UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

# Magnetometric Resistivity Survey Near Hatch Point

# and Lockhart Basin, San Juan County, Utah

by

David V. Fitterman

Open-File Report 82-400

Contents

## Figures

## Introduction

This report describes the results of two magnetometric resistivity surveys conducted at Hatch Point and Lockhart Basin, San Juan County, Utah. These locations are near a proposed nuclear-waste disposal site at Gibson Dome. The surveys were conducted to evaluate the potential of this method for locating faults. The first site was chosen because it lies on the extension of a known fault, which is hidden by more recent geologic deposits. The second site was selected because of the possibility of the existence of unmapped faults. Thus it posed a reasonable test of the value of the method.

## Description of Method

The magnetometric resistivity (MMR) method consists of injecting current of a known magnitude and frequency into the ground, and recording the resulting magnetic fields. The magnetic fields recorded will be produced by three sources: (1) the current in the wire between the two electrodes, (2) the effect of the ground surface, and (3) the effect of any conductivity boundaries in the ground. The first two sources represent corrections which must be made to the data, whereas the third source produces anomalous fields if conductivity boundaries are present. Discussions of the method can be found in several papers including Edwards (1974), Edwards and Howell (1976), Edwards et al. (1978), and Gomez-Trevino and Edwards (1979).

In general, the magnitude of the anomalous magnetic field is proportional to the conductivity reflection coefficient $k_{ij} = (\sigma_j - \sigma_i)/(\sigma_j + \sigma_i)$ across conductivity boundaries and the current flowing parallel to the conductivity boundary, and inversely proportional to the distance from the conductivity boundary where $\sigma$ is the conductivity. In view of these considerations, one tries to locate the two current electrodes on strike with the presumed conductivity boundary or fault.

The depth of investigation of the MMR method is controlled by the distance between the current electrodes and the conductivity structure of the ground. A very crude estimate of the depth of investigation is about one-third the distance between the current electrodes. When the conductivity structure has no natural scale, as in the case of a vertical contact, the width of the anomaly is controlled by the electrode separation. However, if the conductivity structure contains a feature of finite width, such as a vertical dike, the anomaly width is controlled by the width of the feature.

Figure 1 shows a typical field geometry. Current is transmitted between two electrodes connected by a wire. The wire is placed to the side of the measurement area to help minimize its effect. All measurement points are described in terms of an electrode-centered, right-hand coordinate system. For comparison purposes, the measured magnetic anomalies ($B_m$) are normalized by the transmitted current (I). The normalized fields are noted by lower case letters. From the geometry of the transmitter wire and the orientation of the measurement plane, the normalized primary field $b_p$ is computed. The difference between the normalized measured and normalized primary fields gives the normalized anomalous or secondary field ($b_s = b_m - b_p$). These three quantities are computed for all three field components. The percentage MMR anomaly is computed for each observation point as follows:

$$\%MMR_i = \frac{b_{si}\ (x,\ y,\ z)}{b_{py}\ (x,\ o,\ z_p)} \times 100\%$$

where i is the field component, (x, y, z) is the observation point coordinates, and (x, o, $z_p$) is the projection of the observation point onto the line between the current source and sink (in a least squares sense). The observation point plane is determined by fitting a plane to the surveyed

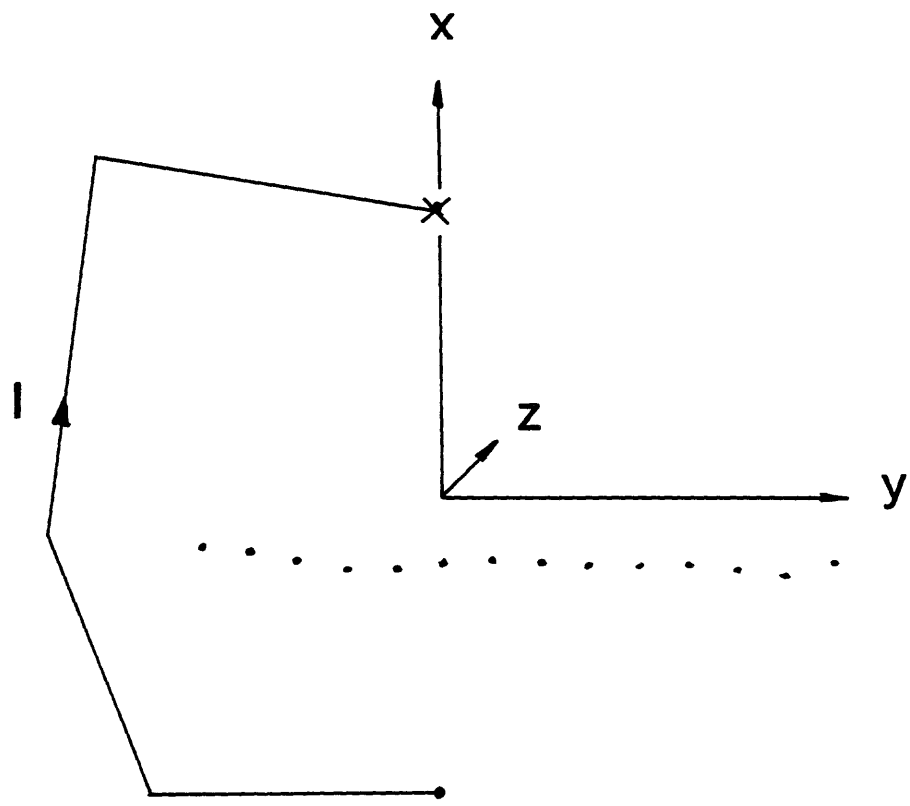



Figure 1. Electrode centered, right-hand coordinate geometry. Current flows in the wire in the direction shown by the arrow, entering the ground along the +x-axis. The dots represent a typical measurement traverse.

Figure 1

observation points and the end points of the transmitter wire segments. This normalization provides an easy way of comparing measured anomalies with computed anomalies. The data are then presented as traverses in the y-direction.

Estimates of conductivity contrasts and conductive zone width for the case of vertical contacts and vertical dikes can be made using published interpretation curves (Edwards et al., 1978). While this technique is not as good as a forward modelling and anomaly matching technique, it is considered to be the most appropriate technique for a preliminary interpretation. This type of procedure was used to make the interpretations presented in this report.

## Equipment

A block diagram of the field equipment used is shown in Figure 2. A motor generator provides power to a Geotronix EMT-5000 resistivity transmitter. The frequency of the transmitter (1 hz) is controlled by the TX box by means of a crystal oscillator which is synchronized with another oscillator in the RX box. The transmitter provides current to the electrodes through a shunt resistor which is monitored by the TX to obtain the transmitter current.

A S.H.E. Corp. Model 330 SQUID magnetometer was used to measure the magnetic field. The appropriate component is selected, filtered (Ithaco Model 4211 filter) and amplified, before being detected by the RX. The RX determines the inphase and quadrature components of the signal. Corrections are applied to the data for the transfer function of each instrument. The signals are predominantly inphase at 1.0 Hz unless the signals are close to the noise level at which point the phase is quite variable.

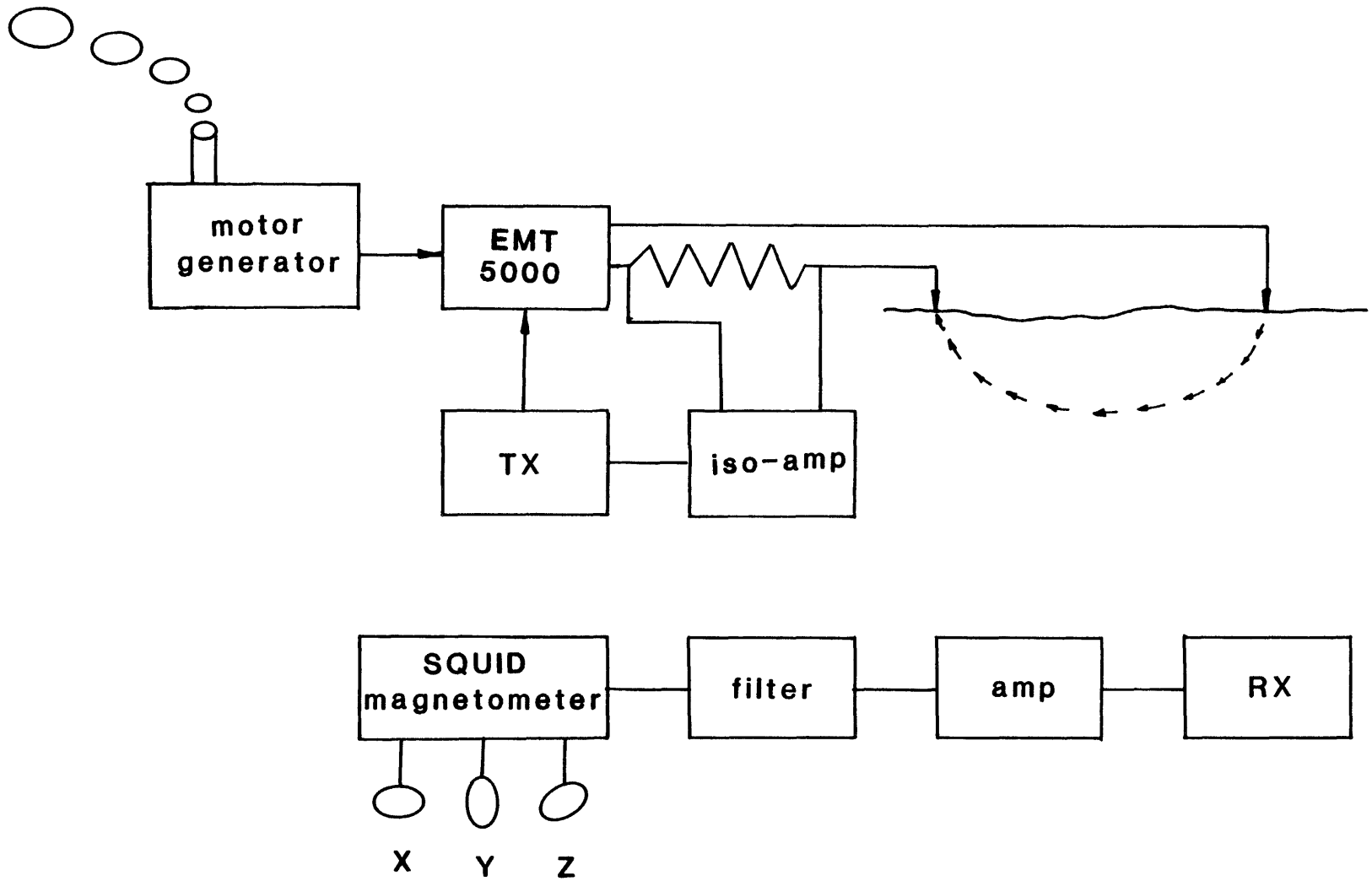



Figure 2. Measurement system block diagram.

Figure 2

## Hatch Point Results

The location of the Hatch Point survey data is shown in Figure 3. The transmitter wire was located so that the current electrodes were close to the projection of the mapped fault which runs through section 34. In section 34, the fault separates the Kayenta Formation, which lies to the northwest, from the Navajo Sandstone, which lies to the southeast (Hinrichs et al., 1968). In section 33 the fault is covered by eolian and alluvial deposits, but is inferred to continue under the survey area.

Two lines called HP-2 and HP-3 were surveyed using the same transmitter wire location. These lines are roughly parallel to each other. Figure 4 shows the results for line HP-2. There is a separate plot for each field component. The normalized primary (P), measured (M), and secondary (S) fields are shown as functions of y. The MMR anomaly (%) is also shown. The vertical scale for the primary and measured fields are the same, while the secondary field scale is to the left and the MMR anomaly scale is to the right. The minimum and maximum values for the scales are displayed. The squares refer to the left-hand scale, and the x's refer to the right-hand scale.

The data are characterized by a peak in the MMR z-component anomaly and a transitional anomaly in the x- and y-components. This behavior is a little clearer in the HP-3 line (Figure 5). This type of anomaly is typical of a contact between materials of different conductivity.

For example, let us assume that there is a contact between two quarter spaces of different resistivities and that there is a current flow in the direction of the contact (Figure 6). If the material in region 1 is less resistive than in region 2, then there will be an excess of current flowing in region 1 and a deficiency of a current in region 2, in comparison to the case

Figure 3. Hatch Point location map taken from U.S. Geological Survey Map I-526 (northeast quarter of Hatch Point quadrangle, San Juan County, Utah). Shown are the measurement coordinate system and the location of the measurement points.

