

LEGEND

QUATERNARY
Q QUATERNARY DEPOSITS: Sand and gravel.

LATE CRETACEOUS

uKga uKga
 exposed covered
GABRIOLA FORMATION: Thick-bedded, channelized, clast-supported, pebble-cobble conglomerate containing predominantly mafic and felsic extrusive clasts; interbedded with medium-grained, poorly to moderately sorted, light olive grey, massive sandstone (feldspathic litharenite) with 5% detrital mica; minor mudstone.

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 exposed covered
SPRAY FORMATION: Massive, olive grey mudstone (65%) intercalated with thin- to locally thick-bedded, light olive grey, massive, parallel and current ripple laminated sandstone (feldspathic litharenite to lithic arkose arenite, 35%) containing 5-7% detrital mica.

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 exposed covered
GEOFFREY FORMATION: Thick-bedded, channelized, clast-supported pebble-cobble conglomerate containing predominantly mafic and felsic extrusives and mafic intrusive clasts; in a matrix of medium-grained, light olive grey sandstone. Conglomerate is interbedded with medium- to coarse-grained, light olive grey, massive, parallel and current ripple laminated, thick-bedded sandstone (feldspathic litharenite); minor mudstone.

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 exposed covered
NORTHUMBERLAND FORMATION: Massive, dark grey mudstone containing abundant calcium carbonate concretions. Mudstone is locally interlaminated and interbedded with siltstone and fine-grained, parallel and current ripple laminated sandstone. Common clastic dikes and slump folded layers.

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 exposed covered
DE COURCY FORMATION: Massive, light-olive grey, medium- to coarse-grained, poorly sorted, thick-bedded sandstone (feldspathic litharenite) containing 45-50% rock fragments including 15% chert. Sandstone is interbedded with thick-bedded, channelized, clast-supported pebble-cobble conglomerate containing a high proportion of mafic and felsic extrusive clasts.

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 exposed covered
CEDAR DISTRICT FORMATION: Massive, dark grey mudstone containing abundant calcium carbonate concretions. Mudstone is locally interlaminated and interbedded with siltstone and fine-grained, thin-bedded parallel and current-ripple-laminated sandstone. Common clastic dikes and slump folded layers.

SYMBOLS

Stratigraphic contact - defined	Primary fracture	75
Stratigraphic contact - approximate	Secondary fracture	75
Stratigraphic contact - inferred	Primary vertical fracture	45
Outcrop extent	Secondary vertical fracture	45
Bedding, tops known	Fault, normal	71
Macrofossils (not exactly located)	Fault, unknown sense	71
	Lineation, slickenline	9

General stratigraphy of the Upper Cretaceous Nanaimo Group

FORMATION

- Gabriola
- Spray
- Geoffrey
- Northumberland
- De Courcy
- Cedar District
- Protection
- Pender
- Extension
- Haslam
- Comox (Sidney Island)

Regional Basements

- Chuckanut & Huntingdon Fms
- Late Cretaceous Nanaimo Group
- Wrangellia
- Cascades

