GEOLOGICAL SURVEY OF CANADA

DEPARTMENT OF MINES AND TECHNICAL SURVEYS

PAPER 60-22

GROUND-WATER RESOURCES OF PLUM COULEE AREA, MANITOBA

62 H/SW and 62 G/SE (parts of)

(Townships 1 to 6, Ranges 1 to 5 West of Principal Meridian)

(Report, 2 maps and 9 figures)

J. E. Charron

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CANADA

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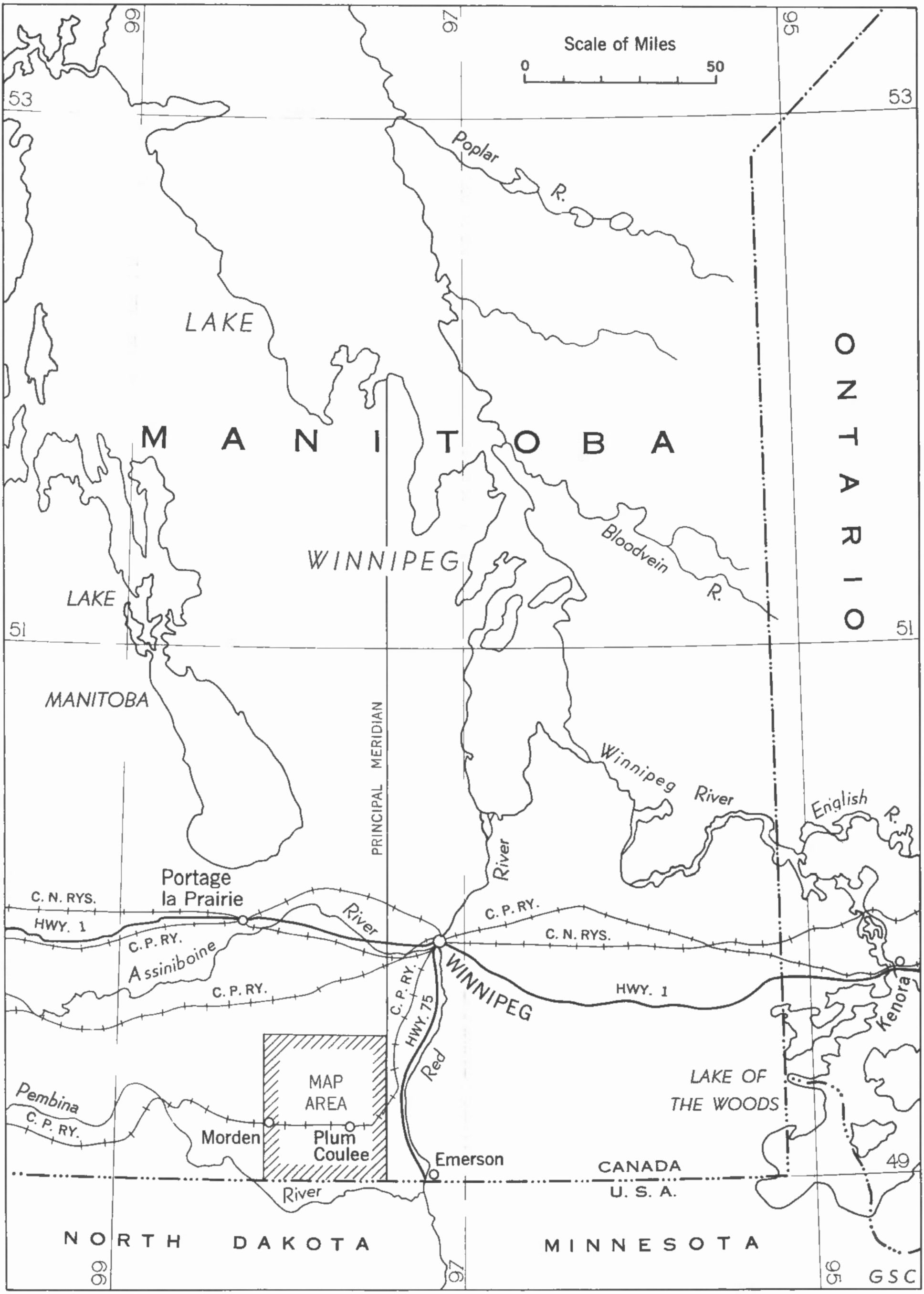

Figure 1. Sketch map showing location of Plum Coulee map area, Manitoba

Chapter I

INTRODUCTION

The Plum Coulee area comprises 30 townships, totalling 1,080 square miles. The work was confined to the area bounded by the principal meridian (approx. long. 97°29') and range 5 west (approx. long. 98°05'), and the International Boundary and township 6 (approx. lat. 49°31'). It covers the municipality of Roland, the southeastern part of Dufferin, the eastern part of Thompson and Stanley, and the western parts of Morris and Rhineland.

Highway 14 crosses the area from east to west, and highways 14A and 32 pass northward from the International Boundary to highway 14. In the western part of the area, highway 3 goes northward from highway 14. A well-developed network of gravel roads and earth roads make any part of the area easily accessible in dry weather. Five railway lines of the Canadian National and Canadian Pacific railways also serve this area.

The economy is entirely agricultural. In the towns, small industrial plants such as canneries and creameries have been developed from the farm produce. The town of Altona has a vegetable oil plant, which treats different varieties of oil seeds.

WATER SUPPLIES

Statistics show the great need for water in this region. The population of the area is approximately 22,000, of which 10,000 live in towns and villages. The following statistics are concerned with the water needs of the 12,000 farm dwellers and their livestock— 22,900 cattle, 32,800 hogs and 650,000 poultry. In compiling an inventory of wells the author visited 2,067 homes including every farm and most homes in the small villages. In the towns, such as Morden (pop. approx. 2,000), information was obtained from the municipal office.

The four means of getting water on a farm in the Plum Coulee area are: (1) a well; (2) a cistern (Even with a well which yields good water, a cistern is needed for soft water, as ordinarily all well water is very hard.); (3) a dugout, which is almost a must for the supply of water for the stock; and (4) hauling from wherever good water is available.

Wells

A total of 1,629 wells were encountered in the 2,067 homes visited. Of these, 1,078 homes (66 per cent) have dug wells, 483 have drilled wells, and 68 have bored wells. Of the homes visited, 355 have more than one well, 1,274 homesteads have only one, and 793 or 38 per cent have none. Of the 1,274 places that have one well, only 785 (62 per cent) are used for domestic purposes. Of the 785 who use their wells for drinking purposes—the water may not necessarily be fit for human consumption, but it is and has been used as such in most cases for many years—some 40 homes (5 per cent) found their wells dry at one time or another in the course of a year, especially in the winter. From these calculations it is significant that only 36 per cent of the places surveyed have a well that can be relied upon to give potable water all year round.

Cisterns

A cistern is a concrete or galvanized tank used to store rain-water collected from the roof of a house or barn. Of the homes visited by the writer, 82 per cent have a cistern of some kind; 1,564 have cement cisterns and 130 have galvanized ones. (This percentage would be much higher if the towns were included.)

Rain-water is not the best drinking water because of its flat taste. If the roof and eaves-troughs are clean, this water should be excellent in comparison to the well water used for drinking purposes in some of the homes.

But cisterns, even though they may alleviate the situation, have their limitations because they depend on precipitation. Meltwater from snow or ice are the most common means of filling a cistern in the winter. If no snow is available, ice is cut from the dug-out and thrown into the cistern, or it is bought and hauled from Morden (Lake Minnewasta) or the Red River, where ice is cut and sold. Thirty-four per cent of those who have cisterns admitted adding snow and 12 per cent admitted putting in ice. The actual percentage may be much higher. Some households use the run-off in the spring to fill their cisterns, and in some cases dugout water is pumped into the cistern when it is dry.

Only 1,022 of the 1,964 homes with cisterns were using that water for drinking and washing purposes. The other 672 only use their cisterns as a source of soft water for washing. Therefore 49 per cent of the homes use a cistern for drinking water as compared to 36 per cent who use a well as their source of potable water.

Dugouts

A dugout is a hole in the ground approximately 100 feet long, by 30 feet to 50 feet wide, and 12 to 18 feet deep. Under the Prairie Farm Rehabilitation Act, the Government of Canada and the farmer share the cost of excavating such a hole with a drag line or a bulldozer. As clays underlie much of the surface of this area, a dugout can hold the water stored in it for over a year. Usually, each spring if the run-off is strong the dugout will fill up naturally.

In this area more than 1,741 dugouts were counted, and the actual number is probably much higher. Some places had more than one dugout in case one went dry. In all, 1,301 farms had at least one dugout and these were used mostly by the stock. As there are no lakes (except at Morden), and the streams are all intermittent, the dugout also serves as the children's swimming hole in the summer. Twelve places were using dugout water as their domestic supply. This survey was conducted during a relatively wet summer; had it been made during a drought period such as during the thirties, the number of homes using dugouts for domestic water supply would have been much higher. Some of the shallow dug wells investigated are situated near the dugout and are recharged by it. In the author's opinion, dugout water should only as a last resource be used for drinking purposes.

Hauling

It is almost imperative to haul water during dry years when dugouts, cisterns, and shallow dug wells go dry. This can be an expensive method, however, depending on the hauling distance and the cost of the water.

In all, 739 farmers (36 per cent) haul water throughout the year. Of these, 214 haul it strictly for drinking purposes. The others also use it for washing. Seventeen per cent of those who haul water bring it from as far away as Winnipeg. As the closest point in this area is approximately 40 miles from Winnipeg, the cost to haul 1,000 gallons ranges between $14 and $20. Other centres from which water is hauled are: Neche in North Dakota (south of the map-area), Morden, Morris (east of the map-area), Glover's farm, and Carman. (Much water is obtained from neighbours who have a good supply.)

To summarize, 75 per cent of the rural homes have at least one cistern; 62 per cent have at least one dugout; 62 per cent have a well, but only 36 per cent of these wells yield potable water; 38 per cent melt snow or ice during the winter months for domestic purposes; and 36 per cent haul their water. These figures plainly show the need and lack of good water. The figures also show that the four methods used by the residents of this area to obtain water, are used to a greater extent than most people would expect.

The shortage of good water in the Red River valley has been known for years. Upham (1896)[1] summed it up very nicely: "The fame of this valley for its large harvest is nearly equalled by the unenviable reputation of the water supplied by its wells."

PREVIOUS WORK AND ACKNOWLEDGMENTS

The only previous ground-water study made in this area, was that by Johnston (1934). His work was a general one, covering a great part of the province of Manitoba, and including the locations and descriptions of some 40 wells in the Plum Coulee area. Sources of information on glacial Lake Agassiz and its deposits include the works of Upham (1896), Tyrrell (1896), and Elson (1957).

Appreciation is expressed to residents of the area for their excellent cooperation, to the well drillers who supplied information, and to the various authorities, both provincial and federal.

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Chapter II

PHYSICAL FEATURES AND GEOLOGY

The outstanding feature of the Plum Coulee area is the characteristic broad, flat expanse of terrain, which rises almost imperceptibly from the eastern margin of the map-area to the Manitoba escarpment and trends almost north-south (Map 30-1960). The altitude of the map-area ranges from 780 feet above sea-level in the northeast corner to 1,450 feet in the southwest corner. The only other natural breaks in this terrain are the beach ridges that rise in steps of 5 to 20 feet above the plain, the channels cut through the lacustrine sediments by the intermittent streams, and the spill banks of ditches, man-made for drainage purposes. Because of this flat topography very little erosion has taken place. As the velocity of the intermittent, meandering streams is low, they tend to deposit the contents of their muddy waters, and erode channels 5 to 15 feet deep only in the spring or at times of heavy rainfall.

UNDERLYING ROCKS

Apart from the Manitoba escarpment, also known as Pembina Mountains, where resistant beds of Cretaceous shales rise above the featureless plain of the former Lake Agassiz, knowledge of the geologic formations under the surficial sediments is based on well cuttings. The Precambrian rocks, such as those cut in a well 1,037 feet deep at Rosenfeld (Dawson, 1886), are chiefly granite. These rocks slope westward and form the base on which all the other rock formations rest.

Overlying the Precambrian rocks are shales, sandstones, and limestones of the Ordovician, Silurian and Devonian periods. Jurassic and Cretaceous rocks are predominantly shales interbedded with layers of sandstone and limestone. The Vermilion River formation (Wickenden, 1945), a dark grey shale of upper Cretaceous age, comprises the only consolidated rocks exposed in the Plum Coulee area. These outcrop in only a few places, notably on or along the east side of the escarpment.

All of these sedimentary rocks have a gentle westward dip of about 5 to 16 feet to the mile. The hole drilled at Rosenfeld penetrated 892 feet of these rocks.

Water-bearing Properties of the Consolidated Rocks

All the water contained in the consolidated rocks in the Plum Coulee area occurs in the sandstones, limestones, and shales, and is commonly under artesian pressure. This water is generally too salty for any use. In the well at Rosenfeld the water rose 18 feet above the ground and contained as much as 36,000 parts per million sodium chloride (common salt). Another well drilled in 1958 in the town of Altona, to a depth of 385 feet, produced artesian flow and contained 38,600 parts per million sodium chloride, as analyzed by the Vegetable Oil Co-op in that town.

None of the wells drilled into the bedrock in the area, eastward from range 4 west, is now being used. They have all been plugged up as their saline content renders them useless. Only in range 5 west do the shales of the Vermilion formation yield potable water. Most of the wells are shallow dug wells on the escarpment and the water occurs in cracks of the highly friable shale. These wells are non-artesian and yield very little water, only enough for farm or domestic use. Since no clay lies above the shale, the water in these wells is soft compared to that in similar wells in the plain below. Some old wells drilled in the northwestern part of the area by the Manitoba Government, in the years 1915 to 1919, yielded good potable water from the shales and sandstones. As the years went by, however, they gradually became more and more saline and are now abandoned.

The artesian flow or subartesian pressure, found in the wells drilled into the consolidated rocks, is explained by Johnston (1934) as follows: "In the highland to the east, the surface deposits are over 300 feet thick and are sandy in their upper parts. The rainfall entering these beds tends to flow in the lower part of the surface deposits and in the bedrock below, west and southwest in direction of the dip of the beds. The water becomes confined beneath the impervious beds and because the surface of the ground to the west is below the level of the highland area, artesian conditions are produced."

Beds yielding water under artesian pressure can be found at different depths at one locality. The well at Rosenfeld yielded saline water under artesian pressure from limestone at 265 feet and 800 feet, and from sandstone at 925 feet. With the increase in depth the artesian pressure was stronger and the water more saline. A similar condition is true throughout the area. The difference in artesian pressure at different localities is due to the amount and size of the fractures in the beds and to the elevation at which the water enters these beds in the highlands to the east.

Only a very small percentage of the wells drilled in the consolidated rocks in the Plum Coulee area are known to have been dry. The high saline content of the water in these rocks, however, renders useless what could otherwise be good productive aquifers, and only a process converting the salty water to fresh potable water could make these deep aquifers useful.

SURFICIAL DEPOSITS

Glacial

During Pleistocene time, a till, which is locally called hard pan or boulder-clay, was deposited unconformably by the ice-mass upon the bedrock formations of the whole Plum Coulee area. This till was deposited principally as ground moraine and varies in thickness from a few feet to as much as 240 feet where it was deposited in a preglacial valley. Such a section of till was penetrated in a well drilled near Roland. On the average, the glacial till along the eastern side of the area is about 20 to 30 feet thick. In SE 1/4 sec. 23, tp. 6, rge. 1W, a section of till 55 feet thick was cut in a well at a depth of 69 feet. Almost due south, in the well at Rosenfeld, the section of till intersected was 18 feet thick, at a depth of 137 feet. In a well at Altona, at a depth of 143 feet, the section of till encountered was 12 feet, but the well was stopped in the till, so that a greater thickness of till probably exists there.

In tps. 1 and 2, rge. 5W, along the Manitoba escarpment, a thin irregular cover of till ranging from 5 to 20 feet thick lies on the bedrock, which outcrops in a few places. The thickness of the drift is greatest in range 4 west along an irregular line running north and passing through Roland and Winkler. One hole drilled at Winkler encountered bedrock at 540 feet below the surface. The log of this hole shows a thickness of 180 feet of gravel and sand, but it can be assumed that some, if not most of this, could be classified as a till (Figs. 2 and 3). Another well drilled near Roland shows 240 feet of till interbedded with layers of sand and gravel. From these and other deep wells (Figs. 2 and 3) it may be deduced that a fairly wide and deep valley existed prior to the advance of the ice.

The drift exposed immediately east of the escarpment is composed chiefly of a grey clay, which forms an unstratified matrix containing rock fragments and boulders of various sizes. Boulders as much as 3 feet across lie at the edges of the fields or in piles in the centre of the fields. The boulders are made up mostly of igneous rocks and the smaller fragments and sands are derived from limestone and igneous rocks. This surface till is commonly soft and easy to dig. Along the beaches of Lake Agassiz, the wave action has removed the clay and left shallow deposits of sand and gravel. On the other hand, the till penetrated by deep drilling seems more compact and hard, rarely carries big boulders, and consists mostly of gravel-size limestone and igneous rocks in a clay matrix. In few cases have big boulders prevented a well from being deepened.

In almost every well drilled, the till penetrated is associated with glacio-fluvial deposits of sand and gravel which were derived from the meltwaters of the retreating glaciers. It could also be that the till itself was modified by the strong-flowing currents of the meltwaters removing the clay content and leaving lenses or long narrow irregular deposits of sand and gravel.

A few drilled holes show clay underlying the till or its sand and gravel components. The most interesting one was drilled near Winkler. The log of the hole shows that 280 feet of clay underlies the till or the gravel associated with it. No such clay was encountered in a well drilled to a depth of 600 feet at Morden, 7 miles to the west (Tyrrell, 1892). This could therefore mean a sharp drop in the bedrock contour, as shown on Figure 2.

Lacustrine

Lacustrine deposits of Lake Agassiz lie above the till, covering the whole of the Plum Coulee area, except in the southwest half of tp. 1, rge. 5W. These deposits may be divided on the basis of texture and colour into two units: a clay unit and a silt unit.

The clay is dark grey with a slightly bluish tinge when wet, so that it is commonly called blue clay by the inhabitants of the area. It is so sticky and compact that narrow wells as deep as 100 feet have been dug in it without caving of the walls. The clay deposit is of variable thickness throughout the entire map-area. In the northeast corner, in a well drilled in SE 1/4 sec. 23, tp. 6, rge. 1W, it was penetrated for 54 feet, commencing at a depth of 15 feet. In the southeast part of the area, in Altona, it was penetrated for 127 feet, commencing at a depth of 16 feet. Along the southern part of the area, the clay seems to average about 125 feet in thickness; it gradually thins westward as it approaches the abrupt rise of the bedrock at the escarpment. In SE 1/4 sec. 14, tp. 3, rge. 4W, it has a maximum thickness of 158 feet.

The clay seems to be a thick, homogeneous deposit, and contains few small pebbles. However, some wells drilled in the northwestern part of the area in tps. 5 and 6, rge. 5W, show, in their cuttings, interbedded layers of sand and gravel. For example, one well drilled in SE 1/4 sec. 20, tp. 5, rge. 5W, contains a 20-foot-thick layer of sand. Another well in NW 1/4 sec. 3, tp. 6, rge. 5W, contains a 55-foot-thick deposit of clay underlain by 45 feet of till, 10 feet of clay, and 28 feet of interbedded sands and gravels associated with till. This sedimentary section provides evidence supporting the hypothesis that the Pleistocene ice retreated and advanced more than once in this region.

In the northeastern and north-central parts of the Plum Coulee area, the clay is at the surface, but for a depth of 10 or 15 feet it differs from the blue clay in that it contains a few sandy silt lenses. The silt deposits are believed to have been brought into Lake Agassiz by distributaries of the Assiniboine River (Upham, 1896). These silt deposits can be subdivided by colour and texture into three distinct units: A dark grey clayey silt with some sand lies immediately above the blue clay in the southwestern part of the area; this silt also occurs locally elsewhere in the area. A buff-coloured sandy silt lies above the dark grey silt and above the clay where the dark grey silt is absent, and covers almost all of the western half and a good part of the southeastern corner of the map-area (Map 30-1960). Between the two buff-coloured silty zones (shown on Map 30-1960), is a light yellowish brown, very fine, sandy loam. Its main characteristic is that it is invariably dry except immediately after a rainfall. Topping all of this is the rich and fertile black-earth soil zone that has made this valley famous.

The silt is generally only about 10 feet thick, but in one well it was penetrated for 30 feet. In a test-hole in NE 1/4 sec. 31, tp. 1, rge. 4W, where both the dark grey and buff-coloured silts occur, the dark grey silt was 10 feet thick and the buff-coloured silt was 8 feet thick[1]. The black-earth soil varies in thickness from place to place, from a minimum of 6 inches to a maximum of 6 feet.

Other surficial deposits are river alluvium and beach bars. The alluvium consists mostly of sand and gravel deposited in an old channel of the present Boyne River, and is now covered by silt and clay of Lake Agassiz. Sand bars were formed by currents that followed the shoreline of the time. One such bar is well exposed a mile south of the village of Rosenort, where it extends for 2 miles in a southeasterly direction. It is 1/2 mile wide at its northern extremity and diminishes gradually to a point at its southern tip. Its surface is convex, sloping gently east and west from its apex. The sands and fine gravels in this bar are well stratified. The small pebbles consist mostly of shale and are smooth and well rounded. A pit dug almost in the centre of the sand bar, in NE 1/4 sec. 11, tp. 1, rge. 3W, gives a good cross-section of the bar. A test-hole bored in the pit at the apex of the sand bar shows it to be 19 feet thick and overlying the clay.

Water-bearing Properties of the Unconsolidated Deposits

The best aquifers in the Plum Coulee area are the glacio-fluvial sands and gravels that are associated with the till. These sands and gravels occur as thin, long, narrow, irregular lenses.

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[1] 18 feet was the depth limitation of the hand-auger used.

These aquifers occur almost anywhere in the area, but a zone has been defined indicating the areas where potable water is available from them (Map 29-1960). The thickest and most permeable zones are in what seems to be a buried valley at Winkler, and they extend north and south of this town. The longitudinal axis of this buried valley seems to follow approximately the pattern shown for areas of potable water from these aquifers (Map 29-1960). As the sides of this buried valley have not been defined, it could be much wider (as can be seen in a cross-section, Fig. 2) than the zone indicated in Map 29-1960.

The till itself is not an aquifer, but could be used as a marker for the glacio-fluvial sands and gravels in drilling for wells. However, these deposits of sand and gravel constitute local aquifers and they may be sufficiently widely distributed and interconnected to make the entire unit a fair aquifer.

Most of the producing wells near Winkler are between 50 and 175 feet deep. The largest yield of any well in the area is that of the industrial well at the cannery in Winkler. It produces 100,000 gallons per day. Wells drilled to these aquifers in the Plum Coulee area average 120 feet in depth and yield only sufficient water for farm and domestic uses. Outside the zone of potable water (Map 29-1960), numerous wells have been drilled to these sand and gravel deposits, but they yield only saline water. All the wells drilled into the aquifers are under artesian pressure, and some even flow at the surface. The salinity of the water probably comes from the saline water in the bedrock below, which because of the artesian pressure, is forced upwards into the sands and gravels.

An area of artesian flow, covering about 30 square miles, lies east and southeast of Winkler, as shown in Map 29-1960. The wells in this artesian-flow zone range from 130 to 190 feet deep, and yield, without pumping, 1 gallon per minute. Water from these wells is too salty for human consumption and is used strictly for the livestock. Most of the wells have been producing for a long time — some for more than 50 years.

A good cross-section of this zone is shown by a well drilled in NW sec. 31, tp. 2, rge. 3W. Here 2 feet of black earth is underlain by 8 feet of buff-coloured silt and 138 feet of bluish grey Lake Agassiz clay. This clay forms the impermeable deposit under which the water is confined. It is underlain by 2 feet of sand, which contained some water, then 14 feet of till, and then another sand and gravel deposit that yielded saline artesian water flowing at a rate of 1 gallon per minute.

In the northwest limb of this flowing artesian zone, secs. 9, 15, and 16, tp. 3, rge. 4W (Map 29-1960), the water is good and potable, although the reason for this is not known. The till may be thick enough to prevent the upward movement of saline waters from the bedrock, and the recharge may be from the west for no known good water exists to the east at this depth.

All artesian-flow wells in the area are controlled by a faucet or valve attached to the casing. The common practice of opening these valves only when water is needed is the reason why so many wells plug up. As the water is not continually flowing, salts accumulate along the sides of the 2-inch (generally) casing until the entire passage is plugged up. Wells may become plugged as often as once a year.

For the drilling of subartesian wells, in which the water rises almost to the surface of the ground from the sands and gravels below, a common procedure used in this area is as follows: The well is drilled and (in most cases) a 2-inch casing is driven into the ground to the aquifer below. A second well is then dug, around the casing of the drilled well, and cribbed. The dug well may be 10 to 30 feet deep, depending on the rise of the water in the casing. Then a hole is drilled into the metal casing, below the rise of the water, allowing the water to collect in the dug well. The dug well therefore acts as a reservoir and the water is pumped for use from the reservoir or dug well, and not from the casing of the original drilled well. Unfortunately, this method generally causes contamination of the shallow ground-water resources with salt water.

The shallow ground-water resources in the Plum Coulee area are controlled by the mean annual precipitation in the form of rain and snow. Part of the water is carried away by the surface run-off, and is eventually lost to streams. A little more is lost through evaporation and transpiration. Some, however, percolates downward through the black-earth soil into the underlying silt or into the sand and gravel on the beaches of Lake Agassiz, to the water-table formed above the clay.

The occurrence of shallow ground water is also controlled by the physical properties of the silt. The southwestern part of the area and an irregular area in the southeast corner form the most extensive shallow aquifers found in the silt. In general, the silt west of the 850-foot contour is more sandy than clayey, and yields small quantities of potable water for farm and domestic supplies. East of this contour, however, the silt is more clayey and yields either no water at all, or water of a poor quality.

Because the clay underlies the silt unit, one should never go deeper than the clay for a shallow-water well. If a test-hole encounters insufficient or poor-quality water in the silt, a new test-hole should be started in another location; deeper drilling will yield no further water.

It is the custom in digging a well in this area to continue the well for 3 or 4 feet into the clay so that the clay will act as a reservoir for the water that is yielded by the overlying silt. This clay, however, generally gives a bad taste to the water. Some people have improved the taste, after digging the well 3 or 4 feet into the clay, by filling the bottom 3 or 4 feet with gravel; one such well can be found in the village of Reinland. The water in these shallow aquifers generally occurs at a depth of between 5 and 25 feet.

The rewashed till, consisting of sand and gravel, that is found on surface along the beaches of Lake Agassiz, also yields small amounts of water for farm and domestic uses. These aquifers are found east of the Manitoba escarpment, principally in tps. 1, 2, 3, and 4, rge. 5W. In most cases the gravel is overlain by a shallow cover of soil and underlain directly by the clay. The depth at which water occurs ranges from 2 to 18 feet.

Shallow ground water occurs also in alluvium sand and gravel along the old buried channel of the Boyne River. This aquifer trends west near the northern margin of the map-area (Map 29-1960). One well bored in sec. 19, tp. 6, rge. 5W, indicated 1 foot of gravel overlain by 25 feet of clay and silt. The recharge of this aquifer is due to the slow stream-infiltration of the Boyne River, which has cut a channel 10 to 15 feet deep into these lacustrine sediments.

As all these shallow wells are affected by the amount of precipitation in the area, they are unpredictable suppliers. During wet years, the shallow aquifers are fairly good sources of ground water for farm and domestic supplies. In dry years, however, only the thicker deposits are saturated and yield water continuously. This is one of the reasons why dugouts are gaining in popularity. Their storage capacity is much greater than that of wells in the shallow aquifers.

As mentioned previously these shallow aquifers may also be contaminated by the salty waters of deeper aquifers, which are brought to the surface under artesian pressure when penetrated by drilling. Another factor affecting these shallow aquifers, particularly those in the very fine sandy loam, is the huge man-made road ditches that trend north and west across the area every mile. Every section of land is thus surrounded by a deep trench that may lower the water-table by more than 5 feet. Examples of this can be seen in SE secs. 19 and 30, and SW sec. 29, tp. 2, rge. 2W. In each area, wells that had produced for years prior to the construction of the road ditches, are now dry.

CLIMATE

Most of the data used here was obtained from records of the weather station at the Dominion Experimental Farm in Morden. For comparison, data were also obtained from the weather stations at Altona and Roland.

The Plum Coulee area is in the north-temperate zone, and the climate is classed as semi-humid, with warm summers and cold winters. More than half the total annual precipitation falls between May and September. Winter temperatures (November to March) average approximately 13°F and summer temperatures (May to September) average approximately 61°F. Wide variations from the normal or average precipitation and temperature are not uncommon from month to month, season to season, and year to year. Widespread floods, severe storms, and droughts have occurred. There are no abrupt changes in the topography to cause great differences in climate within the area. At Morden, the average annual precipitation is 20.56 inches and the average annual temperature is 38.0°F.

Growing Season

The growing season varies from year to year. It is commonly defined as the number of days between the last killing frost in spring and the first killing frost in autumn. At Morden, the average dates of these frosts are May 23 (32°F) and September 21. The average frost-free period is 121.8 days. The shortest growing season on record—93 days—was in 1929; the longest—146 days—was in 1944. Over the past 36 years the average killing-frost-free period (above 28°F) is 142.6 days, from May 12 to October 1.

Precipitation

Table I shows the average monthly and annual precipitation for the 40-year period 1919 to 1958. For this period, the average annual precipitation in the Plum Coulee area was 20.56 inches. The highest annual precipitation was in 1944—28.21 inches; the lowest was in 1952—12.53 inches. The average annual snowfall for the 40-year period was 54.05 inches. Approximately 25 per cent of the total average annual precipitation fell as snow. The timing of winter snowfalls has a great effect on the ground-water situation, particularly in shallow wells. If the snow falls late in the winter, the ground has a better chance to freeze to a greater depth. The water produced by this late fallen snow is lost in the spring, mostly in heavy run-off, which causes damaging floods, especially if the snowfall was great.

