VALDEZ CREEK ELECTROMAGNETIC AND MAGNETIC AIRBORNE GEOPHYSICAL SURVEY DATA COMPILATION

Burns, L.E., Barefoot, J.D., Woods, Rebecca-Ellen, WGM Mining and Geological Consultants, Inc., and Dighem Surveys and Processing

Geophysical Report 2019-5

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DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

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VALDEZ CREEK ELECTROMAGNETIC AND MAGNETIC AIRBORNE GEOPHYSICAL SURVEY DATA COMPILATION

Burns, L.E.[1], Barefoot, J.D.[1], Woods, Rebecca-Ellen[1], WGM Mining and Geological Consultants, Inc., and Dighem Surveys and Processing

ABSTRACT

This geophysical survey is located in central Alaska in the Valdez Creek mining district in the south-central Alaska Range. It is about 180 kilometers south of Fairbanks, Alaska and about 250 kilometers northeast of Anchorage, Alaska. Frequency domain electromagnetic and magnetic data were collected with the DIGHEM system from August to September 1993. A total of 594 line kilometers were collected covering 210.5 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 and to detect zones of conductive mineralization. The survey area contains the Valdez Creek Lode, the source of Valdez Creek placer 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 Alaska State Legislature as part of the DGGS Airborne Geophysical/Geological Mineral Inventory (AGGMI) program.

[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	Geographically registered gridded data, ER Mapper ERS format
grids_geosoft	contractor and DGGS	Geosoft-format binary grids, these grids can be viewed in ESRI ArcMap using a free plugin from Geosoft, or using the free Geosoft Montaj viewer
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	Printable maps in pdf format
maps_prn_format	contractor	Printable maps in HPGL/G 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.

REFERENCES

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McConnell, D.L., 1994, Final summary of 1993 airborne geophysical surveys of the Nome, Circle, Nyac, and Valdez Creek areas: Alaska Division of Geological & Geophysical Surveys Public Data File 94-36, 327 p., 4 sheets, scale 1:63,360. http://doi.org/10.14509/1662

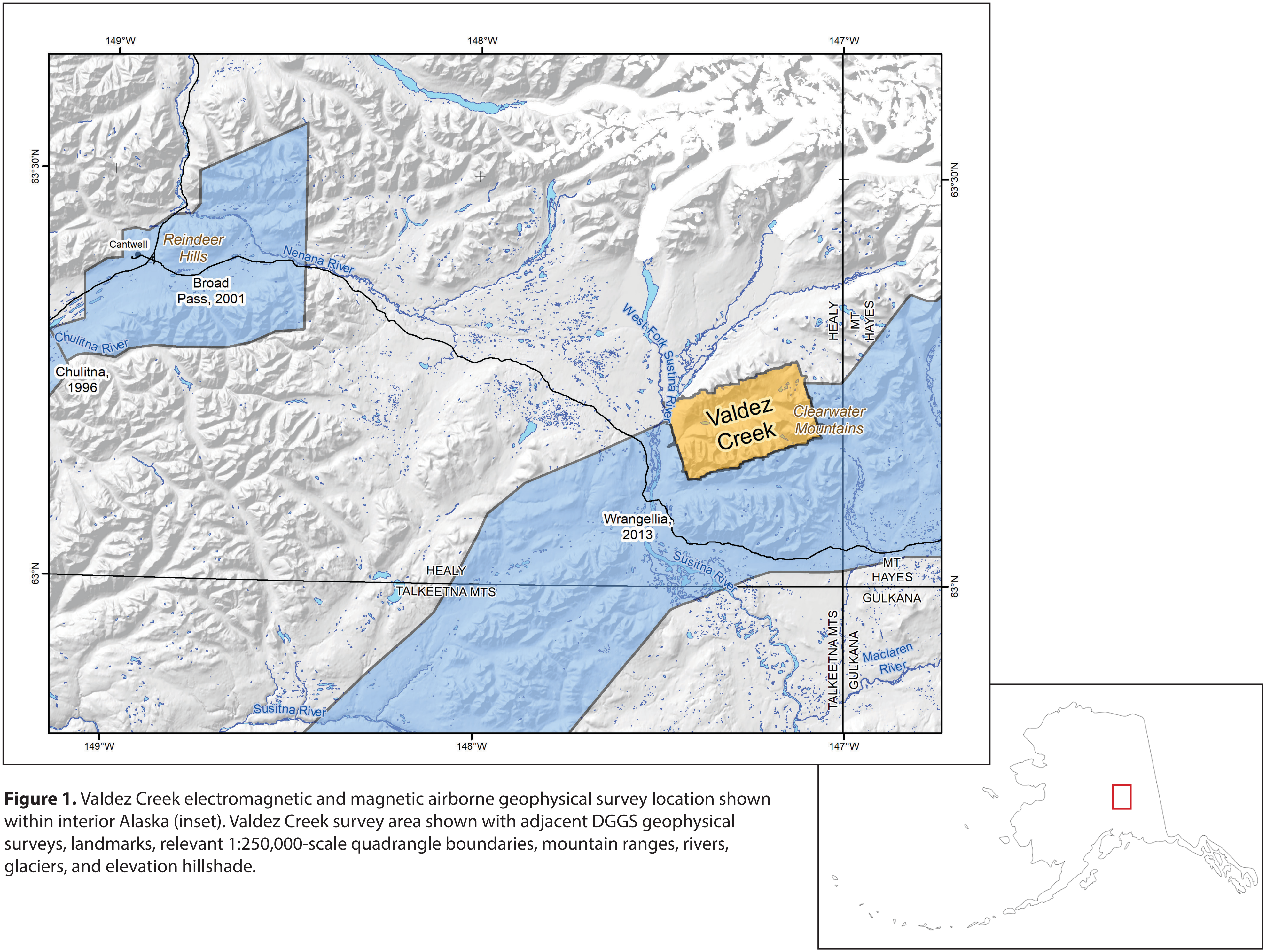


Figure 1. Valdez Creek electromagnetic and magnetic airborne geophysical survey location shown within interior Alaska (inset). Valdez Creek survey area shown with adjacent DGGS geophysical surveys, landmarks, relevant 1:250,000-scale quadrangle boundaries, mountain ranges, rivers, glaciers, and elevation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

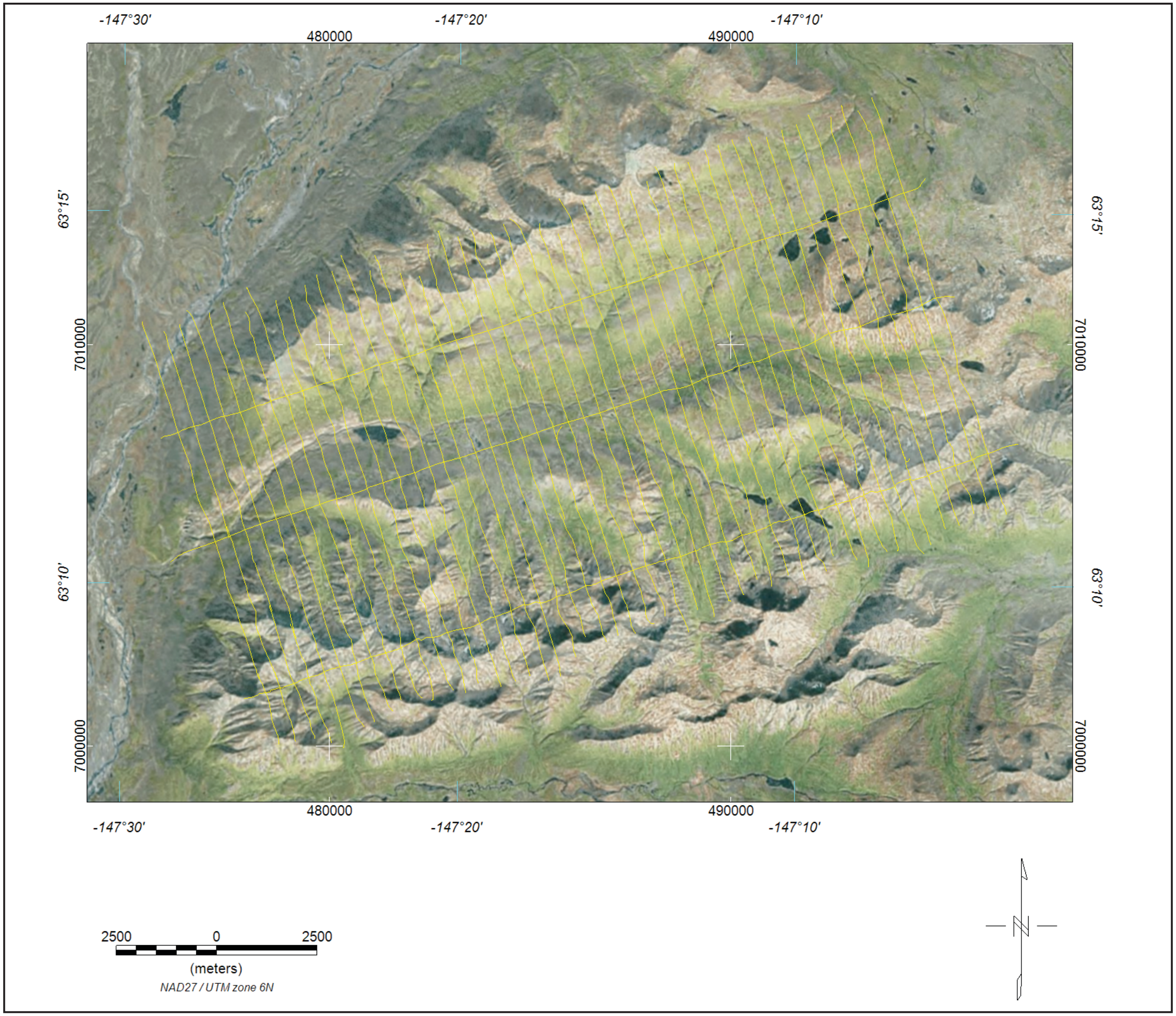


Figure 2. Flight path with orthometric image.

