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BUREAU OF ECONOMIC GEOLOGY

GEOLOGICAL SURVEY

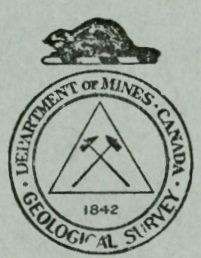
PRELIMINARY REPORT

GROUND-WATER RESOURCES OF THE RURAL MUNICIPALITY OF ELMA No. 291 SASKATCHEWAN

BY

B. R. MacKay, H. N. Hainstock & G. Graham

Water Supply Paper No. 205



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CONTENTS

Illustrations

GROUND WATER RESOURCES OF THE RURAL MUNICIPALITY OF ELMA, NO. 291 SASKATCHEWAN

INTRODUCTION

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

Publication of Results

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

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

How to Use the Report

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

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

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

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

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

GLOSSARY OF TERMS USED

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

WATER-BEARING HORIZONS OF THE MUNICIPALITY

The rural municipality of Elma, No. 291, an area of 216 square miles in the western part of Saskatchewan, consists of six townships described as tps. 28, 29, and 30, ranges 25 and 26, W. 3rd mer. The centre of the municipality is located 20½ miles east of the Fourth meridian, which forms the boundary between Saskatchewan and Alberta, and 171 miles north of the International Boundary line. A branch line of the Canadian National railways enters the municipality in sec. 25, township 28, range 25, and follows a valley in a northwesterly direction through the southern part of the area and leaves the municipality in sec. 19, tp. 29, range 26. The hamlet of Pinkham and the village of Flaxcombe are located on the railway in township 28, range 25, and township 29, range 26, respectively. The village of Flaxcombe is also located on Provincial Highway No. 7, which runs due east and west through the municipality.

The greater part of the municipality is covered by boulder clay or glacial till. A fairly large area in the central part, and a few small areas scattered mainly throughout the southwestern half, are mantled by moraine. In a small area in township 28, range 25, glacial lake clay overlies the boulder clay. Recent deposits of lake sands and silts cover the glacial drift along the floor of the valleys in townships 28 and 30, range 25, and a small deposit of dune sand occurs near the centre of the municipality. The ground surface throughout the municipality is rolling, and in the moraine-covered areas it becomes fairly hilly and rough. Ravines and valleys are common, the main one being that followed by the railway line. Undrained depressions are of frequent occurrence, but they do not contain water throughout the year. A fairly large, marshy depression, locally known as Dewar lake, occurs in the northwestern part of

township 30, range 26. The elevation varies from less than 2,200 feet to more than 2,500 feet above sea-level. The hamlet of Pinkham is at an elevation of 2,216 feet, and the village of Flaxcombe at 2,343 feet above sea-level.

Water-bearing Horizons in the Unconsolidated Deposits

Small quantities of water probably can be obtained at shallow depth from the Recent deposits of dune sand, but these deposits have not been prospected for water. The water from wells sunk in dune sands in other municipalities is moderately soft and is satisfactory for domestic purposes.

The lake deposits that mantle the floor of the valley located near the town of Pinkham were found to be water-bearing. The water-bearing deposits are located at shallow depths, usually less than 20 feet, but the water obtained from these deposits is very highly mineralized, and is not used for household purposes. The water from some of the wells is even too highly mineralized to be used for stock. The lake deposits in the northeastern part of the municipality yield water that is much better in quality. One well in sec. 25, tp. 30, range 25, dug to a depth of 10 feet, yielded a fairly abundant supply of moderately soft water that was used for domestic purposes as well as for stock. It appears probable that other wells sunk in these deposits in this area would yield water of similar quality. Before a well site is finally selected it is advisable to locate a water-bearing deposit by means of a small auger.

The glacial lake clay occurring in township 28, range 25, does not appear to contain water, and any water encountered in this area will probably be derived from water-bearing deposits in the underlying boulder clay.

A few wells have been sunk near undrained depressions in the moraine- and till-covered areas. In years of normal rainfall these wells yield sufficient water for domestic needs and a few head of stock. The supply, however, is easily depleted by drought conditions. As the water table lowers, the supply can be maintained by deepening the well. Shallow wells dug beside dams or dugouts usually yield sufficient water for domestic use and a few head of stock. Care should be taken, however, to see that the water does not become contaminated, and it is advisable to have the water tested frequently for bacteria content. Scattered pockets of sand and gravel occur in the weathered zone of the deposits of moraine and till, and are located generally within 30 feet of the surface. In some small areas these deposits appear to be fairly numerous, but they do not form a continuous water-bearing horizon. A number of wells in this municipality obtain water from these deposits. The supply varies considerably and some of the wells are noticeably affected by continued drought. The water varies from moderately soft to hard, but it is generally suitable for domestic needs as well as for stock.

Most of the wells in this municipality are deriving their supply from scattered pockets of sand and gravel that occur in the lower or unweathered zone of the glacial drift. In the moraine-covered area the pockets are encountered at depths of 10 to 90 feet, but in the boulder clay-covered area they are encountered at depths of 10 to 160 feet. With the exception of the area outlined by the "A" boundary line, where the water-bearing deposits appear to be fairly continuous, the pockets of sand and gravel are of scattered distribution and do not form a continuous water-bearing horizon. No dry holes were reported, however, and no great difficulty should be experienced in obtaining water in most parts of the municipality. In some areas,

however, the yield is inadequate for local needs and two or more wells are used to obtain sufficient water for local requirements. The water varies considerably in quality, is hard and quite highly mineralized, but it is used in most instances for both domestic purposes and for stock.

A few dugouts are used for the collection and retention of surface water for stock. They could be advantageously employed in a number of areas in this municipality. They should be excavated to a depth of at least 12 feet and be large enough to retain a supply of water that will last throughout the year. Suitable locations also exist for the construction of small dams. The supply from springs can often be increased by digging out and cribbing the spring and by excavating a reservoir to retain the overflow water.

Water-bearing Horizons in the Bedrock

Throughout most of the municipality the Belly River formation immediately underlies the glacial drift. A narrow area in the northeastern corner of the municipality is underlain by the Bearpaw formation. The Bearpaw formation is thought to be very thin and it does not appear probable that it contains water-bearing horizons. No wells have been drilled into the bedrock in this municipality. In the municipality directly to the north water is obtained at elevations of 2,150 to 2,245 feet above sea-level from what is thought to be the Bearpaw formation. In the municipality of Kindersley, lying east of the municipality of Elma, water is also obtained from aquifers in the bedrock at similar elevations. In the municipality directly west of Elma bedrock is reported to occur at elevations of 2,135 to 2,200 feet above sea-level. It is possible, therefore, that the contact of the bedrock and glacial drift in this municipality occurs at

elevations of 2,135 to 2,200 feet. Water-bearing horizons no doubt occur in the Belly River formation. The horizons may not be continuous in the upper part of the formation, but horizons of considerable areal extent probably occur in the lower part. As adequate supplies of water are obtained, however, from the glacial drift it is not necessary to drill into the bedrock in search of water.

GROUND WATER CONDITIONS BY TOWNSHIPS

Township 28, Range 25

The ground surface of this township is very rolling and a deep ravine occurs in sections 25, 26, 27, 28, 32, and 31. The floor of this ravine in the eastern part of the township is mantled by a few feet of Recent lake sands and silts. Parts of sections 1, 12, and 13 are covered by glacial lake clay, and morainic deposits mantle a narrow area in the southwestern corner and part of section 11. The remainder of the township is overlain by boulder clay or glacial till.

