



**STRATIGRAPHY AND SEDIMENTOLOGY NOTES ON THE
 BULLHEAD MOUNTAIN-PEACE RIVER CANYON, CARBON CREEK AREA
 NORTHEASTERN BRITISH COLUMBIA
 (930/15, 16; 94B/1, 2)**

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INTRODUCTION

As the new District Geologist at Charlie Lake, 1982 fieldwork was oriented toward gaining a grasp of the regional and local stratigraphy and sedimentology of the coal-bearing sequences in the Northeast Coalfield. In this regard I am indebted to Dave Gibson and Don Stott of the Geological Survey of Canada, Paul Cowley and Norman Duncan of Utah Mines Ltd., and Charlie Williams of Gulf Canada Resources Inc. for informative discussions.

Fieldwork was concentrated in the area between Bullhead Mountain on the east and Pardonet Creek on the west (Fig. 27). This area includes coal licences of Utah Mines Ltd., Gulf Canada Resources Inc., Shell Canada Resources Limited, and Cinnabar Peak Mines Ltd. Recently published papers on the area include those of Gibson (1978), Stott and Gibson (1980), and Anderson (1980).

There are two coal-bearing formations in the area, the Gething Formation of the Bullhead Group and the Bickford Formation of the Minnes Group. The Gething Formation overlies the Bickford Formation and is separated from it by the Cadomin Formation, which is variably pebbly sandstone to conglomerate (see stratigraphic column, Table 1). Regionally the Cadomin Formation may rest on units lower in the succession than the Bickford. According to Stott (1973) this is due to an unconformity which progressively truncates underlying strata in a southwest-northeast direction.

TABLE 1. SIMPLIFIED STRATIGRAPHY OF THE MINNES AND BULLHEAD GROUPS
 (UPPER JURASSIC-LOWER CRETACEOUS)
 IN THE BULLHEAD MOUNTAIN-PARDONET CREEK AREA

Bullhead Group	Gething Formation	Coal measures
	Cadomin Formation	Pebbly sandstone, quartzitic sandstone, conglomerate
Minnes Group	Bickford Formation	Carbonaceous measures
	Monach Formation	Feldspathic sandstone, minor amounts of quartzite
	Beattie Peaks Formation	Interbedded sandstone and shale
	Monteith Formation	Upper quartzites Lower grey sandstones, feldspathic sandstones

The stratigraphy of the area is not yet satisfactorily resolved (D. F. Stott, personal communication). Problems include:

- (1) Identifying the Cadomin Formation in places where it is a sandstone rather than a pebbly sandstone or a conglomerate. It is difficult to distinguish the Cadomin Formation where it overlies sandstone of formations such as the Monach.
- (2) Lateral facies variations within formations of the Minnes Group.
- (3) The nature of the unconformity at the base of the Cadomin Formation. Does it have relief and hence control the thickness and distribution of the Cadomin?

The Carbon Creek basin continues to be a focus of these stratigraphic difficulties. For example, coal measures initially identified as Gething Formation were temporarily re-interpreted to be Bickford Formation by Stott and Gibson (1980).

STRATIGRAPHIC SETTING OF THE CADOMIN FORMATION

A number of sections were examined in order to establish the stratigraphic setting of the Cadomin Formation in the area. These are summarized as follows (see Fig. 27 for location):

- (1) *Ridge Southwest of Mount Monach*

Coal measures	Gething Formation
Thick units of pebbly quartzitic sandstone; local siltstone and recessive beds	Cadomin Formation
Gradational contact ?	
Salt-and-pepper sandstone, siltstone (calcareous), mudstone, carbonaceous shale, coal	Bickford Formation
Massive flaggy sandstone	Monach Formation
- (2) *Battleship Mountain (tributary to Carbon Creek on west side)*

Coal measures	Gething Formation
Thick units of sandstone to pebble sandstone, local recessive interbeds	Cadomin Formation
Contact covered	
Massive quartzitic sandstone, salt-and-pepper sandstone	Monach Formation
- (3) *East of Carbon Creek Road and Carbon Lake*

Coal measures	Gething Formation
Pebbly quartzitic sandstones, quartzite locally at base, coal	Cadomin Formation
Contact sharp	
Salt-and-pepper to quartzitic sandstone, minor amounts of burrowed siltstone	Monach Formation

(4) *Bullhead Mountain - west side*

Pebbly sandstone, conglomerate	Cadomin Formation
Contact sharp	
Feldspathic sandstone (flaggy), salt-and-pepper sandstone, kaolinitic quartzite bed near top	Monach Formation
Interbedded feldspathic sandstone, burrowed siltstone, black mudstone	Beattie Peaks Formation
Quartzite, minor amounts of black mudstone, feldspathic sandstone, dark grey sandstone	Monteith Formation

The *Monach*, *Bickford*, *Cadomin*, and *Gething* Formations are exposed in the 'Whiterabbit' licence area of Gulf Canada Resources Inc. and in ridges extending southwest and west of Mount Monach. They comprise the eastern limb of a major syncline. The *Bickford* Formation is several hundred metres thick and grades into the *Cadomin* over a width of about 5 metres. An interbed of salt-and-pepper sandstone, typical of the *Bickford* Formation, lies above the 10-metre thick basal, sparsely pebbly quartzitic sandstone of the *Cadomin* Formation. Nineteen kilometres to the north-east, on the east side of the Carbon Creek syncline, the *Bickford* Formation is missing. There the pebbly *Cadomin* Formation abruptly overlies a burrowed siltstone (marine?). Off Carbon Creek Road, on the west side of Battleship Mountain, it rests on flaggy massive sandstone units (*Monach* Formation?).

