CANADA
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PRELIMINARY REPORT

GROUND-WATER RESOURCES OF THE RURAL MUNICIPALITY OF EMERALD NO. 277 SASKATCHEWAN

By
B. R. MacKay, H. N. Hainstock and G. L. Scott

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GROUND WATER RESOURCES OF THE RURAL MUNICIPALITY OF EMERALD, NO. 277 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 Emerald is an area of 324 square miles in southeastern Saskatchewan. It consists of nine townships described as tps. 28, 29, and 30, ranges 13, 14, and 15, W. 2nd mer. A branch line of the Canadian Pacific railway traverses township 29, ranges 13 and 14, and on it are located the hamlets of Bankend and Wishart. The line ends at the hamlet of Wishart in the NE.$\frac{1}{4}$, sec. 25, tp. 29, range 15. The centre of the municipality is 66 miles northwest of the city of Yorkton.

The maximum elevation of 2,250 feet above sea-level is reached in the southern part of township 28, range 14. The elevation of the ground surface decreases gradually towards the north to a minimum elevation of 1,935 feet in the northeastern corner of township 30, range 13. A flat, treeless till plain, 2 to $2\frac{1}{2}$ miles wide and 8 miles long, occurs in the central part of the municipality between the hamlets of Bankend and Wishart. The southern limits of another glacial till-covered area extend into the northern parts of township 30, ranges 13 and 14. The remainder of the municipality is covered by moraine, and that part of the morainic area in the northwestern part of the municipality is known as Touchwood hills. The land surface of the moraine-covered area in the southwestern half of the municipality is rolling and rough, and sloughs and small lakes, less than 150 acres in area, are very numerous. The moraine-covered area in the northeastern half of the municipality is not so rough, although small sloughs are very common. The greater part of the municipality is thickly wooded with groves of poplar and willow.

The municipality is drained by two streams and their tributaries. Beckett brook flows in a northerly direction through the three eastern townships and empties into Foam lake. Birch creek flows in a northerly direction through the central part of

the municipality towards Quill lakes. Birch creek and Beckett brook are small streams that flow only during the freshet season, and their valleys are not more than 30 feet deep.

Water-bearing Horizons in the Unconsolidated Deposits

Surface water in lakes and sloughs is used by many farmers for stock, particularly in the southwestern half of the municipality. Five small dams, built across ravines, were reported in the municipality and the surface water that they impound is used for stock. Water conservation by means of dugouts has not been adopted in this municipality. Three springs, one near Beckett brook in township 28, range 13, another near Birch creek in township 29, range 14, and the third near a small lake in township 30, range 14, yield abundant supplies of water. The second spring yields water that rises 2 feet above the surface and has been flowing since 1905.

The producing wells in the municipality do not exceed a depth of 120 feet and they tap aquifers of sand and gravel in the glacial drift. The municipality does not suffer an acute shortage of water and it is estimated that approximately 25 per cent of the farmers have an inadequate supply. Well water is most difficult to obtain in township 20, range 15. The deepest well in the municipality is a drilled dry hole 200 feet deep in the SW.$\frac{1}{4}$, sec. 15, tp. 29, range 15.

The upper 200 feet of the glacial drift is generally composed of 6 to 40 feet yellow, brown, or red clay, that overlies blue clay. The blue clay probably constitutes the bulk of the glacial drift. Pockets of sand and gravel, but no continuous water-bearing horizon of sand and gravel, exist in the upper 120 feet at least of the glacial drift. Only a few dry holes, 120 to 180 feet deep, have been bored in the municipality, however, and that part of the glacial drift below 120 feet has not been thoroughly prospected.

Shallow wells that tap water-bearing sand and gravel above the blue clay do not, as a rule, yield large supplies of water. The water is not under pressure, and in dry years and winters the water-level usually lowers considerably. The quality of the water from these wells, however, is usually much better than the water from the deeper wells, and it is used for drinking. The most productive shallow wells in the municipality are those dug in thick deposits of sand and gravel that outcrop at the surface and extend to a depth of not more than 20 feet below the surface. Most of the wells of this type are located in townships 28 and 30, range 13. Some of these thick deposits of water-bearing sand and gravel extend over as large an area as a quarter-section, and in such places water can be found anywhere by digging to a maximum depth of 10 feet. Some of the shallow wells that have been dug entirely in sand and gravel cannot be pumped dry, and variations in seasonal rainfall have no apparent effect on the supply. With the exception of the three eastern townships and township 28, range 14, deposits of water-bearing sand and gravel that will yield supplies of water are very difficult to locate above the blue boulder clay.

The most reliable wells in the municipality are those that are usually bored, but in some cases dug, to tap water-bearing pockets of sand and gravel in the blue boulder clay. The pocket arrangement of the sand and gravel is shown by the fact that in some areas a number of dry holes are sunk in blue boulder clay to depths of 100 feet a short distance from producing wells. The water-bearing sand and gravel in many places underlie a thin layer of hardpan. The water is usually under hydrostatic pressure and the maximum height to which the water rises is 5 feet below the surface in a 78-foot well in the NE.$\frac{1}{4}$, sec. 17, tp. 29, range 14. Usually the pressure raises the water to points 20 to 40 feet below the surface. The supply of water from these wells

is abundant and not easily influenced by variation in rainfall. The water-level in some of the wells cannot be lowered by continuous pumping. In the municipality only three wells of this type yield soft water. The water is almost invariably hard, much of it contains iron, and some is "alkaline". The water is used for drinking if shallow well water is not available. Only one of these wells, located in township 30, range 15, yields water that is unfit for stock use. A large number of wells have been dug and bored in the blue boulder clay in every township of the municipality, but some farmers are unable to strike the pockets of sand and gravel even after seven or eight attempts.

Deep dugouts are recommended as an economical method of obtaining a permanent supply of water for stock use if boring to depths less than 125 feet does not obtain water. Boring or drilling to depths in excess of 125 feet is not advised, despite the fact that only a few dry holes have penetrated the drift between depths of 125 and 200 feet. If deep drilling is contemplated it should be confined to the glacial drift. The base of the glacial drift is believed to lie at an approximate elevation of 1,750 feet.

Water-bearing Horizons in the Bedrock

The Marine Shale series underlies the glacial drift throughout the municipality. No wells in this municipality have encountered the Marine Shale or "soapstone" as it is locally termed. Two wells near the town of Foam Lake, in the rural municipality of Beaver to the east struck the "soapstone" at an elevation of 1,760 feet above sea-level, and the shale is assumed to be at approximately the same elevation in the municipality of Emerald. The Marine Shale series in this part of Saskatchewan rarely contains deposits of water-bearing sand and gravel, and drilling or boring into it in a search for water is not recommended.

GROUND WATER CONDITIONS BY TOWNSHIPS

Township 28, Range 13

The elevation in this township decreases gradually from approximately 2,230 feet in the southwestern corner to 2,100 feet above sea-level in the northeastern corner. The entire area is covered by moraine. The ground surface is moderately rolling, sloughs and draws are numerous, and poplar bush is quite dense in many sections. Beckett brook, a small, intermittent stream, flows in a northerly direction through sections 24, 25, and 36.

The surface water in sloughs is used during the summer months by many farmers to water stock. The wells in the township are from 8 to 110 feet deep and are dug or bored in the glacial drift. The 8-foot well was dug to create a reservoir for a spring located in a ravine in the NE.$\frac{1}{4}$, section 35, and the well was dug through 8 feet of sand. The water is soft and the supply is sufficient for local requirements. Most of the producing wells are dug to water-bearing pockets of sand and gravel that either underlie the top soil or a 6- to 25-foot layer of yellow clay. The water from these wells is not under pressure. The supply is variable and apparently depends upon the size of the pocket of gravel or sand tapped. The water-level in these wells usually lowers in winter and prolonged drought years. Wells that yield a particularly abundant supply of water are located in the SE.$\frac{1}{4}$, section 4, the NE.$\frac{1}{4}$, section 17, the SE.$\frac{1}{4}$, section 21, the NE.$\frac{1}{4}$, section 28, the NW.$\frac{1}{4}$, section 32, and the SE.$\frac{1}{4}$, section 33, and they are 35, 12, 15, and 14 feet deep, respectively. Most of the shallow wells, however, do not yield abundant supplies of water, but their supply is sufficient in many places for the farmer's requirements. Wells that tap the sand and gravel above the blue boulder clay generally yield hard water that is suitable for drinking, although several wells yield water that is "alkaline" and contains iron.

Nineteen wells, 19 to 110 feet deep, tap pockets of sand and gravel in the blue boulder clay, and yield water under pressure. The supply of water from these wells is abundant and not easily influenced by variations in seasonal rainfall. The water is always hard, usually contains iron, and much of it is "alkaline", but the water from most of the wells is used for drinking.

Most farmers experienced no difficulty in striking water-bearing pockets of sand and gravel in the upper 110 feet of the glacial drift. Of the sixty-nine farmers interviewed, sixteen had an unsatisfactory supply of well water. Nine dry holes, 28 to 76 feet deep, were made in the NW.$\frac{1}{4}$, section 20, blue clay being struck at an average depth of 22 feet. The deepest dry hole in the township, 90 feet deep, is located in the SE.$\frac{1}{4}$, section 28.

If shallow wells do not yield adequate supplies of water throughout the year the supply could be augmented by the use of small, deep dugouts. The glacial drift is believed to be 400 to 500 feet thick in this township. Drilling to depths in excess of 125 feet in the glacial drift is not advisable, although water-bearing pockets of sand and gravel may exist in its lower part.

Township 28, Range 14

The elevation decreases gradually from 2,250 feet at the southern boundary of the township to approximately 2,130 feet at the northern boundary. Moraine covers the entire township and the land is rolling. Sloughs, small lakes, and large, flat, marshy areas are common, and the township is densely wooded with poplar. The headwaters of Birch creek are in the NW.$\frac{1}{4}$, section 34.

The wells in this township are from 4 to 110 feet deep and most of them are dug to depths less than 40 feet. The

producing wells are usually dug to pockets of sand and gravel that underlie yellow boulder clay, or occasionally red clay. The maximum thickness of the yellow boulder clay or oxidized zone is 32 feet and it is generally less than 20 feet. The wells that tap water-bearing sand and gravel above blue boulder clay, with the exception of two located in the NW.$\frac{1}{4}$, section 6, and the SW.$\frac{1}{4}$, section 30, yield sufficient water for local requirements. Four wells, 14, 13, 7, and 37 feet deep, in the SE.$\frac{1}{4}$, section 13, the SW.$\frac{1}{4}$, section 24, the NW.$\frac{1}{4}$, section 32, and the SE.$\frac{1}{4}$, section 34, obtain abundant supplies of water from sand and gravel aquifers beneath yellow boulder clay. The water-level in these wells remains constant throughout the year. The supply of water from the 37-foot well has been sufficient for 100 head of stock since 1919, the year it was dug, and the 13-foot well has watered 90 head of stock since 1913. The water from wells that do not penetrate blue boulder clay is not under pressure, and it is not too highly mineralized for drinking.

Thirteen wells, 38 to 81 feet deep, have been dug or bored to sand and gravel pockets that occur within the blue boulder clay. The water rises from the aquifer under pressure to a point usually about 25 feet below the surface. The supply of water in all these wells is abundant and is not easily affected by prolonged drought. The water is hard, but with one exception is not "alkaline", and it usually contains iron.

Only six farmers have been unable to obtain a sufficient supply of water from wells. Nine dry holes have been dug and bored to a maximum depth of 110 feet in the glacial drift in the SW.$\frac{1}{4}$, section 28, and several dry holes were made as deep as 60 feet in the NE.$\frac{1}{4}$, section 32. Small, deep dugouts are recommended as a means of collecting surface water for stock use. Drilling to depth in the drift is not recommended.

Township 28, Range 15

The township is covered by moraine and the ground surface is rolling and densely wooded with poplar. Sloughs and small lakes, the largest of which is about 150 acres in area, are very numerous. The southern half of the township is very sparsely settled. The difference in relief is approximately 125 feet.

The wells in the township are from 6 to 180 feet deep and most of them have been bored to depths of 40 to 110 feet. Only two wells less than 40 feet deep yield sufficient water for local requirements. Both wells are 22 feet deep, and are located in the NE.$\frac{1}{4}$, section 25, and the SE.$\frac{1}{4}$, section 36. They tap pockets of sand and gravel beneath yellow boulder clay and the well in the NE.$\frac{1}{4}$, section 25, has yielded a constant supply of water since 1915. Two wells 40 and 42 feet deep in the NW.$\frac{1}{4}$, section 10, and the SE.$\frac{1}{4}$, section 13, tap sand aquifers and yield adequate supplies of water that is not under pressure. The well in section 10 will water 70 head of stock. Any other well in the township that yields a satisfactory supply of water is 40 to 80 feet deep and the water is under pressure.

Those wells that yield water under pressure have tapped pockets of sand and gravel lying within the blue boulder clay, and the supply is usually abundant and constant. The water is always hard and contains iron, but was not described as being "alkaline". The deepest producing well, 110 feet, in the NW.$\frac{1}{4}$, section 16, does not yield enough water for 80 head of stock, although the water is under pressure. It is possible that the lower part of this well has become partly clogged with fine sand and the supply of water shut off. The only dry hole reported in the township is located in the NW.$\frac{1}{4}$, section 29, and is 180 feet deep.

Since sloughs and small lakes are numerous there is an abundance of surface water in this township, except in prolonged drought years. In those areas where water cannot be obtained from wells the use of dugouts to collect and retain surface water is recommended. The possibilities of striking water by boring to depths less than 125 feet are considered good. The glacial drift is believed to be 400 to 500 feet thick, and although pockets of water-bearing sand and gravel probably exist in the lower part of the drift, deep drilling is not advised.

Township 29, Range 13

The township is covered by moraine and the ground surface is rolling and is characterized by numerous low-lying hills and undrained depressions. The elevation of the ground surface decreases from 2,150 feet above sea-level at the southern boundary of the township to 2,000 feet at the northern boundary. Beckett brook flows intermittently in a northerly direction through the eastern 3 miles of the township. A small tributary stream originates in section 21, flows through sections 28 and 27, and joins Beckett brook in section 34. The township is wooded with poplar and the growth becomes more dense to the east of Beckett brook.

The water supply in this township is derived mainly from wells, although surface water in sloughs is used during the summer months for stock. The producing wells are from 4 to 100 feet deep and tap pockets of sand and gravel in the glacial drift. Adequate supplies of water are not particularly difficult to strike in the upper 100 feet of the glacial drift, and only eight residents have an unsatisfactory supply.

