

REFLECTION SEISMOGRAPH SURVEY
FT. McPHERSON AREA
N.W.T.

Work Bonus Exploratory Permits
#6223 - #6230 inclusive

551-6-6-4

REFLECTION SEISMOGRAPH SURVEY

FT. McPHERSON AREA

N.W.T.

for

KERR-McGEE OF CANADA NORTHWEST, LTD.

during

March, April & May 1970

by

RAY GEOPHYSICAL LIMITED

on

Work Bonus Exploratory Permits

#6223 - #6230 inclusive

Project No. 551-6-6-69-1

Date: January 18, 1971

Report by: E. A. Horne



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135°00'

134°00'

RICHFIELD
Pt. Separation

MAP Sheet 150

ICE
Sheet 524MAP Sheet 10010
M.S.

P-6230

P-6229

P-6228

P-6290

MAP Sheet 28

67°00'

P-6227

P-6226

P-6225

P-6224

P-6289

TOP R. Tr.
72

P-6223

P-6288

SHELL Pool R
VT 110SHELL Pool R
VT H 50SHELL Pool R
VT B OSHELL Pool R
VT LSHELL Pool R
VT J A

SHELL Pool R

STATISTICAL DATA

Mobilization

Ray Geophysical Party #115 was shared by three separate operating companies during the 1969 - 1970 winter season. As a result, supplies were offloaded at several points along the Mackenzie River in proximity to the prospect areas.

Equipment was barged down the Mackenzie River from several points along the river where it had been stacked the previous spring. Additional equipment from Calgary and Edmonton was shipped from Hay River.

All operating equipment was offloaded at Inuvik during the latter part of September 1969.

Kerr-McGee of Canada Northwest, Ltd. obtained the crew on March 20, 1970 in the Rat Pass area, and spent four days moving the equipment to the Ft. McPherson prospect area. After completion of the program on May 8, 1970, the equipment was stacked on the bank of the Peel River.

After spring break-up, the equipment was barged to Hay River and transported to Edmonton and Calgary.

Production

Miles of Coverage	135
Number of Profiles Shot	1,120
Total Recording Days	28
Total Recording Hours	451
Miles per Recording Day	4.84
Profiles per Recording Day	40
Moving Days	7
Down Days (Equipment	17

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Equipment

A. Recording Crew

Recording	1964 Fargo W-300
Shooting	1966 Fargo W-300
Line	1968 Dodge W-300 1966 Dodge W-200
Survey	2 X 1969 Dodge W-100
Party Manager	1969 Ford F-250
Asst. Party Manager	1969 Dodge W-100
Recording System	- S.I.E. binary gain
Amplifier	- PT 800
Tape Transport	- PDR - 89
Camera	- Mandrel 32 trace SDW - 100
Firing System	- Mandrel RMTU - RDTU
Geophones	- EV - 22 14 cycle
Cables	- 15 portabe CDP cables - 220 foot interval

B. Drilling

<u>Number</u>	<u>Type</u>	<u>Vehicle</u>
1	Failing CFD-1 Air-Water	1967 Dodge 900
1	Failing CFD-1 Air-Water	1966 Fargo Tandem
1	Failing CFD-1B Air-Water	1969 Fargo Tandem
1	Gardner-Denver Top Drive	1968 GMC 960
1	Sewell Auger Model C	1964 Fargo 700
1	Norhill Auger	1962 Nodwell RN-110
1	Norhill Auger	1966 Nodwell RN-110
3	Water Tankers	
3	Drill Support Units	

C. Dozing

6	Caterpillar D-6
1	Caterpillar D-7
2	Drags
2	4 x 4 Support Units

D. Camp

- 1 Kitchen - Diner Unit
- 1 Kitchen - Diner - Sleeper (6 - Man)
- 1 Utility Unit
- 1 Utility - Storage Unit
- 1 Storage Unit
- 2 Sleeper Units (12 - Man)
- 2 Office - Sleeper Units (8 - Man)
- 1 Shop Unit
- 1 30 kw Power Plant
- 1 20 kw Power Plant
- 1 Kenworth Flatbed with 2000 gallon fuel tank

