CANADA
DEPARTMENT OF MINES

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BUREAU OF ECONOMIC GEOLOGY

GEOLOGICAL SURVEY

PRELIMINARY REPORT

GROUND-WATER RESOURCES OF THE RURAL MUNICIPALITY OF WELLINGTON No. 97 SASKATCHEWAN

BY

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

Water Supply Paper No. 40

OTTAWA

1936

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GROUND WATER RESOURCES OF THE RURAL MUNICIPALITY OF WELLINGTON, NO. 97 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 give on the figure. Where contour lines are not shown on the figure, the elevations of adjacent wells as indicated in the Table of Well Records accompanying each report can be used. The approximate elevation of the water-bearing horizon at the well-site can be obtained from the Table of Well Records by noting the elevation of the water-bearing horizon in surrounding wells and by estimating from these known elevations its elevation at the well-site.[1] If the water-bearing horizon is in bedrock the depth to water can be estimated fairly accurately in this way. If the water-bearing horizon is in unconsolidated deposits such as gravel, sand, clay, or glacial debris, however, the estimated elevation is less reliable, because the water-bearing horizon may be inclined, or may be in lenses or in sand beds which may lie at various horizons and may be of small lateral extent. In calculating the depth to water, care should be taken that the water-bearing horizons selected from the Table of Well Records be all in the same geological horizon either in the glacial drift or in the bedrock. From the data in the Table

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

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

GLOSSARY OF TERMS USED

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

WATER-BEARING HORIZONS OF THE MUNICIPALITY

The rural municipality of Wellington is an area of 324 square miles in the southeastern part of Saskatchewan. It consists of nine townships, described as tps. 10, 11, and 12, ranges 13, 14, and 15, w. 2nd mer. The village of Cedoux, which lies approximately in the centre of the municipality, is 55 miles southeast of Regina.

The municipality as a whole lies in a flat, treeless plain that is broken by the valleys of two, small, intermittent streams, that of Waskana creek to the north and the headwaters of Souris river on the west. The divide between these two intermittent streams forms a belt approximately 3 miles wide which runs northwest through the centre of the municipality. It has an undulating surface and is floored by glacial till. Approximately one-half this municipality is extremely flat, and is covered by a thick blanket of black gumbo clay which makes an excellent top soil for the production of wheat. This marks the site of a lake that was eventually drained through Souris valley.

The best farming country and the thickest settlement occurs in the glacial lake clay regions where the top soil is thicker and richer than in an area covered by glacial boulder clay or lake sands. Unfortunately the ground water conditions are far superior in the district of the glacial lake sands area than in the thickly populated lake clay district.

The total thickness of the glacial deposit is approximately 80 feet, and it overlies the Marine shale bedrock formation. The Marine shale is locally termed soapstone and its thickness is estimated at 700 feet to 1,000 feet. A representative cross-section of the unconsolidated mantle from the surface downwards would probably be as follows: 2 feet of loam, 15 feet of yellow, red, or brown clay, 2 feet of sand or gravel, and 60 feet of blue clay.

Water-bearing Horizons in the Unconsolidated Deposits

Two possible water-bearing horizons occur in the glacial deposits in this municipality. The first, and by far the most general horizon is located within 35 feet of the surface. It is composed of sand and less often gravel, and it usually underlies the yellow clay and overlies the heavy blue clay layer. The sand bed is rarely more than 4 feet thick in the area underlain by the lake clay, and the heavy blue clay deposit lies within 20 feet of the surface. The sand deposits in the glacial drift appear to occur in pockets, whereas those in the lake clays occur as more continuous beds. This is due to the difference in the manner of their deposition. The glacial drift was dumped or strewn along by the mechanical action of the ice-sheet, whereas the lake clays accompanying sand deposits were laid down by the agency of water. Hence sand pockets may or may not occur at any depth above the blue clay. The most uniform and thickest bed of sand is found in township 12, range 13. In this district the sand overlies the blue clay and extends to the top soil without any occurrence of yellow clay.

The water supply contained in this upper horizon is totally dependant on surface seepage. The water supply in the first horizon in the lake clay is very small and the water is strongly "alkaline". Both the quality and quantity of water are affected to a high degree by the heavy gumbo clay soil. This layer not only prevents rapid downward seepage of rain water to the underlying sand, but it also is one source of the "alkaline" salts contained in the water. The chief source of the mineral salts is the blue clay that underlies the sand seam. Some wells yield water that has the colour of buttermilk, and continual use of such water by stock would kill them. The small supplies of strongly "alkaline" water in wells has caused farmers to abandon them in favour of dugouts as a source of permanent and better quality of water for both house and stock use.

The areas that are covered by lake sands and till are sparsely settled due to the absence of the rich top soil that is found in the district covered by lake clay. Water supplies are difficult to obtain in the glacial till due to the scarcity of sand pockets. The water contained in sand pockets in the drift is not so "alkaline" as a rule as water from the sand layers in the lake clay. The best wells in the municipality are located in the lake sands occurring in township 12, range 12. The supply is abundant and the quality excellent, and instead of digging a well water can be obtained by driving a sand-point. The thick layer of sand is not overlain with gumbo clay or yellow clay, so that seepage from rainfall into the sand is rapid and the water takes into solution only a small amount of mineral salts. The sand bed acts as a huge storage basin for run-off water and consequently drought years do not have any marked effect on the supply. With the exception of a few places in township 12, range 15, the water in the first horizon is not under any hydrostatic pressure.

The second water-bearing horizon is a quicksand bed found at a depth of 60 feet to 80 feet from the surface. This horizon is not general throughout the municipality, as many deep dry holes do not encounter it. The water obtained from this quicksand is strongly "alkaline" and it is not usually fit for consumption by either man or beast. The supply is small even though it does not depend on rainfall seepage. In some wells the water is under a slight hydrostatic head. Digging or drilling a well to this horizon is not recommended, since both the quantity and quality of the water are unsatisfactory. Moreover, the resident should not hold out hope of finding better water at depth as there is every possibility that no aquifer will be encountered at the location and, if present, the water obtained will doubtless be of

such poor quality that it will not justify the labour of digging or the expense of drilling.

Water-bearing Horizons in the Bedrock

The Marine shale formation underlies the glacial deposits in this municipality at an approximate depth of 75 feet from the surface. The possibility of the occurrence of a water-bearing horizon in the shale or "soapstone" at depth is extremely improbable. If water is found it will be so "alkaline" and salty that it may be unfit for farm use. Farmers are strongly advised to refrain from the expense of deep drilling operations in this municipality. Two holes were drilled to a depth of 1,700 feet near Ralph in the municipality of Weyburn, by the Prospecting and Development Company of Regina, during the war, in a search for potash, and no water was encountered. The Marine shale forms the bedrock formation in that district as well as in the municipality under discussion.

In summarizing the ground water conditions the only place in this municipality where farmers are certain of obtaining good water at any depth is in the area in the northeastern corner that is covered by glacial sands. In the remainder of the municipality farmers should confine their efforts to obtain water to the top 35 feet of glacial covering. The possibility of striking a permanent supply of good water is certainly remote, especially in the lake clay region, but the first horizon contained in the upper part of the drift is the only one where water in any quantity will be found. Digging into the blue clay to any depth is not recommended. Water in small quantities that will be suitable for house use will more likely be found in sand or gravel knolls where the deposits of gravel are thick and there is no overlying clay material.

The construction of large, deep dugouts appears to be the only feasible manner in which water can be obtained in sufficient quantities to water a large herd of stock. Shallow seepage wells dug beside them would furnish a source of water that

would be suitable for human use. The strongly "alkaline" nature of well water and the small quantities obtained, cause the water question to be one of major importance in this municipality.

GROUND-WATER CONDITIONS BY TOWNSHIPS

Township 10, Range 13

The southern half of the township is overlain by deposits of glacial lake clays; the northern half is covered by a deposit of glacial till. The topography of the region that is covered by lake clay is very flat, whereas that of the district that is overlain by glacial till is undulating.

The total depth of the glacial deposit does not exceed 75 feet and it overlies the Marine shale formation. The glacial deposit consists of 5 to 15 feet of yellow and in some cases reddish clay, 1 to 8 feet of fine yellow sand, and approximately 50 to 60 feet of blue clay. A cemented boulder layer underlying the yellow clay is occasionally struck at a depth of 12 feet from the surface. The blue clay is generally struck at a depth of 20 feet or less from the surface at any place in the township. Two holes were sunk in sections 17 and 18 to a depth of 115 feet. Fossils were reported to have been found in the "soapstone", a local name for the Marine shale bedrock.

There is only one possible water-bearing horizon in the township, and this is formed by the fine, yellow sand seam that underlies the yellow or red clay. The quantity of water derived from it is rather scanty and the supply is wholly dependant on the amount of rainfall. In the southern half of the township there are no more than ten existing wells that can be depended upon to water twenty head of stock, and in the northern half of the township, only three. In many sections, such as in sections 10, 32, and 34, numerous dry holes have been dug to the blue clay. If water is found in small quantities it is so strongly "alkaline" that it

cannot be used. The sand aquifer is usually not more than 3 feet thick and it overlies the blue clay. The water contained in the sand comes directly into contact with the blue clay from which it dissolves out mineral salts that cause the water to become "alkaline". This is the reason that water often becomes more "alkaline" after a well has been deepened. In wells where the sand aquifer is thick the water contained is not so strongly "alkaline". The high percentage of $MgSO_4$, (Epsom Salts), contained in the water imparts to it a bitter taste, and also gives the water a harsh, laxative effect.