Wells less than 30 feet deep usually tap the water-bearing pockets of sand and gravel beneath a layer of yellow, brown, or red clay, but four wells, 7 to 20 feet deep, were dug

entirely in sand and gravel. In some localities, however, only 6 to 10 feet of oxidized clay overlies the impervious blue boulder clay. The amount of water derived from the shallow wells depends upon the size of the pocket of sand and gravel tapped, and it is usually not abundant. Pockets of water-bearing sand and gravel are very difficult to strike in some quarter-sections, such as the NE.$\frac{1}{4}$, section 26, but in others, such as the NE.$\frac{1}{4}$, section 24, and the SW.$\frac{1}{4}$, section 25, water can be found very easily in extensive sand deposits at depths less than 20 feet. Shallow wells that yield very abundant supplies of water are located in the NE.$\frac{1}{4}$, section 2, and the NW.$\frac{1}{4}$, section 24. Two wells, 4 and 20 feet deep, dug in sand and gravel in the ravine in the NE.$\frac{1}{4}$, section 2, yield soft water. The supply is abundant in both wells and the water-level, at a point 15 feet below the surface in the 20-foot well, cannot be lowered by pumping. The 27-foot well in the NW.$\frac{1}{4}$, section 24, has not been pumped dry since it was dug in 1923. The water from the shallow wells is generally not highly mineralized and is suitable for drinking.

Eighteen wells, 14 to 100 feet deep, obtain abundant supplies of water from pockets of sand and gravel within the blue boulder clay. The water in these wells is under pressure and prolonged drought years do not seriously deplete the supply. One of these wells, located in the SE.$\frac{1}{4}$, section 20, is bored 55 feet deep. The material penetrated, in descending order, was: 6 feet yellow boulder clay; 20 feet blue boulder clay; 28 feet hard, gravelly, yellow boulder clay; and 8 inches gravel. The water rises from the gravel to a point 25 feet below the surface, and has remained constant at this level since 1923. The supply is over-sufficient for 18 head of stock and the water is hard, "alkaline", and contains iron. The water has a slight laxative effect on humans, but it is used for drinking. The aquifers for these wells are formed by a series of pockets rather than by

continuous layers of sand and gravel, and this is clearly shown in the SW.¼, section 31, where a 58-foot bored well struck an abundant supply of water that rises to a point 15 feet below the surface, a short distance from a 93-foot dry hole. Some petrified wood was struck in the 93-foot dry hole. The deepest dry hole in the township is 131 feet and is located in the NW.¼, section 27.

Drilling to depths greater than 125 feet is not recommended, although the glacial drift is probably 300 to 400 feet thick. The probabilities of striking water in the upper 125 feet of the glacial drift are good in most sections of the township. The supply of water from shallow wells that yield small and inadequate quantities of water could be supplemented by water collected and conserved in small, deep dugouts. The excavation of these dugouts is recommended.

Township 29, Range 14

An area 2 to 2½ miles wide and 6 miles long, in the central part of the township, is mantled by glacial till and lies at an approximate elevation of 2,150 feet. The ground surface is flat and unwooded, and large, shallow, marshy areas are in evidence. The remainder of the township is covered by moraine, the ground surface is undulating, small sloughs are numerous, and it is wooded with poplar. Birch creek, a very small stream, flows intermittently in a northerly direction through the central part of the township. A small tributary creek flows east through section 30 and joins Birch creek in section 29.

A spring that has been flowing continuously since 1905 is located in the bottom of Birch Creek ravine in the SE.¼, section 9. A stone crib, 2 feet high, has been built around this natural spring and the supply of water is very abundant. The water is hard and several farmers haul water from the spring for both drinking and stock purposes.

The wells in the township are from 7 to 105 feet deep and most of them to depths greater than 25 feet were made by a boring machine. On eight farms an adequate supply of water that is not under pressure is obtained from pockets of sand and gravel that lie at depths less than 30 feet. Three of these wells, in the SW.$\frac{1}{4}$, section 5, the SE.$\frac{1}{4}$, section 10, and the SE.$\frac{1}{4}$, section 36, yield abundant supplies of water. Pockets of water-bearing sand and gravel are difficult to strike above the blue boulder clay in most sections of the township.

Twenty wells, 27 to 95 feet deep, yield water under pressure from sand and gravel pockets that lie within the blue boulder clay of the glacial drift. Two of these wells, in the NW.$\frac{1}{4}$, section 9, and the SW.$\frac{1}{4}$, section 21, have been plugged by fine sand washing in at the base of the well, but the remaining wells yield abundant and constant supplies of water. In three wells, 60, 78, and 80 feet deep, in the SW.$\frac{1}{4}$, section 16, the NE.$\frac{1}{4}$, section 17, and the SE.$\frac{1}{4}$, section 34, the pressure is sufficient to raise the water to points 10, 5, and 6 feet, respectively, below the surface. The water is hard, usually contains iron, and is "alkaline", but in many cases it is used for drinking. Dry holes or wells that obtain only small seepages of water have been bored as deep as 105 feet in the SW.$\frac{1}{4}$, section 9, the SE.$\frac{1}{4}$, section 22, the NE.$\frac{1}{4}$, section 29, the NE.$\frac{1}{4}$, section 32, and the SW.$\frac{1}{4}$, and NW.$\frac{1}{4}$, section 33. In most areas, however, little difficulty is experienced in striking abundant supplies of water by boring to depths of 27 to 95 feet. A well 75 feet deep, bored for the school in the hamlet of Bankend, yields an abundant supply of hard, "alkaline" water that contains iron. Water of better quality could not be found at shallow depth.

A small dam built across Birch creek in the SE.$\frac{1}{4}$, section 34, was the only surface water conservation project reported in this township. Deep dugouts are recommended for

those farmers in the township who have been unable to obtain any or inadequate supplies of water from wells. The glacial drift is probably 300 to 400 feet thick and although water-bearing sands and gravels may exist in the lower part of the drift drilling to depths much in excess of 125 feet is not advisable.

Township 29, Range 15

The flat, treeless, glacial till plain mentioned in township 29, range 14, extends into the eastern part of this township and covers parts of sections 13, 14, 23, 24, 25, and 26. The remainder of the township is covered by moraine. The ground surface of the moraine-covered area is rolling and is densely wooded with poplar. Sloughs and small, irregularly shaped lakes, less than 100 acres in area, are common. Some of these small lakes held water throughout the drought years of 1930 to 1934. Two small tributaries of Birch creek flow north through the eastern 2 miles of the township to section 25 where they turn sharply and flow east.

Surface water in sloughs and lakes is used by many farmers for watering stock. One farmer has built a dam across a small creek in the NW.$\frac{1}{4}$, section 12, and the surface water retained is used for stock.

Most of the wells in the township are bored between depths of 40 and 100 feet. A few wells less than 40 feet deep obtain small to moderate supplies of water from sand and gravel aquifers beneath yellow boulder clay. Apparently pockets of water-bearing sand and gravel are very difficult to locate above the blue boulder clay. Most of the producing wells that have tapped pockets of sand and gravel within the blue clay yield water under sufficient pressure to rise half-way up the [illegible] well. A 28-foot well in the NW.$\frac{1}{4}$, section 23, is a flowing artesian well during wet seasons. In other wells, such as a

40-foot well in the hamlet of Wishart, the water does not rise above the aquifer and the supply is not as abundant as in those wells that yield water under pressure. Several farmers have found it necessary to bore several dry holes, usually less than 100 feet deep, before a pocket of sand and gravel is struck, whereas others have obtained an abundant supply of water at the first attempt. Two wells that yield an exceptionally abundant supply of water are located in the SE.$\frac{1}{4}$, section 17, and the SE.$\frac{1}{4}$, section 30. They are 40 and 80 feet deep, respectively, and several farmers haul from the former well during winters. The hamlet of Wishart has bored several dry holes to a maximum depth of 115 feet. The only drilled well in the municipality was made in the SW.$\frac{1}{4}$, section 15. This well is also the deepest in the municipality and was drilled 200 feet into the glacial drift without striking a deposit of water-bearing sand and gravel. Two 90-foot wells in the SW.$\frac{1}{4}$, section 16, and the NE.$\frac{1}{4}$, section 28, have become plugged with fine sand and neither can be used. The wells that yield water under pressure, with one exception, produce hard water that is commonly "alkaline", and contains iron. The exception is a 65-foot well in the SE.$\frac{1}{4}$, section 32, which delivers soft water.

Farmers are not advised to drill deeper than 125 feet in the glacial drift for water. The boring method of making a well is advised in this township. The glacial drift is believed to be 300 to 400 feet thick, but the probabilities of striking water in the upper part of it are just as good or better than drilling into the lower part of it. Deep dugouts are also recommended as a means of retaining a permanent supply of water.

Township 30, Range 13

The elevation of the ground surface decreases gradually from about 2,000 feet at the southern boundary of the township to

approximately 1,935 feet at the northern boundary of the township. The northeastern and northwestern parts of the township are mantled by glacial till, and the land is slightly undulating and thinly wooded. The remainder of the township is covered by moraine, and the ground surface is rougher and contains a large number of sloughs. It is also densely wooded with small poplar trees. Beckett brook flows intermittently in a northeasterly direction across sections 3, 10, 11, 14, 23, 24, and 25, and Birch creek traverses sections 18, 19, 20, 29, 30, and 31. Both streams flow through narrow ravines approximately 30 feet deep.

The unweathered or upper zone of the glacial drift does not exceed a depth of 30 feet and it is composed of yellow, brown, or red boulder clay, and also contains pockets of sand and gravel. This is underlain by a thick deposit of blue boulder clay also containing scattered pockets of sand and gravel. Most of the wells in the township have tapped pockets of water-bearing sand and gravel within the upper 30 feet of the drift. At least fifteen wells have been dug in thick beds of sand and gravel that extend from the surface to depths of 10 to 16 feet. These wells yield moderate to abundant supplies of slightly mineralized water. Several of these wells, such as those in the SE.$\frac{1}{4}$, section 5, the NW.$\frac{1}{4}$, section 12, and the SW.$\frac{1}{4}$, section 25, cannot be bailed dry, and one well in the NE.$\frac{1}{4}$, section 24, will water 200 head of stock. The deposits of sand and gravel are easily located in some quarter-sections and water can be found anywhere in the southeastern corner of the NE.$\frac{1}{4}$, section 30, at a depth of 5 feet in fine sand, and water is almost certain to be struck in sand at depths of 8 to 14 feet in the SW.$\frac{1}{4}$, section 35. Several shallow wells also tap beds of sand and gravel beneath the lighter coloured clays, but the supply of water is not so abundant as in those wells that strike the thick beds of sand directly beneath

the top soil. Any of those wells that strike the sand and gravel in the weathered zone do not yield water under pressure, but one hand-dug well in the NW.¼, section 7, yields water that rises to a point 3 feet above the ground. This well has flowed since at least 1929. The water from this well is hard, contains iron, and is suitable for drinking. The supply of water from this well remained constant through the drought of 1930 to 1934.

At least twenty-two wells, 21 to 103 feet deep, obtain water under pressure from pockets of sand and gravel in the underlying blue boulder clay. Most of these wells are bored, and in many a layer of hardpan 1 to 3 feet thick is struck immediately above the aquifer. In some wells, such as a 76-foot well in the SE.¼, section 17, the blue boulder clay is also quite hard and contains small pebbles. A 100-foot well in the NE.¼, section 17, has the following log in descending order: 20 feet yellow clay; 35 feet blue clay; 10 feet fine grey clay that contained water; 10 feet blue clay; 10 feet yellow clay; and 15 feet blue clay. The fine grey clay yields very little water.

Dry holes, 60 to 100 feet deep, are in many places bored a short distance away from producing wells of similar depth, indicating that the water-bearing deposits are in the form of pockets rather than a continuous layer. When the water is struck in a lens of sand and gravel in the blue boulder clay the supply is usually abundant and constant. The water is almost invariably hard, and much of it contains iron and is "alkaline". One 65-foot well in the NW.¼, section 30, yields an abundant supply of soft water, and several farmers tank water from the well for washing and general household purposes.

Seventeen farmers have an unsatisfactory supply of water. One farmer in the SE.¼, section 22, can obtain water at depths less than 20 feet, but it is too "alkaline" for use. Others have no reliable wells in winters and drought years, and

a few farmers have no producing wells and must haul water throughout the year. Boring to depths less than 125 feet is advised. Small, deep dugouts are also recommended as a means of obtaining permanent supplies of water. If deep drilling is contemplated it should be confined to the glacial drift which is thought to be 200 to 250 feet thick in this township. The underlying Marine Shale series yields little or no water.

Township 30, Range 14

The elevation decreases gradually from 2,050 feet at the southwestern corner of the township to approximately 1,940 feet at the northeastern corner. Parts of sections 34, 35, 36, and 25 are mantled by glacial till, whereas the remainder of the township is covered by moraine. The ground surface is slightly rolling, sloughs are common, and the southern and central sections are wooded with small poplar. Two, long, narrow lakes, one in section 28, and the other in sections 29 and 30, are permanent bodies of water, although their water-level is lowered considerably in drought years. Birch creek flows intermittently in a northwesterly direction across the southeastern corner of the township, and a small tributary stream flows north through sections 22, 27, and 34, from its source in the SW.$\frac{1}{4}$, section 22.

A few wells dug by hand tap pockets of sand and gravel in the upper 25 feet of the glacial drift, but the supply of water obtained from them is usually small. One well was dug 4 feet deep at a point where a natural spring occurs in the SW.$\frac{1}{4}$, section 28. The water barely flows over the well casing from a sand aquifer, and the supply is sufficient for 60 head of stock. The water was described as fairly soft. Water can be found almost anywhere in the vicinity of the small lake at a depth of 3 feet, in sand. A 37-foot well that was dug through 28 feet yellow clay and 9 feet of gravel in the SW.$\frac{1}{4}$, section 19,

yields an abundant supply of soft water. Many farmers haul water from this well for domestic purposes and the water is also used in steam engines. Another good, shallow well is located in the NE.$\frac{1}{4}$, section 12. It was dug through 9 feet of sand, and the water-level has remained constant at a point 3 feet below the surface for seven years. The water is soft and is used by several neighbours for domestic purposes. Most of the wells in the township are bored between depths of 29 and 125 feet and many of them have struck pockets of sand and gravel within the blue clay and yield water under pressure. A thin layer of hardpan overlies the aquifer in many places and when it is penetrated the water rushes into the well and rises to points usually 10 to 30 feet below the surface. The supply of water from these wells is abundant and usually constant. The water is nearly always hard, contains iron, and is commonly "alkaline", but it is only used for drinking if shallow well water is not available. The pocket formation of the sand and gravel deposits in the glacial drift is shown by wells in the SE.$\frac{1}{4}$, section 10. Several dry holes were bored to a maximum depth of 90 feet, and finally a well was bored that struck a sand pocket 56 feet below the surface, and yields a very abundant supply of water. The log of this well in descending order is: 2 feet loam; 18 feet yellow clay; 36 feet hard, blue clay; and 1 foot sand. The water rises to a point 15 feet below the surface, is hard, "alkaline", contains iron, and acts as a laxative. Two wells in the NE.$\frac{1}{4}$, and NW.$\frac{1}{4}$, section 34, both 107 feet deep, tap a common aquifer that yields soft water. Sands and silts with plant remains, which were termed "sea-mud", probably of inter-glacial age, were struck near the base of an 80-foot well in the NW.$\frac{1}{4}$, section 6.

