CANADA
DEPARTMENT OF MINES

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

BUREAU OF ECONOMIC GEOLOGY

GEOLOGICAL SURVEY

PRELIMINARY REPORT

GROUND-WATER RESOURCES OF THE RURAL MUNICIPALITY OF RIVERSIDE No. 168 SASKATCHEWAN

BY

B. R. MacKay, H. H. Beach & R. Johnson

Water Supply Paper No. 144

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INTRODUCTION

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

Publication of Results

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

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

How to Use the Report

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

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

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

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

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

GLOSSARY OF TERMS USED

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

WATER-BEARING HORIZONS OF THE MUNICIPALITY

The rural municipality of Riverside covers an area of approximately 510 square miles in the western part of southern Saskatchewan. The municipality is bounded on the northeast by South Saskatchewan river. It consists of all of townships 16, 17, 18, and 19, ranges 16, 17, and 18; township 20, range 18, and the parts lying to the southwest of South Saskatchewan river; of townships 20, ranges 16 and 17; and townships 21 and 22, ranges 16, all west of the Third meridian.

The southeast corner of the municipality lies 12 miles west and 2 miles north of the city of Swift Current. The Empress branch of the Canadian Pacific railway extends in a northwesterly direction through the central part of the municipality, and on it are situated the towns of Success and Cabri and the villages of Pennant and Battrum. The Verlo branch of the same railway runs in a southwesterly direction from Pennant. The hamlet of Fosterton is located at the point where the railway intersects the northern boundary of township 17, range 18.

The surface of the municipality is gently rolling. It slopes gradually in a northerly direction, from elevations of 2,350 to 2,500 feet above sea-level along the southern border to approximately 2,100 feet at the edge of the valley of South Saskatchewan river at the northeast border of the area, and to 2,000 feet at the top of the south bank of Miry creek, in township 21, range 18. Throughout the greater part of its course along the northern border of the municipality the valley of South Saskatchewan river is 200 to 300 feet deep. The valley slopes are very steep and rugged and are cut at intervals by small ravines that extend short distances back from the main valley. Upstream from the junction of Miry creek with the

river, in the northwest corner, the river valley becomes much wider and the valley slopes less rugged. The river has an approximate elevation of 1,820 feet above sea-level at the northwest corner, and drops to an approximate elevation of 1,790 feet at the northeast corner, of the municipality.

The greater part of the surface in the southern part of the municipality drains to sloughs and small lakes in undrained depressions. In the northern part of the area, Antelope creek, a portion of Miry creek, and a few small intermittent streams carry the surface run-off to the river.

Throughout the southern half of the municipality adequate supplies of ground water are generally available from the unconsolidated Recent and glacial deposits. In the northern half of the area, it is generally necessary to sink wells through the glacial drift into the Bearpaw and Belly River bedrock formations before an adequate water supply is obtained. Many wells have been sunk to great depths, in the extreme northwestern parts of the area, without obtaining more than small seepages of water. Residents of this area have been obliged to excavate dugouts, thus conserving the surface run-off for stock use; domestic supplies are hauled from Miry creek or from South Saskatchewan river.

Water-bearing Horizons in the Unconsolidated Deposits

Over the greater part of the municipality the unconsolidated deposits, consisting of glacial drift and Recent dune sand, are between 50 and 250 feet thick. Along the steep sides of the valleys of South Saskatchewan river and Antelope creek the glacial drift is very thin or even absent, and numerous bedrock exposures occur. The areal distribution of the various types of unconsolidated deposits that have been recognized in the area are indicated on Figure 1 of the map accompanying this report.

The glacial till or boulder clay was laid down by the great continental ice-sheet that many thousands of years ago advanced and retreated across the province of Saskatchewan; the lake deposits by the waters resulting from the melting of the ice; and the Recent dune sands were formed by wind action after the disappearance of the ice-sheet. As the ice-sheet advanced over the surface of the bedrock it deposited a thick layer of bluish grey boulder clay, and during the retreat additional layers of this material were laid down. Where not covered by later deposits this material, generally referred to as ground moraine or glacial till, occurs at the surface in several small areas in the eastern parts of the municipality. At other places where the ice front paused during its retreat a greater accumulation of a generally more porous type of drift was deposited, and is characterized by an irregularly rolling or hummocky surface and many undrained depressions. Such belts of drift, known as moraine, are confined to areas of higher elevation in the eastern part of the municipality. The waters from the melting ice gradually collected to form a large lake that covered the greater part of the western half of the municipality and extended as long, narrow embayments into the southeast corner. The extent of this lake is now indicated by a deposit of some 5 to 30 feet of compact, light bluish grey lake clay. In the later stages smaller lakes occupied only parts of the basin of the large glacial lake. The deposits of the later glacial lakes are generally more sandy than the blue-grey glacial lake clays, and cover the southwestern and south-central parts and a small area in the extreme northwest corner of the municipality in the broad part of South Saskatchewan River valley. Winds blowing over these sandy clays have tended to redistribute much of the sand into dunes. Areas in which these small sand hills predominate occur in townships 16, ranges 17 and 18, and in township 18, range 22.

Throughout the areas covered by lake and dune sands, water supplies are generally obtained at depths of 20 feet or less. The sand is very porous and hence little water is retained at the surface. The water percolates downward and gradually accumulates in depressions in the surface of the underlying lake clays. Many wells located in depressions will water a large number of stock. The water is only moderately hard and suitable for all domestic requirements. Several residents have found it advantageous to excavate large dugouts in depressions for watering range stock; the water seeping in from the sands. In some areas the underlying clay is not sufficiently impervious to retain the water and it percolates downward to collect in sandy beds in the underlying glacial drift. It then becomes necessary to sink wells to depths of 30 or 40 feet before water is obtained. The supply is usually much smaller than that derived from the shallow wells in the dune sands, and the water is more highly mineralized. It is, however, reported to be drinkable.

Throughout the west-central and northwestern part of the municipality, and in a smaller area in the southeast corner, the lake deposits are composed almost entirely of blue-grey clay. So compact is this clay in many places that little or no ground water can be obtained from it. Except in a few isolated localities, which will be discussed in later sections of this report dealing with individual townships, the ground water supply throughout this large area is being obtained from deep wells sunk either to horizons in the underlying glacial drift or into the bedrock formations.

Glacial drift covers the bedrock throughout practically the entire municipality. It is either exposed at the surface as till or moraine or the upper part consists of glacial lake clay. Due to a limited number of records giving accurately the findings in the various wells of the area, estimates of the thickness of the drift over the municipality can at best be only approximate.

It is believed to have a thickness of at least 130 feet in the southeast corner and to be at least 180 feet thick along the southern border in township 16, range 18. Due possibly to irregularities in the surface of the bedrock, the thickness of the drift varies from 150 to 225 feet over the central parts of the municipality, but thins to the north to negligible thickness along the valley of South Saskatchewan river, where at many places the bedrock is exposed at the surface. The belts of moraine on the eastern uplands offer better possibilities of obtaining ground water at shallow depths than do the areas of glacial till. This is due to the fact that the moraine, although made up largely of boulder clay, in many places contains scattered through it fairly thick lenses or pockets of coarse sands and gravels. Such pockets do occur in the upper part of the till, but occur much more sparingly, and considerable prospecting with an auger may be necessary before a supply of water sufficient even for domestic use is located. On the farms in which such pockets have been encountered within 25 feet of the surface, hard water, suitable for drinking, has been obtained. A few of the wells yield sufficient water for both household needs and for a few head of stock. If a reasonable amount of testing, done in such a way as to prospect as large an area as possible, does not yield an adequate water supply, deeper drilling to lower horizons becomes necessary. Throughout the moraine- and till-covered areas gravel beds at the surface forming low knolls and ridges are worthy of prospecting. Wells located at or near the bases of slopes and in ravines and coulées have proved to be productive in many places in this part of Saskatchewan. Throughout the area lying to the south of the "A" line as drawn on the municipality map (Figure 1) the residents who have not found water at shallow depths and have sunk deeper have almost invariably encountered productive sand and gravel beds at depths of 50 to 100 feet. Many of these beds

appear to extend over several square miles. The areal extent of such beds as have been traced will be discussed under the individual townships. Water from these horizons is generally hard and contains sulphate salts in solution, but not in sufficient quantities to render the water undrinkable. The yields from individual wells vary greatly, but are generally sufficient for local requirements.

Another possible ground water aquifer exists at the contact of the drift with the underlying bedrock. Beds of sand or gravel have been tapped at this horizon in several wells, but these are irregular in their occurrence. They may have a thickness of 20 feet or more at one point and be entirely absent at another. Throughout the area lying between the "A" line and the southern part of the "B" line, however, the sand and gravel beds occurring at the contact appear to be fairly continuous and wells tapping these beds generally yield large supplies of drinkable water. The contact is not reached at the same elevation at all places within the area. In township 18, range 16, wells ranging in depth from 100 to 200 feet tap the productive beds at the contact at elevations ranging from 2,235 feet in the southern parts down to 2,135 feet along the northern boundary of the township. Farther west, in township 18, range 17, wells 120 to 170 feet deep find water at this horizon between 2,160 and 2,180 feet above sea-level, and in township 17, range 18, approximately the same ranges of depths and elevation of aquifer prevail.

North of the southern part of the "B" line some of the water may be derived from a white sand at the contact of the drift and the bedrock, but the greater supply probably comes from the bedrock. Efforts to obtain an adequate water supply from beds in the drift at shallow depths have been almost entirely unsuccessful.

Water-bearing Horizons in the Bedrock

The Bearpaw bedrock formation immediately underlies the glacial drift throughout the greater part of the municipality. The Belly River formation outcrops in places along South Saskatchewan river and underlies the glacial drift in a narrow strip along the river. The upper part of the Bearpaw formation is composed of at least 250 feet of dark grey, compact, and largely impervious shales. Near the middle of the formation thick beds of sands occur, and the lower part of the formation is shale. In the central part of the municipality these sand beds occur at an approximate elevation of 2,100 feet above sea-level. This formation was presumably laid down uniformly over the entire area. Erosion before the advance of the ice-sheet had almost entirely removed the upper shales exposing the sands in the area bounded by the "B" line in the central part of the municipality. Still farther north the sand has been eroded away and the 200 or more feet of shales comprising the lower part of the formation occur immediately beneath the drift.

The uneven erosion of the Bearpaw has had marked effects upon the accumulation of ground water in the bedrock of the area. South of the southern part of the "B" line the upper shaly part of the formation immediately underlies the drift. It is not water bearing itself and is probably too impervious to allow water to seep downward into any sands that may occur in the middle part of the formation. A 275-foot well was drilled to an elevation of 2,125 feet above sea-level on the NE.$\frac{1}{4}$, sec. 13, tp. 16, range 16, without encountering water. This well probably penetrated at least 100 feet of the shales. At the village of Success another well was drilled to a depth of 477 feet, of which the lower 300 feet were in the shale. Water derived from this well comes from gravel beds in the drift at the contact with the shale. Within the area bounded by the "B" line in the central part of the municipality the upper

shaly part of the Bearpaw has been completely removed by erosion and the glacial drift immediately overlies the sandy beds of the bedrock. In the eastern and central parts of the area wells 150 to 250 feet deep passed through some 30 feet of coarse, white sand underlain by a similar thickness of blue-grey sand. The upper white sand occurs at an elevation of 2,120 to 2,070 feet above sea-level. It is probable that the upper white sand is of glacial origin and similar to other sand beds found at the contact between the drift and the bedrock in areas to the south, but the lower blue-grey sand probably is a part of the Bearpaw formation. The water found in the sands is of better quality than that generally found in the Bearpaw, and hence it is presumable that supplies at this horizon are part glacial and part bedrock in origin. Farther west within this area the sands do not generally exceed 25 feet in thickness. The depths to these beds in townships 18 and 19, range 18, vary from 20 feet in Antelope Creek valley to 200 feet on the uplands. Wells have been drilled to a depth of 597 feet in the town of Cabri without striking water at this horizon. Two other wells, 170 and 257 feet deep, on secs. 8 and 17, tp. 19, range 18, found this horizon to be unproductive. The wells were deepened to elevations of 1,962 and 1,904 feet, respectively, where they obtained production in sands in the Bearpaw formation. Both of these wells are flowing. The water from the former is undrinkable, due to the presence of a high concentration of dissolved mineral salts. Information was not obtained regarding the character of the water from the well on section 17.

North of the area bounded by the "B" line sand beds in the lower part of the Bearpaw formation are few and apparently of limited areal extent. Several wells in township 19, range 17, and the northern part of township 19, range 18, have obtained water in what appear to be isolated sand beds rather than continuous horizons. The yield and quality of the water differ

considerably in the different wells. These wells will be discussed under the individual townships.

The Belly River formation underlies the Bearpaw shales at an approximate elevation of 1,850 feet above sea-level throughout the greater part of the municipality. This formation is exposed along the banks of south Saskatchewan river and in a well west of the municipality consists of 400 to 450 feet of brownish shales interbedded with beds of sand and sandy shales and thin seams of coal. Much of this formation is more porous than the shales that form the greater part of the Bearpaw. One well located on the SE.¼, sec. 4, tp. 20, range 17, is definitely known to be deriving water from this formation. This well is 299 feet deep and struck a large supply of soft, soda-bearing water at the base of the well at an elevation of 1,778 feet. A 240-foot well, located on the NW.¼, sec. 32, tp. 19, range 18, is recorded as drawing its supply from the Belly River but it may be obtaining its supply from a sand bed at the base of the Bearpaw. Throughout township 20, range 18, and the fractions of 21 and 22, range 18, lying to the west of the river, deep wells have been sunk through the Belly River formation without obtaining water. Several sand horizons were struck in these wells, but all were dry. It is not apparent why a formation that is essentially porous should be unproductive of ground water throughout this extensive area. The wells that have been drilled are located sufficiently far apart to make it appear questionable if any further deep drilling for water should be attempted in this part of the municipality.

The Lea Park formation, which is included in the Marine Shale series, consists of some 1,000 feet of dark grey, compact shales. It underlies the Belly River formation at an approximate elevation of 1,500 to 1,450 feet above sea-level. Wells in the northwest corner of the municipality have penetrated these shales without obtaining water. If an adequate supply is not found in the Belly River formation, deeper drilling into the Lea Park shales cannot be expected to be more productive.

GROUND WATER CONDITIONS BY TOWNSHIPS

Township 16, Range 16

A small area along the western boundary of the township is covered by glacial lake sands having a thickness of 3 to 20 feet. Only one well on the SW.¼, section 6, is known to be yielding a water supply from this sand. It is probable that hard, drinkable water in adequate quantities for farm requirements could be obtained from the sand at other points. However, in order to obtain supplies near their farm buildings several residents have been obliged to sink wells to penetrate sand or gravel pockets in the underlying glacial till.

A narrow strip adjacent to the area of lake sands in the western part of the township is overlain by glacial lake clay. Only a few scattered sand pockets exist in the clay and no appreciable supply of water can be obtained from it. The lake clay is not more than 20 feet thick and residents in the areas covered by these clays derive their ground water supplies from pockets of sand and gravel in the underlying glacial drift.

A flat till plain extends through the centre of the township as a narrow belt approximately one mile wide from north to south. A more irregularly rolling area of moraine, characterized by knolls and depressions, extends over the east-central and northeastern parts.

Localized sand and gravel pockets occur in the upper 30 feet of the drift, from which small supplies of hard, generally drinkable, water are being obtained. It has been found necessary to sink several test holes in some areas before a productive pocket is encountered, due to the irregular distribution of the water-bearing beds. In only a few places have the supplies from these shallow wells been adequate for local requirements. The upper part of the glacial drift is slightly more porous and the sand and gravel pockets more numerous at shallow depths in the moraine-covered area. Water is, therefore, more likely to be obtained at shallow depths in this region.

In order to obtain adequate supplies for stock requirements, many residents of the township have been forced to sink wells to depths of 40 to 128 feet, depending upon the elevation of the particular well site. Most of the wells penetrate water-bearing sand or gravel at elevations between 2,380 and 2,340 feet above sea-level. It is probable that a continuous bed of porous sand and gravel occurs in the glacial drift between these elevations throughout the greater part of the township. In the central part of the area, wells 40 to 60 feet deep generally yield sufficient water for local requirements, from a sand and gravel aquifer found at this horizon. The water is generally hard, but not too highly mineralized for domestic use. Due to greater surface elevations it was found necessary to sink wells to depths of 108 and 84 feet on the SW.$\frac{1}{4}$ and NE.$\frac{1}{4}$, section 25, before the horizon was tapped. Both of these wells are yielding ample supplies of water of good quality. In the same locality, however, a 56-foot well on the NW.$\frac{1}{4}$, section 25, yields only a small supply of water from this horizon, and a 143-foot hole on the SE.$\frac{1}{4}$, section 36, reached an approximate elevation of 2,337 feet without obtaining water.