Either the *Bickford* Formation develops a marine sandy facies eastward or it is truncated by the regional unconformity described by Stott (1973). Rocks in the anticlinal structure near Mount Rochfort and Mount Wrigley may hold the key. Just west of the core of the anticline on the west sides of the two mountains, a thin zone of *Bickford* Formation may be exposed. On a ridge northwest of Mount Wrigley, Paul Cowley of Utah Mines Ltd. (personal communication) describes a carbonaceous mudstone, siltstone, and sandstone sequence that underlies salt-and-pepper (to quartzitic) sandstones of the *Cadomin* Formation. However, pebbly sandstone below and within the sequence makes it unclear whether it is all *Cadomin* or whether both *Cadomin* and *Bickford* Formations are present.

East of the Carbon Creek basin at Bullhead Mountain the *Cadomin* is separated from underlying mottled (bioturbated?) quartzite by several centimetres of coal (the contact is exposed only on the south side of the mountain along the hydro line). Below this are feldspathic sandstones, a shaly transition zone, and quartzite. The feldspathic sandstones correspond to either the *Monach* Formation or a sandy upper facies of the *Beattie Peaks* Formation. The transitional sequence below consists of interbedded quartzite, black shale, burrowed mudstone, feldspathic sandstone, and ferruginous shale. It is probably the *Beattie Peaks* Formation. This sequence grades downward into thick quartzite beds of the *Monteith* Formation which are in rather sharp contact with underlying dark grey

sandstones (also Monteith Formation). These dark sandstones crop out at the base of Bullhead Mountain on both its west and south sides.

At Bullhead Mountain the Cadomin Formation is in part conglomeratic and locally more than 200 metres thick (Stott, 1973). Stott also described 30 metres of conglomerate at the mouth of Carbon Creek. At Battleship Mountain, however, only one 10-metre bed was pebbly and the total thickness of the formation is at most 200 metres. In the Mount Rochfort-Mount Wrigley area the Cadomin is predominantly sandstone. Its appearance is not distinctive and it was mapped as part of the Monach sandstone. As a consequence, pebbly sandstones that are stratigraphically much higher (in the Gething Formation), were mislabelled as Cadomin. Southwest of Mount Monach the Cadomin is apparently thick (400 metres ?) but only sparsely pebbly (maximum clast size 2 to 3 centimetres). Clearly the Cadomin Formation is not a simple westward thickening and coarsening fan of fluvial sediment. A local isopach map, distribution of paleocurrent flow directions, and maximum clast size are required to determine what controls its thickness and lithology in the Bullhead Mountain-Pardonet Creek area.

TRACE FOSSILS

Some rather spectacular examples of trace fossils are evident in the Beattie Peaks Formation along Carbon Lake Road. Abundant vertical pipe-like burrows up to 3 centimetres in diameter are present as well as vertical 20-centimetre-deep U-shaped and steeply inclined rhizocorallium burrows (U-shaped and spreite-filled). They are particularly well developed in a number of regressive, coarsening up sequences (shale-sandstone). The structures correspond to the Skolithos facies of Seilacher (1967) and represent suspension feeders found in the shallowest parts of the sea.

PEACE RIVER CANYON

A section was examined starting at the toe of the dam and continuing along the north shore to Gething Creek. It has been previously described by Stott (1973), McLearn (1923), and others. The first 57 metres of the sequence at the toe of the dam includes three thick sandstone units and is assigned to the Cadomin Formation by Stott. These units are gritty at the base, fine upward, and are ripple cross-laminated at the top. The middle zone has extensive convoluted bedding. The units all have a sharp flat base and two of the three are marked by inclined interbedding of sandstone and shale at the top and coal at the base. These features suggest the sandstone bodies may represent distributaries of the lower or transitional delta plain rather than fluvial channels of the upper delta plain. Foraminifera indicating marine influence were collected by Chamney (in Stott, 1973) from finer sedimentary rocks between the sandstone units but according to Gibson (personal communication) the work requires re-examination. The overlying Gething Formation sediments are

predominantly a monotonous, repeated sequence of sandstone, horizontally interbedded shale, and coal. Interesting features do include some channel structures, lateral accretion bedding (indicative of meandering), minor upward coarsening burrowed sequences (bay fills ?), and coal-bounded crevasse splay deposits.

