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DEPARTMENT OF MINES
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GEOLOGICAL SURVEY OF CANADA
WATER SUPPLY PAPER No. 172

PRELIMINARY REPORT
GROUND-WATER RESOURCES
OF THE
RURAL MUNICIPALITY OF MIRY CREEK
NO. 229
SASKATCHEWAN

By
B. R. MacKay, H. H. Beach and R. Johnson



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DEPARTMENT OF MINES
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GEOLOGICAL SURVEY

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GROUND WATER RESOURCES OF THE RURAL MUNICIPALITY
OF MIRY CREEK, NO. 229
SASKATCHEWAN

INTRODUCTION

Lack of rainfall during the years 1930 to 1934 over a large part of the Prairie Provinces brought about an acute shortage both in the larger supplies of surface water used for irrigation and the smaller supplies of ground water required for domestic purposes and for stock. In an effort to relieve the serious situation the Geological Survey began an extensive study of the problem from the standpoint of domestic uses and stock raising. During the field season of 1935 an area of 80,000 square miles, comprising all that part of Saskatchewan south of the north boundary of township 32, was systematically examined, records of approximately 60,000 wells were obtained, and 720 samples of water were collected for analyses. The facts obtained have been classified and the information pertaining to any well is readily accessible. The examination of so large an area and the interpretation of the data collected were possible because the bedrock geology and the Pleistocene deposits had been studied previously by McLearn, Warren, Rose, Stansfield, Wickenden, Russell, and others of the Geological Survey. The Department of Natural Resources of Saskatchewan and local well drillers assisted considerably in supplying several hundred well records. The base maps used were supplied by the Topographical Surveys Branch of the Department of the Interior.

Publication of Results

The essential information pertaining to the ground water conditions is being published in reports, one being issued for each municipality. Copies of these reports are being sent to the secretary treasurers of the municipalities and to certain Provincial and Federal Departments, where they can be consulted by residents of the municipalities or by other persons, or they may be obtained by writing direct to the Director, Bureau of Economic Geology, Department of Mines, Ottawa. Should anyone require more detailed information than that contained in the reports such additional information as the Geological Survey possesses can be obtained on application to the director. In making such request the applicant should indicate the exact location of the area by giving the quarter section, township, range, and meridian concerning which further information is desired.

The reports are written principally for farm residents, municipal bodies, and well drillers who are either planning to sink new wells or to deepen existing wells. Technical terms used in the reports are defined in the glossary,

How to Use the Report

Anyone desiring information about ground water in any particular locality should read first the part dealing with the municipality as a whole in order to understand more fully the part of the report that deals with the place in which he is interested. At the same time he should study the two figures accompanying the report. Figure 1 shows the surface and bedrock geology as related to the ground water supply, and Figure 2 shows the relief and the location and type of water wells. Relief is shown by lines of equal elevation called "contours". The elevation above sea-level

is given on some or all of the contour lines on the figure.

If one intends to sink a well and wishes to find the approximate depth to a water-bearing horizon, he must learn: (1) the elevation of the site, and (2) the probable elevation of the water-bearing bed. The elevation of the well site is obtained by marking its position on the map, Figure 2, and estimating its elevation with respect to the two contour lines between which it lies and whose elevations are given on the figure. Where contour lines are not shown on the figure, the elevations of adjacent wells as indicated in the Table of Well Records accompanying each report can be used. The approximate elevation of the water-bearing horizon at the well-site can be obtained from the Table of Well Records by noting the elevation of the water-bearing horizon in surrounding wells and by estimating from these known elevations its elevation at the well-site.¹ If the water-bearing horizon is in bedrock the depth to water can be estimated fairly accurately in this way. If the water-bearing horizon is in unconsolidated deposits such as gravel, sand, clay, or glacial debris, however, the estimated elevation is less reliable, because the water-bearing horizon may be inclined, or may be in lenses or in sand beds which may lie at various horizons and may be of small lateral extent. In calculating the depth to water, care should be taken that the water-bearing horizons selected from the Table of Well Records be all in the same geological horizon either in the glacial drift or in the bedrock. From the data in the Table

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

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

GLOSSARY OF TERMS USED

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

WATER-BEARING HORIZONS OF THE MUNICIPALITY

The rural municipality of Miry Creek covers an area of approximately 468 square miles in the western part of southern Saskatchewan. It consists of tps. 19, 20, 21, and 22, ranges 19, 20, and 21, and the parts of tp. 23, ranges 19, 20, and 21, lying south of South Saskatchewan river, all W. 3rd mer. The centre of the area lies approximately 56 miles east of the Alberta boundary (Fourth meridian) and 50 miles northwest of the city of Swift Current. The Lemsford Section of the Canadian Pacific railway extends through the central part of the municipality in a north-westerly direction from the northeast corner of tp. 19, range 19, to section 30, tp. 21, range 21. The villages of Shackleton, Abbey, and Lancer are located on this railway within the boundaries of the area. South Saskatchewan river, flowing in an easterly direction, forms the northern border of the municipality. The elevation of the river, in the northeast corner, is approximately 1,820 feet above sea-level. The river valley is narrow and steep-sided in the western part of the area, but widens out to form broad flats in the central and eastern parts. A gently rolling upland extends south from the valley and rises from an elevation of approximately 1,950 feet at the valley edge to 2,050 feet at the base of a steep escarpment that extends in a northwest-southeasterly direction from the northeast corner of township 19, range 19, to South Saskatchewan river valley in the northwest corner of the municipality. The surface rises abruptly some 150 to 200 feet along the escarpment to the level of the upland extending over the southwestern half of the municipality. The upland rises gradually to the southwest from an average elevation of 2,200 feet, along the top of the escarpment, to slightly more than 2,300 feet in the extreme southwest corner of the municipality.

Spring creek, having its source in springs occurring along the escarpment in the northern part of township 21, range 21, and the southern part of township 22, range 21, flows easterly in a narrow, steep-sided valley across the lowland plain. Miry creek, similarly fed by springs along the escarpment in the southern part of tp. 20, range 19, flows northward to the northwest corner of sec. 22, tp. 21, range 19, where it is joined by Spring creek, which then flows eastward to empty into Saskatchewan river in the adjoining municipality. Both of these creeks flow throughout the year.

A range of low sand hills covers a large area in the northeastern part of the lowland, and two smaller areas of sand hills occur along the southern part of the western boundary of the municipality.

Throughout the southwestern upland adequate supplies of ground water are found by sinking wells in the glacial drift or down into the underlying Bearpaw and Belly River bedrock formations. In the northeastern lowland, however, both the glacial drift and the bedrock are largely barren of water and many of the wells are dry. Only in the sand hill areas are adequate supplies assured at shallow depths. Residents of this area who have been unable to obtain water from wells haul their household supplies from the springs along the escarpment or from wells in the sand hills, and obtain water for stock from Spring creek and Miry creek. Some residents have constructed small dams to conserve the run-off in spring and others have excavated dugouts to provide water for stock. South Saskatchewan river provides water for range stock pasturing in its valley, and, if necessary, the water could be used for domestic purposes. The danger of pollution, however, is always present where water for household use is derived from surface water sources.

Water-bearing Horizons in the Unconsolidated Deposits

The unconsolidated deposits are between 100 and 200 feet thick over most of the municipality except along the steep sides of the escarpment, and South Saskatchewan River valley where they are usually less than 50 feet thick. Exposures of bedrock occur along the sides of the branches of Miry Creek valley at the foot of the escarpment in township 20, range 19. The areal distribution of the different types of Recent and glacial sediments that compose the unconsolidated deposits is indicated on the accompanying map (Figure 1).

The deposition of the different types of deposits presumably occurred in the following manner.

During the advance of the great ice-sheet that many thousands of years ago covered the province of Saskatchewan, a thick layer of glacial drift composed mostly of boulder clay was laid down on the eroded surface of the bedrock throughout the municipality. With the retreat of the ice additional deposits of glacial drift were laid down to form boulder clay or till plains. Water from the melting ice gradually accumulated to form a large lake that extended over the entire municipality. Fine sediments carried into the central part of the lake basin gradually accumulated to form a layer of lake clay that extends over much of the municipality. Along the margins of the lake the sediments introduced were coarser and hence along the southern part of the western border and along the northern part of the municipality the lake deposits are largely sands. After the disappearance of the lake the action of the winds upon the sands has gradually formed them into the dunes that characterize the sand hills areas. These sand hills cover a large region in the northeastern townships and smaller areas in township 20, range 21, and in the extreme southwest corner. Erosion along the steep slopes of the escarpment has removed the lake clay, so that the boulder clay is exposed. The boulder clay is also exposed in isolated areas along the southern boundary of the municipality.

Supplies of soft or only moderately hard water can generally be obtained at shallow depths in the sand-covered areas. In such areas there is very little run-off of surface water, and it readily percolates downward to collect at the base of the sand at places where the more impervious underlying boulder clay forms basins, or the water may even reach localized pockets of sand and gravel interspersed in the upper part of the boulder clay. In the sand hills in the northeastern part of the municipality little difficulty has been experienced in obtaining adequate supplies of water for range stock by sinking shallow wells in the sand. In the southwestern part of the municipality the lake deposits consist mostly of sandy clays which are less porous than those found in the northeastern sections, and the supplies of water available at shallow depths are for the most part small. These wells are, in many places, used only to provide domestic supplies and deeper wells are required to satisfy stock requirements.

The lake clay covering the remainder of the municipality is usually too compact and impervious to yield water, and it tends to prevent the seepage of surface water into the pockets of sand and gravel in the underlying boulder clay. In the upland a few residents have obtained small supplies of water at depths of 40 feet or less from pockets of sand and gravel in the upper part of the boulder clay underlying the lake clay. These supplies are usually barely sufficient for household use and a few head of stock, and as larger supplies are generally available at greater depths, the sinking of a large number of test holes to locate productive pockets at shallow depths is seldom advisable, except where water from the deeper wells is too highly mineralized for domestic use. Throughout a large area in the clay-covered flats adjacent to Spring and Miry creeks in the lowland, very little hope is held of obtaining even small seepages of water at shallow depths from either the compact glacial lake clay or from the upper part of the underlying

boulder clay. In areas where the boulder clay is exposed at the surface along escarpments and in the uplands in the extreme northwestern corner of the municipality, the possibilities of obtaining water at shallow depths are much better. However, most of this land is rugged and uninhabited, and few wells have been sunk. Water-bearing gravels are of common occurrence at shallow depths along the foot of the escarpment and in many places yield adequate supplies of hard, highly mineralized water, for residents in this vicinity.

Wells between 50 and 230 feet deep tapping beds or pockets of sands and gravels in the lower part of the glacial drift provide most of the ground water used in the southwestern upland areas. These water-bearing beds are usually reached at elevations between 2,190 and 2,100 feet above sea-level, and are believed to lie at or near the contact of the glacial drift and the underlying Bearpaw bedrock formation. The contact probably dips in a northeasterly direction toward the escarpment, where springs at elevations between 2,065 and 2,000 feet are believed to mark the northern boundary of this horizon in the lower part of the drift. In only a few places have wells tapping this horizon failed to yield adequate supplies of water for local farm requirements. The water is usually hard, iron-bearing, and highly mineralized, but although it is in several places unfit for domestic use it can be used for stock.

Northeast of the escarpment, several wells have been sunk through the glacial drift without encountering any appreciable supply of water. Dry sands and gravels were reported to have been encountered in some of these wells at depths between 100 and 150 feet. The absence of water in these porous beds may be due to the impervious layer of lake and boulder clays that overlies them, preventing the downward percolation of the water. In the extreme northwestern corner of the lowland, in township 23, range 21, a few

residents have obtained adequate supplies of hard, highly mineralized water, fit only for stock, from sands and gravels in the lower part of the drift at depths between 135 and 180 feet. The area in which water can be obtained from this horizon is probably confined to a small area in this part of the municipality.

Water-bearing Horizons in the Bedrock

Deep, drilled wells in this municipality have penetrated four distinct bedrock formations. They are, in descending order, the Bearpaw, Belly River, Lea Park, and Alberta formations. These formations were presumably all laid down uniformly over the region, but erosion prior to the deposition of the glacial drift removed all of the Bearpaw formation in the lowland area northeast of the escarpment, and there the Belly River formation immediately underlies the glacial drift.

The Bearpaw formation is between 150 and 250 feet thick in the upland area. The compact, dark grey marine shales that comprise most of the formation will yield only small seepages of highly mineralized water. However, in a few places localized beds of sand have been encountered in the formation and yield fairly large supplies of hard, highly mineralized water.

In the southern part of the municipality wells between 207 and 254 feet deep, in secs. 5, 17, and 28, tp. 19, range 19, and sec. 23, tp. 19, range 21, have penetrated water-bearing sands in the Bearpaw at elevations between 2,090 and 2,046 feet. These sand beds are not considered to be continuous, as other wells in the vicinity have been drilled to lower elevations without encountering any appreciable supply of water at this horizon.

A 269-foot well in the village of Lancer in sec. 20, tp. 21, range 21, and a 220-foot well in section 28 of the same township (originally drilled to a depth of 2,222 feet) are drawing their supplies from sands considered to be in the Bearpaw formation

at elevations of 1,968 and 1,974 feet. Three wells in secs. 9, 10, and 17, tp. 20, range 20, 354, 386, and 350 feet deep, respectively, draw their supplies from sands at elevations of 1,976, 1,909, and 1,968 feet, respectively. The contact between the Bearpaw and the Belly River formations occurs near this level and the above sands may be part of the Belly River formation.

This latter formation underlies the Bearpaw at elevations of approximately 1,950 to 1,900 feet in this municipality, and extends down to elevations near 1,500 feet where it rests upon the dark, compact shales of the underlying Lea Park formation. The Belly River formation is composed largely of beds of sand and sandstone interspersed with light-coloured shales and occasional seams of coal. Throughout the upland area in the southwestern half of the township, wells between 350 and 600 feet deep yield fairly large supplies of water from the sand beds of this formation. Most of the waters are hard and iron-bearing, but a few wells yield soft, soda-bearing waters. All the waters derived from this source in this municipality are drinkable. In the lowland, near the base of the escarpment, wells have been sunk through this formation without encountering any appreciable supply of water. The reason for the absence of water in the sand beds of the formation in this area is not definitely known, but may be due to the imperviousness of the overlying glacial lake and boulder clays that prevent the downward percolation of water, although such an effect by sediments of this character was not noted in the upland.

The Lea Park formation that underlies the Belly River formation below an approximate elevation of 1,500 feet is over 1,000 feet thick in this area, and is chiefly composed of compact shales from which no water can be expected. Wells between 600 and 1,011 feet deep in township 21, range 19, have penetrated from 200 to 600 feet into this formation without encountering water. However, an 800-foot well in township 22, range 21, yields a very small

supply of soft, soda-bearing water, from an aquifer in this formation at an approximate elevation of 1,195 feet. The water in this well is reported to have been under sufficient hydrostatic pressure to rise above the surface, but in 1933 even by use of a pump only a small supply of water could be obtained. Drilling into this formation is inadvisable in any part of the municipality.

The Alberta formation that underlies the Lea Park was penetrated in a 2,222-foot hole in sec. 28, tp. 21, range 21. This hole was drilled in prospecting for gas and is at present filled in to a depth of 220 feet and is being used as a water well. The Alberta formation greatly resembles the Lea Park formation in being composed almost entirely of dark grey, compact marine shales. Neither the Lea Park nor the Alberta formations are known to contain any extensive sand beds in this region, so that drilling wells below the base of the Belly River formation cannot be expected to yield an adequate water supply in any part of the municipality.

