

**PACIFIC HYDROLOGY CONSULTANTS LTD.**  
CONSULTING GROUNDWATER GEOLOGISTS

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

March 3, 1988

Union Pumps  
23191 Fraser Highway  
P. O. Box 3446  
LANGLEY, B. C. V3A 4R8

Attention: Mr. H. McLean

Subject: Pumping Test and Water Analysis for Rennie Well

Dear Sirs:

Enclosed are the forms which I have filled in and certified.

The purpose of this letter is to further discuss the chemical quality of the water.

1. The water is certainly suitable for human consumption by people in good health. However, the sodium content is fairly high; this may not be suitable for consumption by persons with certain health problems for which a sodium-free diet has been prescribed.
2. The total iron content is high. This is likely related, at least in part, to the turbidity which is also very high. Iron tends to be adsorbed on clay particles which cause the turbidity. When the turbidity decreases after the well has been pumped for a longer time, the total iron may decrease to an acceptable limit; if not, treatment may be required.
3. The manganese which is very slightly above the suggested limit may also decrease when the turbidity declines with further pumping.
4. The water is a very soft sodium-bicarbonate type water, much like certain waters from the Prairie Provinces.


Union Pumps  
Pumping Test and Water Analysis for Rennie Well  
March 3, 1988 - Page 2

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We trust that all is in order.

Yours truly,

PACIFIC HYDROLOGY CONSULTANTS LTD.

A handwritten signature in cursive script that reads "E. Livingston". The signature is written in dark ink and is positioned above the typed name.

E. Livingston, P. Eng.

Enclosures



# The Corporation of the Township of Langley

SCHEDULE "A"

## PRIVATE WELL CERTIFICATION

PURSUANT TO SCHEDULE "A" of the Subdivision and Development Control Bylaw, I hereby certify that each lot to be created and/or each existing lot forming part of the proposed development can be serviced with potable water in accordance with the requirements of the Bylaw for the development of:

LEGAL DESCRIPTION: \_\_\_\_\_

PROJECT NO.: \_\_\_\_\_

I certify that a quantity of not less than 2,500 litres per day has been proven for each existing or proposed lot in the development.

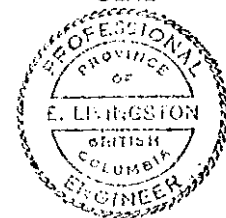
I certify that water quality tests have been conducted and that the "B.C. Drinking Water Standards, 1982" can be met for each existing or proposed lot in the development. (See note below)

E. Livingston, P. Eng.  
Certified By (Name of Professional Engineer)

204 - 1929 West Broadway  
Address

VANCOUVER, B. C. V6J 1Z3

PROFESSIONAL  
SEAL



See attachments as required pursuant to clause 2.2.18 of Schedule "A".

We acknowledge that the report by CanTest Ltd. shows that the water sample collected near the end of the pumping test does not meet the recommended limits of the "B. C. Drinking Water Standards, 1982" for several parameters. Those parameters which exceed the limits are not health hazards but are objectionable for aesthetic reasons - in particular, the iron which may cause staining of laundry and plumbing fixtures. We also point out that the sodium (Na) content may be excessive for persons with certain health problems.



# The Corporation of the Township of Langley

SCHEDULE "A"

## WELL PUMP TEST - FIELD TEST

OWNER'S NAME: Mr. & Mrs. J. Rennie WELL NO. 1  
APPLICATION NO.: \_\_\_\_\_ DATE: \_\_\_\_\_  
LOCATION: \_\_\_\_\_ SHEET 2 OF 8  
TEST NO. 1

