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DETOUR GOLD™

REPORT OF REGIONAL EXPLORATION ACTIVITIES ON THE DETOUR LAKE AREA PROPERTIES

Year 2015

Detour Gold Corporation

May 10, 2016

Charles Hartley, P. Geo

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1 SUMMARY

The property is entirely within Abitibi Greenstone Belt in northeastern Ontario. The property encompasses approximately 630 square kilometers, including the Detour Lake mine operated by Detour Gold Corporation ("**DGC**").

The property covers an area of contiguous mining claims and mining leases and patents of approximately 630 sq. km from the Ontario-Quebec border to about 35 km west, centered about 180 kilometers northeast of Cochrane, ON. Access to the property is available via the Detour Lake mine road, an extension of Highway 652 from Cochrane.

The Company has consolidated the area and now controls approximately 630 km^2. Detour Gold has identified new opportunities for exploration.

The project area is underlain by supracrustal rocks of the Abitibi Greenstone Belt within the volcanic assemblage of the Deloro Group and the younger sediments of the Caopatina Group.

This report describes the logistics, data acquisition, processing and presentation of results of a MIDAS magnetic airborne geophysical survey completed by CGG Canada Services Ltd., Toronto office on the Detour Gold Corp property northeast of Cochrane, Ontario. Total coverage of the survey block amounted to 14024.77 km. The survey was flown between February 20 and April 7, 2015.

The purpose of the survey was to map the geology and structure of the area. Data were acquired using a MIDAS magnetic system with two high-sensitivity cesium magnetometers. The information from these sensors was processed to produce maps and images that display the magnetic properties of the survey area. A GPS electronic navigation system ensured accurate positioning of the geophysical data with respect to the base map coordinates.

The survey was performed by CGG Canada Services Ltd., Toronto office. Maps and data in digital format are provided with this report.

The final report on the survey was prepared by CGG Canada Services Ltd and is included as a separate volume with this report.

The survey has successfully located and defined the magnetic properties of the geology which may assist during future exploration campaigns.

2 INTRODUCTION

The Detour Lake property is located in the northeast Ontario, approximately 180 km northeast of Cochrane. The property consists of both CLM Mining leases and individual claim blocks.

The Company has consolidated the area and now controls approximately 630 km^2. Detour Gold has identified new opportunities that may potentially expand the reserve/resource base.

CGG Canada Services Ltd was contracted by Detour Gold Corporation to conduct a MIDAS magnetic airborne geophysical survey carried out for Detour Gold Corp over the Detour Gold property northeast of Cochrane, Ontario. Total coverage of the survey block amounted to 14024.77 km. The survey was flown between February 20 and April 7, 2015.

3 PROPERTY

3.1 Location, Access and Resources

The Detour Lake Property is accessible by an extension of Highway 652 north about 180 km north of Cochrane. The first 150 km on Highway 652 is paved surface road followed by 30km of well-maintained gravel surfaced road to the project site (Figure 3-1).

The property is covers an area of contiguous mining claims and mining leases covering 630 sq. km from the Ontario-Quebec border to about 35 km west, centered approximately 180 km northeast of Cochrane, ON

Access to some of the more remote areas of Detour property is provided by a series of winter roads and trails leading to these areas.

The south part of the property (straddling the Lower Detour Deformation Zone) has access via winter roads and trails and helicopter services are needed for the exploration programs.

The Property is relatively flat, with maximum relief of about 30 metres and is located close to the Hudson Bay Lowlands. Bedrock outcrops form ridges within large areas overlain by thick 20 to 40metres accumulations of glacial till material (poorly sorted sand with lenses of gravel). Approximately 30% of the property is covered by muskeg swamp, which is locally in excess of 20 meters. Drainage in the area is generally very poor.

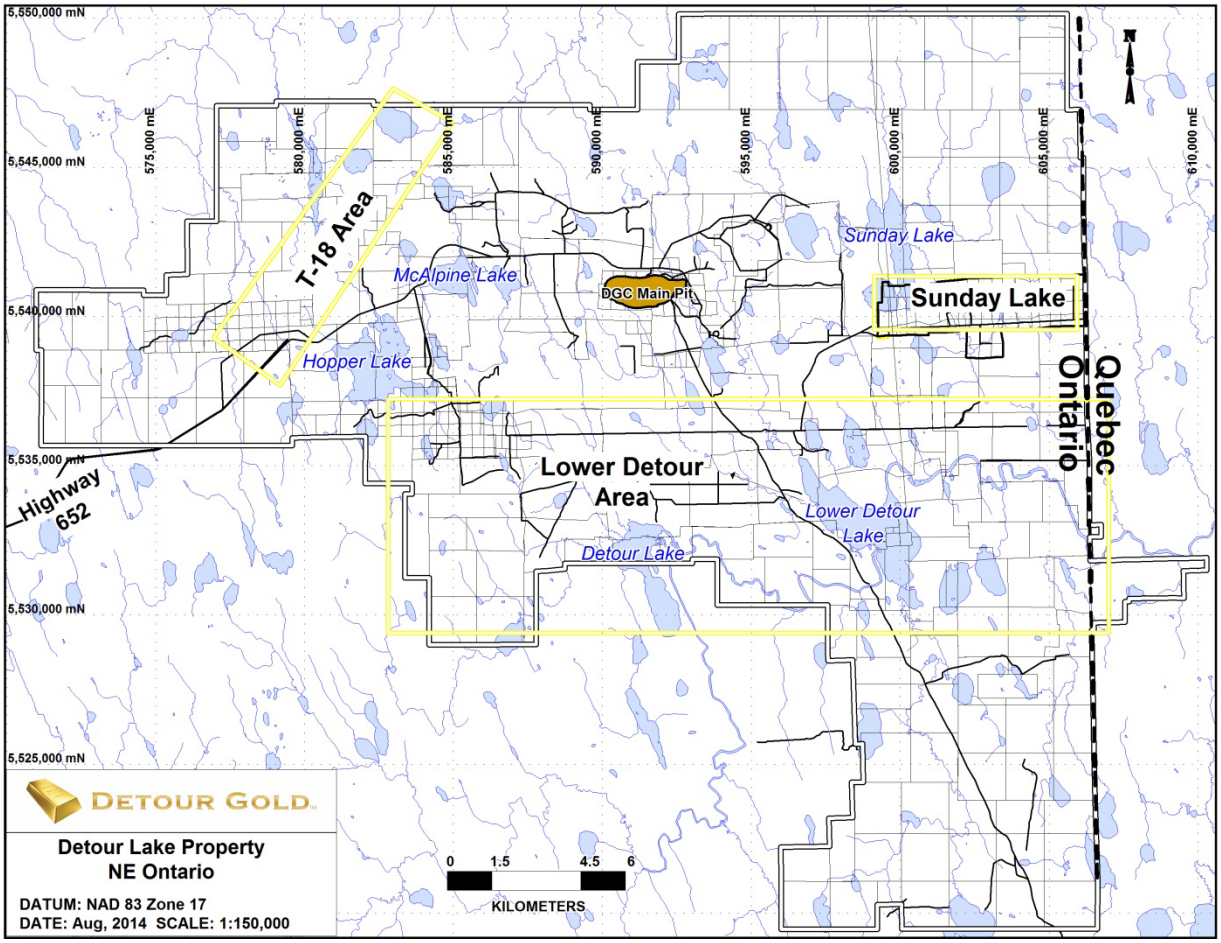


Figure 3-1: Location Map

3.2 Limits and Ownership

The limits and Ownership briefly described here.

The Detour Lake property covers an area of 630 km^2* and forms contiguous patented, unpatented mining claims and mining leases in the District of Cochrane. It includes the Mine Option Property and the surrounding lands known as the Detour Exploration Lands (Blocks A, B, C, D and E), as well as claims that were staked and purchased by the previous owners and unpatented mining claims staked by Detour Gold Corp.

Certain claims are covered under individual agreements which may include specific royalty payments.

The Company has consolidated the area and now controls approximately 630 km^2.

4 HISTORICAL EXPLORATION

The historical exploration here as quoted and modified from Roger Aubertin from the assessment report entitled: "**Report of Regional Exploration Activities on MMI Target T18 and Lower Detour Sector, Detour Lake Property, Year 2011**", report completed on July 25, 2012.

Exploration activities started as early as 1970's but intensified in 1974 with the discovery of Detour Lake mine by Amoco Canada Petroleum Company Limited. Most of the past exploration has been completed by mine operators, including Amoco, Campbell Red Lake Mines and Placer Dome. Other exploration programs have been completed by Pelangio, Tradewinds Venture respectively on Detour Lake and Detour West Block properties. Westmin Resources and Conquest Resources have also made a substantial contribution in the exploration of the Lower Detour Lake Area. Exploration of other areas was completed other companies, including Global Energy Limited, Gowest Amalgamated and Destor Resources Exploration.

In 2007 Detour Gold Corporation acquired the Detour Lake property, the company has completed exploration and delineation diamond drilling of the Detour Lake Mine Deposit and the Detour West Block deposit. As of December 2011, Detour Gold has defined the mineral reserve of 15.6 Million troy ounces gold within the main deposit and as of January 2016 a mineral resource of 1.5 million troy ounces gold in Detour West Block.

During 2010 to 2012 Detour Gold completed regional geochemical MMI and Induced Polarization geophysical surveys over much of the Detour Gold property. Detour also completed limited exploration diamond drilling on the Lower Detour area in 2011, 2112, and 2113 and in 2114 followed up with a more extensive diamond drilling program of testing anomalous areas. These programs have been reported in earlier assessment reports.

5 GEOLOGY

The geology, lithologies and mineralization at the Detour Lake Deposit are best described in: *J Oliver, J Ayer, B Dube, R Aubertin, M Burson, G Panneton, R Friedmen, and M Hamilton (2012) Structure Stratigraphy and Alteration Characteristics of Gold Mineralization at Detour Lake Deposit, Ontario, Canada. In Exploration and Mining Journal Volume 20 p 1 – 30. Copyright (2012) Canadian Institute of Mining Metallurgy and Petroleum.*

The regional geology is briefly described here as quoted and modified from by Roger Aubertin from the assessment report entitled: "**Report of Regional Exploration Activities on MMI Target T18 and Lower Detour Sector, Detour Lake Property, Year 2011**", report completed on July 25, 2012.

5.1 Regional Geology

The Detour Lake property is located within the Abitibi Greenstone Belt in the Superior Province of the Canadian Shield. The supracrustal rocks consist of mafic and ultramafic volcanic rocks of the Deloro Group in thrust contacts with the younger Caopatina sedimentary sequence, forming the core of a regional-scale synform.

The northern and southern contacts of the Caopatina sediments differ in style. The northern contact is highly planar and defines the position of the Sunday Lake Deformation Zone; volcanic units north of this deformation zone are dominated by pillowed and massive mafic flows of the upper Detour Lake formation. The mineralization of the Detour Lake gold deposit is associated to this deformation zone. In contrast, the southern contact (Lower Detour Deformation Zone) is irregular, and is characterized by volcanic rocks with a very high

Magnetic signature characterized by the presence of abundant ultramafic and mafic volcanic rocks; it is considered to be an unconformity similar in nature to the low-angle unconformity found at the base of the Porcupine assemblage in the Timmins camp (Bateman et al., 2008).

The volcanic assemblage of the Deloro Group is made of massive and pillowed tholeiitic basalt flows and local komatiitic volcanic flows with interflows with mafic tuffs while the Caopatina sequence is composed principally of conglomerates, greywacke and graphitic sediments. These units are intruded locally by gabbros sills and felsic dykes.

The regional metamorphism is generally at the upper greenschist facies but increases to lower amphibolite to the west of the property close to the Opatica gneissic basement. Contact metamorphism is principally observed to the south next to the diorite-gabbro batholith.

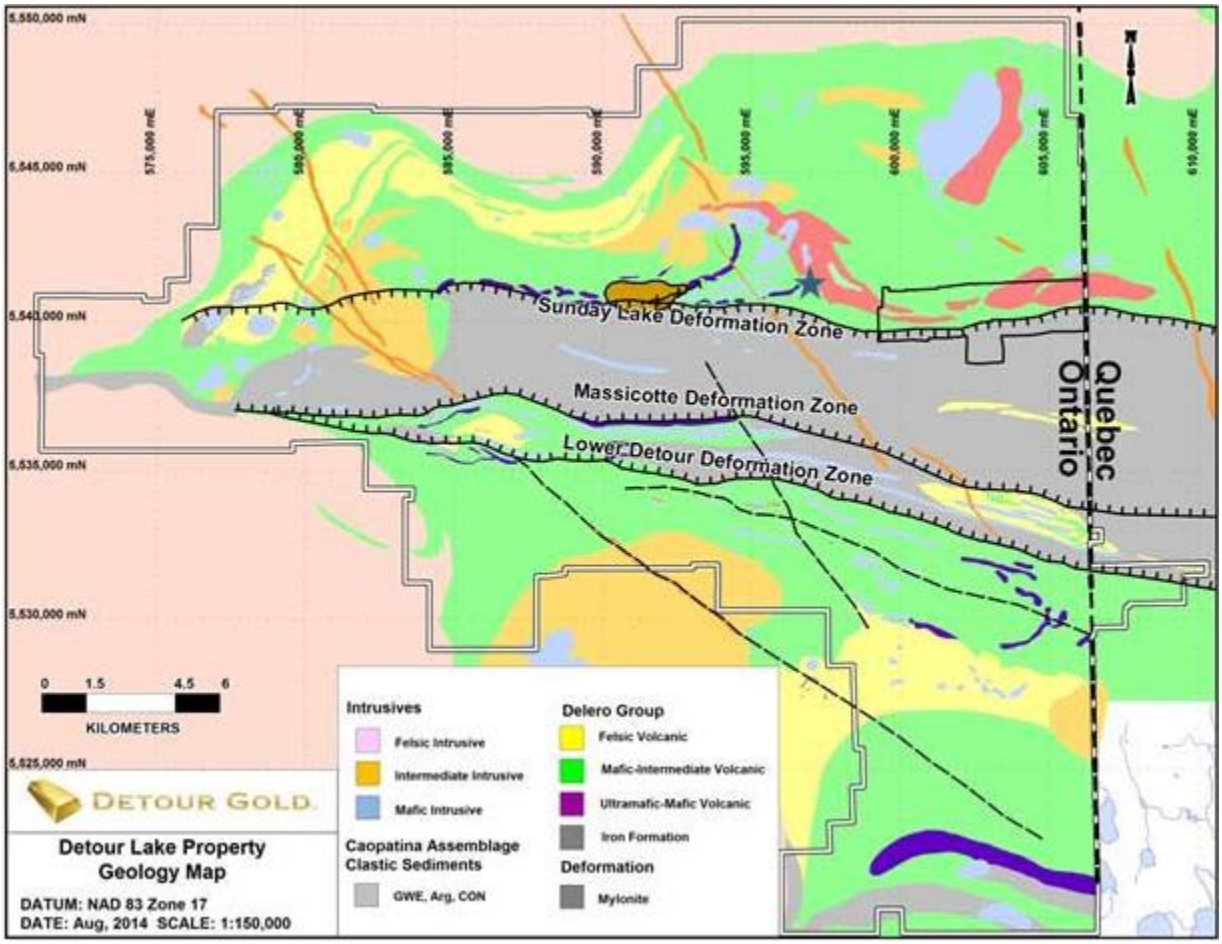


Figure 5-1: Regional Geology Map of the Detour Lake Area

6 2015 EXPLORATION ACTIVITIES

To advance the exploration and further define the geology and to assist in defining the geology of the Detour Lake property CGG Canada Services Ltd was contracted by Detour Gold Corporation to conduct a MIDAS magnetic airborne geophysical survey carried out for Detour Gold Corp over the entire Detour Gold property northeast of Cochrane, Ontario. Total coverage of the survey block amounted to 14024.77 km. The survey was flown between February 20 and April 7, 2015.

7 DISCUSSION AND SCOPE OF WORK

The purpose of the survey was to map the geology and structure of the area. Data were acquired using a MIDAS magnetic system with two high-sensitivity cesium magnetometers. The information from these sensors was processed to produce maps and images that display the magnetic properties of the survey area. A GPS electronic navigation system ensured accurate positioning of the geophysical data with respect to the base map coordinates.

The survey was performed by CGG Canada Services Ltd., Toronto office. Maps and data in digital format are provided with this report.

The final report on the survey was prepared by CGG Canada Services Ltd. and is included in the appendices.

Detour Gold supervision was provided by Detour Gold exploration management personnel.

8 CONCLUSIONS AND RECOMMENDATION

CGG Canada Services Ltd was contracted by Detour Gold Corporation.

The purpose of the survey was to map the geology and structure of the area. Data were acquired using a MIDAS magnetic system with two high-sensitivity cesium magnetometers. The information from these sensors was processed to produce maps and images that display the magnetic properties of the survey area. A GPS electronic navigation system ensured accurate positioning of the geophysical data with respect to the base map coordinates.

The survey has successfully located and defined the magnetic properties of the geology which may assist during future exploration campaigns.

9 EXPENDITURES

The costs of the survey completed in Quebec on the Massicotte property have been deducted from the expenses reported. Only the expenses incurred in Ontario are reported here.

Table 9-1: Table of Expenditures

Description	Net Amount	Total
Camp Administration		
Project management and supervision	$45,700.00	
Accommodation & camp $120man\day x 8 men x 67days	$64,320.00	**$110,020**
CGG Canada Services Ltd		
As invoiced	$467,000	
Less amount spent in Quebec	**($10,624)**	$456, 376
Logistical Support		
Transportation pickup truck $100 x 62days	$6,700	$6,700
		$573,096
Assessment report	$3,000	**$3,000**
Total		**$576,096**

Table 9-2: Distribution of Expenses

See appendix

10 REFERENCES

Detour Gold Corporation:

2015 DGC 2015 vendor balance detailed payments, prepared by Accounting Dept., Detour Gold Corp.

2015 Various Internal and Confidential memos, documents and digital data by Detour Gold.

J Oliver, J Ayer, B Dube, R Aubertin, M Burson, G Panneton, R Friedmen, and M Hamilton (2012).Structure Stratigraphy and Alteration Characteristics of Gold Mineralization at Detour Lake Deposit, Ontario, Canada. In Exploration and Mining Journal Volume 20 p 1-30. Copyright (2012) Canadian Institute of Mining Metallurgy and Petroleum.

S. Marmont: 1986. The geological setting of the Detour Lake gold mine, Ontario, Canada, in MacDonald, A.J., ed, Gold' 86: Willowdale, Ontario, KonsultInternat.inc., pp.81-95.

