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THE SUBSURFACE GETHING AND BLUESKY
FORMATIONS OF NORTHEASTERN
BRITISH COLUMBIA

D. C. Pugh



G E O L O G I C A L S U R V E Y
O F C A N A D A

PAPER 60-1

THE SUBSURFACE GETTING AND
BLUESKY FORMATIONS OF NORTH-
EASTERN BRITISH COLUMBIA

By

D.C. Pugh

D E P A R T M E N T O F
M I N E S A N D T E C H N I C A L S U R V E Y S
C A N A D A

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THE SUBSURFACE GETHING AND BLUESKY FORMATIONS
OF NORTHEASTERN BRITISH COLUMBIA

INTRODUCTION

This report is a preliminary account of a stratigraphic study of the Lower Cretaceous Gething and Bluesky formations penetrated by holes drilled for oil and natural gas in that part of northeastern British Columbia east of longitude 123° and between latitudes 55° 30' and 58°. Descriptions were made from drilling samples and well cores and the strata were correlated with the aid of electrical logs.

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STRATIGRAPHY

South of latitude 58° in northeastern British Columbia, subsurface non-marine strata lithologically similar to the Gething formation of the Peace River foothills (McLearn, 1923)¹ are underlain conformably by the Cadomin formation in the south, by possibly equivalent marine quartzose sandstones in the Buick Creek area, and by thin beds of possible Cadomin chert sand in the north.

Lying on the eroded subsurface Gething formation are marine strata identical with the Bluesky formation of the Peace River region of Alberta (Alberta Study Group, 1954).

GETHING FORMATION

The name Bullhead Mountain formation was proposed by McLearn (1918, p. 16c) to designate the strata lying above the Jurassic Fernie shales and below the Fort St. John group in the Peace River foothills. In 1923 he divided the formation into two parts and called the upper part the Gething member. The lower contact of the Gething member was drawn where "conglomerates and grits disappear, coarse sandstone becomes rare, and medium to fine sandstone, shale, clay ironstone, and coal beds become common" (McLearn, 1923, p. 4B). The Gething member as originally described is overlain by the Moosebar formation (McLearn, 1923, p. 5B), which is overlain by the Gates formation (McLearn and Kindle, 1950, p. 76).

¹Names and dates in parentheses are those of References cited above.

TABLE I

Table of Formations

Era	Epoch	Formation and Thickness (feet)	Lithology	
Mesozoic	Lower Cretaceous	Moosebar formation	Dark grey shales and silty shales	
		Bluesky formation (0 - 170)	Dark grey chert granules and pebbles; glauconitic, porous quartzose sandstone	
		Disconformity		
		Gething formation (0 - 615)	Non-marine sandstones, siltstones, and dark shales; coal	
		Cadomin formation	Conglomerate; cherty sandstone	

TABLE II

Correlation Chart of the Bullhead Group and the Lower Part of the Fort St. John Group

	Peace River Foothills, B.C. (Beach and Spivak, 1944)	Northeastern B.C. sub-surface	Peace River, Alta. (Alberta Study Group, 1954)
Overlying beds	Gates formation	Gates formation	Spirit River formation
Lower part Fort St. John group	Moosebar formation	Moosebar formation	Bluesky formation
		Bluesky formation	
Bullhead group	Gething formation	Gething formation	Bullhead group
	Dunlevy formation	Cadomin formation	
		Nikanassin formation	Nikanassin formation
Underlying beds	Fernie group	Fernie group	Fernie group,

In 1944, Beach and Spivak, employing the term Bullhead group, proposed the name Dunlevy formation for the lower part and retained the term Gething formation for the upper part. The Gething formation was estimated to be about 1,400 feet thick. The overlying strata were reported to be "the marine shale assemblage known as the Fort St. John group" (Beach and Spivak, 1944, p. 4).

In the subsurface of northeastern British Columbia the Jurassic Fernie group is overlain by a succession of sandstones, conglomerates, siltstones, shales, and coal beds similar to rocks of the Bullhead group that outcrop in the Peace River foothills. The lower part of this succession, roughly equivalent to the Dunlevy formation of Beach and Spivak, may be divided into the Nikanassin and Cadomin formations. The upper part consists of non-marine sandstones, shales, and coal beds similar in lithology to the Gething member of McLearn, and has been called the Gething formation by oil-company geologists and the British Columbia Department of Mines (Cosburn, 1956).

The Gething formation (see Fig. 2) has been recognized in the subsurface over all but the most northerly part of the map-area. In the north the formation is possibly truncated due to erosion of the surface before deposition of the Bluesky formation. On the evidence available, the exact position of the northern edge cannot be defined, but it lies approximately south of the Bougie Creek and Chinchaga wells, and north of the Conroy Creek well and Texaco's Beaton River well No. 1 (see Fig. 2). From its possible northern eroded edge, the Gething formation thickens irregularly to the south and southwest, attaining a maximum known subsurface thickness of 615 feet in Gates well No. 1 (Pacific).