Drawdown       Recovery

Rdg #	Time From Start	Depth To Water	Draw Down	Flow Measurement Data			Comments
				(MIN)	(L)	Lpm	
	0	1.37					Static water level; start.
	1	1.37?		0.65	20	30.8	Water very silty.
	2	3.51	2.14				
	3	4.42	3.05				Water clearing.
	4	5.64	4.27				Unidentified odour and taste.
	5	6.86	5.49	0.67	20	29.8	
	6	7.47	6.10				
	7	8.99	7.62				
	8	10.21	8.84				Water almost clear.
	9	11.89	10.52	0.70	20	28.6	
	10	13.26	11.89				
	15	15.09	13.72	0.73	20	27.4	
	20	29.29	27.92				Reduce flow.
	25	33.99	32.62	0.92	20	18.5	
	30	35.67	34.30				
	35	37.96	36.59				Water very silty.
	40	40.09	38.72				Water clearing.
	45	41.92	40.55				
	50	44.21	42.84				
	55	45.88	44.51				Water silty again.



# The Corporation of the Township of Langley

SCHEDULE "A"

## WELL PUMP TEST - FIELD TEST

OWNER'S NAME: Mr. & Mrs. J. Rennie WELL NO. 1

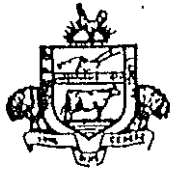
APPLICATION NO.: \_\_\_\_\_ DATE: \_\_\_\_\_

LOCATION: \_\_\_\_\_ SHEET 3 OF 8

TEST NO. 1

Drawdown       Recovery

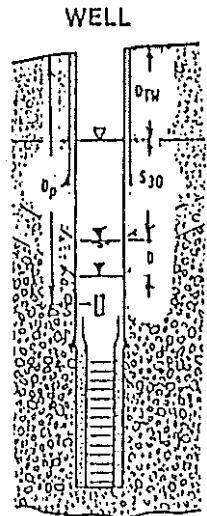
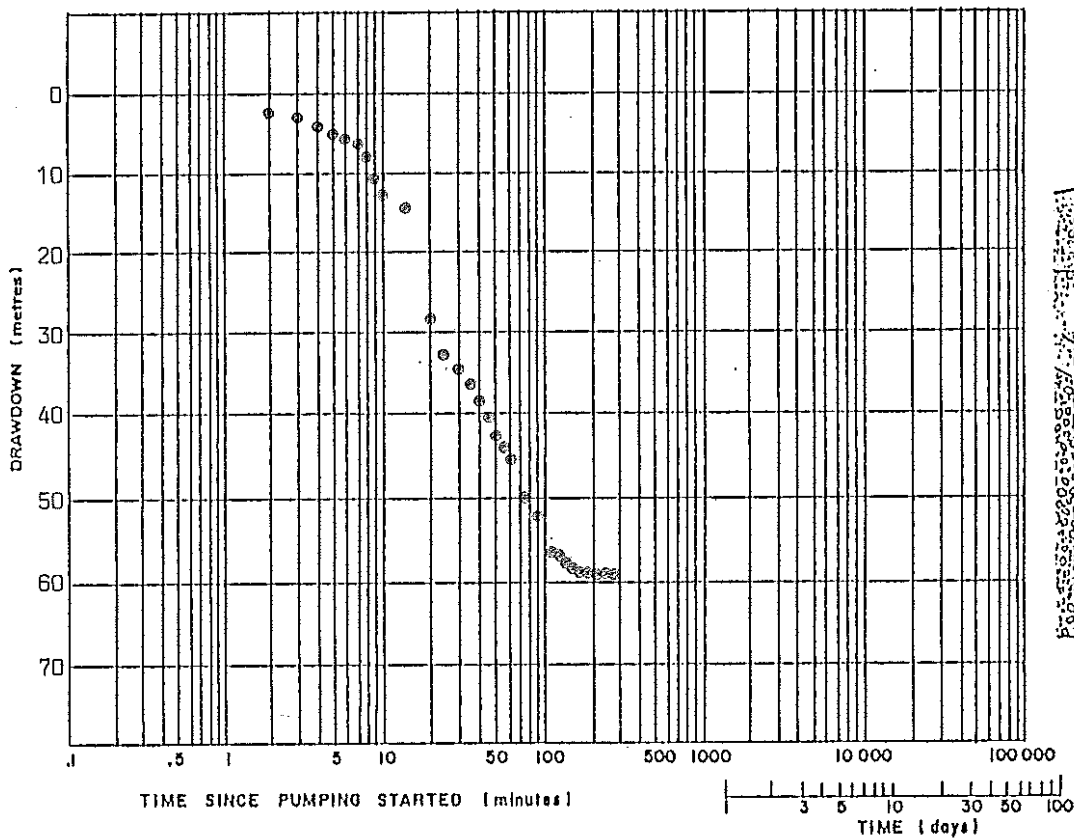
Rdg #	Time From Start	Depth To Water	Draw Down	Flow Measurement Data			Comments
				(Min)	(L)	Lpm	
	60	47.71	46.34	1.12	20	17.9	
	75	51.37	50.00				Water is olive green in colour.
	90	54.45	53.08	1.17	20	17.1	
	105	56.55	55.18	1.20	20	16.7	
	120	58.08	56.71	1.22	20	16.4	
	135	59.63	58.26				Most odour and taste gone.
	150	60.36	58.99	1.23	20	16.3	Still some turbidity.
	165	60.42	59.05	1.25	20	16	
	180	60.49	59.12	1.27	20	15.7	
	195	60.44	59.07	1.28	20	15.6	
	210	60.39	59.02				
	225	60.29	58.92				
	240	60.29	58.92	1.28	20	15.6	Stop pump.



