CANADA

DEPARTMENT OF MINES

AND

TECHNICAL SURVEYS

GEOLOGICAL SURVEY OF CANADA

WATER SUPPLY PAPER No. 128

PRELIMINARY REPORT

GROUND-WATER RESOURCES OF THE RURAL MUNICIPALITY OF LAWTONIA NO. 135 SASKATCHEWAN

By

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

OTTAWA
1936

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CONTENTS

Illustrations

GROUND WATER RESOURCES OF THE RURAL MUNICIPALITY

SASKATCHEWAN

INTRODUCTION

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

Publication of Results

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

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

How to Use the Report

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

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

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

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

GLOSSARY OF TERMS USED

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

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

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

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

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

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

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

Continental Ice-sheet. The great ice-sheet that covered most of the surface of Canada many thousands of years 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 rests upon the Ravenscrag or older formations. The formation is 30 to 125 feet thick.

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

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

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

Bearpaw Formation. The Bearpaw consists mostly of incoherent dark grey to dark brownish grey, partly bentonitic shales, weathering light grey, or, in places where much iron is present, buff. Beds of sand occur in places in the lower part of the formation. It forms the uppermost bedrock formation over much of western and southwestern Saskatchewan and has a maximum thickness of 700 feet or somewhat more.

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

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

WATER-BEARING HORIZONS OF THE MUNICIPALITY

The rural municipality of Lawtonia comprises an area of 324 square miles in southwestern Saskatchewan. It consists of nine townships described as tps. 13, 14, and 15, ranges 7, 8, and 9, W. 3rd. mer. The centre of the municipality is about 33 miles east, and 7 miles south, of the city of Swift Current. The Gravelbourg branch of the Canadian National railways crosses the municipality from the northwest corner of township 14, range 9, to the southeast corner of township 13, range 7. The hamlet of Scottsburgh and the village of Hodgeville are located on this line. Dendron and Vogel are situated on the Codorre branch of the Canadian Pacific railway which crosses the municipality through the northern part of township 13, range 9, and the southern part of township 14, ranges 8 and 7. The southeastern part of the municipality is a gently rolling lowland plain with a surface elevation ranging from 2,300 to 2,350 feet above sea-level. A wide, flat-bottomed valley extends from the southeast corner of the municipality to the northwest corner of township 14, range 9. It varies in width from 2 miles or more at the southeastern part to slightly less than a mile at the point where it crosses the western border of the municipality. The gradient of the valley is low and only along the lower southeastern part is there any well-developed stream channel. On both sides of this valley the land surface rises rapidly to form irregularly rolling uplands, deeply dissected in many places by small ravines and coulées. These uplands reach elevations of 2,700 feet on some of the hill tops in township 15, range 9, but the greatest elevation of 2,850 feet is reached at the extreme southwest corner of the municipality. Wiwa creek, an intermittent stream, rises in the southern highlands in the municipality to the west and flows eastward through a narrow valley to enter the broad valley referred to above at a point approximately 5 miles northwest of Hodgeville. From thence it flows in a southeasterly direction to cross the eastern boundary of the municipality in sec. 13, tp. 13, range 7. A marshy area occurs in the northern part of township 14, range 7, and the southern part of township 15, range 7.

Wells in the municipality are deriving water from the unconsolidated Recent and glacial deposits and from the underlying bedrock formations. In many places these wells do not provide enough water for local requirements and dugouts have been constructed to conserve the spring run-off and thus increase the water supply available for stock. Wiwa creek also provides water for stock in the vicinity during the spring and early summer. Springs occur at several points in the rolling uplands. Some of these springs flow continuously and when dug out provide small but constant supplies of water.

WATER-BEARING HORIZONS IN THE UNCONSOLIDATED DEPOSITS

Recent alluvial deposits occur in a narrow zone bordering Wiwa creek, having been deposited during periods of flood. These deposits consist of fine silts, becoming more sandy towards the west. Coarser material carried by the waters from the uplands was laid down at the foot of the slopes in the southwest corner of township 14, range 8, where the waters spread out on reaching the lower gradient of the flat valley. Extensive beds of gravel are found in sections 5 and 6 of this township. These gravels serve as excellent reservoirs, and large supplies have been obtained by digging shallow wells into them. At other points along the broad valley water-bearing sand pockets are found embedded in the silts 10 to 15 feet below the surface. Where tapped they yield small supplies of hard but usually drinkable water. Aquifers should be found in the Recent deposits along the whole length of the creek at depths not greater than 20 feet. It is probable, however, that the sand deposits occur as discontinuous rather than continuous beds, but they should be readily located by sinking a few test holes with an auger. Shallow wells dug close to the creek in some places obtain water as direct seepage and provide water for a considerable time after the creek itself has ceased to flow.

As indicated on the accompanying map, Figure 1, three types of glacial deposits occur in this municipality. The types vary in their mode of deposition, character of the component sediments, and irregularity of their surface. Many thousands of years ago a great continental ice-sheet slowly advanced and retreated over the province of Saskatchewan. The ice carried with it masses of intermixed clay, sands, gravels, and boulders which it had derived from erosion of the bedrock over which it advanced, and deposited there as a layer of irregular thickness. These heterogeneous deposits are known as glacial drift. At places where the ice-front paused for any considerable period of time during its recession greater thicknesses of glacial drift were deposited. These accumulations are characterized by a much more irregularly rolling topography than the glacial till plains and are referred to as moraines. The presence of the ice tended to block much of the northeastward drainage, and large quantities of water, resulting from the melting of the ice, collected in the lowlands to form lakes in many parts of the country. Such a lake once covered the greater part of the eastern townships of this municipality and extended northwestward along the valley through township 14, ranges 8 and 9. The areal extent of this glacial lake is indicated by the occurrence of lake clay in the region once covered by the waters of the lake. Silts and fine sands were first deposited in the lake, and succeeding deposits of finer sediments built up a layer of glacial lake clay. The clay does not exceed 40 feet in thickness, and becomes thinner towards the margins of the old lake basin.

The fine-textured clay is a poor source of water, but the coarser material found between the lake clay and the underlying boulder clay is usually water-bearing, and most of the wells in the area of lake clay obtain water from sand beds at this contact. In a few places small supplies are being obtained from the clay. Wells tapping sand beds generally produce enough water for 10 to 30 or more head of stock. Water derived from the sand bed between the lake clay and boulder clay is usually of good quality. It is hard and although in a few places it contains appreciable amounts of sulphate salts in solution it can be used for drinking as well as for stock.

In a few places where an aquifer was not encountered at the contact of the lake clay and the boulder clay, wells have been dug deeper into the underlying 20 to 35 feet of boulder clay and have tapped water-bearing sand or gravel pockets. The supply available from such wells depends upon the porosity, areal extent, and thickness of the sand or gravel pocket encountered. Most of these wells yield enough water for 10 to 20 head of stock. The quality of the water varies considerably. Supplies from the larger porous beds are similar to those derived from the lake clay-boulder clay contact, but the water from sandy phases of the boulder clay is in many places too highly mineralized to be drinkable and may even cause scour in stock.

On a few farms in the lake clay-covered area the quantity of water obtained at the upper horizons was inadequate for local requirements. The residents on these sections have generally deepened their wells through the lake clay and the boulder clay to tap water-bearing sand and gravel beds at the contact of the boulder clay and the underlying dark grey shale of the bedrock. These wells vary in depth in different areas from 30 to 75 feet; the deeper wells being nearer the centre of the basin. Where thick, porous beds were encountered, supplies of water of fairly good quality were obtained. The water-bearing deposits are apparently not individually continuous over large areas, as in some places wells sunk to the drift-bedrock contact, in areas intervening between producing wells, failed to encounter water and passed into compact shale. At other places thin beds of sands were penetrated at the contact and a highly mineralized water, characteristic of many of the waters from the underlying bedrock, was obtained. Such supplies are undrinkable and may be too highly charged with dissolved mineral salts to be used for stock.

Very few wells have been sunk in the lake clay area that have failed to locate water at one or another of the several horizons, and at depths rarely exceeding 60 feet. The depth of drilling is limited by the sparingly productive, underlying Bearpaw bedrock formation. Criteria for recognizing this formation in drill holes and its water-bearing properties are given in a later section of this report.

Moraine is confined to the northeast corner of the municipality and to a long, narrow belt varying from 1 to 3 miles in width that extends from near the northeast corner of township 14, range 8, to cross the western part of the northern boundary of township 15, range 8. Glacial till borders the moraine on the southwest in the northeast corner and covers the six western townships except in Scottsburgh valley where it is in turn covered by lake clay. Both the moraine and till are composed essentially of bluish grey, compact boulder clay which in the upper 10 to 20 feet is weathered and has a light yellowish buff colour.

The available water supplies are found mainly in the glacial drift and only to a minor degree in the underlying bedrock. Little water is obtainable from this boulder clay itself except in the zone of weathering. Sand and gravel pockets are interspersed through the boulder clay of the till plain and moraine with little if any apparent uniformity as to their individual areal extent, their thickness, or the depths at which they occur. They appear to have a somewhat greater concentration in the zone of weathering and at or near the base of the drift than in the intervening beds.
The glacial drift varies greatly in thickness and from the data available it has not always been possible to determine the depth at which the wells reach the bedrock. At several localities in the extreme northwest corner the drift is entirely absent and the bedrock is exposed at the surface. In the steeper slopes of the hills

in this region it may not exceed 10 to 15 feet in thickness. Its thickness gradually increases but by no means uniformly toward the lowlands where it reaches 30 to 75 feet, in the central part of the municipality, and may be between 50 and 90 feet over the southern uplands.

The boulder clay comprising the greater part of the glacial drift is usually too impervious to yield more than very small seepages of water, but in a few places, particularly in depressions and at the bases of steep slopes in the moraine-covered areas, it may be more sandy and wells dug into it obtain sufficient water for local requirements. Sand and gravel pockets are not numerous in the glacial drift in this municipality, and in the southern townships appear to be almost entirely absent. They have been found more readily in the drift north of the valley. As these pockets are the main reservoirs of water in the glacial drift it is advisable to test carefully for them with an auger before digging wells. Sandy phases of the boulder clay appear to be also productive of water in some places. The supplies from most of the wells that have tapped porous water-bearing pockets or beds are sufficient for local requirements, but on many farms dams and dugouts are necessary to ensure an adequate supply for stock. The water obtained is variable in quality; from the greater number of the wells it is satisfactory for domestic use, but in a few places where the aquifers are thin or are covered by 20 feet or more of compact boulder clay, the water contains too high a content of dissolved mineral salts to be used for household purposes. The boulder clay is regarded as the source of these salts and hence even shallow wells sunk entirely in clay may yield an "alkaline" water.

A fairly continuous water-bearing horizon that appears to extend over the greater part of the municipality lies at the contact of the glacial drift and the underlying Bearpaw formation. The water collects here, owing to the impervious nature of the Bearpaw shales. In nearly every township wells are drawing water from this horizon, the depth to which varies greatly as will be discussed under the sections of the report dealing with the individual townships. Sulphate salts leached from the boulder clay become concentrated in the water in this zone with the result that in many places the water has a laxative effect on humans. In only a few wells, however, is the water unfit for stock use. Individual wells usually produce sufficient water for local stock requirements. Throughout the municipality both in the boulder clay and the lake clay-covered areas supplies of water should be obtainable from this horizon, but careful prospecting for water in the upper part of the drift should first be conducted as the water obtained from the shallow wells is usually of better quality.

Water-Bearing Horizons in the Bedrock

Three bedrock formations, known as the Cypress Hills, the Eastend, and the Bearpaw formations, immediately underlie the glacial drift in different parts of the municipality. Of these, the Bearpaw formation is the oldest, and it is covered by the other formations where they are present. The Eastend formation at one time probably covered the Bearpaw throughout the entire area, but erosion has removed the greater part of the Eastend, so that now it occurs only in the extreme southwestern uplands area. The Cypress Hills formation was deposited by stream action over an irregular land surface and hence occurs at different elevations in different areas. In the southwest corner it overlies the Eastend formation, but in the northwest corner it immediately overlies the Bearpaw formation. The areal distribution of these formations is shown on Figure 1 of the map accompanying this report.

The Cypress Hills formation consists of interbedded sands, loosely cemented conglomerate of pebbles and cobble stones, and sandy clays. These beds are believed to underlie the drift over the greater part of township 15, range 9, but they are thought to be thin, and may not be sufficiently extensive to form reservoirs for any large accumulations of water. Outcrops of the formation occur along the southern borders of sections 16 and 27. Of the wells in this township only one, located on section 35, is considered to be tapping an aquifer in the Cypress Hills formation. Other shallower wells recorded as being in the glacial drift may have penetrated the Cypress Hills formation. Wells sunk to the base of this formation in municipalities to the west have obtained large supplies of water of excellent quality. In areas where these sediments are known to exist they are worthy of prospecting even if they are not extensive, because of the soft, drinkable water to be expected from them.

No wells have penetrated the Cypress Hills formation where it occurs in township 13, range 9, but water-bearing horizons are believed to exist from the evidence of wells in adjoining townships.

The Eastend formation underlies the Cypress Hills formation in township 13, range 9, and as it occurs at a lower elevation it extends over a slightly greater area. The upper part of the formation consists of buff to yellowish green sands and silts and the lower part of fine sands and silts and grey shales. Wells sunk into the Eastend formation should find water. In the narrow belt in which the Eastend formation is overlain only by the glacial drift, water should be obtained in wells sunk to depths between 50 and 100 feet. On section 6 of this township a 100-foot well has penetrated the Cypress Hills formation and obtains water from the Eastend formation. The water obtained from this well is usable only for stock, but in most places the water from the Eastend formation should be drinkable.

The Bearpaw formation consists of at least 500 feet of compact, dark grey to black shales. The formation is known to be exposed at the surface at only two points in the municipality, namely the NW.$\frac{1}{4}$, sec. 24, tp. 13, range 9, and the NE.$\frac{1}{4}$, sec. 20, tp. 14, range 9. Although the shales are somewhat similar in appearance to the blue-grey clays of the glacial drift they are distinguishable in drilling by their darker colour and soapy feel, and by the small, roughly cubical, grey or buff to orange-coloured fragments into which they crumble unpon weathering. The shales contain practically no stones or pebbles as characterize the boulder clay. The upper part of the Bearpaw formation contains thin beds of fine, dark grey sand interbedded in the shales. These sands are sufficiently porous to be water bearing. Within this municipality the upper part of the formation is confined to the areas of highest relief. Throughout the lower land the upper porous sandy beds were eroded away before the deposition of the glacial drift and the uppermost beds present are compact shales characteristic of the middle part of the formation.

