MAR 19770023: JOHNSON LAKE

Received date: Dec 31, 1977

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AN EVALUATION
OF THE
JOHNSON LAKE PROPERTY, ALBERTA
QUARTZ MINERAL EXPLORATION PERMIT 6876090003
N.T.S. 74 - E - 9

FOR

E. & B. EXPLORATIONS LTD.
CALGARY, ALBERTA
DECEMBER, 1977

BY

TAIGA CONSULTANTS LTD.
#301, 1300 - 8 STREET, S.W.
CALGARY, ALBERTA

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CERTIFICATE

I, the undersigned, J. R. Allan, of the City of Calgary, in the Province of Alberta, do hereby certify:

1. that I am a Professional Geologist with an office mailing address at #301, 1300 - 8 Street, S.W.

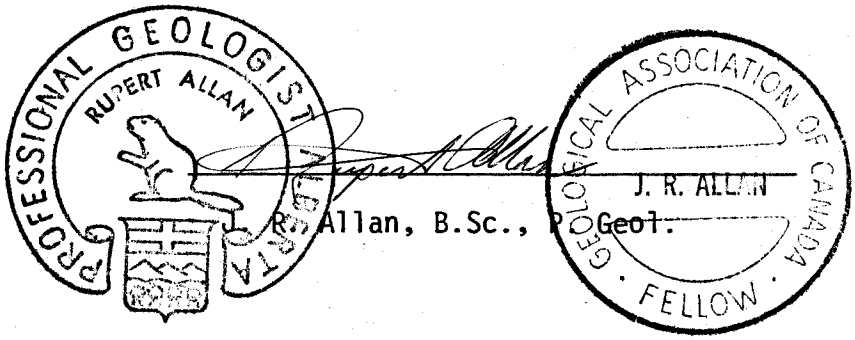
2. that I graduated from the University of Alberta, Edmonton with a Bachelor of Science degree in 1969.

3. that I am a registered Professional Geologist with the Association of Professional Engineers, Geologists and Geophysicists of Alberta.

4. that I am a Fellow of the Geological Association of Canada.

5. that I have been practicing my profession as a geologist for eight years.

DATED AT CALGARY, ALBERTA, this 15 day of DECEMBER, 1977.



J. R. ALLAN

J. R. Allan, B.Sc., P.Geol.

INTRODUCTION

The Johnson Lake Permit, which is located approximately 70 miles north-east of Fort McMurray, Alberta, straddles the Precambrian Shield - Phanerozoic contact.

Thick surficial deposits, predominantly drumlinized outwash sands and gravels, overlie the entire property. This mantle of glacial debris is underlain successively by Methy Formation (Devonian) carbonates; by remnant basal McMurray Formation (Cretaceous) sandstone and conglomerate; minor pre-Devonian sandstone (LaLoche Formation?); and weathered Precambrian basement rocks.

A study of "tar sands" test-hole data (drilled by Shell and Gulf) on and immediately adjacent to the property indicates a prominent SW trending erosional channel of glacial origin transecting the property. This channel erodes much of the McMurray section and, in places, cuts into the Precambrian basement.

The Precambrian basement consists dominantly of granitic and mylonitic rocks. However, reconnaissance mapping by L.P. Tremblay of the G.S.C. (Map 16-1961; Geology, Firebag River Area) and detailed mapping by J.D. Godfrey of the Research Council of Alberta (Geology of the Marguerite River District, 1969) further suggest the presence of one or more narrow metasedimentary belts of arkosic to pelitic rocks. This possibility is also supported by aeromagnetic data.

A number of potential targets that are favorable to host economic concentrations of uranium have been postulated for the property. These include epigenetic or replacement-type deposits associated with:

(a) Precambrian lithologically favorable basement structural traps.

(b) The weathered Precambrian - Phanerozoic interface.

(c) The Devonian - Cretaceous interface.

(d) Cretaceous sandy and bitumen -rich horizons.

A reconnaissance surface exploration program was conducted during the latter part of the 1977 field season. Field worked consisted of:

Lake sediment & lake water geochemistry
Surface prospecting & ground scintillometry
VLF electromagnetic survey
Office compilation of existing data
Tar sands test hole log and sample descriptions
Aerial photograph examinations (Including Landsat Imagery)

LOCATION & ACCESS

The Johnson Lake Permit is located east of the Athabasca River approximately 70 miles northeast of Fort McMurray and 45 miles east-northeast of Bitumount, Alberta. Four lakes within the permit boundaries are accessible by float or ski-equipped aircraft. A 2,500' long Alberta Forest Service gravel airstrip and a manned fire tower are located at the southeast corner of the property. Winter accessible seismic and drill tractor roads traverse the area.

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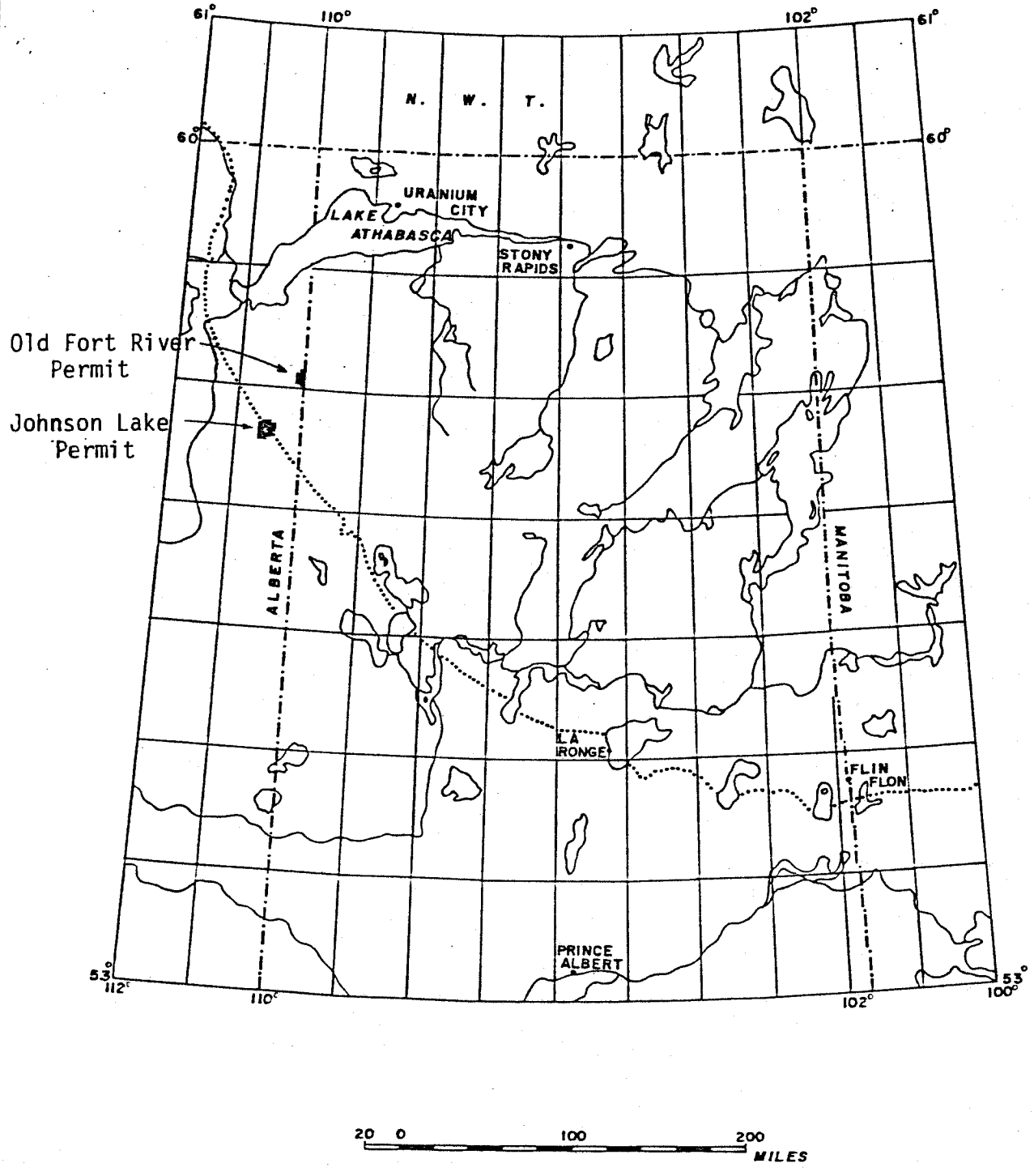
LOCATION MAP #1



LAND STATUS

A Quartz Mineral Exploration Permit entitled the "Johnson Lake Property" was applied for by Taiga Consultants Ltd. on January 30, 1976, and granted September 29, 1976. The first anniversary date for renewal was Sept. 29, 1977.

The permit is more particularly described as follows:

6876090003.

Township 99, Range 3, West of the 4th Meridian

Sections 6, 7, 8 & 15 to 36 inclusive

Township 100, Range 3, West of the 4th Meridian

Section 1; NE, SE & SW ¼'s of section 2; NW, SW & SE ¼'s of section 3; sections 4 to 9 inclusive; W½ section 10; N ½ section 11; section 12; sections 16 to 19 inclusive.

Township 99, Range 4, West of the 4th Meridian

Sections 1 to 4 inclusive, sections 9 to 16 inclusive, sections 21 to 28 inclusive, and sections 33 to 36 inclusive

Township 100, Range 4, West of the 4th Meridian

Sections 1 to 4 inclusive, sections 9 to 15 inclusive, and sections 23 & 24.

TOTAL: 76.5 Sections (48,960 acres)

The permit is presently recorded in the name of E. & B. Explorations Ltd.

The area surrounding the permit is open Crown land available for acquisition by permiting.

HISTORY OF EXPLORATION

A review of assessment work filed at the Research Council of Alberta indicates that the northermost portion of the property (i.e., the Precambrian basement exposure north of Johnson Lake, N½ of Twp. 100, R 3 to R 5 inclusive) was previously held as Quartz Mineral Exploration Permits No. 117 & 118 by Radex Minerals Ltd. In 1969 both permits were flown with a Scintrex Beech Baron mounted spectrometer (4 crystals 5" x 4", 660' spaced lines). No significant anomalies were obtained within the limits of the present permit and there is no record of ground follow-up.

A series of 8 'tar sands' test holes, 4 of which were located within the permit boundaries and 4 in the immediate vicinity, were drilled by Shell Oil Ltd. in 1974. Drill logs and cutting chips are available through Alberta Energy Gas Conservation Board. Southeast of the permit, an additional 7 holes were drilled by Gulf Oil Canada Ltd. in 1976.

This data has been reassessed,with respect to the uranium potential of the area,by Mr. Harold Williams, P. Geol. His summary and log descriptions are included in the appendix of this report.

The basement lithologies have been mapped by L.P. Tremblay (G.S.C. Map 16-1961) and by J.D. Godfrey (R.C.A. Map 1969). The surficial geology was mapped by L.A. Bayrock 1969/70, (R.C.A. Map 34).

The Phanerozoic rocks within the region have not been mapped in sufficient detail to ascertain distribution of specific lithologies. Regional Phanerozoic terrain has been mapped by M.A. Carrigy and R. Green, (R.C.A. 1965). M.A. Carrigy discusses the Phanerozoic geology in considerable detail in R.C.A. Memoir 1 (1959). This discussion, however, is primarily applicable ot the geology south of the permit area.

Aeromagnetic coverage is only available at a scale of 1" = 1 mile (G.S.C. Maps 462G and 463G).

PHYSIOGRAPHY & SURFICIAL GEOLOGY

Maximum relief is in the order of 400' above the elevation of Johnson Lake, approximately 1,325' ASL. Elongated, gently undulating, northeast trending hills are common to most of the permit. The hills present within the southern portion of the property, which display the greatest relief, may reflect Cretaceous subcrop.

Lakes are quite scarce within the permit area. Only five are present which have a maximum dimension greater than one mile and all are elongated in a northeast-southwest direction.

The surficial geology is summarized on Map 2 which is excerpted from Research Council of Alberta (R.C.A.) Map 34 by L.A. Bayrock. The majority of the permit is underlain by fluted and drumlinized outwash sands and gravels. Considerable late and/or postglacial erosion of this material is evident from the aerial photographs. This erosion is indicative of the unconsolidated nature of this material. The presence of sandy material is further indicated by the local development of aeolian deposits, especially along the ridge crests in the southeast sector of the property.

The last ice advance, as evidenced by the drumlinized material, was from the northeast.

In addition to the fluted outwash, minor areas of undisturbed ice contact deposits are also present. The most prominent deposit is a northeast-southwest trending band coincident with the previously mentioned post-glacial erosion channel southwest of Johnson Lake.

Muskeg is prevalent along the northeast trending valley floors and on the NE and SW ends of the lakes.

REGIONAL GEOLOGY

Two small areas of Precambrian basement exposure are noted on the property; along the north boundary, and on the peninsula on the northeast shore of Johnson Lake.

Lithologies consists of characteristically well banded granitoid rocks and dominantly leucocratic gneisses. The granites and granite gneisses (2) are generally coarse grained, (often pegmatitic), garnetiferous, white to pink weathering and contain less than 5% mafic minerals. The gneisses (1) (quartz-feldspar-biotite gneiss) are usually coarsely feldspar porphyroblastic (xtl. size up to 1½") and contain or are interbanded with narrow stringers of metaquartzite and a minor mafic gneiss component (intensely metamorphosed diabase dikes?)

To date, these rocks have received only cursory attention and their regional classification has not been defined. Geologists with the Saskatchewan Mineral Resources Division have very tentatively correlated the Marguerite - Maybelle River exposures with both the Cluff Lake Saskatchewan and Beaverlodge/ Uranium City District crystalline rocks. Thus, all three areas would be included in the Firebag Domain (retrogressed Archean craton).

Intense metamorphism and cataclastic deformation (resulting in mylonitic texture) has obliterated any sedimentary textures that may have been present.

The regional fabric is steeply to vertically dipping, northwest - southeast trending,and may represent infolded metasedimentary remnants in a ganitic terrain.

The regional aeromagnetic map indicates that the gneisses (1) display high magnetic relief in contrast to the magnetically low, near featureless granites (2). Thus, it is suggested that at least one 3 mile (+) wide band of gneiss, and possibly a second, underlie the north central and southern sectors of the property.

The northernmost band displays a 4½ mile long southwestward displaced portion, which probably reflects a set of parallel or sub-parallel northeast-trending strike-slip faults. The western fault, which is coincidental with the previously mentioned post-glacial drainage channel, is marked by a 100 gamma magnetic depression and is clearly in evidence for at least 20 miles. The eastern fault is substantially less well defined.

The Precambrian unconformity surface has a regional southwest dip in the order of 20 feet to the mile. However, steep dips and moderate relief have been observed on the unconformity surface in other areas.

Pre-Devonian beds of detrital sand (La Loche Formation ?),often arkosic & red weathering, overlie the Precambrian basement. In turn, these are apparently overlain by Middle Devonian Methy Formation carbonates in the vicinity of the permit. The Prairie Evaporite sequence apparently pinches out prior to reaching the property.

The Methy Formation, which consists of a hard, buff colored dolomite in the McMurray area, varies in thickness from 113 to 227 feet. Thin stromatoporoid, coral and algal units are locally present. Sulphides are rare with one minor occurrence of galena noted at Whitemud Falls (Twp. 89, R 1, W4M).

Two float occurrences of Methy dolomite are reported by Tremblay (G.S.C. Map 16-1961) although its outcrop presence has not been substantiated in the field. However, this sequence has been intersected in the tarsands test drilling by Gulf and Shell.

