CANADA
DEPARTMENT OF MINES

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BUREAU OF ECONOMIC GEOLOGY

GEOLOGICAL SURVEY

PRELIMINARY REPORT

GROUND-WATER RESOURCES OF THE RURAL MUNICIPALITY OF HART BUTTE No. 11 SASKATCHEWAN

BY

B. R. MacKay, H. H. Beach & J. M. Cameron

Water Supply Paper No. 17

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INTRODUCTION

Lack of rainfall during the years 1930 to 1934 over a large part of the Prairie Provinces brought about an acute shortage both in the larger supplies of surface water used for irrigation purposes and the smaller supplies of ground water required for domestic and stock-raising purposes by settlers, villages, and Indian reserves. The drought conditions resulted in repeated crop failures, and in a large number of farms in the acute drought areas of Saskatchewan and Alberta being abandoned. In an effort to relieve the serious situation a number of special studies of the water problem were begun by both Federal and Provincial Governments and allied organizations. The Federal Department of Agriculture under took among other phases of the drought problem an investigation into the existing supplies of surface water, their conservation by means of dams and dug-outs, and how they could be made more generally available for irrigation. The Geological Survey of the Federal Department of Mines began an extensive study of the underground water conditions of southern Saskatchewan, this water being used principally for domestic and stock-raising purposes. For many years past the water problems in this and other provinces of Canada have engaged the attention of the Geological Survey, and considerable information had already been collected. A number of short reports dealing with the ground water conditions of special areas in Manitoba, Saskatchewan and Alberta have been published by both the Federal and Provincial Geological Surveys, but no systematic study of the ground water resources has been made up to the present.

Field Work

The senior author was in charge of this investigation and was instructed to cover as much of the territory as possible in the season. To effect this it was decided to maintain an

office at Regina and to have a large party consisting of twenty-six units, each to consist of three men who would cover their respective areas and visit every farm. In order that the information gathered by these different party units would be as complete and uniform as possible a questionnaire was prepared on which could be tabulated answers to all the essential questions required for a detailed study of the ground water conditions. An effort was made in the field by each party unit to fill in the questionnaire as completely as possible. In many instances, however, it was found that wells had either been abandoned, or the resident had little or no knowledge of the character of the water-bearing horizon and associated beds. When a party unit had completed the survey of a township the set of questionnaires and a report describing the characteristic features pertaining to the underground water conditions were mailed to the field office. Messrs. D.C. Maddox, F.H. Edmunds, H.H. Beach, H.N. Hainstock, R.D. MacDonald, and D.P. Goodall acted as supervisors in inspecting the work of the field units.

During the field season an area of 80,000 square miles, comprising 2,200 townships, was systematically examined, and records of approximately 60,000 wells were obtained, together with water samples for analyses obtained from 720 representative wells. These are systematically classified so that information pertaining to any well may be readily consulted. These records are supplemented by a set of 24 sectional sheets which cover all of southern Saskatchewan north to include township 32. Each sectional sheet comprises 120 townships. On these are indicated by symbol the location, type, and source of water of each of the 60,000 wells.

Publication of Results

The publication of such a great mass of detailed information is out of the question. This forms the permanent record of the Geological Survey. It is highly desirable, however, that a digest of the essential information pertaining to the ground water conditions of each municipality be furnished in convenient form to the municipality offices, to certain Provincial and Federal departments, and to allied organizations, at which centres it will be possible for any resident of the municipality or other party interested in any particular area to consult these reports. Should anyone find that he requires more detailed data than that contained in the report such additional information as the Geological Survey possesses can be procured on application to the Director, Bureau of Economic Geology, Department of Mines, Ottawa. In making such request the applicant should indicate the exact location of the area by giving the quarter section, township, range and meridian.

The reports have been prepared principally for farm residents, municipal bodies, and well drillers who are either contemplating sinking a well for the first time or considering deepening their well to a lower horizon in order to obtain a more abundant supply of water. In describing the water and geological conditions a certain number of technical terms must of necessity be used, and in case the reader should not be familiar with them their meanings have been defined in the glossary.

How to Use the Report

It is advisable that anyone desiring water information pertaining to a particular section of the municipality read over first the section dealing with the municipality as a whole, as by so doing he will be in a much better position to understand the section of the report dealing with the ground water conditions of

the area in which he is particularly interested. As he reads the text he should keep open before him for constant reference the accompanying map of the municipality on which are two figures, one showing the surface and bedrock geology of the area as they affect the ground water supply, and the other the relief and the location and type of water wells. The land relief is shown by means of lines of equal elevation, termed "contours", which lie generally at vertical intervals of 50 feet. The elevation above sea-level of each fourth line is indicated on the map. The statistical summary that follows the text gives at a glance the main characteristics of the wells in each township of the municipality and of the municipality as a whole as listed under the various sub-headings. This is followed by a section dealing with the analyses and quality of the water derived from the unconsolidated deposits and from bedrock. The table of well records gives the detailed information pertaining to each well. In this are tabulated the altitude of the well, its depth, the height to which the water will rise, and the elevation of the water horizon. The wells are grouped in the table by townships and are numbered from the lower right corner of the township westward and northward, and the location of each well by its quarter section is given. The elevations used were determined by aneroid barometer and were checked frequently by elevations on the published maps or by instrument surveys.

Where the ground surface of an area is comparatively flat every effort has been made to indicate the position of the water-bearing horizon in feet below the surface. In rolling country where there is a considerable difference of elevation within short distances a uniform figure for the water horizon is not generally possible. It then becomes necessary to indicate the position in terms of the elevation of a water-bearing bed in feet above sea-level.

Should one desire to ascertain at any location at which no well has as yet been sunk, the approximate depth at which a particular water-bearing horizon can be reached it is necessary to know two things--first, the elevation of the land surface, and second, the probable elevation of the water-bearing bed, or aquifer. The elevation of the land surface can be obtained by noting the position of the well site on the map, Figure 2, with respect to the two bounding contour lines of known elevation, and estimating either how far above the lower, or how far below the upper, control elevation line the well site lies. The approximate elevation of the water-bearing horizon at the well site can be obtained by noting on the table of well records the elevation of the horizon in the wells adjacent to the proposed location and from the range of elevations given and the relative positions of the wells shown on the map to select what appears to be its most probable elevation at the new well site. Having determined this elevation the depth that it is necessary to sink in order to tap it is the difference between its elevation and the elevation of the land surface. This method is especially applicable when the water-bearing horizon is in bedrock. In unconsolidated deposits the water horizon either conforms to the rolling land surface or occurs in isolated sand beds at various horizons that do not form a continuous water-bearing bed over a large area. Care should be taken in making any calculations for depth of water-bearing horizons to be sure that the elevations selected for the determinations occur in the same geological horizon, that is they should be either all in glacial drift or in the same bedrock formation.

The table of well records also contains notes on the temperature, quality, and quantity of the water being obtained from the various wells, and from this it is possible to draw reasonable conclusions as to the character and quantity of the water likely to be encountered at the proposed well site.

Glossary of Terms Used

Alluvium. Deposits of earth, silt, sand and gravel, and other transported material made by rivers, floods, or other causes upon land that has been submerged beneath the waters of lakes or rivers.

Aquifer. Layers or pockets of water-bearing sand or gravel that occur in unconsolidated deposits or as beds forming part of a bedrock formation.

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

Bedrock. Bedrock, as here used, refers to deposits of gravel, sand, silt, and marl that have been laid down by the agency of water and which through a long period of time and the weight of the overlying sediments have become cemented into a solid rock.

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

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

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

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

Flood-plain. A flat section in a river valley that is covered by water when the river is in flood.

Glacial Drift. The loose, unconsolidated surface deposits of sand, gravel, and clay, or a mixture of these, which were deposited by the continental ice-sheet. It is also referred to as glacial till or boulder clay.

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

Hydrostatic Pressure. The pressure exerted by the water at any given point. It is due mainly to the weight of the column of water occurring at higher levels in the same aquifer or water-bearing bed.

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

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

Potable. Drinkable.

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

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

Saline. Salty, having a high content of sodium chloride.

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

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

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

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

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

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

Water-bearing Horizon. A layer in either unconsolidated deposits or in bedrock formation that is water-bearing; same as aquifer.

Zone of Saturation. An area in which the permeable rocks are saturated with water that will move under ordinary hydrostatic pressure.

Names and Descriptions of Geological Formations, Referred to in These Reports.

Wood Mountain Formation. The local name given to a series of gravel and thin sand beds which have a maximum thickness of 50 feet, and which occur as isolated patches on the higher elevations of Wood mountain. They are the youngest of the consolidated rocks and, where present, rest upon the beds of the Ravenscrag formation.

Cypress Hills Formation. The local name given to a series of conglomerates and sand beds occurring in the southwest corner of Saskatchewan, which rests upon the Ravenscrag or older formations. The thickness of this formation varies from 30 to 125 feet.

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

Whitemud Formation. The local name given to a series of white, grey, and buff coloured clays and sands that varies in thickness from 10 to 75 feet. The base of this formation grades in places into a coarse, limy sand having a maximum thickness of 40 feet.

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

Marine Shale Formation. The general name given to the thick deposit of incoherent, dark grey to dark brownish grey, plastic shales, which weather light grey to buff in places. It forms the bedrock over

the greater part of southern and central Saskatchewan. In the eastern half of the province it has a thickness of at least 700 feet. In the western part of the province it consists of a series of dark shales averaging 700 feet in thickness, termed the Bearpaw formation. This is underlain by a series of sands, shales, and coal seams, known as the Belly River formation, which reaches a maximum thickness of 900 feet.

WATER-BEARING HORIZONS OF THE MUNICIPALITY

The rural municipality of Hart Butte covers an area of 324 square miles comprised of nine townships, described as Townships 1, 2, and 3, ranges 25, 26, and 27, west of the second meridian. The municipality is part of a large plateau or elevated plain area into which Big Muddy and Poplar creeks and their tributary streams have cut deep valleys. From elevations of approximately 2,200 feet above sea-level in Big Muddy valley the land surface rises steeply to approximately 2,600 feet and then more gently to reach a maximum height of over 2,900 feet in the southeastern part of township 3, range 25. The land falls off from here towards the south and west to the valley of Poplar river. From there the land surface again rises and reaches an elevation of over 2,800 feet in the southwest and northwest corners of the municipality. The southeast portion is more level and has an elevation between 2,500 and 2,600 feet.

The ground water supplies of this municipality are derived from three sources. These are: (1), the thin beds of Recent deposits of sands, silts, and gravels which lie along the valley bottoms of Big Muddy and Poplar rivers and their tributary streams; (2), the glacial deposits which, except in a small, driftless area in the southwest part of township 1, range 27, mantle the area to depths varying from a few feet on the slopes and valleys to upwards of 50 feet on the tops of the hills; and (3), the several water-bearing beds that occur in the underlying Ravenscrag formation.

Water-bearing Horizons in the Unconsolidated Deposits

The Recent deposits occurring along the bottoms of the valleys of the main rivers and their smaller tributaries contain small supplies of a usually fairly soft water. Although the supplies from this source are limited, they are ample for the household of the farmers along the valleys and a few head of stock.

Shallow and, therefore, inexpensive wells only are required to tap these supplies of ground water.