GROUND WATER CONDITIONS BY TOWNSHIPS

Township 19, Range 19

A thin deposit of glacial lake clay covers most of this township as shown on Figure 1 of the accompanying map. The clay probably does not exceed 10 to 20 feet in thickness over the relatively level plain in the southwestern part of the township, but becomes thinner over the rolling lands in the eastern parts, the boulder clay being exposed at the surface at intervals along the sides of hills and valleys.

Little or no ground water can be obtained from the lake clay. However, in some places scattered pockets of sand and gravel occur interspersed in the upper part of the underlying boulder clay, from which small supplies of hard, drinkable water can be obtained at depths of 30 feet or less. Shallow wells tapping the small, localized pockets of sand and gravel seldom yield sufficient water for farm requirements, but can be used to provide household supplies where the water obtained from deeper wells is too highly mineralized for drinking. Several test holes are usually necessary to locate a water-bearing sand or gravel pocket, and in some localities not even small seepages of water are found at shallow depths. The possibilities of obtaining water at shallow depths are better in the rolling lands in the eastern part of the township than in the nearly level areas in the western part. In the eastern part of the township, wells between 14 and 20 feet deep, in sections 12 and 23, yield adequate supplies of water for farm requirements.

Below depths of 30 feet the boulder clay becomes more compact, and localized pockets of sand and gravel are seldom encountered. In this township, however, fairly extensive beds of sand and gravel occur in the lower part of the glacial drift at or near its contact with the underlying Bearpaw shales. In the western part of the township, these sands and gravels have been encountered

at elevations between 2,195 and 2,130 feet in wells sunk to depths ranging between 44 and 180 feet, depending on the surface elevation of the well site. On section 13 in the lowland along the eastern boundary this horizon was penetrated at elevations of 2,128 and 2,086 feet in wells 60 and 72 feet deep.

Fairly large supplies of water are being obtained from some of the wells tapping the coarse sands and gravels at this contact horizon. However, in some places, very fine sands are encountered which tend to plug the wells and are even too fine to make the use of screens effective. The waters obtained are hard and highly mineralized, but several residents use them for domestic purposes due to the absence of supplies of better quality.

Wells in sections 5, 17, and 28, 254, 207, and 224 feet deep, respectively, are drawing their supplies from sands in the Bearpaw formation. These wells were reported to have penetrated 20 to 50 feet of fine water-bearing sand at elevations between 2,195 and 2,135 feet, probably at the contact between the glacial drift and the Bearpaw shales, below which 50 to 75 feet of shales were penetrated before the water-bearing sands were encountered at elevations between 2,090 and 2,046 feet. The supplies being obtained from the wells on sections 5 and 28 are fairly large, but the 207-foot well in section 7 is practically plugged with sand and consequently yields only a very small supply of water. The waters from these wells are hard and highly mineralized, but those in sections 17 and 28 are being used for drinking. The sands encountered in these wells may form a more or less continuous bed extending over a considerable area in this township. However, wells in sections 19, 22, 23, and 31 have been drilled below the level of this horizon, indicating that the sands were either absent or that the water supplies encountered were unsatisfactory.

The wells on the above sections range in depth between 440 and 560 feet, and draw their supplies from sand beds in

the Belly River formation that underlies the Bearpaw. The elevations at which the water-bearing beds were encountered in these wells vary between 1,842 and 1,705 feet. The Belly River formation is made up chiefly of sandy beds, and water will probably be encountered in the formation at depths ranging between 400 and 600 feet in all parts of the township. However, an 800-foot dry hole in the adjoining township to the northeast may indicate that the formation will be unproductive in the northeastern part of this township.

Township 19, Range 20

With the exception of a small area in sections 1 and 12, where the glacial till is exposed at the surface, the entire township is covered by a thin deposit of glacial lake clay. The lake clay ranges in thickness between 5 and 20 feet and will rarely yield any water. However, scattered pockets of sand and gravel occur in the upper part of the underlying boulder clay, from which many residents are obtaining water supplies at depths not exceeding 40 feet from the surface. The water obtained from the shallow wells is usually hard, but well adapted to household use. In a few places these wells provide adequate supplies of water for all local farm requirements, but on most farms they are used only as a source of domestic supply and the more highly mineralized water from deeper wells is used for stock. The sand and gravel pockets in the upper part of the glacial till are the most probable source of water supplies suitable for household use, and residents are well advised to do considerable prospecting at shallow depths in areas where the water from deeper wells is highly mineralized.

Most of the water being used in this township is obtained from wells sunk down to sand and gravel beds in the lower part of the glacial drift. In the southwestern part of the township wells ranging in depth between 50 and 147 feet have penetrated water-

bearing sands and gravels at elevations between 2,230 and 2,195 feet above sea-level. These sands and gravels may lie at or near the contact of the glacial drift and the underlying Bearpaw shales, but it seems more probable that they are underlain by 30 to 50 feet of boulder clay and that the sands encountered at elevations of 2,163 and 2,155 feet above sea-level in wells 180 and 200 feet deep, on sections 3 and 15, occur at the contact. In the north-eastern half of the township, wells ranging in depth between 90 and 187 feet are drawing their supplies from sand and gravel beds occurring at elevations between 2,200 and 2,120 feet above sea-level. These sands and gravels are probably at or near the contact. In most places the supplies obtained from these beds are adequate for all local requirements. However, a 138-foot well in the NW. $\frac{1}{4}$, section 18, was sunk to an elevation of 2,157 feet and yields only a very small supply of water. The waters obtained are hard, iron-bearing, and highly mineralized, and in several places cannot be used for drinking, although they are suitable for stock.

Wells drilled in sections 15, 33, and 35, 444, 375, and 535 feet deep, yield fairly large supplies of water from sand beds in the Belly River formation that underlies the Bearpaw. The 375-foot well in section 30 draws its supply from a sand bed at an approximate elevation of 1,940 feet. This sand bed is thought to be near the contact of the Belly River and Bearpaw formations, but may actually be in the Bearpaw. The water from this well is too highly mineralized to be used for drinking, but can be used for stock. The wells in sections 15 and 35 penetrated water-bearing sands at approximate elevations of 1,904 and 1,770 feet, and yield soft soda-bearing waters. The Belly River formation contains many sandy beds, and although continuous water-bearing beds probably do not occur in the formation water will probably be obtained from it at depths between 400 and 600 feet in all parts of this township.

Township 19, Range 21

The entire township is covered by a thin layer of glacial lake deposits varying in thickness between 5 and 20 feet. These lake deposits consist mostly of sand grading into clay in a narrow strip extending along the eastern boundary of the township. In the southwestern corner the sandy lake deposits have been reworked by wind action to form a small area of sand dunes. The lake deposits are underlain by bluish grey boulder clay.

Shallow wells 35 feet or less deep, sunk in depressions and valleys and near sloughs, in many places yield small supplies of soft or only moderately hard water from lake sand and sandy clay, or from scattered pockets of sand or gravel occurring interspersed in the upper part of the underlying boulder clay. The supplies available from the shallow wells are rarely adequate for local stock requirements, but will provide for household needs.

Fairly extensive beds of sand and gravel occur at greater depths in the glacial drift and yield ample supplies of hard, highly mineralized water for stock. Wells sunk to depths between 40 and 90 feet have penetrated these water-bearing sands and gravels at elevations between 2,280 and 2,210 feet above sea-level. These sands and gravels probably do not form continuous beds under the entire township, but such beds are probably sufficiently numerous to ensure water being found in most parts of the township. Should this horizon not be productive or the supplies obtained insufficient for stock requirements, water-bearing beds will probably be encountered at greater depth at or near the contact between the glacial drift and the underlying Bearpaw shale. Wells, in sections 3, 9, 18, 35, and 36, between 105 and 160 feet deep, are drawing their supplies from sand and gravel occurring at elevations between 2,190 and 2,140 feet, near the base of the glacial drift. These wells yield adequate supplies of water for local requirements. The waters obtained from wells over 40 feet

deep in the glacial drift are as a rule hard, iron-bearing, and highly mineralized, but can be used for stock. Only a few of these waters are suitable for drinking.

A 272-foot well in section 23 yields a large supply of hard, iron-bearing, highly mineralized water from a sand bed encountered at an approximate elevation of 2,048 feet in the Boarpaw formation. The areal extent of this water-bearing bed is not known, but water might be obtained from it at depths between 250 and 300 feet, in at least the adjoining sections.

The most probable source of large supplies of water in deep, drilled wells is in the sandy beds of the Belly River formation at depths generally between 400 and 600 feet. The water obtained from this formation varies in character from soft and soda-bearing, to hard and iron-bearing, but is expected to be drinkable.

Township 20, Range 19

Most residents in the eastern part of the township obtain water supplies from Miry creek or from springs issuing from the banks along its course. In the western part of the township water supplies are obtained from wells, but a few residents living close to the creek haul water from it. Small dams and dugouts are used extensively to provide water for stock.

The greater part of this township is covered by a thin deposit of glacial lake clay. Throughout the lowland plain in the northeastern part of the township the lake clay ranges from 10 to 30 feet in thickness, but along the escarpment separating the lowland from the rolling upland in the southwestern part of the township, the glacial lake clay, in many places, is absent, and the boulder clay is at the surface. The glacial lake clay is quite impervious and water can rarely be obtained from it. In some places, however, localized pockets of sand and gravel occur interspersed in the upper part of the underlying boulder clay,

from which small supplies of hard, drinkable water can be obtained at depths of less than 35 feet. In the northeastern lowlands the layer of impervious lake clay usually prevents the seepage of surface water into the porous pockets of the underlying boulder clay, so that shallow wells rarely yield even sufficient water for household requirements. In the rolling uplands in the southwestern part of the township productive pockets of sand and gravel have been located at depths of less than 35 feet, and yield sufficient water for household use, whereas the shallow wells in the NE. $\frac{1}{4}$, section 19, the SE. $\frac{1}{4}$, section 31, and the SW. $\frac{1}{4}$, section 33, yield supplies of water that are ample for all farm requirements.

The glacial drift in this township probably has a maximum thickness of 200 feet on the upland in the southwestern part of the township, but becomes thinner on the slopes leading toward the northeastern lowland, and at several points along the steep sides of the branches of Miry Creek valley bedrock exposures occur. In the northeastern part of the township the combined thickness of the glacial lake clay and the boulder clay may in some places reach 150 feet.

On the upland in the southwestern part of the township sands and gravels have been encountered in the lower part of the glacial drift near its contact with the underlying Bearpaw shale, but they do not as a rule yield adequate supplies of water. A 130-foot well in the SW. $\frac{1}{4}$, section 30, yields a moderately large supply of hard, highly mineralized, but drinkable water from gravel aquifers in the lower part of the glacial drift at an approximate elevation of 2,088 feet. Several other wells, however, have been drilled to depths between 340 and 430 feet, and although sands and gravels were reported to have been penetrated in these wells near the base of the drift at depths between 100 and 200 feet, their water supplies were not considered satisfactory and the wells were continued into the underlying bedrock. The springs along the

tributary branches of Miry creek are believed to be drawing their supplies from the porous beds near this contact, and free drainage of the sands and gravels underlying the upland areas probably prevents accumulation of ground water in these deposits. In the lowland in the northeastern part of the township water-bearing sands were encountered at the base of the glacial drift at elevations of 1,966 and 1,940 feet, in wells 105 and 100 feet deep, in sections 1 and 27. Only small supplies of highly mineralized water were obtained; the water from the well on section 1 is suitable for stock, but that from the well in section 27 was unfit for any farm use.

The Bearpaw formation that underlies the glacial drift throughout the township is more than 200 feet thick in the southwestern upland parts of the township, but in the eastern lowlands does not exceed 150 feet in thickness. This formation is composed mostly of compact, dark-coloured, marine shales from which little or no water can be expected. A 272-foot well in section 12 is reported to be drawing its supply from a sand bed encountered at an approximate elevation of 1,923 feet at a depth of 150 feet. The base of the well is in the Belly River formation at an elevation of 1,801 feet, and water may also be coming from a sand bed at the base.

The Belly River formation, which underlies the Bearpaw below elevations of 1,900 to 1,850 feet in this township, is expected to contain many fairly extensive sandy beds. In the southwestern part of the township several wells have been drilled into this formation and are yielding fairly large supplies of usually hard, iron-bearing water at depths between 340 and 480 feet. The water-bearing beds in this formation are not of large areal extent, but wells sunk to depths between 300 and 500 feet in the southwestern part of the township are almost certain to encounter ample supplies of water. In the lowland in the northeastern part of the township the sand beds of this formation may be

unproductive, as is indicated by an 800-foot dry hole in section 18 of the adjoining township to the east, and a 785-foot dry hole in section 14 of the adjoining township to the north.

Only two wells in the northeastern part of the township are yielding sufficient water for local requirements, and it is doubtful whether adequate supplies will be available at any depth in most localities. In some places, productive pockets of sand and gravel that would yield sufficient water for house use might be located at shallow depths in the drift.

Township 20, Range 20

Glacial lake clay between 5 and 30 feet thick covers most of the township. The lake clay is underlain by glacial drift composed mostly of bluish grey boulder clay. The boulder clay is exposed at the surface over a small area in the northeastern corner of the township, as shown in Figure 1 of the accompanying map, and also at places on the sides of the valleys in the east-central part of the township.

Water can rarely be obtained from the glacial lake clay, but a few localized pockets of sand and gravel probably occur in the upper part of the underlying boulder clay, from which small supplies of hard, drinkable water might be obtained at depths of 30 feet or less. However, the small supplies likely to be obtained at shallow depths do not warrant the sinking of a large number of test holes to locate productive sand or gravel pockets.

Water-bearing sands and gravels in the glacial drift have been encountered in this township at depths between 80 and 150 feet. These beds probably occur at or near the contact of the drift with the underlying Bearpaw shales. In the southern part of the township this horizon is penetrated at elevations between 2,200 and 2,150 feet above sea-level, and in the northern part at elevations between 2,160 and 2,100 feet above sea-level, probably indicating

that the surface of the underlying bedrock slopes northward. Wells in the NE. $\frac{1}{4}$, section 19, the SE. $\frac{1}{4}$, section 31, and the SE. $\frac{1}{4}$, section 34, 243, 204, and 194 feet deep, respectively, tap water-bearing gravels at elevations of 2,037, 2,031, and 2,051 feet respectively. These gravels occur from 70 to 100 feet below the level at which the contact is considered to occur in this area, and hence it may be that the glacial drift in these sections was deposited in narrow pre-glacial stream channels eroded in the surface of the bedrock. In section 13 a 40-foot well is drawing its supply from a gravel aquifer, believed to be at the contact at an approximate elevation of 2,185 feet.

Most residents of the area are obtaining adequate supplies of hard, drinkable water from wells tapping these sands and gravels at the base of the glacial drift. In some places, however, the supplies are small and several wells have been drilled into the underlying bedrock.

The deep wells drilled in this township are drawing their supplies from sand beds in the lower part of the Bearpaw formation and in the Belly River formation. The Bearpaw formation is composed mostly of compact marine shales from which little ground water can be expected. However, wells in the NW. $\frac{1}{4}$, section 9, and the SE. $\frac{1}{4}$, section 17, 354 and 350 feet deep, respectively, are drawing supplies from sand beds, at elevations of 1,976 and 1,968 feet, which may be in the basal part of the Bearpaw. Other wells varying in depths between 365 and 503 feet are drawing supplies from sand beds in the Belly River formation at elevations ranging between 1,930 and 1,775 feet. The individual water-bearing sand beds in this formation do not extend over large areas, but as a large part of the entire formation is composed of sandy beds, water is almost certain to be encountered in it at depths between 350 and 500 feet in this township. The waters obtained from the sand beds in the lower part of the Bearpaw and in the Belly River

formations are hard and iron-bearing, but can be used for drinking. Soda is also commonly contained in the water, particularly supplies derived from the sandy beds of the Belly River formation. The supplies being obtained from the deep drilled wells are usually large, but many residents have experienced difficulty in preventing the fine sands from plugging the wells, and the water itself has an appreciable corrosive action on screens, casings, and pump piping.