Water cannot be found at depth in this township. The blue clay does not contain sand seams and the Marine shale is non-water-bearing. One dry hole, 200 feet deep, was drilled in section 14, and this is indicative of the failure other deep drilling operations would experience. The only means of obtaining water is from shallow wells in the sand overlying the blue clay. It is advised that auger tests be made before digging a well. If sufficient water cannot be found the construction of dugouts is the only means of securing a supply in this township. It is strongly advised that drilling should not be undertaken.

Township 10, Range 14

The entire township, with the exception of the northeastern corner, is overlain with a glacial lake clay deposit. The topography is very flat, but in the area that is embraced by sections 25, 35, and 36, which is mantled by glacial till, is slightly rolling.

The glacial deposit is approximately 80 to 100 feet thick and consists of yellow clay, sand and gravel, and blue clay. The blue clay is struck at a maximum depth of 20 to 30 feet from the surface anywhere in the township, and it extends without interruption to the bedrock. The overlying 20 to 30 feet of material is made up of yellow or red clay containing lenses and pockets of sand or gravel.

The lenses of sand and gravel that overlie the blue clay are the only possible sources of water in this township. The water supply contained in the sand is dependant entirely on precipitation, and the great majority of the wells in the townships can not water ten head of stock in drought years. There are probably only six wells that will water forty head of stock or more, at any time. Farmers have dug numerous wells into the blue clay and generally a paltry supply of water is obtained, but the presence of "alkaline" salts makes it prohibitive for either house or stock use. Good water is only found where the sand bed is thick, or where the sand aquifer occurs very near the ground surface. Wherever water comes into contact with blue clay it dissolves out mineral salts. During the dry years of 1930 to 1934 the ground water supply has decreased, and has resulted in a concentration of these salts. Thus, water is often found which is so heavily charged with salts that stock will become sick from drinking it. However, even though the water is strongly "alkaline", the sand seams that occur within 20 or 25 feet of the surface are the sole source of supply in this township. Usable water cannot be obtained from the blue clay, and the Marine shale that forms the bedrock underlying the blue clay does not contain any water-bearing horizon. A dry hole was drilled in the NE. $\frac{1}{4}$, section 18, to a depth of 140 feet. The bedrock that is locally termed "soapstone" was struck at a depth of 110 feet from the surface. The construction of dugouts is the only means of obtaining a supply of water, if water cannot be located before the blue clay is encountered.

Township 10, Range 15

The flat, plain topography of this township is typical of that of a glacial lake basin. The glacial deposit varies in thickness from 60 to 110 feet, and consists of a 1- to 4-foot layer of dark, heavy gumbo clay, 10 feet of yellowish clay, 5 to 20 feet of white, grey, or buff coloured sand, and a variable

thickness of blue clay. Quicksand beds occur in the blue clay at depths of 50 to 70 feet from the surface in the southern part of the township. A bed of black sand that did not contain water was struck at 100 feet from the surface in a dry hole drilled in NW. ¼, section 19. The blue clay layer generally extends without interruption from a distance of 20 to 30 feet below the surface, to the bedrock Marine shale formation.

The thick bed of sand that generally underlies the yellow clay is fairly continuous throughout the township. Farmers do not seem to have any difficulty in striking it. The supply of water contained in it depends entirely on rainfall seepage. The top layer of black gumbo clay, however, prevents any rapid seepage of water into the horizon. Consequently the amount of water that seeps through to the sand is much less than if the impervious gumbo were absent. In other parts of the province, a thick bed of sand underlying the yellow clay usually denotes a good water supply, but in this township this is not the case. The Yellow Grass ditch was dug by the Government to carry away the surface waters that would otherwise flood the land, due to the impervious gumbo that prevented the water from seeping down to the underlying sand.

Except in a few isolated places, the water supply from the sand beds underlying the yellow clay is very small. Moreover, the water is so strongly "alkaline" that it cannot be used for man or stock. The drought of 1930 to 1934 has dried up sloughs from which seepage water was collected in wells dug near them, and water from wells in the sand aquifer has become more "alkaline" due to the concentration of salts. Many farmers have abandoned the use of wells for any purpose and rely entirely on dugouts for water for both house and stock. Reservoirs are also used to collect rain water.

Except in a 48-foot well located in the SE. $\frac{1}{4}$, section 6, the supply of water from the quicksand layer in the blue clay is very limited. The water is not under pressure, and is heavily charged with mineral salts. Dry holes have been drilled to a maximum depth of 450 feet. The Marine shale bedrock formation occurring at a depth of 60 to 110 feet does not contain water-bearing horizons, and the quicksand beds, when they occur in the blue clay, do not yield a satisfactory supply of water. Hence, deep drilling in this township is not advised. Usable water would most likely be found in large pockets of sand or gravel that occur near the surface and are not overlain by gumbo clay. Apparently a large proportion of the "alkali" salts are dissolved out of this gumbo clay as well as from the blue clay that underlies the sand. If water cannot be obtained from shallow wells, dugouts are the only means of collecting and conserving a water supply.

Township 11, Range 13

Deposits of glacial lake clay occur in the flat plain in the northeastern half of the township, and glacial boulder clay or till deposits in the undulating area in the southwestern half. The township is sparsely settled and the amount of information supplied by well records is very limited.

The depth of the glacial deposits is not accurately known, but dry holes have been dug to a depth of 60 feet without penetrating the glacial blue clay layer. The contact between the glacial and bedrock deposits would probably occur within 100 feet of the surface. The glacial deposit is composed of yellow clay, sand, and blue clay.

The yellow clay underlies the top soil to an average depth of 10 feet. The only water-bearing horizon in the drift is formed by a layer of sand, 1 to 3 feet thick, that occurs beneath the yellow clay. Blue clay underlies the sand to a probable depth

of 100 feet, and overlies the Marine shale bedrock formation.

Only one well, located in the SW. $\frac{1}{4}$, section 16, yields an abundant supply of usable water. The remainder of the wells encounter very small streaks of sand within 30 feet of the surface, their supplies are very scanty and depend entirely on the rainfall. Due to the proximity of the sand aquifer and the blue clay, the water is highly charged with mineral salts, and usually is not fit for humans.

Some farmers have made dugouts; others draw the water in tanks from municipal dugouts, or melt snow in winter. The only means of obtaining a reliable source of water is by the construction of dugouts. Drilling to depth is not advised, since neither the blue clay nor the Marine shale bedrock formation contain water-bearing horizons. The great majority of shallow wells yield strongly "alkaline" water. However, tests with an auger may reveal a suitable water supply such as was found in section 16, but the chances of obtaining a good supply of usable water in wells of any depth are poor.

Township 11, Range 14

The flat plain in the western half of the township is part of a glacial lake bed, and the slightly undulating area in the eastern half of the township is mantled by a deposit of glacial till. The total depth of the glacial deposit is not determined, since the deepest holes were 60 feet in depth, but it is probable that the Marine shale bedrock formation lies at a depth not exceeding 75 to 100 feet. Extending from the surface, the glacial deposit is composed of 2 feet of loam, 4 feet of sandy, yellow clay, in some cases a small seam of fine yellow sand, and blue clay. The blue clay is struck at a maximum depth of 20 feet from the surface anywhere in the township. This blue clay is sometimes referred to as jointed clay, since on exposure to the air it dries and breaks up in rectangular pieces or cubes. This

blue clay layer does not contain sand layers and extends without interruption to the bedrock.

The only available source of water in this township must lie between the ground surface and the blue clay. In all the existing wells the yellow sandy clay, or the small sand layer underlying the yellow clay and overlying the blue clay, act as the aquifers. The water contained in these aquifers is entirely derived from surface seepage. In the drought years of 1930 to 1934, therefore, the water supply in the wells has been extremely small and in many cases nil. In years of average rainfall a fair supply of water can usually be obtained from shallow wells, but the water is so highly mineralized that it is not usable for man or stock. In periods of drought the water becomes more "alkaline" due to the concentration of the dissolved salts in a smaller body of water.

The prospects of locating a permanent water supply in this township, either by shallow digging or deep drilling, are practically negligible. The blue clay does not contain sand layers and the Marine shale formation is not water bearing, so that drilling is out of the question.

Farmers are advised to excavate dugouts that are at least 12 feet deep. Their location should be such that they will collect a maximum amount of runoff water during the spring months. A small well dug beside the dugout would derive enough seepage water from the dugout for household purposes.

Township 11, Range 15

The entire township is situated in a glacial lake basin. The glacial deposit in this lake bed has a thickness of approximately 80 feet and it overlies the bedrock Marine shale formation. The glacial deposit is usually composed of the following materials, 2 to 8 feet of black gumbo soil, approximately 10 feet of yellow, red, or brown clay with sand streaks, 2 feet of yellow or white

sand, and blue clay. Variations occur however, for instance the blue, jointed clay may underlie the yellow clay, or the gumbo soil may overlie the sand without any intervening yellow clay, but the above-mentioned materials will usually be encountered when a well is dug.

