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DEPARTMENT OF MINES

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TECHNICAL SURVEYS

GEOLOGICAL SURVEY OF CANADA

WATER SUPPLY PAPER No. 176

PRELIMINARY REPORT

GROUND-WATER RESOURCES OF THE RURAL MUNICIPALITY OF CALDER NO. 241 SASKATCHEWAN

By

B. R. MacKay, H. N. Hainstock and P. D. Bugg

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BUREAU OF ECONOMIC GEOLOGY

GEOLOGICAL SURVEY

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GROUND WATER RESOURCES OF THE RURAL MUNICIPALITY OF CALDER, NO. 241, 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 Calder, No. 241, is an area of approximately 312 square miles in southeastern Saskatchewan. It consists of six full townships described as tps. 25, ranges 30, 31, and 32, tp. 26, ranges 31 and 32, and tp. 27, range 32; three fractional townships described as tps. 25, 26, and 27, range 33; and three partial townships described as tp. 26, range 30, and tp. 27, ranges 30 and 31, all W. 1st mer. The municipality lies adjacent on the east to the Second meridian and is approximately 150 miles north of the International Boundary line. The centre of the municipality lies 30 miles due east of the city of Yorkton.

Except where cut by several deep valleys the ground surface throughout this municipality is rolling or undulating. The maximum elevation of 1,760 feet above sea-level is attained in the southwestern sections of the municipality. From this area the elevation decreases toward the north and east to a minimum of 1,620 feet above sea-level. Assiniboine valley in the northeastern sections is from 250 to 300 feet deep, approximately 2 miles wide, and the slopes are very steep. Stony creek, a tributary of the Assiniboine, occupies a deep valley in the northern part of the municipality. Other, short, deep, tributary valleys of the Assiniboine occur in the northeastern part of the area. Several small lakes occur throughout the municipality and sloughs are quite common.

The flood-plains of Assiniboine river and several of its wider tributary valleys consist of deposits of Recent alluvium. An area along the western side of the municipality and a small area in the vicinity of Calder are mantled by moraine. These areas are characterized by knolls, ridges, and undrained depressions. The remainder of the municipality is

covered by glacial till or boulder clay. The deposits of glacial till and moraine consist of a weathered or oxidized zone composed of several feet of top-soil, and 10 to 30 feet of yellow boulder clay; and an unweathered zone of blue boulder clay that is known to extend to a depth of 50 to 100 feet in the area bounded by the "A" boundary line shown on Figure 1 of the accompanying map, and to a depth of at least 150 feet in other parts of the municipality. It probably extends to the bedrock. Scattered pockets of sand and gravel occur in the weathered and unweathered boulder clays.

Water-bearing Horizons in the Unconsolidated Deposits

In this municipality water supplies are obtained from Assiniboine river, creeks, lakes, springs, sloughs, dams, dugouts, and from shallow and deep wells. Water from Assiniboine river is used for stock by those farmers living in its vicinity. Stony creek, in the northern part of the municipality, is an important source of water for stock as few wells in this area yield abundant supplies of water. The lakes are permanent bodies of water, although many become stagnant during prolonged periods of drought. Most of the springs are located in the deeper valleys, particularly along the Assiniboine within the "A" boundary line, and they flow throughout the year. The water from sloughs, dams, and dugouts is used to supplement the supply from wells, but in most sections they become dry during the autumn and winter months.

The principal water-bearing horizon of the municipality occurs in the upper 10 to 35 feet of the glacial drift. The horizon is not continuous as it is formed by scattered pockets of sand and gravel that occur within the yellow clay, or in some localities by layers of sand and gravel lying between the yellow and blue boulder clays. Wells that tap

aquifers of large areal extent yield a supply of water sufficient for 50 to 80 head of stock. The water is moderately hard, much of it being locally termed "soft", and is usable for all farm purposes, including the irrigation of gardens in many sections. Wells that tap aquifers of small areal extent yield small or intermittent supplies of water that is more highly mineralized. It is hard and in many cases "alkaline", but with few exceptions is used for drinking and other domestic purposes. From two to five of these shallow wells are used in many cases to obtain sufficient water for local needs. It is advisable to locate deposits of water-bearing sand and gravel by means of a small test auger before digging shallow wells.

A second, discontinuous, water-bearing horizon is located at depths of 40 to 76 feet in the glacial drift. The aquifer is formed by thin layers of sand and gravel that occur within the unweathered or blue clay. It has been tapped at many places throughout the municipality and a large number of wells in the southwestern sections derive water from this source. The water is usually very hard and "alkaline", but that from most of the wells is used for domestic purposes. It has a laxative effect on most persons not accustomed to the use of highly mineralized water. The hydrostatic pressure varies with the individual wells, but in most wells it is sufficient to cause the water to rise to points 15 to 30 feet below the surface. A 76-foot well in the SW.$\frac{1}{4}$, sec. 8, tp. 25, range 31, yields an abundance of water that is under sufficient pressure to rise above the surface. The supply of water available from several of these deeper wells is sufficient for 60 to 100 head of stock, but most of them yield only sufficient supplies for local needs and a few head of stock.

Within the area outlined by the "A" boundary line, wells from 85 to 225 feet deep tap a deposit of sand or gravel

that yields small supplies of water. The sand deposit is from 60 to 175 feet thick and apparently extends to Assiniboine valley, as numerous springs are located along the valley in the outlined area. Most of the wells yield small supplies of water that is not under hydrostatic pressure, and it is thought that the springs drain most of the water out of the sand. A few wells tap beds of gravel, and yield larger supplies of water that is under sufficient hydrostatic pressure to rise to points 75 to 100 feet below the surface. The water is moderately hard and usable for all farm purposes. Although one dry hole was sunk, it appears probable that wells sunk to depths of 100 to 200 feet in this area should locate similar supplies of water. Some difficulty is experienced in keeping the sand from plugging the wells.

In other parts of the municipality few deep drilled wells have encountered water-bearing sands. In townships 25, ranges 30 and 31, a few wells, 80 to 153 feet deep, have tapped aquifers of small areal extent. The water is very highly mineralized and that from some wells is not usable for domestic purposes. A 137-foot well in the NE.$\frac{1}{4}$, sec. 6, tp. 25, range 30, yields an abundance of water, but the others yield supplies sufficient only for local needs. Although a number of dry holes to depths of 80 to 170 feet have been sunk, it is possible that with further prospecting water-bearing sands would be encountered. The uncertainty of obtaining large supplies of water, and the usual poor quality of the water, do not warrant large expenditures for such prospecting operations.

Most of the residents have sufficient water for present local needs. A few, particularly in the northern sections, are forced to haul from creeks or other sources of supply. Dams or dugouts could be used in most sections to retain surface water for stock use. The slightly mineralized surface water is more

beneficial for stock than the highly mineralized water from deep drift wells.

Water-bearing Horizons in the Bedrock

In this part of Saskatchewan the glacial drift is underlain by the Marine Shale series. It is reported in a 172-foot dry hole in the NW.$\frac{1}{4}$, sec. 10, tp. 26, range 30, at an elevation of 1,545 feet above sea-level. Although holes sunk below this elevation in that vicinity did not encounter shale it is possible that a knoll of shale occurs in this section. The driller of this hole reported shale, and did not advise further drilling as the Marine Shale series is considered to be non-water-bearing in this part of Saskatchewan.

GROUND WATER CONDITIONS BY TOWNSHIPS

Township 25, Range 30

This township is mantled throughout by glacial till or boulder clay. The ground surface is slightly rolling with no abrupt changes in elevation. The average elevation of the township is 1,700 feet above sea-level, but there is a slight slope to the east. An unnamed creek flows in an easterly direction through the southern part of the area. Its valley becomes quite deep towards the eastern border of the township.

The glacial drift is at least 225 feet thick in a well in the SE.$\frac{1}{4}$, section 34. It is generally composed of 1 to 3 feet of very sandy top soil; 10 to 20 feet of yellow boulder clay; and blue boulder clay that is thought to extend to bedrock. The 225-foot well and an 85-foot well in the SW.$\frac{1}{4}$, section 35, were drilled through different materials. The 225-foot well passed through 20 feet of yellow boulder clay, 50 feet of blue boulder clay, and 155 feet of sand, and the base of the well is in sand. The 85-foot well passes through a few feet of top-soil and then sand to the base. The southwestern part of the township is more suitable for cultivation than the northeastern.

The supply of water is almost entirely derived from wells. The main water-bearing horizon occurs in the upper 30 feet of the glacial drift, and is formed by scattered pockets of sand and gravel in the yellow boulder clay. A few wells tap pockets of large areal extent and obtain an abundance of water that is usable for all farm purposes including irrigation. Wells that tap pockets of sand and gravel of smaller areal extent yield smaller quantities of more highly mineralized water that is, however, usable for domestic and stock purposes. Approximately twelve farmers in the township experience a shortage of water for present needs, and a considerable number of farmers would experience a shortage of water if the number of stock were increased.

Some dry holes have been sunk to depths of 40 to 102 feet in blue boulder clay, but a number of wells in the south-western sections encounter aquifers of fine sand or gravel in the blue boulder clay, at depths of 71 to 153 feet, that yield small or moderate supplies of water. The water is highly mineralized and contains a fairly large amount of iron which settles as a reddish sediment of iron oxide when the water is exposed to light and air. The water from those wells is being used for household and stock purposes. An 85-foot well in the NW.$\frac{1}{4}$, section 14, obtains a small amount of water, but the supply is insufficient for local needs. The water in the other wells is under sufficient hydrostatic pressure to rise to points 20 to 70 feet below the surface.

The three wells in the NE.$\frac{1}{4}$, section 33, the SE.$\frac{1}{4}$, section 34, and the SW.$\frac{1}{4}$, section 35, are 145, 225, and 85 feet deep, respectively, and tap sand aquifers. The sand bed is reported to be from 40 to 155 feet thick, but only small amounts of water are obtained. The water is not under hydrostatic pressure. It is not highly mineralized and is usable for all farm purposes. It is probable that these sand beds continue in an easterly direction to the slopes of Assiniboine river, where numerous springs that yield abundant supplies of water are located. It is doubtful if a large supply will be obtained from wells tapping this thick sand aquifer.

It is possible that deep drilled wells in other sections would locate water-bearing deposits, but the uncertainty of obtaining water, and the highly mineralized water that is usually obtained, may not warrant the expense of drilling deep wells. In most sections of this township surface water can be retained for stock use by constructing dams or excavating dugouts, and this method of increasing water supplies is highly recommended.

Township 25, Range 31

An area in the south-central part of the township is mantled by moraine, the surface of which is characterized by rock-strewn knolls and ridges, and by several undrained depressions or sloughs. The remainder of the township is mantled by glacial till and its ground surface is gently rolling. The elevation decreases in an easterly direction from 1,750 to 1,725 feet above sea-level. Two shallow lakes that always contain some water occur to the southeast of Calder. The moraine and glacial till deposits are similar in composition, and water conditions are practically the same in each area. The deposits usually consist of 1 to 3 feet of sandy top-soil; 10 to 30 feet of yellow boulder clay containing scattered pockets of sand and gravel; a 1 to 6-foot layer of sand that only occurs in isolated areas; and a great thickness of blue boulder clay in which thin layers of sand and gravel occur at various horizons.

The principal water-bearing horizon lies within the upper 30 feet of glacial drift, and the water is derived from wells that either tap pockets of sand and gravel, or discontinuous layers of sand and gravel underlying the yellow boulder clay. Approximately fifty wells tap this water-bearing horizon. A few of the wells yield quantities of water sufficient for 30 to 50 head of stock, whereas others yield small and insufficient supplies of water. In some sections the farmer may use two or more of these shallow wells to obtain sufficient water for local needs. In some sections five to thirty wells have been dug before water was located, and it appears advisable to locate the water-bearing deposits with a small test auger before digging a well. The water is moderately hard and usable for domestic and stock-raising purposes. It is probable that by systematic prospecting a fairly good supply of water can be obtained from shallow wells in most sections of the township.

Throughout the township a number of wells from 40 to 75 feet deep have struck deposits of water-bearing sand that occur within the blue clay. These water-bearing deposits are not continuous, as dry holes and deeper wells have failed to encounter water-bearing beds. The water on coming in contact with the blue boulder clay takes into solution a large amount of mineral salts, and as a result the water from these wells is quite highly mineralized. It is hard, contains iron, is "alkaline", and has a laxative effect on persons not accustomed to its use. The individual wells yield adequate supplies for 10 to 40 head of stock, and the water in most of the wells is under sufficient hydrostatic pressure to rise to points 15 to 36 feet below the surface.

Six wells from 76 to 100 feet deep, in sections 2, 3, 4, 7, 19, and 20, encounter beds of fine, water-bearing sand. The well in the NW.$\frac{1}{4}$, section 4, is a flowing artesian well. This is the only well that yields an over-sufficient supply of water. The other wells, however, yield sufficient water for local needs. The water rises to points 30 to 50 feet below the surface, and with one exception it is used for domestic purposes, although it is highly mineralized and very hard, but water of better quality is not available. It is possible that wells drilled to these depths in other parts of the township may locate similar water-bearing deposits, but the aquifers are not thought to be continuous.

In several sections where farmers experience a shortage of water and where they have been unable to locate water at depths of 60 to 100 feet, it is advised that dams or dugouts be used to collect and store a supply of surface water for stock use. Deep, drilled wells are not advised, as the uncertainty of locating water and the usual poor quality of the water do not warrant the expense of drilling.

Township 25, Range 32

The average elevation of this township is 1,750 feet above sea-level. An area 2 to 3 miles wide, extending from the northwestern to the south-central part of the township, is mantled by moraine. The ground surface of this area is rolling with northwest to southeast trending ridges, and many undrained depressions or sloughs. With the exception of a small moraine-covered area in the southwestern corner of the township the remainder of the area is mantled by glacial till or boulder clay. The moraine and glacial till deposits generally consist of a thin layer of sandy top soil, 10 to 30 feet of yellow boulder clay containing scattered pockets of sand and gravel, and blue boulder clay that continues to a depth of at least 115 feet and probably extends to the bedrock. Thin, discontinuous beds and pockets of sand occur at various elevations in the blue boulder clay.

