

GEOLOGICAL, GEOCHEMICAL AND GEOPHYSICAL REPORT
ON THE
MULLIGAN GROUP

Squamish Area, Vancouver Mining Division

92 G 11E, Lat. 49°41', Long. 123°03'

by

Peter R. DeLancey, P.Eng.

J.A. Slankis, P.Eng.

Owner: Texasgulf Canada Ltd.

Operator: Texasgulf Inc.

Vancouver, B.C.

November, 1978.

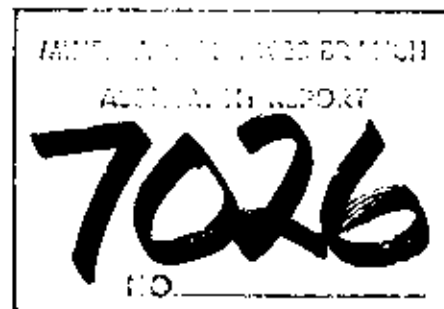


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INTRODUCTION:

SUMMARY

The Mulligan Group consists of the Crane Claim and the Mulligan Claim; each claim is comprised of eight MGS units.

Geological, geochemical and geophysical studies were conducted by Texasgulf Inc. on this group over the period April 6 to September 9, 1978. Outcrops were mapped at a scale of 1:5,000. Thirty-four silt samples were taken in Upper Ray Creek and ninety-nine soil samples collected at the head of Ray Creek Basin.

Geophysical investigation included a VLF survey in Ray Creek Basin and a very limited, follow-up, horizontal loop survey. The geophysical investigations are described separately by J.A. Slankis within this report.

PROPERTY LOCATION, ACCESS AND TERRAIN

The Mulligan Group (Lat. 49°41', Long. 123°03') is located 7 km east of the town of Squamish, in southwestern British Columbia (Figure 1). Access is by 4-wheel drive vehicle along a main haulage logging road heading east from Squamish and then along an abandoned logging road leading to the lower slopes of Mt. Mulligan.

The terrain is rugged; elevations range from 300 metres at the outlet of Ray Creek into the Stawamus River, to 1536 metres at the peak of Mt. Mulligan. Most of the area is timbered, or "clear cut" because of logging operations. The headwaters of Ray Creek drain a relatively flat, swampy, narrow valley, called Ray Creek Basin, situated between Mt. Mulligan and a higher ridge to the southwest.

The higher elevations receive abundant snowfall in the winter and much of the snow remains until mid-summer.

HISTORICAL OUTLINE

In the early 1900's several open-cuts and adits were driven on lenses of massive to semi-massive pyrite outcropping in Ray and Little Ray Creeks. Local concentrations of chalcopyrite and sphalerite are associated with a few of these showings. Claims included the Bruce, Radiant and Contact groups.

In 1929 a "Radiore Electrical Survey" was conducted in the area of Ray Creek Basin for Radiant Copper Ltd. The survey indicated a number of weak conductors, which appeared to be caused by "pyritic shear zones".

Later work focused on a copper showing at the head of the basin; three diamond drill holes tested this showing. Results were not encouraging.

In March 1977, M. Levasseur staked the Crane Claims over the basin area; assessment work included some cat trenching on the copper showing. In October 1977 Texasgulf staked the Mulligan I Claim centred in the area of Ray Creek. On March 31, 1978 the Crane Claim was optioned by Texasgulf Inc. from Eagle River Mines who had acquired the ground from M. Levasseur.

GEOLOGICAL SURVEYS:

The Mulligan Group was mapped at a scale of 1:5,000 (Figure 2). Outcrops were plotted on a topographic base map (1:5,000) which was constructed from a 1:10,000 ortho-photo.

REGIONAL SETTING

The Mulligan Group lies on the north end of a belt of volcano-sedimentary rocks referred to as the Indian River Pendant. This pendant is one of many remnants or septa of stratified rock surrounded by rocks of the Coast Crystalline Complex.

The rocks of the Indian River Pendant are believed to be correlative with the upper part of the Gambier Group which is of Upper Jurassic or Lower Cretaceous age (G.S.C. Memoir 335, Vancouver North, Coquitlam and Pitt Lake Map-Area, B.C.: J.A. Roddick 1965).

