Logistics Report on a UTEM 3 Survey
Frederick House Lake Grid
Timmins, Ontario
for
Dave Meunier

2 21039

LAMONTAGNE GEOPHYSICS LTD
GEOPHYSIQUE LTEE

April, 2000

Rob Langridge, M.Sc.

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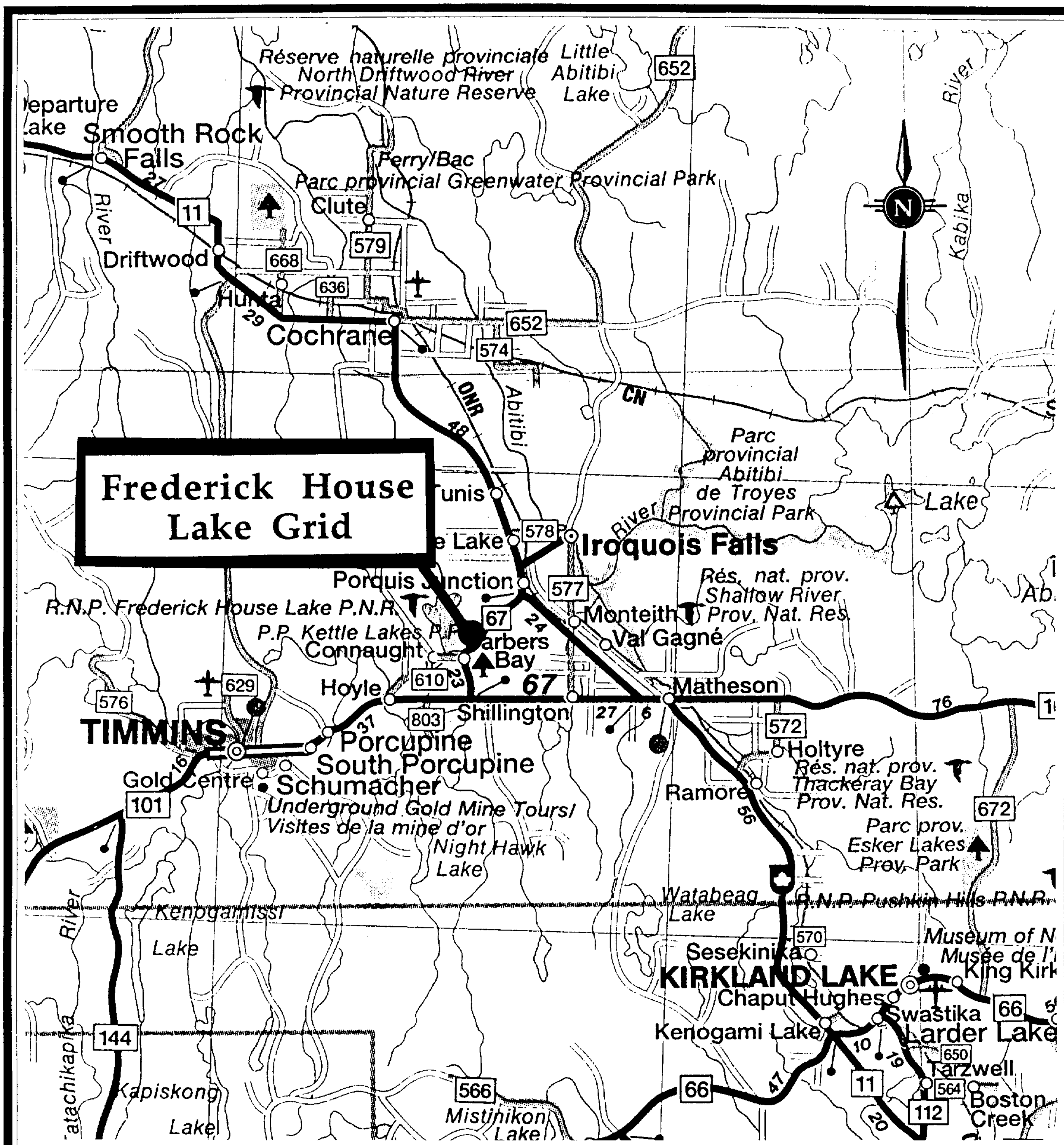
INTRODUCTION

A UTEM survey was conducted on a grid covering part of the Frederick House Lake claims of Dave Meunier between the 28th and the 31st of March, 2000. Personnel employed by Lamontagne Geophysics conducted the survey on behalf of the client. The survey was carried out to test for responses in the vicinity of the Frederick House Lake Grid (Figures 1 and 2).

A total of 9.20km of outside-the-loop UTEM data was collected using a single transmitter loop with the receiver operating in 10-channel mode. All lines were surveyed measuring one component - Hz, the vertical component. A transmitter frequency of 30.974Hz was used with a nominal station spacing of 50m.

This report documents the UTEM survey in terms of logistics, survey parameters and field personnel. Appendix A contains the data presented in profile form. Other appendices contain:

- Production Diary (Appendix B)
- an outline of the UTEM System (Appendix C)
- Note on sources of anomalous Ch1 (Appendix D)



LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTEE

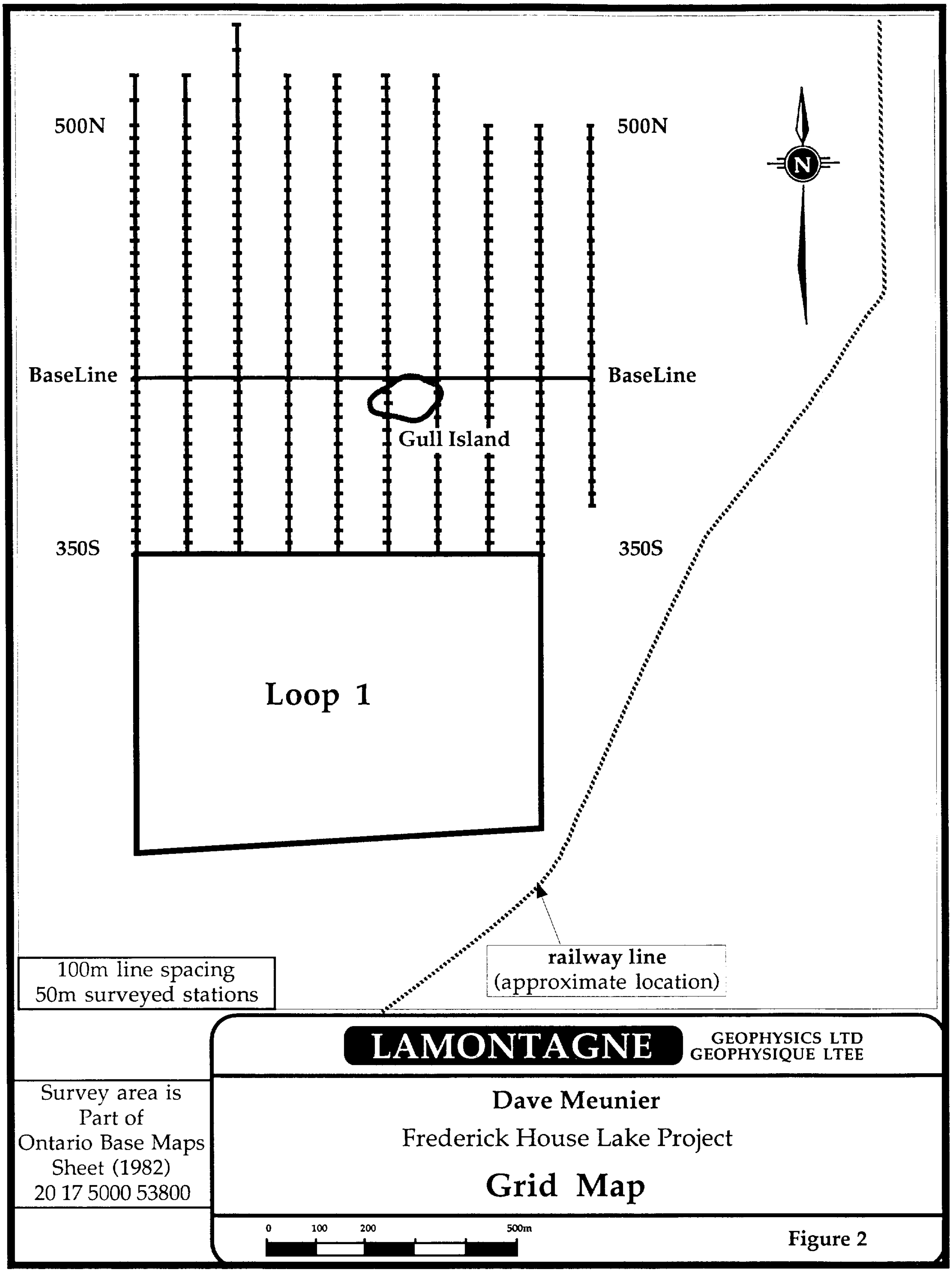
Dave Meunier

Area Location Map

Frederick House Lake Grid Project

0 10 20 50km

Figure 1


500N
500N
N
BaseLine
BaseLine
Gull Island
350S
350S
Loop 1
railway line
(approximate location)
100m line spacing
50m surveyed stations
LAMONTAGNE
GEOPHYSICS LTD
GEOPHYSIQUE LTEE
Survey area is
Part of
Ontario Base Maps
Sheet (1982)
20 17 5000 53800
Dave Meunier
Frederick House Lake Project
Grid Map
0
100
200
500m
Figure 2

SURVEY DESIGN

A single transmitter loop was configured with the depth and orientation of the expected target in mind. Figure 2 shows the location of Loop 1 and the survey lines.

The survey parameters employed:

- outside-the-loop coverage
- approximately 800x600m transmitter loop
- line spacing of 100m
- station interval of 50m reduced in anomalous areas
- Hz (vertical component measurements)
- 10-channel data at a frequency of 30.974Hz
- one UTEM receivers
- minimum 1K stacking (1024 full-cycles/2048 half-cycles) to be increased where noise levels dictate to maintain data quality

were selected to provide good coupling with the expected targets located within the grid area.

Non-decaying Ch1 conductors can be indicative of economical mineralization. Any non-decaying anomalous Ch1 features are therefore of interest. Non-decaying Ch1 UTEM anomalies can reflect:

i) the presence of economic mineralization
ii) the presence of a magnetic anomaly
iii) poor geometric control - either station location or loop location

These are outlined in more detail in Appendix D. From an interpretation point of view this means that magnetics and geometric control should be considered and evaluated as a part of any interpretation. From a field point of view it means that precise geometric control should be part of any UTEM survey where the target is non-decaying. Poor geometric control has the potential to either mask or invent Ch1 conductors.

In this survey topographical control was obtained though a total station survey. All stations and the loop corners were surveyed in. The grid was tied into the island (Gull Island) located on the grid. With all stations and the entire loop on the lake topography was not a consideration.

FIELD WORK

The Lamontagne Geophysics crew carried out the survey over the period of March 28th to March 31st. Operations were based out of the Carabelle Motel in South Porcupine.

Transportation to the survey site was 4x4 pickup. The loop was laid out on March 28th , the survey completed over March 29th and 30th and the loop was picked up. The crew demobilized on April 1st.

Figures 1 and 2 show the location and configuration of the grid. The Production Diary (Appendix B) outlines the day-to-day operations of the survey.

The weather was seasonable with almost ideal conditions. Snowshoes were not required. Equipment problems - specifically Transmitter problems - resulted in a delay at the beginning of the survey. After that the survey went well.

Survey equipment employed consisted of:

- UTEM 3 transmitter
- UTEM 3 receiver and coil.

A field computer (Powerbook 1400c) was used for all reduction and plotting of these survey data while on site. Data was reduced on a daily basis and plotted on return to Kingston.

SURVEY RESULTS

The results of the survey are summarized and presented as UTEM profiles in Appendix A. Equipment problems aside, the survey went well and overall the data quality is good.

For each line the Hz data are presented as 3-axis profiles:

1) Hz continuous norm ***Ch1 reduced***

Continuous normalization is useful for detection of the presence anomalies at any position on a profile. The anomaly shape is distorted by the normalization to the local field.

top axis - Ch5-10
middle axis - Ch2-5
bottom axis - Ch1

2) Hz point normalized ***Ch1 reduced***

normalization point: 400m out from the loop-front centre

Point normalized data is useful for interpretation of anomalous responses. Anomaly shape is preserved as is the amplitude if the normalization point is local to the anomaly.
For this data set the normalization point for off-loop surveys is 400m out from the centre of the loop front. The field at this point is intermediate (~1000m lines).

The disadvantage of point normalization is that small errors in location near the wire and in current tend to appear as large errors in Ch1. If the loop/station locations and the current are accurately known then point normalized Ch1 (in the absence of a local conductor) will tend to be continuous approaching the wire.

top axis - Ch5-10
middle axis - Ch2-5
bottom axis - Ch1

top axis	Ch 5-10	*Ch1 Reduced*
centre axis	Ch 2-5	*Ch1 Reduced*
bottom axis	Ch1	*Primary Field Reduced*

A description of the standard plotting formats used and of the UTEM System is presented in Appendix C.

Discussion of Results

The results show a number of responses that are can be correlated across several lines. Response amplitudes vary from line-to-line.

Appendix A

0015 UTEM Profiles

Loop 1

UTEM Survey

Frederick House Lake Grid

Timmins Area

for

Dave Meunier

Presentation

The results of the survey are summarized and presented as UTEM profiles in this appendix. A description of the standard plotting formats used and of the UTEM System is presented in Appendix C. The survey went well and overall the data quality is good.

Outline of profile types

Hz continuous norm ***Ch1 reduced***

Continuous normalization is useful for detection of the presence anomalies at any position on a profile. The anomaly shape is distorted by the normalization to the local field.

top axis - Ch5-10
middle axis - Ch2-5
bottom axis - Ch1

Hz point normalized ***Ch1 reduced***

normalization point: off-loop data 400m out from the loop-front centre

normalization point: 400m out from the loop-front centre

Point normalized data is useful for interpretation of anomalous responses. Anomaly shape is preserved as is the amplitude if the normalization point is local to the anomaly.
For this data set the normalization point for off-loop surveys is 400m out from the centre of the loop front. The field at this point is intermediate (~1000m lines).

