

PRODUCTION WELLS

NO. 2 and NO. 3

GENEVA HOLDINGS

DOUGLAS HAWKES LTD.

MEREDITH ROAD, MILL BAY, B. C.

by

R. B. ERDMAN

H. W. REED, P. ENG.

December 1978

78-090

## INTRODUCTION

Two additional production wells have been drilled on the subject property. One of the wells is completed in unconsolidated sediments and the other in bedrock. The report on the first well which is now in use is enclosed for your convenience.

### WELL NO. 1

This well is now in use. The well was drilled in June 1969 and was tested in February and March of 1973. At that time the well was rated at 7.5 Igpm.

### WELL NO. 2

This well was also drilled in 1969 to a depth of 143 feet at which depth the well was reported to still be in fine, brown, water-bearing sand. In 1978 the well was deepened to 164 feet at which depth bedrock was encountered. No aquifer was found below 143 feet. The well was back-filled to 143 feet and four feet of 6-inch telescopic well screen was set between 143 and 139 feet. The well was developed by the use of surge blocks.

The following sediments were penetrated in Well No. 2:

<u>Depth below ground</u>	<u>Lithology</u>
0 - 15 feet	Boulders and gravel.
15 - 138 feet	Sand and gravel cemented.
138 - 143 feet	Sand, fine, brown, water-bearing.
143 - 164 feet	Sand, fine, brown, clay.
164 feet	Bedrock.

WELL NO. 2 continued.

Well No. 2 was test pumped in November 1978 for a total of 1500 minutes (25 hours). The pumping level stabilized after 150 minutes of pumping at a depth of 132.51 feet below ground surface (135.11 below the measuring point). The flow rate was 5 Igpm during the last 1400 minutes of the test.

A projection of the data plotted on the recovery curve would indicate that recharge to the aquifer by the fall rains has yet to take place.

A water sample was collected at the end of the pumping test for chemical analysis. The results of the analysis show that the water as tested meets all of the parameters as set out by the Canadian Drinking Water Standards.

WELL NO. 3

This well was drilled to a total depth of 650 feet in granodiorite. Eight-inch casing was carried from surface to 169 feet through the overburden and an 8-inch open hole was drilled to 220 feet. Below 220 feet a 6-inch diameter hole was drilled to 650 feet depth.

Water-bearing fractures were encountered at 176 feet, 197 feet and from 351 to 352 feet. The fractures at 176 and 180 feet had a combined yield of one gpm while an additional one gpm was obtained from the 197 foot fracture. The major portion of the groundwater in this well was obtained from the 351 to 352 foot fracture. Many additional fractures were logged but these were filled with gouge or calcite.

The well was test pumped for a total of 6000 minutes at rates of 5 and 8 Igpm. A pumping rate of 5 Igpm was maintained for the first 4230 minutes of the test after which the pumping rate was increased to 8 Igpm. At a pumping rate of 5 Igpm a stable condition was reached

WELL NO. 3 continued.

after 2550 minutes at a pumping level of 173.57 below the measuring point. At a pumping rate of 8 Igpm the last several readings indicate a stable condition was reached at a depth of 261.49 feet. The specific capacity of the well at 5 Igpm is .089 gpm per foot of drawdown while at 8 Igpm the specific capacity of the well is .055 gpm per foot of drawdown. Since the major fracture is at 351 to 352 feet there is 90 feet of additional drawdown before reaching the major fracture.

A water sample was collected near the end of the test for chemical analysis. The analysis showed that the water was slightly high in turbidity but this will clear with pumping.

#### CONCLUSIONS AND RECOMMENDATIONS

1. The total capacity of the wells now completed is 20.5 Igpm. This total is made up as follows:

Well No. 1	7.5 Igpm
Well No. 2	5.0 Igpm
Well No. 3	8.0 Igpm

2. The pump for Well No. 2 should have the following characteristics:

Outside diameter	(Maximum) 3 3/4"
Suction Set	139'
Capacity	5 gpm

3. The pump for Well No. 3 should have the following characteristics:

Outside diameter	(Maximum) 5 1/2"
Suction Set	400'
Capacity	8 gpm



# B.C. Aquifer Testing & Equipment

PH. 479-4732

588 Melba Plc.  
VICTORIA, B.C.

V8Z 6C5

"Complete Water Well Services"