A well 150 feet deep was drilled in the NE. $\frac{1}{4}$, section 15. The contact between the glacial blue clay and the "soapstone" or bedrock Marine shale was made at a depth of 87 feet from the surface. A small supply of strongly "alkaline" water was obtained from two, small, white sand seams in the blue clay layer. The Marine shale, or "soapstone" as it is locally termed, does not contain water-bearing horizons.

In view of this it is apparent that the only possibility of obtaining a supply of water is from the sand layers overlying the blue clay. Since the water supply in these sand layers is derived wholly from rainfall it is practically impossible to dig a well of any depth that will yield a permanent supply of water. It is true that there are a few wells in the township that yield sufficient water to supply twenty head of stock. These wells have tapped a sand pocket that acts as a reservoir, and drought conditions do not have such a marked effect on them. Limited supplies of water can usually be found at shallow depths, but the water is strongly "alkaline" and it is not usable for stock or humans.

Water that is suitable for human use can only be found in thick beds of sand that lie close to the surface. The only method of obtaining a permanent water supply in this township is to construct large, deep dugouts. In these dugouts the water from the spring run-off may be caught and stored for future use. Drilling to depth is not advised.

Township 12, Range 13

The glacial deposits in this township are of four different kinds, glacial lake clay, glacial lake sands, glacial outwash gravels and sands, and glacial till. The glacial lake clays occur in the extreme western part of the township. A tongue of glacial lake sands runs in a southeast direction from the village of Tyvan, to the southeastern boundary of the township. Section 24 and parts of sections 23, 14, and 13 contain glacial outwash sands and gravels. The remainder of the township is overlain by glacial till. The deposits in the areas covered by glacial lake clay and glacial till usually consist of 5 to 15 feet of yellow or red clay, 2 to 4 feet of fine sand, and approximately 60 to 80 feet of blue clay. The yellow clay underlies the top soil and the blue clay overlies the bedrock Marine shale formation. Apparently there are two water-bearing horizons in this type of glacial drift in this township. The first horizon occurs in the sand that underlies the yellow clay and the second occurs in a sand layer at a depth of 60 to 80 feet from the surface. This second bed probably marks the contact between the glacial drift and the Marine shale formation.

The first sand horizon occurs as pockets from which fairly good supplies of water can be obtained. Wells in the SE. $\frac{1}{4}$, section 4, NW . $\frac{1}{4}$, section 4, and NW. $\frac{1}{4}$, section 18, apparently have tapped pockets of sand. As a rule, a permanent supply is very difficult to obtain from this horizon, since it depends entirely on rainfall for its water supply. The water is usually strongly "alkaline" and not usable by humans. A well in the NE. $\frac{1}{4}$, section 8, tapped the second horizon, but the water was so strongly "alkaline" that it could not be used for stock. The quantity, however, was fairly abundant. Farmers are not advised to drill or bore deeply for water in this township since the few sand layers that may lie at depth in the blue clay deliver highly mineralized

water. Drilling into the Marine shale formation is futile, since it does not contain water-bearing horizons. The farmer's efforts should be confined to testing above the blue clay and in that way a small pocket of sand may be located. Unless the sand bed is very thick and is encountered close to the surface, the water found will be "alkaline".

In the districts that are overlain by glacial outwash and glacial lake sands, yellow sand extends from the surface to depths of 15 feet to 20 feet and is underlain by blue clay. This continuous bed of sand extends over a large area and acts as a huge reservoir for the storage of surface water, and although the water originates from rainfall and snow, drought years do not affect the supply to any extent due to the immense quantities of water stored therein. In order to obtain water, sand-points are generally used and they are driven to a depth of 12 to 15 feet below the surface. The water is of excellent quality, being hard to soft and "non-alkaline". Continuous pumping cannot lower the water level.

Unfortunately in the districts that are covered by glacial lake sand, and where the water conditions are good, the top soil is extremely light and is not the best soil for growing crops, hence the areas are not thickly settled.

Township 12, Range 14

Glacial lake clays occur in the northeastern and southwestern corners of the township and glacial till in the remainder of the township. The glacial deposit overlies the bedrock Marine shale formation, but the contact between the two has not been definitely established. It is probable that the glacial deposit does not exceed a thickness of 80 feet to 100 feet. The glacial deposit in this township is composed of 10 to 25 feet of yellow, sandy clay, a small sand layer, and blue clay. The only possible water-bearing horizon that can be found lies within the material

overlying the blue clay.

There are probably not more than four wells in the township that can be depended upon to yield enough water for twenty or more head of stock. The water obtained from the shallow wells is entirely dependant on rainfall seepage. Even in years of average rainfall the water supply is poor. The high mineral content makes the water unusable by either man or beast. Farmers have dug and tested in numerous places all over their farms, and when water is found it is either too "alkaline" or too salty for use.

A 500-foot hole was drilled in the NE. $\frac{1}{4}$, section 12. Blue clay was struck at a depth of 20 feet from the surface, and the report states that this continued without interruption to the bottom of the hole. It is very likely that the Marine shale, which resembles the blue clay in outward appearance, was struck at approximately 80 feet from the surface and the greater part of the drilling was done in the shale. This shale does not contain water-bearing horizons and it is not surprising that it was a dry hole. Another dry hole, 90 feet in depth, was bored in the NE. $\frac{1}{4}$, section 24, so that it is safe to conclude that the blue clay does not contain sand layers and is non-water-bearing. If a supply of usable water cannot be found within the initial 30 feet of glacial drift it will not be found at all. Dugout construction has proved to be a satisfactory method of obtaining and storing surface run-off water for stock use.

Township 12, Range 15

This township, with the exception of the northeastern corner, is situated in a glacial lake bed and the topography is very flat. In sections 24, 25, 26, 34, 35, and 36, the ground surface is undulating and this area is covered with a deposit of glacial till. The glacial deposit is composed of yellow, grey, and black clay, beds of sand, gravel, and quicksand, and blue clay.

The top soil is a black gumbo clay 3 to 8 feet thick and underlying it is yellow, grey, or black clay, followed by the sand and gravel beds. The blue clay is struck at an approximate depth of 25 feet from the surface and extends to the bedrock Marine shale formation that occurs at a probable depth of 50 to 75 feet. In some places, such as in the bottom of ravines, 20 feet or more of sand or quicksand is struck immediately beneath the top soil. Gravel, when found, usually occurs at a greater depth from the surface than the sand and quicksand. In some places the sand bed grades into gravel.

The sand, quicksand, and gravel beds that overlie the blue clay form the only water-bearing horizon in the township. The sand and gravel beds do not lie in a continuous stratum throughout the township. They seem to occur in beds or pockets that vary in thickness from 4 to 20 feet. The floors of ravines offer favourable places for well digging since the sand bed is usually very thick in such locations. In other places, such as on the plain, a sand aquifer cannot be struck at all.

Several wells in this township that have tapped pockets of sand yield an abundant supply of water. Most noteworthy are two artesian wells, one located in the NW. $\frac{1}{4}$, section 11, and the other in SE. $\frac{1}{4}$, section 28. These wells are 25 feet and 21 feet deep, respectively, and are dug in 20 feet of quicksand at the bottom of a ravine. These wells are really springs. The water delivered is hard, "alkaline", and contains iron, but it may be used for human use as well as for stock. These springs have been extensively used by neighbouring farmers throughout the drought period and the supply has not been greatly affected by the lack of rainfall.

Two wells located in section 36, 20 feet in depth, derive an abundance of hard, slightly "alkaline" water from an

aquifer underlying 6 inches of hardpan. The water is under pressure and rises to within 10 feet of the surface. Wells located in sections 1, 8, 14, 16, 17, and 27, also yield an abundant supply of water. However, even though some good wells do exist in this township, the general rule is that usable water in abundant quantities is exceedingly difficult to locate. In sections 18, 20, and 24, the water from wells is so strongly "alkaline" that it cannot be used for stock.

Dry holes, 120 feet deep, were sunk in the SE. ¼, section 4. Drilling for water is not advised. If water is located in the blue clay it is so heavily "alkaline" that it cannot be used for any purpose and the Marine shale formation does not contain water-bearing horizons. Farmers should confine their well digging or testing efforts to the initial 40 feet of glacial covering. If usable water cannot possibly be found in a sand pocket, the construction of a deep dugout in a suitable location is the only means of obtaining a permanent supply of water.