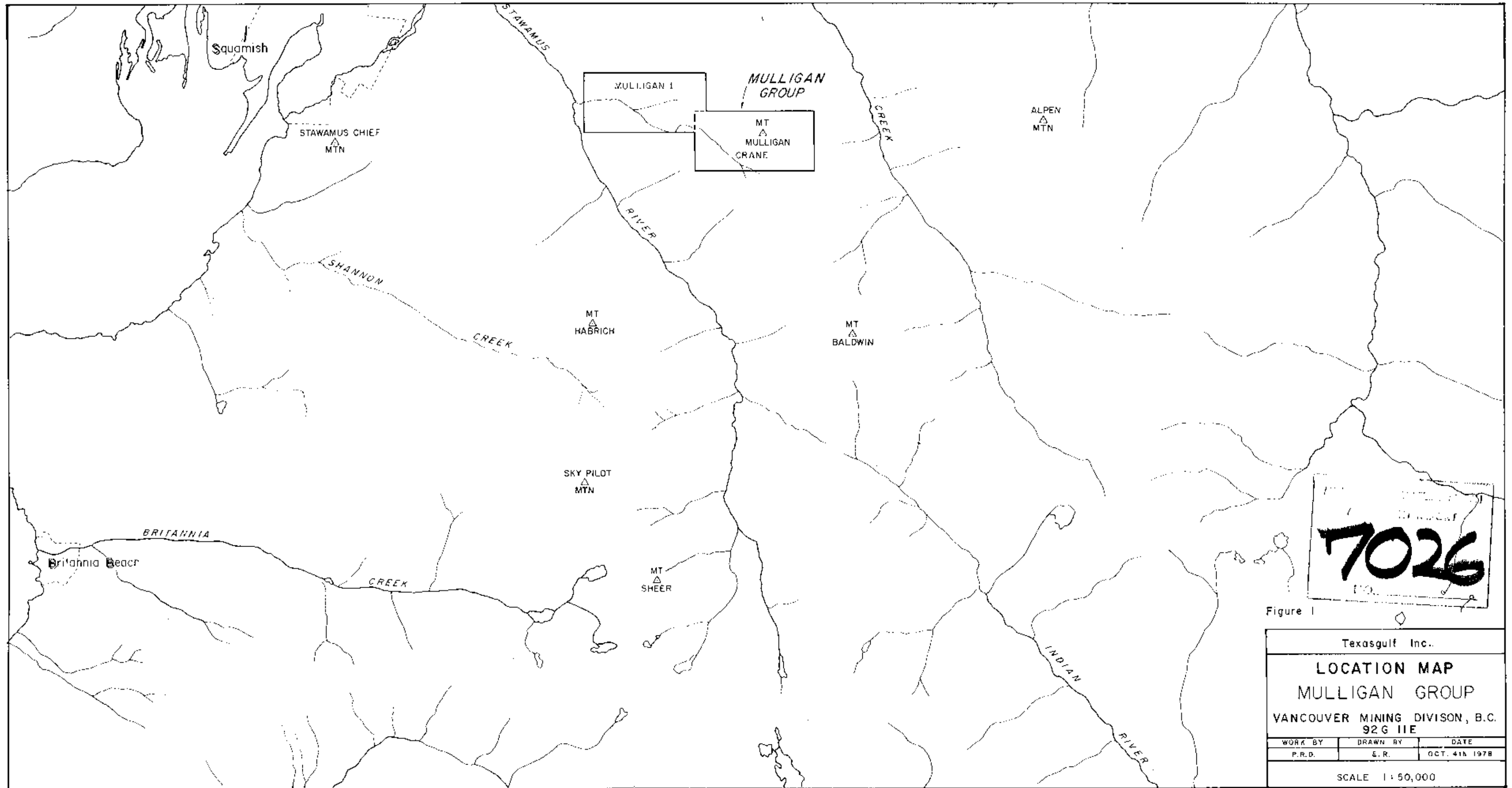


Figure 1

Texasgulf Inc.		
LOCATION MAP		
MULLIGAN GROUP		
VANCOUVER MINING DIVISION, B.C.		
92 G 11E		
WORK BY	DRAWN BY	DATE
P.R.D.	E.R.	OCT. 4th 1978
SCALE 1 : 50,000		

The belt, measuring about 4 km x 20 km, trends north-northwest and is connected to the Britannia Belt, lying 10 km to the southwest, by a "bridge" of volcanic rock. The belt tapers to the southeast and is in contact with younger Garibaldi Volcanics to the north.

PROPERTY GEOLOGY

Most of the area is in heavy timber; outcrops are mainly confined to creeks, steep cliffs and road-cuts.

That portion of the Indian River Pendant which underlies the Mulligan Claim Group is composed largely of pyroclastic volcanic rocks. These are in sharp contact with massive granitic rocks to the southwest and an embayment of granitic rocks to the northeast. An outlier of Garibaldi Volcanics covers an area near the north boundary of the property.

The Indian River volcanic rocks show a variable range of lithologies and have undergone complex structural deformation and alteration.

Lithology

A description of the various lithologies, based on field identification is given below.

Garibaldi Volcanics

An outlier of basaltic flows of the Garibaldi Group, forms an isolated topographic high near the north boundary of the claim group. These rocks are dark, fresh and frequently show columnar jointing.

Coast Range Granitic Rocks

Granodiorite and quartz-diorite are in contact with the felsic volcanics to the southwest and north. These contacts are frequently along faults. Locally there is some assimilation of the volcanic rock; inclusions of volcanic rock within the granitic rocks are also noted.

Indian River Volcanic Rocks

These rocks, which are dominantly felsic pyroclastics, have been divided into several mappable units.

Cherty Rhyolite - This is a white, massive, extremely siliceous rock, frequently containing feldspar and/or quartz phenocrysts. Locally the cherty rhyolites are brecciated or show flow textures.

Rhyolite Tuff - This rock is buff to white in colour, sugary textured and generally massive. Brecciation is noted locally. The tuffs show a close spacial relationship to the cherty rhyolites.

Rhyodacite Agglomerate - This is a coarse pyroclastic rock, consisting of angular to sub-rounded fragments greater than 4 mm in a finer clastic matrix. The composition of the fragments is variable, although andesite, rhyodacite porphyry and cherty rhyolite are most common. The lithology of the fragments in any one location appears to be in part a function of the volume and lithology of the adjacent rock units. These rhyodacite agglomerates form a thick, crudely stratified sequence in the central portion of the map-area.

Rhyodacite Tuff - This rock consists of fragments, less than 4 mm in size, composed principally of rhyodacite porphyry. Broken feldspar phenocrysts are common. The tuffs are generally massive and show little stratification.

Rhyodacite Porphyry - This rock is characterized by feldspar phenocrysts in a greenish-grey aphanitic matrix. The rhyodacite porphyry forms a large massive body to the southeast, and it is believed to be the parent rock from which much of the pyroclastic detritus was derived. In the Mulligan map-area the rhyodacite porphyry shows a close association with the cherty rhyolite, suggesting the two may be genetically related.

Andesite - The andesites are dark green, frequently porphyritic and may locally be pyroclastic. Epidote alteration is common. Local outcrops of chlorite schists are derived from these andesitic rocks. The andesites are abundant in the northeastern part of the belt.

Sedimentary Rocks - Narrow lenses of argillaceous rock are found locally within the pyroclastic units. Although these shales generally show bedding, no top determinations were possible.

STRUCTURE

The structure of the belt is complex and not fully understood. The general trend of the belt is northwesterly. Foliation and bedding attitudes are generally more northerly with a vertical dip. Local dips and strikes are quite variable especially adjacent to granitic or cherty rhyolite contacts.

Faulting is common; faults are most frequent in Ray Creek where steep gulleys reflect the recessive character of the fault zones. Shear zones are marked by narrow zones of intense foliation and accompanied by local bleaching and alteration. These zones are generally pyritic and parallel or at a slight angle to the general stratigraphic trend.

