BROWN, ERDMAN & TURNER LTD.
1409 BEWICKE AVENUE, NORTH VANCOUVER, BRITISH COLUMBIA V7M 3C7
TELEPHONE 986-1557

HYDROGEOLOGIC EVALUATION

FOR PHASE 2 OF

SUBDIVISION ADJOINING

238A STREET & 62ND AVENUE

LANGLEY, BRITISH COLUMBIA

FOR

J.G. NEUFELD

C/O GOODBRAND INTERNATIONAL INC.

Subdivision Application No. 87-111

Legal Description

Lot B of 2 and 3, Plan 13274 and Parcel A (Reference Plan 8562) of Lots 2, 3 and 4, Except Plan 17067, Plan 23779 and part of Lot 31, Plan 54464, all of North East 1/4 of Section 9, Township 11, N.W.D.

W.L. Brown, P.Eng

July, 1988

1.0 INTRODUCTION

1.1 This Hydrogeologic Evaluation of Phase 2 of the subject subdivision is based upon Analyses of:

1.1.1 Two-hour constant rate pumping tests followed by two hours of recovery readings that were run on each of the domestic wells located on the 3 lots of Phase 2 of the subject Subdivision.

1.1.2 Existing maps and reports of the general area.

1.1.3 Available records of wells on adjacent properties.

1.1.4 Chemical and bacteriological analyses of water samples collected near the end of the pumping period on each well. Analysis of water samples were conducted by ASL, Consulting Chemists and Analysts, of Vancouver, B.C.

1.2 As such this report is written to fulfill the requirements of Section 2.2.18 "Private Wells" of the Corporation of the Township of Langley subdivision guidelines dated 87.06.09. Corporation forms F-5, 6, 7 and 8 have been completed for each domestic well.

1.3 The wells were designed and constructed by Walsh Well Drilling of Aldergrove, B.C.

2.0 HYDROGEOLOGY

2.1 Location - The subdivision is located in the central part of the Township on a terrace that lies above the north bank of the Salmon River Valley. Terrace elevations range between 50 and 60 metres above sea level which is approximately 20 m above the Salmon River Valley floor. Please see attached map Figure 1.

2.2 Geology - The attached Surficial Geology Map, Figure 1a shows that the site is underlain by glacial and deltaic sediments of the Fort Langley Formation. These sediments are composed of deltaic sands and gravels deposited by rivers flowing off the front of a glacier.

The details of this sedimentary deposit are shown on geologic section, Figure 3. This section is based upon the driller's logs of the three Phase 2 domestic wells and the Phase 1 wells that are shown. The lower part of the deposits to a depth of approximately 45 metres is underlain by glacial tills with gravel, sand and clay interbeds. The sand and gravel beds that have been screened in the Phase 2 wells have static water levels that lie at an approximate elevation of 35 meters above sea level for Lot 1 and 47 metres above sea level for Lots 2 and 3. The aquifer screened in the Lot 1 Phase 2 well lies in a buried river channel that is most probably connected (off-section) to the aquifer screened in the Lot 6 Phase 1 well. This aquifer extends westwards through those Phase 1 wells shown on the section figure 3. Please note the similar elevations of the static water levels in Lot 6 Phase 1 and Lot 1 Phase 2 wells. The eastern extension of this zone is unknown because of lack of data. The sand aquifer screened in the Lots 2 and 3 Phase 2 is known from drilling on the adjacent property to extend southwards.

2.3 Hydrology - The pump test data indicate that the aquifers screened in the wells are artesian, areally extensive and moderately productive. Well spacing approximates 65 metres. Calculations based upon transmissivity values obtained from the pumping tests, an assumed storativity factor for this artesian system, the recommended pumping rate of 10 Lpm (2.5 U.S. gpm) for each well and an assumed drought of 100 days show that well interference should range from 0.09 to 0.61 metres.

Reference to form F-7 of each well will show that a 4 meter drop below the static water level measured when the pump tests were run has been assumed in rating the productive capacity (pumping rate) of each well. The pumping rate of each well on this basis will still allow for the 0.09 to 0.61 metres of interference between wells under the stringent 100-day drought conditions used in these calculations.

Precipitation records from the Abbotsford weather station (local Langley stations have been closed) show the following pattern:

Month 1988	Precipitation mm	% of 1951-80 Normal
January	110.8	53
February	107.5	67
March	154.7	110
April	161.8	158
May	165.6	211
June	49.7	77

The relatively deep depth of the screened aquifer of 18 to 26 metres and the impervious cap of clay indicate that there will be a considerable time lag between the fluctuation of the water level in the aquifer and the fluctuation of the weather. The pump tests were conducted in June. The effect of the "dry" winter of 1987-88 would most probably have caused low water levels in the wells when the pump tests were run.

Available information on neighbouring wells to the north, west and south-east of the subdivision indicates that the existing neighbouring wells are either shallow (less than 10 m) or deep (over 50 m). As such these wells are most probably using aquifers that are not directly connected to the aquifer used by the Phase 2 subdivision wells.

Also, the closest neighbouring wells are over 70 m away from the subdivision wells so that even if the aquifers in the wells were interconnected, interference would be negligible.

2.4 Water Quality - The laboratory results of the chemical and bacteriological analyses conducted on water samples collected near the end of each pump test are attached. It will be noted that the water meets the acceptable concentrations for the parameters tested as outlined in the Drinking Water Guidelines by B.C. Ministry of Health, 1982.

3.0 RECOMMENDATIONS AND CONCLUSIONS

3.1 Based upon available data, the wells located on the 3 Phase 2 lots of the subject subdivision have a safe productive capacity above the minimum Township of Langley requirement of 2,500 litres per day or 1.74 Lpm (0.5 U.S. gpm).

3.2 The recommended pumping rate for each well is 10 Lpm.

3.3 To protect the wells from being over-pumped small submersible pumps with no more than 1/3 H.P. motors should be set in these wells with appropriate controls to ensure that the pumping rates never exceed the recommended levels.

3.4 These wells must not be:

3.4.1 Overpumped - see above.

3.4.2 Vibrated - machinery must not strike the well head.

3.4.3 Rawhided - the pump must not be rapidly turned off and on.

3.4.4 Junked - when the well cap is off care must be taken to prevent debris from dropping into or flowing into the well.

3.4.5 Back flushed - water from the storage tank or house system must be prevented from flowing back into the well by an appropriate check valve.

3.5 The wells are located in the corners of the lots so that ample room exists to locate all septic tank drain fields at least 30 m away from all wells. The bentonite slurry seals placed around all wells will prevent surface or near surface waters from flowing downwards along the outside of the casing and through the screen into the well. The impervious clay cap overlying the screened intervals will also protect the aquifer from contamination.

3.6 Based upon available data and information it is the opinion of the writer that:

3.6.1 The pumping of the subdivision wells at their recommended pumping rates will have no significant adverse effect on the productivity of each other or on the productivity of neighbouring wells.

3.6.2 Septic tank effluent from the proposed single family homes discharged into properly located, designed and constructed drain fields acceptable to the local health inspector will have no adverse effect on the quality of the water pumped from the subdivision and neighbouring wells or on the quality of the water in the Salmon River.

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: Lot 1 (Phase 2)

PROJECT NO.: 87-111

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.

Certified By (Name of Professional Engineer)

1409 Bewicke Ave.
Address

North Vancouver, B.C., V7M 3C7

PROFESSIONAL SEAL

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

Subdivision Application No. 87-111
Lot B of Lots 2 and 3, Plan 13274 and Parcel A (Reference Plan 8562) of Lots 2, 3 and 4, Except Plan 17067, Plan 23779 and part of Lot 31, Plan 54464, all of North East 1/4 of Section 9, Township 11, N.W.D.