In the upland areas moderately large supplies of water have been obtained from the sand beds of the shales at depths ranging from 25 to 100 feet. In the lowlands, in the absence of porous beds, water percolating down from the surface is trapped in the weathered upper few feet of the shale.

All water from this formation contains salts in solution that are laxative, but some of the supplies derived from the sandy beds, although appreciably "alkaline", can be used for drinking. Water from the upper weathered zone of the shale is more highly mineralized and is used only for stock. At greater depths in the shale the dissolved mineral salt content becomes so high that the small seepages of water obtainable are unfit for any use.

The presence of the Bearpaw shale bedrock is the limiting factor in this area on the depth of wells that can be expected to yield water satisfactory even for watering stock. On the uplands it is probable that water in varying quantities will be found down to depths of 120 to 150 feet, but in the lowlands wells drilled or bored to depths exceeding 90 feet and in some areas beyond 60 feet will yield only small quantities of salty, bitter water.

At several widely scattered points within the municipality wells have been sunk to depths of 300, 400, and even 500 feet penetrating several hundred feet of the shale bedrock without encountering any water. Residents of the lowlands areas are strongly advised to confine prospecting for water to the glacial drift or to the contact of the drift and the bedrock.

GROUND WATER CONDITIONS BY TOWNSHIPS

Township 13, Range 7

The greater part of the water supplies in the township are obtained from wells sunk into the glacial drift. Wiwa creek crosses the centre of the township from west to east and provides water for stock during wet seasons. Dams and dugouts have been constructed on some farms to conserve surface water for stock use. Springs also occur at isolated points at the bases of valley slopes on both sides of the creek.

The Recent alluvial deposits forming a thin deposit along the channel of Wiwa creek probably consist almost entirely of fine silts. Only small seepages of water can be expected from this material. Wells dug close to the creek would probably obtain larger amounts of water even in dry seasons than wells more remote from the stream. Shallow wells located at the base of the valley slopes are expected to yield moderately large supplies of water of good quality.

Glacial lake clay forms the surface covering over all other parts of the township. The deposit of dark, compact clays is about 15 feet thick or less in the northwest corner of the township and increases in thickness towards the east and south. Little or no water is obtainable from the clays, but sand beds lying at or near the base of the lake clays serve as aquifers. These sand and gravel beds have been encountered at many points in the valley at depths not exceeding 30 feet, and some of these wells yield enough water for 25 to 40 head of stock as well as for domestic requirements. Remote from the valley the sand beds at the lake clay-boulder clay contact are scarce and residents have been obliged to sink deeper wells to tap sand or gravel pockets in the underlying boulder clay. On section 24 a sand aquifer was reached at a depth of 64 feet, but in the other wells in the township the aquifers lie 12 to 55 feet below the surface. The supplies from a few wells are adequate only for household needs, but as a rule individual wells produce enough water for 10 to 50 head of stock. Wells located near the creek, on sections 16 and 19, yield water of poor quality. The water from a 45-foot well, on section 7, is also highly mineralized. This well was dug 30 feet deeper after the gravel aquifer was encountered in order to provide a reservoir, and it is probable that small seepages of water from the lower levels contribute much of the undesirable mineral salts. In most places, however, the ground water obtained from this area is of good quality. The glacial drift in this township is more sandy, and hence is more productive of water than in many parts of the district, and additional water supplies should be readily obtained by digging more wells.

The Bearpaw formation underlies the whole township. From the well logs it is difficult to be certain of the exact thickness of the covering of drift throughout the township. A few wells appear to have penetrated the Bearpaw shales and wells on sections 5, [illegible], 15, 18, 24, and 30 are believed to have just reached the top of the bedrock. Part of the water in these wells probably is derived from the zone of contact of the drift and the bedrock. The 28-foot well on section 10 is considered to be drawing its water from the upper beds of the Bearpaw formation. In a well, 75 feet deep, on section 31 a good supply of water is derived from the bedrock. This water is hard and "alkaline", but it is being used for domestic purposes and for watering 30 head of stock. The few feet of weathered shales of the Bearpaw formation are evidently water-bearing, but this horizon cannot be considered as good a source of supply as the overlying, unconsolidated deposits. Hence wells should not be sunk more than a few feet below the contact of the glacial drift and the Bearpaw formation.

Township 13, Range 8

Wiwa creek crosses the northeastern corner of the township and provides seasonal supplies for watering stock in the vicinity. Many deep ravines and coulées occur on the sides of the southwestern uplands and provide excellent sites for small dams. Several such dams have already been constructed and provide large supplies of water for stock. Shallow seepage wells dug close to these surface reservoirs provide water for household use. The greater part of the water supply in the township is obtained from wells.

The silts that compose the Recent deposits bordering Wiwa creek are probably more sandy and porous than those found farther down stream in the next township. Layers of sand may occur at shallow depths interbedded in the silts. A shallow well has been sunk beside the stream channel in section 34, but it probably derives its water entirely as seepage from the creek. It is probable that at many places along the creek sand beds are sufficiently thick to retain water for considerable periods of time after the creek itself has ceased to flow. Recent accumulations of coarse sands and gravels have been washed down from the southwestern uplands into the valleys. Hence shallow wells located in the valleys or at the bases of the steeper slopes in several places yield large supplies of water of good quality. One 7-foot well located on the SW.$\frac{1}{4}$, section 10, has penetrated such a valley deposit and encounters water under sufficient head to flow at the surface. This well provides sufficient water for 200 head of stock.

Glacial lake clay covers most of the northeastern half of the township, as shown on the accompanying map, Figure 1. These clays are 10 to 25 feet thick and overlie the boulder clay. Small seepages of water are obtained from the clays in a few wells, but in most places the supplies are obtained from sand or gravel beds lying at or near the contact of the lake clays and the underlying boulder clay. These aquifers have been found in nearly every well sunk in the area at depths of 13 to 40 feet. Several wells less than 20 feet deep have encountered these sand and gravel beds in Wiwa Creek valley at distances as great as half a mile or more from the stream, indicating that the supply is not derived by seepage from the creek but rather by percolation of surface water from the higher land. Careful testing with augers in the valley and over the northeastern lowlands should locate other pockets or beds at the contact that would yield satisfactory supplies of hard, drinkable water. Wells tapping these beds on the lake clay-covered lowlands remote from the valley range in depth from 15 to 40 feet, and most of them yield sufficient water for household requirements and for 15 to 40 head of stock. Should the village of Hodgeville contemplate increasing its water supply careful prospecting at depths not exceeding 40 feet along the valley would undoubtedly yield better supplies of water than deeper drilling into the bedrock.

Glacial till covers the higher land occupying the southwestern half of the township to depths ranging irregularly from about 25 to 90 feet. The boulder clay is evidently only sparingly productive, as few wells in this part of the area have encountered sand or gravel pockets at shallow depths unless they have been located in valleys or at the bases of slopes. Wells sunk remote from these depressions, which tend to cause accumulation of ground water, must be extended to the contact of the drift with the underlying shales of the bedrock. Such wells have been sunk on sections 2, 9, 10, 15, 17, 18, and 19. The wells on sections 2 and 15 are only 26 feet deep, but the others on the higher land range in depth from 66 feet on section 9, to 96 feet on section 19. The yields obtained vary from place to place, but most individual wells yield sufficient water for 20 to 40 head of stock. The water is of poor quality compared with that from the valley or coulée deposits. It is hard and appreciably mineralized with dissolved sulphate salts, but is being used for household purposes.

Few wells have been sunk to the contact of the boulder clay and the bedrock in the lake clay-covered area. One well located on the SE.$\frac{1}{4}$, section 27, penetrated this horizon at approximately 50 feet below the surface, but the water obtained was not drinkable. The deep well at Hodgeville found water at what is believed to be this horizon at a depth of 80 feet, but here again the water was of very poor quality.

The shales of the Bearpaw formation underlie the drift throughout the entire township. They occur from 60 to 90 feet below the surface over both the uplands and the lake clay-covered areas. On the lower slopes of the hills the shales have been penetrated at depths less than 30 feet. Little water is to be expected from the shales and such small seepages that may be found will be undrinkable and may possibly have harmful effects upon stock. It seems advisable to discontinue the sinking of a well if no water has been obtained after the upper few feet of the shales have been penetrated. One well is reported to have been drilled to a depth of 800 feet in the village of Hodgeville, but no water was obtained below the contact of the drift and the bedrock at a depth of 80 feet from the surface.

Township 13, Range 9

Water supplies in this township are derived from Wiwa creek, from dams constructed in the creek and in the coulées, and from wells. A few springs have also been reported in the valleys, presumably deriving their water as seepage from the uplands.

Wiwa creek flows easterly through the northern sections of the township and has deposited in a narrow belt along its channel a covering of alluvium, consisting of clays, silts and fine sands. A water-bearing sand bed lying beneath a covering of sandy clay was tapped in the 14-foot well on section 35. The water from this well is of good quality and the supply is sufficient for the household and 8 head of stock. Similar supplies should be obtainable at most points along the creek valley. Wells dug close to the creek will obtain water as seepage from the creek.

Glacial till covers the surface over the remainder of the township. The thickness of the till varies from 20 to 60 feet. Owing to the similarity between the dark-coloured clays in the lower part of the glacial drift and the shales of the underlying Bearpaw formation it has been difficult to classify some of the wells. The glacial drift appears to be only sparingly productive of water in this township, as evidenced by the fact that a number of the wells have passed through it into bedrock before locating any water. Small seepages of water are obtained from sandy phases of the boulder clay in some places. Shallow wells in coulée bottoms or close to dams or dugouts provide good drinking water on some farms. In a few wells sand and gravel pockets have been tapped in the boulder clay at depths of 12 to 65 feet and enough water for 10 to 15 head of stock has been obtained. The water is hard and has a fairly high content of dissolved sulphates, but with the exception of the water from one well on section 30 is used for drinking. Water-bearing sand and gravel pockets in the drift, which are as yet untapped, doubtlessly occur in many places and it might be advisable to sink test holes to locate them. The contact of the boulder clay and the Bearpaw formation forms a water-bearing horizon that appears to be the source of water in a number of the wells. If a supply cannot be found in the upper part of the drift wells should be extended down to reach the top of the bedrock.

The Cypress Hills formation directly underlies the glacial drift in the southwestern part of the township. No wells have been sunk into the coarse sand and gravel beds of this formation, but water of good quality is to be expected in the lower beds of the formation at depths not exceeding 120 feet on the highest part of the area.

Throughout most of the area in which the Cypress Hills formation occurs water should be found in it by wells before the underlying Eastend formation is reached. On the SW.$\frac{1}{4}$, section 6, the Cypress Hills formation is apparently thin, and a 100-foot well has apparently penetrated a sand bed in the Eastend formation. Enough water for 70 head of stock is obtained from this well, but the dissolved mineral content is high and the water is not usable for the household. As the Eastend formation lies at a lower elevation than the Cypress Hills it extends over a slightly greater area, as shown on the map, Figure 1. In the narrow belt in which the Eastend immediately underlies the drift, moderately large supplies of water should be obtainable at depths not greatly exceeding 75 feet.

The Bearpaw formation underlies the Eastend formation where it is present and extends beneath the drift throughout the remainder of the township. Wells 24 to 90 feet deep scattered over the central part of the township have penetrated this bedrock. In some of these wells the water is found at the contact between the drift and the bedrock, whereas in others the upper few feet of the Bearpaw shales are found to be water-bearing. Isolated wells yield only enough water for a few head of stock, but the supply from most wells is ample for 15 to 20 or more head. As would be expected from the shales and from the thick covering of boulder clay, the water has a fairly high content of dissolved mineral salts. In a few of the wells the salts are sufficiently concentrated to make the water unfit for drinking, but only from a well on the SW.$\frac{1}{4}$, section 30, is the water reported to be unfit for stock use. In this township the upper part of the Bearpaw formation appears to be a fairly reliable source of water. Deep drilling into the shales is not advised. Despite the fact that water is generally obtainable from the contact beds or from the upper sandy part of the shales, residents located near valleys or coulées would derive a more dependable supply of water of better quality if they were to construct surface reservoirs.

Township 14, Range 7

Throughout the greater part of this township little difficulty has been experienced in obtaining adequate supplies of ground water for all farm requirements at depths not exceeding 60 feet from the surface. A few small dams have been constructed in coulees in the more rolling western parts where the available ground water supplies are small and of poor quality.

As shown on the map, Figure 1, glacial lake clay covers the greater part of the township. The clay is underlain by boulder clay. In the northeastern corner and along the west side of the township the lake clay is absent and the boulder clay is exposed as till plains. The lake clay ranges in thickness from about 20 to 30 feet. It is somewhat sandy in places and yields supplies of water sufficient for local requirements. In places where the clay is more impervious only very small quantities of water are obtained from it. More productive aquifers consisting of sand beds are encountered in most of the wells at or near the contact of the lake clay and the underlying boulder clay and have been found at depths ranging from 12 to 45 feet. In some places the sands apparently are absent and deeper wells have located water-bearing sand pockets in the boulder clay. Individual wells produce enough water for 10 to 20 or more head of stock. Most of the water is of good quality, but from four wells in the northeastern part of the township the water is too highly mineralized to be used for drinking. In three of these wells this condition may be attributed to the fact that sand aquifers are not present and the water is derived from the boulder clay. Sufficient water for local needs should be obtainable throughout the area of the lake clays, either from the contact of the clays and the boulder clay or from the contact of the boulder clay and the bedrock at depths not exceeding 60 feet. On those few farms where supplies are inadequate further testing in the drift would undoubtedly locate better water supplies.

Few wells have been dug in the areas covered by glacial till. Some of these wells have passed through the drift without finding water and have penetrated the Bearpaw formation. Wells on section 31, however, are deriving water from the drift. On the NE.$\frac{1}{4}$, enough water for household use and 15 head of stock is obtained from a sand bed in a 14-foot well, but on the NW.$\frac{1}{4}$ only enough water for 10 head is obtained from a 30-foot well and the water is too "alkaline" for drinking. The water in this well is derived as seepage from the boulder clay. Sand and gravel pockets no doubt occur at other points in the till, but owing to their sparse occurrence will be found only by careful testing. The bases of slopes and the bottoms of coulées may prove to be good locations for shallow wells. It is to be noted that wells on sections 18, 25, and 36 failed to find any water in the drift.