Several dry holes have been bored between depths of 30 and 125 feet, but only twelve farmers in the township obtain

an unsatisfactory supply of water from wells. Water for stock use is usually hauled only during the winters, but several farmers haul drinking water the year round.

The base of the glacial drift is believed to lie at an approximate elevation of 1,750 feet above sea-level, or at a depth of 200 to 300 feet, in this township. Although water-bearing horizons may occur in the lower part of the drift, prospecting for water should be confined to the upper 125 feet of the glacial drift. If deep drilling is contemplated it should be confined to the glacial drift, as the underlying Marine Shale series rarely yields water. The excavation of small, deep dugouts is also recommended for those farmers who have been unsuccessful in obtaining water in the upper 125 feet of the glacial drift.

Township 30, Range 15

The township is covered by moraine, which forms Touchwood hills. The land is rolling and densely wooded in most sections with poplar, and small sloughs are very numerous. The difference in relief is approximately 100 feet.

The upper 115 feet of the glacial drift is generally composed of 10 to 30 feet yellow or brown boulder clay, and 85 to 105 feet blue boulder clay. Pockets of water-bearing sand and gravel occur at various horizons in this part of the drift. Layers of hardpan are struck in many places within the blue boulder clay at depths of 30 to 115 feet. A few wells less than 30 feet deep that tap pockets of sand and gravel beneath yellow or brown boulder clay yield small but sufficient supplies of water for local requirements. Three wells, 15, 20, and 45 feet deep, penetrated thick beds of sand and gravel that outcrop at the surface. The 45-foot well, in the SE.$\frac{1}{4}$, section 24, was bored through 40 feet of gravel before the blue boulder clay

was stuck. The water-level remains constant at a point 5 feet below the surface.

Most of the producing wells in the township are bored to pockets of sand and gravel in the blue boulder clay, and the deepest of these wells, located in the SE.$\frac{1}{4}$, section 36, is 114 feet deep. The water rises from the aquifer under pressure to points usually 30 to 40 feet below the surface. The supply is abundant, but the water is hard and much of it contains a considerable amount of iron, but only occasionally is it "alkaline". A 60-foot well in the SE.$\frac{1}{4}$, section 35, yields water that contains so much iron that it is unsuitable for drinking. A 90-foot well in the SE.$\frac{1}{4}$, section 24, yields water that is so highly mineralized that stock refuse to drink it. Most of the wells, however, deliver water that is being used for drinking.

The pockets of sand and gravel in the upper 125 feet of the glacial drift are more difficult to strike in this township than in any other township of the municipality. Numerous dry holes have been bored to a maximum depth of 115 feet, especially in the western half of the township. Nearly one-half the farmers have either an inadequate supply of water or have been unable to obtain water. Sloughs are used by most of these farmers for stock in summer, but water is hauled or snow is melted during the winter. A few farmers haul water the year round. Deep dugouts are recommended as the most economical and certain method of obtaining a permanent supply of water. These dugouts could be excavated in depressions and should be at least 12 feet deep. Small dams have been built across a ravine in the NE.$\frac{1}{4}$, section 4, and the SE.$\frac{1}{4}$, section 9, but these are the only water-conserving projects reported in this township. The farmer in the SE.$\frac{1}{4}$, section 9, depends entirely on the dam for watering stock, and hauls drinking water.

Drilling or boring to depths greater than 115 feet is not advised, although the glacial drift is probably 300 to 350 feet thick.

STATISTICAL SUMMARY OF WELL INFORMATION IN RURAL MUNICIPALITY OF EMERALD, NO. 277, SASKATCHEWAN

West of 2nd meridian — Township	28	28	28	29	29	29	30	30	30	Total No. in municipality
West of 2nd meridian — Range	13	14	15	13	14	15	13	14	15	
Total No. of Wells in Township	87	57	25	80	53	70	112	99	110	693
No. of wells in bedrock	0	0	0	0	0	0	0	0	0	0
No. of wells in glacial drift	87	57	25	80	53	70	112	99	110	693
No. of wells in alluvium	0	0	0	0	0	0	0	0	0	0
Permanency of Water Supply										
No. with permanent supply	70	40	22	51	43	37	77	72	75	487
No. with intermittent supply	3	3	2	0	0	5	11	3	8	35
No. dry holes	14	14	1	29	10	28	24	24	27	171
Types of Wells										
No. of flowing artesian wells	0	0	0	0	1	1	1	1	0	4
No. of non-flowing artesian wells	19	13	12	18	20	24	23	33	35	197
No. of non-artesian wells	54	30	12	33	22	17	64	41	48	321
Quality of Water										
No. with hard water	67	42	23	46	39	41	81	64	76	479
No. with soft water	6	1	1	5	4	1	7	11	7	43
No. with salty water	0	0	0	0	0	0	0	0	0	0
No. with "alkaline" water	21	3	3	10	19	5	25	23	6	115
Depths of Wells										
No. from 0 to 50 feet deep	71	44	15	54	25	39	76	54	57	435
No. from 51 to 100 feet deep	15	12	8	25	27	27	32	35	47	228
No. from 101 to 150 feet deep	1	1	1	1	1	3	4	10	6	28
No. from 151 to 200 feet deep	0	0	1	0	0	1	0	0	0	2
No. from 201 to 500 feet deep	0	0	0	0	0	0	0	0	0	0
No. from 501 to 1,000 feet deep	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
How the Water is Used										
No. usable for domestic purposes	65	41	22	43	35	36	71	65	76	454
No. not usable for domestic purposes	8	2	2	8	8	6	17	10	7	68
No. usable for stock	73	43	24	50	43	39	88	74	82	516
No. not usable for stock	0	0	0	1	0	3	0	1	1	6
Sufficiency of Water Supply										
No. sufficient for domestic needs	70	40	22	51	43	35	80	72	75	488
No. insufficient for domestic needs	3	3	2	0	0	7	8	3	8	34
No. sufficient for stock needs	56	38	15	36	26	31	55	51	52	360
No. insufficient for stock needs	17	5	9	15	17	11	33	24	31	162

ANALYSES AND QUALITY OF WATER

General Statement

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

Total Dissolved Mineral Solids

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

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

Mineral Substances Present

Calcium and Magnesium

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

Sodium

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

Sulphates

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

Chlorides

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

Iron

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

Hardness

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

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

Analyses of Water Samples From the Municipality of Emerald, No. 277, Saskatchewan.

LOCATION						Depth of Well, Ft.	Total dis'vd Solids	HARDNESS			CONSTITUENTS AS ANALYSED						CONSTITUENTS AS CALCULATED IN ASSUMED COMBINATIONS									Source of Water
No.	Qtr.	Sec.	Tp.	Rge.	Mer.			Total	Perm.	Temp.	Cl.	Alka-linity	CaO	MgO	SO_4	Na_2O	Solids	$CaCO_3$	$CaSO_4$	$MgCO_3$	$MgSO_4$	Na_2CO_3	Na_2SO_4	NaCl	$CaCl_2$	
1	NE.	13	28	13	2nd	38	1,471										1,471	(4)	(1)		(2)		(3)		(5)	✱1
2	SW.	2	29	13	2nd	73	5,000	3000+	3,000+	N D.	26	530	800	767	2,763	70	4,193	530	1,221		2,290		109	43		✱1
3	NE.	17	29	13	2nd	56	1,020	950	900	50	9	465	220	144	398	88	997	394		61	343		184	15		✱1
4	SE.	22	30	13	2nd	9	1,700	1,600	1,500	100	10	90	260	205	1,044	134	1,515	90	510		611		287	17		✱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 ($CaCO_3$).
Analysis No. 1 by Provincial Analyst, Regina.
For interpretation of this table read the section on Analyses and Quality of Water.

Water from the Unconsolidated Deposits

Four samples of water, the analyses of which appear on the accompanying table, were taken from wells whose aquifers lie within the glacial drift. These samples, although differing considerably in the amount of the total dissolved solid content, are all "sulphate waters".

Sample 2 has a total dissolved solid content of 5,000 parts per million, which is very high. The main salts in solution are magnesium sulphate and calcium sulphate. The excessive amount of magnesium sulphate (Epsom salts), 2,290 parts per million, causes the water to be unfit for use. The water is extremely hard. Sample 4, with a total dissolved solid content of 1,760 parts per million, is not excessively mineralized, but the high proportion of magnesium sulphate, 611 parts per million, and sodium sulphate (Glauber's salt), 287 parts per million, causes the water to be laxative. This water would impart no ill effects to stock. Samples 1 and 3, with 1,471 and 1,020 parts per million of total dissolved mineral solids, are not highly mineralized and would have no injurious effects on people accustomed to their use. In general, the water that is obtained from the weathered zone of the glacial drift is suitable for all farm purposes. That derived from large deposits of sand or gravel is less mineralized than that from wells tapping small pockets of sand or gravel. The water from wells tapping water-bearing deposits in the blue boulder clay is as a rule quite highly mineralized. It is hard, and often contains a considerable amount of iron in solution. It is being used for drinking in many cases although it is not desirable for such a purpose. It us usually suitable for stock.

Water from the Bedrock

No analyses are available for water from the Marine Shale series in this municipality. On the rare occasions when water is obtained from the bedrock in this part of Saskatchewan it is usually so highly mineralized with magnesium sulphate, sodium sulphate, and sodium chloride, that it cannot be used for drinking or for stock.

WELL RECORDS—Rural Municipality of EMERALD NO.277, 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.	1	28	13	2	Dug	25	2,175	- 22	2,153			Glacial drift	Hard		D, S	Sufficient for house use only.
2	SW.	1	"	"	"	Dug	43	2,192	- 8	2,184			Glacial drift	Hard, "alkaline"		D, S	Intermittent supply in winter.
3	SW.	2	"	"	"	Bored	25	2,205	- 8	2,197			Glacial sand	Hard		D, S	Sufficient supply.
4	NW.	2	"	"	"	Dug	14	2,195	- 6	2,189	6	2,189	Glacial sand	Hard		D, S	Sufficient and constant supply.
5	NE.	3	"	"	"	Bored	26	2,195	- 14	2,181			Glacial sand	Hard, iron		D, S	Sufficient for 30 head stock.
6	NW.	3	"	"	"	Dug	33	2,208	- 21	2,187			Glacial drift	Hard, iron, "alkaline"		D, S	Sufficient supply.
7	SE.	4	"	"	"	Dug	35	2,215	- 23	2,192	23	2,192	Glacial sand	Hard, iron		D, S	Good supply of water.
8	NE.	4	"	"	"	Dug	16	2,210	- 8	2,202			Glacial drift	Hard, "alkaline"		D, S	Insufficient supply in winter.
9	NW.	4	"	"	"	Bored	66	2,210	- 20	2,190	16	2,194	Glacial gravel	Hard		D, S	Sufficient for 30 head stock; a 38-foot well is also in use.
10	NE.	5	"	"	"	Dug	12	2,200	- 2	2,198			Glacial drift	Hard, "alkaline"		D	Poor supply.
11	SE.	6	"	"	"	Bored	110	2,220	- 60	2,160	110	2,110	Glacial sand	Hard		D, S	Sufficient for 30 head stock.
12	SW.	6	"	"	"	Dug	42	2,230	0	2,230			Glacial drift	Hard, iron, "alkaline"		D, S	Insufficient supply in winter.
13	NW.	6	"	"	"	Dug	35	2,225	- 20	2,205	35	2,190	Glacial sand	Hard, iron		D, S	Constant supply of water.
14	SW.	7	"	"	"	Bored	28	2,212	- 12	2,200	26	2,186	Glacial gravel	Hard, iron		D, S	Good supply of water since 1915.
15	SE.	7	"	"	"	Dug	30	2,205	- 20	2,185	30	2,175	Glacial sand	Hard, iron, "alkaline"		D, S	Abundant supply.
16	NW.	9	"	"	"	Dug	28	2,200	- 22	2,178	26	2,174	Glacial sand	Hard, iron		S	Sufficient supply.
17	SE.	9	"	"	"	Bored	90	2,212	- 5	2,207	90	2,122	Glacial sand?	Hard, "alkaline"		D, S	Abundant supply.
18	NE.	9	"	"	"	Dug	50	2,208									Dry hole in glacial drift.
19	SW.	10	"	"	"	Dug	30	2,213	- 20	2,193			Glacial drift	Hard, "alkaline"		D, S	Sufficient supply.
20	NW.	10	"	"	"	Dug	27	2,195	- 17	2,178			Glacial drift	Hard, "alkaline"		S	Intermittent supply in winter.
21	SE.	10	"	"	"	Dug	47	2,194	- 21	2,173	47	2,147	Glacial sand	Hard, iron		D, S	Sufficient for 20 head stock.
22	NE.	10	"	"	"	Dug	12	2,185	- 6	2,179	6	2,179	Glacial sand	Hard, "alkaline"		D, S	Sufficient supply.
23	NW.	12	"	"	"	Bored	60	2,162	- 40	2,122			Glacial sand	Hard, iron		D, S	Sufficient for house use only.
24	SE.	13	"	"	"	Dug	22	2,155	- 18	2,137	18	2,137	Glacial sand	Hard, iron		D, S	Sufficient supply.
25	NE.	13	"	"	"	Bored	38	2,145	- 28	2,117			Glacial sand	Hard, iron		D, S	Sufficient supply. #
26	SW.	14	"	"	"	Dug	40	2,180	- 20	2,160	40	2,140	Glacial sand				Sufficient and constant supply.
27	SE.	15	"	"	"	Dug	35	2,180	- 30	2,150			Glacial sand	Hard		D, S	Sufficient supply.