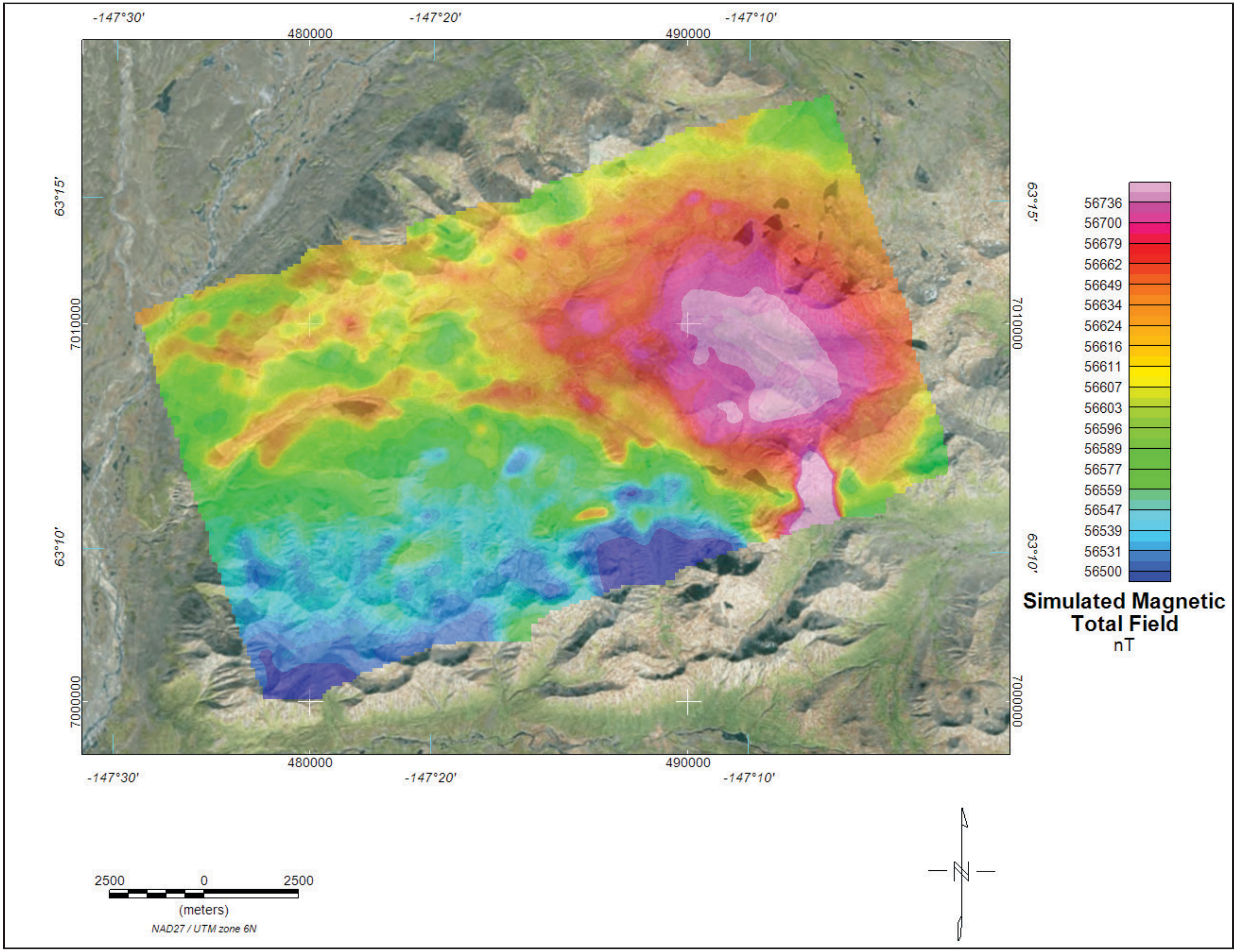


Figure 3. The simulated magnetic total field data were created using digitally recorded data from a Scintrex cesium CS2 magnetometer. Data were collected at a sampling interval of 0.1 seconds. The magnetic data were (1) corrected for diurnal variations by subtracting the digitally recorded base station magnetic data, (2) IGRF corrected (IGRF model 1987, updated August, 1993, updated for date of flight and altimeter variations), (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 (Akima 1970) technique.

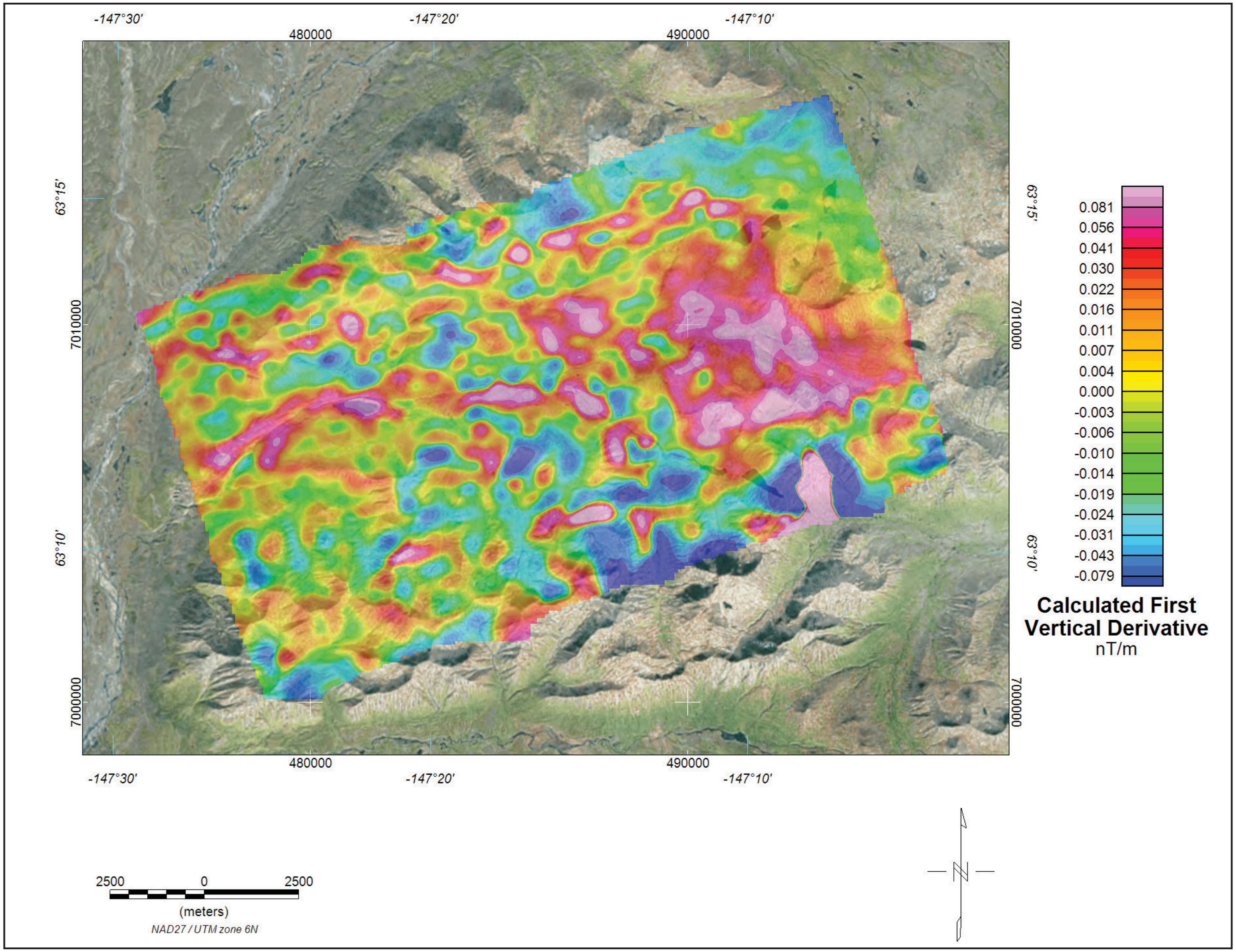


Figure 4. The calculated first vertical derivative data were created using digitally recorded data from a Scintrex cesium CS2 magnetometer. Data were collected at a sampling interval of 0 .1 seconds. The magnetic data were (1) corrected for diurnal variations by subtraction of the digitally recorded base station magnetic data, (2) IGRF corrected (IGRF model 1987, updated August, 1993, updated for date of flight and altimeter variations), (3) leveled to the tie line data, and (4) interpolated onto a regular 100 m grid using a modified Akima (1970) technique. The first vertical derivative grid was calculated from the processed 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.

