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GEOPHYSICAL REPORT
ON
AIRBORNE MAGNETIC AND VLF-EM SURVEYS
OVER THE
RWS 2 AND 4 CLAIMS
INDIAN RIVER AREA
VANCOUVER MINING DIVISION
BRITISH COLUMBIA

PROPERTY : 30 km N16E of Vancouver, B.C. on
Forestry Creek and Indian River
: 49° 122° NW
: N.T.S. 92G/10W

WRITTEN FOR : CHEVY OIL CORPORATION
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SURVEYED BY : COLUMBIA GEOPHYSICAL SERVICES LTD.
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Vancouver,

DATED : February 1



GEOTRONICS
Engineering
VANCOUVER



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SUMMARY

Airborne magnetometer and VLF-EM surveys were carried out over the RWS 2 and 4 Claims owned by Chevy Oil Corporation of Vancouver, British Columbia, during the summer of 1982. The claims are located on Forestry Creek and Indian River, 30 km N18E of Vancouver. The terrain is steep and mountainous with vegetation being fir, cedar and spruce trees. Access is gained by a series of 4-wheel drive logging roads from Squamish, B.C. The purpose of the surveys was to aid in the mapping of geology as well as locate probable areas for the exploration of mineralization.

The area is underlain by the favourable metasedimentary and metavolcanic rocks of the Gambier Formation of Jurassic age and granodiorites and related rocks of the Cretaceous Coast Range Intrusives.

The claims are located in proximity to the Maggie Mines Ltd. property on which the presence of significant intersections of gold, copper, lead, zinc and silver mineralization is known to occur. The Chevy Oil property is also located near the Anaconda-Brittania Mine property which produced copper, silver, zinc and gold mineralization.

The airborne surveys were flown at about a 50-meter terrain clearance on contour-type lines with a separation averaging about 100 meters. The instruments used were Sabre Electronic proton precession magnetometer and a Sabre Electronic VLF-EM receiver. The magnetic data were picked up from the strip charts and computer-contoured. The contours were drawn on a survey plan on which the VLF-EM anomalies were plotted as well.

CONCLUSIONS

1. The Chevy Oil property is underlain by rocks that may be favourable to mineralization. In the area occurs the Britannia Mines property as well as the Maggie Mines property. A number of gossan areas and mineral showings are known to occur on recently staked claims in the surrounding area as well.

2. The magnetic survey appeared to map various phases of the Coast Intrusives. The more favourable Gambier Group metavolcanics may occur on the property as magnetic lows but otherwise may not have a magnetic signature different from that of the Coast Intrusives.

3. Both the VLF-EM and magnetic surveys revealed lineations on the RWS Claims that are likely caused by fault, shear and/or contact zones. These usually are important as indicators of sulphide and native gold mineralization, especially where the lineations cross.

RECOMMENDATIONS

The property should be geologically mapped and/or prospected. If the results are then warranted, then the exploration program should be continued in the form of soil sampling, ground EM and possibly magnetics.

GEOPHYSICAL REPORT

ON

AIRBORNE MAGNETIC AND VLF-EM SURVEYS

OVER THE

RWS 2 AND 4 CLAIMS

INDIAN RIVER AREA

VANCOUVER MINING DIVISION

BRITISH COLUMBIA

INTRODUCTION AND GENERAL REMARKS

This report discusses the survey procedure, compilation of data and the interpretation of airborne magnetic and VLF-EM surveys carried out over the RWS 2 and 4 Claims during the summer of 1982. The surveys were carried out by E.A. Dodd, instrument operator and project manager, and Lloyd Brewer, navigator, both of whom are of Columbia Geophysical Services Ltd. The survey data were brought to the writer, already compiled and contoured, for interpretation.

The RWS Claims were staked for gold, silver and copper mineralization which occurs nearby on the very promising prospect of Maggie Mines Ltd. as well as within the long-running Brittania mine (not running at present).

The object of the two surveys was to aid in the geological mapping of lithology and structure for the purpose of exploration of this type of mineralization.

PROPERTY AND OWNERSHIP

The property consists of two modified grid claims totalling 40 units as follows and as shown on the claim map.