The compact shales of the Bearpaw formation act as a barrier to the downward percolation of water and in many places good supplies of water can be obtained from the zone of contact of the glacial drift and the bedrock. The water in the wells on sections 1, 15, 18, and 22 may be coming from this horizon. In other places the upper few feet of the shales have been rendered more permeable by weathering before the deposition of the drift and they form reservoirs for ground water accumulation. Wells on sections 18, 25, and 36 are drawing water from the upper part of the bedrock. The water is highly mineralized. From the wells on section 18 the water is usable only for stock, but from the other wells it is being used for drinking. The water from shallower wells in the drift is usually of better quality than that from the Bearpaw formation and it is advisable to test thoroughly in the drift before attempting to obtain water supplies by sinking deeper wells into the bedrock.

Township 14, Range 8

Water supplies sufficient for local requirements are obtainable in most parts of the township. The greater part of the supply is derived from wells, but where these do not provide enough water small dams and dugouts have been constructed to store surface water. Wiwa creek crossing through the southwestern part of the township also serves as a seasonal source of stock water.

Recent alluvium carried down by water from the higher land in the southwest has been deposited along the course of Wiwa creek. In sections 5 and 6 extensive gravel beds are found, and on the W.½, section 5, gravel pits have been opened by the railways. Down stream the Recent deposits are less extensive and consist of finer silts and sands. Shallow wells on section 6 are deriving good supplies of water from the gravels, and in the gravel pit on section 5 a shallow well produces a large supply of good water. Additional water should be readily obtained by digging shallow wells on these sections. There are records of wells having been dug in the Recent deposits where they occur on sections 3 and 4, but water supplies should be found in the sand beds at depths not exceeding 15 feet.

The areal distribution of the moraine, till, and lake clay forming the glacial deposits in this township is shown on Figure 1 of the map accompanying this report. The lake clay forms a thin covering over the southern sections 1 to 8; it is largely impervious and yields very little water. Wells on the SE.$\frac{1}{4}$, section 3, and the SE.$\frac{1}{4}$, section 5, are reported to be drawing supplies of water from the clay. It is probable that thin sand beds serve as aquifers in these wells. Sands and gravels similar to those found at this horizon in the townships to the east evidently occur sparingly or are absent, as wells on sections 1, 2, and 4 have passed through the lake clay and underlying till without encountering aquifers and have penetrated the underlying bedrock. There is a possibility, however, that at some points sands or gravels do occur in the boulder clay underlying the lake clays. The presence of these aquifers could be discovered only by testing. Except in the region in which the Recent deposits are found it appears that it will be necessary to sink wells to depths ranging from 50 to 100 feet in the area of lake clay before water can be expected, and supplies that have been found at these depths are of poor quality and usable only for stock.

The till and moraine covering the remainder of the township vary in thickness from 25 to 60 feet, increasing from north to south. The boulder clay in this region appears to be fairly sandy and porous and water supplies are being derived from it in a number of wells ranging in depth from 16 to 40 feet. Other wells have been dug deeper and have found water at the zone of contact between the boulder clay and the bedrock. The water from the boulder clay is hard and in some places is reported to be "alkaline", but from most of the wells the water is usable for household purposes. The dissolved mineral salt content of the water from some of the deeper wells is sufficiently high to make the water unfit for drinking, but suitable for watering stock. Water of good quality is obtained from the few sand and gravel pockets in the boulder clay wherever they have been penetrated. These pockets have been tapped at depths from 22 to 43 feet. Only a small pocket of sand was encountered in the 22-foot well on section 20 and consequently the supply of water obtained is small. More extensive aquifers have been tapped in other wells and have yielded supplies ample for 12 to 25 head of stock. Where the water obtained from deep wells is of poor quality shallow wells have been dug to supply drinking water. Some of these shallow wells are located close to surface reservoirs from which they derive most of their water by seepage. Water supplies appear to be available throughout the areas of till and moraine except in the northern row of sections where most of the wells have failed to locate water until the bedrock was penetrated. Sand and gravel pockets will no doubt be located as more wells are dug in the area. If water is not found in the drift itself, it should be sought at the contact of the drift and the bedrock, as this forms a fairly reliable horizon for water suitable at least for stock.

The Bearpaw formation underlies the whole of the township and has been penetrated by a number of wells, principally in the northern and southern sections. Much of the water in these wells is probably being derived from the contact of the glacial drift and the Bearpaw formation, but some of the water is undoubtedly obtained from the upper few feet of the Bearpaw shales. The wells in the northern sections yield enough water for 20 to 30 head of stock, but supplies from the wells farther south are smaller. The dissolved mineral salt content of the water is high, but it can be used for stock without harmful effects. Only from the wells on the NE.$\frac{1}{4}$, section 23, was the water reported to be unfit for stock. Water from a few of the wells is also used for drinking. On section 12, dry holes have been sunk into the bedrock. Several bedrock wells have also been dug on the NE.$\frac{1}{4}$, section 23, but each produced water only for one season. Hence it would appear that the bedrock is less productive of water in the central part of the township than in the northern and southern sections, and when prospecting for further supplies of ground water greater efforts should be made to locate aquifers in the drift.

Township 14, Range 9

A valley about a mile wide crosses the townships from the northwest to the southeast corners. On both sides of the valley the land rises to form rolling hills. The valley slopes have been dissected by numerous coulées. Most of the water in the township is derived from wells sunk into the glacial drift, but a few deeper wells are drawing water from the underlying bedrock. Dams and dugouts have been constructed on many farms to form surface reseroirs for stock water.

Glacial lake clay covers the valley bottom to depths varying from about 10 to 20 feet. The lake clay is fairly sandy in this area and sand and gravel beds are found interbedded with clay at depths ranging from 5 to 20 feet in the wells that have been dug in the valley. Most of the wells yield adequate supplies of hard, clear water for domestic requirements and for 10 to 30 head of stock. Only on the SE.$\frac{1}{4}$, section 14, has a well failed to find water at this horizon. The water from a 12-foot well on the NW.$\frac{1}{4}$, section 31, and from a 27-foot well on the NE.$\frac{1}{4}$, section 20, is of poor quality and is used only for stock. The water from the other wells is of better quality, and as a rule drinkable water is to be expected from these deposits. Areas in the valley adjacent to the outlets of the larger coulées should prove to be good well locations as sands and gravels washed down from the higher land are concentrated at these localities.

The glacial till covering the areas north and south of the valley varies in thickness from 40 to 50 or more feet. Sandy phases of the boulder clay have been found in a few wells and yield small supplies of water. In others water-bearing sand and gravel pockets have been tapped at depths of 10 to 50 feet. Each well yields enough water for 10 to 40 head of stock. The dissolved mineral salt content of the water is fairly high and the water is hard, but in all places it is usable for the households. As the gravel and sand pockets in the boulder clay appear to be quite numerous in this township additional supplies of water should be obtainable by digging or boring more wells, but before sinking is commenced it is advisable to locate an aquifer by means of a test auger. Depths of well should not exceed 50 feet. Many of the bottoms of the coulées prove to be good sites for shallow wells.

Water is also obtained from the Bearpaw formation, which underlies the drift throughout the township. Wells on sections 7 and 14 are 62 to 88 feet deep and derive water from the upper few feet of the Bearpaw shales. The water-bearing horizon may occur at the contact of the boulder clay and the bedrock. Each well produces sufficient water for 12 to 20 or even more head of stock. The water is highly mineralized, but only from the well on the SW.$\frac{1}{4}$, section 7, is it too "alkaline" for drinking. North of the valley on section 32, a 100-foot hole failed to find water in the Bearpaw. Supplies of water suitable at least for stock could doubtlessly be found in the upper few feet of the bedrock at other places, but it seems more advisable to prospect for water in the overlying glacial drift in which equal or better supplies can be obtained at shallower depths.

A 400-foot well has been reported to have been drilled on the SE.$\frac{1}{4}$, section 31. A good supply of soft water is obtained here from a sand bed presumably in the lower part of the Bearpaw formation. A few, similar, deep wells have obtained water from a deep aquifer in the Bearpaw in townships to the west and northwest, but the evidence from these few wells is not sufficiently conclusive to assume that a continuous water-bearing horizon exists through the intervening area. Moreover, on section 3, a hole was drilled 800 feet deep and although it reached an elevation 265 feet lower than the well on section 31 no water-bearing horizon was encountered. Further deep drilling in the township is not advised as sufficient water for local requirements should be available in the Recent and glacial deposits and by conserving the spring run-off.

Township 15, Range 7

On nearly every farm in this township wells provide sufficient water for local requirements. Shallow wells yield water of satisfactory quality for household use, but the aquifers at shallow depths are apparently of limited occurrence and the supply is not always large. It has been found necessary on some farms to sink wells to horizons at greater depths to ensure more adequate supplies for watering stock. The quality of the water from the deeper wells is generally poorer and may be unsuitable for domestic use.

Three types of glacial deposits, lake clay, till, and moraine, occur in different parts of the township, as shown on the accompanying map, Figure 1. The low, swampy lowland occupying most of the southwestern half of the township is covered by a deposit of glacial lake clay which probably does not exceed 10 to 15 feet in thickness. Most of the wells dug in this area have passed through the lake clay into the underlying boulder clay or even into the bedrock. The sand beds encountered at the base of the lake clay in wells in townships 13 and 14, range 7, evidently occur only very sparingly in this township. On sections 9 and 19 sand beds have been found at depths of 9 and 11 feet, and satisfactory water supplies have been obtained. Other wells have obtained supplies from pockets of sand in the underlying boulder clay at depths ranging from 31 to 50 feet. The logs of some wells show no definite aquifer, and it is probable that at these locations the clays are fairly sandy and porous or include only thin beds of water-bearing sands. The water obtained from the wells is found to have a high content of dissolved salts, which apparently have been concentrated in this low-lying area by water percolating through the boulder clay from the higher ground. As a result, the water from some wells can be used only for stock and the water from the 42-foot well on section 8 is not usable even for this purpose.. In a few places such as the NW.$\frac{1}{4}$, section 15, and the SW.$\frac{1}{4}$, section 16, porous beds were not found even in the boulder clay and still deeper boring was necessary.

Due to the limited occurrence of sand beds in the lake clay considerable testing would undoubtedly be necessary to find them. Residents will be obliged to sink wells to depths of 30 to 50 feet before an adequate supply is obtained in most places.

The till and moraine covering the remaining parts of the township consist largely of boulder clay. In the southwest corner of the township this covering over the bedrock is found to be approximately 40 feet thick, but in the northeast it ranges from 60 to 75 feet or more. The boulder clay here is sandy and is quite pervious to the passage of water, and wells are reported to be drawing from it supplies of water sufficient for 10 to 20 head of stock. A few wells tap gravel and sand pockets scattered irregularly through the boulder clay at depths ranging from 20 to 60 feet. The sand pockets are small and yield only small amounts of water, but the gravels tapped in wells on sections 14 and 33 yield sufficient water for 20 head of stock. In other places the boulder clay will be found to be largely impervious and it will yield only small seepages of water. If such conditions are found it would be advisable to sink several small holes with a test auger in order to locate a sand or gravel aquifer.

Owing to the similarity between the lower clays of the drift and the shales of the upper part of the Bearpaw formation it has been difficult to determine from many of the recorded well logs of the area, the drift-bedrock contact or the position of the producing aquifers. Some of the deeper wells in this township that have been recorded as drawing water from the drift may have penetrated the bedrock. On section 6 a number of holes have been sunk into the Bearpaw formation; but most of these were dry. On the SW.$\frac{1}{4}$ of this section a small seepage of highly mineralized water is obtained from a well 78 feet deep. On section 15 a number of dry holes were drilled into the bedrock, the deepest being 880 feet. However, on sections 10 and 15 water is obtained from two wells 85 and 76 feet deep. This water may be coming from the Bearpaw formation or it may occur at the contact of the drift and the shales. The water in these two wells has a high content of dissolved mineral salts, but it is being used for both household and stock. A 66-foot well on section 27 also appears to have penetrated the bedrock, but the supply obtained is unfit for farm use. Although satisfactory water supplies are obtainable in the Bearpaw formation at some points, drinkable supplies can not be expected in most places. Deep drilling into the bedrock is not advisable in any part of this township.

Township 15, Range 8

Glacial till and moraine cover the area to depths ranging from 30 feet, in section 14, to 75 feet or more throughout the remainder of the area. These deposits both consist essentially of boulder clay which varies somewhat in its composition from place to place. At some localities it is compact and almost impervious, but grades laterally into more sandy, porous clays. Gravel and sand pockets of varying extent are scattered through the boulder clay, but occur only sparingly in this township. The greater part of the water supply in the township is obtained from the glacial drift. A few dams have been constructed to collect surface water and supplement the supply from the wells.

A number of wells throughout the whole township are reported to be deriving water from the boulder clay. These wells range in depth from 12 to 85 feet. Many of the deeper wells have reached the top of the Bearpaw shales or have penetrated into it.

The few sand and gravel pockets that have been tapped were found 10 to 20 feet below the ground surface. The well on section 17, produces sufficient water from a gravel aquifer for 23 head of stock. Other wells, however, have tapped only small sand pockets and the supply of water available is very small. As sand and gravel pockets are so limited in their occurrence and are apparently non-existent in many parts of the township, extensive testing for such aquifers does not seem advisable, although they may be found in a few isolated places. If water is not found in the upper levels of the glacial drift wells should be sunk deeper to reach the contact between the drift and the bedrock.

The flowing artesian well on section 12 derives its water from sand at a depth of 24 feet. This well does not indicate an artesian basin of any large areal extent, but is merely a localized occurrence. No continuation of such an aquifer has been found in the wells dug on the surrounding sections.

The impervious shale tends to prevent the downward percolation of water, and so it collects at the contact of the boulder clay and the shale. It is from this horizon that the deeper wells obtain their water. In some wells the sulphate salts concentrated in the waters to make them unsuitable for drinking, but all supplies are usable for stock. Individual wells do not yield large supplies, but with few exceptions each produces sufficient water for 10 to 35 head of stock.

The Bearpaw formation underlying the glacial drift can not be considered as a source of water in this township. Water is confined to the top weathered zone of the formation and only very small seepages of highly mineralized water can be expected elsewhere from the shales. Deep drilling into the bedrock is not recommended owing to the great depths required to reach sand beds in the lower part of the Bearpaw formation, and to the uncertainty of water occurring in these beds.

