

Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 3300 MAP

3300

GEOLOGICAL SURVEY

HILO CLAIM GROUP

situated
forty-four miles northwest of Cranbrook
in the

Fort Steele Mining Division

49° 116° N.E.
N.T.S. 82 F/16

Report by: D.E. MacKenzie
Supervised by: R.G. Gifford, P.Eng.
Work by: Texas Gulf Sulphur Company
Field Work: August 18 to August 31, 1971

September 10, 1971

Vancouver, B.C.

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GEOLOGICAL SURVEY

HILO CLAIM GROUP

Fort Steele Mining Division, 49° 116° N.E.

INTRODUCTION

The Hilo mineral claims were staked in 1970 to cover a base-metal prospect in southeastern British Columbia. The property covers the geologic possibility of massive sulphide mineralization contained in clastic rocks of Precambrian age.

This report details the results of a geological survey that was undertaken on the claim group to assist in evaluating the economic potential of the prospect. The work was carried out by Texas Gulf Sulphur Company in the period from August 18 to August 31, 1971.

The survey was conducted by Mr. D.E. MacKenzie under the supervision of Mr. R.G. Gifford, P.Eng.

PERSONNEL

The following list gives the category and time distribution for personnel employed in the Hilo field programme during the period August 18-31, 1971:

Supervision	R. G. Gifford	2 days
Geologist	D. E. MacKenzie	11 days
Assistant	R. J. Berdusco	11 days

PROPERTY AND OWNERSHIP

The property totals 12 claims, named Hilo. All the claims were recorded September 11, 1970. All are wholly owned by Texas Gulf Sulphur Company.

LOCATION AND ACCESS

The Hilo claim group is in the Fort Steele Mining Division at latitude $49^{\circ}48'$, longitude $116^{\circ}20'$ and N.T.S. 82 F/16, Figure 1. The elevation on the property ranges from 6,000 feet to 8,600 feet. Water resources are plentiful. Timber is limited to the valleys.

Major air, rail and trucking services as well as natural gas and hydroelectric power are available 44 miles to the southeast at Cranbrook which, with a population of 12,000, is the principal supply centre.

Access to the prospect is gained by 30 miles of gravel road from Highway 95 near the community of Marysville.

PHYSICAL FEATURES

The Hilo property lies on the eastern margin of the rugged Purcell Mountain Range. The property straddles a series of well-defined ridges and cirques sculptured by glacial action. The relief between the valley floor and the ridges is approximately 1500 to 2000 feet.

Numerous streams and five glacier-formed lakes drain the property area. These lakes range in length from 150 feet to 2000 feet and are generally shallow in depth.

GEOLOGY

General Statement

The general geology of the 12-claim property consists of interbedded sedimentary and intrusive units occupying a northwesterly striking anticline. This anticline is major in size and has an overall length of approximately 15 miles and an average width of 5 miles. The axial trace of this anticline strikes obliquely across the property.

The Hilo property encompasses the contact region between the Middle and Lower Aldridge formations. Acidic rocks of the White Creek batholith lie to the north of the claim area.

Outcrop is exposed over approximately 45 percent of the property. Talus slopes cover about 15 percent with the remaining area covered by overburden. The depth of overburden varies from one to ten feet.

Layered Rocks

Sedimentary rocks of the Lower and Middle Aldridge formations underlie the claim area. The sediments are Proterozoic in age and their subdivision is based solely on lithology. The sedimentary units include argillites, quartzites, carbonaceous siltites, argillaceous quartzites and a conglomerate bed.

Rocks of the Middle Aldridge formation include interbedded quartzites, argillaceous quartzites, siltites and carbonaceous argillites. These rocks outcrop mainly in the central and western regions of the claim area and represent the youngest exposed rocks in the antiform. These units are characterized by their light grey weathering colour and black argillite partings between beds of light to dark grey quartzites. The rocks are fine-grained with individual grains being subangular to subrounded in shape.

Rocks of the Lower Aldridge include interbedded quartzites, siltites and argillaceous quartzites. These rocks occur extensively in the eastern region of the property and represent the oldest exposed rocks in the antiform structure. The formation characteristically weathers to a rusty colour. The rocks are very fine-grained with individual grains being subangular to subrounded in shape. Limonitic and sericitic alteration is usually evident. The individual beds range in thickness from one to three feet. The contact between the Lower and Middle Aldridge formations is gradational.

The sedimentary conglomerate unit present in the north-eastern and central regions appears to be associated with the Lower Aldridge formation. Evidence suggesting this is the presence

of a very rusty weathering laminated unit stratigraphically above the conglomerate. The conglomerate unit has been folded and is nearly continuous along strike.

The size and nature of the clasts vary in the conglomerate unit. The clasts range in composition from siltite to argillite. Occasionally an equal number of both types are present, although one or the other generally predominates.

Upon examination of various conglomerate outcrops an apparent bedding lineation can be seen. The parallel orientation of individual clasts supports this postulation. Flow structures with parallel aligned clasts are common.

The clasts are usually oblong in shape and vary in length from 1/16" to 5". However, the majority are in the 1/4" to 1/2" range. The thickness of the clasts vary from 1/32" to 1/2". The density or concentration of clasts varies from outcrop to outcrop. The average number of clasts per square inch is usually six. The clasts vary in colour from light grey to brown and green.

The conglomerate matrix varies between siltite and argillite in composition and is grey to grey black in colour. It can be easily scraped with a penknife.

