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DEVONIAN AND SILURIAN ROCKS
BETWEEN MOUNT BERTHA AND
NABESCHE RIVER, NORTH EASTERN
BRITISH COLUMBIA

Dr. G. J. Dickie

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by Dr. G. J. Dickie

RECOMMENDATIONS

The rocks considered to be most prospective for further mineral exploration occur in the Perkins and Reef Mountain prospects of the Lady Laurier Lake area, and in the Neil claims of the West Bertha area. These rocks appear to be suitable host rocks for mineralization (i.e. strongly re-crystallized dolomite), they occur over a wide area, and their continuation at depth is predictable. The anomaly south of Mount Bertha appears promising also but the rocks causing the anomaly are poorly exposed.

The stratigraphic position of these prospective rocks is similar to that of the ore bearing unit at Robb Lake, and can be equated with the lower Pine Point Formation of early Mid Devonian age.

STRATIGRAPHY

Silurian

The oldest confirmed rocks in the study area are of Silurian age and occur in the centre of major anticlines and in overthrust blocks from the west. As a general rule, the Silurian rocks are dark grey in outcrop and consist of fossiliferous dolomite, cherty dolomite, sandstone and shale. The most conspicuous and useful fossils are corals and brachiopods in particular the coral genus Halysites which does not occur in the Devonian. The corals generally occur in a fine-to-micro-crystalline dolomite and indicate clear, shallow water deposition while the brachiopods are found in a shaly dolomite, indicating muddy depositional conditions.

Interbedded Silurian dolomites and sandstones form resistant units and occur widely in the core of the Bernard Anticline and as thrust sheets west of Mt. Bertha. More shaly sections are found in the thrust blocks to the west and north of the Bernard Anticline. It appears that the muddy depositional conditions predominated to the west, and the clear, shallow seas were more to the east.

Lower Devonian

Sandstone

A section of quartz sandstone overlies the known Silurian

dolomites in the area west of Mt. Bertha and may be equivalent to the Wokkash Formation defined by Taylor and Mackenzie (1970). No fossils were found in or near the sandstone but in a stratigraphically equivalent position north of Lady Laurier Lake, fossils of early Devonian or late Silurian age were collected.

Dolomite and Sandy Dolomite

The quartz sandstone in most occurrences grades upward into a dolomitic quartz sandstone to a sandy dolomite over approximately 100 feet. Overlying the very sandy sequence is approximately 800 feet of alternating dolomitic sandstone, sandy dolomite, and crinoidal, microcrystalline dolomite with no age significant fossils. Various horizons in this formation (which correlates with the Stone Formation of Taylor and Mackenzie) have been partly recrystallised to white coarse crystalline dolomite with large quartz crystals formed in vugs. The recrystallised zones are less resistant and often occur under talus and show the "breccia" texture.

Middle Devonian (Dunedin Formation)

Middle Devonian rocks are black shaly limestones with the development of dark grey fossiliferous "reefal" dolomites at various stratigraphic levels. In some cases, these dolomites directly overlie the light grey Lower Devonian dolomites and the boundary must be drawn on the colour of the rock and the

indications of fossils. Where extensive recrystallisation has occurred, the boundary cannot be distinguished. The "reefs" in the Mt. Bertha area are small in area and are about 50 feet thick, resembling scattered patch reefs which were subsequently covered by shaly limestone -- a deep water environment. The area of patch reefs grades south into the thicker reefs of the Robb Lake area and the Reef Mountain area. The carbonate buildup on Reef Mountain which appears to be reefal is about 200 feet and a similar thickness is found $1\frac{1}{2}$ miles south of the Westoll prospect. In the Nabesche area, reefal developments are again numerous but small in area and in thickness.

Good faunal samples established that all of the reefs were equivalent to the Pine Point Formation (C.R. Stelck) and that the overlying shaly limestones were the same age or only slightly younger.

The reefal dolomites were strongly recrystallised in many places and showed the "zebra" banded texture. However only minor visible mineralization was found in these dolomites.