The Corporation of the Township of Langley  
SCHEDULE "A"

TIME - DRAWDOWN GRAPH FOR PUMP TEST

OWNER'S NAME: Mr. & Mrs. J. Rennie WELL NO. 1  
 APPLICATION NO.: \_\_\_\_\_ DATE: \_\_\_\_\_  
 LOCATION: \_\_\_\_\_ SHEET 4 OF 8  
 DEPTH TO STATIC WATER LEVEL: 1.37 (m) TEST NO. 1



Final Pumping rate 15.6 Lpm Drawdown at 30 days ( $S_{30}$ ) approx. 59 (m)

Estimated minimum adjustment for seasonal decline (D); Use following figures if other local data or hydrogeologist's opinion is not available.

- Tests run in summer time: 2 m
- Tests run in winter time: 6 m
- Tests run in fall and spring: use intermediate values 2 m to 6 m

Depth to proposed pump suction ( $D_p$ ) 79.3 m

Calculate minimum available drawdown:  $D_p - (D_{TW} + S_{30} + D) =$   
79.3 - ( 1.37 + 59 + 6 ) = 12.93

If answer to above calculation is negative, then either the pump has to be set lower or the well is not capable of supplying water for a house.



# The Corporation of the Township of Langley

SCHEDULE "A"

## WELL PUMP TEST - FIELD TEST

OWNER'S NAME: Mr. & Mrs. J. Rennie WELL NO. 1  
APPLICATION NO.: \_\_\_\_\_ DATE: \_\_\_\_\_  
LOCATION: \_\_\_\_\_ SHEET 5 OF 8  
TEST NO. 1

Drawdown  Recovery

Rdg #	Time From Start	Depth To Water	Res. Draw Down	Flow Measurement Data			Time From Stop	t/t	Comments
				(MIN)	(L)	Lpm			
	240	60.29	58.92						Stop pump.
	241	60.06	58.69				1	241	
	242	58.38	57.01				2	121	
	243	57.16	55.79				3	81	
	244	56.25	54.88				4	61	
	245	54.72	53.35				5	49	
	246	53.66	52.29				6	41	
	247	52.90	51.53				7	35.3	
	248	51.88	50.51				8	31	
	249	51.22	49.85				9	27.7	
	250	49.90	48.43				10	25	
	255	47.48	46.11				15	17	
	260	44.05	42.68				20	13	
	265	40.70	39.33				25	10.6	
	270	37.80	36.43				30	9	
	275	35.06	33.69				35	7.9	
	280	32.37	31.00				40	7	
	285	30.34	28.97				45	6.3	
	290	28.05	26.68				50	5.8	
	295	26.22	24.85				55	5.4	