Local thinning of the Gething sediments was recorded in the Buick Creek area where the formation is about 80 feet thick; in wells immediately to the north, south, and west, it is more than 200 feet thick. Between Buick Creek and the Alberta border there appears to be a more extensive area of thinning within the Gething formation. Only about 25 feet of beds were found in Boundary Lake well No. 3; to the north, 179 feet of Gething sediments were recorded in the Milligan well; and to the south the formation thickens to 250 feet in 15 miles. This thinning appears to coincide with the distribution of the quartzose sandstone equivalents of the Cadomin formation (Fig. 2). However, as no marker beds within the Gething formation have been traced, it is not known whether only part of the Gething was deposited, or the upper part was eroded, or the formation as a whole is thinner.

Local thinning is evident in the Nig Creek area. The formation is about 140 feet thick between Texaco's Nig Creek well No. 1 and No. 6, but only 8 miles to the west, 309 feet of Gething beds were recorded in Nig Creek well No. 1 (Fargo). This thinning coincides with a locally thick part of the Lower Fernie, but here, as in the Buick Creek area, the nature of the thinning cannot be determined, due to lack of evidence from any marker beds within the Gething formation.

The Gething isopachs form irregular patterns of thinning and thickening in the Fort St. John and Blueberry areas, but to the southwest the formation thickens apparently uniformly.

The Gething formation consists of grey to dark grey, fine- to coarse-grained siltstones, grey to brownish grey, silty, fine- to coarse-grained sandstones, and dark grey and black, carbonaceous shales and coal. No individual beds have been successfully traced across any part of the map-area, as the formation appears to consist of a complex series of discontinuous beds or lenses. A representative section, of average total thickness with average cumulative thicknesses of sandstones and coal beds, was drilled in Fort St. John well No. 2 (Peace River Allied). It includes strata between the depths of 3,175 feet and 2,809 feet. The section consists mainly of brownish grey, fine- to coarse-grained, commonly argillaceous or sideritic siltstones, some silty, very fine- to coarse-grained, poorly sorted sandstones, and some coal and black carbonaceous shales. The sandstones are characteristically dirty and poorly sorted, with both angular and rounded grains in the same sandstone. Sand-grain-size fragments of coal are common. A medium-grained chert and quartz sandstone occurs 30 to 40 feet above the base. From this general description there appears to be little variation in the subsurface Gething formation, exceptions being the rare occurrence of glauconite (e. g. in Fort St. John well No. 12--see Fig. 5), the presence of conglomeratic, coarse-grained, cherty sandstone in B4 well No. 1 (2,017-1,990 feet) and in Daiber "A" well No. 1 (3,410-3,310 feet), and a percentage increase in cumulative thickness of coal and carbonaceous shale in B4 well No. 1.

The Gething formation overlies the Cadomin formation and its equivalents but in the north it is in contact with older beds, suggesting an unconformity at the base of the Gething (Figs. 5 and 6). However, the coarse, cherty sandstones and conglomerates of the Cadomin formation and the quartzose sandstones possibly equivalent to those of the Cadomin have been generally found to grade upwards into the dirty sandstones and siltstones of the Gething formation, with the contact commonly difficult to determine. McLearn (1923) also recorded a gradation from conglomerates to fine sandstones at the base of the Gething in the Peace River foothills. The evidence therefore indicates that the Gething formation lies conformably on the Cadomin formation and its equivalents, while in some localities in the north the basal chert sand of the Gething represents possible Cadomin deposition. The upper contact of the Gething formation represents an abrupt change in deposition from non-marine sands and silts to marine quartz sands and pebbles. The nature of this contact is discussed under the Bluesky formation.

In Phillips Daiber "A" well No. 1 (see Appendix), Gething and Bluesky beds are repeated by faulting, resulting in a total of 1,134 feet of beds between the Nikanassin formation below and the Moosebar formation above. Similarly repetition by thrust faulting is shown in Cameron River well No. 1 (Texaco NFA) where there is a total of 1,242 feet of repeated beds. In addition, the drilled thickness of the individual beds may be greater than the true thickness due to possible tilting of the strata.

On electrical logs the Gething formation is represented by a generally ragged resistivity curve of medium to high values and by medium to low negative self-potentials. In most wells the lower and upper contacts are indicated by the change to high self-potentials for the underlying Cadomin and overlying Bluesky formations.

