BROAD PASS ELECTROMAGNETIC AND MAGNETIC AIRBORNE GEOPHYSICAL SURVEY DATA COMPILATION

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

Geophysical Report 2020-1

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DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

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BROAD PASS ELECTROMAGNETIC AND MAGNETIC AIRBORNE GEOPHYSICAL SURVEY DATA COMPILATION

L.E. Burns[1], G.R.C. Graham[1], J.D. Barefoot[1], Fugro Airborne Surveys Corp., R.A. Pritchard[2], and Stevens Exploration Management Corp.

ABSTRACT

This Broad Pass electromagnetic and magnetic airborne geophysical survey is located in interior Alaska in the Bonnifield mining district, about 160 kilometers south of Fairbanks, Alaska and about 250 kilometers north of Anchorage, Alaska. Frequency domain electromagnetic and magnetic data were collected with the DIGHEM^{V} system from July to August 2001. A total of 1970.2 line kilometers were collected covering 689.5 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. One placer gold prospect in the survey area is Windy Creek. 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 Alaska State Legislature as part of the DGGS Airborne Geophysical/Geological Mineral Inventory (AGGMI) program.

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

[2] Fugro Airborne Surveys Corp.,

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

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Alaska Division of Geological & Geophysical Surveys, Fugro Airborne Surveys, Stevens Exploration Management Corp., and Burns, L.E., 2002, Grid and vector data of the airborne geophysical survey data for the Broad Pass area, southwestern Bonnifield mining district, central Alaska: Alaska Division of Geological & Geophysical Surveys Geophysical Report 2002-13. http://doi.org/10.14509/2831

Alaska Division of Geological & Geophysical Surveys, Fugro Airborne Surveys, Stevens Exploration Management Corp., and Burns, L.E., 2002, Line, grid and vector data of the airborne geophysical survey data for the Broad Pass area, southwestern Bonnifield mining district, central Alaska: Alaska Division of Geological & Geophysical Surveys Geophysical Report 2002-12, 1 DVD. http://doi.org/10.14509/2830

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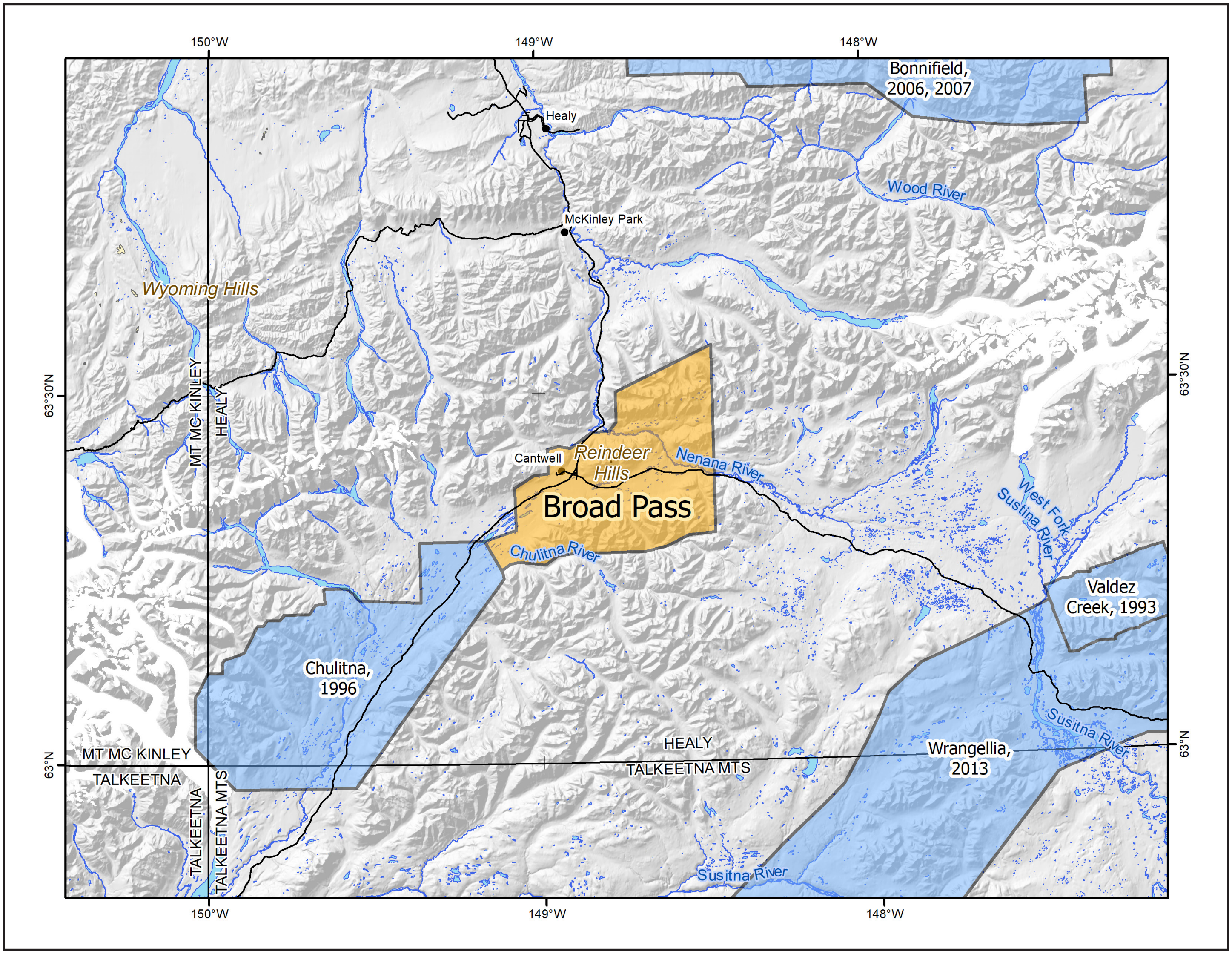
Fraser, D.C., 1978, Resistivity mapping with an airborne multicoil electromagnetic system: Geophysics, v. 43, p. 144-172.

Pritchard, R.A., and Fugro Airborne Surveys, 2002, Project report of the airborne geophysical survey data for the Broad Pass area, southwestern Bonnifield mining district, central Alaska: Alaska Division of Geological & Geophysical Surveys Geophysical Report 2002-14, 203 p., 1 sheet, scale 1:63,360. http://doi.org/10.14509/2832



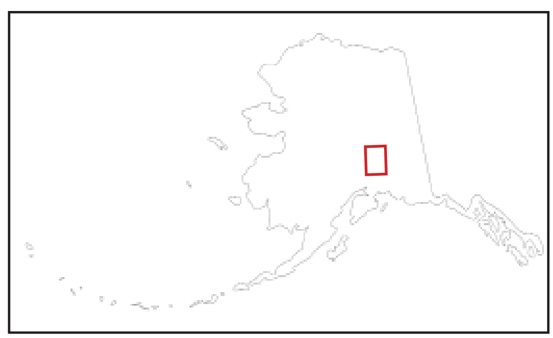


Figure 1. Broad Pass electromagnetic and magnetic airborne geophysical survey location shown in interior Alaska (inset). Broad Pass survey area shown with adjacent DGGS geophysical surveys, landmarks, relevant 1:250,000-scale quadrangle boundaries, mountain ranges, rivers, glaciers, and elevation hillshade.

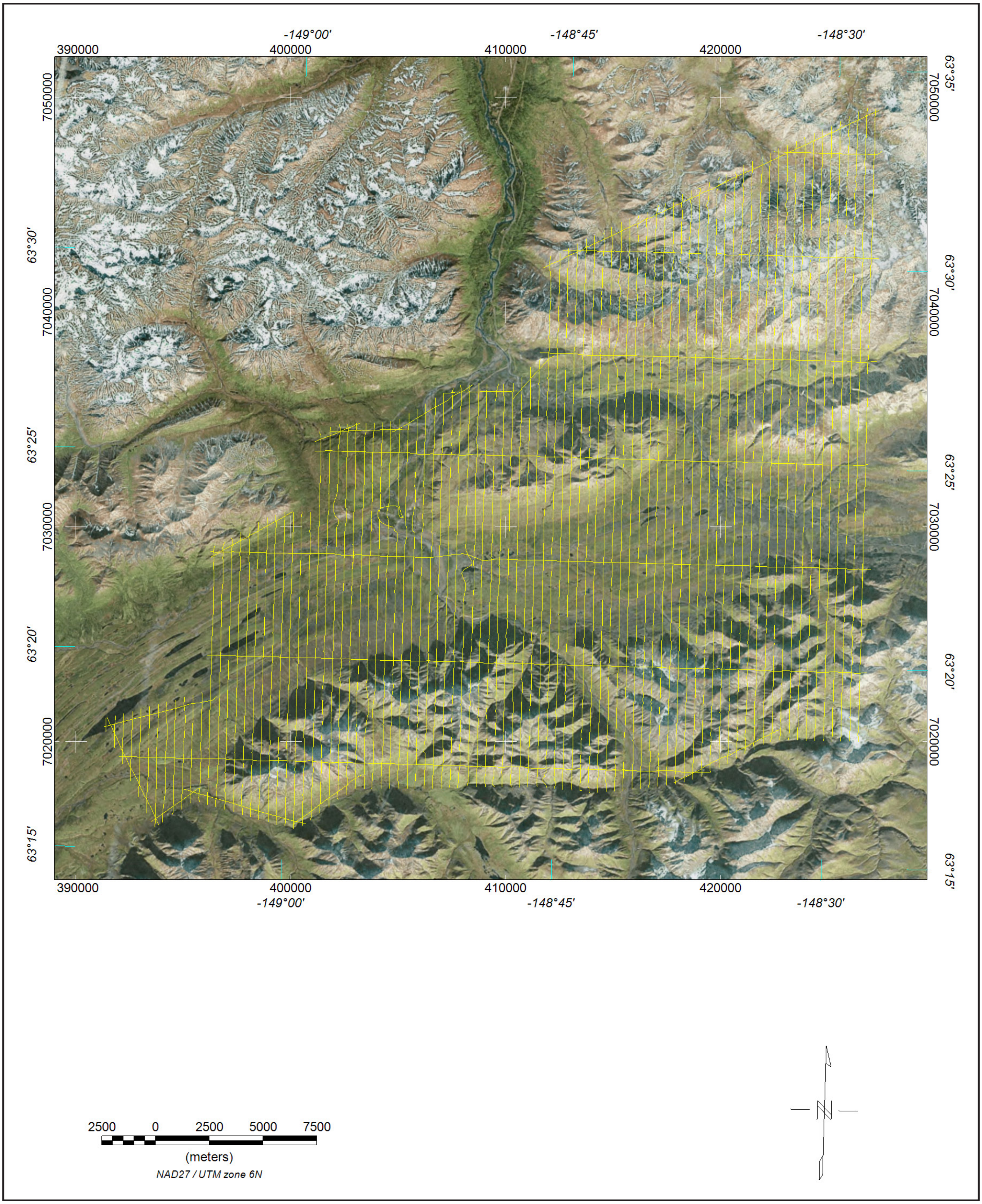


Figure 2. Flight path with orthometric image.

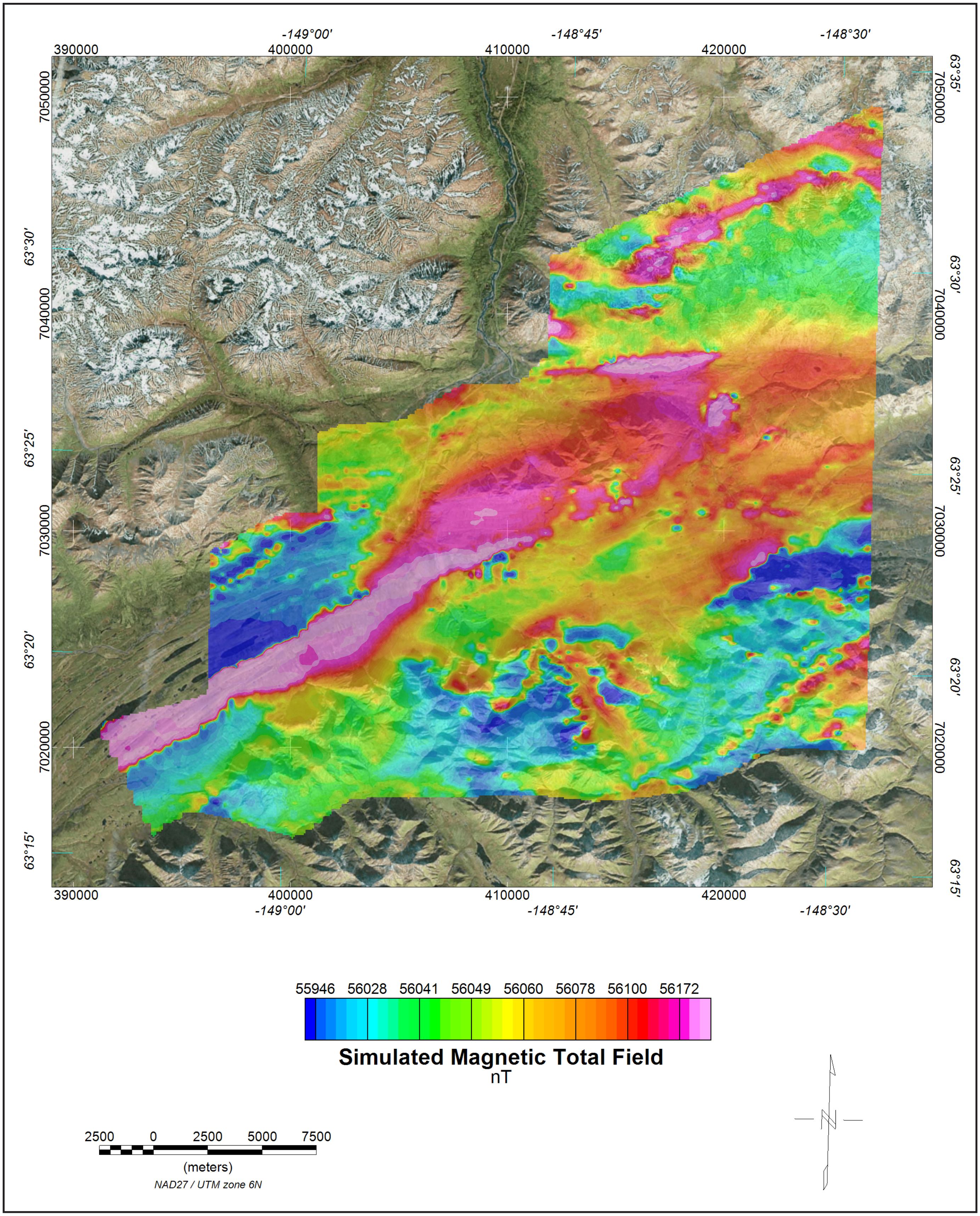


Figure 3. Simulated magnetic total field grid with orthometric image. The simulated magnetic total field data were created using digitally recorded data from a Picodas MEP-710 processor with Geometrics G822 sensor cesium magnetometer. Data were collected at a sampling interval of 0.1 seconds. The magnetic 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 2001), (3) leveled to the tie line data, (4) a constant value of approximately 56,000 nT was added to all data, and (5) interpolated onto a regular 100 m grid using a modified Akima (1970) technique.

