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Geophysical Report 2019-17

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STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

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SOUTHERN DELTA RIVER ELECTROMAGNETIC AND MAGNETIC AIRBORNE GEOPHYSICAL SURVEY DATA COMPILATION

Burns, L.E.[1], Graham, G.R.C.[1], Barefoot, J.D.[1], Fugro Airborne Surveys, and Stevens Exploration Management Corp.

ABSTRACT

The Southern Delta River electromagnetic and magnetic airborne geophysical survey is located in interior Alaska in the Delta River mining district, about 200 kilometers southeast of Fairbanks. Frequency domain electromagnetic and magnetic data were collected with the DIGHEM^{V} system from August to September 2002. A total of 2,902.8 line kilometers were collected covering 1001 square kilometers. Line spacing was 400 meters (m). Data were collected 30 m above the ground surface from a helicopter towed sensor platform ("bird") on a 30 m long line.

PURPOSE

This airborne geophysical survey is part of a program to acquire data on Alaska's most promising mineral belts and districts. The information acquired is aimed at catalyzing new private-sector exploration, discovery, and ultimate development and production. The purpose of the survey was to map the magnetic and conductive properties of the survey area. The survey area contains prospects for lode gold, placer gold, and Ni-Cu-PGE deposits. Other gold and base-metal anomalies, altered zones, favorable lithologies, and structural zones are known to exist throughout the survey area.

SURVEY OVERVIEW DESCRIPTION

This document provides an overview of the survey and includes text and figures of select primary and derivative products of this survey. A table of digital data packages available for download is provided to assist users in data selection. For reference, a catalog of the available maps is presented in reduced resolution. Please consult the metadata, project report, and digital data packages for more information and data.

ACKNOWLEDGMENTS

Funding was provided by the U.S. Department of Interior Bureau of Land Management (BLM).

KNOWN PROBLEMS

The digital data for this compilation is from the 2002 Southern Delta River survey by Fugro Airborne Surveys and Stevens Exploration Management Corp. However, the Southern Delta River contract specified that print maps sheets would also depict previously acquired data from the Nikolai airborne geophysical survey (1995 by Aerodat, Inc.). Merged data grids of several adjacent surveys in this region are available in DGGS publication DDS-12.

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[1] Alaska Division of Geological & Geophysical Surveys, 3354 College Road, Fairbanks, Alaska 99709-3707

AVAILABLE DATA

Data Type	Provider	Description
ascii_data	contractor	ASCII format line data, other ASCII data
databases_geosoft	contractor	Geosoft format database of final line data, other Geosoft format databases
documents	contractor and DGGS	Project and field reports, survey background information, gridded data explanations, other documentation
grids_ermapper	contractor and DGGS	Geographically registered gridded data, ER Mapper ERS format
grids_geosoft	contractor and DGGS	Geosoft-format grids, these grids can be viewed in ESRI ArcMap using a free plugin from Geosoft or the free viewer available from Geosoft
images_registered	DGGS	GeoTiff format images of all gridded data
kmz	DGGS	keyhole markup language (kml) kmz archive files of project data. Viewable in Google Earth and other compatible programs
maps_pdf_format	contractor and DGGS	Printable maps in pdf format
maps_prn_format	contractor	Printable maps in HPGL/2 printer file format with extension .prn
profiles_stacked	contractor	Distance-based profiles of the digitally recorded geophysical data are generated and plotted at an appropriate scale. The profiles display electromagnetic anomalies with their respective interpretive symbols. Printable in pdf format
vector_data	contractor and DGGS	Line path, data contours, and survey boundary in ESRI shapefile (SHP) format, ESRI Geodatabase format, and/or AutoCAD dxf format
video_flightpath	contractor	Survey flight path downward facing video

REFERENCES

Akima, H., 1970, A new method of interpolation and smooth curve fitting based on local procedures: Journal of the Association of Computing Machinery, v. 17, n. 4, p. 589–602.

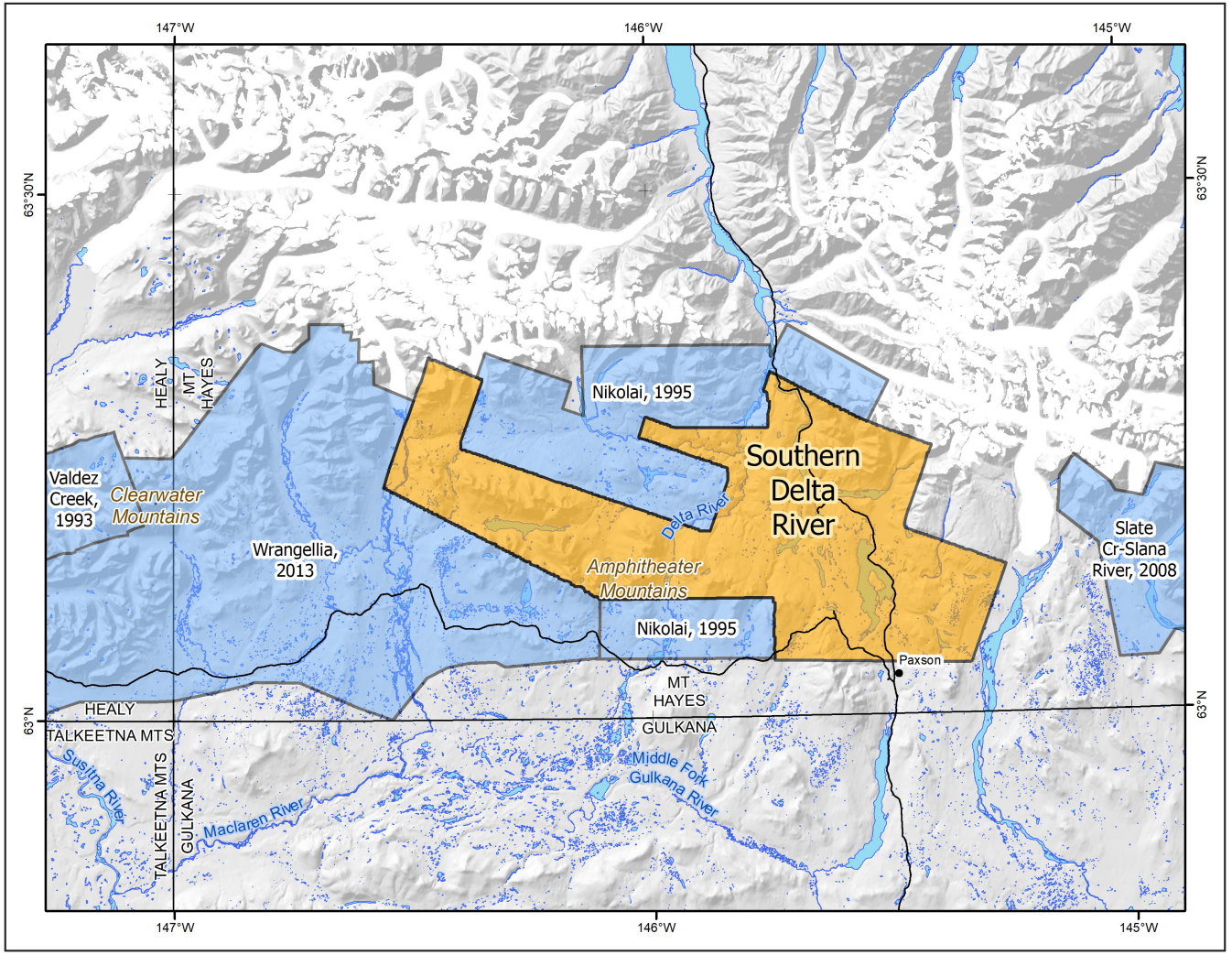
Burns, L.E., U.S. Bureau of Land Management, Fugro Airborne Surveys, and Stevens Exploration Management Corp., 2003, Line, grid, and vector data of airborne geophysical survey data for the southern Delta River area, east-central Alaska: Alaska Division of Geological & Geophysical Surveys Geophysical Report 2003-6, 1 DVD. http://doi.org/10.14509/2973

Burns, L.E., U.S. Bureau of Land Management, Fugro Airborne Surveys, and Stevens Exploration Management Corp., 2003, Plot files of the airborne geophysical survey data of the southern Delta River area, east-central Alaska: Alaska Division of Geological & Geophysical Surveys Geophysical Report 2003-5, 1 DVD. http://doi.org/10.14509/2904

Burns, L.E., and Clautice, K.H., 2003, Portfolio of aeromagnetic and resistivity maps of the southern Delta River area, east-central Alaska: Alaska Division of Geological & Geophysical Surveys Geophysical Report 2003-8, 15 p. http://doi.org/10.14509/2975

Fraser, D.C., 1978, Resistivity mapping with an airborne multicoil electromagnetic system: Geophysics, v. 43, p. 144-172.

Pritchard, R.A., and Fugro Airborne Surveys, 2003, Project report of the airborne geophysical survey for the southern Delta River area, east-central Alaska: Alaska Division of Geological & Geophysical Surveys Geophysical Report 2003-7, 252 p., 2 sheets, scale 1:63,360. http://doi.org/10.14509/2974



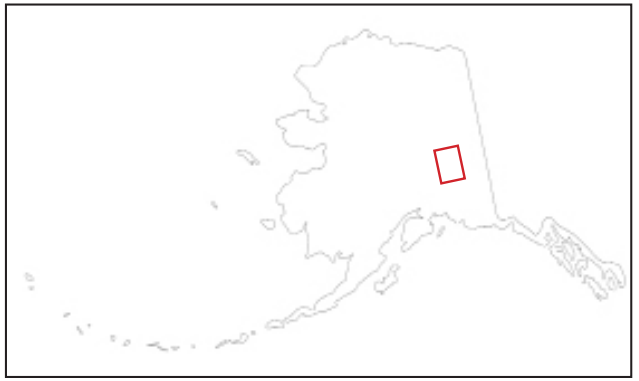


Figure 1. Southern Delta River electromagnetic and magnetic airborne geophysical survey location shown in interior Alaska (inset). Southern Delta River survey area shown with adjacent DGGS geophysical surveys, landmarks, relevant 1:250,000-scale quadrangle boundaries, mountain ranges, rivers, glaciers, and elevation hillshade.

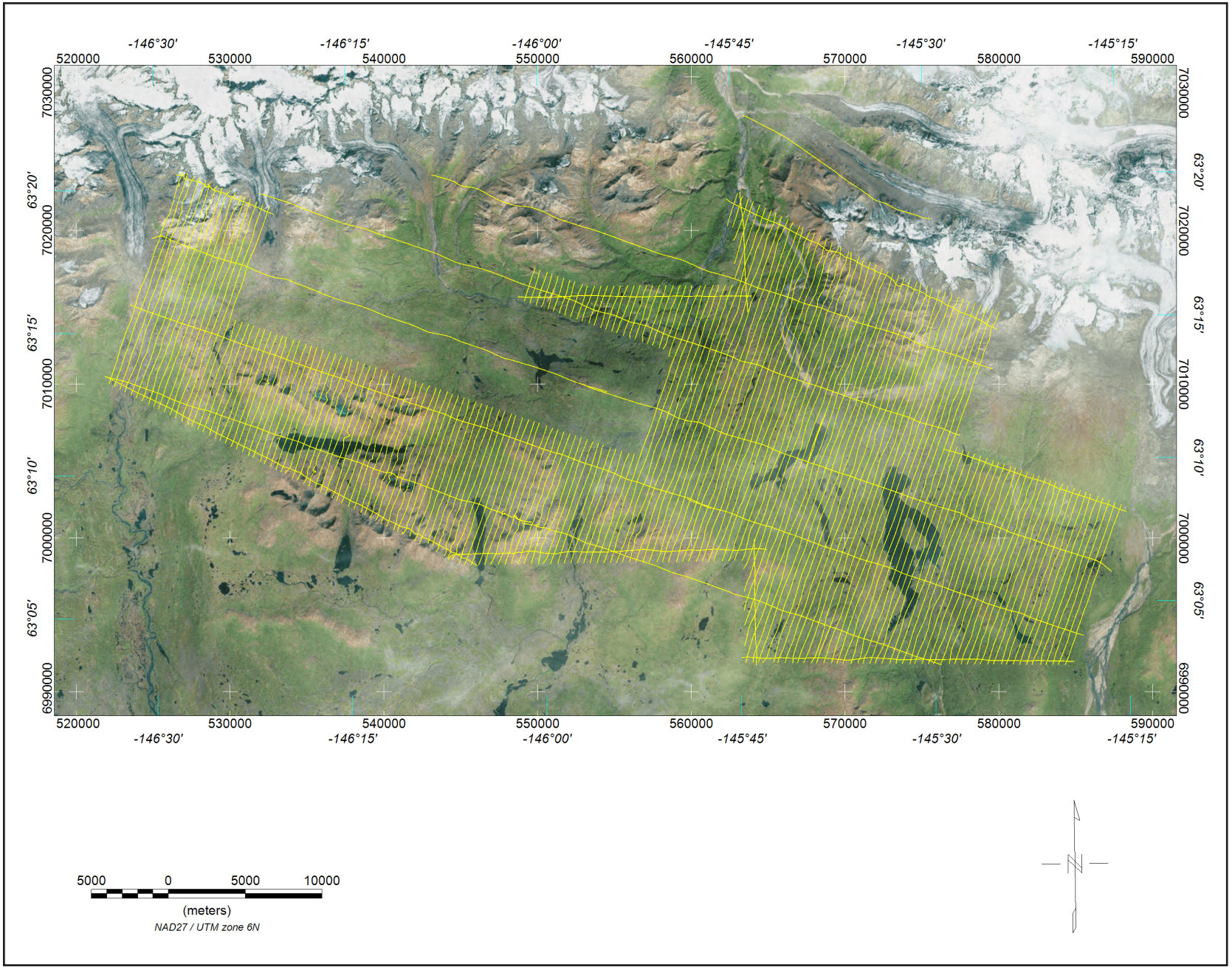


Figure 2. Flight path with orthometric image.

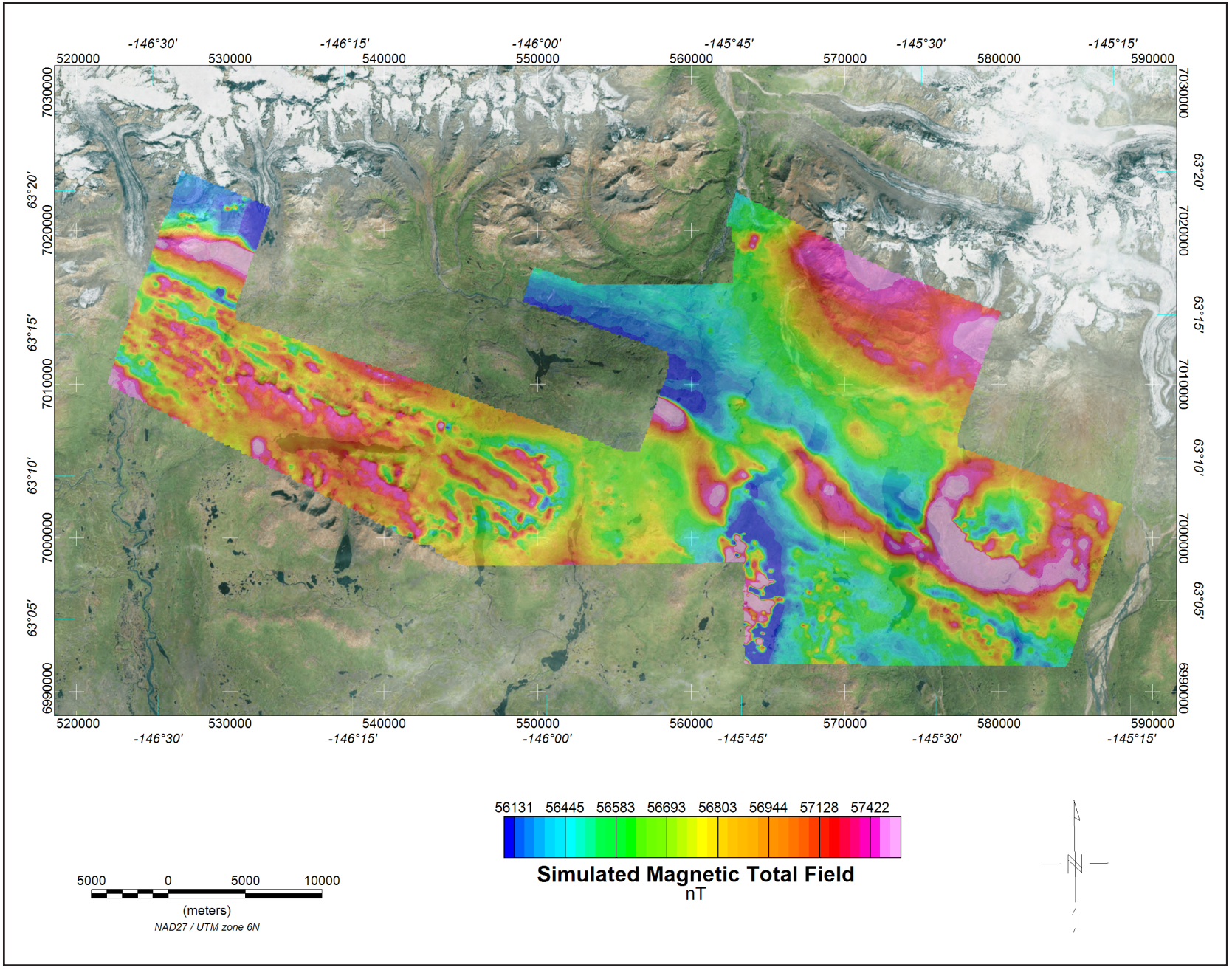


Figure 3. Simulated magnetic total field grid with orthometric image. The simulated magnetic total field data were created using digitally recorded data from a Scintrex cesium magnetometer. Data were collected at a sampling interval of 0.1 seconds. The magnetic data were (1) corrected for diurnal variations by subtracting the digitally recorded base station magnetic data, (2) IGRF corrected (IGRF model 2000, updated to August 2002), (3) leveled to the tie line data, (4) a constant value of approximately 57,000 nT was added to all data, and (5) interpolated onto a regular 100 m grid using a modified Akima (1970) technique.

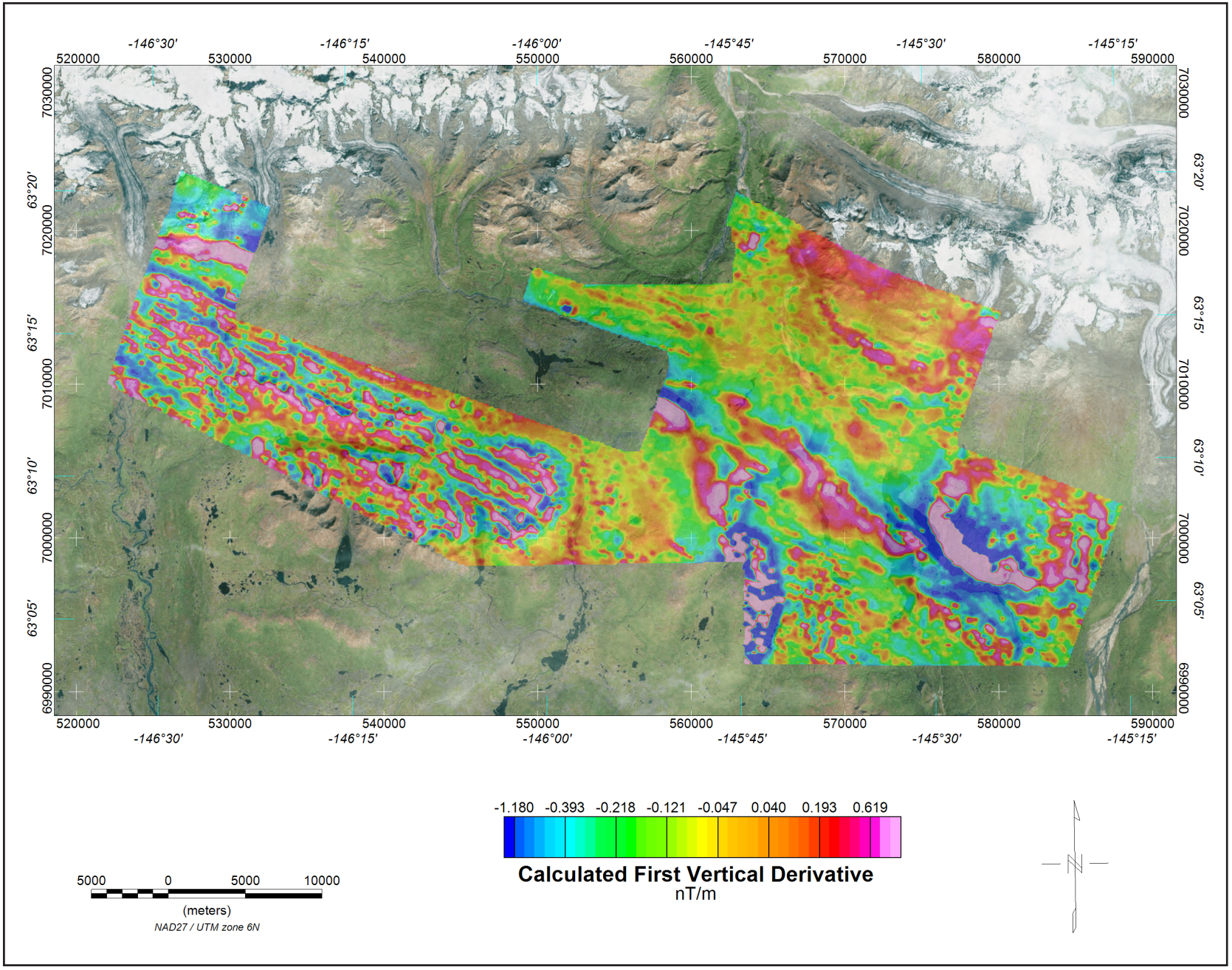


Figure 4. Calculated first vertical derivative grid with orthometric image. The first vertical derivative grid was calculated from the diurnally-corrected, IGRF-corrected total magnetic field grid using a FFT base frequency domain filtering algorithm. The resulting first vertical derivative grid provides better definition and resolution of near- surface magnetic units and helps to identify weak magnetic features that may not be evident on the total field data.

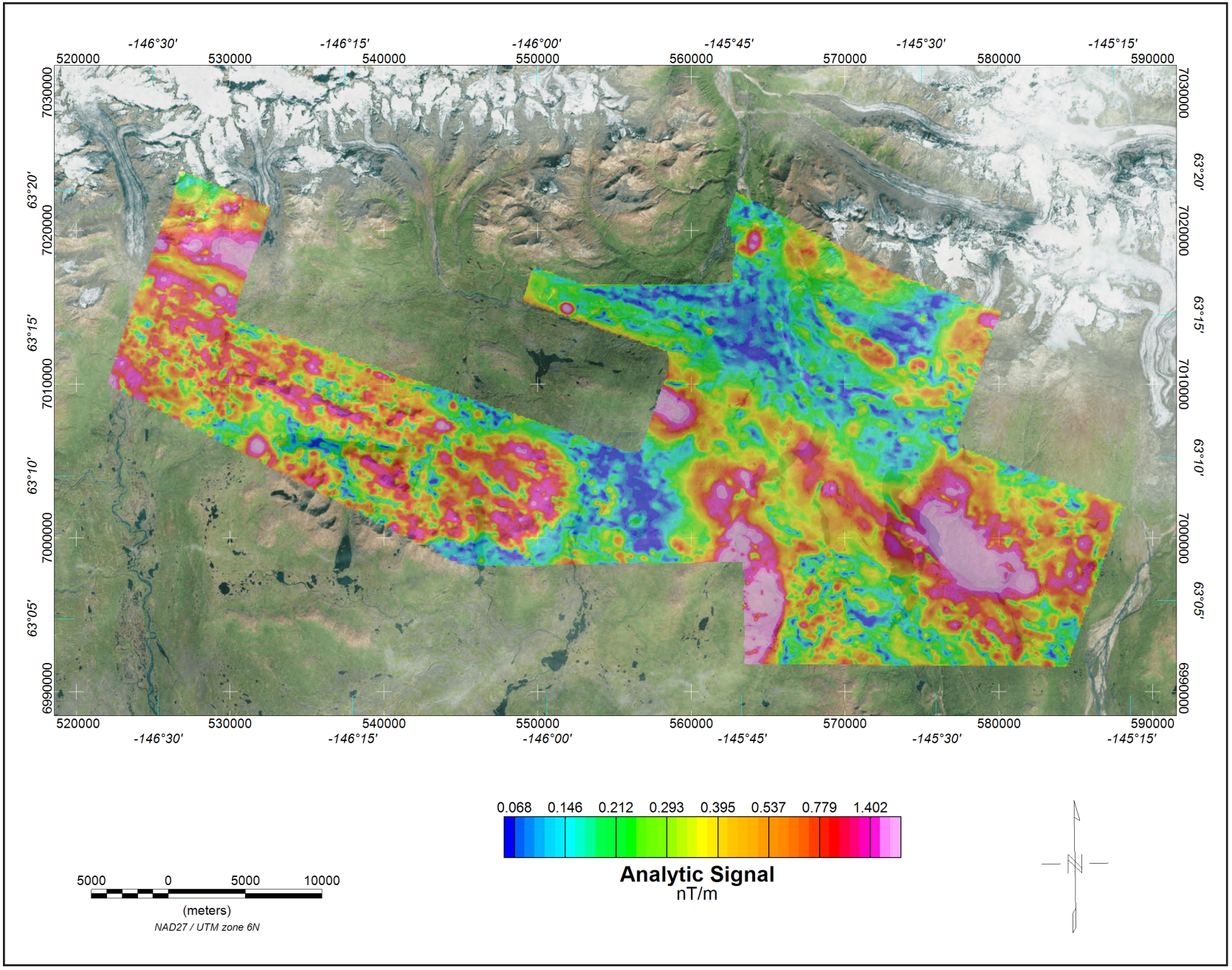


Figure 5. Analytic signal grid with orthometric image. Analytic signal is the total amplitude of all directions of magnetic gradient calculated from the sum of the squares of the three orthogonal gradients. Mapped highs in the calculated analytic signal of magnetic parameter locate the anomalous source body edges and corners (such as contacts, fault/shear zones, etc.). Analytic signal maxima are located directly over faults and contacts, regardless of structural dip, and independent of the direction of the induced and/or remanent magnetizations.

