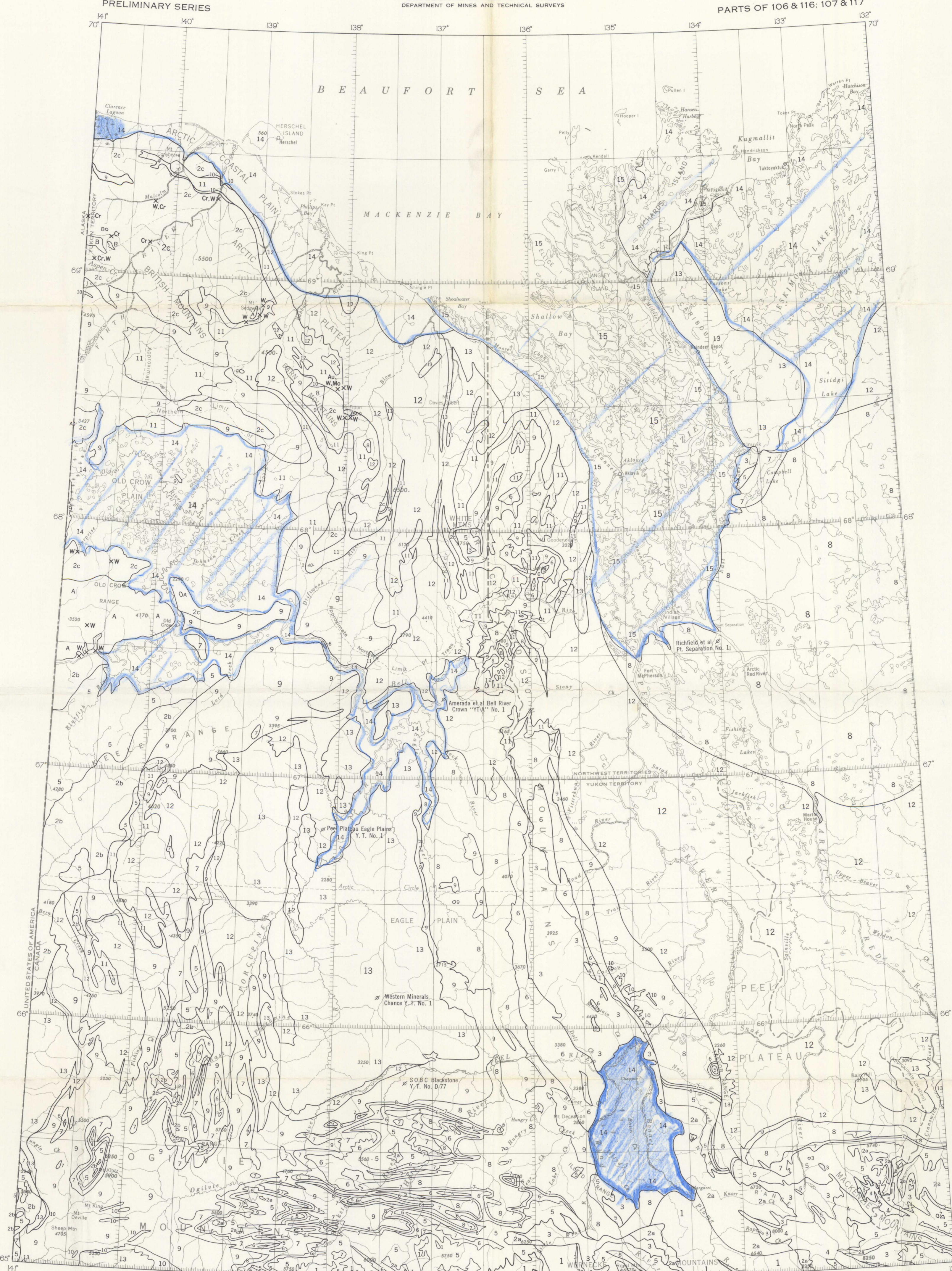


GEOLOGICAL SURVEY OF CANADA
DEPARTMENT OF MINES AND TECHNICAL SURVEYS

PRELIMINARY SERIES

PARTS OF 106 & 116: 107 & 117



LEGEND

- QUATERNARY**
15 Modern Mackenzie delta
- TERTIARY AND QUATERNARY**
14 Mud, silt, sand, coal
- CRETACEOUS**
UPPER CRETACEOUS
13 Shale, sandstone
LOWER CRETACEOUS
12 Shale, sandstone
- JURASSIC**
11 Shale, sandstone; may include Triassic in Arctic coastal plain
- TRIASSIC**
UPPER TRIASSIC
10 Shale, limestone
- CARBONIFEROUS AND PERMIAN**
9 Limestone, shale, sandstone, conglomerate, chert
- DEVONIAN**
UPPER DEVONIAN
8 Shale, sandstone, conglomerate; may include Middle Devonian in Peel Plateau
MIDDLE DEVONIAN
7 Limestone, shale
- CAMBRIAN, ORDOVICIAN AND SILURIAN**
6 Graptolite facies (Road River Formation); includes Lower Devonian in Ogilvie Mountains and Knorr Range
5 Limestone dolomite
- CAMBRIAN**
UPPER CAMBRIAN
4 Conglomeratic mudstone with iron-formation
CAMBRIAN
3 Limestone, shale, siltstone, evaporites; includes Macdougall Group
- PRECAMBRIAN AND CAMBRIAN (?)**
2 Clastic rocks; includes 2a, Katherine Group; 2b, Tindir Group; and 2c, Neroukuk Formation
1 Phyllite, quartzite
- A** Granitic intrusions
B Altered basic lava and intrusions

- Geological contact (assumed) ————
Mineral occurrence ———— X
Abandoned oil well ————

- MINERAL SYMBOLS**
Chromite ———— Cr Molybdenite ———— Mo
Gold ———— Au Scheelite ———— W

Geology by E. W. Bamber, O. L. Hughes, E. W. Mountjoy, B. S. Norton, A. W. Norris, D. K. Norris, R. A. Price, R. M. Procter, G. C. Taylor, 1962

Compilation by D. K. Norris, R. A. Price, and E. W. Mountjoy

Cartography by the Geological Survey of Canada, 1963

Base-map by Surveys and Mapping Branch
Geographical names subject to revision



DESCRIPTIVE NOTES

The accompanying geological sketch map shows the area covered by Operation Porcupine 1962. It is of a preliminary nature and intended solely to meet the immediate need for general geological information in an area where there has been otherwise no regional coverage. In addition to extensive field observations full use was made of all available published information. Age assignment and correlations of bulk lithostratigraphic units included are necessarily tentative because they are based only on gross lithic similarities and field fossil identifications.