A 600-foot well in section 36 reaches considerably deeper into the Belly River formation than do the other bedrock wells of the township. This well yields a large supply of soft water from a sand bed at an approximate elevation of 1,650 feet. No information is available to indicate whether water of similar character will be encountered in wells sunk to similar depths in other parts of the township.

Township 20, Range 21

Glacial lake deposits ranging in thickness between 5 and 30 feet cover the entire township. These deposits are of a sandy character in the western part of the township and grade into clay in the remainder of the area. In the northwestern corner of the township the lake sand has been reworked by wind action to form a small area of sand dunes. The lake sand and clay are underlain by glacial drift, composed mostly of bluish grey boulder clay.

In the sand-covered area in the western part of the township water is being obtained at depths of 40 feet or less in the lake sand, or in localized sand or gravel pockets occurring in the upper part of the underlying boulder clay. Waters obtained from the shallow wells are soft or only moderately hard and are well adapted to household use. In a few places the shallow wells yield more highly mineralized waters, but none is reported to be unfit for drinking. Many residents in the western part of the township are obtaining sufficient water to provide for farm

requirements by sinking one or two of these wells. In some places it has been found necessary to sink wells to greater depths in order to ensure sufficient water for stock. The deeper wells yield hard, highly mineralized waters, so that shallow wells must be depended upon for household supplies.

The lake clay covering the eastern part of the township is too impervious to yield water and also prevent the downward seepage of surface water to the porous pockets in the upper part of the glacial drift. Only very small supplies of water can, therefore, be expected at depths of less than 40 feet in this part of the area. However, localized pockets of sand and gravel might be located at shallow depths, which would yield sufficient water for household use where water from deeper wells is too highly charged with dissolved sulphate salts.

Throughout the entire township wells between 50 and 130 feet in depth can usually be expected to yield ample supplies of water for local requirements from sands and gravels in the lower part of the glacial drift. Most of these water-bearing beds probably occur at or near the contact of the glacial drift and the underlying Bearpaw shales. The contact in this township is believed to be at elevations between 2,200 and 2,150 feet. A 185-foot well in section 10 penetrated water-bearing gravels at an approximate elevation of 2,125 feet, which is slightly lower than the above elevations. The waters obtained from the sands and gravels in the lower part of the glacial drift are, for the most part, hard and iron-bearing, but in only a few places are they too highly mineralized to be used for drinking.

The Bearpaw formation, which underlies the glacial drift throughout the entire township, is composed mostly of compact, dark grey, marine shales that extend down to an approximate elevation of 1,950 feet. The Belly River formation underlies the Bearpaw and is composed mainly of porous beds of sand and sandstone. A 412-foot

well in section 26 yields a large supply of hard, highly mineralized, but drinkable water from a sand aquifer in this formation, at an approximate elevation of 1,913 feet. The individual water-bearing beds occurring in this formation will probably not be of any considerable areal extent, but water is almost certain to be obtained at depths between 350 and 500 feet in all parts of this township.

Township 21, Range 19

Only one well in the township yields an appreciable supply of ground water. All domestic supplies used in the township are hauled from springs located in section 34 of the adjoining township to the south, and in section 5 of the adjoining township to the north. Water for stock is obtained partly from Spring creek and from Miry creek. A few residents conserve surface waters by means of small dams and dugouts to supplement their supplies for stock.

The greater part of the township consists of a lowland plain covered by 10 to 30 feet of compact, glacial lake clay. On the slope of the escarpment, in section 6, in the extreme southeastern corner of the township, and in a small rolling area, in sections 13, 24, and 25, in the east-central part, the clay is absent or very thin and boulder clay is exposed at the surface. Along the northern boundary of the township the lake clay becomes sandy and in some places has been eroded by wind action to form an area of low sand hills.

At least small supplies of drinkable water will probably be available at shallow depths in the sand-covered area in the northern part of the township. In this area, surface waters tend to percolate downward through the porous sands and collect at the base of the glacial lake sand, or in porous pockets of sand and gravel in the upper part of the underlying boulder clay.

Wells dug in valleys and depressions are more likely to be productive than wells dug on knolls and ridges.

The lake clay that covers the greater part of the remainder of the township is too impervious to yield water, and prevents the seepage of water from the surface into the porous pockets of the underlying boulder clay. The possibilities of obtaining even small supplies of water at shallow depths will hardly warrant the sinking of test holes in this area. In section 5 a 20-foot well yields a very small supply of hard, highly mineralized water from a gravel pocket in the glacial drift. In section 20 a well 16 feet deep yields from a sand pocket in the lake clay an adequate supply of highly mineralized water, suitable for stock. Any ground water obtained on this area will probably be too highly mineralized for drinking, as the lake clay is highly charged with sulphate salts, especially in the "alkali" flats in the southwestern corner of the township.

Small supplies of hard, drinkable water might be obtained from sand and gravel pockets at shallow depths along the base of the escarpment in section 6, and in the small area of rolling land in the east-central part of the township. Beds of sand and gravel have been encountered in the lower part of the glacial drift at depths of about 100 feet, but little or no water was present in them.

Some of the above-mentioned wells and others distributed widely through the township have been continued into the underlying bedrock to depths between 100 and 1,011 feet, and no appreciable supply of water has been obtained. Sandy beds were encountered in the Belly River formation at depths between 200 and 500 feet, but these were unproductive. The 785-foot well in section 14, and two wells 600 and 1,011 feet deep, in section 31, have penetrated 200 to 600 feet into the shales of the Lea Park formation. This formation consists of 1,000 feet or more of

compact grey shale in which there is very little probability of water occurring.

It seems advisable in all parts of this township to confine prospecting for ground water to depths of less than 40 feet, although the sand beds of the Bolly River formation might be productive in the southwestern corner of the township at depths of 200 to 500 feet.

Township 21, Range 20

The southwestern part of this township consists of a rolling upland covered by a thin deposit of glacial lake clay. Along an escarpment extending from the southeastern corner of the township to section 19 at the western boundary, the land surface drops sharply some 100 to 150 feet to a lowland plain that extends over the northeastern sections. The plain to the northeast of the escarpment is covered by 10 to 30 feet of compact glacial lake clay that grades into glacial lake sand in the extreme northeastern corner of the township. Spring creek flows in an easterly direction through the northern half of the township.

In the southwestern uplands water supplies are obtained largely from wells, but throughout the northeastern lowlands little or no ground water is available at any depth, and water for stock is obtained from Spring creek. Household supplies are hauled from springs located along the escarpment and in sec. 5, tp. 22, range 19.

The glacial lake clay that covers the southwestern uplands rarely yields water, but localized pockets of sand and gravel interspersed in the upper part of the underlying boulder clay may in some places yield small supplies of hard, drinkable water. The supplies obtained at shallow depths will seldom be sufficient for more than household requirements and a very few head of stock, and do not warrant the sinking of any large number of test holes to locate productive pockets. Shallow wells will

probably be more productive in the area near the escarpment where the lake clay is thin or absent, particularly since the clay is relatively impervious and prevents the downward seepage of surface water into the porous pockets in the underlying drift. Wells between 50 and 100 feet deep on the uplands area have penetrated water-bearing sands and gravels in the lower part of the glacial drift. These sands and gravels occur at elevations between 2,160 and 2,100 feet, and are probably at or near the contact between the glacial drift and the underlying Bearpaw shales. The contact probably dips in a northeasterly direction toward the escarpment where springs occur at this horizon. The waters from these wells are hard and, in some places, highly charged with sulphate salts in solution, but they can generally be used for drinking. The supplies are adequate for local farm requirements. Dry holes, in sections 1 and 2, 84 and 94 feet deep, are down to elevations of approximately 2,160 feet. These wells may not have reached the sands and gravels at the contact which were penetrated in the two 430-foot wells in sections 35 and 36 of the township adjoining to the south at a depth of nearly 150 feet or an elevation of approximately 2,100 feet.

A 229-foot well in section 3 of this township draws its supply from a sand aquifer at an approximate elevation of 2,077 feet. This sand may occur in the Bearpaw formation, but probably occurs in a narrow pre-glacial stream channel, buried under accumulations of drift. Should this water-bearing sand bed be in the Bearpaw formation, it will probably extend over a fairly large area. The most probable source of water available by deep drilling in this area is in the sand beds of the Belly River formation which underlies the Bearpaw.

The Bearpaw formation consists mostly of compact, dark grey, marine shales from which little or no ground water can be obtained. The shales extend down some 200 to 250 feet below

the base of the glacial drift, where they merge into the sandy beds of the Belly River formation at elevations between 1,950 and 1,900 feet. In the adjoining township on the south, large supplies of water have been obtained from sand beds in the Belly River formation at depths ranging from 400 to 600 feet. The waters vary in character from soft to hard and highly mineralized, but are almost always found to be suitable for drinking. Similar supplies will probably be encountered at similar depths in the upland area of this township. .

Throughout most of the lowland plain in the north-eastern part of the township the lake clay is too compact to yield water, and its impervious character prevents the seepage of water into the pockets of sand and gravel in the underlying glacial drift. Little hope is held in this part of the township of obtaining even small seepages of water for household use from shallow wells. Any water obtained would probably be too highly mineralized for domestic use, as the clay is believed to contain relatively large concentrations of sulphate salts, especially in the area of "alkali" flats along the south side of Spring creek.

In section 36, where the lake deposits are of a more sandy nature, a small supply of hard water was obtained at a depth of 10 feet. In this area careful prospecting at depths of 30 feet or less in depressions and valleys should encounter, either in the lake sands or in localized pockets of sand or gravel in the upper weathered zone of the underlying boulder clay, water in sufficient quantities for at least household requirements.

In sections 10, 11, and 21, near the base of the escarpment, adequate supplies of hard, highly mineralized, but drinkable water have been obtained from gravels at depths of 12 to 50 feet. Similar gravel deposits will probably occur at shallow depths at other locations along the foot of the escarpment.

A 120-foot hole was sunk in section 35. This well probably penetrated into the Belly River formation that underlies the glacial drift of this area, the Bearpaw formation being absent or very thin. This well and others sunk to depths between 200 and 1,000 feet in the adjoining township to the east indicate that neither the lower part of the glacial drift nor the Belly River formation are likely to be productive in the lowland parts of this township.

Township 21, Range 21

The greater part of the township consists of a rolling plain covered by 5 to 30 feet of glacial lake clay and sand. These deposits are absent and the boulder clay is exposed along an escarpment in the northeastern corner of the township where elevations drop sharply some 150 feet to a lowland plain in section 36.

In the southwestern corner of the township where the lake deposits are of a sandy nature small supplies of ground water can usually be obtained at shallow depths. A 16-foot well in section 5 and a 20-foot well in section 7 are drawing supplies from sandy beds, and except in dry seasons provide sufficient water for local requirements. The well in section 7 yields soft water, but that from the well in section 5 is hard and too highly mineralized to be used for drinking.

The glacial lake clay that covers most of the township rarely yields water, and as the pockets of sand and gravel occur only sparingly in the upper part of the glacial drift, water is seldom obtained at shallow depths. Gravels washed from the uplands will probably be found near the surface along the foot of the escarpment and in the valleys extending back from it and are worthy of prospecting.

Throughout the uplands water is being obtained from beds of sand and gravel occurring in the lower part of the glacial

drift at depths between 50 and 100 feet. Most of the wells penetrating these sands and gravels yield adequate supplies of hard but usually iron-bearing water. However, an 86-foot dry hole was sunk in section 32, and five wells were drilled in the village of Lancer to depths between 102 and 505 feet. The sands encountered at these depths were unproductive. The wells drilled in Lancer indicate that the lower 70 feet of the glacial drift is composed largely of sands. The wells between 50 and 100 feet deep in this area have probably penetrated the upper part of this porous sand deposit. Water may be present in the sands penetrated in the Lancer wells, but these may be too fine to permit it to flow readily. The springs along the escarpment in the northeastern corner of the township are believed to be drawing supplies from the lower porous beds of the glacial drift.

The Bearpaw formation that underlies the drift at depths between 100 and 150 feet is composed largely of compact marine shales from which no water can be expected. However, the logs obtained from the Lancer wells indicate that the lower part of the formation is sandy and the supply in the 268-foot town well is believed to be coming from a sand bed in this formation at an approximate elevation of 1,957 feet. Other deep wells in the town were unproductive, indicating that the horizon is by no means a certain source of supply. A well on section 28, drilled to a depth of 2,222 feet in prospecting for gas, has been partly filled and is now yielding a fairly large supply of soft water from a sand bed at a depth of 220 feet below the surface. This sand occurs at an approximate elevation of 1,974 feet and is probably in the lower part of the Bearpaw formation.

The Belly River formation that underlies the Bearpaw at elevations below 1,950 to 1,900 feet is composed largely of beds of sand and sandstone. A 400-foot well in section 1 yields a fairly large supply of hard, drinkable water from a sand bed in the

formation at an approximate elevation of 1,855 feet. Water was obtained at a depth of 410 feet in an abandoned 505-foot well drilled in Lancer, but no information is available as to the quantity and quality of the water. The water-bearing beds in this formation are not usually continuous over large areas, but the bedrock wells in this and in adjoining townships indicate that water may be expected in the formation at depths between 300 and 500 feet.

The springs along the escarpment will provide sufficient water for local requirements in the lowlands to the northeast. One resident has dug out one of these springs and obtains a large flow of hard, highly mineralized, but drinkable water. Near the foot of the escarpment gravels may be expected to occur at shallow depths which will probably yield small supplies of drinkable water; these are worthy of systematic prospecting. Deep drilling may prove unproductive in this part of the lowland area, as it has in other parts of the lowlands in this municipality.

Township 22, Range 19

This township is covered by dune sand except adjacent to South Saskatchewan river which passes through the extreme northeastern corner. The dune sand is underlain at shallow depths by glacial lake sand that extends down to the underlying boulder clay.

Water supplies for range stock are obtained from the river and from shallow wells sunk into the sands. Most residents in the adjoining township to the south haul their domestic supplies from springs in section 5, which draw their water from the sands.

Surface water percolates freely through the sand and collects in depressions in the surface of the underlying boulder clay. Shallow wells sunk to the base of the sand in valleys and depressions will, as a rule, yield fairly large supplies of soft or only moderately hard water. In some places, however, wells may

have to be sunk down to pockets of sand and gravel in the underlying boulder clay before water supplies are obtained. The yields obtained from this source will be smaller and more highly mineralized than water from the overlying sands. Several test holes may be sunk before water is encountered in the sand or in the localized porous pockets in the boulder clay. However, this prospecting is well justified in this township, as no satisfactory supplies of water are likely to be obtained at depths exceeding 40 feet.

Sands and gravels will probably occur in the lower part of the glacial drift at depths near 100 feet, and massive sand beds will also be encountered in the underlying Belly River formation down to depths of 400 to 500 feet, but wells sunk to depths between 100 and 1,000 feet in adjoining townships indicate that these beds will probably not be productive.

Township 22, Range 20

The entire township is underlain by 10 to 30 feet of glacial lake deposits. They consist of compact clay in the southwestern corner, but become more sandy toward the northeast. Sand dunes cover the entire northeastern half of the township.