The uppermost water-bearing horizon is formed by the scattered pockets of sand and gravel that occur in the upper 30 feet of glacial drift. These wells are numerous, and at least forty-five wells are reported that obtain water from this source. Most of the wells yield adequate supplies of water for domestic needs and 10 to 50 head of stock. In some sections, however, it is necessary to use two or more shallow wells to obtain sufficient water for farm needs. The water contains a considerable amount of mineral salts in solution, but locally in many cases it is termed "soft" or moderately hard when compared with water from deeper wells. It is probable that with further prospecting fairly good supplies of water could be located. Before digging a well it is advisable to locate the water-bearing sand or gravel pockets with a small auger.

Deposits of sand and gravel that occur in the blue clay at depths of 39 to 70 feet, or at an average elevation of 1,700 feet above sea-level, have been encountered by twenty wells in different parts of the township. The water is hard, generally "alkaline", and contains some iron in solution. The water from the wells is used for domestic purposes, however, but to one not accustomed to its use it may act as a laxative. After the water has been used for some time it causes no apparent ill effects on the human system. Some of the wells yield water that is not under hydrostatic pressure, but others yield water that is under sufficient hydrostatic pressure to rise to points 8 to 23 feet below the surface.

Holes 100 to 115 feet deep in the SE.$\frac{1}{4}$, section 23, are the only attempts made to locate water at depths greater than 70 feet. The 100-foot holes were dry, but the 115-foot hole encountered a very small supply of water in clay. The water is very "alkaline", although it is used for drinking and other domestic purposes. The yield is not sufficient for local needs, and water must be hauled in dry seasons. Holes to similar depths in other sections may encounter water-bearing deposits, but no continuous water-bearing horizon exists in the lower part of the glacial drift. Many sloughs throughout the township are used for stock. Dams and dugouts are recommended for the retention of water in most sections of this township. Deep drilling is not advisable.

Township 25, Range 33

This fractional township is an area of 12 square miles. With the exception of a small, moraine-covered area in the southern part the entire area is mantled by glacial till or boulder clay. The average elevation is 1,750 feet above sea-level.

Seven wells have been reported in this township. Three in the SW.$\frac{1}{4}$, section 2, the NW.$\frac{1}{4}$, section 13, and the SE.$\frac{1}{4}$, section 24, tap pockets of sand and gravel in the yellow boulder clay at depths of 24, 19, and 23 feet, respectively. These wells yield sufficient water for local needs. It is moderately hard, and usable for all domestic purposes. It is probable that other wells will locate usable water at shallow depths.

Four wells, 40 to 60 feet deep, tap layers of sand or gravel in blue boulder clay, from which adequate supplies of water for local needs are obtained. The water is very highly mineralized, but is being used for domestic and stock purposes. The well in the NW.$\frac{1}{4}$, section 25, yields water that was condemned for human use, but it is being used as other water is not obtainable within reasonable hauling distance. The water in all four wells is under sufficient hydrostatic pressure to rise to points 20 to 30 feet below the surface. Probably other holes similar in depth would tap water-bearing beds.

The few residents in this fractional township do not experience a shortage of water for present local needs, but should the number of live stock be increased there would be a shortage. Deep drilling is not recommended as water-bearing beds are not usually encountered in the blue clay, or the water is too highly mineralized for domestic or even stock use. The excavation of dugouts or the erection of dams for the conservation of surface water for stock use is recommended.

Township 26, Range 30

Assiniboine river flows through sections 33, 34, and 26, and only that part of the township to the south of the river is included in this municipality. The valley is steep-sided and is approximately 1$\frac{1}{2}$ miles wide and 300 feet deep, the elevations

at the base of the valley being approximately 1,400 feet above sea-level, and that of the plain level 1,700 feet. The elevation rises to the west and southwest of the river, and the ground surface is gently rolling. The flood-plain of Assiniboine river is covered by Recent stream silts and sands, but the remainder of the area is mantled by glacial till or boulder clay.

The supply of water in this township is derived from twenty-one shallow wells ranging from 14 to 34 feet deep, and sixteen wells from 72 to 200 feet deep, and from auxiliary supplies collected in small dams or dugouts. The shallow wells tap scattered pockets of sand and gravel in the yellow boulder clay. The wells yield sufficient water for present local needs in most sections, but in some sections two or more wells are used to obtain adequate water for local needs. The water is moderately hard and in many places is termed soft when compared with water from deeper wells. It is suitable for all farm purposes including irrigation. Further prospecting at shallow depth should locate similar supplies of water. It is advisable to locate the water-bearing deposits by means of a small auger before digging a shallow well.

Blue boulder clay underlies the yellow clay to a depth of 60 to 100 feet in some sections, and it possibly extends to greater depths in other areas. A well in the NW.$\frac{1}{4}$, section 18, taps a sand bed in the blue boulder clay at a depth of 72 feet. This is the only well that obtains water at this general level, and other deeper wells have failed to locate aquifers in the blue clay. The water is hard, but usable for all domestic purposes. The supply is not sufficient for local needs and the water is not under hydrostatic pressure. A good supply of water is not to be expected at this depth in the glacial drift.

The main supply of water in this township is derived from drilled wells 85 to 200 feet deep. The aquifer is a bed of

sand from 60 to 110 feet thick that underlies the blue boulder clay. It occurs at an elevation of 1,580 to 1,670 feet, rising towards the southwest. The water is moderately hard and usable for all farm purposes. The individual wells do not yield an abundance of water, but the supply is usually sufficient for 20 to 40 head of stock. Two wells in the SE.$\frac{1}{4}$, section 10, and the SE.$\frac{1}{4}$, section 22, tap beds of gravel at depths of 120 and 150 feet, respectively. Water from these wells is more highly mineralized than that from the other deep wells, and is under hydrostatic pressure, whereas the water from wells with sand aquifers is not under pressure. It is thought that the sand beds are drained by numerous springs that occur along the Assiniboine. It is probable that other thick deposits of sand could be located in other parts of the township.

A hole in the NW.$\frac{1}{4}$, section 10, is sunk to a depth of 172 feet or to an elevation of 1,543 feet above sea-level, at which point the drill encountered a hard, shaly substance. The driller thought it was shale, and it may be the Marine Shale series. It is possible that the thick sand deposit is underlain by the Marine Shale series. No outcrops were noted along Assiniboine river. It is doubtful if water will be obtained from the bedrock and drilling into the shale is not advised.

Township 26, Range 31

This township is a slightly rolling plain with no deep valleys or definite drainage systems. Shillingthorpe lake, a permanent body of water, occupies a shallow basin in sections 14 and 15. The entire township is mantled by glacial till that consists of a weathered and unweathered zone of clays. The weathered zone is composed of 1 to 3 feet of sandy top soil, 10 to 35 feet of yellow boulder clay in which scattered pockets of sand occur, and discontinuous layers of sand and gravel that

separate the yellow and blue boulder clays. The unweathered zone is composed of blue boulder clay in which layers of sand and gravel probably occur at various horizons.

The only water-bearing horizon located in this township is formed by the pockets of sand and gravel in the yellow boulder clay and by the layers of sand and gravel lying between the yellow and blue boulder clays. The supplies of water from many of the wells tapping these deposits are more than adequate for local needs, but in some sections two or more wells are used in order to obtain sufficient water for a few head of stock. The wells that yield the larger supplies of water tap pockets of sand and gravel of considerable areal extent. The water is moderately hard and usable for all farm purposes. The wells that yield small and intermittent supplies tap pockets or thin layers of sand of small areal extent. The water from these deposits is more highly mineralized, but with few exceptions it is usable for household purposes. Only a few shallow wells have failed to encounter water. It is advisable to locate the water-bearing deposits by means of a small hand auger before digging wells.

A well in the NW.$\frac{1}{4}$, section 2, tapped a thin bed of sand in the blue boulder clay at a depth of 63 feet. The well does not yield sufficient water for local needs and the water is very highly mineralized. It is possible that more abundant supplies of water may be located at a similar depth in other sections of the township. However, it is not advisable to sink holes to depth, as the uncertainty of obtaining water and the usually poor quality of the water if located do not warrant the expense of drilling. In those areas where an adequate supply of water cannot be obtained at shallow depth, it is recommended that dugouts be excavated to retain surface water for stock.

Township 26, Range 32

Almost all the western half of the township is covered by moraine. This area is rolling with many small knolls and northwest-southeast trending ridges, and numerous, undrained depressions or sloughs. The remainder of the township is mantled by glacial till, and the ground surface is slightly rolling with no abrupt hills or valleys. The drainage is toward the northwest and the surface elevation decreases from 1,750 feet at the southeastern corner to 1,690 feet above sea-level in the northwestern corner. The area is thickly wooded with small willow and poplar, and much of the land has to be cleared before it can be cultivated.

Few farmers experience a shortage of water, and the main source of water lies within 15 to 35 feet of the surface. It is formed by scattered pockets or lenses of sand and gravel that occur in the yellow boulder clay, and by beds of sand and gravel that lie between the yellow and blue boulder clays. In some areas these deposits form a fairly continuous water-bearing horizon. The water from a number of wells that tap these deposits is under hydrostatic pressure and rises 4 to 20 feet above the top of the aquifer, or to points 10 to 20 feet below the surface. The water from wells that yield an abundant supply is moderately hard and usable for all general farm purposes. The wells that yield small or intermittent supplies of water tap isolated pockets of sand and gravel of small areal extent. The water from these wells is usually more highly mineralized and some is "alkaline", but from most wells is used for household and stock purposes. In many sections it is necessary to use two or more shallow wells to obtain sufficient water for local needs.

A well in the SE.$\frac{1}{4}$, section 34, taps a bed of sand in the blue boulder clay at a depth of 44 feet. The water is highly

mineralized due to the proximity of the blue clay. The yield is sufficient for local needs and the hydrostatic pressure causes the water to rise to a point 16 feet below the surface. Possibly holes to similar depths would encounter other deposits of water-bearing sand and gravel.

A well in the NE.$\frac{1}{4}$, section 6, tapped a bed of water-bearing sand at a depth of 85 feet or at an elevation of 1,660 feet above sea-level. The water is highly mineralized, but usable for domestic purposes. It is under sufficient hydrostatic pressure to rise to a point 30 feet below the surface and the supply is adequate for all local needs. Dry holes 100 and 85 feet deep were drilled in the NE.$\frac{1}{4}$, section 10, and the NW.$\frac{1}{4}$, section 30, but water-bearing deposits may occur at these depths in other localities.

It is advisable to construct dams or excavate dugouts to retain surface water for stock in this township. Sloughs are suitable locations for dugouts. Deep drilling is not advised.

Township 26, Range 33

This fractional township comprises an area of 12 square miles. Approximately 4 square miles, largely in the southwestern part of the area, are mantled by glacial till and the ground surface is gently rolling. The remainder of the township is covered by moraine, the ground surface of which is more rolling with a few rock strewn knolls and northwest-southeast trending ridges. The average surface elevation is 1,725 feet above sea-level. The whole area is thickly wooded with small willow and poplar.

Ground water conditions are similar in both the glacial till and moraine-covered areas. In the northern part of the township most of the water is derived from wells, 12 to 30 feet deep, that tap isolated pockets of sand and gravel in the yellow clay.

These wells yield sufficient water for the present local needs, but the supply would not be adequate if larger herds of stock were kept. The water is moderately hard and usable for all domestic purposes, and in some sections two or more wells are used.

In the southern sections most of the water is obtained from wells, 40 to 60 feet deep, that tap layers of water-bearing sand in the blue boulder clay. The water is highly mineralized and in many cases termed "alkaline", but it is used for domestic and stock purposes. It may act as a laxative on those not accustomed to its use. The yield from the individual wells is sufficient for domestic needs and 10 to 30 head of stock. The water from some of the wells is under hydrostatic pressure. These water-bearing deposits may be fairly numerous or continuous as no dry holes have been sunk.

The supply of water in this township is not abundant, but it is usually sufficient for present local needs. The supply could be increased by collecting surface water by means of artificial reservoirs. Deep drilling is not advised.

Township 27, Range 30

The part of this township that lies south of Assiniboine river is included in the municipality of Calder. The area is largely occupied by the southern slopes of Assiniboine valley and it is but slightly settled. The flood-plain of the river is formed by Recent sands and silts. Glacial till or boulder clay mantles the remainder of the area. The ground surface of the plain is slightly rolling and lies at an elevation of 1,700 feet. The valley slopes are steep, and the valley is approximately 300 feet deep and 2 miles wide.

The supply of water is obtained from springs and wells. The springs are situated at an approximate elevation of 1,630 feet above sea-level along the valley, and flow throughout the

year. The water is moderately hard and is suitable for domestic use and irrigation. The wells are from 10 to 38 feet deep and tap pockets of sand and gravel in yellow boulder clay. The water is hard but usable for all farm purposes. An individual well yields sufficient water for local needs, but the requirements are small as only a few head of stock are kept. Should the number of stock be increased the supply of water would be insufficient. It is not advisable to drill to great depths as the uncertainty of encountering water-bearing horizons does not warrant the expense of drilling. Dugouts for the collection of surface water for stock are recommended.

Township 27, Range 31

Assiniboine river passes through sections 36, 35, 24, and 13, and flows in a southeasterly direction. The parts of these sections lying to the east of the river are not discussed in this report. Assiniboine valley in this township is approximately 2 miles wide and 250 to 300 feet deep. The slopes are steep and are covered by small poplar and willow. The remainder of the township is also thickly wooded with poplar, willow, and some spruce. Stony creek enters the township in section 31 and flows in a southeasterly direction into Assiniboine river. The valley of Stony creek is quite deep. Other shorter tributary valleys also occur in the township. The flat flood-plain of Assiniboine valley and a few of its tributaries are composed of several feet of Recent alluvium, but very little water is obtained from these deposits. Several springs on the slopes of the valley yield supplies of drinking water for those residing in the valley. Stock are watered at the river. The slopes of the valleys and the plain above are mantled by a thick deposit of glacial till or boulder clay. The plain is slightly rolling and the elevation decreases from a maximum of 1,700 feet above

sea-level on the plain to approximately 1,400 feet above sea-level in Assiniboine valley.

