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RESULTS OF AN AQUIFER TEST AT PETERS CREEK,
MUNICIPALITY OF ANCHORAGE, ALASKA

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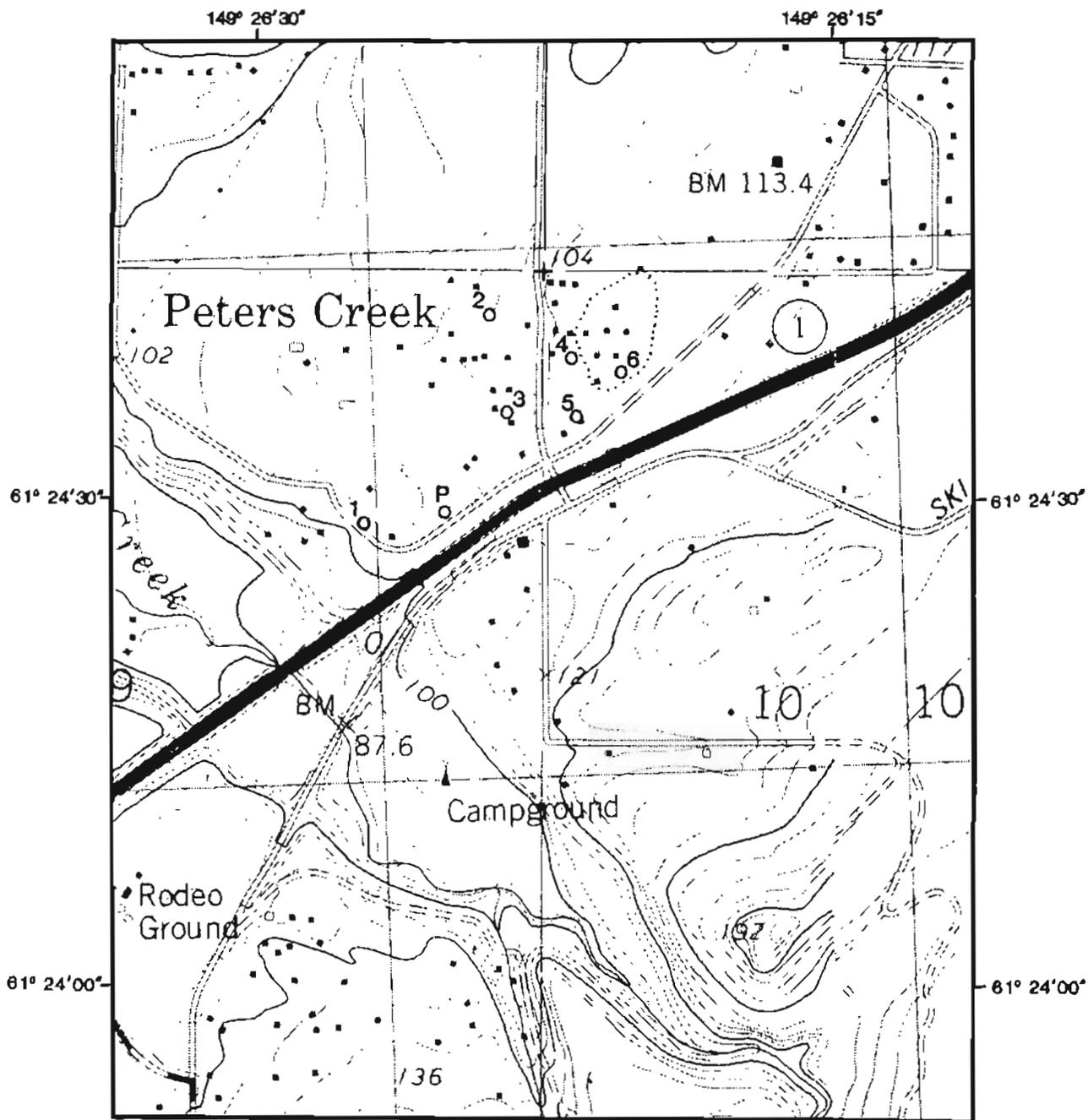
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INTRODUCTION