MINERALIZATION

Most of the showings in the map-area are characterized by conformable lenses of pyrite with local concentrations of chalcopyrite or sphalerite. These mineralized zones occur within the pyroclastic sequence and are associated with siliceous rocks.

The showing at the head of Ray Creek Basin is hosted in cherty rhyolite breccia, adjacent to a rhyodacite lapilli tuff. Local vein-like concentrations of pyrite, chalcopyrite and sphalerite are roughly conformable to the stratigraphic trend.

Most of the other showings are essentially pyritic and contain only local concentrations of chalcopyrite or sphalerite. They occur as narrow zones of foliated, siliceous pyritic rock having strike lengths up to several hundred

metres. Thicker lenses of massive pyrite (up to 3 metres wide) occur as pods within these zones. No significant precious metal values are contained in these pyritic rocks.

INTERPRETATION

The belt of volcanic rocks which underlies the Mulligan Group represents a complex volcanic pile composed mainly of pyroclastic material. The source of the detritus is largely from a rhyodacite porphyry centre to the southeast (Mt. Baldwin), andesitic centres to the northeast and cherty rhyolitic centres within the map-area itself.

The deposition of the sulphides and the associated silicification and alteration resulted from hydrothermal activity related to the volcanism. This activity may be genetically related to the cherty rhyolitic bodies.

Subsequent tectonic activity, associated with the emplacement of the Coast Range Intrusives, caused the deformation of the volcanic rocks and imposed a foliation sub-parallel to the regional stratigraphic trend. This foliation is most strongly developed in the less competent pyroclastic rocks.

GEOCHEMICAL SURVEYS:

INTRODUCTION

A total of thirty-four silt samples were collected at relatively close intervals from the upper portion of Ray Creek, and a total of ninety-nine soil samples were taken over a grid located at the head of Ray Creek Basin.

SAMPLING PROCEDURE

Silts were collected at 100 metre (approx.) intervals along Ray Creek. The sample location site was marked by a flag indicating the sample number. Silt sampling data sheets were used to record information as to the volume and drainage of the creek, the type, colour, texture and organic content of the silt, and the petrology of the bedrock or float. The silts were placed in standard Kraft paper sample bags and partially dried prior to shipment.

Soil samples were collected at 25 metre intervals on lines 50 metres apart, located by chain and compass. Sample numbers are indicated on flags at each site. Where possible, soil samples were taken from the B horizon at depths up to 50 centimetres, but in several locations the material sampled was a clay and boulder till. The soil was placed in Kraft sample bags, and the soil colour, organic content, depth to soil horizon, slope of ground and vegetation type, recorded on soil data sheets. Wet samples were partially dried prior to shipment.

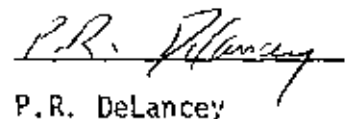
ANALYTICAL PROCEDURE

Unprepared samples were sent to Bondar-Clegg and Co. Ltd. in North Vancouver. The -80 mesh fractions were analyzed for total Cu, Pb and Zn using hot acid extraction and standard atomic absorption techniques. The results shown on the enclosed maps are quoted as ppm total metal.

INTERPRETATION AND EVALUATION OF RESULTS

Slightly anomalous values are noted in the silts collected just below and above the showing at the head of Ray Creek Basin (Figure 3). A soil sampling survey was carried out to further investigate this area of interest.

Results of the soil sampling indicate a few scattered copper and zinc anomalies in the area of the showing. In addition, anomalous copper, lead and zinc values were obtained from soils collected in the southeastern part of the grid, close to the divide between the Ray Creek drainage and the drainage flowing easterly into Raffuse Creek. This area is underlain by rhyodacite agglomerates with "bodies" of cherty rhyolite, which are locally brecciated. These rocks are similar to those hosting the copper-zinc showing at the head of the basin.



P.R. DeLancey

GEOPHYSICAL SURVEYS:

INTRODUCTION

A reconnaissance VLF survey was carried out over part of this claim group to test for the possible presence of massive sulphide mineralization. There was some encouragement in this area in the form of two showings, the one at 0+00/L.0 on the east grid (Ray Head showing) and the other in a creek bed at approximately 1+60W/1+60W on the west grid (Bend showing). Also, in 1927 a geophysical survey ("Radiore"-technical details unknown except that frequencies used were in the 50-100 kHz range) was carried out over most of the present survey area. A number of conductivity anomalies were detected and, judging by partial correlation with present results, the method had technical merit although in some instances it seems to have detected very minor faults, shears or disseminated mineralization.

The present work was carried out on flagged lines established by chain and compass. A Crone Geophysics RADEM was used to measure the dip angle of the signal from the VLF transmitter at Jim Creek, Washington.

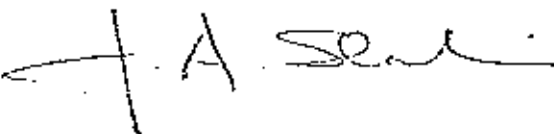
RESULTS

The results are essentially negative: none of the weak VLF responses appears to represent significant concentrations of conductive sulphides.

On the east grid, the Ray Head showing shows a weak response that can be traced for several hundred metres. There is a parallel, equally weak conductor on Lines 40N and 120N.

On the west grid, there is a weak anomaly over the Bend showing and a similar, parallel anomaly about 200 metres to the east. Making allowance for the attenuating effects of 5-15 metres of overburden, these anomalies do not represent zones of either high conductivity or great width.

The only anomaly of interest that was found is the NW-SE trend that crosses the road in the northern part of the west grid. The character of the cross-overs, the strike of the trend - almost at right angles to the other conductors, and the lack of any horizontal loop response, suggest that this is a structural feature, either a fault or a shear.


J. A. Slankis

APPENDIX A

STATEMENT OF QUALIFICATIONS

P.R. DeLancey, P.Eng.

P.R. DeLancey obtained his B.Sc., Honours Geology, in 1965 and his M.Sc. in 1969, from the University of Manitoba. He worked for Anaconda from 1967 to 1969. He joined the staff of Texasgulf Inc. in 1969 and has practised his profession since that time. In 1977 he became a member of the Association of Professional Engineers in the Province of British Columbia.