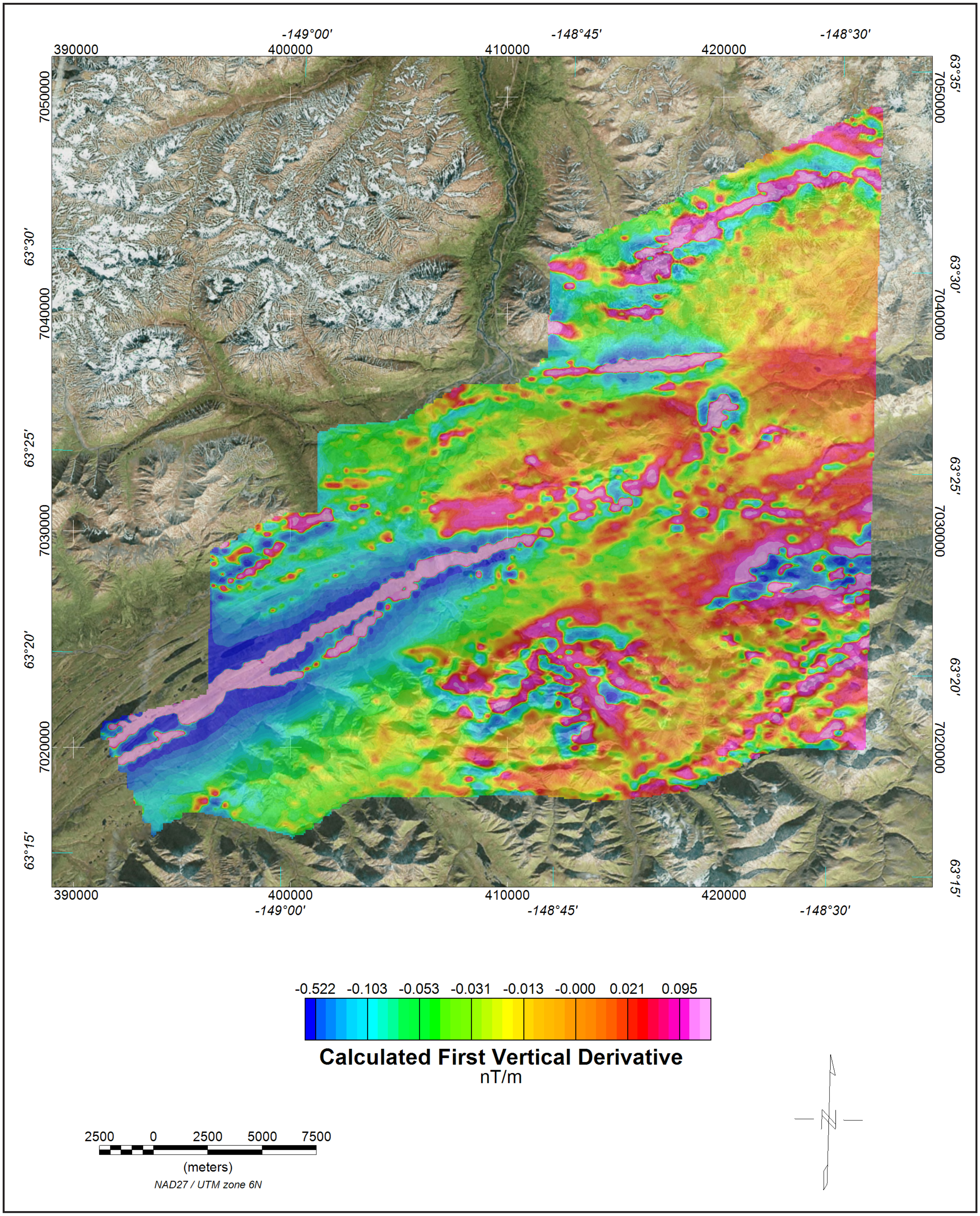


Figure 4. Calculated first vertical derivative grid with orthometric image. The first vertical derivative grid was calculated from the diurnally-corrected, IGRF-corrected total magnetic field grid using a FFT base frequency domain filtering algorithm. The resulting first vertical derivative grid provides 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.

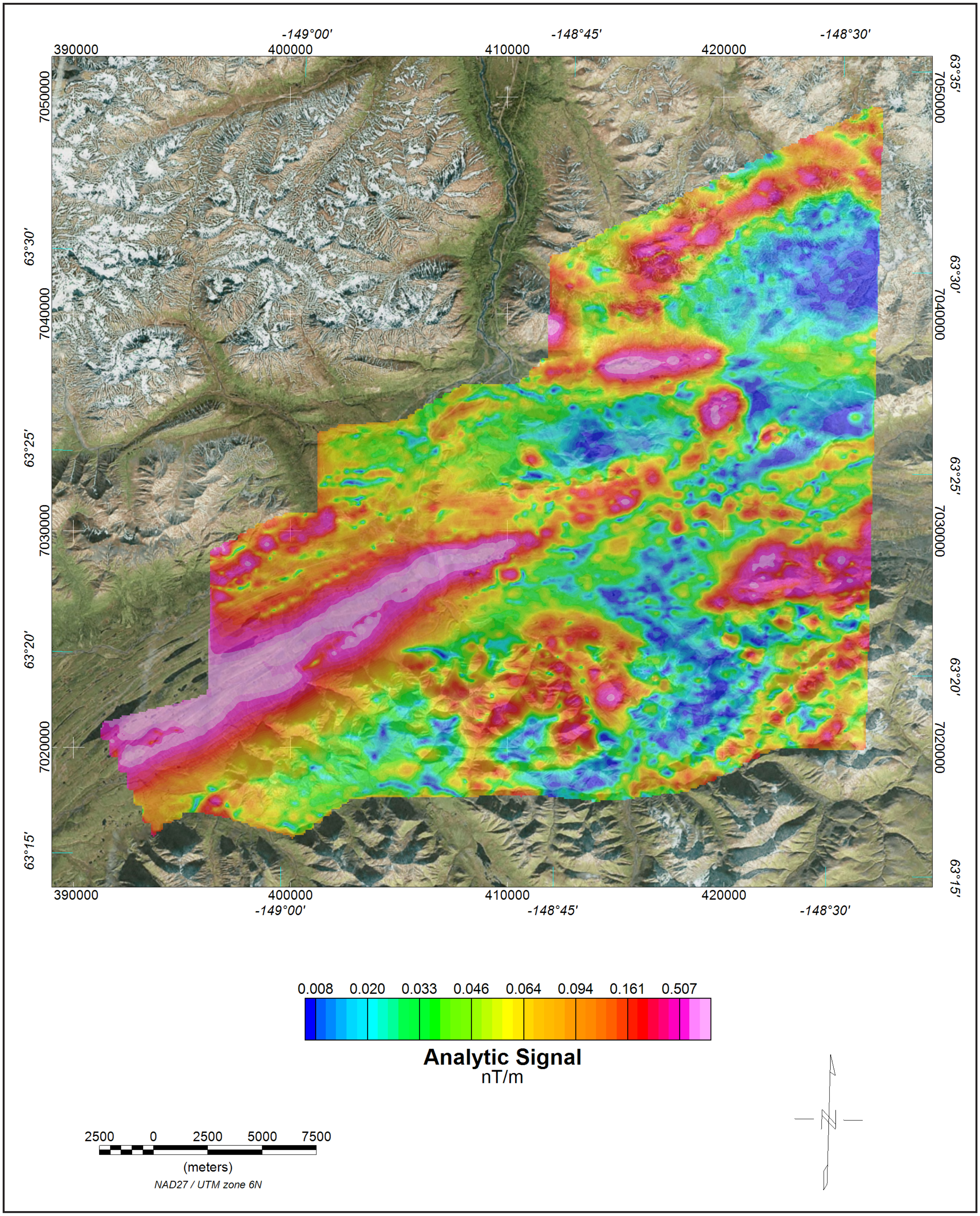


Figure 5. Analytic signal grid with orthometric image. Analytic signal is the total amplitude of all directions of magnetic gradient calculated from the sum of the squares of the three orthogonal gradients. Mapped highs in the calculated analytic signal of magnetic parameter locate the anomalous source 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.

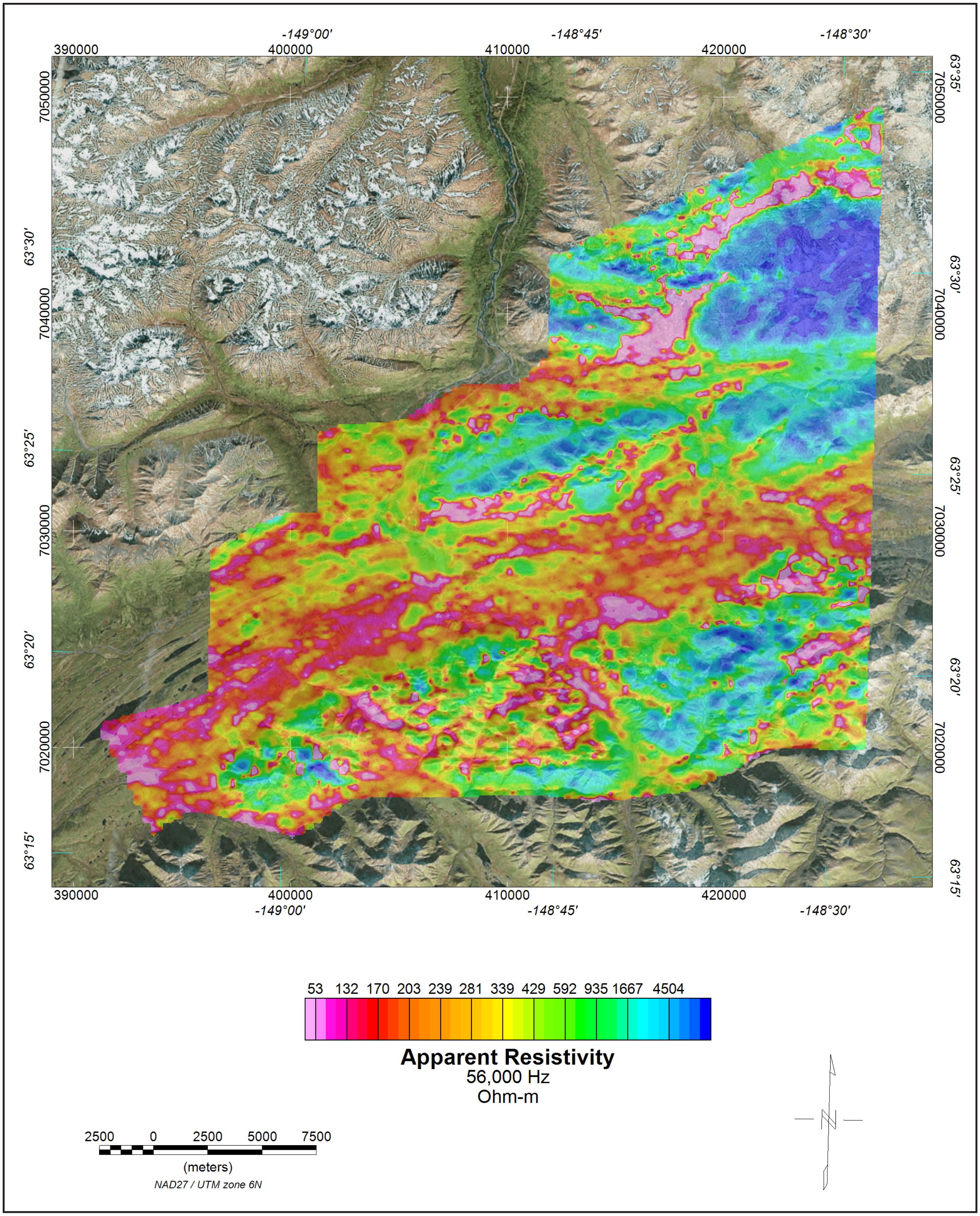


Figure 6. 56,000 Hz coplanar apparent resistivity grid with orthometric image. The DIGHEM[V] EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial coil-pairs operated at 1,000 and 5,500 Hz while three horizontal coplanar coil-pairs operated at 900, 7,200, and 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 (Fraser, 1978). The data were interpolated onto a regular 100 m grid using a modified Akima (1970) technique.