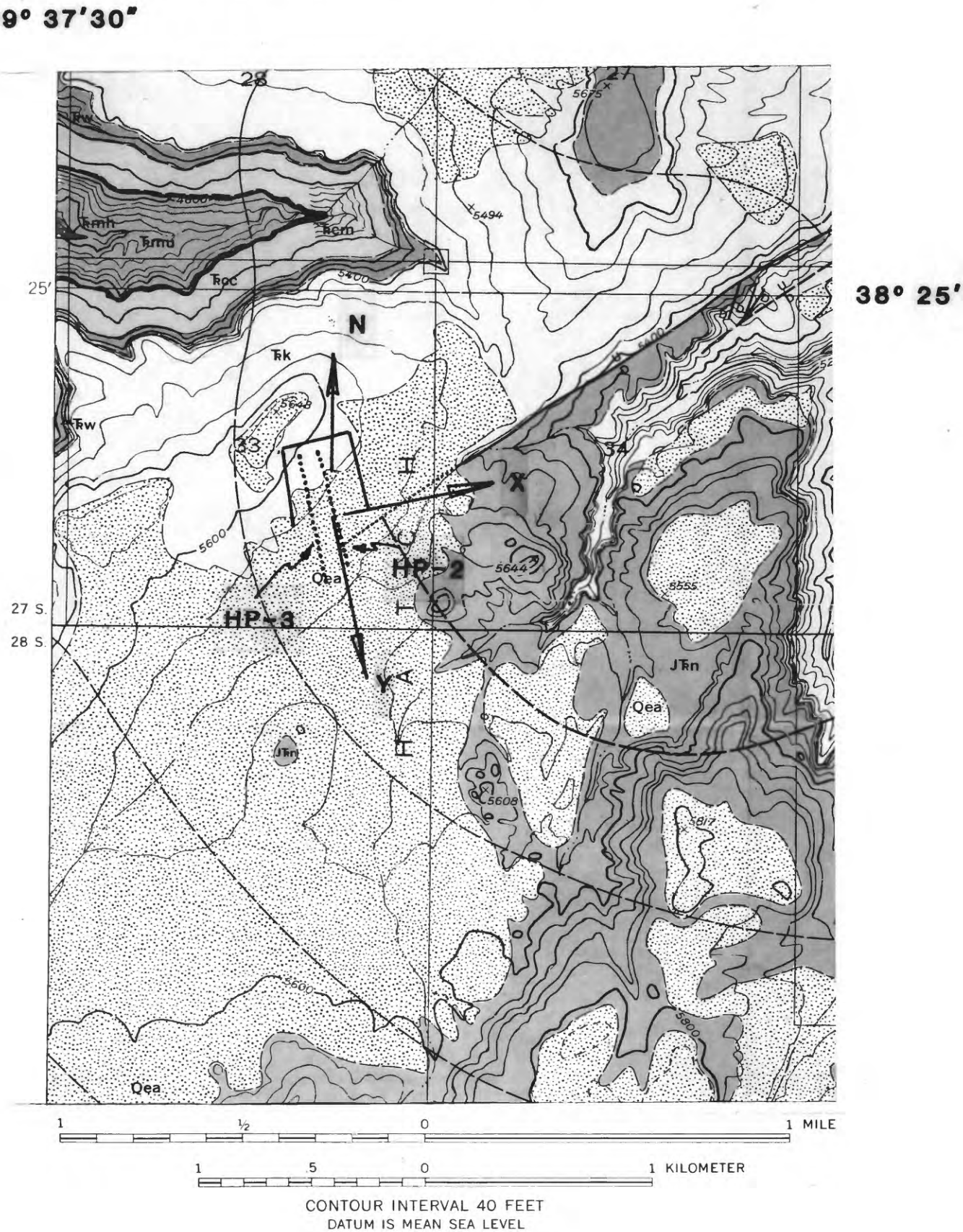
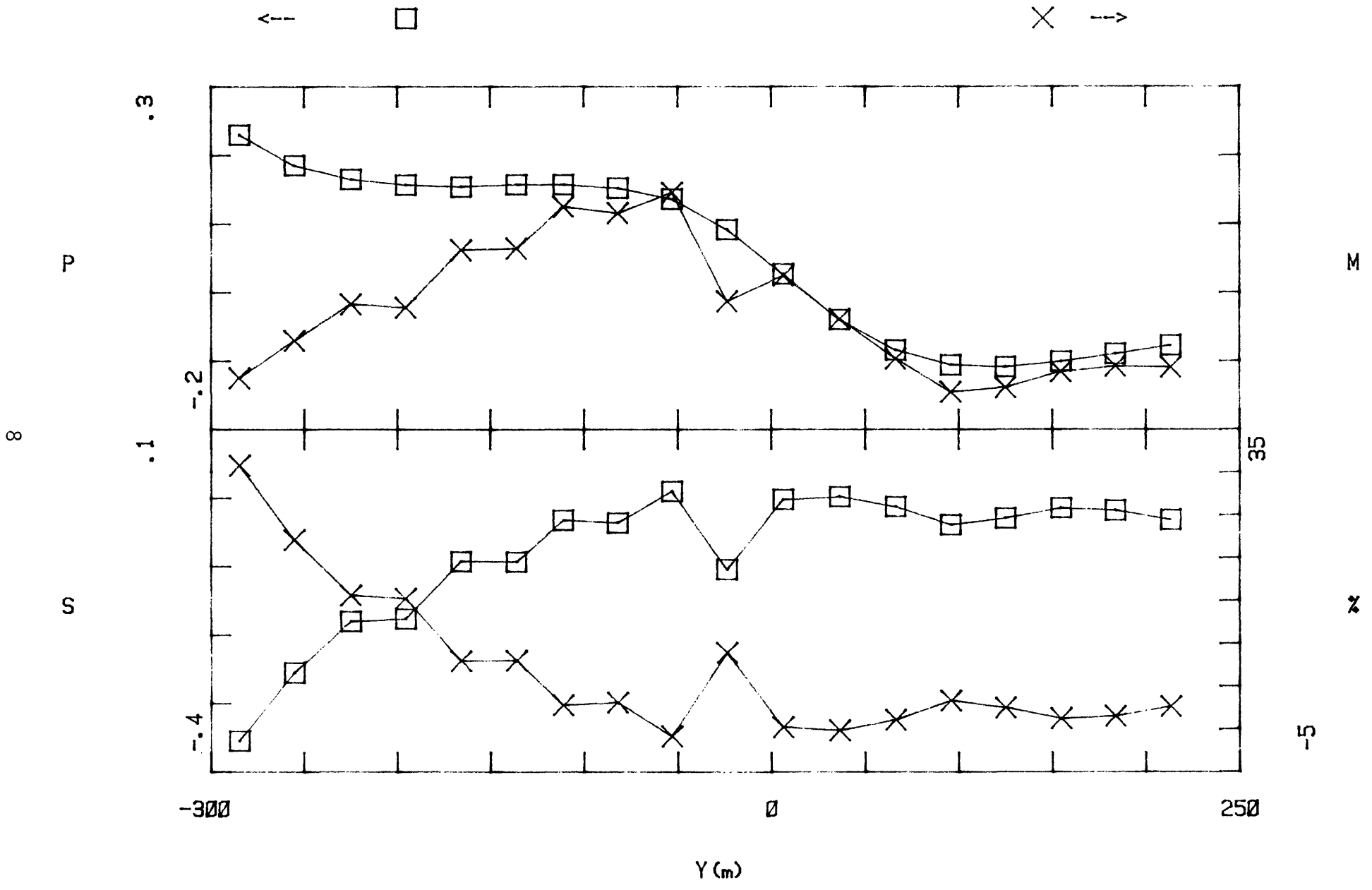
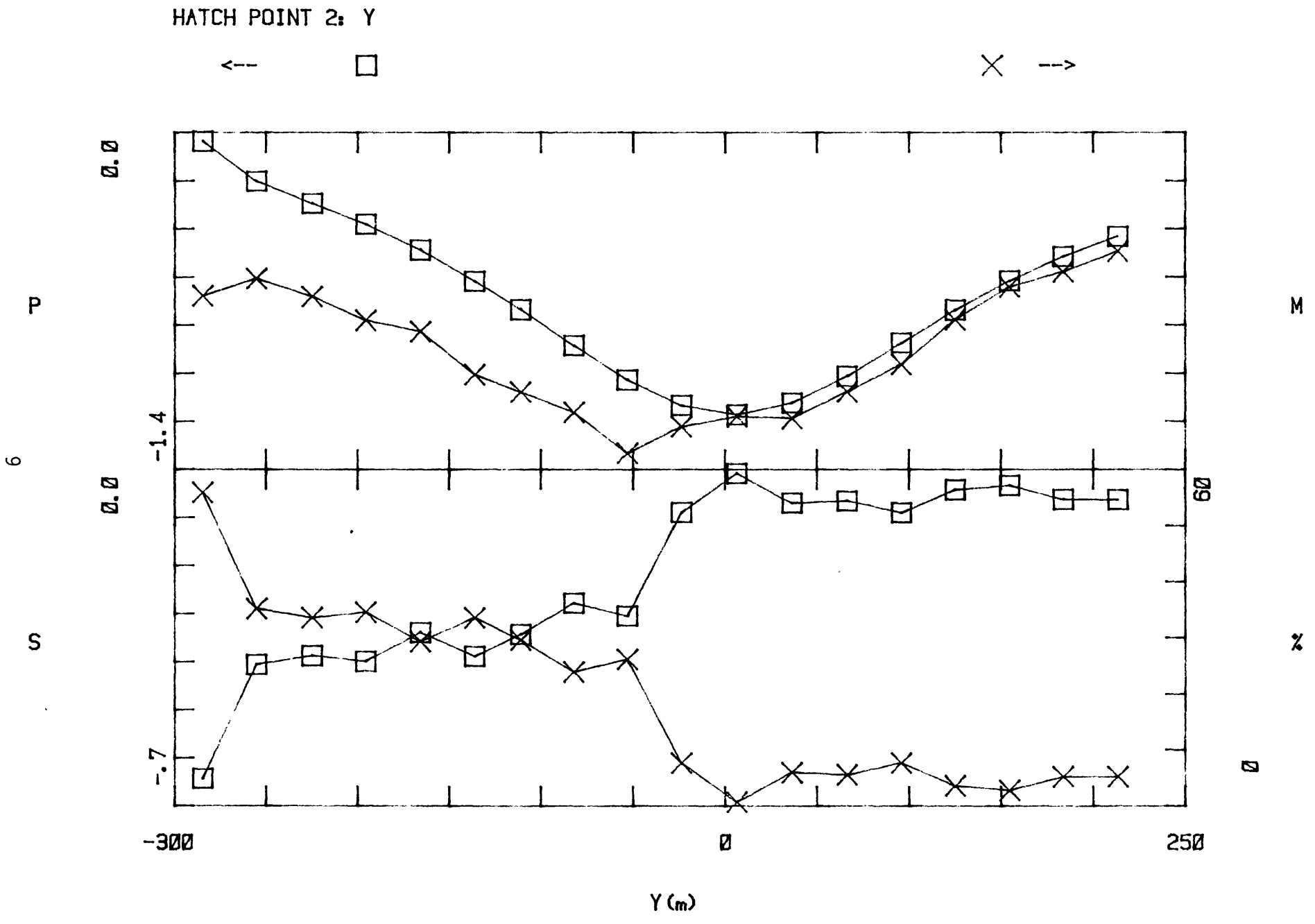


Figure 4. Hatch Point 2 MMR data. The upper plot shows the normalized primary (P) and normalized measured (M) fields. The scales are the same for both curves. The lower plot shows the normalized secondary field (S) to the left, and the MMR anomaly (%) to the right. Data are plotted as a function of y-coordinate. The squares refer to the left-hand scales, while the X's refer to the right-hand scales.




HATCH POINT 2: Y
<---
-->
P
S
M
%
0.0
-1.4
0.0
-.7
60
0
-300
0
250
Y (m)

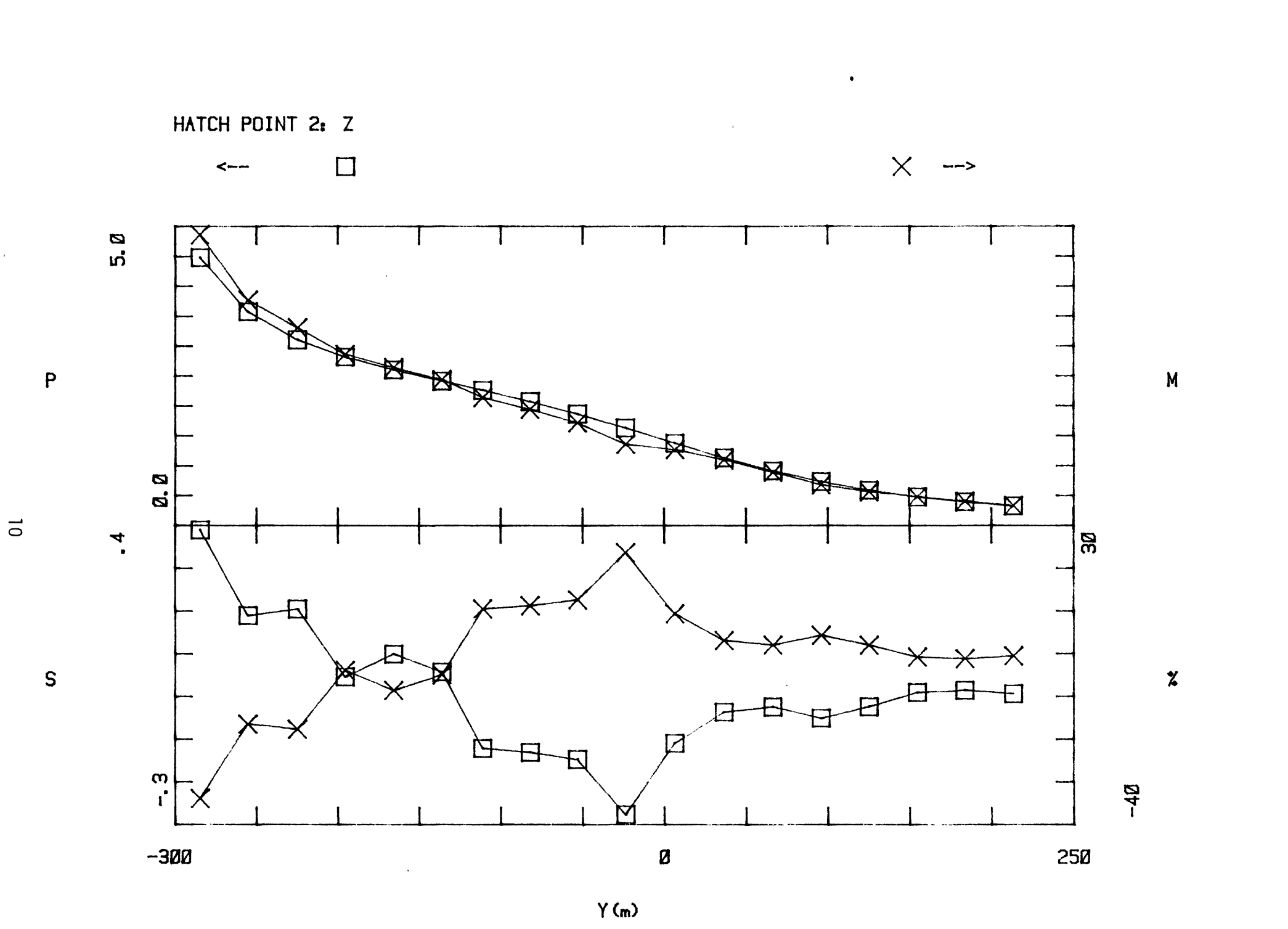
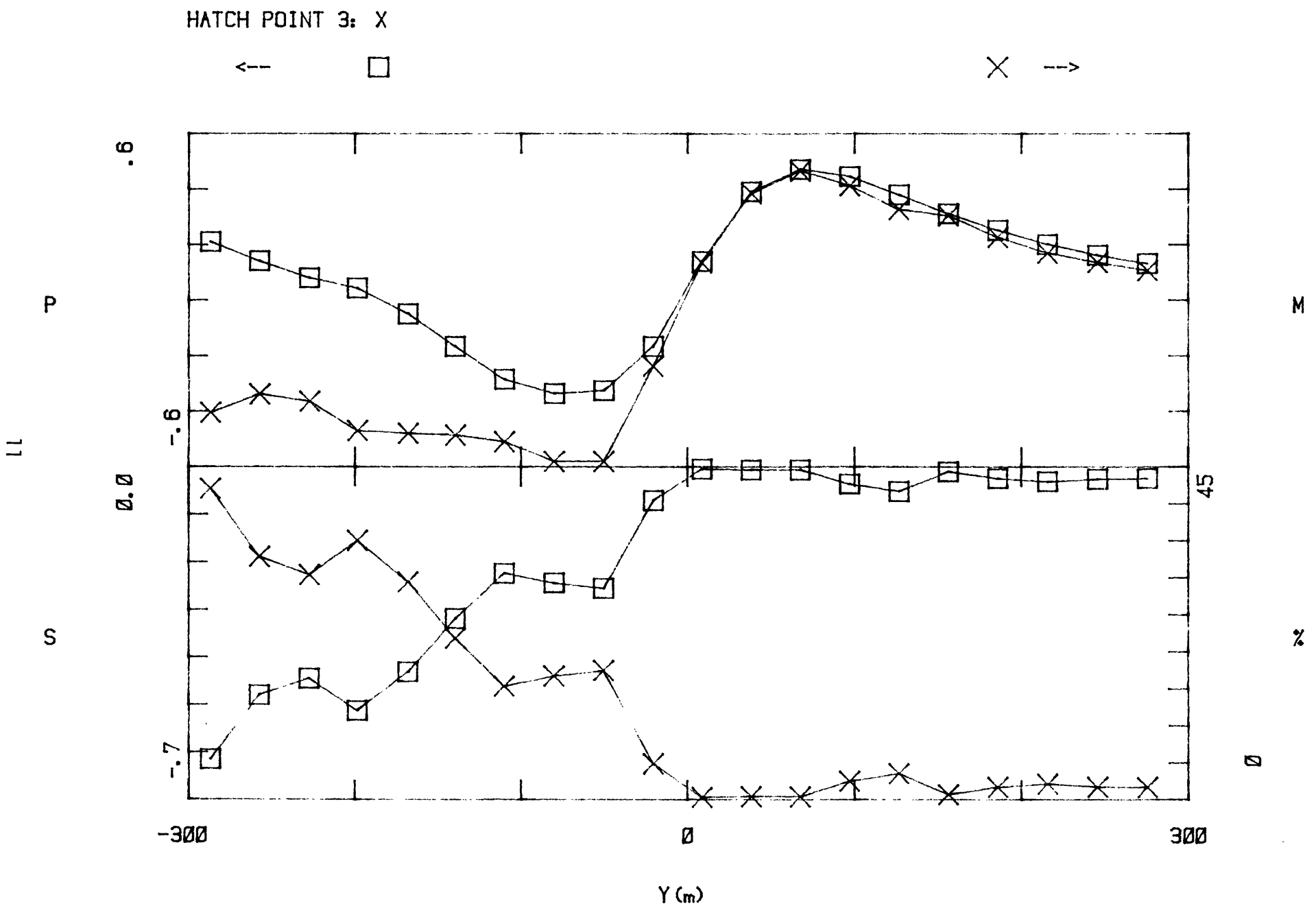
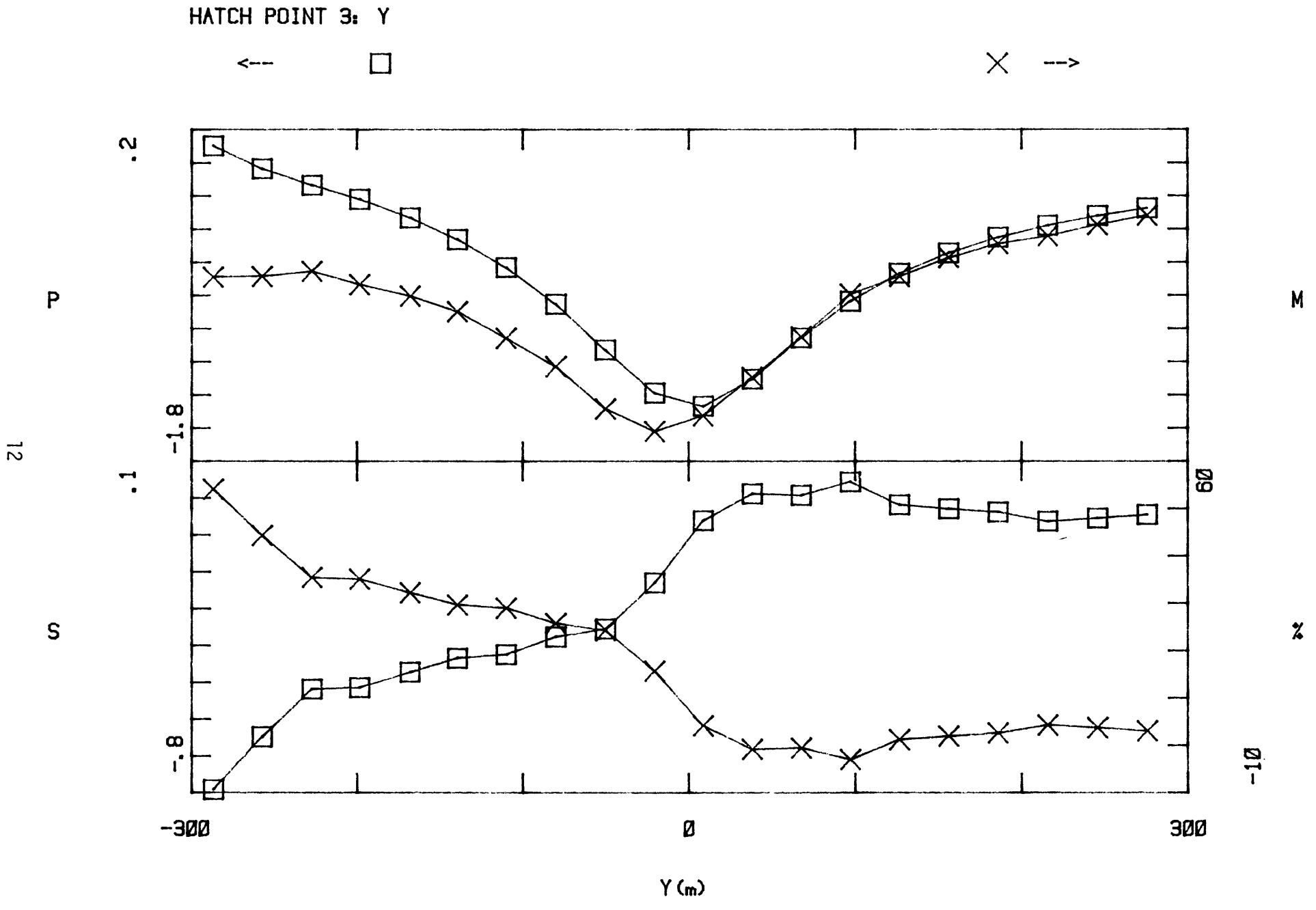
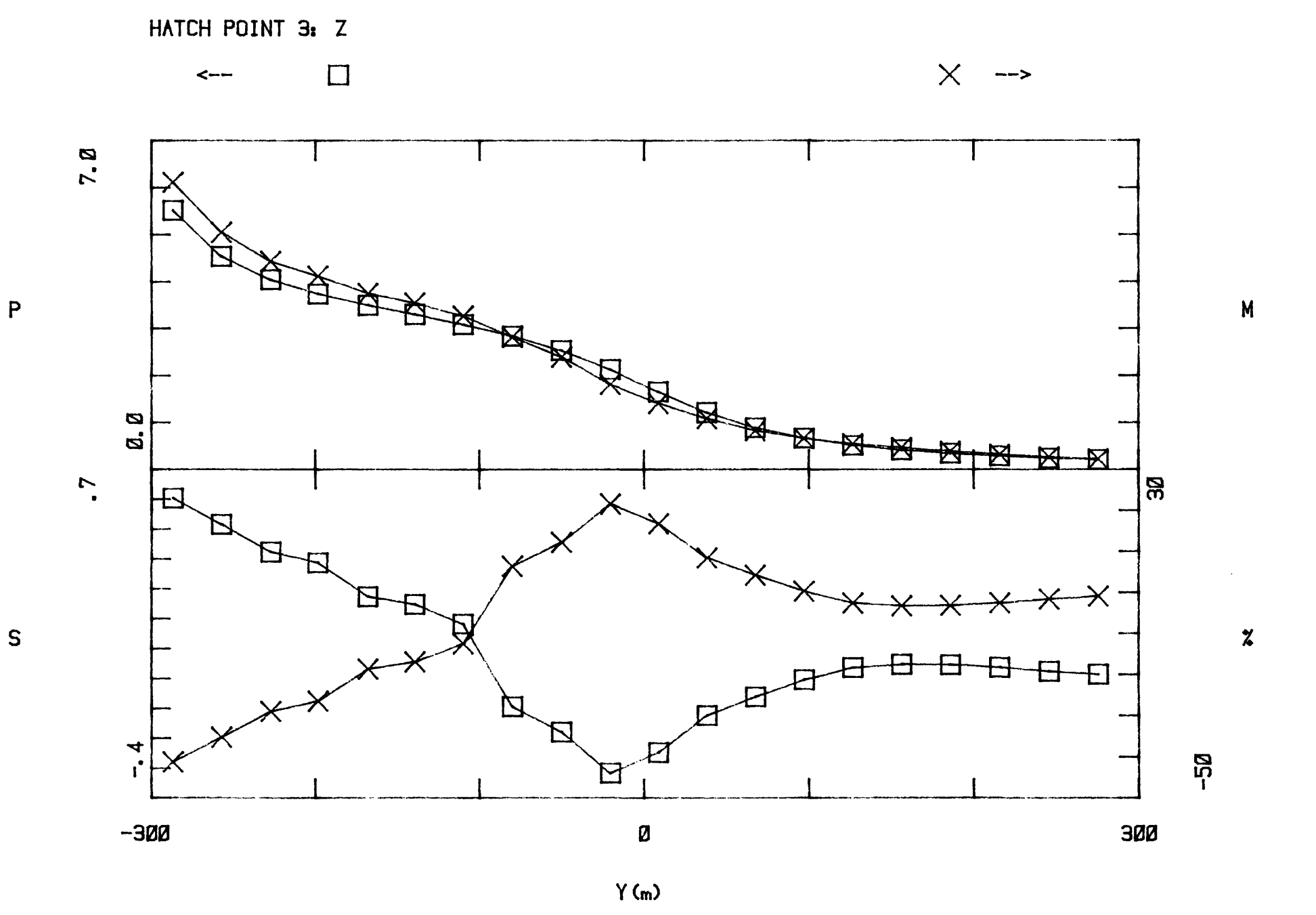