The lake deposits are not thought to be more than 20 feet thick and only one well, located in the NW.$\frac{1}{4}$, section 27, and which derives its water from these deposits, is being used. Other wells have been dug in the deposits, but the water was so highly mineralized that they were filled in. It should not be difficult to obtain water from this source but most of the water so obtained will probably prove to be unsuitable for any farm purpose.

No wells have been dug in the glacial lake clays in this township. It is possible that small quantities of water can be obtained from deposits of sand that may occur at or near the contact of the lake clay and the underlying boulder clay. Test holes should be drilled with small hand augers before a well is dug.

The deposits of moraine and boulder clay generally consist of a few feet of top soil; a weathered or oxidized zone of clay that contains scattered pockets of sand and gravel in its lower part; and an unweathered zone of dark grey to blue, compact clay that contains scattered pockets of sand and gravel. The pockets of sand and gravel in the weathered zone of the drift form the source of supply for approximately one-half the wells in

this township. The deposits do not form a continuous water-bearing horizon and the wells that tap them are interspersed among wells that derive their supply from water-bearing deposits in the lower part of the drift. As the pockets are of local distribution dry holes will probably be dug before a producing well is obtained. It is advisable to locate these deposits by means of a small auger before digging a well. The supply from these shallow wells is usually sufficient for local needs and only a few wells yield supplies that are more than adequate for local requirements. The water varies from moderately soft to hard, but the concentration of mineral salts in solution is not so great as to render the water unfit for domestic purposes.

The remainder of the wells in this township are deriving their supply from pockets of sand and gravel that are scattered throughout the lower or unweathered zone of the glacial drift. They occur at depths of 40 to 160 feet, and most of the deposits are encountered at depths between 80 and 130 feet. The deposits show some continuity in small areas, but they do not form a continuous water-bearing horizon. The supply from the deeper wells is small, and many of the wells do not produce sufficient water for local needs. The water is hard, and generally highly mineralized, and on a number of farms it is necessary to haul water for domestic needs. Many of the wells are being used for household needs since water of better quality is not obtainable. Dugouts and dams have not been used in this township and these means of collecting and storing surface water for stock use can be advantageously employed. Wells sunk near these reservoirs yield suitable water for domestic needs.

Township 28, Range 26

The ground surface of this township is very uneven. It is quite hilly in the northern part, but becomes more level in

the southern part. With the exception of a narrow area in the northwestern corner, and parts of sections 13 and 24 that are mantled by moraine, the township is overlain by boulder clay or glacial till. Recent alluvium may occur in some of the larger valleys.

No wells have been dug in the morainic deposits, but the water conditions should be as good as, if not better than, those in the boulder clay-covered areas. The boulder clay generally consists of a few feet of top soil; a zone of light-coloured weathered clay that contains a fairly large number of pockets of sand and gravel; and a zone of unweathered, compact, blue clay in which scattered deposits of water-bearing sand and gravel are also encountered.

The pockets of water-bearing sand and gravel in the weathered zone of the drift constitute the chief source of water supply in this township, and although they do not form a continuous horizon they are of frequent occurrence. Several dry holes may be dug before a producing deposit is tapped, but little difficulty should be experienced in obtaining water from this source. It is advisable, however, to locate the deposits by means of a test auger before digging a well. The supply of water from these shallow wells varies considerably. Some of the wells yield an over sufficient supply, whereas others yield inadequate supplies for farm needs. In some localities two or more wells are used in order to obtain a sufficient supply of water for local requirements. The water varies from moderately soft to hard, and with few exceptions it is suitable for domestic purposes. Two springs located in sections 18 and 28 yield a large supply of water that is used only for stock, although it is not recorded as being unsatisfactory for domestic use.

A number of wells in this township obtain water from the sand or gravel deposits that occur in the unweathered zone of the glacial drift. No dry holes are recorded in this township, which suggests that the deposits are of fairly frequent occurrence. Over small areas there appears to be some continuity in the occurrence of the deposits, but no water-bearing horizons of considerable areal extent can be traced. The two wells located in section 6, the two located in the NE.$\frac{1}{4}$, section 12, and in the SE.$\frac{1}{4}$, section 13, and the two located in section 22, support the view that aquifers occur over small areas, although there exists no evidence of relationship between the three groups of wells. The deposits are tapped at depths of from 40 to 90 feet, the majority being encountered at depths of 40 to 50 feet and of 80 to 90 feet. The supply of water is usually sufficient for farm needs, and the water, although quite hard and fairly highly mineralized, is usable for all household purposes.

Township 29, Range 25

The water supply in this township is obtained from reservoirs such as dams and dugouts, from sloughs and springs, and from wells sunk into the glacial drift. The supply from the dams, dugouts, and sloughs is used for stock, and that from the springs and wells is used for both stock and domestic purposes. A considerable amount of water for domestic purposes is hauled.

The ground surface of the township is characterized by many steep hills and undrained depressions. Stones are common on the surface of the knolls. A large area in the central part of the township is mantled by moraine and the remainder of the township is covered by boulder clay or glacial till. With the possible exception that shallow wells are somewhat more numerous in the moraine-covered area than in the boulder clay-covered area, there does not appear to be very much difference in the water-bearing

conditions of the two different types of glacial deposits. Consequently, the glacial drift is discussed as a unit. In general it is composed of a few feet of top soil; 20 to 30 feet of weathered or yellow clay in which scattered pockets of sand and gravel occur; and an unweathered zone of compact, unoxidized, blue clay that is known to extend to a depth of at least 109 feet in section 22, and which contains a few scattered deposits of sand and gravel at widely varying depths.

The undrained depressions or sloughs provide some water for stock in the spring and early summer months. Wells sunk near the depressions sometimes yield a small quantity of water, which if not polluted by contaminated surface waters is found to be satisfactory for domestic purposes as well as for stock. If such wells are deepened when the water-table becomes lower, it is possible to obtain a supply of water during the greater part of the year.

A few springs occur in the township and the water derived from them is used for stock, and in a few instances for domestic purposes. The supply from the springs can be increased by digging out and cribbing the springs, and reservoirs can be dug to retain the overflow water.

A number of wells obtain water from the scattered deposits of sand and gravel that occur in the weathered zone of the glacial drift. The wells tapping these pockets are from 6 to more than 30 feet deep, but most of them are 20 to 30 feet deep. The pockets appear to be more numerous in the moraine-covered area than in the remainder of the township, but throughout the township they do not form a continuous horizon and each well appears to have tapped a local pocket of sand or gravel. The supply from the shallow wells varies considerably, and it is readily affected by drought conditions. The water is generally

hard, but it does not contain a large amount of mineral salts in solution and it has usually been found satisfactory for domestic use.

Approximately one-half the wells in the township derive water from the lower, unweathered zone of the drift. The pockets of sand and gravel that occur in this zone are tapped by wells at depths of 40 to 109 feet. They do not form a continuous aquifer and a general water-bearing horizon does not occur within the upper 110 feet of the glacial drift. No dry holes were recorded, however, and it appears as if the pockets are fairly numerous, but dry holes will probably be sunk in an effort to locate a water-bearing deposit. In some areas the supply from wells tapping the deposits in the unweathered clay is inadequate for local needs. Considerable trouble is experienced with the fine sand that forms the aquifers clogging the well casings and partly shutting off the water supply. The water from these wells is quite hard and contains a considerable amount of mineral salts in solution. It is being used for domestic purposes as well as for stock.

A number of dugouts and one dam are used to collect and store surface water for stock. The dugouts should be located so as to collect the maximum amount of run-off water and should be excavated at least 12 feet deep. Wells sunk beside the reservoirs yield suitable water for all household requirements.

Township 29, Range 26

The ground surface of this township is rough, and in some areas is cut by wide valleys. Small moraine-covered areas occur in the east-central, western, and southwestern parts of the township. Dune sands occur in section 24, and the remainder of the township is mantled by boulder clay or glacial till.