J.A. Slankis, PhD.

J.A. Slankis is a registered Professional Engineer in the Province of Ontario.

G.N. Mannard

G.N. Mannard has completed one year towards his degree in geology at Queen's University, Kingston, Ontario. He has been employed by Texasgulf Inc. as junior field assistant during the 1977 and 1978 field seasons.

He is competent to carry out the geochemical field sampling surveys assigned to him on this programme.

APPENDIX B

STATEMENT OF EXPENDITURES

MULLIGAN GROUP

STATEMENT OF EXPENDITURES (GEOPHYSICAL)

MULLIGAN GROUP

SALARIES AND FRINGE BENEFITS - Texasgulf Inc.

Dr. J. Slankis - geophysical surveys & supervision 5 days @ \$135/day	675.00	
D. Londry 5 days @ \$110/day	550.00	
P.R. DeLancey, P.Eng. 1 day @ \$115/day	<u>115.00</u>	
	1,340.00	1,340.00

BOARD AND ROOM

Texasgulf personnel 10 man-days @ \$20/day		200.00
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TRANSPORTATION

4-wheel drive Toyota (rental, service, fuel) 5 days @ \$33/day		165.00
-------------------------------------------------------------------	--	--------

EQUIPMENT RENTAL

150.00

SHIPPING COSTS

100.00

\$1,955.00

STATEMENT OF EXPENDITURES (GEOLOGICAL)

MULLIGAN GROUP

SALARIES AND FRINGE BENEFITS - Texasgulf Inc.

J.M. Newell, P.Eng. - geological mapping and supervision 5 days @ \$170/day	850.00	
P.R. DeLancey, P.Eng. - geological mapping 15 days @ \$115/day	1,750.00	
H.R. Schmitt - geological mapping 5 days @ \$50/day	<u>250.00</u>	
	<u>2,825.00</u>	\$2,825.00

BOARD & ROOM

Texasgulf personnel 25 days @ \$20/day		500.00
-------------------------------------------	--	--------

TRANSPORTATION

4-wheel drive Toyota (rental, service, fuel) 1 month @ \$1,000/month		<u>1,000.00</u>
		\$4,325.00

STATEMENT OF EXPENDITURES (BASE MAP PREPARATION)

MULLIGAN GROUP

1:10,000 orthophoto map, 1:5,000 topo map

\$1,360.00

STATEMENT OF EXPENDITURES (GEOCHEMICAL)

MULLIGAN GROUP

SALARIES AND FRINGE BENEFITS - Texasgulf Inc.

G.N. Mannard - field assistant

Period - July 5-6, August 22-25
6 days @ \$32.50/day

195.00

ROOM & BOARD

G.N. Mannard
6 man-days @ \$20/day

120.00

SOIL AND SILT SAMPLE PREPARATION AND ANALYSES

133 samples @ \$2.90/sample

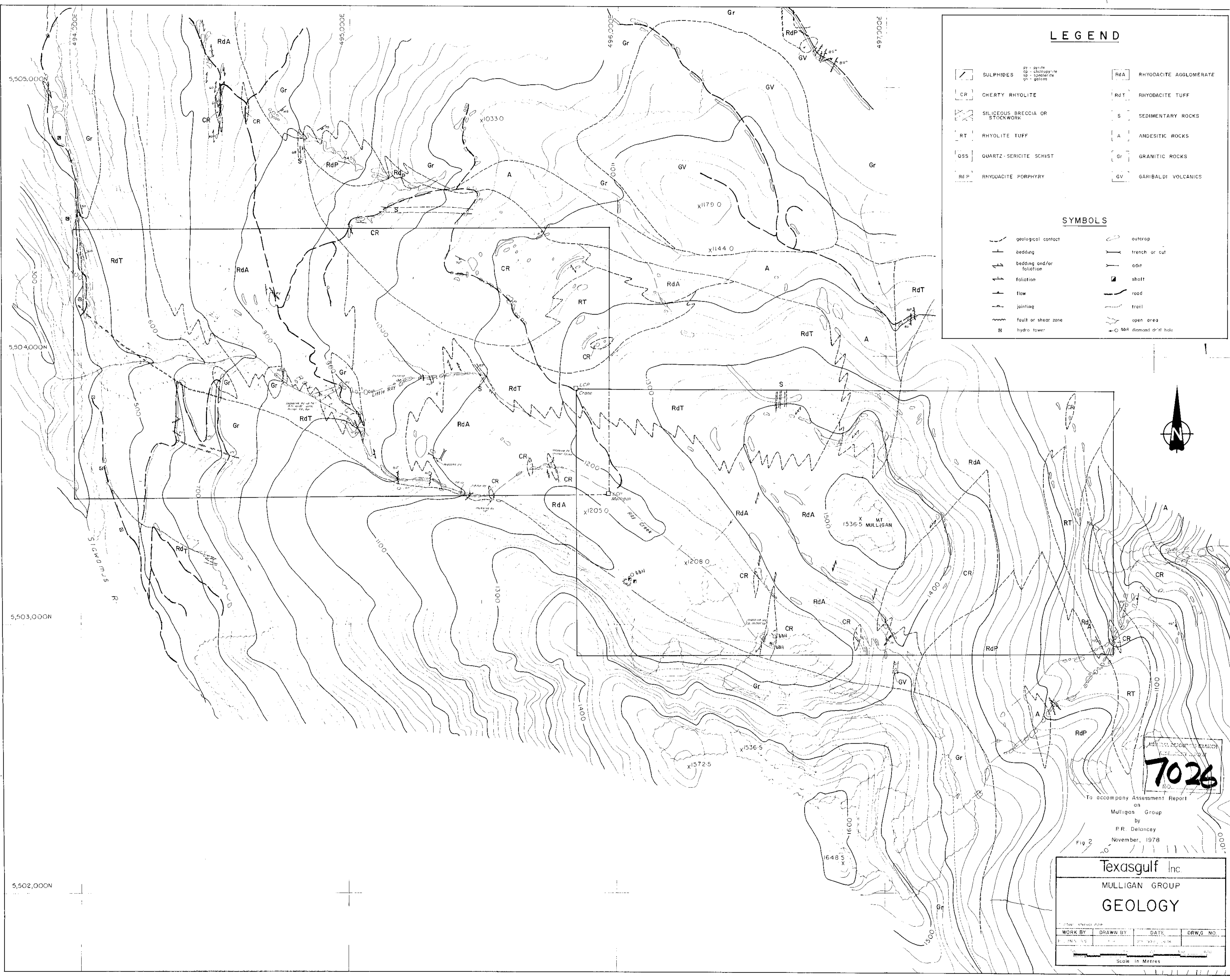
385.70

\$700.70

SUMMARY OF EXPENDITURES

MULLIGAN GROUP

Geological	4,325.00
Base Map	1,360.00
Geophysical	1,955.00
Geochemical	<u>700.00</u>
	\$8,340.00



