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TWIN MINING CORPORATION

COMBINED MAGNETIC AND ELECTROMAGNETIC HELICOPTER SURVEY

Jackson Inlet Project
ARCTIC BAY, BAFFIN ISLAND
73 09' 09"N 88 14' 11" W

FINAL REPORT

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NTS Map Sheets: 58A/15-16, 58D/01-02-08 and 48C/04-05

Fugro SIAL Airborne Surveys Inc.
project number 01-H02-02

Camille St-Hillaire

April 4th to May 15th 2001

THIS REPORT HAS BEEN EXAMINED AND
APPROVED AS TO TECHNICAL WORK UNDER
SECTIONS 6 & 7 OF SCHEDULE II OF THE
CANADA MINING REGULATIONS AND
VALUED IN THE AMOUNT OF \$ 673,809.50.

DATE: Apr 4/03 "Paul Gertzbein"

ENGINEER OF MINES FOR
CHIEF, NUNAVUT MINERAL
RESOURCES SECTION

TWIN MINING CORPORATION

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HELICOPTER SURVEY**

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NTS Map Sheets no. 58A/15-16, 58D/01-02-08 and 48C/04-05

ARCTIC BAY, BAFFIN ISLAND

July 2001

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1.0 INTRODUCTION

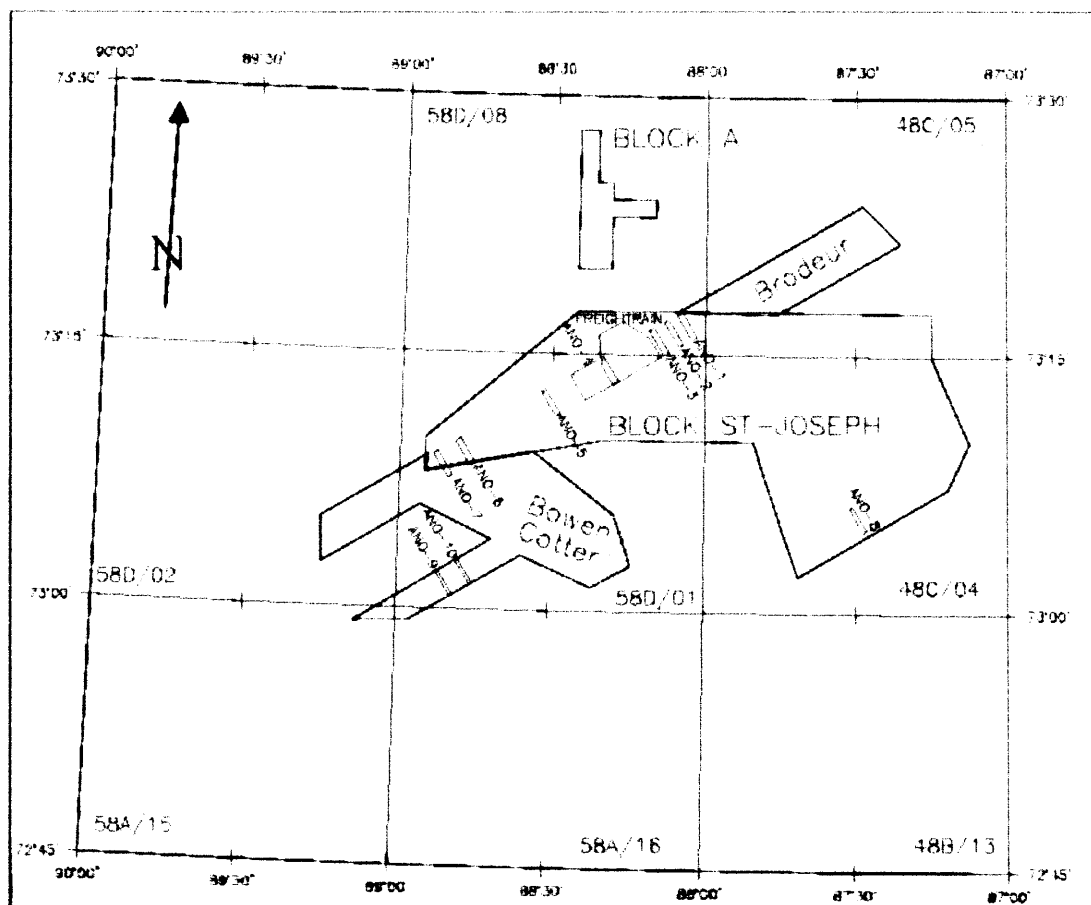
The following report describes the specifications and results of a helicopter high-resolution magnetic and electromagnetic survey that was flown on Baffin Island for the mining company **TWIN MINING CORPORATION**. The survey area was located between 70 and 100 km from Arctic Bay, and required 6641 line-km.

The survey was performed by **Fugro SIAL Airborne Surveys Inc.** (FSAS) from April 4th through May 15th, 2001. Pre-flight tests were performed on site from March 26th through April 4th, 2001.

The primary goal of this project was to provide high quality digitally recorded and processed geophysical data in order to assist geological mapping and to indicate structures potentially favourable to the presence of kimberlite.

The major areas shown on figure 1 were flown with a line spacing of 250 metres; the control lines were flown perpendicular to the survey lines with a spacing of 2000 and 2500 metres. Smaller inner areas located over magnetic anomalies were detailed with a narrowed line spacing of 50 or 100 metres (see table 2). The nominal survey height was 60 metres above the surface of the ground.

Preliminary magnetic and EM anomaly maps were available daily on site. Final maps and digital data on CD-ROM were delivered to **TWIN MINING CORPORATION** in three batch on June 27th, July 4th and July 30th, 2001.



Scale 1 : 550 000

TWIN MINING CORPORATION
 HELICOPTER BORNE SURVEY - ARCTIC BAY AREA
FIGURE 1: LOCATION MAP

5610, Chemin Bois-Franc
 St-Laurent, Québec
 Canada H4S 1A9

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 Fax: +1(514) 339 2997
 Email: aem@siageo.com

fuoro

2.0 MANAGEMENT OF SURVEY

Mr. Mouhamed Moussaoui, from FSAS carried out co-ordination and general management of the project. The TWIN MINING Scientific Authority was Mr. Richard Roy. Mr. Roy worked closely with FSAS to ensure that the work was carried out according to contract specifications.

The survey and office crews consisted of the following permanent employees of FSAS:

Table 1: Field and Office Crew

| POSITION | NAME | ADDRESS | SENIORITY (years) |
|---|----------------------------------|---|----------------------|
| Project Manager | Mouhamed Moussaoui, P.Eng. | 835 Joseph Tassé Sainte Dorothée, Laval, QC Canada, H7X 3L3 | 15 |
| Electronic Engineer | Neil Punstell | 361 De L'Obier Rosemere, Québec, Canada J7A 4H7 | 4 |
| Field Geophysicist & Data processing | Ms. My Phuong Vo | 864 Smyth Road Ottawa, Ontario, Canada K1G 1P6 | 3 |
| Field Operator & Electronic Technician | Mr. Olivier Ayotte | 1000 Desaulniers Ap. 304 Longueuil, Québec, Canada J4K 4Y6 | 5 |
| AutoCAD/Drafting | Mr. Albert Sayed | 9451 Boisjoli, Pierrefond, QC, Canada, H8Y 3M3 | 10 |
| Data Interpretation & Final report | Dr. Marc A.Vallée, Geophy. | 49 Ave. Summerhill Pointe-Claire, QC, Canada H9R 2K8 | 2 |
| | Mr. Camille St-Hilaire, Geoph.y. | 732 Gohier, St-Laurent, Montréal, QC, Canada, H4L 3J1 | 5 |

3.0 SURVEY AREA

The survey area, shown on Figure 1, is located between 70 and 100 km to the West of Arctic Bay, Baffin Island, and covers portions of the 58A/15-16, 58D/01-02-08 and 48C/04-05 NTS map sheets. A total of 6641 line-km was flown. Table 2 present the specifications of each survey block. The topographic relief in the survey area presented no significant challenge in meeting altitude specifications.

| Table 2 : Survey Blocks | | | | | |
|--------------------------------|------------------------|----------------------------------|-------------------------------|------------------------------|---------------------------|
| BLOCK | NTS MAPS | TIE-LINE SPACING (m.) | TIE-LINE DIRECTION | LINE SPACING (m.) | LINE DIRECTION |
| St-Joseph | 48C/04-05 58D/01-08 | 2500 | 330° | 250 | 60° |
| Bowen Cotter | 58A/15-16 58D/01-02 | 2500 | 330° | 250 | 60° |
| Brodeur | 58D/08 48C/05 | 2500 | 330° | 250 | 60° |
| A | 58D/08 | 2000 | 90° | 200 | 0° |
| Freighttrain | 58D/01-08 | 100 | 330° 60° | 100 | 60° 330° |
| ANO-1 | 58D/08 | 250 | 60° | 100 | 330° |
| ANO-2 | 58D/08 | 250 | 60° | 100 | 330° |
| ANO-3 | 58D/08 | 250 | 60° | 100 | 330° |
| ANO-4 | 58D/01 | 250 | 60° | 100 | 330° |
| ANO-5 | 58D/01 | 250 | 60° | 100 | 330° |
| ANO-6 | 58D/01 | 250 | 60° | 100 | 330° |
| ANO-7 | 58D/01 | 250 | 60° | 100 | 330° |
| ANO-8 | 48C/04 | 250 | 60° | 50 | 330° |
| ANO-9 | 58D/01 | 250 | 60° | 50 | 330° |
| ANO-10 | 58D/01 | 250 | 60° | 50 | 330° |

Table 3 : List of Claims

| Claim No. | Claim Name | Claim Holder | Client |
|-----------|--------------|--------------|-------------|
| F45691 | Slot | Twin Mining | Twin Mining |
| F65593 | Freightrain | Twin Mining | Twin Mining |
| F68384 | Dallas | Twin Mining | Twin Mining |
| F68386 | Trudy | Twin Mining | Twin Mining |
| F69377 | Ace | Twin Mining | Twin Mining |
| F69378 | Rob | Twin Mining | Twin Mining |
| F69379 | Todd | Twin Mining | Twin Mining |
| F69380 | John | Twin Mining | Twin Mining |
| F69381 | Mike | Twin Mining | Twin Mining |
| F69382 | Joel | Twin Mining | Twin Mining |
| F69383 | Fiona | Twin Mining | Twin Mining |
| F69385 | Sam | Twin Mining | Twin Mining |
| F69387 | Jamie | Twin Mining | Twin Mining |
| F69388 | Sara | Twin Mining | Twin Mining |
| F69389 | Jason | Twin Mining | Twin Mining |
| F69390 | Krista | Twin Mining | Twin Mining |
| F69391 | Andrea | Twin Mining | Twin Mining |
| F69392 | Emily | Twin Mining | Twin Mining |
| F69393 | Robyn | Twin Mining | Twin Mining |
| F69394 | Britta | Twin Mining | Twin Mining |
| F69395 | Jade | Twin Mining | Twin Mining |
| F69396 | Arnulf | Twin Mining | Twin Mining |
| F69397 | William | Twin Mining | Twin Mining |
| F69398 | Domenic | Twin Mining | Twin Mining |
| F69400 | Jade West | Twin Mining | Twin Mining |
| F69401 | Roswitha | Twin Mining | Twin Mining |
| F69402 | Frederique | Twin Mining | Twin Mining |
| F69403 | Richard | Twin Mining | Twin Mining |
| F69404 | Hermann | Twin Mining | Twin Mining |
| F69405 | Krista South | Twin Mining | Twin Mining |
| F71429 | BP-1 | Twin Mining | Twin Mining |
| F71430 | BP-2 | Twin Mining | Twin Mining |
| F71431 | BP-3 | Twin Mining | Twin Mining |
| F71432 | BP-4 | Twin Mining | Twin Mining |
| F71433 | BP-5 | Twin Mining | Twin Mining |
| F71434 | BP-6 | Twin Mining | Twin Mining |
| F71435 | BP-7 | Twin Mining | Twin Mining |
| F71436 | BP-8 | Twin Mining | Twin Mining |

| | | | |
|--------|-------|-------------|-------------|
| F71437 | BP-9 | Twin Mining | Twin Mining |
| F71438 | BP-10 | Twin Mining | Twin Mining |
| F71439 | BP-11 | Twin Mining | Twin Mining |
| F71440 | BP-12 | Twin Mining | Twin Mining |
| F71441 | BP-13 | Twin Mining | Twin Mining |
| F71442 | BP-14 | Twin Mining | Twin Mining |
| F71443 | BP-15 | Twin Mining | Twin Mining |
| F71444 | BP-16 | Twin Mining | Twin Mining |
| F71445 | BP-21 | Twin Mining | Twin Mining |
| F71446 | BP-22 | Twin Mining | Twin Mining |
| F71447 | BP-23 | Twin Mining | Twin Mining |
| F71448 | BP-24 | Twin Mining | Twin Mining |
| F71449 | BP-20 | Twin Mining | Twin Mining |
| F71450 | BP-19 | Twin Mining | Twin Mining |
| F71451 | BP-18 | Twin Mining | Twin Mining |
| F71452 | BP-17 | Twin Mining | Twin Mining |
| F71453 | BP-25 | Twin Mining | Twin Mining |
| F71454 | BP-26 | Twin Mining | Twin Mining |
| F71455 | BP-27 | Twin Mining | Twin Mining |
| F71456 | BP-30 | Twin Mining | Twin Mining |
| F71457 | BP-28 | Twin Mining | Twin Mining |
| F71458 | BP-29 | Twin Mining | Twin Mining |
| F71459 | BP-31 | Twin Mining | Twin Mining |
| F71460 | BP-32 | Twin Mining | Twin Mining |
| F71461 | BP-33 | Twin Mining | Twin Mining |
| F71462 | BP-34 | Twin Mining | Twin Mining |
| F71463 | BP-35 | Twin Mining | Twin Mining |
| F71464 | BP-36 | Twin Mining | Twin Mining |
| F71465 | BP-37 | Twin Mining | Twin Mining |
| F71466 | BP-38 | Twin Mining | Twin Mining |
| F71467 | BP-39 | Twin Mining | Twin Mining |
| F71468 | BP-40 | Twin Mining | Twin Mining |
| F71469 | BP-41 | Twin Mining | Twin Mining |
| F71470 | BP-42 | Twin Mining | Twin Mining |
| F71471 | BP-43 | Twin Mining | Twin Mining |
| F71472 | BP-44 | Twin Mining | Twin Mining |
| F71473 | BP-45 | Twin Mining | Twin Mining |
| F71474 | BP-46 | Twin Mining | Twin Mining |
| F71475 | BP-47 | Twin Mining | Twin Mining |
| F71476 | BP-48 | Twin Mining | Twin Mining |
| F71477 | BP-49 | Twin Mining | Twin Mining |

4.0 GEOLOGICAL BACKGROUND

The geology of the Brodeur Peninsula is presented below.

Surface rocks are flat lying fossiliferous Ordovician and Silurian carbonated with minor shale interbeds, chert nodules, and occasional goethite nodules. These limestones almost cover the whole peninsula and are greater than 870m thick.

Although rocks older than Proterozoic are not exposed at the surface, it is interpreted that in the northern half of Brodeur the Paleozoic rocks unconformably overlie Upper Proterozoic rocks. These rocks are 3500m thick and are comprised of sandstones, shales, calc-alkaline volcanics and dolomites (host to the MVT Zn/Pb Nanisivik Mine) deposited in shallow water, cratonic basin. These rocks are cut by northwest trending diabase dykes of Franklin age.

Underling these Upper Proterozoic rocks are high-grade metamorphic Archean gneisses which form the basement on Borden to the east.

Kimberlites are intruded through the Ordovician and Silurian limestones. The kimberlites are thought to be cretaceous in age (103Ma, Mason, 1993). In occasional areas these kimberlites are exposed at the surface, where they contrast starkly with the light gray limestone.

5.0 SURVEY EQUIPMENT

All the instrumentation used during the survey met the contractual specifications and was installed in the helicopter by Neil Punstell and Olivier Ayotte, two qualified electronic engineers working for FSAS.

5.1 Helicopter

An Astar AS350-BA helicopter (registration C-GOVH) rented from Canadian Helicopter was used. The helicopter carried the magnetometer and the electromagnetic (with two coil configurations and five frequencies) systems. Average flying speed was 110 km/h. At this speed, and with a recording rate of 10 times per second for the magnetic and electromagnetic systems, the distance between samples along survey lines was typically 3 metres.

5.2 Digital and Analog Acquisition System

A RMS DAS-8/DGR-33A data logging system, an on-board graphical display data-acquisition system and a graphic recorder were used. This system:

- Accepted digital data from the magnetometer sensor and In-Phase and Quadrature components of all five EM coil-pairs, radar and barometric altimeter data, time and raw GPS positions
- Produced a hard-copy graphic record (analog) of both coarse and fine scales data from the magnetometer, In-Phase and Quadrature components of all five EM coil-pairs, radar altimeter, time and fiducial. One-second intervals were indicated on the analogs by means of short tics and fiducial number printed at 10-second intervals
- Produced a digital machine-readable record of raw data on an external hard disk.

The analog records were of sufficient resolution to enable visual checks to be made of system performance. The chart speed of the analog recorder was 1.2 mm/sec.

The data acquisition system was synchronised to GPS time through a one-second GPS pulse. Synchronisation was checked at the end of each day flight.

5.3 Airborne Magnetometer

The magnetometer sensor was mounted in the EM bird, which was towed 30 metres under the helicopter for a ground clearance of 30 metres.

| | |
|---------------------------|--|
| Airborne magnetometer: | Geometrics G822A Cesium Vapour split beam installed in the EM bird |
| Sensor static resolution: | better than 0.1 nT |
| In-flight sensitivity: | ± 0.001 nT |
| Resolution: | ± 0.005 nT |
| Absolute accuracy: | ± 10 nT |
| Dynamic range: | 20 000 - 100 000 nT |
| In-flight noise envelope: | < 0.01 nT |

Sampling rate: ten (10) readings per second or approximately 3 metres at average helicopter speed of 110 km/s.

5.4 Electromagnetic System

The electromagnetic system used for this survey has 5 frequencies and was mounted in a rigid kevlar Bird of 8 meters length. Its specifications were:

| | |
|-------------------|---|
| Model: | SYGHEM-5 (Bird Phoenix) |
| Manufacturer: | FSAS |
| Frequencies: | 933 Hz, vertical coaxial coils 866 Hz, horizontal copl. coils 4 310 Hz, vertical coaxial coils 4 167 Hz, horizontal copl. coils 35 088 Hz, horizontal copl. coils |
| Tx-Rx Separation: | 5.82 meters |
| Noise envelope: | 1 ppm |
| Sampling rate: | 10 per second |
| Time-constant: | 0.1 second |

Ten (10) EM channels of In-Phase and Quadrature values, along with monitors for atmospheric (sferic) and power-line noise, were sampled ten times per second.