1

WTN 108033

GOODBRAND DEVELOPMENT CORPORATION
62ND AVE., LANGLEY, BRITISH COLUMBIA

Well on Lot 1 (S.W. Corner) (Phase 2)

Depth (Below Ground Surface) Metres	Feet	Description
0.00 - 0.61	0 - 2	Sandy loam
0.61 - 3.05	2 - 10	Gravel, silty
3.05 - 8.23	10 - 27	Sand and gravel, silty
8.23 - 9.45	27 - 31	Gravel, silty
9.45 - 15.54	31 - 51	Sand, silty
15.54 - 18.90	51 - 62	Clay, stoney, sandy
18.90 - 20.42	62 - 67	Clay, sticky, fat
20.42 - 27.13	67 - 89	Sand & gravel, water bearing
27.13 - 27.28	89 - 89.5	Gravel, cemented

Construction details - below ground surface

	Metres	Feet
152 mm (6-inch) diameter casing	+ 0.46 - 25.91	+ 1.5 - 85
152 mm (6-inch) telescopic diameter screen	25.76 - 27.28	84.5 - 89.5

Screen - stainless steel, 15 slot with K-packer
Thick Bentonite Slurrey seal around top 3m (10 feet) of casing

The Corporation of the Township of Langley

SCHEDULE "A"

WELL PUMP TEST - FIELD TEST

OWNER'S NAME: Goodbrand Development Corp.

WELL NO. 1 (Phase 2)

APPLICATION NO. 87-111

DATE: 1988 07 07

LOCATION: 238A Street & 62 Ave.

SHEET 1 of 6

Township of Langley

TEST NO. 1

[x] Drawdown [ ] Recovery

Rdg #	Time From Start	Depth To Water	Draw Down	Flow Measurement Data			Comments
	(Min)	(M)	(M)	(Min)	L	LPM	
1	0	16.95	0				Static Water Level below MPT
2	.5	18.00	1.05				Measuring point - top of
3	1.0	.49	.54				casing 0.46 m above ground
4	1.5	.72	.77				
5	2.0	.89	.94				Discharge 20 m away from well
6	2.5	.96	2.01				
7	3.0	19.08	.13				
8	3.5	.15	.20				
9	4.0	.21	.26				
10	4.5	–	–				
11	5.0	.29	.34				
12	6.0	.37	.42				
13	7.0	.39	.44				
14	8.0	.42	.47				
15	9.0	.50	.55				
16	10	.57	.62				
17	12	.67	.72				
18	14	.74	.79				
19	16	.78	.83				
20	18	.83	.88				
21	20	.88	.93				
22	25	20.03	3.08	0.5	20	40	
23	30	.09	.14				Clear and Clean
24	35	.31	.36				
25	40	.31	.36				
26	45	.38	.43				

The Corporation of the Township of Langley

SCHEDULE "A"

WELL PUMP TEST - FIELD TEST

OWNER'S NAME: Goodbrand Development Corp.

WELL NO. 1 (phase 2)

APPLICATION NO. 87-111

DATE: 1988 07 07

LOCATION: 238A Street & 62 Ave.

SHEET 2 of 6

Township of Langley

TEST NO. 1

[x] Drawdown [ ] Recovery

Rdg #	Time From Start	Depth To Water	Draw Down	Flow Measurement Data			Comments
	(Min)	(M)	(M)	(Min)	L	LPM	
27	50	20.47	3.52	0.5	20	40	
28	60	.60	.64				
29	70	.62	.67				
30	80	.72	.77				Slight H_2S Odour
31	90	.79	.84				9 degrees centigrade
32	100	.80	.85				
33	110	.91	.96				Water sample collected
34	120	.90	.95				Pump off

The Corporation of the Township of Langley

SCHEDULE "A"

WELL PUMP TEST - FIELD TEST

OWNER'S NAME: Goodbrand Development Corp.

WELL NO. 1 (Phase 2)

APPLICATION NO. 87-111

DATE: 1988 07 07

LOCATION: 238A Street & 62 Ave.

SHEET 3 of 6

Township of Langley

TEST NO. 1

[ ] Drawdown [x] Recovery

Rdg #	Time From Start	Depth To Water	Draw Down	Flow Measurement Data			Comments
	(Min)	(M)	(M)	(Min)	L	LPM	
1	0	20.90	3.95				Pump off
2	.5	19.84	2.89				
3	1.0	.48	.53				
4	1.5	.14	.19				
5	2.0	.03	.08				
6	2.5	18.93	1.98				
7	3.0	.85	.92				
8	3.5	.80	.85				
9	4.0	.75	.80				
10	4.5	.71	.76				
11	5.0	.68	.73				
12	6.0	.61	.66				
13	7.0	.56	.61				
14	8.0	.50	.56				
15	9.0	.46	.51				
16	10	.38	.43				
17	12	.32	.37				
18	14	.26	.31				
19	16	.12	.17				
20	18	.12	.17				
21	20	.08	.13				
22	25	17.79	0.84				
23	30	.71	.76				
24	35	-	-				
25	40	-	-				
26	45	-	-				

The Corporation of the Township of Langley

SCHEDULE "A"

WELL PUMP TEST - FIELD TEST

OWNER'S NAME: Goodbrand Development Corp.

WELL NO. 1 (phase 2)

APPLICATION NO. 87-111

DATE: 1988 07 07

LOCATION: 238A Street & 62 Ave.

SHEET 4 of 6

Township of Langley

TEST NO. 1

[ ] Drawdown [X] Recovery

Rdg #	Time From Start	Depth To Water	Draw Down	Flow Measurement Data			Comments
	(Min)	(M)	(M)	(Min)	L	LPM	
27	50	17.65	0.70				
28	60	.62	.67				
29	70	.58	.63				
30	80	.56	.61				
31	90	.64	.70				
32	100	.65	.71				
33	110	.61	.66				
34	120	.61	.66				

The Corporation of the Township of Langley

SCHEDULE "A"

TIME - DRAWDOWN GRAPH FOR PUMP TEST

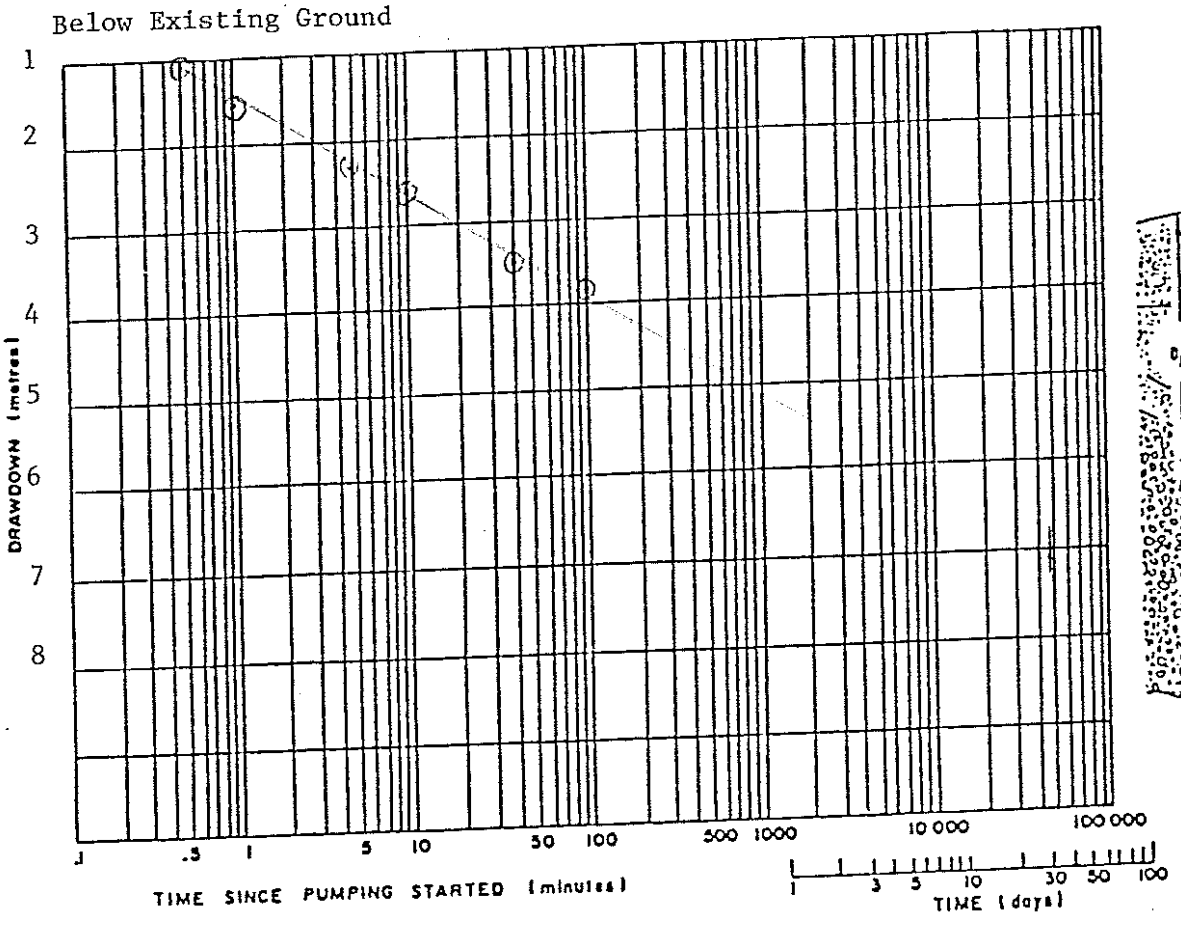
OWNER'S NAME: Goodbrand Development Corp. WELL NO. 1 (Phase 2)