STATISTICAL SUMMARY OF WELL INFORMATION IN RURAL MUNICIPALITY OF WELLINGTON NO. 97, SASKATCHEWAN

Township / West of mer. Range	10 13	10 14	10 15	11 13	11 14	11 15	12 13	12 14	12 15	Total No. in Municipality
Total No. of Wells in Township	115	60	117	31	132	66	59	69	49	698
No. of wells in bedrock	3	1	5	0	0	1	0	1	3	14
No. of wells in glacial drift	112	59	112	31	132	65	59	68	46	684
No. of wells in alluvium	0	0	0	0	0	0	0	0	0	0
Permanency of Water Supply										
No. with permanent supply	46	26	46	11	74	30	44	24	22	323
No. with intermittent supply	9	12	7	7	27	16	3	7	5	93
No. dry holes	60	22	64	13	31	20	12	38	22	282
Types of Wells										
No. of flowing artesian wells	0	0	0	0	0	0	0	0	2	2
No. of non-flowing artesian wells	0	0	0	0	0	0	0	0	9	9
No. of non-artesian wells	55	38	53	18	101	46	47	31	16	405
Quality of Water										
No. with hard water	43	35	51	17	95	43	39	26	26	375
No. with soft water	12	3	2	1	6	3	8	5	1	41
No. with salty water	0	1	1	2	3	1	0	3	0	11
No. with "alkaline" water	29	30	39	15	75	26	22	18	19	273
Depth of Wells										
No. from 0 to 50 feet deep	110	55	104	24	130	62	58	67	46	656
No. from 51 to 100 feet deep	2	4	11	7	2	3	1	1	0	31
No. from 101 to 150 feet deep	2	1	1	0	0	1	0	0	3	8
No. from 151 to 200 feet deep	1	0	0	0	0	0	0	0	0	1
No. from 201 to 500 feet deep	0	0	1	0	0	0	0	1	0	2
No. from 501 to 1,000 feet deep	0	0	0	0	0	0	0	0	0	0
No. over 1,000 feet deep	0	0	0	0	0	0	0	0	0	0
How the Water is Used										
No. usable for domestic purposes	33	9	22	7	47	26	40	20	21	225
No. not usable for domestic purposes	22	29	31	11	54	20	7	11	6	191
No. usable for stock	36	17	27	13	63	37	40	23	22	278
No. not usable for stock	19	21	26	5	38	9	7	8	5	138
Sufficiency of Water Supply										
No. sufficient for domestic needs	55	37	53	18	99	45	47	26	27	397
No. insufficient for domestic needs	0	1	0	0	2	1	0	5	0	9
No. sufficient for stock needs	27	20	22	1	61	29	26	9	18	213
No. insufficient for stock needs	28	18	31	17	40	17	21	22	9	203

ANALYSES AND QUALITY OF WATER

General Statement

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

Total Dissolved Mineral Solids

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

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

Mineral Substances Present

Calcium and Magnesium

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

Sodium

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

Sulphates

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

Chlorides

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

Iron

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

Hardness

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

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

Analyses of Water Samples from the Municipality of Wellington, No. 97, 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.	Alka-linity	CaO	MgO	SO_4	Na_2O	Solids	$CaCO_3$	$CaSO_4$	$MgCO_3$	$MgSO_4$	Na_2CO_3	Na_2SO_4	NaCl	
1.	NE.	8	10	13	2	12	11,628										11,628		(2)		(3)	(4)	(1)	(5)	≠1
2.	SE.	11	10	13	2	20	1,146	(Bacteria content high)									1,146		(2)		(4)	(3)	(1)	(5)	≠1
3.	NE.	18	10	14	2	20	5,520	2,800	2,800		194	85	630	432	2,977	702	4,475	85	1,414		1,436		1,220	320	≠1
4.	NE.	30	10	15	2	28	2,200	1,250	1,250		22	130	380	198	1,353	245	2,021	130	746		590		519	36	≠1
5.	NW.	23	12	14	2	35	5,040	1,600	1,600		146	180	190	360	3,091	1,470	4,788	180	216		1,073		3,078	241	≠1

Water samples indicated thus, ≠ 1, are from glacial drift.
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 and 2, by Provincial Analyst, Regina.
For interpretation of this table read the section on Analyses and Quality of Water.

Water from the Unconsolidated Deposits

The results of analyses of samples of water from five wells in the municipality are given in the table of analyses. The depth of the deepest well is 35 feet and all the wells derive their water from an aquifer in the upper part of the glacial drift.

The total dissolved content of the samples varies widely, the least amount being 1,146 parts per million in one sample, and the greatest amount being 11,628 parts per million in another. The major constituents of the total solid content of the samples analysed are the sulphates of calcium, sodium, and magnesium. The carbonates are either present in very small quantities or they are absent. The two salts, Na_2SO_4 and $MgSO_4$, produce the objectionable and harmful laxative effects that result from the use of the water from almost all wells in the municipality. Generally speaking, three-quarters of the total solid content is made up of these two salts.

$MgSO_4$, (Epsom Salts), produces a high purgative effect on man and if it is present in amounts exceeding approximately 1,000 parts per million, it also may affect stock in the same manner. Epsom Salts impart a bitter taste to water and also cause permanent hardness, that is, the hardness of the water cannot be reduced by boiling.

Na_2SO_4, (Glauber's Salt), is sometimes termed "white alkali". In small amounts it is tasteless, but in the high quantities found in water from this municipality it gives a rather sweet or flat taste to the water. Glauber's Salt in water produces a laxative effect which is not so strong as that produced by Epsom Salts. Since both $MgSO_4$ and Na_2SO_4 occur in large amounts in the same water the result is a purging effect making the water unfit for consumption. Whether water has a bitter or flat, stale taste depends on the relative amounts of $MgSO_4$ and Na_2SO_4 contained in it.

$CaSO_4$, the third sulphate salt, produces no harmful effect on the human system. Combined with $MgSO_4$ it makes water permanently hard. It is tasteless and imparts no laxative effect.

Small amounts of NaCl, common salt, are contained in the water from these wells. Occasionally a well located in the municipality yields water that is described as salty. An excess of approximately 400 parts per million of NaCl will give this result. NaCl in small quantities is harmless, but large quantities of it in drinking water make it impossible to quench one's thirst. Horses especially will drink too much of it after working, and thus are apt to injure themselves.

Strongly "alkaline" water which is so common in this municipality should always be looked upon with suspicion because it may have a high content of chlorine or ammonia. Urine of man and animals contains a high percentage of chlorine, and ammonia occurs in sewage. High amounts of either chlorine or ammonia suggests possible contamination.

The well in the SE. $\frac{1}{4}$, sec. 11, tp. 10, range 13, was condemned by the analyst because it contained water with a high bacteria content. Bacteria including colon bacillus occur in intestinal discharges of both men and animals. Water-borne diseases, such as typhoid fever, cholera, and dysentery, are the direct result of the presence of colon bacillus in abundance in drinking water. A few wells were reported in which the water was covered by an oily scum and which gave off a bad odour. The oily scum consisted of volatile constituents given off by minute, freshwater algae, which, on evaporation, produce the odour. The oily scum may also be an indication of pollution by organic matter.

Many wells in the municipality were reported as supplying water with an iron content. Very small quantities of iron will impair the taste and appearance of water; $\frac{1}{2}$ a part per million is noticeable. Water containing iron is clear when it is first drawn,

but it soon becomes cloudy after standing owing to the absorption of oxygen from the air and the consequent conversion of the soluble ferrous salt into ferrous hydroxide. This substance settles out as a rusty, red sediment. Water containing iron is particularly objectionable when it is used for laundry purposes, because it stains linen. Aeration, or long standing, will reduce the iron content and precipitation of the red sediment will be hastened by the addition of limewater.

All the wells shown on the table of analyses should be condemned for domestic usage. The well in the SE. ¼, sec. 11, tp. 10, range 13, was already analysed for bacteria and it was condemned. The remaining samples have not been examined for colon bacillus, but the high proportion of $MgSO_4$ makes the water unfit for house use. The well water in the NE. ¼, sec. 8, tp. 10, range 13, has a total dissolved content of 11,628 parts per million. This water should not be used even for stock. The high amounts of mineral salts contained in the water make it undesirable and even harmful for irrigation purposes.

This municipality contains a large number of wells that yield strongly "alkaline" water. It is recommended that the water be sent to the Provincial Analyst, Regina, Saskatchewan, and passed by him before it is used for domestic purposes. The water should be tested for bacteria content as well as for dissolved mineral salts.

Water from the Bedrock Formation

There is no well in the municipality that produces water from the Marine Shale Series. Fourteen dry holes are definitely known to have penetrated the bedrock formation in this municipality. On very rare occasions drilled wells do strike a water-bearing horizon in the Marine shale. The water obtained is extremely high in dissolved mineral solids, which makes it useless for any farm purpose. A total dissolved solid content in excess of 4000 parts per million is to be expected of which 20 per cent is usually NaCl (common salt) and the remaining content generally consists of

$MgSO_4$ (Epsom Salts) and Na_2SO_4 (Glauber's Salt). An excess of 500 parts per million of NaCl will make water unsuitable for drinking purposes, and such high quantities of $MgSO_4$ and Na_2SO_4 would produce purgative effects that would prevent its use even for stock.

WELL RECORDS—RURAL MUNICIPALITY OF WELLINGTON, NO. 97, SASKATCHEWAN.