The helicopter mean terrain clearance (averaged over any 2-km distance) was 60 metres. Under conditions of zero airspeed, the exact distance between the horizontal axis of the Bird and the location of the radar altimeter was 30 metres. In flight conditions, the tow cable made an angle of 5° to 8° with the vertical, reducing the distance to 29.9 to 29.7 metres between the horizontal axis of the Bird and the radar altimeter (bird terrain clearance of 30.1 to 30.3 metres).

5.5 Radar altimeter

A radar altimeter recorded the clearance between the ground and the helicopter, while differential GPS measured the altitude of the helicopter. The altimeter was interfaced to the data acquisition system with an output repetition rate of ten per second. The radar altimeter recording was in both digital and analog form.

Radar altimeter: Terra Tra 3000

| | |
|----------------|--|
| Range: | 20-2500 ft |
| Resolution: | 4 mV/foot |
| Accuracy: | 1% over flat terrain; 3% in the range of 0 to 300 feet |
| Sensitivity: | better than 10 feet |
| Sampling rate: | 10 per second |

5.6 Navigation and Flight Path Recovery Systems

5.6.1 Video Camera

A Panasonic TC21554/NC colour-video-camera with audio capability recorded in NTSC format the flight-path terrain beneath the helicopter. This camera, with an automatic iris and wide-angle lens, ensured perfect exposures with no operator adjustment. In level flight, the viewing angle of the camera was less than 2 degrees from the vertical.

The video camera recorded both video and data, which were stored alphanumerically in the top portion of each frame. The data included flight line number, fiducial, time and GPS generated X-Y UTM co-ordinates. Data and video were available for review immediately after each flight with no further processing.

5.6.2 GPS

In flight positioning was sampled at a rate of 1 hertz using a TRIMBLE-4000SE real-time differential GPS receiver system, in conjunction with a OMNI-Star satellite-link and a PICODAS PNAV-4001 navigation console. The system enables data to be positioned to an absolute accuracy better than 5 metres. At least, 4 satellites were monitored at all times during the survey.

5.6.3 Pilot Guidance

In conjunction with the GPS, a PICODAS PNAV 4001 navigation interface provided in-flight navigation control (X-Y guidance).

5.7 Base Station Magnetometer

Breakwater's mining camp, Nanisivik., in a magnetically clean environment, away from any sources of electromagnetic interference or excessive magnetic gradients. A digital record of the variation of the earth's magnetic field was continually recorded. The airborne and digital base station magnetometers were synchronised with an accuracy better than 1.0 second. During the survey, it was found that diurnal was sometime higher than the cut-off required by the contract specifications and fifteen flight line needed to be re flown. The base station magnetometer technical specifications were:

| | |
|----------------------------|--------------------|
| Base station magnetometer: | Scintrex SC-2 |
| Sensor static resolution: | better than 0.1 nT |
| Sensitivity: | ± 0.001 nT |
| Dynamic range: | 20,000 - 95,000 nT |
| Noise envelope: | less than 0.1 nT |
| Recording interval: | 2.0 seconds |

5.8 Field Data Plotting and Verification System

5.8.1 Hardware

The digital data were verified on a daily basis with an in-field processing system to ensure that proper digital recording has taken place and to prevent unnecessary re-flights. The field processing system consisted of one Pentium-PC with a high-resolution screen, a Zip tape drive, a CD-Writer, a Cannon BJ-4000 colour bubble-jet printer and a video player. An Internet access, including e-mail address, helped to maintain good communications with the main office and the scientific authority.

5.8.2 Software

The computer was equipped with custom and commercial software capable of providing preliminary compilation through initial contours in addition to profile plots required to confirm the validity of data collected on each flight. The software package included Geosoft, Oasis and Nortech HPM differential processing software.

6.0 OPERATIONS

Mobilisation of equipment and personnel from Ottawa to Nanisivik started on March 23rd, 2001. Base installation, pre-survey calibrations and tests were carried out from March 26th to April 4th, 2001. Survey flying commenced on April 4th and ended on May 15th, 2001.

The survey base was established at the Breakwater's Mining Camp, Nanisivik.

7.0 TESTS AND CALIBRATIONS

7.1 Altimeter Calibration

Prior to the beginning of the survey, pre-survey calibrations were performed for the radar altimeter, determined from flights at altitudes of 60, 90, 120, 150, 180, 210, 240, 270, 300, 400 and 500 metres above the airstrip at Nanisivik.

A low-pass filter of 6 seconds was applied on the radar altimeter data.

7.2 Magnetic survey

Lag tests, to determine the time difference between the magnetometer and positioning devices, were performed by flying in two directions, at the nominal survey height, over a sheet steel building that provided an anomaly sufficient to determine the system lag (+0.6 sec.) in relation to the GPS positioning data.

PICODAS/GPS synchronisation was achieved by the PICODAS acquisition software. This software uses the 1-pps transmission from the Trimble or OMNI-Star consoles that contains the GPS time. Upon reception of the GPS signal, the corresponding PICODAS system time was logged. GPS and PICODAS were recorded as data fields in the raw PICODAS file at a rate of 1 per second.

7.3 EM Survey

Calibration of the EM system was performed prior to survey commencement at the Nanisivik airstrip. The Bird was rotated 90° about its longitudinal axis to minimise coupling with the ground and placed on a stand 90 cm above ground. This rotation effectively converted the horizontal coplanar coil geometry into a vertical coplanar configuration. Calibration was done with an external Q-coil (which produces a signal of known amplitude) positioned near the Rx-coils end of the Bird. The Q-coil was accurately and rigidly positioned with respect to the Rx-coils by means of a jig

attached to the Bird.

After this calibration, there was no need to adjust the external calibration coil. However, the EM system was calibrated regularly during flight. An internal coil (bucking coil) was used about 3 to 4 times per hour during survey flights for instrumental drift corrections.

The system drift, due to thermal changes, was monitored by watching the chart recorder. Each flight, field procedures included flying to an altitude outside of the ground influence for in-flight zero levelling calibrations.

7.4 Radar Altimeter

Accuracy of the radar altimeter was regularly tested by hovering with the 30 metres tow cable fully extended down to the Bird on the ground, and comparing the radar value with the length of the tow cable.

8.0 QUALITY CONTROL

All flight records, the differentially corrected GPS and the ground station records were merged into a single GEOSOFT-OASIS database on a flight by flight basis. Profiles were examined in detail, on the analog records and mainly using OASIS scrolling and zooming capabilities. The main concerns were the speed check of GPS data, diurnal activity, altimeter data (mainly radar, Z-GPS jumps), magnetic and EM profiles.

8.1 GPS

The velocity and acceleration of the aircraft were calculated for the entire flight as a check on the flight path. Any errors were corrected. Gradient grids were also used to assess GPS quality. Plots of

the flight path were produced on a daily basis to inspect the quality of the coverage.

Before demobilisation, to be sure that data were of good quality, a final check was carried out. Control line magnetic data were gridded separately and the result compared to the survey line grid.

8.2 Magnetic survey

Quality control procedures for the magnetic survey were:

- 1) Application of a de-spiking filter. This filter only affects discrete spikes
- 2) Visual inspection of magnetic profiles and flight path plots
- 3) Application of lag
- 4) Preliminary calculation of the intersections between the traverses and control lines
- 5) Preliminary colour maps

The base station level was determined and continuously updated by averaging all the observations collected during the course of the survey. At the end of the survey, the average value of the main base station was subtracted from magnetic readings.

OASIS profiles and FSAS's software were then used to compare the degree of diurnal activity with the contract tolerance.

After having been merged in the main OASIS database, the base station magnetometer data were carefully inspected in order to remove any cultural noise and spikes. A low-pass filter was applied to remove small amplitude noise.

GEOSOFT line gridding (minimum curvature) software was used in the field. Colour maps of the total field, as well as its derivatives and shadow, were regularly produced in the field, with flight path overlay, in order to evaluate data quality.

8.3 EM Survey

For the electromagnetic data, only a visual inspection of the EM analog records and a quick interpretation of the EM anomalies were done in the field.

9.0 FINAL PROCESSING

Final compilation was completed at FSAS's head office, Montreal, under the supervision of Mr. Mouhamed Moussaoui. Other personnel assigned to this project were Ms. My Phuong Vo, Geophysicist (Magnetic data processing), Mr. Michel Duguay (EM data processing), Mr. Albert Sayegh (AutoCad/Drafting) and Ms. Sylvie Robillard (AutoCad/Drafting). All field-processing steps were exhaustively verified and updated before proceeding further.

9.1 Magnetic data

9.1.1 Data Processing

For the magnetic survey the steps to be completed at this stage were:

- Complete verification of the different field (X-Y, GPS time, radar altimeter, Z-GPS)
- Complete visual verification of the magnetic profile (de-spike, filtering of the low noise, residual calculation)
- Lag removed (0.6 sec)
- Diurnal correction
- Intersection levelling of the total field
- Production of the deliverable items (maps and archives files).

After long wavelength diurnals were removed, the final levelling of the total magnetic field was done by intersection analysis. First, all the intersection differences were calculated and examined. A statistical levelling was done on each control line by subtracting a second order curve. Secondly, any residual difference between control line/traverse-line was applied on each traverse-line to produce identical values for the intersections.

The magnetic values were then reduced to a regular X-Y grid, using GEOSOFT MONTAJ random gridding (minimum curvature) software.

The final grid was contoured using the GEOSOFT contouring routines. Hierarchies of contour intervals were defined, each with its own dropout density, pen weight, and periodic annotation.

A colour contour map of the final total field magnetic intensity gridded data set was produced. Pseudo equal area colour intervals were utilised wherein smaller increments were applied around the mean data values and increasingly larger increments were applied towards the minimum and maximum data values. This resulted in a better resolution of anomalies in the mid-range of the data. Such anomalies can become obscured when linear colour intervals are used.

9.1.2 Magnetic Interpretation and Results

More than 14 small round-shaped anomalous zones, which could possibly indicate the presence of plutonic intrusive bodies (kimberlite), have been mapped. The half-slope method was used to estimate the sources depths (Peters, L.J., 1949. *A direct Approach to Magnetic Interpretation and Its Practical Application*. Geophysics, vol. 14, no. 3, pp. 290-320). This method is widely applied and quite effective. For each anomaly, the estimated distances between the magnetic sensor and the magnetic source are presented in appendix B. The radar altimeter readings were then subtracted from these values to obtain the source depths.

Appendix C presents the magnetic profiles obtained on each anomaly. When an anomaly was clearly observed on more than one line, the profile of each line has been drawn (exemple: Jackson anomaly, which corresponds to Freightrain). The best profile was then selected to estimate the source depth (example: profile N30W for the Jackson anomaly). To help to define the point of maximum slope along the selected profiles, the first derivative were calculated.

FSAS used also more sophisticated interpretation tools to evaluate depth extensions of the magnetic

sources. 2.5-D Interpretation Software, as Magix XL, were used and results indicate that for each magnetic anomaly, the depth extensions must be higher than 30 metres.

9.2 Electromagnetic Data

The processing of the electromagnetic data has been done with **FSAS** software and needed 8 different steps:

- 1- Manually removes the spikes or strange values caused by sferic or other sources
- 2- Remove general and random noises with a triangular filter of thirteen points
- 3- Remove the low frequency and small amplitude noises with a triangular filter of sixty-one points
- 4- Restore the original amplitude of each anomaly by manually moving back the initial anomaly amplitude
- 5- Level each profile by using automatically and/or manually the null and calibration data
- 6- Plot the profiles
- 7- Calculate the apparent resistivity using an homogeneous half space model
- 8- Gridding of the apparent resistivity data

9.2.1 EM Interpretation

The EM anomalies maps represent a compilation and an interpretation (location and conductance, i.e. conductivity-thickness product) of all the EM anomalies detected. Appendix A summarises, in a tabular format, the results of this compilation.

An EM survey allows to detect three types of electric conductors. Each type is described hereafter:

9.2.1.1 TYPE 1 (Bedrock conductors)

Most of the time, the EM anomalies line up from line to line to draw the conductor axis. When a conductor is made up of EM anomalies characterised by well-defined and narrow negative In-Phase and quadrature components, this type of conductor is often related to massive sulphide and/or graphite mineralised beds. Under such circumstances, the quantitative interpretation (conductance and depth) of each anomaly is done by assuming a vertical tabular model. This choice is justified

because this model is the best one to represent narrow conductors, typical of sulphur and graphical mineralisation.

9.2.1.2 TYPE 2 (Superficial conductors)

This type of conductor is characterised by a series of wide and flared EM anomalies, more or less aligned from line to line and with low In-Phase and quadrature components. The calculated conductances are generally weak (limited to a few Siemens). This type of anomaly results from horizontal and superficial conductors, as alluvial and lake deposits, glacial cover, some lithological units and conductive overburden. In this case, the interpretation is done with a homogeneous half-space model. Since these conductors are horizontal, the maximum EM coupling is obtained with the horizontal coplanar configurations (886, 4 167 and 35 088 Hz), which give the best representation of this type of conductors.

9.2.1.3 TYPE 3 (Positive In-Phase conductors)

This third type of conductor consists in a positive In-Phase component without quadrature response. These EM anomalies are associated with highly magnetic lithologies and mineralisation with a magnetic susceptibility so high that it affects the In-Phase component. This type of anomalies cannot be considered as "true" conductors but, when they can be, a negative response on the quadrature component is obtained and the conductor is classified as type 1.

9.2.2 Calculation of the Apparent Resistivity

The apparent resistivity maps were calculated with a routine written in FORTRAN by Zbinek Dvorak. The method is presented in a paper written in 1978 by Douglas C. Fraser, which use mathematical equation developed in 1967 by F.C. Frischknecht. The model, named "**Pseudo-Layer Half-Space Model**", uses the amplitude and phase of the secondary magnetic field to yield apparent resistivity. The amplitude is defined as:

$$\text{Amplitude} = (\text{in-phase}^2 + \text{quadrature}^2)^{1/2}$$

With this model, the altitude of the EM Bird does not enter in the calculations and the apparent resistivity values are not affected by altitude errors, which is an advantage over other models.

9.2.3 EM Results

No type 1 and type 3 conductors were observed. On the other hand, some wide and flared type 2 EM anomalies have been outlined. All these anomalies are located along the hydrographic network and their calculated conductances are so low that they represent superficial conductors. One high conductive area located on the St-Joseph block corresponds to salt water.

No EM responds directly related to the magnetic anomalies were observed.

10.0 DELIVERIES

All final products required by the technical specifications of the contract were delivered in three batch on June 27th, July 4th and July 30th, 2001. M. Albert Sayegh and Ms. Sylvie Robillard prepared all CAD map layouts and digital mapping files.

10.1 Map Products

All maps were made at a scale of 1:20 000 using the North American Datum 1927 with the following parameters:

| | | |
|---|------------------|----------------|
| - | Central Meridian | 87°W |
| - | Zone: | 16 |
| - | Spheroid | Clarke 1866 |
| - | Projection | UTM |
| - | False Easting | 500 000 metres |
| - | False Northing | 0 metres |
| - | Datum | NAD 27 |

Four black & white paper-prints of the following final maps were produced:

- Total-Magnetic-Field contours
- Vertical-Magnetic-Gradient contours
- EM Anomaly map
- EM Profiles (frequency 933 Hz)
- EM Profiles (frequencies 4 310 and 4 167 Hz)
- EM Profiles (frequency 35 088 Hz)

Four paper-prints of the following final maps were produced in full colour:

- Total-Magnetic-Field contours
- Vertical-Magnetic-Gradient contours
- EM-Resistivity Contours for the frequency 4167 Hz
- EM-Resistivity Contours for the frequency 35 088 Hz

All the digital files of these map products, suitable for plotting on an HP 750 ink jet plotter were delivered. All geophysical, positional and ancillary digital data were provided in standard formats (e.g. ASCII and/Geosoft profile archives) on CD ROM. Positional data were provided in latitudes and longitudes and UTM NAD 27.

Note that for the ANO-8 block, the Total Field and Vertical Magnetic gradient maps are presented in appendix D at a scale of 1:20 000.

10.2 Digital Data Products

Four copies of a two CD-ROM containing the digital profile and Grid (Geosoft Format) archives were produced. All digital data are georeferenced to the standard UTM-system for the area.

10.3 Miscellaneous Items

The following miscellaneous items were finally produced:

- Analogue records
- Flight path videocassettes
- This technical project report in four copies

11.0 CONCLUSIONS

All airborne and ground-based records were of excellent quality. More than 14 small round-shaped anomalous zones, which could possibly indicate the presence of plutonic intrusive bodies (kimberlite), have been mapped. No EM responds directly related to the magnetic anomalies were observed. Further work is recommended on these anomalies including ground magnetic surveying for drill target definition.

It was found that even though diurnal was within specifications, diurnal subtraction was not adequate to level the data and, in fact, good intersections were required to produce a reliable final data set. Data were acquired in good diurnal conditions. Fifteen flight line needed to be reflighted due to excessive diurnal activity. The remaining diurnal levelling error, that does not affect map and calculated gradient quality, is however estimated to be in the 1-3 nT range.

GPS results proved to be of high quality and very few intersection displacements were required.

The main causes of down-time were the bad weather (50% of the working period were lost due to poor visibility, fog, blowing snow, strong wind, white out, low ceiling) and diurnal activity. On May 4th 2001, the operator reported a technical problem on the frequency 886 Hz (coplanar). Twin Mining representatives were immediately informed and Mrs. Dallas Davis and Richard Roy agreed to continue the survey in order not to delay the work progress.

It is hoped that the information presented in this report and on the accompanying maps will be useful both in planning subsequent exploration efforts and in the interpretation of related exploration data.

