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ASSESSMENT REPORT

on the

GERRY - JOY PROPERTY

Birch-Uchi Subprovince

Red Lake Mining Division

EAR FALLS, ONTARIO

NTS 52K 15 NAD 83 Zone 15N E493000 N5643300
Lat. 50° 56' 28.62"   Long. -93° 08' 58.68"

for

TRILLIUM GOLD MINES INC.

10.11.21

T.N.J. Hughes, P. Geo

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SUMMARY

The Gerry-Joy Property, located west of the town of Ear Falls, Northern Ontario is the focus of a multi-disciplinary project targeting precious and base metals within the Confederation greenstone belt, part of the Birch-Uchi subprovince ('BUS').

Overall, it may be characterised as an approximately east-west trending volcano-sedimentary sequence of predominantly Confederation assemblage mafic to intermediate and felsic-intermediate volcanic rocks flanked to the north, by unsubdivided, Archæan mainly mafic volcanic rocks, and in the south, intruded by a tonalite-trondhjemite gneissic suite. The Little Bear Lake pluton has intruded the sequence in the north, and the property is bisected by a late probable gabbroic intrusion that based on geophysical data, intrudes the supracrustal sequence.

From the 9th to 11th June, 2021, Precision GeoSurveys Inc. of Langley, B.C. flew a high resolution helicopter-borne aeromagnetic survey for Trillium Gold Mines Inc over the western portion of the Gerry-Joy claim block, informally named 'Joy-West'. The block is centred approximately 50 km east south-east of Red Lake, Ontario.

The survey was flown at 50 metre line spacing at a heading of 000º/180º; tie lines were flown at 500 metre spacing at a heading of 090º/270º. A total of 267 line km was flown, with a total area of 1201 ha. An additional one km was flown to retain data from flight lines flown outside the survey block margins for efficiency.

** For assessment reporting, the total area claimed is 1159.22 ha with a block excluded. However, the data is presented.*

Results indicate perhaps three east-west to ENE-WSW trending iron formation sequences within a mainly mafic volcanic assemblage, perhaps of Agnew sequence age. In the north, these are flanked and intruded by the Little Bear Pluton, and to the south, by the tonalite-trondhjemite gneissic suite. The supracrustal units have been intruded by at least two late- to post-kinematic gabbros.

Data merges well with previous airborne magnetic surveying by Pistol Bay Mines that covers the central and eastern portions of the property.

Three major base metal zones, Joy, Willow and Caravelle, located in the centre-west and west of the property contain copper, zinc and gold mineralisation within or proximal to one or two iron formations. The magnetic signature indicates possible continuity of this mineralised sequence to the east and west, thereby providing guidelines for expanding surface exploration in these areas.

Recommended follow-up is accurate location of drill collars over the mineralised zones, a check on local geology, age dating of the volcanic sequence, and geochemical surveying employing a

technique suitable for use in deep drift covered terrain. Ground geophysical surveys would depend on the results of this programme.

The co-ordinate system used in the report is UTM, NAD 83 Zone 15N. All units in this report are metric unless otherwise stated.

1.0 INTRODUCTION

This report covers an examination of a June 2021 high resolution airborne magnetic survey over 'Joy West', the western portion of the Gerry-Joy claim block, Ear Falls region, northwest Ontario, a review of the regional geology and geophysics, the exploration history, and property geology.

Based on these studies and assessments, a number of areas on Gerry-Joy were identified as favourable for ground follow-up.

Recommendations are made for follow-up work, with a budget provided.

2.0 PROPERTY DETAILS

2.1 Location & Access

The claims are located north north-east of the town of Ear Falls, within the Red Lake Mining Division, (Fig. 1), with property epicentre at UTM Zone 15N NAD83 co-ordinates E493000 N5643000