The water-bearing conditions in the moraine- and till-covered areas are quite similar. A few wells dug near sloughs yield small supplies of water. In years of normal rainfall the supply is sufficient for domestic purposes. During periods of drought, however, the supply is depleted, but by deepening the well as the water-table lowers sufficient water can usually be obtained.

Approximately one-third of the wells in this township derive water from scattered pockets of sand and gravel that occur in the weathered zone of the glacial drift at depths of 12 to 30 feet. The pockets appear to be of very local distribution and they do not form a continuous water-bearing horizon. They should be located by test augers before a well is dug. The supply from these shallow wells varies considerably and in a few instances it is sufficient only for domestic needs. The use of dugouts for the collection and retention of surface water for stock needs is recommended in those areas where the shallow wells yield an inadequate supply. The water from the shallow wells is not so highly mineralized as that from deeper wells, and that from most of the wells is suitable for domestic purposes. A few wells that are dug near springs yield abundant supplies of usable water. Care should be taken to see that the shallow wells do not become polluted by contaminated surface waters.

Most of the wells in this township obtain water from the pockets of sand and gravel that occur in the unweathered part of the glacial drift. The wells vary in depth from 45 to 160 feet, but most of them are from 45 to 90 feet deep. The deposits are not continuous but they are fairly numerous, and little trouble should be experienced in encountering water-bearing deposits in the lower part of the drift. The wells that tap these deposits yield varying supplies of water. The supply is not

always adequate for local needs. The water is being used for domestic purposes, although it is highly mineralized. It acts as a laxative on those not accustomed to its use. A 160-foot well in the NW.¼, section 9, obtains water from a sand aquifer at an elevation of 2,156 feet above sea-level. This aquifer may occur near the contact of the drift and bedrock, but it is not thought to be of large areal extent. The water rises to a point 15 feet below the surface. It is hard and fairly highly mineralized, but is being used for all farm needs. The supply is more than adequate for local needs.

Township 30, Range 25

Water supplies in this township are obtained from sloughs, dugouts, and springs, and from wells sunk in the unconsolidated deposits. The water from the sloughs and dugouts is used exclusively for stock; that from the springs chiefly for stock; and that from the wells for both domestic purposes and stock.

The ground surface is rough, and a wide valley occurs in the northeastern part of the township. Parts of sections 2, 3, and 4 are mantled by moraine. The valley in the northeastern corner is floored by deposits of lake silts, and the remainder of the township is overlain by boulder clay or glacial till.

The lake deposits have not been fully prospected for water, but a well in section 25 obtained a large supply of usable water at a depth of 10 feet. A number of springs that occur along the valley yield large supplies of water that is used for all farm purposes. The overflow water from one spring has been impounded by a dam. This method can be used to conserve the water from other flowing springs.

Approximately one-half the wells in the township derive water from scattered pockets of sand and gravel that occur in the weathered zone of the glacial drift. They do not generally exceed a depth of 35 feet. No dry holes were recorded, but the deposits do not form a continuous water-bearing horizon. Most of the wells yield adequate supplies for domestic requirements and 15 to 20 head of stock, and the water is usable for all farm purposes. Pockets of sand and gravel at depths of 40 to 100 feet in the unweathered clay constitute the aquifers for the remainder of the wells in the township. It is possible that the same aquifer has been tapped by three wells located in the SW.$\frac{1}{4}$ and NW.$\frac{1}{4}$, section 10, and by a well in the SE.$\frac{1}{4}$, section 17. Two wells located on sections 28 and 33 also appear to tap a common aquifer, but elsewhere in the township the aquifers are believed to be formed by localized deposits of sand or gravel. No dry holes were recorded and little difficulty should be experienced in obtaining water. The yield from most of the wells is adequate for farm needs, but the water from some of them is too highly mineralized for drinking. In such instances a shallow seepage well is used for domestic purposes.

Dugouts, excavated in slough basins, are recommended as a means of collecting and storing surface water for stock.

Township 30, Range 26

The ground surface in the western part of this township is quite rough and is characterized by many undrained depressions. The largest of these, in the northwestern corner, is known locally as Dewar lake. The eastern part of the township is comparatively flat. Parts of sections 6, 7, and 18, and 15, 16, 21, and 22 are covered by moraine. The remainder of the township is overlain by boulder clay or glacial till.

Wells sunk into the glacial drift are the main source of water in this township. A ravine in section 17 has been dammed and surface water impounded for stock use. A spring on section 27 feeds a 24-foot well and yields sufficient water for local needs. The water is usable for household requirements.

The glacial drift is usually composed of a few feet of top soil, which in the northern part of the area is a heavy black loam; 20 to 30 feet of light-coloured, weathered clay that contains a few scattered pockets of sand and gravel; and unweathered blue clay that extends to a depth of at least 100 feet. It contains fairly extensive deposits of sand and gravel. The deposits of sand and gravel in the weathered zone of the drift form aquifers for a few wells in the township. Test augers should be used to locate the deposits so that dry holes will not be dug. The supply of water from the producing wells is sufficient for local needs and the water is suitable for all farm purposes.

A number of wells derive water from the unweathered zone of glacial drift. In the area outlined by the "A" boundary line the water-bearing deposits appear to be fairly numerous. They are tapped at depths of 60 to 100 feet, or at elevations of 2,270 to 2,308 feet above sea-level. It is not known if the aquifers form a continuous water-bearing horizon, but it is believed that they are formed by individual pockets of sand or gravel. No difficulty should be experienced in obtaining water in this outlined area. The water from the producing wells is used for all farm needs and the supply is usually fairly abundant. The water in some of the wells is under a slight hydrostatic pressure, but in none of them does it rise more than 40 feet above the top of the aquifer.

A number of wells scattered throughout the remainder of the township obtain water from pockets of sand or gravel at depths of 60 to 82 feet. The water-bearing deposits are not as extensive as in the outlined area, but the two wells in section 31 appear to tap a common aquifer, as do the wells located in sections 33 and 34. Four test borings in section 34, however, failed to encounter sufficient water for local needs. Wells in sections 7, 8, and 33 yield sufficient water for local needs, but the supply from those in sections 31 and 34 is inadequate for farm requirements. The water is used for drinking as well as for stock. No wells have been drilled into the bedrock, but water-bearing horizons probably occur in the Belly River formation.

STATISTICAL SUMMARY OF WELL INFORMATION IN RURAL MUNICIPALITY OF ELMA, NO. 291, SASKATCHEWAN

Township	28	28	29	29	30	30	Total No. in municipality
West of 3rd mer. Range	25	26	25	26	25	26	
Total No. of Wells in Township	31	38	67	23	35	27	221
No. of wells in bedrock	0	0	0	0	0	0	0
No. of wells in glacial drift	30	38	67	23	34	27	219
No. of wells in alluvium	1	0	0	0	1	0	2
Permanency of Water Supply							
No. with permanent supply	31	38	67	23	35	27	221
No. with intermittent supply	0	0	0	0	0	0	0
No. dry holes	0	0	0	0	0	0	0
Types of Wells							
No. of flowing artesian wells	0	2	0	0	1	1	4
No. of non-flowing artesian wells	8	15	7	7	13	12	62
No. of non-artesian wells	23	21	60	16	21	14	155
Quality of Water							
No. with hard water	31	35	63	22	27	23	201
No. with soft water	0	3	4	1	8	4	20
No. with salty water	0	0	0	0	1	0	1
No. with "alkaline" water	13	13	18	12	8	12	76
Depths of Wells							
No. from 0 to 50 feet deep	21	31	47	14	23	11	147
No. from 51 to 100 feet deep	6	7	19	8	12	16	68
No. from 101 to 150 feet deep	3	0	1	0	0	0	4
No. from 151 to 200 feet deep	1	0	0	1	0	0	2
No. from 201 to 500 feet deep	0	0	0	0	0	0	0
No. from 501 to 1,000 feet deep	0	0	0	0	0	0	0
No. over 1,000 feet deep	0	0	0	0	0	0	0
How the Water is Used							
No. usable for domestic purposes	26	36	58	19	32	26	197
No. not usable for domestic purposes	5	2	9	4	3	1	24
No. usable for stock	31	38	67	22	34	27	219
No. not usable for stock	0	0	0	1	1	0	2
Sufficiency of Water Supply							
No. sufficient for domestic needs	31	38	66	23	30	27	215
No. insufficient for domestic needs	0	0	1	0	5	0	6
No. sufficient for stock needs	22	32	39	15	27	17	152
No. insufficient for stock needs	9	6	28	8	8	10	69