A non-marine environment of deposition for almost all of the sediments considered as equivalents of the Gething formation is indicated by the presence of silty, angular and rounded, poorly sorted sandstones, dirty siltstones, carbonaceous shales and coal beds. These suggest deposition in lakes and swamps. However, the presence of some glauconite (e.g. Fort St. John well No. 12), indicates temporary marine or brackish conditions, agreeing with McLearn's (1944, p. 7) evidence of "temporary brackish water or restricted marine conditions" during deposition of the lower part of the Blairmore group and its correlatives (including the Gething formation). Allan and Stelck (1940) in their description of core from Guardian well No. 1 at Bonanza, Alberta, 5 miles from the British Columbia boundary, record the presence in suggested "Gething member" of glauconitic, calcareous sandstone containing "considerable carbonaceous matter", a "glauconite-bearing sandstone", a thin chert-pebble zone, shales and "thin bands of coal". From this description it appears that glauconite is more common and coal beds are fewer and thinner than in the subsurface Gething beds to the west, indicating more marine conditions to the east.

Evidence of increased grain size to the west is shown by the presence of conglomeratic, coarse-grained sandstone in two of the most westerly wells, B4 No. 1 and Daiber "A" No. 1. In all other wells examined nothing coarser than poorly sorted, fine- to coarse-grained sandstones were recorded. McLearn (1944), in reference to the Bonanza section of Allan and Stelck (1940), notes an average decrease in grain size from west to east, which agrees with the evidence from British Columbia wells. This suggests a westerly source for at least some of the Gething sediments.

An Aptian (Lower Cretaceous) age for the Gething formation was suggested by Bell (1956, p. 19), who correlated it with the Lower Blairmore of the Alberta Foothills on the basis of similar flora.

BLUESKY FORMATION

The name Bluesky formation was proposed by the Alberta Study Group (1954, p. 276) for a marine sandstone which occurs in the Peace River wells between the Bullhead group below and the Spirit River formation above. It consists of glauconitic sand and chert pebbles and takes its name from the Bluesky well No. 1 (Shell-British American) in Alberta, lsd. 4-29-81-1, W6, where it occurs between the 2,810- and 2,736-foot depths, having a thickness of 74 feet. The Alberta Study Group (1954) recorded a total of 20 feet of Bluesky strata cored between 2,744 and 2,769 feet of which 11 feet 9 inches were recovered. The recovered portion showed an aggregate of 3 feet of glauconitic, shaly, fine- to medium-grained sandstone, an aggregate of 2 feet of shale with thin sandstone lenses, and 6 feet 9 inches of interbedded sandstone and shale. The top of the Bluesky formation is "characterised commonly by an abundance of black, rounded chert granules and pebbles, decreasing in number downward." (op. cit., p. 276) The sandstone is described as consisting of subangular to subrounded, clear quartz grains. "Glauconite is common...the sandstone generally has fair to good porosity. Irregular medium-high resistivities and negative self-potentials are characteristic of the electrical logs."

By means of electrical-log correlation, the Alberta Study Group carried the Bluesky formation west to the Alberta-British Columbia border where 160 feet of Bluesky sediments were recorded in Wilrich well No. 1 (Peace River Natural Gas). The drilling samples from this well are very poor, but were found to contain fragments of porous, glauconitic, fine-grained quartzose sandstone, indicating lithology similar to that of the type section.

In the subsurface of northeastern British Columbia the Gething formation is overlain by a relatively thin series of beds similar in lithology and electrical-log characteristics to the Bluesky formation of Alberta as described by the Alberta Study Group. These beds have been informally called "Bluesky" by some oil-company geologists, and Cosburn (1956) uses Bluesky as a formational name. It is proposed therefore to use the name Bluesky formation in northeastern British Columbia in its type sense.

The shales overlying the subsurface Bluesky formation in British Columbia are similar in lithology to, and occupy the same stratigraphic position as, the Moosebar formation in the Peace River Foothills lying between probable Bluesky equivalent below and the Gates formation above (Table II). For this reason the shales above the Bluesky formation in the subsurface are referred to in this report as the Moosebar formation. This is used in preference to the names Wilrich and Fahler members of the Spirit River formation overlying the Bluesky formation in Alberta, for if, as is possible, the Moosebar formation be equivalent to part or all of these members, the name Moosebar, proposed for a surface unit in 1923 (McLearn, p. 58), has priority over Wilrich, Fahler and Spirit River, names proposed for subsurface units in 1952 (Badgley, p. 18).

