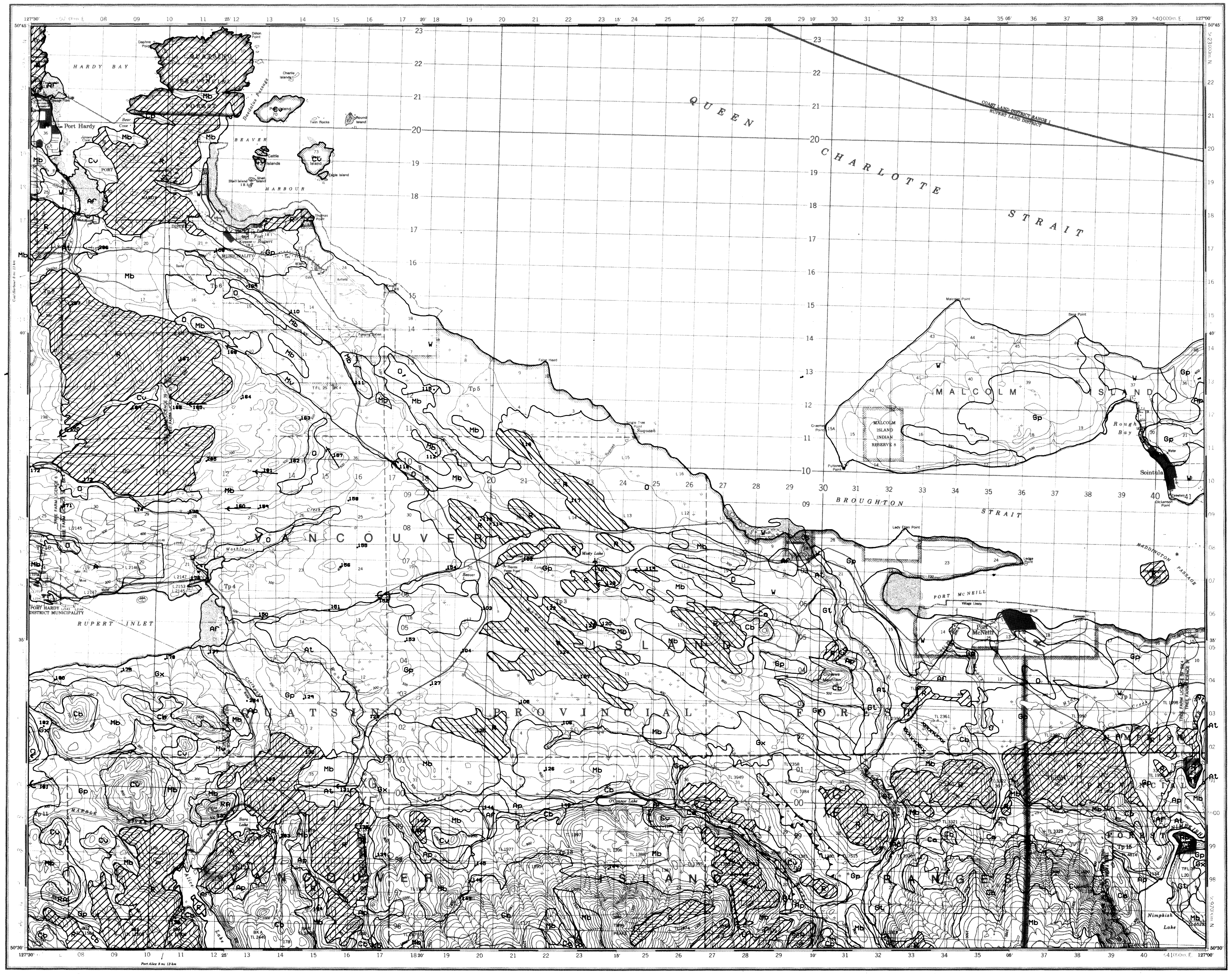
OF94-4



LEGEND

QUATERNARY

HOLOCENE - POST PORT McNEILL GLACIATION

A **ANTHROPOGENIC DEPOSITS**: culturally disturbed and modified terrain

O **ORGANIC DEPOSITS**: peat, muck and other vegetative materials at least 40 to 60 cm thick and often several metres thick; formed by the accumulation and decay of vegetative materials in depressions or level areas including bogs, fens and swamps

E **EOLIAN DEPOSITS**: well sorted, medium to fine sand and coarse silt; transported and deposited by wind action; generally > 1 m thick; occasionally forming dunes

