REPORT ON GEOPHYSICS, STRIPPING AND GEOLOGICAL EVALUATION OF MINERAL PROPERTY AT LUSSIER RIVER, B.C. FORT STEELE MINING DIVISION

REIMCHEN SURFICIAL GEOLOGY LTD.

FOR GENSTAR GYPSUM LTD.

November 12, 1982

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Ministry of Energy, Mines and Petroleum Resources
Mining Recorder
Fort Steele Mining Division
Province of British Columbia

Dear Sirs:

Please find enclosed two copies of the assessment report on the Lussier River property in the Fort Steele Mining Division for Genstar Gypsum Ltd. Also find enclosed a cheque for $685.00.

If there are any questions concerning this report, of if additional information is required, please contact us.

Respectfully submitted,

REIMCHEN SURFICIAL GEOLOGY LTD.

T.H.F. Reimchen, P.Geol.

Encl.

T.H.F.R./lg

REPORT ON GEOPHYSICS, STRIPPING AND GEOLOGICAL EVALUATION

OF

MINERAL PROPERTY AT LUSSIER RIVER, B.C.

Claim Blocks: New Luss 1 (793), New Luss 2 (794), Luss 3 (640), Luss 4 (641), Luss 5 (806), Luss 6 (807), Tina Fractional (1589)

LOCATED IN:	FORT STEELE MINING DIVISION NTS Maps 82G/13 and 82J/4 Latitude 50°0', Longitude 115°31'
OWNER:	Mr. Boris Korun
OPERATOR:	Genstar Gypsum Limited
CONSULTANT:	Reimchen Surficial Geology Limited (formerly CGEI Geological Engineers Incorporated)
AUTHOR:	T. Reimchen and E. Bakker
SUBMISSION DATE:	November 12, 1982

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1.0 INTRODUCTION

1.1 Property Location

The Lussier River property is located in the valley of the Upper Lussier River in the southern part of the main range of the Rocky Mountains, about 25 kilometers southeast of Canal Flats, British Columbia.

The claims extend along both sides of the Lussier River and part way up the valley walls, at elevations ranging from 1,380 m to about 1,650 m. Access from Cranbrook is provided by Provincial Highway 93 and by an all-weather gravel road to Whiteswan and Top of the World Provincial Parks (Figure 1). Abandoned subsidiary logging roads permit trucks to be driven onto all the claim blocks. Some of these roads have recently been blocked.

1.2 Property Definition

The Lussier River property comprises seven claim blocks: New Luss 1 and 2; Luss 3, 4, 5 and 6; and Tina Fractional. Luss 1 to 4 were staked in May 1979 and recorded on May 26. In October 1979, Luss 1 and 2 were abandoned and the same ground re-staked on October 18, 1979 as New Luss 1 and 2. On October 30, 1979, Luss 5 and 6 were staked and recorded. The Tina Fractional claim was staked and recorded on November 16, 1981. Ownership of part of the ground covered by New Luss 1 and 2 may be in question because of the existence of prior claims, Jean 4 and Mid 1, the locations of which are uncertain.

Mr. Boris Korun, of Edmonton, Alberta, is the current owner of the seven claim blocks. The operator is Genstar Gypsum Limited of Edmonton. The consultant is Reimchen Surficial Geology of North Vancouver, British Columbia. Before July 1, 1982, Reimchen Surficial Geology Limited operated as CGEI Geological Engineers Incorporated.

Gypsum is found outcropping over an extensive area on the east side of the Lussier River. In addition, the presence of numerous active and inactive karst sink-holes on both sides of the river indicate that a gypsum horizon exists relatively near the ground surface. On the east side of the Lussier River, the areal extent of gypsum under shallow overburden could be as large as 92.5 hectares of which 33.25 hectares are situated in Luss 6.

Previous drilling work and recent geophysical and geological surveys and stripping showed that the gypsum deposit exists to a thickness of at least 30 m and probably between 65 and 90 m. Therefore, at least 40 million and probably between 85 and 120 million tonnes of gypsum exists under shallow overburden on the east side of the river.

Previous assays show gypsum from these outcrops to be at least 80 per cent pure. Therefore, at least 32 million and probably between 68 and 96 million tonnes of pure gypsum exist on the east side of the river.

1.3 Summary of Work

Since November 16, 1981, a geophysical survey, a stripping program and geological mapping work have been performed on the Lussier property. The geophysical survey is applied to the P.A.C. account. For this assessment report, only the latter part of this survey is applied, because the first part was performed before the claim had been staked. The stripping program is applied to the Tina Fractional and New Luss 1 claims. The geological mapping work is applied to New Luss 2, Luss 3 and 4 and to the P.A.C. account. No work is applied to Luss 5 and 6.

A geophysical survey was carried out from November 13 to 15 and 22 to 25, 1981, the latter part of which is applied to this assessment report. During the November 22 to 25 period, four lines measuring 50 m in width were surveyed over a total length of 950 m. Therefore, the total surveyed area measured 4.75 hectares.

An outcrop exposure stripping program was carried out between July 13 and 16, 1982. Stripping was completed at seven localiaties and gypsum was exposed at three of these. It was not possible to penetrate the thick glacial and fluvial deposits which exist at the other four locations. The total stripped length was 350 m with widths up to 8 m and verticals up to 4 m for a total exposed area of 0.2 hectares. All areas exposed during this work were reclaimed.

During the second part of geophysical survey and during the stripping program, searches were conducted for new outcrops. New outcrops, existing known outcrops and the stripped exposures were mapped, structurally studied, described and photographed. Mapping was performed using B.C. Government 1:31,000 scale aerial photographs. A geological map was prepared to scale 1;14,500. This map incorporates reinterpreted previous mapping results and covers an area of approximately 575 hectares (Figure 2).

1.4 List of Claims

Since November 16, 1981, work was performed on the Lussier claims as tabulated.

Claims	Record No.	Geophysics Line No.	Stripping Cut No.	Geological Mapping
New Luss 1 (2 units)	793	47-02	-	Performed
New Luss 2 (2 units)	794	-	-	"
Luss 3 (3 units)	640	47-05	1a,2,3,5,	"
Luss 4 (3 units)	641	47-03-05	3	"
Luss 5 (4 units)	806	47-03	6,7	"
Luss 6 (9 units)	807	47-04	1b,4	"
Tina Fractional (1 unit)	1589	-	-	"

2.0 DETAILED TECHNICAL DATA AND INTERPRETATION

2.1 Geophysical Survey

2.1.1 Scope of Work

Geo-Physi-Con Co. Ltd. of Calgary performed a geophysical survey from November 13 to 15 and 22 to 25, 1981. This work was performed under the supervision of two geologists from CGEI Geological Engineers Incorporated.

The time delay from November 16 to 21 was caused by an equipment breakdown. Most of the survey was completed from November 22 to 25, which is within the time frame of the assessment report. Because of the limited equipment capability in estimating the depth of gypsum, and the access difficulties encountered with blocked roads and snow, part of the originally proposed program was cancelled.

The Geo-Physi-Con report is included herein as Appendix A.

2.1.2 Resistivity Application

Rock types in the Lussier River area are similar to those existing in the Slave River area of North West Territories and Alberta. Resistivity measurements made by Geo-Physi-Con on Slave River specimens are tabulated:

	Number of Tests	Resistivity ohm-metre	Standard Deviation
gypsum and anhydrite	31	1800	800
limestone and dolomite	16	350	200
siltstone and shale	13	75	45

On the basis of these measurement differences, it appeared possible that gypsum could be located in areas where bedrock is deep. It also appeared that the gypsum thickness could be estimated by measuring the resistivity, or the conductivity, by electromagnetic methods.

The Geonics EM-34-3 instrument was used during the November 13 to 15 period. The Geonics EM 37 instrument was used during the second part of the Lussier River study, which constitutes part of the assessment report.

2.1.3 Geonics EM37

This instrument measures the resistivity of the ground by recording the decay of a magnetic field which originates in a loop after interrupting the current. With increasing time after turn-off, information from greater depth is obtained. The method was found cumbersome and time consuming, because each measurement required the placement of 250 metres of cable and the movement of a transmitter, receiver and generator. The speed of work was influenced by terrain conditions.