The disadvantage of point normalization is that small errors in location near the wire and in current tend to appear as large errors in Ch1. If the loop/station locations and the current are accurately known then point normalized Ch1 (in the absence of a local conductor) will tend to be continuous approaching the wire.

top axis - Ch5-10
middle axis - Ch2-5
bottom axis - Ch1

List of Data Collected and Plotted

Frederick House Lake Grid

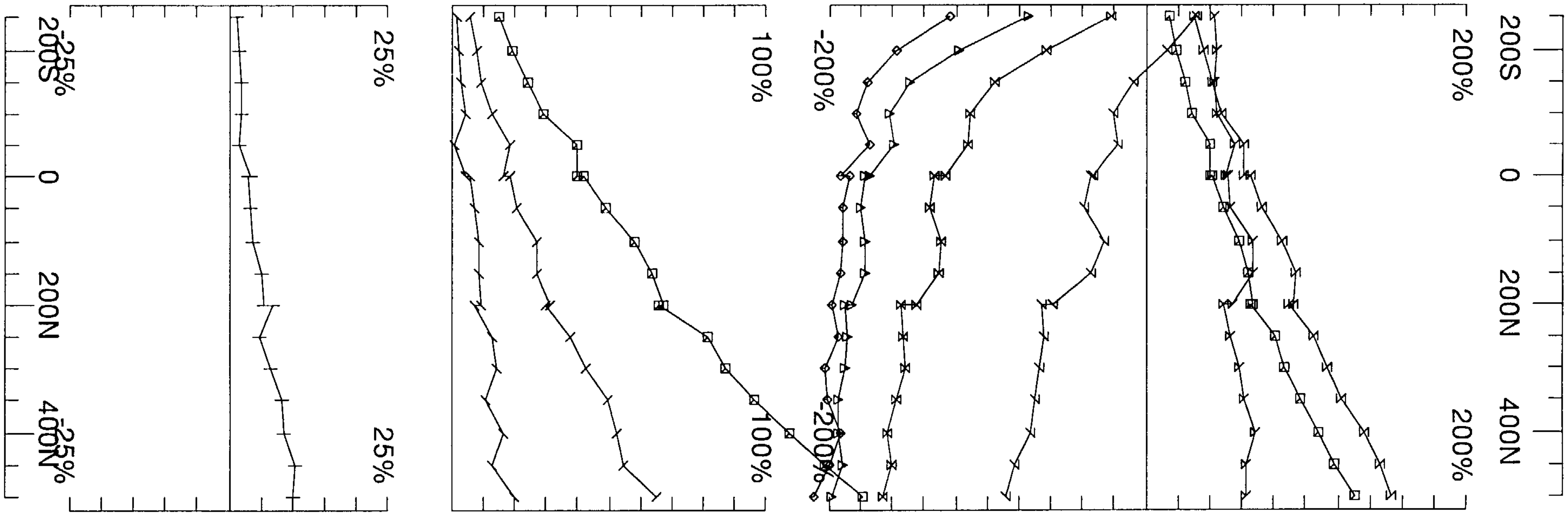
	Line	coverage	
Loop 1	Line 1+00E	(2+50S - 5+00N)	750m
	Line 0+00	(3+50S - 5+00N)	850m
	Line 1+00W	(3+50S - 5+00N)	850m
	Line 2+00W	(3+50S - 6+00N)	950m
	Line 3+00W	(3+50S - 6+00N)	950m
	Line 4+00W	(3+50S - 6+00N)	950m
	Line 5+00W	(3+50S - 6+00N)	950m
	Line 6+00W	(3+50S - 7+00N)	1050m
	Line 7+00W	(3+50S - 6+00N)	950m
	Line 8+00W	(3+50S - 6+00N)	950m
		Total	**9.200km**

Loop 1

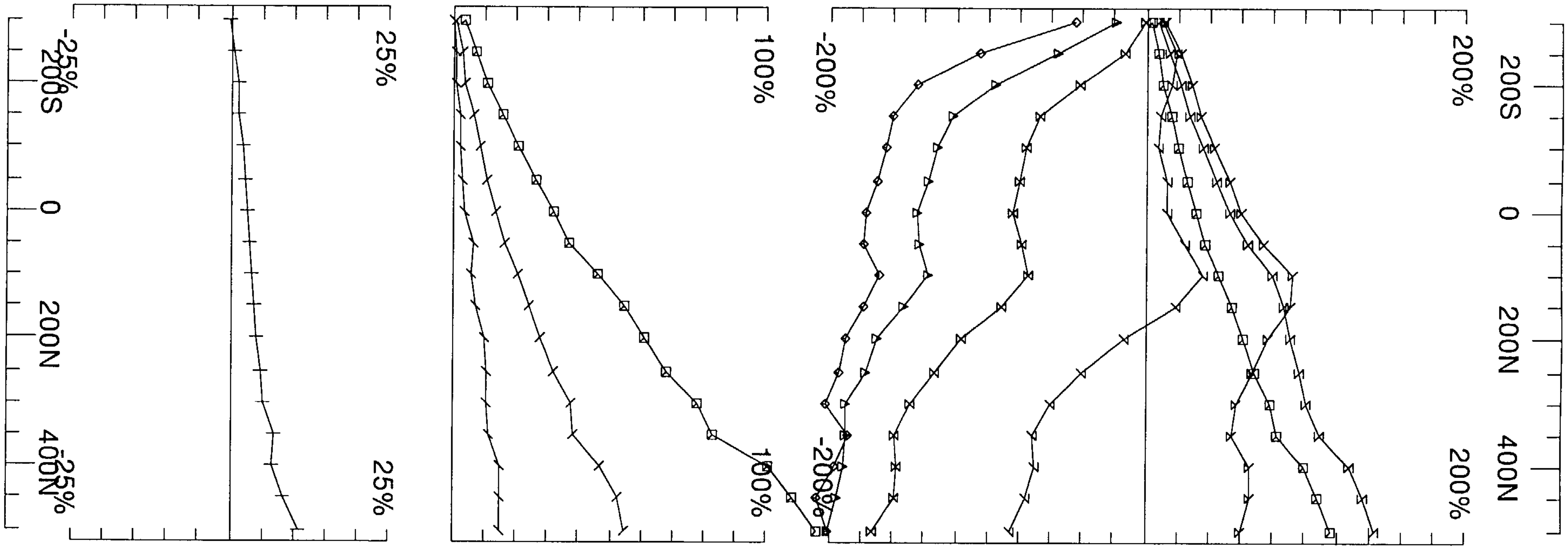
Hz Profiles
(continuous norm)

@ 30.974 Hz

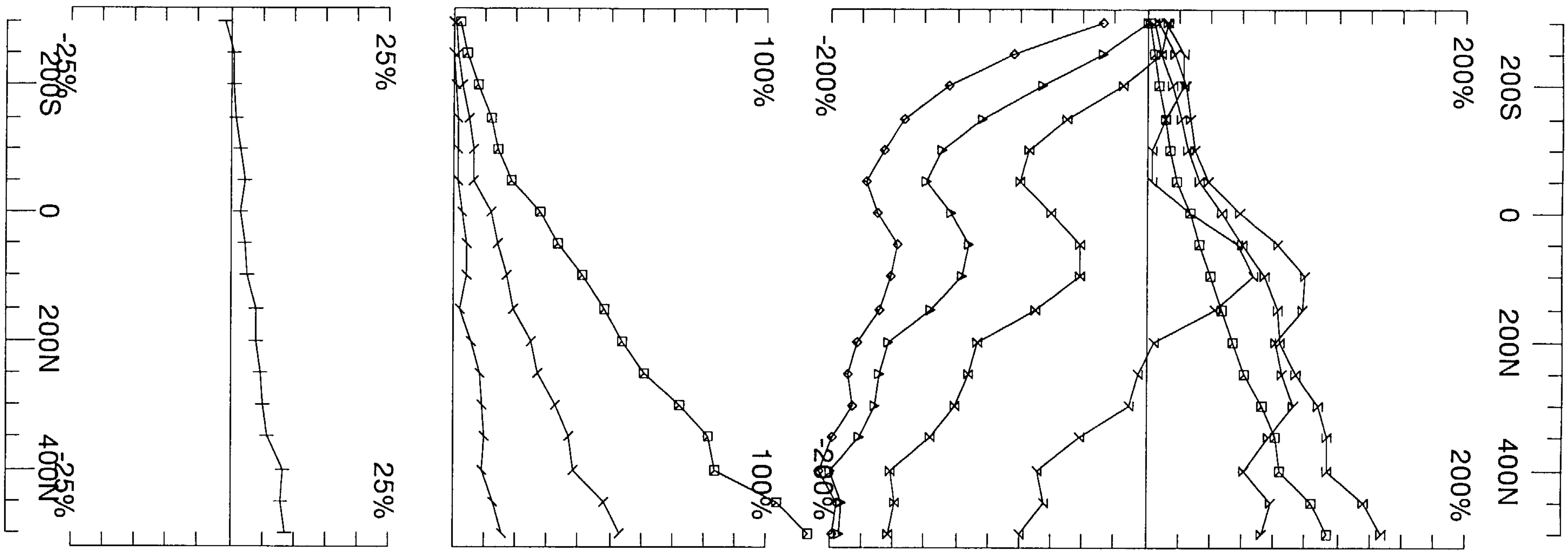
0015 Loop 1 - Hz



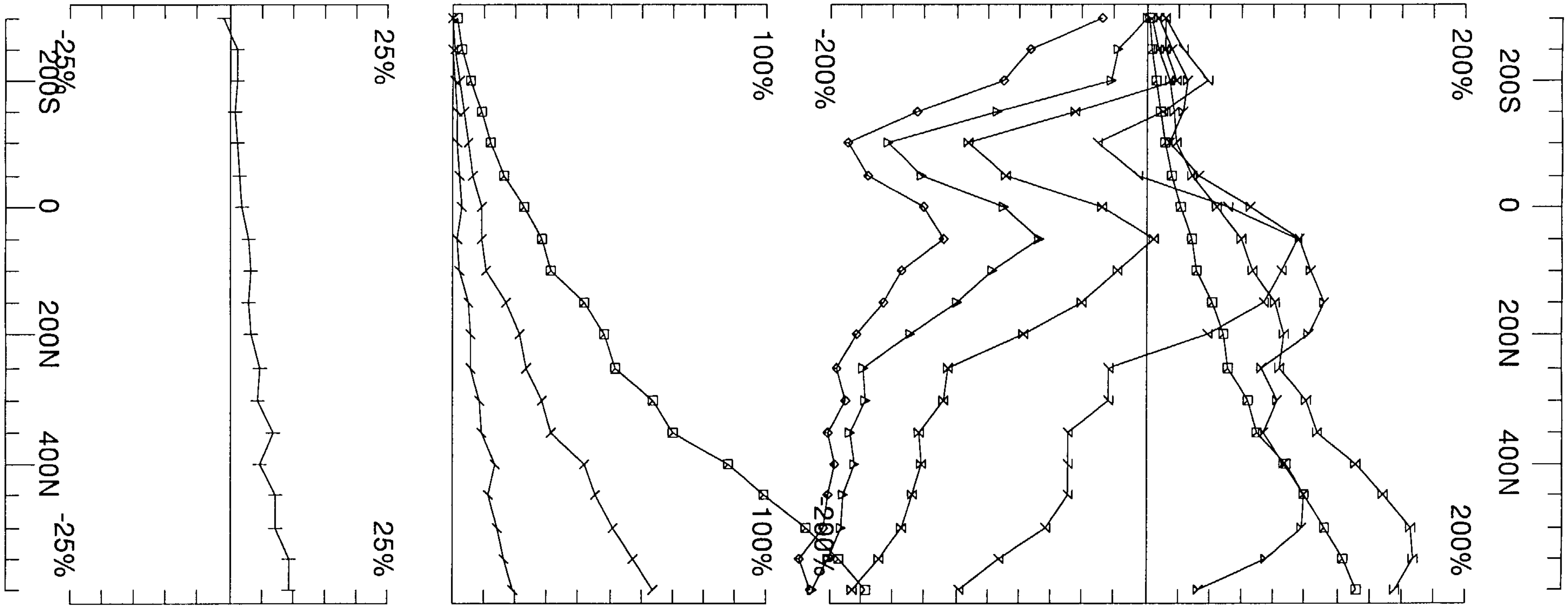
Loop: 1	Secondary, (Chn - Ch1)/IHpl	UTEM Survey at: Frederick House Lake
Line: 100E	Contin. Norm at depth of 0 m	For: Dave Meunier
Compt: Hz	Base Freq. 30.974 Hz	LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTEE Job 0015 Surveyed : 28/2/30 Reduced : 30/3/100 Plotted : 2/4/100



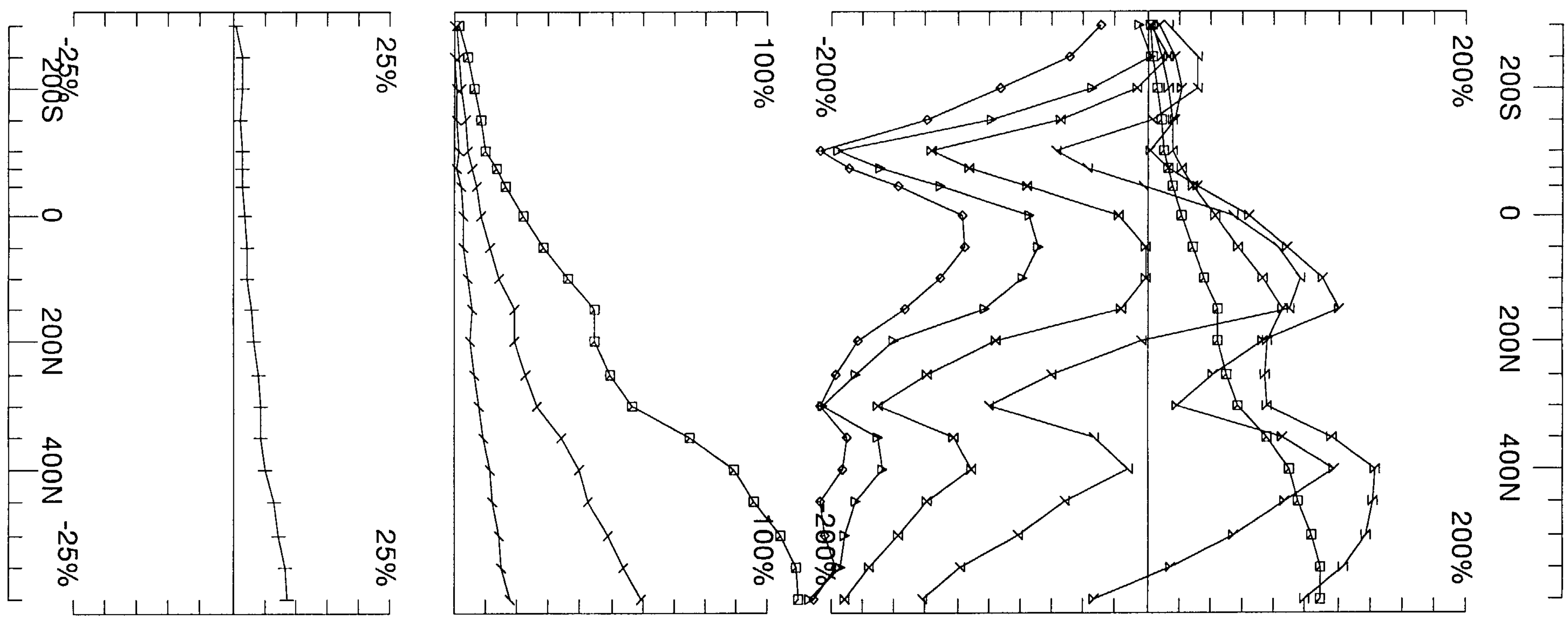
Loop: 1 Line: 0 Compt: Hz	Secondary, (Chn - Ch1)/IHpI Contin. Norm at depth of 0 m Base Freq. 30.974 Hz	UTEM Survey at: Frederick House Lake For: Dave Meunier LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTEE Job 0015 Surveyed : 28/2/30 Reduced : 2/4/100 Plotted : 2/4/100



