Province of British Columbia
Ministry of Environment
WATER MANAGEMENT BRANCH

MEMORANDUM

To: A.P. Kohut
Senior Geological Engineer
Groundwater Section
Water Management Branch

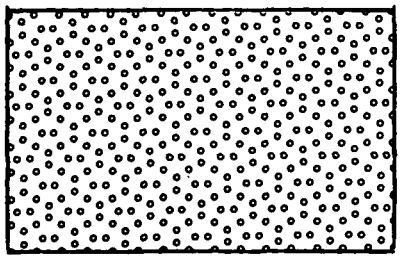
Date: July 6, 1984
File: 92F/8 #18

Re: ALR Fine Tuning Program, Groundwater Study
(Map sheets 92F.028, 029, 038 and 039), Parksville Area

This memorandum report and accompanying maps provides a brief discussion and analysis of developed and potential aquifers in the above area based on presently available groundwater data. The hydrogeological information, thematically presented on the attached map sheets are based on the tabulated data from 875 water well records, water well location maps (both on file with the Groundwater Section) and published surficial geology maps (Fyles, 1963).

Surficial geology units which were considered hydrogeologically significant in terms of groundwater potential were transferred to the water well location maps which were used as a working base. Tabulated data from the water well records (e.g., aquifer characteristics, depth to bedrock etc.) were transferred to these same maps. A synthesis of this data was then transferred to the final 1:20,000 scale base maps.

The description and limitations of each component shown on the map sheets are as follows:

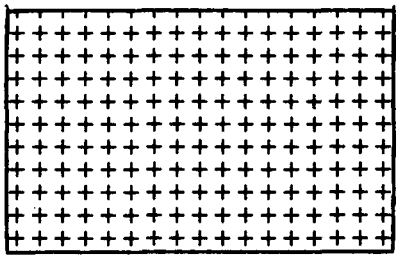


AREA A: Area A outlines the surficial extent of unconsolidated deposits primarily comprised of sand and/or gravels. The deposits which fall into this category include the following four genetic units: (1) shore, deltaic and fluvial deposits of the Salish Sediments; (2) terrace fluvial and some marine and ~~(3)~~ glacio-marine deposits of the Capilano Sediments; (3) glacio-fluvial deposits of the Vashon Drift; (4) and distal glacial outwash aprons identified as the Quadra Sand (Clague, 1977). These surficial geology units were transferred first from 1:63,360 scale mapping

to 1:12,000 scale water well location maps, and then to the 1:20,000 scale cadastral maps. Minor boundary errors may exist therefore on the larger scale mapping.

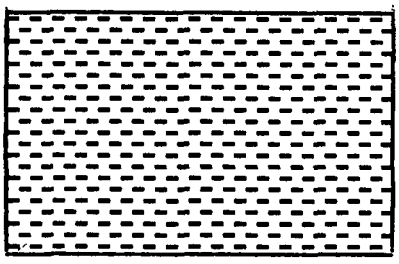
Area A outlines areas where there is a high probability of locating water-bearing sand and/or gravel aquifers but does not imply the existence of water-bearing sand and/or gravel aquifers. In some areas for example the sand and gravel deposits may be very thin and dry throughout their entire thickness.

Area A outlines potential unconfined aquifers at surface, it does not show distribution at depth. This is especially relevant to the Quadra Sand and possibly to some pre-Fraser Glaciation unconsolidated sediments which may underlie younger deposits (marine clays for example) in the region.



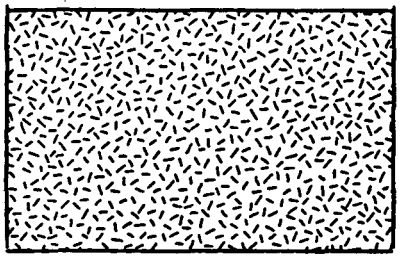
AREA B: Area B outlines regions where sand and/or gravel aquifers (greater than 0.5 metres in thickness) have been identified at depth based on water well lithology records. These aquifers may be either confined or unconfined. Interpreted depths to tops of aquifers ranges from 2 to 90 metres, with a mean of 23 metres. Interpreted thicknesses of these sand and/or gravel aquifers ranges from 0.3 to 26 metres with a mean of 5 metres. An aquifer thickness greater than 9 metres was encountered in 33 water wells. Thicknesses as much as 9 metres are very significant in terms of groundwater potential.