In the southeastern part of the map-area, the Bluesky formation consists of glauconitic sandstone alone. These beds apparently thicken from zero immediately northwest of Fort St. John to a maximum recorded 170 feet in B2 well No. 1 (Southern Production Atlantic), and are commonly about 70 feet in thickness. This compares favourably with reported thicknesses ranging from 35 to 150 feet, averaging 50 feet, in the Peace River region of Alberta (Alberta Study Group, 1954). In the Blueberry and Halfway areas the Bluesky formation averages less than 20 feet in thickness and is represented in the drilling samples by fragments of rounded and polished dark chert granules and pebbles probably up to at least an inch in diameter. In a few isolated wells, quartzose sandstone and chert pebbles are found together, and at some localities the formation is apparently absent (see Fig. 3). The Bluesky formation appears to have a similar northward extension as the underlying Gething formation, with porous quartzose sands and corresponding Bluesky electrical-log characteristics recorded in Buckingham well No. 1 (Fig. 5) and Beaton River well No. 1 (Texaco N.F.A.) (Fig. 6). In Chinchaga well No. 1, possibly 6 feet of rounded chert granules were recorded at the base of the Moosebar formation lying on the eroded surface of Triassic beds. In view of their similarity to the Bluesky granules, they are considered to be equivalent to the Bluesky formation and not to belong to an earlier deposit.

The section in Fort St. John well No. 10 (Pacific) from 3, 278 to 3, 240 feet has been chosen for reference as typically representative of the Bluesky formation in the Peace River area of British Columbia because of its characteristic lithology and as the upper contact and 31 feet of the formation were cored (see Appendix). In ascending order, it consists of 24 feet of very fine-grained, glauconitic sandstone with carbonaceous inclusions, 5 feet of glauconitic, sandy shale and 11 feet of porous, fine-grained, glauconitic sandstone. No chert fragments were observed in the Bluesky drilling samples from this or any other well in the southeastern part of the map-area.

The Gething-Bluesky contact represents a significant break in sedimentation from continental deposits of silty, poorly sorted sands and muddy silts to marine, clean, well-sorted, quartzose sands and rounded chert pebbles. The actual contact has not been observed and no evidence has been recorded of the nature of the contact in the Peace River area between the Gething beds and the Bluesky sandstone. To the north and west, where the Bluesky formation consists of chert granules and pebbles alone, beds of rounded, polished pebbles lie directly on the Gething surface, suggesting that this surface may have been eroded. Supporting this view is the evidence of erosion recorded by Beach and Spivak (1944) who observed black chert pebbles lying on the eroded surface of Gething sandstone.

The upper contact appears to represent a fairly sharp change from sandstone to shale. The cored contact in Fort St. John well No. 10 shows this change in lithology grading through only 6 inches. In the Peace River area of Alberta, the Alberta Study Group (1954, p. 274) recorded a "fairly abrupt downward change from shale to sandstone" at the Spirit River-Bluesky contact.

The electrical-log characteristics for the sandstones and pebble-conglomerate of the Bluesky formation in northeastern British Columbia are identical with those described by the Alberta Study Group for the Bluesky formation in Alberta. The formation is readily identified on electrical logs by the self-potential curve which is noticeably higher than for the underlying Gething formation.

The presence of abundant glauconite and polished pebbles indicates shallow marine environment of deposition. The well-sorted, rounded pebbles suggest either selective transportation from an outside source, or residual deposits resulting from erosion of the underlying beds. In support of the latter view it has been suggested that the underlying Gething formation may have been eroded and it is possible that such poorly sorted sands as are found in the Gething formation contained scattered chert pebbles in sufficient quantity to form the Bluesky pebble beds.

The Bluesky formation was included in the Fort St. John group by the Alberta Study Group (1954), a classification which conforms with the definition of Wickenden and Shaw (1943) of the Fort St. John group to include all predominantly marine strata lying between the Bullhead group and the Dunvegan formation. The formation was dated as Middle Albian (Lower Cretaceous) by Stelck and others (1956).

In the foothills of northeastern British Columbia, thin beds of sand and pebbles occupy the same position in the section as the Bluesky formation: (a) Northwest of Hudson Hope, six British Columbia Government exploratory wells were drilled in 1921-22, and 7 to 60 feet of conglomerate were recorded between the Bullhead group and "St. John Group" (Cosburn, 1956, pp. 8-9); (b) McLearn (1923, p. 5B), in describing the Gething member of the Bullhead Mountain formation, recorded an 18-inch bed of sandstone containing small scattered pebbles at the top of the member; (c) Beach and Spivak (1944, p. 7) noted the presence of a conglomerate bed at the base of the Moosebar formation--"The bed is 2 feet thick and contains well-rounded black chert pebbles up to 2 inches in diameter embedded in a black argillaceous cement. The conglomerate fills small channels and depressions in underlying Gething sandstone indicating an interval of erosion before deposition of the Moosebar." In view of the similarity in lithology and stratigraphic position in the section, these beds are considered to be correlative with the Bluesky formation.

