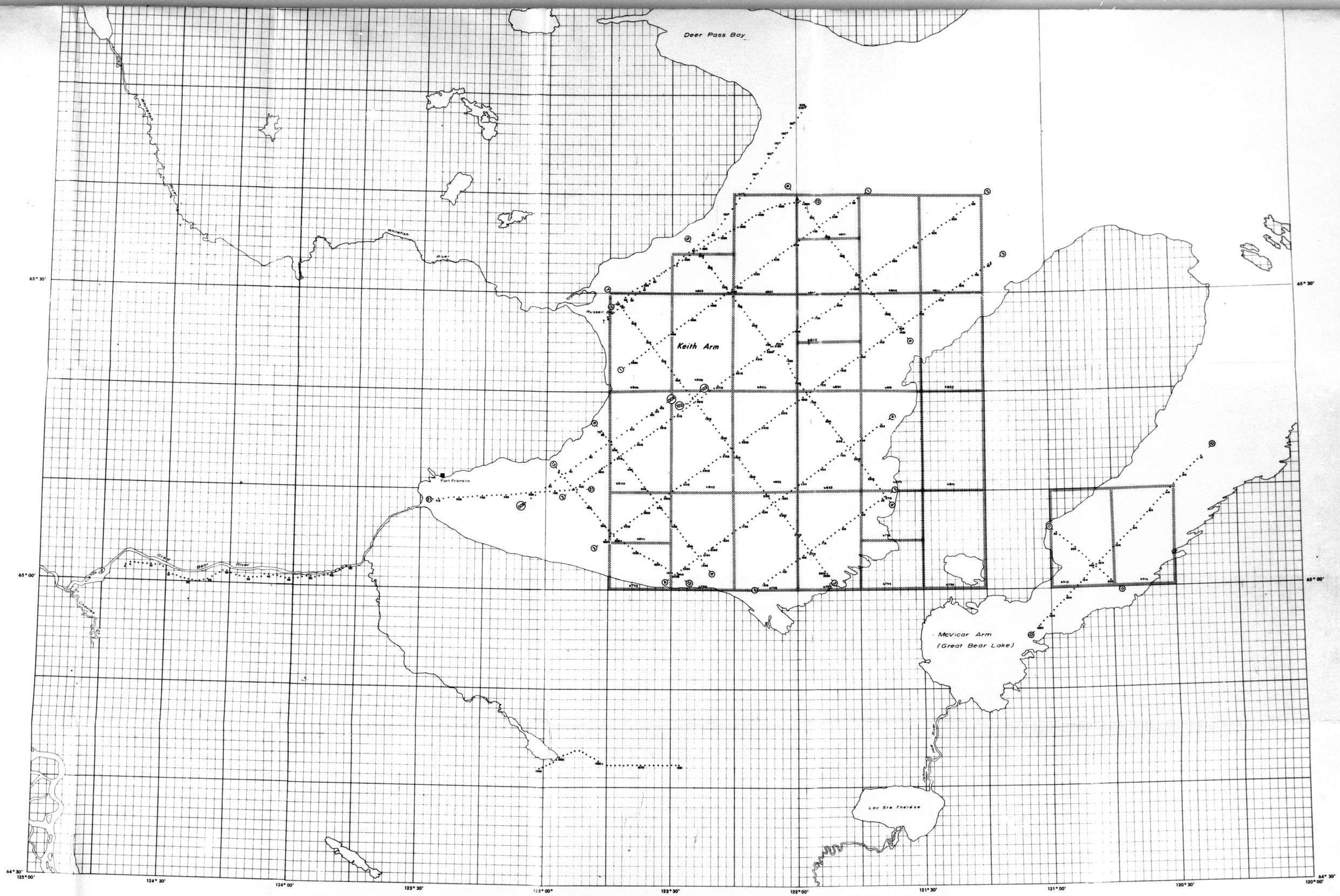

Great Bear Lake
Smith Arm
Good Hope Bay
Echo Island
Mackintosh Bay
Deer Pass Bay
Bridand Bay
Ford Bay
Keith Arm
Fort Franklin
McVicar Arm
(Great Bear Lake)
66° 30'
66° 00'
65° 30'
65° 00'
123° 00'
124° 30'
124° 00'
123° 30'
123° 00'
122° 30'
122° 00'
121° 30'
121° 00'
120° 00'

1 of 2



ALMINEX LIMITED ET AL

GREAT BEAR LAKE PROJECT

NORTHWEST TERRITORIES

SCALE : 1" = 4 Miles

DATE : April 1973

JORDAN – LEWIS & JOSE

CALGARY GEOPHYSICAL CONSULTANTS LTD. ALBERTA

635-06-05-010

SUPPLEMENTARY REPORT
GREAT BEAR LAKE, N.W.T.

Prepared By
R.P. Jordan, P. Eng.
JORDAN LEWIS & JOSE
GEOPHYSICAL CONSULTANTS LTD.

Prepared For
ALMINEX LIMITED ET AL

Project: Interpretation of: Arco marine reflection seismic (300 miles)
Alminex marine reflection seismic (400 miles)
Shell land reflection seismic (40 miles)
Shell aeromagnetic data (64°30' to 65°00'N, 121°15' to 124°00'W)

Permit Numbers: 6793, 6794, 6795, 6796, 6797, 6798, 6799, 6800, 6801, 6802, 6803, 6804, 6805, 6806, 6807, 6914, 6915, 6825, 6826, 6827, 6828, 6829, 6830, 6831, 6832, 6833, 6840, 6841, 6842

Project Number: 635-65-72-1

June 1973

ENCLOSURES

1) 4 miles = 1 inch Seismic Index Map

2) 4 miles = 1 inch Isopach of Middle Devonian - Ronning - Cambrian Interval

3) 4 miles = 1 inch Seismic Structure on 'Basement'

4) 4 miles = 1 inch Aeromagnetic Contours

5) Cross Section A-A'

6) Seismic Sections:

   Constant Velocity Stack Line 014

INTRODUCTION

This report is intended as a supplement to our 1972 report on "Reconnaissance Seismic, Keith and McVicar Arms, Great Bear Lake, N.W.T.". Since that first report the Alminex et al group have acquired some 25 miles of single fold trade data from Shell Canada Ltd. in the area south of the Sinclair Wolverine Creek D-61 well and another 15 miles north of the Buttes et al Blackwater Lake 154A well. This data was reprocessed in January - February 1973 by Teledyne Exploration Ltd. In addition, 300 miles of 600% marine reflection data, shot in Smith Arm, were obtained by trade from Arco and Mobil Oil Canada Ltd. No reprocessing of this latter data has been done, however, two velocity analyses were run along the west end of line 014.