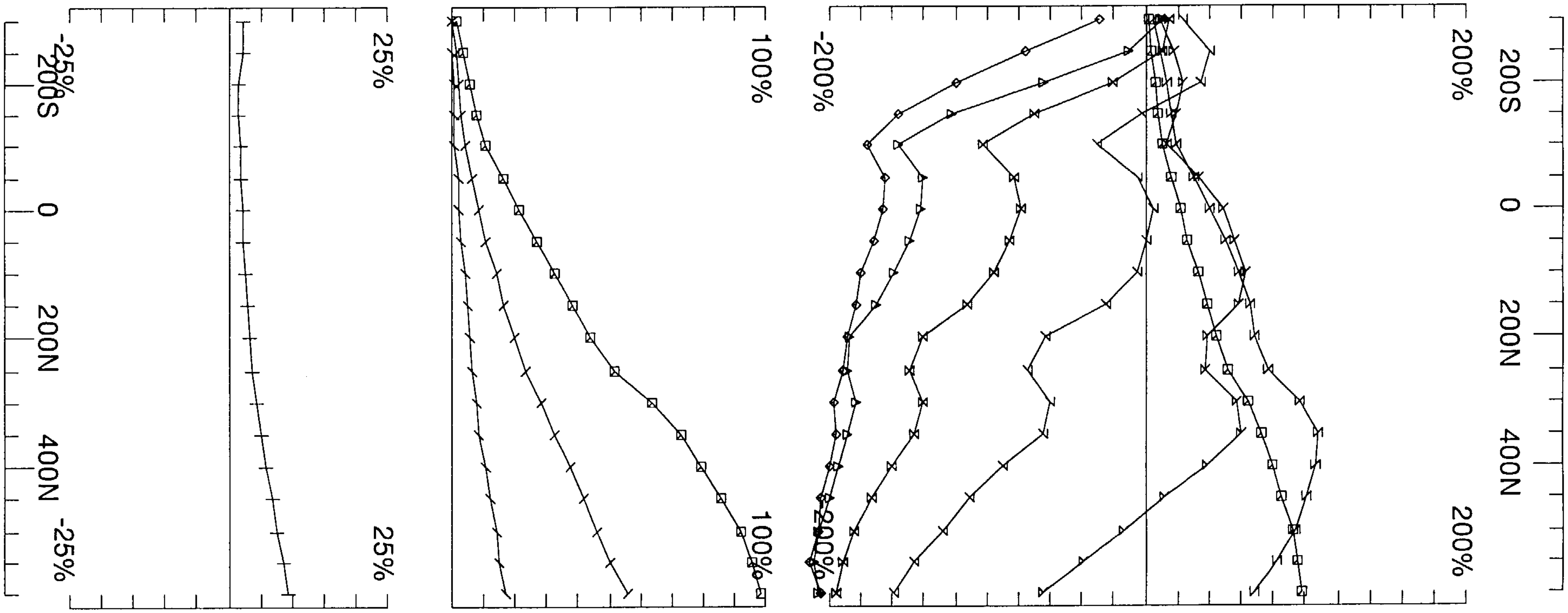
Loop: 1	Secondary, (Chn - Ch1)/IHpl	UTEM Survey at: Frederick House Lake
Line: 100W	Contin. Norm at depth of 0 m	For: Dave Meunier
Compt: Hz	Base Freq. 30.974 Hz	LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTEE Job 0015 Surveyed : 28/2/30 Reduced : 2/4/100 Plotted : 2/4/100



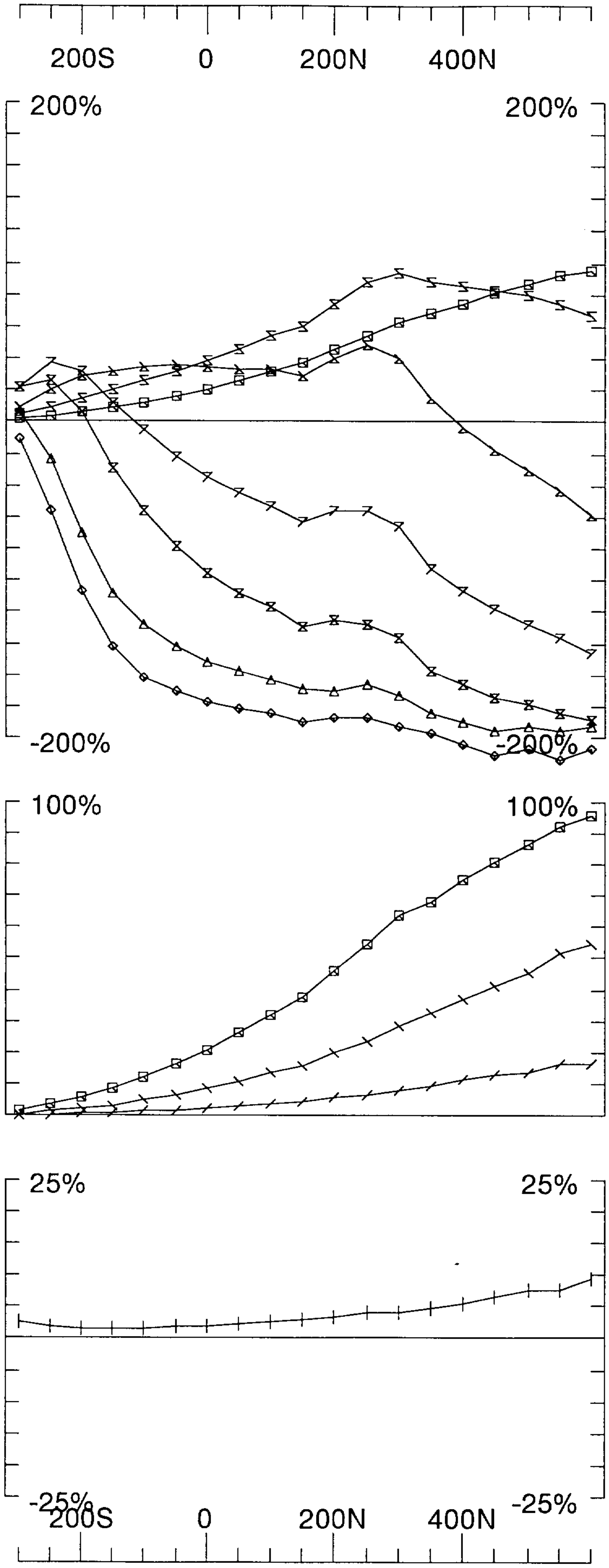
Loop: 1 Line: 200W Compt: Hz	Secondary, (Chn - Ch1)/IHpI Contin. Norm at depth of 0 m Base Freq. 30.974 Hz	UTEM Survey at: Frederick House Lake For: Dave Meunier LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTEE Job 0015 Surveyed : 28/2/31 Reduced : 2/4/100 Plotted : 2/4/100



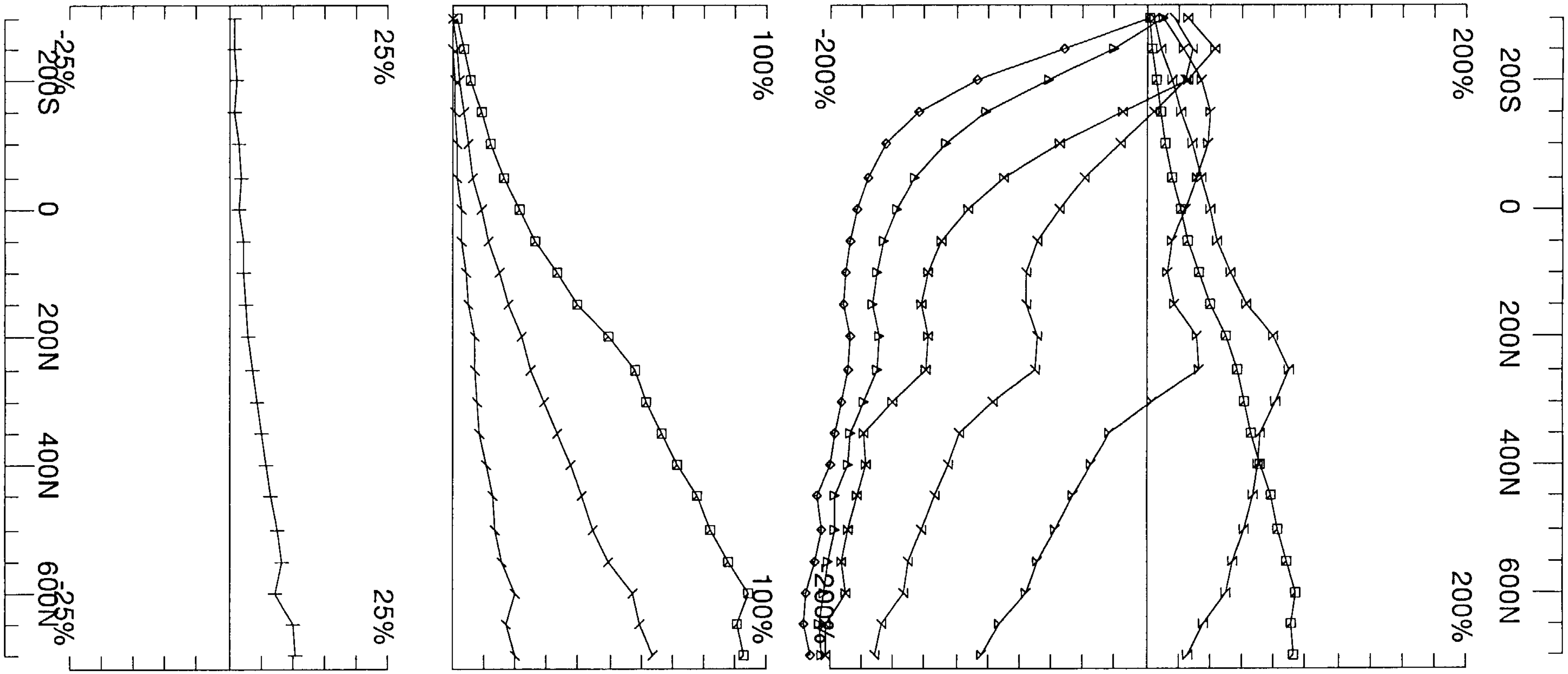
Loop: 1 Line: 300W Compt: Hz	Secondary, (Chn - Ch1)/IHpl Contin. Norm at depth of 0 m Base Freq. 30.974 Hz	UTEM Survey at: Frederick House Lake For: Dave Meunier LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTEE Job 0015 Surveyed : 28/2/31 Reduced : 2/4/100 Plotted : 2/4/100



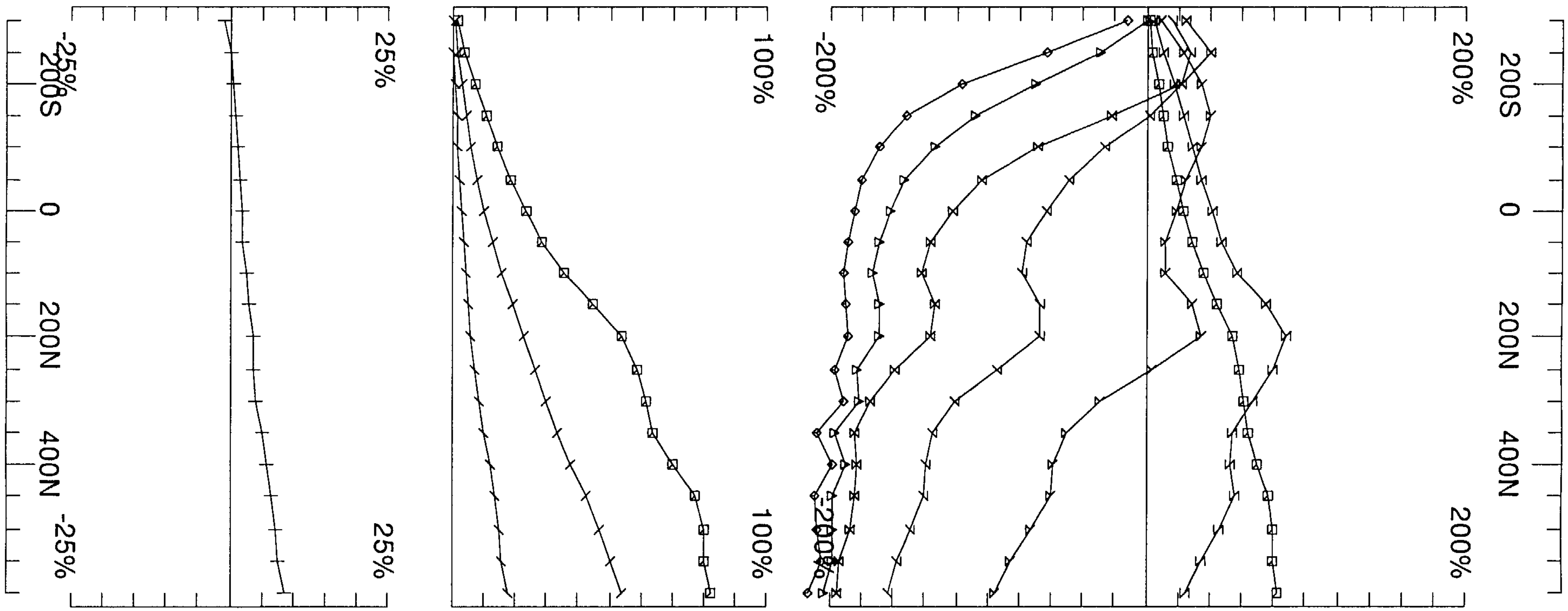
Loop: 1 Line: 400W Compt: Hz	Secondary, (Chn - Ch1)/lHpl Contin. Norm at depth of 0 m Base Freq. 30.974 Hz	UTEM Survey at: Frederick House Lake For: Dave Meunier LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTEE Job 0015 Surveyed : 28/2/31 Reduced : 2/4/100 Plotted : 2/4/100



