4626

GEOPHYSICAL - GEOLOGICAL
GEOCHEMICAL REPORT ON

COPPER CANION GROUP
CLAIM NO. 21G, 91G, 22G,
90G, 23G, 68G, &
COPPER MINT I, II, III

92B/13W

SEPT. 28 1973

MALASPINA
COLLEGE

Serving Central Vancouver Island
375 Kennedy Street, Nanaimo, B.C.
V9R 2J3
Telephone 753-3245

MAR 15 '74 PM

DEPT. OF MINES
AND PETROLEUM RESOURCES

3320

March 6, 1974

INITIAL
C.M.
C.G.C.
ACCTS.
C.I.
C.A.
R. T.
C.P.E.

Mr. E. J. Bowles
Chief Gold Commissioner
Dept. of Mines and Petroleum Resources
Douglas Building
Victoria, B. C.

Dear Mr. Bowles:

The revised report on the Copper Canyon Claim Group (Geophysical Report #4626), is enclosed.

I have revised the diagrams to eliminate any confusion regarding the directions of the profiles. Most now face north or west. Some exceptions had to be made, for example, as with the seismic lines which were run south and east (this depends upon the location of the geophone and the subsequent location of the seismic source stations).

Please note also under Cost Analysis I have included items which are not acceptable until next year. I have done this so that the report will be up to date for student use. In any case, we are only claiming assessment work of $4,800.00 rather than the full amount.

Also note that the report contains data obtained in May 1972 which predates the assessment year. No credit in time is claimed for doing this work, but it is included to make the report complete and up to date. Otherwise, gaps in the survey results would be evident. The chemical analysis (Bondar Clegg) was also completed prior to this year/s anniversary date and the cost of this analysis is only shown for completeness.

Mines ... Resources
ASSESSMENT REPORT
NO. 4626 MAP

The geochemical results were all negative (no indication of copper), hence, they were not listed in the report. In any case, I am not claiming costs for the geochemical results - I was supervising several other crews at the same time, and am only claiming my time.

Also, some of the plotting and interpretation took place after the assessment date. This, too, is listed for completeness only.

Yours truly,

A.B.L. Whittles

Dr. A.B.L. Whittles
Geological Technology

ABLW:aj
Encl.

GEOPHYSICAL - GEOLOGICAL - GEOCHEMICAL

REPORT ON

CLAIM GROUP -

Victoria, Elmore Fraction, Copper Canion, Victoria Fraction, Susan, Klondyke, Copper Mint I, II, and III.

CLAIM RECORD NUMBERS -

21G, 91G, 22G, 90G, 23G, 68G

LOCATION -

About 20 miles by road N.W. of the City of Duncan, B.C., on the Chemainus River Road, approximately 8 miles west of Highway No. 1, and approximately at Latitute 48° - 52' N., Longitude 123° - 48' W., Victoria Mining District, B.C.

AUTHOR -

A.B.L. Whittles, Ph.D.

HOLDERS OF CLAIMS -

George Kinneard
A.B.L. Whittles
F.C. Loring

FIELD WORK DONE BETWEEN AUGUST 1972 TO JULY, 1973

TABLE OF CONTENTS

LIST OF FIGURES

ASSESSMENT REPORT SUMMARY

The work in this report builds upon the work reported earlier (Whittles and Loring, 1971). New data is available from altimeter, gravity, induced polarization, low frequency electromagnetic, VLF (radio frequency) electromagnetic, magnetic, seismic, self potential, geochemical, and geological surveys. The instruments used are discussed in Section 5 of this report, which also includes a discussion of the computer programs used to correct the data. The computer programs are reported in detail in section 13lb). The work was completed during the period August, 1972, to July, 1973, on the days given in the Appendices 13(a), while the persons involved are listed in 13(d). Plotting and interpretation of results has taken place in July and September, 1973, and was completed by the writer of this report, Dr. A.B.L. Whittles. Dr. Whittles also supervised all the field work.

The anomalous zone noted in the 1971 Whittles and Loring Report has been extended approximately 900 feet from the river bank to line 600W on Claim 22G. It now appears likely that north-south folding of the mineralized zone occurs. This mineralized zone, with one fairly definite north-south fold, appears to be the major one on the property (See Figure 82). The VLF-EM anomaly disappears along the 700W line on Claim 22G which may be the location of a second north-south fold. The mineralization in this zone appears to be mainly pyrite, and probably mostly disseminated in occurrance; or at best, it may occur as narrow veins. The reasons for these conclusions are discussed in this report in Section 10, Interpretations.

A second adit has been discovered on the mountain side on the Klondyke claim. This has been briefly examined, and the mineralization explored by this adit appears to be similar in nature to that observed on the riverbank, although its strike is different.

Recommendations for future work are made in Section 11.

1. PROPERTY DESCRIPTION, LOCATION, AND ACCESS

The property location is shown in Figures 1 and 2, near the town of Chemainus, on Vancouver Island, B.C., Canada. It is reached by use of the MacMillan-Bloedel logging road starting at the Island Highway just south of the Chemainus cutoff. Some 8 miles along the logging road a small side road cuts off to the east and enters claim 22G. This claim access road proceeds right down to the Chemainus River, as shown in Figure 3. Several old logging roads cut through the property as does the Chemainus River and several small streams. The property is fairly flat to the west, but steep near the river and to the west. An old mine adit on the River's edge is a short distance north of an old shaft. This mine shaft, close to 300S - OW is about 15 feet across and 30 feet deep. There are the remains of several old buildings and machinery in the area.

Most of the area is covered with overburden, and small and large trees with heavy undergrowth.

The geological features will be described in Section 8. The observable structure-at the Chemainus River's edge-showed a number of schistic formations, with minor mineralization, striking S 80°W and dipping about 70° to the south. Mineralization is mostly pyrite with some chalcopyrite.

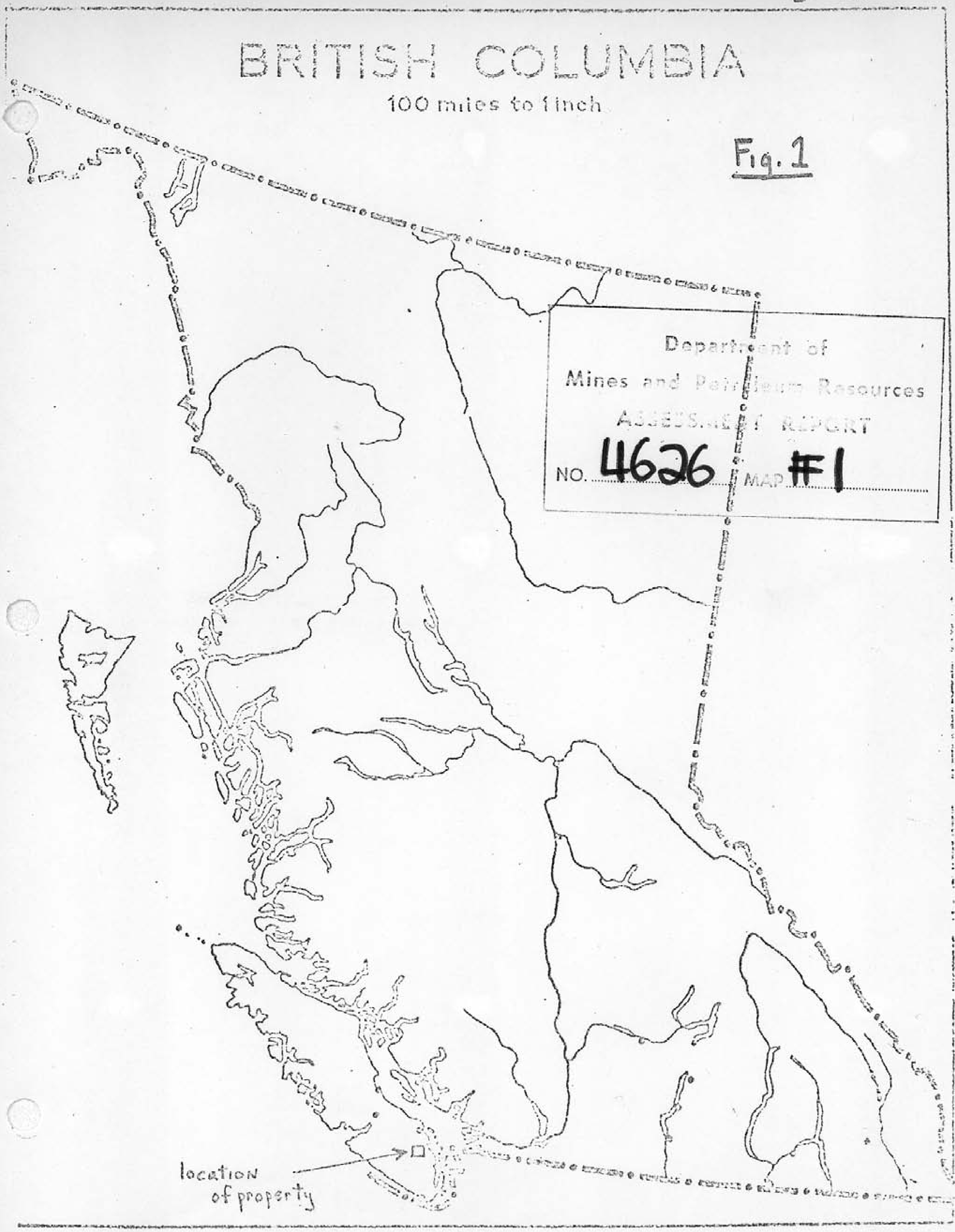
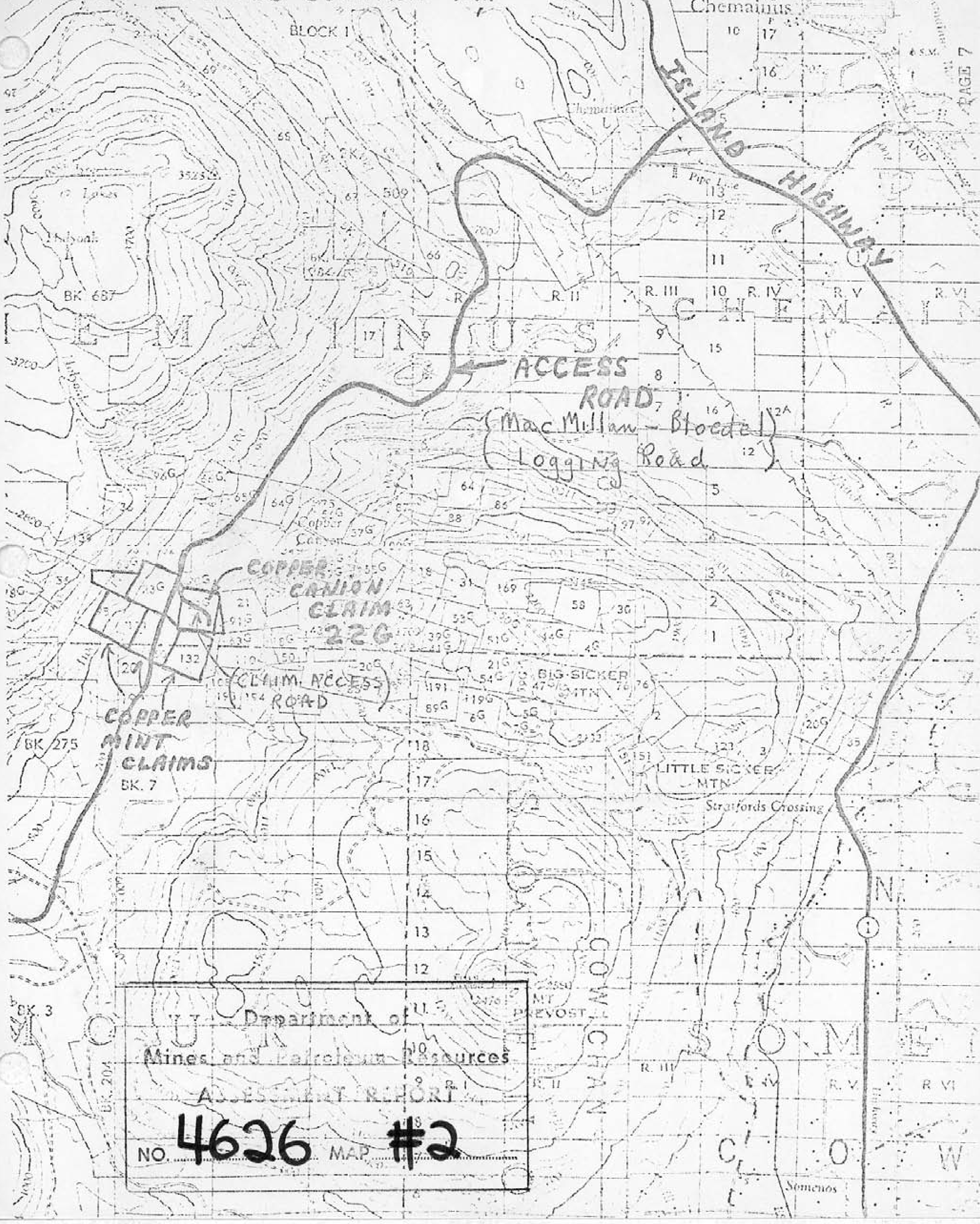

BRITISH COLUMBIA
100 miles to 1 inch
Fig. 1
Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 4626 MAP #1
location of property

Figure 2.

DETAILED LOCATION MAP



2. OWNERSHIP

The Copper Canyon Group of claims is owned by Mr. G. Kinneard, Nanaimo, Mr. F. Loring, P. Eng., Coombs, and Dr. A.B.L. Whittles of Nanaimo.

These claims are:

NAME	RECORD NUMBER
Victoria	21G
Elmore Fraction	91G
Copper Canyon	22G
Victoria Fraction	90G
Susan	23G
Klondyke	68G
Copper Mint I	
Copper Mint II	
Copper Mint III	

3. HISTORY

The first recorded mining interest in the Mount Sicker area occurred in the year 1897, following a forest fire which exposed gossans on what would later become the Lenora and Tyee south ore bodies of Mount Sicker Mines.

The Copper Canyon Claim area first appears in the Minister of Mines annual report for the year 1898, which reported on the Copper Canyon Claim as follows:

> "On this claim a tunnel has been run 100 feet alongside a quartz reef highly mineralized with copper pyrites. The width of the reef is 18 inches."

The claim area again appears in the 1903 report, which mentions mineralized lenses occurring on the Victoria and Copper Canion claims, and states that they are smaller size than previously noted, with the largest showing a width of only 6 or 7 feet, and the mineralization consisting of quartz, with iron sulphides, or pyrrhotite, with a small quantity of chalcopyrite. They also state that the barites found on the upper part of the hill, i.e. the Mount Sicker orebody, are lacking. The report of 1903 also states that these claims are located along the strike of, and on the same band of schists as occurring on the Tyee and Lenora properties, and that this band can be traced from these properties through the Victoria and Copper Canion claims. On the Victoria claim, there was reported two test pits, and a tunnel 150 feet in length, driven below the pits. Two short cross-cuts from this tunnel showed a mineralized zone in the schist to the north, and diorite to the south. On the steep bank of the river, outcrops of fairly solid iron sulphides were reported, and were tested by tunnels a few feet long, showing a small amount of copper, and low gold values.

In addition, in the 1903 report, work is reported on the west bank of the river, on the Copper Canion claim. Here, a tunnel was driven to the west following the strike of the schists for 310 feet. A quartz vein varying in width from 1 to 18 inches can be traced in the roof of this tunnel for 135 feet from the mouth, at which point it stops. From this tunnel 5 cross-cuts were driven, in north and south directions, looking for an extension of this quartz vein, but without success. From the end of the tunnel, a raise was being driven up to the surface. The only mineralization of any importance noted was in the quartz vein, which contained a considerable amount of iron sulphides and some small percentage of copper, with low gold values.

The claim area appears again in the 1928 report, as being owned by the Chemainus Valley Mining Company, Limited, a re-organization of the Mount Sicker and Brenton Mines, Limited. The report is as follows:

"Considerable work was done on the property before the war, consisting of a 300 foot shaft, and drifts from it on one claim, a short tunnel and a great deal of surface work on another claim, all exposing, it is stated, some attractive copper showings. The company is contemplating resuming operations in the near future."

Mineral rights were acquired by the present owners in 1970. Progress to date is covered by a report in June, 1971, (Whittles and Loring, 1971) which indicated, in the main, a large VLF-EM anomaly on Claim 22G. Further work extending this zone and doing reconnaissance surveys across the claim group is discussed in this report.

4. GENERAL GEOLOGY OF THE AREA

The area consists of meta-volcanics (Sicker Volcanics) and schist formations running nearly east and west. (See Muller 1971 Map). The schist formation observed on Claim 22G is assumed to be the same formation which runs through the Mt. Sicker Mines Ltd. Group of claims to the east. The Annual Report of the Minister of Mines (1928) notes that there are two mineralized zones on the claims to the east (on Mt. Sicker). These include one (at the southern edge of the schist zone that runs through the property) which has higher copper and lower zinc content than the north vein. The north vein is located at, or close to, the northern edge of the schist zone.

On Claim 22G, schist zones are apparent on the river bank, and strike about N. 80°E, dipping 70° to the south. The mineralization on Claim 22G appears to be, in part, related to the schist zones, somewhat in the manner of the Mt. Sicker deposits. The schist zones on Claim 22G are more silicious, more compact and less foliated than the Mt. Sicker deposits.

The old adit on Claim 22G apparently was exploring the southern edge of a schist zone. According to the 1898 Annual Report, the mineralized zone explored by this old adit was a 'quartz reef', highly mineralized with copper pyrites. The width of the reef is 18 inches. The deposit appears to lack the large percentage of barite found in the Lenora-Tyee (on Mt. Sicker) deposits.

The mining report of 1903 discussed the underground work to some extent. The mineralization observed on the river bank disappeared 135 feet in, which corresponds to the V.L.F.-EM high observed at 100W, 200S (which appears quite localized). The adit continues for another 200 feet with cross-cuts off north and south. Most of the underground work beyond the 135 feet cut off appears to be in schist.

Other quartz veins were observed to the south and north of the adit. One (at approximately 200W 800S - see Fig. 3) was opened by a short blast hole and a grab sample taken. This assayed at 10.2% copper. These small veins appear to strike in a different direction to the shear zones, about N 65°W. They seem to be quite localized.

Diorite is reported in the area, specifically on Victoria Claim 21G, (see the 1903 Minister of Mines Annual Report), but exploration to date gives no evidence of this on the west side of the river, apart from some (possibility glacial) float found in several locations.

5. INSTRUMENTS AND COMPUTER PROGRAMS USED

(a) Line Surveying Equipment

Lines were surveyed and cut where necessary. Brunton compasses on tripods and 'poly chains' were used for most lines. Distances were corrected for slope, which was estimate with Suunto inclinometers. It is estimated that the 100' station locations are precise to about 5 feet along the reconnaissance line. The cummulative error in the poly chains has lead to a larger absolute error along the base lines (See Section 6(a)).

A computer program was used to calculate the co-ordinates of the stations along the random lines RL1 and RL2. This program may be found in the appendices (13.(b)).

Elevations of two of the Altimeter Reference Stations were surveyed in using an automatic level, and a levelling rod precise to the nearest 0.01 foot. The local reference used to obtain these elevations was the base station OW, ON, which has been tied in by altimeter surveys to a known elevation bench mark in Nanaimo.

(b) Altimeter

The instrument used was a Pauline System Micro Surveying Altimeter Model MJ-6 with a measuring precision of ± 1 foot. The reproductibility of the unit, with temperature and drift correction, was about $\pm$ 10 feet, or better. Note that four separate consecutive readings were taken at each station and averaged. The temperature correction computer program may be found in the Appendices and is based on the formula:

Correction in feet = $(h_2 - h_1)$ $(T_2 + T_1 -100)$ 0.00102

where h_1 = altimeter elevation for 1 station

h_2 = altimeter elevation for next station

T_1 = Temperature (°F) for 1 station

T_2 = Temperature (°F) for next station

Reference: (Hodgson p. 10)

This correction is applied in a cummulative fashion to the altimeter elevations. A drift correction is then applied (Please refer to the <u>Drift Correction Program</u> in the Appendices, 13(b)).

(c) Gravimeter

This unit was the Worden quartz-fiber gravimeter No. 35, owned by the Department of Geophysics, University of B.C., Vancouver, B.C. The dial to gravity reading conversion factor was 0.4203(1) milligals/division. Division readings were recorded to 0.1 division (0.04 milligal). The instruments readings were drift corrected (using the Drift Correction Computer Program) and seemed reproducible to within $\pm$ 0.1 milligals. (Most of the stations were surveyed twice.)

Once the drift corrected values were obtained, the Free Air and Bonguer corrections were applied assuming densities of 2.7, 2.8, and 3.1 gm/cu.cm., for the material (meta-volcanics) between the instrument and datum plane (sea level). The computer program used may be found in the Appendices, 13(b).

The formula used was:

Corrected gravity value = (Observed Value) + (0.09406-0.01277T)h milligals,

Where T = Density gm / cm^3) of rock between point of measurement and datum plane (sea level).

h - Height of instrument above datum level (sea level).

(Reference: Parasnis, 1966, p. 220 - 231)

No terrain or latitude corrections were applied since the lines were short and parallel to the main topographical feature, the river canyon.

(d) Induced Polarization Unit

A Crone Condensor Discharge unit was used. Precision in determining chargeability was estimated to be $\pm$ 0.5 milliseconds. Both chargeability and resistivity were calculated. The Wenner array was used as electrode arrangements. Porous pots filled with saturated $CuSO_4$ solution were used for voltage electrodes. Current electrodes were copper stakes. The earth around all the electrodes were wet with a salt solution before readings were taken.

(e) Low Frequency - EM Survey Unit

A Crone J.E.M. two frequency unit was used. Measurements were precise to ± 1° in resulting tilt angle. Frequencies used were 480 and 1800 hz. The unit consists of two coils each with a transmitter - receiver unit and battery. While one loop is transmitting from a vertical position (plane of coil vertical) the other is receiving. The coils are then reversed as receiver and transmitter. The dip angle for both 'chief' and 'helper' are recorded. The resulting dip angle (the addition of that obtained by 'helper' and 'chief') is plotted at the center point between the two loops. In this survey, the spacings between loops was 200' and 100' on various lines. The reproducibility is somewhat variable, ranging from ± 1° to ± 2 1/2° in one case. The less precise result was obtained in an area of swamp and possibily clay, where it was very hard to obtain a precise null.

No corrections are applied to these results.

(f) Magnetometer

A McPhar M700 vertical component fluxgate magnetometer was used, which is capable of a precision of ± 5 gammas, and a reproducibility of about of about ± 10 gammas.

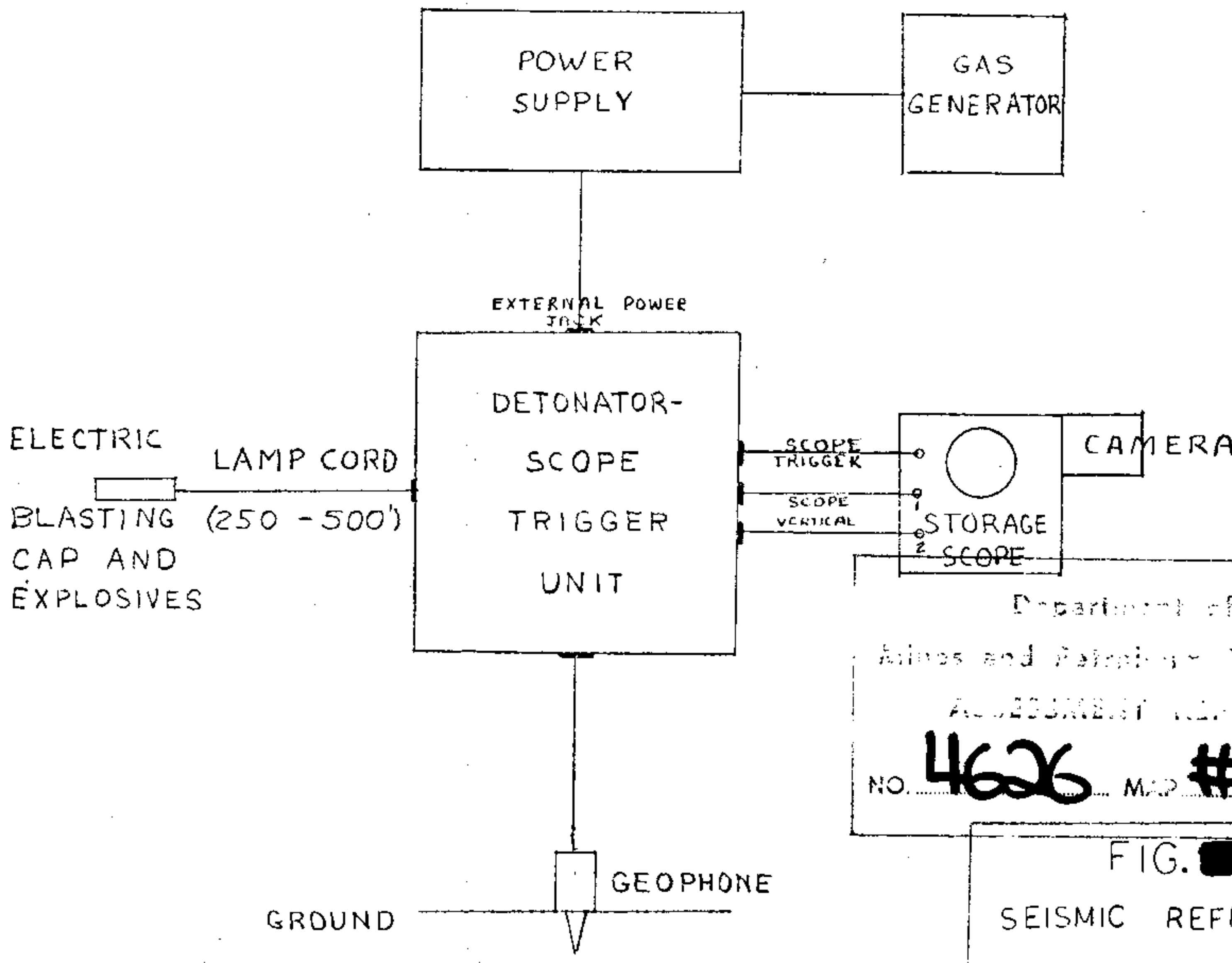
The readings were drift correction when necessary with the base station (ON, OW, Claim 22G) set at -90 gammas. The Magnetic Drift Correction Computer Program (See Appendices 13(b)) assumes a linear drift between the base station readings, around which the magnetic readings were looped.

(g) Seismic Unit

There were two types of units used here.

(1) One was a Soiltest Inc. Model 117C system, consisting of a seismic electronic timer, a geophone pickup, a hammer - trigger and a hammer plate. When the hammer (which is attached electrically to the timer) is struck on the hammer plate, a switch attached to the hammer causes the timer to start counting. The first seismic signal of sufficient amplitude to arrive from the hammer blow, at the geophone, stops the timer. The elapsed time from hammer blow to geophone pickup is displayed as three digits on the timer. The time can be read to 0.1 of a millisecond on one range, and to 1 millisecond on the second range. Reproducability is about $\pm$ 10%. Generally speaking, the timer stops counting on the first arrival from the hammer blow provided the amplitude of this wave is large enough; if not, or if the gain of the timer is not high enough, a later arriving pulse would stop the timer. Hence great care must be taken to insure one is always working with the first pulse of the incoming seismic wave.

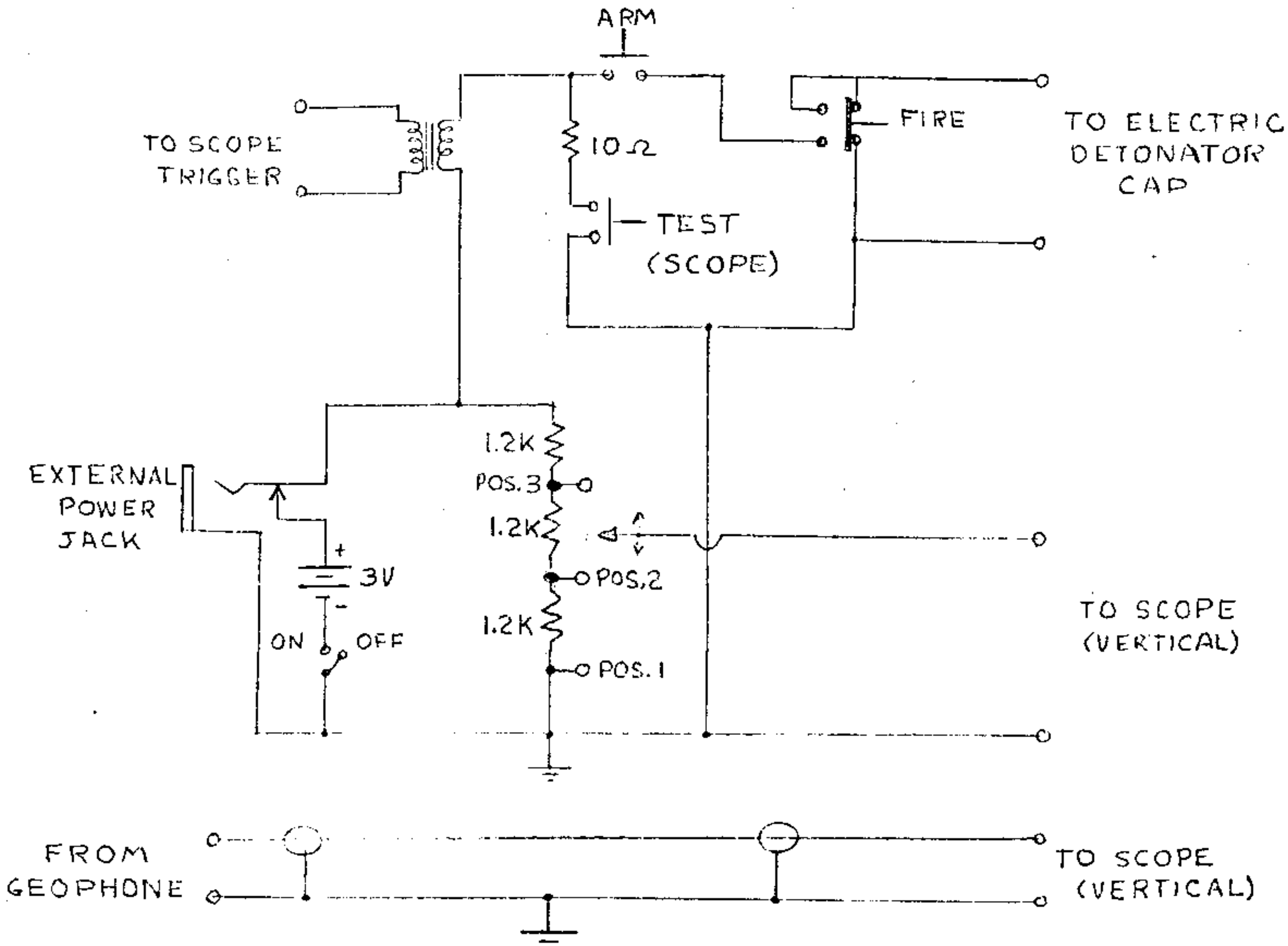
(2) To overcome the inability of the Model 117C to fully show the shape of the incoming seismic wave, an alternate system was constructed . (see Figure 5A). This system uses blasting caps and, if necessary, explosives in place of the hammer. When the detonation



Department of Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 4626 MAP #4

FIG. [redacted] 4
SEISMIC REFRACTION SURVEY EQUIP.

DRN. A.B.L.W., Nov. 27, 1973



Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 4626 MAP #5

FIG. 5[redacted]
DETONATION/SCOPE
TRIGGER UNIT

DRN. A.B.L.W., Nov. 26, 1973

takes place, the current flowing through the electric cap stops abruptly causing a pulse in the Detonator/Scope Trigger unit (see Figure 5B). This pulse triggers the Storage Scope sweep causing it to start at a certain fixed rate (milliseconds/cm) across the oscilloscope screen. The geophone is placed on the ground a certain specified distance from the detonation and is connected to the vertical signal terminals of the Storage Scope. When the seismic wave arrives at the geophone it causes the electron beam on the Storage Scope (which is being swept horizontally across the oscilloscope screen) to move up and down vertically. The resulting trace is an accurate reproduction of the vertical component of the seismic wave which has been refracted through the layers of soil and rock beneath the surface.

The resulting oscilloscope trace of the seismic wave can be stored and displayed, or photographed.

The distance from the trigger pulse to the first arrival is then measured on the photograph and converted (using the sweeps millisecond/division conversion scale) to milliseconds.

Seismic Computor Program

This program was set up for the HP9820 computer based on the formulas for a two layer case (Dobrin, 1960 P. 723; and Heiland, 1940, P. 506 - 509 & P. 521 - 527), assuming various dips. These formulas use the Critical Distance Method. The computer programs are reproduced in the Appendices, 13 (b).

(h) Self Potential Unit

The unit used was the SP Model G-18, constructed by Geotronics, of Burnaby, B.C. It is essentially a high impedance millivoltmeter, using modern Operational Amplifier circuits. The unit reads to the nearest 1 - 2 millivolts.

The two lines surveyed (Figures 49 and 50) suggest the reproducibility when reoccupying a station is about ± 5 millivolts maximum, with ± 2 millivolts being more typical. Some of this variation may well be due to slightly different conditions around the ceramic (unglazed) porous pots used as electrodes. The leads from the millivoltmeter were attached by banana jacks to 1/4" copper rods, which were immersed in a saturated $CuSO_4$ solution, in the porous pots. The pots are kept, when not in use, in plastic containers also containing a $CuSO_4$ solution, so that this solution soaks right through the unglazed ceramic material. The 1/4" copper rod goes through a rubber stopper which seals the solution inside the ceramic pot. The ground around each pot was saturated with water prior to each reading.

In use, one of the electrodes (ceramic pot) is dug into the ground beside the millivoltmeter; the other is attached to a 500' long, 14 gauge plastic coated copper wire which is dragged through the bush to each station. The movable pot is then dug into the ground at that station, and water poured around it prior to the reading.

Each reading is thus relative to the starting station. In the present survey, both lines were referenced to the CW, OS station, set as zero millivolts.

No corrections are applied to the data; multiple readings for the same station are simply averaged in drawing the profile.

(i) V.L.F. - EM Units

The instruments used for this portion of the work were the Ronka EM-16 and the Crone Radem. Both make use of the magnetic part of the electromagnetic waves emitted by the U.S. submarine radio stations. The station used in this survey was Jim Creek, Washington (near Seattle) at 18.6 khz. The code for this station is NPG.

The Ronka EM-16 measures the tilt angle (to ± 1/2°) of the magnetic component of the VLF - EM wave. Only the tilt angle measurement of this instrument was used.

The Crone RADEM is a similar instrument expect that both the tilt angle (to ± 1° in most readings) and field strength (FS to ± 10%) were recorded and used.

The ground slope was also recorded in degrees so that the effect of topography could be estimated. These values were plotted only only in areas where there was a significant variation in tilt angle, to check if the topography changes alone can account for the tilt angle variations.

The first derivative of the tilt angle (the slope of the tilt angle plot, which is found by subtracting one station's tilt angle value from that of the next station and dividing by the distance between stations) was also used since it is less influenced by topography. The values of the first derivative are in degrees per foot (°/ft). These values were calculated and plotted only in areas where there was a significant variation in tilt angle.

Interpretation is based on methods discussed by Whittles (1969) and Frazer (1969).

(j) Geochemical Test Equipment

The test kit used was a LaMotte Chemical Kit, of a type used in pollution (water) testing. The tests were to give any indication of copper content and should be responsive to at least 0.1 ppm copper. On one test on a pyrite sample containing traces of chalcopyite (obtained from the mineralized zone explored by the adit on Chemainus River), a reading of about 50 ppm was obtained. The procedures used are attached in Appendices, 13(c). The objective of the testing was to obtain any indication of copper in the soil, rather than specific ppm values. As is indicated in the later discussions, all soil tests were negative as were the total heavy metal tests discussed in the 1971 Whittles and Loring Report.

All soil samples were taken at a depth of about three feet, using a hand auger.

6. GEOPHYSICAL SURVEYS.

(a) General Field Procedures (refer to figure 3)

The Copper Canion Claim 22G was surveyed in 1897 and later Crown Granted. The geophysical work done in 1971 was based on a base station (OW, ON Claim 22G), set up using a stump 4" thick, 4' high and square on 3 sides. The claim boundaries were then assumed on the basis of the old adit on the river bank which was shown in the 1903 report to be located about 100' South of Claim Post No. 1. In the summer of 1973 the northern corner posts of 22G and 21G were relocated by CPR surveyors and now exist as 1P 20 and 1P 21. The original base station OW, ON was surveyed into these two iron pins (line RL1). This has resulted in shifting the grid lines of the 1971 report 100' north, and now has the centre line of claim 22G starting at the old adit. Since the 1971 report the claim 22G base line was extended from 1000 W to 4500 W across the Victoria Fraction, Susan and Klondyke claims. This extension was made due magnetic west which is in a different direction from the original base line ; the new base line better parallels this set of claims.

Another base line (CM) was also established on the Copper Mint claims and tied into the original base station OW, ON on Claim 22G, by line RL 2. The CM base line runs from CMO to CM 2900, and heads due (magnetic) west.

Several perpendicular reconnaissance lines have been run off both the base lines and most of the geophysical measurements were made along these lines. One of the old original claim posts was found along with its bearing trees (southwest corner of Susan Claim). When the survey lines were tied in to this old post a 100 foot surveying error was indicated in the base line surveyed through the Copper Canion Claim Group. This represents a 100/3100' or about a 3% error, which may be attributed to the polychains used. In the future, it is proposed to use steel chains to further reduce this error. The base line was corrected at the Susan corner post and continued to 4500W.

(b) Altimeter Surveys.

In starting the altimeter surveys four Altimeter Reference stations were set up at various locations on the claims. The main reference station was located at the OW, ON base station on Copper Canion Claim 22G. A series of loops were made with respect to an elevation Bench Mark (240 feet above mean sea level) in Nanaimo, and the readings temperature and drift corrected. The average elevation found was 524.7' above mean sea level for the base station. The Altimeter References No.2 & 3 were surveyed in by automatic level as well as by altimeter looping.

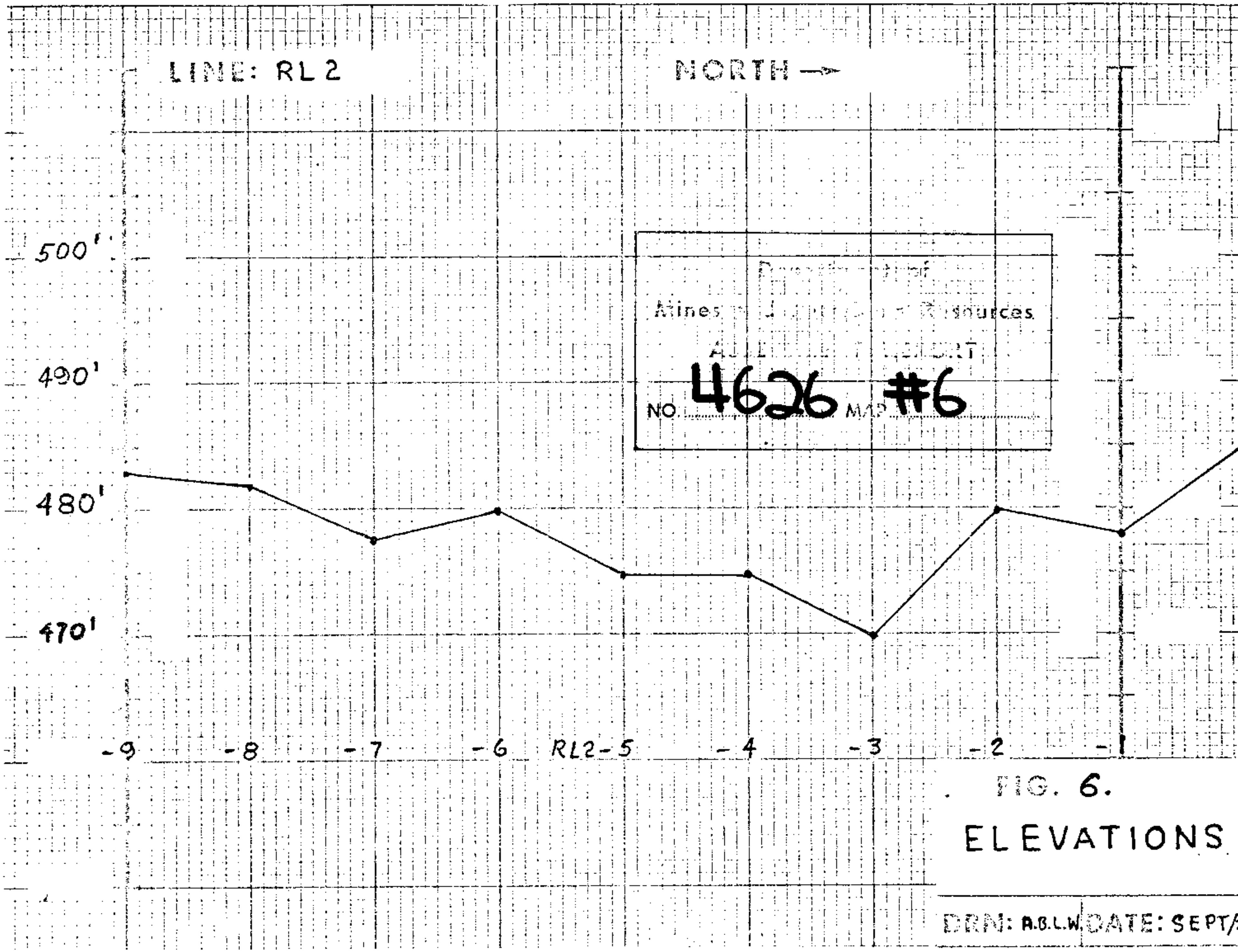


FIG. 6.
ELEVATIONS

DRN: A.B.L.W. DATE: SEPT/73.