These trade data have been interpreted and tied in to the previous interpretation of marine shooting in Keith Arm.

GEOPHYSICAL DISCUSSION

Overall quality of the Arco marine data is generally poor. Data gathering parameters were similar to those used by the Alminex et al group in Keith Arm except that a shorter spread length of 0-275-1025 was used. No record of velocity functions used to correct data is available, however, it appears that a smooth linear function was used. Reflection identification is particularly difficult because of strong water bottom multiple interference and lack of any refraction information. Monitor records were examined for possible water bottom refractions, however, none were evident on any of the lines shot. This lack can be attributed to the shorter spread lengths and probable presence of low velocity layers at the water bottom. Presumably, most of the Arco program area could be underlain by varying thicknesses of Cretaceous shale.

Velocity analysis of SP's 1 - 29 on the west end of line 014 gave interesting results. A strong reflection occurs at .330 seconds along this portion of the line. This reflection is followed by a repeat of the water bottom and by a double water bottom to reflection multiple so there is little doubt that this is a real reflector. Assuming that this is the pre-Cretaceous

unconformity this would occur at a depth of -700' using a 7500'/s Va. This is deeper than might be predicted for this area. However, the velocity scan data indicates a Va of 12,000'/s which is much higher than could be expected for the Cretaceous. This single reflector, present over most of the Arco shooting, has been converted to depth using an interval velocity of 15,000'/s below the water bottom. Although origin of the reflecting interface is not definitely known, we suspect that it originates from the Cambrian. Several large structures have been mapped striking north-south through Smith Arm. Because of very poor seismic data quality, and lack of proper reflection identification, these should be considered only as very tentative anomaly leads.

A limited amount of Arco trade data, lines 006 and 008, were obtained in Keith Arm. Line 008 in particular is good quality and shows a strong hinge line effect on the Pre-Cambrian surface. This had previously been interpreted on our line 21 as Proterozoic dips. It is now believed that this marks the west edge of the shelf area. Interpretation of the west end of line 21 is now in considerable doubt, however, the NE striking high shown on the structure and isopach maps still warrants further investigation.

Interpretation of the Shell data was relatively straightforward. Record quality is fairly good and reasonable ties were obtained with geological data at the Sinclair Wolverine D61 and Buttes et al Blackwater 154A wells.

Line 5-1, shot east from the Franklin Mountains along the Great Bear River, shows a maximum of 2600' of total Middle Devonian - Ronning - Cambrian section at the west end, thinning to approximately 2000' at the east end some 15 miles southwest of Fort Franklin. Three fairly well-defined normal faults can be seen between SP's 53 and 35 with a total west throw of some 650'. The S.O.B.C. Great Bear River H-30 well was probably drilled on the up-thrown side of the most westerly fault seen at SP 35.

Line 5-49, shot E-W some 10 miles north of the Buttes et al Black-

water Lake 154A well has a maximum interpreted Middle Devonian to Pre-Cambrian isopach of 3900'. A large normal fault, downthrown to the west, is interpreted at SP 1568. This fault is not easily recognized on the reflection data, however, its presence was substantiated by interpretation of removed spread refraction data.

Total throw across this fault is about 700'. There does not appear to be any related change in isopach across the fault, although correlations are not entirely clear cut. Faulting appears to post date Lower Cretaceous time, and is probably connected with the structure at Manitou Island. Note that a strong reflection occurs about 600' above the interpreted Pre-Cambrian along the west end of the line. This could be interpreted as Saline River salt.

MAP DISCUSSION

1) Isopach of Total Middle Devonian, Ronning, Cambrian. This is a compilation of regional seismic data and includes well information. Geologic picks on the Pre-Cambrian at the Wolverine Creek, Maloney Lake and Whitefish River wells are tentative only. The high Gamma Ray zone below the Cambrian clastic section in all three wells has been tentatively identified as top of the Proterozoic. On good seismic data, the base of the Cambrian is usually recognizable as a strong angular unconformity with (usually) steeper dipping Proterozoic sediments. The east limit of lake bottom Cretaceous cover is shown in Keith Arm. West of this line, values range from thins of about 1500' to a maximum of 3800' in the vicinity of the Blackwater 154A well. North and east thinning is caused by the effects of erosional truncation at the Pre-Cretaceous unconformity and by depositional thinning in the Cambrian, Ronning and Bear Rock intervals (see schematic cross-section A-A'). Isopachs shown in Smith Arm are in considerable doubt as reflection origin is not definitely established.

2) Structure On 'Basement'. This is a compilation of all available well and seismic data. Again, interpretation of data in Smith Arm is dubious.

3) Cross-Section A-A'. This is a schematic section from Mobil Ontadek Lake N-39 on the NW to Imperial Cartridge on the southeast. The section crosses the southwest or basinal side of the Alminex et al group acreage. This section illustrates effects of Pre-Cretaceous erosional truncation, normal faulting and southeasterly thinning of units within the Cambrian, Ronning and Bear Rock intervals. Note that a considerable thickness of Saline River salt occurs at the Arco Lost Hill Lake well. No definite evidence of salt was seen on the Keith Arm or Smith Arm marine data. Either the seismic data quality is too poor to identify this section, or the salt occupies an embayment of the Saline River basin between Smith and Keith Arms.

4) Aeromagnetic Contours. This map is based on Shell aeromagnetic data which had been submitted for N.W.T. Permit work credits. There appears to be a good coincidence of high intensity magnetic zones with some of the features seen on our seismic 'basement' depth map. In particular, the fault zone seen in the vicinity of the Buttes et al Blackwater Lake 154A well and Manitou Island, and the fault zone seen at SP 558 on Line 21, are accompanied by well-defined zones of high aeromagnetic intensity.

Also attached is a profile drawn across Line A-B. Depths of 7500' and 17,500' have been calculated for the two anomalies crossed by the line of section. These anomalies are probably caused by igneous intrusions, along fault zones, in a thick Proterozoic sedimentary sequence.

