CANADA
DEPARTMENT OF MINES

HON. T. A. CRERAR, MINISTER; CHARLES CAMSELL, DEPUTY MINISTER

BUREAU OF ECONOMIC GEOLOGY

GEOLOGICAL SURVEY

PRELIMINARY REPORT

GROUND-WATER RESOURCES OF THE RURAL MUNICIPALITY OF GOLDEN WEST No. 95 SASKATCHEWAN

BY

B. R. MacKay, H. N. Hainstock & G. L. Scott

Water Supply Paper No. 64

OTTAWA

1936

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CONTENTS

Illustrations

GROUND WATER RESOURCES OF THE RURAL MUNICIPALITY OF GOLDEN WEST, NO. 95, 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 give 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 ago.

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

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

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

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

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

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

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

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

Hydrostatic Pressure. The pressure that causes water in a well to rise above the point at which it is 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 rest 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 Golden West is an area of 324 square miles in the southeastern part of Saskatchewan. It consists of nine townships, described as tps. 10, 11, and 12, ranges 7, 8, and 9, W. 2nd mer. The municipality contains the hamlet of Bemersyde and the villages of Corning and Handsworth, which are located on a branch line of the Canadian National railways running south from Peebles. The village of Corning lies near the centre of the municipality, and is approximately 80 miles southeast of the city of Regina.

Moose Mountain creek flows south through the centre of the municipality. It is an intermittent stream about 10 feet wide, but the valley through which it meanders in the northern half of the municipality is approximately $\frac{1}{2}$ mile wide. The valley slopes are steep and the creek lies at least 75 feet below the level of the plain. Moose Mountain lake is one of a chain of lakes located along the course of Moose Mountain creek. It is a shallow, narrow body of water, approximately 4 miles long. Moose Mountain creek resumes its course from the southeastern part of the lake, through a wide, flat, plain-like valley. It has three main tributaries in this municipality two of which occupy wide, deep ravines, out of all proportion to the size of the present streams. The third tributary is a very small stream that carries the overflow water from Gooseberry and McKinnon lakes to Moose Mountain lake. Numerous coulées carry run-off water in the spring to the creeks and lakes. Small, shallow lakes, the largest of which is Rock lake in township 10, range 8, are scattered through the central and southern townships. The northeastern half of the municipality is partly wooded with poplar, but the southwestern half of the municipality is devoid of any natural tree growth.

Terminal moraine mantles most of the eastern third of the municipality, and also covers the northwestern corner and a strip of country 2 to 4 miles wide extending northwest across the southwestern part of the municipality. Boulder clay or glacial till

occupies a large area in the centre of the municipality and smaller areas at the eastern side and the southwestern corner. A few small areas are covered by glacial lake sands and others by glacial outwash sands and gravels. The surface of the country mantled by moraine is rough and rugged, whereas the other parts of the municipality are relatively flat.

The glacial deposit is very thick, ranging from 200 feet in the low-lying districts that are mantled by glacial till, to 450 feet in the districts in the eastern part of the municipality that are covered by terminal moraine deposits. The contact between the drift and the underlying Marine Shale series has not been definitely established, but is believed to lie at an elevation ranging from 1,900 to 1,950 feet above sea-level.

Water-bearing Horizons in the Unconsolidated Deposits

With the exception of the upper 40 feet, the glacial deposits consist almost entirely of impervious blue clay. The material that composes the upper 40 feet of the drift varies greatly in character within short distances. In the districts that are mantled by glacial till, yellow, sandy clay extends from the surface to the blue clay, or is separated from it by beds of sand or gravel. In the areas that are covered by terminal moraine deposits, yellow clay is present but contains more stones, and layers of boulders are often struck at 20 to 30 feet below the surface. It also contains a few pockets of gravel or sand. In some places red clay is found instead of yellow clay. The two clays are similar except that one has been stained red by iron oxide. In the glacial lake bed districts there is very little or no clay at the surface and sand and gravel extend from the top soil to the blue clay. The sand is usually fine and contains silt in contrast with the coarse sand and gravel of glacial outwash deposits.

Three small areas are outlined (by "A" lines) on Figure 1 where sand and gravel beds are fairly numerous in the first 20 to 50 feet of the glacial blue clay. The three areas lie at the edges of areas of terminal moraine. Elsewhere in the municipality, sand and gravel pockets are of rare occurrence in the blue clay, and for one successful attempt to strike them by boring or drilling there have been approximately ten unsuccessful attempts. The deepest well that struck gravel in blue clay is 255 feet deep, and is located in NE.$\frac{1}{4}$, sec. 24, tp. 11, range 7. The two deepest dry holes were 540 feet and 600 feet, the latter being drilled in sec. 17, tp. 12, range 7, and the former in the vicinity of the village of Corning.

The districts in this municipality wherein the well water supply may be classified as being good, are the following: the southwestern half of township 10, range 7; practically all of township 10, range 8; and the northeastern part of township 12, range 8. Township 10, range 9, may be classified as being patchy. Except for small, isolated areas, the remainder of the municipality may be classified as fair to poor, and adequate supplies of water are difficult to obtain at any depth.

Wells that are dug in the glacial outwash areas can be depended upon to yield an abundant supply of water even in times of drought. Similar conditions exist in the glacial lake sand areas, but in places the sand is so fine that it washes in and shuts off the supply. The water in outwash sands and lake sands comes from the rainfall, as does all the water in the surface deposits, but it seeps into the ground directly. Further, the beds of sand and gravel are porous and are so thick and extensive that enormous quantities of water are stored within them, so that periods of prolonged drought only lower the level of the water table a few feet. The water is not highly mineralized and, therefore, is of good quality for domestic purposes, provided of course that it is not polluted by organic matter.

In the areas that are covered with glacial till and terminal moraine deposits, small beds of sand or gravel can generally be located beneath the yellow or red clay at a depth of 15 feet to 40 feet, but unless the sand or gravel layer is thick and large, which is usually not the case, the supply of water obtained in drought seasons will be very small. The 15-foot to 30-foot wells that strike an aquifer underneath the yellow clay are nearly always unreliable sources of water for stock in periods of drought. The water, however, is not too "alkaline" to prohibit its use for domestic purposes. A few wells, 20 to 50 feet deep penetrated a layer of hard blue clay underlying the yellow clay but above the aquifer. The water supply from these wells is more dependable and the water is under a slight hydrostatic pressure. However, the water is "alkaline" and is suitable only for stock. There are about eight examples of this type of well in township 10, range 9, and there are others scattered throughout the municipality.

It is difficult to obtain water at depths greater than 50 feet, but when it is found, the supply is usually abundant. The water is generally "alkaline" but is suitable for stock, and it is often used for household purposes, although it has a laxative effect until one becomes accustomed to it. Two wells, 195 and 255 feet deep, produce soft water which is under high pressure. The supply of water in the latter well is small, but in the other it is abundant.

No extensive water-bearing horizon occurs in the areas that are mantled by glacial till or terminal moraine deposits, as the sand and gravel aquifers are in the form of pockets in the clays. Numerous dry holes that have not struck anything but blue clay show that these pockets are not abundant. Drilling and boring operations are expensive in regions where this condition exists and unless farmers are able to obtain a sufficient supply of water from shallow wells, it is advisable to collect surface run-off water by means of dugouts or dams. Permanent supplies of water can be collected by

these means, provided the location is suitable and the dugouts are made at least 12 feet deep. Due to its rough topography this municipality contains numerous ideal locations for surface water collection. Moose Mountain lake, Gooseberry lake, Rock lake, and Stone lake are permanent bodies of water which are used as sources of water for stock.

Water-bearing Horizons in the Bedrock

The Marine Shale series underlies the glacial deposits throughout this municipality. Although seven wells have been drilled into it, no water has been struck in the bedrock. Drilling into the Marine Shale is not recommended. Only on very rare occasions has water been obtained from this series of rocks in southeastern Saskatchewan. The water, when found is usually unfit even for stock. It is difficult to distinguish between the marine shale and blue clay. The shale is often locally termed "soapstone". It is of a greyish colour, not blue, and when it is exposed to the atmosphere it breaks up into small cubes. If drilling is undertaken, the farmer is advised to confine his efforts to the glacial deposit which extends down to an elevation of 1,900 to 1,950 feet above sea-level.

GROUND WATER CONDITIONS BY TOWNSHIPS

Township 10, Range 7

The northeastern two-thirds of this township is covered with terminal moraine deposits. The morainal area is bordered on the southwest by a strip of glacial till 2 miles wide. The southwest corner is covered by glacial lake sands. A small area of glacial outwash occurs at the western side of the township. The glacial deposits may vary in thickness from 150 feet in the southwestern corner of the township to approximately 500 feet in the northeastern corner. The elevation of the bedrock surface is not accurately known but is believed to be approximately 1,900 feet above sea-level.

