



To: J.C. Foweraker, Head  
Groundwater Section  
Water Management Branch

Date: June 19, 1984

Our File: 103 F/8

Re: Queen Charlotte City - Well Drilling

As requested by Mr. A.A. McTaggart of the Ministry of Municipal Affairs a review has been completed of the pump test information for test-production well no. 1. The well has been rated at 58 Igpm by Pacific Hydrology Consultants Ltd. on the basis of utilizing 70 percent of the available drawdown.

The well was completed 7 7/8" in diameter to a depth of 420 feet with the first major water-yielding fractures encountered from 112 to 140 feet; other water-yielding fractures were evident to a depth of 385 feet. Twenty feet of 8-inch diameter casing was grouted in place to form a sanitary surface seal. Due to caving conditions, Pacific Hydrology have recommended that the well should be cased with a slotted steel liner before a permanent pump is installed in the well.

The well was tested starting in March 31, 1984 for a duration of 9925 minutes (6.9 days). The pumping rate was adjusted during the test several times but was generally maintained close to 72.4 USgpm for the major portion of the test period. After the first 2490 minutes of pumping the water level was approximately stable at 166 to 168 feet below the top of the well casing. The pumping rate during the period 1800 to 2490 minutes, however, was reduced slightly which could account for the apparent stabilization. During the period 3000 to 9925 minutes the well was pumping from 70.2 to 72.4 USgpm with the water level ranging from 358 to 282 feet below ground. During this period, 98 to 77 percent of the available drawdown in the well was utilized. Upon shutdown the well recovered to within 5 feet of the pre-pumping level (18.9 feet) after 1 day.

Extrapolation of the latter portion of the drawdown curve prior to 1560 minutes suggests the water level would fall to about 290 feet below ground level utilizing 80 percent of the available drawdown in the well after 100 days pumping at 72.4 USgpm. Based on the specific capacity at 100 days and utilizing 70 percent of the available drawdown to 385 feet suggests the well would sustain a theoretical yield of 64 USgpm over the long-term. A number of factors concerning the test should be noted namely:

*drawdown*

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1. The test was carried out at the end of the winter months when ground-water levels would be expected to be seasonally high.
2. The test was not carried out at a constant rate over a sufficient interval of time (normally a period of 72 hours) to facilitate assessment of the well behaviour at the optimum well yield. A constant rate pump test for a minimum of three days duration at or above the optimum pumping rate for the well during the summer months would be required to verify that the well could sustain the 70 USgpm rate.
3. It is not clear from the well drilling results whether the entire zone from 112 to 385 feet is productive or whether the majority of water is coming from a small number of specific fracture zones. If the latter is the case then the actual location of the major-producing fractures would be important for assessing the available drawdown in the well.

A water quality analysis for a sample taken April 7th showed low overall dissolved mineralization (TDS = 180 mg/L) but high total iron (3.48 mg/L) and high turbidity (100 J.T.U.) levels. A strong odour of H<sub>2</sub>S gas was reported occasionally during the pumping test. The high iron and turbidity may be attributed to suspended clay in the discharge which was reported during the test. The suspended materials would be expected to disappear with prolonged pumping.

In summary the well test data shows that the well is capable of sustaining a rate of 70 USgpm over a 7 day period. The water level after 7 days pumping, however, was a minimum of 282 feet below ground utilizing a minimum of 77 percent of the available drawdown in the well. Based on the available test data it would appear from this that the long-term yield of the well would be close to but somewhat less than 70 USgpm, say 60 USgpm, to afford a reasonable safety factor in the well. As a liner has been recommended for the well it may be advisable to retest the well with the production pump after the liner is installed to ensure there has been no change in performance. A test during the late summer months would be recommended to verify that the water levels and well performance are not subject to wide seasonal variations. A pump setting above 385 feet is recommended for a submersible pump to ensure adequate cooling of the pump motor is achieved. Further water quality sampling including on site filtering is recommended to determine if iron is being contributed by suspended matter or whether it is present in the groundwater. When put into production the well should be equipped with a flow meter to monitor consumption and provision should be

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made on the well head for obtaining monthly water level readings. The above review was discussed in a telephone conversation between Dr. Foweraker and E. Livingston of Pacific Hydrology Consultants on June 8 and in person with Mr. Livingston on June 18, 1984.



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