STRUCTURAL RELATIONS

Structure contours on the pre-Moosebar surface are shown in Figure 4. The main features of this surface are: elevated beds in the foothills belt with beds repeated by thrust faulting in the Cameron River area; a structurally low belt from Boundary Lake to Nig Creek with pronounced highs in the Blueberry and Buick Creek areas; a drop in elevation of about 1,000 feet in 12 miles south of Fort St. John.

East of the foothills belt these features closely resemble the structural features on the pre-Jurassic surface.

OIL AND NATURAL GAS

There are very few reported gas or oil shows in the Gething formation in northeastern British Columbia, as the Gething sands are generally silty and dense. Exceptions are in the Boundary Lake area where discontinuous sandstones have produced gas.

The Bluesky formation appears to have more commercial possibilities than the Gething formation (see Fig. 3); Charlie Lake well No. 93 (Pacific) is currently producing oil from Bluesky sand; and gas has recently been discovered in Buick Creek well No. 12 and Boundary Lake well No. 7, both of Texaco N.F.A., in the Bluesky formation. Small flows of inflammable gas were reported in 1922 from conglomerate between the Bullhead sandstone and "St. John group" in the British Columbia Government test-holes northwest of Hudson Hope (Cosburn, 1956). In view of these widely scattered discoveries and the fact that the porous Bluesky beds are sealed below and above by dense strata, it may be worth while to test this formation wherever it is encountered, although the possibility of any major reserve of oil or gas in the Bluesky is unlikely. In this connection structural traps in the foothills may not be discounted.

- APPENDIX -

LOG OF WELLS

Except where otherwise stated, descriptions were made from drilling samples stored at the office of the Geological Survey of Canada in Calgary, Alberta

Pacific Fort St. John Well No. 10

Location: 56° 14' 35" N, 120° 36' W

Elevation: 2,337' KB

#Denotes core description from cores stored at Pacific Petroleum's core house at Charlie Lake, B.C.

Overlying beds: Shale, dark grey, finely silty; siltstone, dark grey, fine-grained, argillaceous, (Moosebar formation)

Depth (feet)	Bluesky Formation
#3,240 - 3,245	Sandstone, buff, fine-grained, mainly quartz, glauconitic; upper contact 'gradational' through 6 inches
#3,245 - 3,251	Sandstone, grey, fine-grained, mainly quartz; glauconitic; good porosity
#3,251 - 3,256	Shale, very dark grey, chunky, slightly dolomitic, very glauconitic, finely sandy (rounded quartz grains) and coarsely silty
#3,256 - 3,271	Sandstone, buff-grey, very fine-grained, very glauconitic; numerous carbonaceous inclusions
3,271 - 3,278	Sandstone, brownish grey, fine-grained, silty, very glauconitic
	Gething Formation
3,278 - 3,290	Siltstone, brownish grey, fine-grained, argillaceous, in part micropyrritic
3,290 - 3,300	Coal
3,300 - 3,310	Sandstone, brownish grey, fine-grained, silty
3,310 - 3,320	Shale, creamy white, bentonitic
3,320 - 3,380	Missing

Pacific Fort St. John Well No. 10--(cont.)

Depth (feet)	
3, 380 - 3, 390	Siltstone, dark brownish grey, fine-grained, argillaceous
3, 390 - 3, 410	Siltstone, greyish brown, fine- to coarse-grained, argillaceous
3, 410 - 3, 420	Sandstone, brownish grey, very fine-grained, silty; coal
3, 420 - 3, 450	Siltstone, dark greyish brown, fine- to coarse-grained, argillaceous
3, 450 - 3, 470	Siltstone, greyish buff, medium- to coarse-grained, argillaceous
3, 470 - 3, 480	Shale, dark grey, flaky
3, 480 - 3, 490	Siltstone, very dark grey, fine-grained, slightly sandy
3, 490 - 3, 500	Siltstone, pale buff-grey, fine-grained
3, 500 - 3, 520	Siltstone, greyish buff, medium-grained
3, 520 - 3, 530	Siltstone, as above; trace shale, white, bentonitic
3, 530 - 3, 540	Siltstone, pale greyish buff, fine-grained, sideritic, dense
3, 540 - 3, 550	Coal
3, 550 - 3, 560	Siltstone, greyish buff, fine- to medium-grained
3, 560 - 3, 570	Siltstone, as above, finely sandy, in part pyritic
3, 570 - 3, 578	Siltstone, buff-grey, fine- to coarse-grained
#3, 578 - 3, 585	Siltstone, greyish buff, fine-grained, dense; some bituminous inclusions
#3, 585 - 3, 588	Siltstone, dark brownish grey, fine-grained, oil-stained; some bituminous inclusions
#3, 588 - 3, 600	Siltstone, buff-grey, fine- to medium-grained, dense
#3, 600 - 3, 605	Siltstone, dark greyish brown, fine-grained, micaceous, bituminous
#3, 605 - 3, 613	Siltstone, greyish buff, coarse-grained; some thin, bituminous, micaceous streaks; slight porosity
Underlying beds:	Conglomerate; chert and fine to coarse sand. (Cadomin formation)

