830

PART 1

OF 2

REPORT OF INDUCED POLARIZATION

AND RESISTIVITY SURVEY

BIG ONION PROPERTY, SMITHERS B.C.

2 parts FOR 93L/15W

TEXAS GULF SULPHUR COMPANY INC.

VOLUME I

PREPARED BY

BARRINGER RESEARCH LIMITED
304 Carlingview Drive
Rexdale, Ontario, Canada

AUGUST - 1966

LIST OF CONTENTS

LIST OF DRAWINGS

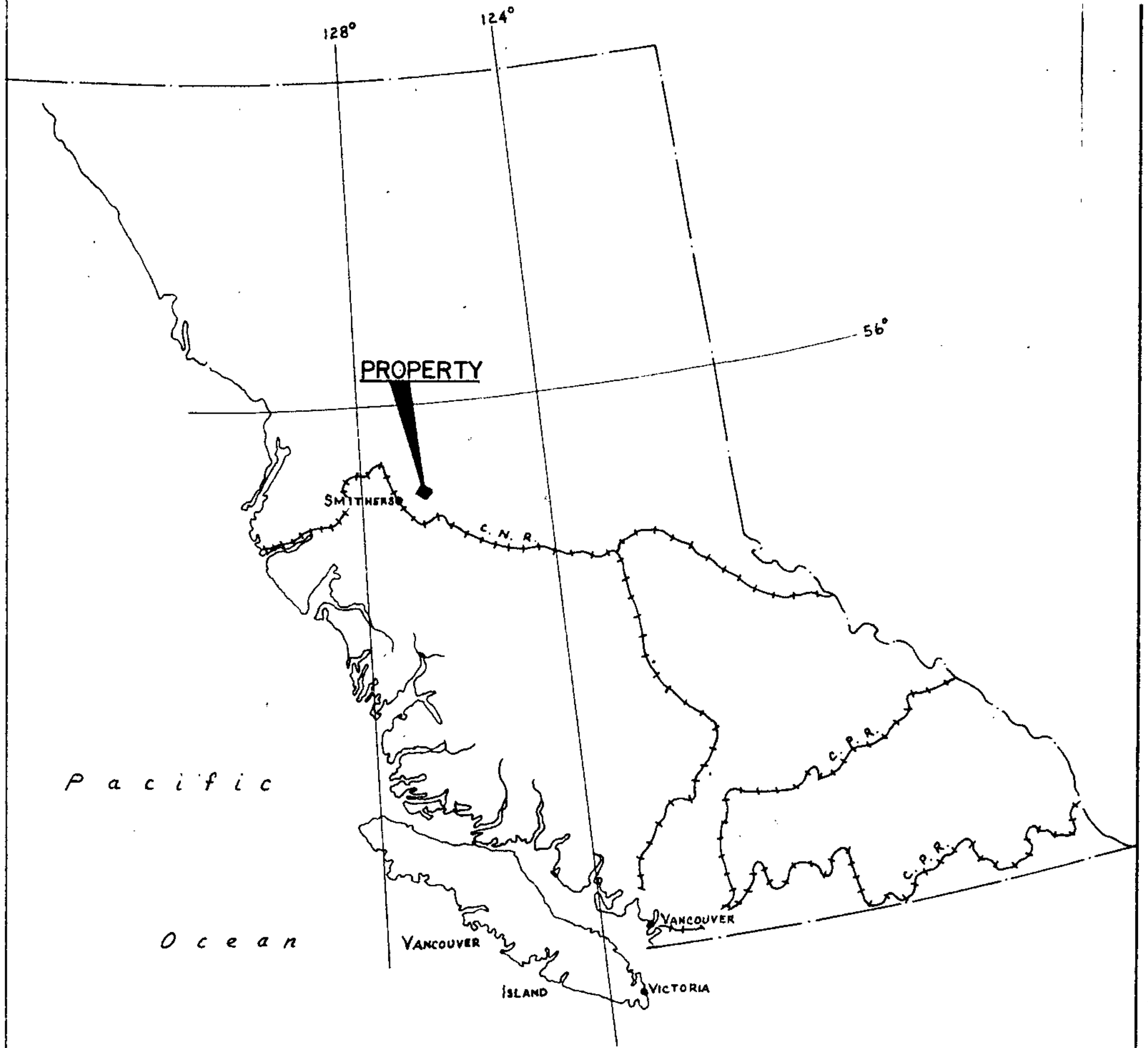
A remaining 11 drawings in Volume II

