

# GEOLOGICAL TRAVERSES

## CARLSON LAKE AREA

Prepared for

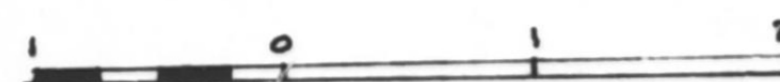
PACIFIC PETROLEUMS LTD

by

W.B. BRADY CONSULTING LTD

Calgary, Alberta

October, 1968



GEOLOGICAL TRAVERSES

CARLSON LAKE AREA

NORTHWEST TERRITORIES

# W. B. BRADY CONSULTING LTD.

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264-7420

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CALGARY. ALBERTA

RESIDENCE:  
289-8144

October 17, 1968

Pacific Petroleum Ltd.  
320 Ninth Ave SW  
Calgary, Alberta

Attention: Mr. Sid Smith

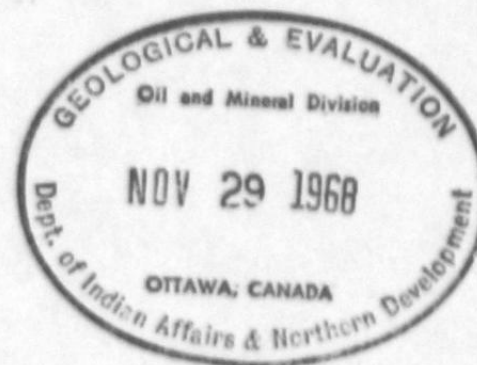
Dear Sir

At your request I examined a portion of your Petroleum and Natural Gas Permits # 4946 - 4949 which cover the Ram Anticline in the Carlson Lake area, Northwest Territories, during the early part of July, 1968.

The following report is a summary of the results obtained from this examination:

## LOCATION, ACCESSIBILITY, AND TOPOGRAPHY

Permits 4946 - 4949 are located on The Camsell Bend and Root River topographic map sheets (95J and 95K respectively) approximately 250 miles north of Fort Nelson, British Columbia. There are no roads in the area. Heavy equipment may be barged down the Mackenzie River from either Fort Nelson or Hay River to Camsell Bend where it must be moved by large helicopters, float planes (e.g. Otter) or by cat-trains (during the winter months.





The topography of the area is relatively rugged, characterized north of Carlson Lake by flat-topped hills which are deeply incised by numerous streams. Maximum relief is in the order of 3,000 feet. Much of the area south of Carlson Lake is heavily forested allowing for poor helicopter operations unless heli-ports have been previously cleared.

Because of the rugged relief, seismic operations conducted by large helicopters are probably more economical than by conventional methods.

#### STRATIGRAPHY

A partial section of the Nahanni Formation was examined on the North Nahanni River at Latitude  $62^{\circ}20'$  N. longitude  $123^{\circ}47'$  W. (Photo A 11348 - 271 - Figure 1). Here 370 feet of section was measured and ten-foot samples collected. The Nahanni Formation consists predominantly of dark grey to greyish-black, micrograined to cryptograined limestone. Thin-shelled brachiopods, small Stromatoporoids, and colonial corals indicate an open marine facies. No porosity was encountered in the section measured.

A recessive and covered interval between the 80 foot to 90 foot interval on the measured section was recognized on the southwest side of the river. (Figure 2)



An estimated additional 250 feet of carbonate is present in this section south of the river but was inaccessible for examination.

Where measured the Nahanni Formation dips 10 to 15 degrees north-northwest. On the G.S.C. map 22-1961, The Nahanni Formation, as exposed, forms part of the Ram Anticline. Actually it is brought to the surface by a thrust fault which cuts up-section to the north and dies out as a faulted anticline where the fault crosses the North Nahanni River.

The Nahanni Formation is overlain by approximately 100 - 120 feet of black, sulphurous shale which is more resistant to erosion than the overlying Fort Simpson Formation, which consists of soft, grey shale. It should be noted that the Horn River Formation may possibly give a similar reflection on seismic records as might be expected from the top of the Nahanni Formation. Because of the localized area, however, this would cause no problem in regards to the structure. It is only where Elk Point reefing is present that this possible error would cause difficulty, e.g. the black shale thickens in the immediate fore-reef area.

