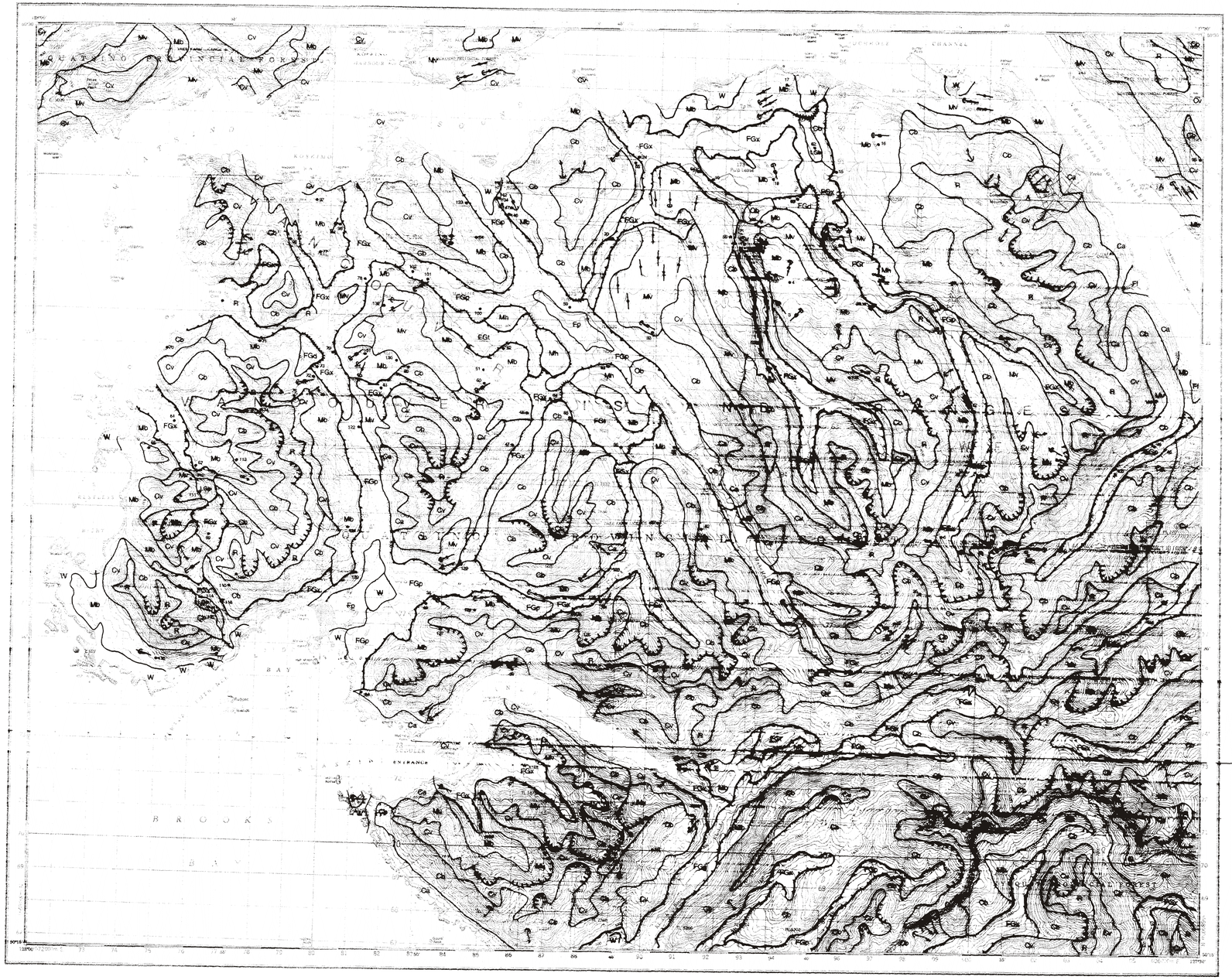

LEGEND

QUATERNARY

HOLOCENE

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

O **ORGANIC DEPOSITS**: peat and other vegetative materials at least 50 cm thick and often several metres thick; formed by the accumulation of organic matter in depressions or level areas including bogs, fens and swamps.