Table I

Monthly and Annual Precipitation at Morden, Manitoba, 1919-1958
(Data from weather station at Morden)
(Precipitation in inches—10 inches of snow = 1 inch of rain)

Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total Snowfall	Total Rainfall	Total Precipitation
1919	0.30	0.50	1.52	0.80	1.90	5.92	3.95	2.12	2.03	1.24	1.30	0.35	46.52	17.36	21.93
1920	1.78	0.90	1.51	0.70	0.66	2.76	2.90	0.59	1.81	0.35	2.00	0.90	63.25	10.53	16.86
1921	0.50	2.40	0.98	1.23	2.02	1.64	6.60	3.40	2.93	0.64	0.44	0.29	45.60	18.51	23.07
1922	0.56	0.80	1.04	0.41	4.53	2.30	3.15	1.14	4.49	0.62	3.02	1.94	44.17	19.58	24.00
1923	0.94	0.60	1.50	1.03	1.45	0.98	1.52	2.39	2.16	0.46	0.96	0.51	43.43	10.59	14.50
1924	1.30	0.63	0.74	6.43	0.55	1.69	3.00	1.15	4.48	4.67	1.12	0.95	56.50	21.06	26.71
1925	0.45	0.40	2.50	1.47	1.36	5.22	0.84	1.32	3.39	2.18	0.28	0.81	47.45	15.48	20.22
1926	0.40	0.73	2.11	0.33	1.59	4.35	2.60	1.81	4.13	2.37	3.05	1.78	85.98	16.65	25.25
1927	1.00	1.10	0.35	1.98	6.01	3.18	1.91	2.08	1.41	1.13	1.79	0.27	48.00	17.41	22.21
1928	0.53	0.15	1.30	0.39	1.38	6.52	6.47	1.51	0.13	0.19	0.56	0.65	27.36	17.04	19.78
1929	1.11	1.05	0.87	1.22	0.92	0.44	1.25	0.81	2.59	1.87	1.14	1.15	69.72	7.45	14.42
1930	0.25	2.20	0.70	0.22	4.07	4.38	1.91	0.44	1.26	2.07	1.81	0.62	54.00	14.53	19.93
1931	0.75	0.25	1.46	0.51	1.34	1.08	1.85	1.98	2.87	2.69	0.73	0.32	38.85	11.94	15.83
1932	1.30	1.10	1.20	1.81	1.51	2.43	2.35	1.06	1.38	3.71	1.64	0.15	68.00	12.79	19.64
1933	0.93	0.50	0.20	0.90	6.18	0.95	0.86	1.45	2.38	0.74	1.25	2.68	65.75	12.43	19.02
1934	0.69	0.63	0.53	0.79	0.62	3.72	1.62	2.06	1.17	0.63	0.83	0.73	32.75	10.73	14.02
1935	1.43	0.10	1.41	1.71	1.59	5.73	2.80	3.59	1.54	0.38	0.98	0.80	48.75	17.26	22.12
1936	1.35	1.23	1.04	0.35	0.55	2.70	0.75	2.25	1.53	0.77	0.43	0.83	55.00	8.27	13.78
1937	0.95	1.05	0.18	3.90	1.70	5.48	6.89	0.43	1.36	0.80	1.00	1.30	46.75	20.36	25.04
1938	1.20	1.95	0.56	1.65	1.47	2.24	4.26	1.88	0.02	0.45	0.83	1.48	58.25	12.15	17.99
1939	0.88	1.40	0.05	1.39	1.76	4.03	0.58	4.10	1.10	0.37	0.00	0.19	26.25	13.21	15.85
1940	0.53	1.83	1.00	2.97	1.65	2.68	4.81	2.26	2.19	0.99	0.97	1.13	71.25	15.87	23.01
1941	1.73	0.35	1.15	1.83	3.27	2.86	0.99	1.53	6.56	1.97	0.59	0.61	52.50	18.17	23.44
1942	0.43	0.68	3.46	1.60	3.37	1.80	3.92	1.88	0.81	0.38	0.37	1.58	61.30	14.12	20.28
1943	1.73	0.90	2.35	0.61	2.87	2.55	2.19	4.39	0.69	0.32	0.32	0.30	56.35	13.58	19.22
1944	0.35	0.93	3.70	0.32	2.26	5.57	2.31	7.22	1.30	0.43	3.77	0.05	67.80	21.40	28.21
1945	1.25	0.28	3.46	1.66	2.38	2.15	3.24	1.72	3.49	0.43	0.88	1.10	42.25	17.81	22.04
1946	0.47	0.50	1.63	0.57	0.93	1.90	3.23	1.80	2.92	2.75	1.18	0.95	49.50	13.88	18.83
1947	1.40	0.75	1.10	0.63	0.35	4.72	1.37	7.24	1.60	1.61	1.49	2.60	73.05	17.56	24.86
1948	0.55	2.25	1.52	3.00	2.58	1.84	5.71	0.85	0.16	0.73	2.19	2.48	87.35	15.12	23.86
1949	1.90	0.65	1.44	0.03	2.55	1.99	2.21	1.72	0.79	4.62	1.01	1.68	62.00	14.38	20.59
1950	2.43	0.58	1.50	2.08	5.06	3.65	3.48	0.78	2.66	0.99	0.72	0.63	89.85	15.55	24.56
1951	0.33	2.07	0.68	1.68	0.31	2.11	1.08	6.06	2.11	0.57	1.02	0.66	41.85	14.48	18.68
1952	1.63	0.05	0.61	0.00	0.44	4.06	2.13	2.55	0.42	0.25	0.30	0.09	25.75	9.99	12.53
1953	1.33	0.44	0.90	1.68	4.47	4.19	3.57	2.43	1.52	1.20	0.20	0.35	34.75	18.79	22.28
1954	1.95	0.24	0.70	2.70	2.42	4.52	1.64	2.12	3.94	1.31	0.75	0.03	39.75	18.33	22.32
1955	1.80	0.98	2.15	1.02	1.74	4.36	2.57	0.82	2.44	1.60	3.64	0.80	90.25	14.89	23.92
1956	2.05	0.98	2.23	0.08	2.50	2.47	4.14	5.19	0.49	1.23	1.91	1.27	67.50	17.78	24.54
1957	0.40	0.36	0.71	0.91	1.80	4.05	5.52	2.86	2.34	1.04	0.37	0.36	18.10	18.91	20.72
1958	0.53	0.53	0.02	0.62	0.32	2.05	3.86	0.98	1.48	0.31	0.17	0.03	58.50	10.38	16.23
40-year Average	1.04	0.90	1.31	1.34	2.12	3.19	2.91	2.31	2.07	1.28	1.18	0.91	54.05	15.16	20.56

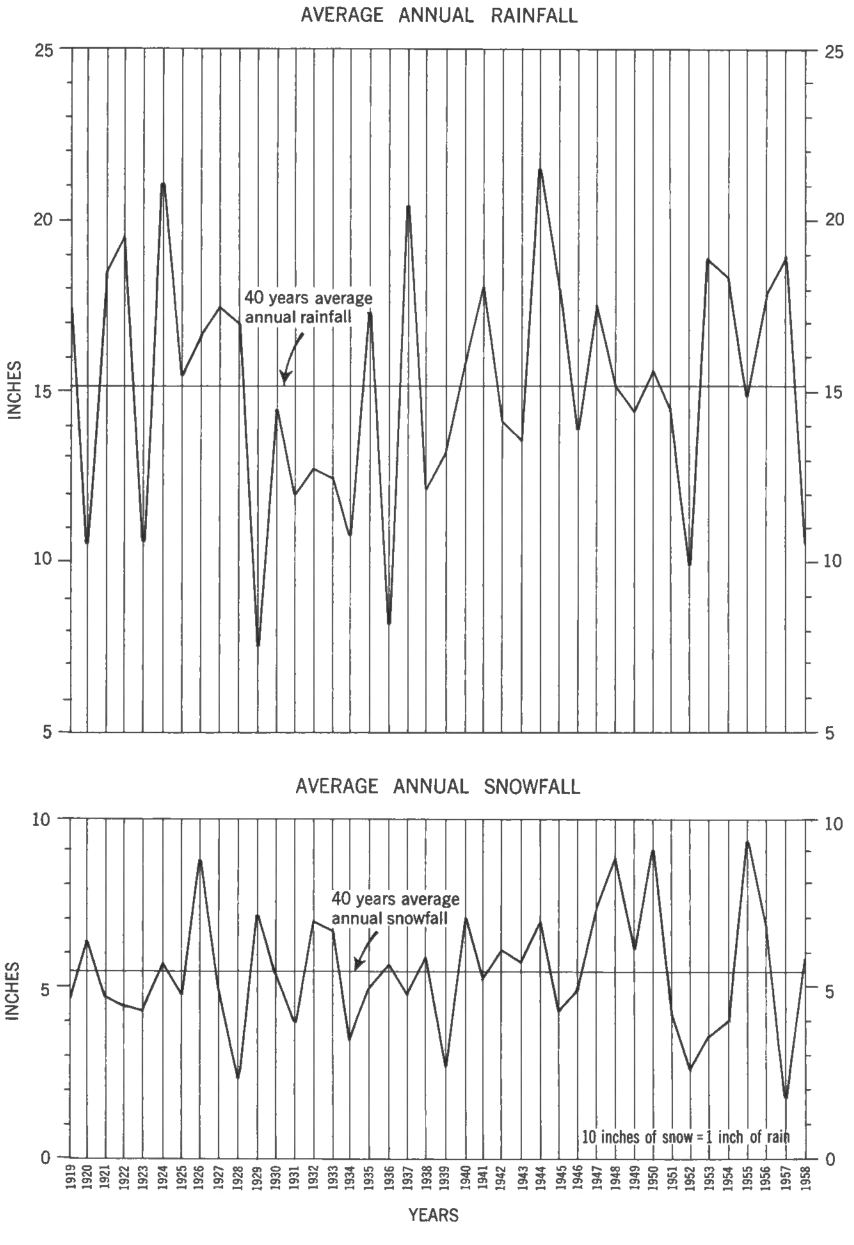

Figure 4. Average mean annual rainfall and snowfall at Morden, Manitoba, 1919-1958

Figure 4 reveals that irregular sequences are characteristic of the average annual rainfall and snowfall. Sequences of years with generally below-normal average annual rainfall and snowfall, followed by several years with generally above-normal average annual rainfall and snowfall are common. There does not appear to be any regularity or fixed periodicity of short cycles that might be useful in the forecasting of future rainfall and snowfall.

Figure 5 shows that the 10-year period between 1929 and 1939 was generally dry, commonly called the drought of the thirties. Only 1934 and 1937 had above-average precipitation. Total precipitation was generally above average from 1940 to 1958, except for the years 1942, 1943, 1945, 1951, 1952, and 1958. The year 1952 was the driest year recorded in the past 40 years.

The average monthly precipitation records are shown on Figure 6. This chart illustrates that 63 1/4 per cent or 12.59 inches of the total annual precipitation falls during the summer months. Even 1952 was no exception, for of the total of 12.53 inches that fell that year, 8.74 inches fell during June, July and August. Ordinarily this rain would help the crops during the growing season and should also help to recharge ground-water aquifers. But daily precipitation records show that most of it falls during intense showers or thunderstorms. Moreover, the basically clayey condition of the ground does not facilitate the penetration of this water into the ground. Thus most of this rainfall is lost as run-off and by evaporation.

For comparison within the Plum Coulee area, Table II shows the average monthly precipitation for 6 months of the year over a period of 7 years at three different places—Morden, Roland, and Altona. During those 7 years, except for 1954, the southern part of the Plum Coulee area around Morden and Altona received on the average, annually, over 1 inch of precipitation more than the Roland area farther north. This condition can be explained by thunderstorms striking the southern part of the Plum Coulee area more often than the northern part.

Temperature

Irregular sequences, similar to those occurring in precipitation, are characteristic of the average annual temperature. Commonly, several years with generally below-normal average annual temperatures are followed by several years with generally above-normal annual temperatures, and there appears to be no regularity or fixed periodicity of short cycles on which to predict future temperature.

The average mean annual temperatures at Morden for the 40-year period 1919 to 1958 are shown in Figure 5 and Table III.

Table II

Precipitation (in inches)—April to September, at Morden, Roland, and Altona, Manitoba, 1952-1958
(Data from weather stations at above centres)

Year	April			May			June			July			August			Sept.			Total		
	Morden	Roland	Altona	M	R	A	M	R	A	M	R	A	M	R	A	M	R	A	Morden	Roland	Altona
1952	0.00	0.16	0.07	0.44	0.40	0.68	4.06	5.11	3.10	2.13	1.44	1.93	2.55	1.31	2.44	0.42	0.37	0.34	9.60	8.79	8.56
1953	1.68	1.06	2.18	4.47	4.04	3.94	4.19	4.17	4.55	3.57	3.41	4.62	2.43	1.01	1.43	1.52	1.33	2.02	17.86	15.02	18.74
1954	2.70	2.15	2.78	2.42	2.36	2.00	4.52	6.90	2.80	1.64	1.08	1.35	2.12	1.86	4.49	3.94	5.42	3.36	17.34	19.77	16.78
1955	1.02	1.00	1.49	1.74	1.63	3.14	4.36	3.50	1.91	2.57	3.73	2.57	0.82	0.79	1.05	2.44	1.85	2.84	12.95	12.50	13.00
1956	0.08	0.06	0.53	2.50	2.21	2.06	2.47	2.40	2.34	4.14	3.32	3.79	5.19	4.86	4.01	0.49	0.48	0.18	14.87	13.33	12.91
1957	0.91	1.08	0.68	1.80	1.84	1.74	4.05	4.15	4.34	5.52	1.78	6.31	2.86	2.44	2.89	2.34	2.01	3.31	17.48	13.30	19.27
1958	0.62	1.06	0.98	0.32	0.36	0.27	2.05	1.52	3.00	3.86	3.17	3.59	0.98	0.65	0.33	1.48	1.01	1.04	9.31	7.77	9.21
7-year Average	1.00	0.94	1.24	1.95	1.83	1.97	3.68	3.96	3.15	3.35	2.56	3.45	2.42	1.85	2.38	1.80	1.78	1.88	14.20	12.92	14.07

Only twice in this period—in 1931 and 1950—has the average mean annual temperature been above or below normal by more than 4°F.

The average monthly temperatures are shown on Figure 6. Local temperatures in the Plum Coulee area are generally similar throughout. On the average the mean monthly temperature is lowest in January. It rises at a uniform rate from February to June. The temperature curve at this point begins to level off and reaches a peak in July. It falls at an increasing rate until August. From August to December temperatures fall at a rather uniform rate back to the minimum in January. January 1950 had the lowest mean monthly temperature, -14.4°F, and July 1936 had the highest, 77.4°F.

Daily deviations from the average are frequent and of considerable magnitude. The highest temperature ever recorded at Morden—111.2°F—was on July 11, 1936; the lowest—minus 41.5°F—was on January 20, 1943.

Evaporation

The weather station at Morden has taken evaporation readings during the summer months since 1950. In the 9-year period from 1950 to 1958, the average evaporation from May to September inclusive has been 23.32 inches, almost 3 inches more than the average annual precipitation for the last 40 years. The rate of evaporation is greatest during the month of May, and the 9-year average for that month is 5.53 inches; evaporation is lowest during September, averaging 3.64 inches over the 9 years.

Conclusions

As the soil in the Plum Coulee area is basically clayey and as the greatest part of the precipitation falls as cloudbursts or thunderstorms, and as the rate of evaporation exceeds that of precipitation, it follows that very little of the total precipitation becomes ground water.

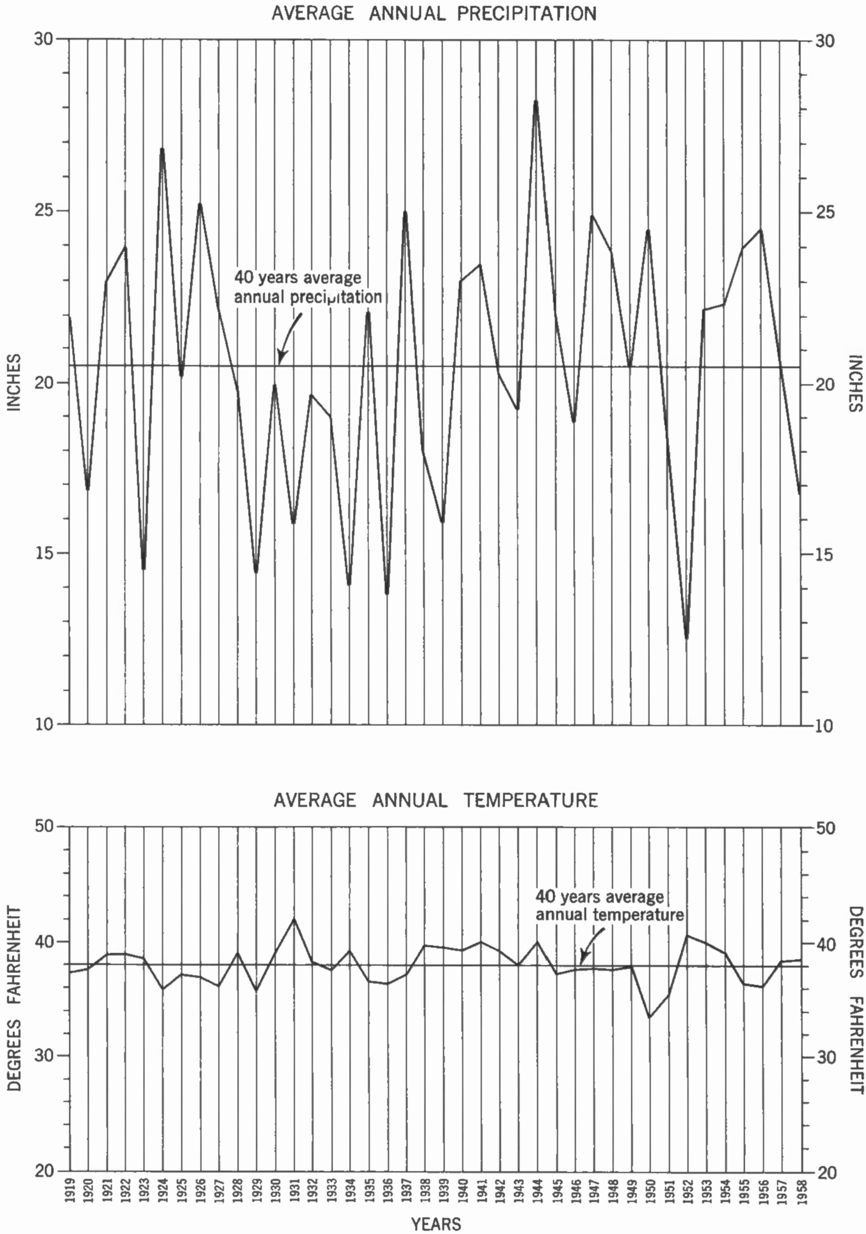

Figure 5. Average mean annual temperature and precipitation at Morden, Manitoba, 1919-1958

Table III

Monthly and Annual Temperatures (°F) at Morden, Manitoba, 1919-1958
(Data from weather station at Morden)

Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
1919	12.9	3.9	14.4	40.4	56.8	67.8	73.2	69.0	56.7	32.2	14.0	3.8	37.1
1920	-4.1	7.0	19.0	28.6	54.0	62.0	67.5	69.3	59.7	49.7	26.6	10.8	37.5
1921	8.0	11.6	16.2	38.4	52.3	66.8	70.5	64.3	59.1	46.6	17.9	15.0	38.9
1922	3.4	0.6	24.9	41.6	57.7	64.6	65.8	69.6	58.5	44.5	31.8	3.4	38.9
1923	4.6	1.5	9.3	35.1	53.5	67.3	71.6	61.8	57.9	42.9	36.1	20.6	38.5
1924	-3.6	13.4	23.9	34.7	45.6	59.1	64.9	63.8	53.1	50.5	23.0	0.1	35.7
1925	2.2	7.7	21.1	44.7	50.7	59.3	65.5	67.5	55.9	32.2	27.0	11.5	37.1
1926	11.4	15.7	19.3	38.2	56.7	58.1	67.1	63.8	50.5	39.9	18.2	4.0	36.9
1927	5.1	8.1	28.0	38.1	45.5	60.9	65.4	62.1	56.6	45.3	18.3	-1.4	36.0
1928	10.8	14.6	22.3	34.0	56.1	57.9	66.3	63.0	52.8	41.7	28.6	20.0	39.0
1929	-9.2	0.6	25.1	39.2	47.8	61.1	68.7	67.1	52.0	45.8	21.6	7.2	35.6
1930	-4.1	15.4	23.0	44.3	49.6	64.1	70.3	69.3	54.9	38.5	27.1	15.5	39.0
1931	13.4	22.9	20.7	41.9	50.7	66.9	69.4	67.9	60.2	47.9	30.1	20.5	42.7
1932	7.8	8.4	14.7	39.3	55.5	69.8	68.8	69.2	58.0	37.3	19.5	8.7	38.1
1933	5.7	4.2	22.3	38.0	55.1	70.0	71.4	69.0	58.0	38.3	21.6	-2.3	37.6
1934	8.7	10.6	20.6	39.4	59.1	63.0	68.9	64.8	51.6	46.8	30.6	6.7	39.2
1935	-5.6	21.4	21.6	36.5	51.1	54.1	74.1	65.3	54.8	42.1	13.7	8.5	36.5
1936	-10.2	-11.9	22.4	32.9	60.2	63.4	77.4	67.5	58.7	38.6	25.2	9.9	36.2
1937	-10.5	4.9	21.1	38.0	55.6	63.6	70.6	70.0	55.7	42.5	24.1	8.3	37.0
1938	3.2	5.2	31.2	38.8	52.8	63.1	69.9	69.3	61.3	49.8	21.1	13.6	39.9
1939	7.1	-6.0	19.0	39.1	57.6	60.2	72.7	69.4	57.9	38.5	33.5	24.8	39.5
1940	4.4	13.0	17.5	35.9	53.4	61.8	70.1	67.1	61.9	49.1	20.9	15.1	39.2
1941	5.8	7.7	21.1	41.8	57.5	65.3	71.5	66.6	55.4	43.9	26.1	17.2	40.0
1942	16.4	8.2	28.2	42.9	50.1	61.6	66.5	66.5	53.5	47.7	23.5	4.6	39.1
1943	-5.8	11.2	14.6	42.1	49.5	60.0	71.8	65.6	54.6	47.5	27.7	18.2	38.1
1944	18.4	7.2	14.9	41.0	57.4	61.5	68.1	65.1	56.7	47.9	28.6	13.4	40.0
1945	7.9	11.3	32.7	33.0	45.2	59.7	67.3	66.5	53.2	43.6	20.0	6.0	37.2
1946	4.5	2.6	31.7	45.3	50.5	62.0	68.4	65.0	55.3	40.7	22.3	6.8	37.9
1947	8.7	3.1	20.6	37.8	48.3	60.8	70.8	69.0	54.4	49.3	21.8	8.2	37.7
1948	2.3	3.0	14.0	34.5	54.5	62.5	67.7	67.2	62.6	47.3	26.8	7.5	37.5
1949	1.0	-2.6	18.3	44.5	54.7	63.7	68.9	71.4	55.4	43.1	32.3	4.7	37.9
1950	-14.4	3.0	16.1	29.9	48.9	60.9	65.3	60.3	57.9	45.3	18.9	5.1	33.3
1951	0.3	9.3	14.8	37.5	57.4	59.6	67.4	62.3	52.2	40.0	19.2	5.5	35.4
1952	0.7	16.8	19.4	49.7	54.3	64.4	68.1	66.1	60.2	42.7	29.4	17.3	40.7
1953	5.6	11.2	23.3	36.6	52.2	62.5	67.5	69.2	55.4	51.0	33.5	16.3	40.3
1954	-7.3	25.5	21.4	34.6	47.9	61.1	68.7	64.6	53.9	44.0	32.5	21.0	39.0
1955	3.3	2.1	8.7	47.2	55.3	63.5	71.1	69.7	54.9	46.1	14.8	0.1	36.4
1956	0.8	4.6	14.4	31.0	49.0	67.0	64.8	65.9	52.0	46.9	28.0	9.9	36.2
1957	-1.7	8.7	23.4	40.2	54.6	58.6	70.9	65.3	53.9	44.7	26.0	17.1	38.5
1958	13.5	7.4	26.8	42.4	55.2	59.2	65.6	65.2	56.2	44.6	25.2	3.3	38.7
40-year Average	3.3	7.8	20.5	39.0	53.0	62.4	69.0	66.5	56.0	43.9	24.6	10.1	38.0

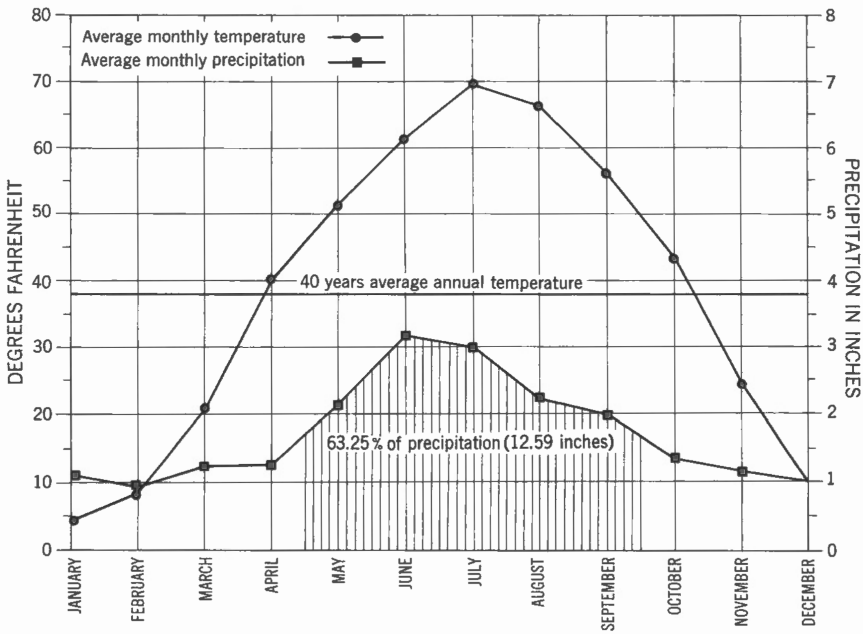

Figure 6. Average monthly temperature and precipitation at Morden, Manitoba, 1919-1958

Chapter III

WATER SUPPLY

TOWNSHIP 1

Range 1 West—Rhineland Municipality

The surface is flat with a rise of about 6 feet per mile. Silt, averaging 13 feet in depth, is underlain by dark grey clay.

Wells dug an average of 15 feet in the silt (only in the zone shown in Map 29-1960) yield sufficient potable water for farm and domestic needs. Some wells outside these areas yield water but are used only for watering stock. The only drilled well was dry; it was one drilled many years ago to a depth of 150 feet.

The town of Gretna (pop. 608) is situated in sec. 5. A town well dug into the silt was used for domestic needs by individuals, although a recent analysis of the water condemned it. Another well dug to a depth of 20 feet in the northwest corner of the town supplies water to the Mennonite Collegiate Institute which has an enrolment of 200 students. Half a dozen homes have their own shallow dug wells. The majority of the population have cisterns. When the rain-water in these cisterns runs out, water must be hauled from Neche, North Dakota, which is roughly a mile south, at a cost of $6 per 1,000 gallons.

Residents of the two villages—Gnadenfeld (pop. 47) and New Bercthal (pop. 122)—get their water from shallow wells dug in the silt. Almost every home in these villages has its own well.

The only aquifer known to be available is in the silt. In a 36-square-mile area such as this, one drilled well is not sufficient to prove that no water exists at depth. Therefore a systematic drilling program would be advisable.

Range 2 West—Rhineland Municipality

As in tp. 1, rge. 1W, the surface is flat. In most parts, the very fine sandy loam overlies the clay. The average depth of the silt, where present, is 13 feet.

Wells yielding potable water (Map 29-1960) are dug in the silt to an average depth of 15 feet. They yield only enough, however, for farm and domestic needs.

Some dug wells, such as one 14 feet deep in NE sec. 35, used to yield good water, but have apparently become contaminated and are now useless except for stock needs.

Eight wells have been drilled to depths of 168, 187, and 149 feet in NW sec. 13, SW secs. 24 and 29 respectively, but yield only saline water. All were subartesian.

Wells dug in the village of Blumenort (pop. 115) in the sandy loam yield only hard, bitter water, which is used for stock only. The inhabitants drink rain-water collected in cisterns.

In all probability, other lenses that would yield potable water could be found in the silt if more test-holes were bored. No new possible zones of good water at depth can be suggested here, owing to the scant information available.

Range 3 West—Rhineland Municipality

Except for the slight, almost imperceptible rise made by a sand bar in secs. 11, 12, and 14, the land surface is flat, with a rise to the west of about 7 feet per mile. The silt unit here is thinner and averages 11 feet.

Wells are dug in the silt to an average of 12 feet in depth and yield potable water only in the area outlined in Map 29-1960. The water is hard and alkaline. Only one well, dug 11 feet in NE sec. 11, yields comparatively soft water. It is dug into the sand on the western edge of a sand bar, which may account for the softness of the water.

In sec. 33, one well 150 feet deep is flowing artesian. It yields salty water, and forms the southern tip of the flowing artesian zone shown in Map 29-1960. This zone may extend farther south, but no drilled wells to the southeast of this zone are available. Other wells have been drilled to depths of 150, 130, 160, 200, and 160 feet in SW and NW sec. 18, SW sec. 19, NE sec. 35, and NW sec. 36 respectively. The last two yield salt water used only for watering the stock, whereas the first three get good potable water from sand and gravel lenses associated with the till below the clay at a depth between 130 and 160 feet. The clay unit is 124 feet thick in SW sec. 18.

Almost all homes in the villages of Neuhorst (pop. 42), Rosengart (pop. 92), Schoenwiese (pop. 69) and Rosenort (pop. 87) have shallow dug wells in the silt, yielding potable water in sufficient quantities for domestic use. In Rosenort, however, the water from the wells is bitter, and most inhabitants prefer rain-water collected in cisterns.

The sand bar situated in secs. 11, 12, and 14, is an area of ground-water interest. It should be probed by test-holes to see if any good water in quantity is available. An experiment could be carried out during spring or summer at times of heavy rainfall, when the run-off is strong, to see if this sand bar could be artificially recharged, for a road ditch crosses the sand bar 200 feet north of a sand and gravel pit. If test-pumping proves that sufficient water is available from this potential aquifer, a waterworks could be established for the village of Rosenort, and perhaps Neuhorst.

As sand commonly has a porosity of 20 per cent, 1 cubic foot of sand can hold more than 1 1/2 gallons of water. The potential number of gallons of water that could be held within the sand bar can be calculated by multiplying the number of cubic feet of sand in the sand bar by 1 1/2, the gallon-per-cubic-foot ratio. From an aerial photograph the sand bar was found to measure 13,200 feet long by an average of 1,320 feet wide. A test-hole bored in the centre of the bar indicated a total depth of the sand of 19 feet, but water was encountered at 10 feet. Therefore, without artificial recharging, 9 feet of water is found in the centre of the sand bar. Using this last figure we get: 13,200 x 1,320 x 9 x 1.5 = 235,224,000 gallons.

This amount available yearly from this potential aquifer would mean more than 600,000 gallons of water available daily— sufficient to supply 10 villages the size of Rosenort. One well in NE sec. 11 is on the western margin of the sand bar and yields softer water than other wells in the region. The water obtained from this aquifer elsewhere would probably also be equally soft, especially if the aquifer was recharged artificially with the spring run-off and the summer's heavy precipitation. A good screened well would do much to increase the standard of living of the people in the villages surrounding this potential aquifer.

Range 4 West—Stanley Municipality

The surface rises to the west at 12 to 15 feet per mile. Water is obtained from two aquifers. The silt deposited in Lake Agassiz forms a shallow aquifer, and the sands and gravels of glacio-fluvial origin associated with the till form an aquifer at depth.

The silt averages 13 feet in thickness; shallow wells dug in it average 14 feet in depth. Only wells within the area shown in Map 29-1960 yield potable water. The yield of each well is small but sufficient for farm and domestic requirements. Wells in the silt, but outside the potable zone, are used only for watering stock.

Wells which are 130, 137 (2), 112, 90, 100, and 140 feet deep were drilled to the till horizon, into the sand and gravel deposits associated with it, in SE sec. 12, NW and NE sec. 13, SE sec. 22, SE and NE sec. 33, and NW sec. 35 respectively. All are subartesian and yield hard potable water. The water rises from 18 to within 4 feet of the surface. A yield of 50 gallons per hour is obtainable from a 2-inch-diameter well in this aquifer in the village of Reinland. A 5-inch-diameter well drilled 112 feet in SW sec. 22 yields 700 gallons per hour. The hardness of the water in this well is 314 ppm. A well drilled in the village of Reinland by Mr. H. Peters of Winkler gives a good cross-section of the lacustrine and glacial deposits in this township. The information was given from memory as no logs were kept. Five feet of black-earth soil is underlain by 20 feet of silt and 80 feet of clay. Four feet of gravel occurs immediately below the clay, but no water was noticeable. This gravel is underlain by 15 feet of till which in turn is underlain by 13 feet of sand that yields 50 gallons of water per hour when pumped. The water rises to within 4 feet of the surface without pumping.

Villages situated in tp. 1, rge. 4W are Haskett (pop. 29), Reinland (pop. 221), Blumenfeld (pop. 93), Hochfeld (pop. 171), Osterwick (pop. 150), and Neuenburg (pop. 103). Haskett has no potable ground water. Bitter water is available from the shallow silt aquifer; this is used only for stock. Cisterns are the chief means of getting drinking water. In Reinland homes, potable water is obtained from the deep aquifer mentioned previously, and also from a few shallow wells dug in the silt. Blumenfeld residents get potable water from shallow dug wells in the silt. Almost every home has a well; those without one haul water from their neighbours. No deep wells are reported here. In Osterwick the silt aquifer yields potable water, but the water has a high iron content and the best potable water is found in the southeast end of the village. Again most homes have a well; those with none haul water from their neighbours. In Hochfeld and Neuenburg, potable water is found both in the shallow aquifer in the silt deposits, and in the deep aquifer in the sands and gravels associated with the till. At Hochfeld the till horizon is penetrated at the shallower depths of 90 and 100 feet, whereas in Neuenburg it is found at a depth of 130 to 150 feet, similar to its depth in other drilled wells in tp. 1, rge. 4W. Wells only 60 and 65 feet deep at both Hochfeld and Neuenburg penetrate gravels (reported to be 20 feet thick at Hochfeld) in the blue clay. If the till horizon is lower at Hochfeld, as indicated by the other wells, this gravel could be alluvium deposited there by a previous stream which had its source in the escarpment and followed a course similar to the one now occupied by an intermittent stream. The water from this aquifer is salty but potable. The yield of the wells in this aquifer is not known but both were subartesian, the water rising to within 6 and 24 feet respectively, of the surface. Further drilling, following the course of the present stream, might disclose the extent of this aquifer.

Range 5 West—Stanley Municipality

The Manitoba escarpment trends southeast from sec. 31 to sec. 3, almost dividing this township in half. East of the escarpment the surface is flat to rolling as each beach ridge is approached. West of the escarpment the surface is uneven and rolling, and is dissected by intermittent streams that have dug deep wide gullies.

All ground water in this township comes from shallow wells dug either in the shale, the reworked till, the sands and gravels of the beach bars along the beach ridges, or in the silt. As far as the writer could ascertain, there are no drilled wells to provide subsurface information.

The friable shale outcrops at various places on the escarpment, as well as in drainage ditches below the escarpment to the east. Most of the shale, however, is covered by a thin mantle of till. Wells in the shale range from 8 to 30 feet deep and yield small quantities of potable water for farm and domestic needs. The water obtained from the shale is the softest available in the Plum Coulee area.

Gravel and sand occur in lenses along the beach ridges in a zone about 2 to 3 miles wide at the foot of the escarpment. These deposits average 8 feet thick and contain water in wet years. The clay is reported to underlie these sands and gravels wherever wells were dug, but it could be that the shale was mistaken for clay and reported as such. For some unknown reason the water in a few of these lenses is bitter. Therefore, digging for a well in these deposits does not ensure getting potable water. A few wells occur in lenses of gravel and sand above the escarpment in what could be outwash deposits. These deposits occur in secs. 29, 30, and 31. The quality of the water is good, but the quantity is small.

The silt aquifer that was mentioned previously comes to an end here against the escarpment. Its average thickness is 8 feet. Potable water that will satisfy farm and domestic needs is obtainable from this aquifer.

Farmers in the south of this township who do not possess good ground water buy water at $10 per 1,000 gallons from the owner of two shallow wells dug in the shale.

Summary of Township 1

In the Plum Coulee area, township 1 has the best supply of shallow ground water. Nevertheless, many farms, and villages such as Rosenort, Neuhorst, Blumenort and the town of Gretna, have not an adequate supply of potable water. Also, only seven of the eighteen rural schools surveyed in this township have wells that yield potable water. The other schools use rain-water stored in cisterns, or hauled water. So far, no well has yielded large enough quantities of water for industrial, municipal, or irrigation needs.

Because of the hardness of the well water, cisterns are used in almost every home to collect soft rain-water. Also, on every farm the supply of well water is augmented by surface waters collected in dugouts.

Many of the farmers in this township have, in recent years, moved into nearby villages, commuting daily to their farm-lands by car. As a result, fewer individual wells are needed. A single good well, if it could be found, would satisfy the needs of all persons in the village.

Two new potential aquifers may be developed in this township as shown by this survey; the most promising is the sand bar in secs. 11, 12, and 14, rge. 3W.

TOWNSHIP 2

Range 1 West—Rhineland Municipality

The surface of the land is flat with a rise to the west of 3 feet to the mile. Buffalo Creek, an intermittent stream, meanders in a general northward direction along the eastern margin of the township. In sec. 31 it turns sharply eastward, following a drainage ditch along the northern margin of the township. As with many other small streams in the Plum Coulee area, this stream has control dams at intervals across the stream channel to impound a part of the normal run-off in a series of long narrow lakes.

Most of this township is devoid of potable water. The silt averages 9 1/2 feet thick and the underlying clay is 127 feet thick. The silt is the only aquifer in this area that yields potable water for farm or domestic needs, and it does so only in the zone shown in Map 29-1960.

Producing wells are usually dug through the silt to the clay to an average depth of 14 feet. Wells have been drilled to depths of 385, 160, 175, 130, and 132 feet, in SW and SE sec. 8, NW sec. 10, SE sec. 12, and NE sec. 32 respectively. The first of these wells was presumably drilled through the unconsolidated deposits into the bedrock (although no log is available) and was a flowing artesian well yielding saline water. The other drilled wells obtained water from the gravels and sand associated with the till. In these four cases the water was subartesian and salty. More wells were drilled, probably to the till horizon, in secs. 24, 29, and 31, but their depths are not known. The water in these wells is also subartesian and salty.

In the village of Old Altona (pop. 88) there are only two dug wells, which yield potable water in wet years; most of the villagers rely on cisterns, dugouts, or hauled water.