INTRODUCTION

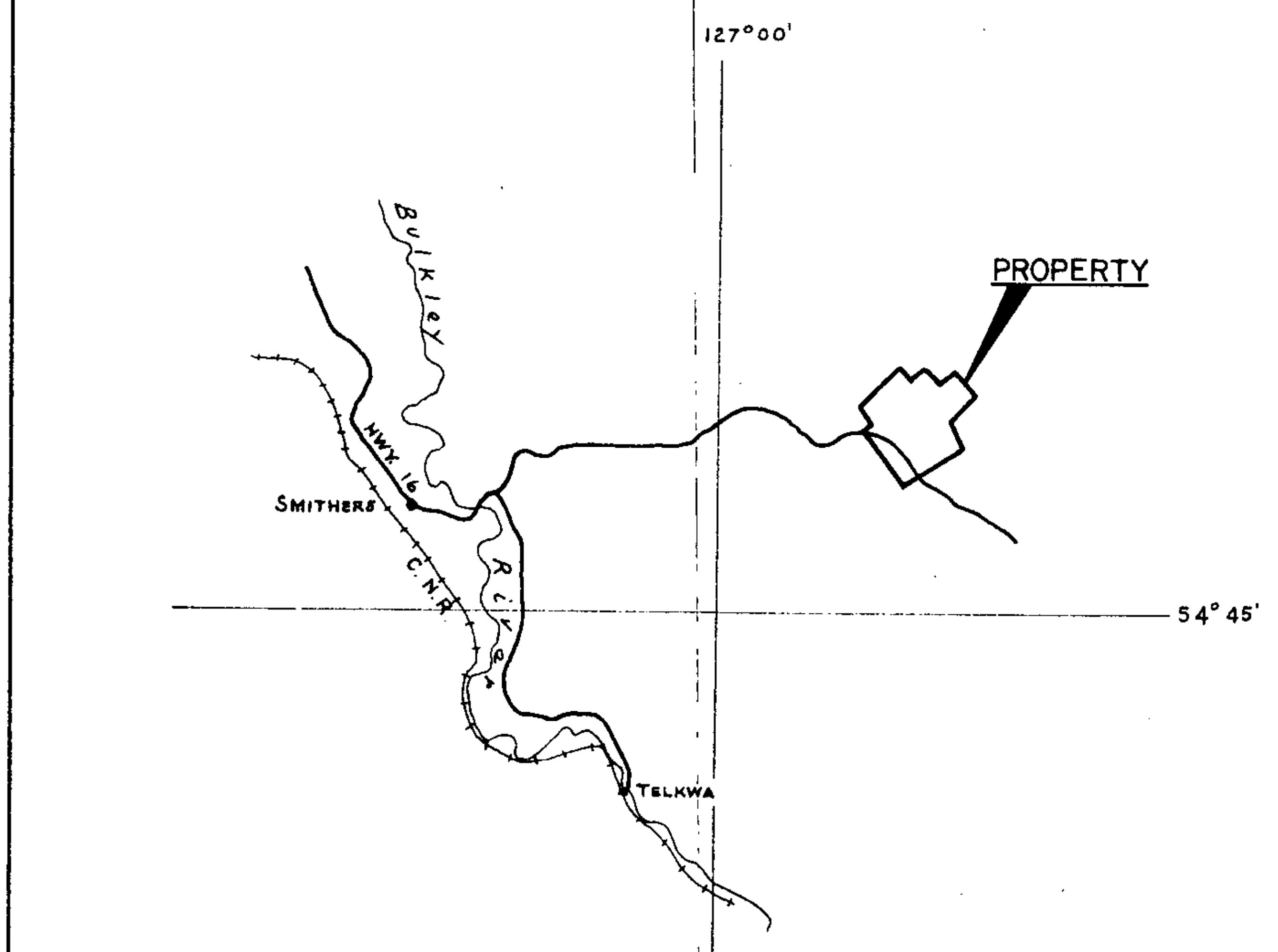
In consequence of previous field investigations, several mineralized exposures on Big Onion Mountain east of Smithers, B.C. were considered by the Texas Gulf Sulphur Company to retain residual interest. As a result, certain protective claims were acquired by option, and in the summer of 1966 this property became the object of detailed exploration.