R. Aubertin: 2012. “Report of Regional Exploration Activities on MMI Target T18 and Lower Detour Sector, Detour Lake Property, Year 2011”. Unpublished internal Assessment report for Detour Gold Corporation, Toronto, Ontario.

C. Hartley: 2013. “Report of Regional Exploration Activities on Lower Detour Lake Area Properties, Year 2012”. Unpublished internal Assessment report for Detour Gold Corporation, Toronto, Ontario.

CGG Canada Services Ltd. 2015, Toronto, Ontario: Geophysical Survey Report, Midas High Resolution Magnetic Survey, Cochrane area, project 15001, unpublished internal report prepared for Detour Gold Corp, Toronto, Ontario.

R J Bailey 2015; Internal Land Management Reports for Detour Gold Corp; unpublished internal report prepared for Detour Gold Corp, Toronto, Ontario.

Tolhurst, James 2015; Report of Geophysical Activities on the Massicotte Property, Quebec.

Unpublished internal report prepared for Detour Gold Corp, Toronto, Ontario.

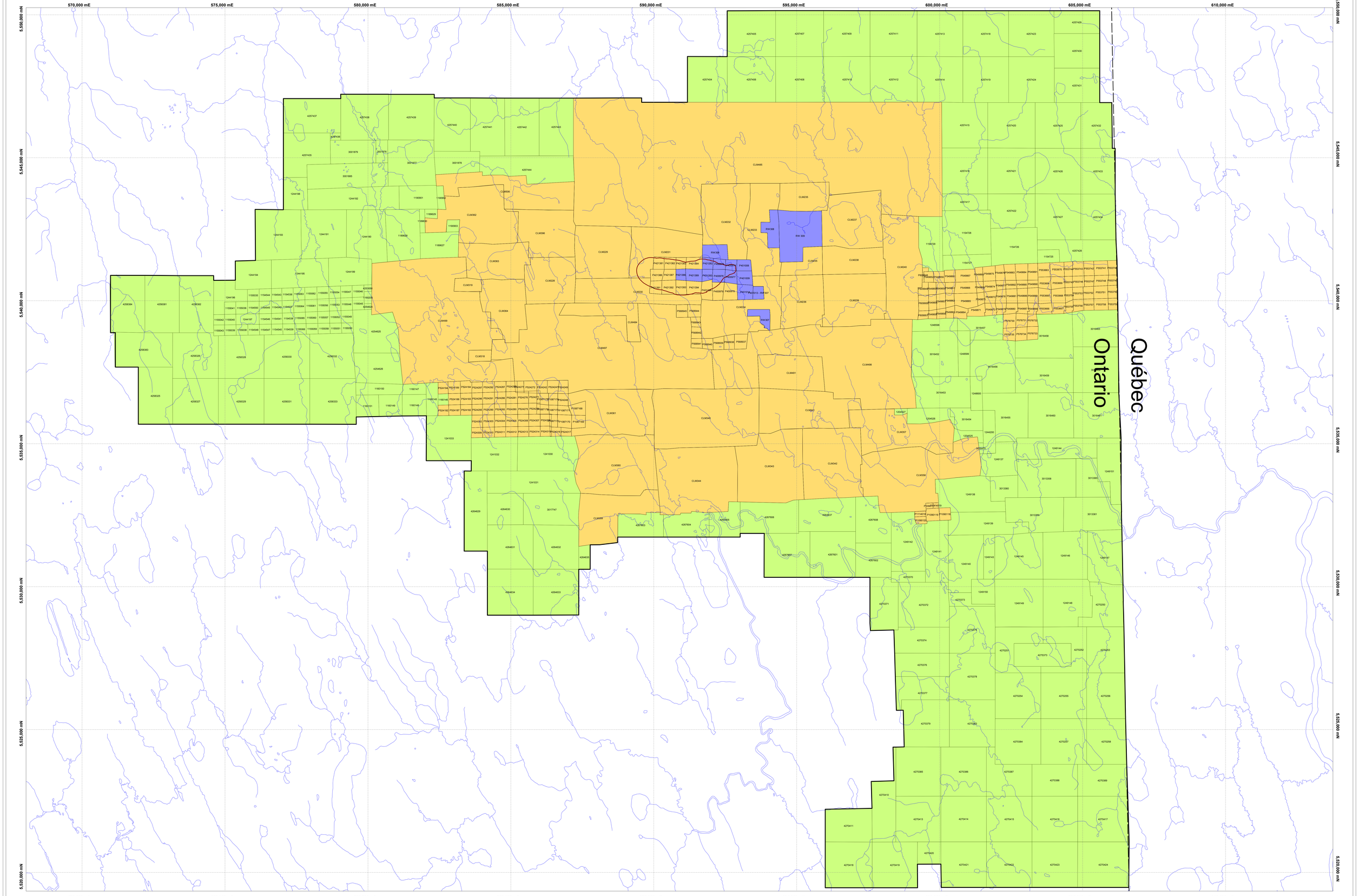
11 CERTIFICATE OF AUTHOR

Charles Hartley, P Geo

I, Charles Hartley, P Geo., certify that:

1. I am consultant Professional Geoscientist living in Timmins, Ontario. I am temporarily employed by Detour Gold Corp.
2. I am a graduate from St. Francis Xavier University 1977, B Sc. Geology and University College of Cape Breton 1994, B Sc. Tech in Environmental Studies;
3. I am a registered member in good standing of Association of Professional Geoscientists of Ontario, the Prospectors and Developers Association of Canada and the Canadian Institute of Mining, Metallurgy and Petroleum;
4. I have worked as a Professional Geoscientist continuously since my graduation from university in 1977 except to continue my studies from September 1992 to May 1994;
5. I have participated in the preparation of all this technical report. However, the report on the airborne magnetic survey is the sole responsibility of contractor; CGG Canada Services Ltd., Toronto office.
6. I was assistant Exploration Manager at Detour Lake project from January 2011 to July 2013
7. I am not aware of any material fact or material change with respect to the subject matter of the Technical Report that is not reflected in the Technical Report, the omission to disclose which makes the Report misleading.
8. I consent to the filing of the Technical Report with any stock exchange and other regulatory authority and any publication by them for regulatory purposes, including electronic publication in the public company files on their websites accessible by the public

APPENDIX-A: CLAIM MAP



N

Land Title
- Staked Mining Claims
- Disposition (Lease)
- Disposition (Patent)

0 800 1600 2400 4000
metres

DETOUR GOLD.

Land Title and Use Map

File: DGC_Land_Title_Map.wor	
Author: James S. Tolhurst	Date: April, 2016
Scale: 1:40,000	Projection: UTM NAD83 (Z17)

APPENDIX-B: GEOLOGICAL MAP

570,000 mE | 575,000 mE | 580,000 mE | 585,000 mE | 590,000 mE | 595,000 mE | 600,000 mE | 605,000 mE | 610,000 mE

5,550,000 mN | 5,545,000 mN | 5,540,000 mN | 5,535,000 mN | 5,530,000 mN | 5,525,000 mN | 5,520,000 mN

Ontario

Quebec

Sunday Lake Property

Sunday Lake Deformation Zone

Massicotte Deformation Zone

Lower Detour Deformation Zone

N

Geology
- Diabase
- Felsic Intrusive
- Intermediate Intrusive
- Mafic Intrusive

Deloro Group
- Felsic Volcanic
- Mafic Volcanic
- Ultramafic Volcanic
- Iron Formation

Cegatina Assemblage
- Clastic Sediments

Opatica
- Basement Gneiss

Structures
- Deformation Zone
- Fault

Property
- Boundary

Topography
- Lake
- River

DETOUR GOLD.

Detour Lake Property Geology

0 2 km

Author: James S. Tolhurst	Date: November, 2013
Scale: 1:40,000	Datum: NAD83 Z17

APPENDIX-C:

CGG Canada Services Ltd., Toronto

GEOPHYSICAL SURVEY REPORT

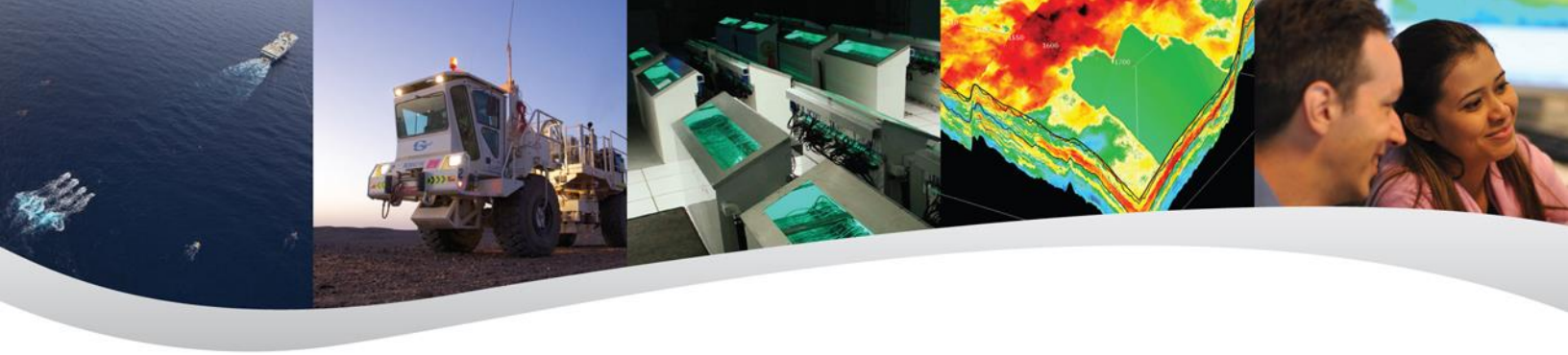
MIDAS HIGH RESOLUTION MAGNETIC SURVEY

COCHRANE AREA

PROJECT 15001

DETOUR GOLD CORP

April 29, 2015



GEOPHYSICAL SURVEY REPORT
MIDAS HIGH RESOLUTION MAGNETIC SURVEY
COCHRANE AREA
PROJECT 15001
DETOUR GOLD CORP

April 29, 2015

Passion for Geoscience
cgg.com

Disclaimer

1. The Survey that is described in this report was undertaken in accordance with current internationally accepted practices of the geophysical survey industry, and the terms and specifications of a Survey Agreement signed between the CLIENT and CGG. Under no circumstances does CGG make any warranties either expressed or implied relating to the accuracy or fitness for purpose or otherwise in relation to information and data provided in this report. The CLIENT is solely responsible for the use, interpretation, and application of all such data and information in this report and for any costs incurred and expenditures made in relation thereto. The CLIENT agrees that any use, reuse, modification, or extension of CGG's data or information in this report by the CLIENT is at the CLIENT's sole risk and without liability to CGG. Should the data and report be made available in whole or part to any third party, and such party relies thereon, that party does so wholly at its own and sole risk and CGG disclaims any liability to such party.

2. Furthermore, the Survey was performed by CGG after considering the limits of the scope of work and the time scale for the Survey.

3. The results that are presented and the interpretation of these results by CGG represent only the distribution of ground conditions and geology that are measurable with the airborne geophysical instrumentation and survey design that was used. CGG endeavours to ensure that the results and interpretation are as accurate as can be reasonably achieved through a geophysical survey and interpretation by a qualified geophysical interpreter. CGG did not perform any observations, investigations, studies or testing not specifically defined in the Agreement between the CLIENT and CGG. The CLIENT accepts that there are limitations to the accuracy of information that can be derived from a geophysical survey, including, but not limited to, similar geophysical responses from different geological conditions, variable responses from apparently similar geology, and limitations on the signal which can be detected in a background of natural and electronic noise, and geological variation. The data presented relates only to the conditions as revealed by the measurements at the sampling points, and conditions between such locations and survey lines may differ considerably. CGG is not liable for the existence of any condition, the discovery of which would require the performance of services that are not otherwise defined in the Agreement.

4. The passage of time may result in changes (whether man-made or natural) in site conditions. The results provided in this report only represent the site conditions and geology for the period that the survey was flown.

5. Where the processing and interpretation have involved CGG's interpretation or other use of any information (including, but not limited to, topographic maps, geological maps, and drill information; analysis, recommendations and conclusions) provided by the CLIENT or by third parties on behalf of the CLIENT and upon which CGG was reasonably entitled or expected to rely upon, then the Survey is limited by the accuracy of such information. Unless otherwise stated, CGG was not authorized and did not attempt to independently verify the accuracy or completeness of such information that was received from the CLIENT or third parties during the performance of the Survey. CGG is not liable for any inaccuracies (including any incompleteness) in the said information.

Introduction

This report describes the logistics, data acquisition, processing and presentation of results of a MIDAS magnetic airborne geophysical survey carried out for Detour Gold Corp over one property northeast of Cochrane, Ontario. Total coverage of the survey block amounted to 14024.77 km. The survey was flown between February 20 and April 7, 2015.

The purpose of the survey was to map the geology and structure of the area. Data were acquired using a MIDAS magnetic system with two high-sensitivity cesium magnetometers. The information from these sensors was processed to produce maps and images that display the magnetic properties of the survey area. A GPS electronic navigation system ensured accurate positioning of the geophysical data with respect to the base map coordinates.

The survey was performed by CGG Canada Services Ltd., Toronto office. Maps and data in digital format are provided with this report.

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Survey Area Description

Location of the Survey Area

One block located northeast of Cochrane, Ontario (Figure 1) was flown between February 20 and April 7, 2015, with Detour Lake Mine as the base of operations. Survey coverage consisted of 12754.20 km of traverse lines flown with a spacing of 50 m and 1270.57 km of tie lines with a spacing of 500 m for a total of 14024.77 km.

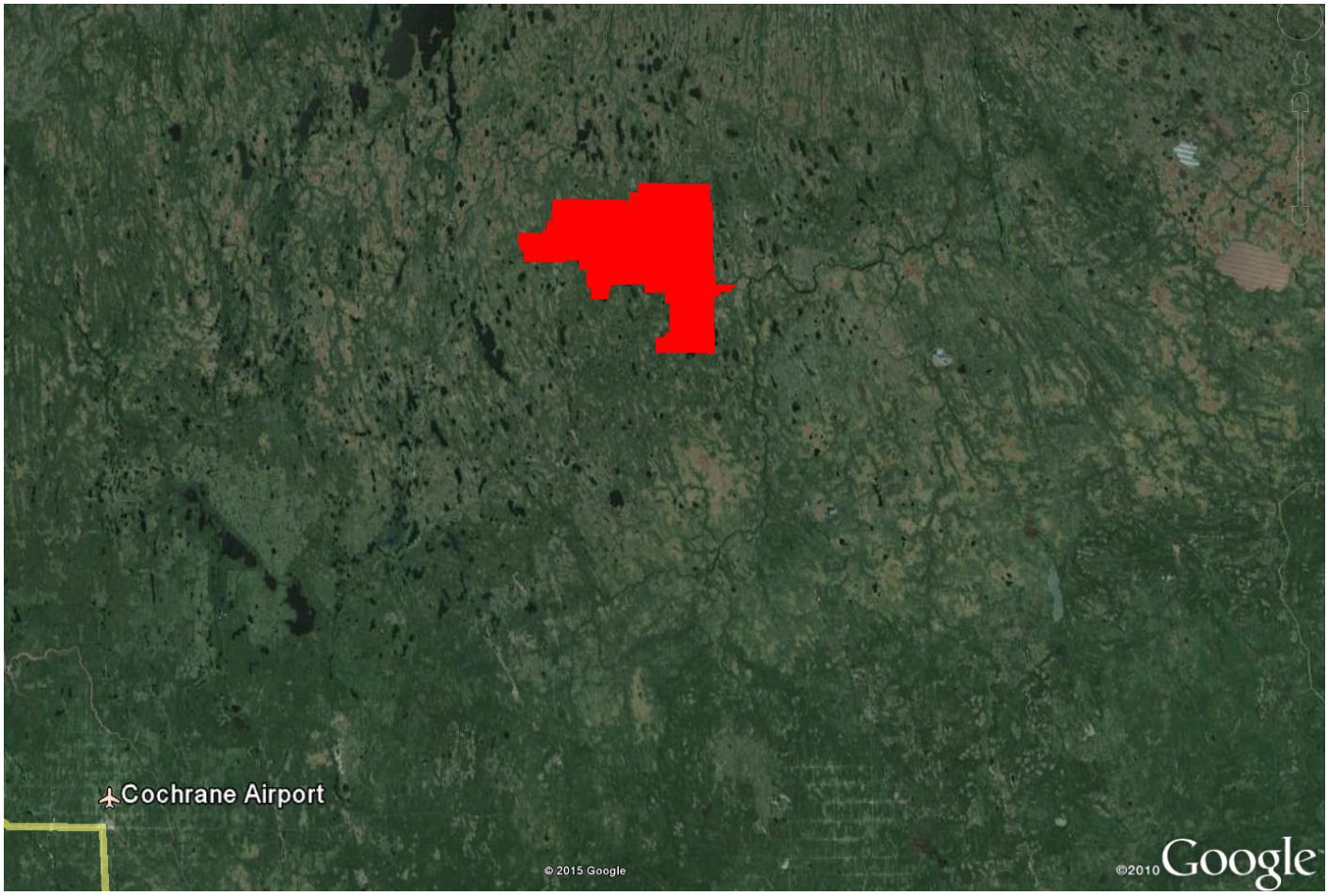

Figure 1 Cochrane Area - Location Map

Table 1 contains the coordinates of the corner points of the survey blocks.