Various floral and faunal collections have been made from the Gething Formation in the Peace River Canyon. They include dinosaur bones and trackways, pelecypods, foraminifera, spores, and remains of ferns, cycads, and conifers. The writer recently collected a well-preserved silicified tree trunk in the east side of the canyon in view of the dam. The trunk measures about a metre in diameter and a metre in height. Growth rings are well preserved and alternating thin and thick bands appear to indicate seasonal variations of climate at the time of growth. Excavation revealed that a laminae of coal enveloped the buried part of the trunk and extended under the flat base of the trunk; perhaps it represents original bark. A number of thick roots extend radially and horizontally from the base. This suggests that the roots were tapping a high water table. The trunk (weighing nearly 1 400 kilograms) has been transported to Charlie Lake and eventually will be placed in the Fort St. John museum.

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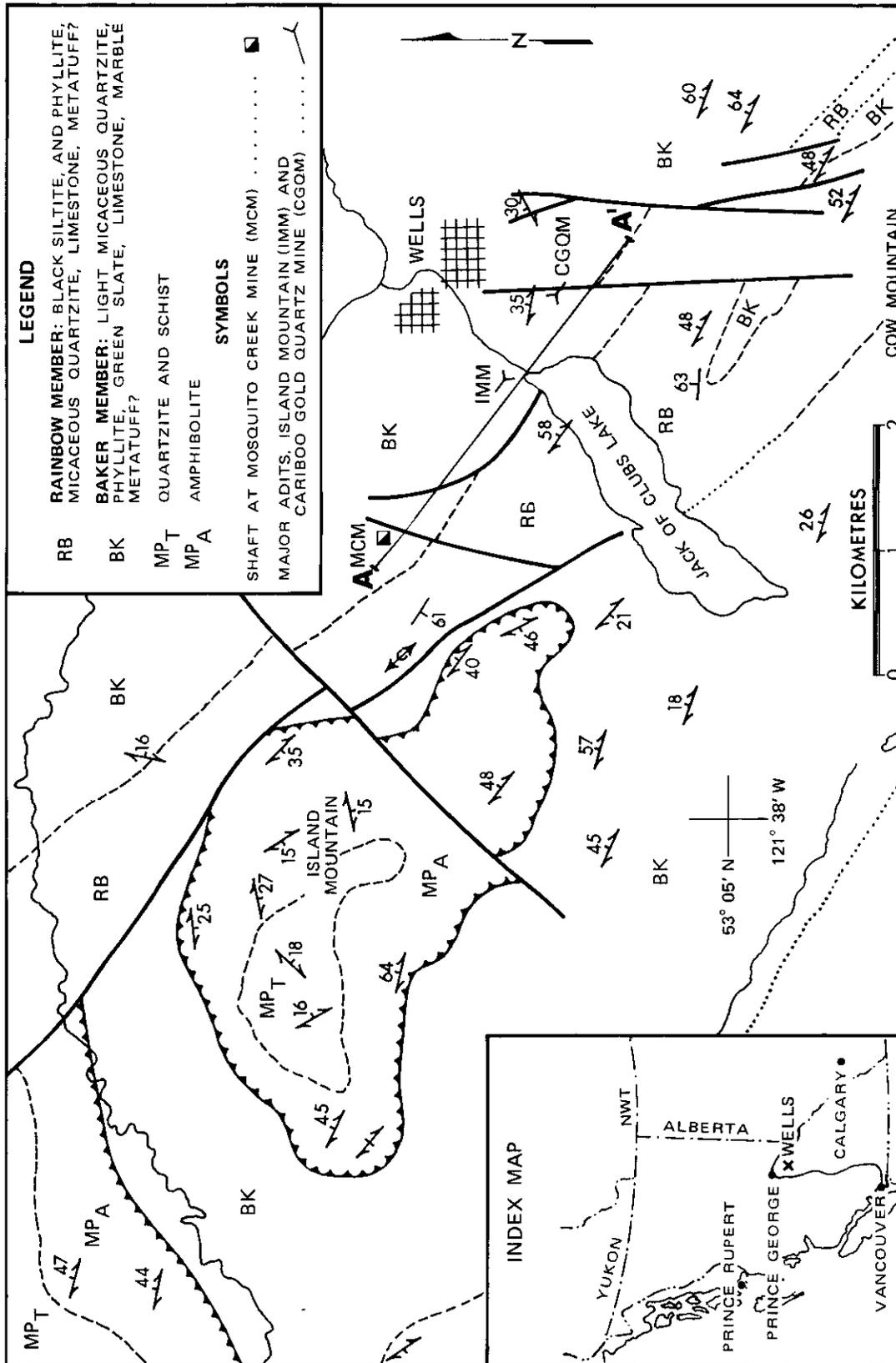


Figure 28. Geology of the Mosquito Creek mine area (modified after Struk, 1982a).