The town of Altona (pop. 2,000) is the third largest community in the area. Its only source of water is the ground water obtained from seven municipally-owned shallow wells, dug to a depth of 16 feet in the silt. Of these, five are used for domestic purposes while two are being used for fire protection, along with a dugout. Each well is equipped with a hand pump. One of these wells, situated at the corner of 5th Avenue and 2nd Street, is actually recharged by a dugout 25 feet away. The water passes through the silt into the well. Two water analyses give this well water an average hardness of 1,954 ppm and an average chloride content of 223 ppm.

The scarcity of water during the drought of the thirties is reflected by the fact that it was then necessary to place a padlock on each pump at night, so that outside farmers could not take the little water available for the urban population the following day. In daytime a watchman stood at each well to see that the water was distributed fairly.

The depth of the water in these wells, when examined in July 1959, was 9 feet, but this may have been due to a heavy rainfall the day before. With this average depth the storage capacity of these wells is approximately 20,000 gallons. Recharge would increase this amount somewhat but this is nonetheless a very small supply of water. One industry alone—the Vegetable Oil Co-op—uses 15,000 gallons of water daily, which it hauls from Neche, North Dakota. Because of the scarcity of water, each home collects rain-water in cisterns.

In the autumn of 1958, municipal authorities tried to alleviate the situation by drilling two wells, hoping to find good water at depth. One was drilled 160 feet deep through the silt and clay, and water was encountered in gravels below the till. The water was analyzed by the Vegetable Oil Co-op in their laboratory and showed a hardness of 5,300 ppm and a chloride content (mostly sodium chloride) of 9,400 ppm. The well was abandoned. The rate at which this well could be pumped is not known. The other well was drilled to a depth of 385 feet, and it is assumed to have penetrated bedrock. Analyses of the water showed hardnesses of 11,200, 5,600, and 6,900 ppm at depths of 178, 300, and 380 feet respectively, while the chloride contents were 37,900, 33,000, and 38,600 ppm respectively. Artesian flow occurred at this well. The well also was abandoned without any knowledge of its yield. The town authorities therefore concluded that no good potable ground water exists in the immediate vicinity in sufficient quantity to satisfy the needs of Altona.

These drilling tests were not completely fruitless, however, for even though no good water was encountered, it proved that water is available at depth. An economical process, such as the distillation method, the ice-separation method, or the ion-exchange method, could probably be developed for the conversion of this salt water into good fresh water. The largest salt-water distilling plant in the world, at Aruba, Netherlands Antilles, produces 2,500,000 gallons per day at a cost of $1 per 1,000 gallons.

It is unfortunate that no logs of the wells were recorded and no pump tests were made, so that the source horizon of the water and the possible yield of such wells, if properly developed, are unknown. As the supply of saline water at depth may well be considerable, the writer believes that the possibility of salt-water distillation and conversion to fresh water is worth further investigation.

Range 2 West—Rhineland Municipality

The surface is flat, rising to the west at a rate of 5 feet per mile. This township is the driest one in the southern part of the Plum Coulee area. The very fine sandy loam at the surface is about 9 feet thick and is in most parts devoid of water. Where water does occur in it, it is not fit for drinking. Only three shallow dug wells yielding potable water—probably dug in silt lenses—are now in use. They occur in SW sec. 6, SE sec. 10, and SW sec. 18. Other dug wells that formerly yielded water are now dry, perhaps due to the lowering of the water-table in these areas by big road ditches. Three such dry wells can be found in secs. 19, 29, and 30.

Wells drilled to depths of 150 (2) and 180 feet occur in SW secs. 5 and 8, and in NE sec. 26. In all cases the water is sub-artesian and salty. Although no data is available, it is presumed that the water is found in the sand gravel lenses associated with the till. These wells are used for watering stock only.

The farms in this township rely predominantly on their cisterns and dugouts.

Range 3 West—Rhineland Municipality

The surface is fairly flat, with a rise to the west of 11 feet per mile. The main aquifer is the sands and gravels of glacio-fluvial origin associated with the till, which yield saline water under artesian flow. The silt and sandy loam is generally about 12 feet thick. The thickness of the underlying clay is fairly constant from place to place and is found to be, from well drillings, 121, 135, and 138 feet in NE sec. 4, and NW secs. 12 and 31 respectively.

Most of the shallow dug wells are found in the eastern half of the township. As indicated on Map 29-1960 very few of these yield potable water. They are dug to an average depth of 18 feet, being dug below the silt and sand loam to increase the storage capacity of the well as the silt and sandy loam aquifer does not yield much water.

The flowing artesian zone in this area can be seen on Map 29-1960. Except in or near the village of Gnadenthal, no dug wells are found within the zone. Local inhabitants are evidently satisfied with the artesian water, obtainable at depth without pumping, for it provides a continuous flow of salty water for their stock. For their own consumption they use rain-water from the cisterns. Few dugouts are to be found in the area underlain by the artesian zone for the same reason. Some of these artesian wells have been producing since 1890.

Water in these flowing artesian wells is found at a depth of between 128 and 230 feet, the average being 166 feet. From the information obtained during the present study, the best part of the aquifer is in sand below the till horizon. As indicated by a well drilled in NW sec. 31, the top part of the till also contains sand that yields water probably less saline than that of the lower horizon. The natural-flowing yield of this well was 1 gallon per minute. However, drillers in this area seldom stop at this aquifer, but drill deeper to the zone that is known to yield a continuous flow.

All wells in this aquifer are drilled by the cable-and-tool method and the casing is in most instances 2 inches in diameter. The wells are not developed and no screens are used. They often need cleaning for continuous flow is prevented by a valve or faucet which causes the salts to accumulate on the inside of the casing and eventually plug the well.

In the northeastern corner of the township, five wells drilled to an average depth of 130 feet yield salt water under sub-artesian pressure. Another well, similar to these, drilled in NW sec. 12 in 1958 to a depth of 152 feet, yields water that showed a hardness of 1,687 ppm, sulphates 740 ppm, and a total chloride content of 850 ppm. At a pumping rate of 10 gallons per minute, the water level stands 60 feet below the surface, which is 45 feet below the level to which the water rises when the well is not being pumped. The height to which the water level rises in this well is affected by the atmospheric pressure. The owner relates the rising and falling of the water level to the wind direction, for "when the wind is from the northwest the water level rises and when the wind is from the southeast, the water level drops". Other farmers in the Plum Coulee area have given the same explanation for water-level fluctuations in their wells.

The village of Gnadenthal (pop. 131) has a few shallow wells dug in the silt, which yield only bitter water. The drilled wells are flowing artesian wells yielding salty water used for stock only. Most of the villagers drink cistern water; some haul water from Morden 20 miles to the northwest, or from Winnipeg 75 miles to the north at a cost of $20 per 1,000 gallons. The Hutterite colony of Blumengart has five wells yielding salt water used only for the stock. This supply is supplemented by water from dugouts and water dammed on an intermittent stream that crosses their land. The residents get their fresh water from cisterns or by hauling from Morden or Winnipeg.

From available information, no new freshwater aquifer can be predicted in this township.

Range 4 West—Stanley Municipality

The even surface in this township is broken by a beach ridge, trending north-northwest, that can be seen at the crossroads at Schanzenfeld school, half a mile east of the village of the same name. As in the township to the south, water is available in both the shallow aquifer in the silt, and the deep aquifers in the sands and gravels associated with the till. The silt is about 18 feet thick; the clay below it is 92 feet thick in the northwest corner, 129 feet thick in the village of Reinfelt, and 165 feet thick 3 miles farther south in the village of Friedensruh. The till, as usual, underlies the clay. The water-bearing lenses associated with the till seem to have a more gravelly texture than those penetrated in wells in townships to the east. No wells in this township are reported to have penetrated bedrock. The clay thickness decreases generally to the west, due to the gradual rise in elevation of the underlying bedrock surface as it approaches the escarpment 6 miles to the west.

The silt aquifer yields potable water in almost half of this township (see Map 29-1960). Wells are commonly dug through the silt into the clay, to an average depth of 19 feet. The water level in these wells is generally 10 feet below the surface in years of normal rainfall, and the quantity of water is sufficient for farm and domestic needs except during winter, when quite a few of the wells go dry.

Potable water also occurs underneath the clay in gravel lenses associated with the till. Such water is found in wells in NW sec. 14, NE sec. 15, NW sec. 16, and SE secs. 20 and 22, at depths of 36, 48, 50, 62, and 52 respectively. In three of the five wells, the water flows at surface at a rate of 2 gallons per minute; the reason for this has not been found, as the source of this water is as yet unknown. As these three wells yielded water even during the drought of the thirties, the area enclosed in NE sec. 15 and vicinity should be thoroughly investigated by drilling. It may have the potential for yielding large quantities of potable water.

The western extension of the artesian-flow zone described in the township to the east covers the northeastern part of this township. Wells in this zone are drilled to depths of between 140 and 200 feet. The water is saline and is used for stock only.

The village of Chortitz (pop. 188) depends on shallow wells dug in the silt. Forty-two dug wells were counted in the village, almost one well per home. Rain-water from cisterns supplies the village with soft water. Only one well has been drilled here. It encountered good water at a depth of 75 feet in sand and gravel below the clay, but the quantity was very limited and the well was abandoned. Further investigation of this deeper zone by drilling might find that it is a reliable aquifer. The shallow wells supply little water during dry years.

In the village of Schanzenfeld (pop. 60), west of the beach ridge, potable water is also available in the silt. A few deeper wells yield potable water from sand and gravel lenses below the clay at depths of 80 and 120 feet. The water in these wells is subartesian and rises to within 17 feet of the surface.

The villages of Freidensruh (pop. 85) and Reinfelt (pop. 115) are completely within the flowing artesian zone shown on Map 29-1960, and all wells yield salty water from depths of between 140 and 200 feet. This salt water is used for the stock only. Wells in these villages that are dug in the silt aquifer do not yield good water because of the contamination of the surface zone by the salts brought up in the water from the deeper zone. Twenty-four flowing artesian wells are now being used in these two villages. Their natural-flowing rate is about 2 gallons a minute, although one well in Reinfelt yields 16 gallons per minute. For domestic needs the inhabitants use cisterns or haul water from Morden, 10 miles to the west.

Range 5 West—Stanley Municipality

The rolling surface in this township is due to numerous linear beach ridges trending north-northwest across its western half, so that the westward rise is more pronounced than in the townships to the east. The land rises an average of 33 feet per mile until it comes sharply against the escarpment in the southwestern part of the township.

Most of the western half is covered by glacial till, modified by wave action, that ranges from 2 to 20 feet thick. The sand-and-gravel beach ridges are no more than rewashed till formed by the washing action of the waves along the shores of the beaches of former Lake Agassiz. The eastern half is covered by silt and a zone of very fine sand. Only in the southwestern part can shales of the Vermilion River formation be seen along stream banks and road-cuts.

All but one well are shallow dug wells. Shallow wells yield water almost anywhere in the township, but in only the zones outlined on Map 29-1960 is the water potable. The wells average about 15 feet deep with the water level rising to within 8 feet of the surface. Wells in the sand and gravel ridges yield more water than those in the shale or silt. In general, however, each well only yields enough water for farm and domestic needs. Farms with two or more wells are common, and additional wells may be dug in dry years.

One well in the extreme northeast corner, in NE sec. 36, was drilled 85 feet through the silt and clay into water-bearing sands below. The water is potable but small in amount.

In the western half of the township, small amounts of water might be obtained from wells drilled in the shale. So far only five such wells have been drilled. These were in NE sec. 31 and none gave satisfactory results. On a turkey farm there, the daily water requirement, 1,000 gallons, is hauled from Morden, a mile to the north.

Summary of Township 2

The best supply of potable water, from either the shallow or the deep aquifers, is in the western part of the township. As in township 1, however, the ground-water supply is inadequate, and must be supplemented by water collected in cisterns and dugouts. A few zones might yield greater amounts of water; the most promising is in NE sec. 15, rge. 4W.

In the eastern part of the township, especially around Altona, more drilling is necessary to prove that fresh water is not available in sufficient quantity, and to determine the amount of salt water that is available. If much salt water is available, a conversion program should be considered. The only other alternative to alleviate the water shortage in Altona is to bring fresh surface water from a considerable distance.

TOWNSHIPS 3, 4, 5, AND 6, RANGES 1 AND 2 WEST— RHINELAND AND MORRIS MUNICIPALITIES

These townships are grouped because very little is known about them, and because the entire area appears to be almost devoid of potable ground water. The area is 288 square miles, a little more than a quarter of the Plum Coulee area studied by the writer.

The surface is flat and slopes to the east at 2 feet per mile. It is crossed by huge drainage ditches, some more than 350 feet wide, which were dug to improve drainage during spring run-off.

The whole area is covered by a black clayey organic soil, which is as much as 6 feet thick in NE sec. 8, tp. 5, rge. 2W. This soil is underlain by a clay with some silt, which occurs in small narrow lenses as seen in the ditch along highway 23. Underlying this clay is the true bluish clay of Lake Agassiz, which is 80 feet thick around Sperling, 54 feet thick at a point 10 miles to the east, 175 feet thick 12 miles south of the latter, and 115 feet thick in a well at Rosenfeld. On the basis of the log records of a few deep wells, it is known that till, or sand and gravel associated with the till, underlies the clay. This till, with or without its sandy or gravelly components, ranges from 5 to 140 feet thick. It in turn is underlain by shale or limestone which is found at depths between 115 and 230 feet.

At present, only two wells yield potable water, and these only in very small quantity. One is dug near Buffalo Creek— 13 feet in the shallow silt aquifer in SE sec. 6, tp. 3, rge. 1W. It supplies enough water for domestic needs. The well is actually re-charged by the water contained by a dam in Buffalo Creek. The other well is bored 96 feet through the clay into a sandy lens in the till. It is 18 inches in diameter and water rises to within 35 feet of the surface when the well is not being pumped. This well supplies 250 gallons per day.

Some dug wells yield only salt water, even at a depth of only 20 feet. In the past, more farms had dug wells that yielded potable water, but these have either become contaminated by salty water from below, or have gone dry. The huge drainage ditches in the region have probably lowered the surface-water table so much that the few water-bearing lenses in the clay are now almost completely dry. In August 1959, cracks as much as 4 inches wide and 8 feet deep could be seen at regular intervals of 10 to 20 feet along the whole length of the fields.

All wells drilled or bored below the clay yield only salt water. Of 83 such wells in this area, only 13 are still in operation and are only used for watering the stock. The rest were plugged up because of their high salt content. Most wells drilled into bedrock were flowing artesian wells and it is believed that the non-flowing wells would flow if they were deepened. A few of those in the drift were also flowing artesian wells, but in general, wells not penetrating bedrock were subartesian. Map 29-1960 shows the western extension (with some modifications) of an area of artesian water flow that was earlier reported by Johnston (1934).

Most of the deep wells having log records available were drilled a long time ago. One was drilled in 1886 to a depth of 1,037 feet at Rosenfeld by the Canadian Pacific Railway. The log of this well (#2154) is shown on the cross-section in Figure 2. Some were drilled by the Manitoba Public Works Department during the years 1915 to 1919. A few others are mentioned by Johnston (1934).

During the early part of the 1950's a single well was drilled for oil in SE sec. 1, tp. 5, rge. 2W. Men in the Lowe Farm area stated that it was drilled to a depth of about 800 feet and that potable water was encountered at 600 feet. No oil was struck, and the well is now filled with cement.

The population in this area is more sparsely distributed than in townships to the south. All residents of Rosenfeld (pop. 325), Horndean (pop. 95), Sewell (pop. 32), Lowe Farm (pop. 365), Kane (pop. 35), and Sperling (pop. 200), as well as farmers in this area, rely on cisterns and dugouts. Most of the inhabitants also haul water from the town of Morris, 4 miles to the east, or from Winnipeg, 40 miles to the northeast, at a cost of from $14 to $16 per 1,000 gallons.

Residents of this clayey area gave up the search for potable ground water several years ago. However, more silt lenses yielding potable water might still exist. The shallow water-table might also be raised again, if some water was to be retained in the drainage ditches by dams after the threat of spring floods has passed. Raising the water-table would restore water to dry wells. Salt water can be found at depth, but the amount to be obtained from the deep aquifers is not yet known. If available in great quantity, it could be rendered useful by means of a cheap salt-water conversion process. This appears to be the only way to alleviate the water shortage, at least in the small communities.

TOWNSHIP 3

Range 3 West—Rhineland Municipality

The surface here is flat with a rise to the west of about 5 feet per mile. The very fine sandy loam in township 2 to the south, extends into this township and covers almost all of the southern half. The northern half is covered by clay.

Only two shallow wells, 14 and 18 feet deep, dug in silty lenses, yield potable water. No extensive shallow aquifer can be said to occur in the township.

Most wells have been drilled through the clay, which is 150 feet thick in sec. 18 and 135 feet thick in sec. 24, to the till below. Sandy lenses associated with the till, more than gravelly lenses, seem to be the aquifers yielding salty water to these wells. The water in these wells is under artesian pressure.

In the subartesian wells the water rises to within 10 feet of the surface. These wells have an average yield of 1 gallon per minute with a drawdown of 1 foot per minute.

In the southwest corner of the township, wells drilled about 175 feet deep yield water under artesian flow. One in SE sec. 18 yields water that is salty but drinkable. It yields 3 gallons per minute without pumping. A similar well a few hundred yards to the west yields only 1 gallon per minute. In general all drilled wells yield only salt water, which is used only for the stock.

The only water available to the town of Plum Coulee (pop. 500)—the sole community in this township—is that collected in cisterns by each home, and also the sluggish water held back in the Plum Coulee stream by a dam built at the railroad station by the Canadian Pacific Railway. There are no wells here. Residents of this town and the surrounding area haul water from Morden, 16 miles to the west, or from Winnipeg, at a cost of $20 per 1,000 gallons.

Some 50 wells were drilled in this township, none of which are known to have reached bedrock. The township has no aquifer from which a sufficient quantity of potable water could be obtained. Water from the bedrock would probably be saline.

Range 4 West—Stanley Municipality

The surface is flat with a rise westward of a little more than 10 feet per mile. Silt averaging 20 feet thick covers almost the entire township.

A few shallow wells dug into the silt to an average depth of 30 feet, along the western margin of the township, yield good potable water in sufficient quantity for farm and domestic requirements.

An area covering nearly one third of this township (Map 29-1960) yields potable water at depth from sand and gravel lenses associated with the till. In NE sec. 20 the water from one of these aquifers tasted excellent. The artesian-flow zone described in township 2 extends here, but it is divided into two distinct lobes (Map 29-1960). The northwestern tip of the westerly lobe is the only place in the Plum Coulee area that good potable water is found under artesian flow. Half a dozen artesian wells can be found in secs. 9, 15, and 16.

Winkler (pop. 2,000) is the only town in the Plum Coulee area that has a sufficient supply of ground water. It has a well with the greatest yield (100,000 gallons per day). When this well is pumped, the water level in other wells in the town drops noticeably.

A well was drilled by the Manitoba Public Works Department in June 1918 near Winkler to a depth of 1,320 feet. (The exact location of the well is unknown.) A cross-section of this well (#2117) is shown in Figures 2 and 3. The log shows that bedrock was encountered at 535 feet and consisted of shale, limestone, and sandstone. No information is given as to whether water was encountered in the bedrock. Overlying the bedrock is 275 feet of clay, 5 feet of which is called "streak of coal sand". If the well log is accurate, this deposit of clay is the thickest and deepest known in the Plum Coulee area. This clay directly overlying the bedrock may be the reason why Winkler has more potable water available at depth than elsewhere in the Plum Coulee area; the clay prevents the upward migration of salty waters from bedrock into the till above the clay. Above the clay are 5 feet of sand and another clay deposit 10 feet thick.

Overlying these two thin deposits, 170 feet of sand and gravel is cut exactly in half by 10 feet of "drift coal". In Figures 2 and 3, the author has changed the top 85 feet of sand and gravel (as reported in the log) to till. One hole to the east shows till to be 70 feet thick. This till probably contains large lenses of sand and gravel and this is probably the zone from which Winkler gets its potable water. It is the only zone reported in the log of the well where water is found. The potable water from these sand and gravel layers in the wells at Winkler is available at depths ranging between 50 and 150 feet. Only the industrial wells used by the cannery and the creamery go deeper—to an average of 180 feet—into the sand and gravel deposit reported in the log. The yield of these deeper wells is much greater. For example two wells at the creamery, 125 and 186 feet deep, yield 500 and 5,000 gallons per hour respectively.

The bottom 85 feet of the 170 feet of sand and gravel reported in the well log could also be till. If so, gravel and sand lenses would again be the aquifers that would supply the wells with a greater flowing rate. In Figures 4 and 5 it has been assumed that this 85 feet of gravel could extend 2 or more miles east and west, and also approximately 8 miles to the south, and 4 miles to the north of Winkler.

The log of this well shows that 40 feet of blue clay lies above the till. This is the same blue clay encountered elsewhere in the area. The clay in turn underlies 20 feet of silt. A few shallow wells are dug in the silt in the town of Winkler.

In Winkler, the west end of town obtains water from an average depth of 60 feet and the water in these wells rises to within 4 feet of the surface, whereas the east end of town obtains water at an average depth of 120 feet and the water there rises to within 10 feet of the surface.

As shown on Figure 2, the deep well at Winkler suggests that a deep buried valley lies below the present surface. As the potable water is obtained at an average depth of 140 feet, the water yielded by the flowing artesian wells in secs. 9, 15, and 16, with a natural-flowing rate of half a gallon per minute, may have its origin in the west. This is the most reasonable explanation, for no potable water is found to the east.

The author believes that the area of approximately 48 square miles surrounding Winkler has the greatest potential ground-water resources in the Plum Coulee region. The extent of these resources could be established by a systematic drill-hole program, with the holes having a minimum depth of 160 feet and a maximum depth of 290 feet.

Range 5 West—Stanley Municipality

The slope of the ground is a little more pronounced than to the east, for the rise to the west is approximately 30 feet per mile. Silt covers a good part of this township to an average depth of 14 feet. Two areas of fine or silty sand have been reported (Johnston, 1934), and are shown as such on Map 30-1960.

The silt is a fair aquifer, supplying enough water for farm and domestic needs. Almost anywhere in the township, wells dug in the silt to a depth of about 16 feet will yield water, but only in the zones outlined in Map 29-1960 is this water potable. Quite a few of these shallow wells also obtain potable water from sands and gravels deposited as alluvium, by streams flowing down off the sharp rise immediately to the west of this township. A few examples of such wells can be seen in SW sec. 17 and NW sec. 35.

Along the eastern margin of this area, deeper wells, averaging 100 feet in depth, obtain potable water from sandy and gravelly lenses associated with the till. However, the amount of water obtained from these lenses is small, although it is under artesian pressure. These subartesian wells generally provide less than a gallon a minute.

In 1889, a well drilled in the town of Morden was logged by Tyrrell (1896). He showed the contact of bedrock (in this case, shale) to be 31 feet below the surface. This well at Morden, (#2141, Figure 2), and the deep well at Winkler (#2117), indicate a sharp decline to the east in the surface contour of the bedrock and lead to the assumption that a deep valley existed there at one time.

Until a few years ago the town of Morden (pop. 2,000) depended on a few shallow wells for its water supply. Some of these were owned by the town, others were privately owned. This water shortage was remedied when the Morden dam was constructed on Dead Horse Creek in 1941 under the Prairie Farm Rehabilitation Act. The dam was rebuilt in 1952, increasing the usable storage capacity to 1,830 acre-feet and creating a reservoir that is now known as Lake Minnewasta. Two pipelines from the reservoir supply parts of the town with as much as 320,000 gallons per day of filtered and treated water, and the whole town will soon be serviced by this water system. Some of the towns and villages to the east hope that one of these pipelines will be extended to link with the Morden reservoir.

Summary of Township 3

The eastern two thirds of township 3 in the Plum Coulee area is generally devoid of potable water, either from shallow or deep aquifers. It is likely that water obtained from bedrock would be salty. On the other hand the western third of the township can obtain potable water from the silt aquifer near surface. Range 4 in this township has the biggest supply of the best potable water. The potential of this last area should be thoroughly investigated.

TOWNSHIP 4

Range 3 West—Roland Municipality

The surface is almost level, rising slowly to the west at 6 feet per mile. It is crossed diagonally by a huge drainage ditch that helps drain the spring flood-waters of Shannon Creek. Most of this township is covered by clay.

Only one shallow well, situated in NE sec. 20, was encountered. It is dug to a depth of 14 feet into the silt, and yields very hard, bitter water. The only well yielding potable water was drilled 120 feet deep just south of the village of Myrtle. All other wells in this area with a depth between 90 and 200 feet are subartesian and yield salt water used only for the stock. No wells are known to have penetrated bedrock.

Few owners of the deeper wells had any information on the source of their water. However, the salty water is probably obtained from sandy layers found in the till at various depths. Again, as in the townships to the east, the inhabitants apparently believe that no good water can be found in this area, so that they have been discouraged from further investigations.

As on the farms in this area, homes in the village of Myrtle (pop. 30) possess two cisterns, one to catch rain-water from the roof, which is the supply of soft water, and the other for storing water hauled for drinking purposes. Water is hauled from Winnipeg, Morris, Morden, and from Glover's farm in tp. 4, rge. 4W.

On the information available, no new water horizons can be anticipated in this township.

Range 4 West—Roland Municipality

The surface is almost level, sloping to the east at 7 feet to the mile. This township is almost entirely covered by silt which averages 16 feet deep.

Shallow wells dug into the silt to an average of 16 feet deep yield potable water in NW sec. 2, SW sec. 11, NE secs. 17 and 29. Few shallow wells have been dug, probably because the silt yields little water and such wells commonly go dry in the winter. However, the silt aquifer may yield potable water at other places than those just mentioned.

Clay is found in every well drilled or dug below the silt. It is 112 feet thick in NW sec. 2, but seems to get thinner northward. In NE sec. 33 it is only 72 feet thick. Till underlies the clay, and a hole drilled to a depth of 200 feet in SE sec. 5 does not reach bedrock. This hole shows that there are three gravelly sand horizons in the till from which potable water is available. One such layer is assumed to be at 90 feet, another at 125 feet, and the third around 165 feet. All wells drilled or dug to these deeper aquifers are subartesian. Outside the zone of fair to potable water shown on Figure 1, the deeper wells of this township all yield salt water, which is used only for stock.

Only one well, in SE sec. 3, is flowing artesian. It is probably the northernmost extension of the eastern lobe (Map 29-1960) described in tp. 3, rge. 4W.

As in other places in the Plum Coulee area, farmers here also make extensive use of all available cisterns and dugouts. Those without potable well water, haul it from Morden or Glover's farm (tp. 4, rge. 5W). There are no villages in this township.

Sec. 5 should be investigated by drilling to determine the exact depth of the three gravelly sand layers within the till. This would show whether they are truly gravelly sand layers, or just till deposits within the clay, and also whether a greater rate of flow could be obtained assuming that they are gravelly sand lenses if a properly developed well was drilled into them. At present the rate of flow of these three horizons is known only to be sufficient for farm and domestic requirements.

Range 5 West—Roland and Thompson Municipalities

The surface is flat with a rise of a little more than 11 feet per mile. Only a beach ridge, running north-northwest from SE sec. 4 to the western margin of the map-area in SW sec. 31, mars the levelness of the ground. This ridge has an abrupt rise of 10 to 15 feet throughout its length. The area is almost entirely covered by silt averaging 17 feet deep. A beach bar consisting of good sorted gravel occurs in SE sec. 11. At present a pit is in operation and the material is used for road construction.

In general, wells dug into the silt yield fair to good potable water. The most important aquifer, however, is in NW sec. 1. In this aquifer is the famous Glover's farm well, from which people for miles around get their potable water. The well is roughly 1 mile southeast of the beach bar mentioned above. It is 16 1/2 feet deep and 3 feet in diameter, and is lined with concrete blocks. It was dug in 1917, through a clayey silt into a sandy layer. Two electric pumps yield as much as 20 gallons per minute and have been doing so for many years. This well yielded a constant supply of water even during the drought of the thirties. The water level in the well is 8 feet below surface when it is not being pumped. The well is believed to be spring fed, for several springs occur in the sides of the trenches made by two nearby intermittent streams that join to form Shannon Creek. The sand through which the spring or springs flow could have been deposited by these streams at flood time, or it could be the southern extension of the beach bar to the northwest. In any case the water in this well is excellent. The owner sells it for $2.50 per 1,000 gallons. The spring that charges this well may also supply the excellent water in a well in NE sec. 20, tp. 3, rge. 4W.

Sand and gravel aquifers associated with the till in this township also yield potable water at depth (Map 29-1960). Wells sunk into these aquifers are subartesian and have an average yield of 350 gallons per day.

The thickness of the clay above the till ranges between 70 and 100 feet. As was found in the deep hole at Winkler, the logs of two holes drilled in this township by the Manitoba Public Works Department show that clay also underlies the till. One hole was drilled in 1915 in SE sec. 17 to a depth of 196 feet, and the other was drilled in 1921 in NE sec. 25, to a depth of 190 feet. The first was reported dry, whereas the second penetrated bedrock (shale) and yielded salt water from two sandy layers that were intersected at depths of 140 and 190 feet. Another dry hole was drilled in SE sec. 8 to a depth of 200 feet. Two more dry holes have been reported in this area, one drilled in SE sec. 33 to a depth of 200 feet, and the other in SE sec. 29 to a depth of 190 feet. A well drilled in sec. 5 to a depth of 120 feet, reported to have encountered rock at 30 feet (Johnston, 1934), may have in fact penetrated a boulder at that depth, for such a shallow depth of bedrock does not agree with the bedrock position elsewhere in this region.

Summary of Township 4

Township 4 in the Plum Coulee area follows the general pattern shown by the townships to the south. The eastern part is practically without potable water and the western part has barely enough for farm and domestic needs. The available ground water is supplemented by water stored in cisterns and dugouts as well as by haulage. No new aquifers have been discovered here, but further investigation by drilling is recommended in sec. 5, rge. 4W. The springs mentioned in sec. 1,rge. 5W should be studied and probed to see if they might extend to the southeast.

TOWNSHIP 5

Range 3 West—Roland Municipality

The surface is almost level, and except for the southwest part which is covered by silt, is entirely covered by clay. Because of its flatness huge drainage ditches cross this area from west to east.

The few wells in use are in the western half. Only one well, dug into a silt lense in NW sec. 20 to a depth of 16 feet, yields potable water.

Four other such wells, dug in SW sec. 8, were dry holes, but they were dug during a drought instead of when there was water in the ground. Test-holes should be made at the most promising locations on the farm, and the most promising of these should then be dug as a well. This does not necessarily mean that this well will never go dry in times of drought—but it does have the best chance of survival. It is difficult enough to find a suitable source of water in the ground when the ground is wet but more difficult or almost impossible when the ground is almost completely dry.

Potable water can be obtained in the southwestern corner of the township (Map 29-1960) at depths averaging 100 feet, in sand and gravel lenses associated with the till. At present only five wells penetrating this aquifer are still in use, and their yield is small, averaging 200 to 500 gallons per day.

The clay is about 100 feet thick. All wells in this township drilled below this horizon are subartesian and the water rises in them to within about 20 feet of the surface. The water yielded by these wells, except for the five mentioned above, is salty and is used only for watering stock.

One well in NE sec. 34, drilled to a depth of 80 feet, is reported as having yielded potable water at one time. For some unknown reason it was abandoned years ago and is now plugged up. This region should be drilled to again locate this lost aquifer and to find out its extent.

No wells are known to have penetrated bedrock, but the water from such a source would probably be salty. There are no communities in this township and the rural population is widely scattered. Apart from the aforementioned site in NE sec. 34, no new zones that might yield potable water can be anticipated.

Range 4 West—Roland Municipality

The surface is almost level. Two thirds of it is covered by silt. Few shallow wells are reported, but it can be assumed that if test-holes were made into the silt, more shallow wells yielding potable water could be developed.

All potable ground water available in this township in 1959 came from wells drilled from 80 to 170 feet deep into sand or gravel lenses in the till. All wells are subartesian, and the water rises in them to within 20 feet of the surface. The yield of each well is small, ranging between 200 and 600 gallons per day. Outside the potable water zone shown on Map 29-1960, similar wells yield only salt water, which is used for watering the stock.

The town of Roland (pop. 325), like the town of Plum Coulee, is without any potable ground-water supply. Practically every house has a cistern to collect rain-water, and six ponds (or dugouts) are used for fire protection and for sewage disposal in public buildings. Most of the homes haul their drinking water from Glover's farm.

The logs of five holes drilled in Roland or nearby in 1909 by the Manitoba Public Works Department are available but the exact locations of the holes are not known. The log of the deepest hole (#2123) is shown in Figure 3. This hole was drilled to a depth of 815 feet. In it, 90 feet of clay overlies 240 feet of alternating deposits of till sand or gravel. The log records a good supply of water at various horizons between 100 and 200 feet, but the water was too salty for domestic use. Water was also encountered at 240 and 345 feet, but its quality was not reported. The rate of flow of these different aquifers was not mentioned. Bedrock lies below the till. Two other holes of this group, drilled to depths of 110 and 258 feet, provided information similar to that of the deepest hole described above. However, a fourth hole, drilled to 185 feet, shows that 150 feet of clay overlies 30 feet of "white rock" (gypsum?) which in turn overlies 5 feet of clay and bedrock. If this section is correct, there would be a 155-foot difference between the depth to bedrock in the first hole and in this one. This hole was dry. The fifth hole was stopped at 96 feet and did not go through the clay. It penetrated a sandy layer in the clay at 65 feet that yielded salt water.

The log of another well (#1955) drilled in 1921 to a depth of 150 feet in SW sec. 33, agrees with the logs of three of the holes near Roland as to the type and depth of the surficial deposits encountered, but differs in that good potable water was obtained at depths of 120 and 150 feet. The water level rises to within 25 feet of the surface and the water is sufficient in quantity for farm and domestic needs.

The available information suggests that potable water might be found near Roland within depths of 150 feet. The yield from such water horizons would, however, be too small for the requirements of a town the size of Roland.

Range 5 West—Roland and Thompson Municipalities

The terrain is flat, sloping to the east at 6 feet per mile. Tobacco Creek, an intermittent stream, crosses the township from west to east, following a shallow trench cut in the silty sediments that cover the entire area. As shown on Figure 1, this township has the least potable ground water of any of the other western townships in the Plum Coulee area.

The silt aquifer in this area has been tested in very few places, and the writer believes that it merits greater attention. The few wells dug into it generally yield sufficient potable water for farm and domestic needs. The farms along Tobacco Creek should also obtain water by digging wells to a maximum of 30 feet along the banks of the creek, for some sand and gravelly sand deposits must occur there, at approximately 30 feet, as they do along most of the other streams in this region.

All the drilled and dug wells more than 100 feet deep, except those in the southwest corner of the township, yield salt water. Whether the water is potable or salty, it is found below the clay in the sand and gravel associated with the till.