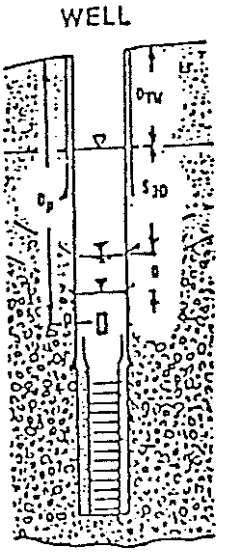
APPLICATION NO.: 87-111 DATE: June 7, 1988

LOCATION: 238A & 62nd Ave. SHEET 5 OF 6

DEPTH TO STATIC WATER LEVEL: 16.49 (m) TEST NO. 1

Below Existing Ground





Pumping rate 10 Lpm Drawdown at 30 days (S_{30}) 7.1 x 10/40 (m) 1.8

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) 25 m

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

25 - (16.5 + 1.8 + 4) = 2.7

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.

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The Corporation of the Township of Langley

SCHEDULE "A"

PUMP TEST SUMMARY

OWNER'S NAME: Goodbrand Development Corp. WELL NO. 1 (Phase 2)

APPLICATION NO.: 87-111 DATE: June 7, 1988

LOCATION: 238A & 62nd Ave. SHEET 6 OF 6

Township of Langley TEST NO. 1

WELL COMPLETION DATA

Depth 27.28 (m)

Diameter 152 (mm)

Static Water Level 16.49 (m)

SCREEN DESIGN (mark one)

☐ Open Hole ☐ Slotted Casing

☒ Screen ☐ Gravel Pack

☐ Other

Screen interval 25.76 m to 27.28 m

DESCRIPTION OF AQUIFER

Sand & Gravel

PUMP TEST

Start: Date 07-06-1988 (d/mo/yr) Time 0800 (hr/min)

Pump Type: ☒ Electric submersible ☐ Jet ☐ Air Lift

Other? Describe

Test Pump Set at 25 m below ground

Water level sounded by: ☐ Electric tape ☐ Air bubbler ☐ Steel tape

☐ Other? Describe

Flow measured by: ☒ Container & watch ☐ Flow meter

☐ Orifice & tube ☐ Other? Describe

TEST

Constant rate of yield 40 Lpm Test duration 2 hours

Initial non-pumping level 16.49 m

Drawdown in well at end of test 3.95 m

Recommended pumping rate 10 Lpm

WATER SAMPLES TAKEN DURING TEST

Chemical Analysis ☒ Yes ☐ No

Bacterial Analysis ☒ Yes ☐ No

Water Temperature 9 °C

Any particular gas smells noted Slight H_2S odor

Comments on clarity of water Clear and Clean

Other

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: Lot 2 (Phase 2)

PROJECT NO.: 87-111

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.

Certified By (Name of Professional Engineer)

1409 Bewicke Ave.
Address

North Vancouver, B.C. V7M 3C7

PROFESSIONAL SEAL

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

Subdivision Application No. 87-111
Lot B of Lots 2 and 3, Plan 13274 and Parcel A (Reference Plan 8562) of Lots 2, 3 and 4, Except Plan 17067, Plan 23779 and part of Lot 31, Plan 54464, all of North East 1/4 of Section 9, Township 11, N.W.D.

WTN 108039

GOODBRAND DEVELOPMENT CORPORATION
62ND AVE., LANGLEY, BRITISH COLUMBIA

Well on Lot 2 (S.W. Corner) (Phase 2)

Depth (Below Ground Surface) Metres	Feet	Description
0.00 - 0.30	0 - 1	Sandy loam
0.30 - 11.58	1 - 38	Sand and gravel, silty
11.58 - 12.50	38 - 41	Sand, fine grained, silty brown
12.50 - 14.02	41 - 46	Sand, fine grained, silty grey
14.02 - 19.51	46 - 64	Sand, brown, Water bearing
19.51	64	Interbedded sand and clay

Construction details - below ground surface

	Metres	Feet
152 mm (6-inch) diameter casing	+ 0.46 - 18.14	+ 1.5 - 59.5
152 mm (6-inch) telescopic diameter screen	17.83 - 19.20	58.5 - 63.0

Screen - stainless steel, 18 slot with K-packer
Thick Bentonite Slurrey seal around top 3m (10 feet) of casing

The Corporation of the Township of Langley

SCHEDULE "A"

WELL PUMP TEST - FIELD TEST

OWNER'S NAME: Goodbrand Development Corp.

WELL NO. 2 (Phase 2)

APPLICATION NO. 87-111

DATE: 1988 06 29

LOCATION: 238A Street & 62 Ave.

SHEET 1 of 6

Township of Langley

TEST NO. 1

[x] Drawdown [ ] Recovery

Rdg #	Time From Start	Depth To Water	Draw Down	Flow Measurement Data			Comments
	(Min)	(M)	(M)	(Min)	L	LPM	
1	0	5.21	0				Static Water Level below MPT
2	.5	6.30	1.09				Measuring point - top of
3	1.0	7.02	.81				casing o.46 m above ground
4	1.5	.48	2.27				
5	2.0	.79	.58				Discharge 27 m away from well
6	2.5	8.10	.89				
7	3.0	.16	.95				Pump Suction 17.37 m
8	3.5	.40	3.19				
9	4.0	.30	.09				Static water level Watson #7
10	4.5	.30	.09				5.43 m
11	5.0	.27	.06				
12	6.0	.37	.16				
13	7.0	.35	.14				
14	8.0	.35	.14	0.5	20	40	
15	9.0	.34	.13				
16	10	.42	.21				
17	12	.50	.29				
18	14	.53	.32				
19	16	.55	.34				
20	18	.52	.31				
21	20	.43	.22				Water level Watson #7 5.46 m
22	25	.50	.29				
23	30	.54	.33				
24	35	.57	.36				
25	40	.57	.36				9 degrees centergrade
26	45	.53	.32				Water level Watson #7 5.49 m

The Corporation of the Township of Langley

SCHEDULE "A"

WELL PUMP TEST - FIELD TEST

OWNER'S NAME: Goodbrand Development Corp. WELL NO. 2 (phase 2)

APPLICATION NO. 87-111 DATE: 1988 06 29

LOCATION: 238A Street & 62 Ave. SHEET 2 of 6

Township of Langley TEST NO. 1

[x] Drawdown [ ] Recovery

Rdg #	Time From Start	Depth To Water	Draw Down	Flow Measurement Data			Comments
	(Min)	(M)	(M)	(Min)	L	LPM	
27	50	8.53	3.32				
28	60	.61	.40				
29	70	.57	.36				
30	80	.64	.43				
31	90	.56	.35				
32	100	.58	.37				Water level Watson #7 5.50 m
33	110	.57	.36				Water sample collected
34	120	.52	.31				Pump off

The Corporation of the Township of Langley

SCHEDULE "A"

