

82L-6-128

POSSIBLE SOURCES OF GROUNDWATER IN THE

VERNON - ARMSTRONG AREA OF B.C.

SUITABLE FOR BOTTLING

PACIFIC HYDROLOGY CONSULTANTS LTD.

April 5, 1983

PACIFIC HYDROLOGY CONSULTANTS LTD.
CONSULTING GROUNDWATER GEOLOGISTS

1401 WEST BROADWAY
VANCOUVER, B.C. V6H 1H6
TELEPHONE: 738-9232

April 5, 1983

Mr. M.E. Duffy
4 Brooklet Crescent
Thornhill, Ontario
L3T 2M9

Subject: Possible Sources of Groundwater in the Vernon-Armstrong Area of B.C.
Suitable for Bottling

Dear Sir:

This is further to our discussion on March 24 about possible sources of spring water in the Vernon-Armstrong area of the North Okanagan Valley that would be suitable for bottling.

We understand that:

1. You are looking for a source of water to be bottled for selling on Canadian and US markets.
2. Initially your objective is to identify a source of water with total dissolved mineralization below 500 mg/litre; we understand that such waters are classified as spring water under California regulations.
3. A definite plan for bottling, handling, etc has not yet been formulated.

Course of Action

We recommend against carrying out exploration for a new source of suitable water. We suggest instead that the initial search be based on the following:

1. Existing information from government files, consultant's files and other sources to identify aquifers that yield water which is chemically suitable for marketing as spring water.
2. In such aquifers, locate (if possible) existing wells with sufficient capacity to serve as sources for a bottling operation.

3. Investigate the possibility of purchasing water from a well owner under an appropriate contract.
4. If water purchase cannot be arranged, consider the possibility of obtaining a parcel of land, either by purchase or lease, in order to construct a well and other required facilities.

Aquifers in the Vernon-Armstrong Area

The purpose of this letter-report is to outline major aquifers in the Vernon-Armstrong area which have occurred to us. The information contained in this letter comes primarily from our files. There are probably other aquifers in the area about which we have no knowledge. We have included water quality analyses when available in our files. Others can probably be obtained from Victoria or from well owners.

1. Vernon Aquifer. The records of a few wells show that part of the City of Vernon is underlain by an aquifer that is capable of supplying wells of medium (15 l/sec) or even high (65 l/sec) capacity. As far as we know, the aquifer has not been explored or tested. There is a well at the NOCA Dairy Plant and also one at the hockey arena, but we believe that neither well is constructed to make use of the full aquifer potential.
2. Coldstream Ranch Aquifers. At the Coldstream Ranch there are three aquifers. The lower (deepest) aquifer has been penetrated by one well which is flowing artesian. The test well got out of control when it was drilled as an exploratory hole by the Federal Government, and attempts to shut the well in and stop the flow were not successful. The well was recently equipped with a well screen and flows at a constant rate. The water is used by the Coldstream Ranch for irrigation during the summer months; the natural flow discharges to Coldstream Creek when irrigation is not under way. Wells constructed in the two upper aquifers supply water to the Vernon Irrigation District system. The two upper aquifers probably extend for some distance toward Lumby and toward Coldstream. (Water quality information was given to you at the time of your visit.)
3. There is a fairly extensive aquifer along the southeast side of the Okanagan Valley between Vernon and the northeast arm of Okanagan Lake. The aquifer, which is found along the foot of the slope, supplies several community water supply systems. However, treated sewage effluent from the City of Vernon is used by farmers on the slope above the aquifer for irrigation. This does not affect the water quality but it certainly detracts from the concept of pure, natural water.
4. Eagle Rock Aquifer. There is an aquifer located north of Vernon along the east side of the Okanagan Valley north of Swan Lake. The aquifer, which consists of fine sand, yields water to the Eagle Rock Waterworks District Well. The Eagle Rock system supplies water to a few rural users and a plywood mill. The aquifer is local in extent but as far as we know it has additional capacity. It may be possible to buy water from Eagle Rock Waterworks District

or to construct another well near the Eagle Rock Well. The same aquifer also supplies water to Larkin Waterworks District. The Larkin Well is downslope from the Eagle Rock Well and is flowing artesian. These wells are close to Crozier Cross Road. (see enclosed map)

