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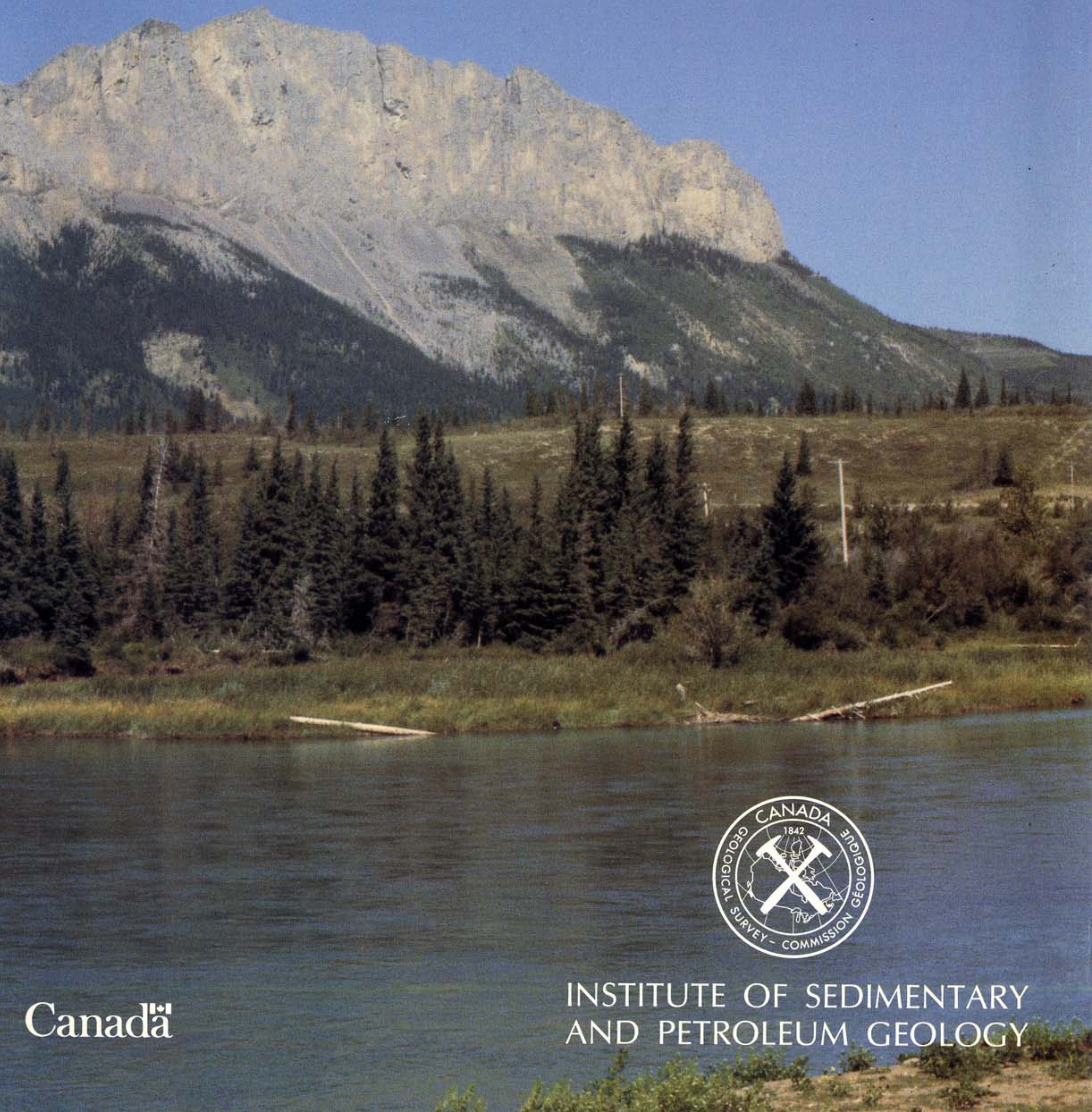
SUBSURFACE CORRELATIONS OF CRETACEOUS AND TERTIARY STRATA IN THE MACKENZIE AND GREAT BEAR PLAINS, NORTHWEST TERRITORIES

J. Dixon



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SUBSURFACE CORRELATIONS OF CRETACEOUS AND TERTIARY STRATA IN THE MACKENZIE AND GREAT BEAR PLAINS, NORTHWEST TERRITORIES

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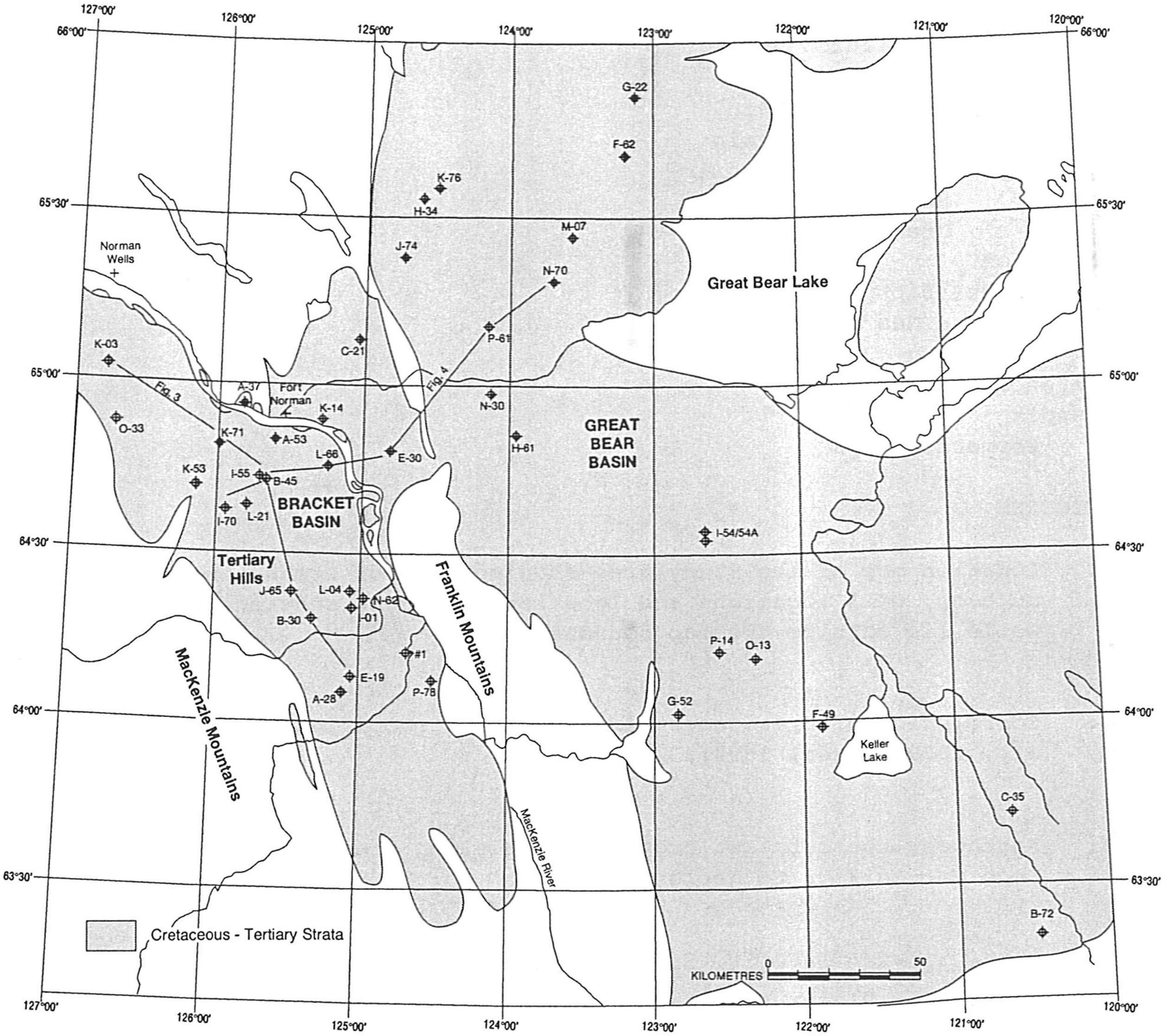

Figure 1: Location map of the study area showing area of Cretaceous-Tertiary outcrop, well locations and locations of cross sections. A few wells lie outside the map boundaries.