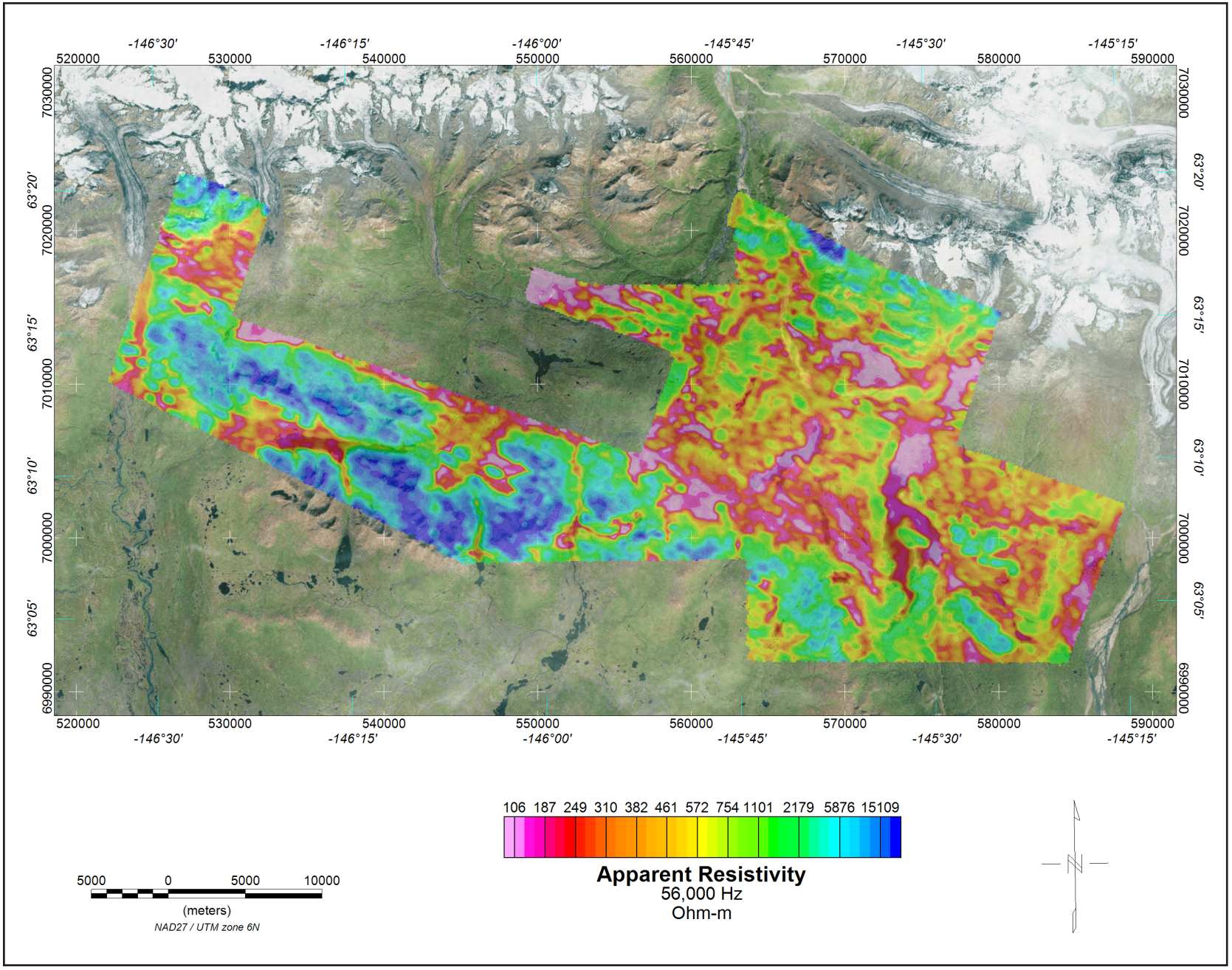


Figure 6. 56,000 Hz coplanar apparent resistivity grid with orthometric image. The DIGHEM^{V} EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial coil-pairs operated at 1,000 and 5,500 Hz while three horizontal coplanar coil-pairs operated at 900, 7,200, and 56,000 Hz. EM data were sampled at 0.1 second intervals. The EM system responds to bedrock conductors, conductive overburden, and cultural sources. Apparent resistivity is generated from the inphase and quadrature component of the coplanar 56,000 Hz using the pseudo-layer half space model. The data were interpolated onto a regular 100 m grid using a modified Akima (1970) technique.

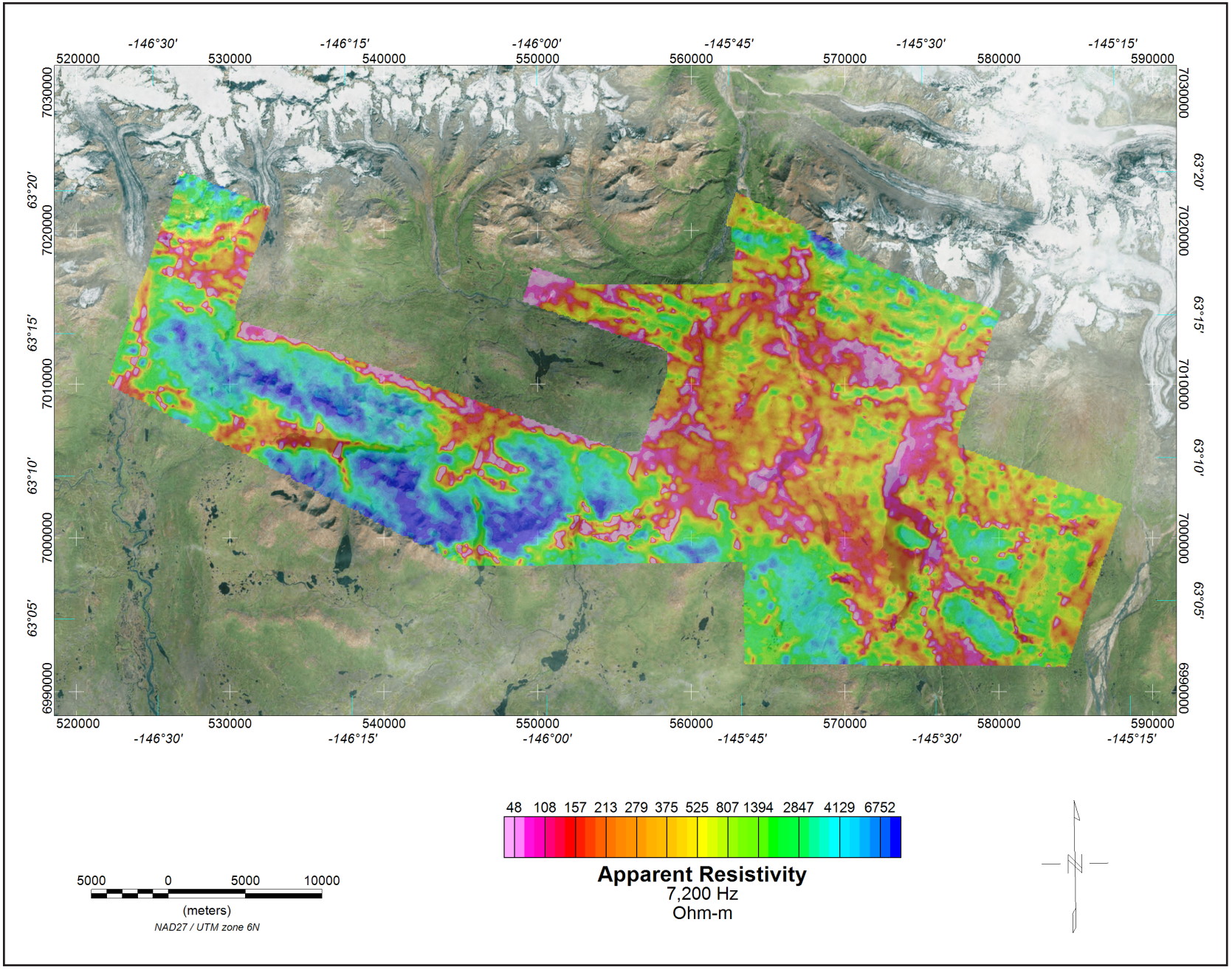


Figure 7. 7,200 Hz coplanar apparent resistivity grid with orthometric image. The DIGHEM^{V} EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial coil-pairs operated at 1,000 and 5,500 Hz while three horizontal coplanar coil-pairs operated at 900, 7,200, and 56,000 Hz. EM data were sampled at 0.1 second intervals. The EM system responds to bedrock conductors, conductive overburden, and cultural sources. Apparent resistivity is generated from the inphase and quadrature component of the coplanar 7,200 Hz using the pseudo-layer half space model. The data were interpolated onto a regular 100 m grid using a modified Akima (1970) technique.

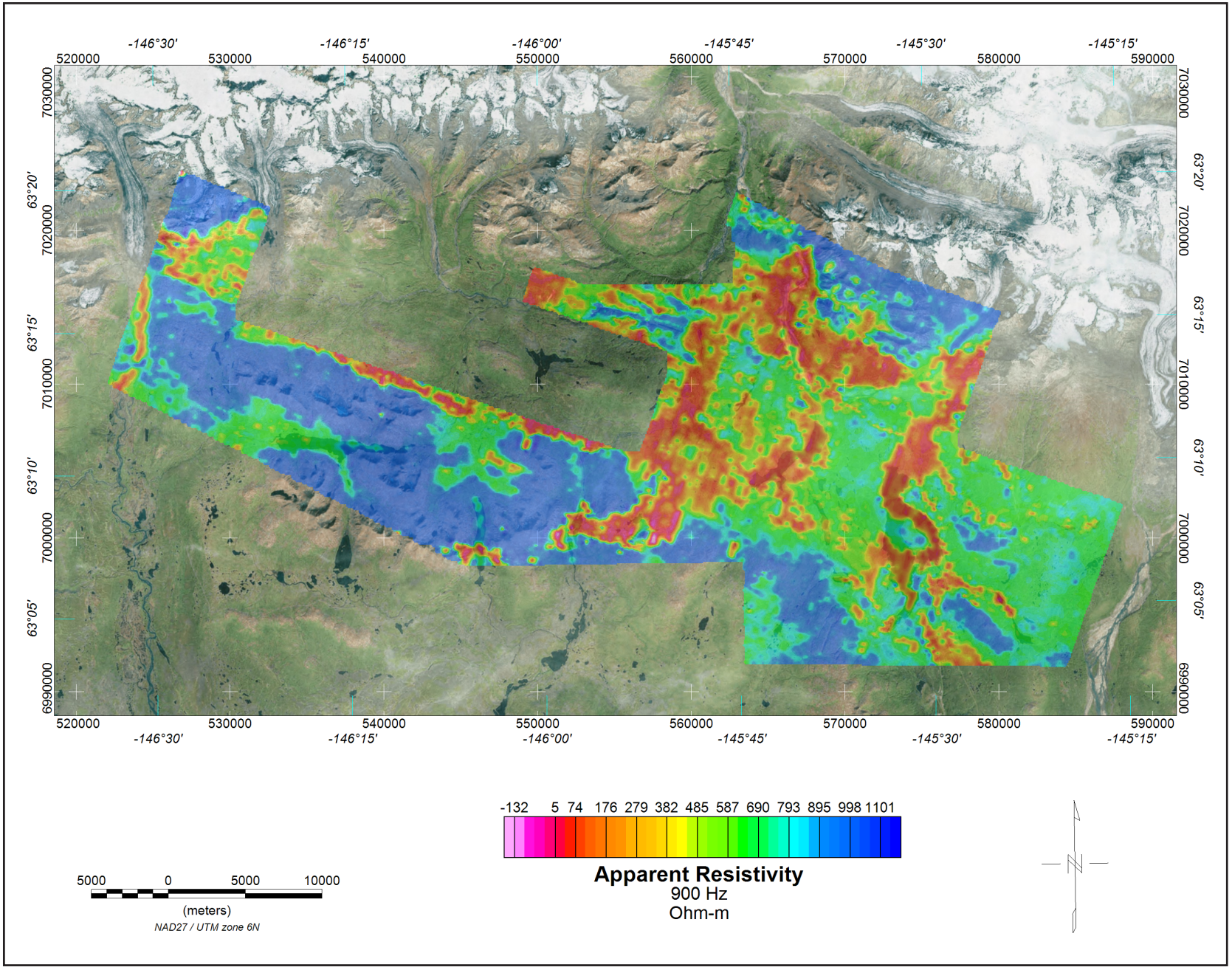


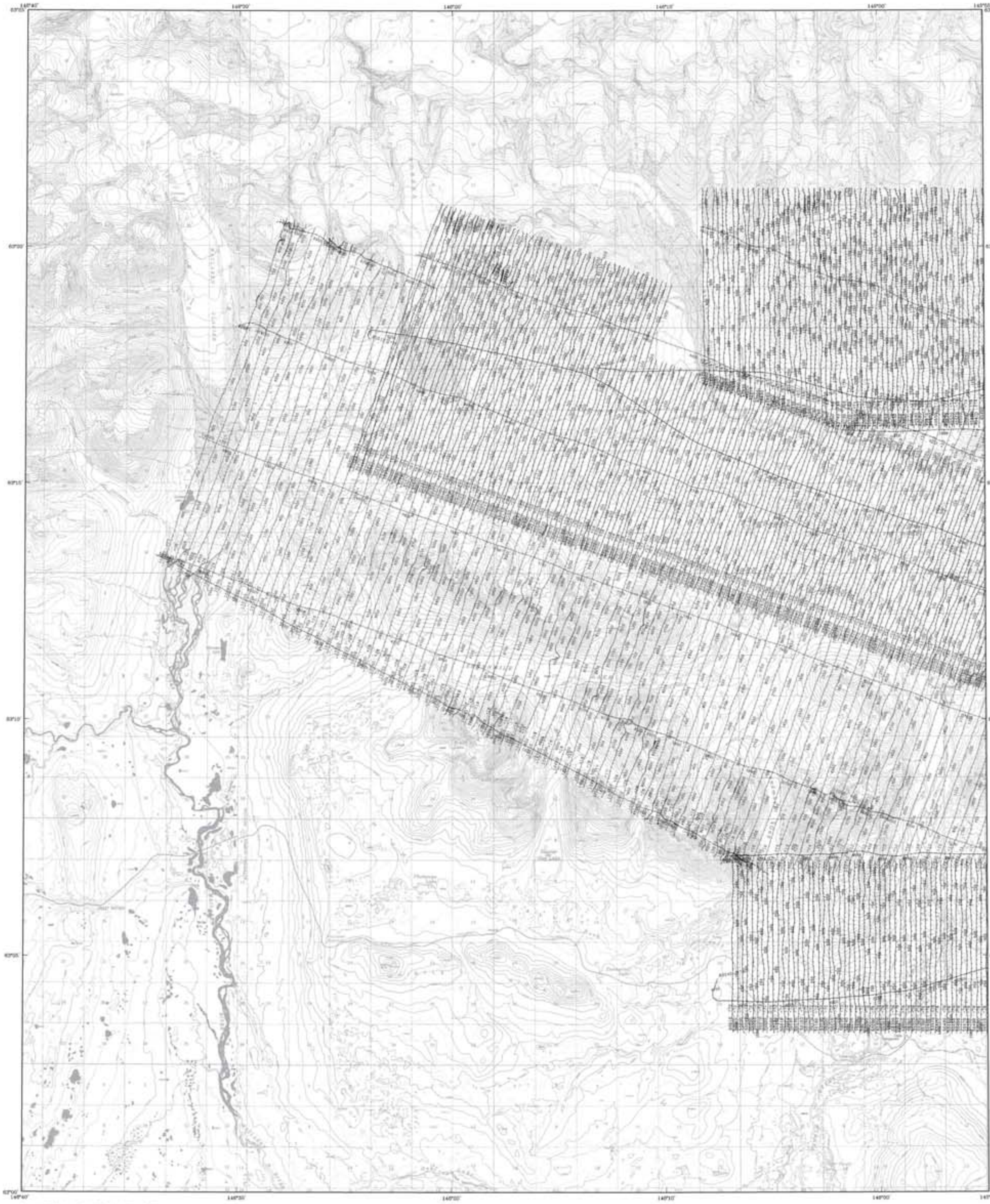
Figure 8. 900 Hz coplanar apparent resistivity grid with orthometric image. The DIGHEM^{V} EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial coil-pairs operated at 1,000 and 5,500 Hz while three horizontal coplanar coil-pairs operated at 900, 7,200, and 56,000 Hz. EM data were sampled at 0.1 second intervals. The EM system responds to bedrock conductors, conductive overburden, and cultural sources. Apparent resistivity is generated from the inphase and quadrature component of the coplanar 900 Hz using the pseudo-layer half space model. The data were interpolated onto a regular 100 m grid using a modified Akima (1970) technique.

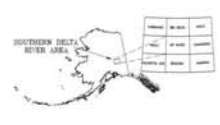
Table 1. Copies of the following maps are included at the end of this booklet. The low-resolution, page-size maps included in this booklet are intended to be used as a search tool and are not the final product. Large-scale, full-resolution versions of each map are available to download on this publication's citation page: http://doi.org/10.14509/30229

Map Title	Description
southerndeltariver_flightlines_topo_map_1of2.pdf	flightlines with topographic base map
southerndeltariver_flightlines_topo_map_2of2.pdf	flightlines with topographic base map
southerndeltariver_sim_magtf_topo_map_1of2.pdf	simulated magnetic total field grid with topographic base map
southerndeltariver_sim_magtf_topo_map_2of2.pdf	simulated magnetic total field grid with topographic base map
southerndeltariver_sim_magtf_contours_plss_map_1of2.pdf	simulated magnetic total field grid with data contours and public land survey system base layer
southerndeltariver_sim_magtf_contours_plss_map_2of2.pdf	simulated magnetic total field grid with data contours and public land survey system base layer
southerndeltariver_sim_magtf_shaded_plss_map_1of2.pdf	color shaded simulated total magnetic field grid with public land survey system base layer
southerndeltariver_sim_magtf_shaded_plss_map_2of2.pdf	color shaded simulated total magnetic field grid with public land survey system base layer
southerndeltariver_res7200hz_topo_map_1of2.pdf	7,200 Hz apparent resistivity grid with topographic base map
southerndeltariver_res7200hz_topo_map_2of2.pdf	7,200 Hz apparent resistivity grid with topographic base map
southerndeltariver_res7200hz_contours_plss_map_1of2.pdf	7,200 Hz apparent resistivity grid with data contours and public land survey system base layer
southerndeltariver_res7200hz_contours_plss_map_2of2.pdf	7,200 Hz apparent resistivity grid with data contours and public land survey system base layer
southerndeltariver_res7200hz_bw_contours_plss_map_1of2.pdf	black and white 7,200 Hz apparent resistivity grid with data contours and public land survey system base layer
southerndeltariver_res7200hz_bw_contours_plss_map_2of2.pdf	black and white 7,200 Hz apparent resistivity grid with data contours and public land survey system base layer
southerndeltariver_res900hz_topo_map_1of2.pdf	900 Hz apparent resistivity grid with topographic base map
southerndeltariver_res900hz_topo_map_2of2.pdf	901 Hz apparent resistivity grid with topographic base map
southerndeltariver_res900hz_contours_plss_map_1of2.pdf	900 Hz apparent resistivity grid with data contours and public land survey system base layer
southerndeltariver_res900hz_contours_plss_map_2of2.pdf	901 Hz apparent resistivity grid with data contours and public land survey system base layer

Table 1, continued. Copies of the following maps are included at the end of this booklet. The low-resolution, page-size maps included in this booklet are intended to be used as a search tool and are not the final product. Large-scale, full-resolution versions of each map are available to download on this publication's citation page: http://doi.org/10.14509/30229

Map Title	Description
southerndeltariver_res900hz_bw_contours_plss_map_1of2.pdf	black and white 900 Hz apparent resistivity grid with data contours and public land survey system base layer
southerndeltariver_res900hz_bw_contours_plss_map_2of2.pdf	black and white 900 Hz apparent resistivity grid with data contours and public land survey system base layer
southerndeltariver_emanomalies_sim_magtf_contours_plss_map_1of2.pdf	em anomalies with simulated total magnetic field grid data contours and public land survey system base layer
southerndeltariver_emanomalies_sim_magtf_contours_plss_map_2of2.pdf	em anomalies with simulated total magnetic field grid data contours and public land survey system base layer
southerndeltariver_emanomalies_sim_magtf_contours_detailed_topo_map_1of7.pdf	detailed em anomalies with simulated total magnetic field grid data contours and topographic base map
southerndeltariver_emanomalies_sim_magtf_contours_detailed_topo_map_2of7.pdf	detailed em anomalies with simulated total magnetic field grid data contours and topographic base map
southerndeltariver_emanomalies_sim_magtf_contours_detailed_topo_map_3of7.pdf	detailed em anomalies with simulated total magnetic field grid data contours and topographic base map
southerndeltariver_emanomalies_sim_magtf_contours_detailed_topo_map_4of7.pdf	detailed em anomalies with simulated total magnetic field grid data contours and topographic base map
southerndeltariver_emanomalies_sim_magtf_contours_detailed_topo_map_5of7.pdf	detailed em anomalies with simulated total magnetic field grid data contours and topographic base map
southerndeltariver_emanomalies_sim_magtf_contours_detailed_topo_map_6of7.pdf	detailed em anomalies with simulated total magnetic field grid data contours and topographic base map
southerndeltariver_emanomalies_sim_magtf_contours_detailed_topo_map_7of7.pdf	detailed em anomalies with simulated total magnetic field grid data contours and topographic base map
southerndeltariver_interpretation_plss_map_1of2.pdf	interpretation with public land survey system base layer
southerndeltariver_interpretation_plss_map_2of2.pdf	interpretation with public land survey system base layer
southerndeltariver_dem_contours_plss_map_1of2.pdf	digital elevation grid with contours and public land survey system base layer
southerndeltariver_dem_contours_plss_map_2of2.pdf	digital elevation grid with contours and public land survey system base layer





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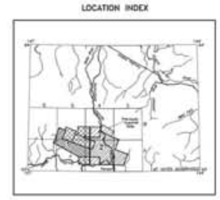


LOCATION INDEX

FLIGHT LINES
OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES QUADRANGLE

2003

DESCRIPTIVE NOTES

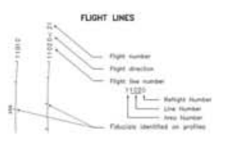
The geophysical data were acquired with a DIGHEM[V] Electromagnetic (EM) system and a Scintrex cesium magnetometer. Both were flown at a height of 100 feet. In addition the survey recorded data from a radar altimeter, GPS navigation system, 50/60 Hz monitors and video camera. Flights were performed with an AS350B-2 Squirrel helicopter at a mean terrain clearance of 200 feet along N20°E survey flight lines with a spacing of a quarter of a mile. Tie lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

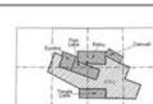
An Ashtech GG24 NAVSTAR / GLONASS Global Positioning System was used for navigation. The helicopter position was derived every 0.5 seconds using post-flight differential positioning to a relative accuracy of better than 5 m. Flight path positions were projected onto the Clarke 1866 (UTM zone 6) spheroid, 1927 North American datum using a central meridian (CM) of 147°, a north constant of 0 and an east constant of 500,000. Positional accuracy of the presented data is better than 10 m with respect to the UTM grid.

PREVIOUSLY SURVEYED AREAS

The previously acquired geophysical data were acquired with an Aerodat Condor Electromagnetic (EM) system and a Scintrex cesium magnetometer. The electromagnetic system utilized two vertical coaxial coil pairs at 935 Hz and 4,475 Hz and three horizontal coil pairs at 849 Hz, 4,189 Hz and 32,490 Hz. Mean terrain clearance for the magnetometer and EM system were slightly higher than 150 and 100 feet, respectively. In addition the survey recorded data from a radar altimeter, GPS navigation system, 60 Hz monitor and video camera. The GPS electronic positioning system operated in differential mode. The flight line direction varies from block to block as follows: Conwell N30°E, Eureka and Fish Lake N20°E, and Rainy and Tangle Lake N-S. The flight lines were one-eighth mile apart. Extended tie lines were flown with the current survey which cover both the 1995 and 2002 survey areas. The older survey was flown with a AS350B2 helicopter.

FLIGHT LINES

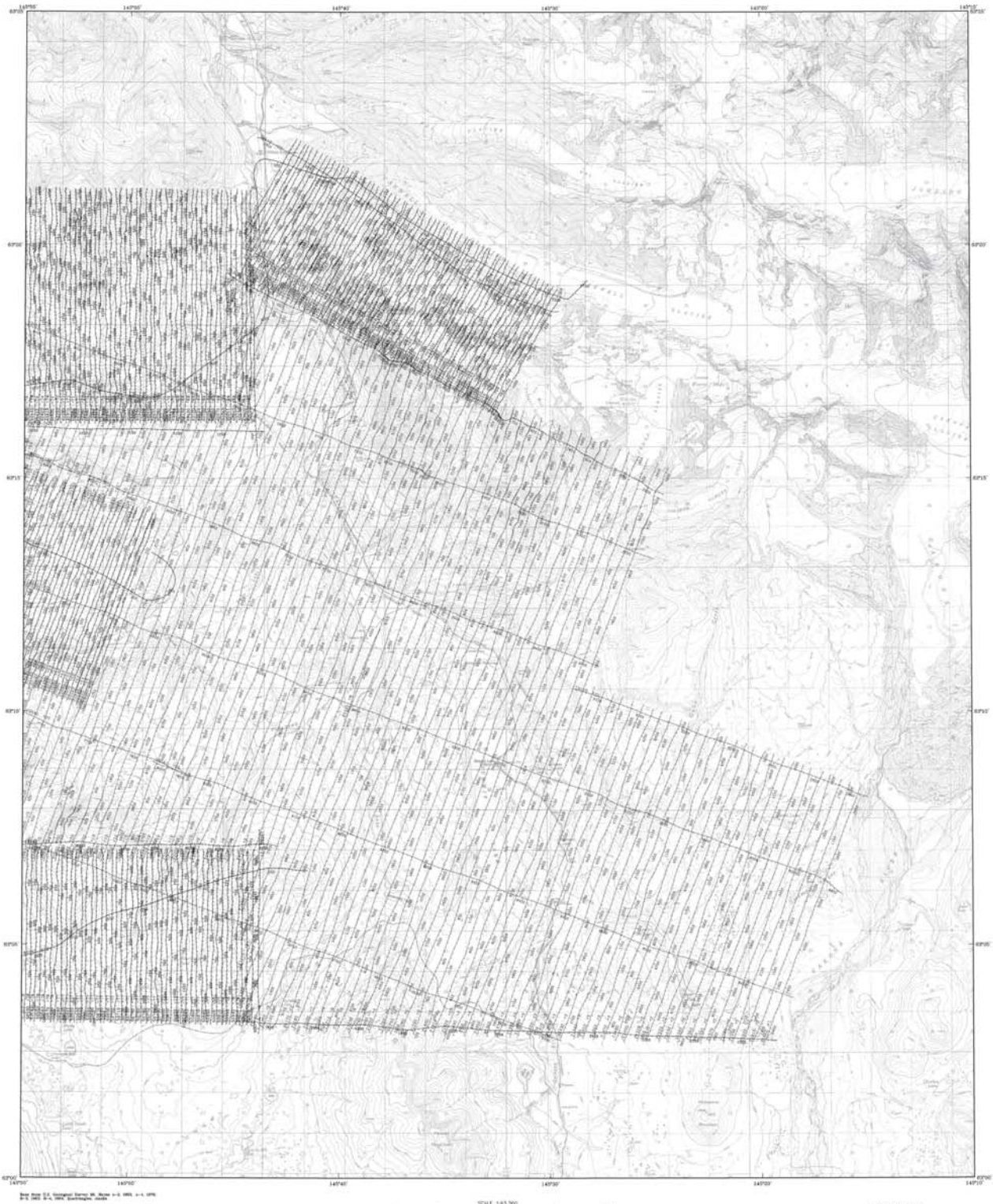


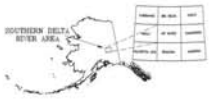


SURVEY HISTORY

This map has been compiled and drawn under contract between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Surveys (DGGS), and Stevens Exploration Management Corp. Airborne geophysical data for the current area were acquired and processed by Fugro Airborne Surveys in 2002. Airborne geophysical data for the Conwell, Eureka, Fish Lake, Rainy and Tangle Lake areas were acquired in 1995 by Aerodat Inc. and were provided for publication by the BLM. The current survey was funded by the U. S. Department of Interior, Bureau of Land Management (BLM) and conducted in support of its mineral assessment program in the Delta River mining district. Laurel Burns was the contract manager for DGGS.