Measurements were completed on four lines close to or along roads. Lines 47-02 and 47-05 traversed areas with good geologic control, while 47-03 and 47-04 traversed areas with little geologic control. Along each line a low resistivity layer of 2.8 to 18.2 ohm-metre corresponded to a possible shale layer. A resistivity of 550 to 2300 ohm-metre was measured in a layer above this conductor.

Along 47-02 and 47-05, the measured variation in this upper layer is the reverse from what would be expected from the Slave River measurements. It appears that this method gives insufficient resolution of the upper layer to indicate the presence and thickness of gypsum.

Along 47-02 and 47-05, the resistivities of rocks underlying gypsum and limestone were respectively found to range from 5.5 to 6.8 and 11 to 18.2 ohm-metre. Geo-Physi-Con concluded that these significant differences in conductivity were caused by changes in groundwater salinities, which are related to the overlying materials. The presence of gypsum would then result in lower resistivity values. However, in line 47-04, high resistivities were measured in a sinkhole area where we believe gypsum exists. Geo-Physi-Con claims that the gypsum contacts are vertical. However, we disagree because of the bedding orientations elsewhere in these areas.

2.1.4. Conclusion

The geophysical methods used to indicate the presence and thickness of gypsum were of limited usefulness. The EM34 method gave information only on the uppermost layer, and could not identify gypsum if it occurs at depths of over 10 to 20 m. The EM37 method was useful at a greater depth, but gave too little resolution of the upper layers to distinguish between gypsum and other high resistivity materials.

2.2 Stripping

2.2.1 Scope of Work

Between July 13 and 16, 1982, seven outcrop exposure strippings were performed by a D8H bulldozer supplied by Peter Hoovanoff of Canal Flats and owned by Kennelly Contracting Ltd. of Cranbrook. This work was performed under the supervision of two geologist and two technicians from Reimchen Surficial Geology Limited. The bulldozer performed very well on the steep slopes, but its blade was often too wide for easy handling on the narrow skid roads.

Stripping was done at five locations east of Lussier River and at two west of the River, (Figure 2). These locations, were selected on the basis of a survey of the area which was carried out to locate targets for stripping. The amount of stripping was limited to minimize environmental impact, which could be severe due to the steepness of the slopes. The stripped areas were designated as Cuts 1 to 7.

2.2.2 Cut 1a

Cut 1a was excavated in the outcrop that was discovered in November 1981 near the Luss 3 and Luss 6 boundary. The cut extended about 150 m along the NNW-SSE bank of a skid road. Gypsum was exposed over 143 metres of the exposure.

At each end, cross cuts were made in easterly directions. In the southern one, the gypsum surface was encountered overlain by limestone. In the northern cut, the gypsum surface was completely weathered to a yellowish clayey soil containing, less weathered, gypsum lenses. This surface was overlain by till.

From the mid-point of the long cut, a cross cut was made down-slope to the west. The base of the gypsum layer was found to be deeper than the bulldozer could reach. Augering down one metre revealed the same completely weather gypsum as discussed above. The thickness of uncovered gypsum in this area is estimated to be 15 to 20 metres.

2.2.3 Cut 1b

Cut 1b was excavated 40 metres in length in a E-W direction south of Cut 1a. It was separated from Cut 1a by a few sinkholes, and was dug across the assumed continuation of the gypsum layer. Limestone was exposed (probable outcrop) in the lower half, and till was uncovered in the upper half. For probable continuation of the gypsum, see 2.4.3.

2.2.4 Cut 2

Cut 2 was excavated in a newly discovered outcrop north of Cut 1a. It extended 100 metres along the bank of a skid road in the N-S direction. Gypsum was found over 88 metres of the cut. Neither the top nor bottom of the gypsum layer were reached. The uncovered thickness is estimated to be 20 to 25 metres.

2.2.5 Cut 3

Cut 3 was excavated in a newly discovered outcrop north of the former ones It was along the bank of a skid road, in a NNW-SSE direction. The cut length reached 30 metres, in which gypsum was irregularly distributed uncovered over 30 metres. Although not proven, this might be slump. However, gypsum appears to be present higher up on the slope, as indicated by minor probable outcrops.

2.2.6 Cut 4

This small cut was excavated in a landing beside some sinkholes in the southern part of Luss 6, east of Lussier River. No evidence of gypsum was found.

2.2.7 Cut 5

Cut 5 was located between Cut 1a and 2, and between sinkholes. It was excavated to a depth of 1 metre and was short in length. Because of the apparent large overburden thickness, no outcrops of gypsum were uncovered.

2.2.8 Cuts 6 and 7

These cuts were excavated to depths of 2 to 3 metres at the most promising locations, on the western side of the Lussier River. However, thick overburden till was encountered and no gypsum was revealed (See 2.3.1)

2.3 Geological Investigation

2.3.1 Introduction

Geological investigations were carried out during the geophysical survey of November 22 and 26, 1981 and the stripping exploration program of July 13 to 16, 1982. Work completed during the first period is applied for assessment to the Tina Fractional claim. Work completed during the second period is applied to the Luss 3 and 4 claims.

2.3.2 Geological Mapping

The most logical locations for gypsum outcrops on the western side of Lussier River, were mapped. These locations corresponded to major creeks. With the exception of dolomite found outside the claim boundary, no outcrops of any rock were found. The deep incisions of these creeks in the overburden till show that the overburden is over 30 metres thick in places. On a larger scale, smooth slopes suggest that the overburden thickness may be over 30 metres throughout. The sinkholes would then be collapsed features of till in sinks with gypsum at deeper levels.

On the eastern side of Lussier River, new limestone outcrops were found within Luss 3 and 6; new gypsum outcrops were located in Luss 3 and 4. Known outcrops were re-investigated and structural observations were emphasised.

In addition, the stripped gypsum outcrops were explored as discussed in 2.2 On the basis of these observations, an updated geological map (Figure 2) and new cross-sections (Figure 3) were prepared.

2.3.3 Regional Geology

Gypsum, limestone, dolomite and shale in the Lussier River area belong to the Middle Devonian Burnais Formation. The area is situated at the western limb of the NNW-SSE trending Lussier syncline, and the bedding dips generally in the easterly direction.

A folding parasitic on the Lussier syncline is evident. This is represented by rather large scale gentle folding in limestone, shale and siltstone. Because of the incompetent behaviour of gypsum, the deformation is inhomogeneous. The parasitic foldsin gypsum are present on a smaller scale and consist of boxfolds, chevron folds and ordinary folds. These folds range from open to tight, and occur side by side.

The orientation of the axial plane is variable. The fold axis is more regular. To the south, the fold axis orientation is horizontal and aligned approximately north to south. To the north, the orientation plunges gently to the east. This orientation change is probably caused by a later, large scale gently folding, with a north-westerly plunging axis. This activity may also be responsible for the reported depression in the Lussier syncline, the doming of an anticline to the east, and the variation in a locally developed joint system in limestone. The depression and the domed anticline are located outside the map area.

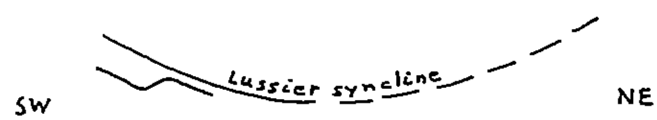
2.3.4 Geologic Question

The question of why a large horizontal extension of gypsum is present in the northern area must be addressed. The easterly dips imply a gypsum thickness of over 400 metres. However, in the 1980 drillhole #6, gypsum was encountered to a depth of 21 metres.

Because there are no westerly dips, this question cannot be answered by simple gentle folding. It also appears unlikely that an interlayering of gypsum and limestone exists, with drillhole #6 being terminated in a limestone layer. No limestone layers were found to be present in any of the gypsum outcrops. A solution based on either faulting or thrusting is not possible either. Sheared limbs of folds in gypsum, and offsets of a few millimetres along small faults in limestone, were observed. No evidence of major faulting was found. Therefore, it appears that the presence of the gypsum deposit can only be explained by folding, with or without faulting.