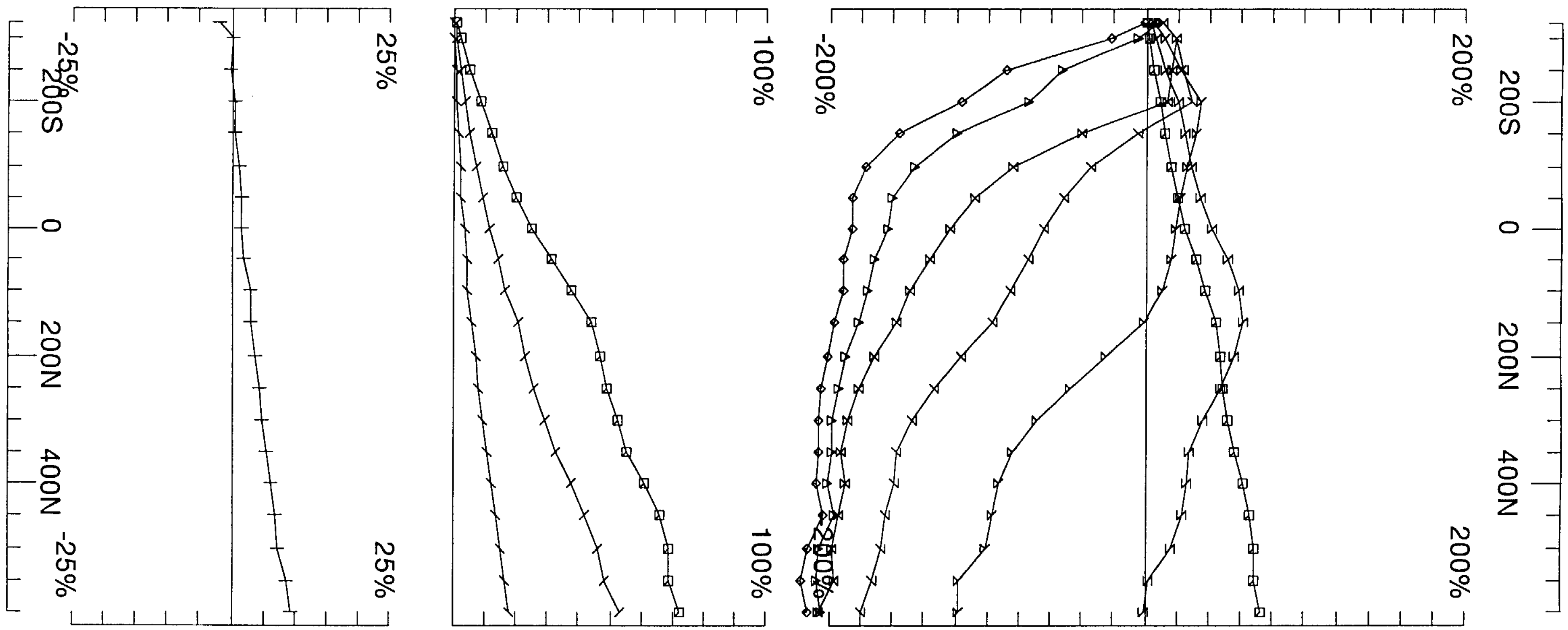
Loop: 1	Secondary, (Chn - Ch1)/IHpl	UTEM Survey at: Frederick House Lake
Line: 500W	Contin. Norm at depth of 0 m	For: Dave Meunier
Compt: Hz	Base Freq. 30.974 Hz	LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTEE Job 0015 Surveyed : 28/2/31 Reduced : 2/4/100 Plotted : 2/4/100



Loop: 1	Secondary, (Chn - Ch1)/IHpl	UTEM Survey at: Frederick House Lake
Line: 600W	Contin. Norm at depth of 0 m	For: Dave Meunier
Compt: Hz	Base Freq. 30.974 Hz	LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTEE Job 0015 Surveyed : 28/2/31 Reduced : 2/4/100 Plotted : 2/4/100



Loop: 1	Secondary, (Chn - Ch1)/lHpl	UTEM Survey at: Frederick House Lake
Line: 700W	Contin. Norm at depth of 0 m	For: Dave Meunier
Compt: Hz	Base Freq. 30.974 Hz	LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTEE Job 0015 Surveyed : 28/2/31 Reduced : 2/4/100 Plotted : 2/4/100



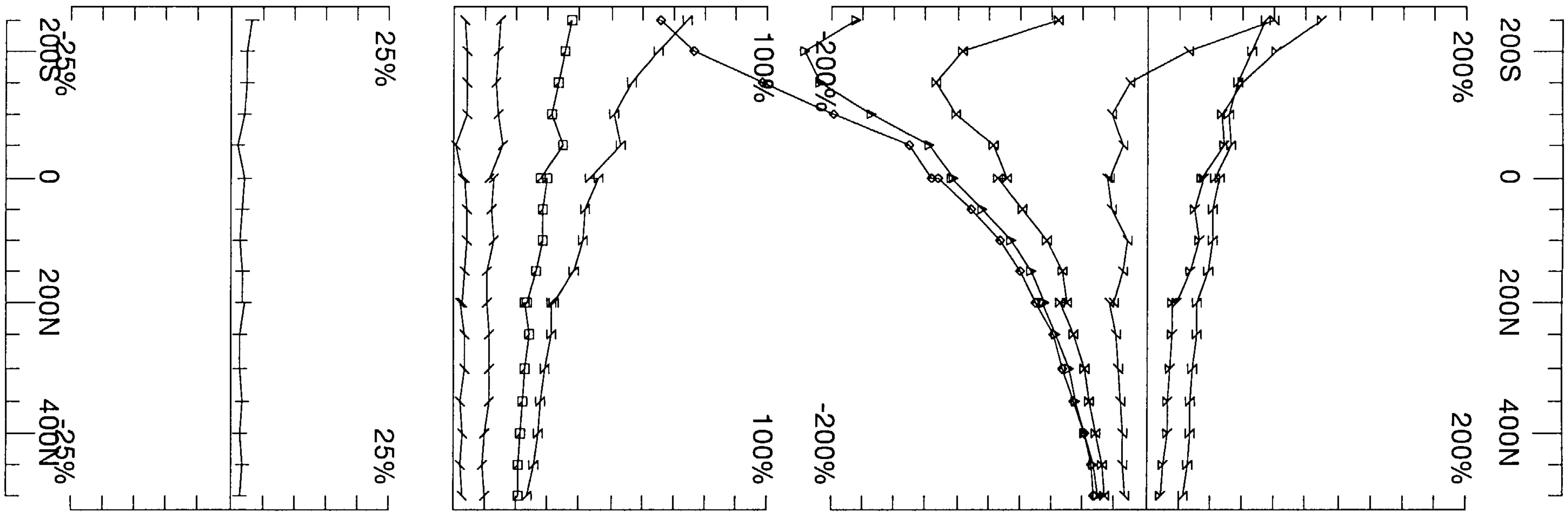
Loop: 1	Secondary, (Chn - Ch1)/IHpl	UTEM Survey at: Frederick House Lake
Line: 800W	Contin. Norm at depth of 0 m	For: Dave Meunier
Compt: Hz	Base Freq. 30.974 Hz	LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTEE Job 0015 Surveyed : 28/2/31 Reduced : 2/4/100 Plotted : 2/4/100

Loop 1

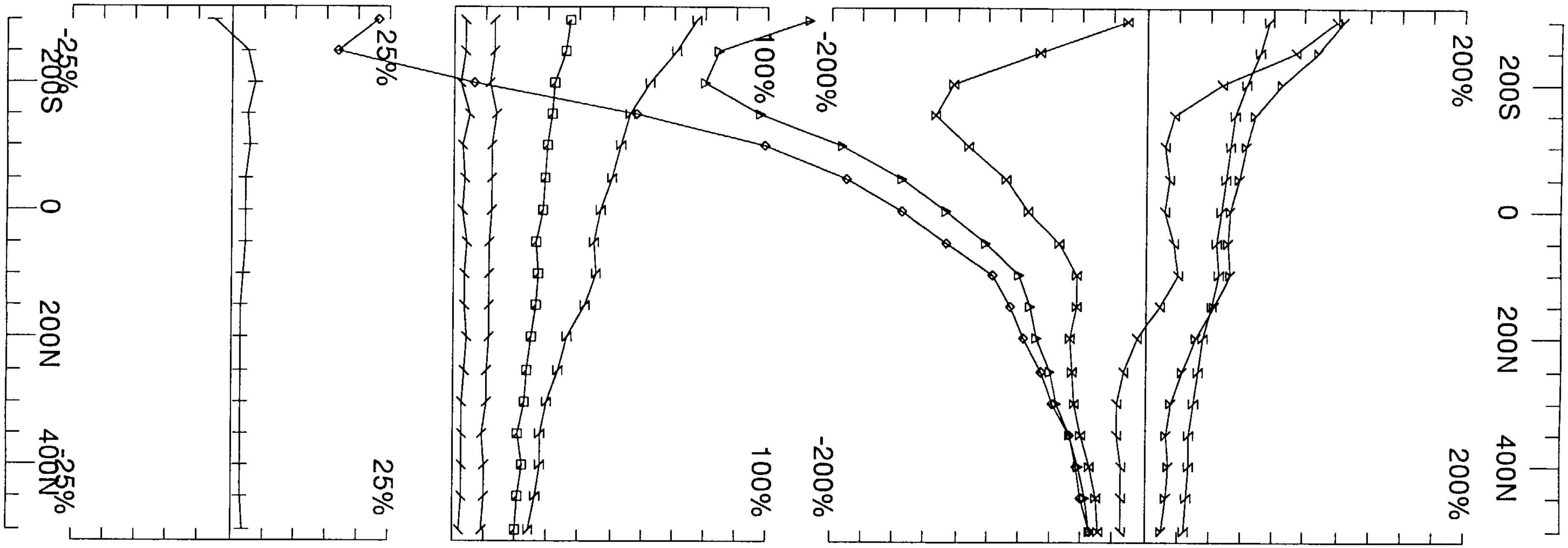
Hz Profiles
(point norm)