5. Armstrong. The City of Armstrong owns a well that was constructed by the Provincial Government about 10 years ago. The well is located behind the new firehall in Armstrong but it has never been put into use as far as we know. There were rumours about water quality problems but we are not sure of the exact details. We have contacted the Groundwater Section to obtain a water analysis and we will forward it when it is available.
6. O'Keefe Ranch - Grandview Flats Aquifer. The Grandview Flats Waterworks District uses a well located in a large kettle (depression) in the northern part of the District. We believe that this aquifer extends northwestward toward Round Lake which is located on Indian Land. It is probably possible to construct a good well in the general vicinity of the O'Keefe Store. The setting is quite attractive.
7. Falkland Aquifer. There is a good aquifer under Falkland. A well at the rodeo grounds on the west side of the community supplies the Falkland Water system. Other wells can be constructed in the area. The enclosed chemical analysis shows that the water is not as good as others because of small amounts of phosphate and manganese.
8. The District of Salmon Arm constructed a production well about 10 years ago. We were not involved with the well construction so we have no details about capacity or water quality. The well was not used for some time and may not even be in use now. Other wells can probably be constructed in the area. We are attempting to get more details on the well and will forward any additional information as soon as it is available.
9. There is an agricultural area north of Armstrong known as Hullcar. At Hullcar and along the valley extending westward toward Schwebb's Bridge there are a number of irrigation wells. The aquifer (or aquifers) are not well known but probably would be suitable for your purposes. The setting is attractive but access is not particularly good.

Discussion

The next step, we suggest, is for you to go over the area and come up with a tentative plan covering bottling, transport, shipping, advertising, etc. Then, in the area which combines the most advantages, try to work out an arrangement with well owners, land owners, etc. The Eagle Rock situation appears to have a number of things going for it: the area is attractive, the aquifer has additional capacity and transportation from the area is straightforward.

This letter does not exhaust all of the possibilities. If, in following up some of these leads, you come across a source not covered in this letter, we are prepared to assist you in any way.

We trust this information is of assistance to you. Please call if you wish to discuss anything in this letter. We will wait to hear from you before carrying out additional work.

Yours truly,

PACIFIC HYDROLOGY CONSULTANTS LTD.

E Livingston P Eng
E. Livingston, P. Eng.