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

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

WELL RECORDS—Rural Municipality of EMERALD NO. 277, SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
28	NW.	15	28	13	2	Dug	17	2,180	- 9	2,171	17	2,163	Glacial sand	Hard		D, S	Good supply for 25 head stock.
29	S..	16	"	"	"	Dug	25	2,200	- 18	2,182	18	2,182	Glacial sand	Hard, "alkaline"		D, S	Sufficient supply.
30	NW.	16	"	"	"	Dug	19	2,190	- 14	2,176	19	2,171	Glacial sandy gravel	Hard		D, S	Sufficient supply.
31	SE.	17	"	"	"	Dug	20	2,200	- 16	2,184	16	2,184	Glacial sand	Hard		D, S	Constant supply of water since 1916.
32	NE.	17	"	"	"	Dug	12	2,190	- 3	2,187	3	2,187	Glacial sand and gravel	Hard		D, S	Abundant supply.
33	SW.	19	"	"	"	Dug	12	2,195	- 6	2,189	6	2,189	Glacial gravel	Hard		D, S	A 64-foot well also yields an abundant supply from a sand aquifer.
34	NW.	19	"	"	"	Dug	14	2,190	- 10	2,180	10	2,180	Glacial sand and gravel	Hard, iron		D, S	Sufficient supply.
35	NE.	19	"	"	"	Dug	22	2,180	- 20	2,160	20	2,160	Glacial fine sand	Hard		D, S	Well has yielded a constant supply of wate since 1909.
36	NW.	20	"	"	"	Dug	76	2,180									The deepest of 9 dry holes in glacial drif
37	NW.	21	"	"	"	Bored	70	2,175	- 68	2,107	68	2,107	Glacial sand	Hard, iron		D	Poor supply; a slough seepage well is also used.
38	SE.	21	"	"	"	Dug	15	2,180	- 1	2,179	1	2,179	Glacial sand and gravel	Soft		S	Abundant supply; a 35-foot well is used fo drinking water.
39	NE.	21	"	"	"	Dug	42	2,170	- 27	2,143			Glacial drift	Hard, iron "alkaline"		D, S	Insufficient supply for 20 head stock in winter.
40	NW.	22	"	"	"	Dug	35	2,162	- 20	2,142			Glacial drift	Hard, iron		D, S	Sufficient supply.
41	NE.	22	"	"	"	Dug	35	2,155	- 20	2,135			Glacial drift	Hard		D, S	Sufficient supply.
42	NW.	23	"	"	"	Bored	65	2,155	- 10	2,145			Glacial drift	Hard, "alkaline"		D, S	Supply decreases in winter; insufficient f 60 head stock.
43	SE.	23	"	"	"	Dug	20	2,160	- 16	2,144	16	2,144	Glacial sand	Hard		D, S	Sufficient supply.
44	NE.	24	"	"	"	Dug	25	2,142	- 19	2,123	19	2,123	Glacial sand and gravel	Hard		D, S	Sufficient supply.
45	NE.	26	"	"	"	Dug	16	2,150	- 12	2,138	12	2,138	Glacial sand	Hard		D, S	Sufficient for house use only.
46	SE.	27	"	"	"	Dug	49	2,155	- 24	2,131	49	2,106	Glacial fine sand	Hard, "alkaline"		S	Sufficient supply; a 20-foot well is used for the house.
47	NE.	27	"	"	"	Bored	64	2,152	- 61	2,091			Glacial drift	Hard, iron, "alkaline"		D	Sufficient for house use only.
48	NW.	27	"	"	"	Dug	22	2,155	- 18	2,137	18	2,137	Glacial gravel	Hard		D, S	Sufficient supply.
49	SE.	28	"	"	"	Dug	27	2,165	- 7	2,158	18	2,147	Glacial gravel	Hard, iron		D, S	Good supply; one dry hole 90 feet deep in glacial drift.
50	NE.	28	"	"	"	Dug	14	2,160	- 4	2,156	4	2,156	Glacial coarse gravel	Soft		D, S	Sufficient for 75 head stock.
51	SW.	28	"	"	"	Dug	12	2,165	- 2	2,163	2	2,163	Glacial sand and gravel	Soft		S	Sufficient supply.
52	NW.	28	"	"	"	Dug	10	2,160	- 6	2,154	6	2,154	Glacial sand and gravel	Soft		S	Plenty of water.
53	SE.	30	"	"	"	Dug	21	2,180	- 14	2,166	15	2,165	Glacial sand and gravel	Hard		D, S	Sufficient supply.
54	NE.	30	"	"	"	Bored	94	2,170	- 24	2,146	94	2,076	Glacial sand	Hard, iron		D, S	Abundant supply.
55	SW.	30	"	"	"	Dug	12	2,180	- 8	2,172	8	2,172	Glacial sand	Hard		D, S	Sufficient supply.

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of EMERALD NO. 277, 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.	31	28	13	2	Bored	60	2,170	- 30	2,140	60	2,110	Glacial dark sand	Hard, iron, "alkaline"		S	Abundant supply.
57	SE.	31	"	"	"	Bored	98	2,170	- 40	2,130	98	2,072	Glacial gravel?	Hard, iron, "alkaline"		S	Sufficient supply.
58	NE.	31	"	"	"	Dug	15	2,155	- 11	2,144	11	2,144	Glacial gravel	Hard		D, S	Constant supply of water since 1915.
59	SW.	32	"	"	"	Bored	67	2,172	- 32	2,140	67	2,105	Glacial white sand	Hard, iron		D, S	Good supply of water.
60	NW.	32	"	"	"	Dug	15	2,155	- 11	2,144	11	2,144	Glacial gravel	Hard		D, S	Well has yielded an ample supply of water since 1908.
61	NE.	32	"	"	"	Bored	55	2,155	- 40	2,115	48	2,107	Glacial blue sand	Hard, bitter, "alkaline"		D, S	Sufficient supply for a few head stock.
62	SW.	33	"	"	"	Dug	10	2,160	- 5	2,155	5	2,155	Glacial sand and gravel	Soft		D, S	Good supply of water.
63	SE.	33	"	"	"	Dug	14	2,155	- 10	2,145			Glacial drift	Hard, "alkaline"		D	A 10-foot well yields plenty of water for the stock.
64	NE.	33	"	"	"	Bored	40	2,150	- 16	2,134	40	2,110	Glacial sand	Hard, iron		D, S	Sufficient supply.
65	SE.	34	"	"	"	Dug	12	2,145	0	2,145			Glacial drift	Hard		D	Intermittent supply; several shallow dry holes.
66	NE.	35	"	"	"	Dug	8	2,100	0	2,100	0	2,100	Glacial sand	Soft		D, S	Plenty of water.
67	SW.	36	"	"	"	Bored	70	2,120	- 20	2,100	70	2,050	Glacial sand	Hard, iron		D, S	Abundant supply.
68	SE.	36	"	"	"	Bored		2,120					Glacial drift	Hard, iron		D, S	Poor supply and sufficient for house use or
69	NE.	36	"	"	"	Bored	35	2,125	- 25	2,100			Glacial sand	Hard, "alkaline"		D, S	Sufficient supply.
1	NE.	1	28	14	2	Bored	76	2,245	- 26	2,219	76	2,169	Glacial sand	Hard, iron		D, S	Abundant supply.
2	SW.	1	"	"	"	Dug	22	2,250	- 16	2,234	16	2,234	Glacial sand	Hard, iron		D, S	Sufficient supply.
3	NW.	2	"	"	"	Dug	16	2,238	- 10	2,228	10	2,228	Glacial sand	Hard		D, S	Sufficient supply.
4	SE.	3	"	"	"	Dug	23	2,250	- 19	2,231	19	2,231	Glacial sand	Hard		D, S	Sufficient supply.
5	NW.	3	"	"	"	Dug	18	2,240	- 9	2,231	15	2,225	Glacial sand	Hard		D, S	Sufficient supply.
6	SW.	4	"	"	"	Dug	70	2,250									Dry hole in glacial drift.
7	NE.	5	"	"	"	Dug	81	2,250	- 25	2,225	81	2,169	Glacial sand	Hard, iron		S	Sufficient for 125 head stock; a 10-foot seepage well is used for drinking water.
8	SW.	6	"	"	"	Dug	4	2,220	- 1	2,219			Glacial drift	Hard, "alkaline"		D, S	Well is dry in winter.
9	NW.	6	"	"	"	Dug	35	2,200	- 30	2,170	34	2,166	Glacial sand	Hard, iron, "alkaline"		D, S	Sufficient for house use only.
10	NW.	9	"	"	"	Dug	63	2,225	- 20	2,205	54	2,171	Glacial gravel	Hard, iron		D, S	Abundant supply.
11	NW.	10	"	"	"	Dug	32	2,225	- 23	2,202	23	2,202	Glacial sand	Hard, iron		D, S	Sufficient supply.
12	SE.	10	"	"	"	Dug	22	2,235	- 12	2,223			Glacial drift	Hard		D, S	Sufficient supply.
13	SE.	12	"	"	"	Dug	38	2,220	- 17	2,203	38	2,182	Glacial sand	Hard, iron		D, S	Plenty of water.

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

WELL RECORDS—Rural Municipality of EMERALD NO. 277, SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
14	NE.	12	28	14	2	Dug	40	2,210	- 20	2,190	40	2,170	Glacial sand	Hard		D, S	Good supply of water.
15	SE.	13	"	"	"	Dug	14	2,195	- 10	2,185	10	2,185	Glacial gravel	Hard		D, S	Good supply of water.
16	NE.	14	"	"	"	Dug	18	2,200	- 10	2,190	10	2,190	Glacial sand	Hard		D, S	Sufficient supply.
17	SE.	16	"	"	"	Dug	52	2,225	- 22	2,203	52	2,173	Glacial sand	Hard,iron		D, S	Abundant and constant supply.
18	NW.	16	"	"	"	Dug	39	2,220	- 18	2,202	36	2,184	Glacial gravel	Hard,iron		D, S	Constant supply.
19	SE.	17	"	"	"	Dug	50	2,215	- 44	2,171	44	2,171	Glacial sand	Hard,iron		D, S	Sufficient supply.
20	SE.	18	"	"	"	Dug	38	2,205	- 20	2,185	36	2,169	Glacial sand	Hard,iron		D, S	Good supply of water.
21	SW.	18	"	"	"	Dug	12	2,195	- 4	2,191			Glacial sand and gravel	Hard,iron		D, S	Sufficient for 30 head stock.
22	NW.	18	"	"	"	Dug	40	2,180	- 20	2,160	38	2,142	Glacial gravel	Hard,iron		D, S	Abundant supply of water.
23	SW.	19	"	"	"	Dug	49	2,175	- 34	2,141	49	2,126	Glacial fine sand	Hard,iron		D, S	Plenty of water.
24	SW.	21	"	"	"	Dug	42	2,210	- 26	2,184	42	2,168	Glacial sand	Hard,iron, "alkaline"		D, S	Plenty of water.
25	NW.	22	"	"	"	Dug	22	2,200	- 14	2,186			Glacial sand	Hard,iron		D, S	Sufficient supply.
26	NE.	22	"	"	"	Dug	20	2,196	- 14	2,182			Glacial drift	Hard		D, S	Sufficient supply.
27	SW.	24	"	"	"	Dug	13	2,190	- 11	2,179	11	2,179	Glacial gravel	Hard,iron		D, S	Sufficient for 90 head stock.
28	NW.	24	"	"	"	Dug	10	2,185	- 3	2,182			Glacial drift	Hard,iron		D, S	Sufficient supply.
29	SE.	26	"	"	"	Dug	18	2,185	- 10	2,175	14	2,171	Glacial gravel	Hard		D, S	Sufficient supply.
30	NE.	26	"	"	"	Bored	50	2,170	- 15	2,155	50	2,120	Glacial sand	Hard		D, S	An 8-foot well also yields a large supply of water.
31	NE.	27	"	"	"	Dug	10	2,165	- 6	2,159	6	2,159	Glacial gravel	Hard		D, S	Constant supply of water.
32	SW.	28	"	"	"	Bored	110	2,180									One of 9 dry holes in glacial drift.
33	SW.	29	"	"	"	Dug	12	2,180					Glacial drift	Hard		D, S	Sufficient supply.
34	SW.	30	"	"	"	Dug	16	2,160	- 8	2,152			Glacial sand	Hard		D, S	Intermittent supply.
35	NW.	31	"	"	"	Dug	8	2,135	- 4	2,131			Glacial gravel	Soft		D, S	Sufficient for 40 head stock.
36	SW.	32	"	"	"	Dug	15	2,160	- 12	2,148	12	2,148	Glacial gravel	Hard		D, S	Sufficient supply.
37	NW.	32	"	"	"	Dug	7	2,150	- 1	2,149	1	2,149	Glacial sand	Hard		D, S	Good supply of water.
38	SE.	32	"	"	"	Dug	28	2,160	- 21	2,139			Glacial drift	Hard		D, S	Sufficient supply.
39	NE.	32	"	"	"	Dug	14	2,140	- 4	2,136			Glacial gravel	Hard		D, S	Intermittent supply; a 22-foot well has yielded a good supply but has been dry for 7 years; dry holes up to 60 feet deep.

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

WELL RECORDS—Rural Municipality of EMERALD NO. 277, 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
40	NW.	33	28	14	2	Bored	64	2,145	- 20	2,125	64	2,081	Glacial sand	Hard		D, S	Sufficient for 50 head stock.
41	SE.	34	"	"	"	Dug	37	2,150	- 32	2,118	32	2,118	Glacial gravel	Hard		D, S	Sufficient for 100 head stock.
42	NE.	34	"	"	"	Dug	20	2,148	- 16	2,132	16	2,132	Glacial gravel	Hard		D, S	Sufficient supply.
43	SW.	35	"	"	"	Dug	25	2,148	- 20	2,128	20	2,128	Glacial gravel	Hard		S	Sufficient supply.
1	NW.	3	28	15	2	Dug	9	2,142	- 2	2,140			Glacial drift	Hard		D, S	Intermittent supply.
2	NW.	10	"	"	"	Dug	40	2,160	- 36	2,124	36	2,124	Glacial sand	Soft,		D, S	Sufficient for 70 head stock.
3	SE.	13	"	"	"	Dug	42	2,185	- 20	2,165	41	2,144	Glacial sand	Hard, iron		D, S	Sufficient supply.
4	NW.	16	"	"	"	Bored	110	2,125	- 80	2,045	110	2,015	Glacial sand	Hard, "alkaline"		D, S	Insufficient for 80 head stock.
5	SW.	19	"	"	"	Dug	6	2,105	- 5	2,100			Glacial drift	Hard		D, S	Intermittent supply.
6	SW.	21	"	"	"	Bored	80	2,110	- 20	2,090	80	2,030	Glacial sand	Hard, "alkaline"		D, S	Sufficient supply.
7	NE.	22	"	"	"	Bored	40	2,140	- 20	2,120	40	2,100	Glacial sand	Hard, iron		D, S	Sufficient supply.
8	SW.	23	"	"	"	Bored	40	2,145	- 20	2,125	38	2,107	Glacial sand	Hard		D, S	Sufficient for house use only.
9	SW.	24	"	"	"	Dug	47	2,150	- 40	2,110			Glacial sand	Hard, iron, "alkaline"		D, S	Sufficient for house use only.
10	NE.	25	"	"	"	Dug	22	2,155	- 20	2,135	20	2,135	Glacial sand	Hard		D, S	Sufficient supply.
11	NE.	26	"	"	"	Bored	40	2,125	- 30	2,095	39	2,086	Glacial gravel	Hard		D, S	Sufficient supply.
12	SE.	28	"	"	"	Bored	60	2,130	- 30	2,100	60	2,070	Glacial sand	Hard, iron		D, S	Sufficient supply.
13	SW.	28	"	"	"	Dug		2,115					Glacial sand	Hard		D, S	Insufficient supply in winter.
14	SW.	29	"	"	"	Bored	38	2,100	- 28	2,072	37	2,063	Glacial gravel	Hard, iron		D, S	Sufficient supply.
15	NW.	29	"	"	"	Bored	100	2,100	- 95	2,005	95	2,005	Glacial sand	Hard, iron		S	Not quite sufficient water. one dry hole 180 feet deep in glacial drift.
16	NE.	31	"	"	"	Bored	40	2,090	- 30	2,060	39	2,051	Glacial gravel	Hard, iron		S	Insufficient supply.
17	SW.	32	"	"	"	Bored	80	2,110	- 50	2,060	78	2,032	Glacial gravel	Hard, iron		D, S	Sufficient supply.
18	NW.	32	"	"	"	Bored	68	2,100	- 50	2,050	67	2,033	Glacial sand	Hard, iron		D, S	Sufficient supply.
19	SW.	33	"	"	"	Dug	40	2,120	- 30	2,090	38	2,082	Glacial gravel	Hard		D, S	Sufficient supply.
20	SE.	33	"	"	"	Bored	80	2,125	- 70	2,055			Glacial drift	Hard		D, S	Insufficient supply.
21	SW.	34	"	"	"	Bored	65	2,125	- 45	2,080	60	2,065	Glacial gravel	Hard		D, S	Sufficient supply.
22	NW.	34	"	"	"	Bored	75	2,110	- 45	2,065	73	2,037	Glacial gravel	Hard, iron		D, S	Sufficient supply.