WELL PUMP TEST - FIELD TEST

OWNER'S NAME: Goodbrand Development Corp. WELL NO. 2 (Phase 2)

APPLICATION NO. 87-111 DATE: 1988 06 29

LOCATION: 238A Street & 62 Ave. SHEET 3 of 6

Township of Langley TEST NO. 1

[ ] Drawdown [x] Recovery

Rdg #	Time From Start	Depth To Water	Draw Down	Flow Measurement Data			Comments
	(Min)	(M)	(M)	(Min)	L	LPM	
1	0	8.52	3.31				Pump off
2	.5	7.40	2.19				
3	1.0	6.73	1.52				
4	1.5	.25	1.04				
5	2.0	5.88	.67				
6	2.5	.68	.47				
7	3.0	.55	.34				
8	3.5	.45	.24				
9	4.0	.39	.18				
10	4.5	.37	.16				
11	5.0	.33	.12				
12	6.0	.30	.09				
13	7.0	.28	.07				
14	8.0	.26	.05				
15	9.0	.25	.04				
16	10	.24	.03				
17	12	.26	.05				
18	14	.25	.04				
19	16	.24	.03				
20	18	.21	.00				
21	20	.23	.02				Water level Watson #7 5.44 m
22	25	.21	.00				
23	30	.23	.02				
24	35	.22	.01				
25	40	.22	.01				
26	45	.22	.01				

OWNER'S NAME: Goodbrand Development Corp. WELL NO. 2 (phase 2)

APPLICATION NO. 87-111 DATE: 1988 07 07

LOCATION: 238A Street & 62 Ave. SHEET 4 of 6

Township of Langley TEST NO. 1

[x] Drawdown [ ] Recovery

Rdg #	Time From Start	Depth To Water	Draw Down	Flow Measurement Data			Comments
	(Min)	(M)	(M)	(Min)	L	LPM	
27	50	.21	.00				
28	60	.21	.00				Water Level Watson #7 5.41 m
29	70	.21	.00				
30	80	.21	.00				
31	90	.20	-.01				
32	100	.21	.00				
33	110	.20	-.01				
34	120	.21	.00				

The Corporation of the Township of Langley

SCHEDULE "A"

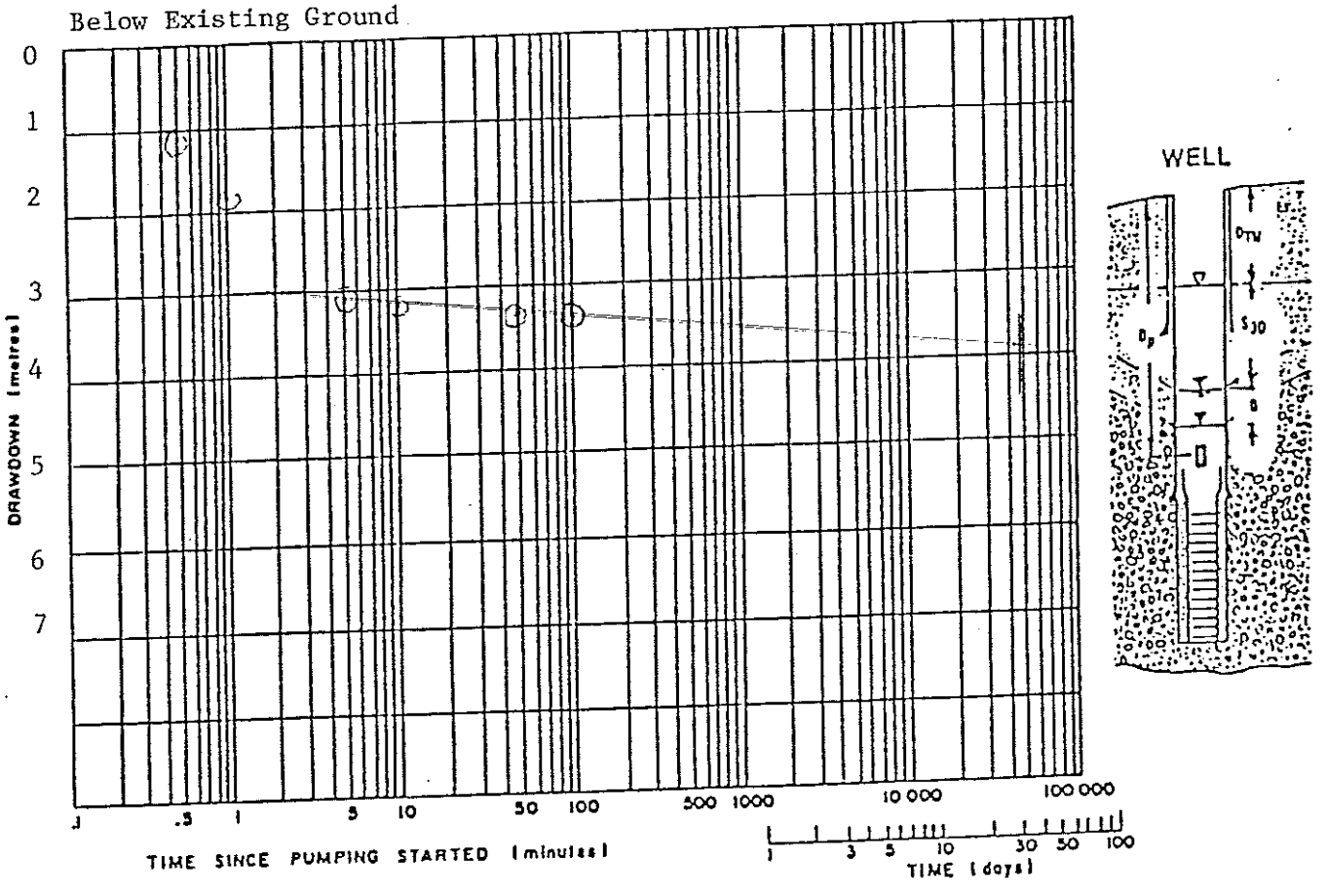
TIME - DRAWDOWN GRAPH FOR PUMP TEST

OWNER'S NAME: Goodbrand Development Corp. WELL NO. 2 (Phase 2)

APPLICATION NO.: 87-111 DATE: June 29, 1988

LOCATION: 238A & 62nd Ave. SHEET 5 OF 6

DEPTH TO STATIC WATER LEVEL: 4.75 (m) TEST NO. 1



Pumping rate 10 Lpm Drawdown at 30 days (S_{30}) $\frac{3.9 \times 10/40}{(m)} = 1.0$

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) 17 m

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

17 - (4.75 + 1.0 + 4) = 7.25

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.

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The Corporation of the Township of Langley

SCHEDULE "A"

PUMP TEST SUMMARY

OWNER'S NAME: Goodbrand Development Corp. WELL NO. 2 (Phase 2)

APPLICATION NO.: 87-111 DATE: June 29, 1988

LOCATION: 238A & 62nd Ave. SHEET 6 OF 6

Township of Langley TEST NO. 1

WELL COMPLETION DATA

Depth 19.51 (m)

Diameter 152 (mm)

Static Water Level 4.75(m)

SCREEN DESIGN (mark one)

☐ Open Hole ☐ Slotted Casing

☒ Screen ☐ Gravel Pack

☐ Other

Screen interval 17.83 to 19.20m

DESCRIPTION OF AQUIFER

Sand & Gravel

PUMP TEST

Start: Date 29 06 1988 (d/mo/yr) Time 0915 (hr/min)

Pump Type: ☒ Electric submersible ☐ Jet ☐ Air Lift

Other? Describe

Test Pump Set at 17.37 m below ground

Water level sounded by: ☒ Electric tape ☐ Air bubbler ☐ Steel tape

☐ Other? Describe

Flow measured by: ☒ Container & watch ☐ Flow meter

☐ Orifice & tube ☐ Other? Describe

TEST

Constant rate of yield 40 Lpm Test duration 2 hours

Initial non-pumping level 4.75 m

Drawdown in well at end of test 3.31 m

Recommended pumping rate 10 Lpm

WATER SAMPLES TAKEN DURING TEST

Chemical Analysis ☒ Yes ☐ No

Bacterial Analysis ☒ Yes ☐ No

Water Temperature 9 °C

Any particular gas smells noted None

Comments on clarity of water Clear and Clean

Other

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: Lot 3 (Phase 2)

PROJECT NO.: 87-111

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.