A Table of Formations for the permit area (and the comparative stratigraphic sequence in northwest Saskatchewan, 50 miles east) is set out overpage.

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Figure #1

TABLE OF FORMATIONS

Southwest of Permit

QUATERNARY

PLEISTOCENE & RECENT
till; unconsolidated surficial deposits.

LOWER CRETACEOUS

CLEARWATER FORMATION
silt, siltstone; marine

McMURRAY FORMATION
sandstone, conglomerate

MIDDLE DEVONIAN

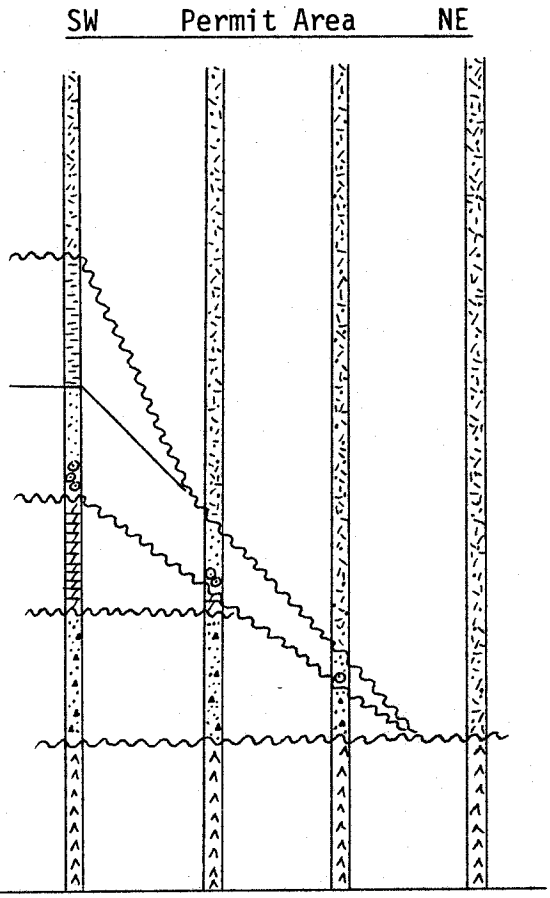
METHY FORMATION
dolomite

MIDDLE DEVONIAN &/or OLDER

LA LOCHE FORMATION (?)
arkosic sandstone

PRECAMBRIAN

FIREBAG DOMAIN
granite & gneiss



COMPARATIVE TABLE OF FORMATIONS FOR NORTHWEST SASKATCHEWAN

(after Sibbald, Munday & Lewry; Sask Geol. Soc., Special Pub. No. 3; Mar., 1977 p. 155).

PLEISTOCENE	
CRETACEOUS	Grand Rapids Formation Clearwater Formation McMurray Formation
DEVONIAN	Methy (Winnipegosis) Formation McLean River Formation La Loche Formation
HELIKIAN	Carswell Formation Athabasca Formation (1350 ± 50 m.y.) Martin Formation (1630 ± 180 m.y.)
HUDSONIAN OROGENY .....(1735 m.y.)	
APHEBIAN	Many Islands Group Thluicho Lake Group Tazin Group (in part ?) Wollaston Group Wollaston, Mudjatik and Virgin River domain granitoid gneisses (in part ?)
KENORAN OROGENY .....(2480 m.y.)	
ARCHEAN	Tazin Group Western granulites Wollaston, Mudjatik and Virgin River domain granitoid gneisses (in part ?)

There is a major break in the stratigraphic sequence between Devonian and Lower Cretaceous strata. Several periods of post-Cretaceous sub-aerial erosion appear to have taken place during this hiatus. The resultant paleo-topographic lows and channelways were subsequently infilled with varying thicknesses of Cretaceous McMurray Formation. Unfortunately, the Lower Cretaceous formations described in available literature are stratigraphic sections in the McMurray area and thus are not directly attributable to the permit.

At the base of the McMurray Formation a coarse feldspathic sand is commonly noted. This unit consists dominantly of coarse grained, well rounded quartz grains and feldspar cleavage fragments. Smokey quartz grains are numerous with "chips of woody material" locally abundant. Clusters of sand grains cemented by marcasite are also common. These sands are generally overlain by a black-grey, carbonaceous shale with much marcasite and "woody material."

The McMurray Formation is a lower Manville equivalent. The heavy mineral assemblage of these sediments suggests that the source is likely the continental Shield area to the northeast.

South of the permit area the McMurray Formation is overlain by the Clearwater Formation, which locally consists of dark grey silty shales and siltstone of marine origin.

ECONOMIC GEOLOGY

The Johnson Lake Permit was originally acquired on the basic premise of a Phanerozic target play with secondary consideration being given to lithologically favorable Precambrian basement structural traps. In view of discouraging results from the reassessment of the potential of the exposed basement rocks north of, and along the northern edge of the permit, no further consideration of that setting is presently warranted.

Selection of the Phanerozoic margin as a potential environment for uranium concentrations is based on having favorable host situations within the Phanerozoic rocks, and favorable source rocks within the adjacent Precambrian units. Hence, it is here suggested that a number of favorable settings which could host uranium deposits are present within the Permit area. Specifically, the presence of major unconformities is of considerable importance in the deposition of uranium in sedimentary environments. Within the property boundaries there are at least two major unconformities; namely the Cretaceous-Precambrian break and the Cretaceous-Devonian unconformity (although the latter may pinch out in parts of the property). Radioactivity could be concentrated along these breaks; in narrow "channelways" related to paleodrainage, margins of basement highs, or basement faults transecting these horizons; or as "roll-front" type occurrences located in Cretaceous sandy and bitumen-rich horizons.

A review of drill logs and sample cuttings from tar sands test holes by H.H. Williams, Ph. D., P. Geol. is summarized in the appendix of this report. Two items of specific interest are noted.

1) A prominent Pre-Cretaceous erosional channel of glacial origin trends west-southwest through the Permit. This channel is coincident with an aeromagnetically interpreted parallel set of basement strike-slip faults.

   Subsequent post-Cretaceous weathering has somewhat altered this channel or created a slightly transecting trough (now mostly infilled with Pleisocene till).

2) 17' of weakly radioactive oil-stained sand which rests unconformably on the basement at a depth of 127' in hole 16-1-100-3 W4M. "The intensity of the top 3' is 200 API units ... (approximately equivalent to 12 ppm uranium?) and the remaining 14' ... 130 API units. The reader is referred to Figures 8, 11 and 12 for location of (1) and (2) above.

EXPLORATION RESULTS

Lake Sediment & Lake Water Geochemistry

A float-equipped helicopter-supported lake sediment and lake water geochemical sampling program was conducted on the Johnson Lake Permit on June 11, 1977. A total of 20 lakes were sampled, three of which had two sample sites. (A duplicate sample was taken from one of the latter sites for error control analysis).

The lake bottom, organic-rich sediment samples were collected with a 1976 model Hornbrook sampler (c.f. photo in appendix). Surface lake water samples were collected in polyethylene bottles at depths of 6 to 12" at the same sites.

Analysis of the uranium content of the sediment samples was by the fluorometric technique and the remaining elements by atomic absorption by Loring Laboratories, Calgary. The water samples were analyzed by the fission track method by Bondar-Clegg & Company, Ottawa.

A comparison of the duplicate sample values is as follows (values are in parts per million).

Sample No.	U_3O_8	Cu	Pb	Zn	Ni	Co	Mo
EBJ-21S	0.6	5	5	70	8	6	NSS
EBJ-22S	1.2	2	5	103	5		

The duplicate analysis yeilded repeatable results within statistical limitations. A standard sample blank, sample EBJ-25S, also returned statistically acceptable values.

The mean and standard deviation are presented below in comparison with values from the Old Fort River Permit and a regional survey, conducted by the Saskatchewan D.M.R.* of 200 samples in the Wollaston Lake region.

	JOHNSON LAKE (n=22)		OLD FORT (N=49)		SASKATCHEWAN D.M.R. SURVEY WOLLASTON LAKE AREA (n=~200)	
	MEAN	1 S.D.	MEAN	1 S.D.	MEAN	1 S. D.
Uranium (ppm)	0.41	0.25	1.39	1.09	2.5	2.0

* personal communication, Dr. C. Dunn

The scarcity of lakes and the dry nature of the muskeg areas in early summer resulted in a low sample density and a high cost per sample. Sample quality was also poor. The lakes sampled were generally small, shallow, and contained brown, organic-rich water. Well developed "oozes", the optimal sampling medium, were not common. Bottom vegatation is prevalent and a high clay or silt content was often noted. The Johnson Lake sediment samples contained a considerable number of snail shells.

The geochemical analysis for uranium in water and U, Cu, Pb, Zn , Ni, Co, and Mo in lake sediments are included in the appendix. Sample locations and geochemical results are plotted on enclosed maps A-76-1-3 and A-76-1-4.

No anamalous uranium values were detected. Also, no significant values were obtained for Cu, Pb, Ni, Co and Mo. Slightly higher than expected concentrations of Zn are noted in samples EBJ-19 & 30 along the southern margin of the property.

PROSPECTING RESULTS (Map A-76-1-1

A four-man field party, under the supervision of the writer, prospected the north half of the permit in early October, 1977. An attempt to prospect the southern half was abandoned due to inclement weather during the latter part of the month.

No radioactivity or mineralization of significance was noted during the course of this programme, nor were any Phanerozoic outcrops located.

Till deposits both north and south of the inferred Phanerozoic contact are composed dominantly of unconsolidated Athabasca Formation sands and gravels. Granitic and gneissic boulders, generally well rounded, are extremely sparse.

Several sub-angular boulders of diabase were located on the drumlin ridge northeast of the lake with sediment samples EBJ - 10 & 11.

Background radioactivity over till deposits is in the order of 25 to 40 counts per second (SRAT - SPP2 Scintillometer).

A band of weakly radioactive, leucocratic, feldspar - porphyroblastic mylonitized granite, located north of Johnson Lake and just outside the permit boundary, was briefly examined. Scattered small spot highs of 120 to 450 counts per second over a width of approximately 40' were recorded in a background of 60 to 80 counts per second. This radioactivity correlates with a poorly defined trend of 8 weak airborne radiometric anomalies (assessment records) over a strike length of 11 miles from L.S.D. 16, Twp. 101, R 4 to L.S.D. 5, Twp. 100 R 2, W 4 M. On a regional scale, this trend appears to be contained within the gneisses adjacent to or at the contact with granites. This contact was prospected in some detail by several operators during the period 1969 to 1971 and does not appear to warrant further investigation.

A twice background airborne radiometric anomaly located ¼ mile northwest of the northwest shore of Johnson Lake along the sideslope of a drumlin (assessment files) was not located or explained on the ground.

A blazed and flagged grid was established over the fault zone trending northeast - southwest from the southwest corner of Johnson Lake (4 miles of baseline, 10.5 miles of 1,000' spaced crosslines). Unfortunately, inclement weather and high water levels in the creek and muskeg on the southeast side of the grid forced abandonment of proposed detailed geophysical coverage. However, a reconnaissance VLF electromagnetic survey and soil gas radon determinations were completed over portions of the grid (Map A-76-1-2).

A strong VLF EM conductor (or banded conductive zone) with a strike length in excess of 5,000' is noted from line 13E to line 69E on the south side of the baseline. Multiple conductivity responses on lines 159E and 183E are on geologic trend with this conductor and also appear to be related to the same aeromagnetically interpreted fault zone.

No anomalous radioactivity was detected in the grid area. Total-count background varied from 10 to 25 counts per second (SRAT SPP2 Scintillometer). Similarly, no anomalous radon soil gas measurements were noted. Measurements were taken at 100' spaced sample sites at depths of 18" to 24" with an E.D.A. RD 200 Radon Emanometer. Results varied from 4 to 19 counts per minute. However, repeatability was found to be exceptionally poor, probably due to the adverse conditions and highly variable nature of the surficial deposits. In view of the unreliability of this data, it has not been incorporated into the compilation map.

CONCLUSIONS

1. The lake sediment and lake water geochemical survey did not locate any areas warranting detailed investigations.
2. Regional mapping, surface prospecting and examination of tar sands

test hole data indicates that the northern portion of the permit is underlain by a Precambrian retrograde metamorphosed interbanded granitic and gneissic assemblage. The central and southern portions of the permit are underlain successively by thick unconsolidated surficial deposits; Middle Devonian "Methy Formation" dolomite; remnant, basal Cretaceous "McMurray Formation" sandstone and conglomerate; minor pre-Devonian sandstone (LaLoche Formation"?); and weathered Precambrian basement.

3. A post-Cretaceous glacial erosion channel, which cuts down to the Precambrian, trends through the center of the permit. This channel is coincidental with a W.S.W. trending fault and ground VLF E.M. conductor.

4. A weak radioactive anomaly was detected in oil-stained McMurray sandstone in tar sands test hole 16-1-100-3,W4M in the northeast sector of the permit.

The presence of Cretaceous-Precambrian and Cretaceous-Devonian. unconformities within the permit are uranium exploration targets which require further evaluation.

RECOMMENDATIONS

1. An airborne electromagnetic and proton magnetometer survey should be completed over a portion of the permit at 1/8 mile flight-line spacing with a NW - SE orientation. Northeast - southwest oriented check lines should also be flown to further examine the Phanerozoic zero edge. The Questor Surveys Ltd. INPUT system is suggested for this programme in view of its proven track record in similar environments and its competitive cost.

2. Electromagnetic conductors should be detailed by ground geophysical surveys.

3. Ground delineated conductors should be tested by drilling (rotary or percussion drilling is suggested).

4. Drill holes should be radiometrically logged and geochemically sampled.

PROPOSED WORK PROGRAMME & BUDGET ESTIMATION - 1978 SEASON

1.	Pre-field and office	$ 2,000.00
2.	Airborne electromagnetic and magnetic survey: 100 line miles, est. @ $35.00 per mile	3,500.00
3.	Provision for an as yet undefined ground geophysical programme, estimate of $500.00 per line mile for 21 miles	10,500.00
	SUB-TOTAL	16,000.00
4.	Provision for percussion, rotary, or diamond drilling programme	50,000.00
	TOTAL	$ 66,000.00

NOTE: The property may not be at the drill stage until the third year of the permit, as drill targets may not be outlined until the spring of 1978. Testing of these targets will probably require a winter programme that would commence in late fall, 1978.

J.R. Allan, P.Geol.

