Mc82 11 8C21w

AUG 7 1937

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 MOOSE JAW No. 161 SASKATCHEWAN

BY

B. R. MacKay, H. H. Beach & E. L. Ruggles

Water Supply Paper No. 137

OTTAWA

1936

This document was produced by scanning the original publication.

Ce document est le produit d'une numérisation par balayage de la publication originale.

CANADA

DEPARTMENT OF MINES

BUREAU OF ECONOMIC GEOLOGY

GEOLOGICAL SURVEY

GROUND WATER RESOURCES OF THE RURAL MUNICIPALITY OF MOOSE JAW NO. 161 SASKATCHEWAN

BY

B.R. MacKAY, H.H. BEACH, and E.L. RUGGLES

WATER SUPPLY PAPER NO. 137

LIBRARY
GEOLOGICAL SURVEY
OF CANADA

CONTENTS

	Page
Introduction	1
Glossary of terms used	5
Names and descriptions of geological formations referred to	8
Water-bearing horizons of the municipality	10
Water-bearing horizons in the unconsolidated deposits	11
Water-bearing horizons in the bedrock	17
Ground water conditions by townships:	
Township 16, Range 25, west of 2nd meridian	19
Township 16, Range 26, " " " "	21
Township 16, Range 27, " " " "	23
Township 17, Range 25, " " " "	26
Township 17, Range 26, " " " "	28
Township 17, Range 27, " " " "	30
Township 18, Range 25, " " " "	31
Township 18, Range 26, " " " "	34
Township 18, Range 27, " " " "	35
Statistical summary of well information	37
Analyses and quality of water	38
General statement	38
Table of analyses of water samples	42
Water from the unconsolidated deposits	43
Water from the bedrock	45
Well records	46

Illustrations

Map of the municipality.

Figure 1. Map showing surface and bedrock geology that affect the ground water supply.

Figure 2. Map showing relief and the location and types of wells.

GROUND WATER RESOURCES OF THE RURAL MUNICIPALITY OF MOOSE JAW, NO. 161 SASKATCHEWAN

INTRODUCTION

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

Publication of Results

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

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

How to Use the Report

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

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

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

---

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

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

GLOSSARY OF TERMS USED

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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 côteau. 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-carine 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 Moose Jaw is an area of 324 square miles in the central part of southern Saskatchewan. It is a square block of land divided into nine townships, described as tps. 16, 17, and 18, ranges 25, 26, and 27, W. 2nd mer. The city of Moose Jaw is located in the south-central part of the municipality, and forms a divisional point for several railways. The main line of the Canadian Pacific railway crosses the area in an east-west direction. From it the "Soo line" branches off to the southeast at Pasqua, approximately 6 miles east of Moose Jaw. The Expanse branch and the Outlook section of the same railway extend, respectively, south and north from the western edge of the city. The Canadian National "Moose Jaw section follows up the valley of Moosejaw creek from the eastern border of the municipality into the city, and extends due south, crossing the southern border of the municipality in the SW.$\frac{1}{4}$, sec. 3, tp. 16, range 26. The Riverhurst division of this railway runs due west from Moose Jaw and turns northwest at the siding of Burt to leave the municipality near the central point of its western border. The greater part of the area is an almost level plain. Moosejaw creek flows in a deep valley in a northwesterly direction through township 16, range 26, and then turns east just east of the city to follow along the line between townships 16 and 17, leaving the municipality in the east-central part of township 17, range 25. Thunder creek flows from the west to join Moosejaw creek at Moose Jaw. Its valley is wide and shallow. Elevations rise from 1,750 feet above sea-level in the valley of Moosejaw creek to 1,950 feet on the northern plains. Similar elevations are reached in the southwest but there the land surface is more rolling, due in part to the occurrence of many low sand dunes.

Water supplies are obtained from wells in the valleys and on the plains in the southern townships. Springs on the slopes of the valleys provide considerable water locally. Moosejaw creek,

Thunder creek, and Qu'Appelle river supply water for stock. The finding of adequate water supplies for farm requirements constitutes a serious problem throughout the greater part of the area north of Moosejaw, and very few producing wells have been reported. Due to the occurrence of compact "gumbo" lake clay over the greater part of the area, dugouts and sloughs retain surface water for considerable periods of time. The excavation of dugouts seems to offer the only method of providing water for both domestic requirements and stock, at many points in the central and northern townships.

Water-bearing Horizons in the Unconsolidated Deposits

Thin layers of Recent stream deposits formed during periods of flood occur in the valleys of Moosejaw and Thunder creeks in the south, and in Qu'Appelle valley in the northeastern corner of the municipality. In Thunder Creek valley the alluvial deposits are composed largely of beds of fine silt and clay that are only slightly permeable. Beds of fine sand occur in some places interbedded with the silt and clay, which due to their greater porosity, are water-bearing. The deposits in the valley of Moosejaw creek are more porous owing to the more widespread occurrence of sand and gravel interbedded with the finer sediments. Wells in the alluvial deposits along this creek range in depth from 7 to 25 feet. A few of the wells in the valley below Moose Jaw do not produce enough water for local requirements, but at most points adequate supplies are obtainable. No wells have been reported in Qu'Appelle valley within this municipality, but water-bearing beds similar to those in Moosejaw creek valley probably occur. Considerable variation in the quality of the water from different localities is reported. Soft water is obtained from a few of the wells, but in most places hard water with a high content of dissolved mineral salts is found. It is to be noted that water in shallow wells in the valleys, particularly down stream from the city, may be contaminated by polluted surface water or sewage and frequent examination of the water for bacteria may be

necessary to be sure that it is satisfactory for domestic use.

On Figure 1 of the geological map accompanying this report glacial lake clay is shown to cover the greater part of the municipality. Glacial lake sands occur in the southwestern part of the area. The glacial till that underlies the glacial lake deposits is found at the surface on the sloping land bordering the valleys, and in the extreme southwestern corner of the municipality. A narrow ridge of morainic deposits extends through township 16, range 27. The differences that exist in the character of the sediments, their porosity, and the topographic relief presented by the various types of deposits forming the glacial drift, may be attributed in large part to the different conditions under which they were originally formed.

A great ice-sheet moved in a southwesterly direction over western Canada many thousands of years ago, and upon melting it gradually retreated to the northeast. During the advance and retreat of the ice a deposit of unsorted clay, silt, and boulders, collectively termed glacial till or boulder clay, was deposited by the ice over the greater part of the area. At some places the retreating ice front paused for considerable periods of time, and additional deposits of boulder clay interspersed with irregular pockets of sands and gravels were deposited. These deposits are known as moraine, and differ from the till plain in having a more irregularly rolling surface. The upper, weathered part of the material, comprising both the till and the moraine is usually yellowish, and the lower part is greyish blue. The pockets of sand and gravel that occur scattered through the boulder clay, with no apparent uniformity as to depth from the surface or individual areal extent, thickness or porosity, form the water-bearing beds in these types of deposits. As the ice melted lakes were formed by damming of the drainage channels. Large amounts of fine sands and silts were carried into the lakes and gradually accumulated over the bottom to form the lake deposits that cover the boulder clay. The coarser sands settled out first and formed beds near the shores of the lake,

or in the bottom, where they were subsequently covered by clay. The glacial lake sands occurring in the southwestern part of the municipality represent near shore conditions in the glacial lake that once covered nearly the whole of this municipality and a large area extending north, south, and east of the city of Regina.

The porous lake sands readily absorb surface water which quickly percolates to depths. The surface deposits dry quickly, and in periods of high winds and low precipitation the sands are drifted and form dunes. Water collects in the lower part of the lake sands. Part of the rainfall in the highlands lying to the southwest of this municipality gradually finds its way through the drift to the lake sands that extend along the southern border of this area. At places on the sides of hills and in coulées and other depressions the water may again come to the surface as springs. Wells sunk to depths of less than 50 feet have obtained, in these sands in the southern parts of townships 16, range 26 and 27, moderately large supplies of hard, clear, drinkable water. Evidently the sands are thinner in the southeast corner of township 16, range 27, as it was found necessary to extend wells to depths of 80 to 90 feet into the underlying boulder clay before an adequate water supply was obtained.

Wells sunk into the glacial lake clay covering the greater part of the municipality have found water only where they have been located beside dugouts or sloughs, and the water is obtained by seepage. The thickness of the clay is not definitely known, but it increases from less than 5 feet along the margins of the lake area to 30 feet or more on the plains north of Moose Jaw. The boulder clay underlying the lake clay is in places more porous, due to the occurrence of thin beds of sands and gravels, and some of these pockets are water bearing. However, owing to the compact nature of the lake clay at the surface, little or no water can seep into the boulder clay, and over large areas all efforts to obtain any water by sinking wells have been fruitless. In the

southwestern part of the municipality water enters the ground through the pervious sands occurring outside the lake clay-covered area and on higher land. Part of this water may gradually find its way to the sand and gravel pockets in the boulder clay underlying the lake clay in the southern half of the municipality.

In the southwestern part of the municipality water is being obtained in wells ranging in depth from 8 to 75 feet. The sands and gravels appear to be numerous in this area, as very few wells have failed to penetrate them. Individual wells yield sufficient water for local requirements, and with one exception all the wells yield water that is usable for household purposes.

In the southeastern part of the municipality a water-bearing horizon occurs in the boulder clay. Unlike the scattered, restricted beds found in the southwest this aquifer appears to be fairly continuous, and is considered to be a northwestern extension of a water-producing horizon traced through several townships to the south and east. The approximate extent of the aquifer within this municipality is outlined by the line "A" on the accompanying map, Figure 1. Its absence toward the north is indicated by a series of deep, dry holes that pass through the glacial drift into the bedrock. The aquifer varies laterally from fine sands to gravels. Toward the north the beds appear to become thinner and finally disappear. Wells tapping this horizon range in depth from 86 to 190 feet, increasing generally from the southeast part of township 16, range 26, towards the northeast of township 16, range 25. With the exception of two of the wells reported, each well produces ample water for local requirements. The dissolved mineral salt content of the water is fairly high and is sufficient to make the water from four of the wells undrinkable. Additional supplies of water should be readily obtained at almost any point within this area by sinking wells to this horizon.

