E. LIVINGSTON, P.Eng.
A. BADRY

# PACIFIC HYDROLOGY CONSULTANTS LTD.

CONSULTING GROUNDWATER GEOLOGISTS

204 - 1929 WEST BROADWAY
VANCOUVER, B.C. V6J 1Z3
TELEPHONE: (604) 738-9232
FACSIMILE: (604) 738-6070

May 31, 1993

Mr. Mike Scudder
30889 Gunn Avenue
MISSION, B.C. V2V 4H9

Subject: **Certification of Water Quantity and Quality for a Drilled Well on East Lot B of a Rural Subdivision at 30889 Gunn Avenue in the District of Mission**
District of Mission Subdivision Application S92-022; File PRF 15-40

Dear Sir:

This letter-report is further to several telephone discussions between Mike McDonald of A & H Construction Ltd. and Ann Badry, P. Geo., Hydrogeologist, of Pacific Hydrology Consultants Ltd., about the subject Scudder Well for which certification is required. In particular, the letter is further to a discussion onsite between Mike McDonald and Ed Livingston, P. Eng., of Pacific Hydrology, during the testing of the subject Well at 30887 Gunn Avenue in Mission on May 20, 1993.

## 1.0 INTRODUCTION

The purpose of this letter is to present information which confirms that a recently drilled well on Lot B of the proposed rural subdivision of Lot 1, Section 25, Township 14, Plan 10893, New Westminster District, will "... provide a quantity of water not less than 2500 litres per day per parcel and provide a sustained yield of 9 litres per minute for

.../2

a minimum of four hours", as required under District of Mission Bylaw No. 2203-1990. This letter also discusses the quality of groundwater yielded by the well and provides the required hydrogeologic impact assessment with respect to:

(i) Impact of the well on neighbour wells both within and adjacent to the proposed subdivision, and

(ii) Long term impact of the proposed well on the source aquifer.

The layout of the proposed Scudder Subdivision is shown on Tunbridge and Tunbridge Plan C-5643, of original scale 1:250, with contours at intervals of 1.8 metres. The Tunbridge and Tunbridge Plan, which has been reduced to an approximate scale of 1:2000, is included as Figure 2 in Appendix A. The topographic setting of the proposed Scudder Subdivision is shown on Figure 1.

The existing residence on Lot A is supplied from two shallow dug wells of estimated depth 3.7 to 4.0 m (12 to 13 ft); these wells are reportedly not adequate in summer even though, at the time of the testing of the new drilled Well on Lot B, the wells were overflowing.

## 2.0 TOPOGRAPHY AND SETTING

The subject Well, at elevation about 140 m (460 ft), is located on the steep south-facing slope of an unnamed mountain; the slope is covered in second-growth bush. Access to the Scudder Well is off Gunn Avenue by way of a steep driveway. The steep slope is between prominent terraces, with the terrace above at elevation about 200 m (660 ft) and that below at elevation about 90 m (295 ft). These terraces may have formed at the end of the last glacial episode about 10,000 years ago, when sea level was much higher than at present.

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## 3.0 GEOLOGY AND HYDROGEOLOGY

Geological Survey of Canada Map 1485A, **Surficial Geology Mission British Columbia**, of scale 1:50,000, shows the area of the proposed Scudder Subdivision to be underlain by "glaciomarine deposits and sandy till and substratified drift". The driller's litholog of the subject Scudder Well, which shows 41.2 m (135 ft) of clay over 4.3 m (14 ft) of gravel over bedrock, fits the conditions shown by GSC Map 1485A. The clay of the driller's log is glaciomarine sediment; the gravel may be substratified drift or, perhaps, ice contact deposits. Two existing drilled wells south of the Scudder Well did not encounter any water-bearing sediment over bedrock but, rather, they are both deep holes that obtain a small amount of water from fractured rock - probably sandstone. All indications are that the gravel aquifer is local in extent - not surprising under the prevailing conditions.

The groundwater in the gravel aquifer encountered in the subject Scudder Well is probably entirely from a groundwater flow system recharged by precipitation on the unnamed mountain northeast of the site. The flow system discharges further down the slope and also into Chester Creek where it probably maintains the base flow in late summer and early fall. As discussed later in this letter, the mineral content of the groundwater is sufficiently high to show that the path of travel is sufficiently long and/or slow enough to have allowed the groundwater to become moderately mineralized.

## 4.0 WELL CONSTRUCTION

The subject Scudder Well was constructed by A & H Construction Ltd. using an air rotary drill with 150 mm (6") diameter casing. The Well was drilled through 41.2 m (135 ft) of clay and into a gravel aquifer

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between 41.2 and 45.4 m (135 and 149 ft); the driller reported that bedrock was encountered at 45.4 m.

The Well was completed by installing 1.5 m (5 ft) of Cook stainless steel well screen with 1.0 mm (0.040") slots; at the top of the assembly, which is set between 43.9 and 45.4 m (144 and 149 ft), is a type K packer and a bail bottom closes the bottom end. Following installation of the screen, the Well was developed by air surging for two hours.

## 5.0 PUMP TESTING

To evaluate whether the subject Scudder Well satisfies the water supply requirements of District of Mission Bylaw 2203-1990, a pumping test was carried out by A & H Construction Ltd. using a submersible test pump connected to the power supply at the Scudder Residence on West Lot A. The water level during testing was measured by an electric water level indicator; the flow rate was measured by timing the filling of a 22 litre container. Water from the pumping was discharged on the ground downslope of the Well. Pump testing of the Well was carried out at a constant rate of 30.4 L/min (0.50 L/sec; 6.67 igpm) for 300 minutes, with a final drawdown of 2.49 m (8.16 ft).

