Province of British Columbia
Ministry of Environment
WATER MANAGEMENT BRANCH

MEMORANDUM

To: Mr. A.P. Kohut
Senior Geological Engineer
Groundwater Section
Water Management Branch

Date: April 18, 1985

Our File: 0317588

Re: Review of Well Test Data - Well No. 3,
Sointula Waterworks District

Introduction

As requested by T. Pollard, Liaison Engineer, Engineering Services a review of the above well test report by Pacific Hydrology Consultants Ltd. dated February 22, 1983 has been completed. The capacity of the well as recommended by the consultants is 12.6 L/s (200 USgpm).

Well Location

The settlement of Sointula is situated on Malcolm Island off the northeast shore of Northern Vancouver Island across from Port McNeill. The well is located about 410 m (1,350') north-northeast of the existing production Well No. 2 and 160 m (525') east of Rough Bay, near the intersection of Alert Avenue and Blunden Avenue at Sointula.

Intended Well Use

According to the consultants, Well No. 3 is intended to be used as a standby well for the District. It is not known if the well will be in simultaneous operation with Well No. 2.

Well Construction

The well was drilled by the air rotary method by Fyfe's Well Drilling Ltd. between late November and early December 1982. Drilling encountered unconsolidated materials of till, sand and gravel, and clay to 85.0 m (279') and bedrock from 85.0 m (279') to 86.9 m (285'). There are three main waterbearing zones in the unconsolidated section: coarse gravel and coarse sand from 27.7 m (91') to 32.9 m (108'), gravel and sand from 39.6 m (130') to 64.6 m (212'), and sand and gravel from 79.2 m (260') to 85.0 m (279'). These zones are bounded by clay and clayey fine sand of apparently low permeability. The hole was cased to 30.5 m (100') with 254 mm (10-inch) casing (with drive shoe) and to 85.0 m (279') with 203 mm (8-inch) casing

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(with drive shoe). The bottommost aquifer was developed by setting a 3 m (10-foot) 150-slot 203 mm (8-inch) nominal size Johnson stainless steel screen bottoming at 85.0 m (279'). The screen assembly included a bottom plate and K packer and totalled 3.4 m (11 feet) in length. The 203 mm (8-inch) casing was pulled back to 82.9 m (272') to expose 2.1 m (7') of screen and the well was developed by air. The optimum transmitting capacity of the exposed screen based on Johnson (1975) is 22.1 L/s (350 USgpm). The water level was about 0.6 m (2') below ground level. Well details are summarized in Figure 1.

It is unknown if the annular space between the surface casing and well casing has been grouted or backfilled to form a sanitary seal around the well.

Pump Test

The well was pump tested for a 24-hour period using a 25 hp submersible pump on January 24, 1983. The pump was initially set at 65.4 m (214'). The initial water level was 1.56 m (5.12') below the top of the 203 mm (8-inch) casing. Pumping began at 8:20 a.m. at 16.4 L/s (260 USgpm) and gradually declined to 14.8 L/s (235 USgpm) after 120 minutes. The pump was stopped at 130 minutes and lowered to 71.8 m (236') and restarted at 154 minutes. The pumping rate declined from 16.0 L/s (254 USgpm) to 14.1 L/s (223 USgpm) at the end of the test but was essentially constant at 14.1 L/s (224 USgpm - 223 USgpm). The water level drewdown about 63.0 m (206.7') after 940 minutes and stabilized about that level for the remainder of the test (8.3 hours). The maximum drawdown of 63.49 m (208.30') after 1,340 minutes represented 78.3% of the available drawdown to the top of the screen assembly. The specific capacity of the well at the end of 24 hours pumping at a constant rate of 14.1 L/s (223 USgpm) was 0.22 L/s/m (1.08 USgpm/ft). Upon the end of pumping, the water level recovered to above its initial level in 1,490 minutes. Pump test details are shown in Figure 1. Well No. 2 was not used to monitor the water level and well interference effects during the pump test.