@ 30.974 Hz

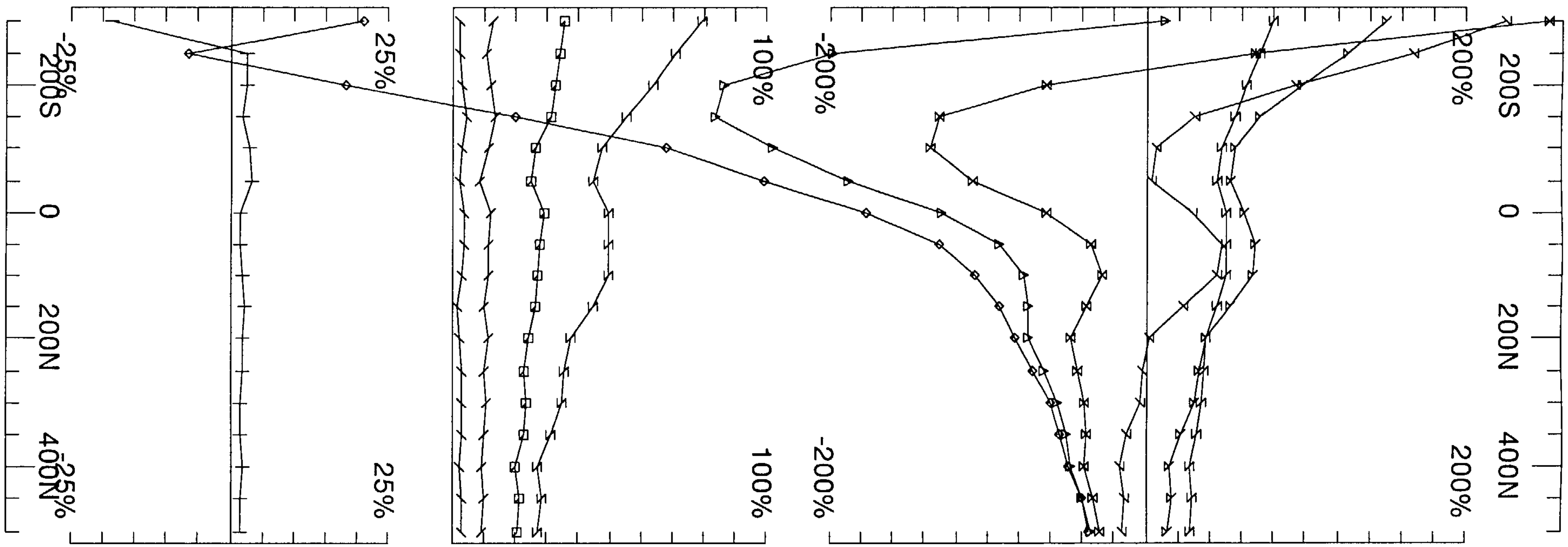
0015 Loop 1 - Hz point norm



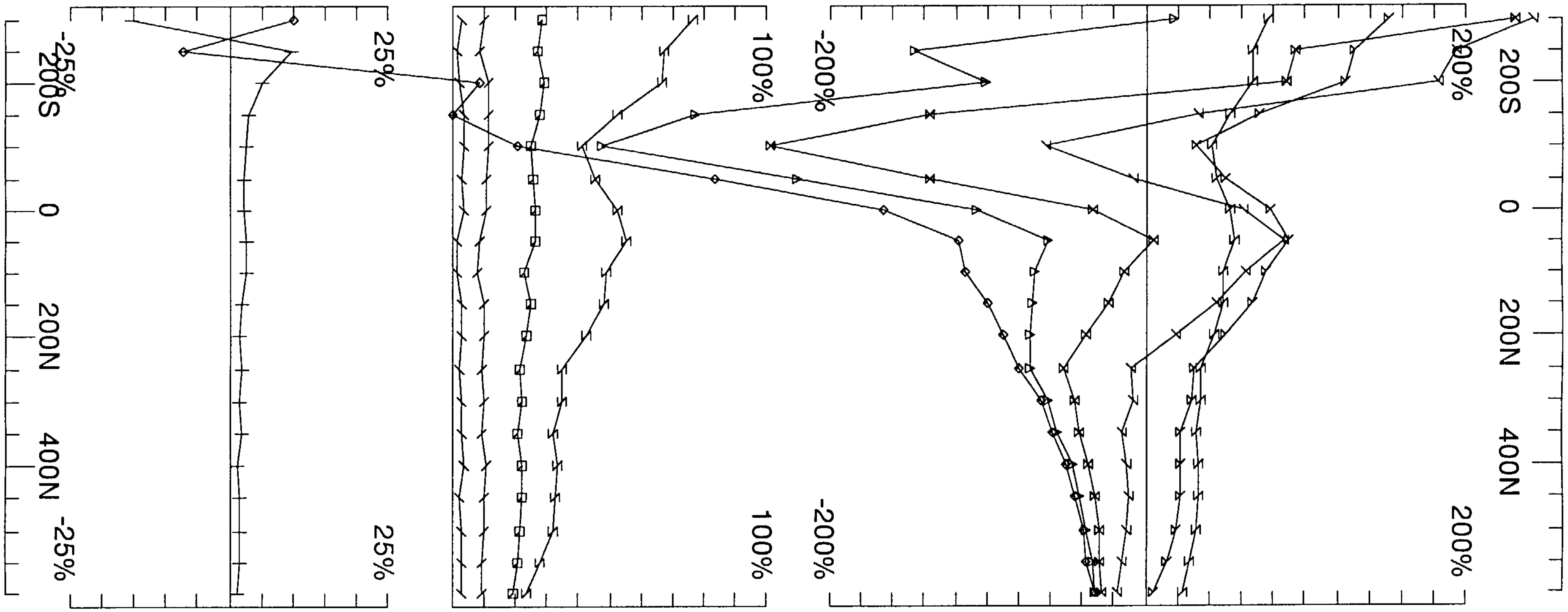
Loop: 1 Line: 100E Compt: Hz	Secondary, (Chn - Ch1)/IHpl Point Norm.at x,y,z (-400,50,0) Base Freq. 30.974 Hz	UTEM Survey at: Frederick House Lake For: Dave Meunier LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTEE Job 0015 Surveyed : 28/2/30 Reduced : 30/3/100 Plotted : 20/4/100



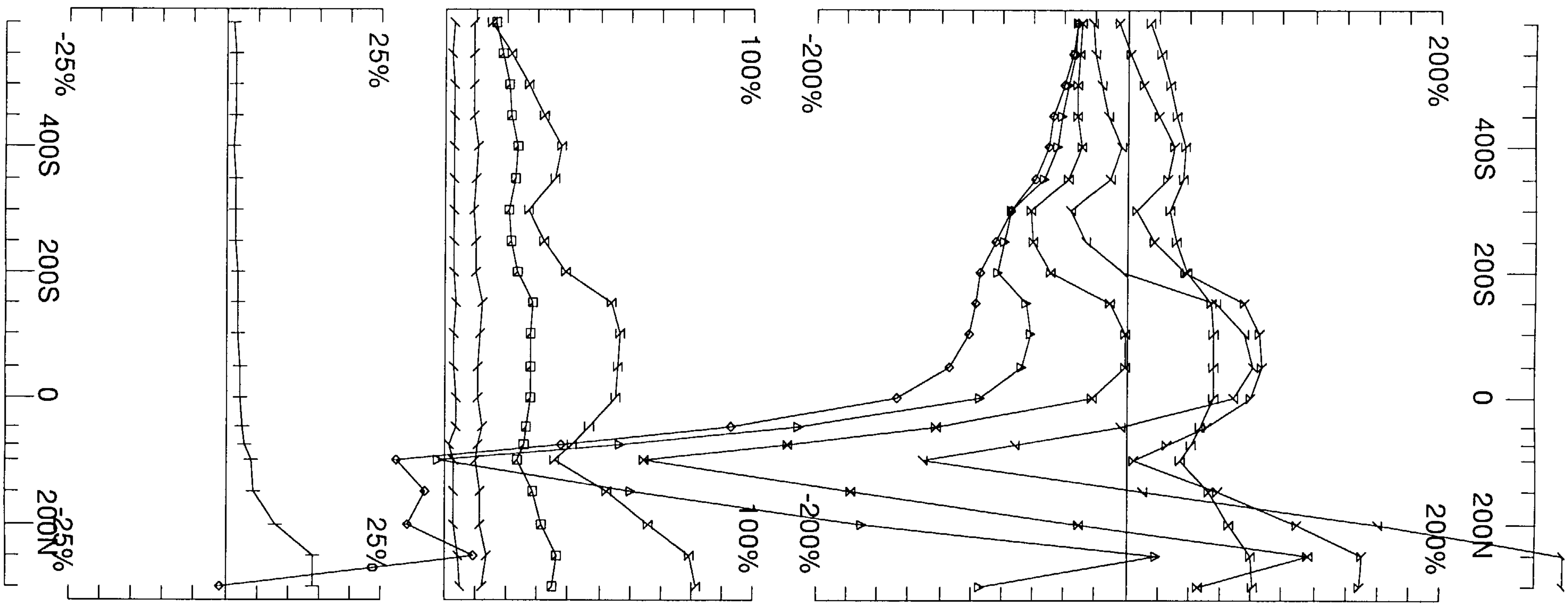
Loop: 1 Line: 0 Compt: Hz	Secondary, (Chn - Ch1)/lHpl Point Norm.at x,y,z (-400,50,0) Base Freq. 30.974 Hz	UTEM Survey at: Frederick House Lake For: Dave Meunier LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTEE Job 0015 Surveyed : 28/2/30 Reduced : 2/4/100 Plotted : 20/4/100



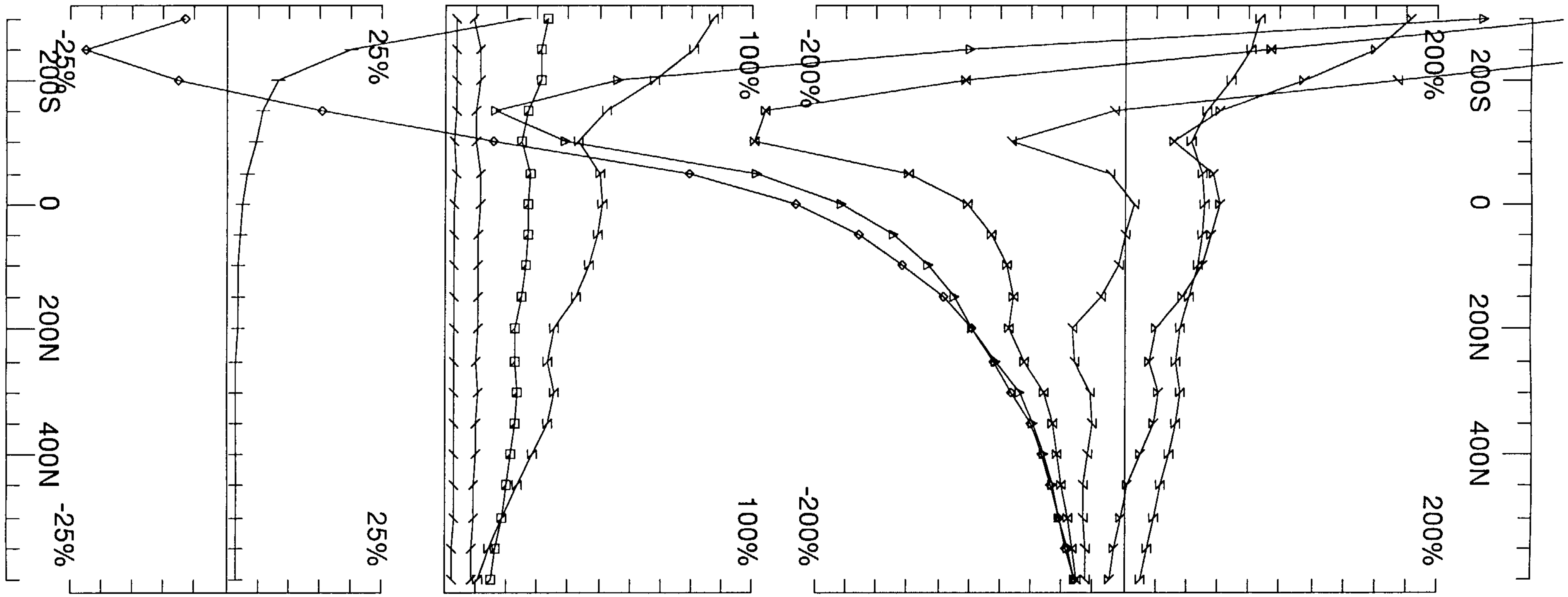
Loop: 1 Line: 100W Compt: Hz	Secondary, (Chn - Ch1)/IHpl Point Norm.at x,y,z (-400,50,0) Base Freq. 30.974 Hz	UTEM Survey at: Frederick House Lake For: Dave Meunier LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTEE Job 0015 Surveyed : 28/2/30 Reduced : 2/4/100 Plotted : 20/4/100



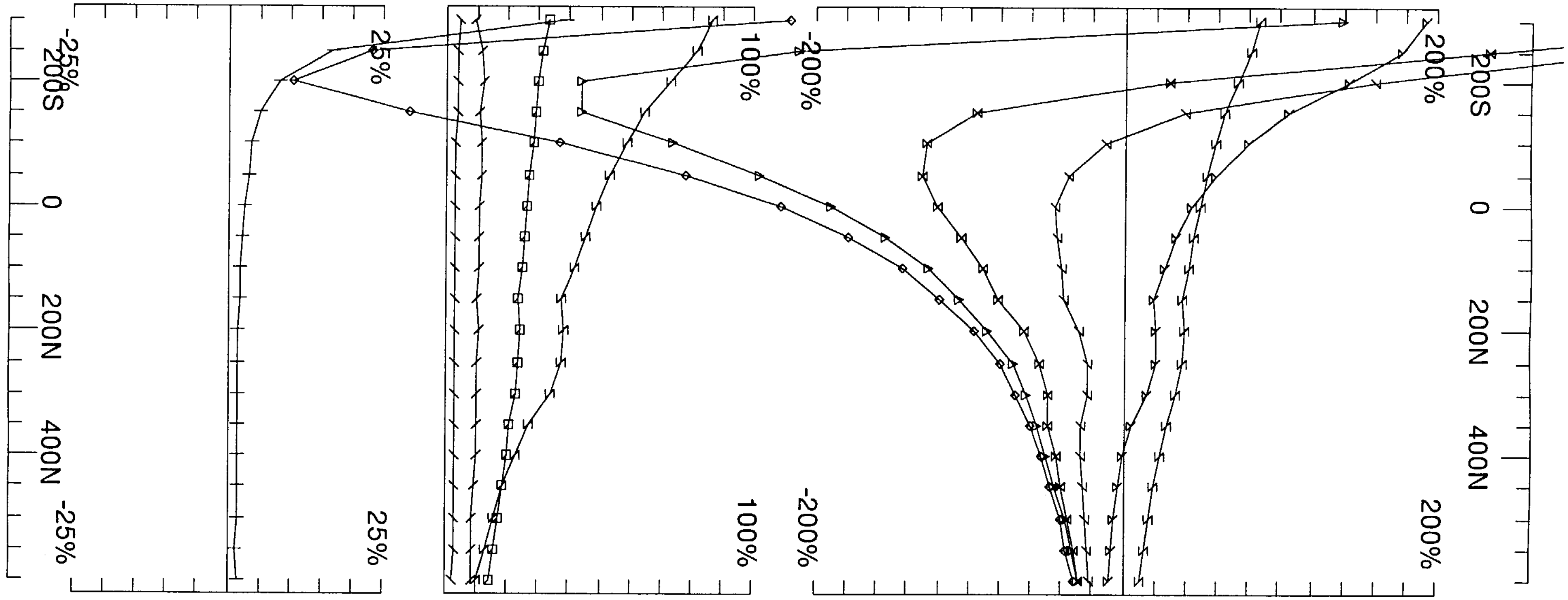
Loop: 1 Line: 200W Compt: Hz	Secondary, (Chn - Ch1)/IHpl Point Norm.at x,y,z (-400,50,0) Base Freq. 30.974 Hz	UTEM Survey at: Frederick House Lake For: Dave Meunier LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTEE Job 0015 Surveyed : 28/2/31 Reduced : 2/4/100 Plotted : 20/4/100