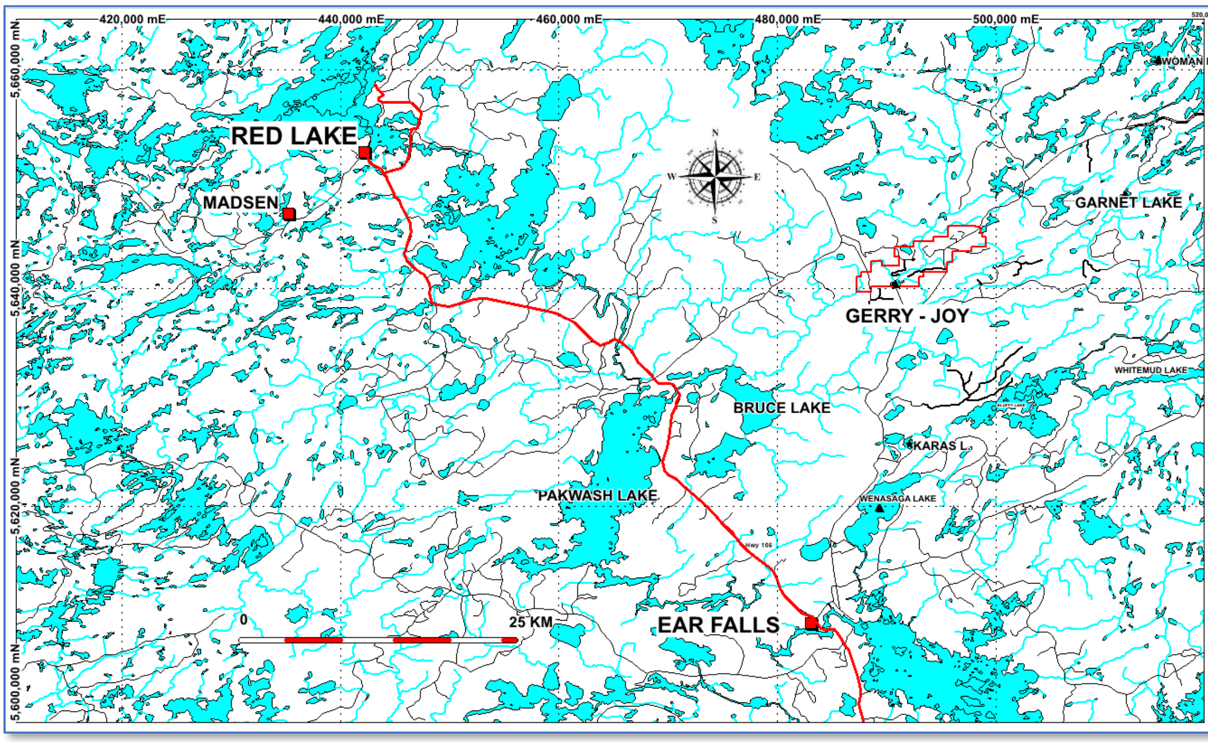


Figure 1 Regional Location map

Access

For northern and far western claims, on Hwy 105, the turn off just South of the Chukuni River crossing, along the Snake Falls (Trout Lake) logging road for a distance of approximately 24 km, then turning off the main haul line south-east, onto the Joy Access road, reaching the NW boundary after 3.7 km. The road continues through the claims and for another ca. five km ending just north of the Troutlake River and Whitefish Falls.

A side road heads east whereby one may access far south-eastern claims.

Central and eastern claims may be accessed by old logging roads some 4.2 km south of the turn-off at the Joy Access road. Joy road did hook up with the South Bay Mine road some years ago, but the river crossing status (bridge) and overall road conditions are unknown.

500 metres past the 24 km turn off on the Snake Falls road, there is a logging road whereby access to central and northern claims is possible. It heads SE, ESE then east for a distance of ca. 6.2 km, at the boundary of the claims.

Troutlake river runs south-west through the property and easternmost claims are accessed using the South Bay road, out of Ear Falls, for a distance of some 37 km. Approximately 43 km from Ear Falls, is located the north-east corner of the property, adjacent to the South Bay road.

2.2 Topography & Vegetation

The property is located in boreal forest, with significant modification by clear-cutting, and today, largely covered by second growth poplar, alder, birch, pine and spruce. The physiography is quite flat, ca. 350 m asl., with minor incision from several creeks and the Troutlake river.

2.3 Claim Status

The Gerry-Joy property consists of 59 contiguous single and multi-cell mining claims covering an area of 30.41 km^2 . The claim numbers are shown in Figure 2 and listed in Table 1. All claims that were flown are highlighted.