# The Corporation of the Township of Langley

SCHEDULE "A"

## WELL PUMP TEST - FIELD TEST

OWNER'S NAME: Mr. & Mrs. J. Rennie WELL NO. 1

APPLICATION NO.: \_\_\_\_\_ DATE: \_\_\_\_\_

LOCATION: \_\_\_\_\_ SHEET 6 OF 8

TEST NO. 1

Drawdown       Recovery

Rdg #	Time From Start	Depth To Water	Draw Down	Flow Measurement Data			Time From Stop	t/t	Comments
				(MIN)	(L)	Lpm			
	300	24.09	22.72				60	5	
	315	16.46	15.09				75	4.2	
	330	13.26	11.89				90	3.7	
	345	9.91	8.54				105	3.3	
	360	9.17	7.80				120	3	



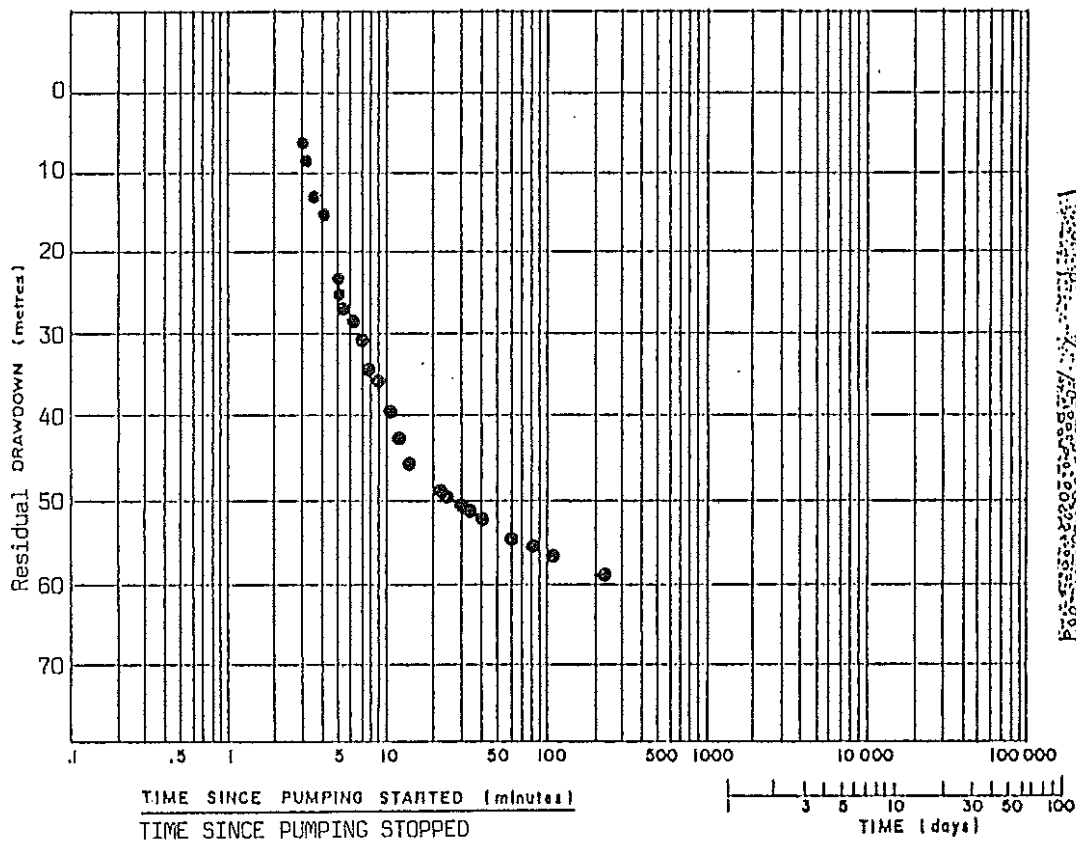


# The Corporation of the Township of Langley

SCHEDULE "A"