Certified By (Name of Professional Engineer)

1409 Bewicke Ave.
Address

North Vancouver, B.C.

PROFESSIONAL SEAL

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

Subdivision Application No. 87-111
Lot B of Lots 2 and 3, Plan 13274 and Parcel A (Reference Plan 8562) of Lots 2, 3 and 4, Except Plan 17067, Plan 23779 and part of Lot 31, Plan 54464, all of North East 1/4 of Section 9, Township 11, N.W.D.

/

WTN 108035

GOODBRAND DEVELOPMENT CORPORATION
62ND AVE., LANGLEY, BRITISH COLUMBIA

Well on Lot 3 (S.W. Curve) (Phase 2)

Depth (Below Ground Surface) Metres	Feet	Description
0.00 - 0.30	0 - 1	Sandy loam
0.30 - 9.75	1 - 32	Sand, silty, drilled open hole
9.75 - 10.97	32 - 36	Clay, sandy, stoney
10.97 - 12.80	36 - 42	Sand, silty, with clay beds
12.80 - 15.54	42 - 51	Sand, silty
15.54 - 19.20	51 - 63	Sand, Water bearing
19.20	63	Interbedded sand and clay

Construction details - below ground surface

	Metres	Feet
152 mm (6-inch) diameter casing	+ 0.46 - 17.83	+ 1.5 - 58.5
152 mm (6-inch) telescopic diameter screen	17.53 - 18.90	57.5 - 62.0

Screen - stainless steel, 20 slot with K-packer
Thick Bentonite Slurrey seal around top 3m (10 feet) of casing

The Corporation of the Township of Langley

SCHEDULE "A"

WELL PUMP TEST - FIELD TEST

OWNER'S NAME: Goodbrand Development Corp.

APPLICATION NO. 87-111

LOCATION: 238A Street & 62 Ave.

Township of Langley

WELL NO. 3 (Phase 2)

DATE: 1988 06 29

SHEET 1 of 6

TEST NO. 1

[x] Drawdown [ ] Recovery

Rdg #	Time From Start	Depth To Water	Draw Down	Flow Measurement Data			Comments
	(Min)	(M)	(M)	(Min)	L	LPM	
1	0	5.35	0				Static Water Level below MPT
2	.5	7.37	1.38				Measuring point - top of
3	1.0	-	-				casing 0.46 m above ground
4	1.5	9.27	3.92				
5	2.0	.53	4.18				Discharge 20 m away from well
6	2.5	.65	.30				
7	3.0	.72	.37				Pump Suction at 17 m
8	3.5	.79	.44				
9	4.0	.87	.52				
10	4.5	.82	.47				
11	5.0	.71	.36				
12	6.0	.75	.40				
13	7.0	.78	.43				
14	8.0	.88	.53				
15	9.0	.98	.63				
16	10	10.03	.68				
17	12	10.00	.65				
18	14	9.96	.61				
19	16	.97	.62				
20	18	10.02	.67				
21	20	10.10	.75				
22	25	.07	.72	.17	20	117	
23	30	.16	.81				
24	35	.14	.79				
25	40	.21	.86				
26	45	.25	.90				

The Corporation of the Township of Langley

SCHEDULE "A"

WELL PUMP TEST - FIELD TEST

OWNER'S NAME: Goodbrand Development Corp. WELL NO. 3 (phase 2)

APPLICATION NO. 87-111 DATE: 1988 07 07

LOCATION: 238A Street & 62 Ave. SHEET 2 of 6

Township of Langley TEST NO. 1

[x] Drawdown [ ] Recovery

Rdg #	Time From Start	Depth To Water	Draw Down	Flow Measurement Data			Comments
	(Min)	(M)	(M)	(Min)	L	LPM	
27	50	10.07	4.72				
28	60	.17	.82				
29	70	.18	.85				
30	80	.18	.83				
31	90	.79	.84				
32	100	.21	.86				9 degrees centigrade
33	110	.25	.90				Water sample collected
34	120	.30	.95				Pump off

The Corporation of the Township of Langley

SCHEDULE "A"

WELL PUMP TEST - FIELD TEST

OWNER'S NAME: Goodbrand Development Corp. WELL NO. 3 (Phase 2)

APPLICATION NO. 87-111 DATE: 1988 06 29

LOCATION: 238A Street & 62 Ave. SHEET 3 of 6

Township of Langley TEST NO. 1

[ ] Drawdown [x] Recovery

Rdg #	Time From Start	Depth To Water	Draw Down	Flow Measurement Data			Comments
	(Min)	(M)	(M)	(Min)	L	LPM	
1	0	10.30	9.90				Pump off
2	.5	8.69	3.34				
3	1.0	7.17	1.82				
4	1.5	6.40	.05				
5	2.0	.28	0.93				
6	2.5	.11	.76				
7	3.0	5.92	.57				
8	3.5	.92	.57				
9	4.0	.83	.48				
10	4.5	.84	.49				
11	5.0	.80	.45				
12	6.0	.65	.30				
13	7.0	.61	.26				
14	8.0	.78	.43				
15	9.0	–	–				
16	10	–	–				
17	12	–	–				
18	14	–	–				
19	16	–	–				
20	18	5.56	0.31				
21	20	.59	.24				
22	25	.58	.23				
23	30	.49	.14				
24	35	.53	.18				
25	40	.50	.15				
26	45	.50	.15				

The Corporation of the Township of Langley

SCHEDULE "A"

WELL PUMP TEST - FIELD TEST

OWNER'S NAME: Goodbrand Development Corp.

WELL NO. 3 (phase 2)

APPLICATION NO. 87-111

DATE: 1988 06 29

LOCATION: 238A Street & 62 Ave.

SHEET 4 of 6

Township of Langley

TEST NO. 1

[ ] Drawdown [x] Recovery

Rdg #	Time From Start	Depth To Water	Draw Down	Flow Measurement Data			Comments
	(Min)	(M)	(M)	(Min)	L	LPM	
27	50	5.49	0.14				
28	60	.43	.08				
29	70	.46	.11				
30	80	.45	.10				
31	90	.43	.08				
32	100	.44	.09				
33	110	.40	.05				
34	120	.43	.08				

The Corporation of the Township of Langley

SCHEDULE "A"

TIME - DRAWDOWN GRAPH FOR PUMP TEST

OWNER'S NAME: Goodbrand Development Corp.

WELL NO. 3 (Phase 2)