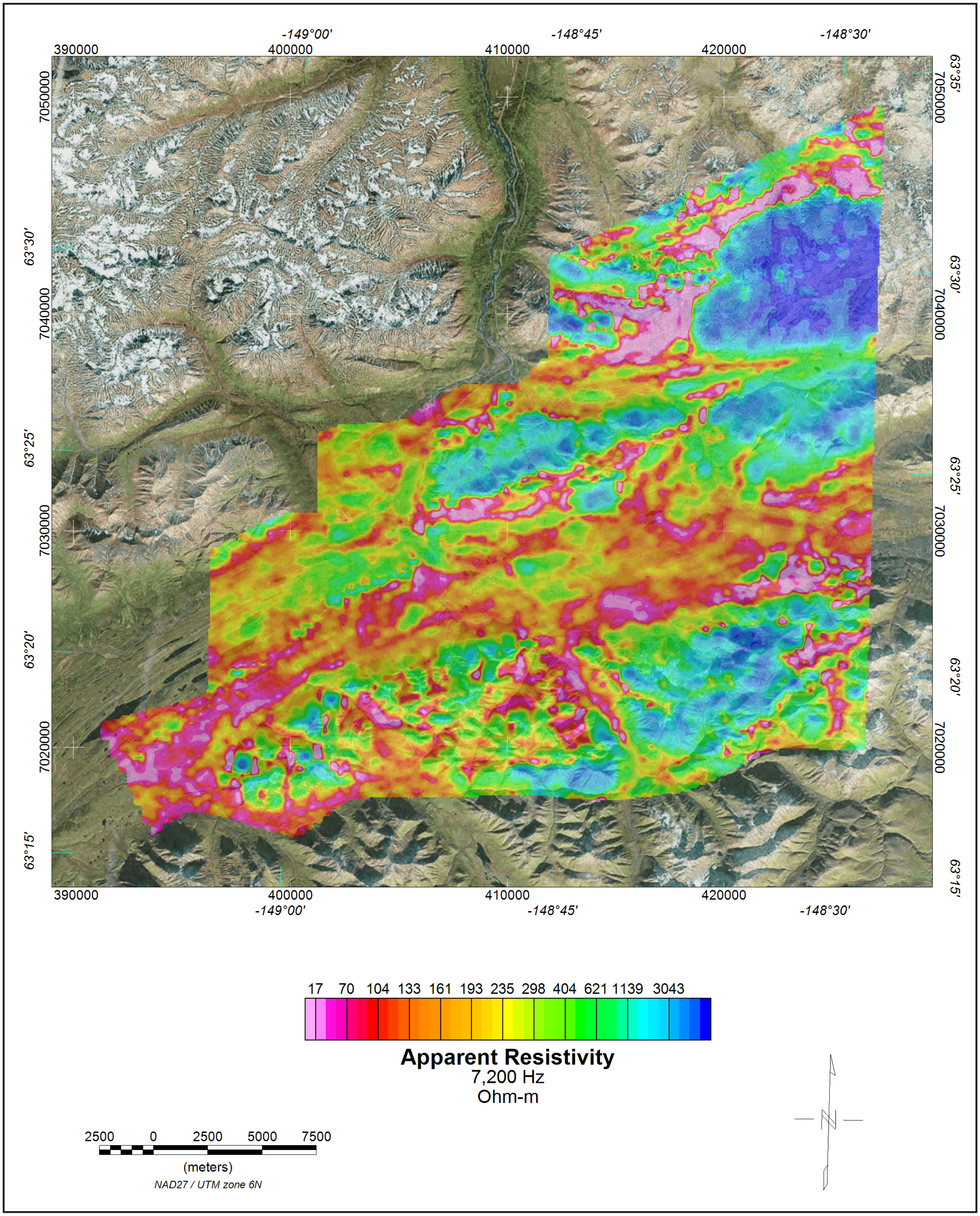


Figure 7. 7,200 Hz coplanar apparent resistivity grid with orthometric image. The DIGHEM^{V} EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial coil-pairs operated at 1,000 and 5,500 Hz while three horizontal coplanar coil-pairs operated at 900, 7,200, and 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 (Fraser, 1978). The data were interpolated onto a regular 100 m grid using a modified Akima (1970) technique.

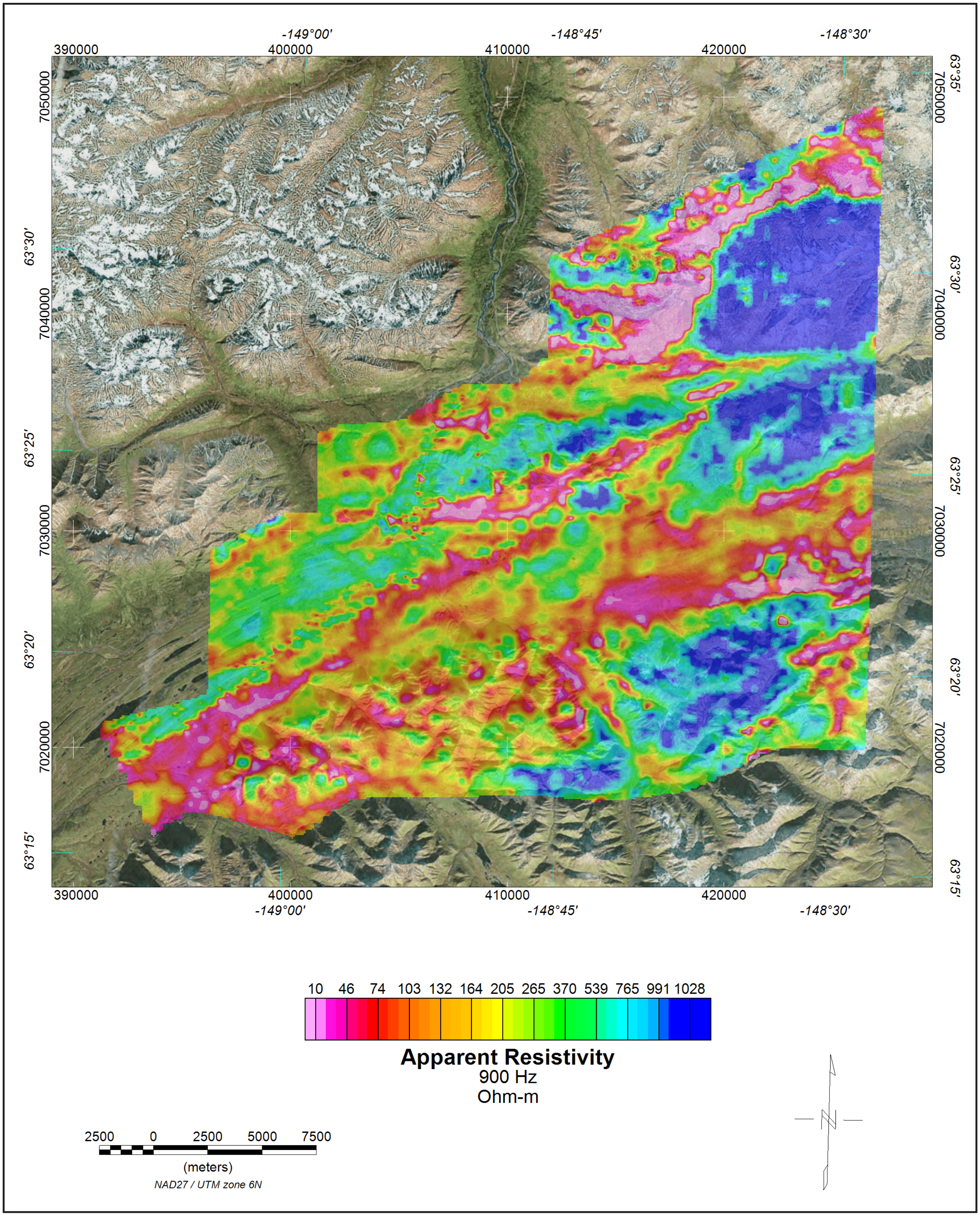
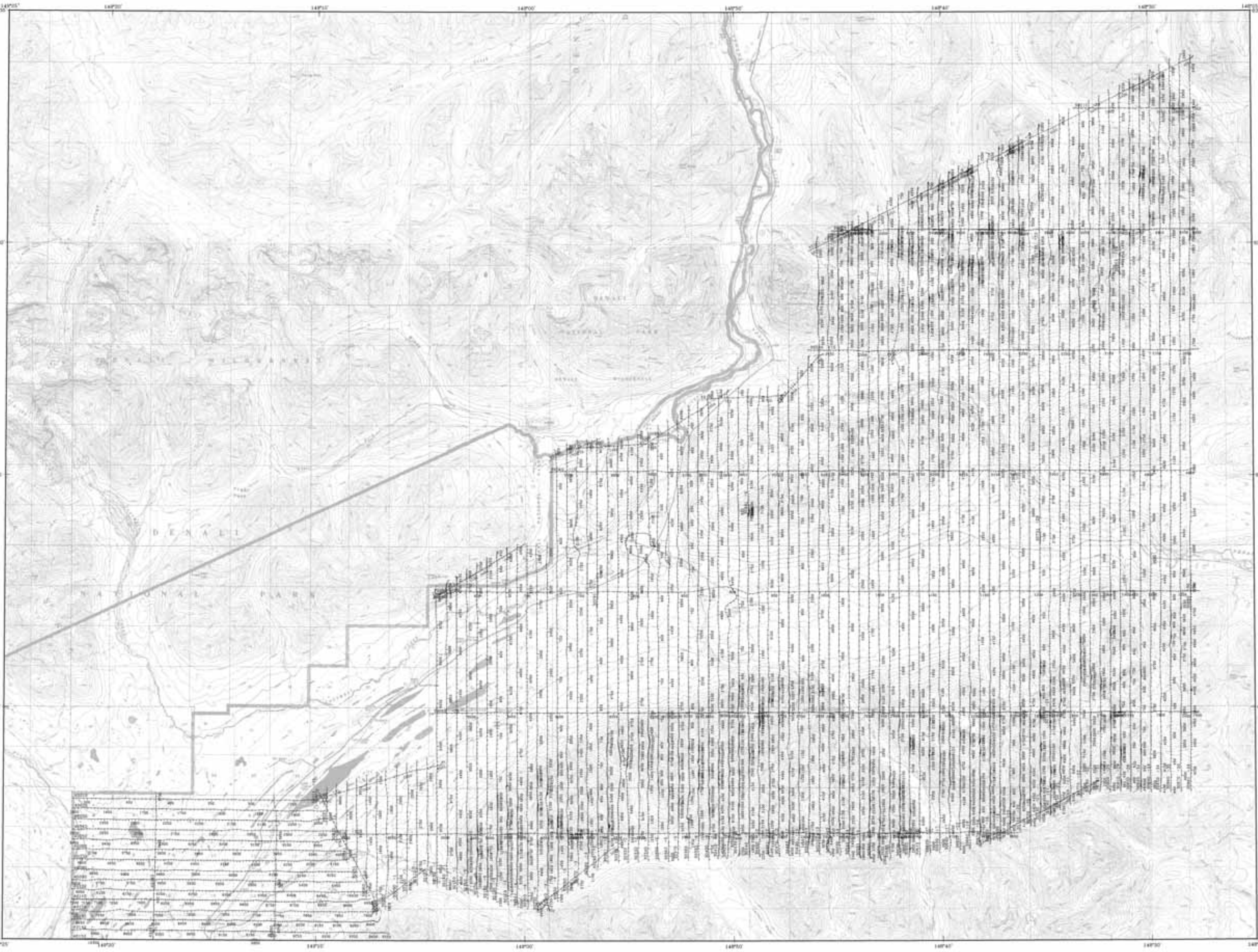
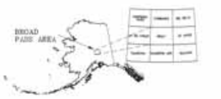


Figure 8. 900 Hz coplanar apparent resistivity grid with orthometric image. The DIGHEM[V] EM EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial coil-pairs operated at 1,000 and 5,500 Hz while three horizontal coplanar coil-pairs operated at 900, 7,200, and 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 (Fraser, 1978). 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/10.14509/30415.