The boundaries of Area B were arbitrarily set at a 100 metre radius from a data point (water well) which identifed a sand and/or gravel aquifer greater than 0.5 metres in thickness. Where two wells, located within 400 metres of each other, show similar lithologies and the geomorphology of the area was homogeneous, Area B was extended between the two wells.



AREA C: Area C outlines areas where the unconsolidated deposits at surface (predominantly tills, silts and/or clays) are generally unsuitable as aquifer materials due to their low permeability. However, suitable aquifer materials may and do exist at depth as evidenced in many regions of Area C where site specific data are available. Where ground moraine deposits have been mapped in Area C, locally there may be sand and/or gravel deposits found at surface or in lenses at depth. Also, older geologic units (e.g., Quadra Sand) that are significant aquifers may be overlain by the marine and moraine deposits found in Area C. Productive aquifers may be found in these older geologic units.

The boundaries of Area C were also transferred from Fyles (1:63,360 scale) surficial geology maps. Minor boundary errors therefore may exist on the larger scale mapping.



AREA D: Area D was identified where bedrock is located at or near ground surface and/or where well logs indicate bedrock aquifers. The possibility of obtaining adequate supplies of groundwater for irrigation purposes are generally considered to be poor in these areas and although some bedrock wells in the area have been reported to yield between 1 and 3 L/s, long duration pumping tests will be required to verify if bedrock aquifers are capable of a sustained high withdrawal rate. Examples of bedrock aquifers capable of yielding sufficient supplies of groundwater for irrigation purposes can be found in the Mill Bay and Saanich regions of southern Vancouver Island where well yields up to 16 L/s have been obtained. It is not known if comparable high yielding bedrock aquifers exist in the study area.

The boundaries for Area D were also arbitrarily set at a 100 metre radius from a data point (e.g., bedrock well or rock outcrop). This distance was extended to 400 metres between data points if water well log lithology and the surface morphology so warranted.

▲ Water wells where yields greater than 3 L/s have been reported. Where these wells are found in Area B these areas show the highest potential for obtaining groundwater supplies to meet irrigation requirements.

△ Water wells where yields between 1 and 3 L/s are reported. These areas also show high potential for obtaining irrigation supplies of groundwater.

On a regional basis, there is potential for locating groundwater supplies capable of meeting irrigation requirements in the coastal areas underlain by unconsolidated deposits. 19 water well records showed wells with reported yields greater than 6 L/s. 24 hour pump tests showed specific capacity ratings from 40 to 200 litres per ~~day~~ min/metre. These ratings are significant in terms of groundwater potential.

There is a paucity of well log information available for a large portion of the areas showing groundwater potential for irrigation (Area A).

Developed sand and gravel aquifers in Area B were identified from over 200 water well records. Approximately half of these aquifers are overlain by

tills, silt and/or clay found in Area C and the other half were found underlying Area A. Almost one half of the water wells with reported yields over 1 L/s were also found in Area C. This shows the potential for groundwater development is significant for both Areas A and C.

Water quality based on 9 Hach field kit analyses and 18 lab analyses indicate groundwaters are generally favourable for irrigation purposes. However, some water from bedrock aquifers may contain high levels of sodium relative to the levels of calcium and magnesium. Waters high in sodium relative to calcium and magnesium may be very undesirable for some crops (Richards, 1969). This relationship is usually expressed as the sodium absorption ratio (SAR) where SAR = $Na^+ / \sqrt{(Ca + Mg)/2}$ and can be used for identifying the suitability of groundwaters for irrigation purposes. The formula applies where all concentrations are expressed in epm.