The conglomerate outcrops are characterized by their rounded nature and rusty weathering. Frequently in areas of high iron content a "pockmark" weathering feature is noticeable. These "pocks" are spherical to circular in shape and have a depth of a few inches.

A gradational contact exists between the adjacent sediments and the conglomerate unit.

No indication of mineralization was seen in the conglomerate.

Intrusive Rocks

Meta-diorites of the Moyie Intrusive phase are present in the claim area. These rocks occur mainly as sills and sometimes as dykes cutting the Proterozoic sediments. The folded nature of the sills indicates that their intrusion, along with that of the dykes, took place prior to regional tectonism.

The meta-diorite sills and dykes intruded both the Lower and Middle Aldridge formations. Their emplacement appears to have had little effect on the compositional and textural nature of the adjacent sediments. The majority of the meta-diorites exposed on the property are sill-like in nature. These sills vary in size from fifteen feet in length and three feet in thickness to 1500 feet in length and 500 feet in thickness. Two small isolated dykes were mapped in the Middle Aldridge formation.

The composition of the sills and dykes are relatively consistent, although small variations do occur. The average mode of the meta-diorites is 40% plagioclase, 50% hornblende, 6% pyroxene, 2% muscovite and 2% opaques. The texture ranges from fine to medium-grained.

The magnetic susceptibility of the meta-diorites is generally weak. Some magnetite is present and occurs mainly as disseminations in the rock.

Tourmaline crystals are frequently seen occurring in a

rosette formation in the more silicified diorites. The tourmaline present is usually associated with sulphide mineralization.

The extent and degree of metamorphism varies amongst the meta-diorites. Some outcrops appear not to have been effected by metamorphism, while others definitely have.

The meta-diorites occur in massive form and are generally well fractured. The fracture patterns are probably related to cooling effects during emplacement, and to regional tectonism. A high iron content inherent in the meta-diorites accounts for the rusty weathering.

Epidote and quartz veining are minor to absent in the majority of the meta-diorite outcrops.

Structure

The rock units present in the claim area have been folded by tectonic forces into an open northwesterly striking anticline. The axial trace of the anticline nearly parallels the northwesterly trending ridge on the property. Except for the southeast corner of the property the structural form of this anticline can be readily observed. The limbs of the anticline strike approximately northeasterly and southwesterly while the dips are generally steep.

The southeastern corner of the claim area is characterized by large scale warping, drag folds and a fold system that appears to strike northerly. Due to the the precipitous nature of the terrain and the presence of snow packs a thorough investigation of this area could not be made. The interaction of the large northwesterly-striking anticline and the smaller northerly striking folds may have produced a small distorted dome in this area.

Few minor folds exist in the central and western regions of the claim area. The presence of folded quartz veins dictates that a period of silica enrichment occurred prior to folding. No evidence of polyphase folding was observed.

Faulting does not appear to have greatly influenced the structural pattern of the area.

Fracturing is pervasive throughout both the sedimentary and intrusive units. This fracturing appears to be genetically and spatially related to the formation of the large anticline previously discussed, as indicated by the presence of closely-spaced conjugate fracture systems in both of the main rock types.

Fracture cleavage is evident in the competent quartzites of both the Lower and Middle Aldridge formations. Slaty cleavage is prevalent in the incompetent siltites of both formations.

Alteration

Regional dynamothermal metamorphism has affected both the sedimentary and the intrusive rock types in the claim area. The area has been subjected to low temperatures and intermediate pressures of deformation, probably in the Lower Greenschist Facies (quartz-albite-muscovite-chlorite subfacies).

The original muds, silts, and sandstones have been metamorphosed to form rock comprising argillite, siltite and quartzite.

Recrystallization is pervasive as seen by the formation of sericite, chlorite and muscovite from original clastic clay materials.

Granulated phyllitic rocks were observed in the southeastern region of the property. The quartzites, even though highly

deformed structurally, lack schistosity.

Tourmaline crystal growth occurs in localized areas of both sedimentary and intrusive rock. Generally the crystals occur in rosette and needle-like forms. Small garnets and apatite crystals were occasionally seen in the diorite.

Limonite alteration is frequent throughout the Lower Aldridge rock units. This can be attributed to the high-iron content inherent in these sediments.

Metamorphism has affected the meta-diorites to various degrees. Some diorites have been subjected to low grade metamorphism while others have not. The metamorphic effects are evidenced by abundant micaceous material and the fine-grained character of the diorite.

Mineralization

Evidence of base-metal mineralization was found at five locations on the Hilo Property.

Mineralization occurs in disseminated, vein, and replacement form in both sedimentary and intrusive rocks. The type, degree and origin of the mineralization varies from showing to showing.

One of the showings, designated the "old workings", is located approximately 1200 feet southwest of Diorite Lake. This showing consists of a shaft and five northwesterly trending trenches in a diorite sill, see Figure 4. The diorite in the immediate area adjacent to the shaft and trenches is well fractured and silicified. The fractures strike in a north-northwesterly direction and are closely-spaced. The most prevalent fracture system has a strike of

155 degrees true and dip of 70 degrees to the southwest.

The shaft present is approximately 12 feet in length, 8 feet in width, and 18 feet deep. These appear to be a drift striking southeasterly at the bottom of the shaft.

The trenches vary in length from 38 feet to 64 feet and have an average width of 8 feet and a depth of 5 feet. They appear to parallel the major fracture strike direction.

The bedrock and talus in the trench vicinity has a characteristic rusty weathering colour and acrid sulphide smell.