WELL No.	LOCATION					TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE		PRINCIPAL WATER-BEARING BED			CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
	¼	Sec.	Tp.	Rge.	Mer.				Above (+) Below (−) Surface	Elev.	Depth	Elev.	Geological Horizon				
1	SW.	2	10	13	2	Dug	20	1,969					Glacial sand	Heavily "alkaline"		N	Too "alkaline" for use.
2	SE.	3	"	"	"	"	18	1,966	- 5	1,961			" "	Hard		D, S	Sufficient for house and 5 head stock.
3	SW.	3	"	"	"	"	15	1,973	- 10	1,963			" gravel	Soft		D, S	" " 20 head stock.
4	SE.	4	"	"	"	"	25	1,972	- 18	1,954			" fine sand	Hard, "alkaline"		D, S	" " 30 " " .
5	SW.	5	"	"	"	"	16	1,998	- 8	1,990	14	1,984	" sand	Hard, bitter, "alkaline"		S	Abundant supply for 14 head stock.
6	NE.	5	"	"	"	"	18	1,992	- 16	1,976	15	1,977	" "	" , hard		D	Yields 1 barrel a day.
7	NW.	7	"	"	"	"	13	1,976	- 8	1,968			" coarse sand	Hard, slightly "alkaline"		D, S	Sufficient for at least 17 head stock.
8	SW.	8	"	"	"	"	16	1,974	- 13	1,961	12	1,962	" "	Hard, slightly "alkaline"		D	Neighbours haul ⅓ tank a day.
9	NE.	8	"	"	"	"	12	1,969	- 6	1,963	8	1,961	" "	Hard, "		D, S	Sufficient for 20 head stock. #
10	NW.	10	"	"	"	"	22	1,972					" clay	"		D	" " house only.
11	SE.	11	"	"	"	"	20	1,978	- 17	1,961	17	1,961	" red sand	", slightly "alkaline"		S	Abundant supply for 15 head stock. #
12	NE.	11	"	"	"	"	20	1,973					"			N	Dry hole.
13	SW.	12	"	"	"	"	12	1,974	- 8	1,966			" fine sand	Hard, iron		D, S	Good supply for 15 head stock; neighbours haul from well.
14	NE.	14	"	"	"	Drilled	200	1,972					Bedrock Marine shale			N	Dry hole.
15	NW.	15	"	"	"	Dug	18	1,980	0	1,980			Glacial	Hard		D	Seepage drived from dugout.
16	NW.	16	"	"	"	"	15	1,972	- 5	1,967			" fine sand	"		D	Intermittent supply.
17	SE.	17	"	"	"	"	16	1,974	- 13	1,961			" sand	"		D	" " .
18	SW.	17	"	"	"	"	18	1,969	- 8	1,961	10	1,959	" "	"		S	Sufficient for 5 head stock only. 115 foot bored; dry hole in bedrock Marine shale.
20	NE.	18	"	"	"	"	18	1,966					" yellow clay	", "alkaline"		N	Intermittent supply; well not used. 110 foot bored dry hole in bedrock Marine shale.
21	NW	21	"	"	"	"	13	1,974	- 3	1,971	5	1,969	" sand	"		D,	Sufficient for house only.
22	NW.	22	"	"	"	"	16	1,973	- 8	1,965			" "	"		D	" " " " .
23	NE.	23	"	"	"	"	20	1,987	- 15	1,972			" gravel	" , iron		D, S	Intermittent supply; waters 20 head stock in wet years.
24	NW.	24	"	"	"	"	30	1,978					"	", "alkaline"		N	Too "alkaline" for use.
25	NE.	25	"	"	"	"	21	1,999	- 10	1,989			"	", " , bitter		N.	Quality of water prohibits use.
26	SE.	26	"	"	"	"	30	1,991	- 25	1,966			" clay	Hard, bitter, "alkaline", oily scum		S	Waters only 14 head stock.
27	SW.	27	"	"	"	"	30	1,981	- 12	1,969			" sand	Hard, "alkaline"		S	Sufficient for 50 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 WELLINGTON, NO. 97, SASKATCHEWAN.

WELL No.	LOCATION					TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE		PRINCIPAL WATER-BEARING BED			CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
	¼	Sec.	Tp.	Rge.	Mer.				Above (+) Below (−) Surface	Elev.	Depth	Elev.	Geological Horizon				
28	SW.	28	10	13	2	Dug	12	1,969	- 4	1,965	4	1,965	Glacial fine sand	Hard,		D, S	Waters 40 head stock.
29	SW.	29	"	"	"	"	16	1,970	- 8	1,962			"	Soft		S	Seepage water from a dugout.
30	SW.	30	"	"	"	"	20	1,958	0	1,958			"	"		D, S	Sufficient for 15 head stock.
31	NE.	32	"	"	"	"	12	1,990	- 7	1,983			" "	"		D	Intermittent supply.
32	NW.	34	"	"	"	"	30	1,950					"	Hard, salty, "alkaline"		N	Well too "alkaline" for use.
34	NW.	36	"	"	"	"	30	1,968	- 24	1,944			" clay	Soft		D	Barely enough for house use.
1	SE.	4	"	14	"	"	14	1,955	- 8	1,947	14	1,941	" "	Hard "alkaline"		D	Sufficient for house only.
2	SW.	7	"	"	"	"	15	1,927					" ", sand	" "		D, S	" " 15 head stock.
3	SE.	8	"	"	"	"	14	1,940	- 9	1,931	10	1,930	" sand	Soft		D, S	" " 17 " " in winter.
4	NE.	8	"	"	"	"	14	1,950	- 5	1,945			" clay	Hard, iron		D	Intermittent supply.
5	SW.	10	"	"	"	"	9	1,948	0	1,948	4	1,944	" gravel	Medium soft		D, S, M	Municipal well; abundant supply.
6	NE.	10	"	"	"	"	25	1,958	- 14	1,944	14	1,944	" sand	Hard		D, S	Waters 4 head stock only.
7	NE.	11	"	"	"	"	12	1,958	- 10	1,948	12	1,946	" "	Soft		D, S	" 25 " " .
8	NW.	12	"	"	"	"	18	1,959	- 8	1,951	11	1,948	" "	Hard, slightly "alkaline"		D, S	Sufficient for 40 head stock except in the winter.
9	SE.	13	"	"	"	"	25	1,969					" blue sand	Hard, salty, iron "alkaline"		N	Water condemned by analyst
10	SW.	14	"	"	"	"	18	1,984	- 16	1,968	16	1,968	" quicksand	Hard, " , salty		S	Abundant supply for 35 head stock.
11	NE.	14	"	"	"	"	16	1,963	- 6	1,957	15	1,948	" sand	Hard, iron, oily scum		S	Waters 60 head stock; water is brownish.
12	SE.	16	"	"	"	"	14	1,973	- 2	1,971			" clay	Hard		D	Intermittent well.
13	NW.	17	"	"	"	"	14	1,957					"	", slightly "alkaline"		D, S	Waters 10 head stock.
14	SW.	18	"	"	"	"	12	1,928					"	Hard, iron		D	Sufficient for house only.
15	NE.	18	"	"	"	"	20	1,935	- 10	1,925	9	1,926	" sand	", slightly "alkaline"		S	" " 10 head stock only; #.
16	SW.	19	"	"	"	"	18	1,948	- 8	1,940			" "	Hard,		D, S	140 foot dry hole in bedrock Marine shale Seepage water from dugout.
17	NE.	21	"	"	"	"	25	1,950					"	Heavily "alkaline"		N	Water quality prohibits use.
18	SE.	22	"	"	"	"	14	1,975	- 5	1,970	7	1,968	" "	Hard		D, S	Will water 15 head stock.
19	SW.	22	"	"	"	"	24	1,965	- 16	1,949			"	" , iron		D, S	Intermittent well.
20	SE.	26	"	"	"	"	14	1,950					"	Heavily "alkaline"		N	Cannot be used. Water is too mineralized.
21	SW.	26	"	"	"	"	20	1,950								N	Dry hole.

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

WELL RECORDS—RURAL MUNICIPALITY OF WELLINGTON, NO. 97, 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
22	SW.	28	10	14	2	Dug	12	1,947	- 9	1,938	6	1,941	Glacial yellow sand	Hard, iron, "alkaline"		D	Not used at present; will need cleaning.
23	SE.	30	"	"	"	"	20	1,961	- 17	1,944			"	very hard, "alkaline"		N	Water condemned by analyst.
24	NE.	30	"	"	"	"	14	1,965	- 8	1,957			" sand	Hard		N	Intermittent supply.
25	SW.	32	"	"	"	"	13	1,928	- 3	1,925	3	1,925	" "	Soft, sweet taste		D, S	Abundant supply; neighbours haul 1 tank a day.
26	NE.	35	"	"	"	"	14	1,982	- 11	1,971			" yellow clay	Hard, bitter, very a "alkaline"		S	Intermittent supply; water makes stock sick.
27	SW.	36	"	"	"	"	18	1,950					"	Hard, heavily "alkaline"		N	Quality of water prohibits use.
28	NE.	36	"	"	"	"	30	1,985	- 26	1,959	30	1,955	" clay	Soft, " , salty		N	Only waters 10 head stock.
1	SW.	1	10	15	2	Bored Re-dug	25	1,906	- 18	1,888			"	Hard		D, S	Will water 25 head stock.
2	NE.	1	"	"	"	Bored	17	1,933	- 12	1,921	13	1,920	" sand	"		D	Used for house only.
3	NW.	2	"	"	"	Dug	21	1,881	- 7	1,874			"	", slightly "alkaline"		D, S	Waters 20 head stock.
4	NE.	2	"	"	"			1,900								N	No well. No dry holes.
5	SW.	3	"	"	"	"	16	1,869	- 6	1,863	5	1,864	" "	Medium hard		D	House use only.
6	NE.	3	"	"	"	"	60	1,895					"			N	Dry hole.
7	SW.	4	10	15	2	"	16	1,863	- 4	1,859			" yellow clay	Hard		D, S	Seepage water from dugout.
8	SE.	6	"	"	"	Bored	48	1,890	- 39	1,851			" quicksand	Very hard, bitter, iron, "alkaline"		D, S	Abundant supply for 30 head stock; laxative.
9	SW.	6	"	"	"	Dug	28	1,879	- 20	1,859			"	" , bitter, hard, oily scum, bad odour		S	" " " 10 " " .
10	NW.	6	"	"	"	"	32	1,881	- 24	1,857	28	1,853	" quicksand	Very hard, slightly "alkaline", sweet		D, S	" " " 20 " " ;laxative.
11	SW.	7	"	"	"	"	29	1,891	- 25	1,866	25	1,866	" "	Hard, iron, "alkaline"		D, S	Sufficient for 60 head stock; laxative.
12	NW.	8	"	"	"	" & Bored	85	1,879					Bedrock Marine shale			N	Dry hole.
13	NE.	8	"	"	"	Dug	65	1,882					Bedrock Marine shale			N	" " .
14	SE.	10	"	"	"	"	100	1,900					Bedrock Marine shale			N	" " .
15	SE.	12	"	"	"	"	12	1,931	- 6	1,925	10	1,921	Glacial gravel	Hard "alkaline"		S	Abundant supply.
16	NW.	12	"	"	"	"	16	1,912	- 4	1,908			" clay	Soft, "		D, S	Intermittent supply.
17	NW.	13	"	"	"	"	15	1,937					" sand	Heavily "alkaline"		N	Quality of water prohibits use.