Middle Devonian to Mississippian (Besa River Shale)

The black, non-calcareous shales of the Besa River Formation are very widespread in the area and overlie either the shaly limestone or recrystallised dolomite. The contact is usually conformable but the lithologic change is always distinct. The shales underlie the broad flat knolls in the West Bertha area

and probably underlie the entire valley west of Mt. Bertha. The dolomite in the Robb Lake area is terminated to the east by the black shales as are the Middle Devonian formations in the Laurier area. In the Wabesche area, the black shales overlies the Middle Devonian reefs and also contain Upper Devonian reefs. The Besa River Formation could be subdivided in this area.

The Besa River shales outcrop only in creeks and usually are very fissile and contorted. Consequently, it is difficult to interpret any structures in the shale. It apparently reacted very pliantly to stress.

Mississippian (Prophet Formation)

These rocks were not examined in outcrop, but from the air they appear to be dark, shaly and cherty dolomites. Part of the formation is recessive and forms valleys in conjunction with the Besa River shales. Other parts form low, linear ridges in these valleys so are slightly more resistant.

POROSITY, RECRYSTALLIZATION, AND POSSIBLE HOST ROCKS

The host rocks from the Robb Lake ore body were originally grey fine to medium crystalline dolomite possibly with some fossil fragments. The dolomite has subsequently been extensively recrystallised to white, coarse crystalline dolomite along a series of small fractures in the rock. The resulting rock has the appearance of a dolomite "breccia", but shows no characteristics of a true breccia apart from the angular fragments.

Much dolomite of a very similar type was found in all of the claim areas, particularly in the east of the Laurier area on Reef Mountain and in the Perkins prospect. Two differences are apparent -- the Laurier rocks still have very high porosity while most of the Robb Lake rocks have been fully cemented, and there are abundant quartz crystals in the Laurier rocks while quartz is rare at Robb Lake.

The main recrystallised zone is between the sandy dolomites of (?) Lower Devonian age and the fossiliferous dolomites of the Middle Devonian. Apparently, rocks of both units are affected by the recrystallization, and may have been caused by subaerial exposure of the rocks and the passage of evaporite formation waters at the end of the period of reef growth.

Another type of recrystallization is a more local effect where fine (0.2 inch) alternating bands of grey original dolomite and white, coarse crystalline dolomite occur. This "zebra"

rock is found near the ore zone at Robb Lake, and it was thought that it may be a useful feature. The banding was found, in this survey, closely associated with Stromatoporoids in the dolomite reefs and the fine bands probably originate in the layered structure of the Stromatoporoids. Therefore the "zebra" banding will point to a reef, but it is unclear whether a reef points to an ore concentration.

STRUCTURE

There are two main structural features in the area:

1. a series of NNW - SSE trending anticlines and synclines;
2. very strong thrusting from the WSW.

In the Laurier and Nabesche areas, the broad, gently folded Bernard Anticline is the prominent structure. On the east limb of the anticline the dips steepen rapidly and there appears to have been underthrusting within the strata on the east, causing a repetition of section in places. On the west a major thrust plate of Silurian and Ordovician shales and carbonates overrides the anticline and covers the western equivalents of the Devonian rocks on the east. In the south, a second thrust sheet containing Devonian rocks parallels the anticlinal structure but there is no evidence that this outer sheet containing Devonian rocks extends further north than the Nabesche River.

North of Lady Laurier Lake, the thrusting carries Devonian and Silurian rocks well to the east forming a multiple thrust block, and cutting off the nose of the Bernard Anticline. Between Lady Laurier Lake and Robb Lake, Silurian rocks are thrust over to the Besa River Shales and there are no Devonian carbonates present. At Robb Lake, there appear to be two anticlines in the Devonian carbonates, but on the west a major Silurian thrust block overrides much of the Devonian section.