2.3.5. Geologic Interpretations

The overall asymmetry of small folds is mainly consistent with them being parasitic on the Lussier syncline. Because of the inhomogeneous deformation in the gypsum deposit, the reverse asymmetry occurs locally. Similarly, larger folding will fit this syncline and will have an asymmetry as shown:

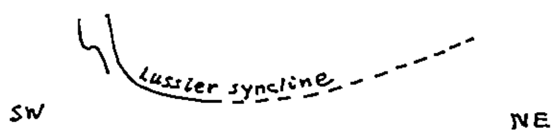


Assuming that the sinkholes on the west side of the Lussier River are underlain by gypsum, and that the same layer is exposed on the eastern side, a structure shown in the upper part of Figure 3 (A_1-A_1') appears to fit the available information. This structure is shown with solid and dashed lines in Figure 3. The observed steep dips would be local, and the long limbs of small folds would remain gentle easterly dipping. However, with a southeasterly plunging fold axis, to the south only one gypsum zone would exist.

If the plunge of the fold axis is more variable on a smaller scale, it seems that the following configuration would be possible.

This would then be the case in the southern area. However, there is presently insufficient information on the area along, and west of, the Lussier River to evaluate the geology there.

In the main part of the study area, the bedding is moderate to gentle dipping. In the northern part, a steep to vertical orientation becomes dominant. Assuming that this steep orientation is the long limb of folds, the following situation would exist:



In this case, the folds become more compressed to the north. This is reflected in the bedding orientation, which varies from 30° in the south to 125° in the north. It is also reported that the Lussier syncline becomes more compressed to the north of the map area.

This second possibility is shown in the centre part of Figure 4 (A_2-A_2'), and with dotted lines in Figure 3. This folding will become less pronounced to the south and the syn - and anticline in B-B' would be the same fold. This structure implies that the gypsum which supposedly underlies the sinkholes west of the Lussier River belongs to a different layer.

There is no indication that the gypsum layer is not continuous. The newly exposed gypsum occurrences are all in strike with the existing ones. This favours the argument for a continuous layer, which only seems thinner to the south because of folding.

No signs were found of major north-south faults. However, even if these are present, they will not influence the distribution of gypsum, because they would be parallel to the strike.

Gypsum was not encountered in Cut 1b. Its occurrence had been expected because of the location in strike with the gypsum of Cut 1a and the presence of sinkholes. The reason gypsum was not found may be the presence of stronger local folding or faulting with a general east-west strike. This would be cross faulting with respect to the Lussier syncline. It should be noted that the three sinkholes here are in an approximate east-west line, as are five sinkholes over a distance of 400 metres in the southeastern part of Luss 6.

The presence of a fault will facilitate the movement of water. Therefore, at fault locations, there will be a better possibility for the development of sinkholes in gypsum. However, at present, the existence of these faults is hypothetical.

Without faulting, or if present with a small offset, the gypsum layer south of Cut 1a probably continues to the southeast, as indicated by the orientation of bedding in limestone.

In the northern area, gypsum is gray with a well developed and often contorted layering. Gypsum exposed in Cut 1a and 2 is generally light coloured and homogeneous. In the northern part of Cut 2, the gypsum surface consists of approximately 0.5 metres of gray and layered gypsum. Because of this fact and the way the outcrops are distributed, it is unlikely that the light coloured type belongs to a different layer. A difference in depositional environment, with local influx of impurities is probably the cause of the different types.

The situation as shown by B-B' in Figure 4 probably continues to the southern end of the map area.

In areas of good geological control, the estimated thickness of gypsum is relatively constant. For example, at the southern end of Luss 3, 80 metres of gypsum exist between limestone, and correlates well with the presence of sinkholes. Northeast of the 1980 drillholes #3 and #6, the gypsum thickness has been calculated to be 90 and 65 metres, respectively. (Because the 1980 drillholes #1 and 6 were located near the gypsum outcrops, the thickness of the gypsum layer was not shown in the drillholes (see Figures 3 and 4)).

The gypsum layer thickens in the northern part of the area, especially in the structure shown in cross-section A_2-A_2'.

West of Lussier River, a thickness of 65 to 90 metres fits with the horizontal extent of the sinkhole area as shown on Figure 3.

3.0 ITEMIZED COST STATEMENT

3.1 Introduction

The itemized Cost Statement has been broken up into two components; geophysical and geological, and stripping and geological. The first component includes the cost of both the geophysical survey and the geological work completed with this survey. The second component includes the cost of both the stripping program and the geological work completed with this program.

3.2 Geophysical and Geological Program

3.2.1 Geophysical Costs

The following geophysical costs were incurred by Geo-Physi-Con:

Field		
Professional geophysicist 2 hrs. @ $30.00		$ 60.00
Technician, field 3 days @ $200.00		600.00
Technician, field 3 days @ $150.00		450.00
Mobilization, 2 technicians 18 hrs. @ $13.75		247.50
Demobilization, 2 technicians 16 hrs. @ $13.75		220.00
Meals (during mobilization and demobilization)		43.60
Accommodation 6 man days @ $60.00		360.00
Vehicle 1295 km @ 0.25 323.75 5 days @ $30. 150.00 Gas 114.11	X 3/5 =	352.72
Geonics EM37 3 days @ $600.00		1,800.00
Computer HP85		72.00
Communications 51.89 x 3/5		31.13
	TOTAL FIELD COST	$ 4,236.95
Report		
Report preparation		402.24
Courier delivery		17.00
	TOTAL REPORT COST	$ 419.24
	TOTAL GEOPHYSICAL SURVEY COST	$ 4,656.19

3.2.2. Geological Costs

The following geological costs were incurred by CGEI Geological Engineers Incorporated during and immediately following the geophysical program:

Field		
General supervision, principal 5 hrs. @ $62.50	$	312.50
Supervising and assisting geophysics		
Sr. geologist 3 days @ $400.00		1,200.00
Project geologist 3 days @ $370.00		1,110.00
Geology fieldwork		
Sr. geologist 1 day @ $400.00		400.00
Project geologist 1 day @ $370.00		370.00
Accommodation 8 man days @ $60.00		480.00
Travel expenses		
Senior geologist 1 day @ $400.00		400.00
Project geologist ½ day # $370.00		185.00
Plane and local transport		277.34
Truck rental and gas 5 days, 2092 km		722.88
Ski-doo rental 3 days @ $24.33		73.00
Communications		54.42
TOTAL FIELD COST	$	5,585.14
Report		
Principal 6 hrs. @ $62.50	$	375.00
Principal 10 hrs @ $50.00		500.00
Senior Geologist 95 hrs @ $40.00		3,800.00
Drafting 4 hrs @ $25.00		100.00
Typing 19 hrs @ $22.00		418.00
Copying		267.25
TOTAL REPORT COST	$	5,460.25
TOTAL GEOLOGICAL STUDY COST	$	11,045.39

3.2.3 Total Cost

The following geophysical and geologcial costs were incurred during, and immediately following the November 22 to 26, 1081 work:

Geophysical field cost		$ 4,236.95
Geophysical report cost		419.24
Geological field cost		5,585.14
Geological report cost		5,460.25
	TOTAL	$ 15,701.58

3.3 Stripping and Geological Program

3.3.1 Stripping Costs

The following stripping costs were incurred by equipment contractors from Cranbrook and Canal Flats:

Bulldozer rental 28 hrs. @ $97.00		$ 2,716.00
Mobilization and demobilization		1,200.00
Services		500.00
	TOTAL EQUIPMENT COST	$ 4,416.00

3.3.2 Geological Costs

The following geological costs were incurred by Reimchen Surficial Geology Limited during, and immediately following the stripping program:

Field	
Preparation fieldwork	
Senior geologist 5½ hrs. @ $50.00	$ 275.00
2 Juniors 24 hrs @ $10.00	240.00