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(#) Sample taken for analysis.

WELL RECORDS[6]—Rural Municipality of EMERALD NO.277, SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
23	SE.	35	28	15	2	Bored	40	2,120	- 30	2,090	38	2,082	Glacial gravel	Hard		D, S	Sufficient supply.
24	SE.	36	"	"	"	Dug	22	2,140	- 17	2,123	21	2,119	Glacial gravel	Hard		D, S	Sufficient supply.
1	NE.	2	29	13	2	Dug	20	2,080	- 15	2,065	15	2,065	Glacial gravel	Soft		D, S	Pumping will not reduce the water level; a 7-foot well dug in gravel yields an abundant supply also.
2	NW.	2	"	"	"	Dug	14	2,115	- 8	2,107	14	2,101	Glacial fine sand	Hard		S	Good supply for 30 head stock; a 34-foot seepage well is used for the house.
3	SW.	2	"	"	"	Dug	73	2,125	- 2	2,123	73	2,052	Glacial sand	Hard,iron, "alkaline"		D	Poor supply since base of well has become plugged; the water is very laxative. #
4	SE.	4	"	"	"	Dug	7	2,150	- 5	2,145	5	2,145	Glacial sand	Soft		D, S	Sufficient for 14 head stock only; usually hauls drinking water.
5	SW.	4	"	"	"	Dug	12	2,145	- 9	2,136	9	2,136	Glacial sand	Soft,odour		S	Sufficient for 7 head stock; well required cleaning.
6	NW.	6	"	"	"	Bored	57	2,110	- 16	2,094	57	2,053	Glacial gravel	Hard,iron		D, S	Sufficient for 25 head stock; one dry hole 24 feet deep.
7	SW.	7	"	"	"	Dug	25	2,110	- 17	2,093	20	2,090	Glacial sand?	Hard		D, S	Plenty of water for 7 head stock.
8	SE.	7	"	"	"	Dug	20	2,115	- 12	2,103			Glacial sand	Hard,"alkaline"		D, S	Sufficient for 14 head stock in summer; a well on Section 8,is used in winter for stock
9	NW.	8	"	"	"	Bored	40	2,100	- 25	2,075			Glacial sand	Hard,iron, "alkaline"		D, S	Sufficient for 8 head stock in summer; water is hauled in winter.Seven dry holes to a maximum depth of 80 feet.
10	SE.	9	"	"	"	Bored	58	2,120	- 9	2,111	58	2,062	Glacial sand	Hard,iron, "alkaline"		D, S	Abundant supply for 30 head stock.
11	SW.	10	"	"	"	Dug	8	2,115	- 4	2,111	4	2,111	Glacial gravel	Soft		D, S	Sufficient for 9 head stock.
12	NW.	12	"	"	"	Dug	34	2,070	- 15	2,055	34	2,036	Glacial sand	Hard		D, S	Good supply for 27 head stock.
13	SW.	12	"	"	"	Dug	27	2,085	- 8	2,077			Glacial black sand	Hard		D, S	Sufficient for 12 head stock; cattle use sloughs in summer.
14	NE.	14	"	"	"	Bored	25	2,050	- 10	2,040			Glacial sand	Hard		D, S	Sufficient for 33 head stock.
15	SW.	14	"	"	"	Dug	17	2,040	- 12	2,028			Glacial sand	Hard,iron		D, S	Sufficient for 17 head stock; a 35-foot well has partly caved in.
16	NE.	17	"	"	"	Bored	56	2,06	- 35	2,025	56	2,004	Glacial fine sand	Hard,sulphur		D, S	Abundant supply for 35 head stock; well has never been pumped dry. #
17	NW.	17	"	"	"	Dug	15	2,060	- 3	2,057			Glacial gravel	Hard		N	Farm house is vacant.
18	NE.	18	"	"	"	Dug	36	2,065	- 28	2,037			Glacial stony clay	Hard,iron		D, S	Sufficient supply.
19	SW.	18	"	"	"	Bored	73	2,075	- 44	2,031	60	2,015	Glacial sand	Hard,"alkaline"		D, S	Abundant supply for 50 head stock; water is laxative for man.
20	SE.	20	"	"	"	Bored	55	2,040	- 25	2,015	54	1,986	Glacial gravel	Hard,iron, "alkaline"		D, S	Abundant supply for 18 head stock.
21	NE.	20	"	"	"	Dug	62	2,040	- 32	2,008	60	1,980	Glacial sand	Hard,iron, "alkaline"		D, S	Sufficient for 6 head stock only; many dry holes as deep as 80 feet.
22	SW.	21	"	"	"	Bored	46	2,045	- 8	2,037	46	1,999	Glacial drift	Hard,iron, "alkaline"		S	A very abundant supply of water; farmers haul from this well; water is laxative for man.
23	NE.	22	"	"	"	Bored	100	2,020	- 20	2,000	100	1,920	Glacial drift	Hard,iron, "alkaline"		D, S	Constant supply of water; several seepage wells less than 16 feet deep.

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 EMERALD NO 277 SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
24	SW.	22	29	13	2	Dug	12	2,045	- 4	2,041	10	2,035	Glacial sandy clay	Hard		D, S	Sufficient for 7 head stock.
25	NE.	24	"	"	"	Dug	16	2,050	- 10	2,040	15	2,035	Glacial sand	Hard		D, S	Sufficient for 35 head stock; water is easily found on this quarter section.
26	NW.	24	"	"	"	Dug	27	2,040	- 12	2,028	16	2,024	Glacial sand	Hard		D, S	Well has never pumped dry; plenty of water for 50 head stock.
27	SW.	24	"	"	"	Bored	70	2,055	- 10	2,045			Glacial sandy clay	Hard		D, S	Good supply for 25 head stock; several shallow wells yielded an unsatisfactory water supply.
28	SE.	25	"	"	"	Dug	9	2,045	- 4	2,041			Glacial sand	Hard		D, S	Several farmers use this well; bails dry but soon refills.
29	NE.	26	"	"	"	Dug		2,020									Many dry holes have been dug during the past 30 years; all water is hauled.
30	NW.	27	"	"	"	Dug	30	2,005	- 26	1,979			Glacial drift	Hard		D	Yields 5 pails of water a day; many dry holes have been dug and bored to 131 feet; hauls water in winter.
31	NE.	28	"	"	"	Bored	56	2,010	- 4	2,006	30	1,980	Glacial sand				Well has not been used yet; two dry holes 72 feet deep.
32	SE.	28	"	"	"	Bored	60	2,020	- 20	2,000	60	1,960	Glacial sand	Hard,iron		D, S	Abundant supply; neighbours haul from this well.
33	SE.	30	"	"	"	Bored	70	2,040	- 25	2,015	70	1,970	Glacial sand?	Hard,iron		D, S	Sufficient for 25 head stock.
34	SW.	31	"	"	"	Bored	58	2,025	- 15	2,010	51	1,974	Glacial sand	Hard,iron, "alkaline"		S	Sufficient for 40 head stock; one dry hole bored 93 feet deep; a 20-foot well is used for the house.
35	SE.	32	"	"	"	Bored	40	2,015	- 21	1,994			Glacial sand?	Hard,iron		S	
36	SW.	32	"	"	"	Dug	35	2,015	- 20	1,995			Glacial sand	Hard,iron		D, S	Two dry holes 95 and 100 feet deep in glacial drift.
37	NE.	34	"	"	"	Bored	50	1,990	- 25	1,965	48	1,942	Glacial gravel	Hard,iron		S	Sufficient for 45 head stock; drinking water is obtained from a rain water cistern.
38	NE.	36	"	"	"	Dug	32	1,995	- 17	1,978	32	1,963	Glacial sand	Hard		D, S	Sufficient for 20 head stock; several hand-dug dry holes.
39	SW.	36	"	"	"	Dug	8	2,010	- 5	2,005	5	2,005	Glacial sand	Hard		D, S	One of two similar wells; plenty of water for 13 head stock.
40	NW.	36	"	"	"	Bored	75	1,995	- 45	1,950	70	1,925	Glacial sand	Hard		D, S	Poor supply; a 65-foot well is also used to water 14 head stock.
1	NW.	2	29	14	2	Dug	30	2,105	- 10	2,095	16	2,089	Glacial gravel	Hard,iron, "alkaline"		D, S	Sufficient for 11 head stock.
2	NE.	2	"	"	"	Dug	27	2,105	- 13	2,092	27	2,078	Glacial fine sand	Hard, "alkaline"		D, S	Stock are watered at a small lake in summer for convenience.
3	SW.	2	"	"	"	Dug	17	2,105	- 8	2,097	11	2,094	Glacial gravel	Hard,iron		D, S	Sufficient supply.
4	SW.	4	"	"	"	Dug	64	2,140	- 17	2,123	64	2,076	Glacial sand and gravel	Hard		D, S	Abundant supply for 30 head stock.
5	SW.	5	"	"	"	Dug	16	2,130	- 11	2,119	14	2,116	Glacial sand and gravel	Soft		D, S	Plenty of water.
6	NW.	6	"	"	"	Dug	30	2,090	- 15	2,075			Glacial sand	Hard,iron, "alkaline"		D, S	Sufficient for 40 head stock.
7	NW.	9	"	"	"	Bored	95	2,085	- 12	2,073	95	1,990	Glacial fine sand	Hard,iron, "alkaline"		D, S	Well is plugged with sand; haul water one mile.
8	SE.	9	"	"	"			2,090	+ 2	2,092			Glacial drift	Hard		D, S	Flowing spring which has flowed continuously since 1905.

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

WELL RECORDS—Rural Municipality of EMERALD NO.277, SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
9	SW.	9	29	14	2	Dug	30	2,105	- 27	2,078			Glacial drift	Hard, iron, "alkaline"		D	Hauls water from the flowing spring; one dry hole 50 feet deep.
10	SE.	10	"	"	"	Dug	27	2,095	- 10	2,085			Glacial drift	Hard, "alkaline"		D, S	Plenty of water for 16 head stock.
11	SE.	12	"	"	"	Dug	7	2,100	- 3	2,097	3	2,097	Glacial sand	Hard		D, S	Sufficient supply.
12	NE.	12	"	"	"	Bored	50	2,090	- 5	2,085			Glacial drift	Hard, "alkaline"		D, S	Sufficient supply.
13	NW.	12	"	"	"	Bored	40	2,090									Dry hole in glacial drift; all water is hauled.
14	SE.	13	"	"	"	Bored	75	2,075	- 20	2,055	75	2,000	Glacial gravel	Hard, iron, "alkaline"		D, S	Well yields 4 barrels of water an hour; Bankend school well.
15	SE.	13	"	"	"	Dug	34	2,070	- 12	2,058			Glacial drift	Hard, iron, "alkaline"		D	Well in hamlet of Bankend; yields one barrel of water a day.
16	NW.	13	"	"	"	Bored	75	2,060	- 30	2,030	75	1,985	Glacial sand	Hard		D, S	Good supply for 30 head stock.
17	NE.	14	"	"	"	Bored	65	2,060	- 40	2,020	65	1,995	Glacial gravel	Hard, iron		D, S	Sufficient supply.
18	SW.	16	"	"	"	Bored	60	2,065	- 10	2,055	60	2,005	Glacial sand	Hard, "alkaline"		S	Well can be bailed dry; water is very "alkaline" when the level is high in spring and summer.
19	NE.	17	"	"	"	Bored	78	2,050	- 5	2,045			Glacial drift	Hard, iron, "alkaline"		D, S	Abundant supply; a 70-foot well yields a very small supply.
20	NW.	21	"	"	"	Bored	22	2,040	- 5	2,035			Glacial drift	Soft		D, S	Sufficient for house use only; sloughs are used for stock and water is hauled.
21	SW.	21	"	"	"	Bored	45	2,055	- 12	2,043	40	2,015	Glacial fine sand	Hard, iron, "alkaline"		D, S	Insufficient supply in winter.
22	SE.	22	"	"	"	Bored	50	2,050	- 47	2,003	47	2,003	Glacial sand and gravel	Hard, iron		D, S	A number of wells 50 feet deep yield poor supplies of water; sloughs areused and water is hauled.
23	NE.	23	"	"	"	Bored	72	2,045	- 18	2,027	72	1,973	Glacial sand ?	Hard, iron		D, S	Abundant supply for 50 head stock.
24	SE.	25	"	"	"	Bored	35	2,045	- 28	2,017			Glacial sand	Hard, iron, "alkaline"		D, S	Sufficient supply.
25	NE.	26	"	"	"	Bored	68	2,030	- 10	2,020	68	1,962	Glacial gravel	Hard, "alkaline"		D, S	Abundant supply for 24 head stock.
26	SW.	27	"	"	"	Bored	85	2,035	- 16	2,019	85	1,950	Glacial sand	Hard, iron		D, S	Plenty of water for 18 head stock.
27	NE.	28	"	"	"	Bored	80	2,035	- 40	1,995	80	1,955	Glacial sand	Hard, iron, "alkaline"		S	Abundant supply; a shallow well is used for the house.
28	NW.	28	"	"	"	Dug	10	2,040	- 5	2,035			Glacial drift	Hard		D	Sufficient supply.
29	NE.	29	"	"	"	Bored	75	2,040	- 10	2,030			Glacial drift	Hard, "alkaline"		S	Poor supply; drinking water is obtained from a 100-foot well that yields a very small supply.
30	SW.	31	"	"	"	Bored	75	2,050	- 30	2,020	75	1,975	Glacial fine sand	Hard, iron, "alkaline"		S	Abundant supply; drinking water is obtained from a 35-foot seepage well.
31	NE.	32	"	"	"	Bored	105	2,035									Dry hole in glacial drift.
32	SW.	33	"	"	"	Bored	90	2,035									The deepest of three dry holes in glacial drift.
33	SE.	33	"	"	"	Bored	80	2,030	- 20	2,010	80	1,950	Glacial sand ?	Hard, "alkaline"		D, S	Sufficient for 100 head stock.