The structure at the Cusker claims south of Sidenius Creek is unclear and complex. A large mountain of flat lying Silurian and Ordovician rocks seems to be adjacent to outcrops of Devonian sandy dolomites. A normal fault has been drawn on the geological map but it is not definite. The Devonian carbonates are tightly folded in an overturned anticline which can be traced to the northern limit of the map. Further to the west, one thrust sheet carries a section of Silurian and Devonian rocks over Middle Devonian limestone and then another thrust brings Silurian over Devonian.

The axis of the overturned anticline in Devonian carbonates may become a thrust plane in places in response to further compression. The east limb of the anticline produces further, gentler folds until it is thrust on to Besa River shales.

Mount Bertha and the hill to the south is a gently dipping thrust block in which the west edge has high dips and could pass into a structurally complex zone in the valley west of the mountain.

Summary

The area has been subjected to large-scale compression in a West-East direction and the resulting structures indicate multiple periods of deformation. Initially, the rocks were folded into large anticlines and synclines but continued

pressure caused steepening of the limbs and overturning. Thrusting occurred both with very large blocks and also as smaller structures within blocks. Compression may still have continued because some of the thrust planes appear to be deformed, eg Mt. Bertha.

BRIEF EVALUATION OF PROSPECTS

HASTINGS - LEE

No suitable host rock for mineralization. Lithology mostly shales and fine crystalline dolomite. Structurally complex with folding in each of the thrust blocks.

PERKINS

Strongly recrystallized dolomite very widespread. Structure apparently simple - beds dipping east at 30°. Thick zone of porous, recrystallized dolomite.

WESTOLL

No evidence of good potential host rock. Mostly finely crystalline dolomite. Some recrystallized zones. Structurally simple beds dip east at 60° but may be underthrust from the west.

REEF MOUNTAIN

Excellent and widespread potential host rock. Strongly recrystallized dolomite with porosity. Structure simple, beds dip 30° North. Iron mineralization and minor galena.