Supervision stripping and geol. mapping	
Principal 3 days @ $240.00	$ 720.00
Principal 4½ hrs. @ $58.00	261.00
Senior geologist 4 days @ $450.00	1,800.00
2 Juniors 6 man days @ $80.00	480.00
Travel expenses	
Principal 1 day @ $240.00	240.00
Senior geologist 6 hrs. @ $50.00	300.00
2 Juniors 4 man days @ $80.00	320.00
Plane (1 person, one way), local transportation	119.25
Subsistence 28 man days @ $20.00	560.00
Mobilization one man	51.95
Motor home rental 7 days, 1672 km	926.28
Truck rental 5 days, 993 km	417.64
Bush bike rental 6 days	120.00
Gas, total	409.16
Communication	32.77
TOTAL FIELD COST	$ 7,273.05
<u>Report</u>	
Principal 3½ hrs. @ $58.00	203.00
Senior geologist 16 hrs @ $50.00	800.00
Drafting 13½ hrs @ $10.00	135.00
Typing 4½ hrs @ $26.00	117.00
Materials	163.37
TOTAL REPORT COST	$ 1,418.37

3.3.3 Total Cost

The following stripping and geological costs were incurred during and immediately following the July 13 to 16, 1982 work:

Stripping field cost		$ 4,416.00
Stripping report cost		0.00
Geological field cost		7,273.05
Geological report		1,418.37
	TOTAL	$ 13,107.42

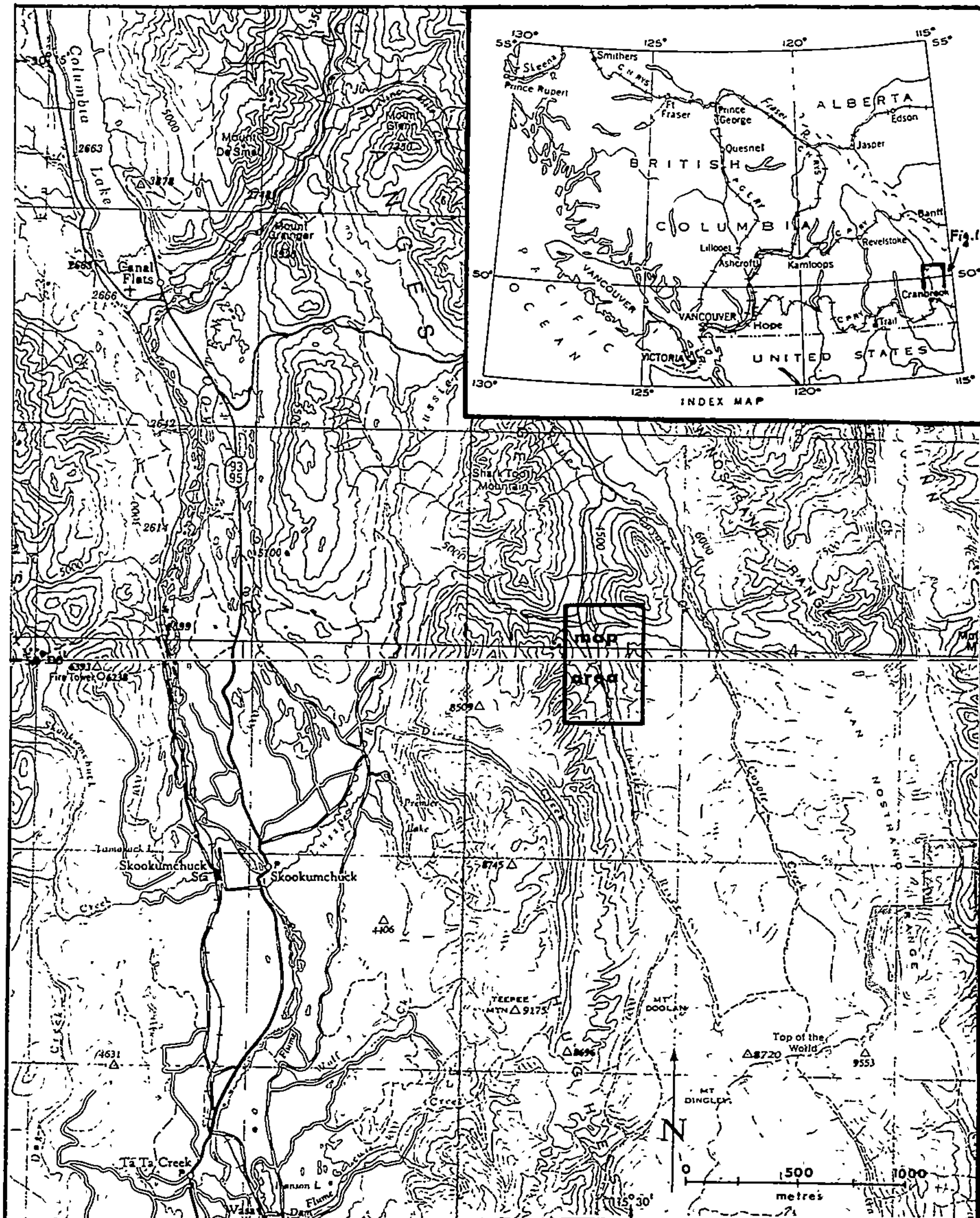
3.4 Cost Statement

Since November 16, 1981, the following costs have been incurred on the Lussier River property:

Geophysical and geological	$ 15,701.58
Stripping and geological	13,107.42
TOTAL	$ 28,809.00

Ebo Bakker
B.Sc. M.Sc.

Ted H.F. Reimchen
P.Geol.