HATCH POINT 2: Z
<--
-->
5.0
0.0
.4
-.3
P
S
M
30
-40
%
-300
0
250
Y (m)

Figure 5. Hatch Point 3 MMR data. See Figure 4 for a description of the plots.




HATCH POINT 3: Y
<---
-->
.2
.1
-1.8
-.8
P
S
M
%
60
-10
-300
0
300
Y (m)


HATCH POINT 3: Z
<---
-->
7.0
0.0
.7
-.4
P
S
M
%
30
-50
-300
0
300
Y (m)

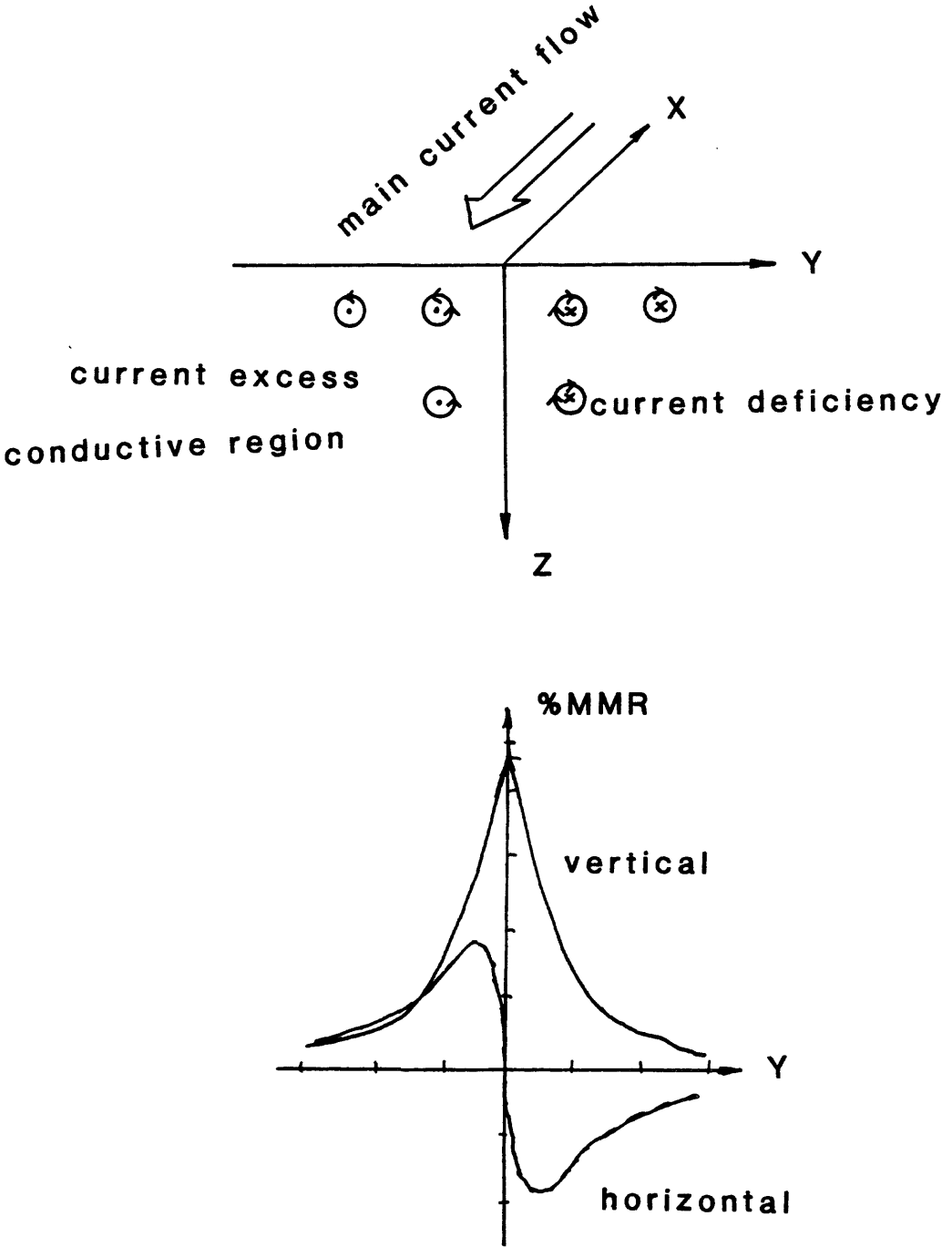



Figure 6 . Schematic representation of MMR anomaly for a vertical contact



6

of a homogeneous half-space. We only need to look at the anomalous currents, which flow in opposite directions along the contact. Applying the right hand rule, we see there is a symmetric negative component of vertical magnetic field produced. (z is positive downward.) Similarly an anti-symmetric component of tangential field is produced. Because the primary y-field produced by the current source and sink is negative between the source and the sink, the sign of the MMR anomaly is reversed. While the noise in the measured values is such that the anomaly is not as clear as the theoretical curves, it is still clear that there is a resistivity boundary present, with more resistive material lying to the southeast (Navajo sandstone). From the maximum vertical MMR anomaly (f25%) the conductivity contrast can be estimated to be about 1.6. Schlumberger soundings near this fault confirmed this finding (R. D. Watts, U.S. Geological Survey; oral communication, 1981). Apparent resistivities out to an AB/2 of about 100 m were higher to the southeast of the fault by a factor of 1.5.

## Lockhart Basin Results

Two profiles were made in Lockhart Basin at two different locations, but within a zone where numerous faults or inferred faults are found (Figure 7) (Hinrichs et al., 1971). The results for traverse LB-1 are shown in Figure 8. They are characterized by a symmetric anomaly in the horizontal components and an antisymmetric anomaly in the vertical component -- the reverse of the Hatch Point data. This situation could be produced by a conductive dike (see Figure 9). There is an excess of current in the dike, and a deficiency of current in the adjacent material. This produces vertical field anomalies over the edges of the dike and a horizontal field anomaly over the dike. Geologically the dike situation would be produced by more conductive material

Figure 7. Lockhart Basin location map taken from U.S. Geological Survey Map I-670 (southwest quarter of Hatch Point quadrangle, San Juan County, Utah). Shown are measurement coordinate system and the location of the measurement points.