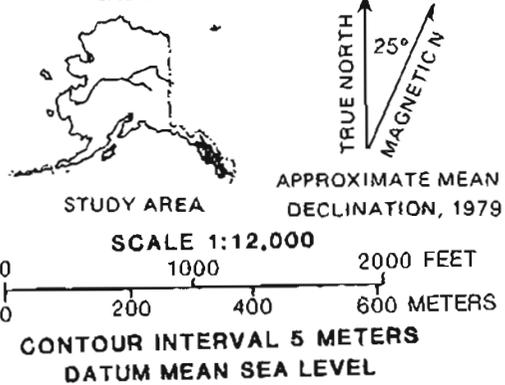
During April 1986, 13 private domestic wells at Peters Creek, Alaska (within the Municipality of Anchorage), were shown to be contaminated by benzene and other aromatic hydrocarbons from an unknown source (Bennett, 1986). As a result, the Municipality of Anchorage hired a private contractor to design and construct a temporary above-ground water system to serve residences in the affected area. The source of water for the temporary system was tentatively identified as a water well that served the Peters Creek Trading Post business complex (fig. 1). On April 30, 1986, a contractor for the Municipality of Anchorage and the Division of Geological and Geophysical Surveys began planning a cooperative aquifer test to be initiated the following day utilizing the Trading Post well as the production well. Six nearby wells were selected as observation wells, with permission of the well owners (fig. 1). The objectives of the test were to assess the capacity of the Trading Post well to produce water, estimate the effects of pumping the Trading Post well on the ability of surrounding wells to obtain water, and assess whether use of the Trading Post well to supply the temporary water system would affect the migration of the contaminated ground water, located about $\frac{1}{4}$ -mile away.

TEST DESCRIPTION

A drillers log of the Trading Post well indicated that a 10-ft length of 100-slot screen (0.1 in. screen openings) had been installed in the well at a depth interval of 171-181 ft. On May 1, 1986, the well was found to be 180 ft deep, and had a static water level 139 ft below the land surface. A 5-horsepower submersible pump was installed in the 6-in.-diam. well, with the pump openings set at a depth of 174 ft. Discharge from the well was



Base from U.S. Geological Survey Anchorage B7 NE and NW quadrangles, scale 1:25000.
ALASKA



EXPLANATION

--- APPROXIMATE LIMIT OF CONTAMINATED GROUND WATER

1 O LOCATION OF OBSERVATION WELL WITH WELL NUMBER

P O LOCATION OF TRADING POST WELL

Figure 1. Locations of selected wells at Peters Creek.

controlled through a valve, and the flow rate was measured with an in-line turbine-style flowmeter, and verified with a bucket and watch. With the pump installed in the well, the water-level measuring device could not be lowered deeper than 146 ft, therefore, drawdown and recovery data from the pumped well were not obtained.

The test pump was started at 10:30 am May 1, 1986, and ran for about 10 seconds and suddenly stopped. A small amount of silt-laden water was produced. The cause of the pump stoppage was found to be a tripped breaker in the power supply from the Trading Post. The pump was restarted three times, with each start followed closely by a tripped breaker and pump shutdown. The test pump then failed to start, presumably because of an excessive amount of sediment in the pump.

A second pump was installed in the well with an intake setting 165 ft below land surface. The pump was started at a rate of about 10 gallons per minute (gpm) at 12:15 p.m. Between 12:15 p.m. and 3:38 p.m. the flow rate was gradually increased to a maximum rate of 32 gpm, with several brief shutdowns caused by a tripped breaker. The amount of sediment produced by the well gradually decreased as pumping progressed, but observable amounts persisted. A lack of progress in being able to increase the pumping rate beyond 32 gpm without tripping the breaker resulted in a decision to remove the second pump and install a third pump at the same depth. The third pump was operated at a gradually increased rate of 8 to 19 gpm from 4:26 to 5 p.m., at which time the breaker tripped again. It was concluded that the excessive load on the power supply, which was causing the breaker to trip, was caused by the passage of an excessive amount of sediment through the test pumps.

The fourth pump installed in the well at an intake depth of 156 ft had worn impellers which allowed the passage of sediment-laden water with relatively little increase in power consumption. The flow rate with this pump was gradually increased from 12 gpm to 60 gpm at 12:45 a.m., May 2, 1986, where it was maintained until noon of that day. Although pumping levels in the production well were not obtained, total drawdown must have been less than the the total available drawdown of 17 ft, resulting in a specific capacity greater than 3.5 gpm/ft of drawdown. At the end of the pumping period, water from the well was free of visible sediment.

AQUIFER ANALYSIS

Six observation wells monitored during the aquifer test are located 500 to 1400 ft from the Trading Post well (figure 1, table 1). A review of the water-level data collected prior to 6 p.m., May 1, 1986, failed to identify any positive water-level response attributable to the pumping at the Trading Post well. Water-level measurement activity was suspended prior to the installation of the fourth test pump because the likelihood of successfully pumping the Trading Post well at a rate of 40 gpm or more appeared to be low.

