CANADA
DEPARTMENT OF MINES

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

BUREAU OF ECONOMIC GEOLOGY

GEOLOGICAL SURVEY

PRELIMINARY REPORT

GROUND-WATER RESOURCES OF THE RURAL MUNICIPALITY OF KELLROSS No. 247 SASKATCHEWAN

BY

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

Water Supply Paper No. 181

OTTAWA

1936

CANADA

DEPARTMENT OF MINES

BUREAU OF ECONOMIC GEOLOGY

GEOLOGICAL SURVEY

GROUND WATER RESOURCES OF THE RURAL MUNICIPALITY OF KELLROSS NO. 247 SASKATCHEWAN

BY

B.R. MacKAY, H.N. HAINSTOCK, and G.L. SCOTT

WATER SUPPLY PAPER NO.181

CONTENTS

Illustrations

GROUND WATER RESOURCES OF THE RURAL MUNICIPALITY OF KELLROSS, NO. 247 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 fine the approximate depth to a water-bearing horizon, be 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

---

[1] If the well-site is near the edge of the municipality, the map and report dealing with the adjoining municipality should be consulted in order to obtain the needed information about nearby wells.

of Well Records it is also possible to form some idea of the quality and quantity of the water likely to be found in the proposed well.

GLOSSARY OF TERMS USED

Alkaline. The term "alkaline" has been applied rather loosely to some ground waters. In the Prairie Provinces a water is usually described as "alkaline" when it contains a large amount of salts, chiefly sodium sulphate and magnesium sulphate in solution. Water that tastes strongly of common salt is described as "salty". Many "alkaline" waters may be used for stock. Most of the so-called "alkaline" waters are more correctly termed "sulphate waters".

Alluvium. Deposits of earth, clay, silt, sand, gravel, and other material on the flood-plains of modern streams and in lake beds.

Aquifer or Water-bearing Horizon. A water-bearing bed, lens, or pocket in unconsolidated deposits or in bedrock.

Buried pre-Glacial Stream Channels. A channel carved into the bedrock by a stream before the advance of the continental ice-sheet, and subsequently either partly or wholly filled in by sands, gravels, and boulder clay deposited by the ice-sheet or later agencies.

Bedrock. Bedrock, as here used, refers to partly or wholly consolidated deposits of gravel, sand, silt, clay, and marl that are older than the glacial drift.

Coal Seam. The same as a coal bed. A deposit of carbonaceous material formed from the remains of plants by partial decomposition and burial.

Contour. A line on a map joining points that have the same elevation above sea-level.

Continental Ice-sheet. The great ice-sheet that covered most of the surface of Canada many thousands of years ago.

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

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

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

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

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

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

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

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

Hydrostatic Pressure. The pressure that causes water in a well to rise above the point at which it is struck.

Impervious or Impermeable. Beds, such as fine clays or shale, are considered to be impervious or impermeable when they do not permit of the perceptible passage or movement of the ground water.

Porvious or Permeable. Beds are pervious when they permit of the perceptible passage or movement of ground water, as for example porous sands, gravel, and sandstone.

Pre-Glacial Land Surface. The surface of the land before it was covered by the continental ice-sheet.

Recent Deposits. Deposits that have been laid down by the agencies of water and wind since the disappearance of the continental ice-sheet.

Unconsolidated Deposits. The mantle or covering of alluvium and glacial drift consisting of loose sand, gravel, clay, and boulders that overlie the bedrock.

Water Table. The upper limit of the part of the ground wholly saturated with water. This may be very near the surface or many feet below it.

Wells. Holes sunk into the earth so as to reach a supply of water. When no water is obtained they are referred to as dry holes. Wells in which water is encountered are of three classes.

(1) Wells in which the water is under sufficient pressure to flow above the surface of the ground. These are called Flowing Artesian Wells.

(2) Wells in which the water is under pressure but does not rise to the surface. These wells are called Non-Flowing Artesian Wells.

(3) Wells in which the water does not rise above the water table. These wells are called Non-Artesian Wells.

NAMES AND DESCRIPTIONS OF GEOLOGICAL FORMATIONS, REFERRED TO IN THESE REPORTS

Wood Mountain Formation. The name given to a series of gravel and sand beds which have a maximum thickness of 50 feet, and which occur as isolated patches on the higher parts of Wood mountain. This is the youngest bedrock formation and, where present, overlies the Ravenscrag formation.

Cypress Hills Formation. The name given to a series of conglomerates and sand beds which occur in the southwest corner of Saskatchewan, and rest upon the Ravenscrag or older formations. The formation is 30 to 125 feet thick.

Ravenscrag Formation. The name given to a thick series of light-coloured sandstones and shales containing one or more thick lignite coal seams. This formation is 500 to 1,000 feet thick, and covers a large part of southern Saskatchewan. The principal coal deposits of the province occur in this formation.

Whitemud Formation. The name given to a series of white, grey, and buff coloured clays and sands. The formation is 10 to 75 feet thick. At its base this formation grades in places into coarse, limy sand beds having a maximum thickness of 40 feet.

Eastend Formation. The name given to a series of fine-grained sands and silts. It has been recognized at various localities over the southern part of the province, from the Alberta boundary east to the escarpment of Missouri coteau. The thickness of the formation seldom exceeds 40 feet.

Bearpaw Formation. The Bearpaw consists mostly of incoherent dark grey to dark brownish grey, partly bentonitic shales, weathering light grey, or, in places where much iron

is present, buff. Beds of sand occur in places in the lower part of the formation. It forms the uppermost bedrock formation over much of western and southwestern Saskatchewan and has a maximum thickness of 700 feet or somewhat more.

Belly River Formation. The Belly River consists mostly of non-marine sand, shale, and coal, and underlies the Bearpaw in the western part of the area. It passes eastward and northeastward into marine shale. The principal area of transition is in the western half of the area where the Belly River is mostly thinner than it is to the west and includes marine zones. In the southwestern corner of the area it has a thickness of several hundred feet.

Marine Shale Series. This series of beds consists of dark grey to dark brownish grey, plastic shales, and underlies the central and northeastern parts of Saskatchewan. It includes beds equivalent to the Bearpaw, Belly River, and older formations that underlie the western part of the area.

WATER-BEARING HORIZONS OF THE MUNICIPALITY

The rural municipality of Kellross comprises an area of approximately 337 square miles in southeastern Saskatchewan. It consists of tps. 25 and 26, ranges 14 and 15, tp. 27, ranges 13 and 14; fractional tps. 25 and 26, range 13, and fractional tp. 27A, ranges 13, 14, and 15; and eighteen sections in the northern part of tp. 27, range 15, all W. 2nd mer. The main line of the Canadian National railways traverses the northern part of the municipality and on it are located the villages of Kelliher, Leross, and Lestock. The centre of the municipality lies 60 miles due west of the city of Yorkton.

The entire municipality is covered by moraine. The ground surface is rolling and in some places is quite hilly. The elevation increases from the south to the north, and the summit of the moraine, at an elevation of 2,270 feet above sea-level, is reached in township 27, range 14. Sloughs are very common, and small lakes, irregular in shape and less than 500 acres in area, are scattered throughout the municipality. These lakes are more numerous in the higher part of the moraine in the northern townships. Pelletier lake, in the western part of township 27A, range 15, is the headwaters of Jumping Deer creek. The creek is a very small, intermittent stream and it meanders southward from the lake through the western sections of townships 26 and 25, range 15. A large part of the municipality is wooded with small poplar trees and the growth is quite dense in the northern 8 miles of the municipality. Stock raising is one of the main sources of income for the farmers.

Water-bearing Horizons in the Unconsolidated Deposits

Lakes and sloughs retain much surface water in years of average rainfall and they are used extensively by the farmers of the municipality for watering stock. The water in some of

the sloughs and lakes is highly mineralized and stock refuse to drink it. One of the larger bodies of water that contains a high amount of mineral salts in solution is located about one mile south of Kelliher. A few springs, situated near lakes and sloughs, were reported, and one of them in township 27A, range 14, waters 100 head of stock throughout the winter.

It is estimated that one-half the farmers of the municipality have an inadequate supply of well water. Water is particularly scarce in winters and prolonged drought years when the sloughs are frozen or dry, at which times farmers haul water, or melt snow and ice.

Wells range in depth from 4 to 286 feet. Most of the wells are dug by hand to depths usually less than 40 feet, and they are often located near sloughs where a maximum amount of seepage water is obtained. These seepage wells are unsatisfactory since they yield adequate supplies of water only in the summer months. Occasionally wells are dug that tap pockets of sand and gravel in the upper 40 feet of the glacial drift, and these wells yield moderate, and some of them abundant, supplies of water. The wells that yield abundant supplies of water are usually dug in thick deposits of sand or gravel that extend from the top soil to the base of the well. Other shallow wells tap the aquifer beneath yellow boulder clay. The source of the water in these pockets of sand and gravel is from precipitation, and the thickness and extent of the sand deposit have a direct bearing on the amount of water available in a well that has tapped it. Water from shallow wells that tap an aquifer above the impervious blue clay is usually not too highly mineralized to prevent it being used for drinking. The water is not under pressure, but a particularly good shallow well will water 50 head of stock. Large pockets of sand and gravel are very difficult to locate in the upper 40 feet of

the glacial drift in this municipality, hence most of the shallow wells are dug near sloughs. Numerous dry holes have been dug from 10 to 40 feet deep.

A discontinuous water-bearing horizon of sand and gravel exists in the blue clay of the glacial drift at depths of 40 to approximately 125 feet throughout the municipality. This water-bearing horizon is composed of large lenses of sand and gravel that generally yield water under slight hydrostatic pressure. Bored wells that tap these pockets exist in every township of the municipality, and they are particularly numerous in townships 26, 27A, and 27, range 13. The water is hard, contains iron, and is often "alkaline", but it is generally used for drinking. The supply of water is abundant and only in a few wells did the drought of 1930 to 1934 lower the water-level. The village of Kellihor and Leross derive their supply of water mainly from this type of well. The pockets of sand and gravel are difficult to locate and many dry holes have been bored to depths of 140 feet. The aquifer is usually coarse sand or gravel. In a few wells in the municipality, however, fine sand forms the aquifers and trouble is experienced by the fine sand plugging the casings. At least ten wells that tap pockets of sand and gravel at depths of 125 to 286 feet, yield fair to abundant supplies of water that is usually under pressure. The deepest dry hole in the municipality is 250 feet.

The glacial drift is very thick and is probably in excess of 400 or 500 feet. The material that composes the glacial drift is largely blue clay. Pockets of sand and gravel probably occur in the drift below the depth of 286 feet just as they do in the upper part of it, but a deep well is not certain of striking water because of the pocket arrangement of the sand and gravel. In view of this fact farmers are not

advised to bore or drill deeply for water unless finances permit the risk of failure. The excavation of dugouts is recommended rather than deep boring or drilling. Sloughs are numerous and they offer suitable locations for these artificial reservoirs. Test borings with a 2-inch auger should be made before the dugout is excavated in order to ascertain the type of material to be excavated. Test borings should also be made before wells are dug by hand. In this manner water-bearing pockets of sand and gravel may be tapped at a minimum expense and effort.

Water-bearing Horizons in the Bedrock

The Marine Shale series underlies the glacial drift throughout the municipality. No well in the municipality has penetrated bedrock. The Marine Shale in this part of Saskatchewan seldom contains water-bearing horizons and drilling into it in search for water is not recommended.

GROUND WATER CONDITIONS BY TOWNSHIPS

Township 25, Range 13

Glacial moraine covers the entire township. The ground surface is undulating and small, undrained depressions are common. Clumps of poplar trees occur throughout the township, the growth being more dense in the southern sections.

Well water conditions are poor, and over one-half the farmers were short of water during the drought of 1930 to 1934. Most of the wells have been dug by hand to depths less than 45 feet and they are usually located near or in sloughs. Many of these wells tap small pockets of sand and gravel, and in years of average rainfall they produce sufficient supplies of water during summer months. In winters and prolonged drought years the supply of water decreases and the wells often become dry. Only ten wells from 10 to 45 feet deep, which tap sand and gravel pockets, yield permanent and sufficient supplies of water. The water is nearly always hard and slightly "alkaline", but is suitable for drinking. Many dry holes have been dug to a maximum depth of 50 feet in all parts of the township.

Seven wells that yield moderate to abundant supplies of water have been bored or drilled to depths of 60 to 234 feet. These wells have tapped large pockets of sand in the glacial drift. The water is under hydrostatic pressure and rises about half-way up the wells. The drought of 1930 to 1934 lowered the water-level 12 feet in an 80-foot well in the NW.$\frac{1}{4}$, section 20, but in the other wells the water-level remained constant. The water is hard, contains iron, and with the exception of that from the 80-foot well, it is used for drinking. Wells 68 and 85 feet deep in the SW.$\frac{1}{4}$, section 6, and section 24, yield very small, inadequate supplies of water. Dry holes over 50 feet deep are confined to one quarter-section in this township,

four dry holes 74, 80, 82, and 92 feet deep being bored in the NE.¼, section 18.