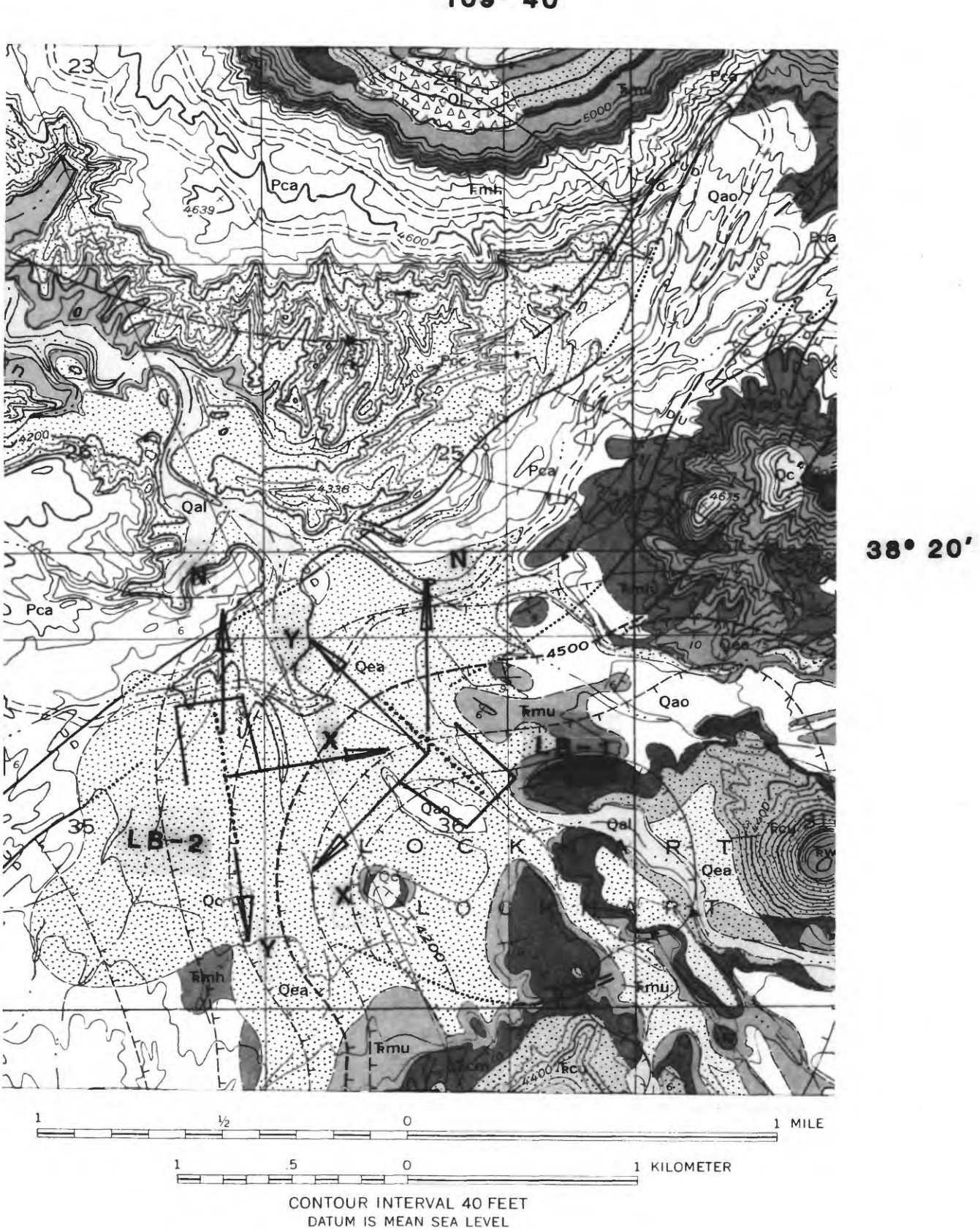
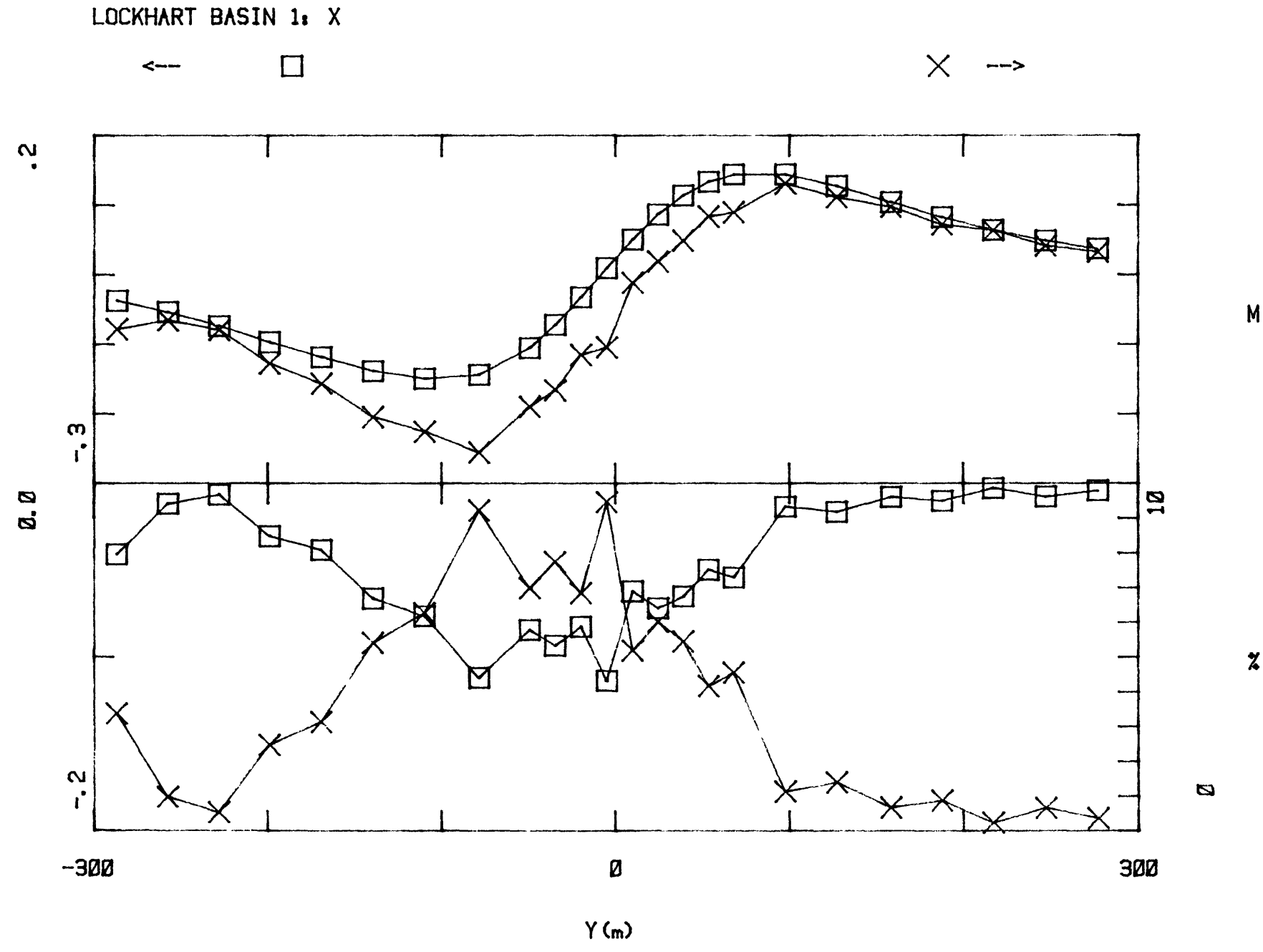
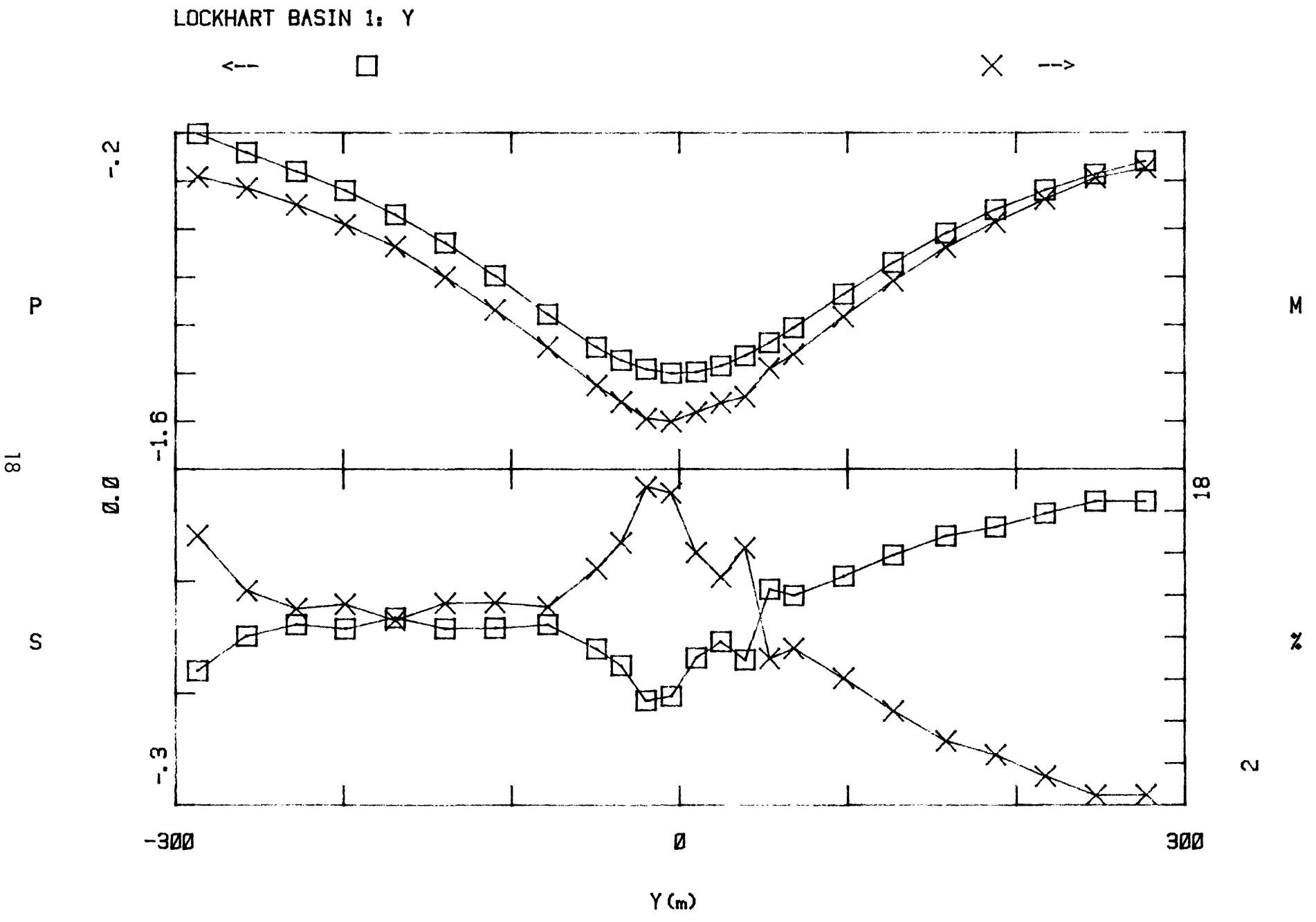
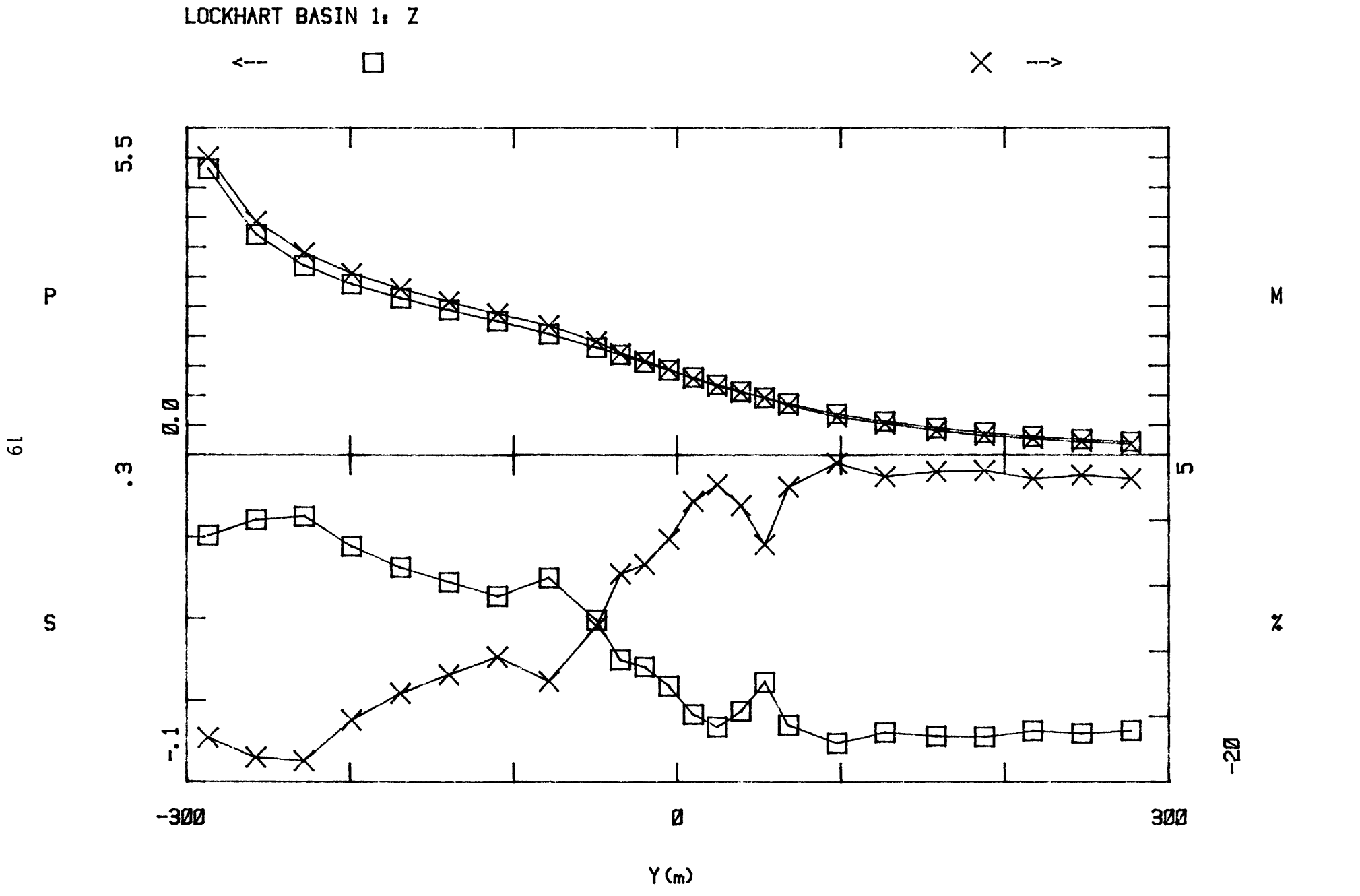


Figure 8. Lockhart Basin 1 MMR data. See Figure 4 for a description of the plots.






8b


LOCKHART BASIN 1: Z
<---
--->
5.5
0.0
.3
-.1
P
S
M
%
5
-20
-300
0
300
Y(m)

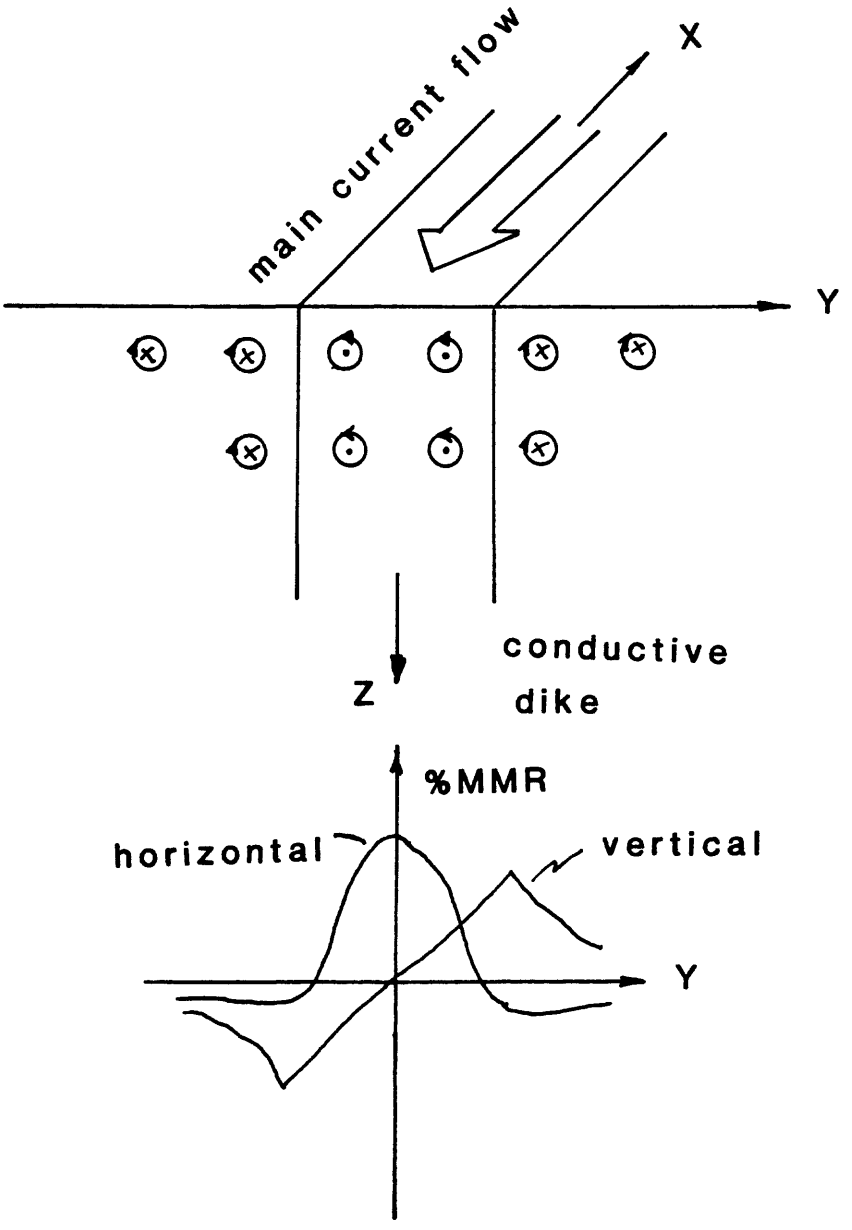



Figure 9. Schematic representation of MMR anomaly for a conductive dike.

between the numerous faults found in the region. A broad shear zone between the numerous faults might produce the conductive zone due to an increased density of fluid filled cracks and fractures. Equally possible is the production of a gouge material, which is usually quite conductive, as a result of extensive fault motion.

The maximum horizontal MMR anomaly would be expected in the direction perpendicular to the strike. Vectorially adding the x and y maximum MMR anomalies, a strike direction of $23^{o}$ is determined. This is in reasonable agreement with the regional fault direction which is estimated to be $45^{o}$. Estimates of dike width and conductivity ratio are less reliable, but assuming a maximum vertical anomaly magnitude of 20% the dike width ranges between 85 m and 640 m with the conductivity enhanced by a factor of 2 to 5.

Profile LB-2 results are shown in Figure 10. The symmetric horizontal and antisymmetric vertical anomaly suggests a conductive feature. Analysis indicates a strike direction of about $65^{o}$. Based on the maximum vertical anomaly, a width on the order of 390 m is determined for the conductive zone, with the conductivity enhanced by a factor of 9-15.

