GOVERNMENT OF BRITISH COLUMBIA

MEMORANDUM

TO: A. P. Kohut
Senior Geological Engineer
Groundwater Section
Hydrology Division
Water Investigations Branch

FROM: E. H. Tradewell
Technician
Groundwater Section

May 18 1977

SUBJECT: Groundwater Potential
Magic Lake Estates

OUR FILE: 0239013

YOUR FILE:

Introduction

In the mid-sixties a land developer began to subdivide a large section of land on North Pender Island. As he was required to supply water to all lots he drilled four wells at random locations in the area to be subdivided. Finding that these could not supply sufficient water he looked for alternate water sources. A wet boggy area was excavated and a small lake was formed. This small lake became known as Magic Lake and presently is the only source of water for approximately 1500 lots, Figures 1 and 2.

Presently the water quality in the lake is poor and I understand that weed growth is also a problem in the lake. The lake also serves as a centre for water sports in the summer which is undesirable for a lake which serves as a water supply. There is some concern that the lake could not supply sufficient water if all lots in the subdivision were built on. This Section has been asked to assess the groundwater potential of the area and to locate some possible sites for exploratory drilling.

Geology

Two formations underlie most of Magic Lake Estates. These are Cedar District Formation and De Courcy Formation. The southern part of the subdivision which borders on the ocean is underlain by the Extension-Protection Formation.

The Cedar District Formation is principally marine mudstones (shale) with repetitively bedded sandstones. It is non-resistant and underlies most of the low area surrounding Magic Lake itself. This material has no primary porosity and the only groundwater movement is through void spaces created by faulting. Many of the higher yielding wells on the Gulf Islands are drilled in this type of material as it is brittle and susceptible to fracturing.

The De Courcey Formation overlies the Cedar District Formation and is composed of resistant sandstones and conglomerates and underlies most of the hills and ridges in Magic Lake Estates. The majority of this formation is sandstone. There is some primary porosity but generally groundwater is confined to void spaces created by faulting. Wells drilled in these materials generally have lower yields because this material is less susceptible to fracturing.

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The Extension-Protection Formation which is the oldest of the Nanaimo group is principally resistant comglomerates and sandstones and overlain by both the Cedar District and De Courcy Formations. Very little is known about the groundwater potential of this formation but is thought it would be similar to other sandstone formations.

Another factor which could have control over the groundwater potential of the area is the bedding. The beds dip to the north so that water would tend to enter the rock on the southern side of the island. Thus the best areas to explore for groundwater would be on the north side of Magic Lake Estates.

The air photos for the area were examined. These show many more lineations than on a figure obtained from a Thesis by J.P. Hudson (1974). From our experience on other Gulf Islands the best places to drill are near these faults or lineations. A copy of the two faulting patterns are attached, (Figure 3)

Groundwater Potential

In 1974 a study of the groundwater potential of Mayne Island was completed. This study calculates the bottom of the potable water zone for each watershed on the island. Using these figures the amount of groundwater in storage in each watershed is also estimated. This then allows figures to be drafted showing the maximum groundwater potential for each area. Areas where groundwater withdrawals exceed recharge can be easily determined.

Using this model then the maximum groundwater potential for Magic Lake Estates is between 25 Igpm and 40 Igpm for one hundred days pumping without recharge assuming the base of the potable water zone lies between 200 and 300 feet (Table 1) below ground surface and half of the water in storage is recoverable by mining. This also assumes there is no movement of groundwater across the watershed boundaries. This later assumption may not be valid as the bedding probably permits movement across these boundaries. Also this model assumes no primary porosity which is probably valid for the non-resistant formations. Thus these figures are considered only as guidelines in determining the groundwater potential of the area. The upper limit for the area is thought to be 80 Igpm.

As previously mentioned a limited amount of groundwater explorations was done during the early stages of the development. Four wells were drilled near Magic Lake (see attached). These wells have yields which are typical for wells in less fractured rock. Based on the limited data available two of the wells have capacities near 2 gpm each. Properly sited wells should have long term yields in the range 10-30 Igpm. Thus it will be necessary to drill several

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wells to develop the full groundwater potential of the area.

Water Quality

Two of the wells which were tested have complete chemical analysis available. The well adjacent to Magic Lake (see attached) shows a very hard groundwater with a high degree of mineralization. This is probably typical of a groundwater at the end of a flow path. The other water sample is more typical of the groundwaters on the Gulf Islands although the majority of the waters will probably fall between these two samples in total mineralization, (Table 2).

Other Considerations

If all the lots in the subdivision are built on then the total water demand for the subdivision is estimated to be between 500 and 600 Igpm. This assumes .33 Igpm/lot and 1500 lots in the subdivision. Obviously groundwater cannot supply this amount of water required for this subdivision. If they wish to augment the existing supply then groundwater could service this purpose. With this in mind, these drilling sites have been chosen.

Site Selection

Four sites have been chosen for exploratory drilling. Two of these are near Magic Lake and the remainder near Buck Lake. It is thought that the sites near Magic Lake have a greater possibility of success (Figure 4). The order of drilling should be A, B, C, D.