The glacial deposits that cover most of the municipality have been found to yield only small supplies of water in a few isolated areas. This yield during the past few years has been very meagre as the beds are wholly dependant on the local rainfall for their supply. The beds, moreover, conveniently placed to the house or stock, are difficult to locate.

Ground water from the glacial drift is of varying degrees of hardness, and differs greatly in the amount of salts which it contains in solution. Generally, it is suitable for stock, but often its laxative effects render it unfit for human consumption.

Water-bearing Horizons in the Bedrock

The Ravenscrag formation is the most important source of water for the farmers of this district. It underlies the glacial drift in the municipality except in a small area on the north of township 3, range 25, at the bottom of Big Muddy valley where lower formations are exposed. The water derived from this formation is not obtained at uniform depths from the surface, but throughout the area appears to occur in six principal water-bearing horizons. These productive beds are of various extent and lie at approximate elevations of 2,850 feet, 2,725 feet, 2,590 feet, 2,500 feet, 2,430 feet, and 2,350 above sea-level. It is to be noted that due to differences in the character and porosity of the water-bearing beds, the yield and quality of the water from a particular aquifer will change in different areas. An attempt has been made on the accompanying geological map to outline roughly the area under which these aquifers exist, and reference to that map will aid in the understanding of the following description.

The highest (A) aquifer ranges in elevation from 2,790 to 2,900 feet. It exists over an area of 7 square miles in the

southern part of township 3, range 25, and in the small sections of the northwest corner of township 2, range 25. The area underlain by it is enclosed by the A boundary line on the geological map. This aquifer occurs in a bed of porous sand, and due to its small areal extent, and the small amount of rainfall which is the source of ground water, individual wells sunk into it yield only small supplies.

The next lowest (B) water-bearing bed is struck at elevations ranging from 2,740 to 2,690 feet. This aquifer is more extensive than the A aquifer which it underlies, and is present in the area comprised of the northwestern part of township 2, range 25, the southwestern part of township 3, range 25, the eastern half of township 2, range 26, and the southeastern and much of the northwestern quarter of township 3, range 26. Remnants of this horizon also occur in the western half of township 3, range 27, and the southwest corner of township 1, range 27. The extent of this aquifer is shown on the map as that area enclosed by the B water horizon line. Except in the small area where the A aquifer is present, this productive bed is the nearest to the surface within the B line and yields a fairly abundant supply of water. The water comes from sand horizons or coal seams.

The third (C) aquifer is encountered at elevations ranging from 2,560 to 2,630 feet. As far as known this aquifer extends under the two higher water producing beds and is present over most of the municipality, except in those areas of lower surface elevation along the valleys of Big Muddy and Poplar rivers and in the southeastern township, 1, range 25. The areas underlain by this aquifer are shown on the map as bounded by the C line and parts of the four boundaries of the municipality. In those areas between the C and B lines it is the topmost aquifer and is tapped by wells of 100 feet or less. A fair supply of water is obtained from this water-bearing horizon which varies in character throughout the area, consisting in some places

of sand, in others of sand with a coal seam, and in still others of a coal seam alone.

The fourth (D) aquifer is believed to underlie, the three higher aquifers and to extend throughout the municipality except for a small area in the north of township 3, range 25, and township 3, range 26, and those areas of low elevation along the stream valleys in the south. The areas where this aquifer does not exist on the map are shown as those parts enclosed by the (D) line and the southern and eastern boundaries in the south, and that part north of the D line along Big Muddy valley. This aquifer occurs usually in a coal bed with underlying sand which is encountered between the elevations of 2,485 to 2,535 feet. The aquifer yields fair supplies of water to the individual wells sunk into it.

The fifth (E) aquifer is present as the topmost aquifer in the places of low elevation along the stream valleys in township 1, range 25, and the southeastern part of township 1, range 26. In the remainder of the municipality this aquifer as far as known extends under the higher aquifers. It occurs in a sand horizon which is encountered between the elevations of 2,405 to 2,470 feet in this municipality. The aquifer provides for the individual wells tapping it, a supply sufficient for 10 to 20 head.

Although no information is available as to the extent of the sixth (F) aquifer, it is very probable that this bed, or possibly a series of water-bearing beds, underlies the whole municipality between the elevations of 2,320 and 2,380 feet. A spring flows from one of these aquifers where it is exposed along the banks of the Big Muddy.

As good supplies of water can be obtained from the Ravenscrag formation, drilling for water in this municipality should not be continued past its base which occurs at an elevation of approximately 2,310 feet; as far as known the underlying

formations do not yield supplies of good water.

Water from the several horizons in the Ravenscrag formation varies from a soft to a hard, and in some places "alkaline" or sulphate type (See page 31). When the horizon tapped is of coal the water contains varying amounts of iron which on exposure to the air settles as a red sediment. Generally water from a Ravenscrag source can be used for household purposes, providing that the iron is removed by aeration and filtration of the water (See page 29).

GROUND WATER CONDITIONS BY TOWNSHIPS

Township 1, Range 25

In this township water is obtained from two sources. These are: (1) the thin beds of Recent sands, silts, and gravels which lie along the bottoms of the stream valleys; and (2) the water-bearing horizons in the underlying Ravenscrag bedrock formation. A third possible source is from the 20 feet to 30 feet of glacial deposits that mantle the area.

The Recent deposits yield to wells of shallow depth a fairly soft water, which is of good quality for household use. The supply to the individual wells is not large, but in places is sufficient for 10 head of stock.

The greatest part of the water requirements in this township is derived from the Ravenscrag formation. The two aquifers of this formation which serve as a source here occur at the approximate elevations of 2,500 feet and 2,460 feet above sea-level.

The highest (D) aquifer exists in the northern, central, and eastern central portions of the township, and is shown on the map as the area outside of the D line. This aquifer occurs in a sand, or coal and sand horizon which is encountered between the elevations of 2,510 and 2,550 feet. The water from it in most cases can be used for household purposes and an individual well is sufficient for 50 head of stock.

The second (E) aquifer occurs as the uppermost aquifer in the areas of lower relief along the southern boundary and in the southwest and northeast corners, and is believed to extend under the (D) aquifer throughout the remainder of the township. This aquifer occurs in a sand or sand with coal horizon, which is encountered here at elevations between 2,425 and 2,484 feet. Supplies from an individual well are usually sufficient for 10 to 20 head of stock.

Township 1, Range 26

In this township water is derived from three sources. These are: (1) the Recent deposits of sand, silt, and gravel which cover the bottom of Poplar Creek valley to depths averaging 16 feet; (2) the glacial deposits that mantle the area, varying in depth from a few feet on the slopes to 65 on some of the hills; and (3) from the water-bearing horizons of the Ravenscrag formation.

Wells sunk in the Recent deposits supply water of good quality which meets the household needs of the farmer along the creek. Their stock is usually watered from the creek itself, or from springs that occur at its side.

Sand and gravel beds in the glacial drift contain fair supplies of a hard, and in many places "alkaline" water which can be obtained at shallow depths and is used for stock and household needs. This supply has been utilized in certain scattered localities of the township.

The water-bearing horizons of the Ravenscrag formation, which serve as a source for water in this township, occur at the approximate elevations of 2,725, 2,500, and 2,465 feet above sea-level.

The highest (B) aquifer occurs in the area of high relief on section 33. It occurs in a sand horizon which is encountered in this township at elevations of 2,720 and 2,728 feet. The supply from this aquifer, though not always of good quality, is sufficient for 10 to 20 head of stock.

The second (D) aquifer occurs under the higher aquifer and extends under the remainder of the township except for an area of low relief in the central and east-central parts. The extent of this aquifer is shown on the map as the area outside the D line, and between the D and C lines this aquifer is the uppermost water-bearing horizon. It is to be noted that in this township no information was available as to the existence of the C aquifer; its southerly extension from the northern township as indicated on the map is inferred.

The D aquifer occurs in a sand bed that in places is associated with coal. It is encountered between the elevations 2,470 and 2,515 feet in this township. The water obtained is usually of good quality and each well is sufficient for 30 to 50 head of stock.

The third (E) aquifer occurs as the uppermost water-bearing bed in the areas of low relief in the central and eastern-central portions of the township. On the map this area is shown as that which is enclosed by the D line. As far as known this aquifer extends under the higher aquifers and a well on the southeast 13 is believed to draw its supply from both this and the D aquifer. The E aquifer occurs in a coal bed in this township which is encountered at elevations of 2,432 and 2,420 feet above sea-level. The water, though of uncertain quality for the household, is sufficient for 20 to 30 head of stock.

Township 1, Range 27.

In this township water is derived from two sources. These are: (1), the glacial drift, which except in the driftless southwest corner, mantles the area to a maximum depth of 40 feet; (2), water-bearing horizons of the underlying Ravenscrag formation. A third possible source of a small domestic supply exists in the northeast corner, being derived from the thin beds of recent deposits which lie at the bottom of Poplar River valley.

The pockets of sand and gravel which are interspersed

through the glacial deposits yield a supply of hard, usually somewhat "alkaline" water usable for household purposes and available at shallow depths. This source becomes important in the central portion of the township where, in order to tap a bedrock aquifer, wells of 110 feet to 140 feet in depth are required. However, the supply is limited and the productive beds are difficult to locate.

The water-bearing horizons in the underlying Ravenscrag formation that are penetrated in this township occur at the approximate elevations of 2,738, 2,590, 2,500, and 2,400 feet above sea-level.

The highest (B) aquifer occurs only in a small area of high relief in the southwest corner of the township. The bed is of sand and yields a satisfactory supply of water to the individual wells.

The second (C) aquifer extends under the western and southern parts of the township, or under that area on the map to the west of the C line. The aquifer occurs in a sand bed and from a well on the NW.¼, section 18, a supply of water sufficient for 100 head of stock is obtained.

The third (D) aquifer is of general occurrence in this township, and continues under the higher water-bearing horizons. Wells on the NW.¼, section 20, NW.¼, section 15, and SW.¼, section 2, are believed to derive their supply from both the C and D aquifers. The D aquifer in this township is encountered between the elevations of 2,555 and 2,473 feet. The water is not always suitable for household use, but an individual well is sufficient for 20 head of stock.

The lowest (E) aquifer lies at an elevation of 2,405 feet. It is believed to extend under the higher water-bearing beds and a well on the NE.¼, section 36, derives a supply from both this and the D aquifers.

Township 2, Range 25.

In this township ground water is obtained only from water-bearing horizons in the Ravenscrag formation. Two other possible sources of small supplies of water exist which have not been utilized. These are: (1) in the thin beds of Recent sands, silts, and gravels which lie along the bottoms of the small stream valleys; (2) in the pockets of sand or gravel interspersed in the 30 to 50 foot zone of glacial deposits that mantle the area.

The water-bearing beds in the Ravenscrag, in this township, occur at the approximate elevations of 2,850, 2,725, 2,590, and 2,560 feet above sea-level. The highest (A) aquifer occurs in the small area of highest relief in the northwest corner and springs flow in places where the aquifer outcrops at the surface.

The second (B) aquifer extends over the northwest corner of the township, and underlies the area of the highest aquifer as shown on the map by the area that is enclosed by the B line. This aquifer is encountered at the elevations of 2,750 and 2,694 feet in that area where it is uppermost. Supplies from the individual wells are small, but the water is usable for household purposes.