A 128-foot well located on the SE.$\frac{1}{4}$, section 1, yields a fairly large supply of hard, drinkable water from a gravel aquifer which is believed to occur at the contact between the glacial drift and the underlying Bearpaw shales. Water could probably be obtained from sand and gravel beds at the contact between the glacial drift and the Bearpaw formation in other parts of the township, although such is not always the case, as indicated by the 275-foot dry hole located on the NE.$\frac{1}{4}$, section 13, the lower 100 feet of which was in bedrock.

Should wells sunk to elevations of 2,380 to 2,340 feet in this township fail to yield adequate supplies of water, an extension of the wells down to the contact of the drift and the bedrock offers possibilities of obtaining water. The actual variations in thickness of the glacial drift over this township have not been accurately

determined, but the contact probably will be reached at depths between 100 and 200 feet. In areas of low elevation along the western boundary of the township it appears advisable to do considerable prospecting at shallow depths before sinking wells to greater depths.

It is not advisable to continue wells below the contact into the Bearpaw shales in any part of the township. Approximately the lower 100 feet of the 275-foot hole on the NE.¼, section 13, is in the shales and the shale did not yield even a small seepage of water.

Township 16, Range 17

A belt of dune sand 1 to 2 miles in width extends in a southwesterly direction across the northern part of the township. The other parts are covered by glacial lake sands. These sands are seldom more than 20 feet thick and are underlain by 30 feet or less of light bluish grey, glacial lake clays, resting in turn upon approximately 100 feet of boulder clay. Throughout the greater part of the township little difficulty has been experienced in obtaining adequate supplies of ground water at shallow depths in the Recent dune sand or in the glacial lake sands. Where depressions occur in the underlying lake clay the ground water collects at the base of the sand and can be obtained by sinking shallow wells or by excavating dugouts in the sand. Such wells and dugouts provide adequate supplies of water for domestic use and for range stock in the dune sand area in the west-central and northeastern parts of the township. Throughout the remainder of the township the sands are thinner and less productive and deeper wells are necessary. Along the eastern border several residents have bored wells through the lake sands and clays to reach pockets of sands and gravels in the upper part of the underlying glacial drift. The wells do not generally exceed 45 feet in depth but on the SW.¼, section 2, and NW.¼, section 12, it was necessary to sink

wells to depths of 65 and 60 feet, respectively, before water-bearing sand beds in the drift were located. These wells yield sufficient quantities of hard, drinkable water for household requirements and for 15 to 20 head of stock. Should an adequate water supply not be found at any particular place within 60 feet of the surface residents should sink shallow test holes, located so as to prospect as large an area as possible, or to deepen existing wells down to the contact of the drift and the bedrock, as little water is likely to be found in the lower part of the boulder clay. This would necessitate wells 150 to 200 feet deep. One well, located on section 1, was bored to 100 feet without encountering water. A well located on the NE.¼, section 23, obtained a small supply in the upper part of the drift at a depth of 55 feet. This well was extended to a depth of 132 feet without obtaining additional supplies. As the quantity of water to be expected at the contact in this township has not been determined, more extensive prospecting at shallow depths is advisable. No wells have reached the Bearpaw shales forming the bedrock in this township. It is improbable, however, that any adequate supply of ground water will be found below the contact of the drift and the shale, i.e., below a depth of 200 feet in any part of the township.

Township 16, Range 18

Glacial lake sands cover the entire township except in a 5-square mile area in the east-central part which is occupied by dune sand. In the dune sand area the few residents have experienced little difficulty in obtaining sufficient ground water for domestic use by sinking wells less than 20 feet in depth. Dugouts deriving their supply as seepage from the glacial lake sand are used to water range stock. A few springs occur along the small valleys in the southwest part of the township. The flow is not large, but with the construction of reservoirs these springs would water a considerable number of stock. Except in the vicinity

of "alkali" sloughs in the depressions, the water from the shallow wells of the township is soft or only moderately hard. Throughout all but the extreme north and southwestern parts shallow wells, not exceeding 20 feet in depth, satisfy all local requirements. Hence, there has been no necessity of sinking deeper wells, and little is known regarding the ground water conditions in the lower part of the glacial drift or at the contact of the drift and the Bearpaw shales.

On sections 32 and 33, however, the upper sands of the lake deposits evidently yielded little water and wells were continued through the underlying lake clays to obtain large supplies of drinkable water in fine sand beds in the glacial till at depths of 45 and 58 feet. Three other wells, in sections 6, 30 and 33, were sunk through the unproductive boulder clay forming the greater part of the drift to find water in sand at the contact between the drift and the bedrock. These wells are, respectively, 183, 150, and 150 feet deep, and reached the contact at elevations of 2,237, 2,270, and 2,220 feet above sea-level. The well on section 6 penetrated a gravel bed in the upper part of the drift, 65 feet from the surface. Neither the supply from the gravel nor that from the contact is sufficient for local requirements. The water is "alkaline", but used for drinking. The yields from the 150-foot wells in sections 30 and 33 are much larger and of suitable quality for domestic use. Several wells in the adjoining township on the west indicate that should the near surface sources of supply in the western part of this township fail small supplies of water of good quality are to be expected from the lower part of the drift at depths of 90 to 120 feet.

No wells are known to have penetrated the Bearpaw shales underlying the drift throughout this township. The shales will in all probability prove to be too impervious to yield more than very small seepages of ground water. Wells in this township should be confined to the glacial lake sands and the upper part of the drift, or at deepest to the contact between the drift and the shale.

Township 17, Range 16

As indicated on Figure 1 of the accompanying map, the surface deposits overlying different parts of this township consist of glacial lake sands, glacial lake clays, moraine, and glaciall till. However, practically all the ground water supplies used in the township are being obtained from the boulder clay that underlies the glacial lake sands and clay, which are seldom more than 30 feet thick. It is possible, however, that supplies of water could be obtained from the glacial lake sands that cover a narrow belt around the small lake in the west-central part of the township.

No water supplies are being obtained from the glacial lake clays that occur at the surface over a small area in the southwestern part of the township. A few residents obtain small supplies of hard, drinkable water from shallow wells tapping sand or gravel pockets in the glacial till and moraine. The productive sand and gravel pockets probably are more numerous in the moraine, which occupies most of the eastern half of the township.

Practically all the ground water supplies in this township are being obtained from wells 50 to 100 feet deep. In the eastern part of the township, where surface elevations are relatively high, these wells reach water-bearing sand and gravel beds at elevations between 2,380 and 2,340 feet. In the western part of the area, however, water is generally being obtained from sand and gravel beds at elevations between 2,320 and 2,300 feet. These beds probably form continuous aquifers over extensive areas. On sites of high or low surface elevation, a few wells have reached these horizons at depths outside the 50- to 100-foot range. The lower horizon of the western part of the area was encountered at a depth of 112 feet on section 4, and at depths of 25 and 43 feet on sections 32 and 33. The upper horizon in the eastern part of the township was reached at depths of 35 and 41 feet on section 23, and 46 feet on section 36.

Supplies of water being obtained from the two horizons are generally sufficient for local requirements. In only two places, on the SE.$\frac{1}{4}$, section 17, and the SE.$\frac{1}{4}$, section 35, are the yields reported to be insufficient for farm needs. The water although hard is seldom too highly mineralized to be used for household purposes. The water from wells on the SE.$\frac{1}{4}$, section 17, and the SE.$\frac{1}{4}$, section 31, is too highly mineralized for drinking.

Two wells in the town of Success were drilled to depths of 395 and 477 feet. In the 477-foot well numerous water-bearing beds were encountered. A supply estimated at 1,000 gallons an hour was encountered at a depth of 175 feet in a bed of gravel. The elevation of the top of this bed is approximately 2,231 feet above sea-level and the gravel is believed to be at the contact between the glacial drift and the underlying Bearpaw shales. Wells in the northern part of the adjoining township to the north yield fairly large supplies of water from sand at this contact, at approximately the same elevation, indicating that the aquifer possibly extends over a considerable area in this vicinity. Should wells less than 100 feet in depth fail to yield adequate quantities of water, the sand and gravel beds at the contact between the glacial drift and the Bearpaw shales appear to be the most promising source of supply at greater depths. The contact is not a certain source of water supply, as in some areas there may be no sand or gravel between the shales and the boulder clay. The glacial drift may be 200 feet thick in some areas and it is inadvisable to sink wells to these depths unless supplies at shallower depths are altogether inadequate.

In the 477- and 395-foot wells in Success water was encountered in sand beds at various depths down to approximately 400 feet, indicating that the upper part of the Bearpaw formation in this area is not entirely barren of water. However, the supplies encountered were not sufficient to warrant further drilling into the Bearpaw formation in this area.

Township 17, Range 17

More difficulty has been experienced in obtaining adequate water supplies in this township than elsewhere in the southern half of the municipality. This condition is due to a great extent to the fact that residents depend upon near surface sources of supply, which are readily affected by drought conditions, rather than attempting to find more permanent supplies at greater depths. Glacial lake clays cover the boulder clay throughout all but the northeast corner of the area. Along the western and southern borders of the area the clays are overlain by 10 to 25 feet of coarse glacial lake sands. Throughout this sand-covered area residents have been able to obtain small supplies of drinkable water from dug wells not exceeding 25 feet in depth. These supplies are, however, generally inadequate for farm requirements. Two wells on section 7 have been sunk through the upper sands and the 20 or 30 feet of underlying blue-grey lake clay, which does not yield water to wells, and obtain larger supplies of hard, slightly "alkaline", but drinkable, water from scattered sand pockets in the upper part of the glacial till at depths of 42 and 53 feet, respectively. Similar wells in sections 34, 35, and the NE.$\frac{1}{4}$, section 36, have reached similarly productive sand and gravel pockets within 60 feet of the surface. Wells 45 and 54 feet deep in section 16 and in the NE.$\frac{1}{4}$, section 36, do not yield sufficient water for farm requirements. The sand and gravel pockets do not form continuous aquifers over large areas and several test holes, spaced to prospect as large an area as possible, may be necessary before a sufficient quantity of water is obtained. One 40-foot test hole was sunk on section 12, and failed to obtain water. This finding in itself should not, however, condemn the possibilities of obtaining water within 60 feet of the surface in this part of the area. The 85-foot well on section 32 is the only deep well in the township. The well yields a moderately large supply of hard, drinkable water from a bed of sand

in the boulder clay. No attempts have been made to determine the water conditions existing either in the lower part of the glacial drift or at the contact of the drift and the underlying dark grey shales of the Bearpaw formation. The actual thickness of the drift throughout the area has not been determined. Findings in adjoining townships would suggest, however, that good possibilities exist of finding adequate water supplies at depths between 100 and 200 feet throughout this township. Drilling below 200 feet will in all probability enter the Bearpaw shales, from which it is unlikely that more than small seepages of highly mineralized water will be obtained.

Township 17, Range 18

Three types of glacial deposits occur in this township. Blue-grey glacial lake clays having a thickness of 20 to 30 feet cover all but the northeast corner of the area. These clays become sandy along the eastern and southern borders. In the northeast corner erosion has removed the lake clays exposing the boulder clay, which underlies the entire area down to depths of 150 to 200 feet. Part of the glacial drift has an irregularly rolling ground surface and is designated moraine.

The lake clays are too fine grained to form a source of ground water, but in the eastern and southern parts dug wells less than 20 feet in depth may yield fairly large supplies of hard, drinkable water from the lake sands. Throughout many parts of the area water has been found in scattered pockets of sand and gravel occurring in the upper 30 feet of the boulder clay underlying the lake clays. Sand yielding moderately large supplies of hard water was found at depths of 20 feet in sections 4 and 5, and at depths of 15 and 30 feet in sections 24 and 36. A well on section 12 found a water-bearing sand at 42 feet. This sand has been struck in two wells in section 7 of the township adjoining on the east and may have a wide areal extent in the southeast corner of this township.

Water conditions at greater depths in the glacial drift vary from place to place. In the southwest corner wells bored to depths of 70 to 90 feet have penetrated a bed of sand, at an approximate elevation of 2,300 feet, which yields adequate supplies of hard water that contains fairly large amounts of dissolved sulphate salts but is usable for household purposes. An even more extensive sand horizon in the lower part of the drift has been found at an approximate elevation of 2,260 feet in wells on sections 10, 14, 18, and 20, the NW.¼, section 22, and SW.¼, section 24. These wells vary in depth depending upon the elevation of the well site. The horizon was struck at 60 feet in section 20, but it was necessary to drill to 180 feet in section 14. All of these wells yield large supplies of water of good quality. This horizon was penetrated in a well on the SE.¼, section 22, at 128 feet from the surface, but since the yield was small the well was continued 73 feet farther to the contact of the drift with the underlying Bearpaw shales at an elevation of 2,200 feet above sea-level. This contact was reached in a 200-foot well in the SE.¼, section 15, and at 195 feet in the SW.¼, section 16. The 110-foot well in section 30 is also believed to derive its supply from sand beds at the contact. All these wells yield large supplies of hard water of good quality. No other wells have been sunk to this horizon in the area, but the logs of existing wells in this and adjoining townships suggest that this horizon will be found to be productive throughout the greater part of the township.

It would appear from the number of horizons that have been found to yield water that an adequate supply is to be expected within 220 feet of the surface in any part of the township. Drilling much below this depth will probably encounter the dark grey shales of the Bearpaw formation, which will undoubtedly be found to be too compact to yield more than small seepages of water.

Township 18, Range 16

The central part and the northeast and southeast corners of the township are flat or gently rolling till plains. In the southwest corner and in sections 13, 23, 24, and parts of 25, the ground surface is more irregular. Low hills and undrained depressions typical of areas of moraine occur in these parts. The upper 30 to 40 feet of the glacial drift in the till- and moraine-covered areas consists chiefly of yellow boulder clay which grades downward into blue clay. Interspersed in this clay are small pockets of sand and gravel. These pockets are generally of very limited extent and considerable testing may be necessary to locate them. A few wells in the area yield adequate supplies for both domestic and stock requirements. Generally, however, the supply is adequate only for domestic needs and must be supplemented by supplies from wells sunk to the more productive horizons at greater depths in the drift. A somewhat greater possibility of obtainign water at shallow depths exists in the moraine-covered areas than in the area of glacial till or ground moraine. The sand and gravel pockets are generally more numerous and in places form low knolls and ridges. Such occurrences are worthy of prospecting as are also the gravel deposits at the bottoms of slopes and along the bottoms of ravines and coulées.

Throughout the entire township the greater part of the ground water supplies is being obtained from sand and gravel beds in the lower part of the glacial drift. Underlying the upper 30 to 40 feet of boulder clay in which the scattered sand and gravel pockets occur is a more compact blue clay. This blue clay is, however, by no means barren of ground water as porous beds carrying large supplies have been encountered in it at several horizons in different parts of the area. In the southern half and along the eastern boundary of the township water-bearing sand and gravels have been tapped at depths between 45 and 90 feet. In the areas of relatively high surface elevation in the southeastern and eastern parts of the township these water-bearing

beds occur at elevations between 2,380 and 2,340 feet. In the southwestern corner of the township, on sections 8 and 18, and also in section 35 in the northern part of the area, the surface elevations are slightly lower and wells 40 to 90 feet deep have reached water-bearing sands and gravels at elevations between 2,330 and 2,290 feet. These findings would indicate that the beds of sand and gravel extend over considerable areas and that water will probably be encountered at depths not exceeding 100 feet throughout practically all but the northwest quarter of the township. The supplies being obtained from existing wells tapping these horizons are not large, and in some places have proved inadequate for local requirements. The water varies in quality from soft to hard, and although highly mineralized is, in all instances, drinkable.

Should wells under 100 feet deep in the southern and eastern parts of this township fail to yield sufficient water the most probable source of a larger supply is at the contact between the glacial drift and the underlying Bearpaw shales. In the southern half of the township no wells have been drilled deep enough to test this source. Wells in the northern half, however, and in the town of Success in the adjoining township to the south, indicate that there is possibility of obtaining fairly large supplies of water from sand or gravel beds at the contact at depths not exceeding 200 feet. Dry holes 200 feet deep on section 13, and a 900-foot dry hole reported on section 12 of the adjoining township to the west, indicate that this contact may not be productive in the southwestern corner of this township.

In the northern part of the township practically all the ground water used is being obtained from wells, drilled to depths of 127 to 200 feet, that tap a sand aquifer at the contact of the glacial drift and the underlying Bearpaw shales. On sections 22, 23, 27, and 28 wells have reached these water-bearing sands at elevations of 2,265 to 2,223 feet above sea-level, but

on sections 19, 20, 31, and 32 the sands occur some 50 to 60 feet lower, at elevations of 2,192 to 2,165 feet. In sections 33 and 34 a 185- and a 200-foot well have yielded large supplies of hard, iron-bearing, but drinkable, water from water-bearing sand at elevations of 2,135 and 2,138 feet, respectively.

On section 35 a well was reported to have been drilled to a depth of 414 feet without encountering any appreciable supply of water. Dry gravel and sand, which is probably at the contact between the glacial drift and the Bearpaw shales, was penetrated at a depth of 156 to 193 feet. Another sand bed containing very little water was reported at a depth of 300 to 337 feet, and it may be a continuation of the sand bed in the Bearpaw formation from which water is being obtained in the adjoining township to the north. The fact that no water was obtained from the sand and gravel at the contact or in the sand bed in the Bearpaw formation in this well may indicate that deep drilling will prove futile in the northeastern corner of the township.

