CERTIFICATION OF WATER QUANTITY AND QUALITY FOR LOT 2 OF A RURAL SUBDIVISION AT 12447 POWELL STREET IN THE DISTRICT OF MISSION

(District of Mission Subdivision Application S90-35 and File PRF 15-40)

Prepared for

MR. & MRS. R. SWANSON
12447 Powell Street, R.R. 7
MISSION, B.C. V2V 6H5

Prepared by

PACIFIC HYDROLOGY CONSULTANTS LTD.
204 - 1929 West Broadway
VANCOUVER, B.C. V6J 1Z3

July 4, 1991

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

July 4, 1991

Mr. & Mrs. R. Swanson
12337 Powell Street, R.R. 7
MISSION, B.C. V2V 6H5

Subject: **Certification of Water Quantity and Quality for Lot 2 of a Rural Subdivision at 12447 Powell Street in the District of Mission**
District of Mission Subdivision Application S90-35 and File PRF 15-40

Dear Sir:

This letter-report is further to recent telephone discussions between Mr. and Mrs. Swanson and Ed Livingston, P. Eng., of Pacific Hydrology Consultants Ltd. and, in particular, it is further to discussions between Mr. and Mrs. Swanson and Ed Livingston during a visit of May 28 to the subject property at 12447 Powell Street.

1.0 INTRODUCTION

The purpose of this letter is to present information which confirms that a new dug well constructed on Lot 2 to be created from the proposed subdivision of Lot 15, N.E.¼ of Section 22, Township 15, Plan 44668, 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 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 each proposed well on neighbour wells both within and adjacent to the proposed subdivision, and

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

The topographic setting of the proposed Swanson Subdivision is shown on Figure 1 in Appendix A and the subdivision layout and site topography is shown on Figure 2, a sketch plan provided by the owner. As shown on Figure 2, the septic tanks and drain fields for the houses on both lots of the proposed Swanson Subdivision are located more than 30 m (100 ft) in a downslope direction from the wells.

The subject Swanson Well on Lot 2 is about 5.5 m (18 ft) deep. It was excavated by a backhoe in silty sandy gravelly till and a 150 mm (6") diameter PVC casing surrounded by drain rock was then set in the hole and the upper part of the hole was backfilled with excavated material to form a surface seal. The Well on Lot 1, which is also about 5.5 m deep, was constructed in a similar manner, but with 0.9 m (3 ft) concrete rings. The Well on Lot 1 has been in use for several years without any water shortages.

2.0 HYDROGEOLOGY

The proposed Swanson Subdivision is located on the west side of Powell Street, at the base of the southeast-facing slope of Blue Mountain. According to Geological Survey of Canada Map 1485A, **Surficial Geology Mission British Columbia,** the surficial cover in the area of the proposed Subdivision consists of "Till and glaciofluvial deposits: **Va**, lodgment till with sandy loam matrix up to 10 m thick, overlain in many places by gravelly ablation till up to 3 m thick". This generally fits the description of sediments encountered in the excavation for the subject well. The well is located in an obvious area of groundwater discharge as shown by the near-surface water level in the well and by the type of local vegetation.

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3.0 WELL CAPACITY

To assess whether the capacity of the subject well on Lot 2 of the proposed subdivision satisfies District of Mission Bylaw 2203-1990, the Well was pump tested by Mr. Swanson, according to instructions by Pacific Hydrology and under Pacific Hydrology's supervision, using an electric test pump discharging through polyethylene pipe to the nearby ditch which carried the water to the road drainage along Powell Street. The pumping rate during the test was determined by timing the filling of a container of known volume. The data collected during the pumping test, along with standard straight line plots on semi-logarithmic graph paper, are attached in Appendix B.

The pumping test of the well on Lot 2 was continued for 4350 minutes (72.5 hours) at a constant rate of 9.1 litres per minute (2.0 igpm). At this rate, the total drawdown was about 1.00 m (3.29 ft). After pumping stopped, the recovery of the water level was observed for about 7½ hours; complete recovery to the pre-pumping static level occurred in 300 minutes (5 hours).

