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DEPARTMENT OF THE INTERIOR
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GROUND WATER IN PALMER, ANCHORAGE, AND FAIRBANKS AREAS, ALASKA

By D. J. Cederstrom
September 1951

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This memorandum containing general information on the occurrence of ground water in the Palmer, Anchorage, and Fairbanks areas, Alaska, was prepared at the request of the Alaska Department of Health, which is interested in the availability of supplemental supplies of water in those areas.

Ground Water in Palmer Area

The Matanuska Valley agricultural area, in which Palmer is situated, occupies a wide flat-floored glaciated valley. Throughout the agricultural area as a whole the dominant surficial materials are of glacial origin: unwashed glacial drift (till), and washed glacial drift (sand and gravel). The till is impermeable. The sand and gravel generally are highly permeable. Bedrock crops out at the surface in a few places but lies close beneath the surface in other parts of the area, notably under the town of Palmer. Nearly all the wells in the area are developed in sand and gravel.

At Palmer, which is near the upstream end of a terrace remnant along the Matanuska River, the terrace is approximately 1 mile wide. The terrace extends about 3 miles downstream (south) from Palmer and reaches a maximum width of approximately 3 miles. Southward from Palmer the till and bedrock lie at increasing depths beneath a cover of sand and gravel. The water table slopes east and south toward the river. One mile south of Palmer it lies about 100 feet below the surface, and 3 miles south of Palmer it lies about 40 feet below the surface. Farm wells in this latter area are satisfactory, although none have been developed to yield more than small

amounts of water. It is likely that moderately large ground-water supplies can be developed from the sand and gravel beneath the terrace at a distance of 1 to 2 miles south of Palmer.

West and northwest of Palmer, sand and gravel lie at the surface and are underlain by till. The surficial sand and gravel and the till have a total thickness of as much as 100 feet. Within 1 to 3 miles west and northwest of Palmer, water occurs locally 20 to 30 feet below the surface but more generally water stands 30 to 70 feet below the surface. More than 20 wells in this area pass through the till into an underlying water-bearing gravel. Exploration for ground-water supplies in this area probably should be directed toward the underlying gravel rather than toward the upper surficial gravel.

For several years the water supply for Palmer was obtained from a group of springs which emerge from the base of a gravel hill about 3 miles (airline) northwest of Palmer. The springs supplied about 300 gallons per minute. During the dry year of 1950 the spring flow declined to about half this amount. Early in 1951 the existing pipeline to the spring was extended to a small stream about half a mile north of the springs. The water in the springs appears to be derived from near-surface gravel overlying till. A well located up the water-table slope from the springs might produce as much water as, or even more than, the former yield of the springs.

Anchorage Ground-Water Supply

Topography.--Anchorage lies upon a relatively flat plain sloping gently seaward, the elevation being about 150 feet above sea level within the corporate limits. This plain is broken by several streams which have cut narrow valleys 50 feet or more below the level of the plain.

Geology.--The area in which Anchorage is situated is underlain by unconsolidated sediments, largely of glacial or immediately post-glacial age. These consist of silts, glacial till ("hardpan"), sand and gravel. Some clay beds are present

but are less important than the other types of sediments named.

These sediments appear to have been derived from the north or northeast; consequently, the finer-grained material does not grade into coarser in the direction of the mountains to the east but, instead, bands of sediments lie parallel to each other and extend approximately northeast-southwest.

Adjacent to the Chugach Mountains on the east is a band of low hills made up in large part of impermeable glacial till. However, subordinate beds of sandy and gravelly material are included in the till. Immediately west of the till hills is a zone of coarse gravelly sand, approximately a mile wide. The relation of the sand to the till hills is imperfectly known, and it appears that in places the gravel zone interfingers with the till zone. Immediately west of the gravelly zone is a zone of fine-grained material--silt, clay, fine sand, till(?), and, uncommonly, coarse sandy or gravelly beds. The city of Anchorage, in large part, the village of Spenard, and the International Airport lie in this zone of fine-grained sediments. The transition from the zone of coarse to the zone of fine sediments appears to be abrupt.

Ground-water supplies.--In the suburban area of Anchorage, particularly at Spenard and Mountain View, a large number of private wells furnish water to the inhabitants. Most of the wells are shallow and yield very small quantities of water, but several hundred drilled wells ranging in depth from 60 to 130 feet, furnish a safe supply to their owners. Most of these wells are 6 inches in diameter and now yield only meager quantities of water. No attempt has been made in most instances to develop more than 3 to 10 gallons a minute. All these wells are finished without strainers and many have not been properly pumped to clear out the fine-grained material and obtain the maximum supply available.

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However, throughout the area the quality of water obtained from drilled wells has been excellent in both sanitary and chemical quality.

A few wells have been developed to yield somewhat more water but nowhere have supplies in excess of 100 gallons a minute been developed.