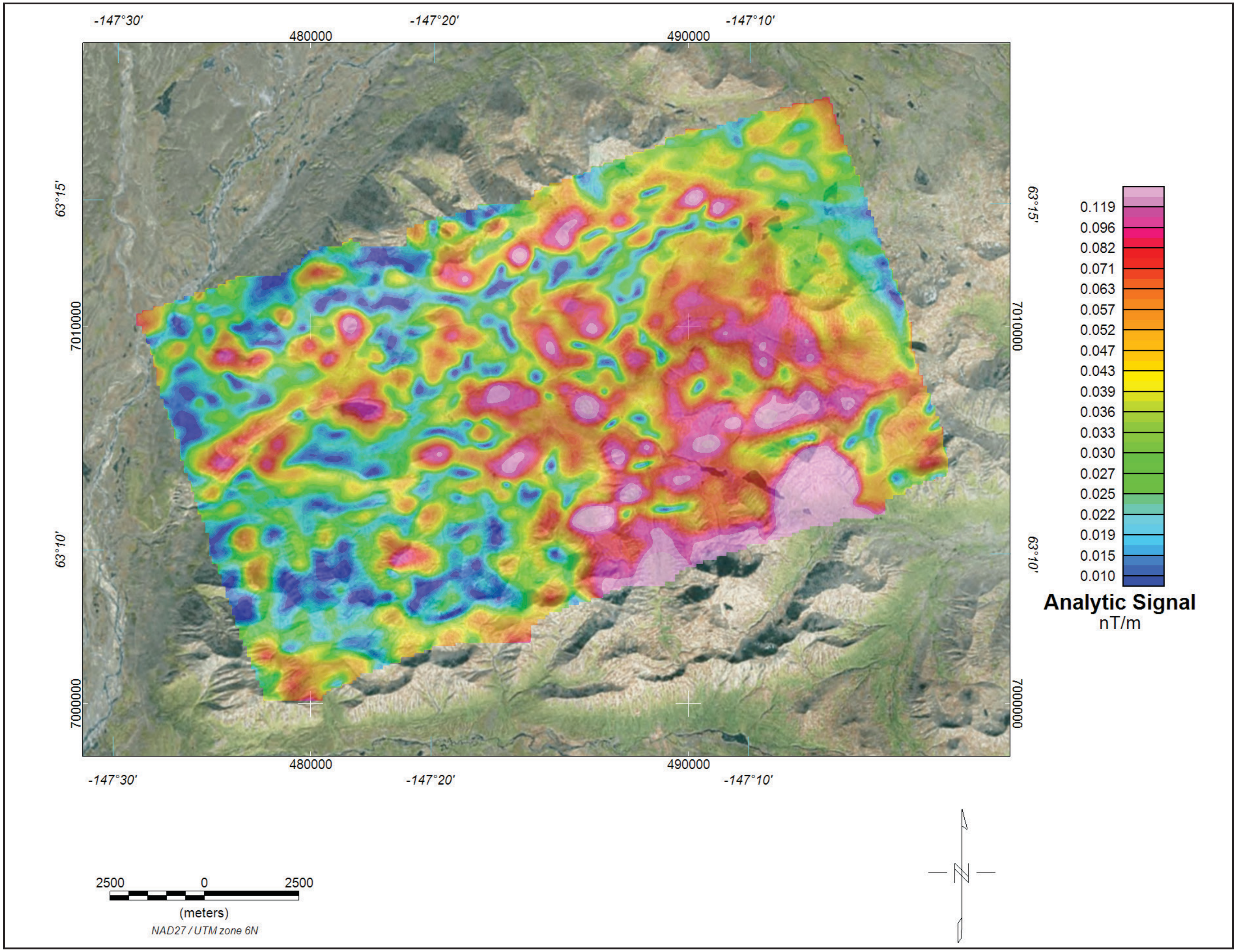


Figure 5. Analytic signal is the total amplitude of all directions of magnetic gradient calculated from the sum of the squares of the three orthogonal gradients. Mapped highs in the calculated analytic signal of magnetic parameter locate the anomalous source body edges and corners (such as contacts, 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.

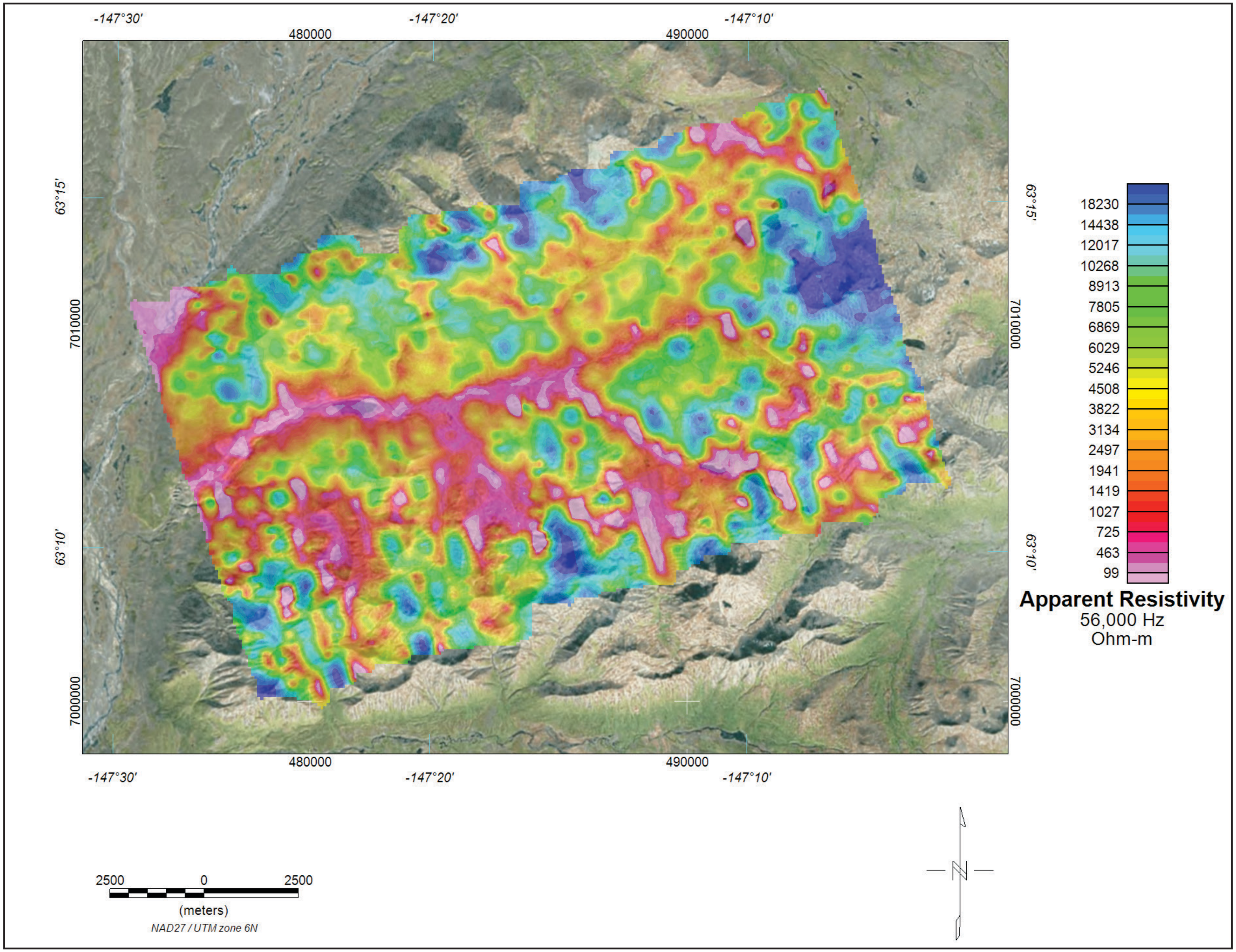


Figure 6. The DIGHEM^{V} EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial coil-pairs operated at 900 and 5000 Hz while three horizontal coplanar coil-pairs operated at 900, 7,200 and 56,000 Hz. EM data were sampled at 0.1 second intervals. The EM system responds 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 (Akima 1970) technique.

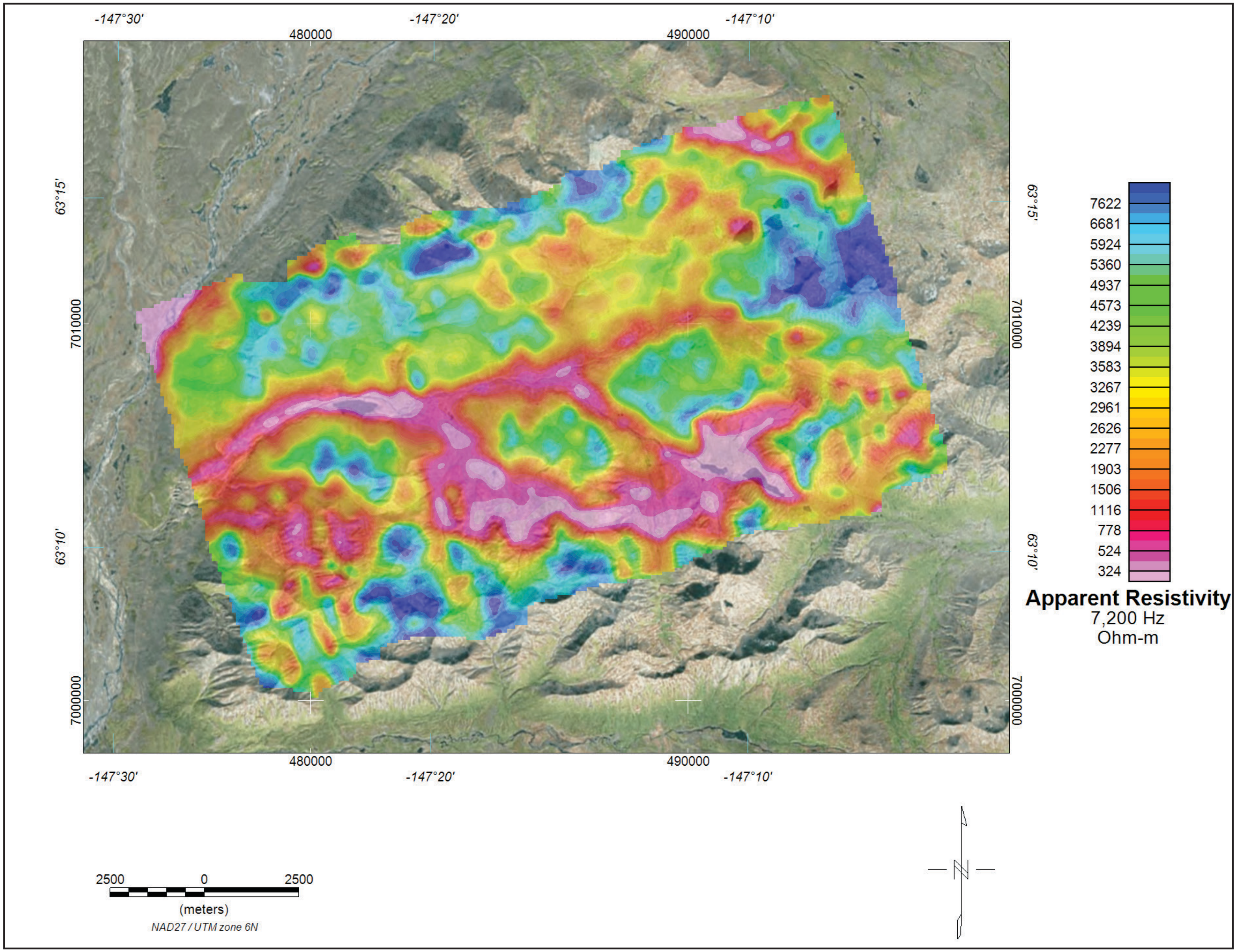


Figure 7. The DIGHEM[V] EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial coil-pairs operated at 900 and 5000 Hz while three horizontal coplanar coil-pairs operated at 900, 7,200 and 56,000 Hz. EM data were sampled at 0.1 second intervals. The EM system responds 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 (Akima 1970) technique.