Nine wells were drilled by the Manitoba Public Works Department in 1917. Only two of these reached bedrock. One was drilled 210 feet in NW sec. 15 and cut through sandstone at 185 feet. The sandstone yielded salty water. In this hole, 100 feet of 'hard pan' (till) overlies the sandstone and underlies 80 feet of blue clay. The other hole was drilled 190 feet in SW sec. 21 and cut through the sandstone at 150 feet. This hole revealed clay both above and below the till and interbedded with the sandstone. On the information available from other holes drilled to bedrock in the Plum Coulee area, it is probable that the clay overlying and interbedded with the sandstone is shale and not clay as reported. Salty water was reported in this hole but the horizon from which it was obtained was not noted.

The other wells were drilled in NE secs. 18, 20, 25, and 35, SE sec. 19, and NW sec. 8. They show the average thickness of the clay to be 80 feet. Till with the usual sand and gravel lenses lies below it. The water found in these wells, where noted, came from the sandy and gravelly deposits and was salty with the exception of the well drilled in NW sec. 8 where the water was classified as good.

The farming population in this township is widely scattered. A public well drilled to 164 feet supplies the water needs of the only village, Rosebank (pop. 38). The static water level in this well was measured as 30 feet. The water is hand pumped.

Most of the inhabitants of this township haul their drinking water from Rosebank, Carman, Morden, and Glover's farm. Cisterns and dugouts supply supplementary water needs.

Summary of Township 5

Township 5 could be called the driest in the Plum Coulee area from the point of view of potable ground water. Apart from the few recommendations mentioned above, no hope of potential water resources can be offered.

TOWNSHIP 6

Range 3 West—Dufferin Municipality

The surface of the land is almost level, rising to the west at 5 feet per mile. The entire area is covered by clay.

Shallow wells dug to an average depth of 14 feet, and yielding potable water, can only be found in the northern part of the township, following the course of an intermittent stream that may be the old Boyne River channel. The water occurs in fine sands at that depth. The yield is small, satisfying domestic needs only.

All other wells in use at the present time in this area were dug, bored, or drilled to depths ranging from 50 to 150 feet. All are subartesian wells. Most of them (Fig. 1) yield potable water in very small quantities. The average static water level in these wells is 20 feet below surface, and the yield of the wells ranges from 150 to 2,160 gallons per day.

The clay is about 100 feet thick throughout the township, except in sec. 9 where thicknesses of 20 and 35 feet are reported. Till underlies the clay and includes the usual sand and gravel lenses that are the aquifers.

The Manitoba Public Works Department drilled two wells in this area in 1915. One in SE sec. 15 cut through 100 feet of clay and 22 feet of hardpan, to a total depth of 122 feet. Although no sand and gravel within the till was reported, potable water was struck at the 122-foot horizon. This well is still in use. The other well was drilled to a depth of 255 feet in NW sec. 9. Bedrock was encountered at 80 feet. At 255 feet good water under artesian flow was reported. The well log reported 20 feet of clay overlying 40 feet of hardpan. The bedrock was described as "white rock" or "red rock". Unfortunately the exact location of this well is unknown, even to nearby residents. In contrast to this last hole, a well drilled to a depth of 110 feet in SE sec. 9, is reported (by the property owner, a former driller) to have penetrated 35 feet of clay and 75 feet of dry gravel. A little water is presently available from the bottom of the gravel.

Gravel containing potable water occurs in SE sec. 21 at 112 feet, in SW sec. 15 at 55 feet, and in NW sec. 10 at 144 feet. The possibility of having an extensive gravel zone in this area appears good. The low yield of these wells may be due to poor recharge conditions, for clay overlies the till and gravel. The writer suggests that at least one hole be drilled to determine whether such a gravel zone exists, and if so, its extent. If such a test proves that poor recharge conditions occur here, artificial recharging could be considered, as follows: In sec. 9 (assuming a deposit of gravel does exist), the top 35 feet or so of clay could be removed over a certain area, exposing the gravel below. Then a ditch could be excavated from the southern limit of sec. 4 (where a main drainage ditch passes) to sec. 9 to allow the strong spring run-off to flow into the gravel deposit. Such a project might provide enough good water for the towns of Sperling, 5 miles to the northeast, and Roland, 8 miles to the southwest, as well as for all the farmers in the vicinity of that potential aquifer. It is essential however, to first establish the existence of the potential aquifer—the gravel zone.

Most of the homes in Homewood (pop. 51) use cisterns for rain-water, and haul their drinking water from Winnipeg. Most of the farmers in this area also get their drinking water from Winnipeg.

Range 4 West—Dufferin Municipality

The surface is almost level, with a rise to the west of a little more than 6 feet per mile. The eastern two thirds is covered by clay, whereas the western part is covered by silt. The Boyne River has cut a meandering trench in the northwest corner.

The silt aquifer yields potable water to a few wells dug to depths averaging 20 feet, but the most common shallow aquifer is along intermittent streams. This aquifer consists of thin, sandy and gravelly sand layers that have been deposited along the streams at depths ranging from 14 to 35 feet and subsequently covered by the silt and the clay of Lake Agassiz. The potable water available is sufficient for domestic purposes. A certain amount of it is directly recharged by the stream, for the yield of the wells is very low in dry years.

A zone of potable water (Map 29-1960) has been intersected by wells drilled 70 to 200 feet deep. The thickness of the clay cut in such wells averages 90 feet. It is underlain by till with sand and gravel lenses, the latter being the aquifers. Figure 3 shows a cross-section of three wells (#1906, #1922, and #1923) drilled by the Manitoba Public Works Department in 1921. The water was struck in sand and gravel deposits at depths of 105, 135, and 190 feet. The water in each aquifer was classified as good; in well #1906 it was reported to be excellent. These wells are still in use but now yield salt water and are used only for watering the stock. All wells in this area penetrating these aquifers are subartesian and the average static water level is 20 feet below surface. Their average yield ranges between 200 and 500 gallons per day.

No wells in this area have been drilled to bedrock. As in the other townships the ground water available is supplemented by cisterns, dugouts, and hauling. On the information available, no new water horizons can be predicted.

Range 5 West—Dufferin Municipality

The surface is featureless with a slight rise to the west of a little less than 8 feet per mile. Boyne River enters the township in sec. 19 and follows a shallow meandering trench cut into the silt that was deposited in glacial Lake Agassiz. The southern part of the township is covered by silt, whereas the northern part is covered by a very fine sandy loam.

The silt aquifer yields potable water in numerous shallow wells dug to depths averaging 15 feet. This water is used mostly for domestic purposes. In a few cases, as in SE sec. 8 and NW sec. 9, wells dug in the silt yield only bitter water. As in the township to the east, numerous shallow wells yielding potable water are found along the banks of the Boyne River. This water is contained within sand and gravelly sand deposits found at depths averaging 20 feet, and is used extensively by the mink farms in this area. The fine sandy loam in the northern part is also, locally, a shallow aquifer. Wells dug into it to a depth of about 20 feet provide potable water in sufficient quantity for farm and domestic needs.

Most wells have been drilled or bored through the clay into the sand and gravel deposits found with the till. The depth of these wells ranges from 60 to 165 feet. Map 29-1960 shows the areas in which potable water is obtainable; outside these areas the water is salty. In every case the water is subartesian and the average static water level is 20 feet below surface. The yield of these wells is very small, ranging between 100 and 200 gallons per day.

The Manitoba Public Works Department drilled a total of eight wells in this area in 1920 and 1921. Two reached bedrock. One was drilled in NE sec. 3 to a depth of 125 feet. Shale is reported to have been encountered at this depth that yielded good potable water. The well cut through 55 feet of clay and 65 feet of till. Its location is no longer known. The other well that reached bedrock was drilled to a depth of 130 feet in SE sec. 33. At that depth shale was penetrated and yielded good water. The well is used, but only for watering the stock as the water is now salty. This well cut through 85 feet of clay and only 25 feet of till. Both wells were subartesian, the water rising to within 15 feet of the surface. Although no sand and gravel layers associated with the till are mentioned in the logs of these two holes, such layers are invariably present in the other six holes where they are the aquifers from which water was obtained. When drilled, some of them yielded salt water, whereas others yielded good water that has gradually become more salty and is now used for watering the stock.

A 3-inch-diameter well was drilled in SE sec. 36 in 1950 to a depth of 225 feet. The first 100 feet consisted mostly of clay and the next 80 feet was reported as gravel (but might be till). Beneath the gravel was 20 feet of very fine, flowing sand, yielding good water; this in turn lay above 25 feet of clay. This well was eventually abandoned because the sand constantly plugged the hole. An aquifer evidently exists at this depth, but even if it could be satisfactorily tapped the water might eventually become salty, as it did in so many of the other wells in the district. Nevertheless, this area could be investigated to determine its true potentialities.

For years the population of Carman (more than 2,000) has depended on shallow wells dug to an average depth of 16 feet, and on the reservoir water behind a dam across the Boyne River. This reservoir is now to be used to supply a $110,000 filtration plant, which will supply 88,000 to 120,000 gallons of treated water per dav to the industry and residents of Carman. The flow of the Boyne River in dry years is almost nil, but since the advent of this project, it has been increased at its source (roughly 18 miles west of Carman) by discharging into the Boyne River the continuous flow of three springs that flow east off the escarpment. It is hoped that the river will keep an adequate supply in the reservoir at all times.

Summary of Township 6

The ground water situation in township 6 is generally poor. Only two sites might produce greater quantities of potable water through drilling. The most promising of these is in sec. 9, rge. 3W.

CONCLUSIONS

1. If any potable-water aquifers are discovered in the future, the author believes that they will be inadequate in quantity to supply municipal, industrial, or irrigational requirements.

2. Aquifers yielding large quantities of salty water could be found in the bedrock below, but this salt water will be relatively useless until an economical means of de-mineralizing it is available.

Several suggestions concerning the location of possible aquifers have been given on previous pages. These would provide only limited amounts of potable water.

Table IV

Representative Well Records,
Plum Coulee Area, Manitoba

The following table has been prepared from data collected in the field, drillers records, and well logs on file at the Manitoba Department of Mines. The terms and abbreviations used are explained below.

Number:	The number of the well as shown on Figure 1.
Location:	To the nearest quarter-section. Municipalities are abbreviated as follows: St, Stanley; RH, Rhineland; M, Morris; R, Roland; T, Thompson; D, Dufferin.
Owner or tenant:	The name of the landowner or tenant at the time of the well survey (1959).
Type of well:	D, dug; B, bored; DR, drilled.
Elevation:	Elevation at the well in feet above sea-level, as determined approximately from topographic maps.
Depth:	Depth, in feet, reported by owner, tenant, or driller; M, indicates well measured at time of field survey (1959).
Diameter:	Approximate inside diameter, in inches, of well or casing.
Date completed:	Year of completion of the well as reported by owner, tenant, or driller.
Character of material:	Material in which water was obtained: cl, clay; si, silt; sa, sand; g, gravel; sh, shale; ls, limestone; ss, sandstone.
Water level:	The depth below land surface of the static water level in the well as reported by the owner, tenant, or driller, and the date it was determined. M indicates water level in the well measured at the time of the survey (1959).

Yield: The rate at which the well can be pumped: gpm, gallons per minute; gph, gallons per hour; gpd, gallons per day.

Use: D, domestic; S, stock; PS, public supply; I, industrial.

Remarks: "Analysis" means that a water analysis of the well is given in Table V; "Log", indicates that the log of the well is shown in Figures 4 or 5; "Sufficient Supply" means that the owner or tenant was satisfied with his water supply, even in some cases, if he had to haul his water.

Table IV

Representative Well Records, Plum Coulee Area, Manitoba

Number	Location: Quarter	Section	Township	Range	Municipality	Owner or Tenant	Type	Elevation (feet)	Depth (feet)	Diameter (inches)	Date Completed	Aquifer (Character of Material)	Water Level: Below Land Surface (feet)	Date	Yield	Use	Remarks
1	NW	30	2	5	St	H.J. Hoepnner	D	1,125	8	48		g	4	2-6-59		D	Sufficient supply
2	NE	25	2	6	St	H.E. Wiebe	D	1,137	8	48	1956	g	4	2-6-59		D	Sufficient supply
4	SW	30	2	5	St	W.C. Hopkins	D	1,151	19		1900	g	10	2-6-59		D	Well low in winter
5	NE	24	2	6	St	F. Kunzelman	D	1,155	8		1925	g	3	2-6-59		DS	Has 4 dug wells
7	SE	24	2	6	St	R. Mayert	D	1,180	15		1949	g	12	2-6-59		DS	
8	SE	13	2	6	St	W. Penner	D	1,180	7		1949	g	0	2-6-59		D	Sufficient supply
9	SW	18	2	5	St	A. Hoepnner	D	1,175	12	36	1910	g	6	2-6-59		DS	Dry in 30's
10	SE	18	2	5	St	A.N. Hildebrand	D	1,145	14		1958	g		2-6-59		DS	Sufficient supply
11	NE	7	2	5	St	J. Hoepnner	D	1,130	12		1955	si	8	2-6-59		D	Sufficient supply
12	SW	17	2	5	St	P. Juenter	D	1,120	18	48	1918	si	4	2-6-59		DS	Sufficient supply
13	NW	17	2	5	St	J.F. Epp	D	1,120	7	48	1953	si	1	2-6-59		DS	
14	SE	19	2	5	St	H.E. Fehr	D	1,130	14	48	1939	g		2-6-59		DS	Has 3 dug wells
15	NE	31	2	5	St	G.K. Remple	D	1,025	10	48				2-6-59		S	Drilled 200 feet; no water
16	NW	32	2	5	St	R. Willcocks	D	1,012	15	48	1944	si	6	2-6-59		DS	Has 2 dug wells
17	SW	32	2	5	St	R. Willcocks	D	1,025	14	48	1944	si	6	2-6-59		S	
18	SE	31	2	5	St	J.H. Warkentine	D	1,080	10	48		si	4	2-6-59		S	
21	SE	30	2	5	St	George Hamm	D	1,115	20	48		g	7	2-6-59		S	Insufficient supply
22	NW	8	2	5	St	P.A. Hoeppner	D	1,125	8	48	1929	si	0	2-6-59		DS	
23	NW	6	2	5	St	I. Friesen	D	1,175	22	48	1924	si	19	2-6-59		DS	Insufficient supply
24	SW	7	2	5	St	R. Friesen	D	1,175	33	48	1941	si	15	2-6-59		DS	Sufficient supply
28	NW	32	1	5	St	Hoeppner	D	1,150	16	36	1900		13	3-6-59		D	
29	SW	4	2	5	St	H.T. Sawatzky	D	1,090	11	72	1958		7	3-6-59		D	Insufficient supply
35	SW	16	2	5	St	J. Sawatzky	D	1,040	25	36	1933	si		3-6-59	100 gpd		Has 3 dug wells
36	SE	20	2	5	St	F.R. Wiebe	D	1,040	22		1948	g		3-6-59		S	Recharged by dugout
37	SW	21	2	5	St	J.M. Wiebe	D	1,035				g		3-6-59		DS	Has 2 dug wells
38	SW	28	2	5	St	Evanson	D	1,015	10		1934	g	5	3-6-59		D	Spring-recharged
39	SE	29	2	5	St	W. Warkentine	D	1,025	12	48	1955	si		3-6-59	20 gpd	D	Has 2 dug wells
40	SW	33	2	5	St	A.A. Hoeppner	D	99	20		1928			3-6-59		DS	Sufficient supply
44	SW	34	2	5	St	D.H. Zacharias	D	975	12	48		si		3-6-59		DS	Well was never dry
45	NE	28	2	5	St	H.H. Pauls	D	980	8	36	1955	g	4	3-6-59		DS	Sufficient supply
46	SW	27	2	5	St	I.N. Hildebrand	D	960	12	48	1949	sa		3-6-59		DS	Has 3 dug wells
47	SE	28	2	5	St	H.B. Klassen	D	1,000	15	36			11	3-6-59		DS	Sufficient supply
48	NE	21	2	5	St	A. Hildebrand	D	1,000	14	36		g	3	3-6-59		DS	Has 2 dug wells
49	NW	22	2	5	St	D.F. Unrau	D	990	18	36	1955	g	12	3-6-59		DS	Has 2 dug wells
51	SW	22	2	5	St	A.J. Hoeppner	D	991	8	36		sa	6	3-6-59		D	Has 4 dug wells
52	SW	21	2	5	St	J.U. Dyck	D	1,020	11	72	1890		3	3-6-59		DS	Sufficient supply
53	NW	15	2	5	St	A.S. Friesen	D	1,000	18	36		g	12	3-6-59		DS	Analysis—supply sufficient
54	SW	15	2	5	St	J. Hildebrand	D	990	16	42	1958	g	10	4-6-59		DS	Has 2 dug wells
55	NW	10	2	5	St	P.J. Brown	D	1,025	10	48	1934	g	8	4-6-59		DS	Little water in dry season
56	NW	10	2	5	St	J.A. Hildebrand	D	1,040	24	48	1900	sa	20	4-6-59		D	Insufficient supply
57	SW	10	2	5	St	H.A. Enns	D	1,040	17	48	1941		15	4-6-59		DS	Has 3 dug wells
58	SE	9	2	5	St	G.G. Dyck	D	1,060	25	48	1943	g	22	4-6-59		D	Has 3 dug wells
59	SW	10	2	5	St	J.P. Thiessen	D	1,040	14	48	1900			4-6-59		DS	Insufficient supply
60	SW	10	2	5	St	A.A. Enns	D	1,020	10	48	1940	g	5	4-6-59		DS	Has 2 dug wells
61	NE	3	2	5	St	C.F. Fehr	D	1,015	18	48	1939	g		4-6-59		DS	Has 2 dug wells
62	NW	3	2	5	St	P.G. Dyck	D	1,050	10	60	1939	sa	0	4-6-59		DS	
63	NW	34	1	5	St	A.D. Thiessen	D	1,050	20	42	1920	si	5	4-6-59		S	
64	SE	3	2	5	St	H. Bergen	D	1,025	14	48	1958	g	5	4-6-59		S	Sufficient supply
65	SW	2	2	5	St	E.H. Boehlie	D	990	12	48	1956	g	10	4-6-59		S	Insufficient supply
66	NW	35	1	5	St	J. Thiessen	D	990	12	48	1957	g		4-6-59		D	
67	NW	2	2	5	St	L.S. Fehr	D	980	22	48	1930	sa	17	4-6-59		DS	
68	SE	11	2	5	St	I.F. Friesen	D	967	18	48	1928	g	11	4-6-59		DS	
69	NE	11	2	5	St	J. Wieler	D	970	14	48	1956	sa	9	4-6-59		DS	
70	NE	15	2	5	St	H.I. Hoeppner	D	970	12	48	1954	sa	6	4-6-59		DS	Sufficient supply

71	NW	14	2	5	St	J.T. Gerbrandt	D	970	14	48	1953	g	9	4-6-59	D	Has 2 dug wells
72	SW	23	2	5	St	J.W. Zacharias	D	970	11	48	1956	sa	5	4-6-59	D	Sand caves in well
73	SW	23	2	5	St	A.J. Ginther	D	960	13	48	1950	sa	6	4-6-59	DS	Sufficient supply
74	SW	23	2	5	St	D.P. Kuhl	D	960	15	48	1940	sa		4-6-59	S	Insufficient supply
75	SW	26	2	5	St	J. Girtson	D	960	14	48	1920	si	9	4-6-59	S	Has 2 dug wells
76	NW	26	2	5	St	J.B. Peters	D	910	18	48			5	4-6-59	S	Sufficient supply
78	SW	35	2	5	St	J.E. Klassen	D	910		48		si		4-6-59	DS	Sufficient supply
79	SE	3	3	5	St	W. Jesserman	D	950	18	36		si		4-6-59	DS	Has 3 dug wells—log
80	SW	2	3	5	St	H.R. Wiebe	D	950	14	48	1958	si	9	4-6-59	S	Sufficient supply
82	NE	35	2	5	St	J.J. Goerthen	D	945	14	48		si	4	4-6-59	DS	Sufficient supply
83	SE	35	2	5	St	G. Elias	D	940	16	48		si	11	4-6-59	S	
84	SW	36	2	5	St	H. Olfert	D	940	15	48	1958		9	4-6-59	S	Has 3 dug wells
86	NW	25	2	5	St	J.A. Walkof	D	935	18	42	1942	si		5-6-59	DS	Dry in winter
88	SW	25	2	5	St	W. Walkof	D	945	20		1920			5-6-59	D	Sufficient supply
90	SW	24	2	5	St	J.A. Reimer	D	955	10	48		si	5	5-6-59	S	Sufficient supply
92	SE	24	2	5	St	M.J. Penner	D	940	14	42	1952	si	9	5-6-59	DS	Sufficient supply
93	SE	14	2	5	St	H.H. Froese	D	965	20	48	1947	si	6	5-6-59	DS	Has 2 dug wells
96	NW	36	1	5	St	Diedrich Unrau	D	965	14	42			3	5-6-59	D	Insufficient supply
97	NE	12	2	5	St	J.K. Friesen	D	950	14	48			7	5-6-59	S	Has 2 dug wells
98	NE	12	2	5	St	C.N. Penner	D	950	12	48			8	5-6-59	S	Sufficient supply
99	NE	25	2	5	St	P.P. Friesen	D	940	21	36		sa	12	5-6-59	DS	Has 2 dug wells
100	NE	36	2	5	St	H.H. Herman	DR	935	85	2	1958	sa		5-6-59	DS	Sufficient supply
101	NE	12	2	6	St	C. Wiebe	D	1,200	12	48	1945	sh	0	5-6-59	DS	Spring fed
102	NE	25	1	6	St	A. Deere	D	1,450	27	48	1930	sh	2	6-6-59	DS	Sufficient supply
104	NE	30	1	5	St	W. Peskey	D	1,375	14	48	1927	g	2	6-6-59	DS	Has 2 dug wells
106	SW	29	1	5	St	F. Klatt	D	1,340	10	36	1958	g	1	6-6-59	DS	Sufficient supply
108	NW	19	1	5	St	B. Massey	D	1,450	10	42	1958	sa		6-6-59	DS	Sufficient supply
109	NE	19	1	5	St	J.J. Zacharias	D	1,375	12	48	1920	sa	6	6-6-59	DS	Sufficient supply
110	SE	19	1	5	St	S. Hildebrand	D	1,400	10	48	1950		0	6-6-59	DS	Has 2 dug wells
111	NW	17	1	5	St	Fehr	D	1,375	12	48	1920	si	1	6-6-59	DS	Insufficient supply
113	NW	18	1	5	St	E. Berger	D	1,475	25		1900	sh	0	6-6-59	DS	
114	SW	17	1	5	St	J.P. Hiebert	D	1;375	16	48	1939	sh	2	6-6-59	DS	Dry in dry season
115	NE	7	1	5	St	C. Hildebrand	D	1,450	20	48			2	6-6-59	DS	Has 2 dug wells
116	NW	8	1	5	St	O. Frogne	D	1,425	20	48	1930	sh	8	6-6-59	D	Low in winter
118	NW	6	1	5	St	H.B. Olfeson	D	1,525	12	48	1930	sh		6-6-59	DS	
120	NE	6	1	5	St	R. Dreiger	D	1,460	30	30		sh		6-6-59	DS	Has 2 dug wells
121	SW	5	1	5	St	C.A. Olson	D	1,450	16	48	1949	sh	12	6-6-59	DS	Sufficient supply
123	SE	5	1	5	St	N. Vigen	D	1,425	30	48	1944	g	10	6-6-59	D	
124	SE	8	1	5	St	J.P. Elias	D	1,360	24	48	1958	sh	0	6-6-59	DS	Analysis
126	NE	4	1	5	St	P. Klassen	D	1,300	12	48	1939	g	2	6-6-59	S	
127	NE	9	1	5	St	I. Elias	D	1,250	12	48		sh		8-6-59	S	Insufficient supply
130	NW	3	1	5	St	H. Bluhm	D	1,200	10	48	1945	g	5	8-6-59	D	Sufficient supply
132	NE	3	1	5	St	P.J. Letkeman	D	1,110	14	48		g		8-6-59	DS	Recharged by dugout
133	SE	3	1	5	St	A. Letkeman	D	1,200	8	48	1946	g		8-6-59	DS	
134	NW	2	1	5	St	H. Letkeman	D	1,050	12	42	1958	si		8-6-59	S	Sufficient supply
135	NW	10	1	5	St	H. Giesbrecht	D	1,090	14	48	1929	si	7	8-6-59	S	Has 2 dug wells
136	SW	15	1	5	St	G.P. Rempel	D	1,115	14	48	1958	g		8-6-59	S	Has 2 dug wells
137	NE	16	1	5	St	A.P. Wiebe	D	1,150	12	48	1959	g	8.5	8-6-59	DS	
138	NW	16	1	5	St	H. Elias	D	1,300	8	48	1944	sh	5	8-6-59	DS	
139	NE	21	1	5	St	P.J. Friesen	D	1,130	12	48	1940	g	6	8-6-59	DS	Has 3 dug wells
140	NW	22	1	5	St	P.A. Hildebrand	D	1,100	12	48	1955			8-6-59		Stock won't drink well water
141	SE	28	1	5	St	H.F. Gerbrandt	D	1,125	12	48	1958	si	0	8-6-59	DS	
142	SW	27	1	5	St	D. Miller	D	1,080	7	48	1958	cl		8-6-59	DS	Not in use
143	NW	27	1	5	St	B.B. Fehr	D	1,060	12	48		si	6	8-6-59	DS	Sufficient supply
144	SE	29	1	5	St	G. Schroeder	D	1,300	16	30	1955	g	13	9-6-59	DS	Sufficient supply
145	SW	33	1	5	St	J.J. Funk	D	1,100	12	30		sa	7	9-6-59	DS	Sufficient supply
146	NW	28	1	5	St	A.W. Friesen	D	1,130	12	48	1953	sa	7	9-6-59	DS	Has 3 dug wells
147	NE	33	1	5	St	F.H. Martens	D	1,070	19	96	1937	si	12	9-6-59	DS	Sufficient supply
148	NE	34	1	5	St	J.D. Zacharias	D	1,025	10	48		g	6	9-6-59	DS	
149	NE	26	1	5	St	C. Neufeld	D	900	12	48	1939		9	9-6-59	DS	Sufficient supply
150	SE	27	1	5	St	H.E. Fehr	D	1,025	14	48	1947	g	10	9-6-59	DS	Sufficient supply
151	NE	27	1	5	St	P.A. Hiebert	D	1,025	13	48	1945	si	9	9-6-59	S	Sufficient supply
152	SE	26	1	5	St	J.B. Neufeld	D	985	12	48	1936	sa & g	6	9-6-59	S	Has 3 dug wells
153	SW	26	1	5	St	B. Vogt	D	1,020	12	48	1942	sa	1	9-6-59		
154	SW	23	1	5	St	J.D. Dyck	D	1,020	10	48	1942	sa & g	6	9-6-59	DS	Well has very little water
155	NW	14	1	5	St	A.C. Janzen	D	1,025	14	48	1930	g		9-6-59	DS	
156	SW	14	1	5	St	J.F. Fehr	D	1,025	12	48	1952	g	6	9-6-59	DS	Sufficient supply

Table IV (continued)

Representative Well Records, Plum Coulee Area, Manitoba

Number	Location: Quarter	Location: Section	Location: Township	Location: Range	Location: Municipality	Owner or Tenant	Type	Elevation (feet)	Depth (feet)	Diameter (inches)	Date Completed	Aquifer (Character of Material)	Water Level: Below Land Surface (feet)	Water Level: Date	Yield	Use	Remarks
157	SE	14	1	5	St	J.W. Elias	D	1,020	21	48	1943	sa	15	9-6-59		DS	
158	NW	12	1	5	St	J. Warkentine	D	990	18	48	1940	si	12	9-6-59		DS	Sufficient supply
159	SW	13	1	5	St	P.O. Fehr	D	1,000	13	48	1940	g & sa	10	9-6-59		S	Sufficient supply
160	NW	1	1	5	St	J. Letkeman	D	1,010	18	48	1940	sa	14	9-6-59		DS	Has 2 dug wells
161	SW	12	1	5	St	C. Elias	D	990	12	48	1952	sa	1	9-6-59	1,000 gpd	DS	Recharged by creek
162	SE	12	1	5	St	G. Elias	D	990	18	48	1920	sa	12	9-6-59		DS	Spring fed
163	NE	1	1	5	St	J. Guanter	D	980	20	48	1957			9-6-59		DS	
164	NE	12	1	5	St	P.J. Warkentine	D	980	14	48	1947		10	9-6-59		S	
165	NW	18	1	4	St	F. Suderman	D	980	12	48	1939	sa		10-6-59		S	Well had water in dry 30's
166	NE	13	1	5	St	G.G. Elias	D	980	12	48	1950	sa	6	10-6-59		S	
167	SE	24	1	5	St	I. Wolfe	D	970	12	48	1956		8	10-6-59		DS	Insufficient supply
168	NE	24	1	5	St	J.A. Janzen	D	978	10	48	1953		6	10-6-59		S	Sufficient supply
169	NW	19	1	4	St	M. Wiebe	D	975	12	48	1944	si	6	10-6-59		S	Sufficient supply
170	NE	19	1	4	St	F.A. Enns	D	955	14	48	1957	si	9	10-6-59		S	Insufficient supply
171	SE	25	1	5	St	J.P. Wiebe	D	970	13	48	1949	si	9	10-6-59		DS	Sufficient supply
172	NE	25	1	5	St	I. Suderman	D	975	20	48			10	10-6-59		DS	Has 2 dug wells
173	SE	36	1	5	St	P.A. Wiebe	D	975	13	48	1952	si	8	10-6-59		DS	Has 2 dug wells
174	SW	36	1	5	St	L.W. Whitman	D	980	14	48	1951	sa	9	10-6-59		DS	Sufficient supply
175	SW	36	1	5	St	D.D. Walls	D	980	12	48	1949		7	10-6-59		DS	Sufficient supply
176	NW	31	1	4	St	C.F. Friesen	D	955	14	48		si	10	10-6-59		DS	Supplies at all times
177	NW	31	1	4	St	P. Pauls	D	955	16	36	1957	si	10	10-6-59		DS	Sufficient supply
178	NW	31	1	4	St	B. Wiebe	D	955	14	48	1940	si	6	10-6-59		DS	Supplies all year
180	NW	31	1	4	St	A. Peters	D	955	13	48	1958	si		10-6-59		DS	
181	NW	31	1	4	St	P. Wiebe	D	955	13	36	1957	si	7	10-6-59		DS	
182	NW	31	1	4	St	D.J. Fehr	D	955	13	48	1949	si	10	10-6-59		DS	Sufficient supply
183	NW	31	1	4	St	J. Fehr	D	955	12	48	1939	si	7	10-6-59		DS	Supplies all year
184	NW	31	1	4	St	School	D	955	17	60	1958	si	6	10-6-59		D	Sufficient supply
185	SW	6	2	4	St	G.C. Reimer	D	955	16	48	1940	si	10	10-6-59		D	Supplies all year
186	NW	31	1	4	St	C.D. Wolfe	D	955	10	48			5	10-6-59		DS	Sufficient supply
187	NW	31	1	4	St	W.H. Berg	D	955	16	48	1945	si	5	10-6-59		S	Low in winter
188	NW	31	1	4	St	A.A. Giesbrecht	D	955	12	42		si	3	10-6-59		S	Analysis
189	NW	31	1	4	St	G.G. Friesen	D	955	22	36				10-6-59		DS	
190	NW	31	1	4	St	D.E. Fehr	D	955	14	42		si		10-6-59		S	Low in spring
191	NW	31	1	4	St	I.I. Peters	D	955	16	42		si	8	10-6-59		S	
192	SW	6	2	4	St	J.D. Krahn	D	955	18	36			6	10-6-59		S	Has 2 dug wells
193	SW	6	2	4	St	I. Friesen	D	955	18	48		si		10-6-59		DS	Has 2 dug wells
204	SW	31	1	4	St	F.I. Enns	D	955	14	48	1948	si	11	10-6-59		DS	Has 3 dug wells
205	NE	31	1	4	St	T. Gerbrandt	D	950	10	36	1956	si		11-6-59		DS	Has 2 dug wells
208	NE	31	1	4	St	J.J. Hiebert	D	954	12	48		si	6	11-6-59		DS	
209	NE	31	1	4	St	I. Warkentine	D	955	13	42	1957	si	5	11-6-59		DS	
210	SE	31	1	4	St	G.B. Wiebe	D	950	13	48	1958	si	7	12-6-59		DS	Sufficient supply
211	NE	19	1	4	St	A. Warms	D	960	14	48	1958	si	9	12-6-59		DS	Supplies all year
212	SE	19	1	4	St	W.I. Fehr	D	958	14	48	1948	si		12-6-59		S	
213	SW	17	1	4	St	I.E. Letkeman	D	958	22	48	1950	si		12-6-59		S	Insufficient supply—log
214	NE	7	1	4	St	E. Giesbrecht	D	965	17	48		si	10	12-6-59		S	Has 2 dug wells
217	SW	8	1	4	St	P.A. Janzen	D	965	14	48			9	12-6-59		S	Sufficient supply
218	SW	8	1	4	St	E.P. Klassen	D	960	12	48	1954	si	8	12-6-59		DS	Has 2 dug wells—log
221	NW	5	1	4	St	D.H. Fehr	D	960	13	48	1938	si	9	12-6-59		DS	Has 2 dug wells—log
222	NW	5	1	4	St	E.P. Zacharias	D	978	12	48	1940	si	10	12-6-59		DS	Sufficient supply
224	SE	8	1	4	St	J. Elias	D	954	12	48	1945			12-6-59		DS	Dry in winter
225	SW	4	1	4	St	A. Banman	D	955	10	36	1958	si	7	12-6-59		DS	Supplies all year—log
226	NE	4	1	4	St	P. Penner	D	945	14	48	1954	si	5	12-6-59		DS	Sufficient supply
228	NW	3	1	4	St	P. Suderman	D	945	12	48	1958	si	6	12-6-59		S	Has 3 dug wells
229	NE	4	1	4	St	P.S. Harder	D	945	10	56	1957	si	4	12-6-59		S	Sufficient supply