December 15, 1977

APPENDIX

PERSONNEL, 1977

	Man days
J.R. Allan, P.Geol. (Project Supervisor); Calgary, Alberta	
Sept. 2 - ½ day, Sept. 5 - ½ day Sept. 23 - Oct. 6, Oct. 16 - 18 Supervision & prospecting - 18 days Data compilation & final report, Nov.Dec. - 10 days	28
R.K. Netolitzky, P.Geol. (Project Supervisor); Calgary, Alberta	
Pre-field data compilation & evaluation report May, 1977 - 3 days Sept., 1977 1 day	4
A. Bak, B.Sc. (field geologist); Calgary Alberta	
Sept. 23 - 30	8
W. Salo, (senior prospector); Yellowknife, N.W.T.	
Sept. 23 - Oct. 17	25
J. Essery, (senior prospector); Yellowknife, N.W.T.	
Oct. 2 - 17	16
S. Cook, (senior prospector); Stanley Mission, Sask.	
Oct. 2 - 6	5
S. Merasty, (junior prospector); LaRonge, Sask.	
Oct. 1 - 6	6
T. Roberts, (junior prospector); Stanley Mission, Sask.	
Oct. 2 - 16	15
TOTAL	107

1977 PROJECT EXPENDITURES (Unaudited)

1.	Pre-field data compilation & evaluation report	$ 600.00
2.	Transportation (fixed wing & helicopter)	6,479.51
3.	Field camp maintenance (camp equipment rental, food, fuel, disposable supplies).	2,118.66
4.	Field support (geophysical & equipment rentals, communications, travel expenses, expediting services, maps, reports, & photocopying).	4,802.78
5.	Non-technical field personnel	7,160.00
6.	Lake sediment & lake water geochemical survey	1,430.00
7.	Supervision, post-field data compilation, drafting & final report	6,854.50
	Invoiced expenditures by Taiga Consultants Ltd., SUB-TOTAL	29,445.45
8.	E.& B. Explorations Ltd., Head Office Administration @ 10% of project expenditures	2,944.54
	TOTAL	$ 32,399.99

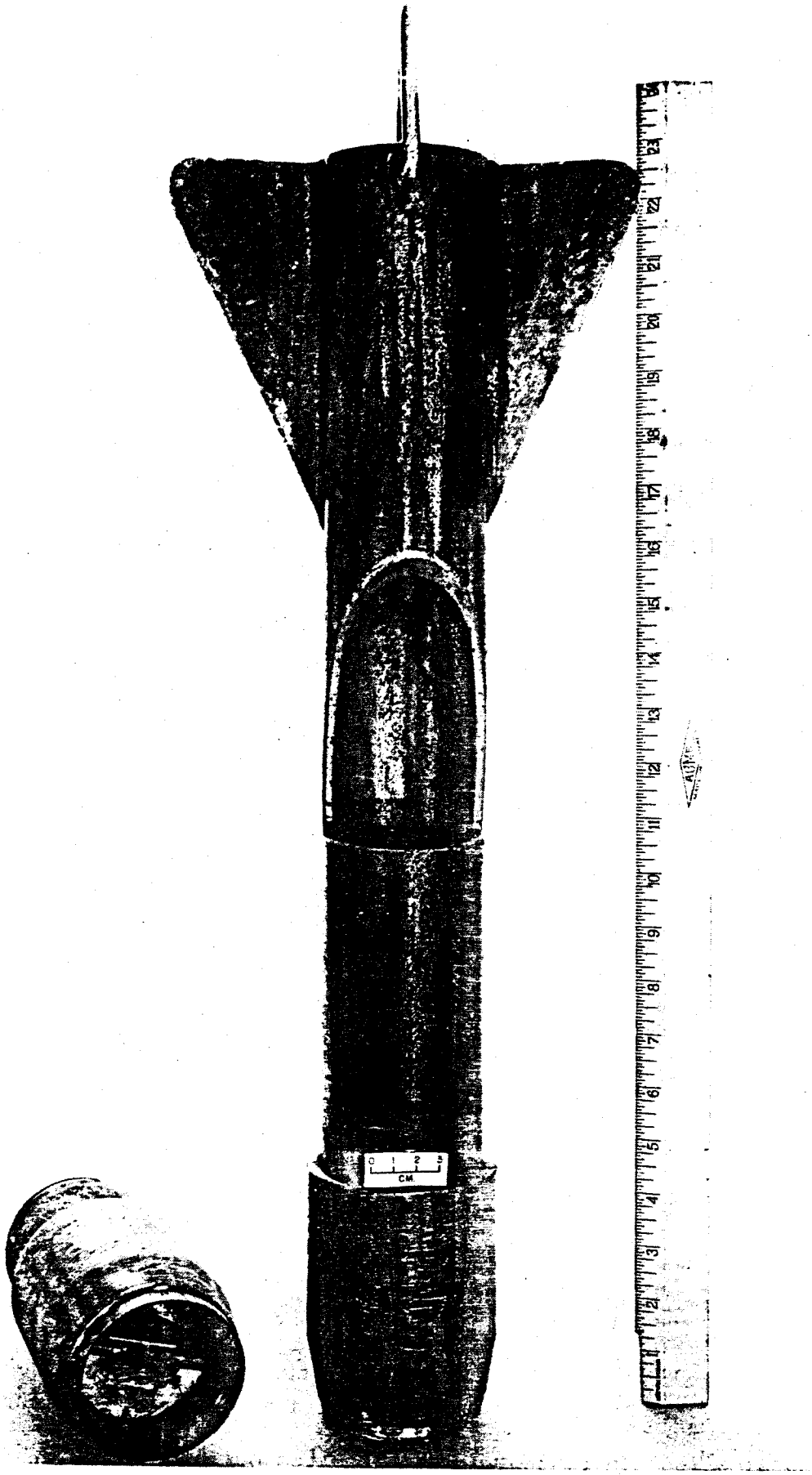


Figure 1a Centre-lake bottom sediment sampling apparatus, 1976 model.

HORNBROOK SAMPLER

To: TAIGA CONSULTANTS LTD.,
Suite 205, Fina Oil Building,
736 - 8th Avenue S. W.,
CALGARY, Alberta T2P 1H4

ATTN: R.K. Netolitzky

cc: LaRonge
Lynn Lake

File No. 13591
Date July 18, 1977
Samples Lake Bottom Sediment

Certificate of ASSAY

LORING LABORATORIES LTD.

SAMPLE No.	PPM U308	PPM Cu	PPM Pb	PPM Zn	PPM Ni	PPM Co	PPM Mo
EBJ-5	.4	3	10	19	10	8	3
EBJ-6	NIL	4	17	21	14	11	5
EBJ-9	.6	3	10	51	8	6	4
EBJ-10	NIL	1	17	34	14	13	5
EBJ-12	.2	3	7	76	8	4	2
EBJ-13	.2	2	7	127	10	6	2
EBJ-14	.2	1	7	46	8	6	2
EBJ-16	.8	9	5	76	7	4	1
EBJ-17	.4	5	4	64	4	4	2
EBJ-18	.4	5	5	98	7	4	4
EBJ-19	.2	4	5	200	5	6	NSS
EBJ-20	.6	6	4	103	8	6	4
EBJ-21	.6	5	5	70	8	6	NSS
EBJ-23	.4	6	5	138	7	6	4
EBJ-24	.4	5	4	162	8	4	3
EBJ-26	.2	4	4	147	8	4	3
EBJ-27	.4	5	4	94	5	4	1
EBJ-28	.2	3	14	78	11	11	4
EBJ-29	.4	4	7	79	2	4	2
EBJ-30	.8	6	4	180	5	4	3
EBJ-31	.8	5	5	100	5	4	2
x EBJ-50 ERT-15	.8	3	4	46	5	4	5

22

I Hereby Certify THAT THE ABOVE RESULTS ARE THOSE ASSAYS MADE BY ME UPON THE HEREIN DESCRIBED SAMPLES . . . .

Rejects Retained one month.

Pulps Retained one month unless specific arrangements made in advance.

[redacted]

Licensed Assayer of British Columbia

To: TAIGA CONSULTANTS LTD.,
Suite 205, Fina Oil Building,
6 - 8th Ave. S.W.,
Calgary, Alberta T2P 1H4
ATTN: Mr. R.K. Netolitzky

File No. 13533
Date July 8, 1977
Samples Lake Bottom

Certificate of ASSAY

LORING LABORATORIES LTD.

SAMPLE No.	PPM U3O8	PPM Cu	PPM Pb	PPM Zn	PPM Ni
"Lake Bottom"					
EBJ-22-5	1.2	2	5	103	5
EBJ-25-5	1.4	4	10	81	14

I Hereby Certify THAT THE ABOVE RESULTS ARE THOSE ASSAYS MADE BY ME UPON THE HEREIN DESCRIBED SAMPLES . . . .

Rejects Retained one month.

Pulps Retained one month unless specific arrangements made in advance.

[redacted]

Licensed Assayer of British Columbia

BONDAR-CLEGG & COMPANY LTD.

Geochemical Lab Report

Report No. 713-7 Page No. 3

SAMPLE NO.	U ppb
EBJ 05W	0.05
06	0.14
09	ND
10	0.13
12	0.01
13	ND
14	0.12
16	0.08
17	0.11
18	ND
19	0.16
20	ND
21	0.13
23	0.10
24	0.05
26	0.13
27	0.09
28	0.08
29	0.05
30	0.10
31	0.09

TAR SANDS TEST HOLE
LOG EVALUATION & SAMPLE EXAMINATION

BY

H.H. WILLIAMS: Ph.D., P. Geol.
DECEMBER, 1977

FOR

TAIGA CONSULTANTS LTD.

LOG EVALUATION & SAMPLE EXAMINATION

Due to the limited outcrop on the Johnson Lake Property, indirect evaluation techniques are necessary. Several tar sands test holes have been drilled on and adjacent to the permit and have a suite of geophysical logs, core and cuttings were examined for radioactive anomalies, evidence of mineralization, and to establish the general stratigraphy and geology of the area.

In addition to those test holes on and immediately adjacent to the permit, data from test holes within the area Twp's 96-101 incl. and Rge's 1-W4M inclusive were examined. This was necessary to establish regional correlations and map geologic trends. Insufficient time was available to permit examination of all drill cuttings and core thus, formation tops are not shown for all the test holes. However, all the geophysical logs were used to confirm correlations and were examined for radioactive anomalies.

A summary of these logs is presented in Table 1. Sample descriptions are presented in Appendix 1.

STRATIGRAPHY

Figure 6 (reproduced from Norris, 1973) illustrates the general Mesozoic and Paleozoic stratigraphic section approximately 50 miles south of the Johnson Lake Property. Figure 7 is a NE-SW stratigraphic section through the Johnson Lake Property and correlates to the section in Figure 6.

A prominent erosion channel of glacial origin is evident (Fig. 6) and erodes much of the McMurray section and cutting into the Precambrian. As a result of this post-Cretaceous erosion, the McMurray sand thickness varies considerably along the erosional edge, as illustrated by Figure 8. The limited drilling control shows a remnant basal McMurray sand with possibly some pre-Devonian sands equivalent to the La Loche sands noted to the south.

STRUCTURAL GEOLOGY

Precambrian

The general structure on the Precambrian basement in the Ft. McMurray area is illustrated in Fig. 9 (reproduced from Norris, 1973). A general westerly slope of about 20 feet per mile is indicated; however, little or no control is shown in the vicinity of the Johnson Lake Property.

Basement surface control from the drill holes examined are too few to permit any meaningful mapping of the Precambrian surface in the permit areas.

Devonian

The regional structure of the Palozoic strata in the Ft. McMurray area is a southwest dipping monocline with a northwest trending strike (Fig. 10; reproduced from Norris, 1973). No structural control or mapping is shown in the Johnson Lake area. Westward tilting of about 15 feet per mile took place prior to deposition of the Cretaceous beds, with a resultant westerly drainage pattern.

Although control is limited, a structure map on the Devonian erosional surface was constructed and shows a prominent west-southwest trending channel cutting through the middle of the permit area (Fig 11). Erosion channels on the Devonian surface was the loci of thick McMurray sand deposits, characterized by coarse conglomerolic sand representing a marginal position on the channel as illustrated in Fig. 11. It is probable that a thick McMurray sand was deposited within the channel and covered much of the permit area.

Cretaceous

The structure of the top of the basal McMurray sand (Fig. 12) shows a prominent erosional channel through the Johnson Lake Property, coincident with the Devonian erosional channel. The extent of this post-Cretaceous channel and the extent of removal of the thick basal McMurray sand is difficult to acertain with the available drilling control.

RADIOACTIVE ANOMALIES

Three radioactive anomalies were noted on the Gamma Ray logs in the test holes examined. Only one of these anomalies occurs within the boundaries of the Johnson Lake Property. These anomalies are briefly described below.

1. 16-1-100-3W4M. This anomaly occurs on the property in a thin (16" thick) oil-stained sand resting unconformably on the Precambrian surface. The most intense radioactive kick is a 3' thick interval at the top of the sand between 127 and 130' depths. Evaluation of samples and geophysical logs suggests that this anomaly is within the sand and is not a volcanic ash or bentonite stringer. The intensity of the top 3 feet of the anomaly is 200 API units; 16.5 API units are equivalent to 1 μ gm Ra-eg./ton. The remaining 14 feet of oil stained sand measures 130 API units indicating that the entire sand has an anomalous radioactivity. A potentially large area of sand development exists in the vicinity of the anomaly and warrants further investigation (Fig. 8).

   Mineralization was not apparent in the drill cuttings, however, sample quality is very poor.

2. 7-29-96-1W4. This anomoly, with an intensity of 200 + API units, occurs several miles south of the permit area within a shale sequence at a depth of 333-336'. The nature of the host rock is not readily apparent from examination of the geophysical logs and drill cuttings. A volcanic ash or bentonite stringer is possible, however, if this were the case the anomoly should be more widespread. The fairly close drilling in the area indicates a local nature to the anomoly. No mineralization was noted in samples.

3. 14-11-96-1W4. This anomaly has a lower intensity of 150 API units and occurs at a depth of 337-340'. Examination of sample and geophysical logs indicates that the anomaly occurs within the Pleistocene till, but the host rock is not obvious.

   No mineralization noted in samples.

REFERENCES

Norris, A. W. 1973 Paleozoic Geology of the Fort McMurray Area.
pp 15-61 in Guide to the Athabasca Oil Sands Area - Carrigy & Kames ed.

	LOCATION					HOLE NO.
	LSD	SEC	TWP.	Range		
*	16 -	30 -	98 -	3	W4M	Shell Athabasca East 98 - 3 #1
*	16 -	30 -	98 -	3	W4M	Shell Athabasca East 98 - 3 #2
+ *	15 -	16 -	99 -	3	W4M	Shell Athabasca East 99 - 3 A
*	15 -	30 -	99 -	2	W4M	Shell Athabasca East 99 - 2
+ *	13 -	28 -	99 -	3	W4M	Shell Athabasca East 99 - 3 B
*	11 -	1 -	100 -	2	W4M	Shell Athabasca East 100 - 2
+	16 -	1 -	100 -	3	W4M	Shell Athabasca East 100 - 2
+ *	16 -	1 -	100 -	2	W4M	Shell Athabasca East 100 - 2A
*	15 -	8 -	96 -	1	W4M	Gulf Firebag 15 - 8
*	14 -	11 -	96 -	1	W4M	Gulf Firebag 14 - 11
*	6 -	26 -	96 -	1	W4M	Gulf Firebag 6 - 26
*	7 -	29 -	96 -	1	W4M	Gulf Firebag 7 - 29
*	2 -	8 -	97 -	1	W4M	Gulf Firebag 2 - 8
*	2 -	11 -	97 -	1	W4M	Gulf Firebag 2 - 11
*	13 -	12 -	97 -	2	W4M	Gulf Firebag 13 - 12

\+ Located within property boundaries

* Sample descriptions overpage

Shell Feb-Mar, 1974

Gulf Jan-Feb, 1976

TABLE 1

LOCATION	FORMATION	TOP (SUBSEA)	REMARKS
*14-11-96-1W4	McMurray km	420' (+1209)	3' Radioactive kick in shale @ 337-340' 150 API
K.B. 1629'	Elk Point Dw	425' (+1204)	
*15-8-96-1W4	Elk Point	423 (+1145)	Poor samples - some dol in spls.
K.B. 1568	McMurray	absent	
*2-8-97-1W4	McMurray	absent	Possible thin km sd @ 392-395
K.B. 1656	Elk Point	404 (+1232)	
*2-11-97-1W4	McMurray	542 (+1244)	
K.B. 1786	Elk Point	557 (+1229)	
*13-12-97-2W4	McMurray	400 (+1212)	
K.B. 1612	Elk Point	474 (+1132)	
*6-26-96-1W4	McMurray	492 (+1222)	Core 501-503; 511-535; 517-527
K.B. 1714	Elk Point	529 (+1185)	No recovery
*7-29-96-1W4	McMurray	absent	Radioactive kick in shale
K.B. 1594	Elk Point	367 (+1217)	@ 333-336 200+API
	Pre-Camb.	372 (+1212)	
*15-16-99-3W4	No tops on logs on spls		Spls indicate Till. Well may have tagged basement but not visible in spls or on log.
*11-1-100-2W4	None		Log did not reach btm. Well may have
Gr 1500	Pre-Camb	(?)140 (+1360)	tagged basement but not visible in spls.
*15-30-99-2W4M	Pre-camb	94' (+1304)	Till resting on granite. Km & Dw absent.
*16-1-100-3W4	McMurray	127 (+1363)	No Dw
Gr 1500	Pre-Camb.	143 (+1357)	Radioactive kick @ top of Kw Sd. 200 API

TABLE 1
CONTINUED

LOCATION	FORMATION	TOP	REMARKS
*13-28-99-3W4 Gr 1300	McMurray Elk Point	159 (+1141) 162 (+1138)	A very th oil st sd overlying Dw. assumed to be remnant McMurray.
*16-30-98-3W4	McMurray	390 (+1310)	Cored from 13-12 97-2W4
8-18-99-3W4			No information available. Lost circ @ T.D.
13-13-100-2W4			No information. Lost circ. in drift & well abandoned
7-25-100-2W4			No information.
11-31-97-1W4	McMurray Pre-camb. } ? Elk Point }	260 263	Cored from 260-263. Btm fm uncertain

* Samples and/or core examined under binocular microscope.