Site A - This site is located near a major fault which runs east-west along the length of the island and a transverse fault which runs through Magic Lake and intercepts the longitudinal fault. This is considered to be the best site and should be drilled first.

Site B - This site is located near the transverse fault which passes through Magic Lake and the contact between the De Courcy and Cedar District Formations. It is thought that this site might receive recharge from Magic Lake.

Site C - This area is located near the longitudinal fault which passes through Site A and the transverse fault which passes through Buck Lake.

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Site D - This location is near the transverse fault which runs through Buck Lake and the contact between Cedar District and De Courcy Formations.

Maximum drilling depth at all locations should be three hundred feet. The higher sites should probably continue drilling to 400 feet if well yield is small. Anticipated costs are $12,000 - $15,000 based on drilling six-inch holes at a cost of ten dollars per foot.

Conclusions

1. Groundwater could supply only a small percentage of total water demand for the subdivision. At present only twenty-five percent of the lots are built on. Using these figures then groundwater could supply about one half of these lots. This assumes the same water usage as in a city environment.

2. The chances of obtaining 40 Igpm are estimated to be 90 percent. While the chances of obtaining 80 Igpm are thought to be 50 percent.

3. A monitoring program should be started if groundwater is developed within the subdivision.

Erne Tradewell

E. H. Tradewell

EHT/dmc

References

Foweraker, J. C. 1974. Evaluation, Development and Management of the Groundwater Resource on Mayne Island. Report No. 1, Water Investigations Branch, Ministry of the Environment

Hudson, J. P. 1974. Stratigraphy and Paleoenvironments of the Cretaceous Rocks, North and South Pender Islands, British Columbia. Master Thesis, Oregon State University

Jeletzky, J. A. and Muller, J. E. 1970. Geology of the Upper Cretaceous Nanaimo Group, Vancouver Island and Gulf Islands, British Columbia. Geological Survey of Canada Paper 69-25, Ottawa, 1970.

TABLE I

GROUNDWATER POTENTIAL - MAGIC LAKE ESTATES

Watershed	Area Sq. Miles	Groundwater In Storage Min.# ac-ft	Max.& ac-ft	Pumping Rate Over 100 days * Min. Igpm	Max. Igpm
Medicine Beach	.73	9.4	14.1	8.9	13.3
Buck Lake	1.3	16.7	25.6	15.7	24.1
Oak Bluffs +	.12	1.7	2.6	1.6	2.4
TOTAL				26.2	39.8 Igpm

\+ Only 25 percent of this watershed could contribute water to wells.

\# This assumes S = 1×10^{-4} and base of potable water bearing zone is 200 feet below ground surface.

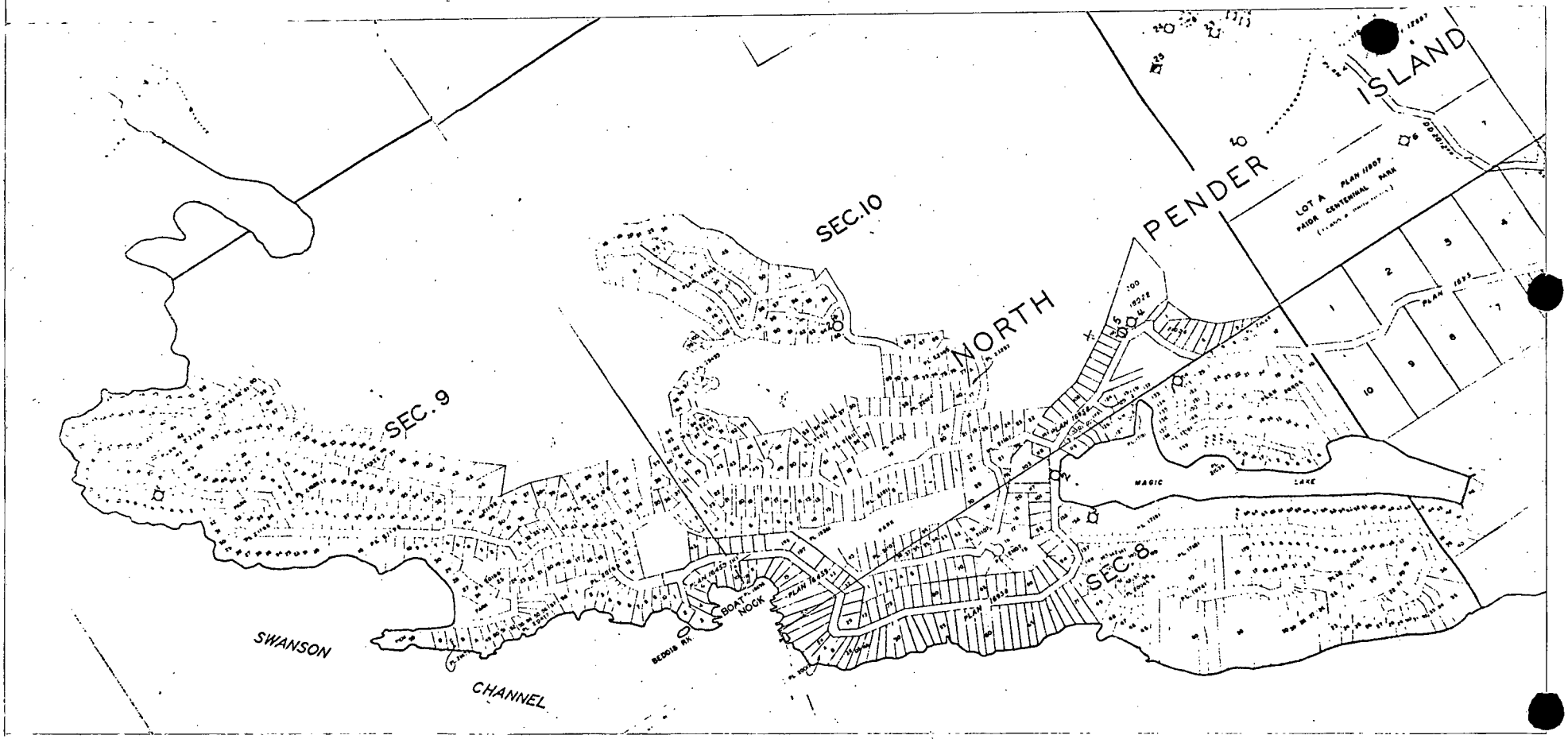
& This assumes base of potable water bearing zone is 300 feet below ground surface.