Tidal effects did not appear to influence drawdown during the pump test. The source of recharge causing stabilization is uncertain but may be: 1) from overlying aquifers and/or 2) with increasing transmissivity or storativity of the screened aquifer a distance from the pumping well.

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Aquifer Parameters

Transmissivity derived from pumping and recovery data appear to be about 10 m^2/day (850 USgpd/ft). This value appears low and may be masked by well inefficiency. The consultants' derived T-value of 133 m^2/day [1.1(10^4) USgpd/ft] cannot be explained. Storativity value cannot be determined from existing data.

Well Capacity

The specific capacity for 100-day pumping at a constant rate of 14.1 L/s (223 US gpm) is expected to remain at 0.22 L/s/m (1.08 USgpm/ft) because stabilization occurred. Using 70% of the available drawdown (56.8 m (186.2')) - 30% being a safety margin for pump setting and seasonal water level fluctuations - the capacity of Well No. 3 under solo operation is 0.22 x 56.8 = 12.6 L/s (200 USgpm). The water level at this pumping rate would remain above the top of the aquifer.

Because well interference affects between Well No. 2 and Well No. 3 was not investigated and aquifer parameters could not be adequately obtained from the pump test, the capacity of Well No. 3 in simultaneous operation with Well No. 2 cannot be determined. To determine this combined well capacity, another pump test would be required involving pumping of one of the wells and monitoring the interference effects on the other well. The combined well capacity of Well No. 3 would be equal to or less than 12.6 L/s (200 USgpm).

Water Quality

A water sample was collected during the pump test for analysis. Lab results show water quality is soft (Hardness = 55.8 mg/L), moderate in pH (= 7.39), low in dissolved mineralization (TDS = 132 mg/L) with negligible iron (Fe diss <0.01 mg/L) and manganese (Mn diss <0.01 mg/L). The groundwater can be characterized as a Na-K-Ca-Mg-HCO_3 type water with corrosive tendencies (Ryznar Index = 9.96, Langelier Index = -1.52, and Aggressive Index = 10.63). The charge balance error is about 5% suggesting all major parameters were tested for. All the parameters tested fall within the limits set in the guidelines, B.C. Drinking Water Quality, 1982.

The possibility of seawater encroachment could not be determined from this short term pump test. However, periodic sampling would be adequate to monitor this situation.

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Conclusions and Recommendations

1) Sointula Waterworks District Well No. 3 is a 203 mm (8-inch) well completed in a sand and gravel aquifer to 85.0 m (279') deep,

2) the well capacity under solo operation is 12.6 L/s (200 USgpm),

3) water quality is soft, moderate in pH, low in dissolved mineralization with negligible iron and manganese; all parameters tested fall within the limits set in the guidelines, B.C. Drinking Water Quality, 1982; the water is apparently corrosive,

4) interference with Well No. 2 and capacity of Well No. 3 under simultaneous operation are unknown, another pump test involving pumping one well and monitoring the other would be required to investigate this,

5) the annular space between the surface casing and well casing should be properly grouted or backfilled (if it hasn't already been done) to provide a surface sanitary seal around the well,

6) a recommended level for the pump setting is from 79.2 m (260') to 81.4 m (267'),

7) the well should be equipped with a suitable water meter to measure the total amount of water pumped from the well,