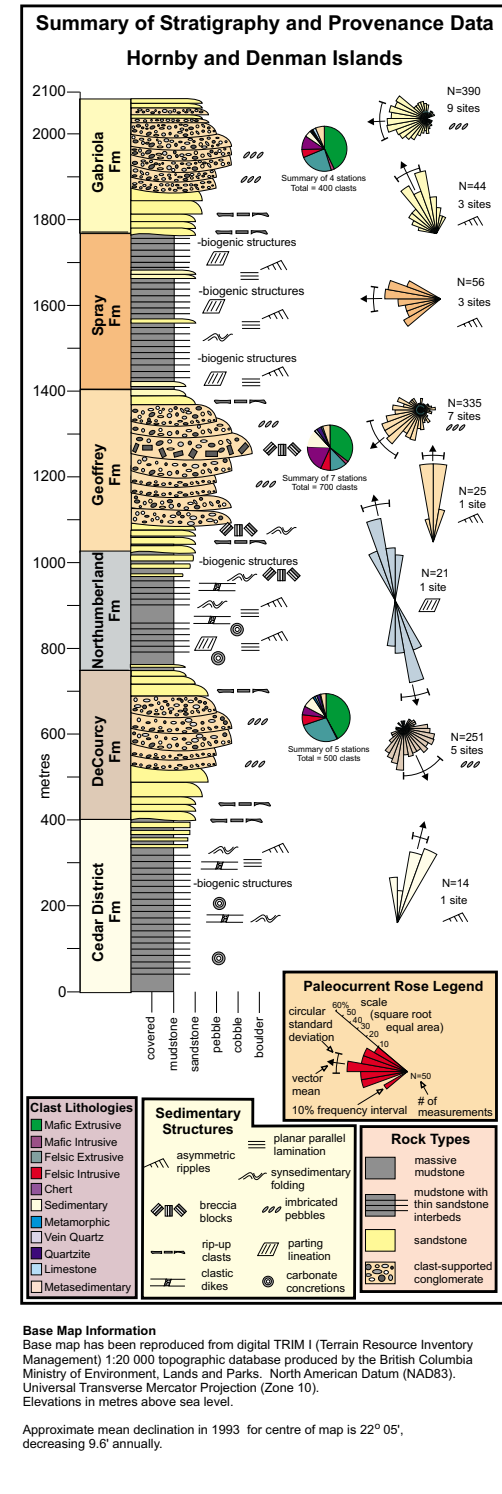
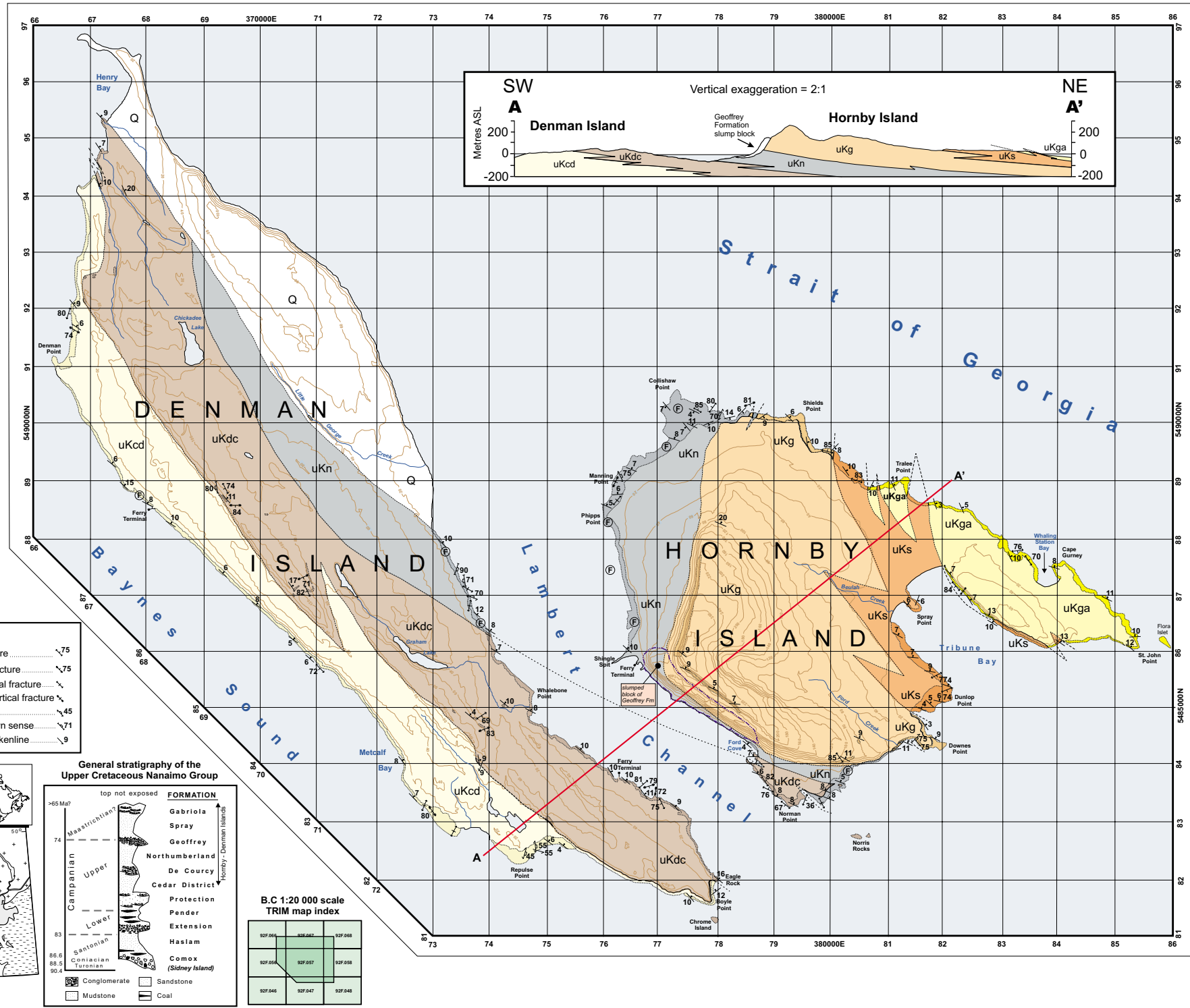
Sedimentary Basins

