MAR 20110011: PROVOST POTASH

Provost Potash - A report on potash exploration near Provost, southeast Alberta.

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PACIFIC CANADA POTASH LTD.

2011 HELICOPTER-BORNE VTEM AND AEROMAGNETIC SURVEY ON THE PROVOST POTASH PROPERTY, EAST-CENTRAL ALBERTA

PART B

Metallic and Industrial Minerals Permits
9307010907 and 9307010908

Geographic Coordinates

52°08' N to 52°21' N
110°01' W to 110°15' W

NTS Sheets 73 D/01 and D/08

Owner and Operator:	MAIM Permits 9307010907 and 9307010908 Pacific Canada Potash Ltd. 18, 10509 - 81 Avenue Edmonton, Alberta T6E 1X7
Consultant:	Dahrouge Geological Consulting Ltd. 18, 10509 - 81 Avenue Edmonton, Alberta T6E 1X7
Author:	P. Kluczny, B.Sc., P.Geol.
Date Submitted:	June 24, 2011

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1. SUMMARY

In late May of 2011, Geotech Ltd. conducted a helicopter-borne geophysical survey over the entirety of the Provost Potash Property. The property encompasses approximately 177.81 km^2 (17,781 hectares) and is located near the town of Provost. The survey was completed to investigate groundwater potential and identify possible disturbances in the Prairie Evaporite Formation underlying the property. The survey totaled approximately 882 line kilometres and covered the entirety of the property. In addition to the survey, research was completed regarding drilling on the property, including initial permitting and discussion with drill contractors.

The airborne survey and drilling preparation were completed to expand upon previous work on the property during 2008 and 2009.

Based on the combined permit area of 17,780.72 hectares, assessment requirements of $10 per hectare, and an existing credit of $2,536.26 from "Years 1 and 2", the required expenditures to keep the entirety of the two permits in good standing are $175,270.94. The balance of expenditures are to be equally divided and assigned to future assessment periods "Years 5 and 6" for the permits.

Expenditures are allocated to MAIM Permits 9307010907 and 9307010908 as follows:

MAIM Permit	Assessment Period	Expiry Date	Required Expenditures*	Assigned Expenditures*
9307010907	Years 3 and 4	01/24/2011	$89,378.67[1]	$89,378.67
	Years 5 and 6	01/24/2013	$90,646.80	$3,478.10
9307010908	Years 3 and 4	01/24/2011	$85,892.27[2]	$85,892.27
	Years 5 and 6	01/24/2013	$87,160.40	$3,478.10
				$182,227.14

* Based on area of 9064.68 ha for 9307010907 and 8716.04 ha for 9307010908

[1] Required expenditures of $90,646.80 minus existing credit of $1,268.13

[2] Required expenditures of $87,160.40 minus existing credit of $1,268.13

2. INTRODUCTION

The helicopter-borne geophysical survey was completed by Geotech Ltd. (Geotech) of Aurora, Ontario. The purpose of the survey was two-fold. The vertical time domain electromagnetic

(VTEM) portion of survey was completed in order to identify regions with groundwater that may benefit future solution mining of the deposit. The aeromagnetic portion of the survey was completed in order to identify potential caverns in the Prairie Evaporite Formation that would impede drilling and mining operations. The survey will not be discussed in detail in this report; a detailed report from Geotech is provided as an appendix. Time was also spent preparing for drilling on the property, including permitting and discussions with drill contractors. The geophysical work described in this report was conducted in late May of 2011, after several delays with the original contractor.

3. GEOGRAPHIC SETTING

3.1 LOCATION AND ACCESS

The Provost Potash Property, which consists of MAIM Permits 9307010907 and 9307010908, is located about 250 km southeast of Edmonton, Alberta, near the Alberta - Saskatchewan border (Fig. 3.1). The property can be accessed by two major highways; Alberta Highway 13 provides excellent east-west access, while secondary highway 899 provides access to the western and southern parts of the property (Fig.'s 3.1 & 3.2). There is also a large network of municipal-maintained secondary gravel roads that provide additional year-round access to nearly every part of the property.

3.2 INFRASTRUCTURE

The infrastructure within the property is highly developed, including multiple paved highways, numerous maintained gravel roads, several railroads and a network of power, gas and various other service lines. The area is considered sparsely populated and is highly reliant on petroleum and agriculture industries. There are several villages, hamlets and towns near the property (Fig. 3.2). Provost (pop. 2,072) is the most notable town, as it is within 5 km of the property boundary and provides basic accommodation and supplies. It is the ideal choice for a base of operations for any future exploration of the property.

3.3 TOPOGRAPHY, VEGETATION AND CLIMATE

The physiography of the area is typical of the western Canadian Prairie. It is between 540 and 760 metres elevation above sea level and is located within the Western Plains physiographic region. The area is dominated by grasslands, livestock pasture lands, and agricultural croplands.

Vegetation consists primarily of prairie grasses, small bushes, and agricultural crops. Large trees and extensive forests are rare. The climate is temperate with an average temperature ranging between 17.1°C in the summer months to -16.6°C in the winter months. Annual precipitation averages between 350 and 400 mm across the property and snowfall is generally moderate to light. The field season in the area can be considered to extend year round, as drilling can be performed regardless of snowfall or precipitation. Most of the roads at the property are regularly cleared of snow during winter months.

3.4 FIELD OPERATIONS

The field portion of the survey was completed from May 26th to May 29th, 2011. The Geotech crew and equipment was based out of the airport in Provost, Alberta. The survey was flown using an Astar 350 B3 helicopter, flying at a mean altitude of 73 metres above the ground with a nominal survey speed of 80 km/hour. Details on the geophysical survey are provided in Appendix 2.

4. PROPERTY, EXPLORATION AND EXPENDITURES

4.1 MAIM PERMITS 9307010907 AND 9307010908

In early 2007, 1248630 Alberta Ltd. acquired MAIM permits 9307010907 and 9307010908, along the Alberta-Saskatchewan border, near the town of Provost, Alberta (Fig.'s 3.1 & 3.2). In early 2011, the permits were transferred to Pacific Canada Potash Ltd. The permits cover expanses of the Prairie Evaporite Formation located 1000 m or more below surface.

MAIM Permit 9307010907 covers an area of 9064.68 hectares; Permit 9307010908 covers an area of 8716.04 hectares. The total property size is 17,780.72 ha.

The entirety of MAIM permits 9307010907 and 9307010908 will be retained.

4.2 2011 EXPLORATION SUMMARY

Previous work on the Provost Potash Property has included a detailed data compilation, a literature review, analysis of petroleum well information and geophysical logs, the completion of a regional-scale 2D seismic study, and a short field visit to evaluate access within the property.

In late May of 2011, Geotech Ltd. completed a detailed helicopter-borne VTEM and aeromagnetic survey on the Provost Potash Property (Appendix 2). The survey included the following components:

Electromagnetic System: The survey utilized a helicopter-mounted Geotech Time Domain EM (VTEM^{plus}) System configuration.

Magnetometer: The survey utilized a Geometrics optically pumped cesium vapour magnetic field sensor.

Altimeter: A Terra TRA 300/TRI 40 radar altimeter was used to record terrain clearance.

Navigation System: A Geotech PC104 based navigation system utilizing a NovAtel CDGPS GPS receiver was used for navigational purposes.

Digital Acquisition System: A Geotech data acquisition system was used to record digital survey data.

Base Station: A combined magnetometer/GPS base station was utilized to normalize location and magnetic data.

The field survey crew consisted of a project manager, a data QA/QC manager, a crew chief, a system operator, a pilot, and an aircraft mechanical engineer. The office crew consisted of a preliminary data processor, a final data processor, a final data QA/QC manager and a reporter/mapper.

Details of the survey are provided in Appendix 2.

4.3 EXPLORATION EXPENDITURES

During early 2011, exploration expenditures totaled $182,227.14. The entirety of MAIM Permits 9307010907 and 9307010908 will be retained.

MAIM Permit	Assessment Period	Expiry Date	Required Expenditures*	Assigned Expenditures*
9307010907	Years 3 and 4	40566	$89,378.67[1]	$89,378.67
	Years 5 and 6	41297	$90,646.80	$3,478.10
9307010908	Years 3 and 4	40566	$85,892.27[2]	$85,892.27
	Years 5 and 6	41297	$87,160.40	$3,478.10
				$182,227.14

* Based on area of 9064.68 ha for 9307010907 and 8716.04 ha for 9307010908

[1] Required expenditures of $90,646.80 minus existing credit of $1,268.13

[2] Required expenditures of $87,160.40 minus existing credit of $1,268.13

5. GEOLOGY

5.1 REGIONAL GEOLOGY

The Provost Potash Property is located within the Western Canada Sedimentary Basin (WCSB), a vast sedimentary basin extending from the southeast corner of Yukon to southern Manitoba, and into the northern United States. Sedimentation within the basin occurred from the Paleozoic to the Cenozoic. The Paleozoic sedimentary succession is comprised of shelf-facies, clastic and carbonate rocks resting unconformably on Precambrian crystalline basement. The lower to middle Devonian Elk Point Group, which includes carbonates, evaporites, redbeds, and clastics, unconformably overlies either lower Paleozoic or Precambrian basement rocks. Within the Elk Point Group, the middle Devonian Prairie Evaporite Formation includes near flat-lying sequences of interbedded halite, sylvite, carnallite, and clay, with minor anhydrite and dolomite that can be traced from east-central Alberta to Manitoba, south to Montana and North Dakota.

Potash in eastern Alberta and western Saskatchewan occurs in the Devonian Prairie Evaporite Formation, the uppermost unit in the Elk Point Group of the Western Canada Sedimentary Basin (Table 5.1). The potash usually occurs in the upper 60 m of the formation (Holter, 1969) in four distinct members, separated by salt beds and up to 7 metres thick. The individual beds have not yet been identified in Alberta; in Saskatchewan they are known as, from youngest to oldest, the Patience Lake, Belle Plaine, White Bear and Esterhazy members (Fuzesy, 1982).

5.2 LOCAL GEOLOGY

The property is directly underlain by thin quaternary glacial deposits, which directly overlie Upper Cretaceous sediments. The geologic unit of interest, the Devonian Prairie Evaporite Formation, ranges in depth from approximately 1,200 to 1,400 metres below surface and does not outcrop at or near the Provost Property. A total of three drill holes completed for oil and gas exploration have penetrated the Devonian Prairie Evaporite Formation either within the boundaries of the property, or within a few kilometres thereof. As these wells do not appear to have been analyzed for potash, there is no direct evidence of potash mineralization underlying the property. Further information regarding these historic wells is provided in Dahrouge and Kluczny (2009) and will not be repeated herein.

TABLE 5.1: STRATIGRAPHIC NOMENCLATURE.

Period	Group/Formation
Cretaceous	Colorado Group Mannville Group: Upper Mannville; Undifferentiated Channel Sandstones; Clearwater; Lower Mannville; Wabiskaw/Cummings; Ellerslie/Basal Quartz
Mississippian	Erosional Unconformity Banff Exshaw
Devonian	Wabamun Group Winterburn Group: Graminia; Nisku Woodbend Group: Ireton; Leduc; Duvenay; Cooking Lake Beaverhill Lake Group: Waterways Elk Point Group: Prairie Evaporite; Keg River/Winnipegosis; Ashern
Ordovician	Red River Winnipeg Group
Cambrian	Deadwood Basal Sandstone
Precambrian	

6. RESULTS

The VTEM and aeromagnetic survey completed by Geotech Ltd. has provided valuable information that will affect future development of the project. Based on research of other potash projects, it was determined that VTEM surveys are useful in establishing the location of groundwater zones (useful for solution mining), whereas aeromagnetic surveys can help identify disturbances, such as caverns, in the Prairie Evaporite Formation. The identification of these disturbances is important to future exploration and development, as they could negatively impact drilling and mining activities. Several large VTEM anomalies and a number of small magnetic anomalies were identified in the survey, although further interpretation is required before a conclusive model can be presented. Details on the methods and results of the survey are provided in Appendix 2.

During the survey, time was also spent identifying potential drill sites, initiating permitting, and contacting drill contractors.

7. CONCLUSIONS

Several VTEM anomalies were identified on the property, which may represent zones of groundwater that could be used for future solution mining of the deposit. Further interpretation of the results by a qualified geophysicist with potash experience is required. Magnetic anomalies were also identified, which may indicate some disturbances (such as caverns) in the Prairie Evaporite Formation underlying the property. As with the VTEM anomalies, these results should be further interpreted by a qualified and experienced geophysicist.

Potential drill sites have been identified on the property, and permitting has begun. Several drill contractors have been contacted about drilling the property later this year.

In addition to further interpretation of the results from the VTEM/aeromagnetic survey, the next phase of exploration should consist of drilling 2-3 holes, each 1700 metres deep, to test the thickness and quality of potentially potash-bearing strata. The entirety of the Prairie Evaporite Formation should be cored and sampled, as well as surveyed by downhole geophysical methods such as gamma ray and neutron. The holes should be located in areas identified by the 2D Seismic Study as being underlain by relatively undisturbed and flat-lying strata, and should heed any recommendations from further interpretation of the aeromagnetic data.

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Saskatchewan Department of Mineral Resources (1965) Potash in Saskatchewan; 18 p.

9. STATEMENT OF QUALIFICATIONS

I, Patrick Kluczny, residing at 14815 - 39 Ave., Edmonton, Alberta, do hereby certify that:

- I am a geologist of Dahrouge Geological Consulting Ltd., Suite 18, 10509 - 81 Ave., Edmonton, Alberta, T6E 1X7.
- I am a 2006 graduate of the University of Alberta, Edmonton, Alberta with a B.Sc. in Geology.
- I have practiced my profession as a geologist continuously since 2006.
- I am a registered Professional Geologist with the Association of Professional Engineers, Geologists and Geophysicists of Alberta, member M81985.
- I hereby consent to the copying or reproduction of this Assessment Report following the one-year confidentiality period.
- I am the author of the report entitled "2011 Helicopter-borne VTEM and Aeromagnetic Survey on the Provost Potash Property, East-Central Alberta" and accept responsibility for the veracity of technical data and results.

Dated this 24th day of June, 2011

Patrick Kluczny, B.Sc., P.Geol.

APEGGA M81985

APPENDIX 1: COST STATEMENT FOR THE 2011 EXPLORATION OF THE PROVOST POTASH PROJECT

a) Personnel	$	15,865.05
b) Food and Accommodation		-
c) Transportation		-
d) Instrument and Software Rental(s)	$	264.00
e) Geophysical	$	149,290.24
f) Analyses		-
h) Other	$	241.75
Total	$	165,661.04
Administration (10%)	$	16,566.10
Total + Administration	**$**	**182,227.14**

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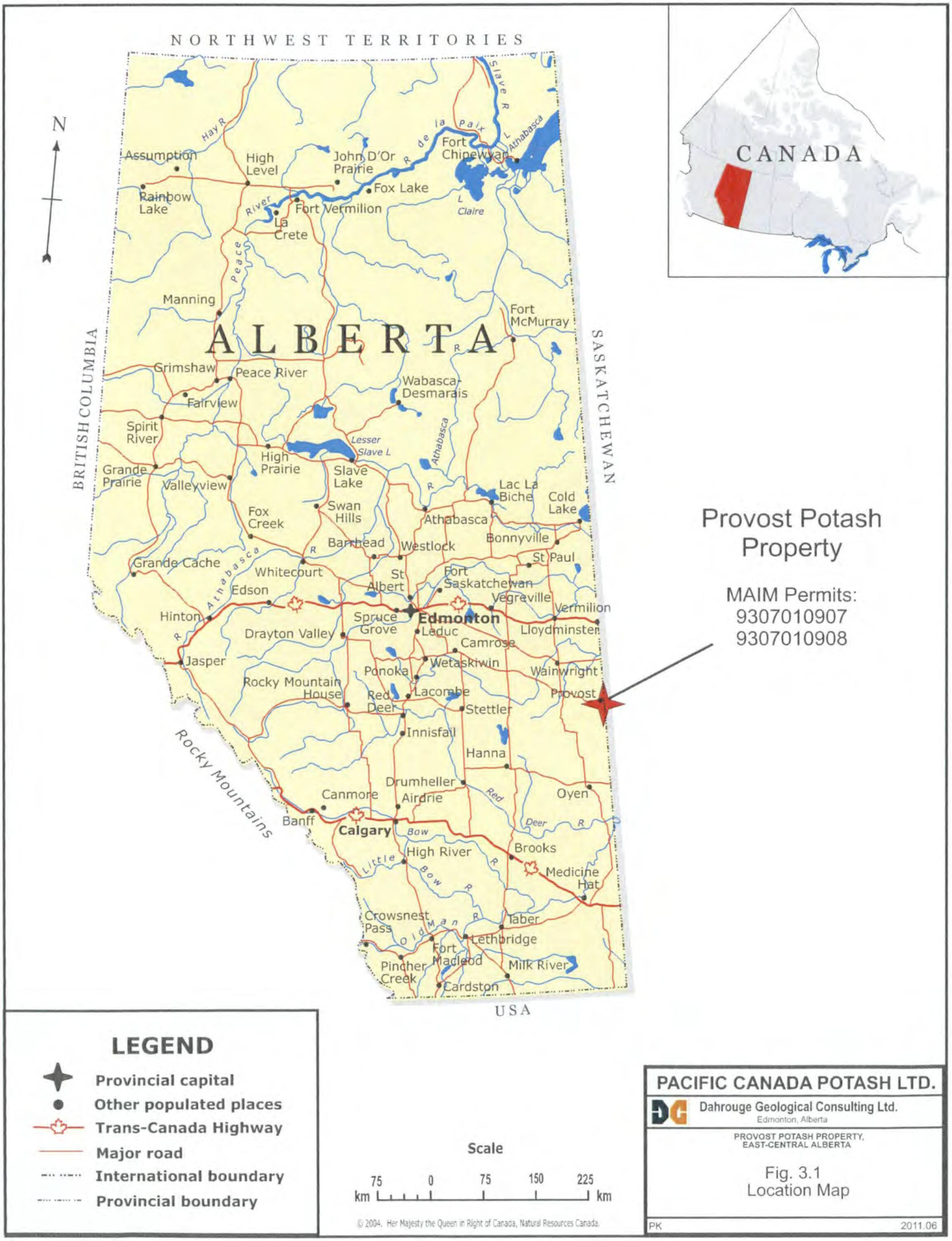
NORTHWEST TERRITORIES
BRITISH COLUMBIA
SASKATCHEWAN
USA
ALBERTA
CANADA
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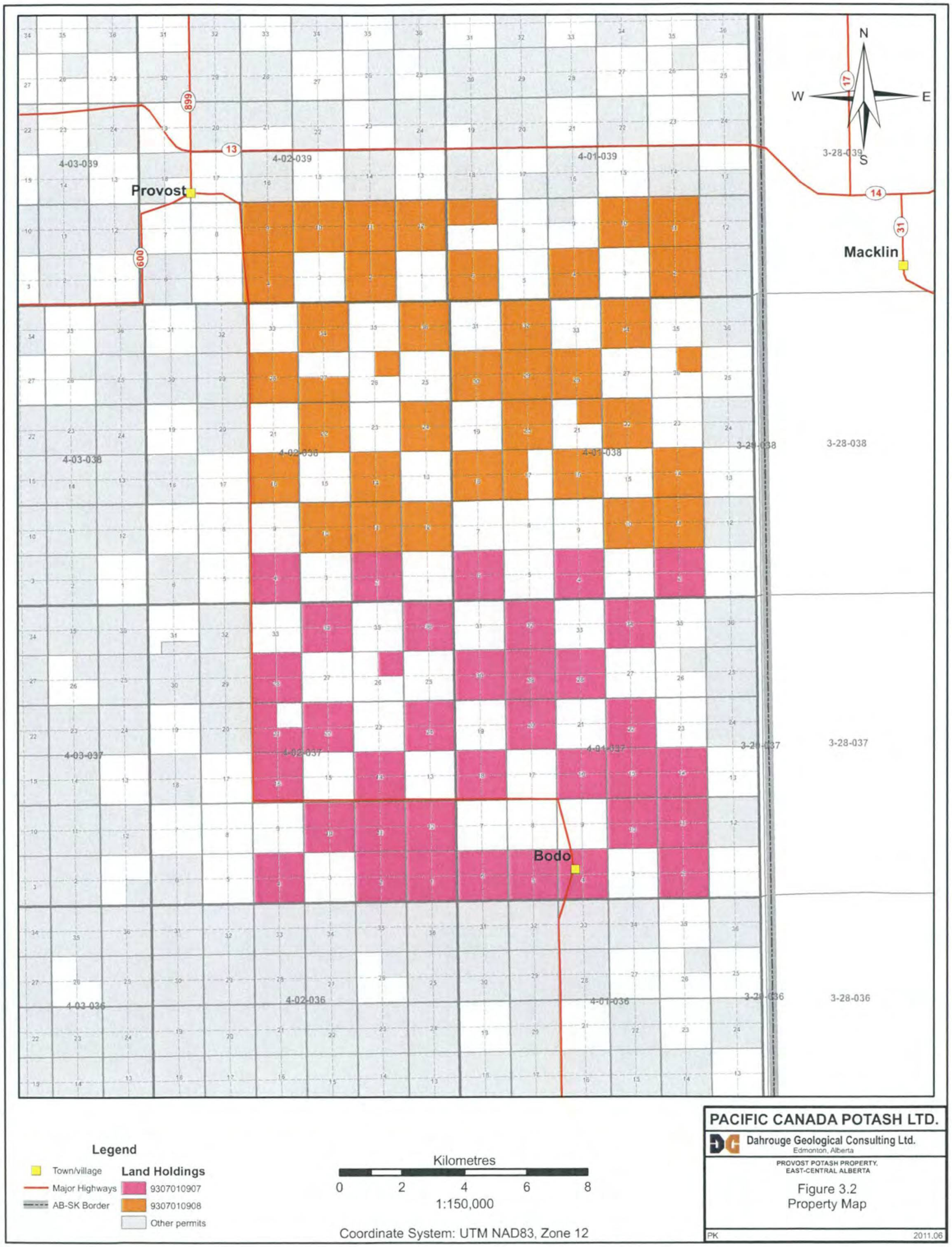
Rocky Mountains
Assumption
High Level
John D'Or Prairie
Fort Chipewyan
Fox Lake
Rainbow Lake
Fort Vermilion
La Crete
L Claire
Manning
Fort McMurray
Grimshaw
Peace River
Fairview
Wabasca-Desmarais
Spirit River
High Prairie
Lesser Slave L
Grande Prairie
Valleyview
Slave Lake
Lac La Biche
Cold Lake
Fox Creek
Swan Hills
Athabasca
Barrhead
Westlock
Bonnyville
St Paul
Grande Cache
Whitecourt
St Albert
Fort Saskatchewan
Edson
Vegreville
Vermilion
Hinton
Spruce Grove
Edmonton
Lloydminster
Drayton Valley
Leduc
Camrose
Jasper
Wetaskiwin
Ponoka
Wainwright
Rocky Mountain House
Red Deer
Lacombe
Provost
Stettler
Innisfail
Hanna
Drumheller
Canmore
Airdrie
Oyen
Banff
Calgary
Brooks
High River
Medicine Hat
Crowsnest Pass
Taber
Lethbridge
Fort Macleod
Pincher Creek
Milk River
Cardston
Provost Potash Property
MAIM Permits:
9307010907
9307010908
LEGEND
Provincial capital
Other populated places
Trans-Canada Highway
Major road
International boundary
Provincial boundary
Scale
75 0 75 150 225
km km
© 2004. Her Majesty the Queen in Right of Canada, Natural Resources Canada.
PACIFIC CANADA POTASH LTD.
Dahrouge Geological Consulting Ltd.
Edmonton, Alberta
PROVOST POTASH PROPERTY,
EAST-CENTRAL ALBERTA
Fig. 3.1
Location Map
PK
2011.06



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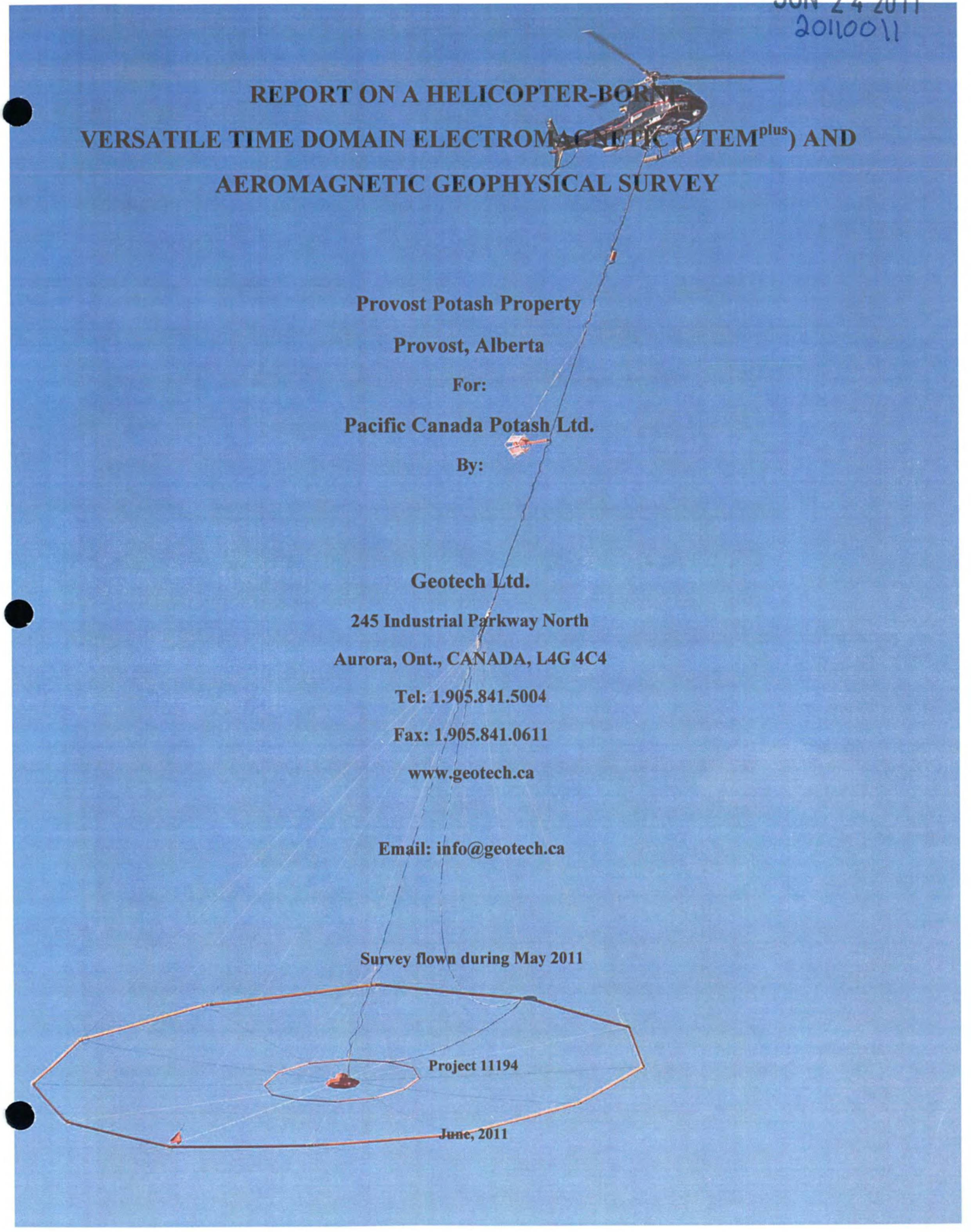
Dahrouge Geological Consulting Ltd.
Edmonton, Alberta

PROVOST POTASH PROPERTY, EAST-CENTRAL ALBERTA

Figure 3.2
Property Map

PK 2011.06



REPORT ON A HELICOPTER-BORNE VERSATILE TIME DOMAIN ELECTROMAGNETIC (VTEM^{plus}) AND AEROMAGNETIC GEOPHYSICAL SURVEY

Provost Potash Property

Provost, Alberta

For:

Pacific Canada Potash Ltd.