Map Title	Description
broadpass_flightpath_topo_map.pdf	flight path with topographic base map
broadpass_sim_magtf_topo_map.pdf	simulated magnetic total field grid with topographic base map
broadpass_sim_magtf_contours_plss_map.pdf	simulated magnetic total field grid and contours with public land survey system base layer
broadpass_sim_magtf_shaded_plss_map.pdf	shaded simulated magnetic total field grid with public land survey system base layer
broadpass_emanomalies_sim_magtf_contours_plss_map.pdf	electromagnetic anomaly map with simulated magnetic total field grid contours and public land survey system base layer
broadpass_emanomalies_sim_magtf_contours_detailed_topo_map_1of3.pdf	electromagnetic anomaly map with simulated magnetic total field grid contours and topographic base map
broadpass_emanomalies_sim_magtf_contours_detailed_topo_map_2of3.pdf	electromagnetic anomaly map with simulated magnetic total field grid contours and topographic base map
broadpass_emanomalies_sim_magtf_contours_detailed_topo_map_3of3.pdf	electromagnetic anomaly map with simulated magnetic total field grid contours and topographic base map
broadpass_res7200hz_topo_map.pdf	7,200 Hz apparent resistivity grid with topographic base map
broadpass_res7200hz_contours_plss_map.pdf	7,200 Hz apparent resistivity grid with data contours and public land survey system base layer
broadpass_res7200hz_bw_contours_plss_map.pdf	7,200 Hz apparent resisitivity data contours with public land survey system base layer
broadpass_res900hz_topo_map.pdf	900 Hz apparent resistivity grid with topographic base map
broadpass_res900hz_contours_plss_map.pdf	900 Hz apparent resistivity grid with data contours and public land survey system base layer
broadpass_res900hz_bw_contours_plss_map.pdf	900 Hz apparent resistivity data contours with public land survey system base layer
broadpass_interpretation_plss_map.pdf	interpretation based on geophysical data with public land survey system base layer





SCALE 1:63,360

FLIGHT LINES
OF THE BROAD PASS AREA,
SOUTHWESTERN BONNIFIELD MINING DISTRICT,
CENTRAL ALASKA

PARTS OF HEALY QUADRANGLE

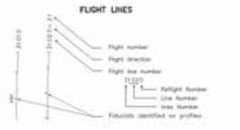
2002

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 North-South (0°) 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. The blank regions indicate an area where the survey aircraft had to detour around populated areas.

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.

FLIGHT LINES

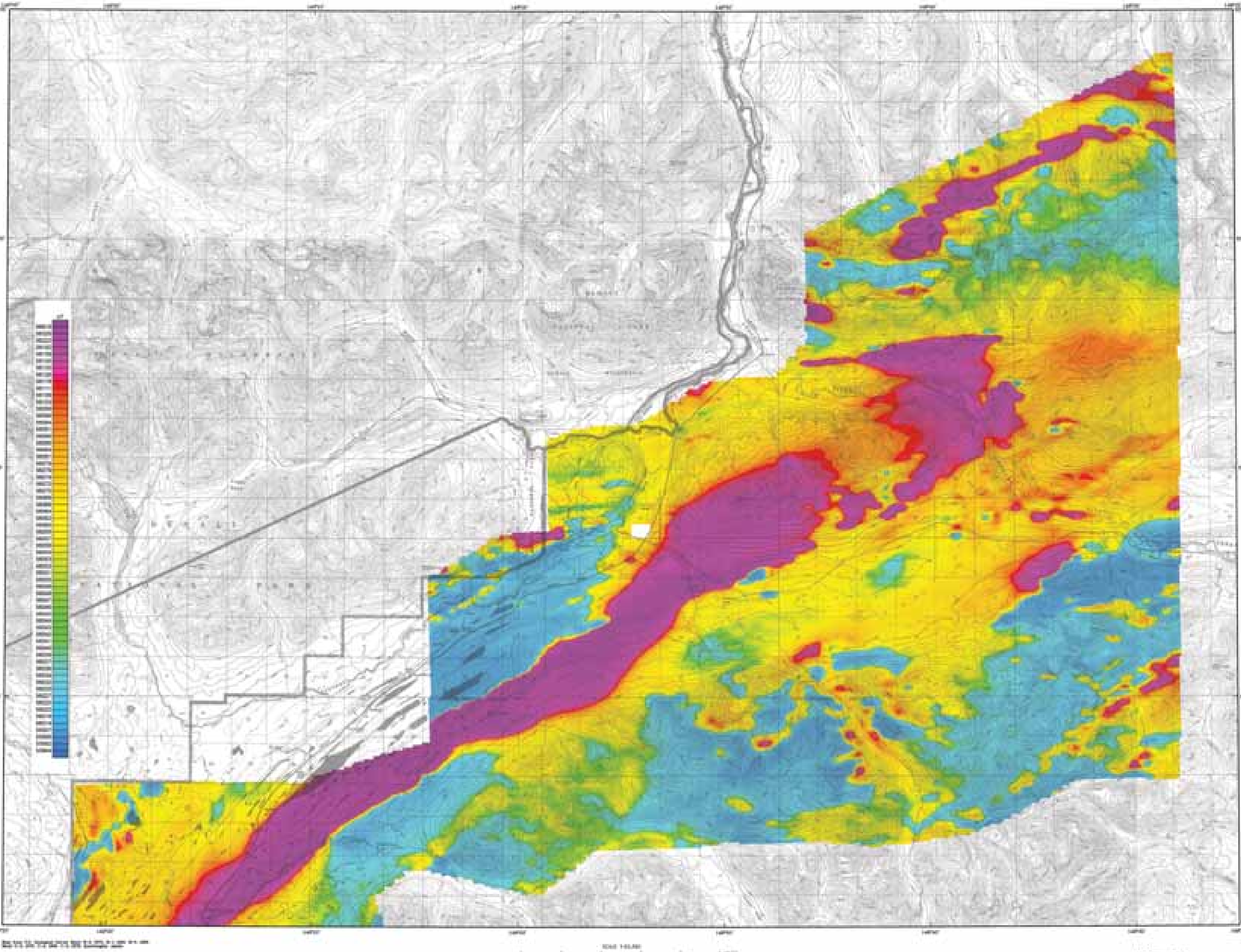


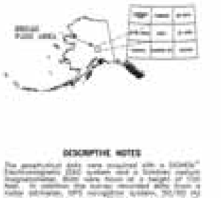
SURVEY HISTORY

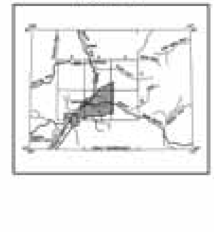
This map has been compiled and drawn under contract between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Surveys (DGGS), and Stevens Exploration Management Corp. Airborne geophysical data for the area were acquired and processed by Fugro Airborne Surveys in 2001. Laurel Burns was the contract manager for DGGS.

This map and other products from this survey are available by mail order or in person from DGGS, 794 University Ave., Suite 200, Fairbanks, Alaska, 99709.

ALASKA DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS **GEOPHYSICAL REPORT 2002_11_1a**







TOTAL MAGNETIC FIELD OF THE BROAD PASS AREA, SOUTHWESTERN BONNIFIELD MINING DISTRICT, CENTRAL ALASKA

PARTS OF HEALY QUADRANGLE

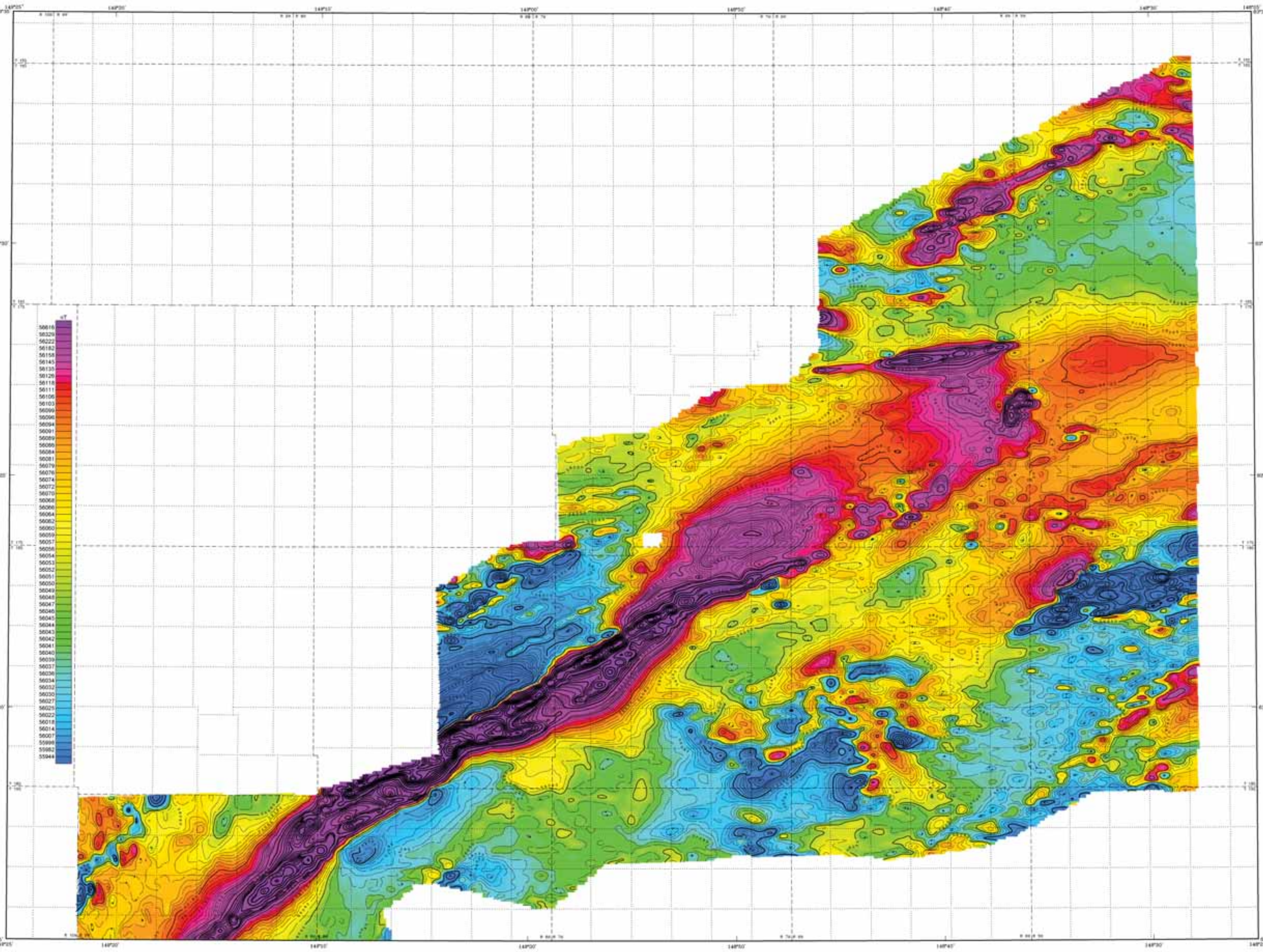
2002

DESCRIPTIVE NOTES

TOTAL MAGNETIC FIELD

SURVEY HISTORY

ALASKA DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS **GEOPHYSICAL REPORT 2002_11_1b**



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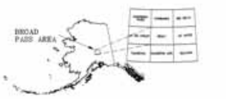
MILES

KILOMETERS



LOCATION INDEX

TOTAL MAGNETIC FIELD OF THE BROAD PASS AREA, SOUTHWESTERN BONNIFIELD MINING DISTRICT, CENTRAL ALASKA

PARTS OF HEALY QUADRANGLE

2002

DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM® 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 North-South (0°) 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. The blank regions indicate an area where the survey aircraft had to detour around populated areas.

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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 2001) 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