Since the delineation of known aquifer areas is based on the interpretation of existing water well data; additional synthesis of geologic data, future review of new well log data etc., could be used to define more accurately and/or extend the boundaries of Area B.

This report is regional in scope and identifies areas which have the potential to supply irrigation water. It does not provide a quantitative assessment of water availability for a site specific location. To provide such an assessment, more accurate delineation of aquifer boundaries and an estimation of groundwater recharge, movement, aquifer parameters and withdrawal rates would be required on a site specific basis.

References:

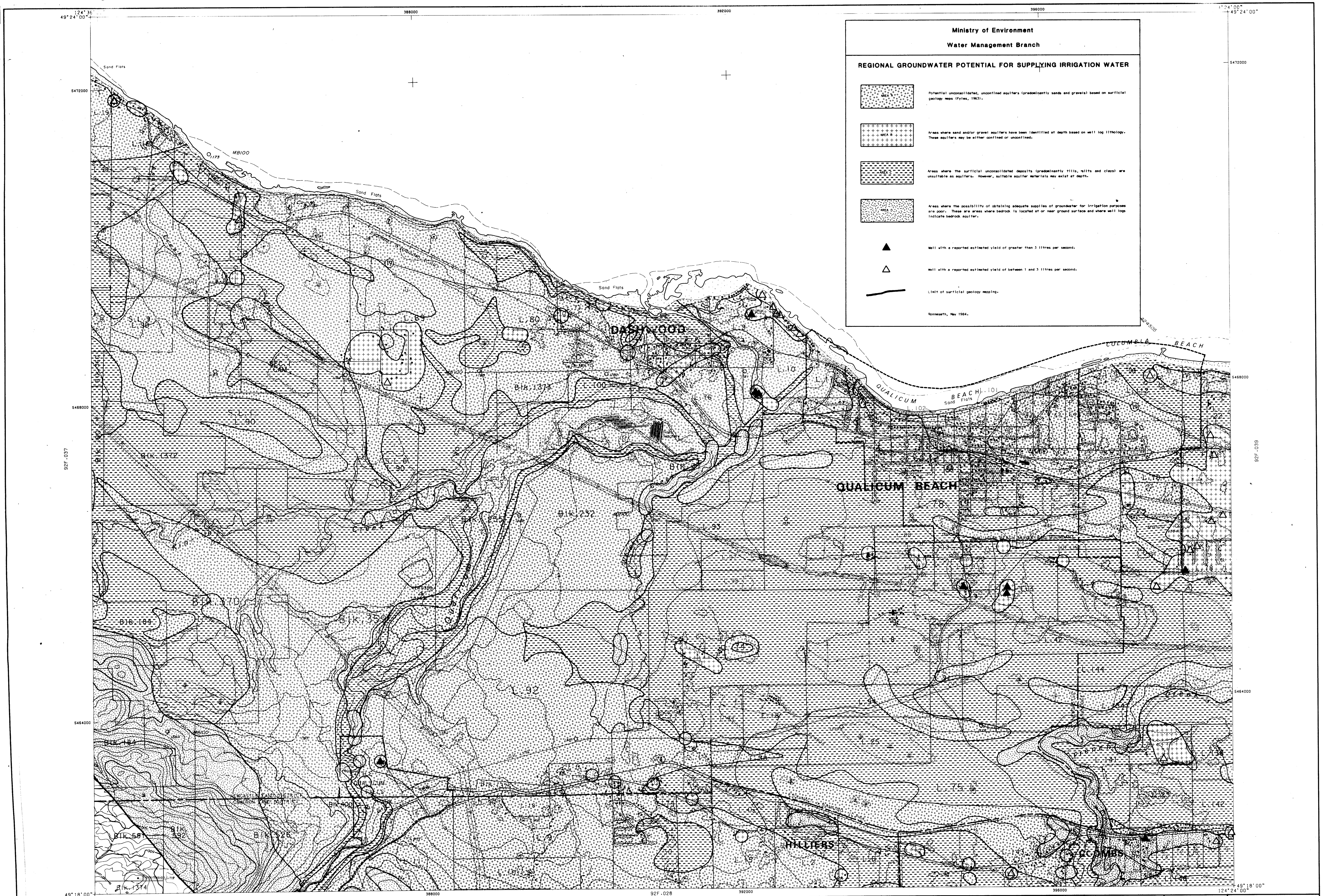
Clague, J.J. 1977. Quadra Sands: A Study of the Late Pleistocene Geology and Geomorphic History of Coastal Southwest British Columbia. Geological Survey of Canada, Paper 77-17, Ottawa, 24 p.