Sloughs are used extensively for watering stock during the summer months. In winters, and during the drought of 1930 to 1934, many farmers were forced to melt snow and to haul water. Farmers are advised to excavate deep dugouts as a means of collecting and storing permanent supplies of water for stock use. The probabilities of obtaining permanent supplies of water at depths greater than 60 feet in the glacial drift are fair. The glacial drift is very thick, probably in excess of 400 feet, and the drilling method is preferable to the boring method. The excavation of dugouts, however, is the more economical method of obtaining water for stock use.

Township 25, Range 14

The township is covered by moraine. The ground surface is rolling and rough, with many knolls and undrained depressions. Poplar bush is quite extensive.

Approximately one-half the farmers in this township are unable to obtain a sufficient supply of water for stock, and a few farmers haul drinking water. The wells have been dug or bored to depths of 5 to 88 feet, and the supply of water from these wells is exceedingly variable. Generally, wells less than 35 feet deep do not yield a permanent supply of water. The pockets of sand and gravel in the upper 35 feet of the glacial drift are small and widely scattered. In winters and drought years shallow wells either yield very small, inadequate supplies of water, or become dry. A few shallow wells, such as a 12-foot well in the SW.¼, section 6, have tapped larger pockets of sand and gravel, and the supply of water obtained is ample and not easily affected by lack of precipitation. The water from the shallow wells is nearly always hard, may be slightly "alkaline", but is suitable for drinking.

Nine wells, 34 to 38 feet deep, tap large pockets of sand and gravel that lie beneath a layer of blue clay. These wells yield water under pressure and the supply is moderate to abundant depending on the extent of the aquifer. The pocket arrangement of the sand and gravel is shown in the SE.¼, section 14, where several dry holes have been bored between depths of 60 and 92 feet, yet a well, 34 feet deep, finally tapped a pocket of sand beneath blue clay that yields a constant and fairly abundant supply of water. Of the nine wells that yield water under pressure, one in the SW.¼, section 28, has been plugged by sand, and another in the NW.¼, section 14, is gradually being clogged with fine sand. Winters and drought years do not appreciably decrease the supply of water in these wells. The water is hard and as a rule more highly mineralized than that from shallow wells, and the water from some of the wells cannot be used for drinking.

Farmers are advised to excavate deep dugouts in depressions. The dugout should be at least 12 feet deep to retain a sufficient supply of water during the winter months. Drilling or boring operations are not at all certain of striking water in the glacial drift, and for this reason the excavation of dugouts is favoured.

Township 25, Range 15

Jumping Deer creek, a very small, intermittent stream, meanders southwards through the western 2 miles of the township. The township is covered by moraine. The ground surface is rolling and shallow depressions are particularly common in the western part of the township. Small poplar groves cover much of the land and they are more dense in the southern sections.

Of the twenty-nine farms visited in the township, thirteen have an insufficient water supply. Most of the wells

have been dug by hand and those that yield permanent supplies of water are 4 to 24 feet deep. Permanent supplies of water are difficult to locate in the upper 40 feet of the glacial drift due to the pocket or lens arrangement of the sand and gravel. Wells less than 25 feet deep that yield permanent supplies of water tap thick beds of sand and gravel that underlie yellow boulder clay. The water originates from precipitation, but a pocket if sufficiently extensive will store a large quantity of water that is not readily reduced by prolonged drought. The water is slightly mineralized and suitable for drinking. Farmers who have been unable to strike one of these pockets usually depend on seepage wells situated near sloughs. These wells yield water only in the summer months, and in winters and drought years the farmer hauls water. Several farmers depend entirely on sloughs as a source of water for stock.

Six wells, 40 to 100 feet deep, tap pockets of sand and gravel in the glacial drift and yield fairly abundant and permanent supplies of water. The water rises under pressure, and the supply is much more constant over a period of years than that from shallow wells less than 40 feet deep. Two wells, 92 and 100 feet deep, in the NW.$\frac{1}{4}$, and SW.$\frac{1}{4}$, section 12, tap an aquifer of black sand. The water rises to points 40 to 50 feet below the surface and the supplies are abundant. The water is hard and very highly mineralized. An oil-like scum, caused by iron oxide forms on top of the water when it is allowed to stand. The water is not used for drinking and the water from the 92-foot well is not even used for watering stock. The pocket formation of the sand and gravel is clearly shown in the NE.$\frac{1}{4}$, section 36. A 70-foot bored well was made that yielded a very small supply of water, and 35 feet away from it,

another well obtains an abundant supply of water under pressure from a gravel pocket 40 feet below the surface. One of the deepest dry holes in the township, 88 feet deep, was bored in the NW.$\frac{1}{4}$, section 23. This well passed through 18 feet of yellow clay, 32 feet blue clay, 30 feet red clay, and 4 feet dry sand. Dry holes to a maximum depth of 90 feet were made in the SE.$\frac{1}{4}$, section 6.

Dugouts have not been adopted as a means of conserving surface water in this township and their excavation is recommended. The glacial drift is very thick, probably in excess of 400 feet, and water may be found in pockets of sand and gravel at any depth within it. Dugouts, however, are considered a more certain method of obtaining a permanent water supply.

Township 26, Range 13

The township is covered by moraine. The ground surface is gently rolling. Sloughs are numerous, and poplar bush covers much of the township. Many small lakes occur, the largest being located one mile south of Kelliher. Stock dislike the water from this lake and some refuse to drink it. The elevation of the lake is 2,155 feet above sea-level. A few small springs are located beside some of the lakes.

Water conditions, although not satisfactory, are better in this township than in any of the three southern townships. At least seventeen farmers do not obtain adequate supplies of water at all times, and must melt snow, haul water, or drive their stock to nearby lakes. Twelve wells, less than 50 feet deep, yield adequate but not abundant supplies of water. These wells tap small pockets of sand and gravel that underlie yellow boulder clay, and in one or two instances the sand or gravel extends to the surface. The water is generally hard, but not too "alkaline" to prevent its use for drinking, and it is

not under pressure. The pockets of sand and gravel are very difficult to locate at depths of less than 50 feet, and many dry holes have been made in an attempt to obtain a permanent water supply. The farmer in the NE.$\frac{1}{4}$, section 8, however, reports that water is easy to locate at shallow depths in this quarter-section. Many farmers rely on shallow seepage wells dug beside sloughs. These wells become dry in winters and drought years.

The largest water supply is obtained from bored wells 32 to 166 feet deep. Eleven of these wells, not including those in Kelliher, yield permanent and generally abundant supplies of water that rises under pressure. The sand and gravel deposits occur as pockets rather than continuous layers, and many dry holes, including a 260-foot dry hole in the SW.$\frac{1}{4}$, section 2, have been bored and drilled. Two wells, 166 and 165 feet deep, in the NE.$\frac{1}{4}$, section 4, and the NW.$\frac{1}{4}$, section 10, have apparently tapped the same aquifer at an elevation of 2,020 feet. The water is generally hard, contains iron, and some is too "alkaline" to be used for drinking.

A 54-foot well in the NW.$\frac{1}{4}$, section 16, taps a black sand aquifer that yields hard, "alkaline" water. An oil-like scum caused by the iron oxide in solution forms on the surface when the water is allowed to stand. Stock refuse to drink this water. The water from this well is similar to that from two wells in township 26, range 15, which is also obtained from a black sand aquifer. The village of Kelliher derives its water supply from eight wells. The well most extensively used was bored 80 feet to a sand aquifer. The water rises to a point 55 feet below the surface and the supply is constant. The water is hard and "alkaline", but there was no shortage in the village during the drought of 1930 to 1934.

The glacial drift is believed to be at least 400 feet thick and pockets of sand and gravel may exist at any depth within it. However, the pocket formation of the aquifers causes deep boring and drilling operations to be risky and costly. Farmers are, therefore, advised to excavate deep dugouts in preference to deep boring or drilling. These reservoirs should be at least 12 feet deep and located so that a maximum amount of surface water can be collected. Slough basins are satisfactory sites for dugouts. Numerous, small lakes provide an abundance of water for stock, but they are often located at an inconvenient distance from the farm buildings.

Township 26, Range 14

This moraine-covered township contains many sloughs and small lakes due to the rough, rolling nature of the ground surface. Poplar bush occurs throughout the township and the growth becomes more dense in the northern sections.

The supply of water obtained from wells in this township is very unsatisfactory, and many farmers use sloughs and small lakes, whenever possible, as sources of water for stock. Most of the wells have been dug to depths less than 35 feet, and only a very few of them yield a permanent and sufficient supply of water. The upper 35 feet of the glacial drift contains small, scattered pockets of sand and gravel that generally underlie yellow boulder clay. In some places blue clay comes to within 9 feet of the surface. The pockets of sand and gravel yield small supplies of water. The supply varies with the seasonal precipitation, being at a minimum during the winter months. The drought years of 1930 to 1934 caused many of these wells to become intermittent. Several farmers have made numerous unsuccessful attempts to obtain

water from wells. Even in years of average rainfall some farmers are forced to haul water. The water from the shallow wells is generally hard, not under pressure, and is suitable for drinking.

Six wells, 40 to 80 feet deep, in the southeastern part of the township, tap a discontinuous water-bearing horizon at elevations of 2,070 to 2,110 feet. The aquifer is formed by sand and gravel, and the water is under hydrostatic pressure. The supply is abundant and constant even in drought years. The water is hard, contains iron, and is used for drinking. The horizon is discontinuous, since several dry holes, 100 to 140 feet deep, were bored in the SE.$\frac{1}{4}$, section 4. Two other wells, 52 and 106 feet deep, in the NW.$\frac{1}{4}$, section 19, and the NE.$\frac{1}{4}$, section 30, tap pockets of sand at depths of 51 and 86 feet. The 106-foot well passed through 86 feet clay, and 20 feet sand, and the well has partly caved in. The water is under pressure, and the supply is constant and sufficient for local needs. The water is hard and "alkaline", but is used for drinking.

A well in the NW.$\frac{1}{4}$, section 18, penetrated 140 feet clay, and the lower 15 feet of clay contained crystals of gypsum. No well in the township is deeper than 140 feet. The glacial drift is believed to be thicker than 400 feet and is probably composed mainly of blue clay. Pockets of water-bearing sand and gravel may occur at any depth within the glacial drift.

Farmers are advised to concentrate their efforts on obtaining water by means of dugouts rather than to risk the uncertainty of obtaining water by deep boring and drilling. Sloughs are numerous and they are good locations for the excavation of artificial reservoirs. The dugout should be at least 12 feet deep.

Township 26, Range 15

The township is covered by moraine. The ground surface is rolling, particularly in the western sections, and is characterized by many small hills and sloughs. Jumping Deer creek meanders in a southerly direction through the western mile of the township and its flow is intermittent. A long, narrow lake occurs in sections 30 and 31. The township is quite thickly wooded with poplar.

The wells in this township range from 9 to 286 feet deep, and the water supply from these wells is extremely variable. The upper 286 feet of the glacial drift is largely composed of clay. Yellow weathered clay occurs from the surface to depths of 3 to 40 feet and is underlain by blue clay. Pockets of sand and gravel may occur at any depth within the clay. In a few wells the sand and gravel outcrop at the surface and extend to 9 to 15 feet below the surface. Most of the shallow producing wells strike small pockets of sand and gravel beneath the yellow boulder clay, and others are dug beside sloughs and rely entirely on seepage water from the slough. Only a very few wells less than 40 feet deep yield permanent and sufficient supplies of water, and many dry holes have been dug in an attempt to strike a water-bearing bed of sand and gravel. A particularly good shallow well is located in the SW.$\frac{1}{4}$, section 20. It is 10 feet deep and has yielded a constant supply of water since 1910. One farmer in the NE.$\frac{1}{4}$, section 2, has dug and bored a number of wells to a maximum depth of 80 feet, but is unable to locate a reliable source of water. A few of these wells yielded water, but it was so highly mineralized that it could not be used. Shallow wells that yield permanent supplies of water are usually less than 20 feet deep and are dug through thick beds of sand and gravel,

which either outcrop at the surface or are overlain by a thin covering of yellow boulder clay. The water from shallow wells is generally hard and suitable for drinking. Farmers who rely on shallow wells for watering stock usually own more than one well and use them all in order to obtain water for their requirements. During winters and drought years many farmers haul water. Eight wells, 50 to 140 feet deep, yield abundant and permanent supplies of water that rises under pressure from pockets of sand and gravel in the glacial drift. The water is hard and highly mineralized, but that from some of the wells is used for drinking. Two wells, 40 and 60 feet deep, yielded water under pressure, but they have been plugged by sand. The 286-foot well, in the NE.$\frac{1}{4}$, section 28, the deepest in the township, yielded water that rose to a point 86 feet below the surface, but at the present time there is only 3 feet of water in the well. This well has probably been plugged by sand that forms the aquifer. Many dry holes, and wells that yield very poor supplies of water, have been bored to a maximum depth of 117 feet in the township.

It is estimated that eighteen farmers have an inadequate supply of water on their farms. These farmers are advised to excavate dugouts in slough basins rather than to attempt to obtain water at depth by boring or drilling. Pockets of water-bearing sand and gravel exist in the glacial drift at depths greater than 40 feet below the surface, but the uncertainty of encountering them does not warrant the expense involved. Dugouts will prove satisfactory if the site is carefully chosen and if they are made at least 12 feet deep.