SOUTH CUSKER

Thin zones of recrystallized dolomite but mostly fine crystalline

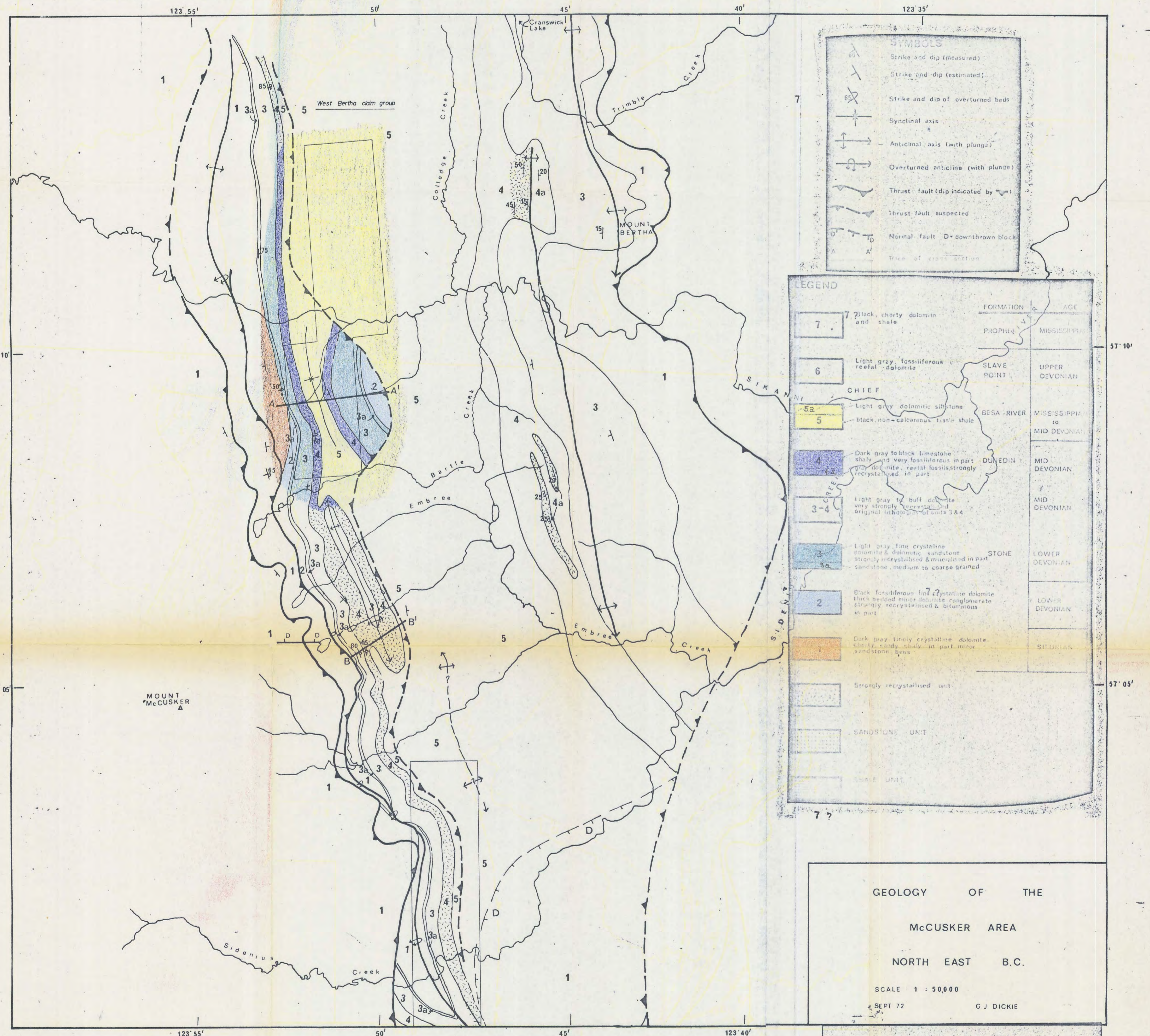
and sandy dolomite. Structure simple, beds dipping 30° West.
No mineralization.

NEIL

Extensive bands of recrystallized dolomite continuous on the overturned east limb of the anticline and in structures to the east. Structure may be complex but beds are readily mappable along strike.

SOUTH BERTHA

No good outcrop but stratigraphically equivalent to Robb Lake and units in NEIL prospect. Structurally simple, gentle anticline dips less than 30°.



SYMBOLS

	Strike and dip (measured)
	Strike and dip (estimated)
	Strike and dip of overturned beds
	Synclinal axis
	Anticlinal axis (with plunge)
	Overturned anticline (with plunge)
	Thrust fault (dip indicated by arrow)
	Thrust fault suspected
	Normal fault
	D = downthrown block
	Trace of cross section

LEGEND

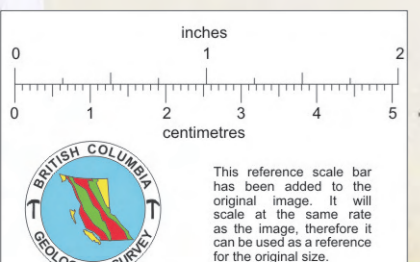
FORMATION	AGE
7	MISSISSIPPIAN
6	UPPER DEVONIAN
5a	MISSISSIPPIAN to MID DEVONIAN
5	MID DEVONIAN
4	MID DEVONIAN
3-4	MID DEVONIAN
3	LOWER DEVONIAN
3a	LOWER DEVONIAN
2	LOWER DEVONIAN
1	SILURIAN