APPLICATION NO.: 87-111

DATE: June 29, 1988

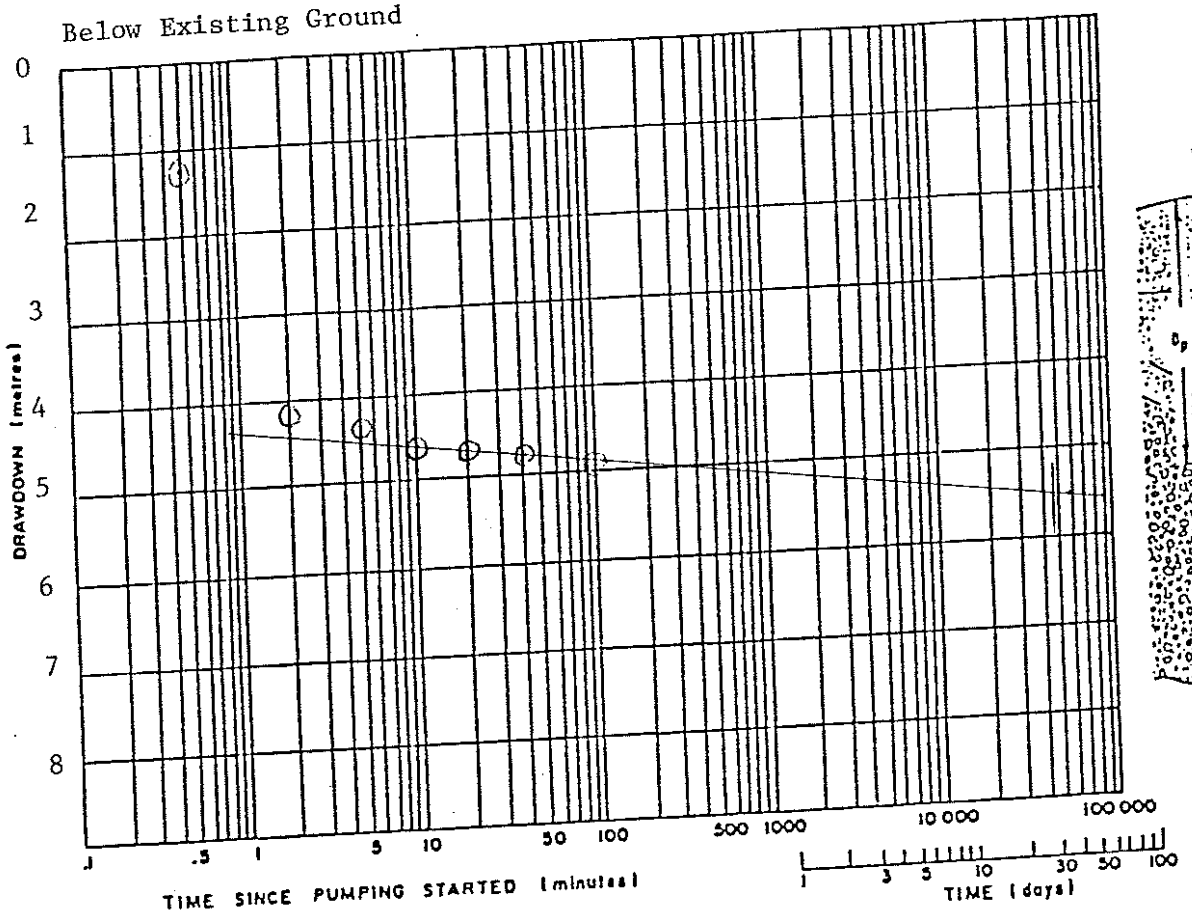
LOCATION: 238A & 62nd Ave.

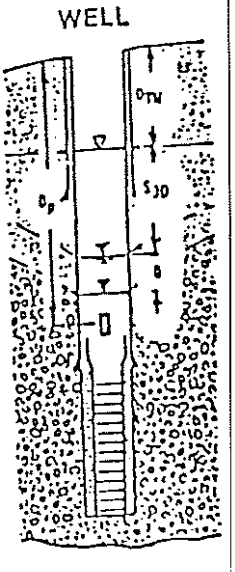
SHEET 5 OF 6

DEPTH TO STATIC WATER LEVEL: 4.89 (m)

TEST NO. 1

Below Existing Ground





Pumping rate 10 Lpm Drawdown at 30 days (S_{30}) $5.5 \times 10/117$ (m) $= 0.47$

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) 17 m

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

17 - (4.89 + 0.47 + 4) = 7.64

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.

F-7

The Corporation of the Township of Langley

SCHEDULE "A"

PUMP TEST SUMMARY

OWNER'S NAME: Goodbrand Development Corp. WELL NO. 3 (Phase 2)

APPLICATION NO.: 87-111 DATE: June 29, 1988

LOCATION: 238A & 62nd Ave. SHEET 6 OF 6

Township of Langley TEST NO. 1

WELL COMPLETION DATA

Depth 19.20 (m)

Diameter 152 (mm)

Static Water Level 4.89 (m)

SCREEN DESIGN (mark one)

☐ Open Hole ☐ Slotted Casing

☒ Screen ☐ Gravel Pack

☐ Other

Screen interval 17.53 m to 18.90 m

DESCRIPTION OF AQUIFER

Sand

PUMP TEST

Start: Date 29 06 1988 (d/mo/yr) Time 1330 (hr/min)

Pump Type: ☒ Electric submersible ☐ Jet ☐ Air Lift

Other? Describe

Test Pump Set at 17 m below ground

Water level sounded by: ☒ Electric tape ☐ Air bubbler ☐ Steel tape

☐ Other? Describe

Flow measured by: ☒ Container & watch ☐ Flow meter

☐ Orifice & lube ☐ Other? Describe

TEST

Constant rate of yield 117 Lpm Test duration 2 hours

Initial non-pumping level 4.89 m

Drawdown in well at end of test 4.95 m

Recommended pumping rate 10 Lpm

WATER SAMPLES TAKEN DURING TEST

Chemical Analysis ☒ Yes ☐ No

Bacterial Analysis ☒ Yes ☐ No

Water Temperature 9 °C

Any particular gas smells noted None

Comments on clarity of water Clear and Clean

Other

CHEMICAL ANALYSIS REPORT

ASL

Date: July 21, 1988

File No. 5910A

Report On: Goodbrand Property, Langley, B.C.

Report To: Brown Erdman & Turner Ltd.
1409 Bewicke Avenue
North Vancouver, B. C.
V7M 2W0

DATE OF SUBMISSION:

July 7, 1988

SAMPLE IDENTIFICATION

Labelled as shown in RESULTS section.

METHODOLOGY

Analysed in accordance with "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, 1985.

RESULTS OF ANALYSIS

Results are presented in the table(s) attached.

analytical service laboratories ltd.
CONSULTING CHEMISTS & ANALYSTS
1650 Pandora Street
Vancouver, B.C. • V5L 1L6
Fax (604) 253-6700 • Tel. (604) 253-4188

ASL

REMARKS

The water as represented by the sample submitted can be characterized as moderate with respect to dissolved mineralization.

The water sample met Canadian and British Columbia drinking water guidelines for all parameters analysed.

ASL ANALYTICAL SERVICE LABORATORIES LTD.

A. W. Maynard, M.Sc.
Senior Partner

Christine M. Smith
Technologist

AWM/CMS/mm

ASL

RESULTS OF ANALYSIS

		Well 1 Phase 2 Jul 7/88	Drinking*1 Water Guidelines
Physical Tests			
pH		6.44	6.5-8.5
Conductivity		176.	-
Colour		8.0	15.
Turbidity	NTU	<1.0	5.
Suspended Solids		8.0	-
Dissolved Solids		130.	-
Hardness	CaCO3	23.3	-*2
Anions and Nutrients			
Alkalinity	CaCO3	67.3	-
Sulphate	SO4	3.85	500.
Chloride	Cl	20.0	250.
Fluoride	F	0.08	1.5
Silicate	SiO2	12.3	-
NO3/NO2	N	<0.005	10.0
Total Metals			
Iron	T Fe	0.13	0.30
Manganese	T Mn	0.017	0.05
Dissolved Metals			
Arsenic	D As	0.0023	0.05
Barium	D Ba	0.015	1.0
Cadmium	D Cd	<0.0002	0.005
Chromium	D Cr	<0.02	0.05
Copper	D Cu	<0.005	1.0
Iron	D Fe	0.07	-
Lead	D Pb	<0.001	0.05
Manganese	D Mn	0.010	-
Zinc	D Zn	<0.005	5.0
Calcium	D Ca	5.73	-
Magnesium	D Mg	2.39	-
Sodium	D Na	22.0	-
Potassium	D K	2.4	-
Microbiological Tests			
Coliform	Total	<2	-
	Fecal	<2	- *3

< = Less than
Results expressed as milligrams per litre except for pH, Conductivity (µmhos/cm), Colour (CU), Turbidity (NTU) and Coliform Bacteria (colonies/100 ml)
*1 "Maximum acceptable concentration" as published by Health & Welfare Canada, 1985
*2 Maximum level not established - water supplies with a hardness exceeding 200 mg/L are considered poor but will be tolerated. Not a health consideration
#3 Maximum level not established - of concern to consumers with sodium restricted diet. Levels exceeding 20 mg/L may be of concern in this circumstance.

CHEMICAL ANALYSIS REPORT

ASL

Date: July 14, 1988

File No. 5872A - Report 2

Report On: Water Samples - Goodbrand Property, Langley, B.C.