The area so encompassed is generally centred on the southern face of the mountain, and characteristically provides varying mixtures of outcrop near-outcrop and deep cover. To complement the geologic and geochemical investigations, and hopefully to more properly map the limits of the mineralization, which at surface appears largely disseminated in form, an induced polarization and resistivity survey was mounted over the most pertinent sections of the property. Auxiliary magnetics were partially applied to provide supplemental data.

The results of this geophysical work, carried out between June and August, 1966 form the subject of this report.



Scale 1" = 20m



SMITHERS - B.C.

Scale 1" = 4m. approx. (1: 250,000)

Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 830 MAP # 1

Work undertaken by
BARRINGER RESEARCH LTD, Toronto, Canada.

TEXAS GULF SULPHUR CO. INC.		
BIG ONION PROPERTY - SMITHERS - B.C.		
LOCALITY PLAN		
AUG. 1966		DWG. 5-150-1

GENERAL GEOLOGY

On its southern exposures the Big Onion reveals a complex sequence of acid to intermediate lava flows with minor tuffs apparently multiply intruded by diorite porphyry dykes and by a series of quartz diorite plugs. The latter tend to occur as a string running through a central rhyolite flow, a circumstance which together with other evidence has led to the speculation of an anticlinal structure fundamental to the setting.

The mineralization is widespread through the area, but generally centred on the intrusive plugs, and occurs there both in the rhyolite and the diorite. It is however variable in its distribution, but appears most influenced by the contacts of the rhyolite with adjacent andesites, by local faulting and by the proximity of the intrusives. Previous drilling in one of the diorite bodies disclosed disseminated copper mineralization in the amount of approximately 0.3% Cu. Elsewhere at surface pyrite is the dominant sulphide, but evidence of chalcopyrite and molybdenite has been observed in scattered places.

WORK UNDERTAKEN

On lines previously prepared, each chained and picketed at 100 ft. intervals and generally spaced 400 ft. apart, induced polarization and resistivity surveying was carried out using Huntec 7.5 kw pulse transient equipment. Over the major portion of the grid including all sections high on the slopes, a pole-dipole array with an "a" spacing of 200 ft. was employed, it being alternately varied at the current electrode to provide "na" spacings of n=1 and n=2. Towards the foot of the slopes and beyond into adjacent sections of suspected deep cover, the same pole-dipole array was applied but with the "n" values now equalling 2 and 3 alternately.

These variations in array provided for each line two sets of measurements of the polarization and resistivity parameters, with the $n = 2$ spacing common to the whole grid. The complete survey amounted to 19 line miles of coverage.

Magnetic measurements of total intensity were taken through most of the central section of the grid area. These were made with a Barringer model GM -102A nuclear precession magnetometer with an accuracy of 10 γ. Readings were taken every 100 ft. but were closed up in areas of peak activity. Approximately 8 miles of line were so traversed.

The geophysical programme was completed through the period 22nd June - 7th August, 1966. Production was hampered by the topography, the weather, and through 5 days lost to equipment break-down.

ASSESSMENT DATA

For the purposes of filing for assessment credit, the following details are supplied.

WORK	MAN-DAYS
IP and resistivity	180
Magnetic surveying	6
Supervision	3
Reduction and Compilation	3
Interpretation and reporting	3
Drafting and typing	5
	200

DATES: 22nd June 1966 - 7th August 1966

PERSONNEL:

L. Read	Geophysicist and party chief
M. Shore	Technician
R. McGowan	Geophysical operator
D. Brown	Field assistant
J.B. Boniwell	Chief geophysicist
D. R. Stone	Draftsman
D. Trottier	Typist

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DISCUSSION OF RESULTS

To provide some cohesiveness and for ease of referral, the discussion that follows will be centred on the contoured polarization plan (Dwg. Nos. 5 - 150 - 2A,B,&C) compiled from the n=2 pole-dipole measurements. Whilst this is a presentation of one facet of the data only, the other geophysical results including the magnetics will be appropriately related as the grid area is systematically appraised.