Fyles, J.G. 1963. Surficial Geology of Horne Lake and Parksville Map-Areas, Vancouver Island, British Columbia, 92F/7, 92F/8. Geological Survey of Canada, Memoir 318, Ottawa, 142 p.

Richards, L.A. (Editor). 1969. Diagnosis and Improvement of Saline and Alkali Soils. United States Salinity Laboratory Staff, Agricultural Handbook No. 60, United States Department of Agriculture, Washington, 160 p.

Kevin Ronneseth

K.D. Ronneseth
Hydrology Study
Ministry of Agriculture



PROVINCE OF BRITISH COLUMBIA — MINISTRY OF ENVIRONMENT

MAPPING CONTROL: FEDERAL GOV'T.
DATUM OF ELEVATIONS: GEODETIC
AIR PHOTOGRAPHY: B.C. & FEDERAL
DATE OF PHOTOGRAPHY: 1976-81
U.T.M. GRID: ZONE 10 (1975)
SHORELINE AS AT DATE OF PHOTOGRAPHY

BASE COMPLETED:
BASE SOURCE: PHOTOGRAMMETRIC
REVISION DATE:
LATEST PLAN No.:
LAND DISTRICTS: CAMERON, NANOOSE & NEWCASTLE
LAND TITLE DIST.: VICTORIA