Mineralization in bedrock was very limited. The minerals found in talus suggest that the trenches contained massive concentrations of scheelite, pyrrhotite, chalcopyrite, arsenopyrite, pyrite, galena, and sphalerite. Scheelite, pyrrhotite, and chalcopyrite appear to have been the more abundant metallic ore minerals. Tourmaline, garnet, and actinolite are associated with the mineralized diorite.

Mineralization occurs in vein and replacement form in these workings. This showing, although apparently worked out may have further economic potential.

The other worked showing, designated the "Main showing", is located 700 feet northwest of the Hilo base camp. It occurs at the base of a rock face approximately 120 feet southwest of a diorite sedimentary contact. The mineralization occurs in thinly interbedded quartzites and siltites of the Lower Aldridge formation. Past work on the showing involves a cut in the rock face that is approximately 10 feet wide and 5 feet in depth. Two small pits were also dug in the outcrop area, see Figure 4.

Mineralization is limited to a 30-foot wide band across the face of the outcrop, with a true thickness of approximately 25 feet. Minor amounts of fine-grained galena and pyrrhotite are disseminated along 1/4 inch thick planes which generally parallel the bedding, and occasionally transect it. Small-scale replacement textures were observed. Fine-grained chloritic material is associated with the disseminated galena and pyrrhotite. The majority of the mineralization occurs in the thin-bedded quartzites, although minor amounts were found in the thin-bedded siltite units. Sericite and epidote are associated with the siltites. The quartzite beds are characterized by their very rusty weathering colour and the well-fractured nature of the rock. Mineralization appears to be syngenetic with sedimentary diagenesis.

A third base-metal occurrence is present in the precipitous cliff region in the southeastern section of the property. Massive pyrrhotite with associated sphalerite, chalcopryrite, scheelite, arsenopyrite found in talus was traced to a very rusty zone situated in a cliff face. This zone is approximately 50 feet wide and 40 feet in height. Although one very small exposure of massive pyrrhotite in quartzite was located on the face it appears as though the majority of the mineralization has been eroded. The mineralization appears to be of the replacement vein type in a southwest dipping limb of a fold. Oxidation of the quartzite host rock is severe.

Disseminated fine-grained galena and chalcopryrite was seen in a diorite and quartzite contact area on the ridge above the Hilo camp. Also, disseminated galena and chalcopryrite was observed in

a localized area of diorite in the northeastern corner of the property.

CONCLUSIONS

1. The rock units on the property have been folded into a northwesterly striking anticline. Deformation has been more complex in the eastern region.
2. Mineralization occurs on the property in disseminated, vein and replacement form in both intrusive and sedimentary rocks. The bedded deposits at the Main Showing possibly have an economic significance.

Submitted by:

D.E. MacKenzie
D.E. MacKenzie

Supervised by:

R.G. Gifford
R.G. Gifford, P.Eng.

September 11, 1971

APPENDIX

Statement of Expenditures, 1971
Hilo Claim Group
Fort Steele Mining Division

PERSONNEL

R.G. Gifford, P.Eng.; supervision, 2 days @ \$75	\$ 150.
D.E. MacKenzie; geologist, 11 days @ \$35	385.
R.J. Berdusco; assistant, 11 days @ \$25	275.

SUPPORT

Lodging: 3 men, 24 man-days @ \$10/man-day	240.
Vehicle: four-wheel drive, 11 days @ \$14/day	154.
Helicopter: 4.45 hrs. @ \$160/hr.	760.

EQUIPMENT AND MATERIALS

Topographic Base Map: scale 1"=500', for 750 acres by McElhanney Surveying & Engineering Ltd., Vancouver	220.
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ANALYSIS

Rock assays	100.
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Total Expenditures, Hilo Claims
for 1971. \$2284.

Declared before me at the City
of Vancouver in the
Province of British Columbia, this 19
day of Oct, 1971, A.D.

R.G. Gifford
R.G. Gifford, P.Eng.

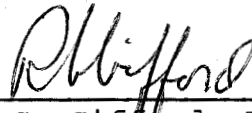
Jill Turner
A Commissioner for taking Affidavits within British Columbia
Sub-mining Recorder

Statement of Qualifications

D.E. MacKENZIE

Mr. D.E. MacKenzie was responsible for conducting the geological survey described herein. He is a graduate geologist of the University of British Columbia (B.Sc. 1971) and has been employed in geological field work since 1964.

I consider Mr. MacKenzie to be a competent and experienced geologist.




R.G. Gifford, P.Eng.

September 10, 1971

C E R T I F I C A T I O N

I, Robert G. Gifford certify that:

1. I am a practising geological engineer with residence at 1256 Alderside Road, Port Moody, B.C.
2. I am a graduate of the University of British Columbia with a degree of Bachelor of Applied Science.
3. I am a member of the Association of Professional Engineers of British Columbia, and have been engaged continuously in mining and exploration geology for thirteen years.
4. I supervised the evaluation programme for the Hilo Claim Group, Fort Steele Mining Division near Cranbrook, British Columbia in the period from August 18 to August 31, 1971.



R.G. Gifford, PEng.

September 10, 1971.