Field Personnel

- 1 Party Manager
- 1 Assistant Party Manager
- 2 Surveyors
- 2 Rodmen
- 1 Observer
- 1 Junior Observer
- 7 Observer Helpers
- 2 Reel Truck Drivers
- 1 Shooter

D. Camp (Cont'd)

Office Personnel

- 1 Party Chief
- 1 Seismologist
- 1 Computer

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Survey

Vertical and horizontal control were obtained by the use of two T-1A Theodolites and steel tapes.

Control on the Peel Plateau was based on Trig Stations Nee and Waste.

East of the Peel River, survey control was based on the locations of shot points established by Imperial Oil Limited.

Conditions

Weather presented very few problems during the course of the survey. Drifting snow on access roads hindered fuel transportation, and continuing mild weather after mid-April contributed to unusually slow driving for the wheeled vehicles.

Radio communication with Inuvik varied from fair to unreadable. Periods of complete communication blackouts varied from a few hours to several days.

Field Procedures

Two types of subsurface coverage were obtained in the prospect area.

600% unilateral multifold coverage on the Peel Plateau
(see diag. 1)

400% bilateral multifold coverage on the Peel Plain
(see diag. 2)

Severe transverse surface waves were minimized by a compromise shot hole pattern consisting of two holes spaced 150 feet apart straddling the shot point location.

Charge size 5# per hole

Station distance - 220 feet

Geophone group - 9 @ 15 foot spacing

Data Processing

Structural corrections were computed for individual shot points relative to a sea level datum.

Normal moveout corrections were applied and a preliminary stack carried out. Individual trace statics were then corrected to the mean reflection time observed on the preliminary stack and then a final corrected stack section was made.

A 15/20 - 55/65 digital bandpass filter was applied to all data.

Data was prepared and processed by R. B. Cruz & Associates Ltd., in conjunction with Computer Sciences Canada Ltd.

December 4, 1970

FORT McPHERSON AREA
SEISMIC REPORT

A seismic reflection survey in the Peel Plain - Peel Plateau region of the NWT was carried out during the period from March 20 to May 8, 1970.

This reconnaissance program was carried out primarily over the Work Bonus Exploratory Permits #6223 - #6230, held jointly by Kerr-McGee of Canada Northwest, Ltd., Canadian Superior Oil Ltd. and Canadian Fina Oil Ltd.

The seismic was designed to provide additional structural detail to supplement the regional control obtained from Imperial Oil trade data, and to look for Middle Devonian reefs.

A single line was extended to the west of these permits on the Peel Plateau to locate the Middle Devonian - Silurian carbonate shaleout edge.

SUMMARY AND CONCLUSIONS

The Middle Devonian structural trends are more clearly defined by the additional seismic coverage, and the orientation of some of the larger faults has been established.

The western extension of the program successfully located the shaleout of the Middle Devonian - Silurian carbonates.

No evidence of any Horn Plateau equivalent reef was apparent.

INTERPRETATION

The data obtained in this area contains only two regional reflected events. Many shallow Devonian reflections occur continuously over short distances, but the eastward expansion of the Devonian clastics appears to create a section of essentially discontinuous reflecting interfaces.

The one continuous regional reflection is from the contact between the Imperial shale and the Hume limestone. This interface provides a strong reflection which can be readily identified at all points in the area east of the shaleout edge.

The second regional event is assumed to occur at the acoustic boundary between the base of the Ordovician carbonate and the Cambrian clastics. This event is evident over most of the prospect but is subject to areas of discontinuity due to faulting, subsidence, and interference from extraneous reflections.

Data quality was generally fair to good, but zones of very poor energy return were encountered in the vicinity of lakes and streams probably due to halos of thawed permafrost.

Two maps were constructed to assess the Middle Devonian and Silurian carbonates for anomalous structural or stratigraphic features.