The uppermost water-bearing horizon lies within 30 feet of the surface and it is encountered mainly in the southern sections of the township. It is formed by isolated pockets of sand and gravel that occur in yellow boulder clay. Most of the wells in the southern sections tap fine sand aquifers that yield supplies of water sufficient for 20 to 35 head of stock. The water is moderately hard and usable for all general farm purposes. Several of these wells yield water that is under slight hydrostatic pressure. In the northern sections some difficulty is experienced in locating water at shallow depths and only small and intermittent supplies are obtained from shallow wells in that area. Deeper wells have been dug in this area and at least eight wells obtain water at depths of 40 to 75 feet. The aquifers are formed by deposits of sand in the blue clay, but they are not continuous. Some wells yield an abundant supply of water under hydrostatic pressure, whereas others yield very small supplies. A 75-foot well in the NW.$\frac{1}{4}$, section 29, tapped an abundance of very highly mineralized water that is not usable for any purposes. The other wells yield water that is very hard and often "alkaline", but it is being used for domestic and stock needs. The water has a slight laxative effect on those not accustomed to the use of highly mineralized water. It is possible that other wells sunk to similar depths would encounter water-bearing deposits, but usually these wells are an unsatisfactory source of water.

With few exceptions, the supply of water in this township is adequate for the present local needs. In the northern section of the township Stony creek, or other small creeks, are used for watering stock. In most sections, if larger supplies

of water are required, surface water can be retained by the use of dams or dugouts. Possibly deep drilled wells would encounter water-bearing beds, but the uncertainty of obtaining water and the usual poor quality of the water obtained at depth in the glacial drift does not warrant the expenditure.

Township 27, Range 32

The western half of the township is largely covered by moraine and the ground surface is characterized by numerous small knolls, several northwest-southeast trending ridges, and by many small, undrained depressions or sloughs. The eastern half and a little of the western half are mantled by glacial till and the ground surface is gently undulating except where cut by stream valleys. Stony creek enters the township in section 18, and flows in an easterly direction to section 14 where it turns abruptly and flows in a northerly direction. It occupies a shallow valley in the western part, but in the northern sections the valley becomes quite deep with steep sides. Several creeks that occupy deep valleys flow into Stony creek. These creeks serve as a source of water for stock. Wells sunk in or near these drainage courses yield good supplies of moderately hard water that is used for all farm purposes.

The deposits of glacial till and moraine are similar in composition, consisting as a rule of 1 to 4 feet of sandy top soil; 10 to 30 feet of yellow boulder clay containing scattered pockets of sand and gravel; a discontinuous bed of sand and gravel varying in thickness from a few inches to 6 to 8 feet; and unweathered, blue, boulder clay that contains very few deposits of sand. The main supply of water in this township is obtained from pockets of sand and gravel in the yellow clay and from the discontinuous layer of sand and gravel that lies between the yellow and blue clays. Several of the shallow wells

in the southern sections tap aquifers of large areal extent, and yield sufficient water for 30 to 80 head of stock. The water from these wells is moderately hard and is suitable for all farm purposes including irrigation. Most of the wells that tap this water-bearing horizon, however, yield small supplies of more highly mineralized water. Many of the farmers use two or more of these wells to obtain sufficient water for local needs. A few farmers are forced to haul water from neighbouring wells yielding an abundant supply.

In those sections where water was not located in the upper 20 to 30 feet of the drift the holes were continued and some encountered water-bearing sands or gravels at depths of 35 to 60 feet below the surface in the blue boulder clay. Due to the proximity of the unweathered blue clay the water is very highly mineralized and usually "alkaline", but with one exception it is being used for drinking and other domestic purposes. The water generally acts as a laxative on those not accustomed to the use of highly mineralized water, but with continued use it apparently has no ill effects on the human system. The water from some of these wells is under slight hydrostatic pressure. The supply of water is not abundant, but is usually sufficient for local needs. It is possible that similar water-bearing deposits may be encountered in other sections, but they are not continuous and do not yield an abundance of water.

Four holes from 80 to 90 feet deep in the NE.$\frac{1}{4}$, section 18, dug in blue clay, did not obtain water. These are the deepest holes in the township and although it is possible that water-bearing sands may occur at greater depths, the uncertainty of obtaining water and the usual poor quality of the water when located do not warrant the expense of deep drilling. In most sections water supplies for stock can be increased by retaining surface water in artificial reservoirs

such as dams or dugouts. The slightly mineralized surface water is more suitable for stock than the highly mineralized water from deep wells.

Township 27, Range 33

This fractional township includes the eastern half of sections 1, 12, 13, 24, 25, and 36, or an area of 3 square miles. It is mantled by moraine and the topography is quite rough. The average surface elevation is 1,720 feet above sea-level.

Water supplies are obtained from wells 6 to 45 feet deep. Eight wells tap pockets of sand and gravel in yellow boulder clay. A 6-foot well in the SE.$\frac{1}{4}$, section 36, yields an abundance of water; two wells in section 12 yield sufficient water for local needs; and the other five shallow wells do not yield sufficient water for local requirements. Water from creeks is used for stock, and in some sections two or more shallow wells are used in order to obtain an adequate supply. The water from these wells is moderately hard and usable for all farm purposes. Prior to digging shallow wells it is advisable to locate the water-bearing deposits by means of a small test auger.

The 45-foot well in the SE.$\frac{1}{4}$, section 1, taps a thin layer of sand in blue boulder clay. The water is very highly mineralized and is not usable for domestic purposes. The yield is very small and other shallow wells are used as auxiliary supplies. Dams or dugouts to retain surface waters for stock use are recommended in this fractional township.

STATISTICAL SUMMARY OF WELL INFORMATION IN RURAL MUNICIPALITY OF CALDER, NO. 241, SASKATCHEWAN

Township	25	25	25	25	26	26	26	26	27	27	27	27	Total No. in municipality
West of 1st meridian Range	30	31	32	33	30	31	32	33	30	31	32	33	
Total No. of Wells in Township	111	187	81	8	56	102	84	29	4	44	74	10	790
No. of wells in bedrock	0	0	0	0	1	0	0	0	0	0	0	0	1
No. of wells in glacial drift	111	187	81	8	55	102	84	29	4	44	74	10	789
No. of wells in alluvium	0	0	0	0	0	0	0	0	0	0	0	0	0
Permanency of Water Supply													
No. with permanent supply	76	87	72	8	44	60	71	27	3	42	62	10	562
No. with intermittent supply	13	13	3	0	8	7	3	2	1	2	4	0	56
No. dry holes	22	87	6	0	4	35	10	0	0	0	8	0	172
Types of Wells													
No. of flowing artesian wells	0	2	0	0	0	0	0	0	0	0	0	0	2
No. of non-flowing artesian wells	5	20	22	4	6	10	25	9	0	5	11	2	119
No. of non-artesian wells	84	78	53	4	46	57	49	20	4	39	55	8	497
Quality of Water													
No. with hard water	74	89	63	7	43	55	61	26	3	41	61	9	532
No. with soft water	15	11	12	1	9	12	13	3	1	3	5	1	86
No. with salty water	0	0	0	0	0	0	0	0	0	0	0	0	0
No. with "alkaline" water	5	12	5	2	3	5	8	5	0	5	6	0	56
Depths of Wells													
No. from 0 to 50 feet deep	96	146	73	6	38	101	78	26	4	41	58	10	677
No. from 51 to 100 feet deep	8	41	7	2	6	1	6	3	0	3	16	0	93
No. from 101 to 150 feet deep	5	0	1	0	7	0	0	0	0	0	0	0	13
No. from 151 to 200 feet deep	1	0	0	0	5	0	0	0	0	0	0	0	6
No. from 201 to 500 feet deep	1	0	0	0	0	0	0	0	0	0	0	0	1
No. from 501 to 1,000 feet deep	0	0	0	0	0	0	0	0	0	0	0	0	0
No. over 1,000 feet deep	0	0	0	0	0	0	0	0	0	0	0	0	0
How the Water is Used													
No. usable for domestic purposes	78	85	69	8	43	61	62	26	4	40	51	8	535
No. not usable for domestic purposes	11	15	6	0	9	6	12	3	0	4	15	2	83
No. usable for stock	87	96	74	8	49	65	73	29	4	42	64	10	601
No. not usable for stock	2	4	1	0	3	2	1	0	0	2	2	0	17
Sufficiency of Water Supply													
No. sufficient for domestic needs	68	84	70	7	43	57	71	27	3	42	59	9	540
No. insufficient for domestic needs	21	16	5	1	9	10	3	2	1	2	7	1	78
No. sufficient for stock needs	52	57	58	7	36	46	59	23	2	33	50	4	427
No. insufficient for stock needs	37	43	17	1	16	21	15	6	2	11	16	61	191

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

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

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.

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 Calder, No. 241, 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	Alkalinity	CaO	MgO	SO_4	Na_2O	Solids	$CaCO_3$	$CaSO_4$	$MgCO_3$	$MgSO_4$	Na_2CO_3	Na_2SO_4	NaCl	$CaCl_2$	
1		15	25	30	1	148	411	Date of collection 28-7-30										(1)	(4)	(2)					(3)	*1
2	NW.	30	25	31	1	15	1,174	"	"	"			4-9-34					(3)	(1)		(2)				(4)	*1
3	NW.	30	25	31	1	24	820	"	"	"			4-9-34					(3)	(1)		(2)				(4)	*1
4	NE.	30	25	31	1	22	1,174	"	"	"			4-9-34					(3)	(1)		(2)				(4)	*1
5	SE.	11	20	33	1	26	1,171	"	"	"			6-4-36					(4)	(1)		(2)		(3)		(5)	*1
6		17	27	32	1	43	480	"	"	"			10-2-36					(3)	(1)		(2)		(4)		(5)	*1

Water samples indicated thus, *1, are from glacial drift.
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 ($CaCO_3$).
Analyses Nos. 1, 2, 3, 4, 5, and 6, by Provincial Analyst, Regina.
For interpretation of this table read the section on Analyses and Quality of Water.

Water from the Unconsolidated Deposits

Six samples of water from the glacial drift in the municipality of Calder were analysed and results are listed in the accompanying table. Samples 2 to 6, inclusive, were taken from wells 15 to 43 feet in depth. The total dissolved solid content varies from 480 to 1,174 parts per million. The following salts occur in each sample, their abundance decreasing in the order given: calcium sulphate, magnesium sulphate, calcium carbonate or sodium sulphate, and calcium chloride. The water is suitable for all general farm purposes and is much used for the irrigation of small gardens. With few exceptions water from shallow wells in this municipality probably is similar to that analysed, being hard or moderately soft. Wells that tap thin layers of sand in the upper few feet of the blue clay, however, usually yield a very highly mineralized water that may not be usable for any farm purpose.

Sample 1 was taken from a 148-foot well that taps a deposit of sand and gravel in the lower part of the drift. The water has a total dissolved solid content of 411 parts per million, which is exceptionally low for water from deep wells. The water is somewhat similar to that obtained from wells in the area outlined by the "A" boundary line, and it probably taps the thick deposits of sand and gravel encountered by the other wells. This water is usable for all farm purposes. The water from wells that tap small deposits of sand and gravel at depth in the blue clay is very hard and highly mineralized. It is usually suitable for stock, but is rarely used for drinking.

Water from the Bedrock

No water is obtained from the bedrock in this municipality. Where water has been located in the Marine Shale series in this part of Saskatchewan it is usually too highly mineralized to be usable for any farm purpose.

WELL RECORDS—Rural Municipality of CALDER, NO. 241, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
1	NE.	2	25	30	1	Dug	15	1,705	- 14	1,691			Glacial sand	Hard, clear, "alkaline"		D	Insufficient for local needs; well has now caved in.
2	NW.	2	"	"	"	Dug	23	1,675	- 19	1,656	19	1,656	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for local needs; another similar well.
3	NE.	3	"	"	"	Dug	18	1,705	- 14	1,691	-		Glacial drift	Hard, clear		S	Intermittent supply.
4	NW.	3	"	"	"	Dug	11	1,680	- 6	1,674	6	1,674	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
5	SW.	4	"	"	"	Drilled	71	1,685	- 40	1,645	71	1,614	Glacial sand and gravel	Hard, clear, iron		D, S	Sufficient for local needs.
6	NE.	4	"	"	"	Dug	18	1,660	- 15	1,645	15	1,645	Glacial sand	Hard, clear		D, S	Insufficient for local needs; another well 6 feet deep is sufficient for 100 head stock.
7	NW.	4	"	"	"	Dug	20	1,672	- 17	1,655			Glacial drift	Hard, clear		D, S	Sufficient for local needs; also another well 6 feet deep.
8	NW.	5	"	"	"	Dug	36	1,690									Dry hole; base in glacial sand.
9	SE.	6	"	"	"	Bored	80	1,710	- 20	1,690	80	1,630	Glacial gravel	Hard, clear, iron		D, S	Sufficient for local needs.
10	SW.	6	"	"	"	Dug	33	1,720	- 13	1,707			Glacial drift	Hard, clear		D, S	Sufficient for local needs.
11	NW.	6	"	"	"	Dug	30	1,715	- 26	1,689	26	1,689	Glacial sand and gravel	Hard, clear, iron		D, S	Sufficient for local needs.
12	NE.	6	"	"	"	Drilled	137	1,715	- 61	1,654	137	1,578	Glacial sand	Hard, clear		D, S	Sufficient for local needs; other wells 76 feet deep have poor supplies.
13	SE.	7	"	"	"	Dug	20	1,720	0	1,720			Glacial drift	Soft, clear		D, S	Intermittent supply.
14	SW.	7	"	"	"	Dug	15	1,728	- 5	1,723			Glacial drift	Hard, clear		D	Intermittent supply; also dry holes to a depth of 30 feet.
15	SW.	8	"	"	"	Drilled	153	1,715	- 73	1,642	153	1,562	Glacial sand	Hard, clear, iron		N	Unfit for use; two other wells 30 and 35 feet deep.
16	NE.	8	"	"	"	Dug	27	1,720	- 7	1,713	8	1,712	Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
17	NE.	9	"	"	"	Dug	15	1,640	- 10	1,630			Glacial sand	Hard, clear		D, S	Sufficient for local needs; another well 10 feet deep.
18	SE.	10	"	"	"	Dug	22	1,705	- 13	1,692	13	1,692	Glacial sand	Hard, clear		D	Insufficient for local needs; another well 6 feet deep.
19	NW.	10	"	"	"	Dug	18	1,660	- 10	1,650	10	1,650	Glacial gravel	Hard, clear		D	Sufficient for local needs.
20	NE.	12	"	"	"	Dug	30	1,690	- 28	1,662			Glacial drift	Hard, clear		D	Insufficient for local needs.
21	SW.	14	"	"	"	Dug	14	1,708	- 8	1,700	8	1,700	Glacial sand and gravel	Hard, clear, "alkaline"		D	Sufficient for local needs; another similar well 12 feet deep is used for stock.
22	NW.	14	"	"	"	Dug	85	1,705	- 82	1,623	82	1,623	Glacial sand	Hard, clear		D	Insufficient for local needs.
23		15					148	1,700	- 35	1,665			Glacial sand and gravel	Hard, clear		D, S	[illegible]
24	SW.	16	"	"	"	Dug	15	1,680	- 10	1,670	10	1,670	Glacial sand	Soft, clear		D, S	Insufficient for local needs; 2 other similar wells.
25	SE.	16	"	"	"	Dug	22	1,670	- 12	1,658	19	1,651	Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
26	NE.	16	"	"	"	Dug	23	1,670	- 19	1,651	19	1,651	Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
27	NW.	16	"	"	"	Dug	28	1,675	- 18	1,657	18	1,657	Glacial gravel	Soft, clear		D, S	Sufficient for local needs.