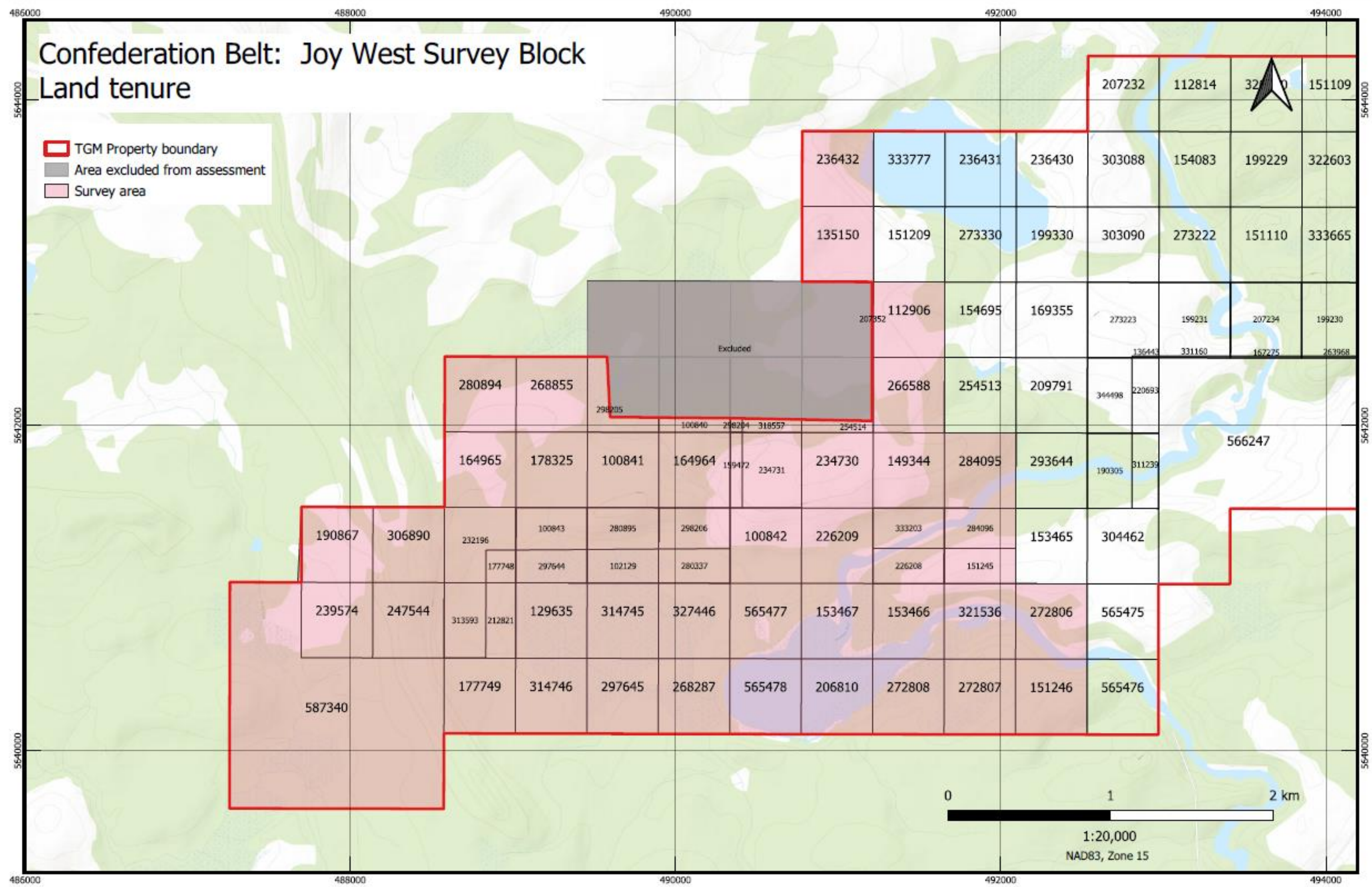


Figure 2 Land tenure

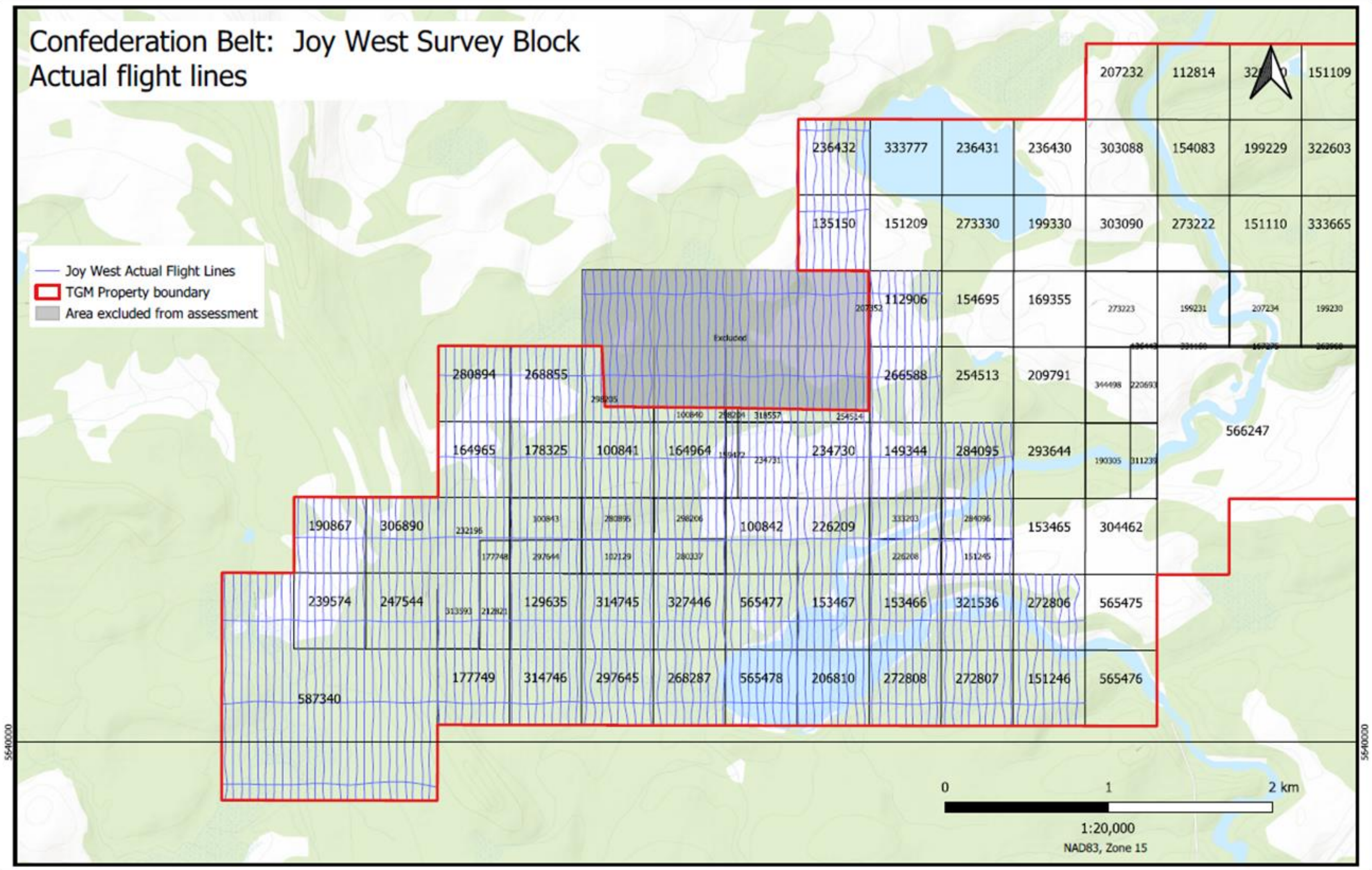


Figure 3 Gerry-Joy Claim map with flight lines

Table 1 Gerry-Joy claims

TENURE_NUM	Township / Area	Tenure Type	HOLDER	No of cells	Area_Ha
100840	Gerry Lake Area	Boundary Cell Mining Claim	(100) TRILLIUM GOLD MINES INC	-1	3.92
100841	Gerry Lake Area	Single Cell Mining Claim	(100) TRILLIUM GOLD MINES INC	1	20.35
100842	Gerry Lake Area	Single Cell Mining Claim	(100) TRILLIUM GOLD MINES INC	1	20.35
100843	Gerry Lake Area	Boundary Cell Mining Claim	(100) TRILLIUM GOLD MINES INC	-1	11.416
102129	Gerry Lake Area	Boundary Cell Mining Claim	(10) TRILLIUM GOLD MINES INC, (90) EMX Properties (Canada) Inc.	-1	9.121
112906	Gerry Lake Area	Single Cell Mining Claim	(10) TRILLIUM GOLD MINES INC, (90) EMX Properties (Canada) Inc.	1	20.35
129635	Gerry Lake Area	Single Cell Mining Claim	(10) TRILLIUM GOLD MINES INC, (90) EMX Properties (Canada) Inc.	1	20.36
135150	Gerry Lake Area	Single Cell Mining Claim	(100) TRILLIUM GOLD MINES INC	1	20.35
149344	Gerry Lake Area	Single Cell Mining Claim	(10) TRILLIUM GOLD MINES INC, (90) EMX Properties (Canada) Inc.	1	20.35
151245	Gerry Lake Area	Boundary Cell Mining Claim	(100) TRILLIUM GOLD MINES INC	-1	9.508
151246	Gerry Lake Area	Single Cell Mining Claim	(100) TRILLIUM GOLD MINES INC	1	20.36
153466	Gerry Lake Area	Single Cell Mining Claim	(100) TRILLIUM GOLD MINES INC	1	20.36
153467	Gerry Lake Area	Single Cell Mining Claim	(100) TRILLIUM GOLD MINES INC	1	20.36
159472	Gerry Lake Area	Boundary Cell Mining Claim	(100) TRILLIUM GOLD MINES INC	-1	3.413
164964	Gerry Lake Area	Single Cell Mining Claim	(100) TRILLIUM GOLD MINES INC	1	20.35
164965	Gerry Lake Area	Single Cell Mining Claim	(100) TRILLIUM GOLD MINES INC	1	20.35
177748	Gerry Lake Area	Boundary Cell Mining Claim	(10) TRILLIUM GOLD MINES INC, (90) EMX Properties (Canada) Inc.	-1	3.684

177749	Gerry Lake Area	Single Cell Mining Claim	(10) TRILLIUM GOLD MINES INC, (90) EMX Properties (Canada) Inc.	1	20.36
178325	Gerry Lake Area	Single Cell Mining Claim	(100) TRILLIUM GOLD MINES INC	1	20.35
190867	Gerry Lake Area	Single Cell Mining Claim	(100) TRILLIUM GOLD MINES INC	1	20.35
206810	Gerry Lake Area	Single Cell Mining Claim	(100) TRILLIUM GOLD MINES INC	1	20.36
207352	Gerry Lake Area	Boundary Cell Mining Claim	(10) TRILLIUM GOLD MINES INC, (90) EMX Properties (Canada) Inc.	-1	0.4
212821	Gerry Lake Area	Boundary Cell Mining Claim	(10) TRILLIUM GOLD MINES INC, (90) EMX Properties (Canada) Inc.	-1	8.506
226208	Gerry Lake Area	Boundary Cell Mining Claim	(100) TRILLIUM GOLD MINES INC	-1	9.539