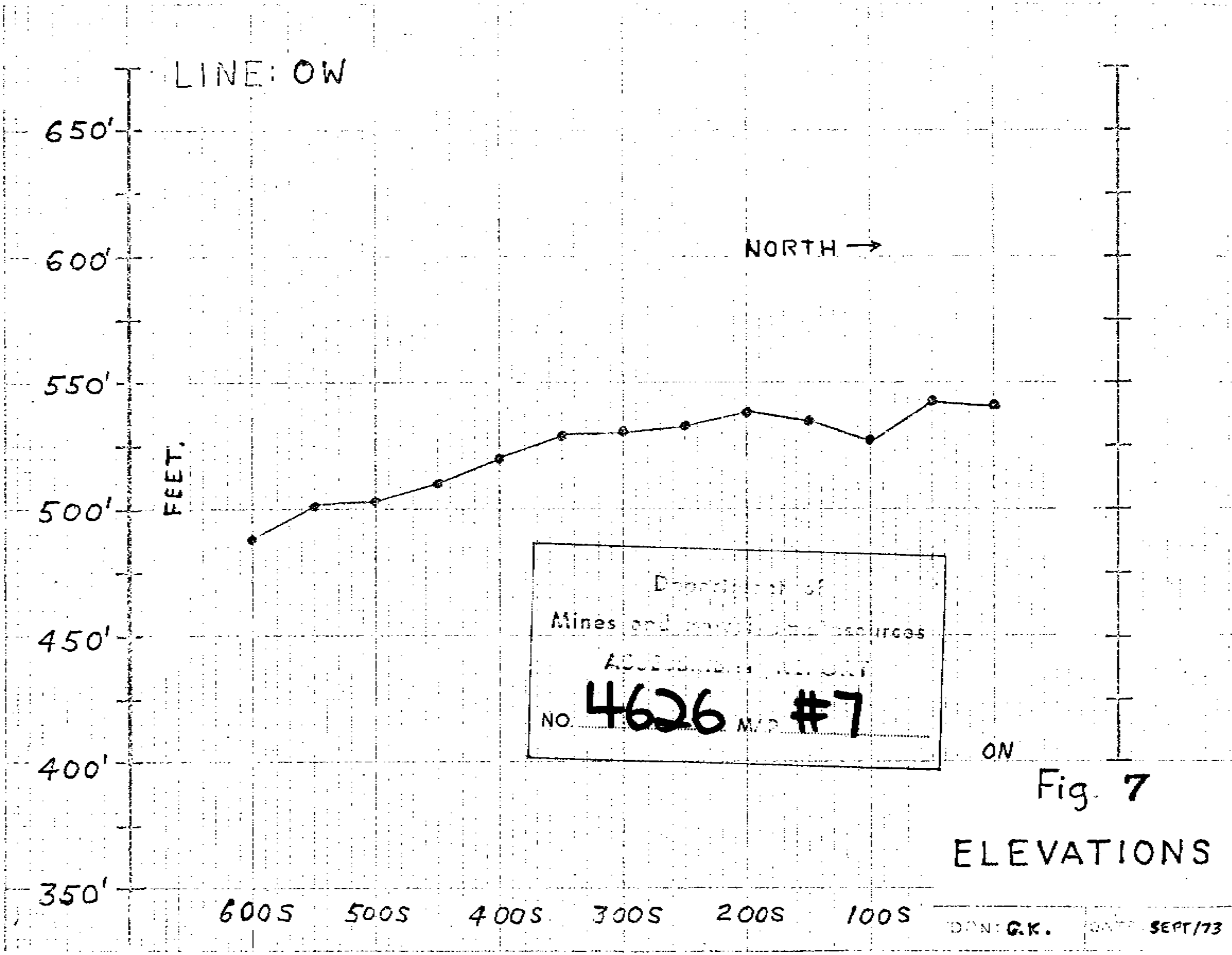


Fig. 7

ELEVATIONS

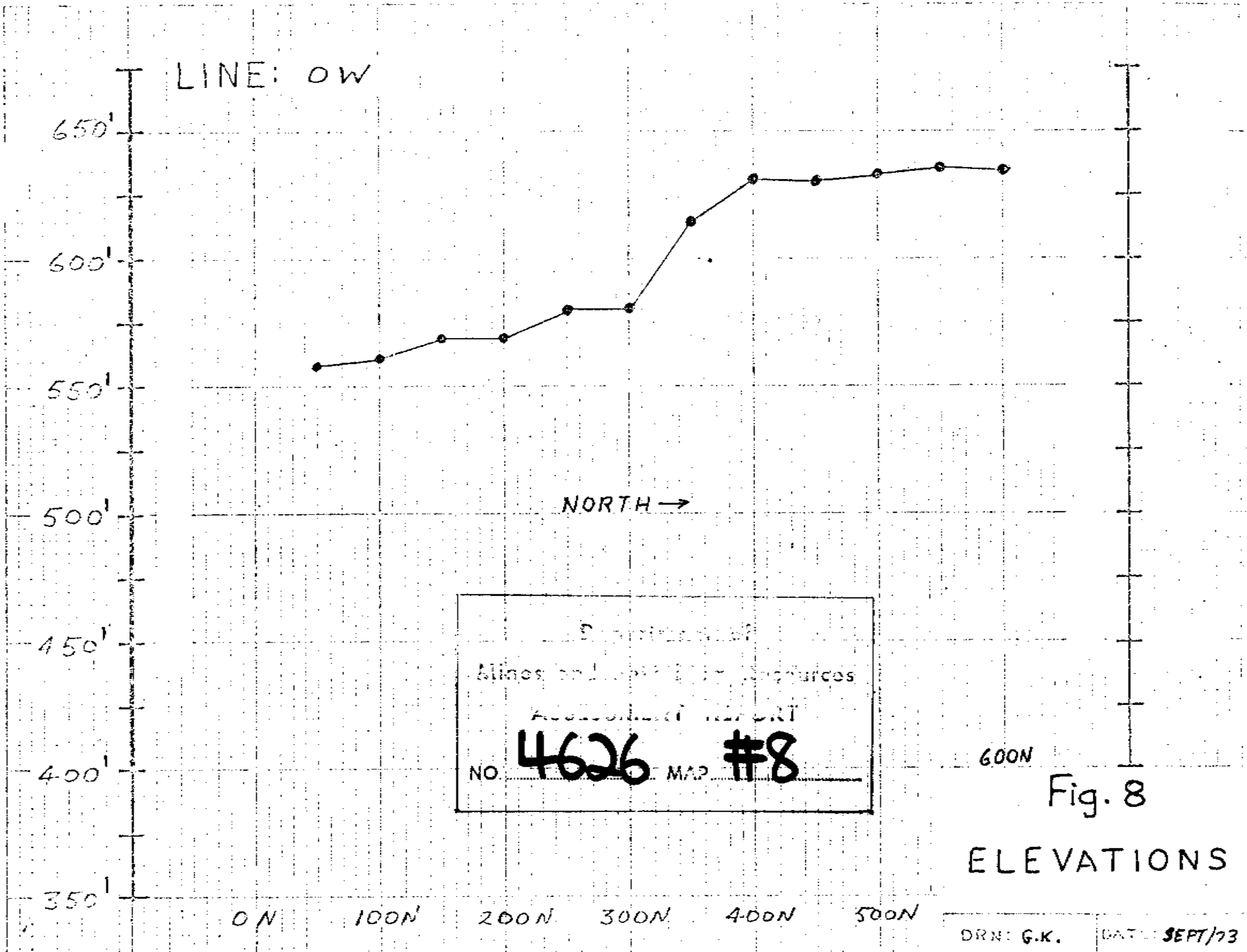


Fig. 8

ELEVATIONS

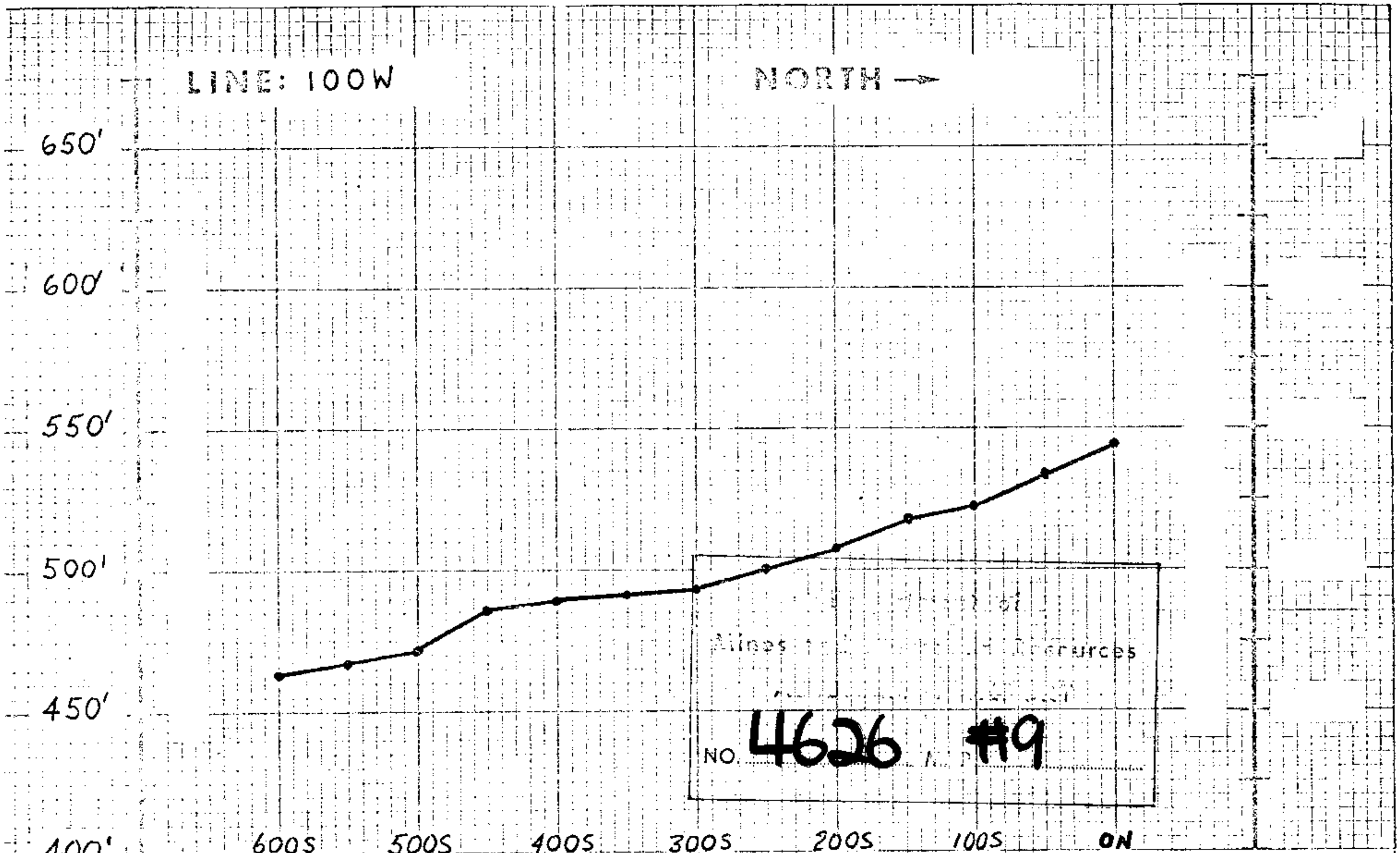


FIG. 9

ELEVATIONS

DRN: A.B.L.W DATE: SEPT. 63

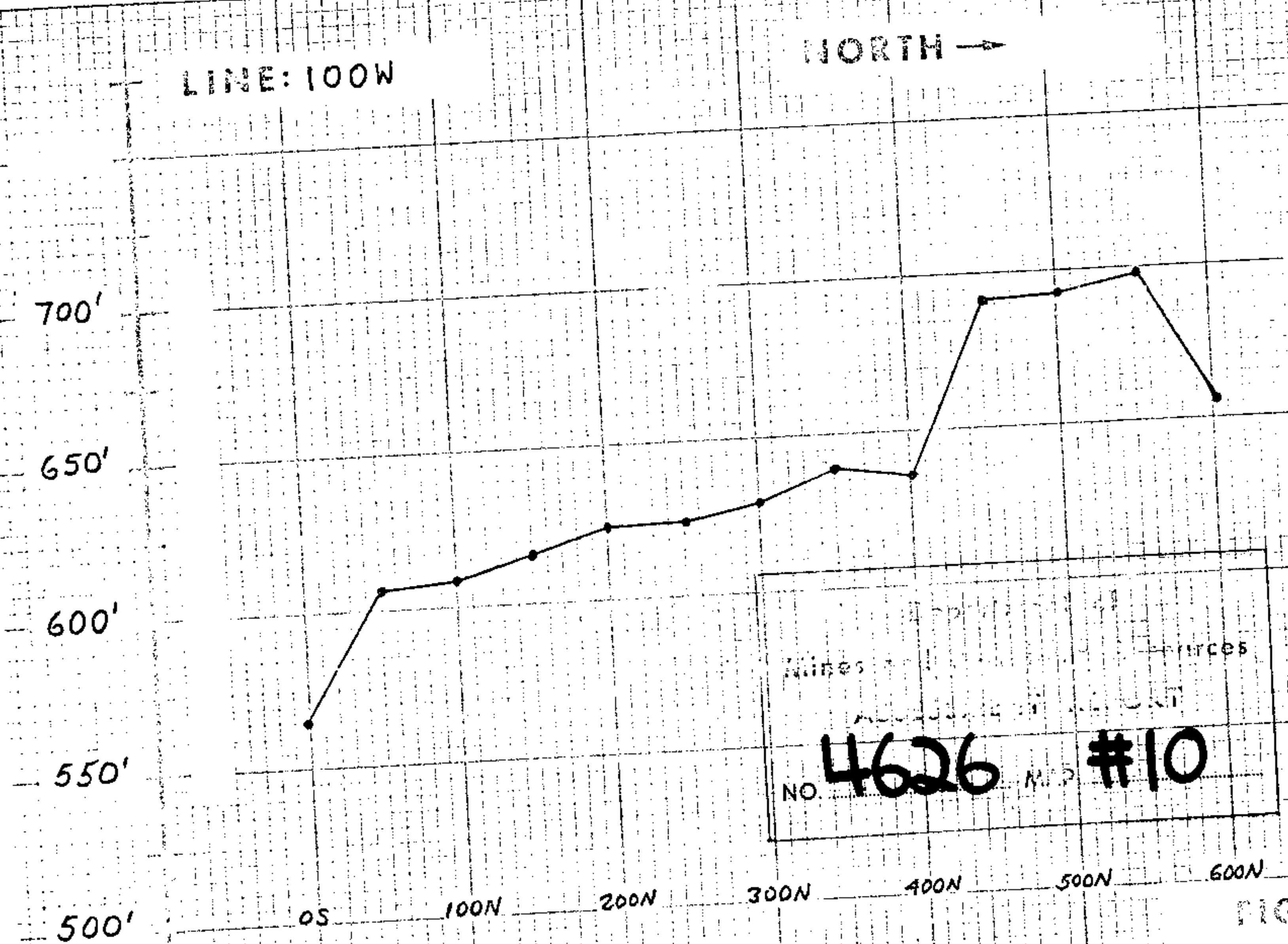


FIG. 10
ELEVATIONS

DRN: A.B.L.W DATE: SEPT. 73

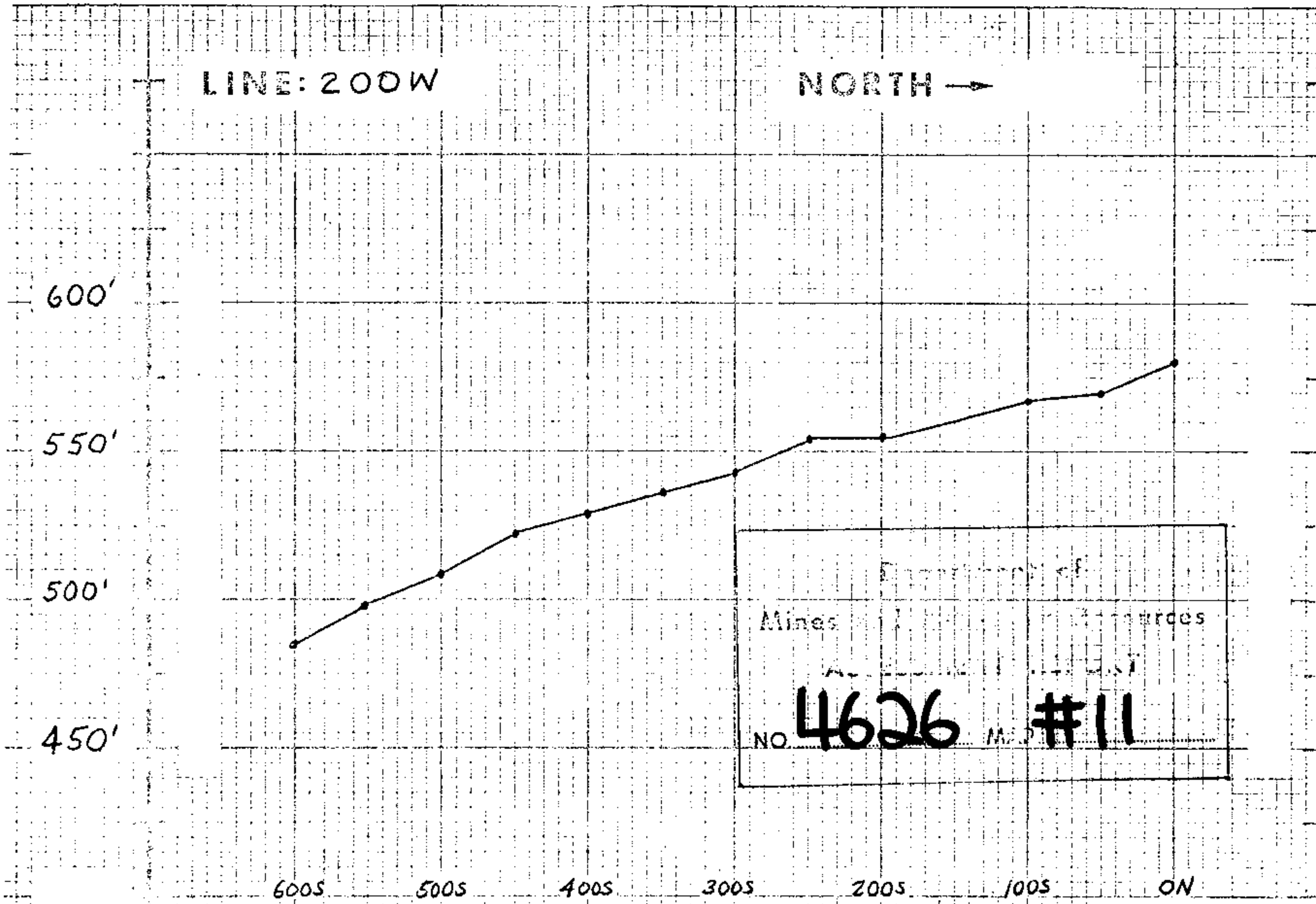


FIG. 11

ELEVATIONS

DRN: A.B.L.W. DATE: SEPT. 73

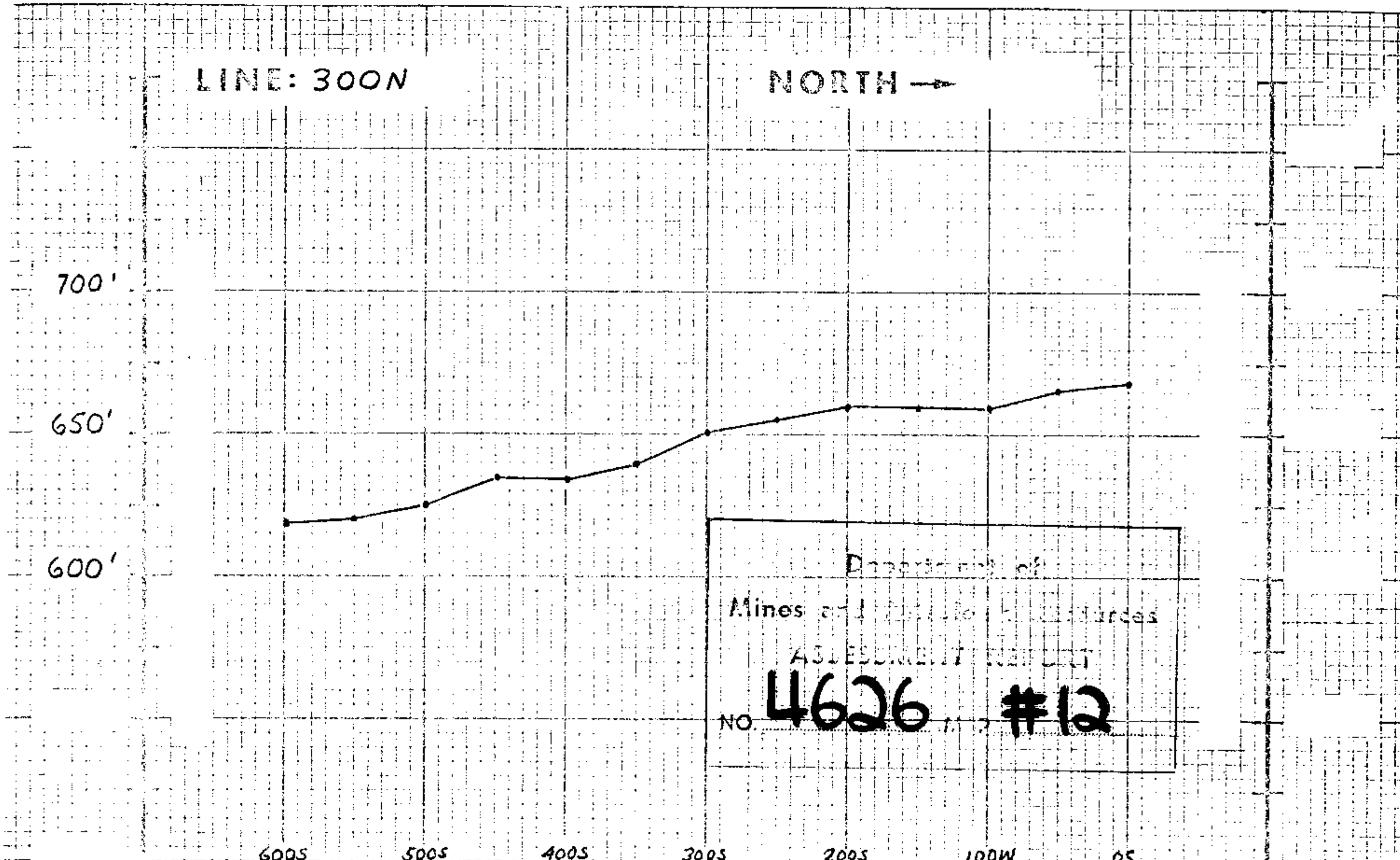
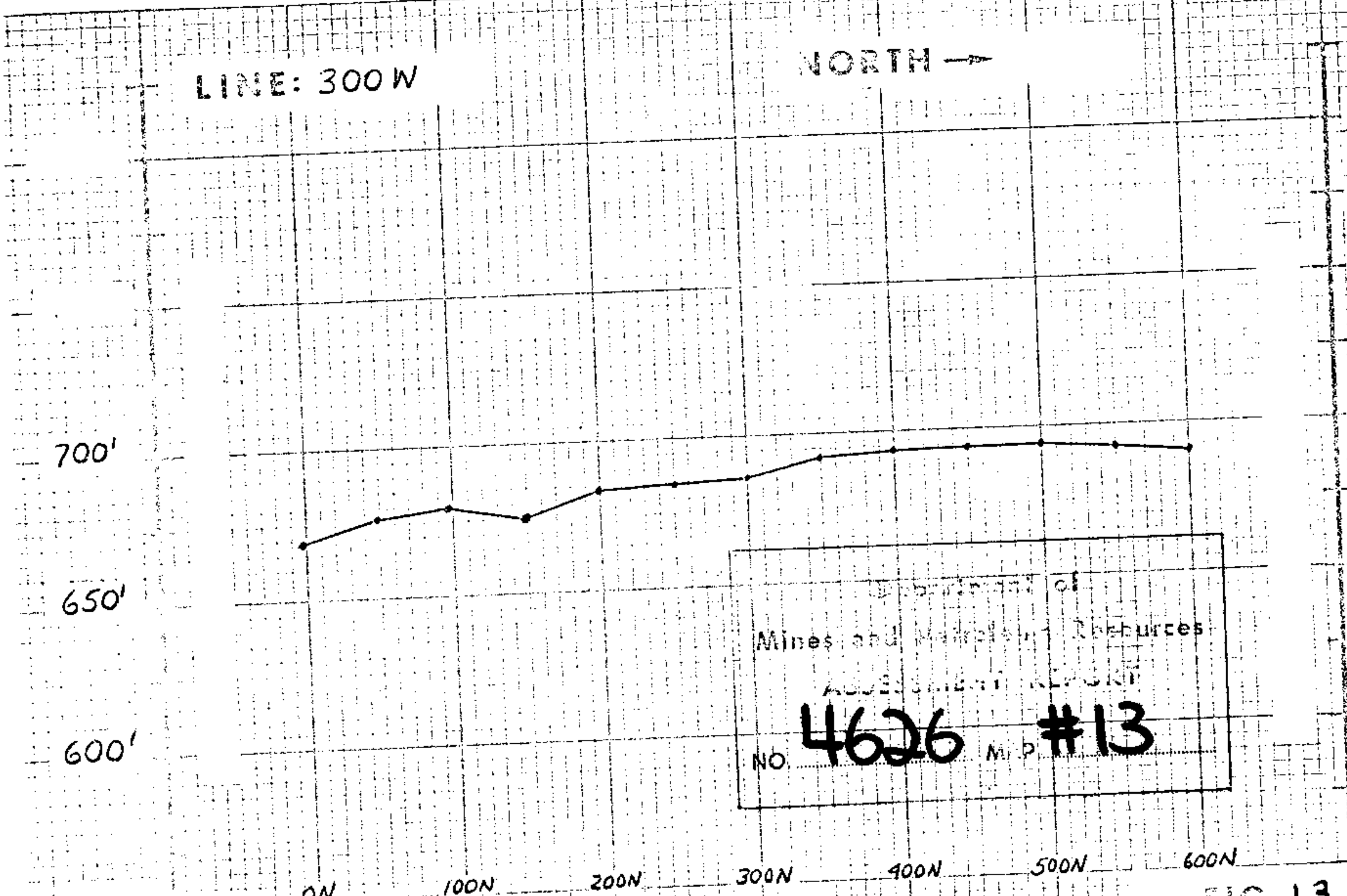