COLLUVIAL DEPOSITS: clast- and matrix-supported diamicton or rubble resulting from the alteration of bedrock and other surficial materials through physical and chemical weathering and the downslope movement of materials; massive to well-stratified; reworked and transported by gravitational processes including creep, sliding, debris flow, avalanching, topple and rockfall

Cb **Colluvial blanket sediments**: diamicton or rubble; > 1 m thick

Ca **Colluvial apron and failure sediments**: rubble or diamicton in complex fans, aprons, talus cones; generally resulting from slope failures and localized movement including debris avalanches, debris slides, debris torrents and mudflows

Cv **Colluvial veneer sediments**: diamicton or rubble; < 1 m thick and/ or discontinuous; also pattern consisting of parallel lines inclined to left

ALLUVIAL DEPOSITS: gravel to silt size sediments deposited by rivers, streams and creeks; commonly well sorted and stratified; clasts often well rounded

Ap **Floodplain sediments**: cobble to pebble gravel, including minor sand, silt and clay; > 1 m thick; includes local organic and lacustrine deposits in abandoned channels, depressions and backswamp areas; floodplain areas subject to occasional stream flooding and sediment reworking

At **Alluvial terrace sediments**: cobble to pebble gravel, including minor sand, silt and clay; > 1 m thick; step-like topography, commonly marginal to channels and floodplains; well-drained areas not subject to stream flooding

Af **Alluvial fan sediments**: cobble to pebble gravel, including sand, silt and clay and diamicton deposits; > 1 m thick; well sorted to massive; includes areas subject to debris flows, flooding and stream avulsion

WISCONSINAN - PORT McNEILL GLACIATION

GLACIOLACUSTRINE DEPOSITS: well stratified sand, silt and clay, including minor gravel and diamicton deposited in lakes adjacent to glacial ice; slump structures, irregular topography, and kettles indicative of collapse from melting of buried ice commonly present

Lb **Glaciolacustrine blanket**: sand, silt and clay; > 1 m thick

Lv **Glaciolacustrine veneer**: sand, silt and clay; < 1 m thick and/or discontinuous; also pattern consisting of horizontal parallel lines

GLACIOMARINE DEPOSITS: well stratified silt and clay, including minor sand, gravel and diamicton deposited in ice-marginal depositional environment; dropstones and level topography is present

W **Glaciomarine sediments**: silt and clay, minor sand and gravel; > 1 m thick

GLACIOFLUVIAL DEPOSITS: cobble to pebble gravel, including minor sand and silt; generally > 1 m thick; deposited by rivers and streams flowing from or in contact with glacial ice, including glacial deltas; sorting good to poor; massive to well stratified; evidence of ice collapse including slumping, kettles and irregular topography common

Gp **Glaciofluvial plain**: cobble to pebble gravel, including minor sand and silt; planar topographic surface; generally > 1 m thick

Gt **Glaciofluvial terrace**: cobble to pebble gravel, including minor sand and silt; planar topographic surface cut into step-like terraces; generally > 1 m thick

Gd **Glaciofluvial delta**: cobble to pebble gravel, including minor sand, silt and diamicton; generally several metres thick

Gx **Glaciofluvial complex**: cobble to pebble gravel, including minor sand, silt and diamicton; generally several metres thick; includes areas consisting of up to 50 percent Gp, Gt, Mb and/or Mv

MORAINAL DEPOSITS: glacial diamicton, primarily till; generally consists of silty sand matrix and pebbles, cobbles and boulders; massive to stratified; deposited either directly by glacial ice or by sediment gravity flow processes associated with ice

Mb **Till blanket**: diamicton; > 1 m thick

Mv **Till veneer**: diamicton; < 1 m thick and or discontinuous; includes areas consisting of Cv and Gx; also pattern consisting of parallel lines inclined to right

PRE-QUATERNARY

R **Bedrock**: includes areas of thin colluvial and morainal cover

RA Bedrock outcrop areas subject to mass wasting processes including rockfalls, topples, avalanches and weathering

ON-SITE SYMBOLS

Drumlin, crag and tail

Striae, grooves, fabric (ice flow direction known; unknown)

Flutings

Moraine ridge (major, minor)

Esker (flow direction known; unkown)

Meltwater channel (major, minor)