226209	Gerry Lake Area	Single Cell Mining Claim	(100) TRILLIUM GOLD MINES INC	1	20.35
232196	Gerry Lake Area	Boundary Cell Mining Claim	(100) TRILLIUM GOLD MINES INC	-1	16.686
234730	Gerry Lake Area	Single Cell Mining Claim	(10) TRILLIUM GOLD MINES INC, (90) EMX Properties (Canada) Inc.	1	20.35
234731	Gerry Lake Area	Boundary Cell Mining Claim	(10) TRILLIUM GOLD MINES INC, (90) EMX Properties (Canada) Inc.	-1	16.963
236432	Gerry Lake Area	Single Cell Mining Claim	(100) TRILLIUM GOLD MINES INC	1	20.35
239574	Gerry Lake Area	Single Cell Mining Claim	(100) TRILLIUM GOLD MINES INC	1	20.36
247544	Gerry Lake Area	Single Cell Mining Claim	(100) TRILLIUM GOLD MINES INC	1	20.36
254514	Gerry Lake Area	Boundary Cell Mining Claim	(10) TRILLIUM GOLD MINES INC, (90) EMX Properties (Canada) Inc.	-1	3.668
266588	Gerry Lake Area	Single Cell Mining Claim	(10) TRILLIUM GOLD MINES INC, (90) EMX Properties (Canada) Inc.	1	20.35

268287	Gerry Lake Area	Single Cell Mining Claim	(10) TRILLIUM GOLD MINES INC, (90) EMX Properties (Canada) Inc.	1	20.36
268855	Gerry Lake Area	Single Cell Mining Claim	(100) TRILLIUM GOLD MINES INC	1	20.35
272806	Gerry Lake Area	Single Cell Mining Claim	(100) TRILLIUM GOLD MINES INC	1	20.36
272807	Gerry Lake Area	Single Cell Mining Claim	(100) TRILLIUM GOLD MINES INC	1	20.36
272808	Gerry Lake Area	Single Cell Mining Claim	(100) TRILLIUM GOLD MINES INC	1	20.36
280337	Gerry Lake Area	Boundary Cell Mining Claim	(10) TRILLIUM GOLD MINES INC, (90) EMX Properties (Canada) Inc.	-1	9.288
280894	Gerry Lake Area	Single Cell Mining Claim	(100) TRILLIUM GOLD MINES INC	1	20.35
280895	Gerry Lake Area	Boundary Cell Mining Claim	(100) TRILLIUM GOLD MINES INC	-1	11.249
284095	Gerry Lake Area	Single Cell Mining Claim	(10) TRILLIUM GOLD MINES INC, (90) EMX Properties (Canada) Inc.	1	20.35
284096	Gerry Lake Area	Boundary Cell Mining Claim	(10) TRILLIUM GOLD MINES INC, (90) EMX Properties (Canada) Inc.	-1	10.863
297644	Gerry Lake Area	Boundary Cell Mining Claim	(10) TRILLIUM GOLD MINES INC, (90) EMX Properties (Canada) Inc.	-1	8.954
297645	Gerry Lake Area	Single Cell Mining Claim	(10) TRILLIUM GOLD MINES INC, (90) EMX Properties (Canada) Inc.	1	20.36
298204	Gerry Lake Area	Boundary Cell Mining Claim	(100) TRILLIUM GOLD MINES INC	-1	0.64
298205	Gerry Lake Area	Boundary Cell Mining Claim	(100) TRILLIUM GOLD MINES INC	-1	8.86
298206	Gerry Lake Area	Boundary Cell Mining Claim	(100) TRILLIUM GOLD MINES INC	-1	11.082
306890	Gerry Lake Area	Single Cell Mining Claim	(100) TRILLIUM GOLD MINES INC	1	20.35
313593	Gerry Lake Area	Boundary Cell Mining Claim	(100) TRILLIUM GOLD MINES INC	-1	11.892