Approximately ten miles east of Carlson Lake, ~~post~~<sup>PRA</sup>-Nahanni strata are exposed, namely the Manetoe and Arnica Formations. These formations are brought to the surface by the Camsell Thrust to form the Camsell Range (GSC Map 22-1961). The implications of these exposures to the Ram Anticline will be discussed in a later section of this report.

#### TRAVERSES

Traverse I A traverse (Photo A 11348 - 392) was made from the mouth of "Creek A" to its headwaters, with spot-checks to the west in search for possible outcrops, then eastward to the top of the prominent ridge, hence northward to Carlson Lake along "Creek B".

No outcrops were encountered on "Creek A", except for two mud slides, which although not in place, would represent the soft shale underlying the valley. Near the headwaters of "Creek A", the ridge to the west was traversed but proved to be all tree covered with no outcrop.

Interbedded mudstone and siltstone is exposed on the ridge to the east. (Station 1 - Figure 3). The siltstone content increases towards the top of the section. A strike of 160 degrees, dip 25 degrees <sup>NE</sup> was measured.

An outcrop of similar lithology was examined near the headwaters of "Creek B" where a strike of 008 degrees, dip 8 degrees NE was measured. The fault as indicated on the photo geological map by V. V. Zay Smith could not be confirmed by Traverse I, but observation made from Carlson Lake indicate it is probably<sup>b</sup> present, although insignificant, and undoubtedly due to tension fracturing over the crest of the anticline.

Traverse II Sid Smith Creek (local native usage) was traversed to the south (Photo A - 11348 - 391), beginning approximately one mile from its mouth to where a small creek enters from the west. This west branch was then traversed northward along a low, sparsely tree covered pass, thence to Carlson Lake along "Creek C".

The outcrops along Sid Smith Creek consisted of interbedded shale and siltstone. The strike and dips of the various stations are outlined on the enclosed map.

A small fault zone was encountered immediately west of the mouth of the small creek entering from the west. West of this fault a resistant limestone bed overlain by red and green shale is exposed for a considerable length along this creek. These limestone beds are mapped as Mississippian by the Geological Survey and similarly by V. Zay Smith. Fossils collected from this limestone are yet to be identified.



As a result of traverse II the axis of the Yohin Syncline as mapped by V. Zay Smith was moved slightly to the east.

The outcrop at the edge of the ridge near the headwaters of "Creek C" (Station II) consists of massive sandstone at the top grading to siltstone and shale downward. The strike of this sandstone was 163 degrees with a dip of 35 degrees NE.

Traverse III      A traverse was made to the south along "Camp Creek" to the top of the ridge behind base camp. It was hoped that a west dip would be measurable on expected outcrops, however, the entire hillside is grass and tree covered with no outcrop exposed.

No traverses were made on any creeks north of Carlson Lake as the structure can be so clearly observed from air photographs. A small high angle fault is present on the west flank of the anticline near the crest. This fault is also of minor significance<sup>ce</sup> and probably reflects tension over the anticline.

HELICOPTER TRAVERSE      A traverse was made by helicopter north and northwest of Carlson Lake where V. Zay Smith indicates a "distinctive alignment, zone of steep dip and surface fault suggest structure may be offset in subsurface along this trend, by oblique fault upthrown to west."

I completely disagree with this interpretation as the actual dips across this "zone of steep dip" are gentle (Figure 4). Furthermore, a similar marker bed can be observed on each side of this high dip zone with no apparent displacement.

#### STRUCTURE

The map as prepared by V. Zay Smith of the actual anticline is essentially good. Strong west dips may be easily observed west and southwest of Carlson Lake on photos A 11348 - 394, A 11019 - 4. Similarly good east dips are prevalent on the east flank of the anticline, as displayed in Photos A 11348 - 271, A 11348 - 391.

It is impossible to verify the various markers as outlined on the map by V. Zay Smith unless detail sections were measured or personal remapping conducted from air photographs.

The photo geological map indicates minor folding between "Camp Creek" and "Creek A". This could not be verified either from the field examination nor from a re-examination of the photographs.

## PERSONAL CONCLUSIONS AND RECOMMENDATIONS

The area is of interest because of the obvious anticline which undoubtedly is doubly plunging. I would hesitate to recommend the area for the following reasons.