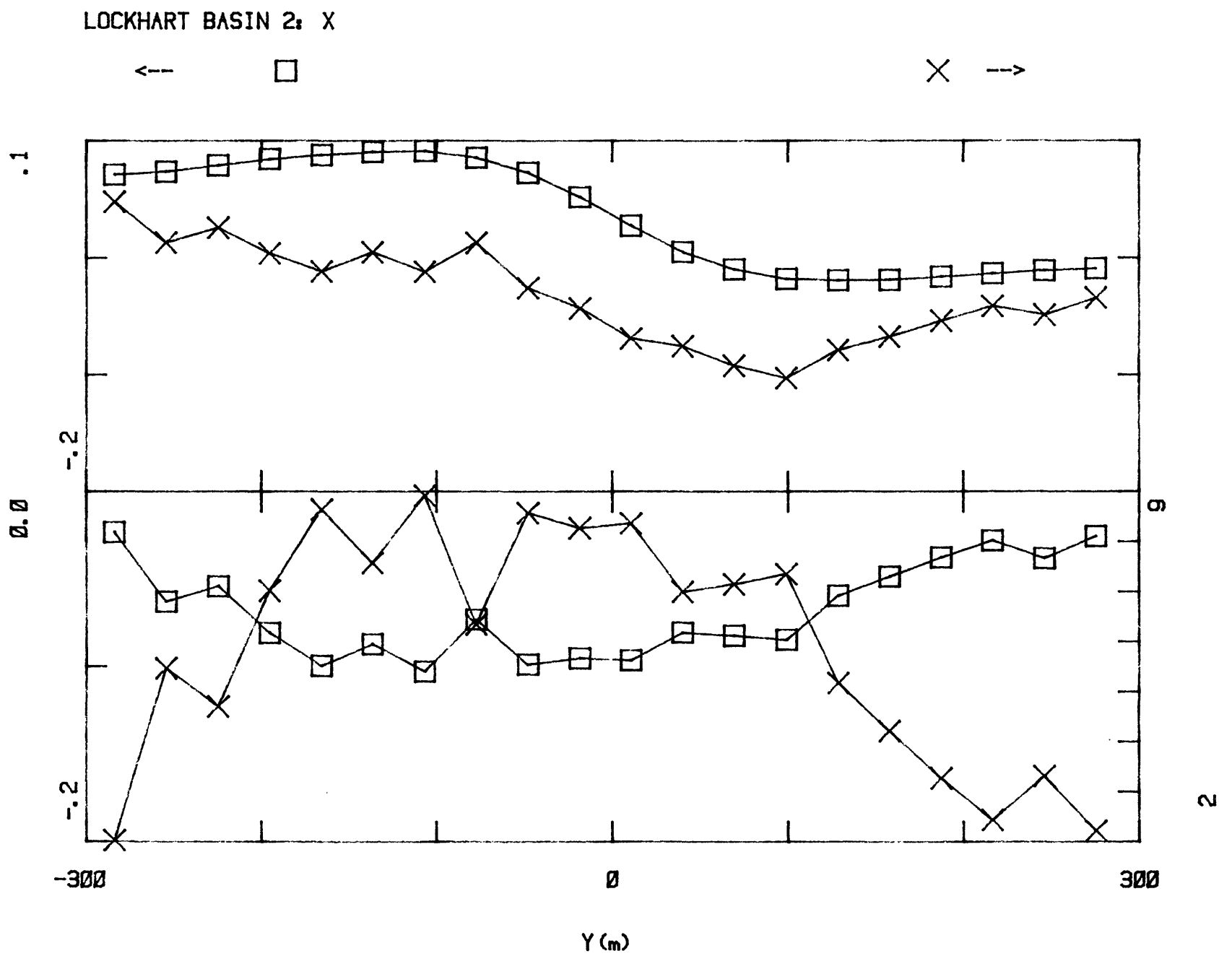
## Conclusions

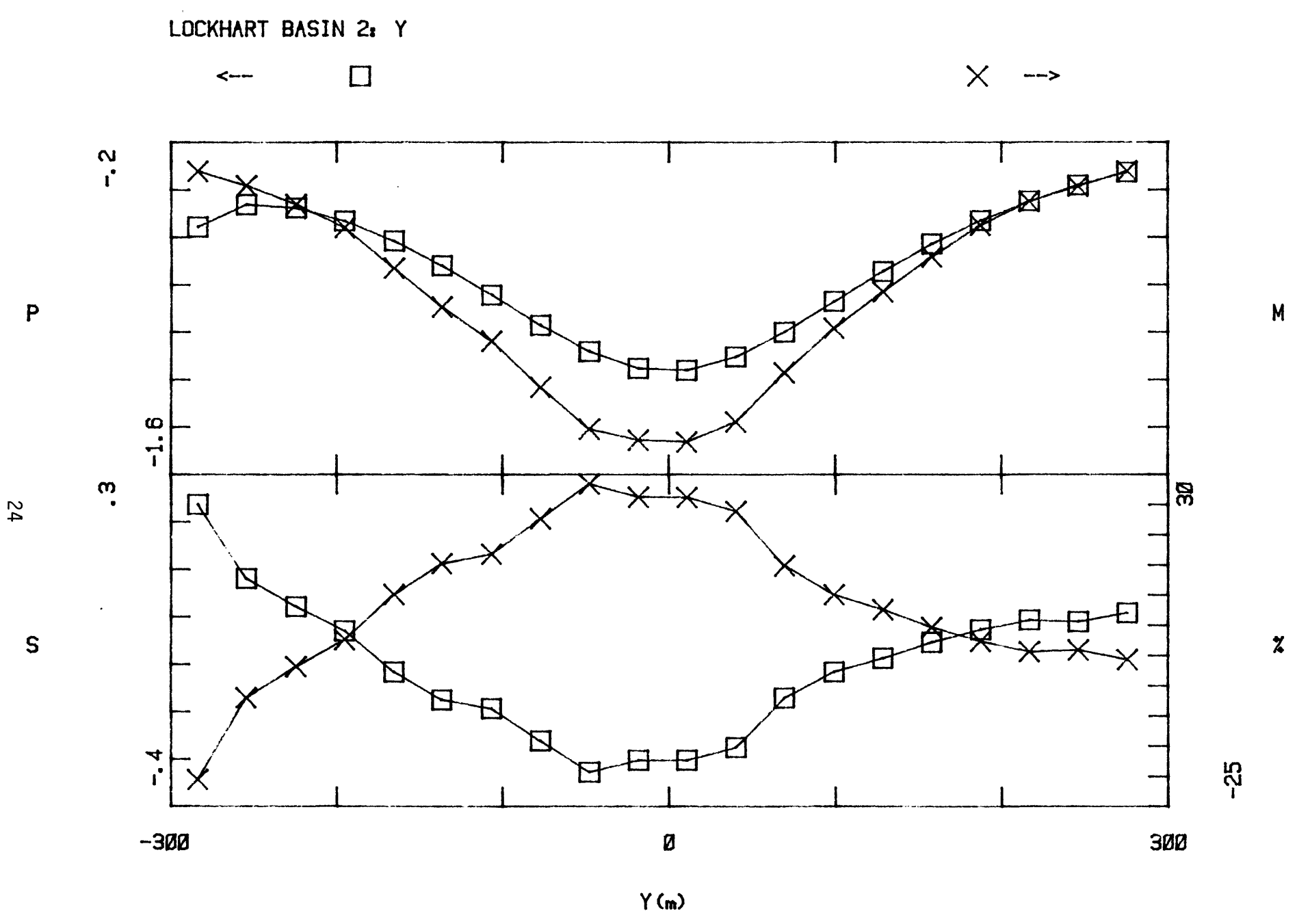
Use of the magnetometric resistivity method near known and suspected fault zones, made it qualitatively possible to detect conductivity boundaries associated with these features. Detailed quantitative analysis of the anomalies has not been possible because of noise in the data. This is felt to be due to primary magnetic fields which were not completely removed from the measurements. In the data reduction procedure, a planar ground surface and straight transmitter wire segments were assumed. Any variation from this situation introduces noise in the MMR anomaly. Better results could probably

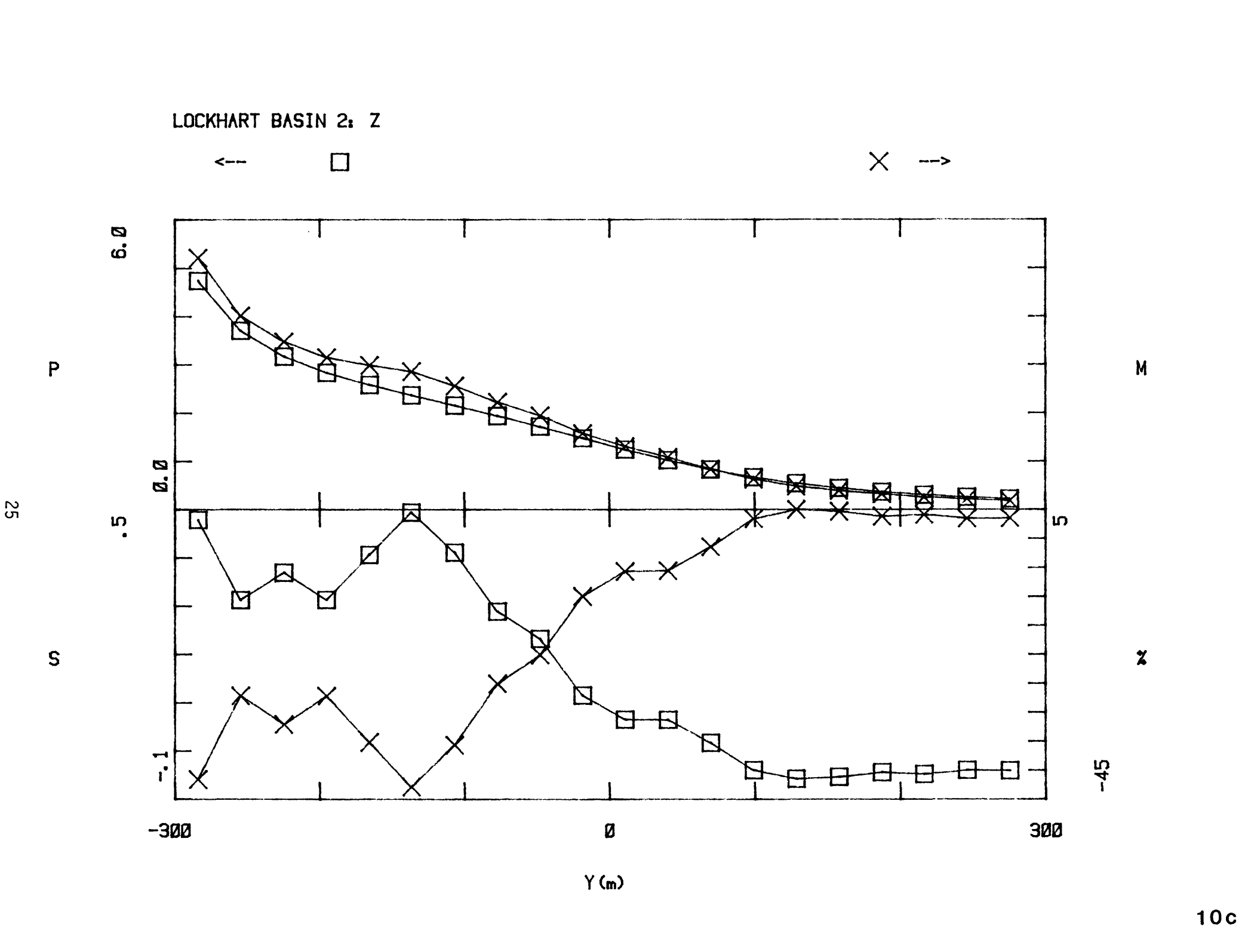
be obtained by using a long straight wire geometry and making measurements off one end of the wire.

The technique appears to make possible the detection of conductivity boundaries associated with faults even when the resistivity ratio is less than 2. Operationally the method proved to be rather cumbersome, and the logistics of tending the cryogenic magnetometer were at times annoying. The method is not well suited as a reconnaissance method, but if additional information is wanted about a known fault zone, the technique could be helpful.

Figure 10. Lockhart Basin 2 MMR data. See Figure 4 for a description of the plots.




LOCKHART BASIN 2: Y
<---
--->
P
M
S
%
-.2
-1.6
.3
-.4
30
-25
-300
0
300
Y(m)


LOCKHART BASIN 2: Z
<---
--->
6.0
0.0
.5
-.1
P
S
M
5
%
-45
-300
0
300
Y (m)

## References

Edwards, R. N., 1974, The magnetometric resistivity method and its application to the mapping of a fault: Canadian Journal of Earth Sciences, 11, 1136-1156.

Edwards, R. N., and Howell, E. C., 1976, A field test of the magnetometric resistivity (MMR) method: Geophysics, 41, 1170-1183.

Edwards, R. N., Lee, H., and Nabighian, M. N., 1978, On the theory of magnetometric resistivity (MMR) method: Geophysics, 43, 1176-1203.

Gomez-Trevino, E., and Edwards, R. N., 1979, Magnetotelluric resistivity (MMR) anomalies of two-dimensional structures: Geophysics, 44, 947-958.

Hinrichs, E. N., Krummel, W. J., Jr., Moore, H. J., 3d, and Connor, J. J., 1968, Geological map of the northeast quarter of the Hatch Point Quadrangle, San Juan County, Utah, U.S. Geological Survey Map I-526, scale 1:24,000.

Hinrichs, E. N., Krummel, W. J., Jr., Connor, J. J., and Moore, H. J., II, 1971, Geological map of the southeast quarter of the Hatch Point Quadrangle, San Juan County, Utah, U.S. Geological Survey Map I-670, scale 1:24,000

## Appendix

This section contains basic information on the instrumentation gains, wire geometry, and the observed and reduced data. The Gain File contains information about the shunt resistor used to measure the transmitter current, and the gain and phase shift of the magnetometer and the receiver amplifier and filter. The Wire File gives the coordinates of the transmitter wire nodes. The highest numbered node is a current sink, and node 1 is a current source. The Data File contains an entry for each observation point. There is a column for each field component, the first row contains the x, y, and z coordinates of the observation point. The next three lines are the receiver real and quadrature voltages, and gain setting respectively. The actual gain and phase shift are found by looking under the corresponding gain entry in the Gain File. The next two lines are the transmitter real and quadrature voltages measured across the shunt resistor. The normalized primary, measured, and secondary magnetic fields are shown on the next three pairs of lines. The first line of each entry is the amplitude, and the second line is the phase. The amplitudes may be negative to keep the phases between $+90^{o}$ and $-90^{o}$. The last line gives the percentage MMR anomaly.

SAN JUAN COUNTY, UTAH

GAIN FILE

RSHUNT= .18 Ω

MAGNETOMETER GAIN

| CHAN | MAG(nT/V) | PHS(DEG) |
|---|---|---|
| X | 70.4 | -2.0 |
| Y | 67.4 | -3.0 |
| Z | 75.8 | -4.0 |

AMPLIFIER-FILTER GAIN

| N | GAIN | MAG | PHS(DEG) |
|---|---|---|---|
| 1 | 10.0 | -7.1 | -1.1 |
| 2 | 30.0 | -21.4 | -1.1 |
| 3 | 100.0 | -70.7 | -1.3 |
| 4 | 300.0 | -216.0 | -1.5 |
| 5 | 1000.0 | -707.0 | -1.1 |
| 6 | 3000.0 | -2110.0 | -1.3 |
| 7 | 10000.0 | -7000.0 | -1.3 |

HATCH POINT 2 & 3

WIRE FILE

| N | X(M) | Y(M) | Z(M) |
|---|---|---|---|
| 1 | -165.6 | 0.0 | -20.8 |
| 2 | -144.6 | -344.4 | -3.0 |
| 3 | 155.0 | -353.1 | -17.7 |
| 4 | 165.6 | 0.0 | -29.2 |

HATCH POINT 2

| STATION | 1 | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | 7.9 | -284.6 | -15.0 |
| Rx:R-Ro | | .160 | .901 | -.598 |
| Q-Qo | | -.005 | -.031 | .047 |
| GAIN | | 100 | 100 | 10 |
| Tx:R-Ro | | .230 | .228 | .238 |
| Q-Qo | | .001 | .001 | 0.000 |
| Bp/I:MAG | (nT/A) | .230 | -.035 | 4.477 |
| PHS | (DEG ) | -.2 | -.3 | 0.0 |
| Bm/I:MAG | (nT/A) | -.125 | -.679 | 4.864 |
| PHS | (DEG ) | 1.5 | 2.3 | 2.3 |
| Bs/I:MAG | (nT/A) | -.355 | -.643 | .390 |
| PHS | (DEG ) | .4 | 2.5 | 7.6 |
| %MMR | | 30.8 | 55.9 | -33.9 |

| STATION | 2 | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | 9.7 | -255.1 | -14.8 |
| Rx:R-Ro | | .093 | .851 | -.466 |
| Q-Qo | | -.012 | -.049 | .046 |
| GAIN | | 100 | 100 | 10 |
| Tx:R-Ro | | .240 | .241 | .240 |
| Q-Qo | | 0.000 | .001 | .002 |
| Bp/I:MAG | (nT/A) | .185 | -.202 | 3.576 |
| PHS | (DEG ) | 0.0 | -.2 | -.5 |
| Bm/I:MAG | (nT/A) | -.070 | -.607 | 3.765 |
| PHS | (DEG ) | -4.1 | 1.0 | 1.0 |
| Bs/I:MAG | (nT/A) | -.255 | -.405 | .190 |
| PHS | (DEG ) | -1.1 | 1.6 | -1.7 |
| %MMR | | 22.1 | 35.2 | -16.4 |

| STATION | 3 | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | 11.1 | -224.8 | -15.8 |
| Rx:R-Ro | | .020 | .948 | -.408 |
| Q-Qo | | -.011 | -.053 | .033 |
| GAIN | | 100 | 100 | 10 |
| Tx:R-Ro | | .239 | .239 | .239 |
| Q-Qo | | 0.000 | .001 | 0.000 |
| Bp/I:MAG | (nT/A) | .165 | -.294 | 3.103 |
| PHS | (DEG ) | 0.0 | -.2 | 0.0 |
| Bm/I:MAG | (nT/A) | -.017 | -.682 | 3.305 |
| PHS | (DEG ) | -25.5 | 1.1 | 1.1 |
| Bs/I:MAG | (nT/A) | -.180 | -.388 | .204 |
| PHS | (DEG ) | -2.3 | 2.1 | 7.8 |
| %MMR | | 15.6 | 33.6 | -17.7 |

| STATION | 4 | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | 13.1 | -195.5 | -17.9 |
| Rx:R-Ro | | .025 | 1.089 | -.353 |
| Q-Qo | | -.015 | -.059 | .032 |
| GAIN | | 100 | 100 | 10 |
| Tx:R-Ro | | .239 | .240 | .239 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | .157 | -.381 | 2.817 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | -.022 | -.780 | 2.862 |
| PHS | (DEG ) | -27.7 | 1.2 | 1.2 |
| Bs/I:MAG | (nT/A) | -.176 | -.399 | .045 |
| PHS | (DEG ) | -3.3 | 2.3 | -5.0 |
| %MMR | | 15.2 | 34.5 | -3.9 |

HATCH POINT 2

| STATION | 5 | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | 14.6 | -165.8 | -19.8 |
| Rx:R-Ro | | -.249 | .346 | -.325 |
| Q-Qo | | .002 | -.027 | .019 |
| GAIN | | 300 | 30 | 10 |
| Tx:R-Ro | | .237 | .238 | .238 |
| Q-Qo | | 0.000 | 0.000 | .001 |
| Bp/I:MAG | (nT/A) | .154 | -.487 | 2.601 |
| PHS | (DEG ) | 0.0 | 0.0 | -.2 |
| Bm/I:MAG | (nT/A) | .062 | -.827 | 2.640 |
| PHS | (DEG ) | 3.0 | -.4 | -.4 |
| Bs/I:MAG | (nT/A) | -.093 | -.339 | .099 |
| PHS | (DEG ) | -2.0 | -.9 | 67.6 |
| %MMR | | 8.0 | 29.3 | -8.5 |

| STATION | 6 | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | 15.8 | -136.1 | -20.2 |
| Rx:R-Ro | | -.260 | .420 | -.300 |
| Q-Qo | | .019 | -.042 | .019 |
| GAIN | | 300 | 30 | 10 |
| Tx:R-Ro | | .238 | .238 | .238 |
| Q-Qo | | -.001 | -.001 | -.001 |
| Bp/I:MAG | (nT/A) | .158 | -.617 | 2.415 |
| PHS | (DEG ) | .2 | .2 | .2 |
| Bm/I:MAG | (nT/A) | .064 | -1.005 | 2.437 |
| PHS | (DEG ) | -.7 | -1.6 | -1.6 |
| Bs/I:MAG | (nT/A) | -.093 | -.389 | .057 |
| PHS | (DEG ) | .9 | -4.6 | 67.3 |
| %MMR | | 8.0 | 33.5 | -4.9 |

| STATION | 7 | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | 16.9 | -111.1 | -22.0 |
| Rx:R-Ro | | -.508 | .452 | -.264 |
| Q-Qo | | .029 | -.027 | .023 |
| GAIN | | 300 | 30 | 10 |
| Tx:R-Ro | | .239 | .238 | .239 |
| Q-Qo | | .001 | .001 | .001 |
| Bp/I:MAG | (nT/A) | .157 | -.736 | 2.261 |
| PHS | (DEG ) | -.2 | -.2 | -.2 |
| Bm/I:MAG | (nT/A) | .125 | -1.079 | 2.140 |
| PHS | (DEG ) | .2 | .7 | .7 |
| Bs/I:MAG | (nT/A) | -.032 | -.343 | -.122 |
| PHS | (DEG ) | -2.1 | 2.7 | -6.6 |
| %MMR | | 2.8 | 29.5 | 10.5 |

| STATION | 8 | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | 18.0 | -82.1 | -23.3 |
| Rx:R-Ro | | -.471 | .488 | -.726 |
| Q-Qo | | .035 | -.043 | .060 |
| GAIN | | 300 | 30 | 30 |
| Tx:R-Ro | | .239 | .239 | .239 |
| Q-Qo | | .001 | 0.000 | .001 |
| Bp/I:MAG | (nT/A) | .152 | -.884 | 2.072 |
| PHS | (DEG ) | -.2 | 0.0 | -.2 |
| Bm/I:MAG | (nT/A) | .116 | -1.162 | 1.943 |
| PHS | (DEG ) | -.8 | -.9 | -.9 |
| Bs/I:MAG | (nT/A) | -.036 | -.278 | -.131 |
| PHS | (DEG ) | 1.4 | -3.9 | -9.5 |
| %MMR | | 3.1 | 23.9 | 11.2 |