Escarpment

Strandline

Sample site 215

Province of British Columbia
Ministry of Energy, Mines
and Petroleum Resources

BRITISH COLUMBIA GEOLOGICAL SURVEY

Geological Survey Branch

OPEN FILE 1994-4

SURFICIAL GEOLOGY OF THE PORT McNEILL AREA

NTS 92L/11

Geology by P.T. Bobrowsky and D. Meldrum

1:50 000

Miles 1 0 1 2 3 Miles

Metres 1000 0 1000 2000 3000 4000 Metres

For an overview of the Quaternary geology of the Port McNeill area please refer to the report entitled "Preliminary Drift Exploration Studies, Northern Vancouver Island (92L/6, 92L/11)" by P.T. Bobrowsky and D. Meldrum; *in* Geological Fieldwork 1993, Grant, B. and Newell, J.M., Editors, *B.C. Ministry of Energy, Mines and Petroleum Resources*, Paper 1994-1. Geology based on terrain map by A. Pattison (1979) and air photo interpretation followed by ground truthing in areas indicated on map. Fieldwork completed in 1993.

QUATERNARY GEOLOGY NOTES

The surficial geology of the Port McNeill map area consists of landforms and deposits resulting from two cycles of glaciation. Howes (1981, 1983) concluded that northern Vancouver Island had been glaciated twice during the Quaternary on the basis of drill-hole evidence for an "older till" underlying interglacial sediments and surface evidence bracketed by ^{14}C dates for Fraser Glaciation drift. In the absence of multiple till sections indicating more than one glaciation, Kerr and Sibbick (1992) implied that the area north of Quatsino Sound had been glaciated only once, most likely during the Late Wisconsinan. However, given the evidence presented by Howes, their interpretation is clearly unfounded. Nonetheless, the near-surface sediments observed in this study and by Kerr and Sibbick, relate to the last phase of glaciation and deglaciation; Port McNeill till and Port McNeill deglacial sediments, respectively.

Approximately 25 000 years ago, ice began to accumulate in several centres of British Columbia, including central Vancouver Island and the Coast Mountains north of Vancouver. As climatic conditions deteriorated, ice on the mainland expanded eastward into the interior and westward into the Strait of Georgia and Queen Charlotte Strait, whereas ice on Vancouver Island expanded locally to occupy topographic lows. Continued climatic deterioration resulted in a significant net transfer of water from the oceans to the ice sheets. This resulted in a eustatic lowering of sea level, a thickening of the ice mass up to 2 kilometres in the straits and 700 metres on Vancouver Island and a concomitant glacio-isostatic depression of the land surface to a maximum of about 200 metres (Clague *et al.*, 1982; Clague, 1983; Howes, 1983). Surrounding this depression was a forebulge which moved westward in union with the advancing ice sheet. At approximately 20 600 ± 330 years BP (GSC-2505), the coast east of Port Hardy and Port McNeill may have been depressed up to 100 metres, thereby inundating nearly 15% of the eastern study area with glaciomarine conditions. Isostatic depression on the west side of the island was also about 100 metres (Luternauer *et al.*, 1989). Glaciomarine sediments were deposited in submerged areas adjacent to the advancing glaciers. At the height of glaciation in this area, about 15 000 years ago, the Cordilleran ice sheet captured local ice masses and the dominant flow of ice was west to northwest, well beyond the present limit of land. During this period thick sequences of subglacial till were deposited in depressions and thinner veneers on topographic highs. Ice began to disappear from the area about 13 630 ± 310 years BP (WAT-721); depositing blankets of supraglacial debris in areas of *in situ* ice decay and thin but widespread accumulations of glaciofluvial sediments in areas of active retreat.

Bedrock outcrops with and without colluvial veneers are common in the high relief areas south of Port Hardy and on either side of Alice Lake in the northwest and southwest corners of the map area, respectively. Scattered outcrops also occur in the highland area south of Port McNeill. The oldest observed Quaternary sediments belong to the Port McNeill glaciation (Late Wisconsinan) and occur as blankets of till throughout the map sheet, but primarily in the south-central part of the study area surrounding O'Connor Lake and the area northeast of Rupert Inlet. Younger glaciofluvial deposits predominate in the low relief area east of Rupert Inlet, whereas marine and glaciomarine sediments are very common along the coast and on Malcolm Island. Holocene age fluvial sediments are not abundant but occur along all major and minor water-courses including the Nimpkish, Quatse and Cluxewe rivers as well as the Waukwaas and Coetkwaus creeks. Colluvial deposits occur as veneers and blankets throughout the map sheet but predominately in the west half. Organic deposits are most common in depressions at the transition between marine deposits and ridges of till or bedrock paralleling the coastline.

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