The third (C) aquifer exists in this township over the north and central portions and as an isolated area south of Buffalo Gap. It consists of a sand or a sand bed and coal seam which is encountered between the elevations of 2,590 feet and 2,680 feet. Supplies from individual wells are usually sufficient for 15 to 25 head, and the water is suitable for household use.

The fourth (D) aquifer is believed to occur under the higher aquifers and to be the uppermost water-bearing horizon underlying the drift over most of the southern part of the township. This aquifer occurs in a sand bed, which is encountered between the elevations of 2,502 to 2,556 feet. Individual wells tapping this aquifer

obtain supplies usable for household purposes, and sufficient for 40 to 50 head of stock.

Township 2, Range 26.

Ground water is obtained in this township from two sources. These are: (1) the glacial deposits that mantle the area to a depth nowhere exceeding 40 feet; and (2) the water-bearing horizons of the underlying Ravenscrag formation. A third possible source for small supplies of a water suitable for the household exists in the thin beds of Recent deposits of sand, silt, and gravel which lie at the bottom of the small stream valleys.

The pockets of sand and gravel which are interspersed through the glacial deposits yield a supply of hard, usually somewhat "alkaline" water which is usable for household purposes and is available at shallow depths.

However, glacial water-bearing beds are difficult to locate, and most residents of the district derive all water for farm requirements from the aquifers in the Ravenscrag formation.

Three water-bearing horizons of the Ravenscrag which serve as sources in this township occur at the approximate elevations of 2,725, 2,590, and 2,500 feet above sea-level.

The highest (B) aquifer exists in the area of high relief underlying the entire eastern half of the township except for a small area in its southeastern corner. This area is shown on the map as that enclosed by the B line. The aquifer occurs in a sand bed encountered between the elevations of 2,690 and 2,744 feet. This aquifer yields a supply of water to the individual wells which is usable for drinking and is sufficient in most places for 10 head of stock.

The second (C) aquifer underlies the area covered by the B bed and extends over the entire township except for a 2 - mile wide strip along the western boundary. On the map the aquifer exists in the area shown as bounded by the C line.

The aquifer is usually a coal bed which is encountered between the elevations 2,570 and 2,627 feet in this township. Throughout the central part of the township wells tapping this aquifer obtain water suitable for domestic use, and in sufficient quantity for 75 head of stock. In the southern part the supply from individual wells is barely sufficient for 10 head of stock.

The third (D) aquifer is believed to extend generally under the township, although where the higher aquifers occur. no wells have been sunk to it. Along the western boundary where it is the uppermost water-bearing bed it occurs in a sand bed and in places thin coal seams are present. The aquifer is encountered in this township between the elevations of 2,510 and 2,541 feet. Supplies of ground water to individual wells from this aquifer are of fair quality and sufficient for 40 or more head of stock,

Township 2, Range 27.

In this township water is obtained from three sources. These are: (1) the thin beds of recent deposits of sand, silt, and gravel which lie at the bottoms of the stream valleys; (2) the glacial deposits that mantle the area, varying in depth from a few feet on the slopes to 60 feet on some of the hills; and (3) two water-bearing horizons in the underlying Ravenscrag formation.

The small supply of a soft, usable water which is obtainable at shallow depths from the recent stream deposits is important only as an auxiliary and domestic supply in this township.

The water-bearing beds of sand or gravel which are interspersed through the glacial deposits, although not used to any great extent in this area, would serve as a shallow source of a hard, usually "alkaline," water usable for household use and for stock. However, water-bearing beds in the glacial deposits are difficult to locate and most of the farmers in this township derive their supply by drilling deeper to tap one of the aquifers in the underlying Ravenscrag formation which exist

at the approximate elevations of 2,590 and 2,500 feet above sea-level.

The highest (C) aquifer is in sand beds, or in a coal seam and an underlying sand bed. It is encountered between the elevations of 2,540 and 2,620 feet in this township. This aquifer underlies the surface of those areas of higher elevations in the northern and western portions of this township, namely, that area on the map lying to the north and west of the C line. Supplies from this aquifer are usually suitable for the household, and sufficient for 15 to 25 head of stock from the individual wells.

The second (D) aquifer is of general occurrence in the township, extending under the higher water-bearing bed, as indicated by wells on SE.¼, sections 22 and 23, and SW.¼, section 30 which it is believed derive their supply from both aquifers. This aquifer occurs usually in a sand bed encountered between the elevations 2,528 and 2,465 feet. South of the C line wells that are not deeper than 75 feet obtain from it a supply of water suitable for the household and sufficient for 20 head of stock.

Township 3, Range 25

In this township ground water is obtained from three principal sources. These are: (1) the thin beds of recent deposits of sand, silt, and gravel that lie along the bottoms of Big Muddy valley and its smaller tributary valleys; (2) the glacial drift that mantles the area to a depth varying from a few inches on the slopes to approximately 40 feet in thickness on some of the hills; and (3) aquifers in the underlying Ravenscrag formation.

The recent deposits furnish an important source in the central portions of the township where they yield small supplies of usually soft water from shallow wells.

The pockets of sand or gravel scattered throughout the glacial deposits hold a small supply of hard, slightly "alkaline" but usable water that has been utilized only in the central portion of the township.

Five water-bearing horizons in the Ravenscrag serve as sources in this township. These occur at the approximate elevations of 2,850, 2,725, 2,590, 2,500, and 2,340 feet above sea-level. Although no information was obtained, it is probable that another aquifer at an approximate elevation of 2,410 feet feeds springs along Big Muddy valley.

The highest (A) aquifer is present in the areas of highest relief in the southern part of the township. It occurs usually in a sand horizon which is encountered here at elevations between 2,770 to 2,874 feet. The supply of ground water to the individual wells from this aquifer varies from place to place, being sufficient for from 2 to 40 head of stock in different localities. The water is usually suitable for household use.

The second (B) aquifer is believed to exist under the higher aquifer and extends slightly farther north and east. Its extent is shown on the map by the area enclosed by the B line. This aquifer occurs in a sand horizon which is encountered in this township at elevations between 2,700 and 2,710 feet. The supply from individual wells is suitable for domestic use and sufficient for 20 to 30 head of stock. The 60-foot dry holes sunk in places north of the B line would probably have encountered a water-bearing horizon within this depth if they had been drilled just south of the line of springs that run across the township as roughly indicated by the B line on the map.

The third (C) aquifer is believed to exist under the B aquifer and extends throughout the southern half of the township. The aquifer occurs in a sand bed or a sand bed with a coal seam, which is encountered in this township between the elevations of 2,568 to 2,625 feet. The supplies of waters from this aquifer are

usable for household purposes, and individual wells usually give quantities sufficient for 20 head of stock.

The D and F aquifers are believed to occur under the higher productive beds, but in this township no wells have been sunk into them, and they yield a supply of water only from springs along Big Muddy valley.

Township 3, Range 26.

Water is derived from two sources in this township. These are: (1) the glacial deposits that mantle the area to a maximum depth of 50 feet; and (2) three water-bearing horizons of the underlying bedrock formation. A third possible source of a small domestic supply exists in the thin beds of Recent deposits of sand, silt, and gravels which lie at the bottom of Poplar river and other smaller streams.

The pockets of sand and gravel that are interspersed through the glacial deposits yield a supply of hard and somewhat "alkaline" water which is usually suitable for household needs. This source of water supply is not widely used since the productive beds are small and difficult to locate.

Three water-bearing horizons occur in the Ravenscrag formation in this township at approximate elevations of 2,725, 2,650, and 2,525 feet above sea-level.

The highest (B) aquifer exists in the area of high relief in the central part of the township. On the map this is the area shown enclosed by the B line. The aquifer occurs in a sand horizon which is encountered here between the elevations 2,725 and 2,755 feet. Towards the south and west this aquifer yields to wells a good supply of ground water. Farther north, the bed becomes smaller and nearly unproductive; in both places the water is suitable for household purposes. In this area, where dry or nearly dry holes occur, it might be advisable to deepen them by 75 feet so as to encounter a lower aquifer.

The second (C) aquifer occurs under the higher bed and extends over the whole township except those areas of low relief in the southwest and northeast corners. Two wells on the NW.¼, section 16, and NE.¼, section 21, 174 and 136 feet deep, respectively, have been sunk through the B aquifer and into the C bed. The C aquifer occurs in a coal bed and yields to wells a plentiful supply of good water.

It is believed that the D aquifer extends under the higher water-bearing horizons in this township, but does not exist in the lower elevations of Big Muddy valley. A spring flows from this bed on the NW.¼, section 7, and a well has been sunk into it on the SW.¼, section 33. The supplies in both are suitable for human consumption and sufficient for 10 head of stock.

Township 3, Range 27

In this township ground water is derived from two sources, in addition to small supplies of a fairly soft water which possibly exist in the thin beds of recent deposits of sand, silt, and gravel lying along the bottoms of the small stream valleys. These are: (1) the glacial deposits that over the area have a maximum thickness of 50 feet; and (2) two water-bearing horizons in the underlying Ravenscrag formation.

The supply from the glacial deposits is from two sources: (1) a hard, "alkaline" water that is frequently unfit for use, is derived in small quantities from slow seepages in clay by wells situated near sloughs; (2) a hard but less "alkaline" water is obtained from sand or gravel beds which are interspersed through the glacial deposits. The supply from this source is larger and the water is of better quality and usable for household purposes. It is only the difficulty of locating these water-bearing beds in the glacial deposits that prevents them from being an important source, since the cost of deeper drilling into the bedrock would be eliminated.

Although the glacial deposits furnish the farm water requirements in several scattered sections of the township, most of the farmers obtain their supply from the water-bearing horizons in the Ravenscrag formation, which occur at the approximate elevations of 2,725 feet and 2,590 feet above sea-level.

The highest (B) aquifer occurs in horizons of sand, and is encountered at elevations from 2,690 to 2,760 feet in this township. This aquifer is continuous over the areas of high relief in the central part of the township, or on that area shown on the map as enclosed by the B line. The water from this aquifer is usually suitable for the household and sufficient for 20 head of stock.

The second (C) aquifer occurs in a coal horizon which is encountered at elevations from 2,570 to 2,640 feet. This aquifer underlies the higher water-bearing horizon and extends throughout this township. In the areas outside the B line a strong supply of water, which is not always usable, is obtained by wells from 20 to 115 feet in depth, depending on the unevenness of the surface elevation.