(a) SOUTH SECTION

It is immediately evident from the above plan that a considerable extent of polarization relief has been recorded over that major portion of the grid area north of line 4N. South of this line, however, there is quite a marked change as chargeabilities drop to values as low as 1 - 2 millivolt-secs per volt (millisecs) in an almost unvarying background. Indeed so abrupt is the change and so stark the contrast that two related circumstances strongly suggest themselves, first that the break is caused by faulting along a NNW axis, and second that the resulting down-thrown block lies to the south under deep cover. The presence of the cover is fairly indicated by the accompanying drop in resistivities across line 8N to 4N from something in the order of 500 ohm-metres to as low as 100 ohm-metres This infers a thick and highly conducting surface sheet, and it is to be noted that the adoption of the deeper n=3 spacing from line 8S southwards did not raise apparent resistivities. It can be presumed, therefore, that an overburden of glacio-fluvial material of upwards 300 ft. thick exists in this region effectively masking the penetration to bedrock. One exception to this condition appears at 14W on line 4S where a single chargeability value of 5 millisecs implies a local bedrock high. Also to the east of lines 8S and 12S a certain amount of relief in the bedrock surface can be inferred from minor changes in the polarization profiles there. From magnetic projections, this last may be caused by local dyke intrusions.

It needs to be noted in passing that the readings on the east half of line 12S and the west half of line 16S are all abnormal with respect to surrounding chargeabilities. Read on the one day, there is little doubt that this sequence of measurements contains an introduced noise peculiar to the condition of the equipment on that day. This is believed related to moisture in the receiver. In any event, the readings are affected by roughly the same amount (2.0 msecs), producing thereby a simple change in background level and not altering the relief above background. Although for the sake of fidelity no connection has been made to these readings (which necessarily excludes them from the contouring), it is obvious the results are otherwise consistent with their environment.

(b) CENTRAL SECTION

If it is clear that there is a very low and uniform background polarization in the south end of the grid area, then it is equally clear that to the north of line 4N background becomes much higher and quite variable. In fact, it is probably necessary to consider two backgrounds, one on the very fringes of the grid area amounting to about 4 - 5 m.secs, and one across the central portions averaging more like 8 - 10 m.secs. The first can be regarded as normal to barren country rock, and in this sense is to be equated to the polarization peaks already seen as bedrock highs in the heavily covered area to the south. The second can be taken as the polarization level of the mineralized background characteristic to the widespread pyritization of the host rocks in the sections of greatest geologic interest. In the present exploration context, it is the chargeability relief, not above the first, but the second established background that holds the greatest significance, and observed anomalies therefrom are thus rated accordingly.

In general terms, the results provide two major areas of polarization anomaly, one to the north of the grid, and one in this centre section. The latter is the larger and somewhat the stronger and embraces a region roughly 2000 ft. by 2000 ft generally centred on station 9E on line 20N. Here peak values in the order of 3½ - 4 times background have been recorded both on the n=1 and n=2 spacings. However, it is evident that the anomalous expressions themselves are complex in detail, and the often irregular peakings throughout the region, these unaccountable by geometric considerations of the electrode array above, can only be presumed indicative of an irregular distribution of metallics. Nevertheless, a more consistent anomaly zone appears to emerge through the peak values on line 20N.

This runs at least from line 12N to 24N and is about 400 ft. at its widest. Its consistency is best displayed towards its southern end where both arrays provide comparable results both in degree and resolution and in their like correlation with a general resistivity low. Towards the north, and in fact up to line 32N, a possible plunge is indicated by the slightly stronger responses obtained at n=2 in conjunction with lowered resistivities.

The geology for this region is sparse and no outcrops appear over the zone itself. Whilst it is reasonable to suppose a flow setting, probably predominantly rhyolite, the magnetic coverage here clearly indicates by extrapolalation the presence of a cross-cutting diorite dyke which, perhaps by more than coincidence, transgresses the peak polarization zone at its apparent termination on line 12N. This could give to a second strong chargeability peak on this line (at 18E) the implication of a faulted off-set with therefore an enclosed strike extent to the SE. The magnetics also provide in addition a local 1000 γ anomaly closely flanking the main polarization peaking on line 20N. This is so much an expression similar to the above dyke responses that a similar intrusion, albeit limited, might be conjectured here. What other intrusives may be present is not known as the quartz diorite plugs as seen elsewhere on the grid proved to yield no distinctive magnetic nor resistivity expression. Thus this polarization zone needs to be investigated on its own merits. Of good dimensions, it represents a target body that can be estimated from the background as manifestly containing 15% - 20% sulphides. The cover from the magnetics appears generally in the order of 50 ft. from line 20N south.