Report To: Brown Erdman & Turner Ltd.
1409 Bewicke Avenue
North Vancouver, B. C.
V7M 2W0

DATE OF SUBMISSION:

June 30, 1988

SAMPLE IDENTIFICATION

Labelled as shown in RESULTS section.

METHODOLOGY

Analysed in accordance with "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, 1985.

RESULTS OF ANALYSIS

Results are presented in the table(s) attached.

REMARKS

Lots 2 and 3, Phase 2

The waters as represented by the sample submitted can be characterized as low with respect to dissolved mineralization.

Both waters met B.C. and Canadian drinking water guidelines for all parameters analysed.

ASL ANALYTICAL SERVICE LABORATORIES LTD.

A. W. Maynard, M.Sc.
Senior Partner

Christine M. Smith
Technologist

CMS/AWM/mm

analytical service laboratories ltd.
CONSULTING CHEMISTS & ANALYSTS
1650 Pandora Street
Vancouver, B.C. • V5L 1L6
Fax (604) 253-6700 • Tel. (604) 253-4188

ASL

RESULTS OF ANALYSIS

	Lot 2 Phase #2 Jun 30/88	Lot 3 Phase #2 Jun 30/88	Drinking* Water Guidelines
Physical Tests			
pH	6.17	6.02	6.5-8.5
Conductivity	43.2	64.8	-
Colour	11.	10.	15.
Turbidity NTU	2.0	2.2	5.
Suspended Solids	1.3	2.0	-
Dissolved Solids	40.	50.	-
Hardness CaCO3	9.65	19.7	-*2
Anions and Nutrients			
Alkalinity CaCO3	10.9	12.0	-
Sulphate SO4	<1.00	3.38	500.
Chloride Cl	4.90	7.57	250.
Fluoride F	0.05	0.03	1.5
Silicate SiO2	12.1	10.2	-
NO3/NO2 N	0.26	1.10	10.0
Total Metals			
Iron T Fe	0.10	0.21	0.30
Manganese T Mn	<0.005	0.007	0.05
Dissolved Metals			
Arsenic D As	<0.0001	<0.0001	0.05
Barium D Ba	0.11	0.044	1.0
Cadmium D Cd	<0.001	<0.001	0.005
Chromium D Cr	<0.02	<0.02	0.05
Copper D Cu	<0.005	<0.005	1.0
Iron D Fe	<0.03	<0.03	-
Lead D Pb	<0.001	<0.001	0.05
Manganese D Mn	<0.005	<0.005	-
Zinc D Zn	0.005	0.006	5.0
Calcium D Ca	2.81	5.10	-
Magnesium D Mg	0.64	1.70	-
Potassium D K	0.32	0.33	-
Sodium D Na	4.60	3.46	-*3
Microbiological Tests			
Coliform Total	<2.	<2.	-
Fecal	<2.	<2.	-

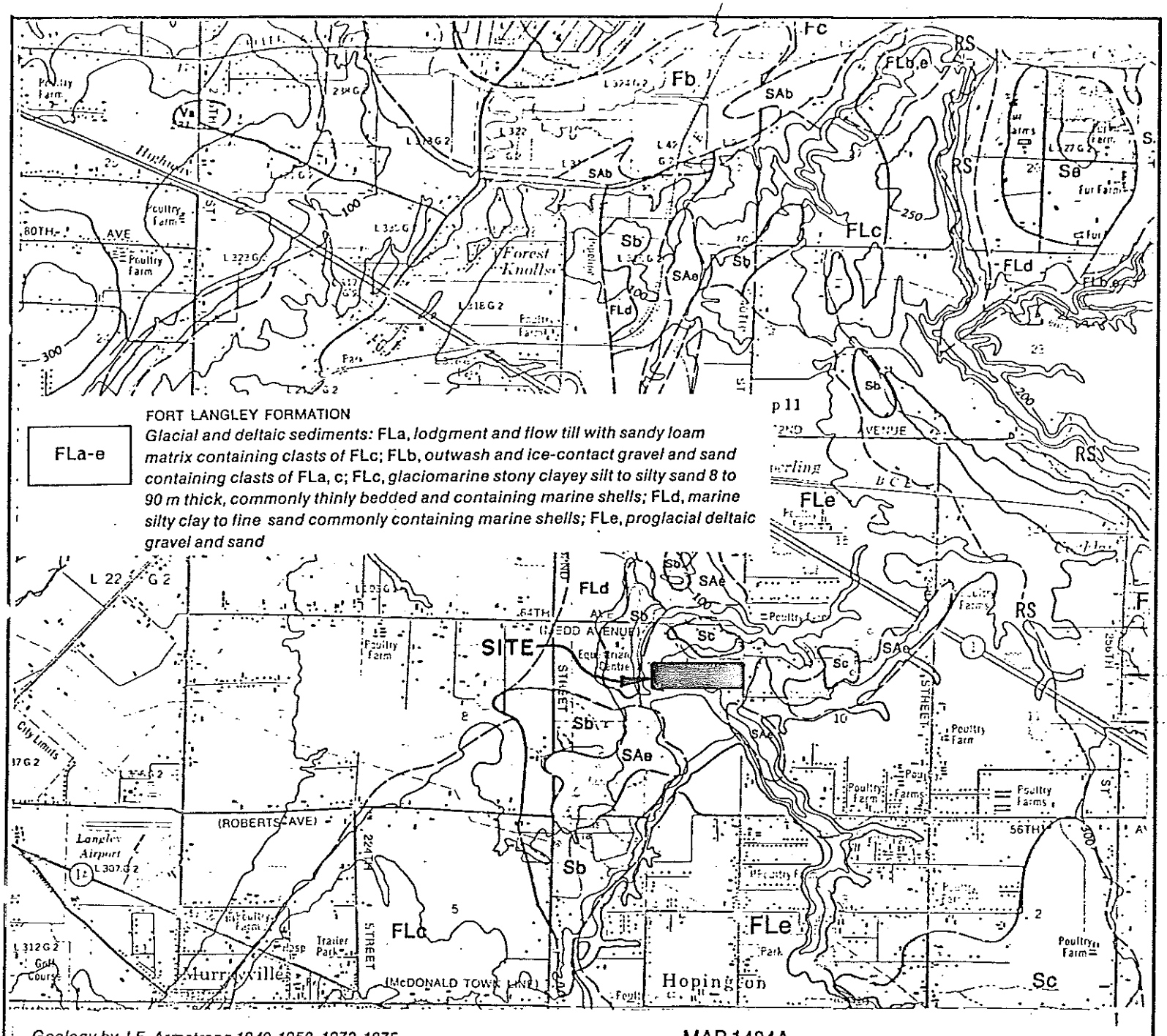
< = Less than
Results expressed as milligrams per litre except for pH, Conductivity (µmhos/cm), Colour (CU), Turbidity (NTU) and Coliform Bacteria (colonies/100 ml)
*1 "Maximum acceptable concentration" as published by Health & Welfare Canada, 1985
*2 Maximum level not established - water supplies with a hardness exceeding 200 mg/L are considered poor but will be tolerated. Not a health consideration
#3 Maximum level not established - of concern to consumers with sodium restricted diet. Levels exceeding 20 mg/L may be of concern in this circumstance.