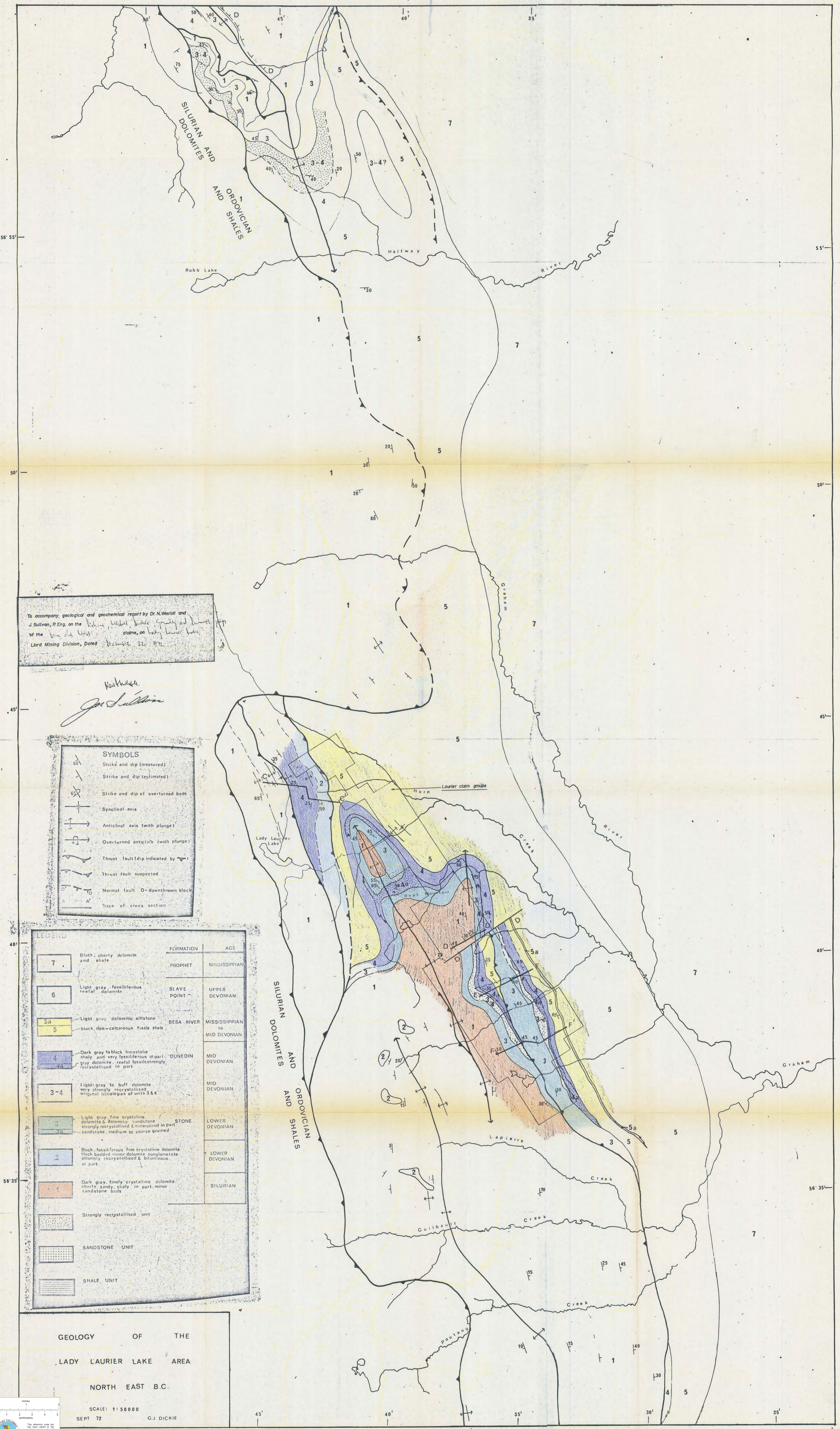
	Strongly recrystallised unit
	SANDSTONE UNIT
	SHALE UNIT

GEOLOGY OF THE
McCUSKER AREA
NORTH EAST B.C.

SCALE 1 : 50,000
SEPT 72 G J DICKIE

To accompany geological and geochemical report by Dr. N. Westoll and J. Sullivan, P. Eng. on the Bertha claims, on the Sidenius Creek claims, on the Llard Mining Division, Dated Sept 72





To accompany geological and geochemical report by Dr. N. Westoll and J. Sullivan, P. Eng. on the *Red Lake, White Group and Mount of the Horn* claims, on Lady Laurier Lake, Lord Mining Division, dated December 22, 1971.