The data collected during the pump testing of the Scudder Well are attached in Appendix C, along with plots of the data on semi-logarithmic graph paper according to standard straight-line methods of analysis. As shown on Figure 3 (Page C - 4), the drawdown was approximately constant for the final 200 minutes of the test. The water level recovery was quite rapid after pumping stopped and was virtually complete within one hour, at t/t' of about 6, as shown on the plot of the recovery data (Figure 4, Page C - 4).

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## 6.0 WELL CAPACITY RATING

The parameters relevant to rating the capacity of the subject Scudder Well are:

1. Total available drawdown = distance to top of screen - static water level = 13.7 m (45 ft).

2. Specific capacity of well at the end of pump testing at a constant rate of 30.4 L/min = 0.2 L/sec/m (0.82 igpm/ft).

3. 70% of total available drawdown = 9.6 m (31.5 ft).

4. Well capacity, at use of 70% of available drawdown, and with provision for reduced performance at higher pumping rate = 1.5 L/sec (20 igpm).

Clearly, the theoretical capacity of the Well is far greater than is required for one residence and/or to satisfy District of Mission Bylaw 2203-1990 requirements. If a pump with capacity more than one L/sec (13 igpm) is to be installed, the Well should first be re-tested at an higher pumping rate.

## 7.0 GROUNDWATER QUALITY

Appendix D contains a certificate of analysis from Norwest Labs, identified as Work Order Number 2377-1 and dated May 25, 1993, for a water sample collected by A & H Construction Ltd. during capacity testing.

The groundwater represented by the Norwest Analysis is a moderately highly mineralized water, which is of generally good quality for domestic use. Because of the predominance of the sodium cation, the water is soft.

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No coliforms were detected in the bacteriological sample and the analysis presented by Norwest Labs for groundwater from the subject Scudder Well satisfies drinking water quality guidelines of B.C. Ministry of Health, and of Health and Welfare Canada, for all chemical parameters checked.

## 8.0 HYDROGEOLOGIC IMPACT ASSESSMENT

As shown on Figure 1 contained in Appendix A, and as summarized in Table 1 in Appendix B, there are several drilled water wells along Gunn Avenue; all of the wells are deep rock wells, except for a well at 31017 Gunn Avenue adjacent to the east and which obtains water from a gravel aquifer at a similar depth as does the subject Scudder Well.

Obviously, use of the new drilled well on Lot B, with a static water level of 30.2 m (99.1 ft), cannot have any impact on the shallow wells supplying the existing residence on Lot A, or on other shallow wells in the area that withdraw water from separate shallow perched groundwater flow system(s).

As shown by pump testing, the capacity of the subject Scudder Well is greatly in excess of the requirements for a single domestic connection. All things considered, including the prevailing favourable recharge conditions and the planned use of the Well to supply one residence, negative impacts to adjacent similar wells completed in the overburden aquifer, and/or to deep rock wells, are unlikely. Further, the amount of water that the Scudder Well can withdraw from the sediments underlying the area represents only a small part of the groundwater which is moving through the sediments toward the discharge end of the flow regime at Chester Creek; therefore, use of the Well not have any negative impacts on the source aquifer, either in the short or long term.

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## 9.0 SUMMARY AND CONCLUSIONS

1. The subject Scudder Well on the new East Lot B, at 30889 Gunn Avenue, is completed in a permeable patch of aquifer between 41.2 and 45.4 m (135 and 149 ft), at the bottom of thick overburden sediments.

2. Pump testing has shown that the drilled well proposed as a source of domestic water for Lot B of the rural Scudder Subdivision of Lot 1, Section 25, Township 14, Plan 10893, New Westminster District, can "...provide a quantity of water not less than 2500 litres per day..." and a sustained yield of 9 litres per minute for four hours, as required by District of Mission Bylaw No. 2203-1990.

3. Rated according to standard procedure, the capacity of the subject Scudder Well is as much as 1.5 L/sec (20 igpm); however, if the Well is to be pumped at a rate greater than about one L/sec (13 igpm), it should first be retested at an higher rate.

4. Chemical and bacteriological water analyses by Norwest Labs show that the groundwater moving through the deep overburden aquifer that yields water to the Scudder Well is moderately highly mineralized, but of generally good quality for domestic consumption. The water represented by the Norwest analysis satisfies B.C. Ministry of Health guidelines for all parameters checked.

5. Under the prevailing conditions, use of the subject Scudder Well, which is completed in a deep sand and gravel aquifer, apparently at the bedrock/overburden contact, will not have any negative impacts to shallow wells within or adjacent to the Subdivision, to adjacent drilled wells that withdraw groundwater from deep rock fractures, to wells completed in other deep local overburden aquifers, or to the source aquifers, either in the short or long-term.

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We trust that this letter-report, along with its attachments, will satisfy District of Mission regarding certification of water quantity and quality from the subject drilled Well on Lot B of the proposed subdivision at 30889 Gunn Avenue. However, please do not hesitate to call if we can be of any further assistance with subdivision approval.

Yours truly,

PACIFIC HYDROLOGY CONSULTANTS LTD.

Ed Livingston

Ed Livingston, P. Eng.