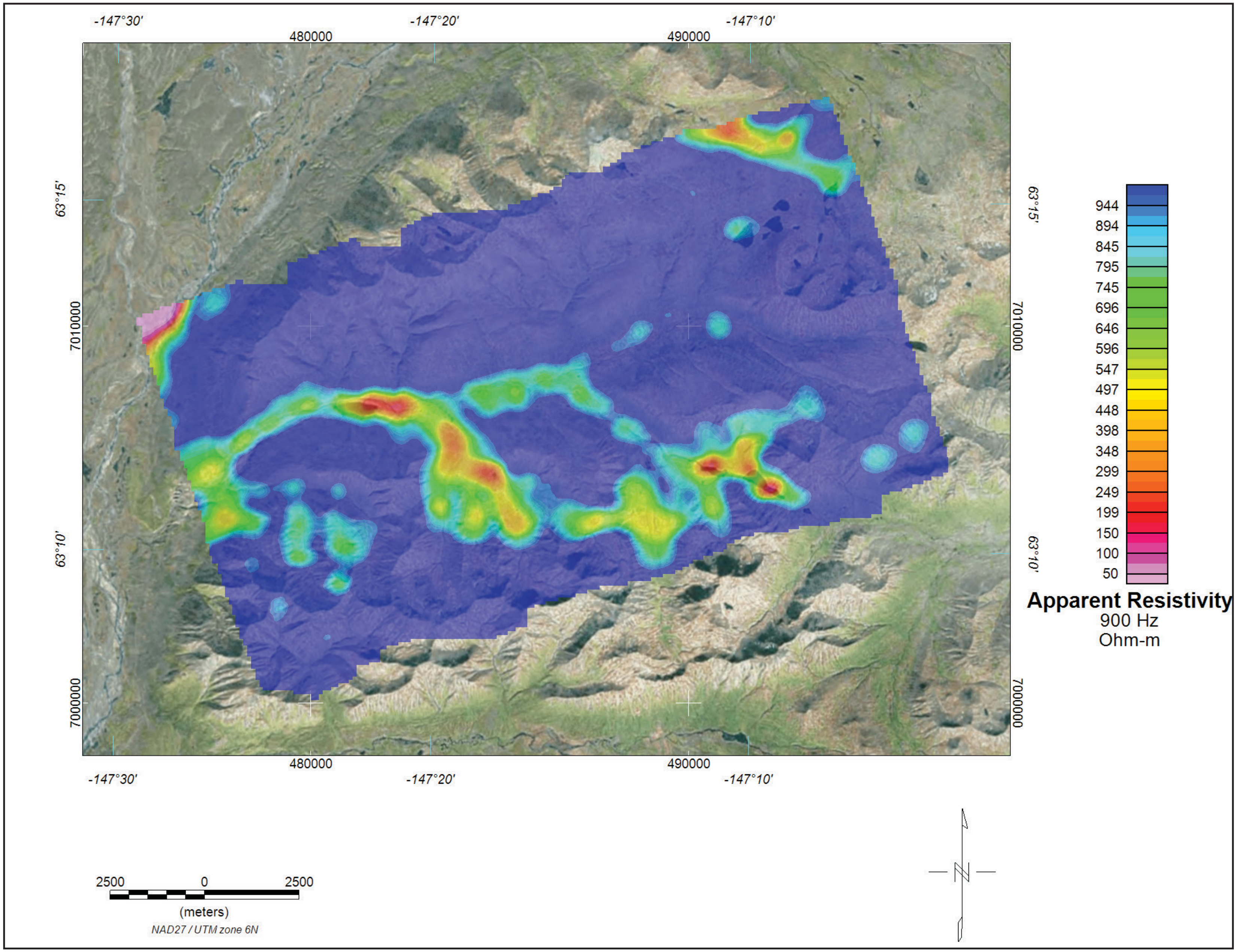
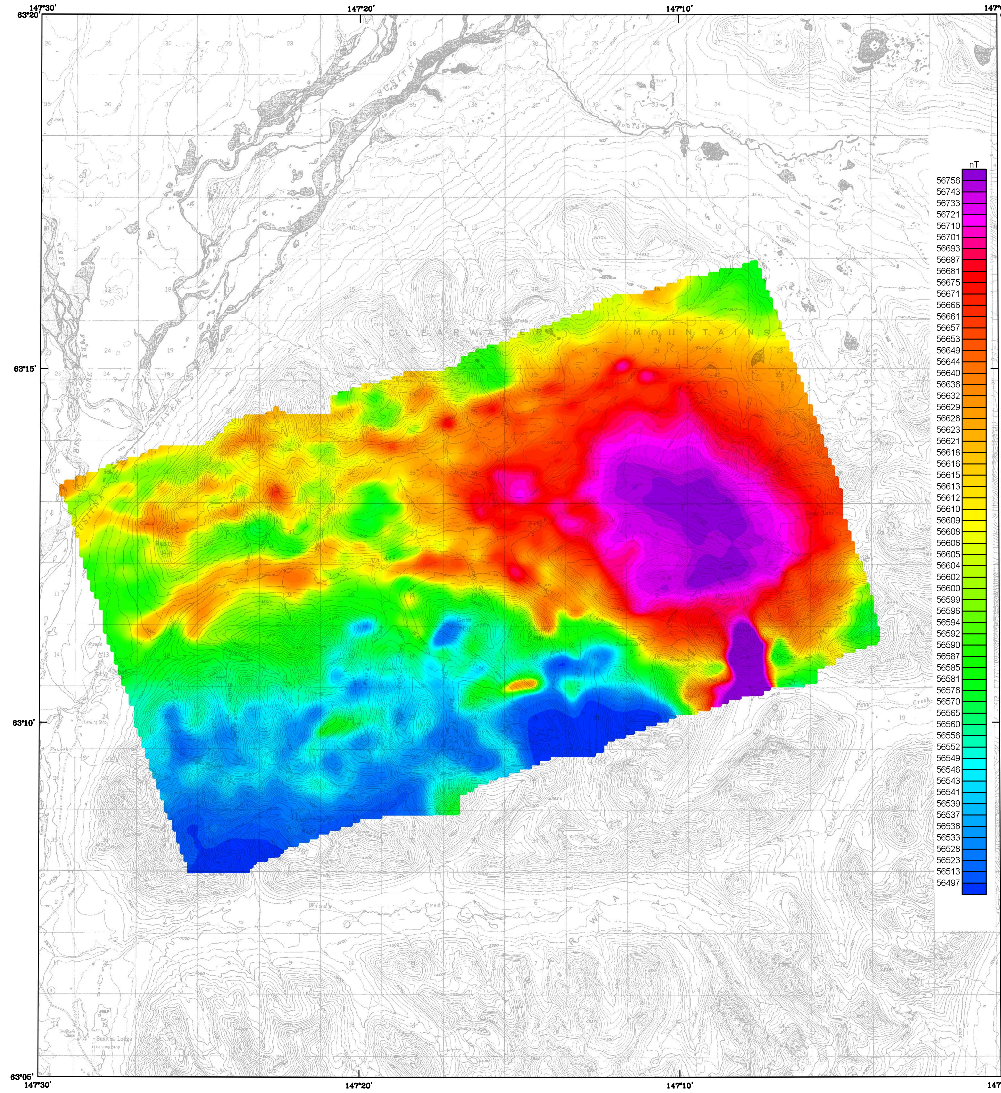


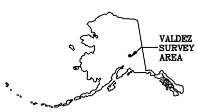
Figure 8. The DIGHEM[V] EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial coil-pairs operated at 900 and 5000 Hz while three horizontal coplanar coil-pairs operated at 900, 7,200 and 56,000 Hz. EM data were sampled at 0.1 second intervals. The EM system responds 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 (Akima 1970) technique.

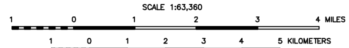
Table 1. Copies of the following maps are included at the end of this booklet. The low-resolution, page-size maps included in this booklet are intended to be used as a search tool and are not the final product. Large-scale, full-resolution versions of each map are available to download on this publication's citation page: http://doi.org/10.14509/30170.

Map Title	Description
valdezcreek_sim_magtf_topo_map	Simulated magnetic total field grid with topographic base map
valdezcreek_sim_magtf_contours_plss_map	Simulated magnetic total field grid with contours and Public Land Survey System base layer
valdezcreek_res7200hz_topo_map	7,200 Hz coplanar apparent resistivity grid with topographic base map
valdezcreek_res7200hz_contours_plss_map	7,200 Hz coplanar apparent resistivity grid with contours and Public Land Survey System base layer
valdezcreek_res900hz_topo_map	900 Hz coplanar apparent resistivity grid with topographic base map
valdezcreek_res900hz_contours_plss_map	900 Hz coplanar apparent resistivity grid with contours and Public Land Survey System base layer
valdezcreek_interpretation_plss	Scanned interpretation map with Public Land Survey System base layer
valdezcreek_vlf_contours_plss_map	Scanned filtered total field VLF with contours and Public Land Survey System base layer
valdezcreek_em_anomalies_sim_magtf_contours_topo_map	Scanned simulated magnetic total field and electromagnetic anomaly map with contours and topographic base map

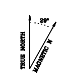


Base from U.S. Geological Survey topographic bases:
Healy A-1 (1949); Healy B-1 (1950); Quadrangles, Alaska





CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL



APPROXIMATE MEAN
DECLINATION, 1949

TOTAL MAGNETIC FIELD OF THE VALDEZ CREEK MINING AREA, CENTRAL ALASKA

PARTS OF HEALY QUADRANGLE

by
Laurel E. Burns, Fugro Airborne Surveys Corp., and Stevens Exploration Management Corp.
2004

DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM^{V} Electromagnetic (EM) system, a Scintrex cesium CS2 magnetometer, and a Herz VLF system installed in an AS350B-1 Squirrel helicopter. In addition, the survey recorded data from a radar altimeter, GPS navigation system, 50/60 Hz monitors and video camera. Flights were performed at a mean terrain clearance of 200 feet along 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 three miles.

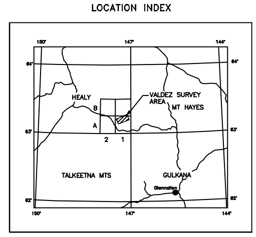
A Sercel Real-Time Differential Global Positioning System (RT-DGPS) was used for both navigation and flight path recovery. The helicopter position was derived every 0.5 seconds using both real-time and post-processing differential positioning to a relative accuracy of better than 10 m. Flight path positions were projected onto the Clarke 1866 (UTM) 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.