Pump testing of the shallow large diameter well on Lot 2 of the proposed Swanson Subdivision has shown that the capacity of the well is much more than the minimum specified in District of Mission Bylaw 2203-1990. Because the well is located in a groundwater discharge zone, we expect that there will be little, if any, reduction in well capacity in late summer when groundwater conditions are at a minimum. Such a conclusion is supported by the experience with the Well on Lot 1.

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4.0 GROUNDWATER QUALITY

Appendix C contains a certificate of analysis from Norwest Labs' dated July 4, 1991 and identified as Work Order No. 2883. The results presented by Norwest show that the water from the Swanson Well satisfies B.C. Ministry of Health's Drinking Water Standards for all parameters checked, including bacteriological.

Inspite of the overall low mineralization, the water represented by the Norwest analysis is a complex calcium + sodium + magnesium/ bicarbonate + chloride type water, which is very soft.

5.0 HYDROGEOLOGIC IMPACT ASSESSMENT

In the prevailing situation, use of the subject well on Lot 2 is unlikely to have any impact on existing drilled and/or dug wells or on the source aquifers in the area.

6.0 SUMMARY AND CONCLUSIONS

1. The well on Lot 2 of the proposed Swanson rural Subdivision, at 12447 Powell Street in the northwest part of the District of Mission, is located in a groundwater discharge area at the base of the southeast-facing slope of Blue Mountain.

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2. The dug well constructed in 1991, which is to be used as the source of domestic water for Lot 2 of the proposed Swanson Subdivision of Lot 15, N.E.¼ of Section 22, Township 15, Plan 44668, New Westminster District, can clearly "...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 a minimum of four hours", as required by District of Mission Bylaw No. 2203-1990.

3. A chemical analysis carried out by Norwest Labs shows that the groundwater from the new Well on Lot 2 of the proposed Swanson Subdivision meets B.C. Ministry of Health's drinking water quality standards for all parameters checked.

4. Under the prevailing circumstances, the new dug well on Lot 2 of the proposed Swanson Subdivision will not have any negative impacts on other existing drilled and/or dug wells in the area, or on the source aquifers.

We trust that this letter will satisfy District of Mission regarding the required certification of water quantity and quality from the new dug well on Lot 2. Please call if we can be of further assistance with this matter.

Yours truly

PACIFIC HYDROLOGY CONSULTANTS LTD.