The boulder clay throughout the greater part of the area north of the valleys of Thunder creek and Moosojaw creek is unproductive of water. This condition is due in part to the compact covering of lake clay that extends over the greater part of the area, and to the sparing occurrence of gravel and sand beds or pockets that normally act as reservoirs for water. In the land adjacent to the valleys over which the lake clay does not extend water has been found in sand or gravel pockets at depths of 13 to 95 feet. The yield from individual wells depends on the thickness and areal extent of the aquifer tapped. Where only small pockets have been encountered the yield from a well is small, but from the greater number of the wells in this area enough water is obtained for household and stock requirements. The water contains appreciable amounts of mineral salts in solution, and these are sufficiently concentrated in the water from some of the deeper wells to prohibit its use for drinking, but it is satisfactory for stock. As evidenced by dry holes that have been sunk at points scattered over the area, the finding of aquifers in the boulder clay is purely a matter of chance.

Water-bearing beds of sand have been encountered at depths of 200 feet to over 300 feet in a few wells in township 17, range 26, and in the northwestern corner of township 18, range 27. It is difficult to determine whether these sands occur in the lower part of the glacial drift at the zone of contact between the drift and the bedrock or in the upper part of the bedrock itself. In this report they have been assumed to be a part of the Bearpaw formation. Three deep wells, 234 to 288 feet, also occur in townships 17 and 18, range 25. The aquifers in these wells have been classified as part of the glacial drift owing to the presence of gravels along with the sand. Good supplies of usable water are obtained from each of the wells. Springs occurring on the lower slopes of Moosojaw Creek valley and Qu'Appelle valley appear to have their sources in the same horizon. Hence, it is possible that a water-bearing bed

extends through the eastern two-thirds of these two townships and is worthy of further prospecting. Throughout the lake clay-covered area extending through townships 17 and 18, ranges 26 and 27, there is little possibility of finding any water in the boulder clay. Many wells have been drilled to depths exceeding 300 feet and encountered no water.

A narrow strip of moraine varying from about $\frac{1}{4}$ to $\frac{1}{2}$ mile in width extends from sec. 6, tp. 16, range 26, northwesterly to sec. 18, tp. 16, range 27. Sand and gravel beds in the moraine are numerous and the deposits, therefore, are porous. Considerable water collects in this ridge from rainfall and by underground and surface flow of water from the higher land to the south. Springs have been reported on secs. 1 and 9, tp. 16, range 27. On section 9 the springs are situated near a valley that has been cut through the ridge, and are known as Snowdy springs. A dam built across the valley forms a reservoir for the collection of the water from the springs. After treatment this water is piped to Moose Jaw where it forms part of the city supply. Water should be readily obtained by digging shallow wells at points along the ridge. Quantities such as those yielded by Snowdy springs are not to be expected at other points along the moraine, but sufficient water for local domestic and stock requirements should be obtainable.

No attempt is made in this report to discuss in detail the water supply of the city of Moose Jaw or to suggest any possible methods for its increase. Considerable work on this problem has been done by W.A. Johnston and R.T.D. Wickenden, and their findings are embodied in the Geological Survey, Canada, Summary Report, 1930, Part B, pages 50-64. As mentioned above, a part of the city supply is piped into the city from Snowdy springs. The greater part of the supply is obtained from a collecting gallery and wells at Sandy creek, and from wells at Forsythe creek in township 17, range 29. The water is derived from the glacial and Recent deposits, which are very sandy and porous in these areas. The water from

these latter sources is pumped through a pipe-line 23 miles long that follows the valley of Thunder creek to the city. Four reservoirs, with capacities of 60,000,000, 2,000,000, 500,000, and 290,000 gallons, and one elevated steel tank with capacity of 100,000 gallons, are connected with the system. A collecting gallery in the Recent deposits in Moosejaw Creek valley, at Britannia Park close to the city, formerly contributed to the city water supply. However, the shales of the Bearpaw bedrock formation lie about 15 feet from the surface in the valley, and the water derived from the gallery contained large concentrations of dissolved mineral salts, partly due to its contact with the shales. Large quantities of water are not available from wells in the Recent or glacial deposits in or near the city, although small seepages of highly mineralized water are obtained from a few shallow wells.

Water-bearing Horizons in the Bedrock

The Bearpaw formation, which occurs immediately beneath the glacial drift throughout the municipality, is made up of dark grey shales interbedded in the upper part, in some localities, with thin sand beds. The shale locally referred to as "soapstone" is not readily distinguished from the dark clay at the base of the glacial drift, but may be identified by the absence of stones or gravel, the soapy feel when wet, the small, roughly cubical fragments into which it breaks when dry, and the light grey to yellowish colour it assumes when weathered. Wells have been sunk into the shale at many places in the municipality. At no place did the thick, compact shales yield water. However, sand beds interbedded with the shales have been encountered in deep wells in township 17, range 26, and in the northwestern part of township 18, range 27, and have been found to be water bearing. In township 17, range 26, the wells are 200 feet deep, but in township 18, range 27, the wells range from 252 to 350 feet deep. The aquifer lies 235 to 250 feet below the ground surface in the latter wells. Although several of the deep

wells were not being used in 1935 ample water for local requirements is available. The water is hard and contains fairly high concentrations of mineral salts in solution. All the water is satisfactory for stock, but that from the wells in township 17, range 26, is not good for drinking. The extent of these water-bearing sand beds cannot be determined definitely, but they are evidently not extensive, as dry holes have been sunk to greater depths not only in adjoining townships but at several points in these townships. Additional water could probably be obtained by drilling wells in the vicinity of the existing wells. Throughout townships 17, ranges 26 and 27, township 18, range 26, and parts of large areas in townships 18, ranges 25 and 27, no water appears to be present in the bedrock, and it is advisable to confine prospecting to the upper part of the boulder clay immediately underlying the lake clay. As even this horizon is unproductive over large areas, the storing of surface water by means of dugouts is of primary importance in these townships.

At Moose Jaw a well was drilled 3,302 feet deep and passed through the Bearpaw formation into older formations at greater depths. Only small seepages of water were obtained at depths of less than 900 feet. A flow of about 4,000 gallons a minute occurred at 980 feet, and large flows at greater depths. The temperature of the water is reported to increase with depth, being 80 degrees F. at 1,500 feet and 92 degrees F. at 2,344 feet. Sodium chloride (common salt) is the largest constituent of the dissolved mineral salts, and it gives the water a decidedly salty taste. The water is pumped to the "Natatorium" where it is used in the swimming pool.

GROUND WATER CONDITIONS BY TOWNSHIPS

Township 16, Range 25

A gently rolling plain extends over the greater part of the township. The valley of Moosejaw creek crosses the northern part of sections 31, 32, and 33. The average elevation of the plain is about 1,880 feet above sea-level, with the bottom of the valley lying about 100 feet lower. Several wells in the township yield good supplies of water, but on many of the farms no ground water has been found although drilling has been extensive. Dugouts form important sources of water on many farms where the ground water supply has proved inadequate.

Recent stream deposits occur in the bottom of Moosejaw Creek valley. These consist of beds of sand and fine silt. Water percolates through these porous deposits from upstream and also in smaller quantities from the deposits bordering the valley. Water supplies could probably be obtained by digging shallow wells in the valley bottom. This water may be polluted, however, and should be examined by the Provincial Analyst before being used. Less possibility of pollution exists on the slopes of the valley, but the yield from wells at the higher elevations is expected to be smaller. On the NE.¼, section 33, a spring on the lower slopes has been dug out and provides considerable water for farmers in the vicinity. A sand bed lying 2 feet beneath the surface carries the water. The water is fairly soft and of excellent quality for household use. It is improbable that supplies such as this will be found at many points on the slopes along the valley.

Glacial lake clay covers all other parts of the township to depths probably not greatly exceeding 20 feet. As the clay is only slightly permeable it will not yield supplies of water. Moreover, it prevents the seepage of any large quantities of water into the underlying boulder clay. The boulder clay is also found to be non-water bearing in this area. Deep wells have been sunk in nearly all parts of the township, and except in the central and northwestern

sections have encountered a water-bearing sand and gravel horizon. This horizon also occurs in adjacent townships to the east and south. The line "A" on the map, Figure 1, is the approximate northern boundary of the area in which this aquifer is believed to be present in this township. Even to the southeast of this line the aquifer is subject to lateral variations, and on sections 17, 28, and 35 deep, dry holes have been sunk, but at most farms supplies of water are obtained. In the southern part of the township the wells range in depth from 86 to 136 feet, whereas in the north the aquifer is encountered at depths as great as 174 feet. The yield of water from each of the wells is ample for local requirements. The water is highly mineralized, but that from most of the wells is usable for household purposes. From four of the wells reported, however, the concentration of sulphate salts in solution renders the water suitable only for stock. At most points throughout the area bounded by the line "A" additional water supplies should be obtained by sinking wells. However, further drilling may show the absence of water-bearing beds at some localities. The lateral variations in the deposits at these depths are well illustrated at Pasqua, on section 28, where a good supply of water is available from a gravel bed near the base of a 165-foot well, whereas a hole drilled 400 feet deep only 30 feet away failed to find any water. Further deep drilling in the central and northwestern sections appears to be useless.

Owing to its impervious nature the lake clay permits little loss of water by seepage from dugouts excavated in it. These dugouts are used on several farms to conserve surface water for stock. Household supplies are obtained by digging shallow wells close to the dugouts.

The Bearpaw formation occurs beneath the glacial drift throughout the township, and has been penetrated by dry holes on several sections in the northern half of the township. The depth to

the bedrock in the holes reported ranges from 130 to 167 feet. Water might be found at depths of several hundred feet, but the water probably will be too highly mineralized for any farm use. Further drilling into the bedrock is of little or no value, and if water is not found within 170 feet of the surface drilling should be discontinued.

Township 16, Range 26

Moosejaw creek enters the township in section 2 and follows a meandering course in a northwesterly direction to section 29, from whence it skirts the northeastern border to leave the township in section 36. The creek occupies a valley 50 to 100 feet deep and about ½ mile wide. Thunder creek flows in a shallower valley through sections 31 and 32, and joins Moosejaw creek in section 33. The land remote from the valleys is a fairly level plain rising very gradually to the south. The southern sections are slightly rolling. Part of the city of Moose Jaw is built on the slopes and in the valleys on sections 28 to 34. Sufficient water is not obtained from wells on all farms. Springs occurring along the sides of the valley of Moosejaw creek are utilized and considerable water is taken from the creek. Dugouts on several farms conserve the surface water for stock use, and a few farmers on the northern sections haul water from Moose Jaw.