In a strip of country mantled by glacial till, 8 to 20 feet of yellow clay underlies the top soil and overlies a gravel bed, 2 to 10 feet thick. Blue clay, which may contain sand and gravel beds, probably underlies the gravel and may extend down to the bedrock. In the areas that are mantled by outwash and glacial sands, the sands and gravels occur at the surface and are at least 30 feet thick. In the moraine country the upper 20 to 80 feet of covering is composed of yellow clay, sandy clay, and beds of gravel and sand, followed by blue clay that probably extends down to the bedrock. In the northeastern corner, blue clay underlies 30 feet of yellow clay without any occurrence of sand and gravel. In the southwestern part of the township the upper 50 feet of blue clay may contain sand and gravel layers, but in the northeastern half of the township it is uncertain if the blue clay contains many water-bearing horizons, as no deep wells have been sunk.

Except in the extreme northeastern part of the township, farmers do not experience much difficulty in striking a suitable aquifer within 80 feet of the surface. The sandy gravel deposits of the lake bed and outwash regions yield an abundance of fairly

soft, slightly mineralized water, which may be tapped by a sand-point driven 10 to 12 feet into the sand and gravel. Within the glacial till area, the thick bed of gravel that underlies 15 to 20 feet of yellow clay yields hard water, which is not under pressure, but these shallow wells supply sufficient water for 25 to 30 head of stock.

In the central part of the township, in the area of terminal moraine, sand and gravel beds underlying the yellow clay contain water under slight pressure. The water is hard in places and soft in other places, but usually is not strongly "alkaline". In a well located on NW.$\frac{1}{4}$, section 3, water was obtained from a fine sand bed underlying 80 feet of yellow clay. The hydrostatic pressure forced the fine sand up into the well and cut off the supply. A well in SW.$\frac{1}{4}$, section 22, struck gravel below the yellow clay, at a depth of 70 feet. This well delivers an abundance of hard water that is under slight pressure. This aquifer is usually found within 40 feet of the surface and the supply in all the wells is good.

Farmers are advised to dig wells only to the gravel and sand beds that usually underlie the yellow clay. It is possible that water-bearing horizons occur in the upper 50 feet of the blue clay, but the water probably will be "alkaline". Deep drilling into the blue clay is not recommended.

Numerous coulées and undrained depressions in the moraine offer ideal locations for the construction of dams or the excavation of dugouts where there is difficulty in finding gravel below the yellow clay.

The Marine Shale bedrock series underlies the thick glacial covering and it does not contain water-bearing horizons.

Township 10, Range 8

The eastern part and the southwestern corner of the township are fairly level and are mantled with glacial till, glacial lake sands, and glacial outwash deposits. Moose Mountain creek flows

southeast through the eastern part of the township. A small, shallow lake in section 14 was completely dry during the drought of 1930 to 1934. Rock lake, in the southwestern corner of the township, is normally 10 to 15 feet deep, but was only 4 feet deep in 1935.

A belt of terminal moraine extends northwest through the centre of the township. This belt is hilly and has large undrained depressions that hold water in years of average rainfall. The general level of the surface rises from south to north and very little land in the northern twelve sections is under cultivation.

Water conditions are good in this township. In the districts in the eastern and southwestern parts of the township that contain glacial outwash and glacial lake sands, abundant supplies of water can be obtained by driving a sand-point into the bed of sand or gravel that underlies the top soil. The sand and gravel are at least 30 feet thick. The well in the village of Handsworth was dug to a depth of 20 feet in this material and the water maintains a level 10 feet from the surface. The water is hard, but is excellent for drinking and the supply is very large. The drought of 1930-1934 has no effect on the supply from wells dug in these deposits. In the districts that are mantled by glacial till, the upper 10 feet is composed of yellow clay and this is underlain by thick beds of sand and gravel. Wells penetrating these beds yield water sufficient for 25 to 40 head of stock.

In the belt of terminal moraine the upper 40 feet is composed of a mixture of yellow, grey, or white clay, sand and gravel, and blue clay. Usually yellow clay, 8 to 25 feet deep, underlies the top soil and is followed by pockets of gravel and sand. The water supply from wells in this material is variable, one well watering only 10 head of stock whereas another, a short distance away, will water 40 head of stock. In two wells a strip of blue clay was found between the yellow clay and the gravel.

In these two wells the water is hard but not highly mineralized, and is under pressure. The sand and gravel pockets in the morains are of frequent occurrence and farmers do not experience undue difficulty in tapping them. Dry holes have been bored to a maximum depth of 75 feet in the blue clay. The glacial blue clay is about 30 to 50 feet beneath the ground surface everywhere in the township and extends to the Marine Shale bedrock series. It is estimated that the glacial deposit is 150 feet thick, and the lower 100 feet of this deposit is probably all blue clay. Wells should not be dug deeper than 50 feet. The bedrock does not contain water-bearing horizons. In years of average rainfall Moose Mountain creek, and numerous small lakes and sloughs, offer convenient sources of water for stock.

Township 10, Range 9

This township is covered mainly by glacial till and the surface is rolling, rising gradually from an elevation of 2,050 feet at the southern boundary, to an elevation of 2,100 feet at the northern boundary.

Since there are no deep drilled wells in this township the depth of the glacial deposit has not been accurately determined. It is believed, however, from the logs of wells in other townships, that the Marine Shale series lies at an elevation ranging from 1,900 to 1,950 feet above sea-level. Using this figure, the glacial deposit would be approximately 125 feet thick in the southern part of the township, increasing to 150 to 175 feet thick in the northern part. Farmers and well drillers usually term the bedrock Marine Shale as "soapstone".

Except in sections 12 and 13, the glacial deposit is generally composed of 10 to 25 feet of yellow or red clay, 1 to 6 feet of sand, followed by blue clay that probably extends to the bedrock. In many places blue clay immediately underlies the yellow clay and a sand bed is struck at approximately 40 feet from the surface in the blue clay. It is doubtful if sand beds occur at

depths exceeding 50 feet from the surface. In sections 12 and 13 sand and gravel lie beneath the top soil and extend at least 20 feet below the surface. Blue clay probably underlies this thick deposit of lake sands and gravel.

Wells that tap the sand aquifer beneath the yellow clay yield a hard, slightly "alkaline" water, which is not under pressure. The drought of 1930-1934 affected the supply in these wells to a considerable extent, and as a rule only 10 to 15 head of stock can be watered at one of these wells in prolonged dry periods.

A better supply of water is obtained from the fine sand aquifer located at depths ranging from 40 to 45 feet beneath the surface. A 10- to 15-foot layer of blue clay usually overlies this sand and the water is under a slight pressure. The water is hard and highly "alkaline", and is usable only for stock. These wells are only slightly affected by drought, and can be depended upon to yield sufficient water for 30 head of stock. The bed of sand that supplies this water is not of general occurrence, as dry holes 55 feet and 60 feet deep have been made in various parts of the township. At least seven wells, located in sections 2, 7, 18, 26, 27, 33, and 34, draw their water from this source.

The best source of water is in the thick sand and gravel bed in an old glacial lake basin that is located in sections 12 and 13. Medium hard to soft water that may be used for drinking can be obtained anywhere in this area by digging 6 to 10 feet below the surface into the sand and gravel. When the water table falls, due to prolonged drought, the wells need only to be deepened slightly to obtain the same abundant supply of water.

This township contains very few dugouts, but their excavation is advised for those farmers who find difficulty in striking a suitable aquifer within 50 feet of the surface. Drilling is not advised in this township. Westwards, toward Creelman, drilling has proved unsuccessful, and since the same formations occur in this township as in the vicinity of Creelman it is probable that similar failures would occur here. Farmers who are contemplating

sinking a well are advised to test with a 2-inch auger to a minimum depth of 50 feet. In this manner a suitable aquifer may be tapped with a minimum amount of effort.

Township 11, Range 7

The ground surface of the township slopes southwestward and is indented by four ravines that carry spring run-off water southwestward to Moose Mountain creek. The largest ravine cuts almost diagonally through the centre of the township. The banks of this ravine are very steep and rise 50 to 75 feet to the plain level. The ravine floor is approximately 40 to 50 feet wide, and is devoid of tree growth. The ground surface is more undulating in the southern half of the township than in the northern half, and the southern twelve sections are quite thickly wooded with poplar. The northeastern part of the township is mantled by glacial till and the ground surface is fairly flat and sandy. The remainder of the township is covered by terminal moraine deposits.