* This allows for only one-half of the groundwater in storage to be recoverable by mining.

Table 2

Water Chemistry - Magic Lake Estates

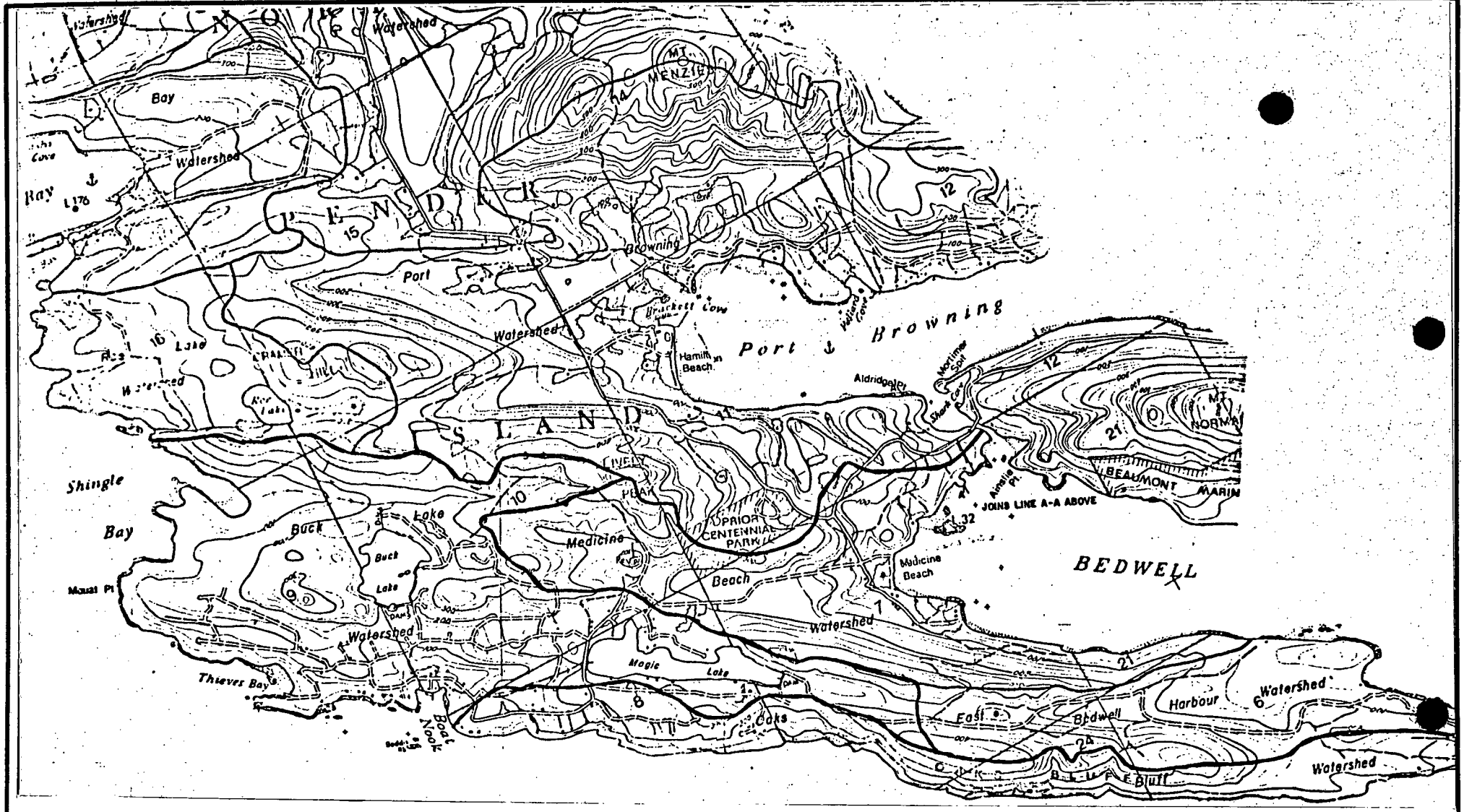
Parameters Measured	Magic Lake Estates Well No. 3		Well No. 4	
pH	7.30		7.40	
Colour (Pt-Co scale)	32.5	ppm	Trace	
Colour with Charcoal	5.5	ppm	Trace	
Turbidity (SiO_2 scale)	6.0	ppm	10.0	ppm
Suspended Matter	3.0	ppm	15.0	ppm
Alkalinity: Carbonate	Not detected		Not detected	
Bicarbonate	127.5	ppm	572.0	ppm
Total Hardness (Soap Method)	32.5	ppm	238.0	ppm
Chlorides	10.0	ppm	35.2	ppm
Sulphates	Trace		5.2	ppm
Total Dissolved Solids	206.0	ppm	833.0	ppm
Volatile Solids	64.0	ppm	242.0	ppm
Fixed Solids	142.0	ppm	591.0	ppm
Calcium	10.0	ppm	65.0	ppm
Magnesium	3.0	ppm	20.6	ppm
Sodium	41.0	ppm	126.0	ppm
Potassium	Trace		Trace	
Manganese	Trace		Trace	
Total Iron	0.64	ppm	0.14	ppm
Dissolved Iron	0.10	ppm	0.06	ppm
Total Aluminum	0.90	ppm	0.82	ppm
Dissolved Aluminum	0.81	ppm	0.70	ppm
Dissolved Silicon	7.2	ppm	7.4	ppm