LEGEND

	SULPHIDES py - pyrite cp - chloropyrite sp - spineliferous gn - galena		RdA RHYODACITE AGGLOMERATE
	CR CHERTY RHYOLITE		RdT RHYODACITE TUFF
	SILICEOUS BRECCIA OR STOCKWORK		S SEDIMENTARY ROCKS
	RT RHYOLITE TUFF		A ANDESITIC ROCKS
	QSS QUARTZ-SERICITE SCHIST		Gr GRANITIC ROCKS
	RdP RHYODACITE PORPHYRY		GV GARIBALDI VOLCANICS

SYMBOLS

	geological contact		outcrop
	bedding		trench or cut
	bedding and/or foliation		adit
	foliation		shaft
	flow		road
	jointing		trail
	fault or shear zone		open area
	hydro tower		diamond drill hole



AMERICAN ACCOUNTS BRANCH
7026

To accompany Assessment Report
 on
 Mulligan Group
 by
 P.R. Delancy
 November, 1978

Fig 2

Texasgulf Inc.
 MULLIGAN GROUP
 GEOLOGY

WORK BY	DRAWN BY	DATE	DRWG NO.
P. DELANCY	P. DELANCY	21/11/78	7026

Scale in Metres



To accompany Assessment Report
 on
 Mulligan Group
 by
 P.R. Delaney
 November, 1978

7026

LEGEND

- Soil Sample Site
- Anomalous value
- △ Soil Sample Site
- 4wd Road
- - - Trail
- Limit of Talus

Fig. 3

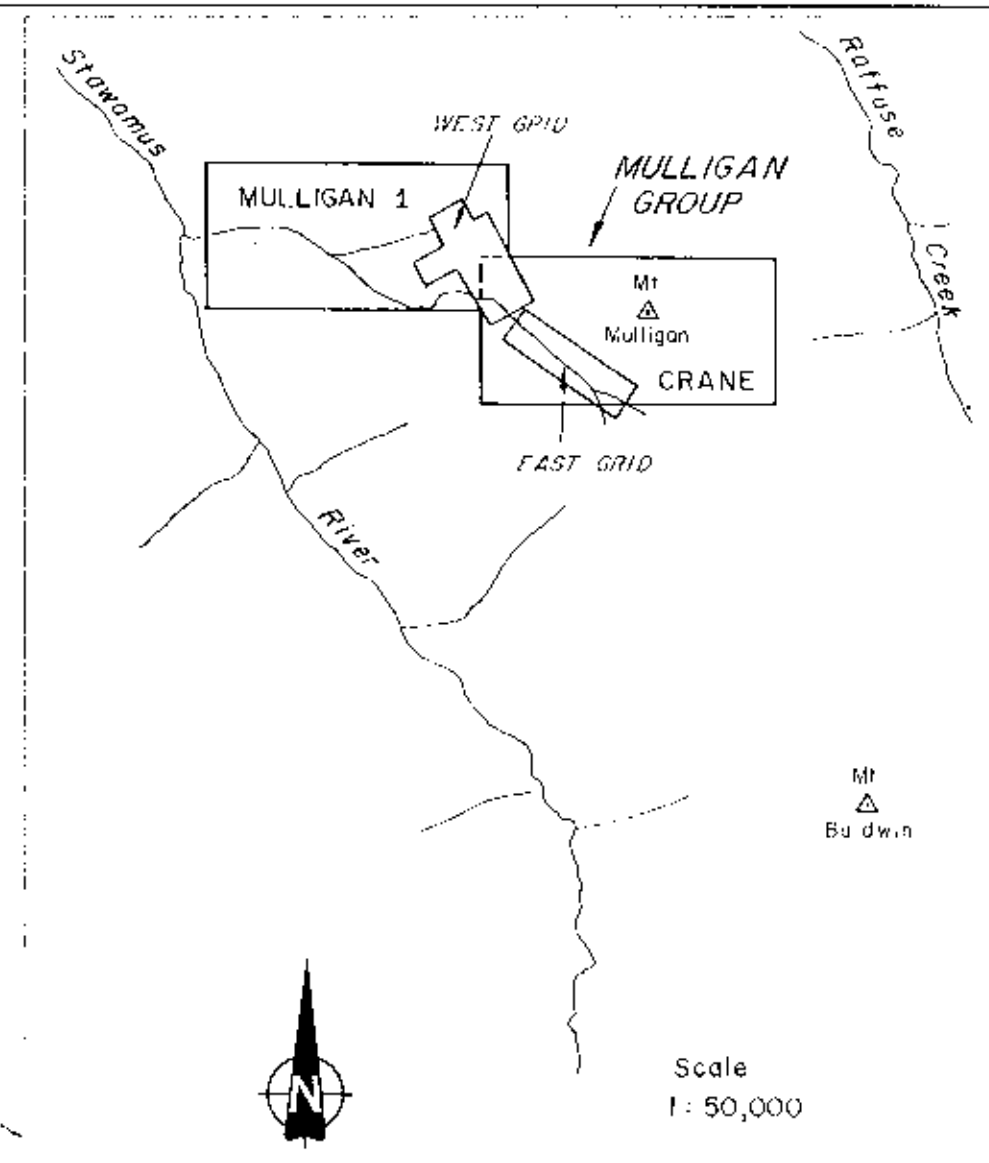
Texasgulf Inc

MULLIGAN - CRANE (WEST SHEET)