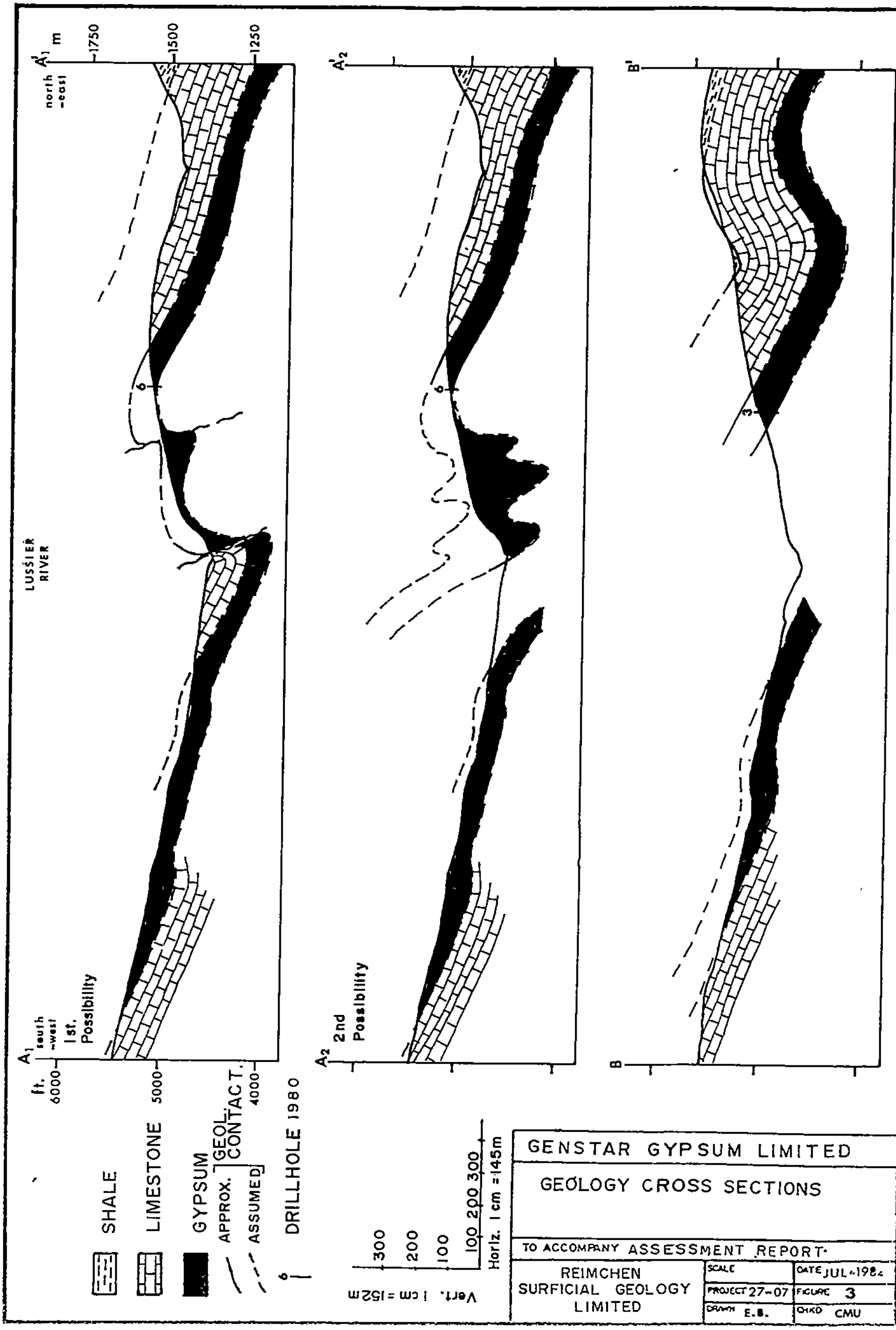


GENSTAR GYPSUM LIMITED

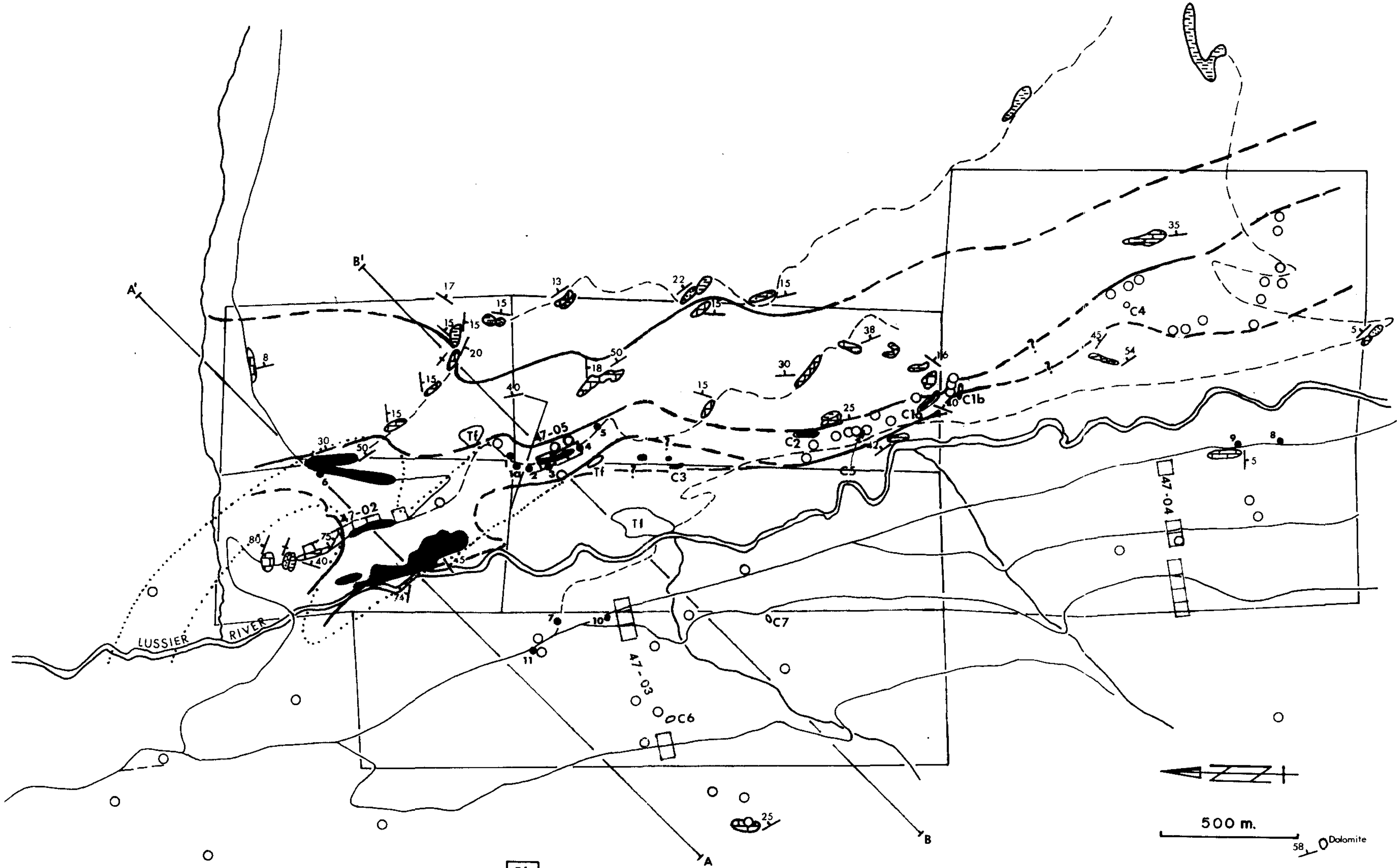
AREA LOCATION
(on maps 82G and 82J)

TO ACCOMPANY ASSESSMENT REPORT

REIMCHEN SURFICIAL GEOLOGY LIMITED	SCALE 1:250,000	DATE JULY 1982
	PROJECT 27-07	FIGURE 1
	DRAWN E.B.	CHKD CMU



GENSTAR GYPSUM LIMITED
GEOLOGY CROSS SECTIONS
TO ACCOMPANY ASSESSMENT REPORT
REIMCHEN SURFICIAL GEOLOGY LIMITED
SCALE
DATE JUL-1984
PROJECT 27-07
FIGURE 3
DRAWN E.B.
CHKD CMU
SHALE
LIMESTONE
GYPSUM
APPROX.
ASSUMED
GEOL. CONTACT.
DRILLHOLE 1980
Vert. 1 cm = 152m
Horiz. 1 cm = 145m
100 200 300
A1 south-west
1st Possibility
A'1 north-east
A2
2nd Possibility
A'2
B
B'
LUSSIER RIVER
ft.
6000
5000
4000
m
1750
1500
1250



10,764

•2	DRILLHOLE 1980
47-	EM37 LOOP
C1-7	STRIPPED AREAS
A—A'	CROSS SECTION
	OPEN ROAD
	BLOCKED ROAD
Tf	TUFA
	SILTSTONE
	SHALE
	LIMESTONE
	GYPSUM
15	BEDDING STRIKE AND DIP
	APPROXIMATE — GEOLOGIC CONTACT
	1st POSSIBILITY — GEOLOGIC CONTACT
	2nd POSSIBILITY — GEOLOGIC CONTACT
o	SINKHOLE

GENSTAR GYPSUM LIMITED

GEOLOGY OF LUSSIER RIVER CLAIM BLOCKS (revised)

TO ACCOMPANY ASSESSMENT REPORT

REIMCHEN SURFICIAL GEOLOGY LIMITED	SCALE 1:14500	DATE JULY 1982
	PROJECT 27-07	FIGURE 2
	DRWN E.B.	CHKD CMU

APPENDIX

GEOPHYSICAL TRIAL SURVEY

UPPER LUSSIER VALLEY, B.C.

Prepared For

CANADIAN GEOLOGICAL ENGINEERS, INC.
VANCOUVER, B.C.

Prepared By

GEO-PHYSI-CON CO. LTD.
CALGARY, ALBERTA

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81-47

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1.0 INTRODUCTION

During a five day period in November, 1981 an electromagnetic survey was carried out by Geo-Physi-Con Co. Ltd. for C.G.E.I. in the Upper Lussier Valley of southeastern British Columbia. The Lussier Valley is characterized by thrust and slip-strike faults and a well developed synclinal structure. The formation of interest consists of gypsum, limestone, dolomite, and shale. The geophysical survey, using both fixed frequency and transient electromagnetic equipment, was performed with the following objectives:

a) to determine the extent and continuity of gypsum deposits. The presence of gypsum had previously been observed in 1980 geological and drilling programs carried out by C.G.E.I.

b) to aid in deciphering the complex structural geology of the area.