<u>Claim Name</u>	<u>No. of Units</u>	<u>Record No.</u>	<u>Expiry Date</u>
RWS 2	20	1120	Nov. 30, 1983
RWS 4	20	1122	Nov. 30, 1983

The two claims are owned by Chevy Oil Corporation of Vancouver, British Columbia

LOCATION AND ACCESS

The claim area is 30 km N18E of Vancouver and is located on Forestry Creek and on the Indian River.

The geographical coordinates are $49^{\circ} 33'$ N latitude and $122^{\circ} 56'$ W longitude.

Property access is by a logging road off Squamish Highway just south of Shannon Falls or by a water taxi from Deep Cove up Indian Arm to the Indian River mouth, then on a logging road leading north along the Indian River for 8 km.

TOPOGRAPHY

The property is located at the south end of the Pacific Ranges which is a physiographic unit of the Coast Mountains. Ranges which is a physiography unit of the Coast Mountain.

The terrain is, in general, steep and mountainous with elevations ranging from 270 m to 1,270 m. The claims are dissected by the southeast-draining Indian River with general relief from range to valley being in the order of 1,000 m. The area is forested and overburden covered with only scattered outcrops generally exposed except for precipitous rock at high elevation. Vegetation on the lower slopes consists of Douglas fir, cedar and spruce.

HISTORY OF PREVIOUS WORK

On the RWS Claims no previous work has been done since the property has been staked.

The area of the Britannia district to the northwest of the claim area has long been well known for production from the Anaconda Mine. Production between 1905 and 1974 yielded 55 million tons of ore grading 1.1% copper, 0.65% zinc, 0.2 oz/ton silver and 0.02 oz/ton gold.

Exploration work on the Maggie Mines property, in proximity to the recently acquired land, between 1977 and 1981 included trenching, geological mapping, diamond drilling, geochemical analysis on diamond drill core, soils and stream sediments, Turam surveys performed by another company in 1970 and reinterpreted, and magnetic surveys.

GEOLOGY

The property according to the GSC map of the area, is underlain by granodiorites and quartz diorites of the Cretaceous Coast Intrusives as well as possibly metasedimentary and metavolcanic rocks of the Gambier Formation of Jurassic age. Cappings

of Tertiary Garibaldi Group basalts also occur in the area.

The following is quoted from the geological report on the nearby Fred Claim Group by W.G. Timmins:

"The favourable metavolcanics (Gambier Formation) appear to be of rhyolite to dacite composition, and are associated with argillites, cherts, anhydrites and minor barite units. The greenstones, cropping out discontinuously as pendants within granitics, are the host rocks for the Britannia Mine, the Maggie, McVicar and other nearby prospects, the Northair Mine, Seneca and Fire Lake prospects as well as numerous other showings.

"They are metamorphosed regionally in the lower greenschist facies and intensely deformed.

"The regional structure is dominated by transposition of pendants of the older metavolcanics in northwest striking attitudes. These may or may not be accompanied by massive regional shear zones such as the Britannia shear.

"Structure and stratigraphy in the area are complicated and as yet, not well known. The structure in the area of the Maggie Mines property consists of tight folds and the transposition of rocks into S-Tectonites."

"The following is an abstract quoted from a paper titled "Deformed Mesozoic Volcanogenic Cu-Zn Sulphide in the Britannia District, British Columbia" authored by J.T. Payne, J.A. Bratt and B.G. Stone and printed in Economic Geology, volume 75, 1980, pages 700 - 721:

'The Brittania copper-zinc sulphide deposits, previously described as having formed from hydrothermal solutions emplaced into foliated host rocks, are re-interpreted as volcanogenic in origin and to have been deposited from hydrothermal and exhalative solutions related to contemporaneous dacite volcanism and then deformed during later shearing and faulting. Massive sulphide deposits occur near the upper contact of coarse dacitic tuff. Anhydrite, barite, and chert form related exhalative deposits.'

Pyrite, pyrrhotite, chalcopyrite, sphalerite and galena are the principal sulphide minerals [on the Maggie Mines property]. The mode of occurrence of silver and gold which has been reported in minor quantities is not known.

