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THE PREGLACIAL EDSON BURIED-VALLEY AQUIFER

by

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Synopsis

The Groundwater Division of the Research Council of Alberta has participated since 1959 in the discovery, exploration, and testing of the preglacial Edson buried-valley aquifer. The Edson buried valley, trending northeast-southwest and passing slightly to the south of the town of Edson, contains in places up to 14 feet of permeable sands and gravels. Single wells completed within it are estimated to be capable of yielding up to 125 imperial gallons per minute on a sustained long-term basis. The total estimated sustained long-term yield for the three town wells now penetrating the aquifer is 210 imperial gallons per minute.

The complete evaluation of the groundwater potential of the buried-valley aquifer requires an extensive program of exploration and testing along an approximate 10-mile length of the valley. The initial part of the program – delineating the extent and thickness of the buried sands and gravels – should cost about $6,000. The costs of the second part of the program – accurate determination of groundwater potential at the more favorable locations – can only be estimated realistically when the first part is complete.

History

The Groundwater Division of the Research Council of Alberta was originally approached by the town of Edson in September 1959 for aid in locating suitable groundwater supplies. Geologic and hydrologic investigations to August 1961 carried out on behalf of, and in cooperation with, the town have been summarized in a report submitted to the town by R. N. Farvolden in October 1959 and in two reports submitted by W. A. Meneley: the first in April 1961, the

second in August 1961. In addition, Mr. Meneley, in a letter dated May 10, 1961, gave detailed recommendations concerning aquifer sampling procedures and well design.

The early work led to the discovery of a buried preglacial valley and to the construction of a production well (Town Well No. 8) which tapped the gravel deposits found in it. The Research Council conducted a seven-week test of this well in the autumn of 1961. In 1962 the Research Council supervised an exploratory program designed to delineate the location, thickness, and extent of the buried preglacial gravels. This program led to the drilling and pump-testing of Town Well No. 9. No formal report has been presented to the town concerning the results of testing the No. 8 and No. 9 wells, nor on the results of the exploration program, but the town has been given estimates of the 20-year safe yields for both wells and has copies of the test-hole logs.

The town has also received two bedrock-topography maps from the Research Council. The first is for township 53, range 17, west of the 5th meridian and was mailed on April 4, 1962. The second, mailed on February 5, 1964, covers townships 51 to 54, ranges 15 to 21, west of the 5th meridian and clearly indicates the most probable course of the buried Edson preglacial valley. This second map constitutes Groundwater Division Project 61-g (Bedrock Topography of the Edson Area) and is, except for a few minor modifications, complete.

Apart from being called on occasionally for advice, the Research Council has not participated in groundwater exploration and testing in the Edson area since 1962. The principal development since that time has been the drilling and testing in 1966 of Town Well No. 10, also completed in the buried preglacial gravels. This program was supervised by Stanley and Associates, the town's consulting engineers.

The Buried-Valley Aquifer

The preglacial Edson buried valley passes generally slightly to the south of the town of Edson and trends approximately in a northeast-southwest direction. The permeable sand and gravel deposits within it are found at depths ranging from about 75 to about 140 feet. The maximum gravel thickness observed in the locations tested to date has been 14 feet and the average thickness is 9 feet.

Of the three production wells now completed in the buried-valley sands and gravels, Well No. 8 is the best producer, with an original estimated 20-year safe yield of 125 igpm (imperial gallons per minute). This estimate was made on the assumption that Well No. 8 was the only well removing water from the aquifer. The 20-year safe yield for Well No. 9, made on the same basis, was 100 igpm. Stanley and Associates have given a corresponding safe-yield figure of slightly over 40 igpm for Well No. 10. The differences in the safe-yield estimates are believed to be a result of variations in aquifer properties and perhaps – in the case of Well No. 10 – of a more conservative well design. With three wells all producing from the buried-valley aquifer, some allowance has to be made for mutual interference, and it is suggested that the safe-yield figures should, therefore, be reduced to 100, 75, and 35 igpm for Nos. 8, 9, and 10, respectively.

Future Studies

The Edson buried-valley aquifer crosses to the other side of the McLeod River at points to the northeast and southwest of Edson. As far as the town is concerned, the usable portion of the channel – some 10 miles in length – is confined between these two points. A complete evaluation of the groundwater potential in the usable length requires an exploration program which will (a) outline

the extent, thickness, and probable potential of the buried sands and gravels and (b) firmly establish the potential groundwater yield at the more promising locations.

If such an exploration and testing program is agreed upon, it is recommended that it be carried out in two stages, corresponding to the two basic objectives (a) and (b) above. On the assumption that the available access roads will permit the drilling of four 150-foot test holes across the valley at each 1-mile east-west interval, determination of extent and thickness of the buried gravels should be possible for about $6,000. Greater test-hole density or selection of sites off the road allowances could increase the costs. However lack of access, a probable average test-hole depth of closer to 100 feet, and the fact that the areas close to town have been fairly well covered should tend to reduce the costs. The figure of $6,000 seems, therefore, reasonably realistic provided the assumed drilling costs of $1.00 per foot can be accepted. The town's own experience with past drilling programs will be the best guide in this respect.

When thickness and extent of the buried gravels have been satisfactorily determined, some money may remain for testing potential groundwater yield at one or more favorable sites. If more money is required for this purpose, a realistic estimate of the amount required can easily be made.

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