HUME TIME STRUCTURE

This map presents an accurate picture of the Middle Devonian structure since the two main factors involved in creating this map are considered reliable. The quality of the Hume reflection provides a reliable interpretation in all parts of the prospect with the exception of the poor reflection quality areas, and the permafrost provides a constant near-surface velocity to minimize structural computation problems.

On the west end of Line 12 continuity is lost in part due to poor data quality and in part because of the interference associated with the shaleout zone. The correlation across this discontinuity is based primarily on the anticipated energy of a shale carbonate interface, but is supported by the Cambrian correlation which shows an apparent depression due to the lower velocity of the shale.

The regional strike of the Hume surface is basically NNW - SSE, but is complicated by narrow folds and considerable faulting.

The density of control is not sufficient to ensure a correct orientation of all the observed faults, but the basic pattern seems to parallel the regional strike while an occasional displacement appears normal to this trend.

Most of the faulting appears to be down thrown to the south and west, minimizing the possibility of faulted reservoirs being a major target.

Occasional fault breaks are observed on the seismic profiles to be down thrown to the north and east, and have been shown this way on the map, but with closer control it might prove to be cross faulting cutting the line of profile at an oblique angle.

No large structural features are present in this area as the majority of the folds are very narrow, and show a limited amount of southeast plunge.

Feature "A" in grid $67^{\circ} 00' - 134^{\circ} 45'$ shows significant updip closure on Line 11, but the inferred closure to the east is based on a structurally low Cambrian, which may not exist on the Silurian and Middle Devonian carbonates. However, due to the anomalous nature of the subsidence to the north and east, this feature is probably the best point in the area to test for hydrocarbon accumulation.

Feature "B" in grid $67^{\circ} 00' - 134^{\circ} 30'$, offers the alternative of playing the possibility of a porosity pinchout east of the shaleout front along a structural nose.

Several small closed features occur throughout the area, but are not structurally large enough to be of interest at present, and show no stratigraphic evidence to suggest any major difference from the IOE Satah R. YT G-72 dry hole.

HUME - CAMBRIAN ISOCHRON

This interval was mapped primarily to look for trends of isochron thickening which might be indicative of porosity development within this basically carbonate section.

The discontinuous nature of the Cambrian interpretation makes much of this data unreliable, and specific values cannot be used singularly to relate to the map as a whole.

The only isochron change of a regional nature is on the northern tier of permits where an approximate 50 ms. of thinning occurs. The remainder of the area, although displaying some major local changes, appears to have a relatively uniform average thickness extending to the shaleout front.

Some localized features display very large amounts of isochron thickening, due to areas of extreme subsidence of the Cambrian reflecting surface. These local slumps appear to be essentially post - Cambrian and for the most part are compensated for during the period preceding Hume deposition. The feature encountered on Line R11 shows an associated structure on the Hume, but the relatively small amount of relief at this point and the fact that it diminishes upwards in the Devonian section, suggests that this is due to draping over the older feature.

No major porosity trends are apparent in this area from this isochron, and there does not appear to be any significant change in porosity adjacent to the shaleout edge.