## RECOVERY GRAPH FOR PUMP TEST

OWNER'S NAME: Mr. & Mrs. J. Rennie WELL NO. 1  
 APPLICATION NO.: \_\_\_\_\_ DATE: \_\_\_\_\_  
 LOCATION: \_\_\_\_\_ SHEET 7 OF 8  
 DEPTH TO STATIC WATER LEVEL: 1.37 (m) TEST NO. \_\_\_\_\_



Pumping rate \_\_\_\_\_ Lpm Drawdown at 30 days ( $S_{30}$ ) \_\_\_\_\_ (m)

Estimated minimum adjustment for seasonal decline (D): Use following figures if other local data or hydrogeologist's opinion is not available.

- Tests run in summer time: 2 m
- Tests run in winter time: 6 m
- Tests run in fall and spring: use intermediate values 2 m to 6 m

Depth to proposed pump suction ( $D_p$ ) \_\_\_\_\_ m

Calculate minimum available drawdown:  $D_p - (D_{TW} + S_{30} + D) =$

\_\_\_\_\_ - ( \_\_\_\_\_ + \_\_\_\_\_ + \_\_\_\_\_ ) = \_\_\_\_\_

If answer to above calculation is negative, then either the pump has to be set lower or the well is not capable of supplying water for a house.



# The Corporation of the Township of Langley

SCHEDULE "A"

## PUMP TEST SUMMARY

OWNER'S NAME: Mr. & Mrs. J. Rennie WELL NO. 1  
 APPLICATION NO.: \_\_\_\_\_ DATE: \_\_\_\_\_  
 LOCATION: \_\_\_\_\_ SHEET 8 OF 8  
 TEST NO. 1

WELL COMPLETION DATA		SCREEN DESIGN (mark one)	DESCRIPTION OF AQUIFER
Depth <u>137.2</u> (m)	<input type="checkbox"/> Open Hole	<input type="checkbox"/> Slotted Casing	<u>fine silty sand</u>
Diameter <u>150</u> (mm)	<input checked="" type="checkbox"/> Screen	<input type="checkbox"/> Gravel Pack	<u>between 134.5 and</u>
Static Water Level <u>1.37</u> (m)	<input type="checkbox"/> Other _____		<u>137.2 m</u>
		Screen Interval <u>134.4m to 137.2m</u>	
<b>PUMP TEST</b>			
Start: Date <u>28/01/88</u>	Time <u>12:15 p.m.</u>		
	<small>d/mo/yr</small>	<small>hr/min</small>	
Pump Type: <input checked="" type="checkbox"/> Electric submersible	<input type="checkbox"/> Jet	<input type="checkbox"/> Air Lift	
Other? Describe _____			
Test Pump Set at <u>83.8</u> m below ground			
Water level sounded by: <input checked="" type="checkbox"/> Electric tape	<input type="checkbox"/> Air bubbler	<input type="checkbox"/> Steel tape	
<input type="checkbox"/> Other? Describe _____			
Flow measured by: <input checked="" type="checkbox"/> Container & watch	<input type="checkbox"/> Flow meter		
<input type="checkbox"/> Orifice & Lube <input type="checkbox"/> Other? Describe _____			
<b>TEST</b>			
Non Constant rate of yield <u>30.8 to 15.6</u> Lpm	Test duration <u>4</u> hours		
Initial non-pumping level <u>1.37</u> m			
Drawdown in well at end of test <u>58.92</u> m			
Recommended pumping rate <u>15 to 16</u> Lpm			
<b>WATER SAMPLES TAKEN DURING TEST</b>			
Chemical Analysis <input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No		
Bacterial Analysis <input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No		
Water Temperature _____ °C			
Any particular gas smells noted <u>Unidentified odour at start; cleared during pumping.</u>			
Comments on clarity of water <u>Water very silty at start; cleared but still turbid at end.</u>			
Other <u>The olive green water colour is probably due to the presence of reduced iron.</u>			
_____			
_____			