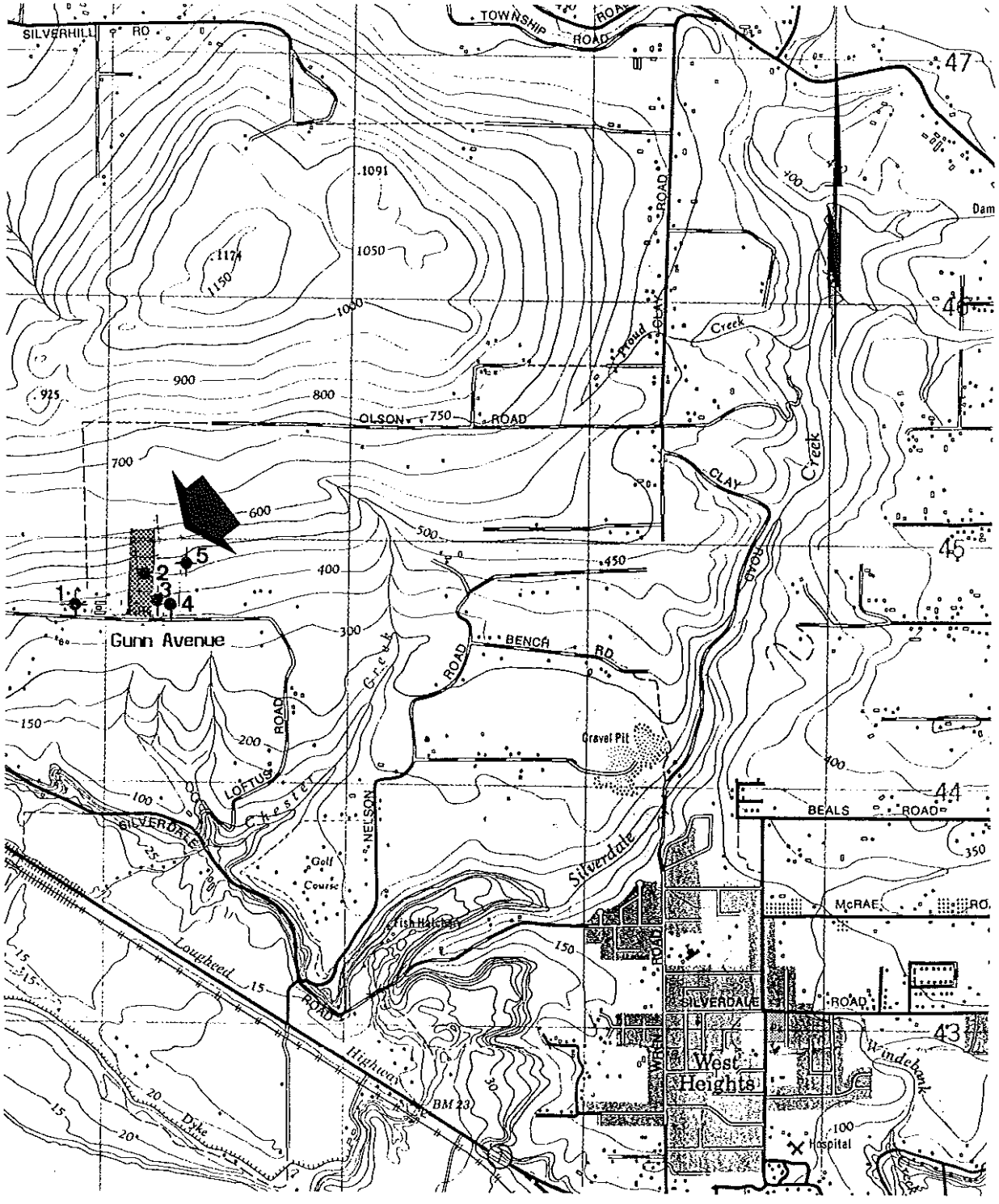
PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
E. LIVINGSTON