"The sulphide minerals occur in several forms. Pyrite and pyrrhotite are frequently disseminated in some of the volcani-clastic units, although not necessarily together. Observations suggest that the principal occurrence of the other sulphides is associated with silicified zones.

"Reports and news releases on the Maggie Mines Ltd. property indicate the presence of significant intersections of copper, lead, zinc and silver mineralization indicated by drilling carried out on the property within a possible massive sulphide volcanogenic mineral belt sub-parallel to and some four miles northeast of the past productive Brittania ore zones."

SURVEY PROCEDURE

The survey was contour flown at 75 meter elevation intervals. The main bird terrain clearance was 50 meters. Navigation was visual, using 1:50,000 scale N.T.S. maps blown up to

1:10,000. The flying was difficult, due to the rugged and varied terrain, but the chief navigator, Mr. Lloyd Brewer, who had previously done much of the claim staking in the area, was able to draw on his experience to overcome numerous navigational pitfalls. He carried out his duties in a thoroughly diligent and professional manner.

Aerial platforms used to conduct this survey were Bell Jet Ranger III helicopters owned and operated by Quasar aviation and Corporated Helicopters Ltd. The pilots were Mr. Dave VanPatten and Mr. Jim Logue, who were chosen over other operators in the province because of their rotary-wing experience and their familiarity with the mountainous terrain east and west of Howe Sound.

Mr. Eugene Dodd, President of Columbia Geophysical Services Ltd., was the instrument operator and project supervisor.

A two-meter bird, specifically designed for the Squamish airborne project, was fitted with a magnetometer coil and two omni-directional EM receivers and towed beneath the helicopter on a 10-meter cable.

Airspeed was a constant 60 K.P.H. Creek valleys and canyons were penetrated thoroughly. The slow airspeed provided safety, detailed coverage of boxed-in areas, and consistency of data retrieval, which is critical in rugged terrain. Increased airspeed would increase the inconsistency of the results.

The project supervisor, Mr. Dodd, has over 14 years of experience in conducting aerial magnetic, electromagnetic, and radio-metric surveys from fixed- and rotary-wing aircraft, under all types of terrain conditions.

INSTRUMENTATION AND THEORY

a) Magnetic Survey

The magnetic data are detected using a nuclear free precession proton magnetometer, manufactured by Sabre Electronic Instruments Ltd., of Burnaby, B.C. The magnetometer measures the total count of the earth's magnetic field intensity with a sensitivity of one gamma. The data are recorded on magnetic tape and a 12 cm analog strip chart.

The magnetic patterns obtained from a regional airborne survey are directly related to the distribution of magnetite in the surveyed area. However, the geology cannot be deduced from isomagnetic maps by simply assuming that all magnetic highs are underlain by gabbro or ultramafic rocks, and that all magnetic lows are caused by limestone or chert. The problem with such simplistic approach is that magnetite is not uniformly distributed in any type of rock. Other problems arise from the fact that most geologic terrains have rocks of high susceptibility superimposed on less 'magnetic' rocks, and vice versa. Cultural features such as powerlines, pipelines and railways also complicate matters. So many variables can be involved that it may be impossible to make a strictly accurate analysis of the geology of an area from magnetic data alone. The researcher must make use of other data such as geological, photogeological and electromagnetic information in combination with magnetic data to make accurate geological analyses.

b) VLF-EM Survey

A two frequency omni-directional receiver unit, manufactured by Sabre Electronic Instruments Ltd., of Burnaby, B.C., was used for the VLF-EM survey. The transmitters used are NLK Arlington (Seattle) Washington, operating on 24.8 KHz, and

Annapolis, Maryland, transmitting at 19.0 KHz. These signals are used due to their ideal orientation with respect to north-west and east-west geological structures, and their good signal strengths. The measurement taken during the survey is the variation in the horizontal component of the signal strength.