Block	Corners	X-UTM (E)	Y-UTM (N)
15001-1	1	576944	5547169
Cochrane Area	2	578948	5547169
	3	578946	5547322
	4	582419	5547317
	5	582419	5547192
	6	587190	5547187
	7	589678	5547192
	8	589676	5547042
	9	591079	5547042
	10	591079	5548642
	11	592468	5548640
	12	592468	5550240
	13	605701	5550243
	14	605701	5547030
	15	606123	5547030
	16	606140	5545430
	17	606243	5545430
	18	606269	5542133
	19	606307	5541417
	20	606338	5539681
	21	606369	5536786
	22	606447	5535197
	23	606452	5533108
	24	606909	5533106
	25	606909	5532623
	26	606909	5532517
	27	606908	5532010
	28	606908	5531940
	29	610444	5532014
	30	610444	5531385
	31	609675	5531364
	32	609679	5530474
	33	607860	5530452
	34	607860	5530361
	35	607722	5530357
	36	607706	5529648
	37	606668	5529644
	38	606668	5529414
	39	606526	5529411
	40	606547	5528595
	41	606578	5526982
	42	606605	5525383
	43	606644	5523785
	44	606682	5522668

	45	606729	5521072
	46	606717	5519376
	47	600059	5519376
	48	599228	5519365
	49	595900	5519365
	50	595897	5522311
	51	597531	5522339
	52	597502	5523286
	53	598367	5523285
	54	598367	5524386
	55	598366	5524609
	56	598369	5525648
	57	598369	5526251
	58	598303	5528381
	59	597483	5528358
	60	597463	5528721
	61	597463	5530224
	62	593760	5530222
	63	593763	5531752
	64	593763	5531762
	65	593124	5531762
	66	593124	5531631
	67	588838	5531631
	68	588838	5531471
	69	588232	5531389
	70	587876	5531368
	71	587876	5530507
	72	587476	5530507
	73	587476	5528907
	74	584079	5528901
	75	584080	5531143
	76	583266	5531143
	77	583266	5534042
	78	583265	5534092
	79	583265	5534304
	80	581940	5534304
	81	581947	5535873
	82	581205	5535866
	83	580397	5535850
	84	579693	5535835
	85	579693	5535575
	86	571869	5535580
	87	571869	5537578
	88	571064	5537578
	89	571064	5538780

	90	570895	5538780
	91	570895	5540987
	92	574700	5540977
	93	574702	5540812
	94	575261	5540816
	95	575258	5541484
	96	575966	5541506
	97	575954	5543292
	98	576944	5543284

Table 1 Area Corners NAD83 UTM Zone 17N

Block	Line Numbers	Line direction	Line Spacing	Line km
1	10010 - 11100	0°/180°	50 m	12569.3 km
Cochrane Area	19010 - 19050	90°/270°	500 m	1253.7 km

Table 2 Planned line kilometre summary

During the survey GPS base stations were set up to collect data to allow post processing of the positional data for increased accuracy. The location of the GPS base stations are shown in Table 3.

Status	Location Name	WGS84 Longitude (deg-min-sec)	WGS84 Latitude (deg-min-sec)	Orthometric Height (m)
Primary	Detour Lake Mine landing pad	79° 41’ 26.7106” W	50° 00’ 05.7790” N	276.265
Primary	Detour Lake Mine moved 10 MAR 2015	79° 41’ 44.5019” W	50° 00’ 16.9890” N	274.013

Table 3 GPS Base Station Location

The location of the Magnetic base stations are shown in Table 4.

Status	Location Name	WGS84 Longitude (deg-min-sec)	WGS84 Latitude (deg-min-sec)
Primary	Detour Lake Mine	79° 41’ 26.7” W	50° 00’ 05.8” N
Secondary	Detour Lake Mine	79° 41’ 44.5” W	50° 00’ 17.0” N

Table 4 Magnetic Base Station Location

System Information

Figure 2 MIDAS System

The MIDAS system is composed of a horizontal boom fixed to the belly of a helicopter containing two magnetometers, a fluxgate magnetometer and a GPS antenna for flight path recovery. The helicopter has a tail boom mounted GPS antenna for in-flight navigation, radar, laser and barometric altimeters, video camera and data acquisition system.

Aircraft and Geophysical On-Board Equipment

Helicopter:	AS350 B2
Operator:	Great Slave Helicopters
Registration:	C-FZTA
Average Survey Speed:	110 km/h (30m/s)
Digital Acquisition:	CGG HeliDAS.
Video:	Panasonic WVCD/32 Camera with Axis 241S Video Server. Camera is mounted to the exterior bottom of the helicopter between the forward skid tubes
Magnetometer:	2-Scintrex Cesium Vapour CS-3, mounted on a transverse boom (13.3 m separation); Operating Range: 15,000 to 100,000 nT Operating Limit: -40°C to 50°C Accuracy: ±0.002 nT Measurement Precision: 0.001 nT Sampling rate: 10.0 Hz
Fluxgate:	Billingsley TMF100 Triaxial fluxgate, mounted on one of the booms; Axial alignment: < ±1 degree Sensitivity: 100 μV per nT Sampling rate10.0 Hz
Radar Altimeter:	Honeywell Sperry Altimeter System. Radar antennas are mounted to the exterior bottom of the helicopter between the forward skid tubes Operating Range: 0 – 2500ft Operating Limit: -55°C to 70°C 0 to 55,000 ft Accuracy: ± 3% (100 – 500ft above obstacle) ± 4% (500 – 2500ft above obstacle) Measurement Precision: 1 ft Sample Rate: 10.0 Hz
Laser Altimeter:	Optech G-150 mounted on the belly of the helicopter; Operating Range: 0.2 to 250 m

Operating Limit: -10°C to 45°C
Accuracy:
±5 cm (10°C to 30°C)
±10 cm (-10°C to 45°C)
Measurement Precision: 1 cm
Sample Rate: 10.0 Hz

Aircraft Navigation: NovAtel OEM4/V Card with an Aero antenna mounted on the tail of the helicopter;

Operating Limit: -40°C to 85°C
Real-Time Accuracy:
0.8m CEP L1/L2
Real-Time Measurement Precision: 6 cm RMS
Sample Rate: 2.0 Hz

Barometric Altimeter: Motorola MPX4115AP analog pressure sensor mounted in the helicopter

Operating Range: 55 kPa to 108 kPa
Operating Limit: -40°C to 125°C
Accuracy:
± 1.5 kPa (0°C to 85°C)
± 3.0 kPa (-20°C to 0°C, 85°C to 105°C)
± 4.5 kPa (-40°C to -20°C, 105°C to 125°C)
Measurement Precision: 0.01 kPa
Sampling Rate = 10.0 Hz

Temperature: Analog Devices 592 sensor mounted on the camera box

Operating Range: -40°C to + 75°C
Operating Limit: -40°C to + 75°C
Accuracy: ± 1.5°C
Measurement Precision: 0.03°C
Sampling Rate = 10.0 Hz

Base Station Equipment

Primary Magnetometer: CGG CF1 using Scintrex cesium vapour sensor with Marconi GPS card and antenna for measurement synchronization to GPS. The base station also collects barometric pressure and outside temperature.

Magnetometer Operating Range: 15,000 to 100,000 nT
Barometric Operating Range: 55kPa to 108 kPa
Temperature Operating Range: -40°C to 75°C
Sample Rate: 1.0 Hz

GPS Receiver:	NovAtel OEM4 Card with an Aero antenna
	Real-Time Accuracy: 0.8m CEP (OEM4/V L1/L2) Sample Rate: 1.0 Hz
Secondary Magnetometer:	GEM Systems GSM-19 with GPS
	Operating Range: 20,000 to 120,000 nT Operating Limit: -40°C to 60°C Accuracy: ± 0.2 nT Measurement Precision: 0.01 nT Sample Rate: 0.1 Hz

Quality Control and In-Field Processing

Digital data for each flight were transferred to the field workstation, in order to verify data quality and completeness. A database was created and updated using Geosoft Oasis Montaj and proprietary CGG Atlas software. This allowed the field personnel to calculate, display and verify both the positional (flight path) and geophysical data. The initial database was examined as a preliminary assessment of the data acquired for each flight.

In-field processing of CGG survey data consists of differential corrections to the airborne GPS data, filtering of all geophysical and ancillary data, verification of the digital video, and diurnal correction of magnetic data.

All data, including base station records, were checked on a daily basis to ensure compliance with the survey contract specifications. Re-flights were required if any of the following specifications were not met.

Navigation

A specialized GPS system provided in-flight navigation control. The system determined the absolute position of the helicopter by monitoring the range information of twelve channels (satellites). The Novatel OEM4 receiver was used for this application. In North America, the OEM4 receiver is WAAS-enabled (Wide Area Augmentation System) providing better real-time positioning.

A Novatel OEM4 GPS base station was used to record pseudo-range, carrier phase, ephemeris, and timing information of all available GPS satellites in view at a one second interval. These data are used to improve the conversion of aircraft raw ranges to differentially corrected aircraft position. The GPS antenna was set-up in a location that allowed for clear sight of the satellites above. The set-up of the antenna also considered surfaces that could cause signal reflection around the antenna that could be a source of error to the received data measurements.

Flight Path

Flight lines did not deviate from the intended flight path by more than 25% of the planned flight path over a distance of more than 1 kilometre. Flight specifications were based on GPS positional data recorded at the helicopter.

Clearance

The survey elevation is defined as the measurement of the helicopter radar altimeter to the tallest obstacle in the helicopter path. An obstacle is any structure or object which will impede the path of the helicopter to the ground and is not limited to and includes tree canopy, towers and power lines.

Survey elevations may vary based on the pilot's judgement of safe flying conditions around man-made structures or in rugged terrain.

The average survey elevation achieved for the helicopter and instrumentation during data collection was:

Helicopter	30.2 metres
Magnetometer	30.2 metres

Survey elevations did not deviate by more than 20% over a distance of 2 km from the contracted elevation.

The achieved survey height average was impacted by built up infrastructure and power lines.

Flying Speed

The average calculated ground speed was 110 km/h ranging between 85 to 130 km/h. This resulted in a ground sample interval of approximately 2.5 to 3.5 metres at a 10 Hz sampling rate. Variance in the survey speed was due to climbing and descending over steep terrain in the west and northeast part of the area and by going around populated areas and power lines.

Airborne High Sensitivity Magnetometer

To assess the noise quality of the collected airborne magnetic data, CGG monitors the 4th difference results during flight which is verified post flight by the processor. The contracted specification for the collected airborne magnetic data was that the non-normalized 4th difference would not exceed 1.6 nT over a continuous distance of 1 kilometre excluding areas where this specification was exceeded due to natural anomalies. Small noise burst events were observed in areas where the helicopter was descending. These observed events never exceeded the contract specifications.

Magnetic Base Station

Ground magnetic base stations were set-up to measure the total intensity of the earth's magnetic field. The base stations were placed in a magnetically quiet area, away from power lines and moving metallic objects. The contracted specification for the collected ground magnetic data was the non-linear variations in the magnetic data were not to exceed 10 nT per minute. Throughout the period of the survey the earth's magnetic activity was calm. CGG's standard of setting up the base station within 50 km from the centre of the survey block allowed for successful removal of the active magnetic events on the collected airborne magnetic data.

Compensation System

The presence of the helicopter in close proximity to the sensors causes considerable interference on the readings. The orientation of the aircraft with respect to the sensors and the motion of the aircraft through the earth's magnetic field are contributing factors. A special calibration flight is flown to record the information necessary to remove these effects.

The manoeuvre consists of flying a series of calibration lines at high altitude to gain information in each of the required line directions. During this procedure, the pitch, roll and yaw of the aircraft are varied. Each variation is conducted in succession (first vary pitch, then roll, then yaw).

A three-axis fluxgate magnetometer measures the orientation and rates of change of the aircraft's magnetic field with respect to the earth's magnetic field. A compensation algorithm is applied to generate a set of coefficients for each line direction and for each magnetometer sensor to compensate for permanent, induced and eddy current magnetic noise generated by the aircraft.

Data Processing

Flight Path Recovery

To check the quality of the positional data the speed of the bird is calculated using the differentially corrected x, y and z data. Any sharp changes in the speed are used to flag possible problems with the positional data. Where speed jumps occur, the data are inspected to determine the source of the error. The erroneous data are deleted and splined if less than five seconds in length. If the error is greater than five seconds the raw data are examined and if acceptable, may be shifted and used to replace the bad data. The GPS-Z component is the most common source of error. When it shows problems that cannot be corrected by recalculating the differential correction, the barometric altimeter is used as a guide to assist in making the appropriate correction. The corrected WGS84 longitude and latitude coordinates were transformed to NAD83 using the following parameters.

Datum:	NAD83
Ellipsoid:	GRS80
Projection:	UTM Zone 17N
Central meridian:	81° West
False Easting:	500000 metres
False Northing:	0 metres
Scale factor:	0.9996
WGS84 to Local Conversion:	Molodensky
Dx,Dy,Dz:	0, 0, 0

Recorded video flight path may also be linked to the data and used for verification of the flight path. Fiducial numbers are recorded continuously and are displayed on the margin of each digital image. This procedure ensures accurate correlation of data with respect to visible features on the ground. The fiducials appearing on the video frames and the corresponding fiducials in the digital profile database originate from the data acquisition system and are based on incremental time from start-up. Along with the acquisition system time, UTC time is also recorded in parallel and displayed (Figure 3).

Altitude Data

Radar altimeter data are despiked by applying a 1.5 second median and smoothed using a 1.5 second Hanning filter. The radar altimeter data are then subtracted from the GPS elevation to create a digital elevation model that is gridded and used in conjunction with profiles of the radar altimeter and flight path video to detect any spurious values.

Laser altimeter data are despiked and filtered using an alpha-trim filter. The laser altimeter data are then subtracted from the GPS elevation to create a digital elevation model that is examined in grid format for spurious values. The laser does a better job of piercing the tree canopy than the radar altimeter.

Figure 3 Flight path video

Magnetic Base Station Diurnal

The raw diurnal data are sampled at 1 Hz and imported into a database. The data are filtered with a 51 second median filter and then a 51 second Hanning filter to remove spikes and smooth short wavelength variations. A non-linear variation is then calculated and a flag channel is created to indicate where the variation exceeds the survey tolerance. Acceptable diurnal data are interpolated to a 10 Hz sample rate and the local regional field value of 56186 for flights 1 to 40 and 56142 for flights 41 to 86, calculated from the average of the first day's diurnal data and first day when base was moved, was removed to leave the diurnal variation. This diurnal variation is then ready to be used in the processing of the airborne magnetic data.

Total Magnetic Field

The Total Magnetic Field (TMF) data collected in flight were profiled on screen along with a fourth difference channel calculated from the TMF. Spikes were removed manually where indicated by the fourth difference. The despiked data were then corrected for lag by 1.6 seconds. The diurnal variation that was extracted from the filtered ground station data was then removed from the despiked and lagged TMF. Once, the diurnal was removed, a magnetic value for the centre of the measurement platform was calculated by taking

the average of the lagged and diurnally corrected, port and starboard magnetic sensors. The results were then levelled using tie and traverse line intercepts. Manual adjustments were applied to any lines that required levelling, as indicated by shadowed images of the gridded magnetic data. The manually levelled data were then subjected to a microlevelling filter.

Transverse Magnetic Gradient

Transverse magnetic gradient data was calculated from the lag corrected port and starboard sensors of the MIDAS system. The gradient was calculated with respect to the flight line direction with the median removed on a line-by-line basis. The results were then subjected to a microlevelling filter to remove any short wavelength residual line-to-line discrepancies.

Enhanced Total Magnetic Field

Bidirectional gridding with the transverse gradient should produce a surface that correctly renders both the measured data and the measured horizontal gradient at each survey line. This can be an advantage when gridding data that include features approaching the line-separation in size and also for rendering features that are not perpendicular to the line direction, particularly those which are sub-parallel to the line direction

Final transverse magnetic gradient data were used in conjunction with the Total Magnetic Field to create a Horizontal Gradient Enhanced grid of the Total Magnetic Field. This grid was created using the enhanced bi-directional gridding tool in proprietary CGG Atlas software.

Calculated Vertical Magnetic Gradient

The Enhanced Total Magnetic Field grid was subjected to a processing algorithm that enhances the response of magnetic bodies in the upper 500 metres and attenuates the response of deeper bodies. The resulting vertical gradient grid provides better definition and resolution of near-surface magnetic units. It also identifies weak magnetic features that may not be quite as evident in the TMF data. Regional magnetic variations and changes in lithology, however, may be better defined on the Total Magnetic Field.

Digital Elevation

The laser altimeter values are subtracted from the differentially corrected and de-spiked GPS-Z values to produce profiles of the height above mean sea level along the survey lines. These values are gridded to produce contour maps showing approximate elevations within the survey area. Any subtle line-to-line discrepancies are manually removed. After the manual corrections are applied, the digital terrain data are filtered with a microlevelling algorithm.

The accuracy of the elevation calculation is directly dependent on the accuracy of the two input parameters, laser altimeter and GPS-Z. The GPS-Z value is primarily dependent on the number of available satellites. Although post-processing of GPS data will yield X and Y accuracies in the order of 1-2 metres, the accuracy of the Z value is usually much less, sometimes in the ±5 metre range. Further inaccuracies may be introduced during the interpolation and gridding process.

Because of the inherent inaccuracies of this method, no guarantee is made or implied that the information displayed is a true representation of the height above sea level. Although this product may be of some use as a general reference, THIS PRODUCT MUST NOT BE USED FOR NAVIGATION PURPOSES.

Contour, Colour and Shadow Map Displays

The magnetic are interpolated onto a regular grid using a modified Akima spline technique. The resulting grid is suitable for image processing and generation of contour maps. The grid cell size is 20% of the line interval.

Colour maps are produced by interpolating the grid down to the pixel size. The parameter is then incremented with respect to specific amplitude ranges to provide colour "contour" maps. No maps were created for this project.

Final Products

This section lists the final products that have been provided under the terms of the survey agreement. Other products can be prepared from the existing dataset, if requested. Most parameters can be displayed as contours, profiles, or in colour.

Digital Archives

Line and grid data in the form of a Geosoft database (*.gdb) and XYZ file and Geosoft grids (*.grd) have been written to DVD. The formats and layouts of these archives are further described in Appendix B (Data Archive Description).

Report

Two paper copies of this Geophysical Survey Report plus a digital copy in PDF format.

Flight Path Videos

All survey flights in BIN/BDX format with a viewer.

CONCLUSIONS AND RECOMMENDATIONS

This report provides a very brief description of the survey results and describes the equipment, data processing procedures and logistics of the airborne survey over a property northeast of Cochrane, Ontario. The various maps included with this report display the magnetic properties of the survey area.

It is recommended that the survey results be assessed and fully evaluated in conjunction with all other available geophysical, geological and geochemical information. In particular, structural analysis of the data should be undertaken and areas of interest should be selected. An attempt should be made to determine the geophysical "signatures" over any known zones of mineralization in the survey areas or their vicinity.

It is also recommended that image processing of existing geophysical data be considered, in order to extract the maximum amount of information from the survey results. Current software and imaging techniques often provide valuable information on structure and lithology, which may not be clearly evident on the contour and colour maps. These techniques can yield images that define subtle, but significant, structural details.

Respectfully submitted,

CGG

R15001

Appendix A List of Personnel

List of Personnel:

The following personnel were involved in the acquisition, processing, interpretation and presentation of data, relating to a MIDAS magnetic airborne geophysical survey carried out for Detour Gold Corp over a property northeast of Cochrane, Ontario.