Township 27A, Range 13

This fractional township is covered by moraine. The ground surface is very undulating, contains numerous sloughs and small lakes, and is thickly wooded with poplar.

A spring, situated near a slough, was reported in the NW.$\frac{1}{4}$, section 4. The water from sloughs and lakes is used by several farmers for stock purposes. Farmers in the eastern half of the township, with the exception of one in the NE.$\frac{1}{4}$, section 10, obtain a sufficient supply of water from wells, but five farmers in the western half of the township are short of water. Wells range in depth from 8 to 101 feet, and eight wells in the eastern half of the township yield abundant supplies of water that is under pressure. The upper 100 feet of the glacial drift is composed of clay, which contains pockets of sand and gravel at various elevations within it. Many dry holes, 20 to 140 feet deep, have been dug and bored in the western sections. Eight dry holes, 20 to 100 feet deep, were made in the SE.$\frac{1}{4}$, section 6, and one of these wells struck a 6-foot bed of dry gravel at a depth of 85 feet. Most of the material penetrated by deep wells is blue clay. The water from the shallow wells is not too highly mineralized for drinking. Water from the deeper bored and drilled wells in the eastern part of the township is more highly mineralized and contains iron, although it is often used for drinking.

Farmers in the western sections are advised to excavate dugouts in slough basins in order to conserve water for stock use during the winter months, when water from wells is scarce. The dugout must be at least 12 feet deep to be satisfactory. It is much better to dig the reservoirs deep and small rather than large and shallow. Water-bearing pockets of sand or gravel can probably be located at depth in the glacial drift, but the expense involved and the uncertainty of striking one of the pockets, do not warrant deep drilling.

Township 27A, Range 14

This fractional township is covered by moraine. The ground surface is rolling, contains many sloughs, and is thickly wooded. Many lakes, 20 to 100 acres in area, are scattered through all the sections of the township.

A spring situated near a slough in the NW.$\frac{1}{4}$, section 2, yields sufficient water for 100 head of stock. All the wells that yield permanent and sufficient supplies of water, with the exception of one well, are less than 20 feet deep. Most of them have been dug in thick beds of sand and gravel that extend from the surface, or a short distance below it, to the base of the wells. Four wells of this type are located in the SE.$\frac{1}{4}$, and SW.$\frac{1}{4}$, section 2, and the SW.$\frac{1}{4}$ and NW.$\frac{1}{4}$, section 12. The supply of water from these wells is more abundant and constant than that from wells that tap small pockets of sand or gravel within the yellow boulder clay. Of the twelve farmers interviewed in this township, six are unable to obtain a sufficient supply of well water. These six farmers have shallow wells that tap sand or gravel aquifers, but the supply is poor and decreases in winter. Sloughs and small lakes are used extensively for watering stock, and in winter snow and ice are melted or water is hauled. Water from shallow wells is usually hard and suitable for drinking. Two wells in the township yield soft water.

The village of Leross has drilled a well 125 feet deep that struck an 8-foot layer of white sand at the base of the well. The water rises from the aquifer under pressure to a point 90 feet below the surface. The supply of water is abundant and constant. The water is hard, and contains iron, but is suitable for drinking. The village also uses a shallow well, 18 feet deep, that was dug through 12 feet of yellow clay

and 6 feet of sand. The water is hard, but the supply like that in most of the shallow wells, decreases in winter. Several dry holes up to 50 feet deep have been made in the SE.¼, section 4, and one dry hole 110 feet deep was bored in blue clay in the SE.¼, section 2. Farmers are advised to excavate dugouts as a means of conserving surface water for stock use. The dugout should be at least 12 feet deep and situated in a depression where a maximum amount of surface water will be collected.

Township 27A, Range 15

This fractional township is covered by moraine, and the ground surface is rolling and contains many low-lying hills, sloughs, and small lakes. Pelletier lake, in sections 5 and 8, is the largest body of water and it is the source of Jumping Deer creek that flows intermittently in a southerly direction through section 5. Portions of Michel lake and Reserve lake occur in section 6 and the NW.¼, section 8, respectively. The township is densely wooded with small poplar.

Most of the wells have been dug to depths less than 25 feet, and the best supply is obtained from those wells that are dug into thick beds of sand and gravel that in some instances extend from the ground surface to the base of the well. These wells usually yield slightly mineralized water, but a 10-foot well in the NE.¼, section 3, delivers water that is so "alkaline" that it is not even used for stock. Other shallow wells are dug besides sloughs, and obtain seepage water from the slough. These wells are satisfactory during the summer months, but in winters and years of drought farmers owning such wells must obtain water from some other source. Three wells in the township are deeper than 25 feet. A 50-foot well in the NW.¼, section 10, penetrates 10 feet of sand at the bottom of

the well, but the aquifer yields only sufficient water for house use. In the SE.$\frac{1}{4}$, section 4, a well was bored through 30 feet of yellow clay, and 30 feet of blue clay, and encountered a bed of sand from which water rises under pressure to a point 40 feet below the surface. The water is hard, and the supply is fairly abundant and constant. The third well was drilled in the SE.$\frac{1}{4}$, section 2. This well is 257 feet deep and is obtaining an abundant supply of water from a fine sand aquifer at the base of the well. The water rises under pressure to a point 87 feet below the surface. When the well was being drilled a small flow of water was struck in sand at a depth of 74 feet, and a larger flow of water was struck in sand at a depth of 125 feet. The well yields an abundant supply of hard water that contains iron, and it is not being used.

Four farmers in the NE.$\frac{1}{4}$, section 3, SE.$\frac{1}{4}$, section 5, NE.$\frac{1}{4}$, section 6, and the SW.$\frac{1}{4}$, section 12, are unable to obtain a sufficient supply of water. These farmers are advised to excavate dugouts to collect and store surface water for stock use.

Township 27, Range 13

The ground surface of this township is rolling and is characterized by many undrained depressions. It is thickly wooded with poplar, and several small lakes, less than 120 acres in area, occur in the western half of the township.

Only seven reported wells, 40 feet or less in depth, yield permanent and sufficient supplies of water. These wells tap pockets of sand and gravel beneath a layer of yellow boulder clay. The water is hard and not too highly mineralized for drinking. Apparently water-bearing pockets of sand and gravel that yield sufficient quantities of water are very difficult to locate in the upper 40 feet of the glacial drift.

The main supply of water in the township is derived from wells, 40 to 100 feet deep, that strike pockets of sand and gravel in the impervious blue clay that underlies the yellow boulder clay. At least twenty of these wells yield water that rises from the aquifer under pressure. The supply is both abundant and constant, and winters or prolonged drought do not have any marked effect on the supply of water. The pressure is usually sufficient to raise the water to a point half-way up the well. The water is hard, contains iron, and is sometimes termed "alkaline", but it is almost always used for drinking. The water from a 60-foot well in the SE.$\frac{1}{4}$, section 11, has a peculiar taste and it is considered unfit for use. Seven wells, 40 to 80 feet deep, do not yield water under pressure. The supply is very poor, and with the exception of a 55-foot well in the NW.$\frac{1}{4}$, section 2, it is not sufficient for local needs. A few dry holes, 50 to 70 feet deep, have been bored, but no dry holes were reported deeper than 100 feet, the depth of the deepest producing well.

Approximately thirteen farmers in the township have been unable to obtain an adequate supply of water and must haul water. Sloughs and small lakes are used extensively by many farmers for stock. The possibilities of striking water in the glacial drift by boring or drilling methods seem to be better in this township than in any of the preceding townships. The excavation of dugouts is considered a more certain and inexpensive method of increasing the water supply, and it is advised for those farmers who must haul water.

Township 27, Range 14

The township is covered by moraine and the ground surface is rolling and is characterized by numerous sloughs and small lakes. The largest lake covers approximately 500 acres,

and most of it lies within sections 13 and 14. The elevation of this lake is 2,209 feet above sea-level. The township is densely wooded with poplar, and only a small portion of the land has been cleared.

The supply of water obtained from wells is very poor and it is estimated that at least twenty of the twenty-nine farmers interviewed obtain an inadequate supply of water from wells. A spring in the SE.$\frac{1}{4}$, section 10, is reported as yielding highly mineralized water that may be used for stock. Most of the wells have been dug by hand to depths less than 40 feet. Of these wells, five located on farms and three in the village of Lestock, yield permanent and adequate supplies of water. Two of the best shallow wells are 16 and 24 feet deep, and are located in the NE.$\frac{1}{4}$, section 18, and the SW.$\frac{1}{4}$, section 34; the latter well will water 50 head of stock. Most of the shallow wells are dug beside sloughs and depend on them for a source of water. The supply of water in these seepage wells varies, many of them becoming dry in winter and prolonged drought years. Farmers experience much difficulty in striking pockets of sand and gravel that will yield ample supplies of water at any depth less than 100 feet, and many dry holes have been dug by hand to depths of 10 to 50 feet. Yellow boulder clay usually underlies the top soil to a depth of 10 to 30 feet and is followed by blue clay. Water from shallow wells in this township is always hard and usually "alkaline", but it is used for drinking. The village of Lestock obtains a sufficient supply of water from three wells, 15, 24, and 40 feet deep, the latter well yielding a good supply of water. A bored well, 90 feet deep, was also made, but the water became contaminated and it is not used.

Only four wells in the township obtain abundant and permanent supplies of water at depths greater than 40 feet. They are 80, 63, 56, and 51 feet deep, and are located in the NE.$\frac{1}{4}$, section 22, the NW.$\frac{1}{4}$, section 23, the NE.$\frac{1}{4}$, section 25, and the NE.$\frac{1}{4}$, section 30, respectively. The aquifers are formed by pockets of sand, and many dry holes 50 to 145 feet deep have been made in other sections of the township. The water in these four wells rises under slight pressure and the supply was constant throughout the drought years of 1930 to 1934. The 80-foot well waters 150 head of stock. The water is hard, contains iron, and is "alkaline". The water in the 51-foot well is too "alkaline" for drinking, but the water from the other three wells is used for domestic purposes as well as for stock.

Sloughs and lakes are frequently used for watering stock. The water from some of the lakes and sloughs is highly mineralized and stock refuse to drink it.

Farmers are advised to excavate dugouts rather than to bore or drill for water. The glacial drift is very thick, probably in excess of 500 feet, but it appears that the sand and gravel are in the form of pockets rather than extensive layers, and the probabilities of striking one of these pockets of sand and gravel do not warrant the expense of deep drilling.

Township 27, Range 15

Sections 1 to 12, 15 to 18, and sections 13 and 24, are part of the Muskowekwan Indian reserve. The area is rolling and hilly, contains numerous small lakes and sloughs, and is densely wooded with poplar. Hudson Bay lake, covering an area of approximately 300 to 350 acres in the northwestern part of the township, is one of the larger lakes, and it is at an elevation of 2,151 feet above sea-level.

Only three farmers obtain an adequate supply of well water. Seven of the twelve wells reported, were dug by hand to depths of 6 to 25 feet, and most of them are located in or near sloughs. The supply of water depends entirely on seepage from the sloughs, so that in winters and drought years the supply is poor. A 6-foot well in the NW.$\frac{1}{4}$, section 22, is the only one of the seven dug wells that yields a sufficient supply of water, and it was dug in 1935.

Two wells bored to depths of 60 and 50 feet in the SW.$\frac{1}{4}$, section 22, and the NE.$\frac{1}{4}$, section 36, have tapped pockets of sand in the glacial drift that yield water under pressure. The water rises to points 40 and 25 feet below the surface, and the supply is adequate and constant. The water is hard and "alkaline", but that in the 50-foot well is used for drinking. A 70-foot well in the NE.$\frac{1}{4}$, section 20, yields an insufficient supply of water. A dry hole, 75 feet deep, was bored in the SW.$\frac{1}{4}$, section 26. Sloughs and lakes are used extensively by farmers for watering stock. Slough basins are suitable locations for dugouts, and these artificial reservoirs are a satisfactory means of collecting water for stock use. Abundant and permanent supplies of water may be obtained from pockets of sand and gravel at depths greater than 50 feet in the glacial drift, but the uncertainty of striking a pocket of sand and gravel does not warrant the expense of drilling. The thickness of the glacial drift is believed to be in excess of 500 feet.

Muskowekwan Indian Reserve No. 85

Eighteen square miles of the Muskowekwan Indian reserve occur within the boundary of the municipality. The area is covered by moraine and the ground surface is rolling, thickly wooded, and contains many sloughs and several small lakes.

No wells were located in this part of the Indian reserve. It is reported, however, that the residents use seepage wells dug beside sloughs and lakes, for water both for drinking and stock use.