ANALYSES AND QUALITY OF WATER

General Statement

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

Total Dissolved Mineral Solids

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

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

Mineral Substances Present

Calcium and Magnesium

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

Sodium

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

Sulphates

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

Chlorides

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

Iron

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

Hardness

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

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

Analysis of Water Sample from the Municipality of Elma, No. 291, Saskatchewan

LOCATION						Depth of Well, Ft.	Total dis'vd solids	HARDNESS			CONSTITUENTS AS ANALYSED						CONSTITUENTS AS CALCULATED IN ASSUMED COMBINATIONS								Source of Water
No.	Qtr.	Sec.	Tp.	Rge.	Mer.			Total	Perm.	Temp.	Cl.	Alka-linity	CaO	MgO	SO_4	Na_2O	Solids	$CaCO_3$	$CaSO_4$	$MgCO_3$	$MgSO_4$	Na_2CO_3	Na_2SO_4	NaCl	
1	SW.	1o	29	26	3	24	3,855												(2)		(3)	(4)	(1)	(5)	⁎1

Water samples indicated thus, ⁎1, are from glacial drift.
Analyses are reported in parts per million; where numbers (1), (2), (3), (4), and (5) are used instead of parts per million, they represent the relative amounts in which the five main constituents are present in the water.
Hardness is the soap hardness expressed as calcium carbonate ($CaCO_3$).
Analysis No. 1 by Provincial Analyst, Regina.
For interpreation of this table read the section on Analyses and Quality of Water.

Water from the Unconsolidated Deposits

No samples of water from the unconsolidated deposits in the municipality of Elma were collected by the field party, but one sample from a 24-foot well in the village of Flaxcombe was analysed by the Provincial Analyst and the results are recorded in the accompanying table. The following discussion is based on the results of samples analysed from surrounding municipalities, and to some extent on the quality of the water as determined in the field.

The water from the Recent dune sand, should water be obtained in this area, will probably be moderately soft and will not contain a high concentration of mineral salts in solution. It should be found quite satisfactory for domestic purposes. The water from the lake sands and silts varies considerably in quality. That from the lake deposits in the southern part of the municipality is very highly mineralized, and it has not been found suitable for domestic purposes or stock. The water from a well sunk in the lake deposits in the northern part of the municipality has been found satisfactory for drinking as well as for stock, and other wells sunk in this area may also obtain usable water, but the quality of the water may vary greatly within narrow limits.

Water from wells that are dug beside sloughs or undrained depressions is as a rule moderately soft since it is largely derived by seepage from impounded surface water. It is suitable for stock and although it is not highly mineralized it is advisable to have such waters tested for bacteria as they may be contaminated by animal refuse.

The waters from the wells that tap small pockets of sand and gravel at shallow depths in the drift are quite hard. The amount of mineral salts contained in solution varies within

narrow limits, and some of the waters are unfit for household purposes. The sample analysed has a total dissolved solid content of 3,855 parts per million, and sodium sulphate (Glauber's salt) and magnesium sulphate (Epsom salts) are the most abundant mineral salts in solution. The water is not being used. The water from most of the shallow wells, however, is used for domestic purposes, but it may act as a laxative on those not accustomed to the use of highly mineralized water. It is satisfactory for stock.

The deeper wells in the drift yield water that is generally excessively hard, and usually contains a higher concentration of mineral salts in solution than does the water from the shallower drift wells. The waters from a number of wells included in this group are recorded as being "alkaline"; they are used for stock, but some of them are unusable for domestic purposes.

Water from the Bedrock

No water is derived from the bedrock in this municipality. Should water be obtained from the Bearpaw or the upper part of the Belly River formation it is probable that it would be very hard and highly mineralized. It may not be suitable for domestic purposes, but should be satisfactory for stock. Water from the lower part of the Belly River formation will probably be soft, although quite highly mineralized. Such waters should be satisfactory for domestic purposes as well as for stock, but they will probably have an injurious effect on vegetation if used for irrigation.

WELL RECORDS—Rural Municipality of ELMA, NO. 291, 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	NE.	1	28	25	3	Dug	15	2,270	- 10	2,260	10	2,260	Glacial drift	Hard, clear, "alkaline"	41	D, S	Oversufficient supply.
2	NW.	2	"	"	"	Bored	72	2,400	- 65	2,335	65	2,335	Glacial drift	Hard, clear	43	D, S	Insufficient supply. Waters 6 to 10 head stock. A 40-foot well with 3 feet of water, for house use only.
3	NW.	3	"	"	"	Dug	21	2,450	- 20	2,430	20	2,430	Glacial clay and quicksand	Medium hard, clear, good	41	D, S	Sufficient for 20 head stock.
4	NE.	4	"	"	"	Dug	20	2,465	- 18	2,447	18	2,447	Glacial clay and quicksand	Hard, clear, good	43	D, S	Barely sufficient for 13 head stock.
5	NW.	7	"	"	"	Dug	15	2,360	- 10	2,370	10	2,370	Glacial sand	Hard, clear, good	43	D, S	Sufficient for 14 head stock.
6	NW.	10	"	"	"	Bored	90	2,420	- 70	2,350	90	2,330	Glacial drift	Hard, clear, iron, "alkaline"	42	S	Sufficient for 20 head stock. Unfit for humans. Haul drinking water.
7	NW.	11	"	"	"	Dug	14	2,345	- 4	2,341	4	2,341	Glacial sand	Hard, clear, good	42	D, S	Sufficient for 20 head stock.
8	SE.	12	"	"	"	Bored	48	2,270	- 16	2,254	48	2,222	Glacial gravel	Hard, clear	43	D, S	Oversufficient for 40 head stock. A 48-foot well with 15 feet of water.
9	SE.	14	"	"	"	Bored	62	2,298	- 57	2,241	57	2,241	Glacial drift	Hard, iron, black sediment	42	D, S	Insufficient supply. Only waters from 6 to 8 head stock. Haul water.
10	NW.	14	"	"	"	Dug	21	2,335	- 9	2,326	9	2,326	Glacial drift	Hard, clear, "alkaline", good	42	D, S	Sufficient supply.
11	SE.	15	"	"	"	Dug	36	2,335	- 27	2,308	36	2,299	Glacial gravel	Hard, clear, iron, good	43	D, S	Sufficient for 20 head stock.
12	NW.	15	"	"	"	Dug	30	2,355	- 27	2,328	27	2,328	Glacial drift	Hard, clear, good	42	D, S	Sufficient for 15 head stock.
13	NE.	17	"	"	"	Bored	160	2,450	-110	2,340	160	2,290	Glacial drift	Hard, clear, iron	41	S	Oversufficient for 20 head stock. Drinking water hauled.
14	NW.	18	"	"	"	Dug	26	2,430	- 24	2,406	24	2,406	Glacial sand	Hard, iron, clear, good	42	S	Sufficient for 10 head stock. A 38-foot well with good supply for house.
15	SE.	20	"	"	"	Bored	80	2,410	- 75	2,335	75	2,335	Glacial driff	Hard, clear, iron, bitter, "alkaline"	41	D, S	Barely sufficient for 15 head stock. Occasionally haul water in summer.
16	NW.	20	"	"	"	Bored	90	2,450	- 70	2,380	90	2,360	Glacial drift	Hard, clear, iron, "alkaline"	42	D, S	Sufficient for 15 head stock.
17	NE.	20	"	"	"	Dug	18	2,350	- 12	2,338	12	2,338	Glacial gravel	Hard, clear, iron, good	42	D, S	Sufficient for 20 head stock.
18	NW.	21	"	"	"	Dug	18	2,340	- 15	2,325	15	2,325	Glacial drift	Hard, clear, good	43	D, S	Sufficient for 10 head stock. Several neighbours haul water from here.
19	NW.	22	"	"	"	Bored	30	2,315	- 24	2,291	24	2,291	Glacial sand	Hard, clear	43	D, S	Only sufficient for 8 head stock.
20	NW.	24	"	"	"		15	2,270	- 10	2,260	10	2,260	Glacial drift	Hard, clear, "alkaline"	42		Apparently sufficient for all purposes.
21	NE.	24	"	"	"	Bored	90	2,320	- 80	2,240	80	2,240	Glacial drift	Hard, clear, "alkaline"	42	S	Sufficient for 10 head stock. Haul water.
22	SE.	27	"	"	"	Bored	120	2,295	-115	2,180	115	2,180	Glacial sand	Hard, clear, iron, "alkaline"	41	D, S	Insufficient supply. Just waters 12 head stock
23	SW.	27	"	"	"	Bored	110	2,285	-106	2,179	106	2,179	Glacial sand	Hard, clear, iron, "alkaline"	41	D	Insufficient supply. Just supplies house. Haul stock water.