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

WELL RECORDS—RURAL MUNICIPALITY OF WELLINGTON, NO. 97, SASKATCHEWAN.

WELL No.	LOCATION					TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE		PRINCIPAL WATER-BEARING BED			CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
	¼	Sec.	Tp.	Rge.	Mer.				Above (+) Below (−) Surface	Elev.	Depth	Elev.	Geological Horizon				
18	SE.	14	10	15	2	Dug	18	1,920	- 12	1,908			Glacial yellow clay	Hard, iron		D, S	Seepage water from a dugout.
19	NE.	14	"	"	"	"	14	1,924	- 6	1,918			" "	"		D, S	" " " " " .
20	NW.	17	"	"	"	"	30	1,893					"			N	Dry hole.
21	NW.	18	"	"	"	Drilled	450	1,889					Bedrock Marine shale			N	" " .
22	NW.	19	"	"	"	Dug	108	1,891					" Marine shale			N	" " .
23	NE.	22	"	"	"	"	22	1,924	- 17	1,907			Glacial gravel	Hard, "alkaline"		D, S	Will water 65 head stock.
24	NE.	24	"	"	"	"	18	1,949	- 2	1,947			" "	" "		D, S	" " 26 " " .
25	SW.	26	"	"	"	"	35	1,907					"			N	Dry hole.
26	NW.	26	"	"	"	"	20	1,900					"	Very "		N	Quality of water prohibits use.
27	SE.	27	"	"	"	"	20	1,905	- 10	1,895			" clay	Hard		D, S	Will water 8 head stock only.
28	SE.	28	"	"	"	"	28	1,910	- 12	1,898			" "	"		D, S	Intermittent supply.
29	SE.	30	"	"	"			1,892								N	No well; dry holes.
30	NE.	30	"	"	"	"	28	1,892	- 22	1,870	26	1,866	" sand	" , bitter, "alkaline"		S	Provides 2 barrels a day; stock refuse it; #.
31	NW.	32	"	"	"	"	20	1,906					"	Hard		N	Well not used at present.
32	SE.	33	"	"	"	"	22	1,916	- 5	1,911			"	", "alkaline"		D	Intermittent supply; laxative.
33	NW.	34	"	"	"	"	18	1,939	- 13	1,926			"	", slightly "alkaline"		D	Sufficient for house only.
34	NW.	36	"	"	"	"	10	1,947					"			N	Dry hole.
35	NE.	36	"	"	"	"	12	1,949	- 6	1,943	11	1,938	" gravel	Soft		D, S	Waters 36 head stock.
1	SW.	16	11	13	"	"	20	1,978	- 13	1,965	16	1,962	" sand	Hard		D, S	" 65 " " .
2	SW.	21	"	"	"	"	25	1,983					" clay	Soft		D, S	Used mostly for house.
3	SE.	22	"	"	"	Bored	58	1,991					"			N	Dry hole.
4	NW.	22	"	"	"	Dug	15	1,990					" yellow clay, sand	Hard, slightly "alkaline"		D	Intermittent well.
5	NW.	24	"	"	"	Bored	30	1,991	- 10	1,981			Glacial yellow clay	Very hard, "alkaline", flat taste		D	Sufficient for house use only.
6	SE.	25	"	"	"			1,994								N	No well; dry holes.
7	NE.	26	"	"	"			1,982								N	" " ; " " .
8	SE.	30	"	"	"	Dug	13	1,982	- 11	1,971	16	1,966	Glacial clay	Hard, iron, "alkaline"		D, S	Poor supply.

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(#) Sample taken for analysis.

WELL RECORDS—RURAL MUNICIPALITY OF WELLINGTON, NO. 97, 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
9	SW.	30	11	13	2	Dug	20	1,996	- 19	1,977			Glacial clay	Hard, very "alkaline"		S	Poor supply; water only used for cattle and horses.
10	SW.	32	"	"	"	"	11	1,974	- 5	1,969	4	1,970	" sand	Hard		D, S	Poor supply.
1	SE.	2	11	14	2	"	16	1,952	- 10	1,942			" sand	", "alkaline"		S	Will water 10 head stock.
2	SE.	3	"	"	"	"	18	1,952	- 13	1,939			"	", very "alkaline"		N	Cannot be used for stock.
3	SE.	4	"	"	"	"	12	1,958	- 8	1,950			" "	", "		S	Will water 15 head stock.
4	NW.	4	"	"	"	"	10	1,949	- 7	1,942			" "	Very hard, "alkaline", flat taste		D	Well in hamlet of Cedoux. Sufficient for 10 families.
5	NE.	4	"	"	"	"	16	1,951	0	1,951			" gravel	Soft		D	Seepage from dugout.
6	NE.	5	"	"	"	"	15	1,946	- 6	1,940	9	1,937	" clay	Hard, "alkaline"		D, S	Intermittent well.
7	SE.	6	"	"	"	"	14	1,948	0	1,948			" "	Soft, "alkaline"		D	Seepage from dugout.
8	NE.	6	"	"	"	"	16	1,945	- 12	1,933	15	1,930	" sand	Hard, bitter, "alkaline"		D, S	Sufficient for 14 head stock; laxative.
9	SW.	7	"	"	"	"	16	1,942	- 12	1,930	5	1,937	" "	Hard		D	" " house only.
10	NE.	7	"	"	"	"	25	1,950					"			N	Dry hole.
11	SW.	10	"	"	"	"	22	1,965	- 7	1,958	11	1,954	" "	"		D, S	Poor supply.
12	SE.	11	"	"	"	"	20	1,973					" clay	"		D, S	Seepage water from dugout.
13	SW.	11	"	"	"	"	15	1,970					"	", "alkaline"		D, S	Water causes sickness if taken in great amount.
14	NW.	11	"	"	"	"	22	1,973	- 12	1,961	15	1,958	" "	"		D	Intermittent supply.
15	SW.	13	"	"	"	"	16	1,966	- 12	1,954			"	Very hard, "alkaline", iron, bitter		D, S	Sufficient for 20 head stock.
16	SW.	15	"	"	"	"	19	1,983	- 9	1,974	10	1,973	" ", sand	Hard, slightly "alkaline"		D, S	Poor supply.
17	NW.	15	"	"	"	"	17	1,976	- 9	1,967	16	1,960	" clay	Hard, "		D	Intermittent well.
18	SW.	16	"	"	"	"	14	1,953	- 6	1,947	12	1,941	" ", gravel	", slightly "alkaline"		D	Sufficient for house use only.
19	SE.	17	"	"	"	"	21	1,953	- 10	1,943	17	1,936	" clay	Hard, "alkaline"		S	Well goes dry in winter.
20	SE.	18	"	"	"	"	23	1,936					" "	" , iron, "alkaline"		D	Sufficient supply for house only.
21	NE.	18	"	"	"	"	16	1,935	- 4	1,931	4	1,931	" sand	Hard, slightly "alkaline" yellowish		D, S	Intermittent well.
22	SW.	19	"	"	"	"	20	1,946	0	1,946			" ", clay	Soft, iron		D	House use only.
23	SW.	20	"	"	"	"	14	1,934	- 9	1,925			"	Hard, slightly "alkaline"		D	" " " .

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(#) Sample taken for analysis.