Recent alluvial deposits cover the bottoms of the valleys of both Moosejaw creek and Thunder creek. The alluvium in both of these valleys consists largely of fine silt and clay that are only slightly permeable. However, sand and gravel occur at many points along the valleys, and wells tapping these materials obtain water. The wells that have been dug in the valleys range in depth from 15 to 25 feet. The yield from individual wells is small and in some places is inadequate for local requirements. The water is hard and contains considerable amounts of mineral salts in solution, but these are not sufficiently concentrated to make the water unsuitable

for drinking. Water from wells in the valley below Moose Jaw should be examined for bacteria before being used as a very real danger exists that the water may be contaminated by sewage from the city.

Glacial lake sands occur in sections 3, 4, 5, and 6, as shown on the map, Figure 1. In some places these sands have been formed into dunes by the prevailing wind. Surface water is readily absorbed by the sands and seeps to levels where it is unaffected by evaporation. The greater part of the water collects in sand and gravel pockets in the underlying boulder clay at varying depths. Wells tapping these pockets range from 26 to 80 feet deep. Ample water is obtained from the wells on sections 4 and 6, but a 20-foot well on section 5 encountered only boulder clay and yields a small supply. It is possible that if this well were deepened a water-bearing bed would be encountered. Water in sufficient quantities for local requirements should be obtainable throughout the lake sand-covered area. Although the aquifers in the underlying clays are not continuous they could probably be located by sinking a few test holes.

The greater part of the township is overlain by a mantle of fine-grained, compact, glacial lake clay. The clay probably does not exceed 15 to 20 feet in thickness anywhere in the area. The clay is unproductive of any supply of ground water. Producing wells in the lake clay-covered areas are obtaining water from gravel and sand aquifers in the underlying boulder clay. Along the northern and southern slopes of Thunder Creek valley the lake clay has been removed by erosion and the boulder clay is exposed at the surface. A part of the water absorbed by the lake sands in the south percolates northward toward lower levels and collects in the sand and gravel pockets in the boulder clay beneath the lake clay. Wells 50 to 72 feet deep on the west side of Moosejaw creek are drawing good supplies of water from these aquifers.

Springs on sections 9 and 10 have their sources in the sand and gravel beds in the boulder clay. Additional wells on the west side of the creek would probably find water. In the southeastern part of the township a continuous water-bearing bed of sand and gravel occurs at depths ranging from about 80 to 130 feet. This aquifer has been traced for some distance through the townships to the south and east. Its approximate extent in this township is indicated by the line "A" on the map. Ample water for local domestic and stock requirements is obtained from this horizon in wells on sections 2, 11, 12, and 14. The beds become less porous toward the north, and on section 22 the yield from a well 119 feet deep is small. Throughout the northern part of the township little or no water has been found in the glacial drift. Very small seepages of water are obtained from several shallow wells in the western part of the city of Moose Jaw, but nearly every hole in the glacial drift in the northern sections is unproductive.

The dark-coloured, impervious shales of the Bearpaw formation underlie the glacial drift at depths increasing from less than 30 feet in the valley of Thunder creek, at Moose Jaw, to 150 feet or more on the plains. Several dry holes have been sunk into the formation in the northeastern part of the township. At Moose Jaw a well was drilled 3,302 feet deep. Good flows of water were not obtained until depths greater than 900 feet were reached, and lower lying formations penetrated. The water is too highly mineralized to be used for drinking. Drilling to any moderate depths into the bedrock at any point in the township cannot be expected to yield a satisfactory water supply.

Township 16, Range 27

Ample supplies of water have been obtained from wells on nearly every farm in this township. Springs occur on the narrow ridge of land that extends from section 1 to section 18. Water for stock is also obtained from the small, intermittent creek that flows northeasterly from section 9, toward Thunder creek, and on a few farms

dugouts conserve surface supplies for stock.

Recent stream deposits floor the valley of Thunder creek in the northern sections of the township, and occur in places along the valley of the small tributary creek. As the alluvial deposits in Moosejaw Creek valley are composed largely of fine silts, the greater part of the surface water is carried away as run-off or is evaporated. In places more sandy deposits occur and absorb water. Sand beds also are embedded in the silts in some localities. Shallow wells dug in the valley bottom should find water where the sands are encountered, but as these do not occur throughout the whole valley several test holes might be necessary before an aquifer can be located. The content of mineral salts in solution in the water will probably be high, but the water should be satisfactory for stock and may be usable for domestic purposes. On section 22, in the valley of the smaller creek, a 15-foot well is drawing water from a sand bed in the Recent alluvium at a depth of 10 feet. The supply is sufficient for local requirements, and the water although hard and "alkaline" is drinkable. Deposits of sand and gravel are numerous along this valley and should yield water wherever they occur.

Glacial lake sands overlie two narrow belts extending from sections 1, 2, and 3, to section 18. Their areal extent is indicated on the accompanying map, Figure 1. Sand dunes are common in parts of this area, having been formed by the action of high winds in periods of dry weather. Water is readily absorbed by these deposits and gradually seeps down to become concentrated in sand and gravel beds in the underlying boulder clay. Only a few wells have been dug in this area, but all yield satisfactory supplies of water, which is of good quality. Additional supplies should be readily located in the lake sand-covered area by digging wells to depths not greater than 35 feet.

Part of the water absorbed in the lake sand-covered area probably percolates northward to the lower lying area covered by glacial lake clay. The lake clay in this area is more sandy and

permeable than in other townships and permits percolation of some water from the surface. Throughout the area water has been found in sand and gravel pockets and beds in the underlying boulder clay. Wells range in depth from 8 to 75 feet. Each well yields sufficient water for local requirements. The water is hard and contains considerable amounts of dissolved mineral salts, but only from one well, on section 23, is the water reported to be unsuitable for drinking. Only on section 19 have any dry holes been reported, so that it would appear that water supplies are to be readily obtained throughout the greater part of this area.

The glacial till or boulder clay that underlies the glacial lake sand and clay is exposed at the surface on the slopes bordering the valley of Thunder creek and in the southwestern corner of the township. Water supplies are also obtained from sand and gravel pockets in this area. Wells tapping these aquifers range in depth from 12 to 70 feet. Ample water for local requirements is obtained from individual wells and the water, although hard and in some places "alkaline" is reported to be suitable for drinking. In a few wells sand or gravel beds were not encountered, but water is obtained from sandy phases of the boulder clay. Wells 60 and 95 feet deep, on section 28, are reported to be obtaining water from the clay. The dissolved mineral salt content of the wells is high. On section 7 only a small supply of water is obtained from the clay, in a well 60 feet deep. Prospecting for water in the boulder clay should not be carried deeper than about 70 feet, as the sands and gravels are usually found at shallower depths. Owing to the non-continuous nature of the aquifers several holes may be sunk in some localities before encountering a water-bearing bed.

A narrow belt of morainic deposits extends as a ridge from section 1 to section 18. This ridge acts as a barrier to water percolating down from the higher land to the south. The only opening through this ridge is on section 9. Gravels and sands that make up a large part of these deposits store considerable water which forms

springs on the slopes. The most productive springs occur on section 9, and are known as Snowdy springs. A dam has been constructed in the valley on this section to collect the water, and after treatment the water is piped to Moose Jaw where it serves as part of the city supply. Ample water for farm use could be obtained by sinking shallow wells near the bases of the slopes of this morainic ridge.

No reports have been received of any drilling in the township deep enough to penetrate the Bearpaw shales that underlie the glacial drift throughout the area. In the valley of Thunder creek the shales lie 30 to 50 feet below the ground surface, but are covered by at least 100 feet of glacial deposits throughout the remainder of the township. Only at depths of at least 700 feet can water be obtained from the bedrock, and this water will be too highly mineralized to be used. Drilling below the base of the drift cannot be recommended in this area.

Township 17, Range 25

Water supplies are obtained from wells on a few farms in this township. Moderate amounts of water are available from springs occurring on the slopes of the valley of Moosejaw creek in the eastern sections. Adequate supplies of ground water have not been found on many sections, and farmers have been obliged to use sloughs and dugouts for their water supplies. Several farmers haul water from the springs in the east or from producing wells. Water is also obtained from the creek.

Recent alluvium floors the valley of Moosejaw creek. These deposits are sandy and porous and yield water to shallow wells. Springs also occur at a number of points in the valley. The supplies obtained are not large, but are sufficient for local requirements, and the water is reported to be of good quality. Additional supplies should be readily obtainable in the valley. Residents in the valley have constructed dams across the creek at several points to provide more water for stock.

The glacial deposits that form a thick covering over the whole township except in the valley consist chiefly of boulder clay. In the northwestern plain, and in the small area in this township south of the valley, the boulder clay is overlain by glacial lake clay. No water is derived from the lake clay owing to its impervious nature, and little water seeps through the lake clay to the underlying boulder clay. Numerous wells have been sunk throughout the area, but in the greater number no water was found. The boulder clay itself is unproductive, and the pockets of sand and gravel encountered in some localities were also dry. In a few wells, however, water-bearing sands and gravels were tapped. Two deep wells on section 1 are drawing water from a sand bed lying at an elevation of about 1,695 feet above sea-level. This aquifer was also found in wells on sections 6 and 7 of the townships immediately to the east. Each of the wells produces a large supply of water of good quality. The sands here encountered are probably a continuation of the productive beds that extend through the townships to the south. The areal extent of the aquifer is not known definitely, but it probably occurs also in sections 2 and 12. A water-bearing sand bed was encountered on section 33, at the same elevation. The aquifer immediately overlies the bedrock. A good supply of water is available in this well, but it has a slightly salty taste. As no other wells this deep have been reported in this township, the areal extent of this aquifer has not been determined. Deep prospecting in the townships north and west failed to encounter any water-bearing horizon, but it is possible that water could be found at depths of about 200 feet on some other sections in this township.