Throughout the area covered by the lake sand and sand dunes, ground water can in most places be obtained at depths of less than 25 feet. The sand is underlain by more impervious boulder clay that prevents the downward percolation of water so that it collects at the base of the sand in depressions in the surface of the clay. In some places in the northeastern half of the township fairly large supplies of soft or only moderately hard water occur in the sand. Nearer the glacial lake clay-covered area in the southwestern part of the township, the sandy beds are interspersed with clayey beds and the supplies available are smaller and more highly mineralized. Residents of this area use two or more wells to provide sufficient water for stock requirements. In the south-

western corner of the township the compact lake clay is too impervious to yield water, and it prevents the seepage of water into any porous pockets that might be present in the underlying boulder clay.

It is inadvisable to sink wells below a depth of 30 feet in any part of this township, as the 125-foot well in section 3 and other wells drilled to depths between 200 and 1,000 feet in this lowland area in other townships indicate that no appreciable supply of water can be expected in either the lower part of the glacial drift or in the sand beds of the underlying Belly River formation.

Township 22, Range 21

An escarpment extending across this township in a northwesterly direction from section 2 to the northwest corner separates the rolling upland in the southwestern part of the township from the plain some 150 feet lower in elevation in the northeastern sections. The escarpment is steep in the southeastern part of the township, but its slopes become more gradual toward the northwest. Most of the township is covered by a thin layer of glacial lake clay that grades into sandy lake deposits in the extreme northeastern corner. Along the escarpment, however, boulder clay occurs at the surface.

Several springs occur along the slope of the escarpment and provide large supplies of water for both stock and household use.

The lake clay covering the southwestern upland area will seldom yield water, but scattered pockets of sand and gravel will probably occur interspersed in the upper part of the underlying boulder clay, from which small supplies of hard, drinkable water could be obtained at depths of 30 feet or less. Considerable difficulty might be experienced in locating productive pockets in the extreme northwestern part of the township, where the impervious lake clay is relatively thick, but near the escarpment

the clay is thin and even absent in places and less difficulty should be experienced in obtaining water at shallow depths.

In the upland most of the water is obtained from wells between 50 and 80 feet deep tapping sands in the lower part of the glacial drift. These sands have been penetrated at elevations between 2,100 and 2,130 feet along the western boundary of the township, and at 2,037 feet in a 70-foot well in section 21 on the upper slopes of the escarpment. Much of the lower part of the glacial drift down to the contact with the Bearpaw shales is probably sandy, as it was found to be in the Lancer wells in the adjoining township to the south. The supplies being obtained from the wells tapping these sands are not usually large, probably due to the fineness of the water-bearing sediments, but except from wells in the SE. $\frac{1}{4}$, section 6, and the SW. $\frac{1}{4}$, section 8, the yields are adequate for local requirements. The quality of the water varies from soft to hard and highly mineralized, and in a well in section 7 cannot be used for drinking. Springs along the lower slopes of the escarpment occurring at elevations between 2,065 and 1,965 feet probably derive their supplies from these sands in the lower part of the glacial drift. Most of these springs have been dug out and cased and the water is reported to be under sufficient hydrostatic head to cause it to rise 5 to 10 feet above the surface. It is unlikely, however, that artesian conditions will exist over any large area along this slope. The Bearpaw formation that underlies the glacial drift in this area is thin and is composed mostly of compact, dark, marine shales. The Belly River formation underlies the Bearpaw below elevations of 1,950 to 1,900 feet above sea-level. It is composed largely of beds of sand. Wells in sections 16 and 17, 476 and 400 feet deep, draw their supplies from sand beds in this formation at elevations of approximately 1,731 and 1,800 feet. Both wells yield fairly large supplies of hard, drinkable water, but the supply in the well in

section 16 has diminished due to sand plugging the well. Throughout this upland area water is almost certain to be encountered in the sand beds of the Belly River formation at depths between 300 and 500 feet.

In the lowlands in the northeastern part of the township water supplies are obtained mostly from the springs along the escarpment and from shallow wells. Along the foot of the escarpment, small supplies of hard, drinkable water are to be expected at shallow depths from gravels that have been washed down from the slopes. Porous beds of this type have been encountered in the SE. $\frac{1}{4}$, section 22, the SE. $\frac{1}{4}$, section 27, and the NW. $\frac{1}{4}$, section 28, at depths of 25, 16, and 14 feet, respectively. Lake clay overlies most of the lowland but does not yield water. In the lowland areas, including the "alkali" flats in the southeastern corner and north-central part of the township, the clay is sufficiently thick and impervious to prevent the downward seepage of surface waters into any localized pockets of sand and gravel that may be present in the upper part of the underlying boulder clay. Hence, not more than very small seepages of water are likely to be obtained at shallow depths in these areas. In the rolling lands lying between the plains the covering of lake clay is less uniform and small supplies of soft or moderately hard water can usually be obtained at depths of less than 35 feet in pockets of sand and gravel in the upper part of the underlying boulder clay. With the exception of a 24-foot well in the SE. $\frac{1}{4}$, section 24, the shallow wells in this area yield supplies of water adequate for farm requirements.

In the extreme northeast corner of the township where the lake deposits at the surface are of a sandy nature water is to be expected at shallow depths in the sand or in irregular pockets of sand or gravel in the underlying boulder clay. In section 36 ample supplies of soft water are being derived from a 7-foot well

in the sand. The glacial drift in the lowlands probably extends down to depths between 100 and 150 feet. In the northern part of the area, in section 33, a 72-foot well yields an adequate supply of hard, highly mineralized water that is usable for stock, from sand or gravel in the lower part of the glacial drift. Water has also been obtained from gravels, at depths of 165 and 125 feet, in sections 2 and 3 of the adjoining township to the north, indicating the possibility of obtaining water for stock in the lower part of the drift in at least the northern part of this township. However, in the southeastern part conditions may be similar to those found in adjoining townships to the east where no water has been obtained in the lower part of the drift.

The Belly River formation that immediately underlies the glacial drift in the lowland is composed to a large extent of sand beds, but these may not be as productive as they are in the southwestern part of the township. An 800-foot well drilled in section 33 was apparently sunk through this formation without encountering a satisfactory supply of water, and is approximately 300 feet into the underlying Lea Park formation. This well reaches to an approximate elevation of 1,195 feet and yields a very small supply of soft, soda-bearing water. The water is reported to have been under sufficient hydrostatic head to cause it to rise 3 feet above the surface, but, even now though a pump is used the yield is small. The Lea Park formation is thought to be more than 1,000 feet thick and is composed mostly of grey clay shales from which little or no ground water can be expected.

Township 23, Range 19

Only the small area lying south of South Saskatchewan river lies in this municipality. The area is covered by Recent dune and glacial lake sands. The river provides a readily accessible supply of water for range stock and ground water can

usually be obtained at shallow depths in the surface sands. A spring, in section 3, provides a large quantity of water for stock.

In sections 3 and 4 residents obtain adequate supplies of soft water from the sand at depths of 10 and 12 feet. In this area it is considered inadvisable to sink wells into the boulder clay that underlies the sand below depths of about 30 feet.

No satisfactory supplies of water are likely to be obtained from either the lower part of the glacial drift or the underlying Belly River formation in this area. A more detailed description of conditions likely to be encountered in deeper wells in this area is discussed in the section dealing with the water-bearing horizons in township 22, range 19.

Township 23, Range 20

Approximately 12 square miles of this township lying to the south of South Saskatchewan river are in this municipality. No wells have been sunk in this area. South Saskatchewan river provides adequate supplies of water for range stock. The water is also suitable for drinking provided it is not contaminated by surface pollution.

The entire area is covered by glacial lake sands which, over most of the area, have been built into low sand hills by wind action. The sand deposit is generally 10 to 30 feet thick and is underlain by glacial boulder clay. Adequate supplies of soft or only moderately hard, drinkable water are expected to occur at shallow depths in the sand or in isolated pockets of sand or gravel in the upper part of the underlying boulder clay. Several test holes may be necessary to locate water at shallow depths, but it seems inadvisable to sink wells to depths of more than 30 feet in this area as deep drilling in other townships indicates that the lower part of the glacial drift and the underlying Belly River formation will probably be either unproductive or only sparingly so.

Township 23, Range 21

Approximately 23 square miles of this township lying to the south of South Saskatchewan river fall in this municipality.

Most residents of this part of the township are obtaining adequate supplies of highly mineralized water for stock from wells, but many are forced to haul water for household use from springs in the adjoining township to the south or from Saskatchewan river. This latter source is subject to possible contamination. It is advisable to take water from shallow seepage wells dug near the river rather than directly from the stream.

An area of hilly uplands extends from the southwestern corner of the township along its western boundary and for a short distance eastward along the south edge of the river valley. From this upland area elevations drop sharply some 250 feet along an escarpment to a lowland plain in the south-central and south-eastern parts of the township. This plain is covered by a thin layer of glacial lake clay which grades into more sandy deposits near the eastern boundary of the township. The glacial drift is exposed at the surface in the upland areas and along the steep sides of Saskatchewan River valley.

Ground water will seldom be obtained at shallow depths in the area covered by the lake clay. Any small seepages that occur are liable to be too highly mineralized for domestic use as the clay contains large amounts of sulphate salts, particularly in the "alkali" flat in the south-central part of the township. Near the part of the escarpment in sections 4 and 5 ample supplies of hard, highly mineralized water, usable for stock, are being obtained from gravels at depths between 10 and 30 feet. These gravels have probably been washed from the slopes of the escarpment. Gravels yielding similar supplies of water can be expected in other places along the foot of the escarpment. The total thickness of the glacial drift in the lowlands is probably between 150 and 200

feet. Water-bearing sands and gravels were penetrated at depths between 135 and 180 foot in sections 2, 3, 9, and 12. The supplies obtained from the wells in sections 2 and 3 are adequate for local requirements, but in sections 9 and 12 they are small. These water-bearing beds occurring at elevations between 1,830 and 1,855 feet are probably at the contact between the glacial drift and the underlying Bolly River formation and may be more or less continuous under the entire area. The 115-foot dry hole in section 4 was not sunk deep enough to reach the level of this horizon. The waters are hard and except from the well in section 3 are too highly mineralized for domestic use.

The Bolly River formation, which underlies the glacial drift in this area, contains many sandy beds that may be water-bearing. However, an 800-foot well in section 33 in the adjoining township to the south was sunk through the formation without encountering any satisfactory supply of water.

The Lea Park formation that underlies this area at an approximate depth of 500 feet is made up almost entirely of compact, grey clay shales in which no ground water can be expected.

On the glacial drift-covered uplands and in Saskatchewan River valley, residents are well advised to do considerable prospecting at shallow depths, as the localized pockets of sand and gravel occurring in the upper 30 feet of the drift will, in many places, yield adequate supplies of hard, drinkable water for farm requirements.

Fairly extensive beds of sand and gravel will probably occur in the lower part of the glacial drift. A 65-foot well in section 18 yields an adequate supply of hard, iron-bearing, drinkable water from sand in the drift, but a 160-foot well in section 17, although penetrating gravels, yields only a small supply of water. No definite information can be given on the possibilities of obtaining water at greater depths as no deep wells have been sunk

in this area. The gravels in the 160-foot well at an approximate elevation of 2,130 feet may be at the contact between the glacial drift and the underlying Bearpaw formation. The Bearpaw formation is composed mostly of compact marine shales from which little water can be expected. However, water may be obtained in sand beds in the lower part of this formation or in the Belly River formation that underlies the Bearpaw at an approximate elevation of 1,950 feet. If these sand beds are water bearing, wells between 300 and 500 feet will be productive.

STATISTICAL SUMMARY OF WELL INFORMATION IN RURAL MUNICIPALITY OF MIRY CREEK, NO. 229, SASKATCHEWAN

	Township															Total No. in muni- cipality
West of 3rd meridian	19	19	19	20	20	20	21	21	21	22	22	22	23	23	23	
Range	19	20	21	19	20	21	19	20	21	19	20	21	19	20	21	
<u>Total No. of Wells in Township</u>	33	34	50	18	39	41	8	10	23	1	10	28	4	0	12	317
No. of wells in bedrock	8	3	1	6	17	1	0	0	0	0	1	3	0	0	0	52
No. of wells in glacial drift	25	31	49	12	22	40	2	16	17	1	9	25	4	0	12	265
No. of wells in alluvium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<u>Permanency of Water Supply</u>																
No. with permanent supply	32	34	50	18	39	41	3	13	20	1	7	20	4	0	11	299
No. with intermittent supply	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	3
No. dry holes	1	0	0	0	0	0	5	3	3	0	2	0	0	0	1	15
<u>Types of Wells</u>																
No. of flowing artesian wells	1	0	0	0	0	0	0	0	1	0	0	4	0	0	0	6
No. of non-flowing artesian wells	23	17	27	8	28	16	0	3	3	0	0	0	0	0	3	134
No. of non-artesian wells	8	17	23	10	11	25	3	10	10	1	8	18	4	0	8	162
<u>Quality of Water</u>																
No. with hard water	30	29	49	16	37	37	3	13	15	1	8	19	0	0	11	268
No. with soft water	2	5	1	2	2	4	0	0	5	0	0	9	4	0	0	34
No. with salty water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
No. with "alkaline" water	9	9	19	2	6	5	3	3	4	2	2	6	0	0	4	74
<u>Depths of Wells</u>																
No. from 0 to 50 feet deep	5	9	24	9	1	21	2	5	4	1	8	17	4	0	5	115
No. from 51 to 100 feet deep	11	11	19	1	6	12	0	9	12	0	1	8	0	0	1	91
No. from 101 to 150 feet deep	7	7	5	2	12	6	1	1	1	0	1	0	0	0	2	45
No. from 151 to 200 feet deep	2	4	1	0	1	1	2	0	0	0	0	0	0	0	4	15
No. from 201 to 500 feet deep	7	2	1	6	16	1	0	1	4	0	0	2	0	0	0	40
No. from 501 to 1,000 feet deep	1	1	0	0	3	0	2	0	1	0	0	1	0	0	0	9
No. over 1,000 feet deep	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	2
<u>How the Water is Used</u>																
No. usable for domestic purposes	23	23	25	17	37	31	1	12	17	1	4	24	2	0	4	221
No. not usable for domestic purposes	9	11	25	1	2	10	2	1	3	0	4	4	2	0	7	81
No. usable for stock	31	33	49	18	39	41	2	12	20	1	8	27	4	0	10	295
No. not usable for stock	1	1	1	0	0	0	1	1	0	0	0	1	0	0	1	7
<u>Sufficiency of Water Supply</u>																
No. sufficient for domestic needs	28	33	50	16	39	38	3	13	18	1	6	25	4	0	11	235
No. insufficient for domestic needs	4	1	0	2	0	3	0	0	2	0	2	3	0	0	0	17
No. sufficient for stock needs	22	27	32	15	37	28	2	13	15	1	4	21	3	0	8	228
No. insufficient for stock needs	10	7	18	3	2	13	1	0	5	0	4	7	1	0	3	74

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 hardness to the sulphates and chlorides of calcium and magnesium. The permanent hardness

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

Analyses of Water Samples from the Municipality of Miry Creek, No. 229, Saskatchewan

LOCATION					DEPTH			HARDNESS			CONSTITUENTS AS ANALYSED						CONSTITUENTS AS CALCULATED IN ASSUMED COMBINATIONS								Source of Water	
No.	Qtr.	Sec.	Trp.	Rge.	Mer.	Well, ft.	Total dis'vd solids	Total	Perm.	Temp.	Cl.	Alka- linity	CaO	MgO	SO ₄	Na ₂ O	Solids	CaCO ₃	CaSO ₄	MgCO ₃	MgSO ₄	Na ₂ CO ₃	Na ₂ SO ₄	NaCl		
1	SE.	15	19	19	3rd	44	2,400	1,500	1,400	100	30	430	290	328	1,255	278	2,155	430	119			979		577	50	±1
2	SE.	6	19	20	3rd	70	1,940	1,250	1,200	50	54	195	70	277	1,104	414	1,857	125			59	742		842	89	±1
3	SE.	12	20	19	3rd	272	900	300	125	175	112	620	110	72	45	277	858	198			150		258	67	185	±3
4	SW.	15	20	19	3rd	Spring	2,340	1,150	900	250	90	545	290	198	1,152	539	2,291	519			22	546		1,056	148	±1
5	NE.	34	20	19	3rd		2,420	1,000	900	100	118	245	70	238	1,320	658	2,271	125			101	566		1,284	195	Miry Creek
6	SE.	17	20	20	3rd	350	1,980	1,500	1,400	100	19	100	200	259	1,164	208	1,094	100	350			772		441	31	±2
7	NE.	3	21	20	3rd	229	1,620	1,300	1,200	100	25	195	120	285	960	190	1,498	195	27			849		386	41	±1
8	SW.	9	21	20	3rd	100	1,480	1,000	1,000	Nil	22	480	270	166	586	141	1,272	480				495		281	36	±1
9	NE.	5	22	19	3rd	Spring	420	280	200	80	8	250	60	68	33	11	283	108			119	33		10	13	±1

Water samples indicated thus, ±1, are from glacial drift or other unconsolidated deposits.