SAMPLE DESCRIPTIONS

15-30-99-2 W4M		Spl Quality: P
0 - 20	No spls	
20 - 90	Uncons Sd cse sub-ang to sub-rd m srt & intbd gvl vf to pea gvl (pred qtzt & grnt frag)	
90 - 100	Gvl & Sd aa wi some fresh grnt red & dk gn-blk - appears fresh	
100 - 110	Grnt lt gy fresh & has gns tex	
16-30-98-3 W4M #1		Spl Quality: P
0 - 10	No spl	
10 - 360	Intbd Sd uncons cse sub-ang to sub-rd m srt & Gvl vf to pea gvl wi cse sd mtx Some dk gy clay bds wi abnt sd in clay Tr oil stn Sd @350-360 Base till @ 340? Spls end @ 360. Core 360 - 482 - description follows:	
360 - 474.5	Sd sft uncons m-cse gr fltg in tar Top 40' has shy bands wi poorer oil sat	
474.5 - 480.5	V cse cgl Sd hvy tar sat	
480.5 - 482	Dol lt gy vf-f xl sl arg p vug por	
16-30-98-3 W4M #2		Spl Quality: P
0 - 30	No spls - Core from this well lost	
30 - 380	Till as for 10-360 of 16-30-98-3 W4M #1 above	
380 - 420	Cse uncons Sd (cvgs) Sd lt bf m-cse gr sub-ang m srt p cons tr oil stn Abnt hem stn wi some hem cmt	
420 - 470	Sd clr to lt brn qtzs sub-ang to sub-rd p-m srt tr hem stn oil stn incr	
470 - 480	Sd aa bcm v cse to cgl no feld Hvy oil stn	
480 - 500	Sd aa pred m-cse gr less cgl wi only lt oil stn No mnrl No Dol in spls	

230 - 420	Pred uncons Sd aa
420 - 435	Mnr Sd cse gr sub-ang to rd m-w srt wi g hvy oil sat Abnt pyr Dol lt gy f xl sl arg p to fr vug por Tr oil stn in Dol

15-8-96-1 W4M — Spl Quality: P

0 - 100	Sd uncons lt brn cse gr sub-rd m-w srt wi some vf gvl intbds
100 - 200	Clay m-dk gy v sft wi abnt Sd aa as intbds & fltg in clay
200 - 420	Uncons Sd aa & pea gvl intbds - appears to have a clay mtx Tr oil sat uncons Sd @ 310
420 - 443	Uncons Sd aa wi tr Dol lt gy vf xl tt Possibly did not penetrate D_W

13-12-97-2 W4M — Spl Quality: V P

0 - 30	Uncons Sd lt brn sub-ang to rd w srt
30 - 80	Cse uncons Sd wi abnt grnt frag
80 - 100	Cse gvl wi finer Sd mtx (uncons) Qtzt pbls, sd, grnt
100 - 120	Sh m gy v sft Lse Sd aa
120 - 280	Gvl as for 80-100
280 - 380	Uncons Sd aa wi some sft clay red to lt gy-brn
380 - 400	Abnt lse cse gvl in thk blk hvy oil
400 - 470	Heavily oil impregnated Sd appears cse gr but oil too hvy to see gr No spl available of Dev Dol

6-26-96-1 W4M — Spl Quality: V P

0 - 500	Cse uncons Sd & f gvl
500 - 520	No spls - Intv cored but no core @ Core Storage Centre
520 - 530	Uncons Sd (cvgs) Dol lt gy f xl sl arg wi fr vug por Tr oil stn Sd

14-11-96-1 W4M — Spl Quality: V P-Fr

0 - 20	Uncons rust-brn Sd in a hem clay mtx
20 - 40	Clay dk gy carb sft abnt lse sd (cvgs?)
40 - 230	Uncons Sd lt gy clr & lt brn cse gr sub-rd w srt & f gvl intbds

13-28-99-3 W4M		Spl Quality: Fr
0 - 160	Intbd Mdst m gy wi 40% qtz gr & uncons Sd cse gr sub-ang to sub-rd m-w srt wi intbd pea to vf gvl	
160 - 167	Uncons Sd & Gvl aa (cvgs?) Dol gy to gy-bf vf xl sl arg tt tr tar Sd dk brn m-cse gr sub-ang srt? wi fr hvy oil sat	
	Well appears to have TD in D_{EP} wi a v thn rmn M^{C} Tar Sd No evidence of mnrl	
16-1-100-3 W4M		Spl Quality: Fr-G
0 - 130	Gvl pea sz wi some intbd v cse uncons Sd and some gy clay mtx between 40-80	
130 - 150	Tar Sd lt brn m-cse cgl sub-ang p srt wi lt oil stn thru Oil stn appears to bcm heavier down section & sd more cons Possibly some oil stn in overlying Pleistocene till No evidence of mnrl	
150 - 160	Grnt gy ang frag appears fresh Abnt gvl cvgs No Dol Similar to 15-30-99-2 W4M well	
11-1-100-2 W4M		Spl Quality: P
0 - 140	Uncons Sd lt gy to bf cse gr sub-ang to sub-rd w srt wi intbd gvl composed of vf to pea sz frag of qtzt & grnt No evidence of fresh grnt in btm spls. May have tagged bsmt?	
15-16-99-3 W4M		Spl Quality: P
10 - 20	Pea Gvl & cse uncons Sd	
20 - 40	Clay lt to dk gy sft wi abnt m-cse Sd	
40 - 160	Gvl pea sz to vf gvl wi abnt uncons Sd	
160 - 190	Sd uncons m-cse gr wi clay mtx	
190 - 240	Pred uncons Sd cse to v cse wi some intbd Gvl	
	Well may have tagged bsmt but no concrete evidence in spls	

2-8-97-1 W4M		Spl Quality: P
0 - 10	Uncons Sd lt bf m-cse gr sub-rd w srt	
10 - 100	Pea Gvl wi cse sd mtx (uncons)	
100 - 175	Clay & Sh wi abnt sd & gvl cvgs	
175 - 380	Pred vf gvl (qtzt & Ss wi mnr grnt frag) Occ clay bd	
380 - 390	Pred cse uncons Sd & grnt frag wi abnt hvy oil stn Abnt dk gy Sh Poss some thn M^C Sd	
390 - 415	Dol lt gy-bf vf xl tt tr sp hvy oil stn	
2-11-97-1 W4M		Spl Quality: V P
0 - 10	Uncons Sd lt bf m-cse gr sub-rd w srt	
10 - 290	Gvl vf wi abnt m-cse uncons Sd aa	
290 - 300	Gvl aa wi 40% oil Sd cse gr sd heavily impregnated wi tar Base Till @ 290?	
300 - 380	Intbd Sh gy & Ss dk gy cse gr dirty p srt wi some hvy oil impregnation	
380 - 550	Uncons cse Sd & vf gvl wi some clay Base till @ 550 in spls	
550 - 555	Ss dk brn vf-f gr sub-ang w srt m cons wi p to fr oil sat Abnt cse Sd to vf Gvl	
555 - 557	Dol lt gy to bf vf-f xl suc wi sp oil stn	
7-29-96-1 W4M		Spl Quality: V P
0 - 60	Uncons Sd lt brn (hem stn) cse gr sub-rd w srt wi intbd Gvl composed of cse pbls grnt, qtzt & Ss	
60 - 360	Clay dk gy carb v sft & Sd aa uncons v p spl - Nothing in spls to acct for radioactive kick @ 329-333 on log	
360 - 373	Ls m-dk gy vf xl arg tt Abnt grnt ang frag appears rel fresh & unwthrd Probably a v thn D_{EP} overlying bsmt	

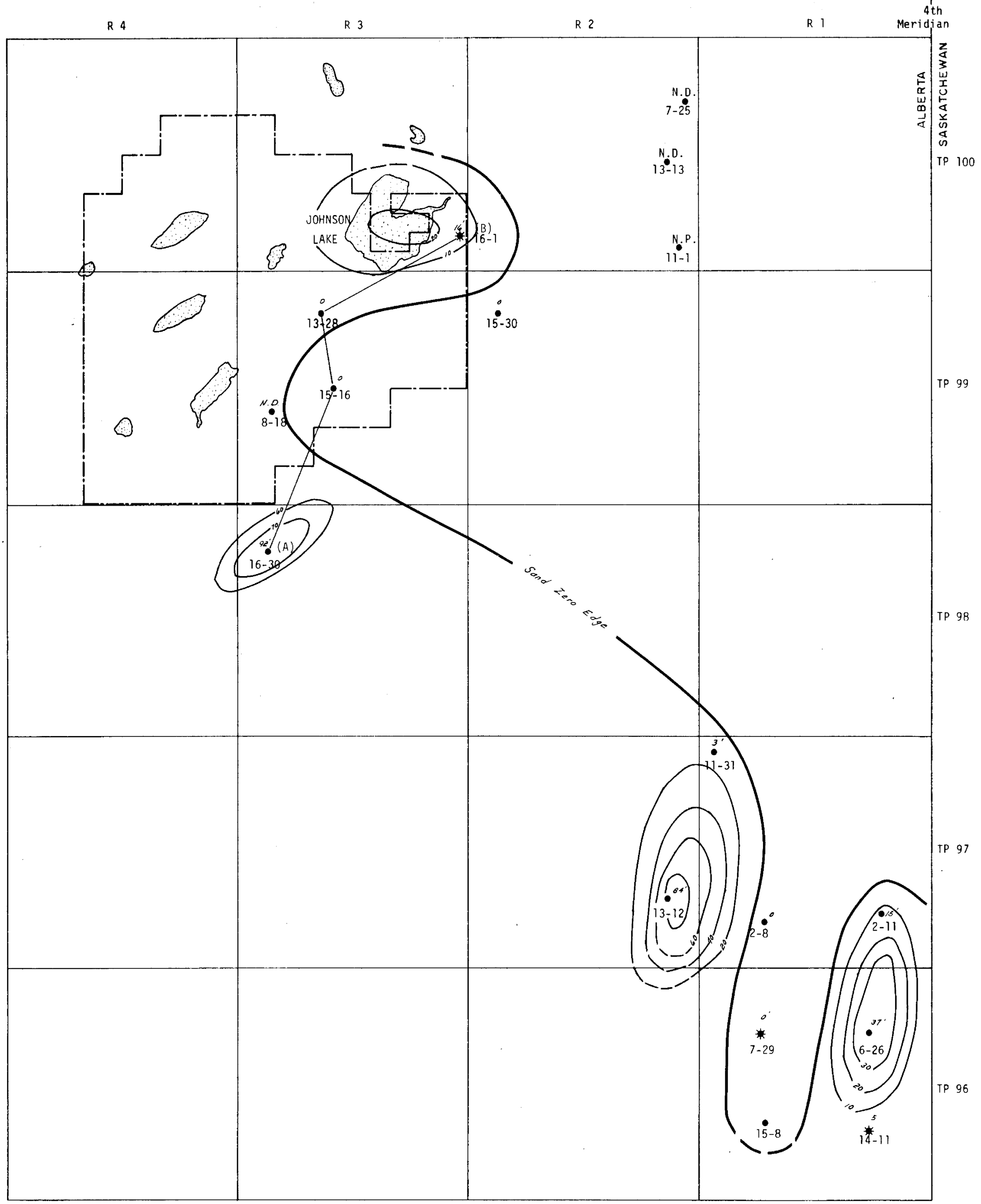
TAR SANDS TEST HOLES

Subsequent to the date on this report, the Alberta Energy Resources Conservation Board have advised of an additional 13 drill holes in the immediate vicinity of the permt. However, none are within the property boundaries.

A cursory review of the drill logs indicate that there are no significant alterations to the regional geologic interpretation.

The drill hole locations and Formation tops are set out overpage.