WELL LOCATION MAP - MAGIC LAKE ESTATES

MINISTRY OF THE ENVIRONMENT WATER INVESTIGATIONS BRANCH	TO ACCOMPANY REPORT ON GROUNDWATER POTENTIAL MAGIC LAKE ESTATES	SCALE: VERT. 1" = 1340' HOR.	DATE May 1977
			ENGINEER
		FILE No. 0239013	DWG. No. Figure 1

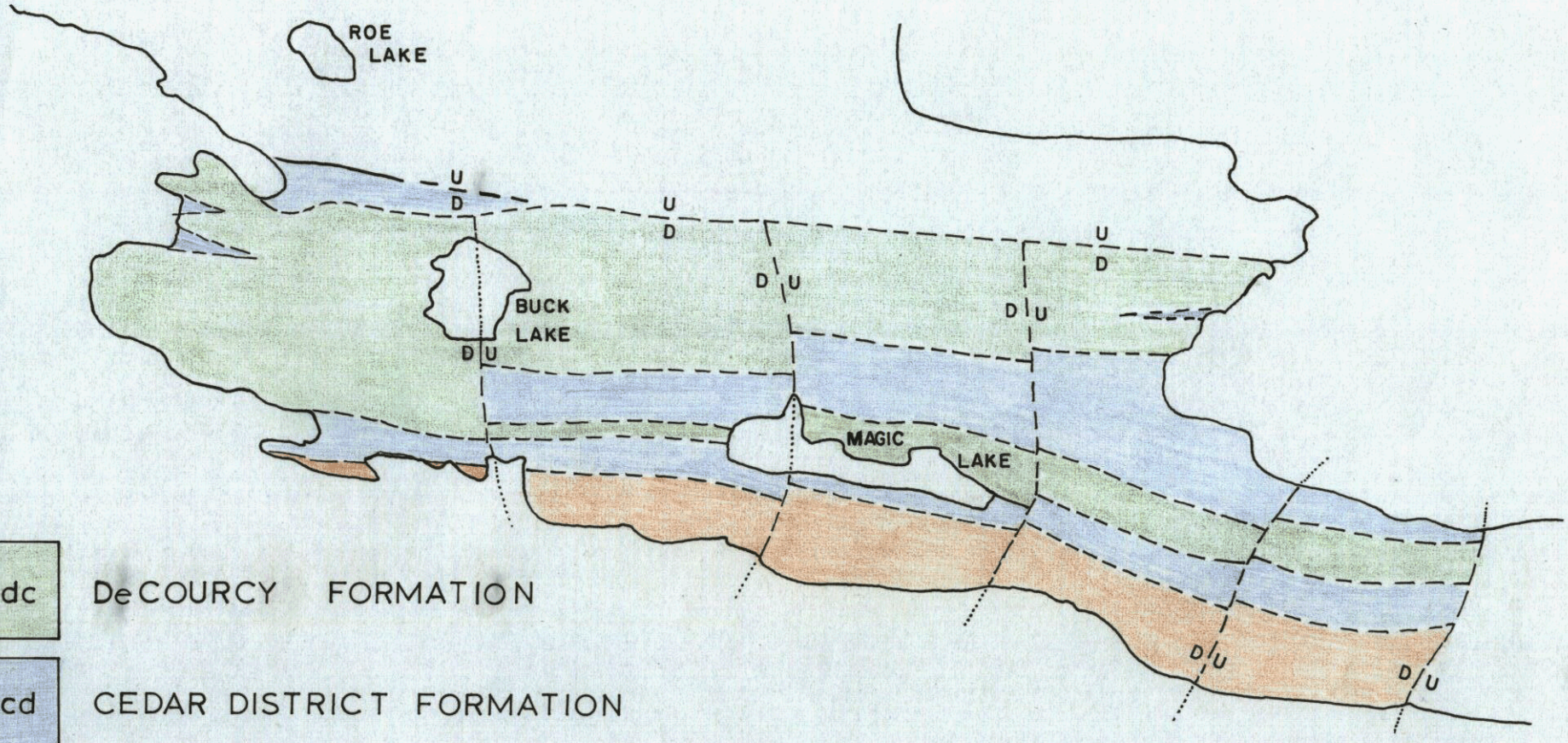
BCIL-3616/A - W.R.B.