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

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

WELL RECORDS—Rural Municipality of CALDER, NO. 241, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
28	SW.	17	25	30	1	Dug	30	1,715	- 12	1,703			Glacial drift	Soft, clear		D, S	Water-level constant.
29	NE.	17	"	"	"	Dug	15	1,690	- 10	1,680	10	1,680	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
30	SE.	18	"	"	"	Dug	20	1,725	- 14	1,711			Glacial drift	Soft, clear		D, S	Sufficient for local needs; also another well 20 feet deep.
31	SW.	18	"	"	"	Dug	50	1,725	- 30	1,695			Glacial sand	Hard, clear		D, S	Intermittent supply; 3 other similar wells 50, 36 and 21 feet deep.
32	NW.	18	"	"	"	Dug	14	1,720	- 8	1,712	8	1,712	Glacial sand	Hard, clear		S	Sufficient for local needs with the aid of another well 16 feet deep.
33	SW.	19	"	"	"	Dug	12	1,720	- 4	1,716	4	1,716	Glacial sandy clay	Hard, clear		D, S	Insufficient for local needs; also 2 other similar wells.
34	SW.	20	"	"	"	Dug	28	1,725	- 26	1,699	26	1,699	Glacial gravel	Hard, clear		D, S	Sufficient for local needs; also another 20-foot well.
35	SE.	22	"	"	"	Dug	7	1,705	- 4	1,701	4	1,701	Glacial gravel	Soft, clear		S	Sufficient for local needs.
36	SW.	22	"	"	"	Dug	10	1,660	- 2	1,658	2	1,658	Glacial sand	Soft, clear		D, S	Sufficient for local needs.
37	NW.	22	"	"	"	Dug	18	1,735	- 6	1,729	6	1,729	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
38	NE.	22	"	"	"	Dug	14	1,730	- 4	1,726	10	1,720	Glacial sand	Hard, clear		D, S	Insufficient for local needs; another 12-foot well is sufficient for 40 head stock.
39	SW.	23	"	"	"	Dug	13	1,705	- 8	1,697	8	1,697	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
40	SW.	24	"	"	"	Dug	30	1,660	- 15	1,645			Glacial sand	Hard, clear		D, S	Sufficient for local needs.
41	SE.	24	"	"	"	Dug	6	1,660	- 3	1,657	3	1,657	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
42	NW.	24	"	"	"	Dug	35	1,720	- 30	1,690	30	1,690	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
43	NE.	24	"	"	"	Dug	12	1,655	- 8	1,647			Glacial sand	Hard, clear		D, S	Sufficient for local needs.
44	NW.	27	"	"	"	Dug	12	1,725	- 8	1,717	8	1,717	Glacial sand	Soft, clear		D, S	Sufficient for local needs; also a 95-foot well.
45	SE.	28	"	"	"	Dug	20	1,685	- 12	1,673	12	1,673	Glacial sand	Hard, clear		D, S	Sufficient for local needs; also 15 dry holes 20 to 50 feet deep.
46	SW.	28	"	"	"	Dug	12	1,705	- 8	1,697	8	1,697	Glacial sand	Soft, clear		S	Sufficient for local needs with the aid of another well 20 feet deep.
47	NW.	28	"	"	"	Dug	24	1,700	- 16	1,684	20	1,680	Glacial sand	Hard, clear, lime		D, S	Sufficient for local needs.
48	SW.	29	"	"	"	Dug	16	1,720	- 11	1,709	11	1,709	Glacial gravel	Hard, clear		D, S	Intermittent supply; several other similar wells.
49	NE.	29	"	"	"	Dug	15	1,705	- 9	1,696	9	1,696	Glacial sand	Soft, clear		D, S	Sufficient for local needs; another well 28 feet deep; also a dry hole 102 feet deep.
50	NE.	30	"	"	"	Dug	15	1,733	- 12	1,721	12	1,721	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
51	SW.	32	"	"	"	Dug	7	1,745	- 3	1,742	3	1,742	Glacial sand and gravel	Hard, clear		S	Sufficient for 90 head stock; another well 10 feet deep is used for domestic needs.
52	SW.	33	"	"	"	Dug	14	1,700	- 11	1,689	11	1,689	Glacial sand	Hard, clear		S	Sufficient for local needs.
53	NE.	33	"	"	"	Drilled	145	1,705	-130	1,575	140	1,565	Glacial sand	Hard, clear		D	Insufficient for local needs; another well 18 feet deep.

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of CALDER, NO. 241, 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
54	SE.	34	25	30	1	Dug	12	1,742	- 7	1,735	7	1,735	Glacial coarse gravel	Soft, clear		D, S	Sufficient for local needs; another well 225 feet deep.
55	NW.	34	"	"	"	Dug	15	1,695	- 11	1,684	11	1,684	Glacial sand and gravel	Hard, clear		D, S	Intermittent supply; other similar wells.
56	SW.	35	"	"	"	Dug	85	1,720	- 79	1,641	79	1,641	Glacial sand	Hard, clear		D, S	Sufficient for 60 head stock; also 2 dry holes.
57	NW.	36	"	"	"	Dug	11	1,700	- 5	1,695	5	1,695	Glacial sand	Hard, clear		D, S	Sufficient for local needs; another similar well.
58	NE.	36	"	"	"	Drilled	113	1,675	-111	1,564	111	1,564	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
1	SW.	2	25	31	1	Dug	23	1,765	- 8	1,757	10	1,755	Glacial sand	Hard, clear		D, S	Insufficient for local needs.
2	NE.	2	"	"	"	Drilled	100	1,725	- 50	1,675	100	1,625	Glacial sand	Hard, clear, iron		N	Abundant supply; but not used.
3	NE.	3	"	"	"	Drilled	95	1,735	- 34	1,701	95	1,640	Glacial sand	Hard, clear, iron		D, S	Sufficient for local needs.
4	NW.	4	"	"	"	Drilled	76	1,732	0	1,732	51	1,681	Glacial sand	Hard, clear, iron		N	Sufficient supply.
5	NE.	4	"	"	"	Dug	31	1,736	- 27	1,709			Glacial drift	Hard, clear, "alkaline"		D	Intermittent supply; another well 42 feet deep is unfit for use.
6	SW.	6	"	"	"	Dug	14	1,755	- 6	1,749	6	1,749	Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
7	SE.	6	"	"	"	Dug	65	1,750	- 10	1,740	65	1,685	Glacial sand(?)	Hard, clear		D, S	Abundant supply.
8	NW.	6	"	"	"	Dug	24	1,755	- 19	1,736	22	1,733	Glacial sand	Hard, clear		D, S	Insufficient for local needs.
9	NE.	6	"	"	"	Dug	52	1,750	- 8	1,742	52	1,698	Glacial sand	Hard, clear, iron		D, S	Abundant supply; 12 other wells up to 80 feet deep with very little water or dry.
10	SE.	7	"	"	"	Dug	80	1,750	- 36	1,714	80	1,670	Glacial fine sand	Hard, clear		D, S	Abundant supply, also 23 dry holes to a depth of 75 feet.
11	SW.	8	"	"	"	Dug	23	1,735	+ 2	1,737			Glacial drift	Soft, clear		D, S	Was abundant supply; now caved in; also 12 dry holes to a depth of 62 feet.
12	NW.	8	"	"	"	Dug	15	1,735	- 13	1,722	13	1,722	Glacial sand and gravel	Hard, clear		S	This well has not been used as yet.
13	NE.	8	"	"	"	Dug	33	1,735	- 17	1,718	33	1,702	Glacial gravel	Hard, clear, "alkaline", iron		D, S	Sufficient for local needs.
14	SE.	9	"	"	"	Dug	20	1,740	- 15	1,725			Glacial drift	Hard, clear		D, S	Insufficient for local needs; 2 other similar wells.
15	SW.	9	"	"	"	Dug	42	1,735	- 39	1,696			Glacial drift	Hard, clear		D, S	Insufficient for local needs; another similar well 30 feet deep.
16	NE.	9	"	"	"	Dug	28	1,745	- 15	1,730	28	1,717	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for local needs.
17	SE.	10	"	"	"	Dug	65	1,736	- 41	1,695			Glacial drift	Hard, clear		D	Intermittent supply.
18	SW.	10	"	"	"	Dug	22	1,735	- 18	1,717	18	1,717	Glacial gravel	Hard, clear		S	Sufficient for local needs.
19	NW.	10	"	"	"	Dug	30	1,736	- 6	1,730	30	1,706	Glacial sand	Hard, clear, "alkaline"		D	Sufficient for local needs.
20	NE.	10	"	"	"	Dug	20	1,740	- 15	1,725	18	1,722	Glacial sand	Hard, clear		D, S	Sufficient for local needs; another similar well.
21	SE.	11	"	"	"	Dug	76	1,725	- 36	1,689	76	1,649	Glacial gravel	Hard, clear, iron		S	Abundant supply; a 50-foot well is used for domestic needs.

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

WELL RECORDS—Rural Municipality of CALDER, NO. 241, 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	NE.	12	25	31	1	Dug	46	1,725	- 36	1,689			Glacial drift	Hard, clear		D, S	Intermittent supply; also a 45-foot well caved in.
23	SW.	13	"	"	"	Dug	33	1,730	- 4	1,726	15	1,715	Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
24	SW.	14	"	"	"	Dug	25	1,740	- 20	1,720	20	1,720	Glacial gravel	Hard, clear		D, S	Intermittent supply.
25	SE.	14	"	"	"	Dug	32	1,715	- 14	1,701			Glacial drift	Hard, clear, iron		D, S	Intermittent supply; also 2 dry holes 35 feet deep.
26	NE.	14	"	"	"	Dug	60	1,725	- 30	1,695			Glacial sand	Hard, clear		D, S	Sufficient for local needs.
27	NW.	14	"	"	"	Dug	18	1,745	0	1,745			Glacial sand	Hard, clear		D, S	Intermittent supply; also 10 dry holes.
28	SW.	15	"	"	"	Dug	36	1,736	- 22	1,714	22	1,714	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
29	NW.	15	"	"	"	Dug	7	1,738	- 1	1,737			Glacial drift	Soft, clear		S	Intermittent supply.
30	SE.	16	"	"	"	Dug	30	1,736	- 5	1,731	6	1,730	Glacial sand	Hard, clear, iron		D, S	Sufficient for local needs.
31	NE.	16	"	"	"	Dug	40	1,740	- 27	1,713			Glacial drift	Hard, clear		D, S	Sufficient for local needs.
32	SW.	17	"	"	"	Dug	22	1,750	- 11	1,739			Glacial drift	Hard, clear, "alkaline"		D, S	Sufficient for local needs; also a 14-foot dry hole.
33	NE.	17	"	"	"	Dug	19	1,740	- 15	1,725	15	1,725	Glacial drift	Hard, clear		D, S	Sufficient for local needs.
34	NE.	18	"	"	"	Dug	22	1,750	- 12	1,738	22	1,728	Glacial sand	Hard, rusty, iron, "alkaline"		D, S	Sufficient for local needs; also 30 dry holes to a depth of 56 feet.
35	NW.	18	"	"	"	Dug	20	1,755	0	1,755			Glacial sand	Hard, clear, "alkaline", iron		D, S	Sufficient for local needs.
36	NE.	19	"	"	"	Bored	90	1,750	- 30	1,720	40	1,710	Glacial sand	Hard, clear, iron		D, S	Sufficient for local needs; also a 40-foot well that is not used.
37	SW.	20	"	"	"	Dug	13	1,750	- 7	1,743			Glacial sand	Soft, clear		D, S	Sufficient for local needs.
38	NW.	20	"	"	"	Dug	82	1,750	- 30	1,720	70	1,680	Glacial gravel	Hard, clear, iron		D, S	Sufficient for local needs; another well 36 feet deep.
39	NE.	20	"	"	"	Dug	25	1,745	- 19	1,726	20	1,725	Glacial sand	Hard, clear		D, S	Sufficient forlocal needs.
40	NE.	21	"	"	"	Dug	27	1,740	- 23	1,717	23	1,717	Glacial sand	Hard, clear		D, S	Sufficient for 50 head stock.
41	NW.	22	"	"	"	Dug	49	1,740	- 19	1,721			Glacial drift	Hard, clear, iron, black sediment		S	Sufficient for local needs; hauls drinking water.
42	SW.	23	"	"	"	Drilled	58	1,725	- 28	1,697	54	1,671	Glacial gravel	Hard, clear, iron		S	Sufficient for local needs; a 17-foot well is used for domestic needs.
43	SW.	24	"	"	"	Dug	75	1,725	- 22	1,703	75	1,650	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for local needs; also an 86-foot well with poor supply.
44	SE.	24	"	"	"	Dug	9	1,720	- 5	1,715	5	1,715	Glacial gravel	Soft, clear		D, S	Sufficient for local needs.
45	NE.	24	"	"	"	Dug	16	1,720	- 12	1,708	12	1,708	Glacial sand	Hard, clear		S	Sufficient for 50 head stock; another well 20 feet deep is used for domestic needs.
46	NW.	25	"	"	"	Bored	14	1,725	- 12	1,713	12	1,713	Glacial gravel	Hard, clear		D, S	Insufficient for local needs.
47	SE.	26	"	"	"	Dug	30	1,725	- 10	1,715			Glacial drift	Hard, clear		S	Insufficient for local needs; 3 other similar wells 12 feet deep.
48	NE.	26	"	"	"	Dug	30	1,725	- 15	1,710	15	1,710	Glacial sand and gravel	Hard, clear		D, S	Sufficient for local needs.