Attachments

# APPENDIX A

## AREA LOCATION MAP AND SUBDIVISION SITE PLAN

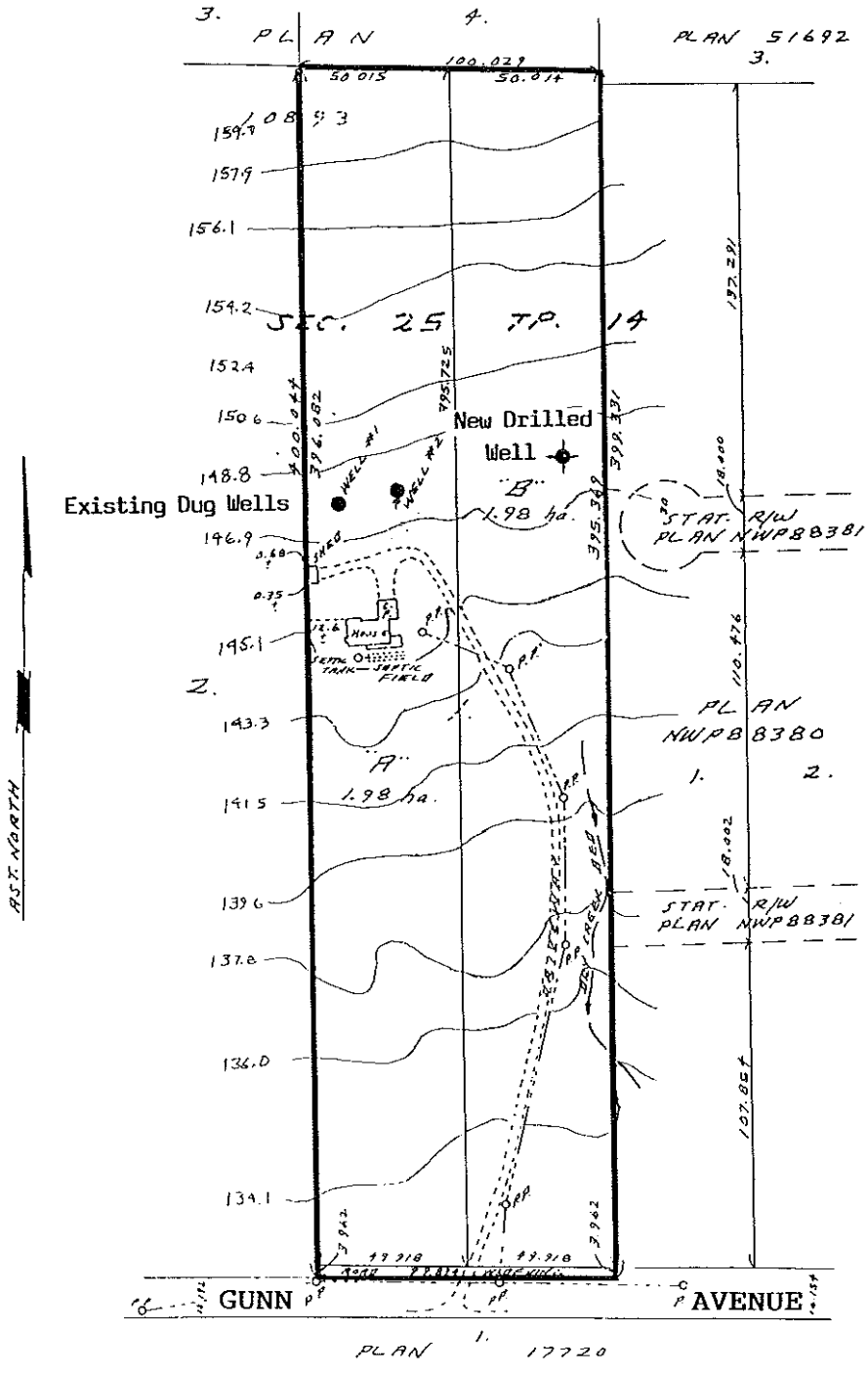
| FIGURE 1 | PROPOSED SUBDIVISION AT 30889 GUNN AVENUE, MISSION - AREA LOCATION MAP |
|---|---|




**Notes:**

1. The base map is 1:25,000 scale topographic map N.T.S. 92G/1, Mission; contour interval is 50 ft.
2. Indicates the area of the proposed Scudder Subdivision at 30889 Gunn Avenue.
3. denotes approximate location of a drilled water well; for well details, see Table 1 in Appendix B.

| FIGURE 2 | DRAFT PLAN OF PROPOSED SCUDDER SUBDIVISION ON GUNN AVENUE IN DISTRICT OF MISSION |
|---|---|




Legal Description of Proposed Scudder Subdivision:

Lot 1, Section 25, Township 14, Plan 10893, New Westminster District

Civic Address: 30889 Gunn Avenue

Notes:

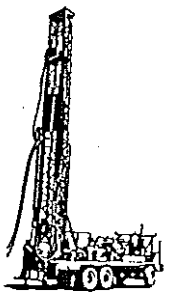
1. The base map is a 1:1,250 scale plan by Tunbridge & Tunbridge (C-5643) reduced to an approximate scale of 1:2,500; contour interval is 1.8 metres.
2. ● ⊕ indicates the approximate location of a dug/drilled water supply well, as identified.

# APPENDIX B

## WATER WELL RECORD

## AND

## SUMMARY OF DRILLED WATER WELLS



TELEPHONE
(604) 853-2513

A&H Construction Ltd.

*"Specializing in Water Wells, Soil Sampling, Exploration"*

1681 SALTON RD.,
P.O. BOX 38,
ABBOTSFORD, B.C.
V2S 4N7

INVOICE NO; 1573

LOG OF WELL

C
L
A
Y

135'

G
R
A
V
E
L

149'

Bed
Rock.

TO Mr. Mike Skutter,

ADDRESS 30889 Gunn Road, Mission, B.C.

WELL DRILLED AT Same

WELL COMPLETED May 7, 1993. INVOICE DATE May 10, 1993.

| | | |
|---|---|---|
| ---------- | Machine Hours at ---------- per Hour | ---------- |
| ---------- | Feet of Drilling at ---------- per Foot | ---------- |
| 149 | Feet of Drilling & Casing at $ 30.00 per Foot | 4,470.00 |
| ---------- | Feet of ------- Casing at ---------- per Foot | ---------- |
| ---------- | Feet of ------- Casing at ---------- per Foot | ---------- |
| ---------- | Feet of ------- Casing at ---------- per Foot | ---------- |
| 1. 6" | Drive Shoes at ---------- each | 86.00 |
| 5 | Feet of 40 slot Screen | 475.00 |
| 2 hrs | Installation of Screen & Developing well @ $100.00 PH | 200.00 |
| | Pump Testing ---------- Hours at ---------- per Hour | ---------- |
| | Surging and Baling ---------- Hours at ---------- per Hour | ---------- |
| | Other Charges: | |
| | Moving on Site and Setting Up ---------- | ---------- |
| | Blasting ---------- | ---------- |
| | Other Sub total | $5,231.00 |
| | G.S.Tax 7% | 366.17 |
| | ---------- | ---------- |
| | Room and Board ---------- | ---------- |
| | Travelling and Tolls ---------- | ---------- |
| | TOTAL INVOICE PRICE ---------- | $5,597.17 |

Notations Set 5ft of Cook Stainless Steel Screen with K Packer & Bail Bottom. Well producing approx. 15 gals per.Minute.