F **FLUVIAL DEPOSITS**: gravel to silt-size sediments deposited by rivers, streams and creeks; commonly well-sorted and stratified; clasts well-rounded.

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

Pf **Fluvial fan sediments**: cobble to pebble gravel, including sand and silt; generally > 1 m thick; well-sorted to massive; includes areas subject to debris flows, flooding and stream avulsion.

C **COLLUVIAL DEPOSITS**: massive and stratified, clast- and matrix-supported diamicton or rubble resulting from mechanical or chemical weathering of bedrock and other surficial materials, and the downslope movement of materials; mobilized and transported by gravitational processes including creep, sliding, debris flow, avalanching, topple and rockfall.

Cb **Colluvial blanket**: 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 related mass movements including debris avalanches, debris slides, debris torrents and mudflows.

Cv **Colluvial veneer**: diamicton or rubble; < 1 m thick and/or discontinuous.

Mv **MARINE DEPOSITS**: stratified sand, gravel and massive, matrix-supported diamictons deposited in near-shore depositional environments; generally > 1 m thick.

LATE WISCONSINAN

LG **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 noted.

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

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

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

FGt **Glaciofluvial terrace**: cobble to pebble gravel, including minor sand and silt; planar topographic surface cut into steep-sided terraces; generally > 1 m thick.

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

FGx **Glaciofluvial complex**: cobble to pebble gravel, including minor sand, silt and diamicton; generally several metres thick; includes areas consisting of up to 50 percent **Ffrg**, **FGt**, **Mfb**, **Mfh** and/or **Mfv**.

M **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.

Mfb **Till blanket**: diamicton > 1 m thick.

Mv **Till veneer**: diamicton < 1 m thick and/or discontinuous.

Mh **Morainal hummocks**: diamicton with irregular topographic surface; commonly with kettle lakes, closed depressions and ridges and knobs; generally several metres thick.

PRE-QUATERNARY

R **Bedrock**: includes areas of thin colluvial and morainal cover; subject to mass wasting processes including rockfalls, topples, avalanches and weathering.

AIR-SIDE SYMBOLS

- Cirque
- Drumlin, crag and tail (iceflow direction known, unknown)
- Striae, grooves, (iceflow direction known, unknown)
- Iceflow (direction inferred from clast fabric in basal till)
- Moraine ridge
- Esker (flow direction known, unknown)
- Meltwater channel
- Terrace escarpment
- Landslide
- • 123 Field station

Province of British Columbia
Ministry of Energy, Mines
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SURFICIAL GEOLOGY OF THE MAHATTA CREEK AREA

NTS 92L/5

Geology by D.H. Huntley and P.T. Bobrowsky

1:50 000

Kilometres 0 1 2 3 miles
Metres 1000 0 1000 2000 3000 4000 Metres
Feet 1000 0 1000 2000 3000 4000 Feet
Contour interval 100 Metres

Surficial geology of the Mahatta Creek area refer to the paper "Surficial Geology and Drift Exploration Potential, Quatsino Sound (92L/5)" by D.H. Huntley and P.T. Bobrowsky, *in* Geological Fieldwork 1994, Grant and Newell, Eds. Paper 1995-1, BC Ministry of Energy, Mines and Petroleum Resources. Paper 1995-1. Geology based partly on terrain map by A. Bornhold (1988), where photo interpretation followed by ground trothing at field stations indicated on map. Bedrock geology from Howes 1983, with assistance by D. Brayshaw.