WELL NO. 2

## PUMP TEST DATA

LOCATION Geneva Holdings PUMP SETTING 137' to suction  
DRILLER Ken's Drilling PUMPING RATE(S) 5 Imp. g.p.m.  
DEPTH OF WELL 139'-top of screen TOTAL TIME PUMPED 1500 mins.  
DIA. OF WELL 6" ORIGINAL STATIC LEVEL 124.88'  
ENGINEER(if any) Dick Erdman TOTAL GALS. PUMPED n/a  
PUMP USED 5 H.P. TOTAL DRAWDOWN 10.24'

TOTAL PRECIPITATION nil

DATE	TIME	ELAPSED TIME	WATER LEVEL	G.P.M.	REMARKS
Nov. 21/78	12:00:00	0	124.88		measuring point 2.6'
	:30	.5	134.61		above ground level
	1:00	1	136.05		
	:30	1.5	133.59		
	2:00	2	131.54		-water sandy
	:30	2.5	130.62		
	3:00	3	130.74		
	:30	3.5	131.06		
	4:00	4	131.35		-water silty
	:30	4.5	131.54		
	5:00	5	131.66	3.6 Imp.	
	6:00	6	131.66		
	7:00	7	131.72		
	8:00	8	131.72		
	9:00	9	132.00		
	10:00	10	132.30		-water clear
	12:00	12	132.68	3.9	
	14:00	14	132.72		
	16:00	16	132.76		
	18:00	18	132.76		
	20:00	20	132.77		
	25:00	25	133.01	4.3	
	30:00	30	134.08		
	35:00	35	134.09		
	40:00	40	134.17		
	50:00	50	134.25		
	13:00	60	134.58	4.3	
	:10	70	134.37		
	:20	80	134.34		
	:30	90	134.32		
	:40	100	135.01	5	
	14:05	125	135.05		
	:30	150	135.11		

DATE	TIME	ELAPSED TIME	WATER LEVEL	G.P.M.	REMARKS
	15:20	200	135.15	5	
	16:10	250	135.16		
	17:00	300	135.16		
	:50	350	135.15		
	18:40	400	135.15		
	19:30	450	135.12	5	
	20:20	500	135.12		
	21:10	550	135.12		
	22:00	600	135.12		
	:50	650	135.12		
	23:40	700	135.12	5	
	24:30	750	135.12		
	01:20	800	135.11		
	02:10	850	135.11		
	03:00	900	135.11		
	:50	950	135.12	5	
	04:40	1000	135.11		
	05:30	1050	135.11		
	06:20	1100	135.11		
	07:10	1150	135.11		
	08:00	1200	135.12	5	
	08:50	1250	135.12		
	09:40	1300	135.12		
	10:30	1350	135.12		
	11:20	1400	135.12		
	12:10	1450	135.12		
	13:00	1500	135.12	5	Water and health samples taken : 12:55



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## RECOVERY DATA

LOCATION Meredith Rd. Sub.

TOTAL PUMPING TIME 1500 mins.

TOTAL DRAWDOWN 10.24'

TOTAL RECOVERY 10.17 in 270 mins.

TOTAL PRECIPITATION nil

DATE	TIME	WATER LEVEL	TIME(t) (mins.)	t/t'	REMARKS
Nov. 22/78	13:00:00	135.12	0		
	:30	130.30	.5		
	1:00	127.66	1		
	:30	126.31	1.5		
	2:00	126.16	2		
	:30	126.02	2.5		
	3:00	125.91	3		
	:30	125.82	3.5		
	4:00	125.71	4		
	:30	125.60	4.5		
	5:00	125.47	5		
	6:00	125.35	6		
	7:00	125.25	7		
	8:00	125.17	8		
	9:00	125.12	9		
	10:00	125.10	10		
	12:00	125.10	12		
	14:00	125.08	14		
	16:00	125.08	16		
	18:00	125.07	18		
	20:00	125.07	20		
	25:00	125.06	25		
	30:00	125.06	30		
	35:00	125.04	35		
	40:00	125.04	40		
	45:00	125.04	45		
	50:00	125.04	50		
	14:00:00	125.04	60		
	:30	125.02	90		
	15:00	125.01	120		
	17:30	124.95	270		