NEW WESTMINSTER

CANADA-UNITED STATES OF AMERICA

FIG 1

JUNE 15 1988 W L BROWN



Geology by J.E. Armstrong 1949-1952, 1973-1975, W.L. Brown 1949-1950, S.R. Hicock 1974, 1976

Additional information from E.C. Halstead 1954-1975; Province of British Columbia Soils Survey 1956-1965

MAP 1484A

SURFICIAL GEOLOGY

NEW WESTMINSTER

WEST OF SIXTH MERIDIAN

BRITISH COLUMBIA

Scale 1:50,000

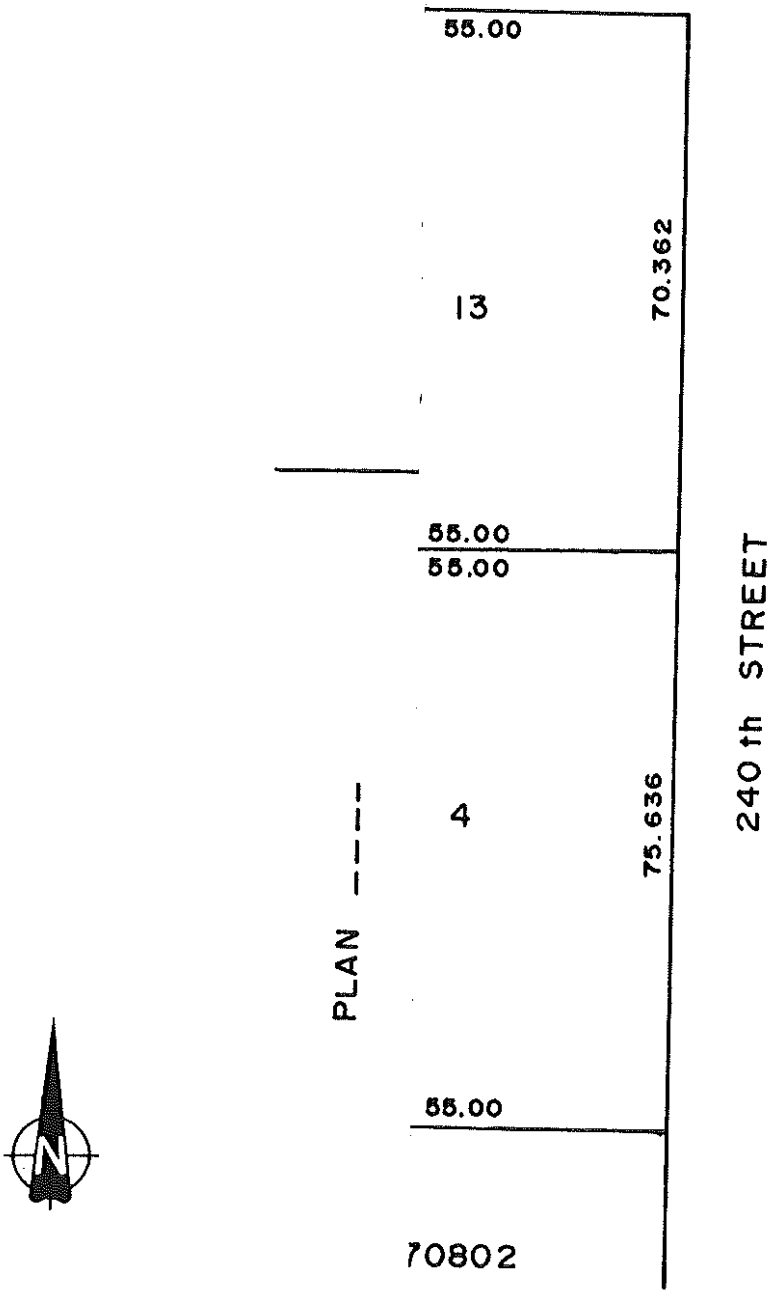
Kilometres 1 0 1 2 3 4 Kilometres

Miles 1 0 1 2 Miles

Universal Transverse Mercator Projection

FIG 1a

JUNE 15 1988 W L BROWN



WELL LOCATION MAP PHASE 2

J.G. NEUFELD

SCALE: 1:100 GOODBRAND INTERNATIONAL INC.

SUITE 210 - 20316 56th AVE

LANGLEY, B.C. V3A 3Y7

20 15 10 0 20

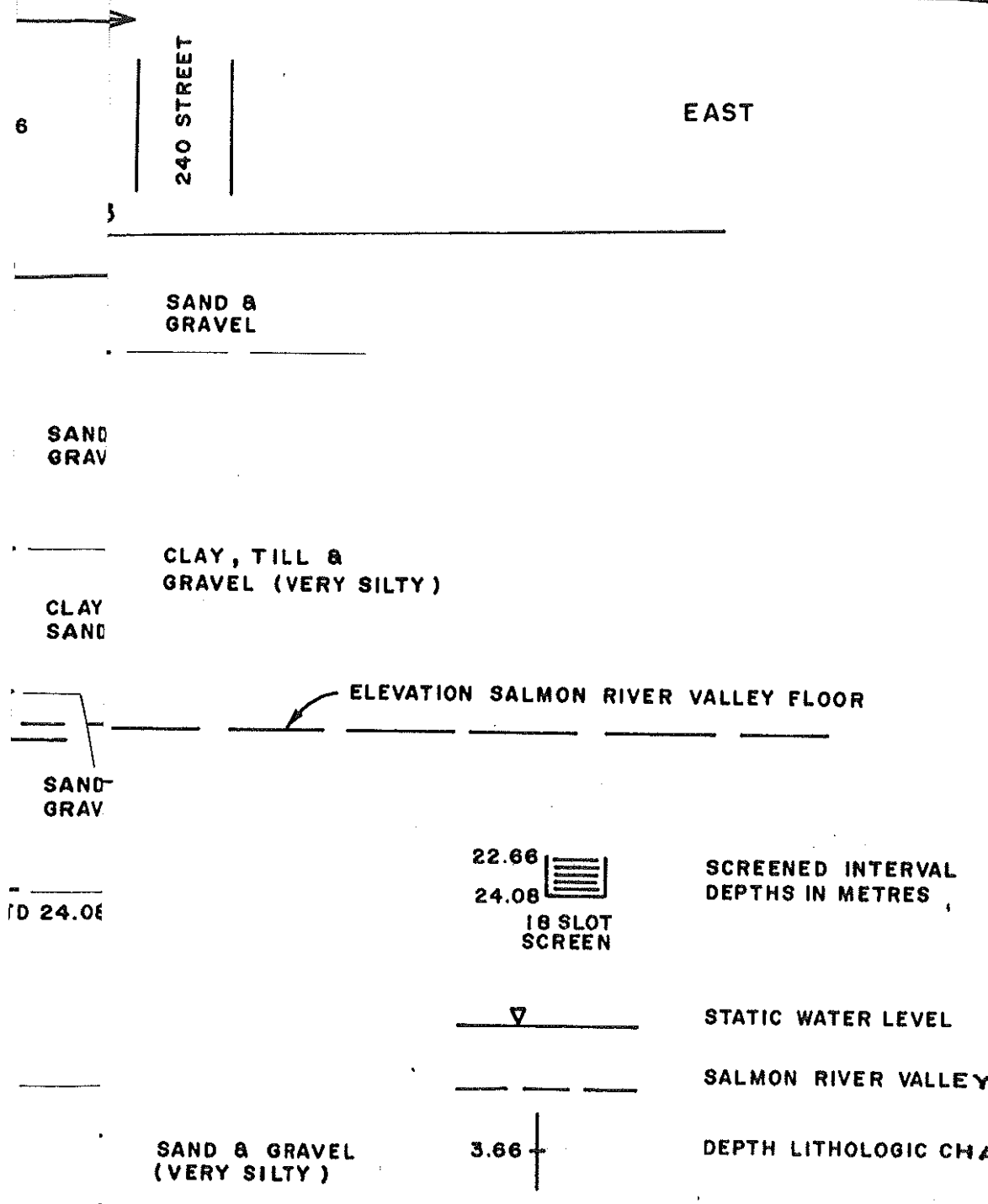
ALL DISTANCES ARE I

BROWN, ERDMAN & TURNER LTD

INTERNATIONAL GROUNDWATER CONSULTANTS

NORTH VANCOUVER, CANADA

	PROJECT	BY	FIGURE NO.
88	86-401	WLB	2



EAST - WEST SECTION THROUGH WELLS

J. G. NEUFELD
c/o GOODBRAND INTERNATIONAL INC.
SUITE 210 - 20316 56th AVE
LANGLEY, B.C. V3A 3Y7

BROWN, ERDMAN & TURNER LTD
INTERNATIONAL GROUNDWATER CONSULTANTS
NORTH VANCOUVER, CANADA

DATE	PROJECT	BY	FIGURE NO.
JUNE 15 1988	86-401	WLB	3