TOTAL MAGNETIC FIELD

The magnetic total field contours were produced using digitally recorded data from a Scintrex cesium CS2 magnetometer, with a sampling interval of 0.1 seconds. The magnetic data 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, 1985, updated to August, 1993) was removed from the leveled magnetic data.

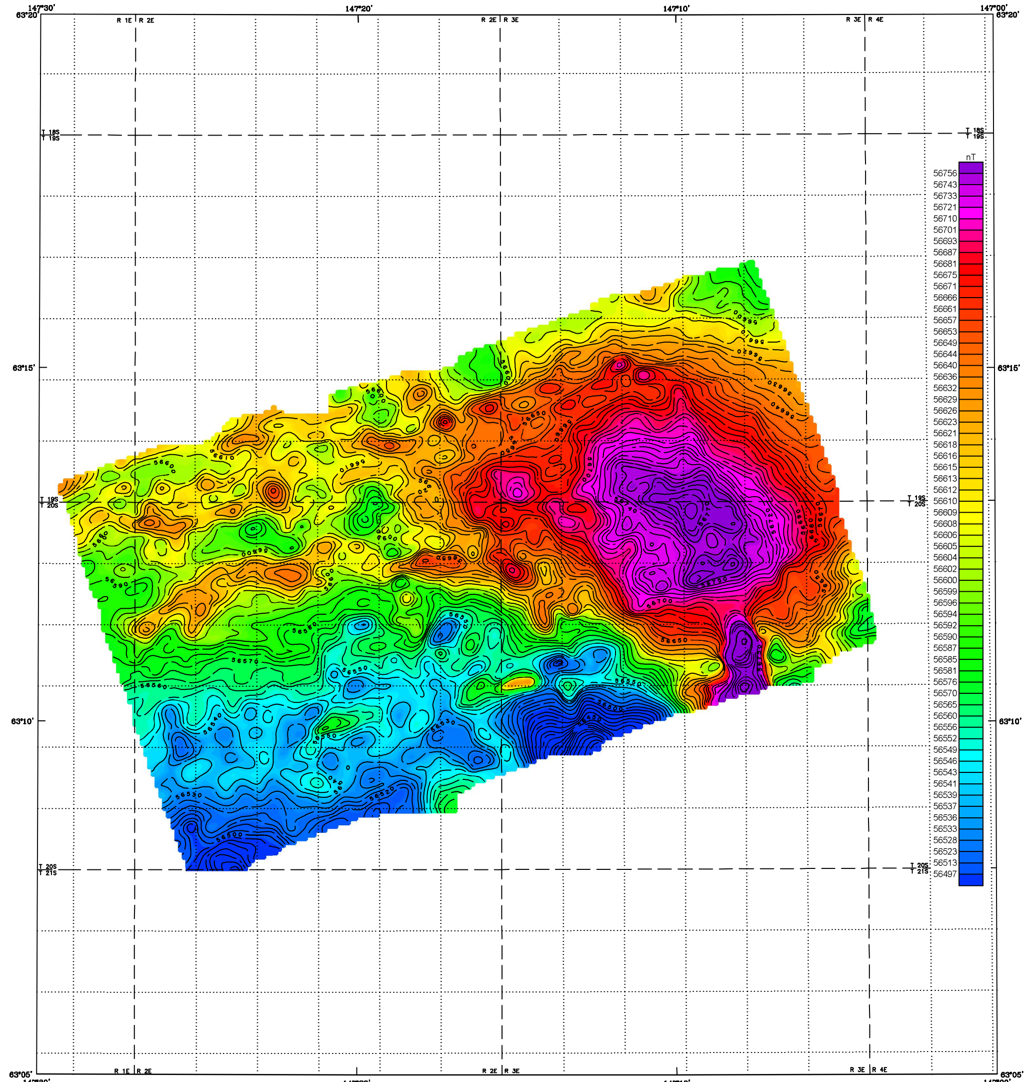
Akima, H., 1970, A new method of interpolation and smooth curve fitting based on local procedures: Journal of the Association of Computing Machinery, v. 17, no. 4, p. 589-602.

LOCATION INDEX

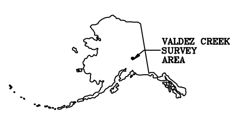


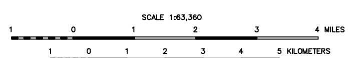
SURVEY HISTORY

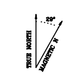
The map has been compiled and drawn under contract between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Surveys, and Stevens Exploration Management Corp. The map was produced by Fugro Airborne Surveys and supercedes the earlier full color version released by DGGS in 1994. Airborne geophysical data for the area were acquired and processed in 1993 under contract between DGGS and WGM, Mining and Geological Consultants, Inc. The subcontractor acquiring and processing the data was DIGHEM, a division of CGG Canada Ltd. Other products from this survey are available from DGGS, 3354 College Road, Fairbanks, Alaska, 99709-3707.



Section outlines from U.S. Geological Survey topographic bases:
Healy A-1 (1949); Healy B-1 (1950); Quadrangles, Alaska







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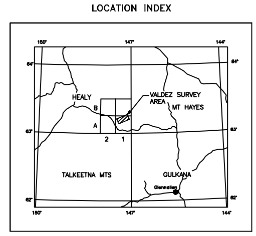

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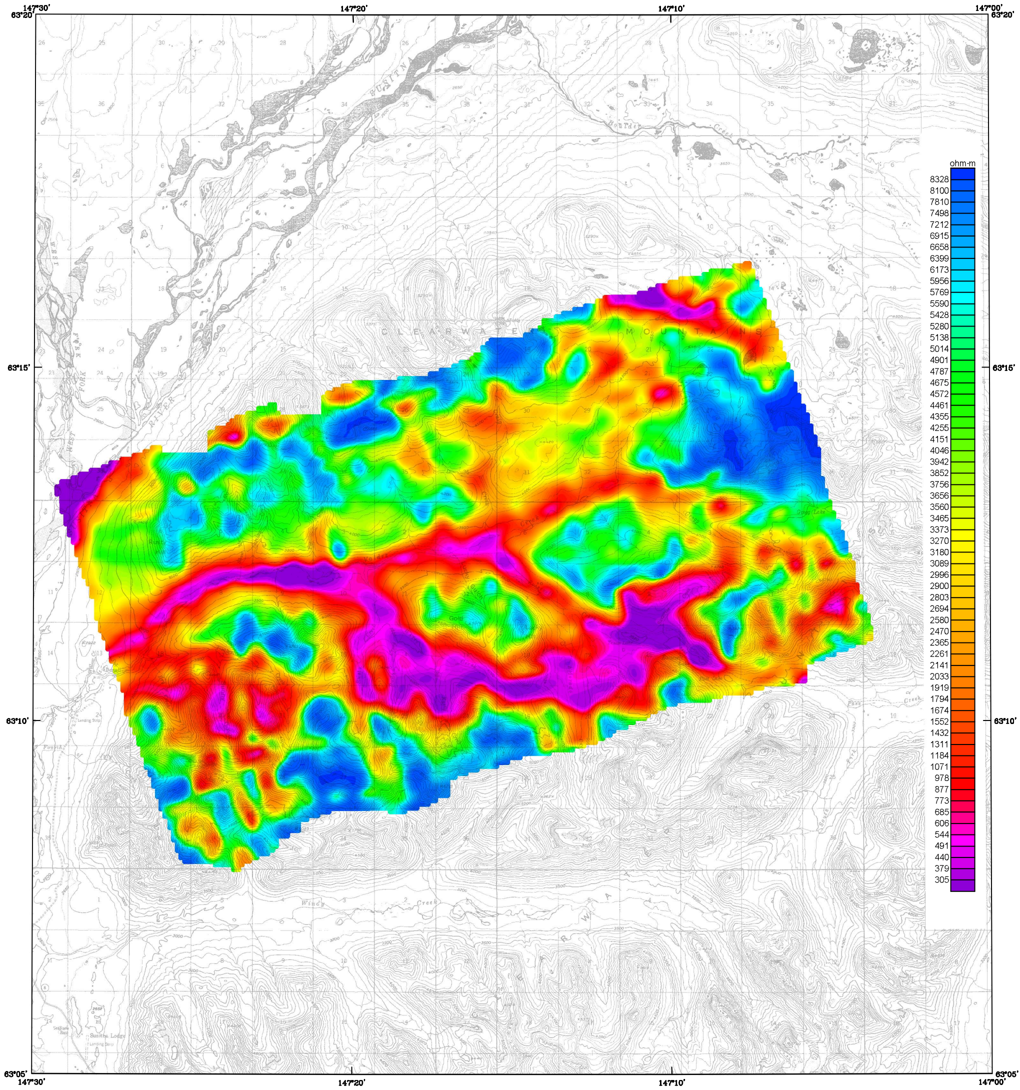
MAGNETIC CONTOUR INTERVAL

Line	Interval
heavy solid line	250 nT
solid line	50 nT
solid line	10 nT
dashed line	5 nT

ALASKA DIVISION OF GEOLOGICAL &
GEOPHYSICAL SURVEYS

GEOPHYSICAL REPORT 2004_3_2a



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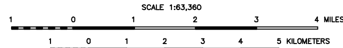
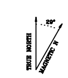


CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL



APPROXIMATE MEAN
DECLINATION, 1949

7200 Hz COPLANAR APPARENT RESISTIVITY OF THE VALDEZ CREEK MINING AREA, CENTRAL ALASKA

PARTS OF HEALY QUADRANGLE

by
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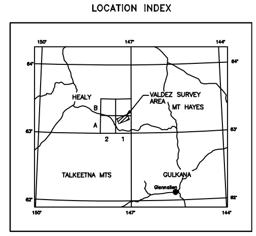


RESISTIVITY

The DIGHEM[V] EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial coil-pairs operated at 900 and 5000 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 component of the coplanar 7200 Hz using the pseudo-layer half space model. The data were interpolated onto a regular 100 m grid using a modified Akima (1970) technique.