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WELL OWNER GENEVA HOLDINGS  
LOCATION HILL BAY

WELL NO. 3  
JOB NO. 78-090

DRAWDOWN ☒  
RECOVERY ☐

DATE	TIME	ELAPSED TIME MINUTES	DTW	Q <u>IMP</u> GPM	REMARKS
NOV 27-78	11:00	0	117.30		MEASURE POINT 1.55' A.G.L.
		1	124.45		
		1.5	131.16		
		2	132.46	10	
		2.5	133.24		
		3.5	135.70		
		4	135.79		
		4.5	136.14		
	11:05	5	136.63	5	
		6	137.01		
		7	137.39		
		8	137.58		
		9	137.73		
	11:10	10	137.92		
		12	137.92		
		14	139.31		
		16	141.18		
		18	142.15		
	11:20	20	142.52		
		25	143.35		
	11:30	30	143.90		
		35	144.58		
	11:40	40	145.16		
		45	145.80		
	11:50	50	146.23		
	12:00	60	147.07		
	12:10	70	147.90		
	12:20	80	148.71		
	12:30	90	149.01		
	12:40	100	150.11		
	13:05	125	151.24		
	13:30	150	152.20	5	



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PAGE 2WELL OWNER GENEVA HOLDINGSWELL NO. 3DRAWDOWN ☒LOCATION MILL BAYJOB NO. 78-090RECOVERY ☐

DATE	TIME	ELAPSED TIME MINUTES	DTW	Q <u>IMP</u> GPM		REMARKS
Nov. 27-78	14:20	200	152.56	5		
	15:10	250	153.23			
	16:00	300	155.20			
	16:50	350	155.79			
	17:40	400	156.21			
	18:30	450	156.44			
	19:20	500	157.16			
	20:10	550	157.62			
	21:00	600	158.16			
	21:50	650	159.39			
	22:40	700	160.78			
	23:30	750	161.08			
Nov. 28-78	00:20	800	161.58			
	01:10	850	162.27			
	02:00	900	162.71			
	02:50	950	162.72			
	03:40	1000	163.34			
	04:30	1050	164.68			
	05:20	1100	165.00			
	06:10	1150	166.13			
	07:00	1200	166.87			
	07:50	1250	167.29			
	08:40	1300	167.80			
	09:30	1350	168.65			
	10:20	1400	168.23			
	11:10	1450	168.17			
	12:00	1500	168.29			
	12:50	1550	168.45			
	13:40	1600	168.54			
	14:30	1650	168.59			
	15:20	1700	169.43			
	16:10	1750	170.21	5		

WELL DEPTH \_\_\_\_\_ CLOSING STICKER \_\_\_\_\_ PUMP SUCTION \_\_\_\_\_



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WELL OWNER GENEVA HOLDINGS  
LOCATION MILL BAY

WELL NO. 3  
JOB NO. 78-090

DRAWDOWN ☒  
RECOVERY ☐

DATE	TIME	ELAPSED TIME MINUTES	DTW	Q <u>IMP</u> GPM		REMARKS
NOV. 28-78	17:00	1800	170.82	5		
	17:50	1850	171.06			
	18:40	1900	171.21			
	19:30	1950	171.40			
	20:20	2000	171.46			
	21:10	2050	171.58			
	22:00	2100	171.64			
	22:50	2150	171.72			
	23:40	2200	171.82			
NOV. 29-78	00:30	2250	172.08			
	01:20	2300	172.20			
	02:10	2350	172.36			
	03:00	2400	172.85			
	03:50	2450	173.16			
	04:40	2500	173.57			
	05:30	2550	177.52			
	06:20	2600	176.46			
	07:10	2650	175.52			
	08:00	2700	175.21			
	08:50	2750	175.19			
	09:40	2800	175.17			
	10:30	2850	175.34			
	11:20	2900	175.34			
	12:10	2950	175.24			
	13:00	3000	175.19			
	13:50	3050	175.15			
	14:40	3100	175.09			
	15:30	3150	175.01			
	16:20	3200	174.95			
	17:10	3250	174.97			
	18:00	3300	174.97			
	18:50	3350	174.95	5		