The VLF (Very Low Frequency) method uses powerful radio transmitters set up in various parts of the world for military communications. These powerful transmitters can induce electric currents in conductive bodies thousands of kilometers away from the radio source. The induced currents set up secondary magnetic fields which can be detected at surface through deviations in the normal VLF field. The VLF method is inexpensive and can be a useful initial tool for mapping structure and prospecting. Successful use of the VLF requires that the strike of the conductor be in the direction of the transmitting station so that the lines of magnetic field from the transmitter cut the conductor. Thus, conductors with northeast to southeast strikes will respond to Annapolis transmissions, while conductors striking south-southeast to east-northeast will respond to Seattle transmissions. Conductors striking southeast may respond to both stations, giving coincident field strength peaks.

The theory of VLF-EM interpretation is quite simple. Conductors are located at field strength maxima. In the Howe Sound area, one may assume that a Seattle field strength peak represents a conductor with a generally northwest-southeast trend, and an Annapolis peak will be a conductor with an east-west trend. This, of course, only applies to conductors with clearly linear trends and cannot be assumed for single line anomalies.

It is impossible to determine the quality of conductors with

any reliability, using field strength data alone. The question of linearity is in doubt if the conductor does not appear to cross the adjacent flight lines. The relatively high frequency results in a multitude of anomalies from unwanted sources such as swamps, creeks and cultural debris. However, the same characteristic also results in the detection of poor conductors such as faults, shear zones, and rock contacts, making the VLF-EM a powerful mapping tool.

The interpretive technique requires information from magnetic surveys, air photo analyses, and ground traverses to aid in discrimination between important and unwanted anomalies. Even armed with this information the interpreter can easily be misled.

DATA REDUCTION AND COMPILATION

The observant magnetic total field was recorded on analogue strip charts. These were played-back together with audio recordings containing fiducial markers, and the fiducial markers were transferred to the strip charts. The fiducial markers were identified with topographic features along the flight lines.

Each flight line within each survey map-area was digitized using a Houston Hipad digital digitizer, and the data was stored on 5 1/4 inch microcomputer diskettes.

The fiducial marker locations and flightline paths between fiducial markers along non-linear flight line were digitized with an accuracy of ± 12.5 meters.

After merging the flight line information with the flight line location coordinated, an equispaced map grid matrix

was computed. The total magnetic field was interpolated at regularly spaced positions every 125 meters from the observed data. The interpolation method consisted of a linear skew norm method based on the potential field equation. All computations were completed on an Otrona Attache microcomputer.

The contour plans of the total magnetic field were generated by a computer printer plot contouring procedure. The accuracy of contour locations is believed to be ± 16 meters. The final contour plans were traced from the printer plot contour plans onto drafting film, and VLF-EM field strength peaks and geolocial information were superimposed.

DISCUSSION OF RESULTS

The magnetic field over the total area of the RWS 2 and 4 claims varies considerably. The range is about 1,000 gammas varying from below 1,500 gammas on the east central side of the property to over 2,400 gammas on the south central, west central, and northeastern parts of the property.

Geological mapping done by the G.S. of C. (Roddick) shows the claims area to be underlain by quartz diorite over the northeastern half of the property and by granodiorite over the southwestern half. The magnetic signature over the two rock-types, as shown on Sheet 2, appears to be about the same.

Two magnetic highs cover major portions of the property. One is located in the northeastern corner of the RWS 2 Claim and the other with a limb striking northwesterly, occurs within the central part of the RWS 4 Claim. The writer feels the likely cause of these highs are more basic phases of the Coast Intrusives such as diorite or gabbro, both of


which occur in this area. Two other causes could be: (1) a magnetite-enriched area of quartz diorite; or (2) cappings of the Tertiary Garibaldi volcanics.

The favourable Gambier Group metavolcanics and metasediments may occur on the property since they have been mapped by the G.S.C. in close proximity. This group may have a magnetic signature similar to that of the granodiorites and quartz diorites. It is also quite possible that the Gambier Group has lower magnetic intensity than the intrusives. If this is the case, then the magnetic lows such as those occurring within the northeastern and southwestern corners of the RWS 4 Claim may be indicative of the Gambier Group.

Since VLF-EM anomalies as well as magnetic lows are often indicative of geological structure, such as fault, shear, and contact zones, the writer has drawn on the map lineal trends of magnetic lows and VLF-EM anomalies. Often the two are coincidental. Structure is often important for the emplacement of mineralizing fluids. For the same reason, where lineations intersect, it is considered to be of greater exploration interest.