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

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

WELL RECORDS—Rural Municipality of ELMA, NO. 291, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
24	NW.	27	28	25	3	Dug	6	2,198	- 3	2,195	3	2,195	Recent sand and gravel	Hard, clear, "alkaline"	44	S	Sufficient for 13 head stock. Unfit for humans.
25	SE.	34	"	"	"	Dug	14	2,270	- 12	2,258	12	2,258	Glacial quick-sand	Hard, clear, "alkaline", good	42	D, S	
26	SW.	35	"	"	"	Dug	40	2,235	- 10	2,225	40	2,195	Glacial quick-sand	Hard, clear, "alkaline"	42	D, S	Insufficient for more than 2 head stock; a 50-foot well with small supply not used.
27	SE.	35	"	"	"	Bored	127	2,290	-100	2,190	127	2,163	Glacial sand, and red clay	Hard, cloudy, iron, "alkaline"	43	S	Sufficient for 25 head stock. Laxative. Domestic supply hauled.
1	SE.	2	28	26	3	Dug	16	2,376	- 6	2,370	6	2,370	Glacial sand	Hard, clear, "alkaline", good	40	D, S	Abundant supply.
2	NW.	2	"	"	"	Dug	25	2,370	- 18	2,352	18	2,352	Glacial drift	Hard, clear, "alkaline", good	40	D, S	Oversufficient for 12 head stock. A similar well in pasture.
3	NE.	4	"	"	"	Dug	27	2,359	- 19	2,340	27	2,332	Glacial sand	Hard, clear, good	42	D, S	Abundant supply.
4	SE.	6	"	"	"	Bored	85	2,320	- 60	2,260	85	2,235	Glacial quick-sand	Hard, iron, clear, good	41	D, S	Sufficient for more than 25 head stock.
5	NE.	6	"	"	"	Bored	85	2,350	- 70	2,280	85	2,265	Glacial sand	Hard, clear, "alkaline"	42	D, S	Sufficient for 25 head stock.
6	NE.	7	"	"	"	Bored	20	2,350	- 13	2,337	13	2,337	Glacial gravel	Hard, clear, good	41	D, S	Abundant supply.
7	NE.	9	"	"	"	Bored	46	2,390	- 42	2,348	42	2,348	Glacial quick-sand	Hard, clear		D, S	Insufficient for 6 head stock. A 30-foot well; large supply.
8	NW.	9	"	"	"	Bored	40	2,350	- 28	2,322	40	2,310	Glacial drift	Hard, clear, good		D, S	Abundant supply.
9	NE.	10	"	"	"	Dug	35	2,400	- 32	2,368	32	2,368	Glacial sand	Hard, clear, slightly "alkaline"	41	D, S	Sufficient for 12 head stock.
10	NW.	10	"	"	"	Dug	26	2,375	- 19	2,356	26	2,349	Glacial black sand	Hard, clear	42	D, S	Just sufficient for 6 head stock.
11	SE.	11	"	"	"	Dug	15	2,365	- 11	2,354	11	2,354	Glacial sand	Hard, clear, good	42	D, S	Good supply.
12	NW.	11	"	"	"	Dug	31	2,408	- 26	2,382	26	2,382	Glacial sand	Hard, clear, good	41	D, S	Abundant supply.
13	SW.	12	"	"	"	Bored	43	2,365	- 14	2,351	43	2,322	Glacial sand	Hard, clear	42	D, S	Good sufficient supply.
14	NE.	12	"	"	"	Bored	65	2,400			65	2,335	Glacial sand	Hard, clear, iron, "alkaline"	43	D, S	Sufficient for 25 head stock.
15	SE.	13	"	"	"	Dug	80	2,415	- 70	2,345	80	2,335	Glacial sand	Hard, iron, clear, "alkaline"	43	D, S	Sufficient supply.
16	NW.	14	"	"	"	Bored	39	2,400	- 26	2,374	39	2,361	Glacial sand	Hard, clear, good, "alkaline"	42	D, S	Sufficient for 35 head stock.
17	NE.	16	"	"	"	Dug	30	2,400	- 21	2,379	30	2,370	Glacial sand	Hard, clear, fair, "alkaline"	41	D, S	Sufficient supply.
18	SE.	18	"	"	"	Dug	30	2,385	- 12	2,373	12	2,373	Glacial drift	Hard, clear	42	D, S	Sufficient for 150 head stock. A flowing spring.