STATISTICAL SUMMARY OF WELL INFORMATION IN RURAL MUNICIPALITY OF HARTBUTTE, NO. 11, SASKATCHEWAN

Township	1	1	1	2	2	2	3	3	3	Total No. in Municipality
West of 2nd mer, Range	25	26	27	25	26	27	25	26	27	
Total No. of Wells in Township	50	36	25	64	41	63	42	21	36	378
No. of Wells in bedrock	45	22	19	60	31	57	32	15	26	307
No. of wells in glacial drift	0	7	6	3	10	5	10	6	8	55
No. of wells in alluvium	5	7	0	1	0	1	0	0	2	16
Permanency of Water Supply										
No. with permanent supply	48	33	22	46	41	55	33	14	35	327
No. with intermittent supply	0	0	1	9	0	0	3	0	0	13
No. dry holes	2	3	2	9	0	8	6	7	1	38
Types of Wells										
No. of flowing artesian wells	0	0	0	0	0	0	0	0	0	0
No. of non-flowing artesian wells	14	8	8	8	6	17	3	5	8	77
No. of non-artesian wells	34	25	15	47	35	38	33	9	27	263
Quality of Water										
No. with hard water	23	28	17	33	39	42	31	14	31	258
No. with soft water	25	5	6	22	2	13	5	0	4	82
No. with salty water	2	0	0	0	0	0	0	0	0	2
No. with alkaline water	9	1	4	5	0	18	5	2	0	44
Depths of Wells										
No. from 0 to 50 feet deep	36	25	9	47	27	31	36	14	19	244
No. from 51 to 100 feet deep	11	10	10	12	14	27	5	1	13	103
No. from 101 to 150 feet deep	3	1	3	5	0	5	1	5	4	27
No. from 151 to 200 feet deep	0	0	2	0	0	0	0	1	0	3
No. from 201 to 500 feet deep	0	0	1	0	0	0	0	0	0	1
No. from 501 to 1,000 feet deep	0	0	0	0	0	0	0	0	0	0
No. over 1,000 feet deep	0	0	0	0	0	0	0	0	0	0
How the Water is used										
No. usable for domestic use	42	31	20	51	41	47	26	11	29	298
No. not usable for domestic use	6	2	3	4	0	8	10	3	6	42
No. usable for stock use	47	33	23	54	41	53	36	13	35	335
No. not usable for stock use	1	0	0	1	0	2	0	1	0	5
Sufficiency of Water Supply										
No. sufficient for domestic needs	45	32	23	54	39	55	35	14	35	332
No. insufficient for domestic needs	3	1	0	1	2	0	1	0	0	8
No. sufficient for stock needs	43	25	18	39	28	50	26	12	30	271
No. insufficient for stock needs	5	8	5	16	13	5	10	2	5	69

ANALYSES AND QUALITY OF WATER

General Statement

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

Total Dissolved Mineral Solids

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

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

Mineral Substances Present

Calcium and Magnesium

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

Sodium

The salts of sodium are next in importance to those of calcium and magnesium. Of these, sodium sulphate (Na_2SO_4) is usually in excess of sodium chloride (NaCl). These sodium salts are dissolved from rocks and soils. Sulphate of sodium is commonly known as "Glauber's Salts" and when there is a large amount present the water is laxative and unfit for domestic use. Sodium carbonate (Na_2CO_3) "Black Alkali", and sodium sulphate and sodium chloride "White Alkali" are injurious to vegetation, and waters that contain a large amount of them cannot be used for irrigation.

Sulphate

Sulphates (SO_4) are one of the common constituents of natural water. The sulphate salts most commonly found are sodium sulphate (Glauber's Salts, Na_2SO_4), magnesium sulphate (Epsom

Salts, ($MgSO_4$), and calcium sulphate ($CaSO_4$). Waters that contain these sulphate salts are called "sulphated waters". When the water contains large quantities of the sulphate of sodium ("White Alkali") it is injurious to vegetation and cannot be used for irrigation. According to John C. Thresh, London, "The continued use of water that contains 1,200 parts or more per million of magnesium sulphate and 500 parts or more per million of sodium sulphate causes diarrhoea and scour among stock, and one-half this quantity makes the water unfit for domestic use".

Chloride

Chloride (Cl) is a common constituent of all natural water and is dissolved in small quantities from rocks. It usually occurs as sodium chloride (common salt, NaCl) and if the quantity is much over 400 parts per million the water has a brackish taste; if the water contains much over 400 parts per million it becomes too salty to be fit for domestic use.

Iron

Iron (Fe) is dissolved from many rocks and the surface deposits derived from them, and also from well casings, water pipes, and other fixtures. In the table of analyses given in this report, the iron content is less than 1 part per million unless otherwise noted. More than 0.1 part per million of iron in solution will settle out as a red precipitate upon exposure to the air. Water that contains not more than 0.5 part of iron per million is considered as the usual upper limit for potable water, but this amount is often exceeded. From 1 to 3 parts per million the water may be considered only fair, and in excess of 3 parts per million the water is bad. A water that contains a considerable amount of iron will stain porcelain, enamelled ware, and clothing that is washed in it, and when used for drinking purposes has a tendency to cause constipation.

Hardness

Calcium and magnesium salts impart hardness to water. Hardness of water is commonly recognized by its soap-destroying powers as shown by the difficulty of obtaining lather with soap. The total hardness of a water is the hardness of the water in its original state. Total hardness is divided into "permanent hardness" and "temporary hardness". Permanent hardness is the hardness of the water remaining after the sample has been boiled and it represents the amount of mineral salts that cannot be removed by boiling. Temporary hardness is the difference between the total hardness and the permanent hardness and represents the amount of mineral salts that can be removed by boiling. Temporary hardness is due to the bicarbonates of calcium and magnesium, and permanent hardness to the carbonates, sulphates and chlorides of calcium and magnesium. The permanent hardness can be partly eliminated by adding natural chemical softeners such as ammonia or sodium carbonate, or many prepared softeners. Water that contains a large amount of sodium carbonate and small amounts of calcium and magnesium salts is soft, but if the calcium and magnesium salts are present in large amounts the water is hard. The following table taken from "The Examination of Water and Water Supplies" by John C. Thresh, London, 1925, can be used for determining the degree of hardness of a water.

Total Hardness (Total Ca and Mg content in parts per million)	Character
Less than 50	Very soft
50 - 100	Moderately soft
100 - 150	Slightly hard
150 - 200	Moderately hard
200 - 300	Hard
Over 300	Excessively hard

Many of the Saskatchewan water samples analysed by the Geological Survey have a total hardness greatly in excess of 300 parts per million; when the total hardness exceeded 3,000 parts per million no exact hardness determination was made. Also no determination for temporary hardness was made on waters having a total hardness less than 50 parts per million.

The term "alkaline" has been applied rather loosely to ground water. Its original meaning was a chemical one and it implied that the substance in question would neutralize acids. The carbonates of calcium, magnesium, and sodium are the only compounds found in ground water that would make it alkaline chemically. A later application of the term "alkaline" was to soils that contain sufficient "black alkali" or "white alkali" to make them unfit for vegetation. In the Prairie Provinces a water is usually considered to be alkaline when it contains so much dissolved solids as to be unfit for human consumption; except that water that tastes strongly of common salt is described as "salty". Many alkaline waters may be used for stock. Most alkaline waters are more correctly termed "sulphated" waters.

Analyses of Water Samples from the Municipality of Hart Butte, No. 11, Saskatchewan.

No.	LOCATION					Depth of Well, Ft.	Total dis'vd Solids	HARDNESS			CONSTITUENTS AS ANALYSED						CONSTITUENTS AS CALCULATED IN ASSUMED COMBINATIONS								Source of Water
	Qtr.	Sec.	Tp.	Rge.	Mer.			Total	Perm.	Temp.	Cl.	Alkalinity	CaO	MgO	SO_4	Na_2O	Solids	$CaCO_3$	$MgCO_3$	$MgSO_4$	Na_2CO_3	Na_2So_4	NaCl	MgCl	
1	SW.	3	1	26	2	16	1,120	600	600	0	16	235	120	115	513	185	969	215	17	319	0	392	26		x 1
2	NE.	12	1	26	2	20	280	230	230	0	8	210	80	41	12	0	235	143	56	15	0	0	0	21	x 2

Water samples indicated thus, x 1, are from Recent stream gravel.
Water samples indicated thus, x 2, are from Glacial drift.
Analyses are reported in parts per million.
Hardness is the soap hardness expressed as calcium carbonate ($CaCO_3$).
For interpretation of this table read the section on Analyses and Quality of Water.

Water from the Unconsolidated Deposits

The water found in the thin beds of gravel and sand lying along the bottoms of the stream valleys is generally not very hard. Only one sample of water from these deposits was obtained and analysed. The results, as here tabulated, show the water to be harder and of poorer quality than might be expected in the case of deposits of this character. Its total dissolved solids are 1,120 parts per million, and the water is hard. The sulphates of sodium and magnesium are in fairly large concentration, but the water, although slightly laxative, is suitable for domestic use.

There is also considerable variation in the quality of water derived from the glacial drift, which is governed by the amount of mineral salts leached from the varied materials with which the ground water has come in contact. Ground water from the boulder clay in this region is exceedingly hard and its sulphate salt content is high. Some analyses of water in adjacent areas show as much as 2,000 parts per million of combined sulphates of sodium and magnesium.

Water from gravel or sand beds in the glacial drift is generally not so hard and does not contain such a large amount of sulphates. An analysis of water from this type of deposit is given on the table. The total solid content in this case is only 280 parts per million. The water is fairly hard, but the amount of salts in solution is exceptionally low. The water is of unusually good quality. It is probably derived from a deposit of thoroughly leached gravels.

Water from the Bedrock

No samples of water from the Ravenscrag horizons in this municipality were taken, but those obtained in the surrounding districts from this source may be considered as representative. The water is of two main types, one soft and the other hard, both of which have a high total solid content, and a high concentration of sodium sulphate (Glauber's Salt). Intermediate types also occur.

The soft water contains in solution a large amount of sodium carbonate "black alkali" along with sodium sulphate and little if any of the sulphates and carbonates of magnesium and calcium. The "black alkali" renders this type of water unfit for irrigation. The hard variety of ground water comes from a depth of 100 feet or less from the surface, and contains no "black alkali". The carbonates of magnesium and calcium, and the sulphate of magnesium are present in fairly large amounts. This water generally is not as suitable for household and stock use as is the softer water.

The quality of most of the waters derived from the Ravenscrag is intermediate between these two main types and is generally usable for domestic purposes as well as for stock. The softer the water the more unsuitable it is likely to be for irrigation purposes due to the larger amounts of sodium carbonate it contains.