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of CALDER, NO. 241, 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
49	SW.	27	25	31	1	Dug	20	1,735	- 15	1,720	19	1,716	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
50	SE.	28	"	"	"	Dug	45	1,740	- 20	1,720	45	1,695	Glacial sand	Hard, clear		D, S	Sufficient for local needs; another well 12 feet
51	NE.	28	"	"	"	Dug	24	1,740	- 15	1,725			Glacial drift	Soft, clear		D	Intermittent supply; another 24-foot well is used for stock.
52	NW.	28	"	"	"	Dug	25	1,750	- 19	1,731	19	1,731	Glacial sand	Soft, clear		D, S	Sufficient for local needs.
53	SE.	29	"	"	"	Dug	26	1,745	- 17	1,728	26	1,719	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
54	SW.	30	"	"	"	Dug	20	1,750	- 13	1,737			Glacial drift	Hard, clear, iron, "alkaline"		D	Sufficient for local needs; another similar well is used for stock.
55	NW.	30	"	"	"	Dug	28	1,750	- 19	1,731	24	1,726	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
56	NE.	30	"	"	"	Dug	18	1,750	- 14	1,736	17	1,733	Glacial gravel	Hard, clear		D, S	Sufficient for local needs; other wells to a depth of 60 feet with small supplies.
57	NE.	30	"	"	"	Dug	40	1,750	- 20	1,730			Glacial drift	Hard, clear, "alkaline"		D, S	Intermittent supply; also another well 22 feet deep.
58	SW.	32	"	"	"	Dug	22	1,750	- 18	1,732	20	1,730	Glacial sand	Hard, clear		D, S	Sufficient for local needs; also another well 22 feet deep.
59	SE.	32	"	"	"	Bored	70	1,750	- 68	1,682			Glacial drift	Soft, clear		D	Intermittent supply; another well 38 feet deep.
60	NW.	32	"	"	"	Dug	20	1,750	- 14	1,736	18	1,732	Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
61	NE.	32	"	"	"	Dug	40	1,750	- 10	1,740	38	1,712	Glacial sand	Hard, clear, iron		D, S	Sufficient for local needs; also a dry hole.
62	SW.	33	"	"	"	Dug	48	1,750	- 42	1,708			Glacial sand	Hard, clear		D, S	Sufficient for local needs.
63	NE.	33	"	"	"	Dug	44	1,740	- 20	1,720			Glacial drift	Hard, clear, "alkaline"		D, S	Sufficient for local needs.
64	SW.	34	"	"	"	Dug	30	1,740	- 24	1,716			Glacial drift	Hard, clear, iron		D, S	Sufficient for local needs; also another well 16 feet deep.
65	NE.	34	"	"	"	Dug	14	1,740	- 8	1,732	8	1,732	Glacial gravel	Soft, clear		D, S	Sufficient for local needs.
66	NW.	34	"	"	"	Dug	20	1,740	- 10	1,730			Glacial gravel	Soft, clear		D, S	Sufficient for local needs.
67	SW.	36	"	"	"	Dug	8	1,730	- 5	1,725	5	1,725	Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
68	SE.	36	"	"	"	Dug	35	1,730	- 18	1,712	35	1,695	Glacial gravel	Soft, clear		D, S	Sufficient for local needs.
69	NW.	36	"	"	"	Dug	24	1,727	- 14	1,713	22	1,705	Glacial sand	Hard, clear		D, S	Insufficient for local need; #; also another well 15 feet deep; #.
70	NE.	36	"	"	"	Dug	22	1,730	- 18	1,712	18	1,712	Glacial sand	Hard, clear		D, S	Sufficient for local needs; another similar well, #.
1	SE.	1	25	32	1	Dug	18	1,756	- 3	1,753	14	1,742	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
2	NW.	1	"	"	"	Dug	37	1,760	- 10	1,750	20	1,740	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for local needs; another similar well 34 feet deep.
3	SE.	2	"	"	"	Dug	18	1,765	- 16	1,749	16	1,749	Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
4	NW.	2	"	"	"	Dug	30	1,760	- 26	1,734	26	1,734	Glacial sand	Soft, clear		D, S	Insufficient for local needs in winter.

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 CALDER, NO. 241, 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	SW.	3	25	32	1	Dug	32	1,760	- 22	1,738	32	1,728	Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
6	SE.	4	"	"	"	Dug	39	1,755	- 22	1,733	39	1,716	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
7	NE.	4	"	"	"	Dug	27	1,760	- 22	1,738	22	1,738	Glacial sand	Hard, clear, "alkaline"		D, S	Constant water-level.
8	SE.	5	"	"	"	Dug	20	1,750	- 10	1,740	18	1,732	Glacial sand	Soft, clear		D, S	Intermittent supply.
9	NE.	6	"	"	"	Bored	31	1,756	- 18	1,738	18	1,738	Glacial sand	Hard, clear, iron		D, S	Sufficient for local needs.
10	NW.	7	"	"	"	Dug	14	1,750	- 10	1,740	12	1,738	Glacial sand	Hard, clear		D, S	Sufficient for local needs; also several dry holes.
11	NE.	7	"	"	"	Dug	70	1,755	- 15	1,740	70	1,685	Glacial sand and gravel	Hard, clear		D, S	Sufficient for local needs.
12	SE.	8	"	"	"	Dug	32	1,755	- 23	1,732	23	1,732	Glacial sand	Soft, clear		D, S	Sufficient for local needs.
13	NE.	8	"	"	"	Dug	32	1,750	- 29	1,721	29	1,721	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
14	SW.	9	"	"	"	Dug & Drilled	50	1,755	- 23	1,732	50	1,705	Glacial sand	Soft, clear		D, S	Sufficient for local needs.
15	NE.	9	"	"	"	Dug & Drilled	50	1,764	- 21	1,743	50	1,714	Glacial sand	Soft, clear		S	Sufficient for local needs; another well 30 feet deep is used for domestic needs.
16	NW.	9	"	"	"	Dug	30	1,750	- 27	1,723	27	1,723	Glacial sand	Soft, clear		D, S	Sufficient for local needs.
17	SW.	10	"	"	"	Dug	28	1,764	- 18	1,746	20	1,744	Glacial sand	Soft, clear		D, S	Sufficient for local needs.
18	NW.	10	"	"	"	Dug	46	1,750	- 30	1,720	46	1,704	Glacial sand	Hard, clear, iron		D, S	Sufficient for local needs.
19	NE.	10	"	"	"	Dug & Drilled	42	1,760	- 7	1,753	34	1,726	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
20	SE.	12	"	"	"	Dug	50	1,755	- 45	1,710	45	1,710	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
21	SW.	14	"	"	"	Dug & Bored	65	1,760	- 35	1,725			Glacial drift	Hard, clear		D, S	Insufficient for local needs.
22	SW.	15	"	"	"	Dug & Drilled	40	1,755	- 29	1,726			Glacial drift	Hard, clear		D	Insufficient for local needs.
23	NW.	15	"	"	"	Dug	23	1,760	- 20	1,740	20	1,740	Glacial sand	Soft, clear		D	Sufficient for local needs; another well 23 feet deep is used for stock.
24	NE.	15	"	"	"	Dug & Drilled	57	1,763	- 27	1,736			Glacial drift	Hard, clear		D	Insufficient for local needs.
25	SW.	16	"	"	"	Dug	18	1,750	- 11	1,739	11	1,739	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
26	SE.	16	"	"	"	Dug	26	1,760	- 20	1,740			Glacial drift	Hard, clear, "alkaline"		D, S	Insufficient for local needs.
27	NE.	16	"	"	"	Dug	40	1,760	- 22	1,738	40	1,720	Glacial sand	Hard, clear		D	Sufficient for local needs; another similar well 38 feet deep.
28	SW.	17	"	"	"	Dug	30	1,751	- 13	1,738	30	1,721	Glacial sand	Hard, clear		D, S	Sufficient for local needs; also a 40-foot dry hole.
29	SW.	18	"	"	"	Dug	44	1,750	- 22	1,728	44	1,706	Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
30	NE.	18	"	"	"	Dug & Drilled	40	1,750	- 23	1,727	40	1,710	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
31	SW.	19	"	"	"	Bored	35	1,750	- 23	1,727			Glacial drift	Hard, iron		D, S	Sufficient for local needs.

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

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

WELL RECORDS—Rural Municipality of CALDER, NO. 241, 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
32	NE.	19	25	32	1	Dug	24	1,750	- 16	1,734	20	1,730	Glacial sand	Hard, clear, iron		D, S	Sufficient for local needs.
33	SW.	20	"	"	"	Dug & Drilled	41	1,750	- 20	1,730	41	1,709	Glacial sand	Hard, clear		S	Insufficient for local needs; another well 30 feet deep is used for domestic needs.
34	NW.	20	"	"	"	Dug	24	1,743	- 17	1,726			Glacial sand	Hard, clear		D, S	Sufficient for local needs.
35	NE.	20	"	"	"	Dug	26	1,760	- 19	1,741	19	1,741	Glacial sand	Soft, clear		D, S	Sufficient for local needs.
36	SE.	21	"	"	"	Dug	40	1,763	- 33	1,730	40	1,723	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
37	NW.	21	"	"	"	Dug	35	1,750	- 29	1,721	29	1,721	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
38	SW.	22	"	"	"	Dug	16	1,755	- 12	1,743	12	1,743	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
39	SE.	23	"	"	"	Dug & Drilled	115	1,760	- 33	1,727			Glacial drift	Hard, clear, "alkaline"		D	Insufficient for local needs; also 2 dry holes 100 feet deep.
40	NE.	23	"	"	"	Dug & Drilled	[illegible]	1,760	- 8	1,752	40	1,720	Glacial sand	Hard, clear		S	Sufficient for local needs.
41	SE.	24	"	"	"	Dug & Drilled	62	1,750	- 24	1,726	62	1,688	Glacial sand	Hard, clear, iron		D, S	Sufficient for local needs; also another well 7 feet deep.
42	SW.	24	"	"	"	Dug	24	1,755	- 14	1,741			Glacial drift	Hard, clear		D, S	Abundant supply; numerous other wells 20 feet deep with poor supplies.
43	NW.	24	"	"	"	Dug	16	1,755	- 12	1,743			Glacial sandy clay	Hard, rusty, iron		S	Sufficient for local needs; another well 12 feet deep.
44	NW.	26	"	"	"	Dug	13	1,750	- 9	1,741	9	1,741	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
45	SW.	27	"	"	"	Bored	22	1,755	- 11	1,744			Glacial sand	Hard, clear		D	Sufficient for local needs.
46	SE.	28	"	"	"	Dug	18	1,760	- 12	1,748			Glacial sand	Hard, clear		D, S	Sufficient for local needs.
47	NE.	28	"	"	"	Dug	36	1,755	- 26	1,729	34	1,721	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
48	SE.	30	"	"	"	Dug	30	1,750	- 26	1,724	26	1,724	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
49	SW.	30	"	"	"	Dug	34	1,750	- 23	1,727			Glacial drift	Hard, clear		D, S	Sufficient for local needs.
50	NW.	30	"	"	"	Dug	40	1,740	- 34	1,706	34	1,706	Glacial sand	Hard, clear		D, S	Sufficient for local needs; another well 15 feet deep; is not used.
51	NE.	30	"	"	"	Dug	14	1,750	- 6	1,744			Glacial sand	Hard, clear		D, S	Sufficient for local needs; another similar 14-foot well.
52	SW.	31	"	"	"	Dug	34	1,740	- 24	1,716	24	1,716	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
53	SE.	31	"	"	"	Dug	13	1,747	- 10	1,737	10	1,737	Glacial sand	Soft, clear		D, S	Sufficient for local needs.
54	SW.	32	"	"	"	Dug & Drilled	60	1,745	- 4	1,741	60	1,685	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
55	NW.	32	"	"	"	Dug	19	1,745	- 9	1,736			Glacial drift	Hard, clear		D, S	Sufficient for local needs.
56	SE.	33	"	"	"	Dug	28	1,760	- 23	1,737			Glacial drift	Hard, clear		D, S	Sufficient for local needs.
57	SW.	34	"	"	"	Dug	34	1,755	- 18	1,737	30	1,725	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
58	NW.	34	"	"	"	Dug	28	1,750	- 17	1,733			Glacial sand	Hard, clear		D, S	Sufficient for local needs.