It is inadvisable to sink wells below the base of the glacial drift in any part of this township, as sand beds encountered in the Bearpaw formation will probably not yield any appreciable supply of water. The thickness of the glacial drift probably does not exceed 200 feet in any part of the township.

Township 18, Range 17

A deposit of 20 to 30 feet of compact, bluish grey, glacial lake clay covers the greater part of the township. Since these clays are almost entirely barren of porous beds of sand and gravels the possibilities of finding ground water at shallow depths in this area are limited. In sections 4 and 5 thin beds of glacial lake sands overlie the lake clays, but have not been found to be water-bearing. Seventy-five to 125 feet of compact boulder clay underlies the lake clays. A rolling hillocky area of moraine occupies

the southeast corner of the township. Isolated pockets of sands and gravels are scattered through the glacial drift or form ridges and knolls. These deposits are worthy of prospecting. One well in the SE.¼, section 2, in the moraine-covered area obtains sufficient quantities of hard, drinkable water from a bed of gravel at a depth of 30 feet to satisfy the needs of the resident.

Wells, 36 and 35 feet deep, on the SE.¼'s, sections 25 and 35, are yielding adequate supplies of drinkable water from sand pockets in the upper part of the glacial till. Similar pockets may occur sparingly elsewhere in the till-covered area of the northeast corner, but considerable prospecting is generally necessary to locate them, and residents of this district have found it more advantageous to sink wells to more consistently productive horizons at greater depths.

On the information obtained regarding the wells in this municipality this township may be divided into three areas, in each of which the majority of wells have a similar source. Throughout the southern third of the area south of the "A" line on Figure 1, water is obtainable at comparatively shallow depths in the glacial drift. In sections 4 and 5 two wells sunk to depths of 25 and 36 feet obtain water from the upper weathered zone of the drift. The well on section 4 derives a small supply of moderately soft water from a porous part of the boulder clay, whereas the 36-foot well on section 5 encountered gravel yielding a much larger supply of hard water.

In sections 1, 2, 12, and 13, along the eastern border, four wells sunk to depths of 60 to 73 feet penetrate sand yielding small supplies of only moderately hard water. It is to be noted that throughout this area in no wells do the aquifers appear to have a large areal extent, but rather they occur as isolated pockets in the drift. The existing evidence does not favour deeper drilling in this part of the area. Two wells are reported to have been drilled to depths of 160 and 900 feet, in section 12, without

obtaining water. Other wells, in sections 13 and 24, reached depths of 200 and 160 feet and were also dry. These findings indicate that water-bearing beds probably do not occur at these places at the contact of the drift and the bedrock or in the underlying, dark grey Bearpaw shales. It may be possible that the contact recorded in the 150-foot well in the SE.¼, section 15, lies at slightly greater depths in sections 9, 10, and 11, and at possibly slightly lesser depths in section 14, but no wells have as yet been sunk to prove or disprove this. In the light of the unsuccessful attempts to find water at depths of 160 to 200 feet in sections 13 and 24, the possibilities of obtaining water at such depths in the town of Pennant are not encouraging. Large supplies of water have been found at the drift-bedrock contact at a depth of 171 feet in section 22, and in sand of the Bearpaw at 231 feet in both SW. and SE.¼'s, section 27, suggesting that drilling to depths of 180 to 250 feet will be necessary to prove or disprove the easterly extension of these horizons as productive aquifers.

Throughout the area lying between the "A" and "B" lines in the central part of the township, sand or gravel beds occurring at the contact of the glacial drift and the Bearpaw shale offer the most consistently productive source of ground water. The contact is irregular and hence varies slightly in elevation from place to place, but has been reached at elevations of 2,200 to 2,160 feet above sea-level throughout this area. The depths of wells necessary to reach the horizon will vary from 150 to 175 feet, except in an area of low elevation as in section 20 where a 120-foot well reached production at the contact. The yield from these wells is not large, but at all places is reported to be adequate for local requirements. The water is hard but not highly mineralized and hence satisfactory for drinking. No information regarding the water-bearing properties of the underlying shales was obtained, but it is questionable if drilling below the contact will yield a satisfactory supply.

In the northern part of the township, north of the "B" line, ground water is considered to be derived from two sources. The blue-grey boulder clay is penetrated in wells to depths of 75 to 150 feet; this is underlain by some 20 feet of white sand. The sand is underlain by 20 to 30 feet of bluish grey sand which is probably a sandy horizon in the Bearpaw formation, here not covered by the dark grey, impervious shales. Both of these sand horizons are water-bearing. Water is found in nearly all wells in the area at elevations of 2,140 to 2,100 feet above sea-level, necessitating a depth of well of 120 to 150 feet in the northwest corner increasing to 230 feet in section 27 and 200 feet in section 36. The water is hard and of good quality. The yields from all the wells are adequate for local requirements, but the wells in the eastern part of the area yield larger supplies than do the slightly shallower wells in the western part.

No deeper drilling into the bedrock has been attempted in this area. It is very questionable, however, that if an adequate supply of water is not found within 250 feet of the surface, deeper wells into the shales will prove more productive.

Township 18, Range 18

Springs occur at the edges of the "alkali" lakes in section 18, and in a valley in section 27. Apart from the water being used from these springs, the ground water supplies in this township are obtained from wells.

With the exception of a small area of moraine in sections 2 and 3, the entire township is mantled by a thin layer of glacial lake clay. The lake clay is generally yellow to brownish near the surface, and becomes bluish grey in the less weathered parts at greater depths. The lake clay is underlain at depths of 10 to 20 feet below the surface by blue boulder clay similar to that which comprises the moraine. This boulder clay underlying the lake clays extends to approximate depths of from 50 feet in the

west-central part to 80 feet or more in other sections. Few if any porous beds of sands or gravels occur in the lake clays, with the result that ground water is not obtainable at very shallow depths in this area. There are, however, occasional sand and gravel pockets scattered irregularly through the upper part of the glacial drift from which a few wells obtain water. Wells located on the SW.¼, section 1, NE.¼, section 23, and NE.¼, section 28, yield adequate supplies of hard, drinkable water from sand pockets below the lake clay at depths of less than 20 feet. Generally, however, only small supplies of water can be expected within 30 feet of the surface, and several test holes are required to locate a water-bearing sand or gravel pocket. In most localities it is advisable to sink wells to greater depths in the glacial drift and penetrate one of the extensive horizons that underlie the greater part of the area. Wells between 45 and 60 feet deep, on sections 2 and 3, NE. ¼, section 10, and section 12, are yielding ground water supplies from sand and gravel beds interspersed in the glacial till. With the exception of the well on section 10, these wells yield adequate supplies of hard, drinkable water for local requirements. However, throughout most of the southern part of the township, south of the "B" line, the ground water supplies are being obtained at greater depths from sand and gravel beds at the contact between the glacial drift and underlying Bearpaw formation. With one exception, wells sunk to sufficient depth throughout this area have found water at the contact at elevations between 2,230 and 2,150 feet above sea-level. The depth of well necessary to reach this horizon is dependant largely on the elevation at the selected well site. In the lowlands, in section 6, the aquifer was tapped at depths of 30 and 36 feet. In most of the western half of the area south of the "B" line, water is to be expected at this horizon at depths between 60 and 100 feet. Farther east, in sections 4, 10, and 13, it was found necessary to sink wells to depths of 120 to 200 feet before the

sand bed was reached! The water from all of these wells is hard and not highly mineralized. With the exception of water from a 70-foot well on section 16, it is reported to be satisfactory for all domestic requirements. The supply is generally sufficient for at least 20 head of stock, but an 80-foot hole on section 17 encountered dry sand at the horizon, and the supply from a 120-foot well on section 10 is not sufficient for farm requirements.

North of the "B" line water is obtainable from two sources. In the northwest quarter of the township wells are considered to draw their supply from sands and gravels occurring at the contact of the glacial drift and the bedrock. Existing evidence would suggest that little difficulty will be experienced in obtaining fairly large supplies of hard, drinkable water from this horizon at depths between 40 and 90 feet in these parts. The elevations at which the aquifers occur in the wells on the NE.¼'s, sections 19 and 32, suggest that the water is being derived from a sandy bed in the Bearpaw formation, and in the absence of more detailed information the horizon has been recorded as such in the well records. Farther east, in sections 25, 35, and 36, two horizons appear to be productive: (1) white sands lying at the contact of the drift and the bedrock; and (2) a fine grey sand bed in the Bearpaw formation inself. The upper sand at the contact was penetrated at a depth of 75 to 125 feet in a 203-foot well on section 25. The well continued through 65 feet of "hard clay", which is presumed to be the shales of the Bearpaw, to reach larger supplies in a fine grey sand bed in the bedrock at an elevation of 2,107 feet. This sand bed forms the aquifer in four wells, between 53 and 157 feet deep, on sections 35 and 36. Although no deep wells have been sunk in sections 24 and 26, it is probable that either or both of these horizons will be water bearing in these sections at depths ranging from 120 to 200 feet. The waters from the wells in this corner of the township are reported to be of good quality, and the supply from each is adequate for all local requirements. Deeper drilling into the shales of the Bearpaw formation has not

been attempted in this township. It is improbable that any sand beds encountered below a depth of 225 feet will be extensive or will possess supplies at all comparable with those obtained from the contact or the upper sand bed of the bedrock present in the northern parts of the area.

Township 19, Range 16

The mantle of glacial drift over this township varies in thickness from a maximum of approximately 240 feet along the southern border to negligible thickness along the edge of South Saskatchewan River valley in the northwest corner of the township. Bedrock is exposed along the sides of the river valley and in ravines running southward from the river valley. The glacial drift is composed chiefly of bluish grey boulder clay which is weathered to a yellow or brownish colour near the surface. A few scattered pockets of sand and gravel may occur in the upper 30 to 40 feet of the clay. Two wells, 40 feet deep, located on the SW.$\frac{1}{4}$, section 1, and the SE.$\frac{1}{4}$, section 4, and a 16-foot well located on the SE.$\frac{1}{4}$, section 15, yield adequate supplies of water for farm requirements from such localized pockets in the glacial drift. Generally, however, the supplies from shallow wells are only sufficient for household needs and 5 to 10 head of stock.. Several test holes may be required to locate a water-bearing sand or gravel pocket, and in many localities no water will be available at shallow depths. Two wells located on sections 5 and 11 yield fairly large supplies of hard, drinkable water from a sand bed which is considered to lie either at the contact between the glacial drift and the underlying Bearpaw shales or in the upper part of the bedrock. The base of the 204-foot well on section 5 is at an elevation of approximately 2,149 feet, and the base of the 160-foot well on section 11 at an elevation of 2,182 feet above sea-level.

With these few exceptions all water supplies in this township are being obtained from wells between 100 and 265 feet deep drawing their supplies from a sand bed in the upper part of

the Bearpaw formation.

The "B" horizon, as indicated on Figure 1, is productive over the greater part of the township. The wells drawing their supplies from this horizon vary in depth between 105 and 265 feet, depending upon the surface elevation of the well site. The water is being obtained from a bluish sand bed in the bedrock overlying compact marine shale. This sand bed is generally encountered at elevations of 2,120 to 2,070 feet. Above the blue sand is a thick layer of light-coloured sand which is probably of glacial origin. The combined thickness of the two sand beds as encountered in several wells reaches 80 feet. In some areas a thin layer of shale occurs between the upper light-coloured sand and the blue sand. All wells drawing their supplies from the "B" horizon have been classified as non-flowing artesian wells. The base of the wells is considered to be near the top of the water-bearing beds. The water, however, in the thick sand beds may be under little or no hydrostatic pressure.

Water will probably be obtainable from either the glacial sand at the contact or from the blue sand in the Bearpaw formation throughout the southern part of the township. The 414-foot dry hole on section 35 of the adjoining township to the south, however, may indicate that the sand beds at the contact and near the top of the Bearpaw formation will be unproductive over a small area in the southeastern corner of this area. The "B" horizon may be found to be productive at locations nearer the river valley along the northern border than indicated by the boundary as shown on Figure 1 of the accompanying map, but due to a lack of wells in the northern sections no definite assurance can be given. From a study of outcrops of the bedrock along South Saskatchewan River valley it seems probable that compact marine shales underlie the sand of the "B" horizon to a depth of at least 250 feet. Under these shales the sand beds of the Belly River formation are believed to be present. A 299-foot well near the south edge of the river valley in township 20, range 17, yields a fairly large supply of soft, soda-bearing

water from a sand bed in the Belly River formation at an elevation of 1,778 feet above sea-level. Other wells in the adjoining municipality to the east and on the north side of South Saskatchewan river indicate that an extensive water-bearing sand bed may be present in this formation at elevations between 1,790 and 1,740 feet. Except in the lowlands along the base of the river valley the depths necessary to reach this horizon will be between 300 and 500 feet. Since no wells have been sunk to sufficient depth in this township information is not available regarding the possibility of obtaining water from this horizon at any great distance south of the river valley.

Township 19, Range 17

Water supplies in this township are obtained chiefly from small reservoirs formed by dams, and from South Saskatchewan river. Only four wells in the area yield sufficient water for local requirements. A mantle of 10 to 20 feet of glacial lake clay overlies the boulder clay throughout all but the southeast quarter of the township, where the lake clays are absent and the drift at the surface is glacial till and moraine.

In this part of the area a few residents are obtaining small supplies of water from scattered sand and gravel pockets in the drift at depths within 65 feet of the surface. The water is hard, but is seldom too highly mineralized to be used for drinking. The 65-foot well, located on the SE.¼, section 15, yields sufficient water for 10 head of stock. A 12-foot well, located on the SE.¼, section 14, yields sufficient water for 20 head of stock. In most parts of this area careful prospecting of the upper 30 to 40 feet is more advisable than sinking wells to greater depths, where the supply obtainable is generally very small.

No water is being obtained from the glacial lake clays that overlie the glacial till over the remaining part of the township. These clays consist chiefly of blue-grey, compact clay

which becomes yellow or brown in the weathered zone near the surface. It yields little or no water to wells. The glacial drift underlying the lake clay is composed mainly of blue boulder clay. Beds or pockets of sand and gravels are almost entirely lacking in the lake clay, but are irregularly interspersed through the underlying drift. It is possible that small supplies of water could be obtained from such scattered pockets in the upper part of the glacial drift at depths within 30 feet from the surface. However, the possibility of obtaining an adequate supply of water from this source hardly warrants the sinking of a large number of test holes to locate a water-bearing pocket.

A study of the deep drilled wells in this and adjoining townships indicates possibilities of obtaining water from sand beds in the Bearpaw formation that immediately underlies the drift throughout the township. A 192-foot well, located on the SE.¼, section 13, yields a fairly large supply of water from a sand bed in the upper part of the Bearpaw formation. This bed is productive in the adjoining townships to the east and south where it has been designated at the "B" horizon. The sand generally occurs at elevations between 2,120 and 2,070 feet above sea-level. This bed will probably be productive in at least that part of this township southeast of the "B" line as indicated on Figure 1. Dry holes on sections 4, 10, and 22 have passed the level of this horizon without encountering water. A 64-foot well, located on the SE.¼, section 6, yields a small supply of water from a sand at the level of this horizon and is probably near the northern edge of the productive sand bed.

A 260-foot well, located on the NW.¼, section 8, yields a large supply of hard, iron-bearing water, which is suitable for stock, from a sand bed in the Bearpaw formation at an elevation of 1,915 feet. A 185-foot well on section 6 of the adjoining township to the north yields a large supply of soft, drinkable water from sand at approximately the same level. Water was also

encountered at this level in a 299-foot well on sec. 4, tp. 20, range 17. This well, however, was continued down to a sand bed in the Belly River formation. The "C" line on Figure 1 bounds the area in which these wells occur. The water-bearing sand encountered in these three wells may not be a continuous bed. However, it is reasonable to expect that there is a continuous water-bearing bed in this area at elevations between 1,920 and 1,900 feet. Due to the relatively high surface elevation in the southeastern corner of the township the "C" horizon, if present, would lie at least 400 feet from the surface.

In the northern part of the township water probably occurs in the sand beds of the Belly River formation. The Belly River beds lie below the dark grey shales of the Bearpaw formation at an approximate elevation of 1,850 feet. A 299-foot well in the adjoining township to the north yields a large supply of soft, soda-bearing water from a sand bed in the Belly River formation at an approximate elevation of 1,778 feet. This well is believed to be drawing its supply from an extensive horizon which has been tapped by wells farther east and by other wells on the north side of the river. The depths of wells required to reach this horizon in the northern part of this township would generally be between 300 and 450 feet. The extent to which this horizon will prove to be productive in this township is not known as no holes have been sunk to sufficient depth to determine its nature as a source of ground water.

Township 19, Range 18

Extensive water-bearing horizons have been traced over parts of the southern half of this township, but throughout the northern half considerable difficulty will be experienced in obtaining adequate supplies of drinkable water.