The glacial deposit is very thick in this township and varies from approximately 200 feet in the southwestern part to 400 or 500 feet in the northeastern part. The terminal moraine is part of the Moose Mountain terminal moraine, a huge mass of material that was deposited by the continental ice-sheet while it was stationary or nearly so. Due to this manner of deposition the materials that constitute the glacial covering do not have any uniform arrangement. As a result, sand and gravel occur in the form of pockets rather than in continuous layers, and they may occur at any depth within the glacial mantle, or be entirely absent. This is the reason why many farmers are unable to strike a suitable aquifer at any depth, whereas their neighbours can obtain a good supply of water at a depth of 20 feet.

The upper 20 feet of the glacial deposit is usually a yellow clay and is underlain by blue clay that extends to the bedrock. The depths of existing wells range from 10 feet to 255 feet, and

numerous dry holes have been dug, bored, and drilled within these depths. The 255-foot drilled well is located in NE.¼, section 24, and the driller's log reveals that 14 feet of surface gravel, 232 feet of blue clay, and 2 feet of hardpan were penetrated before a water-bearing gravel layer was encountered. The water is soft and the hydrostatic pressure causes it to rise to a point 40 feet below the surface. This well, however, can be easily pumped dry. Dry holes 210 feet in depth have been made on this same quarter-section of land. A 20-foot well was bored in SW.¼, section 18, in which the gravel was struck beneath 17 feet of chocolate-coloured clay. The water from this well is hard and is under pressure. In section 12, a farmer has dug and bored forty dry holes to a maximum depth of 80 feet. An 11-foot well in gravel in SE.¼, section 27, cannot be pumped dry, and the water is of excellent quality.

These four examples indicate the well water conditions in this township. It is possible to locate supplies of good water by drilling, but the expense attached to such operations and the uncertainty involved of striking an aquifer, almost prohibits this means of obtaining water.

For those farmers who wish to secure well water, it is suggested that test borings be made with an auger to a maximum depth of 60 feet. In this way a sand or gravel lens may be tapped with a minimum amount of effort. If, however, these tests fail, the alternative method of obtaining water is by collecting and storing the run-off surface waters. The undulating nature of the ground surface provides numerous natural locations for the excavation of deep dugouts. These dugouts will prove successful if the location is such that a maximum amount of run-off water is collected, and the dugout is at least 12 feet deep. Excellent locations for the construction of dams are to be found in the four ravines previously mentioned.

A few springs are found in the ravines, the most notable being in NW.¼, section 23, but the spring water although usable for stock is too "alkaline" for household purposes.

If drilling operations are undertaken, they should be confined to the glacial covering. The bedrock Marine Shale series that underlies the glacial deposit rarely contains water-bearing horizons, and if water is found, it will probably be too highly mineralized for use.

Township 11, Range 8

This township contains Moose Mountain lake, locally termed Long lake, a permanent body of water approximately 5 feet deep. An intermittent tributary of Moose Mountain creek flows south through the township and joins Moose Mountain creek in section 3. This tributary creek is fed from ravines and coulées coming down off the high moraine country to the east. The southwestern corner of the township is covered by a terminal moraine and the topography is extremely rough and broken by sharp ridges and depressions. A small area of glacial outwash sands occurs in sections 2 and 3, and its surface is nearly level. North of the lake and east to the tributary creek, the ground surface is fairly level and rises gradually from an elevation ranging from 2,050 feet near the lake, to an elevation of 2,150 feet at the northern border of the township. This part of the township is covered by glacial till.

The glacial covering is estimated to be 150 to 225 feet thick in this township. Yellow clay underlies the top soil to a depth ranging from 12 to 40 feet. This yellow boulder clay usually overlies a sand or gravel bed, or a layer of boulders. Blue clay is struck at a depth of 40 feet or less from the surface, and extends to the bedrock Marine Shale series. The blue clay contains a few layers of sand.

Most of the wells in this township have been dug or bored to the sand or gravel layer that underlies the yellow clay. In seasons of average rainfall these wells produce a sufficient supply of water for 25 head of stock, but during the drought of 1930-1934 they proved to be very unreliable. The water is hard and usually slightly "alkaline" but it is suitable for house use.

Water horizons that furnish an abundant supply of usable water are extremely difficult to locate in the blue clay. Two farmers in this township have been successful in obtaining a good supply of water from a sand aquifer. An 80-foot bored well in SE.¼, section 16, delivers a hard water that rises under pressure to a point 40 feet below the surface. The supply is abundant and unaffected by drought conditions. The second well was drilled 195 feet deep in NW.¼, section 35, and the water is soft and rises to a point 100 feet below the surface. This well supplies the drinking water for the village of Corning. Whereas these two farmers have been successful, many others have failed in repeated attempts to locate water. The deepest dry hole in the township is in NW.¼, section 36, near Corning, and is 540 feet deep. This hole undoubtedly penetrated a considerable distance into the bedrock. The village of Corning has made eight unsuccessful attempts to locate a water supply, dry holes having been made to a maximum depth of 210 feet. A 300-foot drilled hole was put down in NE.¼, section 14, but it produced only 2 barrels of water a day. Numerous unsuccessful attempts have been made to obtain water within 100 feet below the surface. The sand, therefore, must occur as small, isolated beds within the blue clay.

In digging or drilling a well in this township, it is advisable to confine the operation to the glacial deposit, which probably does not exceed a depth of 225 feet. Water-bearing horizons are very rarely found in the shale or "soapstone", and if they are found the water is too salty for farm use. Moose Mountain lake has been the source of water for stock for many farmers during the drought, and if it had not been for this permanent body of water the shortage of water in this township would have been serious during 1930-1934. There are many natural locations in this township for the construction of dams and the excavation of small, deep dugouts.

Township 11, Range 9

In years of average rainfall this township contains two large bodies of water, Gooseberry and McKinnon lakes. Gooseberry lake holds approximately 10 feet of water, but since 1930 it has not held more than 4 feet and this water has become stagnant. McKinnon lake has been dry since 1932 and Gooseberry lake is said to have contained less water in 1935 than in any year since 1903.

Gooseberry lake is a remnant of a larger glacial lake and is surrounded by glacial lake sands. Terminal moraine, glacial till, and glacial outwash mantle most of the township.

The thickness of the glacial covering is estimated at 175 to 200 feet. The glacial deposit consists of a mixture of yellow, red, or grey clay, beds of fine sand, rocks and stones, and blue clay. The upper 10 to 30 feet of glacial covering is usually composed of the lighter coloured clays which often contain large boulders and very small layers of sand. In the vicinity of Gooseberry lake a bed of quicksand underlies the boulder clay, but elsewhere in the township a strip of blue clay, 3 to 10 feet thick, usually separates the boulder clay from the sands. Blue clay extends to bedrock from a point 50 feet below the surface.

The best wells in the township are dug to the quicksand that is located approximately 20 feet from the surface. These wells deliver an abundant supply of hard, usable water, under a very slight hydrostatic pressure. The main disadvantage of these wells is that the quicksand washes in and cuts off the supply, and the wells must be cleaned out often. These wells are not affected by drought and will supply 35 head of stock. A well of this type is located in SW.$\frac{1}{4}$, section 22.

In the southwestern part of the township the water conditions are extremely poor. No well in this district yields sufficient water for 15 head of stock. Farmers do not experience difficulty in striking sand, but the sand beds are either dry, or they produce a very small supply of water. Numerous dry holes have

been dug or bored to a maximum depth of 170 feet. The majority of the farmers in this area rely upon Gooseberry lake as a source of water for stock.

Medium hard to soft water is readily obtained from the glacial lake sands and outwash sands in the northwestern corner of the township.

Drilling or boring to depths in excess of 50 feet is not advisable. If a water-bearing horizon is encountered in the blue clay, the water will probably be highly "alkaline". The Marine Shale series yields only salty water or none at all. The undulating nature of the ground surface furnishes numerous locations for the excavation of dugouts.

Township 12, Range 7

The comparatively flat, sandy ground surface in the southeastern corner of the township is covered by glacial till, whereas the remainder of the township is undulating and is mantled by terminal moraine deposits. The ground surface rises from an approximate elevation of 2,225 feet at the western boundary of the township, to an approximate elevation of 2,325 feet at the eastern boundary. Two small ravines in the western part carry spring run-off water to an intermittent creek located in township 12, range 8. Very little of the southeastern part of the township, which is mantled by sandy glacial till, is under cultivation.