FIG. 12

ELEVATIONS

DRN: A.B.L.W. DATE: SEPT. 73



Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 4626 M.P. #13

FIG. 13
ELEVATIONS

DRN: A.B.L.W. | DATE: SEPT. 73

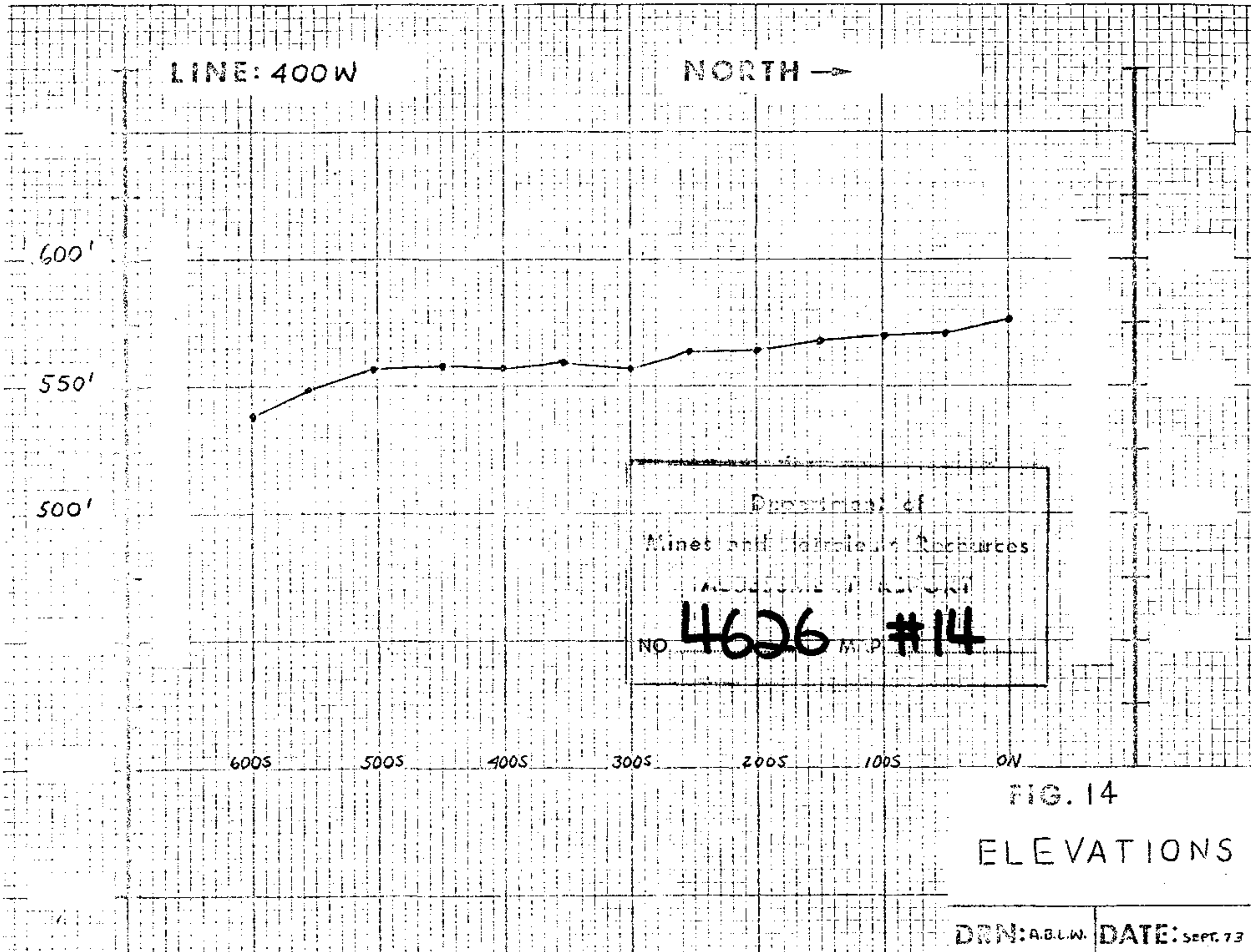


FIG. 14
ELEVATIONS

DRN: A.B.L.W. DATE: SEPT. 73

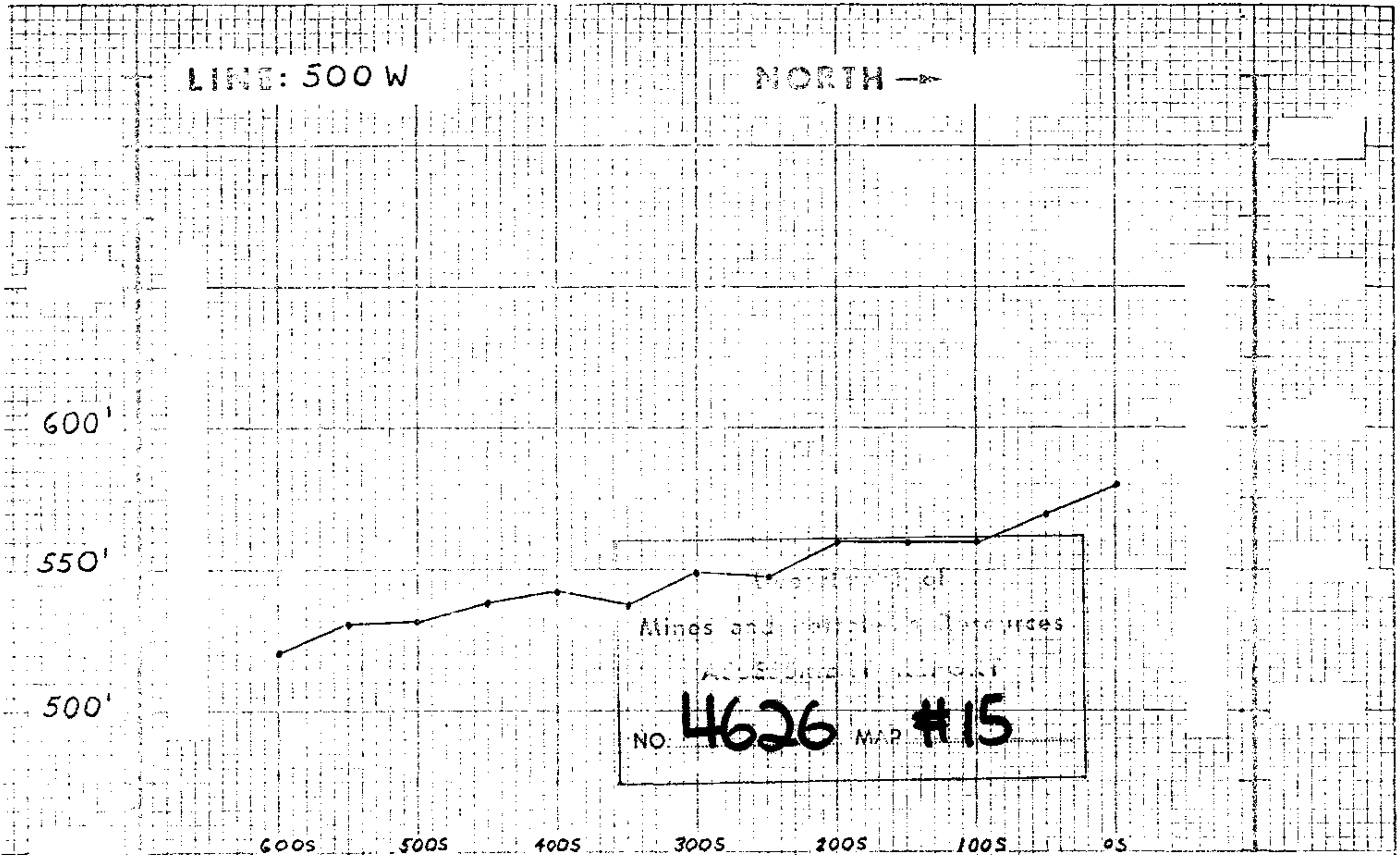


FIG. 15

ELEVATIONS

DRN: A.B.L.W. DATE: SEPT. 73

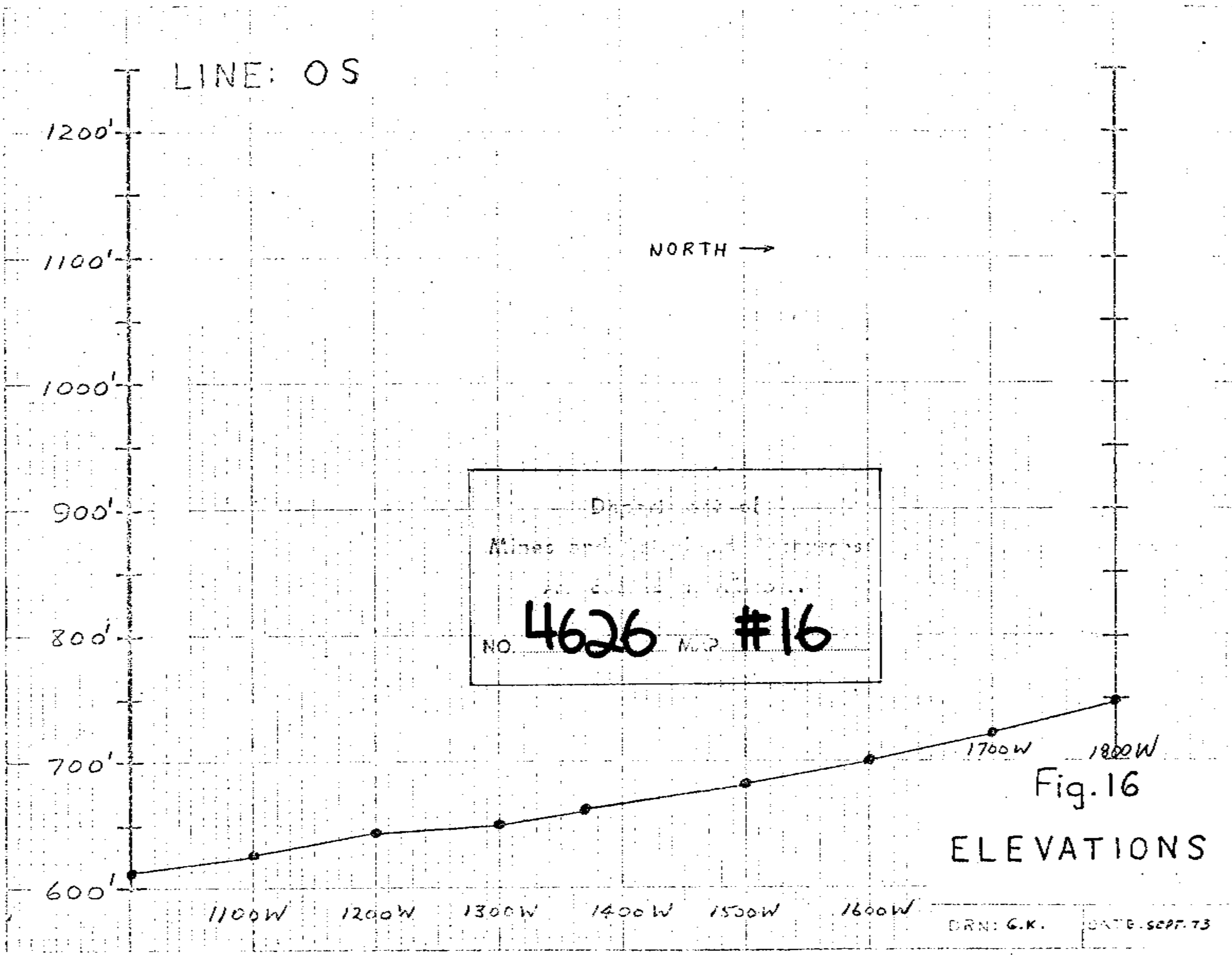


Fig. 16
ELEVATIONS

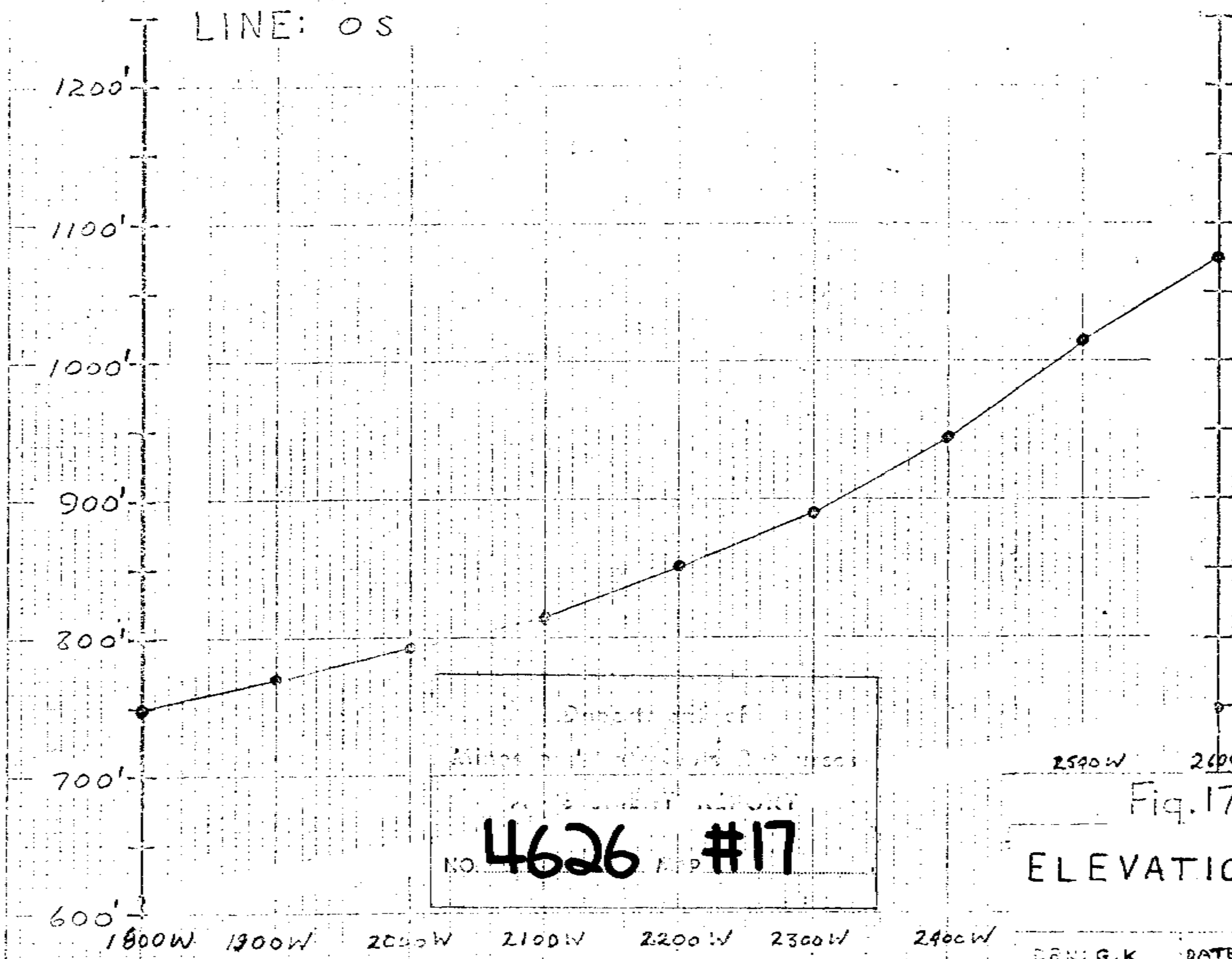


Fig. 17

ELEVATIONS

DRN: G.K. DATE: SEPT. 73

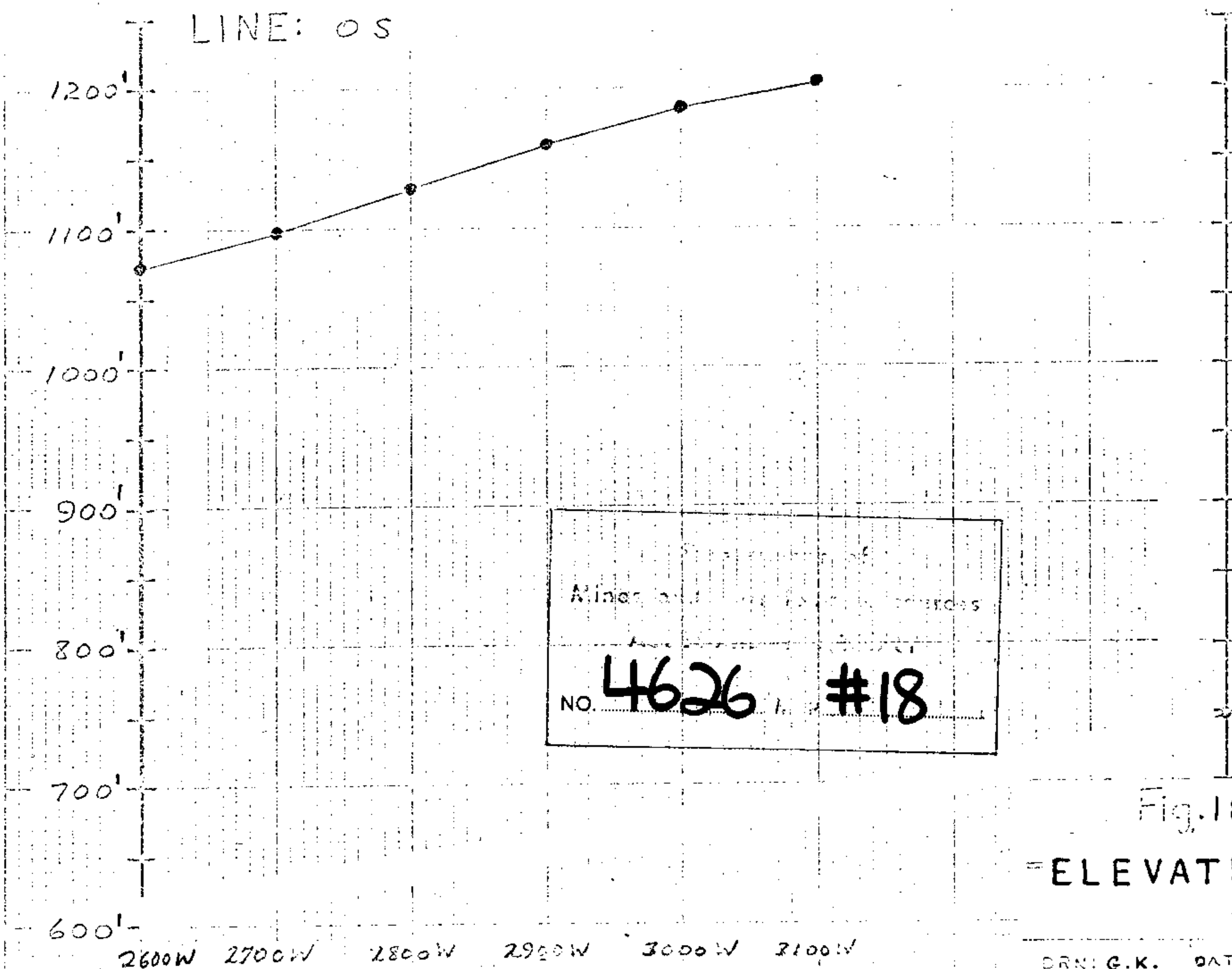


Fig. 18

ELEVATIONS

DRN: G.K. DATE: SEPT. 73

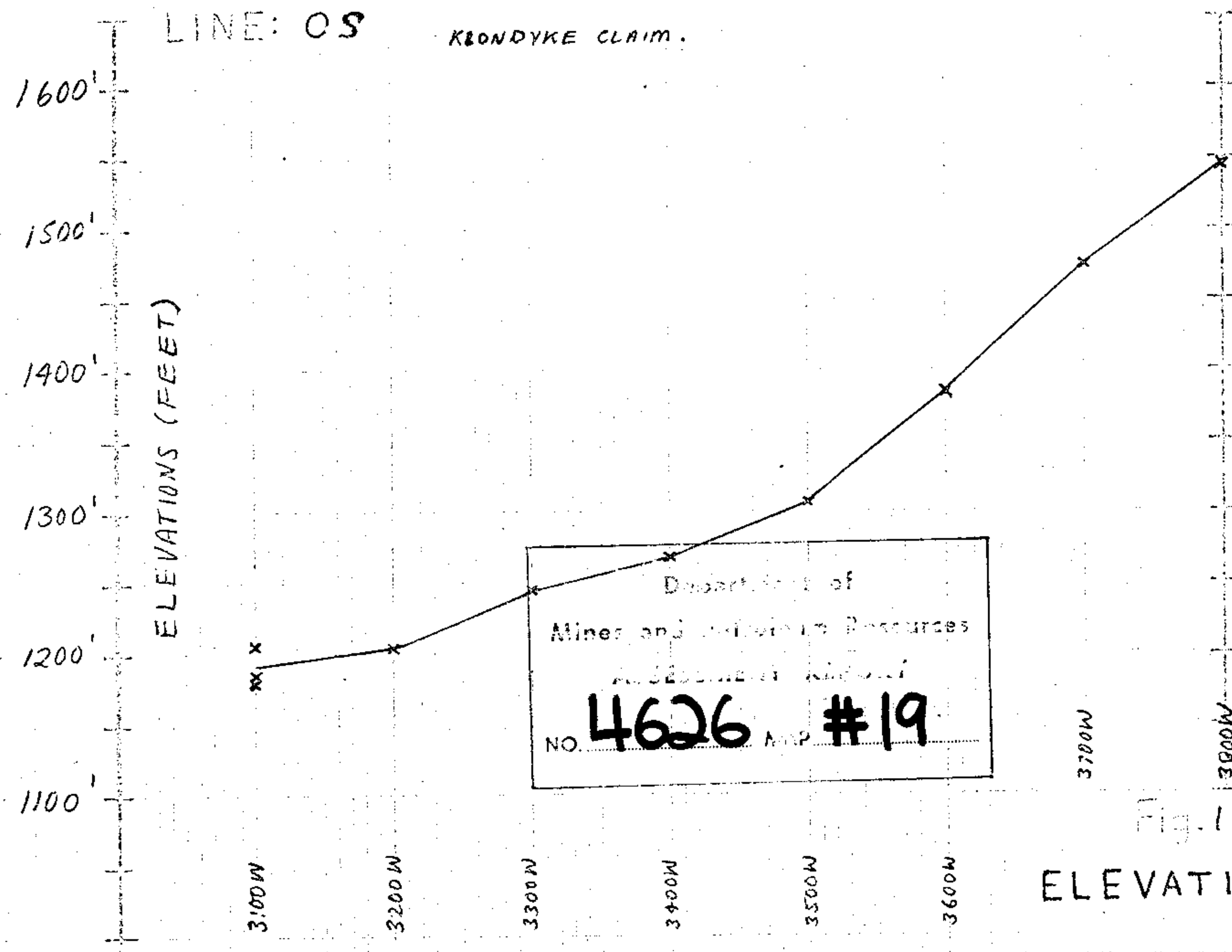


Fig. 19

ELEVATIONS

DRN: A.B.L.N. DATE: SEPT. 73

-41-

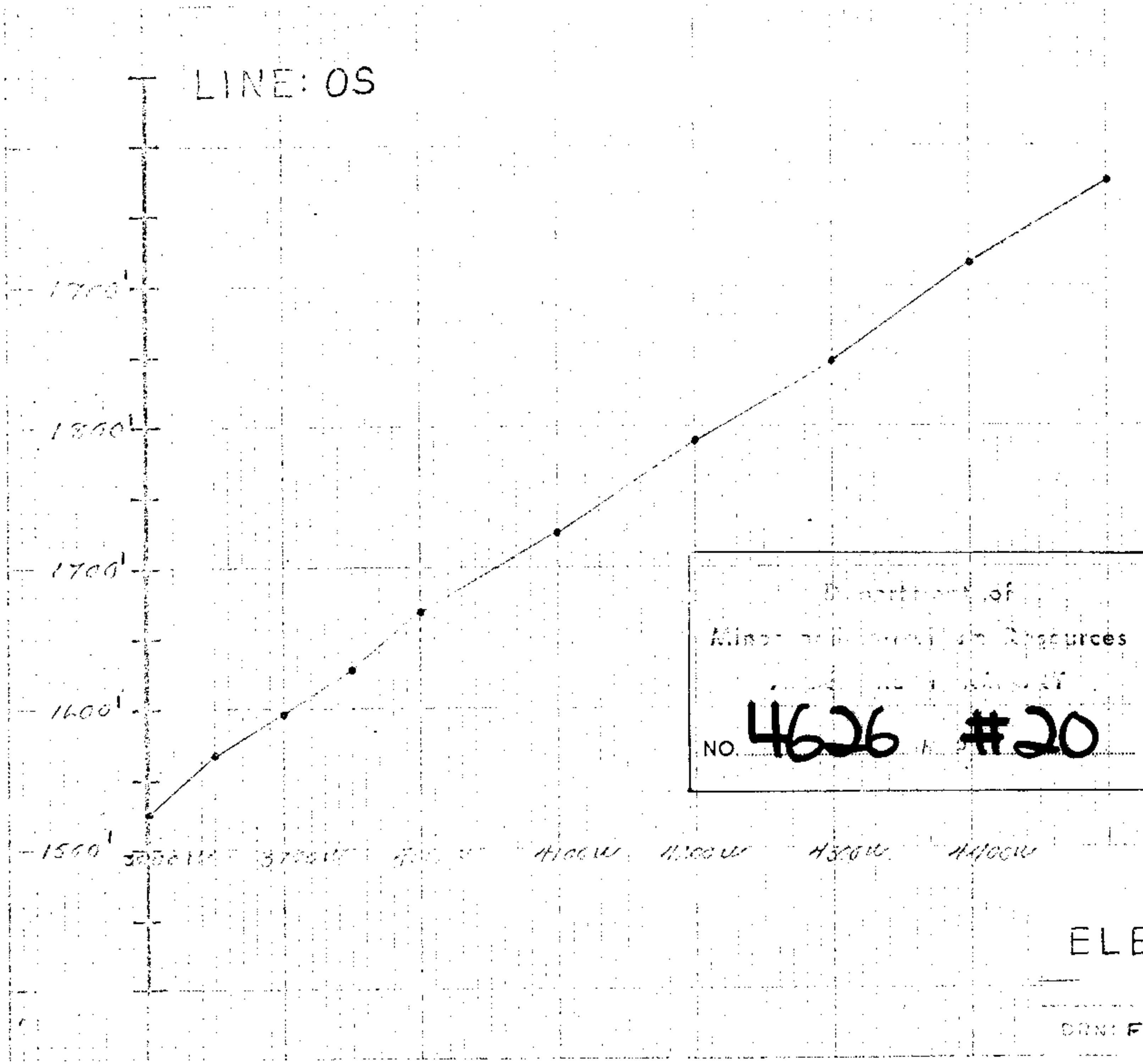


Fig. 20

ELEVATIONS

DRN: F.L. DATE: SEPT.73

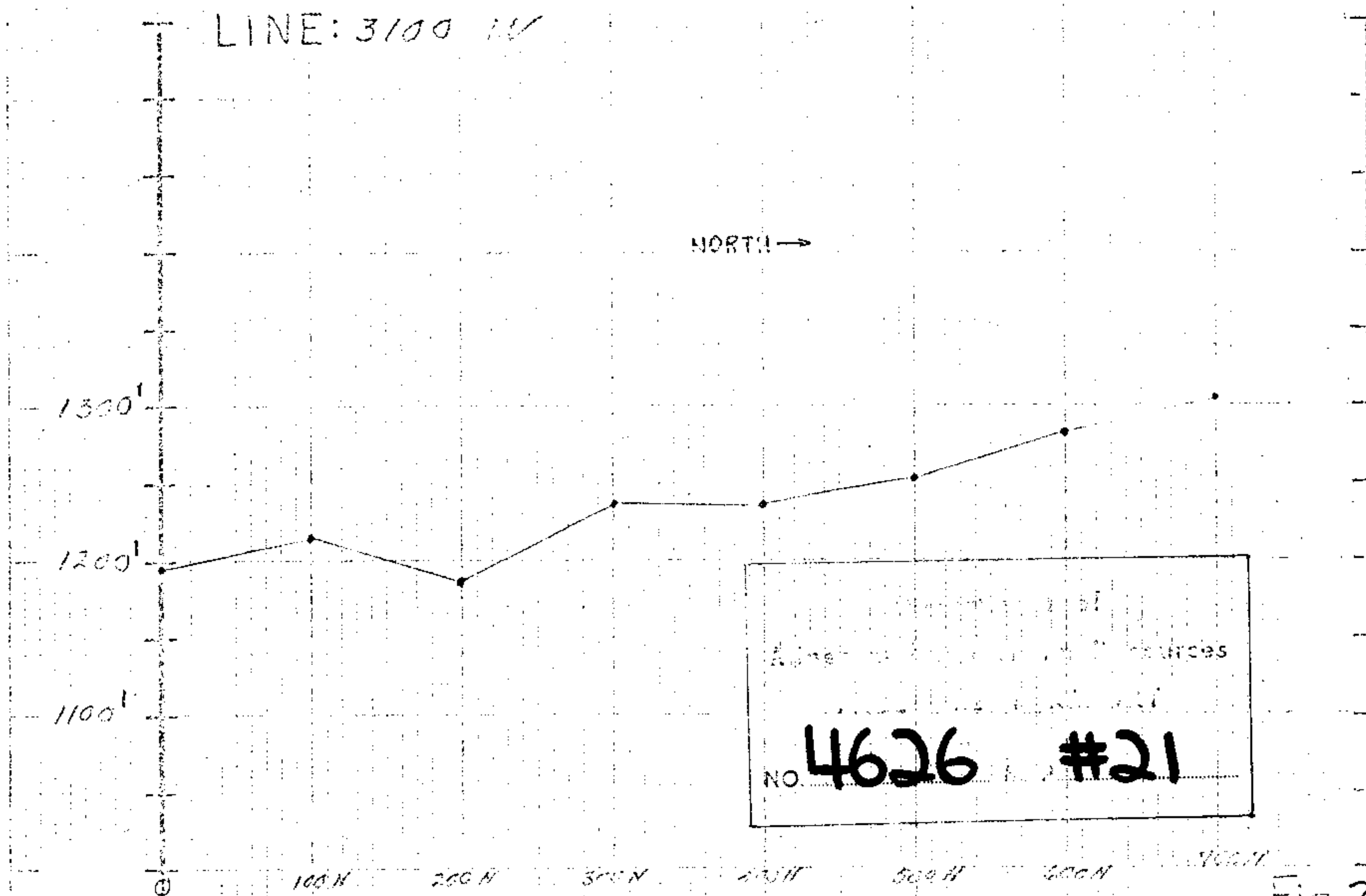


Fig.21

ELEVATIONS

DRN: F.L. DATE: SEPT.'73

-43-

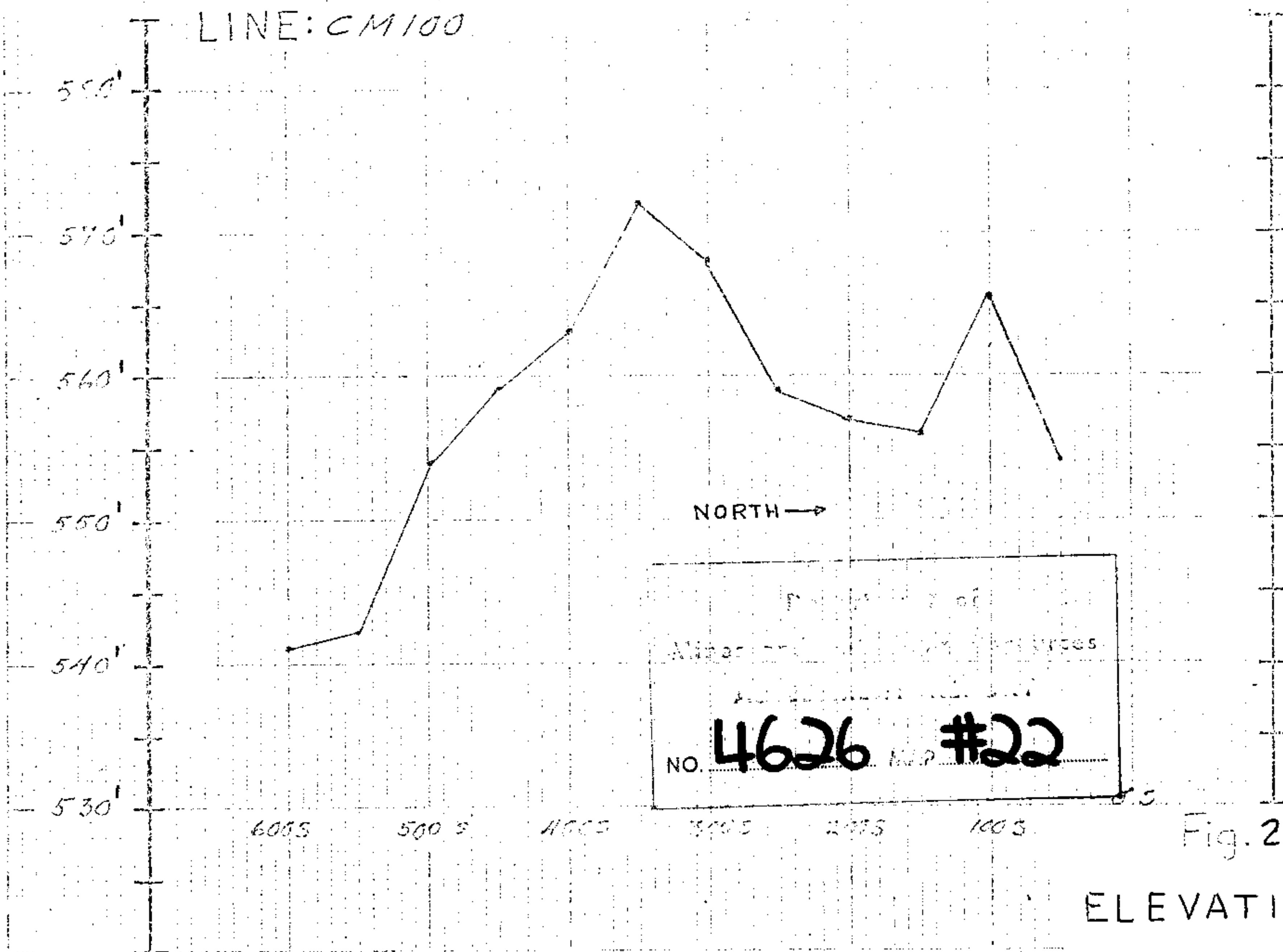


Fig. 22

ELEVATIONS

DRN: F.L. DATE: SEPT.73

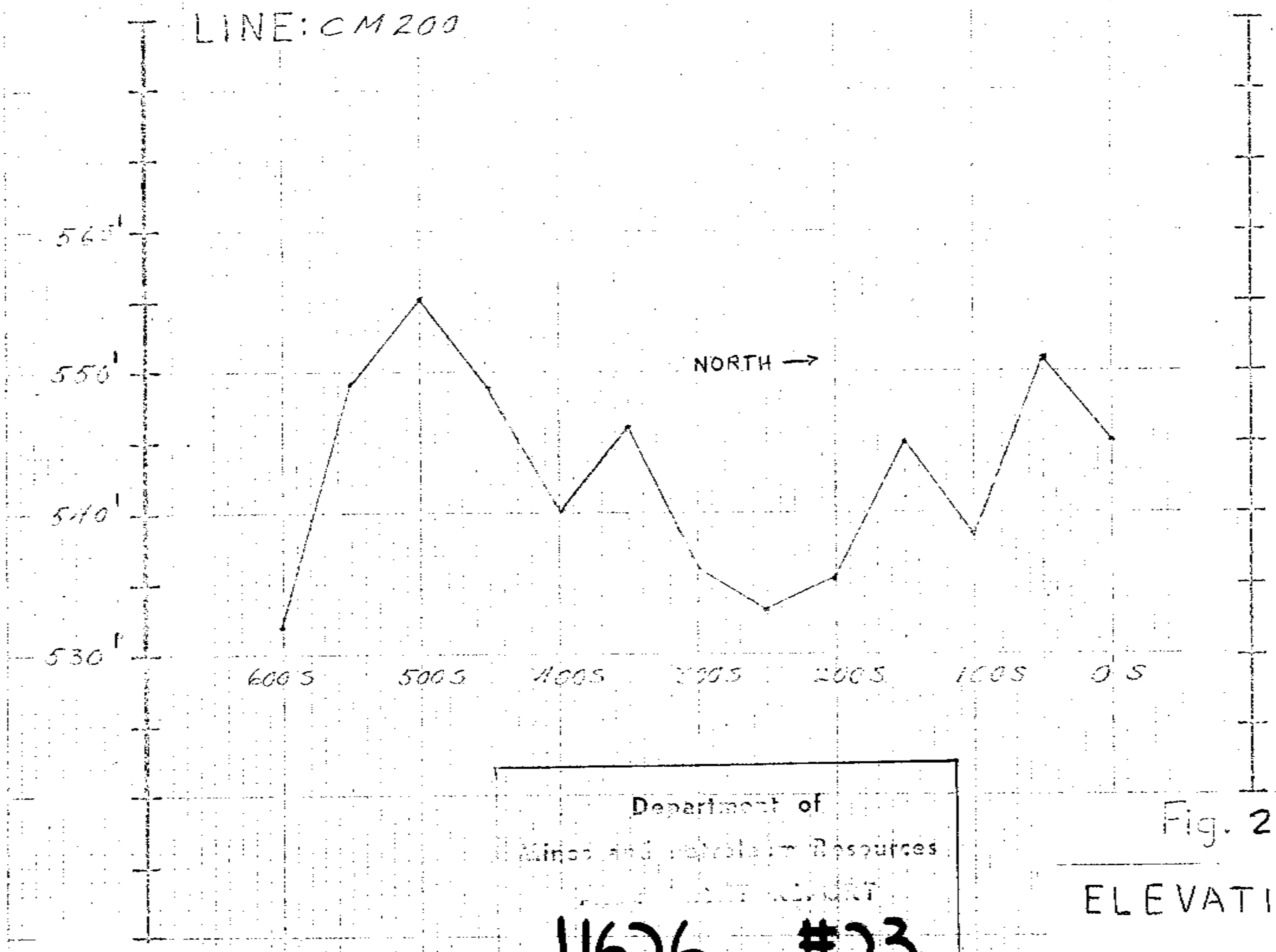
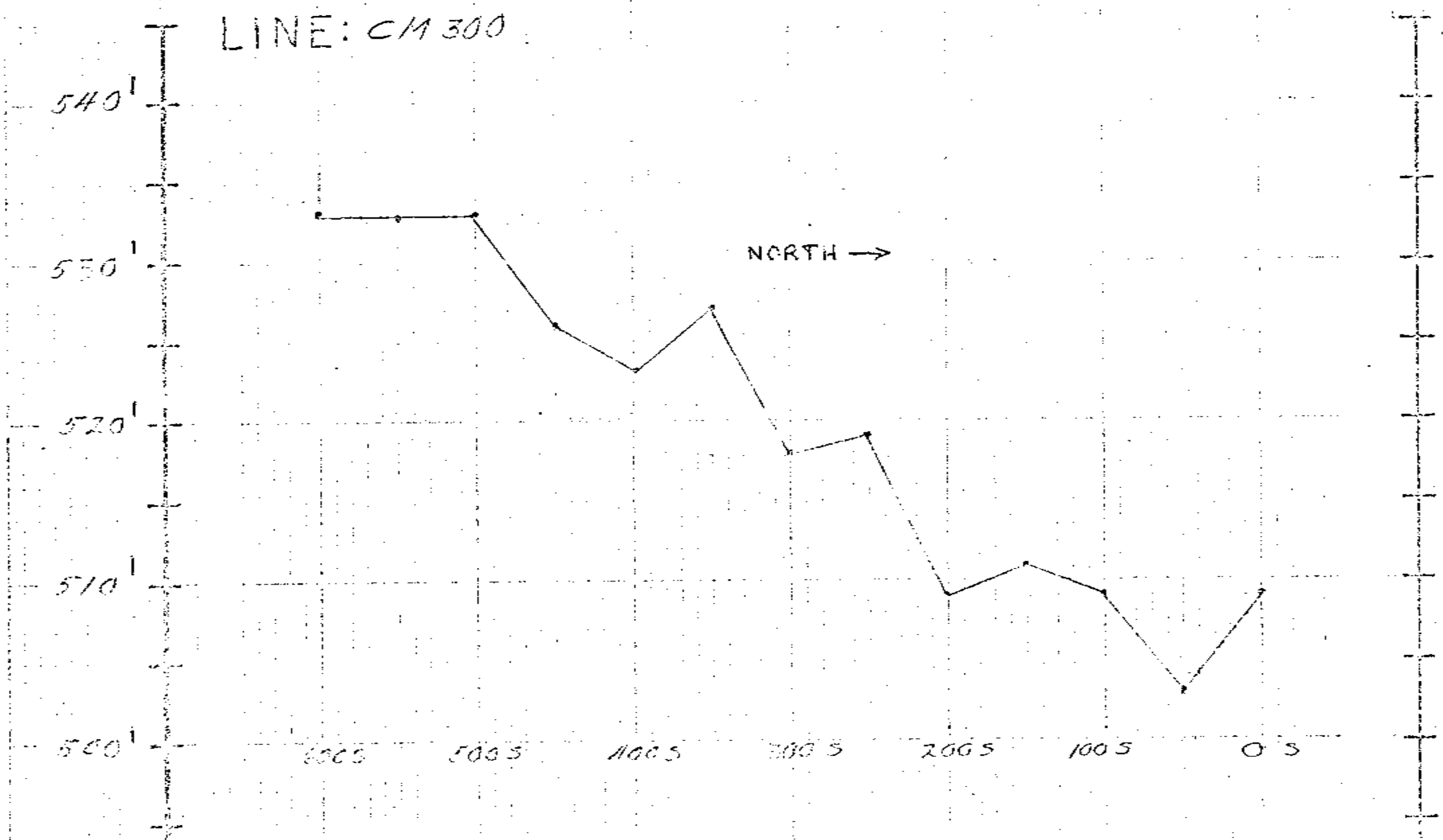


Fig. 23

ELEVATIONS

DRN: ABLW DATE: SEPT-73



Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 4626 MAP #28

Fig. 28

ELEVATIONS

DRN: F.L. DATE: SEPT.73

Location	Name	Elevation using Altimeter (feet)	Elevation using Automatic level (feet)	
(OW,OS)	Alt.Ref.No.1	524.7 ± 7.1		
(OS,300W)	Alt.Ref.No.2	604.7 ± 11.2	605.4	Based on OWON =524.71
(Junction (M & B Road) (& Access (Road	Alt.Ref.No.3	649.2 ± 8.3	655.6	
(CM 100,CN (Copper Mint)	Alt.Ref.No.4	536.0 ± 4.3*		

* The ranges shown here are maximum ranges of the drift and temperature corrected readings, from the averages.

Elevations are above mean sea level. The various Altimeter readings were plotted as profiles on Figures 6 - 28 and show the general topography experienced along the base lines and reconnaissance lines.

Further use of these results is made in interpreting the other geophysical results.

(c) Gravity Surveys.

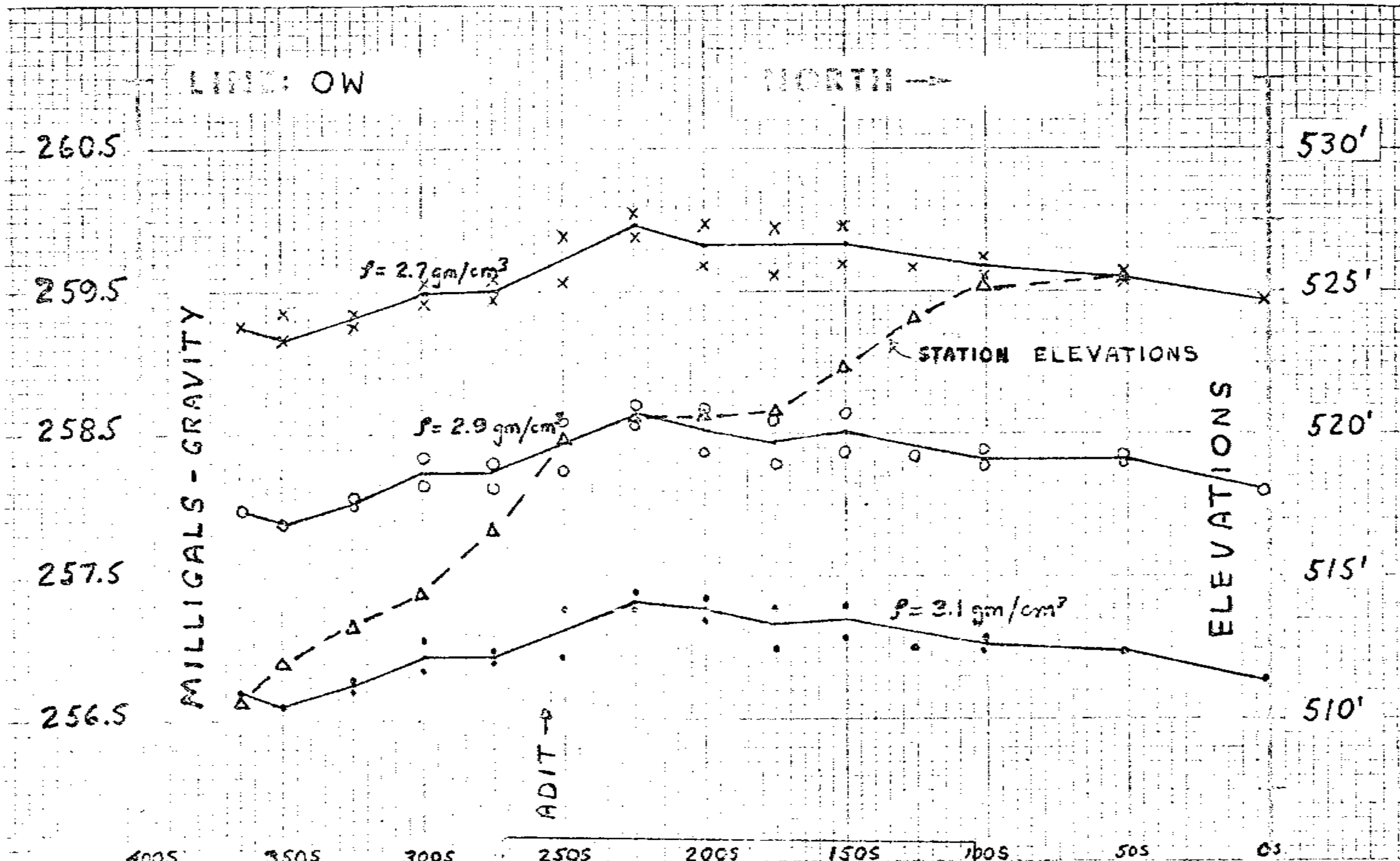
The gravimeter was used on the small tripod and base which comes with the unit. The elevation of the base was recorded with respect to the base station OW,ON on claim 22G. The elevations were determined to the nearest one hundreds of a foot using an automatic level. The gravimeter was carefully leveled each time on its tripod base.

Two computer programs were used - one to correct for drift and another to make the Free-Air and Bouguer corrections. (Refer to Appendices). No terrain or latitude corrections were applied, since the lines were short and parallel to the main topographical feature, the river canyon.

A major problem is to find the average density of the material between the instrument and datum plane so that the Bouguer & Free Air corrections could be applied. This density was not known so three different values were plugged into the computer program and the gravity values for each density were plotted as three profiles for each line. Based on the guide in Parasnis (1966, p 231) the densities used were 2.7, 2.9 and 3.1 gm/cm^3 which just about covers the range for igneous rock (intrusive & extrusive) expected in this area - meta volcanics and diorite mainly.

OW line (Claim 228) (Figure 29).

The three profiles produced for each of the three densities exhibit very similar shapes. The double points for each station on each profile are values obtained going south, then back north at the same locations. The profiles are drawn through the averages at each station. The elevation of each station is also shown (broken line).



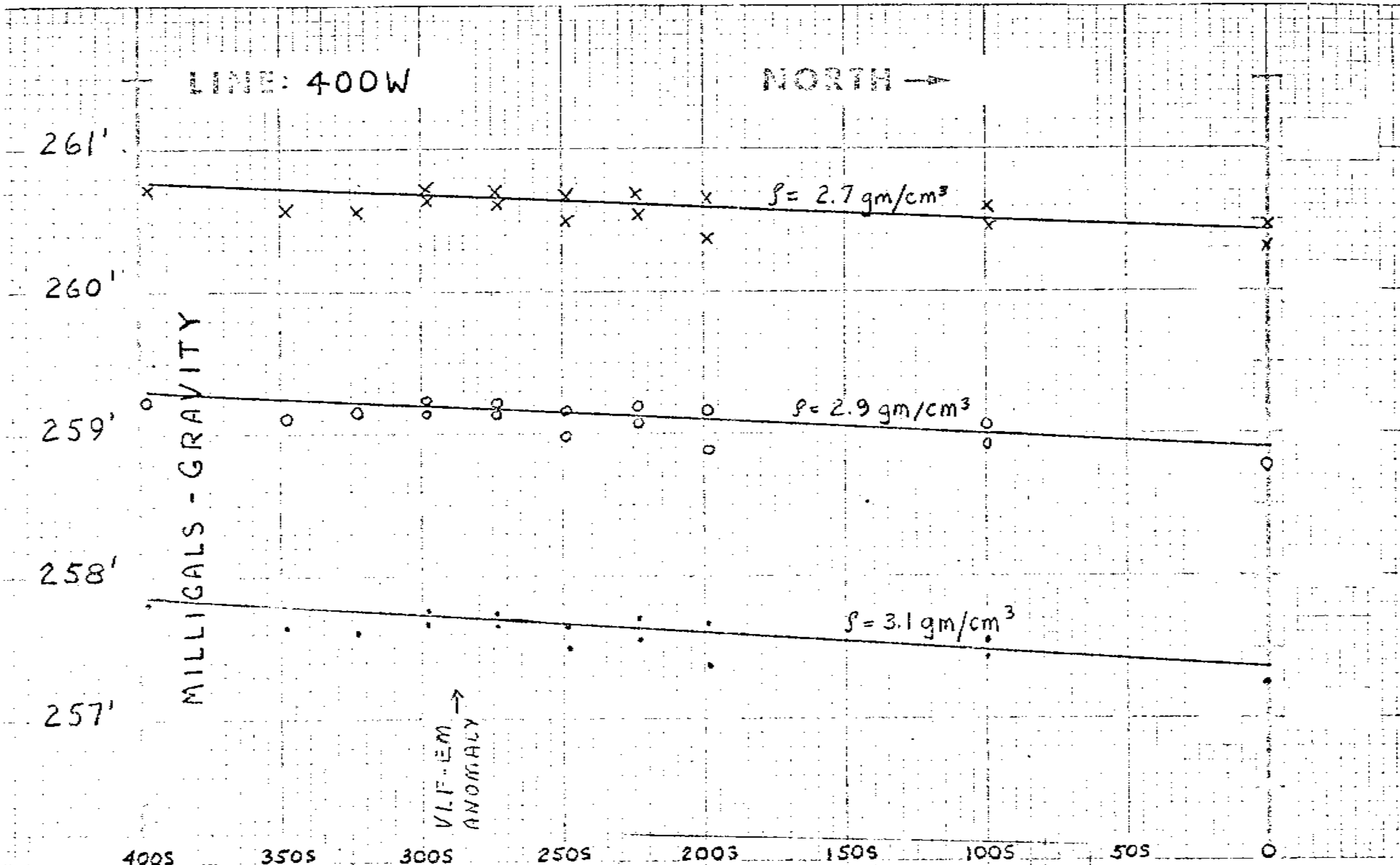
Mines and Petroleum Resources

NO. 4626 MAP #29

29.

GRAVITY SURVEY

A.B.L.W. SEPT.73



FOR ELEVATIONS SEE FIG. 14

Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 4626 MAP #30

FIG. 30
GRAVITY
SURVEY

DRN: A.B.L.W. DATE: SEPT. 73

There is no obvious correlation of topography with the gravity values, and the mineralized zone (which the adit follows) does not show up on the profiles. The changes in the profiles are, in fact, not much bigger than the reproducibility observed and it is concluded that the contrasts in rock density or mineralization density is not sufficiently large to make gravity surveying in this area too useful.

400 W line (Claim 22G) (Figure 30).

This line crosses the large VLF-EM anomaly observed earlier in the 1971 Whittles and Loring Report. The elevation of the stations (not plotted) show a gradual slope downward to the south. (See Figure 14).

The gravity values can be connected with a straight line, if the reproducibility is taken into account. There is no observable change in the gravity values at the position of the large VLF-EM anomaly (280S, 400W, claim 22G).

(d) Induced Polarization Survey.

The Crone Condensor Discharge I.P unit was used to obtain the data displayed in Figure 31 (OW line from OS to 400S, across the adit and mineralyzed zone). This was done to provide some comparison to the previous work over the anomalous area on 400W line (1971 Whittles & Loring Report) the following interpretation is suggested for the OW line -

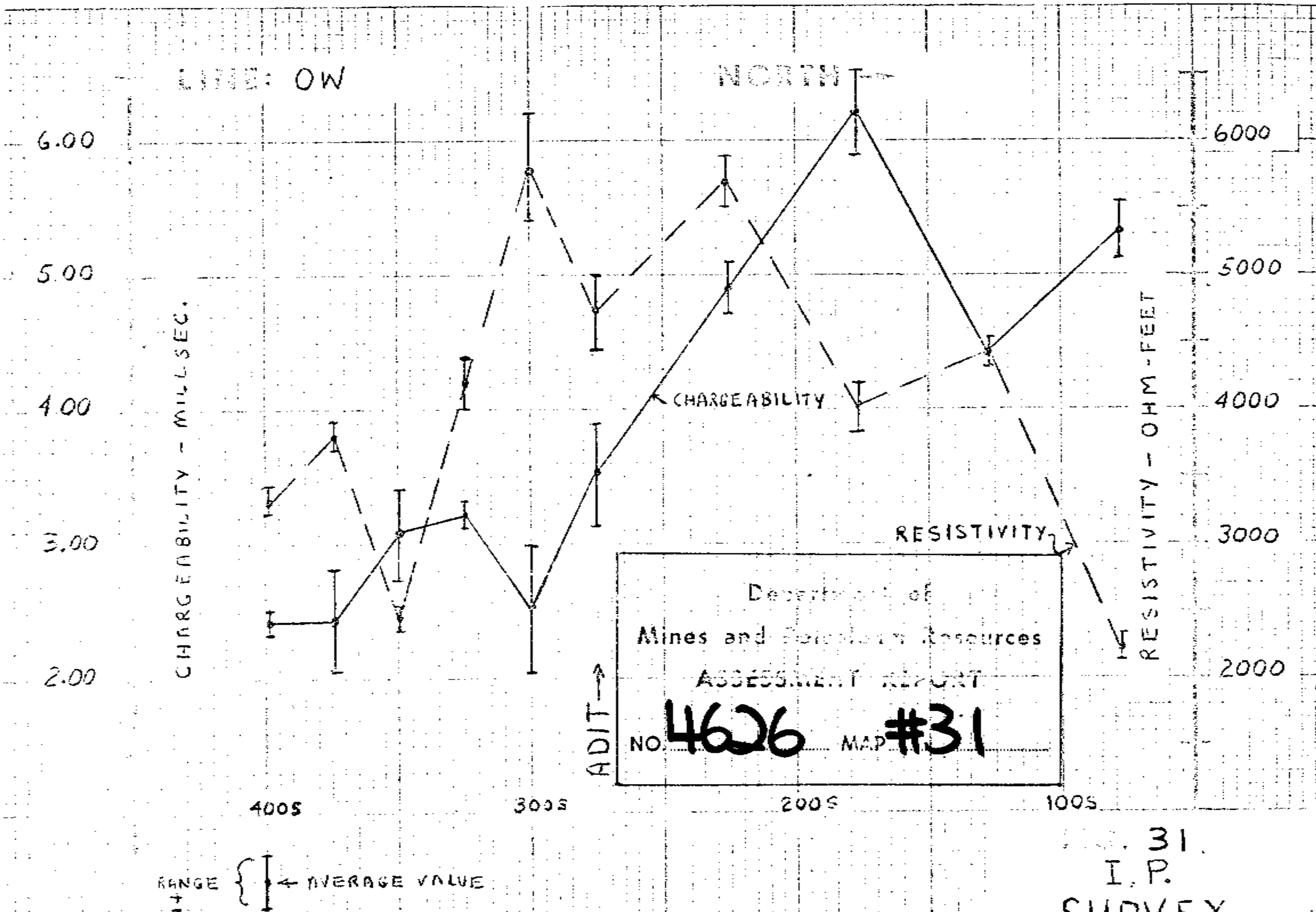
(1) The adit does not show up very clearly on the chargeability curve, and only as a slight decrease in resistivity. The resistivity indication is only just above the reproducibility of the survey and cannot be held too significant.

(2) There is a distinct chargeability high and resistivity low at 175S. There is only a little mineralization here so changes must be due to a water filled schist zone (which is observed on the river bank). The chargeability high indicates a fair amount of weathering and the production of clay minerals. There is no corresponding VLF-EM or CROSS JEM high in this region.

(3) The high chargeability at 75S and low resistivity ties in quite well with both the VLF-EM and CROSS JEM highs at 50S. This is a good indication of mineralization or a heavily weathered schist zone.

(4) There is a large decrease in resistivity and a slight increase (barely above the reproducibility) in the chargeability at 325-350S. This corresponds to a VLF-EM high. It may be due to mineralization in the schist found in line with this location on the river bank.

(5) General Conclusions. It would appear that the changes in the schist (from slight to more intensely metamorphosed) produces a larger I.P. effect (with chargeabilities up to 6 millisec) than the



Department of Mines and Petroleum Resources ASSESSMENT REPORT NO. 4626 MAP #31

31
I. P.
SURVEY

DRN: A.E.L.M. DATE: SEPT. 73

mineralization followed by the adit.

In comparison to the 1971 work on line 400W, one can note that the chargeability values for the OW line are considerably larger. This is probably due to the very thin overburden along the OW line compared to the estimated 18 - 24 feet (see section (g)- Seismic Surveys) along the 400W line.

(e) Low Frequency E M Surveys.

Although the Crone JEM unit used has two frequencies only the "low" frequency (480 hz) was used for most of the surveys. The purpose of the surveys were to locate potential conductors; once these are located a second survey at a higher frequency (1600 hz) may help to indicate the depth, size, shape and conductivity contrast. The lower frequency is used to obtain the deepest penetration (high frequency EM radiation is attenuated more quickly by soil and rock than low frequency).

Spacing also affects the effective penetration. At 100 feet between units the effective penetration would be approximately 50 feet. Most reading (unless otherwise noted) were made with a 100' spacing.

These types of units are generally not very effective with the disseminated type of deposit that we are apparently dealing with on this claim.

The Crone JEM unit generally eliminates regular topographical features but would appear to be influenced by large, rapid changes in topographical slope (for example where one of the units is at the top of a hill, the other part way down the slope). For this reason anomalies obtained in such regions cannot be given much weight in interpretation. The same is true for readings made in the region of metal sheets, machinery, etc.

The results for the various profiles are shown in Figures 32 to 42. There are no really significant anomalies recorded and most of the variations are within the reproducibility of the readings (± 1° to ± 2°).

<u>500 W Line (Figures 32 and 33)</u>

No significant variations are present here. The large VLF-EM anomaly cuts this line about 250S, but no strong evidence of the zone is reflected on these Crone JEM profiles.

<u>400 W Line (Figures 34 and 35)</u>

The results on the northern part of this line are the most variable, with regards to reproducibility, of any line, for both 100' and 200' coil spacings. The presence of swampy areas along this line probably contribute to the very broad null found here and in turn, to the poor reproducibility.

The strong VLF EM anomaly crosses this line about 300S. No strong evidence of low frequency EM response can be found. The + 2° at 250S is still within the reproducibility (±2°) of this survey.

<u>300 W line (Figures 36 and 37)</u>

The southern part of this line should intersect the large VLF-EM anomaly at about 375S, but, again, there is no evidence of a corresponding low frequency effect.

There appears to be a larger than usual response from 200N to 500 N on this line, but it is a very broad response. This zone does not appear on other types of geophysical surveys and its significance (if any) is not understood at this time.

<u>OW and RL 1 lines (Figures 38 and 39)</u>

The random line RL 1 north of the OW, OS base station shows no significant variations.

The OW line to the south shows no large variation although there does appear to be a slightly higher region above the mineralized zone extending in from the river (at about 250 S). This agrees with the earlier work along the same line (Whittles and Loring, 1971), which gave a + 3 reading in about the same location. These results, however, are barely above the level of reproducibility (± 2°) and would likely be even less in areas away from the river bank where the overburden is deeper. The overburden appears only to be a few feet deep near the mineralized zone as compared to approximately 20 feet west of the 200 W line. (Please refer to the Seismic Results for a further discussion of these overburden depths).

200 S line (Figure 40)

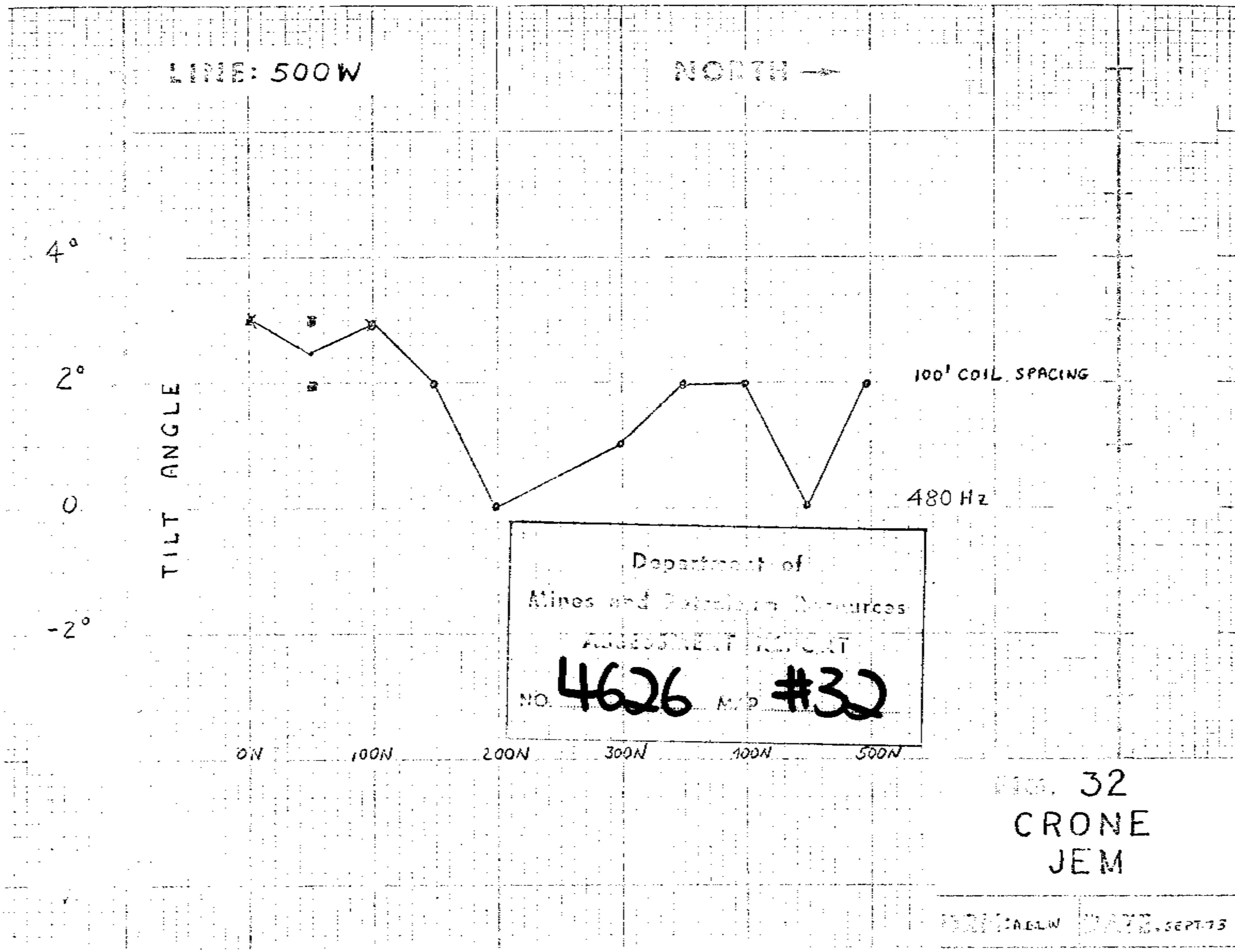
This line was run-east west (in contrast to the preceeding north-south lines) to see if the VLF-EM zone that crosses the 300 W line at about 375 S, folded northward then joined up with the mineralized zone coming from the adit. The variations observed are too small to confirm this possibility but + 3° was obtained on both high and low frequency settings at 325 W. This would be about where the fold in the zone would be expected. The VLF-EM results disappear in this region but this would be expected since the VLF-EM Waves (from Jim Creek, Washington) would not couple very well for a conducting zone that runs almost north-south.

CM 200 Line (Figure 41 and 42)

This line was run on the new claim, Copper Mint I.

No significant variations were observed to the south of this line (figure 41).