It should also be pointed out that the VLF-EM anomalies may be indicating sulphide mineralization directly. This would hold true whether the VLF-EM anomalies occur on lineal trends or whether they are simply 1-line anomalies.

Respectfully submitted,
GEOTRONICS SURVEYS LTD.


David G. Mark,
Geophysicist

February 10, 1983

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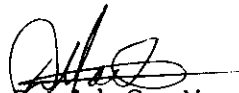
GEOPHYSICIST'S CERTIFICATE

I, DAVID G. MARK, of the City of Vancouver, in the Province of British Columbia, do hereby certify:

That I am a Consulting Geophysicist of Geotronics Surveys Ltd., with offices are #403-750 West Pender Street, Vancouver, British Columbia.

I further certify:

1. That I am a graduate of the University of British Columbia (1968) and hold a B.Sc. degree in Geophysics.
2. I have been practising my profession for the past 15 years and have been active in the mining industry for the past 18 years.
3. That I am an active member of the Society of Exploration Geophysicists and a member of the European Association of Exploration Geophysicists.
4. This report is compiled from data obtained from airborne magnetic and VLF-EM surveys carried out by Columbia Geophysical Services Ltd. under the supervision of E.A. Dodd, during the period from June 3rd to October 5th, 1982.
5. I have no direct or indirect interest in the RWS 2 and 4 Claim nor in Chevy Oil Corporation of Vancouver, B.C., nor do I expect to receive any interest therein as a result of writing this report.


David G. Mark,
Geophysicist

February 10, 1983

AFFIDAVIT OF EXPENSES

This is to certify that I, Eugene A. Dodd, Manager of Columbia Geophysical Services Ltd. carried out airborne magnetic and VLF-EM surveys between the dates of June 5 to October 3, 1982 over the RWS 2 and 4 Claims in the Indian River area of the Vancouver Mining Division, British Columbia for the value of \$100/km. The total number of kms flown were 90.0, giving a total value of \$9,000.00 to the surveys.



Eugene A. Dodd

ANACONDA

122° 56'

WHITECAP ENERGY LTD.

STAKED

ALSTER ENERGY

VANCOUVER M.D.

NEW WESTMINSTER M.D.

MT. JUKES

TRINITY OIL & GAS LTD.

PAN ALASKA RESOURCES LTD.

AUDITPREP RESOURCES

RWS 2
1120 (II)

CHEVY OIL CORPORATION

RWS 4
1122 (II)

49° 33'

BIVOUAC MTN.

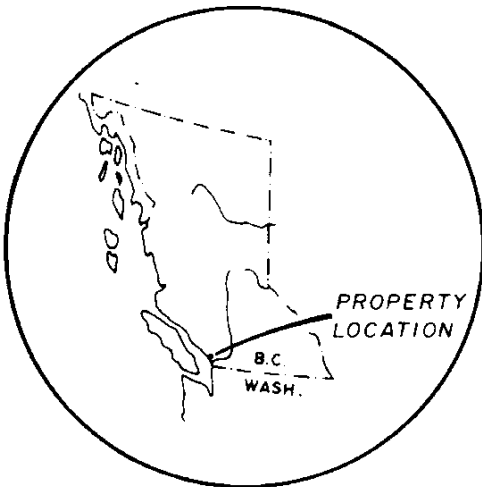
WATER SUPPLY AREA
NO STAKING

MT. ELDEE

Forestry Ck.

Brandt Ck.