heavy solid line	250 nT
solid line	50 nT
thin solid line	10 nT
dashed line	5 nT

SURVEY HISTORY

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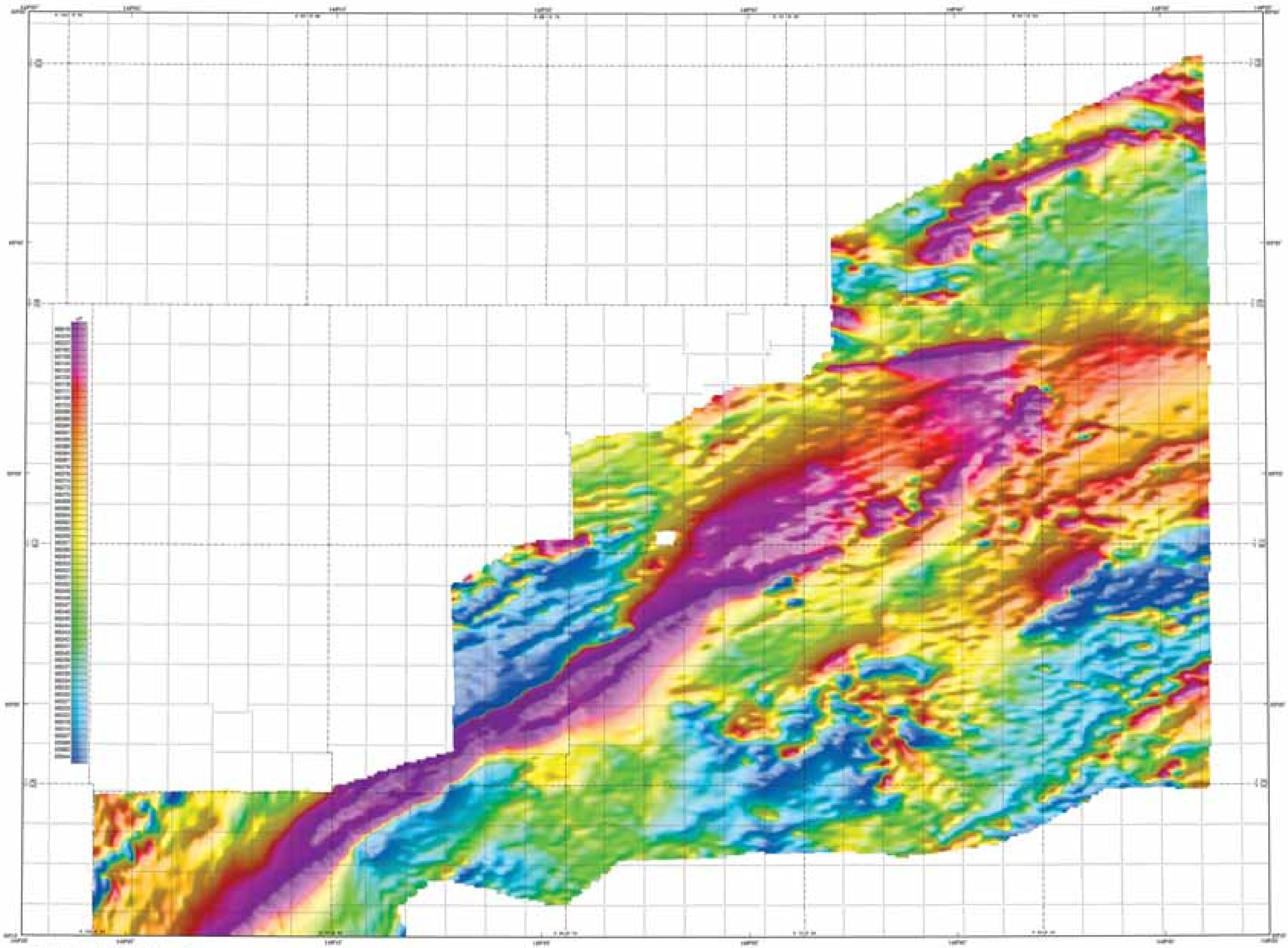
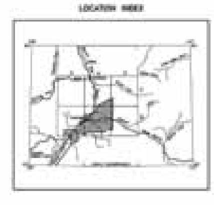
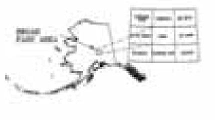


LOCATION INDEX





COLOR SHADOW TOTAL MAGNETIC FIELD OF THE BROAD PASS AREA, SOUTHWESTERN BONNIFIELD MINING DISTRICT, CENTRAL ALASKA

PARTS OF HEALY QUADRANGLE

2002

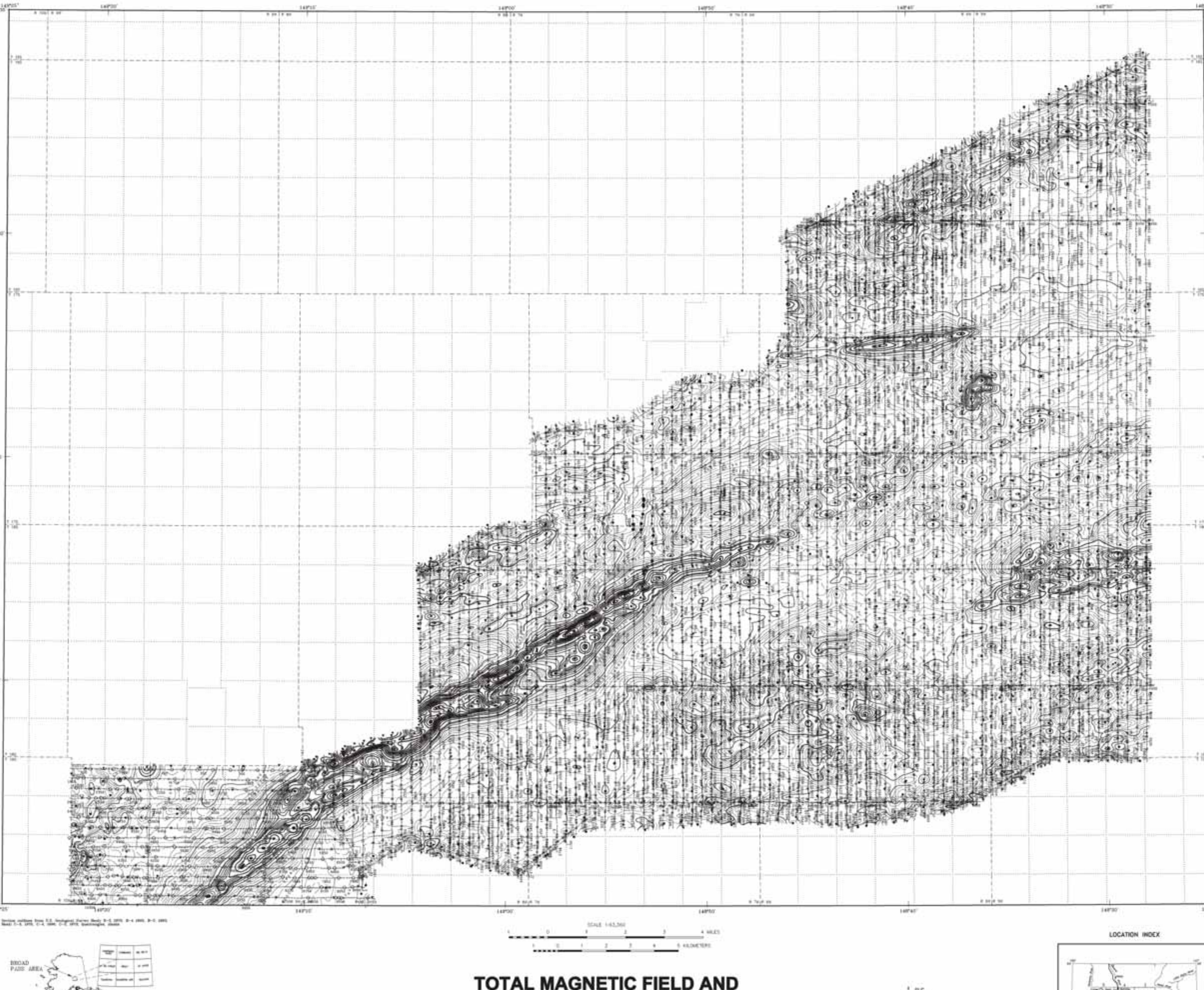
Sun Azimuth: 135 degrees

Sun Inclination: 35 degrees

DESCRIPTIVE NOTES

TOTAL MAGNETIC FIELD

SURVEY HISTORY



TOTAL MAGNETIC FIELD AND ELECTROMAGNETIC ANOMALIES OF THE BROAD PASS AREA, SOUTHWESTERN BONNIFIELD MINING DISTRICT, CENTRAL ALASKA

PARTS OF HEALY QUADRANGLE

2002

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 North–South (0°) 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. The blank regions indicate an area where the survey aircraft had to detour around populated 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 variation (or IGRF gradient, 2000, updated to August 2001) 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

SURVEY HISTORY

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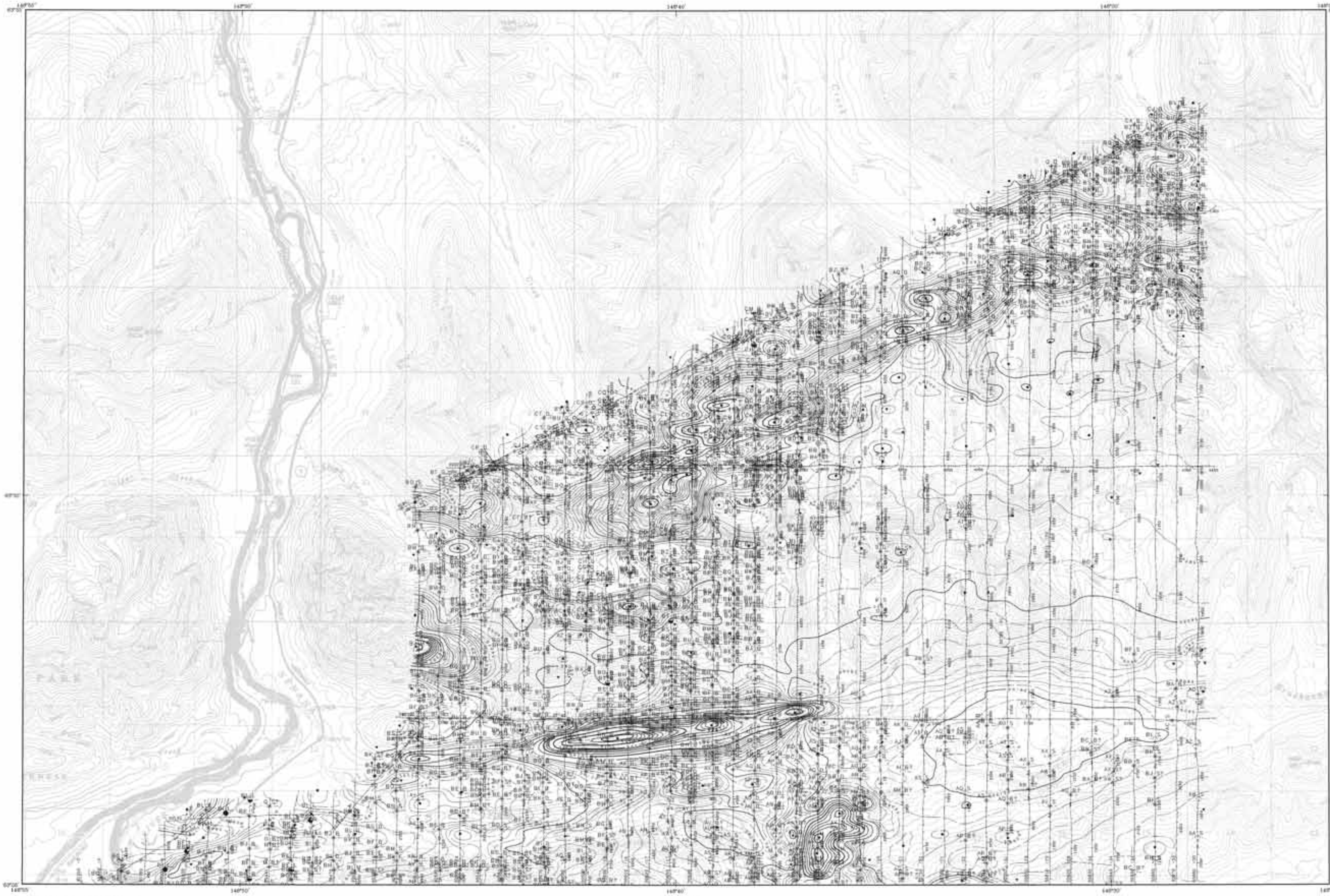
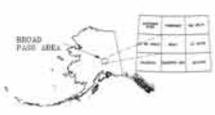




TOTAL MAGNETIC FIELD AND DETAILED ELECTROMAGNETIC ANOMALIES OF THE BROAD PASS AREA, SOUTHWESTERN BONNIFIELD MINING DISTRICT, CENTRAL ALASKA

PARTS OF HEALY B-3, B-4, C-3 AND C-4 QUADRANGLES

2002

DESCRIPTIVE NOTES

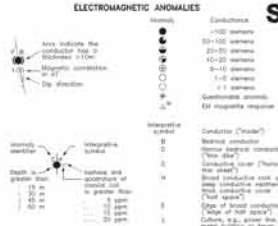
The geophysical data were acquired with a DIGHEM[V] Electromagnetic (EM) system and a Scintrex cesium magnetometer. Both were flown at a height of 100 feet. In addition the survey recorded data from a radar altimeter, GPS navigation system, 50/60 Hz monitors and video camera. Flights were performed with an AS350B-2 Squirrel helicopter at a mean terrain clearance of 200 feet along North-South (0°) 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. The blank regions indicate an area where the survey aircraft had to detour around populated areas.

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.

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 type of conductor is indicated on the aeromagnetic map by the interpretive symbol attached to each EM anomaly. Determination of the type of conductor is based on EM anomaly shapes of the coaxial- and coplanar-coil responses, together with conductor and magnetic patterns and topography. The power line monitor and the flight track video were examined to locate cultural sources.

ELECTROMAGNETIC ANOMALIES

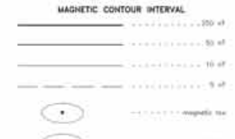


TOTAL MAGNETIC FIELD

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, 2001) 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



LOCATION INDEX FOR SCALE 1:31,680

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 area were acquired and processed by Fugro Airborne Surveys in 2001. Laurel Burns was the contract manager for DGGS.