SUMMARY AND CONCLUSIONS

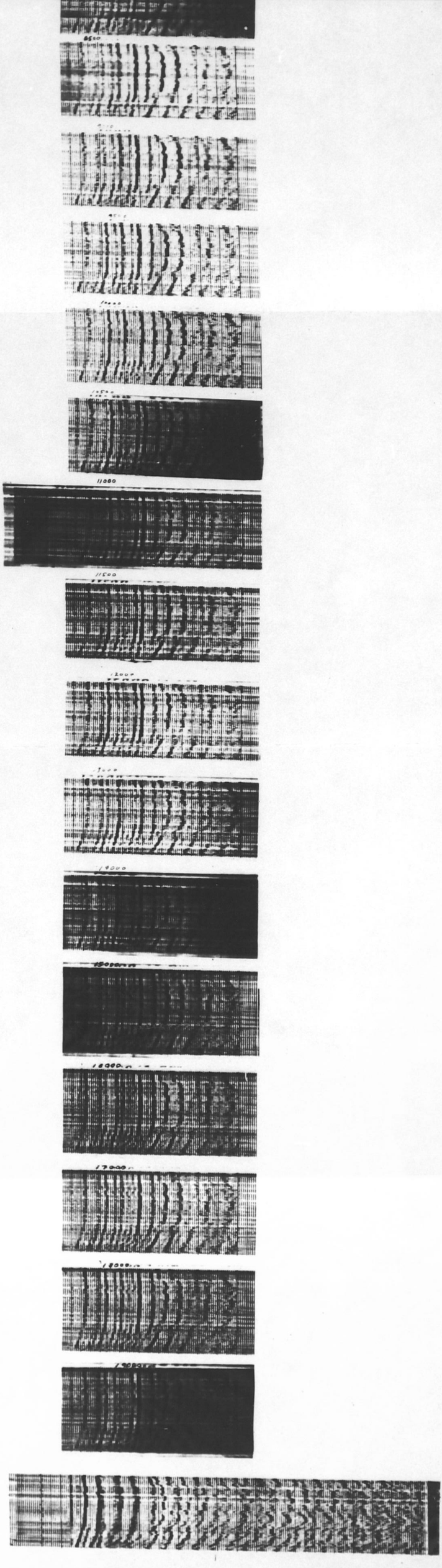
Acquisition of trade data and recent release of well information have resulted in a somewhat better understanding of the regional geological framework of this area. At present, prospects appear to be confined to potential porosity developments in the Ronning dolomites, Mount Cap carbonates and Old Fort Island sandstone. Marine seismic data, shot in two seasons in Great Bear Lake, has not been effective in outlining anything other than gross structure. Until something can be done to resolve water bottom ringing problems no further marine shooting is recommended. Structural prospects associ-

ated with subcropping Ronning porosity and basal Cretaceous sands are not anticipated in the Keith Arm area, however, these might prove attractive in the Cretaceous basin indicated between Deer Pass Bay and the Franklins. Prospects associated with the Mount Cap and Old Fort Island sandstone might be anticipated as regional stratigraphic traps along the basin margin or as local traps associated with Pre-Cambrian topography. None of the seismic seen to date is of good enough quality to provide adequate resolution for these types of traps.

Any additional geophysical work on the Alminex et al group lands should consist of acquisition of gravity and aeromagnetic coverage, and acquisition of a limited amount of multi-fold land data (60 - 80 miles) along the periphery of Keith Arm.

Respectfully Submitted,

R.P. Jordan, P. Eng.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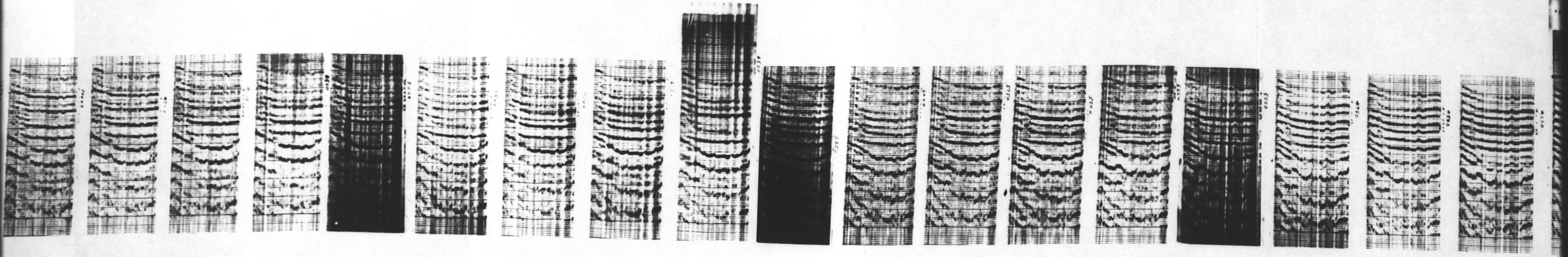

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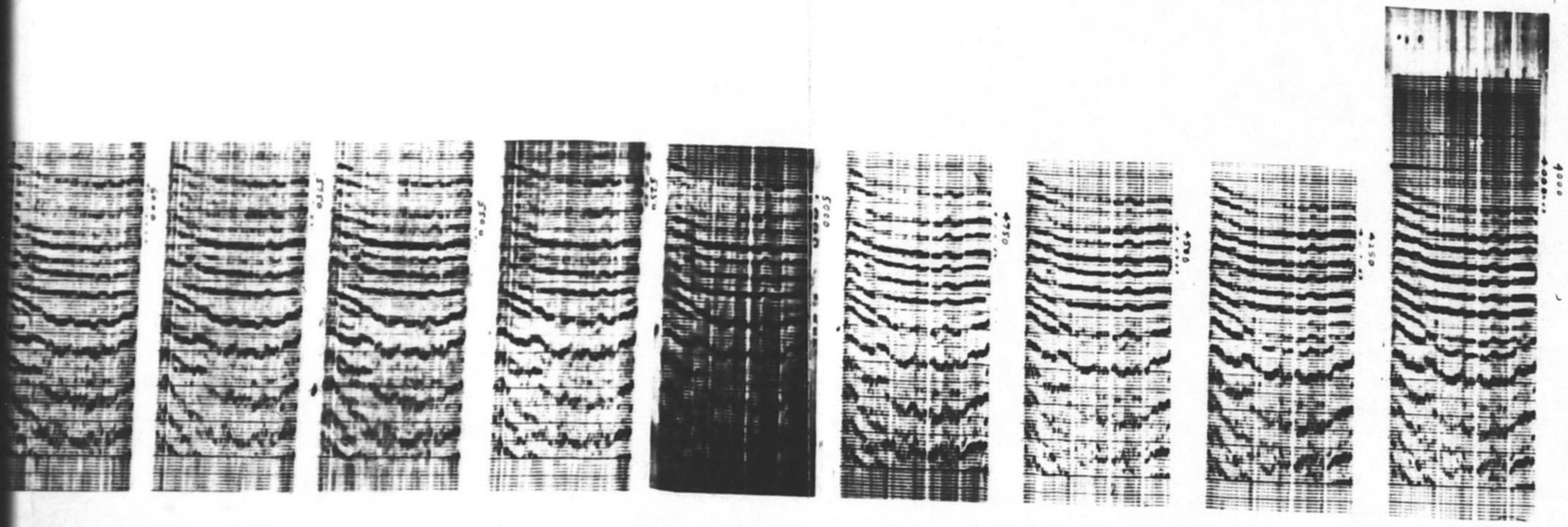