This map and other products from the survey are available by mail order or in person from DGGS, 794 University Ave., Suite 200, Fairbanks, Alaska, 99709. Some products are also available in person only at the BLM's Juneau Mineral Information Center, 100 Savikko Road, Douglas, Alaska, 99824.





SCALE 1:63,360

1 0 1 2 3 MILES

1 0 1 2 3 4 5 KILOMETERS

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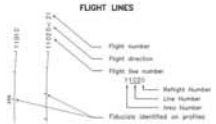
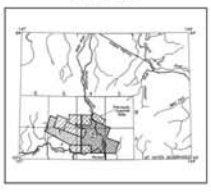


LOCATION INDEX



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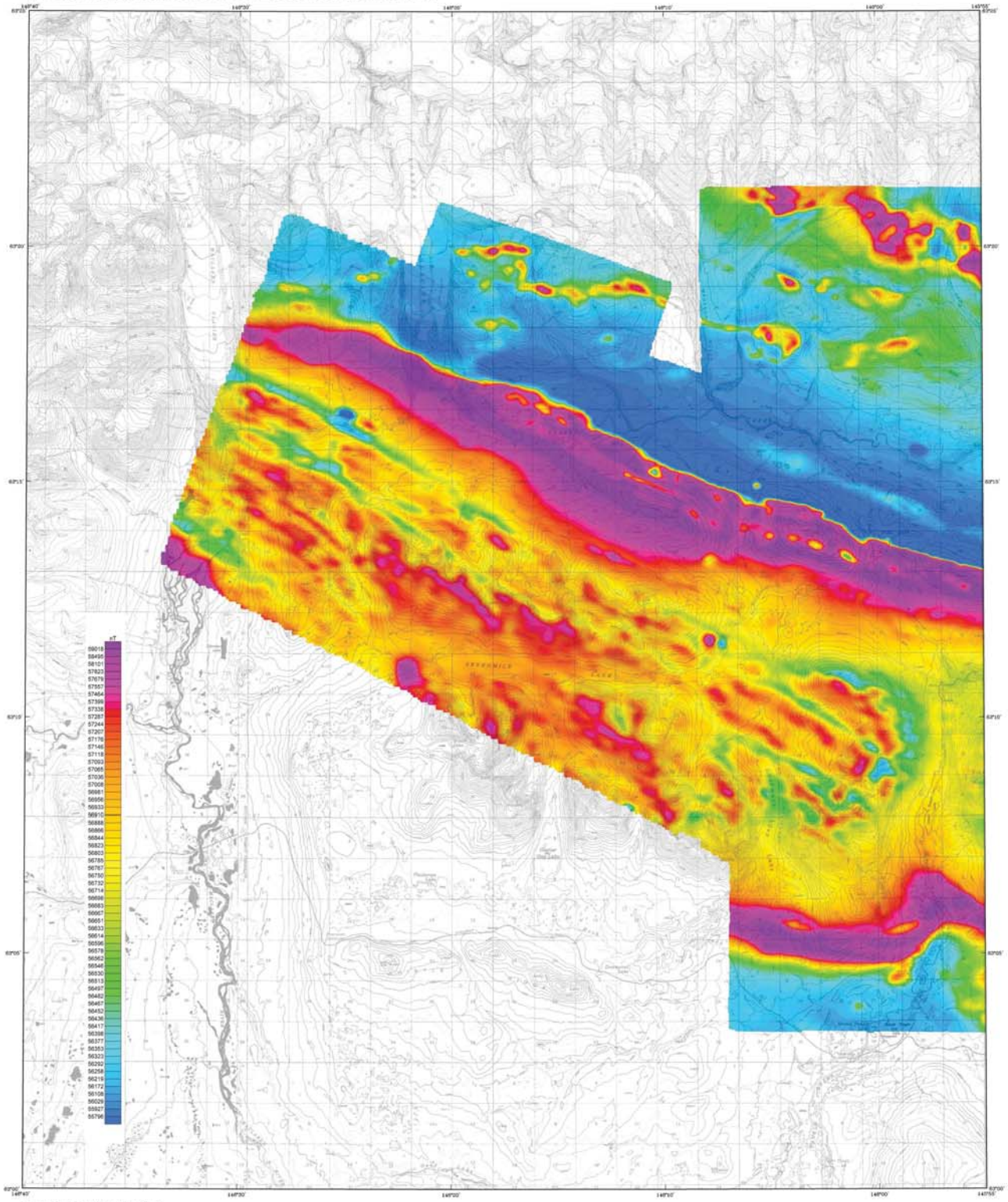

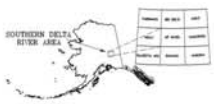

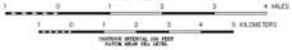

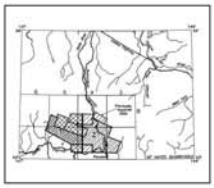

TOTAL MAGNETIC FIELD OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES QUADRANGLE

2003

DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM^{V} Electromagnetic (EM) system and a Scintrex cesium magnatometer. Both were flown at a height of 100 feet. In addition the survey recorded data from a radar altimeter, GPS navigation system, 50/60 Hz monitors and video camera. Flights were performed with an AS350B-2 Squirrel helicopter at a mean terrain clearance of 200 feet along N20°E survey flight lines with a spacing of a quarter of a mile. Tie lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

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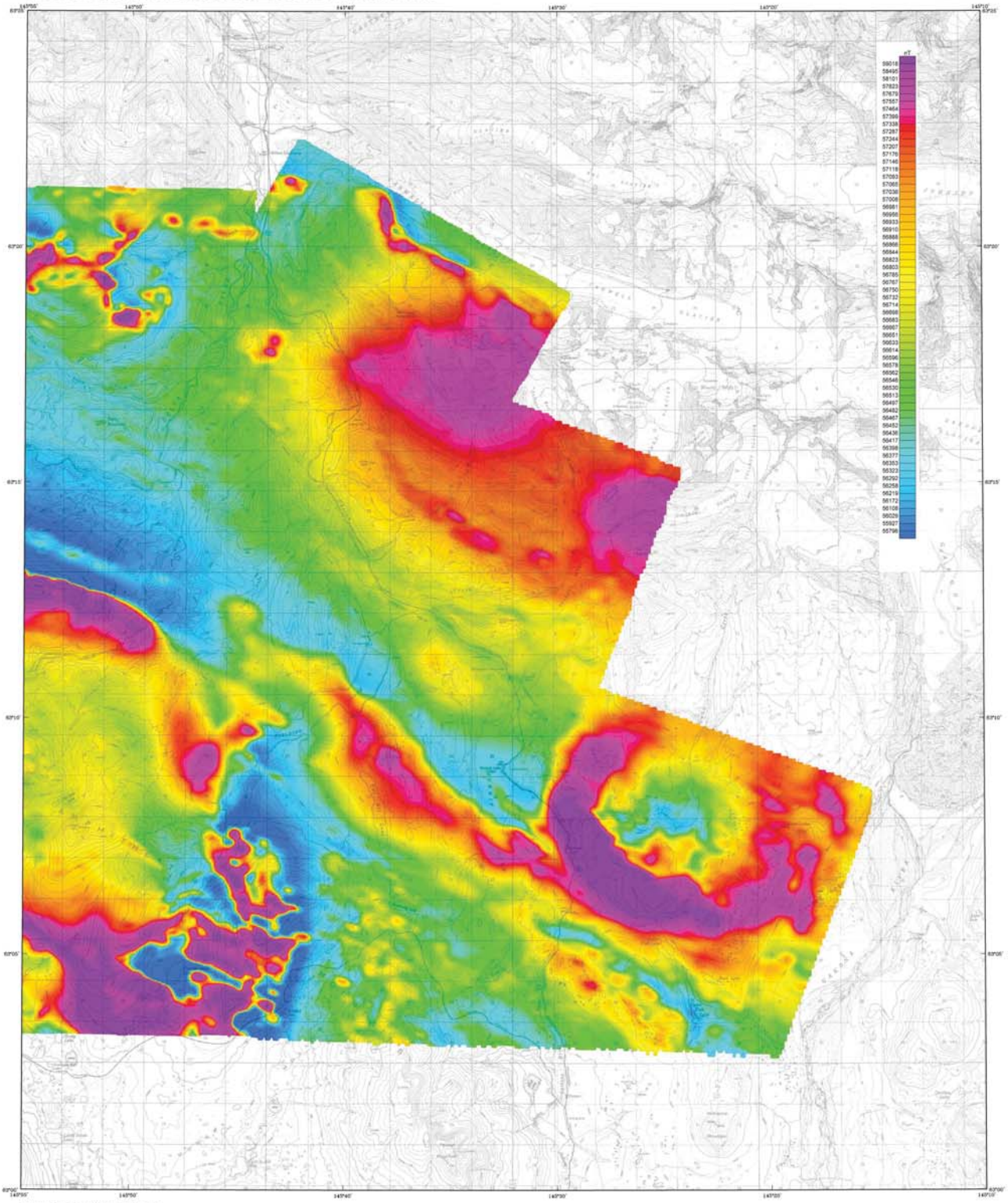
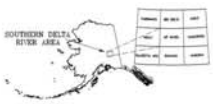




SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

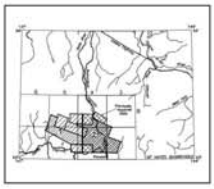
CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL

TOTAL MAGNETIC FIELD OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES QUADRANGLE

2003

LOCATION INDEX



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TRUE NORTH

APPROXIMATE MEAN DECLINATION 2003

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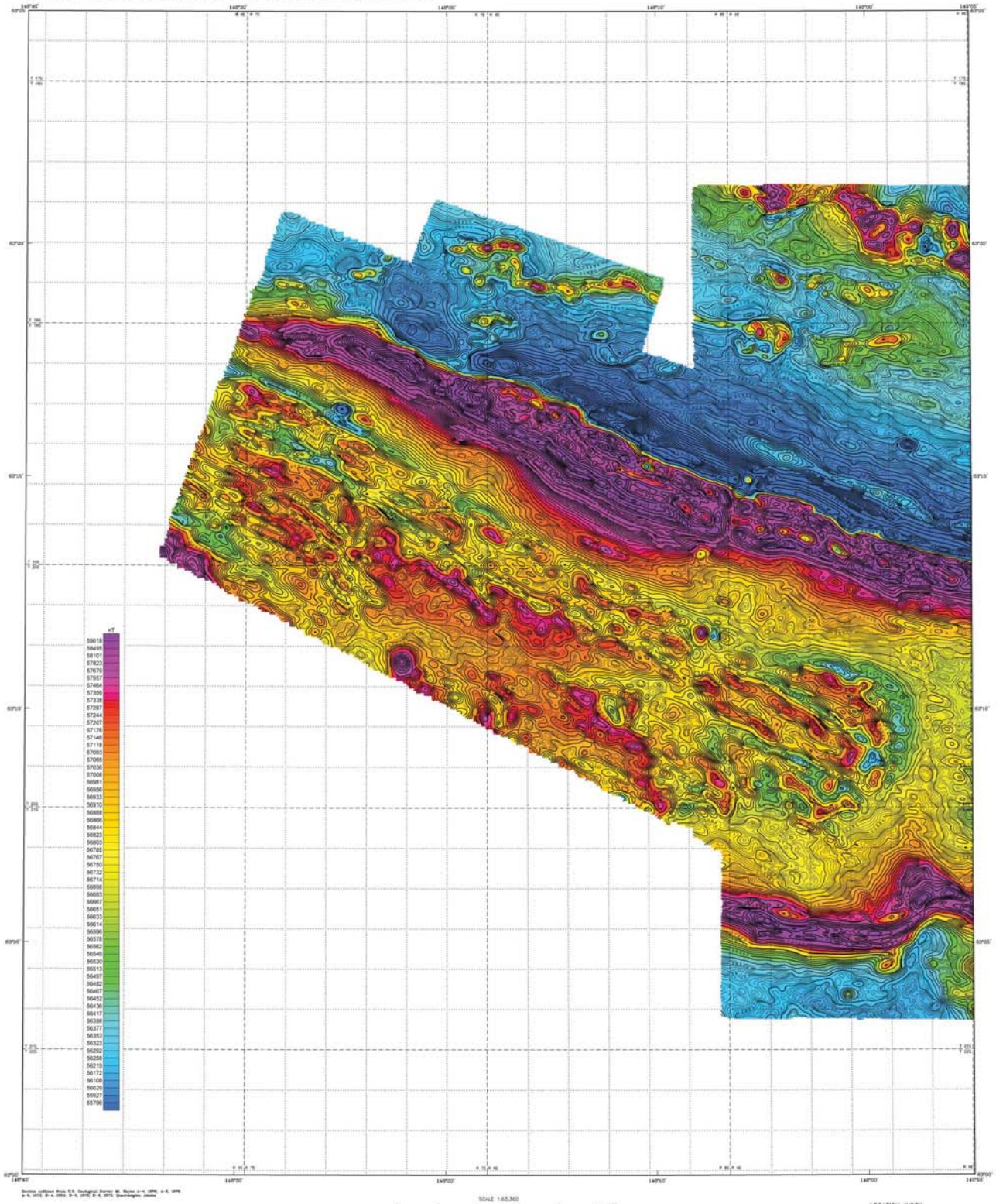
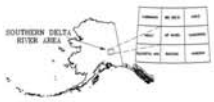


Geology outlined from U.S. Geological Survey, Mt. Hayes A-4, 1978; A-5, 1979; A-6, 1972; B-4, 1980; D-4, 1978; D-5, 1978; Quadrangles, Alaska

SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS



TOTAL MAGNETIC FIELD OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES QUADRANGLE

2003

DESCRIPTIVE NOTES

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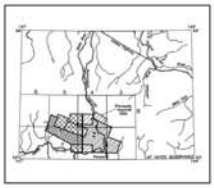
VOLT MOTOR

GEOMAGNETIC FIELD DECLINATION 2003

MAGNETIC CONTOUR INTERVAL

250 nT
50 nT
10 nT
5 nT

LOCATION INDEX



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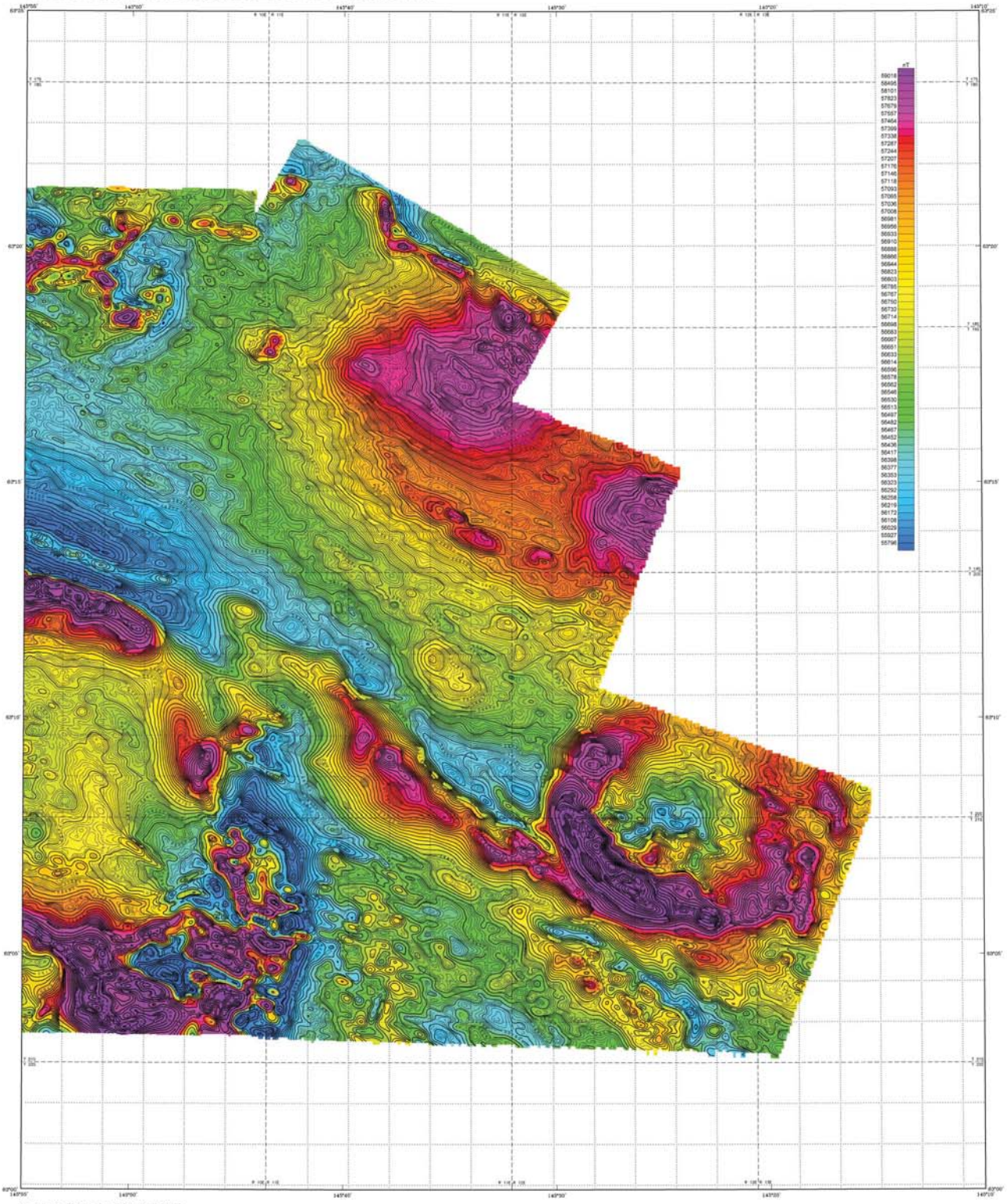

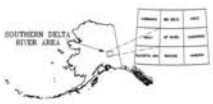

SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

TOTAL MAGNETIC FIELD OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES QUADRANGLE

2003

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MAGNETIC CONTOUR INTERVAL

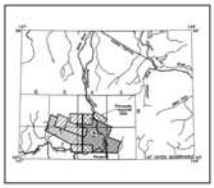
250 nT

50 nT

10 nT

5 nT

LOCATION INDEX



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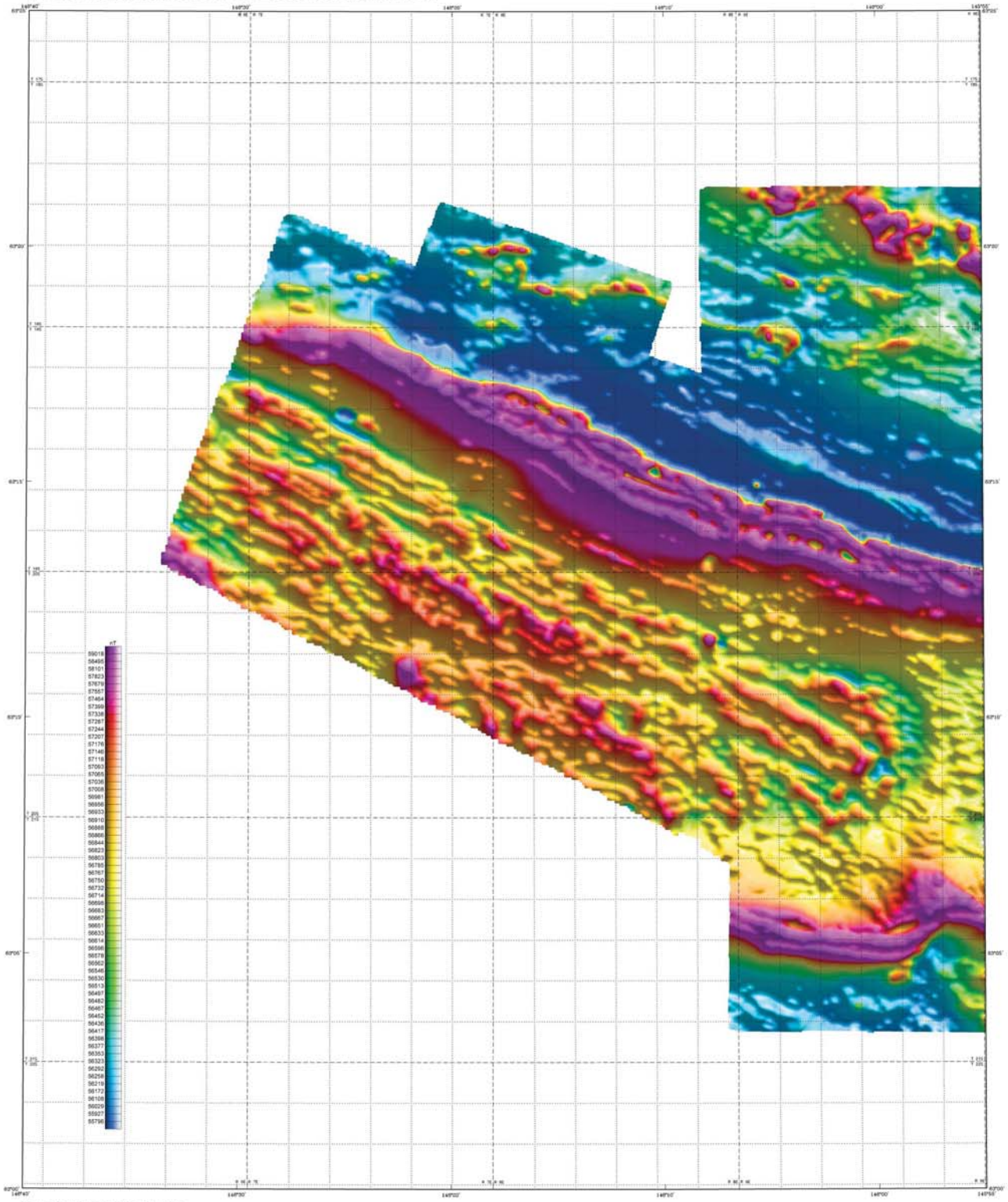

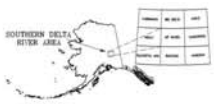

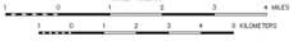

COLOR SHADOW TOTAL MAGNETIC FIELD OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES QUADRANGLE

2003

Sun Azimuth: 20 degrees

Inclination: 30 degrees

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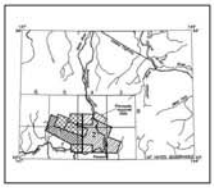

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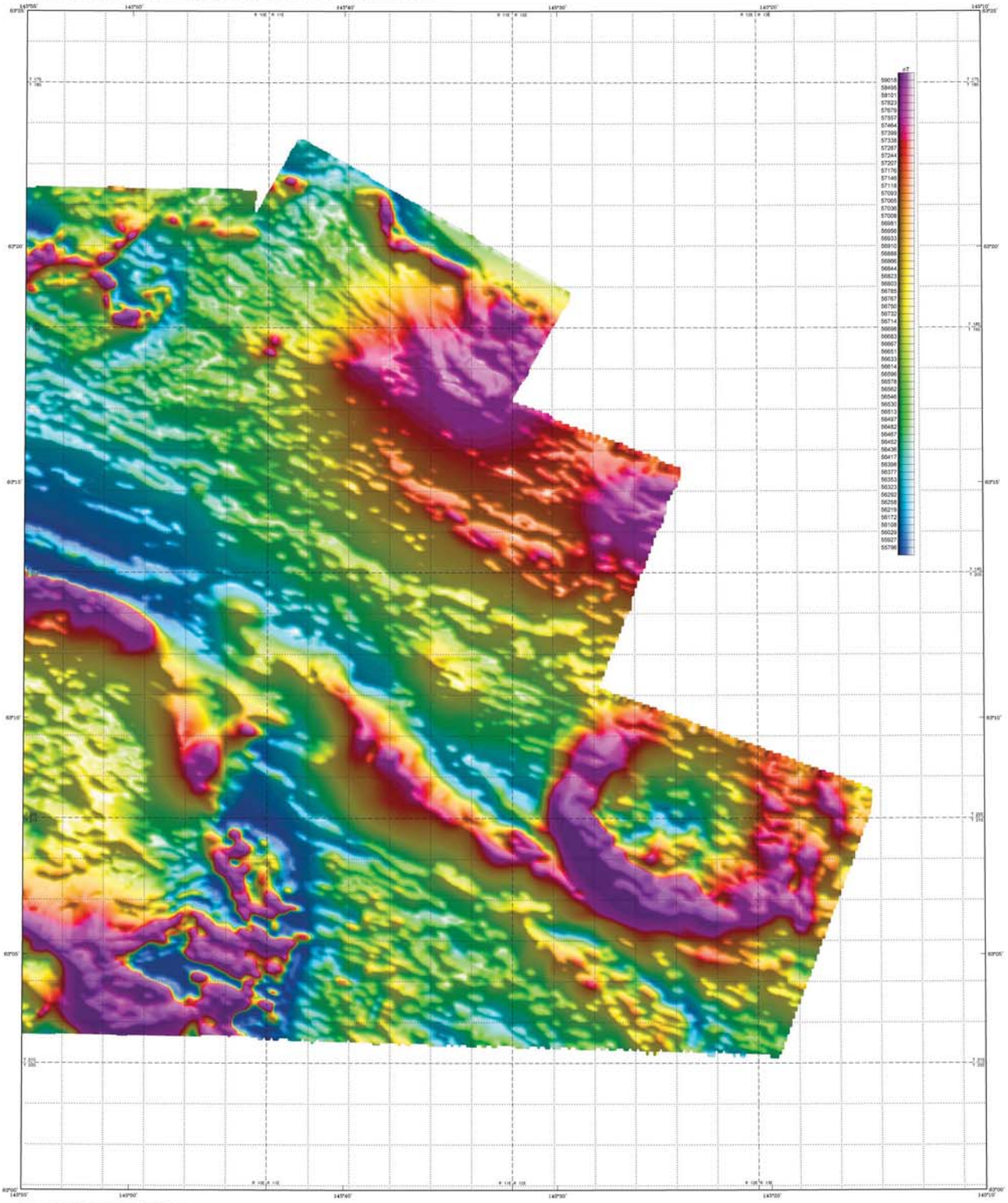
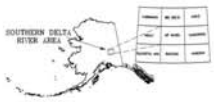




SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

COLOR SHADOW TOTAL MAGNETIC FIELD OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

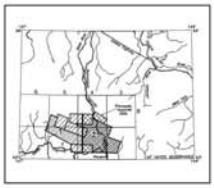
PARTS OF MT. HAYES QUADRANGLE

2003

Sun Azimuth: 20 degrees

Inclination: 30 degrees

LOCATION INDEX



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TOTAL MAGNETIC FIELD

The total magnetic field data were acquired with a sampling interval of 0.1 seconds, and were (1) corrected for diurnal variations by subtraction of the digitally recorded base station magnetic data, (2) levelled to the tie line data, and (3) interpolated onto a regular 100 m grid using a modified Akima (1970) technique. The regional variation (or IGRF gradient, 2000, updated to August 2002) was removed from the levelled magnetic data.