Water samples indicated thus, ±2, are from bedrock, Bearpaw formation.

Water samples indicated thus, ±3, are from bedrock, Belly River formation.

Analyses are reported in parts per million.

Hardness is the soap hardness expressed as calcium carbonate (CaCO₃).

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

Water from the Unconsolidated Deposits

Six samples of water from wells and springs drawing their supplies from the unconsolidated deposits in this municipality, and one sample of water from Miry creek were collected and analysed by the Geological Survey. South Saskatchewan river is also a source of water supply in the northern part of the municipality.

No analyses have been made of the water from the river along this part of its source, but analysis made in the city of Saskatoon is indicative of its character. The dissolved solid content of the river water varies seasonally, as a rule between 200 to 400 parts per million, and the total hardness between 100 and 250 parts per million. The permanent hardness due to dissolved calcium and magnesium sulphates (CaSO_4 and MgSO_4) rarely exceeds 100 parts per million, the temporary hardness due to dissolved carbonates of calcium and magnesium comprises the greater part of the total. This water is much lower in dissolved mineral salts and softer than waters commonly obtained from wells. It is quite suitable for stock watering, and as far as mineral content is concerned it is drinkable. As all surface waters are liable to pollution, it is safer to draw drinking water from wells sunk a short distance from the stream rather than to take it directly from the stream.

Miry and Spring creeks are fed by springs that yield highly mineralized waters. Analyses Nos. 4 and 5 are, respectively, of water from a spring at the head of Miry creek in sec. 15, tp. 20, range 19, and of water from the creek approximately $4\frac{1}{2}$ miles downstream in section 34 of the same township. The water from the spring has a total solid content of 2,340 parts per million and a total hardness of 1,150 parts per million, the greater part of which is permanent. The mineral salts present in the order of their decreasing relative amounts are: sodium

sulphate (Na_2SO_4 Glauber's salt), magnesium sulphate (MgSO_4 Epsom salts), calcium carbonate (CaCO_3), sodium chloride (NaCl), and magnesium carbonate (MgCO_3). Analysis No. 5 shows the water in the creek in section 34 to be almost identical in character with the water from this spring, indicating that there is very little change in the quality of the water along the course of the creek and that other springs feeding the creek yield a similar type of water. This water is very hard and contains Glauber's salt and Epsom salts, both of which exert laxative effects on humans. The water apparently has no ill effect on persons accustomed to its use and several residents of the area use it for both household and stock purposes. Surface run-off in wet seasons would undoubtedly lower the mineral salt content of the water in the creek, and if this water is not polluted by organic matter or does not carry too much sediment it should be drinkable.

The waters obtained at shallow depths from the surface sands in the Recent dune and glacial lake sand areas are, as a rule, soft or only moderately hard. Analysis No. 9 is of water from a spring in the sand on the NE. $\frac{1}{4}$, sec. 5, tp. 22, range 19. The total dissolved solid content of the water is only 420 parts per million, comprised of the following mineral salts in order of their decreasing relative amounts: magnesium carbonate (MgCO_3), calcium carbonate (CaCO_3), magnesium sulphate (MgSO_4), sodium chloride (NaCl), and sodium sulphate (Na_2SO_4). This water is relatively soft having a total hardness of 280 parts per million, and is of exceptionally good quality for domestic use.

Water similar in character to that indicated by the above analysis will quite commonly be obtained in the sand hills in the northeastern part of the municipality. In the southwestern part of the municipality waters from the lake sands as a rule contain slightly higher concentrations of mineral salts in solution, and in a few places hard, highly mineralized waters have been

obtained. These waters probably contain sulphate salts that have been dissolved from the layers of clay interbedded with the sands in this area, or may be carried in solution by waters washing down from the boulder clay-covered uplands. Nevertheless, the waters from the sand in this part of the municipality are for the most part well adapted to household use.

The lake clay that covers most of the municipality is considered to contain fairly large amounts of sulphate salts that are dissolved by the downward percolating waters. The clay does not yield more than small seepages of ground water, but the mineralized water seeping through it affects the quality of waters obtained in the localized pockets of sand and gravel in the upper part of the underlying boulder clay.

No analyses have been made of waters from shallow wells tapping the porous pockets in the upper part of the boulder clay in this municipality. The following brief discussion of the quality of the water is based on analyses made of water from the same source in other municipalities in this district, on observations made in the field, and on reports of residents using the water.

Large variations occur in the character of the boulder clay within small areas, and similar variations commonly occur in the quality of water obtained from shallow wells located only short distances apart. For this reason no definite information can be given as to the quality of water likely to be obtained in any locality. However, most waters obtained at shallow depths in the boulder clay are hard and contain sulphate salts. The quantities of these salts present depend on the nature of the material through which the water from the surface seeps in reaching the porous pockets. In areas covered by lake clay fairly large amounts of mineral salts are generally dissolved by the water in passing through the clay and also in passing

through the boulder clay. In some places the content of Glauber's salt and Epsom salts (sodium and magnesium sulphates) are sufficiently high to cause the water to have laxative effects on humans. However, on the southwestern uplands of this municipality, most of the waters obtained at shallow depths under the lake clay have been satisfactory for household use. In the lowlands in the northeastern part of the municipality, very little water can be obtained in the area covered by lake clay. Any small seepages that might be obtained would probably contain very high concentrations of sulphate salts, especially in the "alkali" flats extending along the foot of the escarpment. In places where the boulder clay is exposed at the surface along the escarpment, and in the extreme northwestern corner of the municipality, water from shallow wells will usually be less highly mineralized than in the lake clay-covered areas. This is also true of the areas in the northeastern and southwestern parts of the municipality where the boulder clay is covered by porous sands.

Analyses Nos. 1, 2, 7, and 8 are of water from sands and gravels in the lower part of the glacial drift in the southwestern upland area. These waters are from 44, 70, 229, and 100-foot wells located, respectively, in: the SE. $\frac{1}{4}$, sec. 15, tp. 19, range 19; the SE. $\frac{1}{4}$, sec. 6, tp. 19, range 20; the NE. $\frac{1}{4}$, sec. 3, tp. 21, range 20; and the SW. $\frac{1}{4}$, sec. 9, tp. 21, range 20. The total dissolved solid contents of the waters are, respectively, 2,400, 1,940, 1,620, and 1,480 parts per million, and the total hardness varies between 1,000 and 1,500 parts per million. Except for the variation in the total amounts of dissolved salts present, all of these waters are similar in character, the predominant mineral salts present being Epsom salts and Glauber's salt (MgSO_4 and Na_2SO_4). These waters are very hard and the concentrations of the above laxative acting salts are relatively high. However, all of these waters are being used for both

household requirements and stock. The waters represented by analyses Nos. 1 and 2 would probably affect persons unaccustomed to drinking highly mineralized waters. These analyses are representative of the waters obtained from the lower part of the glacial drift in this municipality. Even higher concentrations of sulphate salts are probably present in some of the water obtained from this source, as several residents are unable to use the water for drinking. Iron is also present in most of these waters, and tends to stain containers and kitchen utensils, but it is not present in sufficient quantities to affect the quality of the water for drinking.

The water, previously described, from the spring on the SW. $\frac{1}{4}$, sec. 15, tp. 20, range 19, is similar to these waters and is also believed to be coming from an aquifer in the lower part of the glacial drift.

Water from the Bedrock

Analysis No. 6 is of water from a sand bed encountered at a depth of 350 feet near the base of the Bearpaw formation in the SE. $\frac{1}{4}$, sec. 17, tp. 20, range 20. The water has a total dissolved solid content of 1,980 parts per million and a total hardness of 1,500 parts per million. The predominant mineral salts in order of their decreasing quantities are: magnesium sulphate (MgSO_4), sodium sulphate (Na_2SO_4), calcium sulphate (CaSO_4), calcium carbonate (CaCO_3), and sodium chloride (NaCl). This water is very hard, but despite its high sulphate salt content it is being used for all farm purposes. This water cannot be regarded as typical of waters obtained from the more shaly parts of the Bearpaw formation, which generally contain high concentrations of sodium sulphate and sodium chloride that render the waters undrinkable. However, it is probably representative of waters obtained from the sands near the base of the Bearpaw in this area and also of waters

obtained from the upper sands of the Belly River formation. A few wells in townships 19, ranges 19 and 21, are recorded to be drawing supplies from sands in the upper part of the Bearpaw beds. No analyses have been made of these waters, but they are all hard and highly mineralized. The waters from wells in sec. 5, tp. 19, range 19, and in sec. 23, tp. 19, range 21, cannot be used for drinking.

Waters obtained from the Belly River formation vary in character from hard and highly mineralized to soft and soda-bearing. This variation appears to occur from place to place rather than at different depths in the formation, so that the quality of the water likely to be obtained at any site cannot be predicted.

Analysis No. 6, of water from sand near the base of the Bearpaw, is probably representative of the harder waters obtained from the Belly River sands. Analysis No. 3 is of a relatively soft water from the Belly River sands, and is representative of the soft, soda-bearing waters from this formation. It is from a 272-foot well in the SE. $\frac{1}{4}$, sec. 12, tp. 20, range 19. The water has a total dissolved solid content of 900 parts per million made up of the following mineral salts listed in the order of their decreasing relative concentrations: sodium carbonate (Na_2CO_3) (soda), calcium carbonate (CaCO_3), sodium chloride (NaCl), magnesium carbonate (MgCO_3), and sodium sulphate (Na_2SO_4). The total hardness is only 300 parts per million. This water is suitable for all purposes. Waters having a high concentration of sodium carbonate (Na_2CO_3) "black alkali", may have harmful effects upon vegetation if used for irrigation.

The well sunk to a depth of 800 feet on sec. 33, tp. 22, range 21, is considered to be drawing at least part of its supply from the Lea Park formation. The water is soft and soda-bearing. Due to the large percentage of compact shale forming the greater part of this formation it is improbable that water satisfactory for farm use will be derived from this formation in the municipality.

WELL RECORDS—Rural Municipality of

MIRY CREEK, NO. 229, SASKATCHEWAN.

WELL No.	LOCATION					TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE		PRINCIPAL WATER-BEARING BED			CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
	¼	Sec.	Tp.	Rge.	Mer.				Above (+) Below (-) Surface	Elev.	Depth	Elev.	Geological Horizon				
1	SE.	2	19	19	3	Bored	140	2,326	-120	2,206	120	2,206	Glacial sand			N	Never used; too much trouble with sand filling in.
2	SE.	2	"	"	"	Bored	96	2,273	- 83	2,190	96	2,177	Glacial gravel	Hard, clear, iron		D, S	Sufficient supply.
3	NW.	3	"	"	"	Bored	106	2,280	- 88	2,192	106	2,174	Glacial sand	Hard, iron		S	Sufficient for stock needs; 15-foot well in gravel and blue sand.
4	NE.	4	"	"	"	Bored	120	2,288	-116	2,172	116	2,172	Glacial drift	Hard, clear		D	Sufficient only for house.
5	NW.	5	"	"	"	Drilled	254	2,300	-129	2,171	254	2,046	Bearpaw sand-stone	Hard, clear, "alkaline"		S	Sufficient for stock needs.
6	NW.	5	"	"	"	Bored	65	2,300	- 52	2,248	52	2,248	Glacial clay	Hard, clear, iron		D	1½ barrels a day.
7	NE.	7	"	"	"	Bored	115	2,290			115	2,175	Glacial sand	Hard, clear		D, S	Insufficient; supplies house and 24 head stock.
8	NW.	7	"	"	"	Bored	90	2,310	- 70	2,240	90	2,220	Glacial gravel	Hard, clear		S	Supplies 7 head stock.
9	NW.	9	"	"	"	Drilled	170	2,280	- 80	2,200	150	2,130	Glacial sand	Hard, "alkaline", iron, clear		N	Was sufficient until sand cut off supply.
10	SE.	9	"	"	"	Bored	100	2,290	- 80	2,210	100	2,190	Glacial sand	Hard, clear		D, S	Sufficient supply.
11	SW.	10	"	"	"	Bored	105	2,280	- 93	2,187	105	2,175	Glacial sand	Soft, clear		D, S	Sufficient supply; used by neighbours.
12	NW.	12	"	"	"	Bored	16	2,158	- 0	2,158	16	2,142	Glacial sand	Hard, clear		D, S	Sufficient for household and 18 head horses; also 19-foot well, good supply.
13	NE.	12	"	"	"		16	2,148	+ ?	2,148	16	2,132	Glacial sand	Hard, clear, "alkaline", iron		D, S	Large, continuously flowing supply.
14	NW.	13	"	"	"	Bored	60	2,145	- 51	2,094	59	2,086	Glacial gravel	Hard, clear		D, S	Supplies household and 100 head stock.
15	NE.	13	"	"	"	Bored	72	2,200	- 64	2,136	72	2,128	Glacial gravel	Hard, clear, iron		D, S	Abundant supply.
16	SE.	15	"	"	"	Dug	44	2,213	- 41	2,172	41	2,172	Glacial gravel	Hard, clear		D, S	Abundant supply; used by neighbours.
17	SW.	15	"	"	"	Dug	75	2,215	- 73	2,142	73	2,142	Glacial drift	Hard, clear		S	Insufficient supply.
18	SW.	16	"	"	"	Dug	120	2,278	-105	2,173	105	2,173	Glacial gravel	Hard, clear, "alkaline", iron		S	Insufficient supply.
19	NW.	16	"	"	"	Bored	80	2,235	- 60	2,175	80	2,155	Glacial gravel	Hard, clear, "alkaline", iron		S	Ample, but suitable only for stock.
20	SE.	17	"	"	"	Drilled	207	2,285	-132	2,153	195	2,090	Bearpaw sand	Hard, iron, "alkaline"		D	Large supply at first, now 24 barrels a day; also 13 wells in quicksand; supplies cut off.
21	SE.	18	"	"	"	Drilled	180	2,310	-120	2,190	180	2,130	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient; can be pumped dry.
22	NW.	18	"	"	"	Bored	62	2,248	- 42	2,206	51	2,197	Glacial gravel	Hard, clear, "alkaline"		S	Sufficient for stock needs.
23	SW.	19	"	"	"	Drilled	500	2,265	-300	1,965	500	1,705	Belly River sand	Hard, clear, soda		D, S	Sufficient, but plugged at present with sand.
24	SE.	19	"	"	"	Drilled	475	2,270	-100	2,170	475	1,795	Belly River sand	Hard, clear, "alkaline", iron		N	No longer in use.