314745	Gerry Lake Area	Single Cell Mining Claim	(10) TRILLIUM GOLD MINES INC, (90) EMX Properties (Canada) Inc.	1	20.36
314746	Gerry Lake Area	Single Cell Mining Claim	(10) TRILLIUM GOLD MINES INC, (90) EMX Properties (Canada) Inc.	1	20.36
318557	Gerry Lake Area	Boundary Cell Mining Claim	(10) TRILLIUM GOLD MINES INC, (90) EMX Properties (Canada) Inc.	-1	3.070
321536	Gerry Lake Area	Single Cell Mining Claim	(100) TRILLIUM GOLD MINES INC	1	20.36
327446	Gerry Lake Area	Single Cell Mining Claim	(10) TRILLIUM GOLD MINES INC, (90) EMX Properties (Canada) Inc.	1	20.36
333203	Gerry Lake Area	Boundary Cell Mining Claim	(10) TRILLIUM GOLD MINES INC, (90) EMX Properties (Canada) Inc.	-1	10.895
565477	Gerry Lake Area	Single Cell Mining Claim	(10) TRILLIUM GOLD MINES INC, (90) EMX Properties (Canada) Inc.	1	20.36
565478	Gerry Lake Area	Single Cell Mining Claim	(10) TRILLIUM GOLD MINES INC, (90) EMX Properties (Canada) Inc.	1	20.36
587340	Gerry Lake Area	Multi-cell Mining Claim	(100) TRILLIUM GOLD MINES INC	7	142.51
			Excluded from survey		**142.779**

3.0 HISTORY

3.1 Government & Institutional

The earliest survey in the map area was performed by Robert Bell of the Geological Survey of Canada in his canoe journey on the English River and Albany River systems (Bell 1873). A second expedition by Bell (1886) traversed the English River Subprovince, between Lonely Lake (now Lac Seul) and Lake St. Joseph via the Root River. Fawcett (1885) conducted a line survey using transit and micrometre from Rat Portage (Kenora) to Osnaburgh House, returning via the Wenasaga River.

The first geological map of the subprovince was constructed by Dowling (1894) who carried out geological exploration in the vicinity of Red Lake including along the Trout Lake River. Wilson and Johnston (1904) made a reconnaissance traverse from Lac Seul to Cat Lake by way of the Wenasaga River in 1902. Burwash (1920) completed a report that included maps showing the geology of Whitemud Lake.

Seismic signatures have been studied by Hall and Hajnal (1969), Hall (1971) and Brown (1968).

Much of the body of earlier geological studies work was conducted by Breaks and Beakhouse as principal authors, with additional work by Harris, Corfu, Cruden, and Stott. See, Breaks et al., (1976, 1978), Breaks, (1991), Breaks and Bond, (1993).

Seismic reflection transects across the Western Superior Craton were completed in the 1990's and presented by Asudeh et al., 1996. From the mid-nineties to 2012, additional seismic work followed by Lithoprobe seismic reflection surveys and magnetotelluric surveys were completed.

Additional work, including Magnetotelluric (MT) soundings were also carried out by the GSC as a part of the Western Superior Lithoprobe transect. The seismic reflection line WS2B ran along Hwy 105 through Ear Falls.

The GSC OF4256-2004 is a compilation of regional mapping for Red Lake and the Confederation belt greenstone belts, and provides references for work therein.

3.2 Regional Industry Exploration

Following the discovery of gold in Red Lake in 1925, exploration expanded eastward into the Confederation Lake greenstone belt using the Chukuni, English and Woman river systems, and farther north, to Birch Lake. In the 1930's gold exploration saw the discovery and development of a number of mines in the region, including the Uchi and Jackson-Manion mines.

By the 1950's base metal exploration was at the fore, leading to production at Selco's South Bay deposit in 1969. The latter half of the last century saw additional base metal exploration on several zones and deposits, including Fredart, Copper-Lode, Joy, Willow, Caravelle, and Garnet.

See e.g. Bowdidge, 2019 for a broader summary of Confederation belt exploration

Past Work – Gerry Lake area.

1959-1960 Queensland Explorations Ltd. staked claims based on the presumed strike extension of the Fredart "A" zone. Work included prospecting, trenching, SP surveying and seven diamond drill holes (ddh's) totalling 830 metres. Copper, silver and gold assays were reported.

1968 Copper-Lode Mines Ltd. flew EM and magnetometer surveys and followed up on several areas with Induced Polarization (IP) and resistivity surveys. The airborne extended onto the far eastern portions of the now Gerry-Joy property.