230	SE	4	1	4	St	P.H. Harder	D	950	13	48	1958		7	12-6-59		S	Supplies all year
232	SW	21	1	4	St	G. Zacharias	D	945	12	48	1944	si	6	12-6-59		DS	Sufficient supply
233	SW	21	1	4	St	J.P. Elias	D	945	12	48	1944	si	8	12-6-59		DS	Has 2 dug wells—log
234	NE	20	1	4	St	J.B. Sawatsky	D	945	15	48	1957	si	4	12-6-59		DS	Has 2 dug wells—log
235	NW	21	1	4	St	B.P. Klassen	D	940	10	48	1951	si	9	12-6-59		DS	Sufficient supply
236	NE	21	1	4	St	J.D. Klassen	D	935	11	48	1949	si	4	12-6-59		DS	Sufficient supply
237	NE	21	1	4	St	A. Wall	D	935	16	48		si	8	12-6-59		DS	Sufficient supply
238	NE	21	1	4	St	J.B. Schellenburg	D	935	10	48	1956	si	7	12-6-59		D	Sufficient supply
239	NE	21	1	4	St	J.A. Thiessen	D	935	14	48	1943	si	3	12-6-59		DS	Sufficient supply
240	NE	21	1	4	St	C. Wall	D	935	11	48	1945	si	8	12-6-59		DS	Sufficient supply
241	NE	21	1	4	St	J.A. Penner	D	935	17	48	1954	si	10	12-6-59		DS	Has 2 dug wells
242	NE	21	1	4	St	F.M. Suderman	D	935	14	48		si	5	12-6-59		D	Sufficient supply
243	SW	33	1	4	St	H.Y. Neufeld	D	935	16	48	1946	si	8	12-6-59		DS	
244	SW	5	2	4	St	S.O. Hunger	D	945	14	48	1949	si	8	13-6-59		DS	Dry in winter
245	SW	4	2	4	St	G.A. Hiebert	D	930	15	48	1945	si	5	13-6-59		DS	Low in winter—log
246	NE	28	1	4	St	P.E. Klassen	D	930	16	36		si	12	13-6-59		DS	Dry in 1958
247	SW	27	1	4	St	A.E. Hiebert	D	925	14	48	1945		7	13-6-59		S	Sufficient supply
248	NW	22	1	4	St	J.J. Dyck	D	930	13	48	1945	si	7	13-6-59		DS	Sufficient supply
249	SW	22	1	4	St	W.V. Elias	DR	935	112	5	1954	g	12	13-6-59	700 gph	DS	Ejector at 60 feet
250	NW	15	1	4	St	E.G. Elias	D	935	12		1956	si	9	13-6-59		D	Sufficient supply
251	SW	10	1	4	St	J.J. Giesbrecht	D	940	9	48	1953	si	5	13-6-59		DS	Sufficient supply
252	SE	10	1	4	St	H. Giesbrecht	D	930	14	48	1944	si	10	13-6-59		DS	Sufficient supply
253	SE	10	1	4	St	E.G. Wiebe	D	935	12	48	1958	si	4	13-6-59		DS	Sufficient supply
255	NE	3	1	4	St	C.C. Riemer	D	935	11	48	1950	si	6	13-6-59		DS	Sufficient supply
256	NW	2	1	4	St	C.H. Fehr	D	945	12	48	1930	si	4	13-6-59		DS	Sufficient supply
257	SW	11	1	4	St	J. Benman	D	930	14	36	1930	si	9	13-6-59		DS	Sufficient supply
258	SE	10	1	4	St	W. Braun	D	930	16	36	1958	g	10	13-6-59		DS	Has 2 dug wells
259	SE	10	1	4	St	J. Penner	D	930	13	48	1949	si	11	13-6-59		DS	Has 3 dug wells
260	SE	12	1	4	St	W.J. Elias	DR	920	130	2	1890	ti	10	13-6-59		DS	Sufficient supply
261	SE	26	1	4	St	I. Fehr	D	910	12	36	1942	si	7	13-6-59		DS	Has 2 dug wells
262	NW	35	1	4	St	J.J. Toews	D	910	20	42		si	12	15-6-59		DS	Has 2 dug wells
263	NW	35	1	4	St	P.A. Rempel	DR	910	160	2			18	15-6-59		DS	Has 1 dug well
264	NW	35	1	4	St	P.C. Rempel	DR	910	186	2			23	15-6-59		DS	Sufficient supply
265	NW	35	1	4	St	J. Rempel	D	910	30	42			18	15-6-59		DS	
266	NW	35	1	4	St	A.P. Klassen	D	910	30	42			10	15-6-59		DS	
268	SE	3	2	4	St	Birkenhead School	D	910	30	42		si	18	15-6-59		D	Supplies all year
269	SW	2	2	4	St	P.P. Dyck	D	910	30	48		si	18	15-6-59		D	
270	SW	2	2	4	St	J.A. Fehr	DR	910	160	3	1919		70	15-6-59		DS	Sufficient supply
273	SW	2	2	4	St	P.H. Friesen	D	910	26	42	1957	si	15	15-6-59		DS	Dries up
274	SW	2	2	4	St	G.W. Unrau	D	910	28	48	1958	si	23	15-6-59		DS	Sufficient supply
275	SE	2	2	4	St	P.P. Dyck	DR	910	170					15-6-59		DS	Low in winter
276	SE	1	2	4	St	P.C. Wall	D	875	30	48	1954		12	15-6-59		S	Insufficient supply
277	NE	13	1	4	St	G.G.H. Enns	DR	875	140	2	1910	sa & g	10	15-6-59		DS	Supplied in dry 30's
280	NE	13	1	4	St	W.S. Wiebe	DR	875	147	2				15-6-59		DS	Sufficient supply
281	NE	13	1	4	St	A.H. Enns	D	875	25	48	1940		15	15-6-59		DS	
284	NE	13	1	4	St	D.P. Peters	DR	875	136	2	1940			15-6-59		DS	Sufficient supply
285	NE	13	1	4	St	A.P. Peters	DR	875	140	2	1955	g	5	15-6-59		DS	Sufficient supply
286	NE	13	1	4	St	S. Braun	DR	875	137	2	1959	sa & g	6	15-6-59	50 gph	DS	
288	NE	13	1	4	St	F.D. Zacharias	DR	875	80	2			8	15-6-59		DS	Sufficient supply
289	NE	13	1	4	St	F.G. Enns	DR	875	150	2			15	15-6-59		DS	Sufficient supply
292	NE	13	1	4	St	A.A. Paetkau	DR	875	125	2			4	15-6-59	500 gpd	DS	Sufficient supply
297	NE	13	1	4	St	D.H. Falk	DR	875	152	2			10	15-6-59		DS	Sufficient supply
298	NE	13	1	4	St	M. Wieler	DR	875	146	2	1943		12	15-6-59		S	Sufficient supply
300	NE	13	1	4	St	J.F. Wieler	D	875	15			si		15-6-59		D	Sufficient supply
301	NE	13	1	4	St	H.G. Enns	D	875	22	48				15-6-59		S	Insufficient supply
303	NW	19	2	4	St	P. Thiessen	D	945	10	48	1955		5	15-6-59		DS	
304	SW	31	2	4	St	N.D. Wiebe	DR	925	92	6	1958	sa		15-6-59	3 gpm	DS	
305	SW	5	3	4	St	P.P. Krahn	D	915	80	48			34	15-6-59		S	Dry in winter
306	SW	32	2	4	St	C.J. Thiessen	D	920	20	48	1949	si	14	15-6-59		S	Dry in winter—log
308	NE	30	2	4	St	F.W. Funk	D	925	25	48	1954			16-6-59		DS	Has 2 dug wells
309	NW	29	2	4	St	W. Thiessen	D	920	15	48	1949	si		16-6-59		S	Has 2 dug wells
311	SW	29	2	4	St	P. Fehr	D	925	14	48	1958	si	8	16-6-59		DS	
312	SW	29	2	4	St	P. Wolfe	D	925	14	48	1958		9	16-6-59		DS	Sufficient supply
313	SE	29	2	4	St	J. Wolfe	D	920	23	48	1958	si	10	16-6-59		DS	Sufficient supply—log
314	SW	20	2	4	St	G.G. Goertzen	D	930	22	48				16-6-59		DS	
317	SW	20	2	4	St	P.P. Unrau	D	930	17	48		si	10	16-6-59		DS	Sufficient supply

Table IV (continued)

Representative Well Records, Plum Coulee Area, Manitoba

Number	Location: Quarter	Location: Section	Location: Township	Location: Range	Location: Municipality	Owner or Tenant	Type	Elevation (feet)	Depth (feet)	Diameter (inches)	Date Completed	Aquifer (Character of Material)	Water Level: Below Land Surface (feet)	Water Level: Date	Yield	Use	Remarks
318	SW	20	2	4	St	J.F. Wiebe	D	930	22	36				16-6-59		S	
320	SW	20	2	4	St	M.H. Penner	D	930	12	48		si	1	16-6-59		S	
325	NW	17	2	4	St	H.A. Bueckert	D	930	24	42	1957			16-6-59		DS	Has another dug well
326	NW	17	2	4	St	J.A. Froese	D	930	16	42	1959	si	10	16-6-59		DS	Has another dug well
327	NW	17	2	4	St	C.D. Thiessen	D	930	14	42			8	16-6-59		DS	Has 2 dug wells
330	NW	17	2	4	St	J.G. Goertzen	D	930	22	36		si	10	16-6-59		DS	Short in winter
333	SE	19	2	4	St	H.P. Neufeld	D	930	14	48			9	16-6-59		DS	
335	SE	19	2	4	St	D.P. Neufeld	D	930	20	48			17	16-6-59		DS	
336	SE	19	2	4	St	J. Teichroeh	D	930	18	48	1944		14	16-6-59		S	
340	SE	19	2	4	St	J. Schepansky	D	930	20	48	1950		10	16-6-59			
342	NE	18	2	4	St	J. Wiebe	D	930	18	48	1930		8	16-6-59		DS	
343	NE	18	2	4	St	J.P. Thiessen	D	930	21	42	1955	si		16-6-59		DS	
344	NE	18	2	4	St	F. Penner	D	930	16	48	1949	si	4	16-6-59		DS	
345	NE	18	2	4	St	J. Penner	D	930	15	48	1940		7	16-6-59		DS	
346	NE	18	2	4	St	I. Fehr	D	930	22	48	1940		7	16-6-59		DS	
347	NE	18	2	4	St	F. Penner	D	930	15	48	1949	si	8	16-6-59		DS	
348	NE	18	2	4	St	School	D	930	16	48	1955	si	10	16-6-59		D	
349	NE	18	2	4	St	H.H. Klassen	D	930	15	48	1959	si		16-6-59		S	
350	NW	8	2	4	St	H.P. Wiebe	D	940	12	48	1955		6	16-6-59		D	Has 2 dug wells—log
351	NW	5	2	4	St	H. Gerbrandt	D	940	14	48	1940	si	8	16-6-59		DS	Sufficient supply—log
352	SW	5	2	4	St	J.C. Warkentine	D	940	15	48	1944			16-6-59		D	Has 2 dug wells
353	SE	17	2	4	St	F. Suderman	D	940	18	48	1958	si		16-6-59		DS	
355	SE	20	2	4	St	W.P.E. Enns	D	920	18	48				16-6-59		DS	Sufficient supply
356	NE	20	2	4	St	D.E. Dyck	DR	920	62	2	1938			16-6-59		DS	Sufficient supply—log
358	NW	28	2	4	St	R.B. Dyck	DR	900	47	2	1930	g	13	17-6-59		S	Log
359	SW	27	2	4	St	A.D. Thiessen	DR	890	120				10	17-6-59		DS	Sufficient supply
362	NW	15	2	4	St	D. Walls	DR	900	79	2	1958		7	17-6-59		DS	Sufficient supply
363	SE	22	2	4	St	J. Ginter	DR	890	30	2	1948	si		17-6-59		DS	
364	SE	22	2	4	St	S.A. Enns	DR	890	38	2	1946			17-6-59		DS	
365	SE	16	2	4	St	I.G. Dyck	D	915	14	48				17-6-59		DS	
366	SE	16	2	4	St	I.J. Penner	D	915	12	30		si	5	17-6-59		DS	Has 2 dug wells
367	SW	15	2	4	St	A.L. Friesen	D	910	12	48	1950			17-6-59		DS	Sufficient supply
369	SE	9	2	4	St	J.E. Froese	D	915	20	48		si	10	17-6-59		DS	Sufficient supply—log
371	SW	10	2	4	St	G.K. Neufeld	D	915	18	48	1939	si	15	18-6-59		S	Dry in winter
372	NW	3	2	4	St	J.J.G. Hilderbrand	D	915	20	48	1950		14	18-6-59		S	Sufficient supply
374	NE	15	2	4	St	W.G. Graefer	D	890	48	2	1941	g	0	18-6-59		DS	Analysis
375	NW	14	2	4	St	C.C. Enns	DR	890	28	2	1951	sa & g	0	18-6-59	2 gpm	S	Has dug well also
376	SE	22	2	4	St	A.A. Enns	DR	888	52	2	1944	sa	0	18-6-59		DS	Supplies any time
377	SE	3	3	4	St	H.H. Giesbrecht	DR	885	175	2	1938	sa	0	18-6-59		S	
378	SE	3	3	4	St	J.D. Dyck	DR	885	189	2			0	18-6-59		S	
379	SE	3	3	4	St	G.G. Sawatsky	DR	885	140	2				18-6-59		S	Not dry in 30's
383	SW	3	3	4	St	C.J. Hiebert	DR	885	150	3	1934		2	18-6-59		S	Sufficient supply
386	SW	1	3	4	St	I.J. Penner	DR	873	140±	2	1940		0	18-6-59		S	Analysis
387	SW	1	3	4	St	E. Friesen	DR	873	100+	1	1940		0	18-6-59		S	
388	SW	1	3	4	St	P.I. Derksen	DR	873	155	2	1950		0	18-6-59		S	Insufficient supply
389	NE	35	2	4	St	J.J. Thiessen	DR	875	200	2	1944	sa		18-6-59		S	Sufficient supply
390	NE	35	2	4	St	J.C. Wiens	DR	875	150	2	1954	g	0	18-6-59		S	Sufficient supply
392	NE	35	2	4	St	C.C. Wiebe	D	875	11	48	1944	si	6	18-6-59		S	Dry in dry years
394	SW	36	2	4	St	K. Friesen	DR	875	145	2	1950	sa & g	0	18-6-59		S	Insufficient supply

398	SW	1	3	4	St	H. Toews	DR	873	150	3	1938		0	18-6-59		S	Insufficient supply
400	SW	1	3	4	St	J.A. Friesen	DR	873	152	2	1910		0	18-6-59		S	Insufficient supply
401	SW	1	3	4	St	I. Derksen	DR	873	150	2			0	18-6-59		S	Insufficient supply
403	NW	36	2	4	St	Jacob J. Froese	DR	875	150					18-6-59		S	
405	NW	36	2	4	St	E. Hyde	DR	875	150					18-6-59		S	
411	SE	14	2	4	St	H.J. Dyck	DR	885	150	2	1947		0	18-6-59		S	Insufficient supply
412	NE	11	2	4	St	A.A. Kroeker	DR	885	95	2	1925		5	18-6-59	1, 200 gpd	DS	Has 2 other drilled wells
413	SW	21	2	4	St	J.J. Stobie	D	910	22	48	1944	si	18	18-6-59	200 gpd	S	
414	SW	21	2	4	St	W.L. Enns	D	910	40	48	1952		37	19-6-59	45 gpd	D	
415	SW	21	2	4	St	H.M. Heide	D	910	14	48	1954	si	11	19-6-59		DS	Supplies all winter
416	SW	21	2	4	St	C. Peters	DR	910	80	2	1910	g	12	19-6-59		S	Log
417	SE	21	2	4	St	J.F. Reimer	D	910	14	48	1957	si	11	19-6-59		S	
418	SE	21	2	4	St	F.I. Dyck	D	910	50	48				19-6-59		S	Sufficient supply
420	SE	21	2	4	St	D.A. Wiebe	DR	910	26+	2			16	19-6-59		S	Sufficient supply
421	SE	21	2	4	St	A.B. Bergen	D	910	15+	18				19-6-59		S	Sufficient supply
422	SE	21	2	4	St	J.T. Schellenberg	DR	910	120		1947		22	19-6-59		DS	Enough water for 10 cattle
423	SE	21	2	4	St	J.M. Miller	D	910	12	36		si		19-6-59		DS	Recharged from creek
425	SE	21	2	4	St	Isaac Reimer	D	910	82	2	1910	si	17	19-6-59		DS	Silt at 27 feet—where water is
429	NE	28	1	4	St	J.K. Wiebe	D	935	12	36	1958	si	8	19-6-59		D	Supplies all year
431	NE	28	1	4	St	J.O. Froese	D	935	20	48	1939	si	8	19-6-59		DS	Supplies all year
433	SE	33	1	4	St	I. Elias	D	930	20	48	1955	si	9	19-6-59		DS	Sufficient supply
434	SE	33	1	4	St	J.P. Wiebe	D	930	24	48	1939	si	10	19-6-59		DS	Supplies all year
435	SE	33	1	4	St	Hochfeld School	DR	930			1957			19-6-59		D	Goes dry in summer
436	SE	33	1	4	St	D.M. Klassen	D	925	24	48	1958	si	15	19-6-59		D	Two families use well
437	SE	33	1	4	St	D.F. Neufeld	DR	925	40	2	1945		12	19-6-59		DS	Supplies all year
439	NE	33	1	4	St	J. Friesen	DR	925	65	2	1957	si	18	19-6-59		DS	Supplies all year
440	NE	28	1	4	St	J.J. Heide	D	935	17	48	1950	si		19-6-59		DS	Has another dug well
441	NE	28	1	4	St	J.G. Neufeld	D	935	28	48				19-6-59			Log
442	NE	28	1	4	St	J. Heide	D	935	20	48	1958	si		19-6-59		DS	Sufficient supply
443	SE	33	1	4	St	J.J. Froese	D	930	21	42	1955		12	19-6-59		S	Sufficient supply
444	SE	33	1	4	St	I.J. Dyck	D	930	22	28		si	12	19-6-59		DS	Uses water for spraying
445	SE	33	1	4	St	J.A. Hiebert	D	930	21	48	1954			19-6-59		DS	Sufficient supply
446	SE	33	1	4	St	A.A. Hiebert	D	927	29		1944	si	12	19-6-59		S	Sufficient supply—log
447	SE	33	1	4	St	P.B. Klassen	D	925	24	36		si	5	19-6-59		DS	Insufficient supply
451	NE	33	1	4	St	J. Wiebe	DR	925	65	2	1918	g	24	19-6-59		DS	Sufficient supply—log
452	NE	33	1	4	St	J.C. Thiessen	D	925	43	36		g	33	19-6-59		DS	
454	SE	20	1	4	St	W.W. Reimer	D	945	15	48	1959	si	8	19-6-59		DS	Supplies all year
455	SE	20	1	4	St	J.F. Klassen	D	945	14	48	1919	si	11	19-6-59		DS	Sufficient supply
456	SE	20	1	4	St	P. Elias	D	945	12	48		si	9	19-6-59		DS	Dry in dry years
458	SE	20	1	4	St	J. Friesen	D	950	12	48	1956	si	8	19-6-59		D	
459	SE	20	1	4	St	G. Klassen	D	950	13	42	1949	si		19-6-59		DS	Sufficient supply
464	SE	20	1	4	St	A.P. Janzen	D	950	12	42	1957	si		19-6-59		S	
465	SE	20	1	4	St	D. Dueck	D	950	13	48		si		19-6-59		DS	Insufficient supply
469	SE	11	2	4	St	O.R. Grueher	DR	890	100+	2	1941	g	5	20-6-59		DS	Sufficient supply
472	NE	2	2	4	St	A.J. Friesen	DR	890	123	2			6	20-6-59		S	
473	SE	11	2	4	St	H.P. Harder	DR	892	99	2	1951			20-6-59		S	Insufficient supply
474	NE	12	2	4	St	C.H. Wall	DR	885		2	1953		0	20-6-59		S	Sufficient supply
476	SE	24	2	4	St	J.P. Friesen	DR	875	170	2	1950		0	20-6-59		S	Has another drilled well
477	SE	24	2	4	St	P. Janzen	DR	875	170	2	1950		0	20-6-59		S	Sufficient supply
479	NE	13	2	4	St	J.J. Friesen	DR	875	175	2	1949	g	0	20-6-59		S	
480	NE	13	2	4	St	S.P. Ginter	DR	875	350	2	1956		0	20-6-59		S	Sufficient supply
482	NE	13	2	4	St	W.D. Friesen	DR	875	170	2	1955	sa	0	20-6-59		S	
484	NE	13	2	4	St	H.H. Giesbrecht	DR	875	160	2	1955		0	20-6-59		S	
485	NW	31	2	3	RH	A. Suderman	DR	865	165	2	1959	g	0	20-6-59	1 gpm	S	Analysis
486	SE	1	3	4	St	J.M. Froese	DR	865	168	2	1945		0	22-6-59		S	Insufficient supply
487	SW	6	3	3	RH	P.M. Reimer	DR	865	140	2	1940			22-6-59		DS	
488	SW	32	2	3	RH	C.D. Doell	DR	855	170	2	1896		0	22-6-59		S	
489	NW	30	2	3	RH	J. Olfert	DR	865	170	2	1941		0	22-6-59		S	Insufficient supply
490	SE	31	2	3	RH	G.G. Enns	DR	863	192	2	1949	sa	0	22-6-59		S	
491	SW	32	2	3	RH	J.D. Doell	DR	855	183	2	1947		0	22-6-59		S	Insufficient supply
493	NW	29	2	3	RH	C.V. Giesbrecht	DR	858	172	2	1930		0	22-6-59		S	

Table IV (continued)

Representative Well Records, Plum Coulee Area, Manitoba

Number	Location: Quarter	Location: Section	Location: Township	Location: Range	Location: Municipality	Owner or Tenant	Type	Elevation (feet)	Depth (feet)	Diameter (inches)	Date Completed	Aquifer (Character of Material)	Water Level: Below Land Surface (feet)	Water Level: Date	Yield	Use	Remarks
494	SE	29	2	3	RH	H.J. Krahn	DR	860	145	2	1930		0	22-6-59		S	Insufficient supply
495	SE	30	2	3	RH	W. Hilderbrand	DR	865	175	2	1900		0	22-6-59		S	Sufficient supply
496	NE	19	2	3	RH	J. Hunger	DR	860	120+	2	1930		1	22-6-59		S	Insufficient supply
497	SE	19	2	3	RH	F.P. Hoeppner	DR	863	185	2	1930		0	22-6-59	150 gph	S	
498	SW	8	2	3	RH	F. Driedger	DR	865	170	2	1949	g	0	22-6-59	6 gpm	S	Dug-well water is bitter
499	SE	8	2	3	RH	I. Driedger	DR	863	170	4	1890		0	22-6-59		S	Insufficient supply
500	SW	33	2	3	RH	I. Platt	DR	845	134	2	1944		0	22-6-59		S	Insufficient supply
501	SE	5	3	3	RH	H.U. Friesen	DR	845	172	2	1947		0	22-6-59	6 gpm	S	Log
502	SW	4	3	3	RH	J.H. Neufeld	DR	845	190	2	1944		0	22-6-59		S	Sufficient supply—log
508	NW	27	2	3	RH	K. Wiebe	DR	835	115+	2			5	22-6-59		S	Sufficient supply
510	NW	15	2	3	RH	Blumengart	DR	850	300	2-4-6	1910	g	0	22-6-59		S	Have 5 other drilled wells
512	SW	10	2	3	RH	K. Neufeld	D	855	12	48	1945	si	1	22-6-59		S	Dry in winter
513	NE	4	2	3	RH	B.G. Sawatsky	DR	855	146	2	1958	sa	0	23-6-59		S	Analysis
514	NE	4	2	3	RH	D.O. Peters	DR	855	160	2	1900		0	23-6-59		S	Insufficient supply
516	NE	4	2	3	RH	J. Peters	DR	850	128	2	1944		0	23-6-59		S	Insufficient supply
517	NW	3	2	3	RH	B.I. Buhler	DR	850	150	2	1945		0	23-6-59		S	Insufficient supply
518	NW	3	2	3	RH	F.F. Sawatsky	DR	850	175	2	1920		0	23-6-59		S	Sufficient supply
520	NE	4	2	3	RH	A.A. Petkau	D	855	20	36				23-6-59		S	Low in autumn
521	NE	4	2	3	RH	F. Peters	DR	855	175	2				23-6-59		S	
523	NE	4	2	3	RH	J.J. Nickel	DR	855	250	3				23-6-59		S	Sufficient supply
524	NE	4	2	3	RH	B. Schellenberg	D	855	14	48	1930	si		23-6-59		S	
526	NE	4	2	3	RH	George Friesen	D	855	10	48			5	23-6-59		S	Sufficient supply
527	NE	4	2	3	RH	Paul J. Peters	DR	855	167	2	1958	sa	0	23-6-59	3 gpm	S	Sufficient supply
529	NW	3	2	3	RH	C.P. Peters	D	850	12	48	1950	si		24-6-59		S	Has 2 dug wells
531	NW	13	1	3	RH	D.D. Janzen	D	855	12	48				24-6-59		S	Insufficient supply
532	SW	24	1	3	RH	J.P. Fehr	D	855	16	36	1958	sa & g	6	24-6-59		DS	
534	SW	24	1	3	RH	D.G. Arms	D	855	14	36	1955	si	10	24-6-59		S	Sufficient supply
536	SW	24	1	3	RH	A.J. Froese	D	855	14	96	1958	si	6	24-6-59		S	Insufficient supply
538	SW	24	1	3	RH	J. Fehr	D	855	14	48	1946	sa & g	10	24-6-59		DS	Has 2 dug wells
539	SW	24	1	3	RH	C.C. Peters	D	855	12	48	1940		6	24-6-59		DS	
540	NW	13	1	3	RH	A.P. Wieler	D	855	13	36	1935	si	4	24-6-59		S	Has 2 dug wells
541	SE	23	1	3	RH	Rosenort School	D	855	13	30	1949	si		24-6-59		D	Supplies all year
544	NW	13	1	3	RH	A. Elias	D	855	9	36	1958			24-6-59			Insufficient supply
547	NW	13	1	3	RH	E. Platt	D	855	11	48	1953	si		24-6-59		DS	
550	SW	19	1	2	RH	F. Kehler	D	850	16	48	1949	si	12	24-6-59		DS	
551	SW	18	1	2	RH	J.E. Kehler	D	850	14	48	1954	si	10	24-6-59		DS	Supplies all year
553	NW	18	1	2	RH	H. Stoesz	D	850	16	48	1936	si		24-6-59		DS	Sufficient supply
556	SE	17	1	3	RH	P.F. Giesbrecht	D	885	12	48	1945	si	8	24-6-59		DS	Supplies all year
557	SE	17	1	3	RH	J.W. Thiessen	D	885	12	48	1954	si	9	24-6-59		DS	
559	SE	17	1	3	RH	P. Dyck	D	885	12	48	1950	si	8	24-6-59		DS	Sufficient supply
560	SE	17	1	3	RH	W.W. Thiessen	D	885	12	36	1951		6	24-6-59		DS	Supplied in dry 30's
562	SE	17	1	3	RH	S.F. Zacharias	D	885	11	32	1958	si	5	24-6-59		DS	Has 2 dug wells
563	SE	17	1	3	RH	F.J. Peters	D	885	17	36			6	24-6-59		DS	Water slightly salty
564	SE	17	1	3	RH	C.W. Thiessen	D	885	13	30	1945	si		24-6-59		DS	Softener in well water
545	SE	17	1	3	RH	C.C. Thiessen	D	885	13	42			4	24-6-59		DS	Sufficient supply
566	SE	17	1	3	RH	Ben Bergen	D	885	14	30			4	24-6-59		DS	Sufficient supply
568	SW	7	1	3	RH	J.H. Braun	D	910	24	48	1937	si	10	24-6-59		DS	Well pumps dry in 3 hours

570	SW	7	1	3	RH	D.I. Fehr	D	910	18	48	1938	si	12	24-6-59		DS	Supplied in dry 30's
571	SW	7	1	3	RH	J. Martens	D	910	14	48	1944		7	24-6-59		DS	Supplies all year
573	SW	7	1	3	RH	H.B. Wiebe	D	910	19	32	1945	si		24-6-59		DS	Has 2 dug wells
574	SW	7	1	3	RH	Isaac Pauls	D	910	25	48	1935			24-6-59		DS	Sufficient supply
577	SW	7	1	3	RH	P. Giesbrecht	D	910	17	48	1940		2	24-6-59		S	Sufficient supply
578	SW	7	1	3	RH	J.J. Janzen	D	910	20	36	1930		10	24-6-59		DS	
581	SW	3	2	3	RH	P. Letkeman	D	855	17	48	1958		12	25-6-59		S	Sufficient supply
586	NE	35	2	3	RH	D.O. Friesen	DR	830	133	2	1940		5	25-6-59		S	
587	SW	36	2	3	RH	R. Porte	DR	828	132	2	1955		5	25-6-59		S	
588	NW	25	2	3	RH	J.H. Klassen	D	830	13M	48	1951	si	5M	25-6-59		S	Recharged by dugout
589	NE	26	2	3	RH	H.H. Klassen	D	835	22	48	1934	si	8	25-6-59		S	Has drilled well 100 feet deep
591	SE	23	2	3	RH	J. Wiebe	D	836	23	48			15	25-6-59		S	
596	SW	24	2	3	RH	A.R. Penner	D	835	11		1945			25-6-59		S	Recharged by dugout
598	SE	14	2	3	RH	C.J. Wiebe	D	840	15	48	1950			25-6-59		S	Recharged by dugout
599	SW	13	2	3	RH	P.C.F. Penner	DR	840	40	2	1929		6	25-6-59		S	Sufficient supply
600	NW	12	2	3	RH	N. Janzen	DR	840	152	6	1958	g	22	25-6-59	10 gpm	S	Has 2 drilled wells
604	NW	1	2	3	RH	P.F. Hoeppner	D	844	30	48	1950			25-6-59		S	
605	NE	2	2	3	RH	Bergman Sisters	D	844	14	48	1920	si	11	25-6-59		S	
606	SW	1	2	3	RH	H.J. Ginter	D	844	14M	48	1950	si	7M	25-6-59		DS	Dry in winter
607	NE	35	1	3	RH	J. Nickel	D	845	19M	48			8M	25-6-59		S	
608	NW	35	1	3	RH	P. Gunter	D	847	12	48	1948		5	25-6-59		S	Sufficient supply
609	NW	36	1	3	RH	J. Klassen	DR	845	160	2	1956		4	25-6-59		S	
611	NE	1	2	3	RH	J.J. Peters	DR	840	145	2	1950		10	25-6-59		S	
613	NW	30	2	2	RH	J.H. Thiessen	D	825	12	48	1954		9	26-6-59		S	
621	SW	19	1	3	RH	J.P. Riediger	DR	900	160	2	1937		6	26-6-59		DS	
622	SW	18	1	3	RH	H. Janzen	DR	900	150	2	1954		8	26-6-59		DS	Supplies all year
623	SW	18	1	3	RH	J.J. Janzen	D	900	17	36	1953		7	26-6-59		D	Supplies all year
626	NW	18	1	3	RH	P.S. Zacharias	DR	900	150	2	1945		10	26-6-59		DS	Supplies all year
627	NW	18	1	3	RH	J.P. Peters	DR	900			1930			26-6-59	10 gpm	DS	Supplies all year
629	NW	18	1	3	RH	D.D. Klassen	D	900	16	48				26-6-59			Not used
632	NW	18	1	3	RH	A.J. Falk	DR	900	128	2	1955			26-6-59		DS	Insufficient supply
634	NW	18	1	3	RH	P. Yurchak	DR	900	130	2			4	26-6-59		DS	
635	SW	33	1	3	RH	J.J. Fehr	DR	865	150	2	1958		0	26-6-59		S	Sufficient supply
636	NW	16	1	3	RH	H.J. Falk	D	882	13	48	1955	si	6	26-6-59		S	Has 3 dug wells
637	NW	16	1	3	RH	J.J. Falk	D	882	15	48	1933	si	11	26-6-59		S	Sufficient supply
638	NW	9	1	3	RH	P.P. Dyck	D	885	8	48	1950		4	26-6-59		S	Sufficient supply
639	NE	9	1	3	RH	P.J.S. Dyck	D	878	12	48	1949		6	26-6-59		DS	Supplies all year
640	NE	4	1	3	RH	W.J. Zacharias	D	878	12	48	1953		6	26-6-59		DS	Supplies all year
641	SW	10	1	3	RH	H. Goertzen	D	878	10	48			4	26-6-59		DS	
642	NE	16	1	3	RH	J.J. Buhler	D	878	10	48	1950		8	26-6-59		S	Supplies all year
643	NE	21	1	3	RH	J. Giesbrecht	D	865	5	48	1950		1	26-6-59		D	Recharged by dugout
645	SW	34	1	3	RH	P.P. Zacharias	D	850	11	48	1955			26-6-59		DS	Recharged by dugout
648	SE	22	1	3	RH	T. Gerbrandt	D	870	16	48	1929		10	29-6-59		S	Supplies all year
649	NE	15	1	3	RH	B. Gerbrandt	D	870	12	48	1958	si	7	29-6-59		S	
650	NE	10	1	3	RH	C. Mennofast	D	875	11M	36	1952	si	6M	29-6-59		DS	Supplies all year
651	NW	2	1	3	RH	P. Martens	D	874	13	48			7	29-6-59		S	
652	NW	12	1	3	RH	A.J. Wiebe	D	868	11M	48	1958		7M	29-6-59		D	Sufficient supply
653	NE	11	1	3	RH	J.J. Dyck	D	870	11M	48	1939		7M	29-6-59		DS	Supplies all year
654	NE	11	1	3	RH	W. Rempel	D	870	13M	36	1959	sa & g	9M	29-6-59		DS	Analysis
655	SW	36	1	3	RH	C. Thiessen	D	840	7M	48			4M	29-6-59		S	
656	SE	36	1	3	RH	J. Thiessen	D	838	10M	48	1948		5M	29-6-59		DS	Dry in winter
657	NE	25	1	3	RH	P. Thiessen	D	840	12	48	1920	si	8	29-6-59		DS	
659	SW	1	1	3	RH	J.B. Wiebe	D	870	10M	48			5M	29-6-59		DS	Supplies all year
660	SW	1	1	3	RH	D. Janzen	D	870	12	48	1949	si	6	29-6-59		S	
661	NW	1	1	3	RH	J.J. Friesen	D	870	14	48	1949	si	10	29-6-59		S	Hardness—54 gr/gal
663	SE	1	1	3	RH	J. Martens	D	870	19	36	1924	si	11	29-6-59		S	Sufficient supply
665	NE	1	1	3	RH	C. Martens	D	870	12	30	1954	si	8	29-6-59		S	Sufficient supply
667	NW	6	1	2	RH	P.I. Fehr	D	863	12M	36	1958		8M	30-6-59		S	
668	NE	6	1	2	RH	J. Fehr	D	855	17	48	1958	si	4	30-6-59		S	Dry in winter
670	SE	7	1	2	RH	A.J. Janzen	D	850	16	48	1952	si	10	30-6-59		DS	Supplies all year
671	SW	17	1	2	RH	B.D. Giesbrecht	D	840	13	36	1957	si	6	30-6-59		S	Dries up
672	NW	17	1	2	RH	H. Martens	D	835	13	48			10	30-6-59		S	Insufficient supply