1. Middle Devonian carbonate crops out ten miles east of the anticline at a higher elevation than the Middle Devonian carbonate which would be expected to occur in the anticline.
2. Similar Middle Devonian carbonate crops out south of the structure.
3. Shell West Wrigley G-70 drilled to the north of Ram Anticline, but is essentially the same structural basin, encountered relatively fresh water (20,000 ppm NaCl) at a depth of 12,000 feet.
4. The possibility of encountering a second closed structure due to thrusting below the surface is poor.
5. It is my personal opinion that fresh water would be encountered should a well be drilled on this structure.
6. It is recommended that a hydrodynamic study be made in this area as it may still be possible to have hydrocarbons trapped in association with other structures containing fresh water.
7. Depending on the rental period, it would be worth while to keep the acreage because of the activity that is expected in the area by other companies this winter.
8. If further interested, Pacific Petroleum Ltd. should drill the prospect rather than additional spending of monies on seismic.

Respectfully submitted

W. B. BRADY CONSULTING LTD.

*W. B. Brady*  
W. B. Brady, P. Geol  
President



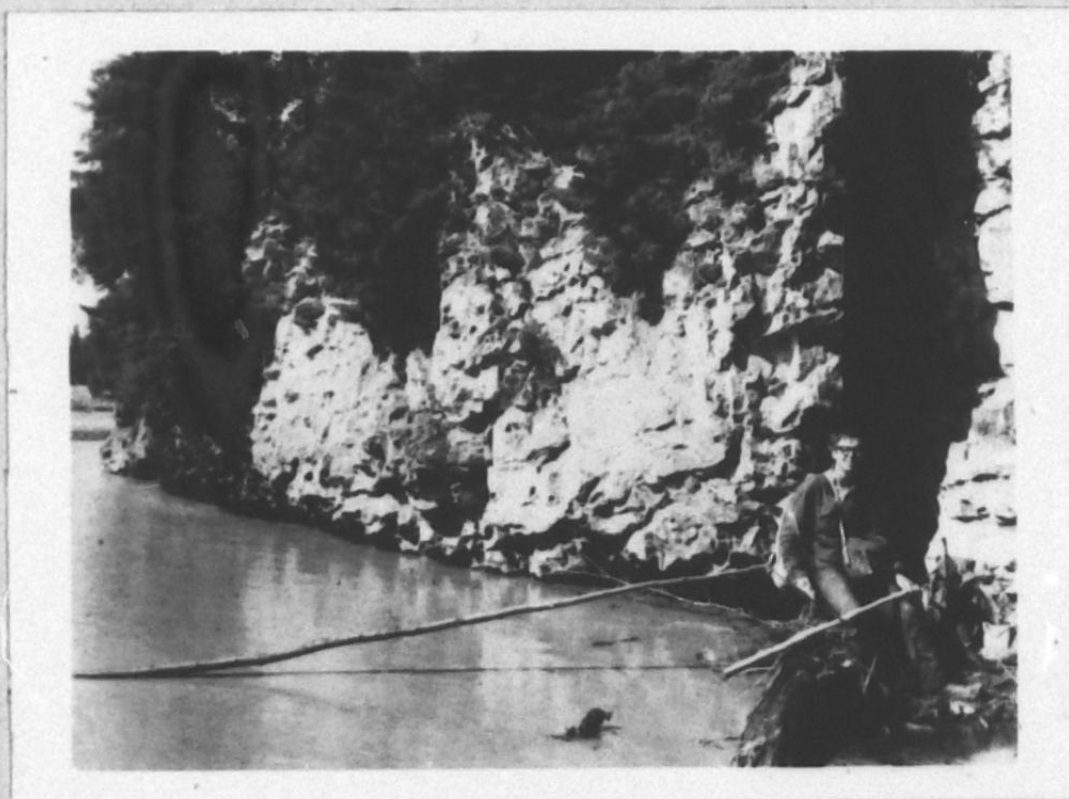


Figure 1

Bedded limestones of the Nahanni  
Formation as measured along the  
northeast bank of the North Nahanni  
River



Figure 2

Picture taken looking south-southeast across the North Nahanni River from Figure 1. An estimated additional 250 feet of strata are exposed in this section as compared to the one measured on the northeast side of the river. A five-place Sud Aloutte II was used for transportation.



Figure 3

Picture taken looking east towards the east-dipping flank of the Ram Anticline. Except for this distant ridge, the remainder of the area is tree covered with no outcrops.