WATERSHEDS IN MAGIC LAKE ESTATES

MINISTRY OF THE ENVIRONMENT WATER INVESTIGATIONS BRANCH	TO ACCOMPANY REPORT ON Groundwater Potential Magic Lake Estates	SCALE: VERT. 1" = 2485' HOR. ENGINEER FILE No. 0239013 DWG. No. Figure 2
		DATE May 1977

GEOLOGY OF MAGIC LAKE ESTATES



MINISTRY OF THE ENVIRONMENT WATER INVESTIGATIONS BRANCH	TO ACCOMPANY REPORT ON GROUNDWATER POTENTIAL MAGIC LAKE ESTATES	SCALE: VERT. 1" = 2100' HOR. DATE May 1977 ENGINEER FILE No. 0239013 DWG. No. Figure 3

BCIL - 3 6167/A - W.R.B.

Figure 4

TOWNSHIP		RANGE		SECTION		QUARTER	LAND DISTRICT	
TENS	UNITS	TENS	UNITS	TENS	UNITS		TENS	UNITS
7 4 2 1	7 4 2 1	6 5 4 3 2	2 1	7 4 2 1	2 1	7 4 2 1	NE SE SW NW	4 2 1	7 4 2 1

GROUND — WATER DIVISION, WATER INVESTIGATIONS BRANCH, DEPT. OF LANDS, FORESTS, and WATER RESOURCES, VICTORIA, B.C.

Sec 10

#4

#1

LOCATION ADJ. TO LOT 116 PL 16958 SEC 10
(COMPLETE LEGAL DESCRIPTION)

OWNER'S NAME MAGIC LAKE ADDRESS

DRILLER'S NAME KEN'S ADDRESS DATE OF COMPLETION 19[redacted]

DEPTH 40' ELEVATION OF COLLAR 250 CASING DIAM 6" LENGTH TYPE

METHOD OF DIGGING DRILLED SCREEN [] SIZE LENGTH TYPE

LOCATION OF SCREEN DEVELOPED [] DESCRIBE

PERFORATED CASING [] LENGTH LOCATION OF PERFORATIONS

GRAVEL PACK [] LENGTH DIAM SIZE GRAVEL, ETC

PUMP [] TYPE POWER

CAPACITY OTHER DATA VICTORIA URBAN GEOLOGY SURVEY

COSTS WELL PUMP PUMP HOUSE, ETC GRID REF. NO.

MAINTENANCE

DISTANCE TO WATER FROM TOP OF CASING 12' [] ESTIMATED [X] MEASURED ELEVATION FLUCTUATION

HIGH WATER MONTH LOW WATER MONTH OBSERVATION DATA [] FILE No

WATER USE

MAX. RATE WITHDRAWAL [] ESTIMATED [6] MEASURED 10.2 gpm

TEMPERATURE PUMPS SAND []

CLOGS SCREEN [] TYPE DEPOSIT

LICENSE No DATE LICENSE

DATE APPLICATION USE

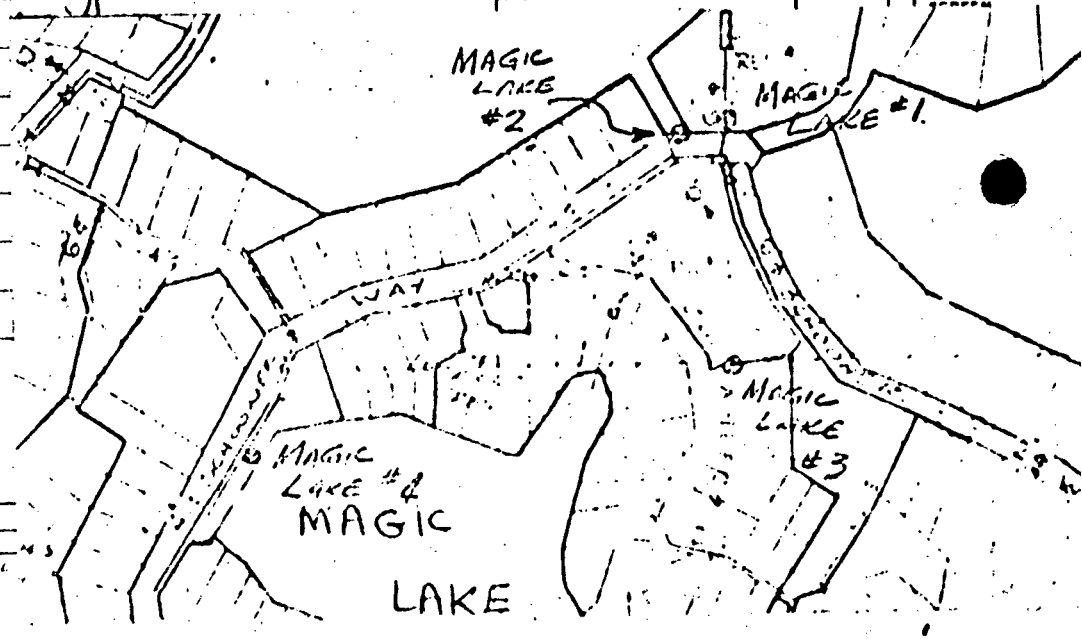
METHOD: DUG, DRIVEN, DRILLED, JETTED, BORED