Westoll
J. Sullivan

SYMBOLS

- Strike and dip (measured)
- Strike and dip (estimated)
- Strike and dip of overturned beds
- Synclinal axis
- Anticlinal axis (with plunge)
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- Thrust fault (dip indicated by arrow)
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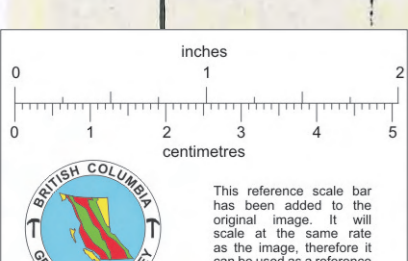
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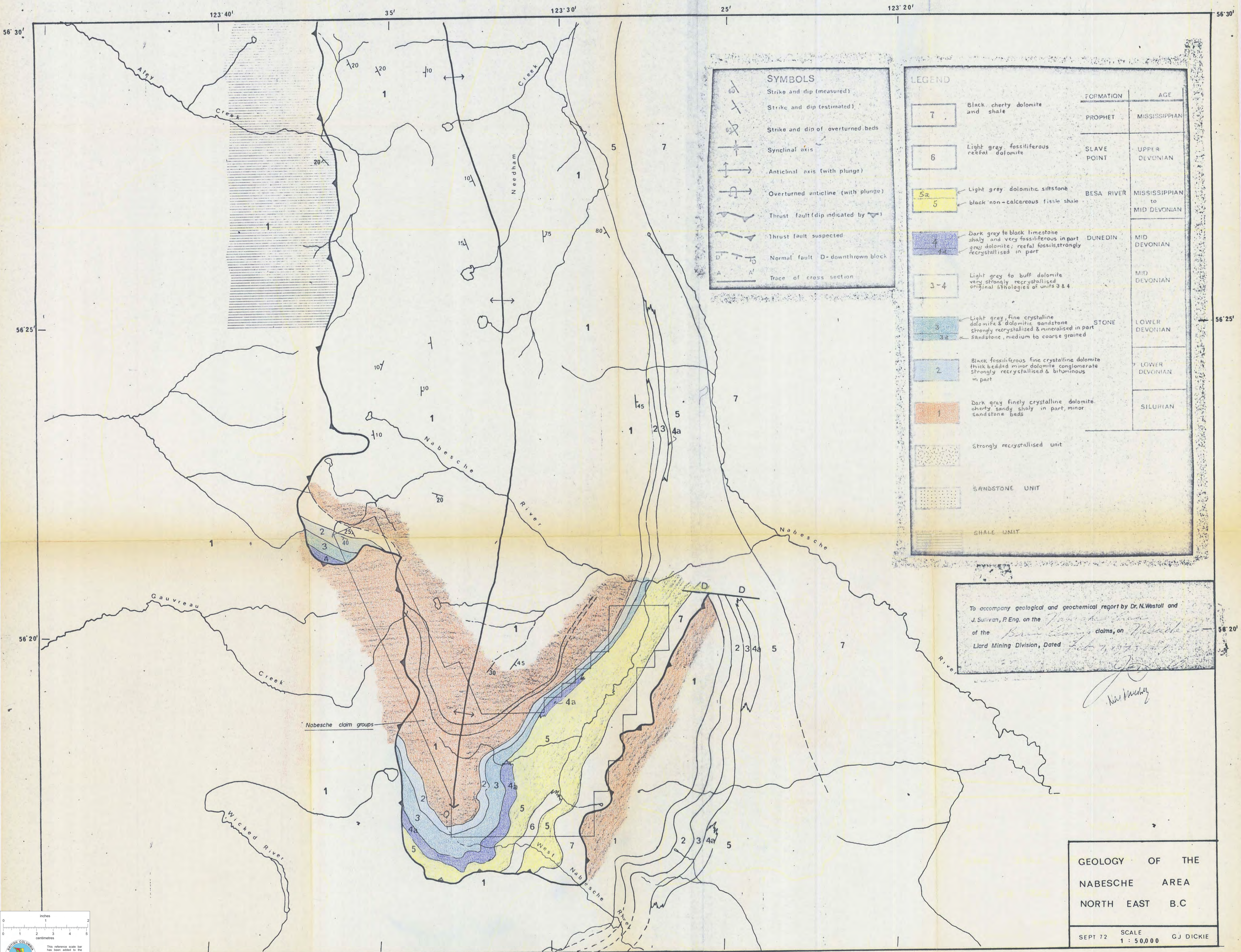
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5	MID DEVONIAN
4	MID DEVONIAN
3-4	MID DEVONIAN
3	LOWER DEVONIAN
2	LOWER DEVONIAN
1	SILURIAN