The thickness of the glacial deposit is not accurately known, although several deep drilled holes have been made in the township. One hole, in section 17, was drilled to a depth of 600 feet and it was reported that blue clay was encountered to the bottom of the hole. It is probable that part of the blue clay was mistaken for the bedrock Marine Shale, since the two materials are not unlike in appearance. It is believed that the bedrock lies at approximately 300 to 400 feet below the surface. Except for the upper 30 feet of yellow boulder clay, the glacial deposit

is almost entirely composed of blue clay. Farmers experience great difficulty in striking a suitable water-bearing horizon at any depth in the glacial deposit. Usually, sand or gravel beds are found to underlie the yellow clay, but the supply of water fluctuates with rainfall conditions and the wells are not dependable, especially in periods of prolonged drought. Generally, farmers have two or three shallow wells and they use all of them in an effort to water their stock, but in the dry years of 1930-1934 even this method failed.

Numerous attempts have been made to secure a water supply from water-bearing horizons in the blue clay, and, except in four cases, the wells have produced a very small supply or they were entirely dry. The four productive wells are in sections 18, 25, and 32. The depths of the wells are 52, 195, 85, and 93 feet, respectively. Many dry holes have been made in excess of these depths, even on the same sections where the successful wells have been made. The water obtained is hard and usually "alkaline", but is usable for stock. The water in the 85-foot and 93-foot wells is under hydrostatic pressure, whereas the water in the 52-foot and 195-foot wells is not under pressure although the supply is abundant.

Although abundant quantities of "alkaline" water can be found in sand or gravel lenses in the blue clay, the expense involved in drilling, and the uncertainty of encountering a sand pocket, make this method of obtaining water almost out of the question. The only alternative to drilling operations as a means of obtaining a permanent supply of large quantities of water, is by the construction of dams or the excavation of dugouts. If drilling operations are undertaken, efforts should be confined to the upper 400 feet. It is not recommended to drill into the Marine Shale or "soapstone".

Township 12, Range 8

Moose Mountain creek flows in a southerly direction through the western part of this township, and an intermittent tributary of Moose Mountain creek passes through the eastern part and joins it

in the township lying immediately to the south. The smaller creek drains the moraine country in the eastern part of the township, whereas Moose Mountain creek drains the highland to the west. Both of these creek flow through wide, deep ravines, out of all proportion to the size of the present streams. Smaller ravines and coulées leading to the two main ravines interrupt the gently rolling surface of the township. Stone lake, a small permanent body of water 8 feet deep, occurs in section 32. The lake is probably spring fed, since drought periods have had little effect on its supply.

The western edge of the Moose Mountain terminal moraine is contained in the eastern mile of the township, and a smaller terminal moraine is also found in sections 19, 30, and part of 31. The remainder of the township is mantled by glacial till. The glacial deposit is approximately 250 feet thick. The upper 15 to 40 feet is usually composed of yellow or red, sandy clay. In some places a bed of sand or gravel separates the lighter clays from the underlying blue clay. Sand and gravel beds are also found in the blue clay.

Ground water conditions are much better in the northern and eastern parts of this township than they are in the southern and western parts. A number of wells located on the edge of the Moose Mountain terminal moraine have tapped sand and gravel layers in the blue clay at depths of 25 to 70 feet from the surface. The water in the wells rises to a point ranging from 10 to 20 feet above its source, and the supply is not affected by drought conditions. The water is hard and slightly "alkaline" but can be used for domestic purposes, as well as for stock. A similar type of well, 70 feet deep, was bored in section 21.

Wells that have been dug to the sand bed that underlies the yellow clay have proved most unreliable in drought seasons. Shallow wells dug in thick sand and gravel beds located in the bottoms of ravines produce a permanent supply of water. Some of these wells are spring fed, and the water is medium hard to soft, and is not highly mineralized.

In the southern and western parts of the township, sand beds are very difficult to locate at any depth in the glacial deposit. Numerous dry holes have been bored to a maximum depth of 300 feet in blue clay. During the drought, farmers in this area have been forced to draw water in tanks from springs in the two main ravines. Some of them have constructed small dugouts and small dams, but they are not large enough to conserve a permanent supply of water.

Drilling operations should not be continued below a depth of 300 feet since the bedrock Marine Shale or "soapstone" is not a source of usable water.

Township 12, Range 9

The slightly undulating nature of the ground surface of this township is broken by a ravine that passes through the township and joins Moose Mountain creek in section 1. The floor of this ravine is approximately 40 feet wide and the banks rise steeply, 40 to 50 feet, to the plain level. Water flows in this ravine for only a few weeks in the spring. The township contains fifteen to twenty abandoned farms, and only a small proportion of the land is under cultivation. With the exception of the southeastern corner, the township is fairly thickly bushed with poplar.

Some of the wells in the township are dug to a gravel or sand aquifer 45 feet below the surface, but most of them tap the sand layer that underlies the yellow clay at approximately 15 to 20 feet from the surface. The deeper wells strike gravel under a layer of blue clay.

As a rule, little difficulty is experienced in locating a water-bearing horizon at shallow depths, and although the supply is not abundant, a sufficient quantity of water is usually obtained. The shallow, 15-foot to 20-foot wells have had their supply depleted by the drought of 1930-1934, but 15 to 25 head of stock can be watered at one well. The deeper wells, which penetrate grey or blue clay before striking gravel, have not been affected

by lack of rainfall to any great extent, and one of these wells, located in NE.¼, section 20, supplies sufficient water for 100 head of stock. Shallow wells, dug in the thick sandbbeds in the bottoms of the ravines, furnish good supplies of water, although the quantity has diminished in the drought periods.

The glacial covering is approximately 200 feet thick in this township, and it is quite possible that water-bearing horizons will be found at depth in the blue clay. Since the upper 40 feet of covering contains suitable water-bearing sand and gravel beds, it is not advisable to undertake expensive drilling operations that possibly will end in failure. If deep drilling is attempted it is advised that the search for water be confined to the 200 feet of glacial covering. Suitable water-bearing horizons will not be found in the bedrock Marine Shale that underlies the glacial deposit.

STATISTICAL SUMMARY OF WELL INFORMATION IN RURAL MUNICIPALITY OF GOLDEN WEST, NO. 95, SASKATCHEWAN

West of 2nd mer. Township / Range	10 7	10 8	10 9	11 7	11 8	11 9	12 7	12 8	12 9	Total No. in Municipality
Total No. of Wells in Township	57	76	85	93	70	99	94	81	50	705
No. of wells in bedrock	0	0	0	0	2	0	3	2	0	7
No. of wells in glacial drift	57	76	85	93	68	99	91	79	50	698
No. of wells in alluvium	0	0	0	0	0	0	0	0	0	0
Permanency of Water Supply										
No. with permanent supply	31	30	28	22	24	19	18	32	20	224
No. with intermittent supply	8	8	16	9	2	5	10	4	9	71
No. dry holes	18	38	41	62	44	75	66	45	21	410
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	2	10	6	2	2	2	8	1	40
No. of non-artesian wells	32	36	34	25	24	22	26	28	28	255
Quality of Water										
No. with hard water	37	35	40	27	25	23	28	34	29	278
No. with soft water	2	3	4	4	1	1	0	2	0	17
No. with salty water	0	1	0	0	0	0	0	0	0	1
No. with "alkaline" water	8	3	17	13	9	10	7	9	11	87
Depths of Wells										
No. from 0 to 50 feet deep	46	67	81	66	45	80	58	62	50	555
No. from 51 to 100 feet deep	10	9	4	22	14	11	27	13	0	110
No. from 101 to 150 feet deep	1	0	0	2	3	3	4	4	0	17
No. from 151 to 200 feet deep	0	0	0	1	6	5	2	0	0	14
No. from 201 to 500 feet deep	0	0	0	2	1	0	2	2	0	7
No. from 501 to 1000 feet deep	0	0	0	0	1	0	1	0	0	2
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	34	32	31	26	21	20	25	32	25	246
No. not usable for domestic purposes	5	6	13	5	5	4	3	4	4	49
No. usable for stock	39	36	39	30	26	24	28	36	28	286
No. not usable for stock	0	2	5	1	0	0	0	0	1	9
Sufficiency of Water Supply										
No. sufficient for domestic needs	39	35	43	31	24	23	27	35	29	286
No. insufficient for domestic needs	0	3	1	0	2	1	1	1	0	9
No. sufficient for stock needs	27	24	22	19	14	11	14	24	14	169
No. insufficient for stock needs	12	14	22	12	12	13	14	12	15	126

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 boilers 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 harness 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 Golden West, No. 95, 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.	NW.	16	10	8	2	10	2,240	1,700	1,500	200	33	275	320	346	1320		2,072	275	403		1,031		309	54		* 1
2.	NW.	13	10	9	2	7	380	280	220	60	10	130	50	61	131		310	90		33	134		36	17		* 1
3.	NW.	23	11	7	2	Spring	2,480	1,800	1,500	300	75	305	390	284	1,292		2,158	305	532		846		351	124		* 1

Water samples indicated thus, * 1, are from glacial drift.
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

Three samples of water, taken from two wells and a spring in the glacial drift, have been analysed and the results appear on the accompanying sheet. The waters from the 10-foot well and from the spring are derived from a gravel aquifer in the terminal moraine and glacial till deposits, respectively. The 7-foot well is located in deposits of glacial lake sands.