DEPTH: 0 — 25, 25 — 50, 50 — 100, 100 — 200, 200 — 400, > 400

OBSERVATION, ABANDONED, DEVELOPED

WATER QUALITY: ANALYSIS, SOFT, HARD, HIGH IRON, HIGH SULPHUR, SALTY, ALKALINE, SALINE, POLLUTED, INADEQUATE QUALITY

CAPACITY GPD: DRY HOLE, INADEQUATE QUANTITY, PUMPING TEST, $0 - 10^3$, $10^3 - 10^4$, $10^4 - 10^5$, $10^5 - 10^6$, 10^6



VISIrecord®

OTHER AQUIFERS				OTHER AQUIFERS			
STRAT		SWL		STRAT		SWL	
FROM	TO			FROM	TO		

TOWNSHIP		MERIDIAN	RANGE		SECTION		QUARTER	LAND DISTRICT	
TENS	UNITS		TENS	UNITS	TENS	UNITS		TENS	UNITS
							NE SE SW NW		

MUNICIPALITY — TENS — UNITS

GROUND — WATER DIVISION, WATER INVESTIGATIONS BRANCH, DEPT. OF LANDS, FORESTS, and WATER RESOURCES, VICTORIA, B.C.

#2

LOCATION ADJ. TO LOT 116 PL 16958 SEC 10
(COMPLETE LEGAL DESCRIPTION)

OWNER'S NAME MAGIC LAKE ADDRESS

DRILLER'S NAME KEN'S ADDRESS DATE OF COMPLETION 1967

DEPTH 190' ELEVATION OF COLLAR 240 CASING DIAM 6" LENGTH TYPE

METHOD OF DIGGING DRILLED SCREEN [] SIZE LENGTH TYPE

LOCATION OF SCREEN DEVELOPED [] DESCRIBE

PERFORATED CASING [] LENGTH LOCATION OF PERFORATIONS

GRAVEL PACK [] LENGTH DIAM. SIZE GRAVEL, ETC

PUMP [] TYPE POWER

CAPACITY OTHER DATA

COSTS WELL PUMP PUMP HOUSE, ETC

MAINTENANCE

DISTANCE TO WATER FROM TOP OF CASING 0 [] ESTIMATED [X] MEASURED ELEVATION FLUCTUATION

HIGH WATER MONTH LOW WATER MONTH OBSERVATION DATA [] FILE No

WATER USE

MAX. RATE WITHDRAWAL [] ESTIMATED [X] MEASURED 6.2 gpm

TEMPERATURE PUMPS SAND []

CLOGS SCREEN [] TYPE DEPOSIT AQUIFER DATA

LICENSE No DATE LICENSE AMOUNT

DATE APPLICATION USE

SEE #4
. SEC 10

N

LOCATION SKETCH—INDICATE NORTH

#5

METHOD: DUG, DRIVEN, DRILLED, JETTED, BORED

DEPTH: 0 — 25, 25 — 50, 50 — 100, 100 — 200, 200 — 400, >400

TYPE WELL: OBSERVATION, ABANDONED, DEVELOPED, SCREEN, PERF. CASING, GRAVEL ENV., PUMP

WATER QUALITY: ANALYSIS, SOFT, HARD, IRON, HIGH SULPHUR, SALTY, ALKALINE, SALINE, POLLUTED, INADEQUATE QUALITY

CAPACITY GPD: DRY HOLE, INADEQUATE QUANTITY, PUMPING TEST; 0 — 10^3, 10^3 — 10^4, 10^4 — 10^5, 10^5 — 10^6, 10^6

TYPE WELL: FLOWING, NON FLOW ARTESIAN, WATER TABLE, PART CONFINED

VICTORIA URBAN GEOLOGY SURVEY

GRID REF. NO.