Township 15, Range 9

The greater part of this township is a rolling upland area dissected by many coulées and narrow, sinuous valleys. The uplands vary in elevation from 2,600 to 2,700 feet above sea-level, but decrease to 2,550 or lower over a more level plain in the extreme southeast corner. The irregularity of the surface and corresponding variation in the thickness of the till that mantles the entire area make it questionable if any extensive water-bearing horizons exist. The drift was deposited over an irregular bedrock surface and hence the bedrock may be encountered within a few feet of the surface at one point and may lie at depths of 50 to 75 feet at points not far distant. Four general zones of ground water occurrence have been recognized. These are: Recent deposits of sands, silts, and gravels occurring in the bottoms of coulées and valleys; the upper 10 to 25 feet of the glacial till that covers the uplands; the contact of the till and the underlying bedrock; and in a few places, the bedrock itself.

Several shallow wells have been dug in the Recent deposits in the valleys and smaller depressions, and derive water supplies from sand beds embedded in the clays. Supplies are not large, but in most places are ample for local requirements. Such locations are favourable sites for wells owing to the large catchment basin provided by the surrounding hills, and to the capacity of the sand beds for storing water. Sand and gravel pockets have also been encountered in the boulder clay on the plains and slopes at depths ranging from 9 to 25 feet and occasionally deeper. These aquifers have been found at points widely distributed over the township, but they do not form any extensive water-bearing horizon. Deep wells show that no aquifers exist in the drift at some points. Owing to the variable thickness of the drift and to lack of information pertaining to the Cypress Hills formation in this area it is difficult in many places to distinguish between sand beds in the drift and in the bedrock. A 12-foot well sunk on section 28 derives only a small quantity of water from a sand aquifer, but other wells of a similar type produce ample water for 10 to 25 head of stock. In some places the water is soft and in others hard, but it is all of good quality. On those farms where satisfactory water supplies have not been obtained it is advisable to conduct further tests in the drift. Small holes should be sunk at several points with a test auger and sand or gravel aquifers will be found at many places at depths less than 25 feet. If water does not occur within this depth tests should be carried to depths of 40 to 50 feet unless the compact shales of the Bearpaw formation are encountered, in which case continued deepening of the well will not likely yield satisfactory water supplies.

On Figure 1 the Cypress Hills formation has been indicated as occurring immediately beneath the glacial drift throughout the greater part of the township. It is probable that the cemented sands and cobble-stones comprising this formation extended over the whole area at one time, but subsequent erosion has removed the greater part of the formation so that it is now more probably confined to limited areas on the tops and upper slopes of the hills. It has been observed outcropping at the surface in the SW.$\frac{1}{4}$, section 16, and in the NW.$\frac{1}{4}$, section 22. The 90-foot well on section 35 is the only well of those recorded in this township that is considered to be obtaining water from the Cypress Hills formation. Sand and gravel at the base of this well yield a small supply of water. Unlike water usually obtained from this formation the water from this well is hard and has a content of dissolved sulphate salts sufficiently high to make the water unfit for household use.

Water supplies should be obtainable from the Cypress Hills beds in the higher regions by digging wells to depths of 50 feet or more. Supplies will not be large, but should be sufficient at least for 10 or 15 head of stock. As the Cypress Hills formation is an uncertain source of water in this township it is advisable to prospect carefully for water in the valley deposits and in the drift before sinking deeper wells into the bedrock.

Throughout much of the township the Bearpaw formation directly underlies the drift. The shales of which this formation is largely composed are nearly impervious to water, so that much of the water slowly percolating downward through the overlying sediments is trapped at the surface of the bedrock. Hence the zone of contact of the glacial drift and the Bearpaw formation has been found to be a good water-bearing horizon. The water in the wells on sections 12, 13, and 14 appears to be derived from this horizon, and at least part of the water in the bedrock wells on sections 1, 22, 24, and 30 also comes from this source. In some places the shales are slightly more permeable owing to pre-glacial weathering and to the presence of thin sand beds, and there they contain small amounts of water. Some of the water in the last group of wells mentioned above is obtained from the upper few feet of the bedrock. The water at the contact has a high content of dissolved mineral salts, but is reported to be usable for domestic purposes. Individual wells derive enough water for 10 to 20 head of stock from this horizon. The water from the shales has a higher content of dissolved minerals and in two of the wells it is unfit for any farm use. The drift-bedrock contact is considered a good source of stock water, but wells should not be sunk into the shales. Deep drilling into the bedrock is useless, as indicated by the 600-foot dry hole on section 33. Water should be found at depths considerably less than 60 feet in most areas and drilling to depths greater than 100 feet in any part of the township is not advisable.

STATISTICAL SUMMARY OF WELL INFORMATION IN RURAL MUNICIPALITY OF LAWTONIA, NO. 135, SASKATCHEWAN

West of 3rd meridian	Township Range	13 7	13 8	13 9	14 7	14 8	14 9	15 7	15 8	15 9	Total No. in municipality
Total No. of Wells in Township		48	31	35	38	46	42	55	51	40	386
No. of wells in bedrock		2	5	16	6	15	7	17	0	13	81
No. of wells in glacial drift		45	25	18	32	26	35	38	51	27	297
No. of wells in alluvium		1	1	1	0	5	0	0	0	0	8
Permanency of Water Supply											
No. with permanent supply		47	31	33	38	43	38	44	46	35	355
No. with intermittent supply		1	0	0	0	1	0	5	2	3	12
No. dry holes		0	0	2	0	2	4	6	3	2	19
Types of Wells											
No. of flowing artesian wells		0	1	0	0	0	0	0	1	0	2
No. of non-flowing artesian wells		5	7	6	4	9	11	5	4	5	56
No. of non-artesian wells		43	23	27	34	35	27	44	43	33	309
Quality of Water											
No. with hard water		47	30	33	32	41	32	49	48	34	346
No. with soft water		1	1	0	6	3	6	0	0	4	21
No. with salty water		0	0	0	0	0	0	0	0	0	0
No. with "alkaline" water		12	19	14	13	19	14	23	25	13	152
Depths of Wells											
No. from 0 to 50 feet deep		44	19	15	32	27	33	23	41	32	266
No. from 51 to 100 feet deep		4	12	20	6	18	4	24	10	6	104
No. from 101 to 150 feet deep		0	0	0	0	1	2	6	0	1	10
No. from 151 to 200 feet deep		0	0	0	0	0	0	0	0	0	0
No. from 201 to 500 feet deep		0	0	0	0	0	1	1	0	0	2
No. from 501 to 1,000 feet deep		0	0	0	0	0	2	1	0	1	4
No. over 1,000 feet deep		0	0	0	0	0	0	0	0	0	0
How the Water is Used											
No. usable for domestic purposes		44	24	26	30	32	32	34	41	33	296
No. not usable for domestic purposes		4	7	7	8	12	6	15	7	5	71
No. usable for stock		46	30	30	37	41	38	45	48	34	349
No. not usable for stock		2	1	3	1	3	0	4	0	4	18
Sufficiency of Water Supply											
No. sufficient for domestic needs		46	31	33	36	44	38	45	46	32	351
No. insufficient for domestic needs		2	0	0	2	0	0	4	2	6	16
No. sufficient for stock needs		43	24	25	34	30	29	42	43	30	300
No. insufficient for stock needs		5	7	8	4	14	9	7	5	8	67

ANALYSES AND QUALITY OF WATER

General Statement

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

Total Dissolved Mineral Solids

The term "total dissolved mineral solids" as here used refers to the residue remaining when a sample of water is evaporated to dryness. It is generally considered that waters that have less than 1,000 parts per million of dissolved solids are suitable for ordinary uses, but in the Prairie Provinces this figure is often exceeded. Nearly all waters that contain more than 1,000 parts per million of total solids have a taste due to the dissolved mineral matter. Residents accustomed to the waters may use those that have much more than 1,000 parts per million of dissolved solids without any marked inconvenience, although most persons not used to highly mineralized water would find such waters highly objectionable.

Mineral Substances Present

Calcium and Magnesium

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

Sodium

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

Sulphates

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

Chloride<u>s</u>

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

Iron

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

Hardness

Calcium and magnesium salts impart hardness to water. Hardness of water is commonly recognized by its soap-destroying powers as shown by the difficulty of obtaining lather with soap. The total hardness of a water is the hardness of the water in its original state. Total hardness is divided into "permanent hardness" and "temporary hardness". Permanent hardness is the hardness of the water remaining after the sample has been boiled and it represents the amount of mineral salts that cannot be removed by boiling. Temporary hardness is the difference between the total hardness and the permanent hardness and represents the amount of mineral salts that can be removed by boiling. Temporary hardness is due mainly to the bicarbonates of calcium and magnesium and iron, and permanent hardness to the sulphates and chlorides of calcium and magnesium. The permanent hardness can be partly eliminated by adding simple chemical softeners such as ammonia or sodium carbonate, or many prepared softeners. Water that contains a large amount of sodium carbonate and small amounts of calcium and magnesium salts is soft, but if the calcium and magnesium salts are present in large amounts the water is hard. Water that has a total hardness of 300 parts per million or more is usually classed as excessively hard. Many of the Saskatchewan water samples have a total hardness greatly in excess of 300 parts per million; when the total hardness exceeded 3,000 parts per million no exact hardness determination was made. Also no determination for temporary hardness was made on waters having a total hardness less than 50 parts per million. As the determinations of the soap hardness in some cases were made after the samples had been stored for some time, the temporary hardness of some of the waters as they come from the wells probably is higher than that given in the table of analyses.

Analyses of Water Samples from the Municipality of Lawtonia, No. 135, Saskatchewan.

LOCATION						Depth of Well, Ft.	Total dis'vd solids	HARDNESS			CONSTITUENTS AS ANALYSED						CONSTITUENTS AS CALCULATED IN ASSUMED COMBINATIONS									Source of Water
No.	Qtr.	Sec.	Tp.	Rge.	Mer.			Total	Perm.	Temp.	Cl.	Alkalinity	CaO	MgO	SO_4	Na_2O	Solids	$CaCO_3$	$CaSO_4$	$MgCO_3$	$MgSO_4$	Na_2CO_3	Na_2SO_4	NaCl	$CaCl_2$	
1	NW.	3	13	7	3	[illegible]	420											(3)	(1)		(2)				([illegible])	x 1
2	SW.	24	13	7	3	64	400	280	180	100	7	275	70	40	41	63	335	125		84		53	61	12		x 1
3	NW.	30	13	7	3	28	600											(3)	(1)		(2)				(4)	x 1
4	SW.	31	13	7	3	15	1,400	850	800	50	72	70	140	137	303											x 1
5	SE.	24	13	8	3	17	710											(3)	(1)		(2)		(4)		(5)	x 1
6	NE.	33	13	8	3	15	900											(3)	(1)		(2)		(4)		(5)	x 1
7		17	13	9	3	63	2,510												(2)		(3)	(4)	(1)	(5)		x 2
8	SW.	30	13	9	3	58	13,040	3,000+	3,000+		630	465	650	1,706	7,630	2062	11,154	465	943		5,084		4,277		380	x 2
9	NW.	4	14	8	3	53	2,590												(2)		(3)	(4)	(1)	(5)		x 2
10	SE.	6	14	8	3	13	610												(2)		(4)	(3)	(1)	(5)		x 1
11	SE.	13	14	8	3	100	1,500	1,100	800	300	14	390	120	176	572	384	1,325	215		148	313		565	23		x 2
12	NE.	8	14	9	3	56	960	900	900		23	325	230	119	308	3	783	325	116		283			5		x 1
13	SW.	18	15	7	3	40	4,830												(2)		(3)	(4)	(1)	(5)		x 1
14	NW.	28	15	7	3	75	980	880	750	130	9	450	150	130	361	142	938	287		137	190		309	15		x 1
15	NE.	29	15	7	3	9	4,230												(2)		(3)	(4)	(1)	(5)		x 1
16	NE.	6	15	8	3	60	3,820	2,500	2,500		8	425	140	504	2325	837	3,614	251		146	1,293		911	13		x 2
17	NE.	12	15	8	3	24	1,850												(2)		(3)	(4)	(1)	(5)		x 1

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

Analyses Nos. 1, 3, 5, 6, 7, 9, 10, 13, 15, and 17, by Provincial Analyst, Regina.
For interpretation of this table read the section on Analyses and Quality of Water.

Water from the Unconsolidated Deposits

Several factors influence the character of waters derived from the Recent deposits bordering Wiwa creek. At places where the sediments are of coarse texture, i.e. composed largely of coarse sands and gravels, water readily circulates and little opportunity is afforded for the gradual concentration of mineral salts. In the finer sands and silts that predominate in these deposits in the broad valley in the vicinity of Hodgeville, water percolates slowly. In its passage from the bordering uplands it comes in contact with boulder clay, and from it dissolves mineral salts. After these waters enter the fine sediments, evaporation near the surface tends to concentrate the salts in solution. Analysis No. 10, given on the accompanying table of analyses, is of water derived from a 6-foot well sunk into the extensive gravel deposits occurring at the point where Wiwa creek joins the large valley that extends across the southern part of the municipality. This water contains only 610 parts per million of dissolved salts. Sodium and calcium salts are present in the largest amounts with lesser quantities of sodium carbonate, magnesium sulphate, and common salt. None of these salts is present in sufficient quantities, however, to have appreciable ill effects on persons drinking it, and if uncontaminated by surface pollution such as sewage and other decaying organic matter, the water is satisfactory for domestic use. Shallow wells in the valley in the vicinity of Hodgeville, however, encounter only fine sediments and the contained water is correspondingly more highly mineralized. One well located on the NW.$\frac{1}{4}$, sec. 19, tp. 13, range 7, yields water so highly charged with dissolved sulphate salts as to be unfit even for watering stock.

Considerable variations in the character of the glacial deposits occur, many within very short distances. This condition results in corresponding variations in the quality of the ground water obtainable from these sources. The boulder clay comprising the greater part of the drift is the source of the contaminating 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 better 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, should the overlying clay be highly charged with salts, the water will be correspondingly highly mineralized even at shallow depths. As the water percolates to greater depths the content of dissolved salts increases, and water from deep wells in the boulder clay is in many cases unfit for use. The mineral salts found most commonly in solution in waters from the drift in the decreasing order of their relative abundance are: sodium sulphate (Na_2SO_4), magnesium sulphate ($MgSO_4$), calcium sulphate ($CaSO_4$), calcium carbonate ($CaCO_3$), and varying amounts of magnesium carbonate ($MgCO_3$) and sodium chloride ($NaCl$). The calcium and magnesium salts contribute to the hardness of the water. Sodium sulphate and magnesium sulphate have laxative effects, and the concentration of these salts in solution as a rule determines the suitability of the water for domestic use or for stock.