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

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

WELL RECORDS—Rural Municipality of CALDER, NO. 214, 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
59	NE.	34	25	32	1	Dug	17	1,750	- 10	1,740	10	1,740	Glacial sand	Hard, clear		D, S	Sufficient for local needs; also a 12-foot well.
60	SE.	36	"	"	"	Dug & Drilled	37	1,753	- 12	1,741	26	1,727	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
61	SW.	36	"	"	"	Bored	34	1,753	- 10	1,743	34	1,719	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
62	NW.	36	"	"	"	Bored	50	1,753	- 20	1,733	50	1,703	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
63	NE.	36	"	"	"	Bored	25	1,753	- 13	1,740	13	1,740	Glacial sand	Soft, clear		D, S	Sufficient for local needs.
1	SW.	2	25	33	1	Dug	24	1,745	- 18	1,727	18	1,727	Glacial sand	Hard, clear		D, S	Sufficient for local needs; another well 18 feet deep.
2	NW.	13	"	"	"	Dug	19	1,750	- 11	1,739	11	1,739	Glacial sand	Soft, clear		D, S	Sufficient for local needs.
3	SE.	14	"	"	"	Bored	40	1,750	- 22	1,728	40	1,710	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
4	SE.	24	"	"	"	Bored	23	1,750	- 16	1,734			Glacial drift	Hard, black		D, S	Constant water-level.
5	NW.	24	"	"	"	Bored	60	1,750	- 30	1,720			Glacial drift	Hard, clear, "alkaline"		D, S	Sufficient for local needs.
6	NW.	25	"	"	"	Bored	60	1,750	- 20	1,730			Glacial drift	Hard, brown, "alkaline", iron		D, S	Sufficient for local needs.
7	NE.	36	"	"	"	Dug & Drilled	40	1,745	- 14	1,731	40	1,705	Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
1	SE.	2	26	30	1	Drilled	170	1,700	-135	1,565	135	1,565	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
2	NE.	2	"	"	"	Dug	16	1,685	- 6	1,679			Glacial sand	Hard, clear		D, S	Sufficient for local needs; another similar well 16 feet deep.
3	NW.	2	"	"	"	Dug	16	1,700	- 13	1,687	13	1,687	Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
4	NE.	3	"	"	"	Dug	85	1,700	- 80	1,620	80	1,620	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
5	NW.	4	"	"	"	Dug	14	1,730	- 8	1,722	8	1,722	Glacial sand	Soft, clear		D, S	Sufficient for local needs; 2 other wells not used.
6	SW.	5	"	"	"	Dug	16	1,740	- 6	1,734			Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
7	SE.	5	"	"	"	Drilled	120	1,730	- 60	1,670	60	1,670	Glacial sand	Hard, clear		D, S	Sufficient for local needs; a 9-foot well has a good supply; and a 20-foot well has an intermittent supply.
8	SE.	6	"	"	"	Dug	14	1,741	- 13	1,728	13	1,728	Glacial sand	Hard, clear		D	Sufficient only for domestic needs.
9	SW.	6	"	"	"	Dug	12	1,740	- 4	1,736	4	1,736	Glacial gravel	Soft, clear		S	Sufficient for local needs.
10	NW.	6	"	"	"	Dug	22	1,740	- 14	1,726	14	1,726	Glacial sand	Hard, clear		D, S	Also two other wells 50 and 18 feet deep.
11	NE.	6	"	"	"	Dug	20	1,730	- 10	1,720			Glacial sand	Soft, clear		D, S	Insufficient for local needs; another well 41 feet deep.
12	SE.	8	"	"	"	Dug	34	1,728	- 28	1,700	32	1,696	Glacial sand	Hard, clear		D, S	Insufficient for local needs; another well 20 feet deep.
13	NE.	8	"	"	"	Drilled	149	1,725	-109	1,616	109	1,616	Glacial sand	Hard, clear		D, S	Sufficient for local needs.

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

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

WELL RECORDS—Rural Municipality of CALDER; NO. 214, 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	SE.	9	26	30	1	Dug	13	1,715	- 3	1,712			Glacial sand	Soft, clear		D, S	Intermittent supply.
15	SE.	10	"	"	"	Drilled	150	1,700	-115	1,585	150	1,550	Glacial gravel	Hard, clear, "alkaline"		D, S	Sufficient for local needs.
16	SW.	10	"	"	"	Drilled	130	1,715	-100	1,615	100	1,615	Glacial gravel	Hard, clear		S	Sufficient for local needs.
17	NW.	10	"	"	"	Drilled	172	1,715									Dry hole; base in Bearpaw shale; also a 6-foot well with good supply.
18	SW.	12	"	"	"	Drilled	200	1,680	-170	1,510	170	1,510	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for local needs.
19	NW.	12	"	"	"	Dug	12	1,680	- 5	1,675	5	1,675	Glacial sand and gravel	Soft, clear		N	Sufficient supply; but used only for washing.
20	SW.	13	"	"	"	Drilled	165	1,690	-145	1,545	145	1,545	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient forlocal needs.
21	SE.	14	"	"	"	Dug	21	1,690	- 16	1,674	18	1,672	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
22	NW.	14	"	"	"	Dug	15	1,700	- 5	1,695	10	1,690	Glacial sand	Hard, clear		S	Intermittent supply.
23	SE.	15	"	"	"	Drilled	125	1,700	- 83	1,617	83	1,617	Glacial sand	Soft, clear		D, S	Sufficient for local needs.
24	NE.	15	"	"	"	Drilled	135	1,700	-100	1,600	135	1,565	Glacial sand	Hard, clear, iron		D, S	Constant water-level.
25	NE.	16	"	"	"	Drilled	120	1,720	-100	1,620	106	1,614	Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
26	NW.	16	"	"	"	Drilled	100	1,715	- 76	1,639	96	1,619	Glacial gravel	Soft, clear		D, S	Sufficient for local needs.
27	SW.	17	"	"	"	Dug	10	1,725	- 6	1,719	6	1,719	Glacial sand	Hard, clear		D	Intermittent supply; also another well 4 feet deep.
28	SE.	18	"	"	"	Bored	82	1,725	- 78	1,647	78	1,647	Glacial sand	Hard, clear		D, S	Sufficient for local needs; another well 12 feet deep
29	NE.	18	"	"	"	Bored	72	1,730	- 70	1,660	70	1,660	Glacial sand	Hard, clear		D, S	Sufficient only for domestic needs; also dry holes to a depth of 19 feet.
30	NW.	20	"	"	"	Dug	12	1,715	- 9	1,706	9	1,706	Glacial sand	Soft, clear		D, S	Intermittent supply.
31	SE.	22	"	"	"	Drilled	120	1,700	- 75	1,625	120	1,580	Glacial sand	Hard, clear, iron		D, S	Sufficient for local needs.
32	SE.	23	"	"	"	Drilled	85	1,700	- 60	1,640	75	1,625	Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
33	SW.	30	"	"	"	Dug	11	1,720	- 7	1,713	7	1,713	Glacial sand	Hard, clear		D, S	Intermittent supply; another similar well.
34	SW.	32	"	"	"	Dug	20	1,720	- 15	1,705			Glacial drift	Hard, clear		D, S	Intermittent supply.
35	SW.	34	"	"	"	Dug	100	1,715	- 97	1,618	97	1,618	Glacial sand and gravel	Hard		D, S	Insufficient for local needs; also 5 springs on farm.
1	SW.	2	26	31	1	Dug	20	1,730	- 13	1,717			Glacial drift	Soft, clear		D, S	Insufficient for local needs.
2	NW.	2	"	"	"	Dug & Drilled	63	1,730	- 30	1,700			Glacial drift	Hard, clear		D	Insufficient forlocal needs.
3	NE.	2	"	"	"	Dug	21	1,750	- 7	1,743			Glacial drift	Hard, clear		D, S	Insufficient for local needs.
4	SE.	4	"	"	"	Dug	26	1,740	- 19	1,721	24	1,716	Glacial gravel	Hard, clear		D, S	Sufficient for local needs; 2 other wells 26 and 12 feet deep, with small supplies.

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 CALDER, NO. 241, 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.	4	26	31	1	Dug	20	1,740	- 11	1,729	11	1,729	Glacial gravel	Hard, clear		D, S	Sufficient for local needs; another well 8 feet deep.
6	NW.	5	"	"	"	Dug	26	1,740	- 19	1,721			Glacial drift	Soft, clear		D, S	Intermittent supply; 2 other similar wells 31 and 26 feet deep.
7	SE.	6	"	"	"	Dug	11	1,750	- 6	1,744			Glacial drift	Hard, clear		D, S	Sufficient for local needs; another well 11 feet deep is not used.
8	SW.	6	"	"	"	Dug	19	1,750	- 11	1,739			Glacial sand	Hard, clear		D, S	Sufficient for local needs.
9	NE.	6	"	"	"	Dug	25	1,740	- 23	1,717			Glacial drift	Hard, clear		D, S	Insufficient supply; 2 other wells 6 and 26 feet deep; also 8 dry holes to a depth of 25 feet.
10	NW.	6	"	"	"	Dug	15	1,750	0	1,750	14	1,736	Glacial sand	Hard, clear, iron		S	Insufficient for local needs.
11	SE.	7	"	"	"	Dug	23	1,745	- 19	1,726			Glacial drift	Hard, iron, "alkaline"		D, S	Sufficient for local needs; also 6 dry holes to a depth of 26 feet.
12	NE.	7	"	"	"	Dug	18	1,740	- 14	1,726	14	1,726	Glacial sand	Soft, clear		D, S	Sufficient for local needs; another similar well.
13	SW.	8	"	"	"	Dug	22	1,740	- 13	1,727			Glacial drift	Hard, clear, iron		D, S	Sufficient for local needs.
14	SE.	9	"	"	"	Dug	20	1,735									Dry hole; base in glacial clay; also a well 8 feet deep.
15	SW.	9	"	"	"	Dug	15	1,735	- 7	1,728			Glacial sand	Hard, clear		D, S	Sufficient for local needs.
16	SE.	10	"	"	"	Dug	36	1,735	- 26	1,709			Glacial drift	Hard, clear, iron		D, S	Intermittent supply; also 15 dry holes to a depth of 40 feet.
17	NE.	10	"	"	"	Dug & Bored	29	1,735	0	1,735			Glacial sand	Hard, clear, iron		S	Insufficient for local needs.
18	NW.	10	"	"	"	Dug	13	1,735	- 11	1,724	11	1,724	Glacial sand	Soft, clear		D, S	Sufficient for local needs.
19	NE.	12	"	"	"	Dug	12	1,730	- 8	1,722	8	1,722	Glacial sand	Hard, clear		D, S	Sufficient for local needs; also another well 20 feet deep.
20	NE.	14	"	"	"	Dug	15	1,730	- 10	1,720	10	1,720	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
21	SW.	15	"	"	"	Dug	12	1,730	- 11	1,719	11	1,719	Glacial sand and gravel	Hard, clear		D, S	Sufficient for local needs.
22	NW.	15	"	"	"	Dug	12	1,730	- 2	1,728			Glacial drift	Hard, clear, "alkaline"		D, S	Intermittent supply; also 2 dry holes to a depth of 40.
23	NW.	16	"	"	"	Dug	35	1,720	- 14	1,706	35	1,685	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
24	NE.	16	"	"	"	Dug	31	1,740	- 8	1,732	31	1,709	Glacial sand	Hard, clear, iron		D, S	Sufficient for local needs; another well 20 feet deep has a small supply.
25	SW.	18	"	"	"	Dug	18	1,730	- 15	1,715	15	1,715	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
26	SE.	18	"	"	"	Dug	20	1,730	- 16	1,714	16	1,714	Glacial sand	Hard, clear		D, S	Sufficient for local needs; another well 18 feet deep.
27	NW.	18	"	"	"	Dug	30	1,730	- 15	1,715			Glacial drift	Hard, clear		D, S	Sufficient for local needs.
28	NE.	18	"	"	"	Dug	20	1,730	- 15	1,715	15	1,715	Glacial sand	Hard, clear		D, S	Sufficient for local needs; another similar well.
29	SE.	19	"	"	"	Dug	15	1,695	- 10	1,685			Glacial sand	Hard, clear		D, S	Intermittent supply.
30	NW.	19	"	"	"	Dug	18	1,700	- 10	1,690	18	1,682	Glacial sand	Soft, clear		D, S	Sufficient for local needs.

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

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

WELL RECORDS—Rural Municipality of CALDER, NO. 241, 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
31	SW.	20	26	31	1	Dug	19	1,710	- 13	1,697	17	1,693	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
32	SW.	22	"	"	"	Dug	24	1,725	- 16	1,709			Glacial drift	Hard, clear, "alkaline", iron		D, S	Sufficient for local needs.
33	SW.	22	"	"	"	Dug	13	1,725	- 3	1,722	8	1,717	Glacial sand	Hard, clear, "alkaline"		S	Sufficient for local needs.
34	NW.	22	"	"	"	Dug	20	1,715	- 17	1,698			Glacial sand	Hard, clear		D, S	Sufficient for local needs.
35	SW.	24	"	"	"	Dug	15	1,730	- 9	1,721			Glacial drift	Hard, clear, "alkaline"		D, S	Insufficient for local needs.
36	NW.	25	"	"	"	Dug	30	1,730									Dry hole; base in glacial clay.
37	NE.	26	"	"	"	Dug	25	1,730	- 19	1,711	19	1,711	Glacial sand	Hard, clear		D, S	Intermittent supply.
38	SE.	28	"	"	"	Dug	15	1,705	- 12	1,693	12	1,693	Glacial sand	Hard, clear		D, S	Insufficient for local needs.
39	NW.	28	"	"	"	Dug	18	1,705	- 12	1,693	17	1,688	Glacial sand and gravel	Hard, clear		D, S	Sufficient for local needs.
40	NE.	28	"	"	"	Dug	15	1,710	- 10	1,700	10	1,700	Glacial sand	Soft, clear		D, S	Sufficient for local needs.
41	SW.	30	"	"	"	Dug	19	1,690	- 12	1,678	19	1,671	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
42	SE.	30	"	"	"	Dug	13	1,685	- 7	1,678	7	1,678	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
43	NE.	30	"	"	"	Dug	20	1,700	- 13	1,687			Glacial drift	Hard, clear		D, S	Insufficient forlocal needs.
44	NW.	30	"	"	"	Dug	30	1,685	- 18	1,667			Glacial drift	Hard, clear, iron		D, S	Sufficient for local needs.
45	SE.	31	"	"	"	Dug & Drilled	34	1,680	- 7	1,673	34	1,646	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
46	SW.	31	"	"	"	Dug	14	1,680	- 6	1,674	12	1,668	Glacial sand	Hard, clear		D, S	Sufficient for local needs; also a 20-foot dry hole.
47	SE.	32	"	"	"	Dug	31	1,705	- 3	1,702	31	1,674	Glacial drift	Soft, clear		D, S	Sufficient for local needs.
48	SW.	32	"	"	"	Dug & Drilled	22	1,700	- 10	1,690	22	1,628	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
49	NW.	32	"	"	"	Dug	32	1,680	- 21	1,659	32	1,648	Glacial sand(?)	Hard, clear		D, S	Sufficient for local needs; also a 15-foot dry hole.
50	NE.	32	"	"	"	Dug	29	1,685	- 9	1,676	27	1,658	Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
51	NE.	33	"	"	"	Dug	15	1,690	- 12	1,678	12	1,678	Glacial sand	Soft, clear		D	Sufficient for local needs; another well 9 feet deep is used for stock.
52	SE.	34	"	"	"	Dug	15	1,723	- 10	1,713	10	1,713	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
53	NW.	35	"	"	"	Dug	20	1,727	- 18	1,709	18	1,709	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
54	NE.	35	"	"	"	Dug	14	1,730	- 9	1,721	9	1,721	Glacial sand	Soft, clear		D, S	Insufficient for local needs.
1	SW.	2	26	32	1	Dug	9	1,745	- 3	1,742	8	1,737	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
2	SE.	2	"	"	"	Bored	33	1,741	- 24	1,717			Glacial sand	Hard, clear, iron		D, S	Sufficient for local needs; also several dry holes to a depth of 20 feet.