WELL RECORDS—RURAL MUNICIPALITY OF HART BUTTE NO.11 SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
1	SE.	1	1	25	2	Dug	16	2,460	- 10	2,450	16	2,444	Recent sand	Hard, clear, alkaline		D, S	Sufficient for local needs.
2	NW.	1	"	"	"	Bored	32	2,445	- 12	2,433	20	2,425	Ravenscrag gravel	Med. hard, clear		D, mS	Insufficient for more than 6 head stock.
3	NW.	1	"	"	"	Dug	16	2,445	- 12	2,433	16	2,429	" clay	Hard, alkaline	42	D, S	" supply.
4	SE.	5	"	"	"	Drilled	120?	2,525	- 73	2,452	100?	2,425	" coal	" "		D,	Insufficient supply. Some stock use it, also watered ¼ mile south of spring
5	NW.	6	"	"	"	Dug	54	2,510	- 50	2,460	50	2,460	" "	" clear, iron	45	D, S	Sufficient supply. Poor repair.
6	NE.	7	"	"	"	Bored	26	2,510	- 24	2,486	26	2,484	" "	Soft, "	45	D, S	" for household and 14 head stock.
7	SW.	10	"	"	"	"	72	2,540	- 47	2,493	63	2,477	" white sand	Hard, " iron	45	D, S	" " " " 11 " ".
8	NW.	11	"	"	"	Spring		2,640	+ 1	2,641			Ravenscrag coal	Med. Soft, clear	44	S,	Indefinite supply; 4 flowing springs for 10 head stock.
9	SE.	15	"	"	"	Bored	108	2,620	- 68	2,552	108	2,512	" white sand	Hard, clear, iron	43	D, S	Sufficient supply for 10 head stock.
10	SW.	16	"	"	"	Spring		2,520	+ 1	2,521			Ravenscrag gravel coal	Med. soft, clear		S,	Indefinite supply, flowing spring.
11	NE.	16	"	"	"	Bored	86	2,580	- 66	2,514	50	2,530	Ravenscrag grey sand	Hard, clear, soda		D, S	Sufficient supply for 11 head stock.
12	SW.	18	"	"	"	Dug	46	2,500	- 39	2,461	39	2,461	Ravenscrag coal	Soft, clear	42	D, S	" " " 50 " " .
13	NW.	18	"	"	"	Bored	112	2,560	- 85	2,475	112	2,448	" " sand	" "		D, S	Over sufficient supply.
14	NW.	19	"	"	"	Spring	4	2,510	+ 1	2,511	4	2,506	Ravenscrag clay	Med. soft, clear	44	D, S	" " " , 5 other springs.
15	NE.	19	"	"	"	Dug	10	2,520	- 5	2,515	10	2,510	" slate stone	" clear	42	D, S	Fair supply for 4 head stock.
16	NW.	21	"	"	"	Bored	100	2,600	- 73	2,527	100	2,500	Ravenscrag coal seam	Hard, soda, iron		D, S	Sufficient supply for 6 head stock.
17	SE.	22	"	"	"	"	105						Ravenscrag yellow sand	Hard, clear	42	D, S	" " " 10 " " .
18	SW.	23	"	"	"	Dug	16	2,565	- 10	2,555	16	2,549	Recent white sand	" " iron		D, S	Not sufficient since 1934.
19	NW.	23	"	"	"	"	9	2,555	- 5	2,550	7	2,548	Recent white sand	Soft,		S,	Sufficient for 13 head stock.
20	NW.	24	"	"	"	"		2,510					Ravenscrag				No information, deserted.
21	SW.	25	"	"	"	"	58	2,520	- 54	2,466	54	2,466	" grey sand	Hard, clear	42	D, S	Sufficient for 10 head stock.
22	NE.	25	"	"	"	Bored	32	2,500	- 22	2,478	32	2,468	Ravenscrag white sand	Soft, "		D, S	" " 6 " " .
23	SE	27	"	"	"	"	80	2,590	- 60	2,530	60	2,530	Ravenscrag	Iron, red sediment		S,	" " 40 " " .
24	SE.	27	"	"	"	Dug	12	2,590	- 6	2,584	12	2,578	Recent white sand	Soft, clear		D, S	" " 25 " " .
25	NW.	27	"	"	"	"	20	2,580	- 14	2,566	14	2,566	Ravenscrag hard blue sand	Mod. soft, clear		D, S	" " 10 " " .
26	NW.	28	"	"	"	Spring		2,550					Ravenscrag coal	Hard, clear alkaline		S,	Over sufficient supply.
27	NE.	28	"	"	"	Dug	20	2,560	- 14	2,546	16	2,544	" blue sand	Hard, clear	44	D, S	Sufficient supply, 32 head stock.

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

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

WELL RECORDS—RURAL MUNICIPALITY OF HART BUTTE NO. 11, SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE: Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED: Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
28	SW.	29	1	25	2	Spring		2,550	+ 1	2,551			Ravenscrag coal seam	Soft, clear	44	S,	Over sufficient supply.
29	SW.	29	"	"	"	Dug	5	2,530	0	2,530	2	2,528	Recent gravel	" "		D, S	Sufficient for 10 head stock.
30	NW.	31	"	"	"	Bored	61	2,580	- 41	2,539	61	2,519	Ravenscrag sand	Hard, "		D, S	" supply.
31	SW.	31	"	"	"	Dug	20	2,590	- 15	2,575	18	2,572	" quick sand	Soft		D, S	Over sufficient supply.
32	SW.	31	"	"	"	Bored	100	2,610	- 80	2,530	100	2,510	Ravenscrag coal-seam	Hard, clear, alkaline		D, S, I	" " for 23 head stock; gardens.
33	SE.	32	"	"	"	Dug	26	2,540	- 21	2,519	21	2,519	Ravenscrag gravel	Soft, clear		D, S	Over sufficient for 9 head stock.
34	NE.	34	"	"	"	Bored	64	2,575	- 49	2,526	50	2,525	Ravenscrag coal	Iron, "	44	D, S	" " " 15 " " .
35	NW.	35	"	"	"	Dug	9	2,555	- 4	2,551	9	2,546	" " seam	Soft, brown		S,	
36	NE.	35	"	"	"	"	26	2,540	- 8	2,532	26	2,514	Ravenscrag blue clay	Hard, alkaline clear		D, S	Over sufficient supply.
37	SE.	36	"	"	"	"	65	2,545			65	2,480	Ravenscrag sand coal	Hard, clear	42	D, S	" " "
38	NW.	36	"	"	"	Bored	85	2,500	- 15	2,485	35	2,465	Ravenscrag coal seam	Hard, clear alkaline	44	D, S	" " " , for 14 head stock
1	SE	1	1	26	2	Dug	54	2,550	- 49	2,501	54	2,496	Ravenscrag coal	Hard, clear, iron	42	D, S	" " " .
2	SW.	3	"	"	"	Bored	16	2,459	- 13	2,446	16	2,443	Recent sand	Hard, iron	43	D,	Sufficient supply. #
3	NW.	3	"	"	"	"	30	2,540	- 8	2,532	30	2,510	Ravenscrag coal	" clear		D, S	" " ,
4	SE.	4	"	"	"	Dug	16	2,465	- 12	2,453	16	2,449	Recent coal, sand	" "	42	D, S	" " , 5 head stock in winter.
5	NE.	5	"	"	"	Bored	32	2,465	- 15	2,450	30	2,435	Glacial gravel	" iron clear	43	D, S	Over sufficient supply. 20 head stock, not good for irrigation.
6	NE.	6	"	"	"	"	43	2,510	- 40	2,470	43	2,467	Ravenscrag gravel	Hard, limy		D, S	Sufficient supply. Water riley before storm.
7	SE.	7	"	"	"	"	42	2,530	- 38	2,492	38	2,492	Ravenscrag gravel	" clear	43	D, S, I	Waters over 25 head stock. Unsatisfactory for irrigation.
8	NW.	9	"	"	"	Dug	13	2,460	- 10	2,450	11	2,449	Recent gravel	Soft, "	43	D,	Sufficient for house, stock waters at creek.
9	NW.	12	"	"	"	Bored	40	2,550	- 35	2,515	35	2,515	Ravenscrag coal	" "	42	D, S	Poor supply, good quality one other well.
10	NE.	12	"	"	"	Dug	20	2,563	- 15	2,548	20	2,543	Glacial gravel	Very soft, clear	43	D, S	Good supply good water, not used now. #
11	SE.	13	"	"	"	Bored	101	2,570	- 80	2,490	101	2,469	Ravenscrag coal	Hard, clear, iron	43	D,	Supplies house only. Laxative effect. Waters 8 head stock; poor quality.
12	NW.	14	"	"	"	"	110	2,520	-100	2,420	100	2,420	" "	Hard, clear, iron	44	S,	Another well 35 feet deep for house use.
13	SE.	16	"	"	"	"	60	2,492	- 50	2,442	60	2,432	" "	Hard, clear, iron	43	D, S	Sufficient supply for 12 head stock.

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

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

WELL RECORDS—RURAL MUNICIPALITY OF HART BUTTE NO. 11 SASKATCHEWAN

WELL No.	LOCATION					TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE		PRINCIPAL WATER-BEARING BED			CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
	¼	Sec.	Tp.	Rge.	Mer.				Above (+) Below (−) Surface	Elev.	Depth	Elev.	Geological Horizon				
14	NW.	16	1	26	2	Dug	10	2,475	- 7	2,468	10	2,465	Recent gravel	Hard,clear, iron		D, S	Sufficient supply; use creek also.
15	SE.	17	"	"	"	"	6	2,500	0	2,500	6	2,494	" sand	Hard,clear, iron	42	D, S	Waters over 10 head stock.
16	SE.	19	"	"	"	Bored	63	2,500	- 59	2,441	63	2,437	Glacial blue clay	Hard,iron		D, S	Sufficient supply.
17	S½.	20	"	"	"	Spring	7	2,480	0	2,480	7	2,473	Recent gravel	" " clear		D,	" " , use creek also.
18	NW.	21	"	"	"	Bored	62	2,540	- 48	2,492	62	2,478	Ravenscrag clay	Hard,clear	42	D, S	" " , slightly laxative. Also 3 dry holes 96', 46',40'.
19	NE.	22	"	"	"	"	65	2,560	- 60	2,500	60	2,500	" sand	" "	42	D, S	Waters 17 head stock, sufficient.
20	SW.	24	"	"	"	Dug	12	2,650	- 9	2,641	9	2,641	Glacial "	" "	43	D, S	Sufficient for 7 head stock only.
21	NW.	26	"	"	"	Bored	73	2,555	- 63	2,492	70	2,485	Ravenscrag gravel	Soft, "	43	D,	" supply for 5 families.
22	NE.	27	"	"	"	Dug	20	2,547	- 17	2,530	20	2,527	Glacial sand	Hard,alkaline		D, S	Insufficient for local needs.
23	SW.	31	"	"	"	"	16	2,570	- 11	2,559	8	2,562	" gravel	" clear	42	D, S	Bad water, not used; stock watered at creek.
24	SE.	31	"	"	"	"	15	2,510	- 14	2,496	15	2,495	Recent "	" "	43	D,	Sufficient for house only.
25	SW.	33	"	"	"	"	35	2,760	- 32	2,728	32	2,728	Ravenscrag	" "	42	D, S	Waters 20 head stock.
26	NW.	33	"	"	"	"	45	2,760	- 10	2,750	40	2,720	" gravel	" iron	44	D, S	Waters over 10 head stock. Poor quality.
27	SW.	35	"	"	"	Bored	65	2,570	- 50	2,520	60	2,510	" sand	" cloudy	43	D, S	Over sufficient supply,45 head stock.
28	NE.	36	"	"	"	"	60	2,640	- 55	2,585	55	2,585	Glacial clay	" clear	42	D, S	Poor supply.
1	SW.	2	1	27	2	Bored	130	2,670	-120	2,550	130	2,540	Ravenscrag coal sand	" "	47	D, S, I	Waters 15 head stock.
2	SE.	5	"	"	"	"	82	2,820	- 75	2,745	?	?	Ravenscrag sand	Soft, clear	44	D, S	Sufficient for 2 head stock.
3	NE.	15	"	"	"	Dug	12	2,575	- 8	2,567	9	2,566	Glacial sand	Med.hard, clear	42	D, S	Waters 9 horses.
4	NW.	15	"	"	"	Bored	172	2,680	-125	2,555	172	2,508	Ravenscrag coal	Hard,iron, rusty	44	D, S	Waters over 5 horses, sufficient.
5	SE.	16	"	"	"	Dug	25	2,690	- 15	2,675	15	2,675	Glacial clay	Med. hard, clear	47	D,	Poor supply. Well goes dry.
6	SW.	17	"	"	"	"	12	2,690	- 1	2,689	12	2,678	" gravel	Soft, clear	41	D, S	Strong supply. Well not used now.
7	NW.	18	"	"	"	Bored	83	2,660	- 24	2,636	24	2,636	Ravenscrag sand	" "	42	D, S	Waters 100 head stock.
8	SW.	19	"	"	"	Dug	33	2,655	- 30	2,625	33	2,622	Glacial sand	Med.Hard, clear	41	D, S	" 13 " " .
9	NW.	20	"	"	"	Bored	215	2,680	-200	2,480	201	2,479	Ravenscrag coal	Med. hard, clear	44	D, S	Waters over 15 head stock.
10	SW.	23	"	"	"	"	72	2,560	- 66	2,494	72	2,488	" quick-sand	Hard,alk-aline,iron	43	S,	Just sufficient for 10 head stock.
11	SW.	27	"	"	"	Dug	16	2,570	- 11	2,559	13	2,557	Glacial sand	Hard,clear	42	D,	Household supply only, another well 95' water used for stock only.
12	NE.	28	"	"	"	Bored	129	2,660	- 85	2,595	129	2,551	Ravenscrag	Soft, clear		D, S	Sufficient supply.