Eleven analyses of waters from the glacial drift in this municipality are given in the accompanying table. Analyses 13, 15, and 17 represent the most common type of water from the drift. The sulphates of sodium, calcium, and magnesium are predominant among the salts present, but they are found in varying concentrations in the three samples as shown by the content of total dissolved solids. Analyses numbers 13 and 15 are of waters that are too highly mineralized to be used for drinking, but they are usable for stock. Analyses 1, 3, 5, and 6 are typical of water found in sand beds at shallow depths. These waters are hard, but are of good quality for domestic use. Sodium sulphate is absent, or present in only very small amounts. Calcium sulphate is predominant of the constituent salts, but imparts only hardness to the water. The calcium carbonate also contributes to the hardness. The magnesium sulphate is not sufficiently concentrated to have a laxative effect on humans. Analyses 2 and 12 show calcium carbonate as the main constituent of the dissolved solids. Sulphates are also present in these waters, but both are of good quality for drinking. The analysis shown as No. 14, in the table, is of water of good quality from the standpoint of the dissolved solids content, but since it is reported to be unfit for use, the water is possibly contaminated by decaying organic matter.

Water from wells penetrating sand or gravel beds at the base of the drift, and immediately overlying the shales of the Bearpaw formation, generally contains large amounts of sulphate salts in solution, and may be unsatisfactory for domestic use. It is presumable that much of the dissolved content is derived from the overlying boulder clay. The shales may, however, contribute some salts, particularly if wells have been extended into the shales so as to form a reservoir.

Water from the Bedrock

No samples were obtained of water from either the Cypress Hills or the Eastend formations. Little water is being derived from the Cypress Hills formation in this municipality, but in the municipality to the west where it covers a considerable area, a larger part of the supply is derived from this formation. The water is mostly soft or only moderately hard, and is of excellent quality for all farm uses. Water of good quality is to be expected from the formation in township 13, range 9, but in township 15, range 9, the water will probably be more highly mineralized. A well on section 35, in this township, yields water derived in part at least from Cypress Hills beds, that is too highly mineralized to be used for drinking.

Water from the Eastend formation will probably be quite highly mineralized. The one well on sec. 6, tp. 13, range 9, that taps the Eastend formation, produces water that is usable only for stock. Water of similar or possibly slightly better quality is to be expected at other points.

Water from the Bearpaw formation is highly mineralized and resembles in character the water obtained from the compact boulder clay. As the water in the bedrock seeped down from the surface through the boulder clay, it has dissolved mineral salts from it and these become concentrated in the upper beds of the Bearpaw formation. The amount of salts present in the water varies from place to place, and in a few wells in the municipality the water from this source is usable for household purposes, but cannot be regarded as being of particularly good quality. The concentration of salts in the water in other wells, particularly those sunk to greater depths into the shales, is higher and the water can be used only for stock. From a few wells the concentration of dissolved salts prohibits the use of the water for even this purpose. Analyses 7, 8, 9, 11, and 16, are of waters from the Bearpaw formation, the waters represented by Nos. 7, 9, and 16 contain sufficient dissolved sulphates to have a laxative effect on humans, but are usable for stock. Analysis No. 11 does not indicate that the salts contained in the water are in themselves in sufficient concentration to make the water undrinkable, but as this water is reported to be unfit for use it is possible that it is contaminated by organic matter.

Analysis No. 8 is of water derived from the compact shales of the Bearpaw and is of exceptionally poor quality, but is believed to be fairly representative of waters from the middle and lower parts of the Bearpaw formation. This water has one of the highest dissolved mineral salt contents of any well water analysed during this investigation of water conditions in the province. It contains 13,040 parts per million of total solids, made up largely of sodium and magnesium sulphate, with lesser amounts of calcium sulphate and calcium chloride. Such water is undrinkable and would have a decided scouring effect upon stock. Water with lesser concentrations of these salts in solution is reported to have killed stock in this region.

WELL RECORDS—Rural Municipality of BUC LATTONIA, NO. 135, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
1	SW.	1	13	7	3	Dug	35	2,325	- 29	2,296	29	2,296	Glacial drift	Hard, clear		D, S	Sufficient for 20 head stock.
2	SE.	2	"	"	"	Sand-point	19	2,300	- 16	2,284	16	2,284	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for house use; a 10-foot seepage well in sand supplies stock.
3	NW.	2	"	"	"	Dug	12	2,300	- 9	2,291	9	2,291	Glacial sand	Soft, clear		D, S	Sufficient for 17 head stock.
4	NW.	3	"	"	"	Dug	55	2,360	- 55	2,305	55	2,305	Glacial sand	Hard, odour, slight sediment, cloudy		D, S	Sufficient for 45 head stock; #.
5	NW.	5	"	"	"	Bored	45	2,350	- 15	2,335	15	2,335	Glacial drift	Hard, clear, "alkaline"		D, S	Sufficient for 10 head stock.
6	NW.	7	"	"	"	Bored	45	2,345	- 15	2,330	15	2,330	Glacial drift	Hard, clear, "alkaline"		N	Insufficient supply; water filtered for domestic use; dam for stock.
7	NE.	10	"	"	"	Dug	28	2,300	- 13	2,287	13	2,287	Bearpaw	Hard, clear, "alkaline"		S	Sufficient supply; laxative on humans; another well with a gravel aquifer.
8	SE.	10	"	"	"	Spring	0	2,320					Glacial drift	Hard			Probably sufficient supply.
9	SW.	10	"	"	"	Spring	0	2,300					Glacial drift	Hard		S	Good supply used all year.
10	NE.	14	"	"	"	Dug	16	2,316	- 12	2,304	12	2,304	Glacial sand	Hard, iron, clear		D, S	Sufficient for 14 head stock.
11	NE.	15	"	"	"	Dug	28	2,300	- 8	2,292	8	2,292	Glacial sand	Hard, clear		D, S	Intermittent supply; usually supplies 18 head stock.
12	NE.	16	"	"	"	Dug	16	2,290	- 12	2,278	12	2,278	Recent alluvium	Hard, clear, "alkaline"		S	Sufficient for 13 head stock; laxative.
13	NW.	18	"	"	"	Bored	90	2,300	- 14	2,286	14	2,286	Glacial sand and gravel	Hard, clear, "alkaline", sulphur odour		D	Sufficient supply; 2 dams.
14	SW.	18	"	"	"	Spring							Glacial drift	Hard		S	Sufficient for stock.
15	NE.	18	"	"	"	Spring							Glacial drift	Hard		S	Sufficient for stock.
16	NW.	19	"	"	"	Dug	16	2,280	- 12	2,268	12	2,268	Glacial drift	Hard, clear, "alkaline"		N	Insufficient supply; unfit for humans or stock.
17	NE.	19	"	"	"	Dug	12	2,280	- 10	2,270	10	2,270	Glacial gravel	Hard, clear, "alkaline"		D, S	Sufficient for 12 head stock.
18	NW.	20	"	"	"	Dug	20	2,326	- 17	2,309	17	2,309	Glacial drift	Hard, clear		D	Sufficient supply; a 30-foot well with sand aquifer waters 10 head stock.
19	NE.	21	"	"	"	Dug	16	2,350	- 5	2,345	16	2,334	Glacial sand	Hard, clear		D, S	Sufficient for 20 head stock.
20	SE.	22	"	"	"	Dug	20	2,325	- 14	2,311	14	2,311	Glacial gravel	Hard, clear		D, S	Sufficient for 27 head stock; a shallow seepage well near a dam.
21	NE.	22	"	"	"	Dug	16	2,340	- 13	2,327	13	2,327	Glacial quicksand	Hard, clear		D, S	Sufficient for 18 head stock.
22	SW.	23	"	"	"	Dug	20	2,330	- 15	2,315	15	2,315	Glacial sand	Hard, clear		D, S	Sufficient for 12 head stock.
23	NE.	23	"	"	"	Dug	30	2,365	- 27	2,338	27	2,338	Glacial sand	Hard, clear		D, S	Sufficient for 45 head stock.
24	SW.	24	"	"	"	Dug	64	2,355	- 44	2,311	64	2,291	Glacial blue sand	Hard, clear		D, S	Sufficient for 35 head stock; #.
25	SW.	25	"	"	"	Dug	20	2,360	- 14	2,346	20	2,340	Glacial quicksand	Hard, clear		D, S	Sufficient for 8 head stock.

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

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

WELL RECORDS—Rural Municipality of LATONIA, NO. 135, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
26	NW.	25	13	7	3	Dug	24	2,366	− 12	2,354	24	2,342	Glacial quicksand	Hard, clear		D, S	Sufficient for 12 head stock.
27	SW.	26	"	"	"	Dug	23	2,372	− 18	2,354	18	2,354	Glacial quicksand	Hard, clear		D, S	Sufficient for 12 head stock; 3 similar wells.
28	NW.	27	"	"	"	Dug	40	2,380	− 35	2,345	35	2,345	Glacial quicksand	Hard, clear		D, S	Sufficient for 28 head stock.
29	SE.	29	"	"	"	Dug	30	2,330	− 24	2,306	24	2,306	Glacial sand	Hard, clear		D, S	Sufficient supply.
30	SW.	30	"	"	"	Dug	9	2,280	− 3	2,277	3	2,277	Glacial drift	Hard, clear		D	Sufficient supply.
31	NW.	30	"	"	"	Bored	40	2,348	− 26	2,322	26	2,322	Glacial drift	Hard, clear		D, S	Sufficient supply; a 28-foot well with large supply in hard red clay; #.
32	SW.	31	"	"	"	Dug	15	2,350	− 11	2,339	11	2,339	Glacial sand	Hard, clear		D, S	Sufficient for 20 head stock; similar well; #.
33	NE.	31	"	"	"	Bored	75	2,350	− 40	2,310	75	2,275	Bearpaw sand	Hard, iron, slightly "alkaline," clear		D, S	Sufficient for 30 head stock.
34	NW.	32	"	"	"	Spring		2,330					Glacial drift	Hard, "alkaline"			Ample supply.
35	SW.	32	"	"	"	Dug	15	2,350	− 9	2,341	9	2,341	Glacial drift	Hard, clear		D, S	Sufficient supply.
36	NW.	35	"	"	"	Dug	28	2,365	− 18	2,347	18	2,347	Glacial drift	Hard, clear, iron		D, S	Sufficient for 15 head stock; a similar well.
37	NW.	36	"	"	"	Bored	42	2,370	− 32	2,338	32	2,338	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 10 head stock; a similar well also.
1	NW.	2	13	8	3	Dug	26	2,430	− 6	2,424	6	2,424	Glacial drift	Hard, clear, slightly "alkaline"		D, S	Sufficient for 10 head stock.
2	SW.	5	"	"	"	Bored	65	2,675	− 35	2,640	35	2,640	Glacial drift	Hard, clear		D, S	Sufficient for 15 head stock.
3	NE.	9	"	"	"	Bored	66	2,560	− 60	2,500	60	2,500	Glacial drift	Hard, clear, "alkaline"		D, S	Sufficient for 15 head stock; a dam also used.
4	SW.	10	"	"	"	Dug	7	2,545	+ 1	2,546	7	2,538	Recent sand	Hard, clear		D, S	Ample supply for 200 head stock.
5	NW.	10	"	"	"	Bored	57	2,475	− 12	2,463	12	2,463	Glacial drift	Hard, clear, slightly "alkaline"		D, S	Sufficient for 20 head stock.
6	NW.	14	"	"	"	Dug	16	2,380	− 4	2,376	4	2,376	Glacial drift	Hard, clear		D, S	Sufficient for 40 head stock.
7	NW.	15	"	"	"	Dug	14	2,430	− 7	2,423	7	2,423	Glacial drift	Hard, clear, "alkaline"			Sufficient for 20 head stock; laxative on humans.
8	SW.	15	"	"	"	Dug	26	2,455	− 20	2,435	20	2,435	Glacial drift	Hard, clear, "alkaline"		D, S	Sufficient for 12 head stock.
9	NE.	17	"	"	"	Bored	67	2,612	− 60	2,552	60	2,552	Bearpaw shale	Hard, clear, "alkaline"		D, S	Sufficient for 25 head stock; 2 dams used.
10	SW.	17	"	"	"	Bored	76	2,650	− 51	2,599	51	2,599	Glacial drift	Hard, clear, "alkaline"		D, S	Insufficient for 35 head stock; a 30-foot and a 14-foot well with small supplies of hard, very "alkaline" water.
11	SE.	18	"	"	"	Bored	70	2,650	− 50	2,600	50	2,600	Glacial drift	Hard, clear, "alkaline"		D, S	Sufficient for 20 head stock.
12	NE.	19	"	"	"	Bored	96	2,560	− 66	2,494	66	2,494	Glacial drift	Hard, clear, "alkaline"		D, S	Insufficient supply; a small dam for 30 head stock.
13	NW.	19	"	"	"	Bored	80	2,560	− 40	2,520	60	2,500	Glacial drift	Hard, clear, "alkaline"		D, S	Sufficient for 10 head stock.