This area lies well within the basin of the large lake that covered a large part of this and adjoining municipalities at the close of the glacial period. A layer of 10 to 30 feet of bluish grey lake clay, which weathers light brown, overlies the entire

township. This clay is too compact to form a source of ground water at shallow depths. Many residents either have no wells or cannot obtain adequate supplies from their wells and are using dugouts and small dams in coulées to provide water for stock. On these farms water for domestic use is generally hauled from neighbouring wells that have tapped horizons at greater depths in the glacial drift or the bedrock. Sand and gravel beds occur sparingly in the blue-grey boulder clay that everywhere underlies the lake clay. The lake clay largely prevents the downward seepage of surface waters and, therefore, the few pockets that have been encountered in shallow wells yield only small supplies of ground water. Only on sections 4, 13, and 28 have shallow wells less than 20 feet in depth yielded sufficient water for local stock requirements. Since there is little or no surface evidence of the possible occurrence of these gravel or sand beds at the contact between the lake clay and the boulder clay systematic prospecting with augers, directed to cover as large an area as possible, seems advisable on the farms in the northern part of the area. Little hope of obtaining any large supply of ground water is held, however, due to the compact, impervious nature of the clays. The bottoms of slopes and gravels occurring in the bottoms of coulées are also worthy of prospecting. In the area bounded by the "B" line, indicated on Figure 1, in the south-central and southeastern parts of the township what is believed to be an extensive productive horizon occurs at the base of the glacial drift and in sand beds at the top of the shale bedrock, at elevations between 2,100 and 2,080 feet above sea-level. The depths of wells necessary to reach this horizon will vary with the elevation of the selected well site. Along the valley of Antelope creek, in the eastern parts of section 4 and 9, this horizon was penetrated at depths of 40 and 21 feet. On the higher land in section 1, SW.$\frac{1}{4}$, section 4, and sections 10 and 16 it was necessary to sink to depths of 60 to 105 feet before water was found. The supplies from each well are only

moderate, but are reported as being sufficient for at least 20 head of stock. Due to the fineness of the sand encountered in the 78-foot well on section 16, considerable difficulty has been experienced in keeping the well clear.

Two wells located on the SE¼'s, sections 8 and 17, are flowing wells. The well on section 8 is 170 feet deep and derives its water from a sand bed at an elevation of 1,962 feet. It has not been definitely determined whether or not the water comes from the contact of the drift and the bedrock or from a sand bed in the bedrock. The water is of very poor quality due to the presence of large amounts of mineral salts in solution, and is regarded as being more characteristic of the bedrock than of the drift of this district. The 257-foot well on section 17 penetrated gravels at a depth of 152 feet from which a small supply was obtained, but the well was deepened to sands at an elevation of 1,907 feet to strike water under sufficient hydrostatic pressure to rise above the surface at the well. The supply is reported to be large, but the quality was not determined. The area in which these artesian conditions exist is not definitely known as no other wells have been sunk sufficiently deep in the southern part of the area to reach this horizon. Several wells at Cabri have found water at this horizon, and the water is under sufficient pressure to rise to a point 70 feet below the surface. The logs of six wells at Cabri indicate that there is very little if any water to be found at the contact of the lake clay and underlying boulder clay. Two wells drilled for the Canadian Pacific Railway Company, in the town, encountered a large supply of water at a depth of 257 feet. Another well drilled for the same company found similar supplies at 220 feet. The aquifers are probably at the same elevation, but as the elevations of the well sites were not determined this is not definitely known. The latter well was continued through the dark grey, compact shales of the Bearpaw formation to a depth of 597 feet without obtaining any further supplies except for a

small seepage at 301 feet. It is improbable that supplies adequate for town use will be found below a maximum depth of 300 feet. A possibility exists that the productive horizon found in the well in section 17, and at Cabri, may be a western extension of the bedrock horizon found at a similar elevation in the township to the east. No wells have been sunk sufficiently deep in the intervening area to determine if such is the case. Three wells located in sections 12, 14, and 15 have been sunk to depths, respectively, of 140, 148, and 125 feet to obtain water in sand. These wells reached elevations of 2,011, 1,996 and 2,003 feet, and are considered to have penetrated the bedrock, but the exact point at which the bedrock was reached was not determined. Only in the 140-foot well in section 12 was the water sufficiently low in mineral salt content to be suitable for domestic use. Water from the other two wells is unfit even for stock. Two wells on the NW. and SE.$\frac{1}{4}$'s, section 30, 60 and 125 feet deep, and one 95-foot well on section 31 have tapped a water-bearing sand horizon in the bedrock at an approximate elevation of 2,015 feet above sea-level. This horizon is considered to be the same water-bearing horizon penetrated in the 240-foot well on NW.$\frac{1}{4}$, section 32, at 120 feet from the surface. All these wells yield adequate supplies of hard, drinkable water. The areal extent of this horizon is not known, as no other deep wells have been sunk in the northern half of the township. The well on section 32 continued through 80 feet of dark shales after reaching this horizon and a fairly large supply of hard, iron-bearing water was encountered below the shale in a sand bed at an approximate elevation of 1,850 feet. This well may be drawing its supply from the sand bed that was encountered in the 268-foot well in the town of Cabri. The contact between the Bearpaw and Belly River formations is at the same approximate elevation as the water-bearing sand and no definite statement can be made as to the formation in which the sands occur. Should further deep drilling be done in the northeastern half of

the township the most probable source of an adequate supply is at the horizons that have been found to be productive on sections 17 and 32, and in the town of Cabri on section 20 at elevations of approximately 1,900 and 1,850 feet. In the southwestern half of the township most residents have obtained adequate water supplies at shallower depths than would be necessary to reach these horizons.

It is inadvisable to drill wells much below an elevation of 1,850 feet in any part of the township, as the 597-foot well in Cabri has shown that the Belly River sands are unproductive in this area.

Township 20, Range 16

Only the part of this township lying south of South Saskatchewan river lies within this municipality. It comprises an area of less than 4 square miles, of which the greater part lies on the southern slopes of the river valley. It is, therefore, unsuited to cultivation and no wells have been sunk in the area. The river naturally offers the most dependable source of water in the area, although shallow wells sunk in deposits along the valley bottom should yield fairly large supplies of drinkable water. The glacial drift is very thin over the valley slopes and does not generally form a source of water. Shales of the Bearpaw formation interbedded with thin layers of sands are exposed almost continuously along the river banks. It is possible that wells located on the uplands and sunk down to these sand beds will yield ground water. Until such wells are sunk, however, it is impossible to predict the quantity or quality of water to be expected.

Township 20, Range 17

Only the southwestern part of this township lying to the south and west of South Saskatchewan river falls within this municipality. It occupies an area of approximately 11 square

miles, of which a large part forms the slopes of South Saskatchewan River valley and the valley of the tributary Antelope creek. The river and creek form the most important sources of water supply in the lowlands, although shallow wells in sand or gravel deposits occurring at intervals along the bottoms of the slopes and near stream channels would undoubtedly yield small supplies of drinkable water. In the southeast corner and along the valley of Antelope creek the glacial deposits are very thin and in places absent, thus exposing the Bearpaw bedrock formation. The uplands area is covered by a thin layer of bluish grey lake clay underlain by 25 feet or more of boulder clay. Small pockets of gravels or sands may occur at the contact of the lake clays and boulder clay or interspersed through the boulder clay, but cannot be regarded as a source of any large supply of ground water. Residents of the uplands are better advised to sink wells through the glacial deposits to reach the more productive sand beds that occur in the lower part of the underlying Bearpaw formation, or at still greater depths in the Belly River formation. Records of only two wells have been obtained in this area; one a 299-foot well on the SE.$\frac{1}{4}$, section 4, and the other a 185-foot well on the SE.$\frac{1}{4}$, section 6. The first well encountered an aquifer at a depth of 160 feet from the surface at approximately 1,900 feet above sea-level. This aquifer is probably the same as that struck at the base of the 185-foot well, but the supply being inadequate the well was drilled deeper and reached two productive sand beds in the Belly River formation. Water was obtained at the same elevation in a 260-foot well in the NW.$\frac{1}{4}$, sec. 8, tp. 19, immediately to the south, suggesting the possibility that a continuous water-bearing horizon may exist at an approximate elevation of 1,915 feet throughout the uplands of this township and the northern parts of the township to the south.

The horizons encountered, in the 299-foot well on section 4, in the Belly river formation at depths of 205 and 299 feet yield soft water containing appreciable amounts of sodium carbonate. Just how extensive these horizons are has not been determined, as no other wells in the vicinity have been sunk sufficiently deep to tap them. It is probable, however, that adequate supplies of drinkable water will be found at these horizons throughout the uplands part of this township.

Township 20, Range 18

Many residents of this township have small dams and dugouts which provide part of the water supply for stock. The greater part of the water supply, however, is hauled from South Saskatchewan river. Practically all the household supplies are being obtained from the river. No adequate supplies of water are being obtained from either shallow or deep wells in this township.

The surface material over the entire township is glacial lake clay. The lake clays are seldom over 20 feet thick and are underlain by 50 to 150 feet of blue boulder clay or glacial till. No water supplies are being obtained from either the lake clays or the till. The lake clay is considered to be too impervious to allow surface waters to penetrate down into any porous beds that may occur interspersed through the upper part of the boulder clay.

The Bearpaw formation underlies the glacial drift down to an approximate elevation of 1,850 feet above sea-level. It is composed largely of dark, compact marine shale. Thin beds of sand are encountered in the shale in several wells. Little water is present, however, in these sand beds, as here again the impervious overlying strata prohibits ground water accumulation. A supply of hard, highly mineralized water, sufficient for only 4 head of stock, is being obtained on the NW.$\frac{1}{4}$, section 5, from one of these beds, at a depth of 160 feet.

The Belly River formation underlies the Bearpaw shales. Beds of sand and sandstone make up a large part of this formation. However, in this township little water is present in these sand beds. A 278-foot well on the SE.¼, section 23, yields a very small supply of hard, highly mineralized water from a sand bed in this formation. An 800-foot hole was sunk on the SW.¼, section 18, and no appreciable supply of water was found. The Belly River beds are considered to be 350 to 400 feet thick in this area, so that this well has apparently passed through the entire formation and penetrated the upper part of the Lea Park formation.

Water-bearing beds are not likely to occur in the Lea Park formation, which is composed chiefly of compact grey shales and is believed to be more than 1,000 feet thick in this area.

Similar dry sand beds have been found in many wells in the townships to the north and west and strongly suggest that the poor water conditions are not only present in areas in which test holes have been sunk but are more or less continuous throughout this township. In the light of these findings further deep drilling is not advisable in this area. Prospecting at shallow depths, directed to cover systematically as large an area as possible, may encounter sufficient water for household use immediately beneath the lake clay, but the conditions throughout the area cannot be considered promising.

Township 21, Range 18

Only the southwestern part of this township, west of South Saskatchewan river, lies in the municipality. Ground water conditions throughout this area are very poor. Most of the residents have small dams and dugouts to provide water for stock. Water for household use is hauled from Miry creek or from South Saskatchewan river, as only two wells in the area yield water supplies.

Recent dune sand and glacial lake sand occur at the surface over a small area in the northern part of the township, as indicated on Figure 1. In this area water will probably be available from

the sand at depths of less than 20 feet.

The surface material over the remainder of the area is glacial lake clay. The lake clay also underlies the Recent sand. The lake clay seldom exceeds 30 feet in thickness and is underlain by glacial till or boulder clay. The total thickness of the drift is probably between 50 and 150 feet on the upland areas. Along the banks of South Saskatchewan river and Miry creek the glacial deposits are very thin. The two productive wells in this area draw their supplies from sand and gravel pockets in the glacial drift. The 12-foot well on the NW.¼, section 2, yields sufficient water for 20 head of stock. The 40-foot well on section 30 yields an adequate supply of hard, drinkable water. It is probable that other supplies of this type could be obtained at depths not exceeding 40 feet in this township. However, the possibility of encountering a productive sand or gravel pocket will hardly warrant the sinking of a large number of test holes.

The dark grey, compact shale of the Bearpaw formation underlies the glacial drift of the area south of Miry creek. The Bearpaw shale is believed to be between 50 and 100 feet thick. It is underlain by the sandy beds of the Belly River formation at an approximate elevation of 1,850 feet above sea-level. In the area north of Miry creek the Bearpaw shale has been completely eroded away and the Belly River formation lies immediately below the glacial drift.

Holes were sunk to depths of 230 to 600 feet, on sections 2 and 3, without encountering any appreciable supply of water in either the Bearpaw or Belly river formations. The 600-foot well on section 3 penetrated the Lea Park shale which underlies the Belly River formation.

It is not advisable to drill deep wells in any part of the township, as deep holes in this and adjoining townships have shown the absence of any water-bearing beds in either the Bearpaw or Belly River formations. The reason for the absence

of waterin the sand beds of the Belly River is not definitely known. It is probable that the impervious nature of the lake clays, the boulder clay, and the shales of the Bearpaw formation that overlie the sandy beds of the Belly River formation prevents the surface water from seeping downward into any porous beds that may occur. The digging of shallow wells with the possibility of encountering small supplies in the upper 30 or 40 feet of the boulder clay seems preferable to deep drilling in any part of the area, but conditions even at shallow depths cannot be regarded as very promising.

Township 22, Range 18

No wells have been sunk in this part of the township, lying west of South Saskatchewan river, as the river provides water for stock requirements.

The entire area is mantled by Recent dune sands and glacial lake sands. In most localities water will probably be available in the sand at shallow depths. Scattered pockets of sand and gravel may occur in the glacial clays that underlie the sand at depths of less than 20 feet. In the light of findings in adjacent areas it does not seem advisable to sink wells below the sand, as the underlying beds of lake clay and boulder clay are too compact to be sources of any large supply of ground water. No wells have been extended down into the sandy beds of the Belly River formation which underlies the drift throughout the area. Evidence from deep drilling in adjacent areas indicates that little water is to be obtained in this area at depths much below 40 feet from the surface.

STATISTICAL SUMMARY OF WELL INFORMATION IN RURAL MUNICIPALITY OF RIVERSIDE, NO.168, SASKATCHEWAN

West of 3rd mer. Township / Range	16 16	16 17	16 18	17 16	17 17	17 18	18 16	18 17	18 18	19 16	19 17	19 18	20 16	20 17	20 18	21 18	22 18	Total No. in Municipality
Total No. of Wells in Township	54	23	34	28	40	31	31	34	37	20	18	30	0	2	6	6	0	403
No. of wells in bedrock	1	0	0	0	0	0	3	8	8	15	5	24	0	2	6	4	0	76
No. of wells in glacial drift	53	23	34	28	40	31	28	25	29	5	13	6	0	0	0	2	0	327
No. of wells in alluvium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Permanency of Water Supply																		
No. with permanent supply	55	21	34	28	38	31	30	27	36	20	8	27	0	2	2	2	0	351
No. with intermittent supply	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
No. dry holes	8	1	0	0	2	0	1	6	1	0	10	3	0	0	4	2	0	40
Types of Wells																		
No. of flowing artesian wells	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2
No. of non-flowing artesian wells	21	3	4	6	5	10	14	17	19	17	2	18	0	2	0	2	0	140
No. of non-artesian wells	35	19	30	22	33	21	16	10	17	3	6	7	0	0	2	0	0	221
Quality of Water																		
No. with hard water	51	21	31	26	33	30	23	24	36	20	8	26	0	0	2	2	0	333
No. with soft water	5	1	3	2	5	1	7	3	0	0	0	1	0	2	0	0	0	30
No. with salty water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
No. with "alkaline" water	15	4	9	3	13	6	2	1	3	1	1	0	0	0	1	0	0	59
Depths of Wells																		
No. from 0 to 50 feet deep	48	18	28	10	37	15	13	8	16	3	13	10	0	0	0	2	0	221
No. form 51 to 100 feet deep	11	3	3	15	3	9	5	4	13	0	2	7	0	0	0	0	0	75
No. from 101 to 150 feet deep	5	2	2	1	0	2	4	10	5	5	0	5	0	0	1	0	0	42
No. from 151 to 200 feet deep	0	0	1	0	0	4	8	8	2	7	2	3	0	1	3	0	0	39
No. from 201 to 500 feet deep	0	0	0	2	0	1	1	2	1	5	1	4	0	1	1	3	0	22
No. from 501 to 1,000 feet deep	0	0	0	0	0	0	0	1	0	0	0	1	0	0	1	1	0	4
No. over 1,000 feet deep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
How the Water is Used																		
No. usable for domestic purposes	35	16	24	25	26	27	27	26	34	20	5	21	0	2	2	2	0	292
No. not usable for domestic purposes	21	6	10	3	12	4	3	1	2	0	3	6	0	0	0	0	0	71
No. usable for stock	53	22	34	28	37	30	30	27	35	20	8	25	0	2	2	2	0	355
No. not usable for stock	3	0	0	0	1	1	0	0	1	0	0	2	0	0	0	0	0	8
Sufficiency of Water Supply																		
No. sufficient for domestic needs	26	16	22	24	21	27	27	26	34	20	5	20	0	0	2	2	0	272
No. insufficient for domestic needs	30	6	12	4	17	4	3	1	2	0	3	7	0	2	0	0	0	91
No. sufficient for stock needs	24	20	22	25	19	28	23	24	30	20	4	22	0	0	2	2	0	265
No. insufficient for stock needs	32	2	12	3	19	3	7	3	6	0	4	5	0	2	0	0	0	98