Akima, H., 1970, A new method of interpolation and smooth curve fitting based on local procedures: Journal of the Association of Computing Machinery, v. 17, no. 4, p. 589–602.

SURVEY HISTORY

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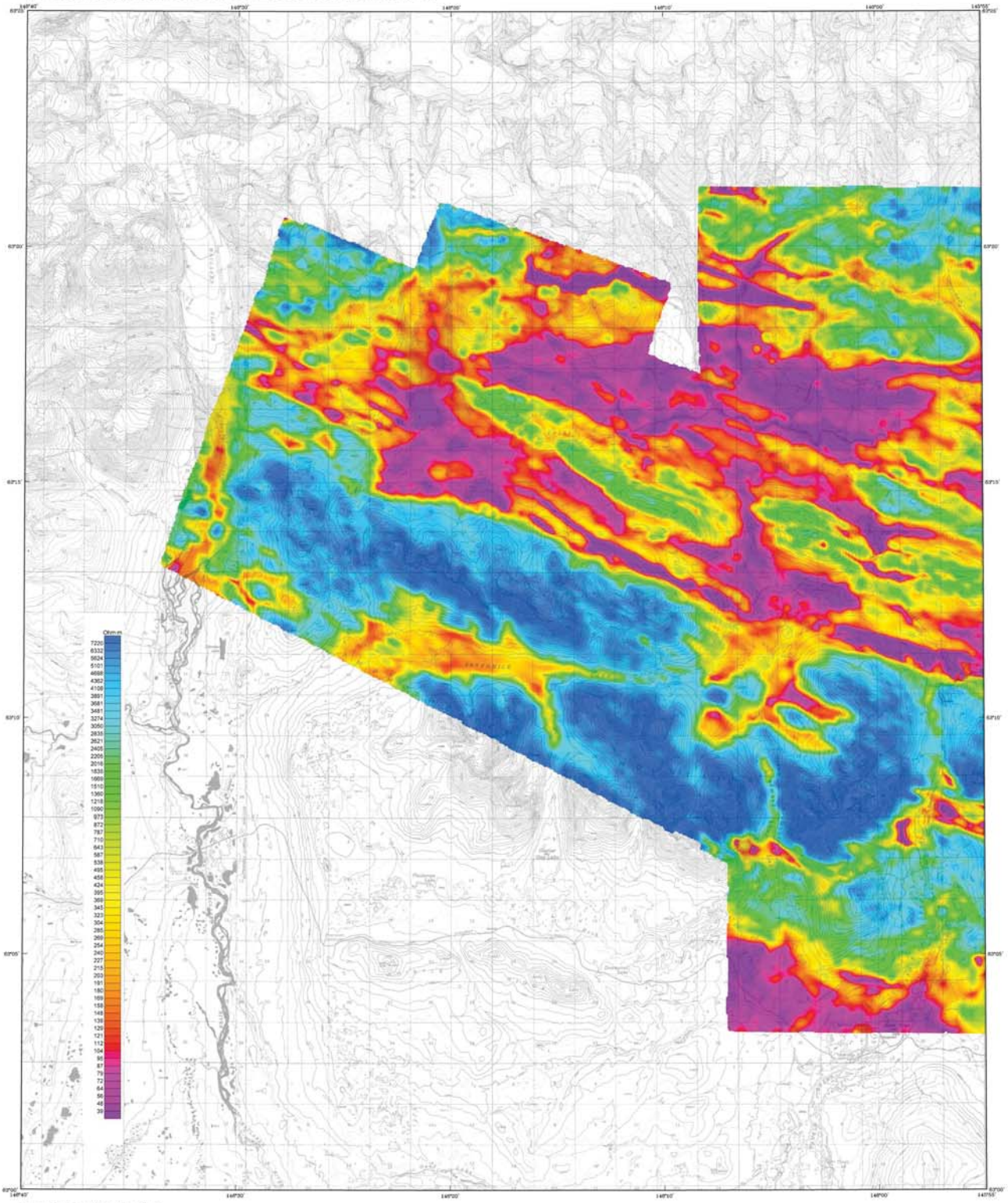


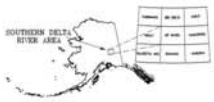
Base from U.S. Geological Survey 1:63,360 Mount J-4, 1970; J-5, 1970; K-4, 1970; K-5, 1969; D-4, 1978; D-5, 1976; Quadrangles, Alaska

SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM AREA 1927 NAD



7200 Hz COPLANAR RESISTIVITY OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES QUADRANGLE

2003

DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM^V Electromagnetic (EM) system and a Scintrex cesium magnetometer. Both were flown at a height of 100 feet. In addition the survey recorded data from a radar altimeter, GPS navigation system, 50/60 Hz monitors and video camera. Flights were performed with an AS350B-2 Squirrel helicopter at a mean terrain clearance of 200 feet along N20°E survey flight lines with a spacing of a quarter of a mile. Tie lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

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RESISTIVITY

The DIGHEM^V EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial-coil pairs operated at 1000 and 5500 Hz while three horizontal coplanar-coil pairs operated at 900, 7200, and 56,000 Hz. EM data were sampled at 0.1 second intervals. The EM system responds to bedrock conductors, conductive overburden, and cultural sources. Apparent resistivity is generated from the inphase and quadrature components of the coplanar 7200 Hz using the pseudo-layer half space model (Fraser 1978). The data were interpolated onto a regular 100 m grid using a modified Akima (1970) technique. The 7200 Hz coplanar data from the current survey have been merged with the 4189 Hz coplanar data from the previously surveyed areas. To facilitate the merge between data sets, the resistivity for the previously acquired 4189 Hz coplanar data was recalculated using the pseudo-layer half space model.

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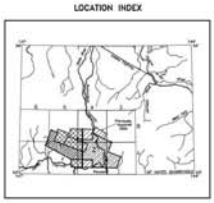
TRUE BEARING

GRID BEARING

APPROXIMATE MEAN DECLINATION, 2003

LOCATION INDEX



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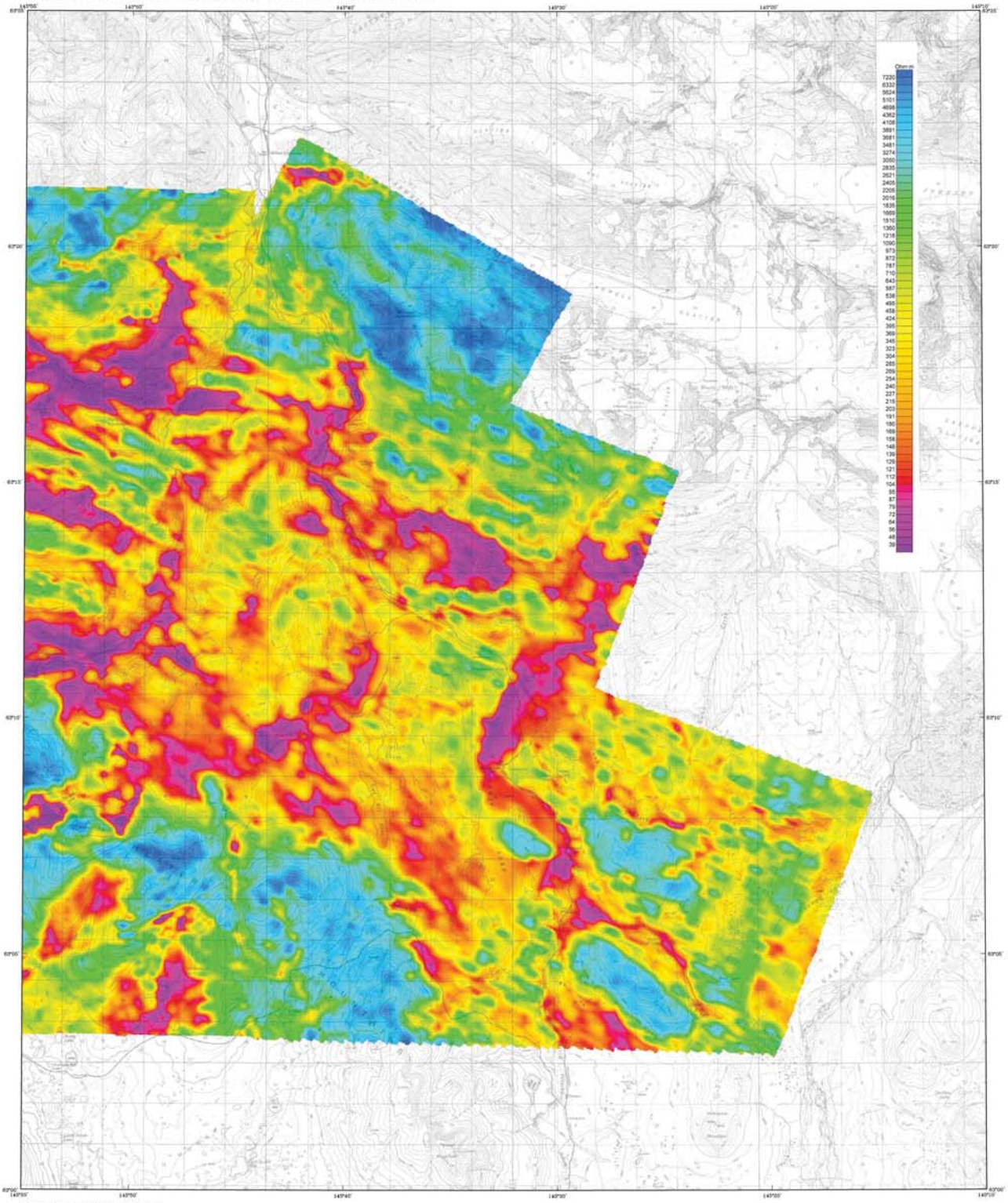
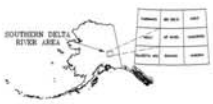




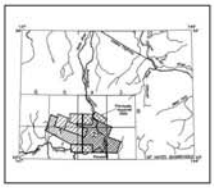
SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL

LOCATION INDEX



7200 Hz COPLANAR RESISTIVITY OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES QUADRANGLE

2003

DESCRIPTIVE NOTES

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TRUE NORTH
24.1°
APPROXIMATE MEAN DECLINATION, 2003

SURVEY HISTORY

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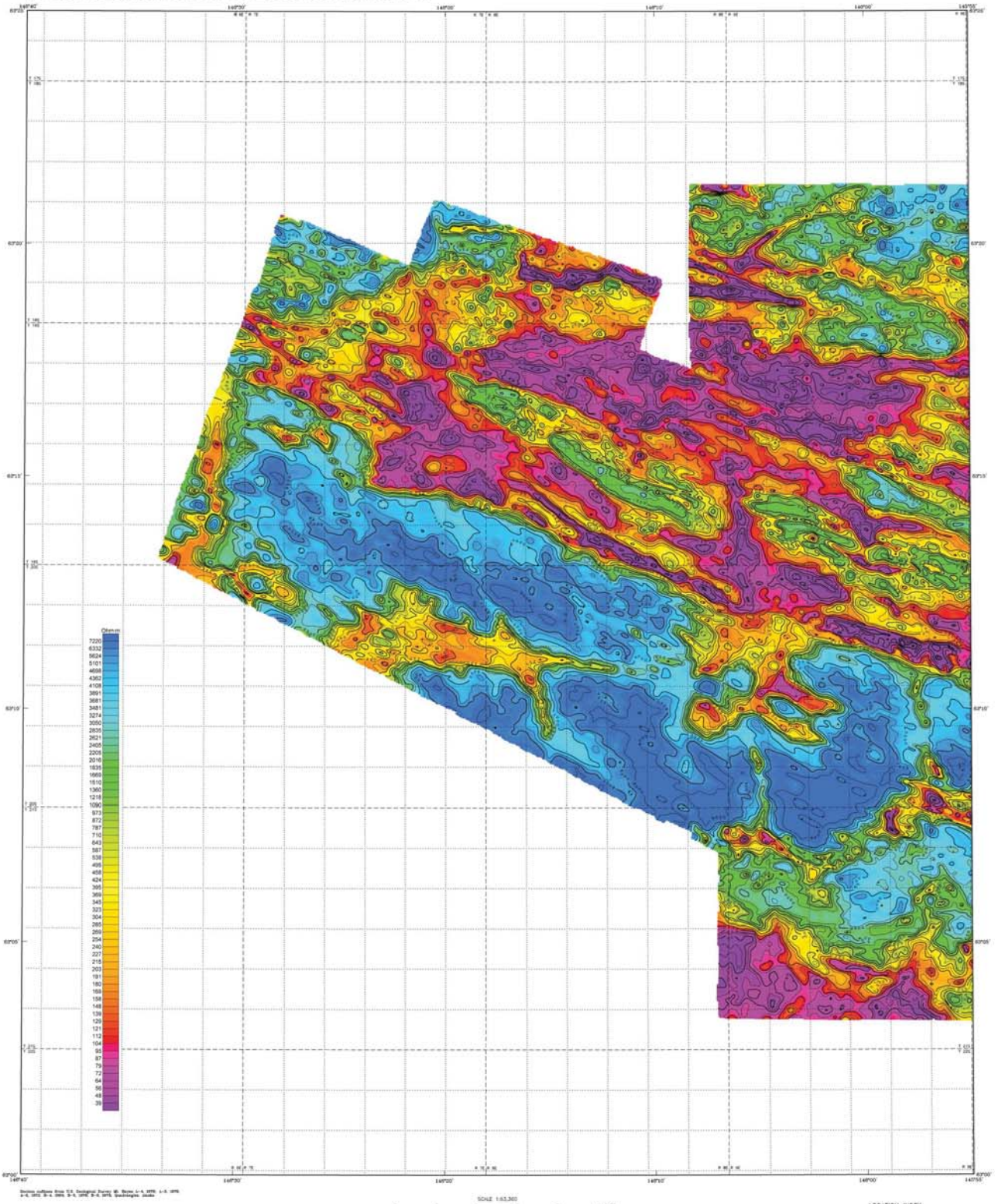
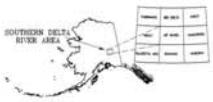


SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS



7200 Hz COPLANAR RESISTIVITY OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES QUADRANGLE

2003

DESCRIPTIVE NOTES

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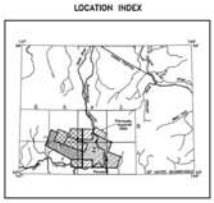
RESISTIVITY CONTOURS

1000
800
600
500
400
300
250
200
150
125
100

Contours in ohm-m at 10 intervals per decade

resistivity low

LOCATION INDEX



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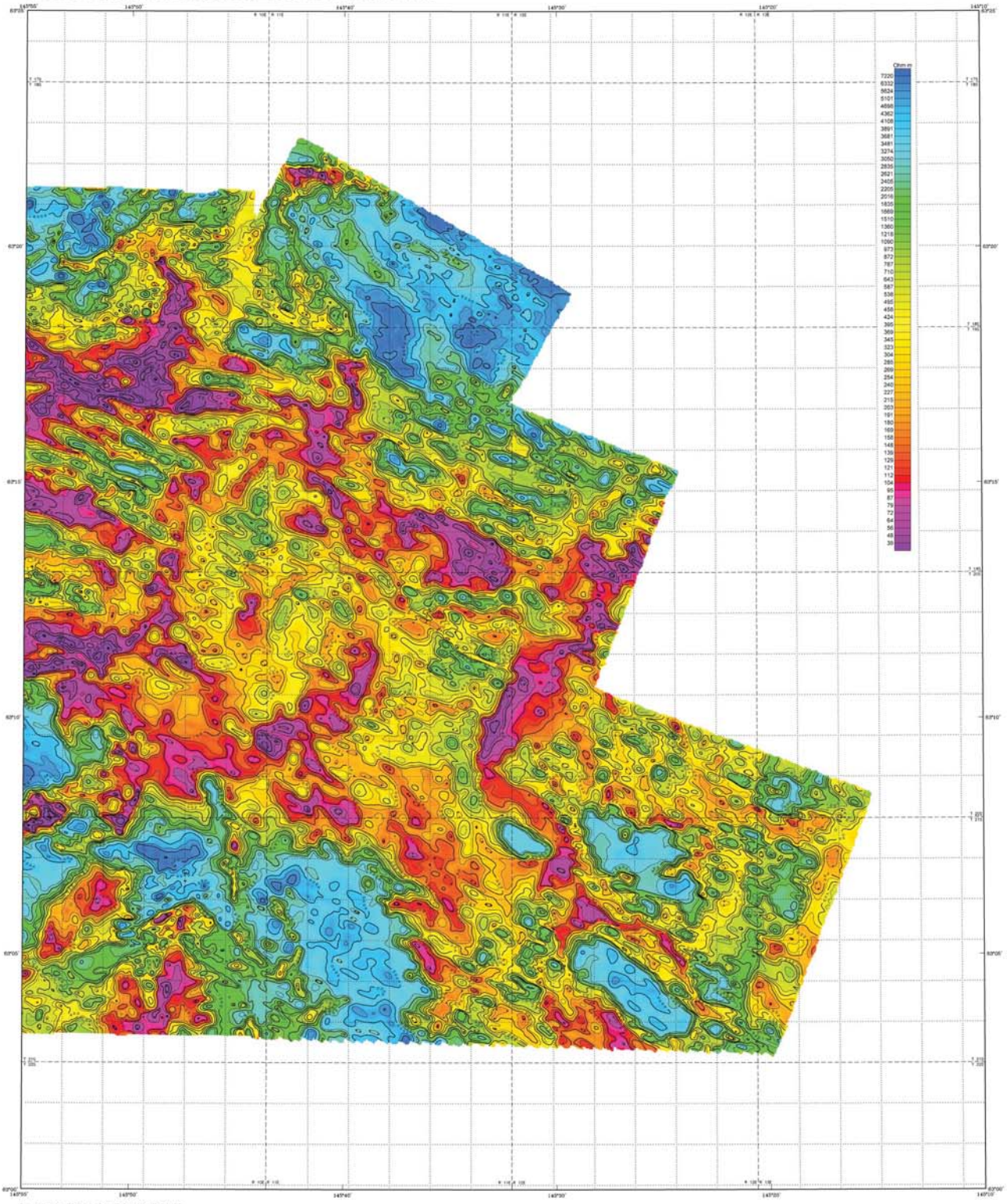
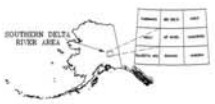


SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS



7200 Hz COPLANAR RESISTIVITY OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES QUADRANGLE

2003

DESCRIPTIVE NOTES

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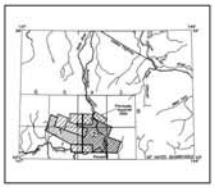
RESISTIVITY CONTOURS

1000
800
600
500
400
300
250
200
150
125
100

Contours in ohm-m at 10 intervals per decade

resistivity low

LOCATION INDEX



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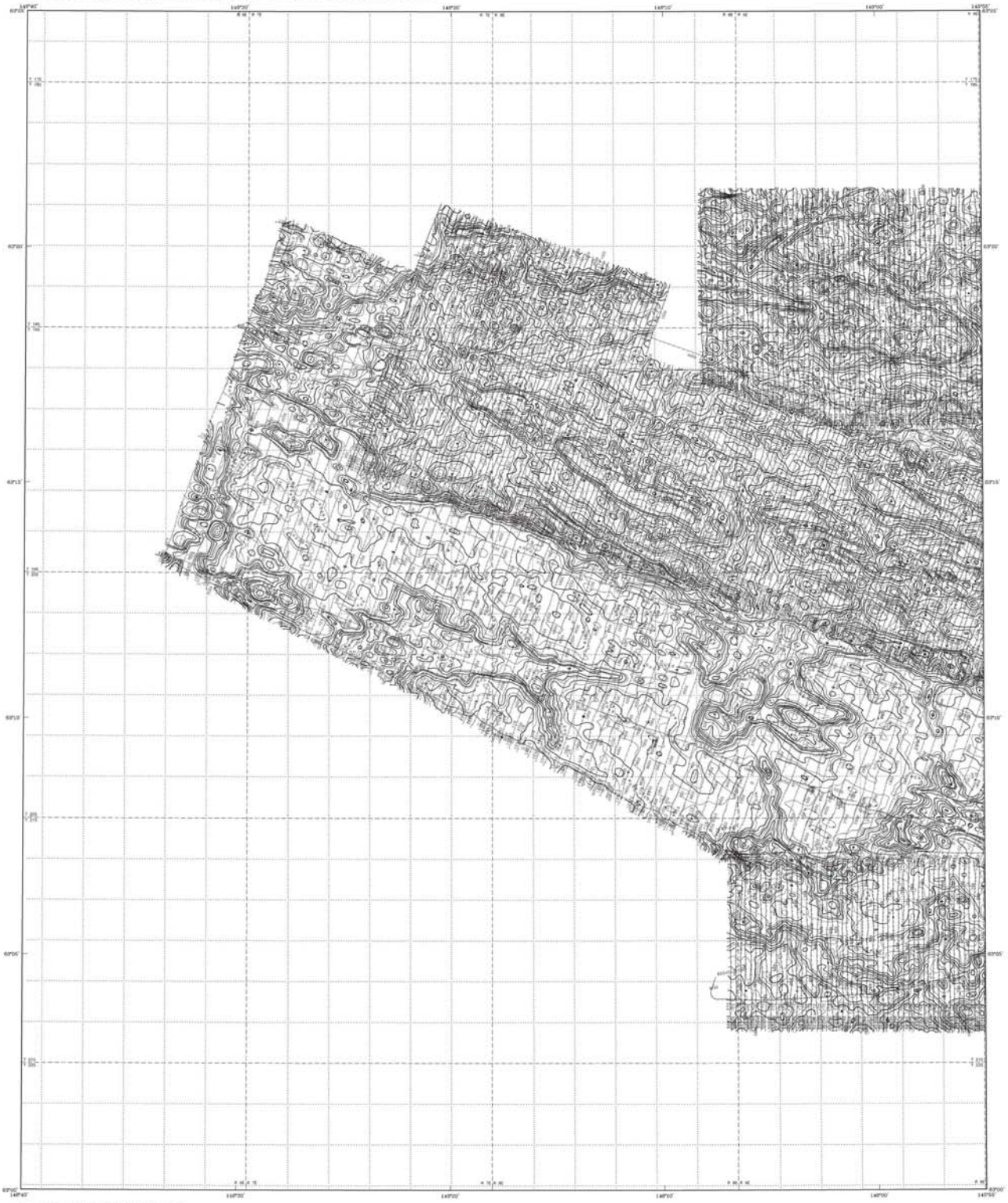

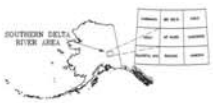

SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

7200 Hz COPLANAR RESISTIVITY OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES QUADRANGLE

2003

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300
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Contours in ohm-m at 10 intervals per decade

resistivity low

LOCATION INDEX

SURVEY HISTORY

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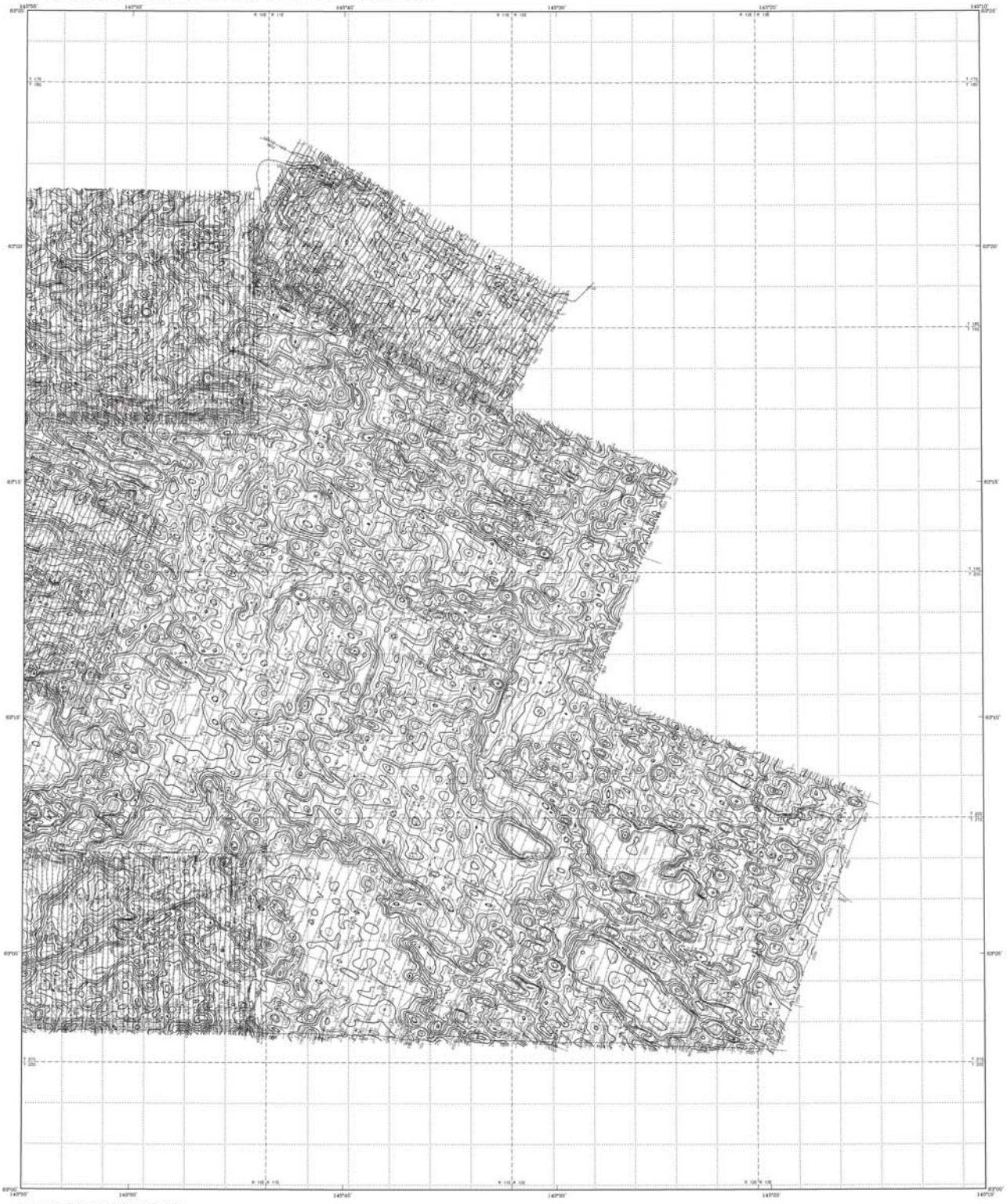
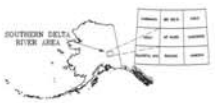




SCALE 1:63,360

1 0 1 2 3 4 MILES

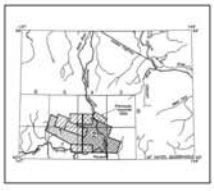
1 0 1 2 3 4 5 KILOMETERS

7200 Hz COPLANAR RESISTIVITY OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES QUADRANGLE

2003

LOCATION INDEX



DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM^V Electromagnetic (EM) system and a Scintrex cesium magnetometer. Both were flown at a height of 100 feet. In addition the survey recorded data from a radar altimeter, GPS navigation system, 50/60 Hz monitors and video camera. Flights were performed with an AS350B-2 Squirrel helicopter at a mean terrain clearance of 200 feet along N20°E survey flight lines with a spacing of a quarter of a mile. Tie lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

An Ashtech GG24 NAVSTAR / GLONASS Global Positioning System was used for navigation. The helicopter position was derived every 0.5 seconds using post-flight differential positioning to a relative accuracy of better than 5 m. Flight path positions were projected onto the Clarke 1866 UTM zone 61 spheroid, 1927 North American datum using a central meridian (CM) of 147°, a north constant of 0 and an east constant of 500,000. Positional accuracy of the presented data is better than 10 m with respect to the UTM grid.

