DEPARTMENT OF THE INTERIOR

U.S. GEOLOGICAL SURVEY

Aeromagnetic gridded data from two surveys flown

over a buried porphyry copper deposit

west of Casa Grande, Arizona

by

Viki Bankey[1], and Robert E. Bracken[1]

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This report is preliminary and has not been reviewed for conformity
with U.S. Geological Survey editorial standards. Trade names are used
for descriptive purposes only and do not constitute endorsement by the
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[1]Denver, CO

INTRODUCTION

The Casa Grande deposit (also known as the Santa Cruz deposit) is a buried porphyry copper deposit 7 mi west of the city of Casa Grande, Arizona. The prospect has been drilled at close spacing and ore was discovered between 1,000 and 2,000 ft below the surface. The deposit is similar to the Sacaton porphyry copper deposit located 6 mi northeast and may have been part of the same hydrothermal system that was later separated by faulting.

Companies developing the deposit have proposed leaching of the buried ore in place. The U.S. Geological Survey (USGS) and the U.S. Bureau of Mines are studying the geology and hydrology of the area to evaluate the environmental impact of the leaching technique. In support of the study, the USGS has recently flown two aeromagnetic surveys over the Casa Grande deposit: one flown north-south, 600 ft above terrain at 1/2-mi spacing, and the second flown east-west, 300 ft above terrain at 1/4-mi spacing (figure 1).

DATA COLLECTION

The aeromagnetic surveys were flown May 7-8, 1988, by the USGS using a fixed-wing aircraft. The altitude was radar controlled at a constant height above ground, and a Motorola Mini-Ranging System III[1] navigation system was set up in the area for horizontal navigation coordinates. A GeoMetrics model G-813 proton precession magnetometer was mounted in the aircraft tail stinger and had a sensitivity of 0.2 nanoTeslas and a cycle time of 0.8 seconds. The sampling interval was 0.2 seconds and average aircraft speed was 90 nautical mi/hour (46 m/sec).

The navigational data were reduced to a UTM coordinate grid having a central meridian of 111° W long. and a base latitude of 0°. The 300-ft survey was gridded at a 0.1-km spacing, and the 600-ft survey was gridded at a 0.2-km spacing, using a computer program written by Webring (1981) based on a minimum curvature algorithm (Briggs, 1974).

The magnetometer readings were corrected for time-dependant changes in the magnetic field as measured by a base magnetometer set up in the field area. The IGRF (Internation Geomagnetic Reference Field) updated to May, 1988, was calculated for the appropriate latitude, longitude, and average survey elevation, and was removed from each grid using a program written by Sweeney (1990).

ACKNOWLEDGEMENTS

DESCRIPTION OF DISKETTE

The 5-1/4 in, high density (1.6 megabyte) diskette in IBM-AT format contains three data files in ASCII (text readable).

file 1: title page of this report (title.)
file 2: 300 ft survey, gridded data (casa300g.asc)
file 3: 600 ft survey, gridded data (casa600g.asc)

GRIDDED DATA FORMAT

The second and third files on the diskette contain data interpolated to a square grid covering the areas shown in figure 1. Each file begins with a 10-line header entry as follows (see Appendix A):

Line 1: type of file stored on tape
Line 2: name of file
Line 3: 80 character description of the file
Line 4: FORTRAN format for each data record.
Line 5: Numbers written per record, numbers making up one grid row, and records required to contain the values in one grid row
Line 6: Grid identification string (56 characters), program name ("min-curv") that created grid (8 characters), central meridian and base latitude of the grid (decimal degrees).
Line 7: Number of columns, number of rows, number of values per grid position (1), projection (UTM), position of first column in km west of the central meridian, the distance between columns (km), position of the first row in km north of the base latitude, and the distance between rows (km).
Line 8-10: Description of lines 6 and 7.

A row is defined as a series of data positions that extend from west to east along a common north coordinate. The first value in each row contains a "0" to indicate that the grid is evenly spaced. The first row is the southernmost. Dummy values, or dvals, are used to indicate areas within the grid that do not contain valid data and have a value of 0.10000000E+31. Such an area occurs in the northwest corner of the 300-ft grid where the Mini-ranger navigation reception was poor.

REFERENCES CITED

Briggs, I.C., 1974, Machine contouring using minimum curvature: Geophysics, v. 39, no. 1, p. 39-48.

Sweeney, R.E., 1990, IGRFGRID--A program for creation of a total magnetic field (International Geomagnetic Reference Field) grid representing the earth's main magnetic field: U.S. Geological Survey Open-File Report 90-45A-B, 39 p.