Doug Garrie	Manager, Processing and Interpretation
Elizabeth Bowslaugh	Supervisor Data Processing and Interpretation
Amir Soltanzadeh	Project Manager
Chris Sawyer	Flight Planner
Gary Ellis	Electronics Technician
S. Ermakov	Electronics Technician
Shane Kochane	Pilot (Questral)
Greg Stephani	Pilot (Questral)
Alex Zlojutro	Data Processor
Mihai Szentesy	Data Processor

All personnel were employees of CGG, except where indicated.

Appendix B Data Archive Description

Data Archive Description:

Survey Details:

Survey Area Name:	Cochrane Area
Project number:	15001
Client:	Detour Gold Corp
Survey Company Name:	CGG
Flown Dates:	February 20 to April 7, 2015
Archive Creation Date:	April 29, 2015

Geodetic Information for map products:

Datum:	NAD83
Ellipsoid:	GRS80
Projection:	UTM Zone 17N
Central meridian:	81° West
False Easting:	500000 metres
False Northing:	0 metres
Scale factor:	0.9996
WGS84 to Local Conversion:	Molodensky
Dx,Dy,Dz:	0, 0, 0

Grid Archive:

Geosoft Grids:

File	Description	Units
hge	Horizontal Gradient Enhanced Total Magnetic Field	nT
cvg	Calculated Vertical Magnetic Gradient	nT/m
mhg	Measured Transverse Magnetic Gradient	nT/m
tmf	Total Magnetic field	nT
dem	Digital Elevation Model	m

kmz:

File	Description	Units
hge	Horizontal Gradient Enhanced Total Magnetic Field	nT
cvg	Calculated Vertical Magnetic Gradient	nT/m
mhg	Measured Transverse Magnetic Gradient	nT/m
tmf	Total Magnetic Intensity	nT
dem	Digital Elevation Model	m

Disclaimer: Google Earth Accuracy
CGG provides images of geophysical data in .KML or .KMZ format for viewing in Google Earth as a convenient product to our clients. It is important to recognize that the horizontal and vertical positional accuracy of Google Earth is not sufficient for close location of targets for drilling, verifying outcrop, etc. CGG makes no warranty as to the accuracy of apparent positioning of CGG data when converted and displayed in Google Earth.

Linedata Archive:

Geosoft Database Layout:

Field	Variable	Description	Units
1	X	Easting NAD83 UTM17N	m
2	Y	Northing NAD83 UTM17N	m
3	fid	fiducial	-
4	longitude	Longitude WGS84	degrees
5	latitude	Latitude WGS84	degrees
6	flight	Flight number	-
7	date	Flight date	ddmmyyyy
8	altrad_heli	Helicopter height above surface from radar altimeter	m
9	altlas_heli	Helicopter height above surface from laser altimeter	m
10	gpsz	Helicopter height above geoid	m
11	dem	Digital elevation model (above geoid)	m
12	diurnal	Measured ground magnetic intensity	nT
13	diurnal_cor	Diurnal correction – base removed	nT
14	magport _raw	Total magnetic field, port sensor – spike rejected	nT
15	magstar_raw	Total magnetic field, starboard sensor – spike rejected	nT
16	magport _comp	Total magnetic field, port sensor - compensated	nT
17	magstar_comp	Total magnetic field, starboard sensor - compensated	nT
18	magport_lag	Total magnetic field, port sensor - corrected for lag	nT
19	magstar_lag	Total magnetic field, starboard sensor - corrected for lag	nT
20	magport_diu	Total magnetic field, port sensor - corrected for lag and diurnal removed	nT
21	magstar_diu	Total magnetic field, starboard sensor - corrected for lag and diurnal removed	nT
22	mag_tmf	Total magnetic field, average of port and starboard sensors – diurnal variation removed and levelled	nT
23	transgrad	Measured transverse horizontal magnetic gradient	nT/m
24	fx	Fluxgate magnetometer, component 1	nT
25	fy	Fluxgate magnetometer, component 2	nT
26	fz	Fluxgate magnetometer, component 3	nT
27	utc_ssm	Universal Time seconds since midnight	sec

Note – The null values in the GDB and XYZ archives are displayed as *.

Report:

A logistics and processing report for Project 15001 in PDF format:

R15001.pdf

Video:

Digital video in BIN/BDX format for all survey flights including a viewer. (*CGGSurveyReplay)*

Appendix C Maps and Grids Products

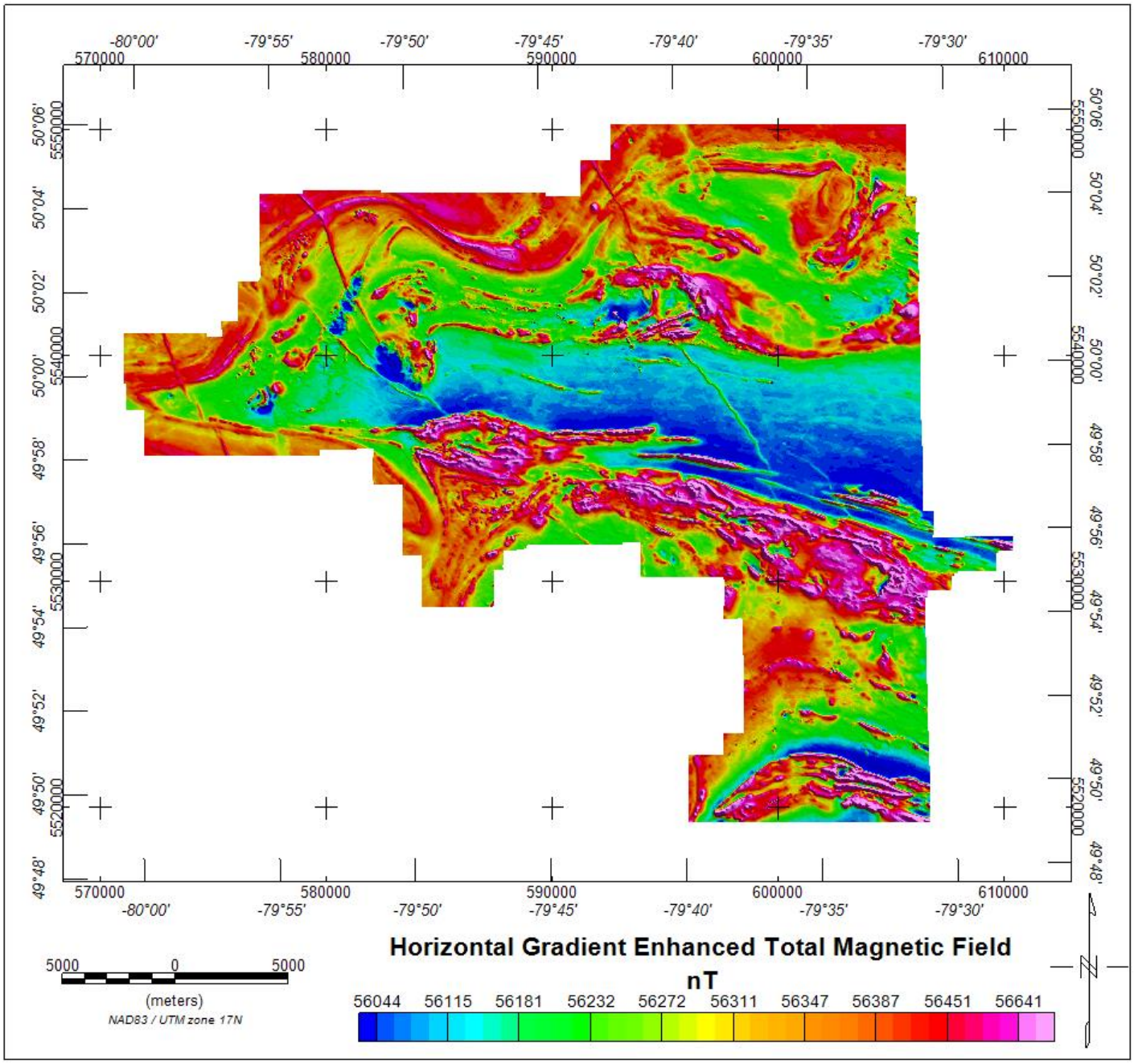

Figure 4 Horizontal Gradient Enhanced Total Magnetic Field

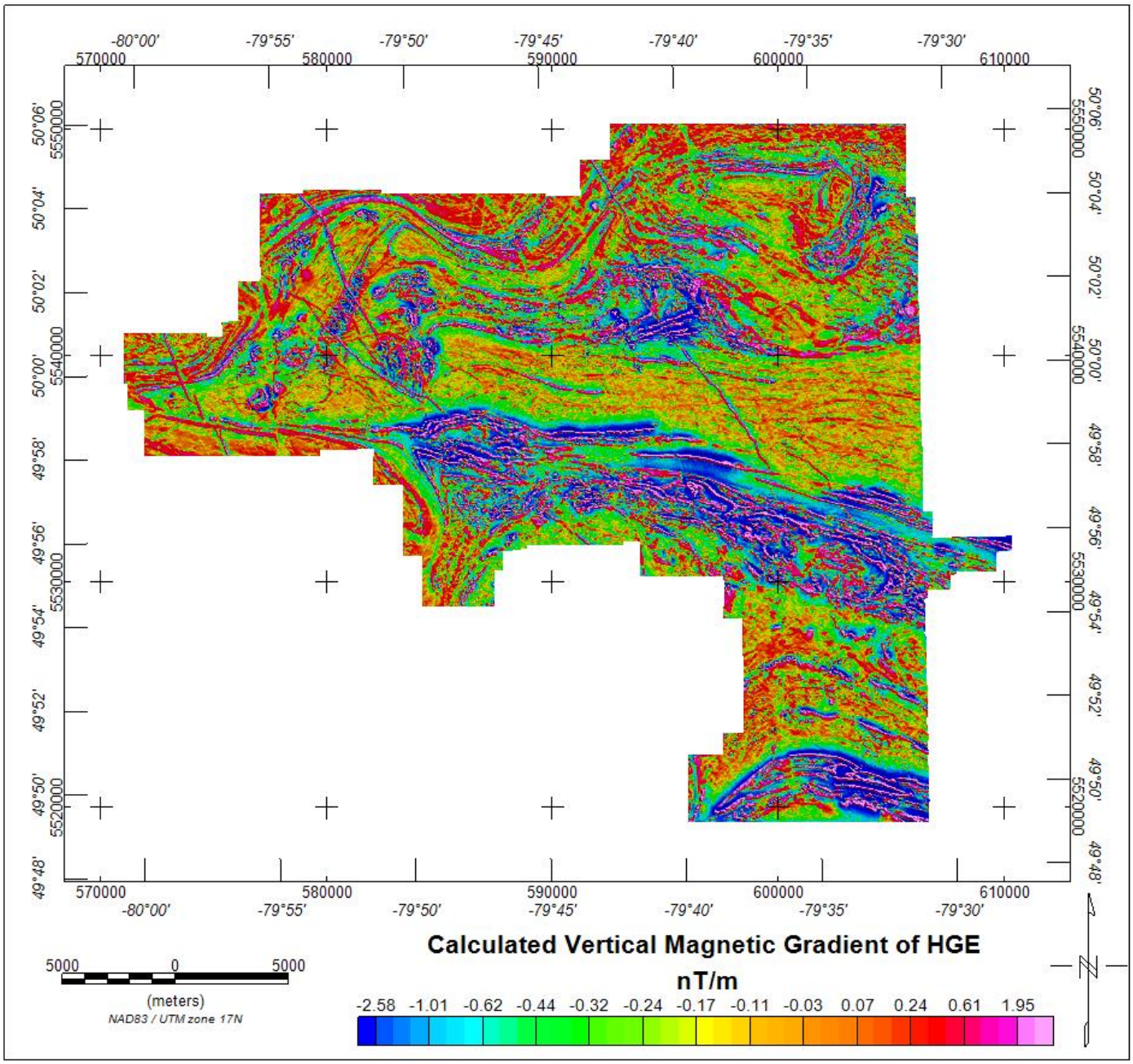

Figure 5 Calculated Vertical Magnetic Gradient

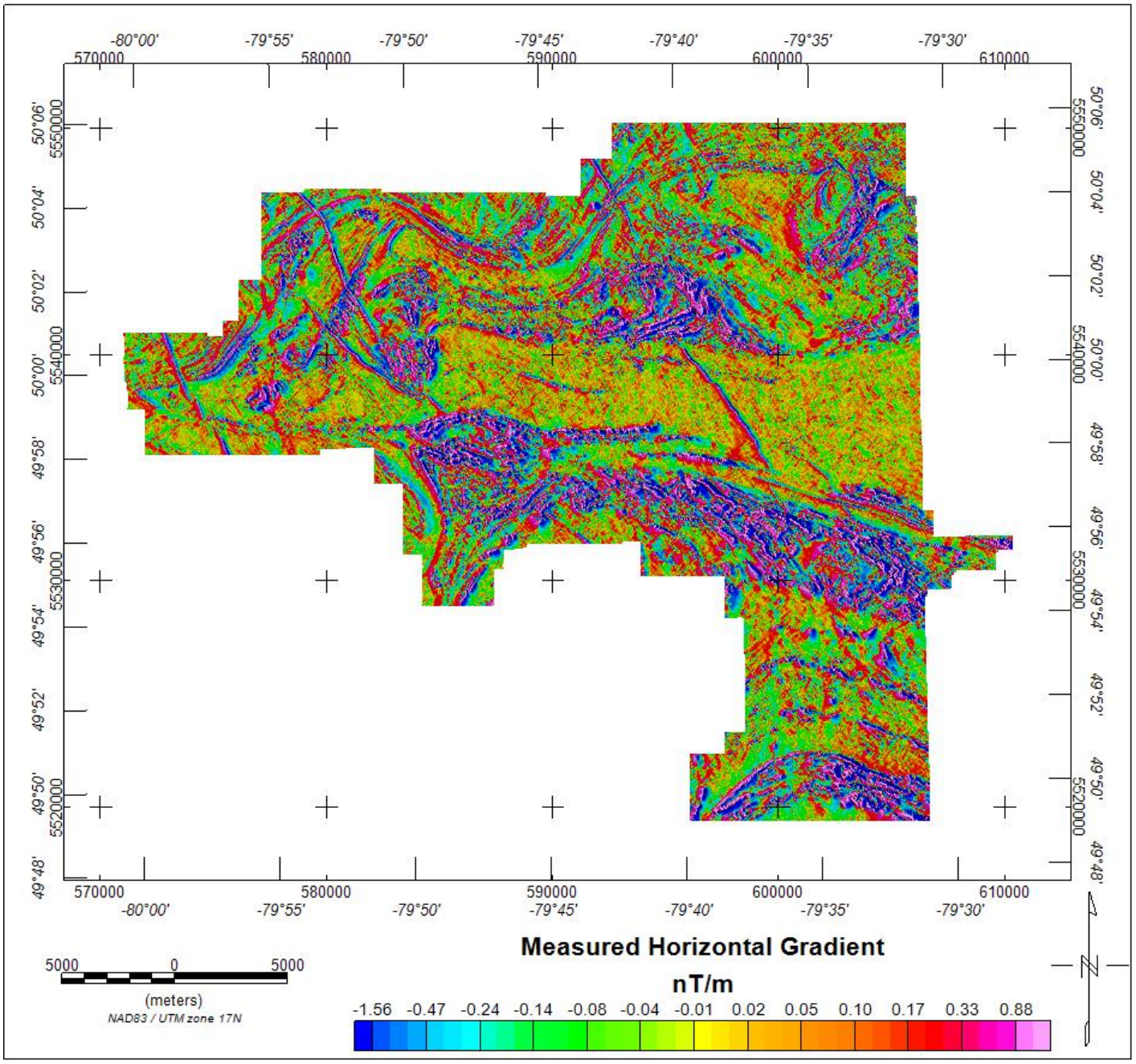

Figure 6 Measured Horizontal Magnetic Gradient

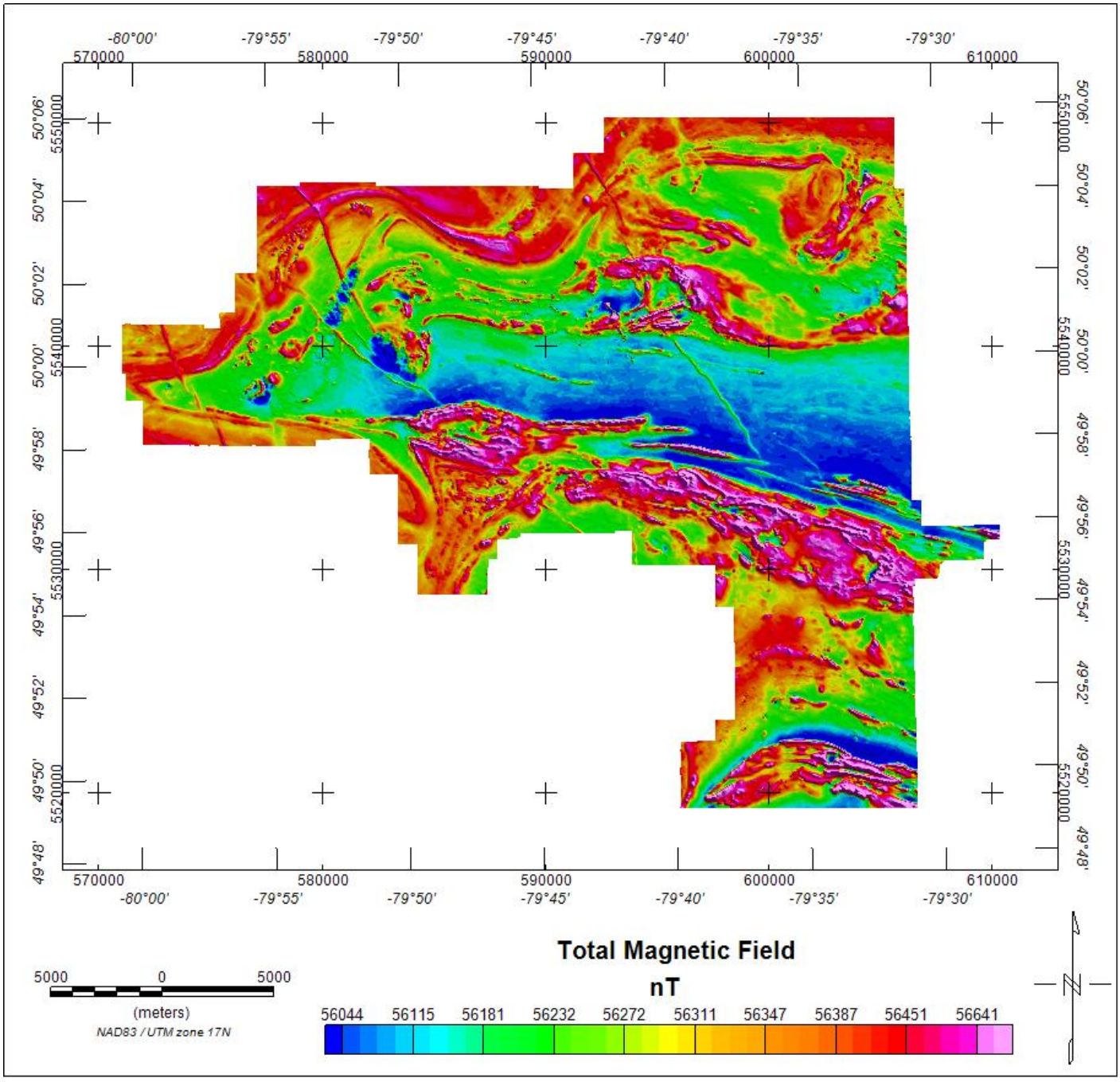

Figure 7 Total Magnetic Field

Appendix D Background Information

Magnetic Responses

The measured total magnetic field provides information on the magnetic properties of the earth materials in the survey area. The information can be used to locate magnetic bodies of direct interest for exploration, and for structural and lithological mapping.