Respectfully Submitted,

Camille St-Hilaire, M.Sc.A.
Senior Geophysicist



**Subject: Certificate of Qualification of Camille St-Hilaire,
Geophysicist, to accompany the Report to Twin Mining Corporation
by Fugro-SIAL Airborne Surveys dated July 2001 .**

I, Camille St-Hilaire, M.Sc.A., Senior Geophysicist, do hereby certify that :

- 1) I reside at 732 rue Gohier, Ville St-Laurent, Qc, H4L-3J1
- 2) I am a geophysicist and employed by Fugro SIAL Airborne Surveys Inc. as the Interpretation Manager
- 3) I am a graduate of École Polytechnique de Montréal with a Master degree obtained on, December 9th, 1975.
- 4) I am a member of the "Ordre des Géologues du Québec", memberships no. 339.
- 5) I did not visit the Jackson Inlet Property of Twin Mining corporation but have evaluated the field data obtained by Fugro-SIAL Airborne Surveys Inc. between April 4th, 2001 and May 15th, 2001, in order to produce the technical report.
- 6) I was responsible for the above reference technical report issued to Twin Mining Corporation.
- 7) I am not aware of any material fact or material change with respect to the subject matter of the technical report, which is not reflected in the technical report, the omission to disclose which makes the technical report misleading.
- 8) I have not produced other reports for Twin Mining Corporation regarding the Torngat Property in Quebec.

DATED : November 1st, 2002 at Ville St-Laurent, Qc

A handwritten signature in black ink, appearing to read "Camille St-Hilaire", written over a horizontal line.

Camille St-Hilaire, Geophysicist, M.Sc.A.

APPENDIX A
EM ANOMALY LIST

**TWIN MINING CORPORATION
EM ANOMALY LIST
BLOCK ST-JOSEPH (fr: 4310 Hz)**

| LINE | FID | UTMX (m) | UTMY (m) | INP. (ppm) | QUAD. (ppm) | COND. (s) | DEPTH (m) | CODE |
|--------|--------|-------------|-------------|---------------|----------------|--------------|--------------|------|
| -32112 | 1844.9 | 494585.1 | 8118056.0 | -0.8 | -5.6 | 0.1 | 0 | 0 |
| -32112 | 1947.5 | 493098.2 | 8114525.0 | -1.9 | -13.7 | 0.1 | 0 | 0 |
| -30901 | 3525.3 | 453703.1 | 8130690.0 | -9.2 | -8.3 | 1.8 | 4 | 2 |
| -30901 | 3534.1 | 453532.9 | 8130985.0 | -10.6 | -7.1 | 2.5 | 18 | 2 |
| 404 | 3181.8 | 452398.0 | 8131314.5 | -3.8 | -8.4 | 0.5 | 21 | 2 |
| 404 | 3192.6 | 452150.3 | 8131154.0 | -27.2 | -12.8 | 3.8 | 7 | 2 |
| 404 | 3197.8 | 452019.7 | 8131064.5 | -29.2 | -12.0 | 7.5 | 20 | 2 |
| 404 | 3208.1 | 451724.1 | 8130879.0 | -10.2 | -17.9 | 0.8 | 6 | 2 |
| 503 | 3440.5 | 452005.2 | 8130725.0 | -20.5 | -24.7 | 1.8 | 12 | 2 |
| 503 | 3462.0 | 452563.3 | 8131076.0 | -14.6 | -15.3 | 1.8 | 15 | 2 |
| 503 | 3468.0 | 452723.7 | 8131167.5 | -4.1 | -11.2 | 0.4 | 15 | 2 |
| 604 | 3907.1 | 452338.2 | 8130741.5 | -27.9 | -13.6 | 3.8 | 13 | 2 |
| 604 | 3912.7 | 452245.7 | 8130668.5 | -19.7 | -18.3 | 1.8 | 10 | 2 |
| 703 | 4419.1 | 452701.2 | 8130610.0 | -4.0 | -7.1 | 0.6 | 21 | 2 |
| 703 | 4441.9 | 453361.6 | 8130984.0 | -21.4 | -15.4 | 2.5 | 18 | 2 |
| 804 | 4844.6 | 453579.6 | 8130861.5 | -19.6 | -11.0 | 4.4 | 25 | 2 |
| 804 | 4854.2 | 453321.7 | 8130682.0 | -14.1 | -12.6 | 1.8 | 17 | 2 |
| 903 | 5548.1 | 453747.3 | 8130613.5 | -7.9 | -13.4 | 0.6 | 0 | 2 |
| 903 | 5554.1 | 453921.7 | 8130713.0 | -12.3 | -11.9 | 1.8 | 28 | 2 |
| 903 | 5568.9 | 454359.1 | 8130969.5 | -6.5 | -8.4 | 0.9 | 18 | 2 |
| 1004 | 5953.7 | 454849.1 | 8130956.0 | -21.9 | -19.8 | 1.8 | 10 | 2 |
| 1004 | 5960.9 | 454616.9 | 8130827.0 | -29.5 | -14.5 | 3.8 | 22 | 2 |
| 1004 | 5978.1 | 454059.4 | 8130553.0 | -3.7 | -10.3 | 0.4 | 18 | 2 |
| 1113 | 480.1 | 454446.1 | 8130439.5 | -1.1 | -7.1 | 0.1 | 0 | 2 |
| 1113 | 489.7 | 454669.9 | 8130567.5 | -2.4 | -7.2 | 0.2 | 26 | 2 |
| 1113 | 506.9 | 455131.9 | 8130839.5 | -16.0 | -17.9 | 1.1 | 10 | 2 |
| 1113 | 526.1 | 455667.0 | 8131145.0 | -9.4 | -17.6 | 0.5 | 0 | 2 |
| 1204 | 1288.2 | 441491.9 | 8122685.0 | -11.3 | -13.1 | 0.9 | 0 | 2 |
| 1304 | 6578.8 | 441596.3 | 8122462.0 | -6.0 | -14.5 | 0.5 | 0 | 2 |
| 8403 | 4733.0 | 473335.9 | 8120288.0 | 0.5 | -6.2 | 0.0 | 0 | 0 |
| 8504 | 6096.7 | 473372.7 | 8120005.5 | 0.7 | -6.1 | 0.0 | 0 | 0 |
| 11203 | 6798.8 | 475806.7 | 8113627.5 | -1.2 | -5.9 | 0.1 | 0 | 0 |
| 11504 | 1595.8 | 476196.0 | 8112966.5 | -1.6 | -6.8 | 0.2 | 5 | 0 |
| 13103 | 2531.4 | 479495.7 | 8110263.5 | -1.7 | -6.0 | 0.3 | 30 | 0 |
| 13103 | 2885.2 | 491647.8 | 8117248.5 | -0.9 | -5.2 | 0.1 | 0 | 0 |
| 13204 | 3515.9 | 483427.3 | 8112229.5 | -1.6 | -10.5 | 0.1 | 10 | 0 |
| 13204 | 3661.0 | 478193.6 | 8109228.5 | -2.7 | -8.4 | 0.3 | 23 | 0 |
| 13303 | 4332.8 | 494367.1 | 8118232.5 | -3.5 | -15.3 | 0.3 | 0 | 0 |
| 13404 | 4478.2 | 494504.7 | 8118062.5 | -1.6 | -9.9 | 0.1 | 7 | 0 |
| 14303 | 2638.1 | 493065.0 | 8114621.0 | -2.0 | -10.4 | 0.1 | 8 | 0 |
| 14404 | 1564.1 | 493252.6 | 8114461.0 | -1.9 | -9.4 | 0.2 | 12 | 0 |
| 14503 | 933.8 | 480187.7 | 8106620.5 | -2.0 | -7.8 | 0.2 | 5 | 0 |
| 14614 | 700.4 | 480197.6 | 8106333.0 | -1.6 | -11.3 | 0.1 | 3 | 0 |

TWIN MINING CORPORATION
EM ANOMALY LIST
BLOCK BOWEN (fr: 4310 Hz)

| LINE | FID | UTMX (m) | UTMY (m) | INP. (ppm) | QUAD. (ppm) | COND. (s) | DEPTH (m) | CODE |
|--------|--------|-------------|-------------|---------------|----------------|--------------|--------------|------|
| -33601 | 3109.8 | 439654.6 | 8105019.5 | -3.3 | -15.0 | 0.2 | 0 | 0 |
| -33411 | 2983.6 | 427782.6 | 8108422.0 | -1.3 | -8.7 | 0.0 | 0 | 2 |
| -33411 | 3021.0 | 427532.2 | 8109882.5 | -2.9 | -13.9 | 0.2 | 0 | 2 |
| -33411 | 3030.3 | 427464.7 | 8110264.0 | -4.2 | -15.4 | 0.3 | 0 | 2 |
| -33411 | 3071.0 | 427212.0 | 8111603.0 | -11.1 | -17.8 | 0.8 | 9 | 2 |
| -33303 | 2497.4 | 433119.2 | 8100252.5 | -1.8 | -8.6 | 0.2 | 9 | 0 |
| 2324 | 1698.5 | 427601.6 | 8111764.5 | -1.6 | -22.9 | 0.1 | 0 | 2 |
| 2324 | 1709.9 | 427263.3 | 8111575.5 | -9.1 | -33.1 | 0.4 | 4 | 2 |
| 2324 | 1716.8 | 427045.6 | 8111460.5 | -93.2 | -59.1 | 6.4 | 0 | 2 |
| 2324 | 1721.9 | 426892.6 | 8111377.5 | -116.9 | -15.4 | 64.6 | 6 | 2 |
| 2423 | 1900.1 | 426849.6 | 8111021.0 | -120.2 | -54.9 | 9.6 | 0 | 2 |
| 2423 | 1904.9 | 427000.8 | 8111129.0 | -162.1 | -82.3 | 7.3 | 0 | 2 |
| 2423 | 1906.7 | 427058.0 | 8111172.5 | -148.0 | -79.6 | 7.3 | 0 | 2 |
| 2423 | 1915.0 | 427335.3 | 8111355.5 | -6.7 | -19.4 | 0.4 | 7 | 2 |
| 2423 | 1918.0 | 427440.2 | 8111409.5 | -6.2 | -27.6 | 0.3 | 5 | 2 |
| 2423 | 1924.6 | 427679.4 | 8111506.0 | -3.6 | -15.8 | 0.3 | 0 | 2 |
| 2524 | 2684.3 | 427610.0 | 8111215.0 | -2.2 | -14.7 | 0.1 | 0 | 2 |
| 2524 | 2717.0 | 426812.6 | 8110747.0 | -176.3 | -138.8 | 4.3 | 5 | 2 |
| 2623 | 2871.2 | 426876.9 | 8110497.5 | -200.0 | -120.4 | 5.6 | 3 | 2 |
| 2623 | 2891.3 | 427564.6 | 8110857.0 | -0.4 | -10.2 | 0.0 | 0 | 2 |
| 2623 | 2900.0 | 427861.1 | 8111047.5 | -0.5 | -7.2 | 0.1 | 0 | 2 |
| 2714 | 3615.4 | 427665.6 | 8110683.5 | -0.3 | -7.5 | 0.1 | 0 | 2 |
| 2714 | 3632.5 | 427191.5 | 8110407.5 | -36.4 | -51.5 | 1.8 | 9 | 2 |
| 2714 | 3635.8 | 427098.6 | 8110351.5 | -65.5 | -60.1 | 3.1 | 10 | 2 |
| 2714 | 3645.4 | 426830.6 | 8110176.5 | -82.6 | -63.1 | 4.5 | 2 | 2 |
| 2813 | 3700.7 | 426896.8 | 8109955.5 | -16.2 | -25.3 | 1.1 | 4 | 2 |
| 2813 | 3709.1 | 427182.0 | 8110073.5 | -31.5 | -47.2 | 1.0 | 6 | 2 |
| 2813 | 3712.1 | 427288.9 | 8110127.0 | -29.2 | -45.8 | 1.0 | 11 | 2 |
| 2813 | 3728.6 | 427794.4 | 8110425.0 | -0.2 | -5.2 | 0.1 | 0 | 2 |
| 2914 | 4485.0 | 427842.2 | 8110161.5 | -1.0 | -15.5 | 0.0 | 0 | 2 |
| 2914 | 4502.6 | 427382.4 | 8109913.5 | -4.0 | -14.6 | 0.3 | 0 | 2 |
| 2914 | 4514.6 | 427045.8 | 8109709.0 | -7.9 | -26.0 | 0.4 | 2 | 2 |
| 2914 | 4517.6 | 426963.2 | 8109655.0 | -8.0 | -27.0 | 0.4 | 3 | 2 |
| 2914 | 4525.4 | 426756.4 | 8109525.5 | -5.3 | -25.0 | 0.3 | 10 | 2 |
| 3013 | 4675.2 | 426917.5 | 8109331.0 | -2.8 | -12.4 | 0.3 | 11 | 2 |
| 3013 | 4692.3 | 427547.4 | 8109694.0 | -2.2 | -11.5 | 0.1 | 5 | 2 |
| 3013 | 4716.8 | 428318.6 | 8110144.0 | -2.4 | -10.0 | 0.1 | 8 | 2 |
| 3114 | 5495.0 | 428517.2 | 8109989.0 | -20.8 | -29.4 | 1.0 | 5 | 2 |
| 3114 | 5501.9 | 428301.8 | 8109861.0 | -2.7 | -9.9 | 0.3 | 14 | 2 |
| 3114 | 5541.1 | 427257.3 | 8109241.0 | -1.7 | -11.2 | 0.1 | 12 | 2 |
| 3114 | 5554.6 | 426820.6 | 8109006.0 | -1.3 | -10.6 | 0.0 | 0 | 2 |
| 3213 | 5655.5 | 427380.7 | 8109081.0 | -1.2 | -8.8 | 0.0 | 0 | 2 |
| 3224 | 2016.5 | 428810.7 | 8109577.0 | -2.6 | -8.0 | 0.3 | 7 | 2 |
| 3224 | 2047.1 | 427848.8 | 8109017.5 | -2.1 | -6.9 | 0.2 | 21 | 2 |
| 3323 | 2262.2 | 427721.1 | 8108658.0 | -4.0 | -14.0 | 0.3 | 0 | 2 |
| 3323 | 2270.6 | 428010.0 | 8108831.0 | -6.1 | -22.2 | 0.4 | 10 | 2 |
| 3424 | 3225.9 | 427928.8 | 8108501.5 | -3.3 | -11.8 | 0.3 | 6 | 2 |
| 3523 | 3472.6 | 428135.0 | 8108343.5 | -2.6 | -10.2 | 0.3 | 0 | 2 |

| | | | | | | | | |
|-------|--------|----------|-----------|------|-------|-----|----|---|
| 3624 | 4502.8 | 428476.4 | 8108213.5 | -4.1 | -14.7 | 0.3 | 0 | 2 |
| 3723 | 4783.8 | 428729.6 | 8108097.0 | -2.1 | -5.2 | 0.3 | 28 | 2 |
| 7014 | 5062.3 | 439788.8 | 8104957.0 | -4.7 | -20.5 | 0.3 | 6 | 0 |
| 7113 | 5726.2 | 440057.8 | 8104799.5 | -2.8 | -14.8 | 0.2 | 0 | 0 |
| 7313 | 1400.9 | 433073.7 | 8100194.0 | -3.1 | -21.2 | 0.1 | 0 | 0 |
| 7414 | 2739.8 | 433220.8 | 8100010.5 | -7.0 | -28.0 | 0.3 | 4 | 0 |
| 7713 | 4241.8 | 435091.8 | 8100202.0 | -1.6 | -13.9 | 0.1 | 0 | 0 |
| 8513 | 2483.0 | 456251.2 | 8110120.5 | -1.6 | -7.7 | 0.2 | 11 | 0 |
| 10414 | 1249.6 | 458817.7 | 8106139.0 | -1.6 | -10.1 | 0.1 | 4 | 0 |

**TWIN MINING CORPORATION
EM ANOMALY LIST
BLOCK ANO-9 (fr: 4310 Hz)**

| LINE | FID | UTMX (m) | UTMY (m) | INP. (ppm) | QUAD. (ppm) | COND. (s) | DEPTH (m) | CODE |
|------|--------|-------------|-------------|---------------|----------------|--------------|--------------|------|
| 502 | 2612.2 | 439559.1 | 8104755.0 | -0.8 | -5.5 | 0.1 | 0 | 0 |
| 611 | 2496.0 | 439593.4 | 8104786.5 | -0.7 | -5.6 | 0.1 | 0 | 0 |

**TWIN MINING CORPORATION
EM ANOMALY LIST
BLOCK A (fr: 4310 Hz)**

| LINE | FID | UTMX (m) | UTMY (m) | INP. (ppm) | QUAD. (ppm) | COND. (s) | DEPTH (m) | CODE |
|------|--------|-------------|-------------|---------------|----------------|--------------|--------------|------|
| 202 | 4736.1 | 454733.1 | 8145515.0 | -0.9 | -4.7 | 0.1 | 0 | 0 |
| 301 | 4264.2 | 454938.3 | 8146201.0 | -2.1 | -11.0 | 0.1 | 0 | 0 |
| 402 | 3650.8 | 455099.8 | 8151009.5 | -1.9 | -12.2 | 0.1 | 1 | 0 |
| 402 | 3773.5 | 455136.6 | 8146781.0 | -1.9 | -6.8 | 0.2 | 25 | 0 |
| 402 | 3789.5 | 455132.3 | 8146272.5 | -0.8 | -5.9 | 0.1 | 0 | 0 |
| 402 | 3805.9 | 455120.8 | 8145753.5 | -3.0 | -9.6 | 0.3 | 9 | 0 |
| 501 | 3257.7 | 455337.5 | 8146028.5 | -1.6 | -4.7 | 0.3 | 23 | 0 |
| 501 | 3273.7 | 455322.8 | 8146629.5 | -1.4 | -5.1 | 0.1 | 0 | 0 |
| 501 | 3402.0 | 455346.7 | 8150991.5 | -3.1 | -14.7 | 0.2 | 0 | 0 |
| 602 | 2639.4 | 455514.1 | 8150888.0 | -2.5 | -11.7 | 0.1 | 4 | 0 |
| 602 | 2786.5 | 455544.7 | 8146022.0 | -12.5 | -45.8 | 0.3 | 2 | 0 |
| 602 | 2799.7 | 455545.7 | 8145615.0 | -1.1 | -4.6 | 0.1 | 0 | 0 |
| 701 | 1938.6 | 455753.8 | 8145981.0 | -13.6 | -24.8 | 1.1 | 13 | 0 |
| 701 | 1943.4 | 455750.4 | 8146173.0 | -8.9 | -14.2 | 0.8 | 2 | 0 |
| 711 | 2305.0 | 455721.3 | 8146008.0 | -11.1 | -22.6 | 0.8 | 2 | 0 |
| 802 | 1291.6 | 455940.5 | 8152683.5 | -1.6 | -4.6 | 0.3 | 19 | 0 |
| 802 | 1478.7 | 455948.9 | 8146127.0 | -7.0 | -16.1 | 0.5 | 0 | 0 |
| 802 | 1482.3 | 455951.2 | 8146006.0 | -12.0 | -23.3 | 0.8 | 0 | 0 |
| 802 | 1514.3 | 455952.7 | 8144905.0 | -0.9 | -6.5 | 0.1 | 0 | 0 |
| 901 | 1008.8 | 456110.9 | 8144991.0 | -0.4 | -6.8 | 0.1 | 0 | 0 |
| 901 | 1039.9 | 456118.5 | 8146140.0 | -7.0 | -19.2 | 0.4 | 0 | 0 |
| 901 | 1064.3 | 456116.1 | 8147038.0 | -1.9 | -11.6 | 0.1 | 0 | 0 |
| 901 | 1123.9 | 456173.4 | 8149085.5 | -0.7 | -6.9 | 0.1 | 0 | 0 |
| 901 | 1225.0 | 456126.2 | 8152828.0 | -1.6 | -6.9 | 0.2 | 0 | 0 |