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(#) Sample taken for analysis.

WELL RECORDS—RURAL MUNICIPALITY OF HART BUTTE NO.11 SASKATCHEWAN

WELL No.	LOCATION					TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE		PRINCIPAL WATER-BEARING BED			CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
	¼	Sec.	Tp.	Rge.	Mer.				Above (+) Below (−) Surface	Elev.	Depth	Elev.	Geological Horizon				
13	NW.	28	1	27	2	Bored	110	2,580	-100	2,480	85	2,495	Ravenscrag coal	Hard, clear, iron	43	D, S	Insufficient water 8 head stock only.
14	NW.	32	"	"	"	"	98	2,585	- 86	2,499	50	2,535	" sand	Hard,iron, rusty	43	D, S	Waters 20 head stock, another well 11' soft water for stock.
15	SE.	32	"	"	"	"	86	2,550	- 70	2,480	70	2,480	" "	Soft, clear	45	D, S	Sufficient supply.
16	NW.	33	"	"	"	"	64	2,550	- 40	2,510	60	2,490	" coal	Hard,iron, rusty	44	S,	Water 16 head stock. Used for cooking also, not for drinking.
17	NE.	33	"	"	"	"	40	2,550	- 15	2,535	40	2,510	" sand	Hard,clear iron		D, S	Sufficient supply.
18	NE.	34	"	"	"	"	47	2,520	- 27	2,493			" ?	Hard, iron, alkaline	43	D, S	Waters over 16 head stock.
19	NE.	35	"	"	"	"	60	2,535	- 50	2,485	60	2,475	" coal sand	Hard,clear, iron		D, S	Over sufficient supply. Also use creek for stock.
20	SW.	36	"	"	"	"	36	2,520	- 30	2,490	36	2,484	Ravenscrag sand	Hard, iron, alkaline at times cloudy	42	D, S	Sufficient for house use. Use creek for stock.
21	NE.	36	"	"	"	"	165	2,570	-130	2,440	165	2,405	" "	Soft, iron, alkaline	44	D, S, I	Waters 50 head stock. Garden use fair.
1	NW.	1	2	25	2	Bored	100	2,610	- 80	2,530	80	2,530	Ravenscrag ?	Hard, clear, alkaline		D, S	" over 18 head stock.
2	NW.	2	"	"	"	"	26	2,560	- 10	2,550	26	2,534	" sand	Hard, clear, alkaline		D, S	" " 40 " " .
3	SE.	3	"	"	"	Dug	35	2,610	- 27	2,583	27	2,583	" quick-sand	Hard,clear	42	D, S	Sufficient for 5 horses.
4	NE.	3	"	"	"	Bored	30	2,550	- 20	2,530	20	2,530	? ?	Hard,clear, alkaline	42	D, S	" supply.
5	SW.	4	"	"	"	"	60	2,650	- 35	2,615	60	2,590	Ravenscrag blue sand	Soft, clear	44	D, S	Over sufficient supply.
6	SW.	5	"	"	"	"	72	2,610	- 64	2,546	72	2,538	Ravenscrag sand	Hard,alk-aline		D, S	Waters only 12 head stock.
7	NE.	6	"	"	"	"	28?	2,600	- 24	2,576	28	2,572	" gravel	Hard, clear		N,	
8	NE.	6	"	"	"	Dug	44	2,600	- 36	2,564	36	2,564	" coal sand	" " alkaline	42	D, S	Waters 46 head stock. Creek also used
9	SW.	7	"	"	"	"	10	2,675	- 4	2,671	4	2,671	Ravenscrag gravel	Soft, clear		S,	Waters 30 head stock, not used for house.
10	NW.	7	"	"	"	Bored	96	2,700	- 92	2,608	90	2,610	" coal seam	Hard,iron		D, S	Sufficient for house use. Good before 1929.
11	SW.	10	"	"	"	"	40	2,545	- 25	2,520	25	2,520	Ravenscrag sand	Soft,clear		D, S	Waters over 25 head stock. 4 similar wells.
12	SW.	10	"	"	"	"	48	2,595	- 23	2,572	48	2,547	" coal	Med. soft, clear		D, S	Good supply in another well; sufficient, cannot, be pumped dry.
13	NE.	10	"	"	"	"	104	2,610	- 74	2,536	104	2,506	" clay"	Hard, clear	42	D, S	Waters 10 head stock.
14	NE.	10	"	"	"	"	14	2,605	- 9	2,596	9	2,596	" sand	Soft, "		D, S	Sufficient supply.
15	SE.	12	"	"	"	Dug	30	2,590	- 30	2,560	30	2,560	Glacial clay	" "		D, S	Insufficient, 2 dry holes also.
16	SW.	12	"	"	"	Bored	98	2,600	- 72	2,528	98	2,502	Ravenscrag	Hard,iron, clear		S,	Sufficient for stock.
17	NE.	15	"	"	"	"	112	2,645	- 96	2,549	112	2,533	" blue clay, traces of coal	Soft, clear		D, S	Waters over 30 head stock. Used for washing.

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(#) Sample taken for analysis.

WELL RECORDS—RURAL MUNICIPALITY OF HART BUTTE NO. 11 SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
18	NE.	15	2	25	2	Spring	2	2,635	- 2	2,633	2	2,633	Ravenscrag coal	Hard, clear		D, S	2 horses lost in clay around spring.
19	SE.	16	"	"	"	Bored	38	2,625	- 28	2,597	38	2,587	" sand gravel	Med. soft, clear	46	D, S	Waters 20 head stock. Well can be pumped dry.
20	SE.	17	"	"	"	Spring		2,590	0	2,590	0	2,590	Black mud	Hard		D, S	Small supply. Gradual flow.
21	NW.	17	"	"	"	Dug	17	2,600	- 15	2,585	17	2,583	Glacial quick-sand	Hard, clear	44	D, S	Waters 20 head stock. Spring also used.
22	NE.	17	"	"	"	"		2,580								D, S	Waters 10 cows. Also house use.
23	NW.	18	"	"	"	Bored	50	2,710	- 30	2,680	50	2,660	Ravenscrag sand	Hard, clear		D, S	Insufficient. Haul water in summer.
24	NE.	20	"	"	"	Dug	10	2,650					" "	Soft, "			Plenty of springs in neighbourhood.
25	NW.	21	"	"	"	"	20	2,650	- 23	2,627	30	2,620	" "	Med. hard,	44	D, S	Goes dry in winter.
26	SE.	22	"	"	"	Bored	105	2,630	- 85	2,545	85	2,545	" blue clay	Hard, clear, iron		D,	Only ¼ tank at one pumping.
27	SE.	22	"	"	"	Spring	4	2,630	0	2,630	4	2,626	Ravenscrag coal	Hard, clear, iron		D, S	Flowing spring. 8 tanks a day.
28	NE.	22	"	"	"	Dug	25	2,680	- 15	2,665	13	2,667	" "	Hard, clear, iron		D, S	Insufficient for 6 head stock. 3 dry holes.
29	NE.	22	"	"	"	"	16	2,640									No water.
30	SW.	23	"	"	"	Bored	72	2,605	- 64	2,541	70	2,535	Ravenscrag sand	Hard, clear, iron		D,	Well never pumped dry.
31	NW.	24	"	"	"	Spring	4	2,585	- 3	2,582	4	2,581	" white mucky sand	Hard, clear, iron		D, S	Continuous small flow.
32	NW.	24	"	"	"	Bored	110	2,615	- 80	2,535	80	2,535	Ravenscrag black silt	Hard, clear, iron		D, S	Pump 1/3 tank at a time, refills in one hour.
33	SE.	25	"	"	"	Dug	12	2,585	- 8	2,577	8	2,577	Ravenscrag above shale	Med. hard, clear		D,	1 bbl. a day. Slow supply.
34	NE.	25	"	"	"	"	24	2,605	- 21	2,584	21	2,584	Ravenscrag clay	Soft, clear	44	D, S	Sufficient for 10 head stock, washing use.
35	NW.	25	"	"	"	Spring		2,575	0	2,575	0	2,575	" coal	Hard, "		D, S	Suppiles several neighbours.
36	SW.	27	"	"	"	Bored	40	2,680	- 30	2,650	30	2,650	" fine sand	Med. hard, clear	44	D, S	Waters 20 head stock.
37	NE.	27	"	"	"	"	135	2,700			135	2,565		Soft, cloudy		D, S	Sufficient supply.
38	SW.	30	"	"	"	Dug	6	2,700	- 3	2,697	6	2,694	Ravenscrag coal	Hard, clear		D, S	Sufficient in summer. Haul water in winter.
39	NW.	31	"	"	"			2,750	+ 1	2,751			" gravel	" iron		S,	Sufficient water, difficult to get.
40	NE.	32	"	"	"	Spring		2,900	+ 1	2,901			" fine sand	Med. soft, clear		D, S	Over sufficient. Several other springs.
41	NE.	34	"	"	"	Bored	52	2,700	- 45	2,655	52	2,648	Ravenscrag blue sand	Hard, clear		D, S	Insufficient supply.
42	NE.	35	"	"	"	Dug	18	2,695	- 14	2,681	15	2,680	Ravenscrag sand	Soft, "		D, S	Not sufficient, only 2 bbls. a day.
43	SE.	36	"	"	"	"	10	2,645	- 9	2,636	9	2,636	" iron stone	" "		D,	Only sufficient for house. Dry in 1933.
44	?	18	"	"	"	Bored	60	2,700	- 10	2,690	60	2,640	Bedrock clay	Hard, cloudy		S,	Not sufficient, needs better supply.

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(#) Sample taken for analysis.