ANALYSES AND QUALITY OF WATER

General Statement

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

Total Dissolved Mineral Solids

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

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

Mineral Substances Present

Calcium and Magnesium

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

Sodium

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

Sulphates

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

Chlorides

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

Iron

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

Hardness

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

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

Analyses of Water Samples from the Municipality of Riverside, No. 168, Saskatchewan

NO.	LOCATION					Depth of Well, Ft.	Total dis'vd solids	HARDNESS			CONSTITUENTS AS ANALYSED						CONSTITUENTS AS CALCULATED IN ASSUMED COMBINATIONS									Source of Water
	Qtr.	Sec.	Tp.	Rge.	Mer.			Total	Perm.	Temp.	Cl.	Alka-linity	CaO	MgO	SO_4	Na_2O	Solids	$CaCO_3$	$CaSO_4$	$MgCO_3$	$MgSO_4$	Na_2CO_3	Na_2SO_4	NaCl	$CaCl_2$	
1	NE.	23	17	16	3	41	1,220	750	600	150	15	385	210	126	525	163	1,119	376		8	364		346	25		x-1
2	NE.	6	17	17	3	13	360	320	200	120	10	185	80	61	119	18	348	143		36	131		21	17		x-1
3	NW.	27	17	17	3	39	3,563											(4)	(2)		(3)		(1)		(5)	x-1
4	SE.	10	17	18	3	155	711											(3)	(1)		(2)				(4)	x-1
5	SE.	15	17	18	3	200	340	240	180	60	9	145	40	58	119	40	308	72		61	86		74	15		x-1
6	NE.	20	18	17	3	120	940	700	500	200	17	415	210	140	357	55	899	376		33	370		92	28		x-1
7	NW.	33	18	18	3	21	1,120	750	600	150	23	195	60	104	529	255	963	107		73	206		539	38		x-2
8	SW.	27	19	16	3	167	700	520	340	180	9	330	20	137	234	130	633	36		247	57		278	15		x-2
9	SE.	8	19	18	3	170	3,500	1,350	1300	50	775	250	50	173	1451	1444	3,591	90		134	325		1,763	1279		x-2
10	SE.	30	19	18	3	125	2,580	1,100	1000	100	300	245	60	378	1218	552	2,345	107		117	960		665	495		x-2

Water samples indicated thus, x-1, are from glacial drift or other unconsolidated deposits.
Water samples indicated thus, x-2, are from bedrock, Bearpaw formation.
Analyses are reported in parts per million; where numbers (1), (2), (3), (4), and (5) are used instead of parts per million, they represent the relative amounts in which the five main constituents are present in the water.
Hardness is the soap hardness expressed as calcium carbonate ($CaCO_3$).

Analyses Nos. 3 and 4, by Provincial Analyst, Regina.
For interpretation of this table read the section on Analyses and Quality of Water.

Water from the Unconsolidated Deposits

Four samples of ground water from the unconsolidated deposits of this municipality were collected and analysed by the Geological Survey. The results of two analyses of ground water made by the Provincial Analyst at Regina are also included in the table of analyses accompanying this report. No analyses were obtained of water from South Saskatchewan river or Miry creek, which provide supplies for many residents in the northwestern part of the municipality. The water obtained from these sources is reported to be of good quality for domestic use.

The water being obtained from the Recent dune sands and the glacial lake sands in the southern part of the municipality is generally only moderately hard, and although in some places containing appreciable amounts of sulphate salts in solution is well adapted to domestic use. Where the wells are located in the vicinity of "alkali" flats and sloughs the water from the sand is more highly mineralized, containing relatively larger quantities of sulphate salts in solution. Generally, however, these salts are not present in sufficient quantities to render the water unfit for persons accustomed to their use. Since no analyses were made of water from the dune or lake sands the above general discussion is based upon observations of the wells and the reports of residents.

So far as known no water is being obtained from the glacial lake clays which mantle a large area in the western part of the municipality. It seems probable from studies of conditions in other lake clay-covered areas that should any water be obtained from the lake clays it would probably be very hard and contain noticeable quantities of sulphate salts.

The character of the upper 30 to 40 feet of the glacial drift varies considerably not only in areas where it is exposed at the surface as till and moraine but where it is covered by the later lake clays. Corresponding variations are to be expected

in the quality of the water derived from it. Sand and gravel pockets encountered near the surface in the till-and-moraine-covered areas yield water that has had little opportunity of coming in contact with any large quantities of soluble mineral salts. It is, therefore, soft to only moderately hard, and satisfactory for domestic use. Small pockets of porous material covered by a considerable thickness of boulder clay or the clay itself yield water that is much more highly charged with dissolved mineral salts. Glauber's salt (sodium sulphate) and Epsom salts (magnesium sulphate) generally predominate and may be in sufficient concentration to cause the water to have a decided laxative effect. Analyses Nos. 2 and 3 are of water obtained from gravel pockets in the glacial drift underlying glacial lake sands and clays on secs. 6 and 27, tp. 17, range 17. The water from the 13-foot well on section 6 has a low total solid content of 360 parts per million, made up chiefly of magnesium sulphate ($MgSO_4$) and calcium carbonate ($CaCO_3$). Both of these salts contribute to the total hardness of the water, which is 320 parts per million. This water is not excessively hard and the magnesium sulphate is not present in a sufficient quantity to render it unsatisfactory for drinking. The water from the 39-foot well on section 27 has a total dissolved solid content of 3,563 parts per million, made up of the following salts given in order of their decreasing relative amounts: sodium sulphate (Na_2SO_4), calcium sulphate ($CaSO_4$), magnesium sulphate ($MgSO_4$), calcium carbonate ($CaCO_3$), and calcium chloride ($CaCl_2$). Although the sulphate salt content is high the water from this well is being used for drinking. The results of these two analyses are indicative of the variation in quality of water obtained from local sand and gravel pockets occurring at shallow depths in the glacial boulder clay. The 39-foot well is in the lake clay area, whereas the 13-foot well is in the lake sand area. The water in the 39-foot well probably becomes mineralized during its passage through the clay as it percolates from

the surface to the gravel aquifer. The waters from the shallow wells, however, are seldom as highly mineralized as the water shown by analysis No. 3, and are generally suitable for domestic use.

Analysis No. 1 is of water from a 41-foot well located on the NE.$\frac{1}{4}$, sec. 23, tp. 17, range 16, and is representative of the water being obtained from the glacial drift at depths between 40 and 100 feet in the southeastern part of the municipality. Analysis indicated this water to have a total dissolved solid content of 1,220 parts per million and a total hardness of 750 parts per million. The dissolved solids are chiefly calcium carbonate ($CaCO_3$), magnesium sulphate ($MgSO_4$), and sodium sulphate (Na_2SO_4). The concentrations of the two sulphate salts (Epsom salts and Glauber's salt) are fairly high, but the water is being used for drinking with no deleterious effect. The reports by residents of the southeastern district would indicate that the water from the sand and gravel beds occurring in the glacial drift at depths between 40 and 100 feet from the surface will be similar in character to the water analysed. However, a few wells are yielding soft water from these beds and a few are yielding water that is too highly mineralized for drinking. Iron is generally present in the water in sufficient quantities to cause stains on pails and kitchen utensils, but is not in sufficient quantities to affect the quality of the water for drinking. Analysis No. 4 is of water from a 155-foot well on sec. 10, tp. 17, range 18. This well derives its supply from a sand bed in the lower part of the glacial drift and is considered to be representative in general of the waters being obtained from wells between 60 and 180 feet in depth in this township. The total dissolved solid content of the water is 711 parts per million and the predominant mineral salts in order of their decreasing quantities are as follows: calcium sulphate ($CaSO_4$), calcium carbonate ($CaCO_3$), and calcium chloride ($CaCl_2$). This water is

considered satisfactory for domestic and stock use. The water from some of the wells in the same township, drawing their supplies from the lower part of the glacial drift, was reported by residents to be highly "alkaline", and it is probable that the concentration of sulphate salts in the water from these wells is considerably higher than indicated by analysis No. 4. However, with the exception of the water from an 80-foot well on section 7, the supplies being obtained from the lower part of the drift in this township are all being used for drinking.

In the area intervening between the "A" line and the southern part of the "B" line on Figure 1 of the map accompanying this report, a large part of the ground water is being obtained from the sand and gravel beds at the contact between the glacial drift and the Bearpaw shales. Analyses Nos. 5 and 6 are of water from wells drawing their supplies from this source. Analysis No. 5 is of water from a 200-foot well on the SE.$\frac{1}{4}$, sec. 15, tp. 17, range 18. It shows a total dissolved solid content of 340 parts per million and a total hardness of 240 parts per million. The predominant mineral salts are magnesium sulphate ($MgSO_4$), sodium sulphate (Na_2SO_4), calcium carbonate ($CaCO_3$), and magnesium carbonate ($MgCO_3$). This water is of good quality for domestic use or for stock. The water from a 120-foot well on the NE.$\frac{1}{4}$, sec. 20, tp. 18, range 17 (Analysis No. 6) has a total dissolved solid content of 940 parts per million and a total hardness of 700 parts per million. The concentration of magnesium sulphate ($MgSO_4$) is considerably higher than in the water from the well on the SE.$\frac{1}{4}$, sec. 15, tp. 17, range 18, but is not sufficiently high to render the water unfit for drinking. The results shown by analysis No. 6 are more representative of the water being obtained from the sands and gravels at the contact between the glacial drift and the bedrock than the results of analysis No. 5, as the water obtained from this source generally contains fairly large quantities of mineral salts. Iron is generally present in the water from the contact and forms

brownish stains on pails and kitchen utensils. The iron, however, is not present in sufficient quantities to affect the quality of the water for drinking. The water from a 70-foot well on the SE.¼, sec. 16, tp. 18, range 18, is the only water being obtained from the contact in this municipality that was reported unfit for drinking.

Water from the Bedrock

Four samples of water derived from sands in the Bearpaw formation in the northern part of the municipality were collected and analysed by the Geological Survey. Analyses Nos. 7 and 8 are of water from the extensive sand bed that is productive in the area bounded by the "B" line on Figure 1. Analysis No. 7 is of water from a 21-foot well located on the NW.¼, sec. 33, tp. 18, range 18, near the western boundary of the area in which the horizon is considered to be productive. The total dissolved solid content of the water is 1,120 parts per million and the total hardness is 750 parts per million. The predominant mineral salts present in order of their decreasing quantities are as follows: sodium sulphate ($MgSO_4$), calcium carbonate ($CaCO_3$), magnesium carbonate ($MgCO_3$), and sodium chloride (NaCl). This water is very hard, but is reported to be satisfactory for domestic use. The water from the 167-foot well on the SW.¼, sec. 27, tp. 19, range 16, is being obtained from the same horizon as in the eastern part of the municipality. Analysis No. 8 shows this water to have a total dissolved solid content of 700 parts per million and a total hardness of 520 parts per million. Essentially the same mineral salts are present in this water as in water from the well on NW.¼, sec. 33, tp. 18, range 18, with a relative increase of magnesium carbonate and a decrease of sodium sulphate. This water is being used for stock and domestic purposes and also for garden irrigation. It is reported to be satisfactory for all purposes. The results of the two above analyses are representative of the water being

obtained from the "B" horizon and show the water to be very hard but without an excessive sulphate salt content. Iron is generally present in the water in sufficient quantities to stain containers, but does not affect the quality of the water for drinking.

Analysis No. 9 is of water from a 170-foot well on the SE.$\frac{1}{4}$, sec. 8, tp. 19, range 18. This water is representative of the character of water likely to be obtained from small sand beds interbedded with the compact dark grey shales of the Bearpaw formation. The water contains 2,500 parts per million of dissolved solids, composed largely of sodium sulphate ($NaSO_4$) and sodium chloride (NaCl). This water is distinctly salty, due to the large amounts of sodium chloride (common salt) present. Such a concentration of common salt in the water from shales known to be of marine origin is not uncommon. The total hardness of the water is very high, 1,350 parts per million. The water from the above well is not fit for drinking, but is being used for stock. Any water obtained from the marine shales in the southern part of the township would probably be similar to the water from this well. Analysis No. 10 is of water from a sand bed in the Bearpaw formation encountered in a 125-foot well located on the SE.$\frac{1}{4}$, sec. 30, tp. 19, range 18. This water is similar in character to the water just described. The total solid content is lower, however, and although the water is being used for household purposes it would undoubtedly prove laxative to persons unaccustomed to its use. The total dissolved solid content of the water is 2,580 parts per million, and the total hardness is 1,100 parts per million. The water contains a high concentration of magnesium sulphate ($MgSO_4$), sodium sulphate (Na_2SO_4), and sodium chloride (NaCl). The water from wells deriving supplies from sand beds in the Bearpaw formation outside the "B" line in the northwestern part of the municipality will probably be similar to the water represented by analyses Nos. 9 and 10. The water from one well on the SW.$\frac{1}{4}$, sec. 14, tp. 19,

range 18, is reported to be unfit for either domestic or stock use. The water from most of the wells in this area, however, is being used for all purposes, but is greatly inferior in quality to waters from the glacial drift.

No analyses were made of water from the sand beds of the Belly River formation. The water from a well located on the NW.¼, sec. 32, tp. 17, range 20, considered to be deriving its supply from this formation, is reported to be hard and iron bearing. This water is being obtained from a sand bed near the contact between the Bearpaw and Belly River formations and the water is probably similar to that obtained from the sandy beds of the Bearpaw formation. The water from a 299-foot well located on the SE.¼, sec. 4, tp. 20, range 17, is being obtained from a sand bed deeper down in the Belly River formation, and is reported to be soft, containing soda (Na_2CO_3). Such water is drinkable and quite satisfactory for laundry purposes, but due to the "black alkali" content is not suitable for watering gardens.

WELL RECORDS—Rural Municipality of RIVERSIDE NO.168, SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
1	SE.	1	16	16	3	Drilled	128	2,420	- 55	2,365	128	2,292	Glacial gravel	Hard, iron		D, S	Large supply, two abandoned wells.
2	SE.	3	"	"	"	Dug	32	2,400	- 18	2,382	32	2,368	Glacial sand	Hard, clear, iron		D, S	Sufficient for 400 head stock.
3	NW.	5	"	"	"	Dug	18	2,400	- 14	2,386	14	2,386	Glacial quick-sand	Hard, clear, "alkaline"		D, S	Supplies household and 30 head stock.
4	SW.	6	"	"	"	Dug	15	2,360	- 11	2,349	11	2,349	Glacial sand	Hard, clear		D, S	Sufficient; another 100-foot well too "alkaline" for use, at present filled in.
5	SW.	9	"	"	"	Dug	60	2,400	- 45	2,355	60	2,340	Glacial quick-sand	Hard, clear		D, S	Abundant supply.
6	NE.	10	"	"	"	Dug	45	2,400	- 41	2,359	45	2,355	Glacial sand	Hard, clear		D, S	Insufficient; waters 10 head stock.
7	SW.	11	"	"	"	Dug	5	2,400	- 3	2,397	3	2,397	Glacial quick-sand	Hard, clear, "alkaline"		S	Waters 40 head cattle.
8	SW.	12	"	"	"	Dug	17	2,430	- 13	2,417	13	2,417	Glacial gravel	Soft, clear		D, S	Barely sufficient for household, 80 head stock and 150 sheep in 1934.
9	NE.	12	"	"	"	Dug	35	2,400	- 30	2,370	30	2,370	Glacial gravel	Hard, clear "alkaline"		S	There are 3 other similar wells, all of which do not water 12 head stock.
10	SW.	13	"	"	"	Dug	22	2,400	- 21	2,379	21	2,379	Glacial gravel	Hard, clear slightly "alkaline"		D, S	Insufficient for household; second 14-foot well gives poor supply.
11	SE.	13	"	"	"	Dug	38	2,400	- 30	2,370	38	2,362	Glacial quick-sand	Soft, clear		D, S	Insufficient, along with another 36-foot well will not water 5 head stock.
12	NE.	13	"	"	"	Drilled	275	2,400									Dry hole, base probably in Bearpaw.
13	NW.	13	"	"	"	Dug	24	2,400	- 22	2,378	22	2,378	Glacial quick-sand	Hard, clear		D, S	Sufficient for house only; also 50-foot and 14-foot wells.
14	NE.	16	"	"	"	Dug	46	2,410	- 33	2,377	33	2,377	Glacial drift	Clear		D, S	Sufficient supply.
15	NW.	16	"	"	"	Dug	55	2,400	- 40	2,360	40	2,360	Glacial drift	Hard, clear		D, S	Sufficient supply.
16	NW.	17	"	"	"	Dug	17	2,450	0	2,450	0	2,450	Glacial sand	Hard, clear, "alkaline"		S	Sufficient for 14 to 15 head stock.
17	SW.	18	"	"	"	Dug	42	2,410	- 36	2,374	42	2,368	Glacial quick-sand	Hard, "alkaline" sediment		S	Sufficient supply.
18	NW.	18	"	"	"	Dug	20	2,350	- 16	2,334	20	2,330	Glacial sand	Hard, clear		D	Insufficient supply, uses dugout for stock, also shallow well beside dugout.
19	NW.	19	"	"	"	Spring		2,340	0	2,340	0	2,340	Glacial sand	Hard, clear, "alkaline"		S	Ample supply.
20	NE.	19	"	"	"	Dug	30	2,360	- 27	2,333	27	2,333	Glacial quick-sand	Hard, clear		D, S	Barely sufficient for household and 8 head stock, also another similar well.
21	NW.	20	"	"	"	Dug	22	2,390	- 17	2,373	17	2,373	Glacial gravel	Hard, clear, "alkaline"		D, S	Insufficient supply; also 150-foot dry hole and two other similar wells.
22	NE.	20	"	"	"	Bored	50	2,400	- 30	2,370	50	2,350	Glacial quick-sand	Hard, clear, iron		D, S	Sufficient; limited to 6 head stock; also similar well.
23	SE.	21	"	"	"	Bored	56	2,400	- 50	2,350	50	2,350	Glacial quick-sand	Hard, clear		D, S	Dried up during drought; also 2,20-foot dry holes.
24	SE.	23	"	"	"	Dug	16	2,400	- 14	2,386	14	2,386	Glacial sand	Hard, clear		D	Sufficient for household; a 12-foot well supplies cattle.
25	SE.	24	"	"	"	Bored	55	2,450	- 45	2,405	55	2,395	Glacial gravel	Hard, clear		D, S	Supplies household and 20 head stock.
26	SW.	25	"	"	"	Bored	108	2,460	- 98	2,362	98	2,362	Glacial gravel	Hard, clear		D, S	Sufficient supply; can be pumped dry but comes in rapidly.