APPENDIX B
MAGNETIC ANOMALY LIST

MAGNETIC ANOMALIES OBSERVED

| Anomaly | Line Number | x (Nad 27) | y (Nad 27) | Approximate Diameter (metres) | Maximum Amplitude (nT) | Mag sensor to source (metres) | Source Depth (metres) |
|-----------------------------|-------------|---------------|---------------|-------------------------------------|------------------------------|--|-----------------------------|
| *Jackson-E | 3503 | 459180.94 | 8128295.00 | 120/500 | 34 | 25 | 0 |
| *Jackson-W (Freightrain) | 7801 | 459134.66 | 8128287.00 | 100/300 | 38 | 29 | 0 |
| Ano1-E | 2804 | 465652.59 | 8131993.50 | 100 | 2.0 | N/A | N/A |
| | 30011 | 465860.00 | 8131840.00 | 100 | 2.0 | | |
| Ano1-W | 30112 | 465829.00 | 8132077.00 | 150 | 1.25 | | |
| Ano2-E | 3004 | 463975.81 | 8130440.00 | 100 | 0.35 | N/A | N/A |
| Ano2-W | weak, | | | | | | |
| *Ano3-E | 3304 | 463388.34 | 8129228.50 | 140 | 19 | 47 | 16 |
| *Ano3-W | 26612 | 463453.22 | 8129167.50 | 100 | 20 | 38 | 18 |
| Ano4a-E | 2903 | 457658.97 | 8127109.00 | 150 | 1.1 | N/A | N/A |
| Ano4a-W | 20512 | 457594.59 | 8127152.00 | 240 | 0.6 | | |
| Ano4b-E | 3004 | 457007.91 | 8126407.50 | 90 | 5.5 | N/A | N/A |
| Ano4b-W | 19612 | 456951.94 | 8126415.00 | 300 | 4.0 | | |
| Ano4c | 17702 | 455550.00 | 8125030.00 | 613 | 7.0 | | |
| Ano4d | 17001 | 454143.78 | 8126117.50 | 633 | 5.0 | | |
| *Ano5-E | 2703 | 451203.25 | 8123978.00 | 600 | 12.41 | 290 | 250 |
| *Ano5-W | 13301 | 451141.69 | 8123945.95 | 300 | 12 | | |
| Ano6-E | 2804 | 442204.19 | 8118490.00 | 300 | 4.63 | N/A | N/A |
| Ano6-W | 2901 | 442126.91 | 8118679.00 | 169 | 4.00 | | |
| Ano7-E | 2804 | 439856.16 | 8117129.00 | 130 | 2 | N/A | N/A |
| Ano7-W | 301 | 439742.34 | 8117210.20 | 300 | 2 | | |
| *Ano8a | 401 | 484210.34 | 8110407.50 | 50 | 2 | 50 | 22 |
| *Ano8b | 201 | 484096.34 | 8110398.50 | 52 | 4 | 60 | 29 |
| *Ano9-E | 7214 | 439736.00 | 8104340.50 | 30 | 16 | 21 | 0 |
| *Ano9-W | *** | | | | | | |
| *Ano10-E | 7614 | 442354.25 | 8104685.50 | 60 | 5 | 29 | 0 |
| *Ano10-W | 412 | 442438.63 | 8104644.00 | 52 | 6 | 30 | 0 |

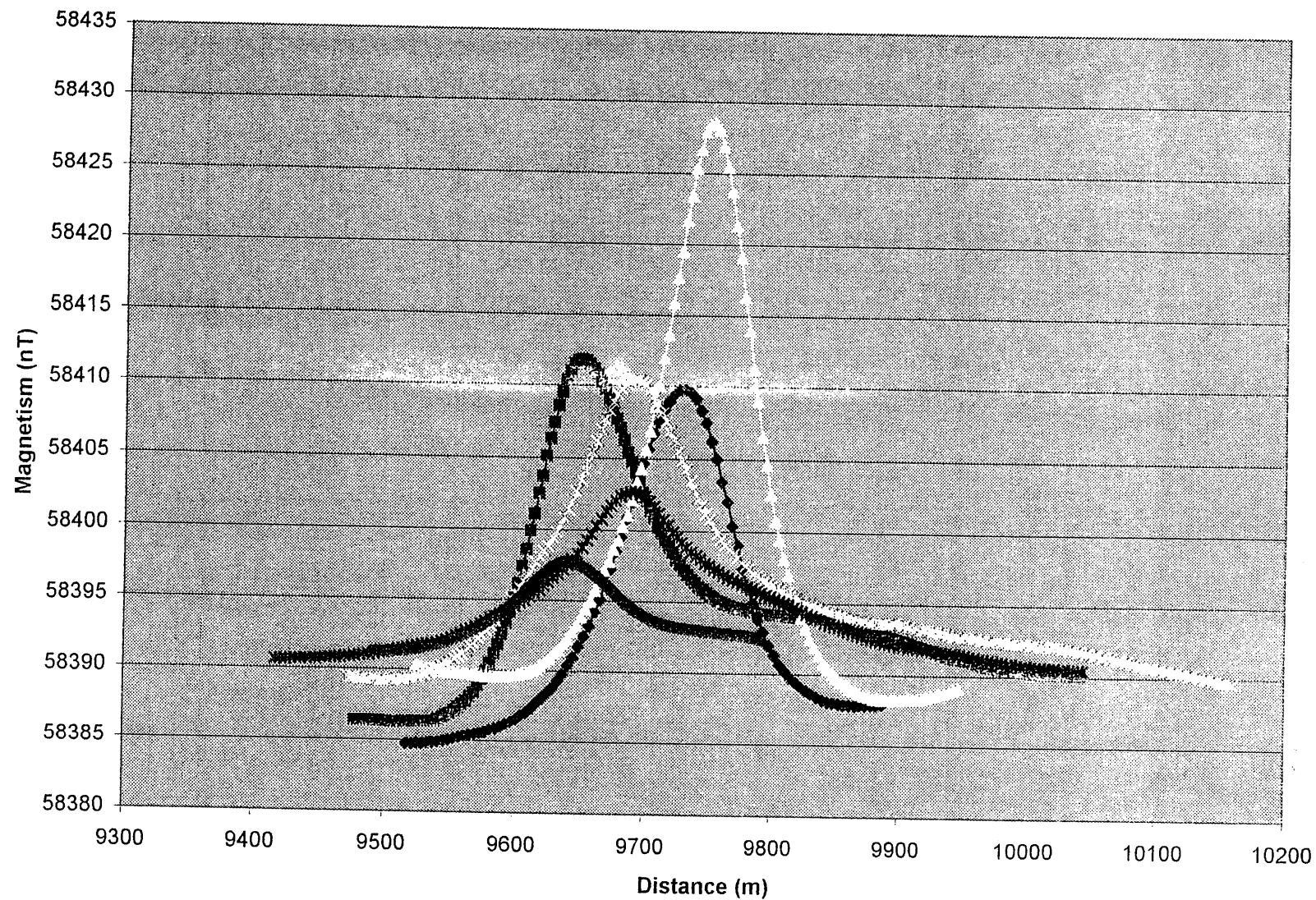
LEGEND

- *** » Flight lines are crooked and do not pass directly on the anomaly .
- * » Important anomalies
- N/A » Anomalies are so small in amplitude that it is impossible to derive their depth estimate using Peters (1949) method
- E » Means lines are flown at N60°E
- W » Means lines are flown at N30°W

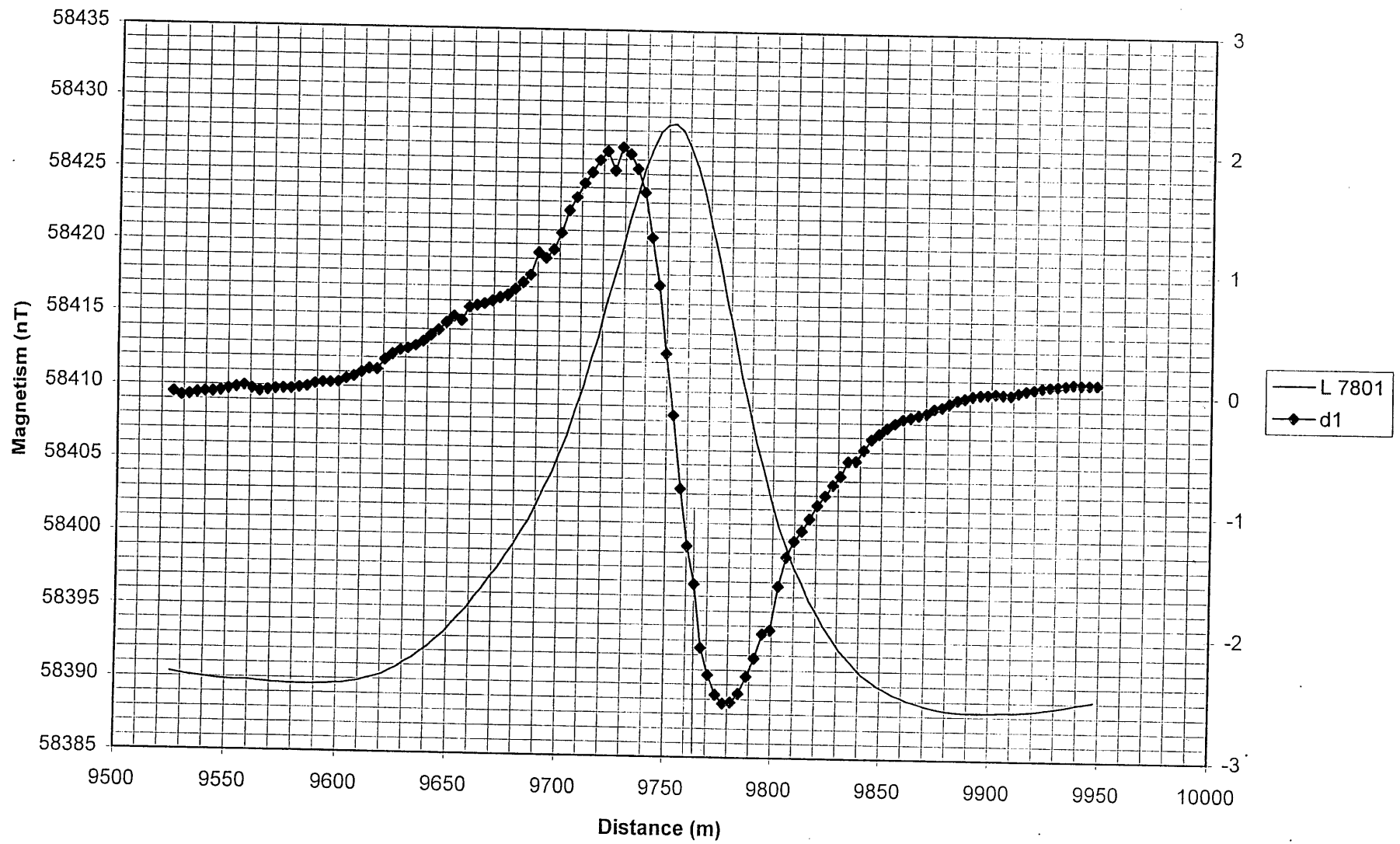
- Notes :**
- Average altitude of the magnetic sensor was 30 metres above the ground. Consider a margin error of ± 5 metres on the distance of magnetic sensor to source displayed in the table above. Depth estimation where obtained using Peters half slope method (Peters, L.J., 1949. The direct approach to magnetic interpretation and its practical application. Geophysics, vol. 14, p.290-320).
 - The whole Jackson anomaly has a diameter, which ranges from 300 – 500 m .
 - Jackson anomaly and Ano1 to Ano8 are located on the St-Joseph block.. Ano9 and Ano10 are located on the Bowen block.