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.

2
WELL RECORDS—Rural Municipality of ~~MIRY CREEK, NO. 229, SASKATCHEWAN.~~

WELL No.	LOCATION					TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE		PRINCIPAL WATER-BEARING BED			CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
	¼	Sec.	Tp.	Rge.	Mer.				Above (+) Below (−) Surface	Elev.	Depth	Elev.	Geological Horizon				
25	SW.	21	19	19	3	Bored	100	2,250	- 70	2,180	80	2,170	Glacial sand	Hard, clear, iron		S	Sufficient, but suitable only for stock. Use dugout water for household.
26	NE.	22	"	"	"	Drilled	450	2,292	-160	2,132	450	1,842	Belly River sand	Hard, iron, yellow		D, S	Sufficient supply.
27	NW.	23	"	"	"	Drilled	440	2,282	-150	2,132	440	1,842	Belly River sand	Hard, iron, yellow		D, S	Sufficient supply.
28	NE.	23	"	"	"	Dug	20	2,180	- 15	2,165	15	2,165	Glacial gravel	Soft, clear		D, S	Supplies household and 8 head stock.
29	SW.	28	"	"	"	Drilled	224	2,285	-150	2,135	218	2,067	Bearpaw sand	Hard, clear, iron		D, S	Large supply.
30	NW.	31	"	"	"	Drilled	448	2,285	-160	2,125	448	1,837	Belly River sand	Hard, clear, iron		D, S	Sufficient when well is clean.
31	SE.	32	"	"	"		150	2,282									Dry hole; base in glacial drift; hauls drinking water from Miry creek. Sufficient supply.
1	SE.	3	19	20	3	Bored	89	2,293	- 77	2,216	88	2,205	Glacial gravel	Hard, clear		D, S	
2	NW.	2	"	"	"	Dug	14	2,325	- 10	2,315	10	2,315	Glacial gravel	Soft			
3	NE.	3	"	"	"	Dug	14	2,279	- 9	2,270	9	2,270	Glacial gravel	Soft, clear		D, S	Sufficient for household; also 180-foot well not in use.
4	SW.	4	"	"	"	Dug	54	2,271	- 44	2,227	44	2,227	Glacial gravel	Hard, clear		D, S, I	Large supply.
5	SE.	5	"	"	"	Bored	66	2,293	- 60	2,233	60	2,233	Glacial gravel	Hard, clear, "alkaline"		D, S	Sufficient supply.
6	SE.	6	"	"	"	Bored	71	2,300	- 55	2,245	71	2,229	Glacial gravel	Hard, clear, odour		D, S	Sufficient supply.
7	NE.	7	"	"	"	Bored	38	2,290	- 28	2,262	28	2,262	Glacial drift	Hard, clear		D, S	Sufficient supply; used by neighbours.
8	SW.	9	"	"	"	Bored	60	2,263	- 58	2,205	58	2,205	Glacial gravel	Hard, clear		D, S	Sufficient for household and 30 head stock.
9	NE.	10	"	"	"	Bored	147	2,342	-125	2,217	147	2,195	Glacial sand	Hard, clear "alkaline", iron.		S	Sand fills in decreasing supply; hauls drinking water.
10	NW.	10	"	"	"	Dug	14	2,300					Glacial drift	Soft, clear			
11	SE.	13	"	"	"	Bored	75	2,310	- 70	2,240	70	2,240	Glacial sand	Hard, clear, iron		S	Insufficient supply.
12	SE.	14	"	"	"	Bored	97	2,300	- 86	2,214	97	2,203	Glacial sand	Hard, clear		D, S	Sufficient supply.
13	SE.	15	"	"	"	Drilled	200	2,363	-140	2,223	200	2,163	Glacial sand	Hard, clear, "alkaline"		S	Sand fills in decreasing supply.
14	NW.	15	"	"	"	Bored	87	2,298	- 69	2,229	87	2,211	Glacial sand	Hard, clear, iron		S	Sufficient for stock; hauls drinking water.
15	NE.	15	"	"	"	Drilled	444	2,348	-120	2,228	444	1,904	Belly River sand	Soft, clear		D, S	Sufficient supply; also 187-foot well in quicksand, filled in.
16	SW.	16	"	"	"	Bored	50	2,253	- 38	2,215	51	2,202	Glacial gravel	Hard, clear, "alkaline"		D, S	Sufficient supply.
17	NW.	18	"	"	"	Bored	138	2,295	- 40	2,255	40	2,255	Glacial clay	Hard, clear		S	Insufficient; waters only 4 head stock.
18	NE.	18	"	"	"	Bored	35	2,303	- 31	2,272	31	2,272	Glacial gravel	Hard, clear		D, S	Sufficient supply.
19	SE.	19	"	"	"	Bored	90	2,235	- 35	2,200	50	2,185	Glacial gravel	Hard, clear, iron		S	Sufficient supply; also 18-foot seepage well supplies 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.

3
WELL RECORDS—Rural Municipality of MARY CREEK, NO. 229, SASKATCHEWAN.

WELL No.	LOCATION					TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE		PRINCIPAL WATER-BEARING BED			CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
	¼	Sec.	Tp.	Rge.	Mer.				Above (+) Below (−) Surface	Elev.	Depth	Elev.	Geological Horizon				
20	NW.	19	19	20	3	Bored	75	2,285	- 68	2,217	68	2,217	Glacial drift	Hard, clear, iron		D, S	Sufficient for local needs.
21	SW.	20	"	"	"	Bored	50	2,252	- 20	2,232	50	2,202	Glacial gravel	Hard, clear, "alkaline", iron		S	Hauls water from the NE. ¼, section 7.
22	NW.	21	"	"	"	Bored	50	2,285	- 40	2,245	40	2,245	Glacial drift	Hard, clear		D, S	Sufficient supply.
23	SW.	23	"	"	"	Bored	175	2,315	-115	2,200	175	2,140	Glacial gravel	Hard, clear, iron		D	Sufficient for cooking.
24	NW.	23	"	"	"	Bored	122	2,315	-102	2,213	102	2,213	Glacial sand	Hard, clear, iron		S	Large supply for stock.
25	NE.	24	"	"	"	Drilled	180	2,300	-160	2,140	180	2,160	Glacial gravel	Hard, clear, "alkaline"		D, S	
26	SE.	26	"	"	"	Bored	140	2,305	-125	2,180	140	2,165	Glacial gravel	Hard, clear, "alkaline"		N	Sufficient, but not in use.
27	NW.	26	"	"	"	Bored	140	2,315	-125	2,190	140	2,175	Glacial gravel	Hard, clear, "alkaline"		S	
28	NW.	28	"	"	"	Bored	120	2,285	-111	2,174	111	2,174	Glacial gravel	Hard, clear		D, S	Sufficient supply.
29	NE.	32	"	"	"	Bored	120	2,300	-100	2,200	120	2,180	Glacial gravel	Hard, clear		D, S	Sufficient for household and 12 head stock.
30	NW.	33	"	"	"	Bored	90	2,278					Glacial drift	Hard, iron, clear		D, S	Sufficient supply.
31	NE.	33	"	"	"	Drilled	375	2,315			375	1,940	Belly River sand	Hard, cloudy, "alkaline"		S	Large supply; suitable only for stock.
32	SE.	35	"	"	"	Drilled	535	2,305	-120	2,185	535	1,770	Belly River sand	Soft, clear		D, S	Sufficient supply.
1	NW.	2	19	21	3	Dug	57	2,280	- 27	2,253	52	2,228	Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
2	SE.	3	"	"	"	Bored	70	2,280	- 18	2,262	70	2,210	Glacial gravel	Hard, "alkaline"		D, S	Sufficient supply; laxative.
3	NW.	3	"	"	"	Dug	20	2,315	- 7	2,308	20	2,295	Glacial sand	Soft		D, S	Sufficient supply.
4	NE.	3	"	"	"	Drilled	160	2,300			160	2,140	Glacial sand	Hard, iron, "alkaline", rusty		D, S	Sufficient supply.
5	SW.	4	"	"	"	Bored	62	2,310	- 42	2,268	62	2,248	Glacial gravel	Hard, iron, "alkaline"		S	Sufficient for stock needs; hauls water for household purposes.
6	NW.	9	"	"	"	Bored	107	2,290	- 32	2,258	107	2,183	Glacial gravel	Hard, clear, iron		D, S	Sufficient supply; #.
7	NE.	11	"	"	"	Bored	28	2,310	- 22	2,288	22	2,288	Glacial gravel	Hard		N	Used to meet stock needs.
8	SE.	12	"	"	"	Bored	70	2,290	- 50	2,240	70	2,220	Glacial gravel	Hard, iron, "alkaline"		D, S	Sufficient supply; laxative.
9	NE.	14	"	"	"	Bored	32	2,285	- 26	2,259	26	2,259	Glacial gravel	Hard, clear		D, S	Sufficient supply.
10	NE.	15	"	"	"	Bored	90	2,335	- 30	2,305	90	2,245	Glacial gravel	Hard, iron, rusty		S	Just sufficient for stock; also shallow well for household.
11	SW.	16	"	"	"	Dug	16	2,325	- 12	2,313	12	2,313	Glacial sand	Hard, clear		D, S	Sufficient supply.
12	NE.	17	"	"	"	Bored	65	2,275	- 45	2,230	45	2,230	Glacial drift	Hard, iron, "alkaline"		S	Insufficient supply; laxative.
13	NE.	18	"	"	"	Bored	129	2,310	- 39	2,271	129	2,181	Glacial gravel	Hard, clear, iron		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.

4
WELL RECORDS—Rural Municipality of MIRY CREEK, NO. 229, SASKATCHEWAN.

WELL No.	LOCATION					TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE		PRINCIPAL WATER-BEARING BED			CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
	¼	Sec.	Tp.	Rge.	Mer.				Above (+) Below (−) Surface	Elev.	Depth	Elev.	Geological Horizon				
14	SW.	19	19	21	3	Bored	85	2,315	- 45	2,270	85	2,225	Glacial gravel	Hard, clear, iron		S	Sufficient supply; second 19-foot well for household.
15	NW.	19	"	"	"	Bored	42	2,315	- 28	2,287	28	2,287	Glacial sand	Hard, clear, "alkaline"		S	Sufficient for stock; too laxative for man.
16	SW.	20	"	"	"	Bored	47	2,300	- 32	2,268	47	2,253	Glacial gravel	Hard, clear, iron		D, S	Sufficient supply.
17	SE.	21	"	"	"	Bored	80	2,340	- 40	2,300	80	2,260	Glacial gravel	Hard, iron, "alkaline"		S	Sufficient for stock; laxative; 12-foot seepage well for household.
18	NW.	22	"	"	"	Bored	80	2,355	- 78	2,277	78	2,277	Glacial sand	Hard, iron, "alkaline"		S	Insufficient supply; laxative; hauls household water.
19	SW.	22	"	"	"	Bored	95	2,360	- 40	2,260	95	2,205	Glacial sand	Hard, clear		S, I	Sufficient for stock needs.
20	SW.	23	"	"	"	Drilled	272	2,320	- 90	2,230	272	2,048	Bearpaw sand	Hard, clear, iron, "alkaline"		S	Sufficient for cattle; laxative; hauls household water.
21	NE.	23	"	"	"	Bored	75	2,260	- 57	2,203	75	2,185	Glacial gravel	Hard, iron		S	Insufficient supply; hauls household water.
22	SE.	24	"	"	"	Bored	58	2,290	- 38	2,252	58	2,238	Glacial sand	Hard, clear, "alkaline"		S	Sufficient for stock; laxative; also seepage well.
23	SW.	26	"	"	"	Bored	80	2,325	- 35	2,290	80	2,245	Glacial gravel	Hard, iron, "alkaline"		S	Sufficient for stock; laxative.
24	SW.	27	"	"	"	Bored	80	2,335	- 55	2,280	80	2,255	Glacial sand	Hard, iron, "alkaline"		S	Sufficient for stock; laxative; also 26-foot well for house.
25	NW.	27	"	"	"	Bored	71	2,290	- 31	2,259	71	2,219	Glacial sand	Hard, iron, "alkaline"		S	Sufficient for stock; laxative; house water obtained from seepage well.
26	SW.	28	"	"	"	Bored	85	2,330	- 65	2,265	85	2,245	Glacial sand	Hard, clear, "alkaline"		S	Sufficient for stock; shallow seepage well for house use.
27	NE.	28	"	"	"	Dug	40	2,310	- 20	2,290	40	2,270	Glacial gravel	Hard, iron, clear		D, S	Sufficient supply.
28	NW.	30	"	"	"	Dug	52	2,305	- 32	2,273	52	2,253	Glacial gravel	Hard, iron, clear		D, S	Sufficient supply; laxative.
29	SE.	31	"	"	"	Bored	57	2,325	- 37	2,288	37	2,288	Glacial drift	Hard, iron, "alkaline"		S	Insufficient supply; laxative; hauls household water.
30	NE.	31	"	"	"	Bored	50	2,325	- 30	2,295	50	2,275	Glacial gravel	Hard, iron		S	Sufficient for stock needs; seepage well for house use.
31	SE.	33	"	"	"	Bored	64	2,300	- 44	2,256	64	2,236	Glacial sand	Hard, iron, "alkaline"		S	Just sufficient for stock; laxative; shallow seepage well for house use.
32	SW.	33	"	"	"	Bored	45	2,335	- 33	2,302	33	2,302	Glacial sand	Hard, iron, "alkaline"		S	Insufficient; laxative; water hauled for house use.
33	SW.	34	"	"	"	Bored	39	2,295	- 12	2,283	39	2,256	Glacial gravel	Hard, iron		S	Sufficient for stock; shallow well for house use.
34	NW.	35	"	"	"	Bored	45	2,270	- 30	2,240	45	2,225	Glacial sand	Hard, iron		S	Sufficient for stock; house water obtained from seepage well.
35	NE.	35	"	"	"	Dug	105	2,270	- 65	2,205	65	2,205	Glacial sand	Hard, iron		S	Sufficient for stock; seepage well for household.
36	SE.	36	"	"	"	Bored	120	2,290			120	2,170	Glacial sand	Hard, clear, "alkaline", iron		S	
37	NW.	36	"	"	"	Bored	105	2,250	- 55	2,195	55	2,195	Glacial sand	Hard, iron, "alkaline"		S	Sufficient for stock needs; laxative; has 14-foot seepage well for house use.
1	SE.	1	20	19	3	Bored	105	2,071	- 98	1,973	98	1,973	Glacial sand	Hard, iron, black sediment		S	Insufficient; supplies only 10 head stock; has a dam.
2	NW.	7	"	"	"	Drilled	460	2,235	-120	2,115	450	1,785	Belly River sand	Hard, clear, iron		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.

5
WELL RECORDS—Rural Municipality of

MIRY CREEK, NO. 227, SASKATCHEWAN.