E. Livingston

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
E. LIVINGSTON

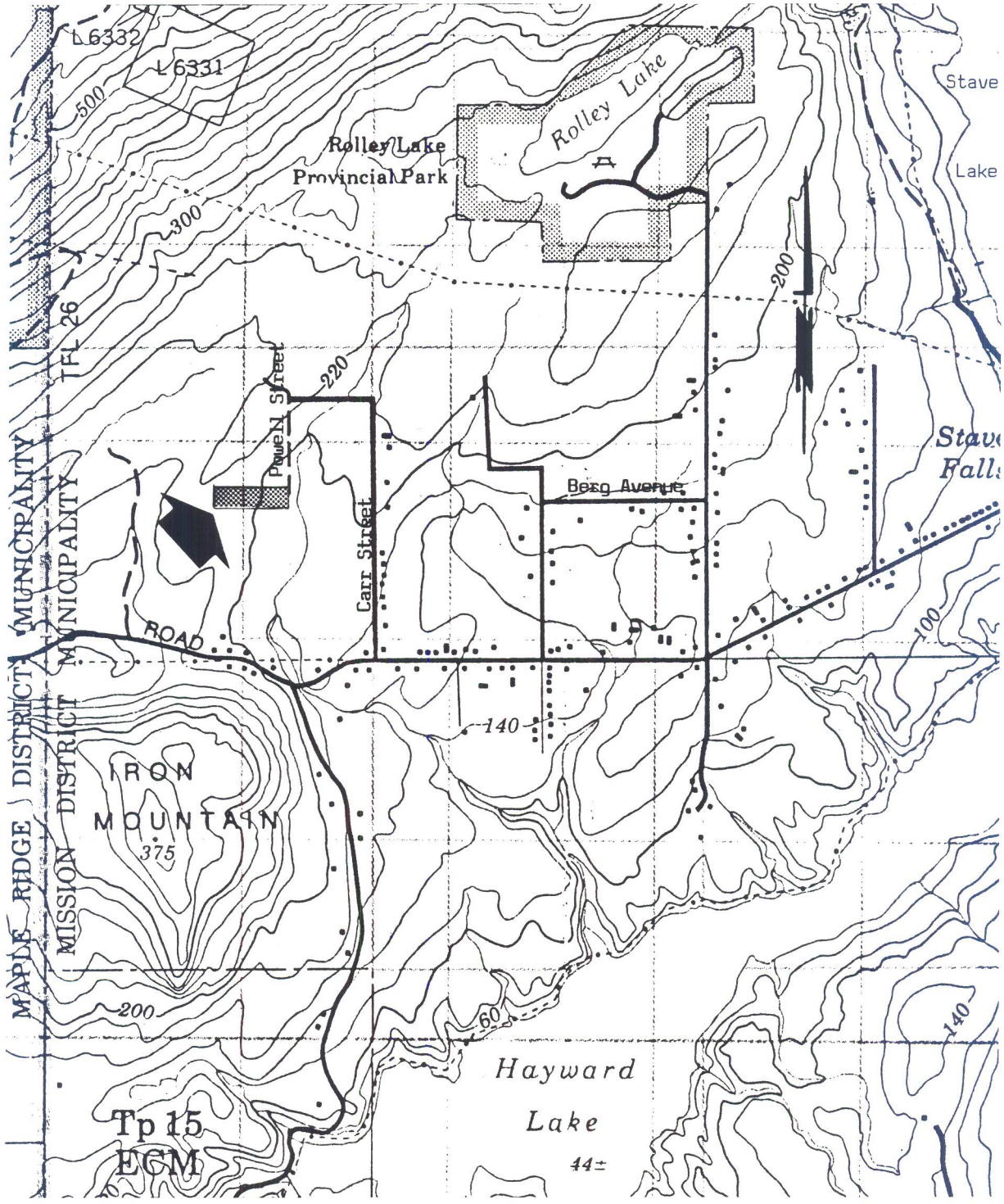
E. Livingston, P. Eng.