INTRODUCTION

Correlation of Cretaceous to Tertiary strata in the Mackenzie and Great Bear plains of the Northwest Territories (Fig. 1) has been hindered by poor exposures and, in some intervals, inadequate or ambiguous paleontological control. A basic stratigraphic framework, based primarily on surface exposures has evolved over the years (see Tassonyi, 1969; Yorath and Cook, 1981, for reviews) but the vertical and lateral relationships of the named units has not always been readily interpreted. However, there has been a significant number of exploratory wells drilled in the area and these offer a better three-dimensional approach to correlation than the poorly exposed Cretaceous and Tertiary strata. Some of the correlation problems were recognized and, in many cases, resolved by Williams (1988), who used the boreholes as his primary source of stratigraphic data. This brief report is intended to support most of Williams' stratigraphic conclusions, to add further clarification to the stratigraphy, and to comment on the nature of the stratigraphic contacts.

One of the first comprehensive accounts of the Cretaceous and Tertiary of the area was by Tassonyi (1969). The most recent comprehensive account of Cretaceous and Tertiary stratigraphy in the study area can be found in Yorath and Cook (1981). Dixon (1986), in a review of Cretaceous to Tertiary stratigraphy and paleogeography of northwest mainland Canada, suggested some alternative correlations to those of Yorath and Cook (op. cit.). Williams (1988) presented some important revisions to the stratigraphic framework, although his main emphasis was on the tectonic history of the area. Detailed biostratigraphic and sedimentological data for some of the Upper Cretaceous and Lower Tertiary strata can be found in Sweet et al. (1989).

Figure 2 illustrates the interpreted stratigraphic relationships of Cretaceous and Tertiary strata, and is based on the available published data and the interpretations of subsurface correlations (Figs. 3 and 4). Figures 3 and 4 are two cross sections across the study area; Figure 3 follows the Mackenzie valley and Figure 4 extends into Great Bear Basin. Up

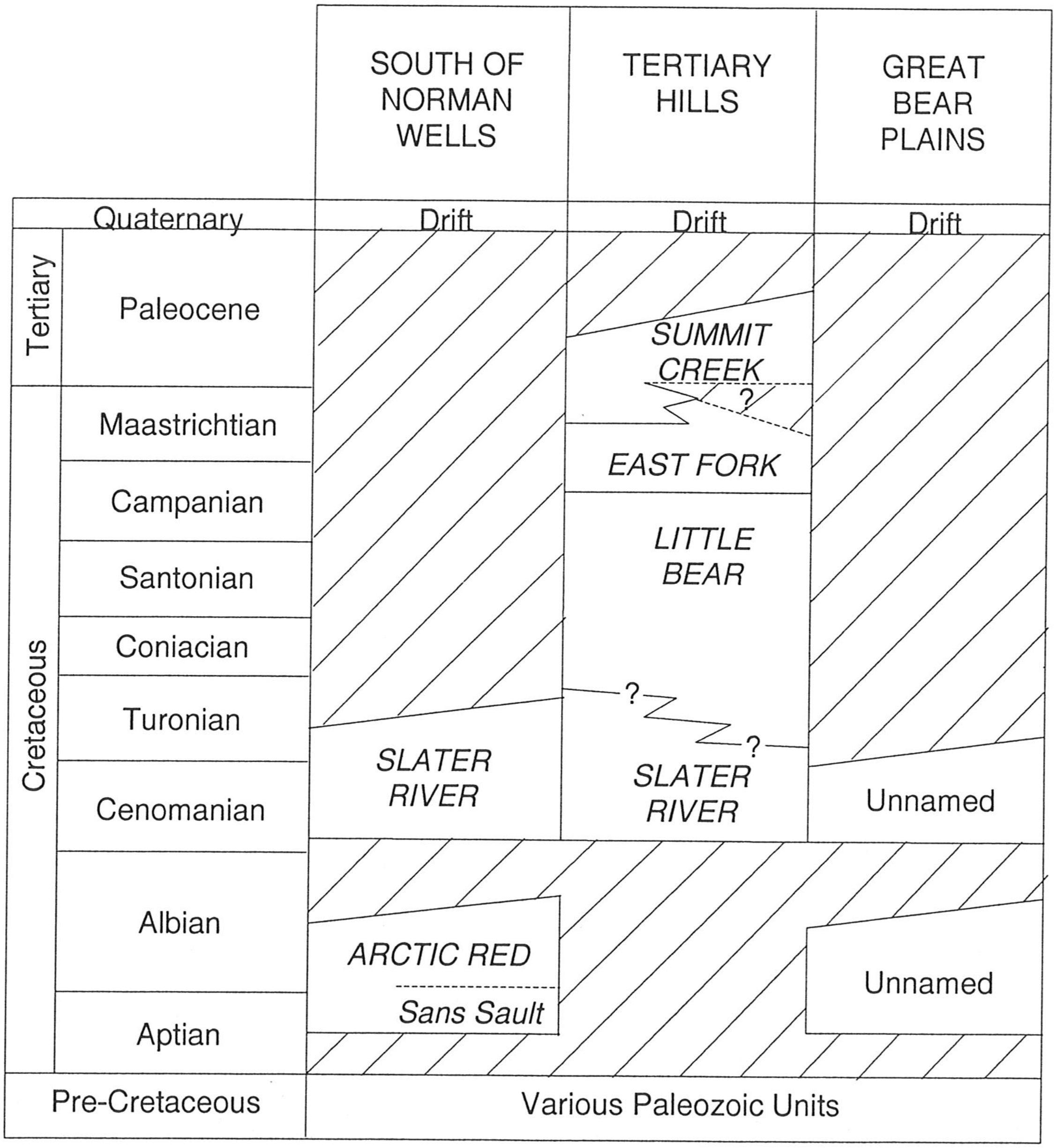

Figure 2: Correlation of Cretaceous-Tertiary units (modified from Sweet et al., 1989; Dixon, 1993).