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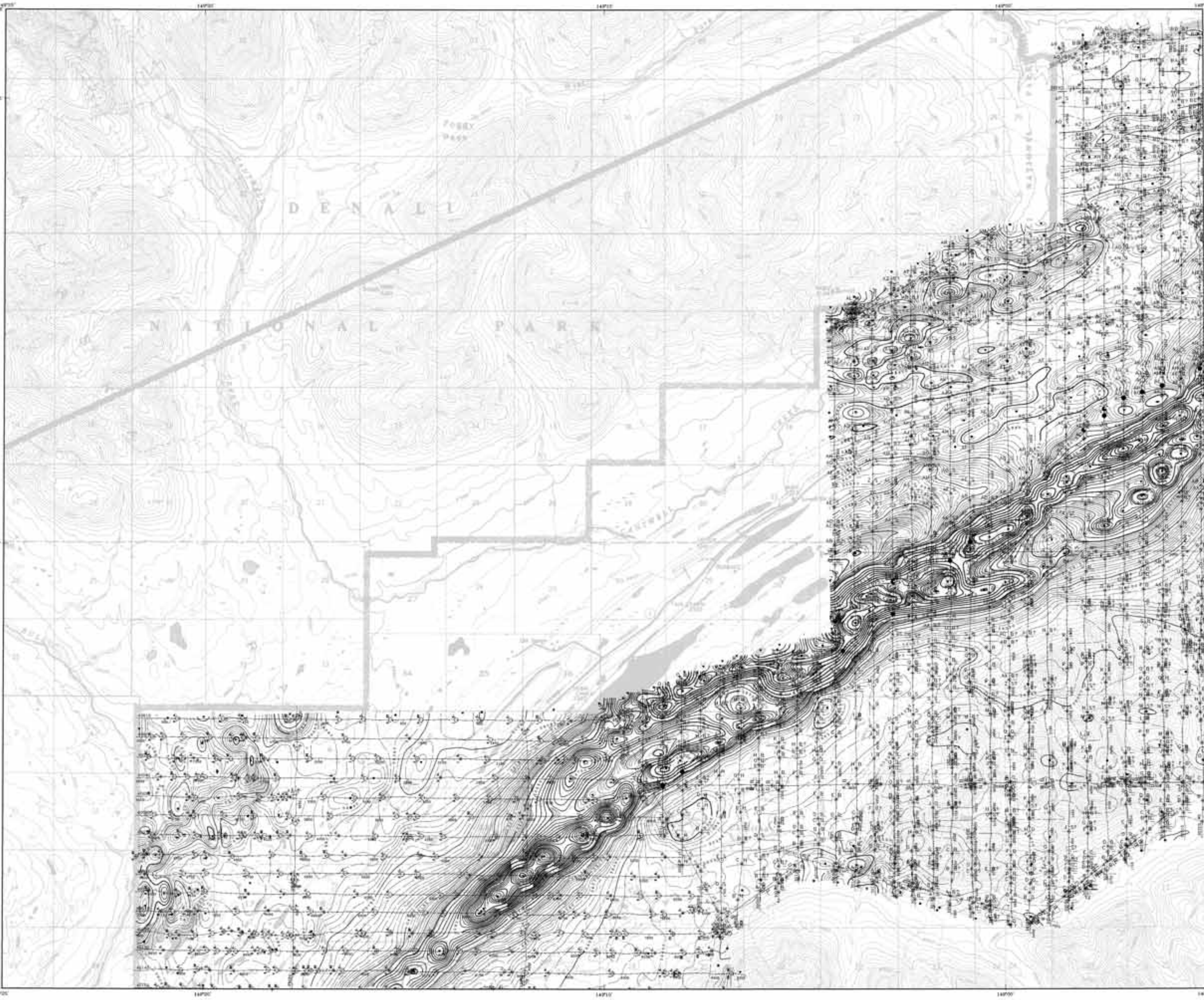

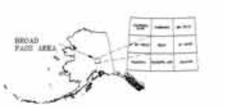

TOTAL MAGNETIC FIELD AND DETAILED ELECTROMAGNETIC ANOMALIES OF THE BROAD PASS AREA, SOUTHWESTERN BONNIFIELD MINING DISTRICT, CENTRAL ALASKA

PARTS OF HEALY B-4 AND B-5 QUADRANGLES

2002

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 North-South (0°) 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. The blank regions indicate an area where the survey aircraft had to detour around populated areas.

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.

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 type of conductor is indicated on the aeromagnetic map by the interpretive symbol attached to each EM anomaly. Determination of the type of conductor is based on EM anomaly shapes of the coaxial- and coplanar-coil responses, together with conductor and magnetic patterns and topography. The power line monitor and the flight track video were examined to locate cultural sources.

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

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

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

Anomaly identifier; Interpretive symbol; Inphase and quadrature of coaxial coil in ppm; Depth is greater than: 0 m, 20 m, 45 m, 60 m; 5 ppm, 10 ppm, 15 ppm, 20 ppm

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, 2001) 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 FOR SCALE 1:31,680

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 area were acquired and processed by Fugro Airborne Surveys in 2001. Laurel Burns was the contract manager for DGGS.

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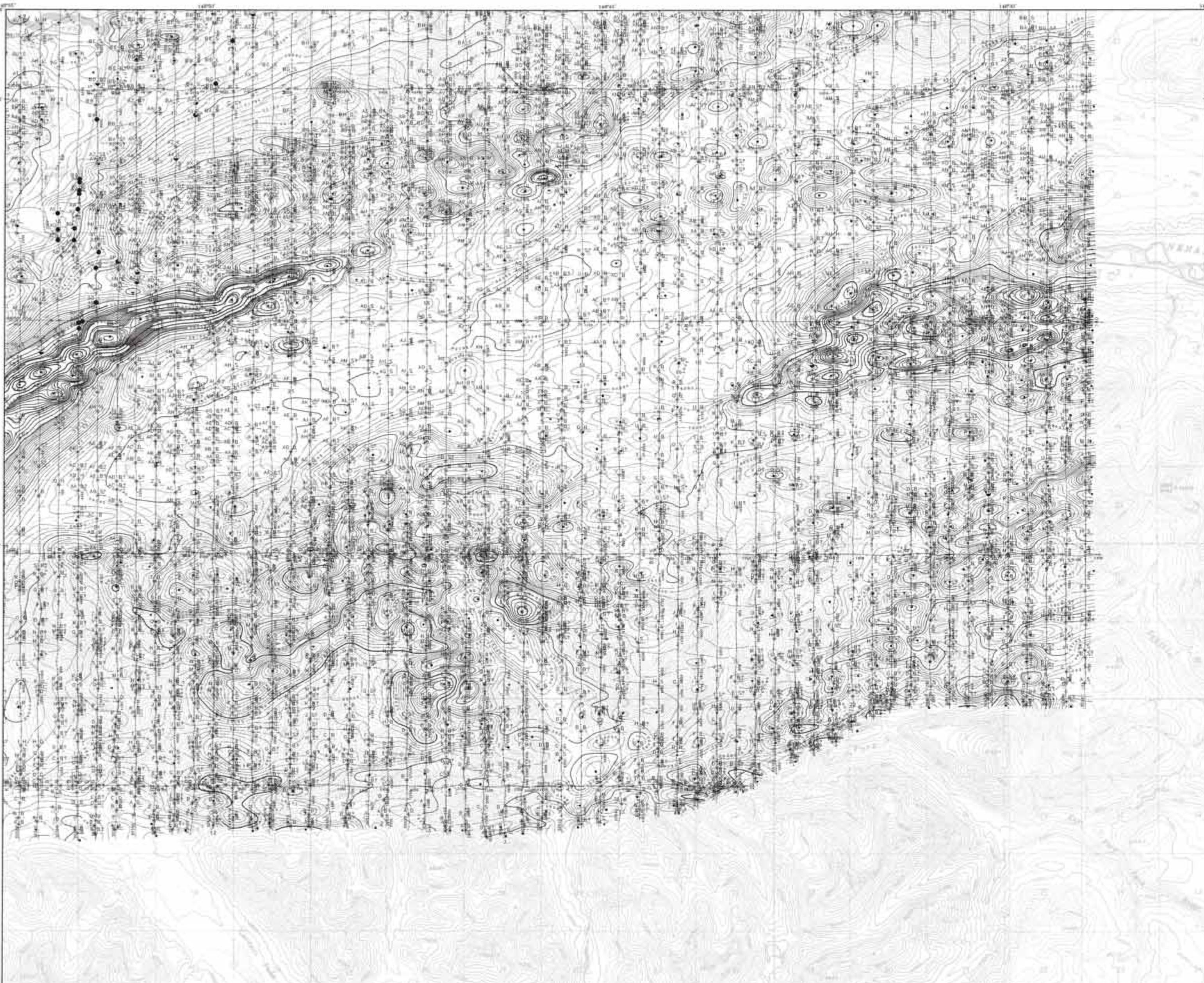
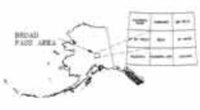


SCALE 1:31,680



ELECTROMAGNETICS

To determine the location of EM anomalies or their boundaries, the DIGHEM[V] EM system measured inphase and quadrature components of 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 type of conductor is indicated on the aeromagnetic map by the interpretive symbol attached to each EM anomaly. Determination of the type of conductor is based on EM anomaly shapes of the coaxial- and coplanar-coil responses, together with conductor and magnetic patterns and topography. The power line monitor and the flight track video were examined to locate cultural sources.

ELECTROMAGNETIC ANOMALIES

Anomaly	Conductance
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◕	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")
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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

Anomaly identifier; Interpretive symbol; Depth is greater than; Inphase and quadrature of coaxial coil is greater than; Magnetic correlation in nT; Dip direction

TOTAL MAGNETIC FIELD AND DETAILED ELECTROMAGNETIC ANOMALIES OF THE BROAD PASS AREA, SOUTHWESTERN BONNIFIELD MINING DISTRICT, CENTRAL ALASKA

PARTS OF HEALY B-3 AND B-4 QUADRANGLES

2002

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 North-South (0°) 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. The blank regions indicate an area where the survey aircraft had to detour around populated areas.

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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, 2001) 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 FOR SCALE 1:31,680

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 area were acquired and processed by Fugro Airborne Surveys in 2001. Laurel Burns was the contract manager for DGGS.

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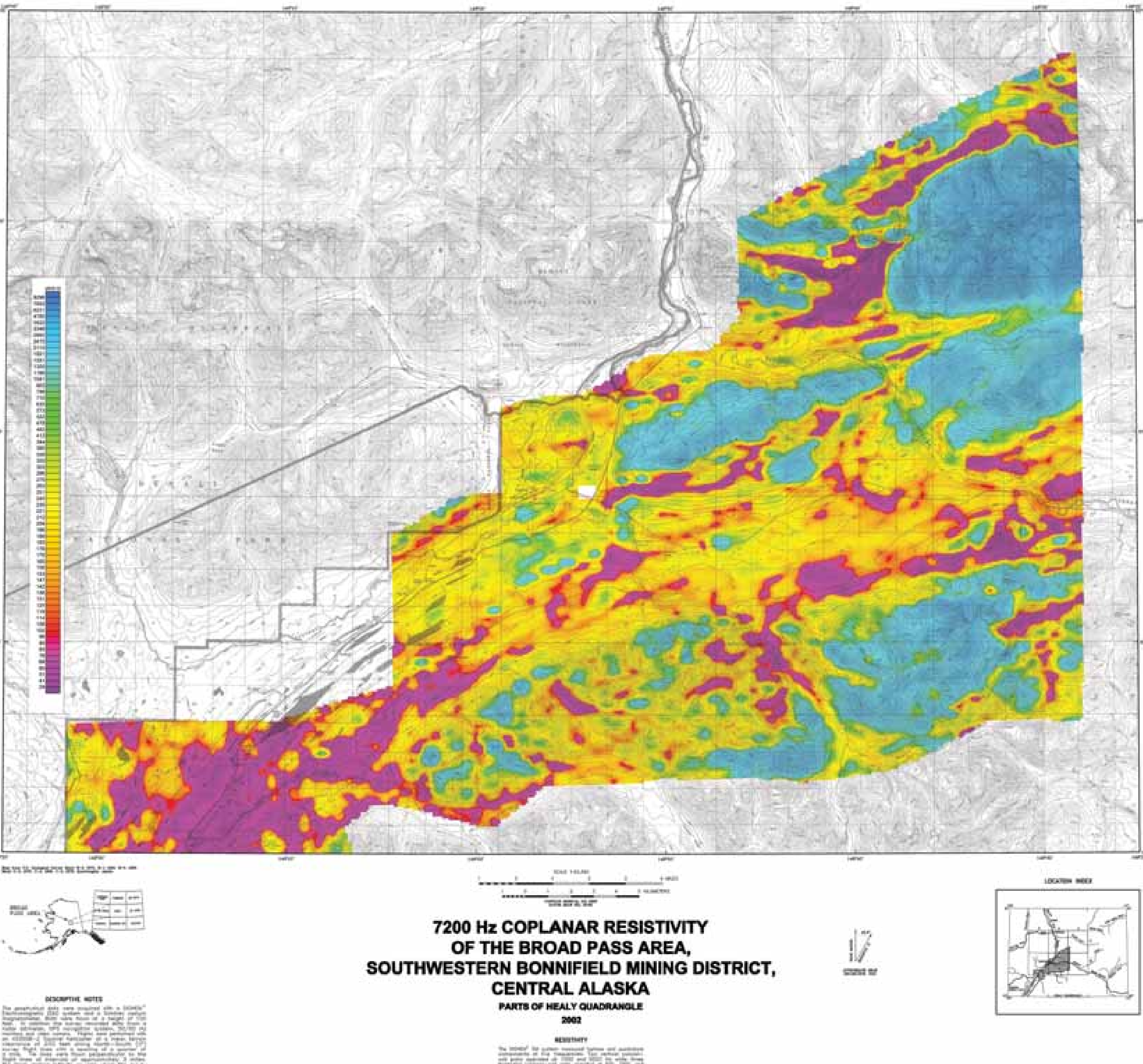