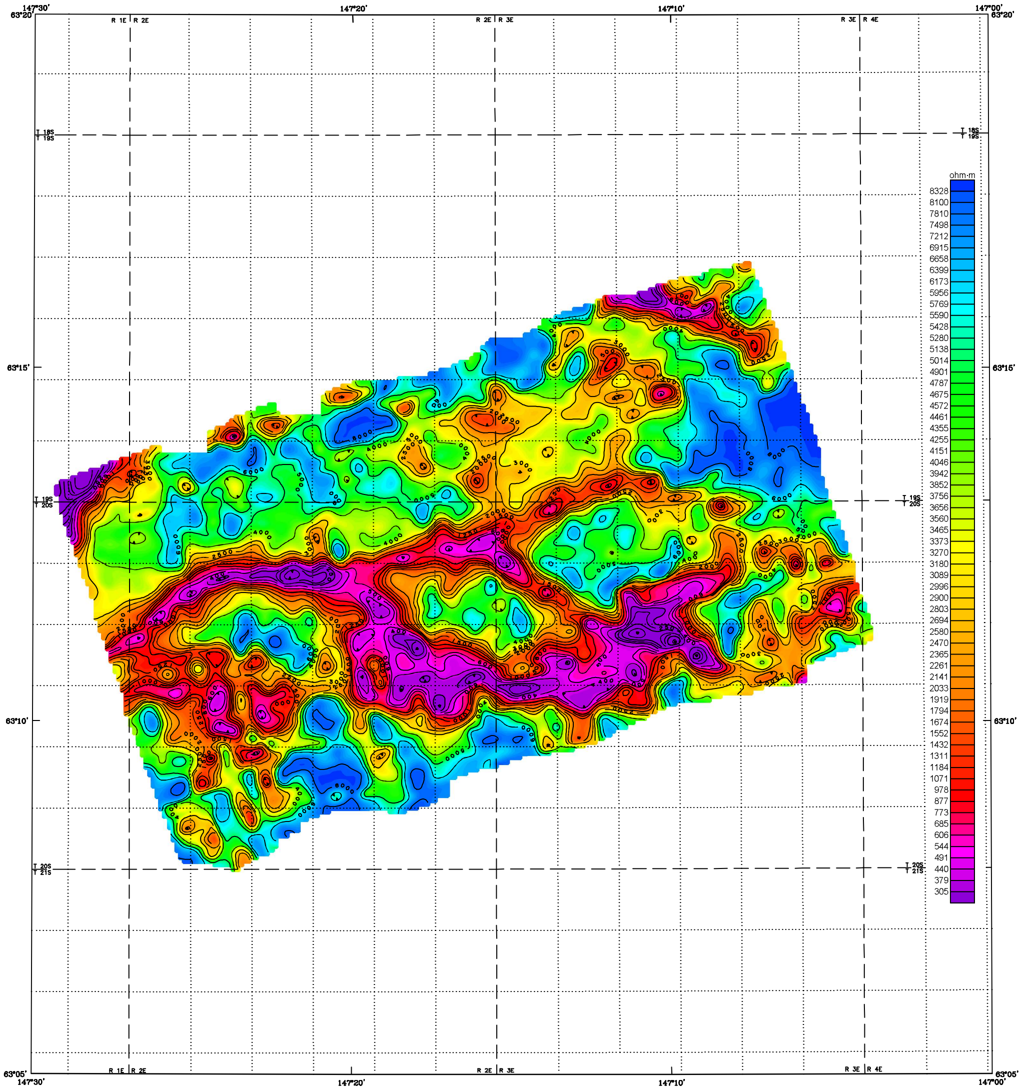
Akima, H.,1970, A new method of interpolation and smooth curve fitting based on local procedures: Journal of the Association of Computing Machinery, v. 17, no.4, p.589-602.

SURVEY HISTORY

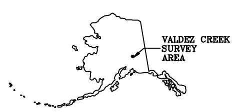
The map has been compiled and drawn under contract between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Surveys, and Stevens Exploration Management Corp. The map was produced by Fugro Airborne Surveys and supercedes the earlier full color version released by DGGS in 1994. Airborne geophysical data for the area were acquired and processed in 1993 under contract between DGGS and WGM, Mining and Geological Consultants, Inc. The subcontractor acquiring and processing the data was DIGHEM, a division of CGG Canada Ltd. Other products from this survey are available from DGGS, 3354 College Road, Fairbanks, Alaska, 99709-3707.

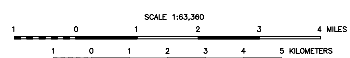
ALASKA DIVISION OF GEOLOGICAL &
GEOPHYSICAL SURVEYS

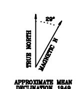
GEOPHYSICAL REPORT 2004_3_2b



Section outlines from U.S. Geological Survey topographic bases:
Healy A-1 (1949); Healy B-1 (1950); Quadrangles, Alaska







7200 Hz COPLANAR APPARENT RESISTIVITY OF THE VALDEZ CREEK MINING AREA, CENTRAL ALASKA

PARTS OF HEALY QUADRANGLE

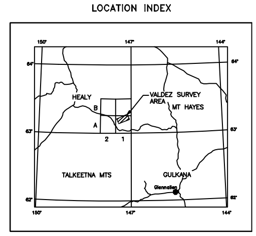
by
Laurel E. Burns, Fugro Airborne Surveys Corp., and Stevens Exploration Management Corp.
2004

DESCRIPTIVE NOTES

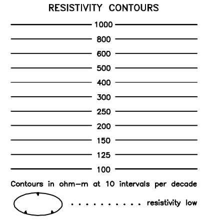
The geophysical data were acquired with a DIGHEM^V Electromagnetic (EM) system, a Scintrex cesium CS2 magnetometer, and a Herz VLF system installed in an AS350B-1 Squirrel helicopter. In addition, the survey recorded data from a radar altimeter, GPS navigation system, 50/60 Hz monitors and video camera. Flights were performed at a mean terrain clearance of 200 feet along 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 three miles.

A Sercel Real-Time Differential Global Positioning System (RT-DGPS) was used for both navigation and flight path recovery. The helicopter position was derived every 0.5 seconds using both real-time and post-processing differential positioning to a relative accuracy of better than 10 m. Flight path positions were projected onto the Clarke 1866 (UTM) 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.

LOCATION INDEX



RESISTIVITY CONTOURS



RESISTIVITY

The DIGHEM^V EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial coil-pairs operated at 900 and 5000 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 component of the coplanar 7200 Hz using the pseudo-layer half space model. 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.

SURVEY HISTORY

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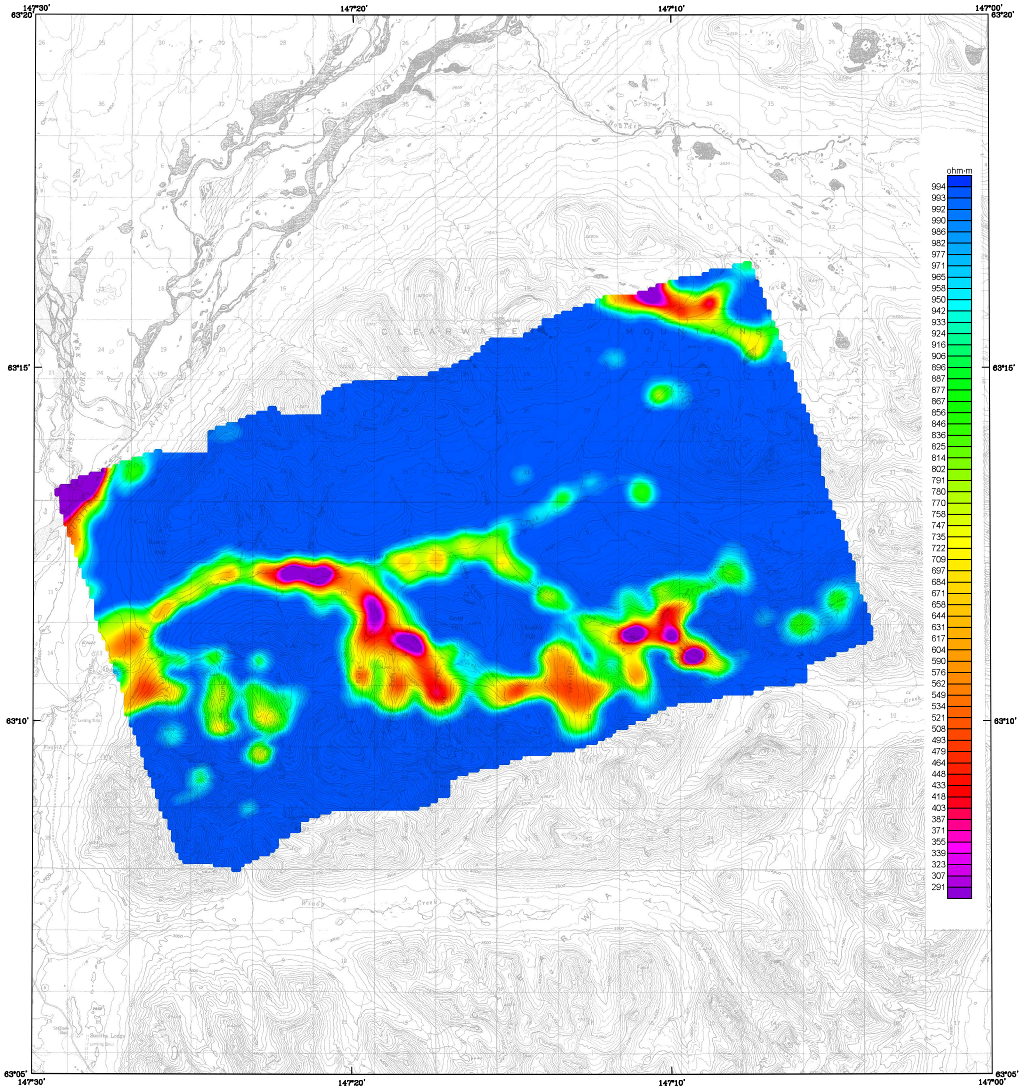
ALASKA DIVISION OF GEOLOGICAL &
GEOPHYSICAL SURVEYS

GEOPHYSICAL REPORT 2004_3_3a



Base from U.S. Geological Survey topographic bases:
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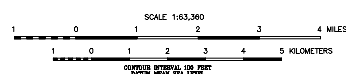