By:

Geotech Ltd.

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Survey flown during May 2011

Project 11194

June, 2011

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REPORT ON A HELICOPTER-BORNE VERSATILE TIME DOMAIN ELECTROMAGNETIC (VTEM^{plus}) and AEROMAGNETIC SURVEY

Provost Potash Property
Provost, Alberta

Executive Summary

During May 26th to May 30th, 2011 Geotech Ltd. carried out a helicopter-borne geophysical survey over the Provost Potash Property situated approximately 2 kilometres southeast of Provost, Alberta, Canada.

Principal geophysical sensors included a versatile time domain electromagnetic (VTEM^{plus}) system, and a cesium magnetometer. Ancillary equipment included a GPS navigation system and a radar altimeter. A total of 882 line-kilometres of geophysical data were acquired during the survey.

In-field data quality assurance and preliminary processing were carried out on a daily basis during the acquisition phase. Preliminary and final data processing, including generation of final digital data and map products were undertaken from the office of Geotech Ltd. in Aurora, Ontario.

The processed survey results are presented as the following maps:

- Total Magnetic Intensity
- B-Field Z Component Channel
- Calculated Time Constant (TAU)
- Electromagnetic stacked profiles of the B-field Z component
- Electromagnetic stacked profiles of the dB/dt Z component

Digital data includes all electromagnetic and magnetic products, plus ancillary data including the waveform.

The survey report describes the procedures for data acquisition, processing, final image presentation and the specifications for the digital data set.

1. INTRODUCTION

1.1 General Considerations

Geotech Ltd. performed a helicopter-borne geophysical survey over the Provost Potash Property located approximately 2 kilometres southeast of Provost, Alberta, Canada (Figure 1 & 2).

Patrick Kluczny represented Pacific Canada Potash Ltd. during the data acquisition and data processing phases of this project.

The geophysical surveys consisted of helicopter borne EM using the versatile time-domain electromagnetic (VTEM^{plus}) system with Z and X component measurements and aeromagnetics using a cesium magnetometer. A total of 882 line-km of geophysical data were acquired during the survey.

The crew was based out of Provost, Alberta (Figure 2) for the acquisition phase of the survey. Survey flying started on May 26th, 2011 and was completed on May 30th, 2011.

Data quality control and quality assurance, and preliminary data processing were carried out on a daily basis during the acquisition phase of the project. Final data processing followed immediately after the end of the survey. Final reporting, data presentation and archiving were completed from the Aurora office of Geotech Ltd. in June, 2011.

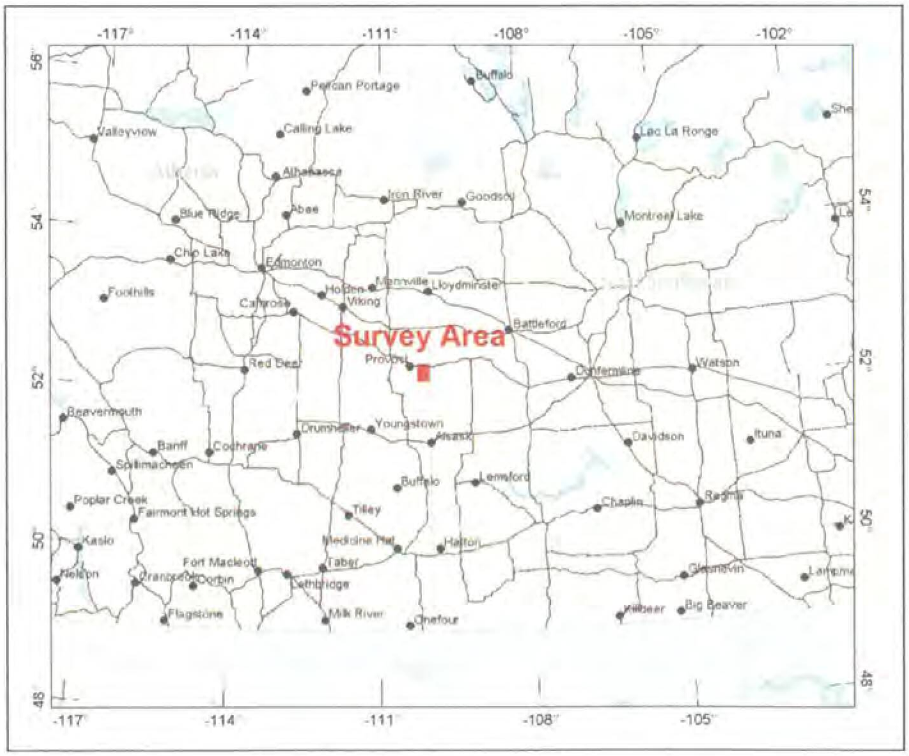


Figure 1 - Property Location

1.2 Survey and System Specifications

The survey area is located approximately 2 kilometres southeast of Provost, Alberta (Figure 2).

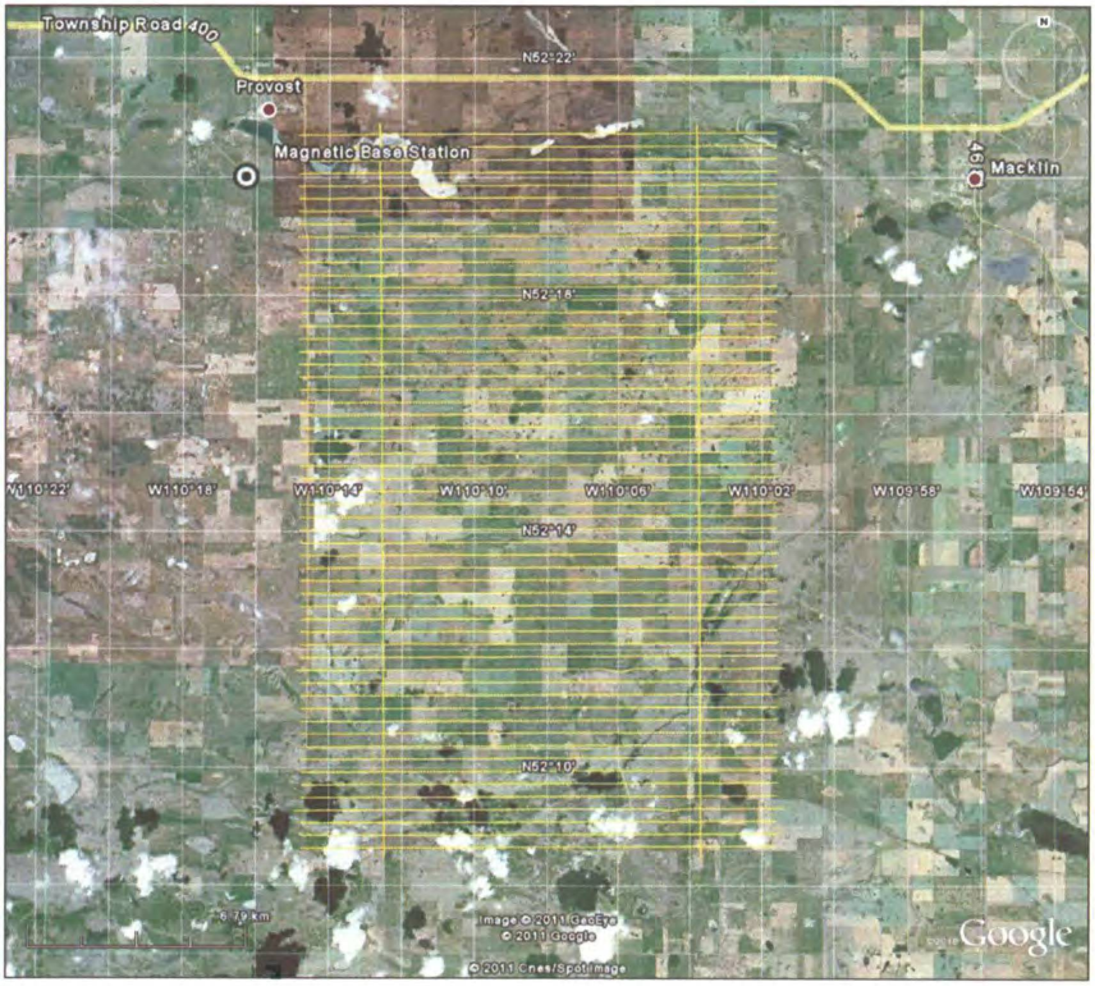


Figure 2 – Survey area location on Google Earth

The block was flown in an east to west (N 89° E azimuth) direction with traverse line spacing's of 400 metres as depicted in Figure 3. Tie lines were flown perpendicular to the traverse lines at a spacing of 10000 metres (N 179° E azimuth). For more detailed information on the flight spacing and direction see Table 1.

1.3 Topographic Relief and Cultural Features

Topographically, the block exhibits a shallow relief with elevations ranging from 648 to 749 metres above mean sea level over an area of 346 square kilometres (Figure 3).The survey area has various rivers and streams running through which connect various lakes and wetlands. Cultural features such as roads, buildings, and pipelines are also found throughout the survey area. Special care is recommended in identifying any potential cultural features from other sources that might be recorded in the data. The survey block is covered by numerous Alberta mining claims, which are shown in Appendix A, and are plotted on all maps. The survey area is covered by NTS (National Topographic Survey) of Canada sheets 073D08 and 073D01.

Figure 3 – Flight path over a Google Earth Image

2. DATA ACQUISITION

2.1 Survey Area

The survey block (see Figure 3 and Appendix A) and general flight specifications are as follows:

Table 1 - Survey Specifications

Survey block	Traverse Line spacing (m)	Area (Km^2)	Planned[1] Line-km	Actual Line-km	Flight direction	Line numbers
Provost Potash	Traverse: 400	346	882	907.5	N89° E / N 269° E	L1000-L1560
	Tie: 10000				N 179° E / N 359° E	T2000-T2010
TOTAL		346	882	907.5		

Survey block boundaries co-ordinates are provided in Appendix B.

2.2 Survey Operations

Survey operations were based out of Provost, Alberta from May 26th to May 30th, 2011. The following table shows the timing of the flying.

Table 2 - Survey schedule

Date	Flight #	Block	Crew location	Comments
26-May-11			Provost, AB	System assembly
27-May-11			Provost, AB	Testing completed
28-May-11	1,2		Provost, AB	177km flown
29-May-11	3,4,5		Provost, AB	425km flown
30-May-11	6,7		Provost, AB	280km flown – flying is complete

[1] Note: Actual Line kilometres represent the total line kilometres in the final database. These line-km normally exceed the Planned line-km, as indicated in the survey NAV files.

2.3 Flight Specifications

During the survey the helicopter was maintained at a mean altitude of 73 metres above the ground with a nominal survey speed of 80 km/hour. This allowed for a nominal EM bird terrain clearance of 38 metres and a magnetic sensor clearance of 60 metres.

The on board operator was responsible for monitoring the system integrity. He also maintained a detailed flight log during the survey, tracking the times of the flight as well as any unusual geophysical or topographic features.

On return of the aircrew to the base camp the survey data was transferred from a compact flash card (PCMCIA) to the data processing computer. The data were then uploaded via ftp to the Geotech office in Aurora for daily quality assurance and quality control by qualified personnel.

2.4 Aircraft and Equipment

2.4.1 Survey Aircraft

The survey was flown using a Eurocopter Aerospatiale (Astar) 350 B3 helicopter, registration C-GEOJ. The helicopter is owned and operated by Geotech Aviation. Installation of the geophysical and ancillary equipment was carried out by a Geotech Ltd crew.

2.4.2 Electromagnetic System

The electromagnetic system was a Geotech Time Domain EM (VTEM) system. The configuration is as indicated in Figure 4.

The VTEM Receiver and transmitter coils were in concentric-coplanar and Z-direction oriented configuration. The receiver system for the project also included a coincident-coaxial X-direction coil to measure the in-line dB/dt and calculate B-Field responses. The EM bird was towed at a mean distance of 35 metres below the aircraft as shown in Figure 4 and Figure 6. The receiver decay recording scheme is shown in Figure 5.

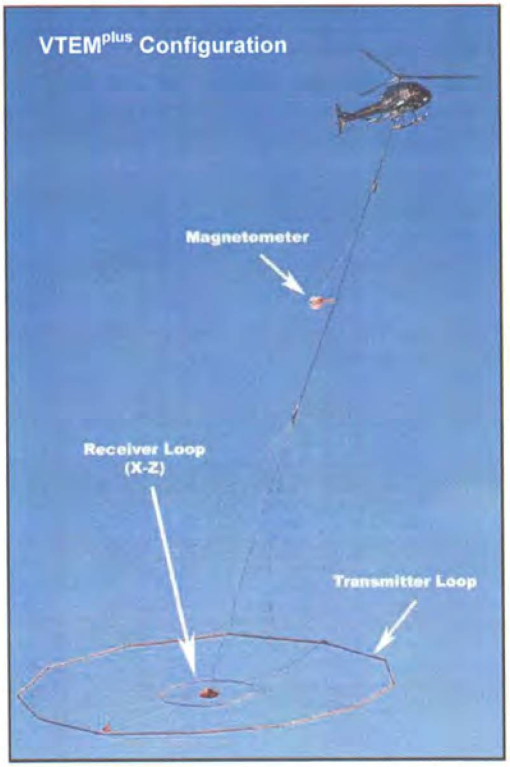


Figure 4 - VTEM^{plus} Configuration, with magnetometer.

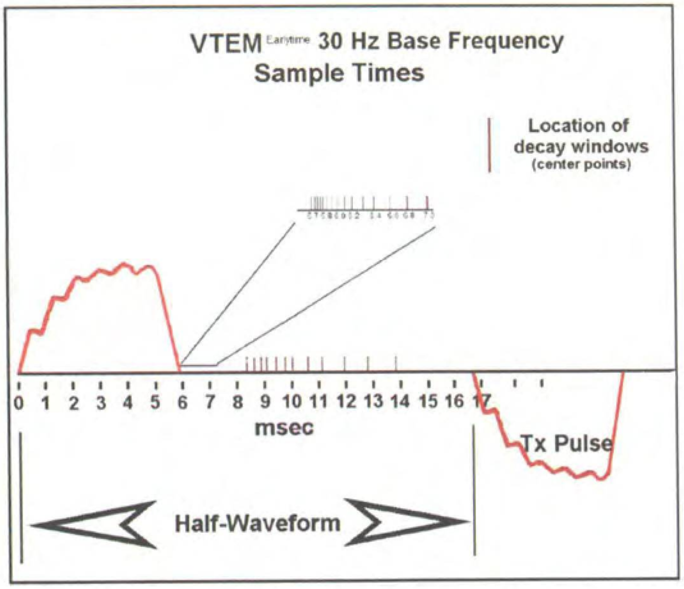


Figure 5 - VTEM^{plus} Waveform & Sample Times

The VTEM decay sampling scheme is shown in Table 3 below. Thirty-two time measurement gates were used for the final data processing in the range from 96 to 7036 μ sec.

Table 3 - Decay Sampling Scheme

VTEM Decay Sampling Scheme				
Index	**Middle**	**Start**	**End**	**Window**
	Microseconds			
14	96	90	103	13
15	110	103	118	15
16	126	118	136	18
17	145	136	156	20
18	167	156	179	23
19	192	179	206	27
20	220	206	236	30
21	253	236	271	35
22	290	271	312	40
23	333	312	358	46
24	383	358	411	53
25	440	411	472	61
26	505	472	543	70
27	580	543	623	81
28	667	623	716	93
29	766	716	823	107
30	880	823	945	122
31	1,010	945	1,086	141
32	1,161	1,086	1,247	161
33	1,333	1,247	1,432	185
34	1,531	1,432	1,646	214
35	1,760	1,646	1,891	245
36	2,021	1,891	2,172	281
37	2,323	2,172	2,495	323
38	2,667	2,495	2,865	370
39	3,063	2,865	3,292	427
40	3,521	3,292	3,781	490
41	4,042	3,781	4,341	560
42	4,641	4,341	4,987	646
43	5,333	4,987	5,729	742
44	6,125	5,729	6,581	852
45	7,036	6,581	7,560	979

VTEM system parameters:

Transmitter Section

- Transmitter coil diameter: 26 m
- Number of turns: 4
- Transmitter base frequency: 30 Hz
- Peak current: 215.3 A
- Pulse width: 4.43 ms
- Duty cycle: 27 %
- Wave form shape: trapezoid
- Peak dipole moment: 524, 542 nIA
- Nominal EM Bird terrain clearance: 38 metres above the ground
- Effective coil area: 2123 m^2

Receiver Section

X-Coil

- X Coil diameter: 0.32 m
- Number of turns: 245
- Effective coil area: 19.69 m^2

Z-Coil

- Z-Coil coil diameter: 1.2 m
- Number of turns: 100
- Effective coil area: 113.04 m^2

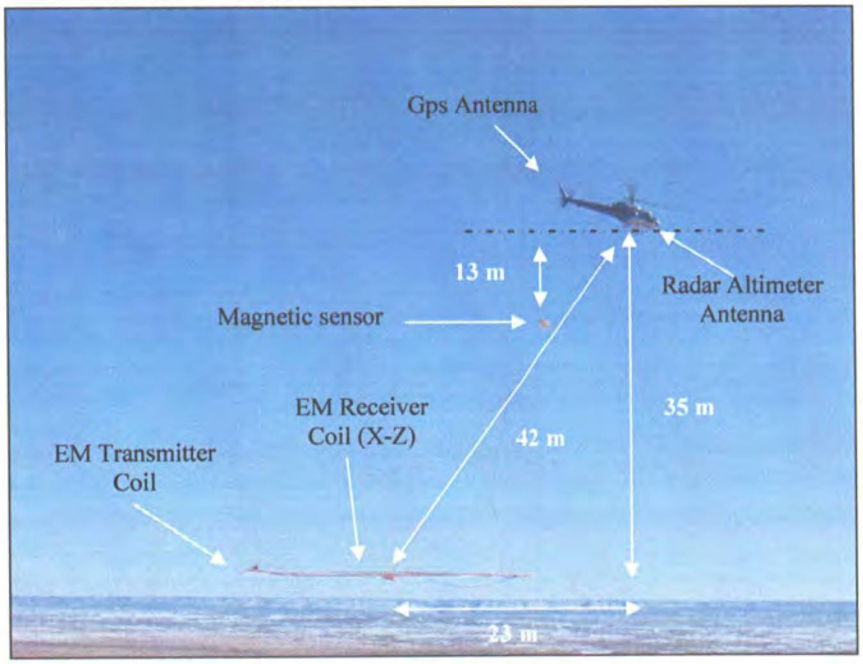


Figure 6 - VTEM^{plus} System Configuration

2.4.3 Airborne magnetometer

The magnetic sensor utilized for the survey was Geometrics optically pumped cesium vapour magnetic field sensor mounted 13 metres below the helicopter, as shown in Figure 6. The sensitivity of the magnetic sensor is 0.02 nanoTesla (nT) at a sampling interval of 0.1 seconds.

2.4.4 Radar Altimeter

A Terra TRA 3000/TRI 40 radar altimeter was used to record terrain clearance. The antenna was mounted beneath the bubble of the helicopter cockpit (Figure 6).

2.4.5 GPS Navigation System

The navigation system used was a Geotech PC104 based navigation system utilizing a NovAtel's CDGPS (Canada-Wide Differential Global Positioning System Correction Service) enable OEM4-G2-3151W GPS receiver, Geotech navigate software, a full screen display with controls in front of the pilot to direct the flight and an NovAtel GPS antenna mounted on the helicopter tail (Figure 6). As many as 11 GPS and two CDGPS satellites may be monitored at any one time. The positional accuracy or circular error probability (CEP) is 1.8 m, with CDGPS active, it is 1.0 m. The co-ordinates of the block were set-up prior to the survey and the information was fed into the airborne navigation system.

2.4.6 Digital Acquisition System

A Geotech data acquisition system recorded the digital survey data on an internal compact flash card. Data is displayed on an LCD screen as traces to allow the operator to monitor the integrity of the system. The data type and sampling interval as provided in Table 4.

Table 4 - Acquisition Sampling Rates

DATA TYPE	SAMPLING
TDEM	0.1 sec
Magnetometer	0.1 sec
GPS Position	0.2 sec
Radar Altimeter	0.2 sec

2.5 Base Station

A combined magnetometer/GPS base station was utilized on this project. A Geometrics Cesium vapour magnetometer was used as a magnetic sensor with a sensitivity of 0.001 nT. The base station was recording the magnetic field together with the GPS time at 1 Hz on a base station computer.

The base station magnetometer sensor was installed off of the runway at the Provost airport (52° 20'2.44" N, 110° 16' 15.39" W); away from electric transmission lines and moving ferrous objects such as motor vehicles. The base station data were backed-up to the data processing computer at the end of each survey day.

3. PERSONNEL

The following Geotech Ltd. personnel were involved in the project.

Field:

Project Manager:	Darren Tuck (office)
Data QA/QC:	Emilio Schein (office)
Crew chief:	Yves Larouche
System Operator:	Sam McNeil

The survey pilot and the mechanical engineer were employed directly by the helicopter operator – Geotech Aviation.

Pilot:	Alex Para
Aircraft Mechanical Engineer:	N/A

Office:

Preliminary Data Processing:	Emilio Schein
Final Data Processing:	Timothy Eadie
Final Data QA/QC:	Timothy Eadie
Reporting/Mapping:	Kyle Orlowski

Data acquisition phase was carried out under the supervision of Andrei Bagrianski, P. Geo, Chief Operating Officer. Processing phase was carried out under the supervision of Alex Prikhodko, P. Geo. The customer relations were looked after by Paolo Berardelli.

4. DATA PROCESSING AND PRESENTATION

Data compilation and processing were carried out by the application of Geosoft OASIS Montaj and programs proprietary to Geotech Ltd.

4.1 Flight Path

The flight path, recorded by the acquisition program as WGS 84 latitude/longitude, was converted into the NAD 83 Datum, UTM Zone 12 North coordinate system in Oasis Montaj.