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 ELMA, NO. 291, 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
19	SW.	20	28	26	3	Dug	36	2,410	- 32	2,378	32	2,378	Glacial sand	Hard, clear, "alkaline"	40	S	Insufficient supply. Laxative on humans. A 24-foot well; 5 feet of hard, iron water for house use.
20	NE.	20	"	"	"	Dug	18	2,410	- 12	2,398	12	2,398	Glacial drift	Hard		S	Sufficient for 10 head stock.
21	NW.	20	"	"	"	Bored	20	2,480	- 17	2,463	17	2,467	Glacial sand	Hard, clear	42	D	Sufficient for house use.
22	NW.	20	"	"	"	Bored	20	2,480	- 15	2,465	15	2,465	Glacial sand	Hard, clear		S	Sufficient for 25 head stock.
23	SW.	21	"	"	"	Bored	32	2,415	- 29	2,386	29	2,386	Glacial sand	Soft, clear	40	D, S	Sufficient for house only. Insufficient supply.
24	NW.	21	"	"	"	Bored	32	2,415	- 26	2,389	26	2,389	Glacial drift	Soft, clear, good	40	D, S	Fair supply.
25	SW.	22	"	"	"	Bored	78	2,430	- 38	2,392	78	2,352	Glacial sand	Hard, clear, iron, "alkaline"	42	D, S	Large supply.
26	NE.	22	"	"	"	Bored	90	2,450	- 70	2,380	90	2,360	Glacial sand	Hard, iron, clear, good	41	D, S	Good supply.
27	SE.	24	"	"	"	Bored	30	2,425	- 28	2,397	28	2,397	Glacial quicksand	Hard, clear, "alkaline"	42	D, S	Insufficient for stock. Just enough for house use.
28	NE.	24	"	"	"	Bored	38	2,405	- 23	2,382	38	2,367	Glacial quicksand	Hard, clear	42	D, S	Just sufficient for house. A 15-foot well with 3 feet of soft water; large supply; used for stock.
29	SE.	28	"	"	"	Bored	40	2,480	- 28	2,452	40	2,440	Glacial sand	Hard, clear, "alkaline"		N	Sufficient for stock.
30	..	28	"	"	"	Dug	14	2,500	- 12	2,488	12	2,488	Glacial sand	Hard, clear	41	D	Sufficient for house use. A flowing spring used for stock.
31	NW.	31	"	"	"	Bored	40	2,410	- 36	2,374	36	2,474	Glacial gravel	Hard, clear, iron, good	41	D, S	Oversufficient for 12 head stock.
32	SW.	36	"	"	"	Bored	90	2,390	- 65	2,325	90	2,300	Glacial drift	Hard, clear, iron, "alkaline"		D, S	Abundant supply.
1	SE.	1	29	25	3	Bored	25	2,265	- 17	2,248	17	2,248	Glacial quicksand	Fairly soft, clear	42	D, S	Sufficient for 35 head stock. A 50-foot well in quicksand; fills in with sand; not used.
2	SW.	3	"	"	"	Bored	80	2,300	- 75	2,225	75	2,225	Glacial quicksand	Hard, clear, iron	42	D, S	Only sufficient for house use.
3	NW.	3	"	"	"	Spring	0	2,300					Glacial drift			S	Sufficient supply.
4	SE.	5	"	"	"	Bored	92	2,300	- 77	2,223	92	2,208	Glacial sand	Very hard, clear	42	D, S	Sufficient for 15 head stock. A 55-foot well yields 1 to 2 barrels a day.
5	NW.	6	"	"	"	Dug	30	2,275	- 25	2,250	25	2,250	Glacial quicksand	Hard, iron, clear	42	D, S	Sufficient with 3 other wells. One 40 to 50 feet deep. Two wells 20 and 30 feet deep. All 3 aquifers in sand.
6	SW.	7	"	"	"	Bored	60	2,420	- 50	2,370	60	2,360	Glacial drift	Hard, clear	42	D, S	Abundant supply for 18 head stock.
7	NE.	7	"	"	"	Dug	12	2,290	- 8	2,282	8	2,282	Glacial gravel	Hard, clear, "alkaline"	42	S	Sufficient for 25 head stock.
8	SW.	11	"	"	"	Bored	47	2,295	- 42	2,253	42	2,253	Glacial quicksand	Hard, clear, "alkaline"	41	D, S	Sufficient for 6 head stock.
9	SE.	13	"	"	"	Bored	50	2,280	- 40	2,240	40	2,240	Glacial drift and black clay	Hard, cloudy, iron, "alkaline"	42	D, S	Just sufficient for 10 head stock.
10	SW.	13	"	"	"	Dug	65	2,300	- 60	2,240	60	2,240	Glacial gravel	Hard, clear	41	D, S	Sufficient for 35 head stock. A 65-foot well; small supply of hard water.

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

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

WELL RECORDS—Rural Municipality of ELMA, NO. 291, 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
11	NW.	14	29	25	3	Dug	55	2,295	- 45	2,250	55	2,240	Glacial sand	Hard, clear	41	D, S	Insufficient supply for 8 head stock. A 56-foot well only yields 6 pails a day.
12	NE.	16	"	"	"	Bored	42	2,330	- 36	2,294	36	2,294	Glacial quick-sand	Hard, clear	42	D, S	Sufficient for 25 head stock.
13	SW.	16	"	"	"	Dug	30	2,310	- 16	2,294	16	2,294	Glacial sand	Hard, clear	42	D, S	Insufficient supply. Only enough for house. Another 30-foot well similar.
14	SE.	18	"	"	"	Bored	35	2,390	- 32	2,358	32	2,358	Glacial sand	Hard, clear	42	D, S	Sufficient for 4 horses and house use. Another well 20 feet deep; good supply; filled in.
15	NE.	19	"	"	"	Dug	46	2,440	- 42	2,398	42	2,398	Glacial sand	Hard, clear, iron	42	D, S	Barely sufficient for 20 head stock.
16	NW.	20	"	"	"	Dug	28	2,370	- 8	2,362	8	2,362	Glacial drift	Hard, clear,	42	D, S	Sufficient for 9 head stock.
17	SW.	20	"	"	"	Bored	100	2,390	- 40	2,350	45	2,345	Glacial sandy clay	Very hard, clear, "alkaline"	42	S	Abundant supply for 30 head stock. Laxative. A 10-foot well with good supply; not used.
18	SE.	20	"	"	"	Dug	34	2,365	- 10	2,355	10	2,355	Glacial sand	Hard, iron, clear, "alkaline"	42	D, S	Sufficient with use of slough and dugout. A 28-foot well in valley A well near house used for drinking; better quality of water.
19	SW.	21	"	"	"	Dug	16	2,300	- 10	2,290	10	2,290	Glacial drift	Hard, iron, clear	42	D, S	Abundant supply for 23 head stock. Another well has supplied 80 head stock.
20	NW.	21	"	"	"	Dug	12	2,290	- 9	2,281	9	2,281	Glacial drift	Fairly soft, clear	42	D, S	Sufficient supply with a 24-foot well yielding small supply, and a small supply from spring.
21	SW.	22	"	"	"	Bored	109	2,300	- 49	2,251	109	2,191	Glacial gravel and sand	Hard, clear, "alkaline"	42	S	Ample supply for 10 head stock. Laxative on humans. Not good for stock. Haul house water.
22	NE.	22	"	"	"	Dug		2,280					Glacial drift	Hard, cloudy, "alkaline"	42	D	Insufficient; supplies house only; a 10-foot well supplies 8 head stock.
23	SE.	23	"	"	"	Spring							Glacial drift	Hard		S	Sufficient for stock.
24	SW.	23	"	"	"	Dug	8	2,290	- 5	2,285	5	2,285	Glacial sand	Hard, clear, "alkaline"	42	S	Sufficient for 6 head stock. Laxative.
25	SE.	24	"	"	"	Bored		2,300					Glacial drift	Hard, slightly yellow, "alkaline"	42	S	Sufficient for 15 head stock. Laxative.
26	NE.	24	"	"	"	Bored	53	2,290	- 50	2,240	50	2,240	Glacial drift	Hard, clear, "alkaline"	42	D	Only sufficient for house. A 50-foot well with very small seepage supply.
27	SE.	27	"	"	"	Bored	30	2,290	- 26	2,264	26	2,264	Glacial sand	Fairly hard, clear	42	D, S	Good supply.
28	NW.	27	"	"	"	Bored	56	2,270	- 50	2,220	50	2,220	Glacial sand	Hard, clear, slightly "alkaline"	42	D, S	Sufficient for 15 head stock. Another 50-foot well with similar water supply.
29	NW.	28	"	"	"	Dug	60	2,320	- 56	2,264	56	2,264	Glacial sand	Hard, clear, iron	42	D, S	Insufficient in summer. Haul water during summer.
30	SE.	30	"	"	"	Dug	22	2,430	- 12	2,418	12	2,418	Glacial sand	Hard, clear, iron	42	S	Good supply for 10 head stock. A 6-foot well with good supply of soft water.
31	SE.	32	"	"	"	Bored	38	2,330	- 10	2,320	38	2,292	Glacial sand	Soft, clear	42	D, S	Ample supply for 18 head stock. 5 wells 95 feet deep cannot be used because sand fills in.
32	SW.	34	"	"	"	Dug	22	2,330	- 17	2,313	17	2,313	Glacial sand	Hard, clear	43	S	Sufficient with a 6-foot well which yields a good supply. Water laxative. A 30-foot well being dug at present.
33	NE.	34	"	"	"	Bored	35	2,270	- 25	2,245	25	2,245	Glacial drift	Hard, clear, iron, "alkaline"	42	S	Sufficient supply. A 30-foot well with small supply used. Also a spring on SE.¼, section 3, township 30, range 25, meridian 3.