Water-bearing pockets of sand and gravel have been encountered north of the valley at depths ranging from 10 to 95 feet. On sections 15, 17, 18, and 26 ample water for local requirements is obtained. The water from the wells on sections 15 and 17 is too highly mineralized to be used for drinking, but is usable for stock. Wells on sections 17 and 23 are tapping small gravel pockets and yield only small quantities of water. Little or no water can be

expected in the lake clay-covered area in the northwest, but additional supplies should be found in sands and gravels at some points in the remaining, till-covered area. The water-bearing sand bed encountered at a depth of 95 feet, on section 15, may be fairly extensive through the southern part of the township, and further prospecting for water in the vicinity of this well may be advisable.

The Bearpaw formation underlies the whole of the township. In the valley bottom the covering of unconsolidated deposits probably does not exceed 30 feet in thickness, but on the plains they reach a thickness of over 200 feet in places. Some of the unrecorded dry holes have probably penetrated the compact shales of the bedrock. No water is to be expected from the shales. The deep well on section 33 appears to have penetrated the shales at a depth of a little more than 210 feet, but water was not obtained below this point. The water in this well contains considerable amounts of sodium chloride and has a salty taste. This salt is probably dissolved from the shales surrounding the well by the water from the drift. Drilling below the base of the glacial drift for the purpose of finding water at any point in the township is useless. Moreover, holes should not be continued into the shales to create a reservoir for water obtained from the drift as the mineral salts inherent to the shales may spoil the quality of otherwise drinkable water.

Township 17, Range 26

The surface of the township is an almost level plain with an approximate elevation of 1,900 feet above sea-level and falling off slightly to the south. The southern sections, 1 to 6, lie along the northern slopes of the valleys of Moosejaw creek and Thunder creek. Part of the city of Moose Jaw is located on the slopes in sections 4, 5, and 6.

Water is obtained from shallow wells in the valley of Moosejaw creek, but few other wells in the township are productive.

Storage of surface water in dugouts forms the main source of supply on many farms. Water is also being hauled from the city of Moose Jaw. Local requirements for stock water are less than they were formerly owing to the increased use of tractors.

The wells in the valleys obtain their water from sands and gravels in the Recent stream deposits at depths of from 5 to 15 feet. Twenty-foot wells on sections 2 and 3 produce only enough water for household use, but other wells, on sections 1 and 2, yield ample water for stock requirements. Additional supplies should be readily obtained at almost any point along the valley. Untried supplies should be examined for bacteria before using, due to the possibility of contamination by sewage from the city.

Unproductive glacial lake clay mantles the greater part of the township to depths of about 20 feet. Below the lake clay lies glacial till or boulder clay to depths that have not been definitely determined, but probably exceed 100 feet in most localities. On sections 5, 6, and 8 small seepages of water have been obtained from the shallow wells, but on several sections deep holes have passed through the drift into the underlying bedrock without encountering an aquifer in the drift. It appears that drilling of deep wells into the drift is useless. On the southern sections where the boulder clay is not covered by the compact lake clay water should be found in shallow wells if gravel or sand pockets can be located. These occur very sparsely in this area, however, and could probably be located only after extensive testing.

On sections 10, 14, and 15 water is derived from a sand bed, in wells 200 feet deep. Good supplies of water are available in each of the wells, but are being used only to a small extent at the present time. The water has a high content of dissolved mineral salts and is not satisfactory for household use, but is usable for stock. As sand beds occur in the Bearpaw formation at some points it is impossible to determine whether the aquifer in these wells lies

Bearpaw formation. The quality of the water does not give any definite clue as to its source. The extent of this aquifer is not known, but it probably extends a short distance towards the north or northwest.

Dry holes 400 to 700 feet deep, on sections 17, 31, and 34, indicate the unproductive nature of the Bearpaw formation throughout the greater part of the area. Unless the aquifer described above at depths of about 200 feet deep is encountered, drilling into the bedrock in this township is useless.

Township 17, Range 27

An almost level plain occupies the greater part of the township. In the southern sections the surface becomes more irregular and slopes gradually towards the valley of Thunder creek, which passed through section 6. Ground water supplies have been obtained in wells in the southern sections, but throughout the remainder of the township all the holes sunk have been unproductive. Supplies of water are obtained from dugouts and sloughs. The pipe-line carrying water to Moose Jaw from the wells at Sandy creek and Forsythe creek to the west is tapped at Beharm, on section 6. Residents at Beharm and the surrounding district obtain water from this source.

The Recent stream deposits covering the bottom of the valley consist largely of fine silts, but include more permeable sand beds in places. Shallow wells sunk in the valley would obtain supplies of water from the sands. A well 10 feet deep in the valley, on the SW.$\frac{1}{4}$, section 5, tapped one of these sand beds 6 feet below the surface and obtained a supply of water ample for local stock requirements. The water is hard and highly mineralized, and is not used for domestic purposes.

Glacial till or boulder clay extends throughout the remainder of the township and is covered by glacial lake clay in all

but the southern townships. The glacial lake clay is too compact to yield supplies of water, and it prevents seepage of water into the underlying boulder clay. Wells have been sunk to varying depths in the lake clay-covered area, but water has not been found. Further prospecting in this area appears to be useless, as even the underlying bedrock shows no promise of yielding more than small seepages of unusable water.

The boulder clay exposed at the surface in the southern section is more permeable than the lake clay, and surface water percolates into it. Sand and gravel pockets scattered through the boulder clay store this water and yield supplies when tapped by wells. Shallow depressions in this area are particularly favourable well sites. On sections 2, 3, 4, and 5, wells 13 to 52 feet deep are drawing water from the sand and gravel pockets. Supplies from those wells are generally ample for local requirements, but the yield has decreased considerably in dry years. Additional supplies when required should be obtainable in this area by digging more wells. The sands and gravels probably do not form continuous horizons, so that a few test holes may be necessary to locate an aquifer in some localities.

The Bearpaw formation occurs beneath the glacial drift throughout the township. In the valley bottom the unconsolidated deposits do not greatly exceed 30 feet in thickness, but on the plain to the north it lies at least 150 feet from the surface. Some of the unreported dry holes that were sunk in the area probably penetrated the shales. Water supplies are not to be expected from the Bearpaw formation in this township.

Township 18, Range 25

An almost level plain sloping slightly to the east occupies the western half of the township. In the eastern sections the land is more rolling and slopes downward towards Moosejaw creek just beyond the eastern boundary of the township. The Qu'Appelle

valley occupies sections 35 and 36, and parts of sections 33 and 34. Buffalo Pound lake extends into the northern part of sections 34 and 35. Several coulées have been eroded into the slopes leading to both valleys. Ample water is obtained from springs and shallow wells in the valleys, but only a few wells on the plain supply sufficient water for local requirements. Surface water for stock is collected in dugouts on some farms, and shallow wells dug close to these reservoirs supply water for drinking. Water is hauled from the springs in the valleys by some farmers.

Recent alluvial deposits consisting of fine sands and silts occur in the bottom of Qu'Appelle valley. Supplies of water are available by digging shallow wells into the sand beds in the valley bottom. The water, however, contains large amounts of mineral salts in solution and may not be usable for drinking. It is probably similar in quality to the water in Buffalo Pound lake, which is satisfactory for watering stock but is not fit for domestic use. Residents in Qu'Appelle valley and in Moosejaw Creek valley obtain their supplies from springs on the lower slopes of the valleys.

Glacial till occurs at the surface in the southeastern part of the township and along Qu'Appelle valley. Glacial lake clay overlies the boulder clay on the plain throughout the greater part of the township. The lake clay forms a layer about 5 to 15 feet thick that is only slightly permeable to water, and no supplies have been obtained from it. The boulder clay is likewise compact, and although it is less impervious than the lake clay it does not yield supplies of water. Scattered through the boulder clay, however, are pockets of sand and gravel which are found to be water bearing in some places. Wells 8 to 35 feet deep, on sections 4, 6, 7, 15, 18, 21, and 25, encountered pockets of this nature. The yield from some of these wells is ample for local requirements, but in three of the wells the aquifers encountered are evidently restricted in areal extent, and only very small quantities of water are obtained. The

water from the well on section 4 is reported to be soft, but that from the others is hard. In places the dissolved mineral salt content of the water is high. A 17-foot well, dug on section 7, obtained water that was too highly mineralized to be used even for stock. These aquifers in the boulder clay are restricted in their extent and occurrence, so that the greater number of holes sunk in the township have obtained no water. Numerous dry holes, most of which are not recorded in this report, have been bored 40 to 100 feet deep. Dry sands and gravels were encountered in some of these holes and indicate the impermeability of the overlying clay deposits. Springs occurring on the lower slopes of the valley of Moosejaw creek and Qu'Appelle valley have their sources in sands and gravels in the boulder clay. The exact location of the springs is not known, and they are not shown on the map accompanying this report, Figure 2.

Two deep holes were drilled on section 16, one 234 feet deep and the other 248 feet. Good supplies of water were obtained in each well from sand and gravel beds at or near their bases. The water is highly mineralized, but not sufficiently so to make it unfit for domestic use. The water in the well on the SE.¼, section 16, probably comes in contact with the bedrock shales immediately below the sand and gravel aquifer, as it has a noticeable content of common salt. The areal extent of this aquifer has not been determined. Deep dry holes on sections 8 and 19 indicate its absence in the western sections of the township. Dry holes sunk in most parts of the township are not deep enough to reach this horizon at the base of the glacial drift. On section 21 water was found in a well at a depth of 180 feet, but owing to difficulties in drilling the well was not completed. On section 33 of the township immediately to the south the same aquifer was encountered at a depth of 210 feet. The springs occurring on the valley slopes may have their source in this horizon. It appears that wells drilled 200 to 250 feet deep in the south-central part of this township, and possibly north and east to the valleys of Moosejaw creek and Qu'Appelle river, should encounter this aquifer. The water-bearing sands and gravels may lie in the

bed of a buried pre-glacial stream channel, in which case they would occur only within narrow bounds. On sections 4 and 9 drilling could be conducted with reasonable certainty of obtaining water.

Dugouts excavated in the compact lake clay and boulder clay, and dams built across small coulées, have proved to be reliable reservoirs for water in this township. Several farmers have provided ample water for domestic and stock requirements in this manner.

Dry holes 450 and 300 feet deep, in sections 8 and 19, have penetrated the shales of the Bearpaw formation which underlie the plain area at depths of about 200 to 250 feet below the ground surface. In the valleys the unconsolidated deposits are less than 50 feet thick. No water is to be expected from the formation except at depths of 700 feet or more, and this water is unfit for use. Drilling in the township in the future should not be extended beyond the contact between the glacial drift and the bedrock.