VIBlueprint J2708

OTHER AQUIFER PENETRATED						CHARACTER OF SUPPLY AQUIFER			WATER USE							RELIABILITY OF DATA			ROCK
SEQ NO		SWL		SEQ NO		SWL		SEQ NO		SWL		SAND	GRAVEL	TILL	DOMESTIC	GARDEN	STOCK	COOLING	IRRIGATION	INDUSTRIAL	WATERWORKS	GOOD	FAIR	POOR	SPRING
1 2 3 4		1 2 3 4		1 2 3 4		1 2 3 4		1 2 3 4		1 2 3 4															

TOWNSHIP		MERIDIAN	RANGE		SECTION		QUARTER	LAND DISTRICT	
TENS	UNITS		TENS	UNITS	TENS	UNITS		TENS	UNITS
7 4 2 1	7 4 2 1	6 5 4 3 1	2 1	7 4 2 1	2 1	7 4 2 1	NE SE SW NW	4 2 1	7 4 2 1

MUNICIPALITY: TENS / UNITS

GROUND — WATER DIVISION, WATER INVESTIGATIONS BRANCH, DEPT. OF LANDS, FORESTS, and WATER RESOURCES, VICTORIA, B.C.

#3

LOCATION (COMPLETE LEGAL DESCRIPTION) LOT ~~333~~ 154 PL. 17181 SEC 8

OWNER'S NAME MAGIC LAKE ADDRESS

DRILLER'S NAME KEN'S ADDRESS DATE OF COMPLETION 1967

DEPTH 205 ELEVATION OF COLLAR 230 CASING DIAM 6" LENGTH TYPE

METHOD OF DIGGING DRILLED SCREEN [] SIZE LENGTH TYPE

LOCATION OF SCREEN DEVELOPED [] DESCRIBE

PERFORATED CASING [] LENGTH LOCATION OF PERFORATIONS

GRAVEL PACK [] LENGTH DIAM SIZE GRAVEL, ETC

PUMP [] TYPE POWER

CAPACITY OTHER DATA

COSTS WELL PUMP PUMP HOUSE, ETC

MAINTENANCE

DISTANCE TO WATER FROM TOP OF CASING 11' [] ESTIMATED [X] MEASURED ELEVATION FLUCTUATION

HIGH WATER MONTH LOW WATER MONTH OBSERVATION DATA [] FILE NO

WATER USE

MAX. RATE WITHDRAWAL [] ESTIMATED [X] MEASURED 5.8 gpm

TEMPERATURE PUMPS SAND []

CLOGS SCREEN [] TYPE DEPOSIT AQUIFER DATA

LICENSE NO DATE LICENSE AMOUNT

DATE APPLICATION USE

SEE #4
- SEC 10

LOCATION SKETCH—INDICATE NORTH

N

VICTORIA URBAN GEOLOGY SURVEY

GRID REF. NO.

12708

WATER QUALITY: ANALYSIS; SOFT; HARD; HIGH IRON; HIGH SULPHUR; SALTY; ALKALINE; SALINE; POLLUTED; INADEQUATE QUALITY

METHOD: DUG; DRIVEN; DRILLED; JETTED; BORED

DEPTH: 0 — 25; 25 — 50; 50 — 100; 100 — 200; 200 — 400; >400

TYPE WELL: OBSERVATION; ABANDONED; DEVELOPED; SCREEN; PERF. CASING; GRAVEL ENV.; PUMP; FLOWING; NON FLOW ARTESIAN; WATER TABLE; PART CONFINED

CAPACITY GPD: DRY HOLE; INADEQUATE QUANTITY; PUMPING TEST; $0 - 10^3$; $10^3 - 10^4$; $10^4 - 10^5$; $10^5 - 10^6$; 10^6

SUPPLY AQUIFER		OTHER AQUIFER PRESENT		OTHER AQUIFER PRESENT		CHARACTER OF SUPPLY AQUIFER	WATER USE							RELIABILITY OF DATA			ROCK
UNITS	TENS	UNITS	TENS	UNITS	TENS	SAND / GRAVEL / TILL	DOMESTIC	GARDEN	STOCK	COOLING	IRRIGATION	INDUSTRIAL	WATERWORKS	GOOD	FAIR	POOR	SPRING
1 2 4 7	1 2 4 7	1 2 4 7	1 2 4 7	1 2 4 7	1 2 4 7												

TOWNSHIP (TENS / UNITS)	MERIDIAN	RANGE (TENS / UNITS)	SECTION (TENS / UNITS)	QUARTER (NE SE SW NW)	LAND DISTRICT (TENS / UNITS)

#4

GROUND — WATER DIVISION, WATER INVESTIGATIONS BRANCH, DEPT. OF LANDS, FORESTS, and WATER RESOURCES, VICTORIA, B.C.