Table IV (continued)

Representative Well Records, Plum Coulee Area, Manitoba

Number	Location: Quarter	Section	Township	Range	Municipality	Owner or Tenant	Type	Elevation (feet)	Depth (feet)	Diameter (inches)	Date Completed	Aquifer (Character of Material)	Water Level: Below Land Surface (feet)	Date	Yield	Use	Remarks
679	SW	29	1	2	RH	D.C. Peters	DR	830	149	2	1949		6	30-6-59		S	Dry in winter
681	NE	30	1	2	RH	D.A. Thiessen	D	835	10	48	1956		6	30-6-59			Very bad water
685	NW	31	1	2	RH	H.B. Penner	D	835		48	1955			30-6-59		S	Supplies all year
695	NE	21	1	2	RH	J.Z. Klassen	D	820	12	48	1957		7	2-7-59		S	Soil and subsoil very dry
698	SE	17	1	2	RH	I.W. Fehr	D	830	11M	36			4M	2-7-59		S	
699	NE	8	1	2	RH	H. Fehr	D	835	10 1/2	48	1958		6	2-7-59		S	Sufficient supply
701	SE	4	1	2	RH	H. Hilderbrand	D	845	12	48	1945		3	2-7-59		S	Prefers rain-water for drinking
702	SW	15	1	2	RH	P. Sawatsky	D	830	10	36			3	2-7-59			Has 2 dug wells
704	NW	15	1	2	RH	W. Wiebe	D	825	11	48	1948	si		2-7-59		S	Insufficient supply
708	SW	22	1	2	RH	A. Neudorf	D	820	10	48	1951		5	2-7-59		S	Supplies all year
712	SE	33	1	2	RH	A.P. Hiebert	D	824	11	48	1955		5	2-7-59		S	Prefers rain-water for drinking
716	NW	35	1	2	RH	K.P. Kroeker	D	818	14	48	1947			2-7-59			Sufficient supply
717	NW	26	1	2	RH	H. Buehlig	D	813	12	48	1950		7	2-7-59			Prefers rain-water
722	SW	23	1	2	RH	C.S. Dyck	D	818	12	48	1942		8	2-7-59		S	Supplies all year
723	NE	15	1	2	RH	A.K. Klassen	D	825	16	48	1946		10	2-7-59		DS	Recharged from dugout
724	SE	15	1	2	RH	Mrs. Penner	D	828	22	48	1939	si	14	3-7-59		D	Pressure system to house
725	NW	11	1	2	RH	E. Sawatzky	D	835	12	48	1941	si	8	3-7-59			Supplies all year
726	SW	12	1	2	RH	J.J. Rempel	D	830	14	48	1952	si	5	3-7-59		S	Has 2 dug wells
727	NE	11	1	2	RH	P.H. Higden	D	835	14	48	1951			3-7-59		DS	Insufficient supply
728	NW	12	1	2	RH	N. Hiede	D	830	15	48	1957	si	11	3-7-59		S	
729	SE	13	1	2	RH	R.K. Hiede	D	830	22	48	1919		6	3-7-59		D	Supplied in dry 30's
730	SE	14	1	2	RH	P. Harder	D	833	14	48	1949		6	3-7-59		DS	Neighbours haul from here
731	SW	13	1	2	RH	L.P. Buhr	D	830	10	36			5	3-7-59		S	Sufficient supply
732	NE	14	1	2	RH	G.P. Giesbrecht	D	825	18	48	1942		8	3-7-59		DS	Dry in dry 30's
733	SE	23	1	2	RH	A.P. Driedger	D	820	15	48			11	3-7-59		S	Had water in dry 30's
734	NW	13	1	2	RH	A.A. Driedger	DR	825	165	2	1936			3-7-59		S	Dry in dry years
735	SW	24	1	2	RH	J. Krahr	DR	825	187	2	1954			3-7-59		S	
750	NE	13	1	2	RH	P.M. Giesbrecht	D	820	11	48	1949		7	3-7-59		S	Supplies all year
751	NE	1	1	2	RH	J. Derksen	D	828	12	48	1929		4	3-7-59		S	Has 2 dug wells
755	SW	5	2	2	RH	P.G. Penner	DR	833	150	2	1925		2	4-7-59			Not used
756	NW	5	2	2	RH	S. Penner	D	832	14M	48	1950		7M	4-7-59		S	Supplies all year
760	SW	8	2	2	RH	J.J. Wiebe	DR	828	150	2	1919		10	4-7-59		S	
778	NW	30	2	2	RH	J.H. Thiessen	D	825	12 1/2	48	1949		6	4-7-59		S	
800	SE	10	2	2	RH	H.P. Schmidt	D	819	12	48	1939	si		6-7-59		D	Recharged by dugout
841	NE	25	2	2	RH	A. Unrau	DR	810		2	1956		10	7-7-59		S	Analysis
842	NE	26	2	2	RH	D.J. Friesen	DR	810	180	2	1900			7-7-59	400 gpd	S	Sufficient supply
843	NW	36	2	2	RH	J.B. Funk	DR	808		2	1952		7	7-7-59		S	Sufficient supply
844	SE	1	3	2	RH	J.I. Nickel	D	804	10	36	1953		3	7-7-59			Not used—log
858	SE	8	2	1	RH	Town of Altona	D	810	14	96	1936	si	4	8-7-59		PS	Recharged from dugout
859	SE	8	2	1	RH	Town of Altona	D	810	13M	96	1930	si	6M	8-7-59		PS	Dry in 1958
860	NE	5	2	1	RH	Town of Altona	D	810	16	96	1952	si	6	8-7-59			Not used
861	NE	5	2	1	RH	Town of Altona	D	810	16	48		si	6	8-7-59		PS	
862	SE	8	2	1	RH	Town of Altona	D	810	16	96	1930	si	6	8-7-59		PS	
863	SE	8	2	1	RH	Town of Altona	D	810	16	96		si	6	8-7-59		PS	
864	SW	8	2	1	RH	Town of Altona	DR	810	385	4	1958		0	8-7-59			Abandoned
865	SE	8	2	1	RH	Town of Altona	DR	810	160	12	1958	sa		8-7-59			Abandoned
878	SW	20	2	1	RH	Aaron Dueck	D	808	14	48	1919		5	9-7-59		DS	Supplied in 30's

879	NE	19	2	1	RH	J.S. Dueck	D	805	11M	48	1949		3M	9-7-59		S	Had good drinking water
880	NW	20	2	1	RH	A.A. Dueck	D	806	14	36	1958			9-7-59		D	Supplies all year
886	SE	6	3	1	RH	P.D. Berg	D	800	13	36	1919		8	9-7-59		D	Supplied in 30's—log
889	NE	32	2	1	RH	W.H. Friesen	DR	800	132	2	1957	g	6	9-7-59		S	Sufficient supply
892	NE	29	2	1	RH	A.D. Friesen	DR	800		2	1948		7	9-7-59			Supplies all year
893	NW	28	2	1	RH	P.H. Friesen	D	800	10	36	1946	si	7	9-7-59			Water once good to drink
897	NW	28	2	1	RH	C.P. Friesen	D	803	13	48	1929		5	9-7-59		DS	Never dry
899	SE	29	2	1	RH	W. Faulk	D	805	16	48	1929	si	6	9-7-59		DS	Recharged by dugout
901	NE	20	2	1	RH	W.E. Dueck	D	806	14	48	1929		6	9-7-59			Insufficient supply
905	NW	4	2	1	RH	J.J.D. Dyck	D	808	12	36	1959		5	9-7-59		DS	Insufficient supply
906	NW	4	2	1	RH	A. Warkentine	D	808	10	48	1951		5	9-7-59			
907	SW	34	2	1	RH	W. Penner	D	795	12	60	1958	si	4	10-7-59	48 gpd	DS	Sufficient supply
909	NW	22	2	1	RH	J.G. Doraksan	D	795	14	48	1950			10-7-59		DS	Sufficient supply
910	SW	22	2	1	RH	P.D. Friesen	D	795	14	48	1935		4	10-7-59		S	Supplies all year
912	NW	10	2	1	RH	F.F. Funk	DR	800	175	2	1930		4	10-7-59		S	Sufficient supply
913	SW	10	2	1	RH	A.J. Braun	D	805	20	48	1939			10-7-59		DS	
915	SE	10	2	1	RH	J.J. Klueger	D	808	15	48	1957	si	6	10-7-59		DS	Supplied in dry 30's
917	NE	11	2	1	RH	J.H. Hamm	D	800	14	48	1931	si	4	10-7-59		DS	Has 2 dug wells
918	SW	11	2	1	RH	J.J. Hamm	D	800	16	48	1930		5	10-7-59		S	Has 2 dug wells
920	SE	15	2	1	RH	B.R. Martens	D	800	14	30	1952	si	10	10-7-59		DS	Never dry
922	SW	14	2	1	RH	H.J. Krueger	D	798	13	36	1955	si	7	10-7-59		DS	Sufficient supply
923	NW	14	2	1	RH	J.N. Braun	D	798	15	48	1957		6	10-7-59		S	
924	SW	14	2	1	RH	J.E. Kroeker	B	798	14	24	1955		6	10-7-59		DS	
925	NE	15	2	1	RH	J. Wiebe	D	798	8	36	1949		2	10-7-59		S	Supplies all year
926	SE	23	2	1	RH	P. Dueck	D	795	14	48			4	10-7-59		S	Prefers rain-water
944	SW	12	2	1	RH	J.K. Braun	D	793	16	48	1919		6	10-7-59		DS	Supplies all year
945	SE	12	2	1	RH	J. Martens	DR	793	130	2	1940			10-7-59		S	
947	SW	1	2	1	RH	P.G. Kehler	D	800	14M	48	1932		4M	11-7-59		DS	Sufficient supply
948	SE	2	2	1	RH	J.K. Schwartz	D	805	18	48	1945		6	11-7-59		DS	Sufficient supply
949	NW	36	1	1	RH	B.G. Hamm	D	804	14	48	1929		7	11-7-59		DS	Short of water in 1936
950	NE	36	1	1	RH	B.P. Kehler	D	803	14	48	1952			11-7-59		DS	
954	NW	18	1	1	RH	M.A. Driedger	D	823	13	48	1939		4	11-7-59		S	Dry—autumn 1958
955	SW	18	1	1	RH	J. Banman	D	823	15	48			6	11-7-59		DS	Sufficient supply
957	SE	18	1	1	RH	K. Harder	D	823	17M	48			6M	11-7-59			Pressure system
958	NE	7	1	1	RH	D. Kehler	D	825	16	48	1939	si	6	11-7-59		D	Supplies all year
959	SE	6	1	1	RH	G. Smith	D	828	14	60	1939		6	11-7-59		S	Insufficient supply
960	SW	7	1	1	RH	W. Nickel	D	825	12M	30			5M	11-7-59		DS	Dry in 1958
964	SE	19	1	1	RH	I.P. Martens	D	820	11M	36	1939		5M	11-7-59		S	Supplies all year
966	NW	17	1	1	RH	J.V. Heinrichs	D	820	14	48	1945		6	11-7-59		DS	Supplies all year
967	NW	29	1	1	RH	J. Schwitteck	D	812	12	48	1949		7	11-7-59		D	Water not good
970	SE	32	1	1	RH	B.H. Sawatsky	D	810	21	48	1934	si	6	15-7-59			
971	SW	33	1	1	RH	H.K. Penner	D	810	17M	48	1909		4M	15-7-59		S	Supplied in dry 30's
974	SE	29	1	1	RH	D.P. Zacharias	D	815	11	48	1943	si	2	15-7-59		S	Insufficient supply
975	SW	28	1	1	RH	J.I. Hilderbrand	D	815	14	48	1944	si	1	15-7-59		DS	Insufficient supply
976	SE	28	1	1	RH	J.J. Voth	D	820	15	48	1940	si	3	15-7-59		DS	Supplies all year
977	NE	20	1	1	RH	H. Harder	D	820	12	48	1958		6	15-7-59		S	Supplies all year
978	NE	17	1	1	RH	I. Hunger	D	820	14	48	1953		5	15-7-59		DS	Prefers rain-water
979	NW	16	1	1	RH	H.H. Driedger	D	820	18	48	1939		6	15-7-59		DS	Supplies all year
980	SW	21	1	1	RH	P.G. Voth	D	820	20	36	1944		8	15-7-59		S	Dry in 30's
981	SE	21	1	1	RH	C.C. Voth	D	820	15	36	1939	si	7	15-7-59		DS	Supplied in dry 30's
982	SW	16	1	1	RH	J.H. Hilderbrand	D	820	14	48	1942	si	6	15-7-59		DS	
983	NW	9	1	1	RH	P. Klassen	D	823	16	48	1920		4	15-7-59		DS	
985	NW	4	1	1	RH	J. Schellenberg	D	825	14	36	1900		4	15-7-59		DS	Supplied in dry 30's
986	SW	9	1	1	RH	J.W. Klassen	D	825	15	36	1942		8	15-7-59		DS	Sufficient supply
987	NW	4	1	1	RH	D.G. Loewen	D	824	15	48			6	15-7-59		S	Very old well
988	SW	5	1	1	RH	I.I. Funk	D	825	14	48	1948		4	15-7-59			Stock won't drink it
989	NW	5	1	1	RH	M.C.I. Gretna	D	828	20	96	1954			15-7-59		D	Dowsing found this one
992	SW	15	1	1	RH	H.H. Driedger	D	815	11M	48	1947		5M	15-7-59		S	Sufficient supply
993	SW	27	1	1	RH	J.R. Braun	D	815	12	48	1951	si	4	15-7-59		DS	
994	NE	33	1	1	RH	J.H. Hiebert	D	810	14	48	1952	si	3	15-7-59		DS	Has 2 dug wells

Table IV (continued)

Representative Well Records, Plum Coulee Area, Manitoba

Number	Location: Quarter	Location: Section	Location: Township	Location: Range	Location: Municipality	Owner or Tenant	Type	Elevation (feet)	Depth (feet)	Diameter (inches)	Date Completed	Aquifer (Character of Material)	Water Level: Below Land Surface (feet)	Water Level: Date	Yield	Use	Remarks
995	NE	34	1	1	RH	J.H. Sawatsky	D	810	15M	48	1946	si	5M	15-7-59		D	Supplied in dry 30's
996	SE	34	1	1	RH	D.H. Friesen	D	810	18	48	1957			15-7-59		D	Sufficient supply
997	SE	33	1	1	RH	J. Kroeker	D	810	16	48	1939		6	16-7-59		DS	Supplies all year
1000	NW	27	1	1	RH	B. Friesen	D	810	14	48	1943	si	8	16-7-59		DS	
1003	NE	28	1	1	RH	J.J. Kehler	D	815	18	48	1934	si		16-7-59		DS	Dry in 30's
1004	NW	27	1	1	RH	Gnadenfeld School	B	810	11	12	1959	si		16-7-59		D	
1005	SE	27	1	1	RH	H.P. Funk	D	812	13	30	1959	si	6	16-7-59		S	Sufficient supply
1006	NE	22	1	1	RH	M.F. Falk	D	812	22	36	1944	si	11	16-7-59		DS	Needs water for irrigation
1007	NW	14	1	1	RH	J.J.H. Martens	D	810	16	48	1940	si	6	16-7-59		DS	Has 2 dug wells
1008	SW	14	1	1	RH	J.J.P. Martens	D	810	10	48	1949			16-7-59		DS	Has 2 dug wells
1009	SE	14	1	1	RH	J. Sawatsky	D	810	10	48	1959			16-7-59		DS	Prefers rain-water
1010	SE	14	1	1	RH	J.P. Sawatsky	D	810	12	48	1934	si	5	16-7-59		DS	Supplies all year
1011	SE	3	1	1	RH	G. Rempel	D	820	20	30	1954	si	5	16-7-59		DS	Prefers rain-water
1012	NE	2	1	1	RH	A. Wiebe	D	815	16M	48	1949		10M	16-7-59		DS	Supplies all year
1013	SE	2	1	1	RH	J. Kruda	D	815	21	48	1951			16-7-59		DS	Has 2 dug wells
1014	SW	1	1	1	RH	H. Hilderbrand	D	808	18	48	1947	si	7	16-7-59		DS	Has 3 dug wells
1015	SE	12	1	1	RH	J. Sawatsky	D	805		48	1949			16-7-59		S	Sufficient supply
1016	NE	1	1	1	RH	J. Loepky	D	805	9	48	1950		2	16-7-59		DS	Supplies all year
1017	SW	12	1	1	RH	J.D. Driedger	D	805	19	48	1934			16-7-59		S	Supplies all year
1018	SE	11	1	1	RH	H. Buhr	D	810	21	48	1915		5	16-7-59		S	Dry in 30's
1019	SW	11	1	1	RH	A.J. Janzen	D	810	16	48	1925	si	12	16-7-59		DS	Supplies all year
1020	SW	13	1	1	RH	J. Sebersky	D	800	18	48	1939		5	16-7-59		S	Insufficient supply
1021	NW	13	1	1	RH	J.E. Funk	D	805	16	48	1929		7	16-7-59		DS	Dry in 30's
1022	SE	23	1	1	RH	P.A. Brahms	D	805	12	48	1951		6	16-7-59		DS	Supplies all year
1023	SE	23	1	1	RH	H.P. Abrahms	D	815	12	48	1946	si	7	16-7-59		DS	Supplies all year
1024	SW	24	1	1	RH	P.S. Friesen	D	805	12M	48	1925	si	8M	16-7-59		DS	Dry in 30's
1025	NW	24	1	1	RH	P.B.R. Funk	D	805	15	48	1949		3	16-7-59		DS	Has 3 dug wells
1027	SE	24	1	1	RH	G.R. Funk	D	800	12	48	1948		2	16-7-59		DS	
1029	NW	36	1	1	RH	P.K. Braun	D	805	15	48	1939	si	9	17-7-59		DS	Sufficient supply
1030	SW	36	1	1	RH	J.J. Krueger	D	805	15	48	1958	si	9	17-7-59		S	Insufficient supply
1031	SW	36	1	1	RH	P. Friesen	D	805	25	48	1939		17	17-7-59		DS	
1032	SW	36	1	1	RH	H.F. Hamm	D	805	16	48	1900	si	8	17-7-59		DS	Dry in 30's
1033	SW	36	1	1	RH	M.P. Klippenstein	D	805	14	48	1953	si	8	17-7-59		DS	Dry in 30's
1034	NW	25	1	1	RH	J.W. Schwartz	D	805	16	48	1914		11	17-7-59		DS	Dry, 1958
1035	NW	25	1	1	RH	H. Isaac	D	805	12	48	1956			17-7-59		DS	Neighbors haul from here
1036	SE	35	1	1	RH	A.J. Schmidt	D	805	14	48	1954			17-7-59		S	Sufficient supply
1038	SE	35	1	1	RH	J. Hoeppner	D	805	18	48	1918	si	5	17-7-59		DS	Sufficient supply
1039	SE	35	1	1	RH	J. Klippenstein	D	805	16	36		si	4	17-7-59		S	Sufficient supply
1040	NE	26	1	1	RH	J.A. Friesen	D	805	15	48		si	8	17-7-59		DS	Insufficient supply
1044	SE	5	2	1	RH	E. Braun	D	810	13	48	1955			17-7-59		S	Insufficient supply
1045	SE	5	2	1	RH	I.P. Ganter	D	810	12	48	1955			17-7-59		DS	Neighbors haul from here
1052	SE	3	1	2	RH	J. Rempel	D	830	22	48	1932	si	9	17-7-59		DS	Dry in 30's
1053	SE	3	1	2	RH	H.B. Rempel	D	830	18M	48	1947		8M	17-7-59		S	
1055	SE	3	1	2	RH	G.G. Schroeder	D	830	20	36	1945		14	17-7-59		S	Sufficient supply
1057	SW	3	1	2	RH	W.H. Goertzen	D	830	18	48		g		17-7-59		S	Dry in 30's
1058	SW	3	1	2	RH	J. Funk	D	830	18	48			11	17-7-59		S	Sufficient supply
1059	SW	3	1	2	RH	K.F. Heide	D	830	24	36				17-7-59		S	Sufficient supply
1060	SW	3	1	2	RH	J.K. Klassen	D	830	24	48		si		17-7-59		S	Sufficient supply

1082	NW	9	3	1	RH	H.J. Siemens	D	794	13	36	1958			20-7-59		S	Insufficient supply
1112	SW	9	3	1	R	Rosenfeld Village	DR	795	150	2			0	21-7-59			Abandoned—salt water
1172	NW	2	4	2	M	I.A. Funk	DR	798	125	2	1919		15	23-7-59		S	Sufficient for stock
1222	NE	2	3	2	R	H. Schwartz	DR	803	138	2	1948	g	6	27-7-59	3 gph	S	Sufficient supply—log
1240	NW	26	3	2	RH	A.W. Klassen	DR	799	130	2			16	27-7-59			Not used
1249	SW	11	3	2	RH	D.D. Toews	DR	804	155	2	1953			27-7-59		S	Supplies all year—log
1255	NW	15	3	2	RH	B.B. Wiebe	DR	805	128	2	1956			27-7-59		S	Salt water
1269	SW	16	3	2	RH	D.H. Letkemen	D	811	12M	48	1929		7M	28-7-59			Not used
1288	NE	18	3	2	RH	J. Giesbrecht	DR	820	?	2	1939			28-7-59		S	Supplies all year
1294	NE	36	3	3	RH	J.F. Braun	DR	815	130	2	1948		4	28-7-59		S	Sufficient for stock
1298	SE	24	3	3	RH	I. Reimer	DR	820	130	2	1958		3	28-7-59	16 gph	S	Water drinkable
1299	SW	19	3	2	RH	W. Reimer	DR	820	135	2	1958	g	1	28-7-59	50 gph	S	
1300	SE	24	3	3	RH	R. Giesbrecht	DR	820	134	2	1948	sa	1	28-7-59		S	Supplies all year
1304	SE	2	3	3	RH	F.A. Rempel	DR	833	142	2	1946	g	8	28-7-59		S	Supplies all year—log
1307	SW	12	3	3	RH	E. Friesen	DR	830	130	2	1948		4	29-7-59		S	Plugs up—log
1309	SE	14	3	3	RH	J.S. Braun	DR	830	130	2	1957			29-7-59		S	Sufficient supply
1310	NW	13	3	3	RH	J.L. Harder	DR	828	?	2	1909			29-7-59		S	Supplies all year
1311	NE	23	3	3	RH	W.R. Toews	DR	825	145	2	1955			29-7-59			Not used
1312	NW	24	3	3	RH	J.D. Giesbrecht	DR	825	140	2	1949			29-7-59		S	Analysis
1313	SW	26	3	3	RH	A.F. Janzen	DR	828	142	2	1958		5	29-7-59		S	Water drinkable
1314	SW	25	3	3	RH	C.C. Neufeld	DR	825	140	2	1949		9	29-7-59		S	Supplies all year
1315	SE	35	3	3	RH	C.C. Siemens	DR	825	134	2	1944		5	29-7-59		S	Insufficient supply
1316	SW	35	3	3	RH	C.W. Isaac	DR	825	137	2	1947		6	29-7-59		S	Supplies all year
1317	NW	26	3	3	RH	P.A. Elias	DR	826	140	2	1939		2	29-7-59		S	Sufficient for stock
1319	SE	3	4	3	R	J. Braun	DR	828	200	2	1950			29-7-59		S	Supplies all year
1320	SE	34	3	3	RH	D.P. Unrau	D	828	13M	48			4M	29-7-59		S	Also has 2 drilled wells
1321	NE	27	3	3	RH	J.E. Braun	DR	828	120	2	1956		9	29-7-59		S	Can be pumped dry
1322	SE	27	3	3	RH	J.J. Peters	DR	830	145	2				29-7-59		S	Also has dug well
1328	SE	10	3	3	RH	H.D. Wielder	DR	835	163	3	1957		8	29-7-59	10 gpm	S	Recharges fast—log
1329	NE	3	3	3	RH	J.J. Wolfe	DR	835	150		1940		8	29-7-59		S	Supplies all year
1333	SE	9	3	3	RH	J.W. Enns	DR	840	?	2	1940			29-7-59		S	Supplies all year
1334	NW	9	3	3	RH	A.D. Hilderbrand	DR	840	135	2	1934		12	29-7-59		S	Log
1338	NE	21	3	3	RH	A.H. Friesen	DR	835	140	2	1938	g	7	29-7-59		S	Sufficient for stock
1346	NW	5	3	3	RH	J.A. Goertzen	DR	848	170	3	1880		0	30-7-59	300 gph	S	1,500/ppm salt—log
1347	NE	5	3	3	RH	G.I. Derksen	DR	845	100	2	1943		0	30-7-59		S	Insufficient supply
1349	NE	17	3	3	RH	D.D. Hilderbrand	DR	840	165	2	1879		20	30-7-59	20 gph	S	Sufficient for stock
1350	SW	33	3	3	RH	C.B. Falk	DR	835	100	2	1944		10	30-7-59		S	Supplies all year
1352	SE	33	3	3	RH	J. Dyck	DR	835	120	2	1939		6	30-7-59		S	Can be pumped dry
1355	SW	32	3	3	RH	A.A. Hilderbrand	DR	839	160	2	1919		7	30-7-59		S	Supplies all year
1356	NW	29	3	3	RH	I.B. Braun	DR	839	124	2	1920		8	30-7-59		S	
1357	SW	29	3	3	RH	A. Peters	D	840	14M	48	1958	si	6M	30-7-59		S	Formerly good water
1358	SE	33	3	3	RH	C.G. Peters	DR	845	180		1940			30-7-59		S	Insufficient supply
1359	NW	19	3	3	RH	P. Driedger	DR	850	120	2	1938		8	30-7-59		S	Supplies all year
1360	NE	7	3	3	RH	H.I. Hilderbrand	DR	855	169	2	1934		0	30-7-59		S	Too salty for stock—log
1361	SW	18	3	3	RH	B.J. Hilderbrand	DR	855	175		1925	sa	0	30-7-59	3 gpm	DS	Fair water
1363	SW	18	3	3	RH	H.A. Hilderbrand	DR	855	175	2	1949	sa	0	30-7-59		S	Sufficient for stock
1365	SW	18	3	3	RH	A.P. Wiebe	DR	835	178	2	1951	sa & g	0	30-7-59	60 gph	S	
1366	SW	19	3	3	RH	J. Suderman	DR	850	120	2	1929		0	30-7-59		S	Sufficient for stock
1367	SW	30	3	3	RH	H. Reimer	DR	850	140	2	1949		8	30-7-59		S	Had water in 30's
1369	SW	6	4	3	R	P. Harder	DR	845	127	2	1955		20	30-7-59		S	Supplies all year
1370	SW	12	4	3	R	J. Banman	DR	815	116	2	1958		3	30-7-59		S	Supplies all year
1377	SE	23	4	3	R	I. Wiebe	DR	816	135	2	1934		4	30-7-59			Analysis
1383	SW	3	4	3	R	C.P. Falk	DR	825	120	2	1939		4	31-7-59		S	
1388	NE	34	4	3	R	M.C. Kerlie	DR	818	100	2	1954			31-7-59		S	Well not sufficient
1389	SW	34	4	3	R	W. Remple	DR	820	220	2	1905	sa	5	31-7-59		S	Supplies all year
1393	SW	15	4	3	R	F. Wiebe	DR	828	?	2	1941			31-7-59		S	Supplies all year
1394	NE	5	4	3	R	B.D. Enns	DR	835	90	2				31-7-59		S	Sufficient for stock
1395	SE	8	4	3	R	A.R. Labun	DR	840	?	2	1920		15	31-7-59		S	Supplies all year
1402	NW	33	4	3	R	E. Halstead	DR	824	100	2	1940			31-7-59		S	Insufficient supply
1403	SW	5	5	3	R	F. Glover	DR	830	102	5	1937		12	31-7-59	500 gpd	DS	Analysis

Table IV (continued)

Representative Well Records, Plum Coulee Area, Manitoba

Number	Location					Owner or Tenant	Type	Elevation (feet)	Depth (feet)	Diameter (inches)	Date Completed	Aquifer (Character of Material)	Water Level		Yield	Use	Remarks
	Quarter	Section	Township	Range	Municipality								Below Land Surface (feet)	Date			
1404	SE	6	5	3	R	N. J. Andersen	B	835	90	14	1919		30	31-7-59	1,500 gpd	DS	Insufficient supply
1405	NW	32	4	3	R	I.A. Allyson	DR	830	120	2			25	31-7-59		DS	Has 2 drilled wells
1411	NE	6	4	3	R	J.D. Penner	DR	845	100	2	1904		12	31-7-59		S	Supplies all year
1412	SW	5	4	3	R	A.A. Hyde	DR	840	165	2	1926		10	31-7-59		S	Supplies all year
1414	NE	25	4	4	R	Mullins	D	840	90	36	1919			31-7-59	200 gpd	DS	Supplies all year
1415	SW	6	5	3	R	O.G. Barry	D	838	100	36	1920			31-7-59		DS	Dries up
1422	SW	24	4	4	R	J. Hodgson	DR	845	110	2	1910		24	1-8-59		S	Slow recharge
1423	SE	23	4	4	R	P. Langtry	D	848	100	48	1900			1-8-59		D	Supplies at all times
1425	NW	12	4	4	R	J.D. McCallum	DR	853	128	2	1919		18	1-8-59		S	Supplies all year
1426	SW	12	4	4	R	A.D.W. Dyck	D	853	18M	36	1919		10M	1-8-59		S	Low in winter
1428	SE	3	4	4	R	C.J. Penner	DR	865	100	2	1937		0	1-8-59		S	Supplies all year
1429	SW	2	4	4	R	B. Dyck	DR	860	144		1948			1-8-59		S	
1430	NW	2	4	4	R	B.A. Loewen	DR	863	130	2	1931	g	15	1-8-59		S	Supplies all year
1431	SW	11	4	4	R	J. Labun	D	864	16	48	1941		5	1-8-59		DS	Also has drilled well
1433	SE	22	4	4	R	B. Burnett	B	853	128	14	1909		20	1-8-59		S	Sufficient supply
1436	NE	34	4	4	R	J. Bonnar	DR	852	100	2	1929		15	1-8-59	400 gpd	S	Supplies all year
1437	SW	2	5	4	R	H. Phillips	DR	850	90	2	1920		35	1-8-59		DS	Supplies all year
1438	SW	27	4	4	R	M.E. McCallum	B	858	120	18	1919		20	1-8-59		D	Analysis
1439	SE	28	4	4	R	A.E. Wakely	DR	865	128	2	1949		30	1-8-59		S	Sufficient supply—log
1440	SW	22	4	4	R	M.E. Cameron	D	865	75	48	1909		65	1-8-59		D	Supplies all year
1442	NW	10	4	4	R	M.R. Stewart	DR	865	100	2	1919			1-8-59		S	
1444	NE	4	4	4	R	J.W. Whitehead	DR	873	155	2	1930		3	1-8-59		DS	Supplied in 30's
1445	SE	5	4	4	R	H. Jannick	DR	880	200	2	1938	sa	2	1-8-59		DS	48 gr/gal hardness—log
1446	NW	4	4	4	R	A.P. Dyck	DR	875	160	2	1956		5	3-8-59		DS	Log
1447	SE	8	4	4	R	J.M. Brown	DR	880	142	2	1917			3-8-59		D	Supplies all year
1448	SW	8	4	4	R	H.J. Brown	DR	880	150	2	1951			3-8-59		DS	Log
1449	NW	9	4	4	R	M.H. Hennan	B	875	100	18	1920		10	3-8-59		S	Log
1450	NE	17	4	4	R	A.W. Hennan	DR	875	150	3	1917			3-8-59		DS	Also has dug well—log
1451	SE	20	4	4	R	O. Glover	DR	875	?	2	1919			3-8-59		D	Supplies all year
1452	NE	29	4	4	R	T. Wakeley	D	873	14	48	1919		6	3-8-59		D	Supplies all year—log
1453	NE	33	4	4	R	R.F. Wilson	B	855	95	14	1922	g	25	3-8-59		S	
1454	NW	33	4	4	R	C.V. Chatwin	B	865	140	14	1930			3-8-59		DS	Sufficient supply—log
1455	NE	32	4	4	R	J. Born	DR	865	121	2	1945		25	3-8-59		DS	Supplies all year
1457	SE	31	4	4	R	J.E. Lytle	B	878	90	18	1928		10	3-8-59		DS	Supplies all year
1458	NE	19	4	4	R	C.B. Martin	DR	880	130	6			14	3-8-59		DS	Insufficient supply
1459	SW	20	4	4	R	S. Phillips	DR	880	100	3	1919		6	3-8-59		DS	Supplies all year
1460	SE	7	4	4	R	J.J. Wakertine	DR	890	100	2	1919		8	3-8-59		DS	Sufficient supply
1461	NE	6	4	4	R	J. Redekopp	DR	888	124	2	1949		1	3-8-59		DS	
1462	SW	18	4	4	R	T. Bannan	DR	885	200	3	1955	sa		3-8-59		DS	Supplies all year
1465	SW	12	3	4	St	P.G. Dyck	DR	860	213	2	1912	g	1	3-8-59		S	Supplies all year—log
1466	NE	12	3	4	St	D. Suderman	DR	858	200	2	1923		0	4-8-59		S	Insufficient supply
1468	NE	25	3	4	St	B.A. Hilderbrand.	DR	850	?	2	1938			4-8-59	1,000 gpd	S	Supplies all year
1469	SE	36	3	4	St	M. Olfert	DR	848	140		1911		2	4-8-59		S	Insufficient supply
1473	NE	26	3	4	St	P. Olfert	DR	860	130	2	1899		0	4-8-59	100 gph	S	Supplies all year
1474	NW	25	3	4	St	P. Nickel	DR	855	140	2	1935		10	4-8-59		S	Salty
1476	SW	24	3	4	St	A. Hilderbrand	DR	860	160	2	1956		1	4-8-59		S	Supplies all year
1478	SE	24	3	4	St	F.A. Janzen	DR	855	155	2	1930	g	0	4-8-59		S	Sufficient supply
1481	NW	12	3	4	St	J.T. Hilderbrand	DR	865	164	2	1944	sa	8	4-8-59		DS	Supplies all year