Webring, M.W., 1981, MINC--A gridding program based on minimum curvature: U.S. Geological Survey Open-File Report 81-1224, 41 p.
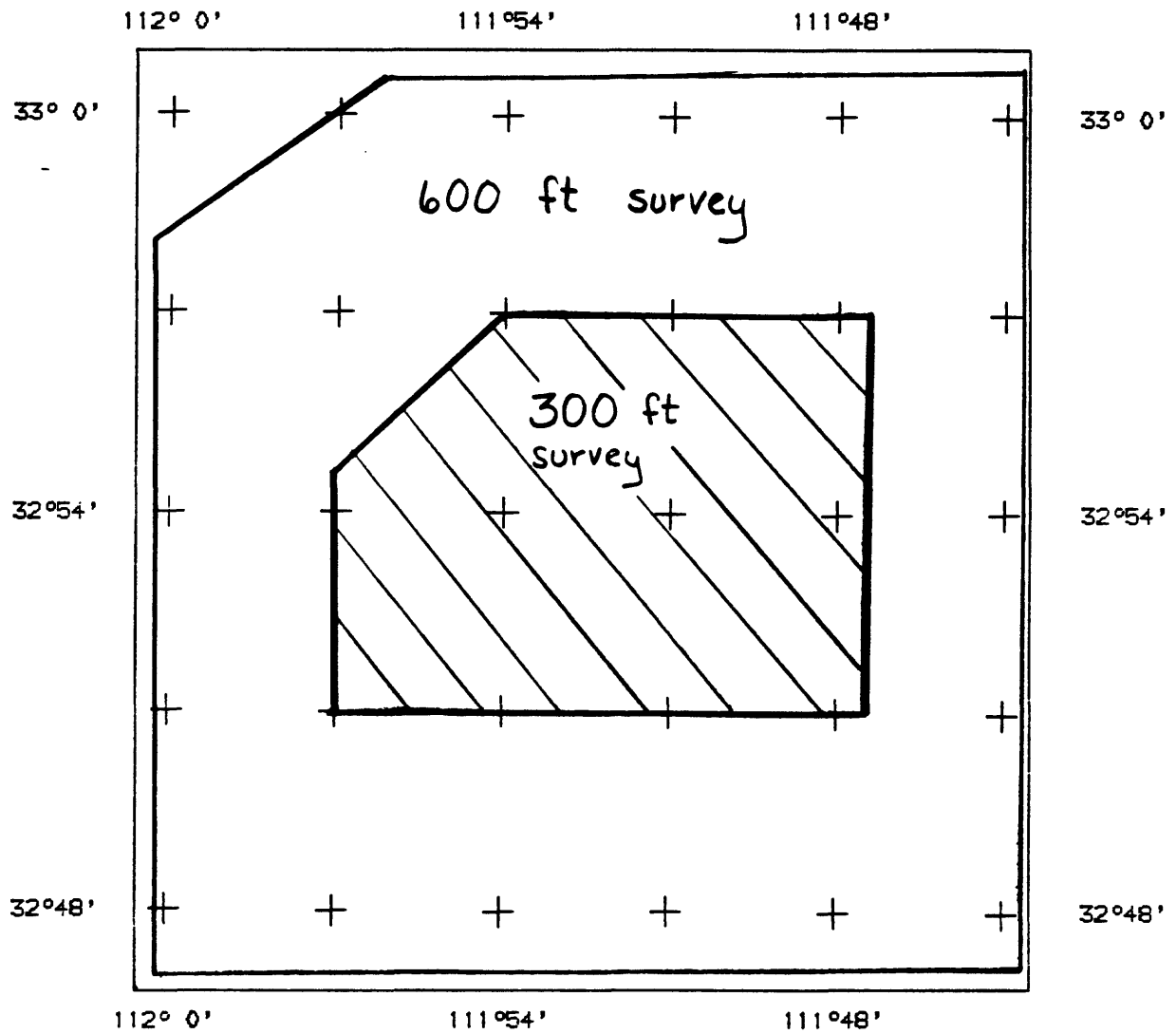
Figure 1--Location of two aeromagnetic surveys studied in report.

APPENDIX A--FIRST 13 LINES OF GRID FILES (FILES 2 AND 3 ON DISKETTE)

FILETYPE= GRID,   CREATION DATE: 18-JUL-1990 11:01:56.34
CASA300MAG.GRD
CASA GRANDE 300 FT MAG GRID
(5E16.8)
5 NUMBERS WRITTEN PER LINE; 140 NUMBERS = 1 GRID ROW; 28 RECORDS = 1 GRID ROW
Casa Grande 300 ft. survey, .1 km grid, IGRF removed;   min-curv; 111.0   0.000
     139   103   1 UTM -88.6   0.1   3635.4   0.1
THE TWO LINES ABOVE CONTAIN GRID SPECIFICATIONS.
LINE 1: GRID ID, CREATION PROGRAM, CENTRAL MERID, BASE LATITUDE
LINE 2: #COL, #ROW, #VAL, PROJ, X ORIG., DEL X, Y ORIG., DEL Y
    0.00000000E+00 -0.85039063E+02 -0.89593750E+02 -0.95023438E+02 -0.10130859E+03
   -0.10832031E+03 -0.11589453E+03 -0.12386328E+03 -0.13207422E+03 -0.14034375E+03
   -0.14842578E+03 -0.15621094E+03 -0.16364844E+03 -0.17080078E+03 -0.17782813E+03

FILETYPE= GRID CREATION DATE: 18-JUL-1990 11:03:26.86
CASA600MAG.GRD
CASA GRANDE 600 FT MAG GRID
(5E16.8)
5 NUMBERS WRITTEN PER LINE; 125 NUMBERS = 1 GRID ROW; 25 RECORDS = 1 GRID ROW
Casa Grande 600 ft survey, .2 km grid, IGRF removed;   min-curv; 111.000   0.000
     124   127   1 UTM -94.0278   0.2   3627.2773   0.2
THE TWO LINES ABOVE CONTAIN GRID SPECIFICATIONS.
LINE 1: GRID ID, CREATION PROGRAM, CENTRAL MERID, BASE LATITUDE
LINE 2: #COL, #ROW, #VAL, PROJ, X ORIG., DEL X, Y ORIG., DEL Y
    0.00000000E+00 0.10000000E+31 0.10000000E+31 0.10000000E+31 0.10000000E+31
    0.10000000E+31 0.10000000E+31 0.10000000E+31 0.10000000E+31 0.10000000E+31
    0.10000000E+31 0.10000000E+31 0.10000000E+31 0.10000000E+31 0.10000000E+31

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