WELL RECORDS—RURAL MUNICIPALITY OF HART BUTTE NO. 11 SASKATCHEWAN

WELL No.	LOCATION					TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE		PRINCIPAL WATER-BEARING BED			CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
	¼	Sec.	Tp.	Rge.	Mer.				Above (+) Below (−) Surface	Elev.	Depth	Elev.	Geological Horizon				
1	SE.	2	2	26	2	Dug	53	2,650	- 46	2,604	26	2,624	Ravenscrag clay	Hard, clear	42	D,	Only sufficient for house. 9' well for stock.
2	SW.	4	"	"	"	"	60	2,680	- 53	2,627	58	2,622	" sand	" "	40	D, S	Several other wells, poor supply, not sufficient only waters 8 head stock.
3	NW.	4	"	"	"	"	35	2,650	- 32	2,618	32	2,618	" "	" iron	42	D, S	Waters 15 head stock.
4	NE.	5	"	"	"	Bored	60	2,600	- 50	2,550	60	2,540	" " below coal	clear Hard, rusty	42	D, S	Over sufficient supply.
5	SW.	10	"	"	"	"	94	2,800	- 80	2,720	94	2,706	Ravenscrag sand	" clear, iron	43	D, S	Only waters 10 head stock. Not sufficient for all stock.
6	SE.	12	"	"	"	Dug	30	2,645	- 24	2,621	30	2,615	" coal	Hard, " iron	42	D, S	Sufficient for 20 head stock.
7	NE.	16	"	"	"	Bored	90	2,700	- 70	2,630	90	2,610	" sand	Hard, " iron	42	D, S, I	Very strong supply, garden use.
8	SW.	16	"	"	"	Spring		2,585	0	2,585			" coal	Hard, "	42	D, S	Over sufficient for 75 head stock.
9	SE.	17	"	"	"	Bored	90	2,600	- 72	2,528	90	2,510	" gravel, coal	" " gas	42	D, S	" " " 75 " " , but used for house only.
10	NE.	17	"	"	"	"	84	2,625	- 67	2,558	84	2,541	Ravenscrag sand	Hard, clear	42	D, S	Waters over 26 head stock; good supply, one 50' well.
11	NE.	20	"	"	"	Dug	14	2,640	- 8	2,632	14	2,626	" coal	" " iron	42	D, S	Over sufficient, 5 springs, water from coal.
12	NE.	20	"	"	"	Bored	60	2,660	- 40	2,620	60	2,600	" "	Hard, " iron	42	S,	Laxative. Over sufficient supply 10 head stock.
13	SW.	22	"	"	"	"	76	2,725	- 64	2,661	76	2,649	" sand	Hard, " iron	42	D, S	46' well, glacial supply good.
14	NW.	22	"	"	"	"	48	2,780	- 45	2,735	48	2,732	" quick-sand, claybase	Med. hard, clear	43	D, S	Insufficient for 6 head stock.
15	NE.	22	"	"	"	"	60	2,750	- 56	2,694	60	2,690	Ravenscrag sand	Hard, clear	43	D, S	Waters 6 head stock. Good supply.
16	SW.	24	"	"	"	"	30	2,805	- 24	2,781	30	2,775	" "	Slightly hard, clear	42	D, S	Over sufficient; another 15' seepage well.
17	SE.	25	"	"	"	Dug	45	2,740	- 35	2,705	40	2,700	" gravel	" "		D, S	Waters 40 head stock. Good quality.
18	SE.	28	"	"	"	Bored	45	2,790	?		45	2,745	" sand	" "		D, S	No information.
19	NE.	30	"	"	"	Spring		2,570	0	2,570			" "	" "	43	D, S, I	Waters 5 head stock and garden irrigation.
20	NW.	32	"	"	"	Bored	80	2,620	- 55	2,565	80	2,540	" clay	" "	45	D, S	Waters over 10 head stock.
21	NE.	33	"	"	"	Dug	6	2,750	- 4	2,746	6	2,744	" sand gravel	Soft, clear		D, S	Sufficient for household.
22	SW.	34	"	"	"	"	8	2,800	- 1	2,799	8	2,792	Glacial gravel	Med. hard clear		D, S	" " " .
1	SE.	1	2	27	2	Bored	23	2,500	- 18	2,482	18	2,482	Ravenscrag sand	Soft, clear	42	D, S	Waters 8 head stock. Sufficient.
2	SE	2	"	"	"	"	45	2,510	- 25	2,485	25	2,485	" clay	" "	43	D, S	Sufficient for 8 head stock, stock uses creek. also.
3	NE.	2	"	"	"	Dug	45	2,520	- 41	2,479	45	2,475	" "	Hard, clear, alkaline	43	D, S	Sufficient for 8 head stock.
4	NW.	2	"	"	"	Bored	22	2,490	- 18	2,472	22	2,468	" sand	Hard, clear, alkaline	43	D, S	Waters 12 head stock. Also use creek.
5	SE.	3	"	"	"	Dug	10	2,530	- 9	2,521	10	2,520	Moraine, glacial gravel	Hard, clear, alkaline		N,	Stock water at creek. Haul drinking water.

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

WELL RECORDS—RURAL MUNICIPALITY OF HART BUTTE NO.11 SASKATCHEWAN

WELL No.	LOCATION					TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE		PRINCIPAL WATER-BEARING BED			CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
	¼	Sec.	Tp.	Rge.	Mer.				Above (+) Below (−) Surface	Elev.	Depth	Elev.	Geological Horizon				
6	NW.	4	2	27	2	Dug	4	2,470	0	2,470	1	2,469	Ravenscrag sand	Soft, clear, iron	48	D,	Stock water at creek, sufficient.
7	SE.	7	"	"	"	"	48	2,610	- 35	2,575	35	2,575	" gravel	Hard, clear, iron	44	S,	Laxative. Waters 30 head stock.
8	SE.	10	"	"	"	"	5	2,500	-	2,500	1	2,499	" sand	Hard, clear	43	D, S	Waters 20 head stock. Slow flow, sufficient.
9	NW.	11	"	"	"	Bored	75	2,565	- 69	2,496	70	2,495	" clay gravel	Hard, clear		M,	Sufficient for 10 families. 6 other wells in town; all can be pumped dry except one.
10	NW.	12	"	"	"	"	148	2,630	-145	2,485	148	2,482	Ravenscrag quick-sand	Med. hard, clear	43	D, S	Insufficient, water hauled, quicksand chokes well.
11	SE.	13	"	"	"	"	55	2,560	- 52	2,508	55	2,505	Glacial clay	Hard, clear	42	D, S	Insufficient for 4 head stock.
12	SW.	14	"	"	"	Dug	52	2,580	- 48	2,532	52	2,528	Ravenscrag gravel	Soft, "	44	D, S	Good supply, good water; 17 head stock.
13	SW.	16	"	"	"	Bored	42	2,590	- 26	2,564	42	2,548	" black-sand	Hard, " iron	43	D, S, I	Over sufficient 28 head stock and garden.
14	NE.	18	"	"	"	"	49	2,590	- 4	2,586	49	2,541	Ravenscrag gravel	Hard, " iron	42	D, S	Waters 50 head stock and garden, over sufficient.
15	NW.	18	"	"	"	"	63	2,620	- 16	2,604	63	2,557	" "	Hard, " alkaline	44	D, S	Over sufficient for 10 head stock.
16	NE.	19	"	"	"	"	85	2,650	- 75	2,575	85	2,565	" sand	Hard, clear	42	D, S	Good supply. Good quality, 14 head stock.
17	SE.	20	"	"	"	"	90	2,660	- 80	2,580	90	2,570	" coal sand	" clear alkaline	42	D, S	Waters 8 head stock, sufficient.
18	NW.	21	"	"	"	"	95	2,670	- 75	2,595			Ravenscrag	Hard, alkaline clear	44	D, S	Waters 18 head stock, sufficient.
19	SE.	21	"	"	"	"	96	2,650	- 80	2,570	96	2,554	" sand	Slightly hard iron, clear	41	D, S, I	Over sufficient 17 head stock and gardens.
20	SE.	21	"	"	"	"	110	2,620	- 95	2,525	100	2,520	" blue sand	Hard, clear, alkaline	43	D, S	" " 50 " ".
21	SW.	23	"	"	"	"	60	2,650	- 50	2,600	51	2,599	Ravenscrag coal	Soft, clear, cloudy	44	D, S	Insufficient for more than 12 head stock.
22	SE.	23	"	"	"	"	144	2,620	-135	2,485	135	2,485	" sand	Hard, iron	44	S,	Sufficient for 25 head stock.
23	NE.	23	"	"	"	"	64	2,620	- 36	2,584			? ?	Med. hard, clear	44	D, S	" " 4 " " .
24	SW.	24	"	"	"	"	63	2,620	- 50	2,570	60	2,560	Ravenscrag sand	Hard, clear	42	D,	Good supply. Several farmers haul water from here.
25	NW.	25	"	"	"	"	34	2,620	- 23	2,597	34	2,586	" gravel	Med. hard, clear	40	D, S	Sufficient supply.
26	NW.	26	"	"	"	"	60	2,625					" clay			N,	Use spring on N,E 26.
27	SE.	27	"	"	"	"	96	2,680	- 80	2,600	96	2,584	" coal gravel	Hard, clear	44	D, S	Waters 15 head stock only.
28	NE.	28	"	"	"	"	59	2,630	- 45	2,585	45	2,585	Ravenscrag sandy clay	" "	44	D, S	Sufficient for 8 head stock, good quality.
29	SW.	28	"	"	"	"	110	2,680	-100	2,580	110	2,570	Ravenscrag sand	" " alkaline	44	S,	Laxative. Waters over 6 head stock.
30	SW.	30	"	"	"	"	96	2,575	- 84	2,491	96	2,479	" " coal	Hard, clear	44	D, S	Good supply for 9 head stock, good quality.
31	SW.	33	"	"	"	"	100	2,700	- 80	2,620	100	2,600	Ravenscrag sand	Slightly hard clear	40	D, S	Waters over 10 head stock.
32	NW.	33	"	"	"	"	98	2,700	- 80	2,620	80	2,620	"	Soft, clear	44	D, S	" " 80 " " . Excellent quality.