CONSTANT VELOCITY STACK

Line 014 Part 1

S.P's 1-29

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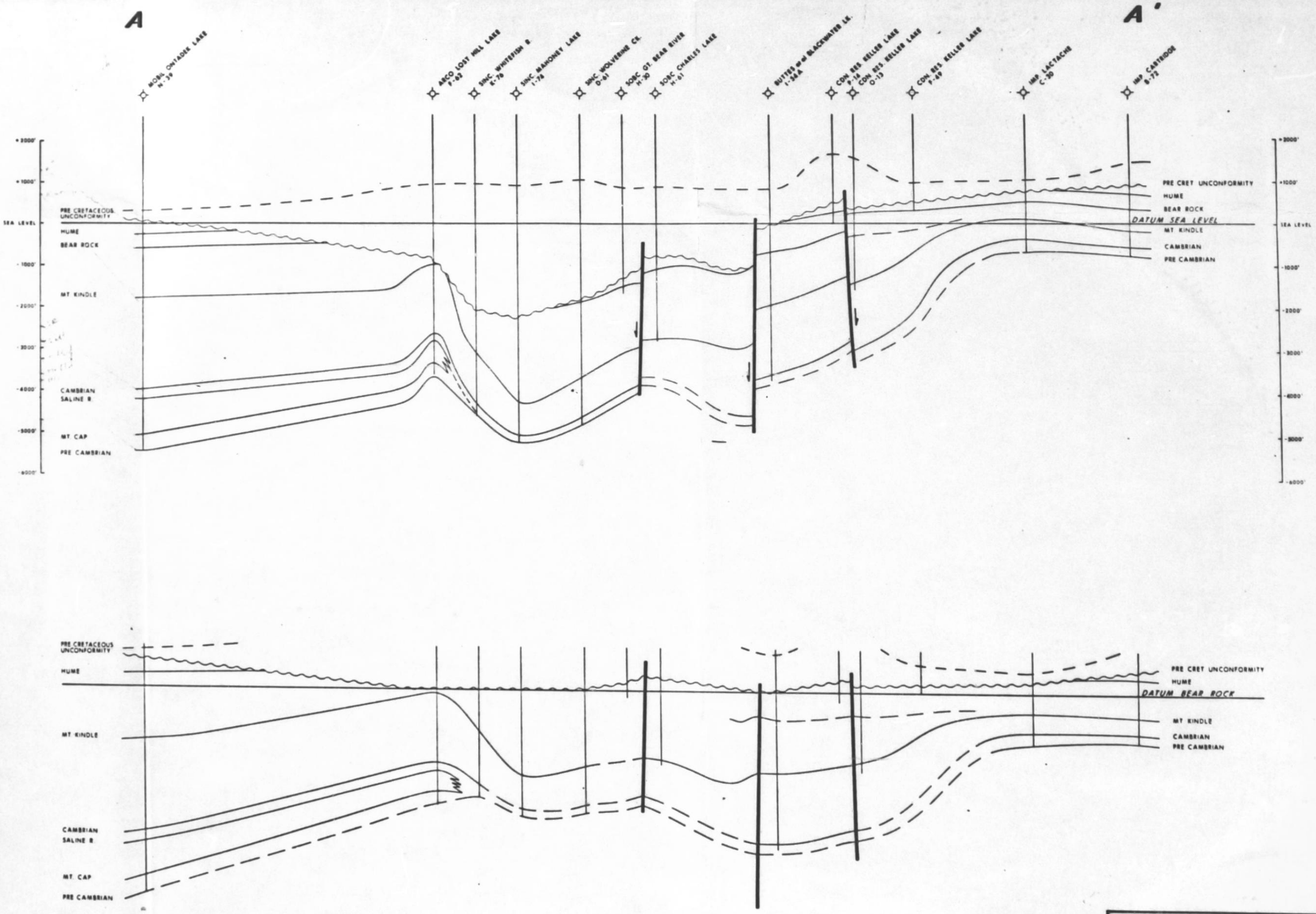

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GREAT BEAR LAKE PROJECT
NORTHWEST TERRITORIES

SCHEMATIC CROSS - SECTION A-A'