WELL RECORDS—RURAL MUNICIPALITY OF WELLINGTON, NO. 97, 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
24	NE.	20	11	14	2	Dug	14	1,948	- 10	1,938	10	1,938	Glacial clay	Hard, alkaline"		S	Intermittent well.
25	SW.	21	"	"	"	"	22	1,955	- 6	1,949			" ", sand	" , slightly "alkaline"		D, S	Sufficient for 10 head stock.
26	NW.	23	"	"	"	"	18	1,989	- 10	1,979	16	1,973	" "	Hard, slightly "alkaline"		D	" " house only.
27	NE.	24	"	"	"	"	10	1,954					" yellow clay	Hard		D, S	Seepage water from dugout.
28	SE.	26	"	"	"	"	24	1,990	- 18	1,972	18	1,972	"	" , very "alkaline"		N	Well not used.
29	NE.	28	"	"	"	"	30	1,961	- 7	1,954			" clay, sand	Hard, slightly "alkaline"		D, S	Waters about 25 head stock.
30	NE.	26	"	"	"	"	14	1,974	- 8	1,966	14	1,960	" sand, gravel	Hard, sweet		D, S	Abundant supply for 27 head stock.
31	NE.	30	"	"	"	"	18	1,947	- 14	1,933	12	1,935	" "	", alkaline" little iron		D, S	Intermittent well.
32	SE.	31	"	"	"	Bored	30	1,954	- 7	1,947			"	Hard, alkaline"		S	Stock do not like the water.
33	SE.	32	"	"	"	Dug	18	1,951	- 10	1,941			" clay	" "		D, S	Waters 10 head stock.
34	NW.	33	"	"	"	"	14	1,957	- 10	1,947			"	", slightly "alkaline"		D	House use only.
35	SW.	35	"	"	"	"	15	1,985	- 5	1,980			" sand	Hard, slightly "alkaline"		D, S	Waters 40 head stock.
36	NW.	35	"	"	"	"	18	1,987	0	1,987			" "	Hard, "		N	Cribbing to be replaced.
37	NE.	36	"	"	"	"	30	1,973	- 5	1,968	30	1,943	" gravel	Soft		D	House use only.
1	SW.	1	11	15	2	Dug	16	1,944					" yellow clay	"		D	Seepage derived from dugout.
2	SE.	2	"	"	"	"	16	1,941	- 7	1,934	16	1,925	" sand	"		D	Sufficient for house use.
3	NW.	2	"	"	"	Bored	15	1,940	- 13	1,927	10	1,930	" yellow clay	Hard, slightly "alkaline"		D	Intermittent supply.
4	SW.	4	"	"	"	Dug	22	1,914	0	1,914	20	1,894	" clay	Very hard, slightly "alkaline" bitter.		D, S	Sufficient for 10 head stock; laxative.
5	NW.	4	"	"	"	"	20	1,918	- 10	1,908			"	Very hard, "alkaline", sweet		D, S	" " 10 " " : " .
6	NE.	7	"	"	"	W	26	1,920	- 6	1,914			" sand, gravel	Hard, little "alkaline"		D, S	Seepage water from dugout.
7	NW.	8	"	"	"	W	16	1,918					"	Hard, very "alkaline"		N	Quality of water prohibits use.
8	SW.	10	"	"	"	"	22	1,936	- 10	1,926	11	1,925	"	Hard, little "alkaline"		D, S	Sufficient for 20 head stock.
9	NW.	10	"	"	"	"	22	1,940	- 4	1,936			" clay	Hard, very "alkaline," iron		S	Waters 8 head stock.
10	SE.	12	"	"	"	"	14	1,945	- 6	1,939			" "	Hard, bitter, "alkaline"		S	Intermittent well.
11	SE.	13	"	"	"	"	16	1,938	- 11	1,927	11	1,927	" sand	" , hard		D, S	Waters 30 head stock.
12	NE.	15	"	"	"	Drilled	150	1,926					Bedrock Marine shale			N	Dry hole.

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(#) Sample taken for analysis.

WELL RECORDS—RURAL MUNICIPALITY OF WELLINGTON NO. 97. SASKATCHEWAN.

WELL No.	LOCATION					TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE		PRINCIPAL WATER-BEARING BED			CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
	¼	Sec.	Tp.	Rge.	Mer.				Above (+) Below (−) Surface	Elev.	Depth	Elev.	Geological Horizon				
13	SE.	16	11	15	2	Test	18	1,933			18	1,915	Glacial sand	Very "alkaline"		N	Water cannot be used.
14	SE.	17	"	"	"	Bored	60	1,932	- 6	1,926	60	1,872	"	Hard, very "alkaline"		N	Well was abandoned on account of the quality of water.
15	NE.	18	"	"	"	Dug	16	1,910					"			N	Dry hole.
16	NE.	19	"	"	"	"	20	1,942	- 16	1,926			"	" , "		S	Will water 26 head stock.
17	NE.	20	"	"	"	"	17	1,946	- 4	1,942	4	1,942	" sand	" , salty, "alkaline"		S	" " 20 " " .
18	NW.	21	"	"	"	"	12	1,928	0	1,928			" clay	Hard, slightly "alkaline"		D	Intermittent supply; seepage from slough.
19	NE.	21	"	"	"	"	25	1,932								N	Dry holes.
20	SE.	22	"	"	"	"	16	1,922	- 9	1,913			" sand	Hard, " , bad odour		D, S	Supplies 1 barrel a day; laxative effect on man
21	NW.	22	"	"	"	"	18	1,918					"	Hard "alkaline"		N	Water has been contaminated.
22	SW.	23	"	"	"	"	15	1,924	- 7	1,917	11	1,913	" clay	" , iron		S	Abundant supply.
23	NE.	27	"	"	"	"	20	1,916	- 12	1,904	18	1,898	" sand	Soft		D	Sufficient for house use.
24	SE.	28	"	"	"	"	19	1,912	- 5	1,907			"	Hard "alkaline"		D	" " " " .
25	NE.	29	"	"	"	"	24	1,910	0	1,910			"	" " iron		D	Supplies ½ tank a day in dry years.
26	SW.	30	"	"	"	"	20	1,939	- 10	1,929	10	1,929	" brown clay	Hard, " a little, sweet		S	" " " " " .
27	NE.	31	"	"	"	"	18	1,906	- 3	1,903	8	1,898	" sand, "	Hard		D, S	Waters 10 head stock.
28	SE.	32	"	"	"	"	18	1,909	- 4	1,905	18	1,891	" clay	"		D, S	" 15 " " .
29	NW.	32	"	"	"	"	12	1,907	- 2	1,905			" "	" , slightly "alkaline"		D	Well goes dry every winter.
30	SE.	33	"	"	"	"	20	1,930	- 15	1,915			" gravel	", very hard bitter		S	Well used very little on account of poor quality
31	SE.	34	"	"	"	Bored	63	1,935					" sand	Very hard, " , "alkaline", Hard, bitter		N	" has been abandoned.
32	SW.	34	"	"	"	Dug	14	1,934	- 4	1,930	12	1,922	" green sand	"		D	Sufficient for house use.
33	NE.	34	"	"	"	"	35	1,935	- 16	1,919	16	1,919	" clay	" , "alkaline" iron		S	" " 30 head stock.
34	SW.	35	"	"	"			1,930								N	Dry holes; no well.
35	SE.	36	"	"	"	"	35	1,945	- 10	1,935	8	1,937	"	Hard, very "alkaline", bitter		S	Sufficient for 15 head stock.
1	SE.	4	12	13	2	"	13	1,988	- 5	1,983	8	1,980	" quicksand	Soft, slightly "alkaline"		D, S	Barely enough for 20 head stock.
2	NW.	4	"	"	"	"	15	1,988					" sand	Soft		D, S	Sufficient " 25 " " .
3	SW.	5	"	"	"	"	18	1,991	- 14	1,977	17	1,974	" quicksand	Hard, little "alkaline", sweet		D, S	Supplies 5 pails a day in winter.