Attachments

APPENDIX A

AREA LOCATION MAP AND SUBDIVISION PLAN

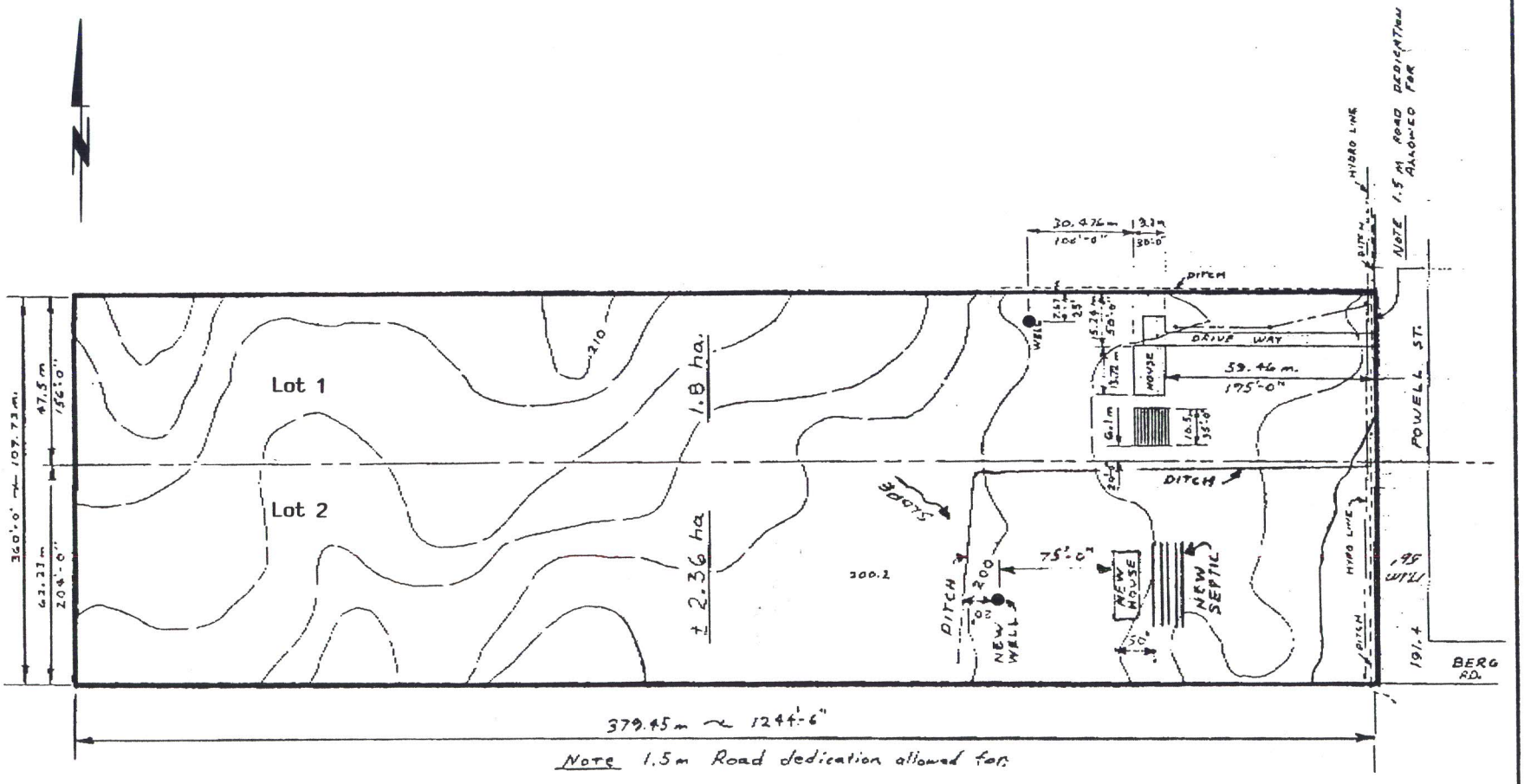
FIGURE 1	AREA LOCATION MAP - PROPOSED SWANSON SUBDIVISION AT 12447 POWELL STREET, MISSION



Notes:

1. The base map is 1:50,000 scale topographic map N.T.S. 92G/1, **Mission**, enlarged to a scale of approximately 1:30,000; contour interval is 20 metres.
2. ▶▒ indicates location of proposed Swanson Subdivision at 12447 Powell Street.

FIGURE 2	PROPOSED SWANSON SUBDIVISION LOT LAYOUT AND WATER WELL LOCATIONS



Notes:

1. The scale of the base map is approximately 1:1,900; contour interval is two metres.
2. ● approximate (unsurveyed) location of a dug well.
3. ≡≡≡ approximate (unsurveyed) location of a wastewater drain field.

APPENDIX B

PUMPING TEST DATA AND PLOTS

PUMP TEST – DRAWDOWN DATA

14	JUNE	1991
DAY	MONTH	YEAR

CONTRACTOR -

PROJECT SWANSON - MISSION SUBDIVISION APPLICATION S90-35

Location 12447 Powell Street, Mission

Well on Lot 2

Pumping Rate (Q) Constant at 0.15 L/sec (2 igpm)

Datum Point Top of PVC casing

Elevation of Datum Point 1.2 m (4 ft) above grade

Static Water Level 6'6½" (6.54 ft; 1.99 m)