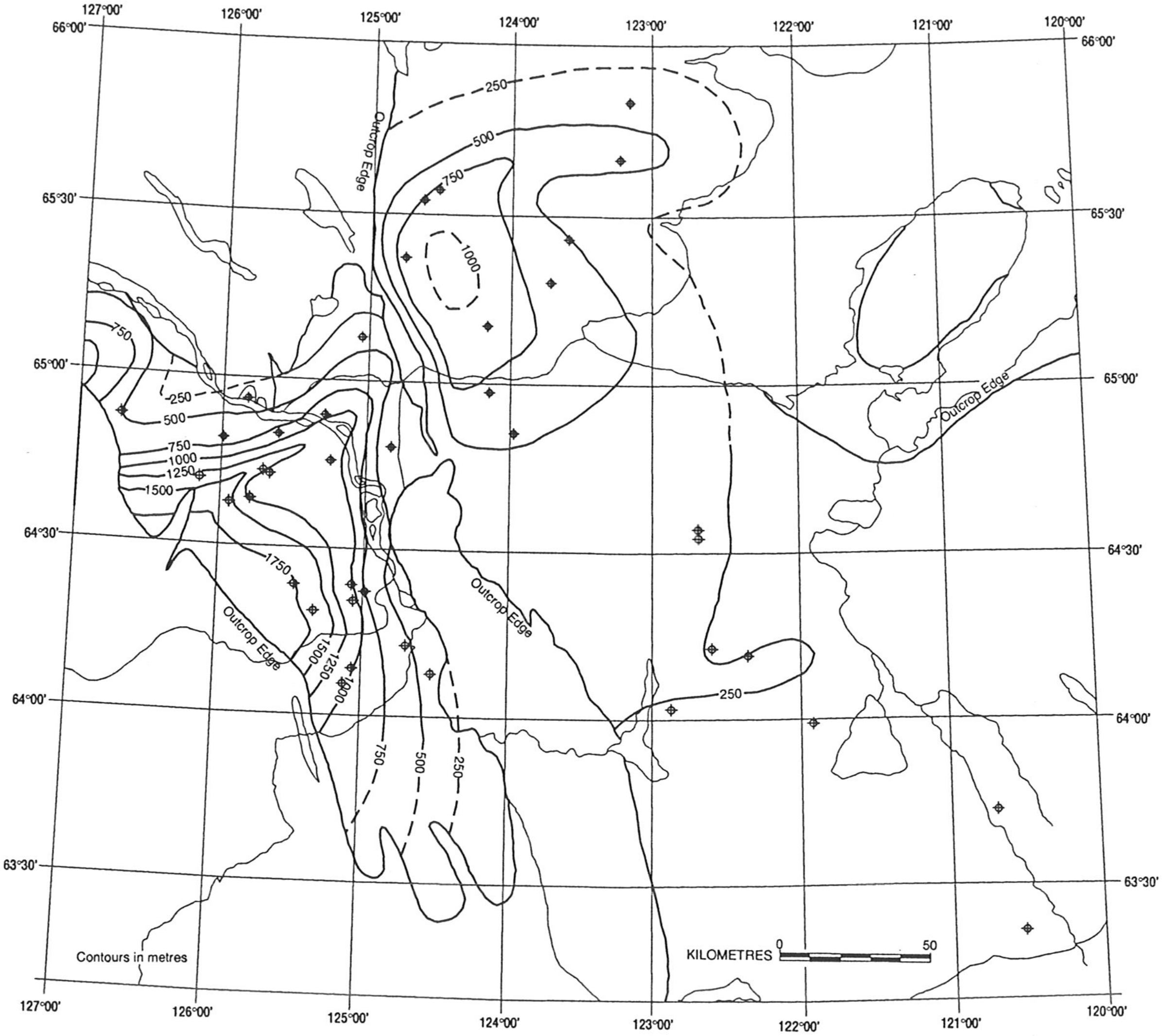

Figure 5: Isopach map of Cretaceous to Quaternary strata in Mackenzie Plain and Great Bear Basin. Quaternary strata are usually only a minor component of the thicknesses.

to 1750 m of Albian to Tertiary strata are known from the area, in the Tate J-65 well (Fig. 5). The isopach trends and the mapped distribution of Cretaceous-Tertiary strata (Yorath and Cook, 1981), suggest that the Tate J-65 well may be close to the preserved maximum thickness. The unusual deflections of the isopachs in the vicinity of the Little Bear and Mackay wells probably reflects a local structural complication.

SUBSURFACE CORRELATIONS

The lithological succession, available paleontological data (Yorath and Cook, 1981; Sweet et al., 1989; Williams, 1988) and several distinct log markers have been used to correlate the Cretaceous-Tertiary succession (Figs. 3 and 4). The recognition of a major unconformity between Albian and Cenomanian strata is critical to unlocking the relationships between units. Although Yorath and Cook (1981) hinted at such an unconformity at the base of the Slater River Formation, it was Dixon (1986, 1993) who emphasized its importance, based on a regional stratigraphic analysis. Williams' (1988) correlations confirmed the presence of this unconformity.

A re-evaluation of the paleontological data from Yorath and Cook (1981) reveals that the Late Albian to possible Santonian age range they assigned to the Slater River Formation, especially the Late Albian age, is based on data that can be reinterpreted. For example, the oldest age is based on fossils with a known range of Late Albian to Cenomanian, not a specific date. Based on regional considerations (Dixon, 1986, 1993) and some local paleontology (cited in Williams, 1988) it seems more likely that the oldest strata are Cenomanian. Also, Yorath and Cook (1981, table 1) implied diachroneity of the basal Slater River Formation from Late Albian to Turonian, a supposition not supported by the physical or biostratigraphic data. The youngest age of the Slater River Formation is poorly constrained and is likely to be only Turonian, based on the few specific identified ages (cited in Williams, 1988)

LOWER CRETACEOUS

Mackenzie Plain

Pre-Upper Aptian strata have not been positively identified in the study area, although Tassonyi (1969, p.134) suggested the possible presence of some Neocomian strata. However, the paleontological data for this conclusion are ambiguous and it seems more likely that the Neocomian fossils are reworked faunas within the basal Arctic Red Formation. Also, regional correlations do not support the presence of Neocomian beds.

Upper Aptian to Albian strata in the Mackenzie valley are represented by the Arctic Red Formation. The subsurface character of the Arctic Red Formation is illustrated on Figure 3, in the Dodo Canyon K-03 well. Unlike Yorath and Cook (1981, fig. 4), no Trevor Formation (typically consisting of interbedded sandstone and shale) is recognized between log depths 269 and 1509 ft (82-460 m); the log character and lithology do not indicate the presence of significant quantities of sandstone to warrant identifying this interval as Trevor Formation. Yorath and Cook also mapped the Trevor Formation passing laterally into the Slater River Formation in the general area of the Dodo Canyon K-03 well (op. cit., fig. 3 and Map 1498A). The revised Cretaceous stratigraphic correlations and the reinterpreted stratigraphy of the Dodo Canyon well would suggest that the Trevor Formation does not exist in this particular area.

Arctic Red strata in Dodo Canyon K-03 begin with a distinct basal unit between log depths 2512 and 2987 ft (765.7-910.4 m) which consists of interbedded sandstone, siltstone and shale (Fig. 3). Because of the distinct lithology and log character these basal beds can be readily correlated in the subsurface. Williams (1988) correctly pointed out that the Sans Sault Formation (mapped just to the west of the study area; Yorath and Cook, 1981) is just a surface manifestation of these basal beds and that the nomenclature should be adjusted to reflect its status, reducing it to a member of the Arctic Red Formation. The presence of glauconite and ironstone, and the brownish coloration are typical characteristics of Upper Aptian to Lower Albian beds throughout the Peel Plateau (e.g., the Martin House Formation of the Peel Plateau). The basal beds are abruptly overlain by a shale interval (log depths 2020-2512 ft: 615.7-765.7 m) that is characterized by a brownish grey colour, abundant ironstone and the presence of *Inoceramus* prisms. The gamma-ray response for this interval is slightly higher than that of the overlying shale interval. Abruptly overlying the brown shale is a succession of silty shale with very thin interbeds of siltstone and very fine to fine grained sandstone. Farther west, on Peel Plateau, these upper silty to sandy shale beds grade vertically into the sandstone-rich Trevor Formation. At the Dodo Canyon well the Arctic Red Formation is abruptly overlain by a slightly radioactive shale of the Slater River Formation. The three subsurface lithological divisions of the Arctic Red Formation are similar to those seen in outcrop: a basal sandstone, overlain by concretionary shale, in turn succeeded by a silty shale (Mountjoy and Chamney, 1969; Yorath et al., 1981; Aitken et al., 1982).