LOCATION (COMPLETE LEGAL DESCRIPTION) PARK AT WEST END OF MAGIC LAKE SEC 8

OWNER'S NAME MAGIC LAKE ADDRESS PENDER ISLAND

DRILLER'S NAME KEN'S DRILLING ADDRESS ______ DATE OF COMPLETION 1[illegible]7

DEPTH 210 ELEVATION OF COLLAR 226 CASING DIAM 6" LENGTH ______ TYPE ______

METHOD OF DIGGING DRILLED SCREEN [] SIZE ______ LENGTH ______ TYPE ______

LOCATION OF SCREEN ______ DEVELOPED [] DESCRIBE ______

PERFORATED CASING [] LENGTH ______ LOCATION OF PERFORATIONS ______

GRAVEL PACK [] LENGTH ______ DIAM ______ SIZE GRAVEL, ETC ______

PUMP [] TYPE ______ POWER ______

CAPACITY ______ OTHER DATA ______

COSTS WELL ______ PUMP ______ PUMP HOUSE, ETC. ______

MAINTENANCE ______

DISTANCE TO WATER FROM TOP OF CASING 3 [] ESTIMATED [X] MEASURED ELEVATION ______ FLUCTUATION ______

HIGH WATER ______ MONTH ______ LOW WATER ______ MONTH ______ OBSERVATION DATA [] FILE No ______

WATER USE ______

MAX. RATE WITHDRAWAL [] ESTIMATED [X] MEASURED 7.6 gpm

TEMPERATURE ______ PUMPS SAND [] ______

CLOGS SCREEN [] TYPE DEPOSIT ______ AQUIFER DATA ______

LICENSE No ______ DATE LICENSE ______ AMOUNT ______

DATE APPLICATION ______ USE ______

SEE #4
SEC 10
N

LOCATION SKETCH—INDICATE NORTH

WATER QUALITY: ANALYSIS, SOFT, HARD, HIGH IRON, HIGH SULPHUR, SALTY, ALKALINE, SALINE, POLLUTED, INADEQUATE QUALITY

DRY HOLE, INADEQUATE QUANTITY, PUMPING TEST

CAPACITY GPD: $0 - 10^3$, $10^3 - 10^4$, $10^4 - 10^5$, $10^5 - 10^6$, 10^6

METHOD: DUG, DRIVEN, DRILLED, JETTED, BORED

DEPTH: 0 — 25, 25 — 50, 50 — 100, 100 — 200, 200 — 400, >400

OBSERVATION, ABANDONED, DEVELOPED, SCREEN, PERF. CASING, GRAVEL ENV, PUMP

TYPE WELL: FLOW, NON-FLOW ARTESIAN, WATER TABLE, PART CONFINED

VICTORIA URBAN GEOLOGY SURVEY

GRID REF. NO.

VISIrecord 12706

SUPPLY AQUIFER (UNITS / TENS) — OTHER AQUIFER PRESENT (UNITS / TENS) — OTHER AQUIFER PRESENT (UNITS / TENS)

CHARACTER OF SUPPLY AQUIFER: SAND, GRAVEL, TILL

WATER USE: DOMESTIC, GARDEN, STOCK, COOLING, IRRIGATION, INDUSTRIAL, WATERWORKS

RELIABILITY OF DATA: GOOD, FAIR, POOR

ROCK, SPRING

DATA AILABLE FOR PENDER ISLAND

Confidential N.T.S.

✓ 92 B/11	#25	Groundwater Development, Bedwell Harbour Resorts Ltd., South Pender Island
92 B/14	#15	Pender Utilities - North Pender Island Trinco Well No. 1
	#16	Pender Utilities - North Pender Island Trinco Well No. 2
	#17	Pender Utilities - North Pender Island Trinco Well No. 3
	#18	Pender Utilities - North Pender Island Trinco Well No. 4
	#19	Pender Utilities - North Pender Island Trinco Well No. 5
	#20	Pender Utilities - North Pender Island Trinco Well No. 6
	#21	Pender Utilities - North Pender Island Trinco Well No. 7
	#24	Groundwater Development, North Pender Island Neptune Estates Ltd. October 1968

Current N.T.S.

92 B/14 ✓	#7	Pender Island, Hydrochemical Data
✓	#8	Pender Island, Hydrogeological Data
✓	#9	Pender Island, Field Sheets Eric Thorn, 1974
✓	#10	Preliminary Groundwater Investigation of North Pender Island G. J. Harris May 1976
✓	#46	Magic Lake Wells, North Pender Island 1967

Closed Files

✓0239013-3-6	Gulf Islands Study, 1968-1970
✓0239013-4-11	Gulf Islands Study, 1971
✓0239013-5-4	Gulf Islands Study, 1971-1972
✓0239013-6-1	Gulf Islands Study, 1972
✓ 0239013-7-5	Pender Island, June 1973
✓0239013-11-1	Possible Groundwater Depletion of Pender Island, April 1976
✓ 0239013-12-9	Pender Island Observation Wells - Establishment, August 1976
✓0239013-12-10	North Pender Island Study, Continued from Volume II
0239013-13-5	Sketch Development on North Pender Island, November 1976 Stanley Point Estates
0239013-14-2	Proposed North Pender Island Observation Wells, January 1977 Contract No. 61
0239013-15-3	Contract No. 61, Drilling of Two Observation Wells by the Air Rotary Method, North Pender Island

Library

Notes for Gulf Island, Well Inventory Survey, Hydrochemical Data Collection

✓ Stratigraphy and Paleoenvironments of the Cretaceous Rocks, North and South Pender Island, B.C. July 1974, J.P. Hudson, M.Sc. Thesis, Oregon State University

✓ Hydrogeology of the Coastal Lowland - Nanaimo to Victoria, Vancouver Island Including the Gulf Islands, B.C. by E.C. Halstead

✓ Geology of the Upper Cretaceous Nanaimo Group, Vancouver Island and Gulf Islands, G.S.C. Paper 69-25

Well Cards

Approximately 1000 for whole Island (?)

Well Location Maps

Sheets 8, 9, 10, and 11, Cowichan Land District