Peace River Allied Fort St. John Well No. 2

Location: 56°03'N, 120°54'W

Elevation: 2,129' KB

Overlying beds: Shale, dark grey, chunky, finely silty, (Moosebar formation)

Depth (feet) Bluesky Formation

2,770 - 2,790 Sandstone, buff-grey, very fine-grained; dolomitic cement

2,790 - 2,800 Siltstone, buff-grey, medium-grained; dolomitic cement

2,800 - 2,809 Sandstone, grey, fine- to medium-grained; some glauconite

Gething Formation

2,809 - 2,820 Coal and carbonaceous shale

2,820 - 2,830 Sandstone, pale grey, fine-grained, silty; some dolomitic cement; some coal

2,830 - 2,840 Coal and carbonaceous shale

2,840 - 2,860 Siltstone, greyish brown, fine-grained, sideritic

2,860 - 2,870 Siltstone, dark brownish grey, fine-grained argillaceous

2,870 - 2,890 Sandstone, brownish grey, fine-grained, silty, sideritic

2,890 - 2,900 Siltstone, dark brownish grey, fine-grained

2,900 - 2,990 Siltstone, greyish brown, fine- to medium-grained, sideritic, some coal at 2,930 - 2,940 feet

2,990 - 3,000 Sandstone, pale brown and black, fine-grained, silty, some shale, pale buff, bentonitic

3,000 - 3,010 Siltstone, greyish brown, coarse-grained, sideritic

3,010 - 3,020 Siltstone, dark greyish brown, fine-grained, sideritic

3,020 - 3,030 Siltstone, brownish grey, medium- to coarse-grained, sideritic

3,030 - 3,040 Siltstone, greyish brown, medium-grained, sideritic

Peace River Allied Fort St. John Well No. 2--(cont.)

Depth (feet)	
3,040 - 3,050	Siltstone, as above, coarse-grained
3,050 - 3,060	Siltstone, dark greyish brown, fine-grained sideritic
3,060 - 3,070	Coal
3,070 - 3,075	Sandstone, dark greyish brown, fine-grained, sideritic
3,075 - 3,095	Siltstone, dark grey, fine-grained, argillaceous
3,095 - 3,110	Siltstone, greyish brown, medium-grained; some coal
3,110 - 3,140	Siltstone, buff-grey, coarse-grained, sideritic
3,140 - 3,150	Sandstone, grey, medium-grained, angular, chert, and quartz; good porosity
3,150 - 3,170	Siltstone, buff-grey, coarse-grained
3,170 - 3,175	Sandstone, grey and pale brown, fine- to medium- grained, silty; dolomitic or sideritic cement
Underlying beds: Conglomerate; chert and coarse sand, (Cadomin formation)	

Phillips Daiber "A" Well No. 1

Location: 56°47'42" N, 122°27' W

Elevation: 3,112' KB

This section is believed to be repeated by thrust faults.
The following interpretation is based on this assumption,
aided by electrical log.

Overlying beds:	Shale, dark grey, finely silty, micromicaceous, (Moosebar formation)
Depth (feet)	Bluesky Formation
2,742 - 2,782	Sandstone, very pale buff, fine-grained, mainly quartz, slightly glauconitic; some chert, white, (trace green), at 2,750-2,760 feet
	Gething Formation (?)
2,782 - 2,800	Sandstone, greyish buff, very fine-grained, silty
2,800 - 2,840	Siltstone, dark brownish grey, medium- to coarse- grained, argillaceous, micromicaceous
2,840 - 2,854	Sandstone, pale grey, fine-grained, silty
	Bluesky Formation (?)
2,854 - 2,910	Sandstone, buff, very fine-grained, slightly glauconitic
2,910 - 2,937	Sandstone, as above; shale, black, in part finely silty
	Gething Formation
2,937 - 2,950	Siltstone, buff, coarse-grained
2,950 - 2,960	Sandstone, pale grey, fine- to very-fine-grained
2,960 - 2,970	Siltstone, dark brownish grey, fine-grained, argillaceous, micromicaceous
2,970 - 3,000	Siltstone, as above, medium-grained
3,000 - 3,010	Siltstone, buff, coarse-grained
3,010 - 3,020	Sandstone, buff, very fine-grained, coarsely silty
3,020 - 3,050	Siltstone, very dark brownish grey, fine-grained, argillaceous, micromicaceous

Phillips Daiber "A" Well No. 1--(cont.)