EL/ab

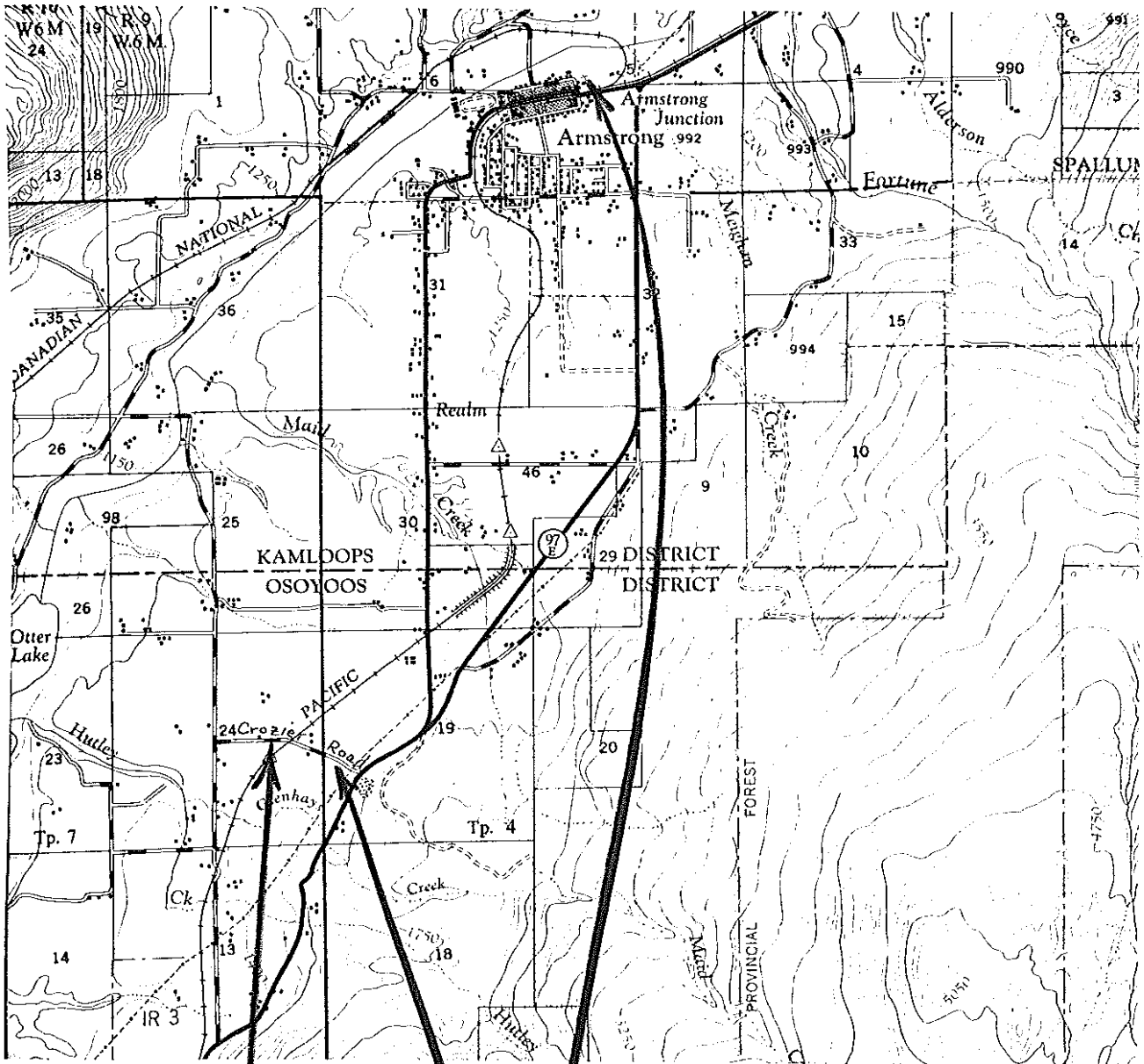
attachments

ATTACHMENTS

to Accompany

Letter of April 5, 1983 to Mr. M.E. Duffy

POSSIBLE SOURCES OF GROUNDWATER IN THE
VERNON-ARMSTRONG AREA OF B.C.
SUITABLE FOR BOTTLING



(Portion of NTS 82L/6 East; Scale 1:50,000)

Armstrong Well

Eagle Rock Waterworks District Wells

Larkin Improvement District Wells

LOCATION OF EAGLE ROCK, LARKIN AND ARMSTRONG WELLS

Certificate

WOOD LABORATORY LTD.

ANALYTICAL & CONSULTING CHEMISTS • BACTERIOLOGISTS & FOOD TECHNOLOGISTS

555 HOMER ST., VANCOUVER 3, B.C.

TELEPHONE (604) 684-8732

Mr. E. Livingston
107 - 1401 West Broadway
Vancouver 9, B.C.