On the north side of the CM base line (200N, CM 200) one reading of + 6° was obtained. This has not been rechecked and must be


LINE: 500W
NORTH →
4°
2°
0
-2°
TILT ANGLE
100' COIL SPACING
480 Hz
0N
100N
200N
300N
400N
500N
NO. 4626
#32
32
CRONE
JEM
SEPT-73

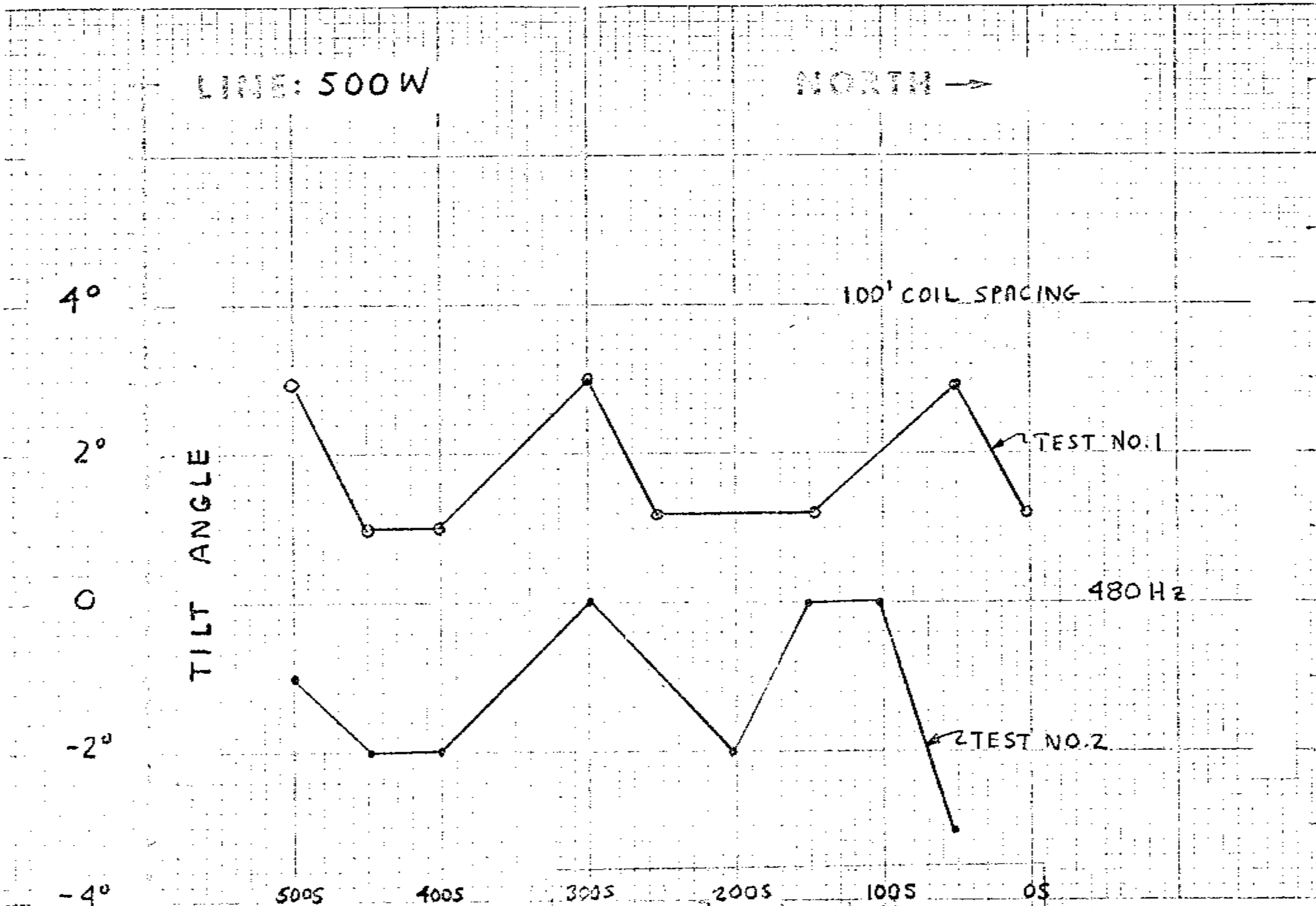


FIG. 33
CRONE
JEM

A.B.L.W. SEPT. 73

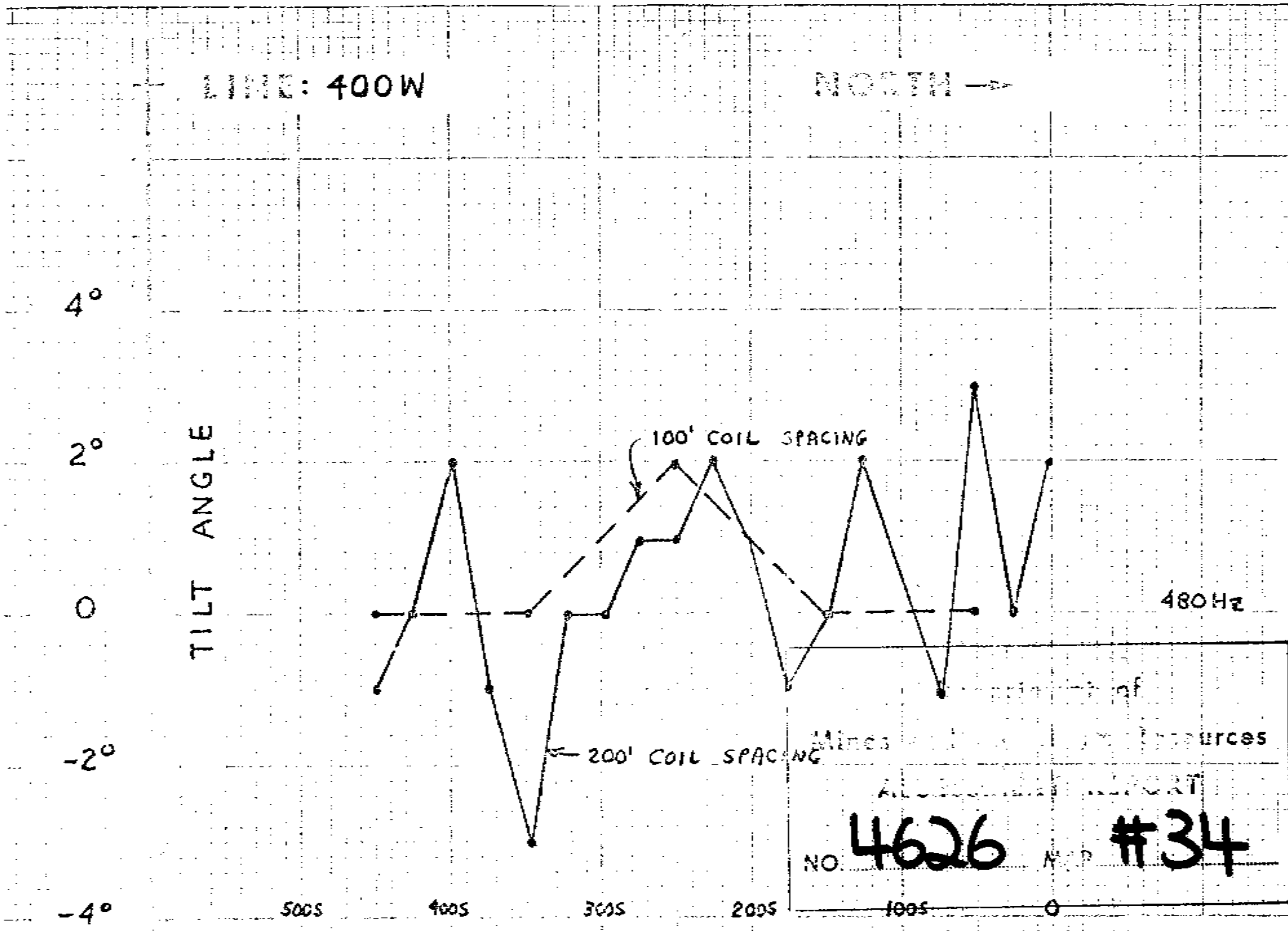


FIG. 34.
CRONE
JEM

DRN: A.B.L.W. DATE: SEPT. 73

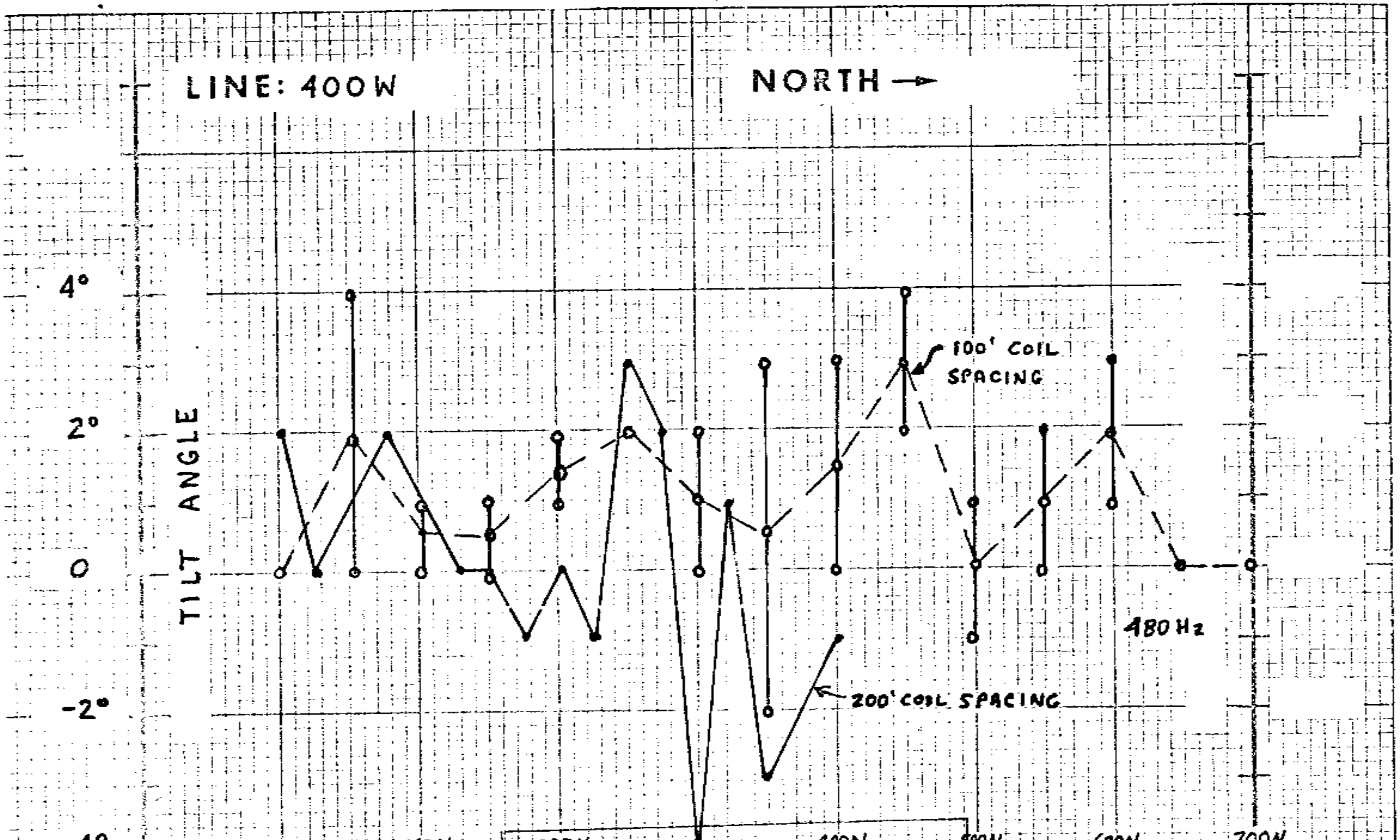


FIG. 35
CRONE
JEM

DRN: A.B.L.W. DATE: SEPT. 73

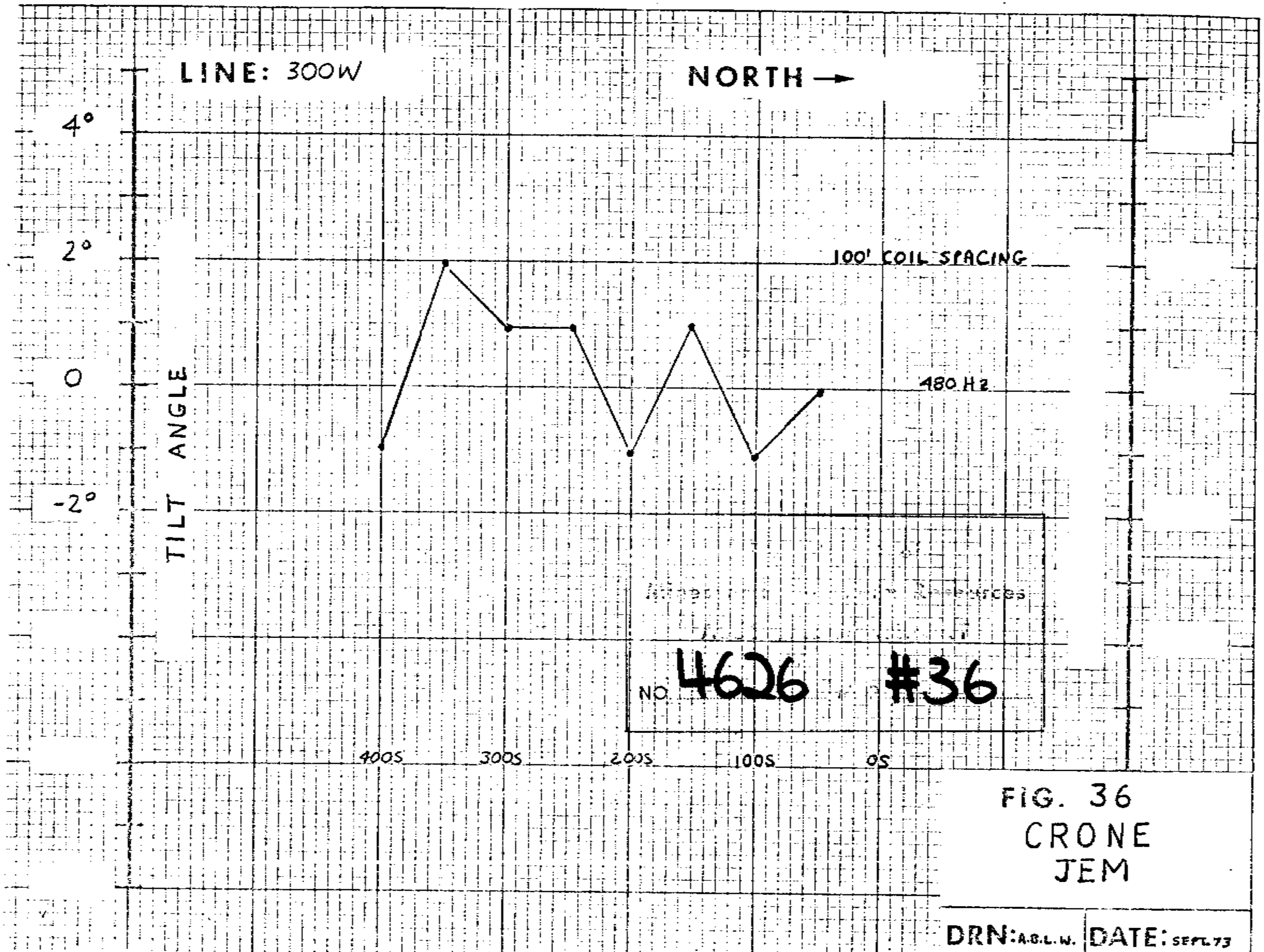


FIG. 36
CRONE
JEM

DRN: A.B.L.W. | DATE: SEPT. 73

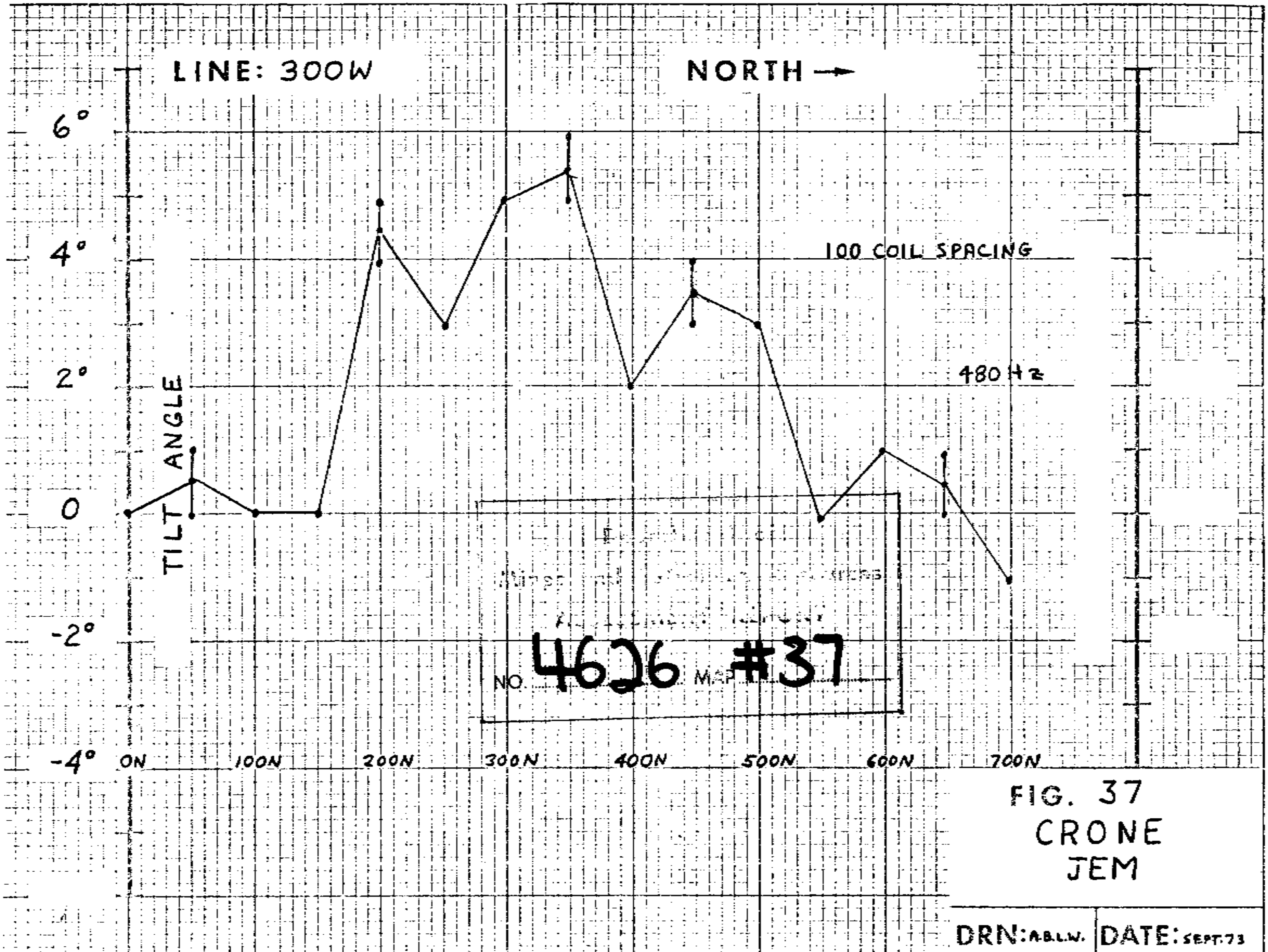


FIG. 37
CRONE
JEM

DRN: A.B.L.W. DATE: SEPT. 73

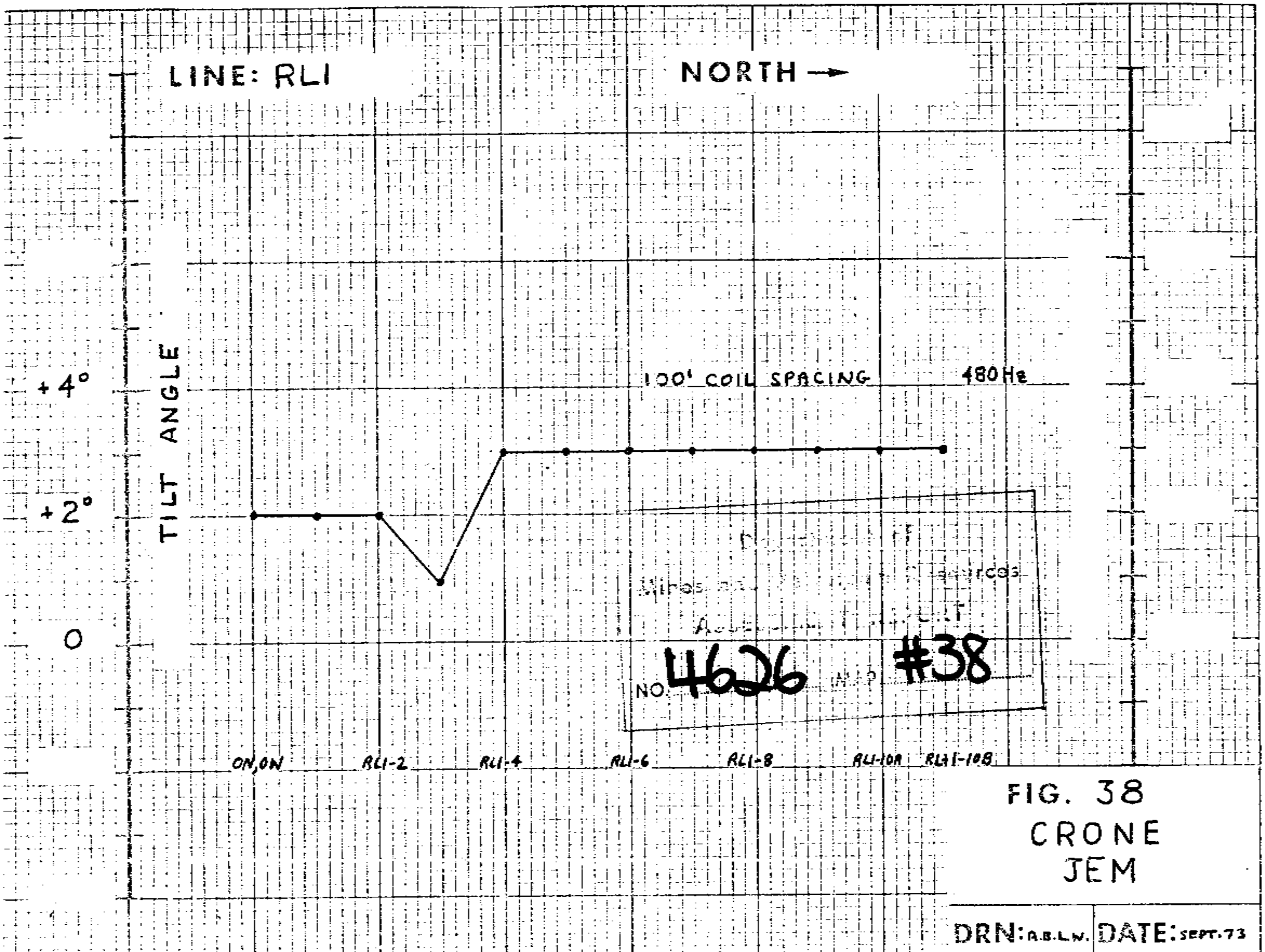


FIG. 38
CRONE
JEM

DRN: A.B.L.W. DATE: SEPT. 73

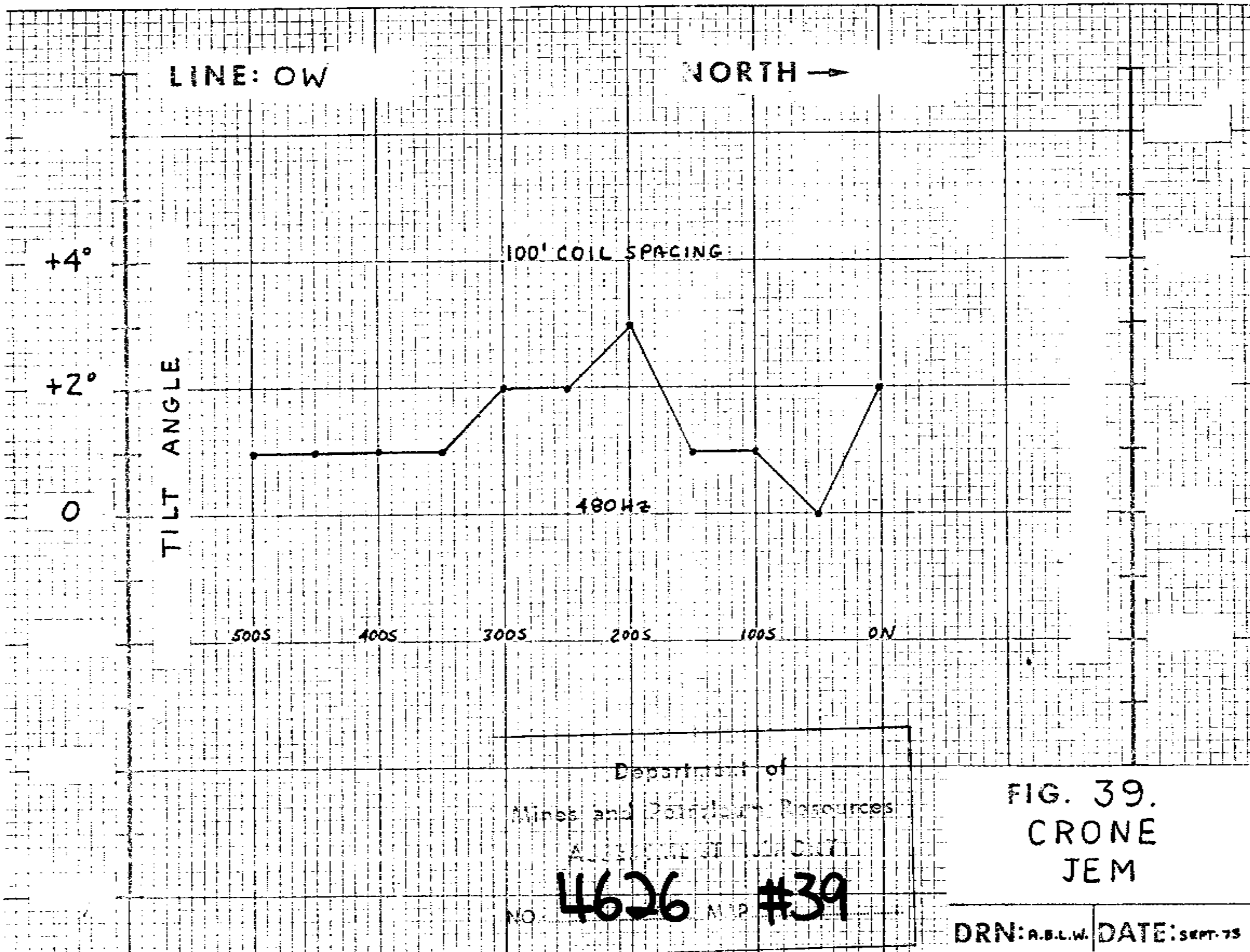


FIG. 39.
CRONE
JEM

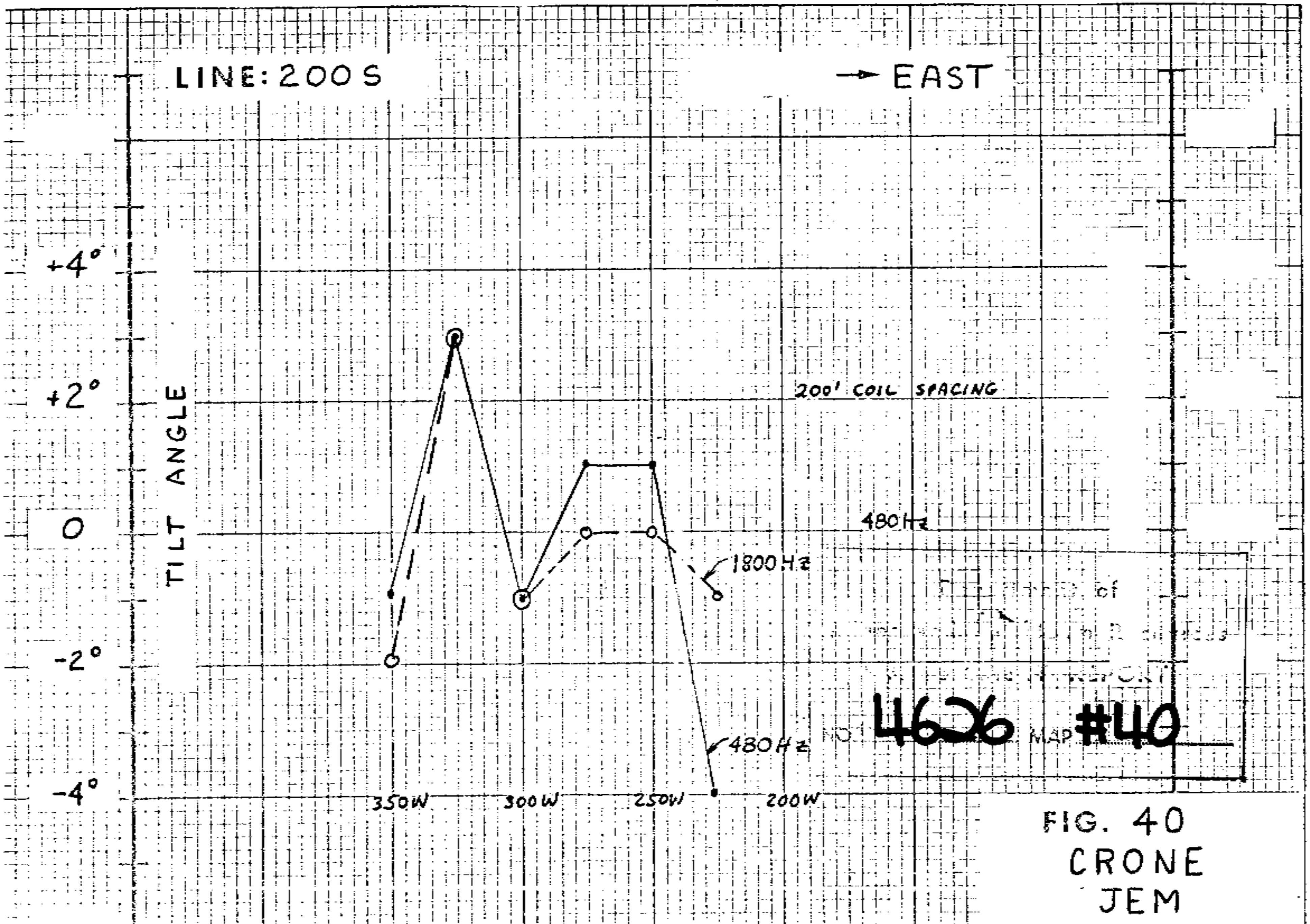


FIG. 40
CRONE
JEM

DRN: A.B.L.W. DATE: SEPT. 73

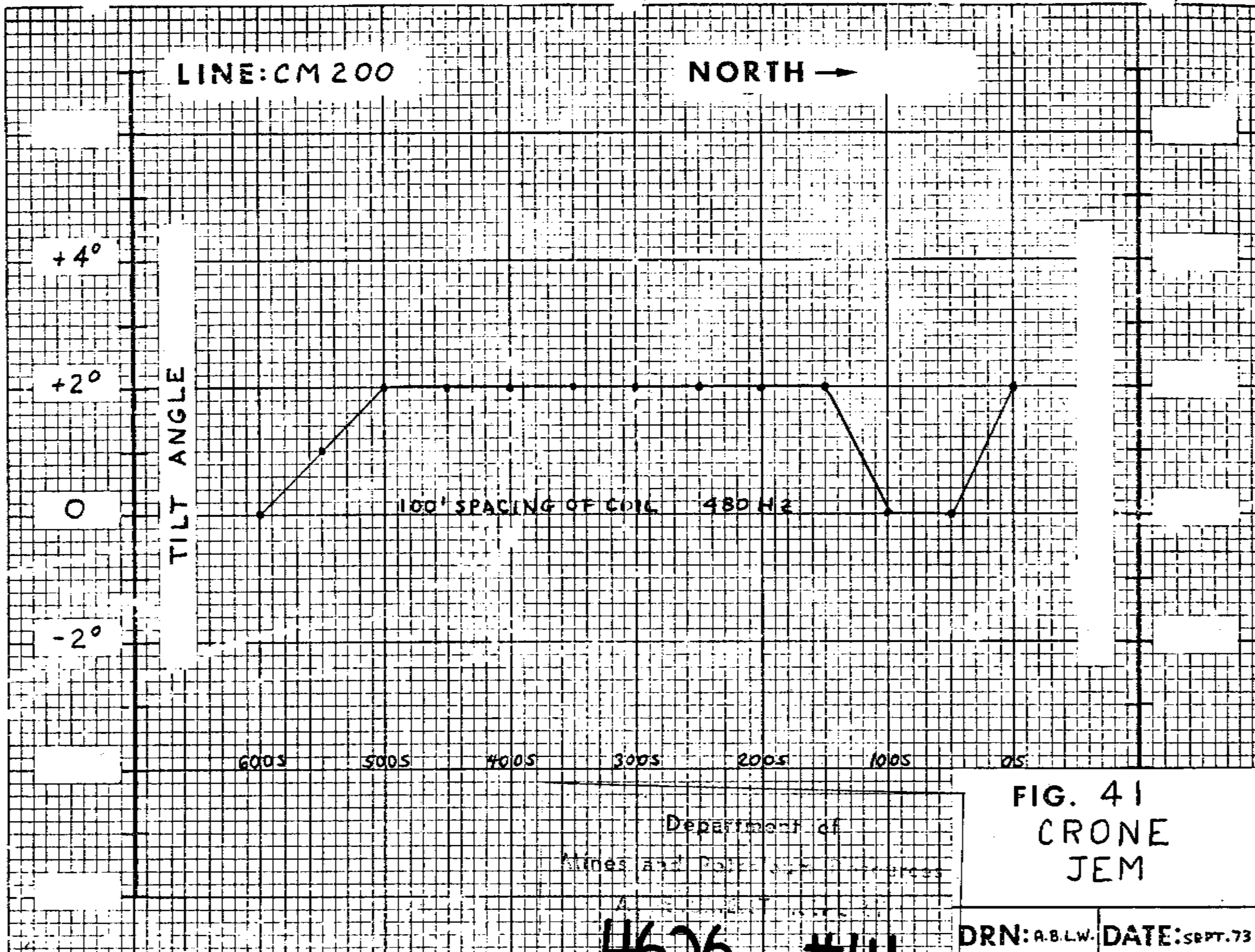


FIG. 41
CRONE
JEM

DRN: A.B.L.W. | DATE: SEPT. 73

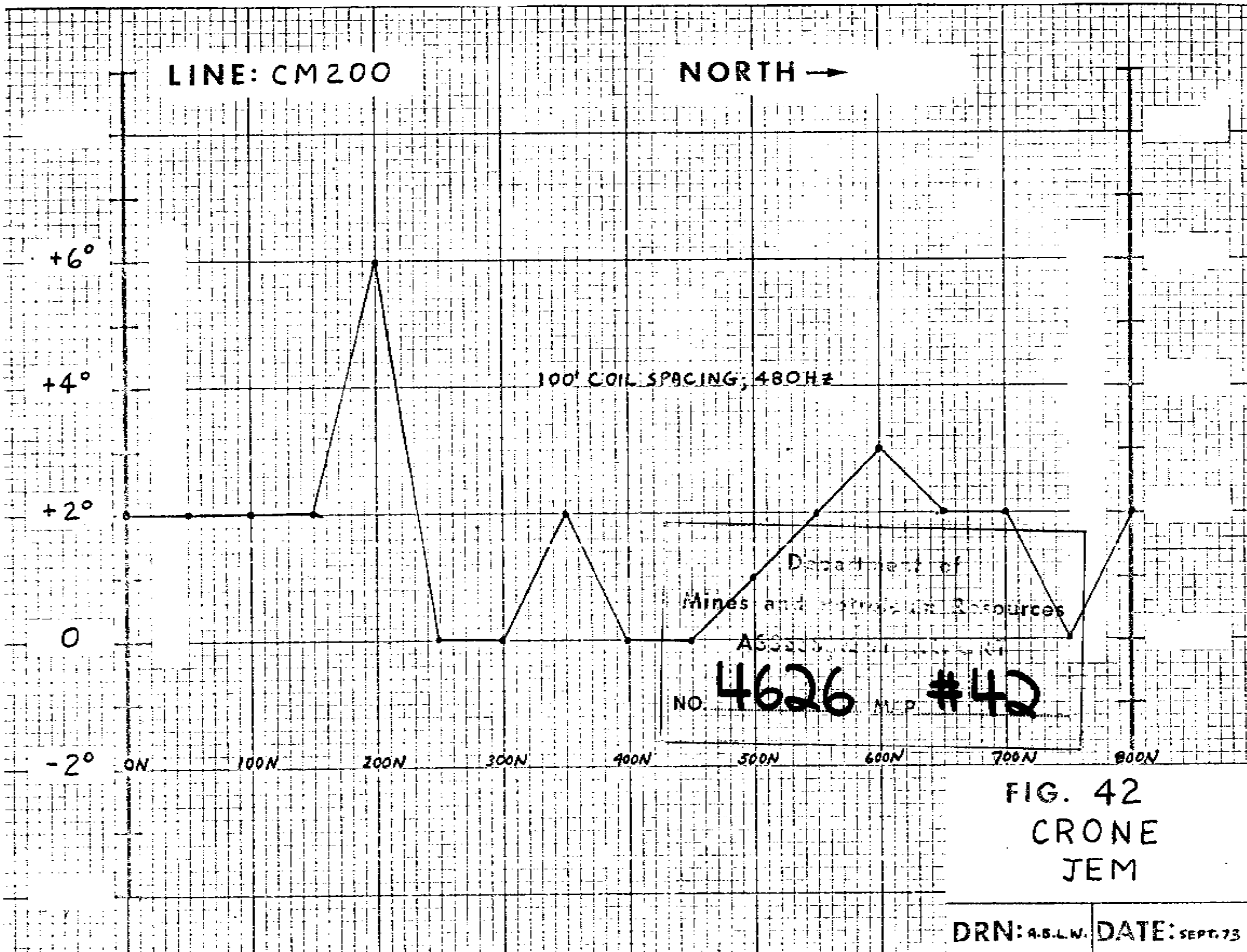


FIG. 42
CRONE
JEM

DRN: A.B.L.W. DATE: SEPT. 73

considered tentative. Another reading of +3° was obtained at 600 N. No VLF-EM anomalies were observed at these locations. The magnetic results do not seem to correlate with the Crone JEM results discussed here, apart from the slight magnetic low near the 200 N Crone JEM high. This type of correlation has also been indicated in previous surveys (Whittles and Loring, 1971, p.13).

(f) Magnetic Surveys.

These surveys were tied into the base station OW ON on Claim 22G, set at -90 gammas, and are plotted in Figures 43, 44 and 45. All readings were drift corrected using a linear drift computer program (see Appendices). Although there are no indications of significant amounts of magnetic mineral, it is hoped that the magnetic surveys can help indicate changes in rock type over the claim area or changes of mineralization as suggested in the 1971 Whittle and Loring Report on this claim group. In considering Figures 43, 44 and 45, there seems to be more magnetic rock on line CM 200 from 300 N to 800 N, and 650 N to 800 N on CM 300. There are lower values along most of line CM 400 except perhaps 500 N to 550 N. Note that along CM 400, 600 N to 800 N (in the creek bed) there was a distant drop in the magnetic values. One could interpret this in a number of

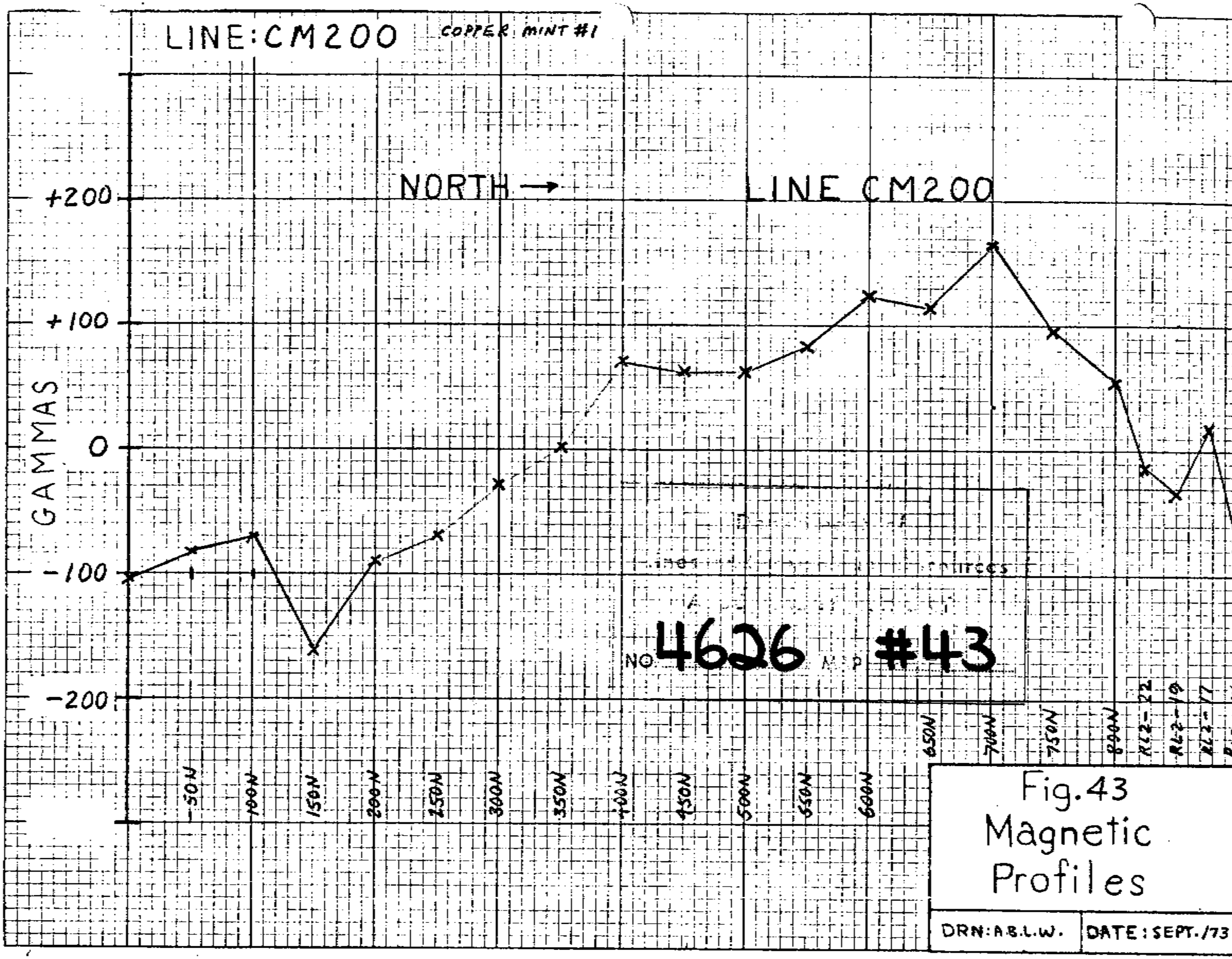


Fig. 43
Magnetic
Profiles

DRN: A.B.L.W. DATE: SEPT./73

- 70 -

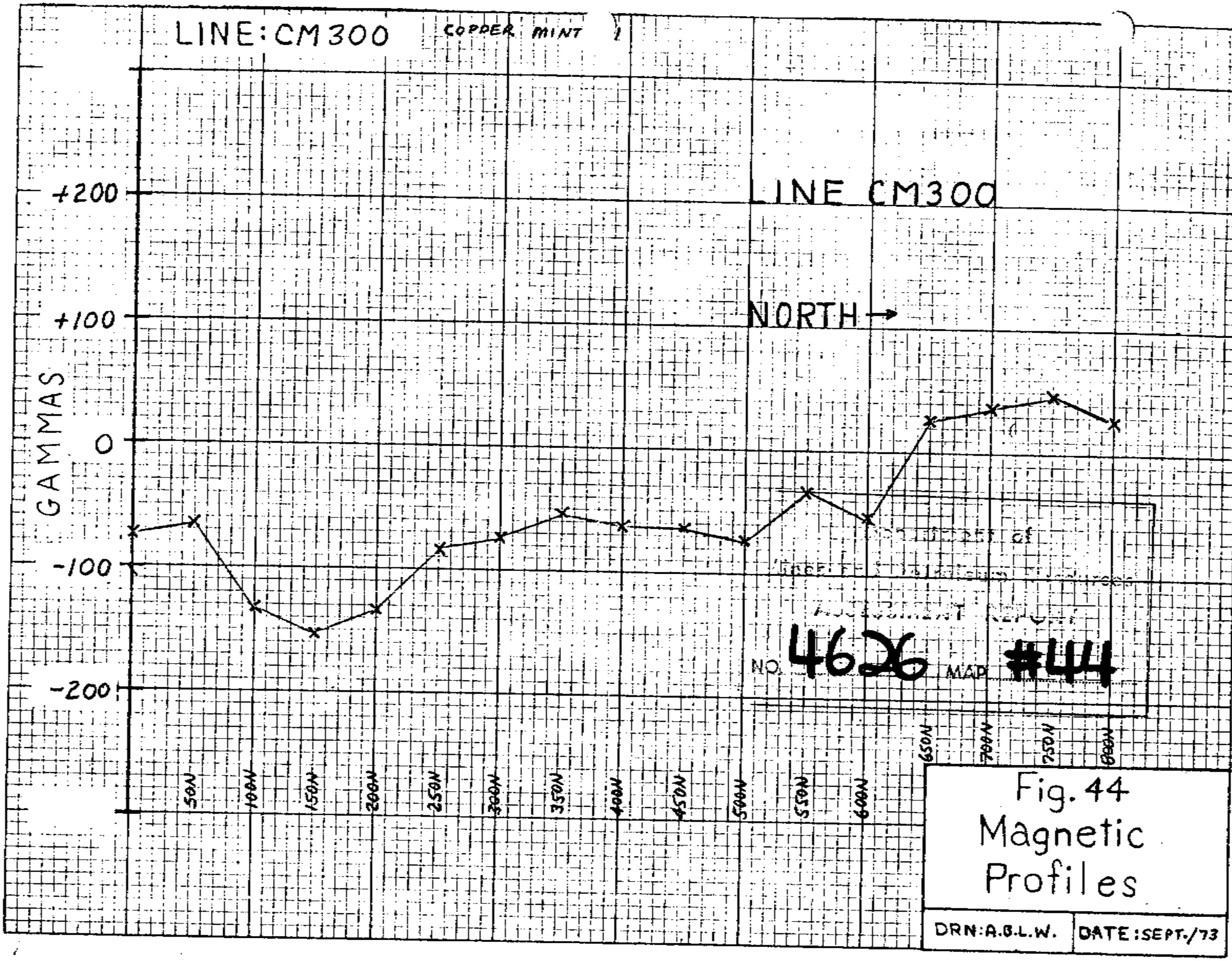


Fig. 44
Magnetic Profiles

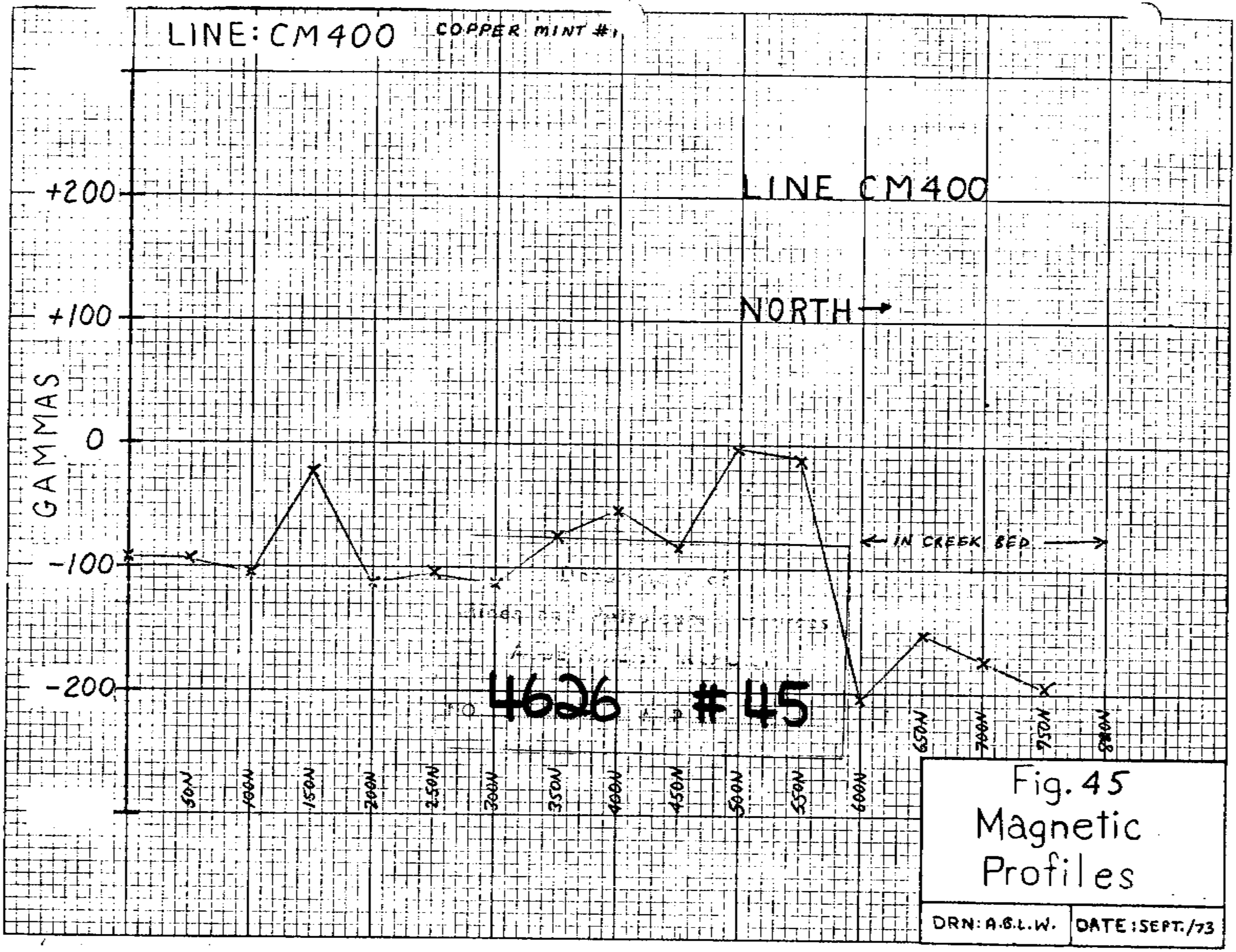


Fig. 45
Magnetic Profiles

ways. The most probable explanation is that there is a slight change in rock type in this region that also extends over to line 100 W & line OW on Claim 22G. Another possibility is that the underlying rock is reverse magnetized and so that in the creek bed the values are more negative (e.g. the underlying rock is closer to the instrument).

The first suggestion seems more probable since generally changes due to topography are smaller than changes due to rock types (see Figure 15-3, Dobrin, 1960, p310). This needs to be checked further by magnetic surveys along the exposed rock on the river bank, and by filling in the various lines so that a contour map could be produced.

One other possible explanation should be considered. In the 1971 report slight magnetic highs were found in the strongly anomalous (VLF-EM) zone on line 400W Claim 22G, which suggested the possibility of slightly magnetic mineralization . Since that report was published (July, 1971) further work has been done which suggest the anomalous zone makes a sharp northerly bend along line 300 W then heads east to the adit. The presence of mineralization along 300W (from 300S to OS) might be the cause of the higher magnetic values found there. This possibility needs to be checked by magnetic surveys along the VLF-EM anomalous zone to the west on lines 500 W and 600 W, Claim 22G.

(g) Seismic Surveys

Line 77E (Figure 46)

The set of results in Figure 46 show two straight line segments. These results were obtained using the soil test 117C system. This test was carried out on bedrock beside the river (line 77E) to determine directly what the bedrock velocity might be. The results obtained (using the seismic computer program for two layers) suggest a partially weathered rock layer (V1 = 8500 ft./sec.) about 10 feet thick and a second layer with a velocity V2 = 18,000ft./sec.. This second layer could indicate an intrusive such as diorite is underlying the meta-volcanics (as is reported across the river) but this can only be guessed at with the little data that is available. (Heiland, 1940, p. 472). More likely the second layer is the unweathered meta-volcanic rock.