WELL No.	LOCATION					TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE		PRINCIPAL WATER-BEARING BED			CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
	¼	Sec.	Tp.	Rge.	Mer.				Above (+) Below (−) Surface	Elev.	Depth	Elev.	Geological Horizon				
3	SE.	7	20	19	3	Drilled	340	2,208	-200	2,008	340	1,868	Belly River sand	Hard, iron, cloudy		D, S	Sufficient supply.
4	NW.	8	"	"	"	Drilled	425	2,185	- 80	2,105	425	1,760	Belly River sand	Hard, iron		D, S	Sufficient supply.
5	SW.	9	"	"	"	Drilled	430	2,215	-100	2,115	430	1,785	Belly River sand	Hard, clear, iron		D, S	Sufficient supply.
6	SE.	10	"	"	"	Spring	0	2,027	0	2,027	0	2,027	Glacial drift				Flows all year.
7	SE.	12	"	"	"	Drilled	272	2,073	-122	1,951	272	1,801	Belly River sand	Soft, clear, iron, red sediment, "alkaline"		D, S	Supplies household and 11 head stock; also sells to neighbours; #.
8	SW.	15	"	"	"	Spring	0	2,015	0	2,015	0	2,015	Glacial sand	Hard			These springs feed Miry Creek; #.
9	SE.	16	"	"	"	Spring	0	2,015	0	2,015	0	2,015	Glacial sand	Hard			
10	SE.	19	"	"	"	Dug	32	2,200	- 26	2,174	30	2,170	Glacial sand	Hard, clear		D, S	Supplies household and 3 head stock; dam located on the SW. ¼, section 20.
11	NE.	19	"	"	"	Dug	20	2,210	- 10	2,200	20	2,190	Glacial sand	Soft, clear		D, S	Supply ample.
12	SW.	20	"	"	"	Dug	60	2,210	- 58	2,152	58	2,152	Glacial sand	Hard, clear		D	Insufficient supply; 2 pails a day.
13	SW.	27	"	"	"	Dug	20	2,040	- 18	2,022	18	2,022	Glacial drift	Hard, clear, iron, red sediment		D, S	Insufficient; supplies household and 4 head stock; also 100-foot well unfit for human consumption; filled in.
14	SW.	28	"	"	"	Dug	30	2,015	- 25	1,990	25	1,990	Glacial drift	Hard, clear		D, S	Insufficient for stock needs.
15	SW.	30	"	"	"	Dug	130	2,210	-122	2,088	122	2,088	Glacial gravel	Hard, clear, iron		D, S	Sufficient until 1934; needs repairing.
16	NE.	30	"	"	"	Drilled	420	2,255			420	1,825	Belly River sand	Hard, iron		D, S	Sufficient supply.
17	SE.	31	"	"	"	Dug	10	2,115	- 4	2,111	4	2,111	Glacial sand	Hard, clear		D, S	Sufficient supply.
18	SW.	33	"	"	"	Dug	32	2,015	- 22	1,993	22	1,993	Glacial drift	Hard, clear, "alkaline", iron		D, S	Sufficient supply.
19		34	"	"	"	Spring							Glacial drift			D	Furnishes domestic supplies for number of farms.
1	SE.	3	20	20	3	Drilled	403	2,333			403	1,930	Belly River sand	Hard, clear, Na ₂ CO ₃		D, S	Sufficient supply; Na ₂ CO ₃ — sodium carbonate.
2	SW.	3	"	"	"	Bored	138	2,307	-120	2,187	120	2,187	Glacial sand	Hard, clear		D, S	Insufficient supply.
3	NW.	4	"	"	"	Dug	84	2,290	- 68	2,222	68	2,222	Glacial drift	Hard, clear		D, S	Supplies household and 350 head stock; also 80-foot well filled in.
4	NW.	5	"	"	"	Dug	115	2,318	- 85	2,233	115	2,203	Glacial gravel	Hard, clear		D, S	Sufficient supply.
5	NW.	9	"	"	"	Drilled	354	2,330	-125	2,205	354	1,976	Bearpaw sand	Hard, clear, iron, red sediment		D, S	Sufficient supply.
6	NE.	10	"	"	"	Drilled	386	2,295	-160	2,135	386	1,909	Belly River sandstone	Hard, clear		D, S	Sufficient supply; also 150-foot well in quicksand; filled in.
7	NE.	10	"	"	"	Drilled	426	2,295	-160	2,135	426	1,869	Belly River sand	Hard, clear		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.

6
WELL RECORDS—Rural Municipality of MARY CREEK, NO. 229, SASKATCHEWAN.

WELL No.	LOCATION					TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE		PRINCIPAL WATER-BEARING BED			CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
	¼	Sec.	Tp.	Rge.	Mer.				Above (+) Below (-) Surface	Elev.	Depth	Elev.	Geological Horizon				
8	NW.	12	20	20	3	Drilled	372	2,245	-140	2,105	372	1,873	Belly River sand	Hard, clear, iron, soda		D, S	Sufficient supply.
9	SE.	13	"	"	"	Dug	40	2,225	- 30	2,195	30	2,195	Glacial gravel	Hard, clear		D, S	Sufficient supply.
10	SE.	14	"	"	"	Drilled	365	2,290	-290	2,000	365	1,925	Belly River sand	Hard, clear, iron, soda		D, S	Sufficient supply; second 305-foot well, base in sand, filled in.
11	SE.	15	"	"	"	Drilled	433	2,303	-220	2,083	400	1,903	Belly River sand	Hard, clear, iron		D, S	Sufficient supply.
12	NE.	16	"	"	"	Drilled	503	2,295	-150	2,145	503	1,792	Belly River sand	Hard, clear, iron, yellow sediment		D, S	Sufficient supply.
13	SE.	17	"	"	"	Drilled	350	2,318	-150	2,168	350	1,968	Bearpaw sand	Hard, clear, iron		D, S	Large, sufficient supply; #.
14	SW.	18	"	"	"	Dug	87	2,288	- 83	2,205	83	2,205	Glacial sand	Hard, clear, red sediment, iron		D, S	Large, sufficient supply.
15	NE.	19	"	"	"	Drilled	243	2,280	-100	2,180	243	2,037	Glacial gravel	Hard, iron, reddish, "alkaline", odour		D, S	Sufficient supply.
16	NW.	20	"	"	"	Dug	100	2,255	- 87	2,168	87	2,168	Glacial gravel	Hard, clear		D, S	Sufficient supply.
17	SE.	21	"	"	"	Bored	107	2,250	-102	2,148	102	2,148	Glacial gravel	Hard, clear		D, S	Sufficient supply.
18	SE.	21	"	"	"	Dug	120	2,280	-114	2,166	114	2,166	Glacial drift	Hard, clear		D	Sufficient supply.
19	SW.	22	"	"	"	Bored	110	2,251	- 25	2,150	95	2,156	Glacial gravel	Hard, clear, iron, soda, white sediment		D, S	Sufficient supply.
20	NE.	24	"	"	"	Drilled	385	2,230	-200	2,030	385	1,845	Belly River sand	Hard, clear, iron		D, S	Sufficient supply.
21	SE.	25	"	"	"	Drilled	440	2,215	-200	2,015	440	1,775	Belly River sand	Hard, iron, red sediment		D, S	Sufficient supply.
22	NE.	26	"	"	"	Drilled	410	2,246	-150	2,096	410	1,836	Belly River sand	Hard, clear, "alkaline", iron, white sediment		D, S	Large sufficient supply.
23	SW.	27	"	"	"	Dug	84	2,230	- 78	2,152	78	2,152	Glacial gravel	Hard, clear, "alkaline", iron		D, S	Sufficient supply.
24	NW.	27	"	"	"	Drilled	436	2,235	-165	2,070	436	1,799	Belly River sand	Hard, clear, iron		D, S	Sufficient supply; also 600-foot well supplies soft water.
25	NE.	28	"	"	"	Dug	108	2,250	- 93	2,157	93	2,157	Glacial gravel	Hard, clear, iron		D, S	Sufficient supply.
26	NW.	30	"	"	"	Bored	100	2,220	- 70	2,150	100	2,120	Glacial gravel	Hard, clear, "alkaline"		D, S	Sufficient supply.
27	SW.	31	"	"	"	Drilled	130	2,245	- 90	2,155	130	2,115	Glacial sand	Hard, clear, iron		S	Sufficient supply for stock; 20 barrels in 3 hours.
28	NW.	31	"	"	"	Drilled	140	2,240	- 80	2,160	135	2,105	Glacial gravel	Hard, clear		D, S	Sufficient supply.
29	SE.	31	"	"	"	Drilled	204	2,235	-134	2,101	204	2,031	Glacial gravel	Hard, clear		S	Sufficient for stock needs; not used for household due to unsanitary surroundings.
30	SE.	31	"	"	"	Drilled	142	2,255	- 82	2,173	142	2,113	Glacial gravel	Hard, clear		D, S	Large, sufficient supply.
31	NE.	31	"	"	"	Drilled	140	2,235	- 80	2,155	140	2,095	Glacial sand	Hard, clear		D	3,000 gallons an hour; also a second well; C.P.R. wells.

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.

7
WELL RECORDS—Rural Municipality of MARY CREEK, NO. 229, SASKATCHEWAN.

WELL No.	LOCATION					TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE		PRINCIPAL WATER-BEARING BED			CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
	¼	Sec.	Tp.	Rge.	Mer.				Above (+) Below (−) Surface	Elev.	Depth	Elev.	Geological Horizon				
32	SW.	32	20	20	3	Drilled	150	2,240			150	2,090	Glacial sand	Hard, clear		D, S	Sufficient supply.
33	SE.	33	"	"	"	Bored	100	2,240	- 95	2,145	95	2,145	Glacial gravel	Hard, clear		D, S	Sufficient supply.
34	SE.	34	"	"	"	Drilled	194	2,245	-144	2,101	194	2,051	Glacial gravel	Hard, clear, "alkaline", iron		D, S	Sufficient supply.
35	SE.	35	"	"	"	Drilled	430	2,250	-170	2,080	430	1,820	Belly River sand	Hard, clear, "alkaline"		D, S	Sufficient supply.
36	SE.	36	"	"	"	Drilled	600	2,250			600	1,650	Belly River sand	Soft			
37	SW.	36	"	"	"	Drilled	430	2,250	-170	2,080	430	1,820	Belly River sand	Hard, clear		D, S	Sufficient supply.
1	SW.	1	20	21	3	Drilled	118	2,315	- 68	2,247	110	2,205	Glacial gravel	Hard, clear		S	Sufficient for stock needs.
2	SE.	3	"	"	"	Bored	28	2,325	- 12	2,313	12	2,313	Glacial sand	Hard, iron, "alkaline"		D, S	Sufficient supply.
3	SW.	4	"	"	"	Bored	45	2,310	- 40	2,270	40	2,270	Glacial sand	Hard, iron, clear		S	Sufficient for stock needs; 18-foot seepage well for house.
4	SE.	6	"	"	"	Bored	90	2,310	- 30	2,280	90	2,220	Glacial gravel	Hard, clear, iron		S	Sufficient for stock needs.
5	NE.	6	"	"	"	Bored	90	2,310	- 50	2,260	90	2,220	Glacial gravel	Hard, dark colour		S	Sufficient supply; shallow well supplies drinking water.
6	NE.	7	"	"	"	Bored	40	2,305	- 5	2,300	40	2,265	Glacial gravel	Hard, clear		D, S	Sufficient supply.
7	NE.	8	"	"	"	Dug	30	2,300	- 27	2,273	27	2,273	Glacial sand	Hard, clear		D, S	Sufficient supply.
8	SW.	9	"	"	"	Dug	12	2,265	- 8	2,257	8	2,257	Glacial sand	Soft, cloudy		D, S	Supply insufficient.
9	NE.	9	"	"	"	Bored	115	2,265	-100	2,165	115	2,150	Glacial sand	Hard, clear		D, S	Sufficient supply.
10	NW.	10	"	"	"	Bored	35	2,305	- 25	2,280	25	2,280	Glacial sand	Hard, clear		D, S	Insufficient supply.
11	NE.	10	"	"	"	Drilled	185	2,305	- 45	2,260	180	2,125	Glacial gravel	Hard, clear, iron		S	Sufficient supply; also 50-foot household well.
12	NE.	13	"	"	"	Bored	126	2,285	- 94	2,191	126	2,159	Glacial gravel	Hard, clear, iron		D, S	Sufficient supply; laxative to man.
13	SE.	14	"	"	"	Dug	52	2,260	- 26	2,234	52	2,208	Glacial gravel	Hard, clear, iron		D, S	Sufficient supply.
14	SW.	14	"	"	"	Bored	65	2,250	- 15	2,235	65	2,185	Glacial gravel	Hard, clear, iron		D, S	Sufficient supply.
15	NE.	14	"	"	"	Bored	66	2,290	- 64	2,226	64	2,226	Glacial gravel	Hard, clear		D, S	Sufficient supply.
16	SE.	16	"	"	"	Dug	27	2,340	- 21	2,319	21	2,319	Glacial sand	Hard, iron, rusty		D, S	Sufficient supply.
17	NE.	16	"	"	"	Bored	52	2,260	- 44	2,216	44	2,216	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient supply.
18	SE.	17	"	"	"	Dug	30	2,275	- 20	2,255	20	2,255	Glacial sand	Hard, clear		S	Sufficient supply.
19	SE.	18	"	"	"	Bored	30	2,250	- 15	2,235	15	2,235	Glacial sand	Hard, clear, "alkaline"		S	Insufficient supply.
20	SE.	20	"	"	"	Drilled	96	2,235	- 66	2,169	96	2,139	Glacial sand	Hard, clear		S	Sufficient supply.
21	NE.	21	"	"	"	Bored	70	2,300	- 30	2,270	65	2,235	Glacial gravel	Hard, clear, iron		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

MIRY CREEK, NO. 227, SASKATCHEWAN.

WELL No.	LOCATION					TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE		PRINCIPAL WATER-BEARING BED			CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
	¼	Sec.	Tp.	Rge.	Mer.				Above (+) Below (−) Surface	Elev.	Depth	Elev.	Geological Horizon				
22	SE.	22	20	21	3	Bored	80	2,310	- 20	2,290	75	2,235	Glacial gravel	Hard, clear, iron		D, S	Sufficient supply; laxative to man.
23	SE.	24	"	"	"	Dug	127	2,315	-103	2,212	127	2,188	Glacial gravel	Hard, clear, iron		D, S	Sufficient supply.
24	SE.	25	"	"	"	Dug	50	2,290	- 48	2,242	48	2,242	Glacial gravel	Hard, clear		D, S	Sufficient supply.
25	NW.	26	"	"	"	Bored	95	2,290	- 86	2,204	86	2,204	Glacial gravel	Hard, clear		D, S	Sufficient supply.
26	NE.	26	"	"	"	Drilled	412	2,325	- 90	2,235	412	1,913	Belly River sand	Hard, clear, "alkaline"		D, S	
27	SW.	27	"	"	"	Dug	19	2,275	- 11	2,264	11	2,264	Glacial sand	Hard, clear, iron		D, S	Sufficient supply.
28	SE.	28	"	"	"	Dug	16	2,285	- 10	2,275	10	2,275	Glacial sand	Soft, clear		D, S	Insufficient supply; has been hauling water for past three years.
29	SE.	29	"	"	"	Dug	24	2,305	- 12	2,293	12	2,293	Glacial clay	Soft, clear		D, S	Insufficient supply; also 10-foot well aids supply.
30	NE.	29	"	"	"	Dug	18	2,295	- 14	2,281	14	2,281	Glacial sand	Soft, clear		D	Insufficient supply; also 20-foot well supplies stock.
31	SE.	30	"	"	"	Bored	35	2,240	- 29	2,211	29	2,211	Glacial sand	Hard, clear		S	Insufficient supply.
32	SE.	32	"	"	"	Dug	30	2,300	- 10	2,290	30	2,270	Glacial sand	Hard, clear		D, S	Sufficient supply.
33	NE.	32	"	"	"	Bored	110	2,310	-104	2,206	104	2,206	Glacial sand	Hard, clear, "alkaline"		S	Insufficient supply.
34	SE.	33	"	"	"	Bored	100	2,280	- 80	2,200	100	2,180	Glacial gravel	Hard, clear		D, S	Sufficient supply; laxative to man.
35	NE.	34	"	"	"	Bored	100	2,280	- 90	2,190	90	2,190	Glacial gravel	Hard, clear, iron		D, S	Sufficient supply.
36	SE.	36	"	"	"	Drilled	110	2,250	-100	2,150	100	2,150	Glacial gravel	Hard, clear, iron		D, S	Sufficient supply; poor quality.
1	SW.	5	21	19	3	Dug	20	2,000	- 10	1,990	10	1,990	Glacial gravel	Hard, clear, "alkaline"		D, S	Insufficient; hauls water complete stock needs.
2	SE.	14	"	"	"	Drilled	785	1,990									Dry hole; base in Lea Park shale;
3	SE.	20	"	"	"	Dug	16	1,975	- 11	1,964	11	1,964	Glacial sand	Hard, clear, "alkaline"		S	Ample for stock needs.
4	NW.	20	"	"	"	Drilled	125	1,900									Dry hole; base in Belly River formation.
5	NE.	27	"	"	"	Bored	180	1,930					Base in Belly River formation	Hard, "alkaline"		N	Not fit for consumption.
6	SE.	31	"	"	"	Drilled	1011	1,930									Dry hole; base in Lea Park formation; also 200-foot and 600-foot dry holes.
1	SW.	1	21	20	3	Dug	84	2,244									Dry hole; base in Glacial clay; hauls water from 3 miles south.
2	SE.	2	"	"	"	Dug	94	2,270									Dry hole; base in Glacial clay.
3	NE.	3	"	"	"	Drilled	229	2,300	-196	2,104	223	2,077	Glacial sand	Hard, clear, reddish sediment, iron		D, S	Supplies household and 20 head stock.
4	SW.	3	"	"	"	Dug	98	2,240	- 94	2,146	94	2,146	Glacial sand	Hard		D, S	Supplies household and 14 head stock.
5	SW.	4	"	"	"	Dug	80	2,230	- 77	2,153	77	2,153	Glacial sand	Hard, clear		D, S	Supplies household and 20 head stock.
6	SE.	5	"	"	"	Bored	60	2,220	- 54	2,166	54	2,166	Glacial sand	Hard, clear, "alkaline"		D, S	Supplies household and 25 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

MIRY CREEK, NO. 229, SASKATCHEWAN.