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

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

WELL RECORDS—Rural Municipality of LAETONIA, NO. 135, 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	HEIGHT TO WHICH WATER WILL RISE Elev.	PRINCIPAL WATER-BEARING BED Depth	PRINCIPAL WATER-BEARING BED Elev.	PRINCIPAL WATER-BEARING BED Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
14	NW.	23	13	8	3	Dug	13	2,346	- 10	2,336	10	2,336	Glacial drift	Hard, clear, "alkaline"		D	Insufficient supply; waters 15 head stock at creek.
15	SE.	24	"	"	"	Dug	17	2,325	- 13	2,315	13	2,312	Glacial sand and gravel	Soft, clear		D, S	Sufficient for 15 head stock; #.
16	NE.	24	"	"	"	Bored	37	2,315	- 8	2,307	37	2,278	Glacial drift	Hard, clear		D, S	Sufficient for 15 head stock; a 48-foot well with water very strongly "alkaline".
17	SE.	25	"	"	"	Drilled	80	2,280			80	2,200	Bearpaw	Hard, clear, sand sediment		D	Well was drilled to 800 feet, but filled in to 80 feet; very poor quality; no further information.
18	SW.	25	"	"	"	Dug	14	2,300	- 9	2,291	9	2,291	Glacial gravel	Hard, clear		D	Insufficient supply; creek supplies 30 head stock.
19	SE.	27	"	"	"	Bored	55	2,340	- 15	2,325	55	2,285	Bearpaw	Hard, clear, "alkaline"		S	Sufficient for 25 head stock.
20	NW.	28	"	"	"	Bored	60	2,355	- 20	2,335	60	2,295	Bearpaw shale	Hard, clear, "alkaline"		N	Insufficient supply; a 15-foot seepage well for domestic use; a small dam for 15 head stock.
21	SW.	32	"	"	"	Bored	72	2,350	- 30	2,320	72	2,278	Bearpaw shale	Hard, clear		D, S	Sufficient for 15 head stock.
22	NE.	33	"	"	"	Dug	15	2,296	- 11	2,285	11	2,285	Glacial quicksand	Hard, clear, "alkaline"		S	Sufficient for 11 head stock.
23	NE.	33	"	"	"	Dug	15	2,296					Glacial quicksand	Hard [illegible] "alk[illegible]			No further information; #.
24	NE.	34	"	"	"	Bored	17	2,296	- 11	2,285	11	2,285	Glacial drift	Hard, clear, "alkaline"		D	Seepage supply form Wiwa creek.
25	SW.	35	"	"	"	Dug	16	2,325	- 12	2,313	12	2,313	Glacial sand and gravel	Hard, clear		D, S	Sufficient for 20 head stock.
26	SE.	36	"	"	"	Dug	24	2,340	- 21	2,319	21	2,319	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 20 head stock; a seepage well near slough.
1	SE.	1	13	9	3	Bored	57	2,740	- 55	2,685	55	2,685	Glacial sand	Hard, clear, "alkaline" slightly		D	Insufficient supply; a 20-foot seepage well supplies 12 head stock.
2	SW.	2	"	"	"	Dug	22	2,625	- 19	2,606	19	2,606	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 17 head stock.
3	SW.	6	"	"	"	Bored	100	2,840	- 80	2,760	80	2,760	Eastend?	Hard, clear, "alkaline"		N	Sufficient for 70 head stock.
4	NW.	7	"	"	"	Dug	24	2,680	- 14	2,666	14	2,666	Glacial drift	Hard, clear, "alkaline"		D, S	Insufficient supply; a 70-foot well in soapstone; small supply.
5	SE.	7	"	"	"	Bored	63	2,760	- 45	2,715	45	2,715	Glacial drift	Hard, clear, "alkaline"		D, S	Sufficient for 11 head stock, with small dams.
6	SW.	8	"	"	"	Dug	30	2,790	- 6	2,784	30	2,760	Glacial drift	Hard, clear, "alkaline"		D, S	Sufficient for 15 head stock.
7	NW.	8	"	"	"	Bored	60	2,710	- 40	2,670	55	2,655	Glacial drift	Hard, iron, clear, red sediment		D, S	Sufficient for 30 head stock; a 40-foot well supplies house; dam used.
8	NW.	10	"	"	"	Bored	90	2,780					Bearpaw	Hard, clear		D, S	Sufficient for 18 head stock.
9	NW.	11	"	"	"	Bored	800	2,690	- 76	2,614	76	2,614	Bearpaw soapstone	Hard, clear		D, S	Sufficient for 6 head stock.
10	NW.	12	"	"	"	Bored	52	2,750	- 45	2,705	45	2,705	Bedrock sand	Hard, clear, "alkaline"		D, S	Insufficient supply; waters 16 head stock; also use dugouts.
11	NW.	14	"	"	"	Spring							Glacial drift	Hard			Used all year for stock.
12	SE.	15	"	"	"	Bored	80	2,700	- 56	2,644	80	2,620	Bearpaw soapstone	Hard, clear, "alkaline"		N	

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 LAWTONIA, NO. 135, 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
13	NW.	15	13	9	3	Bored	90	2,690	- 74	2,616	74	2,616	Bearpaw shale	Hard, clear, "alkaline", slightly, iron		D, S	Sufficient for 25 head stock.
14	SW.	16	"	"	"	Bored	40	2,690	- 32	2,658	32	2,658	Glacial sand	Hard, clear		D, S	Sufficient for 30 head stock; a similar well.
15	NW.	16	"	"	"	Bored	990	2,680	- 70	2,610	70	2,610	Bearpaw soap-tone stone	Hard, clear, red sediment		D, S	Insufficient supply; 2 dry holes 90 to 95 feet; dugout and sloughs used also.
16		17	"	"	"		63	2,660	- 50	2,610			Bearpaw	Hard, cloudy, red sediment			#
17	SW.	19	"	"	"	Dug	40	2,550	- 34	2,516	34	2,516	Bearpaw?	Hard, clear, "alkaline"		S	Insufficient for 20 head stock; laxative; Small dam; 10 feet water for stock .
18	SW.	21	"	"	"	Bored	80	2,620	- 62	2,558	62	2,558	Bearpaw blue clay	Hard, clear, iron, slightly "alkaline"		D, S	Sufficient for 20 head stock.
19	SE.	22	"	"	"	Bored	75	2,650					Bearpaw soap-stone	Hard, clear, "alkaline"		N	Well in poor condition needs repairing; an 8-foot well for house; dam for stock.
20	SE.	23	"	"	"	Bored	70	2,630	- 50	2,580	50	2,580	Bearpaw	Hard, clear		D, S	Supplies 40 head stock; also dugout used.
21	NW.	24	"	"	"	Bored	65	2,570	- 40	2,530	65	2,505	Glacial gravel	Hard, clear		D, S	Sufficient for 25 head stock; spring also used.
22	NW.	25	"	"	"	Dug	12	2,400	- 6	2,394	6	2,394	Glacial sand	Hard, clear		D, S	Sufficient for 5 head stock.
23	SE.	30	"	"	"	Bored	65	2,500	- 53	2,447	65	2,435	Glacial sand	Hard, clear, iron, red sediment		S	Insufficient for 15 head stock; laxative; 2 seepage wells in coulee.
24	SW.	30	"	"	"	Bored	58	2,465	- 18	2,447	38	2,427	Bearpaw shale	Hard, clear, "alkaline", iron	44	N	Sufficient supply; unfit for humans or stock; #.
25	SE.	35	"	"	"	Dug	14	2,375	- 9	2,366	9	2,355	Recent alluvium quicksand	Hard, clear, iron		D, S	Sufficient for 8 head stock.
1	SW.	1	14	7	3	Bored	45	2,365	- 25	2,340	25	2,340	Glacial drift	Hard, clear		D, S	Sufficient for 17 head stock; a similar well.
2	SE.	2	"	"	"	Dug	24	2,360	- 20	2,340	20	2,340	Glacial drift	Hard, clear, iron		D, S	Insufficient supply; 2 similar wells; all wells supply 17 head stock.
3	NE.	5	"	"	"	Dug	30	2,370	- 26	2,344	26	2,344	Glacial sand	Soft, clear		D, S	Sufficient for 14 head stock.
4	NW.	9	"	"	"	Dug	40	2,370	- 38	2,332	38	2,332	Glacial sand	Hard, clear		D, S	Sufficient for 20 head stock.
5	NE.	9	"	"	"	Dug	40	2,370	- 38	2,332	38	2,332	Glacial sand	Hard, clear		D, S	Sufficient for 20 head stock.
6	SW.	10	"	"	"	Dug	25	2,360	- 21	2,339	21	2,339	Glacial quick-sand	Hard, clear		D, S	Sufficient for 10 head stock.
7	NW.	13	"	"	"	Dug	25	2,350	- 10	2,340	10	2,340	Glacial drift	Hard, "alkaline"		S	Sufficient for 25 head stock; laxative.
8	SE.	15	"	"	"	Bored	40	2,350	- 20	2,330	20	2,330	Bearpaw?	Hard, clear		D, S	Sufficient for 20 head stock.
9	NW.	16	"	"	"	Dug	12	2,370	- 7	2,363	7	2,363	Glacial sand	Soft, clear		D, S	Sufficient for 15 head stock.
10	SW.	18	"	"	"	Bored	98	2,440	- 32	2,408	82	2,358	Bearpaw soap-stone	Hard, iron, red sediment		S	Sufficient for 16 head stock; laxative.
11	NW.	18	"	"	"	Bored	78	2,444	- 50	2,394			Bearpaw?	Hard, clear, "alkaline"		D, S	Sufficient for 20 head stock; a 14-foot seepage well for house 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 LAKTONIA, NO. 135, 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	SE.	20	14	7	3	Dug	24	2,350	- 21	2,329	21	2,329	Glacial sand	Hard, clear		D, S	Sufficient for 5 head stock.
13	NE.	20	"	"	"	Bored	30	2,340	- 13	2,327	13	2,327	Glacial quick-sand	Soft, clear		D, S	Sufficient for 50 head stodk.
14	NW.	20	"	"	"	Bored	30	2,340	- 13	2,327	13	2,327	Glacial quick-sand	Soft, clear		D, S	Sufficient for 50 head stock.
15	SW.	21	"	"	"	Bored	41	2,360					Glacial quick-sand	Hard, clear		N	Insufficient supply; well filled with quick-sand; haul water for house and stock.
16	SE.	22	"	"	"	Bored	50	2,350	- 20	2,330	20	2,330	Bearpaw ?	Hard, clear, iron		D, S	Sufficient for 18 head stock.
17	NW.	23	"	"	"	Dug	20	2,350	- 18	2,332	18	2,332	Glacial sand	"Alkaline", hard, clear		S	Sufficient for 13 head stock.
18	NW.	23	"	"	"	Dug	20	2,350	- 18	2,332	18	2,332	Glacial sand	Hard, clear, "alkaline"		S	Sufficient for 13 head stock.
19	SE.	23	"	"	"	Dug	20	2,350	- 18	2,332	18	2,332	Glacial sand	Hard, clear, "alkaline"		S	Sufficient for 13 head stock.
20	NW.	24	"	"	"	Dug	30	2,350	- 15	2,335	15	2,335	Glacial drift	Hard, clear, "alkaline"		D, S	Sufficient for 7 head stock.
21	SE.	24	"	"	"	Dug	30	2,350	- 15	2,335	15	2,335	Glackal drift	Hard, clear, "alkaline"		D, S	Sufficient for 7 head stock.
22	SE.	25	"	"	"	Dug	50	2,370	- 30	2,340	55	2,315	Bearpaw shale	Hard, clear, "alkaline"		S	Sufficient for 25 head stock.
23	SE.	26	"	"	"	Dug	28	2,350	- 13	2,337	13	2,337	Glacial drift	Hard, dark colour, "alkaline"		S	Sufficient for 10 head stock; laxative.
24	NW.	26	"	"	"	Dug	48	2,350	- 18	2,332			Glacial drift	Hard, clear, "alkaline"		S	Sufficient for 20 head stock; laxative. Shallow seepage well 14 feet deep used for house.
25	NW.	27	"	"	"	Bored	45	2,340	- 25	2,315	25	2,315	Glacial quick-sand	Hard, clear		D, S	Sufficient for 15 head stock; a 30-foot well in quicksand; good water.
26	SE.	28	"	"	"	Dug	27	2,350	- 14	2,336	14	2,336	Glacial drift	Soft, clear		D, S	Sufficient for 10 head stock; a 60-foot well in black sand caved in.
27	NW.	31	"	"	"	Dug	30	2,412	- 25	2,387	25	2,387	Glacial drift	Hard, clear, "alkaline", iron		S	Insufficient for 10 head stock; a 10-foot seepage well with soft water for house use.
28	NE.	31	"	"	"	Dug	14	2,385	- 8	2,377	8	2,377	Glacial sand	Hard, clear		D, S	Sufficient for 15 head stock.
29	NW.	34	"	"	"	Bored	40	2,340	- 28	2,312	28	2,312	Glacial yellow clay	Hard, clear, "alkaline", red sediment, iron		S	Insufficient for 15 head stock; laxative on humans.
30	SW.	36	"	"	"	Dug	50	2,360	- 20	2,340	50	2,310	Bearpaw shale	Hard, clear, "alkaline"		D, S	Sufficient for 20 head stock.
1	SE.	1	14	8	3	Bored	80	2,382	- 72	2,310	72	2,310	Bearpaw shale	Hard, clear, "alkaline"		S	Sufficient supply; laxative on humans; small dugout for stock.
2	SE.	2	"	"	"	Bored	100	2,372	- 50	2,322	50	2,322	Bearpaw	Hard, clear, "alkaline"		D, S	
3	SE.	3	"	"	"	Dug	12	2,300	- 9	2,291	9	2,291	Glacial drift	Hard, cloudy, "alkaline"		S	Sufficient for 25 head stock.
4	NW.	4	"	"	"	Bored	53	2,310	- 35	2,275	35	2,275	Bearpaw blue clay	Hard, cloudy, "alkaline", iron, yellow		D, S	Sufficient supply; laxative; water has been condemned; #.