1969-1970 Caravelle Mines intersected Cu-Zn mineralisation over five metres in drilling adjacent to the south-west corner of claim 3012630. Their best intersection was reported as 21.6% Zn plus 0.13% Cu over 0.25 m. Many logs provide no results, only 'pencil' summaries of best intercepts.

1969 - 1970 Erzgesellschaft M.B.H. flew an airborne EM and magnetic survey covering a portion of the Gerry-Joy claims and surrounding area. Subsequently, the company upgraded the property to the 'Yorbeau Project', and drilled five holes (*70-*) on two ?EM anomalies in the north-east of the claims. Gneissic amphibolitic and biotite gneiss plus andesite, tuff and granite dykes were intersected; also minor faulting with quartz-carbonate but no mention was made of sulphides therein. Minor siliceous zones with weak sulphides were also reported, but no results presented.

Mapping and where possible sampling, was also completed but with limited success due to lack of exposures.

1971-77 Hudson Bay Exploration & Development (HBED) carried out airborne mag & EM-17, MaxMin, and geological mapping. The targets appear to be VMS, with at least some focus on gabbroic intrusions. One underlying the eastern portion of Gerry-Joy was targeted ('Group 'J'), with three grids, straddling the South Bay Mine road (2). The other gabbro is to the west, less than 500 m NW of the road. Two EM zones were located, with recommendations for drilling.

1974 Roxmark Mines Ltd. ran an IP survey, identified eight responses and drill tested three with four ddh's totalling 823 m. Copper and significant gold assays were reported, though precise numbers are lacking.

1976-1978 Selco drilled at least one EM conductor in the centre of the present property, intercepting 1-2 m wide po-py-(cp) in intraflow sediments (carbonate-chlorite-silica, possibly silicate facies type IF), and fault-hosted carbonate-silicate-sulphides. Minimal Au, Ag, Cu, Zn assays were reported. They also drilled at least ten holes on the Caravelle zone including discovery holes. Gold ran nil to 0.002 opt. in several intercepts cutting several percent to semi-massive sulphides.

1980 Selco Mining Corp. Ground mag and Pulse (EM-37) following up airborne mag-EM.

1983-1997 Noranda reported on Joy property diamond drilling, ('J'-holes), lithogeochemistry, MaxMin surveys, surface and bore hole PEM surveys, with the latter indicating deeper EM responses at Caravelle and to the west of Joy Zone. *These are located mainly in the Joy West block*. They systematically drilled on the Joy-Willow trend intersecting stringer and massive sulphides down to ca. -300 m. vertical. On Joy, a 0.5 m wide semi-massive sulphide intercept ran 2610 ppb Au, 0.1% Cu and 4 ppm Ag. Lower values were obtained within what may be a single semi-massive sulphide band forming the 'core' of the sulphide zone. Below, main zone locations from the 1994 Noranda Executive Summary.