The quality of the water from the 10-foot well, and from the spring, is typical of water that is found in shallow wells located in the glacial till and moraine deposits of this municipality. The analysis data of these two samples are practically identical. The total solid content of 2,100 parts per million is not considered excessive in Saskatchewan, although in some parts of the world this water would not be regarded as usable for human drinking purposes. The three main constituents of the total dissolved solid content are $MgSO_4$, $CaSO_4$, and Na_2SO_4, their abundance decreasing in the order given. These waters would have a laxative effect upon people not accustomed to their use. The waters analysed are suitable for stock.

The water from the 7-foot well is typical of the water from glacial lake sands and glacial outwash sand and gravel deposits. The main source of the dissolved salts in ground water in this municipality are the yellow and blue clay. Since the glacial lake sands and outwash gravels usually underlie the top soil, seepage water does not come into contact with clay and as a result the total dissolved salts content of the water is very low. The total dissolved content of 310 parts per million is so small that this water would be considered excellent for domestic purposes anywhere so far as the mineral content is concerned. Although the wells in glacial lake sands and outwash deposits deliver abundant quantities of excellent water, great care must be taken that these wells do not become contaminated. Wells dug near barns will easily become polluted by organic matter of animal origin, and since the sand and gravel bed

is so extensive this one polluted well may contaminate others a considerable distance away. Popular opinion is that water from thick beds of sand is always pure. This is not true, as the water may be contaminated by harmful bacteria. The well in the village of Handsworth produces water with a low mineral salt content, but, like the well from which the water was analysed, there is no top covering of impervious yellow clay to prevent easy contamination by organic matter. Water from these shallow wells should be examined regularly for bacteria, especially if they are being used as a source of water for towns, schools, and domestic purposes.

Water from the Bedrock

No wells produce water from the bedrock in this municipality. Only on very rare occasions has water been located in the Marine Shale series, and when it has been found the water is so highly mineralized with $MgSO_4$, Na_2SO_4, and NaCl, that it cannot be used even for stock.

WELL RECORDS—Rural Municipality of GOLDEN WEST NO. 95, 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	SW.	1	10	7	2	Dug	22	2,035	- 19	2,016	22	2,013	Glacial quick-sand	Mod. hard		D, S	Good supply; pumps dry but refills fast.
2	NW.	3	"	"	"	Bored	80	2,040	- 75	1,965	80	1,960	Glacial quick-sand	Hard, "alka-line"	42	S	Poor supply; pumps dry, refills in 70 hours.
3	SW.	4	"	"	"	Sand-point	9	2,005	- 7	1,998	0	2,005	Glacial sand and gravel	Soft		D, S, I	Abundant supply.
4	SE.	9	"	"	"	Dug	28	2050	- 15	2,035	27	2,023	Glacial sand	Hard, "alka-line"	44	S	Good supply; decreases in winter. Laxative effect on humans.
5	SW.	10	"	"	"	"	42	2,045	- 20	2,025	42	2,003	" " and gravel	Hard	41	D, S, I	Sufficient for 100 head stock.
6	NW.	10	"	"	"	Bored	22	2,095	- 12	2,083	12	2,083	Glacial sand	"	41	D, S, I	Abundant supply for 20 head stock.
7	NE.	14	"	"	"	Spring		2,150	0	2,150			"	"		D, S	Intermittent flow.
8	SW.	15	"	"	"	Dug	36	2,100	- 22	2,078	36	2,064	" gravel	"	42	D, S	Abundant supply.
9	NW.	16	"	"	"	"	20	2,050	- 6	2,044	20	2,030	"	Soft		D, S	Good supply.
10	NE.	17	"	"	"	"	18	2,055	- 10	2,045	18	2,037	"	Hard	41	D, S	" " .
11	SW.	17	"	"	"	"	20	2,035	- 18	2,017	18	2,017	"	"	42	D	School well; sufficient supply.
12	NE.	18	"	"	"	"	30	2,045					" sand and gravel	"	41	D, S	Sufficient for 10 head stock.
13	SW.	18	"	"	"	"	20	2,025	- 12	2,013	8	2,017	Glacial gravel	"	43	D, S	" " 40 " " .
14	NW.	18	"	"	"	"sand-point	30	2,025					"	"	40	D, S	Abundant supply.
15	SW.	22	"	"	"	Drilled	70	2,098	- 58	2,040	70	2,028	"	"	42	D, S	Well cannot be pumped dry.
16	SE.	30	"	"	"	Dug	12	2,050	- 8	2,042	0	2,050	"	"	46	D, S	Intermittent well.
17	NE.	30	"	"	"	"	13	2,100	- 9	2,091	9	2,091	"	"	46	D, S	Abundance of water for 30 head stock.
18	NW.	30	"	"	"	"	60	2,075	- 30	2,045	60	2,015	" coarse sand	"	42	D, S	Sufficient for 15 head stock.
19	SW.	34	"	"	"	"	10	2,260	- 6	2,254	0	2,260	" gravel	"	46	D, S	" " 80 " " .
20	SE.	35	"	"	"	"	30	2,355					" clay				Dry hole.
21	SE.	36	"	"	"	"	26	2,415					"				" " .
1	SW.	2	10	8	2	Dug	18	2,040	0	2,040	4	2,036	" quick-sand	Hard, iron, "alkaline" soda, salty, yellow colour		S	Insufficient for 20 head stock; laxative effect
2	NE.	4	10	8	2	Dug	12	2,040	- 6	2,034	9	2,031	Glacial sand	Soft		D, S	Good supply for 15 head stock.
3	NW.	8	"	"	"	"	8	2,050	- 4	2,046	0	2,050	"	" "alkaline"		D, S	Sufficient for 90 head stock.
4	NW.	9	"	"	"	Bored	41	2,050	- 23	2,027	36	2,014	"	Hard		D, S	" " 20 " " .
5	NE.	10	"	"	"	Dug	9	2,060	0	2,060	0	2,060	" gravel	"		D, S	Water seepage from lake.