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

WELL RECORDS—Rural Municipality of LAUTONIA, NO. 135, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (—) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
5	SE.	5	14	8	3	Dug	20	2,300	- 10	2,290	10	2,290	Glacial drift	Soft, clear		N	Used in C.N.R. Boilers; seepage supply.
6	SW.	5	"	"	"	Bored		2,290					Recent alluvium	Hard			Large supply; C.N.R. gravel pit.
7	SE.	6	"	"	"	Dug	13	2,300	- 11	2,289	11	2,289	Recent alluvium; sand	Hard, clear		D	Sufficient for house use; an 18-foot well in Recent alluvium; hard water for stock;#.
8	NW.	6	"	"	"	Dug	12	2,310	- 10	2,300	10	2,300	Recent alluvium; gravel	Hard, clear, "alkaline"		D, S	Supplies 15 head stock; a 6-foot well in Recent alluvium quicksand; good supply.
9	NW.	10	"	"	"	Bored	43	2,405	- 20	2,385	43	2,362	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 20 head stock.
10	NE.	10	"	"	"	Bored	40	2,405	- 30	2,375	30	2,375	Glacial drift	Hard, clear, "alkaline"		D, S	Sufficient for 20 head stock; small dam.
11	NW.	12	"	"	"	Dug	16	2,420	- 4	2,416	4	2,416	Glacial drift	Hard, clear, "alkaline"		D, S	Usually sufficient; seepage from dam; two dry holes 80 and 100 feet in Bearpaw.
12	SE.	13	"	"	"	Bored	100	2,440	- 50	2,390	100	2,340	Bearpaw shale	Hard, iron, clear		S	Sufficient for 20 head stock; unfit for any use; laxative; #.
13	NE.	14	"	"	"	Bored	63	2,465	- 33	2,432	60	2,405	Glacial drift	Hard, iron, "alkaline", clear		S	Sufficient for 8 head stock; laxative.
14	SE.	15	"	"	"	Bored	36	2,400	- 27	2,373	27	2,373	Glacial drift	Hard, clear		D, S	Sufficient for 12 head stock.
15	SE.	16	"	"	"	Dug	30	2,400	- 15	2,385	15	2,385	Glacial drift	Hard, clear, "alkaline"		D, S	Sufficient for 14 head stock.
16	NE.	16	"	"	"	Dug	28	2,480	- 8	2,472	28	2,452	Glacial sand	Hard, clear		D, S	Sufficient for 12 head stock; a 20-foot well with small supply.
17	SE.	18	"	"	"	Bored	60	2,425	- 30	2,395	30	2,395	Glacial sand	Soft, clear		D, S	Ample supply for 20 head stock; neighbours haul from here in dry years.
18	NE.	20	"	"	"	Dug	22	2,484	- 20	2,464	20	2,464	Glacial sand	Hard, clear		D, S	Insufficient supply for 6 head stock; a 90-foot seepage well.
19	SE.	22	"	"	"	Dug	35	2,510	- 17	2,493	35	2,475	Glacial drift	Hard, clear		D, S	Ample supply; 84 barrels a day.
20	SW.	23	"	"	"	Bored	58	2,520	- 31	2,489	40	2,480	Glacial drift	Hard, clear		D, S	Sufficient for 15 head stock.
21	NE.	23	"	"	"	Bored	80	2,500	- 40	2,460	40	2,460	Bearpaw	Hard, clear, "alkaline"	45	N	Insufficient supply; water killed several head stock; three 30-foot seepage wells with small supply of good water for house use
22	SE.	24	"	"	"	Bored	90	2,470	- 30	2,440			Glacial drift	Hard, iron, "alkaline", clear		S	Sufficient supply; laxative on humans; a dam used for stock.
23	SE.	25	"	"	"	Bored	105	2,470	- 65	2,405	105	2,365	Glacial drift	Hard, clear, "alkaline", iron		S	Insufficient for 15 head stock; a 55-foot well waters 5 head stock; a 35-foot well used for house.
24	NE.	26	"	"	"	Dug	22	2,527	- 17	2,510	17	2,510	Glacial gravel	Hard, clear		D, S	Sufficient for 25 head stock; good water.
25	SW.	27	"	"	"	Bored	60	2,535	- 30	2,505			Bearpaw	Hard, "alkaline"		S	Sufficient for 30 head stock; laxative; a 15-foot seepage well; dam also used.
26	NE.	28	"	"	"	Dug	25	2,545	- 22	2,523	22	2,523	Glacial drift	Hard, clear, "alkaline"		S	Sufficient for 8 head stock; laxative.
27	NE.	31	"	"	"	Bored	60	2,560	- 48	2,512	48	2,512	Bearpaw shale	Hard, iron, clear		S	Sufficient for 20 head stock.
28	NW.	32	"	"	"	Bored	50	2,580	- 45	2,535	45	2,535	Bearpaw blue clay	Hard, iron, "alkaline", clear		D, S	Sufficient for 20 head stock.
29	NW.	33	"	"	"	Bored	30	2,600	- 26	2,574	26	2,574	Glacial drift	Soft, clear		D, S	Insufficient for 14 head stock; good water.

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of LAKTONIA, NO. 135, 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
30	SE.	33	14	8	3	Dug	8	2,550					Glacial sand	Hard,			
31	SW.	34	"	"	"	Dug	23	2,580	- 19	2,561	19	2,561	Bearpaw soap-stone	Hard, clear, slightly "alkaline"		D, S	Sufficient for 13 head stock.
32	NW.	35	"	"	"	Bored	770	2,560						Hard, clear, slightly "alkaline"		D, S	Sufficient for 20 head stock.
33	SE.	35	"	"	"	Bored	60	2,540	- 40	2,500	40	2,500	Bearpaw clay	Hard, clear, "alkaline", iron		S	Sufficient for 16 head stock; a 30-foot well in Bearpaw.
1	SW.	2	14	9	3	Dug	18	2,415	- 7	2,408	7	2,408	Glacial drift	Hard, clear		D	Insufficient supply for 10 head stock; dam used for stock also.
2	NW.	3	"	"	"	Drilled	800	2,485									Dry holes in Bearpaw formation.
3	NE.	5	"	"	"	Dug	14	2,580	- 6	2,574	6	2,574	Glacial sand	Hard, clear		D	Sufficient for 11 head stock; dam waters 8 head stock.
4	NE.	6	"	"	"	Bored	50	2,595	- 34	2,561	34	2,561	Glacial gravel	Hard, clear, "alkaline"		D, S	Sufficient for 13 head stock.
5	SE.	7	"	"	"	Bored	88	2,625	- 40	2,585	88	2,537	Bearpaw shale	Hard, clear, "alkaline"		D, S	Sufficient for 20 head stock.
6	SW.	7	"	"	"	Bored	64	2,650	- 50	2,600	50	2,600	Bearpaw shale	Hard, clear, "alkaline", red sediment, iron		S	Insufficient for 12 head stock; dugout also used for stock.
7	NE.	8	"	"	"	Bored	56	2,580	- 28	2,552	28	2,552	Glacial drift	Hard, slightly "alkaline"		D, S	Sufficient for 32 head stock; dam in pasture for cattle; #.
8	NW.	9	"	"	"	Bored	28	2,590	- 25	2,565	25	2,565	Glacial quick-sand	Hard, clear		D, S	Sufficient for 10 head stock.
9	SE.	9	"	"	"	Bored	41	2,515	- 20	2,495	36	2,479	Glacial sand	Hard, clear		D, S	Sufficient for 25 head stock; a similar well in quicksand—"alkaline" water.
10	SW.	10	"	"	"	Dug	28	2,530	- 25	2,505	25	2,505	Glacial quick-sand	Hard, clear, slightly "alkaline"		D, S	Sufficient for 25 head stock.
11	NW.	13	"	"	"	Dug	11	2,330	- 3	2,327	3	2,327	Glacial sand	Soft, clear		D, S	Sufficient for 6 head stock; a similar well.
12	SE.	14	"	"	"	Drilled	62	2,315	- 4	2,311			Bearpaw	Hard		S	Sufficient for stock in stock yards.
13	NE.	20	"	"	"	Dug	27	2,400	- 23	2,377	23	2,377	Glacial gravel	Hard, "alkaline"		S	Sufficient for 22 head stock; laxative; similar well in coulée 16 feet deep.
14	NW.	22	"	"	"	Dug	17	2,340	- 14	2,326	14	2,326	Glacial sand and gravel	Hard, clear		D, S	Sufficient for 15 head stock.
15	SE.	27	"	"	"	Dug	22	2,450	- 20	2,430	20	2,430	Glacial drift	Hard, clear		D, S	Sufficient supply; another well not used; aquifer in quicksand.
16	NW.	28	"	"	"	Dug	20	2,360	- 17	2,343	17	2,343	Glacial gravel	Hard, clear		D, S	Sufficient for 12 head stock.
17	SE.	29	"	"	"	Bored	30	2,400	- 26	2,374	26	2,374	Glacial drift	Hard, clear		D, S	Sufficient for 30 head stock.
18	SE.	30	"	"	"	Bored	30	2,400	- 6	2,394	6	2,394	Glacial sand	Soft, clear		D, S	Sufficient for 25 head stock.
19	NW.	31	"	"	"	Dug	12	2,360	- 10	2,350	10	2,350	Glacial sand	Hard, clear, "alkaline"		S	Insufficient for 20 head stock; 3 similar wells on this quarter; laxative on humans.

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of LAWTONIA, NO. 135, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
20	SE.	31	14	9	3	Drilled	400	2,350					Bearpaw	Soft, brown			Good supply.
21	NE.	32	"	"	"	Dug	20	2,460	- 8	2,452	8	2,452	Glacial drift	Hard, clear		D, S	Insufficient supply; 2 dry holes 108 and 100 feet deep in Bearpaw soapstone.
22	NW.	33	"	"	"	Bored	28	2,510	- 22	2,488	22	2,488	Glacial drift	Soft, clear		D	Sufficient for domestic use; dam for stock.
23	NE.	33	"	"	~~"~~	~~Dug~~	~~14~~	~~2,500~~	~~- 4~~	~~2,496~~	~~14~~	~~[illegible]~~	~~Glacial gravel~~	~~Soft, clear~~		D, S	Sufficient for 30 head stock; a 30-foot well with "alkaline" water.
24	NE.	34	"	"	"	Bored	25	2,450	- 15	2,435	25	2,425	Glacial sand	Hard		D, S	Sufficient for 40 head stock; 3 similar wells.
25	NE.	35	"	"	"	Bored	25	2,480	- 13	2,467	13	2,467	Glacial drift	Hard, clear		D, S	Sufficient for 26 head stock; also a spring in ravine used.
26	SE.	35	"	"	"	Bored	45	2,450	- 12	2,438	12	2,438	Glacial sand	Hard, clear, "alkaline"		S	Insufficient for 22 head stock; a small dam for stock.
27	SW.	36	"	"	"	Bored	36	2,440	- 27	2,413	36	2,404	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 15 head stock.
1	SW.	1	15	7	3	Bored	65	2,370	- 30	2,340	30	2,340	Glacial drift	Hard, clear		D, S	Sufficient for 18 head stock.
2	SE.	2	"	"	"									Hard		N	Good water in this well; has not been used since 1929.
3	NE.	2	"	"	"	Bored	50	2,360	- 25	2,335	25	2,335	Glacial drift	Hard, clear		D, S	Sufficient for 15 head stock.
4	NW.	5	"	"	"	Bored	31	2,375	- 7	2,368	7	2,368	Glacial sand	Hard, clear, "alkaline"		S	Sufficient for 6 head stock; laxative; a dry hole 150 feet deep in Bearpaw.
5	NE.	6	"	"	"	Bored	150	2,400									Five dry holes in Bearpaw soapstone from 80 to 150 feet.
6	SW.	6	"	"	"	Bored	78	2,320	- 54	2,366	54	2,366	Bearpaw	Hard, clear, "alkaline"		S	Insufficient supply; laxative; similar well 70 feet deep; intermittent.
7	NE.	7	"	"	"	Bored	45	2,360	- 20	2,340	20	2,340	Glacial sand	Hard, iron, clear		S	Sufficient for 10 head stock; an 18-foot well used for household.
8	NW.	8	"	"	"	Dug	42	2,350	- 15	2,335	15	2,335	Glacial drift	Hard, clear, very bitter, "alkaline"		N	Stock refuse to drink this water; constant supply.
9	NW.	9	"	"	"	Dug	13	2,352	- 9	2,343	9	2,343	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 10 head stock.
10	NW.	10	"	"	"	Bored	35	2,352	- 45	2,307	45	2,307	Bearpaw	Hard, clear, "alkaline"		D, S	Ample supply for 20 head stock; 2 wells 65 feet deep with similar water.
11	SW.	12	"	"	"	Dug	30	2,360	- 10	2,350	10	2,350	Glacial drift	Hard, clear		D	Sufficient supply; a 55-foot well, "alkaline water, supplies 30 head stock.
12	SE.	14	"	"	"	Dug	42	2,350	- 27	2,323	39	2,311	Glacial coarse gravel	Hard, clear		D, S	Sufficient for 20 head stock.
13	SW.	15	"	"	"	Bored	76	2,354	- 50	2,304	50	2,304	Bearpaw	Hard, clear, "alkaline", iron		D, S	Ample supply for 8 head stock; several wells from 75 feet to 250 feet water unusable; one well drilled 880 feet in black sand and clay.
14	SW.	16	"	"	"	Bored	50	2,350	- 20	2,320	45	2,295	Glacial sand	Hard, clear, "alkaline"		D, S	Ample supply for 12 head stock.
15	NE.	16	"	"	"	Bored	40	2,350	- 20	2,330	20	2,330	Glacial drift	Hard, clear, "alkaline"		S	Sufficient supply.
16	SW.	18	"	"	"	Dug	40	2,400	- 35	2,365	35	2,365	Glacial drift	Hard, cloudy, "alkaline", sediment		S	Sufficient supply; laxative; #.
17	NE.	19	"	"	"	Dug	13	2,370	- 6	2,364	6	2,364	Glacial sand	Hard, "alkaline"	44	S	Sufficient for 16 head stock.