Line 189 W (Figure 47)

The results of figure 47 were obtained using the Storage Scope system discussed in section 5 (g) and Figures 5A & 5B. The time (in milliseconds) of first arrival is plotted against the distance between the detonation and geophone. By moving the detonation farther away the usual seismic profile is obtained. The first linear position of figure 47, represents the direct wave from detonation. The reflected wave would always arrive later than the direct wave. At a distance of 60 feet, the refracted wave (or the 'head' wave of the critically refracted ray in the second layer) begins to arrive first. The velocities can then be calculated from the inverses of the slopes of these two straight segments. Within the uncertainties of the individual points (indicated by the vertical bars through the points) only two layers are evident. The first layer was soil, but well compacted (the survey line was along a gravel road).

The velocity of the second layer indicated on Figure 47, Line 189N is only 6813 ft./sec., while that found in earlier work (Line 325S: Whittles and Loring, 1971; Figure 25 reproduced as Figure 48) was 34,000 ft./sec. The variation in these two results might well be the result of a dipping second layer, so the depths were calculated for both Figures 47 and 48 assuming various dips, to see if these V2 values might be brought into agreement with that obtained for Figure 46. Seismic Computer Program No. 2 was used.

A depth estimate ranging from 18.00' to 18.18' was obtained for Figure 47 assuming a dip of 7° to 5° south along line 189 W (as compared to 19' for Seismic Computer Program No. 1). At the same time the corrected V2 was found to range from 8999 ft./sec. to 8230 ft./sec., with 8597 ft./sec., being obtained for a dip of 6°. This latter dip angle would bring the V2 value into agreement

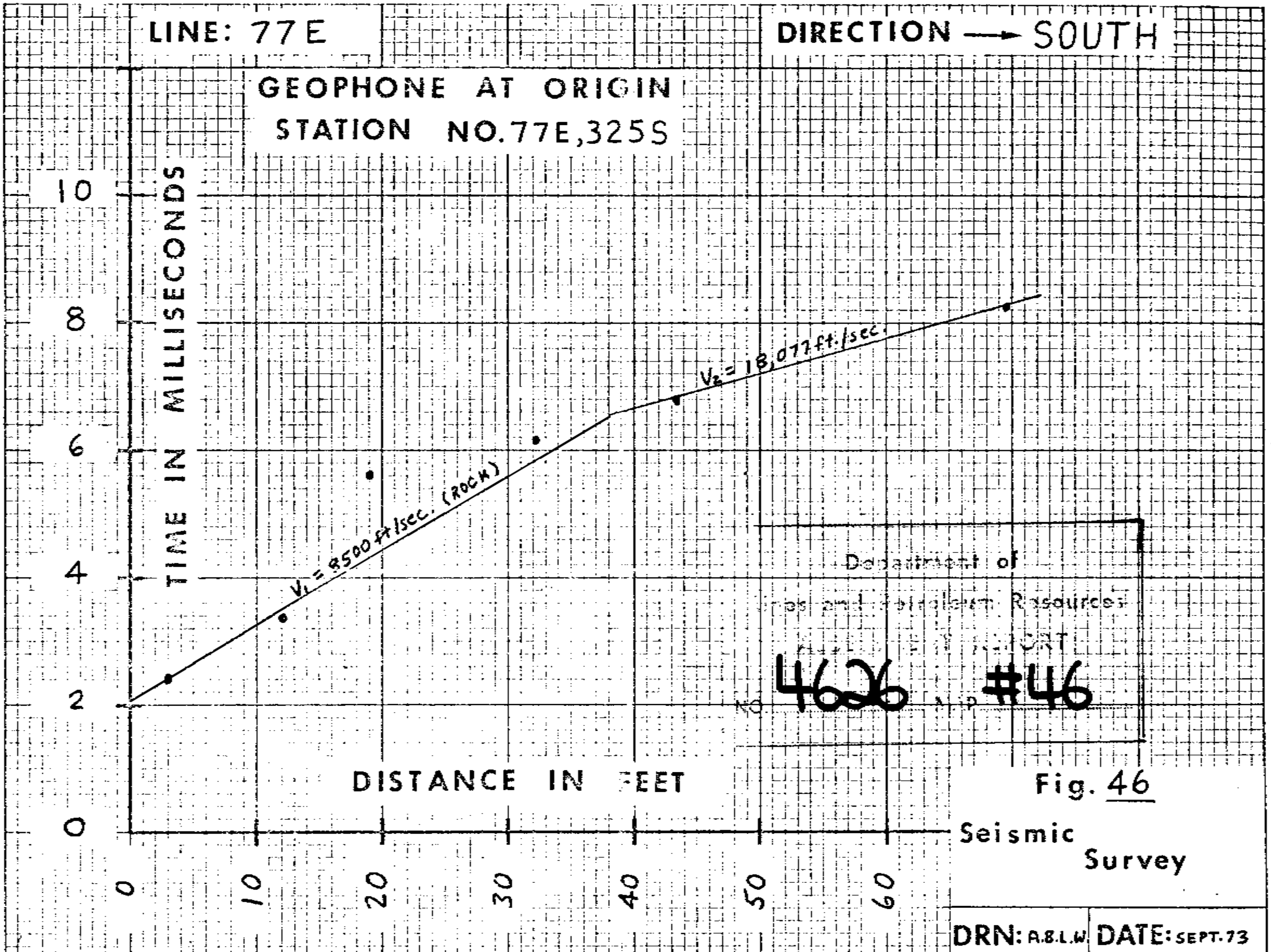

LINE: 77E
DIRECTION → SOUTH
GEOPHONE AT ORIGIN
STATION NO. 77E,325S
TIME IN MILLISECONDS
0
2
4
6
8
10
V_1 = 8500 ft/sec. (ROCK)
V_2 = 18,077 ft./sec.
DISTANCE IN FEET
0
10
20
30
40
50
60
Department of
Resources
4626
#46
Seismic Survey
DRN: A.B.L.W.
DATE: SEPT. 73

Fig. 46

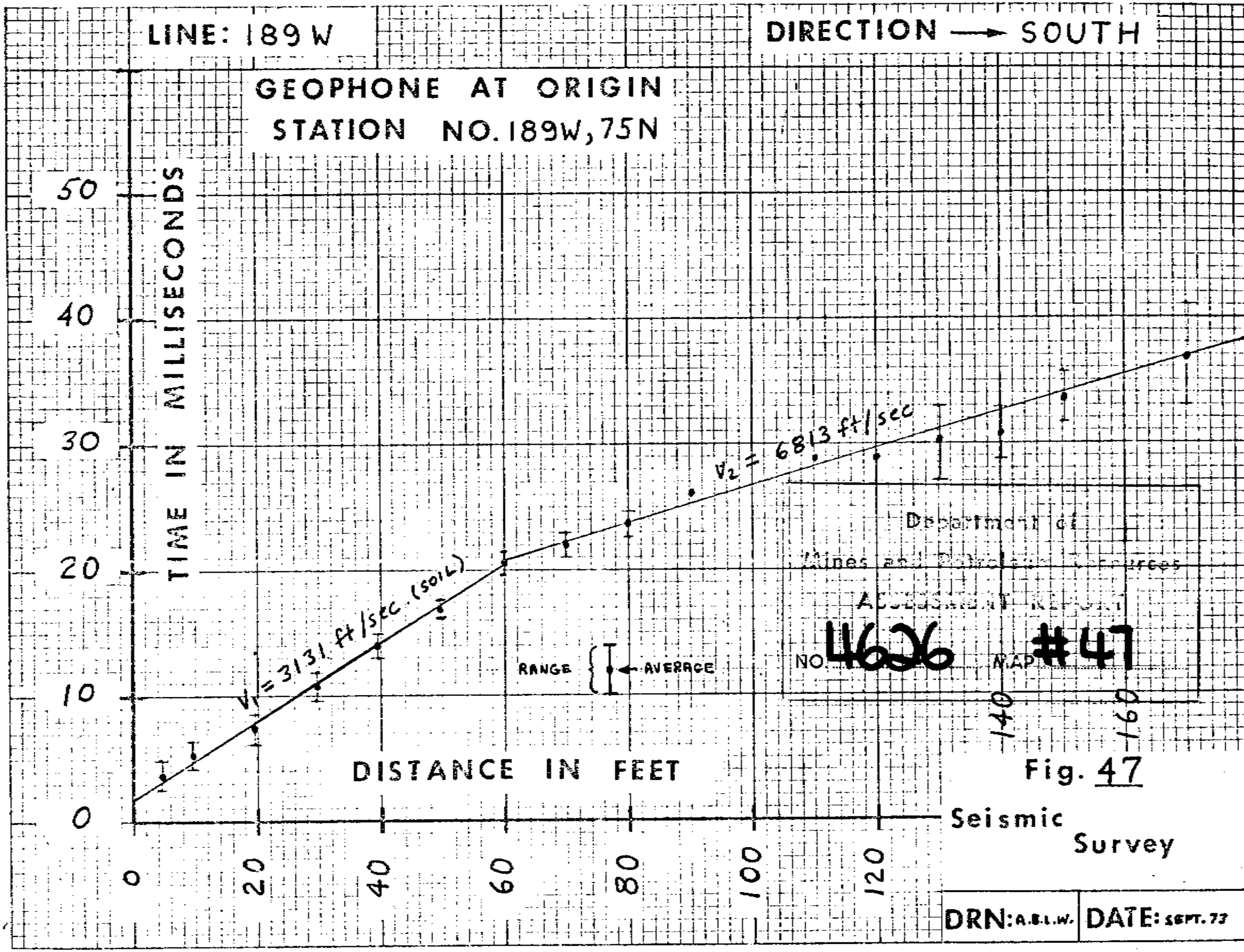


Fig. 47
Seismic Survey

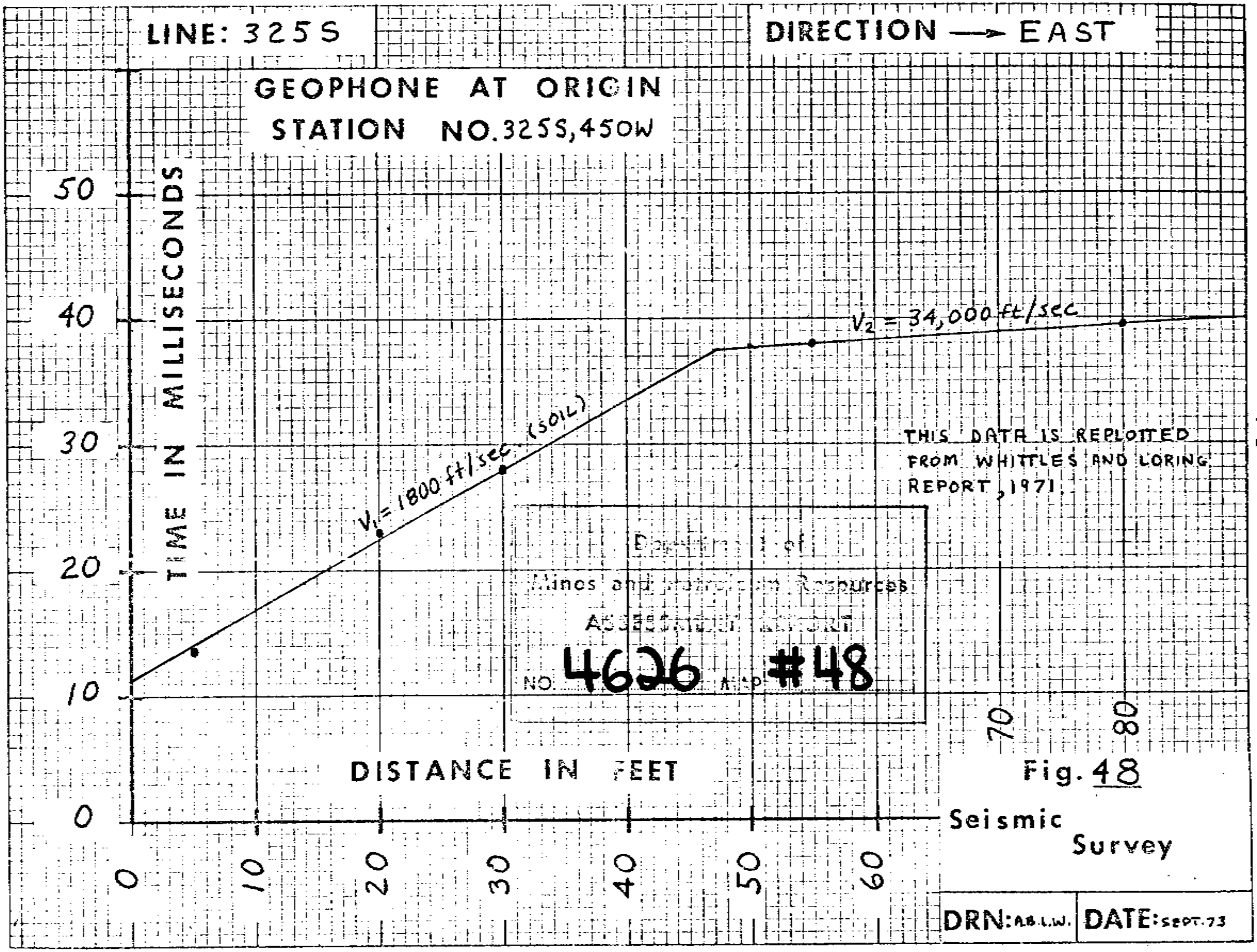


Fig. 48
Seismic Survey

-78-

with the weathered rock value found for line 77E (8500 ft./sec., Figure 46). Note that layer No. 1 for line 77E should correspond to layer No. 2 for 189W.

Line 325 S

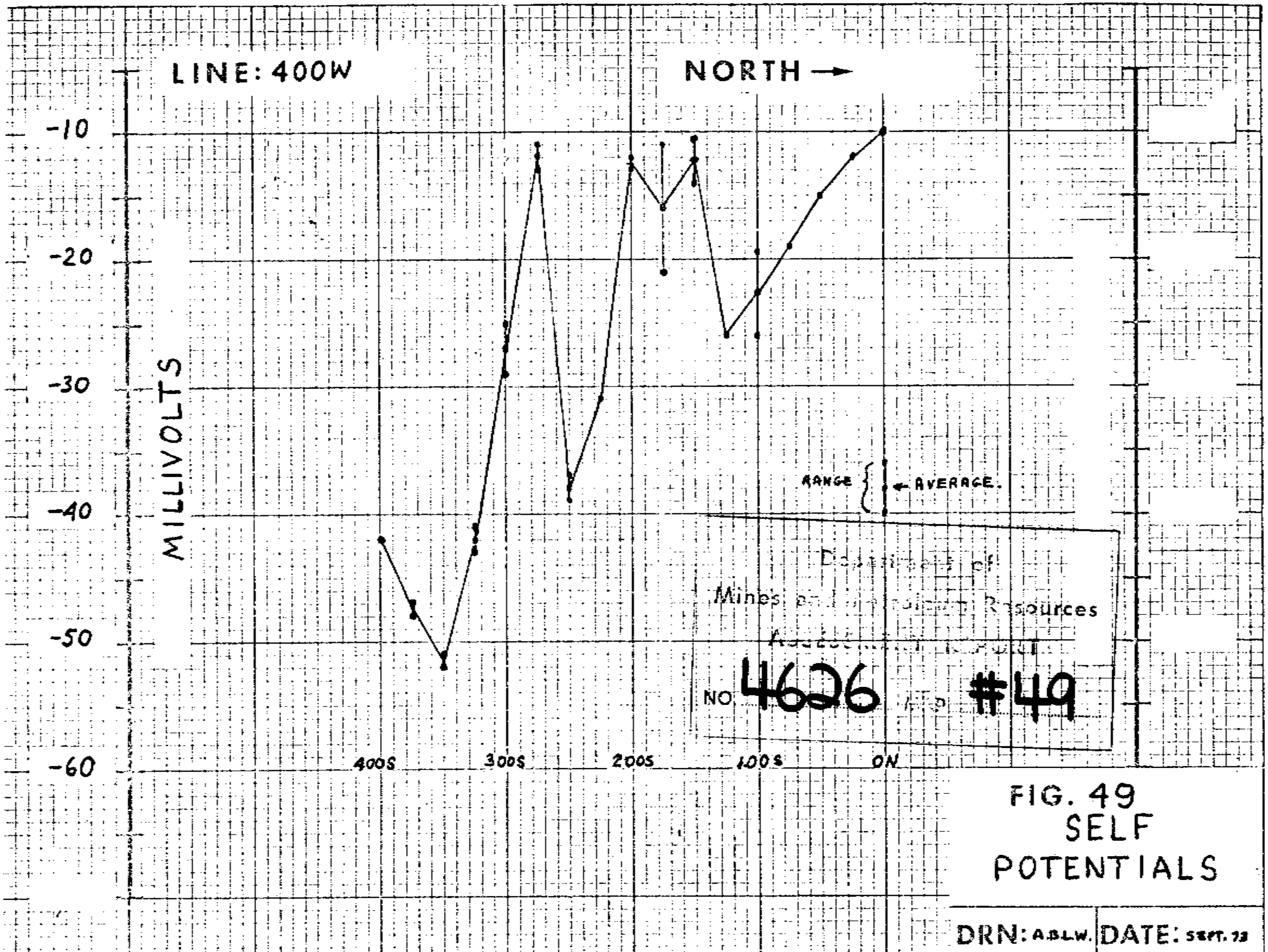
In view of this new data, Figure 25 of the 1971 Whittles and Loring Report (shown on Figure 48 in this report) was reinterpreted. The closest V2 value (compared to V2 = 18,077 ft./sec., Line 77E, Figure 46) was 18,662 ft./sec. for an angle of dip to the west of 2.5° along line 325S. The depth calculated by this new method was found to be 24', the same figure found in the 1971 survey. The first layer on 77E (the weathered rock) appears to be missing on 325S. The paucity of data on 325S might have masked this layer. The overburden depths for locations 325S, 450W, and 189W, 110N are thus very similar (24 to 18 feet). No overburden is observed on line 77E (the river bank). The overburden on the 325S line is much less compacted than that along line 189W.

(h) Self Potential Surveys

The resulting millivolt readings are plotted in Figures 49 and 50. It is to be noted one looks for negative drops in the millivolt readings as indications of mineralized bodies.

400 W Line (Figure 49)

The 400W line is run over the large VLF-EM anomaly reported in the 1971 Whittles and Loring report. This seems to show up as a -30 millivolt drop (below a 11 millivolt regional trend) at


LINE: 400W
NORTH →
MILLIVOLTS
-10
-20
-30
-40
-50
-60
400S
300S
200S
100S
0N
RANGE
← AVERAGE.
Mines
NO 4626
#49
FIG. 49
SELF
POTENTIALS
DRN: A.B.L.W.
DATE: SEPT. 73

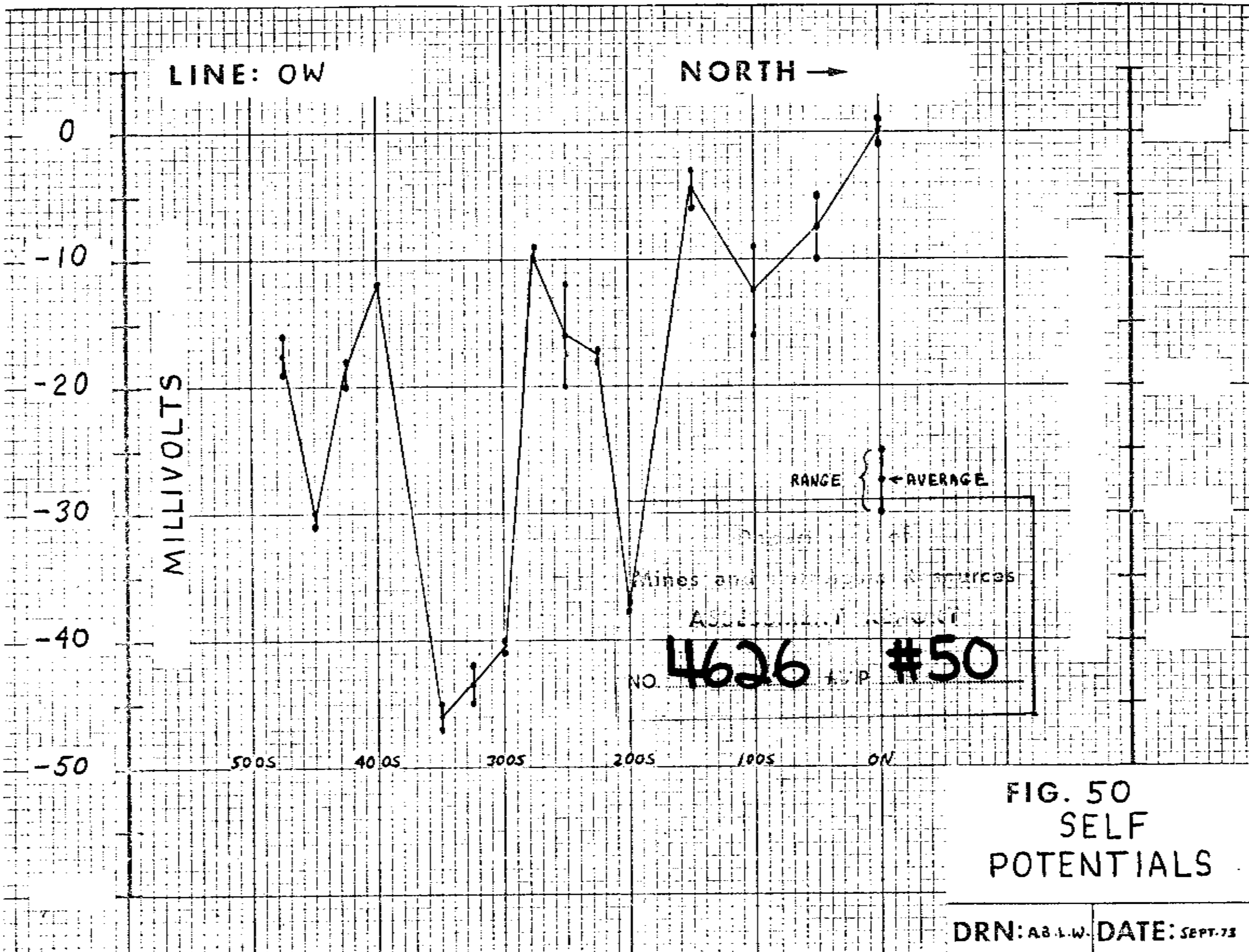


FIG. 50
SELF POTENTIALS

DRN: A.B. L.W. DATE: SEPT. 73

about 250 S. There is a second, larger, dip of about -40 millivolts at 350W, which does not correspond any observed VLF-EM, Magnetic, I.P. or JEM variations, and the present writer cannot offer any explanation at the present time, other than to note that there are evidences of old logging activity in this area and pieces of steel have been observed nearby. Salt solution from the I.P. surveys may also have an effect.

OW Line (Figure ~~49~~ 50)

The results for this line, run across the known mineralized zone exposed by the adit on the river, are not very encouraging with respect to the use of S.P. to detect this type of zone. The resulting millivolt dips do not correspond to known anomalous or mineralized areas; the dip at 200S being too far north and that from 275 S to 400 S being too far south of the VLF-EM, JEM anomalies and the mineralized zone at about 250 S - 275 S. There is a lot of old machinery and signs of human occupation (old cabins, garbage dumps, etc.) in this area which may account for the S.P. dips. Salt solutions from the I.P. surveys may also be a factor.

The lack of good response over the mineralized zone may indicate that suitable conditions are not present for the setting up of the currents in the earth around the mineralized body, which give rise to the S.P. effect. The hard, crystalline, meta-volcanics probably are effective barriers to the flow of earth currents, and the weathered layer (and soil) along this line is very shallow.

(i) VLF-EM Surveys.

As noted earlier in Section 5, two instruments were used -- an Em-16 (Ronka) and a Crone RADEM. The results for each line are illustrated in Figures 51 to 79. The tilt angles in degrees (of the resultant magnetic component of the VLF-EM field), the slope of the ground (in degrees) and the first derivative of the tilt angle are recorded on these profiles (see Section 5(i) for a discussion of how the first derivatives are obtained).

Genrally speaking all anomalies associated with rapid topographical changes were not considered since they cannot be uniquely assigned as conductivity changes. The topographical changes apparently can cause changes of ~.10°/ft in the tilt angle of the V.L.F. field in this area. Values greater than .10°/ft/ may be considered to reflect true conductivity changes.

One must point out that one can only infer a change in conductivity-- the effect may be due to graphite, clay, a water filled fracture, a change in rock type and not necessarily mineralization.

Note that not all topographical or First Derivative profiles were plotted, although topographical slopes were made at each station in the field. These two types of profiles were only

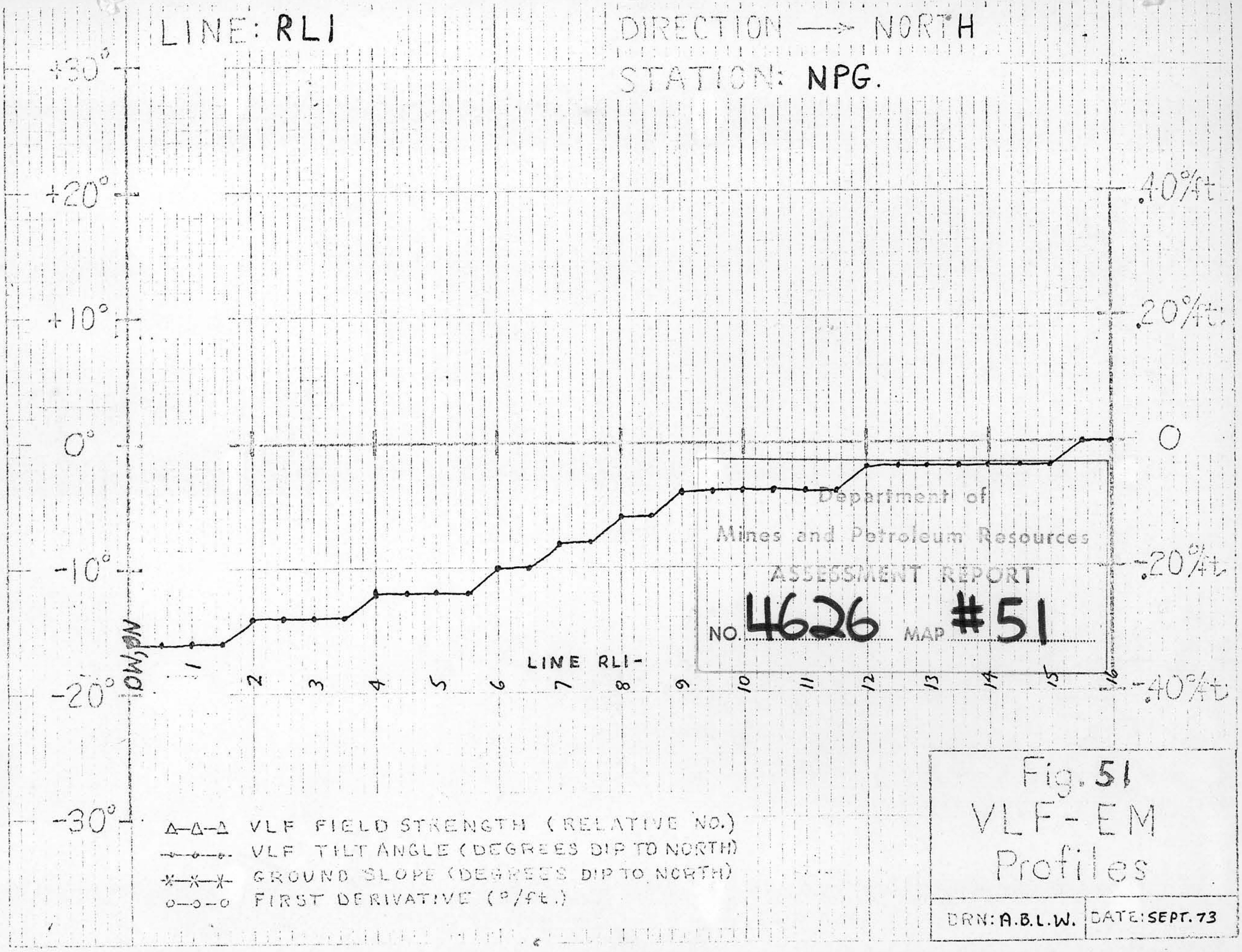


Fig. 51
VLF-EM
Profiles

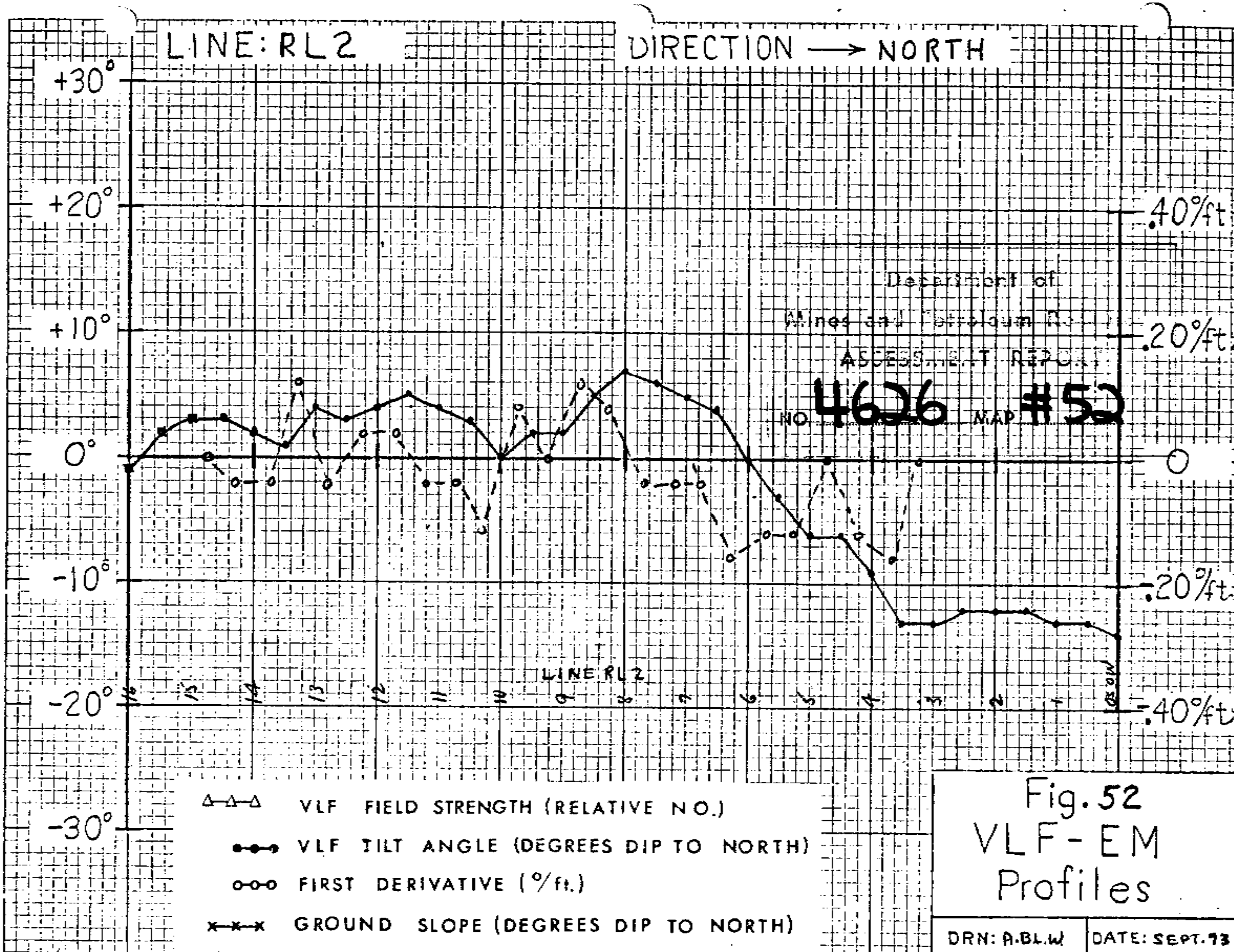
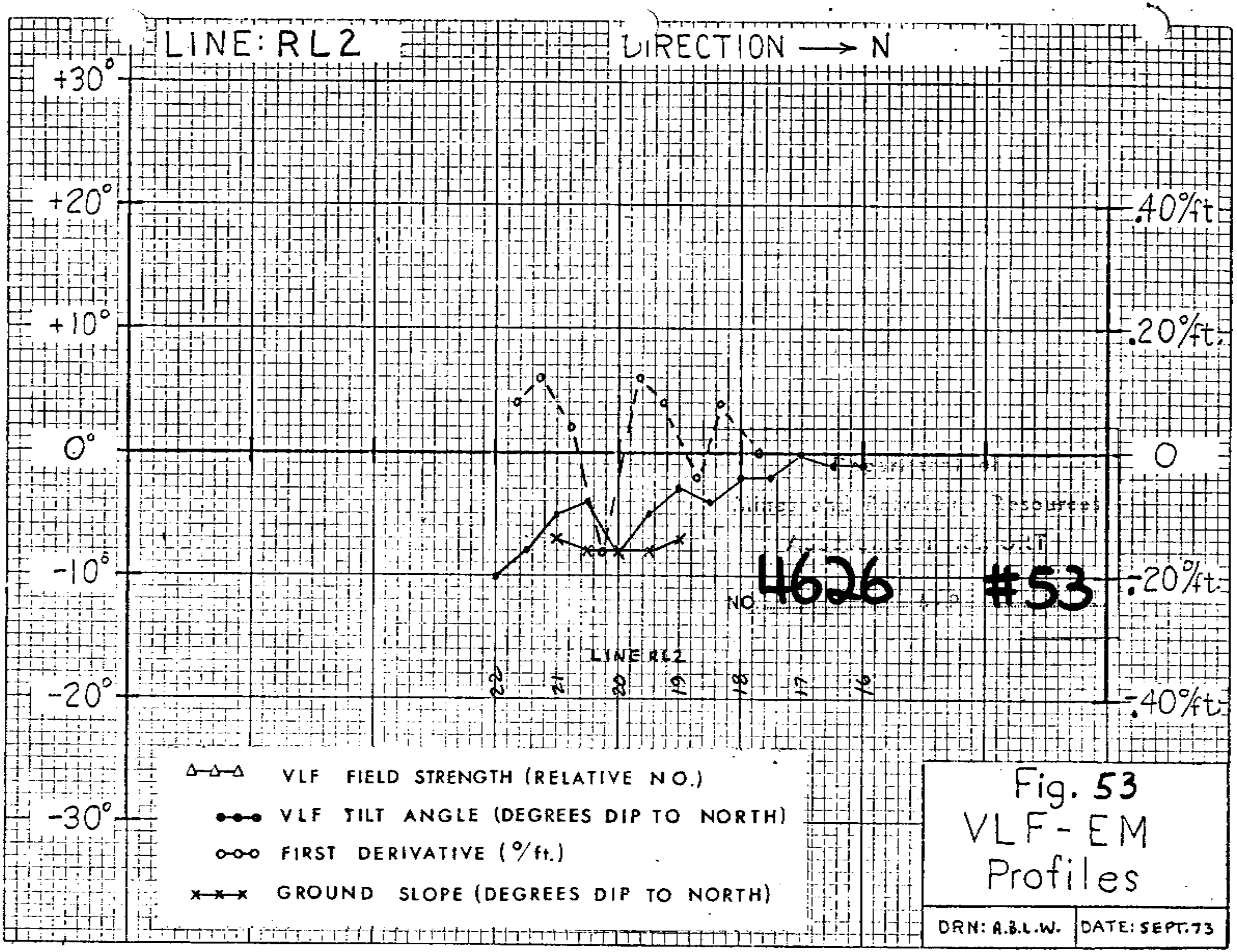


Fig. 52
VLF-EM Profiles

DRN: A.BL.W | DATE: SEPT. 73



LINE: RL2
DIRECTION ⟶ N
+30°
+20°
+10°
0°
-10°
-20°
-30°
.40%ft.
.20%ft.
0
.20%ft.
.40%ft.
LINE RL2
22
21
20
19
18
17
16
NO. 4626 #53
△-△-△ VLF FIELD STRENGTH (RELATIVE NO.)
●-●-● VLF TILT ANGLE (DEGREES DIP TO NORTH)
o-o-o FIRST DERIVATIVE (%/ft.)
x-x-x GROUND SLOPE (DEGREES DIP TO NORTH)
Fig. 53
VLF-EM
Profiles
DRN: A.B.L.W.
DATE: SEPT. 73

included in cases where the Tilt Angle rate of change gave rise to a First Derivative of greater than about - 0.10°/ft. (e.g. compare Figures 51 and 52)

<u>RL1 Line, Claim 22G (Figure 51)</u>

No changes above reproducibility can be detected on this profile.

<u>Line RL2, Claim 22G (Figure 52 and 53)</u>

Four First Derivative changes were detected on this profile of >0.1°/ft. (at stations 10.5, 5 to 6.5 and 3.5 to 4.5 and 20.5) The result for RL2 3.5 to 4.5. is in line with the strike of the former VLF anomalous zone (Whittles and Loring, 1971) found associated with the mineralized zone explored by the adit on the river bank. The second zone from RL2 - 5 to RL2 - 6.5 agrees also with 1971 report and would definitely seem to indicate a second higher conductive zone. This is confirmed by the geological survey (Figure 81A) along the river. Note, however, that some large metal plates were reported earlier at this same location. The -0.12°/ft. found at RL2 -10.5 would seem to be associated mainly with a rapid change in slope in this area (see the 1971 Report).

The -0.18°/ft. at RL2 -20.5 is probably associated with the creek that empties out into the river at this point. It does not appear on lines to the west.

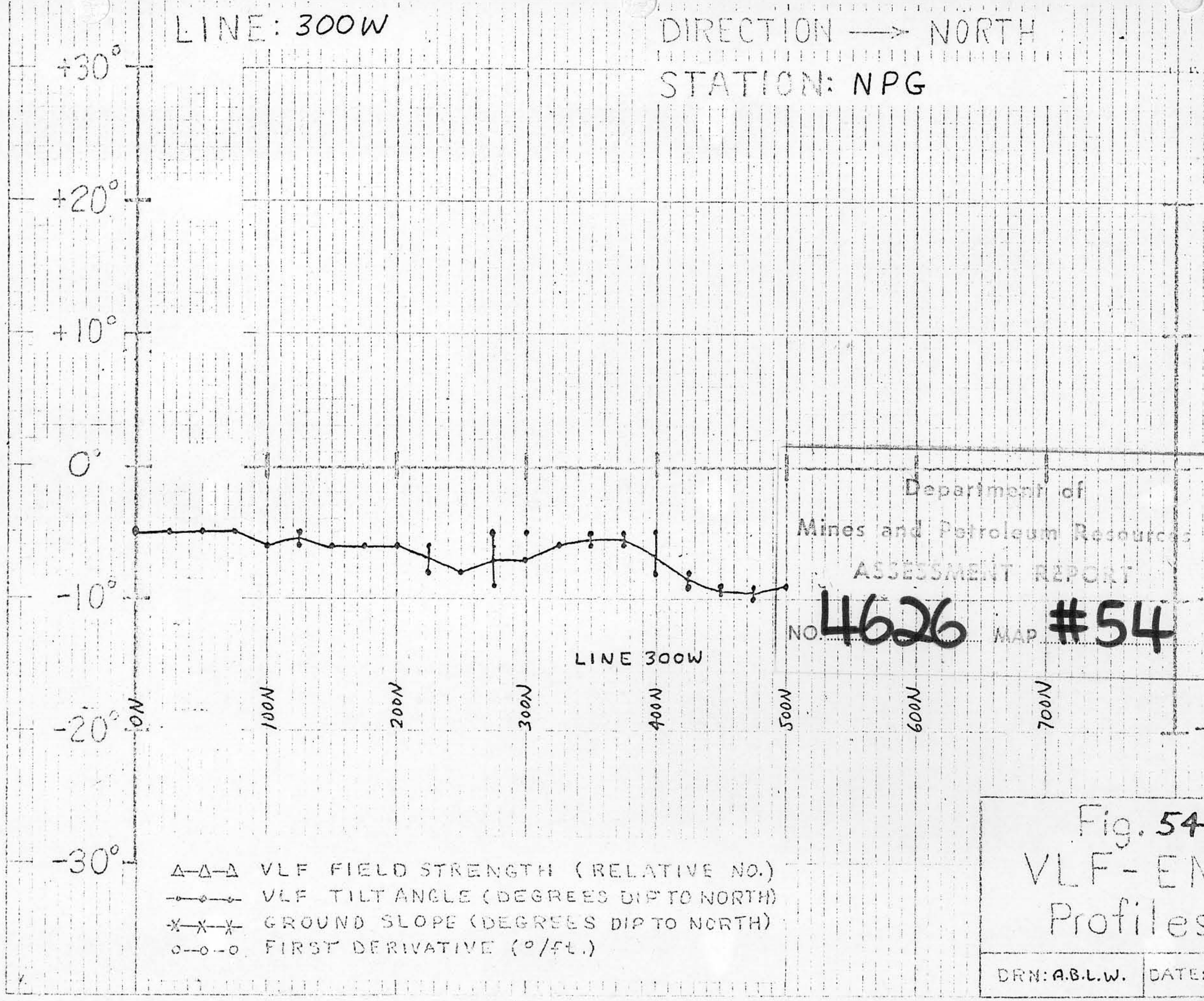
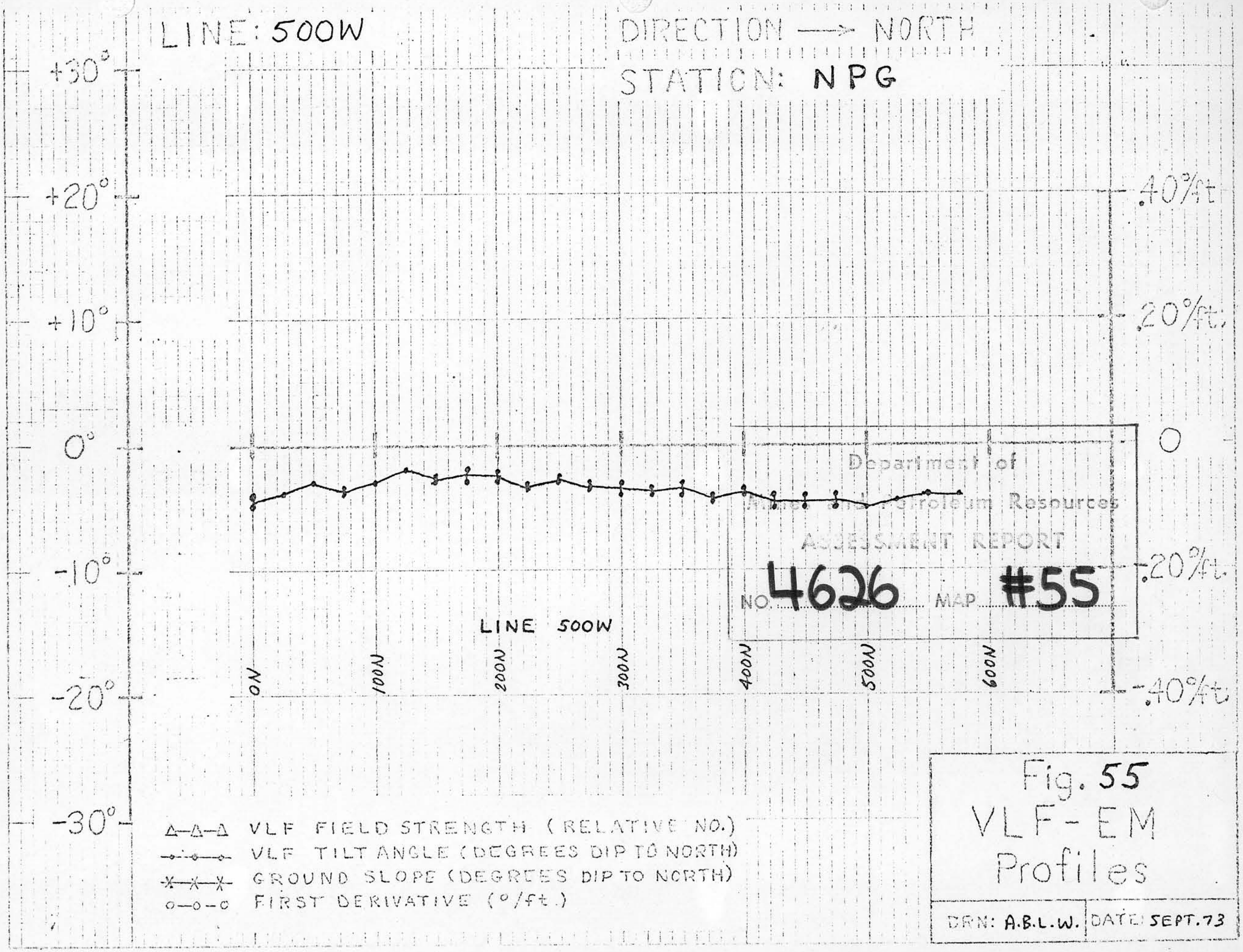


Fig. 54
VLF-EM
Profiles

DRN: A.B.L.W. | DATE: SEPT. 73

-88-


LINE: 500W
DIRECTION → NORTH
STATION: NPG
+30°
+20°
+10°
0°
-10°
-20°
-30°
.40%ft
.20%ft.
0
.20%ft.
.40%ft.
LINE 500W
0N
100N
200N
300N
400N
500N
600N
VLF FIELD STRENGTH (RELATIVE NO.)
VLF TILT ANGLE (DEGREES DIP TO NORTH)
GROUND SLOPE (DEGREES DIP TO NORTH)
FIRST DERIVATIVE (°/ft.)
Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 4626 MAP #55
Fig. 55
VLF-EM
Profiles
DRN: A.B.L.W.
DATE: SEPT.73

-68-

Line 300 W. Claim 22G (Figure 54)

This is a northern continuation of the line first surveyed in 1971. No significant changes were observed. Note the reproducibility of data (the line was surveyed twice). The reproducibility would seem to be normally about ± 1°, with ± 2° common in wet areas where it is difficult to get the proper null.

Line 500 W, Claim 22G (Figure 55)

No significant variations were observed. Note that this new data for lines 300W and 500W indicates the First Derivative value of -0.16 and -0.12°/ft. found in 1971 on line 400W are only of local consequence, being confined to line 400W.

Lines 600W and 700W Claim 22G (Figures 56, 57 and 58)

The large anomaly at 600W, 175S is a continuation of the large VLF-EM anomaly found to the east as reported in the 1971 Report. The value is -0.44°/ft. compared to -0.64°/ft. on 500W line and -0.80°/ft. found on 450W line.

It is interesting to note that the anomaly does not extend to the 700W line. It is either terminated at this point or makes another southward fold as observed along line 200W in the 1971 report. This needs to be checked by additional lines to the south of the claim 22G base line.

Some small variations occur at 225N and 275N of 700W line (Fig. 58) but these do not seem to extend any further (e.g. not to the line 900W).