Within the mapped area, the Dodo Canyon K-03 contains the thickest known section of Albian strata (746 m). Albian strata thin southeastward and the last known occurrence in Mackenzie Plain is in Bluefish K-71 (Fig. 6). The absence of Albian beds southeast of Bluefish K-71 is due principally to sub-Slater River erosion along the Keele Arch. Albian strata reappear in Great Bear Plain.

Great Bear Plain

East of the Franklin Mountains, in Great Bear Plain, the unnamed Upper Aptian to Albian succession has been informally divided into five units, A to E, by Yorath and Cook (1981, fig.4) and Williams (1988). However, some problems identifying and correlating these units are apparent and a reassessment of the internal stratigraphy is warranted. Units A and B, and the contact between B and C are well defined on logs but unit D is less clearly defined. Unit D is defined as a thin siltstone, shale and sandstone interval which has a distinct sonic log response but a poorly defined response on other log types (Williams, 1988, fig. 24). Unit D is not recognizable in all the wells of Great Bear Plain but when recognizable, appears to be the initial introduction of coarser siliciclastic material that typifies the overlying unit E of Yorath and Cook (op. cit.).

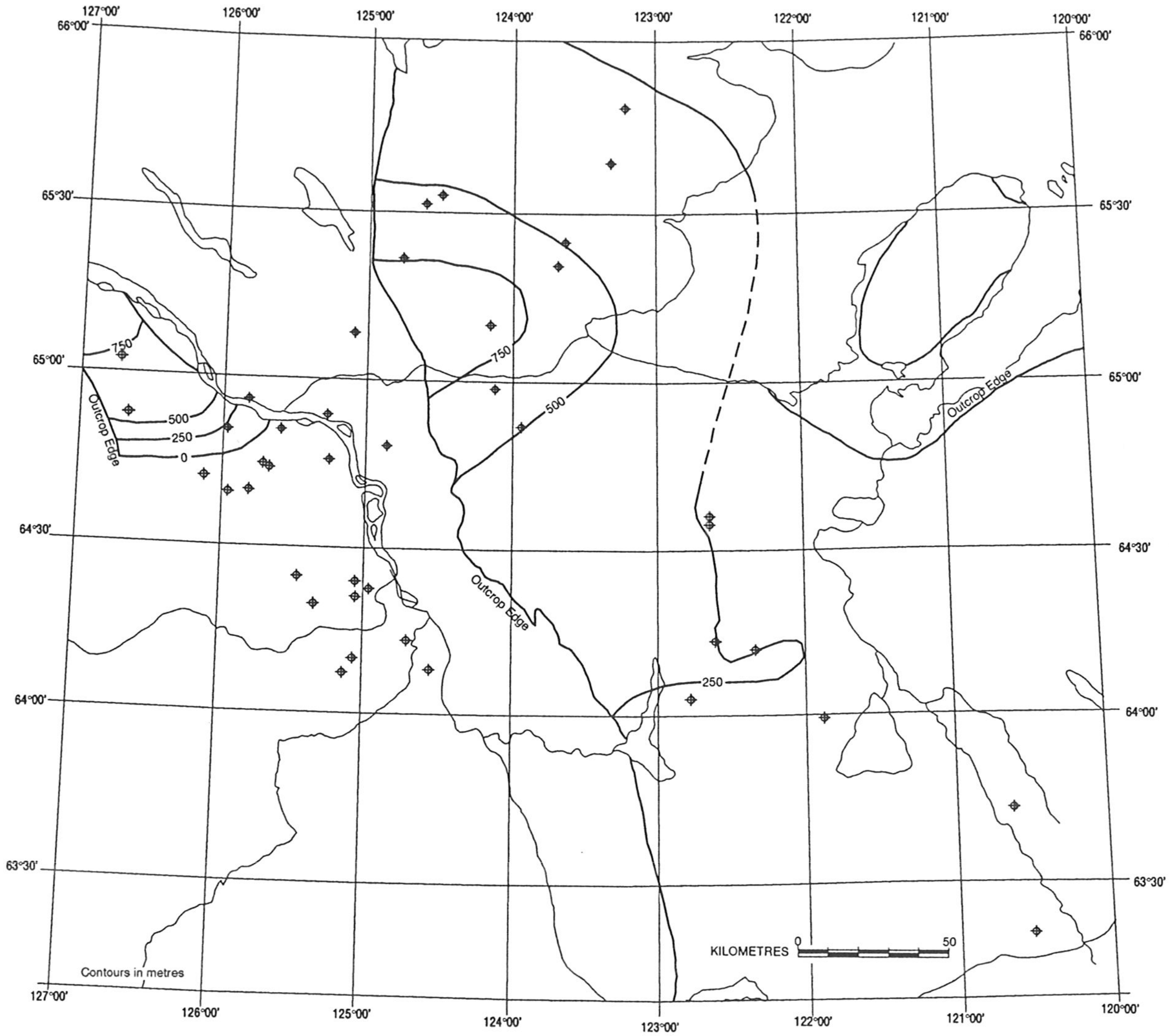

Figure 6: Isopach map of Albian strata in Mackenzie Plain and Great Bear Basin (May include some minor amounts of Quaternary strata in Great Bear Plain).

Yorath and Cook's (op.cit.) unit E is an interval of upward increasing sandstone content that is clearly characterized on gamma-ray logs. If unit D is not easily identifiable then the fivefold division cannot be applied consistently.

A modification of the subdivisions is proposed based on the lithological succession and log character. When the complete set of wells in Great Bear Plain is examined three informal units in the Albian are recognized throughout the basin: a basal unit, a shale unit, and a sandstone-shale unit.

The basal unit is characterized by interbedded sandstone, siltstone and shale (units A and B of Yorath and Cook, 1981). Glauconite, ironstone and carbonate material are common in this interval, and a brownish grey coloration is typical. In some wells this basal interval contains a "clean" sandstone immediately overlying the basal unconformity (unit A of Yorath and Cook, 1981). The contact between the lowermost "clean" sandstone and the overlying beds is commonly abrupt. The basal interval is abruptly overlain by a shale-dominant unit. These shales are brownish grey in colour and commonly contain calcite prisms from *Inoceramus*. In a few wells the shale unit also contains a thin radioactive shale (i.e. Wolverine D-61, Grey Goose N-70, Russell M-07 and Great Bear River N-30). The third unit consists of a relatively thick interval of interbedded sandstone, siltstone and shale. The vertical extent of this upper interval is unknown and in wells with a thick representative of this upper interval there may be Upper Cretaceous strata present in the uppermost beds (e.g. Mahoney Lake I-74). The revised internal stratigraphy of the Albian succession in Great Bear Basin is illustrated on Figure 4, in the Wolverine Creek D-61 and Grey Goose N-70 wells.

The overall Albian succession in Great Bear Plain is similar to the Albian of the Mackenzie valley and Peel Plateau. The main difference is the thinner character of the succession in Great Bear Plain. Williams (1988) also noted the similarities but because of the physical separation of the areas by the Keele Arch he preferred not to use the same stratigraphic nomenclature.

