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UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WASHINGTON, D.C. 20242

WATER-RESOURCES RECONNAISSANCE

OF

ANAKTUVUK PASS, ALASKA

BY

Charles E. Sloan

Prepared in cooperation with
Alaska Department of Public Works

Open-File Report
June 1972

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ABSTRACT

A hydrologic reconnaissance was made of Anaktuvuk pass in the central Brooks Range during the summer of 1971 to help develop a water supply for the village school. Winter icings and summer flow conditions in Contact Creek both indicate that ground water is present beneath the creek bed. A well-site area was selected in the channel of Contact Creek near the school where the prospects of obtaining a suitable ground-water supply seem best. In the event that wells are unsuccessful, water can be hauled from Eleanor Lake to the school. Chemical quality of water at Anaktuvuk Pass is excellent, but any source of water may be subject to bacterial contamination and would require treatment.

INTRODUCTION

A hydrologic reconnaissance of Anaktuvuk Pass was made on June 17, 1971, by the U.S. Geological Survey in response to a request from the Alaska Department of Public Works. The work was done under a cooperative funding agreement to assist in the location and development of a water supply for the village school.

Simon Paniaq and Joe Mekiana of Anaktuvuk Pass provided valuable information about local streams and lakes, and Mr. Mekiana also acted as guide during the author's visit to the village.

Anaktuvuk Pass is a native village of about 120 inhabitants in the central Brooks Range between the John and Anaktuvuk River valleys (fig. 1). Arctic weather dominates the climate of Anaktuvuk Pass, which is well within the zone of continuous permafrost (Ferrians, 1965). Precipitation averages about 11 inches per year and about 75 percent occurs as snowfall. Mean annual temperature is about 14°F (Porter, 1966); June, July, and August are the only months when the mean temperature is above freezing.

SOURCES OF WATER

Most of the water used at Anaktuvuk Pass during the summer comes from surface water in Contact Creek and during the winter from melting snow. When these sources are unavailable, water is carried from springs near the south end of the airstrip or from Eleanor Lake (fig. 1). There is no central water supply in the village, and all the existing sources are subject to bacterial contamination.

Three potential water sources for continuous use by the village school at Anaktuvuk Pass are Eleanor Lake (also called Summit Lake), an unnamed lake at the southwest edge of the village, and ground water from the valley of Contact Creek.