1482	SE	14	3	4	St	A. Driedger	DR	868	172	2	1945	sa	5	4-8-59		DS	Insufficient supply
1483	NW	12	3	4	St	J. Wiebe	D	865	8	48	1956		7	4-8-59		S	Dry in winter
1484	NE	11	3	4	St	J. Neudorf	DR	866	164	2	1947			4-8-59		S	Supplies all year
1485	NE	2	3	4	St	P.F. Girtzen	DR	870	256	2	1955			4-8-59		S	Insufficient supply—log
1486	NW	1	3	4	St	P. Wiebe	DR	870	150	2	1956			4-8-59			Supplies all year—log
1487	SE	3	3	4	St	A.B. Giesbrecht	DR	883	145	2	1935		0	4-8-59		S	Sufficient for stock
1488	SW	3	3	4	St	D.J. Schellenberg	DR	885	124	2	1919		6	4-8-59		S	Sufficient for stock
1489	NW	3	3	4	St	J.L. Friesen	DR	882	170	2	1958		0	4-8-59		S	Insufficient supply
1490	SW	14	3	4	St	J. Suderman	DR	872	140	2	1944		7	4-8-59		S	Sufficient for stock
1491	SW	26	3	4	St	A.J.J. Peters	DR	865	209	2	1935	g	2	4-8-59		S	Slow recharge
1493	SE	34	3	4	St	A.M. Peters	DR	870	130	2	1945		1	4-8-59		S	Sufficient for stock
1494	NW	35	3	4	St	C.C. Reimer	DR	863	145	2	1919		12	4-8-59		S	Supplies all year
1495	SE	9	3	4	St	J.C. Pauls	DR	885	130	2	1937		8	4-8-59		DS	Supplies all year
1497	SE	9	3	4	St	I.J. Friesen	DR	885	125				0	5-8-59		DS	Sufficient supply
1499	SE	9	3	4	St	G. Toews	DR	895	90	2	1956			5-8-59		S	Supplies very little
1500	SW	10	3	4	St	J.J. Siemens	DR	883	153	2	1950		4	5-8-59	45 gpd	S	Slow recharge
1501	SE	9	3	4	St	Janzen Garage	DR	885	147	2	1959		6	5-8-59			Slow recharge
1502	NE	9	3	4	St	J.B. Marten	DR	885	150		1900		0	5-8-59		DS	Artesian flow
1503	NE	9	3	4	St	A. Klassen	DR	805	150	2	1947		0	5-8-59		DS	Supplies all year
1504	NE	9	3	4	St	D.H. Funk	DR	885	150	2	1900		30	5-8-59	8 gph	S	Has 2 drilled wells
1505	NW	10	3	4	St	J.P.W. Dyck	DR	883	133	2		g	5	5-8-59		DS	Sufficient supply—log
1506	SW	15	3	4	St	D.E. Dyck	DR	880	130	2	1934		0	5-8-59		DS	Supplies all year
1510	SE	27	3	4	St	W.J. Peters	DR	870	130	2	1912		4	5-8-59		S	Supplies all year
1511	NE	28	3	4	St	W. Dempke	DR	878	140	2	1925		12	5-8-59	750 gpd	DS	Has 4 drilled wells—log
1512	SW	34	3	4	St	J.J. Peters	DR	875	120	2	1944		1	5-8-59		S	Has 4 drilled wells—log
1513	SE	33	3	4	St	D.A. Peters	DR	875	135	2	1919		6	5-8-59		S	Has 4 drilled wells—log
1514	NW	33	3	4	St	H.A. Peters	DR	878	130	2	1909	sa	5	5-8-59		DS	Salt—45 gr/gal—log
1515	SE	32	3	4	St	P. Dempke	DR	885	140	2	1930		6	5-8-59		DS	Supplies all year—log
1516	NW	21	3	4	St	J.W. Trimke	DR	885	120	2	1939			5-8-59		DS	Softener installed
1517	NE	20	3	4	St	J.P. Dyck	DR	890	120	2	1917		6	5-8-59		DS	Log—analysis
1518	SE	20	3	4	St	H.W. Dyck	DR	890	145	2	1919		5	5-8-59		DS	Supplies all year—log
1519	NW	16	3	4	St	J.P. Dyck	DR	888	130	2	1951	sa	0	5-8-59	30 gph	DS	Softener installed—log
1520	SW	16	3	4	St	J.J. Braun	DR	886	130	2	1955		0	5-8-59		DS	Supplies all year—log
1521	NE	8	3	4	St	G. Wiebe	DR	895	135	2	1947			5-8-59		D	Softener installed—log
1522	SW	8	3	4	St	G.W. Enns	DR	900	130	2	1955		15	5-8-59		DS	Supplies all year—log
1525	SE	7	3	4	St	I.G. Friesen	D	915	30	48	1919	sa		5-8-59		DS	Sufficient supply—log
1526	NE	7	3	4	St	G.B. Penner	D	913	32	48	1952		17	5-8-59		DS	Sufficient supply—log
1527	SE	18	3	4	St	H.K. Enns	D	910	37	48	1925		18	5-8-59		DS	Dry in 30's
1529	SW	32	3	4	St	R. Unrich	DR	890	118	2	1953	g	2	5-8-59			Recharges fast
1531	NE	31	3	4	St	S. Krieger	DR	890	103	2	1955	g	3	5-8-59		DS	Supplies all year
1532	NW	1	3	5	St	I. Siemens	D	935	19	48	1958	sa	5	5-8-59		DS	Supplies all year
1533	NE	1	3	5	St	I.F. Loewen	DR	930	160	2	1957	g	18	6-8-59		DS	Insufficient supply—log
1534	SW	6	3	4	St	C.C. Hiebert	D	925	11	48	1953		5	6-8-59		DS	Slow recharge
1535	NW	6	3	4	St	N.J. Spangelo	D	920	21	48	1944	sa	17	6-8-59		D	Slow recharge
1537	NE	12	3	5	St	I.C. Dyck	DR	925	65	2	1951	g		6-8-59		DS	Hardness—30 gr/gal
1540	SE	13	3	5	St	J. Wiebe	DR	925	90	2	1949		20	6-8-59		DS	Sufficient supply
1541	NE	13	3	5	St	J.L. Dyck	DR	925	80	2	1946	sa	28	6-8-59		DS	Selenite crystals in clay
1543	NW	24	3	5	St	W.J. Braun	DR	920	100	2	1934	sa	35	6-8-59		DS	
1544	SE	25	3	5	St	G.G. Froese	D	910	28	36	1958		23	6-8-59		S	Supplies all year
1545	SW	30	3	4	St	Burhwalde School	D	910	32	36	1940	sa	27	6-8-59		D	Sufficient supply
1546	SE	24	3	5	St	W. Brown	D	920	32	36	1955	sa	6	6-8-59		DS	Supplies all year
1547	NE	25	3	5	St	H.H. Janzen	D	920	29	36	1949	sa	23	6-8-59		DS	
1548	SE	36	3	5	St	L. Loewen	D	912	29M	36	1954		19M	6-8-59		DS	
1549	NW	36	3	5	St	J.A. Peters	D	918	30	36	1919	sa	26	6-8-59		DS	Dry in 30's
1550	SW	36	3	5	St	B. Peters	D	915	34	36	1926		26	6-8-59		DS	Supplies all year
1551	NW	25	3	5	St	M.D. Burhwalde	D	920	29	36			20	6-8-59		DS	Insufficient supply
1552	SW	25	3	5	St	J.J. Braun	D	920	14	48	1919	sa	4	6-8-59		S	Supplies all year
1553	SE	26	3	5	St	P.P. Wiebe	DR	925	145		1938	g	12	6-8-59		DS	
1554	NE	23	3	5	St	P.B. Dyck	DR	920	100	2	1940			6-8-59		S	Plugged up
1555	SW	24	3	5	St	J.P. Dyck	DR	925	96	2	1939		5	6-8-59		S	Supplies all year

Table IV (continued)

Representative Well Records, Plum Coulee Area, Manitoba

Number	Location: Quarter	Section	Township	Range	Municipality	Owner or Tenant	Type	Elevation (feet)	Depth (feet)	Diameter (inches)	Date Completed	Aquifer (Character of Material)	Water Level: Below Land Surface (feet)	Date	Yield	Use	Remarks
1556	NW	13	3	5	St	J.R. Wiebe	DR	930	165	2	1950		40	6-8-59	45 gpd	S	Dry in winter
1557	NE	14	3	5	St	H. Suderman	D	940	15	48			8	6-8-59		DS	Insufficient supply
1558	NW	12	3	5	St	G.P. Dyck	DR	940	127	5	1958	sa	22	6-8-59	425 gph	S	Supplies all year—log
1559	SW	11	3	5	St	G.H. Penner	D	948	15	48	1950		12	6-8-59		DS	Sufficient supply
1560	NE	2	3	5	St	J.B. Banman	D	945	15	48	1949	sa	10	6-8-59		DS	Insufficient supply—log
1561	SE	2	3	5	St	P. Dyck	D	945	16	36	1957		10	6-8-59		DS	Supplies all year
1562	SW	11	3	5	St	Husky gas station	D	950	20M	36			8M	6-8-59		D	Also for restaurant—log
1563	NW	11	3	5	St	W.R. Braun	D	950	20	48	1955		12	7-8-59		DS	Supplies all year
1564	SE	15	3	5	St	J.J. Rempel	D	950	13	48	1957	si	10	7-8-59		DS	
1565	NW	14	3	5	St	P.P. Heppner	D	945	16	48	1938	si	13	7-8-59		DS	Supplies all year
1566	NE	15	3	5	St	J.P. Kuhl	D	945	15	36	1952		8	7-8-59		DS	Supplies all year
1567	SW	23	3	5	St	B. Wiebe	D	930	20	36	1940	si	17	7-8-59		DS	Supplies all year
1568	NE	22	3	5	St	J.R. Wiebe	D	935	28	36	1939	si	20	7-8-59		DS	Dry in 30's
1569	SE	27	3	5	St	A.A. Doerksen	D	940	14	36	1951	si		7-8-59		D	Supplies all year
1570	NE	27	3	5	St	A. Doelke	D	930	18	48	1943	si		7-8-59		DS	Dries up easily
1572	NW	35	3	5	St	A.A. Thiessen	DR	923	49		1937	sa	21	7-8-59	320 gpd	DS	Supplies all year
1573	SE	4	4	5	T	A.T. Toews	D	940	20	36	1955	si	9	7-8-59		DS	Has 2 dug wells
1575	NW	22	3	5	St	M.P. Unrau	D	950	20	36	1943		10	7-8-59		DS	Sufficient supply
1576	SW	22	3	5	St	E. Rempel	D	950	22	48	1918			7-8-59		DS	Creek on property
1578	SE	21	3	5	St	I.H. Barkley	D	955	20	36		si	13	7-8-59		D	18 inches of water in 30's
1579	NW	16	3	5	St	D.R. Kram	D	959	15	48	1949			7-8-59		D	Dries up
1580	NW	15	3	5	St	J.R. Toews	D	955	21	48	1948	si	20	7-8-59		DS	Low in Jan. and Feb.
1581	SW	10	3	5	St	Julius Petkau	D	960	18	48		si		7-8-59		S	Sufficient supply—log
1582	NW	3	3	5	St	J.H. Rempel	D	960	20	48	1956		8	7-8-59		S	Supplies all year
1583	NW	9	3	5	St	A. Janzen	D	965	15	48			10	7-8-59		S	Has 2 dug wells—log
1584	SW	16	3	5	St	J. Patterson	D	965	14	48	1944		11	7-8-59		DS	Has 2 dug wells
1586	SW	20	3	5	St	A.J. Petkau	D	970	30	48	1957			7-8-59		S	Goes dry
1587	NE	20	3	5	St	W. Ferras	DR	960	90	2	1952	sa	15	7-8-59		S	
1588	SE	29	3	5	St	J.H. Klassen	D	960	18	36	1934	si		7-8-59		DS	Goes dry in winter
1589	NW	28	3	5	St	J.C. Shore	D	950	20	48	1949			7-8-59		DS	Supplies all year
1590	SE	32	3	5	St	W. Gutzke	D	950	20	48	1938	si	10	7-8-59		DS	Supplies all year
1591	SW	32	3	5	St	J. Dalke	D	950	21	36				7-8-59		DS	Has 2 dug wells
1594	SE	31	3	5	St	J.A. Brestrom	D	960	15	48	1946		5	7-8-59		D	Dries up
1595	NW	30	3	5	St	D. Kehler	D	970	18	48	1955		11	7-8-59		S	Supplies stock
1596	NE	30	3	5	St	J.H. Doerksen	D	960	22	36				7-8-59		DS	Sufficient supply
1597	SW	17	3	5	St	Krushel Farm	D	980	24	36	1928	g	16	7-8-59		D	
1598	SE	18	3	5	St	E. Sandercock	D	990	18M	36	1945	si	8M	7-8-59		DS	Sufficient supply
1599	NE	7	3	5	St	H.H. Klassen	D	1,000	26	48	1947		16	7-8-59		DS	Never pumped dry
1601	NW	7	3	5	St	T. Hamm	D	1,025	17	48	1949	si	12	8-8-59		DS	Supplies all year
1603	SW	19	3	5	St	J.A. Peters	D	985	10	36	1948	si	6	8-8-59		DS	Supplies all year
1604	NW	31	3	5	St	F. Schmidt	D	965	20	48	1950		10	8-8-59		DS	Supplies all year
1605	SE	7	4	5	T	D.M. Harder	D	960	12	48	1950		8	8-8-59		S	Dry in spring
1606	SW	30	4	5	T	R. Cowie	D	950	18	48	1951		14	8-8-59		D	Dry in winter
1607	NW	30	4	5	T	G. Thompson	B	950	12	12	1951			8-8-59		D	Supplies all year
1608	SW	31	4	5	T	W.A. Duncan	D	935	45	36	1950	sa	16	8-8-59		DS	Has 2 dug wells
1609	NW	31	4	5	T	W. Glaycock	D	930	30	48	1929		5	8-8-59		DS	Supplies all year
1610	SW	32	4	5	T	P.M. Livingstone	DR	920	249	4	1919	g	35	8-8-59		DS	Supplies all year
1612	SW	17	4	5	T	W. Leatherdale	D	954	25	48	1934	si	19	8-8-59		D	Dry in 30's

1613	NE	7	4	5	T	J.P. Riediger	B	955	54	8	1958	si	20	8-8-59	1,500 gpd	S	Supplies all year
1615	NE	5	4	5	T	S.H. Janzen	D	950	55	48			40	10-8-59		D	Insufficient supply
1616	NE	8	4	5	T	N. Nerhort	D	946	18	48	1956	si	12	10-8-59		D	Dry 1958
1619	SE	17	4	5	T	N.I. Elliot	D	945	20	48	1938	si	16	10-8-59		DS	Slow recharge
1620	SW	16	4	5	T	R. Leatherdale	DR	925	133	2	1949	g	18	10-8-59		DS	
1621	NE	20	4	5	T	H. Pentland	D	920	50	48	1919		20	10-8-59		S	Supplies all year
1622	SW	28	4	5	T	A. Dieckey	D	918	90	48	1925		50	10-8-59		DS	Supplies all year
1624	SE	34	4	5	R	G. Norwood	DR	899	200	2	1900		16	10-8-59		DS	Sufficient supply
1625	NW	27	4	5	R	T. Galligan	DR	900	140					10-8-59		D	Sufficient supply
1627	SE	28	4	5	T	N.R. Williams	DR	910	150	2	1941	sa	20	10-8-59		DS	Recharges fast
1628	SW	22	4	5	R	R.A. Patterson	DR	908	140	2	1918	sa	19	10-8-59	200 gpd	DS	Sufficient supply
1632	SW	15	4	5	R	H.P. Kuhl	D	915	40	48	1943			10-8-59		DS	Supplies all year
1633	SE	2	4	5	R	A.H. Penner	DR	915	45	2	1928		30	10-8-59		DS	Insufficient supply
1635	SW	11	4	5	R	A.H. Voth	DR	915	55	2	1936		29	10-8-59		DS	Insufficient supply
1637	SW	14	4	5	R	G. Patterson	DR	905	165	2	1918		24	10-8-59		DS	Supplies all year
1638	SE	15	4	5	R	G. Patterson	DR	910	114	2	1954	sa	20	10-8-59	500 gpd	DS	Supplies all year
1639	NW	26	4	5	R	C.E. Clarke	DR	898	180	6	1925		15	10-8-59		D	Insufficient supply
1640	NE	35	4	5	R	L. Allison	DR	890	110	2	1909		18	10-8-59		S	Insufficient supply
1641	NW	25	4	5	R	R. Allison	D	890	16	36	1956	si	10	10-8-50		D	
1642	SE	36	4	5	R	J. Allison	D	885	100	36	1918	sa	40	10-8-59		D	Supplies all year
1643	NE	25	4	5	R	A. Allison	DR	884	190	2	1921	sa	25	10-8-59		D	Abandoned
1645	SW	12	4	5	R	D.F. Glover	DR	905	120	2	1910		10	10-8-59		D	Could support 100 cattle
1646	NW	1	4	5	R	D.F. Glover	D	900	17	36	1917	sa	8	10-8-59	20 gpm	DS	Analysis
1647	NE	2	4	5	R	B. Giesbrecht	DR	905	90	3	1948		20	10-8-59		DS	Sufficient supply
1648	NE	13	4	5	R	A.H. Scott	DR	890	150	3	1938			10-8-59		S	Supplies all year
1649	SE	1	4	5	R	J. Unrau	D	900	12	48	1954			10-8-59		DS	Supplies all year
1738	SW	35	6	2	M	A. Sandulak	DR	789	146	5	1948	g	1	13-8-59			Not used
1761	SE	31	6	2	M	Kurdt Bros.	B	800	96	18	1900	sa	35	13-8-59	250 gpd	DS	Supplies all year
1762	SW	31	6	2	M	R.C. Mogk	B	800	90	18			30	13-8-59		DS	Supplies all year
1782	NE	36	6	3	D	V.A. Waddell	B	800	90	18	1900	g		14-8-59		DS	Not used since 1948
1784	NW	18	6	2	M	E. Jorgensen	B	801	90		1887			14-8-59		S	Hauled for stock 1958-59
1792	SE	3	5	3	R	W. Neiles	B	816	105	12	1885		8	15-8-59		S	Supplies all year
1795	SE	16	5	3	R	H.J. Andersen	B	819	100	18	1938	g	30	17-8-59		S	Sufficient for stock
1801	NE	17	5	3	R	A. Halstead	DR	820	100	2	1944		10	17-8-59		S	Also has dug well
1802	SW	16	5	3	R	A.W. Dyck	DR	820	100	2	1946			17-8-59		S	Supplies all year
1806	NE	6	5	3	R	W.G. Stockes	B	840	50	18	1885		8	17-8-59		DS	Supplies all year
1808	NE	7	5	3	R	F. Fife	D	830	28	48	1938		3	17-8-59		S	Insufficient supply
1809	SE	18	5	3	R	L.A. Fife	D	830	104	36	1929		30	17-8-59		S	
1810	SW	20	5	3	R	J.W. Hole	DR	824	110	18	1925	g	10	17-8-59		S	Also has dug well
1812	SW	31	5	3	R	A. Milne	B	825	110	12	1933		20	17-8-59		S	Insufficient supply
1813	NE	31	5	3	R	J. Johnson	B	825	120	12	1909		20	17-8-59		S	Not used
1814	NW	30	5	3	R	K. Pinkerton	DR	830	110	3	1909	g	23	17-8-59		DS	Supplies all year
1816	NW	18	5	3	R	M. Awrey	DR	830	90	5	1912		14	17-8-59		DS	
1817	NE	11	6	3	D	R. Cran	B	808	110	18	1928		20	18-8-59		DS	Supplies all year
1819	NE	23	6	3	D	E.G. Ferris	B	805	96	18	1916		2	18-8-59		S	Not used
1828	SE	22	6	3	D	T. Berryman	B	810	110	18	1937			18-8-59		S	Supplies all year
1829	NE	10	6	3	D	R.E. Findley	DR	813	123	36			18	18-8-59		DS	
1830	SE	15	6	3	D	J. Swain	DR	812	122		1915		20	18-8-59		DS	Public Works Dept. hole
1832	NE	4	6	3	D	P. McEachern	B	815	100	18	1934			18-8-59		DS	Sufficient supply
1833	SE	9	6	3	D	R. Findlay	DR	815	110	2	1951	g		18-8-59		DS	Little water
1834	NW	10	6	3	D	G.A. Findlay	DR	813	144	6	1953		40	18-8-59	1 1/2 gpm	D	Insufficient supply
1835	SW	15	6	3	D	J. Husty	D	814	55	36	1943		30	18-8-59		DS	
1837	SE	21	6	3	D	A. Finnie	D	815	112	36		sa & g	22	18-8-59		DS	Used for prisoner of war camp
1839	NE	28	6	3	D	M.J. Bates	B	815	80	18	1890		20	18-8-59		S	Poor supply
1840	NE	28	6	3	D	M.J. Bates	D	815	14	48	1900	sa	6	18-8-59		D	Enough for drinking
1841	NE	29	6	3	D	F.C. Roberts	D	822	15	48	1890	sa		18-8-59		D	Sufficient supply
1842	NW	28	6	3	D	G. Finnay	D	820	12	36	1889	sa		18-8-59		D	Supplies all year
1843	SW	28	6	3	D	Mrs. Marseth	D	818	100	36	1948			18-8-59		DS	Sufficient supply
1844	SW	21	6	3	D	A. Stobart	B	820	112	18	1939	g	32	18-8-59		DS	Sufficient supply
1845	NE	17	6	3	D	M. Albertsen	B	820	200	18	1944		12	18-8-59		DS	Very little water

Table IV (continued)

Representative Well Records, Plum Coulee Area, Manitoba

Number	Location: Quarter	Section	Township	Range	Municipality	Owner or Tenant	Type	Elevation (feet)	Depth (feet)	Diameter (inches)	Date Completed	Aquifer (Character of Material)	Water Level: Below Land Surface (feet)	Date	Yield	Use	Remarks
1846	SW	17	6	3	D	R. Langtry	D	825	15	48	1948		9	18-8-59		D	Supplies all year
1847	NW	8	6	3	D	M.D. McGill	DR	825	140	2	1900			18-8-59		DS	Supplies all year
1848	NE	8	6	3	D	E. McGill	B	825	120	18	1953			18-8-59		DS	Sufficient supply
1852	NE	6	6	3	D	H.E. Johnston	D	822	112	36	1940		20	19-8-59		DS	Supplies all year
1853	NE	7	6	3	D	M.B. Woods	B	826	128	18	1939			19-8-59		S	Insufficient supply
1854	SE	18	6	3	D	R.R. Woods	B	825	113	16	1919	g	20	19-8-59	150 gpd	S	
1856	NE	19	6	3	D	R.C. Watson	D	824	120	24			50	19-8-59		DS	Sufficient supply
1857	SE	31	6	3	D	P.C. Giesbrecht	DR	825	80		1940			19-8-59		DS	Very little water
1860	SW	32	6	3	D	R.G. Waddell	D	822	14	48	1956		10	19-8-59		DS	Supplies all year
1861	NW	32	6	3	D	J. Vanderveen	D	821	100	48	1956			19-8-59		S	Supplies all year
1862	NW	31	6	3	D	J. McCutcheon	DR	820	150	6	1956	g	20	19-8-59		S	Recharges fast
1863	NE	36	6	4	D	A.L. McCutcheon	DR	823	160	6		g	25	19-8-59		S	Recharges fast
1865	SW	30	6	3	D	J. Gnatham	D	826	16	36		sa	6	19-8-59		D	Supplies all year
1866	SW	30	6	3	D	F.S. Norwood	D	826	12	24		sa	4	19-8-59		D	Supplies all year
1867	NE	24	6	4	D	R. Mutcher	D	828	20	48	1947	sa	12	19-8-59		DS	Dry in dry season
1868	NW	18	6	3	D	A.E. McCutcheon	DR	826	60		1953			19-8-59		DS	Supplies all year
1869	NE	12	6	4	D	S.S. Carr	D	828	100	36	1914		40	19-8-59		DS	Supplies all year
1870	SW	7	6	3	D	J. Woods	DR	826	100	3	1959		30	19-8-59		S	Supplies all year
1872	NW	12	6	4	D	J. Dickenson	DR	830	155	5	1953		20	19-8-59		DS	
1873	NW	12	6	4	D	R.C. Carr	DR	830	125	5	1955	sa	20	19-8-59		DS	Recharges fast
1874	SE	23	6	4	D	M.R. Morgan	D	833	36	48	1946			19-8-59		DS	Supplies all year
1875	SW	25	6	4	D	J.W. Laycock	D	835	18M	48	1934		12M	19-8-59		DS	Has 2 dug wells
1876	NE	26	6	4	D	P. Cutting	DR	833	120	2	1929		30	19-8-59		DS	Insufficient supply
1877	SE	35	6	4	D	M. Cutting	DR	830	165	3	1959	sa	20	19-8-59		DS	Insufficient supply
1878	SW	36	6	4	D	J. Fisher	D	827	16	36	1956			19-8-59		DS	Insufficient supply
1879	SW	35	6	4	D	A. Thompson	B	833	109	16	1946		25	19-8-59	250 gpd	DS	Supplies all year
1880	NE	22	6	4	D	G. Taylor	D	840	99	36	1919		10	19-8-59		S	Recharges fast
1881	NW	22	6	4	D	S. McCutcheon	DR	840	115	6	1953		15	19-8-59		DS	Supplies all year
1882	SW	27	6	4	D	G. Kippen	D	840	19	48	1943		6	19-8-59		DS	Supplies all year
1883	NW	22	6	4	D	L. Meyer	B	840	18	18			6	19-8-59			Not used
1884	SW	23	6	4	D	H. Colpitts	D	835	90	48	1919			19-8-59		DS	Supplies all year
1885	SE	22	6	4	D	F. Last	DR	835	125	3			10	19-8-59		D	Sufficient supply
1887	SW	2	6	4	D	C.W. Last	DR	838	110		1948			19-8-59		DS	Sufficient supply
1888	NE	34	5	4	R	C.F. Cook	DR	840	70	2	1938			19-8-59		DS	Sufficient supply
1889	NW	34	5	4	R	H. Heman	B	848	110	24	1958		20	19-8-59	500 gpd	DS	Sufficient supply
1891	SE	9	6	4	D	F.W. VanKoughnet	B	849	100	18	1930	g	22	20-8-59		DS	Sufficient supply—log
1892	SW	15	6	4	D	F. Lutonski	DR	844	137	3	1959	sa & g		20-8-59		DS	Insufficient supply
1893	NE	16	6	4	D	W. Stonehouse	B	844	100	18	1890			20-8-59		DS	Sufficient supply—log
1895	NW	27	6	4	D	A. Bergman	D	844	18	36				20-8-59		DS	Also has drilled well
1896	SE	33	6	4	D	A.E. Mackenzie	B	845	80	18	1939	sa	30	20-8-59		DS	Insufficient supply—log
1897	NE	28	6	4	D	A. Wilkie	DR	845	125		1937			20-8-59		DS	Insufficient supply—log
1898	NW	34	6	4	D	J. Smith	B	840	105	18		sa		20-8-59		DS	
1900	SW	4	6	4	D	A. Heaman	B	850	115	15	1919		17	21-8-59		DS	Log
1901	NW	4	6	4	D	R. McGill	B	850	80	18	1909	sa	15	21-8-59		DS	Beside dugout
1905	SW	29	6	4	D	Aubin Nurseries	D	856	14	48	1950		11	21-8-59		D	Has 3 dug wells
1906	NE	20	6	4	D	A. King	DR	855	192	6	1915	g	31	21-8-59		S	Log
1907	SE	29	6	4	D	J.D. Parker	DR	852	172				10	21-8-59		DS	Log
1908	SW	28	6	4	D	A. McEachern	D	854	24	48	1929	si	4	21-8-59		DS	Softener

1909	NE	28	6	4	D	T. Stout	DR	846	122	3	1955	g	8	21-8-59		DS	
1910	NW	28	6	4	D	F. Neiles	D	850	34	48			10	21-8-59		D	Has bored well 50 feet deep
1911	NE	22	6	4	D	W. Gould	DR	848	142	5	1949		15	21-8-59		S	Sufficient supply
1912	NW	33	6	4	D	N. King	DR	846	150		1942			21-8-59		DS	Sufficient supply—log
1913	SE	31	6	4	D	A. Keith	DR	860	105	5	1954		16	21-8-59		S	Supplies all year
1914	SE	30	6	4	D	W.T. Johnson	D	860	24	36	1930	si	14	21-8-59		DS	Has 3 dug wells
1916	SW	29	6	4	D	W.R. Parrott	DR	858	157	5	1950	sa	24	21-8-59		S	Sufficient supply
1917	SE	30	6	4	D	W. McFee	D	860	22	24	1946	si	11	21-8-59		D	Enough to drink
1918	SE	30	6	4	D	M. Morrison	D	860	18	42		si		21-8-59	800 gpd	DS	Insufficient supply
1919	SW	20	6	4	D	W. Poklitas	DR	860	200	5	1943		6	21-8-59		D	Supplies all year—log
1920	SE	19	6	4	D	B. Derksen	B	865	50	18	1952		30	21-8-59		DS	Dry 1958
1921	NE	18	6	4	D	P.J. Friesen	DR	860	100		1948			21-8-59		DS	
1922	SW	17	6	4	D	H.D. Loewen	DR	860	175		1940	sa	20	21-8-59		S	Insufficient supply—log
1923	NW	5	6	4	D	P. Davies	DR	863	135	5		g	17	21-8-59		DS	Public Works Dept. hole—log
1926	NW	6	6	4	D	E.J. Pritchard	B	867	80	18	1929		30	21-8-59		DS	
1927	NW	7	6	4	D	D.D. Thiessen	D	865	100	36	1941		30	21-8-59		D	Sufficient supply
1929	NW	31	6	4	D	A. Klassen	DR	865	175		1939			21-8-59		DS	Sufficient supply
1930	NW	1	5	4	R	R. Young	DR	840	180	6	1939			24-8-59		S	Supplies all year
1931	NE	2	5	4	R	J.A. Hawley	DR	844	160	2	1931			24-8-59		DS	Fast recharge
1932	SE	11	5	4	R	R. McCallum	DR	844	100	5				24-8-59	200 gpd	S	Insufficient supply
1933	SW	12	5	4	R	F.R. Frith	DR	840	100	2	1934	g	20	24-8-59		DS	Supplied in dry 30's
1934	SE	14	5	4	R	C. Preston	DR	840	160	3	1953			24-8-59		DS	Slow recharge
1936	NE	11	5	4	R	G. Adams	B	840	140	18	1922	sa		24-8-59		D	
1938	SE	23	5	4	R	M.E. Anderson	DR	840	40	4	1920		22	24-8-59		DS	Iron content high
1940	SE	25	5	4	R	R. Bell	DR	835	188		1915		20	24-8-59		S	Slow recharge
1941	SW	35	5	4	R	L. Horsman	B	841	100	18	1919		30	24-8-59		DS	Supplies all year
1942	SW	26	5	4	R	R.H. McKnight	B	842	110	16	1919	g	35	24-8-59		DS	Recharges fast
1944	SE	27	5	4	R	G. Hiebert	B	845	100	18	1953		20	24-8-59		DS	Windmill pump
1946	NE	3	5	4	R	H. Pearson	DR	850	165	2	1958	g	10	24-8-59		S	
1947	SW	10	5	4	R	W.C. Moffatt	DR	853	125		1919			24-8-59		DS	Supplies all year
1948	SW	3	5	4	R	B. Bartley	DR	855	100	5	1948		12	24-8-59		S	Supplies all year
1950	NW	10	5	4	R	H. McClaren	DR	850	82	2	1930	g	24	24-8-59	500 gph	DS	Supplies all year
1951	SE	16	5	4	R	I. McLearn	DR	850	95	5	1923		15	24-8-59		DS	Fast recharge—log
1952	NW	15	5	4	R	G.D. Pritchard	DR	850	80				20	24-8-59		DS	Sufficient supply
1953	SW	22	5	4	R	G.A. Pritchard	DR	850	100	2	1919		30	24-8-59		DS	Supplies all year
1955	SW	33	5	4	R	G. Young	DR	853	150	6	1921	sa	21	24-8-59		DS	Public Works Dept. hole—log
1956	NE	29	5	4	R	A. Wilton	DR	853	90	2	1919		20	24-8-59		DS	Insufficient supply
1957	NW	28	5	4	R	A.J. Wilton	DR	852	117	2	1956		22	24-8-59		DS	Sufficient supply—log
1958	SW	28	5	4	R	W.G. Vanuych	DR	857	168	3			22	24-8-59		DS	Log
1961	NW	21	5	4	R	J. Bartley	B	863	160	16				24-8-59		S	Sufficient for stock
1962	SW	4	5	4	R	H.J. Cameron	DR	859	132	4	1890	sa	28	24-8-59		S	Insufficient supply
1963	SE	5	5	4	R	J. Scott	DR	870	135	4	1919		45	24-8-59		S	Supplies all year
1964	NE	6	5	4	R	H. Scott	B	879	80	18	1915		30	24-8-59		S	Supplies all year
1965	NW	5	5	4	R	G. Bartley	B	876	100	18	1944		25	24-8-59		DS	Slow recharge
1966	SE	18	5	4	R	K. Pritchard	D	878	80	48	1919		35	25-8-59	150 gpd	S	Low in winter
1967	SE	19	5	4	R	J.R. Ball	DR	876	250	4	1941		35	25-8-59		DS	Sufficient supply
1972	NW	29	5	4	R	J. Wilton	DR	865	100	6	1912	g	25	25-8-59	480 gpd	DS	Supplies all year
1973	NW	31	5	4	R	L. Wilton	DR	872	64		1958			25-8-59		D	Sufficient supply
1974	NE	36	5	5	R	I. MacIntosh	DR	880	98	2	1948	g	13	25-8-59		S	Public Works Dept. hole
1975	NW	30	5	4	R	H.L. Hurton	B	875	78	18	1920		40	25-8-59		DS	
1977	NW	19	5	4	R	G.D. Graham	DR	880	70	2	1938		30	25-8-59		DS	Supplies all year
1982	SE	12	5	5	R	M. Gibb	D	883	14	48		si	6	25-8-59		D	Analysis
1983	SW	6	5	4	R	R.E. Sutton	D	881	140	48			20	25-8-59		S	Supplies all year
1984	SE	2	5	5	R	G.R. Muir, M.P.	D	887	20	24	1958	si	10	25-8-59			
1988	SE	23	5	5	R	Ralph Brown	D	888	120	36	1921		80	25-8-59		S	Supplies all year
1991	NW	26	5	5	R	K.W. Savage	D	895	16	48	1930		4	25-8-59		D	Has drilled well 145 feet deep
1992	SW	14	5	5	R	L.M. Sutton	D	895	100	48	1939			25-8-59		S	
1995	NE	4	5	5	T	A. Stuart	DR	902	165	2	1939	g	20	26-8-59		DS	
1997	SW	21	5	5	T	J.A. Gibson	DR	905	190	4	1917	ss	21	26-8-59			Public Works Dept. hole
2000	NE	32	5	5	T	A.R. Mutchy	D	908	100	36	1944		14	26-8-59		S	Fast recharge