BONDAR-CLEGG & COMPANY LTD.

geochemists • assayers • analytical chemists

1500 PEMBERTON AVENUE, NORTH VANCOUVER, B.C.
PHONE: 988-5315 TELEX: 04-54554

CERTIFICATE OF ASSAY

TO Texas Gulf Sulphur
701 - 1281 W. Georgia St.
Vancouver, B.C. Att: Mr. R. Gifford

Report No: A21-720
Samples Rec'd: Sept. 28, 1971
Results Completed: Oct. 8, 1971

Project: A 744

I hereby certify that the following are the results of assays made by us upon the herein described Ore samples.

MARKED	GOLD		SILVER	Cu	Pb	Zn					TOTAL VALUE PER TON (2000 LBS.)
	Ounces per Ton	Value per Ton	Ounces per Ton	Percent	Percent	Percent	Percent	Percent	Percent		
Ore											
4484	---		0.05	---	0.06	0.02					
4485	---		0.02	---	0.02	0.03					
4486	---		0.14	---	0.34	0.74					
4487	---		0.04	---	0.02	0.02					
4488	---		Trace	---	0.02	0.01					
4489	---		0.04	---	0.02	0.02					
4490	Trace		0.21	1.58	0.16	0.01					

NOTE:
Rejects retained two weeks
Pulps retained three months
unless otherwise arranged.

Gold & Silver values reported on these sheets
have not been adjusted to compensate losses and
gains inherent in fire assay methods.

Gold calculated at \$.....per ounce

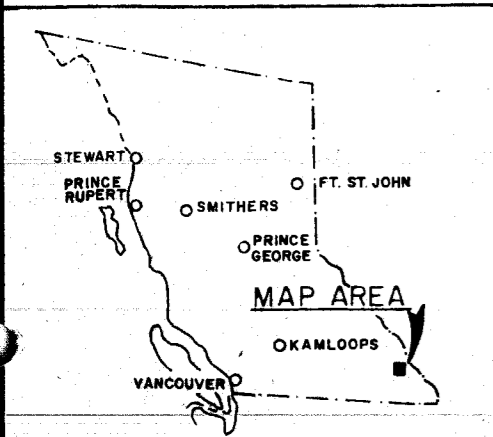
Registered Assayer, Province of British Columbia



HILO CLAIMS



SCALE: ONE INCH = 1000'



BRITISH COLUMBIA

Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. **3300** MAP # **1**

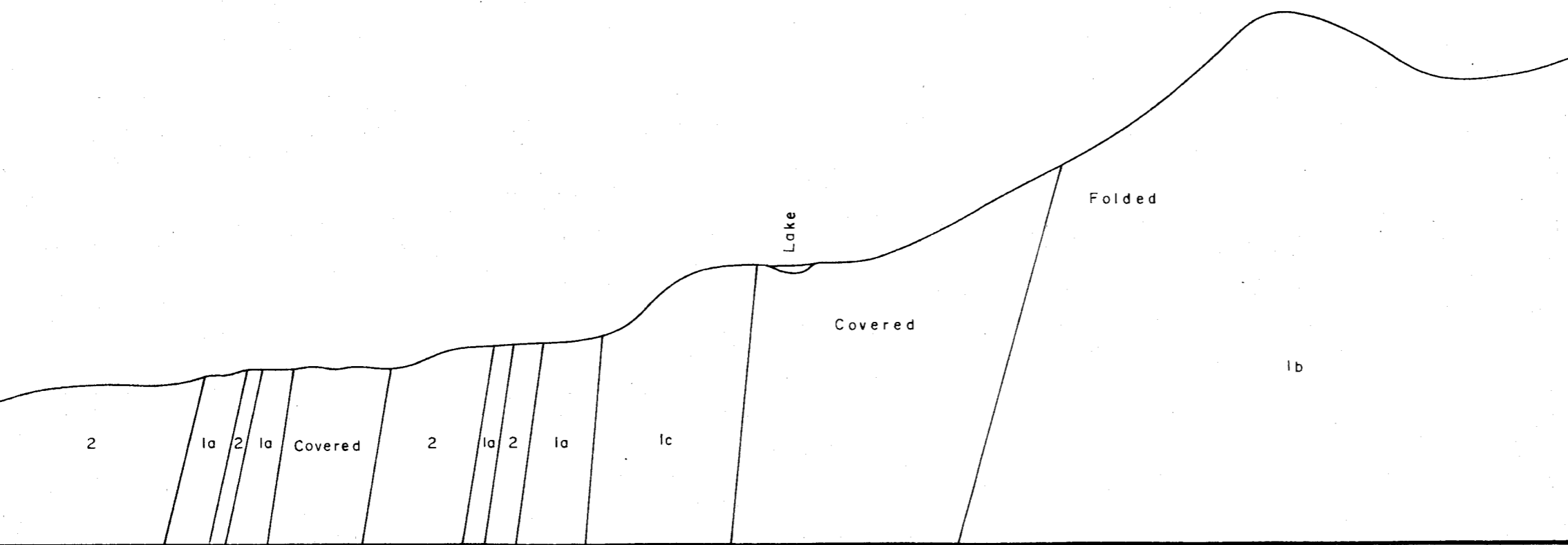
To Accompany:
Geological Report on the
HILO GROUP, White Creek,
Fort Steele Mining Division;
by D.E. MacKenzie,
dated September 10, 1971.