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

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

WELL RECORDS—Rural Municipality of EMERALD NO.277, 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
34	NW.	33	29	14	2	Bored	75	2,030									The deepest of many dry holes in glacial dr water is hauled and stock use sloughs.
35	SE.	34	"	"	"	Bored	80	2,030	- 6	2,024	80	1,950	Glacial sand	Hard, "alkaline"		S	Abundant supply; stock water at dam in summer; a 30-foot well is used for drinking water.
36	NE.	34	"	"	"	Bored	76	2,025	- 14	2,011	76	1,949	Glacial sand	Hard, iron, "alkaline"		D, S	Sufficient supply; the water acts as a laxative on man.
37	SE.	36	"	"	"	Dug	14	2,020	- 7	2,013			Glacial sand	Soft		D, S	Sufficient supply.
38	NE.	36	"	"	"	Bored	19	2,015	- 4	2,011			Glacial sand	Hard, iron		S	A 93-foot well is used for drinking water; one dry hole 82 feet deep.
1	SE.	1	29	15	2	Bored	30	2,100	- 12	2,088	20	2,080	Glacial sand	Hard		D, S	Sufficient supply.
2	NE.	2	"	"	"	Dug	20	2,095	- 15	2,080	18	2,077	Glacial sand	Hard		D, S	Sufficient but supply decreased during the drought.
3	SE.	3	"	"	"	Dug	30	2,110									Dry hole in glacial drift; stock use slough and drinking water is hauled.
4	NE.	3	"	"	"	Dug	23	2,110									Dry hole in glacial drift.
5	NE.	3	"	"	"	Bored	80	2,110	- 20	2,090	80	2,030	Glacial sand	Hard, iron, "alkaline"		D, S	Abundant supply.
6	SE.	5	"	"	"	Dug	22	2,105	- 12	2,093	12	2,093	Glacial sand	Hard		D, S	Sufficient for 30 head stock; 14 dry holes 22 to 110 feet deep.
7	SW.	5	"	"	"	Bored	90	2,100									Dry hole in glacial drift; uses sloughs and hauls water.
8	NE.	8	"	"	"	Bored	85	2,090									Dry hole in glacial drift; uses sloughs and hauls water.
9	SW.	10	"	"	"	Bored	35	2,110	- 27	2,083			Glacial sand	Hard		D, S	Sufficient supply; stock also water at a large slough.
10	NW.	12	"	"	"		30	2,090	- 20	2,070			Glacial sand	Hard		D, S	A dam on a creek is also used for stock.
11	SE.	13	"	"	"	Bored	70	2,075	- 35	2,040	70	2,005	Glacial sand	Hard		D, S	Sufficient supply.
12	NE.	13	"	"	"	Bored	70	2,070	- 40	2,030	70	2,000	Glacial sand	Hard		D, S	Plenty of water.
13	SW.	14	"	"	"	Bored	78	2,090	- 20	2,070	78	2,012	Glacial sand	Hard, iron		D, S	Abundant supply; several dry holes in glacial drift.
14	SW.	15	"	"	"	Drilled	200	2,100									Dry hole in glacial drift; hauls water.
15	SW.	16	"	"	"	Bored	90	2,095					Glacial sand			N	Well requires repairs; hauls water.
16	NE.	16	"	"	"	Bored	60	2,085	- 40	2,045	60	2,025	Glacial sand	Hard		D, S	Sufficient supply.
17	NW.	16	"	"	"	Bored	50	2,095	- 40	2,055	50	2,045	Glacial sand?	Hard		D, S	Abundant supply; a 30-foot well dried up in 1934.
18	NW.	17	"	"	"	Dug	24	2,100					Glacial drift				
19	SE.	17	"	"	"	Bored	40	2,100	- 15	2,085	40	2,060	Glacial sand	Hard, iron, "alkaline"		D, S	Abundant supply; several farmers haul from this well.
20	SE.	18	"	"	"	Dug	25	2,095	- 15	2,080	15	2,080	Glacial gravel	Hard		D, S	Good supply of water.
21	NE.	20	"	"	"	Bored	90	2,100	- 50	2,050	90	2,010	Glacial fine sand	Hard, iron		D, S	Abundant supply although well is partly plugged; a 15-foot well is not in use.

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of EMERALD NO.277, SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
22	SW.	21	29	15	2	Bored	80	2,095	- 70	2,025			Glacial sand	Hard, iron, "alkaline" cloudy		S	Poor supply ; uses sloughs for stock in summer and hauls water in winter; drinking water is hauled.
23	SW.	23	"	"	"	Bored	35	2,080	- 20	2,060	35	2,045	Glacial sand	Hard, iron		D, S	One of two similar wells; good supply of water.
24	NW.	23	"	"	"	Bored	42	2,075	- 10	2,065	42	2,033	Glacial gravel	Hard, iron		S	Abundant supply; a 28-foot well yields an artesian flow of water in wet seasons.
25	SE.	25	"	"	"	Bored	40	2,050	- 20	2,030			Glacial gravel	Hard		D, S	A 70-foot seepage well is used for domestic purposes.
26	NW.	25	"	"	"	Bored	70	2,055	- 40	2,015	70	1,985	Glacial sand	Hard, iron		D, S	Oversufficient supply.
27	NE.	25	"	"	"	Dug	40	2,050	- 32	2,018	35	2,015	Glacial gravel	Hard		D, S	Hamlet well in Wishart sufficient supply; dry holes as deep as 115 feet in glacial drift.
28	NW.	26	"	"	"	Bored	50	2,065	- 40	2,025	50	2,015	Glacial sand	Hard, iron		S	A 30-foot well is used for house; sufficient supply.
29	SW.	27	"	"	"	Bored	35	2,075	- 20	2,055	35	2,040	Glacial sand	Hard		D, S	Sufficient supply.
30	SE.	28	"	"	"	Bored	16	2,080	- 12	2,068			Glacial gravel	Hard		N	Well has caved in; hauls water from a neighbour's well.
31	NE.	28	"	"	"	Bored	90	2,080	- 60	2,020	90	1,990	Glacial sand	Hard, iron, "alkaline"		D, S	Insufficient supply; hauls water.
32	SW.	29	"	"	"		100	2,095	- 50	2,045	100	1,995	Glacial sand	Hard, iron, "alkaline"		D, S	Abundant supply.
33	NW.	29	"	"	"	Bored	80	2,090	- 30	2,060	80	2,010	Glacial sand	Hard, iron		D, S	Sufficient supply.
34	SE.	30	"	"	"	Bored	80	2,100	- 40	2,060	80	2,020	Glacial fine sand	Hard, iron		D, S	Very abundant supply of water.
35	SE.	32	"	"	"	Bored	65	2,080	- 35	2,045	65	2,015	Glacial gravel	Soft		D, S	Sufficient supply.
36	NW.	32	"	"	"	Dug	10	2,100	0	2,100			Glacial drift	Hard		D, S	Intermittent supply.
37	SW.	33	"	"	"	Dug	18	2,075	0	2,075			Glacial drift	Hard		D, S	Intermittent supply; one dry hole 100 feet deep; hauls water.
38	SE.	35	"	"	"	Bored	40	2,060	- 30	2,030	40	2,020	Glacial sand	Hard		D, S	Sufficient supply.
39	SW.	35	"	"	"	Dug	10	2,065	0	2,065			Glacial drift	Hard		D, S	Intermittent supply.
40	SW.	36	"	"	"	Bored	60	2,055	- 40	2,015	60	1,995	Glacial sand	Hard, iron		D, S	Abundant supply.
41	NW.	36	"	"	"	Dug	15	2,050	0	2,050			Glacial drift	Hard		D, S	Intermittent supply; hauls water in winter.
1	SW.	1	30	13	2	Dug	9	1,990	- 4	1,986	4	1,986	Glacial sand	Hard		D, S	Sufficient for 8 head stock.
2	NW.	2	"	"	"	Dug	14	1,985	- 9	1,976	9	1,976	Glacial sand	Hard		D, S	Sufficient for 25 head stock.
3	SE.	3	"	"	"	Bored	27	1,990	- 17	1,973	27	1,963	Glacial sand	Hard, iron		D, S	Sufficient and constant supply for 12 head stock.
4	NW.	3	"	"	"	Bored	95	1,985	- 10	1,975	95	1,890	Glacial sand	Hard, iron		D, S	Abundant supply for 45 head stock; a 36-foot well yields a fair supply; dry holes as deep as 80 feet.
5	NE.	4	"	"	"	Dug	14	1,990	- 8	1,982	8	1,982	Glacial sand	Hard, "alkaline"		D, S	Well becomes intermittent in winter; stock are watered at a slough in winter.

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of EMERALD NO. 277, SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
6	SW.	4	30	13	2	Dug	54	2,000	- 44	1,956	48	1,952	Glacial drift	Hard,"alkaline"		D, S	Well has never bailed dry and waters 45 head stock; a 12-foot well is used that yields soft water.
7	NW.	4	"	"	"	Bored	54	1,995	- 12	1,983	52	1,943	Glacial coarse gravel	Hard,"alkaline"		S	Yields 2 tanks of water a day; a 36-foot well is also used.
8	SE.	5	"	"	"	Dug	8	2,000	- 6	1,994	6	1,994	Glacial gravel	Soft		D, S	Abundant supply for 40 head stock; well cannot be bailed dry.
9	NW.	5	"	"	"	Dug	62	1,990	- 8	1,982	62	1,928	Glacial sand	Hard,iron, "alkaline"		D, S	Sufficient for 100 head stock; well requires cleaning, since sand washes in.
10	NW.	7	"	"	"	Dug		1,990	+ 3	1,993			Glacial sand	Hard,iron		D, S	This artesian well has flowed continuously since 1929 at least; the depth of the well is unknown.
11	NE.	7	"	"	"	Dug	11	1,990									One of several shallow dry holes; hauls all water.
12	SE.	9	"	"	"	Dug	10	1,985	- 6	1,979	6	1,979	Glacial sand	Hard,"alkaline"		D, S	Sufficient for 30 head stock; also 10-foot well is also used in dry years.
13	SW.	10	"	"	"	Dug	12	1,970	- 10	1,960	10	1,960	Glacial sand	Hard,"alkaline"		D, S	Well bails dry easily; but soon refills; small supply.
14	NE.	10	"	"	"	Bored	88	1,975	- 75	1,900			Glacial sand	Hard		D, S	Very poor supply; 3 dry holes 70,110 and 130 feet deep; a dam on a creek is used for stock.
15	NW.	10	"	"	"	Dug	14	1,980	- 11	1,969	11	1,969	Glacial gravel	Hard,"alkaline"		D, S	Sufficient for 30 head stock.
16	SE.	10	"	"	"	Bored	100	1,975	- 10	1,965	100	1,875	Glacial fine sand	Hard,iron		D, S	Abundant supply and farmers have hauled from this well; several shallow wells became dry in the drought.
17	NW.	12	"	"	"	Dug	13	1,970	- 7	1,963	7	1,963	Glacial sand	Soft		D, S	Well has never pumped dry.
18	SE.	12	"	"	"	Bored	30	1,965	- 15	1,950	30	1,935	Glacial sand	Hard,iron		D, S	Sufficient for 40 head stock; several dry holes as deep as 90 feet in glacial drift.
19	SW.	13	"	"	"	Dug	20	1,970	- 12	1,958	12	1,958	Glacial sand	Soft		D, S	The drought sloughs are used, snow melted and water is hauled.
20	SE.	15	"	"	"	Dug	12	1,965	- 6	1,959	6	1,959	Glacial sand	Hard		D, S	Sufficient for 15 head stock in summer; snow is melted for stock in winter.
21	SW.	15	"	"	"	Dug	10	1,970	- 7	1,963	7	1,963	Glacial sand	Hard		S	Good supply of water.
22	NW.	15	"	"	"	Bored	30	1,955	- 24	1,931			Glacial sand	Hard		D, S	Insufficient for 15 head stock in winter.
23	SE.	16	"	"	"	Bored	40	1,965	- 12	1,953	38	1,927	Glacial sand	Hard,iron		D, S	Sufficient for 60 head stock.
24	NE.	16	"	"	"	Dug	40	1,955	- 15	1,940	40	1,915	Glacial gravel	Hard,iron		D, S	Sufficient for 80 head stock.
25	NW.	16	"	"	"	Bored	85	1,965	- 30	1,935	85	1,880	Glacial sand	Hard,iron		D, S	Abundant supply; three shallow wells became dry during the drought; 30-and 60-foot wells yield very little water.
26	SE.	17	"	"	"	Bored	76	1,970	- 35	1,935			Glacial drift	Hard,iron, "alkaline"		D, S	Good supply for 26 head stock; also uses an 18-foot well; dry holes to a maximum depth of 95 feet.
27	NE.	17	"	"	"	Bored	100	1,965	- 80	1,885			Glacial drift	Hard,iron, "alkaline"		S	Poor supply and drives stock to a neighbours well; a 12-foot well yields sufficient water for house.
28	SW.	17	"	"	"	Bored	65	1,975	- 55	1,920			Glacial drift	Hard,"alkaline"		D	Water is hauled winter and summer for stock.