7200 Hz COPLANAR RESISTIVITY OF THE BROAD PASS AREA, SOUTHWESTERN BONNIFIELD MINING DISTRICT, CENTRAL ALASKA

PARTS OF HEALY QUADRANGLE

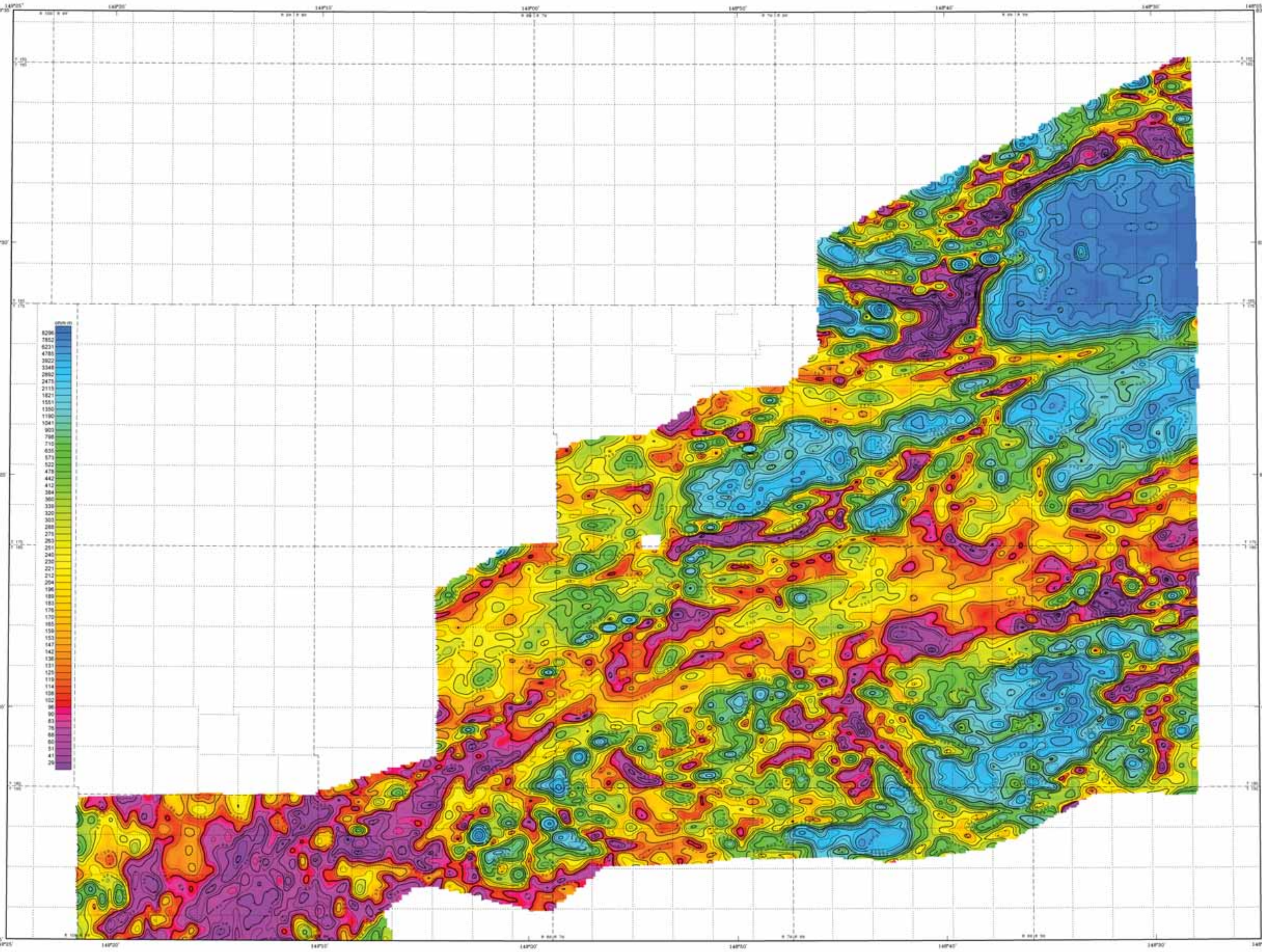
2002

LOCATION INDEX

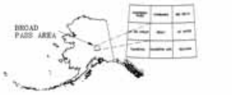
DESCRIPTIVE NOTES

RESISTIVITY

SURVEY HISTORY



SCALE 1:63,360



7200 Hz COPLANAR RESISTIVITY OF THE BROAD PASS AREA, SOUTHWESTERN BONNIFIELD MINING DISTRICT, CENTRAL ALASKA

PARTS OF HEALY QUADRANGLE

2002

DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM® 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 North-South (0°) 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. The blank regions indicate an area where the survey aircraft had to detour around populated areas.

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.

RESISTIVITY

The DIGHEM® 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.

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 area were acquired and processed by Fugro Airborne Surveys in 2001. Laurel Burns was the contract manager for DGGS.

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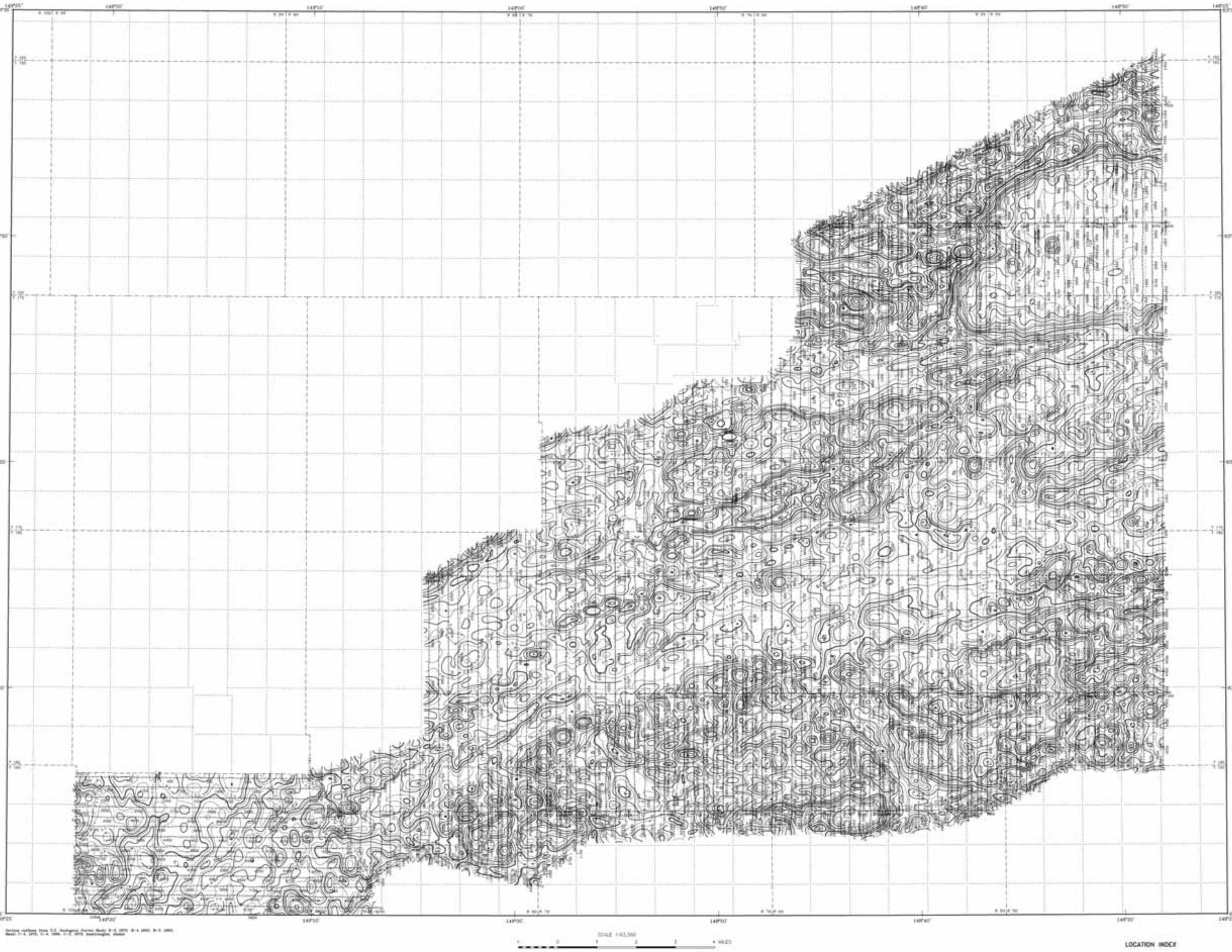

7200 Hz COPLANAR RESISTIVITY OF THE BROAD PASS AREA, SOUTHWESTERN BONNIFIELD MINING DISTRICT, CENTRAL ALASKA

PARTS OF HEALY QUADRANGLE

2002

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 North-South (0°) 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. The blank regions indicate an area where the survey aircraft had to detour around populated 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 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.

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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

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 area were acquired and processed by Fugro Airborne Surveys in 2001. Laurel Burns was the contract manager for DGGS.

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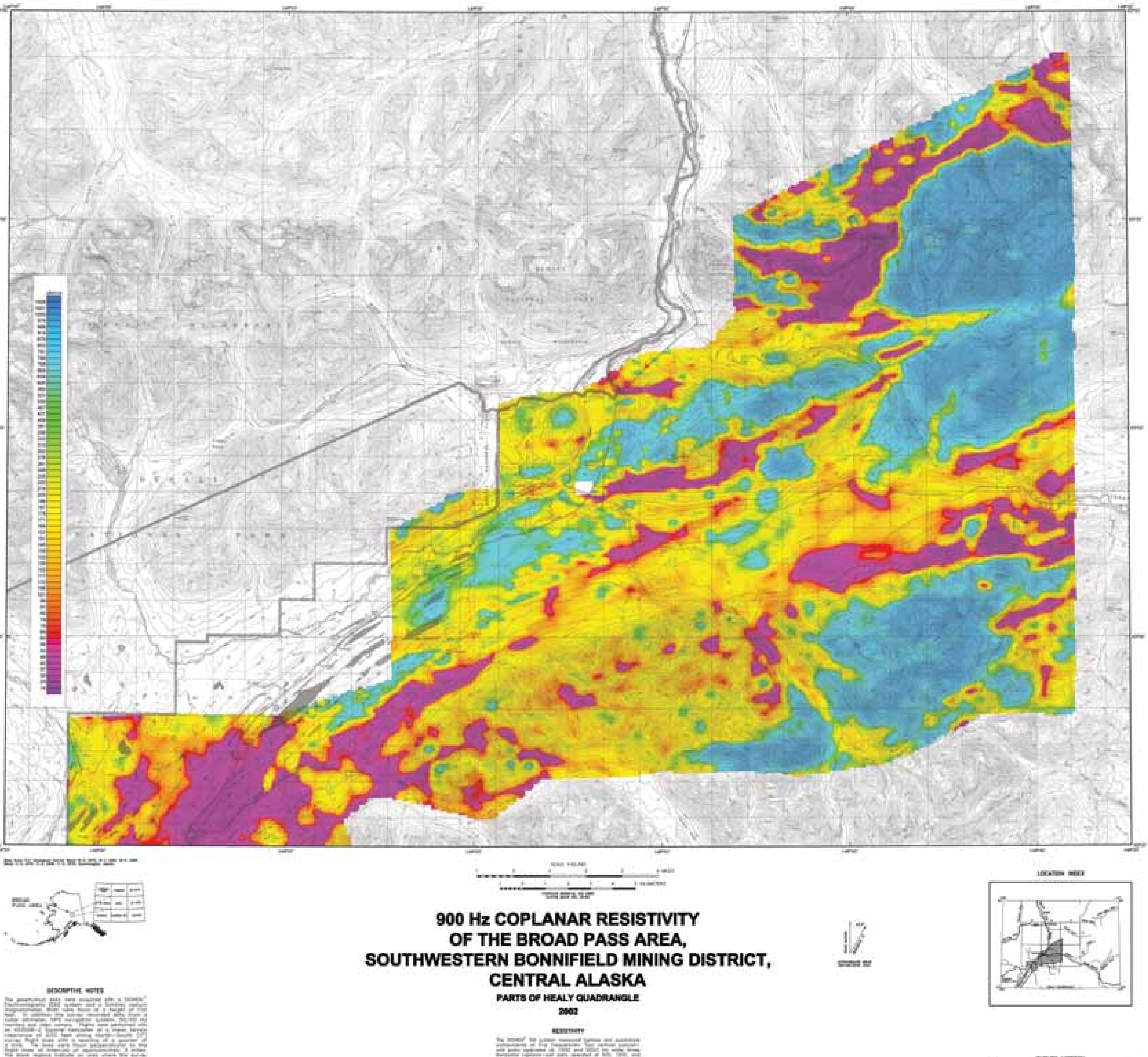
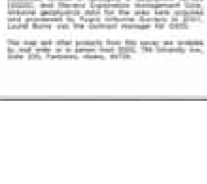