The flight path was drawn using linear interpolation between x, y positions from the navigation system. Positions are updated every second and expressed as UTM easting's (x) and UTM northing's (y).

4.2 Electromagnetic Data

A three stage digital filtering process was used to reject major sferic events and to reduce system noise. Local sferic activity can produce sharp, large amplitude events that cannot be removed by conventional filtering procedures. Smoothing or stacking will reduce their amplitude but leave a broader residual response that can be confused with geological phenomena. To avoid this possibility, a computer algorithm searches out and rejects the major sferic events.

The signal to noise ratio was further improved by the application of a low pass linear digital filter. This filter has zero phase shift which prevents any lag or peak displacement from occurring, and it suppresses only variations with a wavelength less than about 1 second or 15 metres. This filter is a symmetrical 1 sec linear filter.

The results are presented as stacked profiles of EM voltages for the time gates, in linear - logarithmic scale for the B-field Z component and dB/dt responses in the Z and X components. B-field Z component time channel recorded at 0.505 milliseconds after the termination of the impulse is also presented as contour colour images. Calculated Time Constant (TAU) with anomaly contours of Calculated Vertical Derivative of TMI is presented in Appendix D and F. Tau was calculated using noise level of 0.032 for B-Field and 0.026 for dB/dt. Resistivity Depth Image (RDI) is also presented in Appendix D and G.

VTEM has two receiver coil orientations. Z-axis coil is oriented parallel to the transmitter coil axis and both are horizontal to the ground. The X-axis coil is oriented parallel to the ground and along the line-of-flight. This combined two coil configuration provides information on the position, depth, dip and thickness of a conductor. Generalized modeling results of VTEM data, are shown in Appendix E.

In general X-component data produce cross-over type anomalies: from "+ to – "in flight direction of flight for "thin" subvertical targets and from "- to +" in direction of flight for "thick" targets. Z component data produce double peak type anomalies for "thin" subvertical targets and single peak for "thick" targets.

The limits and change-over of "thin-thick" depends on dimensions of a TEM system. For example, for VTEM-26 the border corresponds to diameter of the system (Appendix E, Fig.E-16).

Graphical representations of the VTEM transmitter input current and the output voltage of the receiver coil are shown in Appendix C.

4.3 Magnetic Data

The processing of the magnetic data involved the correction for diurnal variations by using the digitally recorded ground base station magnetic values. The base station magnetometer data was edited and merged into the Geosoft GDB database on a daily basis. The aeromagnetic data was corrected for diurnal variations by subtracting the observed magnetic base station deviations.

Tie line levelling was carried out by adjusting intersection points along traverse lines. A micro-levelling procedure was applied to remove persistent low-amplitude components of flight-line noise remaining in the data.

The corrected magnetic data was interpolated between survey lines using a random point gridding method to yield x-y grid values for a standard grid cell size of approximately 100 metres at the mapping scale. The Minimum Curvature algorithm was used to interpolate values onto a rectangular regular spaced grid.

5. DELIVERABLES

5.1 Survey Report

The survey report describes the data acquisition, processing, and final presentation of the survey results. The survey report is provided in two paper copies and digitally in PDF format.

5.2 Maps

Final maps were produced at scale of 1:20,000 for best representation of the survey size and line spacing. The coordinate/projection system used was NAD83 Datum, UTM Zone 12 North. All maps show the mining claims, flight path trace and topographic data; latitude and longitude are also noted on maps.

The preliminary and final results of the survey are presented as EM profiles, a late-time gate gridded EM channel, and a color magnetic TMI contour map. The following maps are presented on paper;

- VTEM dB/dt profiles Z Component, Time Gates 0.220 – 7.036 ms in linear – logarithmic scale.
- VTEM B-Field profiles Z Component, Time Gates 0.220 – 7.036 ms in linear – logarithmic scale.
- VTEM B-field late time Z Component Channel 26, Time Gate 0.505 ms colour image.
- Total Magnetic Intensity (TMI) colour image and contours.
- VTEM dB/dt Calculated Time Constant (TAU) with contours of anomaly areas of the Calculated Vertical Derivative of TMI

5.3 Digital Data

- Two copies of the data and maps on DVD were prepared to accompany the report. Each DVD contains a digital file of the line data in GDB Geosoft Montaj format as well as the maps in Geosoft Montaj Map and PDF format.

- DVD structure.

Data	contains databases, grids and maps, as described below.
Report	contains a copy of the report and appendices in PDF format.

Databases in Geosoft GDB format, containing the channels listed in Table 5.

Table 5 - Geosoft GDB Data Format

Channel name	Units	Description
X:	metres	UTM Easting NAD83 Zone 12 North
Y:	metres	UTM Northing NAD83 Zone 12 North
Z:	metres	GPS antenna elevation (above Geoid)
Longitude:	Decimal Degrees	NAD83 Longitude data
Latitude:	Decimal Degrees	NAD83 Latitude data
Radar:	metres	helicopter terrain clearance from radar altimeter
Radarb:	metres	Calculated EM bird terrain clearance from radar altimeter
DEM:	metres	Digital Elevation Model
Gtime:	Seconds of the day	GPS time
Mag1:	nT	Raw Total Magnetic field data
Basemag:	nT	Magnetic diurnal variation data
Mag2:	nT	Diurnal corrected Total Magnetic field data
Mag3:	nT	Levelled Total Magnetic field data
SFz[14]:	$pV/(A*m^4)$	Z dB/dt 96 microsecond time channel
SFz[15]:	$pV/(A*m^4)$	Z dB/dt 110 microsecond time channel
SFz[16]:	$pV/(A*m^4)$	Z dB/dt 126 microsecond time channel
SFz[17]:	$pV/(A*m^4)$	Z dB/dt 145 microsecond time channel
SFz[18]:	$pV/(A*m^4)$	Z dB/dt 167 microsecond time channel
SFz[19]:	$pV/(A*m^4)$	Z dB/dt 192 microsecond time channel
SFz[20]:	$pV/(A*m^4)$	Z dB/dt 220 microsecond time channel
SFz[21]:	$pV/(A*m^4)$	Z dB/dt 253 microsecond time channel
SFz[22]:	$pV/(A*m^4)$	Z dB/dt 290 microsecond time channel
SFz[23]:	$pV/(A*m^4)$	Z dB/dt 333 microsecond time channel
SFz[24]:	$pV/(A*m^4)$	Z dB/dt 383 microsecond time channel
SFz[25]:	$pV/(A*m^4)$	Z dB/dt 440 microsecond time channel
SFz[26]:	$pV/(A*m^4)$	Z dB/dt 505 microsecond time channel
SFz[27]:	$pV/(A*m^4)$	Z dB/dt 580 microsecond time channel
SFz[28]:	$pV/(A*m^4)$	Z dB/dt 667 microsecond time channel
SFz[29]:	$pV/(A*m^4)$	Z dB/dt 766 microsecond time channel
SFz[30]:	$pV/(A*m^4)$	Z dB/dt 880 microsecond time channel
SFz[31]:	$pV/(A*m^4)$	Z dB/dt 1010 microsecond time channel
SFz[32]:	$pV/(A*m^4)$	Z dB/dt 1161 microsecond time channel
SFz[33]:	$pV/(A*m^4)$	Z dB/dt 1333 microsecond time channel
SFz[34]:	$pV/(A*m^4)$	Z dB/dt 1531 microsecond time channel
SFz[35]:	$pV/(A*m^4)$	Z dB/dt 1760 microsecond time channel
SFz[36]:	$pV/(A*m^4)$	Z dB/dt 2021 microsecond time channel
SFz[37]:	$pV/(A*m^4)$	Z dB/dt 2323 microsecond time channel
SFz[38]:	$pV/(A*m^4)$	Z dB/dt 2667 microsecond time channel
SFz[39]:	$pV/(A*m^4)$	Z dB/dt 3063 microsecond time channel
SFz[40]:	$pV/(A*m^4)$	Z dB/dt 3521 microsecond time channel
SFz[41]:	$pV/(A*m^4)$	Z dB/dt 4042 microsecond time channel
SFz[42]:	$pV/(A*m^4)$	Z dB/dt 4641 microsecond time channel
SFz[43]:	$pV/(A*m^4)$	Z dB/dt 5333 microsecond time channel
SFz[44]:	$pV/(A*m^4)$	Z dB/dt 6125 microsecond time channel
SFz[45]:	$pV/(A*m^4)$	Z dB/dt 7036 microsecond time channel
SFx[20]:	$pV/(A*m^4)$	X dB/dt 220 microsecond time channel
SFx[21]:	$pV/(A*m^4)$	X dB/dt 253 microsecond time channel
SFx[22]:	$pV/(A*m^4)$	X dB/dt 290 microsecond time channel
SFx[23]:	$pV/(A*m^4)$	X dB/dt 333 microsecond time channel
SFx[24]:	$pV/(A*m^4)$	X dB/dt 383 microsecond time channel

Channel name	Units	Description
SFx[25]:	pV/(A*m^4)	X dB/dt 440 microsecond time channel
SFx[26]:	pV/(A*m^4)	X dB/dt 505 microsecond time channel
SFx[27]:	pV/(A*m^4)	X dB/dt 580 microsecond time channel
SFx[28]:	pV/(A*m^4)	X dB/dt 667 microsecond time channel
SFx[29]:	pV/(A*m^4)	X dB/dt 766 microsecond time channel
SFx[30]:	pV/(A*m^4)	X dB/dt 880 microsecond time channel
SFx[31]:	pV/(A*m^4)	X dB/dt 1010 microsecond time channel
SFx[32]:	pV/(A*m^4)	X dB/dt 1161 microsecond time channel
SFx[33]:	pV/(A*m^4)	X dB/dt 1333 microsecond time channel
SFx[34]:	pV/(A*m^4)	X dB/dt 1531 microsecond time channel
SFx[35]:	pV/(A*m^4)	X dB/dt 1760 microsecond time channel
SFx[36]:	pV/(A*m^4)	X dB/dt 2021 microsecond time channel
SFx[37]:	pV/(A*m^4)	X dB/dt 2323 microsecond time channel
SFx[38]:	pV/(A*m^4)	X dB/dt 2667 microsecond time channel
SFx[39]:	pV/(A*m^4)	X dB/dt 3063 microsecond time channel
SFx[40]:	pV/(A*m^4)	X dB/dt 3521 microsecond time channel
SFx[41]:	pV/(A*m^4)	X dB/dt 4042 microsecond time channel
SFx[42]:	pV/(A*m^4)	X dB/dt 4641 microsecond time channel
SFx[43]:	pV/(A*m^4)	X dB/dt 5333 microsecond time channel
SFx[44]:	pV/(A*m^4)	X dB/dt 6125 microsecond time channel
SFx[45]:	pV/(A*m^4)	X dB/dt 7036 microsecond time channel
BFz	(pV*ms)/(A*m^4)	Z B-Field data for time channels 14 to 45
BFx	(pV*ms)/(A*m^4)	X B-Field data for time channels 20 to 45
PLM:		60 Hz power line monitor
CVG	nT/m	Calculated Magnetic Vertical Gradient
TauSF	milliseconds	Time Constant (Tau) calculated from dB/dt data
Nchan_TauSFz:		Last channel where the Tau algorithm stops calculation, dB/dt

Electromagnetic B-field and dB/dt Z component data is found in array channel format between indexes 14 – 45, and X component data from 20 – 45, as described above.

- Database of the VTEM Waveform "11194_waveform_final.gdb" in Geosoft GDB format, containing the following channels:

  Time: Sampling rate interval, 5.2083 microseconds
  Rx_Volt: Output voltage of the receiver coil (Volt)
  Tx_Current: Output current of the transmitter (Amp)

- Grids in Geosoft GRD format, as follows:

  BFz26: B-Field Z Component Channel 26 (Time Gate 0.505 ms)
  TAUSFz: dB/dt Calculated Time Constant (TAU)
  TMI: Total Magnetic Intensity (nT)
  DEM: Digital Elevation Model (metres)
  CVG: Calculated Vertical Derivative of TMI

  A Geosoft .GRD file has a .GI metadata file associated with it, containing grid projection information. A grid cell size of 100 metres was used.

- Maps at 1:20,000 in Geosoft MAP format, as follows:

11194_20k_dBdZ:	dB/dt profiles Z Component, Time Gates 0.220 – 7.036 ms in linear – logarithmic scale.
11194_20k_BfieldZ:	B-field profiles Z Component, Time Gates 0.220 – 7.036 ms in linear – logarithmic scale.
11194_20k_BFz26:	B-field late time Z Component Channel 26, Time Gate 0.505 ms colour image.
11194_20k_TMI:	Total Magnetic Intensity (TMI) colour image and contours.
11194_20k_TAUSFz:	dB/dt Calculated Time Constant (TAU) with contours of anomaly areas of the Calculated Vertical Derivative of TMI

Maps are also presented in PDF format.

1:50,000 topographic vectors were taken from the NRCAN Geogratis database at; http://geogratis.gc.ca/geogratis/en/index.html.

- A Google Earth file *11194_flightpath.kmz* showing the flight path of the block is included. Free versions of Google Earth software from: http://earth.google.com/download-earth.html

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

A helicopter-borne versatile time domain electromagnetic (VTEM) geophysical survey has been completed over the Provost Potash Property located near Provost, Alberta, Canada.

The total area coverage is 346 km^2. Total survey line coverage is 882 line kilometres. The principal sensors included a Time Domain EM system and a magnetometer. Results have been presented as stacked profiles, and contour color images at a scale of 1:20,000.

6.2 Recommendations

Based on the geophysical results obtained, a number of interesting EM anomalies that were identified across the property. The magnetic results may also contain worthwhile information in support of exploration targets of interest. We therefore recommend a detailed interpretation of the available geophysical data, in conjunction with the geology. It should include 2D - 3D inversion modeling analyses and magnetic derivative analysis prior to ground follow up and drill testing.

Respectfully submitted[6],

PROFESSIONAL GEOSCIENTISTS
ALEXANDER PRIKHODKO
PRACTISING MEMBER
1638
ONTARIO

Alexander Prikhodko, P.Geo.
Geotech Ltd.

[redacted]

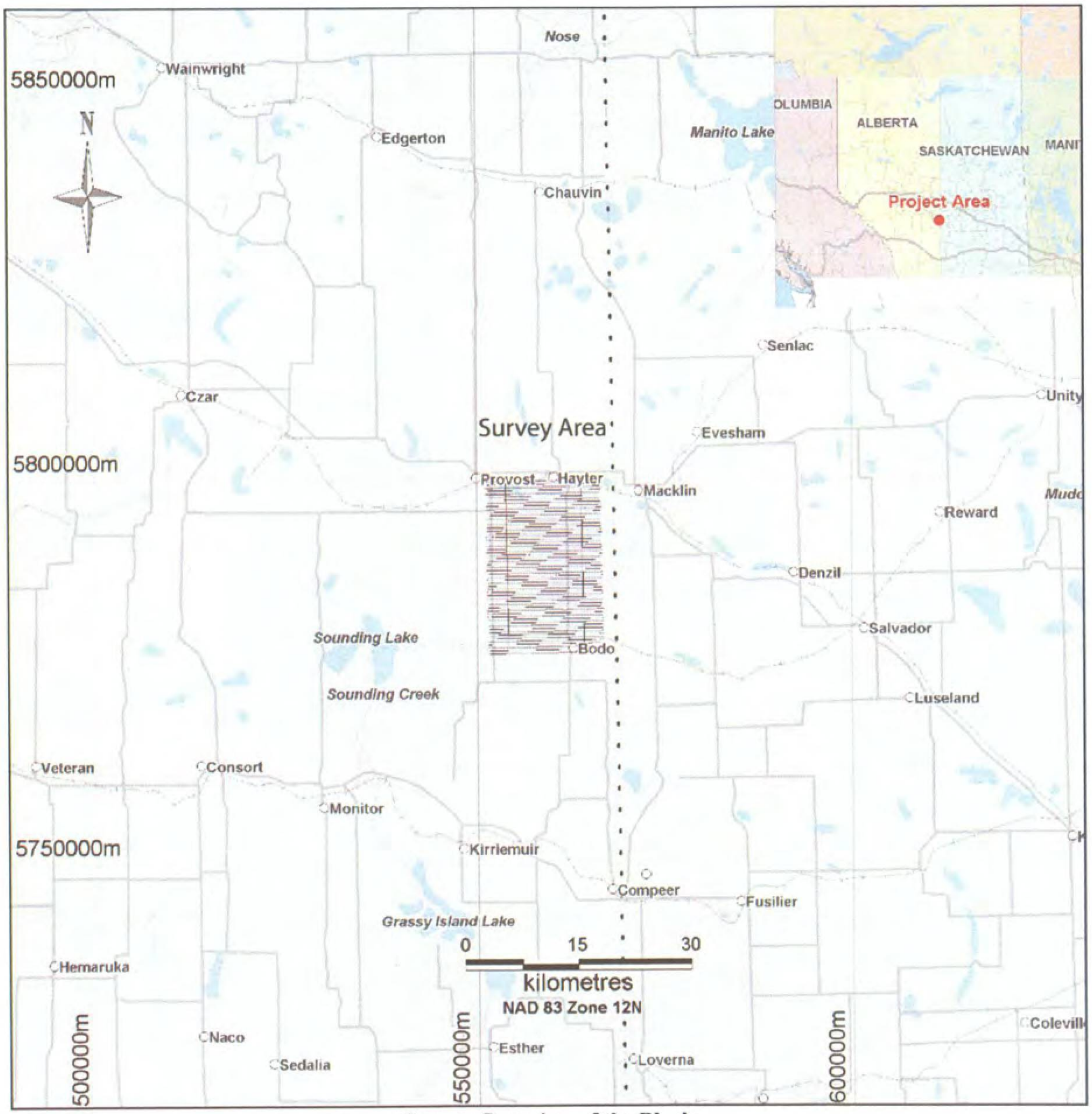
Timothy Eadie
Geotech Ltd.

June 2011

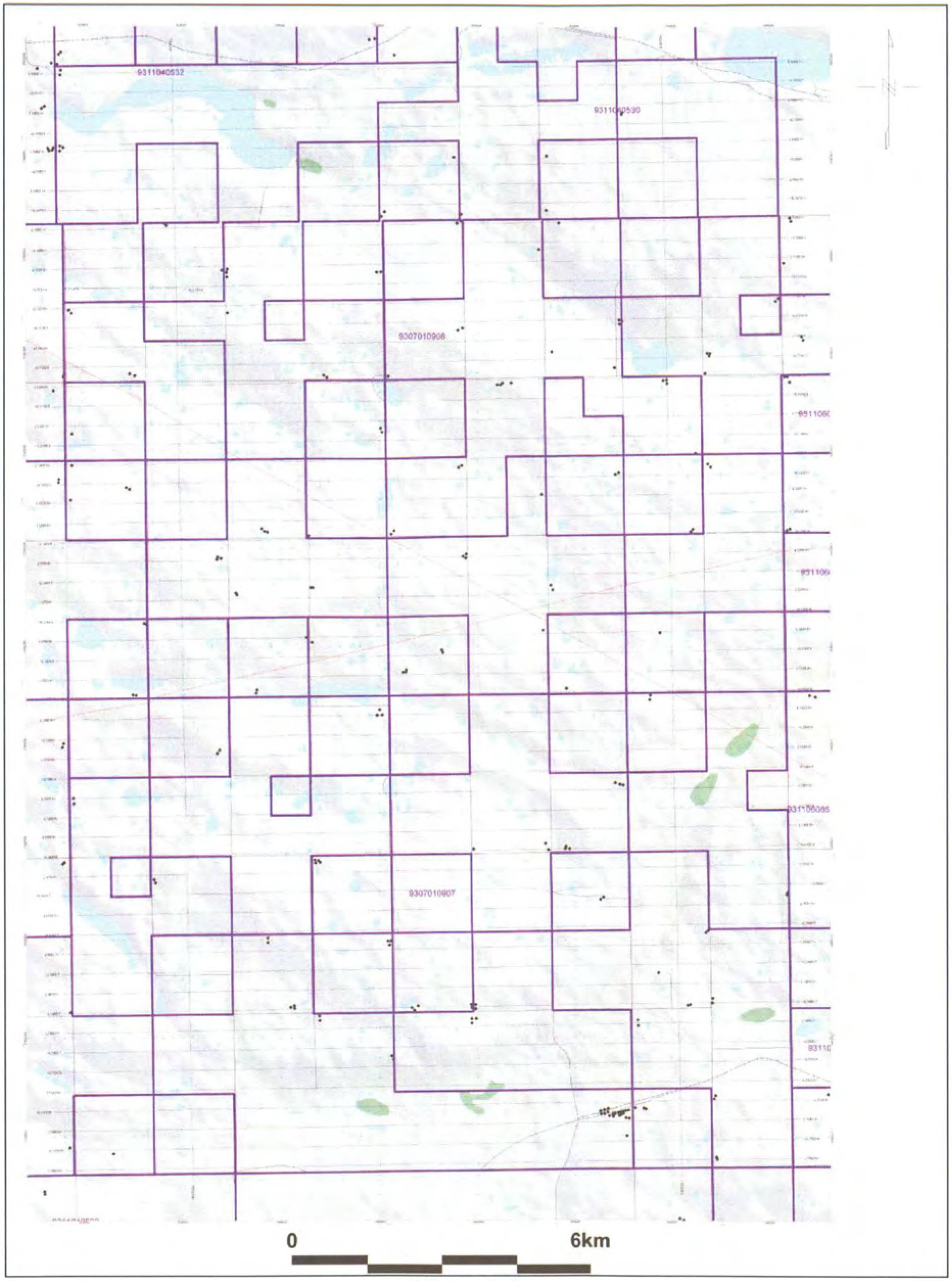
[6]Final data processing of the EM and magnetic data were carried out by Timothy Eadie, from the office of Geotech Ltd. in Aurora, Ontario, under the supervision of Alexander Prikhodko, P.Geo., PhD, Senior Geophysicist, VTEM Interpretation Supervisor.