Depth (feet)	
3,050 - 3,060	Siltstone, as above, medium-grained
3,060 - 3,070	Sandstone, pale buff, medium- to very-fine-grained, silty
3,070 - 3,080	Siltstone, very dark brownish grey, fine-grained, argillaceous, micromicaceous
3,080 - 3,090	Siltstone, as above; sandstone, pale grey, fine-grained, angular, silty
3,090 - 3,098	Siltstone, brownish grey, coarse-grained
Bluesky Formation (?)	
3,098 - 3,157	Sandstone, white, fine-grained, quartz; good porosity
Gething Formation	
3,157 - 3,180	Siltstone, brownish grey, fine- to medium-grained
3,180 - 3,190	Sandstone, white, fine- to medium-grained, quartz; good porosity (electrical log does not suggest Bluesky beds)
3,190 - 3,200	Siltstone, brownish grey, coarse-grained; some dark streaks
3,200 - 3,210	Shale, black, chunky, finely silty, carbonaceous
3,210 - 3,220	Siltstone, dark grey, fine-grained, argillaceous
3,220 - 3,230	Shale, black, chunky, finely silty; some coal
3,230 - 3,240	Siltstone, greyish buff, fine- to coarse-grained
3,240 - 3,250	Coal, in part silty
3,250 - 3,270	Siltstone, greyish buff, fine- to coarse-grained; some sandstone, fine-grained, silty
3,270 - 3,290	Siltstone, dark brownish grey, medium-grained, argillaceous; some shale, black, carbonaceous
3,290 - 3,310	Siltstone, brownish grey, medium-grained, micromicaceous
3,310 - 3,340	Sandstone, grey, fine- to coarse-grained, conglomeratic, chert and quartz

Phillips Daiber "A" Well No. 1--(cont.)

Depth (feet)	
3,340 - 3,350	Siltstone, greyish brown, medium-grained
3,350 - 3,380	Sandstone, pale grey, fine- to coarse-grained, chert and quartz
3,380 - 3,410	Sandstone, pale grey, medium- to very-coarse-grained, chert and quartz, conglomeratic; good porosity
3,410 - 3,420	Sandstone, greyish buff, fine-grained, silty
3,420 - 3,430	Sandstone, grey, fine- to medium-grained, silty, chert and quartz
3,430 - 3,440	Sandstone, pale grey, fine- to coarse-grained, chert and quartz
3,440 - 3,470	Siltstone, very dark grey, fine-grained
3,470 - 3,480	Sandstone, greyish buff, very fine-grained, silty
3,480 - 3,490	Siltstone, very dark brownish grey, fine-grained, argillaceous, micromicaceous
3,490 - 3,500	Siltstone, greyish buff, medium-grained
3,500 - 3,520	Siltstone, dark greyish brown, medium-grained, argillaceous, pyritic
3,520 - 3,530	Shale, black, chunky, finely silty, carbonaceous
3,530 - 3,550	Sandstone, greyish buff, very fine-grained, silty; some shaly coal
3,550 - 3,570	Sandstone, pale grey, fine-grained, silty; some coal
3,570 - 3,590	Siltstone, dark greyish brown, fine-grained
3,590 - 3,620	Siltstone, greyish brown, medium-grained
3,620 - 3,630	Sandstone, very pale grey, fine- to coarse-grained, quartz
3,630 - 3,640	Siltstone, greyish brown, medium-grained
3,640 - 3,650	Siltstone, as above; shale, black, carbonaceous
3,650 - 3,660	Shale, black, chunky, finely silty, carbonaceous
3,660 - 3,670	Siltstone, brownish grey, fine- to medium-grained; some sandstone, fine-grained

Phillips Daiber "A" Well No. 1 --(cont.)

Depth (feet)	
3,670 - 3,680	Siltstone, greyish brown, medium-grained
3,680 - 3,690	Siltstone, pale grey, coarse-grained, finely sandy
3,690 - 3,700	Siltstone, as above; siltstone, black, fine-grained, carbonaceous; some coal
3,700 - 3,710	Sandstone, pale grey, fine-grained
3,710 - 3,760	Sandstone, white, fine- to coarse-grained, quartz; medium porosity (electrical log does not suggest Bluesky beds)
3,760 - 3,770	Sandstone, greyish buff, fine- to very-fine-grained
3,770 - 3,780	Siltstone, very dark brownish grey, fine-grained, argillaceous
3,780 - 3,800	Sandstone, pale grey, fine- to very-fine-grained, quartz
3,800 - 3,810	Siltstone, brownish grey, coarse-grained
3,810 - 3,830	Siltstone, pale grey, coarse-grained
3,830 - 3,840	Siltstone, very dark brownish grey, fine-grained, argillaceous, micromicaceous
3,840 - 3,850	Sandstone, greyish buff, fine-grained, silty
3,850 - 3,860	Shale, black, flaky
3,860 - 3,876	Sandstone, greyish buff, very fine-grained, silty
Underlying beds:	Sandstone, fine-grained, quartz, porous; siltstone, medium-grained, quartz, (Nikanassin formation)