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.....

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
34	NW.	35	29	25	3	Dug	3	2,305	- 6	2,299	6	2,299	Glacial sand	Hard, clear	44	D	Only sufficient for house. Two wells 30 feet with "alkaline" water, not used.
35	SW.	36	"	"	"	Bored	64	2,280	- 48	2,232	48	2,232	Glacial quick-sand	Hard, clear, "alkaline"	42	D, S	Insufficient supply; water hauled all year.
36	SE.	36	"	"	"	Bored	63	2,325	- 51	2,274	63	2,262	Glacial sand	Very hard, clear, "alkaline"	42	D, S	Sufficient for 15 head stock and house use.
37	NE.	36	"	"	"	Dug	12	2,300	- 5	2,295	5	2,295	Glacial sand	Hard, clear	42	D, S	Sufficient for 8 head stock, and neighbour's stock. A 20-foot well for house use.
1	NE.	2	29	26	3	Dug	18	2,335	- 13	2,322	13	2,322	Glacial gravel	Hard, clear, "alkaline"		D, S	Sufficient for 15 head stock.
2	NE.	6	"	"	"			2,390					Glacial drift	Hard		S	Oversufficient supply. Could water 60 head stock. Well near a spring.
3	N½.	9	"	"	"	Bored	160	2,316	- 15	2,301	160	2,156	Glacial sand	Hard, iron, clear, red sediment, "alkaline"	47	D, S	Oversufficient for 12 head stock; could water 50 head stock.
4	SW.	10	"	"	"			2,380					Glacial drift	Hard, clear, "alkaline"	48	D	Insufficient supply. A 40-foot well in pasture; also insufficient supply.
5	SE.	13	"	"	"	Bored	90	2,435	- 80	2,355	80	2,355	Glacial quick-sand	Hard, clear, "alkaline"	48	D, S	Sufficient for 12 head stock.
6	SW.	14	"	"	"	Bored	85	2,440	- 84	2,356	84	2,356	Glacial quick-sand	Hard, iron, clear	48	D, S	Insufficient supply. Yields 4 barrels a day.
7	SW.	16	"	"	"	Dug	24	2,350	- 10	2,340	10	2,340	Glacial sandy clay	Hard	45	N	Supplies 30 barrels a day, #.
8	SE.	16	"	"	"	Bored	24	2,345	- 23	2,322	23	2,322	Glacial drift	Medium hard, clear	48	D, S	Insufficient supply. Enough water for house use. Hauls water from C. N. R. well.
9	S½.	18	"	"	"	Dug	20	2,401	- 10	2,391	10	2,391	Glacial drift	Soft, iron, clear, red sediment	47	D, S	Insufficient supply. Waters 20 head stock.
10	SE.	19	"	"	"	Bored	42	2,371	- 32	2,339	32	2,339	Glacial drift	Hard, clear, iron, red sediment, "alkaline"	48	D, S	Sufficient for 10 head stock.
11	NE	21	"	"	"	Bored	45	2,461	- 30	2,431	45	2,416	Glacial sand	Hard, clear, iron	47	D, S	Sufficient for 10 head stock.
12	SW.	22	"	"	"	Bored	75	2,420	- 55	2,365	75	2,445	Glacial drift	Hard, iron, clear, red sediment, "alkaline"	48	S	Sufficient supply for 23 head stock. Laxative.
13	SE.	24	"	"	"	Bored	50	2,450			50	2,400	Glacial drift	Hard, clear, "alkaline"	48	D, S	Sufficient for 15 head stock.
14	NW.	25	"	"	"	Bored	35	2,405	- 25	2,380	25	2,380	Glacial drift	Hard, clear, "alkaline"	48	D, S	Insufficient supply; only water 2 head stock.
15	NE.	26	"	"	"	Dug	22	2,380	- 14	2,366	14	2,366	Glacial drift	Hard, clear, "alkaline"	48	D, S	Sufficient for 20 head stock.
16	SW.	27	"	"	"	Bored	74	2,430	- 60	2,370	74	2,356	Glacial gravel	Hard, iron, clear	47	D, S	Insufficient supply. Waters 22 head stock. Yields 6 barrels a day.
17	SE.	28	"	"	"	Bored	47	2,430	- 40	2,390	40	2,390	Glacial drift	Hard, iron, clear	48	D, S	Sufficient for 10 head stock.
18	SW.	28	"	"	"	Bored	56	2,400	- 40	2,360	56	2,344	Glacial sand	Hard, iron, "alkaline", cloudy	48	S	Sufficient for 8 head stock. Laxative.
19	E½.	30	"	"	"	Bored	60	2,366	- 30	2,336	60	2,306	Glacial sand	Hard, iron, red sediment, clear	47	D, S	Oversufficient for 40 head stock. Well could supply 130 head stock.

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of.....