QUATERNARY GEOLOGY NOTES

The Mahatta Creek map area comprises two physiographic elements: i) coastal margins flanking Quatsino Sound and Side Bay are dominated by glacially-smoothed, joint and fault-fractured bedrock hillsides, ranging in height from 10 to 100 m; ii) centralized southeastern portions are dominated by a glaciated montane landscape with highly variable relief. Montane and coastal areas are incised by U-shaped valleys that drain to fjords including Quatsino Sound, Neroutsos Inlet, Klaskino and Klaskish inlets. Valleys and fjords exhibit regional northwest and northeast-trending trends.

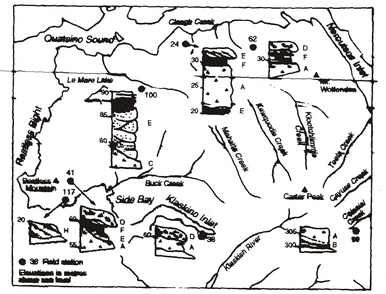
During the early part of the late Wisconsinan, ice accumulated in upper drainages on major peaks in the east-central part of the map area. Early ice flow was controlled by valley orientation. By the glacial maximum (ca. 15 000 years ago), valley glaciers were confluent with larger west-flowing ice streams occupying Quatsino Sound and Klaskino Inlet. At this time, lodgement and basal melt-out tills were deposited over glacially-smoothed bedrock. These tills are presumed to be cumulative with the Boat McNeill drift (Howes, 1983). During full glacial conditions, a stable ice-surface elevation varied from 880 metres above sea level in the east, to 600 metres above sea level along the western seaboard, about 2% of the map area was likely ice-free. Ice thicknesses greater than 900 m were attained by ice streams in Neroutsos Inlet and Quatsino Sound. Glacial erosion ice-thickness gradients in eastern montane valleys, to 550 metres in western coastal areas. Above the glacial limit, relict solifluction deposits and felsenmeer indicate that periglacial conditions prevailed.

Deglaciation probably began around 13 630 ± 340 years before present (WAT-721), with glaciers in coastal margins and lower valley reaches downwasting *in situ* as they became isolated from source areas. As ice melted, ablation tills were locally deposited, forming hummocky ground moraines. Kames, eskers, terminal spillways and meltwater channels formed in proximity to these moraines and indicate a complex pattern of ice retreat. Meltwater drained to outlets at Side Bay, Klaskino Inlet, Klaskishness and Cleagh creeks. Later, supraglacial channels formed on remnant glacier ice occupying Quatsino Sound and Side Bay and drained to ice-free areas of the continental shelf. Glaciofluvial and glaciolacustrine deposits were graded to stable ice-contact elevations at 210, 152, 90, 60 and 30 metres above sea level.

In early Holocene times, glacio-isostatically depressed coastal lowlands were inundated to a maximum height of 20 metres above sea level. In these areas, glacial and deglacial sediments were locally reworked and subsequently exposed through crustal rebound. Terrestrial glacial sediments on slopes were extensively mobilized and redeposited to form a variety of colluvial deposits. Elsewhere, glacial deposits were modified *in situ* by pedogenesis. Underlying geology, dominated by acidic Bonanza Group volcanics, favoured the development of podzols with distinctive aluminum and iron-rich B horizon horizons. Fluvial deposits of variable thickness are located into older units along valley floors. Organic deposits are rare and restricted to poorly drained depressions.

Howes, D.E. (1983): Late Quaternary Sediments and Geomorphic History of Northern Vancouver Island, British Columbia; *Canadian Journal of Earth Sciences*, Volume 20, pages 57-65.

Huntley, A. (1979): Terrain Geology of the Mahatta Creek area, NTS 92L/5; Ministry of Environment, Lands and Parks, 1:50 000 Scale.



SIMPLIFIED LITHOSTRATIGRAPHY

Morainal Facies
- A - Lodgement till (M)
- B - Basal melt-out till (M)
- C - Ablation till (M)

Colluvial Facies
- D - Colluvium (C)

Other Facies
- E - Glaciofluvial sediments (FG)
- F - Glaciolacustrine sediments (LG)
- G - Fluvial sediments (F)
- H - Marine sediments (M)