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 GOLDEN WEST NO.95, 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	NE.	12	10	8	2	Sand-point	12	2,040	- 9	2,031	0	2,040	Glacial gravel	Hard, iron		D, S	Sufficient for 40 head stock; irrigation results fair.
7	NE.	15	"	"	"	Bored	24	2,055	- 21	2,034	21	2,034	" "	"		D, S	Sufficient for 20 head stock.
8	NE.	16	"	"	"	Dug	28	2,060	- 22	2,038	25	2,035	Glacial gravel	Hard, "alkaline"		S	Sufficient for 15 head stock; in dry years.
9	NW.	16	"	"	"	"	10	2,055	- 7	2,048	10	2,045	" "	Hard		D, S, I	Abundant supply for 30 head stock. #
10	SW.	17	"	"	"	"	9	2,050	- 0	2,050	7	2,043	" sand	"		D, S	Sufficient for 40 head stock.
11	SE.	18	"	"	"	"	9	2,050	- 7	2,043	8	2,042	" gravel	Soft, "alkaline"		D, S	Good supply for 15 head stock.
12	NW.	20	"	"	"	Bored	47	2,065	- 17	2,048	37	2,028	"	Medium hard		D, S	" " " 15 " " .
13	NE.	20	"	"	"	Dug	9	2,070	- 7	2,063	1	2,069	" coarse sand	" "		D, S	" " " 35 " " .
14	NW.	22	"	"	"	"	20	2,055	- 16	2,039	19	2,036	" gravel	Hard, iron		S	Sufficient for 50 " " .
15	NE.	23	"	"	"	Sand - point	14	2,040	- 12	2,028	5	2,035	" sandy gravel	"		D, S, I	Abundant supply for 40 head stock.
16	SE.	35	"	"	"	Dug	20	2,050	- 10	2,040	3	2,047	Glacial	"		D, S	Village of Handsworth well; abundant supply.
17	SE.	29	"	"	"	Bored	38	2,090	- 10	2,080			" gravel	"		D, S	Abundant supply for 40 head stock.
18	NE.	30	"	"	"	Dug	15	2,060	- 11	2,049	0	2,060	" "	"		S	Fair supply; occasionally intermittent.
19	NW.	30	"	"	"	"	16	2,055	- 11	2,044	11	2,044	" sand	"		D, S	Sufficient for 30 head stock.
20	NW.	34	"	"	"	"	7	2,040					" gravel	"		D, S	Seepage water from creek.
1	NW.	2	10	9	2	Dug	40	2,045	- 15	2,030	40	2,005	" sand	" "alkaline"		S	Abundant supply, but laxative effect on man.
2	SW.	3	"	"	"	Bored	32	2,055	- 22	2,033	32	2,023	" gravel	" iron		D, S	Slow seepage; level constant.
3	SW.	4	"	"	"	"	18	2,060	- 14	2,046	12	2,048	" sand	" "alkaline"		D, S	Sufficient for 25 head stock.
4	NW.	6	"	"	"	"	30	2,055	- 27	2,028	25	2,030	" clay	" "		D, S	Intermittent well.
5	NE.	7	"	"	"	"	48	2,055	- 25	2,030			" quicksand	" "		S	Abundant supply for 30 head stock.
6	NW.	10	"	"	"	Dug	28	2,050	- 10	2,040	1	2,049	" sand	"		D, S	" " " 70 " " .
7	NW.	13	"	"	"	"	7	2,045	- 0	2,045	1	2,044	" gravel	Soft		D, S	Abundant supply. #
8	SE.	14	"	"	"	"	14	2,050	- 8	2,042	11	2,039	" sand	Medium hard		D, S	Sufficient for 25 head stock.
9	SW.	14	"	"	"	Bored	30	2,055	- 24	2,031			" "	Soft		D, S	" " 20 " " .
10	SE.	16	"	"	"	Dug	19	2,060	- 10	2,050	19	2,041	" "	Hard		D, S	Intermittent well.
11	NE.	18	"	"	"	Bored	36	2,065	- 15	2,050	36	2,029	" gravel	" iron		D, S	Insufficient for 50 head stock.
12	SW.	18	"	"	"	Dug	45	2,075			44	2,031	" sand	" "alkaline"		S	Barely enough for 20 head stock.

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

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

WELL RECORDS—Rural Municipality of GOLDEN WEST NO. 95 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
13	SE.	20	10	9	2	Dug	27	2,075	- 13	2,062	25	2,050	Glacial sand	Medium hard		D, S	Sufficient for 20 head stock.
14	SW.	21	"	"	"	"	20	2,065	- 17	2,048	19	2,046	" "	Hard		D, S, I	Insufficient for 15 head stock; irrigation results good.
15	NE.	21	"	"	"	Bored	24	2,075	- 10	2,065	22	2,053	" "	"		D, S, I	Insufficient for 10 head stock.
16	NE.	22	"	"	"	"	55	2,065	- 15	2,050			" clay	" "alkaline"		S	" " 12 " " .
17	SE.	22	"	"	"	Dug	40	2,060					"	" " iron		S	Sufficient " 10 " " .
18	SW.	26	"	"	"	Bored	45	2,075	- 22	2,053	38	2,037	" sand	Hard, "alkaline"		S	Abundant supply.
19	SE.	27	"	"	"	"	46	2,075	- 24	2,051	39	2,036	" "	Hard, "alkaline"		S	Sufficient for 20 head stock.
20	NE.	28	"	"	"	Dug	40	2,085	- 15	2,070	39	2,046	" gravel	Hard, "alkaline"		D, S	Intermittent wupply; water produces laxative effect on man.
21	NW.	28	"	"	"	"	20	2,090	- 10	2,080	19	2,071	" sand	Hard		D, S, I	Intermittent supply.
22	SW.	30	"	"	"	"	28	2,075	- 20	2,055	26	2,049	" "	" iron, slightly "alkaline"		S	Insufficient for 35 head stock.
23	NW.	32	"	"	"	Bored	25	2,100	- 15	2,085			" "	Hard		D, S	Well requires cleaning.
24	SE.	32	"	"	"	Dug	12	2,090	- 2	2,088	9	2,081	" "	"		D, S	Sufficient for 25 head stock.
25	SE.	33	"	"	"	Bored	40	2,100	- 14	2,086	39	2,061	" gravel	" iron		D, S	" " 12 " " .
26	SW.	34	"	"	"	Dug	20	2,090	- 6	2,084	18	2,072	" sand	Soft		D	Seepage frp, slough water.
27	NW.	34	"	"	"	Bored	45	2,100	- 23	2,077	44	2,056	" "	Hard, iron		D, S, I	Constant supply, but seepage is slow, waters 25 head stock.
1	SE.	1	11	7	2	Bored	65	2,405	- 40	2,365	50	2,355	" gravel	" " "alkaline"		D, S	Sufficient for 40 head stock at least, laxative effect on man.
2	SE.	2	"	"	"	Dug	22	2,365	- 20	2,345	20	2,345	"	Hard		D, S	Insufficient for 10 head stock.
3	SE.	3	"	"	"	"	20	2,335	- 18	2,317	0	2,335	" sand and gravel	Soft		D, S, I	Well cannot ne pumped dry.
4	NW.	3	"	"	"	Bored	42	2,310	- 34	2,276	34	2,276	Glacial	Hard, "alkaline"		D, S	Abundant supply; laxative effect on man.
5	SW.	4	"	"	"	Dug	12	2,265	- 6	2,259	8	2,257	" sand	Hard, "alkaline"		S	Small supply in dry seasons, water has a laxative effect on man.
6	SW.	5	"	"	"	Bored	55	2,180					"				Dry hole.
7	SE.	8	"	"	"	Dug	6	2,260	0	2,260	0	2,260	" sand	Medium hard, iron		D, S, I	Well situated in coulee and is spring fed; barely enough for 10 head stock.
8	NW.	10	"	"	"	"	20	2,315	- 16	2,299	19	2,296	" fine sand	Hard		D, S	Sufficient for 30 head stock good well but must be cleaned often.
9	NE.	10	"	"	"	"	20	2,345					"				Dry hole.
10	NW.	12	"	"	"	"	80	2,380					"				" " .
11	SW.	14	"	"	"	Bored	100	2,365	- 85	2,280	95	2,270	" gravel	Hard, iron, "alkaline"		S	Abundant supply for 20 head stock.

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

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

WELL RECORDS—Rural Municipality of GOLDEN WEST NO. 95 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
13	SE.	16	11	7	2	Dug	15	2,290	0	2,290	15	2,275	Glacial gravel	Hard		D, S, I	Sufficient for 20 head stock.
14	SW.	18	"	"	"	Bored	20	2,175	- 6	2,169	18	2,157	" "	Medium hard, iron		D, S	Good supply for 10 head stock.
15	NW.	22	"	"	"	Dug	17	2,300	- 4	2,296	15	2,285	" sand	Hard, "alkaline"		N	Water condemned by analyst; stock are watered at permanent springs.
16	NW.	23	"	"	"	Spring		2,260					" "	Hard, "alkaline" iron		S	Sufficient for 25 head stock; neighbours haul for stock. #
17	NE.	24	"	"	"	Drilled	255	2,365	- 38	2,327	249	2,116	" gravel	Soft		D, S	Small supply, water comes in slowly; insufficient for 20 head stock.
18	SE.	25	"	"	"	Dug	10	2,360	0	2,360	1	2,359	" "	"		D, S	Intermittent well.
19	SE.	27	"	"	"	"	11	2,310	- 8	2,302	0	2,310	" "	"		D, S, I	Well cannot be pumped dry good well; neighbours haul water.
20	NE.	32	"	"	"	"	10	2,190	- 6	2,184	1	2,189	" "	Hard		D, S	Sufficient for 30 head stock.
21	NE.	32	"	"	"	Bored	24	2,260	- 8	2,252			" "	" "alkaline"		D, S	" " 15 " " .
22	SW.	34	"	"	"	Dug	7	2,270	- 3	2,267			" "	Medium hard		D, S	" " 15 " " .
23	NW.	34	"	"	"	"	12	2,270	- 2	2,268	10	2,260	" "	Hard		D, S	Seepage water from a dugout.
24	NW.	36	"	"	"	"	40	2,320	- 35	2,285	32	2,288	" "	" "alkaline"		D, S	Sufficient for 20 head stock only; laxative effect on man.
25	SE.	36	"	"	"	Bored	30	2,360	- 18	2,342			" sand	"		D, S	Intermittent supply.
1	SW.	2	11	8	2	Dug	7	2,040	- 2	2,038	4	2,036	Glacial sand	Medium hard		D, S, I	Sufficient for 25 head stock.
2	SE.	6	"	"	"	"	35	2,050	- 32	2,018	34	2,016	" gravel	" "		D, I	" " 100 " " .
3	SW.	6	"	"	"	"	41	2,050	- 40	2,010	40	2,010	" "	Hard, iron		S, I	Abundant supply for 40 head stock; but well requires re-digging.
4	NW.	6	"	"	"	"	30	2,070	- 26	2,044	26	2,044	" sand	" "alkaline"		D, S	Poor supply; sufficient for house only.
5	NW.	10	"	"	"	"	26	2,070	- 18	2,052	24	2,046	" " and gravel	Hard, iron, "alkaline"		S	Sufficient for 40 head stock.
6	NE.	14	"	"	"	Bored	22	2,160	- 16	2,144	14	2,146	" sandy clay	Hard		D	" " house only. 300 foot dry hole in bedrock marine shale.
7	SE.	16	"	"	"	"	80	2,075	- 40	2,035			" sand	Hard, iron,		D, S	Abundant supply for 20 head stock.
8	NW.	18	"	"	"	Dug	12	2,075	- 8	2,067	9	2,066	" "	" slightly "alkaline"		D	Sufficient for house use only.
9	SW.	20	"	"	"	"	25	2,075	- 17	2,058	18	2,057	" gravel	Hard		D, S	" " 25 head stock.
10	SE.	20	"	"	"	"	15	2,080	- 7	2,073			" sand	Hard, "alkaline"		D, S	" " house only in dry years.
11	SW.	24	"	"	"	"	20	2,165					"				Dry hole.
12	NE.	28	"	"	"	Drilled	70	2,145	- 60	2,085	58	2,087	" gravel	Hard, iron		D, S	Small supply; waters 25 head stock.
13	SW.	32	"	"	"	Dug	25	2,100	- 10	2,090	11	2,089	" " clay	" slightly "alkaline"		D, S	" " ; sufficient for 20 head stock.
14	SE.	32	"	"	"	"	34	2,120	- 29	2,091	26	2,094	Glacial sand	Hard, "alkaline"		D	Sufficient for house supply only.