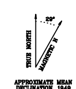

900 Hz COPLANAR APPARENT RESISTIVITY OF THE VALDEZ CREEK MINING AREA, CENTRAL ALASKA

PARTS OF HEALY QUADRANGLE

by
Laurel E. Burns, Fugro Airborne Surveys Corp., and Stevens Exploration Management Corp.
2004

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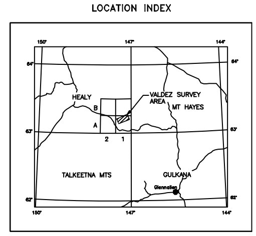

RESISTIVITY

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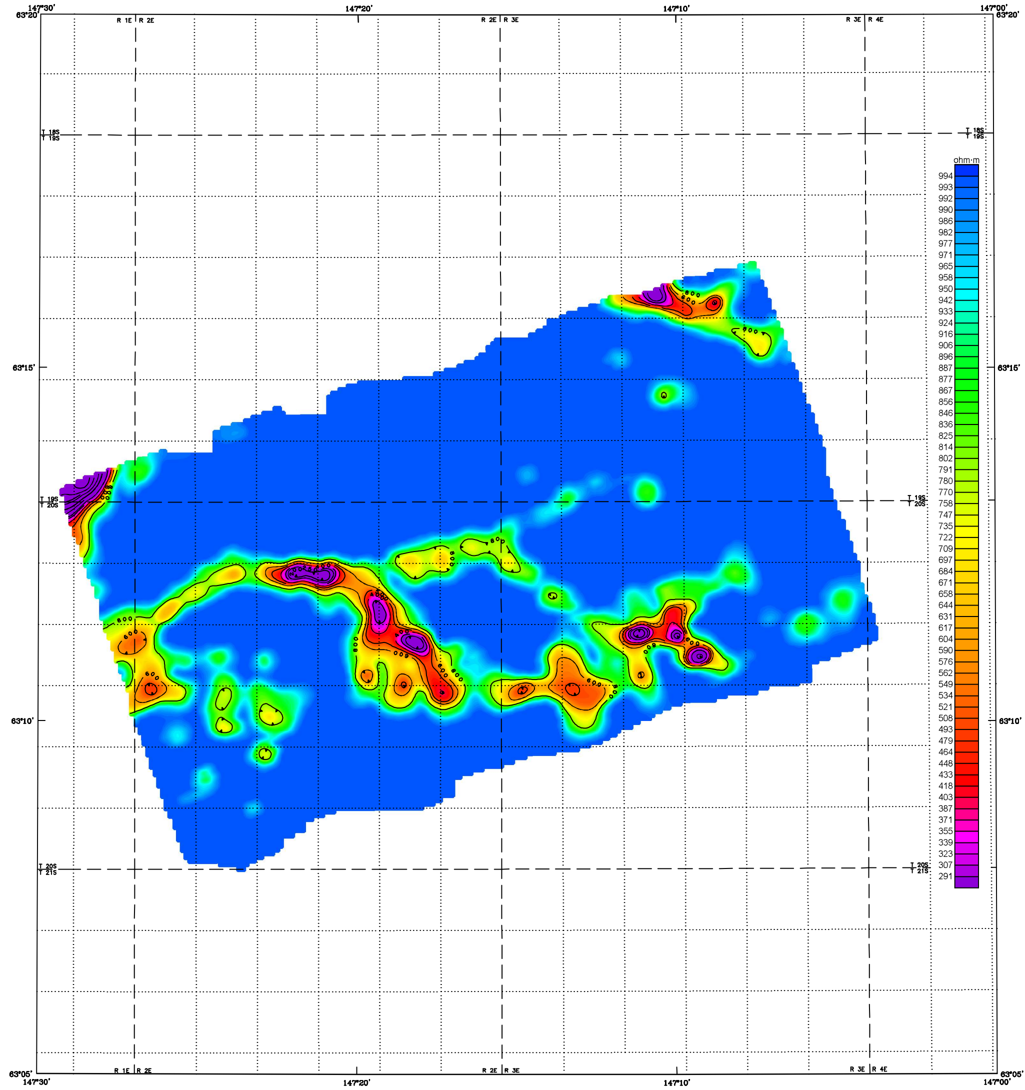
ALASKA DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

GEOPHYSICAL REPORT 2004_3_3b



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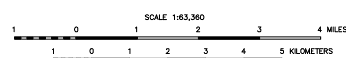

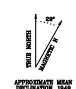

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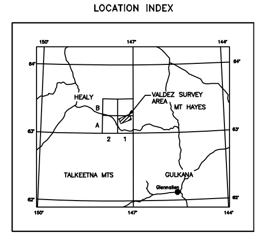
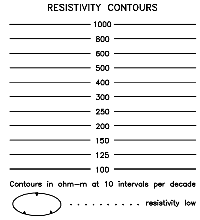


RESISTIVITY CONTOURS



RESISTIVITY

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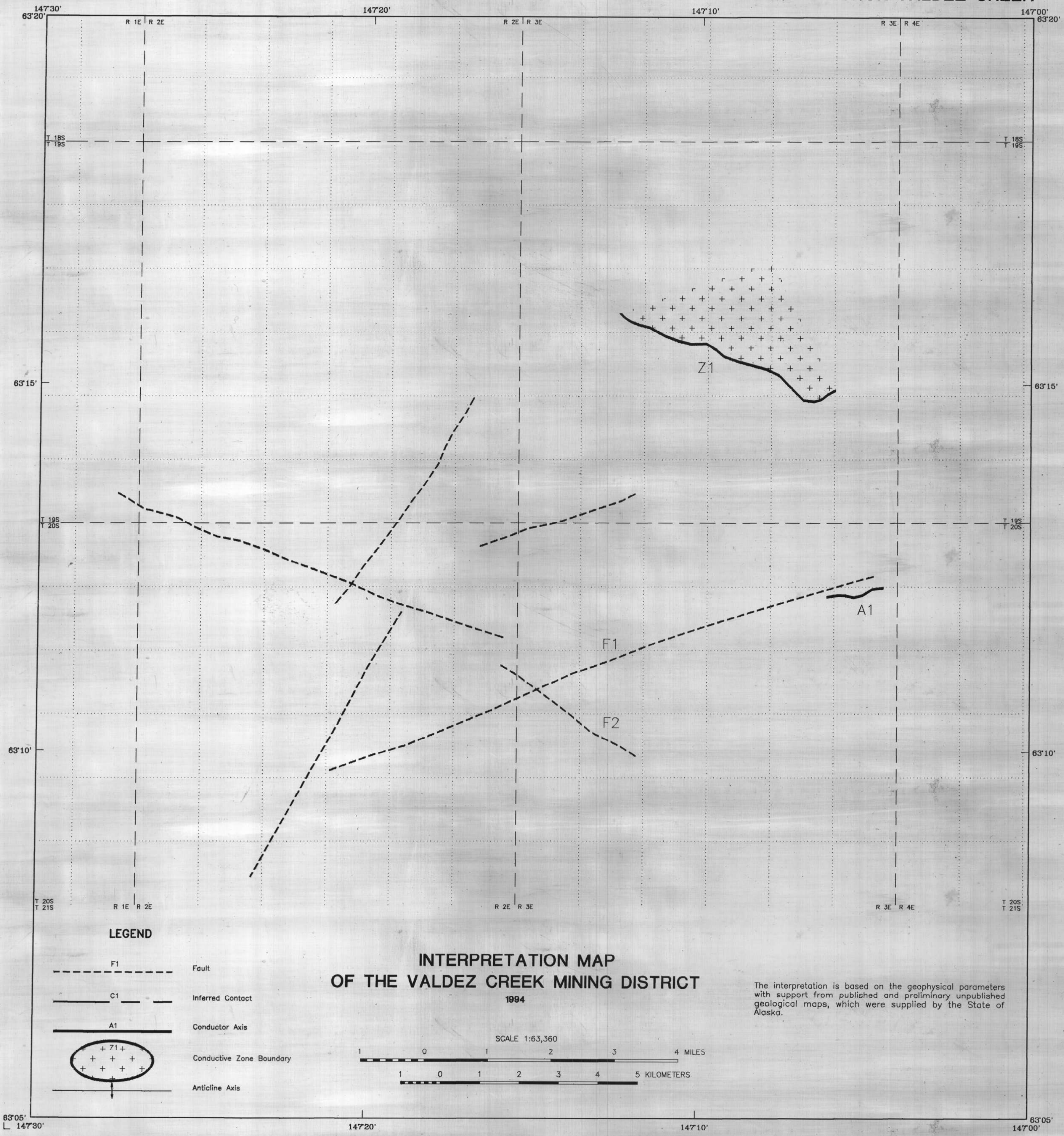
ALASKA DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