APPENDIX A

SURVEY BLOCK LOCATION MAP



Survey Overview of the Block



Mining Claims

APPENDIX B

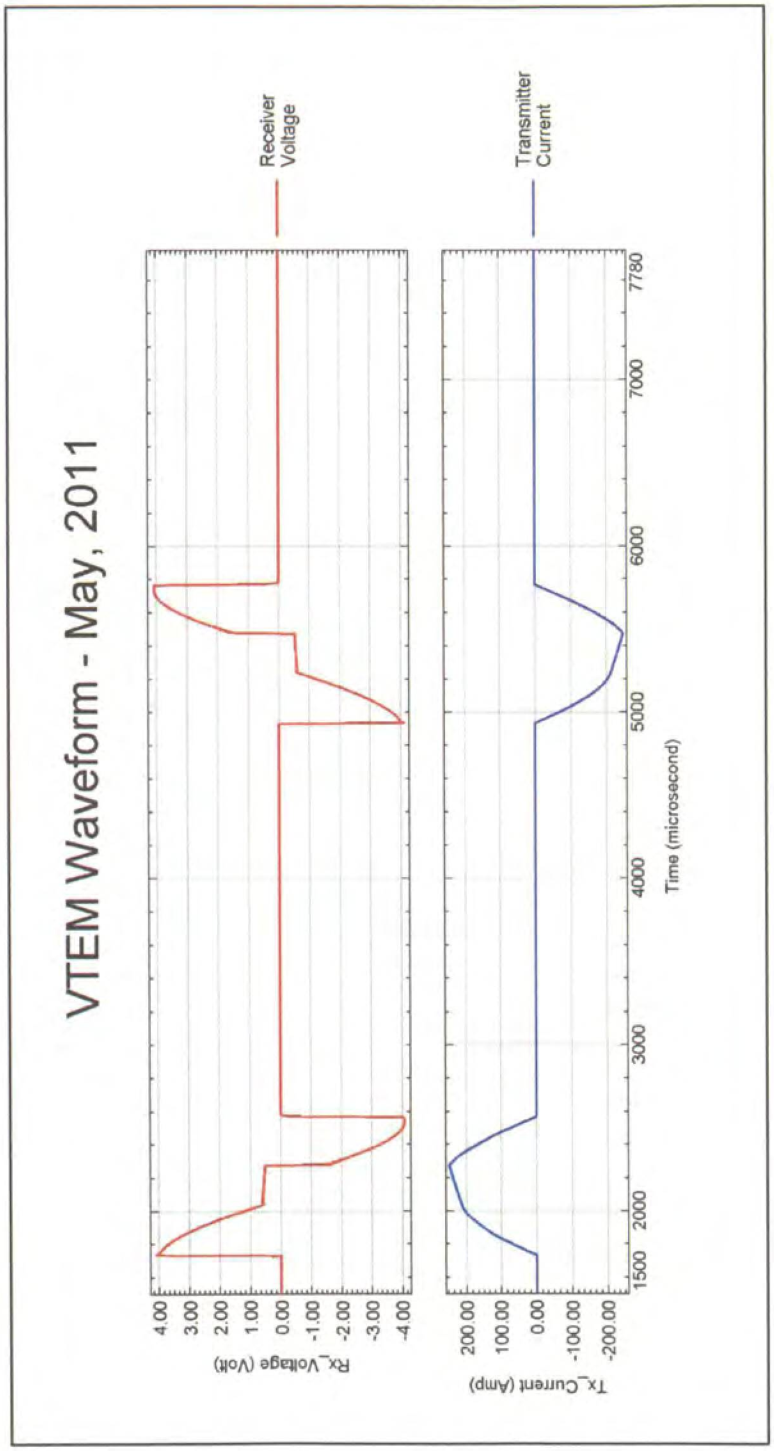
SURVEY BLOCK COORDINATES

(NAD 83, UTM Zone 12 North)

Provost Potash Property	
X	Y
551430.2	5799848.7
551811.5	5777204.6
566456.9	5777378.6
566140.3	5800034

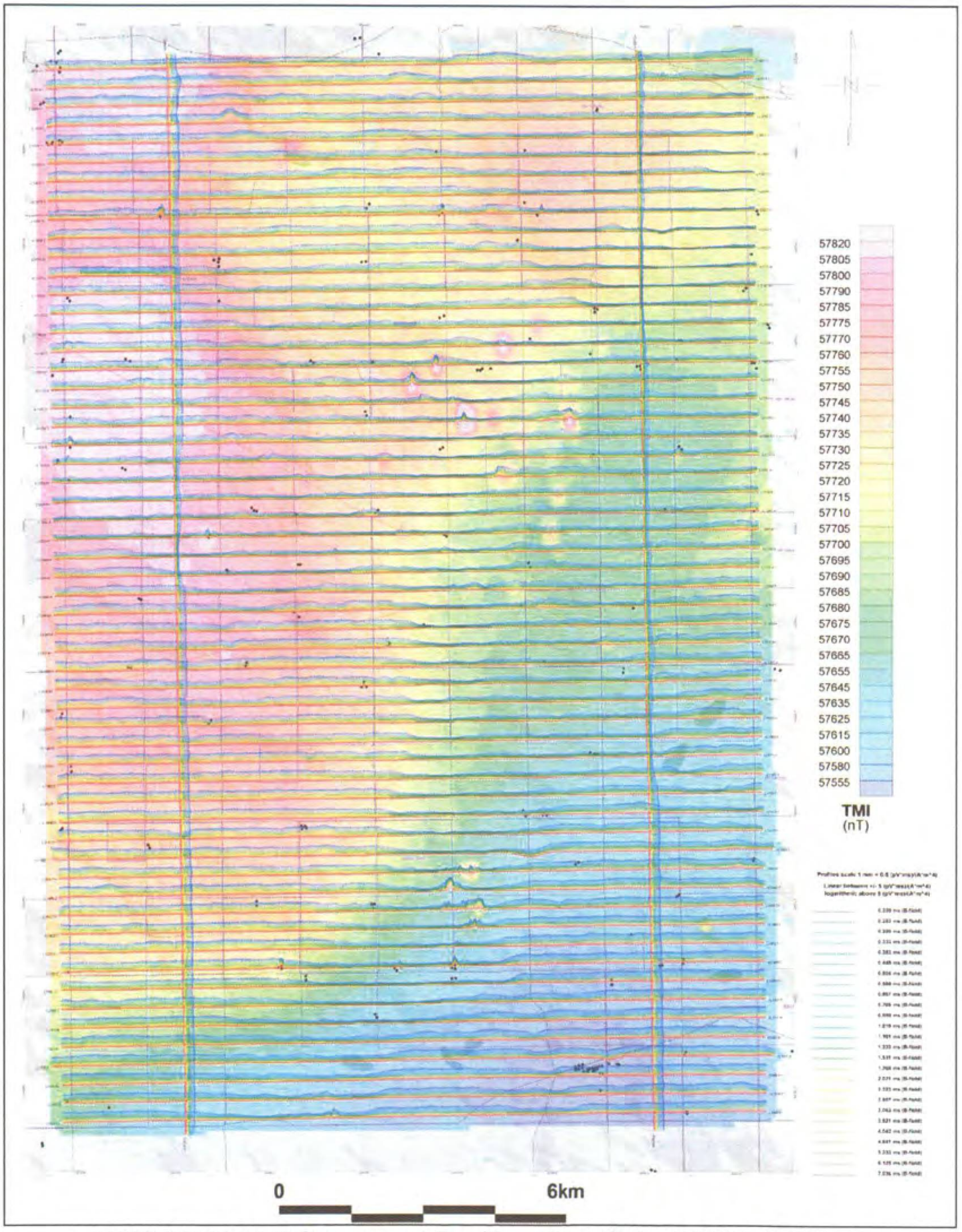
APPENDIX C

VTEM WAVEFORM



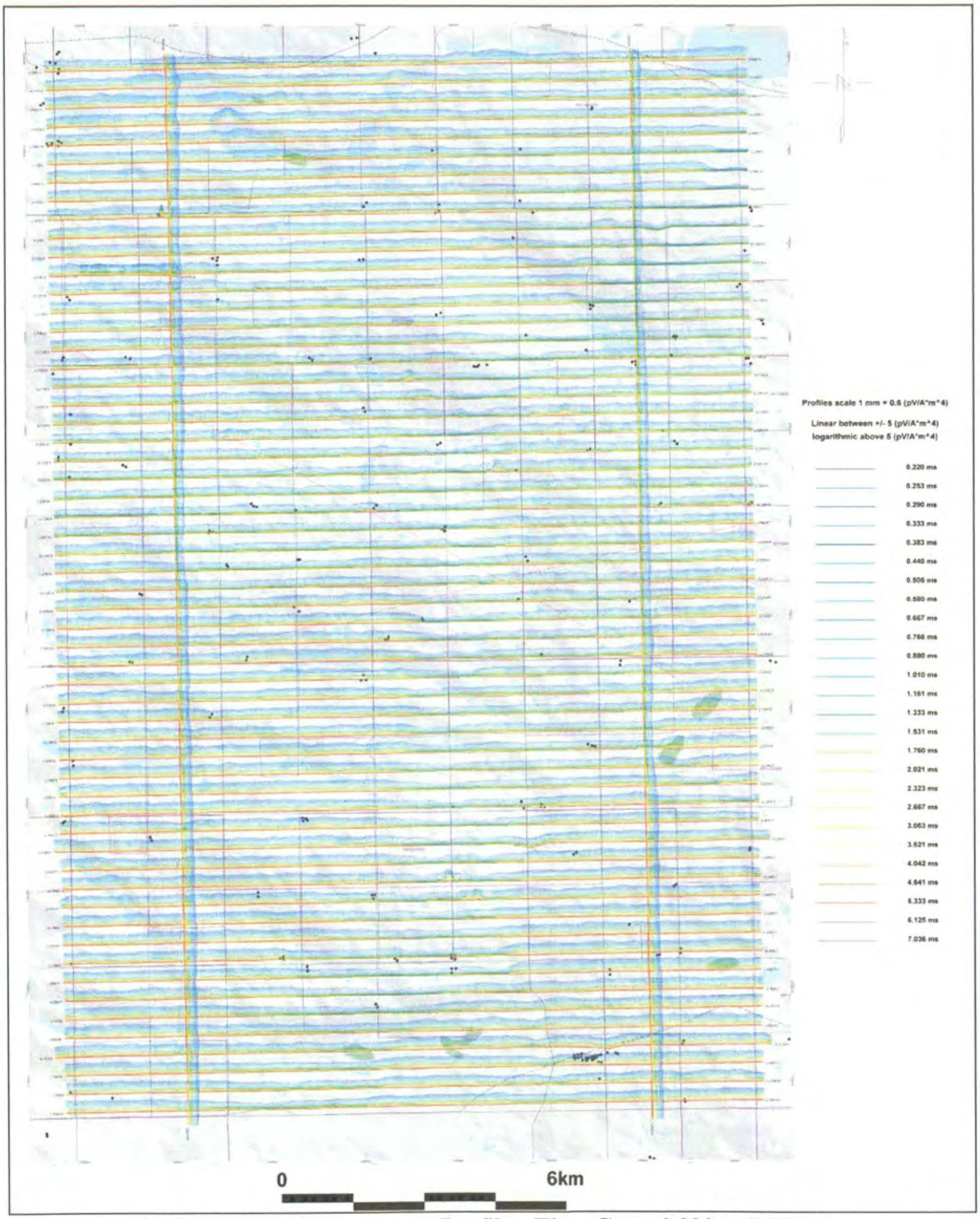
APPENDIX D

GEOPHYSICAL MAPS[1]

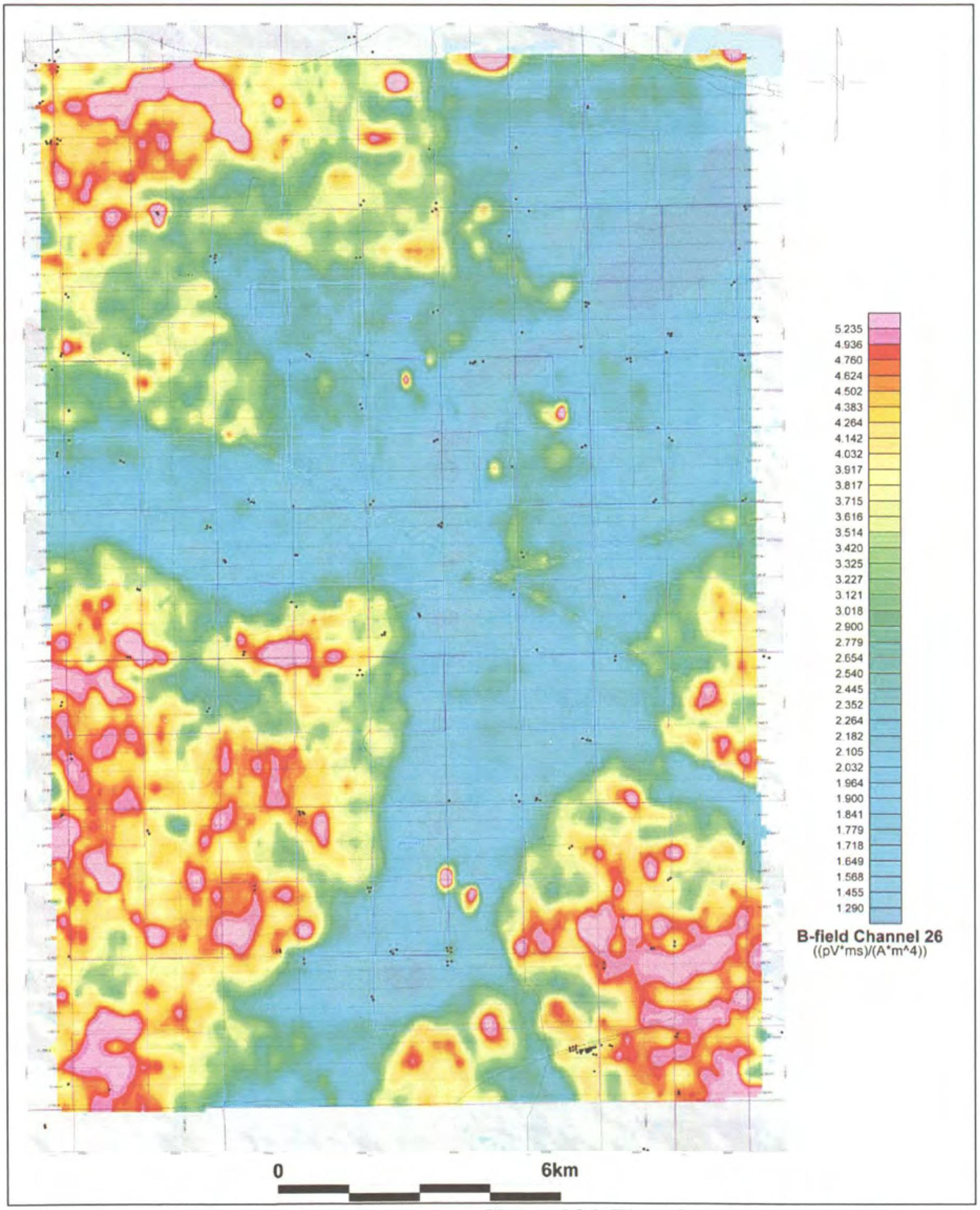


VTEM B-Field Z Component Profiles, Time Gates 0.220 to 7.036 ms

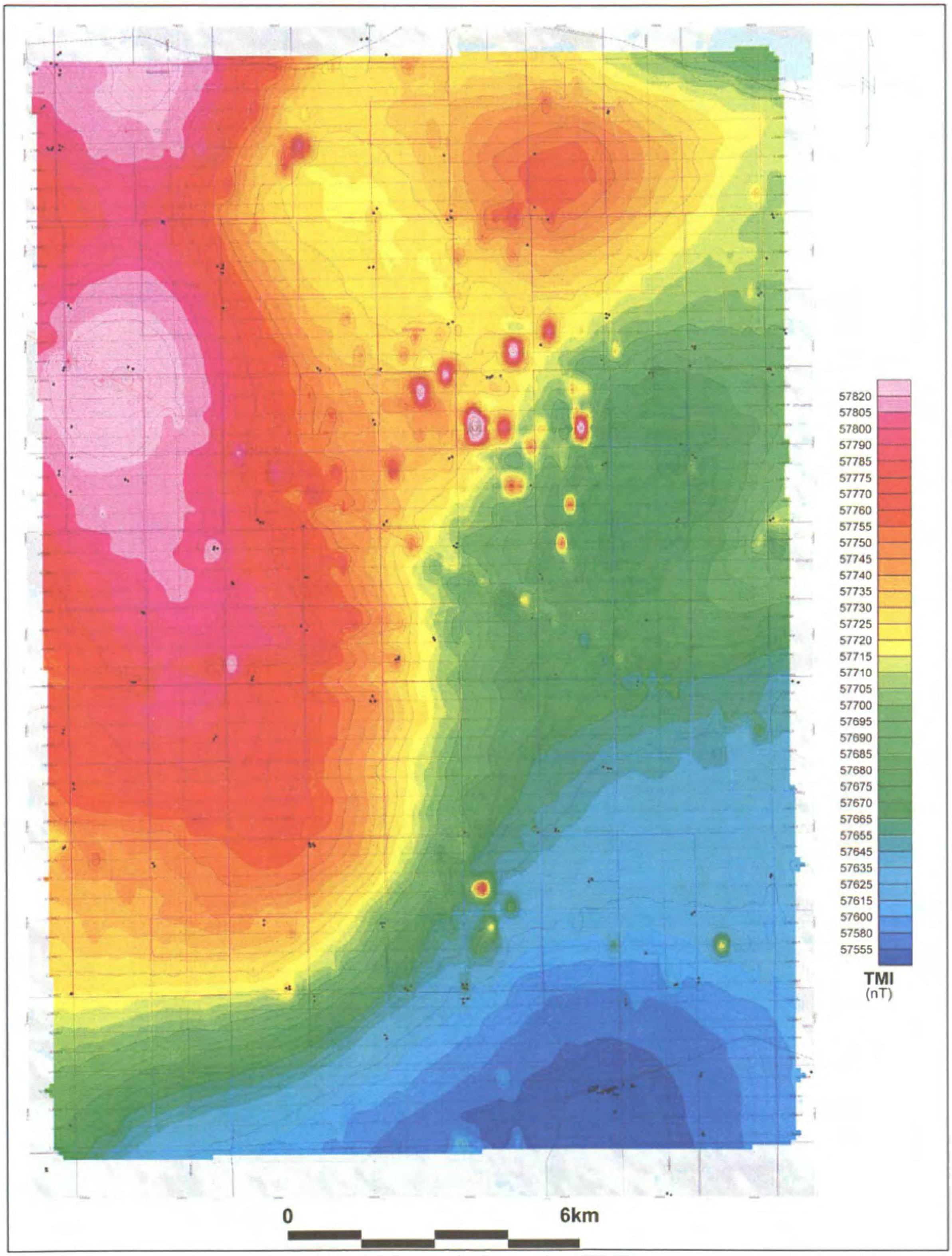
[1] Full size geophysical maps are also available in PDF format on the final DVD



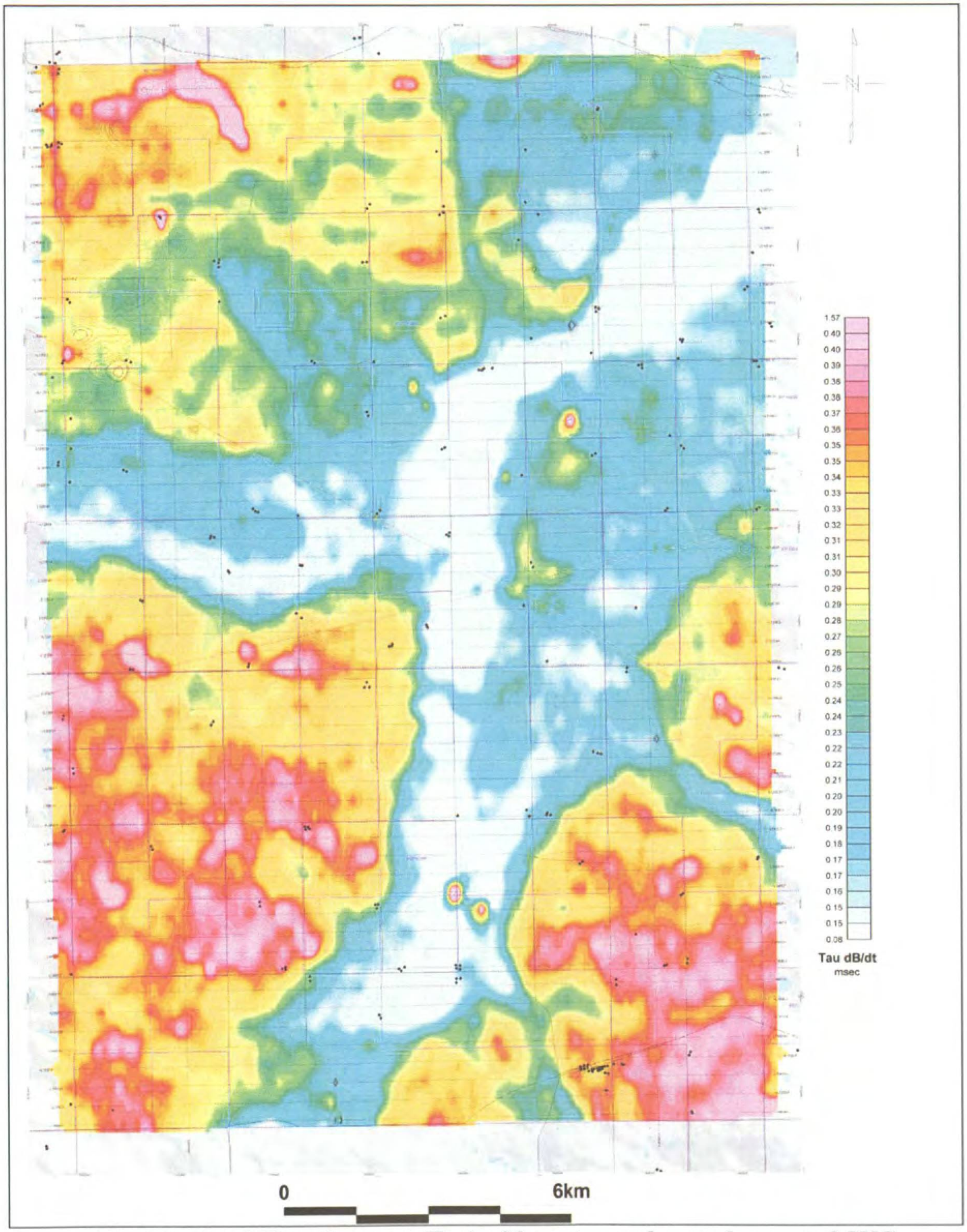
VTEM dB/dt Z Component Profiles, Time Gates 0.220 to 7.036 ms



VTEM B-Field Z Component Channel 26, Time Gate 0.505 ms



Total Magnetic Intensity (TMI)



dB/dt Calculated Time Constant (Tau) with contours of anomaly areas of CVG

APPENDIX E

GENERALIZED MODELING RESULTS OF THE VTEM SYSTEM

Introduction

The VTEM system is based on a concentric or central loop design, whereby, the receiver is positioned at the centre of a transmitter loop that produces a primary field. The wave form is a bi-polar, modified square wave with a turn-on and turn-off at each end.

During turn-on and turn-off, a time varying field is produced (dB/dt) and an electro-motive force (emf) is created as a finite impulse response. A current ring around the transmitter loop moves outward and downward as time progresses. When conductive rocks and mineralization are encountered, a secondary field is created by mutual induction and measured by the receiver at the centre of the transmitter loop.

Efficient modeling of the results can be carried out on regularly shaped geometries, thus yielding close approximations to the parameters of the measured targets. The following is a description of a series of common models made for the purpose of promoting a general understanding of the measured results.

A set of models has been produced for the Geotech VTEM® system dB/dT Z and X components (see models E1 to E15). The Maxwell ™ modeling program (EMIT Technology Pty. Ltd. Midland, WA, AU) used to generate the following responses assumes a resistive half-space. The reader is encouraged to review these models, so as to get a general understanding of the responses as they apply to survey results. While these models do not begin to cover all possibilities, they give a general perspective on the simple and most commonly encountered anomalies.

As the plate dips and departs from the vertical position, the peaks become asymmetrical.

As the dip increases, the aspect ratio (Min/Max) decreases and this aspect ratio can be used as an empirical guide to dip angles from near 90° to about 30°. The method is not sensitive enough where dips are less than about 30°.