HATCH POINT 2

| STATION 9 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | 19.8 | -53.1 | -24.0 |
| Rx:R-Ro | | -.589 | .560 | -.642 |
| Q-Qo | | .046 | -.043 | .056 |
| GAIN | | 300 | 30 | 30 |
| Tx:R-Ro | | .238 | .239 | .239 |
| Q-Qo | | .001 | .001 | .001 |
| Bp/I:MAG | (nT/A) | .136 | -1.027 | 1.866 |
| PHS | (DEG ) | -.2 | -.2 | -.2 |
| Bm/I:MAG | (nT/A) | .146 | -1.332 | 1.719 |
| PHS | (DEG ) | -1.0 | -.3 | -.3 |
| Bs/I:MAG | (nT/A) | .010 | -.305 | -.148 |
| PHS | (DEG ) | -11.2 | -.5 | -4.3 |
| %MMR | | -.8 | 26.1 | 12.6 |

| STATION 10 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | 20.7 | -23.6 | -24.8 |
| Rx:R-Ro | | .169 | .513 | -.507 |
| Q-Qo | | -.001 | -.045 | .025 |
| GAIN | | 1000 | 30 | 30 |
| Tx:R-Ro | | .239 | .239 | .238 |
| Q-Qo | | 0.000 | 0.000 | -.001 |
| Bp/I:MAG | (nT/A) | .092 | -1.134 | 1.631 |
| PHS | (DEG ) | 0.0 | 0.0 | .2 |
| Bm/I:MAG | (nT/A) | -.013 | -1.222 | 1.360 |
| PHS | (DEG ) | 2.8 | -.9 | -.9 |
| Bs/I:MAG | (nT/A) | -.104 | -.090 | -.276 |
| PHS | (DEG ) | .3 | -12.6 | -9.8 |
| %MMR | | 8.9 | 7.7 | 23.6 |

| STATION 11 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | 22.3 | 6.4 | -25.8 |
| Rx:R-Ro | | -.324 | .496 | -.472 |
| Q-Qo | | .026 | -.037 | .047 |
| GAIN | | 1000 | 30 | 30 |
| Tx:R-Ro | | .238 | .239 | .238 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | .027 | -1.172 | 1.380 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | .024 | -1.180 | 1.271 |
| PHS | (DEG ) | -1.5 | -.2 | -.2 |
| Bs/I:MAG | (nT/A) | -.003 | -.008 | -.110 |
| PHS | (DEG ) | 14.1 | -24.3 | 6.9 |
| %MMR | | .2 | .7 | 9.4 |

| STATION 12 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | 23.4 | 36.5 | -27.1 |
| Rx:R-Ro | | .512 | .498 | -.410 |
| Q-Qo | | -.015 | -.049 | .043 |
| GAIN | | 1000 | 30 | 30 |
| Tx:R-Ro | | .239 | .239 | .239 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | -.040 | -1.124 | 1.132 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | -.038 | -1.187 | 1.100 |
| PHS | (DEG ) | 1.4 | -1.5 | -1.5 |
| Bs/I:MAG | (nT/A) | .002 | -.070 | -.036 |
| PHS | (DEG ) | -35.5 | -26.7 | 27.9 |
| %MMR | | -.1 | 6.0 | 3.1 |

HATCH POINT 2

| STATION 13 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | 24.3 | 66.3 | -28.1 |
| Rx:R-Ro | | .394 | .455 | -.333 |
| Q-Qo | | -.017 | -.030 | .027 |
| GAIN | | 300 | 30 | 30 |
| Tx:R-Ro | | .239 | .240 | .239 |
| Q-Qo | | .001 | .001 | .001 |
| Bp/I:MAG | (nT/A) | -.084 | -1.012 | .913 |
| PHS | (DEG ) | -.2 | -.2 | -.2 |
| Bm/I:MAG | (nT/A) | -.097 | -1.077 | .891 |
| PHS | (DEG ) | 1.0 | .3 | .3 |
| Bs/I:MAG | (nT/A) | -.013 | -.066 | -.024 |
| PHS | (DEG ) | 9.4 | 9.1 | -27.1 |
| %MMR | | 1.1 | 5.6 | 2.0 |

| STATION 14 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | 25.9 | 95.9 | -28.9 |
| Rx:R-Ro | | .585 | .402 | -.836 |
| Q-Qo | | -.047 | -.021 | .080 |
| GAIN | | 300 | 30 | 100 |
| Tx:R-Ro | | .237 | .237 | .238 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | -.106 | -.874 | .732 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | -.145 | -.963 | .681 |
| PHS | (DEG ) | -1.1 | 1.1 | 1.1 |
| Bs/I:MAG | (nT/A) | -.039 | -.090 | -.051 |
| PHS | (DEG ) | -4.1 | 11.9 | 2.3 |
| %MMR | | 3.3 | 7.7 | 4.3 |

| STATION 15 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | 27.4 | 125.1 | -30.2 |
| Rx:R-Ro | | .564 | .326 | -.695 |
| Q-Qo | | -.030 | -.016 | .061 |
| GAIN | | 300 | 30 | 100 |
| Tx:R-Ro | | .239 | .238 | .238 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | -.109 | -.738 | .589 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | -.139 | -.777 | .566 |
| PHS | (DEG ) | .5 | 1.3 | 1.3 |
| Bs/I:MAG | (nT/A) | -.030 | -.043 | -.024 |
| PHS | (DEG ) | 2.1 | 24.2 | -6.7 |
| %MMR | | 2.5 | 3.6 | 2.0 |

| STATION 16 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | 28.9 | 154.7 | -31.2 |
| Rx:R-Ro | | .469 | .269 | -.592 |
| Q-Qo | | -.021 | -.011 | .047 |
| GAIN | | 300 | 30 | 100 |
| Tx:R-Ro | | .238 | .238 | .238 |
| Q-Qo | | .001 | .001 | .001 |
| Bp/I:MAG | (nT/A) | -.101 | -.616 | .477 |
| PHS | (DEG ) | -.2 | -.2 | -.2 |
| Bm/I:MAG | (nT/A) | -.116 | -.641 | .482 |
| PHS | (DEG ) | .9 | 1.8 | 1.8 |
| Bs/I:MAG | (nT/A) | -.015 | -.033 | .009 |
| PHS | (DEG ) | 9.0 | 41.7 | 63.5 |
| %MMR | | 1.2 | 2.8 | 33.8 |

HATCH POINT 2

| TATION 17 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | 30.5 | 183.7 | -32.1 |
| Rx:R-Ro | | .454 | .252 | -.520 |
| Q-Qo | | -.036 | -.019 | .043 |
| GAIN | | 300 | 30 | 100 |
| Tx:R-Ro | | .248 | .248 | .248 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | -.090 | -.515 | .393 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | -.108 | -.578 | .406 |
| PHS | (DEG ) | -1.0 | -.2 | -.2 |
| Bs/I:MAG | (nT/A) | -.018 | -.062 | .014 |
| PHS | (DEG ) | -6.1 | -2.0 | 16.6 |
| %MMR | | 1.5 | 5.2 | -1.2 |

| STATION 18 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | 32.2 | 213.4 | -32.9 |
| Rx:R-Ro | | .460 | .711 | -.424 |
| Q-Qo | | -.031 | -.058 | .041 |
| GAIN | | 300 | 100 | 100 |
| Tx:R-Ro | | .248 | .248 | .248 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | -.077 | -.431 | .325 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | -.109 | -.494 | .331 |
| PHS | (DEG ) | -.4 | -.4 | -.4 |
| Bs/I:MAG | (nT/A) | -.032 | -.063 | .006 |
| PHS | (DEG ) | -1.2 | -2.9 | -11.6 |
| %MMR | | 2.7 | 5.2 | -.5 |

HATCH POINT 3

| STATION 1 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | -77.4 | -286.7 | -11.2 |
| Rx:R-Ro | | .544 | .296 | -.757 |
| Q-Qo | | -.018 | -.017 | .072 |
| GAIN | | 100 | 30 | 10 |
| Tx:R-Ro | | .241 | .244 | .240 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | .211 | .103 | 5.512 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | -.405 | -.689 | 6.115 |
| PHS | (DEG ) | 1.4 | .8 | .8 |
| Bs/I:MAG | (nT/A) | -.615 | -.792 | .603 |
| PHS | (DEG ) | .9 | .7 | -3.3 |
| %MMR | | 42.0 | 54.1 | -41.2 |

| STATION 2 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | -77.4 | -257.1 | -13.1 |
| Rx:R-Ro | | .451 | .288 | -.623 |
| Q-Qo | | -.027 | -.020 | .052 |
| GAIN | | 100 | 30 | 10 |
| Tx:R-Ro | | .239 | .239 | .239 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | .141 | -.036 | 4.533 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | -.339 | -.685 | 5.048 |
| PHS | (DEG ) | -.1 | .1 | .1 |
| Bs/I:MAG | (nT/A) | -.480 | -.649 | .516 |
| PHS | (DEG ) | -.1 | .1 | 3.2 |
| %MMR | | 32.8 | 44.3 | -35.2 |

| STATION 3 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | -77.5 | -227.1 | -14.8 |
| Rx:R-Ro | | .487 | .278 | -.553 |
| Q-Qo | | -.037 | -.008 | .029 |
| GAIN | | 100 | 30 | 10 |
| Tx:R-Ro | | .240 | .241 | .241 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | .080 | -.136 | 4.040 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | -.365 | -.654 | 4.434 |
| PHS | (DEG ) | -1.0 | 2.5 | 2.5 |
| Bs/I:MAG | (nT/A) | -.445 | -.519 | .424 |
| PHS | (DEG ) | -.9 | 3.1 | 22.6 |
| %MMR | | 30.4 | 35.4 | -28.9 |

| STATION 4 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | -77.7 | -198.3 | -17.2 |
| Rx:R-Ro | | .630 | .313 | -.515 |
| Q-Qo | | -.046 | -.018 | .040 |
| GAIN | | 100 | 30 | 10 |
| Tx:R-Ro | | .241 | .242 | .242 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | .043 | -.220 | 3.735 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | -.470 | -.734 | 4.119 |
| PHS | (DEG ) | -.9 | .8 | .8 |
| Bs/I:MAG | (nT/A) | -.513 | -.514 | .387 |
| PHS | (DEG ) | -.8 | 1.2 | 7.0 |
| %MMR | | 35.0 | 35.1 | -26.4 |

HATCH POINT 3

| STATION 5 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | -77.8 | -167.9 | -18.2 |
| Rx:R-Ro | | .646 | .343 | -.469 |
| Q-Qo | | -.047 | -.004 | .028 |
| GAIN | | 100 | 30 | 10 |
| Tx:R-Ro | | .242 | .242 | .242 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | -.048 | -.332 | 3.495 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | -.480 | -.804 | 3.747 |
| PHS | (DEG ) | -.9 | 3.4 | 3.4 |
| Bs/I:MAG | (nT/A) | -.431 | -.472 | .273 |
| PHS | (DEG ) | -1.0 | 5.8 | 23.7 |
| %MMR | | 29.4 | 32.2 | -18.6 |

| STATION 6 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | -77.8 | -139.3 | -18.2 |
| Rx:R-Ro | | .651 | .380 | -.441 |
| Q-Qo | | -.045 | -.031 | .035 |
| GAIN | | 100 | 30 | 10 |
| Tx:R-Ro | | .241 | .241 | .241 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | -.166 | -.462 | 3.297 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | -.485 | -.897 | 3.543 |
| PHS | (DEG ) | -.7 | -.6 | -.6 |
| Bs/I:MAG | (nT/A) | -.319 | -.435 | .247 |
| PHS | (DEG ) | -1.0 | -1.2 | 8.0 |
| %MMR | | 21.8 | 29.6 | -16.9 |

| STATION 7 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | -77.7 | -109.8 | -18.1 |
| Rx:R-Ro | | .687 | .452 | -.410 |
| Q-Qo | | -.047 | -.029 | .037 |
| GAIN | | 100 | 30 | 10 |
| Tx:R-Ro | | .242 | .243 | .243 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | -.286 | -.632 | 3.087 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | -.510 | -1.057 | 3.269 |
| PHS | (DEG ) | -.6 | .4 | .4 |
| Bs/I:MAG | (nT/A) | -.224 | -.425 | .182 |
| PHS | (DEG ) | -1.4 | 1.1 | -1.1 |
| %MMR | | 15.3 | 29.0 | -12.4 |

| STATION 8 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | -77.7 | -79.9 | -19.9 |
| Rx:R-Ro | | .783 | .522 | -.353 |
| Q-Qo | | -.040 | -.051 | .020 |
| GAIN | | 100 | 30 | 10 |
| Tx:R-Ro | | .242 | .242 | .242 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | -.336 | -.853 | 2.841 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | -.581 | -1.229 | 2.820 |
| PHS | (DEG ) | .4 | -1.5 | -1.5 |
| Bs/I:MAG | (nT/A) | -.244 | -.377 | -.094 |
| PHS | (DEG ) | .9 | -4.8 | -76.1 |
| %MMR | | 16.7 | 25.7 | 6.4 |

HATCH POINT 3

| STATION 9 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | -77.9 | -50.2 | -21.0 |
| Rx:R-Ro | | .783 | .632 | -.300 |
| Q-Qo | | -.052 | -.043 | .013 |
| GAIN | | 100 | 30 | 10 |
| Tx:R-Ro | | .242 | .242 | .242 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | -.325 | -1.129 | 2.534 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | -.581 | -1.484 | 2.395 |
| PHS | (DEG ) | -.5 | .2 | .2 |
| Bs/I:MAG | (nT/A) | -.256 | -.355 | -.179 |
| PHS | (DEG ) | -1.1 | .9 | -37.6 |
| %MMR | | 17.5 | 24.2 | 12.2 |

| STATION 10 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | -78.1 | -20.5 | -21.5 |
| Rx:R-Ro | | .320 | .690 | -.686 |
| Q-Qo | | -.018 | -.043 | .049 |
| GAIN | | 100 | 30 | 30 |
| Tx:R-Ro | | .242 | .242 | .242 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | -.166 | -1.390 | 2.127 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | -.237 | -1.620 | 1.812 |
| PHS | (DEG ) | .1 | .5 | .5 |
| Bs/I:MAG | (nT/A) | -.071 | -.230 | -.317 |
| PHS | (DEG ) | .3 | 3.8 | -5.8 |
| %MMR | | 4.9 | 15.7 | 21.6 |

| STATION 11 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | -78.5 | 8.8 | -22.9 |
| Rx:R-Ro | | -.559 | .650 | -.534 |
| Q-Qo | | .039 | -.037 | .031 |
| GAIN | | 300 | 30 | 30 |
| Tx:R-Ro | | .242 | .242 | .242 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | .140 | -1.468 | 1.652 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | .136 | -1.525 | 1.409 |
| PHS | (DEG ) | -.5 | .8 | .8 |
| Bs/I:MAG | (nT/A) | -.005 | -.061 | -.247 |
| PHS | (DEG ) | 14.1 | 21.5 | -10.2 |
| %MMR | | .3 | 4.2 | 16.8 |

| STATION 12 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | -78.5 | 38.3 | -24.6 |
| Rx:R-Ro | | -.520 | .551 | -.410 |
| Q-Qo | | .035 | -.041 | .032 |
| GAIN | | 100 | 30 | 30 |
| Tx:R-Ro | | .242 | .242 | .242 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | .391 | -1.306 | 1.207 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | .386 | -1.294 | 1.084 |
| PHS | (DEG ) | -.6 | -.2 | -.2 |
| Bs/I:MAG | (nT/A) | -.006 | .012 | -.124 |
| PHS | (DEG ) | 35.5 | 17.6 | -5.6 |
| %MMR | | .4 | -.8 | 8.5 |

HATCH POINT 3

| STATION 13 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | -78.5 | 67.7 | -25.9 |
| Rx:R-Ro | | -.629 | .447 | -.312 |
| Q-Qo | | .033 | -.030 | .020 |
| GAIN | | 100 | 30 | 30 |
| Tx:R-Ro | | .242 | .242 | .242 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | .472 | -1.056 | .882 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | .467 | -1.050 | .824 |
| PHS | (DEG ) | .3 | .3 | .3 |
| Bs/I:MAG | (nT/A) | -.006 | .008 | -.062 |
| PHS | (DEG ) | -23.4 | -37.5 | -19.3 |
| %MMR | | .4 | -.5 | 4.2 |

| STATION 14 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | -78.8 | 97.1 | -26.5 |
| Rx:R-Ro | | -.557 | .338 | -.825 |
| Q-Qo | | .012 | -.020 | .074 |
| GAIN | | 100 | 30 | 100 |
| Tx:R-Ro | | .242 | .242 | .242 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | .446 | -.836 | .665 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | .413 | -.793 | .661 |
| PHS | (DEG ) | 2.1 | .7 | .7 |
| Bs/I:MAG | (nT/A) | -.037 | .044 | -.005 |
| PHS | (DEG ) | -23.9 | -13.0 | -24.8 |
| %MMR | | 2.5 | -3.0 | .3 |

| STATION 15 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | -78.8 | 126.8 | -27.3 |
| Rx:R-Ro | | -.442 | .292 | -.686 |
| Q-Qo | | .023 | -.019 | .036 |
| GAIN | | 100 | 30 | 100 |
| Tx:R-Ro | | .242 | .242 | .242 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | .380 | -.668 | .518 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | .328 | -.685 | .548 |
| PHS | (DEG ) | .3 | .4 | .4 |
| Bs/I:MAG | (nT/A) | -.052 | -.018 | .037 |
| PHS | (DEG ) | -2.0 | 14.4 | 36.7 |
| %MMR | | 3.5 | 1.2 | -2.5 |

| STATION 16 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | -79.0 | 156.5 | -28.6 |
| Rx:R-Ro | | -.411 | .805 | -.578 |
| Q-Qo | | .014 | -.062 | .047 |
| GAIN | | 100 | 100 | 100 |
| Tx:R-Ro | | .242 | .242 | .242 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | .312 | -.543 | .415 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | .305 | -.573 | .462 |
| PHS | (DEG ) | 1.4 | -.1 | -.1 |
| Bs/I:MAG | (nT/A) | -.010 | -.029 | .047 |
| PHS | (DEG ) | -44.8 | -2.0 | 6.4 |
| %MMR | | .7 | 2.0 | -3.2 |