DATED: August 31st, 1972

CERTIFICATE No.: 72-8-28

Sample: Well Water
Marks: Eagle Rock
Received On: August 18th, 1972

We hereby certify that we have tested the above described sample and report as follows:

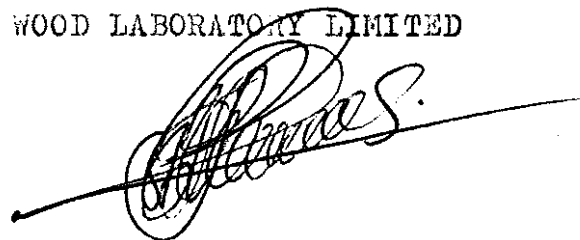
pH /	8.3	
Colour(APHA)	10 Units	
Turbidity (JTU)	0.2	ppm
M-O Alkalinity as CaCO ₃	110.0	ppm
Total Hardness " " ₃	101.0	"
Calcium (Ca)	34.0	"
Magnesium (Mg)	3.9	"
Total Iron (Fe)	0.22	"
Manganese (Mn)	< 0.01	"
Silica (SiO ₂)	16.0	"
Sodium (Na) ² & Potassium (K) ..	5.0	"
Total Phosphates (PO ₄)	0.10	ppm
Fluorides (F)	< 0.01	"
Carbonates (Equiv. to HCO ₃) ...	66.11	ppm
Bicarbonates (HCO ₃)	134.20	"

...../2

- 2 -

Sulfates (SO ₄)	.....	6.0	ppm
Chlorides (Cl ⁻)	1.8	"
Ammonia "N"	.....	< 0.001	"
Nitrates (NO ₃)	.....	0.25	"
Nitrites (NO ₂)	.....	Traces	
Total Solids	.....	135.0	ppm
Dissolved Solids	.....	130.0	"
Suspended Solids	.....	5.0	"

Respectfully submitted,
WOOD LABORATORY LIMITED



B.B. Sharma, Chief Chemist

BBS/ab

CC: The Controller of Water Rights
Water Rights Branch, Victoria, B.C.
Attn: Mr. J.W. Webber

RESULTS OF TESTING:Sample Identification1 - Grandview2 - Webber DamPhysical Tests

pH		8.20	8.20
Conductance (umhos/cm)		595.	665.
Color (CU)	L	5.	L 5.
Turbidity (JTU)		0.23	0.34
Total Dissolved Solids (mg/L)		540.	590.
Total Suspended Solids (mg/L)		0.25	L 0.2

Dissolved Anions (mg/L)

Alkalinity			
Bicarbonate	HCO ₃	339.	342.
Carbonate	CO ₃	NIL	NIL
Chloride	Cl ³	2.45	1.65
Sulfate	SO ₄	58.	106.
Nitrate & Nitrite	N	0.002	L 0.001
Phosphate	PO ₄	0.17	L 0.030
Fluoride	F ⁴	0.37	0.18
Silica	SiO ₂	29.3	17.5

Dissolved Cations (mg/L)

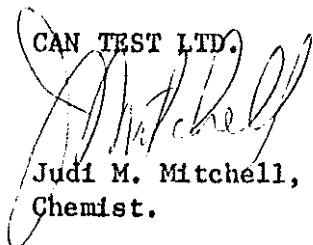
Total Hardness	CaCO ₃	285.	350.
Calcium	Ca	54.5	63.5
Magnesium	Mg	36.3	46.4
Sodium	Na	13.6	7.25
Potassium	KK	7.38	2.28
Iron	Fe	L 0.030	L 0.030
Manganese	Mn	0.064	0.005
Cadmium	Cd	L 0.001	L 0.001
Copper	Cu	0.003	L 0.001
Lead	Pb	L 0.001	L 0.001
Zinc	Zn	0.016	0.007

Others gm/L

Total Iron	Fe	0.083	0.036
Total Manganese	Mn	0.067	0.005

L - less than, mg/L - milligrams per liter (or parts per million for drinking water)

CAN TEST LTD.



Judi M. Mitchell, B.Sc.,
Chemist.