DATE : April 1973

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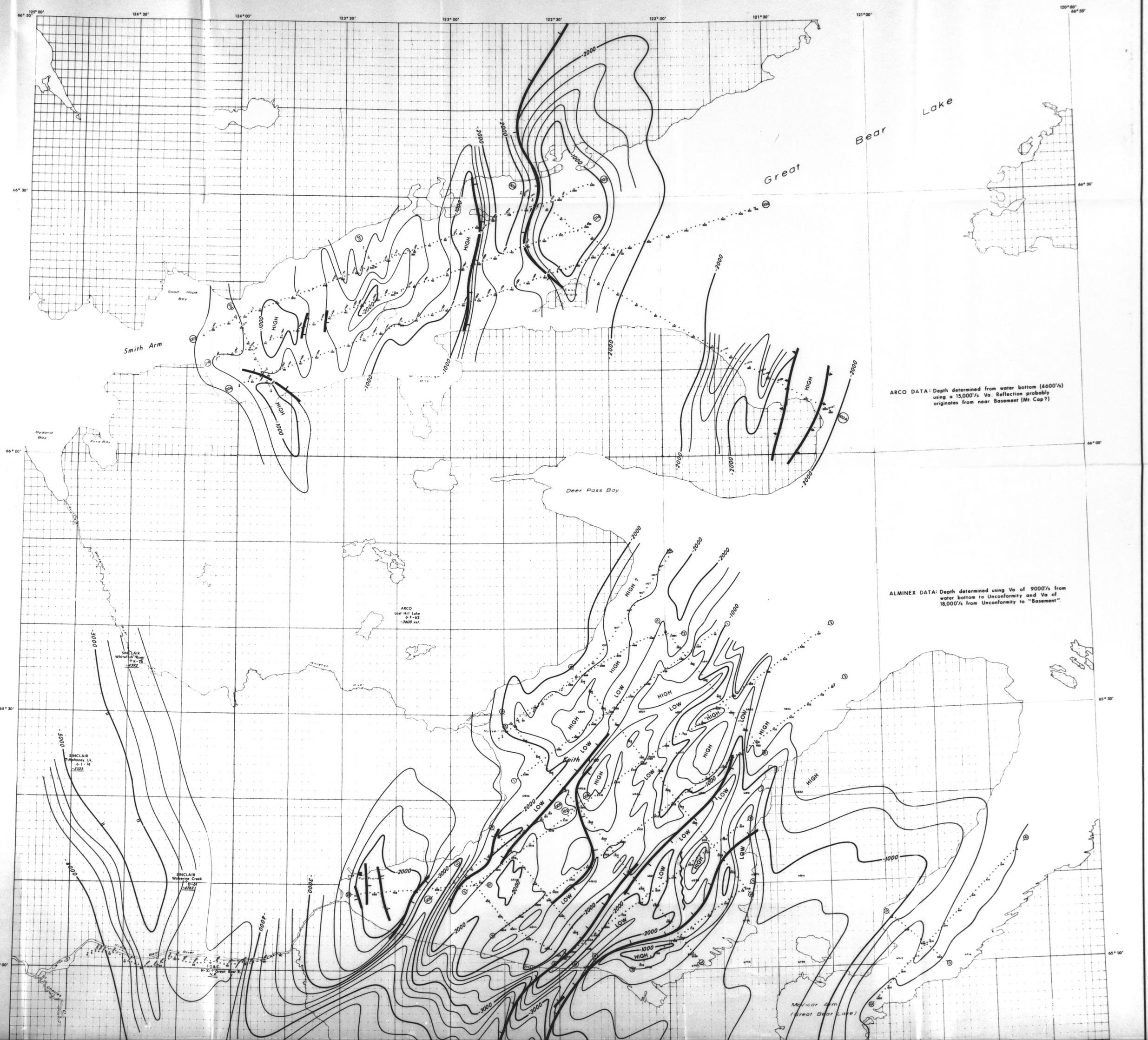
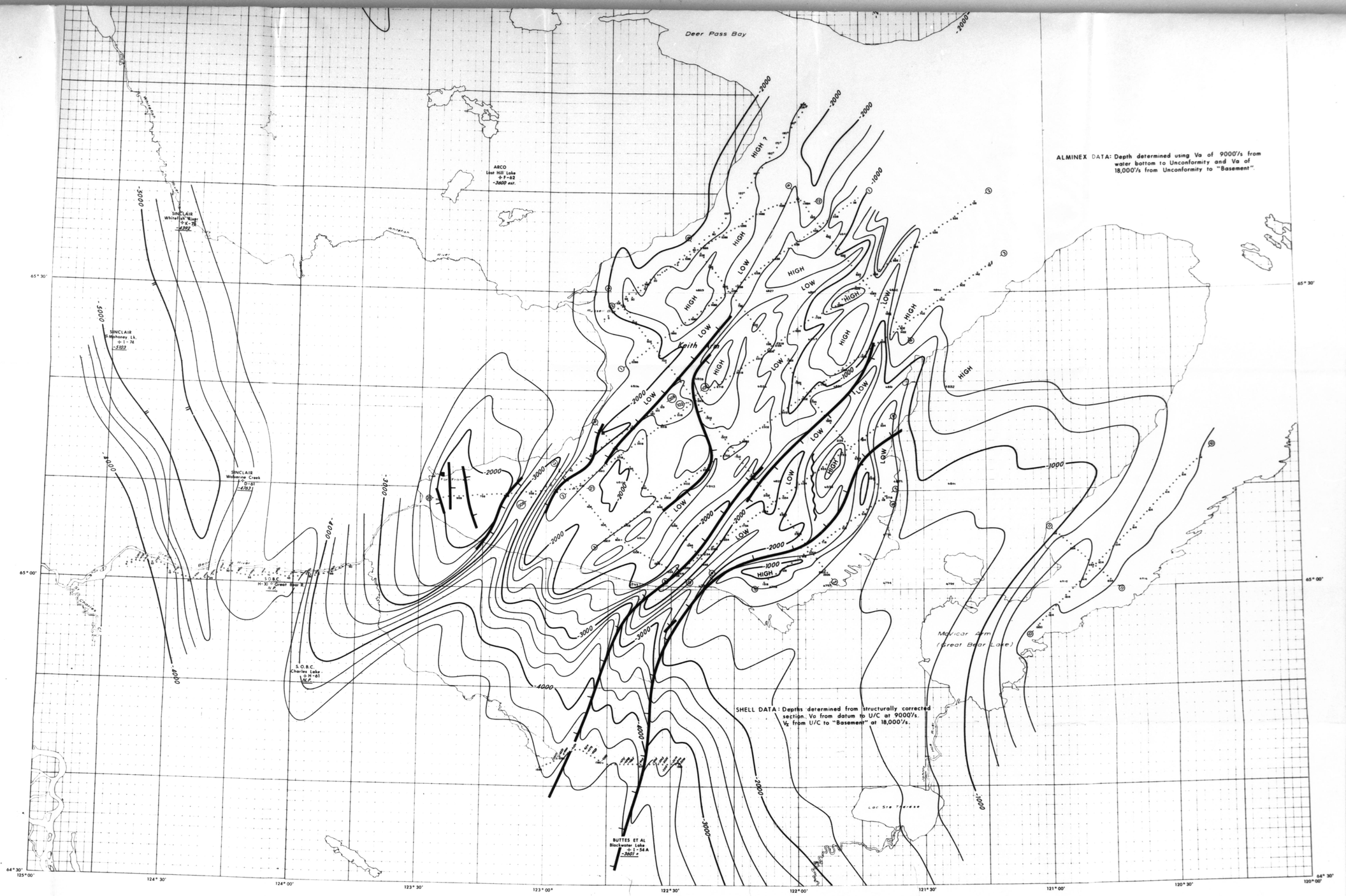