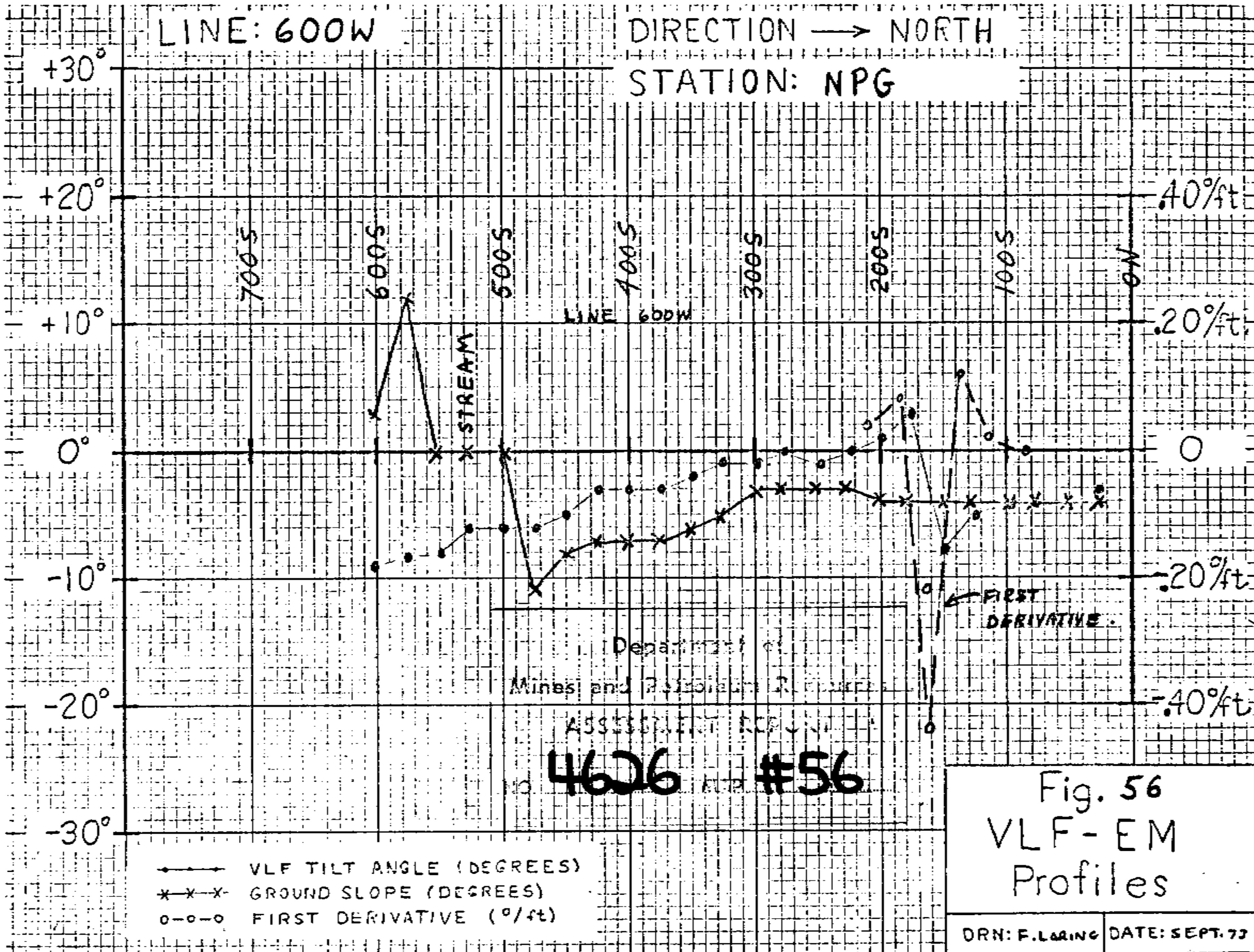


Fig. 56
VLF-EM Profiles

DRN: F. LARING | DATE: SEPT. 73

-16-

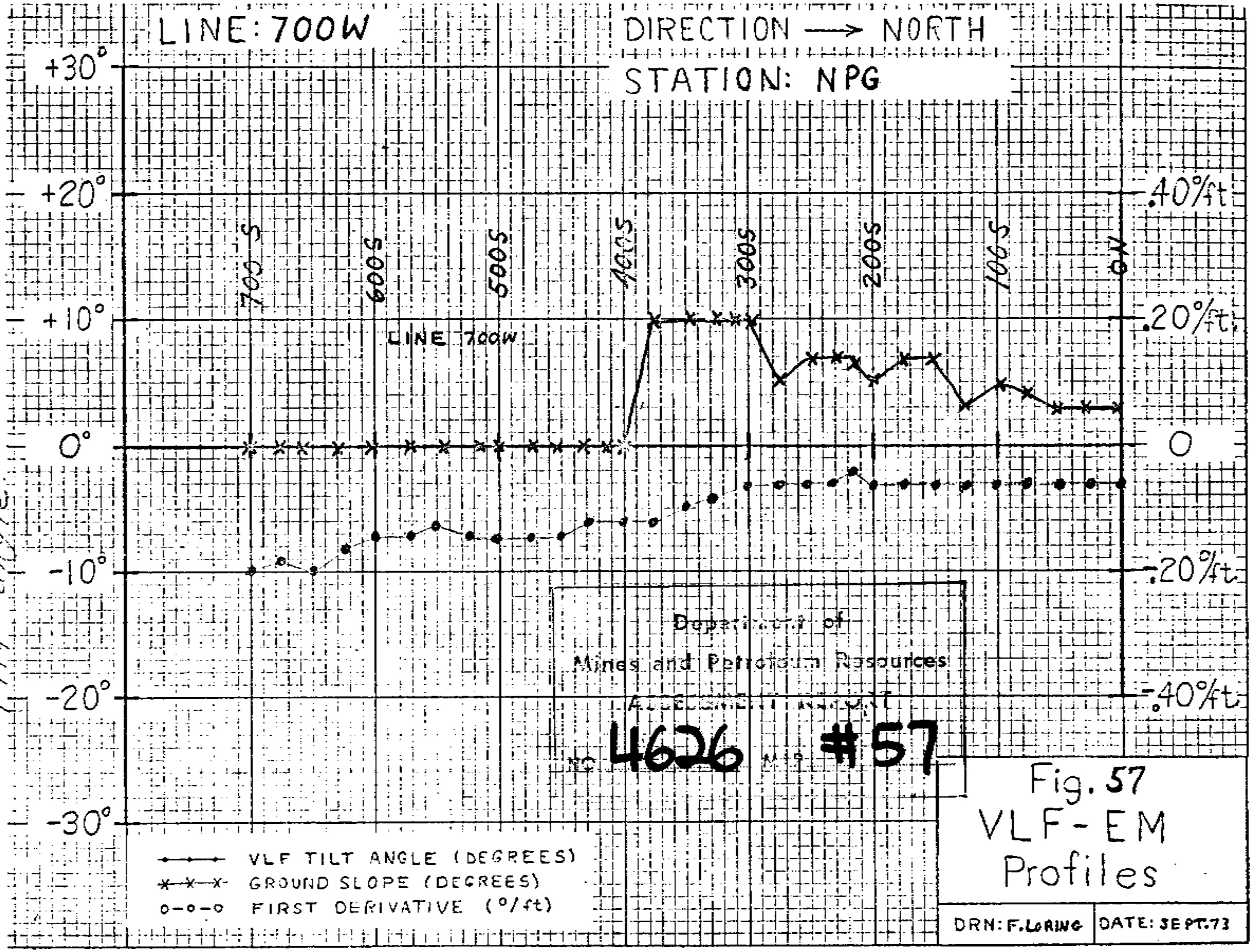
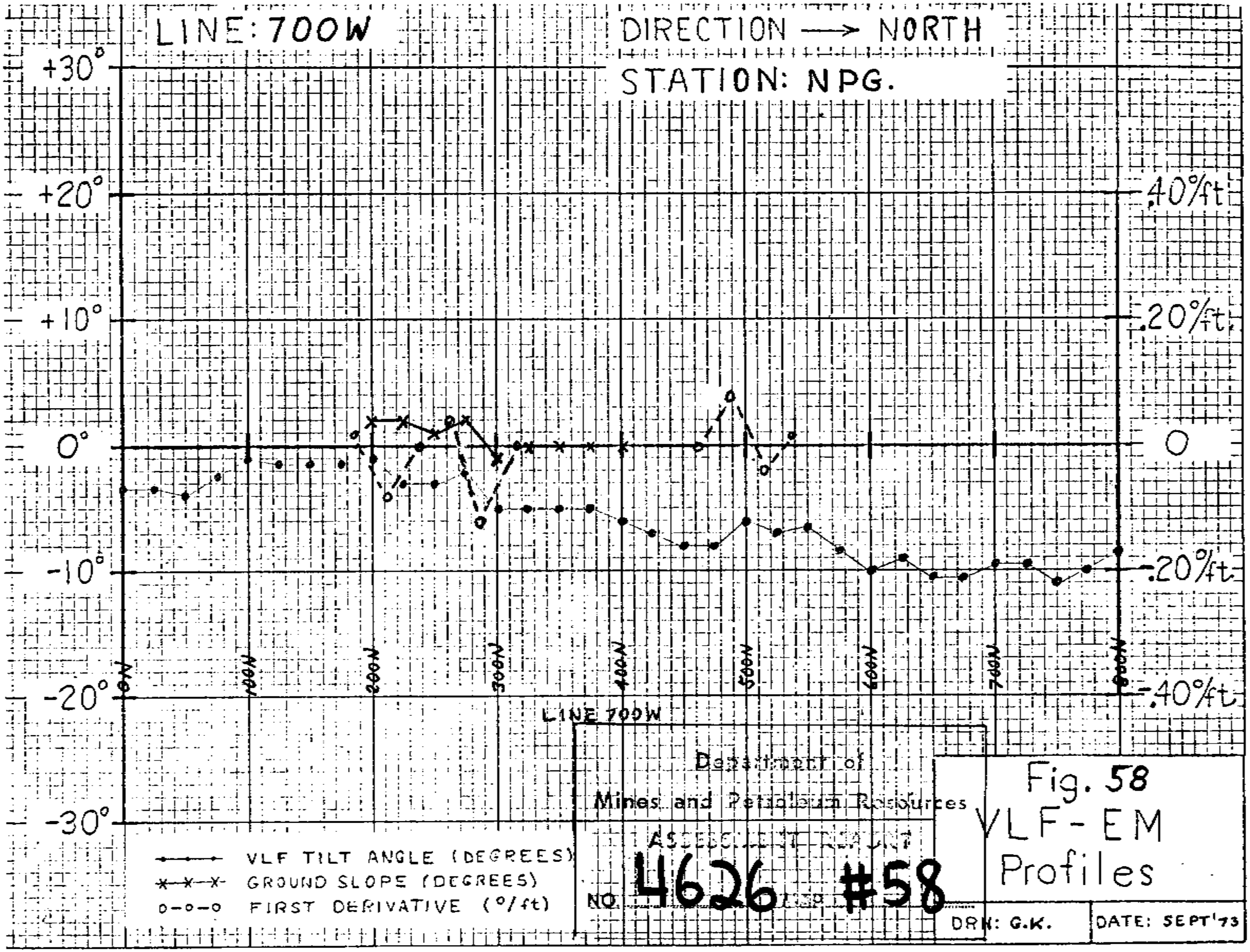


Fig. 57
VLF-EM
Profiles

DRN: F. LORING | DATE: SEPT. 73


LINE: 700W
DIRECTION ⟶ NORTH
STATION: NPG.
+30°
+20°
+10°
0°
-10°
-20°
-30°
.40%ft
.20%ft
0
.20%ft
.40%ft
0N
100N
200N
300N
400N
500N
600N
700N
800N
LINE 700W
VLF TILT ANGLE (DEGREES)
GROUND SLOPE (DEGREES)
FIRST DERIVATIVE (°/ft)
Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 4626 #58
Fig. 58
VLF-EM
Profiles
DRN: G.K.
DATE: SEPT '73

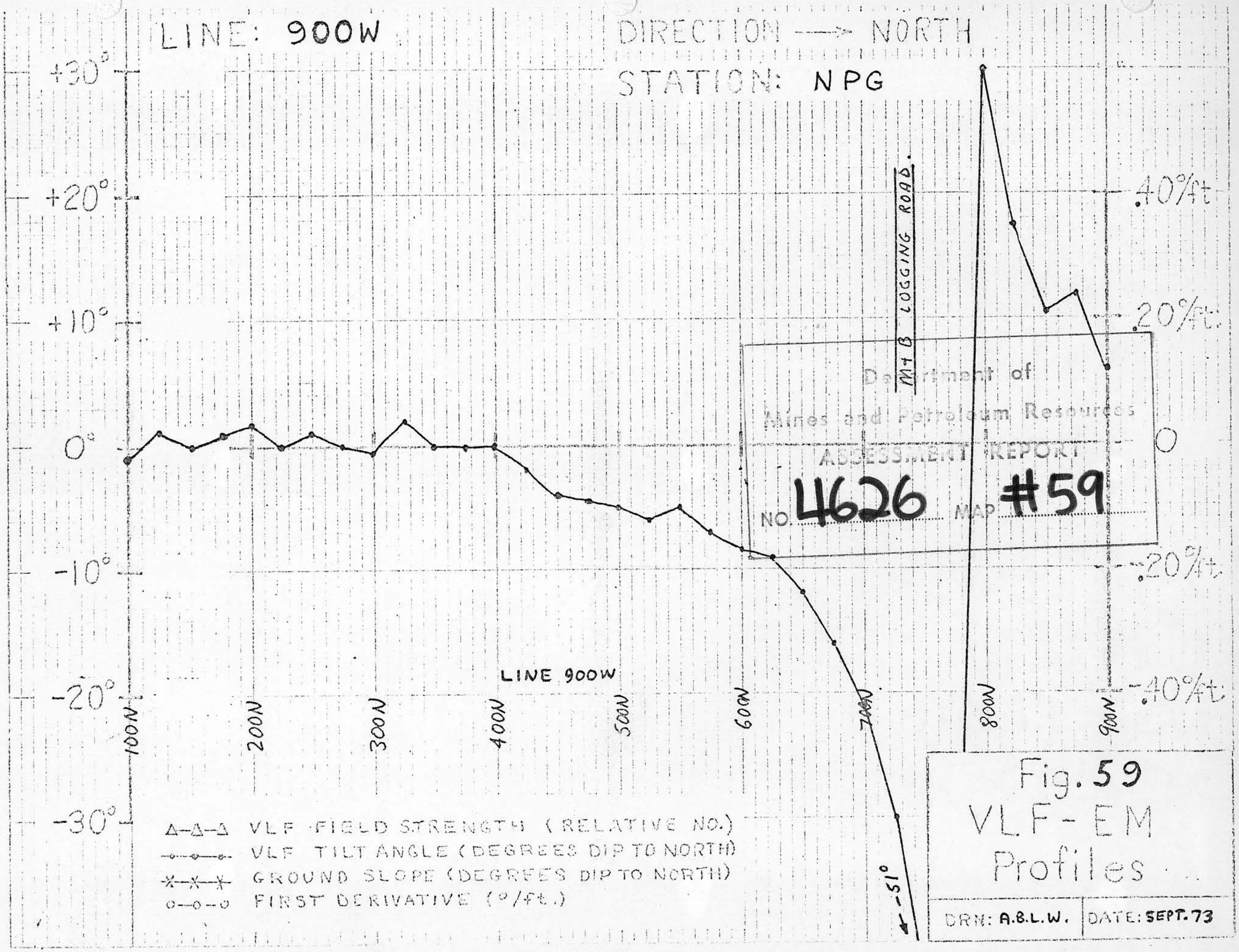


Fig. 59
VLF-EM
Profiles

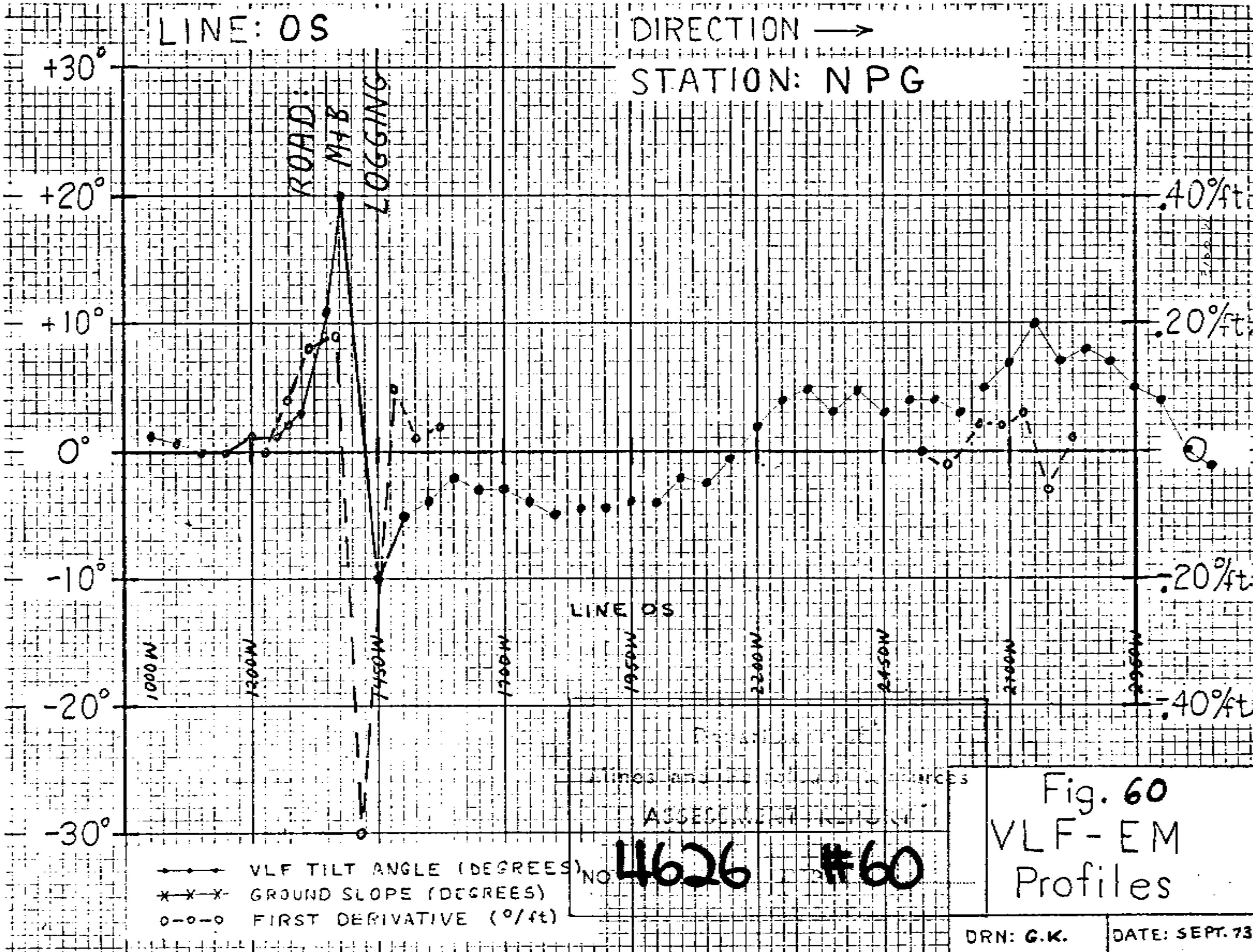


Fig. 60
VLF-EM Profiles

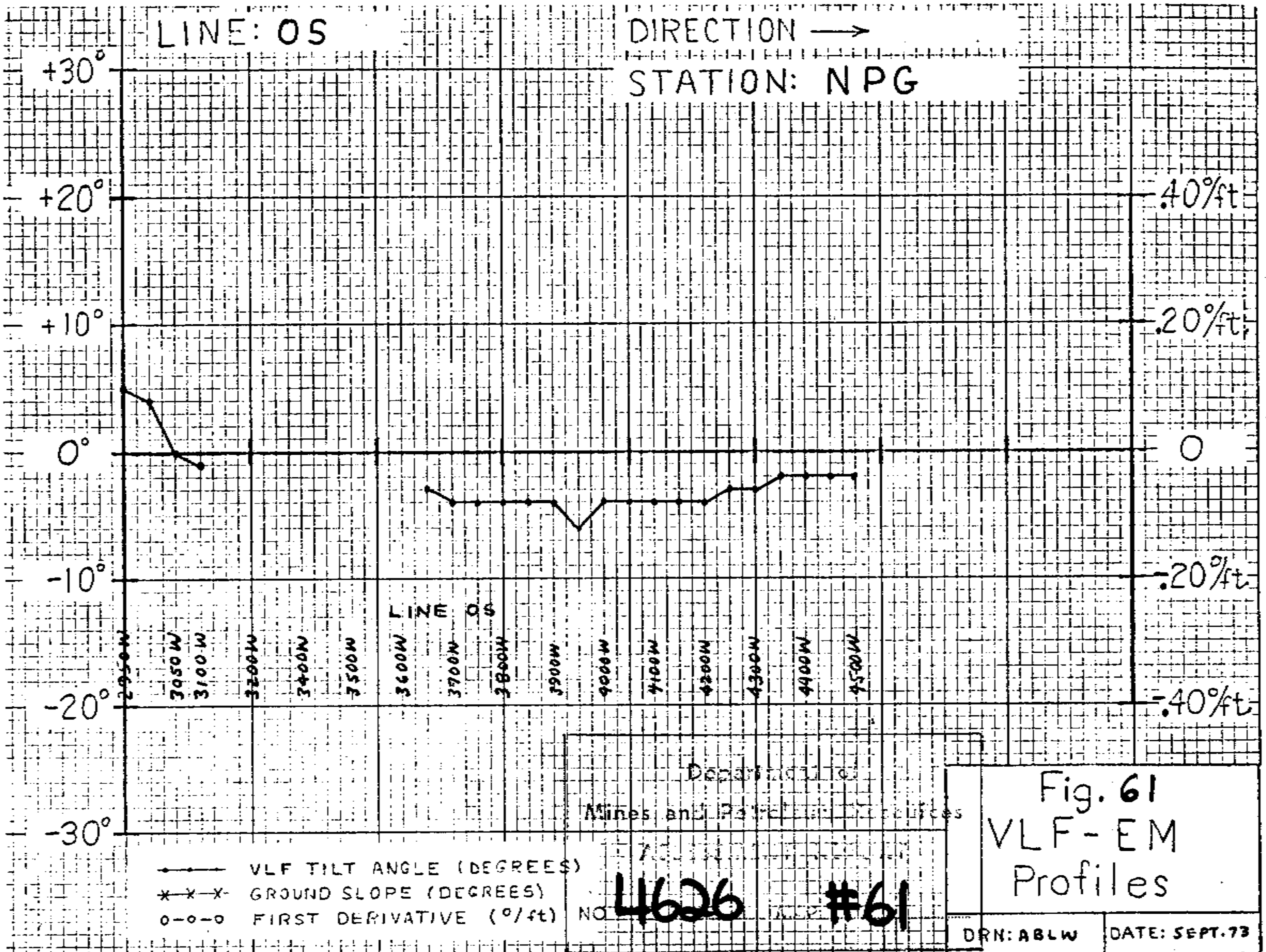


Fig. 61
VLF-EM
Profiles

Line 900W Claim 22G (Figure 59)

Note the extremely large anomaly at 750N. This anomaly seems almost entirely due to the logging road which is understood to follow an old logging railway. It is possible the railway tracks are the source of the variation, since similar results were obtained on the OS base line and the Copper Mint base line surveys where they cross the road.

OS (Base line) Claims 22G, 90G and 23G (Figure 60)

Apart from the large anomaly associated with the logging road (and old railway?) no significant variations were observed, although one should note that the line is along the strike of possible mineralization so not too much is to be expected.

OS (Base line) Claim 68G (Figure 61)

No significant variations were observed along this line.

Line 3100 Claim 68G (Figure 62)

Numerous interesting variations were observed here and require further investigation. The tilt angle variations are large but so are the topographical variations so no First Derivative values were calculated. There is evidence of disseminated (pyrite?) mineralization in schist along this line and also what appears to be old mining exploration pits. The presence of mineralization is suspected here and a low frequency EM survey should be

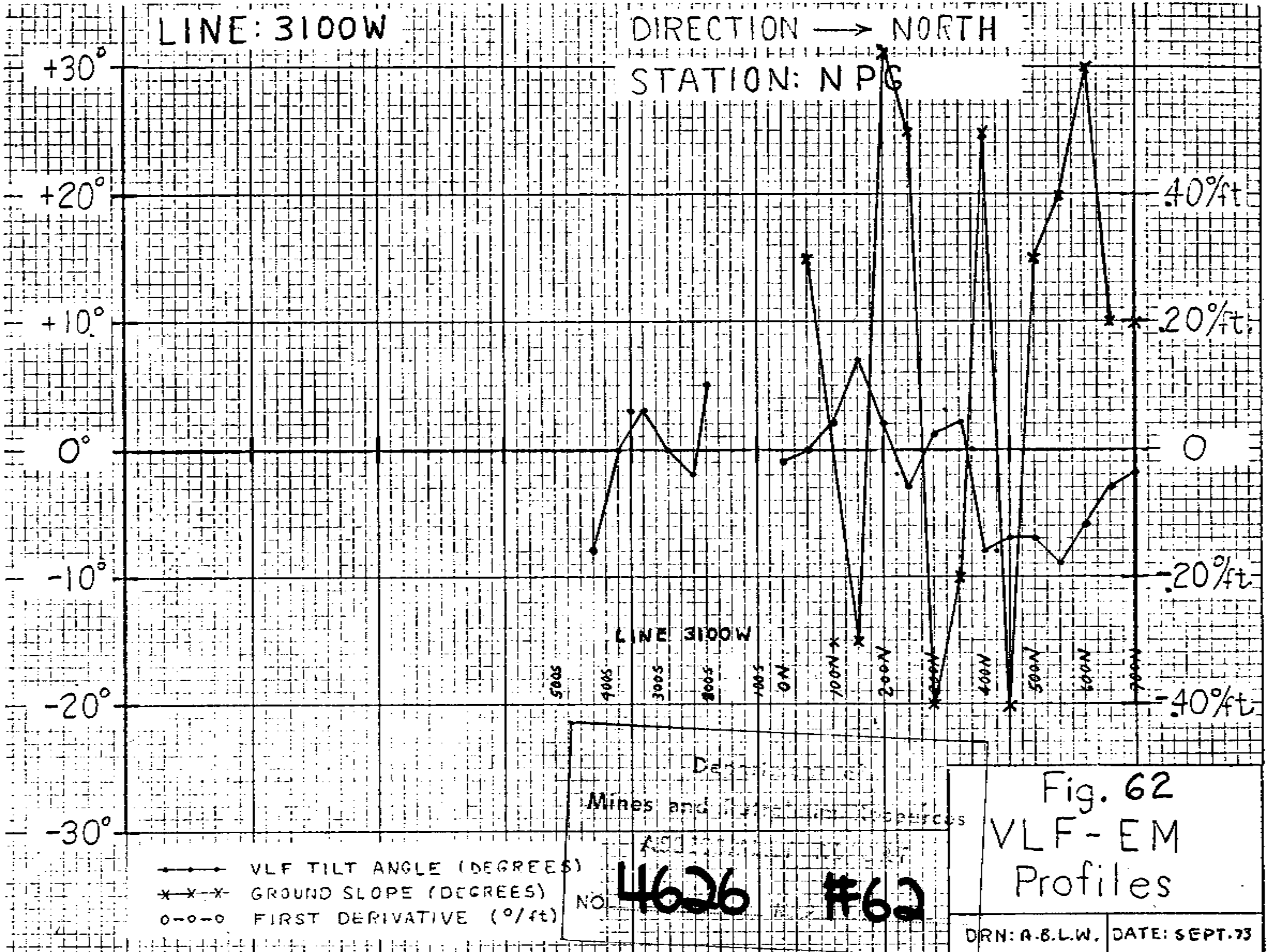


Fig. 62
VLF-EM Profiles

DRN: A.B.L.W. | DATE: SEPT. 73

- 98 -

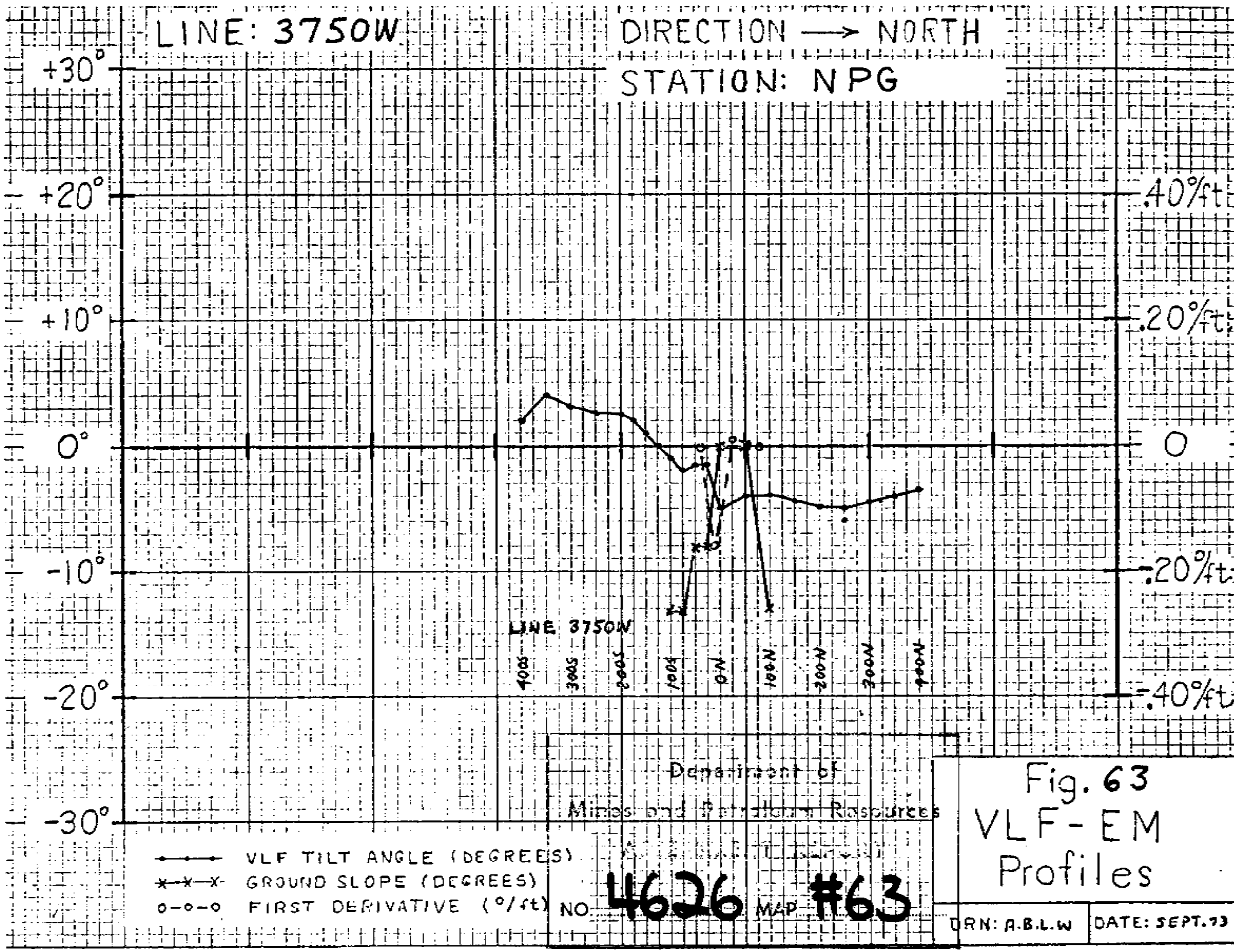


Fig. 63
VLF-EM Profiles

- 99 -

considered, along with magnetic and geochemical surveys.

Line 3750W Claim 68G (Figure 63)

The one value of -0.16°/ft. could be an indication of the pyrite vein found in the old adit located near this point, since the vein strikes in that direction. This suggests that the VLF-EM method could trace this vein up hill further. The vein (see 7. Geochemical Results and 8 Geological Mapping, for a further discussion) strikes across the schist zone and appears to be different in nature or age from the veins observed on the river bank. Another possibility is that it represents another fold in the schist - mineralized zones as observed on the river bank and on the claim 22G VLF-EM results.

Copper Mint Base Line (Figures 64, 65, 66 and 67)

Apart from the usual effect of the logging road (and railway?) no significant variations were observed along this line. Note that while the line faces west, the operator still faced east and measured the degrees dip to the north.

CM 100, Copper Mint I (Figure 68)

Only one significant negative First Derivative result was observed (at 475S) and this appears to be a local effect since it does not extend across to CM 200 line.

CM 200, Copper Mint I (Figures 69 and 70)

No significant negative First Derivative values were observed along this line.

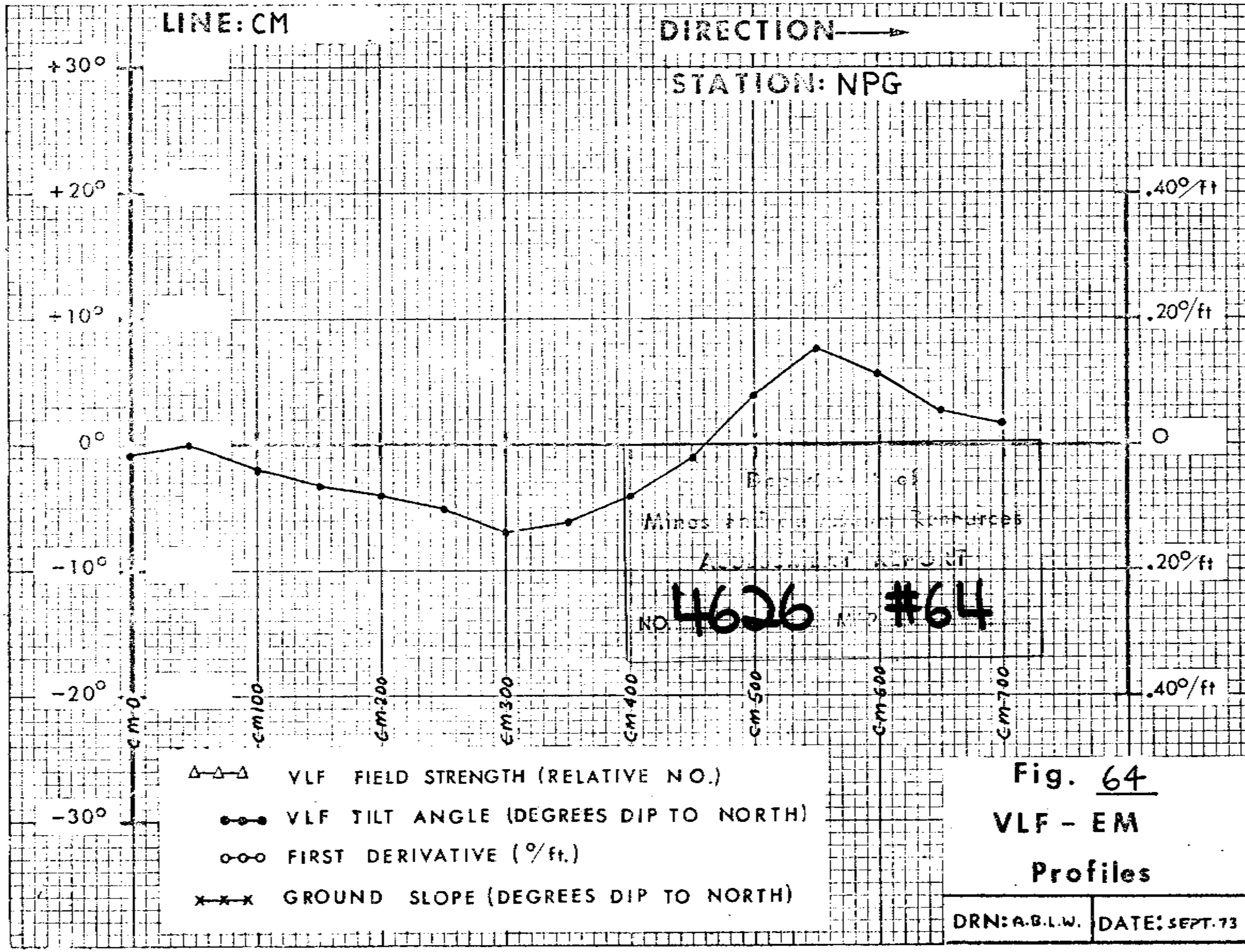


Fig. 64
VLF - EM
Profiles

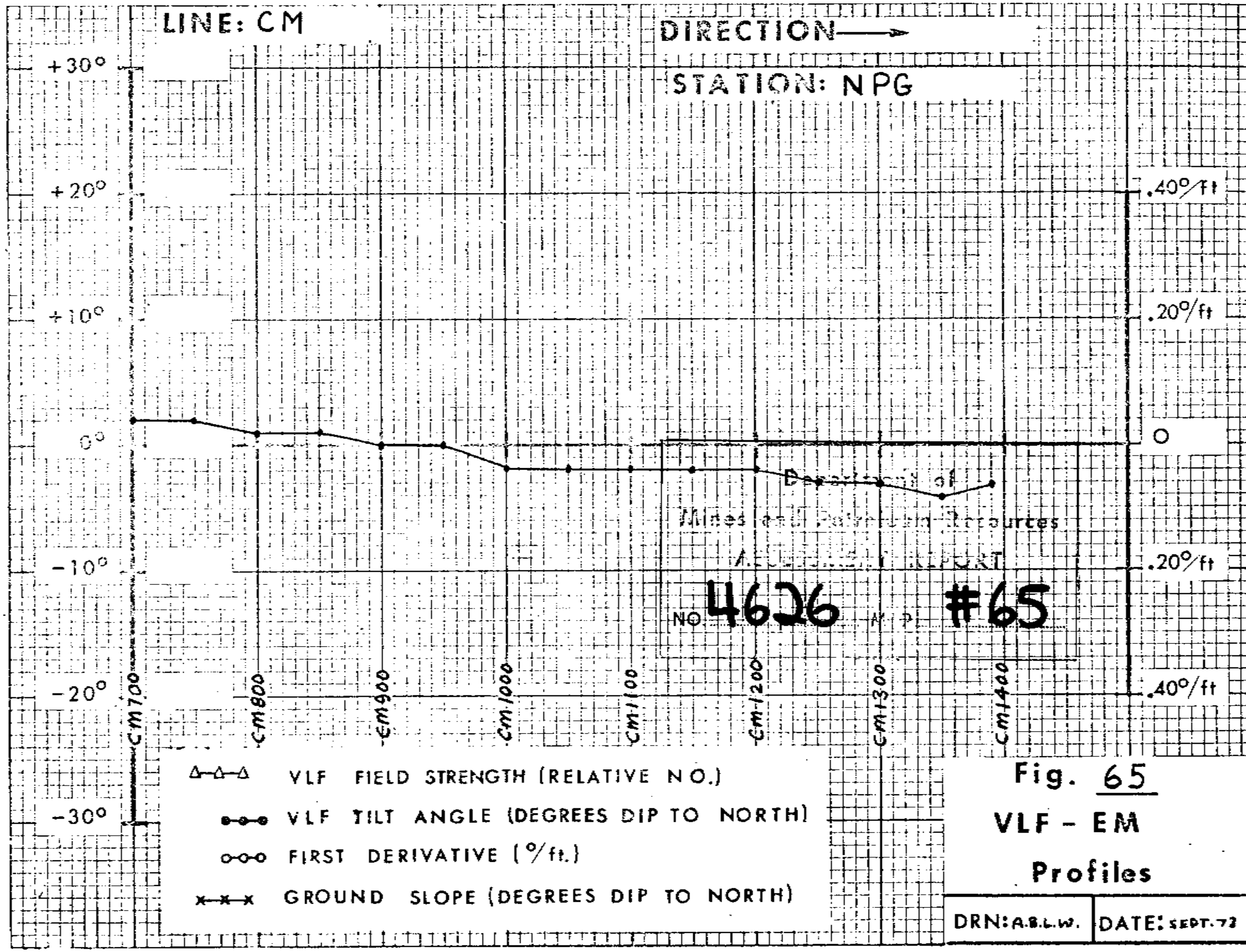


Fig. 65
VLF - EM
Profiles

DRN: A.B.L.W. DATE: SEPT.-73

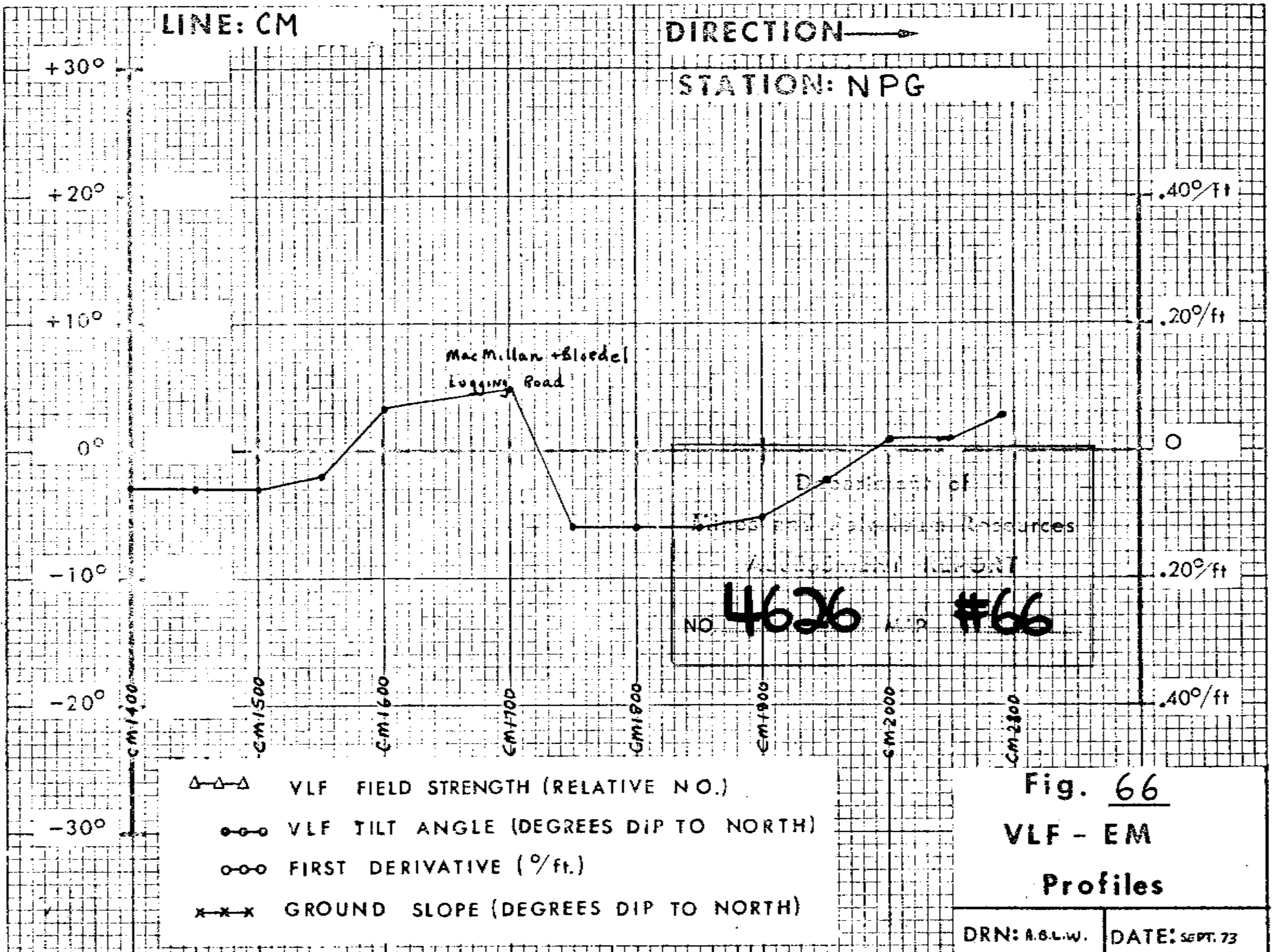


Fig. 66

VLF - EM

Profiles

DRN: A.B.L.W. DATE: SEPT. 73

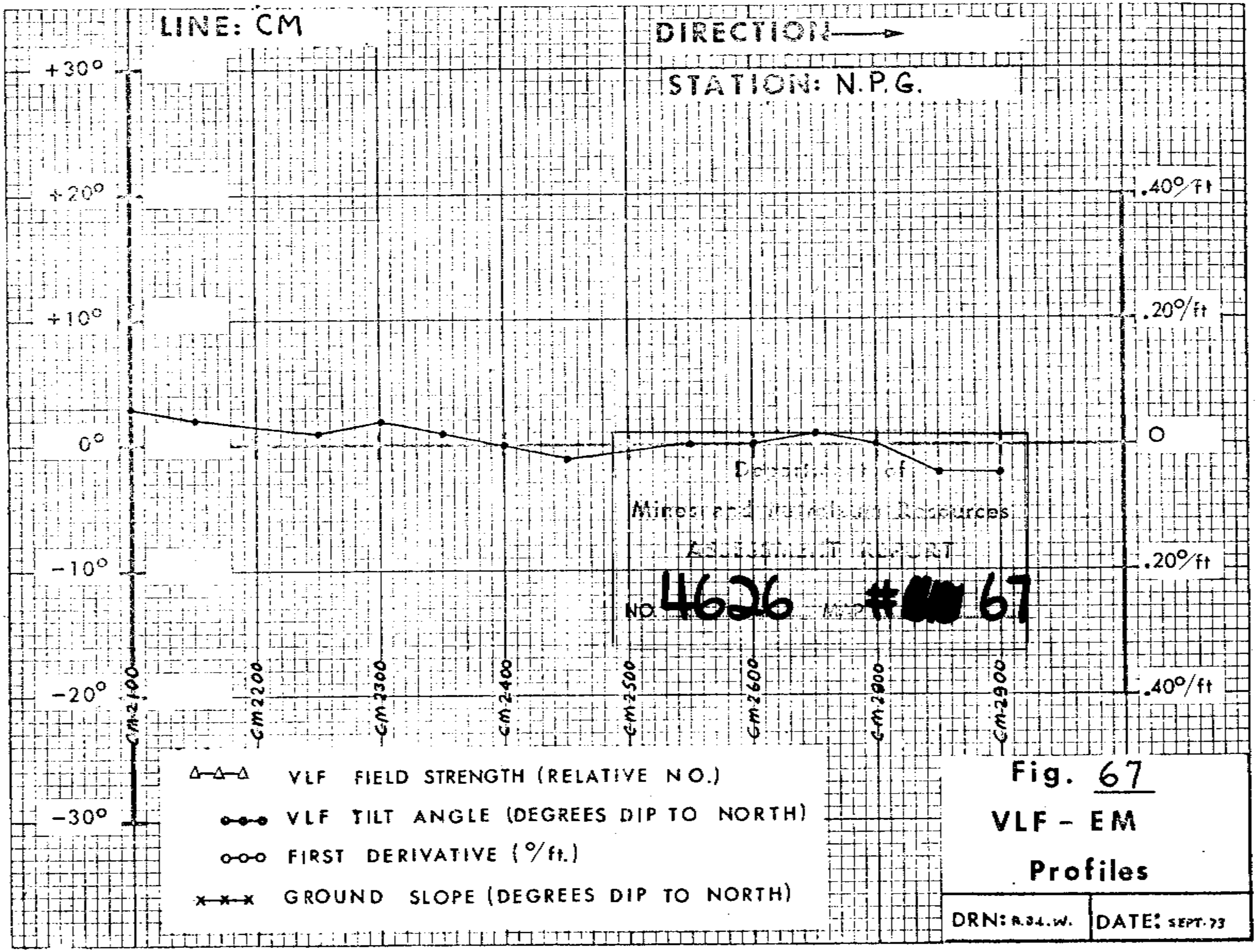
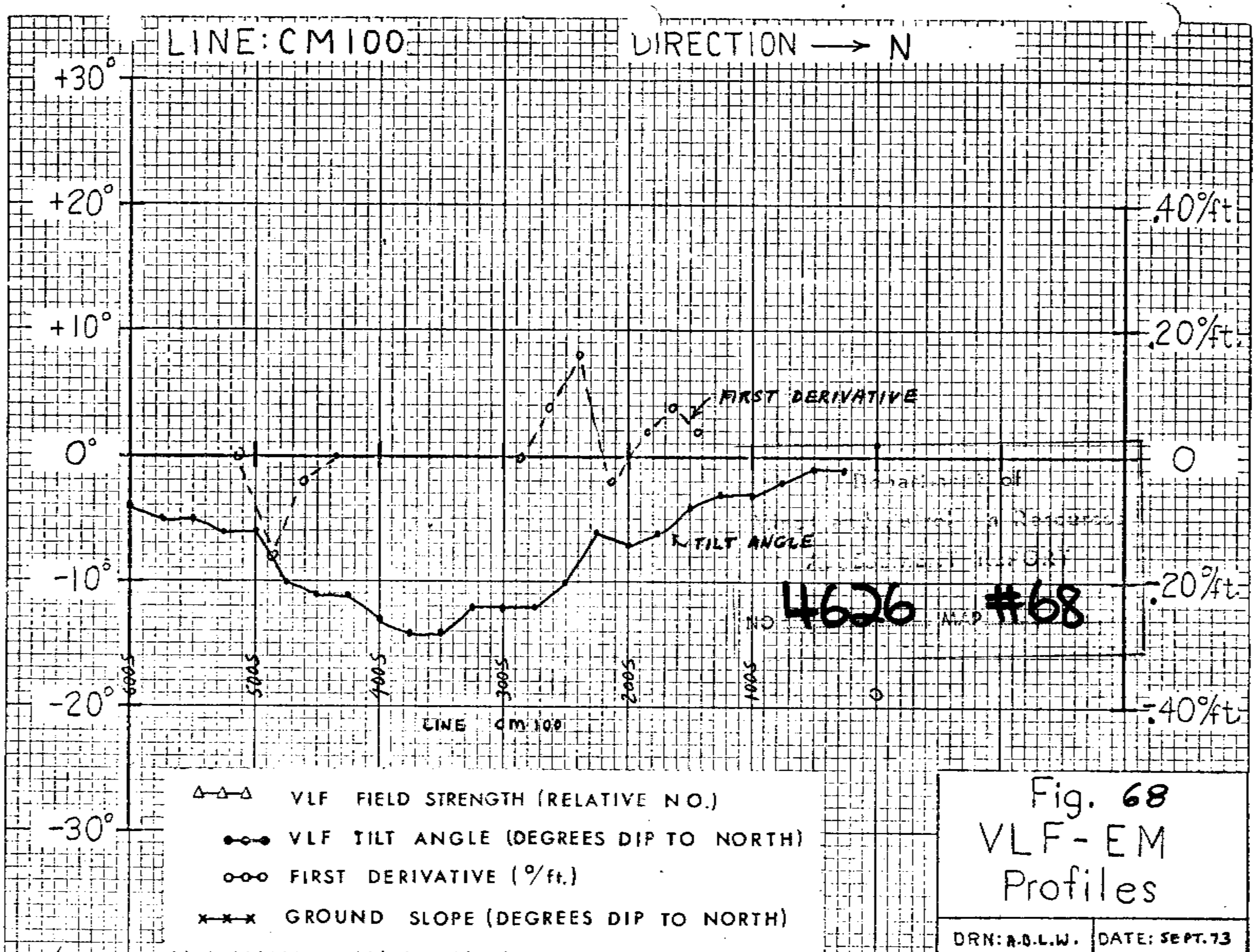