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WELL RECORDS—RURAL MUNICIPALITY OF HART BUTTE NO. 11 SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
33	SW.	34	2	27	2	Bored	61	2,675	- 30	2,645	50	2,625	Ravenscrag	Hard, clear	42	D, S	Waters 10 head stock, good quality.
34	SE.	35	"	"	"	"	75	2,650	- 50	2,600	60	2,590	" gravel	Soft, "	43	D, S	" 15 " " , " " .
35	NE.	36	"	"	"	Dug	10	2,710	- 7	2,703	7	2,703	Recent gravel	Med. hard clear	45	D, S	" over 30 head stock, also creek.
1	NW.	2	3	25	2	Spring		2,840	+ 1	2,841			Ravenscrag coal	Soft, clear		D,	Sufficient for house use. Washing
2	NW.	2	"	"	"	Dug	8	2,820	0	2,820	8	2,812	" blue clay	Hard, clear, alkaline		S,	Insufficient, 60 head stock in winter. Goes dry in summer.
3	SW.	4	"	"	"	"	6	2,880	- 2	2,878	2	2,878	Ravenscrag blue clay sand	Med. soft, clear		D, S	Fair supply in ordinary years.
4	SW.	4	"	"	"	"	14	2,870	- 10	2,860	10	2,860	Ravenscrag clay sand	Med. soft, clear		D, S	Waters 15 head stock.
5	NE.	5	"	"	"	"	8	2,930	- 3	2,927	3	2,927	Glacial sand gravel	Soft, clear		D, S	Supplies 20 head stock or more.
6	NW.	6	"	"	"	Bored	60	2,800	?	?	?	?	Ravenscrag			N,	Dry holes.
7	SW.	7	"	"	"	Dug	8	2,800	- 4	2,796	4	2,796	" quick-sand	Hard, clear		D, S	Suppiles 36 head stock.
8	NW.	7	"	"	"	Bored	30	2,800	- 12	2,788	30	2,770	Ravenscrag fine sand	" "	45	D, S	Supplies 30 head stock and house.
9	SW.	8	"	"	"	"	80	2,930	- 35	2,895	80	2,850	Ravenscrag sand	" "	50	D, S	Only sufficient for 2 head stock.
10	NW.	8	"	"	"	Spring		2,790	- 0	2,790			" gravel	" iron			Excellent supply, 10 gals. a minute.
11	NW.	9	"	"	"	"	2	2,800	0	2,800	2	2,798	" coal	" "		S,	Continuous small flow.
12	NE.	9	"	"	"	Dug	6	2,710	- 1	2,709	6	2,704	" gravel	" clear, iron		D, S	Small steady supply.
13	NE.	9	"	"	"	Spring		2,710	0	2,710			Ravenscrag	Med. hard, clear		D,	Small flow, only used for house.
14	SW.	10	"	"	"	"		2,830	0	2,830			"			S,	Small steady supply.
15	SE.	12	"	"	"	Bored	140	2,700	-132	2,568	132	2,568	" quick-sand	Soft, iron, red		N,	Cannot be pumped dry.
16	SE.	12	"	"	"	Springs		2,625	0	2,625			Ravonscrag	Hard, clear, iron		S,	Continuous small supply in coulee.
17	NW.	12	"	"	"	Dug	8	2,700	0	2,700	0	2,700	" quick-sand	Hard, " iron		D, S	Good supply, flows quickly.
18	NW.	12	"	"	"	"	11	2,650	- 9	2,641	9	2,641	Ravenscrag gravel	Med. hard, clear		D, S	Good supply.
19	NE.	12	"	"	"	Spring		2,600	+ 2	2,602	2	2,598	" clay	Hard, clear, iron		D, S	Strong flow.
20	SE.	15	"	"	"	Dug	15	2,790	- 3	2,787	3	2,787	Recent sand clay	Hard, clear, alkaline		D,	Insufficient for house, haul salt water.
21	SE.	15	"	"	"	Bored	60	2,790					Ravenscrag blue clay			N,	Dry hole.
22	NW.	15	"	"	"	Dug	11	2,760	- 8	2,752	9	2,751	Glacial gravel	Hard, clear		D, S	Sufficient only for 6 head stock, several other small wells.
23	NW.	16	"	"	"	"	4	2,640	0	2,640	4	2,636	Recent sand and gravel	" "		S,	This was a good spring. Insufficient, only waters 8 head stock.
24	NW.	16	"	"	"	"	14	2,640	- 10	2,630	10	2,630	Glacial gravel clay	" " alkaline		D. S	Sufficient for 30 head stock.

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WELL RECORDS—RURAL MUNICIPALITY OF HART BUTTE NO. 11 SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
25	NW.	16	3	25	2	Dug	24	2,640	- 8	2,632	8	2,632	Ravenscrag coal sand	Hard, clear, alkaline		S,	Sufficient.
26	SE.	18	"	"	"	Bored	60	2,800					Ravenscrag blue clay gravel			N,	No water.
27	NW.	18	"	"	"	"	28	2,820	- 23	2,797	26	2,794	Glacial yellow sand	Hard, clear		D, S	Insufficient, uses 2 other wells also.
28	NW.	18	"	"	"	Dug	14	2,820	- 10	2,810	13	2,807	Glacial yellow sand	" "		D, S	" " 2 " " . "
29	NW.	22	"	"	"	"	24	2,600	- 22	2,578	22	2,578	Ravenscrag sandy clay	" "		D,	Only sufficient for house.
30	SW	25	"	"	"	Spring		2,340	+ 1	2,341			Ravenscrag coal seam	" " alkaline	47	S,	Over sufficient supply.
31		30	"	"	"	"		2,500	+ 1	2,501			Ravenscrag coal seam	Hard, clear, alkaline		S,	" " " .
1	NW.	2	3	26	2	Dug	20	2,775	- 16	2,759	20	2,755	Ravenscrag clay	Hard, clear alkaline, iron	42	D,	Water hauled from spring ½ mile west. Sufficient for house use only.
2	NW?	7	"	"	"	Spring		2,550	+ 1	2,551			"	Med. hard, clear, iron	47	D, S	Waters over 40 head stock. Springs feeds east Poplar creek.
3	NW.	9	"	"	"	Dug	46	2,800	- 38	2,762	46	2,754	" sand	Hard, clear, iron	42	D, S	Sufficient for 15 head stock.
4	NE.	9	"	"	"	Bored	18	2,770	- 14	2,756	18	2,752	" "	Hard, " iron		S,	" " 8 " ".
5	NW.	14	"	"	"	Dug	20	2,700					" "	Hard, " iron		N,	Dry hole, water hauled.
6	NW.	16	"	"	"	Bored	174	2,820	-156	2,664	174	2,646	" coal	Hard, iron, rusty	44	D, S	Waters over 60 head stock, 2 dry holes.
7	NE.	19	"	"	"	"	80	2,815	- 70	2,745	80	2,735	" sand stone	Hard, clear	41	D, S	" " 45 " " , good quality.
8	SW.	20	"	"	"	"	125	2,850			125	2,725	Ravenscrag coal seam	" "	42	D, S	" " 35 " ", another 14' well dry.
9	NE.	21	"	"	"	"	136	2,800	-120	2,680	136	2,664	Ravenscrag coal seam	Hard, rusty, iron, alkaline	43	S,	Shallow well for drinking water. Water 50 head stock, not good for house use.
10	SE.	22	"	"	"	Dug	22	2,840					Glacial clay	Hard, clear		N,	Very small supply, haul water.
11	SE.	26	"	"	"	Bored	24	2,750	- 20	2,730	24	2,726	" sand	" "	42	D, S	Waters over 15 head stock. Spring supply along Big Muddy Valley.
12	NE.	30	"	"	"	"	35	2,800	- 15	2,785	35	2,765	" "	" "	43	D, S	Insufficient, only waters 10 head stock.
13	SE.	31	"	"	"	"	45	2,725					" "	" "		N,	Dry for 3 years, a small supply.
14	SW.	33	"	"	"	"	140	2,650	-110	2,540	110	2,540	Ravenscrag	"oily blue substance on top		S,	No remarks.
1	SW.	2	"	"	"	Bored	84	2,790	- 78	2,712	84	2,706	Glacial sand	Hard, iron, rusty	44	D, S	Sufficient for 22 head stock.
2	SE.	2	"	"	"	"	42	2,825			42	2,783	Ravenscrag sand	Hard, clear	46	D, S	Sufficient.
3	SE.	3	"	"	"	"	120	2,810			120	2,690	" blue sand	" "		D, S	Steady supply.
4	SW.	3	"	"	"	"	80	2,790	- 75	2,715	80	2,710	Ravenscrag sand	Med. hard, clear	42	D, S	Waters over 25 head stock.
5	SW.	5	"	"	"	"	37	2,680	- 34	2,646	37	2,643	Glacial sand	Hard, iron, rusty	44	D, S	Poor supply, poor quality.

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WELL RECORDS—RURAL MUNICIPALITY OF HART BUTTE NO. 11 SASKATCHEWAN

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
6	SW.	6	3	27	2	Bored	80	2,642	- 52	2,593	28	2,617	Ravenscrag coal	Hard, iron, rusty	43	D, S	Supplies 8 head stock, sufficient.
7	NW.	9	"	"	"	"	40	2,765	- 23	2,742	23	2,742	" gravel	Hard, clear	42	D, S, I	Waters 10 head stock, poor irrigation.
8	NE.	14	"	"	"	Dug	20	2,590	- 15	2,575	20	2,570	" sandy clay	" "	43	D,	Oversufficient; water stock at creek.
9	SW.	14	"	"	"	Bored	110	2,700	-100	2,600	110	2,590	Ravenscrag	Soft, "		D, S	Sufficient supply.
10	SE.	16	"	"	"	Spring		2,760	+ 1	2,761			" sand	Med. hard, clear	43	D, S	Over sufficient for 25 head stock.
11	SE.	17	"	"	"	Bored	54	2,810	- 44	2,766	30	2,780	" gravel	Hard, clear	42	D, S	Sufficient for 10 head stock, also use dam.
12	NE.	18	"	"	"	"	32	2,725	- 28	2,697	32	2,693	" coal	Med. hard, clear	47	D,	Sufficient for house; use spring for stock.
13	NE.	19	"	"	"	"	60	2,770	- 10	2,760	60	2,710	" sand	Soft, clear	42	D, S	Waters 30 head stock, good quality.
14	NE.	20	"	"	"	Dug	5	2,750	- 3	2,747	5	2,745	Glacial sand	Hard, "	44	D,	Good supply, use another spring for stock.
15	NW.	21	"	"	"	Bored	30	2,700	- 15	2,685	30	2,670	" "	" "	42	D, S	Good supply, 10 head stock, good quality.
16	SE.	22	"	"	"	"	74	2,650	- 54	2,596	74	2,576	Ravenscrag coal	" " iron	40	D, S	Excellent supply, waters 165 head stock at one time.
17	NE.	25	"	"	"	"	70	2,700	- 58	2,642	70	2,630	" "	Hard, clear, iron	43	D, S	Waters 15 head stock easily.
18	NE.	26	"	"	"	"	80	2,660	- 65	2,595	70	2,590	" "	Hard, iron, rusty	43	D, S	Waters over 18 head stock, another 20' well.
19	NE.	27	"	"	"	"	32	2,640	- 20	2,620	20	2,620	Glacial clay	Hard, clear		D, S	Sufficient only in summer.
20	SE.	28	"	"	"	"	100	2,700	- 98	2,602	98	2,602	Ravenscrag sand	" "	40	D, S	Waters 40 head stock, slow supply.
21	SE.	30	"	"	"	"	55	2,770	- 48	2,722	55	2,715	" "	Med. hard, clear	43	D, S	Waters over 30 head stock, also spring SW. 29.
22	NW.	30	"	"	"	"	48	2,760	- 38	2,722	48	2,712	" "	Med. hard, clear	42	D, S	Waters over 10 head stock, also flowing spring.
23	NW.	31	"	"	"	"	60	2,720	- 30	2,690	54	2,666	" coal	Hard, clear, iron	41	D, S	Over sufficient.
24	SE.	32	"	"	"	"	50	2,690	- 35	2,655	50	2,640	" sand	Hard, clear, iron	42	D, S	Waters 15 head stock, also 70' well needs cleaning.
25	SE.	34	"	"	"	"	45	2,640	- 40	2,600	45	2,595	Glacial sand	Iron		S,	Insufficient supply.
26	SW.	36	"	"	"	"	97	2,710	- 89	2,621	97	2,613	Ravenscrag sand	Hard, rusty, iron	45	S,	Waters 20 head stock, use shallow seepage well for drinking.
27	NW.	36	"	"	"	"	108	2,705	- 96	2,609	108	2,597	" "	Hard, clear, iron	43	S,	Waters 10 head stock, use shallow well for drinking.

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