STATISTICAL SUMMARY OF WELL INFORMATION IN RURAL MUNICIPALITY OF KELLROSS, NO.247, SASKATCHEWAN

Township	25	25	25	26	26	26	27A	27A	27A	27	27	27	Total No. in municipality
West of 2nd meridian Range	13	14	15	13	14	15	13	14	15	13	14	15	
Total No. of Wells in Township	68	53	62	83	70	90	36	28	18	50	46	12	616
No. of wells in bedrock	0	0	0	0	0	0	0	0	0	0	0	0	0
No. of wells in glacial drift	68	53	62	83	70	90	36	28	18	50	46	12	616
No. of wells in alluvium	0	0	0	0	0	0	0	0	0	0	0	0	0
Permanency of Water Supply													
No. with permanent supply	36	37	24	46	35	44	20	18	17	40	25	10	352
No. with intermittent supply	8	5	19	15	13	10	4	3	1	4	15	1	98
No. dry holes	24	11	19	22	22	36	12	7	0	6	6	1	166
Types of Wells													
No. of flowing artesian wells	0	0	0	0	0	0	0	0	0	0	0	0	0
No. of non-flowing artesian wells	9	9	9	18	3	13	8	1	2	21	4	3	105
No. of non-artesian wells	35	33	34	43	40	41	16	20	16	23	36	8	345
Quality of Water													
No. with hard water	37	39	37	53	39	49	18	1	13	44	40	10	398
No. with soft water	7	3	0	8	9	5	0	2	5	0	0	1	52
No. with salty water	0	0	0	0	0	0	0	0	0	0	0	0	0
No. with "alkaline" water	15	11	5	25	17	12	11	5	2	13	16	3	135
Depths of Wells													
No. from 0 to 50 feet deep	54	36	52	50	58	71	22	26	16	29	37	9	460
No. from 51 to 100 feet deep	12	17	10	30	6	15	12	0	1	21	7	3	134
No. from 101 to 150 feet deep	0	0	0	0	0	3	2	2	0	0	2	0	15
No. from 151 to 200 feet deep	1	0	0	2	0	0	0	0	0	0	0	0	3
No. from 201 to 500 feet deep	1	0	0	1	0	1	0	0	1	0	0	0	4
No. from 501 to 1,000 feet deep	0	0	0	0	0	0	0	0	0	0	0	0	0
No. over 1,000 feet deep	0	0	0	0	0	0	0	0	0	0	0	0	0
How the Water is Used													
No. usable for domestic purposes	38	34	33	54	41	40	19	14	15	38	36	10	372
No. not usable for domestic purposes	0	8	10	7	7	14	5	7	3	6	4	1	78
No. usable for stock	42	42	41	59	45	50	23	18	16	43	38	11	428
No. not usable for stock	2	0	2	2	3	4	1	3	2	1	2	0	22
Sufficiency of Water Supply													
No. sufficient for domestic needs	35	36	27	46	35	42	20	18	16	39	22	10	346
No. insufficient for domestic needs	9	6	16	15	13	12	4	3	2	5	18	1	104
No. sufficient for stock needs	16	19	20	36	22	26	16	13	13	29	14	3	227
No. insufficient for stock needs	28	23	23	25	26	23	8	8	5	15	26	8	223

ANALYSES AND QUALITY OF WATER

General Statement

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

Total Dissolved Mineral Solids

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

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

Mineral Substances Present

Calcium and Magnesium

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

Sodium

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

Sulphates

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

Chlorides

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

Iron

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

Hardness

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

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

ANALYSES OF WATER SAMPLES FROM THE MUNICIPALITY OF KELLROSS, NO. 247, SASKATCHEWAN

LOCATION						Depth of Well, Ft.	Total dis'vd solids	HARDNESS			CONSTITUENTS AS ANALYSED						CONSTITUENTS AS CALCULATED IN ASSUMED COMBINATIONS										Source of Water
No.	Qtr.	Sec.	Tp.	Rge.	Mer.			Total	Perm.	Temp.	Cl	Alkalinity	CaO	MgO	SO_4	Na_2O	Solids	$CaCO_3$	$CaSO_4$	$MgCO_3$	$MgSO_4$	Na_2CO_3	Na_2SO_4	NaCl	$CaCl_2$	$MgCl_2$	
1	SW.	6	25	13	2	68	1,760	1,300	1,100	200	11	415	430	216	808		Anomalous										x1
2	NW.	14	25	13	2	234	1,540	900	900	-	31	105	170	194	832	141	1,267	105	270		578		263	51			x1
3	NE.	34	25	13	2	90	1,940										1,940		(1)		(2)	(3)		(4)			x1
4	SE.	28	26	13	2	75	2,771	High Bacteria Content									2,771	(3)	(1)		(2)			(4)			x1
5	NW.	6	27	14	2	24	1,683										1,683	(4)	(1)		(2)		(3)		(5)		x1
6	NW.	6	27	14	2	40	760										760	(3)	(1)		(2)				(4)		x1
7	NW.	6	27	14	2	90	1,754										1,754	(1)	(5)	(2)				(6)	(3)	(4)	x1

Water samples indicated thus, x 1, are from glacial drift

Analyses are reported in parts per million; where numbers (1), (2), (3), (4), (5), and (6) are used instead of parts per million, they represent the relative amounts in which the five main constituents are present in the water.

Hardness is the soap hardness expressed as calcium carbonate ($CaCO_3$).

Analyses Nos. 3, 4, 5, 6, and 7, by Provincial Analyst, Regina.

For interpretation of this table read the section on Analyses and Quality of Water.

Water from the Unconsolidated Deposits

Seven samples of water derived from aquifers in the glacial drift have been analysed and the results listed in the accompanying table. The first sample has a total dissolved solid content of 1,300 parts per million, which is not excessive, but the water is very hard. This sample is anomalous, that is, the component parts of the total dissolved solid content could not be determined. Samples 2 to 6 inclusive show total dissolved solid contents of 760 to 2,771 parts per million, the most abundant mineral salts being calcium sulphate, magnesium sulphate, and calcium carbonate. These waters are known as sulphate waters and they are very common in the glacial drift. Sample 4, which has 2,771 parts per million of total dissolved solids, was condemned by the Provincial Analyst as being too hard, and also because of its high bacteria content. Samples 2, 3, 5, and 6 do not indicate an excessive amount of salts in solution and the water shown by the samples is quite suitable for stock use and probably would impart no ill effects to humans accustomed to its use. The occurrence of sodium carbonate (black alkali) in the water from the 90-foot well, shown by sample 3, would prevent this water being used for irrigation purposes. Sample 7 was taken from a 90-foot well in the village of Lestock. The total dissolved content of 1,754 parts per million is not considered excessive in water of glacial drift origin, but the well has been contaminated and the water is not used. The laxative producing salts, sodium sulphate, and magnesium sulphate, are absent from this water.

Water from the Bedrock

No wells are deriving water from the Marine Shale series in this municipality, so that no analyses of water from this formation are available. Water, when found in the Marine Shale series in this part of Saskatchewan, is usually so highly mineralized that it is unfit for either drinking or stock.