The total magnetic field response reflects the abundance of magnetic material in the source. Magnetite is the most common magnetic mineral. Other minerals such as ilmenite, pyrrhotite, franklinite, chromite, hematite, arsenopyrite, limonite and pyrite are also magnetic, but to a lesser extent than magnetite on average.

In some geological environments, an EM anomaly with magnetic correlation has a greater likelihood of being produced by sulphides than one which is non-magnetic. However, sulphide ore bodies may be non-magnetic (e.g., the Kidd Creek deposit near Timmins, Canada) as well as magnetic (e.g., the Mattabi deposit near Sturgeon Lake, Canada).

Iron ore deposits will be anomalously magnetic in comparison to surrounding rock due to the concentration of iron minerals such as magnetite, ilmenite and hematite.

Changes in magnetic susceptibility often allow rock units to be differentiated based on the total field magnetic response. Geophysical classifications may differ from geological classifications if various magnetite levels exist within one general geological classification. Geometric considerations of the source such as shape, dip and depth, inclination of the earth's field and remanent magnetization will complicate such an analysis.

In general, mafic lithologies contain more magnetite and are therefore more magnetic than many sediments which tend to be weakly magnetic. Metamorphism and alteration can also increase or decrease the magnetization of a rock unit.

Textural differences on a total field magnetic contour, colour or shadow map due to the frequency of activity of the magnetic parameter resulting from inhomogeneities in the distribution of magnetite within the rock, may define certain lithologies. For example, near surface volcanics may display highly complex contour patterns with little line-to-line correlation.

Rock units may be differentiated based on the plan shapes of their total field magnetic responses. Mafic intrusive plugs can appear as isolated "bulls-eye" anomalies. Granitic intrusives appear as sub-circular zones, and may have contrasting rings due to contact metamorphism. Generally, granitic terrain will lack a pronounced strike direction, although granite gneiss may display strike.

Linear north-south units are theoretically not well-defined on total field magnetic maps in equatorial regions due to the low inclination of the earth's magnetic field. However, most stratigraphic units will have variations in composition along strike that will cause the units to appear as a series of alternating magnetic highs and lows.

Faults and shear zones may be characterized by alteration that causes destruction of magnetite (e.g., weathering) that produces a contrast with surrounding rock. Structural breaks may be filled by magnetite-rich, fracture filling material as is the case with diabase dikes, or by non-magnetic felsic material.

Faulting can also be identified by patterns in the magnetic total field contours or colours. Faults and dikes tend to appear as lineaments and often have strike lengths of several kilometres. Offsets in narrow, magnetic, stratigraphic trends also delineate structure. Sharp contrasts in magnetic lithologies may arise due to large displacements along strike-slip or dip-slip faults.

Appendix F Glossary

CGG GLOSSARY OF AIRBORNE GEOPHYSICAL TERMS

accelerometer: an instrument that measures both acceleration (due to motion) and acceleration due to ***gravity***.

altitude attenuation: the absorption of gamma rays by the atmosphere between the earth and the detector. The number of gamma rays detected by a system decreases as the altitude increases.

AGG: Airborne ***gravity gradiometer.***

AGS: Airborne ***gamma-ray spectrometry***.

amplitude: The strength of the total electromagnetic field. In ***frequency domain*** it is most often the sum of the squares of ***in-phase*** and ***quadrature*** components. In multi-component electromagnetic surveys it is generally the sum of the squares of all three directional components.

analytic signal: The total amplitude of all the directions of magnetic ***gradient***. Calculated as the sum of the squares.

anisotropy: Having different ***physical parameters*** in different directions. This can be caused by layering or fabric in the geology. Note that a unit can be anisotropic, but still **homogeneous**.

anomaly: A localized change in the geophysical data characteristic of a discrete source, such as a conductive or magnetic body: something locally different from the **background**.

apparent- : the ***physical parameters*** of the earth measured by a geophysical system are normally expressed as apparent, as in "apparent ***resistivity*****"**. This means that the measurement is limited by assumptions made about the geology in calculating the response measured by the geophysical system. Apparent resistivity calculated with ***HEM***, for example, generally assumes that the earth is a ***homogeneous half-space*** – not layered.

attitude: the orientation of a geophysical system relative to the earth. Some surveys assume the instrument attitudes are constant, and other surveys measure the attitude and correct the data for the changes in response because of attitude.

B-field: In time-domain **electromagnetic** surveys, the magnetic field component of the (electromagnetic) **field**. This can be measured directly, although more commonly it is calculated by integrating the time rate of change of the magnetic field **dB/dt**, as measured with a receiver coil.

background: The "normal" response in the geophysical data – that response observed over most of the survey area. **Anomalies** are usually measured relative to the background. In airborne gamma-ray spectrometric surveys the term defines the **cosmic**, radon, and aircraft responses in the absence of a signal from the ground.

base-level: The measured values in a geophysical system in the absence of any outside signal. All geophysical data are measured relative to the system base level.

base frequency: The frequency of the pulse repetition for a ***time-domain electromagnetic*** system. Measured between subsequent positive pulses.

base magnetometer: A stationary magnetometer used to record the ***diurnal*** variations in the earth's magnetic field; to be used to correct the survey magnetic data.

bird: A common name for the pod towed beneath or behind an aircraft, carrying the geophysical sensor array.

bucking: The process of removing the strong ***signal*** from the ***primary field*** at the ***receiver*** from the data, to measure the ***secondary field***. It can be done electronically or mathematically. This is done in ***frequency-domain EM***, and to measure ***on-time*** in ***time-domain EM***.

calibration: a procedure to ensure a geophysical instrument is measuring accurately and repeatably. Most often applied in ***EM*** and ***gamma-ray spectrometry***.

calibration coil: A wire coil of known size and dipole moment, which is used to generate a field of known ***amplitude*** and ***phase*** or ***decay constant*** in the receiver, for system calibration. Calibration coils can be external, or internal to the system. Internal coils may be called Q-coils.

coaxial coils: **[CX]** Coaxial coils in an HEM system are in the vertical plane, with their axes horizontal and collinear in the flight direction. These are most sensitive to vertical conductive objects in the ground, such as thin, steeply dipping conductors perpendicular to the flight direction. Coaxial coils generally give the sharpest anomalies over localized conductors. (See also ***coplanar coils***)

coil: A multi-turn wire loop used to transmit or detect electromagnetic fields. Time varying ***electromagnetic*** fields through a coil induce a voltage proportional to the strength of the field and the rate of change over time.

compensation: Correction of airborne geophysical data for the changing effect of the aircraft. This process is generally used to correct data in ***fixed-wing time-domain electromagnetic*** surveys (where the transmitter is on the aircraft and the receiver is moving), and magnetic surveys (where the sensor is on the aircraft, turning in the earth's magnetic field.

component: In ***frequency domain electromagnetic*** surveys this is one of the two **phase** measurements – ***in-phase or quadrature***. In "multi-component" electromagnetic surveys it is also used to define the measurement in one geometric direction (vertical, horizontal in-line and horizontal transverse – the Z, X and Y components).

Compton scattering: gamma ray photons will bounce off electrons as they pass through the earth and atmosphere, reducing their energy and then being detected by ***radiometric*** sensors at lower energy levels. See also ***stripping***.

conductance: See ***conductivity thickness***

conductivity: [σ] The facility with which the earth or a geological formation conducts electricity. Conductivity is usually measured in milli-Siemens per metre (mS/m). It is the reciprocal of ***resistivity***.

conductivity-depth imaging: see ***conductivity-depth transform***.

conductivity-depth transform: A process for converting electromagnetic measurements to an approximation of the conductivity distribution vertically in the earth, assuming a ***layered earth***. (Macnae and Lamontagne, 1987; Wolfgram and Karlik, 1995)

conductivity thickness: [σ**t**] The product of the ***conductivity***, and thickness of a large, tabular body. (It is also called the "conductivity-thickness product") In electromagnetic geophysics, the response of a thin plate-like conductor is proportional to the conductivity multiplied by thickness. For example a 10 metre thickness of 20 Siemens/m mineralization will be equivalent to 5 metres of 40 S/m; both have 200 S conductivity thickness. Sometimes referred to as conductance.

conductor: Used to describe anything in the ground more conductive than the surrounding geology. Conductors are most often clays or graphite, or hopefully some type of mineralization, but may also be man-made objects, such as fences or pipelines.

continuation: mathematical procedure applied to ***potential field*** geophysical data to approximate data collected at a different altitude. Data can be continued upward to a higher altitude or downward to a lower altitude.

coplanar coils: **[CP]** In HEM, the coplanar coils lie in the horizontal plane with their axes vertical, and parallel. These coils are most sensitive to massive conductive bodies, horizontal layers, and the ***halfspace***.

cosmic ray: High energy sub-atomic particles from outer space that collide with the earth's atmosphere to produce a shower of gamma rays (and other particles) at high energies.

counts (per second): The number of ***gamma-rays*** detected by a gamma-ray ***spectrometer*.** The rate depends on the geology, but also on the size and sensitivity of the detector.

culture: A term commonly used to denote any man-made object that creates a geophysical anomaly. Includes, but not limited to, power lines, pipelines, fences, and buildings.

current channelling: See current gathering.

current gathering: The tendency of electrical currents in the ground to channel into a conductive formation. This is particularly noticeable at higher frequencies or early time channels when the formation is long and parallel to the direction of current flow. This tends to enhance anomalies relative to inductive currents (see also ***induction***). Also known as current channelling.

daughter products: The radioactive natural sources of gamma-rays decay from the original "parent" element (commonly potassium, uranium, and thorium) to one or more lower-energy "daughter" elements. Some of these lower energy elements are also radioactive and decay further. ***Gamma-ray spectrometry*** surveys may measure the gamma rays given off by the original element or by the decay of the daughter products.

dB/dt: As the ***secondary electromagnetic field*** changes with time, the magnetic field [**B**] component induces a voltage in the receiving ***coil***, which is proportional to the rate of change of the magnetic field over time.

decay: In ***time-domain electromagnetic*** theory, the weakening over time of the ***eddy currents*** in the ground, and hence the ***secondary field*** after the ***primary field*** electromagnetic pulse is turned off. In ***gamma-ray spectrometry***, the radioactive breakdown of an element, generally potassium, uranium, thorium, into their ***daughter*** products.

decay constant: see time constant.

decay series: In ***gamma-ray spectrometry***, a series of progressively lower energy ***daughter products*** produced by the radioactive breakdown of uranium or thorium.

depth of exploration: The maximum depth at which the geophysical system can detect the target. The depth of exploration depends very strongly on the type and size of the target, the contrast of the target with the surrounding geology, the homogeneity of the surrounding geology, and the type of geophysical system. One measure of the maximum depth of exploration for an electromagnetic system is the depth at which it can detect the strongest conductive target – generally a highly conductive horizontal layer.

differential resistivity: A process of transforming ***apparent resistivity*** to an approximation of layer resistivity at each depth. The method uses multi-frequency HEM data and approximates the effect of shallow layer ***conductance*** determined from higher frequencies to estimate the deeper conductivities (Huang and Fraser, 1996)

dipole moment: [NIA] For a transmitter, the product of the area of a ***coil***, the number of turns of wire, and the current flowing in the coil. At a distance significantly larger than the size of the coil, the magnetic field from a coil will be the same if the dipole moment product is the same. For a receiver coil, this is the product of the area and the number of turns. The sensitivity to a magnetic field (assuming the source is far away) will be the same if the dipole moment is the same.

diurnal: The daily variation in a natural field, normally used to describe the natural fluctuations (over hours and days) of the earth's magnetic field.

dielectric permittivity: **[ε]** The capacity of a material to store electrical charge, this is most often measured as the relative permittivity [ε_r], or ratio of the material dielectric to that of free space. The effect of high permittivity may be seen in HEM data at high frequencies over highly resistive geology as a reduced or negative ***in-phase***, and higher ***quadrature*** data.

dose rate: see **exposure rate**.

drape: To fly a survey following the terrain contours, maintaining a constant altitude above the local ground surface. Also applied to re-processing data collected at varying altitudes above ground to simulate a survey flown at constant altitude.

drift: Long-time variations in the base-level or calibration of an instrument.

eddy currents: The electrical currents induced in the ground, or other conductors, by a time-varying ***electromagnetic field*** (usually the ***primary field***). Eddy currents are also induced in the aircraft's metal frame and skin; a source of ***noise*** in EM surveys.

electromagnetic: **[EM]** Comprised of a time-varying electrical and magnetic field. Radio waves are common electromagnetic fields. In geophysics, an electromagnetic system is one which transmits a time-varying ***primary field*** to induce ***eddy currents*** in the ground, and then measures the ***secondary field*** emitted by those eddy currents.

energy window: A broad spectrum of ***gamma-ray*** energies measured by a spectrometric survey. The energy of each gamma-ray is measured and divided up into numerous discrete energy levels, called windows.

equivalent (thorium or uranium): The amount of radioelement calculated to be present, based on the gamma-rays measured from a **daughter** element. This assumes that the ***decay series*** is in equilibrium – progressing normally.

exposure rate: in radiometric surveys, a calculation of the total exposure rate due to gamma rays at the ground surface. It is used as a measurement of the concentration of all the **radioelements** at the surface. Sometimes called "dose rate".See also: **natural exposure rate**.

fiducial, or fid: Timing mark on a survey record. Originally these were timing marks on a profile or film; now the term is generally used to describe 1-second interval timing records in digital data, and on maps or profiles.

Figure of Merit: **(FOM)** A sum of the 12 distinct magnetic noise variations measured by each of four flight directions, and executing three aircraft attitude variations (yaw, pitch, and roll) for each direction. The flight directions are generally parallel and perpendicular to planned survey flight directions. The FOM is used as a measure of the **manoeuvre noise** before and after **compensation.**

fixed-wing: Aircraft with wings, as opposed to "rotary wing" helicopters.

flight: a continuous interval of survey data collection, generally between stops at base to refuel.

flight-line: a single line of data across the survey area. Surveys are generally comprised of many parallel flight lines to cover the survey area, with wider-spaced ***tie lines*** perpendicular. Flight lines are generally separated by ***turn-arounds*** when the aircraft is outside the survey area.

footprint: This is a measure of the area of sensitivity under the aircraft of an airborne geophysical system. The footprint of an ***electromagnetic*** system is dependent on the altitude of the system, the orientation of the transmitter and receiver and the separation between the receiver and transmitter, and the conductivity of the ground. The footprint of a ***gamma-ray spectrometer*** depends mostly on the altitude. For all geophysical systems, the footprint also depends on the strength of the contrasting ***anomaly***.

frequency domain: An ***electromagnetic*** system which transmits a harmonic ***primary field*** that oscillates over time (e.g. sinusoidal), inducing a similarly varying electrical current in the ground. These systems generally measure the changes in the ***amplitude*** and ***phase*** of the ***secondary field*** from the ground at different frequencies by measuring the **in-phase** and **quadrature** phase components. See also ***time-domain***.

full-stream data: Data collected and recorded continuously at the highest possible sampling rate. Normal data are stacked (see ***stacking***) over some time interval before recording.

gamma-ray: A very high-energy photon, emitted from the nucleus of an atom as it undergoes a change in energy levels.

gamma-ray spectrometry: Measurement of the number and energy of natural (and sometimes man-made) gamma-rays across a range of photon energies.

GGI: gravity gradiometer instrument. An airborne gravity gradiometer (AGG) consists of a GGI mounted in an inertial platform together with a temperature control system.

gradient: In magnetic surveys, the gradient is the change of the magnetic field over a distance, either vertically or horizontally in either of two directions. Gradient data can be measured, or calculated from the total magnetic field data because it changes more quickly over distance than the ***total magnetic field***, and so may provide a more precise measure of the location of a source. See also ***analytic signal***.

gradiometer, gradiometry: instrument and measurement of the gradient, or change in a field with location usually for ***gravity*** or ***magnetic*** surveys. Used to provide higher resolution of ***targets***, better ***interpretation*** of ***target*** geometry, independence from drift and absolute field and, for ***gravity***, accelerations of the aircraft.

gravity: Survey collecting measurements of the earth's gravitational field strength. Denser objects in the earth create stronger gravitational pull above them.

ground effect: The response from the earth. A common ***calibration*** procedure in many geophysical surveys is to fly to altitude high enough to be beyond any measurable response from the ground, and there establish ***base levels*** or ***backgrounds***.

half-space: A mathematical model used to describe the earth – as infinite in width, length, and depth below the surface. The most common halfspace models are ***homogeneous*** and ***layered earth***.

heading error: A slight change in the magnetic field measured when flying in opposite directions.

HEM: Helicopter ElectroMagnetic, This designation is most commonly used for helicopter-borne, ***frequency-domain*** electromagnetic systems. At present, the transmitter and receivers are normally mounted in a ***bird*** carried on a sling line beneath the helicopter.

herringbone pattern: A pattern created in geophysical data by an asymmetric system, where the **anomaly** may be extended to either side of the source, in the direction of flight. Appears like fish bones, or like the teeth of a comb, extending either side of centre, each tooth an alternate flight line.

homogeneous: This is a geological unit that has the same ***physical parameters*** throughout its volume. This unit will create the same response to an HEM system anywhere, and the HEM system will measure the same apparent ***resistivity*** anywhere. The response may change with system direction (see ***anisotropy***).

HFEM: Helicopter Frequency-domain ElectroMagnetic, This designation is used for helicopter-borne, **frequency-*domain*** electromagnetic systems. Formerly most often called HEM.