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 .....

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
27	NW.	25	16	16	3	Bored	56	2,420	- 20	2,400	56	2,364	Glacial sand	Hard, clear		S	Sufficient for 35 head stock.
28	NE.	25	"	"	"	Bored	84	2,430	- 59	2,371	84	2,346	Glacial sand	Soft, clear		S	Ample for 30 head stock; a 20-foot well 15-foot distant supplies household; dry holes from 30 to 100 feet.
29	SW.	26	"	"	"	Bored	50	2,400	- 20	2,380	50	2,350	Glacial quick-sand	Hard, clear		D, S	Ample for household and 14 head stock.
30	NE.	26	"	"	"	Dug	60	2,440	- 56	2,384	56	2,384	Glacial gravel	Hard, clear		D	Insufficient; 3 barrels a day; also 71-foot and 67-foot dry holes
31	SE.	27	"	"	"	Dug	45	2,400	- 27	2,373	27	2,373	Glacial drift	Hard, clear, "alkaline"		D, S	Barely sufficient for household and 8 head stock, also slough for part time use.
32	SW.	28	"	"	"	Dug	47	2,400	- 22	2,378	47	2,353	Glacial gravel	Hard, clear		S	Insufficient supply, requires cleaning.
33	SE.	29	"	"	"	Dug	40	2,410	- 5	2,405	38	2,362	Glacial quick-sand	Hard, clear		D, S	Ample supply.
34	SE.	31	"	"	"	Dug	42	2,380	- 26	2,354	36	2,344	Glacial sand	Hard, clear		D, S	Ample for household and 7 head stock.
35	SE.	32	"	"	"	Bored	40	2,400	- 32	2,368	38	2,362	Glacial quick-sand	Hard, clear, iron		D, S	Sufficient along with a second 84-foot well.
36	NE.	33	"	"	"	Bored	100	2,420	- 54	2,366	100	2,320	Glacial sand	Clear		D, S	
37	NE.	34	"	"	"	Bored	57	2,420	- 14	2,406	57	2,363	Glacial gravel	Hard, clear, iron		D, S	Sufficient supply.
38	SE.	36	"	"	"	Bored	60	2,470	- 20	2,450	20	2,450	Glacial clay and gravel	Hard, clear		D, S	Insufficient, also a similar well 42 feet deep and a 20-foot well near slough supplies drinking water varying with amount of water in slough; also a dry hole.
39	NW.	36	"	"	"	Bored	42	2,450	- 35	2,415	32	2,418	Glacial gravel and sand	Soft, clear		S	Sufficient supply.
1	SE.	1	16	17	3	Bored	39	2,450	- 25	2,425	39	2,411	Glacial drift	Hard, clear		D, S	Ample for household and 20 head stock; also a 100-foot dry hole.
2	NE.	1	"	"	"	Dug	32	2,410	- 30	2,380	30	2,380	Glacial quick-sand	Hard, clear		D, S	Sufficient for household and 20 head stock; another 41-foot well gives abundant supply.
3	SW.	2	"	"	"	Bored	65	2,520	- 25	2,495	65	2,455	Glacial drift	Hard, clear, "alkaline"		S	Sufficient supply a second 110-foot well.
4	NW.	3	"	"	"	Dug	25	2,400	- 21	2,379	21	2,379	Glacial sand	Soft, clear		D, S	Insufficient; stock watered at spring on NW.¼ section 4.
5	NW.	4	"	"	"	Spring	0	2,400	0	2,400	0	2,400	Glacial sand	Hard		S	Abundant supply.
6	SW.	5	"	"	"	Dug	30	2,410	- 24	2,386	24	2,386	Glacial drift	Hard, clear		D, S	Insufficient supply; cattle watered at NW.¼, section 4.
7	SE.	5	"	"	"	Dug	24	2,400	- 18	2,382	18	2,382	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for household and stock.
8	SE.	10	"	"	"	Dug	26	2,430	- 21	2,409	21	2,409	Glacial sand	Hard, clear		D, S	Insufficient in dry weather.
9	NE.	12	"	"	"	Dug	44	2,400	- 38	2,362	38	2,362	Glacial sand	Hard, clear, "alkaline"		D, S	Supplies household and 40 head stock.
10	NW.	12	"	"	"	Bored	60	2,380	- 60	2,320	50	2,330	Glacial sand	Hard, clear		D, S	Supplies household; a nearby spring waters stock.
11	SE.	15	"	"	"	Dug	44	2,400	- 40	2,360	40	2,360	Glacial quick-sand	Hard, clear, "alkaline"		S	Used only in spring and fall when working this quarter section. Sufficient supply.
12	SW.	22	"	"	"	Dug	16	2,400	- 14	2,386	14	2,386	Glacial gravel	Hard, clear		D, S	Sufficient supply.
13	NE.	22	"	"	"	Dug	14	2,400	- 11	2,389	11	2,389	Glacial gravel	Hard, clear		D, S	Sufficient for household and 16 head stock.

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

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

WELL RECORDS—Rural Municipality of RIVERSIDE NO.168, SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
14	NE.	23	16	17	3	Drilled	132	2,410	- 52	2,358	52	2,358	Glacial quick-sand	Hard,clear, iron		D, S	Sufficient supply; an18-foot well has 6 feet of soft water.
15	SW.	24	"	"	"	Dug	22	2,360	- 17	2,343	17	2,343	Glacial gravel	Hard,clear		D, S	Sufficient supply.
16	SW.	28	"	"	"	Dug	12	2,400	- 12	2,388	12	2,388	Glacial sand	Hard,clear, iron		S	Supplies 100 head stock; also a dugout.
17	SW.	29	"	"	"	Dug	12	2,400	- 10	2,390	10	2,390	Glacial sand	Hard,clear, iron,lime		D, S	Supplies household and 3,300 sheep.
1	SE.	2	16	18	3	Dug	20	2,450	- 16	2,434	16	2,434	Glacial quick-sand	Hard,clear		D, S	Supplies household and 16 head stock.
2	NE.	2	"	"	"	Spring	0	2,350	0	2,350	0	2,350	Glacial gravel	Soft,clear		S	Ample supply.
3	NW.	3	"	"	"	Spring	0	2,330	0	2,330	0	2,330	Glacial sand	Hard,clear		S	Insufficient supply.
4	NE.	4	"	"	"	Dug	20	2,340	- 17	2,323	17	2,323	Glacial sand	Hard,clear, "alkaline"		D, S	Insufficient, waters stock at creek and springs.
5	SW.	6	"	"	"	Drilled	183	2,420	- 53	2,367	106	2,314	Glacial quick-sand	Hard,clear, "alkaline"		S	Insufficient; the well is filled with quick-sand, also 36-foot well in gravel; used for all purposes.
6	SW.	8	"	"	"	Spring		2,260	0	2,260	0	2,260	Glacial gravel	Hard,clear, iron		S	Sufficient supply.
7	NW.	10	"	"	"	Dug	14	2,350	- 11	2,339	11	2,339	Glacial sand	Hard,clear, "alkaline"		D, S	Sufficient for household; stock watered at dam on SW.¼ section 10.
8	SE.	13	"	"	"	Dug	5	2,430	- 3	2,427	3	2,427	Glacial sand	Hard,clear, "alkaline"		S	Insufficient supply, stock watered on section 11 on alternate days.
9	SW.	20	"	"	"	Dug	16	2,280	- 8	2,272	8	2,272	Glacial sand	Soft,clear		S	Ample supply.
10	SE.	23	"	"	"	Dug	15	2,360	- 12	2,348	12	2,348	Glacial sand	Hard,clear, slightly "alkaline"		D, S	Sufficient supply; there are 3 dugouts on this quarter section.
11	SE.	26	"	"	"	Dug	7	2,360	- 4	2,356	4	2,356	Glacial sand	Hard,clear, "alkaline"		S	Barely sufficient for stock.
12	SW.	27	"	"	"	Spring		2,330	0	2,330	0	2,330	Glacial sand	Soft,clear		S	Sufficient supply; waters many head stock.
13	NW.	28	"	"	"	Dug	12	2,290	- 10	2,280	10	2,280	Glacial sand	Clear,slight hardness		D	Sufficient supply; other similar wells all are practically dry in cold weather.
14	NE.	29	"	"	"	Dug	14	2,360	- 8	2,352	8	2,352	Glacial sand	Clear,slight hardness		D, S	Supplies 20 head stock; 14-foot well supplies house; dugout on SE.¼ section 29.
15	SE.	30	"	"	"	Dug	24	2,320	- 16	2,304	16	2,304	Glacial sand	Hard,clear		D, S	Sufficient supply.
16	NW.	30	"	"	"	Dug	150	2,420	-140	2,280	140	2,280	Glacial drift	Hard,cloudy, iron		D, S	Supplies household and 10 head stock.
17	SW.	31	"	"	"	Dug	70	2,400	- 50	2,350	70	2,330	Glacial quick-sand	Hard,clear		D, S	Supplies household and 25 head stock. This with another similar well are joined by pipe at bottom.
18	SW.	32	"	"	"	Dug	45	2,380	- 37	2,343	37	2,343	Glacial quick-sand	Hard,clear		D, S	Supplies household and 10 head stock.
19	NE.	32	"	"	"	Dug	18	2,320	- 10	2,310	10	2,310	Glacial sand	Hard,clear		D, S	Sufficient supply; also 27-foot well.
20	NE.	33	"	"	"	Drilled	150	2,370	- 50	2,320	150	2,220	Glacial quick-sand	Hard,clear		D, S	Sufficient supply.
21	NW.	33	"	"	"	Drilled	58	2,350	- 25	2,325	58	2,292	Glacial quick-sand	Hard,clear		D, S	Yields 4 barrels an hour.
22	NE.	34	"	"	"	Dug	12	2,390	- 9	2,381	9	2,381	Glacial sand	Hard,clear		D, S	Supplies household and 15 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 RIVERSIDE NO. 168, SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
23	NE.	35	16	18	3	Dug	10	2,400	- 7	2,393	7	2,393	Glacial gravel			D	Sufficient supply; there is a 4-foot dugout on this quarter section.
24	NW.	35	"	"	"	Dug	12	2,390	- 9	2,381	9	2,381	Marine Shale	Hard, clear, "alkaline"		D, S	Supplies household and 25 head stock.
1	NE.	2	17	16	3	Bored	90	2,420	- 60	2,360	80	2,340	Glacial sand	Hard, iron, red sediment		D, S	Sufficient for household and 26 head stock.
2	SW.	2	"	"	"	Bored	60	2,435	- 50	2,385	60	2,375	Glacial sand	Hard, clear, iron		D, S	Insufficient; water 15 head stock.
3	NE.	3	"	"	"	Bored	70	2,430	- 68	2,362	68	2,362	Glacial sand	Hard, clear		D, S	Sufficient for household and 30 head stock.
4	SE.	4	"	"	"	Bored	112	2,400	- 96	2,304	96	2,304	Glacial sand	Hard, clear, iron		D, S	Sufficient for household and 18 head stock.
5	NW.	7	"	"	"	Bored	80	2,360					Glacial drift	Hard, clear, iron		D, S	Waters 15 head stock and supplies house.
6	NE.	7	"	"	"	Bored	70	2,372					Glacial drift	Hard, clear, iron		D, S	Waters 15 head stock and supplies house.
7	SE.	14	"	"	"	Dug	50	2,395	- 30	2,365	30	2,365	Glacial sand	Hard, clear, "alkaline"		D, S	Waters 20 head stock and supplies house, 14-foot well in coulee giving large supply.
8	SE.	15	"	"	"	Bored	68	2,390					Glacial sand	Hard, clear, iron		D, S	Ample supply for 15 head stock and household.
9	SE.	16	"	"	"	Bored	60	2,365					Glacial sand	Hard, clear, iron		D, S	Waters 16 head stock and supplies house, a second 60-foot well gives small supply.
10	SE.	17	"	"	"	Bored	65	2,380	- 45	2,335	45	2,335	Glacial clay	Hard, black		S	Insufficient; enough for 3 head stock; water hauled.
11	SE.	18	"	"	"	Bored	90	2,405					Glacial sand	Hard, clear, iron		D, S	Ample supply for 16 head stock and household.
12	SE.	23	"	"	"	Drilled	35						Glacial sandy clay	Hard, clear, iron		D, S	Insufficient for household and 12 head stock.
13	NE.	23	"	"	"	Bored	41	2,380	- 17	2,363	41	2,339	Glacial drift	Hard, clear, iron		D, S	Sufficient for household and 30 head stock, #
14	SW.	25	"	"	"	Drilled	477	2,406			175	2,231	Glacial gravel				1,000 gallons an hour; base in Bearpaw; also 395-foot well.
15	SE.	26	"	"	"	Drilled	90	2,390					Glacial sand	Hard, clear, iron		D, S	Abundant supply.
16	SE.	27	"	"	"	Bored	50	2,380	- 47	2,333	47	2,333	Glacial sand	Hard, clear, iron		D, S	Sufficient for household and 8 head stock.
17	NE.	27	"	"	"	Bored	80	2,390					Glacial sand	Hard, clear, iron		D, S	Sufficient for household and 13 head stock.
18	SE.	31	"	"	"	Bored	80	2,385	- 50	2,335	76	2,309	Glacial sand	Hard, clear, "alkaline"		S	Sufficient for 40 head stock.
19	NE.	31	"	"	"	Dug	10	2,402	- 6	2,396	6	2,396	Glacial sand	Soft, clear		D, S	Sufficient for household and 15 head stock; also a similar well.
20	SW.	32	"	"	"	Dug	25	2,350	- 22	2,328	22	2,328	Glacial sand	Hard, clear		D, S	Ample supply for household and 10 head stock.
21	SW.	33	"	"	"	Bored	43	2,360					Glacial drift	Hard, clear		D, S	Supplies household and 12 head stock.
22	NE.	34	"	"	"	Dug	65	2,420	- 58	2,362	65	2,355	Glacial gravel	Hard, clear, iron		D, S	Supplies household and 40 head stock.
23	SE.	35	"	"	"	Bored	65	2,405	- 40	2,365	65	2,340	Glacial sand	Hard, clear, iron, "alkaline"		D, S	Supplies household and 50 head stock.
24	NE.	36	"	"	"	Dug	46	2,416					Glacial drift	Hard, clear, iron		D, S	Supplies household and 12 head stock.