900 Hz COPLANAR RESISTIVITY OF THE BROAD PASS AREA, SOUTHWESTERN BONNIFIELD MINING DISTRICT, CENTRAL ALASKA

PARTS OF HEALY QUADRANGLE

2002

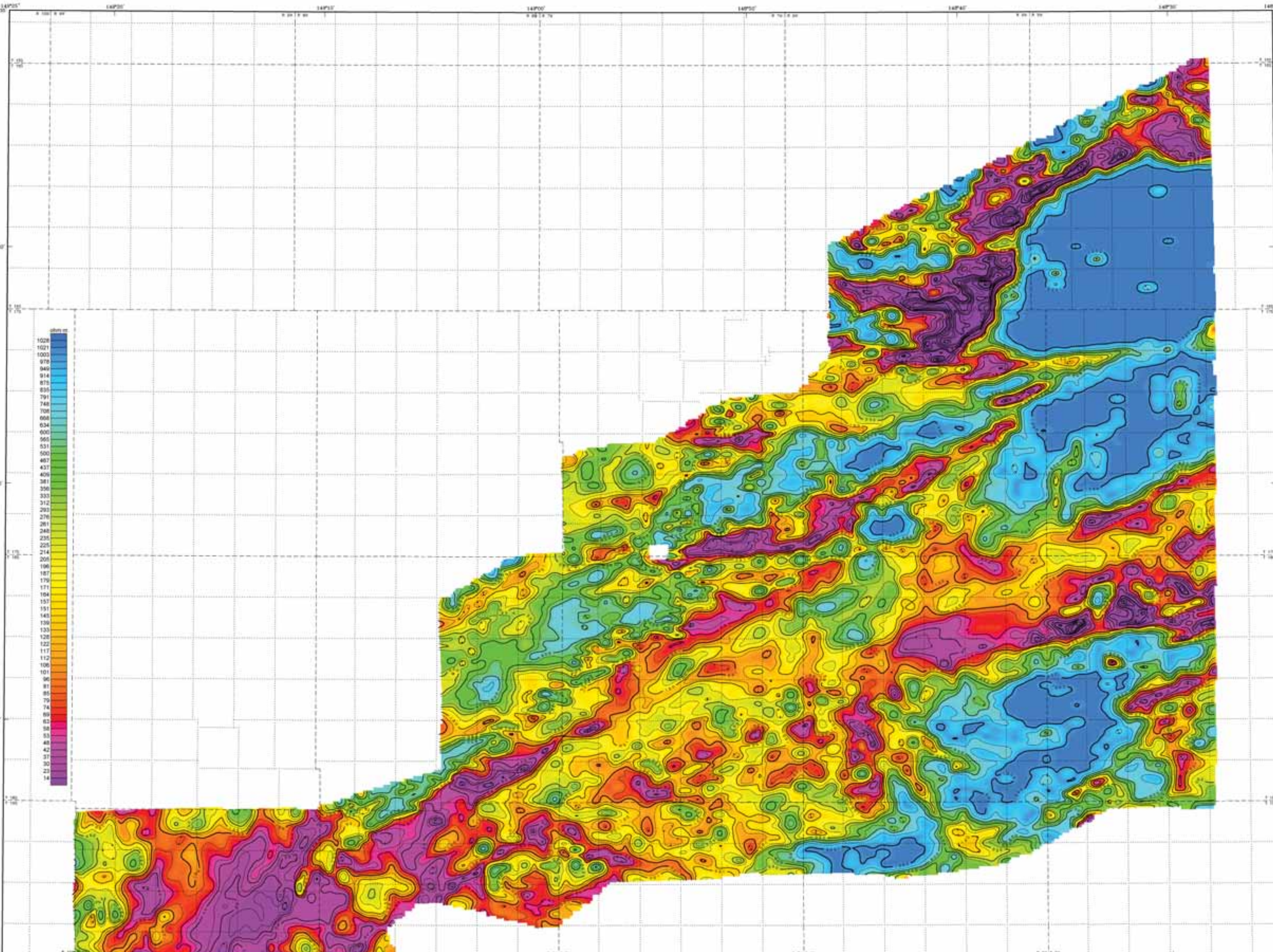
LOCATION INDEX



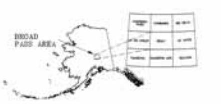
DESCRIPTIVE NOTES

RESISTIVITY

SURVEY HISTORY



SCALE 1:63,360



900 Hz COPLANAR RESISTIVITY OF THE BROAD PASS AREA, SOUTHWESTERN BONNIFIELD MINING DISTRICT, CENTRAL ALASKA

PARTS OF HEALY QUADRANGLE

2002

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 North–South (0°) 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. The blank regions indicate an area where the survey aircraft had to detour around populated 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.

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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

SURVEY HISTORY

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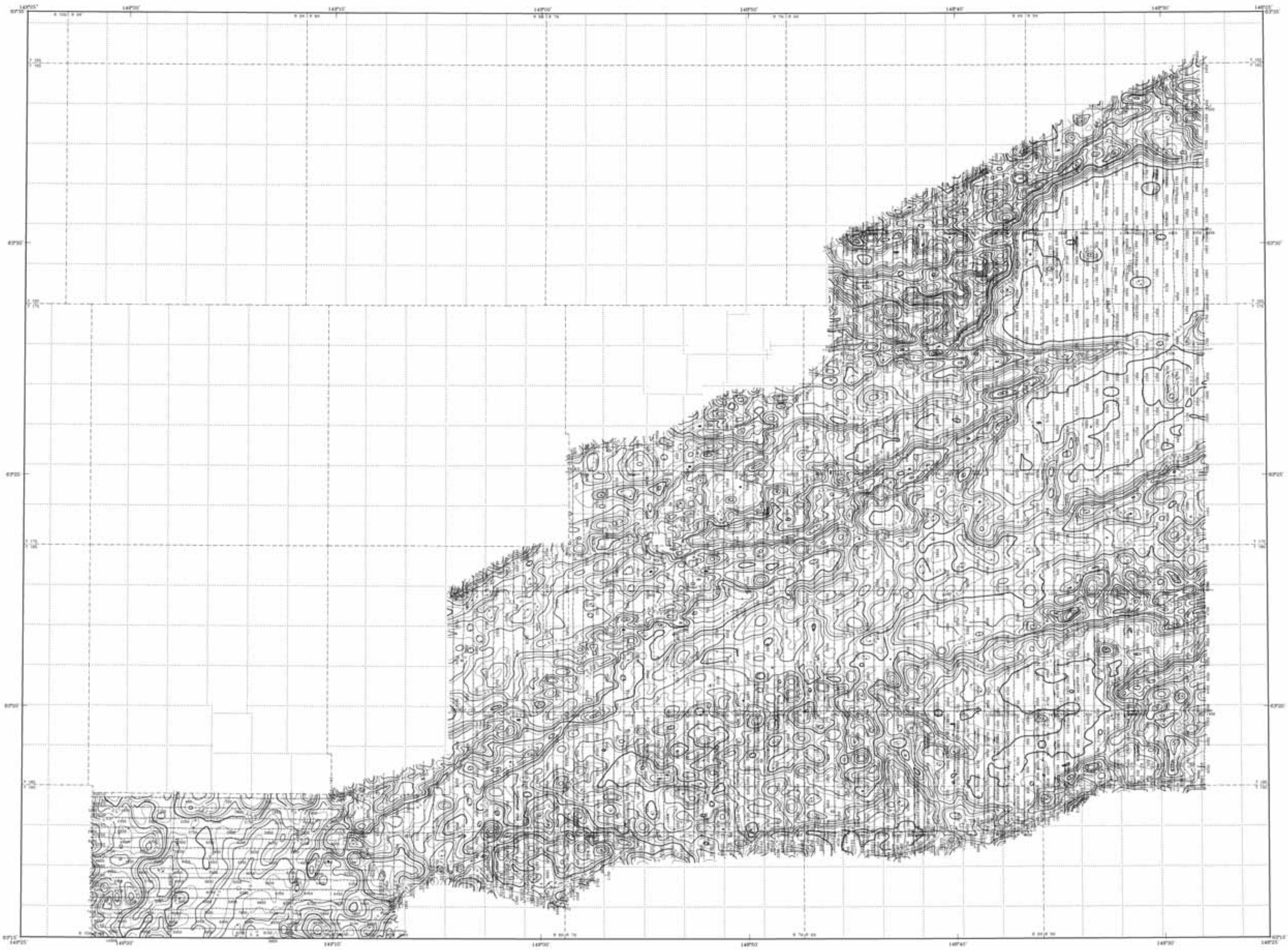

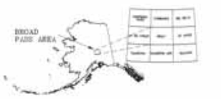

900 Hz COPLANAR RESISTIVITY OF THE BROAD PASS AREA, SOUTHWESTERN BONNIFIELD MINING DISTRICT, CENTRAL ALASKA

PARTS OF HEALY QUADRANGLE

2002

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 North-South (0°) 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. The blank regions indicate an area where the survey aircraft had to detour around populated areas.

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RESISTIVITY CONTOURS

- 1000
- 800
- 600
- 500
- 400
- 300
- 250
- 200
- 150
- 125
- 100

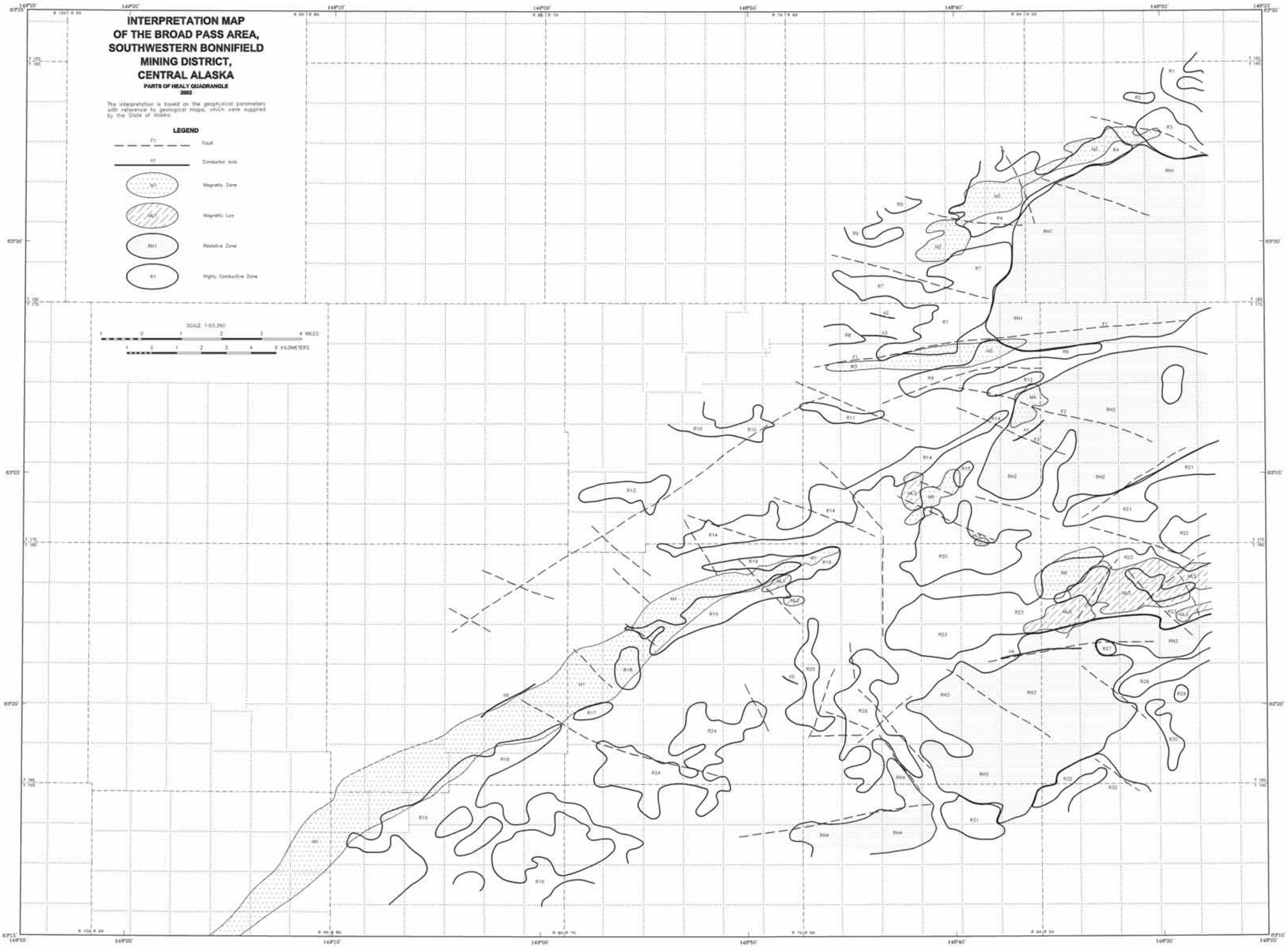
Contours in ohm-m at 10 intervals per decade

resistivity low

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 area were acquired and processed by Fugro Airborne Surveys in 2001. Laurel Burns was the contract manager for DGGS.

This map and other products from this survey are available by mail order or in person from DGGS, 794 University Ave., Suite 200, Fairbanks, Alaska, 99709.


INTERPRETATION MAP
OF THE BROAD PASS AREA,
SOUTHWESTERN BONNIFIELD
MINING DISTRICT,
CENTRAL ALASKA
PARTS OF HEALY QUADRANGLE
2002
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
RH1
Resistive Zone
R1
Highly Conductive Zone
SCALE 1:63,360
1 0 1 2 3 4 MILES
1 0 1 2 3 4 5 KILOMETERS
149°20'
149°10'
149°00'
148°50'
148°40'
148°30'
63°30'
63°25'
63°20'