Table IV (continued)

Representative Well Records, Plum Coulee Area, Manitoba

Number	Location: Quarter	Section	Township	Range	Municipality	Owner or Tenant	Type	Elevation (feet)	Depth (feet)	Diameter (inches)	Date Completed	Aquifer (Character of Material)	Water Level: Below Land Surface (feet)	Date	Yield	Use	Remarks
2001	NW	28	5	5	T	W.L. Sylvester	DR	895	145	6	1948	sa	8	26-8-59		S	Sufficient supply
2004	SE	8	5	5	T	J. Popkes	DR	908	116	6	1933	g	25	26-8-59		DS	Very little water
2005	SW	8	5	5	T	Rosebank Village	DR	912	164	4	1900		30	26-8-59		PS	Fast recharge
2006	NW	5	5	5	T	J. Guenther	DR	915	130	2	1954	g	20	26-8-59		DS	Dries up in spring
2008	NE	7	5	5	T	W. McCullough	DR	915	192	3	1934	sa	26	26-8-59		D	Supplies all year
2011	NW	30	6	5	D	J. Kuik	DR	918	75	2	1954		30	26-8-59		DS	Supplies all year
2012	NW	7	6	5	D	McCullough	B	915	105	13	1919		25	26-8-59		DS	Insufficient supply
2013	SW	7	6	5	D	R.S. Graham	DR	916	132		1908	sa	35	26-8-59		D	Only enough to drink
2014	NW	18	5	5	T	G. Vanstone	DR	921	110	2	1951	sa	20	26-8-59		DS	Softener
2016	NW	6	5	5	T	R. Duncan	DR	921	100	4	1943		20	26-8-59		DS	Softener
2018	NW	8	6	5	D	G. Howie	B	909	96	18	1939		15	26-8-59		D	Goes dry
2019	NW	17	6	5	D	G.G. Graham	D	908	90	48	1934			27-8-59		D	
2020	SE	19	6	5	D	J. Nisbett	DR	909	67	6	1919		20	27-8-59		DS	Iron content high
2022	NW	19	6	5	D	R.T. Mills	B	911	25	18	1939	g	12	27-8-59		D	Analysis
2023	SW	31	6	5	D	T. McNaughton	D	917	25	48	1956		6	27-8-59		D	Supplies domestic needs
2024	SW	32	6	5	D	G. Renn	DR	910	80	4	1949		20	27-8-59		S	Insufficient supply
2025	NE	31	6	5	D	C.H. Dueck	DR	912	135	4	1944		20	27-8-59		S	Supplies all year
2026	SE	33	6	5	D	P.F. Gibson	DR	900	130	6	1918	s	15	27-8-59		S	Public Works Dept. hole
2027	NE	28	6	5	D	H. Reimer	DR	900	140	6	1956		15	27-8-59		DS	Sufficient supply
2028	SE	22	6	5	D	Kuik Bros.	D	906	16	48	1958	sa	7	27-8-59		D	Low in dry season
2031	SW	20	6	5	D	L. Johnson	B	905	100	18	1944		80	27-8-59	4 gpd	D	
2033	SE	20	6	5	D	A. Kerr	DR	900	172	6	1908	sa & g	14	27-8-59		DS	Supplies all year
2034	SE	20	6	5	D	H.W. Coburn	D	902	15		1926	sa	12	27-8-59	10 gpd	D	
2035	NE	17	6	5	D	D. McIntyre	DR	903	145	6			30	27-8-59			Recharges fast
2038	NE	8	6	5	D	H. Wieler	B	905	18	12	1953	si	16	27-8-59		D	Sufficient supply
2041	SW	4	6	5	D	J.H. Howie	D	900	20		1957		5	28-8-59		S	Has drilled well 100 feet deep
2043	NW	27	6	5	D	J. McCullough	DR	895	110	6	1921	g	12	28-8-59		D	Public Works Dept. hole
2044	NW	22	6	5	D	D. Loree	D	895	24	48	1951	sa	19	28-8-59		D	Softener
2045	NW	22	6	5	D	H.W. Garnett	D	900	16		1954		6	28-8-59		DS	Low in winter 1958
2046	SE	16	6	5	D	C. Alldred	DR	900	120	6	1918		20	28-8-59		S	Supplies all year
2047	SE	16	6	5	D	C. Alldred	D	900	14	30		sa	9	28-8-59		D	Sufficient supply
2049	SE	9	6	5	D	J. Wiens	B	900	80	18	1948		18	28-8-59	100 gpd	S	Not much water
2050	SE	4	6	5	D	H.L. Corden	DR	898	135	6	1949		20	28-8-59		S	
2051	NE	3	6	5	D	O.C. Swain	D	895	18	48	1939	si	14	28-8-59		S	Supplies all year
2052	SW	11	6	5	D	L. Alldred	DR	890	135	4	1919		20	28-8-59		S	Public hole
2054	SE	15	6	5	D	N.O. Galbraith	DR	893	163	6	1922		32	28-8-59		DS	Supplies all year
2057	NW	23	6	5	D	N. Shaw	D	887	24		1957			28-8-59		DS	Mink ranch
2058	NE	22	6	5	D	J. Stow	D	895	25	30	1946		15	28-8-59		D	Supplies all year
2064	NE	36	6	5	D	H. Peters	D	870	99	36	1950		33	29-8-59		S	Fast recharge
2065	SE	36	6	5	D	R.E. Smith	D	873	14	48	1950	sa	11	29-8-59		DS	Has 2 dug wells
2066	SE	36	6	5	D	R.E. Smith	DR	873	225	3	1958	sa	50	29-8-59		D	Abandoned
2068	SE	26	6	5	D	Mrs. Walker	DR	876	70		1945		37	29-8-59		DS	Sufficient supply
2070	SW	25	6	5	D	H.J. Sexmith	D	875	24	48	1900		10	29-8-59		DS	Softener
2071	NE	23	6	5	D	R.W. Roth	DR	880	100	4	1944		30	29-8-59		S	Supplies all year
2072	SE	26	6	5	D	A.W. Stevenson	B	875	25	18			16	29-8-59		D	Sufficient supply
2073	SW	25	6	5	D	W.C. Gardiner	D	875	14	24	1949	si	7	29-8-59		D	Sufficient supply
2074	NW	24	6	5	D	C. Denning	D	874	13	48	1944		5	29-8-59		D	Supplies all year
2076	NW	24	6	5	D	D.S. Stilson	B	875	14	12	1958	si	7	29-8-59		D	

2077	NE	14	6	5	D	J. Downie	DR	884	100	4	1949			29-8-59		S	Supplies all year
2078	NE	11	6	5	D	E. Swanton	DR	880	118		1921	g	25	29-8-59			Public Works Dept. hole
2079	NE	2	6	5	D	I. Boywood	DR	885	160		1920			29-8-59		S	
2080	SE	2	6	5	D	K. Teitsman	B	885	70	12	1954		10	29-8-59		S	Dries up
2083	SE	13	6	5	D	M. Swanton	B	870	90	18	1933		20	29-8-59		D	Supplies all year
2084	NE	13	6	5	D	G. Harrison	DR	870	150		1948			29-8-59		DS	Plugged
2085	NE	12	6	5	D	L. Swanton	D	875	16	42	1957	si	10	29-8-59		D	Sufficient supply
2086	NE	12	6	5	D	L. Swanton	DR	875	122	8	1943	g	22	29-8-59	300 gpd	S	Sufficient supply
2087	NE	5	3	5	St	W.H. Sandercock	D	985	30	36	1909	si	5	8-9-59		D	Town of Morden—log
2090	NE	6	3	5	St	P. Giest	D	1,010	14	36	1950	si	11	8-9-59		D	Town of Morden—log
2091	NW	4	3	5	St	Dom. Exp. Farm	D	978	18	96	1931	g		8-9-59		DS	Supplied water in 30's
2094	SW	4	3	4	St	F.D. Frank	DR	895	60			sa	7	8-9-59		D	14th St., Winkler—log
2098	SW	4	3	4	St	J. Dyck	DR	895	53				5	8-9-59		D	11th St., Winkler
2099	SW	4	3	4	St	C. Peters	DR	894	60				12	8-9-59		D	10th St., Winkler
2102	SW	4	3	4	St	D.F. Peters	DR	892	92				5	8-9-59		D	Winkler—log
2110	SE	4	3	4	St	W.F. Goertzen	DR	885	150				0	8-9-59		D	Winkler—log
2111	SE	4	3	4	St	Winkler Creamery	DR	890	125	6		sa & g		8-9-59	500 gph	I	Hardness 744 ppm
2112	SE	4	3	4	St	Winkler Creamery	DR	890	186	6		sa & g		8-9-59	5,000 gph	I	Hardness 386 ppm
2113	NE	4	3	4	St	C.P.R. well	DR	885	178	10		sa & g		8-9-59	5,000 gph	I	
2114	NE	4	3	4	St	Co-op Cannery	DR	885	172	10	1947	sa & g		8-9-59	2,200 gph	I	Chlorides 3,089 ppm
2115	NE	18	3	5	St		DR	985	212	6	1915	si	5	8-9-59			Abandoned
2116	SW	32	3	5	St		DR	963	195	6	1915	sa & g	6	8-9-59			Abandoned
2117	SW	4	3	4	St		DR	890	1,320		1918	sa & g		8-9-59			Bedrock at 535 feet—log
2118	SW	21	4	1	M		DR	790	195	6	1917	ls	52	8-9-59			Bedrock at 185 feet—abandoned
2119	NW	4	4	5	T		DR	948	30	6	1915	si	7	8-9-59			Abandoned
2120	SE	8	4	5	T		DR	950	200	6	1915			8-9-59			Dry hole
2121	SE	17	4	5	T		DR	945	196	6	1915			8-9-59			Dry hole
2122		36	4	5	R		DR	887	130	6	1909	sa	22	8-9-59			Abandoned
2123		4	5	4	R		DR	858	815	6	1909	sa & g		8-9-59			Bedrock at 335 feet—log
2124	NE	4	5	4	R	PUBLIC	DR	858	96	6		sa	20	8-9-59			Abandoned—salt water
2125		4	5	4	R		DR	858	110	6	1909	sa & g		8-9-59			Abandoned—log
2126	NE	4	5	4	R	WORKS	DR	855	185	6				8-9-59			Dry hole
2127		4	5	4	R		DR	860	258	6	1909			8-9-59			Abandoned
2128	SE	19	5	5	T		DR	913	190	6	1916	sa	20	8-9-59			Abandoned—salt water
2129	NW	8	5	5	T	DEPARTMENT	DR	910	165	6	1916	sa	15	8-9-59			Abandoned—good water
2130	NE	25	5	5	R		DR	880	175	6		sa	15	8-9-59			Abandoned—salt water
2131	NE	35	5	5	R	RECORDS	DR	890	165	6		sa	30	8-9-59			Abandoned—good water
2132		29	6	2	M		DR	795	965	8	1910	g		8-9-59			Bedrock at 230 feet—abandoned
2133		29	6	2	M		DR	795	220	6		g		8-9-59			Abandoned
2134		29	6	2	M		DR	797	330	8		sa	15	8-9-59			Bedrock at 228 feet—abandoned
2135	NW	9	6	3	D		DR	820	255			ls	0	8-9-59			Bedrock at 120 feet—abandoned
2136	SE	7	6	4	D		DR	865	160			sa & g	28	8-9-59			Abandoned—good water
2137	SW	30	6	4	D		DR	865	100		1915	g	15	8-9-59			Abandoned—good water
2138	NE	3	6	5	D		DR	895	125		1920	ss	16	8-9-59			Bedrock at 125 feet—good water
2139	NW	3	6	5	D		DR	899	163		1921	g	13	8-9-59			Abandoned—salt water
2140	NW	7	6	5	D		DR	915	150			sa & g	28	8-9-59			Abandoned—salt water
2141	NW	5	3	5	St		DR	978	600	6	1889	sa		8-9-59			Bedrock at 31 feet—log
2142	SE	5	4	5	T		DR	950	120					8-9-59			Dry hole
2143	NE	5	4	5	T		DR	950	94			g	18	8-9-59			Abandoned—salt water
2144	SW	18	5	5	T	JOHNSTON	DR	920	136			g	19	8-9-59			Abandoned—good water
2145		8	5	5	T		DR	910	207			g	19	8-9-59			Abandoned
2147		6	5	1	M		DR	790	201			sa	10	8-9-59			Abandoned—salt water
2150		15	6	2	M	(1934)	DR	790	122				20	8-9-59			Abandoned—good water
2151		10	1	2	RH		D	840	20					8-9-59			Abandoned—good water
2153		5	1	1	RH	(REFERENCES)	DR	828	150					8-9-59			Dry hole
2154	SE	8	3	1	RH		DR	794	1,037		1886	ss	0	8-9-59			Bedrock at 143 feet—log
2155		21	5	1	M		DR	785	160					8-9-59			Bedrock at 145 feet—poor
2156		28	5	1	M		DR	785	328				0	8-9-59			Bedrock at 135 feet—salt

Table V

Analyses of Ground Water, Plum Coulee Area, Manitoba

Sample Number	Well Number	Location: Quarter	Location: Section	Location: Township	Location: Range	Temperature (0°F)	Aquifer*	Colour (Hazen Units)	pH	Conductance (Micromhos at 25°C)	Hardness as $CaCO_3$: Non-carbonate	Hardness as $CaCO_3$: Total	Total Alkalinity as $CaCO_3$	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Iron (Fe)	Manganese (Mn)	Bicarbonate (HCO3)	Sulphate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Silica (SiO2)	Sum of Constituents
											Chemical Constituents in Parts per Million															
1	53	NW	15	2	5	52	g	15	7.7	971.7	191.0	411	220	92.2	44.0	43.7	8.1	0.02	0.1	268	166.0	22.3	0.0	100.0	29	629
2	209	NE	31	1	4	50	si	5	8.1	987.3	137.0	535	398	100.0	69.2	12.4	2.2	tr	0.2	485	54.5	31.0	0.0	80.0	20	609
3	124	SE	8	1	5	54	sh	5	7.7	1795.0	161.0	362	201	96.2	29.6	265.0	16.4	0.02	0.1	244	690.0	4.5	1.1	64.0	34	1321
4	161	SW	12	1	5	52	si	15	7.8	5307.0	1719.0	2081	362	435.0	242.0	706.0	16.0	0.06	0.1	441	2980.0	94.1	1.8	18.0	19	4729
5	654	NE	11	1	3	52	sa	5	7.9	528.5	17.0	206	189	46.3	21.9	18.0	10.0	tr	0.1	230	31.2	6.2	0.0	40.0	29	316
6	513	NE	4	2	3	61	sa	10	7.7	11032.0	1419.0	1558	139	390.0	142.0	1894.0	28.2	5.10	0.4	169	930.0	3270.0	0.0	8.0	18	6764
7	841	NE	25	2	2	48		0	7.9	2299.0	582.0	885	303	156.0	121.0	167.0	12.4	0.07	0.1	370	620.0	208.0	0.0	60.0	13	1539
8	374	NE	15	2	4	58	g	0	8.1	1226.0	120.0	385	265	90.6	38.7	135.0	8.7	0.66	0.2	323	300.0	91.5	0.0	1.6	22	848
9	485	NW	31	2	3	48	g	0	7.9	8326.0	899.0	1117	218	286.0	111.0	1410.0	23.8	4.30	0.2	265	881.0	2270.0	0.0	0.6	24	5137
10	386	SW	1	3	4	56		0	8.0	6516.0	545.0	828	282	203.0	78.7	1110.0	21.3	3.00	0.2	344	704.0	1650.0	0.0	0.4	21	3958
11	1517	NE	20	3	4	54		0	8.1	1180.0	53.0	303	250	81.5	24.2	132.0	8.4	1.40	0.1	305	227.0	70.4	0.1	1.4	27	713
12	1312	NW	24	3	3	48		0	7.8	5002.0	1464.0	1648	184	413.0	150.0	426.0	18.3	6.60	0.0	224	661.0	1280.0	0.0	5.0	21	3085
13	1377	SE	23	4	3	44		0	7.8	9752.0	3068.0	3280	212	708.0	368.0	862.0	35.0	0.11	0.2	259	936.0	2900.0	0.0	80.0	19	6035
14	1403	SW	5	5	3	44		0	8.0	5238.0	1322.0	1495	173	330.0	163.0	507.0	12.7	5.50	0.2	211	580.0	1379.0	0.1	1.2	22	3100
15	1438	SW	27	4	4	44		0	8.1	3820.0	896.0	1156	264	249.0	130.0	362.0	11.0	2.30	0.2	322	458.0	889.0	0.1	15.0	17	2290
16	1646	NW	1	4	5	46	sa	0	7.9	521.1	50.6	279	228	63.2	29.4	2.8	3.0	0.10	0.2	278	46.4	4.5	0.0	5.0	23	315
17	1982	SE	12	5	5	46	si	20	8.0	1125.0	180.0	603	424	113.0	77.9	19.2	8.1	0.05	0.0	516	138.0	24.1	0.0	60.0	14	708
18	2005	SW	8	5	5	46		0	8.0	1357.0	19.1	351	332	62.4	47.9	163.0	7.9	1.40	0.0	405	266.0	88.8	0.1	3.0	23	853
19	2022	NW	19	6	5	44	g	5	8.1	1162.0	226.0	637	411	113.0	87.0	21.8	2.4	0.29	0.3	500	146.0	41.9	0.0	60.0	20	739
Averages:																										
Shallow wells						49.5		9	7.9	1549.7	335.0	639	304	132.5	75.1	136.1	8.3	0.06	0.1	370	531.5	28.8	0.4	53.4	24	1171
Deep wells						50.0		1	7.9	5068.0	944.0	1182	238	270.0	125.0	651.2	17.0	2.77	0.2	309	596.6	1281.5	0.0	16.0	21	3120
Total average						49.8		5	7.9	3308.8	639.0	910	271	201.2	100.0	393.6	12.7	1.41	0.1	340	564.0	655.1	0.2	34.7	22	2145

*Abbreviations: g, gravel; si, silt; sa, sand; sh, shale

Samples collected September 1 and 2, 1959.

Chapter IV

CHEMICAL QUALITY OF GROUND WATER

Samples of ground water from 19 wells in the Plum Coulee area were analyzed by the Industrial Minerals Division, of the Mines Branch, Ottawa. The samples were taken from wells of aquifers considered representative in their respective zones. These analyses show the dissolved mineral content of the waters but do not indicate whether a water that is reported to be chemically suitable for domestic use is bacteriologically safe. The results of the analyses are given in Table V and averages are illustrated in Figure 7.

The chemical quality of the ground water varies widely in both quality and quantity of dissolved mineral constituents. The following general description is based on a limited number of chemical analyses.

The ground water is generally very hard. The softest had a total hardness of 206 ppm. It came from a well in NE sec. 11, tp. 1, rge. 3W, which is 13 feet deep in a sand and gravel lens in the silt. The minimum hardness in water from the deeper sand-gravel lenses associated with the till was 303 ppm. This sample was from a well 120 feet deep in NE sec. 20, tp. 3, rge. 4W. In general the shallow dug wells yielded softer water than the deeper drilled wells.

The pH of all 19 samples was above 7.6 and below 8.2, indicating water of a slightly alkaline character. The average pH for both shallow and deep wells was 7.9. Iron was present in all samples in concentrations ranging from a trace to 6.6 ppm. The deeper drilled wells showed a higher iron content than the shallow dug wells. More than half of the wells tested contained an objectionable quantity of iron. Manganese was present in a number of samples in amounts ranging from 0.0 to 0.4 ppm. The sodium content covered a wide range—from 2.8 to 1,894.0 ppm. On the average the deeper wells contained five times more sodium than the shallow wells. The bicarbonate content ranged from 169 to 516 ppm and in this case the shallow dug wells contained more than the deeper drilled wells. The sulphate content ranged from 31.2 to 2,980.0 ppm; generally it was more than 200 ppm. The chloride content of the shallow wells was generally low, averaging 28.8 ppm; whereas it was high in the deeper wells, there averaging 1,281.5 ppm. The minimum chloride content was 4.5 ppm, whereas the maximum was 3,270.0 ppm. Fluoride ranged from 0.0 to 1.8 ppm; the latter figure was obtained in only one well, and is 0.3 ppm in excess of the permissible standard. Nitrate was most prominent in the shallow dug wells, ranging from 5 to 100 ppm. The high nitrate content in these shallow wells is probably due to the nearness of the

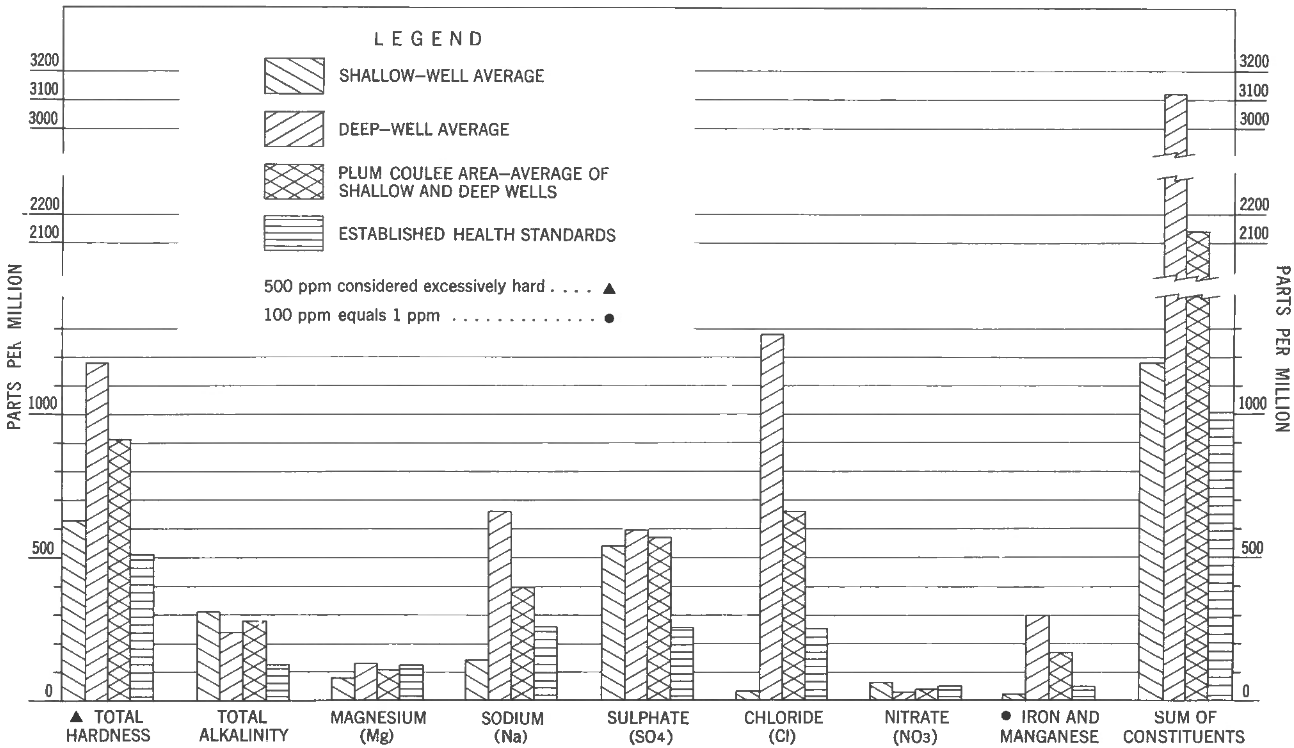

Figure 7. Chemical analyses of water, Plum Coulee area, Manitoba

GSC

wells to barns. Total dissolved solids ranged from 315 to 6,035 ppm, and total hardness from 206 to 3,280 ppm. The average temperature of the water was 49.5°F in the shallow wells and 50°F in the deeper wells. The minimum and maximum water temperatures were 44 and 61°F respectively.

The wells analyzed were 10 to 175 feet deep. No samples were obtained from deeper zones, but samples taken in the past from wells drilled into the bedrock show the chloride content (mostly sodium chloride) to be as high as 39,036.0 ppm.

INTERPRETATION OF CHEMICAL ANALYSES BY PATTERNS

The patterns derived from the chemical analyses of the water samples are illustrated in Figures 8 and 9. If the patterns maintain a characteristic shape, they show the correlation of the wells in a particular aquifer. The patterns are made by plotting in parts per million the positive ions of Na, Ca, Mg, and Fe against the negative ions of Cl, HCO_3, SO_4, and CO_3 (Stiff, 1951). The figure immediately beneath each ion gives the scale. The patterns present a variety of shapes and sizes, each easily recognized and characteristic of a certain water.

Figure 8 illustrates the patterns made from the eight water samples taken from shallow dug wells. In six of the eight patterns the shape is characteristically similar, varying in size only. The size variation is due to the amount of total salt concentration being different from each well. For discussion purposes the patterns have been set up from top to bottom in order of increasing salt concentration.

Wells No. 654, No. 1646, and No. 53 were dug in silt and actually obtain their water from sand or fine gravel lenses in the silt. A beach bar exists near each, and the sand and gravel encountered in the wells is assumed to be the extension of these bars at depth. The wells are approximately 11 and 18 miles apart. The other three wells—Nos. 209, 1982, and 2022—that also have the same characteristic pattern, but a greater amount of total salt concentration, were also dug in silt. This is confirmed by a test-hole bored 150 feet from well No. 209 during the writer's investigations in 1959; it was found that a sandy silt supplied the water to this well. These three wells are approximately 11 and 22 miles apart. The water in all six of the wells was used domestically. In fact, wells No. 1646 and No. 654 supply the best potable water (from a chemical point of view) in the Plum Coulee area. This pattern may be standard for any water encountered in the silt aquifer of the area.

The bottom two patterns on Figure 8 represent water obtained from wells dug in the shale of the Vermilion River formation.

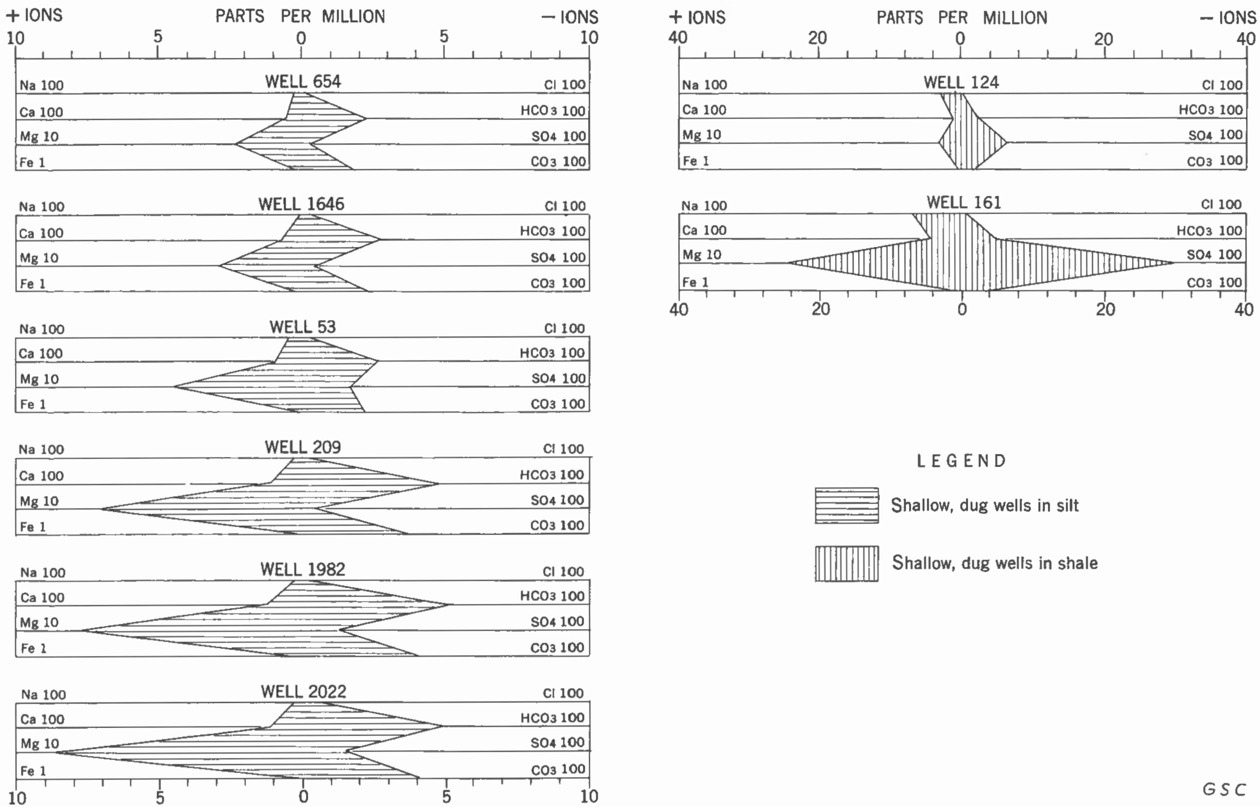

Figure 8. Chemical water analysis patterns

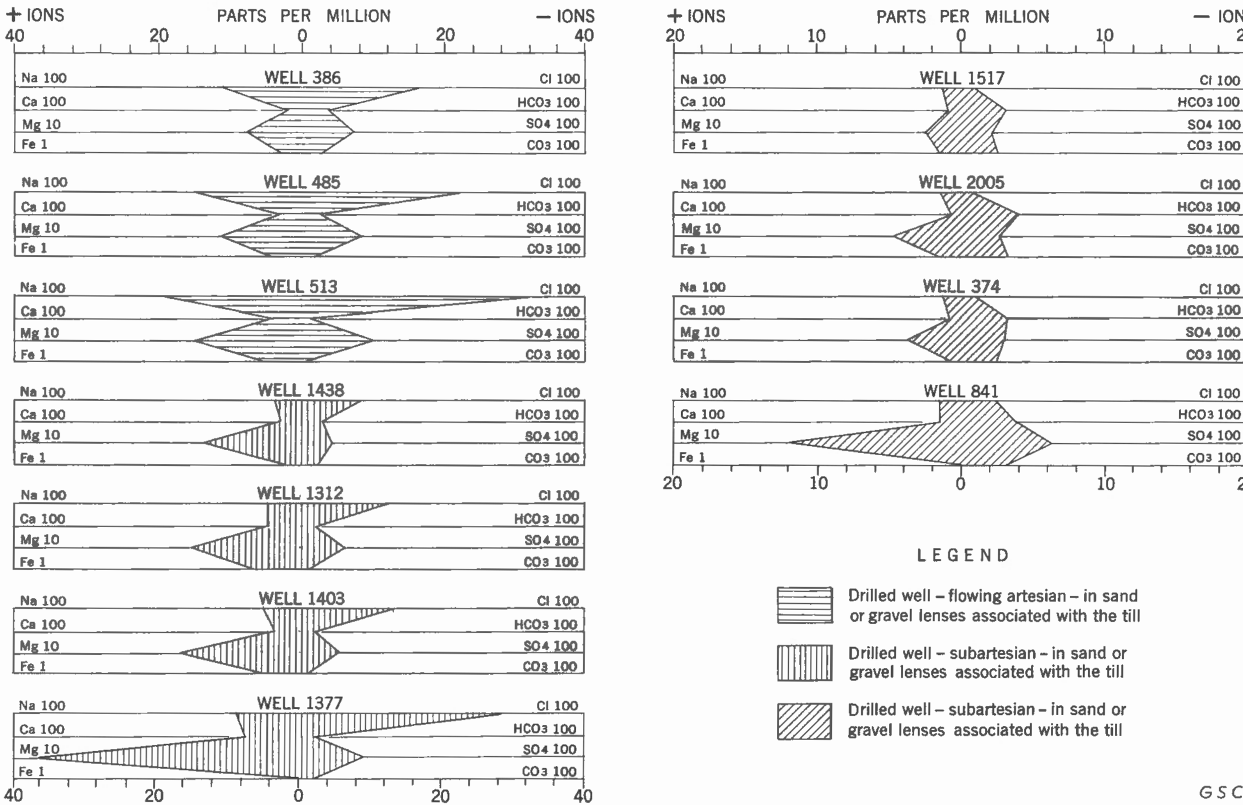

Figure 9. Chemical water analysis patterns

Well No. 124 is known to be dug in shale, for the shale outcrops where the well was dug. Well No. 161 was thought to be dug in clayey silt, but the similarity of the two patterns suggests that the shale is close to the bottom of the well or that waters from the shale on the escarpment flow to the well because the well is below the escarpment. These two wells are approximately 4 miles apart.

The patterns made from the analyses of the 11 drilled wells are shown on Figure 9. The first three, Nos. 386, 485, and 513, are flowing artesian wells. Their high sodium chloride concentration is obvious. Their depths range from 140 to 175 feet. The water in these wells is obtained from sand and gravelly sand lenses associated with the till. They are located all within the flowing artesian zone shown on Map 29-1960.

Wells No. 1438, No. 1312, No. 1403, and No. 1377 also obtain water from aquifers similar to those found in the three flowing wells just mentioned, but are subartesian. The sodium content in these four wells is less, however, although the chloride content is still high. Basically the patterns of these four subartesian wells are similar to those of the three flowing wells. This may be the standard pattern for all flowing artesian wells derived from the surficial deposits. It would be interesting to plot the waters derived from bedrock to see if they are comparable to these, for they are known to be salty and also under artesian flow. As the patterns of the flowing artesian and sub-artesian wells are basically the same, and as the waters may have been obtained from sand and gravel lenses associated with the till, it now seems probable that these lenses are interrelated or interconnected with one another.

The last four wells, Nos. 1517, 2005, 374, and 841 have been grouped together although certain discrepancies do occur in the patterns. The last two patterns differ in that in each one the sulphate content exceeds the carbonate content, and in well No. 41 the sulphate content exceeds both the bicarbonate and carbonate contents. This last well is the only one of the nineteen analyzed for which the depth is not available. The other three wells in this group yield potable water. As seen from these patterns the obvious difference between the four wells in this group and the seven drilled wells mentioned before, is in the lower sodium and chloride contents of the former.

CONCLUSION

Only two of the nineteen wells analyzed can be classified as suppliers of good water (on the basis of 500 ppm of total dissolved solids being the maximum acceptable by health authorities). If this figure is raised to 1,000 ppm, seven more wells could be said to yield potable water. Therefore, on the basis of the chemical analyses, only 10 per cent of the existing wells in the Plum Coulee area yield good water, and an additional 37 per cent yield fair water.

The chances of obtaining good potable water by digging or drilling a well in the Plum Coulee area do not appear good.