WELL RECORDS—Rural Municipality of KELLROSS NO.247, SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
1	NE.	2	25	13	2	Dug	15	2,200	- 13	2,187			Glacial drift	Hard,"alkaline"		D, S	Intermittent supply; uses sloughs in summer and melts snow in winter; dry holes to a dept of 20 feet.
2	SW.	6	"	"	"	Bored	68	2,155	- 53	2,102			Glacial drift	Hard,iron, "alkaline"		D, S	Insufficient supply. #
3	SW.	7	"	"	"	Bored	60	2,155	- 46	2,109	60	2,095	Glacial fine sand	Hard,iron, "alkaline"		D, S	Sufficient supply; one dry hole 65 feet deep.
4	NE.	11	"	"	"	Dug	12	2,210	- 9	2,201			Glacial drift	Hard		D, S	Insufficient supply in winter.
5	SW.	12	"	"	"	Dug	12	2,205	0	2,205	2	2,203	Glacial sand	Hard,"alkaline"		D, S	Sufficient supply.
6	SW.	13	"	"	"	Dug	12	2,210	- 6	2,204	10	2,200	Glacial gravel	Hard,"alkaline"		S	Intermittent supply; a 50foot well is used for the house; uses sloughs for stock; dry holes to a depth of 12 feet.
7	NW.	14	"	"	"	Drilled	234	2,195	-154	2,041	234	1,961	Glacial fine sand	Hard,iron		D, S	Abundant supply; 40-foot seepage well is not in use. #
8	SE.	15	"	"	"	Dug	14	2,190	- 9	2,181	12	2,178	Glacial sand	Hard		D, S	Sufficient supply.
9	SW.	16	"	"	"	Dug	20	2,180	- 17	2,163	17	2,163	Glacial sand	Hard		D, S	Another 15-foot well was dug in sand; dry hole to a depth of 25 feet; good supply of water.
10	NE.	16	"	"	"	Dug	15	2,190	- 12	2,178	14	2,176	Glacial sand	Soft		D, S	Poor supply in winter; also uses sloughs for stock; dry holes dug to 25 feet.
11	SW.	18	"	"	"	Bored	45	2,155	- 40	2,115			Glacial fine sand	Hard,"alkaline"		D, S	Sufficient supply; a slough is also used for stock.
12	NE.	18	"	"	"	Bored	45	2,160	- 38	2,122			Glacial sand	Hard		D, S	Insufficient supply; dry holes 74, 80, 82 and 92 feet deep.
13	NE.	19	"	"	"	Bored	73	2,155	- 35	2,120	73	2,082	Glacial sand	Hard,iron, "alkaline"		D, S	Good supply.
14	NW.	19	"	"	"	Drilled	71	2,150	- 41	2,109	71	2,079	Glacial sand	Hard,iron		D, S	Sufficient supply.
15	NW.	20	"	"	"	Bored	80	2,160	- 60	2,100	80	2,080	Glacial sand	Hard,iron, "alkaline"		S	Insufficient supply; another similar well 50 feet deep; several shallow wells and sloughs used for stock.
16	SW.	21	"	"	"	Dug	12	2,175	0	2,175	7	2,168	Glacial black sand	Hard, "alkaline"		D, S	Insufficient supply in winter and is forced to haul water.
17	NE.	21	"	"	"	Dug	17	2,180	- 13	2,167			Glacial gravel	Hard,"alkaline"		D, S	Intermittent supply; uses sloughs and hauls water; dry holes dug to a depth of 25 feet.
18	NW.	21	"	"	"	Dug	20	2,175	- 12	2,163	17	2,158	Glacial sand	Soft		D	Another well and sloughs are used for stock.
19	SE.	22	"	"	"	Dug	8	2,200	- 6	2,194	7	2,193	Glacial sand	Soft		D, S	Poor supply; sloughs are used for stock in summer and water is hauled in winter.
20	NW.	22	"	"	"	Drilled	180	2,190	-100	2,090	180	2,010	Glacial fine sand	Hard,iron, "alkaline"		D, S	Abundant supply; a 50-foot well yields an intermittent supply.
21	SE.	24	"	"	"	Dug	9	2,200	- 6	2,194	8	2,192	Glacial sand	Hard,iron		D, S	Intermittent supply; melts snow in winter; 85-foot well yielded a small supply of unusable water.
22	SW.	24	"	"	"	Dug	12	2,190	- 8	2,182	10	2,180	Glacial sand	Soft		D, S	Sufficient supply; also uses another similar well.
23	NW.	27	"	"	"	Dug	10	2,200	- 8	2,192	3	2,197	Glacial sand	Soft		D, S	Sufficient supply.
24	SE.	28	"	"	"	Dug	8	2,190	- 6	2,184	7	2,183	Glacial sand	Hard		D	Intermittent supply; hauls water in winter for house and stock use; dry holes to about 22 feet.
25	NE.	29	"	"	"	Dug	10	2,165	- 6	2,159	8	2,157	Glacial gravel	Hard, "alkaline"		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 KELLROSS NO. 247, 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
26	NW.	29	25	13	2	Dug	9	2,160	- 4	2,156	7	2,153	Glacial sand	Hard		D, S	Poor and insufficient supply.
27	SW.	30	"	"	"	Bored	40	2,155	- 35	2,120	38	2,117	Glacial sand	Hard,iron		D, S	Uses sloughs for stock.
28	NE.	30	"	"	"	Dug	50	2,155					Glacial drift				Dry hole; hauls water for house and stock use.
29	NW.	31	"	"	"	Bored	45	2,150	- 35	2,115			Glacial drift	Hard,iron, "alkaline"		S	Poor supply; a 25-foot well is used for drinking water; hauls water for stock.
30	SW.	32	"	"	"	Dug	9	2,160	- 3	2,157			Glacial sand	Hard		D, S	Poor supply; hauls water in winter for cattle
31	NE.	33	"	"	"	Dug & Sand-point	16	2,185	- 4	2,181	4	2,181	Glacial gravel	Hard		D, S	Sufficient supply.
32	NE.	34	"	"	"	Bored	90	2,205	- 40	2,165	90	2,115	Glacial sand	Hard,iron, "alkaline"		D, S	Sufficient supply. #
1	SE.	1	25	14	2	Dug	18	2,142	- 11	2,131			Glacial drift	Hard		D, S	Sufficient supply.
2	SE.	2	"	"	"	Dug	20	2,140	- 4	2,136			Glacial drift	Hard		D, S	Poor and insufficient supply.
3	NE.	2	"	"	"	Dug	16	2,155	- 4	2,151	15	2,140	Glacial sand	Hard,"alkaline"		D, S	Insufficient supply.
4	NE.	3	"	"	"	Bored	60	2,150	- 52	2,098	58	2,092	Glacial sandy clay	Hard,"alkaline"		D, S	Insufficient supply.
5	SW.	3	"	"	"	Dug	10	2,140	- 6	2,134			Glacial gravel	Hard		D	Sufficient for house use only.
6	NW.	4	"	"	"	Bored	60	2,125	- 52	2,073			Glacial drift	Hard,"alkaline"		S	Another well is also used for stock; hauls drinking water.
7	NE.	5	"	"	"	Dug	24	2,115					Glacial drift				One of six dry holes; hauls all water 2½ miles
8	SW.	6	"	"	"	Dug	12	2,100	- 8	2,092	8	2,092	Glacial gravel	Hard		D, S	Abundant supply.
9	NE.	9	"	"	"	Bored	40	2,130	- 34	2,096	34	2,096	Glacial sand	Hard		D, S	Good supply; supply of water has been constant since 1912.
10	SE.	11	"	"	"	Dug	16	2,155	- 3	2,152	14	2,141	Glacial sand	Hard		D, S	Sufficient supply.
11	SE.	12	"	"	"	Bored	58	2,160	- 50	2,110	50	2,110	Glacial sand and gravel	Hard,"alkaline"		D, S	Insufficient supply.
12	SE.	14	"	"	"	Bored	34	2,135	- 16	2,119	34	2,101	Glacial sand	Hard		D, S	Good supply; several dry holes 60 to 92 feet deep.
13	NW.	14	"	"	"	Bored	88	2,150	- 48	2,102	88	2,062	Glacial fine sand	Hard,iron		D, S	Sufficient supply; well is partially clogged by sand.
14	SW.	16	"	"	"	Dug	50	2,125	- 15	2,110			Glacial drift	Hard,"alkaline"		D	Insufficient for stock use.
15	SW.	18	"	"	"	Dug	9	2,110	- 4	2,106	4	2,106	Glacial fine sand	Hard		D	Another well 5 feet deep in fine sand is used for stock.
16	NW.	20	"	"	"	Bored	50	2,150	- 35	2,115	50	2,100	Glacial sand	Hard,"alkaline"		D, S	Sufficient supply.
17	SE.	20	"	"	"	Bored	61	2,140	- 40	2,100			Glacial sand	Hard,"alkaline"		S	Sufficient supply for stock; hauls drinking water; another 80-foot well struck a little water at 40 feet.
18	NW.	22	"	"	"	Bored	38	2,145	- 26	2,119			Glacial gravel	Hard		D, S	Good supply.
19	SE.	22	"	"	"	Dug	14	2,150	- 6	2,144	8	2,142	Glacial sand	Soft		D, S	Another similar well is also used; sufficient supply of 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 KELLROSS NO. 247, 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
20	NE.	22	25	14	2	Dug	30	2,150	- 27	2,123	29	2,121	Glacial sand	Hard,"alkaline"		D, S	Poor supply in drought years; a 60-foot well also yields a poor supply of water.
21	SE.	24	"	"	"	Bored	80	2,145	- 7	2,138			Glacial sand and gravel	Hard		S	Insufficient supply; hauls drinking water.
22	NW.	24	"	"	"	Bored	75	2,140	- 30	2,110	70	2,070	Glacial sand	Hard,iron		D, S	Abundant supply; a 12-foot well yields soft water.
23	SW.	28	"	"	"	Bored	50	2,140	- 25	2,115	50	2,090	Glacial fine sand	Hard,"alkaline"		D, S	Well is partly plugged by sand and doesn't always yield a sufficient supply of water.
24	NE.	30	"	"	"	Bored	48	2,130	- 34	2,096	48	2,082	Glacial sand	Hard		D, S	Plenty of water.
25	SW.	30	"	"	"	Bored	18	2,125	- 13	2,112			Glacial sandy clay	Hard		D	Water sock on the NE.¼,section 13,tp. 25,range 15; several other similar wellshave been bored
26	SW.	32	"	"	"	Bored	75	2,160	- 30	2,130	55	2,105	Glacial sand	Hard		D, S	Insufficient for stock use; another 55-foot bored well yields a small supply of water.
27	NE.	32	"	"	"	Bored	80	2,160	- 23	2,137	80	2,080	Glacial sand	Hard,"alkaline"		S	Good supply; water pronounced fit for stock only; hauls drinking water.
28	NW.	32	"	"	"	Dug	6	2,155	- 4	2,151			Glacial gravel	Hard,"alkaline"		D, S	Intermittent supply.
29	SE.	34	"	"	"	Dug	12	2,140	- 4	2,136	4	2,136	Glacial fine sand	Hard		D, S	Sufficient supply.
30	SE.	36	"	"	"	Dug	15	2,150	- 7	2,143			Glacial sand	Hard		D, S	Insufficient supply.
1	SW.	4	25	15	2	Dug	10	2,100	- 7	2,093	7	2,093	Glacial fine sand	Soft		D, S	Sufficient and constant supply.
2	SE.	6	"	"	"	Bored	24	2,075	- 21	2,054	22	2,053	Glacial gravel	Hard,"alkaline"		D, S	Intermittent supply; hauls water in winter; several dry holes to a maximum depth of 90 feet
3	NE.	6	"	"	"	Dug	24	2,090					Glacial drift				One of several dry holes; hauls water 1½ miles.
4	NE.	9	"	"	"	Dug	10	2,125	- 7	2,118	7	2,118	Glacial sand	Hard		D, S	Sufficient and constant supply.
5	SW.	10	"	"	"	Dug	20	2,130	- 12	2,118	12	2,118	Glacial sand	Hard		D, S	Sufficient supply.
6	NW.	10	"	"	"	Dug	8	2,130	- 5	2,125	5	2,125	Glacial gravel	Soft		D, S	Constant supply.
7	SE.	10	"	"	"	Dug	20	2,125	- 17	2,108	18	2,107	Glacial sand	Hard,"alkaline"		D, S	Hauls water for stock in winter.
8	NE.	10	"	"	"	Bored	40	2,135	- 15	2,120	40	2,095	Glacial sand	Hard		D, S	Very good supply.
9	SW.	12	"	"	"	Bored	100	2,125	- 40	2,085	100	2,025	Glacial black sand	Hard,iron, "alkaline"		S	Sufficient supply; a 12-foot well yields a good supply of soft water.
10	NW.	12	"	"	"	Bored	92	2,135	- 52	2,083	92	2,043	Glacial black sand	Hard,iron, "alkaline"		N	Uses shallow seepage wells beside sloughs for a water supply.
11	SW.	16	"	"	"	Dug	24	2,140					Glacial drift	Hard,very "alkaline"		N	Uses shallow wells dug beside sloughs for watering stock.
12	NW.	16	"	"	"	Dug	18	2,140	0	2,140			Glacial drift	Hard		S	Intermittent supply; uses a number of shallow wells to obtain sufficient water.
13	SW.	20	"	"	"	Dug	12	2,155	0	2,155			Glacial drift	Hard		D, S	Intermittent supply; several similar wells used to obtain enough water.
14	NE.	22	"	"	"	Dug	12	2,140	- 6	2,134	8	2,132	Glacial sand	Soft		D, S	Sufficient and constant supply.
15	NW.	23	"	"	"	Bored	84	2,140					Glacial drift				One of three dry bored holes; uses seepage wells dug near sloughs.
16	NW.	24	"	"	"	Bored	16	2,135	- 11	2,124			Glacial sand	Hard,"alkaline"		S	Well is dry in winter; a 42-foot well is used for drinking 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 KELLROSS NO. 247, 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
17	SE.	24	25	15	2	Dug	8	2,130	- 4	2,126	4	2,126	Glacial sand	Hard		D, S	Sufficient and constant supply.
18	NE.	28	"	"	"	Dug	8	2,150	- 2	2,148			Glacial drift	Hard		D	Intermittent supply.
19	SW.	28	"	"	"	Dug	10	2,150	0	2,150			Glacial drift	Hard		S	Intermittent supply; hauls drinking water.
20	NW.	29	"	"	"	Dug	4	2,100	0	2,100	0	2,100	Glacial black sand	Hard		S	Sufficient supply.
21	SE.	30	"	"	"	Dug	12	2,100	0	2,100			Glacial gravel	Soft		D, S	Sufficient supply.
22	NE.	30	"	"	"	Dug	16	2,150	- 14	2,136			Glacial drift	Hard		D, S	Intermittent supply.
23	NW.	31	"	"	"	Dug	19	2,140	- 7	2,133	14	2,126	Glacial sand	Hard		S	Sufficient supply.
24	SW.	32	"	"	"	Dug	24	2,140	- 14	2,126			Glacial drift	Hard		D	A 9-foot well ½ mile from buildings is used for stock.
25	SE.	32	"	"	"	Dug	38	2,150					Glacial drift				One of seven dry holes; hauls water ½ mile from a creek.
26	NE.	32	"	"	"	Dug	10	2,150	- 2	2,148			Glacial sand and gravel	Soft		D, S	Sufficient supply.
27	SW.	36	"	"	"	Bored	43	2,145	- 37	2,108	43	2,102	Glacial sand	Hard		D, S	Abundant supply.
28	SE.	36	"	"	"	Bored	73	2,145	- 50	2,095	73	2,072	Glacial gravel	Hard		D, S	Abundant and constant supply.
29	NE.	36	"	"	"	Bored	40	2,150	- 20	2,130	40	2,110	Glacial gravel	Hard		D, S	Abundant supply; a 70-foot well bored 35 feet away, yields a small supply.
1	NW.	1	26	13	2	Dug	20	2,190	- 16	2,174	18	2,172	Glacial gravel	Hard		D, S	Sufficient supply.
2	SW.	2	"	"	"	Drilled	96	2,205	- 76	2,129	95	2,110	Glacial sand	Hard, iron		D, S	Barely sufficient; uses sloughs in summer for stock; one drilled 260-foot dry hole.
3	SW.	3	"	"	"	Drilled	100	2,185	- 26	2,159	100	2,085	Glacial gravel and black sand	Hard, iron, "alkaline"		S	Abundant supply; a 16-foot well provides drinking water.
4	SE.	4	"	"	"	Bored	96	2,185	- 76	2,109	96	2,089	Glacial fine sand	Hard, iron, "alkaline"		D, S	Intermittent supply; uses sloughs and hauls water for stock; a 6-foot seepage well yields soft water.
5	SW.	4	"	"	"	Bored	53	2,190	- 23	2,167			Glacial drift	Hard		S	Poor supply; uses sloughs in summer and hauls water in winter.
6	NE.	4	"	"	"	Drilled	166	2,185	- 56	2,129	166	2,019	Glacial sand	Hard, iron		D, S	Good supply.
7	NE.	4	"	"	"	Dug	14	2,185	- 5	2,180	11	2,174	Glacial sand	Soft		D, S	Well was dry in 1933; supply increased in 1934 and 1935.
8	SW.	6	"	"	"	Dug	15	2,160	- 12	2,148	13	2,147	Glacial sand	Hard		D, S	Sufficient supply.
9	SE.	6	"	"	"	Bored	88	2,160					Glacial drift				One of three dry holes; uses sloughs and hauls water for house and stock.
10	NW.	7	"	"	"	Dug	16	2,165	0	2,165	12	2,153	Glacial sand	Hard		D, S	Sufficient supply.
11	NE.	8	"	"	"	Dug	16	2,170	- 13	2,157	13	2,157	Glacial fine sand	Soft		D, S	Good supply; water easily found on this quarter section.
12	SE.	9	"	"	"	Dug	20	2,175	- 15	2,160			Glacial drift	Hard, "alkaline"		S	Intermittent supply; hauls drinking water; hauls water for stock in winter.
13	NE.	10	"	"	"	Dug	8	2,185	0	2,185			Glacial drift	Hard, "alkaline"		D	Poor supply; dry holes 50 to 83 feet; hauls water for house and 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 KELLROSS NO. 247, 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	NW.	10	26	13	2	Drilled	165	2,190	- 30	2,160	165	2,025	Glacial gravel	Hard,iron		D, S	Abundant supply.
15	NW.	11	"	"	"	Bored	65	2,180	- 35	2,145	65	2,115	Glacial sand	Hard		D, S	Good supply.
16	NW.	12	"	"	"	Dug	14	2,180	- 4	2,176			Glacial sandy clay	Hard,"alkaline"		D, S	Poor supply; 3 dry holes 42 feet deep; hauls water in winter and waters stock at sloughs in summer.
17	SE.	14	"	"	"	Dug	30	2,185	- 7	2,178	28	2,157	Glacial sand	Hard,"alkaline"		D	Waters stock at sloughs.
18	NW.	14	"	"	"	Bored	32	2,190	- 22	2,168	30	2,160	Glacial sand	Hard,"alkaline"		D, S	One of several wells that yield poor supplies of water; uses sloughs and hauls water in winter.
19	SE.	16	"	"	"	Dug	25	2,180					Glacial drift				Dry hole; one well, now filled in, yielded unusable water.
20	SW.	16	"	"	"	Dug	16	2,185	- 14	2,171	14	2,171	Glacial gravel	Hard,iron, "alkaline"		D, S	Sufficient supply.
21	NW.	16	"	"	"	Bored	54	2,195	- 16	2,179	50	2,145	Glacial black sand	Hard,iron, "alkaline"		D	Abundant supply, but stock refuse the water; dry holes made to a maximum depth of 76 feet.
22	SW.	18	"	"	"	Dug	16	2,170	- 14	2,156			Glacial drift	Hard		D	Waters stock at a small lake.
23	NE.	18	"	"	"	Bored	16	2,175	- 10	2,165	8	2,167	Glacial sandy clay	Hard		D, S	Insufficient supply; one dry hole 82 feet deep
24	SE.	20	"	"	"	Dug	25	2,200	- 23	2,177			Glacial drift	Hard,iron		D, S	One of two intermittent wells; uses sloughs and hauls water.
25	NE.	20	"	"	"	Dug & Sand-point	20	2,200	- 16	2,184	16	2,184	Glacial sand	Hard		D, S	Sufficient supply.
26	SW.	22	"	"	"	Dug	17	2,210	- 4	2,206			Glacial drift	Hard		D, S	Intermittent supply; uses sloughs for watering stock.
27	NW.	22	"	"	"	Bored	32	2,205	- 7	2,198			Glacial drift	Soft		D, S	Poor supply; uses sloughs in summer and hauls water in winter; one dry hole 100 feet deep.
28	NW.	23	"	"	"	Dug	10	2,190	- 3	2,187			Glacial drift	Hard,iron, "alkaline"		S	Poor supply; hauls drinking water from Kolliher and melts snow for stock in winter.
29	SE.	25	"	"	"	Dug	6	2,200	- 3	2,197			Glacial drift	Hard		D	Intermittent supply; uses sloughs and hauls water for stock; several dry holes made.
30	NE.	27	"	"	"	Bored	50	2,200	- 24	2,176	50	2,150	Glacial sand	Hard,iron		D, S	Good supply; also uses a spring near a lake for cattle.
31	SE.	28	"	"	"	Drilled	75	2,200	- 40	2,160	75	2,125	Glacial sand	Hard,iron		D, S	Good supply but analyst condemned the water.
32	SW.	28	"	"	"	Dug	12	2,190	0	2,190	11	2,179	Glacial sand	Soft		N	Uses sloughs in summer and hauls water in winter.
33	SW.	29	"	"	"	Dug	50	2,185	- 8	2,177			Glacial drift	Hard,iron, "alkaline"		D, S	Intermittent supply; hauls water in winter.
34	SE.	30	"	"	"		100	2,180					Glacial drift				The deepest of several dry holes.
35	NW.	30	"	"	"	Dug	28	2,190	- 24	2,166			Glacial sandy clay	Hard,iron, "alkaline"		D, S	Sufficient supply.
36	NE.	32	"	"	"	Dug	15	2,200	- 8	2,192	14	2,186	Glacial sand	Soft		D, S	Sufficient supply; also uses sloughs for stock
37	NW.	32	"	"	"	Dug	6	2,210	- 3	2,207	3	2,207	Glacial gravel	Hard		D, S	Sufficient supply; also uses sloughs for stock
38	SE.	34	"	"	"	Bored	60	2,210	- 30	2,180	60	2,150	Glacial sand	Hard,iron		D, S	Abundant supply; a lake is also used for watering cattle.