DIST. LOT & TP. SEC.
SUBDIVISION LOT

TRIANGULATION STATION WITH ELEVATION
SURVEYED CONTROL POINT WITH ELEVATION
BENCH MARK
AIR PHOTO CENTRE
SURVEYED LOT TIE

BUILDING
CONTOURS & ELEVATION
APPROX. CONTOUR
WOODED AREA
SWAMP
CULTIVATED
DEPRESSION
SCRUB
TREED SWAMP
ORCHARD

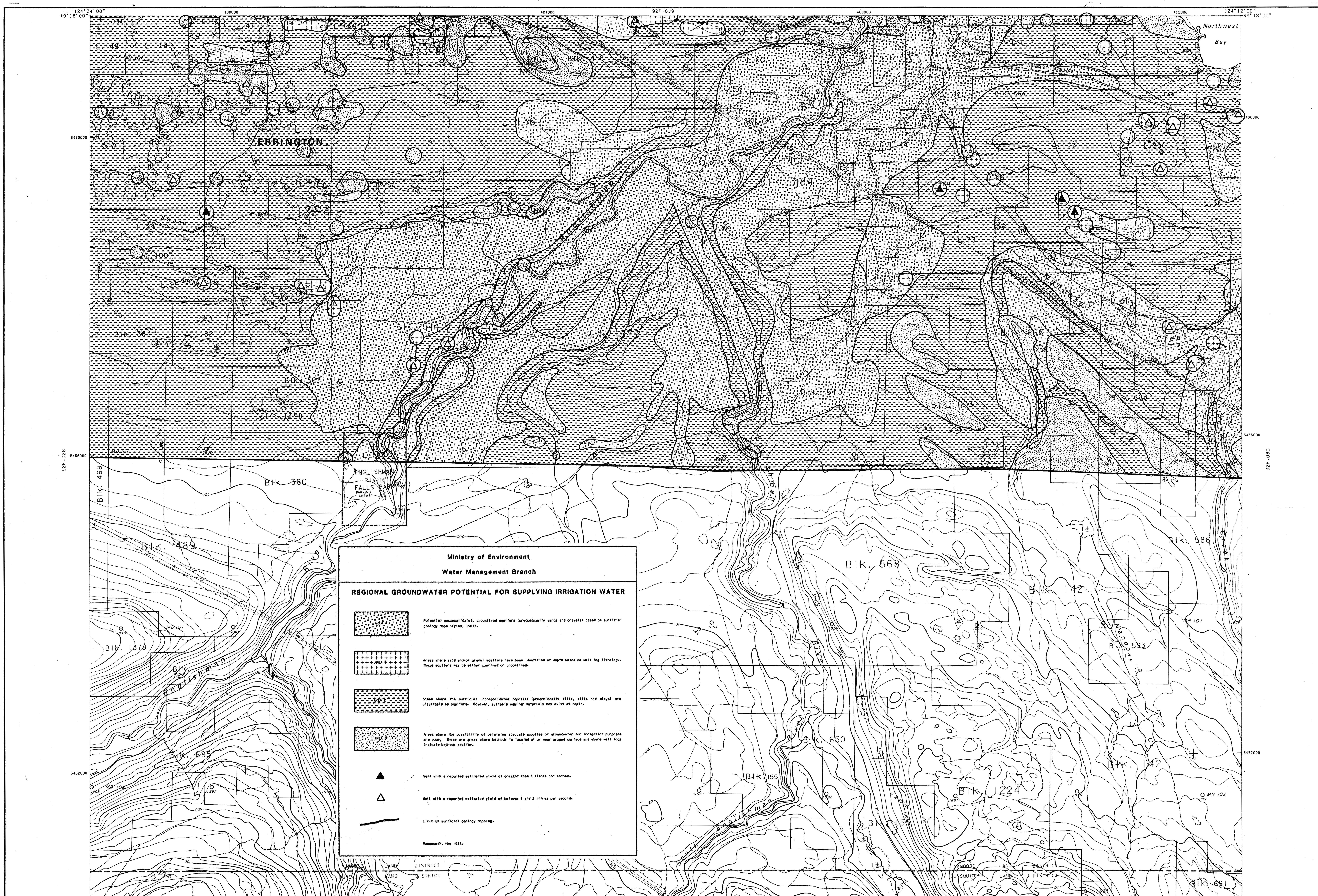
ROADS PAVED ROUGH
GRAVEL TRAIL
RAILWAY
POWER LINE ON POLE ON TOWER
FENCE
FLUME

SCALE : 1:20000
200 0 200 400 600 800 METRES
CONTOUR INTERVAL 20 METRES

PLANIMETRIC NEG. No. 214923
CADASTRAL DIGITAL
CONTOUR

SEE INDEX 92F
PROJECT No. 81-023P-C

92F.038



124°24'00"
49°18'00"
400000
404000
92F.039
408000
412000
124°12'00"
49°18'00"
Northwest Bay
ERRINGTON
Nanoose Creek
ENGLISHMAN RIVER FALLS PARK
PARKING AREAS
Blk. 380
Blk. 468
Blk. 469
Blk. 1378
Blk. 720
Englishman River
Blk. 895
Blk. 568
Blk. 586
Blk. 142
Blk. 593
Blk. 650
Blk. 155
Blk. 1224
South Englishman River
NANOOSE LAND DISTRICT
DUNSMUIR LAND DISTRICT
Blk. 691
92F.028
92F.030
49°12'00"
124°24'00"
92F.019
124°12'00"
49°12'00"
Ministry of Environment
Water Management Branch
REGIONAL GROUNDWATER POTENTIAL FOR SUPPLYING IRRIGATION WATER
AREA A
Potential unconsolidated, unconfined aquifers (predominantly sands and gravels) based on surficial geology maps (Fyles, 1963).
AREA B
Areas where sand and/or gravel aquifers have been identified at depth based on well log lithology. These aquifers may be either confined or unconfined.
AREA C
Areas where the surficial unconsolidated deposits (predominantly tills, silts and clays) are unsuitable as aquifers. However, suitable aquifer materials may exist at depth.
AREA D
Areas where the possibility of obtaining adequate supplies of groundwater for irrigation purposes are poor. These are areas where bedrock is located at or near ground surface and where well logs indicate bedrock aquifer.
Well with a reported estimated yield of greater than 3 litres per second.
Well with a reported estimated yield of between 1 and 3 litres per second.
Limit of surficial geology mapping.
Ronneseth, May 1984.