Location	Grd Elev.	Formation Tops	Subsea	Comments
4-6-99-3W4	1420	McMurray 180?	+1240	
		Methy 280	+1140	
13-11-99-1W4	1675	Not picked		
13-27-97-2W4	1600	McMurray 505?	+1095	
7-17-97-2W4	1600	Not picked		
11-31-97-1W4	1500	McMurray Absent		
		Methy 264	+1236	
14-23-98-3W4	1700	Not picked		
4-12-97-3W4	1650	Pre-Camb	+1494	
		McMurray Absent?		
5-20-97-2W4	1650	McMurray 315?	+1335	
		Methy 394	+1256	
1-13-98-1W4	1900	McMurray Absent		
		Pre-Camb 697	+1203	
10-16-98-2W4	1900	Not Picked		T.D. 578 - Logged to 495
4-28-97-2W4	1675	McMurray absent?		
		Methy 580	+1095	
2-3-99-1W4	1725	Not picked		
14-28-97-2W4	1600			



19770123

FIG. 8 REMNANT McMURRAY BASAL SAND ISOPACH & ZERO EDGE

✸ Radioactive Anomaly
N.D. No Data
5 Sand thickness in feet
● Drill hole location & number
14-11

A - B Cross section line
SCALE: 1" = 2 miles

E. & B. EXPLORATIONS LTD.

JOHNSON LAKE PROPERTY, ALBERTA
PERMIT 6876090003

Compiled by: H. H. Williams, P. Geol.
For: TAIGA CONSULTANTS LTD.
Date: December, 1977

R 4 R 3 R 2 R 1 4th Meridian

ALBERTA SASKATCHEWAN

TP 100

TP 99

TP 98

TP 97

TP 96

JOHNSON LAKE

+1220 +1200 +1180 +1160 +1140

Pre Cretaceous Erosional Channel

+1138

N.D. 7-25

N.D. 13-13

NP 16-1 (B)

N.P. 11-1

13-28

N P 15-30

NP 15-16

N.D. 8-18

+1218 16-30 (A)

Carbonate Zero Edge

11-31

+1240 +1220 +1200

+1212 13-12

+1232 2-8

+1244 2-11

+1180 +1160 +1140

+1217 7-29

+1222 6-26

+1145 15-8

+1204 14-11

19770023

Fig. 11 STRUCTURE ON DEVONIAN EROSIONAL SURFACE

&

DEVONIAN ZERO EDGE

N.D. No data
N.P. Not present

A - B Cross section line

SCALE: 1" = 2 miles

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PERMIT 6876090003

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Date: December, 1977

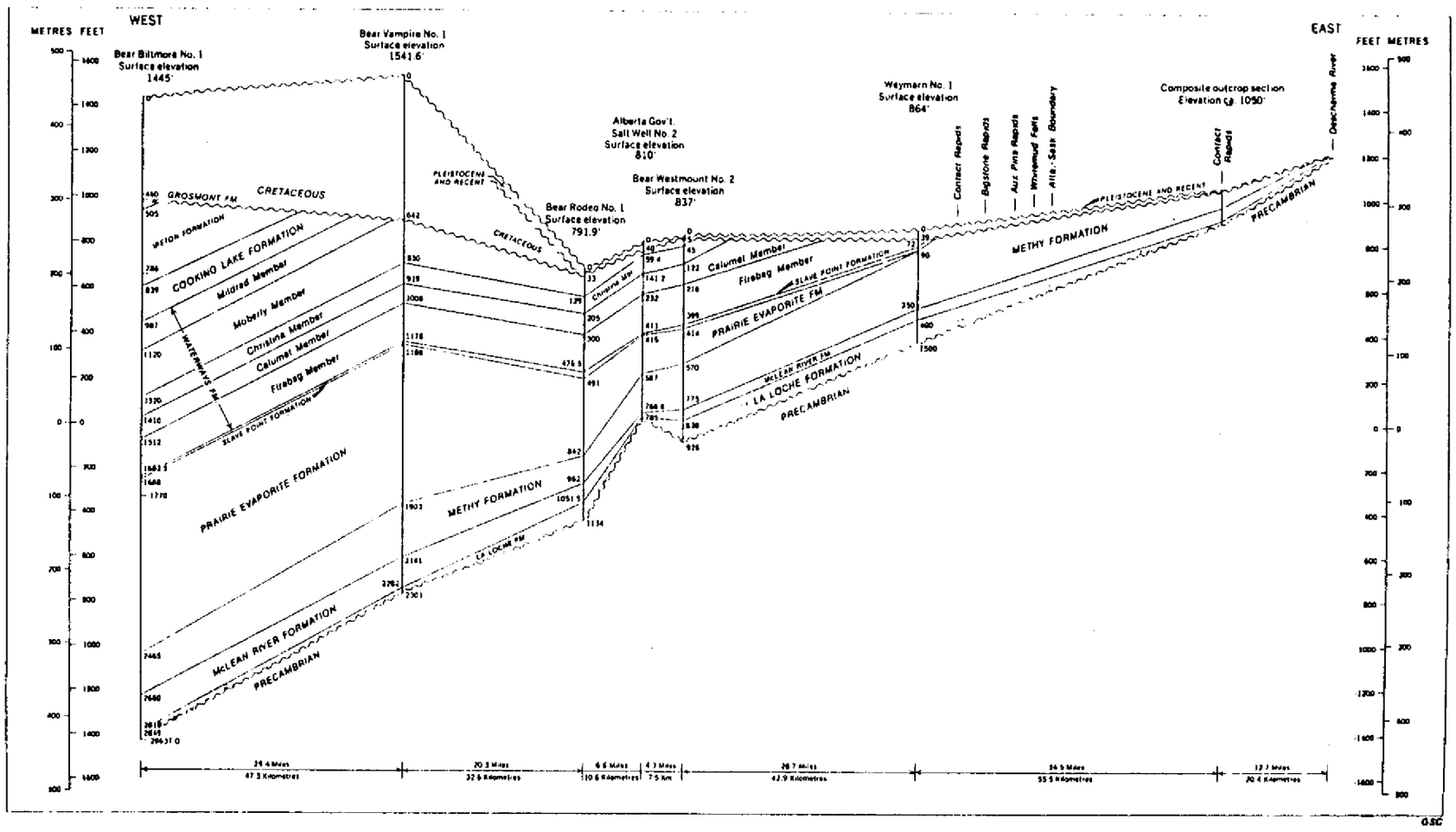


FIGURE 6. Structure section from Bear Biltmore No. 1 well in the west to the edge of the Canadian Shield near the mouth of Descharme River in the east.

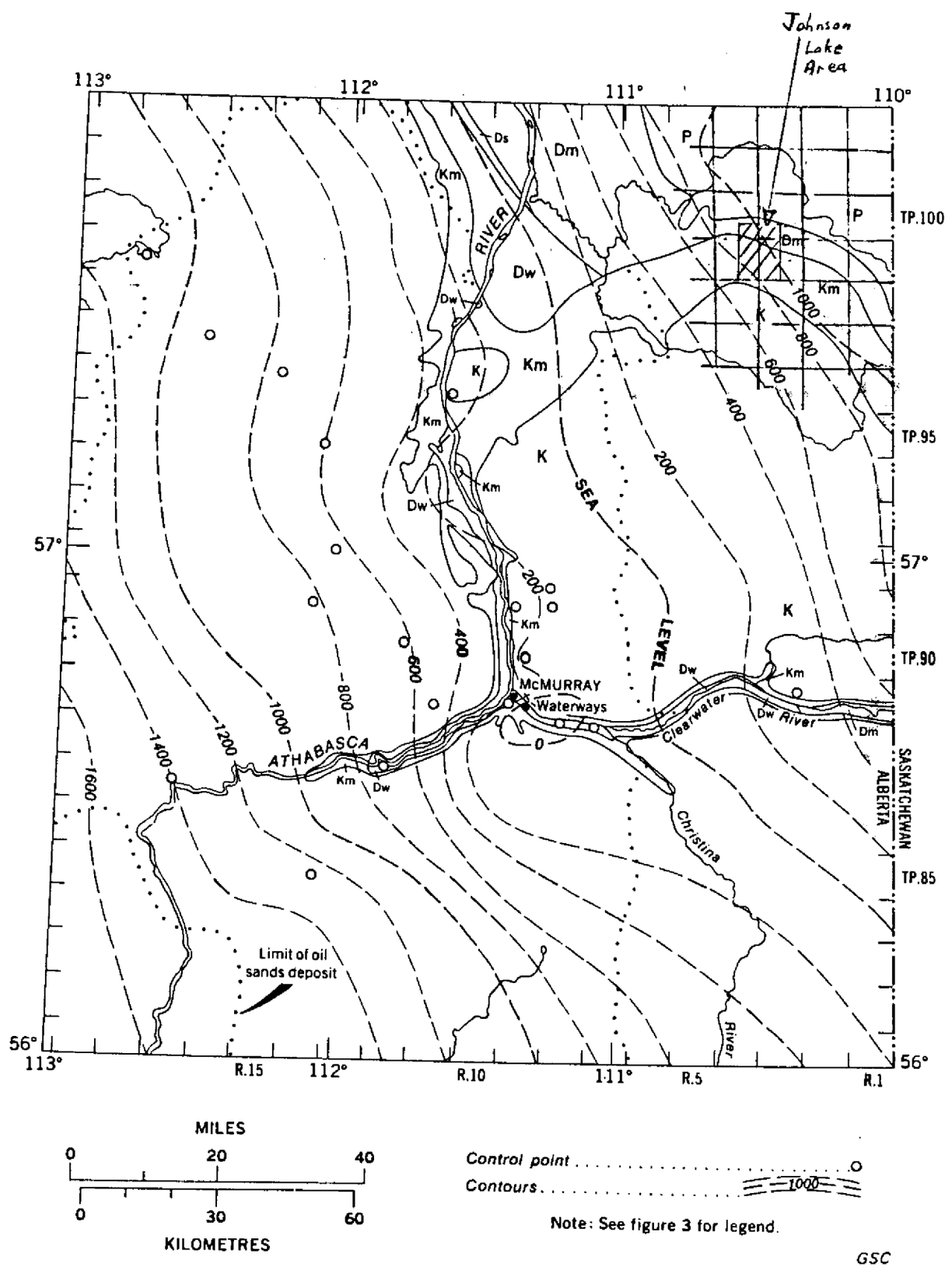


FIGURE 9. Structure contours on Precambrian surface (from Carrigy, 1959, fig. 4).

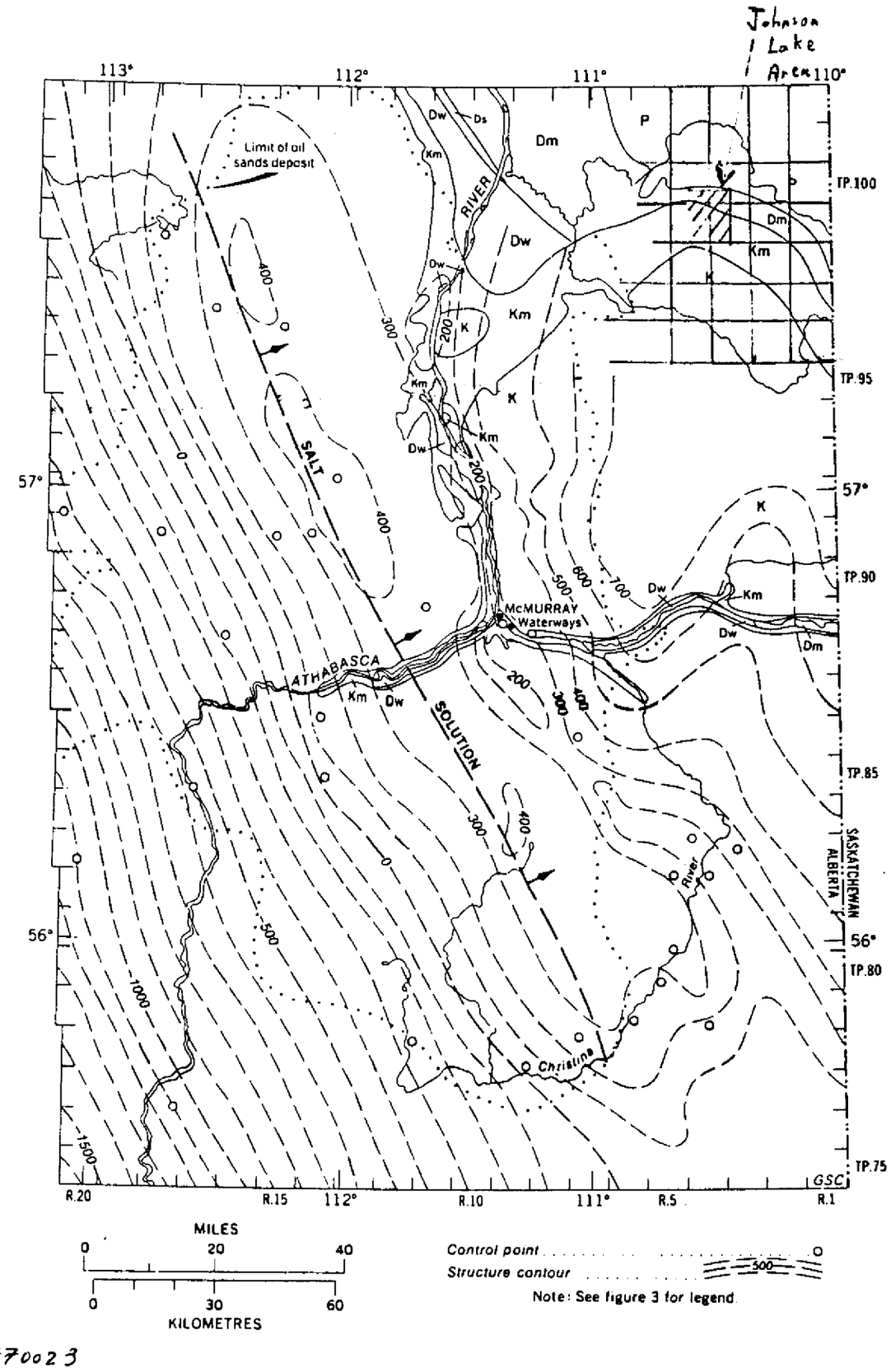


FIGURE 10. Structure contours on the upper surface of the Elk Point Evaporites (from Carrigy, 1959, fig. 5).

1977 0023

(Guide to the Athabasca Oil Sands Area; Information Series No. 5
Alberta Research Council: M.A. Carrigy & J.W. Kramers; 1973)

R 4 | R 3 | R 2 | R 1 | 4th Meridian

ALBERTA | SASKATCHEWAN

TP 100

TP 99

TP 98

TP 97

TP 96

JOHNSON LAKE

+1300

+1200

+1100

+1343 (B) 16-1

N.D. 7-25

N.D. 13-13

N.P. 11-1

+1141 13-28

15-30

Post Cretaceous Erosional Channel

N.P. 15-16

N.D. 8-18

+1200

+1300

+1310 (A) 16-30

Sand Zero Edge

+1300

+1220

+1200

11-31

+1212 13-12

N.P. 2-8

+1244 2-11

N.P. 7-29

+1228 6-26

+1220

N.P. 15-8

+1209 14-11

+1200

19770023

FIG. 12 STRUCTURE ON BASAL McMURRAY SAND & SAND ZERO EDGE

N.D. No data
N.P. Not present
+1209 ● 14-11 Subsea elevation & Drill hole location & number

A - B Cross section line
SCALE: 1" = 2 miles

E. & B. EXPLORATIONS LTD.

JOHNSON LAKE PROPERTY, ALBERTA
PERMIT 6876090003

Compiled by: H. H. Williams, P. Geol.
For: TAIGA CONSULTANTS LTD.
Date: December, 1977

TP. 100, R 5 | TP. 100, R 4 | TP. 100, R 3 | TP. 100, R 2 | TP. 100, R 1

TP. 99, R5 | TP. 99, R4 | TP. 99, R3 | TP. 99, R 2 | TP. 99, R 1

TP. 98, R5 | TP. 98, R4 | TP. 98, R 3 | TP. 98, R 2 | TP. 98, R 1

JOHNSON LAKE

Camp

Firetower Airstrip

Marguerite River

Marguerite River

Weakly radioactive oil-stained sand from 127-130 feet

PRE-CRETACEOUS EROSIONAL CHANNEL Flagged Grid

POST-CRETACEOUS EROSIONAL CHANNEL

McMURRAY FM. ZERO EDGE

METHY FM. ZERO EDGE

13-28 | 15-30 | 15-16 | 8-18 | 16-30

LEGEND

- LAKE SEDIMENT SAMPLE SITE & SAMPLE NUMBER
- Refer to Maps A-76-3,4 for geochemical survey results
- SWAMP
- OUTCROP BOUNDARY
- DRUMLINOID FEATURE
- GLACIAL FLUTING
- QUATERNARY — ICE CONTACT DEPOSITS (Esker complex, kame deposits)
- MIDDLE DEVONIAN / LOWER CRETACEOUS — METHY FORMATION (dolomite) - Zero Edge; McMURRAY FORMATION (sandstone, conglomerate) - Zero Edge
- PRECAMBRIAN — FIREBAG DOMAIN
  - 2 — GRANITE 2c, gneissic, impure (weakly magnetic)
  - 1 — GNEISS
- TAR SANDS TEST DRILL HOLE (c.f. Fig. 8, 11 and 12 this report)
- FAULT (AEROMAGNETICALLY INTERPRETED), INFERRED
- AIR PHOTO LINEAMENT
- REPORTED METHY FORMATION FLOAT (G.S.C. Map 16-1961)

Note: Basemap compiled from uncontrolled photomosaic

E. & B. EXPLORATIONS LTD.

JOHNSON LAKE PROPERTY
NORTHEAST ALBERTA
PERMIT 6876090003

GEOLOGY - COMPILATION MAP

MAP NO. A-76-1-1
SCALE 1:3,440'
DECEMBER, 1977 JRL

TAIGA CONSULTANTS LTD.