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
20	W½	30	29	26	3	Dug	30	2,335	- 20	2,315	20	2,315	Glacial drift	Clear	48	D, S	Sufficient supply.
21	SE.	35	"	"	"	Bored	54	2,560	- 38	2,522	38	2,522	Glacial drift	Hard, iron, clear, "alkaline"	48	S	Only sufficient for 6 head stock. Laxative.
22	SE.	35	"	"	"	Bored	85	2,360	- 73	2,287	73	2,287	Glacial sand	Hard, iron, "alkaline"		D, S	Insufficient for 30 head stock.
1	NW.	2	30	25	3	Bored	60	2,320	- 42	2,278	60	2,260	Glacial quicksand	Hard, clear	42	D, S	Ample supply. 4 other wells in quicksand.
2	SE.	3	"	"	"	Spring	0						Glacial drift	Hard		S	Probably sufficient.
3	NE.	4	"	"	"	Bored	34	2,318	- 14	2,304	34	2,284	Glacial sand	Hard, clear	42	D, S	Sufficient for 40 head stock.
4	SW.	5	"	"	"	Bored	70	2,370	- 20	2,350	70	2,300	Glacial sand	Hard, iron, clear, "alkaline"	41	D, S	Ample supply.
5	SE.	6	"	"	"	Dug	40	2,365	- 20	2,345	40	2,325	Glacial sand	Hard, clear	41	D, S	Sufficient supply.
6	SW.	10	"	"	"	Bored	100	2,290	- 30	2,260	100	2,190	Glacial sand and gravel	Hard, clear, iron, "alkaline"	42	S	Sufficient supply. Laxative.
7	NW.	10	"	"	"	Bored	78	2,305	- 38	2,267	78	2,227	Glacial drift	Hard, clear, "alkaline"		S	Sufficient for 15 head stock. A 10-foot well in glacial sand with soft water for house.
8	NE	14	"	"	"	Bored	30	2,243	- 12	2,231	30	2,213	Glacial sandy clay	Hard, iron, clear	41	D, S	Sufficient for 14 head stock. A 0-foot well; good supply; hard water in sand.
9	SW	14	"	"	"	Dug	20	2,260	- 14	2,246	14	2,246	Glacial sand	Fairly soft, clear	40	D, S	Sufficient for 40 head stock. A 60-foot well in sand; salty water; not usable. Also a 10-foot well; poor water.
10	SW.	15	"	"	"	Dug	8	2,290	- 6	2,284	6	2,284	Glacial quicksand	Soft, clear	42	D, S	Sufficient supply.
11	NW.	15	"	"	"			2,290					Glacial quicksand	Soft			Shallow well with good supply.
12	SE.	17	"	"	"	Bored	90	2,308	- 40	2,268	90	2,218	Glacial sand	Hard, iron, clear, "alkaline"	42	D, S	Sufficient for 30 head stock.
13	SE.	20	"	"	"	Spring	0	2,280	0	2,280			Glacial sand and gravel	Hard, clear, "alkaline"		S	Sufficient supply.
14		23	"	"	"	Spring	0							Soft, clear			Good supply.
15	SW.	25	"	"	"	Dug	10	2,220	- 3	2,217	3	2,217	Recent alluvium and gravel	Soft, clear		N	Ample supply. Well filled in.
16	NW.	25	"	"	"	Spring	0						Glacial drift			S	Sufficient for 50 head stock.
17		26	"	"	"	Spring	0						Glacial drift	Soft, clear		S	Good supply.
18	NE.	28	"	"	"	Bored	80	2,285	- 60	2,225	80	2,205	Glacial quicksand	Hard, clear, iron, "alkaline"	41	S	Insufficient supply. A 40-foot well; good supply of soft water in sand; filled in.
19	NE.	32	"	"	"	Bored	46	2,295	- 38	2,257	38	2,257	Glacial drift	Hard, iron, clear	42	D, S	Insufficient supply for stock.
20	SE.	32	"	"	"	Bored	76	2,290	- 30	2,260	76	2,214	Glacial drift	Hard, iron, clear	42	S	Sufficient for 14 head stock.
21	SW.	33	"	"	"	Dug	65	2,285	- 60	2,225	60	2,225	Glacial drift	Hard, clear	42	D, S	Sufficient for 10 head stock. Another well yields good supply.

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

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

WELL RECORDS—Rural Municipality of ELMA, NO. 291, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
22	ST.	33	30	25	3	Bored	65	2,350	- 35	2,315			Glacial blue sand	Hard, iron, clear, slight yellow sediment "alkaline"	42	D, S	Sufficient supply.
23	NT.	36	"	"	"	Bored	57	2,260	- 46	2,214	46	2,214	Glacial gravel	Fairly soft, clear	42	D, S	Insufficient supply. Only waters 25 head stock. A 12-foot well in sand. Two wells are sufficient.
24	NE.	36	"	"	"	Dug	60	2,280	- 45	2,235	60	2,220	Glacial dark sand	Hard, salty, "alkaline", slightly cloudy	42	D, S	Sufficient for 75 head stock.
1	NE.	1	30	26	3	Dug	60	2,350	- 40	2,310	60	2,290	Glacial drift	Hard, clear, "alkaline"	46	D, S	Waters 60 head stock.
2	SW.	3	"	"	"	Bored	75	2,380	- 65	2,315	75	2,305	Glacial gravel	Hard, clear	46	D, S	Waters 30 head stock.
3	SE.	4	"	"	"	Bored	100	2,400	- 70	2,330	100	2,300	Glacial sand	Medium hard, clear	42	D, S	Waters 24 head stock easily.
4	NW.	4	"	"	"	Bored	92	2,400	- 88	2,312	88	2,312	Glacial quick-sand	Hard, clear, iron, "alk-aline"	44	D, S	Waters 15 head stock.
5	SW.	7	"	"	"	Bored	80	2,300	- 40	2,260	80	2,220	Glacial gravel	Hard, clear	45	D, S	Sufficient for 60 head stock.
6	NE.	7	"	"	"	Dug	20	2,300	- 14	2,286	14	2,286	Glacial drift	Hard, clear	48	D, S	Sufficient for 20 head stock.
7	SE.	8	"	"	"	Bored	70	2,390	- 58	2,332	70	2,320	Glacial drift	Hard, iron, clear, "alk-aline"	45	D, S	Sufficient supply. Yields 6 barrels a day.
8	NW.	8	"	"	"	Bored	82	2,335	- 62	2,273	82	2,253	Glacial drift	Hard, clear, "alkaline"	46	D, S	Sufficient for 10 head stock.
9	NE.	9	"	"	"	Dug	60	2,340	- 50	2,290	60	2,280	Glacial gravel	Hard, clear, slightly "alkaline"	46	D, S	Abundant supply.
10	NW.	10	"	"	"	Bored	75	2,360	- 70	2,290	70	2,290	Glacial sand	Hard, clear, "alkaline"	46	D, S	Yields 20 bbls a day. Another well caved in.
11	SW.	15	"	"	"	Bored	80	2,350	- 76	2,274	76	2,274	Glacial sand	Hard, clear, "alkaline"	46	D	Sufficient for house only. Yields 3 barr ls a day.
12	SE.	16	"	"	"	Bored	100	2,370	- 60	2,310	100	2,270	Glacial quick-sand	Hard, cloudy, "alk-aline"	46	D, S	Waters 12 head stock. Laxative.
13	NW.	21	"	"	"	Bored	30	2,300	- 15	2,285	15	2,285	Glacial sand	Soft, clear		D, S	Waters 17 head stock.
14	SE.	22	"	"	"	Bored	38	2,400	- 25	2,375	38	2,362	Glacial quick-sand	Hard, clear, slightly "al-kaline"	46	D, S	Sufficient for 50 head stock. Another well in house; very small supply.
15	NE.	23	"	"	"	Dug	90	2,390	- 60	2,330	90	2,300	Glacial drift	Hard, clear, "alkaline"	45	D, S	Abundant supply.
16	NW.	27	"	"	"	Bored	24	2,300	- 5	2,295	5	2,295	Glacial drift	Soft, clear		D, S	Sufficien for 6 barrels a day. A flowing spring used also.
17	NW.	31	"	"	"	Bored	60	2,335	- 50	2,285	50	2,285	Glacial sand	Soft, clear	46	D, S	Insufficient supply; only 3 barrels a day.
18	NE.	31	"	"	"	Bored	60	2,335	- 50	2,285	60	2,275	Glacial sand	Soft, clear	46	D, S	Insufficient supply; yields 10 barrels a day.
19	NE.	33	"	"	"	Bored	60	2,300	- 40	2,260	60	2,240	Glacial sand	Hard, clear, iron, "alk-aline"	46	D, S	Waters 12 head stock.
20	NW.	34	"	"	"	Bored	66	2,300	- 50	2,250	50	2,250	Glacial drift	Hard, clear, "alkaline"	48	D, S	Insufficient supply. Yields 4 barrels a day. Four test holes with small supply.

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

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

WELL RECORDS—Rural Municipality of ELMA No. 291 SASKATCHEWAN

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1860—10,000

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
	NW	2	28	25	3		60	2400	-20	2380	25	2375	Glacial sand	Fresh			No other information.
	NE	24	29	25	3		80	2200	-25	2175	80	2120	" "	"			" " "
	NE	28	28	25	3		10	2300					Belly River				" " "
	SE	16	29	26	3		40	2400	-20	2380	30	2370	Glacial sand				" " "
	NW	9	29	26	3		210	2400			210	2190	" "				" " "
	NE	23	29	26	3		40	2400	-10	2390	35	2365	" "	Fresh			" " "
	SW	14	30	26	3		50	2400	-15	2385	50	2350	" "	Fresh			" " "

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