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 CALDER, NO. 214, 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	NW.	2	26	32	1	Dug	12	1,750	− 6	1,744			Glacial drift	Hard, iron, red		D, S	Intermittent supply.
4	NW.	3	"	"	"	Dug	26	1,750	− 12	1,738	26	1,724	Glacial sand	Hard, clear		D, S, M	Sufficient for local needs.
5	SE.	4	"	"	"	Dug	17	1,750	0	1,750			Glacial drift	Hard, clear		D, S	Sufficient for local needs; another well 8 feet deep.
6	SW.	4	"	"	"	Dug	24	1,745	− 21	1,724	21	1,724	Glacial sand and gravel	Soft, clear		D, S	Sufficient for local needs; also 2 other wells 20 feet deep.
7	NW.	4	"	"	"	Dug	15	1,745	− 3	1,742	10	1,735	Glacial sand	Hard, clear		D	Sufficient for local needs; another well 1 feet deep.
8	SW.	6	"	"	"	Dug	14	1,750	− 7	1,743	9	1,741	Glacial sand	Hard, clear, iron		D, S	Sufficient for local needs.
9	NW.	6	"	"	"	Dug	30	1,745	− 20	1,725			Glacial drift	Hard, clear		D, S	Sufficient for local needs.
10	NE.	6	"	"	"	Bored	85	1,745	− 20	1,725	85	1,660	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for local needs; also 2 dry ho 40 and 60 feet deep.
11	SE.	7	"	"	"	Bored	31	1,740	− 25	1,715			Glacial sand	Hard, clear, iron		D, S	Insufficient for local needs.
12	NE.	7	"	"	"	Dug	23	1,737	− 8	1,729			Glacial drift	Hard, clear		S	Sufficient for local needs; another well 16 feet deep is used for domestic needs.
13	SE.	8	"	"	"	Bored	30	1,740	− 3	1,737	25	1,715	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
14	SW.	8	"	"	"	Dug	20	1,739									Dry hole; base in glacial clay.
15	NE.	9	"	"	"	Dug	10	1,745	− 5	1,740	5	1,740	Glacial gravel	Soft, clear		S	Sufficient for local needs.
16	SW.	10	"	"	"	Dug	24	1,751	− 12	1,739			Glacial sand	Hard, clear		D, S	Sufficient for local needs.
17	SE.	10	"	"	"	Dug	35	1,740	− 14	1,726	35	1,705	Glacial sand	Hard, iron, rusty		D, S	Sufficient for local needs.
18	NW.	10	"	"	"	Dug	12	1,745	− 7	1,738	7	1,738	Glacial gravel	Soft, clear		D, S	Sufficient for local needs; also a 100-foot dry hole.
19	NE.	10	"	"	"	Dug	22	1,738	− 11	1,727			Glacial sand	Hard, clear		D, S	Sufficient for local needs.
20	SE.	12	"	"	"	Dug	14	1,740	− 8	1,732			Glacial sand	Hard, clear		D, S	Sufficient for local needs.
21	SW.	12	"	"	"	Dug	20	1,750	− 16	1,734	16	1,734	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
22	NE.	12	"	"	"	Dug	12	1,730	− 3	1,727	9	1,721	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
23	NW.	12	"	"	"	Dug	18	1,740	− 15	1,725	15	1,725	Glacial sand	Soft, clear		D, S	Sufficient for local needs.
24	SW.	13	"	"	"	Dug	24	1,740	− 12	1,728	12	1,728	Glacial sand	Hard, clear, "alkaline"		S	Insufficient for local needs.
25	SE.	14	"	"	"	Dug	22	1,740	− 11	1,729			Glacial sand	Hard, clear, "alkaline"		S	Sufficient for local needs with aid of another well 18 feet deep.
26	SW.	14	"	"	"	Dug	18	1,745	− 14	1,731			Glacial sand	Hard, clear		D, S	Sufficient for local needs.
27	NW.	14	"	"	"	Dug	20	1,728	− 8	1,720	20	1,708	Glacial sandy clay	Hard, cloudy		S	Sufficient for local needs; another well 16 feet deep.
28	NE.	15	"	"	"	Dug	13	1,730	− 8	1,722	12	1,718	Glacial gravel	Soft, clear		D, S	Sufficient for local needs.
29	SE.	16	"	"	"	Dug	17	1,735	− 13	1,722			Glacial sand	Hard, clear		D, S	Sufficient for local needs.

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

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

WELL RECORDS—Rural Municipality of CALDER, NO. 241, 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.	18	26	32	1	Dug	12	1,740	- 8	1,732	8	1,732	Glacial sand	Hard, clear		D, S	Insufficient for local needs; another well 6 feet deep.
31	SE.	18	"	"	"	Dug	20	1,735	- 10	1,725	20	1,715	Glacial sand	Hard, clear, iron		S	Sufficient for local needs; an 18-foot well is used for domestic needs.
32	NE.	18	"	"	"	Dug	18	1,730	- 13	1,717	16	1,714	Glacial sand	Soft, clear		D	Sufficient for local needs; another well is used for stock needs.
33	SW.	19	"	"	"	Bored	15	1,740	- 10	1,730			Glacial drift	Hard, clear		S	Intermittent supply; another similar well.
34	SW.	20	"	"	"	Dug	21	1,730	- 14	1,716	18	1,712	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
35	SE.	20	"	"	"	Bored	26	1,730	- 14	1,716	25	1,705	Glacial sand	Soft, clear		D, S	Sufficient for local needs.
36	NE.	20	"	"	"	Dug & Bored	30	1,725	- 15	1,710	30	1,695	Glacial sand	Hard, clear		S	Sufficient for local needs.
37	NW.	20	"	"	"	Dug	23	1,728	- 15	1,713	23	1,705	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
38	SW.	21	"	"	"	Dug	25	1,730	- 17	1,713	25	1,705	Glacial sand	Hard, clear		S	Sufficient for local needs.
39	SE.	22	"	"	"	Dug	18	1,720	- 13	1,707			Glacial sand	Soft, clear		D, S	Sufficient for local needs.
40	NW.	22	"	"	"	Dug & Drilled	33	1,725	- 13	1,712	30	1,695	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
41	SE.	24	"	"	"	Dug	24	1,730	- 16	1,714	24	1,706	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
42	SW.	24	"	"	"	Dug	30	1,715	- 7	1,708	30	1,685	Glacial sand	Soft, clear		D, S	Sufficient for local needs.
43	NE.	24	"	"	"	Dug	18	1,705	- 8	1,697	18	1,687	Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
44	SW.	25	"	"	"	Dug	40	1,710	- 20	1,690	40	1,670	Glacial sand	Hard, clear, iron		D, S	Sufficient for local needs.
45	NE.	27	"	"	"	Bored	50	1,725	- 20	1,705			Glacial drift	Hard, clear, "alkaline", iron		D, S	Sufficient for local needs.
46	SW.	28	"	"	"	Dug	21	1,725	- 12	1,713	18	1,707	Glacial sand	Hard, clear		D	Sufficient for local needs; another similar well 24 feet deep is used for stoc
47	NE.	28	"	"	"	Bored	32	1,720	- 10	1,710	32	1,688	Glacial sand	Soft, clear		D, S	Sufficient for local needs.
48	SE.	30	"	"	"	Dug	22	1,734	- 15	1,719			Glacial sandy clay	Soft, clear		D, S	Sufficient for local needs.
49	NE.	30	"	"	"	Dug	34	1,725	- 14	1,711	34	1,691	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
50	NW.	30	"	"	"	Dug	25	1,730	- 10	1,720	22	1,708	Glacial gravel	Hard, clear, "alkaline"		D, S	Sufficient for local needs; also dry holes to a depth of 80 feet.
51	SE.	32	"	"	"	Dug	26	1,720	- 20	1,700	26	1,694	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
52	NW.	32	"	"	"	Dug	26	1,720	- 22	1,698	22	1,698	Glacial sand	Hard, clear		D, S	Sufficient for local needs; another well 12 feet deep.
53	NE.	32	"	"	"	Dug	22	1,720	- 16	1,704	16	1,704	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
54	NW.	33	"	"	"	Bored	23	1,720	- 20	1,700	20	1,700	Glacial sand	Hard, clear		D, S	Insufficient for local needs.
55	SE.	34	"	"	"	Dug & Bored	44	1,725	- 16	1,709	44	1,681	Glacial sand	Hard, clear		D, S	Sufficient for local needs.

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

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

WELL RECORDS—Rural Municipality of CALDER, NO. 241, 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
56	SW.	34	26	32	1	Dug	26	1,710	- 12	1,698	26	1,684	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
57	NW.	34	"	"	"	Dug	22	1,725	- 18	1,707	18	1,707	Glacial sand	Soft, clear		D, S	Sufficient for local needs.
58	NE.	34	"	"	"	Dug	24	1,710	- 14	1,696	24	1,696	Glacial drift	Hard, clear, "alkaline", iron		D, S	Sufficient for local needs.
59	SW.	35	"	"	"	Bored	27	1,725	- 14	1,711	27	1,698	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
60	SW.	36	"	"	"	Dug	21	1,700	- 15	1,685			Glacial drift	Hard, clear, "alkaline"		D, S	Insufficient for local needs; also another well 12 feet deep.
61	NW.	36	"	"	"	Dug	21	1,690	- 10	1,680	21	1,669	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for local needs.
1	SE.	2	26	33	1	Bored	45	1,730	- 30	1,700	45	1,685	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
2	NE.	2	"	"	"	Dug	50	1,745	- 33	1,712			Glacial drift	Hard, clear		D, S	Sufficient for local needs.
3	NW.	2	"	"	"	Dug & Bored	60	1,736	- 28	1,708	60	1,676	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
4	SE.	11	"	"	"	Dug & Bored	40	1,735	- 25	1,710			Glacial drift	Hard, clear, iron		D, S	Sufficient for local needs; also another well 26 feet deep.
5	NE.	12	"	"	"	Dug	20	1,740	- 15	1,725			Glacial drift	Hard, clear, iron		D, S	Insufficient for local needs.
6	NW.	12	"	"	"	Dug & Bored	50	1,740	- 14	1,726			Glacial drift	Hard, clear		D, S	Insufficient for local needs; also another well 12 feet deep.
7	SE.	14	"	"	"	Dug	20	1,725	- 8	1,717	20	1,705	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
8	SE.	23	"	"	"	Bored	40	1,728	- 15	1,713	40	1,688	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for local needs.
9	NE.	23	"	"	"	Bored	60	1,724	- 25	1,699	60	1,664	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for local needs.
10	NW.	24	"	"	"	Dug	30	1,725	- 27	1,698			Glacial drift	Hard, clear		S	Intermittent supply; 2 other wells 34 and 29 feet deep.
11	NE.	24	"	"	"	Dug	26	1,735	- 10	1,725	26	1,709	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for local needs; also another well 24 feet deep.
12	SW.	25	"	"	"	Dug	16	1,725	- 11	1,714	11	1,714	Glacial sand	Hard, clear, iron		D, S	Sufficient for local needs; also another similar well.
13	NW.	25	"	"	"	Dug	25	1,725	- 15	1,710	25	1,700	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
14	SE.	26	"	"	"	Dug	25	1,725	- 15	1,710	20	1,705	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
15	SE.	35	"	"	"	Dug	25	1,725	- 15	1,710	23	1,702	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for local needs; also another well 12 feet deep.
16	SW.	35	"	"	"	Dug	12	1,720	- 8	1,712	10	1,710	Glacial sand	Soft, clear		S	Sufficient for local needs.
17	NE.	35	"	"	"	Bored	65	1,725	- 60	1,665			Glacial drift	Soft, clear		D	Intermittent supply; also another well 12 feet deep.
18	SE.	36	"	"	"	Dug	16	1,730	- 11	1,719	15	1,715	Glacial sand	Soft, clear		D, S	Sufficient for local needs.
19	SW.	36	"	"	"	Dug	25	1,725	- 17	1,708	25	1,700	Glacial sand	Hard, clear		D	Sufficient for local needs; also another well 22 feet deep.
20	NE.	36	"	"	"	Dug	25	1,730	- 17	1,718	25	1,705	Glacial sand	Hard, clear		D, S	Sufficient for local needs.