APPENDIX C
MAGNETIC ANOMALY PROFILES

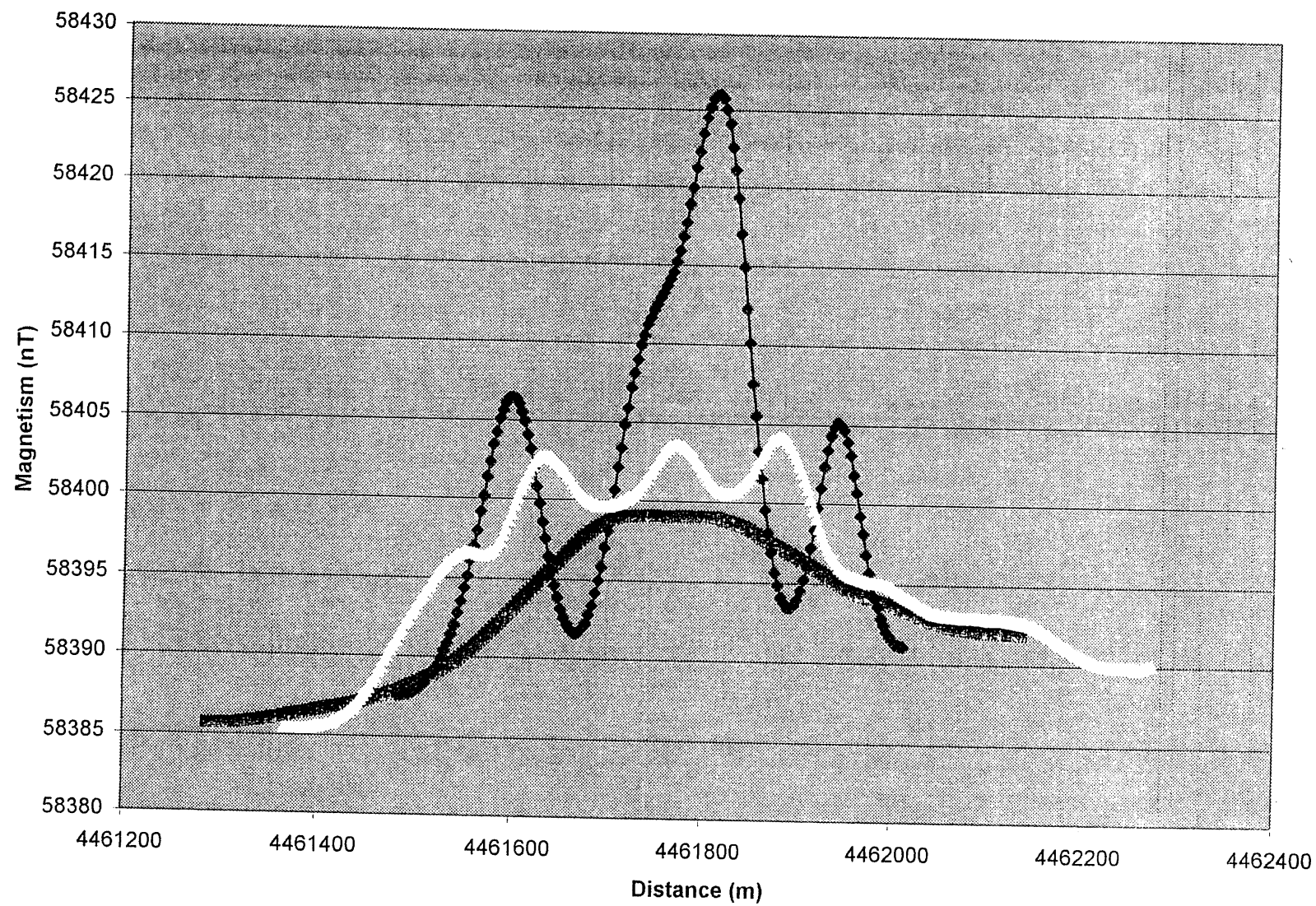
Jackson, Lines N30W



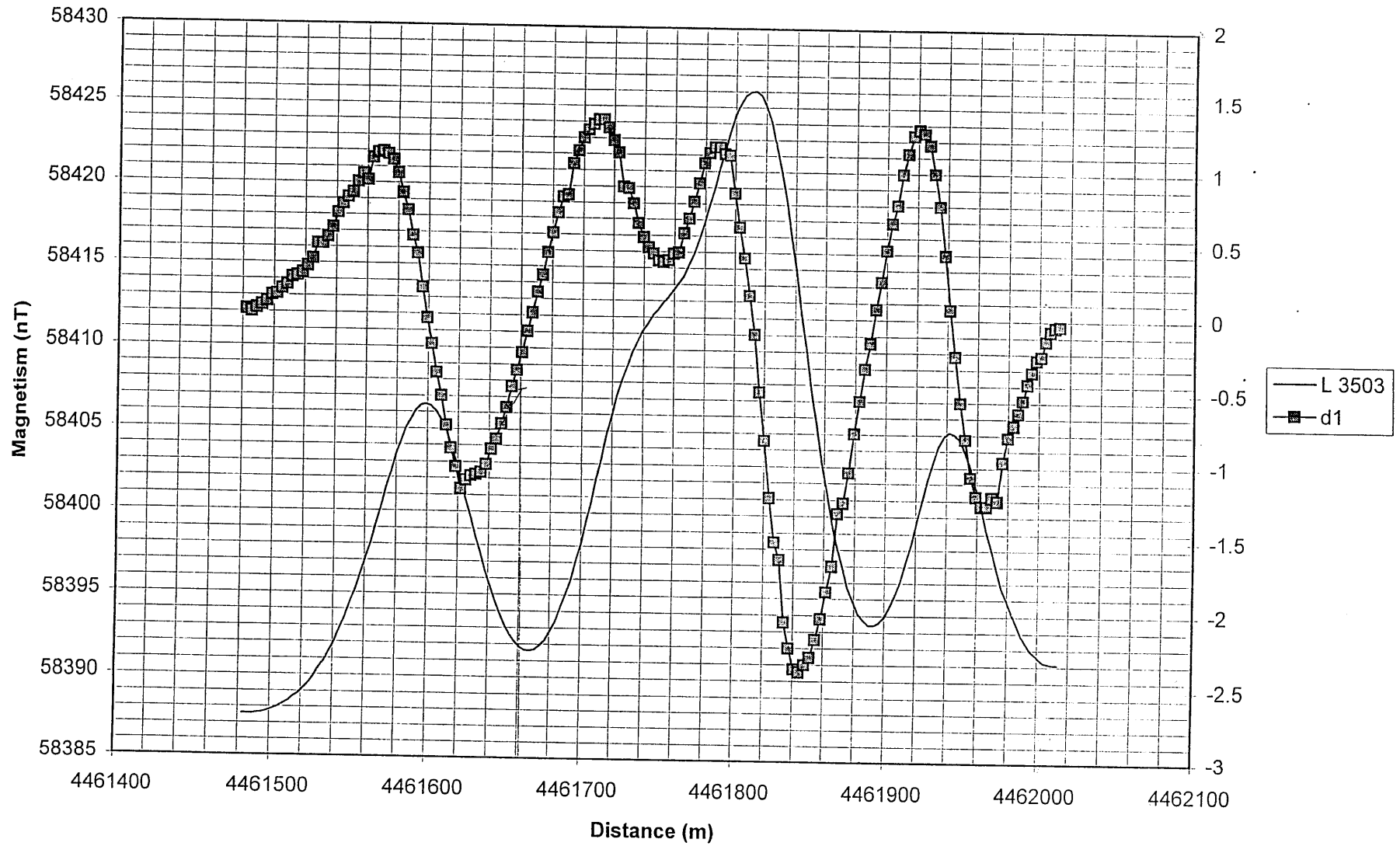
Jackson, Lines N30W



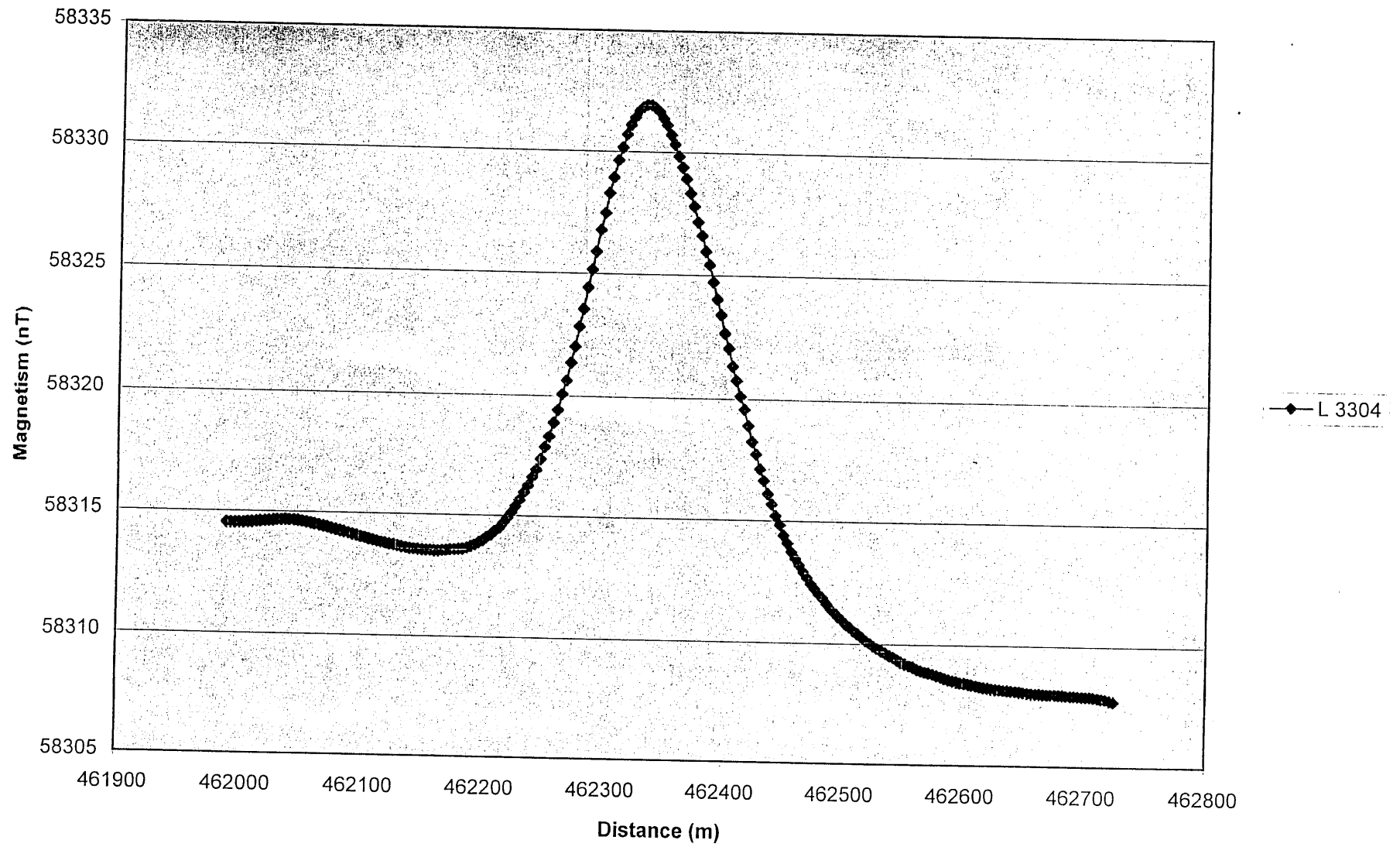
Jackson, N 60 E lines



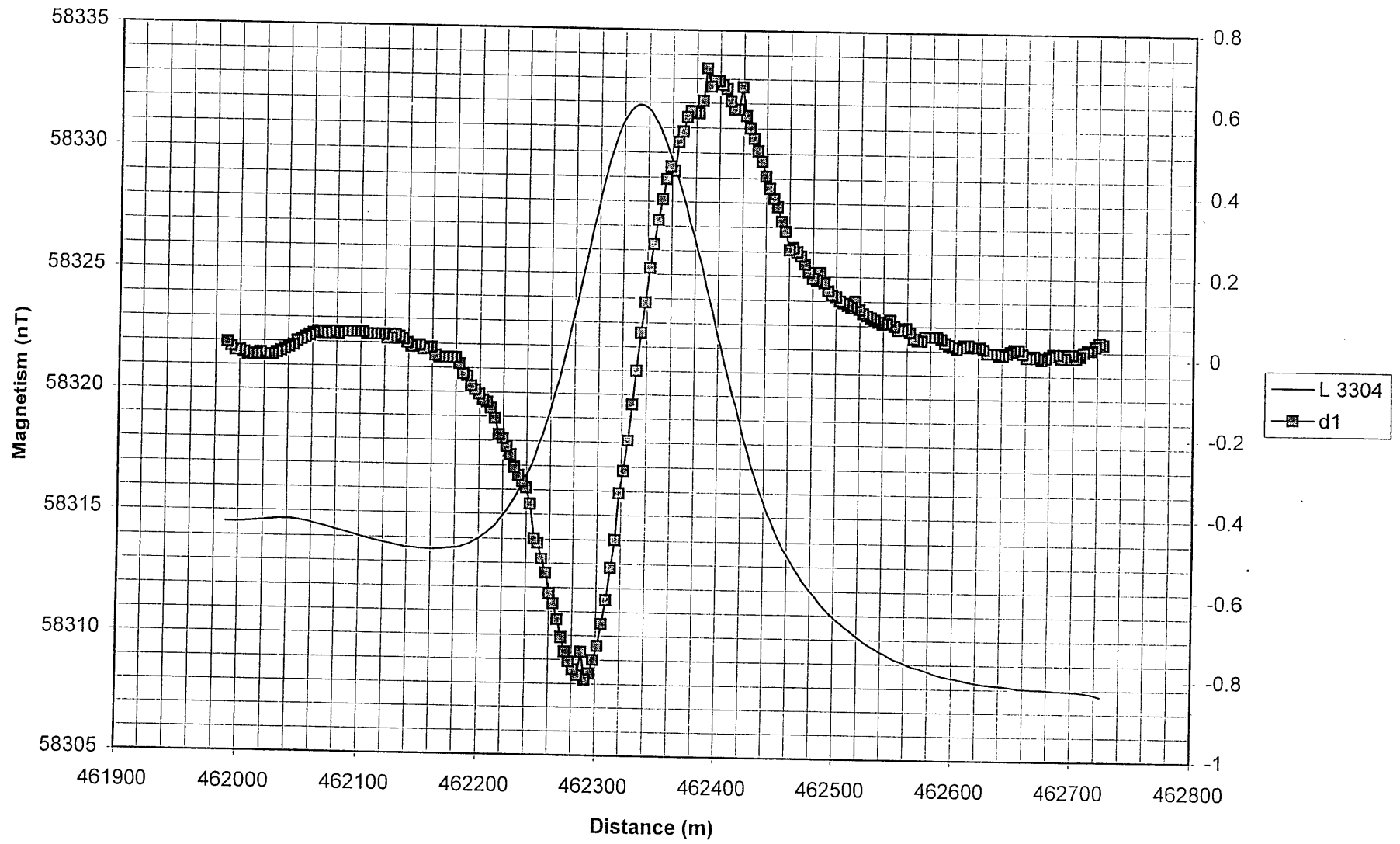
Jackson, N 60 E lines



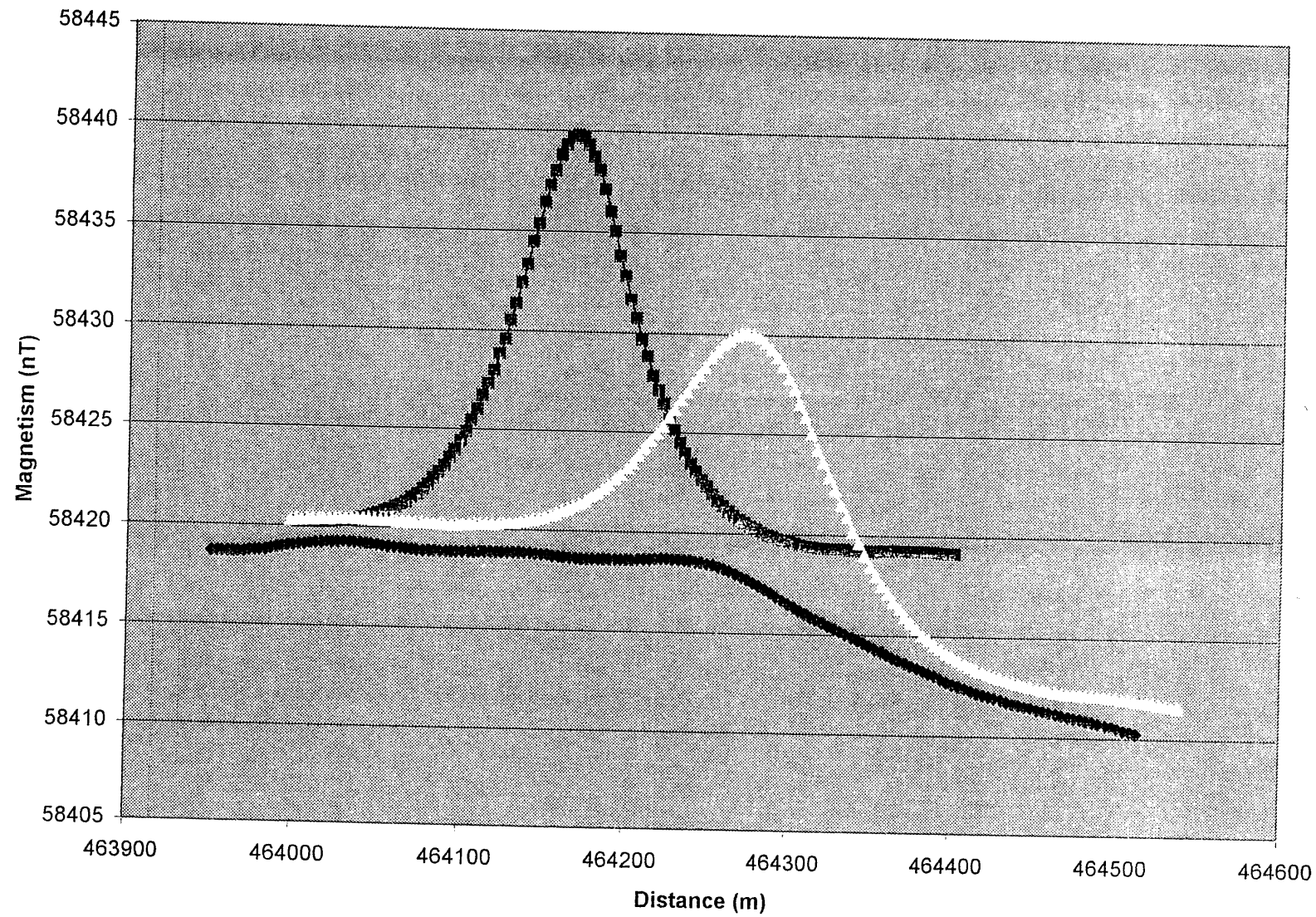
Ano 3 N60E



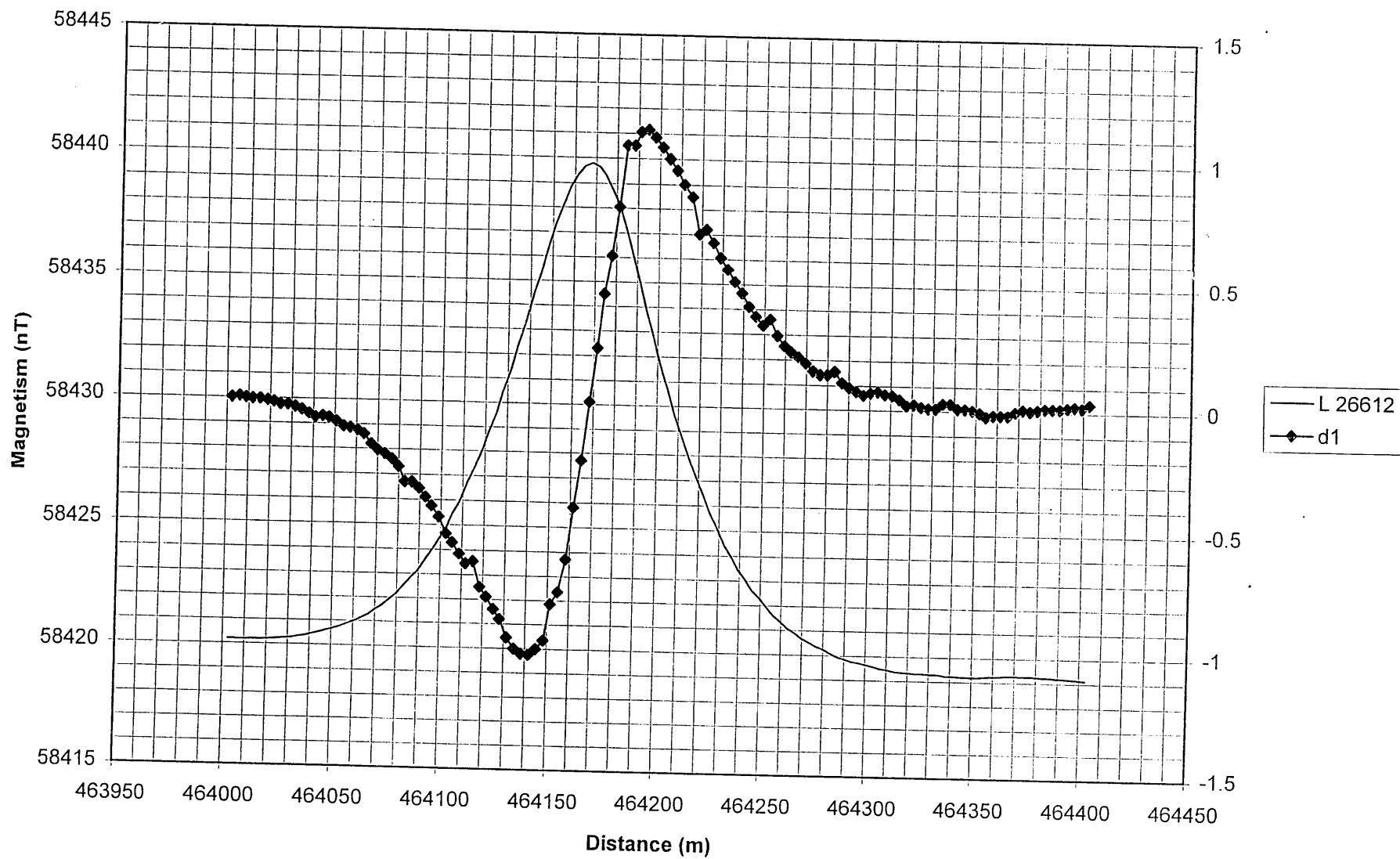
Ano 3 N60E



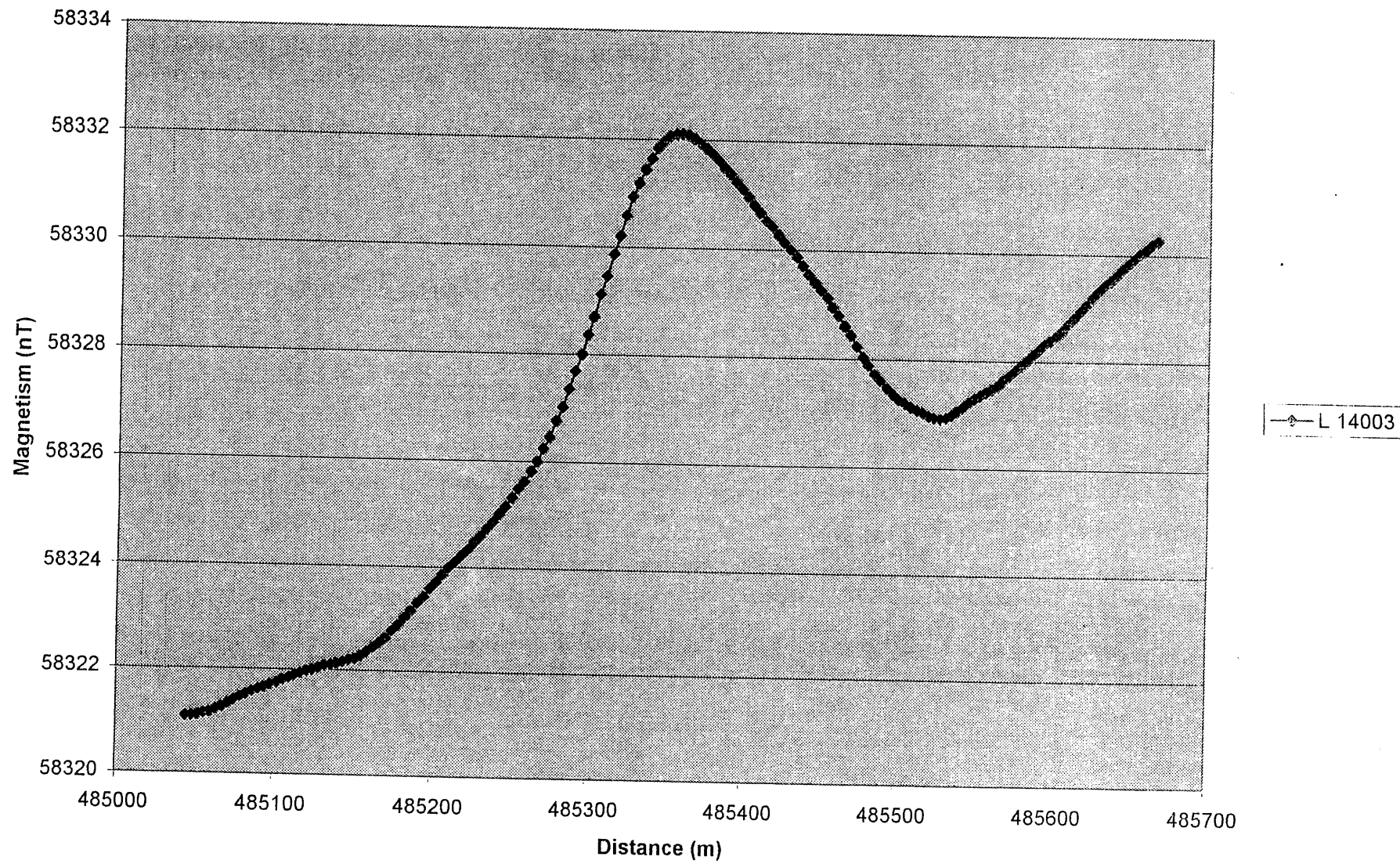
Ano3 Lines N30W



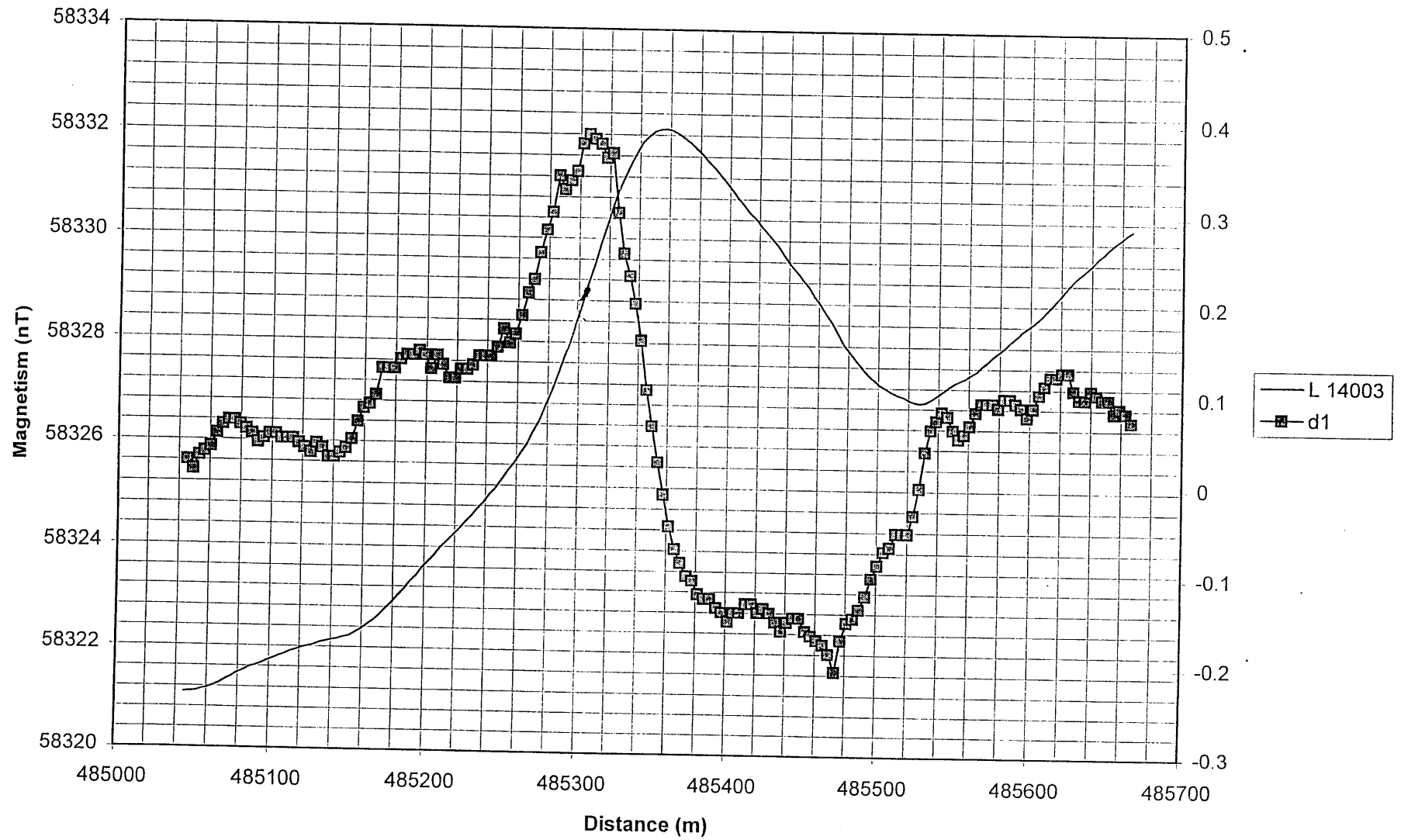
Ano3 Lines N30W



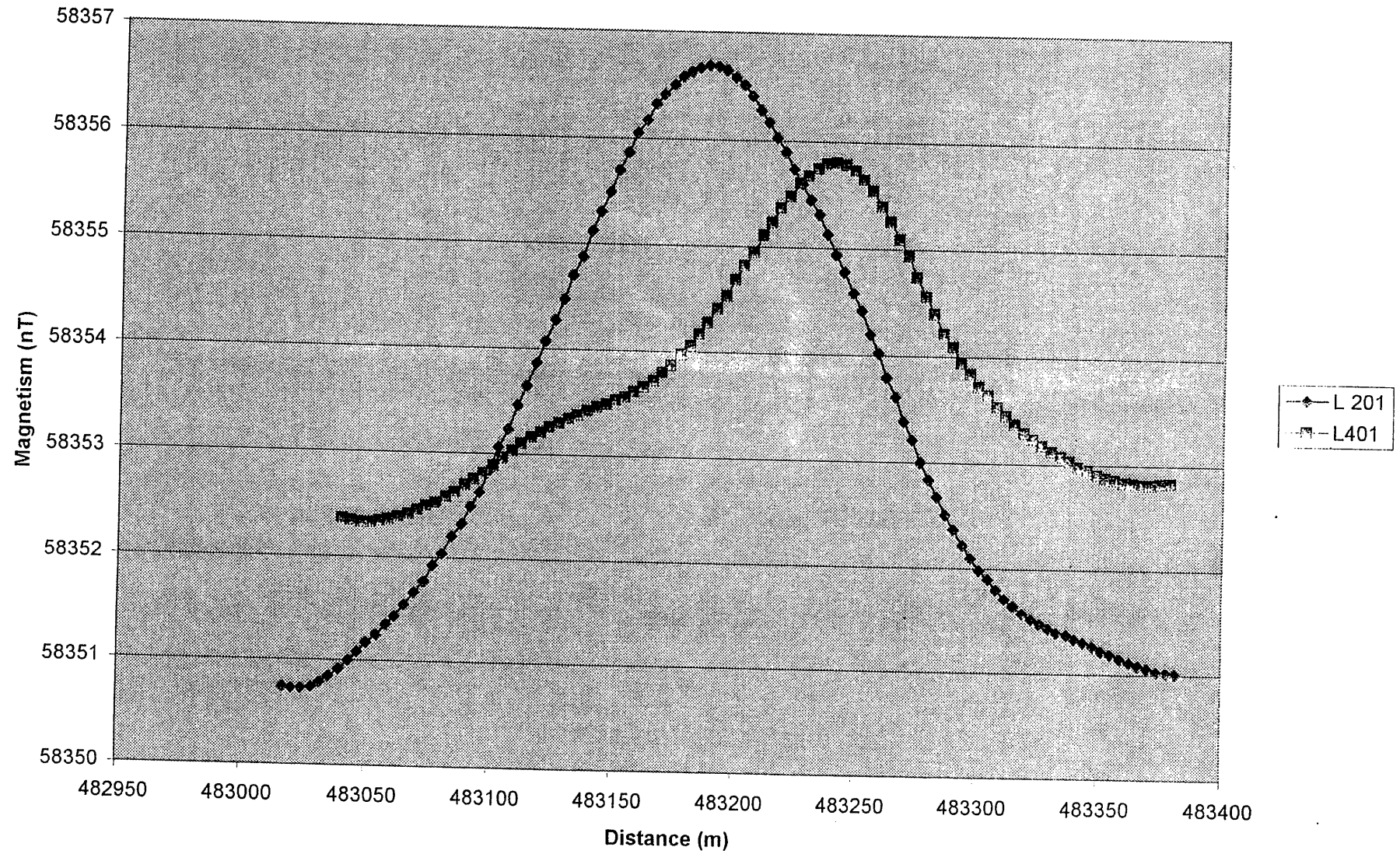