The area includes a mountain complex of varied structural trends surrounding Old Crow and Eagle Plains and Arctic Plateau. The mountains comprise the west-trending, northern termination of Mackenzie Mountains and their structural continuation through Wernecke and southern Ogilvie Mountains into north-trending, northern Ogilvie Mountains. The structural grain of Keele Range trends northeast across the north-trending structural elements of Richardson Mountains and continues into Campbell uplift east of Mackenzie delta. Structures within British Mountains trend southeast and those within Barn Mountains trend south.

With the possible exception of British and Barn Mountains, the structure is dominated by broad folds that are intimately related to steep faults with reverse and strike-slip movement. The only major thrust fault known is in northern Ogilvie Mountains and Keele Range. It is believed to be folded and locally has strata as old as Precambrian Tindir Group thrust on to Upper Cretaceous rocks. Southeast-trending faults on which there has been important right-lateral movement are common in Richardson Mountains and can be traced into northern Mackenzie and Wernecke Mountains where many pass into east-trending faults. Domes such as White Mountains in northern Richardson Mountains are structurally complex with their flanks commonly faulted on nearly all sides. Structures within the Neroukuk Formation in British and Barn Mountains have not been resolved. The former area, however, would appear to be essentially a south-west-dipping monocline overlapped unconformably by Mississippian and older rocks. On its northeast flank, the Neroukuk is in fault contact with Upper Triassic and Jurassic strata so that the northern limit of these old sediments is unknown.

The bulk of the deformation evident within the project area is believed to be Laramide, although pre-Permian rocks of central Richardson Mountains would appear also to have been deformed during a Variscan orogeny. Numerous metamorphic rocks of map-unit 2 are unconformably overlapped by Cambrian and younger rocks.