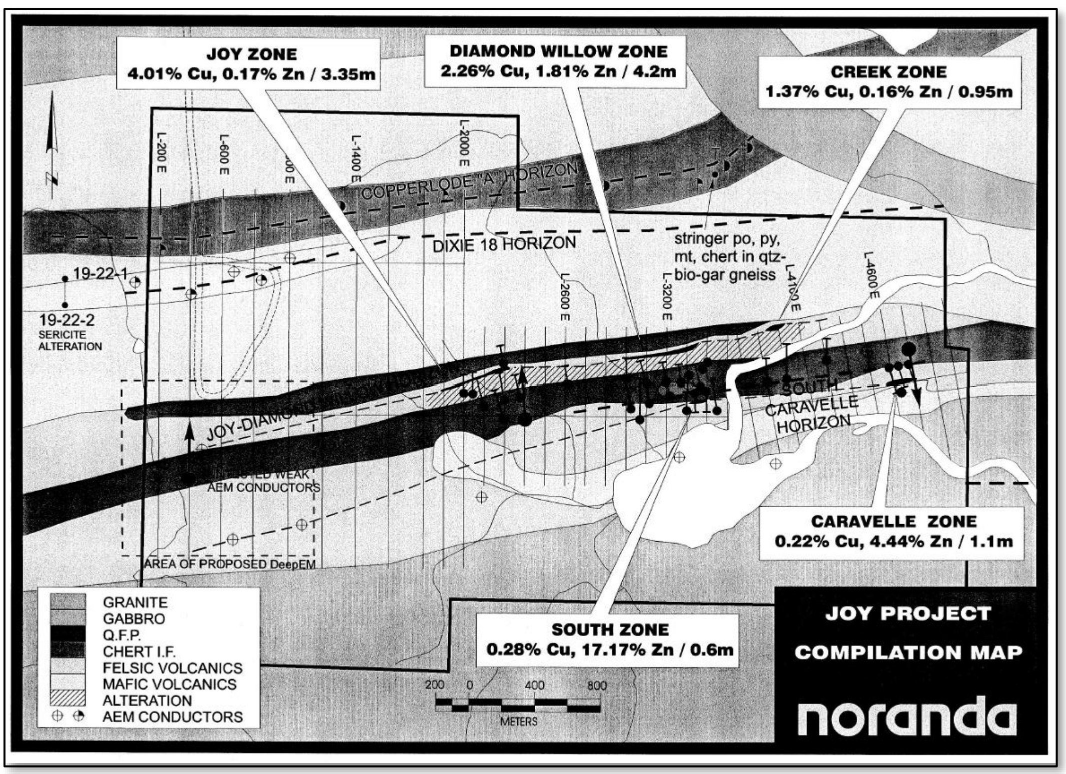


Figure 4 Joy Project Plan Map

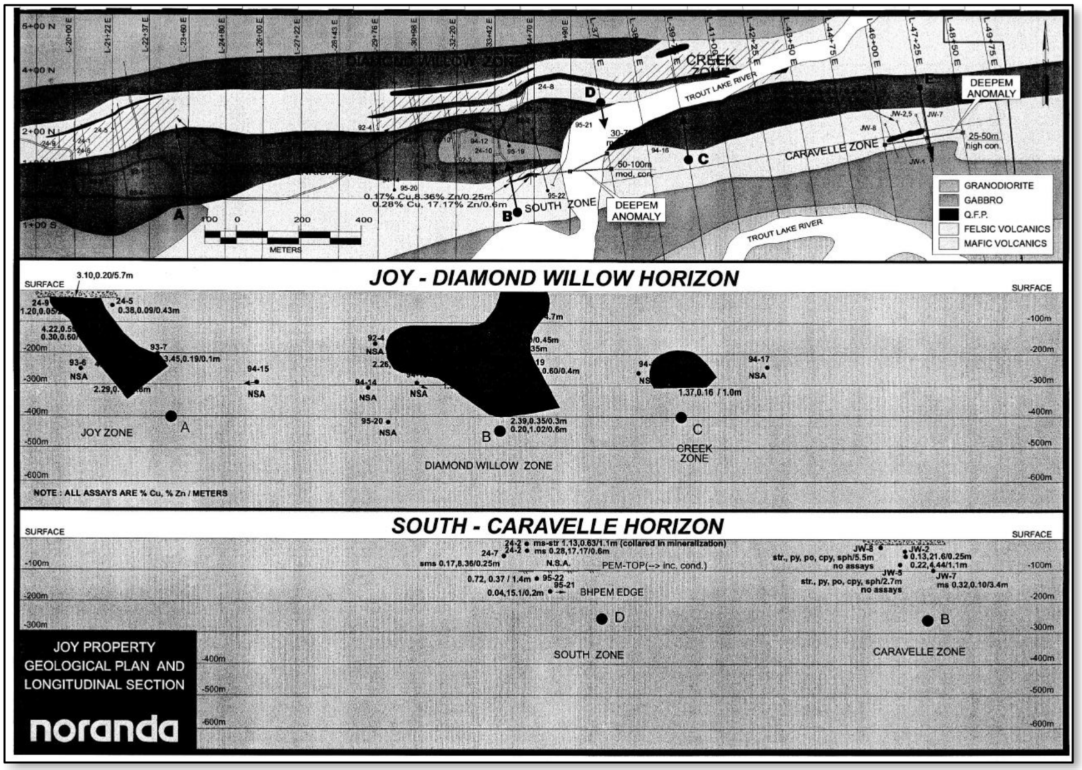


Figure 5 Joy Project Composite plan & sections

Results of the Noranda BHPEM surveys and from the lithogeochemistry sampling programme identified a potential new mineralized horizon south of and possibly stratigraphically above the Diamond Willow Zone, towards the South-Caravelle mineralized horizon.

Noranda recommendations were:

1) Complete the drill core geochemical study using the data collected so as to identify potentially new areas of metal enrichment within altered stratigraphy and/or identify possible new altered/mineralized horizons.

2) A surface PEM geophysical survey to evaluate the newly identified altered horizon located south of the Diamond Willow Zone, and the Caravelle-South mineralized horizon previously identified by Selco.

3) A two hole diamond drill programme (750m) was tentatively proposed to test:

a) the east plunge of the Diamond Willow at the -300m level.

b) the new altered horizon and associated BH PEM targets located south of the Diamond Willow Zone, between holes J-94-13 and 14.

“A third hole will be proposed if sufficient funds remain to test the Caravelle-South mineralized horizon at the - 200-250m vertical level. Hole placement to be determined by the surface PEM survey.”

From the BHPEM survey, the following conclusions were drawn:

“i) The Joy and Diamond Willow Zones remain open to the east along interpreted plunge extensions.

The Diamond Willow Zone would appear to have the most tonnage potential.

ii) The Creek Zone appears to be of limited size, and no further work is warranted on this zone.

iii) Numerous off-hole responses were detected proximal to a number of drill holes that correspond to known mineralization, or appear small in size. Of further interest however, are the multiple off-hole responses detected up-hole in holes J-94-13 and 14 that corresponded to significant hydrothermal alteration and base metal enrichment.

The anomalies may be defining the up-dip extension of a significant new mineralized horizon stratigraphically above the Diamond Willow Zone.”

In 1995, more drilling, surface and borehole EM:

“The program was designed to test the down plunge extension of the Diamond Willow Zone, the South-Caravelle mineralized horizon and multiple BHPEM responses detected in diamond drill holes J-94-13 and J-94-14 during the 1994 work program.

The Diamond Willow Zone has now been tested to the -370m level. The narrow sulphide intersections encountered confirm the continuity of the zone although the sulphides (mainly bedded py + *p*o) are reminiscent of fringe-type mineralization associated with VMS deposits. Follow-up BH PEM indicates the zone has better conductivity to the west below previous drilling which intersected better Cu values.

The South-Caravelle horizon has been enhanced by surface PEM. The Caravelle Zone has yet to be tested and due to the severe deflection of diamond drill hole J-95-21, the South Zone has not truly been tested.

Follow-up BHPEM indicates the bulk of the conductor which represents the South Zone lies to the east of J-95-21.

Additional regional compilation identified a significant untested target on the western portion of the claim block. An untested AEM anomaly was identified which is located approximately 2 km west along strike from the Joy Cu-Zone. Apparently, the response is similar to that observed with the Joy and Diamond Willow Zones and is a priority target for follow-up”

1990-93 Major General, intersected 4% Cu and 0.17% Zn over 3.35 metres in the Joy Zone.