GEOCHEMISTRY

WORK BY	HAWN BY	DATE	DRWG. NO.
HHS, GNM	E.R.	5th October '78	

Scale in Metres 1:1250



KEY MAP

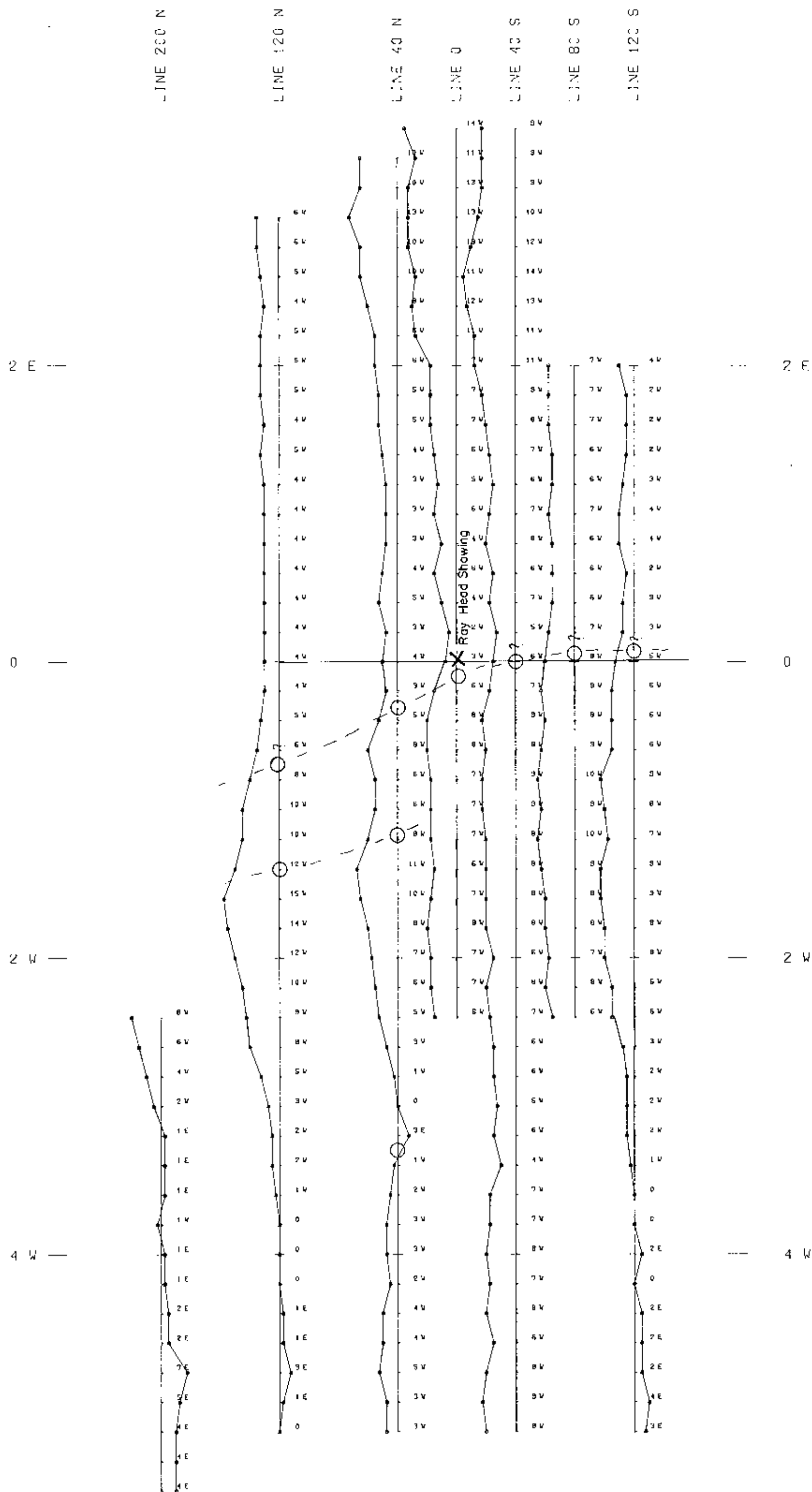


Figure 4
To accompany Assessment Report
on
Mulligan Group
by
P.R. DeLancey, J.A. Slankis
Nov. 1978

LEGEND

MINERAL RESOURCES DIVISION
ASSESSMENT REPORT
7026
NO.

INSTRUMENT : CRONE RADOM
STATION :
PROFILE SCALE : DIP ANGLE 1 CM = 10°

TEXASGULF INC.	
V L F SURVEY	
MULLIGAN-CRANE CLAIMS	
EAST GRID	
NTS: 92-G-II	PROJ. #55
WORK BY J A Slankis, D Landry	DATE 1978