- Chuckanut & Huntingdon Fms
- Late Cretaceous Nanaimo Group
- Wrangellia
- Cascades

Regional Basements

- Chuckanut & Huntingdon Fms
- Late Cretaceous Nanaimo Group
- Wrangellia
- Cascades

Location Map



B.C. Geological Survey Branch

GEOSCIENCE MAP 2001-3

GEOLOGY OF DENMAN AND HORNBY ISLANDS, BRITISH COLUMBIA

NTS 92F/7E; 92F/10

By D.C. Katnick and P.S. Mustard

Scale 1:50 000

Note: map originally produced as figure BP-1 to accompany unpublished M.Sc. thesis of D.C. Katnick, 2001, Simon Fraser University.

NOTES

Denman and Hornby islands represent the best exposed northern occurrence of the upper two-thirds of the Nanaimo Group, a Turonian to Maastrichtian (~90 to 65 Ma) or younger sedimentary package deposited within a single sedimentary basin during the Late Cretaceous Period. The succession on these islands is both well-preserved and minimally deformed, although in general the basin was buried, lithified, uplifted and deformed during the last 60 Ma. Exposures are nearly continuous along the islands coasts, but inland are restricted to road cuts, cliffs and rare small outcrops. Effects of Pleistocene glaciation are most evident as scattered glacial erratics, thin till cover and rare exposures of glacially eroded bedrock. These probably generally reflect the last (Fraser) glaciation (about 25,000 to 10,000 ybp). Thick deposits of pro-glacial sands and gravels of the Quadra Sand covers the north-east part of Denman Island and are also exposed in several gravel pits.

Stratigraphy

More than two kilometres of sedimentary strata are preserved, consisting of conformable and laterally intertonguing successions, with sandstone-conglomerate dominated units separated by mudstone and fine-grained sandstone assemblages. These represent the upper six formations of the Nanaimo Group. From lowest these are: the upper Cedar District Formation, the De Courcy, Northumberland, Geoffrey and Spray formations, and the lower part of the Gabriola Formation. The age of the lower three formations is well constrained by common macrofossils and microfossils. These indicate a range spanning from about the mid Campanian to the late Campanian / early Maastrichtian stages of the Cretaceous Period (about 80 to 70 Ma). However, no fossils have been recovered from the upper three formations. These have generally been considered to also be Late Cretaceous (thus about 70 to 65 Ma) based on the apparent conformable depositional contact with the underlying unit, apparent continuity of deposition, and on rare fossil evidence from correlative formations of the southern Gulf Islands. However, the only constraint on the upper age is that in other places the Nanaimo Group is unconformably overlain by late Paleocene sedimentary units.

Structure

The succession exposed on Denman and Hornby islands occurs as a structural homocline with beds dipping gently to the northeast (average 8°). There is no evidence of major structural features such as significant faults and folds. This interpretation contrasts with previous maps, which show major faults with significant (100's of m) of dip-slip displacement. On Denman Island, minor faults with a few metres of displacement coincide with the laterally intertonguing depositional contact of the Cedar District and De Courcy formations, mimicking significant fault offset, but actually a depositional feature with later very minor faulting. On Hornby Island extensive sedimentary slump blocks, breccias and slump-folded intervals occur in several places, and appear to have been misinterpreted as post-depositional fault effects by some earlier workers. However, there are minor faults and at least two well developed fracture sets. These minor features are generally sub-vertical and the main sets trend to the northeast and northwest. The few well-exposed minor faults are normal faults with <10m offset.

Depositional Environments

The Nanaimo Group on these islands is interpreted as deposited in relatively deep water with sediment gravity flows as the main transport mechanism. Multiple coalescing submarine fans are considered the main depositional setting. These fans were sand-rich with elements of gravel-rich systems and fed by submarine canyon point sources cross-cutting a narrow, adjacent shelf. Paleocurrents, paleoslope indicators, conglomerate clast types, and lateral facies variations all suggest that the submarine fans came from eastern or north-eastern sources and were deposited into a basin open to the west. The Coast Belt to the east and the Cascades to the southeast were probably the predominant source areas, although some rare clast types are not common to either of these proposed sources.