**REPORT ON:** Analysis of Water Sample**REPORTED TO:** Union Pumps  
23191 Fraser Hwy.  
c/o P.O. Box 3446  
Langley, B.C.  
V3A 4R8**FILE NO:** 6791G**DATE:** February 15, 1988

cc: Pacific Hydrology

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We have tested the sample submitted by you and report as follows:

**PROJECT NAME:** Water Quality  
**DATE SUBMITTED:** February 1, 1988  
**TYPE OF CONTAINER:** Plastic**SUMMARY:**

For the chemical parameters tested, the sample did not meet all the limits set by the "British Columbia Drinking Water Quality Standards, 1982", Province of B.C., Ministry of Health and "Guidelines for Canadian Drinking Water Quality, 1978", published by authority of Health and Welfare Canada, as indicated in the "Results of Testing".

Parameters are limited for health or aesthetic reasons. The parameters that did not meet the limits were pH, color, total dissolved solids, turbidity, total iron, and total manganese. These are limited primarily for aesthetic (taste, appearance, staining, etc.) reasons.

For the bacteriological parameters tested, the samples met the limits (i.e. coliform bacteria was not detected).

In summary, the water represented by the samples submitted may be characterized as extremely high in dissolved mineralization and soft with respect to hardness.

**SAMPLE IDENTIFICATION AND RESULTS OF TESTING:**

(on the following page)

**SAMPLE IDENTIFICATION AND RESULTS OF TESTING:**

<b>SAMPLE #</b>	1	<b>MAXIMUM</b>
<b>CLIENT SAMPLE I.D.</b>	<b>MRS. RENNIE</b>	<b>ACCEPTABL</b>
	22378-96 AVENUE	<b>CONC.***</b>
	LANGLEY, B.C.	

**PHYSICAL TESTS**

pH (pH units)	8.77x	6.5-8.5
Conductivity (us/cm)	677.	-
True Color (CU)	50.x	15.
Turbidity (NTU)	16.x	5.
Hardness as CaCO3	5.7	-
 Total Dissolved Solids (mg/L)	 540.x	 500.*

**DISSOLVED ANIONS (mg/L)**

<b>Alkalinity:</b>		
Bicarbonate	HCO3	355.
Carbonate	CO3	12.
Hydroxide	OH	Nil
Chloride	Cl	5.85
Sulfates	SO4	3.18
Nitrates/Nitrites	N	< 0.05
Fluorides	F	0.32
		250.
		500.
		10.**
		1.5

**DISSOLVED METALS (mg/L)**

Calcium	Ca	1.06
Magnesium	Mg	0.72
Sodium	Na	149.
Potassium	K	5.00
 Iron	 Fe	 0.23
Manganese	Mn	0.010
Silica	SiO2	14.1
		-
		0.30
		0.05

**TOTAL METALS (mg/L)**

Mageslum	Mg	0.86
Iron	Fe	3.07x
Manganese	Mn	0.062x
		-
		0.30
		0.05

**Coliform Bacteria (MPN/100mL\*R)**

Total (Confirmed)	< 1.	-
Fecal	< 1.	Not Detected

\* = filtered a 0.45 micron membrane  
 \*\* = total nitrate and nitrite nitrogen  
 \*\*\* = maximum acceptable concentration as set by "B.C. Drinking Water Quality Standards, 1982" a Canadian Drinking Water Quality, 1978"  
 < = less than; mg/L = milligrams per litre  
 x = exceeded the "guidelines"  
 \*R = See "Remarks" page

**REMARKS:**

When evaluating coliform results, the following excerpts from the "Guidelines for Canadian Drinking Water Quality, published by the authority of Health and Welfare, Canada should be noted:

**Page 24-25** "It should be emphasized that no bacteriological analysis of water can take the place of a complete knowledge conditions at the sources of supply and throughout the distribution system. Contamination is often intermittent and may be revealed by the examination of a single sample. The most a bacteriological report can prove is that, at the time of examination bacteria indicating fecal pollution did or did not grow under laboratory conditions from a sample of water."