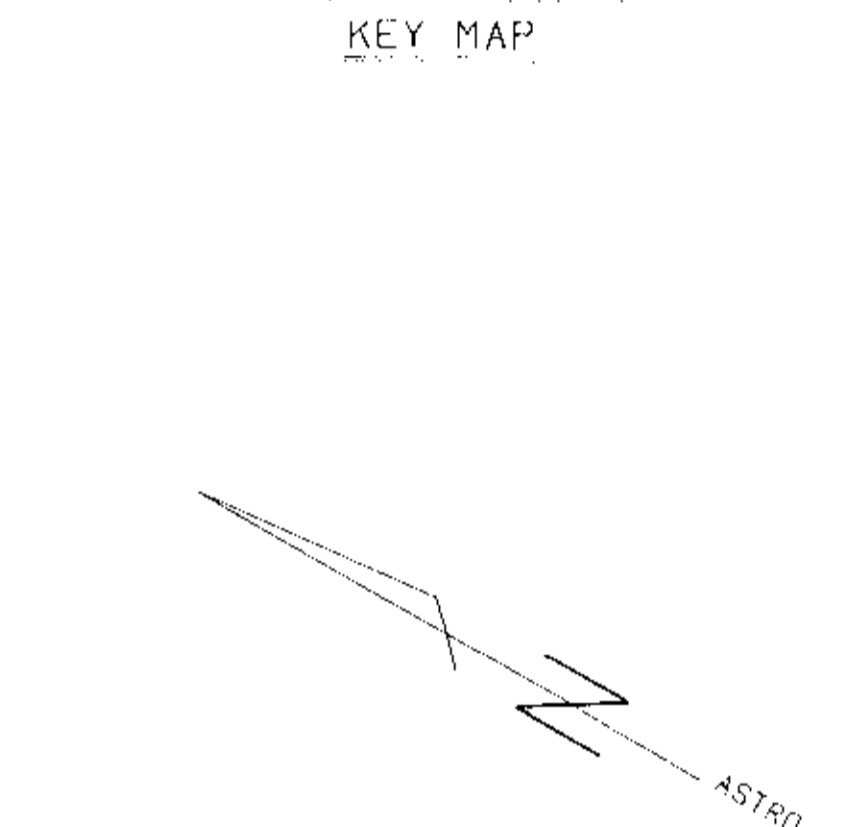
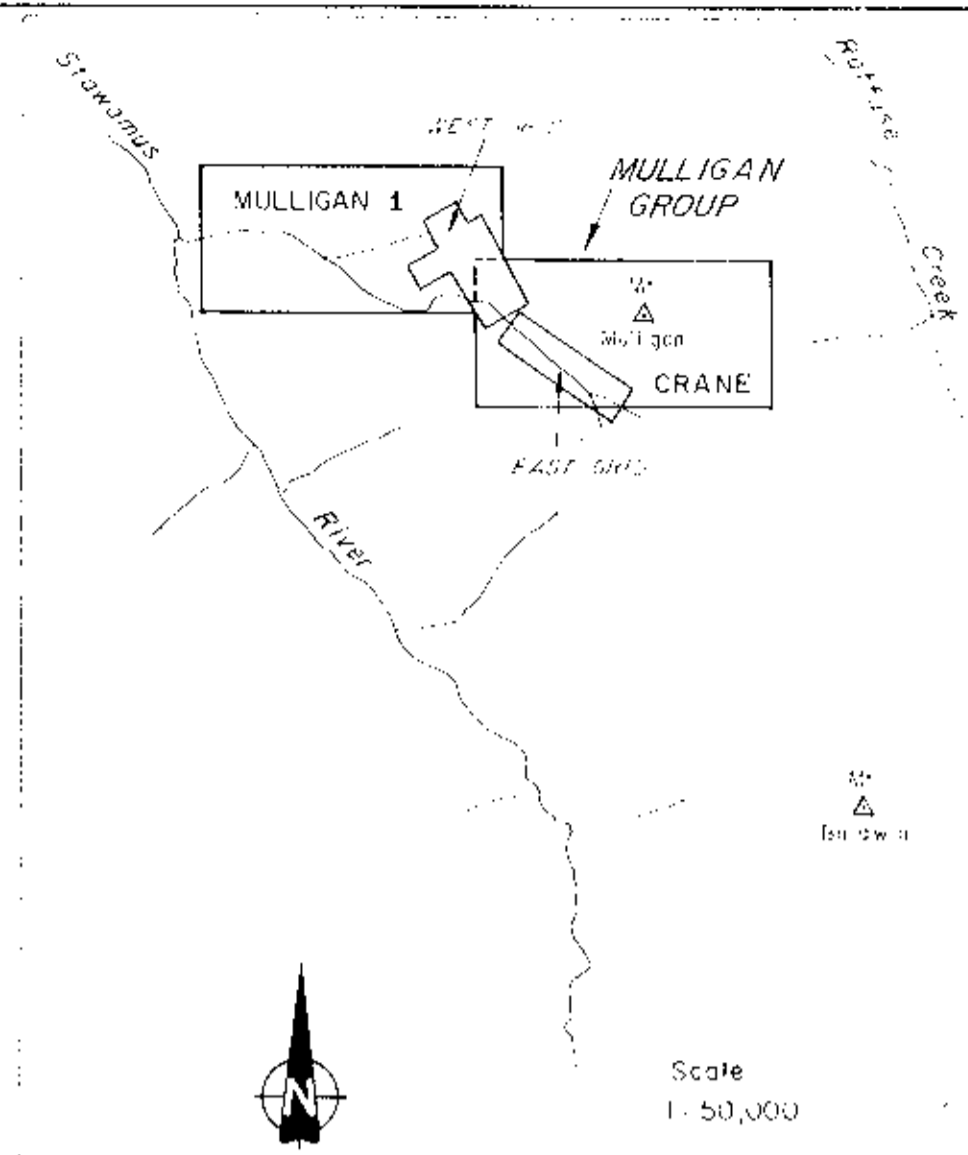