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

B 4-4

WELL RECORDS—Rural Municipality of GOLDEN WEST NO. 95, 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.	35	11	8	2	Drilled	195	2,195	-100	2,095			Glacial sand and gravel	Soft		D, S	Sufficient for 80 head stock; water is sold to village of Corning.
16	NW.	36	"	"	"	Bored	36	2,210	- 10	2,200	13	2,197	Glacial gravel	Medium hard		S, I	Sufficient for 25 head stock. 540 foot dry hole in bedrock marine shale.
17	NW.	36	"	"	"	Drilled	200	2,200					"				Dry hole; village of Corning.
18	SW.	36	"	"	"	Bored	24	2,200	- 12	2,188	19	2,181	" sand	Medium hard		D, S	Intermittent supply; slough seepage.
19	SE.	36	"	"	"	"	40	2,215	- 30	2,185	34	2,181	" fine sand	Hard, "alkaline"		S	Insufficient for 12 head stock.
20	NE.	36	"	"	"	"	65	2,225	- 30	2,195	38	2,187	" sand	Hard, "alkaline"		D, S	Sufficient for 20 head stock; laxative effect on man.
1	NE.	2	11	9	2	Dug	20	2,050	- 15	2,035	17	2,033	Glacial gravel	Hard, "alkaline"		S	Insufficient for 20 head stock.
2	SW.	2	"	"	"	"	24	2,085	- 18	2,067	24	2,061	" sand	Hard, "alkaline"		S	Sufficient for 10 headstock; laxative effect on man.
3	SE.	3	"	"	"	"	50	2,095	- 48	2,047	46	2,049	" fine sand	Hard, iron		D	Sufficient for house use only.
4	SW.	3	"	"	"	Borod	60	2,110					" sand	" "alkaline"		D, S	" " 15 head stock in dry years.
5	SW.	4	"	"	"	"	30	2,105	- 10	2,095	17	2,088	" "	Hard		D	" " house use only.
6	SE.	5	"	"	"	"	36	2,105	- 1	2,104			"	"		D	Seepage water from a dugout.
7	NW.	5	"	"	"	"	40	2,120					"				Dry hole.
8	SW.	6	"	"	"	Dug	50	2,100					"				" " .
9	NW.	6	"	"	"	Bored	20	2,125	- 8	2,117	18	2,107	" sand	Hard		D, S	Good supply in wet seasons; well was dry in 1934.
10	NW.	7	"	"	"	Dug	30	2,155	- 23	2,132			" "	""alkaline"		N	Well not in use at present.
11	NE.	12	"	"	"	"	14	2,065	- 6	2,059	11	2,054	" "	"		D, S, I	Sufficient for 50 head stock.
12	NE.	14	"	"	"	"	16	2,050	- 13	2,037	16	2,034	" quicksand	"		D, S	" " 30 " " .
13	SW.	15	"	"	"	"	20	2,090	- 8	2,082	18	2,072	" "	"		D, S, I	Good supply for 15 head stock.
14	SE.	16	"	"	"	Bored	26	2,100	- 17	2,083	22	2,078	" sand	"		D, S	Abundant supply for 25 head stock.
15	SW.	17	"	"	"	Dug	30	2,145					"				Dry hole.
16	SW.	18	"	"	"	Bored	30	2,155	- 15	2,140	26	2,129	"	Hard		D	Supplies the house only.
17	SW.	20	"	"	"	Dug	28	2,120	- 25	2,095	27	2,093	" sand and rocks	"		D, S	Intermittent supply.
18	SW.	22	"	"	"	"	23	2,105	- 20	2,085	21	2,084	Glacial sand	"		D, S	Sufficient for 70 head stock; trouble with sand caving in.
19	SE.	28	"	"	"	Bored	25	2,080					"			N	Well caved in and has not been cleaned out.
20	SW.	28	"	"	"			2,075									No well.
21	SE.	30	"	"	"			2,100									" " .

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

WELL RECORDS—Rural Municipality of GOLDEN WEST NO.95 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
22	SW.	30	11	9	2	Dug	18	2,120	- 12	2,108	17	2,103	Glacial quick-sand	Hard, slightly "alkaline" iron		D	Good supply, but only used for domestic purposes.
23	NW.	32	"	"	"	"	12	2,075	- 8	2,067	0	2,075	Glacial sand	Soft		D, S	Good supply for 20 head stock.
24	SW.	34	"	"	"	"	24	2,100	- 3	2,097	21	2,079	" "	Medium hard		D, S, I	Sufficient for 35 head stock.
1	SW.	2	12	7	2	Bored	70	2,315	- 46	2,269	56	2,259	Glacial gravel	Hard, iron		D, S	Sufficient for about 30 head stock; laxative effect on man.
2	NW.	4	"	"	"	Dug	14	2,295	- 7	2,288			" sand	"		D, S	Sufficient for 10 head stock.
3	NW.	6	"	"	"	"	30	2,250	- 16	2,234	0	2,250	" "	"		D, S	Poor supply; varies greatly with rainfall.
4	NE.	8	"	"	"	"	16	2,285	- 12	2,273	14	2,271	" sand and gravel	"		D, S	Good supply for 20 head stock.
5	NE.	9	"	"	"	"	27	2,315	- 23	2,292	2	2,313	Glacial sand	"		D, S	Sufficient for about 10 head stock.
6	SW.	10	"	"	"	Bored	20	2,310					"	"		D	Intermittent supply.
7	SE.	14	"	"	"	"	18	2,315	- 4	2,311			"	"		D	" " ; dugout seepage.
8	SE.	17	"	"	"	"	30	2,290	- 28	2,262	30	2,260	" sand	"		D	" " . 600 foot dry hole on the SW.¼. section 17 in bedrock marine shale.
9	NW.	18	"	"	"	"	52	2,290	- 46	2,244	52	2,238	" gravel	" "alkaline"		D, S	Well has never been pumped dry; water poor for irrigation. 500 foot dry hole in bedrock.
10	SE.	20	"	"	"	"	23	2,285	- 9	2,276	18	2,267	" "	"		D, S, I	Intermittent supply.
11	NW.	23	"	"	"	Dug	20	2,310	- 16	2,294	18	2,292	" "	""alkaline"		D, S	Sufficient for 35 head stock.
12	NE.	24	"	"	"	"	21	2,300	- 18	2,282	14	2,286	" "	"		D, S	Insufficient for 20 head stock.
13	SE.	25	"	"	"	Drilled	195	2,300	-191	2,109			" sand	""alkaline"		S	Abundant supply for 40 head stock.
14	SE.	28	"	"	"	Dug	13	2,290	- 2	2,288	6	2,284	" gravel	"		D, S, I	Good supply for 30 head stock.
15	SE.	30	"	"	"	"	18	2,245	- 5	2,240	12	2,233	" "	"		D, S	Well goes dry in drought periods.
16	NE.	30	"	"	"	"	35	2,230	0	2,230			" "	" iron		D, S	Sufficient for 20 head stock.
17	NE.	31	"	"	"	"	22	2,230	- 18	2,212			"	"		D	Intermittent supply. 320 foot dry hole in bedrock marine shale.
18	SW.	32	"	"	"	Bored	85	2,245	- 25	2,220	85	2,160	" gravel	" iron		S	Abundant supply for 20 head stock.
19	SE.	32	"	"	"	"	93	2,255	- 30	2,225	93	2,162	" sand	""alkaline"		D, S	Sufficient for 60 head stock. Laxative effect on man.
20	SW.	34	"	"	"	Dug	25	2,275	- 23	2,252	0	2,275	" "	"		D, S	Intermittent supply.
21	NW.	34	"	"	"	"	12	2,255	- 4	2,251	0	2,255	" gravel	"		S	Insufficient for 30 head stock.
22	SE.	35	"	"	"	"	20	2,285	- 3	2,282			"	""alkaline"		D	Direct seepage from dugout.
1	NE.	2	12	8	2	Bored	22	2,210	- 12	2,198			"	"		D	Intermittent supply. 300 foot dry hole in bedrock marine shale.