INVOICE

B - 1

- Account due on presentation of this invoice.
Interest at 1½% per Month (18% per Annum) on all accounts overdue 30 days.

**Table 1. Summary of Drilled Water Wells in Area of Proposed Scudder Subdivision at 30889 Gunn Avenue in Mission**

| Map Ident. No. | Completed Well Depth (ft) | Static Water Level (ft) | Aquifer Material and Well Completion | Drillers Litholog | | Remarks |
|---|---|---|---|---|---|---|
| 1 | 445 | 245 (06/21/79) | Fractured rock. | 0- 12 ft<br>12- 13 ft<br>13-145 ft<br>at 145 ft | clay<br>sand and silt<br>clay<br>bedrock. | 6" diameter casing to 145 ft; estimated capacity of 3.0 L/sec (40 gpm); location - 30819 Gunn Road (Vanderspeck). |
| 2 | 149 | 98.5 (05/20/93) | Gravel; completed with a 5 ft long Cook stainless steel well screen assembly, including a type K packer and a bail bottom, set between 144 and 149 ft. | 0-135 ft<br>135-149 ft<br>at 149 ft | clay<br>gravel<br>bedrock. | 6" diameter casing to 149 ft; tested capacity of at least 30 L/min (6.7 gpm); location - Lot B at 30889 Gunn Avenue (Scudder). |
| 3 | 503 | 123.2 (01/30/91) | Fractured rock with water-yielding fractures at 271 to 278 ft and 352 to 365 ft. | 0- 7 ft<br>7-136 ft<br>136-143 ft<br>143-503 ft | brown sand and clay<br>grey stoney clay<br>silty medium sand and clay<br>sandstone. | 6" diameter casing to 143 ft; tested capacity of at least 5.0 L/min (1.1 igpm); location - 30923 Gunn Avenue. |
| 4 | 180 | 127.9 (02/01/91) | Fractured rock with water-yielding fractures at 151 to 162 ft and 173 to 180 ft. | 0- 8 ft<br>8-135 ft<br>135-140 ft<br>140-180 ft | brown sand and clay<br>grey stoney clay<br>clay and silty gravel<br>sandstone bedrock. | 6" diameter to 141 ft and completed with 4½" i.d. PVC liner, slotted from 140 to 160 ft and 170 to 180 ft; tested capacity of less than 33 L/min (7.3 igpm); location - 30957 Gunn Avenue. |

**Table 1. Summary of Drilled Water Wells in Area of Proposed Scudder Subdivision at 30889 Gunn Avenue in Mission** (cont'd)

| Map Ident. No. | Completed Well Depth (ft) | Static Water Level (ft) | Aquifer Material and Well Completion | Drillers Litholog | | Remarks |
|---|---|---|---|---|---|---|
| 5 | 136 | 89.76 (10/14/90) | Coarse gravel and sand, open-end casing. | 0- 12 ft<br>12- 91 ft<br>91-134 ft<br>134-136 ft | brown silty sand<br>grey clay<br>grey stoney clay<br>coarse gravel and with layers of clay; water-bearing. | 6" diameter casing; capacity of well is greater than test rate of 36.4 L/min (8 igpm); location - Lot A at 31017 Gunn Avenue (Mundt). |

# APPENDIX C

# PUMPING TEST DATA AND PLOTS

# PUMP TEST - DRAWDOWN DATA

Project: MIKE SCUDDER

Location: 30889 Gunn Avenue, Mission, B.C. Well: on East Lot B

Datum: Top of 6" (0.15 m) diameter well casing at 0.5 ft (0.15 m) agl

Static Water Level: 99.08 ft (30.21 m) Screen Location: 144 - 149 ft (43.9 - 45.4 m)