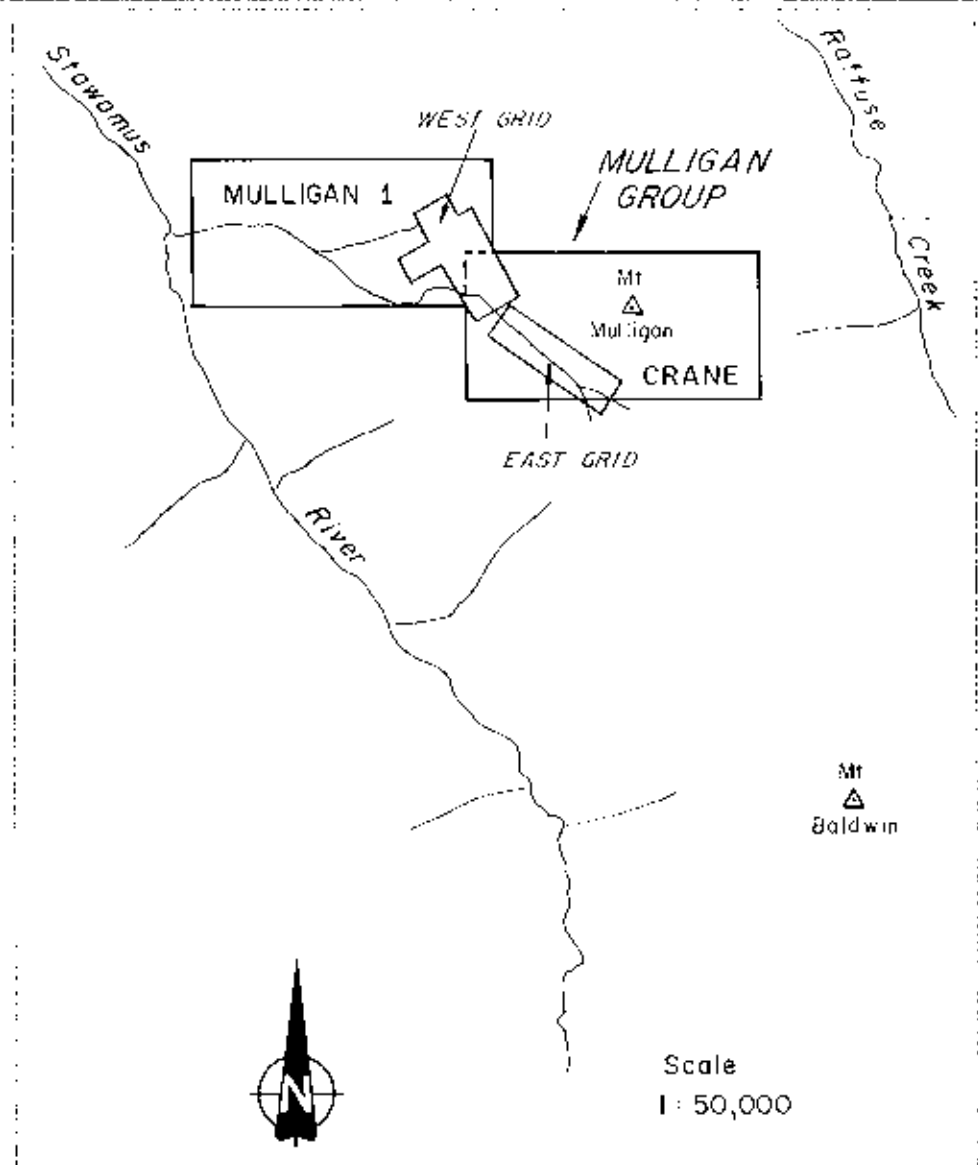
Figure 5
 To accompany Assessment Report
 on
 Mulligan Group
 by
 P. R. DeLancey, J.A. Stankis
 Nov. 1978

LEGEND

---○--- Conductor
 DIP ANGLE (DEGREES)
 INSTRUMENT : CRONE RADER
 STATION : SEATTLE, 18.6 KHz
 PROFILE SCALE : DIP ANGLE 1 CM = 10°
 ← W DIPS E DIPS →
 0 50 100 150 200 250
 METRES (1:2500)

7026
 NO.

TEXASGULF INC.
 V L F SURVEY
 MULLIGAN-CRANE CLAIMS
 WEST GRID
 NTS: 92-G-II PROJ. # 55
 WORK BY: J.A. Stankis, D. Landry DATE: 1978



KEY MAP

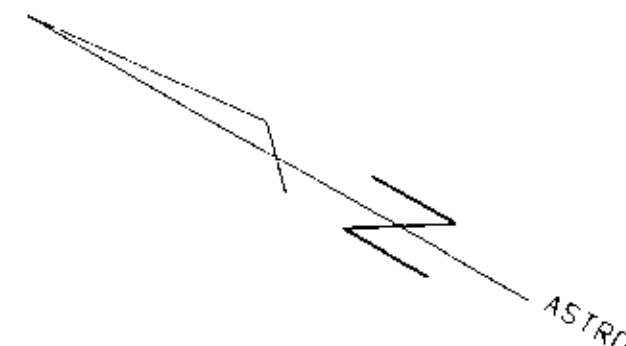
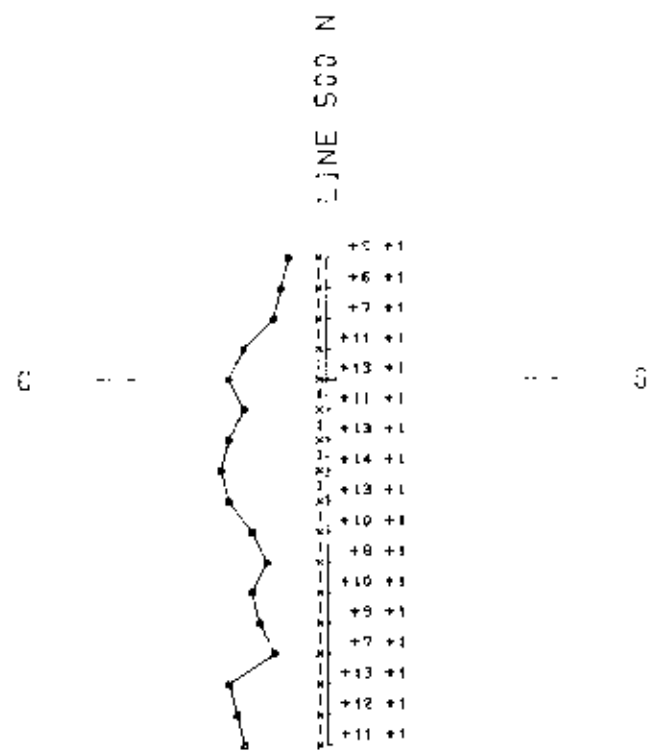


Figure 6
To accompany Assessment Report
on
Mulligan Group
by
P.R. DeLancey, J.A. Slankis
Nov 1978

LEGEND

HORIZONTAL LOOP SURVEY
7026

1777 Hz
IN-PHASE READINGS
QUADRATURE READINGS

INSTRUMENT : APEX PARAMETRICS MAXMIN II
FREQUENCY : 1777 Hz
COIL SPACING : 40 METERS
PROFILE SCALE : 1 CM = 10%
← + READINGS - READINGS →
0 50 100 150 200 250
METRES (1:2500)

TEXASGULF INC.	
HORIZONTAL LOOP SURVEY	
MULLIGAN - CRANE CLAIMS	
WEST GRID	
NTS: 92-G-II	PROJ. #55
WORK BY	DATE
J.A. Slankis, D. Landry	1978