Black, cherty dolomite and shale	PROPHET
Light gray, fossiliferous reefal dolomite	SLAVE POINT
Light gray dolomitic siltstone	BESA RIVER
black, non-calcareous fissile shale	
Dark gray to black limestone shaly and very fossiliferous in part	DUNEDIN
gray dolomite, reefal fossils, strongly recrystallised in part	
Light gray to buff dolomite very strongly recrystallised original lithologies of units 3 & 4	
Light gray, fine crystalline dolomite & dolomitic sandstone strongly recrystallised & mineralised in part	STONE
sandstone, medium to coarse grained	
Black fossiliferous fine crystalline dolomite thick bedded minor dolomite conglomerate strongly recrystallised & bituminous in part	
Dark gray, finely crystalline dolomite, cherty, sandy, shaly in part, minor sandstone beds	
Strongly recrystallised unit	
SANDSTONE UNIT	
SHALE UNIT	

GEOLOGY OF THE LADY LAURIER LAKE AREA NORTH EAST B.C.

SCALE: 1:50000
 SEPT 72 GJ DICKIE





SYMBOLS

- Strike and dip (measured)
- Strike and dip (estimated)
- Strike and dip of overturned beds
- Synclinal axis
- Anticlinal axis (with plunge)
- Overturned anticline (with plunge)
- Thrust fault (dip indicated by \blacktriangle)
- Thrust fault suspected
- Normal fault D-downthrown block
- Trace of cross section

LEGEND

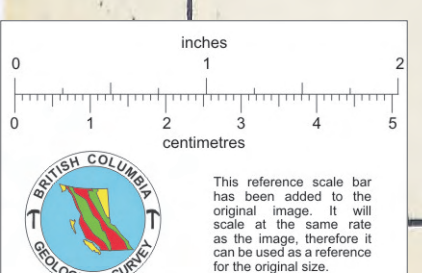
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3-4	MID DEVONIAN
3	LOWER DEVONIAN
2	LOWER DEVONIAN
1	SILURIAN
Strongly recrystallised unit	
SANDSTONE UNIT	
SHALE UNIT	

To accompany geological and geochemical report by Dr. N. Westall and J. Sullivan, P. Eng. on the Nabesche claim groups of the Basin claims, on Nabesche River, Lord Mining Division, Dated Feb 7, 1972.

N. Westall

GEOLOGY OF THE NABESCHE AREA NORTH EAST B.C.

SEPT 72 SCALE 1:50,000 GJ DICKIE





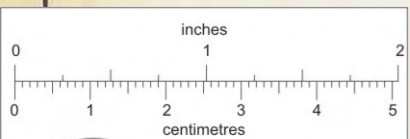
BRITISH NEWFOUNDLAND EXPLORATION LIMITED

date December 1972

drawn by: E.B.

Approximate Claim Location Map

Fig. I



This reference scale bar has been added to the original image. It will scale at the same rate as the image, therefore it can be used as a reference for the original size.