WELL DEPTH

PIPE CLOSURE

PIPE SUCTION



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WELL OWNER GENEVA HOLDINGS  
LOCATION MILL BAY

WELL NO. 3  
JOB NO. 78-090

DRAWDOWN ☒  
RECOVERY ☐

DATE	TIME	ELAPSED TIME MINUTES	DTW	Q <u>IMP</u> GPM	REMARKS
Nov. 29-78	19:40	3400	174.68	5	
	20:30	3450	174.72		
	21:20	3500	174.72		
	22:10	3550	174.69		
	23:00	3600	174.20		
	23:50	3650	174.05		
Nov. 30-78	00:40	3700	174.05		
	01:30	3750	174.01		
	02:20	3800	174.00		
	03:10	3850	174.00		
	04:00	3900	173.95		
	04:50	3950	173.92		
	05:40	4000	173.91		
	06:30	4050	173.89		
	07:20	4100	173.87		
	08:10	4150	173.83		
	09:00	4200	173.95	5	INCREASE TO 8 IGPM AT 4230
	09:30	4230	175.01	8	
		4231	176.26		
		4232	177.35		
		4233	178.60		
		4234	179.65		
	09:35	4235	180.80		
		4236	181.45		
		4237	182.05		
		4238	182.62		
		4239	183.08		
	09:40	4240	183.72		
		4242	185.00		
		4244	186.46		
		4246	187.24		
	09:48	4248	188.31	8	

WELL DEPTH

CASING STICKUP

PUMP SUCTION

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DATE	TIME	ELAPSED TIME MINUTES	DTW	Q <u>IMP</u> GPM		REMARKS
Nov. 30-78	09:50	4250	189.22	8		
		4255	190.19			
	10:00	4260	191.30			
		4265	190.90			
	10:10	4270	191.20			
		4275	192.20			
	10:20	4280	193.84			
	10:30	4290	194.20			
	10:40	4300	195.00			
	10:50	4310	196.11			
	11:00	4320	197.79			
	11:10	4330	198.64			
	11:35	4355	199.34			
	12:00	4380	202.27			
	12:20	4400	211.30			
	13:10	4450	220.76			
	14:00	4500	231.03			
	14:50	4550	235.68			
	15:40	4600	239.30			
	16:30	4650	240.13			
	17:20	4700	240.78			
	18:10	4750	241.11			
	19:00	4800	241.16			
	19:50	4850	241.33			
	20:40	4900	241.55			
	21:30	4950	241.79			
	22:20	5000	241.86			
	23:10	5050	241.99			
DEC. 1-78	00:00	5100	242.20			
	00:50	5150	242.38			
	01:40	5200	242.46			
	02:30	5250	242.51	8		



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WELL OWNER GENEVA HOLDINGS

WELL NO. 3

DRAWDOWN ☒

LOCATION MILL BAY

JOB NO. 78-090

RECOVERY ☐

DATE	TIME	ELAPSED TIME MINUTES	DTW	Q <u>IMP.</u> GPM		REMARKS
DEC. 1-78	03:20	5300	242.70	8		
	04:10	5350	242.86			
	05:00	5400	243.30			
	05:50	5450	244.50			
	06:40	5500	245.68			
	07:30	5550	245.95			
	08:20	5600	246.04			
	09:10	5650	246.45			
	10:00	5700	246.92			
	10:50	5750	247.49			
	11:40	5800	251.46			
	12:30	5850	257.52			
	13:20	5900	259.75			
	14:10	5950	261.49			
	15:00	6000	261.45	8		WATER SAMPLE
	END	PUMPING	START	RECOVERY		
		0.5	258.37			
		1	255.13			
		1.5	251.49			
		2	247.77			
		2.5	244.62			
		3	241.57			
		3.5	238.30			
		4	235.48			
		4.5	232.32			
	15:05	5	229.75			
		6	225.81			
		7	222.87			
		8	219.85			
		9	216.97			
	15:10	10	214.08			
		12	208.72			

WELL DEPTH \_\_\_\_\_ CASING STICKUP \_\_\_\_\_ PUMP SUCTION \_\_\_\_\_



$\frac{1}{2} \left( \frac{1}{2} \right) = \frac{1}{4}$

April 3, 1973

John Graeme Engineering Ltd.,  
895 Fort Street,  
Victoria, British Columbia.

Attention: Mr. John Graeme, P. Eng.

Subject: Chemical Analysis, Douglas Hawkes Ltd.  
Well, Meredith Road.