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 GOLDEN WEST NO. 95, 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	SE.	5	12	8	2	Bored	25	2,125	- 17	2,108	1	2,124	Glacial clayey gravel	Hard, iron		D, S	Very poor supply.
3	NE.	6	"	"	"	"	35	2,110	- 15	2,095	20	2,090	Glacial sandy gravel	"		S	Intermittent well.
4	SW.	10	"	"	"	"	22	2,165	- 2	2,163	8	2,157	Glacial sand	"		D, S	" " since 1930.
5	NE.	10	"	"	"	Dug	20	2,150	- 3	2,147	16	2,134	" gravel	"		D, S	Seepage water from a dam.
6	NW.	12	"	"	"	Bored	65	2,210	- 40	2,170			" "	" iron		D, S	Abundant supply for 30 head stock.
7	SW.	13	"	"	"	"	42	2,200	- 32	2,168	42	2,158	" black sand	" "		D, S	Sufficient for 30 head stock at least.
8	NW.	13	"	"	"	"	50	2,200	- 40	2,160			"	""alkaline"		D, S	" " 25 " " .
9	SW.	14	"	"	"	Dug	25	2,170	- 17	2,153	25	2,145	" sand	" "		S	Poor supply even in wet seasons; insufficient for 10 head stock.
10	SE.	16	"	"	"	Bored	120	2,175					"				Dry hole.
11	NE.	16	"	"	"	"	45	2,175	- 35	2,140	31	2,144	" gravel	Hard		D	Sufficient for house only.
12	NE.	19	"	"	"	Dug	9	2,155	- 4	2,151			"	" "alkaline" iron		D, S	Insufficient for 35 head stock; laxative effect on man.
13	SW.	20	"	"	"	"	9	2,080	- 7	2,073	4	2,076	" gravel	Hard		D, S	Good supply for 25 head stock.
14	NE.	21	"	"	"	Bored	70	2,170	- 60	2,110	67	2,103	" sand	" "alkaline"		D, S, I	Abundant supply for 30 head stock; neighbours tank from this well.
15	SW.	22	"	"	"	"	30	2,180					"				Dry hole.
16	SW.	23	"	"	"	Dug	20	2,160	- 16	2,144	0	2,160	" sand	Hard		D, S	Abundant supply; neighbouts tank, sells water to school.
17	NE.	23	"	"	"	"	20	2,165	- 10	2,155	16	2,149	" gravel	Soft		D, S, I	Good supply for 15 head stock.
18	SW.	24	"	"	"	Bored	45	2,215	- 30	2,185			"	Hard, iron, "alkaline"		S	Sufficient for 20 head stock.
19	NE.	24	"	"	"	"	56	2,220	- 34	2,186	52	2,168	" clay?	Hard, "alkaline"		D, S, I	Sufficient for 70 head stock; water comes in fast.
20	SE.	25	"	"	"	Dug	25	2,205	- 10	2,195	18	2,187	" gravel	Soft		D, S, I	Sufficient for 70 head stock.
21	SW.	26	"	"	"	"	15	2,190	0	2,190	1	2,189	" "	Hard, slightly "alkaline"		D, S	Insufficient for 10 head stock.
22	NW.	32	"	"	"	"	6	2,060	- 4	2,056	0	2,060	" "	Hard		D, S	Abundant supply for 20 head stock.
23	SE.	33	"	"	"	"	10	2,110	- 7	2,103	2	2,108	" "	"		D, S	" " " 60 " " .
24	SW.	34	"	"	"	"	12	2,155	- 4	2,151	8	2,147	" sand	Medium hard		D, S, I	Sufficient for 35 head stock.
25	NW.	34	"	"	"	Bored	20	2,175	- 10	2,165			"	Hard, iron, "alkaline"		D	" " 20 " " .
26	NW.	36	"	"	"	Dug	14	2,190	- 9	2,181	0	2,190	" gravel	Medium hard, "alkaline"		D, S	" " 20 " " .Water readily found on this farm.
27	SE.	36	"	"	"	"	25	2,205	- 22	2,183	25	2,180	" "	Hard, iron		D, S, I	Good supply for 15 head stock.
28	NW.	36	"	"	"	Drilled	128	2,200	-113	2,087			"	""alkaline"		S	Poor supply and poor quality; C.N.R. well; used only for stock yard.

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 GOLDEN WEST NO. 95, SASKATCHEWAN.

WELL No.	LOCATION					TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE		PRINCIPAL WATER-BEARING BED			CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
	¼	Sec.	Tp.	Rge.	Mer.				Above (+) Below (−) Surface	Elev.	Depth	Elev.	Geological Horizon				
1	SE.	4	12	9	2	Dug	14	2,120	- 11	2,109	12	2,108	Glacial gravel	Hard		D	Sufficient for house use only.
2	SW.	6	"	"	"	"	12	2,065	- 11	2,054	9	2,056	" "	"		D, S	" " 25 head stock.
3	SE.	10	"	"	"	"	12	2,100	- 8	2,092	1	2,099	" sandy "	Medium hard		D, S, I	" " 15 " " .
4	NW.	13	"	"	"	"	10	2,095	0	2,095	8	2,087	" sand	Hard		D, S	" " 30 " " .
5	NE.	18	"	"	"	"	20	2,120	- 10	2,110	18	2,102	" "	""alkaline"		D, S	Barely " " 15 " " ; laxative effect on man.
6	SW.	18	"	"	"	"	12	2,090	- 8	2,082	8	2,082	" red sand	" iron		D, S, I	Abundant supply for 30 head stock.
7	NW.	19	"	"	"	"	15	2,130	- 6	2,124	9	2,121	" sand	"		D, S, I	Good supply for 25 head stock.
8	NE.	20	"	"	"	Bored	45	2,110	- 40	2,070	40	2,070	" gravel	"		D, S	Sufficient for 100 head stock.
9	SE.	22	"	"	"	Dug	14	2,115	- 12	2,103	13	2,102	" sand	""alkaline"		S	Small supply; insufficient for 17 head stock.
10	SW.	26	"	"	"	Bored	35	2,110	- 32	2,078	32	2,078	" "	" "		S	Never abundant; will water about 25 head stock laxative effect.
11	NE.	30	"	"	"	Dug	12	2,100	- 9	2,091	1	2,099	" gravel	"		D, S	Sufficient for 20 head stock; poor water for irrigation purposes.
12	SW.	32	"	"	"	"	32	2,115	- 20	2,095	30	2,085	" "	"		D, S	Sufficient for 25 head stock at least.
13	NW.	34	"	"	"	"	20	2,100	- 5	2,095	17	2,083	" sand	""alkaline"		S	Insufficient for 40 head stock in dry years and winters.
14	NE.	34	"	"	"	"	15	2,070	- 11	2,059	7	2,063	" fine sand	"		D, S, I	Abundant supply for 40 head stock.
15	SW.	36	"	"	"	"	14	2,155	- 4	2,151	12	2,143	" sand and gravel	Medium hard		D, S, I	Sufficient for 15 head stock.
16	NE.	36	"	"	"	"	24	2,160	- 12	2,148	23	2,137	Glacial sand	Hard		D	Intermittent supply.

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

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