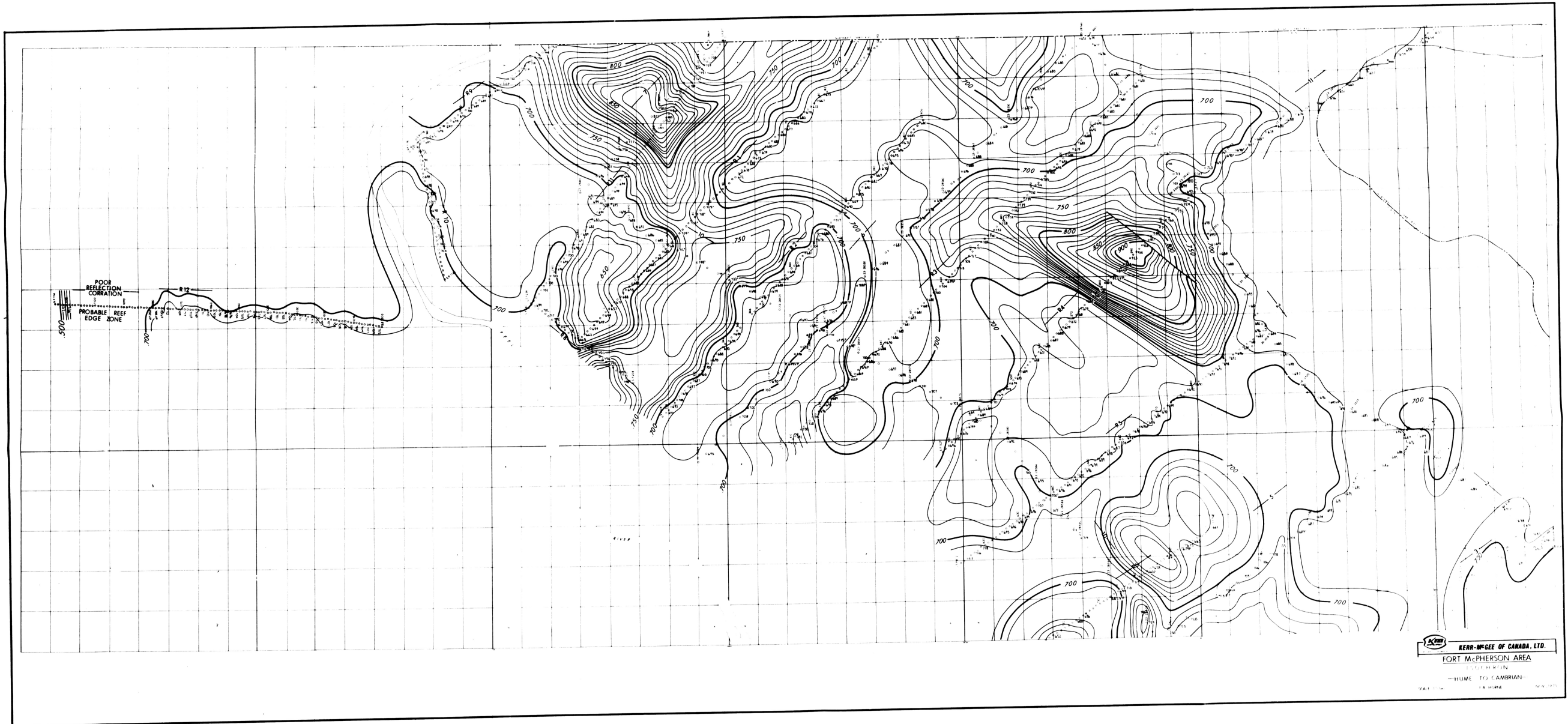
A number of local areas of thinning of this interval are probably due to structurally high Cambrian, since the velocity increase necessary to produce anomalies of these magnitudes is not likely to occur in this manner.