Well Details 5.5 m (18 ft) deep; 150 mm (6") PVC casing

TIME		ELAPSED TIME	DISTANCE TO WATER	DRAWDOWN (ft)			PUMPING RATE	REMARKS
HR.	MIN.	t (MIN.)					(igpm)	
13	00		6' 6.5"					Static level; start.
13	01	1	6' 9"	0.21				
13	02	2	7' 0"	0.46			2	
13	03	3	7' 2"	0.63				
13	04	4	7' 4"	0.79				
13	05	5	7' 6"	0.96				
13	06	6	7' 8"	1.13				
13	07	7	7' 10.5"	1.335				
13	08	8	8' 1"	1.54				
13	09	9	8' 4"	1.79				
13	10	10	8' 6"	1.96				
13	12	12	8' 8"	2.13				
13	14	14	8' 10"	2.29				
13	16	16	9' 0"	2.46				
13	18	18	9' 2"	2.63				
13	20	20	9' 3"	2.71				
13	25	25	9' 5"	2.88				
13	30	30	9' 6"	2.96				
13	35	35	9' 7"	3.04				
13	40	40	9' 8"	3.13				
13	45	45	9' 8.75"	3.19				
13	50	50	9' 9"	3.21				
14	00	60	9' 10"	3.29				
14	10	70	9' 11"	3.38				
14	20	80	9' 10"	3.29				
14	30	90	9' 10.5"	3.335				
14	40	100	9' 11"	3.38				
15	00	120	9' 10.5"	3.335				

PUMP TEST – DRAWDOWN DATA

14-17	JUNE	1991
DAY	MONTH	YEAR

PROJECT SWANSON - MISSION SUBDIVISION APLLICATION S90-35

Well on Lot 2 Static Water Level 6'6½" (6.54 ft; 1.99 m)

TIME HR.	TIME MIN.	ELAPSED TIME t (MIN.)	DISTANCE TO WATER	DRAWDOWN (ft)			PUMPING RATE	REMARKS
15	30	150	9' 10.5"	3.335			(igpm)	
16	00	180	9' 10.5"	3.335				
17	00	240	9' 10.5"	3.335				
18	00	300	9' 10"	3.29				
19	00	360	9' 10"	3.29				
22	00	540	9' 10.5"	3.335				
24	00	760	9' 10"	3.29				
15/01	00	820	9' 10.5"	3.335				
06	30	1150	9' 10"	3.29				
11	00	1320	9' 10"	3.29				
13	00	1440	9' 10"	3.29				
17/13	30	4350	9' 10"	3.29				Stop pump.

PUMP TEST – RECOVERY DATA

17	JUNE	1991
DAY	MONTH	YEAR

PROJECT SWANSON - MISSION SUBDIVISION APPLICATION S90-35

Well on Lot 2

Datum Point Top of PVC casing

Elevation of Datum Point 1.2 m (4 ft) above grade

Static Water Level 6'6½" (6.54 ft; 1.99 m)

Total Drawdown 3.29 ft (1.00 m)

TIME		ELAPSED TIME SINCE PUMPING STARTED	ELAPSED TIME SINCE PUMPING STOPPED	RATIO (t/t')	DISTANCE TO WATER	RESIDUAL DRAWDOWN (ft)		REMARKS
HR.	MIN.	t (min.)	t' (min.)					
13	30	4350	0		9' 10"	3.29		Stop pump.
13	31	4351	1		8' 8½"	2.17		
13	32	4352	2		8' 5½"	1.92		
13	33	4353	3		8' 2½"	1.67		
13	34	4354	4		8' 1½"	1.585		
13	35	4355	5		8' ½"	1.50		
13	36	4356	6		8' 0"	1.46		
13	37	4357	7		7' 11½"	1.42		
13	38	4358	8		7' 10½"	1.335		
13	39	4359	9		7' 10"	1.29		
13	40	4360	10		7' 9½"	1.25		
13	42	4362	12		7' 8"	1.13		
13	44	4364	14		7' 7½"	1.085		
13	46	4366	16		7' 7"	1.04		
13	48	4368	18		7' 6½"	1.00		
13	50	4370	20		7' 6"	0.96		
13	55	4375	25		7' 5"	0.88		
14	00	4380	30		7' 4½"	0.835		
14	05	4385	35		7' 4"	0.79		
14	10	4390	40		7' 3½"	0.75		
14	15	4395	45		7' 3"	0.71		
14	20	4400	50		7' 2½"	0.67		
14	30	4410	60		7' 1½"	0.585		
14	40	4420	70		7' ½"	0.50		
14	50	4430	80		6' 11½"	0.42		
15	00	4440	90		6' 11"	0.38		
15	10	4450	100		6' 10½"	0.335		
15	30	4470	120		6' 10"	9.29		
16	00	4500	150		6' 8½"	0.17		
16	30	4530	180		6' 7½"	0.085		