In Great Bear Plain, Albian strata reach a maximum known thickness of 802 m in the Wolverine D-61 well. Isopach trends (Fig. 6) indicate thickening towards the west, towards the thrust front of the Franklin Mountains. Internal correlations show that this thickening trend is due, in part, to original depositional trends, as well as preservational trends.

UPPER CRETACEOUS-TERTIARY

Mackenzie Plain

In wells drilled to the south of Fort Norman,in the vicinity of Tertiary Hills, the Slater River Formation rests unconformably on Paleozoic rocks. There, the Slater River succession consists of a thin basal sandy and silty interval abruptly overlain by an interval of radioactive shale. This radioactive shale is a critical log marker which facilitates reliable correlation of the Slater River Formation between wells and is especially critical for correlation into the western wells to reveal the unconformable relationship with the Albian Arctic Red Formation. Also, it reveals the true lateral relationship of the well developed basal Cretaceous sandstones in the Old Fort Point E-90 and Police Island L-66 wells to the Slater River Formation.

Gradationally overlying the shale-dominant Slater River succession is interbedded sandstone and shale of the Little Bear Formation. Little Bear strata can be divided into two informal members; a lower member consisting of a series of coarsening-upward, shale-to-sandstone cycles in which the sandstone part of each cycle is moderately well developed, and an upper member in which the sandstone beds of coarsening-upward cycles are thicker and better developed than those in the lower member. These coarsening-upward intervals represent transgressive-regressive cyles of sedimentation. As can be seen on Figures 3 and 4, many of the cycles can be correlated with confidence between most wells. The transition from the lower to upper member is well defined on gamma-ray logs and can be readily correlated between wells. An anomalous succession of interbedded sandstone and shale overlies the 'normal' upper member in the Little Bear I-70 well (between log depths 2782 and 3285 ft; 848-1001.3 m; Fig. 4) and also in the nearby Little Bear L-21 well. The most likely explanation is that the uppermost beds are a repeat of the upper member due to thrust faulting. However, it is difficult to match the log character exactly with the underlying "normal" upper member succession. Alternatively, the uppermost beds within the Little Bear Formation of the I-70 well could be a previously unknown stratigraphic interval. The fact that the anomalous section is present only in the Little Bear I-70 and nearby Little Bear L-21 wells, and that all other wells penetrating the Little Bear Formation are "normal", favours the structural repetition interpretation.

An abrupt shale-on-sandstone contact marks the boundary between the Little Bear and East Fork formations (Figs. 3 and 4). This is a fundamental stratigraphic break, herein interpreted to be a marine flooding surface. This concept differs drastically from the contact relationships indicated by Yorath and Cook (1981) and Sweet et al., 1989), who indicated a transitional facies boundary. However, Yorath and Cook (op. cit., p.31) did suggest that at the type section of the Little Bear Formation the contact possibly was disconformable. This contact is a very prominent log character change and can be readily correlated between wells. The East Fork Formation is a shale and siltstone dominant unit that is overlain by interbedded sandstone, conglomerate, shale and coal of the Summit Creek Formation.

Yorath and Cook (1981) included a sandstone and shale member in the upper part of the East Fork Formation but Sweet et al. (1989) preferred to include these beds in the Summit Creek Formation. If the sandstone and shale member is included in the Summit Creek Formation the contact with the East Fork Formation is gradational locally (e.g., in the Tate J-65 well; Fig. 3). However, in some places the Summit Creek succession appears to rest abruptly on older strata (e.g. Police Island L-66, Stewart B-30), suggestive of an unconformable contact, as implied originally by Yorath and Cook (1981).

The Summit Creek Formation is very poorly represented in the wells drilled around Tertiary Hills, largely because the upper levels of the exploratory holes generally are behind casing. Most comprehensive descriptions of Summit Creek strata are based on outcrop studies (Yorath and Cook, 1981; Sweet et al., 1989).

The thickest known Upper Cretaceous-Tertiary succession occurs in the Tate J-65 well, where 1750 m of section are preserved. Strata thin to the east, northeast and northwest, due both to original depositional thickness trends and Holocene erosion (Fig. 7). Thickness trends within a single, large-scale, transgressive-regressive cycle, such as the Slater River-Little Bear succession, indicate that the greatest thickness occurs close to the mountain front, thinning to the northeast.

Great Bear Plain

Isolated outcrops of Upper Cretaceous and Lower Tertiary strata have been reported from near Great Bear Lake and tentatively identified in some of the wells in the Great Bear Basin (Yorath and Cook, 1981; Williams, 1988). In many of the wells, the location of these presumed Upper Cretaceous beds is in strata behind casing, therefore the cuttings samples are either widely spaced or were not collected, and there are no geophysical logs available. Also, paleontological control on the ages of these sediments is lacking.

In Grey Goose N-70 (Fig. 4) there is an abrupt change at log depth 390 ft (118.9 m), where well developed sandstones overlie Albian beds. These sandstones are abruptly overlain by a shale succession. Yorath and Cook (1981) and Williams (1988, fig. 24) interpreted these beds to be Upper Cretaceous, an interpretation followed in this report. Oil staining is common in the sandstones at the base of the presumed Upper Cretaceous succession (see Williams, 1989, fig. 24).

Only a thin cover of Upper Cretaceous strata are known in Great Bear Plain (Fig. 7). The thickest known section occurs in the Mahoney Lake I-74 well, where 229 m of strata have been identified as Upper Cretaceous.