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

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

WELL RECORDS—Rural Municipality of EMERALD NO. 277, 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
29	SE.	18	30	13	2	Dug	10	1,980	- 5	1,975	5	1,975	Glacial sand	Hard,iron, "alkaline"		D, S	Intermittent supply; hauls water.
30	NE.	18	"	"	"	Bored	50	1,970	- 10	1,960	50	1,920	Glacial blue sand	Hard		S	Abundant supply, but well becomes plugged with sand.
31	NE.	19	"	"	"	Dug	10	1,950	- 5	1,945	5	1,945	Glacial sand	Soft		D, S	A 7-foot well yields a better supply of water one dry hole 15 feet deep.
32	SE.	19	"	"	"	Bored	66	1,960	- 22	1,938	66	1,894	Glacial sand	Hard,iron		D, S	Plenty of water but well is partly plugged with sand; several dry holes as deep as 100 feet; also uses a 10-foot well that yields a small supply.
33	SW.	20	"	"	"	Bored	39	1,955	- 14	1,941	39	1,916	Glacial gravel	Hard,iron		D, S	Sufficient for 40 head stock.
34	SE.	20	"	"	"	Dug	12	1,960	- 8	1,952	8	1,952	Glacial sand	Hard		D, S	One of two similar wells; sufficient supply; dry holes as deep as 44 feet.
35	NE.	20	"	"	"	Bored	44	1,950	- 12	1,938	44	1,906	Glacial sand	Hard,iron, "alkaline"		D, S	Sufficient for 70 head stock.
36	SW.	21	"	"	"	Dug	80	1,960	- 40	1,920	60	1,900	Glacial sand	Hard,iron, "alkaline"		S	Sufficient for 50 head stock; a 12-foot well is used for drinking water. Hauls drinking water in winter.
37	SE.	21	"	"	"	Dug	10	1,950	- 6	1,944	6	1,944	Glacial sand	Hard		D, S	Sufficient for 20 head stock; one other farmer uses this well.
38	SW.	22	"	"	"	Dug	22	1,950	- 18	1,932	18	1,932	Glacial sand	Hard		S	Sufficient for 10 head stock.
39	SE.	22	"	"	"	Dug	9	1,960	- 8	1,952	8	1,952	Glacial sand	Hard,very "alkaline"		S	Yields 15 pails of water a day; several other wells less than 20 feet deep yield poor supplies of water. #
40	NW.	23	"	"	"	Dug	19	1,955	- 16	1,939	16	1,939	Glacial sand	Hard		D, S	Sufficient for 50 head stock.
41	SE.	23	"	"	"	Dug	11	1,945	- 6	1,939	6	1,939	Glacial sand	Hard,"alkaline"		D, S	Sufficient for 10 head stock; stock also water at the creek in summer.
42	SW.	24	"	"	"	Bored	80	1,955	- 77	1,878			Glacial sand	Hard,"alkaline"		N	Very poor supply and seldom used.
43	SE.	24	"	"	"	Dug	12	1,950	- 3	1,947	3	1,947	Glacial sand and gravel	Soft		D, S	Oversufficient for 80 head stock; several farmers use this well.
44	NE.	24	"	"	"	Dug	15	1,945	- 12	1,933	12	1,933	Glacial gravel	Hard		D, S	Waters 200 head stock.
45	SE.	25	"	"	"	Dug	16	1,945	- 12	1,933	12	1,933	Glacial gravel	Hard		D, S	Plenty of water for 16 head stock.
46	SW.	25	"	"	"	Dug	12	1,950	- 7	1,943	7	1,943	Glacial fine sand	Hard		S	Well has never bailed dry; waters 33 head stock.
47	NW.	25	"	"	"	Dug	15	1,940	- 13	1,927	13	1,927	Glacial sand	Hard		D	Sufficient for house use only.
48	NW.	26	"	"	"	Dug	12	1,950	- 7	1,943	7	1,943	Glacial sand	Hard,iron		D, S	Sufficient for 30 head stock.
49	SE.	27	"	"	"	Dug	55	1,950	- 30	1,920	55	1,895	Glacial sand	Hard,iron		D, S	Water 20 head stock only; well requires cleaning out.
50	NE.	27	"	"	"	Bored	75	1,950	- 15	1,935	75	1,875	Glacial sand	Hard,iron		N	Well has waterod 40 head stock.
51	SE.	28	"	"	"	Bored	75	1,950	- 40	1,910	64	1,886	Glacial sand	Hard,iron		S	Waters 12 head stock only; a 15-foot well is used for the house.
52	NE.	30	"	"	"	Bored	85	1,945	- 35	1,910	85	1,860	Glacial sand	Hard,iron		D, S	Sufficient for 30 head stock; water easily found at 5 feet in the southern part of the quarter-section.

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 EMERALD NO.277, 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
53	SW.	30	30	13	2	Bored	103	1,955	- 40	1,915	103	1,852	Glacial gravel	Hard		D, S	Oversufficient for 30 head stock; dry holes as deep as 80 feet.
54	NW.	30	"	"	"	Bored	65	1,950	- 30	1,920	65	1,885	Glacial gravel	Soft		D, S	Good supply; water is hauled from this well for washing purposes.
55	SW.	31	"	"	"	Dug	12	1,945	- 7	1,938			Glacial sand and gravel	Hard,iron		D, S	Oversufficient for 100 head stock; water is hauled from this well for steam engines;well dug in 1910.
56	NW.	31	"	"	"	Dug	21	1,940	- 10	1,930	13	1,927	Glacial sand	Hard,iron		D, S	Oversufficient for 30 head stock.
57	NE.	31	"	"	"	Bored	36	1,935	- 18	1,917			Glacial gravel	Hard,"alkaline"		D, S	Sufficient for 20 head stock in summer; some water must be hauled in winter.
58	NE.	32	"	"	"	Dug	30	1,935	- 15	1,920			Glacial gravel	Hard,iron		D, S	Sufficient for 40 head stock; but supply decreases in winter.
59	SE.	33	"	"	"	Dug	16	1,945	- 10	1,935	10	1,935	Glacial sand	Hard,iron		D, S	Sufficient for 32 head stock.
60	NW	34	"	"	"	Dug	16	1,935	- 10	1,925	10	1,925	Glacial sand	Hard,"alkaline"		S	Sufficient for 16 head stock; rain water is used for house purposes.
61	SW.	35	"	"	"	Dug	8	1,945	- 4	1,941	4	1,941	Glacial sand	Hard		D, S	Water can be found almost anywhere at 8 feet.
62	NE.	35	"	"	"	Dug	15	1,935	- 10	1,925	10	1,925	Glacial blue sand	Hard,"alkaline"		S	Sufficient for 55 head stock; a 15-foot well is used for drinking water.
63	SW.	36	"	"	"	Dug	16	1,940	- 11	1,929	11	1,929	Glacial sand	Hard		D, S	Oversufficient for 25 head stock.
64	NE.	36	"	"	"	Bored	120	1,935	- 10	1,925			Glacial drift	Hard		S	Yields 2 barrels of water a day; drinking water is obtained from a neighbours well.
1	SE.	1	30	14	2	Bored	60	2,015	- 56	1,959			Glacial drift	Hard,"alkaline"		D, S	Intermittent supply; a similar well 50 feet deep is also used for stock.
2	SW.	1	"	"	"	Dug	17	2,015	- 9	2,006			Glacial sand	Hard		D, S	Sufficient for 10 head stock; one dry hole 68 feet deep.
3	NE.	1	"	"	"	Bored	52	2,000	- 25	1,975	51	1,949	Glacial sand and gravel	Hard,iron, "alkaline"		D, S	Sufficient supply; one dry hole 55 foot deep.
4	NW.	1	"	"	"	Bored	65	2,010	- 25	1,985	65	1,945	Glacial gravel	Hard,iron		D, S	Abundant supply.
5	SE.	2	"	"	"	Dug	55	2,015	- 15	2,000			Glacial gravel ?	Hard		D, S	Abundant supply.
6	NE.	2	"	"	"	Bored	66	2,010	- 20	1,990	66	1,944	Glacial coarse sand	Hard,iron, "alkaline"		D, S	Plenty of water; another 66-foot well is unused now.
7	SE.	3	"	"	"	Bored	75	2,005	- 20	1,985	75	1,930	Glacial gravel	Hard,iron		D, S	Oversufficient for 20 head stock.
8	SW.	4	"	"	"	Dug	6	2,025	- 3	2,022	3	2,022	Glacial fine sand	Hard,iron		D, S	Another 6-foot well yields soft water.
9	NW.	4	"	"	"	Dug	12	2,020	- 8	2,012			Glacial sand	Soft		D, S	A 90-foot well is used for stock in summer.
10	SW.	6	"	"	"	Bored	46	2,050	- 40	2,010			Glacial gravel	Hard,iron		D, S	Barely sufficient for 14 head stock.
11	NE.	6	"	"	"	Bored	80	2,040	- 40	2,000	80	1,960	Glacial gravel	Hard		D, S	Sufficient for 25 head stock.
12	NW.	6	"	"	"	Dug	26	2,040	- 22	2,018	22	2,018	Glacial sand	Soft		D, S	Sufficient for 34 head stock; an 80-foot well yields an abundant supply.
13	NW.	7	"	"	"	Bored	50	2,035	- 25	2,010	50	1,985	Glacial sand	Hard		D, S	Abundant supply; farmers have hauled from this well in dry years.
14	NW.	9	"	"	"	Dug	10	2,015	- 7	2,008			Glacial sand	Hard		D, S	Uses two other similar wells to obtain sufficient water.

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 EMERALD NO.277, SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
15	SE.	10	30	14	2	Bored	57	2,000	- 15	1,985	56	1,944	Glacial sand	Hard,iron, "alkaline"		S	Abundant supply; a 50-foot well is used for drinking water; several dry holes as deep as 90 feet.
16	SW.	10	"	"	"	Bored	76	2,010	- 26	1,984	76	1,934	Glacial sand	Hard,iron, "alkaline"		S	Oversufficient for 40 head stock; a 12-foot well is used for drinking water.
17	NW.	10	"	"	"	Bored	24	2,005	- 8	1,997	24	1,981	Glacial gravel	Hard,"alkaline"		D, S	Oversufficient for 30 head stock.
18	SE.	12	"	"	"	Dug	118	2,000	- 10	1,990	118	1,882	Glacial sand?	Hard,iron		D, S	Sufficient for 30 head stock.
19	NE.	12	"	"	"	Dug	9	1,995	- 3	1,992	3	1,992	Glacial sand	Soft		D, S	Abundant supply; neighbours haul from well and a school also uses it.
20	SW.	13	"	"	"	Bored	20	1,990	- 17	1,973			Glacial drift	Hard		D	Intermittent supply; one dry hole 38 feet deep.
21	NW.	14	"	"	"	Dug	35	1,990	- 25	1,965	34	1,956	Glacial sand	Hard		D, S	Barely sufficient water.
22	NE.	15	"	"	"	Bored	45	1,995	- 25	1,970			Glacial drift	Hard,iron		D, S	Sufficient for 8 head stock.
23	SW.	16	"	"	"	Bored	50	2,010	- 40	1,970			Glacial drift	Soft		D, S	Barely sufficient water.
24	NE.	16	"	"	"	Bored	45	2,000	- 15	1,985	45	1,955	Glacial sandy gravel	Hard,"alkaline"		S	Sufficient for 30 head stock, A 40-foot well provides drinking water.
25	NW.	16	"	"	"	Bored	70	2,000	- 25	1,975	70	1,930	Glacial gravel	Hard,iron, "alkaline"		D, S	Abundant supply; neighbours water stock at this well in winter.
26	NW.	17	"	"	"	Bored	66	2,010	- 24	1,986	54	1,956	Glacial black sand	Hard,iron		D, S	Oversufficient for 16 head stock.
27	SE.	18	"	"	"	Bored	65	2,020	- 45	1,975			Glacial drift	Hard,"alkaline"		D	Poor supply; stock are watered at sloughs.
28	NW.	18	"	"	"	Bored	57	2,030	- 12	2,018	57	1,973	Glacial gravel	Hard,iron		S	Good supply for 14 head stock.
29	SW.	19	"	"	"	Dug	37	2,025	- 22	2,003	22	2,003	Glacial gravel	Soft		S	This soft water is hauled for use in steam-engines.
30	NE.	20	"	"	"	Bored	75	1,995	- 60	1,935	75	1,920	Glacial sand	Hard,"alkaline"		D, S	Oversufficient for 30 head stock.
31	NW.	20	"	"	"	Dug	10	2,000	- 7	1,993	7	1,993	Glacial sand	Soft		D	Poor supply; stock are watered at sloughs.
32	NE.	21	"	"	"	Bored	60	1,985	- 20	1,965	60	1,925	Glacial gravel	Hard,iron, "alkaline"		D, S	Abundant supply.
33	SE.	22	"	"	"	Bored	45	1,990	- 39	1,951			Glacial drift	Hard,iron, "alkaline"		D, S	Poor supply; stock use sloughs in summer and water at a neighbour's well in winter; one dry hole 125 feet deep.
34	SW.	22	"	"	"	Bored	42	1,995	- 15	1,980	42	1,953	Glacial gravel	Hard,iron		D, S	Good supply; a 45-foot well supplies some water for the house.
35	NW.	22	"	"	"	Bored	45	1,980	- 20	1,960	45	1,935	Glacial gravel	Hard,iron, "alkaline"		D, S	Sufficient supply.
36	SW.	23	"	"	"	Bored	56	1,980	- 20	1,960	56	1,924	Glacial gravel	Hard,iron		D, S	Sufficient supply; three dry holes about 20 feet deep.
37	NE.	23	"	"	"	Bored	50	1,975	- 20	1,955	50	1,925	Glacial gravel	Hard,iron, "alkaline"		D, S	Constant supply of water.
38	NE.	24	"	"	"	Bored	88	1,965	- 12	1,953	88	1,877	Glacial sand	Hard,iron, "alkaline"		D, S	Good supply of water.
3.	NE.	27	"	"	"	Bored	125	1,955									The deepest of 5 dry holes in glacial drift; stock water at sloughs winter and summer.