1777a23

TP. 100, R 5 | TP. 100, R 4 | TP. 100, R 3 | TP. 100, R 2 | TP. 100, R 1

TP. 99, R5 | TP. 99, R 4 | TP. 99, R 3 | TP. 99, R 2 | TP. 99, R 1

TP. 98, R 5 | TP. 98, R 4 | TP. 98, R 3 | TP. 98, R 2 | TP. 98, R 1

JOHNSON LAKE

Marguerite River

Camp

Flagged Grid

Firetower Airstrip

13-28

15-16

8-18

16-1

15-30

16-30

LEGEND

- LAKE SEDIMENT SAMPLE SITE & SAMPLE NUMBER
- U_3O_8 in sediments (ppm) | U in water (ppb)
- Zn in sediments (ppm) | Pb in sediments (ppm)
- SWAMP
- OUTCROP BOUNDARY
- DRUMLINOID FEATURE
- GLACIAL FLUTING
- QUATERNARY — ICE CONTACT DEPOSITS (Esker complex, kame deposits)
- MIDDLE DEVONIAN — METHY FORMATION (dolomite) - Zero Edge
- LOWER CRETACEOUS — McMURRAY FORMATION (sandstone, conglomerate) - Zero Edge
- PRECAMBRIAN — FIREBAG DOMAIN
  - 2 GRANITE
  - 1 GNEISS
- TAR SANDS TEST DRILL HOLE (c.f. Fig. 8, 11 and 12 this report)
- FAULT (AEROMAGNETICALLY INTERPRETED), INFERRED
- AIR PHOTO LINEAMENT
- REPORTED METHY FORMATION FLOAT (G.S.C. Map 16-1961)

Note: Basemap compiled from uncontrolled photomosaic

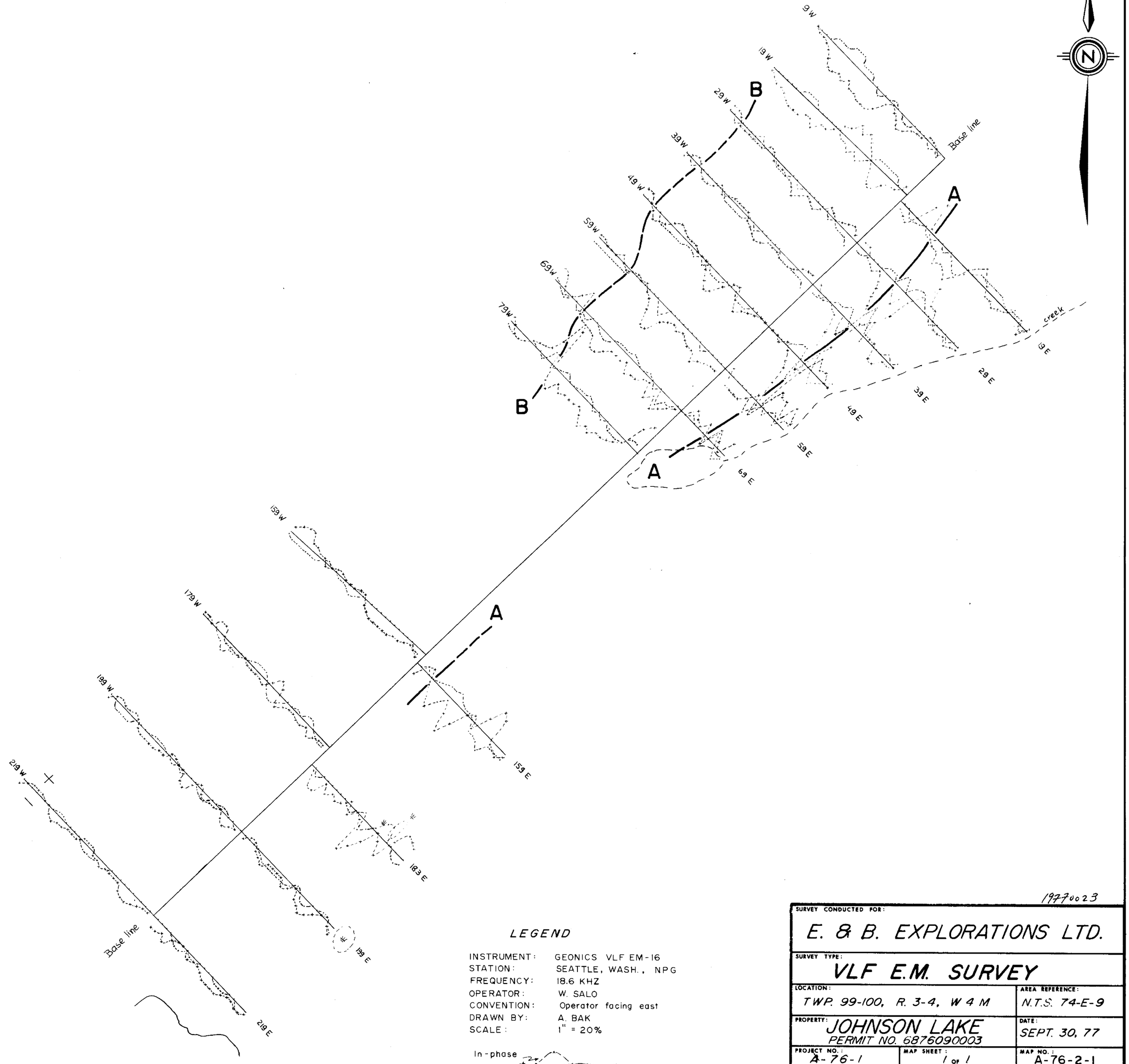
E. & B. EXPLORATIONS LTD.

JOHNSON LAKE PROPERTY
NORTHEAST ALBERTA
PERMIT 6876090003

LAKE SEDIMENT GEOCHEMISTRY
URANIUM, LEAD & ZINC
MAP NO. A-76-1-3
SCALE 1:3,440'
DECEMBER, 1977 JRA

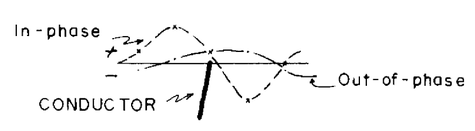
TAIGA CONSULTANTS LTD.

1977-023



LEGEND

INSTRUMENT:	GEONICS VLF EM-16
STATION:	SEATTLE, WASH., NPG
FREQUENCY:	18.6 KHZ
OPERATOR:	W. SALO
CONVENTION:	Operator facing east
DRAWN BY:	A. BAK
SCALE:	1" = 20%



19770023

SURVEY CONDUCTED FOR:
E. & B. EXPLORATIONS LTD.

SURVEY TYPE:
VLF E.M. SURVEY

LOCATION: TWP. 99-100, R. 3-4, W 4 M
AREA REFERENCE: N.T.S. 74-E-9

PROPERTY: JOHNSON LAKE
PERMIT NO. 6876090003
DATE: SEPT. 30, 77

PROJECT NO.: A-76-1
MAP SHEET: 1 OF 1
MAP NO.: A-76-2-1

1000 0 SCALE 1000 2000 feet

Scale: 1" = 1000'

SURVEY CONDUCTED BY:
TAIGA CONSULTANTS LTD.

EXPL PERMIT 6876090003

81

TP. 100, R 5 | TP. 100, R 4 | TP. 100, R 3 | TP. 100, R 2 | TP. 100, R 1

TP. 99, R5 | TP. 99, R 4 | TP. 99, R 3 | TP. 99, R 2 | TP. 99, R 1

TP. 98, R 5 | TP. 98, R 4 | TP. 98, R 3 | TP. 98, R 2 | TP. 98, R 1

JOHNSON LAKE

Camp

Marguerite River

Flagged Grid

Firetower Airstrip

16-1

13-28

15-30

15-16

8-18

16-30

LEGEND

- LAKE SEDIMENT SAMPLE SITE & SAMPLE NUMBER
- Copper | Nickel / Cobalt | Molybdenum — Sediment analyses in parts per million
- SWAMP
- OUTCROP BOUNDARY
- DRUMLINOID FEATURE
- GLACIAL FLUTING
- QUATERNARY — ICE CONTACT DEPOSITS (Esker complex, kame deposits)
- MIDDLE DEVONIAN / LOWER CRETACEOUS — METHY FORMATION (dolomite) - Zero Edge; McMURRAY FORMATION (sandstone, conglomerate) - Zero Edge
- PRECAMBRIAN — FIREBAG DOMAIN; 2 GRANITE; 1 GNEISS
- 16-30 TAR SANDS TEST DRILL HOLE (cf. Fig. 8, 11 and 12 this report)
- FAULT (AEROMAGNETICALLY INTERPRETED), INFERRED
- AIR PHOTO LINEAMENT
- REPORTED METHY FORMATION FLOAT (G.S.C. Map 16-1961)

Note: Basemap compiled from uncontrolled photomosaic

E. & B. EXPLORATIONS LTD.

JOHNSON LAKE PROPERTY
NORTHEAST ALBERTA
PERMIT 6876090003

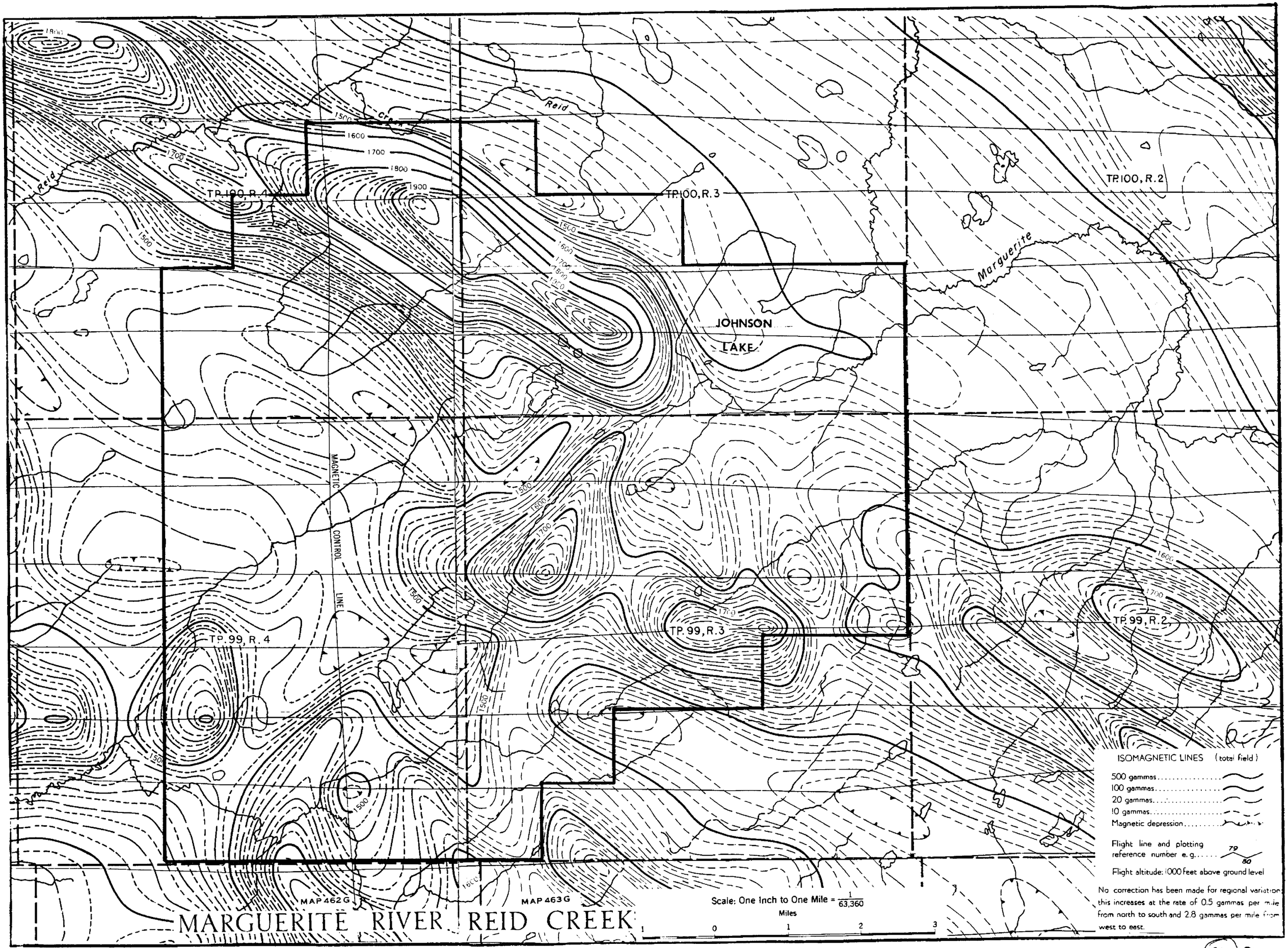
LAKE SEDIMENT GEOCHEMISTRY
COPPER, NICKEL, COBALT, MOLYBDENUM

MAP NO. A-76-1-4
SCALE 1" = 3,440'
DECEMBER, 1977 JRA

TAIGA CONSULTANTS LTD.