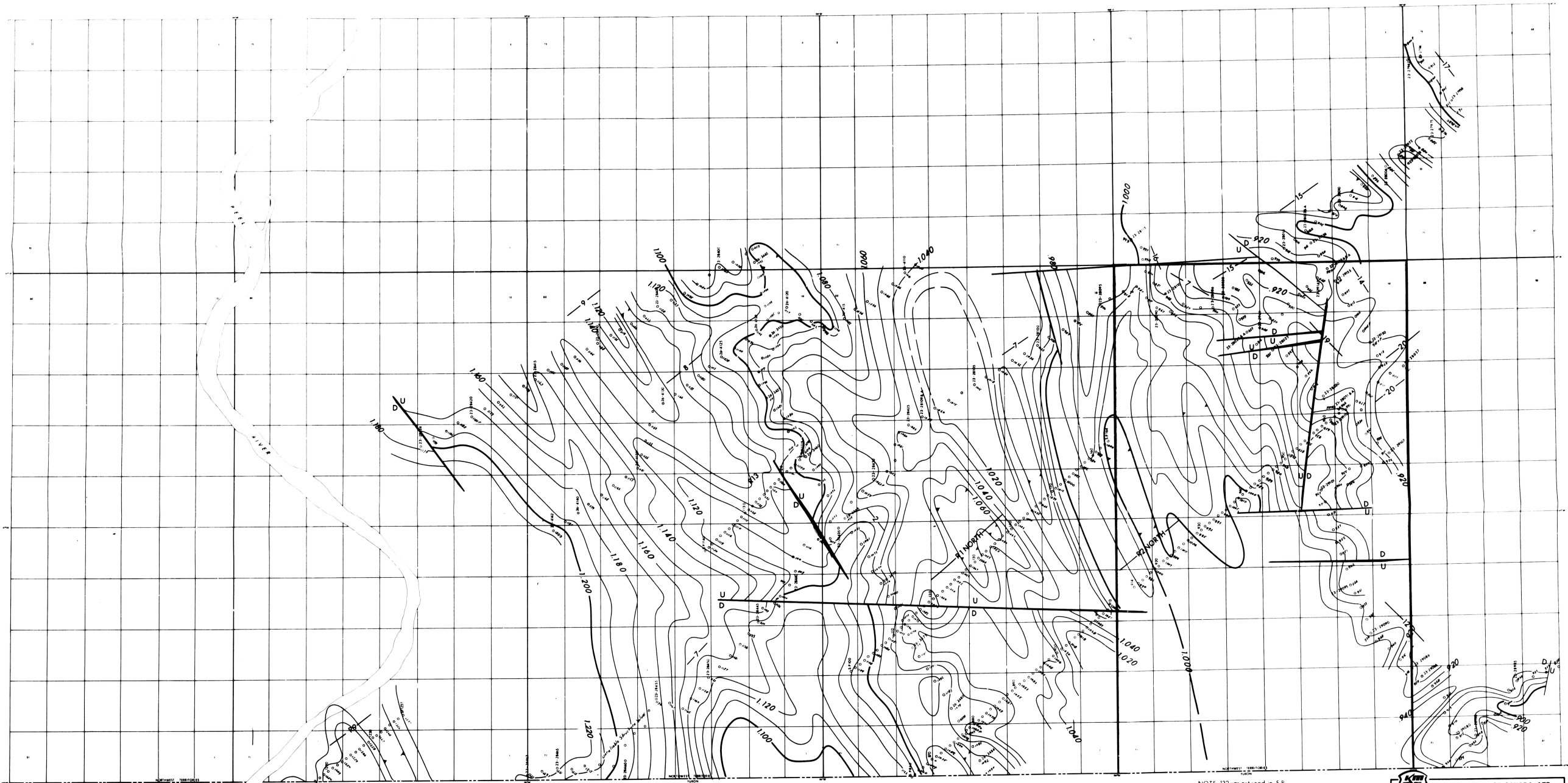
Numerous events appear to occur from within the carbonate section, but none can be carried continuously for any substantial distance. Much of this energy is probably due to reverberations of the Hume event with shallower Devonian reflectors. However, the appearance of diffractions which occur within this section, and dips which cannot be related to shallow events, indicates that stratigraphic and structural changes are present in these carbonates, but cannot be interpreted with any degree of reliability from the current seismic data.

A handwritten signature in dark ink, appearing to be 'E. A. Horne', written in a cursive style with a long horizontal line extending to the right.