PUMP TEST – RECOVERY DATA

17	JUNE	1991
DAY	MONTH	YEAR

PROJECT SWANSON - MISSION SUBDIVISION APPLICATION S90-35

Well on Lot 2

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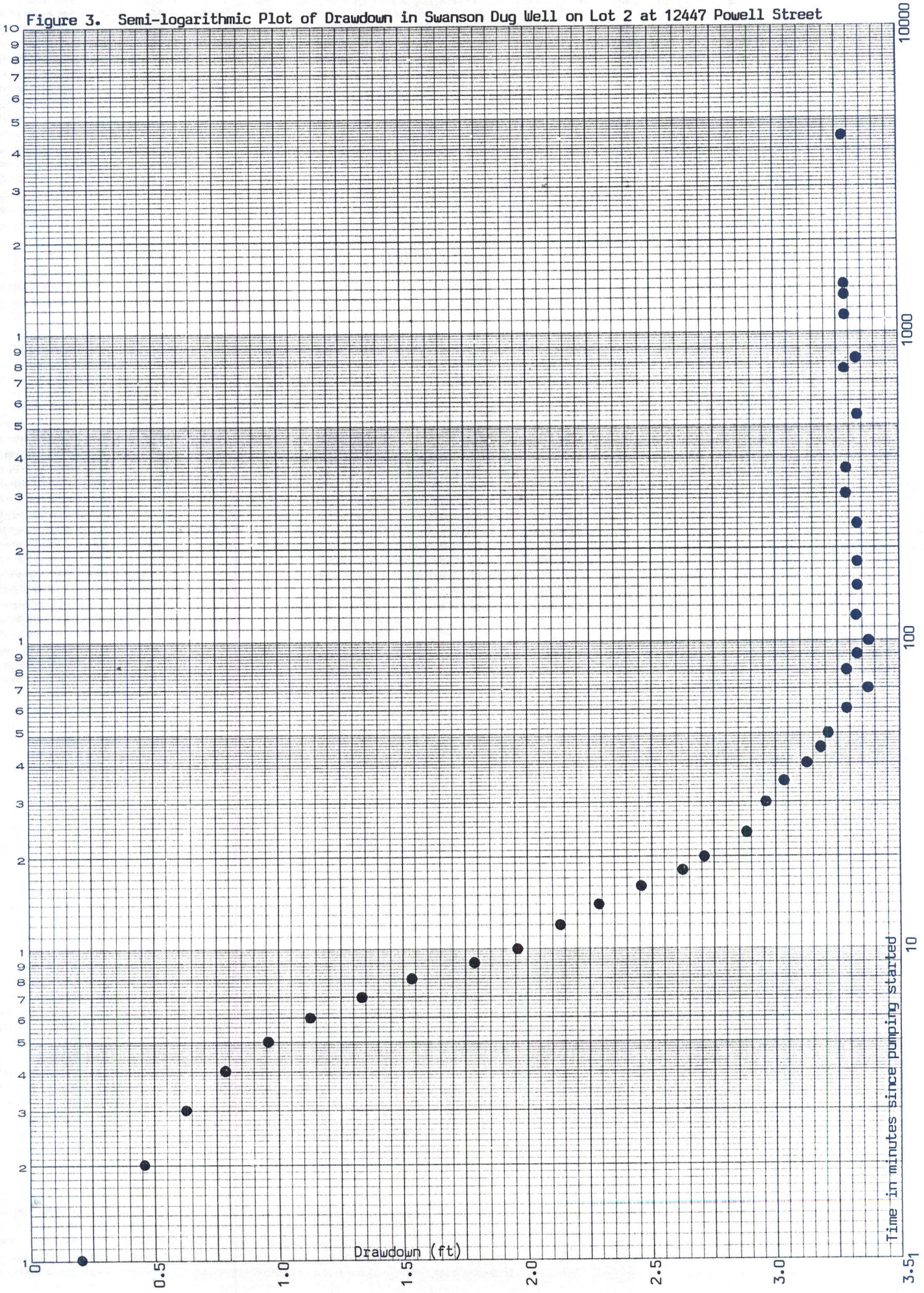
TIME		ELAPSED TIME SINCE PUMPING STARTED	ELAPSED TIME SINCE PUMPING STOPPED	RATIO (t/t')	DISTANCE TO WATER	RESIDUAL DRAWDOWN (ft)		REMARKS
HR.	MIN.	t (min.)	t' (min.)					
17	30	4590	240		6' 7"	0.04		
18	30	4650	300		6' 6½"	0		
19	30	4710	360		6' 6½"	0		
20	00	4740	390		6' 6½"	0		
21	00	4800	450		6' 6½"	0		