D.E. MacKenzie

TEXAS GULF SULPHUR CO.		
HILO PROPERTY CLAIM MAP		
NTS. 82 F/16 FORT STEELE MINING DIVISON		
WORK BY	DRAWN BY	DATE
D. E. M.	VERSATILE INDUSTRIES LTD.	SEPTEMBER 10, 1971

NORTH

SOUTH



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 No 3300 MAP # 3

'A'

'A''

SCALE: ONE INCH = 500'

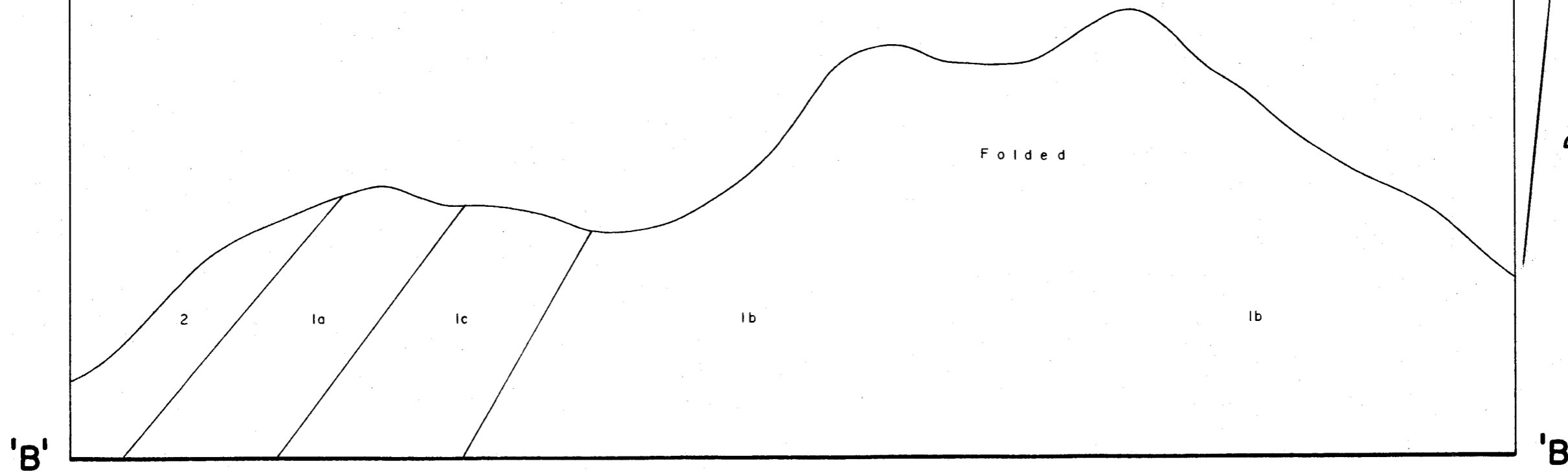
To Accompany:
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 Fort Steele Mining Division
 by D.E. MacKenzie,
 dated September 10, 1971.

D. E. MacKenzie

TEXAS GULF SULPHUR CO.		
HILO PROPERTY SECTION 'A'-A' (LOOKING EAST)		
WORK BY	DRAWN BY	DATE
D. E. M.	VERSATILE INDUSTRIES LTD.	AUGUST 27, 1971

WEST

EAST



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ASSESSMENT REPORT
NO. 3900 MAP # 4

SCALE: ONE INCH = 500'

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dated September 10, 1971

D. E. MacKenzie

TEXAS GULF SULPHUR CO.		
HILO PROPERTY SECTION 'B'-'B' (LOOKING NORTH)		
WORK BY	DRAWN BY	DATE
D. E. M.	VERSATILE INDUSTRIES LTD.	AUGUST 27, 1971



LEGEND

- WHITE CREEK BATHOLITH 3 Granodiorite
- MOYIE INTRUSIVES 2 Meta-diorites, sill form, dykes noted
- ALDRIDGE
 - 1a Thick and thin bedded argillite and quartzite
 - 1b Very rusty, thin bedded quartzites and siltites
 - 1c Rusty, massive conglomerate
- Contact
- Outcrop boundary
- Claimpost, with claimnumbers
- Bedding
- Foliation
- Cross-Section
- Syncline, anticline
- Minor folds
- Ridge
- Packhorse Trail
- Lineation (Mineral)

3300

3300

To accompany:
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D.E. MacKenzie

Department of
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 ASSESSMENT REPORT
 No. 3300 MAP #2
 M-2