Township 18, Range 26

Very little ground water has been obtained from wells in this township. Most of the farmers are obliged to rely on surface water stored in dugouts for their supplies.

Glacial lake clay mantles the entire township. Its thickness has not been definitely determined, but from the few well logs available it appears to be less than 10 feet thick. The clay is fine grained and compact, and is not a source of water. Moreover it prevents seepage of much of the surface water to the underlying boulder clay. Deep holes were drilled on several farms a number of years ago, but no water supplies were found at depth. Records of the drillings are not available. The boulder clay is almost entirely unproductive of water, and the sands and gravels encountered in many of the wells were also dry. Producing wells are reported on sections 21, 29, 33, and 36. The wells on sections 21 and 33 obtained only very small supplies of highly mineralized water, and neither well is being used. On section 29, sufficient water is obtained from a bed

of sand and gravel in a 42-foot well to water 30 head of stock. Part of the water in this well is derived by seepage from a nearby dugout. On the SW.¼, section 36, a water-bearing sand bed was tapped at a depth of 83 feet, but here again the yield of water is small. A 15-foot well on the NW.¼, section 36, produces ample water for 35 head of stock, but the water is highly mineralized and cannot be used for drinking. As prospecting for ground water in this township has been extensive, and as the few supplies obtained are inadequate and of poor quality, the further sinking of wells is apparently useless. Deep, drilled wells indicate an absence of water at the contact between the glacial drift and the bedrock. No water is to be expected from the Bearpaw shales underlying the drift except at depths of several hundred feet, and this water probably would be too highly mineralized to be used. Efforts to obtain water supplies must be confined to storing surface water in dugouts.

Township 18, Range 27

The surface of the township is an almost level plain in which slight depressions occur at irregulr intervals. Considerable difficulty has been experienced in obtaining water supplies in the township. A few deep wells in the northern sections formerly yielded good supplies of water, but are not producing now owing to sand filling in the lower part of the wells. A few shallow wells yield supplies, but, in general, farmers rely on the storage of surface water in dugouts for both domestic and stock use.

Compact glacial lake clay covers the area to depths of 10 to 15 feet. The clay absorbs little water from the surface and allows very little seepage of water into the underlying boulder clay. The impermeability of the clay, however, aids the retention of water in dugouts. "Filter" wells are dug into the clay close to the dugouts and supply water for both household use and for stock.

Only in the shallow depressions which form small catchment basins has water been obtained from the underlying till. Small pockets of sand or sandy clay at these locations are found to be water-bearing. These occur at shallow depths and have been tapped in wells 16 to 35 feet deep. The water in these wells is obtained in part from the aquifers and in part as seepage from the surface reservoirs. On section 36, a well 194 feet deep tapped a bed of water-bearing gravel and derives a moderately large supply of water of good quality. No other wells in the locality have encountered a similar aquifer, and it is apparently only local in occurrence. Other deep wells extending to the base of the glacial drift failed to encounter any such aquifer. Future digging of wells in the glacial drift in the township should be confined to the small hollows or should be located close to dugouts or other surface reservoirs.

A more extensive water-bearing horizon, encountered in deep wells on sections 30 and 34, appears to be in the Bearpaw formation which underlies the entire township. The fine sand beds from which the water is obtained occur 225 to 250 feet, respectively, below the ground surface on the two sections. Similar beds of sand are known to occur in the Bearpaw formation in the area to the north-west, extending as far as South Saskatchewan river. They do not extend south and east, however, as evidenced by deep, dry holes on sections 5, 16, and 28, in this township, and by other deep, dry holes in the township immediately to the east. Deep wells drilled on sections 29 to 36 should encounter the water-producing sands. Large supplies of water were obtained from each of the wells. The water was only moderately hard and was of good quality for both household and stock use. It was found impossible, however, to keep the fine sand from flowing into the wells and choking off the flow of water, and as a result, none of the wells was in use in 1935. Good supplies of water could again be obtained if these wells were cleared of sand. Throughout the remainder of the township water does not appear to be obtainable from the Bearpaw formation, as no sand beds occur in the shales.

STATISTICAL SUMMARY OF WELL INFORMATION IN RURAL MUNICIPALITY OF MOOSE JAW, NO. 161, SASKATCHEWAN

West of 2nd mer. Township / Range	16 / 25	16 / 26	16 / 27	17 / 25	17 / 26	17 / 27	18 / 25	18 / 26	18 / 27	Total No. in Municipality
Total No. of Wells in Township	54	48	37	21	29	11	27	11	17	255
No. of wells in bedrock	20	6	0	1	7	0	2	2	7	45
No. of wells in glacial drift	33	35	36	20	16	10	25	9	10	194
No. of wells in alluvium	1	7	1	0	6	1	0	0	0	16
Permanency of Water Supply										
No. with permanent supply	20	35	35	12	15	9	14	6	10	156
No. with intermittent supply	1	0	0	2	1	0	0	0	2	6
No. dry holes	33	13	2	7	13	2	13	5	5	93
Types of Wells										
No. of flowing artesian wells	0	0	0	0	1	0	0	0	0	1
No. of non-flowing artesian wells	1	2	6	4	2	2	3	3	4	27
No. of non-artesian wells	20	33	29	10	13	7	11	3	8	134
Quality of Water										
No. with hard water	16	32	29	14	13	9	13	5	9	140
No. with soft water	5	3	6	0	3	0	1	1	3	22
No. with salty water	0	1	0	3	0	0	1	0	0	5
No. with "alkaline" water	7	18	13	3	6	9	3	2	2	63
Depths of Wells										
No. from 0 to 50 feet deep	7	25	22	11	19	8	16	3	7	118
No. from 51 to 100 feet deep	10	12	13	4	4	3	3	6	0	55
No. from 101 to 150 feet deep	14	7	2	1	0	0	1	0	1	26
No. from 151 to 200 feet deep	14	0	0	2	2	0	2	0	1	21
No. from 201 to 500 feet deep	9	3	0	2	1	0	5	2	6	28
No. from 501 to 1,000 feet deep	0	0	0	1	3	0	0	0	2	6
No. over 1,000 feet deep	0	1	0	0	0	0	0	0	0	1
How the Water is used										
No. usable for domestic purposes	16	26	29	10	14	7	13	3	12	130
No. not usable for domestic purposes	5	9	6	4	2	2	1	3	0	32
No. usable for stock	19	28	32	14	15	9	13	3	12	145
No. not usable for stock	2	7	3	0	1	0	1	3	0	17
Sufficiency of Water Supply										
No. sufficient for domestic needs	19	32	33	12	14	9	11	4	10	144
No. insufficient for domestic needs	2	3	2	2	2	0	3	2	2	18
No. sufficient for stock needs	16	29	31	10	9	8	9	3	10	125
No. insufficient for stock needs	5	6	4	4	7	1	5	3	2	37

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 those 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 differance between the total hardness and the permanent hardness and represents the amount of mineral salts that ban be removed by boiling. Temporary hardness is due mainly to the bicarbonates of calcium and magnesium and iron, and permanent hardness to the sulphates and chlorides of calcium and magnesium. The permanent hardness

can be partly eliminated by adding simple chemical softeners such as ammonia or sodium carbonate, or many prepared softeners. Water that contains a large amount of sodium carbonate and small amounts of calcium and magnesium salts is soft, but if the calcium and magnesium salts are present in large amounts the water is hard. Water that has a total hardness of 300 parts per million or more is usually classed as excessively hard. Many of the Saskatchewan water samples have a total hardness greatly in excesss 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 Moose,Jaw, No. 161, 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.	Alkalinity	CaO	MgO	SO_4	Na_2O	Solids	$CaCO_3$	$CaSO_4$	$MgCO_3$	$MgSO_4$	Na_2CO_3	Na_2SO_4	NaCl	$CaCl_2$	
1	NW.	10	16	26	2	40	1,500	600	320	280	49	470	140	86	566	409	1,355	251		180		5	838	81		* 1
2	NE.	11	16	26	2	117	980	160	80	80	29	415	40	18	369	448	1,020	72		38		316	546	48		* 1
3	SW.	33	16	26	2	3,418	6,280											(3)			(4)		(2)	(1)		* 2
4	SE.	1	16	27	2	35	940	500	360	140	47	265	170	65	403	176	900	265	53		194		310	78		* 1
5	SE.	1	17	25	2	185	1,360	850	700	150	14	595	30	140	426	405	1,204	54		293		204	630	23		* 1
6	SW.	1	17	25	2	250	2,580	1,800	1,200	600	40	785	20	252	1,103	821	2,390	36		527		129	1,632	66		* 1
7	SW.	33	17	25	2	288	2,100											(4)			(1)			(2)	(3)	* 1
8		6	18	25	2	28	2,120											(4)	(1)		(2)		(3)		(5)	* 1
9	NW.	36	18	26	2	15	1,940	1,800	1400	400	17	430	160	263	910	645	1,667	286		119	614		620	28		* 1
10	SW.	15	18	27	2	16	570											(3)	(1)		(2)				(4)	* 1
11	NW.	36	18	27	2	194	2,940	1,000	700	300	150	445	130	115	1525	1006	2,900	233		178	86		2,155	248		* 1

Water samples indicated thus, * 1, are from glacial drift or other unconsolidated deposits.
Water samples indicated thus, * 2, are from bedrock.
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, 7, 8, and 10, by Provincial Analyst, Regina.
For interpretation of this table read the section on Analyses and Quality of Water.

Water from the Unconsolidated Deposits

The quality of the water derived from the Recent stream deposits at any one place seems to depend largely upon the porosity of the sediments forming the aquifers. Sands and gravels allow water to circulate freely, and since they do not contain inherently large amounts of readily dissolvable mineral salts, the water is only moderately hard, and suitable for domestic use. Silts and clays, on the other hand, tend to prevent waters from circulating rapidly, and thus allow them ample opportunity to dissolve such mineral salts as may be present. These waters are appreciably "alkaline", and may be unsuitable for domestic use. The highly mineralized water found in porous beds in some localities has probably derived its dissolved salt content as it seeped through the boulder clay on the surrounding hill-sides, and through the finer materials in the Recent deposits before entering the sand or gravel beds. Evaporation causes concentration of dissolved salts in the surface and near surface waters, particularly on the flood-plains of the streams and in depressions. Water from the stream deposits lying below the city of Moose Jaw is particularly liable to contamination by sewage, and frequent examination of samples of the water for bacteria may be necessary to indicate any possible pollution. These bacteriological examinations are made by the Provincial Analyst.