From the acquired data it was possible to:

i) infer contact of gypsum with limestone on two survey lines where fixed frequency data crossed the contact, and

ii) to interpret the presence of a deep conducting layer at considerable depth from the transient EM data. It appears that the resistivity value of the deep conductor can be used as an indicator for the presence of gypsum.

2.0 LOGISTICS

The electromagnetic survey was carried out by a four-man crew. This crew consisted of two geophysical technicians from Geo-Physi-Con Co. Ltd. and two helpers provided by C.G.E.I.

A motor home owned by C.G.E.I. was used as accommodation. The motor home was placed at Akes Lake, located approximately 20 km north of the survey area. Two trucks, one owned by Geo-Physi-Con Co. Ltd. and one (owned) by C.G.E.I., were used to provide access to the site.

The two instruments used in the survey were the Geonics EM34-3 and the Geonics EM37. Readings were taken with both 20 and 40 metre separations at a 50 metre interval with the EM34-3. Transient soundings inside a 50 metre by 50 metre transmitter loop were taken with the EM37. For specifications on these two instruments see Appendix A. Survey lines were chosen in two types of areas, including:

a) areas with geologic controls, e.g., drillholes, outcrops.

b) areas without geologic controls, but where the presence of gypsum is suspected.

Due to the failure of the geophysical equipment (EM37) it was necessary to mobilize and demobilize twice.

3.0 DATA ACQUISITION AND RESULTS

On the location map of Figure 1 are shown:

i) the location of the geophysical surveys, consisting of two lines with the EM34-3 (numbered 81-47-01 and 81-47-02) and 4 lines with the EM37 (lines 81-47-02 to 81-47-05). The locations of the 50 metre by 50 metre transmitter loops are also shown.

ii) geological contacts between gypsum and limestone derived from geologic mapping and drilling.

iii) the occurrence of sink holes.

iv) land marks (rivers, roads, etc.).

Fixed Frequency Surveys with EM34-3

In Figure 2 the conductivity profiles measured along lines 81-47-01 and 81-47-02 with the EM34-3 (20 m), and EM34-3 (40 m) are given. Below the profiles are shown the gypsum-limestone boundary derived from geologic mapping and the boundary interpreted from the geophysical data. The geophysical interpretation is based on the following observations and interpretations:

a) On line 81-47-01 the apparent conductivity measured with the EM34-3 at 40 metres separation, has a value of less than 0.2 millimhos/m between stations 0 to 300 and increases to values in excess of 1 millimhos/m from station 300 to the end of the line. A similar behavior occurs along line 81-47-02. On this line the apparent conductivity is very low between stations 0 to 400, and increases rapidly from station 400 to the end of the line.

   The apparent conductivity values measured with the EM34-3 at 20 metre spacing are considerably higher than with EM34-3 at 40 metre spacing and show a more random behavior.

b) To interpret the fixed frequency data the following reasoning was used.

i) gypsum is expected to have lower conductivities than limestone based on information published in the literature.

ii) when gypsum occurs near the surface some overburden and a weathering layer with higher conductivity can be expected. The apparent conductivities measured with the EM34-3 (20 m) should, therefore, be higher than those measured with the EM34-3 (40 m), because of the shallower effective depth of exploration of the EM34-3 (20 m). It is expected that the apparent conductivities measured with the EM34-3 at 40 metre spacing will approximate the conductivities of unweathered gypsum and limestone, if the overburden and the weathered layer are less than about 5 metres. The sharp rise in the apparent conductivity measured with the EM34-3 at 40 metres on both lines 81-47-01 and 81-47-02 was picked as the limestone-gypsum boundary, and is expected to reflect the change in true conductivity from limestone to gypsum.

When the boundary derived from the geophysical interpretation is compared with the mapped geologic boundary there is good agreement on line 81-47-01. On line 81-47-02 the boundary is off by about 100 metres. Both lines 81-47-01 and 87-41-02 crossed the gypsum-limestone boundary and the behavior of the apparent conductivity values measured with the EM34-3 at 40 metre spacing is consistent. Although it may be questioned if 2 crossings of the boundary is adequate information on which to base a conclusion, it must be inferred from the two lines that measurements with the EM34-3 at 40 metre spacing can map the limestone-gypsum boundary.

It is difficult to compute the depth of the gypsum from this data since the conductivity values are very low, and the limestone underlying the gypsum may also be quite resistive.

Transient EM

In transient electromagnetic soundings, depth of exploration increases with increasing time of measurement. Three sounding curves along line 81-47-02 at stations 3, 5 and 7 are shown in Figure 3. From the available geologic information, station 7 is on limestone, station 3 on gypsum and station 5 at the interface.

In the sounding curves of Figure 3, the apparent resistivity measured is plotted versus the root of time on a bi-logarithmic plot. All three curves have in common that the apparent resistivity rapidly decreases with increasing time; this fact is indicative of a highly resistive layer overlaying a layer of much lower resistivity (conductor). From the curves the depth to the conductor and the resistivity of the conductor can be computed. The results of these computations are shown on Figure 4 for lines 81-47-02 to 81-47-05. Computation of these curves assumes a horizontal stratified ground. At the boundary of, for example, limestone and gypsum vertical contacts can be expected resulting in distortions of the curves. Station 5 is a distorted curve in early as well as late time. Station 5 is, therefore, expected to be near a contact.

The results on line 81-47-02 in Figure 4 show the resistivity of the conductor to be 5.5 ohm-m from station 0 to 275, and 11 ohm-m from 275 m to the end. At 325 m the resistivity of the distorted curve was computed at 6.8 ohm-m. The depth to the conductor is about 150 metres. The geologic mapping places the occurrence of gypsum from 0 m to 375 m, and limestone from 375 m to the end of the line. Based on the geologic information along line 81-47-02 the conductive layer of 5.5 ohm-m at depth would be associated with gypsum, and the conductor of 11 ohm-m with limestone. A physical reason for such change in resistivity below the gypsum could be that generally high pore water salinities are associated with occurrence of evaporites.

Line 81-47-05 was also expected to be near a gypsum-limestone (dolomite) boundary. The data show a sharp decrease in the resistivity of the conductor (6.8 ohm-m to 18.2 ohm-m) between 100 m and 50 m.

Line 81-47-02, and line 81-47-05 were the only traverses near mapped gypsum-limestone (dolomite) contacts. The occurrence of gypsum along other lines can only be speculated by assuming the occurrence of gypsum to be associated with low resistivity (<7 ohm-m) in the conductor at depth; that assumption is at present supported by little ground truth. Figure 4 shows where deposits of gypsum are expected, on the basis of the speculation discussed above, along lines 81-47-03 and 81-47-04.

4.0 SUMMARY AND RECOMMENDATIONS

By comparing the limited available geologic information with geophysical results and interpretations the following conclusions were made:

a) measurements with the EM34-3 at 40 metre spacing appear to map the boundary of gypsum and limestone, because of the high resistivities associated with gypsum. It is difficult to obtain thickness of gypsum.

b) although transient EM may map boundaries of gypsum and limestone (dolomite) the mapping is inferred not from direct detection of gypsum, but from low resistivities associated with very deep layers (>150 m) underlying the gypsum.

For routine mapping purposes the EM34-3 at 40 metre spacing would be the recommended tool. It may fail to map contacts in areas with overburden in excess of 10 metres. The exploration depth of the EM37 is too deep to map the shallow gypsum deposits. Although it may detect features associated with evaporites at great depth, that purpose would not be an effective use of the EM37.

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF ALBERTA
PERMIT NUMBER
P 2832
Geo Physi Con Co. Ltd.

Respectfully submitted,

GEO-PHYSI-CON CO. LTD.