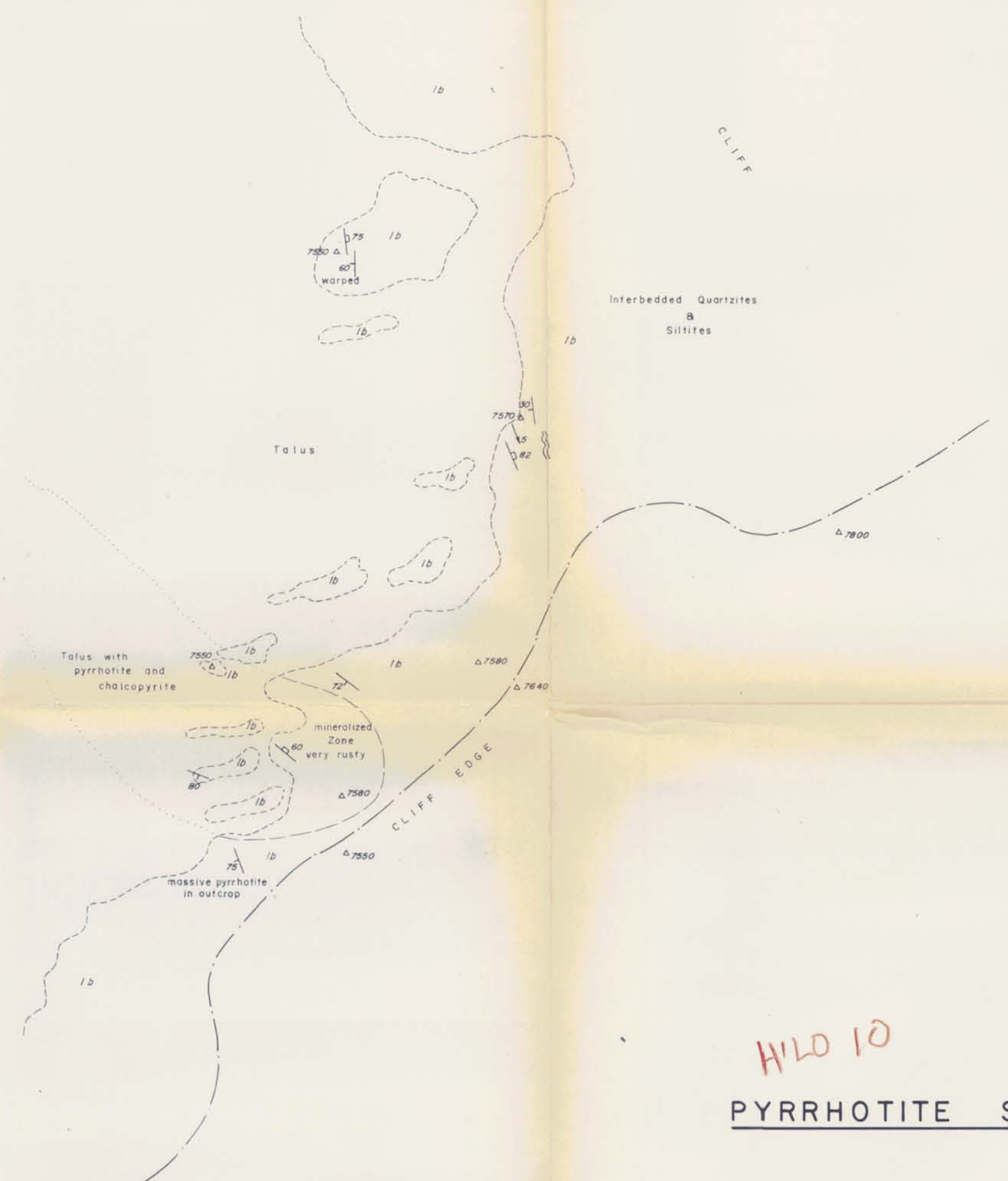
SCALE: ONE INCH = 500 FEET

TEXAS GULF SULPHUR CO.		
HILO PROPERTY		
GENERAL GEOLOGY		
WORK BY	DRAWN BY	DATE
D. E. M.	VERSATILE INDUSTRIES LTD.	AUGUST 28, 1971