Pronounced unconformities at the base of the Cambrian, Mississippian, Permian, Cretaceous and Tertiary as well as regional unconformities at the base of the Upper Devonian, Upper Triassic, Jurassic and Upper Cretaceous divide the succession into many rock sequences, some of which display marked facies variations. Major acid and minor basic intrusions and extrusions are present.

Precambrian metasediments (1) make up a large part of northern Wernecke Mountains and form scattered outcrops in eastern Ogilvie Mountains. This sequence has undergone recurrent deformation and the internal stratigraphy has not been resolved. On upper Hart Bay just north of 65° latitude these metasediments are overlain with strong angular unconformity by red sandstones and conglomerates assumed to be Lower or Middle Cambrian. In northern Wernecke Mountains they are overlain by a thin, conformable sequence of dark grey slates, quartzites and orange dolomites (2). Map-unit 2 includes non-metamorphic rocks predominantly of a clastic nature, as for example the thick succession in western Knorr Range, Tindir Group in western Ogilvie Mountains and Keele Range, the Neroukuk Formation in British Mountains, the cherts, argillites and quartzites of Barn Mountains, and the Katherine Group of Mackenzie Mountains. Overlying the Katherine Group with apparent conformity in northern Mackenzie Mountains are rocks of the Macdougall Group, map-unit 3, which in the type area is known to be Middle or Upper Cambrian in age. Also included within this unit is the 1200-foot limestone breccias of Road River (3). Cambrian fossils immediately north of Doll Creek, together with the overlying thick brown, platy siltstone succession forming the core of the Richardson Mountains. Scattered outcrops of Cambrian carbonates (3) occur in northern Richardson Mountains.

In northern Mackenzie Mountains a thick, conglomeratic-mudstone succession (4) containing iron-formation occurs a wedge-shaped mass up to about 4000 feet thick. Constituent pebbles suggest the succession represents fanglomerate and associated sediments derived locally from the Macdougall and Katherine Groups and underlying phyllites.

A thick carbonate succession (5) rests unconformably on strata of map-units 1, 2, 3 and 4 in northern Mackenzie and eastern Ogilvie Mountains. This succession, highly variable in thickness, is widespread in northern Wernecke and Ogilvie Mountains and Keele Range; it is Upper Cambrian and Ordovician in eastern Ogilvie Mountains, mainly Ordovician and Silurian in northern Mackenzie Mountains and Silurian in Illy Range. Brown, shaly siltstones in the core of Richardson Mountains (3), may be equivalent to the lower part of map-unit 5. Map-unit 5 is for the most part laterally and temporally equivalent to graphitic shales with interbedded limestone breccias of Road River (6). This unit is thickest in Richardson Mountains, a basinal area which commenced to subside in the Middle or Late Cambrian and persisted through Lower Devonian time. The Road River Formation thin away from this area; it is known or inferred at the headwaters of Ogilvie River, near the mouth of Driftwood River and in northern Richardson Mountains.

Map-unit 6 includes a thin, mildly recessive, orange weathering shale and limestone unit of possible Lower Devonian age resting with apparent conformity on Road River strata in eastern Ogilvie Mountains and on the northeast flank of Knorr Range.

Middle Devonian carbonates of the Bear River and Hume Formations and laterally equivalent shales, both included in map-unit 7, have conformable upper and lower contacts. The carbonate succession of northern Mackenzie Mountains passes westward into shales in Knorr Range, Wernecke Mountains and eastern Ogilvie. Along the mountain front between Clear Creek and Blackstone River a thick carbonate building is observed, which passes abruptly westward into shale and limestone in the southwest corner of the area. In Nahoni Range and northern Ogilvie Mountains, carbonate is again the principal lithology of map-unit 7. Middle Devonian Hare Indian and Canol Formations are included within the thick, mainly non-marine clastic succession of map-unit 8 ("Imperial Formation").

The marine Upper Devonian succession of northern Mackenzie Mountains grades westward into continental, clastic rocks between Arctic Red and Snake Rivers; it lies disconformably on older rocks and forms a thick succession on either flank of southern Richardson Mountains. It is bevelled rapidly westward and its presence has not been proved west of Blackstone River, although a recessive, generally covered interval occupying an equivalent stratigraphic position in western Ogilvie Mountains may include it. Northwest, Upper Devonian shales and siltstones cover a wide area in the vicinity of Mackenzie River and may reach a thickness of several thousand feet as suggested by the drilling thickness in the Point Separation well.