PROVINCE OF BRITISH COLUMBIA
MINISTRY OF ENVIRONMENT

MAPPING CONTROL: FEDERAL GOV'T.
DATUM OF ELEVATIONS: GEODETIC
AIR PHOTOGRAPHY: B.C. & FEDERAL
DATE OF PHOTOGRAPHY: 1976-81
U.T.M. GRID: ZONE 10 (1975)
SHORELINE AS AT DATE OF PHOTOGRAPHY

BASE COMPLETED:
BASE SOURCE: PHOTOGRAMMETRIC
REVISION DATE:
LATEST PLAN No.:
LAND DISTRICTS: DUNSMUIR & NANOOSE
LAND TITLE DIST.: VICTORIA

DIST. LOT & TP. SEC.
SUBDIVISION LOT

TRIANGULATION STATION WITH ELEVATION
SURVEYED CONTROL POINT WITH ELEVATION
BENCH MARK
AIR PHOTO CENTRE
SURVEYED LOT TIE

BUILDING
CONTOURS & ELEVATION
APPROX. CONTOUR
WOODED AREA
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CULTIVATED
DEPRESSION
SCRUB
TREED SWAMP
ORCHARD

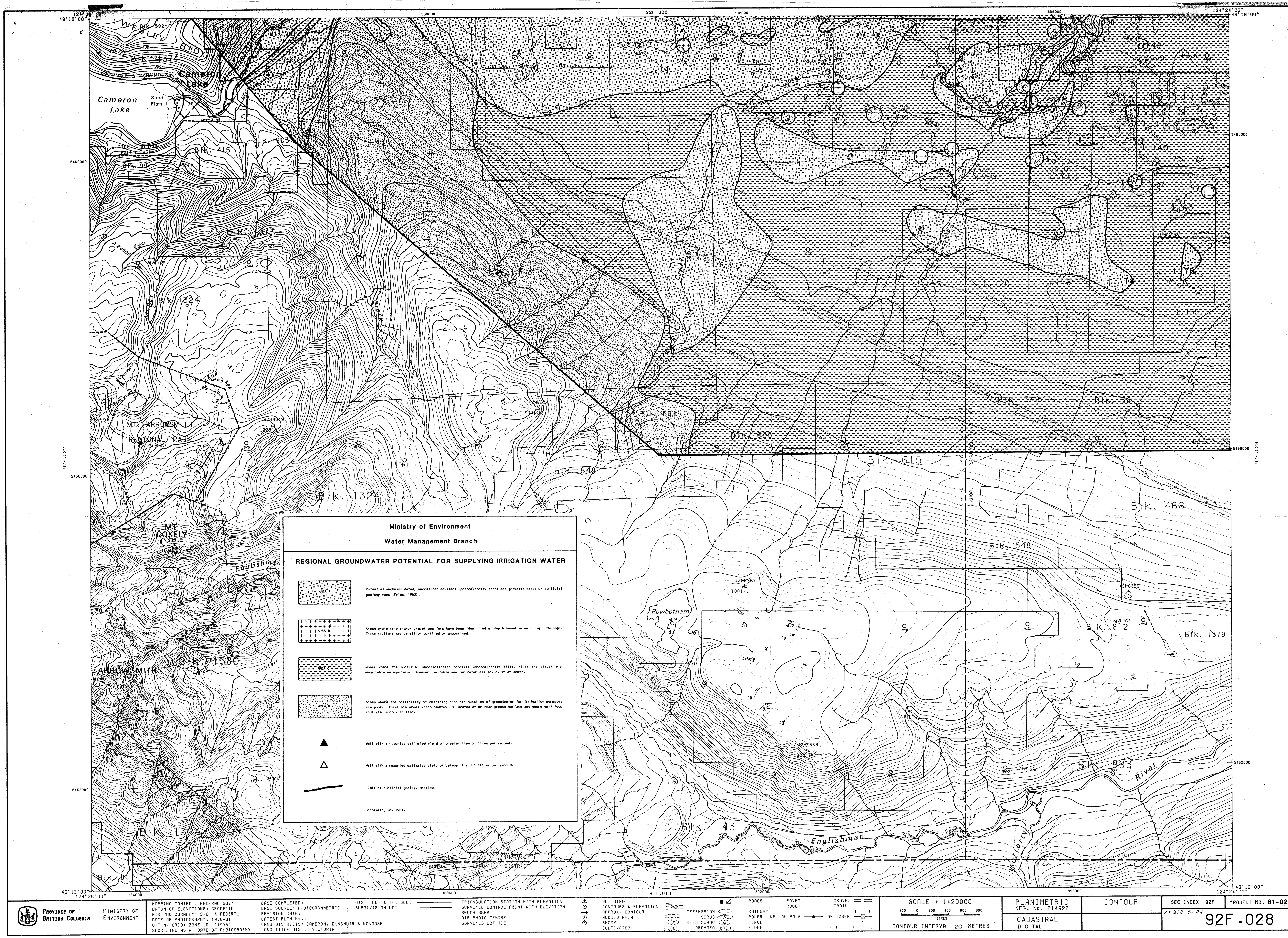
ROADS PAVED ROUGH GRAVEL TRAIL
RAILWAY
POWER LINE ON POLE ON TOWER
FENCE
FLUME

SCALE : 1:20000
METRES
CONTOUR INTERVAL 20 METRES

PLANIMETRIC
NEG. No. 214924
CADASTRAL
DIGITAL
CONTOUR

SEE INDEX 92F