Great Bear Lake
Smith Arm
Good Hope Bay
Bydand Bay
Ford Bay
Deer Pass Bay
Keith Arm
Mavicar Arm (Great Bear Lake)
ARCO DATA: Depth determined from water bottom (4600'/s) using a 15,000'/s Va. Reflection probably originates from near Basement (Mt. Cap?)
ALMINEX DATA: Depth determined using Va of 9000'/s from water bottom to Unconformity and Va of 18,000'/s from Unconformity to "Basement".
ARCO Lost Hill Lake P-62 -3600 est.
SINCLAIR Whitefish River K-76 -4392
SINCLAIR Mahoney Lk. I-74 -7103
SINCLAIR Wolverine Creek D-61 -4763
S.O.B.C. H-30 Great Bear R. N.P.
HIGH
LOW
HIGH ?
-1000
-2000
-3000
-5000
66° 50'
66° 30'
66° 00'
65° 30'
65° 00'
125° 00'
124° 30'
124° 00'
123° 30'
123° 00'
122° 30'
122° 00'
121° 30'
121° 00'
120° 00'



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GREAT BEAR LAKE PROJECT

NORTHWEST TERRITORIES

STRUCTURE ON "BASEMENT"

SCALE : 1" = 4 Miles

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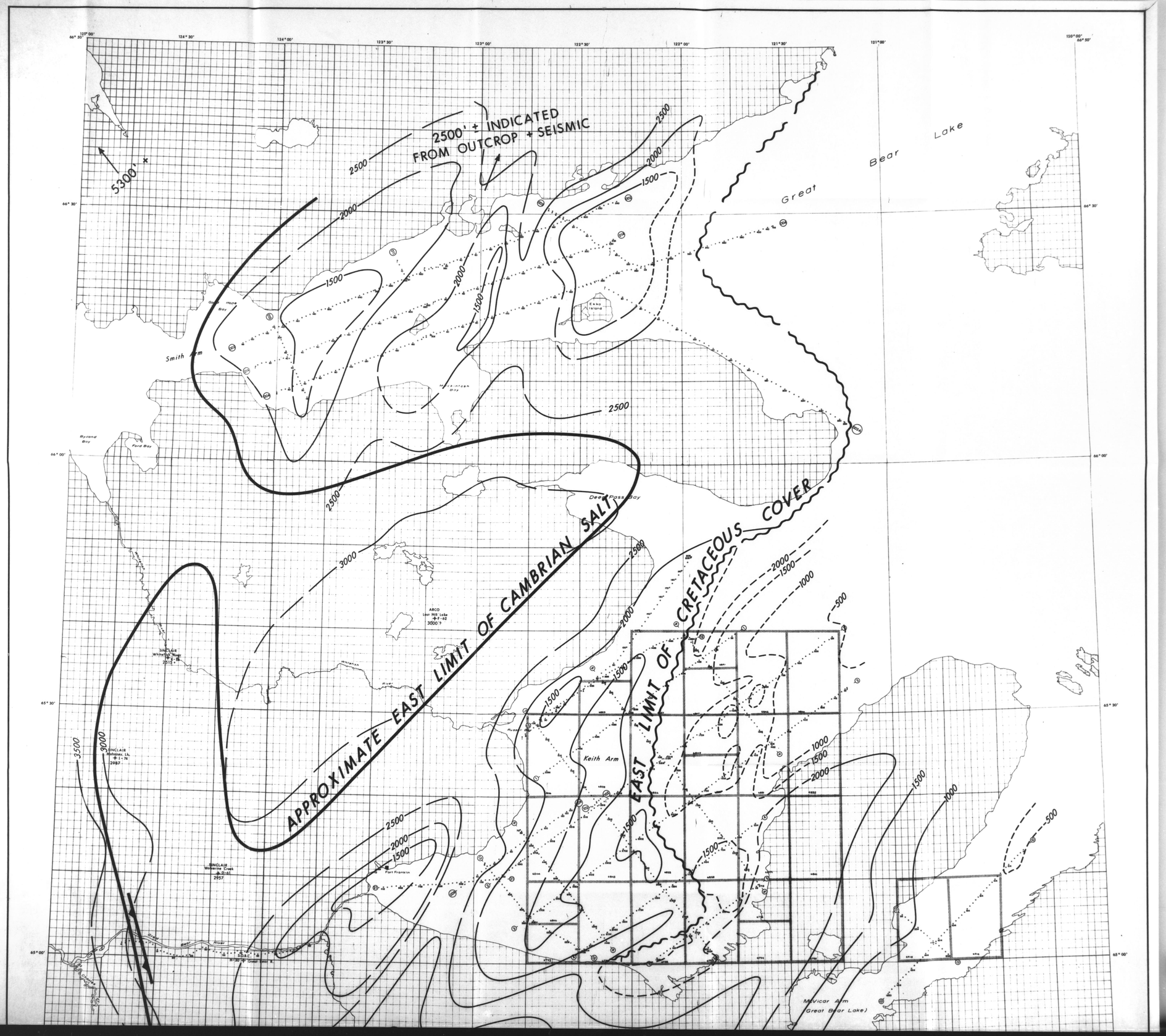
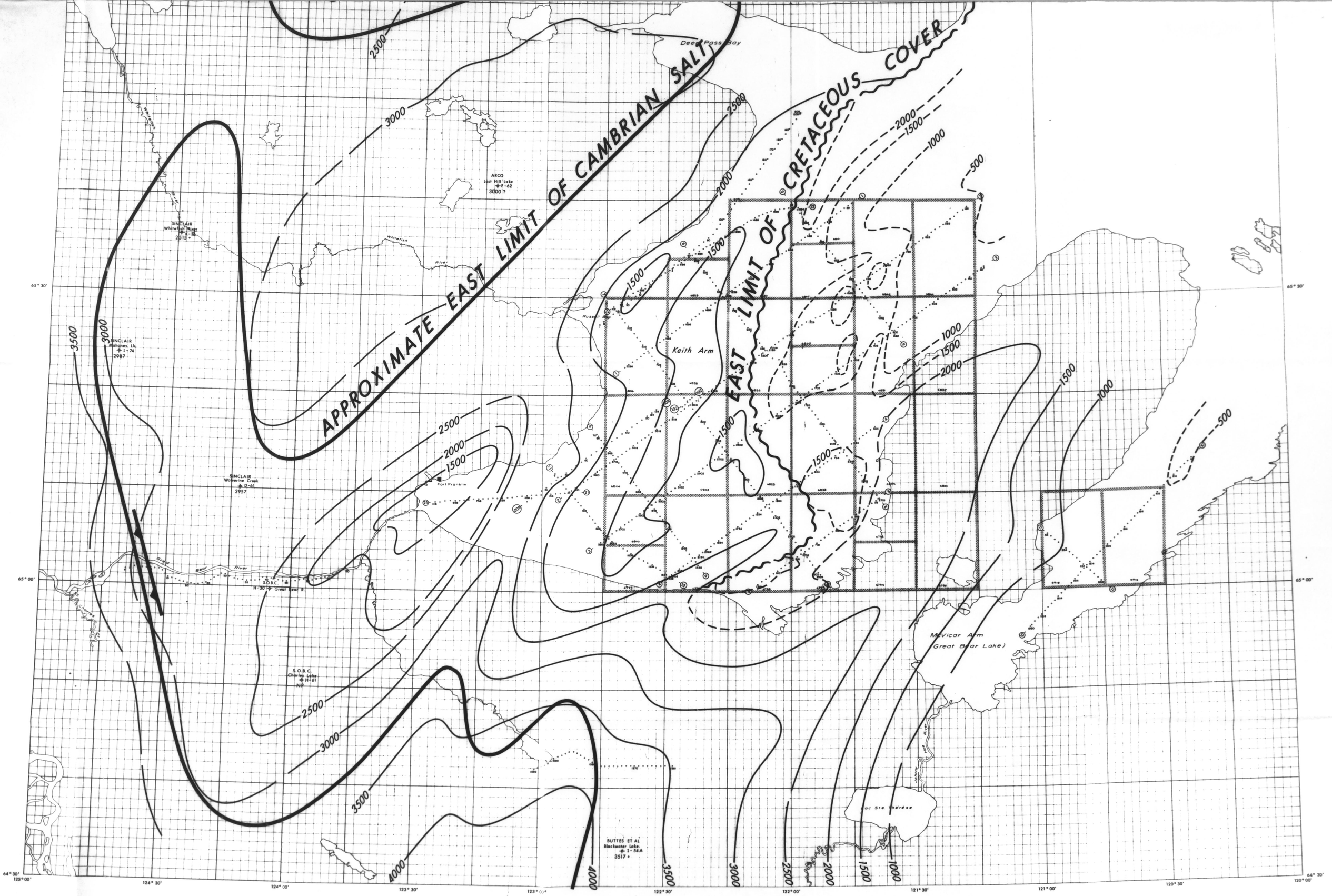