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—[15]Rural Municipality of EMERALD NO.277, 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
40	SW.	28	30	14	2	Dug	4	1,965	+ 1	1,966	0	1,965	Glacial sand	Soft		D, S	Sufficient for 60 head stock; water can be found at 3 feet in the vicinity of a large slough.
41	NE.	28	"	"	"	Dug	12	1,955	- 8	1,947	8	1,947	Glacial gravel	Hard		D, S	Sufficient for 13 head stock.
42	SE.	30	"	"	"	Bored	47	2,000	- 37	1,963	42	1,958	Glacial sand	Hard		D	Poor supply; stock water at small lake on section 29.
43	SW.	30	"	"	"	Dug	6	2,010	- 2	2,008	2	2,008	Glacial gravel	Hard		D, S	Three or four farmers use this well as a source for drinking water; the water freezes in winter.
44	SW.	30	"	"	"	Bored	64	2,005	- 54	1,951	64	1,941	Glacial fine sand	Soft		D, S	Sufficient for 16 head stock; 5 dry holes as deep as 113 feet.
45	NE.	30	"	"	"	Bored	60	1,995	- 40	1,955	60	1,935	Glacial gravel	Hard		D, S	Stock use a small lake winter and summer.
46	NW.	30	"	"	"	Dug	37	2,000	- 14	1,986			Glacial sand	Hard		D	A 12-foot well is used for stock in winter; stock water at sloughs in summer.
47	NW.	31	"	"	"	Bored	80	2,000	- 20	1,980	80	1,920	Glacial sand	Hard		D, S	Oversufficient for 20 head stock.
48	NE.	32	"	"	"	Bored	112	1,970	- 30	1,940	112	1,858	Glacial sand	Hard,iron		D, S	Abundant supply for 35 head stock.
49	NW.	32	"	"	"	Bored	115	1,975	- 50	1,925	115	1,860	Glacial sand	Hard		D, S	Abundant supply; a 20-foot well is also used for stock.
50	SE.	33	"	"	"	Bored	100	1,955	- 50	1,905			Glacial drift	Hard,iron, "alkaline"		S	Water is highly mineralized; stock use slough and drinking water is obtained from a 13-foot well.
51	NW.	33	"	"	"	Bored	81	1,975	- 31	1,944	81	1,894	Glacial gravel	Hard		D, S	Sufficient for 25 head stock.
52	SW.	34	"	"	"	Bored	70	1,955	- 40	1,915			Glacial drift	Hard		D, S	Poor supply; water is hauled winter and summer for stock.
53	NE.	34	"	"	"	Bored	107	1,950	- 30	1,920	107	1,843	Glacial sand	Soft		D, S	Abundant supply.
54	NW.	34	"	"	"	Bored	107	1,950	- 40	1,910	107	1,843	Glacial sand	Soft		D, S	Oversufficient for 50 head stock.
55	NW.	35	"	"	"	Bored	29	1,950	- 10	1,940	29	1,921	Glacial sand	Hard,"alkaline" scum		D, S	Sufficient for 50 head stock; several dry holes as deep as 30 feet.
56	SE.	36	"	"	"	Bored	20	1,940	- 9	1,931			Glacial sand and gravel	Hard,"alkaline"		D, S	Sufficient for 20 head stock; a 30-foot well dug nearby yielded a very small supply of water.
57	SW.	36	"	"	"	Bored	30	1,950	- 15	1,935	15	1,935	Glacial sand	Soft		D, S	Sufficient for 60 head stock; one dry hole 80 feet deep.
58	NE.	36	"	"	"	Dug	10	1,935	- 5	1,930	7	1,928	Glacial green sand	Hard,iron		D, S	Sufficient supply; also uses a 16-foot well.
59	NW.	36	"	"	"	Dug	20	1,945	- 16	1,929	16	1,929	Glacial sand	Hard,iron, "alkaline"		D, S	Sufficient supply with the aid of a 46-foot well.
1	NW.	1	30	15	2	Bored	50	2,045	- 20	2,025	40	2,005	Glacial sand	Hard		D, S	Oversufficient for 26 head stock.
2	SE.	1	"	"	"	Dug	10	2,045	- 7	2,038	7	2,038	Glacial sand	Soft		D, S	Abundant supply.
3	SE.	2	"	"	"	Bored	80	2,050	- 10	2,040			Glacial drift	Hard		S	Sufficient for 4 head stock only; drinking water is obtained from a shallow well near creek.
4	NE.	2	"	"	"	Bored	60	2,050	- 30	2,020	60	1,990	Glacial sand	Hard		D, S	Sufficient for 16 head stock.

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

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

WELL RECORDS—Rural Municipality of EMERALD NO. 277, 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.	3	30	15	2	Dug	20	2,080	- 12	2,068	12	2,068	Glacial sand	Hard		D, S	Sufficient for 20 head stock.
6	SE.	3	"	"	"	Bored	70	2,070	- 20	2,050	70	2,000	Glacial gravel	Hard,iron		D, S	Oversufficient supply.
7	NE.	3	"	"	"	Bored	60	2,070	- 30	2,040	60	2,010	Glacial sand	Hard,iron		S	Good supply but water has a high iron content; a shallow well provides drinking water.
8	SW.	4	"	"	"	Bored	22	2,090	- 10	2,080			Glacial gravel	Hard		D	Sufficient for house use only; two dry holes 109 feet deep.
9	NE.	4	"	"	"	Bored	48	2,085	- 25	2,060	48	2,037	Glacial gravel	Hard		S	Sufficient for 85 head stock; a small dam is also used.
10	SW.	5	"	"	"	Bored	40	2,105	- 36	2,069	39	2,066	Glacial sand	Hard,iron		S	Very poor supply; water is hauled and stock driven to a well on the SE.¼,section 6.
11	NW.	5	"	"	"	Bored	76	2,110	- 44	2,066	76	2,034	Glacial sand	Hard,iron		D, S	Supply decreases in winter.
12	SE	6	"	"	"	Bored	76	2,100	- 44	2,056	72	2,028	Glacial sand	Hard,iron		D, S	Abundant supply and neighbours use this well; also owns a shallow seepage well; dry holes up to 100 feet.
13	SW.	6	"	"	"	Bored	42	2,100	- 22	2,078	42	2,058	Glacial sand	Hard,iron		D, S	Constant supply of water.
14	NE.	6	"	"	"	Dug	10	2,110	- 6	2,104			Glacial sand	Soft		D	Stock water at sloughs.
15	NW.	6	"	"	"	Bored	81										Dry hole in glacial drift.
16	NE.	8	"	"	"	Bored	55	2,105	- 40	2,065	55	2,050	Glacial fine sand	Hard		D, S	Sufficient supply.
17	NW.	9	"	"	"	Bored	60	2,100	- 25	2,075	60	2,040	Glacial sand	Hard,iron		D, S	Oversufficient supply.
18	SE.	9	"	"	"	Bored	110	2,090									Dry hole in glacial drift; a dam is used for stock and drinking water is hauled.
19	NE.	9	"	"	"	Bored	32	2,090	- 12	2,078	32	2,058	Glacial fine sand	Hard		D, S	Good supply of water.
20	NW.	10	"	"	"	Dug	15	2,085	- 10	2,075	14	2,071	Glacial sand	Soft		D	Insufficient supply; stock are driven ½ mile to a dam for water.
21	SW.	10	"	"	"	Bored	70	2,090	- 20	2,070	70	2,020	Glacial sand	Hard,iron		S	Sufficient supply of laxative water; a 20-foo seepage well provides drinking water.
22	NE.	10	"	"	"	Dug	12	2,060	- 5	2,055			Glacial drift	Hard		D, S	Intermittent supply.
23	NE.	12	"	"	"	Bored	60	2,040	- 30	2,010	52	1,988	Glacial stones	Hard,iron		D, S	Sufficient for 15 head stock only; stock also use sloughs.
24	NW.	12	"	"	"	Bored	55	2,045	- 30	2,015			Glacial drift	Soft		D, S	Insufficient supply in winter and stock are watered at sloughs.
25	SW.	12	"	"	"	Bored	50	2,040	- 25	2,015	50	1,990	Glacial sand	Hard,iron		D, S	Oversufficient for 25 head stock.
26	NE.	13	"	"	"	Dug	38	2,035	- 15	2,020			Glacial sandy clay	Hard		D, S	Yields three barrels of water a day.
27	NW.	13	"	"	"	Bored	70	2,050	- 25	2,025	70	1,980	Glacial gravel	Hard,iron		D, S	Abundant supply.
28	NE.	14	"	"	"	Dug	10	2,045	- 7	2,038			Glacial drift	Soft		D, S	Poor supply; stock are watered at sloughs.
29	SE.	14	"	"	"	Bored	60	2,050	- 20	2,030	58	1,992	Glacial sand	Hard		D	Poor supply; stock arewatered at sloughs.
30	SW.	14	"	"	"	Dug	40	2,050	- 15	2,035	40	2,010	Glacial sand	Hard		D, S	Oversufficient supply.

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

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of EMERALD NO.277, 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	NE.	15	30	15	2	Bored	60	2,060	- 30	2,030	60	2,000	Glacial sand	Hard,iron		D, S	Sufficient supply.
32	SE.	15	"	"	"	Bored	70	2,060	- 30	2,030	70	1,990	Glacial sand	Hard,iron		D, S	Plenty of water.
33	SW.	16	"	"	"	Dug	24	2,090	- 14	2,076			Glacial drift	Hard		D, S	Intermittent and insufficient supply.
34	NW.	16	"	"	"	Bored	90	2,090									Dry hole in glacial drift.
35	SE.	16	"	"	"	Bored	30	2,085	- 20	2,065	20	2,065	Glacial gravel	Hard		D, S	Good supply of water.
36	NE.	16	"	"	"	Bored	74	2,080	- 30	2,050	74	2,006	Glacial fine sand	Hard,iron		D, S	Oversufficient supply.
37	SE.	17	"	"	"	Bored	75	2,100	- 35	2,065	75	2,025	Glacial sand	Hard,iron, "alkaline"		D, S	Sufficient supply.
38	NE.	17	"	"	"	Bored	100	2,095									Dry hole in glacial drift; uses slough water.
39	SW.	17	"	"	"	Bored	115	2,105									Dry hole in glacial drift; uses sloughs and a slough seepage well.
40	SE.	18	"	"	"	Dug	7	2,110	- 0	2,110			Glacial drift	Hard		D, S	Intermittent supply; hauls water.
41	NE.	18	"	"	"	Dug	8	2,105	0	2,105			Glacial drift			D, S	Hauls water when well becomes dry.
42	NW.	18	"	"	"	Dug	17	2,115	- 7	2,108	7	2,108	Glacial sand	Hard		D, S	Sufficient supply; has dug many shallow dry holes.
43	SW.	18	"	"	"	Dug	17	2,115	- 10	2,105			Glacial sand	Hard		D, S	Sufficient supply; several hand-dug dry holes.
44	NE.	19	"	"	"	Dug	12	2,110	0	2,110			Glacial drift	Hard		D, S	Intermittent supply.
45	SW.	19	"	"	"	Dug	15	2,120	- 3	2,117	4	2,116	Glacial gravel	Hard		D, S	Abundant supply.
46	NW.	21	"	"	"	Dug	20	2,085	- 15	2,070			Glacial gravelly clay	Hard		D	Intermittent supply.
47	SE.	21	"	"	"	Bored	70	2,075	- 60	2,015	70	2,005	Glacial sand	Hard		D, S	Sufficient supply.
48	SE.	22	"	"	"	Bored	60	2,060	- 30	2,030	60	2,000	Glacial sand	Hard		D, S	Sufficient supply.
49	NE.	24	"	"	"	Bored	98	2,015	- 70	1,945	98	1,917	Glacial sand	Hard,iron		D, S	Sufficient for 24 head stock.
50	SE.	24	"	"	"	Bored	45	2,020	- 5	2,015	5	2,015	Glacial gravel	Hard		D, S	Sufficient supply; a 90-foot well yields water that cattle refuse to drink.
51	NE.	25	"	"	"	Bored	60	2,010	- 12	1,998			Glacial drift	Hard		D	Stock are watered at a 24-foot well in summer and snow is melted in winter.
52	SE.	25	"	"	"	Bored	114	2,015	- 70	1,945			Glacial drift	Hard		D	Stock are watered mainly at sloughs.
53	SW.	25	"	"	"	Dug	12	2,035	- 9	2,026			Glacial sand	Soft		D	Stock use sloughs in summer and snow is melted in winter.
54	NW.	25	"	"	"	Bored	70	2,030	- 20	2,010	70	1,960	Glacial gravel	Hard,iron, "alkaline"		D, S	Abundant supply.
55	NE.	27	"	"	"	Dug	7	2,055	- 3	2,052			Glacial drift	Soft		D	Stock water at sloughs in summer.
56	SW.	27	"	"	"	Bored	70	2,070	- 30	2,040	70	2,000	Glacial gravel ?	Hard		D, S	Oversufficient supply.

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of EMERALD NO.277, 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
57	NW.	27	30	15	2	Dug	55	2,065	- 25	2,040	55	2,010	Glacial gravel	Hard		D, S	Abundant supply.
58	NE.	28	"	"	"	Dug	30	2,075	- 20	2,055	30	2,045	Glacial sand	Hard		D, S	Sufficient supply.
59	SW.	28	"	"	"	Bored	70	2,060	- 45	2,035	70	2,010	Glacial sand	Hard		D, S	Oversufficient supply.
60	SE.	28	"	"	"	Bored	73	2,070	- 28	2,042	73	1,997	Glacial sand	Hard		D, S	Good supply of water.
61	SE.	30	"	"	"	Bored	100	2,105									One of several dry holes in glacial drift; melts snow in winter and uses slough water in summer.
62	SW.	30	"	"	"	Bored	100	2,110									One of several dry holes; melts snow in winter and uses slough seepage wells in summer.
63	NE.	30	"	"	"	Bored	80	2,105	- 45	2,060	80	2,025	Glacial sand	Hard, iron, "alkaline"		D, S	Abundant supply.
64	NW.	30	"	"	"	Bored	80	2,110	- 60	2,050	80	2,030	Glacial sand	Hard, iron, "alkaline"		D, S	Abundant supply.
65	SW.	31	"	"	"	Bored	80	2,100	- 35	2,065	80	2,020	Glacial sand	Hard, iron, "alkaline"		D, S	Oversufficient supply.
66	SE.	31	"	"	"	Dug	16	2,095	- 12	2,083	12	2,083	Glacial fine sand	Hard		D, S	Good supply of water.
67	NW.	31	"	"	"	Bored	90	2,090									Dry hole in glacial drift; hauls water and uses a slough seepage well.
68	NE.	32	"	"	"	Bored	80	2,070									Dry hole in glacial drift; cattle use sloughs and drinking water is hauled.
69	SW.	32	"	"	"	Dug	16	2,090	- 10	2,080	10	2,080	Glacial fine sand	Hard		D, S	Oversufficient supply.
70	SE.	32	"	"	"	Dug	20	2,090	- 10	2,080			Glacial gravel	Hard		D, S	Sufficient for 40 head stock.
71	NW.	32	"	"	"	Dug	35	2,080	- 25	2,055			Glacial gravel	Hard		D, S	Insufficient supply and must haul water.
72	SW.	33	"	"	"	Dug	16	2,075	- 8	2,067			Glacial gravel	Hard		D, S	Oversufficient supply.
73	NE.	33	"	"	"	Dug	14	2,055	- 6	2,049	6	2,049	Glacial gravel	Hard		D, S	Abundant supply.
74	NW.	33	"	"	"	Bored	80	2,060	- 77	1,983			Glacial drift	Hard		D	Poor supply; stock use sloughs and water is hauled.
75	NW.	34	"	"	"	Dug	10	2,050	- 5	2,045	5	2,045	Glacial sandy clay	Hard		D, S	Sufficient for 15 head stock; a 15-foot well is also used.
76	SW.	34	"	"	"	Bored	60	2,065	- 10	2,055	55	2,010	Glacial sand	Hard, iron		D, S	Abundant supply.
77	NE.	35	"	"	"	Dug	24	2,030	- 21	2,009	23	2,007	Glacial sand	Hard		D, S	Sufficient supply in summer, but water is hauled in winter.
78	SE.	35	"	"	"	Bored	60	2,040	- 30	2,010	60	1,980	Glacial sand	Hard, iron		S	Good supply, but water has a high iron content; drinking water is obtained from a 26-foot well.
79	NE.	36	"	"	"	Dug	12	2,010	- 8	2,002	8	2,002	Glacial gravel	Hard		D, S	Well is nearly dry in winter and snow must be melted; several dry holes up to 25 feet deep.
80	SE.	36	"	"	"	Bored	114	2,015	- 25	1,990	114	1,901	Glacial sand	Hard		D, S	Oversufficient for 28 head stock.

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(#) Sample taken for analysis.