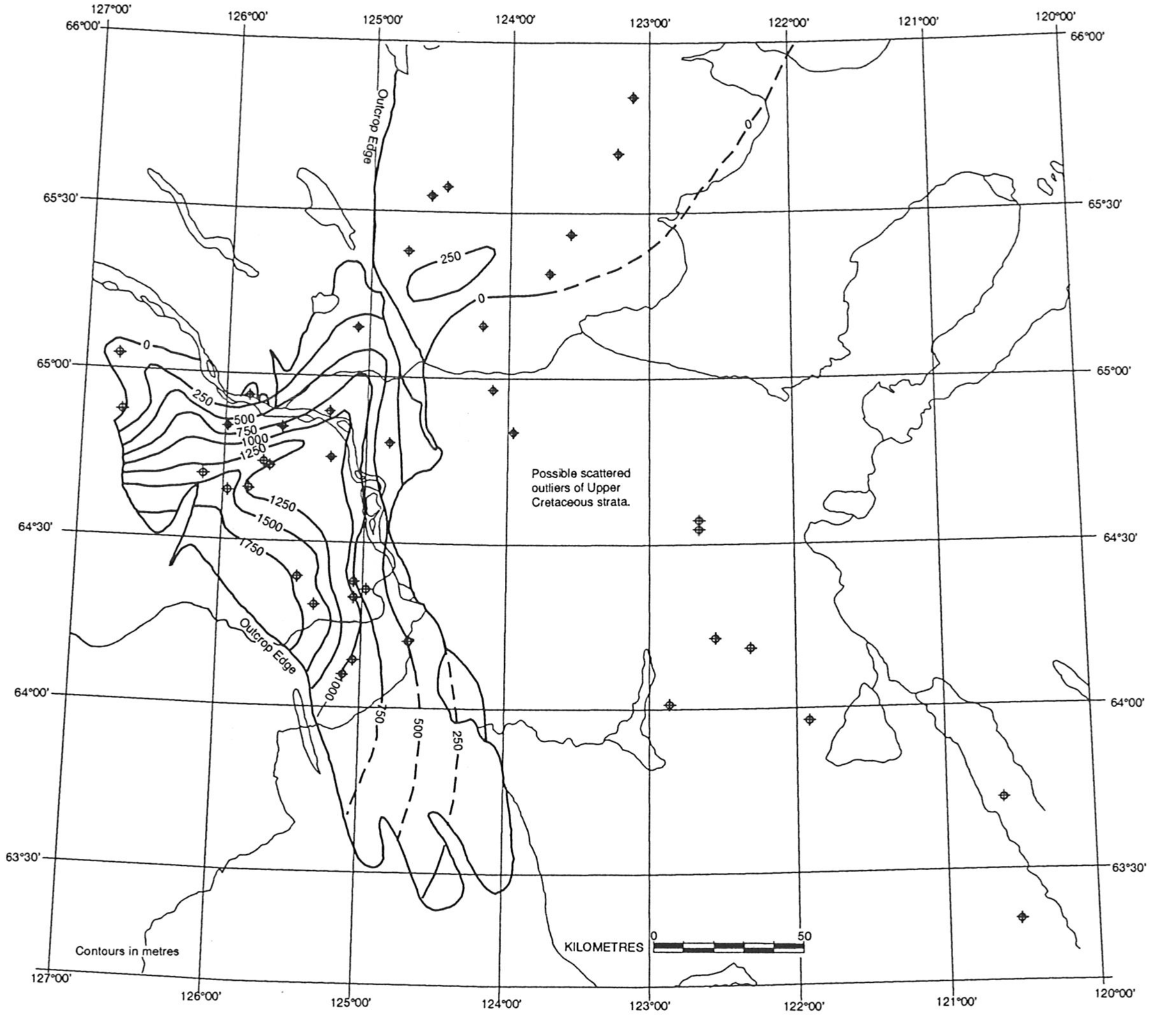

Figure 7: Isopach map of Upper Cretaceous strata in Mackenzie Plain and Great Bear Basin (may include some Quaternary strata in some wells).

DISCUSSION

Stratigraphy

The proposed correlations reflect most of the views expressed previously (Dixon 1986, 1993), that there are fundamental boundaries separating some formations in this part of the Northwest Territories. However, as will become apparent later in the discussion some modifications to these earlier views are now proposed.

A Late Aptian to Early Albian transgression, that was widespread throughout western North America, is reflected in the basal beds of the Arctic Red Formation and the unnamed Albian strata in Great Bear Basin. These basal transgressive beds characteristically have a "clean" basal sandstone overlain by interbedded shale, siltstone and sandstone, in which glauconite, ironstone and a brown coloration are common features. These beds in turn are abruptly overlain by a shale-dominant succession. This latter abrupt contact is interpreted to be a flooding surface, possibly a maximum flooding surface.

The next major boundary is between Albian and Cenomanian strata, which in the study area is between the Arctic Red and Slater River formations. The cross sections clearly show the removal of Albian strata below the Slater River Formation in the vicinity of Tertiary Hills, along an approximately north-south trend. This trend coincides with the position of the Keele Arch (Cook, 1975; Yorath and Cook, 1981; Williams, 1988), a long-lived tectonic feature reactivated in the mid-Cretaceous, probably because of tectonic stress emanating from the Cordilleran orogen. Also coincident with the Keele Arch are the presence of thick, quartz arenites at the base of the Slater River Formation, although they tend to be located more towards the centre and eastern margin of the arch (e.g., the Police Island L-66 and Old Fort Point E-30 wells). West of the arch, the basal Slater River is less sandy and contains more interbedded sandstone and shale.

The Slater River to Little Bear succession appears to represent an overall transgressive-regressive (T-R) cycle of sedimentation which apparently spans the Cenomanian to Santonian.

This is in contrast to the stratigraphic succession seen in other parts of northern Canada (Dixon, 1986, 1993), where a major regional discontinuity exists between Turonian and Santonian strata. If such an event affected Slater River-Little Bear sedimentation it is possible that it is within the sandstone and shale succession of the Little Bear Formation. The apparently consistent stratigraphic horizon, and the marked contrast, between the lower and upper members could signify a major stratigraphic boundary. However, without better biostratigraphic control the presence or absence of a discontinuity will remain unresolved.

The next fundamental boundary is that between the Little Bear and East Fork formations, here interpreted to be a flooding surface. If correctly interpreted there should be a ravinement and/or unconformity surface somewhere within the uppermost beds of the Little Bear Formation. Alternatively, the three surfaces lie in such close stratigraphic proximity that their separation is below the resolution of the logs. Based on the available paleontological data, the flooding surface separates Santonian from late Campanian or early Maastrichtian beds (Sweet et al., 1989).

Although a major unconformity exists between upper Maastrichtian and older strata in the northern Richardson Mountains (Dixon, 1986, 1993), a corresponding event in the Upper Cretaceous of the Norman Wells-Fort Norman area is not as apparent from presently available data. In fact, the paleontological data of Sweet et al. (1989) suggests deposition throughout the Maastrichtian. However, the lithostratigraphic divisions used by Sweet et al. (1989) may have clouded the issue and Yorath and Cook's (1981) original contention of an implied unconformity between East Fork and Summit Creek strata may be valid. If there is an unconformable relationship between East Fork and Summit Creek strata, especially in the Police Island area, it is possible that the first occurrence of major conglomeratic beds could be an indicator of such a relationship. In Sweet et al.'s (op. cit., fig. 5) cross section (and especially sections SLA-85-13 and 86-2) the first significant conglomerate beds appear in the informal biozone of *Porosipollis porosus*. This zone is dated as mid or late Maastrichtian.

Strata of the Cuesta Creek Member, Tent Island Formation, which lie above the Campanian-Maastrichtian unconformity of the northern Richardson Mountains contain a palynological assemblage that is similar to Sweet et al.'s (op. cit.) *Myrtipites scabratus/Aquipollenites delicatus* var. *collaris* zone (Sweet, 1978), which is dated as late Maastrichtian and lies above the *Porosipollis porosus* zone. If an unconformity exists the exact stratigraphic level at which it occurs remains uncertain.

The biostratigraphic data from the Brackett Basin indicate that there is an early to middle Maastrichtian succession not seen elsewhere in northern mainland Canada, adding an additional transgressive-regressive cycle to the eight already identified in the Cretaceous of northern mainland Canada by Dixon (1993).

The Albian to Paleocene succession reflects the extensive marine inundation of the craton in the late Aptian-Early Albian and the subsequent infilling of the Peel Trough, Brackett, and Great Bear foreland basins (Yorath and Cook, 1981). Marine influences can be found in strata as young as the early to middle Maastrichtian East Fork Formation but by late Maastrichtian time only nonmarine beds are present (Sweet et al., 1989), suggesting a retreat of the interior seaway to the continental margin areas of the Beaufort Sea and alluvial deposition on the craton within interior basins. The Late Cretaceous to Paleocene record of sedimentation is not as continuous as Yorath and Cook (1981) implied, rather there were several transgressive-regressive events of basin-wide, and regional, magnitude (Dixon, 1993). Whether the resulting patterns of sedimentation were caused by eustasy or tectonism is debatable (Dixon, 1993) but the proximity of the sediments to the active Cordillera tends to favour a strong tectonic influence.