2500' ± INDICATED
FROM OUTCROP + SEISMIC
5300' ×
APPROXIMATE EAST LIMIT OF CAMBRIAN SALT
EAST LIMIT OF CRETACEOUS COVER
Great Bear Lake
Smith Arm
Keith Arm
Deep Pass Bay
Echo Islands
Fort Franklin
Mavicar Arm
(Great Bear Lake)
ARCO
Lost Hill Lake
1-62
3000?
SINCLAIR
Whitefish River
1
2515
SINCLAIR
Mahaney, L.L.
1-26
2987
SINCLAIR
Wolverine Creek
D-61
2957
3500
3000
2500
2000
1500
1000
500

1 of 2



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GREAT BEAR LAKE PROJECT

NORTHWEST TERRITORIES

ISOPACH

TOTAL MIDDLE DEVONIAN, RONNING & CAMBRIAN

SCALE : 1" = 4 Miles

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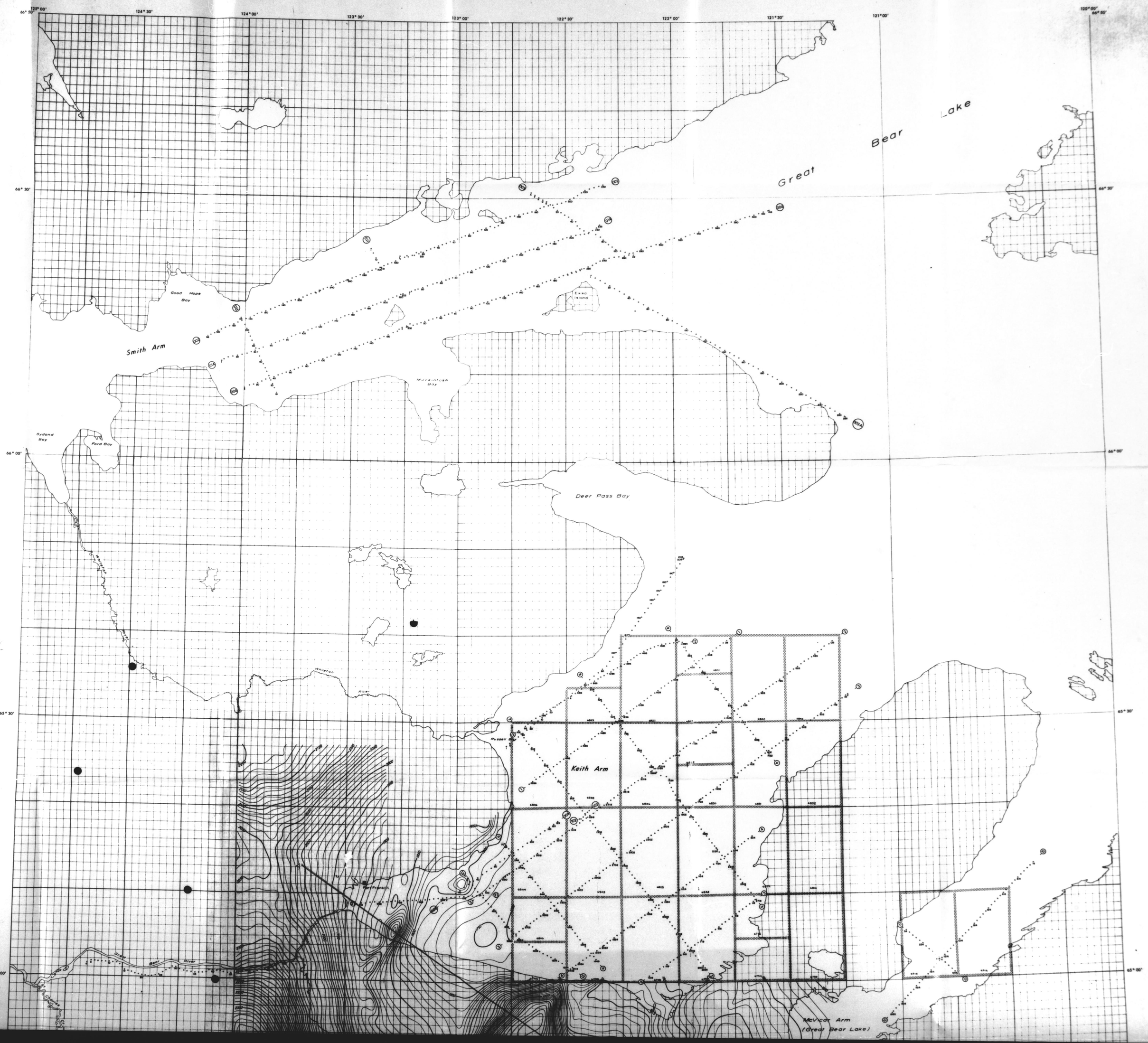