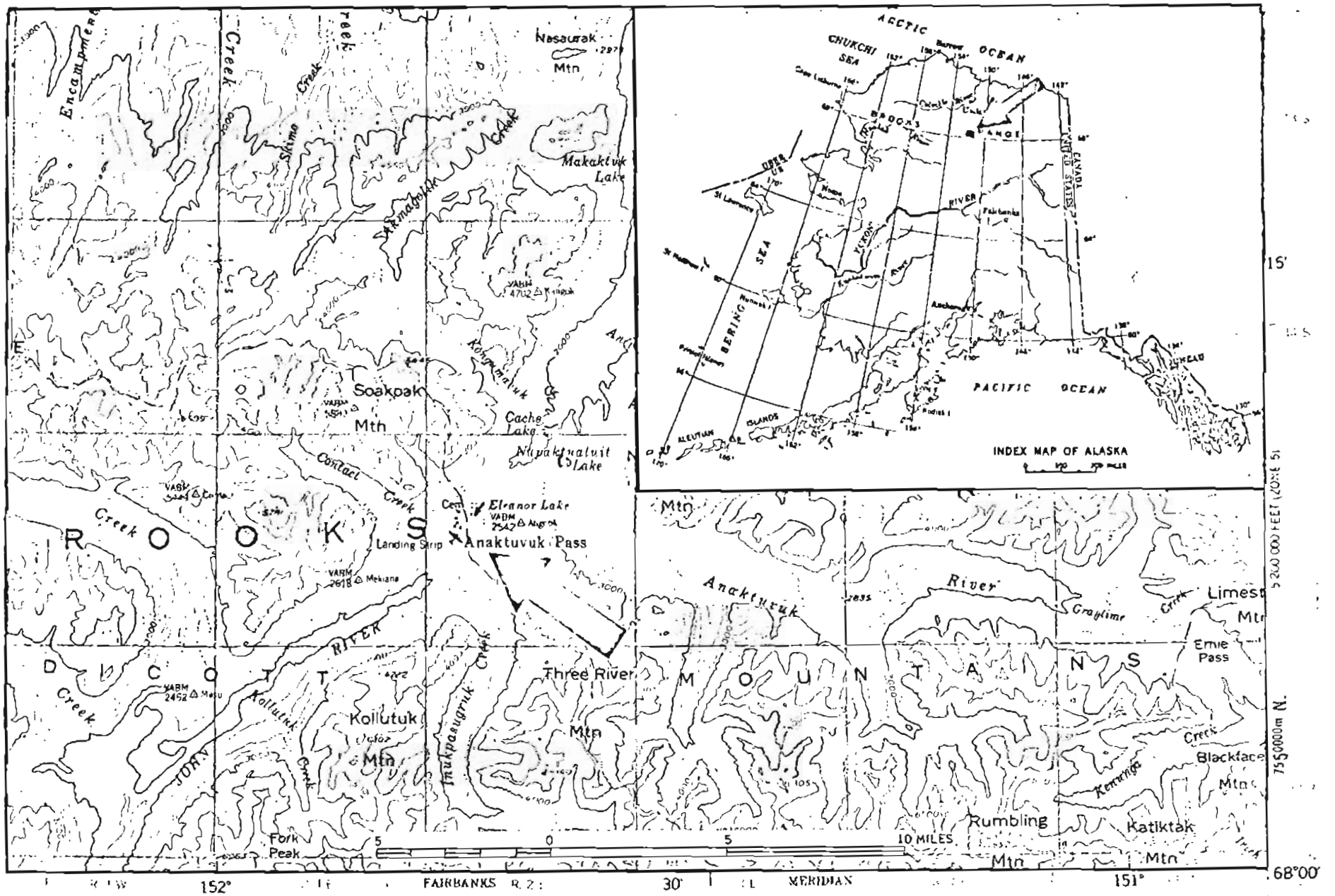

Figure 1.--Location of the Anaktuvuk Pass area.

Eleanor Lake, covering an area of about 30 acres and located half a mile northeast of the school, is about 45 feet deep (Porter, 1966) and could provide an ample supply of water. Its distance from the school, however, makes the cost of using Eleanor Lake as a water supply high and probably prohibitive.

A smaller lake, unnamed, at the southwest edge of the village (fig. 2) is closer to the school than Eleanor Lake but is a questionable source because of possible contamination.

A ground-water supply might be obtained from the saturated sand and gravel underlying the channel of Contact Creek, which flows from only about mid-June to late August.

QUALITY OF WATER

Chemical analyses of water from Eleanor Lake and Contact Creek made in 1961 (table 1) indicate that the inorganic chemical quality of water is very good. However, John Scribner, State of Alaska, Department of Health, Education, and Welfare (oral commun., July 6, 1971), reports that all surface-water sources at Anaktuvuk Pass are moderately to highly contaminated by bacteria. Chemical analysis of water in the small lake at the south edge of the village (table 2) indicates that it is of good chemical quality. Because of the small size of the lake, and its location, it may also be subject to contamination. Winter freezing could also concentrate the dissolved solids and make the water unacceptable.