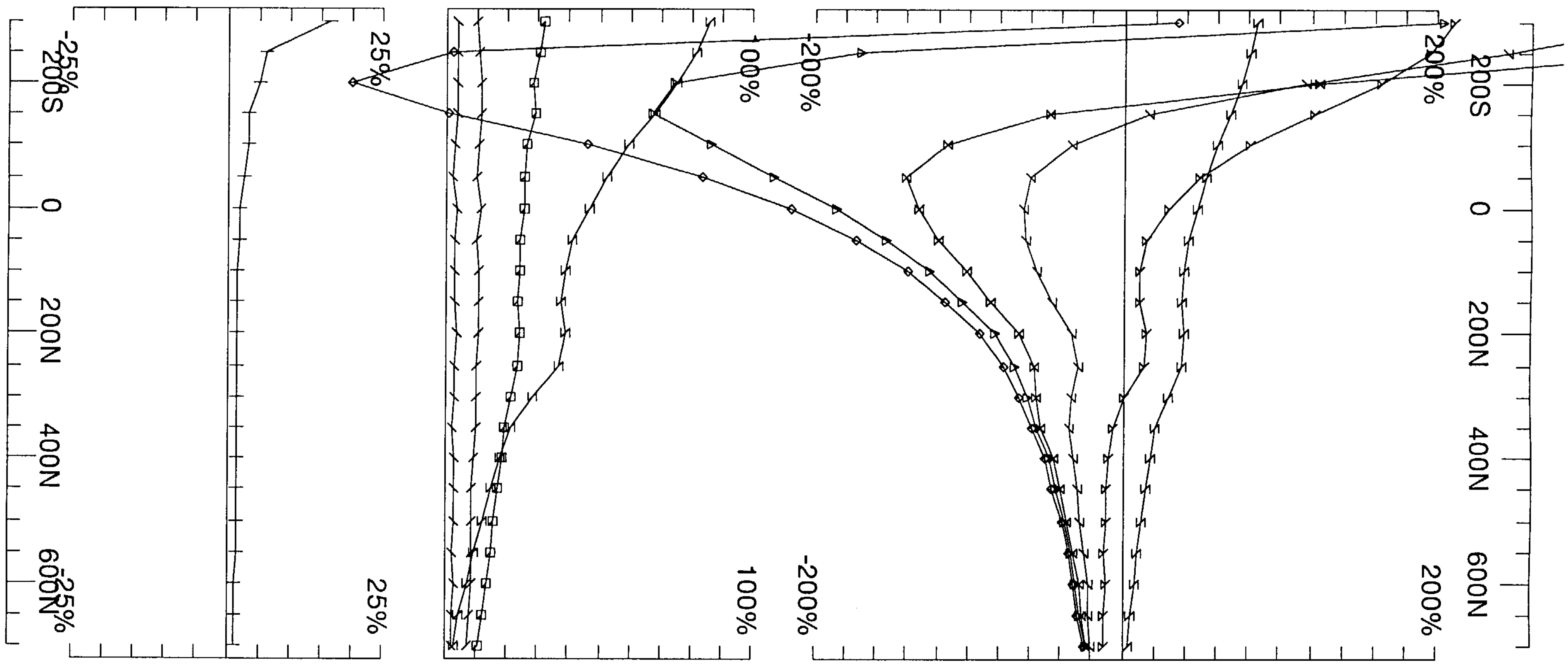
Loop: 1 Line: 300W Compt: Hz	Secondary, (Chn - Ch1)/IHpl Point Norm.at x,y,z (-400,50,0) Base Freq. 30.974 Hz	UTEM Survey at: Frederick House Lake For: Dave Meunier LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTEE Job 0015 Surveyed : 28/2/31 Reduced : 2/4/100 Plotted : 20/4/100



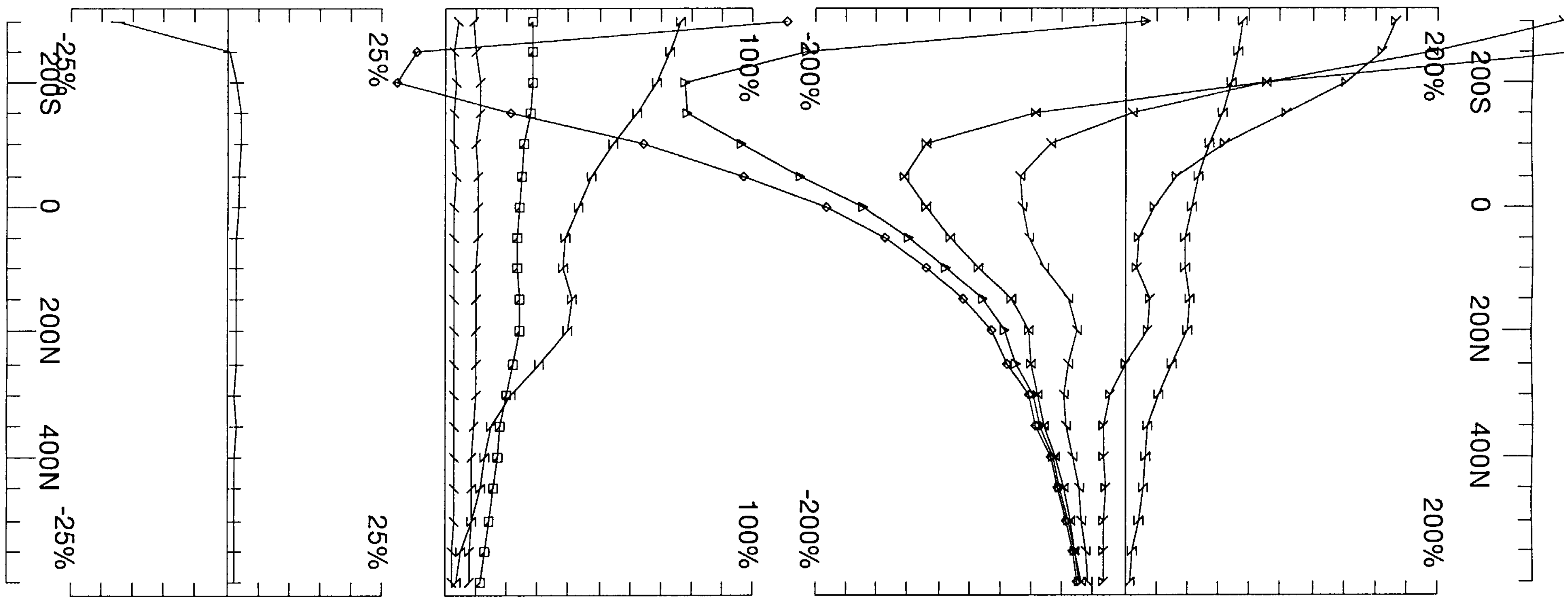
Loop: 1 Line: 400W Compt: Hz	Secondary, (Chn - Ch1)/lHpl Point Norm.at x,y,z (-400,50,0) Base Freq. 30.974 Hz	UTEM Survey at: Frederick House Lake For: Dave Meunier LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTEE Job 0015 Surveyed : 28/2/31 Reduced : 2/4/100 Plotted : 20/4/100



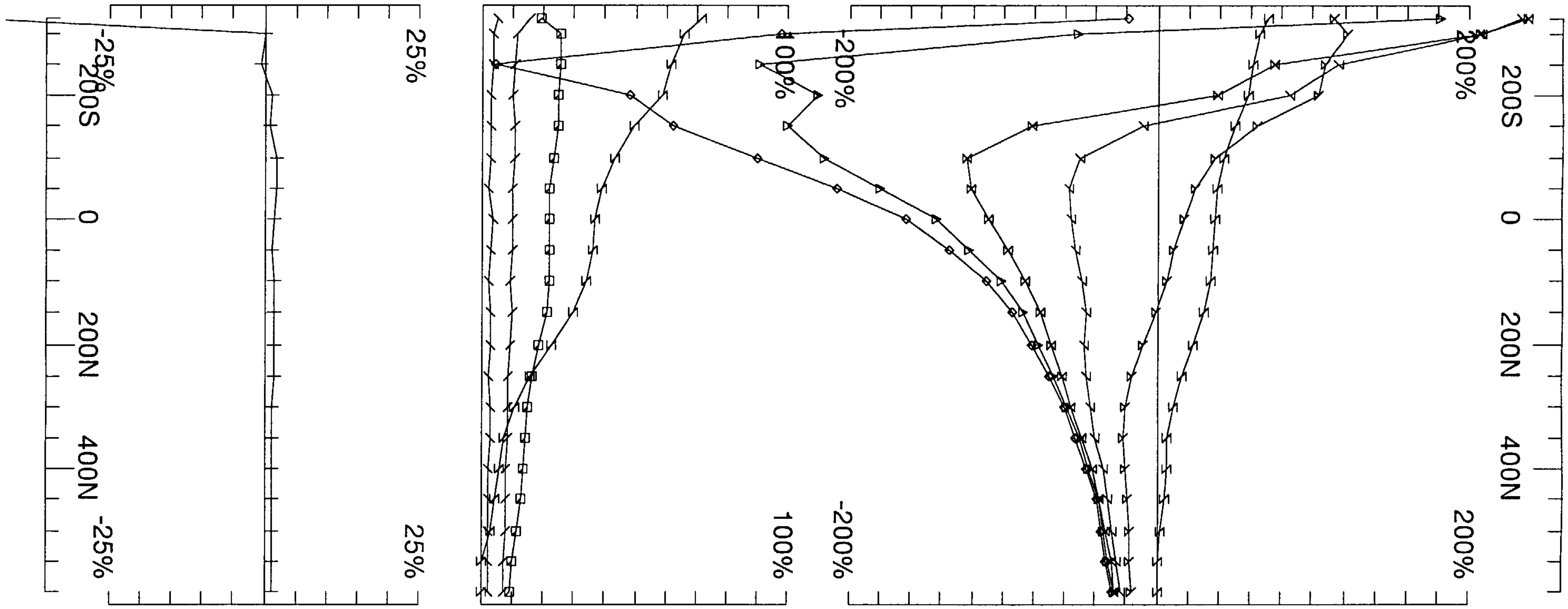
Loop: 1 Line: 500W Compt: Hz	Secondary, (Chn - Ch1)/lHpl Point Norm.at x,y,z (-400,50,0) Base Freq. 30.974 Hz	UTEM Survey at: Frederick House Lake For: Dave Meunier LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTEE Job 0015 Surveyed : 28/2/31 Reduced : 2/4/100 Plotted : 20/4/100



Loop: 1 Line: 600W Compt: Hz	Secondary, (Chn - Ch1)/lHpl Point Norm.at x,y,z (-400,50,0) Base Freq. 30.974 Hz	UTEM Survey at: Frederick House Lake For: Dave Meunier LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTEE Job 0015 Surveyed : 28/2/31 Reduced : 2/4/100 Plotted : 20/4/100



Loop: 1 Line: 700W Compt: Hz	Secondary, (Chn - Ch1)/lHpl Point Norm.at x,y,z (-400,50,0) Base Freq. 30.974 Hz	UTEM Survey at: Frederick House Lake For: Dave Meunier LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTEE Job 0015 Surveyed : 28/2/31 Reduced : 2/4/100 Plotted : 20/4/100



Loop: 1 Line: 800W Compt: Hz	Secondary, (Chn - Ch1)/IHpl Point Norm.at x,y,z (-400,50,0) Base Freq. 30.974 Hz	UTEM Survey at: Frederick House Lake For: Dave Meunier LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTEE Job 0015 Surveyed : 28/2/31 Reduced : 2/4/100 Plotted : 20/4/100

Appendix B

0015 Production Diary

UTEM 3 Survey
at

Frederick House Lake Grid

for

Dave Meunier

Production Diary (0015)
UTEM Survey on Frederick House Lake Grid, Timmins area area, Ontario
Dave Meunier

Date	Rate - Production	Comments
March 28	Mob	Packed up the gear and left Kingston ~15:30. Ran in to alternating heavy rain, heavy snow. Arrived at the South Porcupine Tim Hortons ~21:00. Met with Dave Meunier. Checked in to the Carabelle Motel, unpacked the gear and started the clocks.
March 29	1/2Looping/Standby (1/2 Down)	Headed out to the grid after breakfast and had the loop loop layed out by lunch. Repaired several bad splices and tried the transmitter again. There was a problem with the transmitter - it did not sound right. It eventually exhibited the symptoms of a blown power transistor. It was still early enough (13:30) that the problem could be repaired in town and some surveying done afterwards so we headed to town. The problem transistor was found and replaced but repairs were attempted all evening on the original problem.
March 30	1/2P-1 - 2450m (1/2 Down)	Read: Loop 1 **Frederick House Lake Grid** **Line 1+00E 2+50S - 5+00N** Hz **Line 0+00 3+50S - 5+00N** Hz **Line 1+00W 3+50S - 5+00N** Hz The transmitter was finally repaired ~14:00. Headed out to the grid and surveyed until after 19:00. Crew: R. Langridge. To Date: 2.450km
March 31	P-1 - 6750m	Read: Loop 1 **Frederick House Lake Grid** **Line 2+00W 3+50S - 6+00N** Hz **Line 3+00W 3+50S - 6+00N** Hz **Line 4+00W 3+50S - 6+00N** Hz **Line 5+00W 3+50S - 6+00N** Hz **Line 6+00W 3+50S - 7+00N** Hz **Line 7+00W 3+50S - 6+00N** Hz **Line 8+00W 3+50S - 6+00N** Hz Headed out to the grid and surveyed until after 18:00. Picked up the loop to complete the survey @12:00 Crew: R. Langridge. To Date: 9.200km
April 1	Demob	Discussed the results with Dave Meunier in the morning and then traveled to Kingston

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LEGEND

P(x) - Production (# of personnel)

Appendix C

The UTEM SYSTEM

The UTEM System

UTEM Data Reduction and Plotting Conventions

Data Presentation

The UTEM SYSTEM

UTEM uses a large, fixed, horizontal transmitter loop as its source. Loops range in size from 300m x 300m up to as large as 4km x 4km. Smaller loops are generally used over conductive terrain or for shallow sounding work. The larger loops are only used over resistive terrain. The UTEM receiver is typically syncronized with the transmitter at the beginning of a survey day and operates remotely after that point. The clocks employed - one in each of the receiver and transmitter - are sufficiently accurate to maintain synchronisation.

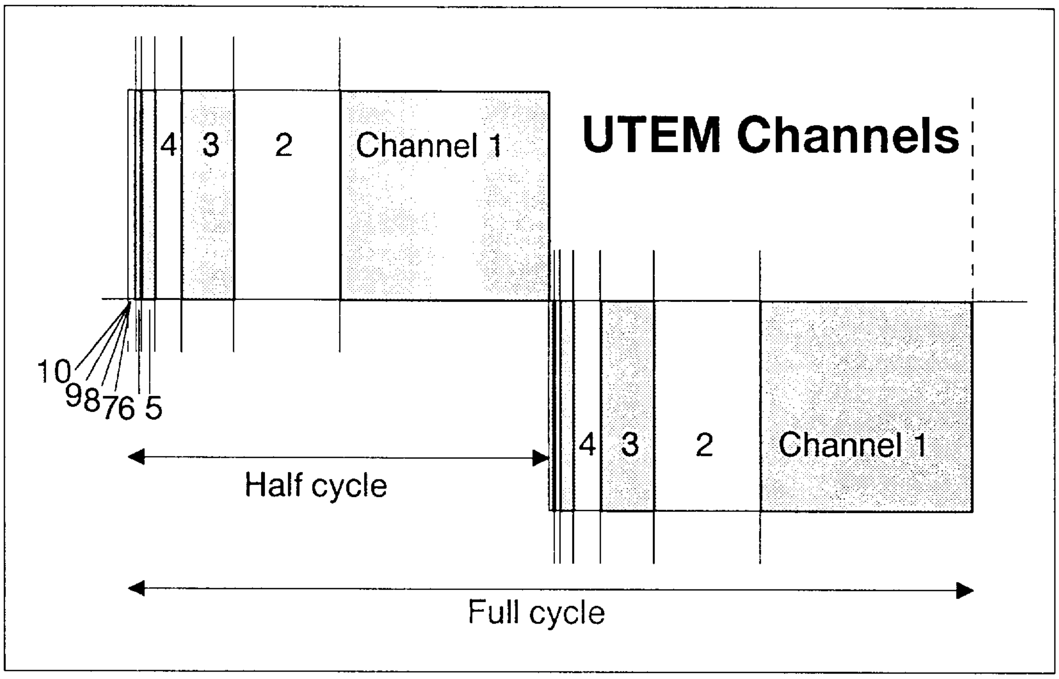
Measurements are routinely taken to a distance of 1.5 to twice the loop dimensions, depending on the local noise levels, and can be continued further. Lines are typically surveyed out from the edge of the loop but may also be read across the loop wire and through the centre of the loop, a configuration used mainly to detect horizontal conductors. BHUTEM - the borehole version of UTEM -surveys have been carried out to depths up to 3000+ metres.