PREVIOUSLY SURVEYED AREAS

The previously acquired geophysical data were acquired with an Aerodat Dondar Electromagnetic (EM) system and a Scintrex cesium magnetometer. The electromagnetic system utilized two vertical coaxial coil pairs at 856 Hz and 4,476 Hz and three horizontal coil pairs at 849 Hz, 4,186 Hz and 32,490 Hz. Mean terrain clearance for the magnetometer and EM system were slightly higher than 150 and 100 feet, respectively. In addition the survey recorded data from a radar altimeter, GPS navigation system, 60 Hz monitor and video camera. The GPS electronic positioning system operated in differential mode. The flight line direction varies from block to block as follows: Canwell N30°E, Eureka and Fish Lake N20°E, and Rainy and Tangle Lake N–S. The flight lines were one-eighth mile apart. Extended tie lines were flown with the current survey which cover both the 1995 and 2002 survey areas. The older survey was flown with a AS350B2 helicopter.

RESISTIVITY

The DIGHEM^V EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial-coil pairs operated at 1000 and 5500 Hz while three horizontal coplanar-coil pairs operated at 900, 7200, and 56,000 Hz. EM data were sampled at 0.1 second intervals. The EM system responds to bedrock conductors, conductive overburden, and cultural sources. Apparent resistivity is generated from the inphase and quadrature components of the coplanar 7200 Hz using the pseudo-layer half space model (Fraser 1978). The data were interpolated onto a regular 100 m grid using a modified Akima (1970) technique. The 7200 Hz coplanar data from the current survey have been merged with the 4189 Hz coplanar data from the previously surveyed areas. To facilitate the merge between data sets, the resistivity for the previously acquired 4189 Hz coplanar data was recalculated using the pseudo-layer half space model.

Akima, H., 1970, A new method of interpolation and smooth curve fitting based on local procedures: Journal of the Association of Computing Machinery, v.17, no. 4, p. 589–602.

Fraser, D.C., 1978, Resistivity mapping with an airborne multicoil electromagnetic system: Geophysics, v. 43, p. 144–172.

RESISTIVITY CONTOURS

1000
800
600
500
400
300
250
200
150
125
100

Contours in ohm-m at 10 intervals per decade

resistivity low

SURVEY HISTORY

This map has been compiled and drawn under contract between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Surveys (DGGS), and Stevens Exploration Management Corp. Airborne geophysical data for the current area were acquired and processed by Fugro Airborne Surveys in 2002. Airborne geophysical data for the Canwell, Eureka, Fish Lake, Rainy and Tangle Lake areas were acquired in 1995 by Aerodat Inc. and were provided for publication by the BLM. The current survey was funded by the U. S. Department of Interior, Bureau of Land Management (BLM) and conducted in support of its mineral assessment program in the Delta River mining district. Laurel Burns was the contract manager for DGGS.

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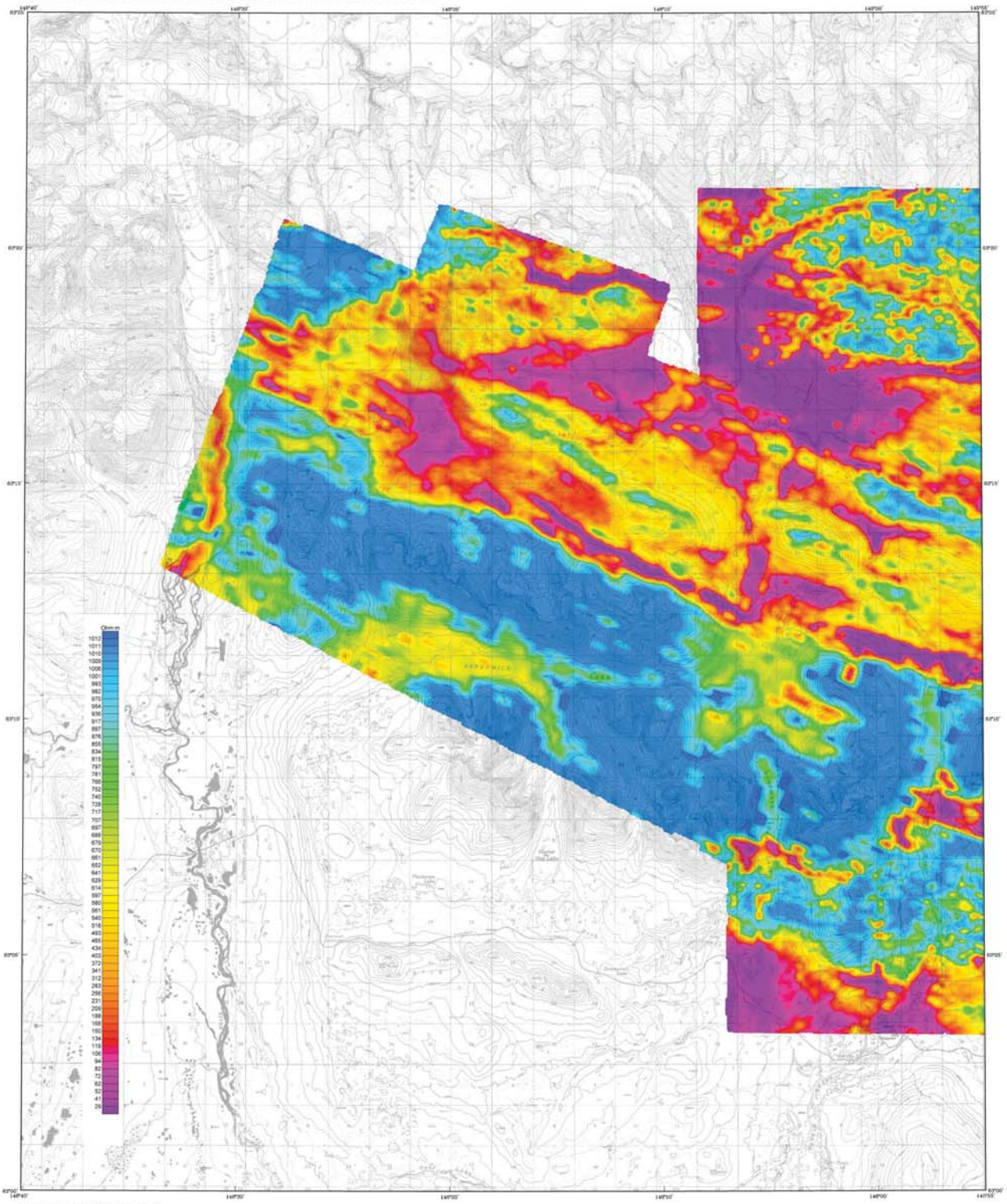
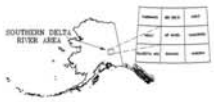


SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM: NAD83 (NAD 1983)



900 Hz COPLANAR RESISTIVITY OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES QUADRANGLE

2003

DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM^V Electromagnetic (EM) system and a Scintrex cesium magnetometer. Both were flown at a height of 100 feet. In addition the survey recorded data from a radar altimeter, GPS navigation system, 50/60 Hz monitors and video camera. Flights were performed with an AS350B-2 Squirrel helicopter at a mean terrain clearance of 200 feet along N20°E survey flight lines with a spacing of a quarter of a mile. Tie lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

An Ashtech GG24 NAVSTAR / GLONASS Global Positioning System was used for navigation. The helicopter position was derived every 0.5 seconds using post-flight differential positioning to a relative accuracy of better than 5 m. Flight path positions were projected onto the Clarke 1866 (UTM zone 6) spheroid, 1927 North American datum using a central meridian (CM) of 147°, a north constant of 0 and an east constant of 500,000. Positional accuracy of the presented data is better than 10 m with respect to the UTM grid.

PREVIOUSLY SURVEYED AREAS

The previously acquired geophysical data were acquired with an Aerodat Dondar Electromagnetic (EM) system and a Scintrex cesium magnetometer. The electromagnetic system utilized two vertical coaxial coil pairs at 3.56 Hz and 4,476 Hz and three horizontal coil pairs at 849 Hz, 4,189 Hz and 32,490 Hz. Mean terrain clearance for the magnetometer and EM system were slightly higher than 150 and 100 feet, respectively. In addition the survey recorded data from a radar altimeter, GPS navigation system, 60 Hz monitor and video camera. The GPS electronic positioning system operated in differential mode. The flight line direction varies from block to block as follows: Conwell N30°E, Eureka and Fish Lake N20°E, and Rainy and Tangle Lake N–S. The flight lines were one-eighth mile apart. Extended tie lines were flown with the current survey which cover both the 1995 and 2002 survey areas. The older survey was flown with a AS350B2 helicopter.

RESISTIVITY

The DIGHEM^V EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial-coil pairs operated at 1000 and 5500 Hz while three horizontal coplanar-coil pairs operated at 900, 7200, and 56,000 Hz. EM data were sampled at 0.1 second intervals. The EM system responds to bedrock conductors, conductive overburden, and cultural sources. Apparent resistivity is generated from the inphase and quadrature components of the coplanar 900 Hz using the pseudo-layer half space model (Fraser 1978). The data were interpolated onto a regular 100 m grid using a modified Akima (1970) technique. The 900 Hz coplanar data from the current survey have been merged with the 849 Hz coplanar data from the previously surveyed areas. To facilitate the merge between data sets, the resistivity for the previously acquired 849 Hz coplanar data was recalculated using the pseudo-layer half space model.

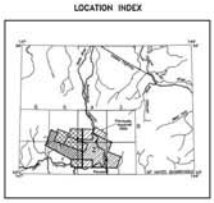
Akima, H., 1970, a new method of interpolation and smooth curve fitting based on local procedures: Journal of the Association of Computing Machinery, v. 17, no. 4, p. 589–602.

Fraser, D.C., 1978, Resistivity mapping with an airborne multicoil electromagnetic system: Geophysics, v. 43, p. 144–172.

TRUE NORTH

APPROXIMATE MEAN DECLINATION, 2003

LOCATION INDEX



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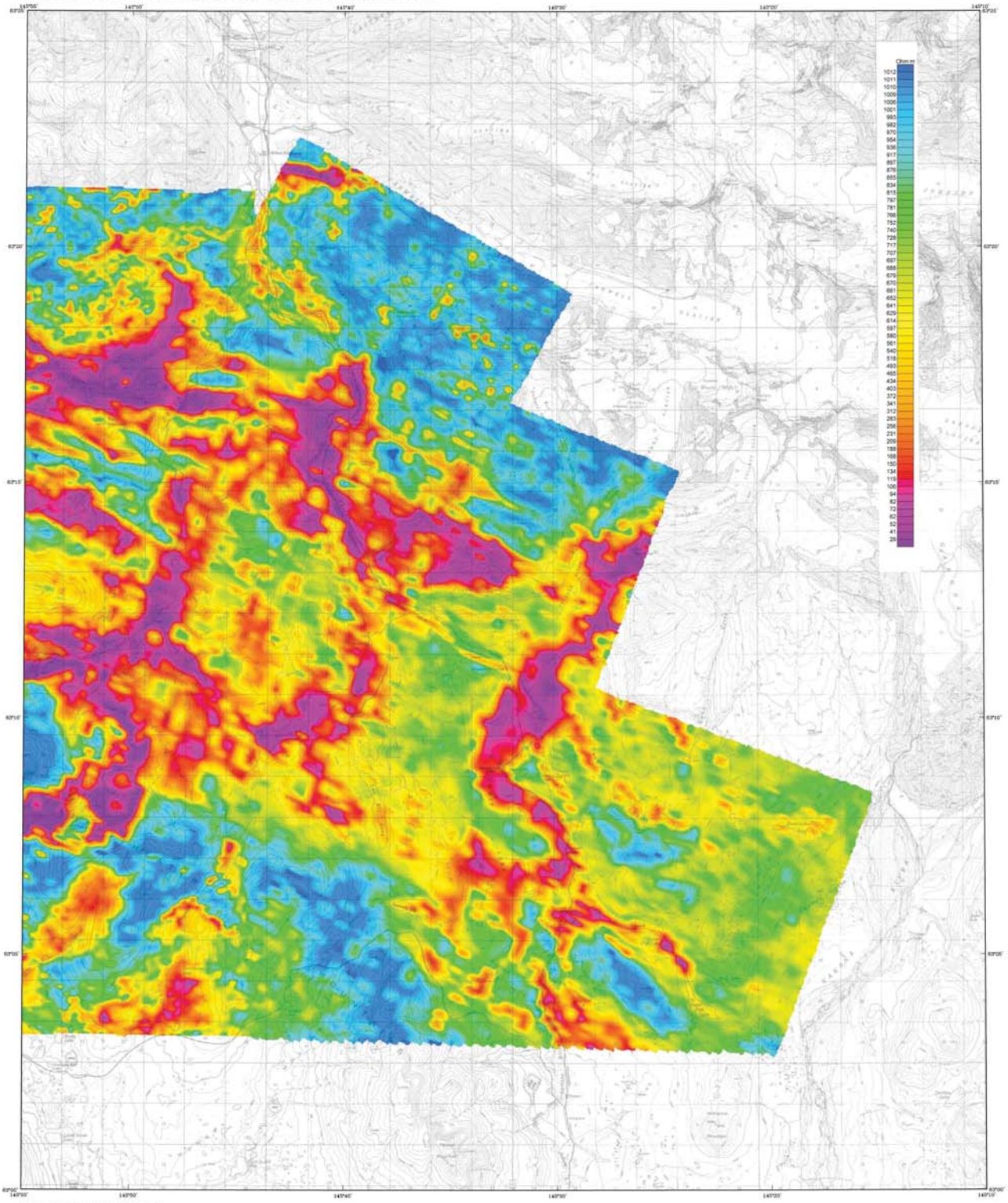


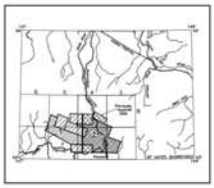
SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL

LOCATION INDEX



900 Hz COPLANAR RESISTIVITY OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES QUADRANGLE

2003

DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM^V Electromagnetic (EM) system and a Scintrex cesium magnetometer. Both were flown at a height of 100 feet. In addition the survey recorded data from a radar altimeter, GPS navigation system, 50/60 Hz monitors and video camera. Flights were performed with an AS350B-2 Squirrel helicopter at a mean terrain clearance of 200 feet along N20°E survey flight lines with a spacing of a quarter of a mile. Tie lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

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PREVIOUSLY SURVEYED AREAS

The previously acquired geophysical data were acquired with an Aerodat Condor Electromagnetic (EM) system and a Scintrex cesium magnetometer. The electromagnetic system utilized two vertical coaxial coil pairs at 936 Hz and 4,476 Hz and three horizontal coil pairs at 849 Hz, 4,189 Hz and 32,490 Hz. Mean terrain clearance for the magnetometer and EM system were slightly higher than 150 and 100 feet, respectively. In addition the survey recorded data from a radar altimeter, GPS navigation system, 60 Hz monitor and video camera. The GPS electronic positioning system operated in differential mode. The flight line direction varies from block to block as follows: Canwell N30°E, Eureka and Fish Lake N20°E, and Rainy and Tangle Lake N–S. The flight lines were one-eighth mile apart. Extended tie lines were flown with the current survey which cover both the 1995 and 2002 survey areas. The older survey was flown with a AS350B2 helicopter.

RESISTIVITY

The DIGHEM^V EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial-coil pairs operated at 1000 and 5500 Hz while three horizontal coplanar-coil pairs operated at 900, 7200, and 56,000 Hz. EM data were sampled at 0.1 second intervals. The EM system responds to bedrock conductors, conductive overburden, and cultural sources. Apparent resistivity is generated from the inphase and quadrature components of the coplanar 900 Hz using the pseudo-layer half space model (Fraser 1978). The data were interpolated onto a regular 100 m grid using a modified Akima (1970) technique. The 900 Hz coplanar data from the current survey have been merged with the 849 Hz coplanar data from the previously surveyed areas. To facilitate the merge between data sets, the resistivity for the previously acquired 849 Hz coplanar data was recalculated using the pseudo-layer half space model.

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TRUE NORTH
0°
GRID NORTH
CENTRAL MERIDIAN 147°

SURVEY HISTORY

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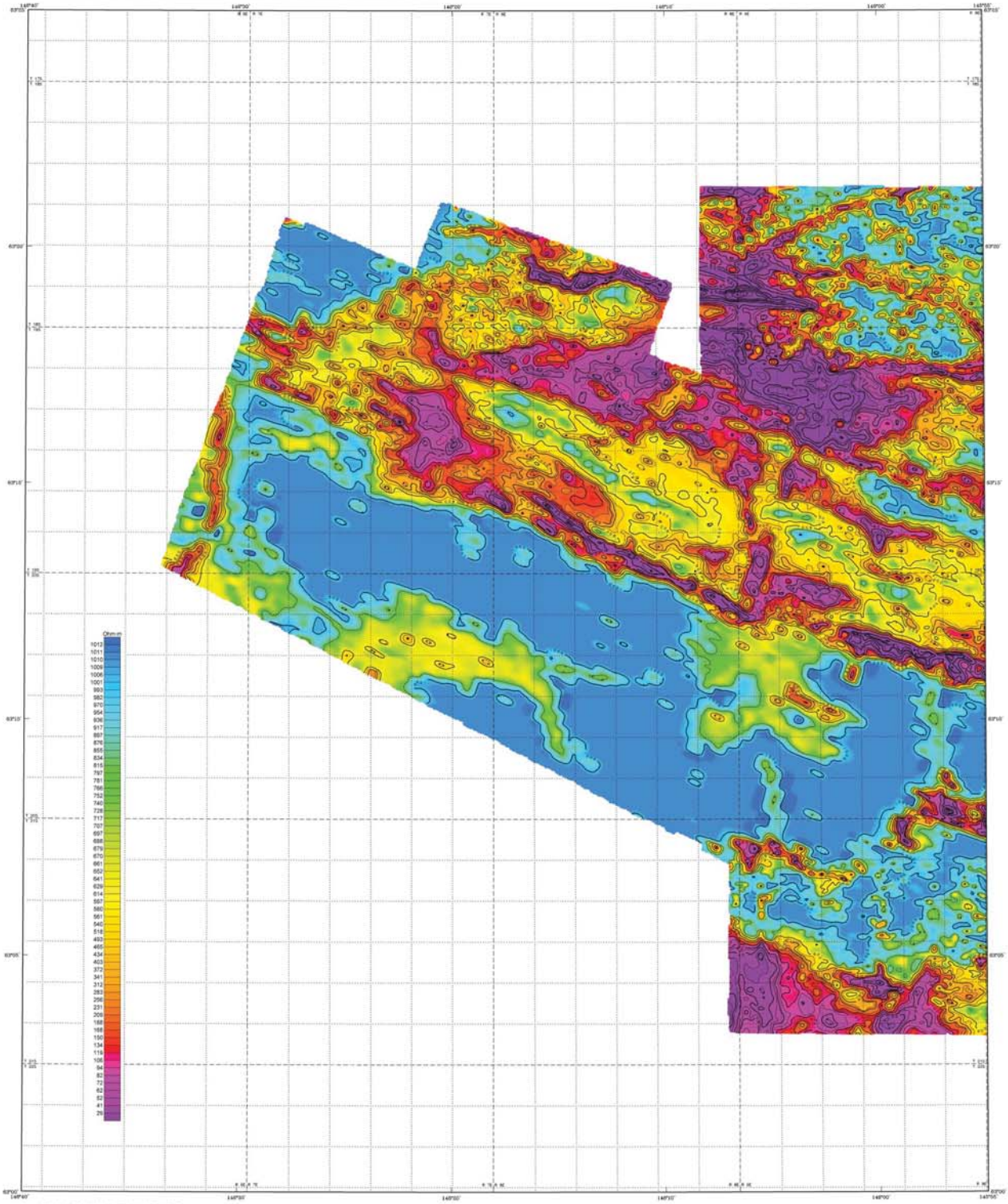
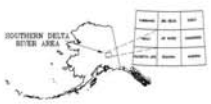


SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS



900 Hz COPLANAR RESISTIVITY OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES QUADRANGLE

2003

DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM^{V} Electromagnetic (EM) system and a Scintrex cesium magnetometer. Both were flown at a height of 100 feet. In addition the survey recorded data from a radar altimeter, GPS navigation system, 50/60 Hz monitors and video camera. Flights were performed with an AS350B-2 Squirrel helicopter at a mean terrain clearance of 200 feet along N20°E survey flight lines with a spacing of a quarter of a mile. Tie lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

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PREVIOUSLY SURVEYED AREAS

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RESISTIVITY

The DIGHEM^{V} EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial-coil pairs operated at 1000 and 5500 Hz while three horizontal coplanar-coil pairs operated at 900, 7200, and 56,000 Hz. EM data were sampled at 0.1 second intervals. The EM system responds to bedrock conductors, conductive overburden, and cultural sources. Apparent resistivity is generated from the inphase and quadrature components of the coplanar 900 Hz using the pseudo-layer half space model (Fraser 1978). The data were interpolated onto a regular 100 m grid using a modified Akima (1970) technique. The 900 Hz coplanar data from the current survey have been merged with the 849 Hz coplanar data from the previously surveyed areas. To facilitate the merge between data sets, the resistivity for the previously acquired 849 Hz coplanar data was recalculated using the pseudo-layer half space model.

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Fraser, D.C., 1978, Resistivity mapping with an airborne multicoil electromagnetic system: Geophysics, v. 43, p. 144–172.