Figure 3. Semi-logarithmic Plot of Drawdown in Swanson Dug Well on Lot 2 at 12447 Powell Street



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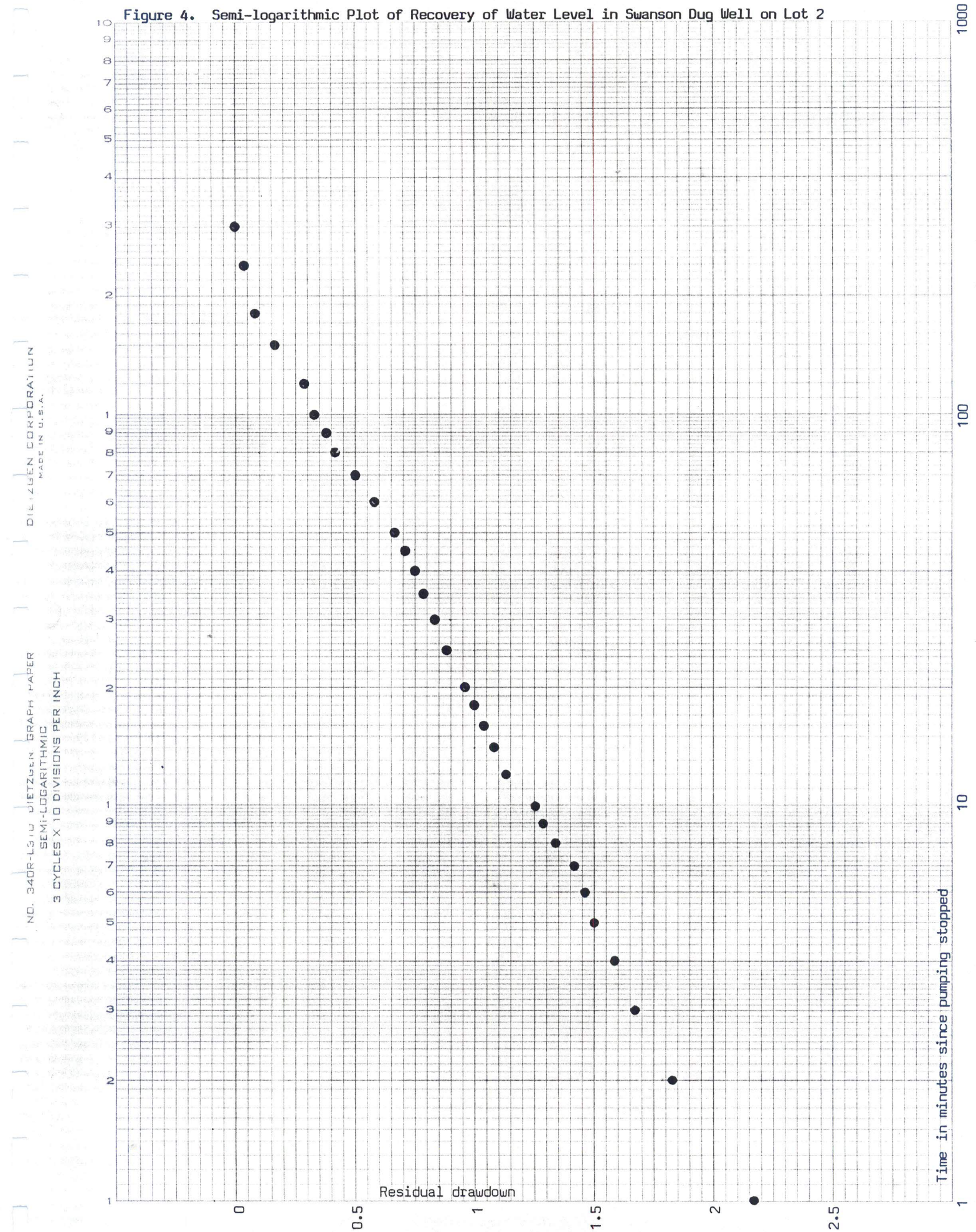
NO. 340-L410 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
4 CYCLES X 10 DIVISIONS PER INCH