Still a part of this first anomaly region is a second less strong and more diffuse zone running between lines 16N and 32N just west of the BL. This latter is more clearly identifiable with the observed mineralization around the southern end of the largest diorite plug mapped. Pyrite is quite abundant here and has been noted most particularly in the rhyolitic wall rocks. Nevertheless, this is the locality where previous drilling revealed significant amounts of copper, albeit sub-ore, in the intrusive itself. It is of some consequence therefore that the main axis of this polarization zone at about 4W passes through several incidences of malachite staining and chalcopyrite at surface west of the limits of the early drilling. This places the zone squarely in the diorite, and although the chargeability relief is only of the order 1½ - 2 times background, any implied evidence of as much as 10% sulphides in this local setting is obviously of interest. Further the sustained strength from the n=1 spacing to the n=2 indicates that this is no narrow concentration but something that may actually improve in depth. The best anomaly resolution occurs on line 24N at approximately 5W (n=1) with an apparent steep dip grid east. In a general region of lowered resistivities, there is no distinctive resistivity expression in correlation, nor as might be expected, any magnetic activity. As noted previously the diorite body provides no magnetic description of itself which means that it is no more precisely known through the present geophysics. However, along its faulted west contact, there is a certain amount of polarization relief culminating in two relatively sharp peaks, one at 12W on line 28N, and the other at 8W on line 52N. The relief most manifestly relates to pyrite mineralization disseminated through the host rhyolite which here is also in close contact with the adjacent andesites west. Geophysically it is not clear which is the more important contact, as the two peaks are too local in their inference of sulphide concentration to establish any consistent relationship. *In any event, these two anomalies in the overall context are of passing* interest only.

(c) NORTH-CENTRE SECTION

This is not the case with a system of anomaly peaks developing between lines 44N and 64N. What links these responses together is their consistent coincidence with a marked resistivity contrast between the order of resistivities already seen across the centre of the grid and a highly resistive belt of rocks lying to the east. The latter provide resistivities in the order of 4500 ohm-metres, and are presumed to relate to one specific andesite flow. (*Only in the extreme west of* lines 12N and 16N *do* comparable resistivities appear). The polarization response in correlation with this contrast thus suggests a contact mineralization between rhyolites and andesites, and a likely control for some of the sulphide emplacement in the area. So faithful indeed is the correlation here that the polarization peak on line 48N at the BL on the contour plan can properly be joined to that appearing at 6W on line 52N. On the other hand, the relationship is not perpetual, for breaks are evident on line 40N and 28N, as the contour continues to the south. On lines 36N and 32N the chargeability association finds further correlation in the magnetics.

Since these latter two lines virtually represent the extent of the magnetic coverage over this contact, the sharp relief of about 1000 γ could be characteristic. In the setting it could possibly indicate pyrrhotite which if fully attributable to the magnetic width and amplitude observed, would almost alone be in sufficient amounts to account for the anomalous chargeabilities. This of course is not a necessary conclusion as minor magnetite or an intrusive are equal possibilities. Again, going north from line 64N, the main contact is lost, it presumably swinging sharply NE off the grid. The existence of this strong resistivity unit obviously makes some differentiation of the andesite flows, a fact that could be of assistance in future geologic projections.

(d) NORTH SECTION

The second major area of polarization anomaly given by the results occurs in this farthest north portion of the grid. It runs from lines 64N to 84N, and possibly remains open to the north. Over this defined 2000 ft. distance it is approximately 1000 ft. wide, but again it breaks down into two component zones. One of these embraces the peak chargeability recorded with the n=1 array on line 80N at station 1W (Sub-BL). Approximately 3½ times background this response centres on the eastern rim, as mapped, of a small diorite plug. The latter in its surface exposure is highly altered to this side, and there is every evidence of mineralization in the setting. Most notable is the geochemical train, anomalous in both copper and molybdenum, detected down-drainage from the intrusive. By these measures, this is an anomaly zone of interest and it merits further investigation. However, it needs be recognized that it is relatively confined, exhibiting about 1000 ft. of strike and 200 ft. of width. Not surprisingly therefore there is some diminution in amplitude of response on the n=2 spacing, although this is not so great as to affect the continuation in depth. On the other hand, this zone, largely occurring in rhyolites, may well be an integral part of the second polarization zone in this area, and indeed may join it on line 72N.