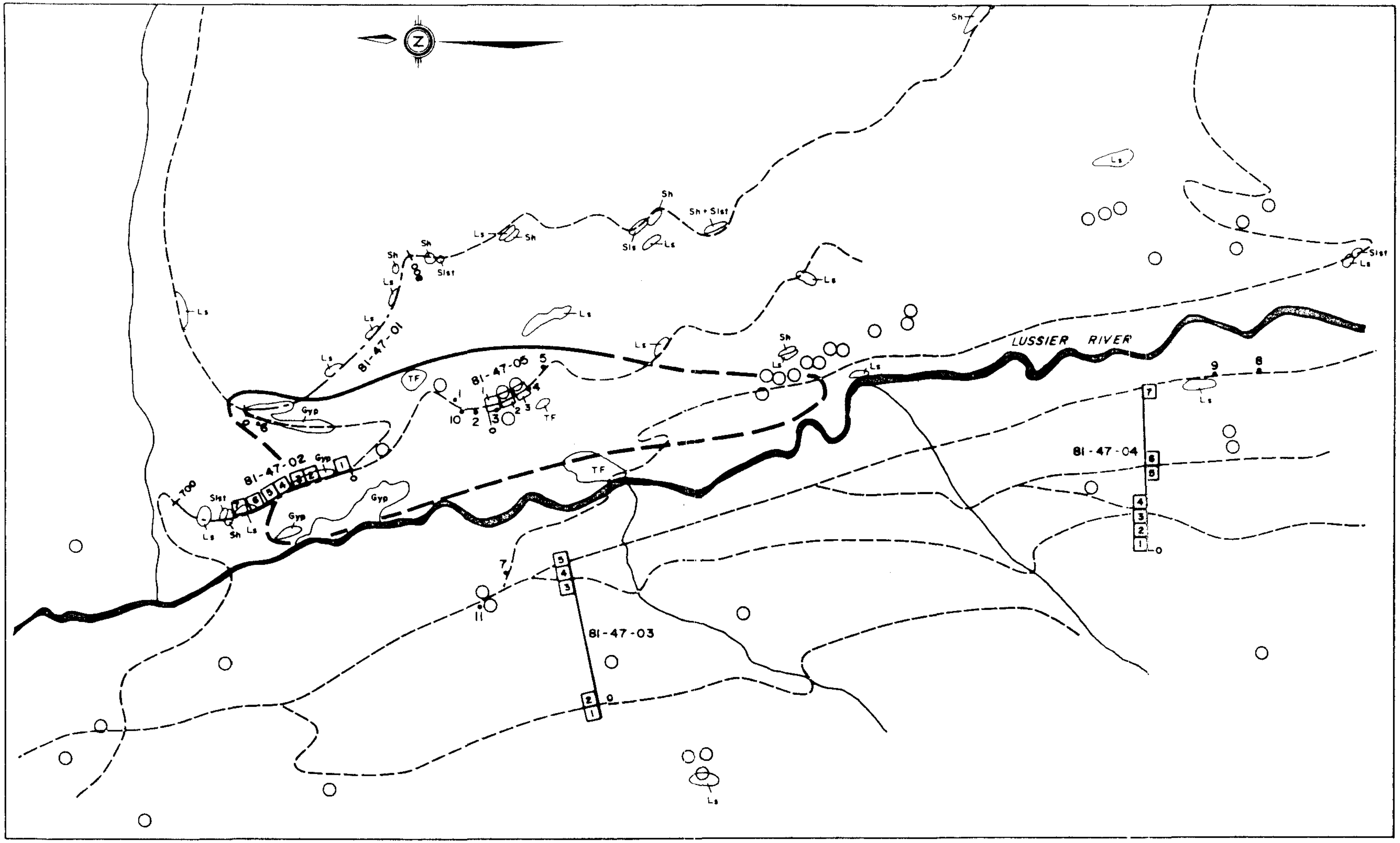
Per:

for Eric Schneider

Per:

Pieter Hoekstra, Ph.D.,P.Eng.

Calgary, Alberta
December, 1981
81-47



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LEGEND

Ls	Limestone	▬▬▬	Geologic Contact (known)
Sh	Shale	▬ ▬ ▬	Geologic Contact (unknown)
Slst	Siltstone		EM 37 Loop Location
Gyp	Gypsum		EM 34 Line Location
TF	Tufa	○	Sinkhole
•	Drillhole	------	Road

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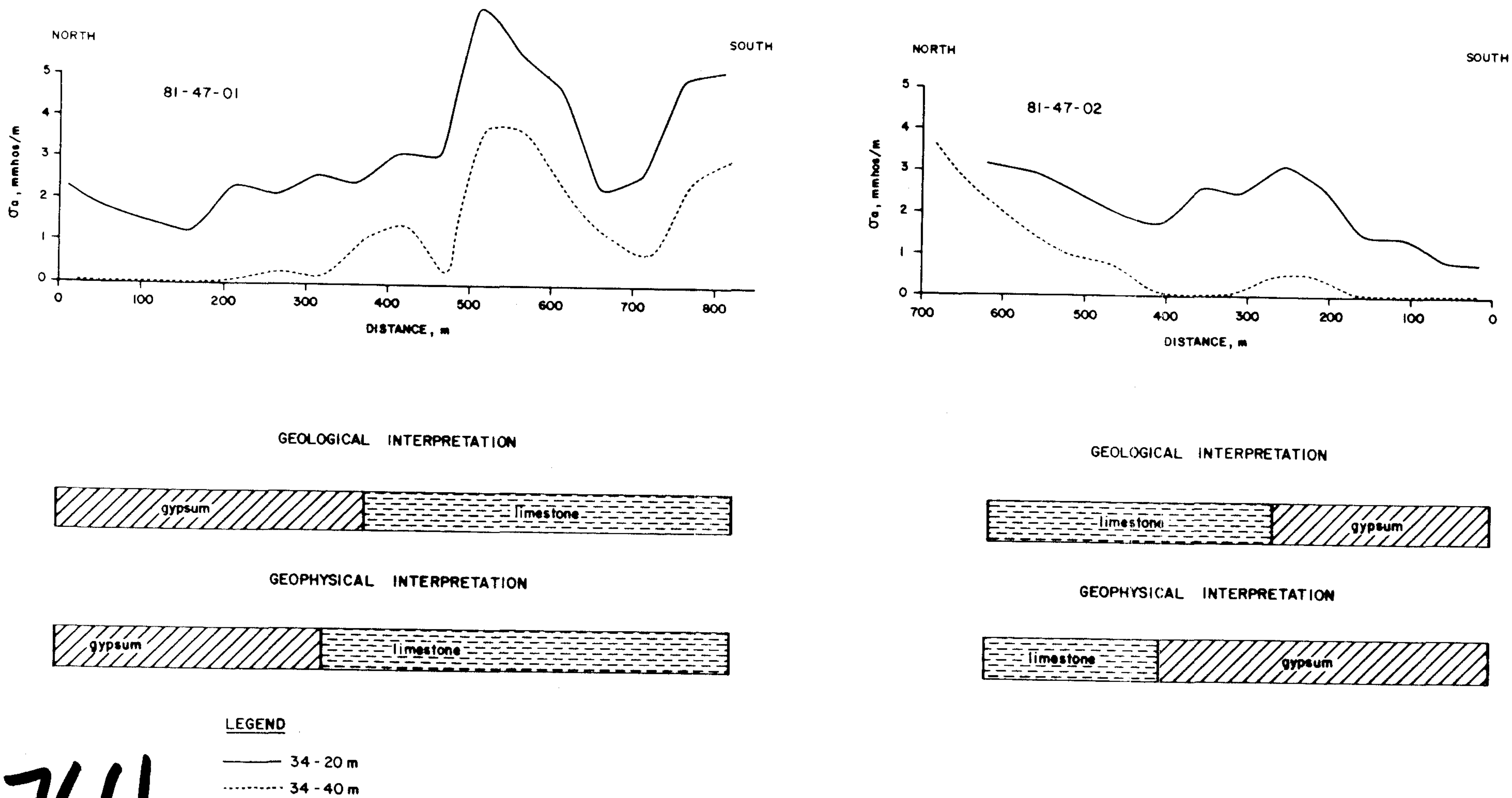
C.G.E.I.