FalklandPhysical Tests

pH		7.95
Conductance (umhos/cm)		722.
Color (CU)		L5.
Turbidity (JTU)		0.54
Total Dissolved Solids (mg/L)		490.
Total Suspended Solids (mg/L)		0.2

Dissolved Anions (mg/L)

Alkalinity		
Bicarbonate	HCO ₃	345.
Carbonate	CO ₃	Nil
Chloride	Cl	1.9
Sulfate	SO ₄	L5.
Nitrate & Nitrite	N	0.015
Phosphate	PO ₄	0.50
Fluoride	F	0.43
Silica	SiO ₂	27.6

Dissolved Cations (mg/L)

Total Hardness	CaCO ₃	127.
Calcium	Ca	51.0
Magnesium	Mg	26.0
Sodium	Na	27.5
Potassium	K	5.25
Iron	Fe	0.041
Manganese	Mn	0.15
Cadmium	Cd	L0.001
Copper	Cu	0.051
Lead	Pb	0.002
Zinc	Zn	0.007

Others (mg/L)

Total Iron	Fe	0.043
Total Manganese	Mn	0.19

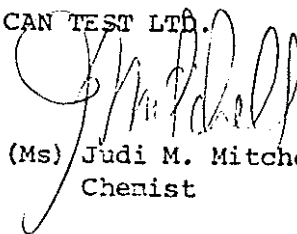
L = Less than, mg/L = milligrams per liter (or parts per million for drinking water)

REMARKS:

The water represented by the sample submitted can be characterized as moderate with respect to hardness, and moderately high in dissolved mineralization. For the parameters tested the sample met the limits set by the Canadian Drinking Water Standards with the exception of dissolved phosphates (limit = 0.2 mg/L) and dissolved manganese (limit = 0.05 mg/L).

Phosphates are limited because their presence tends to promote the growth of photosynthetic organisms (algae). Dissolved manganese is limited for aesthetic reasons and is not considered a health hazard.

CAN TEST LTD.



(Ms) Judi M. Mitchell B. Sc.,
Chemist

TABLE 2

COMPARISON OF HYDROCHEMISTRY OF
ARMSTRONG TEST PRODUCTION WELL WITH
DRINKING WATER QUALITY STANDARD RECOMMENDED BY
BRITISH COLUMBIA MINISTRY OF HEALTH

1401422

Constituents*	Sampled Nov. 21/77 During Preliminary Pump Test	Sampled Nov. 29/77 ½ hr. after Production Test	Sampled Nov. 29/77 9 hrs. after Production Test	Sampled Nov. 30/77 23 hrs. after Production Test	Maximum Limit - Recommended Drinking Standard
pH	8.0	8.2	8.1	8.1	
Specific Conductivity	520	527	527	527	
Alkalinity (T)	236	235	234	234	
Cl ⁻	1.0	0.9	0.9	0.8	250
F ⁻		0.38	0.38	0.38	1.5
Hardness	256	260	266	266	180
NO ₂ , NO ₃		<0.02	<0.02	<0.02	
Phosphorus (T)		0.105			
Phosphorus (D)		0.066	0.064	0.065	0.2
SO ₄ ⁻⁻		53.5	53.1	53.5	500
Ca (D)	70.5	70.5	73.0	73.5	200
Cu (T)		<0.001	<0.001	<0.001	
Cu (D)		<0.001	<0.001	<0.001	1.0
Fe (T)	0.5	0.5	0.5	0.5	
Fe (D)	0.1	0.1	0.1	0.1	0.3
Pb (T)		<0.001	<0.001	<0.001	
Pb (D)		<0.001	<0.001	<0.001	
Mg (D)	19.5	20.3	20.3	20.1	150
Mn (D)	0.24	0.24	0.24	0.24	0.05
K (D)	5.7	5.7	5.7	5.7	
Na (D)	10.3	10.0	10.2	9.8	
Zn (T)		<0.005	<0.005	<0.005	
Zn (D)		<0.005	<0.005	<0.005	5.0

*Units shown are in mg/L except pH (relative units) and conductivity (micromhos/cm).

T Total
D Dissolved
< less than