HTEM: Helicopter Time-domain ElectroMagnetic, This designation is used for the new generation of helicopter-borne, ***time-domain*** electromagnetic systems.

in-phase: the component of the measured ***secondary field*** that has the same phase as the transmitter and the ***primary field***. The in-phase component is stronger than the ***quadrature*** phase over relatively higher ***conductivity***.

induction: Any time-varying electromagnetic field will induce (cause) electrical currents to flow in any object with non-zero ***conductivity***. (see ***eddy currents***)

induction number: also called the "response parameter", this number combines many of the most significant parameters affecting the ***EM*** response into one parameter against which to compare responses. For a ***layered earth*** the response parameter is $\mu\omega\sigma h^2$ and for a large, flat, ***conductor*** it is $\mu\omega\sigma th$, where μ is the ***magnetic permeability***, ω is the angular ***frequency***, σ is the **conductivity**, t is the thickness (for the flat conductor) and h is the height of the system above the conductor.

inductive limit: When the frequency of an EM system is very high, or the **conductivity** of the target is very high, the response measured will be entirely **in-phase** with no **quadrature** (**phase** angle =0). The in-phase response will remain constant with further increase in conductivity or frequency. The system can no longer detect changes in conductivity of the target.

infinite: In geophysical terms, an "infinite' dimension is one much greater than the ***footprint*** of the system, so that the system does not detect changes at the edges of the object.

International Geomagnetic Reference Field: **[IGRF]** An approximation of the smooth magnetic field of the earth, in the absence of variations due to local geology. Once the IGRF is subtracted from the measured magnetic total field data, any remaining variations are assumed to be due to local geology. The IGRF also predicts the slow changes of the field up to five years in the future.

inversion, or **inverse modeling**: A process of converting geophysical data to an earth model, which compares theoretical models of the response of the earth to the data measured, and refines the model until the response closely fits the measured data (Huang and Palacky, 1991)

layered earth: A common geophysical model which assumes that the earth is horizontally layered – the ***physical parameters*** are constant to ***infinite*** distance horizontally, but change vertically.

lead-in: approach to a ***flight line*** outside of survey area to establish proper track and stabilize instrumentations. The lead-in for a helicopter survey is generally shorter than required for fixed-wing.

line source, or line current: a long narrow object that creates an ***anomaly*** on an ***EM*** survey. Generally man-made objects like fences, power lines, and pipelines (***culture***).

mag: common abbreviation for ***magnetic.***

magnetic: ("**mag**") a survey measuring the strength of the earth's magnetic field, to identify geology and targets by their effect on the field.

magnetic permeability: **[μ]** This is defined as the ratio of magnetic induction to the inducing magnetic field. The relative magnetic permeability [μ_r] is often quoted, which is the ratio of the rock permeability to the permeability of free space. In geology and geophysics, the ***magnetic susceptibility*** is more commonly used to describe rocks.

magnetic susceptibility: **[k]** A measure of the degree to which a body is magnetized. In SI units this is related to relative ***magnetic permeability*** by $k=\mu_r-1$, and is a dimensionless unit. For most geological material, susceptibility is influenced primarily by the percentage of magnetite. It is most often quoted in units of 10^{-6}. In HEM data this is most often apparent as a negative ***in-phase*** component over high susceptibility, high ***resistivity*** geology such as diabase dikes.

manoeuvre noise: variations in the magnetic field measured caused by changes in the relative positions of the magnetic sensor and magnetic objects or electrical currents in the aircraft. This type of noise is generally corrected by magnetic **compensation**.

model: Geophysical theory and applications generally have to assume that the geology of the earth has a form that can be easily defined mathematically, called the model. For example steeply dipping **conductor**s are generally modeled as being **infinite** in horizontal and depth extent, and very thin. The earth is generally modeled as horizontally layered, each layer infinite in extent and uniform in characteristic. These models make the mathematics to describe the response of the (normally very complex) earth practical. As theory advances, and computers become more powerful, the useful models can become more complex.

natural exposure rate: in radiometric surveys, a calculation of the total exposure rate due to natural-source gamma rays at the ground surface. It is used as a measurement of the concentration of all the natural **radioelements** at the surface. See also: **exposure rate**.

natural source: any geophysical technique for which the source of the energy is from nature, not from a man-made object. Most commonly applied to natural source ***electromagnetic*** surveys.

noise: That part of a geophysical measurement that the user does not want. Typically this includes electronic interference from the system, the atmosphere (***sferics***), and man-made sources. This can be a subjective judgment, as it may include the response from geology other than the target of interest. Commonly the term is used to refer to high frequency (short period) interference. See also ***drift***.

Occam's inversion: an ***inversion*** process that matches the measured ***electromagnetic*** data to a theoretical model of many, thin layers with constant thickness and varying resistivity (Constable et al, 1987).

off-time: In a ***time-domain electromagnetic*** survey, the time after the end of the ***primary field pulse***, and before the start of the next pulse.

on-time: In a ***time-domain electromagnetic*** survey, the time during the ***primary field pulse***.

overburden: In engineering and mineral exploration terms, this most often means the soil on top of the unweathered bedrock. It may be sand, glacial till, or weathered rock.

Phase, phase angle: The angular difference in time between a measured sinusoidal electromagnetic field and a reference – normally the primary field. The phase is calculated from $\tan^{-1}$(***in-phase*** / ***quadrature***).

physical parameters: These are the characteristics of a geological unit. For electromagnetic surveys, the important parameters are ***conductivity***, ***magnetic permeability*** (or ***susceptibility***) and ***dielectric permittivity***; for magnetic surveys the parameter is magnetic susceptibility, and for gamma ray spectrometric surveys it is the concentration of the major radioactive elements: potassium, uranium, and thorium.

permittivity: see ***dielectric permittivity***.

permeability: see ***magnetic permeability***.

potential field: A field that obeys Laplace's Equation. Most commonly used to describe ***gravity*** and ***magnetic*** measurements.

primary field: the EM field emitted by a transmitter. This field induces ***eddy currents*** in (energizes) the conductors in the ground, which then create their own ***secondary*** **fields**.

pulse: In time-domain EM surveys, the short period of intense ***primary*** field transmission. Most measurements (the ***off-time***) are measured after the pulse. **On-time** measurements may be made during the pulse.

quadrature: that component of the measured ***secondary field*** that is phase-shifted 90° from the ***primary field***. The quadrature component tends to be stronger than the ***in-phase*** over relatively weaker ***conductivity***.

Q-coils: see ***calibration coil***.

radioelements: This normally refers to the common, naturally-occurring radioactive elements: potassium (K), uranium (U), and thorium (Th). It can also refer to man-made radioelements, most often cobalt (Co) and cesium (Cs)

radiometric: Commonly used to refer to ***gamma ray*** spectrometry.

radon: A radioactive daughter product of uranium and thorium, radon is a gas which can leak into the atmosphere, adding to the non-geological background of a gamma-ray spectrometric survey.

receiver: the ***signal*** detector of a geophysical system. This term is most often used in active geophysical systems – systems that transmit some kind of signal. In airborne ***electromagnetic*** surveys it is most often a ***coil***. (see also, ***transmitter***)

resistivity: **[ρ]** The strength with which the earth or a geological formation resists the flow of electricity, typically the flow induced by the ***primary field*** of the electromagnetic transmitter. Normally expressed in ohm-metres, it is the reciprocal of ***conductivity***.

resistivity-depth transforms: similar to ***conductivity depth transforms***, but the calculated ***conductivity*** has been converted to ***resistivity***.

resistivity section: an approximate vertical section of the resistivity of the layers in the earth. The resistivities can be derived from the ***apparent resistivity***, the ***differential resistivities***, ***resistivity-depth transforms***, or ***inversions***.

response parameter: another name for the **induction number**.

secondary field: The field created by conductors in the ground, as a result of electrical currents induced by the ***primary field*** from the ***electromagnetic*** transmitter. Airborne ***electromagnetic*** systems are designed to create and measure a secondary field.

Sengpiel section: a ***resistivity section*** derived using the ***apparent resistivity*** and an approximation of the depth of maximum sensitivity for each frequency.

sferic: Lightning, or the ***electromagnetic*** signal from lightning, it is an abbreviation of "atmospheric discharge". These appear to magnetic and electromagnetic sensors as sharp "spikes" in the data. Under some conditions lightning storms can be detected from hundreds of kilometres away. (see ***noise***)

signal: That component of a measurement that the user wants to see – the response from the targets, from the earth, etc. (See also ***noise***)

skin depth: A measure of the depth of penetration of an electromagnetic field into a material. It is defined as the depth at which the primary field decreases to 1/e of the field at the surface. It is calculated by approximately 503 x √(resistivity/frequency). Note that depth of penetration is greater at higher ***resistivity*** and/or lower ***frequency***.

spec: common abbreviation for *gamma-ray spectrometry*.

spectrometry: Measurement across a range of energies, where ***amplitude*** and energy are defined for each measurement. In gamma-ray spectrometry, the number of gamma rays are measured for each energy ***window***, to define the ***spectrum***.

spectrum: In ***gamma ray spectrometry***, the continuous range of energy over which gamma rays are measured. In ***time-domain electromagnetic*** surveys, the spectrum is the energy of the **pulse** distributed across an equivalent, continuous range of frequencies.

spheric: see ***sferic***.

stacking: Summing repeat measurements over time to enhance the repeating ***signal***, and minimize the random ***noise***.

stinger: A boom mounted on an aircraft to carry a geophysical sensor (usually ***magnetic***). The boom moves the sensor farther from the aircraft, which might otherwise be a source of ***noise*** in the survey data.

stripping: Estimation and correction for the gamma ray photons of higher and lower energy that are observed in a particular ***energy window***. See also ***Compton scattering***.

susceptibility: See ***magnetic susceptibility***.
tau: [τ] Often used as a name for the ***decay time constant***.

TDEM: ***time domain electromagnetic***.

thin sheet: A standard model for electromagnetic geophysical theory. It is usually defined as a thin, flat-lying conductive sheet, ***infinite*** in both horizontal directions. (see also ***vertical plate***)

tie-line: A survey line flown across most of the ***traverse lines***, generally perpendicular to them, to assist in measuring ***drift*** and ***diurnal*** variation. In the short time required to fly a tie-line it is assumed that the drift and/or diurnal will be minimal, or at least changing at a constant rate.

time constant: The time required for an ***electromagnetic*** field to decay to a value of 1/e of the original value. In ***time-domain*** electromagnetic data, the time constant is proportional to the size and ***conductance*** of a tabular conductive body. Also called the decay constant.

Time channel: In ***time-domain electromagnetic*** surveys the decaying ***secondary field*** is measured over a period of time, and the divided up into a series of consecutive discrete measurements over that time.

time-domain: ***Electromagnetic*** system which transmits a pulsed, or stepped ***electromagnetic*** field. These systems induce an electrical current (***eddy current***) in the ground that persists after the ***primary field*** is turned off, and measure the change over time of the ***secondary field*** created as the currents ***decay***. See also ***frequency-domain***.

total energy envelope: The sum of the squares of the three ***components*** of the ***time-domain electromagnetic secondary field***. Equivalent to the ***amplitude*** of the secondary field.

transient: Time-varying. Usually used to describe a very short period pulse of ***electromagnetic*** field.

transmitter: The source of the ***signa***l to be measured in a geophysical survey. In airborne ***EM*** it is most often a **coil** carrying a time-varying electrical current, transmitting the ***primary field***. (see also ***receiver***)

traverse line: A normal geophysical survey line. Normally parallel traverse lines are flown across the property in spacing of 50 m to 500 m, and generally perpendicular to the target geology. Also called a **flight line**.

turn-arounds: The time the aircraft is turning between one ***traverse*** or ***tie line*** and the next. Turn-arounds are generally outside the survey area, and the data collected during this time generally are not useable, because of aircraft ***manoeuvre noise***.

vertical plate: A standard model for electromagnetic geophysical theory. It is usually defined as thin conductive sheet, ***infinite*** in horizontal dimension and depth extent. (see also ***thin shee***t)

waveform: The shape of the ***electromagnetic pulse*** from a ***time-domain*** electromagnetic transmitter.

window: A discrete portion of a ***gamma-ray spectrum*** or ***time-domain electromagnetic decay***. The continuous energy spectrum or ***full-stream*** data are grouped into windows to reduce the number of samples, and reduce ***noise***.

zero, or zero level: The ***base level*** of an instrument, with no ***ground effect*** or ***drift***. Also, the act of measuring and setting the zero level.

Common Symbols and Acronyms

k	Magnetic susceptibility
ε	Dielectric permittivity
μ, μ_r	Magnetic permeability, relative permeability
ρ, ρ_a	Resistivity, apparent resistivity
σ,σ_a	Conductivity, apparent conductivity
σt	Conductivity thickness
τ	Tau, or time constant
Ωm	ohm-metres, units of resistivity
AGS	Airborne gamma ray spectrometry.
CDT	Conductivity-depth transform, conductivity-depth imaging (Macnae and Lamontagne, 1987; Wolfgram and Karlik, 1995)
CPI, CPQ	Coplanar in-phase, quadrature
CPS	Counts per second
CTP	Conductivity thickness product
CXI, CXQ	Coaxial, in-phase, quadrature
FOM	Figure of Merit
fT	femtoteslas, common unit for measurement of B-Field in time-domain EM
EM	Electromagnetic
keV	kilo electron volts – a measure of gamma-ray energy
MeV	mega electron volts – a measure of gamma-ray energy 1MeV = 1000keV
NIA	dipole moment: turns x current x Area
nT	nanotesla, a measure of the strength of a magnetic field
nT/s	nanoteslas/second; standard unit of measurement of secondary field dB/dt in time domain EM.
nG/h	nanoGreys/hour – gamma ray dose rate at ground level
ppm	parts per million – a measure of secondary field or noise relative to the primary or radioelement concentration.
pT	picoteslas: standard unit of measurement of B-Field in time-domain EM
pT/s	picoteslas per second: Units of decay of secondary field, dB/dt
S	siemens – a unit of conductance
x:	the horizontal component of an EM field parallel to the direction of flight.
y:	the horizontal component of an EM field perpendicular to the direction of flight.
z:	the vertical component of an EM field.

References:

Constable, S.C., Parker, R.L., And Constable, C.G., 1987, Occam's inversion: a practical algorithm for generating smooth models from electromagnetic sounding data: Geophysics, 52, 289-300

Huang, H. and Fraser, D.C, 1996. The differential parameter method for muiltifrequency airborne resistivity mapping. Geophysics, 55, 1327-1337

Huang, H. and Palacky, G.J., 1991, Damped least-squares inversion of time-domain airborne EM data based on singular value decomposition: Geophysical Prospecting, v.39, 827-844

Macnae, J. and Lamontagne, Y., 1987, Imaging quasi-layered conductive structures by simple processing of transient electromagnetic data: Geophysics, v52, 4, 545-554.

Sengpiel, K-P. 1988, Approximate inversion of airborne EM data from a multi-layered ground. Geophysical Prospecting, 36, 446-459

Wolfgram, P. and Karlik, G., 1995, Conductivity-depth transform of GEOTEM data: Exploration Geophysics, 26, 179-185.

Yin, C. and Fraser, D.C. (2002), The effect of the electrical anisotropy on the responses of helicopter-borne frequency domain electromagnetic systems, Submitted to *Geophysical Prospecting*

DETOUR GOLD CORPORATION

DETOUR LAKE CLAIMS LIST

	Detour Gold Corporation Land Holdings (Ontario) Land Tenure as of March 31, 2016			
Claim #/Lease/Patent	Ownership	Township/Area	Recorded Date	Expiry\Date
592958	Detour Gold Corporation	093L	October 16, 2008	December 3, 2017
592969	Detour Gold Corporation	093L	October 16, 2008	December 3, 2017
592980	Detour Gold Corporation	093L	October 16, 2008	December 3, 2017
505416	Detour Gold Corporation	103I	February 1, 2005	December 2, 2016
505417	Detour Gold Corporation	103I	February 1, 2005	December 2, 2016
505418	Detour Gold Corporation	103I	February 1, 2005	December 2, 2016
505623	Detour Gold Corporation	103I	February 2, 2005	December 5, 2017
505625	Detour Gold Corporation	103I	February 2, 2005	December 5, 2017
505626	Detour Gold Corporation	103I	February 2, 2005	December 5, 2017
505628	Detour Gold Corporation	103I	February 2, 2005	December 5, 2017
505629	Detour Gold Corporation	103I	February 2, 2005	December 5, 2017
505630	Detour Gold Corporation	103I	February 2, 2005	December 5, 2017
505631	Detour Gold Corporation	103I	February 2, 2005	December 5, 2017
510714	Detour Gold Corporation	103I	April 13, 2005	December 5, 2017
510716	Detour Gold Corporation	103I	April 13, 2005	December 5, 2017
510719	Detour Gold Corporation	103I	April 13, 2005	December 2, 2016
515062	Detour Gold Corporation	103I	June 23, 2005	December 5, 2017
515064	Detour Gold Corporation	103I	June 23, 2005	December 5, 2017
517515	Detour Gold Corporation	103I	July 12, 2005	December 2, 2016
517726	Detour Gold Corporation	103I	July 14, 2005	December 2, 2016
531627	Detour Gold Corporation	103I	April 10, 2006	August 31, 2016
531629	Detour Gold Corporation	103I	April 10, 2006	August 31, 2016
531650	Detour Gold Corporation	103I	April 10, 2006	December 2, 2016
531653	Detour Gold Corporation	103I	April 10, 2006	December 2, 2016
531655	Detour Gold Corporation	103I	April 10, 2006	December 2, 2016
531658	Detour Gold Corporation	103I	April 10, 2006	December 2, 2016
531663	Detour Gold Corporation	103I	April 10, 2006	December 2, 2016
535609	Detour Gold Corporation	103I	June 13, 2006	December 5, 2017