Ano8e



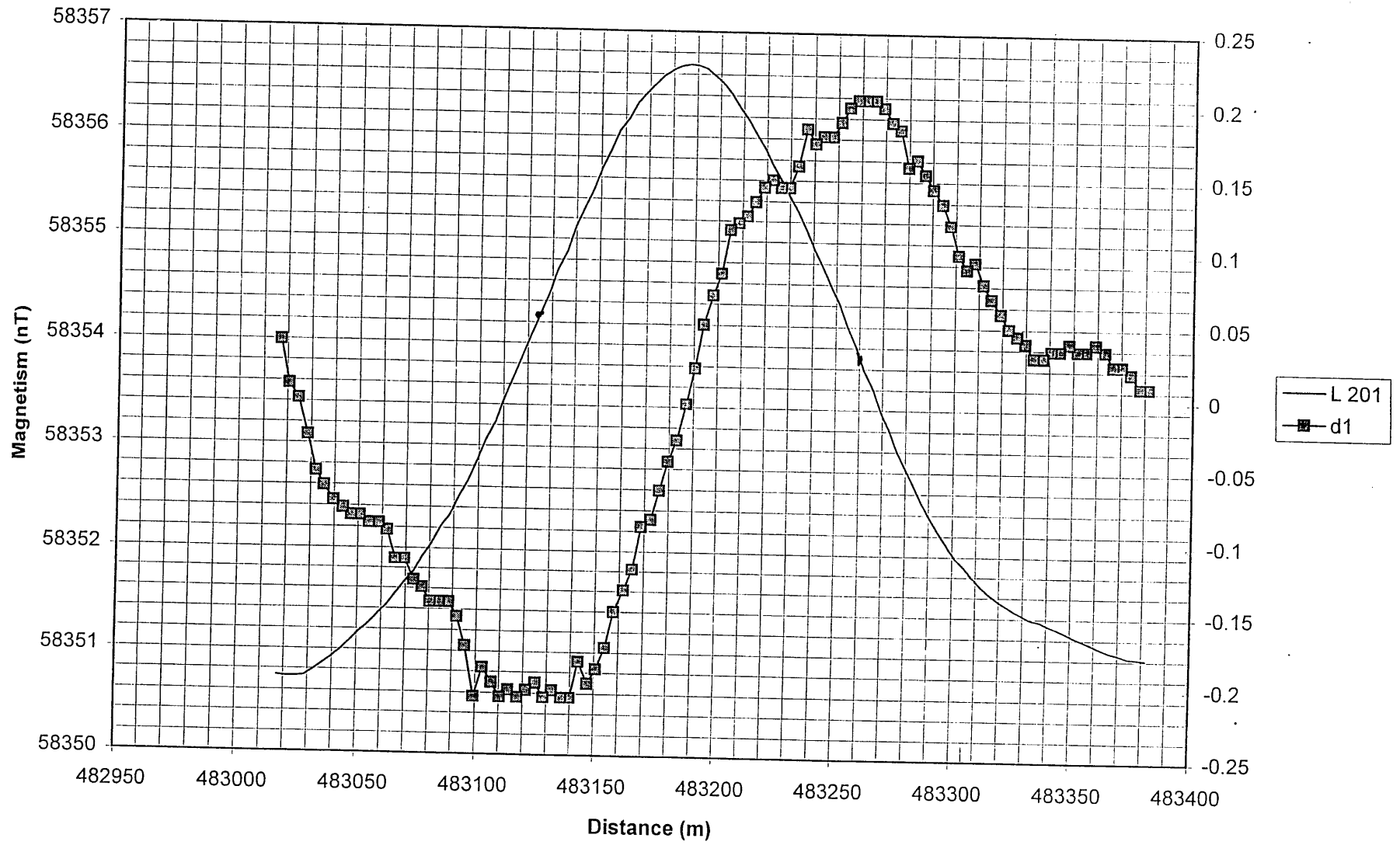
Ano8e



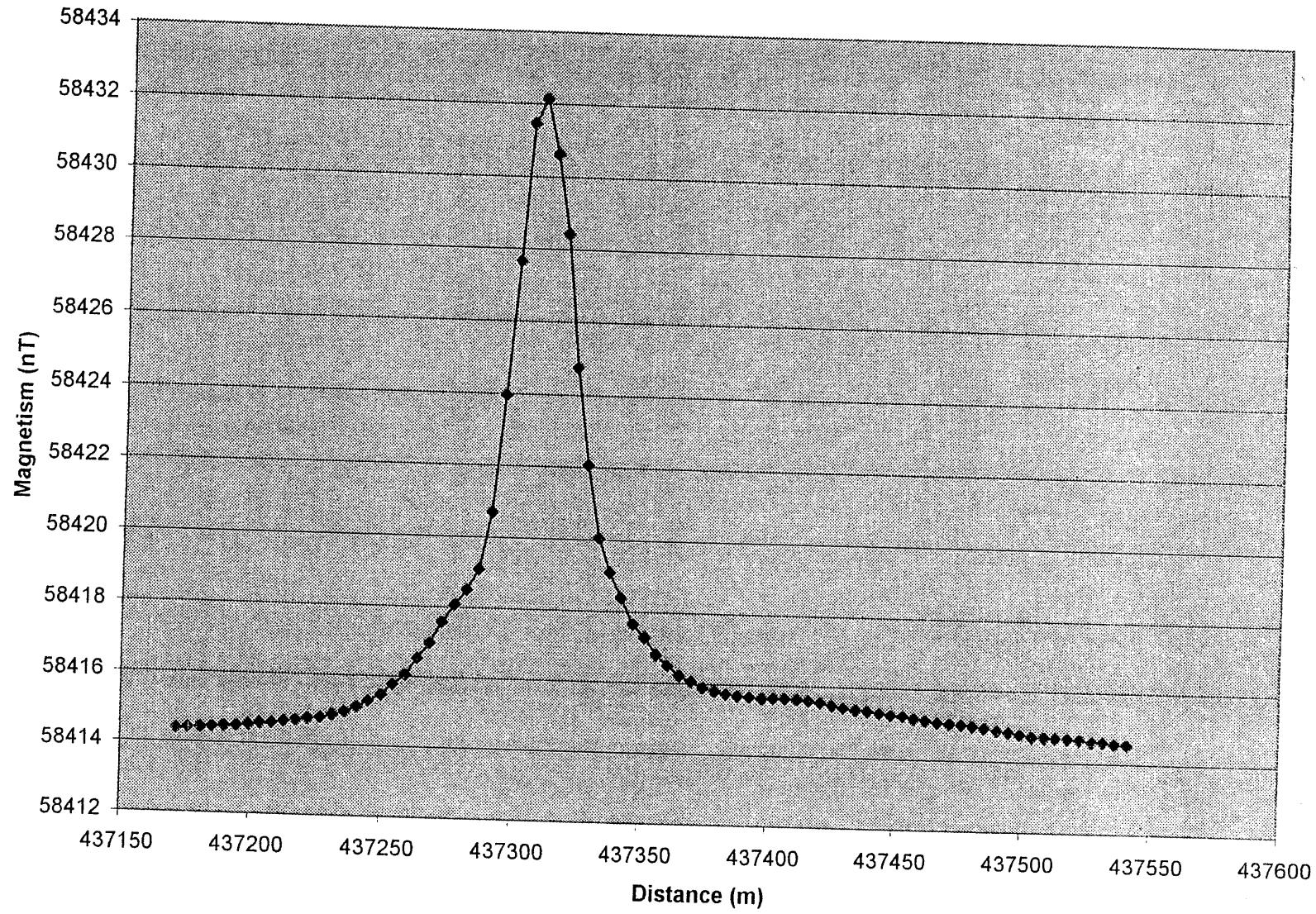
Ano8W



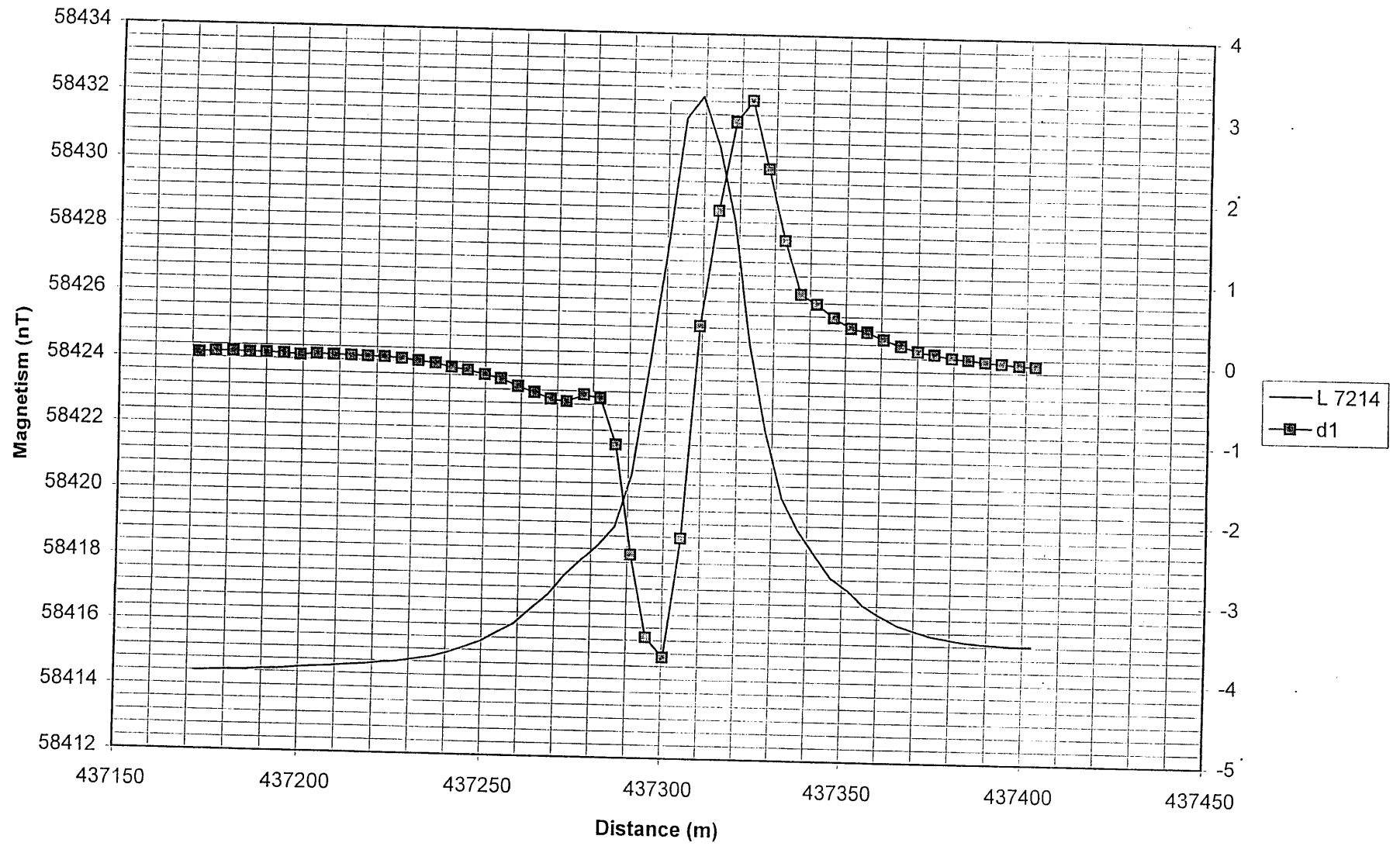
Ano8W



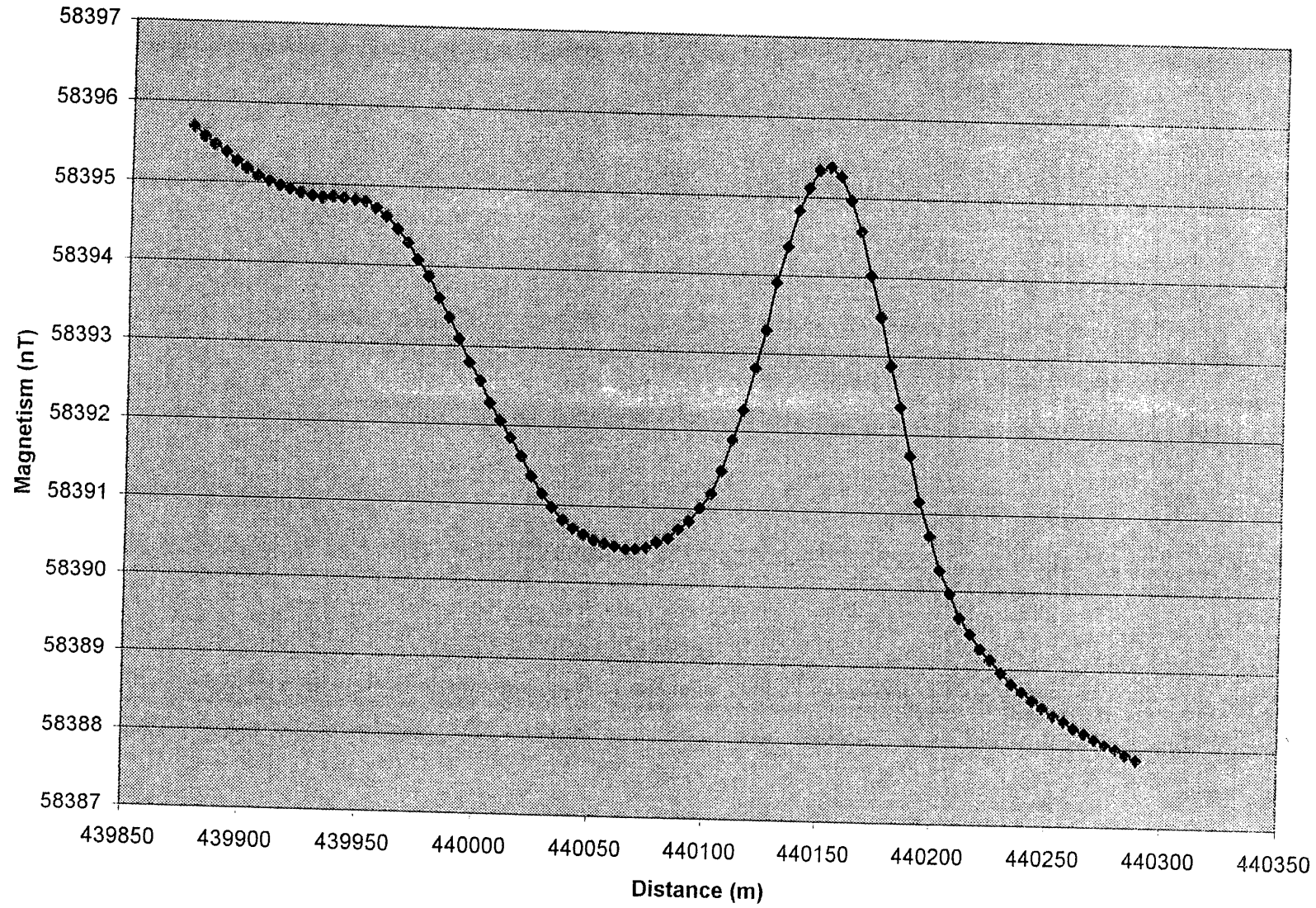
Ano9E



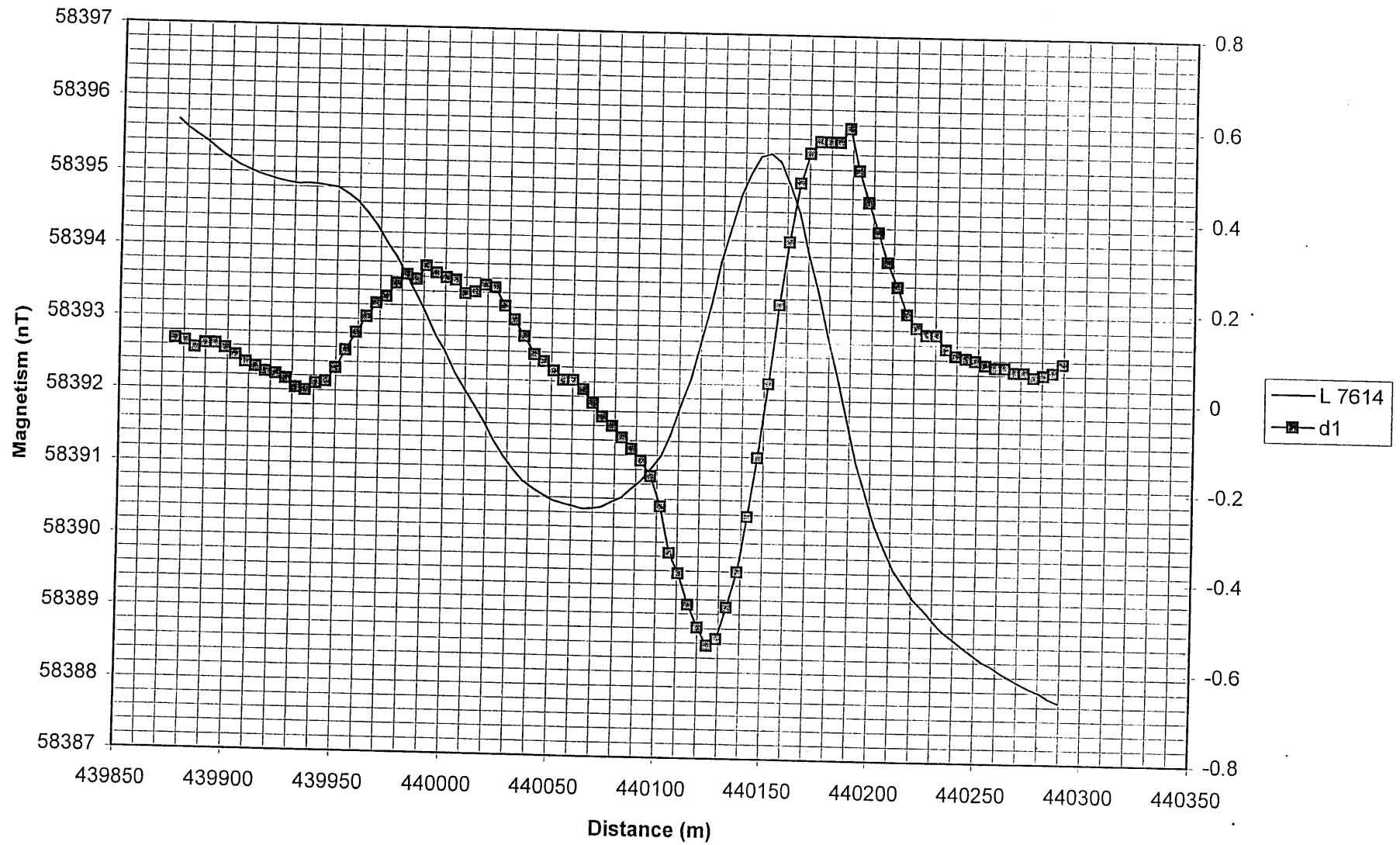
Ano9E



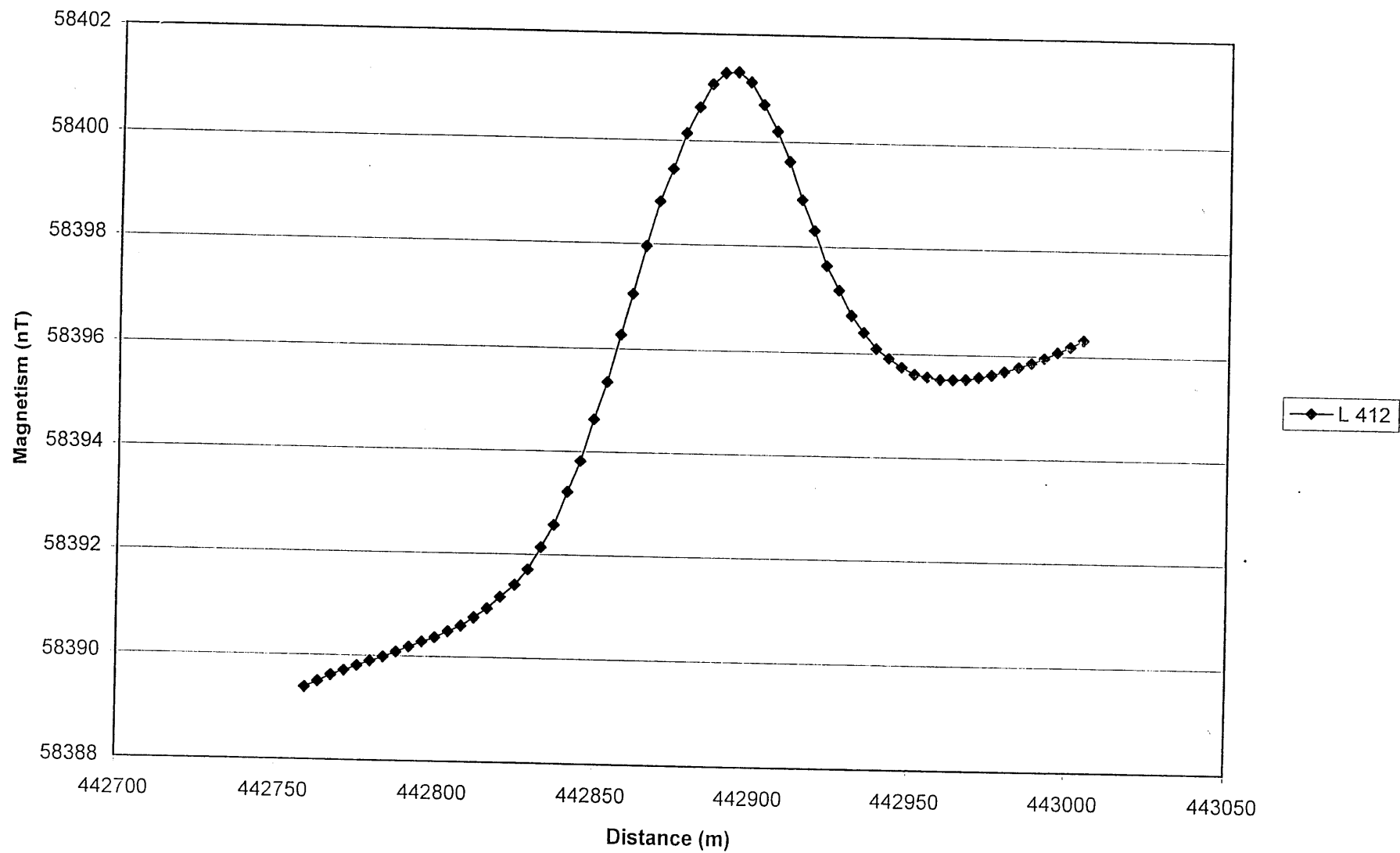
Ano10E



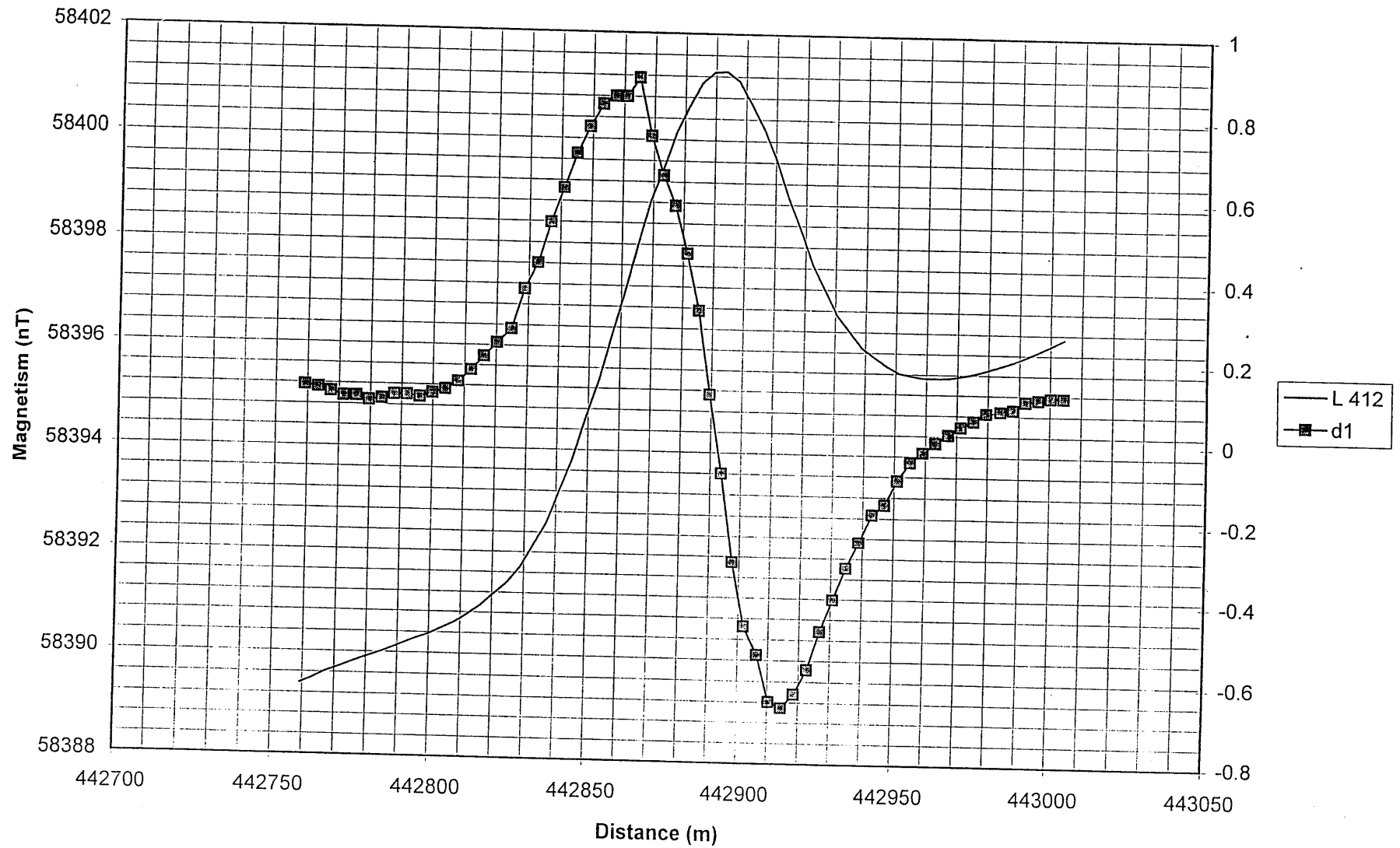
Ano10E



Ano10W



Ano10W



APPENDIX D
BLOCK ANO-8 MAGNETIC MAPS

482000E.
8113300N.

484000E.
8113000N.

486000E.
8113000N.

TOTAL MAGNETIC FIELD

Map contours are in nanoTesla.

0.2 nT : ----- 0.2 -----

1 nT : ----- 1 -----

5 nT : ----- 5 -----

10 nT : ----- 10 -----

DATA GRIDDING

CELL SIZE: 25 m

IGRF: NOT REMOVED

482000E.
8112000N.

484000E.
8112000N.

486000E.
8112000N.

58325.4
58324.8
58324.2
58323.0
58322.8
58322.6
58322.4
58322.2
58322.0
58321.8
58321.6
58321.4
58321.2
58321.0
58320.8
58320.6
58320.4
58320.2
58320.0

58319.8
58319.6
58319.4
58319.2
58319.0
58318.8
58318.6
58318.4
58318.2
58318.0
58317.8
58317.6
58317.2
58316.8
58316.6
58316.4
58316.0
58315.8
58315.2
58314.8
58314.2
58313.2

NANOTESLAS

482000E.
8108000N.