Oil and Gas Potential

Rock-Eval data for some wells in the Fort Norman area can be found in Snowdon (1990), and vitrinite reflectance data in Feinstein et al. (1991). Unfortunately neither report includes data from the Albian succession of the study area and there are few data points from within the East Fork and Summit Creek formations. In general, the bulk of the East Fork and Slater

River shales contain about 1% organic carbon and are either immature to marginally mature. At the base of the Slater River Formation there is an organic-rich interval coincident with a highly radioactive shale. Organic values up to 6.84% have been recorded from this interval in the Little Bear L-21 well (Snowdon, 1990). The high Hydrogen Index and low Oxygen Index values suggest type I or II organic matter (Snowdon, 1990), indicating an oil-prone source rock.

The Little Bear Formation has a highly variable organic carbon content, due in large part to the presence of coal and coaly material. Summit Creek strata contain numerous coal seams and coaly material and can be anticipated to have a high organic carbon content. However, it is assumed that both the East Fork and Summit Creek sediments are thermally immature, based on the marginal maturity of the more deeply buried Slater River Formation. In the East Mackay B-45 well, oil was recovered from Paleozoic rocks immediately below the Cretaceous Slater River Formation. Geochemical properties suggest the oil was derived from the Slater River Formation (Yorath and Cook, 1981, p.46).

The basal sandstones of the Arctic Red and other Albian strata, and the basal sandstone of the Slater River Formation could be prospective reservoirs, along with the sandstones of the Little Bear and Summit Creek formations. The petrophysical (log parameters and cuttings samples) characteristics of the Arctic Red and Slater River basal sandstones generally indicate poor quality reservoirs. Only the locally developed 'clean' arenites of the Slater River Formation in the Old Fort Point E-30 and Police Island L-66 wells have good reservoir properties. Unfortunately, drillstem tests show these sandstones to be water bearing. Likewise the Little Bear and Summit Creek sandstones are exposed to the surface and probably have been subject to freshwater recharge.

Based on the marginal maturity of the Slater River source rock it is unlikely that large volumes of oil have been generated. Any oil released probably flowed to surface out of the potential Cretaceous reservoirs, or was degraded by freshwater influx. The possibility of trapping oil from the Cretaceous source rock within Paleozoic strata is a possible play concept, as exemplified by the East Mackay B-45 oil recovery, however, it seems unlikely that large quantities would exist.

Coal

Coal beds are common only in the Summit Creek Formation, especially in sections adjacent to the Police Island area where cumulative thicknesses of 30 m or more, and individual beds up to 12.1 m, have been noted (Sweet et al., 1989). The coal varies in rank from lignite to high volatile C bituminous, generally low-rank coals. The high-energy fluvial style of deposition ascribed to the Summit Creek Formation (Sweet et al., 1989) is not conducive to lateral continuity of coal beds. These deposits are not economic at present, even for local usage, because the oil reserves at nearby Norman Wells are a far more efficient fuel source.

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APPENDIX

LIST OF WELLS AND FORMATION TOPS (log depths)

Many wells have a variably thick cover of Quaternary sediments, however, they are only identified where there is a considerable thickness of unconsolidated sediments readily identifiable as Quaternary. In some areas the differentiation between Quaternary and Summit Creek strata is impossible, this is especially common in the Tertiary Hills and Police Island areas. Some wells are not included because the shallowness of the Cretaceous-Tertiary strata and their lack of log and/or sample data precludes accurate assesment of the stratigraphy.

Blackwater Lake G-52

Quaternary	0 ft	0 m

Albian - logs begins at 440 ft and poor samples do not allow for an accurate estimate of the Albian top.

Paleozoic	?608 ft	?185.3 m

Blackwater Lake I-54A

Quaternary	0 ft	0 m
Albian	?240 ft	?73.2 m
Basal zone	712 ft	217.0 m
Paleozoic	?875 ft	?266.7 m

Blueberry Creek K-53

Little Bear Fm - upper member	0 m
- lower member	?205 m
Slater River Fm	?433 m
Radioactive shale	1128 m
Basal sandstone	1139 m
Paleozoic	?1286 m

Bluefish K-71

Quaternary	0 ft	0 m
Slater River Fm	?530 ft	?161.5 m
Radioactive shale	1190 ft	362.7 m
Basal sandstone	1220 ft	371.9 m
Arctic Red Fm	1280 ft	390.1 m
Radioactive shale	1280 ft	390.1 m
Basal zone	1350 ft	506.6 m
Paleozoic	2020 ft	615.7 m

Brackett lake C-21

Slater River Fm	0 ft	0 m
Radioactive shale	844 ft	257.3 m
Basal sandstone	?917 ft	?279.5 m
Paleozoic	1114 ft	339.5 m

Cartridge B-72

Quaternary	0 ft	0 m
Albian	?240 ft	?73.2 m
Basal zone	?580 ft	?176.8 m
Paleozoic	733 ft	223.4 m

Dodo Canyon K-03

Quaternary	0 ft	0 m
Slater River Fm	?140 ft	?42.7 m
Radioactive shale	450 ft	137.2 m
Basal sandstone	502 ft	153.0 m
Arctic Red Fm	530 ft	161.5 m
Sans Sault Mbr	2512 ft	765.7 m
Paleozoic	2978 ft	907.7 m

East Mackay B-45

East Fork Fm	0 ft	0 m
Little Bear Fm - upper member	2088 ft	636.4 m
- lower member	2580 ft	786.4 m
Slater River Fm	3175 ft	967.7 m
Radioactive shale	3850 ft	1173.5 m
Basal sandstone	3880 ft	1182.6 m
Paleozoic	3987 ft	1215.2 m

East Mackay I-55

Summit Creek Fm or Quaternary	0 m
East Fork Fm	90 m
Little Bear Fm - upper member	690 m
- lower member	867 m
Slater River Fm	1073 m
Radioactive shale	1312 m
Paleozoic	1325 m

Fort Norman K-14

Little Bear Fm	0 ft	0 m
Slater River Fm	900 ft	274.3 m
Basal sandstone	2217 ft	675.7 m
Paleozoic	?2254 ft	?687.0 m

Great Bear River N-30

Quaternary	0 ft	0 m
Albian	?160 ft	?48.8 m
Radioactive shale - top	1445 ft	440.4 m
- base	1510 ft	460.2 m
Basal zone	2012 ft	613.3 m
Paleozoic	2250 ft	685.8 m

Grey Goose N-70

?Upper Cretaceous shale	0 ft	0 m
Basal sandstone	240 ft	73.2 m
Albian	935 ft	285.0 m
Radioactive shale - top	1386 ft	422.5 m
- base	1494 ft	455.4 m
Basal zone	1824 ft	556.0 m
Basal sandstone	2095 ft	638.6 m
Paleozoic	2146 ft	654.1 m

Note: Poorly defined Albian radioactive shale.
Upper Cretaceous may include a thin veneer of Quaternary.