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 KELLROSS NO.247, 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
39	NE.	34	26	13	2	Bored	80	2,210	- 55	2,155	80	2,130	Glacial sand	Hard, "alkaline"		D, S	Village well of Kelliher; 7 similar wells in the village; sufficient supply of water.
40	SW.	35	"	"	"	Bored	65	2,205	- 53	2,152	65	2,140	Glacial sand	Hard, "alkaline"		D, S	Good supply.
41	NW.	35	"	"	"	Bored	50	2,205	- 42	2,163			Glacial sand and gravel	Hard, iron		D, S	Sufficient supply; another 40-foot well also used.
42	NW.	35	"	"	"	Dug	11	2,190	- 10	2,180			Glacial drift	Hard, "alkaline"		N	Hauls water.
43	SW.	36	"	"	"	Bored	32	2,200	- 16	2,184	30	2,170	Glacial gravel	Hard, "alkaline"		D, S	Sufficient supply.
44	NW.	36	"	"	"	Dug	42	2,210	- 27	2,183	39	2,171	Glacial gravel	Hard, iron, "alkaline"		D, S	Sufficient supply; a 10-foot well yields soft water; several dry holes up to 40 feet deep.
1	SE.	1	26	14	2	Dug	12	2,140	0	2,140	6	2,134	Glacial sand	Soft		D, S	Intermittent supply.
2	NE.	1	"	"	"	Dug	22	2,160	- 19	2,141	19	2,141	Glacial sand	Hard, iron		D, S	Sufficient supply.
3	NE.	2	"	"	"	Bored	40	2,150	- 20	2,130	40	2,110	Glacial sand	Hard, iron		D, S	Good supply; two 20-foot wells that yield poor supplies are not in use.
4	SE.	4	"	"	"	Bored	140	2,150					Glacial drift				Several dry holes 100 to 140 feet deep; hauls water for house and stock.
5	SW.	4	"	"	"	Bored	55	2,150	- 26	2,124	54	2,096	Glacial gravel	Hard, iron		D, S	Good supply.
6	NE.	4	"	"	"	Bored	80	2,150	- 26	2,124	80	2,070	Glacial sand	Hard, iron		D, S	Plenty of water.
7	SE.	10	"	"	"	Bored	77	2,155	- 67	2,088			Glacial drift	Hard, "alkaline"		S	Intermittent supply; uses sloughs and hauls water; several dry holes.
8	SW.	11	"	"	"	Bored	49	2,150	- 28	2,122	49	2,101	Glacial sand	Hard, iron		D, S	Sufficient and constant supply.
9	SW.	12	"	"	"	Dug	12	2,155	- 7	2,148	7	2,148	Glacial sand	Soft		D, S	Sufficient supply.
10	NW.	12	"	"	"	Bored	70	2,160	- 35	2,125	70	2,090	Glacial sand	Hard, iron		D, S	Good supply.
11	SE.	13	"	"	"	Dug	10	2,160	- 4	2,156			Glacial sand	Hard, "alkaline"		D	Poor supply; waters stock at a slough.
12	SW.	14	"	"	"	Bored	50	2,160	- 30	2,130	50	2,110	Glacial sand	Hard, iron, "alkaline"		D, S	Constant supply.
13	NE.	16	"	"	"	Dug	19	2,155	- 15	2,140	15	2,140	Glacial sand	Hard, "alkaline"		D, S	Intermittent supply; hauls water for stock from a lake.
14	NW.	16	"	"	"	Dug	12	2,145	- 2	2,143			Glacial drift	Hard, "alkaline"		D, S	Sufficient supply.
15	SW.	17	"	"	"	Dug	20	2,150	- 14	2,136			Glacial sand	Hard, "alkaline"		D,	A 12-foot well dug beside a slough is used for stock.
16	SE.	18	"	"	"	Dug	10	2,155	- 7	2,148			Glacial drift	Hard, "alkaline"		D	Intermittent supply; uses slough water for cattle.
17	SW.	18	"	"	"	Dug	34	2,160	- 30	2,130	30	2,130	Glacial white sand	Hard		D, S	Insufficient supply; an 8-foot well in sand waters stock in winter.
18	NW.	18	"	"	"	Bored	140	2,170	- 50	2,120			Glacial drift	Hard, "alkaline"		S	Insufficient for stock requirements; several seepage wells used for the house.
19	NW.	19	"	"	"	Bored	52	2,190	- 42	2,148	51	2,139	Glacial sand and gravel	Hard, "alkaline"		D, S	Sufficient supply; one dry hole 14 feet deep.
20	NW.	20	"	"	"	Dug	16	2,155	- 12	2,143			Glacial drift	Hard, "alkaline"		N	Water too "alkaline" for use; a 14-foot well used for drinking water and stock water at sloughs; dry hole.