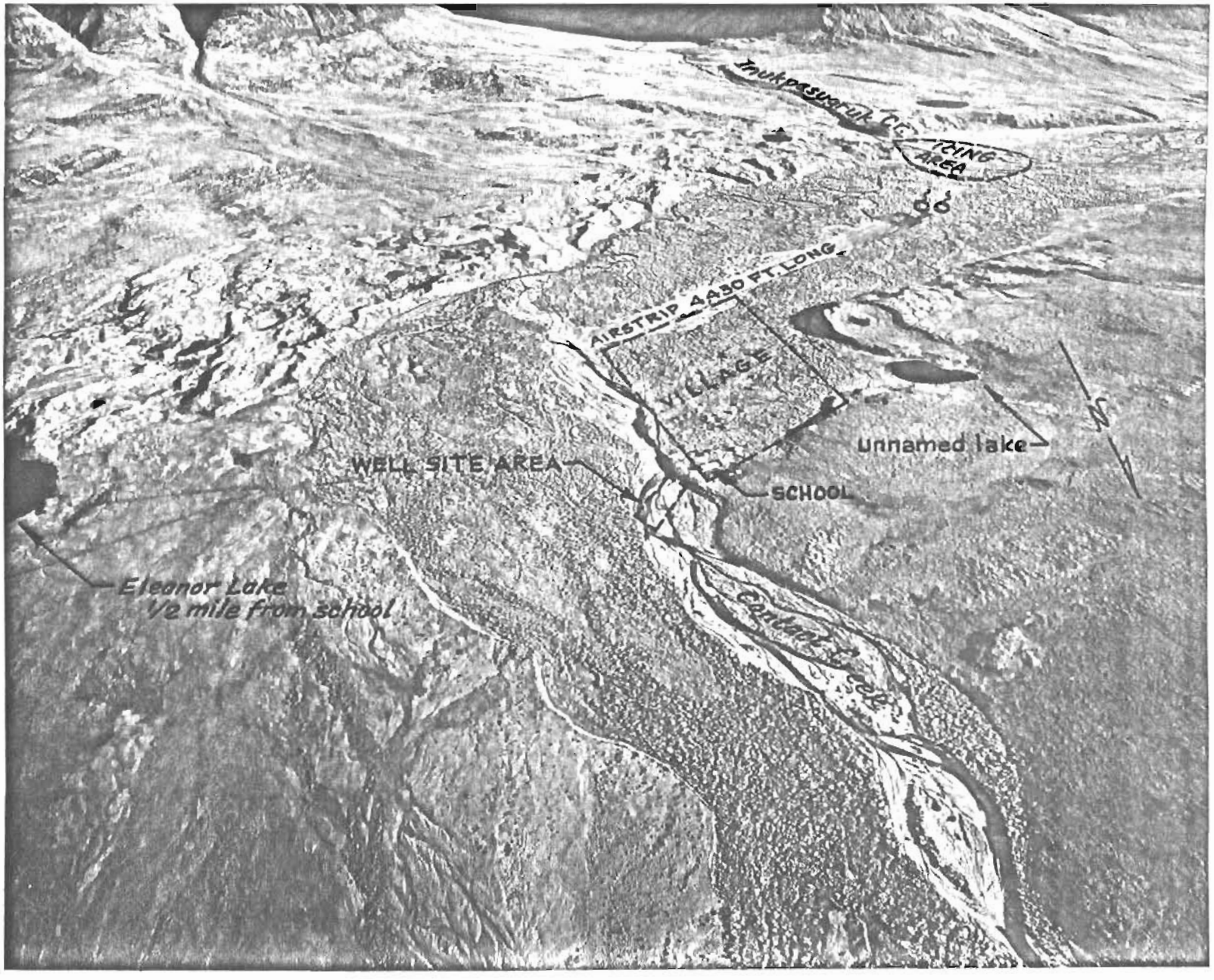

Figure 2.--Oblique aerial view of Anaktuvuk Pass showing school and well-site area.

Table 1.--Chemical analyses of Eleanor Lake and Contact Creek.

(From "Characteristics of Surface and Ground Water in Selected Villages of Alaska" - Part II "Drainages of the Tanana River, Upper Yukon River, Koyukuk River, Brooks Range and Arctic Slope," by G. M. Arnow and G. L. Hubbs.)

Date	Origin	Color	Odor	pH	Cond.	Total solids	Organic matter	Hard-ness	Ca	Mg	Na	Fe	NO_3	Cl	F
2-10-61	Eleanor Lake	<5	none	6.8	9	20	10	4	1	<1	<1	<0.05	<1	<1	<0.1
8-6-61	Contact Creek	10	none	7.9	122	88	21	78	17	8	<1	0.5	<1	1	<0.1

le 2.--Chemical analysis of unnamed lake south edge of Anaktuvuk Pass village.