Fig. 67
VLF - EM
Profiles


LINE: CM100
DIRECTION → N
+30°
+20°
+10°
0°
-10°
-20°
-30°
.40%ft
.20%ft
0
.20%ft
.40%ft
FIRST DERIVATIVE
TILT ANGLE
600S
500S
400S
300S
200S
100S
0
LINE CM100
NO 4626 MAP #68
VLF FIELD STRENGTH (RELATIVE NO.)
VLF TILT ANGLE (DEGREES DIP TO NORTH)
FIRST DERIVATIVE (%/ft.)
GROUND SLOPE (DEGREES DIP TO NORTH)
Fig. 68
VLF-EM
Profiles
DRN: A.B.L.W.
DATE: SEPT. 73

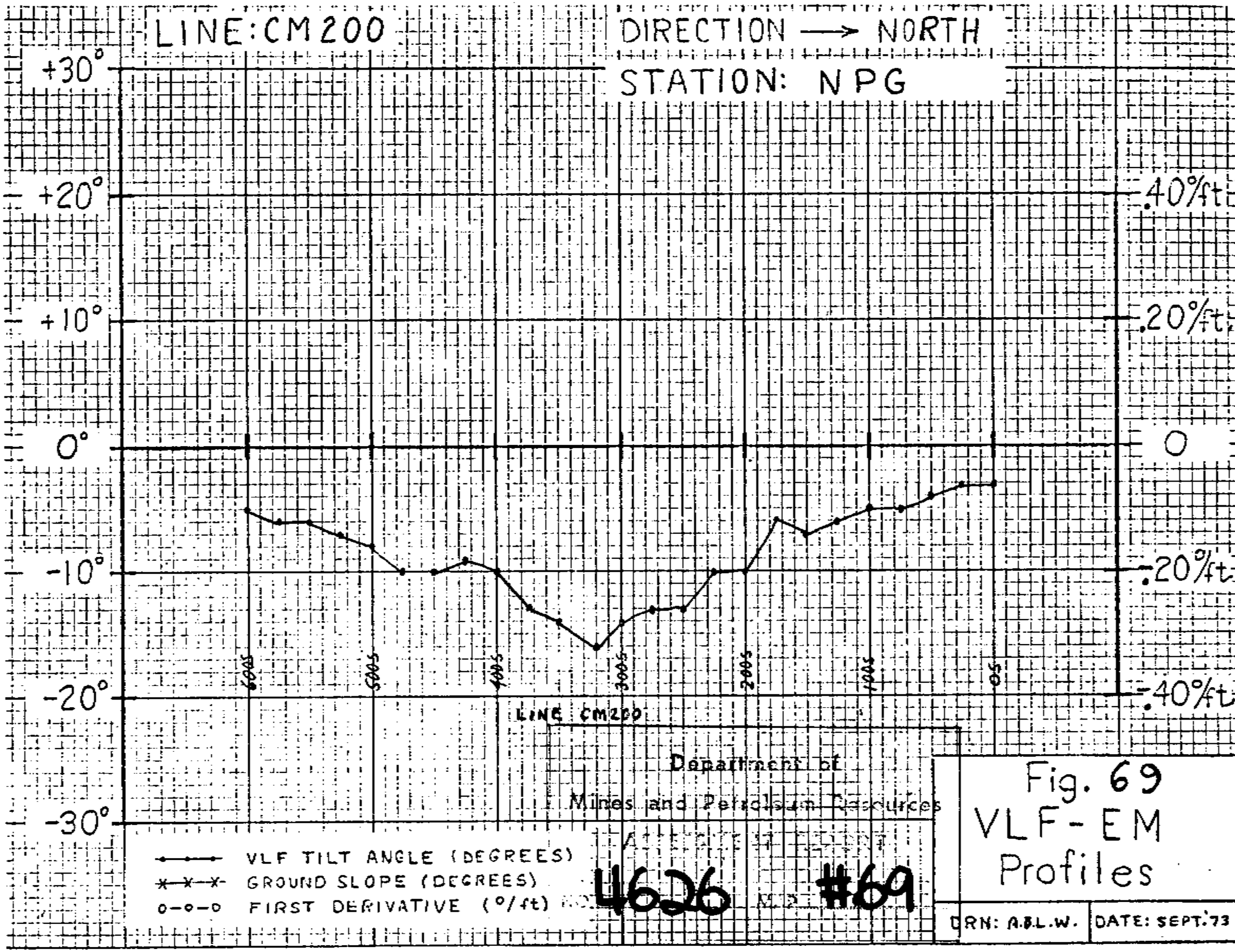
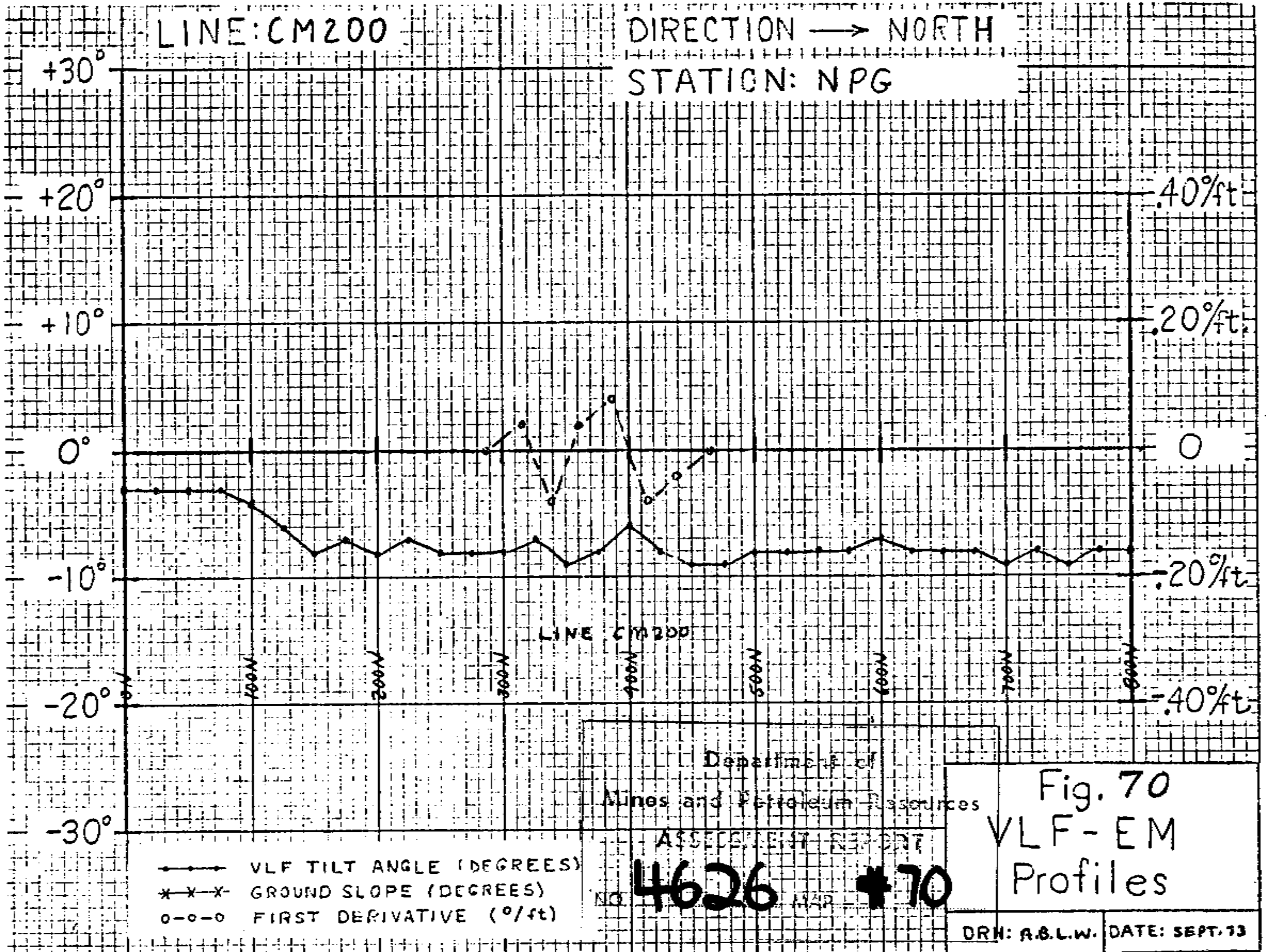


Fig. 69
VLF-EM
Profiles

-106-


LINE: CM200
DIRECTION ⟶ NORTH
STATION: NPG
+30°
+20°
+10°
0°
-10°
-20°
-30°
.40%ft
.20%ft
0
.20%ft
.40%ft
LINE CM200
0
100N
200N
300N
400N
500N
600N
700N
800N
VLF TILT ANGLE (DEGREES)
GROUND SLOPE (DEGREES)
FIRST DERIVATIVE (°/ft)
Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO 4626 MAP #70
Fig. 70
VLF-EM
Profiles
DRN: A.B.L.W.
DATE: SEPT. 73
-107-

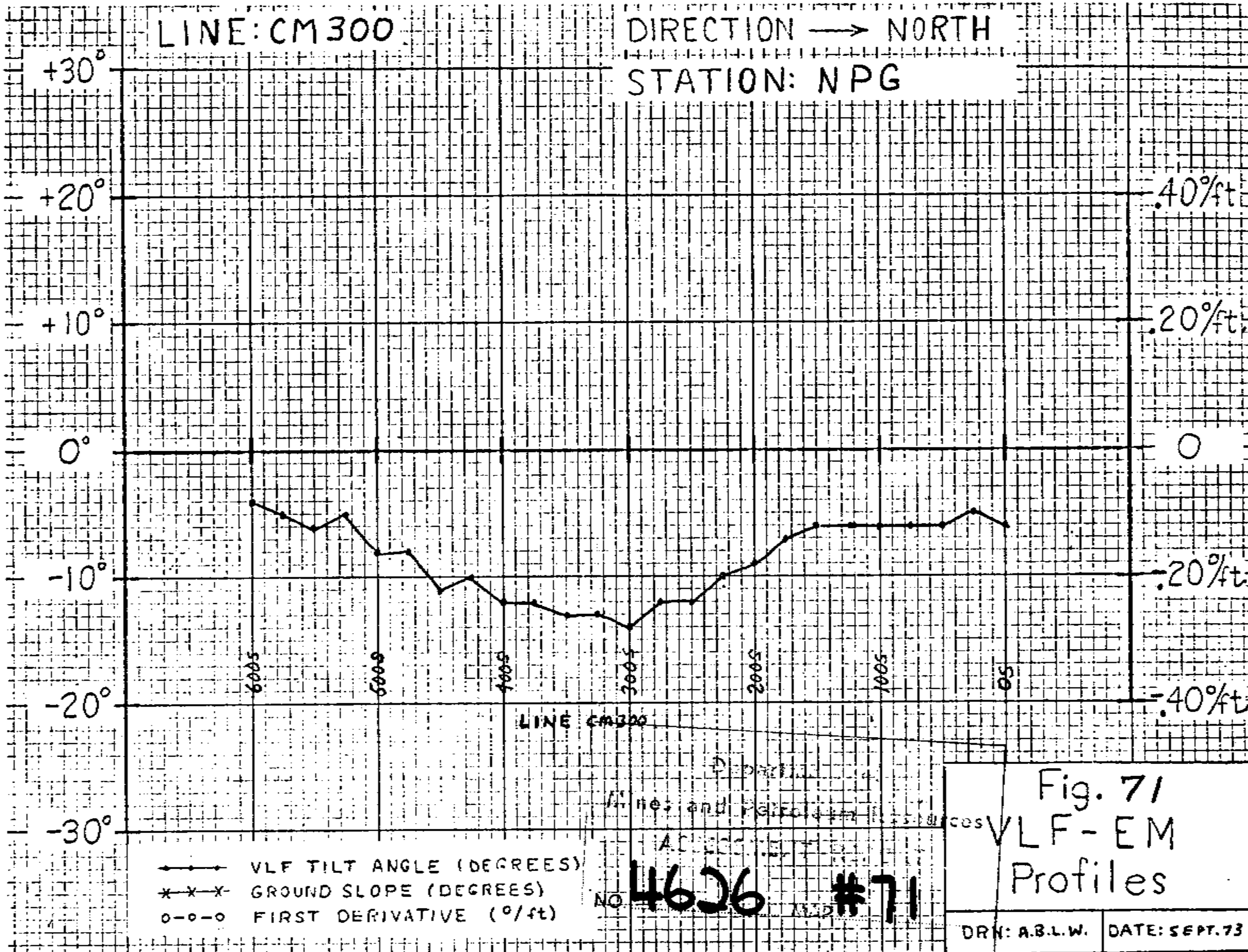


Fig. 71
VLF-EM Profiles

DRN: A.B.L.W. DATE: SEPT.73

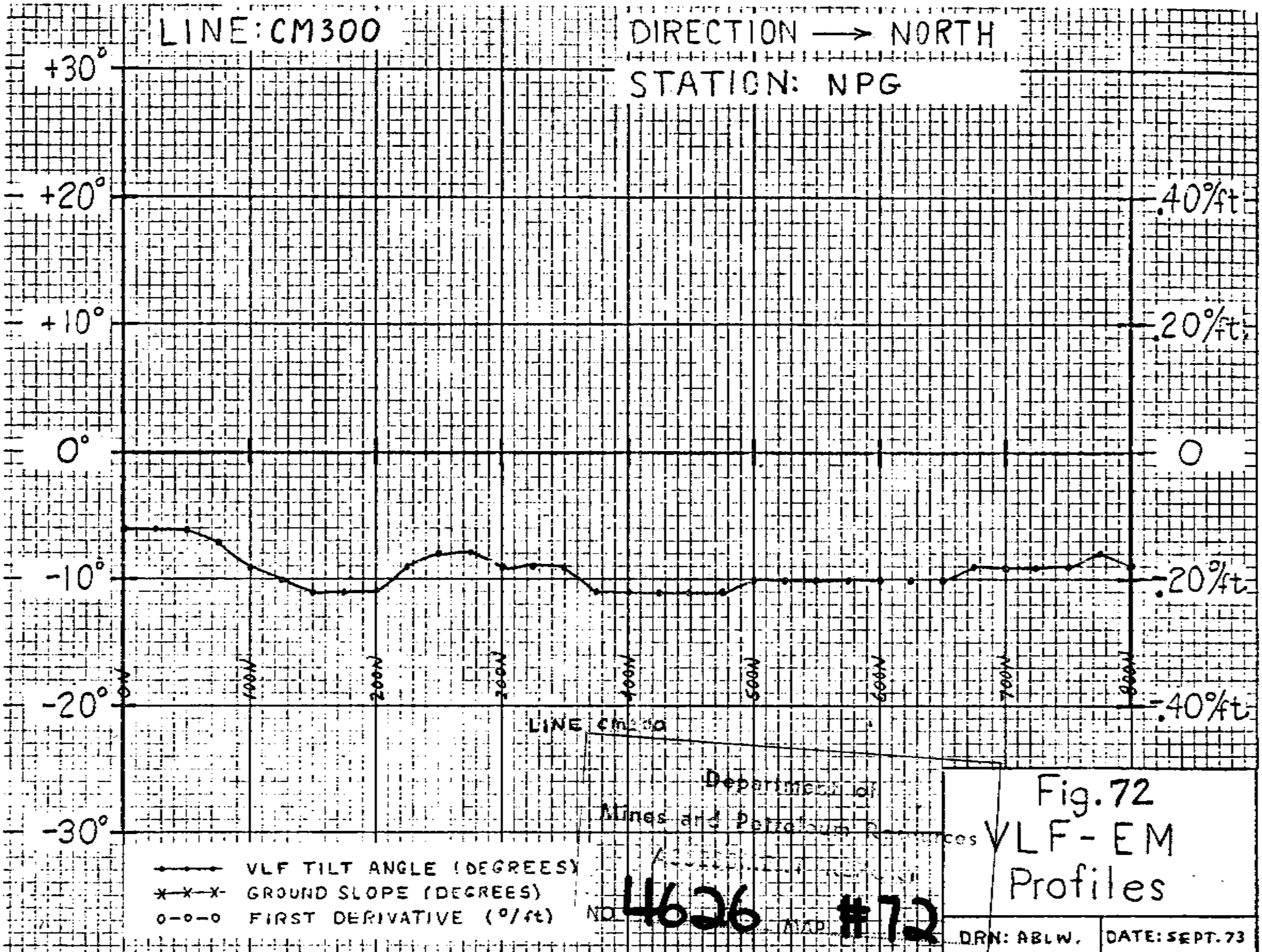


Fig. 72
VLF-EM
Profiles

CM 300 Copper Mint I (Figures 71 and 72)

No significant variations were observed along this line.

Lines CM 400 & CM 500 Copper Mint I (Figures 73, 74, 75 and 76)

Two regions (225N and 275N) on line CM 400 show some signs of variation, but this is also a region of strong topographical variation. This variation does not extend to CM 300, and seems to give only a small variation on CM 500W. The variations seem of minor importance.

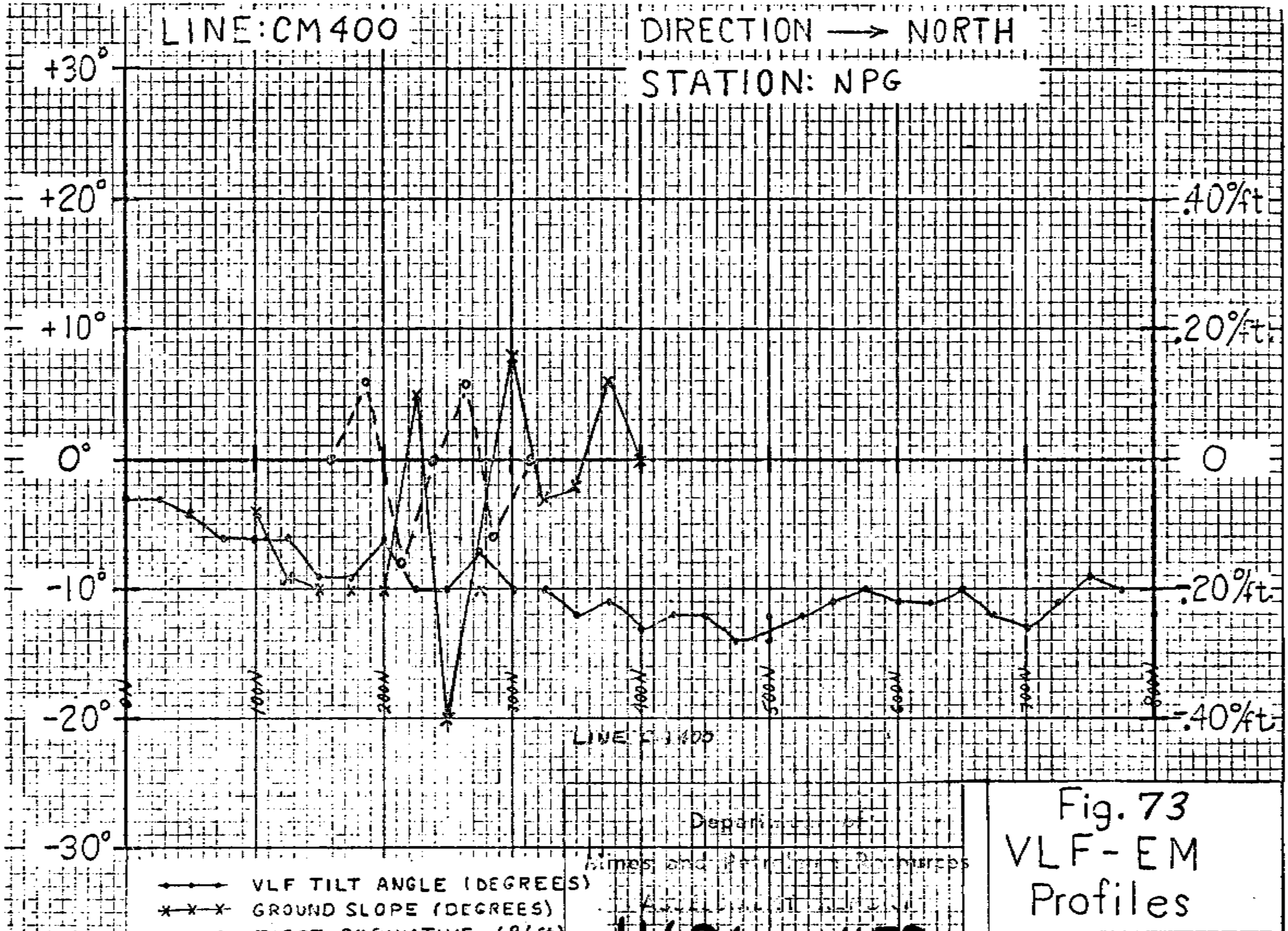
No other regions of significant variation are found on the 500W line either to the north or south of the base line. It is interesting to note that the creeks (500N, 550N, 650N and 1000N) do not have much effect along this line.

Line CM 700 Copper Mint I (Figure 77)

No significant variations are found on this profile.

Line CM 2900 Copper Mint II & III (Figures 78 and 79)

Apart from the dip at 300N, which is probably related to a deep creek ravine at that point, no significant variations were observed either to the north or south of the base line.



Department of Mines and Petroleum Resources

NO. 4626 MAP #73

Fig. 73
VLF-EM Profiles

DRN: ABLW | DATE: SEPT. 73

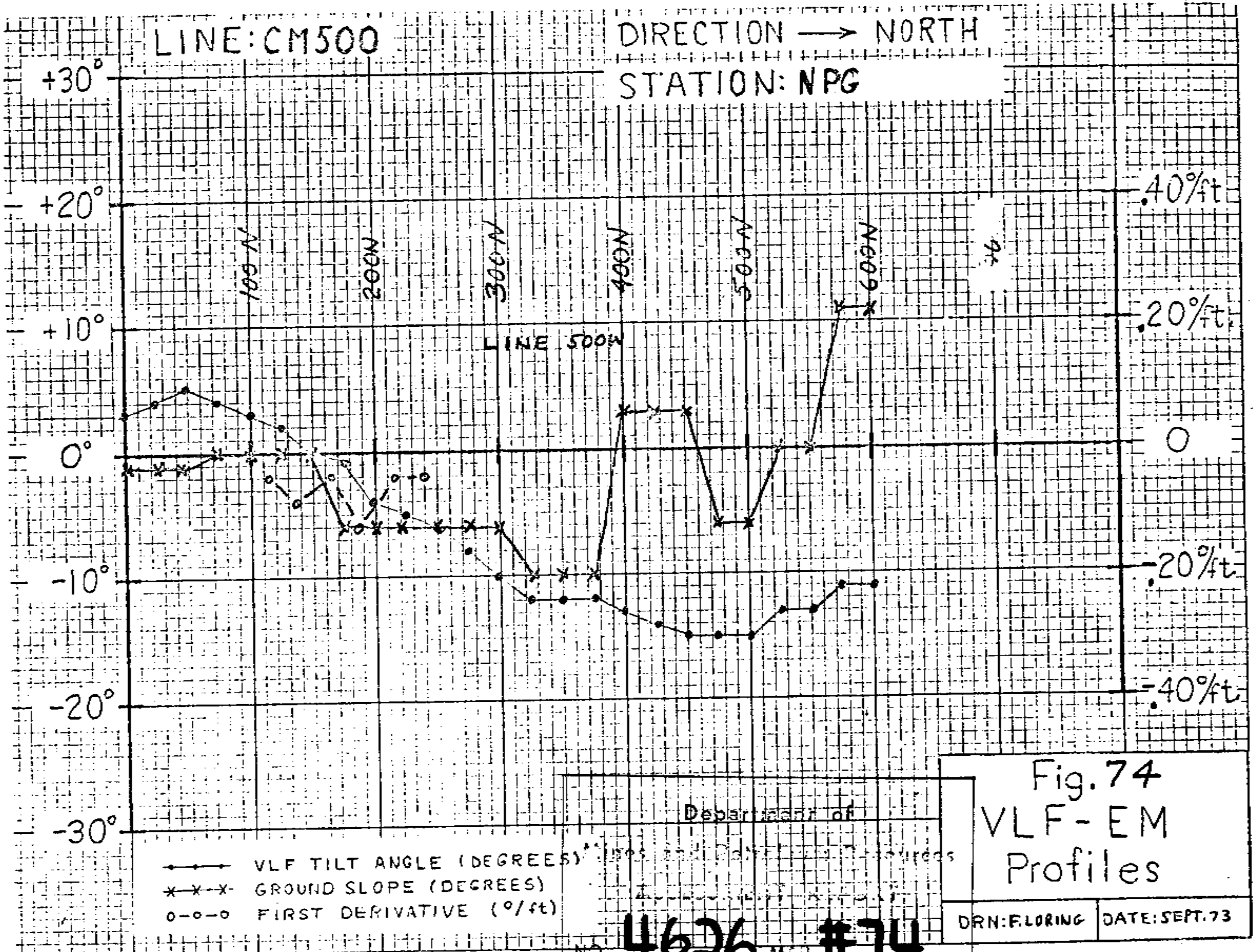


Fig. 74
VLF - EM
Profiles

DRN: F. LORING | DATE: SEPT. 73

NO. 4626 MAP #74

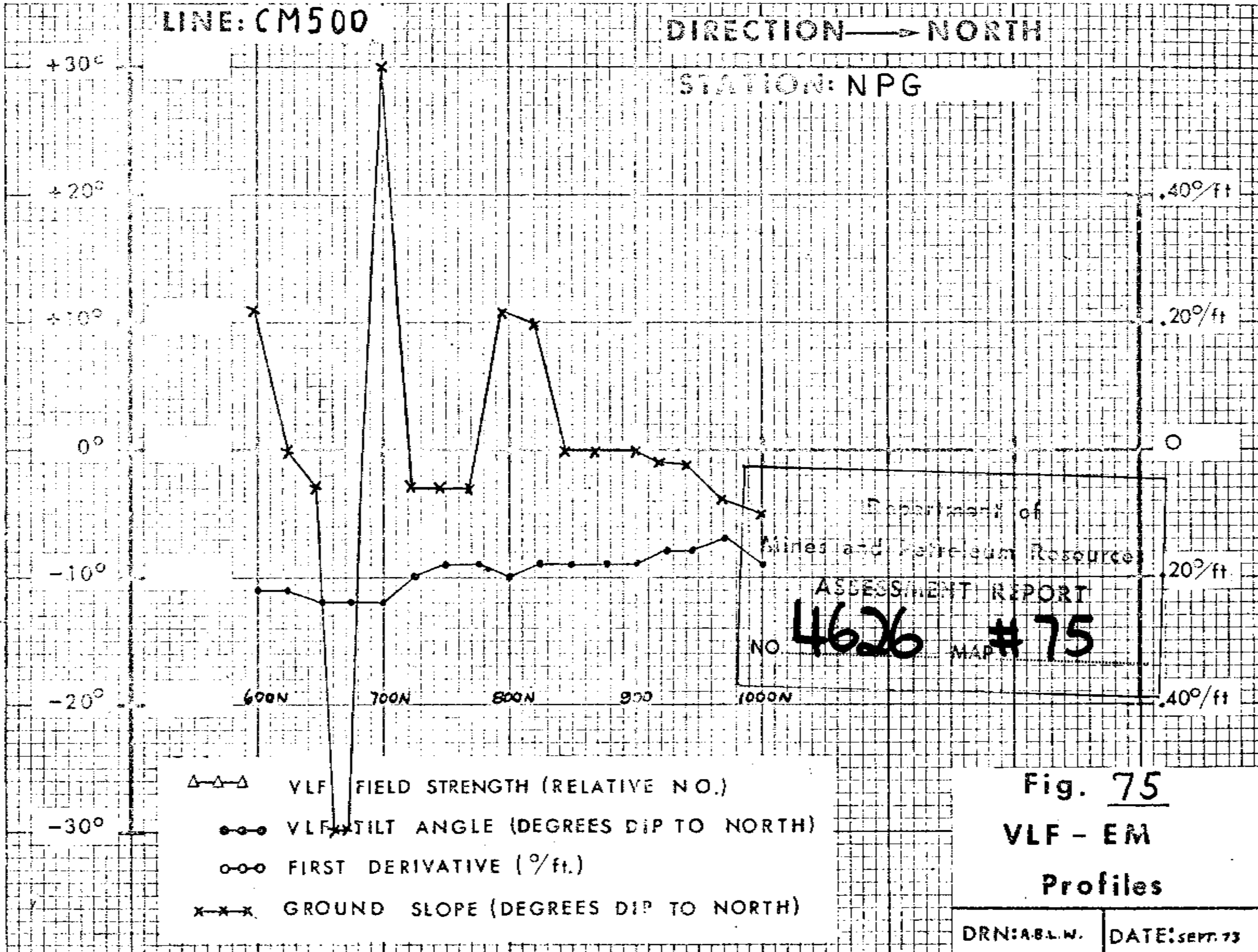


Fig. 75

VLF - EM

Profiles

DRN: A.B.L.W.	DATE: SEPT. 73

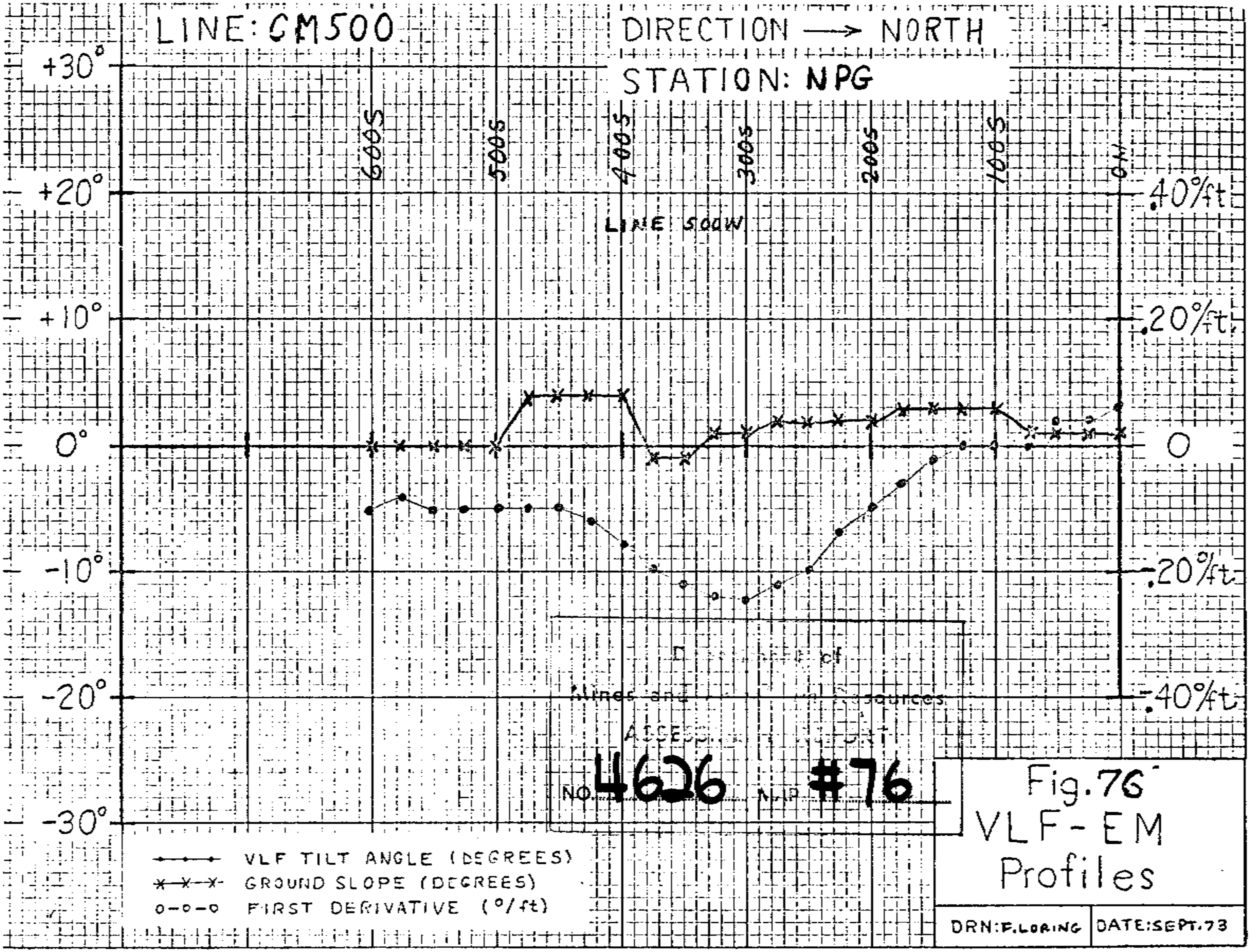
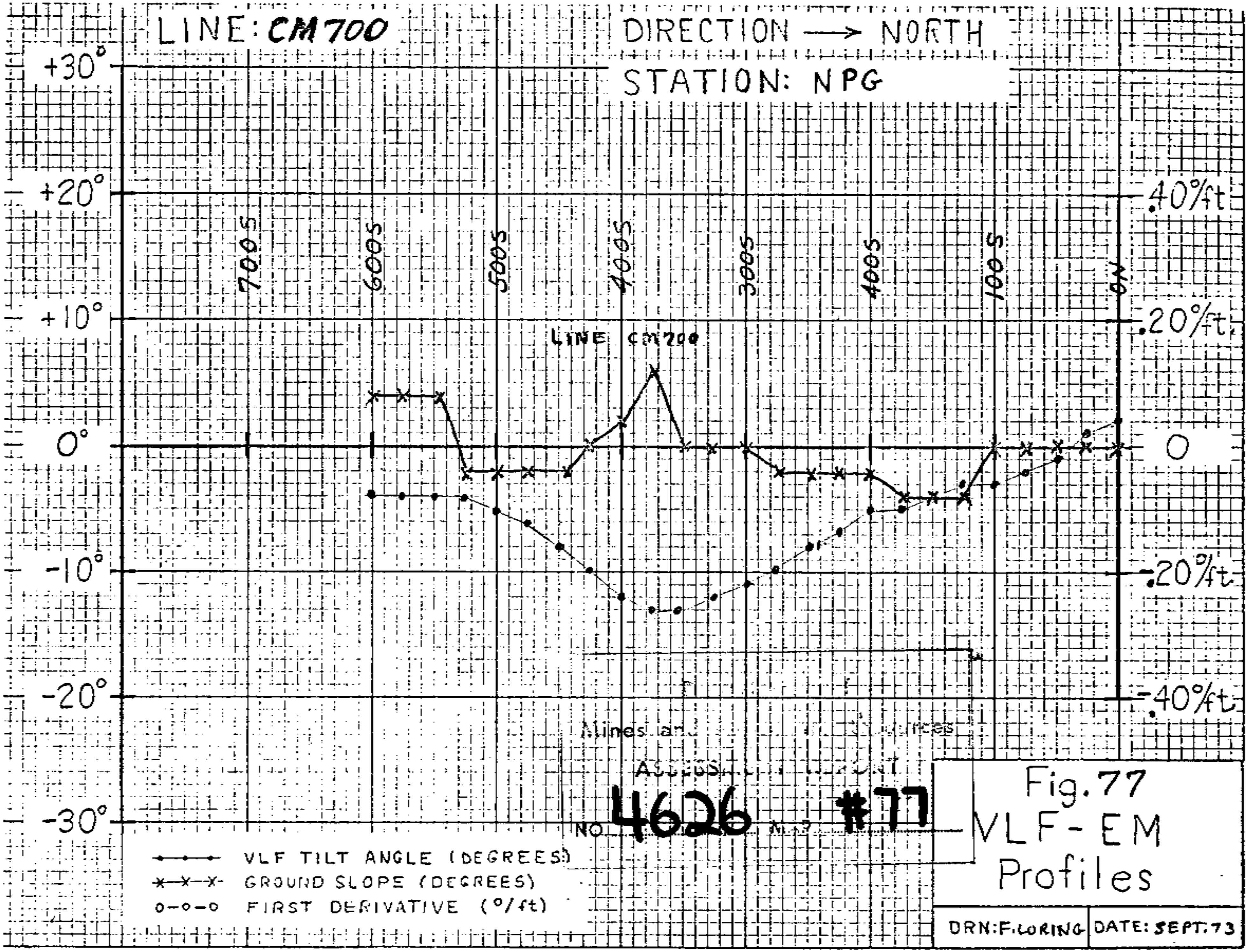


Fig. 76
VLF-EM
Profiles

-114-


LINE: CM700
DIRECTION ⟶ NORTH
STATION: NPG
+30°
+20°
+10°
0°
-10°
-20°
-30°
40%ft
20%ft
0
20%ft
40%ft
700S
600S
500S
400S
300S
200S
100S
0N
LINE CM700
VLF TILT ANGLE (DEGREES)
GROUND SLOPE (DEGREES)
FIRST DERIVATIVE (°/ft)
Fig. 77
VLF-EM
Profiles
DRN: F. LORING
DATE: SEPT. 73
NO. 4626 #77

-115-

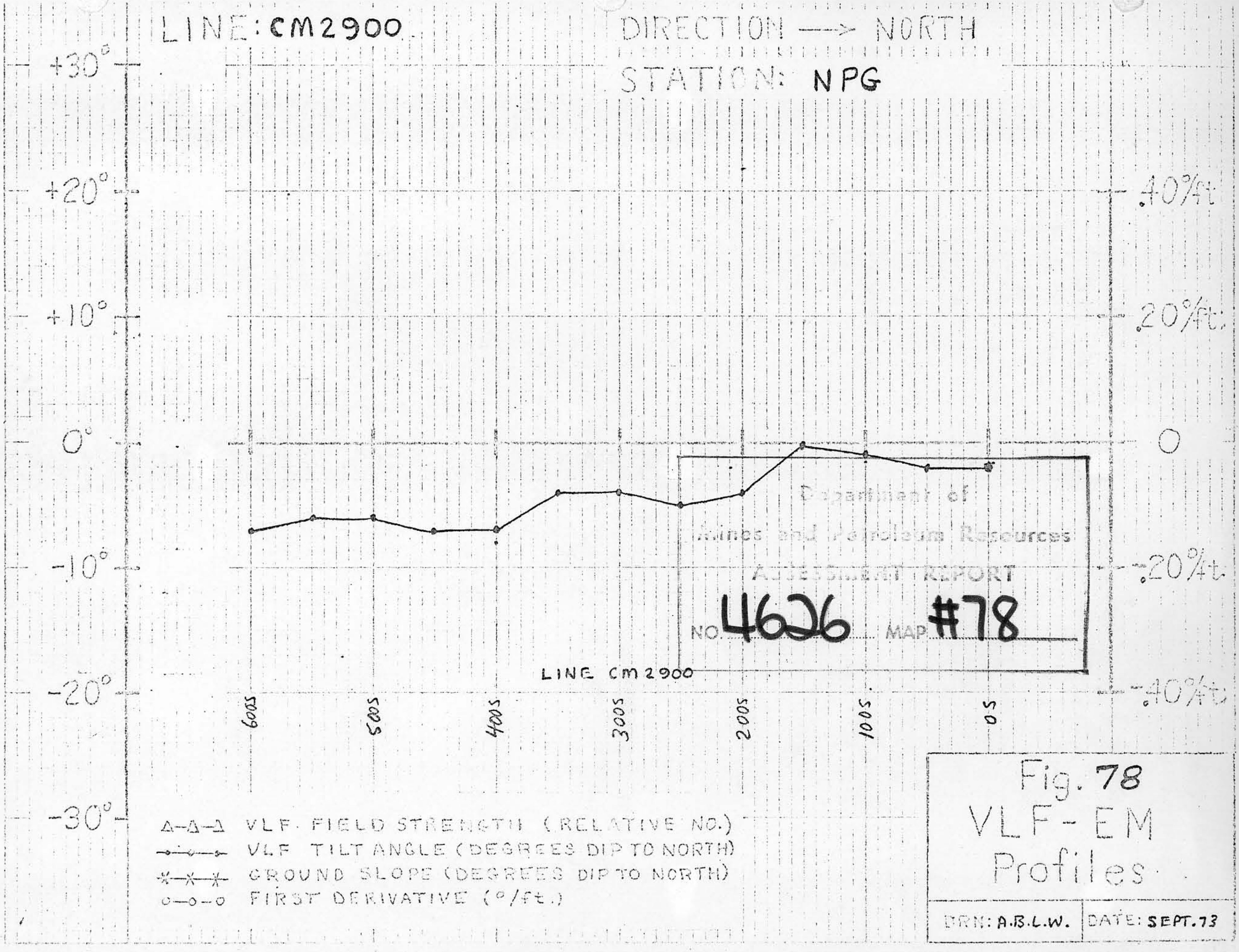
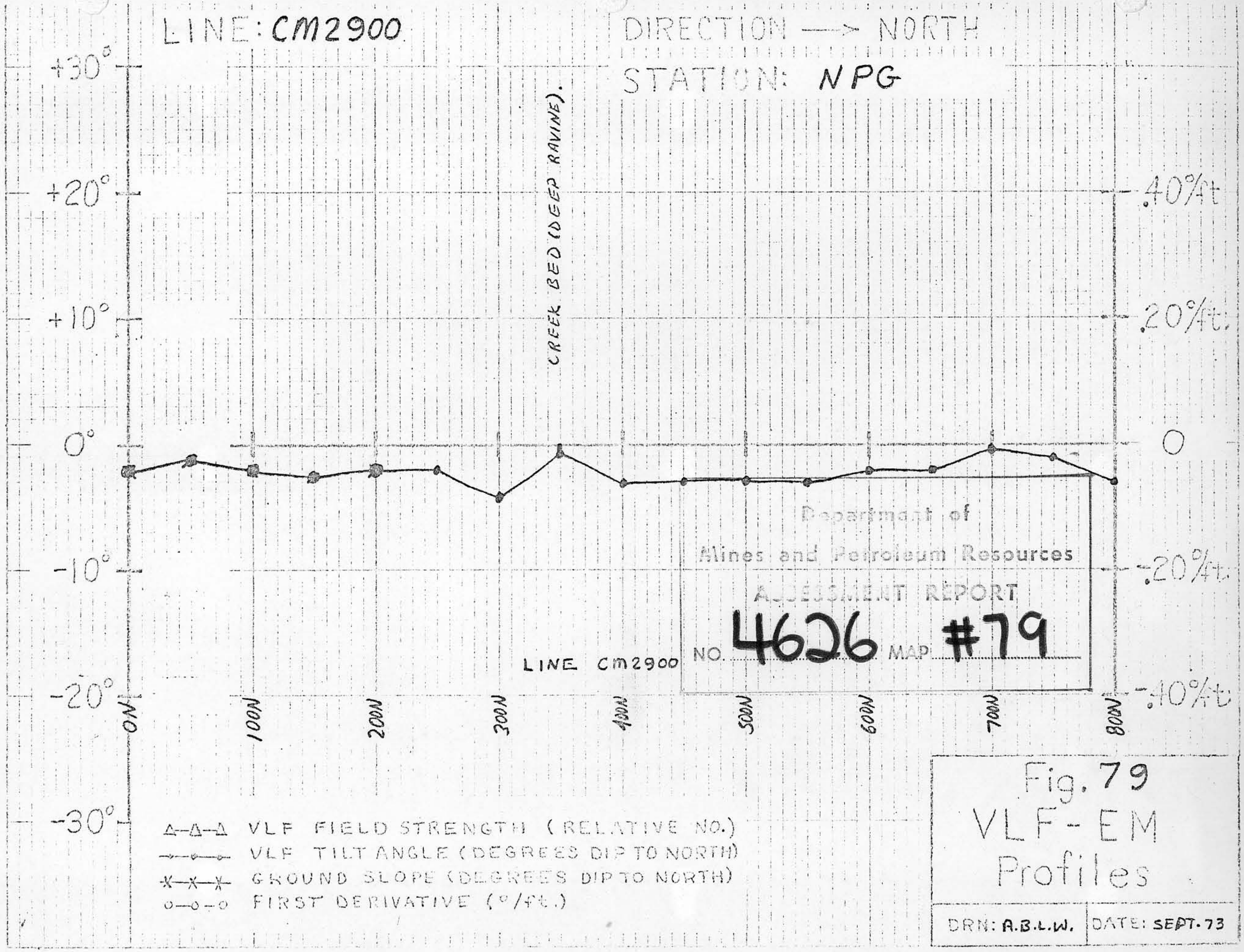


Fig. 78
VLF-EM Profiles

DRN: A.B.L.W. | DATE: SEPT. 73


LINE: CM2900
DIRECTION ——> NORTH
STATION: NPG
+30°
+20°
+10°
0°
-10°
-20°
-30°
.40%ft
.20%ft.
0
-.20%ft.
-.40%ft
CREEK BED (DEEP RAVINE).
0N
100N
200N
300N
400N
500N
600N
700N
800N
LINE CM2900
Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 4626 MAP #79
VLF FIELD STRENGTH (RELATIVE NO.)
VLF TILT ANGLE (DEGREES DIP TO NORTH)
GROUND SLOPE (DEGREES DIP TO NORTH)
FIRST DERIVATIVE (°/ft.)
Fig. 79
VLF-EM
Profiles
DRN: A.B.L.W.
DATE: SEPT. 73

-117-

7. GEOCHEMICAL RESULTS

(a) Soil Samples

A series of soil samples were taken at a depth of about 3 feet, at 25 ft. intervals, using a hand auger. In addition; a small pit was dug (at 250S, 400 W, Claim 22G), to obtain a soil profile. The lines surveyed were 400 W, across the VLF-EM anomaly from 100 S to 400 S; 300 W, from 200 N to 500 N; and OW, from 100 S to 400 S, across the adit and mineralized zone at the river. All lines are on Claim 22G.