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

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

WELL RECORDS—Rural Municipality of CALDER, NO. 241, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
1	NE.	5	27	30	1	Dug	12	1,630	- 10	1,620	10	1,620	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
2	SW.	6	"	"	"	Dug	38	1,730	- 34	1,696	34	1,696	Glacial sand	Hard, clear		D, S	Sufficient only for domestic needs.
3	NW.	6	"	"	"	Dug	7	1,720	- 4	1,716	4	1,716	Glacial sand	Soft, clear		D, S	Intermittent supply.
4	SE.	7	"	"	"	Dug	10	1,630	- 6	1,624	9	1,621	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
1	SW.	1	27	31	1	Dug	20	1,730	- 18	1,712	18	1,712	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
2	SE.	2	"	"	"	Dug	20	1,720	- 11	1,709	15	1,705	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
3	SW.	2	"	"	"	Dug	13	1,720	- 8	1,712	8	1,712	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
4	NW.	2	"	"	"	Dug	15	1,730	- 11	1,719	11	1,719	Glacial sand	Hard, clear		D, S	Insufficient for 20 head stock.
5	NW.	3	"	"	"	Dug	10	1,690	- 6	1,684	6	1,684	Glacial sand	Hard, clear		D, S	Sufficient for local needs; also other similar wells.
6	SW.	4	"	"	"	Dug & Bored	34	1,690	- 10	1,680	34	1,656	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
7	SW.	5	"	"	"	Dug	16	1,690	- 12	1,678	12	1,678	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
8	NW.	5	"	"	"	Dug	5	1,690	0	1,690	0	1,690	Glacial drift	Hard, clear		D, S	Sufficient for local needs; also another well 17 feet deep.
9	NW.	6	"	"	"	Dug	20	1,700	- 18	1,682	18	1,682	Glacial sand	Soft, clear		D, S	Sufficient for local needs.
10	NW.	7	"	"	"	Bored	27	1,720	- 21	1,699	21	1,699	Glacial sand	Hard, clear		D, S	Sufficient for 20 head stock.
11	NW.	8	"	"	"	Bored	35	1,700	- 30	1,670			Glacial drift	Hard, clear		D, S	Sufficient for local needs.
12	NE.	9	"	"	"	Bored	10	1,680	- 6	1,674	6	1,674	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
13	SW.	10	"	"	"	Dug	20	1,690	- 17	1,673			Glacial drift	Hard, clear		D, S	Sufficient for local needs.
14	NW.	10	"	"	"	Bored	22	1,680	- 15	1,665	18	1,662	Glacial sand	Hard, clear, "alkaline"		D	Sufficient for local needs.
15	NE.	10	"	"	"	Bored	28	1,725	- 20	1,705			Glacial drift	Hard, clear		D	Sufficient only for domestic needs; also another well 10 feet deep.
16	SE.	13	"	"	"	Dug	10	1,630	- 4	1,626			Glacial drift	Hard, clear		D, S	Sufficient for local needs.
17	NW.	13	"	"	"	Spring	7	1,630	- 6	1,624	6	1,624	Glacial drift	Hard, clear		D, S	Sufficient for local needs.
18	SE.	15	"	"	"	Dug	32	1,730	- 29	1,701	29	1,701	Glacial sand	Hard, clear		D, S	Sufficient for local needs; also another well 16 feet deep.
19	NE.	15	"	"	"	Dug	20	1,680	- 17	1,663	17	1,663	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
20	SE.	16	"	"	"	Bored	78	1,690	- 38	1,652	78	1,612	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for local needs.
21	NW.	16	"	"	"	Dug	27	1,660	- 24	1,636	24	1,636	Glacial sand	Hard, clear		D, S	Insufficient for local needs.
22	SW.	17	"	"	"	Dug	25	1,700	- 20	1,680			Glacial drift	Hard, clear		D, S	Insufficient for local needs.
23	SW.	18	"	"	"	Bored	45	1,700	- 35	1,665	35	1,665	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
24	NW.	19	"	"	"	Bored	40	1,690	- 32	1,658			Glacial drift	Hard, clear, "alkaline"		S	Sufficient for stock needs; also another 40-foot well with intermittent supply.
25	NW.	20	"	"	"	Bored	30	1,640	- 24	1,616	26	1,614	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
26	SW.	21	"	"	"	Dug	16	1,650	- 2	1,648	16	1,634	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
27	SE.	21	"	"	"	Dug	8	1,630	- 4	1,626	4	1,626	Glacial sand	Soft, clear		D, S	Sufficient for local needs.

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

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

WELL RECORDS—Rural Municipality of CALDER, NO. 241, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
28	NE.	23	27	31	1	Dug	16	1,630	- 8	1,622			Glacial drift	Hard, clear		D, S	Sufficient for domestic needs only.
29	SW.	24	"	"	"	Dug	26	1,620	- 23	1,597			Glacial drift	Hard, clear, "alkaline"		D, S	Intermittent supply.
30	SW.	28	"	"	"	Bored	52	1,640	- 46	1,594	46	1,594	Glacial sand	Hard, clear		D	Sufficient only for domestic needs.
31	NW.	29	"	"	"	Bored	75	1,685	- 15	1,670	75	1,610	Glacial sand	Hard, clear, "alkaline"		N	Unfit for use.
32	SW.	30	"	"	"	Bored	46	1,690	- 40	1,650	40	1,650	Glacial sand	Hard, clear		D	Sufficient only for domestic needs; another well 36 feet deep.
33	NW.	30	"	"	"	Bored	45	1,680	- 40	1,640	40	1,640	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
34	NE.	31	"	"	"	Dug	10	1,670	- 3	1,667	3	1,667	Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
35	NW.	34	"	"	"	Dug	43	1,695	- 27	1,668	43	1,652	Glacial sand	Hard, clear		N	Uses water from a spring near the creek.
1	SW.	1	"	"	"	Bored	40	1,710	- 20	1,690			Glacial drift	Hard, clear, "alkaline"		S	Sufficient for local needs; also another well 30 feet deep.
2	SE.	2	"	"	"	Bored	24	1,690	- 12	1,678	12	1,678	Glacial sand and gravel	Hard, clear		D, S	Sufficient for 24 head stock.
3	SW.	2	"	"	"	Dug	18	1,690	- 15	1,675	15	1,675	Glacial sand	Soft, clear		D, S	Sufficient for 80 head stock.
4	SW.	3	"	"	"	Dug	18	1,720	- 16	1,704	16	1,704	Glacial sand	Hard, clear		S	Sufficient for local needs.
5	NE.	4	"	"	"	Dug	40	1,720	- 37	1,683			Glacial drift	Hard, clear		D, S	Sufficient only for domestic needs; also another well 10 feet deep.
6	NW.	5	"	"	"	Bored	70	1,730					Glacial sand	Hard, clear		D, S	Sufficient for local needs.
7	NE.	6	"	"	"	Dug	16	1,730	- 14	1,716	14	1,716	Glacial gravel	Hard, clear		D, S	Insufficient for local needs; also a dry hole 65 feet deep.
8	SW.	6	"	"	"	Dug	14	1,720	- 7	1,713	14	1,706	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
9	NW.	6	"	"	"	Dug & Drilled	44	1,720	- 30	1,690	32	1,688	Glacial sand	Hard, clear		D	Sufficient for local needs; also another well 21 feet deep.
10	SW.	9	"	"	"	Dug	35	1,730	- 30	1,700			Glacial drift	Hard, clear		D	Supply intermittent; another well 5 feet deep is used for stock.
11	NE.	9	"	"	"	Dug	6	1,660	- 4	1,656	4	1,656	Glacial sand and gravel	Hard, clear		D, S	Sufficient for local needs.
12	SW.	11	"	"	"	Dug	27	1,710	- 20	1,690	20	1,690	Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
13	SE.	11	"	"	"	Bored	35	1,690	- 25	1,665	30	1,660	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
14	SE.	12	"	"	"	Dug	12	1,720	- 7	1,713	9	1,711	Glacial gravel	Soft, clear		D, S	Sufficient for local needs; another well 42 feet deep caved in.
15	NE.	12	"	"	"	Bored	30	1,720	- 25	1,695	29	1,691	Glacial sand	Soft, clear		D, S	Sufficient for local needs.
16	NE.	13	"	"	"	Bored	26	1,690	- 20	1,670	24	1,666	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
17	SE.	16	"	"	"	Dug	50	1,670	- 47	1,623			Glacial sand	Hard, clear		D	Insufficient for local needs; another well 12 feet deep is used for stock.
18	SW.	16	"	"	"	Dug	40	1,690	- 27	1,663	40	1,650	Glacial sand	Hard, clear, "alkaline"		D	Sufficient for local needs; another well 15 feet deep is used for stock.

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

WELL RECORDS—Rural Municipality of CALDER, NO. 241, 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	NW.	16	27	32	1	Bored	60	1,690	- 30	1,660	60	1,630	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
20		17	"	"	"		43	1,700	- 16	1,684			Glacial sand and gravel	Hard, cloudy, brown sediment			#.
21	SE.	18	"	"	"	Dug	12	1,700	- 9	1,691	9	1,691	Glacial gravel	Hard, clear		D, S	Insufficient for local needs.
22	NE.	18	"	"	"	Bored	90	1,715									Dry hole; base in glacial clay; 3 other dry holes 80 feet deep.
23	SW.	20	"	"	"	Dug	6	1,685	- 3	1,682			Glacial drift	Hard, clear, iron		D, S	Sufficient for local needs.
24	SE.	20	"	"	"	Bored	60	1,690	- 28	1,662	60	1,630	Glacial sand	Soft, clear		D, S	Sufficient for local needs; also 2 other wells 100 and 90 feet deep.
25	NE.	20	"	"	"	Dug	45	1,700	- 20	1,680	45	1,655	Glacial gravel	Hard, clear, "alkaline"		D, S	Sufficient for local needs.
26	NE.	21	"	"	"	Bored	40	1,685	- 15	1,670	40	1,645	Glacial sand	Hard, clear, iron		D, S	Sufficient for local needs.
27	NW.	22	"	"	"	Dug	13	1,655	- 6	1,649	6	1,649	Glacial gravel	Hard, clear, iron		D, S	Sufficient for local needs.
28	NE.	23	"	"	"	Bored	64	1,680	- 54	1,626			Glacial drift	Hard, clear		D, S	Intermittent supply.
29	SW.	24	"	"	"	Bored	45	1,685	- 15	1,670			Glacial drift	Hard, clear		D, S	Sufficient only for domestic needs; another well 12 feet deep.
30	NW.	24	"	"	"	Dug	36	1,680	- 30	1,650			Glacial drift	Hard, clear		D	Sufficient only for domestic needs; another well 14 feet deep.
31	SE.	24	"	"	"	Dug	24	1,690	- 19	1,671			Glacial drift	Hard, clear		D, S	Sufficient for local needs.
32	NE.	25	"	"	"	Dug	38	1,685	- 34	1,651	34	1,651	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
33	SW.	27	"	"	"	Bored	60	1,670	- 59	1,611	59	1,611	Glacial sand	Hard, clear, iron		D, S	Insufficient for local needs; also dry holes to a depth of 20 feet.
34	NW.	27	"	"	"	Dug	16	1,700	- 2	1,698			Glacial drift	Hard, clear		D	Insufficient for local needs; another well 12 feet deep.
35	SE.	28	"	"	"	Bored	24	1,690	- 10	1,680	24	1,666	Glacial sand	Soft, clear		D, S	Sufficient for local needs.
36	SW.	28	"	"	"	Bored	40	1,705	- 30	1,675			Glacial drift	Hard, clear		N	Not used; also another well with a small supply.
37	NW.	28	"	"	"	Bored	40	1,700	- 35	1,665			Glacial drift	Hard, clear		S	Sufficient for local needs.
38	NW.	30	"	"	"	Dug	24	1,710	- 19	1,691	19	1,691	Glacial sand	Hard, clear		D, S	Sufficient for local needs; another well 10 feet deep.
39	NW.	31	"	"	"	Dug	16	1,715	- 7	1,708	14	1,701	Glacial sand	Hard, clear, iron		S	Sufficient for local needs; also 2 other wells 12 and 52 feet deep.
40	SW.	32	"	"	"	Bored	60	1,710	- 10	1,700	60	1,650	Glacial sand	Hard, clear, "alkaline"		N	Sufficient supply; but not used; also 2 other wells 14 feet deep.
41	NW.	32	"	"	"	Bored	70	1,710	- 65	1,645			Glacial drift	Hard, clear		D	Insufficient for local needs; also another well 12 feet deep.
42	SE.	32	"	"	"	Dug	14	1,685	- 7	1,678	13	1,672	Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
43	SW.	33	"	"	"	Dug	14	1,705	- 10	1,695	10	1,695	Glacial sand	Hard, clear, iron		D, S	Sufficient for local needs.
44	SE.	33	"	"	"	Dug	18	1,700	- 15	1,685	15	1,685	Glacial sand	Hard, clear		D, S	Insufficient for local needs.

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

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

WELL RECORDS—Rural Municipality of CALDER, NO. 241, 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
45	SW.	34	27	32	1	Dug	27	1,710	- 26	1,684			Glacial drift	Hard, clear		D	Intermittent supply; also another well 10 feet deep.
46	NW.	34	"	"	"	Dug	45	1,690	- 43	1,647			Glacial drift	Hard, clear		D	Intermittent supply; also another well 20 feet deep.
47	SE.	34	"	"	"	Bored	60	1,680	- 56	1,624			Glacial drift	Hard, clear, "alkaline"		D, S	Sufficient for local needs.
1	SE.	1	27	33	1	Dug	45	1,727	- 30	1,697			Glacial drift	Hard, clear, iron		S	Sufficient for local needs; another well 20 feet deep.
2	NE.	1	"	"	"	Dug	33	1,720	- 20	1,700			Glacial drift	Hard, clear		D	Sufficient only for domestic needs; also 2 other wells.
3	SE.	12	"	"	"	Dug	27	1,725	- 12	1,713	27	1,698	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
4	NE.	12	"	"	"	Dug	21	1,720	- 6	1,714	20	1,700	Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
5	SE.	24	"	"	"	Dug	28	1,720	- 14	1,706	24	1,696	Glacial sand	Soft, clear		D, S	Insufficient for local needs.
6	NE.	24	"	"	"	Dug	20	1,724	- 14	1,710			Glacial drift	Hard, clear, iron		D, S	Insufficient for local needs.
7	SE.	36	"	"	"	Dug	6	1,715	- 3	1,712	3	1,712	Glacial gravel	Hard, clear		D, S	Sufficient for local needs.

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

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