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 KELLROSS NO. 247, 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
21	NW.	22	26	14	2	Dug	6	2,170	- 2	2,160			Glacial gravel	Soft		D	Well is dry in winter; stock are watered at a small lake.
22	SW.	23	"	"	"	Dug	25	2,165					Glacial drift				Dry hole; hauls water; also uses a small lake 1 mile east of farm.
23	SW.	24	"	"	"	Dug	18	2,160	- 15	2,145			Glacial sand	Hard, "alkaline"		D, S	Poor supply; uses sloughs in summer and hauls water in winter.
24	NE.	24	"	"	"	Dug	25	2,175	- 10	2,165	21	2,154	Glacial fine sand	Hard		D	Poor supply, well was dry in 1933; hauls water for stock in winter; several dry holes to a depth of 30 feet.
25	NW.	26	"	"	"	Dug	6	2,185	- 3	2,182	4	2,181	Glacial gravel	Soft		D, S	Insufficient supply; hauls water in winter; one dry hole 12 feet deep.
26	SE.	28	"	"	"	Dug	14	2,175	- 8	2,167			Glacial sandy clay	Hard, "alkaline"		D	Intermittent supply; uses lakes as a source for water for stock.
27	NE.	28	"	"	"	Dug	14	2,180	- 4	2,176	4	2,176	Glacial sand	Soft		D, S	Two similar wells are also used; sufficient water supply.
28	SE.	30	"	"	"	Bored	115	2,190	- 12	2,178	16	2,174	Glacial drift	Hard		D, S	Intermittent supply; a 55-foot well yields a poor supply.
29	NE.	30	"	"	"	Bored	106	2,190	- 68	2,122	86	2,104	Glacial sand	Hard, "alkaline"		D, S	Good supply of highly mineralized water; well has partly caved in.
30	NE.	31	"	"	"	Bored	31	2,180	- 26	2,154			Glacial sand	Hard		D, S	Good supply; a 50-foot well yields only seepage water.
31	SW.	33	"	"	"	Dug	8	2,185	- 2	2,183			Glacial drift	Hard, "alkaline"		S	Sufficient for stock; water is unfit for human consumption; hauls drinking water.
32	SW.	34	"	"	"	Dug	20	2,195	- 16	2,179	16	2,179	Glacial gravel	Hard		D, S	Uses a lake for stock in winter; several dry holes 20 feet deep.
33	NW.	34	"	"	"	Dug	12	2,200	- 8	2,192	8	2,192	Glacial sand	Soft		D, S	Sufficient supply with the aid of a 25-foot well.
34	NE.	35	"	"	"	Dug	28	2,200					Glacial drift				One of four dry holes; hauls drinking water an uses a lake for stock.
35	SW.	36	"	"	"	Dug	8	2,175	- 6	2,169	6	2,169	Glacial sandy clay	Hard, "alkaline"		D	Sufficient supply.
36	NE.	36	"	"	"	Dug	12	2,200	- 7	2,193	6	2,194	Glacial sand and gravel	Hard		D	Stock are watered at small lakes.
37	NW.	36	"	"	"	Dug	14	2,200	- 6	2,194	6	2,194	Glacial sand	Hard		D, S	Sufficient supply.
1	SE.	1	26	15	2	Dug	14	2,155	- 11	2,144	11	2,144	Glacial gravel	Hard		D	Good supply.
2	SE.	2	"	"	"	Bored	40	2,150	- 30	2,120	40	2,110	Glacial sand	Hard		D, S	Insufficient supply; because the well is partl caved in; dry holes and seepage wells to a depth of 32 feet.
3	NE.	2	"	"	"	Bored	80	2,160					Glacial drift				The deepest of many dry holes; hauls drinking water.
4	SW.	2	"	"	"	Bored	80	2,165					Glacial sand			N	Well is not in use.
5	NE.	3	"	"	"	Dug	11	2,170	- 7	2,163	7	2,163	Glacial gravel	Hard		D, S	Sufficient supply.
6	SE.	4	"	"	"	Dug	14	2,160	- 2	2,158			Glacial sand	Hard		D, S	Insufficient supply in winter; a 12-foot well also yields a poor supply.
7	SW.	4	"	"	"	Dug	14	2,160	- 6	2,154	6	2,154	Glacial gravel	Soft		D, S	Sufficient supply; several dry holes to a maximum depth of 30 feet.
8	NW.	4	"	"	"	Drilled	140	2,160	-100	2,060	140	2,020	Glacial sand	Hard, "alkaline"		D, S	Abundant supply.
9	SE.	5	"	"	"	Bored	40	2,150					Glacial drift				Bored eight dry holes; uses a well on 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 KELLROSS NO.247, SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
10	SE.	6	26	15	2	Dug	9	2,150	- 5	2,145			Glacial sand	Hard		D, S	Sufficient supply.
11	SW.	6	"	"	"	Dug	40	2,150					Glacial drift				One of thirteen dry holes.
12	NW.	10	"	"	"	Bored	93	2,170	- 49	2,121	93	2,077	Glacial fine sand	Hard,"alkaline"		D, S	Abundant supply.
13	SE.	10	"	"	"	Dug	54	2,160	- 50	2,110			Glacial sand	Hard		S	Sufficient supply; a 16-foot well yields soft water for house.
14	NE.	10	"	"	"	Bored	60	2,160	- 40	2,120	60	2,100	Glacial fine sand			N	Well is plugged by sand.
15	SW.	12	"	"	"	Dug	14	2,150	- 6	2,144			Glacial gravel and clay	Hard		D, S	Sufficient supply; a 15-foot well becomes dry in winter.
16	SE.	12	"	"	"	Dug	22	2,170	- 16	2,154			Glacial gravel	Hard,"alkaline"		D	Poor supply; a 14-foot well is used for stock; insufficient supply in winter.
17	NE.	12	"	"	"	Dug	30	2,170	- 25	2,145	25	2,145	Glacial sand	Hard		D, S	Sufficient and constant supply.
18	NW.	14	"	"	"	Bored	90	2,160	- 60	2,100	90	2,070	Glacial sand and gravel	Hard,"alkaline"		D, S	Water analysed and found drinkable; water was soft when well was bored.
19	NE.	16	"	"	"	Bored	100	2,160	- 50	2,110	100	2,060	Glacial sand	Hard,"alkaline"		S	Sufficient for stock requirements.
20	SW.	16	"	"	"	Dug	12	2,160	- 4	2,156	8	2,152	Glacial sand	Soft		D,	Intermittent supply in winter; a 10-foot well near a slough used for stock.
21	SE.	17	"	"	"	Bored	65	2,155	- 61	2,094	57	2,098	Glacial sand	Hard		D, S	Sufficient and constant supply; several dry holes to a maximum depth of 117 feet.
22	NE.	17	"	"	"	Dug	12	2,155	- 8	2,147			Glacial sand and gravel	Hard		D, S	Sufficient supply.
23	SE.	18	"	"	"	Dug	12	2,140	- 6	2,134			Glacial gravel	Hard		D, S	Insufficient supply in winter.
24	SW.	18	"	"	"	Dug	18	2,150	- 9	2,141	9	2,141	Glacial sand	Hard		D, S	Well becomes dry in winter; waters stock at sloughs.
25	SW.	20	"	"	"	Dug	10	2,150	- 6	2,144	6	2,144	Glacial gravel	Hard		D, S	Abundant supply.
26	NW.	20	"	"	"	Dug	32	2,170	- 28	2,142			Glacial sand	Hard,"alkaline"		D, S	Insufficient supply.
27	NE.	20	"	"	"	Bored	77	2,180	- 61	2,119	70	2,110	Glacial gravel	Hard,"alkaline"		S	Good supply; rain water is used forthe house; anothor similar well also used for stock.
28	NW.	22	"	"	"	Bored	50	2,185	- 38	2,147	50	2,135	Glacial fine sand	Hard		D, S	Good supply.
29	SW.	24	"	"	"	Dug	14	2,170	- 10	2,160	10	2,160	Glacial sand	Soft		D, S	Sufficient supply.
30	NW.	24	"	"	"	Dug	12	2,190	- 4	2,186	8	2,182	Glacial sand and gravel	Hard		D, S	Good supply, but well is ½ mile from buildings dry holes to 93 feet near the house.
31	NE.	24	"	"	"	Dug	24	2,190	- 21	2,169	20	2,170	Glacial sand	Hard		D, S	Sufficient supply.
32	NE.	26	"	"	"	Dug	20	2,195	- 13	2,182			Glacial drift	Hard,"alkaline"		S	Sufficient for stock use; a 90-foot well yield only sufficient water for the house.
33	NW.	26	"	"	"	Dug	20	2,200	- 15	2,185			Glacial drift	Hard		D, S	Poor supply in wintor; 2 other wells yield additional water in summer.
34	SE.	28	"	"	"	Drilled	65	2,190	- 40	2,150	65	2,125	Glacial sand	Hard		D, S	Abundant and constant supply.
35	NE.	28	"	"	"	Drilled	286	2,190	- 86	2,104	286	1,904	Glacial sand	Hard		N	Poor supply at present; well is probably plugged with sand. A 25-foot well yields a small supply of 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 KELLROSS NO. 247, SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE: Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED: Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
36	NW.	30	26	15	2	Dug	16	2,200					Glacial drift				Dry hole; a 12-foot well yields unusable water; hauls water and stock use a lake.
37	SE.	32	"	"	"	Dug	16	2,190	- 8	2,182			Glacial gravel	Hard, "alkaline"		D, S	Insufficient supply.
38	SE.	34	"	"	"	Drilled	129	2,190	- 59	2,131	129	2,061	Glacial gravel	Hard, "alkaline"		D, S	Abundant supply.
39	NW.	35	"	"	"	Dug	10	2,190	- 7	2,183			Glacial sand	Soft		D, S	Sufficient supply; an 8-foot well yields a small supply in summer.
40	SW.	36	"	"	"	Dug	12	2,185	- 6	2,179			Glacial drift	Hard		D, S	Intermittent supply.
41	NE.	36	"	"	"	Dug	16	2,200	- 10	2,190			Glacial drift	Hard		D, S	Intermittent supply; two other wells also use for stock; insufficient supply.
1	NW.	1	27A	13	2	Bored	60	2,190	- 40	2,150	60	2,130	Glacial sand ?	Hard, "alkaline"		S	Good supply; a 20-foot well yields soft water for domestic use.
2	SE.	2	"	"	"	Bored	61	2,200	- 49	2,151	61	2,139	Glacial sand	Hard, iron		D, S	Sufficient and constant supply.
3	SW.	2	"	"	"	Bored	70	2,190	- 50	2,140			Glacial sand ?	Hard, iron, "alkaline"		D, S	Constant supply.
4	NW.	2	"	"	"	Dug	11	2,200	- 5	2,195			Glacial drift	Hard, "alkaline"		S	Two other wells also used; sufficient supply.
5	SE.	4	"	"	"	Bored	46	2,200	- 23	2,177	40	2,160	Glacial sand	Hard, iron		D, S	Sufficient supply; one dry hole 90 foot deep; sloughs also used for stock.
6	NW.	4	"	"	"	Dug	8	2,215	0	2,215	0	2,215	Glacial gravel	Soft		D, S	Good supply; well located in a gravel pit; also owns a flowing spring.
7	SE.	5	"	"	"	Dug	40	2,180	0	2,180	24	2,156	Glacial gravelly clay	Hard, iron, "alkaline"		N	Four similar wells yield unusable water; haul drinking water and uses a lake for stock.
8	NW.	5	"	"	"	Dug	16	2,216	- 12	2,204			Glacial sand	Soft		D, S	Sufficient supply.
9	SE.	6	"	"	"	Dug	16	2,190	- 9	2,181			Glacial sand	Soft		D, S	Insufficient supply; 8 dry holes from 20 to 100 feet deep.
10	NW.	6	"	"	"	Dug	14	2,210	0	2,210			Glacial drift	Hard, "alkaline"		D	Intermittent supply; hauls water for stock; dry holes 70 to 100 feet deep.
11	SE.	7	"	"	"	Dug	10	2,218	- 8	2,210			Glacial drift	Hard		D	Poor supply; uses a lake for stock; one dry hole 140 foot deep.
12	SW.	7	"	"	"	Dug	12	2,220	- 7	2,213			Glacial sand	Hard		D	Intermittent supply; waters stock at a lake.
13	SE.	10	"	"	"	Dug	70	2,200	- 30	2,170			Glacial drift	Hard, "alkaline"		D, S	Sufficient supply; sloughs are used for cattl
14	NE.	10	"	"	"	Bored	66	2,200	- 46	2,154	50	2,150	Glacial fine sand	Hard, iron		D, S	Insufficient supply; a 12-foot well yields soft water.
15	SE.	11	"	"	"	Bored	50	2,190	- 22	2,168	50	2,140	Glacial sand	Hard, iron, "alkaline"		D, S	Sufficient and constant supply.
16	SW.	11	"	"	"	Drilled	101	2,190	- 42	2,148	101	2,089	Glacial sand	Hard, iron		D, S	Abundant supply.
17	SE.	12	"	"	"	Bored	33	2,200	- 20	2,180			Glacial drift	Hard, "alkaline"			Constant supply.
18	SW.	12	"	"	"	Bored	33	2,200	- 15	2,185			Glacial drift	Hard, iron, "alkaline"		D, S	Sufficient supply.
19	NE.	12	"	"	"	Dug	30	2,200	- 20	2,180			Glacial sand	Hard		D, S	Sufficient supply.
1	SE.	2	27A	14	2	Dug	14	2,190	- 5	2,185	5	2,185	Glacial gravel	Hard		D, S	Sufficient supply; one dry hole 110 foot deep
2	SW.	2	"	"	"	Dug	14	2,215	- 7	2,208	7	2,208	Glacial gravel	Hard		D, S	Good supply; several unused wells up to 20 foot 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 KELLROSS NO.247, SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
3	NW.	2	27A	14	2	Dug	14	2,225	- 3	2,222			Glacial drift	Hard,"alkaline"		D	A spring beside a slough waters 100 head stock
4	NE.	3	"	"	"	Dug	16	2,220	- 7	2,213	13	2,207	Glacial sand	Soft		S	Sufficient supply.
5	SE.	4	"	"	"	Dug	14	2,195	- 10	2,185	10	2,185	Glacial sand	Hard,"alkaline"		D, S	Poor supply; waters stock in sloughs in winter several dry holes up to 50 feet deep.
6	SE.	5	"	"	"	Bored	42	2,190	- 39	2,151			Glacial sand	Hard		D	Poor supply; a shallow seepage well is used for stock.
7	SW.	6	"	"	"	Dug	26	2,190	- 20	2,170			Glacial sand	Hard		D	Stock are watered at sloughs.
8	NE.	10	"	"	"	Dug	15	2,250	- 3	2,247	3	2,247	Glacial gravel	Hard,"alkaline"		D	Sloughs and seepage wells used for stock; ice melted for house use in winter.
9	NW.	10	"	"	"	Dug	6	2,230	0	2,230			Glacial sand	Hard		D	Stock are watered at lakes and sloughs.
10	SE.	11	"	"	"	Drilled	125	2,220	- 90	2,130	117	2,103	Glacial white snad	Hard,iron		D, S	Village well of Leross; plenty of water; an 18-foot well also used.