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WATER ANALYSIS

Location Anaktuvuk, near corner of village - lat 68°8'10" N.; long 151°45'15" W.
Source Lake south edge of Anaktuvuk Village
Point of coll. Surface sample at edge of lake
Owner _____ Treatment _____
Use _____ Gage height (ft) _____ Discharge (cfs) _____ Temp (°F) _____
Appear. when coll. Clear
Collected June 17, 1971 By Sloan, Charles
Remarks

	me/l	ap/l		mg/l	ap/l
Silica (SiO_2)	2.1		Bicarbonate (HCO_3)	91	1.49
Aluminum (Al)			Carbonate (CO_3)		
Iron (Fe)	.00				
Manganese Mn	.03		Sulfate (SO_4)	0.2	.00
			Chloride (Cl)	0.8	.02
			Fluoride (F)	0.0	.00
Calcium (Ca)	25	1.25			
Magnesium (Mg)	3.9	.29	Nitrate (NO_3)	0.4	.01
Sodium (Na)	0.1	.00			
Potassium (K)	0.2	.01			
		1.55			1.52
Total			Total		

	mg/l		
		Specific conductance (micromhos at 25° C)	145
Dissolved solids: Calculated	78	pH	7.4
Residue on evaporation at 180° C		Color	10
Hardness as $CaCO_3$	77		
Noncarbonate	2		
Alkalinity as $CaCO_3$	75		

Lab. No. 14713 Field No. Project Anaktuvuk School AK-71-082-C

GROUND-WATER CONDITIONS

The best prospect for a suitable water supply near the school is the possible ground-water supply underlying Contact Creek. This supposition is supported by the presence of icings in Contact Creek both upstream and downstream from the village. An aerial reconnaissance of Anaktuvuk Pass made on May 21, 1971, noted icings near the village. A narrow channel icing occupied Contact Creek about one mile west of the village and extended for several miles upstream. In addition, an extensive icing field occurred at the confluence of Contact Creek and Inukpasugruk Creek downstream from the village. Additional evidence of the probability of ground water in the alluvium of Contact Creek is given by the presence of surface-water flow in late summer in Contact Creek both above and below the village. Even though the surface flow in Contact Creek ceases near the school during this period, there must be a substantial flow of water as underflow through the gravels of Contact Creek near the school.

Although the prospect is good for developing ground water, uncertainties regarding the thickness of unfrozen alluvium in the channel, the degree of saturation, and the depth to which the water table might recede during the winter makes further exploration necessary.

Because of frozen zones in the gravel or inadequate gravel thickness, it may be necessary to drill several holes before a satisfactory well is obtained. Drilling should be undertaken in springtime prior to breakup when water levels in the gravels are lowest. Boulders are numerous in the alluvium of Contact Creek, particularly near the south bank close to the school. An attempt to bulldoze a pit into the water table at this location several years ago was thwarted by near-surface boulders

which were too large to be moved. Drilling at a site near the present channel of Contact Creek stands a better chance of avoiding boulders than a site nearer the school at the south bank.

RECOMMENDED DEVELOPMENT

The well should be drilled to a depth of 50 feet or several feet into the glacial till that underlies the alluvium in the channel, whichever is less. The well should be cased its full depth with 6-inch casing that is slot perforated through the lowest 5 feet. The casing should also protrude about 10 feet above the present surface so that a base may be constructed to protect the well from flood flows in Contact Creek. A heat tape and insulation will be required for the upper part of the casing and the supply pipeline to the school to prevent freezing.

If an adequate ground-water supply cannot be found underlying Contact Creek, the next best alternate source of water is Eleanor Lake. In this instance, because of the distance to the school, it may be more economical to construct an all-weather road and to haul water to heated storage tanks at the school than to build a heated pipeline.

REFERENCES CITED

Arnow, G. M., and Hubbs, G. L., 1962, Characteristics of surface and ground waters in selected villages of Alaska. Pt. II - Drainage of the Tanana River, Upper Yukon River, Brooks Range, and Arctic Slope: U.S. Public Health Service, Dept. of Health, Education, and Welfare, Arctic Health Research Center, Anchorage, mimeo., 22 p.

Ferrians, O. J., Jr., 1965, Permafrost map of Alaska: U.S. Geol. Survey Misc. Geol. Inv. Map I-445.

Porter, S. C., 1966, Pleistocene geology of Anaktuvuk Pass, central Brooks Range, Alaska: Arctic Inst. of North America, Tech. Paper No. 18, 100 p.