PROJECT No. 81-023P-C
L=359.0158
92F.029

92F.029



Ministry of Environment
Water Management Branch
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Cameron Lake
Mt. Arrowsmith Regional Park
Mt Cokely
Mt Arrowsmith
Rowbotham
Englishman River
Fishtail
Blk. 1324
Blk. 615
Blk. 468
Blk. 548
Blk. 812
Blk. 1378
Blk. 143
Province of British Columbia
Ministry of Environment
Mapping control: Federal Gov't.
Datum of elevations: Geodetic
Air photography: B.C. & Federal
Date of photography: 1976-81
U.T.M. grid: Zone 10 (1975)
Shoreline as at date of photography
Base completed:
Base source: Photogrammetric
Revision date:
Latest plan No.:
Land districts: Cameron, Dunsmuir & Nanoose
Land title dist.: Victoria
Scale 1:20000
Contour interval 20 metres
Planimetric
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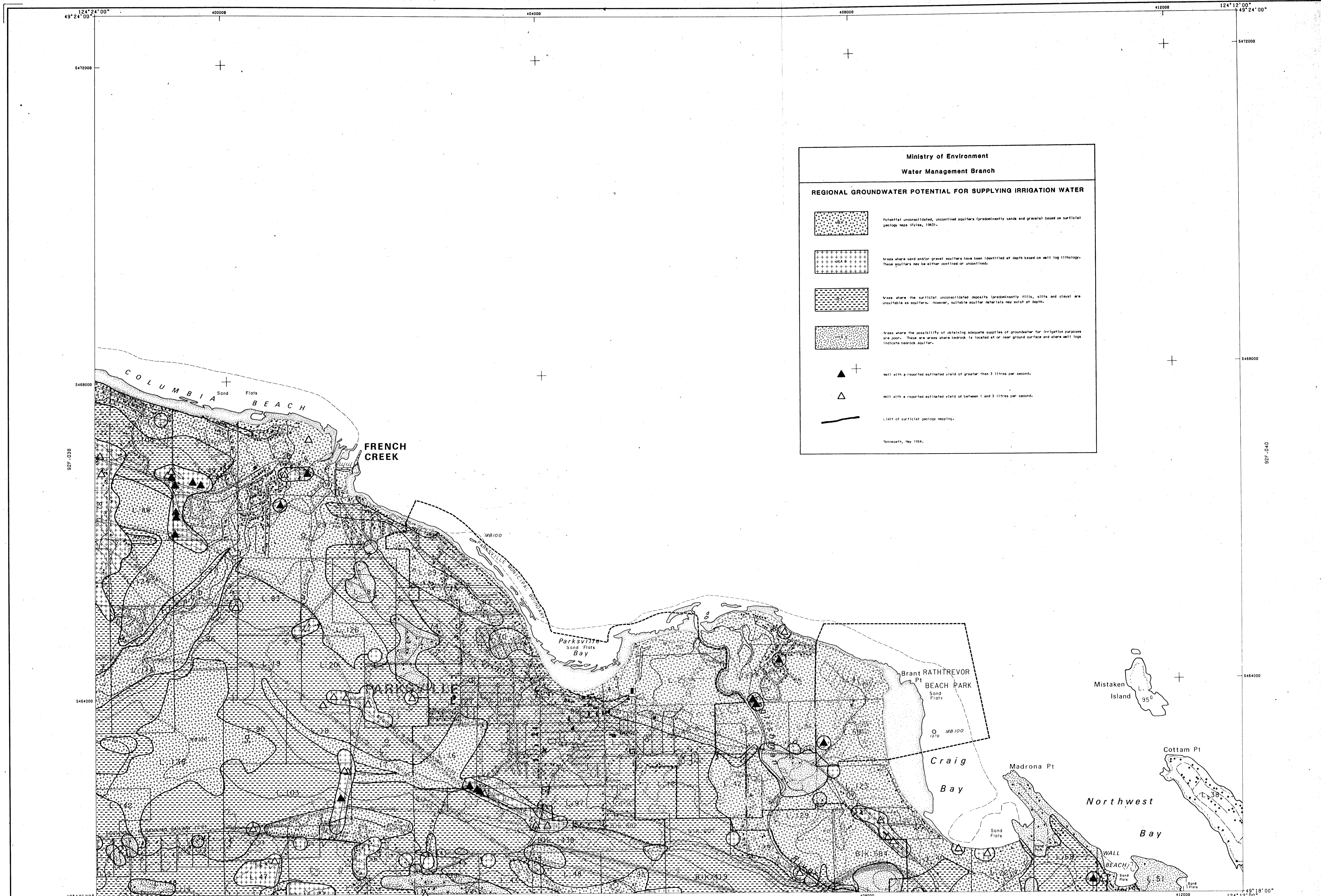
Cadastral
Digital
Contour
See index 92F
Project No. 81-023P-C
92F.028



Ministry of Environment

Water Management Branch

REGIONAL GROUNDWATER POTENTIAL FOR SUPPLYING IRRIGATION WATER

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△ — Well with a reported estimated yield of between 1 and 3 litres per second.

Limit of surficial geology mapping.

Ronneseth, May 1984.

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BASE COMPLETED:
BASE SOURCE: PHOTOGRAMMETRIC
REVISION DATE:
LATEST PLAN No.:
LAND DISTRICT: NANOOSE
LAND TITLE DIST.: VICTORIA

DIST. LOT & TP. SEC.
SUBDIVISION LOT

TRIANGULATION STATION WITH ELEVATION
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SURVEYED LOT TIE

BUILDING
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TREED SWAMP
ORCHARD ORCH

ROADS PAVED GRAVEL
ROUGH TRAIL
RAILWAY
POWER LINE ON POLE ON TOWER
FENCE
FLUME

SCALE : 1:20000
200 0 200 400 600 800 METRES
CONTOUR INTERVAL 20 METRES

PLANIMETRIC NEG. No. 214925
CADASTRAL DIGITAL
CONTOUR

SEE INDEX 92F
PROJECT No. 81-023P-C

92F.039