Considerable variations in the character of the glacial deposits are also noted, often within very limited areas, and corresponding variations occur in the quality of the ground water obtainable from these sources. The boulder clay comprising the greater part of the drift is the main source of the mineral salts found in most of the waters occurring in the area. Water percolating down from the surface through the boulder clay dissolves quantities of mineral salts in amounts depending on the depth of percolation and the porosity of the clay. The less porous the clay, and the longer the waters are in contact with it, the greater is the opportunity

afforded for dissolving large quantities of mineral salts. Water collecting in sand or gravel beds at shallow depths usually has a low mineral content. However, if the overlying clay is highly charged with salts, as is often the case in undrained depressions, then the water will be correspondingly highly mineralized even at shallow depths. As the water percolates to greater depth the content of dissolved salts increases, and water from many of the deep wells in the boulder clay is unfit for drinking. The mineral salts found most commonly in solution in waters from the drift are, in the decreasing order of their relative abundance: sodium sulphate (Na_2SO_4), magnesium sulphate ($MgSO_4$), calcium sulphate ($CaSO_4$), calcium carbonate ($CaCO_3$), and varying amounts of magnesium carbonate ($MgCO_3$), sodium carbonate (Na_2CO_3), and sodium chloride ($NaCl$).

The variations in the quantity and proportion of the various mineral salts dissolved in the water from the glacial drift are well illustrated by the analyses given in the accompanying table. Sodium sulphate is shown to be predominant in seven of the ten samples analysed. Magnesium sulphate is present in considerable amounts in most of the samples, but calcium sulphate is not found to the degree common in most localities. Calcium carbonate is present in each sample. Sample No. 9 is the only one of those from the glacial drift that is reported to be unfit for drinking. This is probably not due to the dissolved mineral content of the water, but rather to the presence of decaying organic matter in it. Analyses Nos. 8 and 10 are of water from shallow wells in the glacial drift. The hardness-creating calcium and magnesium salts are predominant in these waters. Analyses Nos. 6 and 11 are of waters from deeper wells in the drift. These waters approach the limits of usefulness for domestic purposes, owing to the high content of sodium sulphate in solution. They would undoubtedly have laxative effects on persons unaccustomed to the use of highly mineralized water.

Analysis No. 7 is of water of entirely different character. The well from which this water was taken is 288 feet deep, and has

probably penetrated at least 70 feet into the shales of the Bearpaw formation. The water has dissolved considerable amounts of sodium chloride from the shales, and although it has a decidedly salty taste and laxative effect it is reported to be used for domestic purposes.

Water from the Bedrock

Water from the upper part of the Bearpaw formation is usually highly mineralized and similar in character to water derived as seepage from the boulder clay. Water seeping through the boulder clay dissolves mineral salts and carries them down to the top of the shales, where the salts become even more concentrated. The water obtained from the deep wells in township 17, range 26, contains considerable amounts of sulphate salts and is suitable only for stock. In the northwestern part of township 18, range 27, however, the water found in sand beds, which appear to be in the Bearpaw formation, is soft or only moderately hard and is not highly charged with sulphates. No analyses of water from this aquifer are available, but sodium carbonate is probably the predominant salt in the water. Sodium carbonate (black alkali) in water tends to have an injurious effect upon plants, and water from this aquifer may not be suitable for irrigation.

Analysis No. 3 is of water from the deep well penetrating bedrock formations below the Bearpaw shale at Moose Jaw. Of the mineral salts dissolved in the water, sodium chloride is in the greatest concentration. The water is unsuitable for domestic use or for stock. Sodium chloride is inherent to the shales making up several of the bedrock formations penetrated in this well, and is to be expected in large amounts in any water obtained at depth.

WELL RECORDS—Rural Municipality of MOOSE JAW, NO. 161, 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.	3	16	25	2	Drilled	136	1,880	-126	1,754	126	1,756	Glacial sand	Hard, "alkaline"	42	D, S	Insufficient supply; intermittent.
2		4	"	"	"		87	1,880	- 79	1,801	79	1,801	Glacial drift	Hard, "alkaline"		N	Unable to locate well.
3	NE.	5	"	"	"	Bored	86	1,870	- 81	1,789	81	1,789	Glacial gravel	Hard, "alkaline"	42	S	Sufficient supply; 150 barrels a day; hauls drinking water; dry holes.
4	NE.	8	"	"	"	Drilled	190	1,880					Glacial drift	Soft		D, S	Sufficient supply.
5	SW.	9	"	"	"	Bored	122	1,880	-120	1,760	120	1,760	Glacial drift	Soft, "alkaline"	42	D, S	Sufficient supply.
6	NW.	9	"	"	"	Bored	136	1,880	- 80	1,800	80	1,800	Glacial sand	Hard, "alkaline"	42	D, S	Plenty of water; 80 barrels a day.
7	SW.	13	"	"	"	Drilled	135	1,880	-127	1,753	127	1,753	Glacial gravel	Hard, iron	40	D, S, I	Good supply.
8		16	"	"	"	Drilled	296										Dry hole in Bearpaw; unknown in district.
9	NE.	16	"	"	"	Dug	18	1,860					Glacial drift	Hard, "alkaline"		D, S	Sufficient supply; also a seepage well. Three dry holes 160 feet deep in Bearpaw.
10		16/17	"	"	"	Dug	15	1,880					Glacial drift				No information available on this well.
11	SW.	17	"	"	"	Drilled	130	1,880	-117	1,763	117	1,763	Glacial gravel	Soft	42	D, S	Sufficient supply; two dry holes 130 feet in Bearpaw.
12	NW.	17	"	"	"												No information available about this well.
13	SE.	18	"	"	"	Drilled	133	1,880	-131	1,749	131	1,749	Glacial gravel	Soft	42	D, S, I	Sufficient supply.
14	NE.	20	"	"	"	Drilled	200	1,890									Several dry holes in Bearpaw.
15	NE.	21	"	"	"		110	1,880									Several dry holes in Bearpaw.
16	NW.	21	"	"	"		207										Several dry holes in Bearpaw.
17		24	"	"	"		70	1,890	- 55	1,835	55	1,835	Glacial drift				No information.
18		24	"	"	"		68	1,900									Dry hole in glacial drift.
19		24	"	"	"		57	1,890									Dry hole in glacial drift.
20	SE.	27	"	"	"	Drilled	163	1,930	-136	1,794	163	1,767	Glacial sand	Hard, "alkaline"	41	S	Sufficient supply; dry hole 138 feet deep in glacial drift.
21		28	"	"	"	Drilled	165	1,880	-160	1,720	160	1,720	Glacial gravel	Hard, iron		N	Sufficient supply.
22		28	"	"	"	Drilled	400	1,880									Dry holes 210 and 400 feet in Bearpaw.
23		28	"	"	"		300	1,880									Information not available.
24	NW.	28	"	"	"	Drilled	170	1,890					Glacial gravel	Hard, iron	42	S	Sufficient supply; also a spring for house use.
25		28	"	"	"		158	1,880									Dry hole; no information.
26	NE.	29	"	"	"	Drilled	150	1,880	-140	1,740	140	1,740	Glacial gravel	Hard, iron	42	S	Sufficient supply--10 tanks a day; laxative on humans.
27	SW.	30	"	"	"		85	1,880									Dry hole in glacial drift.

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 MOOSE JAW, NO. 161, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
28	SW.	30	16	25	2		85	1,880									Dry hole in glacial drift.
29	SE.	30	"	"	"		91	1,890									Dry hole in glacial drift.
30	SW.	30	"	"	"	Drilled	350	1,685									Four dry holes from 128 to 350 feet in Bearpas; dry holes at 80 feet in glacial drift.
31	NE.	33	"	"	"	Dug	7	1,800	- 5	1,795	5	1,795	Recent alluvium sand	Soft	43	D, S, M	Sufficient supply.
32	NE.	34	"	"	"	Drilled	200	1,925									Dry hole in glacial drift.
33	SW.	35	"	"	"	Drilled	215	1,930									Three similar dry holes in Bearpaw.
34	SW.	30	"	"	"		190	1,680	-170	1,710	174	1,706	Glacial sand and gravel	Hard			Sufficient supply.
1	SE.	2	16	26	2	Bored	90	1,849	- 82	1,767	82	1,767	Glacial gravel	Hard, iron, "alkaline"	42	D, S	Sufficient supply; hard on humans.
2	SE.	2	"	"	"	Dug	24	1,825	- 22	1,803	22	1,803	Recent alluvium quicksand	Hard, iron, "alkaline"		D, S	Sufficient supply.
3	NE.	4	"	"	"	Bored	50	1,844	- 25	1,819	50	1,794	Glacial drift	Hard, iron, cloudy	42	D, S	Sufficient supply.
4	NW.	4	"	"	"	Bored	80	1,890					Glacial gravel	Hard	42	D, S	Sufficient supply.
5	SW.	5	"	"	"	Dug	20	1,925	- 18	1,907	18	1,907	Glacial drift	Hard, iron, "alkaline"	42	D, S	Insufficient supply; also 50-foot well too "alkaline" for use.
6	NE.	6	"	"	"	Dug & Bored	26	1,925	- 17	1,908	17	1,908	Glacial drift	Hard, "alkaline"	42	D, S	Sufficient supply.
7	NE.	9	"	"	"	Bored	70	1,850	- 40	1,810	40	1,810	Glacial drift	Hard, "alkaline"	41	D, S	Sufficient supply; another well and springs.
8	NW.	10	"	"	"		40	1,810					Glacial drift	Hard, cloudy	42		Sufficient supply; #. Springs also used.
9	SW.	10	"	"	"	Bored	72	1,845					Glacial drift	Hard		S	Sufficient supply; several springs.
10	NE.	11	"	"	"	Bored	117	1,850	-107	1,743	107	1,743	Glacial quicksand	Soft, "alkaline"	42	D, S	Sufficient supply; #.
11	NW.	12	"	"	"	Bored	127	1,850	-107	1,743	107	1,743	Glacial quicksand	Soft, "alkaline"		N	Sufficient supply.
12	SE.	12	"	"	"	Bored	125	1,850	-105	1,745	105	1,745	Glacial quicksand	Hard, "alkaline"	42	D, S	Sufficient supply.
13	NE.	12	"	"	"		100	1,850									Dry hole; no information.
14	NW.	13	"	"	"	Bored	100	1,850									Dry hole in glacial drift.
15	SW.	14	"	"	"	Bored	50	1,850									Dry hole in glacial drift.
16	NW.	14	"	"	"	Bored	125	1,850	-123	1,727	123	1,727	Glacial drift	Hard, "alkaline"	43	D, S	Sufficient supply.
17	SW.	15	"	"	"	Bored	250	1,850									Dry hole in Bearpaw.
18	NW.	16	"	"	"	Dug	22	1,805	- 19	1,786	19	1,780	Recent alluvium	Hard	40	D, S	Insufficient supply.
19	NE.	17	"	"	"	Dug	18	1,800	- 15	1,785	15	1,785	Recent alluvium gravel	Hard, "alkaline"	42	D, S	Sufficient supply; several wells too "alkaline" for use.
20	SE.	18	"	"	"	Drilled	50	1,855	- 30	1,825	30	1,825	Glacial drift	Hard, "alkaline"	42	D, S	Steady supply.