The second zone passes through the western edge of the same diorite plug, but is more persistent and extends well beyond the surface limits of the intrusive. Presuming its continuity through the very short line 76N, over 2000 ft. of strike is indicated more or less running with the adjacent contact of the rhy-otite with the andesites to the west. It appears of some consequence there-fore that as the rhyolites suddenly widen at line 72N, even though this may be part caused by topography, the chargeability expressions become better developed, and over the section 68N to 72N provide relief in the order of 3 times back-ground in correlation with a fairly defined resistivity low. This relief tends increase at the deeper spacing. As sulphide concentrations averaging between 10% - 15% seem likely, this section deserves a separate checking to further sample the potential in this intruded environment. Again a steep dip to the east is implicit to this zone.

(e) GENERAL

Although consideration of this latter region completes the evaluation of the main body of data, mention can usefully be made of one or two additional features. In the first instance, increasing polarization values have been observed on the eastern extremities of lines 52N and 56N. Not fully resolved into anomalies, these chargeabilities nevertheless suggest the appearance of another mineralized zone at the contact of the high resistivity belt of previous note, but on the opposite side. This relief is not all due to background for it attains levels as high as some of the anomalies already discussed, and a new sulphide emplacement on the fringe of the grid area can reasonably be presumed. In the second place, there is some evidence that the magnetics provide changes in background level over some of the geolgic contacts in the area e.g. at 4W on line 8N, and at 4E on line 20N. Unfortunately at present there is nothing too consistent in these contrasts relative to outcrop geology, but it is presumable that with further information becoming available, a greater understanding of geologic extensions may be identified from the appropriate magnetic coverage.

CONCLUSIONS AND RECOMMENDATIONS

It is concluded as a result of the present coverages that a wide area of disseminated mineralization has been outlined, in which two major regions of anomalous polarization stand out as representing areas of increased metallic concentration. In the gross sense, both these regions provide areal dimensions of sufficient size to be of considerable interest for deposits ranging between 10% - 20% total sulphide content. However, there are evident variations within and relatively barren sections are probable. Thus attention is directed to peak chargeability zones that appear in both regions as expressions of likely locally controlled emplacements with the good chance of economic potential. Each region provides two such zones, and since they are of immediate appeal, they are separately recommended for drill testing.

The first hole has already been sited in the field from the field IP data. it is located at 10+70E on line 20N drilling approximately grid west at a depression of 60 degrees. The hole is planned to be taken to about 600 ft. The second and third holes have been recommended as follows:

DDH #2	Collar	5 + 00 W (Sub BL) on line 80N
	Bearing	Grid East
	Depression	- 45 degrees
	Estimated Length	600 ft.

DDH #3	Collar	00 + 00 (Sub BL) on line 72N
	Bearing	Grid West
	Depression	- 45 degrees
	Estimated Length	600 ft.

The fourth hole that has been added as a result of the completed interpretation is sited thus:

DDH #4	Collar	1 + 50 W on line 24N
	Bearing	Grid West
	Depression	- 45 degrees
	Estimated Length	600 ft.

The order in which the holes are given is not meant to be the order of drilling. The former has no geophysical significance whilst the latter is obviously going to be dominated by logistics, weather, access, etc.

The recommendation of the above four holes to widely sample what is essentially the one setting of intruded flows is some measure of the enhancement the geophysical results have brought to a lively area of sulphide mineralization. Should any of these holes provide encouraging intersections, then not only the geologic features of the core but the possible geophysical expression of them at surface are liable to yield likely controls for further drilling. In this respect, it is recommended that the wider implications of the geophysical results not be lost sight of. There are, for instance, certain magnetic expressions, not now certainly identified, that could take on added meaning if their source be fully established. Particular reference is made here to the suggested magnetic mineralization at the rhyolite-andesite contact along the east side of the grid. But perhaps of most importance is the evidence provided by the resistivity results that the andesite flows are differentiated, and that the highly resistive unit on the east side has no immediate counterpart to the west. This could cause some re-consideration of the concept of an anticlinal structure in the cross-section across the grid.

BARRINGER RESEARCH LIMITED

September 1, 1966

J. B. Boniwell
Chief Geophysicist.

830

LEGEND

Contour interval 1 millisec

1 millisec interval

5 millisec interval

Depression

INDEX

	A
C	B

Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 830 MAP #2
Work undertaken by
BARRINGER RESEARCH LTD, Toronto, Canada.

TEXAS GULF SULPHUR CO. INC.

BIG ONION PROPERTY – SMITHERS B.C.