1977 Fig 23

MARGUERITE RIVER REID CREEK



19770023

MAP 34

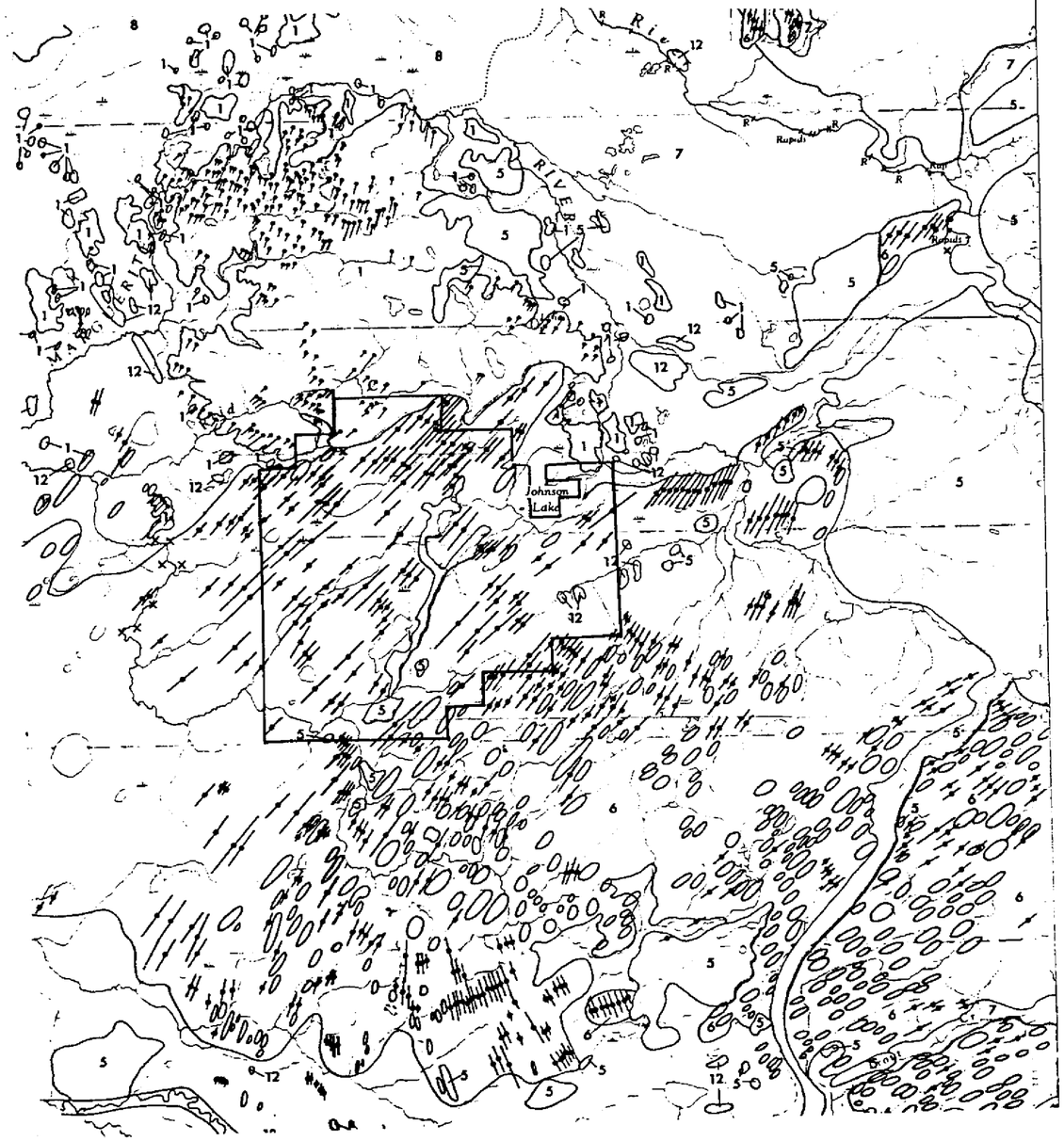
SURFICIAL GEOLOGY
BITUMOUNT
NTS 74E

SCALE 1:250,000

1 Inch to 4 Miles Approximately

Miles 5 0 5 10 15 20

Kilometres 5 0 5 10 15 20 25 30



AEOLIAN DEPOSITS

12 Aeolian sand, dunes: *medium-grained quartzitic sand in sheet and dune form; thick in dunes, 2 to 10 feet in sheet sand*

PLEISTOCENE

GLACIOLACUSTRINE DEPOSITS

11 Mixed: *bedded silt, clay and sand with pebbles and till-like layers; overlying till*

10 Silt and clay: *bedded silt and clay with minor sand; overlying till*

GLACIOFLUVIAL DEPOSITS

9 Meltwater channel sediment: *medium- to coarse-grained sand, overlying thin gravel and lag gravel containing many large boulders; in part, early Athabasca River sediments*

8 Outwash sand: *medium- to coarse-grained sand with pebbles and small gravel lenses; generally thin; surface level to gently undulating*

7 Outwash sand and gravel: *sand and gravel to gravel forming outwash plains; generally thick; surface level to gently undulating; some discontinuous terraces*

6 Outwash sand and gravel overridden by glacier: *fluted and drumlinized outwash of sand and gravel to gravel, with many large boulders; generally thick to very thick; topography undulating to rolling*

5 Ice-contact deposits: *sand and gravel to gravel, numerous very large boulders; rolling topography, individual hills reach heights of several hundred feet; includes kame moraine, eskers, moulin kames, crevasse fillings, and other related ice-contact glaciofluvial deposits; form end moraines of glacier advances*

GLACIAL DEPOSITS

4 Hummocky moraine: *till composed of mixed sand, silt and clay with gravel; generally thick; topography undulating to gently rolling*

3 Colluviated ground moraine: *till composed of sand, silt and clay, mantling colluviated steep slopes; partly bedded near surface; stable slope; generally thin*

2 Ground moraine: *till composed of sand, silt and clay with gravel, variable in thickness; topography level to undulating*

PRECAMBRIAN

1 Granite, gneiss and metasedimentary rocks: *outcrops form hills and knolls; generally bare with glacial deposits on the lee side of outcrops*†

Geological boundary; defined, approximate, assumed .....

Abandoned beach .....

Channel scarp (ticks indicate downslope side) .....

Bedrock outcrop (not Precambrian) .....

Crag and tail (head of symbol indicates stoss side) .....

Crevasse filling .....

Drumlin (outline to scale) .....

Glacial fluting .....

Karst area .....

Sink hole .....

† Detailed Precambrian geology is presented in RCA Map "Geology of the Marguerite River District", by J. D. Godfrey, 1970.

Geology by L. A. Bayrock, 1969, 1970

AN EVALUATION
OF THE
JOHNSON LAKE PROPERTY, ALBERTA
QUARTZ MINERAL EXPLORATION PERMIT 6876090003
N.T.S. 74 - E - 9

FOR

E. & B. EXPLORATIONS LTD.
CALGARY, ALBERTA
DECEMBER, 1977

BY

TAIGA CONSULTANTS LTD.
#301, 1300 - 8 STREET, S.W.
CALGARY, ALBERTA

INTRODUCTION

The Johnson Lake Permit, which is located approximately 70 miles north-east of Fort McMurray, Alberta, straddles the Precambrian Shield - Phanerozoic contact.

Thick surficial deposits, predominantly drumlinized outwash sands and gravels, overlie the entire property. This mantle of glacial debris is underlain successively by Methy Formation (Devonian) carbonates; by remnant basal McMurray Formation (Cretaceous) sandstone and conglomerate; minor pre-Devonian sandstone (LaLoche Formation?); and weathered Precambrian basement rocks.

A study of "tar sands" test-hole data (drilled by Shell and Gulf) on and immediately adjacent to the property indicates a prominent SW trending erosional channel of glacial origin transecting the property. This channel erodes much of the McMurray section and, in places, cuts into the Precambrian basement.

The Precambrian basement consists dominantly of granitic and mylonitic rocks. However, reconnaissance mapping by L.P. Tremblay of the G.S.C. (Map 16-1961; Geology, Firebag River Area) and detailed mapping by J.D. Godfrey of the Research Council of Alberta (Geology of the Marguerite River District, 1969) further suggest the presence of one or more narrow metasedimentary belts of arkosic to pelitic rocks. This possibility is also supported by aeromagnetic data.

A number of potential targets that are favorable to host economic concentrations of uranium have been postulated for the property. These include epigenetic or replacement-type deposits associated with:

test hole data indicates that the northern portion of the permit is underlain by a Precambrian retrograde metamorphosed interbanded granitic and gneissic assemblage. The central and southern portions of the permit are underlain successively by thick unconsolidated surficial deposits; Middle Devonian "Methy Formation" dolomite; remnant, basal Cretaceous "McMurray Formation" sandstone and conglomerate; minor pre-Devonian sandstone (LaLoche Formation"?); and weathered Precambrian basement.

3. A post-Cretaceous glacial erosion channel, which cuts down to the Precambrian, trends through the center of the permit. This channel is coincidental with a W.S.W. trending fault and ground VLF E.M. conductor.

4. A weak radioactive anomaly was detected in oil-stained McMurray sandstone in tar sands test hole 16-1-100-3,W4M in the northeast sector of the permit.

The presence of Cretaceous-Precambrian and Cretaceous-Devonian. unconformities within the permit are uranium exploration targets which require further evaluation.

RECOMMENDATIONS

1. An airborne electromagnetic and proton magnetometer survey should be completed over a portion of the permit at 1/8 mile flight-line spacing with a NW - SE orientation. Northeast - southwest oriented check lines should also be flown to further examine the Phanerozoic zero edge. The Questor Surveys Ltd. INPUT system is suggested for this programme in view of its proven track record in similar environments and its competitive cost.

2. Electromagnetic conductors should be detailed by ground geophysical surveys.

3. Ground delineated conductors should be tested by drilling (rotary or percussion drilling is suggested).

The regional aeromagnetic map indicates that the gneisses (1) display high magnetic relief in contrast to the magnetically low, near featureless granites (2). Thus, it is suggested that at least one 3 mile (+) wide band of gneiss, and possibly a second, underlie the north central and southern sectors of the property.

The northernmost band displays a 4½ mile long southwestward displaced portion, which probably reflects a set of parallel or sub-parallel northeast-trending strike-slip faults. The western fault, which is coincidental with the previously mentioned post-glacial drainage channel, is marked by a 100 gamma magnetic depression and is clearly in evidence for at least 20 miles. The eastern fault is substantially less well defined.

The Precambrian unconformity surface has a regional southwest dip in the order of 20 feet to the mile. However, steep dips and moderate relief have been observed on the unconformity surface in other areas.

Pre-Devonian beds of detrital sand (La Loche Formation ?),often arkosic & red weathering, overlie the Precambrian basement. In turn, these are apparently overlain by Middle Devonian Methy Formation carbonates in the vicinity of the permit. The Prairie Evaporite sequence apparently pinches out prior to reaching the property.

The Methy Formation, which consists of a hard, buff colored dolomite in the McMurray area, varies in thickness from 113 to 227 feet. Thin stromatoporoid, coral and algal units are locally present. Sulphides are rare with one minor occurrence of galena noted at Whitemud Falls (Twp. 89, R 1, W4M).

Two float occurrences of Methy dolomite are reported by Tremblay (G.S.C. Map 16-1961) although its outcrop presence has not been substantiated in the field. However, this sequence has been intersected in the tarsands test drilling by Gulf and Shell.

A Table of Formations for the permit area (and the comparative stratigraphic sequence in northwest Saskatchewan, 50 miles east) is set out overpage.

LOG EVALUATION & SAMPLE EXAMINATION

Due to the limited outcrop on the Johnson Lake Property, indirect evaluation techniques are necessary. Several tar sands test holes have been drilled on and adjacent to the permit and have a suite of geophysical logs, core and cuttings were examined for radioactive anomalies, evidence of mineralization, and to establish the general stratigraphy and geology of the area.

In addition to those test holes on and immediately adjacent to the permit, data from test holes within the area Twp's 96-101 incl. and Rge's 1-W4M inclusive were examined. This was necessary to establish regional correlations and map geologic trends. Insufficient time was available to permit examination of all drill cuttings and core thus, formation tops are not shown for all the test holes. However, all the geophysical logs were used to confirm correlations and were examined for radioactive anomalies.

A summary of these logs is presented in Table 1. Sample descriptions are presented in Appendix 1.

STRATIGRAPHY

Figure 6 (reproduced from Norris, 1973) illustrates the general Mesozoic and Paleozoic stratigraphic section approximately 50 miles south of the Johnson Lake Property. Figure 7 is a NE-SW stratigraphic section through the Johnson Lake Property and correlates to the section in Figure 6.

A prominent erosion channel of glacial origin is evident (Fig. 6) and erodes much of the McMurray section and cutting into the Precambrian. As a result of this post-Cretaceous erosion, the McMurray sand thickness varies considerably along the erosional edge, as illustrated by Figure 8. The limited drilling control shows a remnant basal McMurray sand with possibly some pre-Devonian sands equivalent to the La Loche sands noted to the south.

STRUCTURAL GEOLOGY

Precambrian

The general structure on the Precambrian basement in the Ft. McMurray area is illustrated in Fig. 9 (reproduced from Norris, 1973). A general westerly slope of about 20 feet per mile is indicated; however, little or no control is shown in the vicinity of the Johnson Lake Property.

Basement surface control from the drill holes examined are too few to permit any meaningful mapping of the Precambrian surface in the permit areas.

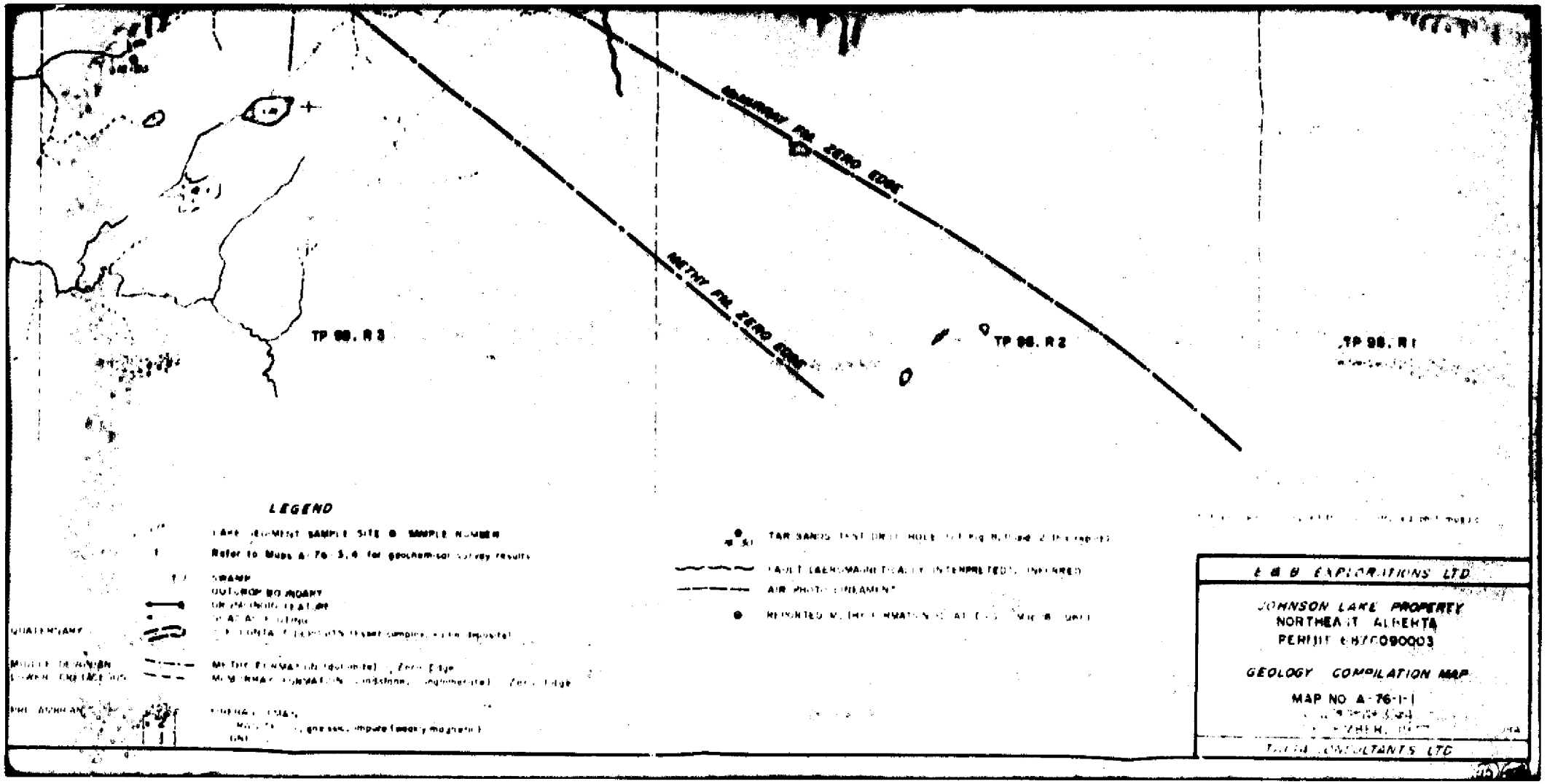
Devonian

The regional structure of the Palozoic strata in the Ft. McMurray area is a southwest dipping monocline with a northwest trending strike (Fig. 10; reproduced from Norris, 1973). No structural control or mapping is shown in the Johnson Lake area. Westward tilting of about 15 feet per mile took place prior to deposition of the Cretaceous beds, with a resultant westerly drainage pattern.