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WELL RECORDS—Rural Municipality of LAWTONIA, NO. 135, 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
18	SE.	21	15	7	3	Bored	60	2,360	- 20	2,340	20	2,340	Glacial drift	Hard, clear, "alkaline", iron		D, S	Sufficient for 20 head stock.
19	NE.	22	"	"	"	Bored	75	2,404	- 35	2,369	35	2,369	Glacial drift	Hard, iron, "alkaline", red colour		S	Laxative on humans; ample supply for 20 head stock.and cooking.
20	NE.	23	"	"	"	Bored	40	2,370	- 30	2,340	30	2,340	Glacial drift	Hard, clear		S	Sufficient for 6 head stock.
21	NW.	24	"	"	"	Bored	60	2,370	- 30	2,340	30	2,340	Glacial drift	Hard, clear		S	Sufficient for 6 head stock.
22	NE.	24	"	"	"	Bored	69	2,350	- 20	2,330	20	2,330	Glacial drift	Hard, clear, iron		D, S	Two similar wells; sufficient for 60 head stock from 3 wells together.
23	NE.	27	"	"	"	Dug	20	2,400	- 8	2,392	8	2,392	Glacial sand	Hard, clear		D, S	Intermittent supply; depends on rainfall.
24	SW.	27	"	"	"	Bored	24	2,400	- 17	2,383	17	2,383	Glacial sand	Hard, clear		D	Sufficient for house; intermittent supply; a 65-foot well good supply, very "alkaline".
25	NE.	28	"	"	"	Bored	60	2,420	- 20	2,400			Glacial drift	Hard, iron, "alkaline", clear		S	Sufficient for 15 head stock; laxative on humans.
26	SW.	28	"	"	"		55	2,400					Glacial drift?	Hard, "alkaline"			Sufficient supply.
27	NW.	28	"	"	"	Bored	75	2,408	- 15	2,393	75	2,333	Glacial drift	Hard, clear, "alkaline", sulphur, odour		S	Sufficient for 10 head stock; unfit for human use; Affects stock; #.
28	NE.	29	"	"	"	Bored	32	2,408	- 22	2,386	22	2,386	Glacial drift	Hard, clear, "alkaline"		D	Sufficient supply; also a 9-foot well in sand; #.
29	SW.	30	"	"	"	Bored	75	2,395	- 35	2,360	35	2,360	Glacial drift	Hard, clear, "alkaline"		S	Sufficient for 20 head stock; a 16-foot well in glacial quicksand for house use.
30	NW.	31	"	"	"	Bored	45	2,408	- 30	2,378	30	2,378	Glacial drift	Hard, clear, iron		D, S	Sufficient for 10 head stock.
31	NW.	32	"	"	"	Bored	45	2,412	- 39	2,373	39	2,373	Glacial drift	Hard, clear, iron		D, S	Sufficient for 10 head stock.
32	SW.	33	"	"	"	Bored	60	2,408	- 52	2,356	57	2,351	Glacial gravel	Hard, clear, iron		S	Ample supply for 25 head stock; a 30-foot well in gravel; ample supply of hard water for house.
33	NW.	34	"	"	"	Bored	75	2,432	- 55	2,377	55	2,377	Glacial gravel	Hard, iron, clear		S	Sufficient for 20 head stock.
34	SW.	36	"	"	"	Bored	36	2,420	- 30	2,390	30	2,390	Glacial drift	Hard, clear		D, S	Sufficient for 15 head stock; a 95-foot well in Bearpaw; poor water.
1	SE.	1	15	6	3	Dug	13	2,430	- 9	2,421	9	2,421	Glacial gravel	Hard, clear		D	Sufficient for house only; a 16-foot and a 26-foot well together sufficient for local needs.
2	NE.	1	"	"	"	Dug	52	2,450	- 32	2,418	32	2,418	Glacial drift	Hard, clear, "alkaline"		S	Sufficient for 10 head stock; laxative on humans.
3	SW.	1	"	"	"	Dug	35	2,470	- 25	2,445	25	2,445	Glacial drift	Hard, clear		D, S	Sufficient for 25 head stock.
4	NE.	2	"	"	"	Dug	30	2,470	- 15	2,455	15	2,455	Glacial drift	Hard, clear, "alkaline", iron		S	Sufficient for 25 head stock.
5	SW.	2	"	"	"	Dug	18	2,550	- 1	2,549	1	2,549	Glacial drift	Hard, clear, slightly "alkaline"		D	Sufficient supply; dam for stock.

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WELL RECORDS—Rural Municipality of LAWTONIA, NO. 135, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
6	SW.	4	15	8	3	Bored	78	2,560	- 30	2,530	65	2,495	Glacial drift	Hard, clear, "alkaline", iron		S	Sufficient for 22 head stock; dam for stock; haul water.
7	NE.	4	"	"	"	Dug	18						Glacial drift	Hard			Small supply in sand; insufficient for 20 head stock.
8	SE.	5	"	"	"	Bored	74	2,560	- 60	2,500	60	2,500	Glacial drift	Hard, "alkaline"		D, S	Insufficient for 20 head stock; laxative on humans; dam for stock; haul water.
9	NE.	6	"	"	"	Bored	60	2,580	- 20	2,560	20	2,560	Bearpaw clay	Hard, clear, "alkaline", iron		S	Sufficient for 15 head stock; #.
10	SE.	6	"	"	"	Dug	25	2,550					Glacial drift	Hard, "alkaline"			Ample supply.
11	SW.	6	"	"	"	Dug	30	2,550					Glacial drift	Hard, "alkaline"			Ample supply.
12	SW.	7	"	"	"	Bored	48	2,560	- 33	2,527	33	2,527	Glacial drift	Hard, iron, "alkaline", brown		S	Sufficient for 15 head stock.
13	SE.	7	"	"	"	Bored	40	2,550	- 20	2,530	20	2,530	Glacial drift	Hard, clear, slightly "alkaline", iron		D, S	Sufficient for 17 head stock.
14	NE.	10	"	"	"	Bored	45	2,480	- 15	2,465			Glacial drift	Hard, clear, "alkaline", iron		S	Sufficient for 15 head stock; shallow 18-foot well for house use.
15	SE.	11	"	"	"	Dug	10	2,450					Glacial drift	Hard		D	Sufficient for house use.
16	NW.	12	"	"	"	Bored	40	2,440	- 25	2,415	25	2,415	Glacial drift	Hard, clear, "alkaline", iron		S	Sufficient for 20 head stock; shallow 12-foot well in sand for house.
17	SE.	12	"	"	"	Dug	16	2,400	- 1	2,399	1	2,399	Glacial sand	Hard, clear		D, S	Intermittent supply; sufficient for 10 head stock at times.
18	NE.	12	"	"	"	Dug	24	2,390	- 0	2,290			Glacial drift	Hard, clear		D, S	Well caved in to 8 feet from surface; water flows, abundant supply; waters 12 head stock; #.
19	NE.	13	"	"	"	Dug	42	2,380	- 32	2,348	32	2,348	Glacial drift	Hard, iron, red colour, cloudy		S	Intermittent well; practically a dry hole; several other 40-foot dry holes.
20	NW.	13	"	"	"	Dug	8						Glacial sand	Hard, clear, "alkaline"		S	Sufficient supply.
21	SE.	14	"	"	"	Dug	43	2,445	- 28	2,417	40	2,405	Glacial sand	Hard, clear, iron		D, S	Sufficient for 16 head stock.
22	NE.	14	"	"	"	Dug	12	2,430	- 9	2,421	9	2,421	Glacial drift	Hard, clear, "alkaline", iron		S	Sufficient for 16 head stock; laxative.
23	NW.	14	"	"	"	Dug	35	2,470	- 18	2,452	32	2,438	Glacial drift	Hard, clear		D, S	Sufficient for 35 head stock; also a 35-foot well.
24	SE.	15	"	"	"	Bored	50	2,470	- 40	2,430	40	2,430	Glacial drift	Hard, clear, "alkaline"		D, S	Sufficient for 8 head stock; one similar well.
25	SE.	17	"	"	"	Bored	70	2,550	- 20	2,530	18	2,532	Glacial drift	Hard, clear, "alkaline"		D, S	Sufficient for 23 head stock.
26	NW.	18	"	"	"	Dug	18	2,540	- 16	2,524	16	2,524	Glacial drift	Hard, clear, "alkaline"		D, S	Sufficient for 6 head stock.
27	NW.	19	"	"	"	Bored	37	2,500	- 17	2,483	17	2,483	Glacial drift	Hard, clear, "alkaline"		S	Sufficient for 10 head stock; laxative.

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WELL RECORDS—Rural Municipality of LAWTONIA, NO. 135, 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.	20	15	8	3	Dug	25	2,500	- 15	2,485	15	2,485	Glacial drift	Hard, clear, "alkaline", iron		D, S	Sufficient for 16 head stock.
29	NW.	21	"	"	"	Dug	32	2,520	- 20	2,500	20	2,500	Glacial drift	Hard, clear, "alkaline", iron		D, S	Sufficient for 27 head stock; another similar well; 28 feet deep.
30	SW.	22	"	"	"	Dug	42	2,560	- 36	2,524	36	2,524	Glacial yellow clay	Hard, clear		D, S	Sufficient for 10 head stock.
31	NW.	22	"	"	"	Bored	50	2,510	- 30	2,480	30	2,480	Glacial drift	Hard, clear		D, S	Sufficient for 10 head stock.
32	NE.	22	"	"	"	Dug	15	2,496	- 12	2,484	12	2,484	Glacial drift	Hard, clear		D, S	Sufficient for 16 head stock; a 16-foot dry hole.
33	NE.	24	"	"	"	Bored	75	2,400	- 40	2,360	40	2,360	Glacial drift	Hard, clear, iron	44	S	Sufficient for 20 head stock; unfit for human consumption.
34	NE.	27	"	"	"	Bored	85	2,460	- 50	2,410	50	2,410	Glacial drift	Hard, clear, iron, "alkaline"		D, S	Sufficient for 17 head stock; a 4-foot seepage well in ravine.
35	NW.	28	"	"	"	Dug	40	2,480	- 28	2,452	28	2,452	Glacial drift	Hard, clear, cloudy, iron		D, S	Sufficient for 8 head stock; laxative on humans.
36	NW.	30	"	"	"	Dug	18	2,500					Glacial drift	Hard, clear, "alkaline", iron		D, S	Sufficient for 23 head stock.
37	NE.	31	"	"	"	Bored	34	2,450	- 14	2,436	14	2,436	Glacial drift	Hard, clear		D, S	Sufficient supply.
38	NW.	36	"	"	"	Bored	65	2,460	- 53	2,407	53	2,407	Glacial drift	Hard, clear, "alkaline"		D, S	Sufficient for 14 head stock; a similar well 65 feet deep.
1	SW.	1	15	9	3	Bored	57	2,540	- 50	2,490	50	2,490	Bearpaw	Hard, clear, "alkaline"		D, S	Insufficient supply for stock; a 27-foot well in glacial drift; sufficient for 100 head stock.
2	SW.	3	"	"	"	Dug	13	2,500	- 10	2,490	10	2,490	Glacial sand	Hard, clear		D, S	Sufficient supply.
3		3	"	"	"	Bored	72	2,500	- 4	2,496	4	2,496	Bearpaw shale	Hard, cloudy	47	D, S	Intermittent, insufficient supply.
4	SE.	4	"	"	"	Dug	13	2,500	- 9	2,491	9	2,491	Glacial sand	Soft, clear		D, S	Sufficient supply.
5	SW.	4	"	"	"	Dug	30	2,550	- 15	2,535	15	2,535	Glacial drift	Hard, clear		D, S	Sufficient for 10 head stock; dam also used.
6	SW.	6	"	"	"	Dug	25	2,400	- 13	2,387	13	2,387	Glacial sand	Hard, clear		D, S	Intermittent supply.
7	NE.	7	"	"	"	Bored	125	2,570									Dry hole in Bearpaw sand; spring for stock in Cypress Hills formation.
8	NW.	9	"	"	"	Dug	15	2,600	- 9	2,591	9	2,591	Glacial sand	Hard, clear		D, S	Sufficient for 12 head stock.
9	NE.	10	"	"	"	Bored	35	2,600	- 20	2,580	20	2,580	Glacial sand	Hard, clear		D, S	Sufficient for 10 head stock.
10	NE.	11	"	"	"	Dug	14						Glacial drift	Hard, "alkaline"			Small supply.
11	NE.	12	"	"	"	Bored	36	2,590	- 16	2,574	36	2,554	Glacial drift	Hard, clear, "alkaline"		D, S	Sufficient for 20 head stock.
12	SE.	13	"	"	"	Bored	46	2,580	- 40	2,540	40	2,540	Glacial drift	Hard, "alkaline"		D, S	Sufficient for 10 head stock.
13	SE.	14	"	"	"	Bored	46	2,590	- 41	2,549	41	2,549	Glacial drift	Hard, clear, "alkaline"		D, S	Sufficient for 20 head stock.
14	NW.	14	"	"	"	Bored	45	2,675	- 20	2,655	45	2,630	Glacial sand	Soft, clear		D, S	Sufficient for 20 head stock.

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15	SW.	15	15	9	3	Bored	25	2,550	- 15	2,535	25	2,525	Glacial sand	Soft, clear		D, S	Sufficient for 15 head stock.
16	SW.	18	"	"	"	Dug	16	2,600	- 8	2,592	16	2,584	Glacial sand	Hard, clear		D, S	Sufficient for 10 head stock.
17	NW.	13	"	"	"	Spring							Cypress Hills	Hard		S	Small supply.
18	SW.	19	"	"	"	Spring							Cypress Hills	Hard			Small supply.
19	NW.	19	"	"	"	Spring							Cypress Hills	Hard			Small supply.
20	SE.	19	"	"	"	Dug	14	2,600	- 4	2,596	11	2,589	Glacial gravel	Hard, clear, "alkaline"		D, S	Sufficient for 15 head stock.
21	SE.	21	"	"	"	Dug	10	2,625	- 7	2,618	7	2,618	Glacial sand	Hard, clear		D, S	Sufficient for 15 head stock.
22	SE.	22	"	"	"	Bored	70	2,625	- 65	2,560	65	2,560	Bearpaw(?) shale	Hard, clear	47	D, S	Insufficient for 4 head stock; a 14-foot well in sand; waters 15 head stock.
23	NE.	24	"	"	"	Bored	38	2,550					Bearpaw ?	Hard		N	Could supply 16 head stock; water unfit for use.
24	SE.	24	"	"	"	Dug	12	2,550	- 4	2,546	4	2,546	Glacial drift	Hard		D, S	Sufficient supply.
25	SE.	25	"	"	"	Bored	35	2,500	- 29	2,471	29	2,471	Glacial drift	Hard, clear		D, S	Sufficient for 19 head stock.
26	NE.	25	"	"	"	Bored	30	2,490	- 15	2,475	15	2,475	Glacial sand	Hard, clear		D, S	Sufficient for 24 head stock.
27	NW.	28	"	"	"	Dug	12	2,580	- 10	2,570	10	2,570	Glacial sand	Hard, clear, "alkaline"		D, S	Insufficient supply; water too "alkaline" for use.
28	NE.	30	"	"	"	Dug	21	2,500	- 18	2,482	18	2,482	Glacial quick- and sand	Hard, clear, "alkaline"		D, S	Intermittent well; sufficient supply with a small dam.
29	NW.	30	"	"	"	Bored	60	2,500	- 58	2,442	58	2,552	Bearpaw	Hard, clear, "alkaline"		N	Insufficient supply; unfit for use.
30	NW.	32	"	"	"	Bored	76	2,560	- 68	2,492	76	2,484	Cypress Hills(?)	Hard, iron, "alkaline", clear		S	Sufficient for 20 head stock.
31	SW.	33	"	"	"	Drilled	600	2,600									Dry hole penetrating Bearpaw shales; domestic supply hauled.
32	NE.	33	"	"	"	Dug	27	2,640	- 25	2,615	25	2,615	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 15 head stock.
33	SE.	34	"	"	"	Dug	18	2,600	- 6	2,594	6	2,594	Glacial drift	Soft, clear		D, S	Also a spring in Cypress Hills formation.
34	NW.	35	"	"	"	Bored	90	2,550	- 83	2,467	83	2,467	Cypress Hills gravel	Hard, clear, "alkaline"		S	Well may penetrate Bearpaw formation; sufficient for 6 head stock; laxative.
35	SE.	35	"	"	"	Bored	18	2,500	- 16	2,484	16	2,484	Glacial drift	Hard, clear, "alkaline"		N	Sufficient supply; unfit for use; dugout with spring used.

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.