INDUCED POLARIZATION CONTOURS

POLE – DIPOLE (n = 2)

AUG. 1966	Scale 1" = 200	DWG. 5-150-2A

830

LEGEND

Contour interval 1 millisec
1 millisec interval
5 millisec interval
Depression

INDEX

	A
C	B

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NO. 830 MAP #3

Work undertaken by
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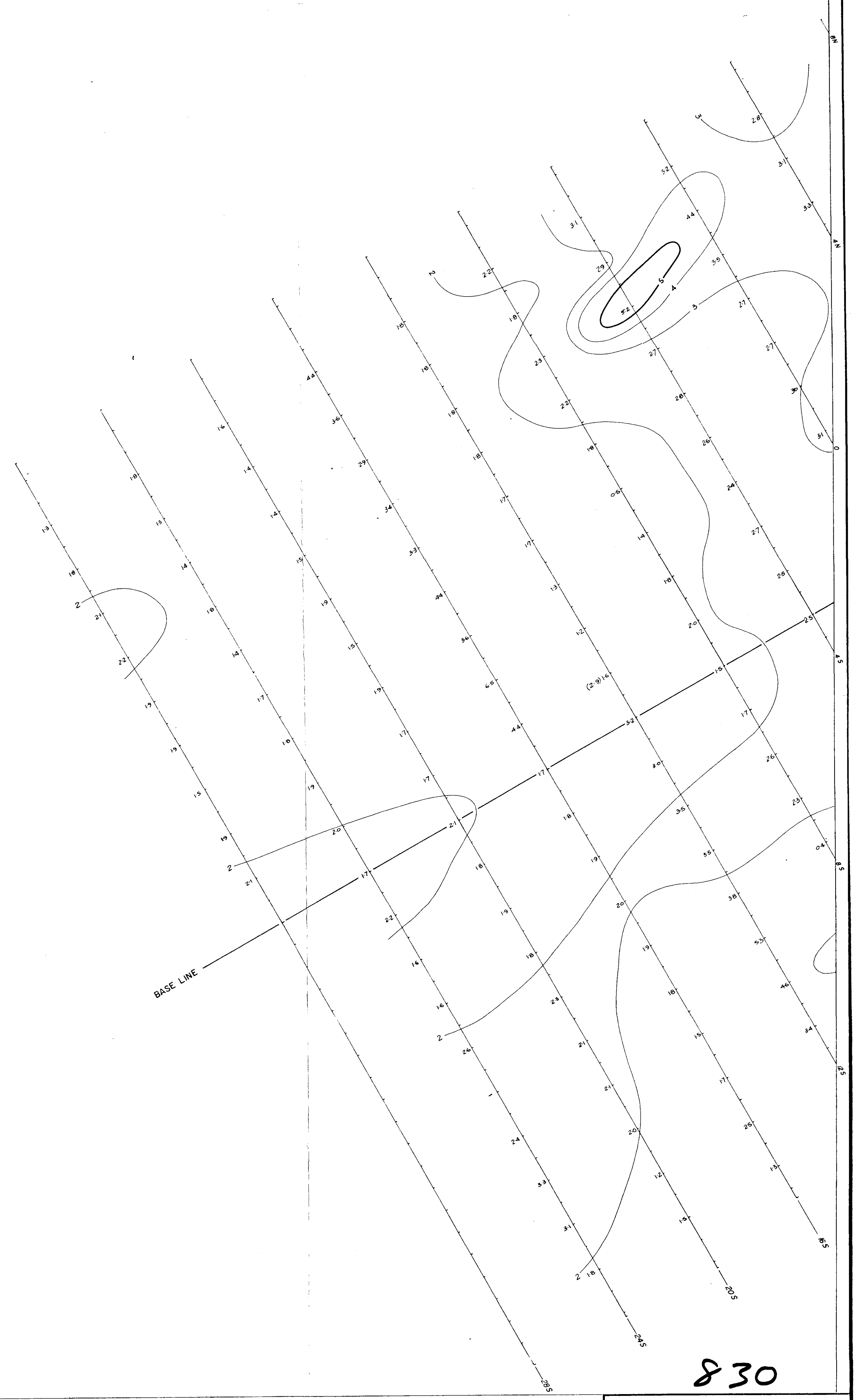
BIG ONION PROPERTY – SMITHERS B.C.