The pit showed three distinct layers, a top (A) zone of decayed vegetation about 4" thick, a brown to orange-brown layer of soil about 2 1/2" thick, and below this (to an indeterminate depth) a layer of clay. Tests for Copper gave negative results in the pit, and on the three lines surveyed. Consequently no profiles were drawn.

The conclusions of the 1971 Whittles and Loring Report (P.21) would seem also to apply to this new work, with (a) being the most probable: that is, any mineralization present consists mainly of pyrite, with very little chalcopyrite present. The following section (b) further supports this conclusion.

One must enter a note of caution here. The equipment used is extremely sensitive but is not of a type commonly used in geochemical sampling of soils (although it could be used in

METALS IN SOILS

FIGURE 80

METAL	OCCURRENCE	MOBILITY	REMARKS
CU	10 - 50 ppm (Average)	Medium	Fairly easily leached. Absorbed by clays. Concentrates in swamps
Zn	25 - 200 ppm	High	Fixed by organic substances. Easily leached. High over C_2CO_3 or basic rocks
Pb	10 - 50 ppm	Low	Strong affinity for humus. Migrates as bicarbonate. Resists leaching.
Mo	1 - 4 ppm Rauge	Very High	Defection sensitivity very high (1-5 ppm). Good pathfinder for Cu.
As	3 - 5 ppm Average 1 - 50 ppm Range	Low	Associated with Fe. Immobile in arid areas. Leached out in wet areas. Pathfinder for Co, W, Ag.
Ni	30 - 50 ppm Av. 5 - 500 ppm Range	Medium-High	Mobility inhibited by limonite and Ph>6.5
Ag	0.1 ppm. Average	Low	Associated with Pb, Zn, Cu.

REF: Geochemistry in Mineral Exploration
Warren, Delavault & Cross, Western Miner, Feb. '66

NO. 4626 #80

Figure 80

water sampling). As a consequence, some chemical effect may be interferring with the detection of copper in the soils. Certainly one would think that the soils should have 10 - 60 ppm in them from the weathering of rocks (See Figure 80).

Before these results can be considered valid, certain tests of standardized samples need to be carried out.

(b) Rock Sample Analysis

One sample, from the adit at about 3600 W on the Klondyke Claim (See Figure 3) was sent in for a spectral analysis (See the attached sheet from Bondar-Clegg & Co. Ltd. Please note that this was analyzed in June 1972 which is not in the present assessment year; however, it is new information and is included here for completeness.)

The sample was obtained from a 1 foot wide vein of massive pyrite located about 20 feet in from the mouth of the adit. Only traces of the metallic elements are present (Co: 100 - 300 ppm, Cu & Zn from 30 - 100 ppm, Mn 300 - 1000 ppm).

These values are not much different from the normally found ppm ranges in soils (See Figure 80).

BRANCH OFFICES
INL RIAL RD., WHITEHORSE, Y.T. — 1500 PEMBERTON AVE., NORTH VANCOUVER, B.C. — BOX 487, CAMPBELLTON, N.B.

BONDAR-CLEGG & COMPANY LTD.

768A BELFAST ROAD (M.R. 1), OTTAWA, ONTARIO K1G 0Z5
PHONE: 237-3110 TELEX: 013-3548

SEMI-QUANTITATIVE ANALYSIS

No: 549-2

Sample No. 1

From: B.C.C. Vancouver - 22-255

Method: X.R.F.

Date: June 20, 1972.

No. of Elements: 32

Analyst: J.E.

MAJOR ELEMENTS (%)	<.003	.003-.01	.01-.03	.03-0.1	0.1-0.3	0.3-1.0	1.0-3.0	3.0-10.0	> 10.0	REMARKS
SiO_2									X	
Al_2O_3								X		
Total Fe (Fe_2O_3)									X	
MgO					X					
CaO					X					
Na_2O					X					
K_2O							X			
TiO_2				X						
TRACE ELEMENTS (%)										
V	X									
Cr	X									
Mn				X						
Co			X							
Ni	X									
Cu		X								
Zn		X								
As	X									
Sr	X									
Y	X									
Zr	X									
Nb	X									
Mo	X									
Ag	X									
Sn	X									
Sb	X									
Ba					X					
La	X									
Ce	X									

8. GEOLOGICAL MAPPING

The geological mapping was confined main ly to the river bank and shore where the rock is exposed, apart from a few isolated outcrops on the Susan and Klondyke claims.

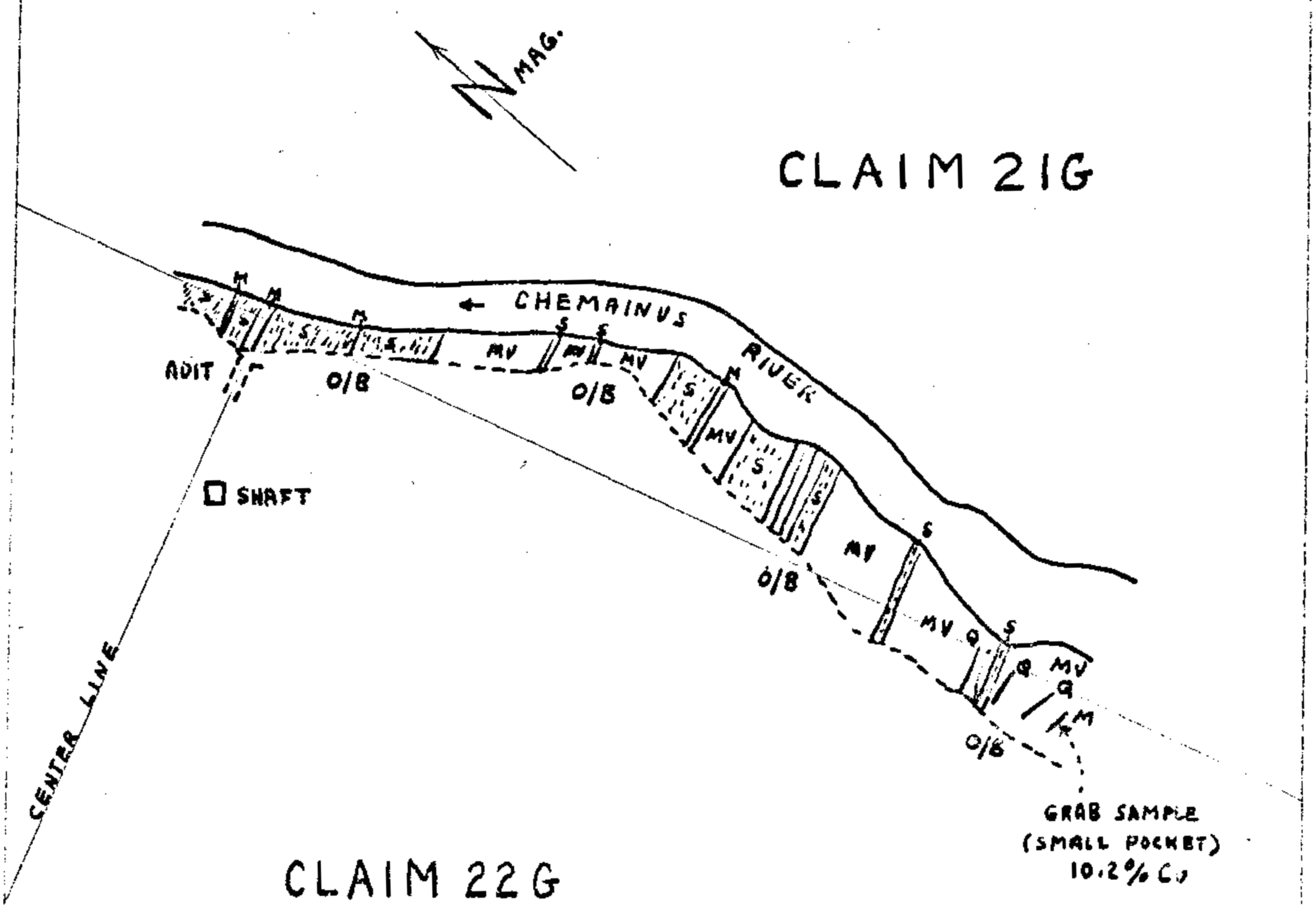
Susan and Klondyke Claims

The isolated outcrops and various indications of float are indicated on Figure 3. These maintain, for the most part, the same pattern as found on the river shore: green schist containing quartz and disseminated mineralization, mostly pyrite. (See Section 8, Geochemical Results). In one location on the Klondyke Claim, an old adit was discovered which cut through a quartz-pyrite vein about 6" wide. This was the only indication of massive metallic mineralization, apart from those veins found on the shore of the river. The nature or age of this vein would seem to be different from those on the river, since the strike seems to be NE-SW.

River Bank and Shore Mapping

These results are Figures 81A and 81B. There is a pattern of green chlorite schist zones, (in more crystalline meta-volcanics) which contain quartz veins, massive pyrite in some locations, and disseminated pyrite in others.

Traces of chalcopyrite and malacite are



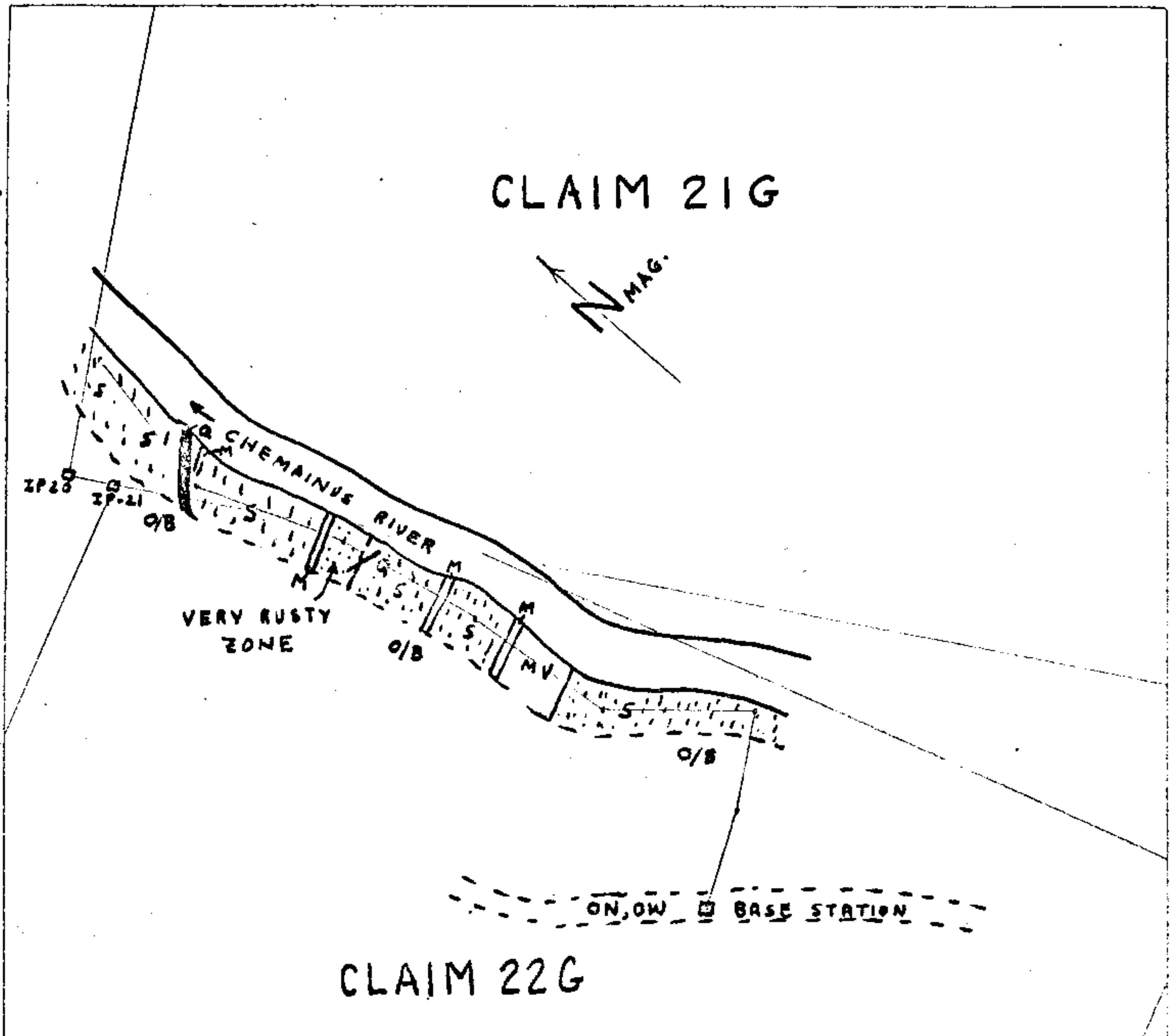
SCALE 1" = 100'

O/B = OVERBURDEN
M = MINERALIZED ZONE
(PYRITE + MINOR CHALCOPYRITE)
Q = QUARTZ VEIN
S = SCHIST
MV = META-VOLCANICS

FIG. 81A

GEOLOGY

DRN: A.B.L.W.	DATE: SEPT. 73



SCALE 1" = 100'

NO. 4626 #81B

O/B = OVERBURDEN
M = MINERALIZED ZONE
(PYRITE + MINOR CHALCOPYRITE)
Q = QUARTZ VEIN
S = SCHIST
MV = META-VOLCANICS

FIG. 81B

GEOLOGY

DRN: A.B.L.W. DATE: SEPT. 73

found in several locations. The amounts, however, appear to be minor, even in the one pocket of mineralization from which a grab sample assayed 10.2% Cu.

Little geophysical work has been done right along the river shore to see how it correlates with the geology; obviously this is a worthwhile project and should be completed in the future.

9. PHYSICAL WORK

A small amount of drilling and blasting (about six, 1 ft. deep holes) were completed to remove the surface layer of a rusty zone suspected of being mineralized. Location was 200 W, 800 S, directly to the west of the small vein discussed in the 1971 Report, which assayed at 10.2% copper.

The fresh rock showed disseminated pyrite in a green schist, but no other minerals could be observed under the hand lens. No chemical analysis were obtained.

10. INTERPRETATIONS

(a) General Features

The hypothesis suggested in the 1971 Whittles and Loring Report must be completely revised. It now seems improbable that the eastern part of Claim 22G is part of a fault block. The shifts in the anomalous zones are more probably caused by shearing or folding. The reasons for this revised conclusion are the following.

(1) The VLF-EM anomalous zone appears to be continuous from the adit to line 600W, folding north-south along 250W to 300W. The Crone JEM results for line 200S suggests this continuation, although the VLF-EM response is negligible along 300W Line. The VLF-EM response to a north-south vein would be very low (being broadside to the incoming VLF-EM waves).

(2) Examination of the river bank suggests folding may be fairly common. Across the river from about 100W, 700S there is a 20 foot section of schist which has been folded in a north-south direction.

(3) If the region under discussion was faulted and moved north and downward, the rocks on either side of the river should show this discontinuity; they do not. In fact, it is easy in may places to trace the rock formations directly from one river bank to another.

The discussion in the 1971 Whittles and Loring Report regarding the VLF-EM zones on the northern side of Claim 22G (on lines OW and 400W) would also seem to need revision. The new lines run north from the base line (lines 100W, 300W, 500W, 700W, and 900W) do not show the VLF-EM anomalies observed on line 400W. Hence, one might conclude that these anomalies are fairly localized.

There is other reported evidence for north - south folding. In the 1903 Annual Report there is the following statement: "It is claimed, and with some evidence to back the supposition, that the mineralized zone at the elevation of the Key City Claim (#37G) has been deflected to the south or into the XL claim (#196G) ground". Also, the "Geophysical Report on Mt. Sicker Mines Ltd. (N.P.L.)" of November 30, 1968, (in the Summary, page 7), indicates the possibility of "flectures toward the north and south" which the authors of the 1968 Report interpreted as folding.

Hence one can infer folds running almost north-south, and dipping to the east. The upper (western) edge of the fold line along line 300W would run along the edge of the steep bank that strikes from about 400W, 600S, to 000W, 400N. The total north-south displacement involved seems to be about 270 feet.

(b) Mineralization

There is known to be some mineralization on the property, primarily at the old adit on the river bank of claim 22G.

(c) Location of Mineralization

The results discussed here suggest that this mineralization follows an intensely schistose zone to the west that folds once along the 300W line, then continues westward over to the 600W line at 160S (See Figure 82). Since no VLF-EM continuation was observed on the 700W line, the mineralization either terminates, or else folds again north-south along this line.

Note that the intersection of the VLF-EM anomaly on line 600W is not in line with the trend across lines 400W and 500W, suggesting the start of another fold. If the mineralization runs about north-south across the 700W line, no VLF-EM anomaly would be observed (because of the poor wave coupling). This zone may thus reappear on line 800W or 900W to the south of the Claim 22G base line.

(d) Type of Mineralization

The VLF-EM, I.P., and resistivity results indicate a higher conductivity for this zone than the surrounding rock, and the magnetic map in the 1971 report suggests a slight magnetic mineralization (alteration). This gives support for the idea that the zone is mineralized and the process of mineralization has altered the surrounding rock. The mineralization must, however, consist of narrow veins or be disseminated in the schist. The mineralization appears to be primarily pyrite. These conclusions are supported by the following observations.

(1) The S.P. results are small. S.P. responds well to massive mineralization, but poorly to disseminated mineralization since

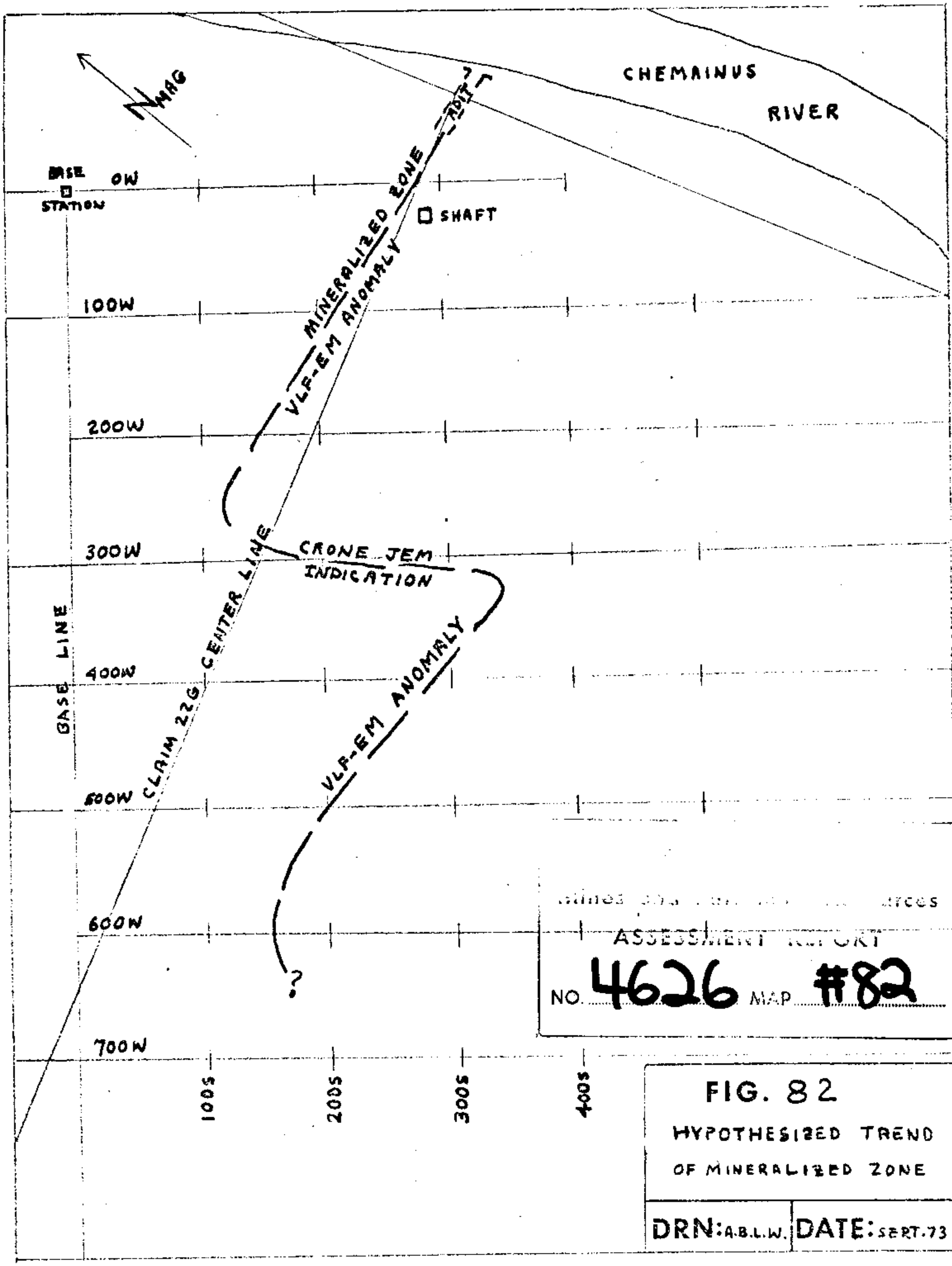


FIG. 82
HYPOTHESIZED TREND OF MINERALIZED ZONE

in the latter case the S.P. current paths are too broken up. This conclusion is weakened somewhat by the fact that the mineralization is in hard crystalline rock and surrounded by quartz. Hard crystalline rock around the mineralization would tend to interfere with the flow of the S.P. currents, even if the mineralization were massive.

(2) The gravity results indicate no large concentration of high specific gravity minerals. On the other hand, it must be pointed out that pyrite and chalcopyrite do not have very high specific gravities.

(3) The Crone JEM, which also responds best to massive mineralization gives only a few dip angle values which are above the reproducibility of the results. The mineralization could thus be inferred as being disseminated.

(4) The I.P. results are also low. Since I.P. responds well to disseminated minerals, the concentrations of the disseminated minerals is likely to be quite low. On the other hand, a hard crystalline host rock might also interfer with the flow of the I.P. currents.

(5) Finally, the lack of geochemical indications of heavy metal and copper in this report and the 1971 Whittles and Loring Report, indicate no large concentrations of these metals, to the east of the 400W line. The concentration of the heavy metals may improve as one moves up the mountain side; such is the case in the Mount Sicker area to the east. However, the one test made of mineralization

on the Klondyke claim does not offer any encouragement of this nature.

In the end analysis, through, one should always note that the presence of pyrite itself may well be important. Muller & Carson (1969) state, in discussing disposits such as the one on Mt. Sicker (the old Twin J. Mine),:

"Abundant disseminated pyrite is found on the fringes of the known deposits and could be a useful guide in exploration."

11. RECOMMENDATIONS

(1) The magnetometer's use would seem to be limited (a) to giving a general rock structure picture, (b) with some application in a detailed sense to confirm the presence of mineralization and alteration (as in the 1971 Report). It is not useful, in this case, to locate mineralization by itself, since the mineralization appears to be mostly non-magnetic; that is, it cannot be used in a reconnaissance sense. Further magnetic surveys should be considered along 500W and 600W, from OS to 500S on Claim 22G.

(2) Geochemical surveys should be continued to the west of the 400W line.

(3) More detailed work should be carried out along the river bank where the rock is exposed. This should involve (a) more detailed, geological surveys, (b) Crone JEM surveys (c) RADEM surveys, using the field strength measurement as well as the tilt angle measurement (d) magnetic surveys, (e) seismic surveys, (f) S.P. surveys and (g) I.P. surveys.

Such a concentrated effort would provide a greater level of confidence in interpreting the geophysical results on the drift covered areas away from the river.

(4) The VLF-EM Surveys should (a) be contined to the west of 700W and to the south of the base line (Claim 22G) and (b), be redone along the CM 400 and CM 500 lines to check the variations found there.

(5) The Crone JEM Unit should (a) be run over the VLF-EM anomalies and the mineralized zone at the river bank (Line OW) with coil spacings of 50', 100', and 200' and station spacings of 25' to obtain the spacings which give the best response; both frequencies should be used; (b) be run on line 300W, 200N to 600N at various spacings and frequencies to check the variations found there; and (c) be run on line CM200 from 200N to 600N to check on the variations found there.

(6) More work needs to be done on the 3100W & 3750W lines on the Klondyke claim. This should involve VLF, Crone JEM, magnetic, SP, geochemical & IP surveys, in addition to detailed geological mapping, particularily of the old adit and mineralized vein found on 3750W.

(7) It might prove worthwhile to survey and map the old underground workings. This would help to decide on the hypothesized geologic structure and future work on the claim.

(8) In the future, all the geophysical surveys should be done twice on each line and the results averaged. The variations being observed are quite small and in may cases just above the level of reproducibility of the surveys. Double readings for each station would give a greater confidence level in interpreting the observed results.

12. REFERENCES

(1) 1898 Report of the Minister of Mines of B.C.; Page 1148

(2) 1903 Report of the Minister of Mines of B.C.; Pages II,-239, 240, 252, 253.

(3) 1928 Report of the Minister of Mines of B.C.; Page C365

(4) 1940 "Geophysical Exploration", by C.A. Heiland; reprinted in 1968 by the Hafner Publishing Co.

(5) 1960 "Introduction to Geophysical Prospecting", by M.B. Dobrin, McGraw - Hill Book Co., Inc.

(6) 1966 "Mining Geophysics" by D.S. Parasnis, Elsevier Pub. Co.

(7) 1967 "Seismic Refraction Prospecting", Edited by A.W. Musgrave, Soc. Exploration Geophysicists.

(8) 1968 (November 30) "Geophysical Report on Mt. Sicker Mines Ltd. (NPL)" by E.P. Sheppard, P. Eng.

(9) 1969 "Prospecting with Radio Frequency EM-16 in Mountainous Regions"; Western Miner, Vol. 42, No. 2, March, 1969, by A.B.L. Whittles.

(10) 1969 "Geology & Mineral Possibilities of Vancouver Island" by J.E. Muller and D.J.T. Carson. Paper presented to the Annual Meeting of the Prospectors & Developers Association.

(11) 1969 "Contouring of VLF-EM data"; Geophysics, Vol. 34, No. 6, December 1969, by D.C. Fraser

(12) 1970 "EM-16 Operating Manual", Geonics Ltd., 2 Thorncliffe Park Drive, Toronto 17, Ontario.

(13) 1971 "Geophysical-Geochemical Report on the Copper Canion Group" by A.B.L. Whittles and F.C. Loring.

(14) 1971 "Geological Reconnaissance Map of Vancouver Island and Gulf Islands", J.E. Muller, Geological Survey of Canada.

(15) "Precision Altimeter Survey Procedures" by R.A. Hodgson (no date given), Paulin Altimeter Company.

13. APPENDICES

(a) Cost Analysis

(1) Time used by Dr. A.B.L. Whittles

(a) Field Supervision and Instrument Operation

(Aug. 3, 5, 6, 7, 12, 13, 15, 19, and 31, of 1972:
and Feb. 22, Mar. 15, Apr. 27, May 3, 4, 11 and 18,
June 28, July 2, 3, 1973) — 19 days

(b) Computing, plotting & interpretation of data

(July 5, 6, 7, 10, & 12, Sept. 8, 9, 15, 16,
23, 27, 1973) — 11 days

30 days

(2) Time used by F.C. Loring, P. Eng.

(Aug. 3, 5, 6, 7, 12, 13, 15, 19 and 31, 1972
and July 2, 3, 1973) — 11 days

Total Time of Dr. A.B.L. Whittles & F.C. Loring: — 41 days

41 days at $150.00 per day — $6,150.00

(3) Mileage

B. Whittles	- 56 mi. x 19 days x 0.15/mile	159.60	
F. Loring	- 60 mi. x 11 days x 0.15/mile	81.00	
			240.60
	SUB-TOTAL		$6,390.60

		SUB-TOTAL BROUGHT FORWARD	$6,390.60
(4)		Physical Work	
	(a)	Line Cutting - $150/mile x 3 miles	450.00
	(b)	Equipment Rentals (Boyd Gordon Industries)	68.00
	(c)	Continental Explosives (Caps & Explosives)	31.40
(5)		Other Expenses	
	(a)	Food and Accommodation (July 2 and 3, 1973)	40.00
	(b)	Chemical Analysis (Bondar Clegg)	20.00
	(c)	Geophysical Equipment Rental	200.00
	(d)	Film (Seismic Results)	15.00
	(e)	Maps and Aerial Photos	5.00
	(f)	Duplicating of Maps, Profiles, Reports, Claim Survey notes	45.00
	(g)	Typing	50.00
			$7,315.00

(b) <u>Computer Programs HP9820A</u> (Four Pages Attached)

1. Elevation Calculation Program

```
0:
SPC 2;FXD 3⊢
1:
PRT "ELEVATIONS"
,"FROM LEVELING"
⊢
2:
ENT "BASE STN.EL
EV.",A⊢
3:
ENT "LINE/STATIO
N",R0,"BACK SIGH
T",R1,"FORE SIGH
T",R2⊢
4:
A+R1-R2→B⊢
5:
PRT "LINE/STATIO
N=",R0⊢
6:
PRT "ELEVATION="
,B⊢
7:
B→A;GTO 3⊢
8:
END ⊢
R145
```

2. Altimeter Temperature Correction Program

```
0:
SPC 2;FXD 2⊢
1:
PRT "ALTIMETER",
"TEMPERATURE","A
DJUSTMENT","PROG
RAM";SPC 1;0→R9⊢
2:
ENT "STARTING L/
S",R0,"STARTING
ELEV.",R1,"TEMP.
FAHRENHEIT",R2⊢
3:
ENT "LINE/STATIO
N",R3,"ELEVATION
",R4,"TEMP.DEGRE
ES F",R5⊢
4:
ENT "TIME OF RDG
",R8⊢
5:
(R4-R1)(R5+R2-10
0).00102→R6⊢
6:
R3→R0;R4→R1;R5→R
2;R6+R9→R9⊢
7:
R9+R1→R7⊢
8:
PRT "LINE/STATIO
N=",R0⊢
9:
PRT "TEMP.ADJ.EL
EV.=",R7⊢
10:
PRT "TIME OF RDG
.=",R8;SPC 1;
GTO 3⊢
11:
END ⊢
R121
```

3. Magnetic Drift Correction Computer Program

```
0:
SPC 2;FXD 0;6→A;
7→B;8→C⊢
1:
ENT "BASE RDG.ST
ART",R0,"BASE RD
G.FINISH",R1⊢
2:
ENT "TIME BRS-HR
S",R2,"TIME BRS-
MIN",X;X/60+R2→R
2;0→X⊢
3:
ENT "TIME BRF-HR
",R3,"TIME BRF-M
IN",X;X/60+R3→R3
;0→X⊢
4:
ENT "BASE STAT.L
EVEL",R4⊢
5:
ENT "LINE/STATIO
N",RA,"MAG.RDG."
,RB⊢
6:
ENT "TIME MAG.RD
G-HRS",RC,"TIME
MAG.RDG-MIN",X;X
/60+RC→RC;0→X⊢
7:
IF FLG 13=1;GTO
9⊢
8:
A+3→A;B+3→B;C+3→
C;GTO 5⊢
9:
6→A;7→B;8→C⊢
10:
(R0-R1)(RC-R2)/(
R3-R2)+(RB-R0)+R
4→R5;SPC 2⊢
11:
IF RC=0;GTO 15⊢
12:
PRT "LINE STATIO
N=",RA⊢
13:
PRT "CORR.RDG.="
,R5;0→R5⊢
14:
A+3→A;B+3→B;C+3→
C;GTO 10⊢
15:
END ⊢
R105
```

4. Gravity Data Correction Program

```
0:
SPC.2;FXD 3⊢
1:
PRT "GRAVITY DAT
A","CORRECTION P
ROG."⊢
2:
PRT "BOUGUER AND
","FREE AIR","CO
RRECTIONS ONLY";
SPC 2⊢
3:
ENT "GRAVIMETER
CONST?",R0⊢
4:
ENT "BASE STAT.L
EVEL?",R2⊢
5:
ENT "BOUGUER DEN
SITY?",R1,"LINE/
STATION",R3,"GRA
VI.DIAL RDG.",R4
⊢
6:
ENT "ELEV.W.R.T.
SEA",R5⊢
7:
R0*R4+(.09406-.0
1277*R1)R5→R6⊢
8:
PRT "LINE/STATIO
N=",R3⊢
9:
PRT "CORR.READIN
G=",R6⊢
10:
PRT "BOUGUER DEN
SITY=",R1;SPC 1⊢
11:
GTO 5⊢
12:
END ⊢
R124
```

5. Seismic Program No. 1

```
0:
SPC 4;FXD 0⊢
1:
PRT "TWO LAYER",
"SEISMIC PROGRAM
","ZERO SLOPE";
SPC 2⊢
2:
ENT "CRITICAL DI
ST.C1",R0,"VELOC
ITY V1",R1,"VELO
CITY V2",R2⊢
3:
√((R2-R1)/(R2+R1
))*.5*R0→R3⊢
4:
PRT "DEPTH TO","
FIRST LAYER=",R3
⊢
5:
PRT "VELOCITY V1
",R1⊢
6:
PRT "VELOCITY V2
",R2⊢
7:
END ⊢
R140
```

6. Seismic Computer Program No. 2

```
0:
SPC 4;FXD 2⊢
1:
PRT "IF TITLE IS
 TO","BE SKIPPED
","ENTER 1";SPC
2;ENT "SKIP TITL
E?",B⊢
2:
IF B=1;GTO 5⊢
3:
PRT "TWO LAYER",
"SEISMIC PROGRAM
","FOR ONE PROFI
LE","DIPPING BED
S"⊢
4:
PRT "WHEN ANGLE
OF","DIP IS KNOW
N","USING CRITIC
AL","DISTANCES";
SPC 2⊢
5:
ENT "VELOCITY V1
",R1,"VELOCITY V
2",R2⊢
6:
ENT "CRITICAL DI
ST. ",R3,"ANGLE
OF DIP",R4⊢
7:
PRT "IF GEOPHONE
","IS UP","SLOPE
 ENTER 1";SPC 1⊢
8:
PRT "IF GEOPHONE
","IS DOWN","SLO
PE ENTER 2";SPC
2⊢
9:
ENT "ENTER 1 OR
2",A⊢
10:
IF A=2;GTO 12⊢
11:
ASN (R1/R2)-R4→R
5;GTO 13⊢
12:
ASN (R1/R2)+R4→R
5⊢
13:
R1/SIN R5→R6⊢
14:
R3*(1-R1/R2)/(2*
COS R5*COS R4)→R
7⊢
15:
PRT "VELOCITY V1
=",R1⊢
16:
PRT "CORRECTED V
2=",R6⊢
17:
PRT "VERTICAL DE
PTH","TO SECOND
LAYER=",R7⊢
18:
PRT "ANGLE OF DI
P=",R4,"
 DEGREES"⊢
19:
IF A=1;PRT "UP D
IP";SPC 2⊢
20:
IF A=2;PRT "DOWN
 DIP";SPC 2⊢
21:
END ⊢
R83
```

7. Universal Drift
   Correction Program

```
0:
SPC 2;FXD 1⊢
1:
PRT "DRIFT","COR
RECTION","PROGRA
M";SPC 1⊢
2:
ENT "BASE RDG.ST
ART",R0,"BASE RD
G.FINISH",R1⊢
3:
ENT "TIME BRS-HR
S",R2,"TIME BRS-
MIN",X;X/60+R2→R
2;0→X⊢
4:
ENT "TIME BRF-HR
",R3,"TIME BRF-M
IN",X;X/60+R3→R3
;0→X⊢
5:
ENT "BASE STAT.L
EVEL",R4⊢
6:
ENT "LINE/STATIO
N",R6,"READING",
R7⊢
7:
ENT "TIME READIN
G-HRS",R8,"TIME
READING-MIN",X;X
/60+R8→R8;0→X⊢
8:
(R0-R1)(R8-R2)/(
R3-R2)+(R7-R0)+R
4→R5⊢
9:
PRT "LINE STATIO
N=",R6⊢
10:
PRT "CORR.RDG.="
,R5;SPC 1;GTO 6⊢
11:
END ⊢
R115
```

(c) Geochemical Field Test Methods (La Motte Kit)

Equipment A - Copper Reagent A

B - Copper Reagent B *

C - Copper Reagent C

D - Test Tubes (2), special

E - Funnel ., plastic

F - Filter Paper, 7 cm

G - Pipette, unmarked

* Important: This reagent contains sodium cyanide. It must be handled with extreme care.

1. Fill the test tube to the upper line marked "A" with the sample to be tested.

2. Using an unmarked pipette, add two drops of Reagent A and mix, then add two drops of Reagent B and mix. If a precipitate forms, filter the solution into the second test tube until the test tube is filled to line "B". A pink color indicates the presence of copper.

3. Rinse the first test tube carefully and then fill it to the line marked "B" with clear water.

4. Add two drops of Copper Reagent B to the clear water sample and mix the contents.

5. To the clear water sample tube, (from Step 4), Copper Reagent C is added one drop at a time until the color of the liquid matches the color of the test sample (from Step 2). Match the colors by looking down through the test tubes as they are held about a half inch above a plain white surface. Count the number of drops of Copper Reagent C added. Each drop of the Copper Reagent C added is equal to 0.025 ppm. of Copper. If four drops of Copper Reagent C were required to match the color of the test sample, the result is 4 times 0.025 or 0.1 ppm. Copper.

(d) Resume of Experience of Field Workers

The following persons did the field work discussed in this report, under the supervision of Dr. A.B.L. Whittles: M. Filion, T. Greer, G. Hicks, R. Van den Nieuwenhof, J. Scholtens, D. Gutteridge, D. Bryden, B. Buse, R. Gardner, K. Nummela, F. Syrotuck, P. Brunner, H. Slobodan, G. Harris, S. Janes, R. Zeman. All of these persons were students of the Geological Technology, Malaspina College and had about 8 months of geophysical experience prior to the reported field work.

In addition, F. Loring, P. Eng. did field work for several days. Mr. Loring is a graduate Mining Engineer with 25 years of Mining and Exploration experience. Mr. Loring is a registered B.C. Engineer

Mr. T. Avery, Electronics Technician, helped design and test the photographic seismic equipment, under the direction of Dr. A.B.L. Whittles. Mr. Avery has approximately 20 years of radio, T.V. and Electronics experience and is presently in charge of the Electrical-Electronic Technology, Malaspina College.

Mr. G. Kinneard worked on the August 1972 field days. Mr. Kinneard has 2 years of College Geology and has had 2 years of part time field experience under the direction of Dr. A.B.L. Whittles.

(e) Resumé of Technical and Field Work Experience of Dr. A.B.L. Whittles, Ph.D.

(1) University training at University of B.C. and University of Toronto, with the completion of a Ph.D. in Physics (Geophysics section) in 1964, from U.B.C.

(2) Prior experience (2 summers) with geophysical section Imperial Oil Ltd., in Alberta.

(3) Surveying experience, Buttle Lake Power Project.

(4) Four years at the B.C. Institute of Technology, teaching geophysical prospecting courses to day and evening students, and three years at Malaspina College.

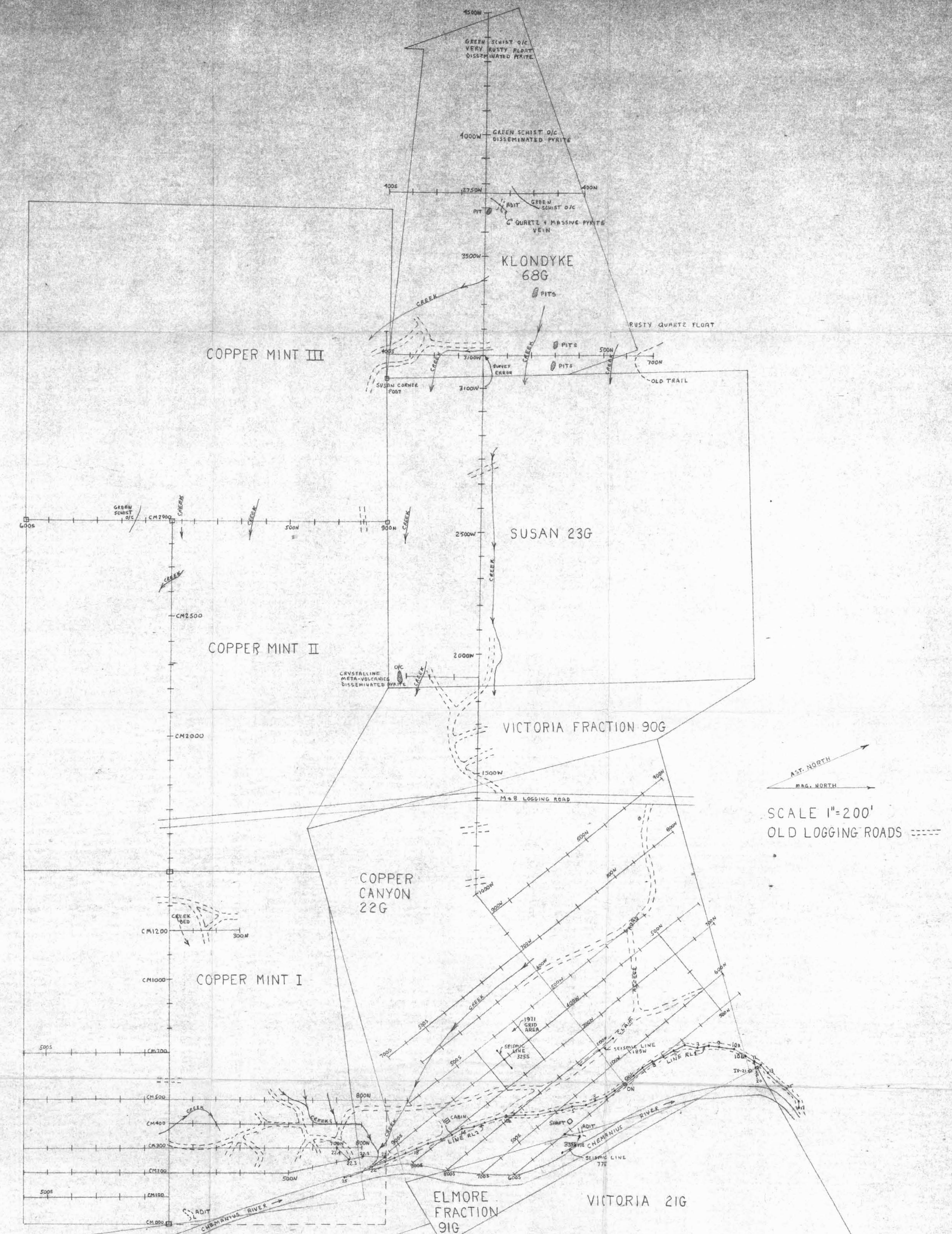
(5) Consulting experience during the past seven years with companies in Vancouver, Victoria, and Calgary, including field supervision and interpretation.

(6) Presently in charge of the Geological Technology, Malaspina College, Nanaimo, and including the teaching of courses on geophysical prospecting.

(7) An active member with the Society of Exploration Geophysicists, and the B.C. Geophysical Society.

A.B.L. Whittles

Dr. A.B.L. Whittles, Ph.D.



4626

M3

FIG.3
CLAIM, SURVEY
LINE AND
PHYSICAL FEATURES
MAP

DRN: A.B.L.W. | DATE: SEPT '73