WELL No.	LOCATION					TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE		PRINCIPAL WATER-BEARING BED			CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
	¼	Sec.	Tp.	Rge.	Mer.				Above (+) Below (-) Surface	Elev.	Depth	Elev.	Geological Horizon				
7	SE.	6	21	20	3	Dug	84	2,240	- 80	2,160	80	2,160	Glacial sand	Hard, clear, iron		D, S	Supplies household and 25 head stock.
8	SE.	7	"	"	"	Dug	70	2,225	- 66	2,159	66	2,159	Glacial sand	Hard, clear, iron, red- ish sediment		D, S	Supplies household and 7 head stock.
9	NE.	8	"	"	"	Bored	100	2,215	- 95	2,120	95	2,120	Glacial gravel	Hard, clear, iron		D, S	Oversufficient supply.
10	SW.	9	"	"	"	Dug	100	2,260	- 96	2,164	96	2,164	Glacial sand	Hard, clear, iron, red- ish sediment		D, S	Supplies household and 20 head stock.
11	NE.	10	"	"	"	Dug	50	2,050	- 37	2,013	50	2,000	Glacial gravel	Hard, clear, "alkaline"		N	Well filled in; also a spring.
12	NE.	11	"	"	"	Dug	12	1,960	- 7	1,953	12	1,948	Glacial gravel	Hard, clear, "alkaline"		D, S	Sufficient supply.
13	SW.	14	"	"	"	Dug	21	1,965	- 17	1,948	17	1,948	Glacial gravel	Hard, clear		D, S	Supplies household and 30 head stock.
14	NE.	36	"	"	"		10	1,954					Glacial sandy clay				Caved in; not used.
1	NE.	1	21	21	3	Drilled	400	2,255			400	1,855	Belly River sand	Hard, clear	44	D, S	Sufficient supply.
2	NE.	2	"	"	"	Bored	100	2,275	- 90	2,185	90	2,185	Glacial sand	Hard, clear	44	D, S	Sufficient supply.
3	NW.	5	"	"	"	Dug	16	2,300	- 12	2,288	12	2,288	Glacial sand	Hard, clear, "alkaline"	44	S	Not always sufficient.
4	NE.	7	"	"	"	Dug	20	2,310	- 17	2,293	17	2,293	Glacial sand	Soft, clear	44	D, S	Not always sufficient.
5	SE.	9	"	"	"	Bored	80	2,240	- 75	2,165	75	2,165	Glacial sand	Hard, clear	44	D, S	Sufficient supply.
6	NE.	9	"	"	"	Dug	76	2,235	- 70	2,165	70	2,165	Glacial sand	Hard, clear, iron	44	D, S	Sufficient supply.
7	NW.	10	"	"	"	Bored	76	2,230	- 70	2,160	70	2,160	Glacial sand	Hard, clear, iron	44	S	Sufficient for stock needs.
8	NE.	10	"	"	"	Bored	76	2,230	- 6	2,164	66	2,164	Glacial gravel	Hard, clear	44	D, S	Sufficient for local needs.
9	SW.	13	"	"	"		62	2,230					Glacial sand				
10	NW.	14	"	"	"	Bored	90	2,232	- 85	2,147	85	2,147	Glacial sand	Hard, clear, "alkaline", iron	44	D, S	Sufficient supply.
11	NW.	20	"	"	"	Drilled	268	2,225	-143	2,082	268	1,957	Bearpaw sand	Hard, clear, "alkaline"	44	D, S	Sufficient supply.
12	NW.	20	"	"	"	Drilled	276	2,200									Well filled in; base probably in Belly River formation.
13	NW.	20	"	"	"	Drilled	505	2,210			410	1,800	Belly River sand				Well filled in.
14	NW.	20	"	"	"	Drilled	269	2,225	257	1,968	257	1,968	Bearpaw sand				Well filled in; slow supply.
15	NW.	20	"	"	"	Drilled	102	2,215									Well filled in; base in glacial sand.
16	SW.	22	"	"	"	Bored	95	2,200	- 85	2,115	85	2,115	Glacial sand	Soft, clear		D, S	Sufficient for local needs.
17	NW.	22	"	"	"	Bored	50	2,175	- 39	2,136	40	2,135	Glacial sand	Soft, clear	44	D, S	Sufficient supply.
18	SW.	27	"	"	"	Bored	90	2,194					Glacial sand	Soft, clear	44	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

MIRY CREEK, NO. 229, SASKATCHEWAN.

WELL No.	LOCATION					TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE		PRINCIPAL WATER-BEARING BED			CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
	¼	Sec.	Tp.	Rge.	Mer.				Above (+) Below (−) Surface	Elev.	Depth	Elev.	Geological Horizon				
19	SE.	28	21	21	3	Drilled	2222	2,194			220	1,974	Bearpaw sand	Soft, clear	44	D, S	Sufficient supply; partly plugged.
20	NW.	31	"	"	"	Dug	85	2,233	− 80	2,153	80	2,153	Glacial sand	Hard, clear	44	D, S	Sufficient supply.
21	SE.	32	"	"	"	Bored	65	2,184	− 48	2,136	48	2,136	Glacial gravel	Hard, clear	44	D, S	Sufficient supply;
22	SE.	32	"	"	"	Bored	86	2,195									Dry hole; base in glacial sand.
23	SW.	36	"	"	"	Spring	8	2,017	+ 1	2,018	8	2,009	Glacial sand	Hard, clear, "alkaline"	44	S	Sufficient for local needs.
1		5	22	19	3	Spring	0	1,976	0	1,976	0	1,976	Glacial sand	Hard, clear		D, S	Supplies many residents; #.
1	NE.	3	22	20	3	Dug	14	1,970					Glacial sand	Hard, clear		D	Insufficient supply; second well waters 20 head stock.
2	SE.	3	"	"	"	Bored	125	1,943									Dry hole; base probably in Belly River formation; also 75-foot dry hole.
3	SE.	9	"	"	"	Dug	16	1,980	− 15	1,965	15	1,965	Glacial sand	Hard, clear, "alkaline"		D, S	Intermittent supply; new wells made each autumn.
4	NE.	18	"	"	"	Dug	24	2,060	− 14	2,046	14	2,046	Glacial sand	Hard, clear		S	Insufficient supply; waters 9 head stock; also 24-foot and 16-foot similar wells; hauls water.
5	NW.	18	"	"	"	Dug	15	2,050	− 9	2,041	9	2,041	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for household and 5 head stock.
6	SW.	30	"	"	"	Dug	20	2,060	− 16	2,044	16	2,044	Glacial sand	Medium hard		D, S	Sufficient for local needs.
1	SE.	2	22	21	3	Spring		1,966	+ 10	1,976	0	1,966	Glacial gravel	Hard, clear, "alkaline"	44	D, S	Sufficient to yields 24 barrels an hour; supplies several farms.
2	SE.	6	"	"	"	Bored	80	2,210	− 75	2,135	75	2,135	Glacial sand	Hard, clear, iron			Intermittent supply.
3	NE.	6	"	"	"	Dug	50	2,148	− 44	2,104	44	2,104	Glacial drift	Hard, clear, "alkaline"		D, S	Sufficient supply.
4	SE.	7	"	"	"	Bored	85	2,186	− 70	2,116	70	2,116	Glacial sand	Hard, clear, iron	44	D	Sufficient for stock needs.
5	SW.	8	"	"	"	Bored	75	2,186	− 58	2,128	58	2,128	Glacial sand	Hard, clear, iron	44	S	Sufficient for stock needs.
6	NW.	18	"	"	"	Spring		2,065	+ 5	2,070	0	2,065	Glacial sand	Hard, iron, "alkaline", sulphur	44	S	Sufficient; used only for stock; not fit for human consumption.
7	NE.	15	"	"	"	Spring	0	2,040	0	2,040	0	2,040	Glacial sand	Soft, clear	44	D, S	Sufficient supply.
8	SW.	16	"	"	"	Drilled	476	2,207	−160	2,047	476	1,731	Belly River sand	Hard, iron, cloudy		D, S	Was sufficient; but has been allowed to fill in.
9	SE.	17	"	"	"	Drilled	400	2,200	−100	2,100	400	1,800	Belly River sand	Hard, clear	44	D, S	Sufficient supply.
10	SW.	17	"	"	"	Dug	70	2,200	− 58	2,142	58	2,142	Glacial sand	Hard, clear	44	D, S	Sufficient supply.
11	NE.	19	"	"	"	Dug	65	2,170	− 48	2,122	65	2,105	Glacial sand	Soft, clear		D, S	Sufficient supply.
12	NW.	19	"	"	"	Bored	54	2,159	− 40	2,119	54	2,105	Glacial sand	Hard, clear		D, S	Sufficient supply.
13	NW.	20	"	"	"	Dug	20	2,153	− 14	2,139	14	2,139	Glacial sand	Soft, clear		D, S	Sufficient with aid of nearby slough to complete stock needs.
14	SE.	21	"	"	"	Bored	70	2,107	− 50	2,057	70	2,037	Glacial sand	Hard, clear		D, S	Sufficient supply.
15	NW.	21	"	"	"	Dug	3	2,053	+ 10	2,063	3	2,050	Glacial gravel	Hard, clear		D, S	Sufficient supply; yields 50 barrels a day.

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

MIRY CREEK, NO. 229, SASKATCHEWAN.

WELL No.	LOCATION					TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE		PRINCIPAL WATER-BEARING BED			CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
	¼	Sec.	Tp.	Rge.	Mer.				Above (+) Below (-) Surface	Elev.	Depth	Elev.	Geological Horizon				
16	SE.	22	22	21	3	Dug	25	2,040	- 18	2,022	18	2,022	Glacial gravel	Soft, clear	44	D, S	Sufficient supply.
17	NE.	23	"	"	"	Dug	32	2,055	- 28	2,027	28	2,027	Glacial sand	Hard, clear	44	D, S	Sufficient supply.
18	SW.	24	"	"	"	Dug	14	2,050	- 10	2,040	10	2,040	Glacial sand	Soft, clear	44	D, S	Sufficient supply.
19	SE.	24	"	"	"	Dug	24	2,070	- 22	2,048	22	2,048	Glacial sand	Soft, clear	44	D, S	Not always sufficient.
20	NE.	26	"	"	"	Dug	27	2,035	- 25	2,010	25	2,010	Glacial sand	Soft, clear	44	D, S	Sufficient for local needs.
21	SE.	27	"	"	"	Dug	16	1,960	- 14	1,946	14	1,946	Glacial gravel	Hard, clear, "alkaline"	44	D, S	Insufficient for local needs; second 40-foot well went dry.
22	NW.	28	"	"	"	Dug	14	2,064	- 11	2,053	11	2,053	Glacial gravel	Hard, clear		D, S	Sufficient supply; #; also a spring that is used.
23	SW.	33	"	"	"	Bored	72	1,998	- 18	1,980	72	1,920	Glacial drift	Hard, clear, "alkaline"		S	Sufficient for stock needs; unfit for domestic use.
24	SE.	33	"	"	"	Drilled	800	1,995	+ 3	1,998	800?	1,195?	Lea Park ?	Soft, cloudy, soda		D, S	Insufficient supply; an artesian well but with very slow supply.
25	SE.	36	"	"	"	Dug	20	2,044	- 17	2,027	17	2,027	Glacial sand	Hard, clear, "alkaline"	44	N	Not used now; needs re-cribbing.
26	SE.	36	"	"	"	Dug	7	2,030	- 4	2,026	4	2,026	Glacial sand	Soft, clear	44	D, S	Sufficient supply.
1	SW.	3	23	19	3	Dug	10	1,950	- 3	1,947	3	1,947	Glacial sand	Soft, clear		S	Sufficient for 10 head stock; sand point in house used for cooking and drinking; spring waters 760 sheep.
2	NE.	4	"	"	"	Dug	12	1,960	- 9	1,951	9	1,951	Glacial sand	Soft, clear		D, S	Sufficient supply.
1	NW.	2	23	21	3	Bored	165	2,000	-140	1,860	165	1,835	Glacial gravel	Hard, clear, iron		S	Sufficient supply.
2	NE.	3	"	"	"	Bored	135	1,990	-125	1,865	135	1,855	Glacial gravel	Hard, clear, "alkaline", iron	44	D, S	Sufficient supply.
3	SW.	4	"	"	"	Dug	10	1,995	- 7	1,988	7	1,988	Glacial gravel	Hard, clear, "alkaline"		S	Sufficient supply for stock; also 115-foot dry hole; 14-foot well supplies household.
4	SE.	5	"	"	"	Dug	30	2,020	- 28	1,992	28	1,992	Glacial sand	Hard, clear, "alkaline"		S	Sufficient supply for stock.
5	SW.	9	"	"	"	Drilled	180	2,010	-175	1,835	175	1,835	Glacial sand	Hard, clear, "alkaline"		S	Insufficient supply; unsuitable for domestic use.
6	SW.	12	"	"	"	Bored	160	2,015	-148	1,867	160	1,855	Glacial gravel	Hard, iron, clear	44	S	Not always sufficient.
7	SW.	17	"	"	"	Dug	20	2,260	- 16	2,244	16	2,244	Glacial sand	Hard, clear	44	D, S	Sufficient supply.
8	NW.	17	"	"	"	Bored	160	2,260	-130	2,130	130	2,130	Glacial gravel				Some water; not used.
9	NW.	18	"	"	"	Bored	65	2,325	- 62	2,263	62	2,263	Glacial sand	Hard, clear, iron	44	D, S	Sufficient supply; aided by spring on the SE. ¼, section 18.
10	SE.	18	"	"	"	Spring	0						Glacial drift			S	

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.