E. A. Horne

EAH:hb





NOTE 132 was not used in S.P. numbering sequence

WIDE BEAMS PERMITS

EXHIBITION PERMITS

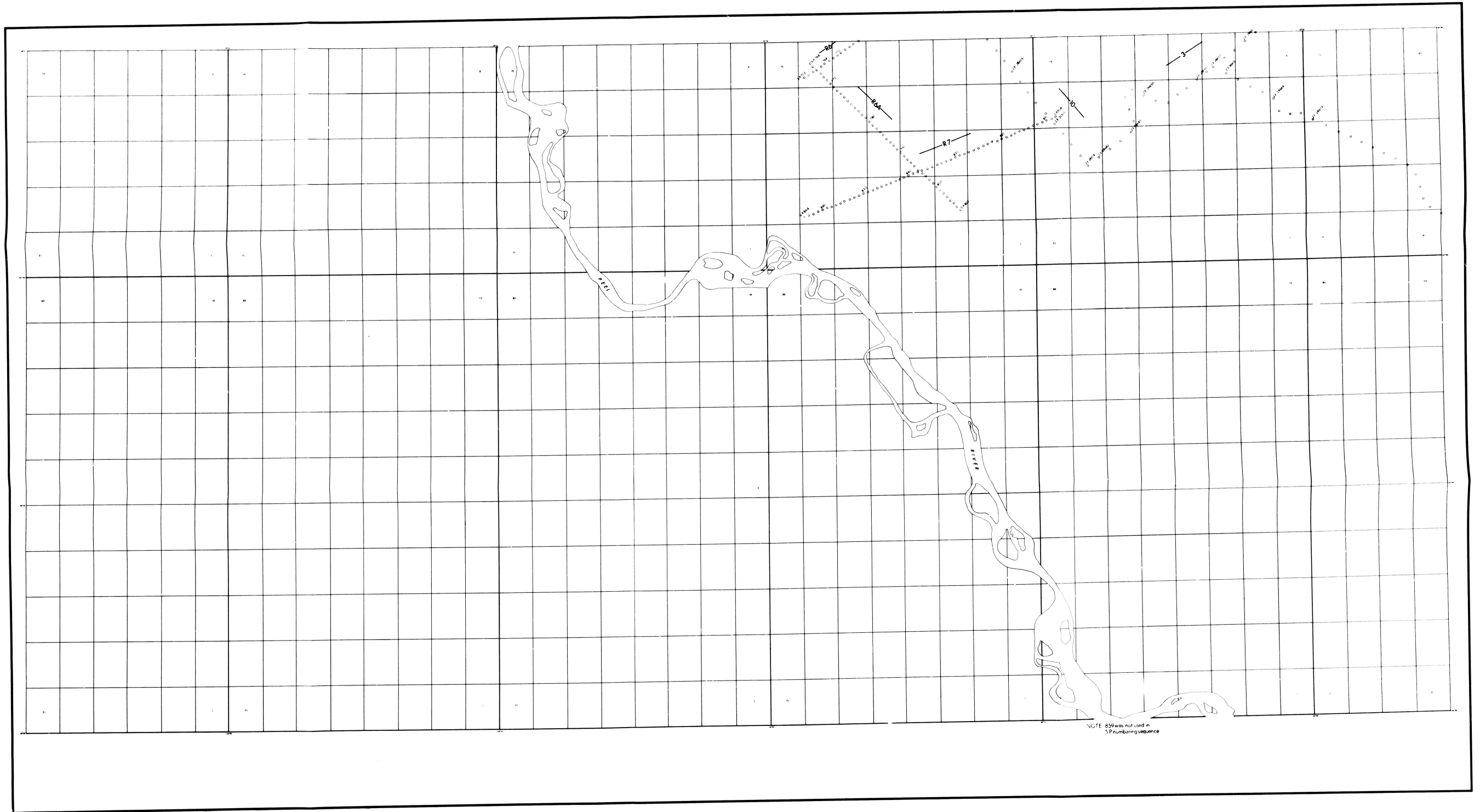
KERR-McGEE OF CANADA, LTD.