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

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of RIVERSIDE NO.168, SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
1	NW.	2	17	17	3	Dug	35	2,405	- 32	2,373	32	2,373	Glacial sand	Hard, clear		D, S	Supplies household and 35 head stock; difficulty with quicksand filling in.
2	NE.	3	"	"	"	Dug	30	2,415					Glacial drift	Hard, clear, iron, "alkaline"		D	Insufficient for local needs; second shallow well waters 11 head stock.
3	NW.	4	"	"	"	Dug	24	2,430	- 21	2,409	20	2,410	Glacial sand	Hard, clear		D, S	Insufficient; supplies household and 4 head stock; second well waters 30 head stock.
4	NE.	6	"	"	"	Dug	13	2,405	- 10	2,395	10	2,395	Glacial gravel	Hard, clear		D, S	Supplies household and 100 head stock; also spring. #
5	SW.	7	"	"	"	Dug	42	2,430	- 40	2,390	40	2,390	Glacial sand	Hard, clear		D, S	Supplies household and 26 head stock.
6	SE.	7	"	"	"	Dug	53	2,440	- 49	2,391	49	2,391	Glacial sand	Hard, clear, "alkaline"		D, S	Supplies household and 25 head stock.
7	NW.	10	"	"	"	Dug	22	2,480	- 20	2,460	20	2,460	Glacial gravel	Hard, clear, "alkaline"		S	Insufficient supply; second 14-foot well yields poor supply for household, hauls water for 15 head stock.
8	NE.	12	"	"	"	Bored	40	2,360									Dry hole; glacial drift, second well 29 feet deep small supply.
9	SE.	14	"	"	"	Dug	12	2,400					Glacial drift	Hard, clear		D, S	Sufficient supply.
10	SW.	15	"	"	"	Dug	18	2,465					Glacial sand	Hard, clear		D	Insufficient supply.
11	NE.	15	"	"	"											S	Shallow well waters 20 head stock.
12	NE.	16	"	"	"	Bored	45	2,440	- 42	2,398	42	2,398	Glacial sand	Hard, clear "alkaline"		S	Insufficient; waters 9 head stock; water hauled for house; several dry holes.
13	NE.	18	"	"	"	Dug	12	2,355	- 5	2,350	5	2,350	Marine Shale	Moderately soft		D, S	Insufficient supply; 3 similar wells with poor yields; dugout for stock.
14	SE.	19	"	"	"	Dug	12	2,355	- 9	2,346	9	2,346	Marine Shale	Hard, clear		D, S	Insufficient supply; supplies household and 4 head stock; stock watered at neighbours.
15	NE.	20	"	"	"	Bored	30	2,335	- 10	2,325	30	2,305	Glacial sand	Hard, clear		D, S	Abundant supply for household, and 40 head stock; second 8-foot well yields good supply.
16	NW.	20	"	"	"		12						Glacial sand				Poor supply.
17	SE.	22	"	"	"	Dug	20	2,415	- 16	2,399	16	2,399	Glacial sand	Soft, clear		D, S	Sufficient for household and 15 head stock.
18	NE.	23	"	"	"	Dug	14	2,396	- 11	2,385	11	2,385	Glacial sand	Hard, clear		D, S	Sufficient for household and 20 head stock.
19	SW.	25	"	"	"	Dug	12	2,390	- 9	2,381	9	2,381	Glacial sand	Hard, clear		S	Supplies 35 head stock, second 30-foot well for house, third 18-foot well unfit for stock.
20	NW.	27	"	"	"	Dug	39	2,380	- 36	2,344	36	2,344	Glacial gravel	Hard, clear, "alkaline"		D, S	Insufficient supply; second 8-foot well in coulee for stock. #
21	NE.	28	"	"	"	Dug	22	2,380	- 21	2,359	21	2,359	Glacial gravel	Soft, clear		D	Insufficient supply; several similar wells water stock.
22	NE.	31	"	"	"	Drilled	85	2,370					Glacial sand	Hard, clear		D, S	Sufficient supply.
23	NW.	32	"	"	"	Drilled	85	2,370					Glacial sand	Hard, clear		D, S	Sufficient supply.
24	NE.	34	"	"	"	Bored	50	2,340	- 28	2,312	50	2,290	Glacial gravel	Hard, clear, "alkaline"		D, S	Supplies household and 10 head stock.
25	SW.	35	"	"	"	Dug	30	2,325	- 28	2,297	28	2,297	Glacial sand	Hard, clear		D, S	Supplies household and 10 head stock.
26	NW.	36	"	"	"	Bored	31	2,320	- 19	2,301	31	2,289	Glacial sand	Hard, clear iron, "alkaline"		D, S	Supplies household and 60 head stock.

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of RIVERSIDE NO.168, SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
27	NE.	36	17	17	3	Bored	54	2,376	- 53	2,323	53	2,323	Glacial sand	Hard,clear, iron,"alkaline"		D	Insufficient, supplies household, two shallow wells for stock.
1	SW.	1	17	18	3	Dug	8	2,380	- 4	2,376	4	2,376	Glacial sand	Hard,clear		D, S	Along with 2 other wells, sufficient for household and 35 head stock.
2	NW.	4	"	"	"	Dug	20	2,320	- 18	2,302	18	2,302	Glacial sand	Hard,clear		D, S	Sufficient for household and 15 head stock.
3	NE.	5	"	"	"	Dug	20	2,335	- 6	2,329	6	2,329	Glacial drift	Hard,clear, "alkaline"		D, S	Ample supply.
4	SE.	6	"	"	"	Bored	70	2,375	- 60	2,315	60	2,315	Glacial drift	Hard,clear		D, S	
5	NE.	6	"	"	"	Bored	94	2,400	- 82	2,318	82	2,318	Glacial drift	Hard,clear		D, S	Sufficient for household and 12 head stock; shallow well near slough.
6	NE.	7	"	"	"	Bored	80	2,350	- 60	2,290	80	2,270	Glacial sand	Hard,"alkaline"		S	Waters 12 head stock.
7	SW.	8	"	"	"	Bored	60	2,380	- 50	2,330	50	2,330	Glacial sand	Hard,clear, iron		D, S	Supplies household and 15 head stock; similar well not is use.
8	SE.	10	"	"	"	Drilled	155	2,405	-145	2,260	145	2,260	Glacial sand	Hard,clear, iron		D, S	Abundant supply. #
9	SE.	12	"	"	"	Dug	42	2,420	- 39	2,381	38	2,382	Glacial sand	Hard,clear		D, S	Supplies household and 12 head stock only.
10	NE.	14	"	"	"	Drilled	180	2,440			180	2,260	Glacial sand	Hard,clear, "alkaline"		D, S	Supplies household and 15 head stock.
11	SE.	15	"	"	"	Drilled	200	2,395			200	2,195	Glacial sand	Hard,clear		D, S	Supplies household and 20 head stock. #
12	SW.	16	"	"	"	Drilled	195	2,375	-120	2,255	195	2,180	Glacial sand	Hard,clear		D, S	Supplies household and 15 head stock.
13	NE.	17	"	"	"	Bored	65	2,330	- 25	2,305	65	2,265	Glacial sand	Hard,clear, iron		D, S	Ample supply for household and 40 head stock.
14	NE.	18	"	"	"	Bored	50	2,300	- 20	2,280	50	2,250	Glacial sand	Soft,clear		D, S	Supplies household and 10 head stock.
15	SW.	18	"	"	"	Bored	80	2,330	- 60	2,270	78	2,252	Glacial sand	Hard,clear, iron,"alkaline"		D, S	Supplies household and 30 head stock.
16	NE.	20	"	"	"	Bored	60	2,295					Glacial sand	Hard,clear, iron		D, S	Supplies household and 20 head stock.
17	NW.	22	"	"	"	Bored	120	2,360	-108	2,252	108	2,252	Glacial gravel	Hard,clear		D, S	Supplies household and 13 head stock.
18	SE.	22	"	"	"	Drilled	205	2,405	-105	2,300	205	2,200	Glacial gravel	Hard,clear		D, S	Supplies household and 20 head stock.
19	NW.	23	"	"	"	Dug	20	2,294	- 17	2,277	17	2,277	Glacial sand	Hard,clear		D, S	Insufficient; waters household and 6 head stock only; uses dam.
20	SW.	24	"	"	"	Drilled	130	2,390			130	2,260	Glacial sand	Hard,iron, "alkaline"		D, S	Supplies household and 15 head stock.
21	NE.	24	"	"	"		14	2,430	- 12	2,418	12	2,418	Glacial sand	Hard,clear		D, S	Sufficient supply; also second 10-foot well.
22	SE.	25	"	"	"	Bored	100	2,410	- 95	2,315	95	2,315	Glacial sand	Hard,clear		D, S	Supplies household and 25 head stock.
23	NW.	30	"	"	"	Bored	100	2,285			100	2,185	Glacial sand	Hard,clear, iron		D, S	Supplies household and 18 head stock.
24	NE.	33	"	"	"	Bored	65	2,320					Glacial sand	Hard,clear		D, S	Insufficient; a similar well and a shallow well in slough,water 15 head stock.
25	NE.	36	"	"	"	Dug	30	2,340	- 28	2,312	28	2,312	Glacial sand	Hard,clear		D, S	Ample supply.

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of RIVERSIDE NO.168, SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
1	SW.	2	18	16	3	Bored	60	2,422					Glacial sand	Hard, slightly "alkaline"		D, S	Ample supply for household and 40 head stock.
2	NW.	2	"	"	"	Bored	46	2,412					Glacial sand	Hard, clear, iron		D, S	Insufficient, supplies household and 8 head stock.
3	SE.	4	"	"	"	Bored	50	2,415	- 48	2,367	48	2,367	Glacial sand	Hard, clear		D, S	Insufficient; supplies household and 16 head stock; also shallow well completes the supply.
4	SW.	4	"	"	"	Dug	60	2,400	- 58	2,342	58	2,342	Glacial drift	Hard, clear, iron, "alkaline"		D, S	Insufficient for household and 15 head stock.
5	SE.	7	"	"	"	Dug	30	2,340	- 27	2,313	27	2,313	Glacial sand	Soft, clear		D, S	Supplies household and 18 head stock.
6	NW.	8	"	"	"	Bored	90	2,385	- 65	2,320	80	2,305	Glacial sand	Hard, clear		D, S	Supplies household and 20 head stock.
7	SW.	12	"	"	"	Bored	46	2,400	- 30	2,370	30	2,370	Glacial sand	Soft, clear		D, S	Supplies household and 15 head stock.
8	SE.	12	"	"	"	Bored	50	2,410	- 40	2,370	40	2,370	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
9	SE.	18	"	"	"	Bored	80	2,400	- 76	2,324	76	2,324	Glacial sand	Soft, clear		D, S	Supplies household and 16 head stock; second 20-foot well gives good supply.
10	NE.	19	"	"	"	Drilled	170	2,362			170	2,192	Glacial sand	Hard, clear, iron		D, S	Ample supply.
11	NE.	20	"	"	"	Drilled	175	2,350			175	2,175	Glacial sand	Hard, clear, iron		D, S	Supplies household; 30 head stock and farmer on SE.¼, section 29 uses this well.
12	SW.	22	"	"	"	Drilled	150	2,415	- 60	2,355	150	2,265	Glacial gravel	Hard, clear, iron		S	Ample for 40 head stock; 60-foot well supplies house.
13	NW.	22	"	"	"	Drilled	135	2,390			135	2,255	Glacial sand	Hard, clear, iron		D, S	Supplies household and 30 head stock.
14	SE.	22	"	"	"								Glacial sand				Shallow well.
15	NW.	23	"	"	"	Drilled	160	2,400			160	2,240	Glacial sand	Hard, clear, iron		S	Ample for 30 head stock, 20-foot well used for house.
16	NE.	23	"	"	"		35	2,346	- 20	2,326	20	2,326	Glacial sand	Soft, clear		D, S	Ample supply.
17	NW.	25	"	"	"	Dug	33	2,400	- 28	2,372	28	2,372	Glacial gravel	Soft, clear		D, S	Supplies household and 25 head stock.
18	NW.	27	"	"	"	Drilled	135	2,358	- 85	2,273	135	2,223	Glacial sand	Hard, clear, iron		D, S	Ample supply.
19	NE.	28	"	"	"	Drilled	127	2,360	-116	2,242	127	2,233	Glacial sand	Hard, clear, "alkaline"		D, S	Supplies household and 40 head stock.
20	NW.	28	"	"	"	Drilled	158	2,360	- 30	2,330	158	2,202	Glacial sand	Hard			Abundant supply.
21	SE.	31	"	"	"	Drilled	160	2,325			160	2,165	Glacial sand	Hard, clear, iron		D, S	Supplies household and 20 head stock.
22	NE.	32	"	"	"	Drilled	160	2,334			160	2,174	Glacial sand	Hard, clear		D, S	Ample supply for household and 20 head stock.
23	NE.	33	"	"	"	Drilled	185	2,320			185	2,135	Glacial sand	Hard, clear		D, S	Ample supply.
24	SW.	34	"	"	"	Drilled	200	2,338			200	2,138	Glacial sand	Hard, clear, iron			Ample supply.
25		35	"	"	"	Drilled	414	2,370									Dry hole; base in Bearpaw.
26	NW.	35	"	"	"	Bored	80	2,362	- 51	2,311	66	2,296	Glacial gravel	Hard, clear		D, S	Supplies household and 20 head stock.
27	NE.	35	"	"	"	Drilled	40	2,370			40	2,330	Glacial sand	Soft, clear		D, S	Ample for household and 25 head stock.

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

WELL RECORDS—Rural Municipality of RIVERSIDE NO.168, SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
28	NE.	36	18	16	3	Dug	60	2,421					Glacial sand	Hard,clear,		D, S	Insufficient; supplies household and 20 head stock only.
1	NW.	1	18	17	3	Bored	73	2,360	- 30	2,330	73	2,287	Glacial sand	Hard,clear, iron,sulphur		D, S	Supplies household and 40 head stock.
2	SE.	2	"	"	"	Dug	30	2,345	- 26	2,319	26	2,319	Glacial gravel	Hard,"alkaline"		D, S	Sufficient along with a 60-foot well.
3	SW.	4	"	"	"	Dug	25	2,312	- 20	2,292	20	2,292	Glacial drift	Soft,cleaf		D, S	Insufficient; supplies household and 6 head stock.
4	SE.	5	"	"	"	Dug	36	2,294	- 29	2,265	29	2,265	Glacial sand	Hard,clear		D, S	Sufficient for household and 100 head stock.
5	NE.	8	"	"	"	Drilled	150	2,333			150	2,183	Glacial sand	Hard,clear, iron		D, S	Supplies household and 22 head stock.
6	NE.	12	"	"	"	Dug	62	2,350					Glacial sand	Soft,clear		D, S	Insufficient; dugout for stock, also insufficient, 900-foot and160-foot dry holes.
7	NW.	13	"	"	"	Bored	60	2,350	- 40	2,310	50	2,300	Glacial sand	Hard,clear		D, S	Sufficient supply; several dry holes.
8	SE.	15	"	"	"	Dug	150	2,355	-138	2,217	138	2,217	Glacial gravel	Hard,clear		D, S	Sufficient supply.
9	SE.	17	"	"	"	Drilled	156	2,336			156	2,180	Glacial sand	Hard,clear, iron		D, S	Supplies household and 20 head stock.
10	NE.	19	"	"	"	Bored	150	2,320			150	2,170	Glacial sand	Hard,clear		D, S	Ample supply.
11	NE.	20	"	"	"	Bored	120	2,288	-117	2,171	117	2,171	Glacial sand	Hard,clear, iron		D, S	Supplies household and 20 head stock.
12	NE.	21	"	"	"												Dry hole, water hauled.
13	SE.	21	"	"	"	Drilled	148	2,310			148	2,162	Glacial sand	Hard,clear, iron		D, S	Supplies household and 10 head stock.
14	SW.	22	"	"	"	Drilled	171	2,320	-130	2,190	159	2,161	Glacial sand	Hard,clear, iron		D, S	Supplies household and 20 head stock.
15	NE.	22	"	"	"	Drilled	180						Glacial sand				Large supply.
16	SW.	23	"	"	"	Drilled	114	2,360	-100	2,260	114	2,246	Glacial sand	Hard,clear		D, S	Supplies household and 30 head stock.
17	NW.	24	"	"	"	Bored	160	2,340									Dry hole also a similar dry hole.
18	SE.	25	"	"	"	Dug	36	2,300	- 32	2,268	32	2,268	Glacial drift	Soft,clear		D, S	Supplies household and 15 head stock;closeby dam improved quantity of water.
19		26	"	"	"	Drilled	160	?									Dry hole, base in glacial drift.
20	SE.	27	"	"	"	Drilled	231	2,335	-180	2,155	231	2,104	Bearpaw sand	Hard,clear, sediment		D, S	Supplies household and 100 head stock.
21	SW.	27	"	"	"	Drilled	231	2,325	-190	2,135	231	2,094	Bearpaw sand	Hard,clear			Sufficient supply.
22	NE.	28	"	"	"	Bored	35	2,340					Glacial sand	Hard,clear		D	Insufficient; water hauled for stock.
23	SE.	31	"	"	"	Drilled	125	2,242	-105	2,137	125	2,117	Bearpaw sand	Hard,clear		D, S	Sufficient for household and 15 head stock; also dugout for stock.
24	NE.	31	"	"	"	Drilled	125	2,242	-105	2,137	125	2,117	Bearpaw sand	Hard,clear		D, S	Sufficient supply.
25	SE.	32	"	"	"	Bored	130	2,250	-110	2,140	130	2,120	Bearpaw sand	Hard,clear		D, S	Supplies household and 35 head stock.
26	NE.	32	"	"	"	Drilled	140	2,250			140	2,110	Bearpaw sand	Hard,clear		D, S	Supplies household and 20 head stock; also uses dugout for stock.