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

WELL RECORDS—RURAL MUNICIPALITY OF WELLINGTON, NO. 97, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
4	NE.	5	12	13	2	Dug	22	1,975	- 12	1,963			Glacial gravel	Soft		D, S	Insufficient for local needs.
5	NE.	8	"	"	"	"	26	1,986	- 16	1,970			" yellow clay	Very hard, "alkaline"		D, S	Waters 8 head stock; laxative.
6	NE.	17	"	"	"	"	25	1,995	- 18	1,977			" sand	Hard		D	House use only.
7	SE.	18	"	"	"	"	8	1,985	- 2	1,983			"	Soft		D, S	Watered 200 head stock in 1935.
8	NW.	18	"	"	"	"	25	1,990					" "	"		D, S	Supplies 5 tanks a day in winter.
9	NW.	21	"	"	"	"	14	1,992	- 11	1,981	10	1,982	" blue sand	Hard, slightly "alkaline"		S	Sufficient for 50 head stock.
10	NW.	22	"	"	"	Sand point	8	1,985			7	1,978	" sand	Hard		D	Abundant supply.
11	NE.	25	"	"	"	Dug	14	2,013					"			N	Dry hole.
12	NW.	26	"	"	"	"	12	2,008	- 7	2,001			" "	" , bitter, "alkaline"		D, S	Sufficient for 35 head stock; laxative. effect on man.
13	NW.	27	"	"	"	"	14	1,992	- 4	1,988	3	1,989	" "	Soft		D, S	Cannot be pumped dry.
14	SE.	28	"	"	"	"	16	1,985	- 12	1,973			" ",gravel	"		D, S	Sufficient for 50 head stock.
15	NW.	28	"	"	"	"	16	1,983	- 7	1,976	7	1,976	" "	Hard, iron			C.P.R. well. Water used for locomotives.
16	NE.	28	"	"	"	"	18	1,983	- 9	1,974			" "	Soft, flat taste		D, S	Sufficient for 50 head stock.
17	SE.	30	"	"	"	"	17	1,982					" fine sand	Hard		S	" " 12 " " .
18	SE.	31	"	"	"	"	14	1,986	- 7	1,979			" sand	" ,"alkaline"		D, S	Good supply; rapid seepage.
19	NE.	31	"	"	"	"	18	1,987	- 10	1,977			" quicksand	",slightly "alkaline"		D	House use only.
20	SE.	32	"	"	"	"	52	1,986					" sand	",iron		D, S	Waters 12 head stock.
21	NW.	32	"	"	"	"	16	1,983					"	", "		D, S	" 15 " " .
22	NE.	32	"	"	"	Sand point	12	1,998	- 8	1,990	8	1,990	" quicksand	"		S	" 25 " " .
23	SW.	33	"	"	"	Sand point	12	1,998	- 8	1,990	8	1,990	" "	Medium hard		D	Abundant supply; village of Tyvan.
24	NW.	36	"	"	"	Dug	10	2,030					"	Hard, cloudy		S	Intermittent.supply.
1	SW.	3	12	14	2	Dug	30	1,995					" sand	" ," alkaline"		D, S	Sufficient for 25 head stock.
2	SW.	4	"	"	"	"	18	1,992	- 9	1,983	8	1,984	" "	Soft		D, S	" " 16 " " .
3	NE.	5	"	"	"	"	20	1,991	- 13	1,978			" gravel	Hard, little "alkaline",iron, flat taste		D, S	" " 15 " " ;fast seepage.
4	NE.	11	"	"	"	"	18	1,973					" sand			N	Dry hole.
5	NE.	12	"	"	"	"	20	1,973	- 6	1,967	12	1,961	" gravel	Hard, bitter, "alkaline"		S	Yields 5 barrels a day. 500 foot dry hole in bedrock Marine shale.
6	NE.	13	"	"	"	"	10	1,982	- 7	1,975	8	1,974	" sand	Soft		D, S	Intermittent well.

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(#) Sample taken for analysis.

WELL RECORDS—RURAL MUNICIPALITY OF WELLINGTON, NO. 97, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
7	SE.	14	12	14	2	Dug	24	1,975					Glacial sand, clay	Hard		D, S	Insufficient for local needs.
8	NE.	15	"	"	"	"	20	1,998	- 10	1,988			"	Very hard, slightly "alkaline"		D,	Water used for house only.
9	NE.	17	"	"	"	"	14	1,985	0	1,985			" yellow clay, sand	Hard, "alkaline" iron, cloudy		S	Seepage water from dugout.
10	NE.	18	"	"	"	"	18	1,965					"			N	No well; dry holes.
11	NE.	20	"	"	"	"	10	1,990	- 8	1,982	8	1,982	" "	Hard, very "alkaline"		N	Quality of water prohibits use.
12	NW.	23	"	"	"	"	35	1,980	- 12	1,968			"	Very hard, "alkaline", iron, bitter, cloudy		N	Water unfit for use although abundant supply; #.
13	SE.	24	"	"	"	"	30	1,970					"	Hard		D, S	Insufficient for 25 head stock in dry years.
14	NE.	24	"	"	"	"	28	1,978	- 16	1,962	25	1,953	" gravel	" , slightly "alkaline"		S	Waters about 5 head stock. 90 foot bored dry hole.
15	NW.	25	"	"	"	"	16	1,990	- 11	1,979	11	1,979	" sand	Hard, slightly "alkaline", iron		D	House use only.
16	SW.	26	"	"	"	"	17	1,979	- 14	1,965			" "	Hard		D	" " " .
17	NE.	27	"	"	"	"	28	1,985	- 14	1,971			" "	", brown sediment, iron		D, S	Sufficient for 20 head stock.
18	NW.	28	"	"	"	"	14	1,993	- 3	1,990	6	1,987	" clay	Soft, slightly "alkaline"		D	House use only.
19	NW.	33	"	"	"	"	18	1,998	- 9	1,989	9	1,989	" quicksand	Hard		D, S	Sufficient for 15 head stock; fast seepage.
20	NW.	34	"	"	"	Bored, redug	40	1,977	- 20	1,957	38	1,939	" gravel	", "		S	Waters 40 head stock; very laxative effect on man.
21	SE.	36	"	"	"	Dug	15	1,962	- 7	1,955	9	1,953	" white sand	", slightly "alkaline"		D, S	Sufficient for 50 head stock.
1	NW.	1	12	15	2	"	24	1,940	- 15	1,925	24	1,916	" clay, stones	Hard, slightly "alkaline"		D, S	Abundant supply.
2	SE.	2	"	"	"	"	15	1,940	0	1,940	12	1,928	" "	Hard		D, S	Intermittent well.
3	SE.	4	"	"	"	Bored	120	1,935					Bedrock Marine shale			N	Dry hole.
4	SE.	6	"	"	"	Dug	14	1,940	- 9	1,931	11	1,929	Glacial clay	" "alkaline"		D, S	Can be pumped dry; slow seepage.
5	SW.	8	"	"	"	"	24	1,940	- 13	1,927	13	1,927	" sand	", "		D, S	Sufficient for 30 head stock.
6	NE.	9	"	"	"	"	36	1,930	- 26	1,904	16	1,914	" gravel	", "		S	Insufficient for local needs.
7	SW.	10	"	"	"	"	22	1,940	0	1,940	22	1,918	" clay	", " , sulphur		S	Intermittent well.
8	NW.	11	"	"	"	"	25	1,930	+ 3	1,933	4	1,926	" quicksand, gravel	", " , hard, iron		D, S	Has yielded 15 tanks a day in dry years.
9	NW.	12	"	"	"	"	25	1,940	- 22	1,918	24	1,916	" "	"		D, S	Intermittent well; waters 20 head stock in dry years.
10	SE.	14	"	"	"	"	21	1,940	- 18	1,922	20	1,920	" "	"		D, S, I	Waters 15 head stock.

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WELL RECORDS—RURAL MUNICIPALITY OF WELLINGTON, NO. 97, SASKATCHEWAN.

WELL No.	LOCATION					TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE		PRINCIPAL WATER-BEARING BED			CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
	¼	Sec.	Tp.	Rge.	Mer.				Above (+) Below (−) Surface	Elev.	Depth	Elev.	Geological Horizon				
11	NW.	14	12	15	2	Dug	17	1,950	- 15	1,935	17	1,933	Glacial quick-sand	Hard		D	Good supply.
12	SE.	15	"	"	"	"	20	1,930	- 10	1,920	10	1,920	" red clay	","alkaline"		N	Too "alkaline" for use.
13	NE.	16	"	"	"	"	14	1,940					"			N	Dry hole.
14	SW.	16	"	"	"	"	17	1,930	- 7	1,923	10	1,920	" quicksand	",slightly "alkaline"		D, S	Over sufficient supply.
15	NE.	17	"	"	"	"	20	1,930	- 2	1,928	18	1,912	" sand	Soft		D, S	Good supply.
16	NW.	18	"	"	"	"	32	1,920	- 18	1,902	18	1,902	" clay	Hard,"alkaline"		N	Water too "alkaline" for use.
17	NW.	19	"	"	"	"	36	1,920					"			N	Dry hole.
18	NE.	20	"	"	"	Bored	50	1,940	- 38	1,902	50	1,890	" sand	" ,very "alkaline"		N	Well abandoned; water too "alkaline."
19	SW.	24	"	"	"	Dug	40	1,950	- 5	1,945	40	1,910	"	Hard, very "alkaline"		N	Water too "alkaline" for use.
20	NE.	24	"	"	"	Bored	30	1,970	- 18	1,952	28	1,942	" gravel	" ,hard		S	Intermittent well; stock dislike water.
21	SW.	27	"	"	"	Dug	28	1,950	- 22	1,928	24	1,926	" "	Hard,iron		D, S	Sufficient for local needs.
22	SE.	28	"	"	"	"	21	1,940	+ 3	1,943	1	1,939	" quicksand	",slightly "alkaline"		D, S	Abundant supply.
23	NE.	30	"	"	"	Test	45	1,930					"			N	Dry holes.
24	NE.	31	"	"	"	Drilled	40	1,940					"			N	" " .
25	NE.	33	"	"	"	Dug	28	1,970	- 18	1,952	28	1,942	" gravel	Hard,slightly "alkaline"		D, S	Will water 10 head stock.
26	NE.	34	"	"	"	"	35	1,975	- 32	1,943			" "	Hard		D, S	Insufficient in dry years.
27	NW.	36	"	"	"	"	21	2,000	- 11	1,989	21	1,979	",quicksand	",slightly "alkaline"		D, S	Abundant supply.
28	NE.	36	"	"	"	"	20	2,000	- 8	1,992	20	1,980	",sand	Hard,slightly "alkaline"		D, S	Supplies 20 head stock the year round.

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(#) Sample taken for analysis.