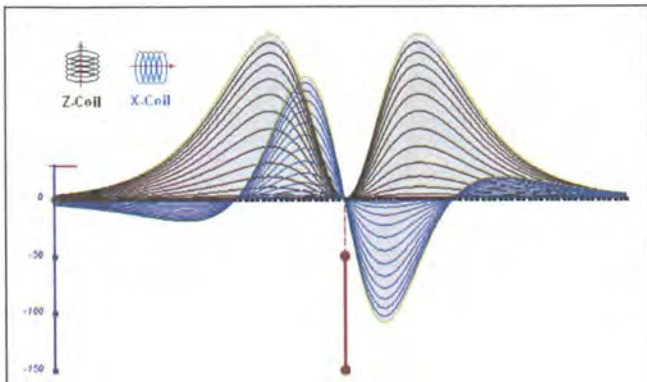


Fig E-1: vertical thin plate

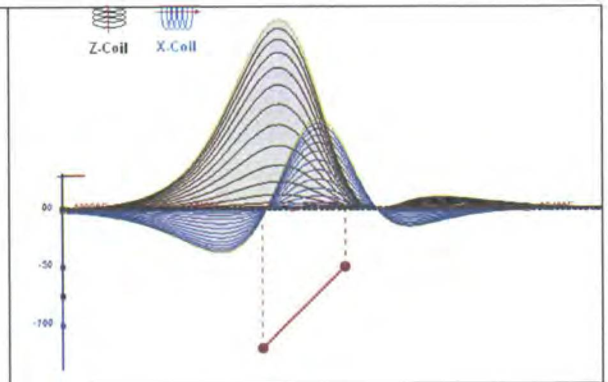


Fig E-2: inclined thin plate

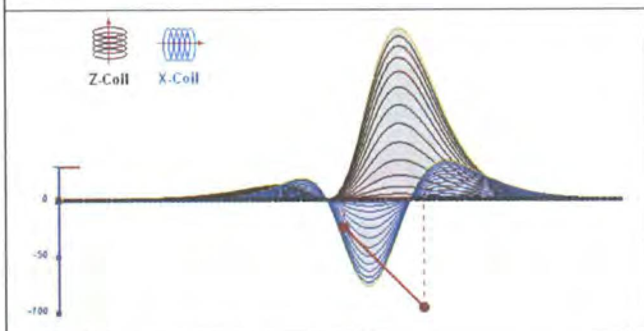


Fig E-3: inclined thin plate

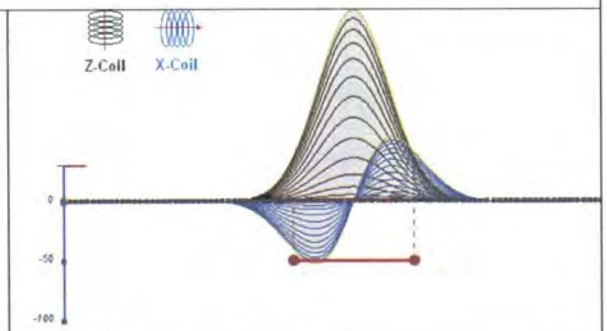


Fig E-4: horizontal thin plate

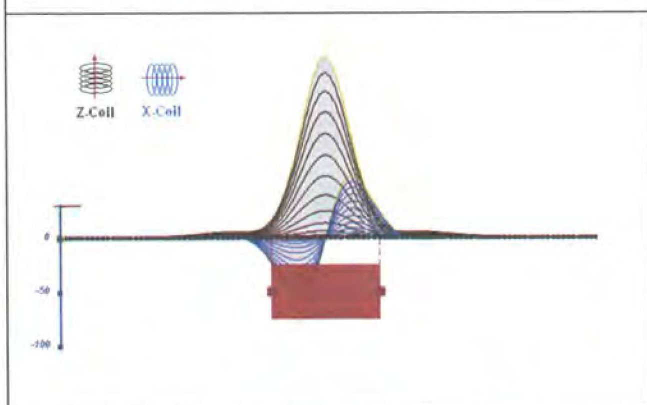


Figure E-5: horizontal thick plate (linear scale of the response)

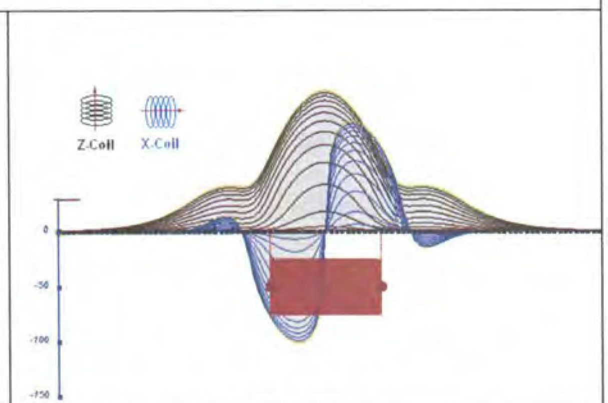


Figure E-6: horizontal thick plate (log scale of the response)

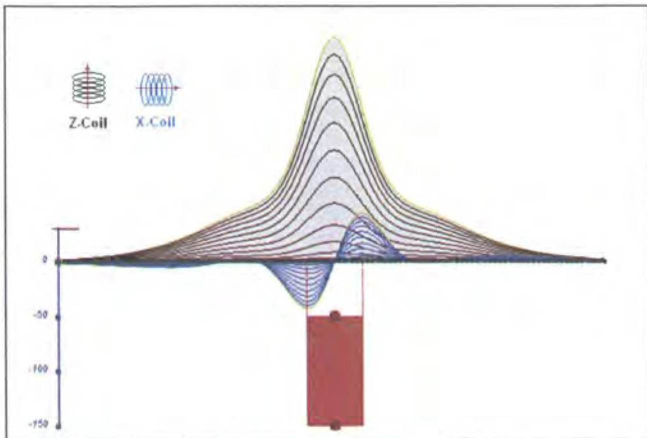


Figure E-7: vertical thick plate (linear scale of the response). 50 m depth

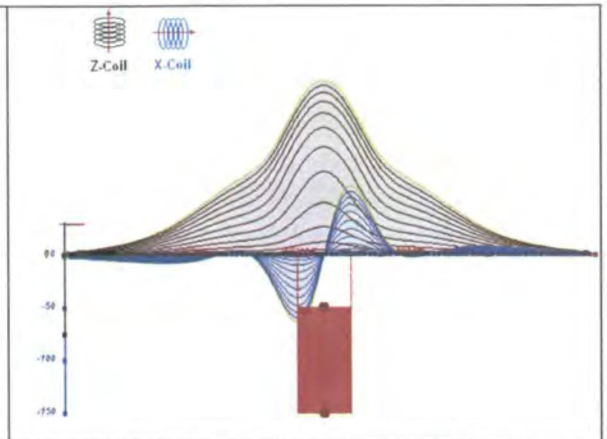


Figure E-8: vertical thick plate (log scale of the response). 50 m depth

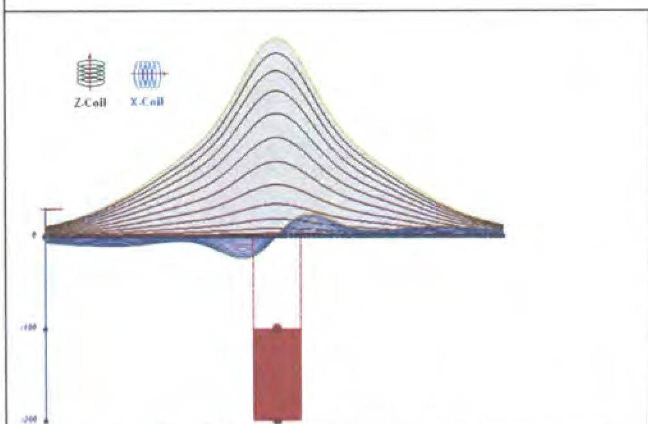


Fig E-9: vertical thick plate (linear scale of the response). 100 m depth

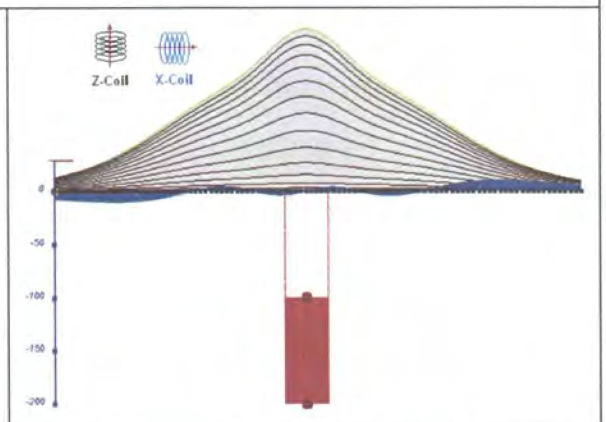


Fig E-10: vertical thick plate (linear scale of the response). Depth/hor.thickness=2.5

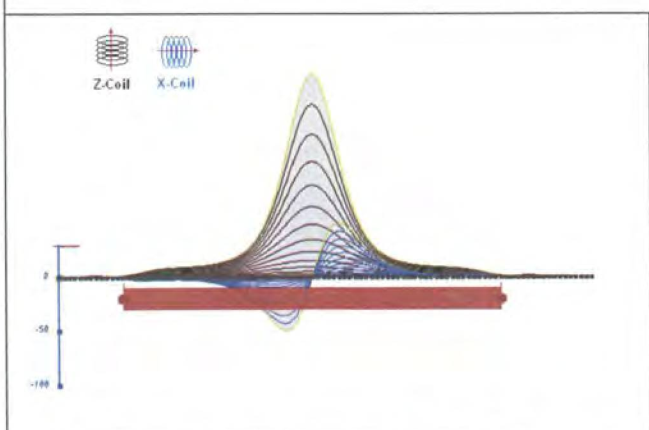


Fig E-10: horizontal thick plate (linear scale of the response)

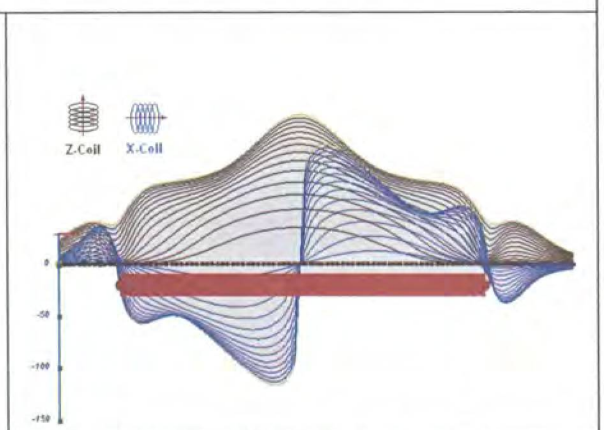


Fig E-11: horizontal thick plate (log scale of the response)

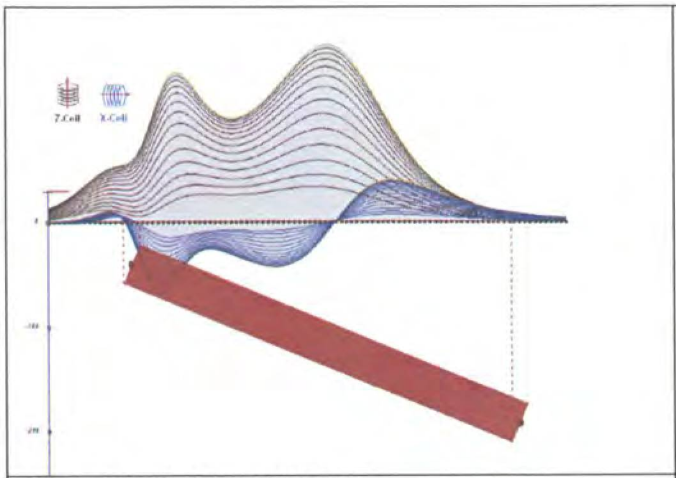


Fig E-12: inclined long thick plate

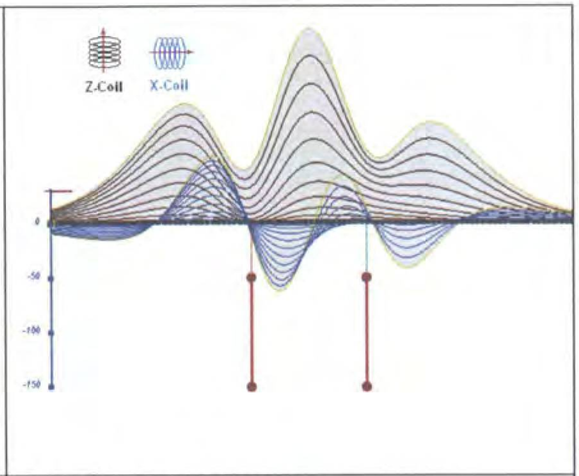


Fig E-13: two vertical thin plates

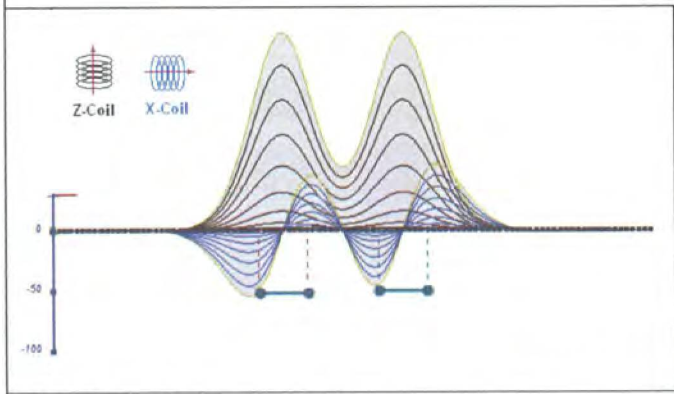


Fig E-14: two horizontal thin plates

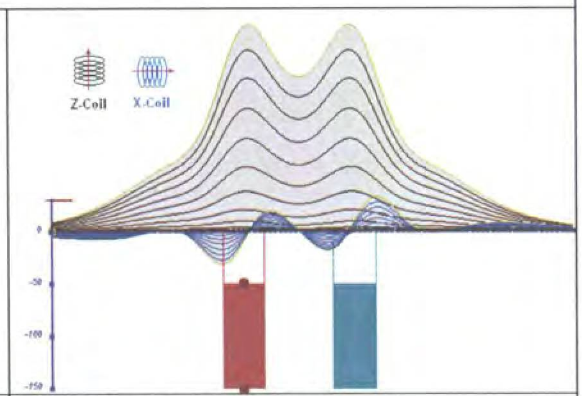


Fig E-15: two vertical thick plates

The same type of target but with different thickness, for example, creates different form of the response:

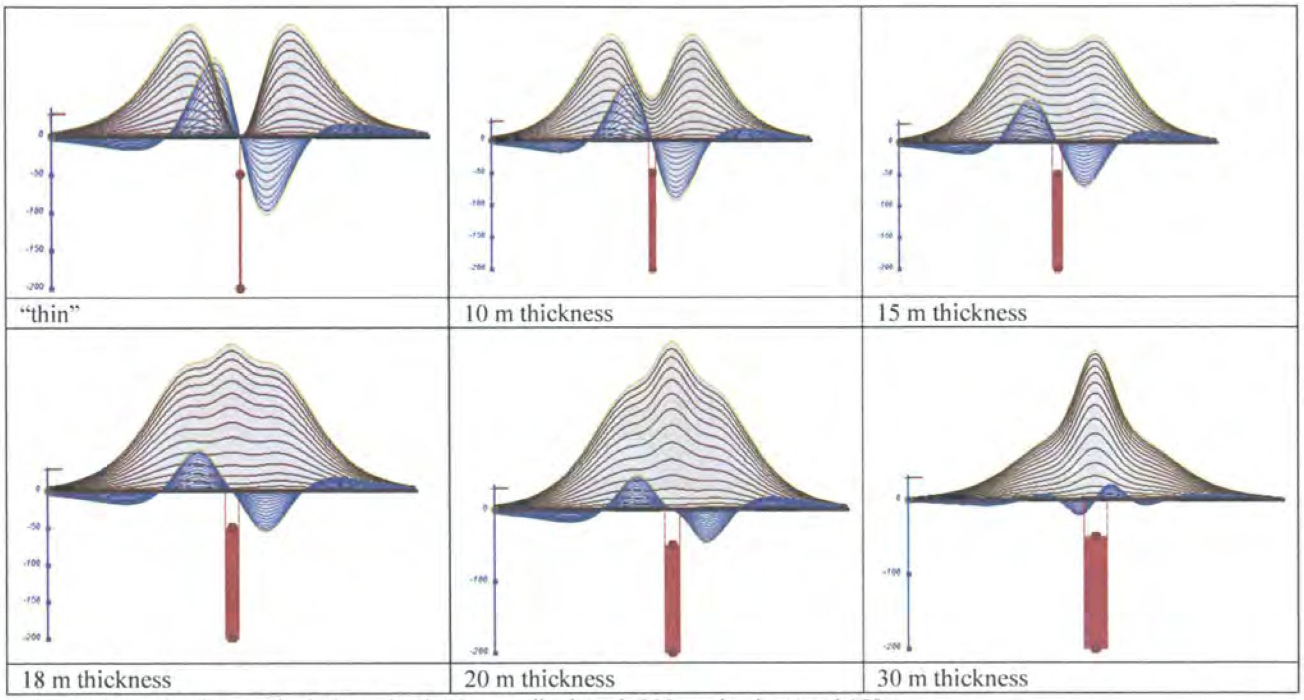


Fig.E-16 Conductive vertical plate, depth 50 m, strike length 200 m, depth extend 150 m.

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APPENDIX F

EM TIME CONSTANT (TAU) ANALYSIS

Estimation of time constant parameter[1] in transient electromagnetic method is one of the steps toward the extraction of the information about conductances beneath the surface from TEM measurements.

The most reliable method to discriminate or rank conductors from overburden, background or one and other is by calculating the EM field decay time constant (TAU parameter), which directly depends on conductance despite their depth and accordingly amplitude of the response.

Theory

As established in electromagnetic theory, the magnitude of the electro-motive force (emf) induced is proportional to the time rate of change of primary magnetic field at the conductor. This emf causes eddy currents to flow in the conductor with a characteristic transient decay, whose Time Constant (Tau) is a function of the conductance of the survey target or conductivity and geometry (including dimensions) of the target. The decaying currents generate a proportional secondary magnetic field, the time rate of change of which is measured by the receiver coil as induced voltage during the Off time.

The receiver coil output voltage (**e_0**) is proportional to the time rate of change of the secondary magnetic field and has the form,

$$e_0 \ \alpha \ (1 / \tau) \ e^{-(t/\tau)}$$

Where,
$\tau = L/R$ is the characteristic time constant of the target (TAU)
R = resistance
L = inductance

From the expression, conductive targets that have small value of resistance and hence large value of τ yield signals with small initial amplitude that decays relatively slowly with progress of time. Conversely, signals from poorly conducting targets that have large resistance value and smallτ, have high initial amplitude but decay rapidly with time[1] (Fig. F1).

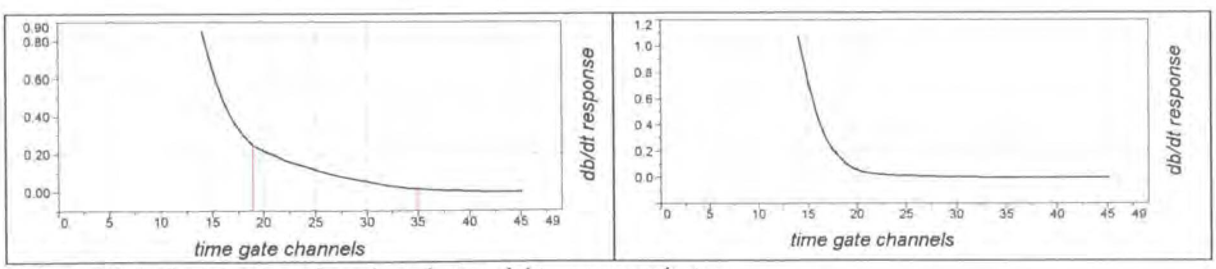

Figure F1 Left – presence of good conductor, right – poor conductor.

[1] McNeill, JD, 1980, "Applications of Transient Electromagnetic Techniques", Technical Note TN-7 page 5, Geonics Limited, Mississauga, Ontario.

EM Time Constant (Tau) Calculation

The EM Time-Constant (TAU) is a general measure of the speed of decay of the electromagnetic response and indicates the presence of eddy currents in conductive sources as well as reflecting the "conductance quality" of a source. Although TAU can be calculated using either the measured dB/dt decay or the calculated B-field decay, dB/dt is commonly preferred due to better stability (S/N) relating to signal noise. Generally, TAU calculated on base of early time response reflects both near surface overburden and poor conductors whereas, in the late ranges of time, deep and more conductive sources, respectively. For example early time TAU distribution in an area that indicates conductive overburden is shown in Figure 2.

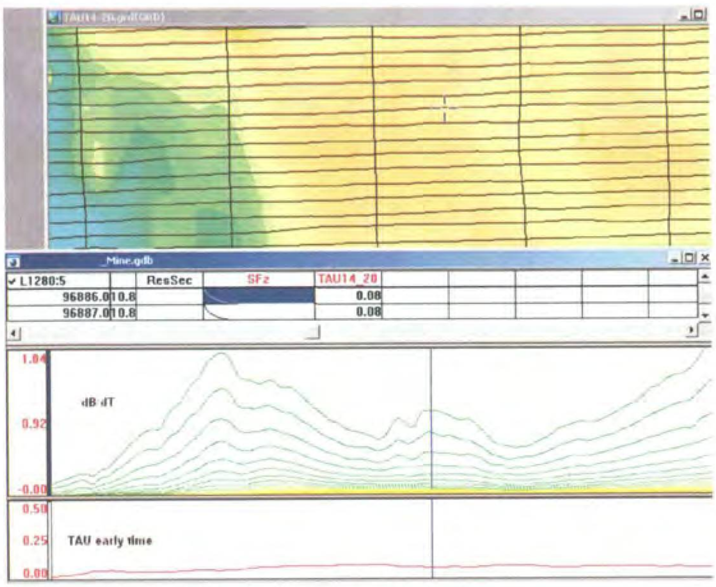

Figure F2 – Map of early time TAU. Area with overburden conductive layer and local sources.

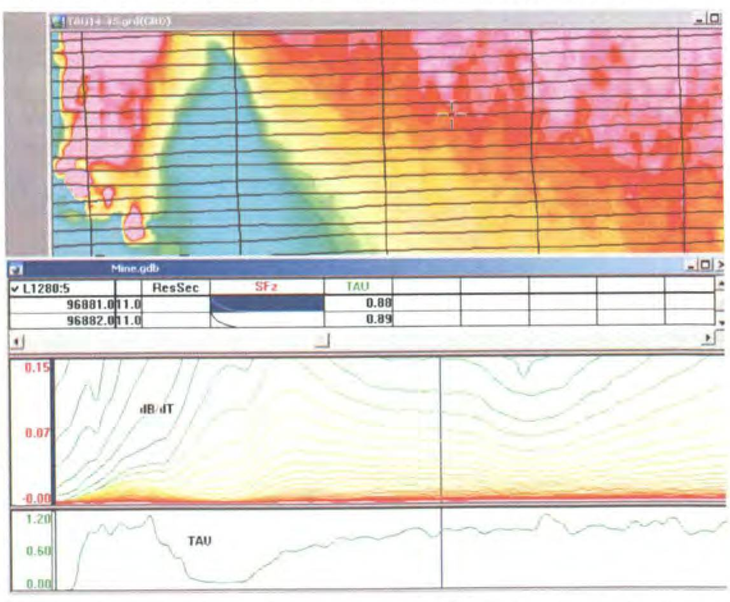

Figure F3 – Map of full time range TAU with EM anomaly due to deep highly conductive target.

There are many advantages of TAU maps:

- TAU depends only on one parameter (conductance) in contrast to response magnitude;
- TAU is integral parameter, which covers time range and all conductive zones and targets are displayed independently of their depth and conductivity on a single map.
- Very good differential resolution in complex conductive places with many sources with different conductivity.
- Signs of the presence of good conductive targets are amplified and emphasized independently of their depth and level of response accordingly.

In the example shown in Figure 4 and 5, three local targets are defined, each of them with a different depth of burial, as indicated on the resistivity depth image (RDI). All are very good conductors but the deeper target (number 2) has a relatively weak dB/dt signal yet also features the strongest total TAU (Figure 4). This example highlights the benefit of TAU analysis in terms of an additional target discrimination tool.

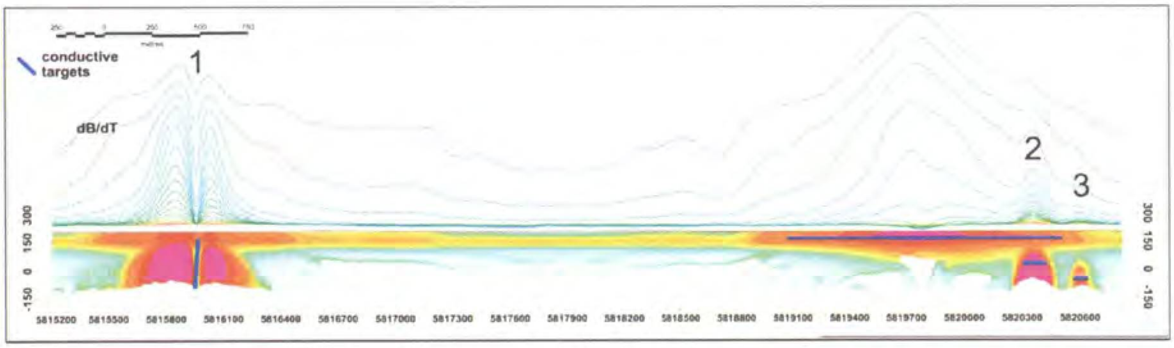

Figure F4 – dB/dt profile and RDI with different depths of targets.

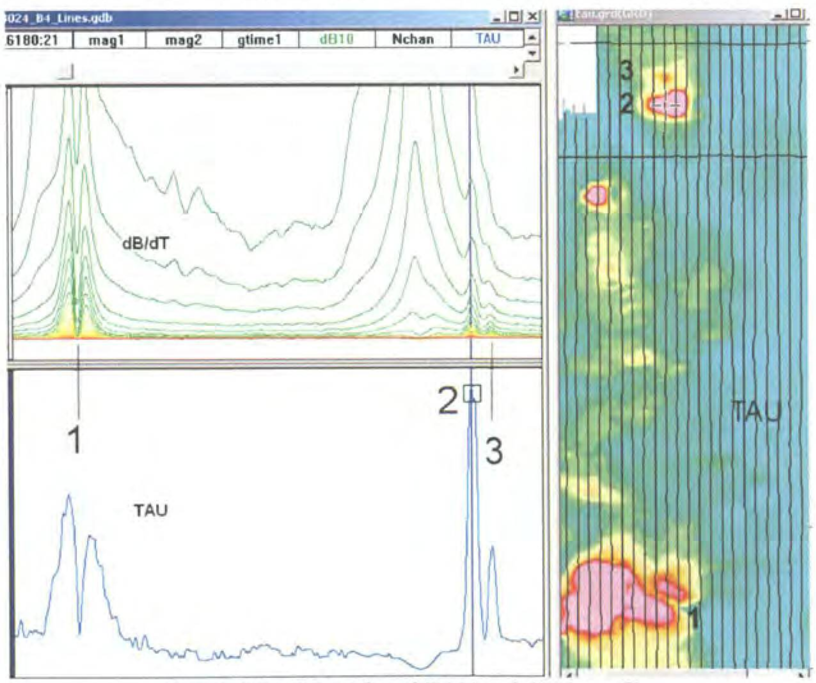

Figure F5 – Map of total TAU and dB/dt profile.

The EM Time Constants for dB/dt and B-field were calculated using the "sliding Tau" in-house program developed at Geotech2. The principle of the calculation is based on using of time window (4 time channels) which is sliding along the curve decay and looking for latest time channels which have a response above the level of noise and decay. The EM decays are obtained from all available decay channels, starting at the latest channel. Time constants are taken from a least square fit of a straight-line (log/linear space) over the last 4 gates above a pre-set signal threshold level (Figure F6). Threshold settings are pointed in the "label" property of TAU database channels. The sliding Tau method determines that, as the amplitudes increase, the time-constant is taken at progressively later times in the EM decay. Conversely, as the amplitudes decrease, Tau is taken at progressively earlier times in the decay. If the maximum signal amplitude falls below the threshold, or becomes negative for any of the 4 time gates, then Tau is not calculated and is assigned a value of "dummy" by default.