**Page 26** "Since the presence of any type of coliform organism in treated water suggest either inadequate treatment contamination, the objective level for total coliforms should be no organisms detectable per 100mL; however, in practice level is not always attainable."

**Page 27** "If any coliform organisms are detected, the site should be resampled, and if the presence of coliforms is confirmed action taken to determine the cause. If the maximum acceptable level is exceeded, the local control agency or Medical Officer of Health should be contacted for the appropriate corrective action. The most common immediate actions include increasing chlorine dosage, flushing the water mains, using an alternative source of water and advising consumers to boil drinking water."

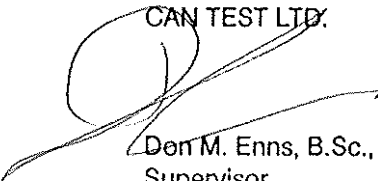
The "B.C. Drinking Water Quality Standards, 1982" published by Province of British Columbia, Ministry of Health further state:

**Page 3** "If any raw water sample contains fecal coliforms or if more than five percent of the samples in any consecutive period have a total coliform density greater than 10 per 100mL, disinfection is required."

**METHOD OF TESTING:**

The analyses were carried out in accordance with procedures described in "Laboratory Manual for the Chemical Analysis of Water, Wastewater, Sediments and Biological Materials (2nd Edition)" published by the Government of B.C., Ministry of Environment, Water Resources Services, 1976 and "Standard Methods for the Examination of Water and Wastewater", 15th Edition, 1980, published by the American Public Health Association.

The metals were determined using Inductively Coupled Plasma Spectrographic analysis, direct or graphite furnace absorption spectrophotometry.

CAN TEST LTD.  
  
 Don M. Enns, B.Sc., M.B.A.  
 Supervisor  
 Water Quality Laboratory

DME/csd  
 C:WATER

**PACIFIC HYDROLOGY CONSULTANTS LTD.**  
CONSULTING GROUNDWATER GEOLOGISTS

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

July 14, 1988

Mrs. John Rennie  
Box 431  
FORT LANGLEY, B. C. VOX 1J0

Dear Mrs. Rennie:

This is further to our telephone discussion of July 14 about the quality of water from your well and what can be done to change it. We examined pump test results from this well in February and, in a letter to Union Pumps dated March 3, 1988, we discussed some aspects of the chemical quality of the water.

We understand that the Municipality of Langley will not issue a building permit to you unless you can present them with a statement from a qualified person outlining what can be done to lower the sodium and dissolved iron contents of the well water which are shown in a water analysis from Can Test Ltd., File No. 6791G; we have a copy of this analysis in our files.

The colour and turbidity of the water are certainly high. We are quite sure that these are due to the fact that the well is new and has only been pumped for a short time. It is not unusual for a well to yield cloudy and coloured water for several weeks after it is put into use. As stated in our letter mentioned above, we believe that the high total iron is associated with the turbidity and that it will decline as the water clears.

If iron persists, it can be removed quite easily by standard, fairly inexpensive, treatment equipment commonly known as a manganese-green sand filter. It is also probably possible to stabilize the iron to prevent staining by using a feeder to inject a very small amount of silica gel or polyphosphate.

Mrs. John Rennie  
July 14, 1988  
Page 2

The high sodium content can be reduced by use of reverse osmosis equipment. This equipment is quite expensive but is available on the market from several suppliers. It is necessary to install only a low capacity unit to produce a small amount of water for drinking and cooking. As mentioned in our previous letter, sodium is an health hazard only for people with certain health disorders involving kidneys and blood pressure.

We have included a couple of brochures from our water treatment file; they give some ideas about dealing with iron and sodium problems.

If you require further information, please contact us.

Yours truly,

PACIFIC HYDROLOGY CONSULTANTS LTD.

  
E. Livingston, P. Eng.

Enclosures