Figure 4

Gently dipping strata of Upper Devonian age.  
The incised creek was previously described  
as a "distinctive alignment, zone of steep  
dip and surface Fault. . . "



WELL LOCATION	NORTH NAHANNI RIVER - NORTHWEST TERRITORIES
WELL NAME	MIDDLE DEVONIAN SURFACE SECTION - N. NAHANNI RIVER
WELL NAME	MIDDLE DEVONIAN SURFACE SECTION - NORTH NAHANNI RIVER
LOCATION	NORTH NAHANNI RIVER - NORTHWEST TERRITORIES
COORDINATES	Latitude 62° 20' N., Longitude 123° 47' W.
ELEVATION — GROUND	KELLY BUSHING
CONTRACTOR	
OPERATOR	T.D.
SUPERVISION — GEOLOGIST	
ENGINEER	
PARTICIPANTS	
SPUDDED	COMPLETED
CASING — SURFACE	
PRODUCTION	
LOGS RUN	Section measured by W.B. Brady and E. Hawkes

W.B.Brady Consulting Ltd.

1	AGE	
2	GROUP / FORMATION / MEMBER	
3	DEPTH OR FOOTAGE	
4	SHOWS	
5	TYPE POROSITY	
6	PERCENTAGE POROSITY	
7	LITHOLOGY	
8	GRAIN OR CRYSTAL SIZE	
9	ROUNDING	
10	SORTING	
11	FRAMEWORK (GREATER THAN SILT SIZE)	
12	MATRIX	
13	CEMENT	
14	ROCK BUILDERS	
15	DESCRIPTION	Section measured on the northeast side of North Nahanni River.
16	SUGGESTED ENVIRONMENTS	
17	ENGINEERING DATA (WELLS) BEDDING (SURFACE SECTION)	
18	PROFILE (SURFACE SECTION)	



MIDDLE DEVONIAN

UPPER DEVONIAN

GROUP / FORMATION		DEPTH OR FATHOMS	SHOWS	TYPE POROSITY	PERCENT	GRAIN OR FRAMEWORK		LIME OOLITE	DOLOMITE	CLAY MINERALS	SILT	CALCITE	ANHYDRITE	SILICA	MISCELLANEOUS	STROMATOPORIDS	AMPHIPODS	CRINOIDS	BIOCLASTIC	BRACHIOPODS	GASTROPODS - OST	ALGAE	OOLITES	PELLETS	CORALS	SUGGESTED ENGINEERING BEDDING (SURF)	PROFILE (SURF)
HORN RIVER F.M.		400																									
FT. SIMPSON F.M.																											

Section measured on the northeast side of North Nahanni River.

The Nahanni Fm. is overlain by black, sulphurous shale of the Horn River Fm. which is in turn overlain by the Ft. Simpson Fm. (not examined)

Ls., gy., merg./crpg., mass., upper 5' not sampled because of river.

-crin. com.

Ls., gy. bl., merg., mass. with irr. nodular bedding, small Stroms. com.

Ls., gy. bl., merg., v. mass., ab. thin brachs.

Ls., dk. gy., merg./v.f.xl., mass., ab. irr. and layered Stroms. Some colonial corals.  
-dk. gy./gy. bl., merg., mass. corals, Stroms., crin. stems and thin-shelled brachs.  
-gy. bl., dk. gy. w.  
-dk. gy.  
-dk. gy., merg., mass. bed.  
-dk. gy., merg., mass. bed.  
-dk. gy., merg./crptox., mass. with irr. bed., w. gy.  
-as above, cherty layers, small Stroms + corals  
Ls., arg., dk. gy./gy. bl., merg., mass. bed., weath. gy.  
Ls., gy., merg./v.f.xl., mass., ab. corals, irreg. sh. beds 4-6' apart within mass. cliff  
Ls., brn. gy., crptox., thin, weath. gy.  
Ls., dk. gy., merg., mass.  
arg., ab., calc. Stroms., w. from top of cliff  
Ls., dk. gy., merg., mass., weath. gy., ab. small Stroms 1/2' at base with corals.  
-arg., ab., dk. gy./gy. bl., merg., mass., mass. cliff in 4" bands.  
-arg., merg., mass., weath. gy., occ. brachs.  
-arg., ab.  
-arg., ab., merg., occ. Stroms 2-3"  
-arg., dk. gy.-gy., merg., mass. with irr. bed. bands weath. gy. occ. brachs. and small crinoids.



UPPER  
FT.