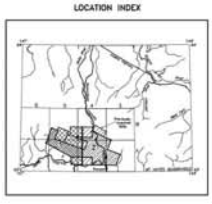
RESISTIVITY CONTOURS

1000
800
600
500
400
300
250
200
150
125
100

Contours in ohm-m at 10 intervals per decade

resistivity low

LOCATION INDEX



SURVEY HISTORY

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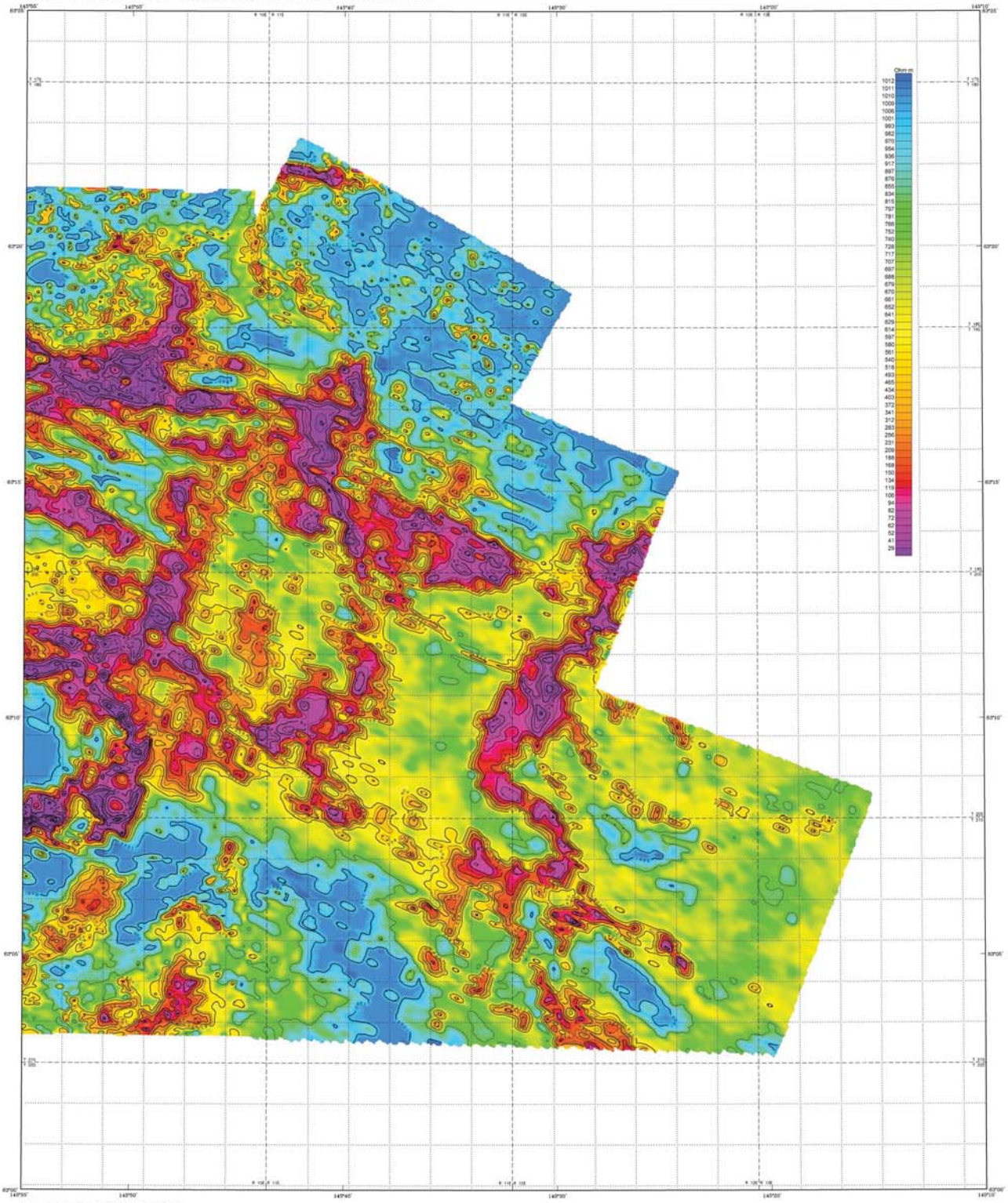
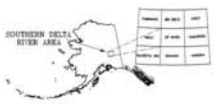


SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

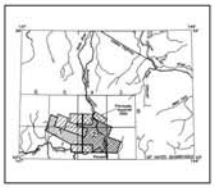


900 Hz COPLANAR RESISTIVITY OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES QUADRANGLE

2003

LOCATION INDEX



DESCRIPTIVE NOTES

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PREVIOUSLY SURVEYED AREAS

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RESISTIVITY

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RESISTIVITY CONTOURS

1000
800
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Contours in ohm-m at 10 intervals per decade

resistivity low

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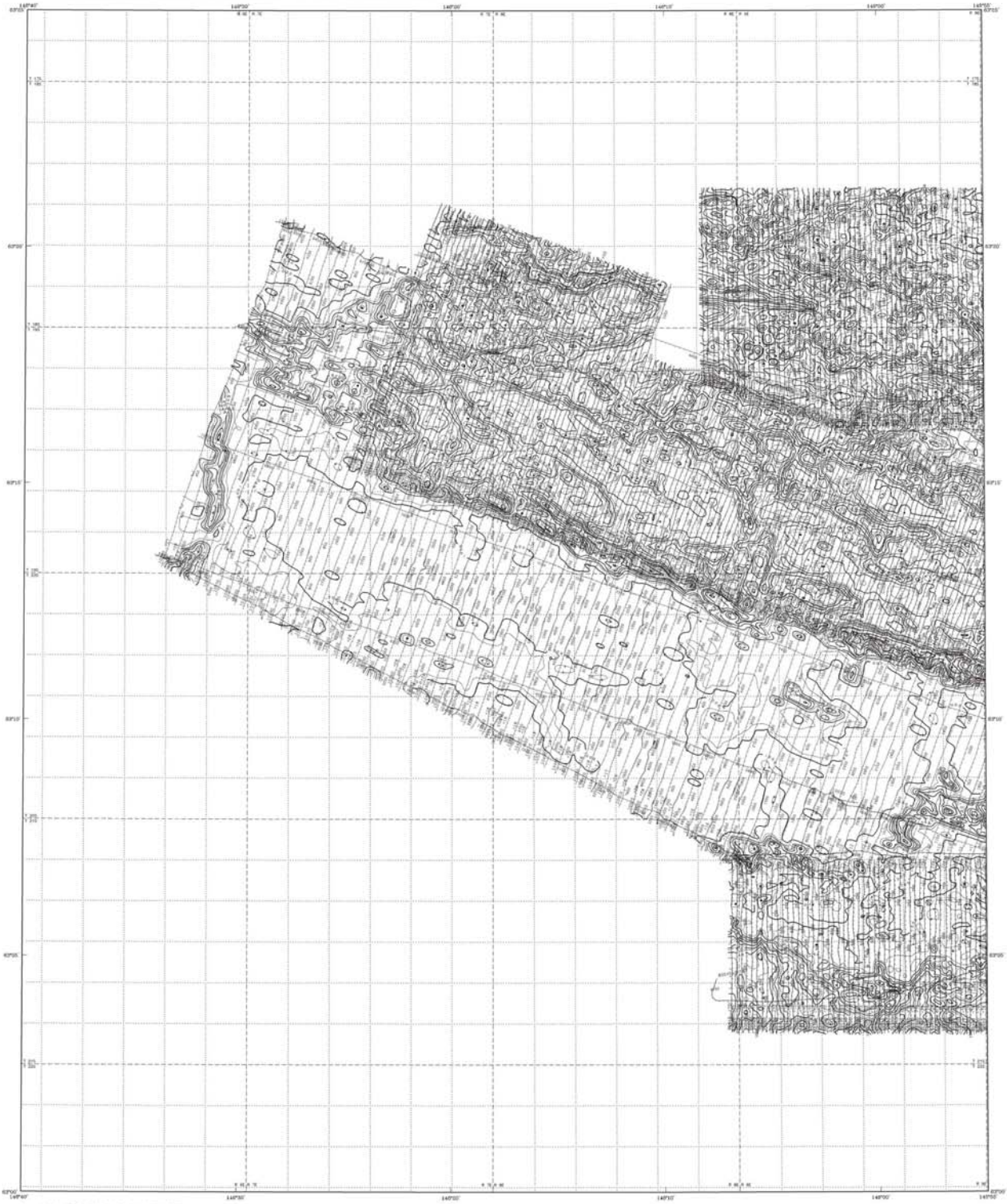
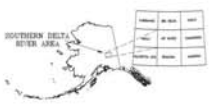


SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS



900 Hz COPLANAR RESISTIVITY OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES QUADRANGLE

2003

DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM^{V} Electromagnetic (EM) system and a Scintrex cesium magnetometer. Both were flown at a height of 100 feet. In addition the survey recorded data from a radar altimeter, GPS navigation system, 50/60 Hz monitors and video camera. Flights were performed with an AS350B-2 Squirrel helicopter at a mean terrain clearance of 200 feet along N20°E survey flight lines with a spacing of a quarter of a mile. Tie lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

An AshTech G12+ NAVSTAR / GLONASS Global Positioning System was used for navigation. The helicopter position was derived every 0.5 seconds using post-flight differential positioning to a relative accuracy of better than 5 m. Flight path positions were projected onto the Clarke 1866 (UTM zone 6) spheroid, 1927 North American datum using a central meridian (CM) of 147°, a north constant of 0 and an east constant of 500,000. Positional accuracy of the presented data is better than 10 m with respect to the UTM grid.

PREVIOUSLY SURVEYED AREAS

The previously acquired geophysical data were acquired with an aerodat Condor Electromagnetic (EM) system and a Scintrex cesium magnetometer. The electromagnetic system utilized two vertical coaxial coil pairs at 835 Hz and 4,475 Hz and three horizontal coil pairs at 849 Hz, 4,189 Hz and 32,490 Hz. Mean terrain clearance for the magnetometer and EM system were slightly higher than 150 and 100 feet, respectively. In addition the survey recorded data from a radar altimeter, GPS navigation system, 60 Hz monitor and video camera. The GPS electronic positioning system operated in differential mode. The flight line direction varies from block to block as follows: Canwell N30°E, Eureka and Fish Lake N20°E, and Rainy and Tangle Lake N~S. The flight lines were one-eighth mile apart. Extended tie lines were flown with the current survey which cover both the 1995 and 2002 survey areas. The older survey was flown with a AS350B2 helicopter.

RESISTIVITY

The DIGHEM^{V} EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial-coil pairs operated at 1000 and 5500 Hz while three horizontal coplanar-coil pairs operated at 900, 7200, and 56,000 Hz. EM data were sampled at 0.1 second intervals. The EM system responds to bedrock conductors, conductive overburden, and cultural sources. Apparent resistivity is generated from the inphase and quadrature components of the coplanar 900 Hz using the pseudo-layer half space model (Fraser 1978). The data were interpolated onto a regular 100 m grid using a modified Akima (1970) technique. The 900 Hz coplanar data from the current survey have been merged with the 849 Hz coplanar data from the previously surveyed areas. To facilitate the merge between data sets, the resistivity for the previously acquired 849 Hz coplanar data was recalculated using the pseudo-layer half space model.

Akima, H., 1970, a new method of interpolation and smooth curve fitting based on local procedures: Journal of the Association of Computing Machinery, v. 17, no. 4, p. 589–602.

Fraser, D.C., 1978, Resistivity mapping with an airborne multicoil electromagnetic system: Geophysics, v. 43, p. 144–172.

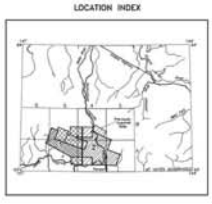
RESISTIVITY CONTOURS

1200
800
600
500
400
300
250
200
150
125
100

Contours in ohm-m at 10 intervals per decade

resistivity low

LOCATION INDEX



SURVEY HISTORY

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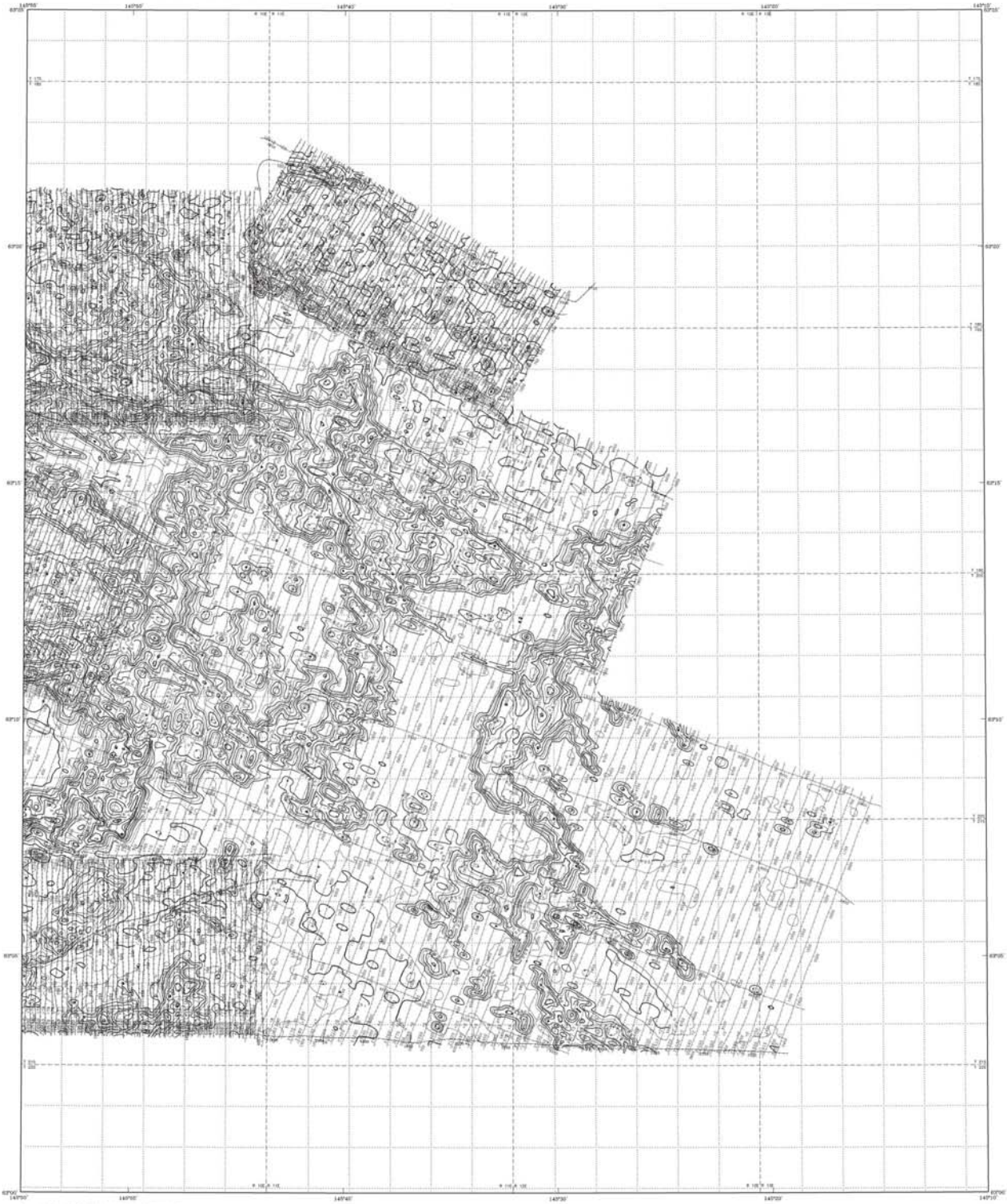
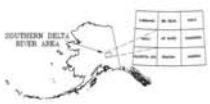




SCALE 1:63,360

1 0 1 2 3 4 MILES

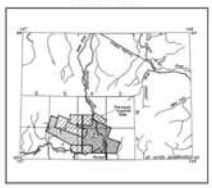
1 0 1 2 3 4 5 KILOMETERS

900 Hz COPLANAR RESISTIVITY OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES QUADRANGLE

2003

LOCATION INDEX



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The geophysical data were acquired with a DIGHEM[1] Electromagnetic (EM) system and a Scintrex cesium magnetometer. Both were flown at a height of 100 feet. In addition the survey recorded data from a radar altimeter, GPS navigation system, 50/60 Hz monitors and video camera. Flights were performed with an AS350B-2 Squirrel helicopter at a mean terrain clearance of 200 feet along N20°E survey flight lines with a spacing of a quarter of a mile. Tie lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

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RESISTIVITY

The DIGHEM[1] EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial-coil pairs operated at 1000 and 5500 Hz while three horizontal coplanar-coil pairs operated at 900, 7200, and 56,000 Hz. EM data were sampled at 0.1 second intervals. The EM system responds to bedrock conductors, conductive overburden, and cultural sources. Apparent resistivity is generated from the inphase and quadrature components of the coplanar 900 Hz using the pseudo-layer half space model (Fraser 1978). The data were interpolated onto a regular 100 m grid using a modified Akima (1970) technique. The 900 Hz coplanar data from the current survey have been merged with the 849 Hz coplanar data from the previously surveyed areas. To facilitate the merge between data sets, the resistivity for the previously acquired 849 Hz coplanar data was recalculated using the pseudo-layer half space model.

[1]Geotech, Ltd., 1470, A new method of interpolation and smooth curve fitting based on local procedures: Journal of the Association of Computing Machinery, v. 17, no. 4, p. 589–602.

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RESISTIVITY CONTOURS

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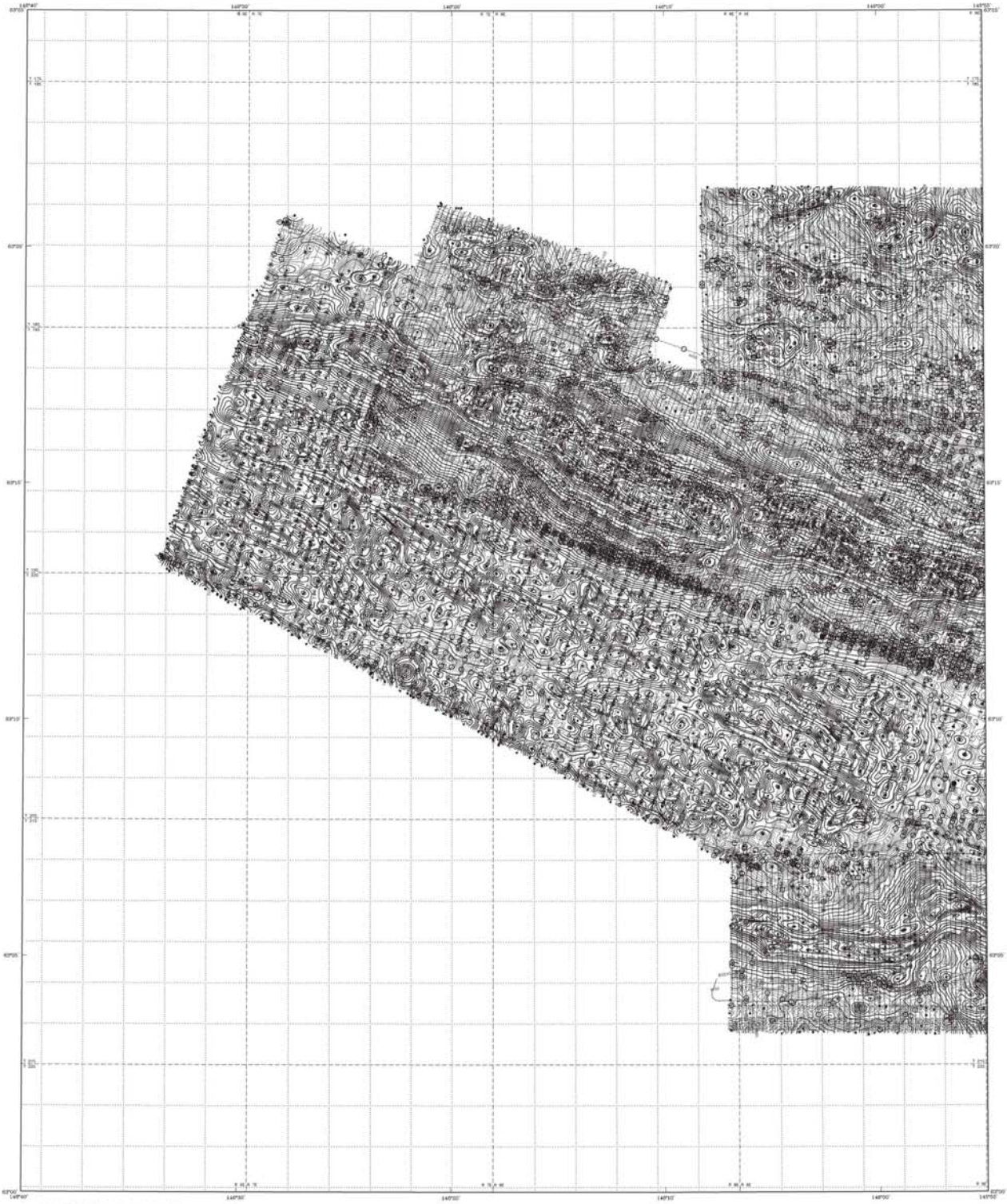
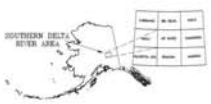


SCALE 1:63,360

1 0 1 2 3 4 MILES

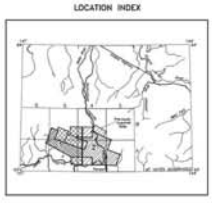
1 0 1 2 3 4 5 KILOMETERS



TOTAL MAGNETIC FIELD AND ELECTROMAGNETIC ANOMALIES OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES QUADRANGLE

2003



DESCRIPTIVE NOTES

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PREVIOUSLY SURVEYED AREAS

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ELECTROMAGNETIC ANOMALIES

Anomaly	Conductance
●	>50 siemens
○	<50 siemens
✱	Questionable anomaly
△	Weak conductivity associated with an EM magnetite response

ELECTROMAGNETICS

To determine the location of EM anomalies or their boundaries, the DIGHEM^{V} EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial-coil pairs operated at 1000 and 5500 Hz while three horizontal coplanar-coil pairs operated at 900, 7200, and 56,000 Hz. EM data were sampled at 0.1 second intervals. The EM system responds to bedrock conductors, conductive overburden, and cultural sources. The power line monitor and the flight track video were examined to locate cultural sources. The EM anomalies that are indicated are classified by conductance.

TOTAL MAGNETIC FIELD

The total magnetic field data were acquired with a sampling interval of 0.1 seconds, and were (1) corrected for diurnal variations by subtraction of the digitally recorded base station magnetic data, (2) leveled to the tie line data, and (3) interpolated onto a regular 100 m grid using a modified Akima (1970) technique. The regional correction (or IGRF gradient, 2000, updated to August 2002) was removed from the leveled magnetic data.

Akima, H., 1970, A new method of interpolation and smooth curve fitting based on local procedures: Journal of the Association of Computing Machinery, v. 17, no. 4, p. 589–602.

MAGNETIC CONTOUR INTERVAL

———	250 nT
———	50 nT
———	10 nT
— — — —	5 nT
⊕	magnetic low
⊕	magnetic high

LOCATION INDEX

SURVEY HISTORY

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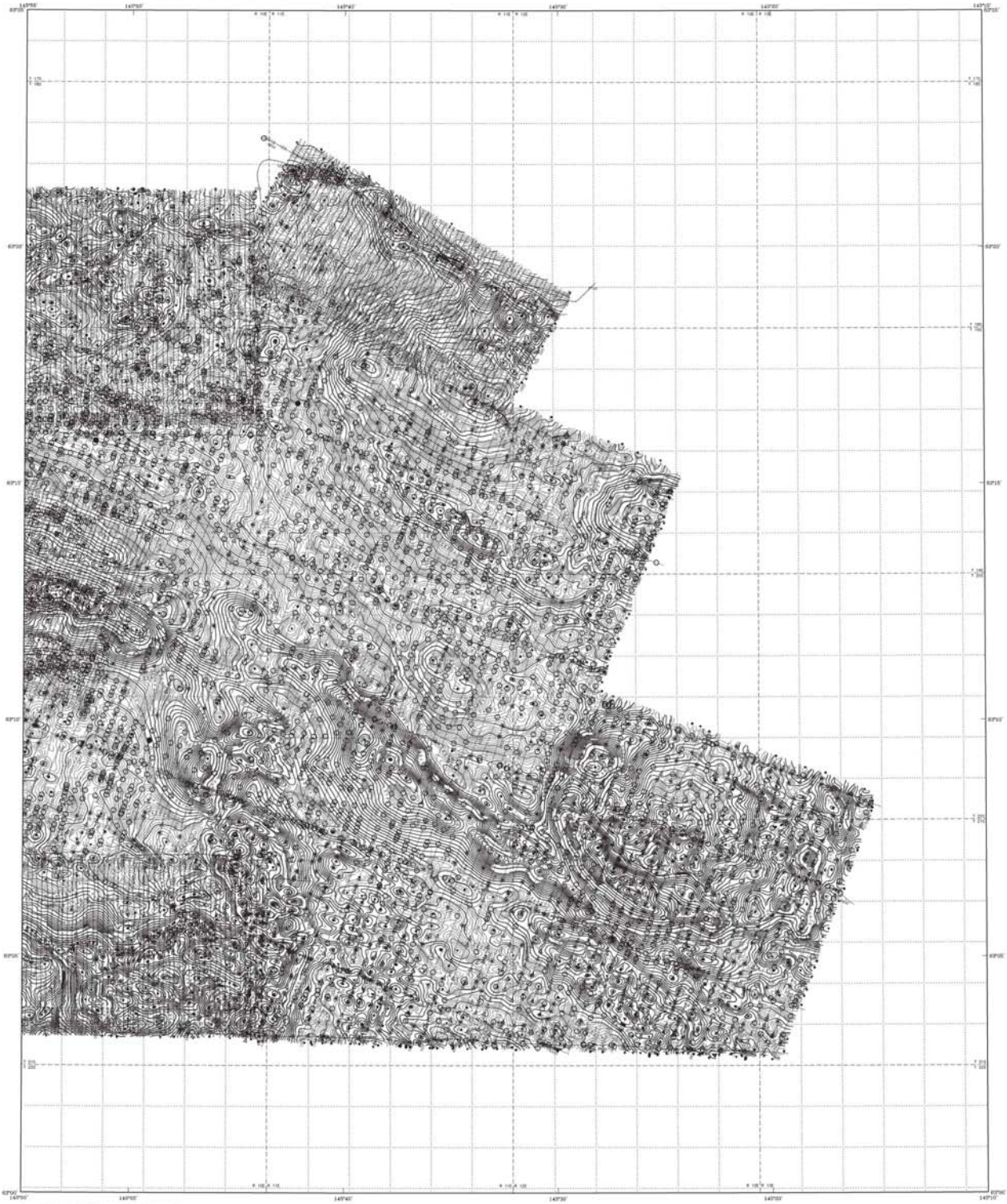
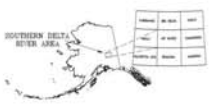




SCALE 1:63,360

1 0 1 2 3 4 MILES

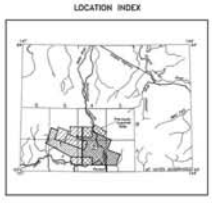
1 0 1 2 3 4 5 KILOMETERS

TOTAL MAGNETIC FIELD AND ELECTROMAGNETIC ANOMALIES OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES QUADRANGLE

2003

LOCATION INDEX



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ELECTROMAGNETIC ANOMALIES

Amplitude — Conductance

- +50 siemens
- −50 siemens
- Questionable anomaly
- Weak conductivity associated with an EM magnetite response

ELECTROMAGNETICS

To determine the location of EM anomalies or their boundaries, the DIGHEM^{V} EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial-coil pairs operated at 1000 and 5500 Hz while three horizontal coplanar-coil pairs operated at 900, 7200, and 56,000 Hz. EM data were sampled at 0.1 second intervals. The EM system responds to bedrock conductors, conductive overburden, and cultural sources. The power line monitor and the flight track video were examined to locate cultural sources. The EM anomalies that are indicated are classified by conductance.