System Waveform

The UTEM transmitter passes a low-frequency (4 Hz to 90 Hz) current of a precisely regulated triangular waveform through the transmitter loop. The frequency can be set to any value within the operating range of the transmitter, however, it is usually set at 31 Hz to minimise power line (60 Hz in North America) effects. Since a receiver coil responds to the time derivative of the magnetic field, the UTEM system really "sees" the step response of the ground. UTEM is the only time domain system which measures the step response of the ground. All other T.D.E.M. systems to date transmit a modified step current and "see" the (im)pulse response of the ground at the receiver. In practice, the transmitted UTEM waveform is tailored to optimize signal-to-noise. Deconvolution techniques are employed within the system to produce an equivalent to the conceptual "step response" at the receiver.

System Sampling

The UTEM receiver measures the time variation of the magnetic field in the direction of the receiver coil at 10 delay times (channels). UTEM channels are spaced in a binary, geometric progression across each half-cycle of the received waveform. Channel **10** is the earliest channel and it is $1/2^{10}$ of the half-cycle wide. Channel **1**, the latest channel, is $1/2^1$ of the half-cycle wide (see Figure below). The measurements obtained for each of 10 channels are accumulated over many half-cycles. Each final channel value, as stored, is the average of the measurements for that time channel. The number of half-cycles averaged generally ranges between 2048 (1024 full-cycles - 1K in UTEM jargon) to 32768 (16K) depending on the level of ambient noise and the signal strength.



System Configurations

For surface work the receiver coil is mounted on a portable tripod and oriented. During a surface UTEM survey the vertical component of the magnetic field (Hz) of the transmitter loop is always measured. Horizontal in-line (Hx) and cross-line (Hy) components are also measured if more detailed information is required. The UTEM System is also capable of measuring the two horizontal components of the electric field, Ex and Ey. A dipole sensor comprised of two electrodes is used to measure the electric field components. This is generally used for outlining resistive features to which the magnetic field is not very sensitive.

BHUTEM surveys employ a receiver coil that is smaller in diameter than the surface coil. The borehole receiver coil forms part of a down-hole receiver package used to measure the axial (along-borehole) component of the magnetic field of the transmitter loop. Due to the distance between coil and receiver in borehole surveys the signal must be transmitted up to the receiver. In BHUTEM the signal is transmitted to surface digitally using a kevlar-reinforced fibre-optic cable as a data link. Using a fibre-optic link avoids signal degradation problems and allows surveying of boreholes to 3000+m. The cable is also very light - the specific gravity is nearly 1.0 - making the cable handling hardware quite portable.

The EM Induction Process

Any time-varying transmitted ("primary") field induces current flow in conductive regions of the ground below and around the transmitter loop (i.e. in the earth or "half-space"). This current flow produces a measurable EM field, the secondary field, which has an inherent "inertia" that resists the change in primary field direction. This "inertial" effect is called self-inductance; it limits the rate at which current can change and is only dependent on the shape and size of a conductive path.

It takes a certain amount of time for the transmitted current flow to be redirected (reversed) and reestablished to full amplitude after the rate-of-change of the primary field reverses direction. This measurable reversal time is characteristic for a given conductor. In general, for a good conductor this time is greater than that of a poor conductor. This is because in a good conductor the terminal current level is greater, whereas its rate of change is limited by the inductance of the current path. The time-varying current causes an Emf in the sensor proportional to the time derivative of the current. This Emf decays with time - it vanishes when the reversal is complete - and the characteristic time of the Emf decay as measured by the sensor is referred to as the **decay time** of the conductor.

The large-scale current which is induced in the half-space by the primary field produces the half-space response as seen in typical UTEM profiles. This background response is influenced by the finite conductivity of the surrounding rock. Other currents may be induced in locally more conductive zones (conductors) that have longer decay times than the half-space response. The responses of these conductors are superimposed upon the background response. The result is that the UTEM receiver detects:

- the primary field waveform, a square-wave
- the half-space (background) response of the surrounding rock
- a slight-to-large response due to any conductors present.

The result is that in the presence of conductors the primary field waveform is substantially (and anomalously) distorted.

UTEM DATA REDUCTION and PLOTTING CONVENTIONS

The UTEM data as it appears in the data files is in total field, continuously normalized form. In this form, the magnetic field data collected by the receiver is expressed as a % of the calculated primary magnetic field vector magnitude at the station. These are total field values - the UTEM system measures during the "on-time" and as such samples both the primary and secondary fields.

For plotting purposes, the reduced magnetic field data (as it appears in the data file) are transformed to other formats as required. The following is provided as a description of the various plotting formats used for the display of UTEM data. A plotting format is defined by the choice of the *normalization* and *field type* parameters selected for display.

NORMALIZATION

UTEM results are always expressed as a % of a normalizing field at some point in space.

In **continuously normalized** form the normalizing factor (the denominator) is the magnitude of the computed local primary field vector. As the primary exciting field magnitude diminishes with increasing distance from the transmitter loop the response is continuously amplified as a function of offset from the loop. Although this type of normalization considerably distorts the response shape, it permits anomalies to be easily identified at a wide range of distances from the loop.

Note: An optional form of continuous normalization permits the interpreter to normalize the response to the magnitude of the primary field vector at a fixed depth below each station. This is useful for surface profiles which come very close to the loop. Without this adjustment option, the normalizing field is so strong near the loop that the secondary effects become too small in the presence of such a large primary component. In such circumstances interpretation is difficult, however; by "normalizing at some depth" the size of the normalizing field, near the loop in particular, is reduced and the resulting profile can be more effectively interpreted to a very close distance from the transmitter wire. The usual choice for the depth is the estimated target depth is used.

In **point normalized form** the normalizing factor is the magnitude of the computed primary field vector at a single point in space. When data is presented in this form, the point of normalization is displayed in the title block of the plot. Point normalized profiles show the non-distorted shape of the field profiles. Unfortunately, the very large range in magnitude of anomalies both near and far from the loop means that small anomalies, particularly those far from the loop, may be overlooked on this type of plot in favor of presenting larger amplitude anomalies.

Note: Selecting the correct plot scales is critical to the recognition of conductors over the entire length of a point normalized profile. Point normalized data is often used for interpretation where an analysis of the shape of a specific anomaly is required. Point normalized profiles are therefore plotted selectively as required during interpretation. An exception to this procedure occurs where surface data has been collected entirely inside a transmitter loop. The primary field does not vary greatly inside the loop, therefore, the benefits of continuous normalization are not required in the display of such results. In these cases data is often point normalized to a fixed point near the loop centre.

FIELD TYPE

The type of field may be either the **Total field** or the **Secondary field.** In general, it is the secondary field that is most useful for the recognition and interpretation of discrete conductors.

UTEM Results as Secondary Fields

Because the UTEM system measures during the transmitter on-time the determination of the secondary field requires that an estimate of the primary signal be subtracted from the observations. Two estimates of the primary signal are available:

1) UTEM Channel 1

One estimate of the primary signal is the value of the latest time channel observed by the UTEM System, channel 1. When Channel 1 is subtracted from the UTEM data the resulting data display is termed ***Channel 1 Reduced***. This reduction formula is used in situations where it can be assumed that all responses from any target bodies have decayed away by the latest time channel sampled. The Channel 1 value is then a reasonable estimate of the primary signal present during Channels 2....10.

In practice the ***Channel 1 Reduced*** form is most useful when the secondary response is very small at the latest delay time. In these cases channel 1 is indeed a good estimate of the primary field and using it avoids problems due to geometric errors or transmitter loop current/system sensitivity errors.

2) Calculated primary field

An alternate estimate of the primary field is obtained by computing the primary field from the known locations of the transmitter loop and the receiver stations. When the computed primary field is subtracted from the UTEM data the resulting data display is termed ***Primary Field Reduced*** .

The calculated primary field will be in error if the geometry is in error - mislocation of the survey stations or the loop vertices - or if the transmitter loop current/system sensitivity is in error. Mislocation errors from loop/station geometry may give rise to very large secondary field errors depending on the accuracy of the loop and station location method used. Transmitter loop current/system sensitivity error is rarely greater than 2%. ***Primary Field Reduced*** is plotted in situations where a large Channel 1 response is observed. In this case the assumption that the Channel 1 value is a reasonable estimate of the primary field effect is not valid.

Note: When UTEM data is plotted in the ***Channel 1 Reduced*** form the secondary field data for Channel 1 itself are always presented in ***Primary Field Reduced*** form and are plotted on a separate axis. This plotting format serves to show any long time-constant responses, magnetostatic anomalies and/or geometric errors present in the data.

Mathematical Formulations

In the following expressions:

$\mathbf{Rn_j}$ is the result plotted for the n^{th} UTEM channel,

$\mathbf{R1_j}$ is the result plotted for the latest-time UTEM channel, channel 1,

$\mathbf{Chn_j}$ is the raw component sensor value for the n^{th} channel at station j,

$\mathbf{Ch1_j}$ is the raw component sensor value for channel 1 at station j,

$\mathbf{H^P{}_j}$ is the computed primary field component in the sensor direction

$|\mathbf{H^P}|$ is the magnitude of the computed primary field at:

- a fixed station for the entire line (point normalized data)
- the local station of observation (continuously normalized data)
- a fixed depth below the station (continuously normalized at a depth).

Channel 1 Reduced Secondary Fields : Here, the latest time channel, Channel 1 is used as an "estimate" of the primary signal and channels 2-10 are expressed as:

$$Rn_j = (Chn_j - Ch1_j) / |H^P| \quad x\ 100\%$$

Channel 1 itself is reduced by subtracting a calculation of the primary field observed in the direction of the coil, H^P as follows:

$$R1_j = (Ch1_j - H^P{}_j) / |H^P| \quad x\ 100\%$$

Primary Field Reduced Secondary Fields : In this form all channels are reduced according to the equation used for channel 1 above:

$$Rn_j = (Chn_j - H^P{}_j) / |H^P| \quad x\ 100\%$$

This type of reduction is most often used in cases where very good geometric control is available (leading to low error in the calculated primary field, $H^P{}_j$) and where very slowly decaying responses result in significant secondary field effects remaining in channel 1 observations.

UTEM Results as a Total Field

In certain cases results are presented as a % of the **Total Field**. This display is particularly useful, in borehole surveys where the probe may actually pass through a very good conductor. In these cases the shielding effect of the conductor will cause the observed (total) field to become very small below the intersection point. This nullification due to shielding effects on the total field is much easier to see on a separate ***Total Field*** plot. In cases where the amplitude of the anomalies relative to the primary field is small, suggesting the presence of poorly conductive bodies, the ***Total Field*** plot is less useful.

The data contained in the UTEM reduced data files is in ***Total Field,*** continuously normalized form if:

$$Rn_j = Chn_j / |H^P| \quad x\ 100\%$$

DATA PRESENTATION

All UTEM survey results are presented as profiles in an Appendix of this report. For BHUTEM surveys the requisite Vectorplots, presented as plan and section views showing the direction and magnitude of the calculated primary field vectors for each transmitter loop, are presented in a separate Appendix.

The symbols used to identify the channels on all plots as well as the mean delay time for each channel is shown in the table below.

UTEM System Mean Delay Times
10 Channel Mode @ 31 hz.(approx.)
(base freq: 30.974 hertz)

Channel #	Delay time (ms)	Plot Symbol
1	12.11	|
2	6.053	\
3	3.027	/
4	1.513	□
5	0.757	Σ
6	0.378	∠
7	0.189	7
8	0.095	X
9	0.047	Δ
10	0.024	◇

Notes on Standard plotting formats:

10 channel data in *Channel 1 Reduced* form - The data are usually displayed on three separate axes. This permits scale expansion, allowing for accurate determination of signal decay rates. The standard configuration is:

Bottom axis - Channel 1 (latest time) is plotted alone in ***Primary Field Reduced*** form using the same scale as the center axis.

Center axis - The intermediate to late time channels, ch5 to ch2 are plotted on the center axis using a suitable scale.

Top axis - The early time channels, ch10 to ch6 and a repeat of ch5 for comparison are plotted on the top axis at a reduced scale. The earliest channels, ch8 to ch10, may not be plotted to avoid clutter.

earliest channels, ch8 to ch10, may not be plotted to avoid clutter.

10 channel data in ***Primary Field Reduced*** form: The data are displayed using a single axis plot format. Secondary effects are plotted using a Y axis on each data plot with peak to peak values up to 200%.

BHUTEM data plotted as total field profiles: Data are expressed directly as a percentage of the ***Total Field*** value. The Y axis on each single axis data plot shows peak values of up to 100%. These departures are always relative to the measured total field value at the observation station.

BHUTEM data plotted as secondary field profiles: Check the title block of the plot to determine if the data is in ***Channel 1 Reduced*** form or in ***Primary Field Reduced*** form.

Note that on all BHUTEM plots the ratio between the axial component of the primary field of the loop and the magnitude of the total primary field strength **(dc)** is plotted as a profile without symbols. In UTEM jargon this is referred to as the "primary field" and it is plotted for use as a polarity reference tool.

Appendix D

Note on sources of anomalous Ch1

<u>Note on sources of anomalous Ch1</u>

This section outlines the possible sources of anomalous channel 1 which is not correlated to the Ch2-10 data plotted on the upper axes of a *channel 1 normalized* plot.