484000E.
8110000N.

486000E.
8110000N.

TOTAL MAGNETIC FIELD

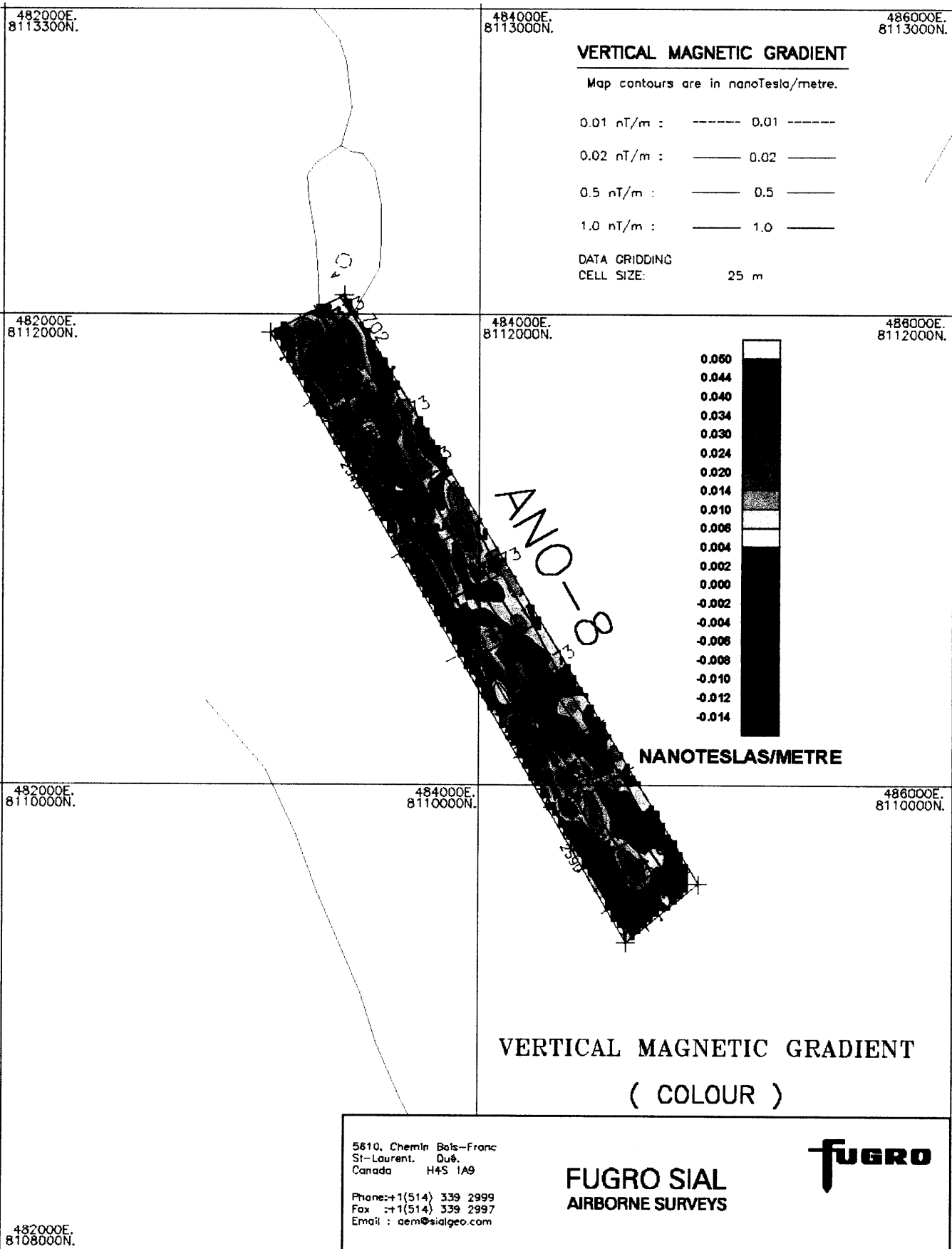
(COLOUR)

5610, Chemin Bois-Franc
St-Laurent, Dué,
Canada H4S 1A9

Phone: +1(514) 339 2999
Fax : +1(514) 339 2997
Email : aem@sialgeo.com

FUGRO SIAL
AIRBORNE SURVEYS

FUGRO





SIAL GEOSCIENCES INC.

5610, CHEMIN BOIS-FRANC ST-LAURENT
RUEBEC CANADA H4S 1A9
TEL: (514) 337-2959 FAX: (514) 339-2997

2. TWIN MINING CORPORATION
SUITE 1250, 155 UNIVERSITY AVENUE
TORONTO, ONTARIO
M5H 3B7 - CANADA

TEL : (416) 777-0013
FAX : (416) 777-0014

No. Façture:
Invoice No.: 01-06

084496

DATE: February 27, 2001

First Invoice

No. Projct:
Project No.: 01-H02-02

us contrat:

AGREEMENT OF FEBRUARY 26TH, 2001

| DESCRIPTION | Prix Unitaire Unit Price | MONTANT AMOUNT |
|--|-----------------------------|----------------------|
| <u>ELECTRO-MAGNETIC AIRBORNE SURVEY</u> <u>PENINSULA - ARTICBAY</u> | | |
| MOBILIZATION | | |
| SURVEY CHARGES : | | |
| a) (3,000 Line-Km x 103.00\$/Line-Km) | | 30,000.00 |
| b) (500 Line-Km x 78.00 \$/Line-Km) | | 92,700.00 |
| | | 11,700.00 |
| | | <hr/> |
| 7% canadian good and services Taxes (GST) | | 134,400.00 |
| | | 9,408.00 |
| | | <hr/> |
| | | \$ 143,808.00 |

02 MAY 01
4175-01
34-11
134 400
9.408 -

PS R122603399
/Q 1001060849-TQ 0001

30 jours nets - 2% d'intérêt par mois

'S R122609399

10 1001060949-TQ 0001

: 30 jours nets - 2% d'intérêt par mois.
: net 30 days - 2% charge per month.

| | |
|---------------|-----------------------|
| 30 jours nets | 2% d'intérêt par mois |
| net 30 days | 2% charge per month |

2/3/01



MAY-08-2002 WED 09:19 AM TWIN MINING CORPORATION

FAX NO. 416 777 0014

P. 04

STAL GEOSCIENCES INC.

5610, CHEMIN BOIS FRANCO, ST-LAURENT

QUÉBEC, CANADA H4S 1A9

TEL: (514) 339-2999 FAX: (514) 339-2997

À:

TO:

TWIN MINING CORPORATION
SUITE 1250, 155 UNIVERSITY AVENUE
TORONTO, ONTARIO
M5H 3B7 - CANADA

TEL : (416) 777-0013

FAX : (416) 777-0014

No. Facture:

Invoice No.: 01-029

DATE: June 30, 2001

084496

Final Invoice

No. Projet:

Project No.: 01-H02-02

No. de contrat:

Contract No.:

AGREEMENT OF FEBRUARY 26TH, 2001

1266

DESCRIPTION

Prix Unitaire
Unit PriceMONTANT
AMOUNT

ELECTRO-MAGNETIC AIRBORNE SURVEY
PENINSULA - ARCTICBAY

MOBILIZATION and DEMOBILIZATION

40,000.00

SURVEY CHARGES :

a) (3 000

Line-Km x 103.00\$/Line-Km)

309,000.00

b) (3 041

Line-Km x 78.00\$/Line-Km)

283,998.00

632,998.00

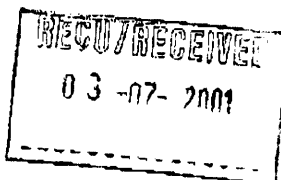
Less : Progress billing No. 01-06, 01-019
& 01-021

(563,398.00)

7% canadian good and services Taxes (GST)

69,600.00

4,872.00



TOTAL:

\$ 74,472.00

No. TPS: R122609399

No. TVQ: 1001050849-TQ 0001

ERMES: 30 jours nets - 2% d'intérêt par mois.
ERMES: net 30 days - 2% charge per month.

**SIAL GEOSCIENCES INC.**

6610, CHEVIN BOIS-FRANC, ST-LAURENT
QUÉBEC, CANADA H4S 1A9
TEL: (514) 339-2999 FAX: (514) 339-2997

084496

TWIN MINING CORPORATION
SUITE 1250, 155 UNIVERSITY AVENUE
TORONTO, ONTARIO
M5H 3B7 - CANADA

TEL : (416) 777-0013
FAX : (416) 777-0014

No. Facture: 01-019
Invoice No.:

DATE: May 09, 2001

Second Invoice

No. Projet: 01-H02-02
Project No.:

No. de contrat:

Contract No.: AGREEMENT OF FEBRUARY 26TH, 2001

| DESCRIPTION | Prix Unitaire Unit Price | MONTANT AMOUNT |
|--|-----------------------------|-------------------|
| ELECTRO-MAGNETIC AIRBORNE SURVEY PENINSULA - ARTICBAY | | |
| MOBILIZATION SURVEY CHARGES : | | |
| a) (3,000 Line-Km x 103.00\$/Line-Km)x30% | | 92,700.00 |
| b) (500 Line-Km x 78.00\$/Line-Km)x30% | | 11,700.00 |
| c) (3000 Extra Line-Km x 78.00\$/Line-Km)x60% | | 140,400.00 |
| CANADIAN G.S.T. | | 244,800.00 |
| 7% canadian good and services Taxes (GST) | | 17,136.00 |
| 12 MAY/01 4775-01 352-18 244,500 - 17,136 - | | |
| No. TPS. R122609399 No. TVQ. 1001050849-TO 0001 | TOTAL: | 321,336.00 |

TERMES: 30 jours nets - 2% d'intérêt par mois.
TOUTES LES MONTAGNES SONT EN DOLLARS CANADIENS

[Handwritten signature]
12 MAY 2001


SIAL GEOSCIENCES INC.

 5610, CHEMIN BOIS-FRANC, ST-LAURENT
 QUÉBEC, CANADA H4S 1A9
 TEL: (514) 339-2999 FAX: (514) 339-2997

084496

 A: **TWIN MINING CORPORATION**
 TO: **SUITE 1250, 155 UNIVERSITY AVENUE**
TORONTO, ONTARIO
M5H 3B7 - CANADA

 No. Facture: **01-021**
 Invoice No.:

 DATE: **May 31, 2001**

 TEL: (416) 777-0013
 FAX: (416) 777-0014

Third Invoice

 No. Projet: **01-H02-02**
 Project No.:

 No. de contrat:
 Contract No.:

AGREEMENT OF FEBRUARY 26TH, 2001

| DESCRIPTION | Prix Unitaire Unit Price | MONTANT AMOUNT |
|---|-----------------------------|----------------------|
| <u>ELECTRO-MAGNETIC AIRBORNE SURVEY</u> <u>PENINSULA - ARCTICBAY</u> | | |
| MOBILIZATION and DEMOBILIZATION | | 40,000.00 |
| SURVEY CHARGES : | | |
| a) (3,000 Line-Km x 103.00\$/Line-Km) | | 309,000.00 |
| b) (3641 Line-Km x 78.00\$/Line-Km) | | 283,998.00 |
| | | 632,998.00 |
| Less: 20% for the end of field survey and on delivery of preliminary maps. | | (69,600.00) |
| | | (118,599.60) |
| Less: Progress billing No. 01-06&01-019 | | (379,200.00) |
| | | 184,198.00 |
| 7% canadian good and services Taxes (GST) | | 12,893.86 |
| TOTAL: | | \$ 197,091.86 |

 254,400
 244,500

 05.10.01
 4735-01
 336-21
 184148
 12 893 86

 No. TPS. R122009300
 No. TVQ. 1001050848-TQ 0001

 ERMES: 30 jours nets - 2% d'intérêt par mois.
 ERMES: net 30 days - 2% interest per month.

NORDQUEST

110 CURÉ ROY
VAL D'OR, QUÉBEC
J9P 3B5
TEL/FAX: (819) 874-4446
Email: nordquest@cablevision.qc.ca

084496

FACTURE/INVOICE

Date: March 31st 2001

Invoice No.: 301

To: Twin Mining Corp.

SERVICES:

| RECIPIENT | DATE | PROJECT | DESCRIPTION | AMOUNT |
|-------------|--------|---------------|---|------------|
| Twin Mining | Jan-01 | Jackson Inlet | 2001 Preparation and PDAC 24 days at \$350 | \$8,400.00 |
| | | Jackson Inlet | On Site Supervision Nanisivik 8 days at \$400 | \$3,200.00 |
| | | Jackson Inlet | Vehicle - 934 km at \$0.35 per km | \$326.90 |

TOTAL \$11,926.90**Expenses**

| RECIPIENT | DATE | PROJECT | DESCRIPTION | TPS | TVQ | AMOUNT |
|---------------------|------------|---------|---|-----------|----------|------------|
| 4745 Phone Charges | 01/01/2001 | Jackson | Phone charges for Feb and Mar 2001 | 6.37 \$ | 7.31 \$ | \$104.71 |
| 4785 Claire Belzil | 02/28/2001 | Jackson | Slides prep Invoice 208 | 3.50 \$ | 0.00 \$ | \$53.50 |
| 4130 Claire Belzil | 02/02/2001 | Tornat | Update of maps - Invoice 207 | 3.50 \$ | 4.01 \$ | \$57.51 |
| 4450 Claire Belzil | 03/30/2001 | Tornat | Update maps and slide prep. Invoice 213 | 29.11 \$ | 33.37 \$ | \$478.34 |
| 4740 Claire Belzil | 03/29/2001 | Jackson | Slides prep. Invoice 214 | 6.13 \$ | 0.00 \$ | \$93.65 |
| 4740 FEDEX | 03/02/2001 | Tornat | Report Shipping Invoice 5-729-39700 | 3.86 \$ | 2.96 \$ | \$81.79 |
| 4740 Hotel | 03/31/2001 | Jackson | Marriot (Ott.) and Sheraton (Tor) | 103.39 \$ | 0.00 \$ | \$1,100.49 |
| 4720 Meals | 03/31/2001 | Jackson | PDAC and Nanisivik Trip (8 receipts) | 5.64 \$ | 0.00 \$ | \$77.10 |
| 4720 Transportation | 03/31/2001 | Jackson | PDAC Taxi, bus, and airport parking (6 items) | 3.28 \$ | 0.00 \$ | \$100.00 |
| Total Taxes | | | | 164.78 \$ | 47.63 \$ | |

SIAATHCONA

SUBTOTAL: \$2,147.1610% on pretax expenses of: 1,934.73 \$ **\$193.47****TAXABLE TOTAL: \$12,120.37**

FEDERAL TAX (7%): \$848.43

PROVINCIAL TAX (7.5%): \$90.90

Expenses: \$2,147.16

AMOUNT DUE: \$15,115.96

Please make cheque payable to NordQuest or 9098-3131 Quebec Inc.
Thank You.

3526⁹⁰ For Airborne Survey

084496

Ikiaryuk Services Ltd.
P.O. Box 25
Arctic Bay, Nunavut XGA 0A0

Tel (867) 439-8750 Fax (867) 439-8052



8th Ave. N. Unit 25
Arctic Bay, Nunavut
XGA 0A0

| | | | | | |
|--------------------|-------------------------------------|-------------------|-------------|------------|---------|
| CUSTOMER OBJECTING | | TELEPHONE | | DATE | |
| NAME | | TWIN MINING CORP. | | MAR. 31/01 | |
| ADDRESS | | TORONTO, ONTARIO | | | |
| CASH | CHARGE | CHEQUE | CREDIT CARD | C.O.D. | ON ACCT |
| | <input checked="" type="checkbox"/> | | | | |
| 19 | days | | | | |
| | TRUCK | | | | |
| | @ \$75.00 | | | | |
| MAR. 13 → 31/01 | | RENTAL 2001 | | | |
| SUBTOTAL | | 1425 | | | |
| GST | | 99.75 | | | |
| PST | | 5 | | | |
| TOTAL | | 1524.75 | | | |

0145

Product No.

THANK YOU

ANISIVIK MINE

A division of CanZinco Ltd.

c/o CanZinco Ltd.
P.O. Box 56, Bathurst, NB
Canada E2A 3Z1

Tel: (506) 546-1999 ext. 2201

Fax: (506) 548-1100

E-Mail: canzinco@ibm.net

Sold To: TWIN MINING
1250-155 UNIVERSITY AVENUE
TORONTO, ON M5H 3B7

Invoice Number

2585

Date

15 APRIL 2001

| Terms: Net 30 Days | Our Reference No. | SEE BELOW | Your Order No. |
|--|-------------------|-----------|----------------|
| Description | Quantity | Rate | |
| MONTH OF MARCH | | | |
| 144074 | | | |
| JET FUEL AS PER ATTACHED | 8076 L. | 1.14 | 9206.64 |
| GASOLINE | 266 L | 1.01 | 268.66 |
| <p>25 APR 01 4730.01 341-10 9475.30 663.27</p> | | | |
| SUB-TOTAL | | | 9475.30 |
| A40-230 | | | |
| 7% GST - R125548453 | | | 663.27 |
| TOTAL INVOICE | | | 10138.57 |

REC'D/RECEIVED
24-04-2001

ANISIVIK MINE

A Division of CanZinco Ltd.

c/o CanZinco Ltd.
P.O. Box 56, Bathurst, NB
Canada E2A 3Z1

084496

Tel: (506) 548-1999 ext. 2201
Fax: (506) 548-1100
E-Mail: canzinco@ibm.net

Sold To: TWIN MINING
1250-155 UNIVERSITY AVENUE
TORONTO, ON M5H 3B7

Invoice Number

2560

Date

12 APRIL 2001

| Terms: Net 30 Days | | Our Reference No. 2-85-0001-0085-6 | | Your Order No. | |
|--|--|------------------------------------|--------|----------------|--|
| Description | | Quantity | Rate | | |
| MONTH OF MARCH ACCOMMODATION/MEAL CHARGES | | | | | |
| D. PIKE | | 17 DAYS | 181.00 | 3077.00 | |
| H. ZURLOFF | | 17 DAYS | 181.00 | 3077.00 | |
| C. ROQUEBURNE | | 19 DAYS | 181.00 | 3439.00 | |
| S. SAVARO | | 19 DAYS | 181.00 | 3439.00 | |
| R. ROY | | 7 DAYS | 181.00 | 1267.00 | |
| GST INCLUDED - R125548453 | | | | | |
| TOTAL INVOICE | | | | | |

25 APR 01
4720 CI
314-9
13 363.55
135.45

13,363.55

GST 935.45

14299.00

12670 for Pickborne
Survey.