TOTAL MAGNETIC FIELD

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MAGNETIC CONTOUR INTERVAL

- 250 nT
- 50 nT
- 10 nT
- 2 nT
- magnetic low
- magnetic high

SURVEY HISTORY

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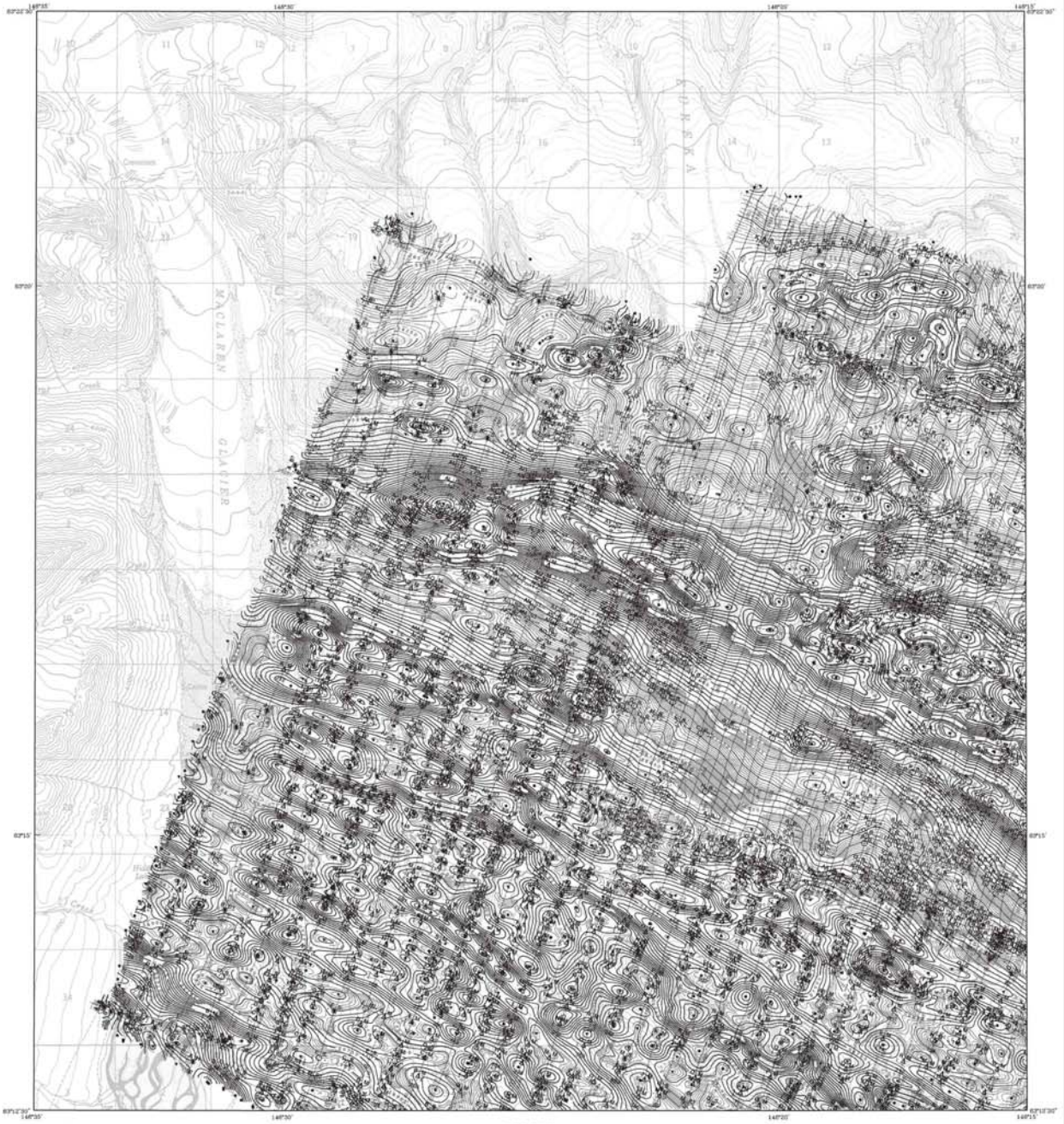
ALASKA DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS
IN COOPERATION WITH THE U.S. BUREAU OF LAND MANAGEMENT

GEOPHYSICAL REPORT 2003_5_2a
PARTS OF MT. HAYES A-5, A-6, B-5 AND B-6 QUADRANGLES



Base from U.S. Geological Survey Mt. Hayes A-5, 1978, A-6, 1977, B-5, 1978, B-6, 1977, Quadrangles, Alaska

SCALE 1:31,680

0.5 0 0.5 1 1.5 2 MILES

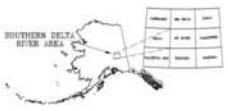
0.5 0 0.5 1 1.5 2 2.5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL

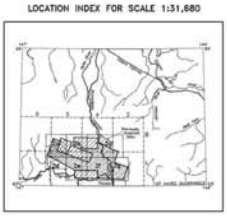
TOTAL MAGNETIC FIELD AND DETAILED ELECTROMAGNETIC ANOMALIES OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES A-5, A-6, B-5 AND B-6 QUADRANGLES

2003



LOCATION INDEX FOR SCALE 1:31,680



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ELECTROMAGNETIC ANOMALIES

Anomaly	Conductance
●	>100 siemens
◕	50–100 siemens
◑	20–50 siemens
◔	10–20 siemens
⊖	5–10 siemens
○	1–5 siemens
○	<1 siemens
✱	Questionable anomaly
△	EM magnetite response

Interpretive symbol	Conductor ("model")
B	Bedrock conductor
D	Narrow bedrock conductor ("thin dike")
S	Conductive cover ("horizontal thin sheet")
H	Broad conductive rock unit, deep conductive weathering, thick conductive cover ("half space")
E	Edge of broad conductor ("edge of half space").
L	Culture, e.g., power line, metal building or fence

MAGNETIC CONTOUR INTERVAL

250 nT

50 nT

10 nT

5 nT

magnetic low

magnetic high

SURVEY HISTORY

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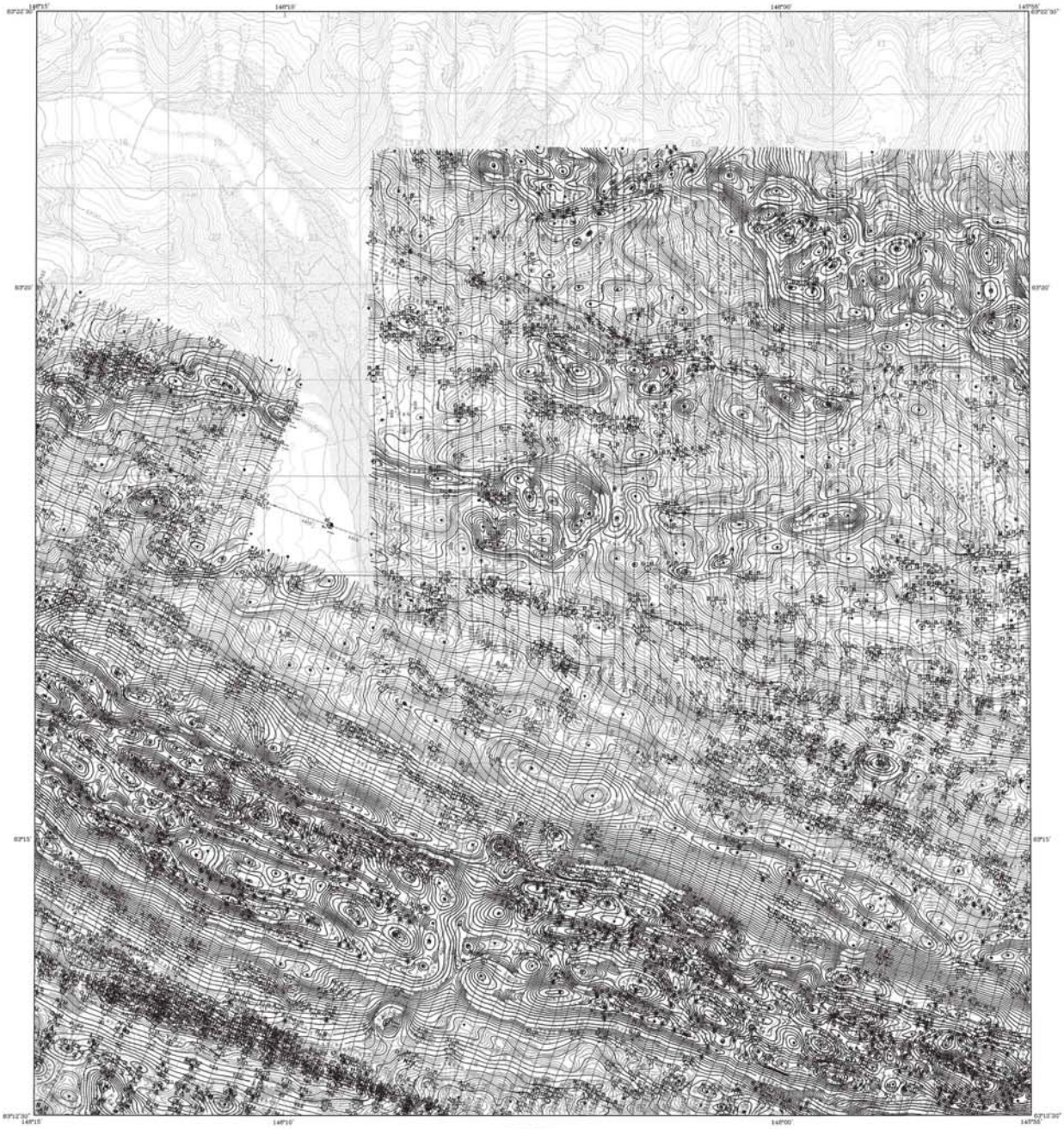
IN COOPERATION WITH THE U.S. BUREAU OF LAND MANAGEMENT

GEOPHYSICAL REPORT 2003_5_2b
PARTS OF MT. HAYES A-4, A-5, B-4 AND B-5 QUADRANGLES



Base from U.S. Geological Survey Mt. Hayes A-4, (1978), A-5, (1979), B-4, (1984), B-5, (1978) Quadrangles, Alaska

SCALE 1:31,680

0.5 0 0.5 1 1.5 2 MILES

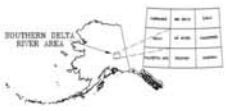
0.5 0 0.5 1 1.5 2 2.5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL

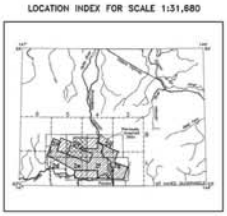
TOTAL MAGNETIC FIELD AND DETAILED ELECTROMAGNETIC ANOMALIES OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES A-4, A-5, B-4 AND B-5 QUADRANGLES

2003



LOCATION INDEX FOR SCALE 1:31,680



DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM^{V} Electromagnetic (EM) system and a Scintrex cesium magnetometer. Both were flown at a height of 100 feet. In addition the survey recorded data from a radar altimeter, GPS navigation system, 50/60 Hz monitors and video camera. Flights were performed with an AS350B-2 Squirrel helicopter at a mean terrain clearance of 200 feet along N20°E survey flight lines with a spacing of a quarter of a mile. Tie lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

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PREVIOUSLY SURVEYED AREAS

The previously acquired geophysical data were acquired with an Aerodat Condor Electromagnetic (EM) system and a Scintrex cesium magnetometer. The electromagnetic system utilized two vertical coaxial coil pairs at 935 Hz and 4,476 Hz and three horizontal coil pairs at 849 Hz, 4,189 Hz and 32,490 Hz. Mean terrain clearance for the magnetometer and EM system were slightly higher than 150 and 100 feet, respectively. In addition the survey recorded data from a radar altimeter, GPS navigation system, 60 Hz monitor and video camera. The GPS electronic positioning system operated in differential mode. The flight line direction varies from block to block as follows: Carwell N30°E, Eureka and Fish Lake N20°E, and Rainy and Tangle Lake N–S. The flight lines were one-eighth mile apart. Extended tie lines were flown with the current survey which cover both the 1995 and 2002 survey areas. The older survey was flown with a AS350B2 helicopter.

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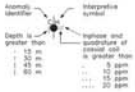
ELECTROMAGNETIC ANOMALIES

Anomaly	Conductance
●	>100 siemens
●	50–100 siemens
●	20–50 siemens
●	10–20 siemens
⊕	5–10 siemens
○	1–5 siemens
○	< 1 siemens
*	Questionable anomaly
△[W]	EM magnetite response



Interpretive symbol	Conductor ("model")
B	Bedrock conductor
D	Narrow bedrock conductor ("thin dike")
S	Conductive cover ("horizontal thin sheet")
H	Broad conductive rock unit, deep conductive weathering, thick conductive cover ("half space")
E	Edge of broad conductor ("edge of half space").
L	Culture, e.g., power line, metal building or fence

MAGNETIC CONTOUR INTERVAL

———	250 nT
———	50 nT
———	10 nT
— — —	5 nT
	magnetic low
	magnetic high

SURVEY HISTORY

This map has been compiled and drawn under contract between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Surveys (DGGS), and Ste-ere Exploration Management Corp. Airborne geophysical data for the current area were acquired and processed by Fugro Airborne Surveys in 2002. Airborne geophysical data for the Carwell, Eureka, Fish Lake, Rainy and Tangle Lake areas were acquired in 1995 by Aerodat Inc. and were provided for publication by the BLM. The current survey was funded by the U. S. Department of Interior, Bureau of Land Management (BLM) and conducted in support of its mineral assessment program in the Delta River mining district. Laurel Burns was the contract manager for DGGS.

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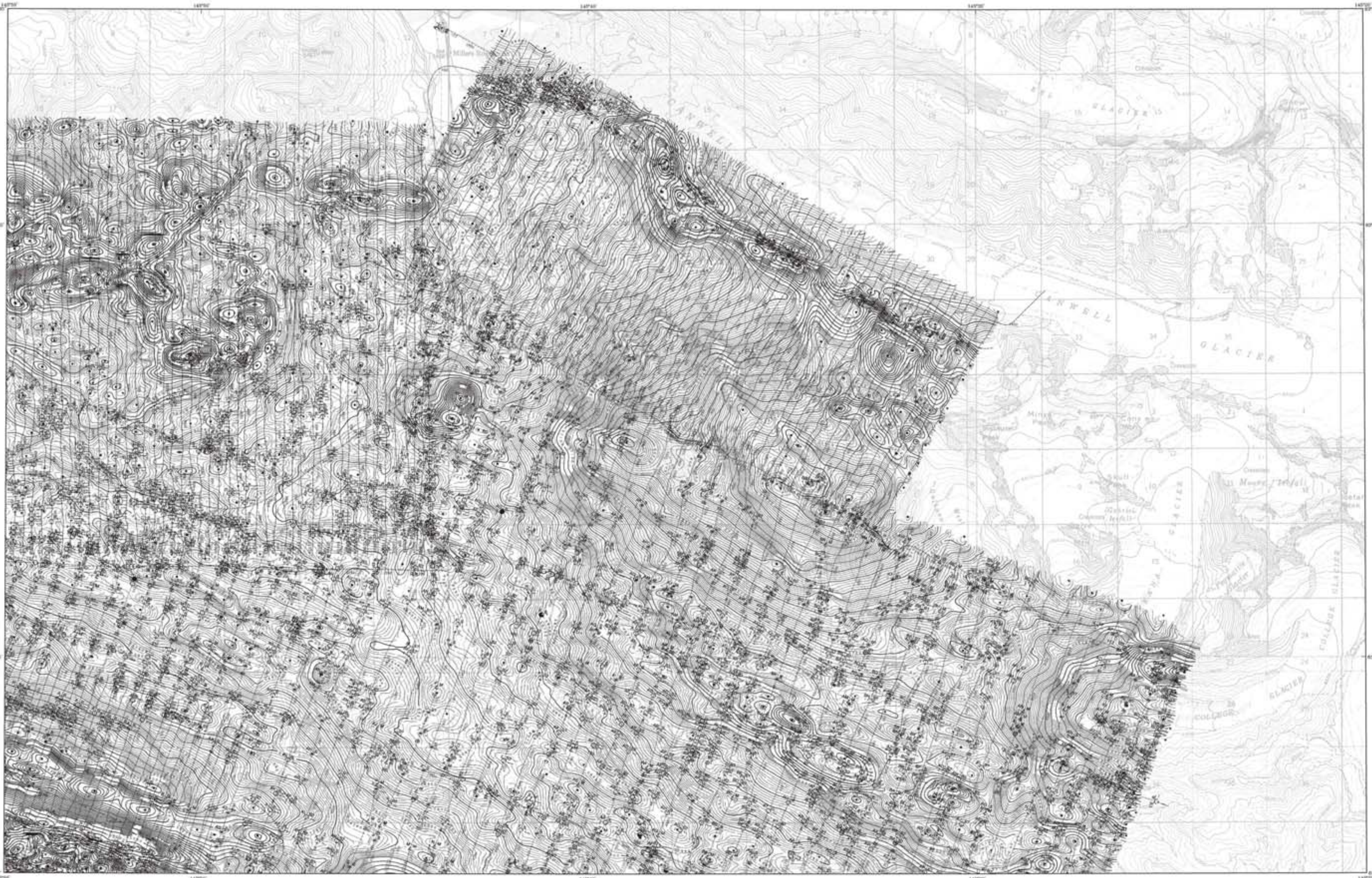
TOTAL MAGNETIC FIELD

The total magnetic field data were acquired with a sampling interval of 0.1 seconds, and were (1) corrected for diurnal variations by subtraction of the digitally recorded base station magnetic data, (2) leveled to the tie line data, and (3) interpolated onto a regular 100 m grid using a modified Akima (1970) technique. The regional variation (or IGRF gradient, 2000, updated to August, 2002) was removed from the leveled magnetic data.

Akima, H., 1970, A new method of interpolation and smooth curve fitting based on local procedures: Journal of the Association of Computing Machinery, v. 17, no. 4, p. 589–602.

ALASKA DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS
IN COOPERATION WITH THE U.S. BUREAU OF LAND MANAGEMENT

GEOPHYSICAL REPORT 2003_5_2c
PARTS OF MT. HAYES A-3, A-4, B-3 AND B-4 QUADRANGLES



SCALE 1:31,680

TOTAL MAGNETIC FIELD AND DETAILED ELECTROMAGNETIC ANOMALIES OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES A-3, A-4, B-3 AND B-4 QUADRANGLES

2003

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ELECTROMAGNETIC ANOMALIES

Arcs indicate the conductor has a thickness >10m
Magnetic correlation in nT
Dip direction

Anomaly identifier
Interpretive symbol
Depth is greater than: 15 m, 30 m, 45 m, 60 m
Inphase and quadrature of coaxial coil is greater than: 5 ppm, 10 ppm, 15 ppm, 20 ppm

Anomaly	Conductance
●	>100 siemens
◕	50–100 siemens
◒	20–50 siemens
◔	10–20 siemens
⊕	5–10 siemens
○	1–5 siemens
○	<1 siemens
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MAGNETIC CONTOUR INTERVAL

Line	Interval
heavy solid line	250 nT
solid line	50 nT
thin solid line	10 nT
dashed line	5 nT
ellipse with dot	magnetic low
ellipse with dot	magnetic high

PREVIOUSLY SURVEYED AREAS

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LOCATION INDEX FOR SCALE 1:31,680

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ALASKA DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS
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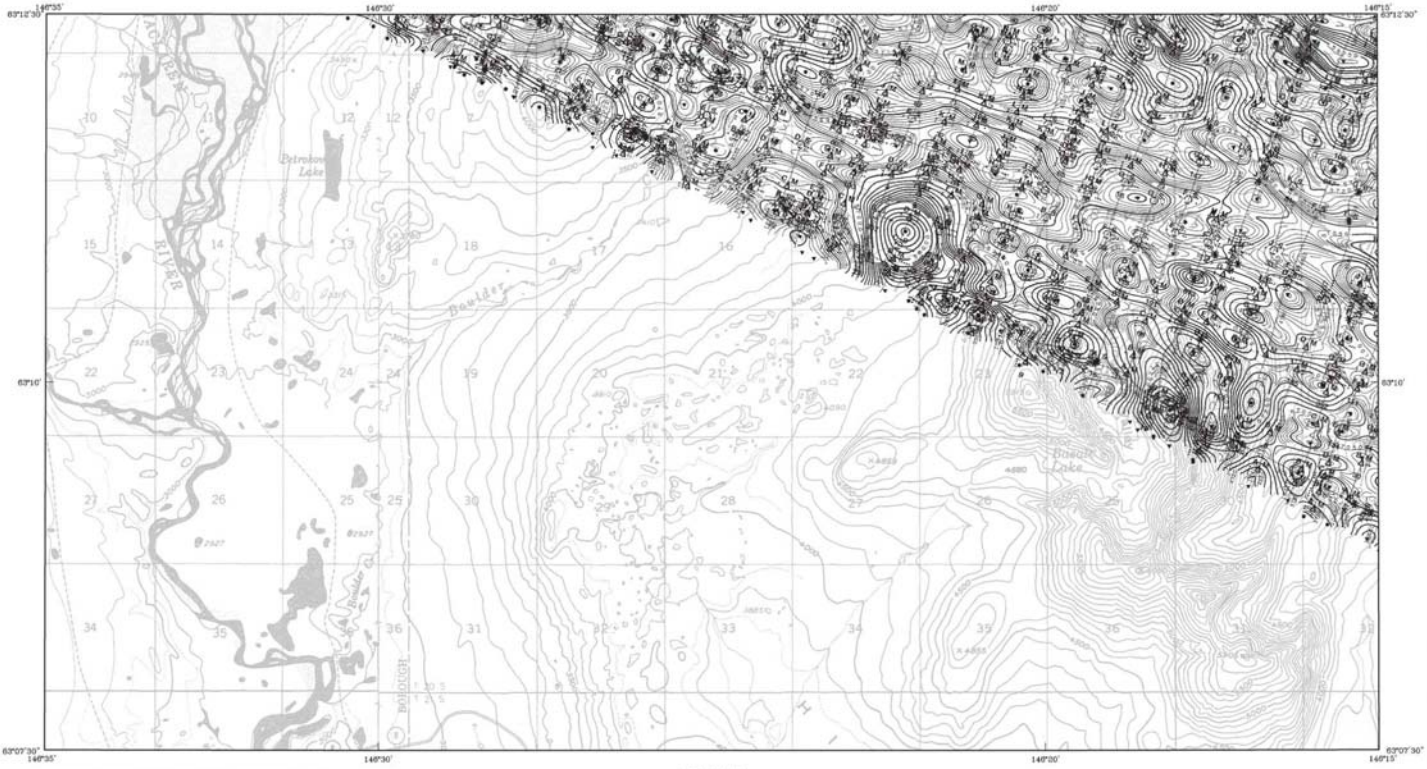
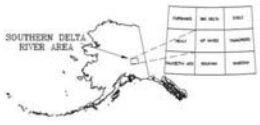
GEOPHYSICAL REPORT 2003_5_2d
PARTS OF MT. HAYES A-5 AND A-6 QUADRANGLES



Base from U.S. Geological Survey Mt. Hayes A-5, 1978; A-6, 1973; Quadrangles, Alaska

SCALE 1:31,680
0.5 0 0.5 1 1.5 2 MILES
0.5 0 0.5 1 1.5 2 2.5 KILOMETERS
CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL

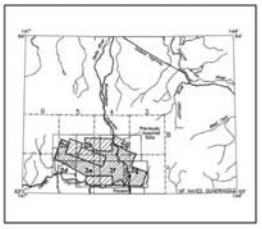


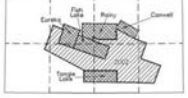
TOTAL MAGNETIC FIELD AND DETAILED ELECTROMAGNETIC ANOMALIES OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES A-5 AND A-6 QUADRANGLES

2003

LOCATION INDEX FOR SCALE 1:31,680





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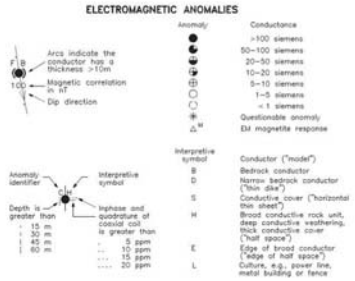