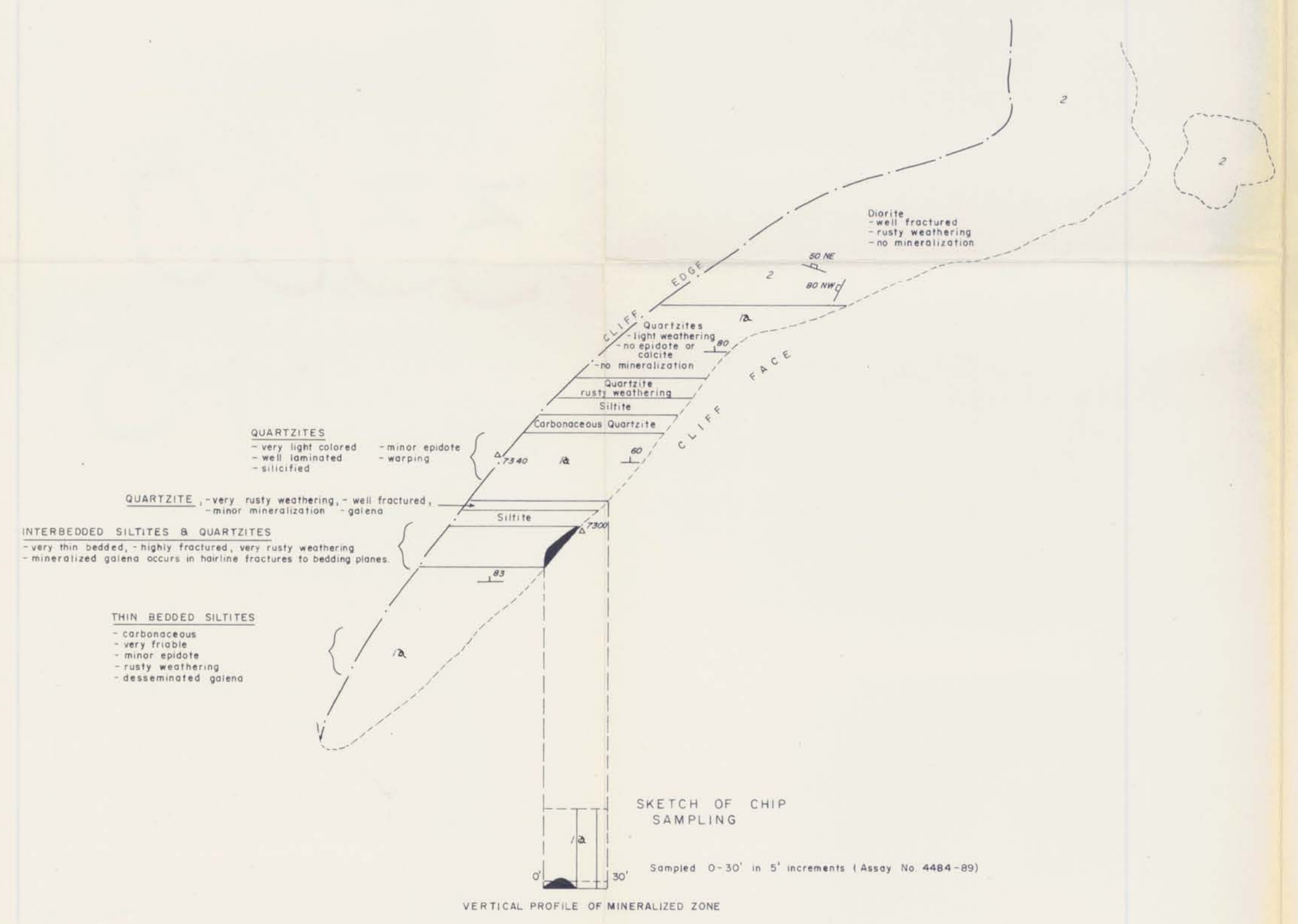
MAIN SHOWING

HIL03

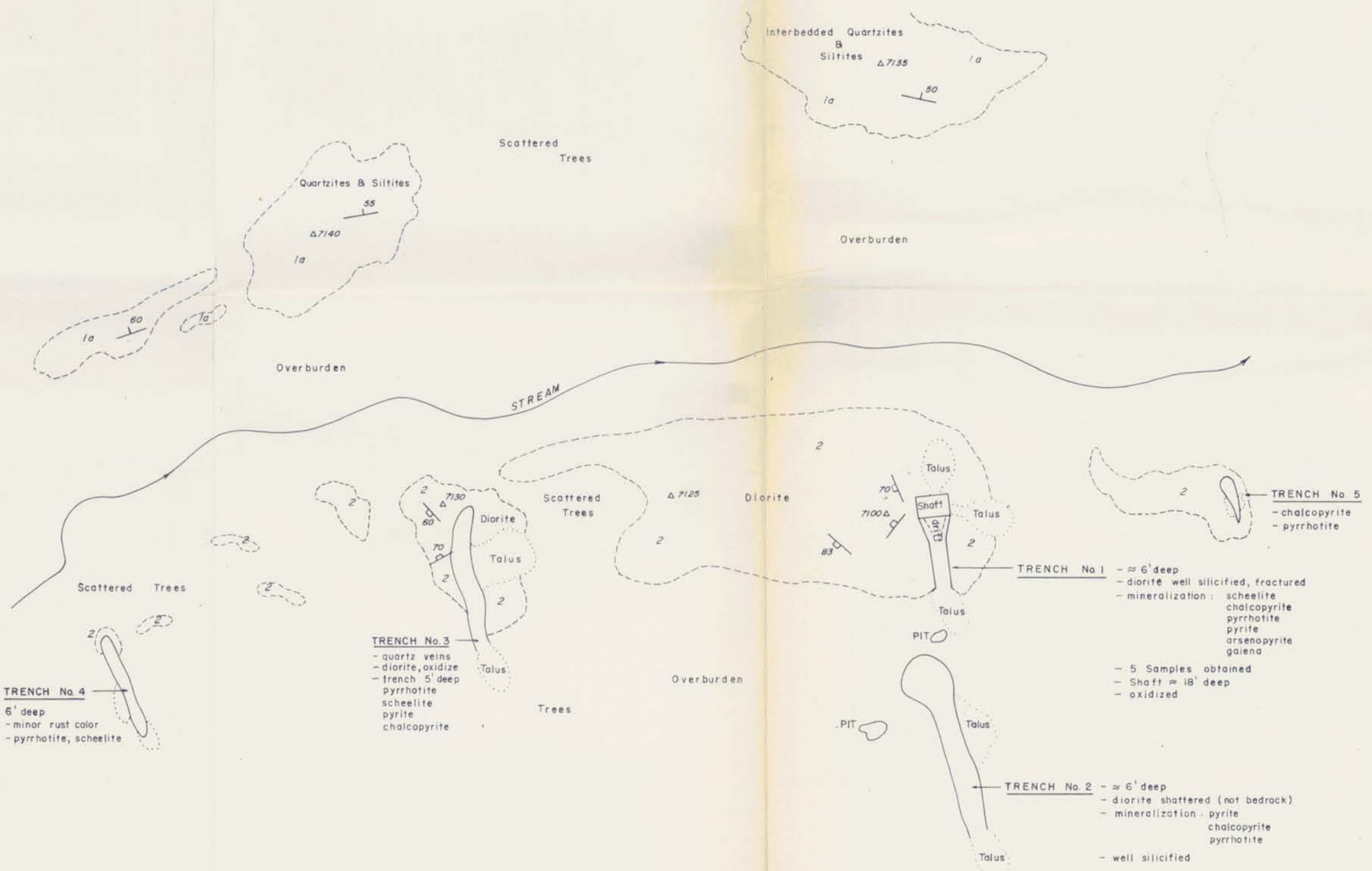


PYRRHOTITE SHOWING

HIL010



MAIN SHOWING
INCLINED VIEW OF CLIFF FACE



HIL04
OLD WORKINGS

Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
MAP #3
NO. 3300

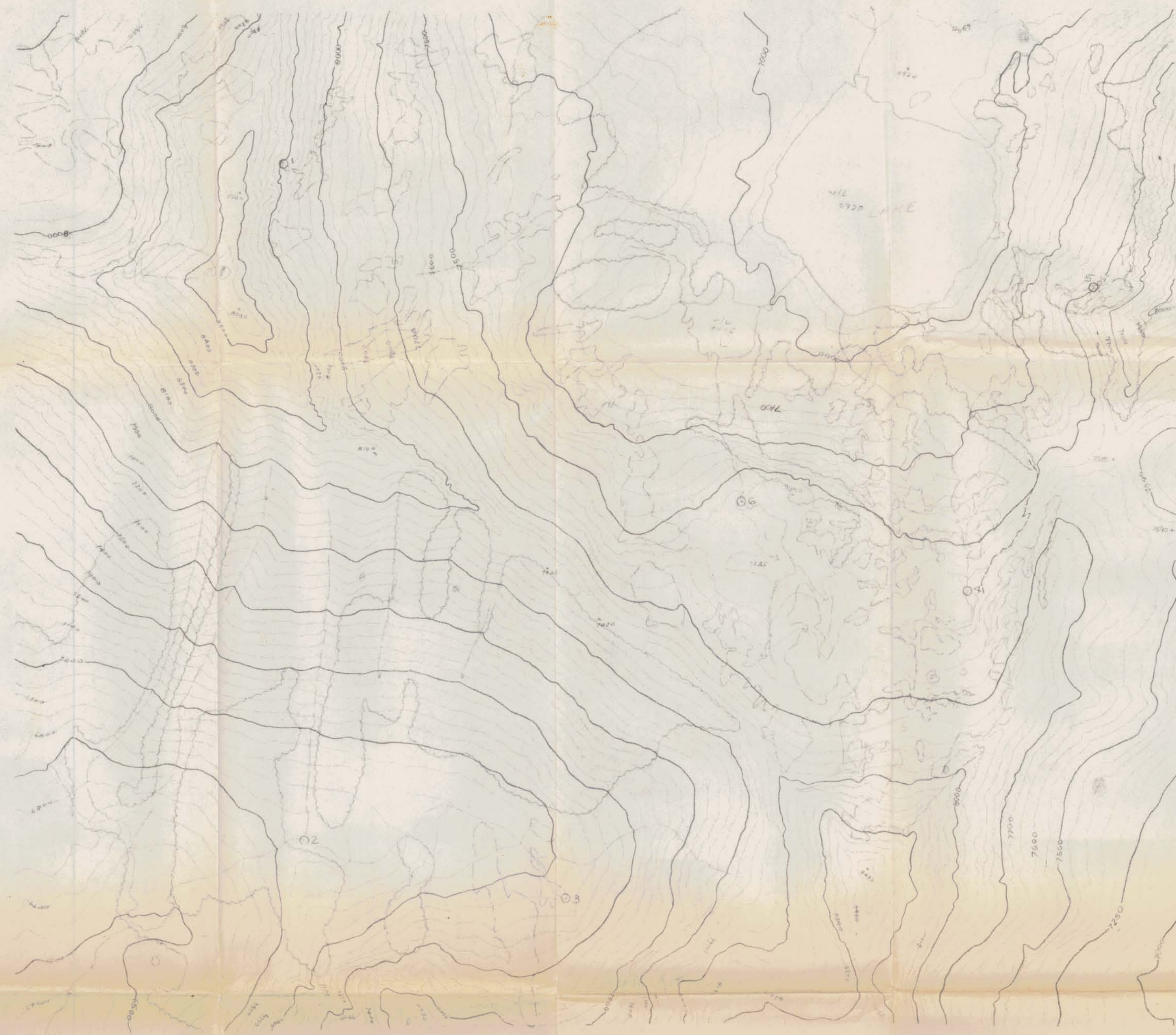
3300
M-5

To Accompany:
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dated September 10, 1971.

D.E. MacKenzie

SCALE: ONE INCH = 40'

TEXAS GULF SULPHUR CO.		
HILO PROPERTY		
MINERAL SHOWINGS		
WRK BY	DRAWN BY	DATE
D. E. M.	VERSATILE INDUSTRIES LTD	AUGUST 28,



Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
No. 3300 Map #6

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Dated September 10, 1971.

D.E. MacKenzie

TEXAS GULF SULPHUR CO.				
HILO GROUP				
PRELIMINARY RECONNAISSANCE TYPE MAPPING				
Compiled by McELHANNEY SURVEYING & ENGINEERING LTD. 1200 West Pender St. Vancouver, B.C.				
SCALE	CONTOUR INTERVAL	DATE	JOB NO.	SHEET NO.
1" TO 500'	50'	FEB 19, 1971	05628-0	1 OF 1
<small>SCALE AND ELEVATION DATUM BASED ON LIMITED GROUND CONTROL RESULTING IN GOOD RELATIVE, BUT UNCERTAIN ABSOLUTE MAP ACCURACY COMPILED FROM AERIAL PHOTOGRAPHY AT AN APPROXIMATE SCALE OF 1 INCH EQUALS 2540 FEET FLOWN IN 1968 (2071)</small>				



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M.P.R. NO. 05628-0



3300 HILO GROUP
M-7

To Accompany:
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SCALE-1" to 500' (APPROX.)

D.E. MacKenzie