INDUCED POLARIZATION CONTOURS
POLE - DIPOLE (n=2)

AUG. 1966	Scale 1" = 200'	DWG. 5-150-2B



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LEGEND

Contour interval 1 millisec

- 1 millisec interval
- 5 millisec interval
- Depression

INDEX

A
C B

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NO. 830 MAP # 4

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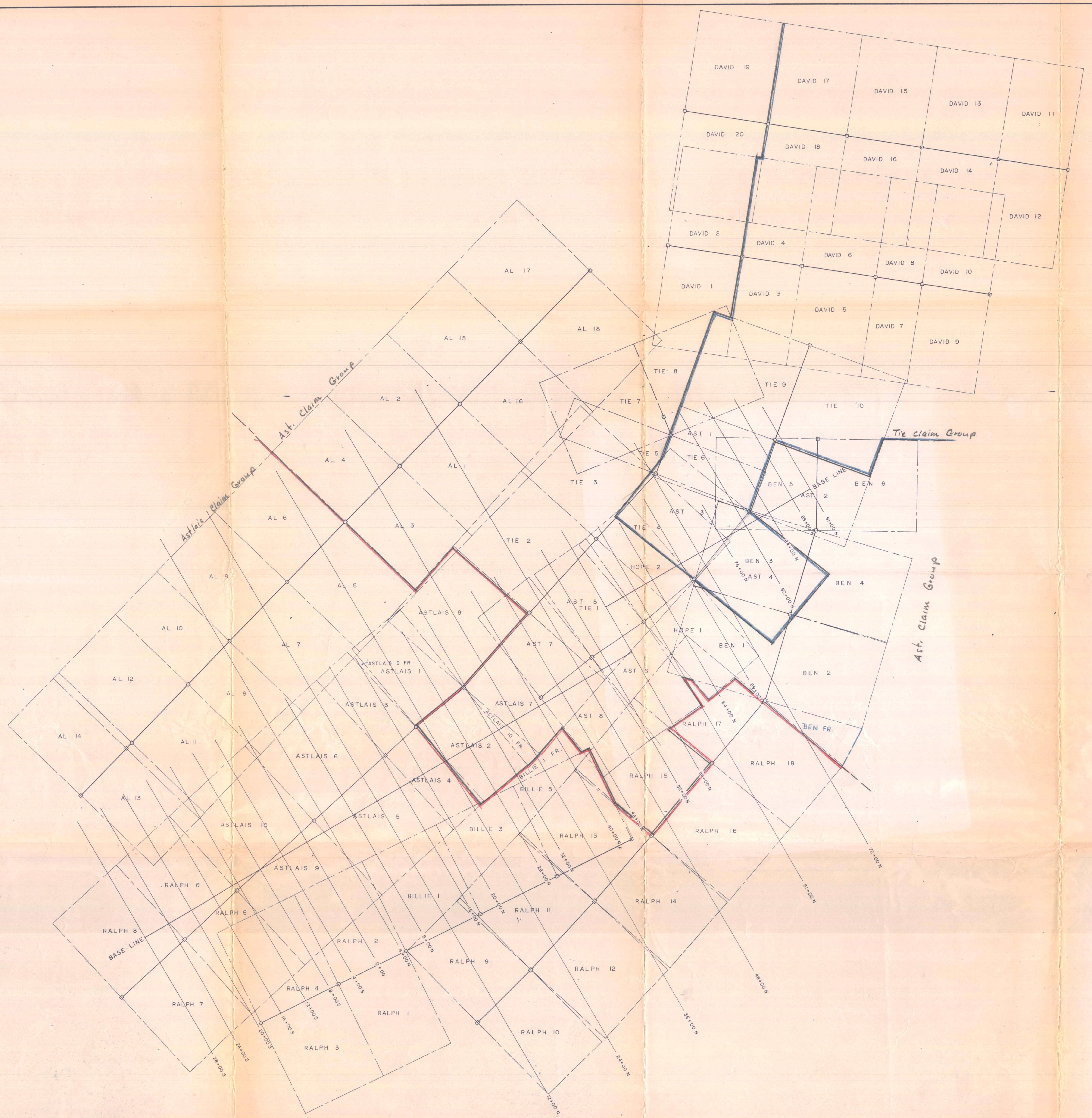
BIG ONION PROPERTY – SMITHERS B.C.

INDUCED POLARIZATION CONTOURS
POLE - DIPOLE (n=2)

AUG. 1966	Scale 1" = 200'	DWG. 5-150-2C



Department of
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ASSESSMENT REPORT
NO. 830 MAP # 15'A

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SCALE: ONE INCH = 600 FT.

8 30

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BIG ONION PROPERTY		
Omineca M.D.		
WORK BY	DRAWN BY	DATE