LOCATION MAP

81-47

Figure 1



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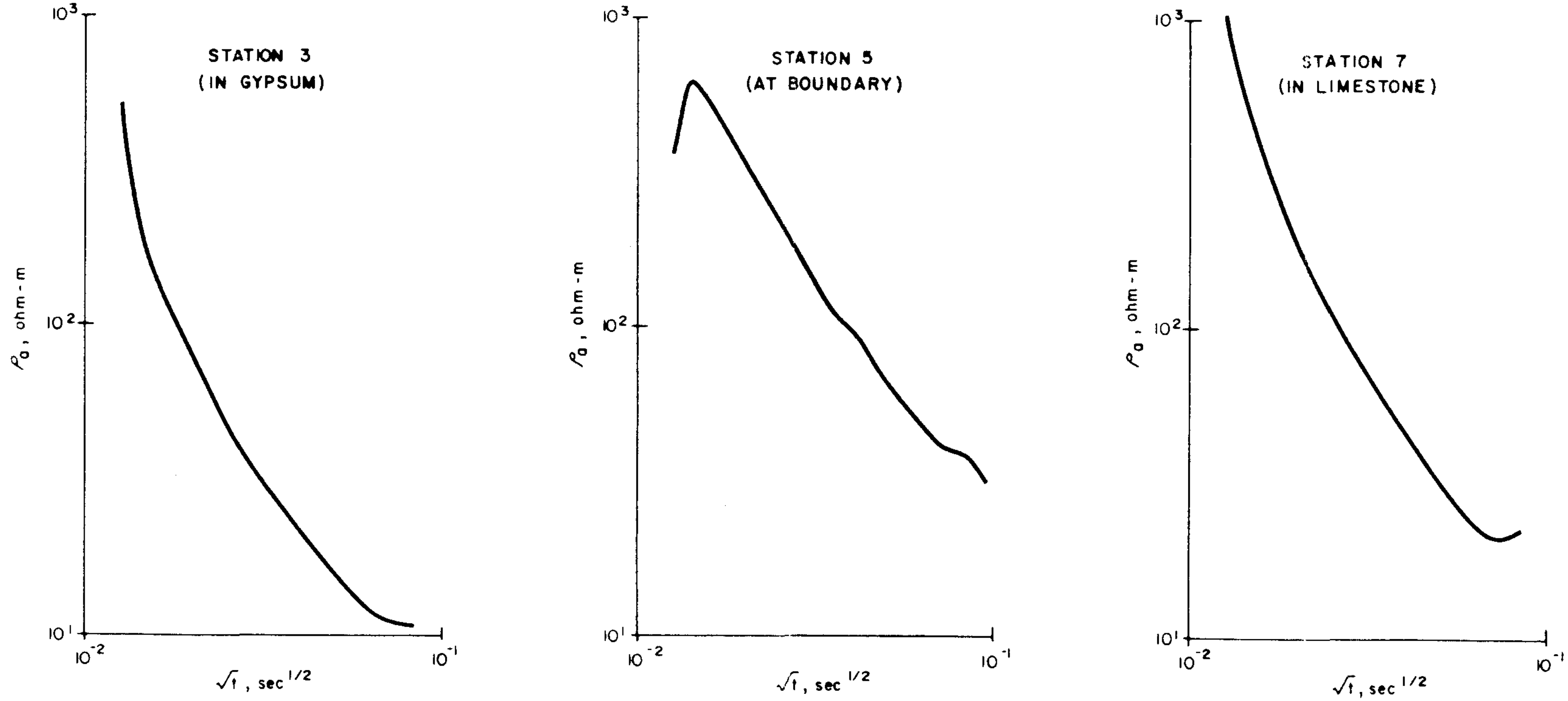
CONDUCTIVITY PROFILES
EM 34 - 3

81-47

Figure 2



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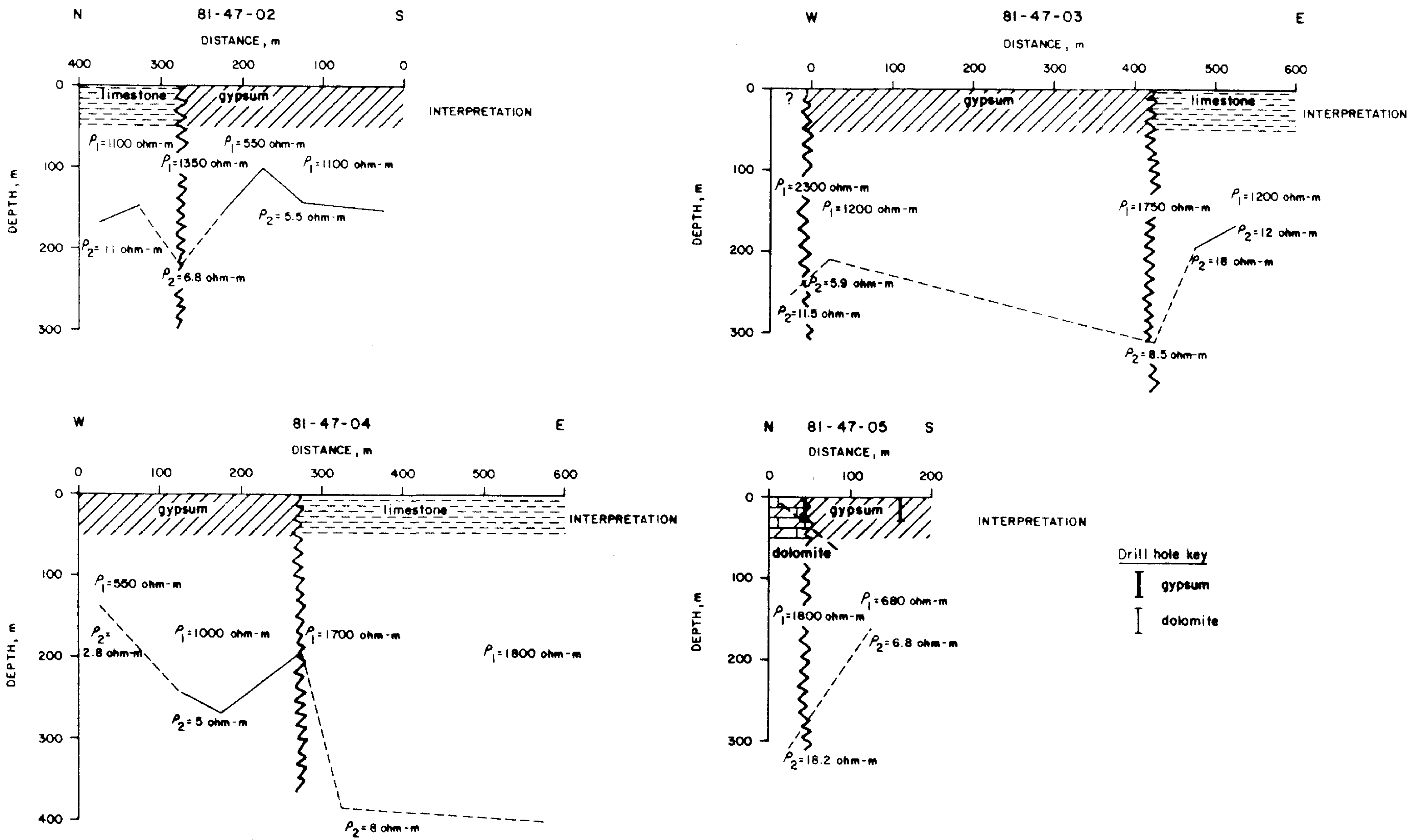
C.G.E.I.
TRANSIENT EM SOUNDING CURVES
APPARENT RESISTIVITY
LINE 81-47-02

81-47

Figure 3



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C.G.E.I.
INTERPRETED PROFILES
TRANSIENT EM

81-47

Figure 4