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GROUNDWATER RESOURCES OF THE SARCEE INDIAN RESERVE, NUMBER 145, ALBERTA

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Introduction

This report presents the results of a rapid reconnaissance survey of the groundwater resources of the Sarcee Indian Reserve, Number 145, Alberta, conducted during September, 1961. The survey was confined to the settled, eastern third of the main part of the Reserve, which lies immediately to the southwest of Calgary. There is no present demand for groundwater in the western two-thirds of the Reserve.

During the survey a small number of representative wellsites were visited and information obtained from the householders. Mr. Dennis Anderberg - a leading driller of wells on the Reserve - supplied additional information; geological and topographic maps were studied, and well logs supplied by the Sarcee Agency in Calgary were examined. The logs were of particular value and it is hoped that equally good logs will be kept of future wells.

GEOLOGY

The bedrock geology of the Reserve is shown at a scale of 1 inch to 1 mile on Geological Survey of Canada maps 258A (Bragg Creek), 667A (Fish Creek), and 606A (Midnapore). The last two cover the eastern part of the Reserve. The geology is discussed in the marginal notes of the Midnapore Sheet, from which much of the following section is taken.

The Paskapoo Formation of Tertiary age underlies the eastern part of the Reserve. This formation, of freshwater origin, may be as much as 2,000 feet thick near the eastern edge of the Reserve but thins westward. It consists of alternating grey and greenish sandstones and dark shales,

with a few thin coal seams. Towards the bottom a conglomeratic sandstone occurs, and a basal member consisting of very coarse sandstone is probably present.

The Edmonton Formation, of fresh or brackish water origin, underlies the Paskapoo Formation or outcrops to the west of it. It is finer-grained than the Paskapoo, and contains more shale and coal. It in turn is underlain by the largely marine Bearpaw Formation, which consists chiefly of shale.

The structure of the bedrock is not well known. At the eastern edge of the Reserve the beds appear to dip gently westward, but farther west the dips undoubtedly are to the east.

The surficial geology has not been mapped, but the Reserve was subjected to Quaternary glaciation and has a cover of drift (glacier deposits). In general this cover is only a few feet thick on slopes and hills, but reaches substantial thicknesses in low areas and valleys. In the lowlands streams have deposited much alluvium since glaciation, resulting in local, large deposits of gravel and sand.

GROUNDWATER RESOURCES

One well in the extreme western part of the Reserve obtains water at 50 feet from gravel. No other wells are known to draw water from surface materials, and there should be no need to develop such water in areas underlain by Paskapoo Formation. However in the unpopulated western part of the Reserve the surface materials are likely to contain the best aquifers.

The Paskapoo Formation characteristically contains large quantities of water, mostly hard; it is highly permeable, water moves through its beds easily, and this formation readily yields its water to wells. These same characteristics also favour formation of good springs where valleys cut through the aquifers, and these springs will largely drain the bedrock above the level of the valley floor. The distance from a valley over which this effect is felt depends to a large extent on strike and dip of the beds, which is generally unknown.

Any well drilled into the Paskapoo Formation on this Reserve should obtain water in satisfactory amount, and this is generally borne out by the wells that have been drilled. If a well does not obtain sufficient water it is either too shallow or there is some fault in its development. The few unsatisfactory wells were on high ground, and generally on slopes toward river or stream valleys where the higher aquifers would be drained. These wells should have been deeper. In planning other wells near a valley one should be prepared to drill to near the bottom of the valley, and such wells normally will be deeper than average. Exceptions will occur, but finding them would be a hit or miss matter. Thus a certain well might obtain adequate water fairly high on a slope, or prolific springs may be present there. The well at the corral of Chief James Starlight appears to be such an exception.

There are two areas where there has been trouble in obtaining sufficient water. The first is the area just mentioned, near Chief James Starlight's residence, where all the wells are above 3,850 feet altitude. Eastward from here the surface falls to 3,700 feet in one mile, and north-eastward to below 3,600 feet in two miles. Most of the wells are about

150 feet deep, and all have insufficient water except the rather shallow one at the corral which has a good supply.

The second problem area is near the school, where there are three wells. The school well supplies enough water to support a pressure system and probably has a substantial excess capacity. On the other hand the nearby well at the rink has but a poor supply and the well at the community hall has a capacity of but 30 gallons an hour. Evidently the rink well once had sufficient water for watering the rink, but the supply has decreased not through any fault of the aquifer but due to 'silting in' or other trouble with the well itself. The school and rink wells are about 200 feet deep. The well at the hall stands on ground 10 or 15 feet higher, and is only about 150 feet deep. As the land falls away rapidly to the south, about 175 feet in a mile, a large quantity of water could hardly be expected at the depth of the community hall well.

An estimate of the depth to a water supply, and thus the cost of a well, can be made in the eastern part of the Reserve with aid of a topographic map. If the well site is much higher than some of the nearby area, the well will probably be deep; if the site is lower the well should be shallow. If the country is fairly level for some distance around, the well should be of about average depth. However a well once started in the eastern part of the Reserve should be drilled until sufficient water is obtained, even if this necessitates going deeper and spending more money than planned. It is more economical to complete a well and obtain water than to abandon such a hole as 'dry' at a certain, predetermined depth, and start a fresh hole elsewhere with perhaps the same result. It is definitely the wrong procedure in this area to decide beforehand on a

maximum depth at which drilling will be stopped, whether or not water has been found. With a limited fund of money available the wells should be drilled in an established priority, and each well in turn satisfactorily completed before starting another one. This would determine how many wells can be drilled with the money available. It is not advisable to divide this fund by the number of wells desired and thus set a standard, maximum depth for each well. The foregoing applies to wells drilled into the Paskapoo Formation, but not necessarily to those in other bedrock formations.

The well of Mr. Lawrence Whitney has the soft water with high soda content characteristic of water from the Edmonton Formation. As this well is farther to the west than most of the others, and is also on fairly low ground, it probably draws its water from this formation. However certain aquifers in the Paskapoo Formation can also supply similar water.

The pump tests shown on the logs indicate capacities of 5 to 20 gallons per minute, or well above the general amount required for farm and house use. These tests in many cases show the capacity of the bailer or pump, rather than full capacity of the well, and many of the wells can probably yield more water than indicated.

CONCLUSIONS AND RECOMMENDATIONS

1. Adequate supplies of hard water can be obtained at reasonable depth anywhere in that part of the Sarcee Reserve underlain by the Paskapoo Formation, or approximately the eastern half of the Reserve.

2. The few wells that do not supply sufficient water are on high

land, and are too shallow to intercept aquifers that are not drained by springs into nearby valleys. If wells are required on high land near to valleys they will need to be deeper than wells in other areas.

3. Once drilling is commenced on a well into the Paskapoo Formation, it should be continued until it encounters sufficient water, even if the cost is somewhat more than originally estimated. It is better to drill fewer wells and complete them successfully than to drill a greater number of holes to a predetermined depth and have a number of failures amongst them.

4. In the eastern part of the Reserve the policy of using bedrock aquifers should be continued, as these will generally be more satisfactory than aquifers in the surface materials. Drilling would appear to be the most satisfactory method of well construction.

5. Well logs similar to those being made at present should be made for wells drilled on the Reserve in future. In addition to information now shown, temperature of the water (preferably measured during the pumping test) should be noted.