Figure 4. Semi-logarithmic Plot of Recovery of Water Level in Swanson Dug Well on Lot 2



APPENDIX C

GROUNDWATER QUALITY

Norwest Labs

"We Solve Problems"

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

Date: July 4, 1991

Work Order No.: 2883

Source of Sample:

Domestic Well Water from New Well - 12447 Powell Street, Mission

CERTIFICATION OF POTABILITY

Norwest Soil Research Inc. certifies that the above mentioned water sample number 91-3154 supplied by K. Swanson 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

W.O. NUMBER : 2883
LAB. NUMBER : 913154

SAMPLE RECEIVED : 06-11-1991
ANALYSIS COMPLETED : 07-04-1991
SAMPLE RETAINED FOR 30 DAYS

SAMPLE SUBMITTED BY :

K. SWANSON
12447 - POWELL STREET
MISSION, B.C. V2V 6H5

SAMPLE IDENTIFICATION : NEW WELL WATER - 12447 POWELL ST, MISSION

ANALYTICAL RESULTS			GUIDELINES FOR DRINKING WATER
pH	7.00		pH values between 6.5 & 8.5 considered acceptable
Electrical Conductivity	0.06	ms/cm	Values above 1.0 ms/cm indicate increasing salt content
Total Dissolved Solids	57	mg/l	Objective level 500 mg/l; higher values indicate high salts
Total Suspended Solids	2	mg/l	Values above 250 mg/l indicate increasing levels of sediment
Ammonium-N	0.0	mg/l	Acceptable values below 0.5 mg/l; objective level below 0.01 mg/l
Potassium	0.7	mg/l	No acceptable level set; values normally in the 0.5 to 10 mg/l range
Calcium	4.0	mg/l	Below 200 mg/l acceptable; objective level below 75 mg/l
Magnesium	1.4	mg/l	Below 150 mg/l acceptable; objective level below 50 mg/l
Sodium	3.8	mg/l	Below 300 mg/l acceptable; over 20 mg/l high for low sodium diets
Iron	0.00	mg/l	Above 0.3 mg/l may cause staining & deposits; objective limit 0.05 mg/l
Copper	0.00	mg/l	Below 1.0 mg/l acceptable; objective limit below 0.01 mg/l
Zinc	0.00	mg/l	Below 5.0 mg/l acceptable; objective limit below 1.0 mg/l
Manganese	0.02	mg/l	Below 0.05 mg/l acceptable; objective limit below 0.01 mg/l
Phosphate-P	0.0	mg/l	No acceptable limit set; below 0.2 mg/l desirable
Sulphate-S	0.3	mg/l	Below 500 mg/l acceptable; objective limit below 250 mg/l
Nitrate-N	0.0	mg/l	Below 10 mg/l acceptable: high values may indicate contamination
Chloride	6.5	mg/l	Below 250 mg/l acceptable
Fluoride	0.69	mg/l	Values up to 1.2 mg/l desirable; under 1.5 mg/l acceptable
Boron	0.08	mg/l	Below 5.0 mg/l acceptable
Carbonate	0	mg/l	Presence indicates alkaline water
Bicarbonate	29	mg/l	Presence indicates mildly alkaline water
Hardness (CaCO3 equiv)	16	mg/l	Soft waters are less than 75 mg/l; hard waters above 150 mg/l
Total coliforms	0/100ml		Above 2/100 ml unacceptable
Fecal coliforms	0/100ml		Greater than 0/100ml unacceptable

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