PUBLIC-DATA FILE 94-36

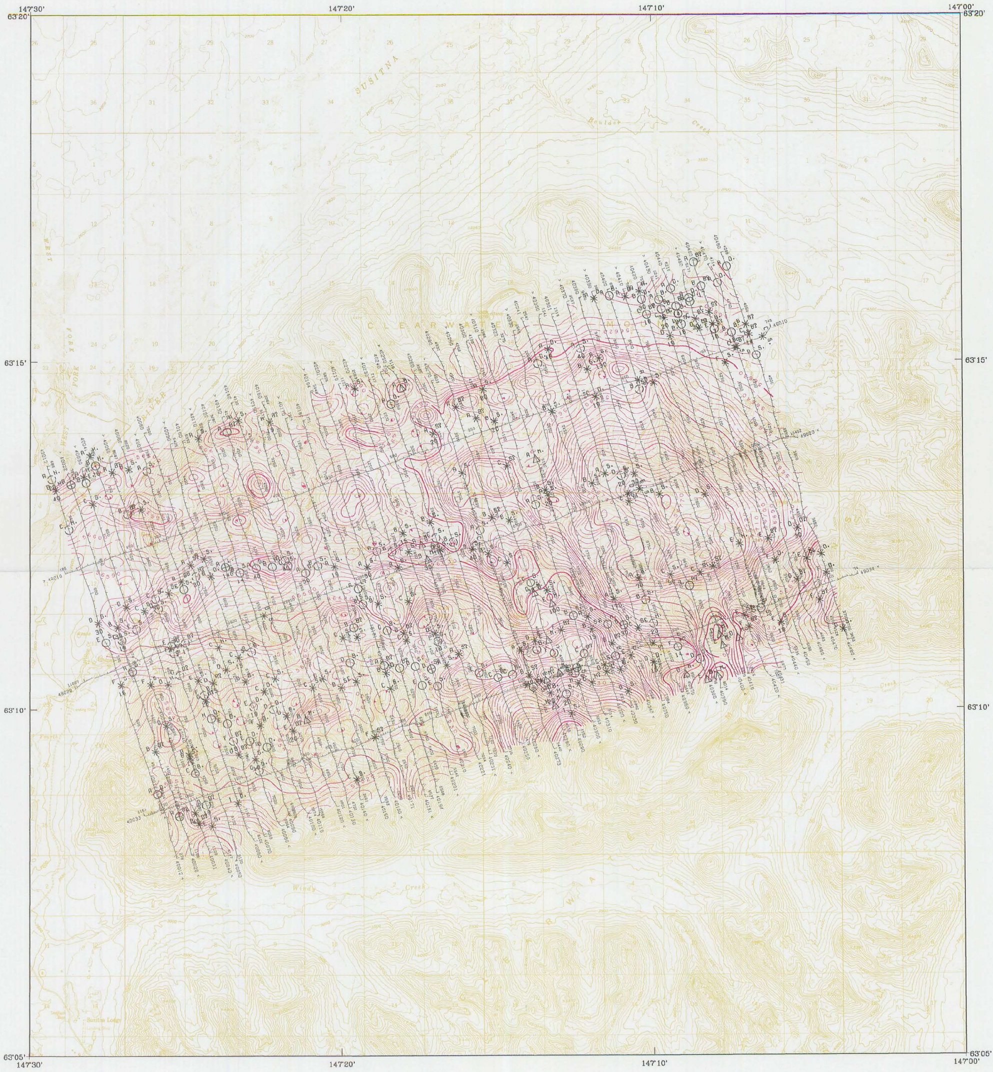
FIGURE 4-6

INTERPRETATION-VALDEZ CREEK

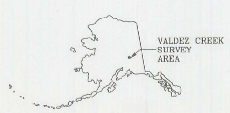


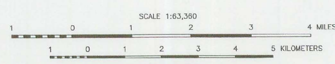
ALASKA DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

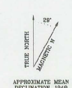
REPORT OF INVESTIGATIONS 94-4



Base from U.S. Geological Survey Healy A-1 (1949); Healy B-1 (1950); Quadrangles, Alaska







TOTAL FIELD MAGNETICS AND ELECTROMAGNETIC ANOMALIES OF THE VALDEZ CREEK MINING DISTRICT

1994

This publication, released by the Division of Geological & Geophysical Surveys, was produced and printed by Map Art in Toronto, Ontario, Canada, at a cost of $2.30 per copy. Publication is required by Alaska Statute 41, "to determine the potential of Alaskan land for production of metals, minerals, fuels, and geothermal resources; the location and supplies of ground water and construction materials; the potential geologic hazards to buildings, roads, bridges, and other installations and structures; and shall conduct such other surveys and investigations as will advance knowledge of the geology of Alaska."

DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM^{V} Electromagnetic (EM) system, a Scintrex cesium CS2 magnetometer, and a Herz VLF system installed in an AS350B-1 Squirrel helicopter. In addition, the survey recorded data from a radar altimeter, GPS navigation system, 50/60 Hz monitors and video camera. Flights were performed at a mean terrain clearance of 200 feet along 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 three miles.

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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 900 and 5000 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.

TOTAL FIELD MAGNETICS

The magnetic total field contours were produced using digitally recorded data from a Scintrex cesium CS2 magnetometer, with a sampling interval of 0.1 seconds. The magnetic data 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, 1985, updated to August, 1993) was removed from the levelled magnetic data.

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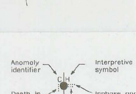
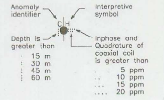
ELECTROMAGNETIC ANOMALIES

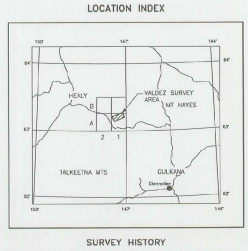


Grade	Anomaly	Conductance
7	●	>100 siemens
6	◕	50–100 siemens
5	◒	20–50 siemens
4	⊕	10–20 siemens
3	⊕	5–10 siemens
2	○	1–5 siemens
1	◌	<1 siemens
–	*	Questionable anomaly
–	△M	Weak conductivity associated with an EM magnetite response



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

LOCATION INDEX



SURVEY HISTORY

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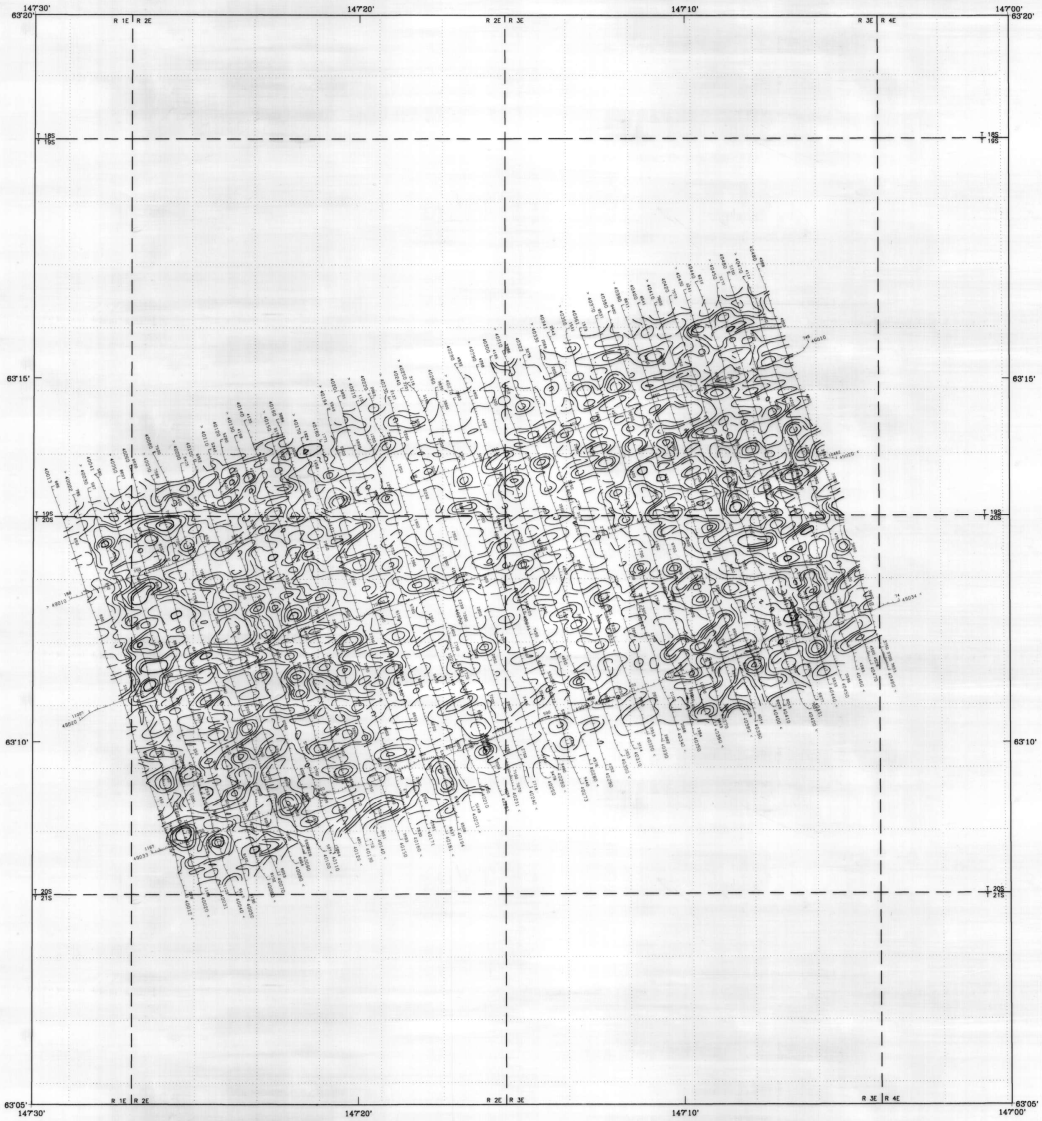
MAGNETIC CONTOUR INTERVAL

Line	Interval
heavy solid line	.... 250 nT
solid line	.... 50 nT
thin solid line	.... 10 nT
dashed line	.... 5 nT
hachured closed contour	.... magnetic low

ALASKA DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

PUBLIC-DATA FILE 94-23



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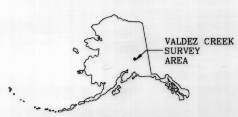

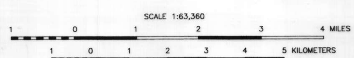

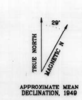

FILTERED TOTAL FIELD VLF OF THE VALDEZ CREEK MINING DISTRICT

1994

DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM^{V} Electromagnetic (EM) system, a Scintrex cesium CS2 magnetometer, and a Herz VLF system installed in an AS350B-1 Squirrel helicopter. In addition, the survey recorded data from a radar altimeter, GPS navigation system, 50/60 Hz monitors and video camera. Flights were performed at a mean terrain clearance of 200 feet along 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 three miles.

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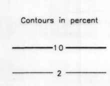
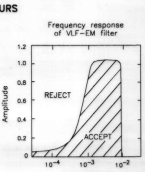
VLF CONTOURS

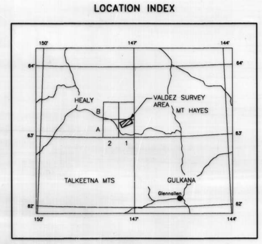


STATION

NSS Annapolis (Md.) - 21.4 kHz



LOCATION INDEX



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FILTERED VLF

The Herz Industries Totem 2A-VLF system recorded the total and vertical quadrature EM field at a sample interval of 0.1 seconds. Filtered total field data from the transmitter station at Annapolis, Maryland (NSS-21.4 kHz) were interpolated onto a regular 100 m grid using a modified Akima (1970) technique.

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