556682	Detour Gold Corporation	103I	April 19, 2007	December 5, 2017
556684	Detour Gold Corporation	103I	April 19, 2007	December 5, 2017
558987	Detour Gold Corporation	103I	May 22, 2007	December 5, 2017
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558991	Detour Gold Corporation	103I	May 22, 2007	December 4, 2017
561002	Detour Gold Corporation	103I	June 22, 2007	December 3, 2017
561005	Detour Gold Corporation	103I	June 22, 2007	December 3, 2017
592985	Detour Gold Corporation	103I	October 16, 2008	December 3, 2017
398666	Detour Gold Corporation	103I049	December 2, 2002	December 2, 2016
4270384	Detour Gold Corporation	Atkinson Lake	April 19, 2013	April 19, 2020
4270385	Detour Gold Corporation	Atkinson Lake	April 19, 2013	April 19, 2020
4270386	Detour Gold Corporation	Atkinson Lake	April 19, 2013	April 19, 2019
4270387	Detour Gold Corporation	Atkinson Lake	April 19, 2013	April 19, 2020
4270388	Detour Gold Corporation	Atkinson Lake	April 19, 2013	April 19, 2020
4270389	Detour Gold Corporation	Atkinson Lake	April 19, 2013	April 19, 2020
4270410	Detour Gold Corporation	Atkinson Lake	April 19, 2013	April 19, 2020
4270411	Detour Gold Corporation	Atkinson Lake	April 19, 2013	April 19, 2020
4270413	Detour Gold Corporation	Atkinson Lake	April 19, 2013	April 19, 2019
4270414	Detour Gold Corporation	Atkinson Lake	April 19, 2013	April 19, 2019
4270415	Detour Gold Corporation	Atkinson Lake	April 19, 2013	April 19, 2019
4270416	Detour Gold Corporation	Atkinson Lake	April 19, 2013	April 19, 2019
4270417	Detour Gold Corporation	Atkinson Lake	April 19, 2013	April 19, 2019
4270418	Detour Gold Corporation	Atkinson Lake	April 19, 2013	April 19, 2019
4270419	Detour Gold Corporation	Atkinson Lake	April 19, 2013	April 19, 2019
4270420	Detour Gold Corporation	Atkinson Lake	April 19, 2013	April 19, 2020
4270421	Detour Gold Corporation	Atkinson Lake	April 19, 2013	April 19, 2019
4270422	Detour Gold Corporation	Atkinson Lake	April 19, 2013	April 19, 2019
4270423	Detour Gold Corporation	Atkinson Lake	April 19, 2013	April 19, 2019
4270424	Detour Gold Corporation	Atkinson Lake	April 19, 2013	April 19, 2019
4270257	Detour Gold Corporation	Atkinson Lake	October 9, 2012	October 9, 2021
4270258	Detour Gold Corporation	Atkinson Lake	October 9, 2012	October 9, 2021

1154539	Detour Gold Corporation	Hopper Lake	May 28, 1990	May 28, 2021
1154540	Detour Gold Corporation	Hopper Lake	May 28, 1990	May 28, 2021
1154547	Detour Gold Corporation	Hopper Lake	May 28, 1990	May 28, 2021
1154548	Detour Gold Corporation	Hopper Lake	May 28, 1990	May 28, 2021
1155038	Detour Gold Corporation	Hopper Lake	May 28, 1990	May 28, 2021
1155039	Detour Gold Corporation	Hopper Lake	May 28, 1990	May 28, 2021
1155043	Detour Gold Corporation	Hopper Lake	May 28, 1990	May 28, 2021
1155050	Detour Gold Corporation	Hopper Lake	May 28, 1990	May 28, 2021
1155051	Detour Gold Corporation	Hopper Lake	May 28, 1990	May 28, 2021
1155058	Detour Gold Corporation	Hopper Lake	May 28, 1990	May 28, 2021
1155059	Detour Gold Corporation	Hopper Lake	May 28, 1990	May 28, 2021
1155066	Detour Gold Corporation	Hopper Lake	May 28, 1990	May 28, 2021
1160145	Detour Gold Corporation	Hopper Lake	March 15, 1994	March 15, 2021
1160146	Detour Gold Corporation	Hopper Lake	March 15, 1994	March 15, 2021
1160147	Detour Gold Corporation	Hopper Lake	March 15, 1994	March 15, 2021
1160148	Detour Gold Corporation	Hopper Lake	March 15, 1994	March 15, 2021
1160149	Detour Gold Corporation	Hopper Lake	March 15, 1994	March 15, 2021
1160150	Detour Gold Corporation	Hopper Lake	March 15, 1994	March 15, 2021
1160151	Detour Gold Corporation	Hopper Lake	March 15, 1994	March 15, 2021
1241030	Detour Gold Corporation	Hopper Lake	May 8, 2002	May 8, 2021
1241031	Detour Gold Corporation	Hopper Lake	May 8, 2002	May 8, 2021
1241032	Detour Gold Corporation	Hopper Lake	May 8, 2002	May 8, 2021
1241033	Detour Gold Corporation	Hopper Lake	May 8, 2002	May 8, 2019
3017747	Detour Gold Corporation	Hopper Lake	August 31, 2004	August 31, 2021
4254626	Detour Gold Corporation	Hopper Lake	March 3, 2010	March 3, 2021
4258325	Detour Gold Corporation	Hopper Lake	August 20, 2010	August 20, 2019
4258326	Detour Gold Corporation	Hopper Lake	August 20, 2010	August 20, 2019
4258327	Detour Gold Corporation	Hopper Lake	August 20, 2010	August 20, 2019
4258328	Detour Gold Corporation	Hopper Lake	August 20, 2010	August 20, 2019
4258329	Detour Gold Corporation	Hopper Lake	August 20, 2010	August 20, 2019
4258330	Detour Gold Corporation	Hopper Lake	August 20, 2010	August 20, 2019

4258331	Detour Gold Corporation	Hopper Lake	August 20, 2010	August 20, 2019
4258332	Detour Gold Corporation	Hopper Lake	August 20, 2010	August 20, 2019
4258333	Detour Gold Corporation	Hopper Lake	August 20, 2010	August 20, 2019
4258383	Detour Gold Corporation	Hopper Lake	August 20, 2010	August 20, 2019
4264629	Detour Gold Corporation	Hopper Lake	September 8, 2011	September 8, 2021
4264630	Detour Gold Corporation	Hopper Lake	September 8, 2011	September 8, 2021
4264631	Detour Gold Corporation	Hopper Lake	September 8, 2011	September 8, 2021
4264632	Detour Gold Corporation	Hopper Lake	September 8, 2011	September 8, 2021
4264633	Detour Gold Corporation	Hopper Lake	September 8, 2011	September 8, 2021
4264634	Detour Gold Corporation	Hopper Lake	September 8, 2011	September 8, 2021
4264635	Detour Gold Corporation	Hopper Lake	September 8, 2011	September 8, 2021
1204525	Detour Gold Corporation	Lower Detour Lake	August 8, 1994	August 8, 2021
1204526	Detour Gold Corporation	Lower Detour Lake	August 8, 1994	August 8, 2021
1204527	Detour Gold Corporation	Lower Detour Lake	August 8, 1994	August 8, 2021
1244200	Detour Gold Corporation	Lower Detour Lake	October 25, 2002	October 25, 2021
1248598	Detour Gold Corporation	Lower Detour Lake	October 25, 2002	October 25, 2021
1248599	Detour Gold Corporation	Lower Detour Lake	October 25, 2002	October 25, 2021
1248600	Detour Gold Corporation	Lower Detour Lake	October 25, 2002	October 25, 2021
1249137	Detour Gold Corporation	Lower Detour Lake	June 3, 2002	June 3, 2021
1249138	Detour Gold Corporation	Lower Detour Lake	June 3, 2002	June 3, 2021
1249139	Detour Gold Corporation	Lower Detour Lake	June 3, 2002	June 3, 2021
1249140	Detour Gold Corporation	Lower Detour Lake	June 3, 2002	June 3, 2021
1249141	Detour Gold Corporation	Lower Detour Lake	June 3, 2002	June 3, 2021
1249142	Detour Gold Corporation	Lower Detour Lake	June 3, 2002	June 3, 2021
1249143	Detour Gold Corporation	Lower Detour Lake	June 3, 2002	June 3, 2021
1249144	Detour Gold Corporation	Lower Detour Lake	June 3, 2002	June 3, 2021
1249145	Detour Gold Corporation	Lower Detour Lake	June 3, 2002	June 3, 2021
1249146	Detour Gold Corporation	Lower Detour Lake	June 3, 2002	June 3, 2021
1249147	Detour Gold Corporation	Lower Detour Lake	June 3, 2002	June 3, 2021
1249148	Detour Gold Corporation	Lower Detour Lake	June 3, 2002	June 3, 2021
1249149	Detour Gold Corporation	Lower Detour Lake	June 3, 2002	June 3, 2021

1249150	Detour Gold Corporation	Lower Detour Lake	June 3, 2002	June 3, 2021
1249151	Detour Gold Corporation	Lower Detour Lake	June 3, 2002	June 3, 2021
3013358	Detour Gold Corporation	Lower Detour Lake	October 14, 2003	October 14, 2021
3013359	Detour Gold Corporation	Lower Detour Lake	October 14, 2003	October 14, 2021
3013360	Detour Gold Corporation	Lower Detour Lake	October 14, 2003	October 14, 2021
3013361	Detour Gold Corporation	Lower Detour Lake	October 14, 2003	October 14, 2020
3013365	Detour Gold Corporation	Lower Detour Lake	October 14, 2003	October 14, 2021
3016452	Detour Gold Corporation	Lower Detour Lake	March 11, 2004	March 11, 2020
3016453	Detour Gold Corporation	Lower Detour Lake	March 11, 2004	March 11, 2020
3016454	Detour Gold Corporation	Lower Detour Lake	March 11, 2004	March 11, 2020
3016455	Detour Gold Corporation	Lower Detour Lake	March 11, 2004	March 11, 2020
3016456	Detour Gold Corporation	Lower Detour Lake	March 11, 2004	March 11, 2020
3016457	Detour Gold Corporation	Lower Detour Lake	March 11, 2004	March 11, 2020
3016458	Detour Gold Corporation	Lower Detour Lake	March 11, 2004	March 11, 2020
3016459	Detour Gold Corporation	Lower Detour Lake	March 11, 2004	March 11, 2020
3016460	Detour Gold Corporation	Lower Detour Lake	March 11, 2004	March 11, 2020
3016461	Detour Gold Corporation	Lower Detour Lake	March 11, 2004	March 11, 2020
3016462	Detour Gold Corporation	Lower Detour Lake	March 11, 2004	March 11, 2020
3016463	Detour Gold Corporation	Lower Detour Lake	March 11, 2004	March 11, 2020
3016470	Detour Gold Corporation	Lower Detour Lake	March 11, 2004	March 11, 2021
4264637	Detour Gold Corporation	Lower Detour Lake	August 8, 2011	August 8, 2021
4267601	Detour Gold Corporation	Lower Detour Lake	August 8, 2011	August 8, 2021
4267602	Detour Gold Corporation	Lower Detour Lake	August 8, 2011	August 8, 2021
4267603	Detour Gold Corporation	Lower Detour Lake	August 8, 2011	August 8, 2021
4267604	Detour Gold Corporation	Lower Detour Lake	August 8, 2011	August 8, 2021
4267605	Detour Gold Corporation	Lower Detour Lake	August 8, 2011	August 8, 2021
4267606	Detour Gold Corporation	Lower Detour Lake	August 8, 2011	August 8, 2021
4267607	Detour Gold Corporation	Lower Detour Lake	August 8, 2011	August 8, 2021
4267608	Detour Gold Corporation	Lower Detour Lake	September 22, 2011	September 22, 2021
4270250	Detour Gold Corporation	Lower Detour Lake	October 9, 2012	October 9, 2021
4270251	Detour Gold Corporation	Lower Detour Lake	October 9, 2012	October 9, 2021

4270252	Detour Gold Corporation	Lower Detour Lake	October 9, 2012	October 9, 2021
4270253	Detour Gold Corporation	Lower Detour Lake	October 9, 2012	October 9, 2021
4270254	Detour Gold Corporation	Lower Detour Lake	October 9, 2012	October 9, 2021
4270255	Detour Gold Corporation	Lower Detour Lake	October 9, 2012	October 9, 2021
4270256	Detour Gold Corporation	Lower Detour Lake	October 9, 2012	October 9, 2021
4270370	Detour Gold Corporation	Lower Detour Lake	April 19, 2013	April 19, 2021
4270371	Detour Gold Corporation	Lower Detour Lake	April 19, 2013	April 19, 2021
4270372	Detour Gold Corporation	Lower Detour Lake	April 19, 2013	April 19, 2021
4270373	Detour Gold Corporation	Lower Detour Lake	April 19, 2013	April 19, 2021
4270374	Detour Gold Corporation	Lower Detour Lake	April 19, 2013	April 19, 2020
4270375	Detour Gold Corporation	Lower Detour Lake	April 19, 2013	April 19, 2020
4270376	Detour Gold Corporation	Lower Detour Lake	April 19, 2013	April 19, 2020
4270377	Detour Gold Corporation	Lower Detour Lake	April 19, 2013	April 19, 2020
4270378	Detour Gold Corporation	Lower Detour Lake	April 19, 2013	April 19, 2020
4270379	Detour Gold Corporation	Lower Detour Lake	April 19, 2013	April 19, 2020
4270383	Detour Gold Corporation	Lower Detour Lake	April 19, 2013	April 19, 2020
4275373	Detour Gold Corporation	Lower Detour Lake	February 24, 2014	February 24, 2019
1154725	Detour Gold Corporation	Sunday Lake	July 12, 1994	July 12, 2021
1154726	Detour Gold Corporation	Sunday Lake	July 12, 1994	July 12, 2021
1154727	Detour Gold Corporation	Sunday Lake	July 12, 1994	July 12, 2021
1154728	Detour Gold Corporation	Sunday Lake	July 12, 1994	July 12, 2021
1154729	Detour Gold Corporation	Sunday Lake	July 12, 1994	July 12, 2021
4257404	Detour Gold Corporation	Sunday Lake	April 26, 2010	April 26, 2019
4257405	Detour Gold Corporation	Sunday Lake	April 26, 2010	April 26, 2019
4257406	Detour Gold Corporation	Sunday Lake	April 26, 2010	April 26, 2019
4257407	Detour Gold Corporation	Sunday Lake	April 26, 2010	April 26, 2019
4257408	Detour Gold Corporation	Sunday Lake	April 26, 2010	April 26, 2019
4257409	Detour Gold Corporation	Sunday Lake	April 26, 2010	April 26, 2019
4257410	Detour Gold Corporation	Sunday Lake	April 26, 2010	April 26, 2019
4257411	Detour Gold Corporation	Sunday Lake	April 26, 2010	April 26, 2019
4257412	Detour Gold Corporation	Sunday Lake	April 26, 2010	April 26, 2019

4257413	Detour Gold Corporation	Sunday Lake	April 26, 2010	April 26, 2019
4257414	Detour Gold Corporation	Sunday Lake	April 26, 2010	April 26, 2019
4257415	Detour Gold Corporation	Sunday Lake	April 26, 2010	April 26, 2019
4257416	Detour Gold Corporation	Sunday Lake	April 26, 2010	April 26, 2019
4257417	Detour Gold Corporation	Sunday Lake	April 26, 2010	April 26, 2019
4257418	Detour Gold Corporation	Sunday Lake	April 26, 2010	April 26, 2019
4257419	Detour Gold Corporation	Sunday Lake	April 26, 2010	April 26, 2019
4257420	Detour Gold Corporation	Sunday Lake	April 26, 2010	April 26, 2019
4257421	Detour Gold Corporation	Sunday Lake	April 26, 2010	April 26, 2019
4257422	Detour Gold Corporation	Sunday Lake	April 26, 2010	April 26, 2019
4257423	Detour Gold Corporation	Sunday Lake	April 26, 2010	April 26, 2019
4257424	Detour Gold Corporation	Sunday Lake	April 26, 2010	April 26, 2019
4257425	Detour Gold Corporation	Sunday Lake	April 26, 2010	April 26, 2019
4257426	Detour Gold Corporation	Sunday Lake	April 26, 2010	April 26, 2019
4257427	Detour Gold Corporation	Sunday Lake	April 26, 2010	April 26, 2019
4257428	Detour Gold Corporation	Sunday Lake	April 26, 2010	April 26, 2019
4257429	Detour Gold Corporation	Sunday Lake	April 26, 2010	April 26, 2019
4257430	Detour Gold Corporation	Sunday Lake	April 26, 2010	April 26, 2019
4257431	Detour Gold Corporation	Sunday Lake	April 26, 2010	April 26, 2020
4257432	Detour Gold Corporation	Sunday Lake	April 26, 2010	April 26, 2019
4257433	Detour Gold Corporation	Sunday Lake	April 26, 2010	April 26, 2019
4257434	Detour Gold Corporation	Sunday Lake	April 26, 2010	April 26, 2019
1154536	Detour Gold Corporation	West of Sunday Lake	May 28, 1990	May 28, 2021
1154537	Detour Gold Corporation	West of Sunday Lake	May 28, 1990	May 28, 2021
1154538	Detour Gold Corporation	West of Sunday Lake	May 28, 1990	May 28, 2021
1154541	Detour Gold Corporation	West of Sunday Lake	May 28, 1990	May 28, 2021
1154542	Detour Gold Corporation	West of Sunday Lake	May 28, 1990	May 28, 2021
1154543	Detour Gold Corporation	West of Sunday Lake	May 28, 1990	May 28, 2021
1154544	Detour Gold Corporation	West of Sunday Lake	May 28, 1990	May 28, 2021

1154545	Detour Gold Corporation	West of Sunday Lake	May 28, 1990	May 28, 2021
1154546	Detour Gold Corporation	West of Sunday Lake	May 28, 1990	May 28, 2021
1154550	Detour Gold Corporation	West of Sunday Lake	May 28, 1990	May 28, 2021
1155035	Detour Gold Corporation	West of Sunday Lake	May 28, 1990	May 28, 2021
1155036	Detour Gold Corporation	West of Sunday Lake	May 28, 1990	May 28, 2021
1155040	Detour Gold Corporation	West of Sunday Lake	May 28, 1990	May 28, 2021
1155041	Detour Gold Corporation	West of Sunday Lake	May 28, 1990	May 28, 2021
1155042	Detour Gold Corporation	West of Sunday Lake	May 28, 1990	May 28, 2021
1155045	Detour Gold Corporation	West of Sunday Lake	May 28, 1990	May 28, 2021
1155046	Detour Gold Corporation	West of Sunday Lake	May 28, 1990	May 28, 2021
1155047	Detour Gold Corporation	West of Sunday Lake	May 28, 1990	May 28, 2021
1155048	Detour Gold Corporation	West of Sunday Lake	May 28, 1990	May 28, 2021
1155049	Detour Gold Corporation	West of Sunday Lake	May 28, 1990	May 28, 2021
1155052	Detour Gold Corporation	West of Sunday Lake	May 28, 1990	May 28, 2021
1155053	Detour Gold Corporation	West of Sunday Lake	May 28, 1990	May 28, 2021
1155054	Detour Gold Corporation	West of Sunday Lake	May 28, 1990	May 28, 2021
1155055	Detour Gold Corporation	West of Sunday Lake	May 28, 1990	May 28, 2021
1155056	Detour Gold Corporation	West of Sunday Lake	May 28, 1990	May 28, 2021
1155057	Detour Gold Corporation	West of Sunday Lake	May 28, 1990	May 28, 2021
1155060	Detour Gold Corporation	West of Sunday Lake	May 28, 1990	May 28, 2021
1155061	Detour Gold Corporation	West of Sunday Lake	May 28, 1990	May 28, 2021
1155062	Detour Gold Corporation	West of Sunday Lake	May 28, 1990	May 28, 2021
1155063	Detour Gold Corporation	West of Sunday Lake	May 28, 1990	May 28, 2021
1155064	Detour Gold Corporation	West of Sunday Lake	May 28, 1990	May 28, 2021