| TIME | ELAPSED TIME t(min) | DISTANCE TO WATER (ft) | DRAWDOWN (ft) | TIME TO FILL 5 IGALS (sec) | PUMPING RATE (igpm) | REMARKS |
|---|---|---|---|---|---|---|
| 05/20/93 | | | | | | |
| 9:20:00 | 0.00 | 99.08 | 0.00 | | | Static level; start pump. |
| 9:20:30 | 0.50 | 101.00 | 1.92 | 45 | 6.7 | |
| 9:21:00 | 1.00 | 103.17 | 4.09 | | | |
| 9:21:30 | 1.50 | 103.67 | 4.59 | | | |
| 9:22:00 | 2.00 | 104.04 | 4.96 | | | |
| 9:22:30 | 2.50 | 104.13 | 5.05 | | | |
| 9:23:00 | 3.00 | 104.25 | 5.17 | | | |
| 9:23:30 | 3.50 | 104.46 | 5.38 | | | |
| 9:24:00 | 4.00 | 104.67 | 5.59 | | | |
| 9:24:30 | 4.50 | 104.83 | 5.75 | | | |
| 9:25:00 | 5.00 | 105.17 | 6.09 | | | |
| 9:26:00 | 6.00 | 105.58 | 6.50 | | | |
| 9:27:00 | 7.00 | 105.92 | 6.84 | | | |
| 9:28:00 | 8.00 | 106.04 | 6.96 | | | |
| 9:29:00 | 9.00 | 106.13 | 7.05 | | | |
| 9:30:00 | 10.00 | 106.17 | 7.09 | | | |
| 9:32:00 | 12.00 | 106.21 | 7.13 | 45 | 6.7 | |
| 9:34:00 | 14.00 | 106.25 | 7.17 | | | |
| 9:36:00 | 16.00 | 106.33 | 7.25 | | | |
| 9:38:00 | 18.00 | 106.42 | 7.34 | | | |
| 9:40:00 | 20.00 | 106.54 | 7.46 | | | |
| 9:45:00 | 25.00 | 106.83 | 7.75 | | | |
| 9:50:00 | 30.00 | 107.00 | 7.92 | | | |
| 10:00:00 | 40.00 | 107.13 | 8.05 | | | |
| 10:10:00 | 50.00 | 107.13 | 8.05 | | | |
| 10:35:00 | 75.00 | 107.10 | 8.02 | | | |
| 11:00:00 | 100.00 | 107.17 | 8.09 | | | |
| 11:50:00 | 150.00 | 107.21 | 8.13 | 45 | 6.7 | |
| 12:40:00 | 200.00 | 107.25 | 8.17 | | | |

| | | PUMP TEST - DRAWDOWN DATA | | | | |
|---|---|---|---|---|---|---|
| Project: | MIKE SCUDDER | | | | | |
| Well: on East Lot B | | | Static Water Level: 99.08 ft (30.21 m) | | | |
| | | DISTANCE | | TIME | | |
| | ELAPSED | TO | | TO FILL | PUMPING | REMARKS |
| TIME | TIME | WATER | DRAWDOWN | 5 IGALS | RATE | |
| | t(min) | (ft) | (ft) | (sec) | (igpm) | |
| 13:30:00 | 250.00 | 107.25 | 8.17 | | | |
| 14:20:00 | 300.00 | 107.25 | 8.17 | | | Stop pump. |

# PUMP TEST - RECOVERY DATA

Project: MIKE SCUDDER

Location: 30889 Gunn Avenue, Mission, B.C. Well: on East Lot B

Datum: Top of 6" (0.15 m) diameter well casing at 0.5 ft (0.15 m) agl

Static Water Level: 99.08 ft (30.21 m) Final Drawdown: 8.17 ft (2.5 m)

| TIME | ELAPSED TIME SINCE PUMPING STARTED t(min) | ELAPSED TIME SINCE PUMPING STOPPED t'(min) | RATIO (t/t') | DISTANCE TO WATER (ft) | RESIDUAL DRAWDOWN (ft) | REMARKS |
|---|---|---|---|---|---|---|
| 05/20/93 | | | | | | |
| 14:20:00 | 305.0 | 0.0 | | 107.25 | 8.17 | Stop pump. |
| 14:20:30 | 305.5 | 0.5 | 611.0 | 104.08 | 5.00 | |
| 14:21:00 | 306.0 | 1.0 | 306.0 | 103.13 | 4.05 | |
| 14:21:30 | 306.5 | 1.5 | 204.3 | 102.46 | 3.38 | |
| 14:22:00 | 307.0 | 2.0 | 153.5 | 101.88 | 2.80 | |
| 14:22:30 | 307.5 | 2.5 | 123.0 | 101.51 | 2.43 | |
| 14:23:00 | 308.0 | 3.0 | 102.7 | 101.21 | 2.13 | |
| 14:23:30 | 308.5 | 3.5 | 88.1 | 101.00 | 1.92 | |
| 14:24:00 | 309.0 | 4.0 | 77.3 | 100.88 | 1.80 | |
| 14:24:30 | 309.5 | 4.5 | 68.8 | 100.75 | 1.67 | |
| 14:25:00 | 310.0 | 5.0 | 62.0 | 100.58 | 1.50 | |
| 14:26:00 | 311.0 | 6.0 | 51.8 | 100.50 | 1.42 | |
| 14:27:00 | 312.0 | 7.0 | 44.6 | 100.44 | 1.36 | |
| 14:28:00 | 313.0 | 8.0 | 39.1 | 100.35 | 1.27 | |
| 14:29:00 | 314.0 | 9.0 | 34.9 | 100.35 | 1.27 | |
| 14:30:00 | 315.0 | 10.0 | 31.5 | 100.33 | 1.25 | |
| 14:35:00 | 320.0 | 15.0 | 21.3 | 100.21 | 1.13 | |
| 14:40:00 | 325.0 | 20.0 | 16.3 | 100.08 | 1.00 | |
| 14:50:00 | 335.0 | 30.0 | 11.2 | 99.73 | 0.65 | |
| 15:00:00 | 345.0 | 40.0 | 8.6 | 99.48 | 0.40 | |
| 15:10:00 | 355.0 | 50.0 | 7.1 | 99.21 | 0.13 | |
| 15:20:00 | 365.0 | 60.0 | 6.1 | 99.15 | 0.07 | |

Figure 3. Time-Drawdown Plot for Pumping Test of Mike Scudder Well on East Lot B at 30889 Gunn Avenue, Mission