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

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

WELL RECORDS—Rural Municipality of RIVERSIDE NO.168, SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE: Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED: Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
27	NW.	35	18	17	3	Drilled	162	2,318	- 82	2,236	158	2,160	Glacial sand	Hard,clear		S	Sufficient supply.
28	SE.	35	"	"	"	Dug	35	2,282	- 18	2,264	18	2,264	Glacial sand	Hard,clear, iron		D, S	Ample supply.
29	NW.	36	"	"	"	Drilled	200	2,300			200	2,100	Bearpaw sand	Hard,clear, iron		D, S	Sufficient for household and 50 head stock.
1	SW.	1	18	18	3	Bored	20	2,305					Glacial sand	Hard,clear		D, S	Ample for 15 head stock.
2	NW.	2	"	"	"	Bored	44	2,275					Glacial sand	Hard,clear		D, S	Ample supply; also 100-foot well unused.
3	SE.	3	"	"	"	Bored	58	2,290	- 46	2,244	56	2,234	Glacial gravel	Hard,clear, iron		D, S	Supplies household and 22 head stock.
4	SE.	4	"	"	"	Drilled	120	2,322	- 60	2,262	110	2,212	Glacial sand	Hard,clear, iron		D, S	Supplies household and 60 head stock.
5	NE.	6	"	"	"	Bored	36	2,235	- 20	2,215	36	2,199	Glacial sand	Hard,clear, iron		D, S	Supplies household and 20 head stock.
6	SW.	6	"	"	"	Bored	30	2,224	- 27	2,197	27	2,197	Glacial sand	Hard,clear, iron		D, S	Supplies household and 15 head stock.
7	SE.	7	"	"	"	Bored	98	2,252	- 48	2,204	95	2,157	Glacial gravel	Hard,clear, iron		D, S	Supplies household and 45 head stock; also springs in coulee
8	SW.	9	"	"	"	Drilled	106	2,300	- 56	2,244	96	2,204	Glacial sand	Hard,clear		D, S	Supplies household and 50 head stock.
9	NW.	9	"	"	"	Bored	80	2,260					Glacial sand	Hard,clear, iron		D, S	Supplies household and 15 head stock.
10	NW.	10	"	"	"	Drilled	120	2,264					Glacial sand	Hard,clear, iron		D, S	Insufficient supply.
11	NE.	10	"	"	"	Bored	45	2,266					Glacial drift	Hard,clear		D, S	Insufficient, supplies household and 9 head stock.
12	SW.	12	"	"	"	Bored	50	2,320					Glacial sand	Hard,clear		D, S	Supplies household and 8 head stock.
13	SE.	13	"	"	"	Drilled	200	2,350	-120	2,230	180	2,170	Glacial sand	Hard,clear, iron		D, S	Ample for household and 30 head stock.
14	SW.	13	"	"	"	Bored	120	2,345	-100	2,245	120	2,225	Glacial sand	Hard,clear, iron		D, S	Ample supply.
15	SW.	15	"	"	"	Bored	63	2,275	- 43	2,232	63	2,212	Glacial sand	Hard,clear		D, S	Supplies household and 30 head stock.
16	SE.	16	"	"	"	Bored	70	2,264					Glacial drift	Hard,cloudy, "alkaline"		S	Ample supply, but very poor water for stock.
17	SW.	16	"	"	"	Bored	78	2,254	- 60	2,194	78	2,176	Glacial sand	Hard,iron, red sediment		D, S	Supplies household and 30 head stock.
18	NW.	17	"	"	"	Bored	80	2,252									Dry hole; second well "alkaline"; all water hauled, other dry holes.
19	SE.	18	"	"	"	Dug	6	2,180	- 4	2,176	4	2,176	Glacial sand	Hard,clear		D	Insufficient; also good spring in coulee.
20	NE.	19	"	"	"	Bored	65	2,180	- 63	2,117	63	2,117	Bearpaw sand	Hard,clear, iron		D, S	Insufficient; supplies household and 12 head stock.
21	NE.	20	"	"	"	Bored	40	2,200	- 25	2,175	40	2,160	Glacial sand	Hard,clear, iron,red sediment		D, S	Ample for household and 15 head stock.
22	NE.	23	"	"	"	Dug	16	2,240	- 10	2,230	10	2,230	Glacial sand	Hard,"alkaline"		S	Ample supply.
23	SE.	25	"	"	"	Drilled	203	2,310	-160	2,150	203	2,107	Bearpaw sand	Hard,clear, iron		D, S	Supplies household and 13 head stock.
24	NE.	26	"	"	"	Dug	7	2,208	- 3	2,205	3	2,205	Glacial sand	Hard,clear		D, S	Supplies household and 18 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 RIVERSIDE NO. 168, SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE: Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED: Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
25	NW.	27	18	18	3	Bored	80	2,275			80	2,195	Glacial sand	Hard, clear, iron		D, S	Supplies household and 25 head stock.
26	SE.	27	"	"	"	Spring										N	Good supply.
27	NE.	28	"	"	"	Dug	18	2,235	- 14	2,221	14	2,221	Glacial sand	Hard, clear, iron		D, S	Ample for household and 70 head stock.
28	SW.	30	"	"	"	Bored	40	2,165	- 20	2,145	40	2,125	Glacial gravel	Hard, clear		D, S	Supplies household and 40 head stock.
29	NW.	32	"	"	"	Bored	56	2,222	- 20	2,202	56	2,166	Glacial sand	Hard, clear, iron, "alka-line"		D, S	Ample supply.
30	NE.	32	"	"	"	Bored	93	2,220	- 73	2,147	93	2,127	Bearpaw sand	Hard, clear, iron		D, S	Ample supply.
31	NW.	33	"	"	"	Bored	21	2,158	- 1	2,157	21	2,137	Bearpaw sand	Hard, clear, iron		D, S, M	Ample supply. #
32	NW.	35	"	"	"	Drilled	120	2,247	-119	2,128	119	2,128	Bearpaw sand	Hard, clear, iron		D, S	Supplies household and 20 head stock.
33	SW.	36	"	"	"	Drilled	157	2,255	-155	2,100	157	2,098	Bearpaw sand	Hard, clear, iron		D, S	Supplies household and 30 head stock.
34	NW.	36	"	"	"	Bored	53	2,180			53	2,127	Bearpaw sand	Hard, clear, iron		D, S	Ample supply.
35	NE.	36	"	"	"	Bored	80	2,167			80	2,087	Bearpaw sand	Hard, clear, iron		D, S	Ample supply.
1	SW.	1	19	16	3	Drilled	40	2,365					Glacial sand	Hard, clear		D, S	Supplies household and 30 head stock.
2	SE.	4	"	"	"	Dug	40	2,332					Glacial sand	Hard, clear		D, S	Good supply.
3	SW.	5	"	"	"	Drilled	204	2,353			204	2,149	Glacial sand	Hard, clear		D, S	Supplies household and 20 head stock.
4	NW.	7	"	"	"	Drilled	251	2,280	-183	2,097	251	2,029	Bearpaw sand	Hard, clear, iron		D, S	Abundant supply.
5	SE.	7	"	"	"	Drilled	180	2,270			180	2,090	Bearpaw sand	Hard, clear, iron		D, S	Abundant supply.
6	NE.	8	"	"	"	Drilled	215	2,292			215	2,077	Bearpaw sand	Hard, clear, iron		D, S	Ample supply.
7	SW.	11	"	"	"	Drilled	160	2,342			160	2,182	Glacial sand	Hard, clear, iron		D, S	Ample supply for household and 20 head stock.
8	NE.	13	"	"	"	Drilled	256	2,358	-216	2,142	256	2,102	Bearpaw sand	Hard, clear, iron		D, S	Ample supply for household and 15 head stock.
9	SE.	14	"	"	"	Drilled	265	2,375			265	2,110	Bearpaw sand	Hard, clear, iron		D, S	Ample for household and 17 head stock.
10	SE.	15	"	"	"	Dug	16	2,327			16	2,311	Glacial sand	Hard, clear		D, S	Ample for household and 15 head stock.
11	SW.	17	"	"	"	Dug	146	2,290			146	2,134	Bearpaw sand	Hard, clear		D, S	Ample supply.
12	NE.	18	"	"	"	Drilled	198	2,310	-134	2,176	198	2,112	Bearpaw sand	Hard, iron		D, S	Ample supply.
13	SW.	18	"	"	"	Drilled	201	2,287			201	2,086	Bearpaw sand	Hard, clear, iron		D, S	Ample for household and 15 head stock.
14	SW.	20	"	"	"	Drilled	204	2,285			204	2,081	Bearpaw sand	Hard, clear, iron		D, S	Ample for household and 15 head stock.
15	NE.	20	"	"	"	Drilled	160	2,280			160	2,120	Bearpaw sand	Hard, clear, iron		D, S	Ample for household and 15 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 RIVERSIDE NO. 168, SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
16	SW.	22	19	16	3	Drilled	165	2,262	-140	2,122	165	2,097	Bearpaw sand	Hard,clear, iron		D, S	Ample for household and 20 head stock.
17	SW.	23	"	"	"	Drilled	150	2,262	-135	2,127	150	2,110	Bearpaw sand	Hard		D, S, I	150 barrels a day.
18	SE.	25	"	"	"	Drilled	105	2,210			105	2,105	Bearpaw sand	Hard,iron, clear,"alka-line"		D, S	Supplies household and 25 head stock.
19	SW.	27	"	"	"	Drilled	167	2,252	-147	2,105	167	2,085	Bearpaw sand	Hard,clear, iron		D, S	Abundant supply; waters household and 20 head stock. #
20	SW.	28	"	"	"	Drilled	150	2,250			150	2,110	Bearpaw sand	Hard,clear		D, S, I	Ample supply.
1	NE.	4	19	17	3												Several dry holes.
2	SE.	6	"	"	"	Dug	64	2,175	- 61	2,114	61	2,114	Bearpaw sand	Hard,clear, iron		D, S	Insufficient for household and 25 head stock.
3	NW.	8	"	"	"	Drilled	260	2,175	-160	2,015	260	1,915	Bearpaw sand	Hard,clear, iron		S	Ample for stock; hauls drinking water.
4	NW.	9	"	"	"												Dry holes.
5	NW.	10	"	"	"												Dry holes.
6	SE.	13	"	"	"	Drilled	192	2,290			192	2,098	Bearpaw sand	Hard,clear, iron		D, S	Ample supply.
7	NE.	14	"	"	"	Dug	20	2,322	- 19	2,303	19	2,303	Glacial sand	Hard,clear		D, S	Insufficient supply.
8	SE.	14	"	"	"	Dug	12						Glacial sand			S	Waters 20 head stock.
9	SE.	15	"	"	"	Bored	65	2,320					Glacial sand	Hard,clear, "alkaline"		S	Supplies 10 head stock only; second well 20 feet deep,supplies household.
10	NW.	16	"	"	"												Dry holes.
11	SE.	22	"	"	"	Bored	35	2,160	- 33	2,127	33	2,127	Glacial drift	Hard,clear		D, S	Insufficient supply; uses dugout for stock; also 100-foot dry hole, base in Bearpaw.
12	SW.	22	"	"	"		200										Dry hole, base in Bearpaw.
1	SE.	1	19	18	3	Bored	60	2,172			60	2,112	Bearpaw sand	Hard,clear, iron		D, S	Supplies household and 15 head stock.
2	NE.	4	"	"	"	Bored	40	2,140	- 34	2,106	34	2,106	Bearpaw sand	Hard,clear		D	Insufficient; well in coulee 8 feet deep.
3	SW.	4	"	"	"	Bored	105	2,176	- 75	2,101	100	2,076	Bearpaw sand	Hard,clear, iron		D, S	Supplies household and 13 head stock.
4	NW.	7	"	"	"	Bored	56	2,142	- 26	2,116	56	2,086	Bearpaw sand	Hard,iron		D, S	Supplies household and 60 head stock.
5	SE.	8	"	"	"	Drilled	170	2,132	+ 5	2,137	170	1,962	Bearpaw sand	Hard,clear, iron		S	Supplies 15 head stock. #
6	SE.	9	"	"	"	Dug	21	2,100	- 11	2,089	21	2,079	Bearpaw sand	Hard,clear		D, S, M	Ample supply for town of Cambri.
7	NW.	10	"	"	"	Dug	80	2,180	- 76	2,104	76	2,104	Bearpaw sand	Hard,clear, iron		D, S	Ample supply.
8	SW.	10	"	"	"	Dug	40	2,140	- 5	2,135	40	2,100	Bearpaw sand	Hard			Ample supply.
9	NW.	12	"	"	"	Dug	140	2,150	-139	2,011	139	2,011	Bearpaw sand	Hard,clear, iron		D, S	Supplies household and 10 head stock.
10	SW.	13	"	"	"	Dug	14	2,052	- 9	2,043	14	2,038	Glacial sand	Soft,clear		D	Sufficient only for household, also 10-foot well closeby, large supply; caved in.

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.

RIVERSIDE NO.168, SASKATCHEWAN

B 4-4

WELL RECORDS—Rural Municipality of .....

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE: Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED: Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
11	NW.	13	19	18	3	Dug	15	2,044	- 10	2,034	15	2,029	Glacial gravel	Hard,clear, iron		S	Sufficient only for 10 head stock.
12	NE.	14	"	"	"	Dug	60	2,042									Dry hole; several dry holes in coulee.
13	SW.	14	"	"	"	Bored	148	2,144	-142	2,002	142	2,002	Bearpaw sand	Hard,iron, cloudy		N	Small dam for stock; water pronounced unfit for use by Department of Health.
14	NE.	15	"	"	"	Bored	125	2,128	-107	2,121	107	2,021	Bearpaw sand	Hard,clear, iron		N	Fills in with quicksand; hauls drinking water; small dam for stock.
15	SW.	16	"	"	"	Bored	78	2,160	- 60	2,100	76	2,084	Bearpaw sand	Hard,clear, iron		N	Insufficient; water hauled.
16	SE.	17	"	"	"	Drilled	257	2,150	+ 1	2,151	243	1,907	Bearpaw sand				Fair supply; also 200-foot well in quicksand.
17	NW.	20	"	"	"	Drilled	268	2,122	- 70	2,052	261	1,861	Bearpaw sand				Good supply.
18	NW.	20	"	"	"	Drilled	597	2,122	- 90	2,032	220	1,902	Bearpaw sand				Good supply.
19	NW.	20	"	"	"	Drilled	265	2,122					Bearpaw sand				No information on water; base in Bearpaw.
20	NW.	20	"	"	"	Drilled	160	2,122									Dry hole, base in Bearpaw.
21	NW.	20	"	"	"	Drilled	171	2,122	- 50	2,072	171	1,951	Bearpaw sand				No information on supply.
22	SE.	23	"	"	"	Drilled											Dry hole.
23	SE.	28	"	"	"	Dug	14	2,056	- 7	2,049	7	2,049	Glacial sand	Hard,clear		D, S	Supplies household and 15 head stock; also two similar wells.
24	SE.	30	"	"	"	Bored	125	2,145	- 95	2,050	125	2,015	Bearpaw sand	Hard,clear, iron		D, S	Ample supply. #
25	NW.	30	"	"	"	Bored	60	2,080	- 43	2,037	60	2,020	Bearpaw sand	Hard,clear, iron		D, S	Supplies household and 9 head stock.
26	NE.	31	"	"	"	Bored	95	2,110	?		93	2,017	Bearpaw sand	Hard,clear, iron		S	Sufficient for 10 head stock.
27	NW.	32	"	"	"	Drilled	240	2,090	-160	1,930	240	1,850	Belly River sand	Hard,clear, iron		D, S	Supplies household and 20 head stock.
1	SE.	4	20	17	3	Drilled	299	2,077	-224	1,853	299	1,778	Belly River sand	Soft,clear		D, S	Abundant supply.
2	SE.	6	"	"	"	Drilled	185	2,090			185	1,905	Bearpaw sand	Soft,clear		D, S	Sufficient supply.
1	SW.	2	20	18	3	Bored	113	2,060									Dry hole; base in Bearpaw.
2	NW.	3	"	"	"	Drilled	190	2,068									Dry hole, base in Bearpaw.
3	NW.	5	"	"	"	Bored	160	2,140	?				Bearpaw sand	Hard,clear iron,"alkaline"		D, S	Insufficient supply.
4	SW.	18	"	"	"	Drilled	800										Dry hole, base in Belly River or Lea Park.
5	SE.	23	"	"	"	Drilled	278						Belly River sand	Hard,clear, "alkaline"		N	Insufficient supply.
6	SW.	32	"	"	"	Bored	164										Dry hole; base in Bearpaw.
1	SW.	2	21	18	3	Drilled	230	1,990									Dry hole; base in Belly River also 150-foot bored hole.
2	NW.	2	"	"	"	Dug	12	1,990	0	1,990	11	1,979	Glacial sand	Hard,clear,		D, S	Supplies household and 70 head stock.
3	N½	3	"	"	"	Drilled	600	2,000									Dry hole,base in Belly River or Lea Park; also 350and 450-foot dry holes.
4	E½	30	"	"	"	Dug	40	1,950	- 26	1,924	40	1,910	Glacial gravel	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.