Permian and Carboniferous rocks (9) are widespread. Along Peel River and in the southwest corner of the area the succession is Mississippian, Pennsylvanian and Permian, divisible into a number of mappable units. In northern Richardson Mountains, the succession is mainly clastic rocks of Permian age, with isolated occurrences of Permian carbonate. Elsewhere the Permian strata rest with strong angular disconformance on rocks of map-unit 8. On the flanks of Barn and British Mountains carbonates of the Mississippian Lisburne Group are widespread and are commonly underlain by black, marine shales of the Mississippian Kyak Formation. The latter rests unconformably on the Neroukuk. In the vicinity of Joe Creek where it crosses the 141st Meridian, the Lisburne is overlain by shale, conglomerate and sandstone of Permian and possibly Upper Triassic age.

Upper Triassic shale and limestone (10) is thin; known occurrences are limited to small areas in Richardson, Barn, British and Ogilvie Mountains, and possibly also on the north side of Old Crow Plain.

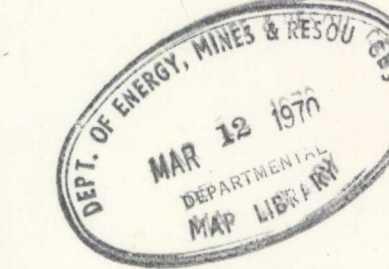
Jurassic rocks (11) occur widely in northern Richardson Mountains and north and east of British Mountains. They occur in northern Ogilvie Mountains but in the central part of the map-area they are not known south of about the latitude of Vitrekwa River.

Lower Cretaceous shale and sandstone (12) cover a wide area between British and Richardson Mountains, and in northern Ogilvie Mountains. In Peel Plateau and Eagle Plain, however, only the upper part of this unit is present. Cretaceous sediments in the vicinity of Sittigi Lake are assumed to belong to map-unit 12. Upper Cretaceous shale, sandstone and coal (13) are limited so far as is known to scattered areas on the north flank of Mackenzie Mountains, northern Richardson Mountains and western Ogilvie Mountains. The poorly consolidated sandstones, shales and conglomerates of the Caribou Group are tentatively assigned to map-unit 13. Shale, sandstone and conglomerate with minor lignite (14) outcrop extensively in the lower reaches of Wind and Bonnet Plume Rivers.

Intrusions of porphyritic granite (A) are known in the Old Crow Range, at Mount Fitton in Barn Mountains, and around Mount Sedgwick in southeast British Mountains. Their contact relations are in general unknown although deformed Lisburne strata near the Mount Sedgwick contact would suggest that it was post-Mississippian in age.

Five wells have been drilled in the area. Western Minerals Chance Y.T. No. 1 encountered shows of gas and oil in clastic rocks of map-unit 9 in one of the several major anticlinal structures in Eagle Plain. Oil and gas possibilities in Old Crow Plain would appear to be slight because the area is flanked by Precambrian Tindir Group granites, thin Devonian and Mississippian carbonates or by Jurassic and Lower Cretaceous clastic rocks. Little is known of the potentialities of the Mackenzie delta although acutely deformed Lower and Upper Cretaceous strata extend beneath it at least locally. In Arctic Plateau these strata are underlain unconformably by Jurassic and Permian clastic rocks. Carbonates of the Lisburne Group are known to thin northeastward and disappear north of a line trending northwest from northern Barn Mountains to the north flank of British Mountains; they are presumably absent beneath the delta.

Several occurrences of scheelite, molybdenite, gold and chromite were noted from soil and heavy mineral samples. The source rock for the tungsten and molybdenum minerals would appear to be the granitic intrusions, that for the gold the sediments of the Neroukuk and that for the chromite the limited area of strongly altered basic rocks (B) near the International Boundary in the vicinity of Aspen Creek.



MAP 10-1963
GEOLOGY
NORTHERN YUKON TERRITORY
AND
NORTHWESTERN DISTRICT OF MACKENZIE

Scale: One Inch to 15.78 Miles = $\frac{1}{1,000,000}$
Miles
10 0 10 20 30 40 50

10-1963
C.3
G
3401
:C5
1956
G4
omvsc