Although control is limited, a structure map on the Devonian erosional surface was constructed and shows a prominent west-southwest trending channel cutting through the middle of the permit area (Fig 11). Erosion channels on the Devonian surface was the loci of thick McMurray sand deposits, characterized by coarse conglomerolic sand representing a marginal position on the channel as illustrated in Fig. 11. It is probable that a thick McMurray sand was deposited within the channel and covered much of the permit area.

Cretaceous

The structure of the top of the basal McMurray sand (Fig. 12) shows a prominent erosional channel through the Johnson Lake Property, coincident with the Devonian erosional channel. The extent of this post-Cretaceous channel and the extent of removal of the thick basal McMurray sand is difficult to acertain with the available drilling control.


TP 98, R3
TP 98, R2
TP 98, R1
LEGEND
SWAMP
OUTCROP BOUNDARY
Refer to Maps A-76-3,4 for geochemical survey results
AIR PHOTO LINEAMENT
E & B EXPLORATIONS LTD
JOHNSON LAKE PROPERTY
NORTHEAST ALBERTA
PERMIT 8687090003
GEOLOGY COMPILATION MAP
MAP NO A-76-1-1

TP 100, R 3

TP 100, R 2

TP 100, R 1

JOHNSON LAKE

Marguerite River

TP 99, R 3

TP 99, R 2

TP 99, R 1

McMURRAY FM. ZERO EDGE

TP 100, R 5

TP 100, R 4

TP 100,

TP 99, R5

TP 99, R 4

TP 99

Marguerite River

PRE-CRETACEOUS EROSIONAL CHANNEL

POST-CRETACEOUS EROSIONAL CHANNEL

1

2

2c

ALBERTA

N.D.
7-25

N.D.
13-13

JOHNSON LAKE

NP 16-1 (B)

N.P.
11-1

+1220
+1200
+1180
+1160
+1140

Pre-Cretaceous Erosional Channel

+1138

13-28

N.P
15-30

NP
15-16

N.D.
8-18

+1218

16-30
(A)

Carbonate Zero Edge

11-31

+1240
+1220
+1200

+1212

13-12

+1232

2-8

+1244

2-11

+1217

7-29

+1222

6-26

+1180
+1160
+1140

+1145

15-8

+1204

14-11

RUCTURE ON DEVONIAN EROSIONAL SURFACE

&

DEVONIAN ZERO EDGE

ata
present

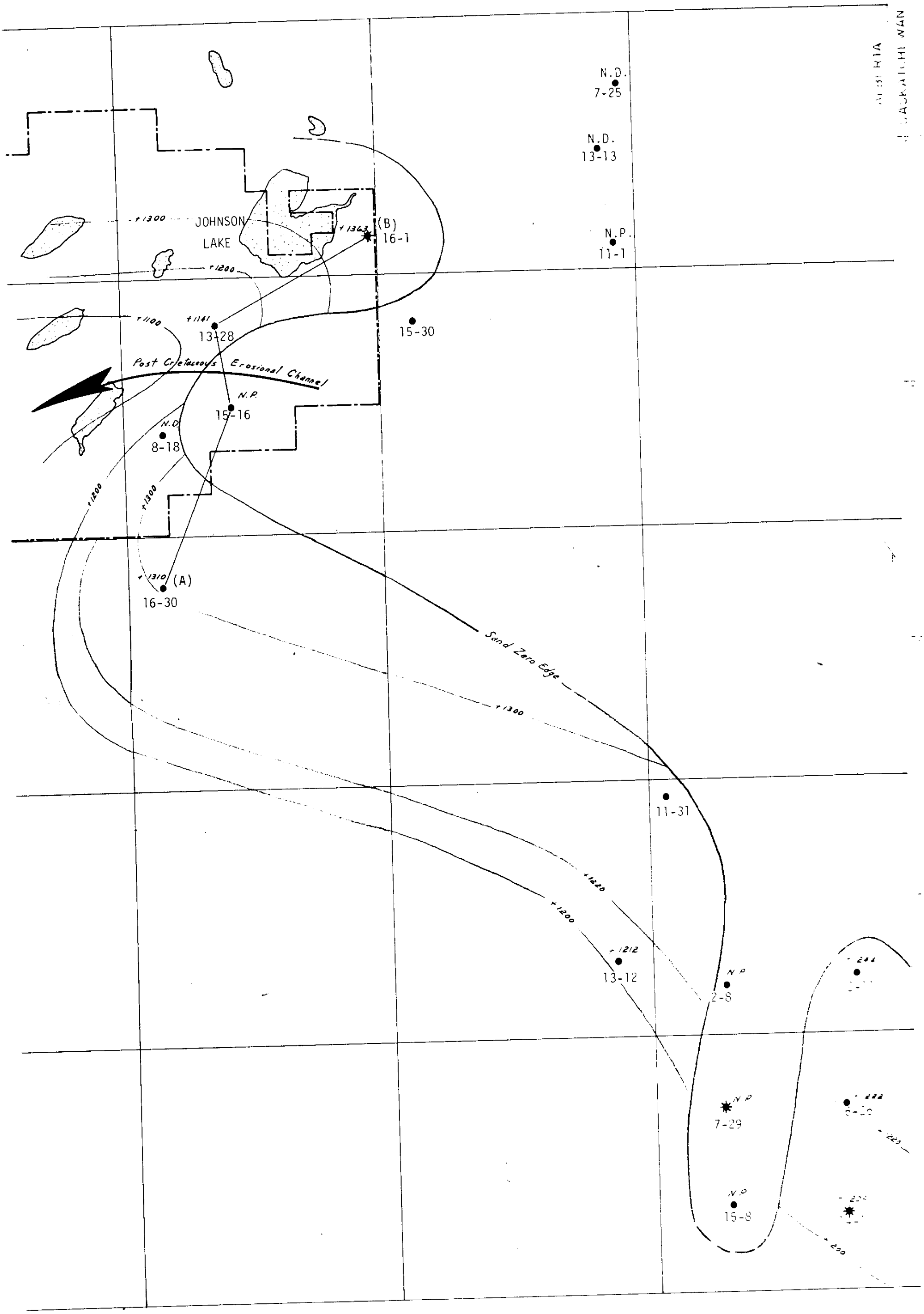
A - B Cross section line

SCALE: 1" = 2 miles

E. & B. EXPLORATIONS LTD.

JOHNSON LAKE PROPERTY, ALBERTA
PERMIT 6876090003

Compiled by: H. H. Williams, P. Geol.
For: TAIGA CONSULTANTS LTD.
Date: December, 1977



JCTURE ON BASAL McMURRAY SAND & SAND ZERO EDGE

sent
elevation
ole location & number

A - B Cross section line
SCALE: 1" = 2 miles

E. & B. EXPLORATIONS LTD.

JOHNSON LAKE PROPERTY, ALBERTA
PERMIT 6876090003

Compiled by: H. H. Williams, P. Geol.
For: TAIGA CONSULTANTS LTD.
Date: December, 1977

TP.100, R.4

TP.100, R.3

TP.100, R.2

TP. 99, R. 4

TP. 99, R. 3

TP. 99, R. 2

JOHNSON LAKE

Marguerite

MAGNETIC CONTROL LINE

1700
1800
1900
1500
1600

MAP 462G

MAP 463G

Scale: One Inch to One Mile = $\frac{1}{63,360}$

Miles

ISOMAGNETIC LINES (total field)

500 gammas

100 gammas

20 gammas

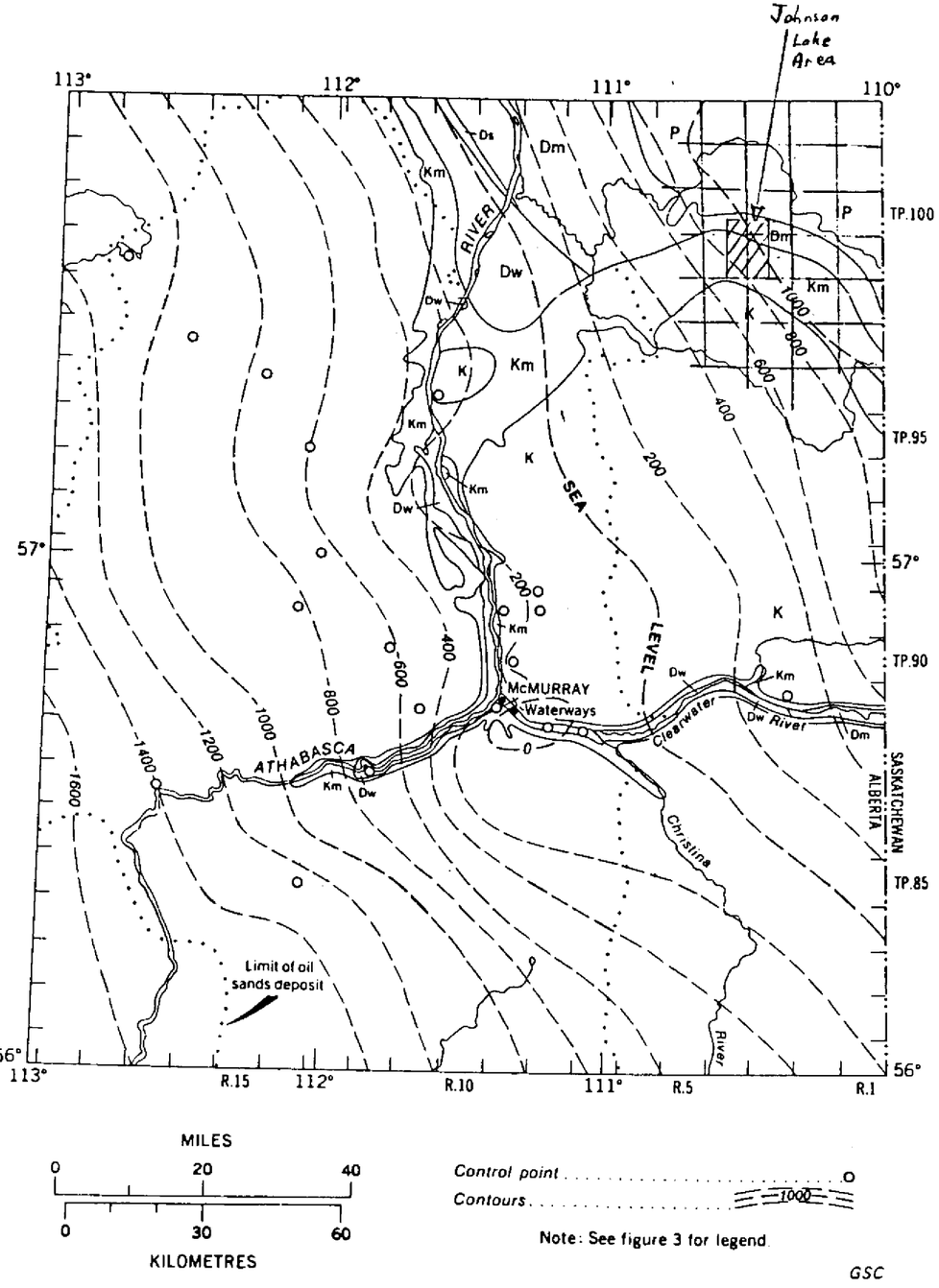
10 gammas

Magnetic depression

Flight line and plotting reference number e.g. 79/80

Flight altitude 1000 feet above ground level

No correction has been made for regional variation this increases at the rate of 0.5 gammas per mile from north to south and 2.8 gammas per mile



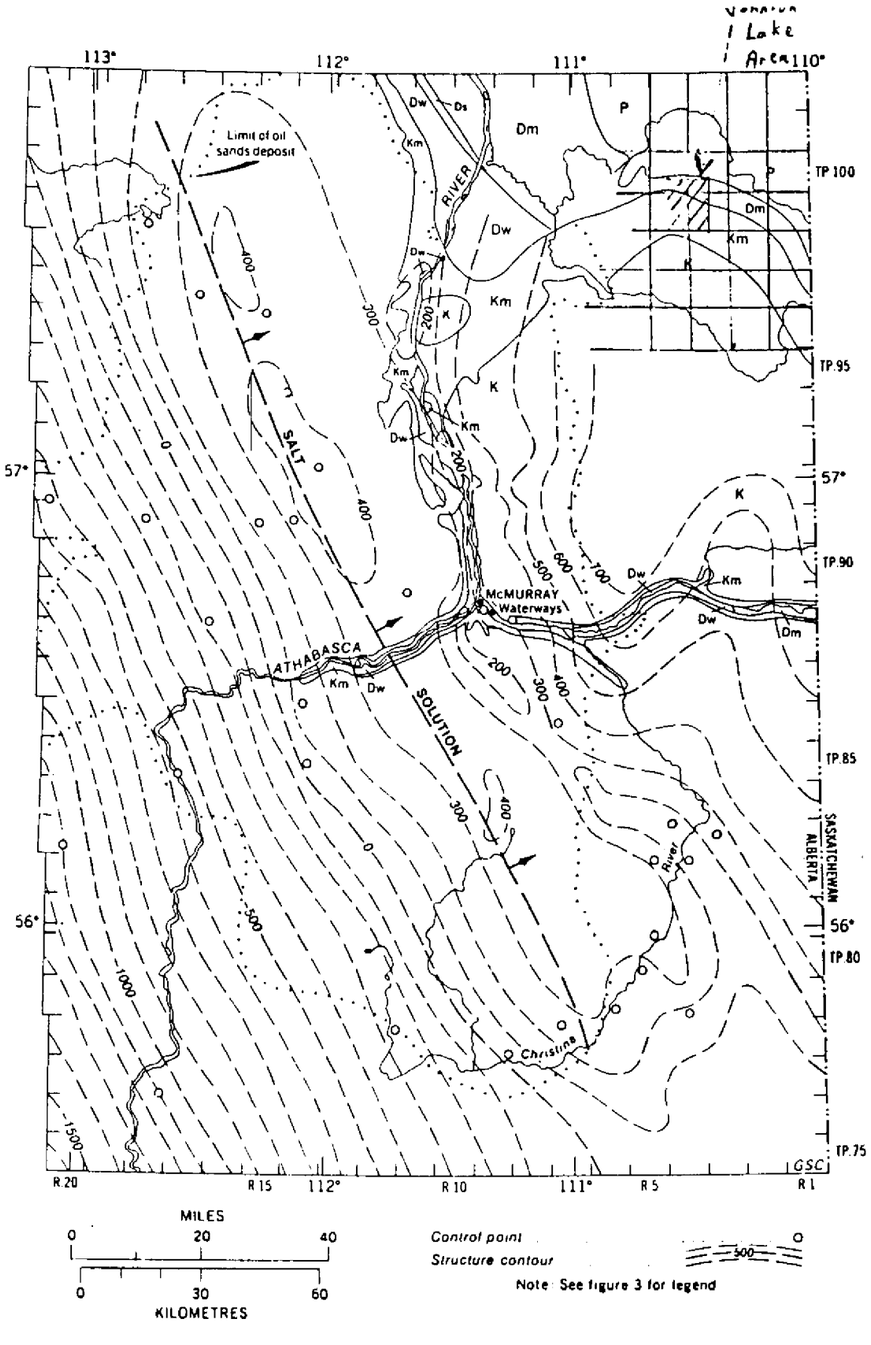


FIGURE 9. Structure contours on Precambrian surface (from Carrigy, 1959, fig. 4). *FIGURE 10. Structure contours on the upper surface of the Elk Point Evaporites (from Carrigy, 1959, fig. 5).*

(Guide to the Athabasca Oil Sands Area; Information Series No. 5
Alberta Research Council: M.A. Carrigy & J.W. Kramers; 1973)