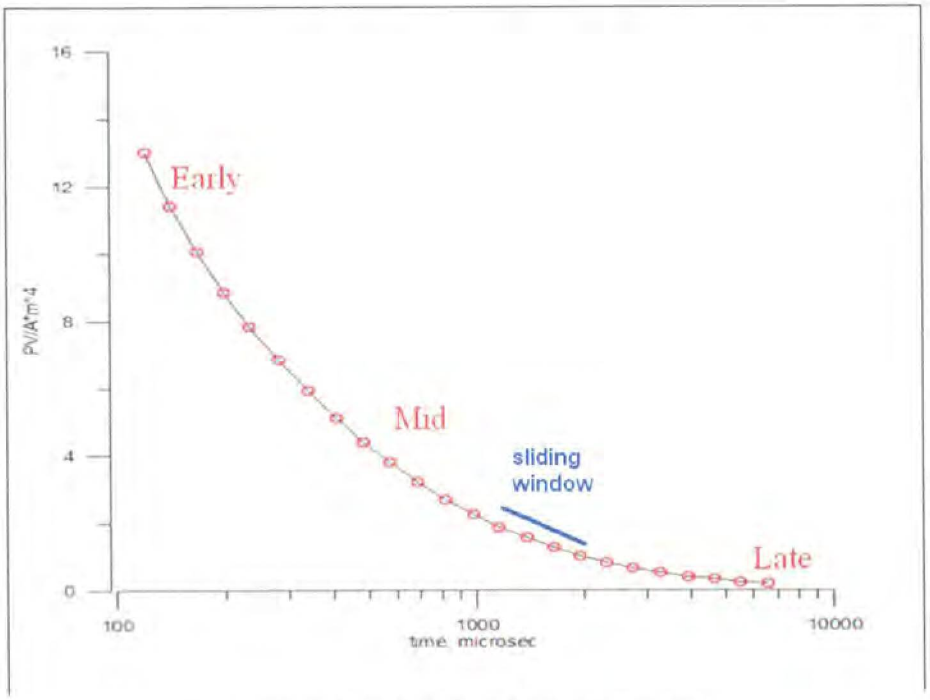

Figure F6 - Typical dB/dt decays of Vtem data

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[2] by A.Prikhodko

APPENDIX G

TEM Resistivity Depth Imaging (RDI)

Resistivity depth imaging (RDI) is technique used to rapidly convert EM profile decay data into an equivalent resistivity versus depth cross-section, by deconvolving the system or measured waveforms from the EM data. There are many different schemes to get conductivity/resistivity depth sections from time-domain data. The used RDI algorithm of Resistivity-Depth transformation is based on scheme of on the apparent resistivity transform of Maxwell A.Meju (1998)[1] and TEM response from conductive half-space adopted for time-domain data and system configuration. The program is in-house developed at Geotech for VTEM data[2].

The VTEM Resistivity Depth Sections have checked and proven on several real known targets, results of drilling and synthetic models (Fig. 1-12). Adding individual responses across the profile produces a pseudo 2-dimensional cross-section, called a RDI. RDIs provide reasonable indications of conductor relative depth and vertical extent, as well as accurate 1D layered-earth apparent conductivity/resistivity structure across a VTEM flight line.

Approximate depth of investigation of a TEM system, image of secondary field distribution in half space, effective resistivity, initial geometry and position of conductive targets is the information obtained on base of the RDIs.

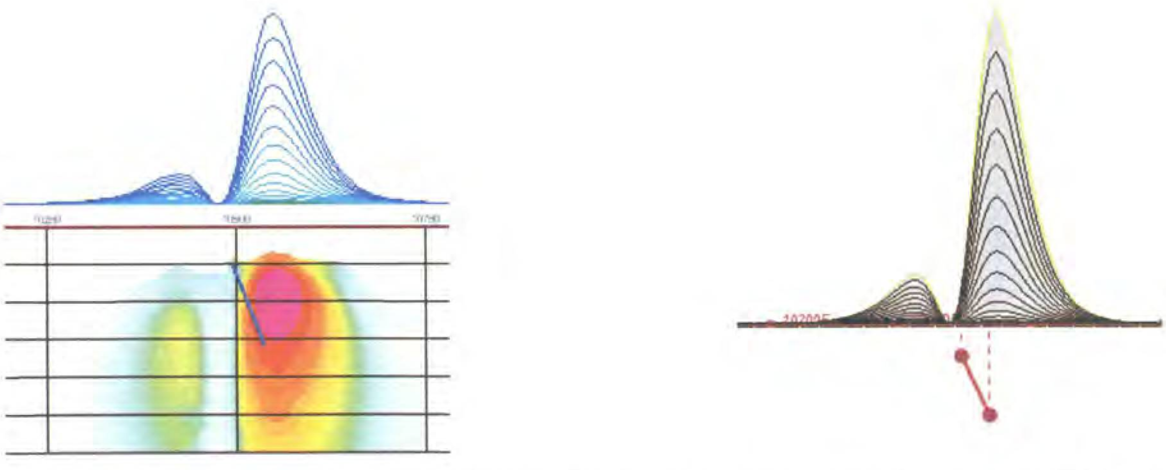


Fig. 1 Maxwell plate model and RDI from the calculated response for conductive "thin" plate (depth 50 m, dip 65 degree, depth extend 100 m).

[1] Maxwell A.Meju, 1998, Short Note: A simple method of transient electromagnetic data analysis, Geophysics, **63**, 405–410.

[2] by A.Prikhodko

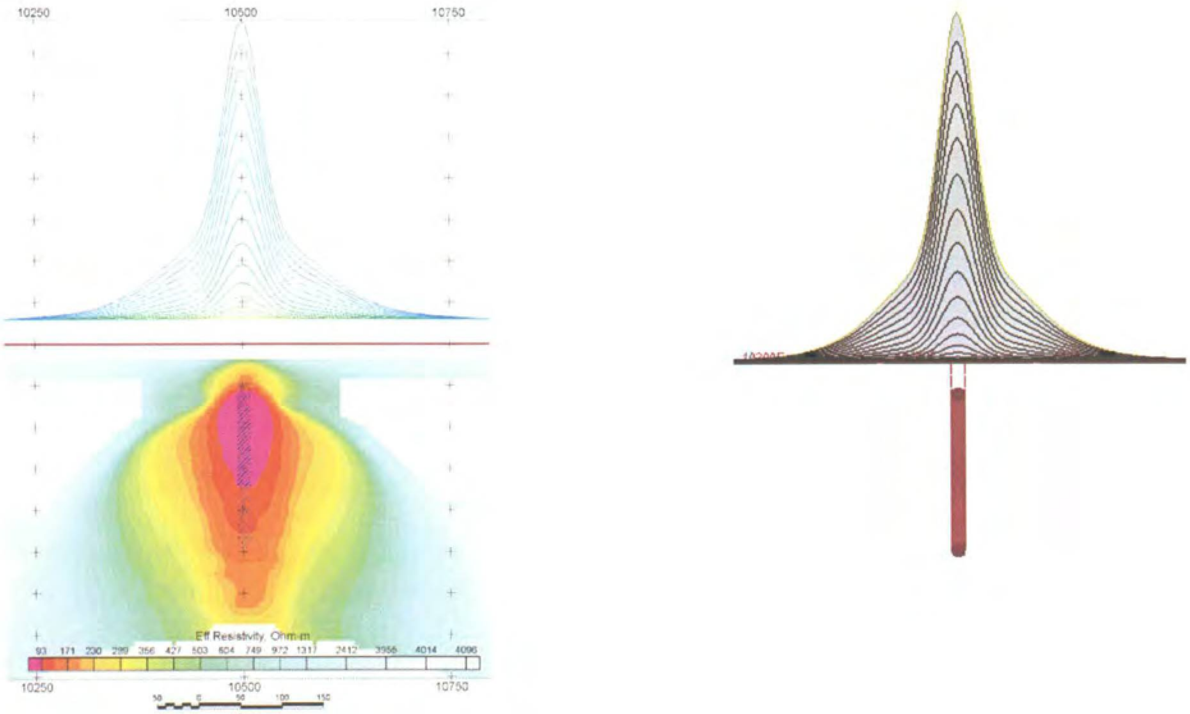


Fig. 2 Maxwell plate model and RDI from the calculated response for "thick" plate 18 m thickness, depth 50 m, depth extend 200 m).

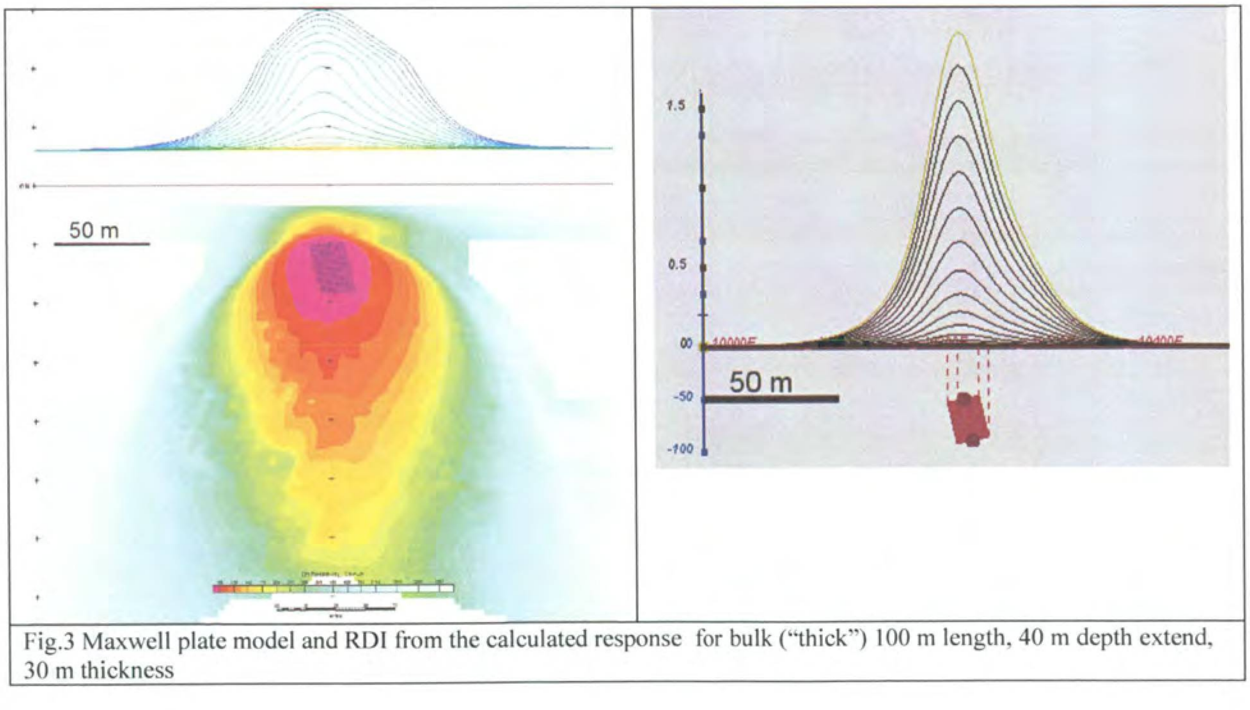


Fig.3 Maxwell plate model and RDI from the calculated response for bulk ("thick") 100 m length, 40 m depth extend, 30 m thickness

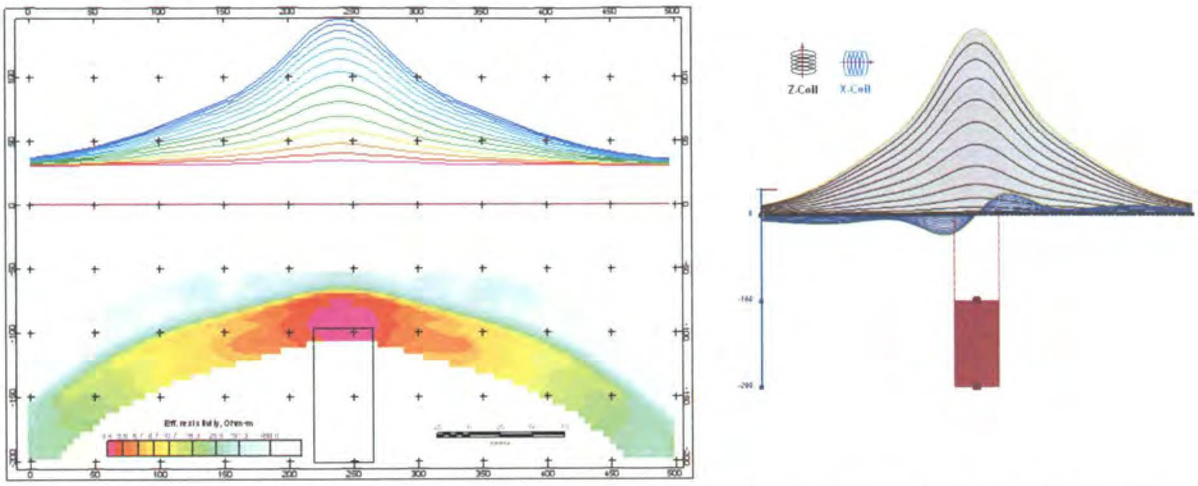


Fig. 4 Maxwell plate model and RDI from the calculated response for "thick" vertical target (depth 100 m, depth extend 100 m). 19-44 chan.

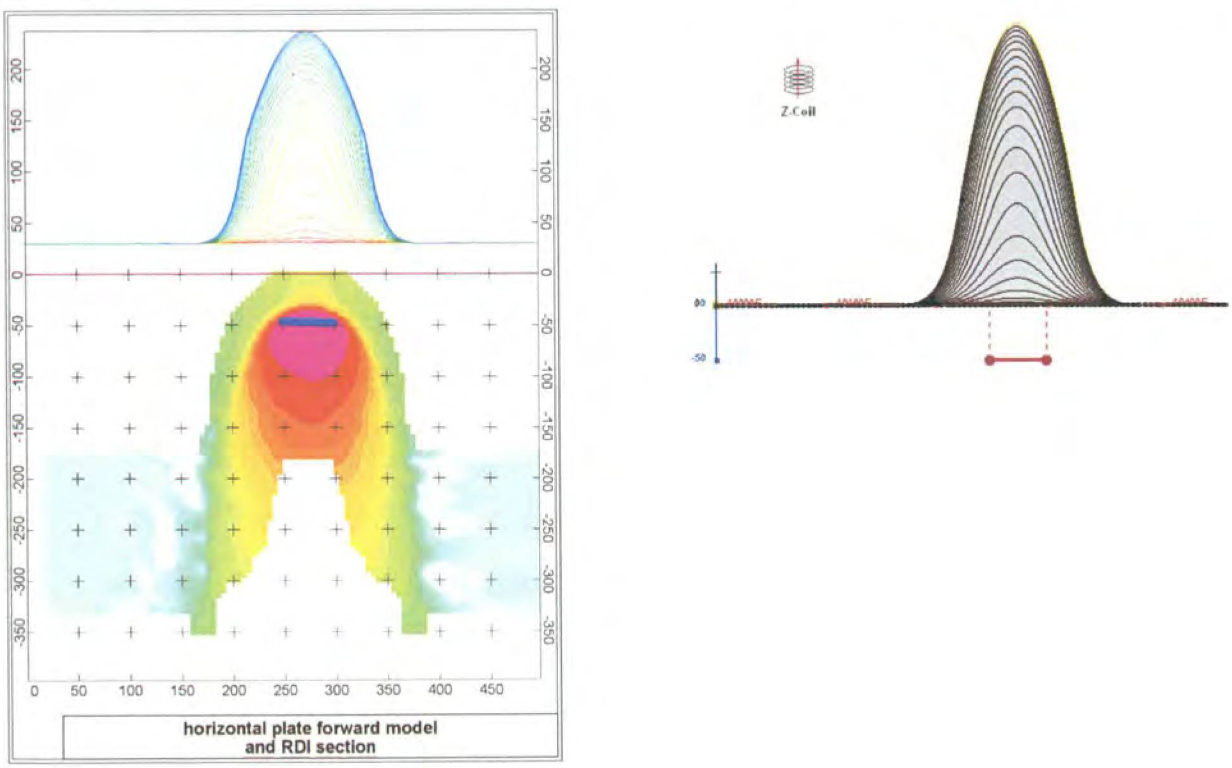


Fig. 5 Maxwell plate model and RDI from the calculated response for horizontal thin plate (depth 50 m, dim 50x100 m). 15-44 chan.

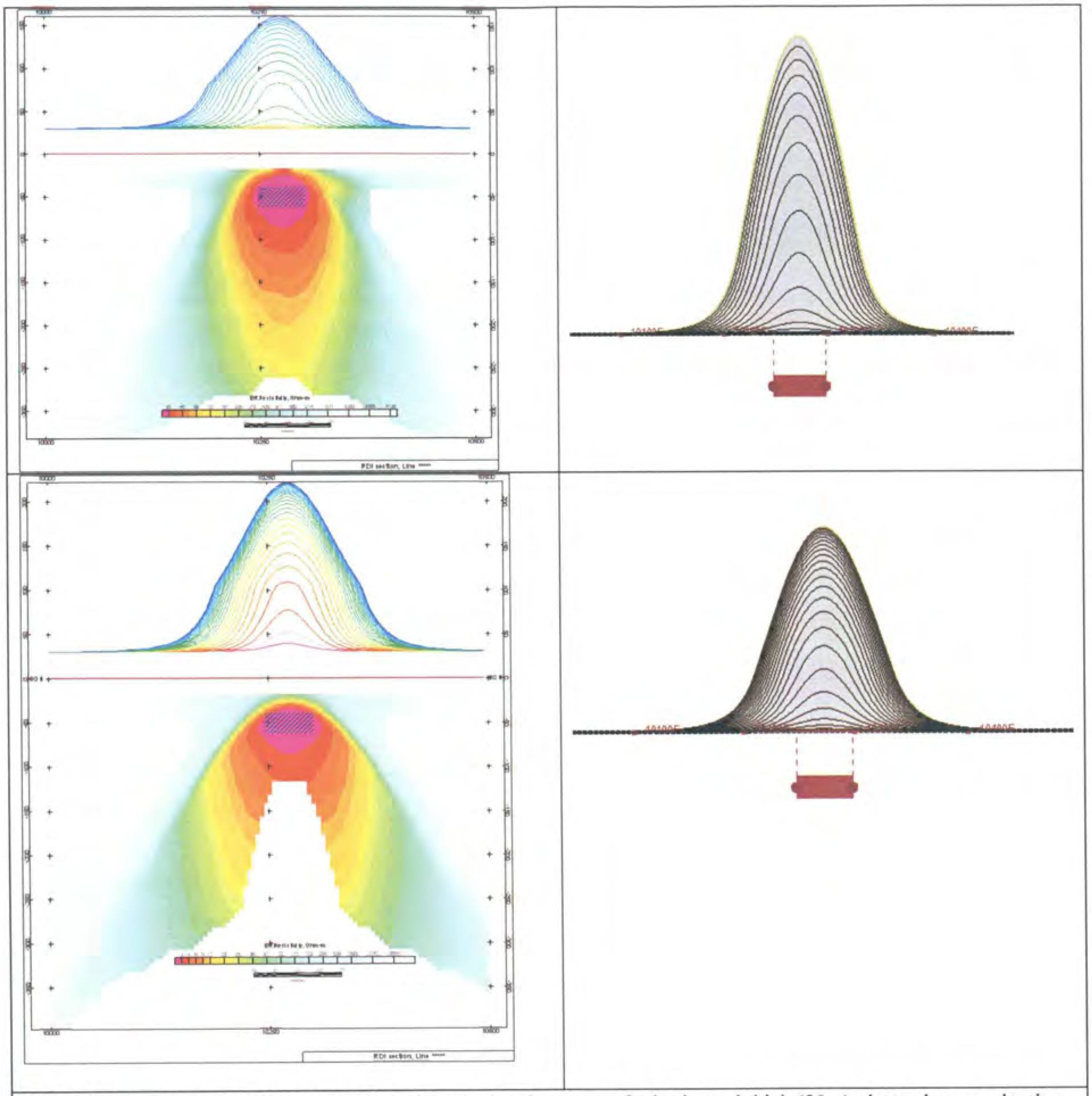


Fig.6 Maxwell plate model and RDI from the calculated response for horizontal thick (20m) plate – less conductive (on the top), more conductive (below)

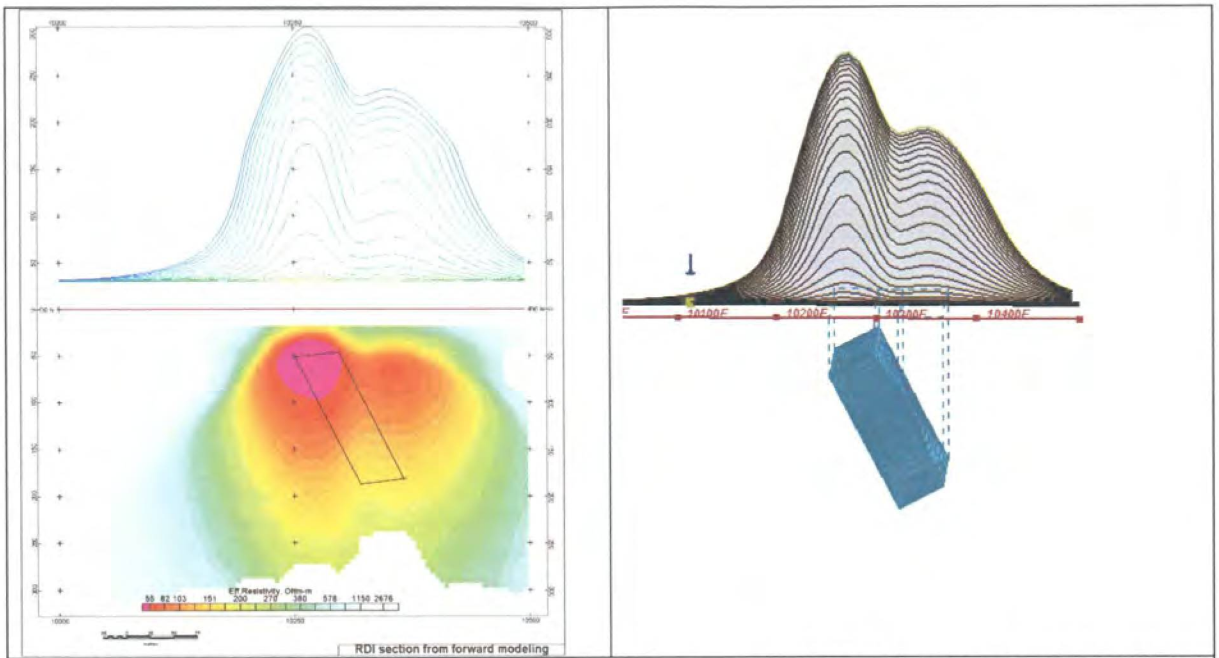


Fig.7 Maxwell plate model and RDI from the calculated response for inclined thick (50m) plate. Depth extend 150 m, depth to the target 50 m.

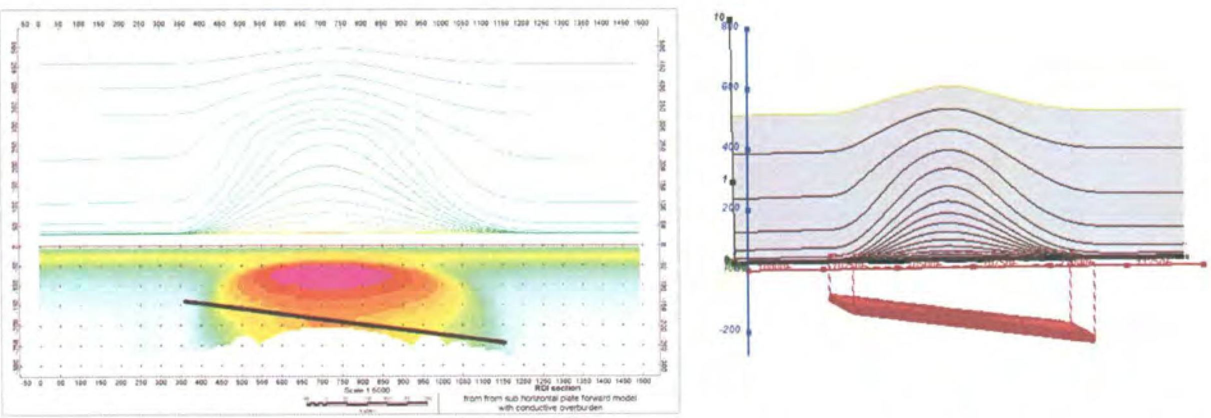


Fig.8 Maxwell plate model and RDI from the calculated response for the long, wide and deep subhorizontal plate (depth 140 m, dim 25x500x800 m) with conductive overburden.