1155065	Detour Gold Corporation	West of Sunday Lake	May 28, 1990	May 28, 2021
1160200	Detour Gold Corporation	West of Sunday Lake	March 2, 1994	March 2, 2021
1189627	Detour Gold Corporation	West of Sunday Lake	April 13, 1992	April 13, 2021
1189628	Detour Gold Corporation	West of Sunday Lake	April 13, 1992	April 13, 2021
1189629	Detour Gold Corporation	West of Sunday Lake	April 13, 1992	April 13, 2021
1189630	Detour Gold Corporation	West of Sunday Lake	April 13, 1992	April 13, 2021
1190901	Detour Gold Corporation	West of Sunday Lake	September 18, 1992	September 18, 2021
1190902	Detour Gold Corporation	West of Sunday Lake	September 18, 1992	September 18, 2021
1190903	Detour Gold Corporation	West of Sunday Lake	September 18, 1992	September 18, 2021
1244190	Detour Gold Corporation	West of Sunday Lake	April 23, 2002	April 23, 2020
1244191	Detour Gold Corporation	West of Sunday Lake	April 23, 2002	April 23, 2019
1244192	Detour Gold Corporation	West of Sunday Lake	April 23, 2002	April 23, 2019
1244193	Detour Gold Corporation	West of Sunday Lake	April 23, 2002	April 23, 2019
1244194	Detour Gold Corporation	West of Sunday Lake	April 23, 2002	April 23, 2020
1244195	Detour Gold Corporation	West of Sunday Lake	April 23, 2002	April 23, 2020
1244196	Detour Gold Corporation	West of Sunday Lake	April 23, 2002	April 23, 2020
1244197	Detour Gold Corporation	West of Sunday Lake	April 23, 2002	April 23, 2020
1244198	Detour Gold Corporation	West of Sunday Lake	April 23, 2002	April 23, 2020
1244199	Detour Gold Corporation	West of Sunday Lake	April 23, 2002	April 23, 2019
3001876	Detour Gold Corporation	West of Sunday Lake	June 3, 2002	June 3, 2021
3001877	Detour Gold Corporation	West of Sunday Lake	June 3, 2002	June 3, 2020
3001878	Detour Gold Corporation	West of Sunday Lake	June 3, 2002	June 3, 2021
3001879	Detour Gold Corporation	West of Sunday Lake	October 25, 2002	October 25, 2021
3001885	Detour Gold Corporation	West of Sunday Lake	October 25, 2002	October 25, 2021

4253050	Detour Gold Corporation	West of Sunday Lake	March 3, 2010	March 3, 2021
4254624	Detour Gold Corporation	West of Sunday Lake	March 3, 2010	March 3, 2021
4254625	Detour Gold Corporation	West of Sunday Lake	March 3, 2010	March 3, 2021
4257435	Detour Gold Corporation	West of Sunday Lake	April 26, 2010	April 26, 2019
4257436	Detour Gold Corporation	West of Sunday Lake	April 26, 2010	April 26, 2022
4257437	Detour Gold Corporation	West of Sunday Lake	April 26, 2010	April 26, 2020
4257438	Detour Gold Corporation	West of Sunday Lake	April 26, 2010	April 26, 2019
4257439	Detour Gold Corporation	West of Sunday Lake	April 26, 2010	April 26, 2019
4257440	Detour Gold Corporation	West of Sunday Lake	April 26, 2010	April 26, 2019
4257441	Detour Gold Corporation	West of Sunday Lake	April 26, 2010	April 26, 2019
4257442	Detour Gold Corporation	West of Sunday Lake	April 26, 2010	April 26, 2019
4257443	Detour Gold Corporation	West of Sunday Lake	April 26, 2010	April 26, 2019
4257444	Detour Gold Corporation	West of Sunday Lake	April 26, 2010	April 26, 2019
4258381	Detour Gold Corporation	West of Sunday Lake	August 20, 2010	August 20, 2019
4258382	Detour Gold Corporation	West of Sunday Lake	August 20, 2010	August 20, 2019
4258384	Detour Gold Corporation	West of Sunday Lake	August 20, 2010	August 20, 2019
ML 109339(SRO)**	Detour Gold Corporation	West of Sunday Lake		July 31, 2032
CLM 228	Detour Gold Corporation	West of Sunday Lake		March 31, 2023
CLM 229	Detour Gold Corporation	West of Sunday Lake		March 31, 2023
CLM 230	Detour Gold Corporation	Sunday Lake		February 28, 2023
CLM 231	Detour Gold Corporation	Sunday Lake		February 28, 2023
CLM 232	Detour Gold Corporation	Sunday Lake		February 28, 2023
CLM 233	Detour Gold Corporation	Sunday Lake		February 28, 2023
CLM 234	Detour Gold Corporation	Sunday Lake & Lower Detour Lake		February 28, 2023
CLM 235	Detour Gold Corporation	Sunday Lake		March 31, 2023
CLM 236	Detour Gold Corporation	Sunday Lake		March 31, 2023
CLM 237	Detour Gold Corporation	Sunday Lake		March 31, 2023
CLM 238	Detour Gold Corporation	Sunday Lake		March 31, 2023
CLM 239	Detour Gold Corporation	Sunday Lake		March 31, 2023

CLM 240	Detour Gold Corporation	Sunday Lake		March 31, 2023
CLM 340	Detour Gold Corporation	Lower Detour Lake		May 31, 2033
CLM 341	Detour Gold Corporation	Lower Detour Lake		May 31, 2033
CLM 342	Detour Gold Corporation	Lower Detour Lake		May 31, 2033
CLM 343	Detour Gold Corporation	Lower Detour Lake		May 31, 2033
CLM 344	Detour Gold Corporation	Lower Detour Lake		May 31, 2033
CLM 357	Detour Gold Corporation	Lower Detour Lake		May 31, 2033
CLM 358	Detour Gold Corporation	Lower Detour Lake		February 28, 2018
CLM 359	Detour Gold Corporation	Lower Detour Lake		May 31, 2033
CLM 360	Detour Gold Corporation	Lower Detour Lake		May 31, 2033
CLM 361	Detour Gold Corporation	Lower Detour Lake		May 31, 2033
CLM 396	Detour Gold Corporation	West of Sunday Lake		May 31, 2033
CLM 484	Detour Gold Corporation	W of Sunday Lake & Hopper Lake		June 30, 2033
CLM 485	Detour Gold Corporation	W of Sunday Lake & Sunday Lake		November 30, 2033
CLM318	Detour Gold Corporation	Hopper Lake		September 30, 2031
CLM319	Detour Gold Corporation	West of Sunday Lake		October 31, 2031
CLM362	Detour Gold Corporation	West of Sunday Lake		December 31, 2032
CLM363	Detour Gold Corporation	West of Sunday Lake		December 31, 2032
CLM364	Detour Gold Corporation	West of Sunday Lake		December 31, 2032
CLM491	Detour Gold Corporation	Lower Detour Lake		June 30, 2033
CLM497	Detour Gold Corporation	Lower Detour Lake		October 31, 2034
CLM498	Detour Gold Corporation	Lower Detour Lake		October 31, 2034
CLM499	Detour Gold Corporation	West of Sunday Lake		March 31, 2035
CLM506	Detour Gold Corporation	West of Sunday Lake		February 28, 2035
P1090117	Detour Gold Corporation	Lower Detour Lake		March 31, 2035
P1087168	Detour Gold Corporation	Hopper Lake		May 31, 2034
P1087169	Detour Gold Corporation	Hopper Lake		May 31, 2034
P1087170	Detour Gold Corporation	Hopper Lake		May 31, 2034
P1087171	Detour Gold Corporation	Hopper Lake		May 31, 2034
P1087172	Detour Gold Corporation	Hopper Lake		May 31, 2034

P1087173	Detour Gold Corporation	Hopper Lake		May 31, 2034
P1087174	Detour Gold Corporation	Hopper Lake		May 31, 2034
P1087175	Detour Gold Corporation	Hopper Lake		May 31, 2034
P1087176	Detour Gold Corporation	Hopper Lake		May 31, 2034
P400974	Detour Gold Corporation	Sunday Lake		
P400975	Detour Gold Corporation	Sunday Lake		
P400976	Detour Gold Corporation	Sunday Lake		
P400977	Detour Gold Corporation	Sunday Lake		
P400978	Detour Gold Corporation	Sunday Lake		April 30, 2019
P400979	Detour Gold Corporation	Sunday Lake		April 30, 2019
P401008	Detour Gold Corporation	Sunday Lake		
P401009	Detour Gold Corporation	Sunday Lake		
P401014	Detour Gold Corporation	Sunday Lake		
P421282	Detour Gold Corporation	Sunday Lake		
P421283	Detour Gold Corporation	Sunday Lake		
P421284	Detour Gold Corporation	Sunday Lake		April 30, 2019
P421381	Detour Gold Corporation	Sunday Lake		April 30, 2019
P421382	Detour Gold Corporation	Sunday Lake		April 30, 2019
P421383	Detour Gold Corporation	Sunday Lake		April 30, 2019
P421384	Detour Gold Corporation	Sunday Lake		April 30, 2019
P421386	Detour Gold Corporation	Sunday Lake		April 30, 2019
P421387	Detour Gold Corporation	Sunday Lake		April 30, 2019
P421388	Detour Gold Corporation	Sunday Lake		
P421389	Detour Gold Corporation	Sunday Lake		
P421391	Detour Gold Corporation	Sunday Lake		April 30, 2019
P421392	Detour Gold Corporation	Sunday Lake		April 30, 2019
P421393	Detour Gold Corporation	Sunday Lake		April 30, 2019
P421394	Detour Gold Corporation	Sunday Lake		April 30, 2019
P524182	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524183	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524184	Detour Gold Corporation	Hopper Lake		May 31, 2033

P524187	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524188	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524189	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524192	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524194	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524242	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524247	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524248	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524249	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524270	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524271	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524272	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524275	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524276	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524277	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524280	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524281	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524282	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524285	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524286	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524287	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524290	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524291	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524292	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524295	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524296	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524297	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524302	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524303	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524304	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524305	Detour Gold Corporation	Hopper Lake		May 31, 2033

P524306	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524307	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524308	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524309	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524310	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524311	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524312	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524313	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524314	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524315	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524316	Detour Gold Corporation	Hopper Lake		May 31, 2033
P524317	Detour Gold Corporation	Hopper Lake		May 31, 2033
P549852	Detour Gold Corporation	Sunday Lake		April 30, 2030
P549853	Detour Gold Corporation	Sunday Lake		April 30, 2030
P549854	Detour Gold Corporation	Sunday Lake		April 30, 2030
P549855	Detour Gold Corporation	Sunday Lake		April 30, 2030
P549856	Detour Gold Corporation	Sunday Lake		April 30, 2030
P549857	Detour Gold Corporation	Sunday Lake		April 30, 2030
P549858	Detour Gold Corporation	Sunday Lake		April 30, 2030
P549859	Detour Gold Corporation	Sunday Lake		April 30, 2030
P549860	Detour Gold Corporation	Sunday Lake		April 30, 2030
P549861	Detour Gold Corporation	Sunday Lake		April 30, 2030
P549862	Detour Gold Corporation	Sunday Lake		April 30, 2030
P549863	Detour Gold Corporation	Sunday Lake		April 30, 2030
P549864	Detour Gold Corporation	Sunday Lake		April 30, 2030
P549865	Detour Gold Corporation	Sunday Lake		April 30, 2030
P549866	Detour Gold Corporation	Sunday Lake		April 30, 2030
P549867	Detour Gold Corporation	Sunday Lake		April 30, 2030
P549868	Detour Gold Corporation	Sunday Lake		December 31, 2031
P549869	Detour Gold Corporation	Sunday Lake		December 31, 2031
P549870	Detour Gold Corporation	Sunday Lake		December 31, 2031

P549871	Detour Gold Corporation	Sunday Lake		December 31, 2031
P549872	Detour Gold Corporation	Sunday Lake		December 31, 2031
P549873	Detour Gold Corporation	Sunday Lake		December 31, 2031
P549874	Detour Gold Corporation	Sunday Lake		December 31, 2031
P549875	Detour Gold Corporation	Sunday Lake		December 31, 2031
P549876	Detour Gold Corporation	Sunday Lake		December 31, 2031
P549877	Detour Gold Corporation	Sunday Lake		December 31, 2031
P549878	Detour Gold Corporation	Sunday Lake		December 31, 2031
P549879	Detour Gold Corporation	Sunday Lake		December 31, 2031
P549880	Detour Gold Corporation	Sunday Lake		December 31, 2031
P549881	Detour Gold Corporation	Sunday Lake		December 31, 2031
P549882	Detour Gold Corporation	Sunday Lake		December 31, 2031
P549883	Detour Gold Corporation	Sunday Lake		December 31, 2031
P549884	Detour Gold Corporation	Sunday Lake		December 31, 2031
P549885	Detour Gold Corporation	Sunday Lake		December 31, 2031
P549886	Detour Gold Corporation	Sunday Lake		December 31, 2031
P549887	Detour Gold Corporation	Sunday Lake		December 31, 2031
P549888	Detour Gold Corporation	Sunday Lake		December 31, 2031
P549889	Detour Gold Corporation	Sunday Lake		December 31, 2031
P549890	Detour Gold Corporation	Sunday Lake		December 31, 2031
P549891	Detour Gold Corporation	Sunday Lake		December 31, 2031
P553663	Detour Gold Corporation	Sunday Lake		December 31, 2031
P553664	Detour Gold Corporation	Sunday Lake		December 31, 2031
P553665	Detour Gold Corporation	Sunday Lake		December 31, 2031
P553666	Detour Gold Corporation	Sunday Lake		December 31, 2031
P553667	Detour Gold Corporation	Sunday Lake		December 31, 2031
P553668	Detour Gold Corporation	Sunday Lake		December 31, 2031
P553669	Detour Gold Corporation	Sunday Lake		December 31, 2031
P553670	Detour Gold Corporation	Sunday Lake		December 31, 2031
P553740	Detour Gold Corporation	Sunday Lake		December 31, 2031
P553741	Detour Gold Corporation	Sunday Lake		December 31, 2031

P553742	Detour Gold Corporation	Sunday Lake		December 31, 2031
P553743	Detour Gold Corporation	Sunday Lake		December 31, 2031
P553744	Detour Gold Corporation	Sunday Lake		December 31, 2031
P553745	Detour Gold Corporation	Sunday Lake		December 31, 2031
P553746	Detour Gold Corporation	Sunday Lake		December 31, 2031
P553747	Detour Gold Corporation	Sunday Lake		December 31, 2031
P553748	Detour Gold Corporation	Sunday Lake		December 31, 2031
P553749	Detour Gold Corporation	Sunday Lake		December 31, 2031
P553750	Detour Gold Corporation	Sunday Lake		December 31, 2031
P553751	Detour Gold Corporation	Sunday Lake		December 31, 2031
P553752	Detour Gold Corporation	Sunday Lake		December 31, 2031
P553753	Detour Gold Corporation	Sunday Lake		December 31, 2031
P553754	Detour Gold Corporation	Sunday Lake		December 31, 2031
P553755	Detour Gold Corporation	Sunday Lake		December 31, 2031
P553756	Detour Gold Corporation	Sunday Lake		December 31, 2031
P553757	Detour Gold Corporation	Sunday Lake		December 31, 2031
P553758	Detour Gold Corporation	Sunday Lake		December 31, 2031
P553759	Detour Gold Corporation	Sunday Lake		December 31, 2031
P568937	Detour Gold Corporation	Lower Detour Lake		December 31, 2028
P568938	Detour Gold Corporation	Lower Detour Lake		December 31, 2028
P568939	Detour Gold Corporation	Lower Detour Lake		December 31, 2028
P568940	Detour Gold Corporation	Lower Detour Lake		December 31, 2028
P568941	Detour Gold Corporation	Lower Detour Lake		December 31, 2028
P568942	Detour Gold Corporation	Lower Detour Lake		December 31, 2028
P568943	Detour Gold Corporation	Lower Detour Lake		December 31, 2028
P568944	Detour Gold Corporation	Sunday Lake		December 31, 2028
P568945	Detour Gold Corporation	Sunday Lake		December 31, 2028
P576730	Detour Gold Corporation	Lower Detour Lake		December 31, 2031
P576731	Detour Gold Corporation	Lower Detour Lake		December 31, 2031
P576732	Detour Gold Corporation	Lower Detour Lake		December 31, 2031
P576733	Detour Gold Corporation	Lower Detour Lake		December 31, 2031

P576734	Detour Gold Corporation	Lower Detour Lake		December 31, 2031
P576735	Detour Gold Corporation	Lower Detour Lake		December 31, 2031
P609948	Detour Gold Corporation	Sunday Lake		April 30, 2030
P609949	Detour Gold Corporation	Sunday Lake		April 30, 2030
P609950	Detour Gold Corporation	Sunday Lake		April 30, 2030
P609951	Detour Gold Corporation	Sunday Lake		April 30, 2030
RW306	Detour Gold Corporation	Sunday Lake		
RW307 Part 1	Detour Gold Corporation	Sunday Lake & Lower Detour Lake		
RW307 Part 2	Detour Gold Corporation	Sunday Lake		
RW308	Detour Gold Corporation	Sunday Lake		
RW309	Detour Gold Corporation	Sunday Lake		
Note				
Ontario Leasehold Lands	Mining Leases are now the primary form of Crown grant for mining purposes. Leases are issued for either 10-year or 21-year terms. Rent is applied to mining leases.			
Ontario Patented Lands	Freehold patented mining lands are lands originally granted for mining purposes, or mining rights that were severed from the surface rights after their original grant. Patented mining lands are liable to mining land tax.			
* Mining Lease Renewal Pending				
** Surface Rights Only Mining Lease 109339 issued for the surface rights of CLM's 362, 363 & 364. Total area encompassed by surface rights mining lease is 738.3402 Hectares adjusted for surface rights reservations				