HORN RIVER  
FM.

MIDDLE DEVONIAN

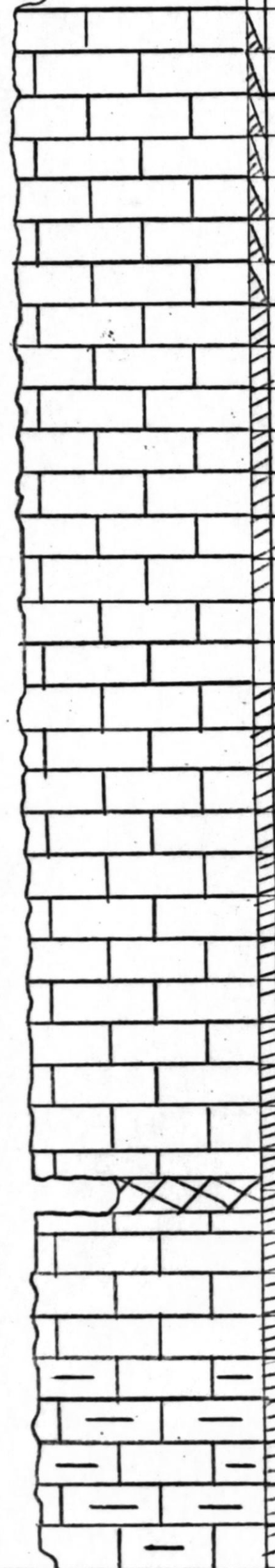
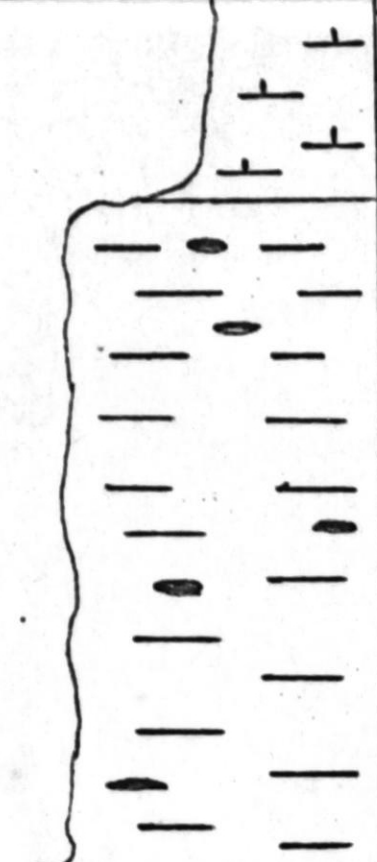
400

300

200

100

0



The Nahanni Fm. is overlain by black, sulphurous shale of the Horn River Fm. which is in turn overlain by the Ft. Simpson Fm. (not examined)

ls., gy., merg./crpg., mass., upper 5' not sampled because of river.

-crin. com.

ls., gy. bl., merg., mass. with irr. nodular bedding, small Stroms. com.

ls., gy. bl., merg., v. mass., ab. thin brachs.

ls., dk. gy., merg./v.f.xl., mass., ab. irr. and layered Stroms, some colonial corals, crin. stems and corals, thin-shelled brachs.

-dk. gy.

-dk. gy., merg., mass. bed.

-dk. gy., merg., mass. bed.

-dk. gy., merg./crptox., mass. with irr. bed. w. gy.

-as above, cherty layers, small Stroms + corals

ls., arg., dk. gy./gy. bl., merg., mass. bed., weath. gy.

ls., gy., merg./v.f.xl., mass., ab. corals, irreg. sh. beds 4-6' apart within mass. cliff

ls., dk. gy., merg., mass.

ls., dk. gy., merg., mass., thin, weath. gy.

ls., dk. gy., merg., mass.

ls., dk. gy., merg., mass., weath. gy., ab. small Stroms 1/2' at base with corals

-arg., ab., dk. gy./gy. bl., merg., mass., mass. cliff in 4' bands, mor arg. thin below

-arg., merg., mass., weath. gy., occ. brachs.

-arg., ab.

-arg., ab., merg., occ. Stroms 2-3"

-arg., dk. gy.-gy., merg., mass. with irr. bed. bands weath. gy., occ. brachs, and small crinoids.

An additional 250 feet of strata are present on the opposite side of the river but was inaccessible for examination.

370  
250  
600