RWS GROUP

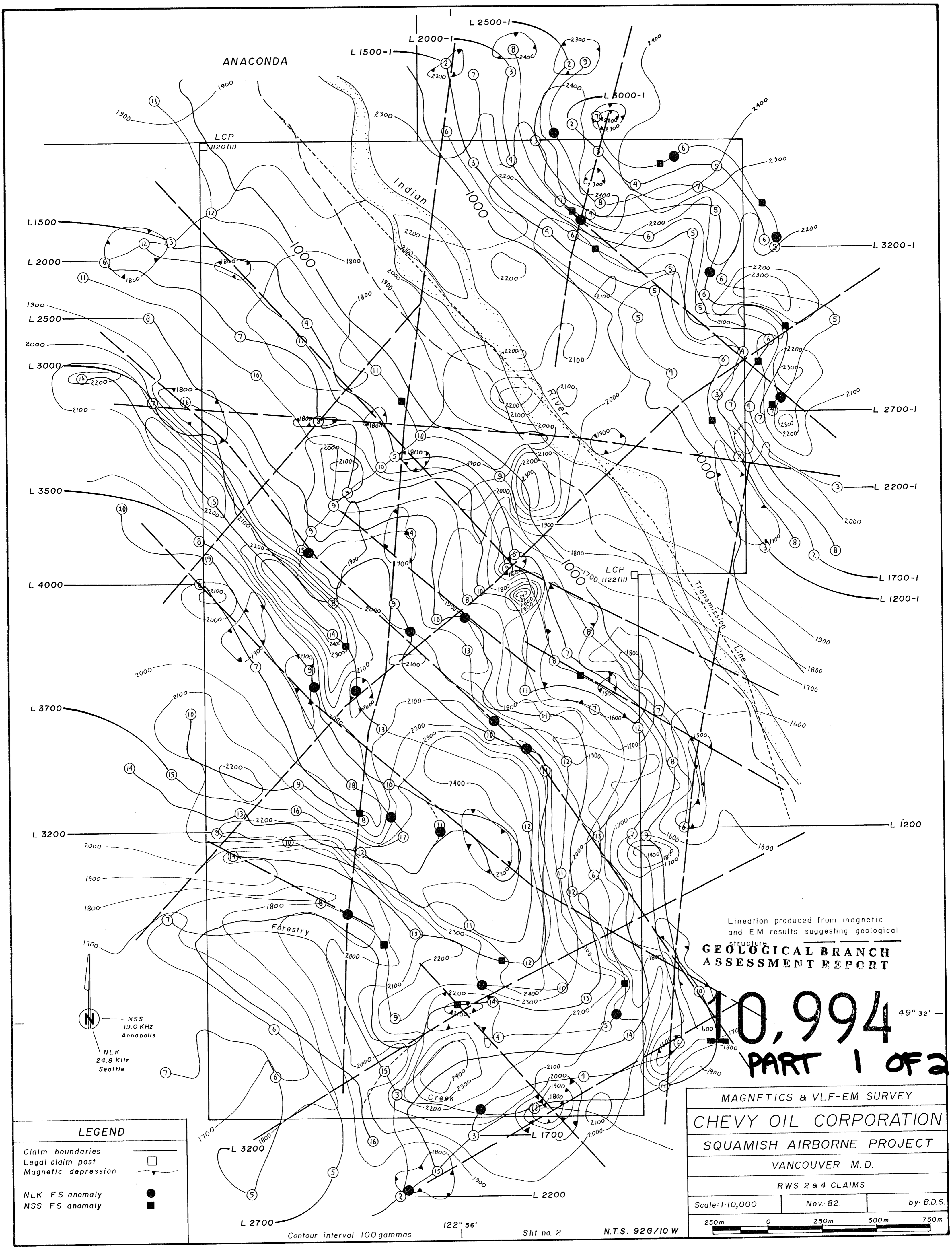


**CHEVY OIL CORPORATION
RWS 2,4 CLAIMS
CLAIM LOCATION MAP
INDIAN RIVER AREA
VANCOUVER M.D.**

1:50,000 Jan. 83 Sht. 1 B.D.S.

N.T.S. 92 G/10 W

1 Km 0 1 Km 2 Km



Lineation produced from magnetic and EM results suggesting geological structure
GEOLOGICAL BRANCH ASSESSMENT REPORT

10,994 49° 32' -
PART 1 OF 2

MAGNETICS & VLF-EM SURVEY		
CHEVY OIL CORPORATION		
SQUAMISH AIRBORNE PROJECT		
VANCOUVER M.D.		
RWS 2 & 4 CLAIMS		
Scale: 1:10,000	Nov. 82.	by: B.D.S.

LEGEND

Claim boundaries	—
Legal claim post	□
Magnetic depression	⤵
NLK FS anomaly	●
NSS FS anomaly	■