Keele River A-28

East Fork Fm	0 ft	0 m
Little Bear Fm - upper member	1484 ft	441.4 m
- lower member	1990 ft	606.6 m
Slater River Fm	2590 ft	789.4 m
Radioactive shale	3842 ft	1171.0 m
Basal sandstone	poorly developed	
Paleozoic	?3872 ft	1180.2 m

Keele River I-01

?Summit Creek Fm/Quaternary	0 ft	0 m
East Fork Fm	?360 ft	?109.7 m
Little Bear Fm - upper member	1962 ft	598.0 m
- lower member	2366 ft	721.2 m
Slater River Fm	2898 ft	883.3 m
Radioactive shale	3534 ft	1077.2 m
Basal sandstone (poorly developed)	3608 ft	1099.7 m
Paleozoic	3670 ft	1118.6 m

Keele River L-04

Quaternary	0 ft	0 m
East Fork Fm	?130 ft	?39.6 M
Little Bear Fm - upper member	668 ft	203.6 m
- lower member	?918 ft	?279.8 m
Slater River Fm	1590 ft	484.6 m
Radioactive shale	2160 ft	658.4 m
Basal sandstone (poorly developed)	2220 ft	676.7 m
Paleozoic	?2290 ft	?698.0 m

Keele River N-62

East Fork Fm	0 ft	0 m
Little Bear Fm - upper member	1132 ft	345.0 m
- lower member	1500 ft	457.2 m
Slater River Fm	2129 ft	648.9 m
Radioactive shale	2722 ft	829.7 m
Basal sandstone (poorly developed)	2782 ft	848.0 m
Paleozoic	2840 ft	865.6 m

Keller Lake F-49

Quaternary	0 ft	0 m
Albian	?75 ft	?22.9 m
Basal zone	180 ft	54.9 m
Paleozoic	?352 ft	?107.3 m

Note: poorly defined stratigraphy

Keller Lake O-13

Quaternary	0 ft	0 m
Albian	370 ft	112.8 m
Radioactive shale - top	712 ft	217.0 m
- base	722 ft	220.1 m
Basal zone	?895 ft	?272.8 m
Paleozoic	1260 ft	349.3 m

Keller Lake P-14

Quaternary	0 ft	0 m
Cretaceous (?Albian)	?260 ft	?79.2 m
Sandstone	660 ft	201.2 m
Paleozoic	?768 ft	?234.1 m

Lac Tache C-35

Quaternary	0 ft	0 m
Albian	?215 ft	?65.3 m
Paleozoic	?315 ft	?96.0 m

Little Bear I-70

East Fork Fm	0 ft	0 m
Little Bear Fm	2766 ft	843.1 m
(Possible repeated section between 2766-3282 ft)		
upper member	3282 ft	1000.4 m
lower member	3705 ft	1129.3 m
Slater River Fm	4400 ft	1341.1 m
Radioactive shale	5192 ft	1582.5 m
Basal sandstone	5310 ft	1618.5 m
Paleozoic	5670 ft	1728.2 m

Lost Hill Lake F-62

Quaternary	0 ft	0 m
?Upper Cretaceous	?90 ft	?27.4 m
Radioactive shale - top	322 ft	98.1 m
- base	425 ft	129.5 m
?Basal sandstone	592 ft	180.4 m
Albian	612 ft	186.5 m
Basal zone	1356 ft	413.3 m
Basal sandstone	1670 ft	509.0 m
Paleozoic	1750 ft	533.4 m

Note: identification of Upper Cretaceous strata is based on the data of Yorath and Cook (1981) and Williams (1988).

Losh Lake G-22

Quaternary	0 ft	0 m
Albian	?230 ft	?70.1 m
Basal zone	825 ft	251.5 m
Basal sandstone	1116 ft	340.2 m
Paleozoic	1226 ft	373.7 m

Mahoney Lake I-74

Quaternary	0 ft	0 m
?Upper Cretaceous shale	240 ft	73.3 m
Upper Cretaceous sandstone	750 ft	228.6 m
Albian	?805 ft	?245.4 m
Basal zone	?2890 ft	?880.9 m
Basal sandstone	3058 ft	932.1 m
Paleozoic	3140 ft	957.1 m

Mirror Lake O-33

Arctic Red Fm		0 m
Sans Sault Mbr		322 m
Paleozoic		?608 m

North Little Bear L-21

Quaternary		0 m
East Fork Fm		?50 m
Little Bear Fm		634 m
(Possible repeated section between 634-769 m)		
upper member		769 m
lower member		891 m
Slater River Fm		1109 m
Radioactive shale		1345 m
Paleozoic		?1348 m

Old Fort Point E-30

Summit Creek Fm and Quaternary	0 ft	0 m
Slater River Fm	?398 ft	?121.3 m
Radioactive shale	578 ft	176.2 m
Basal sandstone	624 ft	190.2 m
Paleozoic	910 ft	277.4 m

Police Island L-66

Summit Creek Fm and Quaternary	0 ft	0 m
East Fork Fm	?852 ft	?259.7 m
Little Bear Fm	2270 ft	691.9 m
Slater River Fm	?2370 ft	?722.4 m
Radioactive shale	2965 ft	903.7 m
Basal sandstone	2970 ft	905.3 m
Paleozoic	3098 ft	941.5 m

Russell M-07

Quaternary	0 ft	0 m
?Upper Cretaceous	?150 ft	?45.7 m
Albian	?210 ft	?64.0 m
radioactive shale - top	930 ft	283.5 m
- base	988 ft	301.1 m
Basal zone	1248 ft	380.4 m
Basal sandstone	1490 ft	454.2 m
Paleozoic	1612 ft	491.3 m

Note: Casing to 300ft: tops within this interval are uncertain.

South Keele E-19

Quaternary	0 m
East Fork Fm	?55 m
Little Bear Fm - upper member	242 m
- lower member	?360 m
Slater River Fm	560 m
Radioactive shale	926 m
Basal sandstone	932 m
Paleozoic	?945 m

St Charles Creek H-61

Quaternary	0 ft	0 m
Albian	?30 ft	?9.1 m
Basal zone	1425 ft	434.3 m
Paleozoic	1655 ft	504.1 m

Stewart B-30

Quaternary (or Summit Creek Fm)	0 ft	0 m
East Fork Fm	?490 ft	?149.4 m
Little Bear Fm - upper member	3550 ft	1082.0 m
- lower member	3985 ft	1214.6 m
Slater River Fm	4560 ft	1389.9 m
Radioactive shale	5290 ft	1612.4 m
Basal sandstone	5320 ft	1621.5 m
Paleozoic	5451 ft	1661.5 m

Tate J-65

Quaternary	0 ft	0 m
Summit Creek Fm	?280 ft	?85.3 m
East Fork Fm	1462 ft	445.6 m
Little Bear Fm - upper member	3743 ft	1140.9 m
- lower member	4155 ft	1266.4 m
Slater River Fm	4810 ft	1466.1 m
Radioactive shale	5525 ft	1684.0 m
Basal sandstone	5729 ft	1746.2 m
Paleozoic	5742 ft	1750.2 m

White M-04

Quaternary	0 ft	0 m
Albian	?280 ft	?85.3 m
Radioactive shale - top	?700 ft	?213.4 m
- base	712 ft	217.0 m
Basal zone	1088 ft	331.6 m
Basal sandstone	1375 ft	419.1 m
Paleozoic	1464 ft	446.2 m

Whitefish River H-34

Quaternary	0 ft	0 m
?Upper Cretaceous sandstone	72 ft	21.9 m
Albian	490 ft	149.4 m
Basal zone	2222 ft	677.3 m
Basal sandstone	2439 ft	740.7 m
Paleozoic	2500 ft	762.0 m

Note: the identified Upper Cretaceous sandstone could be an Albian unit.

Whitefish River K-76

Quaternary	0 ft	0 m
Upper Cretaceous shale	?60 ft	18.3 m
Albian	?600 ft	?182.9 m
Basal zone	?2198 ft	?670.0 m
Basal sandstone	2418 ft	737.0 m
Paleozoic	2664 ft	812 m

Wolverine Creek D-61

Quaternary	0 ft	0 m
Albian	?200 ft	?61.0 m
Radioactive shale - top	1915 ft	583.7 m
- base	1950 ft	594.4 m
Basal zone	2487 ft	758.0 m
Basal sandstone	2730 ft	832.1 m
Paleozoic	2828 ft	862.0 m