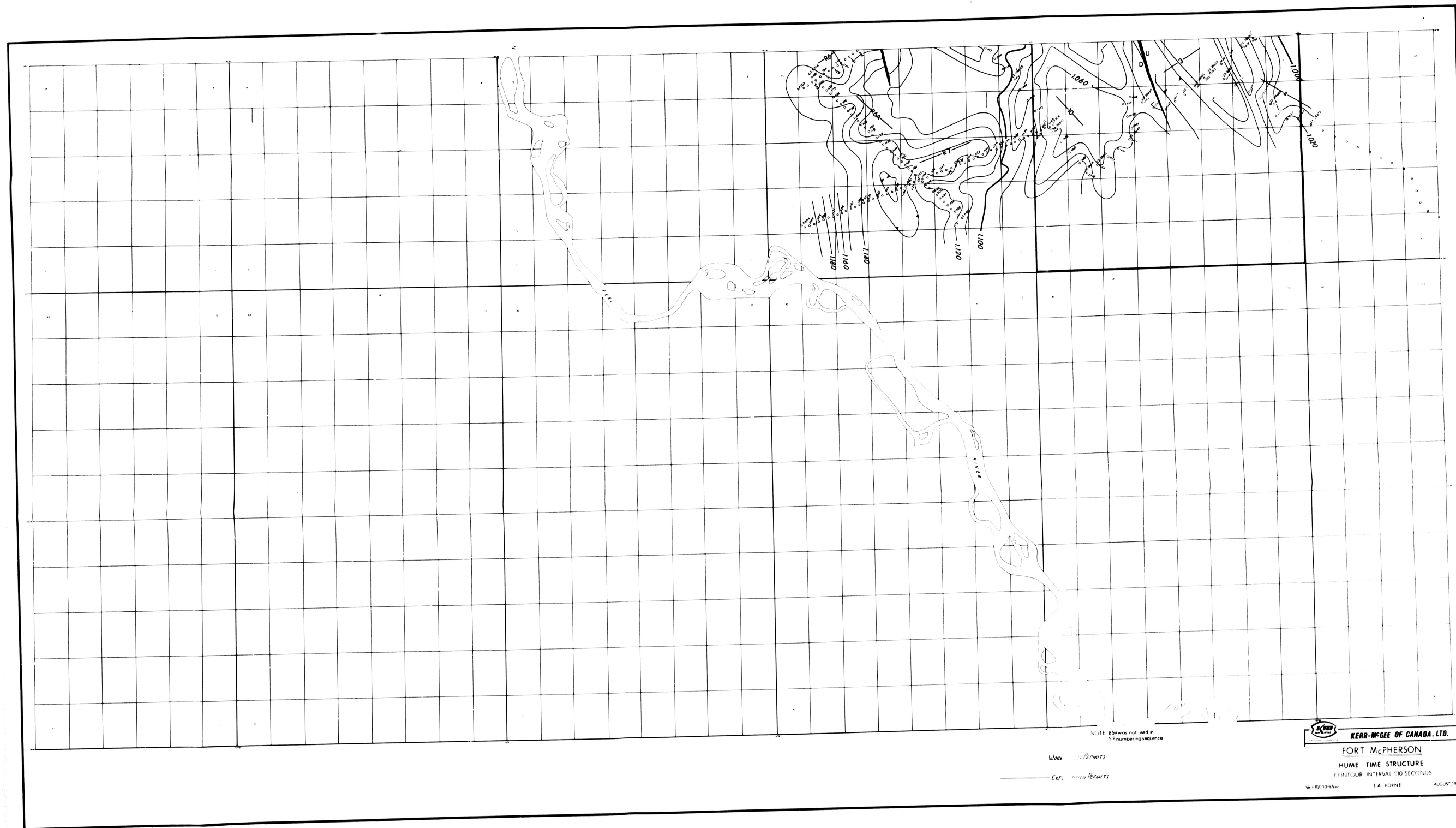
FORT McPHERSON

HUME TIME STRUCTURE

CONTOUR INTERVAL 0.10 SECONDS

Ve=10,000 ft/sec E. A. HORNE AUGUST, 1970



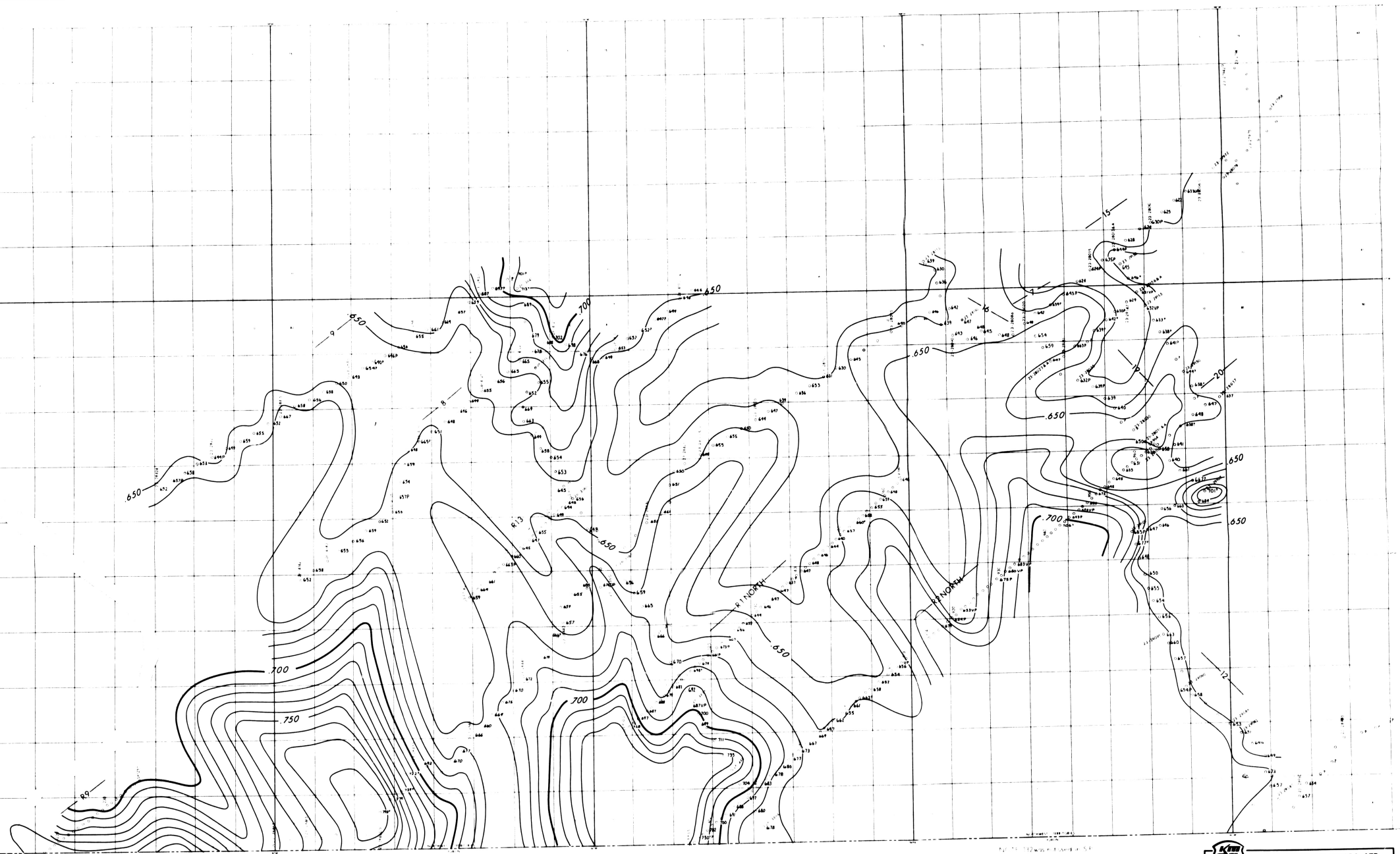


NOTE: 859 was not used in
SP numbering sequence

WLOU: 1000 PERMITS

EXP: 1000 PERMITS

KERR-McGEE OF CANADA, LTD.
FORT McPHERSON
HUME TIME STRUCTURE
CONTOUR INTERVAL 100 FEET
W. 100001/100002
E.A. HORNE
AUGUST 1970



 **KERR-McGEE OF CANADA, LTD.**
FORT McPHERSON AREA
ISOCHRON
—HUME TO C. MBRIAN—
SCALE 1"=1mi. E. A. HURNE NOV. 1970