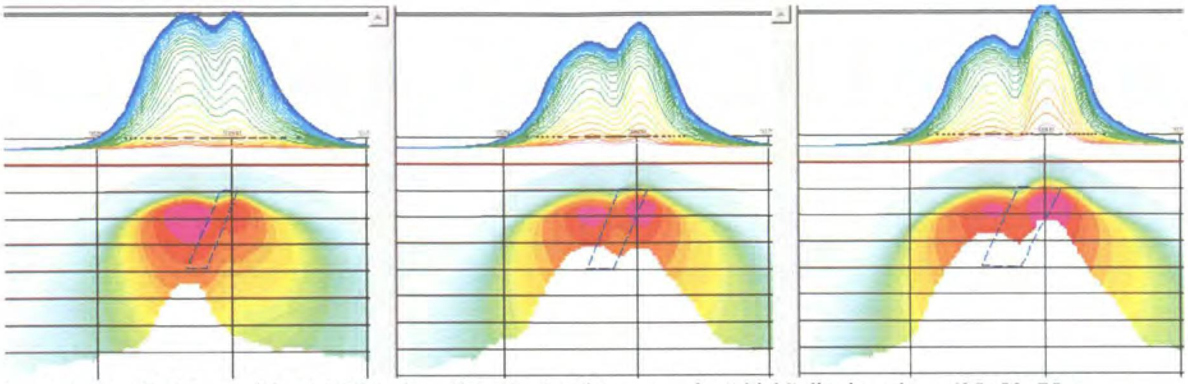


Fig.9 Maxwell plate models and RDIs from the calculated response for "thick" dipping plates (35, 50, 75 m thickness), depth 50 m, conductivity 2.5 S/m.

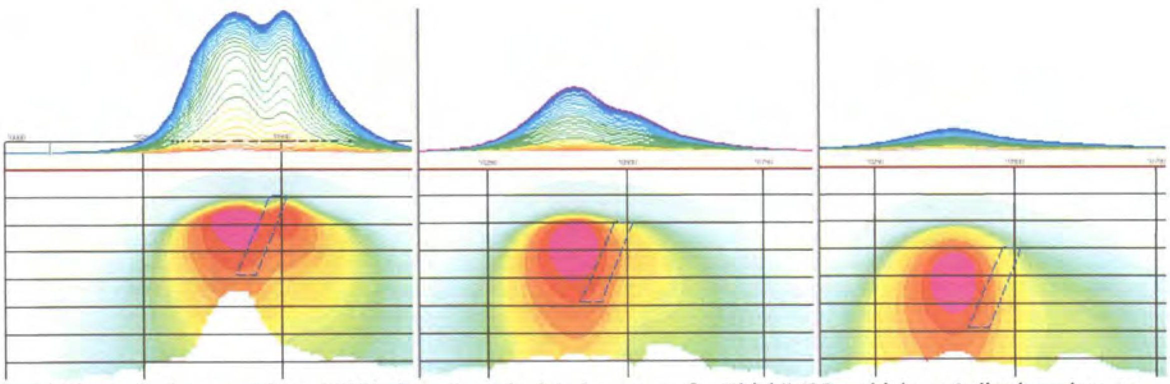


Fig.10 Maxwell plate models and RDIs from the calculated response for "thick" (35 m thickness) dipping plate on different depth (50, 100, 150 m),, conductivity 2.5 S/m.

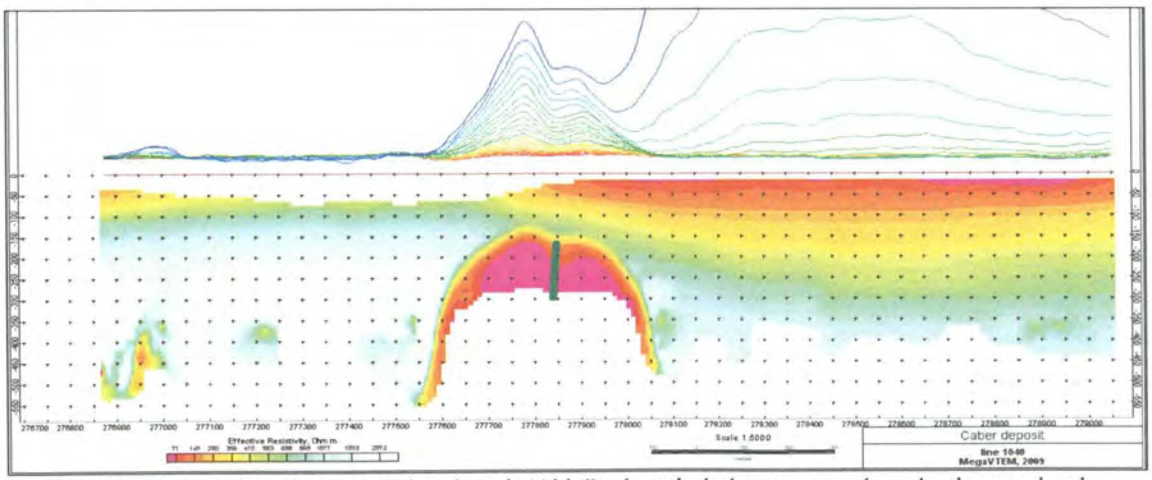


Fig. 11 RDI section of the line over Caber deposit ("thin" subvertical plate target and conductive overburden.

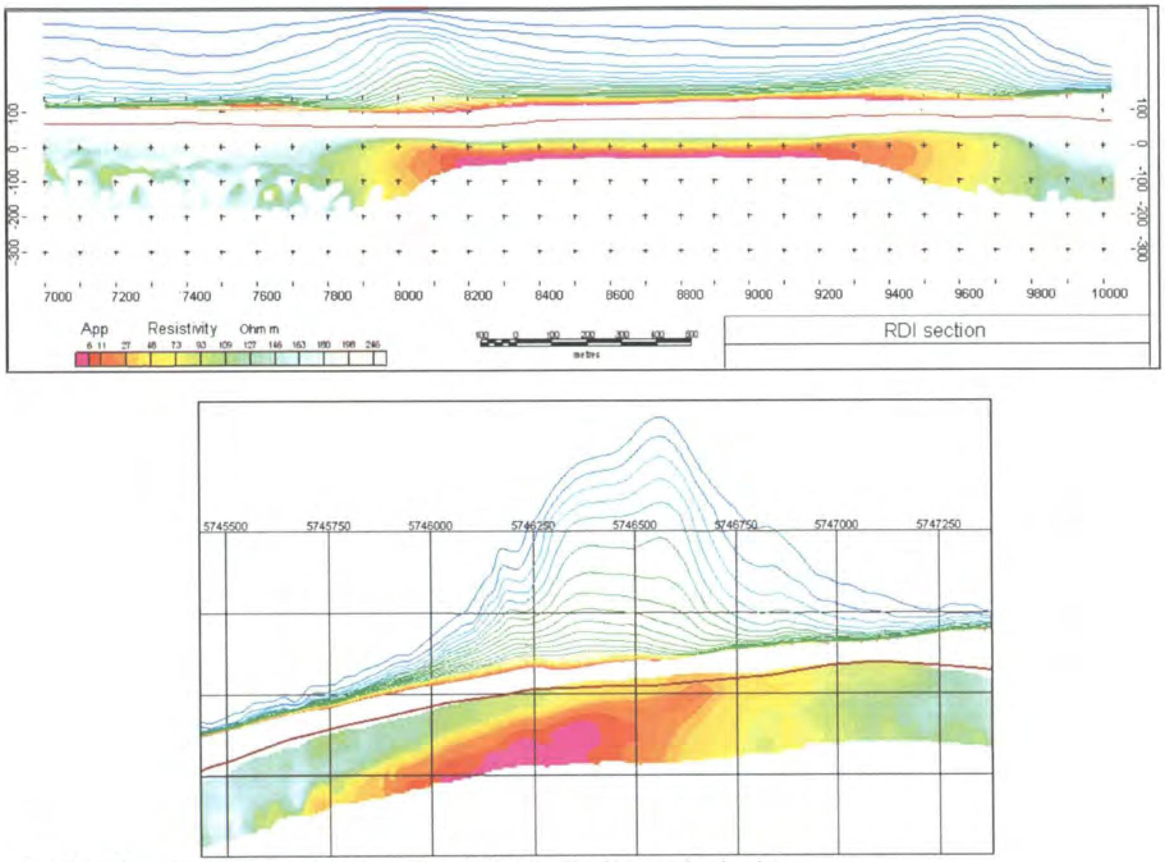
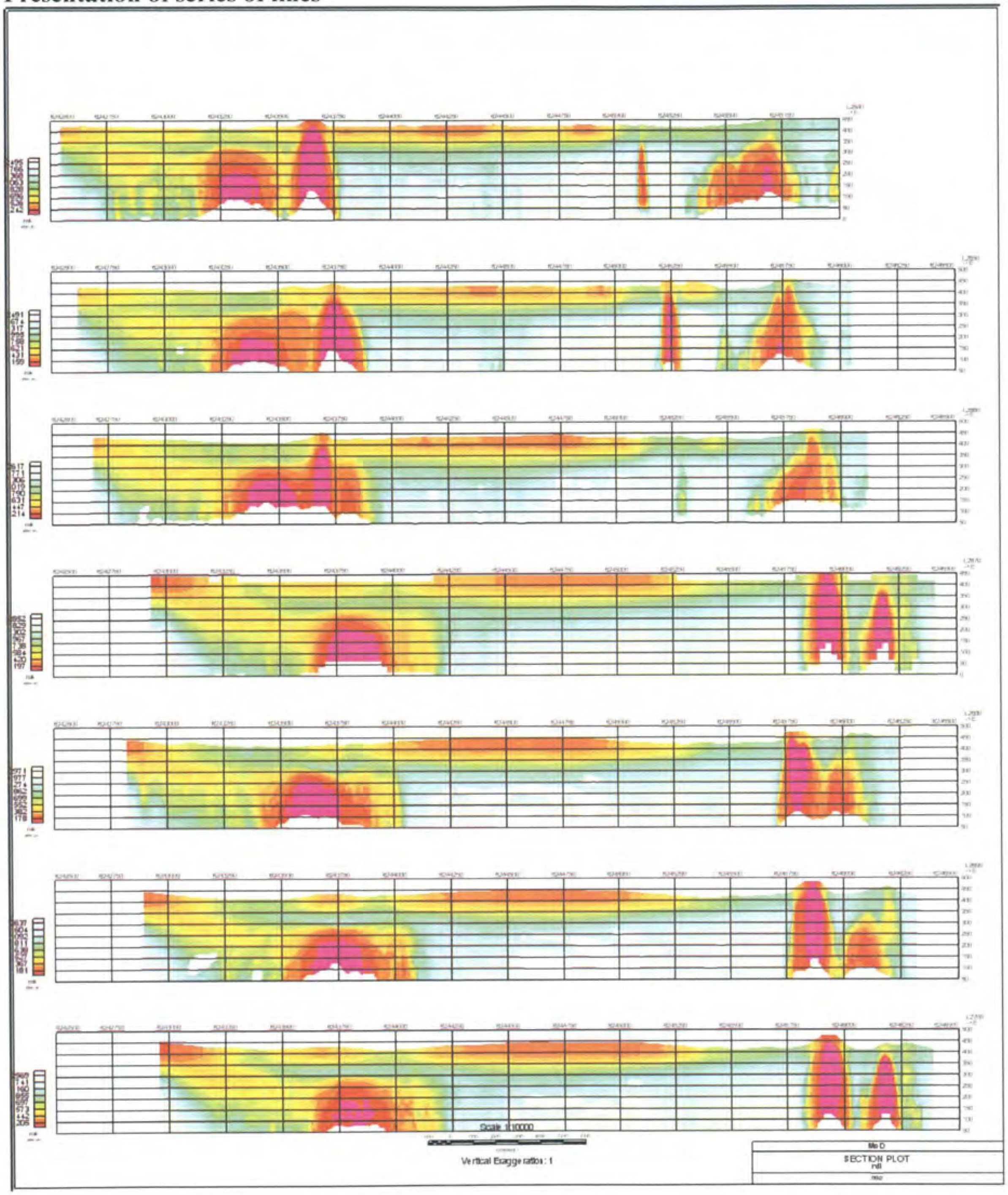
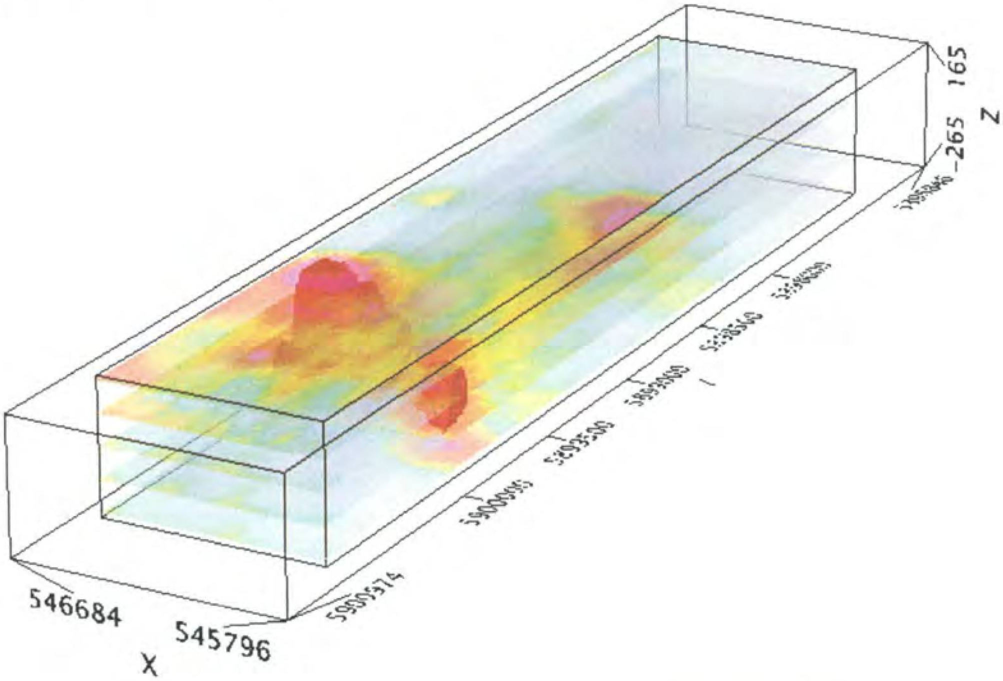


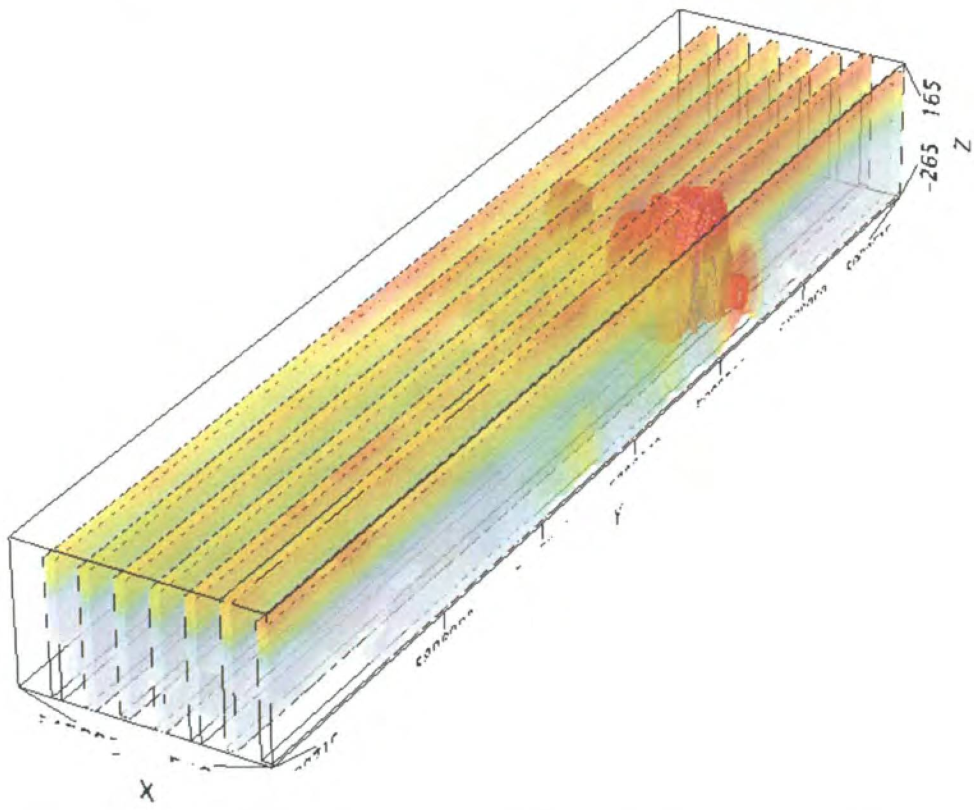
Fig.12 RDI section for the real horizontal and slightly dipping conductive layers

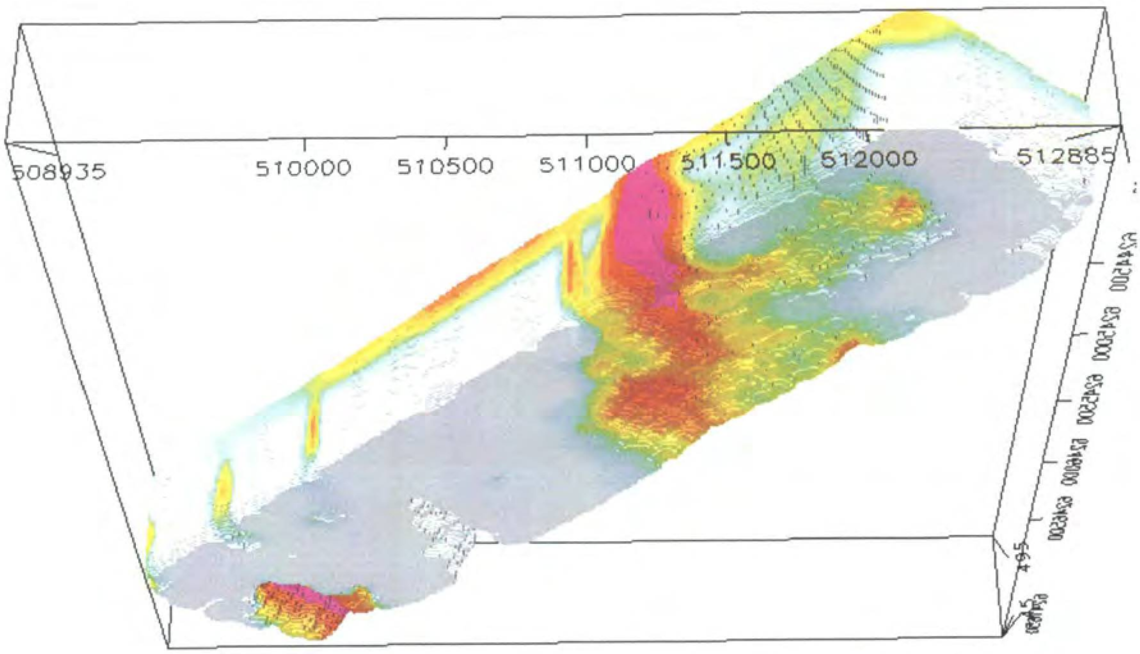
Presentation of series of lines

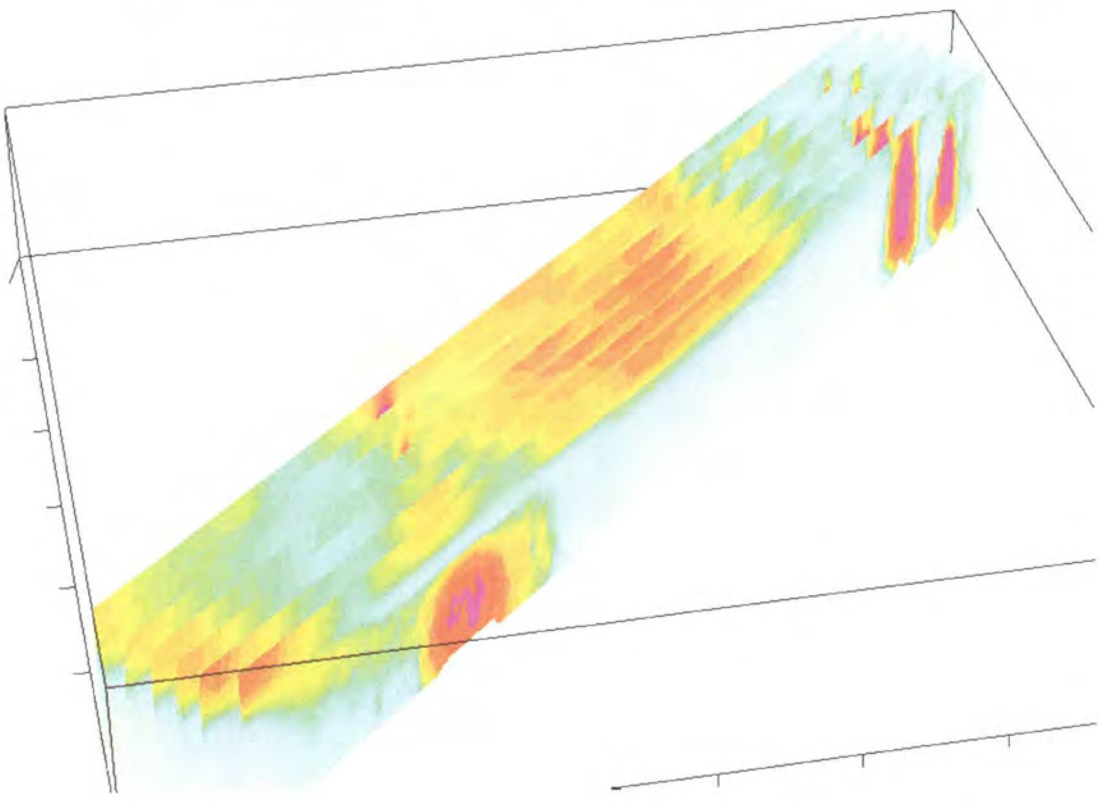


3d presentation of RDIs









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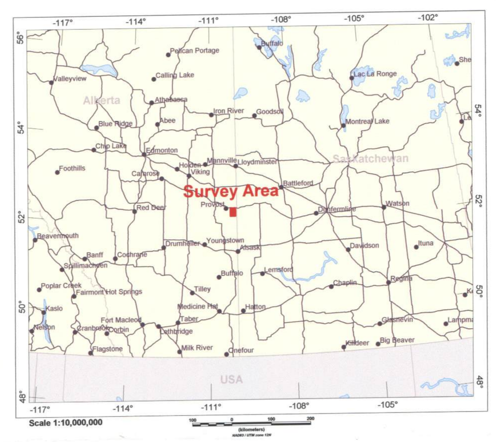


SURVEY SPECIFICATIONS:

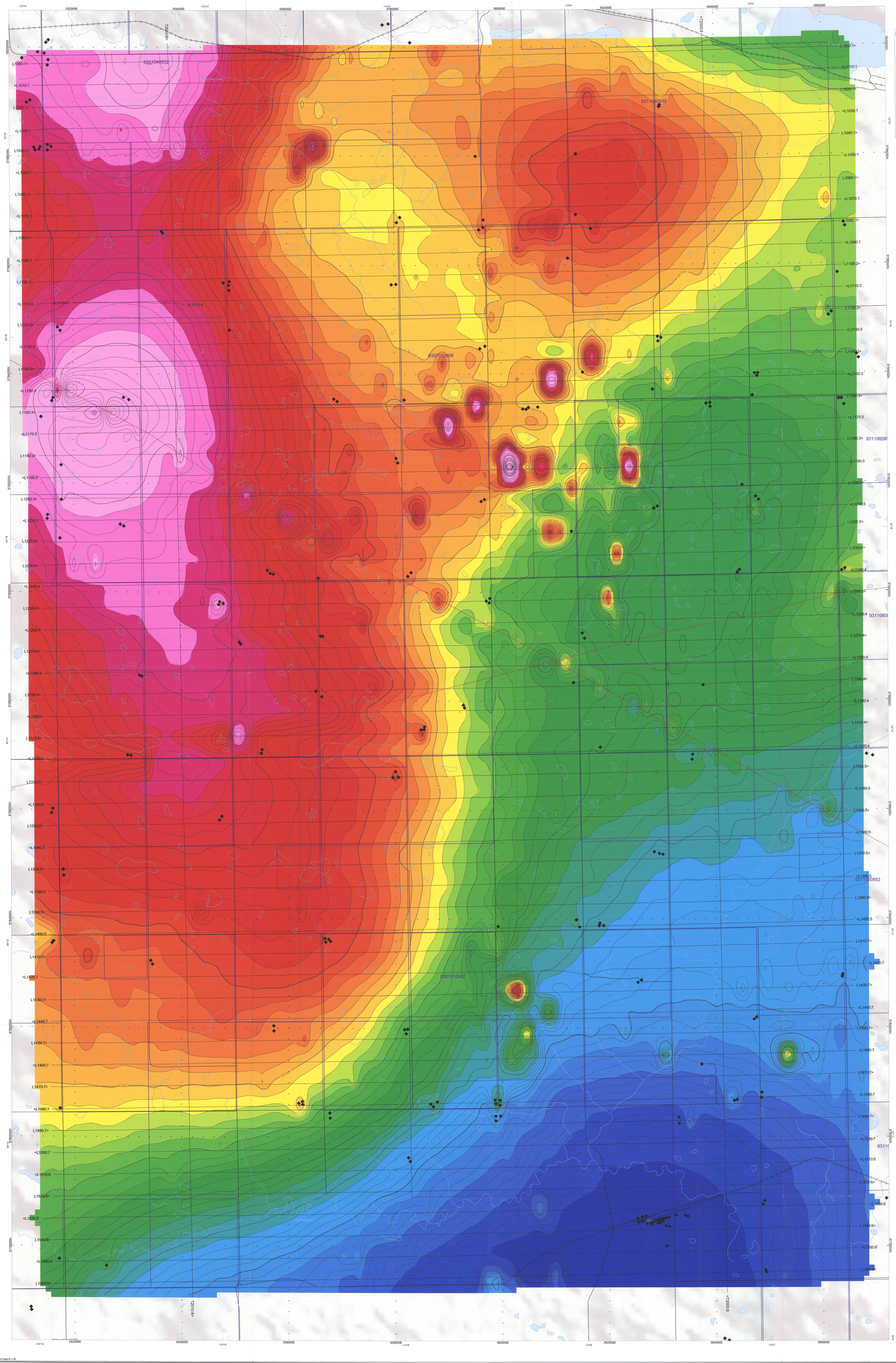
Survey Date: May 26th to May 30th, 2011
Survey Base: Provost, Alberta
Aircraft: Aerospatiale A-Star 350 B3 (C-GEOJ)
Nominal Survey Line Spacing: 400 Meters
Nominal Survey Line Direction: N 89° E / N 269° E
Nominal Tie Line Spacing: 10000 Meters
Nominal Tie Line Direction: N 179° E / N 359° E
Nominal Terrain Clearance: 73 Meters
EM Loop: Towed at a mean distance of 35 meters below the Helicopter
Magnetic Sensor: Towed at a mean distance of 13 meters below the Helicopter

INSTRUMENTS

Geotech Time Domain Electromagnetic System (VTEM)
Concentric Rx/Tx Geometry
X-Coil Loop: Diameter 0.32 Meters, Base Frequency 30 Hz
Transmitter Loop: Diameter 26 Meters,Base Frequency 30 Hz
Dipole Moment: 524,542 nIA
Transmitter Wave Form: Trapezoid, Pulse Width 4.43 ms.
Geometrics High Sensitivity Cesium Magnetometer
Mag Resolution: 0.02 nT at 10 samples/sec

MAP PROJECTION

Datum: NAD 83
Projection: Universal Transverse Mercator
Central Meridian: 111°W (Zone 12N)
Central Scale Factor: 0.9996
False Easting/Northing: 500,000m/0m
Major Axis: 6378137.000
Eccentricity: 0.081819191
NTS: 073D01 & 073D08



Scale 1:20000

(meters)
NAD83 / UTM zone 12N

The topographic data base was derived from 1:50000 NRC (Natural Resources Canada) NTDB data
Background shading is derived from NASA SRTM (Shuttle Radar Topography Mission) data
Inset data derived from Geocommunities 1:250,000 Canadian National Topographic database
Mining Claims are derived from Government of Alberta Department of Energy
(www.geocomm.com)(www.geogratis.ca)(http://gis.energy.gov.ab.ca)

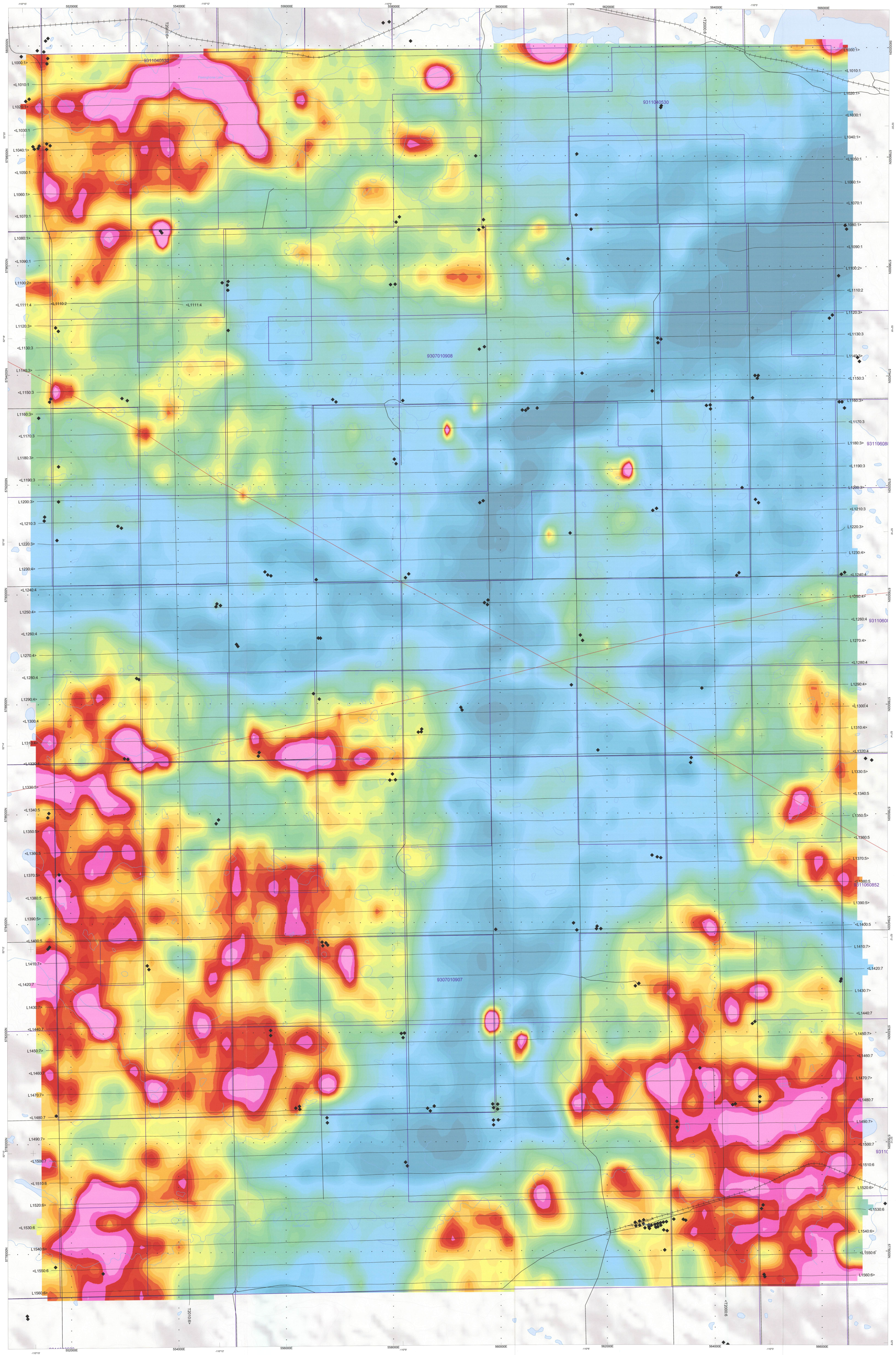
Pacific Canada Potash Ltd.
Provost Potash Property
Provost, Alberta

Geotech VTEM System

Total Magnetic Intensity (TMI)

Flown and processed by Geotech Ltd.
245 Industrial Parkway North,
Aurora, Ontario, Canada L4G 4C4
www.geotech.ca

June 2011



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Provost Potash Property
Provost, Alberta

Geotech VTEM System

Z-Component B-field Channel 26
Time Gate 0.505 ms

Flown and processed by Geotech Ltd.
245 Industrial Parkway North,
Aurora, Ontario, Canada L4G 4C4
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June 2011

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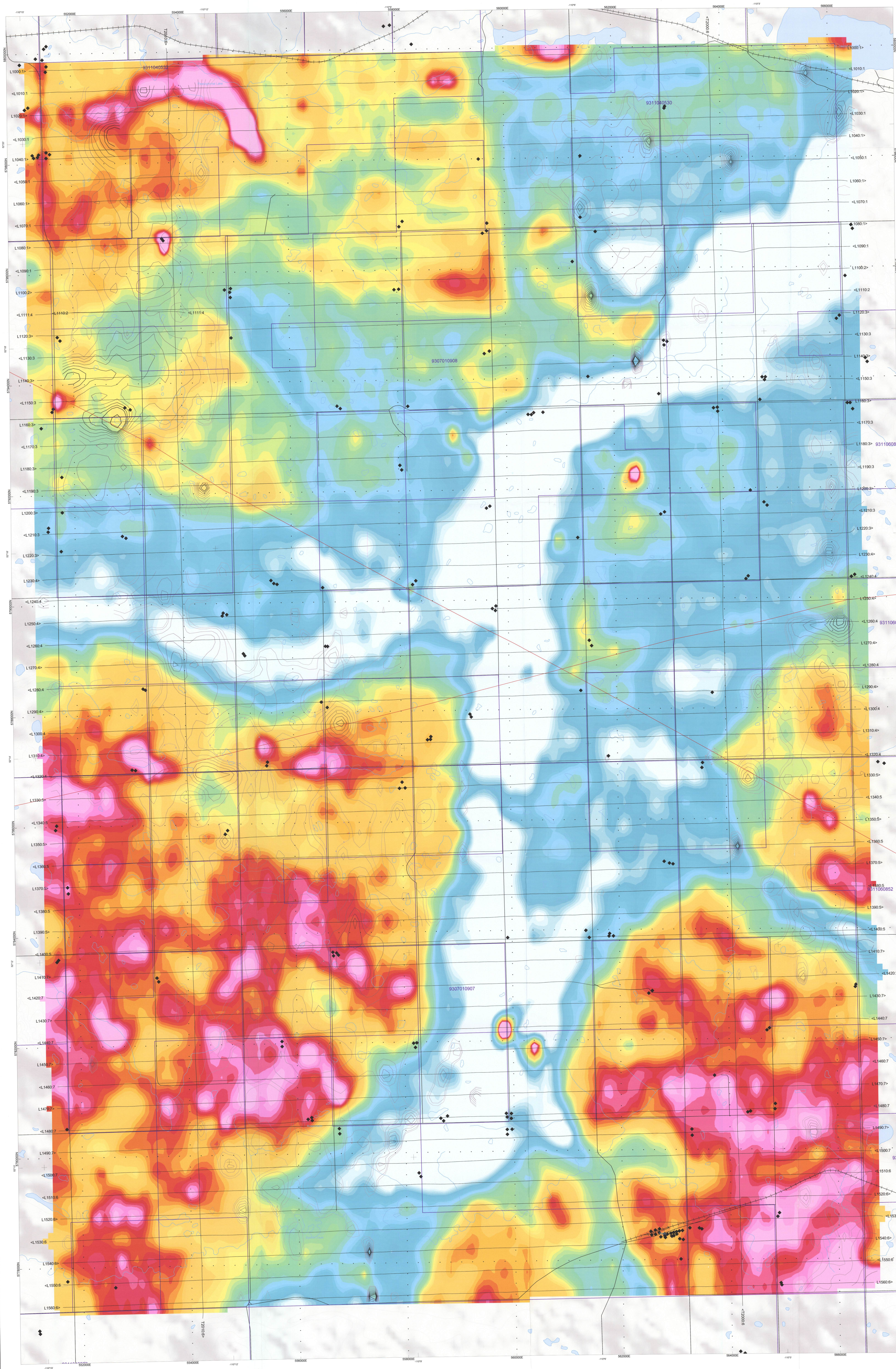

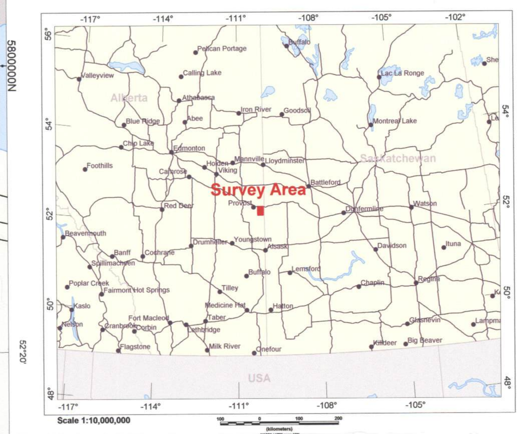

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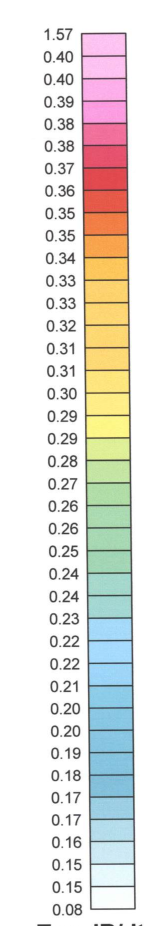

Tau dB/dt
msec

TOPOGRAPHIC LEGEND:
Buildings
Pipelines
Railways
Roads
Contours
Rivers / Streams
Lakes / Ponds
Wetlands
Mining Claims

Scale 1:20000
(meters)
NAD83 / UTM zone 12N

The topographic data base was derived from 1:50000 NRC (Natural Resources Canada) NTDB data
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Pacific Canada Potash Ltd.
Provost Potash Property
Provost, Alberta

Geotech VTEM System

dB/dt Calculated Time Constant (Tau)
with contours of anomaly areas of the
Calculated Vertical Derivative of TMI

Flown and processed by Geotech Ltd.
245 Industrial Parkway North,
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June 2011

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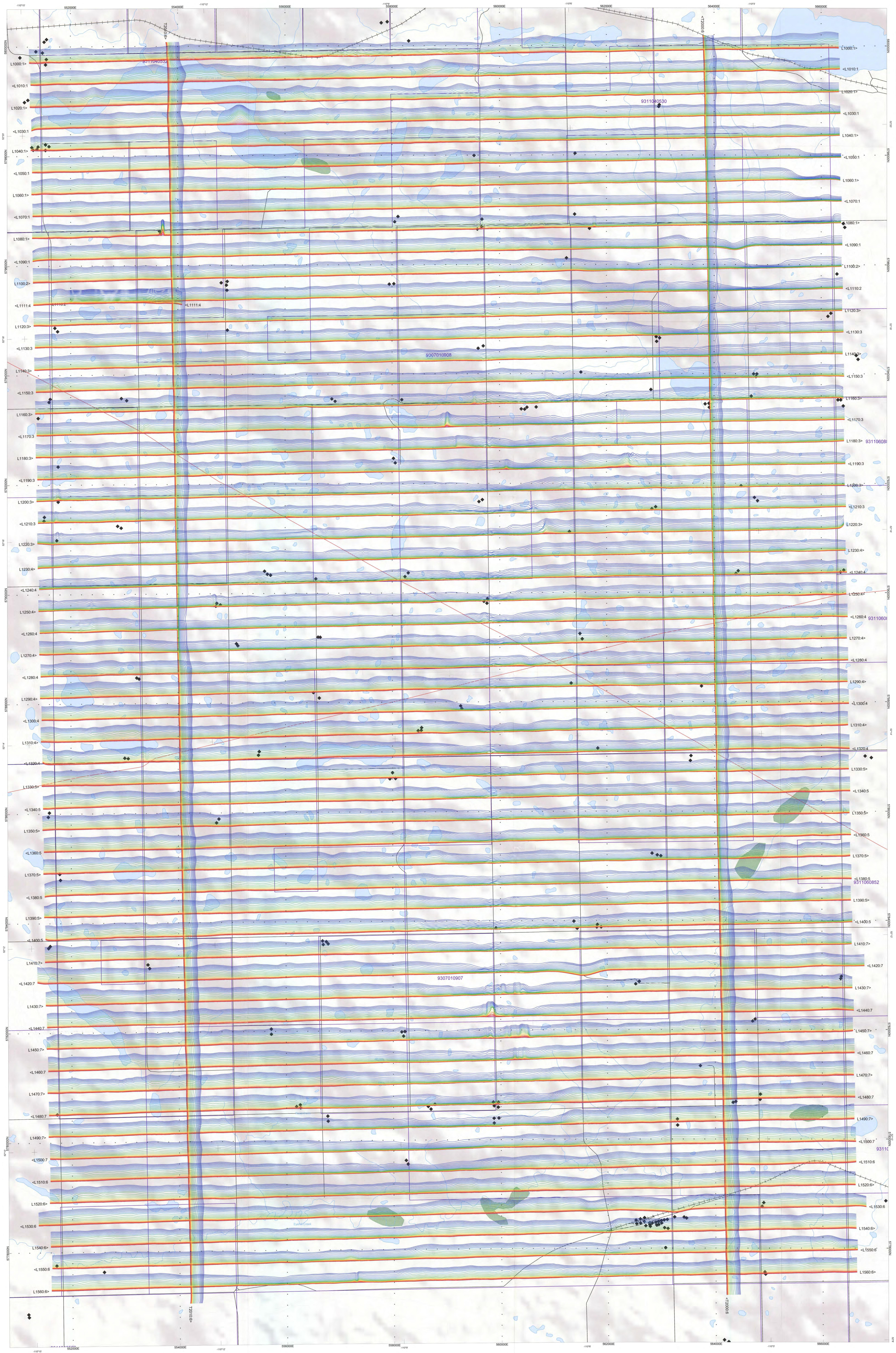
Nominal Tie Line Direction: N 179° E / N 359° E
Nominal Terrain Clearance: 73 Meters
EM Loop: Towed at a mean distance of 35 meters below the Helicopter
Magnetic Sensor: Towed at a mean distance of 13 meters below the Helicopter

INSTRUMENTS
Geotech Time Domain Electromagnetic System (VTEM)
Concentric Rx/Tx Geometry
X-Coil Loop: Diameter 0.32 Meters, Base Frequency 30 Hz
Transmitter Loop: Diameter 26 Meters,Base Frequency 30 Hz
Dipole Moment: 524,542 nIA
Transmitter Wave Form: Trapezoid, Pulse Width 4.43 ms.
Geometrics High Sensitivity Cesium Magnetometer
Mag Resolution: 0.02 nT at 10 samples/sec

MAP PROJECTION
Datum: NAD 83
Projection: Universal Transverse Mercator
Central Meridian: 111°W (Zone 12N)
Central Scale Factor: 0.9996
False Easting/Northing: 500,000m/0m
Major Axis: 6378137.000
Eccentricity: 0.081819191
NTS: 073D01 & 073D08



Profiles scale 1 mm = 0.6 (pV/A*m^4)
Linear between +/- 5 (pV/A*m^4)
logarithmic above 5 (pV/A*m^4)

0.220 ms
0.253 ms
0.290 ms
0.333 ms
0.383 ms
0.440 ms
0.505 ms
0.580 ms
0.667 ms
0.766 ms
0.880 ms
1.010 ms
1.161 ms
1.333 ms
1.531 ms
1.760 ms
2.021 ms
2.323 ms
2.667 ms
3.063 ms
3.521 ms
4.042 ms
4.641 ms
5.333 ms
6.125 ms
7.036 ms

TOPOGRAPHIC LEGEND:
Buildings
Pipelines
Railways
Roads
Contours
Rivers / Streams
Lakes / Ponds
Wetlands
Mining Claims

Scale 1:20000
250 0 250 500 750 1000
(meters)
NAD83 / UTM zone 12N

The topographic data base was derived from 1:50000 NRC (Natural Resources Canada) NTDB data
Background shading is derived from NASA SRTM (Shuttle Radar Topography Mission) data
Inset data derived from Geocommunities 1:250,000 Canadian National Topographic database
Mining Claims are derived from Government of Alberta Department of Energy
(www.geocomm.com)(www.geogratis.ca)(http://gis.energy.gov.ab.ca)

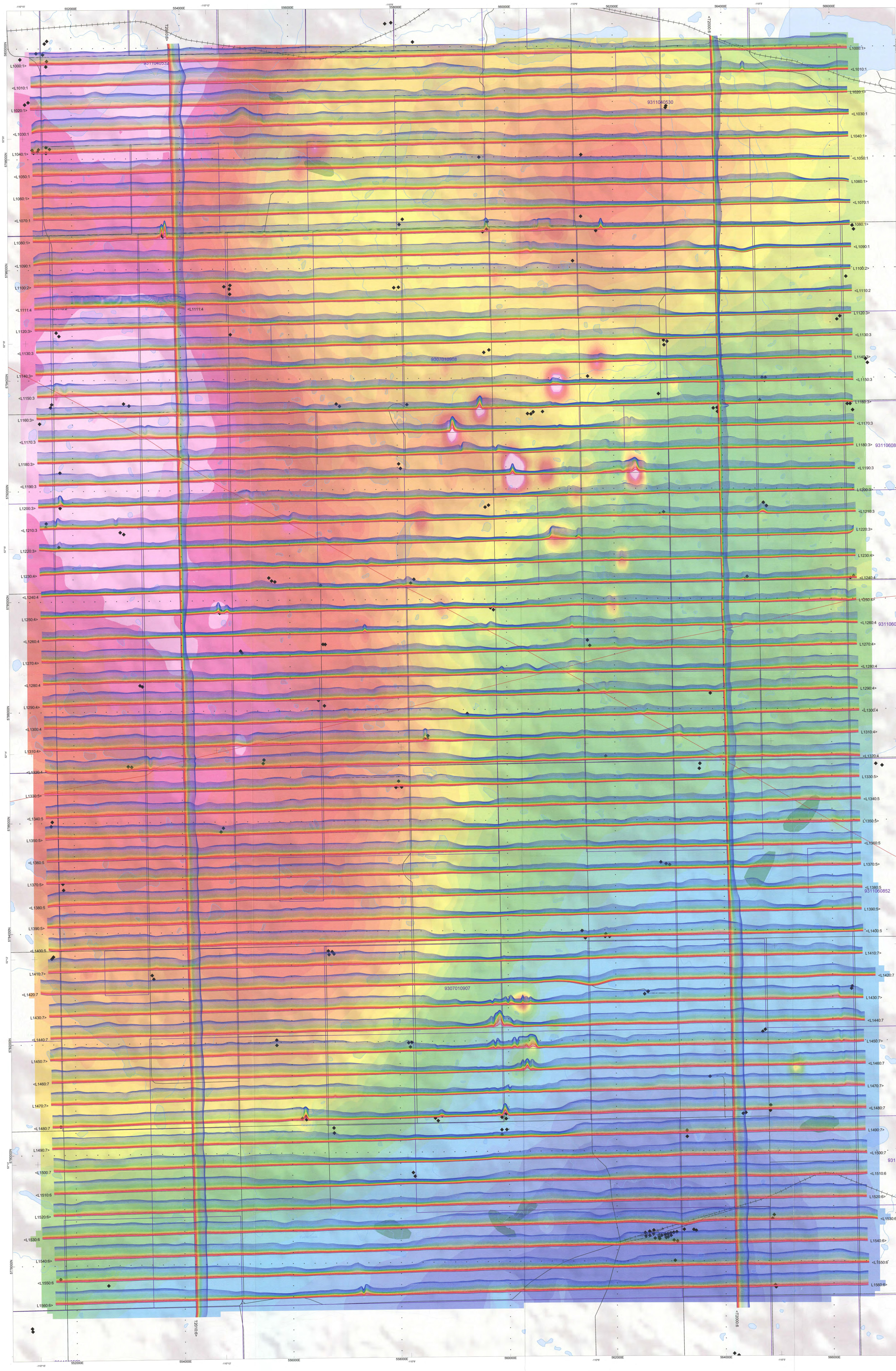
Pacific Canada Potash Ltd.
Provost Potash Property
Provost, Alberta

Geotech VTEM System

Z-Component dB/dt Profiles
Time Gates 0.220 to 7.036 ms

Flown and processed by Geotech Ltd.
245 Industrial Parkway North,
Aurora, Ontario, Canada L4G 4C4
www.geotech.ca

June 2011



GEOTECH LTD.

SURVEY SPECIFICATIONS:

Survey Date: May 26th to May 30th, 2011
Survey Base: Provost, Alberta
Aircraft: Aerospatiale A-Star 350 B3 (C-GEOJ)
Nominal Survey Line Spacing: 400 Meters
Nominal Survey Line Direction: N 89° E / N 269° E
Nominal Tie Line Spacing: 10000 Meters
Nominal Tie Line Direction: N 179° E / N 359° E
Nominal Terrain Clearance: 73 Meters
EM Loop: Towed at a mean distance of 35 meters below the Helicopter
Magnetic Sensor: Towed at a mean distance of 13 meters below the Helicopter

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Geotech VTEM System
Z-Component B-field Profiles
Time Gates 0.220 to 7.036 ms
displayed over TMI

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