Dear Sirs:

Please find enclosed one copy of the chemical analysis on the subject well. As can be seen by the remarks, the water easily met with American Public Health Association standards for domestic water. This analysis is to be attached to and form part of our report of March 9, 1973, on the Douglas Hawkes Ltd. well, Meredith Road.

Yours very truly,

R.B. Erdman

RBE/jm  
Encl.

c.c. Douglas Hawkes Ltd.  
990 Blanshard  
Victoria, British Columbia

March 9, 1973

John Graeme Engineering Ltd.  
895 Fort Street  
Victoria, British Columbia

Attention Mr. B. Gregory, P.Eng.

Subject Pump Test - Douglas Hawkes Ltd. Well  
Meredith Road

Dear Sirs:

Mr. R. B. Erdman of this office visited the subject site on February 19, 1973 with Mr. Brian Gregory of John Graeme Engineering Ltd. Mr. Erdman also observed the pumping test conducted on the subject well by Butler Brothers on February 28 and March 1, 1973.

The information obtained from Pacific Water Wells (1969) Ltd. and Ken's Drilling indicates that this well had been drilled to a total depth of 158 feet. The well was subsequently back-filled to 134 feet and 5 feet of 6-inch telescopic diameter well screen with a 12/1000 slot opening was set between depths of 129 and 134 feet. The well encountered the following sediments:

depth below ground	lithology
0 - 124 feet	cemented sand and gravel
124 - 134	fine brown sand <u>water-bearing</u>
134 - 154	fine brown sand with clay beds
154 - 158	brown clay

Pacific Water Wells (1969) Ltd. drilled the well from 0 to 129 feet and Ken's Drilling completed the drilling and set and developed the screen. During construction the static water level was reported to be at a depth of 111 feet. The measured level before the start of the pump test was 113.50 feet below the top of the 6-inch diameter casing.

The test pump was set with its suction at 129 feet below the top of the casing. Pumping continued for a total of 1400 minutes

*This well deepened April 1978 to Bedrock at 164'.*  
HR.



John Graeme Engineering Ltd.  
Page 2  
March 9, 1973

at a rate of 9 U.S. gallons per minute. The plot of the measurements taken during the pumping test indicates that a stable pumping level was reached after 300 minutes. Transmissibility calculations range from 1000 U.S. gallons per day per foot on the first leg to 4000 U.S. gpd/ft on the second leg. The recovery measurements do not allow for the calculation of transmissibility but do indicate that the well has not been properly developed. The specific capacity of the well is calculated at just slightly in excess of one gallon per minute per foot of drawdown. The total available drawdown at the time the pumping test was performed was 15.5 feet. To allow for the seasonal fluctuation of the water level in the well a safety of 6.5 feet has been selected. This will leave a useable drawdown of 9 feet. At a yield of 1 gallons per minute per foot of drawdown the capacity of the well would thus be 9 U.S. gallons per minute. This 9 gpm could be revised upwards if after several years of operation it was determined that the seasonal fluctuation was not as much as anticipated.

A submersible type pump is recommended with a motor diameter small enough to fit inside the well screen. The suction of the pump should be set at the top of the screen but not into the screen.

The results of the chemical analysis conducted on a sample of the water collected during the pumping test have not been received to date. However, verbal discussions with the chemist indicate that the water is potable. When the completed results are received copies will be forwarded.

Even though the information obtained from the pumping test indicates that the well is not efficient and the yield should be about twice what was obtained no further work on the well is recommended at this time. The reasoning behind this statement is that we do not know if the well has not been developed enough or has been over-developed. If the well has not been completely developed then the productive capacity could be improved. However, if the well has been over-developed then additional work would only lower the capacity. Since the material outside the well is stable under pumping conditions it is recommended that it be left as is.

Records indicate that Pacific Water Wells (1969) Ltd. drilled two

John Graeme Engineering Ltd.

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March 9, 1973

additional wells. The first well penetrated 155 feet of cemented sand and gravel before reaching bedrock. The well was drilled to 247 feet in the bedrock and only encountered 3/4 gpm of water. It is recommended that this well be abandoned. The second well was drilled to 153 feet through boulders from 0 to 15 feet, cemented sand and gravel from 15 to 148 feet and fine brown sand from 148 to 153 feet. The static water level on this well was reported to be at a depth of 138 feet. If additional water is required it is recommended that this well be drilled through the sand aquifer, screened, developed and test-pumped.