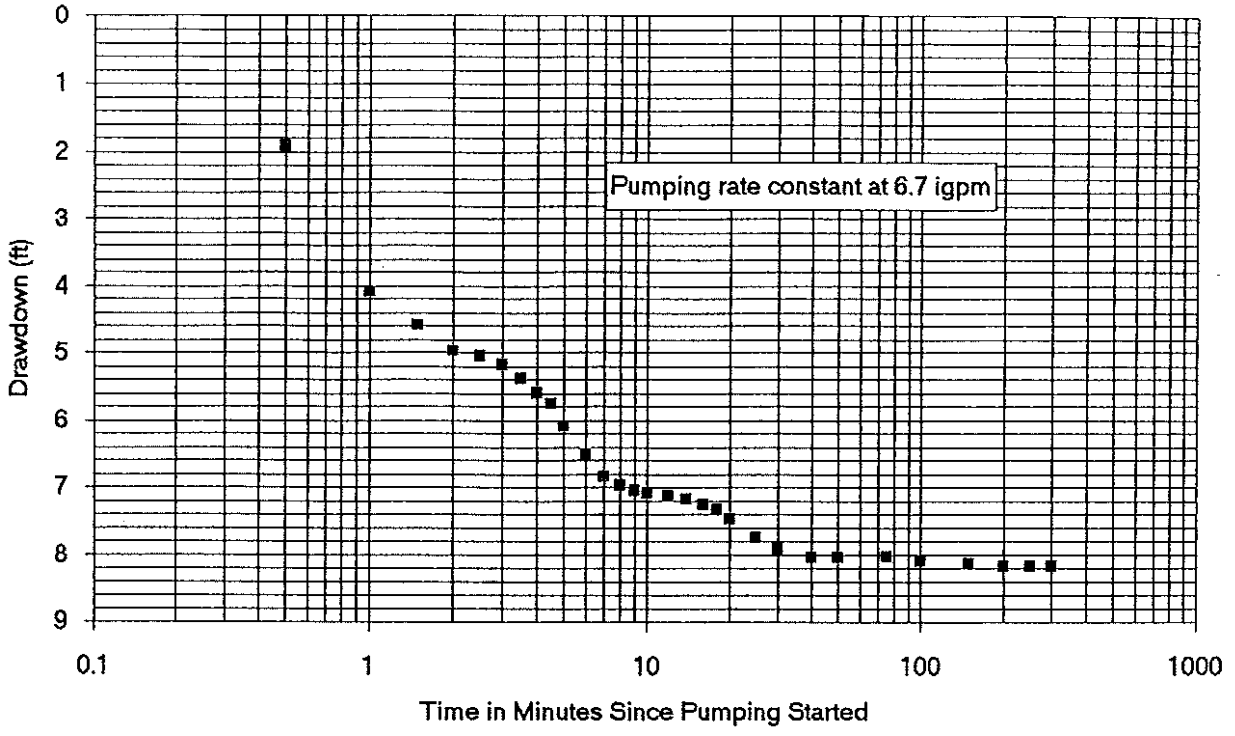
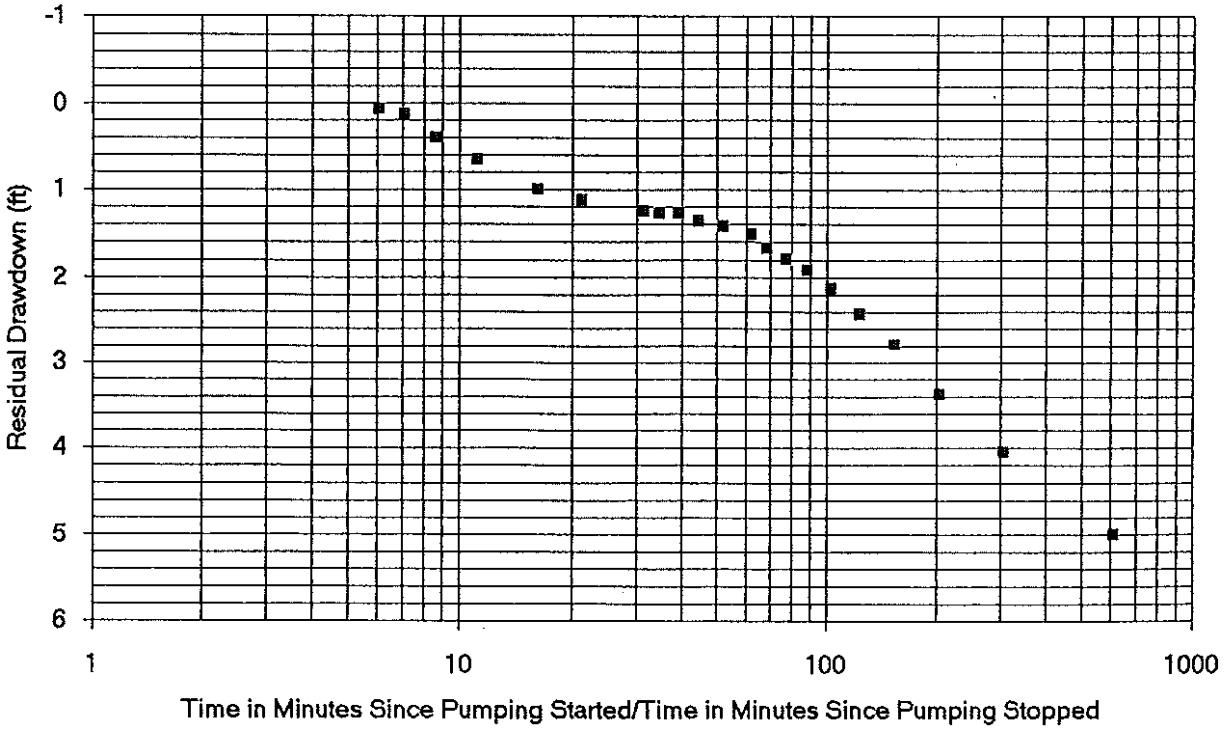