1) **Mislocation of the transmitter loop and/or survey stations**

Mislocating the transmitter loop and/or the survey stations results in an error in the calculated primary field at the station and appears as an anomalous Ch1 value not correlated to *channel 1 normalized* Ch2-10. The effect is amplified near the loop front. This can be seen in the profiles - the error in Ch1 generally increases approaching the loop. As a rule a 1% error in measurement of the distance from the loop will result in, for outside the loop surveys, an error in Ch1 of:

- 1% near the loop front (long-wire field varies as $1/r$)
- 3% at a distance from the loop front (dipolar field varies as $1/r^3$)
- 2% at intermediate distances (intermediate field varies as $\sim 1/r^2$)

Errors in elevation result in smaller errors but as they often affect the chainage they accumulate along the line.

The in-loop survey configuration generally diminishes geometric error since the field gradients are very low. At the centre of the loop the gradient in the vertical field is essentially zero so it is difficult to introduce geometric anomalies near the loop centre. Near the loop sides and at the closest approach of the lines to the wire mislocation of the loop and the station becomes more critical. Typically loop sides are designed to be >200m from any survey stations.

2) **Magnetostatic UTEM responses**

Magnetostatic UTEM responses arise over rocks which generate magnetic anomalies. Such magnetic materials will amplify the total (primary + secondary) field of the UTEM transmitter which is sensed by the receiver coil. The secondary field is generated by subtracting a computed primary which does not include magnetic effects. This can give rise to strong and abrupt channel 1 anomalies when the source of the magnetics is at surface. This is the case in a number of places on these grids. UTEM magnetostatic anomalies differ from DC magnetic anomalies in the following three major ways:

1) In the case of DC magnetics the field is dipping N and is very uniform over the scale of the survey area while the UTEM field inside the loop is vertical and it is stronger near the loop edges.
2) Most aeromagnetics are collected as total field while with UTEM we

measure a given (in this case the z) component.

3)DC magnetic instruments observe the total magnetization of the causative body which is due to its susceptibility as well as any remnant magnetization. An AC method such as UTEM will not respond to the remnant portion of the magnetization.

The larger amplitude of the UTEM Ch1 response is explained by the fact that the UTEM primary field is often more favourably coupled (magnetostatically speaking) to magnetic mineralization as compared to the earths field. Another factor could be the presence of a reverse remnant component to the magnetization.
Note that positive (*negative*) magnetic anomalies will cause:
- positive (*negative*) Ch1 anomalies in data collected outside the loop
- negative (*positive*) Ch1 anomalies in data collected inside the loop

3) **Extremely good conductors**

An extremely good conductor will be characterized by a time constant much longer than the half-period (@ 30Hz >>16ms). This will give rise to an anomalous Ch1 which is not correlated to the Ch2-10 data plotted on the upper axes of a *channel 1 normalized* plot.

Appendix E

Qualifications Statement

LAMONTAGNE GEOPHYSICS LTD
GEOPHYSIQUE LTEE

Qualifications Statement

I, **Robert John Langridge** of 1-162 King Street East, Kingston, Ontario certify that:

1) I am a graduate of Queen's University
   Degree: B.Sc.(Hons) Geology and Physics received 1978.

2) I am a graduate of the University if Toronto
   Degree: M.Sc. Physics received 1982.

3) I have been practicing as a geophysicist since 1976.

4) I have no direct interest in the companies, leases or securities of Dave Meunier

5) This report was prepared by me and is based on field work done by:
   Lamontagne Geophysics Ltd.
   115 Grant Timmins Drive, Kingston, Ontario, Canada K7M8N3

2000.04.19
Date

Robert Langridge,M.Sc.,PGeo.
Senior Associate
Lamontagne Geophysics Ltd.

115 GRANT TIMMINS DRIVE, KINGSTON, ONTARIO K7L4V4 CANADA
TEL. (613) 531-9950 • FAX (613) 531-8987

ONTARIO MINISTRY OF NORTHERN DEVELOPMENT AND MINES

Work Report Summary

Transaction No:	W0160.00136	**Status:**	APPROVED
Recording Date:	2001-APR-09	**Work Done from:**	2000-MAR-24
Approval Date:	2001-AUG-15	**to:**	2000-APR-01

Client(s):

169976 MEUNIER, DAVID

Survey Type(s):

EM LC

Work Report Details:

Claim#	Perform	Perform Approve	Applied	Applied Approve	Assign	Assign Approve	Reserve	Reserve Approve	Due Date
P 1219080	$3,894	$3,894	$0	$0	$0	0	$3,894	$3,894	2002-APR-09
P 1219081	$5,389	$5,389	$0	$0	$0	0	$5,389	$5,389	2002-APR-09
	$9,283	$9,283	$0	$0	$0	$0	$9,283	$9,283	

External Credits: $0

Reserve:

$9,283 Reserve of Work Report#: W0160.00136

$9,283 Total Remaining

Status of claim is based on information currently on record.

42A10NW2005 2.21039 900

Ministry of
Northern Development
and Mines

Ministère du
Développement du Nord
et des Mines

Ontario

Date: 2001-AUG-16

GEOSCIENCE ASSESSMENT OFFICE
933 RAMSEY LAKE ROAD, 6th FLOOR
SUDBURY, ONTARIO
P3E 6B5

Tel: (888) 415-9845
Fax:(877) 670-1555

DAVID MEUNIER
P.O. BOX 1624
403 DOME STREET
SOUTH PORCUPINE, ONTARIO
P0N 1H0 CANADA

Submission Number: 2.21039
Transaction Number(s): W0160.00136

Dear Sir or Madam

Subject: Approval of Assessment Work

We have approved your Assessment Work Submission with the above noted Transaction Number(s). The attached Work Report Summary indicates the results of the approval.

At the discretion of the Ministry, the assessment work performed on the mining lands noted in this work report may be subject to inspection and/or investigation at any time.

The revisions outlined in the Notice dated June 29, 2001 have been corrected. Accordingly, assessment work credit has been approved as outlined on the Declaration of Assessment Work Form accompanying this submission.

If you have any question regarding this correspondence, please contact BRUCE GATES by email at bruce.gates@ndm.gov.on.ca or by phone at (705) 670-5856.

Yours Sincerely,

Ron Gashinski
Supervisor, Geoscience Assessment Office

Cc: Resident Geologist

David Meunier
(Claim Holder)

Assessment File Library

David Meunier
(Assessment Office)

MINING LAND TENURE MAP

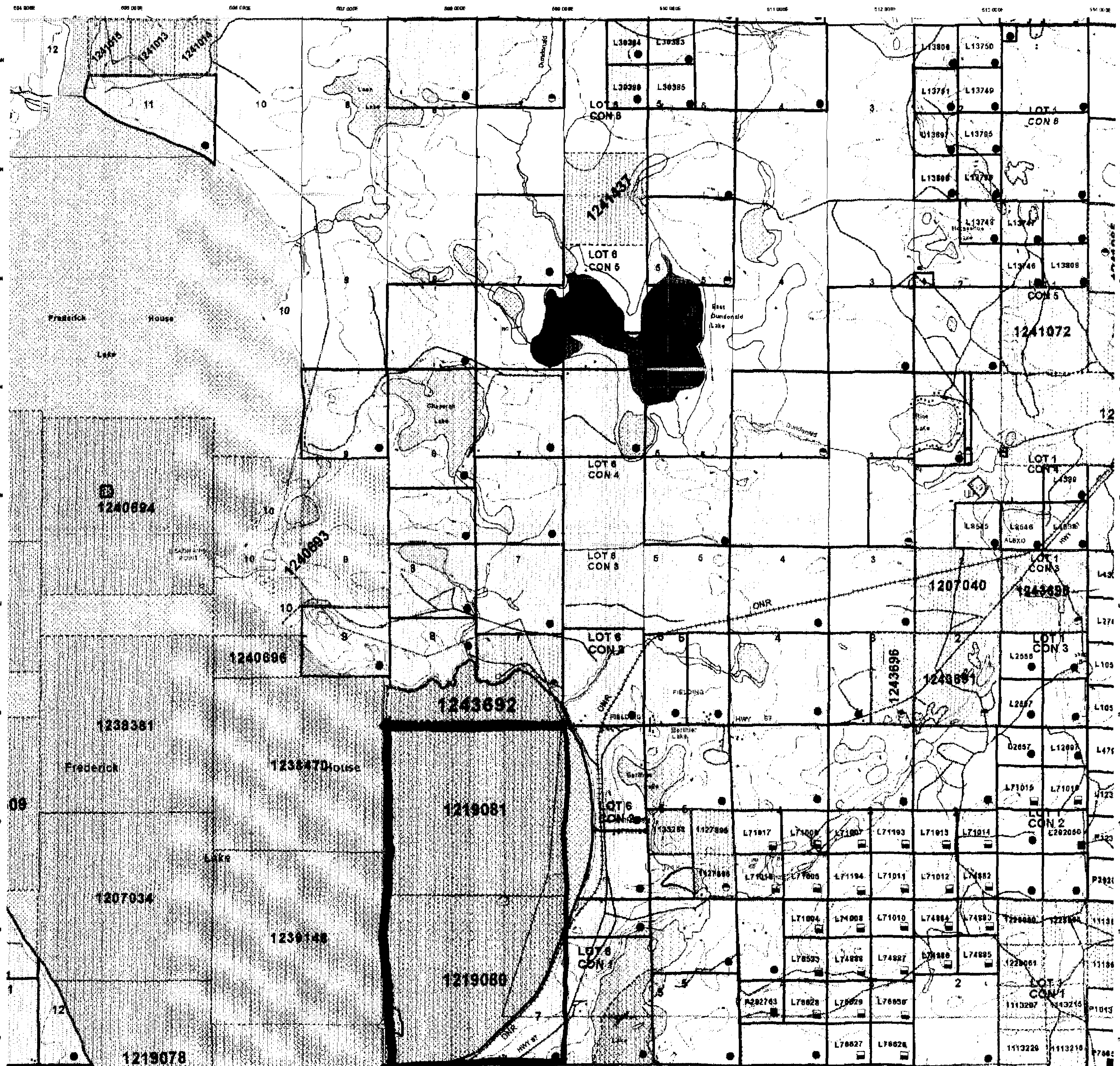
Date / Time of Issue Mar 23 2001 11:03h Eastern

TOWNSHIP / AREA: DUNDONALD

PLAN: G-3240

ADMINISTRATIVE DISTRICTS / DIVISIONS

Mining Division	Porcupine
Land Titles/Registry Division	COCHRANE
Ministry of Natural Resources District	COCHRANE



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EM

TOPOGRAPHIC

LAND TENURE

LAND TENURE WITHDRAWALS

IMPORTANT NOTICES

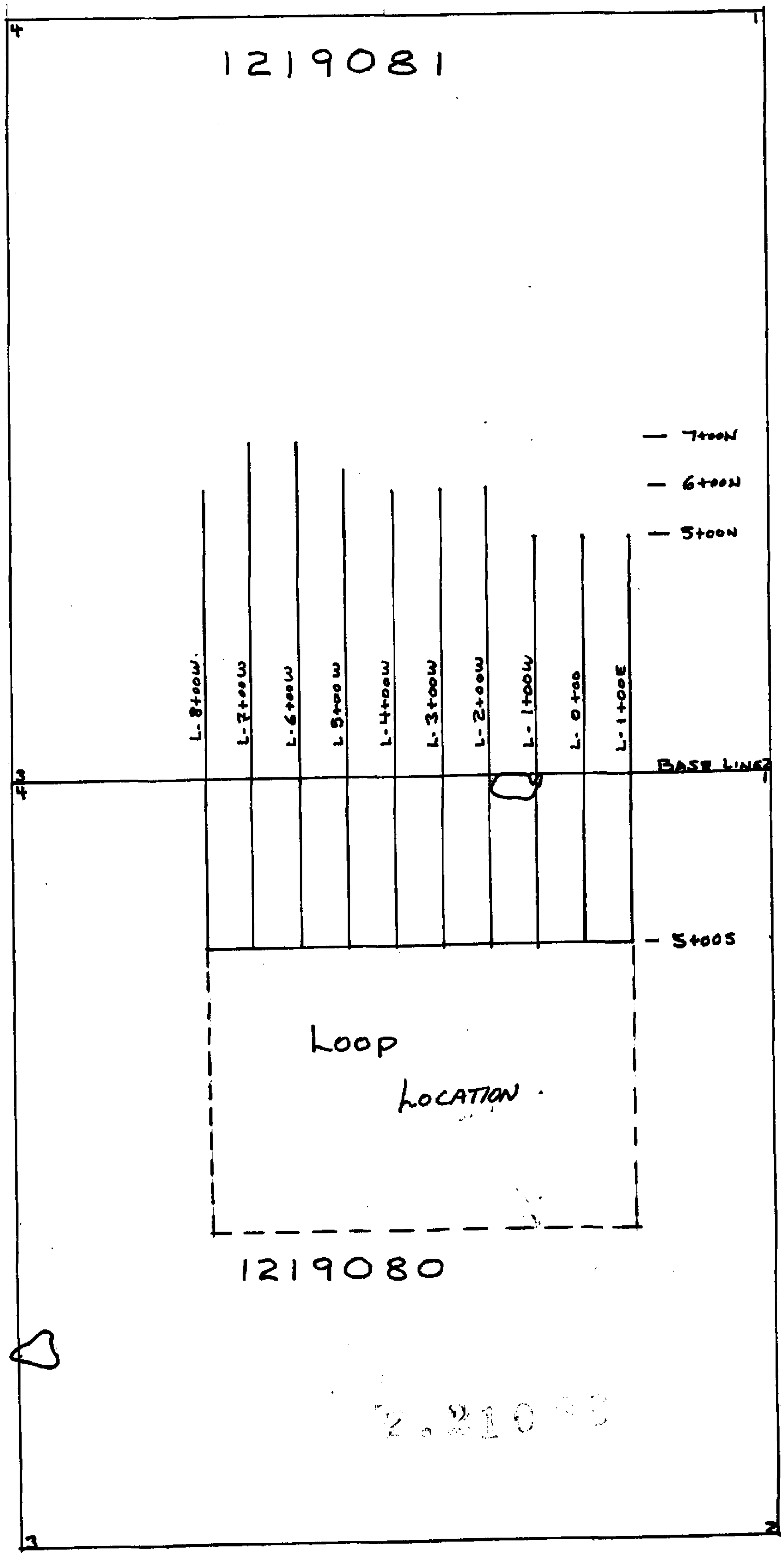
LAND TENURE WITHDRAWAL DESCRIPTIONS

IMPORTANT NOTICES

General Information and Limitations

42A10NW2005 2.21039 200

U.T.E.M GRID ON FREDERICK HOUSE LAKE DUNDONALD TOWNSHIP



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