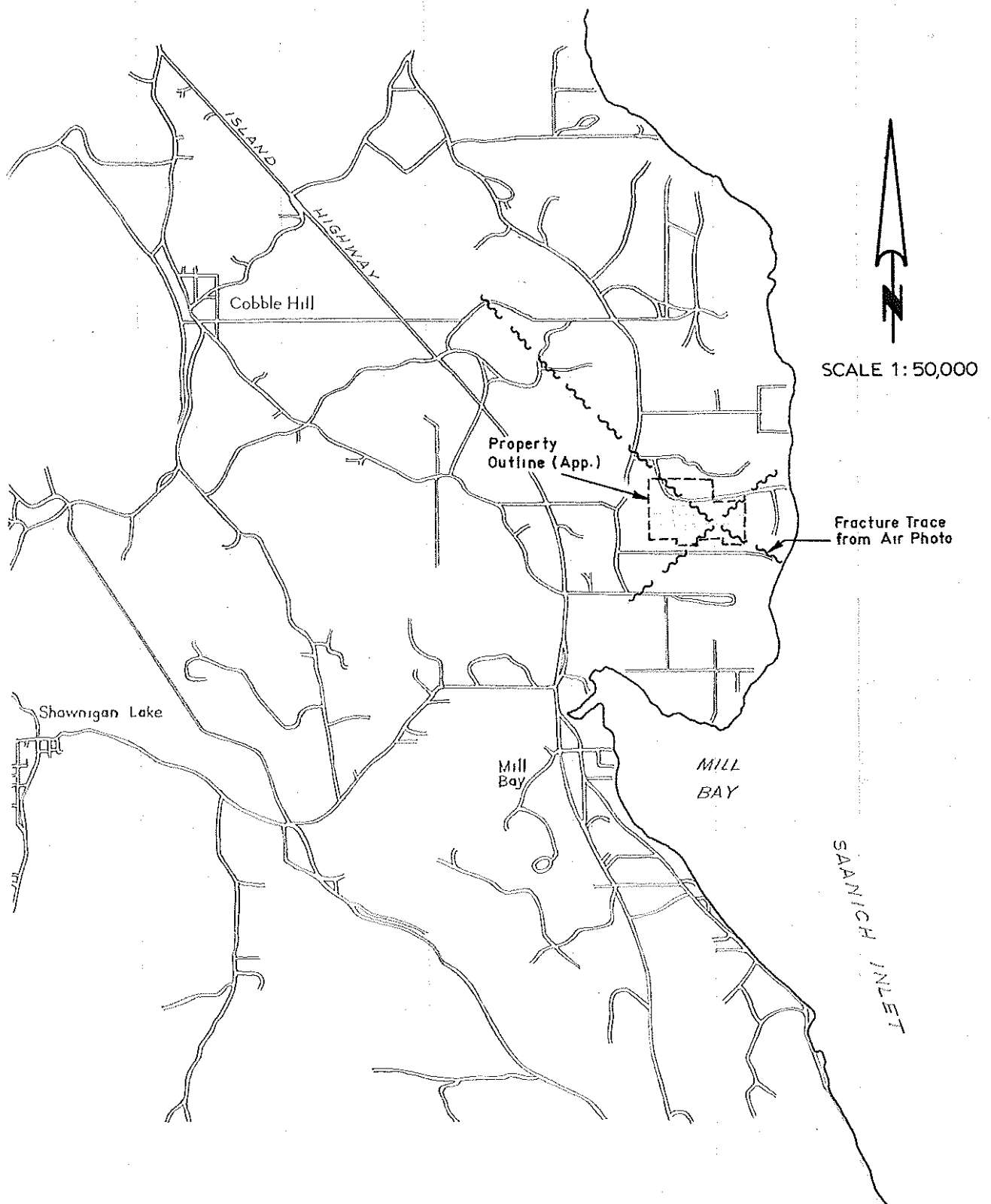
If we can be of any assistance to you on carrying out this phase of the work or if any part of the above is not clear please do not hesitate to contact us.

Yours very truly,

R. B. Erdman

RBE:an

cc Douglas Hawkes Ltd.



DOUGLAS HAWKES LTD.

**MEREDITH ROAD PROPERTY**

BROWN, ERDMAN & ASSOCIATES LTD.

APRIL 1978

78-090