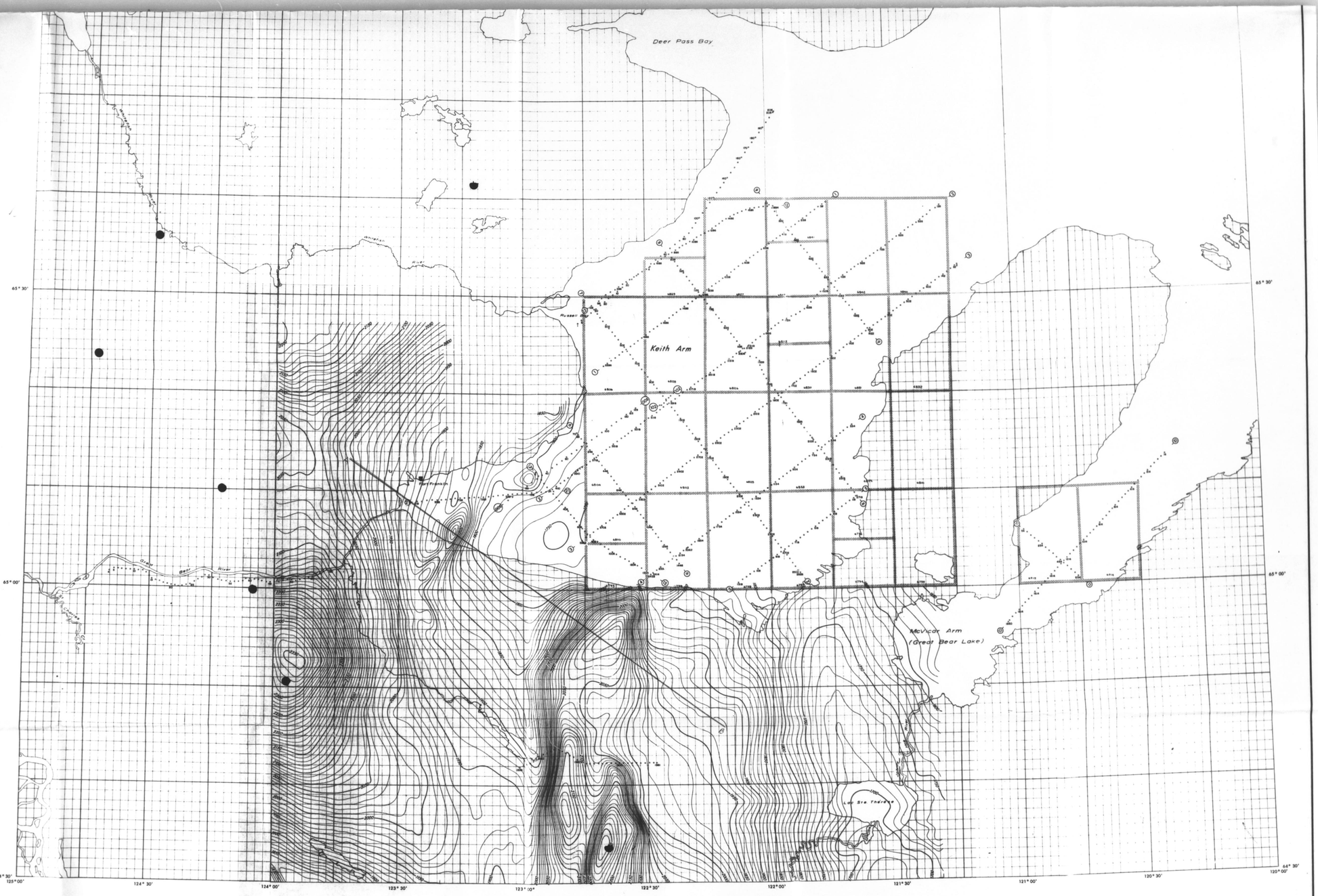
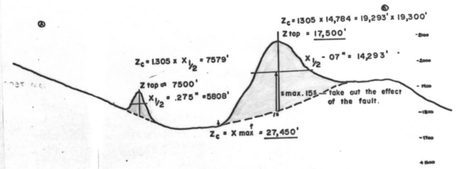

Great Bear Lake
Smith Arm
Good Hope Bay
Ekko Island
Macintosh Bay
Bydond Bay
Ford Bay
Deer Pass Bay
Keith Arm
Russell Bay
Fort Franklin
Great Bear River
Chapies
McVicar Arm
(Great Bear Lake)
125° 00'
124° 30'
124° 00'
123° 30'
123° 00'
122° 30'
122° 00'
121° 30'
121° 00'
120° 00'
66° 50'
66° 30'
66° 00'
65° 30'
65° 00'





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GREAT BEAR LAKE PROJECT

NORTHWEST TERRITORIES

AERO - MAGNETIC MAP

TOTAL INTENSITY

CONTOUR INTERVAL : 10 Gammas

SCALE : 1" = 1 Mile

DATE : April 1973

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