MAGNETIC CONTOUR INTERVAL

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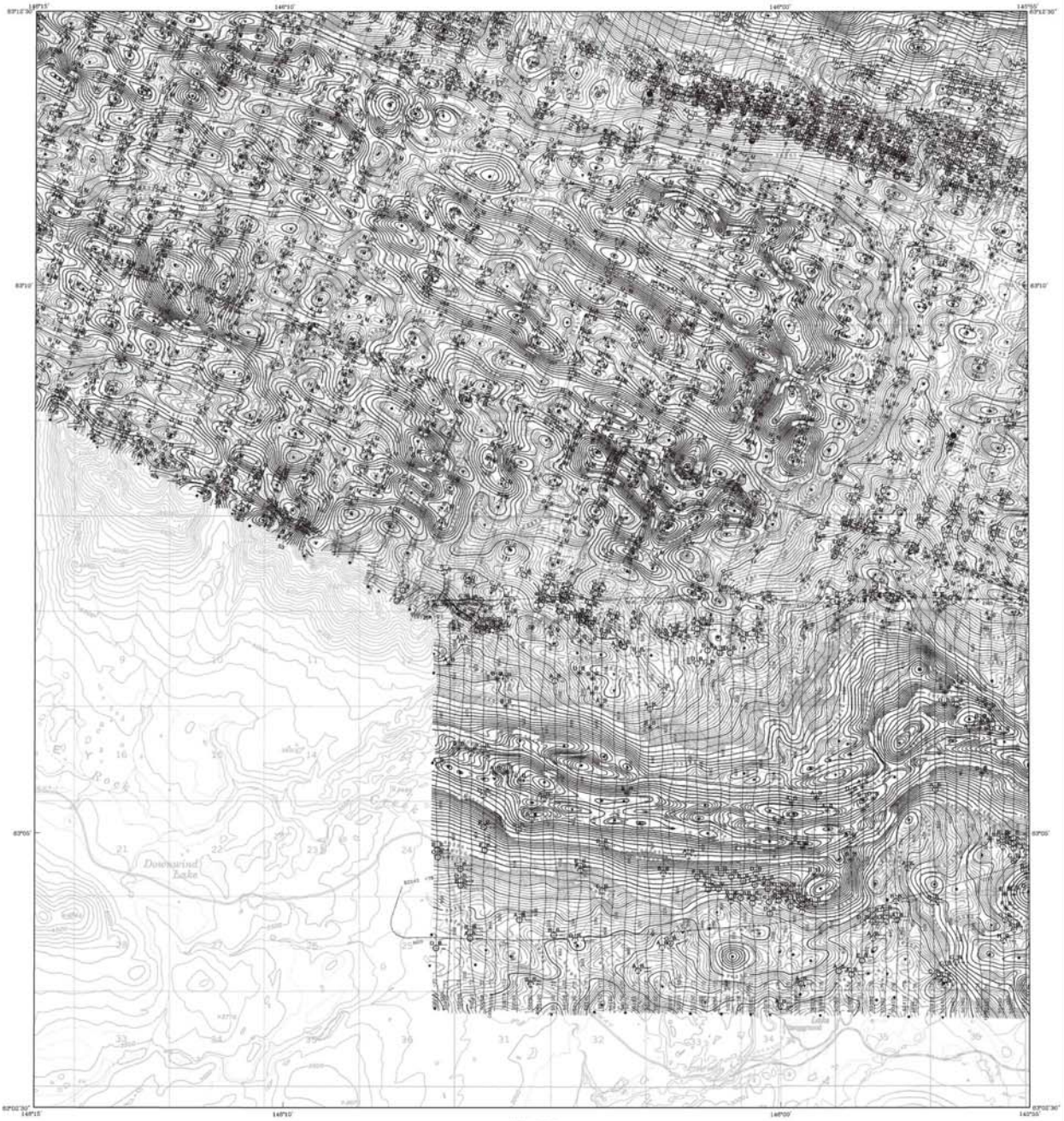
GEOPHYSICAL REPORT 2003_5_2e
PARTS OF MT. HAYES A-4 AND A-5 QUADRANGLES



Base from U.S. Geological Survey Mt. Hayes A-4, 1978, A-5, 1978, Quadrangles, Alaska

SCALE 1:31,680

0.5 0 0.5 1 1.5 2 MILES

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CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL

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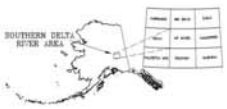
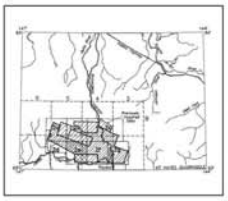
PARTS OF MT. HAYES A-4 AND A-5 QUADRANGLES

2003



LOCATION INDEX FOR SCALE 1:31,680



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GEOPHYSICAL REPORT 2003_5_2f
PART OF MT. HAYES A-4 QUADRANGLE

Base from U.S. Geological Survey Mt. Hayes A-4, 1978, Gondwanglin, Alaska

SCALE 1:31,680

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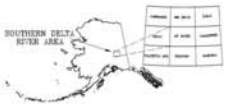
CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL



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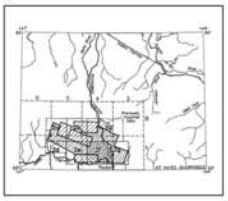
PART OF MT. HAYES A-4 QUADRANGLE

2003

LOCATION INDEX FOR SCALE 1:31,680



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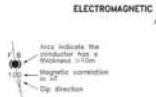
ELECTROMAGNETIC ANOMALIES



Anomaly	Conductance
●	>100 siemens
◕	50–100 siemens
◑	20–50 siemens
◔	10–20 siemens
⊕	5–10 siemens
○	1–5 siemens
○	<1 siemens
✳	Questionable anomaly
△^{M}	EM magnetite response

Interpretive symbol	Conductor ("model")
B	Bedrock conductor
D	Narrow bedrock conductor ("thin dike")
S	Conductive cover ("horizontal thin sheet")
H	Broad conductive rock unit, deep conductive weathering, thick conductive cover ("half space")
E	Edge of broad conductor ("edge of half space")
L	Culture, e.g., power line, metal building or fence

MAGNETIC CONTOUR INTERVAL

———	250 nT
———	50 nT
———	10 nT
— — —	5 nT
●	magnetic low
●	magnetic high

SURVEY HISTORY

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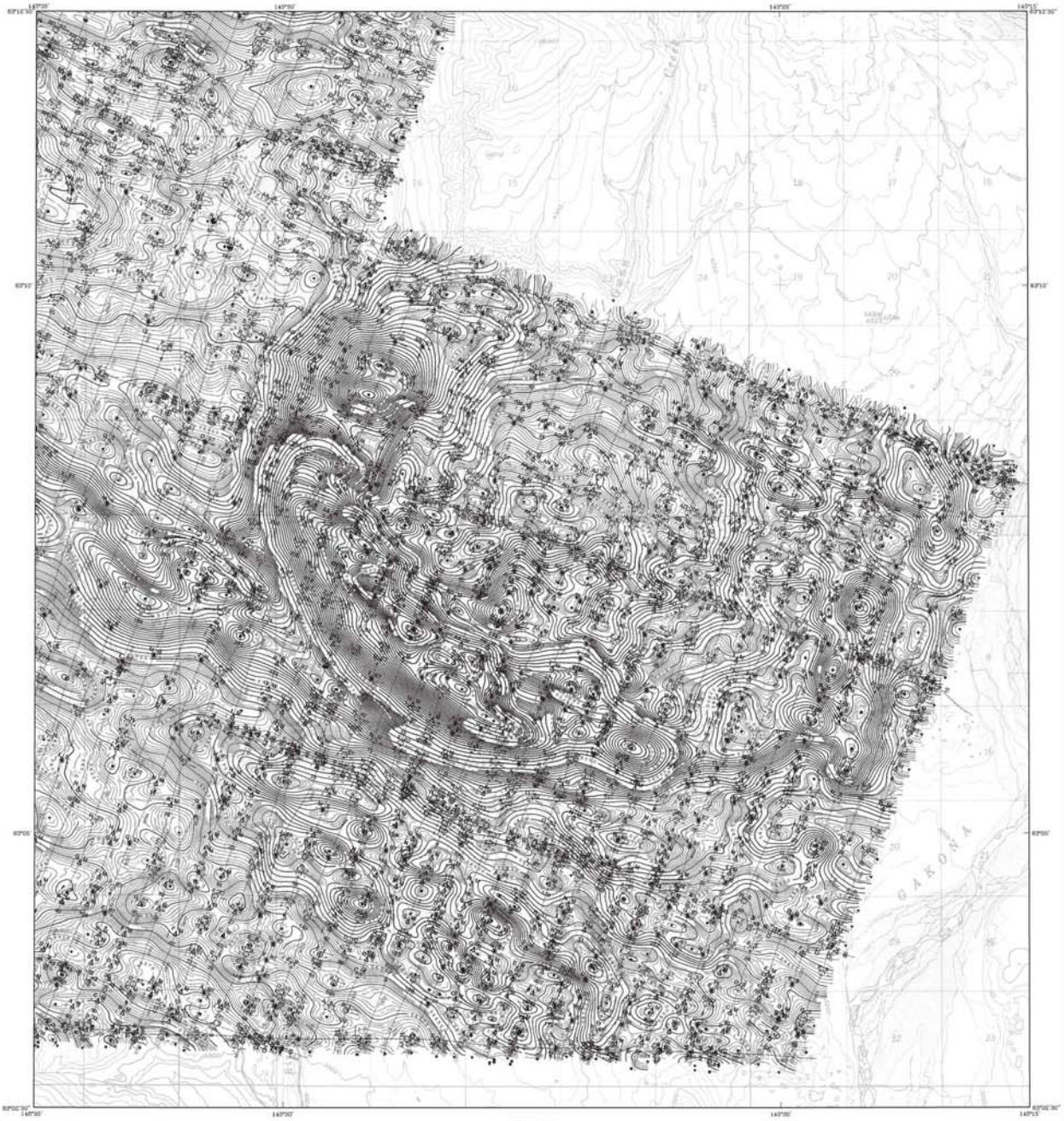
TOTAL MAGNETIC FIELD

The total magnetic field data were acquired with a sampling interval of 0.1 seconds, and were (1) corrected for diurnal variations by subtraction of the digitally recorded base station magnetic data, (2) leveled to the tie line data, and (3) interpolated onto a regular 100 m grid using a modified Akima (1970) technique. The regional variation (or IGRF gradient, 2000, updated to August, 2002) was removed from the leveled magnetic data.

Akima, H., 1970, a new method of interpolation and smooth curve fitting based on local procedures: Journal of the association of Computing Machinery, v. 17, no. 4, p. 589–602.

ALASKA DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS
IN COOPERATION WITH THE U.S. BUREAU OF LAND MANAGEMENT

GEOPHYSICAL REPORT 2003_5_2g
PARTS OF MT. HAYES A-3 AND A-4 QUADRANGLES



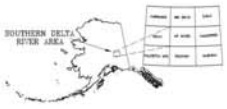
Base from U.S. Geological Survey Mt. Hayes A-3, 1955, A-4, 1979, Quadrangles, Alaska

SCALE 1:31,680

0.5 0 0.5 1 1.5 2 MILES

0.5 0 0.5 1 1.5 2 2.5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL

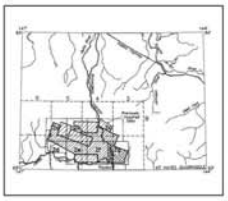


TOTAL MAGNETIC FIELD AND DETAILED ELECTROMAGNETIC ANOMALIES OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES A-3 AND A-4 QUADRANGLES

2003

LOCATION INDEX FOR SCALE 1:31,680



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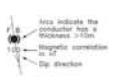

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ALASKA DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS
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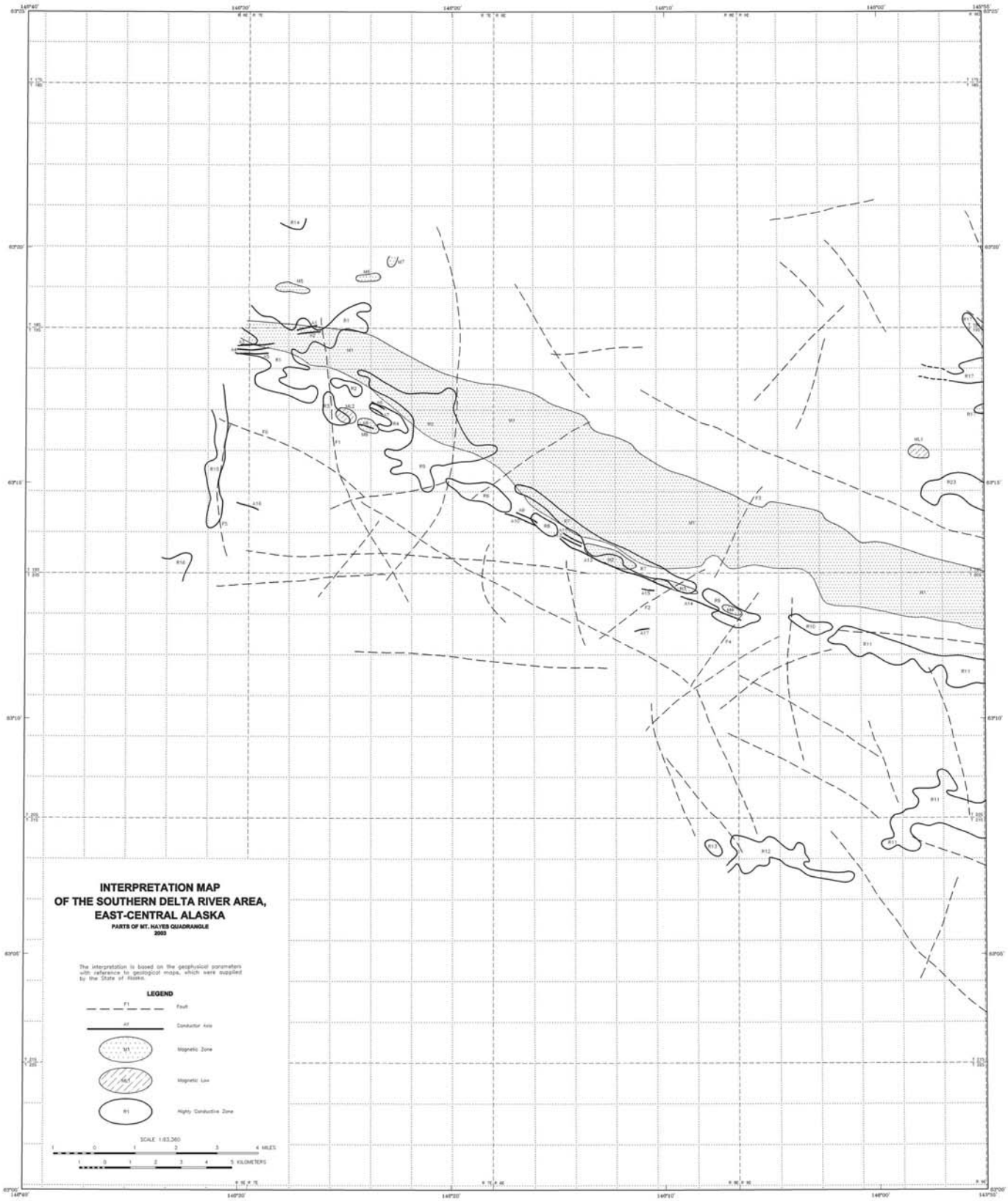
GEOPHYSICAL REPORT 2003_7
Sheet 1 of 2



INTERPRETATION MAP OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES QUADRANGLE
2003

The interpretation is based on the geophysical parameters with reference to geological maps, which were supplied by the State of Alaska.

LEGEND

- F1 — Fault
- A1 — Conductor Axis
- M1 — Magnetic Zone
- ML1 — Magnetic Low
- R1 — Highly Conductive Zone

SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

ALASKA DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS
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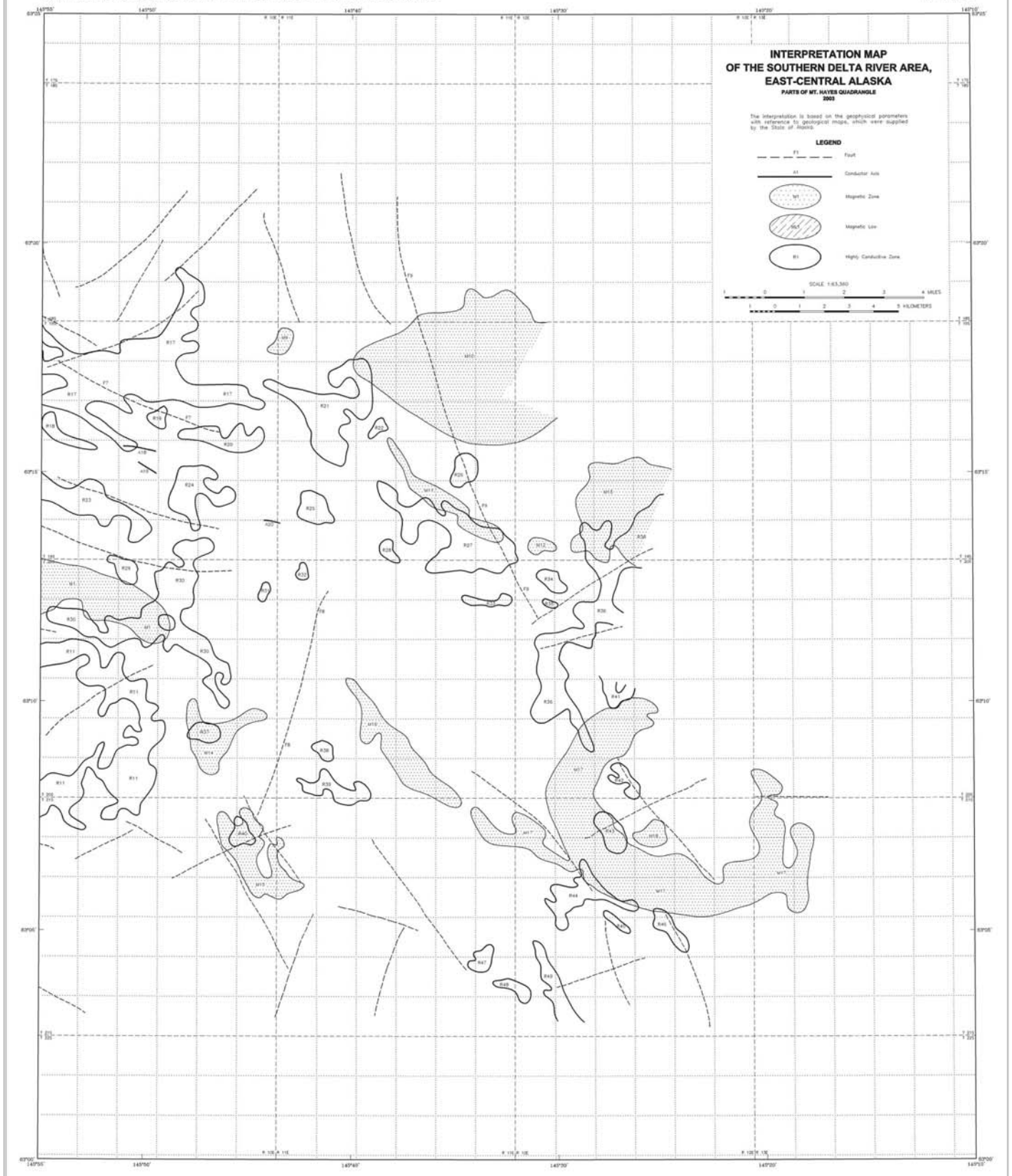
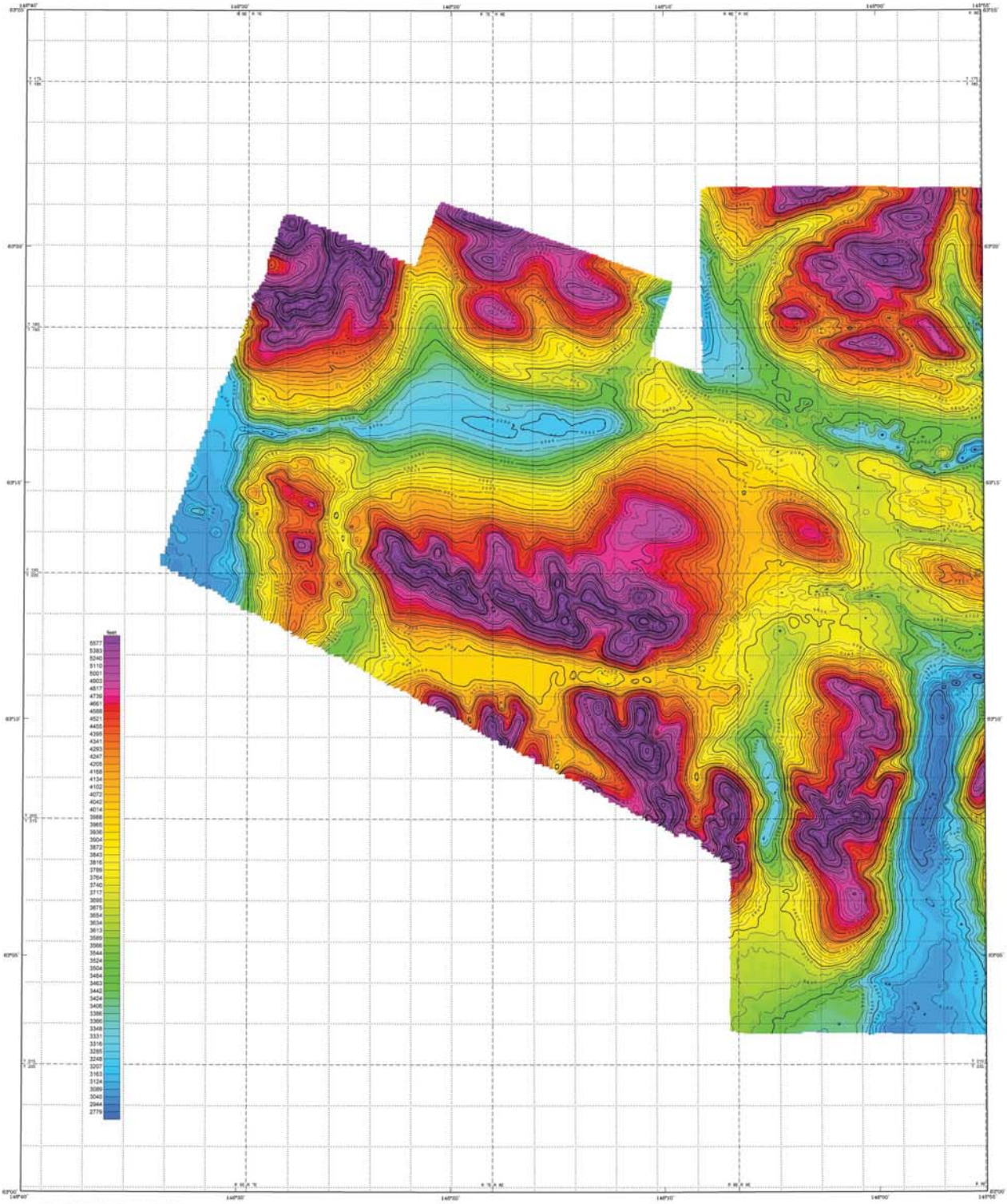
GEOPHYSICAL REPORT 2003_7
Sheet 2 of 2





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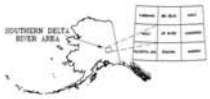
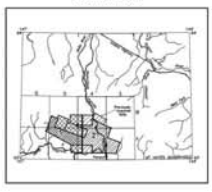


DIGITAL ELEVATION MODEL OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES QUADRANGLE

2003

LOCATION INDEX



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DIGITAL ELEVATION MODEL

This Digital Elevation Model (DEM) has been computed from GPS "Z" values minus the aircraft altimeter data recorded during the course of a helicopter-borne geophysical survey flown at a nominal line spacing of a quarter of a mile, azimuth 20 degrees. Elevation values have been interpolated/gridded between survey lines. Every effort has been made to make the model a useful general reference. No guarantee can be made that this model is a true representation of the height above sea level and it may contain radar altimeter responses from buildings and in some instances dense timber. Users of the product should be aware of the topographic limitations mapped hereafter.

DO NOT USE THIS MAP FOR NAVIGATION PURPOSES

TRUE NORTH

APPROXIMATE GRID DECLINATION 1993

DIGITAL ELEVATION CONTOURS

250 feet

100 feet

50 feet

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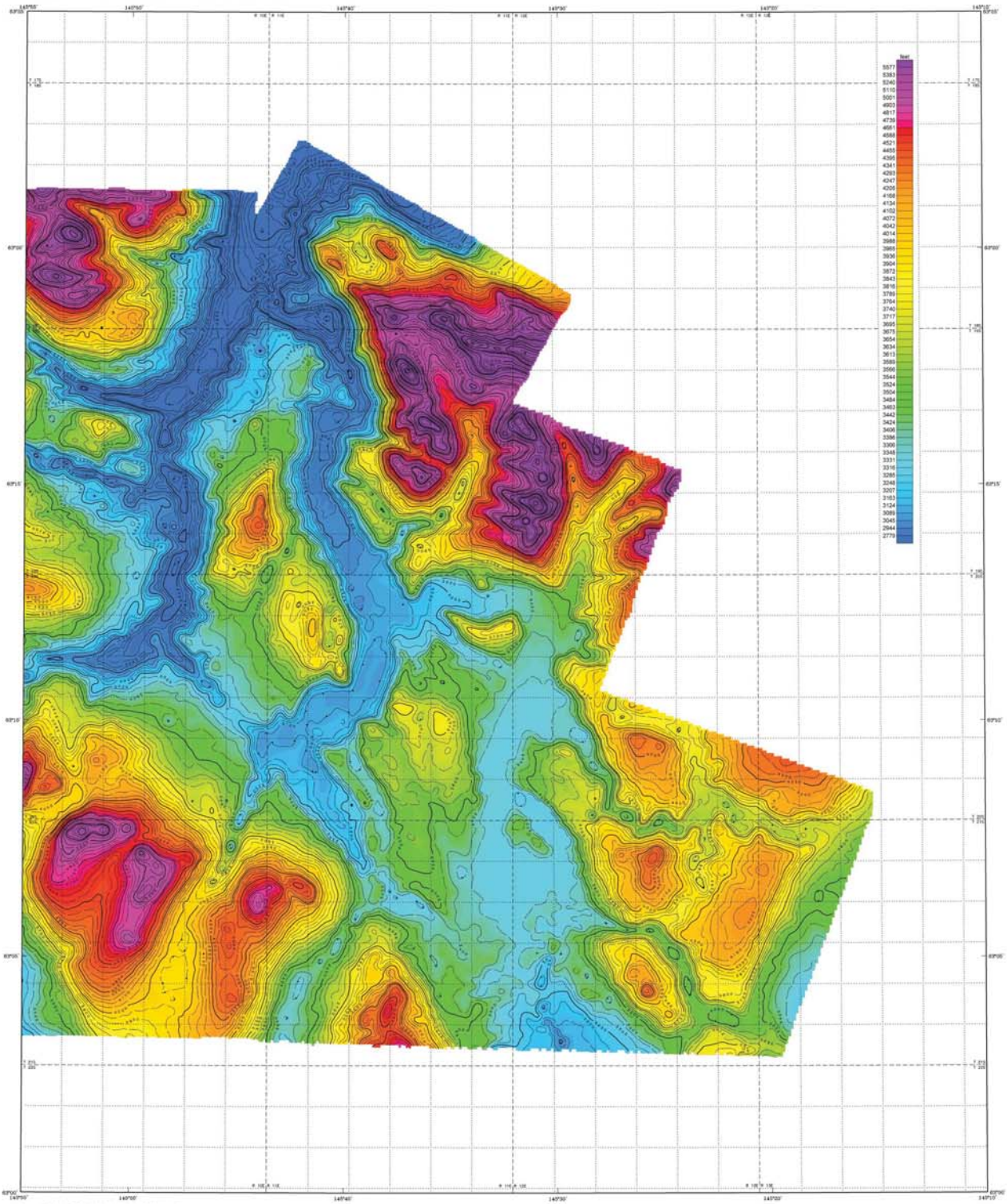

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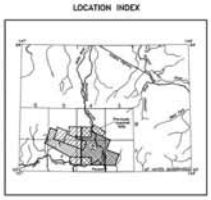

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