Water-level data were collected in four of the six observation wells on May 2 to determine if significant drawdowns had occurred, and if so, to collect recovery data. Water-levels measured prior to noon, May 2, were all slightly higher than measurements made about 24 hrs earlier (Table 2), which was indicative of a background trend of increasing water levels. No conclusive evidence of drawdown caused by overnight pumping of the Trading Post well could be discerned.

Table 1. Summary of observation well data. Well locations are shown in figure 1.

Well Number	Land Surface Altitude* (ft above sea level)	Casing Height (ft above land surface)	Depth to Water (ft below top of casing)	Time of Measurement (ADT)	Well Depth (ft)
1	337	2	141.01	12:15 p.m. 5-01-86	195
			140.95	11:31 a.m. 5-02-86	
2	337	3	155.19	12:15 p.m. 5-01-86	179
3	342	3	139.95	12:16 p.m. 5-01-86	175
			139.87	11:50 a.m. 5-02-86	
4	345	1	108.90	12:15 p.m. 5-01-86	184
5	354	3	127.70	12:15 p.m. 5-01-86	145
			127.54	11:59 a.m. 5-02-86	
6	350	3	93.55	12:15 p.m. 5-01-86	109
			93.46	11:47 a.m. 5-02-86	

*estimated from 4 ft-contour-interval topographic map, scale 1:2400.

Upon cessation of pumping, the water-level in well 1 (figure 1) rose a total of 0.03 ft within about 20 minutes. The precision of water level measurements at Well 1 was about ± 0.01 ft and the water level was steady prior to noon and after 12:20 p.m. (table 2), strongly suggesting that water-level recovery actually occurred at Well 1 in direct response to the termination of pumping at the Trading Post well. Although the data are insufficient to analyze quantitatively, they provide an indication that a relatively productive aquifer is present in the vicinity of the Trading Post well. In fact, using a minimum specific capacity of 3.5 gpm/ft of drawdown and 30 ft of available drawdown, a minimum well yield of about 100 gpm can be projected for the Trading Post well, assuming that sediment production from the well would not inhibit pumping.

Table 2. Water level data collected at Well 1 (see figure 1), May 1-2, 1986.

<u>May 1</u>		<u>May 2</u>	
Time	Depth to Water (ft below top of casing)	Time	Depth to Water (ft below top of casing)
9:29 AM	141.02	12:06:25 PM	140.92
9:47	141.03	12:07:30	140.93
10:25	141.01	12:08:20	140.92
10:30	141.01	12:09:20	140.92
12:15 PM	141.01	12:10:40	140.92
1:00	141.00	12:12:20	140.92
1:30	141.08	12:14:30	140.92
1:55	141.00	12:15:40	140.92
2:15	140.95	12:16:20	140.91
2:25	140.93	12:17:00	140.91
3:38	140.95	12:18:15	140.90
4:08	140.95	12:19:20	140.90
5:08	140.95	12:20:30	140.90
		12:21:30	140.90
		12:23:00	140.91
		12:24:30	140.91
		12:27:00	140.91
		12:30:00	140.92
		12:33:00	140.90
		12:34:00	140.90
		12:37:00	140.91
		12:42:00	140.90
		12:48:00	140.91
		12:58:30	140.91
		13:10:00	140.90
		13:21:30	140.91

The available data indicate that short-term water-level declines could be expected to result from pumping the Trading Post well at a rate of 60 gpm or less are small. The declines would not be great enough to significantly affect the operation of local domestic wells, nor would they significantly affect existing ground-water gradients in the vicinity of the benzene-contaminated ground water. Thus, movement of the contaminant plume would not appear to be affected by use of the Trading Post well at a rate of extraction less than 60 gpm. Additional water-level, water-use, and water-quality data are required to further characterize movement of the contaminant plume.

POSTSCRIPT

Subsequent to the May 1-2, 1986, aquifer test at the Trading Post well, the Municipality of Anchorage began to utilize the Trading Post well and a second well (called the Oberg Field well) as sources of water for a public water system serving the area of contaminated ground water. The Oberg Field well is located about 500 feet northwest of the Trading Post well. On May 12, 1986, the well was found to be 184 feet deep with a static water level 150 feet below the top of the casing and was test pumped for 44 minutes at a maximum rate of 58 gpm with a maximum drawdown of 6 feet (J. Sullivan, written comm., 1986). The analysis described in this report regarding the potential effects of utilizing the Trading Post as a public supply well is likely also to apply to the Oberg Field well because the two wells appear to tap the same aquifer.

REFERENCES CITED

Bennett, Ed, 1986, Peters Creek well tests show petro pollution:
Chugiak-Eagle River Star, v.16, no. 17, p. 1.