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

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

WELL RECORDS—Rural Municipality of MOOSE JAW, NO. 161, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
21	NE.	18	16	26	2	Bored	63	1,865	- 52	1,813	52	1,813	Glacial sand	Hard, iron, "alkaline"	42	D, S	Sufficient supply; also a 60-foot dry hole.
22	NE.	20	"	"	"	Bored	90	1,850									Dry holes in glacial drift.
23	SE.	21	"	"	"	Bored	119	1,850	-108	1,742	108	1,742	Glacial drift	Hard, "alkaline"	42	D, S	Insufficient supply.
24	NE.	24	"	"	"	Bored	130	1,850									Dry hole in Bearpaw.
25	NE.	26	"	"	"	Bored	300										Dry holes 150 and 300 feet in Bearpaw.
26	NW.	28	"	"	"	Dug	15	1,790	- 12	1,778	12	1,778	Recent alluvium gravel	Soft	42	D	Sufficient supply.
27	SW.	33	"	"	"	Drilled	3,418	1,778					Entered Palaeozoic limestone	Salty, brown		M	Excellent supply; #. Used in swimming pool.
28	NW.	34	"	"	"	Dug	15	1,780	- 14	1,766	14	1,766	Recent alluvium gravel	Hard, "alkaline"		N	Insufficient supply; haul water.
29	NE.	34	"	"	"	Dug	25	1,780	- 23	1,757	23	1,757	Recent alluvium gravel	Hard	44	D, S	Insufficient supply.
30	SE.	36	"	"	"	Bored	100	1,850									Dry hole in glacial drift; also another hole 100 feet.
31		36	"	"	"	Drilled	247	1,805									Dry hole in Bearpaw.
32	NW.	36	"	"	"	Dug	15	1,775	- 11	1,764	11	1,764	Recent alluvium gravel	Hard	45	D, S	Sufficient supply.
1	NE.	1	16	27	2	Bored	40	1,925	- 34	1,891	34	1,891	Glacial gravel sand	Hard	42	D, S	Two springs supply sufficient water.
2	SE.	1	"	"	"	Dug	35	1,952	- 32	1,923	35	1,917	Glacial sand	Soft	44	D, S	Sufficient supply; #.
3	NW.	1	"	"	"	Dug	26	1,947	- 18	1,929	18	1,929	Glacial drift	Hard	42	S	Sufficient supply.
4	SE.	5	"	"	"	Dug	12	1,948	- 8	1,940	8	1,940	Glacial sand	Hard	42	D	Fair supply; another well also.
5	NW.	7	"	"	"		60	1,950	- 60	1,890	60	1,890	Glacial drift	Soft	50	S	Insufficient supply.
6	SW.	11	"	"	"	Dug	14	1,950	- 9	1,941	9	1,941	Glacial sand	Soft	42	D, S	Sufficient supply.
7	SE.	11	"	"	"	Bored	17	1,950	- 2	1,948	17	1,933	Glacial drift	Soft	40	D, S	Sufficient supply.
8	SW.	12	"	"	"	Dug	8	1,928	- 0	1,928	8	1,920	Glacial drift	Soft	40	D, S	Sufficient supply.
9	NW.	12	"	"	"	Bored	85	1,900	- 60	1,840	85	1,815	Glacial sand	Hard	42	D, S	Sufficient supply.
10	SE.	12	"	"	"	Bored	31	1,924	- 22	1,902	22	1,902	Glacial sand	Hard, iron, "alkaline"	42	D, S	Sufficient supply.
11	NE.	12	"	"	"	Bored	53	1,900	- 51	1,849	51	1,849	Glacial drift	Hard, iron, "alkaline"	42	D, S	Sufficient supply.
12	NE.	13	"	"	"	Bored	60	1,864	- 25	1,839	60	1,804	Glacial drift	Hard, "alkaline"	42	D, S	Sufficient supply.
13	NE.	15	"	"	"	Dug	60	1,864	- 50	1,814	50	1,814	Glacial sand	Hard, "alkaline"	42	D, S	Sufficient supply.
14	SW.	15	"	"	"	Dug	14	1,890	- 8	1,882	8	1,882	Glacial gravel	Hard	42	D, S	Sufficient supply.
15	SW.	15	"	"	"	Dug	11	1,890	- 5	1,885	5	1,885	Glacial gravel	Hard, "alkaline"	42	D, S	

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

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

WELL RECORDS—Rural Municipality of MOOSE JAW, NO. 161, 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	NW.	16	16	27	2	Bored	58	1,854	- 53	1,801	53	1,801	Glacial drift	Hard	44	D,S	Sufficient supply.
17	NE.	17	"	"	"	Bored	30	1,894	- 27	1,867	27	1,867	Glacial quick-sand	Hard	42	D, S	Sufficient supply.
18	SE.	18	"	"	"	Dug	25	1,939	- 18	1,921	18	1,921	Glacial gravel	Hard, iron	42	D, S	Sufficient supply.
19	NW.	18	"	"	"	Dug	22	1,900	- 15	1,885	15	1,885	Glacial drift	Hard		D, S	Insufficient supply.
20	NW.	19	"	"	"	Dug	11	1,929	- 7	1,922	7	1,922	Glacial sand	Hard		D, S	Sufficient supply; several dry holes up to 140 feet.
21	SE.	22	"	"	"	Bored	70	1,856	- 68	1,788	68	1,788	Glacial sand	Soft	42	D, S	Sufficient supply.
22	NE.	22	"	"	"	Dug	15	1,829	- 10	1,819	10	1,819	Recent alluvium sand	Hard, iron, "alkaline"	42	D, S	Sufficient supply; another well "alkaline" water, not used.
23	SW.	23	"	"	"	Bored	75	1,934	- 50	1,884	50	1,884	Glacial drift	Hard, sulphur, "alkaline"		D, S	Sufficient supply; too "alkaline" for humans.
24	NW.	23	"	"	"	Bored	65	1,884	- 62	1,822	62	1,822	Glacial sand	Hard, iron	42	S	Insufficient supply; haul water for house.
25	NE.	25	"	"	"	Bored	49	1,849	- 16	1,833	16	1,833	Glacial drift	Hard, "alkaline"	42	D, S	Sufficient supply; similar well not used.
26	NE.	26	"	"	"	Bored	60	1,839					Glacial drift		40	D, S	No information.
27	NW.	26	"	"	"	Dug	16	1,809	- 12	1,797	12	1,797	Glacial sand and gravel	Hard, "alkaline"	42	D, S	Sufficient supply.
28	NE.	28	"	"	"	Drilled	95	1,840	- 92	1,748	92	1,748	Glacial drift	Hard, "alkaline"	42	D, S	Sufficient supply.
29	NW.	28	"	"	"	Dug	60	1,829	- 30	1,799	60	1,769	Glacial sand	Hard, "alkaline"	42	D, S	Sufficient supply.
30	NW.	33	"	"	"	Dug	25	1,790	- 23	1,767	23	1,767	Glacial gravel and sand	Hard, "alkaline"	42	N	Poor supply; unfit for stock.
1	SE.	1	17	25	2	Drilled	185	1,880	-165	1,715	185	1,695	Glacial sand	Hard, iron	44	D, S	Sufficient supply; #.
2	SW.	1	"	"	"	Drilled	250	1,870	-170	1,700	178	1,692	Glacial quick-sand	Hard, iron		D, S	Large supply; #.
3	NE.	10	"	"	"								Glacial drift	Hard		D, S	Shallow seepage well; sufficient supply.
4	SW.	13	"	"	"								Glacial drift	Hard		D, S	Sufficient supply; seepage well.
5	SW.	14	"	"	"								Glacial drift	Hard		D, S	Sufficient supply; seepage well.
6	SW.	15	"	"	"	Bored	95	1,880	- 60	1,820	95	1,785	Glacial quick-sand	Hard, iron, salty		S	Sufficient supply; intermittent.
7	SE.	17	"	"	"	Bored	48	1,880	- 28	1,852	28	1,852	Glacial drift	Hard, "alkaline"	45	S	Insufficient supply; haul water for house.
8	NE.	17	"	"	"	Dug	55	1,890	- 40	1,850	40	1,850	Glacial gravel	Hard, "alkaline"	43	S	Sufficient supply; laxative; another 30-foot well for drinking water.
9	SW.	18	"	"	"	Dug	75	1,895	- 55	1,840	55	1,840	Glacial drift	Hard, iron, "alkaline", salty	45	S	Sufficient supply; 14 barrels a day.
10	SW.	21	"	"	"	Drilled	154	1,905									Dry hole in glacial drift; another 136-foot dry hole and a 20-foot well, small supply.
11	NE.	23	"	"	"	Dug	24	1,870	- 10	1,860			Glacial gravel	Hard, iron		S	Intermittent supply; shallow dry holes; haul drinking water.