8) provisions should be made to record the monthly water level, and

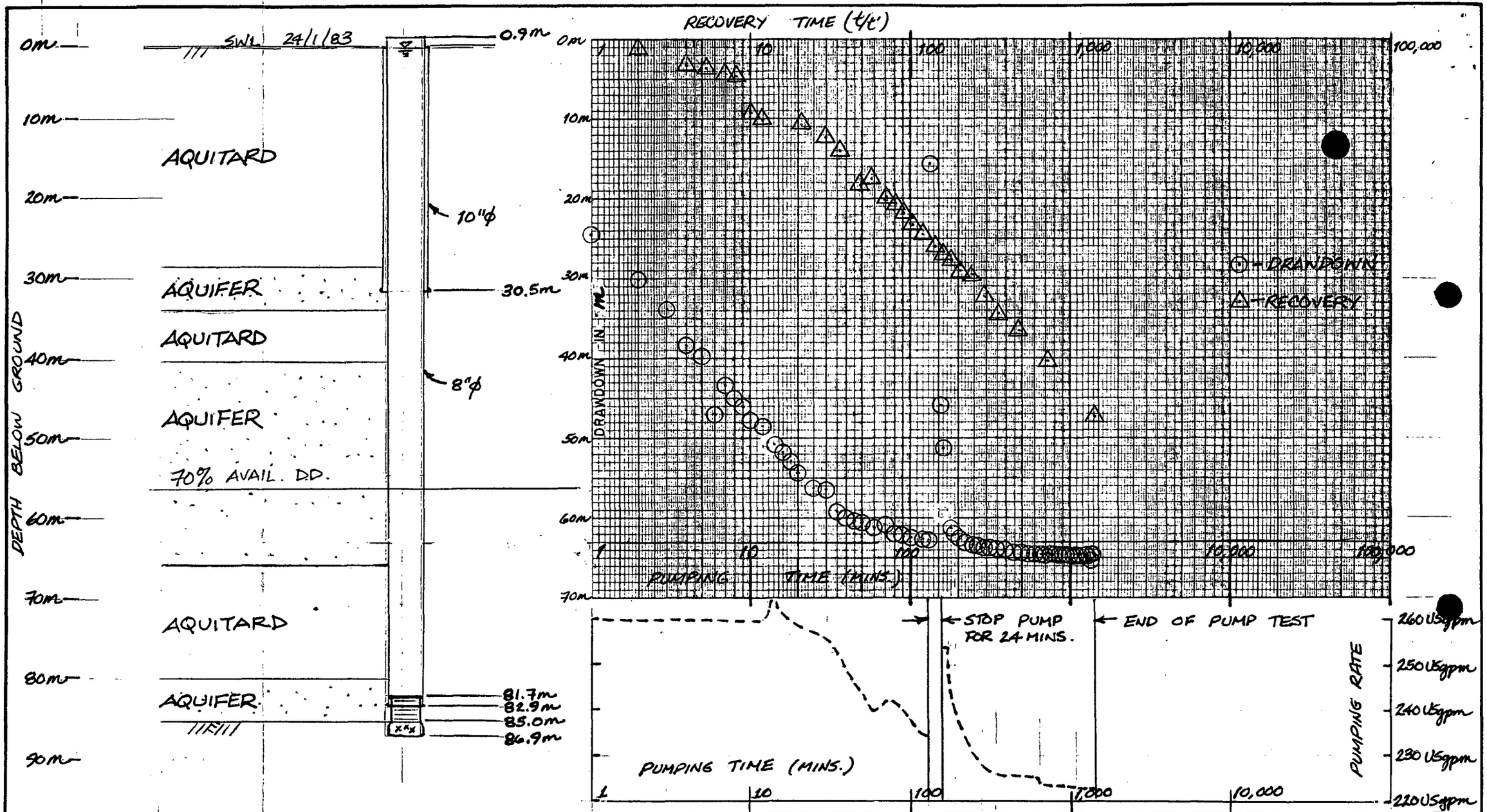
9) water samples should be collected at least once a year to monitor groundwater quality.

References

Johnson. 1975. Groundwater and Wells. Johnson Division, UOP Inc., Saint Paul, Minnesota.

Mike Wei

Mike Wei
Geological Engineer
Groundwater Section
Water Management Branch
387-1115



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~~TO ACCOMPANY REPORT ON~~

WELL AND PUMP TEST DETAILS, WELL NO. 3, SOINTULA WATERWORKS DISTRICT

SCALE: VERT. AS SHOWN
HOR. AS SHOWN

DATE APRIL/85

M. WEI ENGINEER

FILE No. 0317588 DWG No. FIGURE 1

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