The till yields no water to wells but within the till thin sandy or gravelly beds yield small supplies, more than ample for domestic use. The depth to sandy beds cannot be predicted. In one location such a sandy bed may occur at 40 feet, whereas a few hundred feet away another well may be drilled to 150 feet before encountering such a water-bearing formation. Large supplies are probably not available in areas of till.

The gravelly zone just west of the till hills is a favorable area to explore for large supplies of ground water, and such explorations are at present being made in this zone by the Geological Survey. The amount of drilling in the area to date is not sufficient to warrant generalizations but it is believed that, if thick, permeable beds are present anywhere in the Anchorage area, they will be found in this zone. The depth to bedrock, and hence the total thickness of material in which permeable beds may occur, is not yet known.

The area of fine-grained sediments is a poor area in which to seek large water supplies. Wells in this area at present have a small yield and many wells are troublesome in that they tend to silt up. Special methods of development appear to be necessary for successful well construction here. However, it is possible that coarser and thicker beds lie at depth (beyond 300 feet), and that larger quantities of water are available than are now apparent.

Summary.--The information available on ground-water supplies in the Anchorage area is very meager, and it cannot be said now whether ground water in quantities suitable for municipal supplies is or is not available. The drilling to date has been of shallow depth, and no attempt has been made to develop large quantities

of water. Hence, the small yields of existing wells cannot be cited as evidence that only small quantities of ground water are available. It is hoped that Geological Survey explorations will be sufficient to indicate the ground-water potential of the area in the near future.

Fairbanks Ground-Water Supply

Topography.--Fairbanks is in the Tanana Valley on a level plain about 2 miles south of a low range of hard-rock hills. The plain is broken by shallow streams and abandoned meander scars.

Geology.--The area is underlain by silt, sand, and gravel of late glacial and postglacial age, deposited by streams. The hills to the north have cores of bedrock but in large part are mantled by a variable thickness of fine-grained brown silt and highly organic silt called muck. Much of the low plain area is permanently frozen. The permafrost, where present, has the form of wedges and ranges in thickness from a feather edge to 250 feet. Areas of frozen ground alternate with areas of thawed ground. The thickness of the unconsolidated sediments underlying Fairbanks and vicinity is unknown.

Ground-water supplies.--Hundreds of small diameter private wells ranging in depth from 15 to 250 feet supply the residents of Fairbanks and vicinity with water. These wells are constructed by a jet-drive process and are highly successful; some 2-inch wells yield up to about 40 gallons a minute. In frozen areas water is obtained from above or below the permafrost, and no real difficulty is experienced either in drilling the wells or in keeping them in operation when completed. A number of larger-diameter wells have been constructed and these yield up to 500 to 600 gallons a minute. Some of the largest-diameter wells yield more than 800 gallons a minute.

Although water is available everywhere in the Fairbanks and the immediate vicinity, with ease and in large quantity, the quality of water available is poor. The ground water almost invariably has an unpleasant taste due to high iron content. It can be successfully treated by commercial water softeners and it seems likely that treatment on a municipal scale would not be difficult or prohibitively expensive.

There is little likelihood that a substantial supply of iron-free water can be obtained from the ground in the Fairbanks area.

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UNITED STATES
DEPARTMENT OF THE INTERIOR
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Aug.7,1950

To:A.N.Sayre
From D.J.Cederstrom
Subject: Alaska Ground Water Activities

Work at Kotzebue finished when an Army LCT picked up the rig on July 23. The rig was returned to the airbase at Nome and tools and other equipment disposed of at various points.

It is expected that the rig will be shipped immediately to Anchorage and delivered to the District Engineer who in turn will loan the rig to the Geological Survey for work in the Anchorage area. This rig may be in operation by the USGS before September 15.

Pipe for drilling is at hand and should be delivered shortly after Sept.1. A complete set of tools will be on hand shortly after that date.

Storage space in Anchorage has been donated by the REA (Chugatch Electric Co.) at their siding along the RR south of town. We have found it necessary to construct a small tool shed on skids which can be locked and left at the storage area and or dragged on any individual job if necessary. It was initially necessary in order to store things here in Palmer.

The hole at Kotzebue was carried to a depth of 325 feet, cased all the way. Only salt water was encountered. It was not possible to conduct a tundra stripping and thawing operation as had been planned. Considering the great expense and remoteness of the area, it is unlikely that this operation will be attemptedsoon

The jet rig at Palmer is built and ready to start drilling this morning. Cost of the rig has been moderate but local machine shop charges have been excessive. The jetter believes he can operate successfully in Palmer but I do not look for really good results until we go to Anchorage,presumably around Sept.1, where sediments are less cobbly.

Mr.Trainer continues mapping,etc, in the Palmer area. Mr. Kerr will probably start working up the Anchorage area when we locate some transportation for him. The cable tool driller,Mr. Chausse, and Field Assistant Sprout are working with Mr.Reynolds, the jetter, at present.

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