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

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

WELL RECORDS—Rural Municipality of MOOSE JAW, NO. 161, 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
12	SW.	26	17	25	2	Dug	17	1,860	- 14	1,846	14	1,846	Glacial sand and gravel	Hard, iron	40	D, S	Sufficient supply; two 20-foot dry holes.
13	SW.	32	"	"	"	Drilled	65	1,910									Dry hole in glacial drift.
14	SW.	33	"	"	"	Drilled	288	1,905			210	1,695	Glacial sand	Hard, salty	46	D	Sufficient supply; #.
1	SE.	1	17	26	2	Dug	13	1,770	- 8	1,762	8	1,762	Recent alluvium sand	Soft	48	S	Sufficient supply; also another well 8 feet deep for stock; soft, iron-bearing, sufficient; also a dry hole.
2	SW.	1	"	"	"	Dug	8	1,775					Recent alluvium sand	Hard	46	S	Insufficient supply,
3	SW.	1	"	"	"	Dug	20	1,780	- 15	1,765	15	1,765	Recent alluvium fine gravel	Hard	45	D, I	Sufficient supply.
4	SE.	2	"	"	"	Dug	20	1,770	- 15	1,755	15	1,755	Recent alluvium sand and gravel	Soft	44	D	Sufficient for house use only.
5	NE.	2	"	"	"	Dug	8	1,875	- 0	1,875	8	1,867	Recent alluvium sand and gravel	Hard	40	S	Sufficient for 40 head stock; three dry holes.
6	SW.	3	"	"	"	Dug	20	1,780	- 18	1,762	18	1,762	Recent alluvium	Hard, "alkaline"			Insufficient supply.
7	SW.	5	"	"	"	Dug	15	1,856	- 12	1,844	12	1,844	Glacial drift	Hard, "alkaline"	44	S	Insufficient; 2 barrels a day.
8	SE.	6	"	"	"	Dug	17	1,856	- 10	1,846	10	1,846	Glacial drift	Hard, "alkaline"	45	D	Sufficient for domestic use only; several other wells.
9	NE.	7	"	"	"	Bored	100	1,860									Dry hole in glacial drift.
10	NE.	7	"	"	"	Bored	68	1,860									Several dry holes in glacial drift.
11	SE.	8	"	"	"		45	1,860					Glacial drift	Hard, sulphur		N	Intermittent supply.
12	SW.	12	"	"	"	Bored	60	1,860					Bearpaw	Hard, "alkaline"		S	Sufficient supply.
13	SW.	14	"	"	"	Bored	200	1,880	-160	1,720			Bearpaw	Hard, "alkaline"		S	Well used in winter; drinking water hauled.
14	SW.	15	"	"	"	Drilled	200	1,860	-140	1,720			Bearpaw	Hard, iron, "alkaline"	45	S	Sufficient supply; drinking water hauled.
15	E.½	17	"	"	"		400	1,875									Dry hole in Bearpaw.
16	SW.	23	"	"	"	Bored	100	1,890									Two dry holes in glacial drift.
17	SE.	31	"	"	"	Drilled	660	1,925									Dry hole in Bearpaw; also another hole 660 feet in Bearpaw.
18	NE.	34	"	"	"	Drilled	700										Dry hole 700 feet deep in Bearpaw.
1	SW.	2	17	27	2	Dug	13	1,860	- 11	1,849	11	1,849	Glacial quicksand	Hard, "alkaline"	44	D, S	Sufficient supply.
22	NE.	3	"	"	"	Dug	52	1,880	- 15	1,865	52	1,828	Glacial gravel	Hard, "alkaline"	46	S	Sufficient supply.
3	NE.	3	"	"	"	Dug	20	1,865	- 10	1,855	20	1,845	Glacial quicksand	Hard, "alkaline"	41	D, S	Sufficient supply.
4	N.½	4	"	"	"	Dug	15	1,850	- 10	1,840	10	1,840	Glacial quicksand	Hard, "alkaline"	44	D, S	Sufficient supply; two similar wells.
5	SE.	5	"	"	"	Dug	18	1,830					Glacial silt	Hard, "alkaline"	54	D, S	Insufficient supply.

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

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

WELL RECORDS—Rural Municipality of MOOSE JAW, NO. 161, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
6	SW.	5	17	27	2	Dug	10	1,800	- 6	1,794	6	1,794	Recent alluvium sand	Hard, "alkaline"	45	S	Sufficient supply.
7	NW.	5	"	"	"	Dug	20	1,820	- 14	1,806			Glacial quicksand	Hard, iron, "alkaline"	45	S	Sufficient supply.
8	SE.	8	"	"	"	Bored	80	1,850									Dry hole in glacial drift.
9	NW.	11	"	"	"	Drilled	64	1,940									Dry hole.
1	SW.	4	18	25	2	Dug	8	1,910	- 6	1,904	6	1,904	Glacial gravel	Soft		D, S	Sufficient supply.
2		6	"	"	"	Dug	28	1,915	- 18	1,897	18	1,897	Glacial sand and gravel	Hard		D, S	Sufficient supply; #.
3	NW.	7	"	"	"	Bored	110	1,910									Dry hole; a 20-foot well with "alkaline" water unfit for use.
4	SW.	8	"	"	"	Drilled	450	1,910									Dry hole in Bearpaw; several other dry holes 80 feet; a seepage well 30 feet.
5	SW.	11	"	"	"	Dug	14	1,905	- 13	1,892	13	1,892	Glacial sand and gravel	Hard		D	Insufficient supply.
6	SE.	15	"	"	"	Dug	12	1,900	- 7	1,893	7	1,893	Glacial sand	Hard	40	D, S	Sufficient supply.
7	SE.	16	"	"	"	Drilled	234	1,910	-213	1,697	234	1,676	Glacial gravel and sand	Hard, iron, salts	40	D, S	Sufficient for 35 head stock.
8	SW.	10	"	"	"	Drilled	248	1,910	-235	1,675			Glacial sand	Hard, iron, "alkaline"		D, S	Insufficient supply.
9	SW.	18	"	"	"	Bored	35	1,915	- 28	1,877	28	1,877	Glacial sand and gravel	Hard, iron	40	D, S	Insufficient supply.
10	SE.	19	"	"	"	Drilled	300	1,917									Dry hole; a 16-foot and 20-foot dry hole; a small seepage well.
11	SW.	21	"	"	"	Drilled	180	1,910									Dry hole in glacial drift.
12	SW.	21	"	"	"	Bored	32	1,910	- 12	1,898	32	1,878	Glacial gravel	Hard, iron	43	D, S	Insufficient supply; dry hole 200 feet.
13	SW.	22	"	"	"	Drilled	50	1,910									Dry hole in glacial drift; also another dry hole 85 feet.
14	SE.	25	"	"	"	Dug	25	1,880	- 20	1,860	20	1,860	Glacial sand	Hard, sulphur	44	D, S	Sufficient supply.
15	SE.	30	"	"	"	Drilled	210	1,920									Dry hole; two seepage wells 28 feet and 18 feet deep.
16	SW.	34	"	"	"		30	1,850									A dry hole 30 feet deep.
1	SW.	13	"	"	"	Drilled	96	1,925									Dry hole in glacial drift.
2		9/16	"	"	"	Drilled	253	1,940									Dry hole in Bearpaw.
3		21	"	"	"		80	1,940					Glacial drift	Hard		N	Small supply.
4	NW.	29	"	"	"	Bored	42	1,950	- 11	1,939	30	1,920	Glacial sand and gravel	Soft, "alkaline"	45	D, S	Sufficient for 30 head stock in winter.
5	NE.	32	"	"	"		350	1,950									Dry hole in Bearpaw.
6	NE.	33	"	"	"	Bored	56	1,940					Glacial drift	Hard, "alkaline"		N	Insufficient supply; too "alkaline" for use.

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

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

WELL RECORDS—Rural Municipality of MOOSE JAW, NO. 161, 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
7	SW.	36	18	26	2	Bored	84	1,925	- 57	1,868	83	1,842	Glacial sand	Hard	43	D, S	Insufficient supply; a 75-foot hole, no water; also a 54-foot dry hole.
8	NW.	36	"	"	"	Dug	15	1,925	- 11	1,914	15	1,910	Glacial gravel	Hard, iron	42	S	Sufficient supply for 35 head stock; #. Also a 50-foot well not used.
1	SE.	5	18	27	2	Drilled	900	1,925									Dry hole in Bearpaw.
2	SW.	15	"	"	"	Bored	35	1,935	- 15	1,920	15	1,920	Glacial sand	Hard, iron		D, S	Sufficient for 20 head stock.
3	SW.	15	"	"	"	Dug	16	1,935					Glacial drift	Medium hard		D	School well; #.
4	NE.	16	"	"	"	Drilled	600										Dry hole probably in Bearpaw.
5	SW.	20	"	"	"	Drilled							Glacial quick-sand				Casing collapsed; well not used.
6	SW.	28	"	"	"	Drilled	365	1,948									Dry hole in Bearpaw; two other dry holes.
7	SE.	29	"	"	"	Dug	16	1,945	- 12	1,933	12	1,933	Glacial sand	Hard, "alk-aline"	41	D, S	Sufficient for 20 head stock.
88	SW.	30	"	"	"	Drilled	252	1,960	-249	1,711	249	1,711	Glacial fine sand	Hard, "alk-aline"		D, S	Large supply.
9	NE.	30	"	"	"	Dug	16	1,950	- 7	1,943	7	1,943	Glacial drift	Soft	43	D, S	Large supply.
10	SW.	31	"	"	"	Dug	25	1,955	- 15	1,940	15	1,940	Glacial drift	Hard		D, S	Intermittent supply; house use only.
11	NE.	32	"	"	"	Dug	30	1,950					Glacial drift	Hard	44	D, S	Intermittent supply.
12	SW.	34	"	"	"	Drilled	330	1,950					Bearpaw	Soft			Large supply.
13	NW.	34	"	"	"	Drilled	360	1,950	- 90	1,860	235	1,715	Bearpaw sand	Hard		D, S	Strong supply.
14	NE.	34	"	"	"		350	1,950									Bearpaw; farm vacant; no information.
15	NE.	34	"	"	"		320	1,950					Bearpaw sand	Soft, "soda"			Very large supply.
16	NW.	36	"	"	"	Drilled	194	1,950	-174	1,776	174	1,776	Glacial gravel	Hard	43	D, S	Large 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.