Southern Production Canadian Atlantic B4 Well No. 1

Location: 56°04'50" N, 121°45'40" W

Elevation: 2,189' KB

Overlying beds: Shale, dark grey, finely silty, (Moosebar formation)

Depth (feet)	Bluesky Formation
1,438 - 1,440	Siltstone, brownish grey, medium-grained; some glauconite
1,440 - 1,460	Conglomerate, dark grey chert; siltstone, greyish buff, coarse-grained, pyritic
	Gething Formation
1,460 - 1,470	Sandstone, greyish buff, very fine- to coarse-grained, sideritic
1,470 - 1,490	Sandstone, grey, fine- to coarse-grained, silty
1,490 - 1,500	Sandstone, brownish grey, fine-grained, silty
1,500 - 1,510	Siltstone, greyish buff, fine- to coarse-grained, pyritic
1,510 - 1,520	Shale, black, carbonaceous
1,520 - 1,540	Siltstone, brownish grey, fine-grained
1,540 - 1,550	Siltstone, dark brownish grey, fine-grained, argillaceous
1,550 - 1,560	Siltstone, pale buff-grey, coarse-grained
1,560 - 1,580	Siltstone, brownish grey, medium-grained; some coal
1,580 - 1,590	Sandstone, brownish grey, very fine- to medium-grained, silty; shale, black, chunky, finely silty, carbonaceous
1,590 - 1,600	Siltstone, buff-grey, fine- to medium-grained
1,600 - 1,610	Sandstone, pale greyish buff, very fine-grained, silty
1,610 - 1,620	Sandstone, pale grey to pink, fine-grained, silty

Southern Production Canadian Atlantic B4 Well No. 1--(cont.)

Depth (feet)	
1,620 - 1,660	Siltstone, pale buff-grey, medium-grained, micromicaceous
1,660 - 1,670	Siltstone, buff-grey, fine-grained; shale, black, carbonaceous; trace coal
1,670 - 1,680	Shale, black, carbonaceous; coal
1,680 - 1,690	Shale, as above; siltstone, brownish grey, fine-grained
1,690 - 1,710	Siltstone, brownish grey, fine-grained, micromicaceous
1,710 - 1,720	Sandstone, pale buff-grey, fine-grained, silty
1,720 - 1,750	Siltstone, brownish grey, fine-grained, micro-pyritic; some coal
1,750 - 1,760	Siltstone, as above; shale, black, carbonaceous
1,760 - 1,770	Sandstone, greyish buff, fine-grained; siltstone, brownish grey, fine-grained
1,770 - 1,780	Siltstone, pale buff, coarse-grained, grading to very fine-grained sandstone
1,780 - 1,800	Siltstone, brownish grey, fine-grained; some coal
1,800 - 1,820	Coal; siltstone, greyish buff, coarse-grained
1,820 - 1,840	Coal; siltstone, greyish buff, fine-grained
1,840 - 1,850	Siltstone, greyish buff, fine- to coarse-grained
1,850 - 1,870	Siltstone, greyish buff, coarse-grained; some coal
1,870 - 1,920	Siltstone, greyish buff, fine-grained; some coal
1,920 - 1,940	Siltstone, greyish buff, fine- to medium-grained
1,940 - 1,950	Siltstone, pale greyish buff, coarse-grained
1,950 - 1,960	Sandstone, pale greyish buff, very fine- to medium-grained, silty
1,960 - 1,970	Coal; siltstone, brownish grey, fine-grained
1,970 - 1,980	Shale, black, very carbonaceous; siltstone, greyish buff, coarse-grained

Southern Production Canadian Atlantic B4 Well No. 1--(cont.)

Depth (feet)	
1,980 - 1,990	Sandstone, greyish buff, fine-grained, silty; some coal
1,990 - 2,010	Sandstone, grey, coarse- to very-coarse-grained, chert and quartz
2,010 - 2,017	Sandstone, as above, conglomeratic
2,017 - 2,030	Siltstone, greyish buff, fine-grained; some coal
2,030 - 2,040	Siltstone, greyish buff, coarse-grained; some coal
2,040 - 2,045	Siltstone, greyish buff, fine-grained
2,045 - 2,055	Siltstone, pale greyish buff, coarse-grained
2,055 - 2,060	Siltstone, pale grey, fine-grained
2,060 - 2,065(?)	Siltstone, dark grey, fine-grained; some coal
2,065(?)-2,067	Sandstone, pale greyish buff, fine-grained, silty
Underlying beds:	Sandstone, pale grey, medium- to coarse-grained, angular, chert and quartz, conglomeratic, (Cadomin formation)