HATCH POINT 3

| STATION 17 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | -79.2 | 186.0 | -29.4 |
| Rx:R-Ro | | -.306 | .687 | -.484 |
| Q-Qo | | .024 | -.040 | .037 |
| GAIN | | 100 | 100 | 100 |
| Tx:R-Ro | | .242 | .242 | .242 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | .252 | -.450 | .342 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | .227 | -.488 | .387 |
| PHS | (DEG ) | -1.2 | 1.0 | 1.0 |
| Bs/I:MAG | (nT/A) | -.025 | -.038 | .046 |
| PHS | (DEG ) | 10.8 | 12.4 | 7.9 |
| %MMR | | 1.7 | 2.6 | -3.1 |

| STATION 18 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | -78.9 | 215.9 | -30.1 |
| Rx:R-Ro | | -.229 | .620 | -.403 |
| Q-Qo | | .011 | -.056 | .034 |
| GAIN | | 100 | 100 | 100 |
| Tx:R-Ro | | .242 | .242 | .242 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | .201 | -.378 | .286 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | .170 | -.441 | .323 |
| PHS | (DEG ) | .6 | -.9 | -.9 |
| Bs/I:MAG | (nT/A) | -.032 | -.063 | .037 |
| PHS | (DEG ) | -3.0 | -6.0 | 4.2 |
| %MMR | | 2.1 | 4.3 | -2.5 |

| STATION 19 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | -79.4 | 245.9 | -30.7 |
| Rx:R-Ro | | -.563 | .528 | -.331 |
| Q-Qo | | .041 | -.025 | .031 |
| GAIN | | 300 | 100 | 100 |
| Tx:R-Ro | | .242 | .242 | .242 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | .163 | -.321 | .242 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | .137 | -.375 | .265 |
| PHS | (DEG ) | -.7 | 1.6 | 1.6 |
| Bs/I:MAG | (nT/A) | -.026 | -.055 | .023 |
| PHS | (DEG ) | 3.6 | 10.9 | -.6 |
| %MMR | | 1.7 | 3.7 | -1.6 |

| STATION 20 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | -79.8 | 275.8 | -31.4 |
| Rx:R-Ro | | -.441 | .450 | -.275 |
| Q-Qo | | .029 | -.021 | .021 |
| GAIN | | 300 | 100 | 100 |
| Tx:R-Ro | | .242 | .242 | .242 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | .132 | -.275 | .207 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | .107 | -.319 | .220 |
| PHS | (DEG ) | -.3 | 1.6 | 1.6 |
| Bs/I:MAG | (nT/A) | -.025 | -.045 | .013 |
| PHS | (DEG ) | 1.1 | 11.5 | 15.8 |
| %MMR | | 1.7 | 3.1 | -.9 |

LOCKHART BASIN 1

WIRE FILE

| N | X(M) | Y(M) | Z(M) |
|---|---|---|---|
| 1 | -171.3 | 0.0 | -5.8 |
| 2 | -189.0 | -348.1 | -3.6 |
| 3 | 113.3 | -340.4 | -4.8 |
| 4 | 171.3 | 0.0 | -11.5 |

LOCKHART BASIN 1

| STATION | 1 | | X | Y | Z |
|---|---|---|---|---|---|
| COORD | (m | ) | -37.9 | -286.7 | -5.6 |
| Rx:R-Ro | | | .266 | .438 | -.507 |
| Q-Qo | | | -.010 | -.026 | .045 |
| GAIN | | | 300 | 100 | 10 |
| Tx:R-Ro | | | .199 | .197 | .196 |
| Q-Qo | | | .001 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | | -.038 | -.202 | 4.810 |
| PHS | (DEG ) | | -.3 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | | -.078 | -.382 | 5.012 |
| PHS | (DEG ) | | 1.3 | .9 | .9 |
| Bs/I:MAG | (nT/A) | | -.041 | -.180 | .201 |
| PHS | (DEG ) | | 2.8 | 1.9 | .7 |
| %MMR | | | 3.4 | 14.8 | -16.6 |

| STATION | 2 | | X | Y | Z |
|---|---|---|---|---|---|
| COORD | (m | ) | -39.7 | -257.4 | -6.3 |
| Rx:R-Ro | | | .219 | .509 | -.414 |
| Q-Qo | | | -.007 | -.025 | .034 |
| GAIN | | | 300 | 100 | 10 |
| Tx:R-Ro | | | .196 | .204 | .204 |
| Q-Qo | | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | | -.054 | -.280 | 3.711 |
| PHS | (DEG ) | | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | | -.066 | -.429 | 3.930 |
| PHS | (DEG ) | | 1.7 | 1.5 | 1.5 |
| Bs/I:MAG | (nT/A) | | -.012 | -.149 | .221 |
| PHS | (DEG ) | | 9.3 | 4.3 | 7.3 |
| %MMR | | | 1.0 | 12.2 | -18.1 |

| STATION | 3 | | X | Y | Z |
|---|---|---|---|---|---|
| COORD | (m | ) | -41.5 | -228.0 | -6.5 |
| Rx:R-Ro | | | .277 | .592 | -.359 |
| Q-Qo | | | -.007 | -.036 | .028 |
| GAIN | | | 300 | 100 | 10 |
| Tx:R-Ro | | | .205 | .204 | .204 |
| Q-Qo | | | .002 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | | -.074 | -.360 | 3.185 |
| PHS | (DEG ) | | -.6 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | | -.079 | -.499 | 3.407 |
| PHS | (DEG ) | | 2.1 | .8 | .8 |
| Bs/I:MAG | (nT/A) | | -.007 | -.139 | .225 |
| PHS | (DEG ) | | 32.6 | 2.9 | 9.7 |
| %MMR | | | .5 | 11.3 | -18.4 |

| STATION | 4 | | X | Y | Z |
|---|---|---|---|---|---|
| COORD | (m | ) | -43.4 | -198.8 | -7.1 |
| Rx:R-Ro | | | .443 | .690 | -.322 |
| Q-Qo | | | -.018 | -.050 | .022 |
| GAIN | | | 300 | 100 | 10 |
| Tx:R-Ro | | | .204 | .204 | .204 |
| Q-Qo | | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | | -.097 | -.439 | 2.875 |
| PHS | (DEG ) | | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | | -.128 | -.582 | 3.053 |
| PHS | (DEG ) | | 1.2 | .2 | .2 |
| Bs/I:MAG | (nT/A) | | -.030 | -.143 | .188 |
| PHS | (DEG ) | | 4.9 | .6 | 19.7 |
| %MMR | | | 2.5 | 11.6 | -15.3 |

LOCKHART BASIN 1

| STATION | 5 | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | -42.3 | -168.9 | -7.4 |
| Rx:R-Ro | | .432 | .632 | -.709 |
| Q-Qo | | -.018 | -.057 | .055 |
| GAIN | | 300 | 100 | 30 |
| Tx:R-Ro | | .162 | .162 | .162 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | -.118 | -.540 | 2.639 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | -.157 | -.672 | 2.799 |
| PHS | (DEG ) | 1.1 | -.9 | -.9 |
| Bs/I:MAG | (nT/A) | -.038 | -.133 | .163 |
| PHS | (DEG ) | 4.5 | -4.3 | 11.4 |
| %MMR | | 3.1 | 10.8 | -13.2 |

| STATION | 6 | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | -41.3 | -139.2 | -7.9 |
| Rx:R-Ro | | .566 | .753 | -.654 |
| Q-Qo | | -.046 | -.054 | .047 |
| GAIN | | 300 | 100 | 30 |
| Tx:R-Ro | | .163 | .162 | .162 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | -.138 | -.657 | 2.443 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | -.204 | -.800 | 2.581 |
| PHS | (DEG ) | -1.1 | .2 | .2 |
| Bs/I:MAG | (nT/A) | -.066 | -.142 | .145 |
| PHS | (DEG ) | -3.5 | 1.1 | 18.0 |
| %MMR | | 5.4 | 11.6 | -11.8 |

| STATION | 7 | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | -39.9 | -109.6 | -8.5 |
| Rx:R-Ro | | .630 | .267 | -.602 |
| Q-Qo | | -.033 | -.018 | .049 |
| GAIN | | 300 | 30 | 30 |
| Tx:R-Ro | | .164 | .162 | .162 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | -.149 | -.795 | 2.251 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | -.226 | -.936 | 2.377 |
| PHS | (DEG ) | .5 | .2 | .2 |
| Bs/I:MAG | (nT/A) | -.076 | -.142 | .127 |
| PHS | (DEG ) | 1.5 | 1.6 | 8.4 |
| %MMR | | 6.3 | 11.6 | -10.4 |

| STATION | 8 | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | -38.5 | -78.2 | -8.5 |
| Rx:R-Ro | | .702 | .311 | -.549 |
| Q-Qo | | -.067 | -.027 | .063 |
| GAIN | | 300 | 30 | 30 |
| Tx:R-Ro | | .162 | .162 | .162 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | -.144 | -.954 | 2.035 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | -.255 | -1.092 | 2.175 |
| PHS | (DEG ) | -2.0 | -.9 | -.9 |
| Bs/I:MAG | (nT/A) | -.112 | -.139 | .150 |
| PHS | (DEG ) | -4.5 | -6.8 | -21.6 |
| %MMR | | 9.2 | 11.4 | -12.3 |

LOCKHART BASIN 1

| STATION 9 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | -37.2 | -49.0 | -8.9 |
| Rx:R-Ro | | .520 | .357 | -.483 |
| Q-Qo | | -.018 | -.020 | .041 |
| GAIN | | 300 | 30 | 30 |
| Tx:R-Ro | | .161 | .162 | .162 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | -.105 | -1.092 | 1.810 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | -.190 | -1.251 | 1.908 |
| PHS | (DEG ) | 1.5 | .9 | .9 |
| Bs/I:MAG | (nT/A) | -.085 | -.161 | .098 |
| PHS | (DEG ) | 3.4 | 7.0 | 4.9 |
| %MMR | | 7.0 | 13.3 | -8.1 |

| STATION 10 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | -36.5 | -34.3 | -9.2 |
| Rx:R-Ro | | .627 | .516 | -.592 |
| Q-Qo | | -.024 | -.028 | .068 |
| GAIN | | 300 | 30 | 30 |
| Tx:R-Ro | | .222 | .222 | .222 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | -.072 | -1.146 | 1.687 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | -.166 | -1.320 | 1.711 |
| PHS | (DEG ) | 1.3 | 1.0 | 1.0 |
| Bs/I:MAG | (nT/A) | -.094 | -.175 | .049 |
| PHS | (DEG ) | 2.3 | 7.5 | -61.4 |
| %MMR | | 7.7 | 14.5 | -4.1 |

| STATION 11 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | -35.7 | -19.5 | -9.5 |
| Rx:R-Ro | | .316 | .396 | -.400 |
| Q-Qo | | -.028 | -.030 | .044 |
| GAIN | | 300 | 30 | 30 |
| Tx:R-Ro | | .162 | .162 | .162 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | -.032 | -1.183 | 1.559 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | -.115 | -1.390 | 1.584 |
| PHS | (DEG ) | -1.6 | -.2 | -.2 |
| Bs/I:MAG | (nT/A) | -.083 | -.207 | .041 |
| PHS | (DEG ) | -2.2 | -1.6 | -53.5 |
| %MMR | | 6.8 | 17.1 | -3.4 |

| STATION 12 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | -34.9 | -4.8 | -9.5 |
| Rx:R-Ro | | .394 | .547 | -.502 |
| Q-Qo | | .015 | -.048 | .043 |
| GAIN | | 300 | 30 | 30 |
| Tx:R-Ro | | .222 | .222 | .222 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | .010 | -1.200 | 1.430 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | -.104 | -1.402 | 1.447 |
| PHS | (DEG ) | 5.7 | -.9 | -.9 |
| Bs/I:MAG | (nT/A) | -.114 | -.203 | .017 |
| PHS | (DEG ) | 5.2 | -6.3 | 16.9 |
| %MMR | | 9.5 | 16.9 | -1.4 |

LOCKHART BASIN 1

| STATION 13 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | -34.1 | 10.0 | -9.4 |
| Rx:R-Ro | | .138 | .533 | -.446 |
| Q-Qo | | -.038 | -.032 | .038 |
| GAIN | | 1000 | 30 | 30 |
| Tx:R-Ro | | .221 | .222 | .222 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | .051 | -1.196 | 1.302 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | -.012 | -1.364 | 1.286 |
| PHS | (DEG ) | -12.3 | .7 | .7 |
| Bs/I:MAG | (nT/A) | -.062 | -.168 | -.017 |
| PHS | (DEG ) | -2.3 | 5.4 | -17.3 |
| %MMR | | 5.2 | 14.0 | 1.4 |

| STATION 14 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | -33.2 | 24.5 | -9.6 |
| Rx:R-Ro | | -.185 | .515 | -.400 |
| Q-Qo | | .150 | -.036 | .028 |
| GAIN | | 1000 | 30 | 30 |
| Tx:R-Ro | | .221 | .221 | .221 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | .087 | -1.170 | 1.181 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | .019 | -1.324 | 1.157 |
| PHS | (DEG ) | -35.9 | .1 | .1 |
| Bs/I:MAG | (nT/A) | -.072 | -.154 | -.033 |
| PHS | (DEG ) | 9.1 | .9 | -42.9 |
| %MMR | | 6.0 | 12.9 | 2.7 |

| STATION 15 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | -32.2 | 39.0 | -9.8 |
| Rx:R-Ro | | -.138 | .379 | -.274 |
| Q-Qo | | .017 | -.029 | .022 |
| GAIN | | 300 | 30 | 30 |
| Tx:R-Ro | | .166 | .166 | .166 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | .114 | -1.128 | 1.065 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | .049 | -1.298 | 1.056 |
| PHS | (DEG ) | -3.5 | -.3 | -.3 |
| Bs/I:MAG | (nT/A) | -.065 | -.170 | -.013 |
| PHS | (DEG ) | 2.7 | -2.1 | -44.3 |
| %MMR | | 5.4 | 14.3 | 1.1 |

| STATION 16 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | -31.5 | 53.6 | -9.9 |
| Rx:R-Ro | | -.316 | .459 | -.332 |
| Q-Qo | | .009 | -.027 | .022 |
| GAIN | | 300 | 30 | 30 |
| Tx:R-Ro | | .221 | .221 | .221 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | .134 | -1.073 | .958 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | .084 | -1.180 | .960 |
| PHS | (DEG ) | 1.9 | .7 | .7 |
| Bs/I:MAG | (nT/A) | -.050 | -.107 | .022 |
| PHS | (DEG ) | -3.2 | 8.1 | 86.6 |
| %MMR | | 4.2 | 9.0 | -1.8 |

LOCKHART BASIN 1

| STATION 17 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | -30.8 | 68.1 | -10.0 |
| Rx:R-Ro | | -.257 | .331 | -.726 |
| Q-Qo | | .021 | -.030 | .048 |
| GAIN | | 300 | 30 | 100 |
| Tx:R-Ro | | .168 | .168 | .167 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | .144 | -1.011 | .861 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | .090 | -1.122 | .841 |
| PHS | (DEG ) | -1.2 | -1.1 | -1.1 |
| Bs/I:MAG | (nT/A) | -.054 | -.113 | -.030 |
| PHS | (DEG ) | 1.9 | -10.8 | -47.1 |
| %MMR | | 4.6 | 9.5 | 2.6 |

| STATION 18 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | -29.3 | 97.7 | -10.4 |
| Rx:R-Ro | | -.390 | .296 | -.581 |
| Q-Qo | | .029 | -.014 | .041 |
| GAIN | | 300 | 30 | 100 |
| Tx:R-Ro | | .175 | .174 | .175 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | .144 | -.872 | .692 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | .131 | -.965 | .642 |
| PHS | (DEG ) | -.8 | 1.4 | 1.4 |
| Bs/I:MAG | (nT/A) | -.013 | -.096 | -.052 |
| PHS | (DEG ) | 7.3 | 14.2 | -15.7 |
| %MMR | | 1.1 | 8.1 | 4.4 |

| STATION 19 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | -27.8 | 127.1 | -10.4 |
| Rx:R-Ro | | -.329 | .250 | -.468 |
| Q-Qo | | .028 | -.020 | .041 |
| GAIN | | 300 | 30 | 100 |
| Tx:R-Ro | | .174 | .174 | .174 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | .128 | -.741 | .561 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | .111 | -.817 | .521 |
| PHS | (DEG ) | -1.4 | -.5 | -.5 |
| Bs/I:MAG | (nT/A) | -.017 | -.077 | -.040 |
| PHS | (DEG ) | 9.2 | -5.1 | -3.8 |
| %MMR | | 1.4 | 6.5 | 3.3 |

| STATION 20 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | -26.3 | 158.2 | -10.5 |
| Rx:R-Ro | | -.288 | .681 | -.367 |
| Q-Qo | | .030 | -.053 | .035 |
| GAIN | | 300 | 100 | 100 |
| Tx:R-Ro | | .174 | .173 | .174 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | .104 | -.618 | .453 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | .098 | -.678 | .409 |
| PHS | (DEG ) | -2.5 | -.2 | -.2 |
| Bs/I:MAG | (nT/A) | -.008 | -.060 | -.044 |
| PHS | (DEG ) | 31.5 | -1.7 | 1.4 |
| %MMR | | .7 | 5.1 | 3.7 |