11	NE.	11	"	"	"	Dug	20	2,205	0	2,205			Glacial drift	Hard,iron		S	Intermittent supply; hauls water and melts snow; several shallow dry holes.
12	SW.	12	"	"	"	Dug	12	2,220	- 6	2,214	6	2,214	Glacial sand	Hard,"alkaline"		D, S	Another similar well also used; sufficient supply.
13	NW.	12	"	"	"	Dug	15	2,215	- 7	2,208	7	2,208	Glacial gravel	Soft		D, S	Sufficient supply.
1	SE.	2	27A	15	2	Drilled	257	2,190	- 87	2,103	257	1,933	Glacial fine sand	Hard,iron		N	Wells is not used although analyst reports water suitable for stock; shallow well used for all purposes.
2	NE.	3	"	"	"	Dug	10	2,205	- 5	2,200			Glacial fine sand	Hard,very "alkaline"		N	Water is unusable; hauls water.
3	NW.	3	"	"	"	Dug	12	2,205	- 8	2,197	8	2,197	Glacial sand	Soft		D, S	Sufficient supply.
4	SE.	4	"	"	"	Bored	60	2,200	- 40	2,160	60	2,140	Gla cial sand	Hard		D, S	Abundant supply.
5	NE.	4	"	"	"	Dug	9	2,200	- 6	2,194	6	2,194	Glacial sand	Soft		D, S	Sufficient supply.
6	SE.	5	"	"	"	Dug	10	2,190	- 7	2,183			Glacial drift	Hard		D	Insufficient supply.
7	SW.	5	"	"	"	Dug	8	2,200	- 5	2,195	5	2,195	Glacial sand and gravel	Hard		D, S	Good supply.
8	NE.	6	"	"	"	Dug	12	2,200	- 10	2,190			Glacial drift	Hard,"alkaline"		D, S	Well becomes dry in winter.
9	SE.	9	"	"	"	Dug	15	2,200	- 11	2,189	11	2,189	Glacial sand	Soft		D, S	Sufficient supply.
10	NW.	10	"	"	"	Dug	50	2,200	- 45	2,155	40	2,160	Glacial sand	Hard		D	Sufficient for house use only; an 18-foot well is used for stock.
11	NE.	10	"	"	"	Dug	12	2,190	- 7	2,183			Glacial gravel	Hard		D, S	Sufficient supply.
12	SW.	12	"	"	"	Dug	22	2,200	- 16	2,184			Glacial sand	Hard		D, S	Insufficient for stock needs.
13	NW.	12	"	"	"	Dug	14	2,200	- 9	2,191	10	2,190	Glacial gravel	Soft		D, S	One of two similar wells; sufficient supply.
1	NW.	1	27	13	2	Bored	48	2,195	- 10	2,185	48	2,147	Glacial sand	Hard		D, S	Abundant supply.
2	SW.	2	"	"	"	Bored	60	2,208	- 40	2,168	60	2,148	Glacial sand	Hard,iron		D, S	Abundant supply.
3	NW.	2	"	"	"	Bored	55	2,220	- 48	2,172	48	2,172	Glacial sand	Hard,iron		D, S	Plenty of 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 KELLROSS NO. 247, SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
4	NW.	6	27	13	2	Bored	80	2,245	- 78	2,167			Glacial drift	Hard,iron, "alkaline"		S	Poor supply; a 14-foot well is used for domestic purposes.
5	SW.	7	"	"	"	Dug	20	2,245	- 16	2,229			Glacial drift	Hard,iron		D, S	Poor supply; a 15-foot seepage well is used for stock.
6	SW.	10	"	"	"	Bored	93	2,212	- 30	2,182	93	2,119	Glacial gravel	Hard		D, S	Abundant supply.
7	NW.	10	"	"	"	Bored	64	2,218	- 30	2,188	64	2,154	Glacial sand	Hard,iron, "alkaline".		S	Good supply for 40 head stock.
8	SE.	10	"	"	"	Bored	70	2,208					Glacial drift				The deepest of three dry holes.
9	NE.	10	"	"	"	Dug	50	2,222	- 46	2,176	46	2,176	Glacial sand	Hard,iron, "alkaline"		D, S	Insufficient supply.
10	SE.	11	"	"	"	Bored	60	2,210	- 30	2,180	60	2,150	Glacial sand	Hard,iron		D	Good supply, but water has an unpleasant taste.
11	SW.	12	"	"	"	Bored	50	2,190	- 42	2,148	49	2,141	Glacial sand	Hard,iron		D, S	Sufficient for 20 head stock.
12	SE.	12	"	"	"	Bored	45	2,190	- 25	2,165	45	2,145	Glacial sand	Hard		D, S	Constant supply.
13	SW.	14	"	"	"	Bored	49	2,208	- 37	2,171	49	2,159	Glacial sand	Hard,iron		D, S	Abundant supply; another 52-foot well yields a good supply.
14	NW.	14	"	"	"	Dug	40	2,210					Glacial sand	Hard,"alkaline"		D, S	Sufficient for 25 head stock.
15	SE.	15	"	"	"	Dug & Bored	60	2,215	- 38	2,177			Glacial sand	Hard		D	Insufficient supply.
16	NE.	16	"	"	"	Dug	40	2,220	- 34	2,186			Glacial sand	Hard		D	Poor supply; waters stock at a lake.
17	SW.	16	"	"	"	Dug	20	2,220	- 15	2,205			Glacial sand	Hard		D, S	Sufficient for 30 head stock.
18	NE.	18	"	"	"	Dug	12	2,230					Glacial drift	Hard		D, S	Intermittent supply.
19	SW.	18	"	"	"	Bored	54	2,235	- 24	2,211	54	2,181	Glacial sand	Hard,iron, "alkaline"		D, S	Plenty of water.
20	NW.	18	"	"	"	Bored	54	2,235	- 24	2,211	54	2,181	Glacial sand	Hard,iron, "alkaline"		D, S	Sufficient supply.
21	NW.	20	"	"	"	Bored	74	2,230	- 70	2,160			Glacial drift	Hard		D, S	Poor supply; also uses a 35-foot well that yields "alkaline" water.
22	NE.	20	"	"	"	Bored	55	2,230	- 35	2,195	55	2,175	Glacial gravel	Hard,iron		D, S	Good supply for 30 head stock.
23	NE.	21	"	"	"	Bored	40	2,221	- 20	2,201	40	2,181	Glacial sand	Hard,iron		D, S	Sufficient supply.
24	NW.	22	"	"	"	Bored	56	2,220	- 50	2,170	50	2,170	Glacial sand	Hard,iron		D	Insufficient supply; several dry holes to a maximum depth of 70 feet.
25	SE.	22	"	"	"	Bored	50	2,206	- 20	2,186	50	2,156	Glacial sand	Hard		D, S	Sufficient and constant supply.
26	NE.	22	"	"	"	Dug	50	2,210	- 30	2,180	50	2,160	Glacial sand	Hard		D, S	Good supply.
27	SE.	27	"	"	"	Drilled	100	2,215	- 20	2,195	100	2,115	Glacial sand ?	Hard,iron		D, S	Abundant supply.
28	SE.	28	"	"	"	Dug	45	2,225	- 31	2,194	45	2,180	Glacial sand	Hard,iron		D, S	Good supply for 35 head stock.
29	NE.	28	"	"	"	Bored	49	2,232	- 37	2,195	49	2,183	Glacial fine sand	Hard,iron		D, S	Sufficient for at least 30 head stock.
30	SW.	28	"	"	"	Bored	58	2,230	- 38	2,192	58	2,172	Glacial drift	Hard		D, S	Sufficient for 35 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 KELLROSS NO.247, 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	SE.	30	27	13	2	Dug	7	2,232	- 5	2,227			Glacial fine sand	Hard		D	Intermittent supply.
32	NE.	30	"	"	"	Dug	6	2,210	- 4	2,206			Glacial drift	Hard		D	Sufficient supply.
33	NW.	30	"	"	"	Bored	30	2,240	- 26	2,214	26	2,214	Glacial sand	Hard, "alkaline"		D, S	Plenty of water.
34	NW.	32	"	"	"	Dug	8	2,220	- 4	2,216			Glacial drift	Hard, "alkaline"		D, S	Sufficient supply.
35	NE.	33	"	"	"	Dug	27	2,220	0	2,220			Glacial sand	Hard, "alkaline"		D, S	Insufficient supply in winter.
36	SW.	34	"	"	"	Dug	32	2,215	- 22	2,193			Glacial drift	Hard, iron		D, S	Sufficient and constant supply.
37	SE.	34	"	"	"	Bored	22	2,205	- 20	2,185	20	2,185	Glacial sand	Hard, "alkaline"		N	Intermittent supply.
38	NW.	35	"	"	"	Dug	35	2,200	- 20	2,180	30	2,170	Glacial sand	Hard, "alkaline"		S	Intermittent supply.
39	SE.	35	"	"	"	Bored	44	2,190	- 14	2,176	44	2,146	Glacial sand	Hard, iron, "alkaline"		D, S	Good supply.
40	NE.	35	"	"	"	Dug	14	2,190	- 6	2,184	6	2,184	Glacial sand	Hard		D, S	Plenty of water.
41	NE.	36	"	"	"	Bored	80	2,180	- 25	2,155	80	2,100	Glacial sand	Hard, iron		D, S	Sufficient for at least 25 head stock.
1	SW.	1	27	14	2	Bored	145	2,240					Glacial drift				Dry hole; another dry hole 120 feet deep; sloughs used for stock and seepage well used for the house.
2	SW.	2	"	"	"	Dug	14	2,260	- 12	2,248			Glacial drift	Hard		D	Intermittent supply; sloughs are used for stock.
3	NW.	5	"	"	"	Dug	6	2,200	- 4	2,196			Glacial sand	Hard, "alkaline"		D	Intermittent supply.
4	NW.	6	"	"	"	Dug	24	2,210	- 17	2,193			Glacial sand	Hard, "alkaline"		D, S	Village well of Lestock; #a 40-foot well also yields a good supply of water. #
5	NW.	6	"	"	"	Dug	15	2,210	- 5	2,205			Glacial sand	Hard, "alkaline"		D, S	Another well in Lestock; a 90-foot well yielded water unfit for use. #
6	NE.	7	"	"	"	Dug	10	2,200	- 3	2,197			Glacial sand	Hard, iron, "alkaline"		D, S	Sufficient supply.
7	SE.	10	"	"	"	Dug	10	2,245	0	2,245			Glacial sand	Hard		D	Intermittent supply; a spring that yields hard "alkaline" water is used in winter.
8	NE.	10	"	"	"	Dug	14	2,250	0	2,250			Glacial sand	Hard, "alkaline"		D, S	Intermittent supply; one bored dry hole.
9	SE.	12	"	"	"	Dug	14	2,232	- 11	2,221	11	2,221	Glacial sand	Hard		D, S	Sufficient supply; several other shallow wells yield "alkaline" water.
10	NE.	12	"	"	"	Dug	26	2,235	- 24	2,211			Glacial sand	Hard		D	Intermittent supply.
11	NE.	13	"	"	"	Dug	12	2,225	- 10	2,215			Glacial sand	Hard, iron, "alkaline"		D	Poor and insufficient supply, especially in winter.
12	NW.	13	"	"	"	Dug	15	2,235	0	2,235			Glacial drift	Hard, "alkaline"		N	Slough seepage well.
13	SE.	14	"	"	"	Dug	10	2,220	0	2,220			Glacial drift	Hard		D	Uses slough for stock.
14	NW.	14	"	"	"	Dug	14	2,228	0	2,228			Glacial drift	Hard, iron, "alkaline"		S	Well is dry in winter; stock refuse slough water; an 8-foot well is used for the house in summer.
15	SE.	15	"	"	"	Dug	18	2,232	- 2	2,230			Glacial sandy clay	Hard, "alkaline"		D, S	Poor and insufficient 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 KELLROSS NO.247, 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
16	NE.	15	27	14	2	Dug	15	2,250	0	2,250			Glacial drift	Hard,iron		D, S	Poor supply.
17	NW.	17	"	"	"	Dug	15	2,210	- 13	2,197			Glacial drift	Hard,"alkaline"		D	Intermittent supply.
18	NE.	18	"	"	"	Dug	16	2,220	- 8	2,212			Glacial sand	Hard		D, S	Abundant supply.
19	NE.	19	"	"	"	Dug	12	2,210	- 10	2,200	10	2,200	Glacial sand	Hard,iron, "alkaline"		D, S	Intermittent supply.
20	NW.	20	"	"	"	Bored	70	2,239					Glacial drift				Dry hole.
21	SW.	22	"	"	"	Dug	8	2,250	0	2,250			Glacial drift	Hard,iron		D	Insufficient supply in winter.
22	NE.	22	"	"	"	Bored	80	2,250	- 50	2,200	75	2,175	Glacial sand	Hard,iron		D, S	Sufficient for 150 head stock.
23	NW.	23	"	"	"	Bored	63	2,255	- 43	2,212	60	2,195	Glacial sand	Hard,iron		D, S	Abundant supply.
24	SW.	24	"	"	"	Bored	100	2,260					Glacial drift				Dry hole; a 14-foot seepage well is used in summer.
25	NW.	24	"	"	"	Dug	16	2,255					Glacial drift	Hard,iron		D, S	Sufficient for a few head stock.
26	SE.	24	"	"	"	Dug	12	2,240	- 8	2,232	8	2,232	Glacial gravel	Hard,"alkaline"		D	Insufficient supply; one 50-foot dry test hole
27	NE.	25	"	"	"	Dug	56	2,240	- 20	2,220	56	2,184	Glacial sand ?	Hard,"alkaline"		D, S	Sufficient for 60 head stock.
28	NE.	30	"	"	"	Dug	51	2,225	- 41	2,184	51	2,174	Glacial sand	Hard,"alkaline"		D, S	Good supply, but analyst reported water unfit for human use; a 10-foot seepage well used for drinking water.
29	NW.	30	"	"	"	Dug	50	2,220	- 40	2,180			Glacial drift	Hard,iron		D, S	Poor supply; a 22-foot well is also used.
30	SE.	33	"	"	"	Dug	35	2,250	- 29	2,221			Glacial sand	Hard,iron		D, S	Sufficient supply.
31	SW.	34	"	"	"	Dug	24	2,240	- 12	2,228			Glacial sand	Hard,iron		S	Sufficient for 50 head stock; a 35-foot well yields sufficient water for house use.
1	NE.	20	27	15	2	Bored	70	2,165	- 40	2,125	70	2,095	Glacial sand	Hard,iron		D, S	Sufficient for house use only.
2	NE.	21	"	"	"	Dug	6	2,175	- 4	2,171			Glacial drift	Hard		D, S	Poor supply.
3	SW.	22	"	"	"	Bored	60	2,190	- 40	2,150	59	2,131	Glacial sand	Hard,"alkaline"		S	Good and constant supply.
4	NW.	22	"	"	"	Dug	6	2,165	- 3	2,162			Glacial drift	Hard		D, S	Sufficient supply.
5	SE.	22	"	"	"	Dug	8	2,180	- 6	2,174			Glacial drift	Hard,"alkaline"		D, S	Sufficient for house use only.
6	SW.	26	"	"	"	Bored	75	2,210					Glacial drift				Dry hole.
7	SW.	27	"	"	"	Dug	12	2,190	- 6	2,184			Glacial drift	Hard		D, S	Intermittent supply.
8	SE.	28	"	"	"	Dug	12	2,200	- 5	2,195			Glacial drift	Soft		D, S	Insufficient supply in winter.
9	SW.	31	"	"	"	Dug	25	2,150	- 23	2,127			Glacial gravel	Hard		D, S	Sufficient for house use only.
10	NE.	31	"	"	"	Bored	50	2,150	- 43	2,107			Glacial sand	Hard		D, S	Poor supply.
11	SE.	32	"	"	"	Dug	12	2,160	- 7	2,153			Glacial drift	Hard		D, S	Slough seepage well; poor supply.
12	NE.	36	"	"	"	Bored	50	2,215	- 25	2,190	48	2,167	Glacial sand	Hard,"alkaline"		D, S	Constant and 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.