Figure 4. Time-Recovery Plot for Pumping Test of Mike Scudder Well on East Lot B at 30889 Gunn Avenue, Mission



# APPENDIX D

# WATER QUALITY CERTIFICATE

Norwest Labs

"We Solve Problems"

203 - 20771 Langley By-Pass
Langley, B.C. V3A 5E8
Phone (604) 530-4344
Fax: (604) 534-9996

Date: May 25, 1993

Work Order No.: 2377

Source of Sample:

Domestic Well Water from 30889 Gunn Road, Mission

CERTIFICATION OF POTABILITY

Norwest Soil Research Inc. certifies that the above mentioned water sample number 2377-1 supplied by A & H Construction meets the chemical and bacteriological requirements specified by the 1989 Guidelines for Canadian Drinking Water Quality for the constituents tested.

Sincerely,

Thomas F. Guthrie

Dr. Thomas F. Guthrie, P.Ag.
Laboratory Manager

TELEPHONE (604) 530-4344
FACSIMILE (604) 534-9996

# NORWEST LABS

"Keeping B.C. Growing"

## WATER ANALYSIS REPORT

WORK ORDER NUMBER : 2377-1
SAMPLE RECEIVED : 05/20/93
ANALYSIS COMPLETED : 05/25/93
SAMPLE RETAINED FOR : 30 DAYS

SAMPLE SUBMITTED BY:

A & H CONSTRUCTION LTD.
BOX 38, 1681 SALTON ROAD
ABBOTSFORD, B.C.
V2S 4N7

SAMPLE IDENTIFICATION : WELL WATER - 30889 GUNN RD.,MISSION

| ANALYTICAL RESULTS | | | GUIDELINES FOR DRINKING WATER |
|---|---|---|---|
| pH | 8.41 | mg/l | pH values between 6.5 & 8.5 considered acceptable |
| Electrical Conductivity | 0.41 | ms/cm | Values above 1.0 ms/cm indicate increasing salt content |
| Total Dissolved Solids | 277.0 | mg/l | Objective level 500 mg/l; higher values indicate high salts |
| Total Suspended Solids | 12.0 | mg/l | Values above 250 mg/l indicate increasing levels of sediment |
| Ammonium-N | 0.7 | mg/l | Acceptable values below 0.5 mg/l; objective level below 0.01 mg/l |
| Potassium | 8.2 | mg/l | No acceptable level set; values normally 0.5 to 10 mg/l |
| Calcium | 8.80 | mg/l | Below 200 mg/l acceptable; objective level below 75 mg/l |
| Magnesium | 6.60 | mg/l | Below 150 mg/l acceptable; objective level below 50 mg/l |
| Sodium | 70.00 | mg/l | Below 300 mg/l acceptable; over 20 mg/l high for low sodium diets |
| Iron | 0.32 | mg/l | >0.3 mg/l may cause staining & deposits;objective limit 0.05 mg/l |
| Copper | 0.03 | mg/l | Below 1.0 mg/l acceptable; objective limit below 0.01 mg/l |
| Zinc | 0.06 | mg/l | Below 5.0 mg/l acceptable; objective limit below 1.0 mg/l |
| Manganese | 0.08 | mg/l | Below 0.05 mg/l acceptable; objective limit below 0.01 mg/l |
| Phosphate-P | 0.50 | mg/l | No acceptable limit set; objective below 0.01 mg/l |
| Sulphate-S | 0.10 | mg/l | Below 500 mg/l acceptable; objective limit below 250 mg/l |
| Nitrate-N | 0.00 | mg/l | Below 10 mg/l acceptable; high values may indicate contamination |
| Chloride | 3.20 | mg/l | Below 250 mg/l acceptable |
| Fluoride | 0.49 | mg/l | Values up to 1.2 mg/l desirable; under 1.5 mg/l acceptable |
| Boron | 0.20 | mg/l | Below 5.0 mg/l acceptable |
| Carbonate | 0.70 | mg/l | Presence indicates alkaline water |
| Bicarbonate | 227.00 | mg/l | Presence indicates moderately alkaline water |
| Hardness (CaCO3 equiv) | 49.2 | mg/l | Soft waters are less than 75mg/l; hard waters above 150 mg/l |
| Total coliforms | 0 | /100ml | Below 3/100 ml acceptable |
| Fecal coliforms | 0 | /100ml | Below 1/100 ml acceptable |

Results quoted as zero indicate concentrations below the following detection limits:

Less than 0.01 mg/l Fe, Cu, Zn, Mn, B
Less than 0.05 mg/l Na, Ca, Mg, K, PO4-P, NH4-N, NO3-N
Less than 0.10 mg/l Cl, Fl, SO4-S
Less than 1 mg/l TDS, TSS, carbonate & bicarbonate