LOCKHART BASIN 1

| STATION 21 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | -24.7 | 187.7 | -10.9 |
| Rx:R-Ro | | -.696 | .575 | -.297 |
| Q-Qo | | .050 | -.036 | .016 |
| GAIN | | 1000 | 100 | 100 |
| Tx:R-Ro | | .173 | .173 | .173 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | .082 | -.520 | .374 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | .072 | -.571 | .332 |
| PHS | (DEG ) | -1.0 | .7 | .7 |
| Bs/I:MAG | (nT/A) | -.010 | -.052 | -.045 |
| PHS | (DEG ) | 7.1 | 7.9 | -16.7 |
| %MMR | | .9 | 4.4 | 3.8 |

| STATION 22 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | -23.2 | 217.3 | -11.4 |
| Rx:R-Ro | | -.615 | .481 | -.248 |
| Q-Qo | | .060 | -.049 | .034 |
| GAIN | | 1000 | 100 | 100 |
| Tx:R-Ro | | .174 | .174 | .174 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | .064 | -.439 | .313 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | .064 | -.477 | .278 |
| PHS | (DEG ) | -2.5 | -1.5 | -1.5 |
| Bs/I:MAG | (nT/A) | -.003 | -.040 | -.038 |
| PHS | (DEG ) | 78.7 | -18.6 | 18.9 |
| %MMR | | .2 | 3.4 | 3.2 |

| STATION 23 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | -21.4 | 247.1 | -11.7 |
| Rx:R-Ro | | -.402 | .388 | -.610 |
| Q-Qo | | .051 | -.054 | .058 |
| GAIN | | 1000 | 100 | 300 |
| Tx:R-Ro | | .174 | .173 | .173 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | .049 | -.373 | .264 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | .042 | -.389 | .224 |
| PHS | (DEG ) | -4.1 | -3.6 | -3.6 |
| Bs/I:MAG | (nT/A) | -.008 | -.029 | -.040 |
| PHS | (DEG ) | 22.9 | -58.1 | -.4 |
| %MMR | | .7 | 2.5 | 3.5 |

| STATION 24 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | -19.6 | 277.0 | -12.1 |
| Rx:R-Ro | | -.311 | .348 | -.513 |
| Q-Qo | | .015 | -.032 | .055 |
| GAIN | | 1000 | 100 | 300 |
| Tx:R-Ro | | .171 | .173 | .173 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | .037 | -.318 | .225 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | .033 | -.347 | .188 |
| PHS | (DEG ) | .3 | -1.0 | -1.0 |
| Bs/I:MAG | (nT/A) | -.004 | -.029 | -.037 |
| PHS | (DEG ) | -2.6 | -11.4 | 3.1 |
| %MMR | | .4 | 2.5 | 3.2 |

LOCKHART BASIN 2

WIRE FILE

| N | X(M) | Y(M) | Z(M) |
|---|---|---|---|
| 1 | -157.3 | 0.0 | 5.7 |
| 2 | -157.1 | -344.8 | 2.1 |
| 3 | 146.5 | -343.7 | -1.3 |
| 4 | 157.3 | 0.0 | 2.9 |

LOCKHART BASIN 2

| STATION 1 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | 5.1 | -283.7 | .7 |
| Rx:R-Ro | | -.144 | .331 | -.482 |
| Q-Qo | | .011 | -.012 | .040 |
| GAIN | | 300 | 100 | 10 |
| Tx:R-Ro | | .177 | .177 | .179 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | .071 | -.557 | 4.737 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | .048 | -.321 | 5.214 |
| PHS | (DEG ) | -.9 | 2.2 | 2.2 |
| Bs/I:MAG | (nT/A) | -.023 | .236 | .479 |
| PHS | (DEG ) | 1.8 | -3.0 | 3.9 |
| %MMR | | 2.0 | -20.5 | -41.5 |

| STATION 2 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | 5.7 | -254.4 | 1.0 |
| Rx:R-Ro | | -.109 | .397 | -.371 |
| Q-Qo | | .073 | -.029 | .030 |
| GAIN | | 1000 | 100 | 10 |
| Tx:R-Ro | | .179 | .179 | .179 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | .074 | -.462 | 3.702 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | .013 | -.382 | 4.013 |
| PHS | (DEG ) | -30.7 | .1 | .1 |
| Bs/I:MAG | (nT/A) | -.063 | .081 | .313 |
| PHS | (DEG ) | 6.1 | -.6 | 6.2 |
| %MMR | | 5.5 | -7.0 | -27.1 |

| STATION 3 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | 6.1 | -224.4 | 1.4 |
| Rx:R-Ro | | -.265 | .512 | -.344 |
| Q-Qo | | .067 | -.023 | .010 |
| GAIN | | 1000 | 100 | 10 |
| Tx:R-Ro | | .191 | .191 | .191 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | .079 | -.476 | 3.166 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | .026 | -.460 | 3.477 |
| PHS | (DEG ) | -11.1 | 1.7 | 1.7 |
| Bs/I:MAG | (nT/A) | -.054 | .021 | .369 |
| PHS | (DEG ) | 5.2 | -41.3 | 34.3 |
| %MMR | | 4.7 | -1.8 | -32.1 |

| STATION 4 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | 6.5 | -195.1 | 1.8 |
| Rx:R-Ro | | -.038 | .632 | -.315 |
| Q-Qo | | -.013 | -.035 | .029 |
| GAIN | | 1000 | 100 | 10 |
| Tx:R-Ro | | .188 | .194 | .194 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | .084 | -.532 | 2.834 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | .004 | -.560 | 3.147 |
| PHS | (DEG ) | 22.0 | 1.1 | 1.1 |
| Bs/I:MAG | (nT/A) | -.081 | -.030 | .313 |
| PHS | (DEG ) | -1.0 | 21.5 | -1.6 |
| %MMR | | 7.0 | 2.6 | -27.2 |

LOCKHART BASIN 2

| STATION 5 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | 6.8 | -165.5 | 2.1 |
| Rx:R-Ro | | .122 | .816 | -.296 |
| Q-Qo | | -.020 | -.042 | .026 |
| GAIN | | 1000 | 100 | 10 |
| Tx:R-Ro | | .191 | .192 | .192 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | .088 | -.615 | 2.581 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | -.012 | -.730 | 2.987 |
| PHS | (DEG ) | -6.2 | 1.4 | 1.4 |
| Bs/I:MAG | (nT/A) | -.100 | -.117 | .406 |
| PHS | (DEG ) | -.7 | 8.5 | .6 |
| %MMR | | 8.6 | 10.1 | -35.2 |

| STATION 6 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | 6.9 | -136.5 | 2.7 |
| Rx:R-Ro | | -.034 | .304 | -.285 |
| Q-Qo | | .037 | -.019 | .023 |
| GAIN | | 1000 | 30 | 10 |
| Tx:R-Ro | | .193 | .193 | .193 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | .091 | -.719 | 2.366 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | .005 | -.895 | 2.859 |
| PHS | (DEG ) | -44.3 | .5 | .5 |
| Bs/I:MAG | (nT/A) | -.087 | -.175 | .494 |
| PHS | (DEG ) | 2.1 | 2.7 | 2.8 |
| %MMR | | 7.6 | 15.2 | -42.9 |

| STATION 7 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | 7.4 | -106.5 | 2.9 |
| Rx:R-Ro | | .126 | .365 | -.266 |
| Q-Qo | | -.042 | -.022 | .025 |
| GAIN | | 1000 | 30 | 10 |
| Tx:R-Ro | | .200 | .200 | .201 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | .091 | -.843 | 2.155 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | -.012 | -1.037 | 2.565 |
| PHS | (DEG ) | -15.3 | .7 | .7 |
| Bs/I:MAG | (nT/A) | -.103 | -.194 | .411 |
| PHS | (DEG ) | -1.8 | 3.5 | -1.7 |
| %MMR | | 8.9 | 16.8 | -35.6 |

| STATION 8 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | 7.6 | -77.1 | 3.1 |
| Rx:R-Ro | | -.145 | .448 | -.238 |
| Q-Qo | | -.018 | -.036 | .014 |
| GAIN | | 1000 | 30 | 10 |
| Tx:R-Ro | | .206 | .207 | .207 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | .086 | -.970 | 1.941 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | .013 | -1.231 | 2.223 |
| PHS | (DEG ) | 10.2 | -.5 | -.5 |
| Bs/I:MAG | (nT/A) | -.073 | -.262 | .289 |
| PHS | (DEG ) | -1.8 | -2.3 | 13.4 |
| %MMR | | 6.3 | 22.7 | -25.1 |

LOCKHART BASIN 2

| STATION 9 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | 7.7 | -47.8 | 3.6 |
| Rx:R-Ro | | .300 | .510 | -.208 |
| Q-Qo | | .006 | -.043 | .015 |
| GAIN | | 1000 | 30 | 10 |
| Tx:R-Ro | | .208 | .206 | .207 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | .073 | -1.081 | 1.714 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | -.026 | -1.409 | 1.944 |
| PHS | (DEG ) | 4.2 | -.7 | -.7 |
| Bs/I:MAG | (nT/A) | -.099 | -.327 | .232 |
| PHS | (DEG ) | 1.1 | -3.1 | 8.2 |
| %MMR | | 8.6 | 28.4 | -20.1 |

| STATION 10 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | 7.7 | -18.3 | 4.0 |
| Rx:R-Ro | | .512 | .542 | -.173 |
| Q-Qo | | .002 | -.045 | .009 |
| GAIN | | 1000 | 30 | 10 |
| Tx:R-Ro | | .212 | .212 | .212 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | .052 | -1.152 | 1.477 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | -.043 | -1.454 | 1.577 |
| PHS | (DEG ) | 3.3 | -.6 | -.6 |
| Bs/I:MAG | (nT/A) | -.095 | -.302 | .115 |
| PHS | (DEG ) | 1.5 | -3.1 | 30.5 |
| %MMR | | 8.3 | 26.2 | -10.0 |

| STATION 11 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | 7.7 | 10.9 | 4.2 |
| Rx:R-Ro | | .250 | .553 | -.435 |
| Q-Qo | | -.011 | -.042 | .034 |
| GAIN | | 300 | 30 | 30 |
| Tx:R-Ro | | .213 | .215 | .213 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | .027 | -1.160 | 1.242 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | -.069 | -1.462 | 1.306 |
| PHS | (DEG ) | 1.0 | -.2 | -.2 |
| Bs/I:MAG | (nT/A) | -.096 | -.302 | .065 |
| PHS | (DEG ) | .7 | -1.2 | 12.7 |
| %MMR | | 8.4 | 26.2 | -5.7 |

| STATION 12 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | 7.9 | 40.4 | 4.5 |
| Rx:R-Ro | | .291 | .547 | -.380 |
| Q-Qo | | -.011 | -.050 | .044 |
| GAIN | | 300 | 30 | 30 |
| Tx:R-Ro | | .226 | .226 | .226 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | .005 | -1.103 | 1.021 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | -.076 | -1.378 | 1.079 |
| PHS | (DEG ) | 1.3 | -1.1 | -1.1 |
| Bs/I:MAG | (nT/A) | -.081 | -.276 | .064 |
| PHS | (DEG ) | 1.3 | -5.6 | -26.1 |
| %MMR | | 7.0 | 23.9 | -5.6 |

LOCKHART BASIN 2

| STATION 13 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | 7.9 | 69.6 | 4.9 |
| Rx:R-Ro | | .360 | .471 | -.298 |
| Q-Qo | | -.009 | -.040 | .021 |
| GAIN | | 300 | 30 | 30 |
| Tx:R-Ro | | .229 | .229 | .228 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | -.010 | -.999 | .830 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | -.092 | -1.170 | .835 |
| PHS | (DEG ) | 2.1 | -.8 | -.8 |
| Bs/I:MAG | (nT/A) | -.082 | -.172 | .017 |
| PHS | (DEG ) | 2.3 | -5.2 | 69.8 |
| %MMR | | 7.1 | 14.9 | -1.4 |

| STATION 14 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | 8.1 | 99.3 | 5.2 |
| Rx:R-Ro | | .401 | .397 | -.226 |
| Q-Qo | | -.017 | -.016 | .023 |
| GAIN | | 300 | 30 | 30 |
| Tx:R-Ro | | .229 | .229 | .230 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | -.018 | -.871 | .668 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | -.103 | -.984 | .630 |
| PHS | (DEG ) | 1.1 | 1.8 | 1.8 |
| Bs/I:MAG | (nT/A) | -.085 | -.116 | -.039 |
| PHS | (DEG ) | 1.3 | 15.4 | 11.4 |
| %MMR | | 7.3 | 10.1 | 3.4 |

| STATION 15 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | 8.0 | 128.7 | 5.6 |
| Rx:R-Ro | | .308 | .334 | -.173 |
| Q-Qo | | -.016 | -.030 | .015 |
| GAIN | | 300 | 30 | 30 |
| Tx:R-Ro | | .229 | .229 | .229 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | -.019 | -.744 | .541 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | -.079 | -.830 | .483 |
| PHS | (DEG ) | .5 | -1.0 | -1.0 |
| Bs/I:MAG | (nT/A) | -.060 | -.087 | -.058 |
| PHS | (DEG ) | .7 | -9.9 | -1.2 |
| %MMR | | 5.2 | 7.6 | 5.0 |

| STATION 16 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | 8.2 | 158.1 | 5.8 |
| Rx:R-Ro | | .263 | .275 | -.462 |
| Q-Qo | | -.010 | -.019 | .026 |
| GAIN | | 300 | 30 | 100 |
| Tx:R-Ro | | .229 | .229 | .229 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | -.019 | -.629 | .442 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | -.067 | -.682 | .390 |
| PHS | (DEG ) | 1.3 | .1 | .1 |
| Bs/I:MAG | (nT/A) | -.049 | -.054 | -.054 |
| PHS | (DEG ) | 1.8 | 1.9 | -15.3 |
| %MMR | | 4.2 | 4.7 | 4.7 |

LOCKHART BASIN 2

| STATION 17 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | 8.2 | 187.5 | 6.0 |
| Rx:R-Ro | | .216 | .751 | -.388 |
| Q-Qo | | -.004 | -.029 | .040 |
| GAIN | | 300 | 100 | 100 |
| Tx:R-Ro | | .235 | .235 | .235 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | -.016 | -.530 | .364 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | -.054 | -.549 | .320 |
| PHS | (DEG ) | 2.4 | 2.1 | 2.1 |
| Bs/I:MAG | (nT/A) | -.038 | -.027 | -.044 |
| PHS | (DEG ) | 3.5 | 47.0 | 4.3 |
| %MMR | | 3.3 | 2.4 | 3.8 |

| STATION 18 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | 8.2 | 216.7 | 6.4 |
| Rx:R-Ro | | .166 | .613 | -.311 |
| Q-Qo | | .008 | -.056 | .033 |
| GAIN | | 300 | 100 | 100 |
| Tx:R-Ro | | .235 | .235 | .235 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | -.013 | -.448 | .304 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | -.041 | -.449 | .257 |
| PHS | (DEG ) | 6.3 | -.9 | -.9 |
| Bs/I:MAG | (nT/A) | -.028 | -.007 | -.048 |
| PHS | (DEG ) | 9.3 | -79.5 | 4.1 |
| %MMR | | 2.4 | .6 | 4.1 |

| STATION 19 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | 8.1 | 246.0 | 6.6 |
| Rx:R-Ro | | .644 | .534 | -.810 |
| Q-Qo | | -.101 | -.027 | .092 |
| GAIN | | 1000 | 100 | 300 |
| Tx:R-Ro | | .239 | .238 | .237 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | -.011 | -.381 | .257 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | -.049 | -.386 | .217 |
| PHS | (DEG ) | -5.8 | 1.4 | 1.4 |
| Bs/I:MAG | (nT/A) | -.038 | -.011 | -.040 |
| PHS | (DEG ) | -7.5 | 63.6 | 5.4 |
| %MMR | | 3.3 | .9 | 3.5 |

| STATION 20 | | X | Y | Z |
|---|---|---|---|---|
| COORD | (m ) | 8.3 | 275.6 | 7.0 |
| Rx:R-Ro | | .446 | .455 | -.688 |
| Q-Qo | | -.130 | -.025 | .107 |
| GAIN | | 1000 | 100 | 300 |
| Tx:R-Ro | | .243 | .244 | .244 |
| Q-Qo | | 0.000 | 0.000 | 0.000 |
| Bp/I:MAG | (nT/A) | -.009 | -.325 | .219 |
| PHS | (DEG ) | 0.0 | 0.0 | 0.0 |
| Bm/I:MAG | (nT/A) | -.034 | -.320 | .180 |
| PHS | (DEG ) | -13.2 | 1.2 | 1.2 |
| Bs/I:MAG | (nT/A) | -.026 | .008 | -.040 |
| PHS | (DEG ) | -17.7 | -54.3 | 15.0 |
| %MMR | | 2.2 | -.7 | 3.5 |