1994 Cumberland Minerals did geological mapping and lithogeochemical sampling over the property but focused mainly to the east of the then Gerry Lake property, adjacent to the Noranda ground.

1998 From 8-12th April, Cross Lake Minerals drilled four hole diamond drill hole totalling 1005 meters, testing Airborne EM, MAG and ground IP responses within prospective felsic stratigraphy hosting VMS style deposits, this in an area with numerous sub-economic and stringer base metal occurrences. Results were mixed but included the identification of significant VMS-style footwall alteration with associated massive and stringer sulphide mineralization containing localised anomalous base metals. Whole rock results exhibited strong sodium depletion and moderate Ishikawa alteration within favourable felsic stratigraphy. This programme succeeded in explaining the geophysical conductors and identifying prospective VMS style alteration within the 'Felsic Stratigraphy'. The holes ('GL-*) were drilled at the Troutlake river and in the north-east of the property. Au values were reported but negligible metal was found.

1998 Cross Lake Minerals drilled four holes on their Gerry property, with one in the far north-east of the property. They tested airmag/EM and ground IP 'anomalies'. Whole rock geochemistry returned strong Na depletion (VMS indicator) within felsic volcanic rocks.

2003 Tribute Minerals held the contiguous Gerry-Joy, Fredart Lake and Fredart West properties, and reported MMI, enzyme leach, geological, magnetometer, Titan-24 and IP surveys, and follow-up diamond drilling, though no work was reported for Gerry-Joy. The geochemical surveys did return anomalous base metals values including over EM conductors.

A summary from T. Boyd, then with Tribute:

"Tribute completed no work on the (Joy) property despite the moderately favorable historic exploration results obtained by Selco and Noranda.

- Bearing this in mind, the recommended exploration targets outlined in the Noranda Executive Summary can be assessed and followed-up on their own merits with no new significant information provided by Tribute. It should be noted that the property was explored earlier in the 1980s thus most of the results are available as paper copies only. Due to swampy terrain and poor road access, it is difficult area to work and is predominantly drilled during the winter only.
- A small property called Joy North held by prospector Greg Campbell borders the northern boundary of the Joy Property. It covers the eastern extension of the Dixie 18-20 horizon 10 kms to the west, and hosts an attractive undrilled airborne EM anomaly situated directly north of the Joy or Dixie 24 showing. The owner has completed some surface geochemical and geophysical exploration which is filed in assessment reports. It is recommended that this work be reviewed and that the property be considered for acquisition if it becomes available." *This corresponds to the Precambrian Ventures block.*

2008 MMI sampling (64 samples) on a grid in the north-east, east of Troutlake river, and along various logging roads returning a very small Zn response. There is no information on the surficial geology, though o/c was noted. Au results were typically <0.3 ppb, with the highest, 0.7.

Tribute exploration ceased by the end of 2008.

2009 Precambrian Ventures completed a MMI survey targeting precious and base metals, this under the watchful eye of M. Fedikow. “For the Joy North survey only the elements Au, Ag, Pd, Co, Ni, Cd, Cu, Pb and Zn were analyzed. The specific details of this assessment are described below. The Au, Pb and Pd responses in this survey were consistently at or near the LLD and as such were not plotted for interpretive purposes.” A single high Ag was returned with no specific recommendations for follow-up, with a note declaring the (technical) success of the method in this area. A re-assessment of results only listed previous analyses, with Au from 0.05 to 0.2 ppb – at or near the lower detection limit.

In 2017, Pistol Bay Mines Inc. completed a large airborne survey over a number of claim blocks, including central and eastern Gerry-Joy. Magnetic and VTEM was flown, but there was minimal ground follow-up. The company optioned the properties from Tribute.

4.0 REGIONAL GEOLOGY

The block lies within the western Birch-Uchi sub-province, with stratigraphy and lithologies presented below taken from GSC 4256, 2004. On a local scale, the divisions have to the best of this author's knowledge not been verified by geochronology.

Overall, there is an approximately east-west trending volcano-sedimentary sequence of predominantly Confederation felsic-intermediate volcanic rocks, flanked to the north, by unsubdivided, mainly mafic volcanic rocks. The Little Bear Lake pluton has intruded the sequence in the north, and the property is bisected by a late probable gabbroic intrusion that based on geophysical data, intrudes the supracrustal sequence. Below, Legend, taken from GSC OF 4256 2004

Gmu6gb Gabbroic rocks: generally undated gabbroic rocks intrusive into Confederation assemblage, including fine-grained tholeiitic dykes and sills intrusive into the Sundown Lake metasedimentary assemblage and coarse-grained magnetite-bearing gabbro dates at ca. 2699 Ma at locality #57; includes Leg Lake mafic complex.

Gbe69gd Granodiorite-quartz monzonite: weakly foliated, equigranular to porphyritic granodiorite-quartz monzonite, intrusive into deformed and locally mineralised strata; includes the ca. 2722 Ma Little Bear Lake granodiorite (U-Pb #62) and Shabumeni Lake stock (U-Pb #73) in the Birch-Uchi belt 2714 ± 4 Ma QFP (U-Pb #44) that according to the GSC OF, cuts gold mineralisation at the Red Lake mine.

Ycf74iv Heyson sequence (Red Lake) ca. 2739 Ma Intermediate volcanic rocks: andesitic to dacitic calc-alkaline flows, commonly plagioclase-phyric, possibly correlative with the Earngey sequence of the Birch-Uchi belt.

Zcf35th Agnew Sequence ca 2744 Ma: mafic volcanic rocks: pillowed and pillow breccia of dominantly tholeiitic affinity.

Tcf12mv Mafic volcanic rocks: basaltic rocks considered part of the Confederation assemblage formed at the transitional continental margin setting.

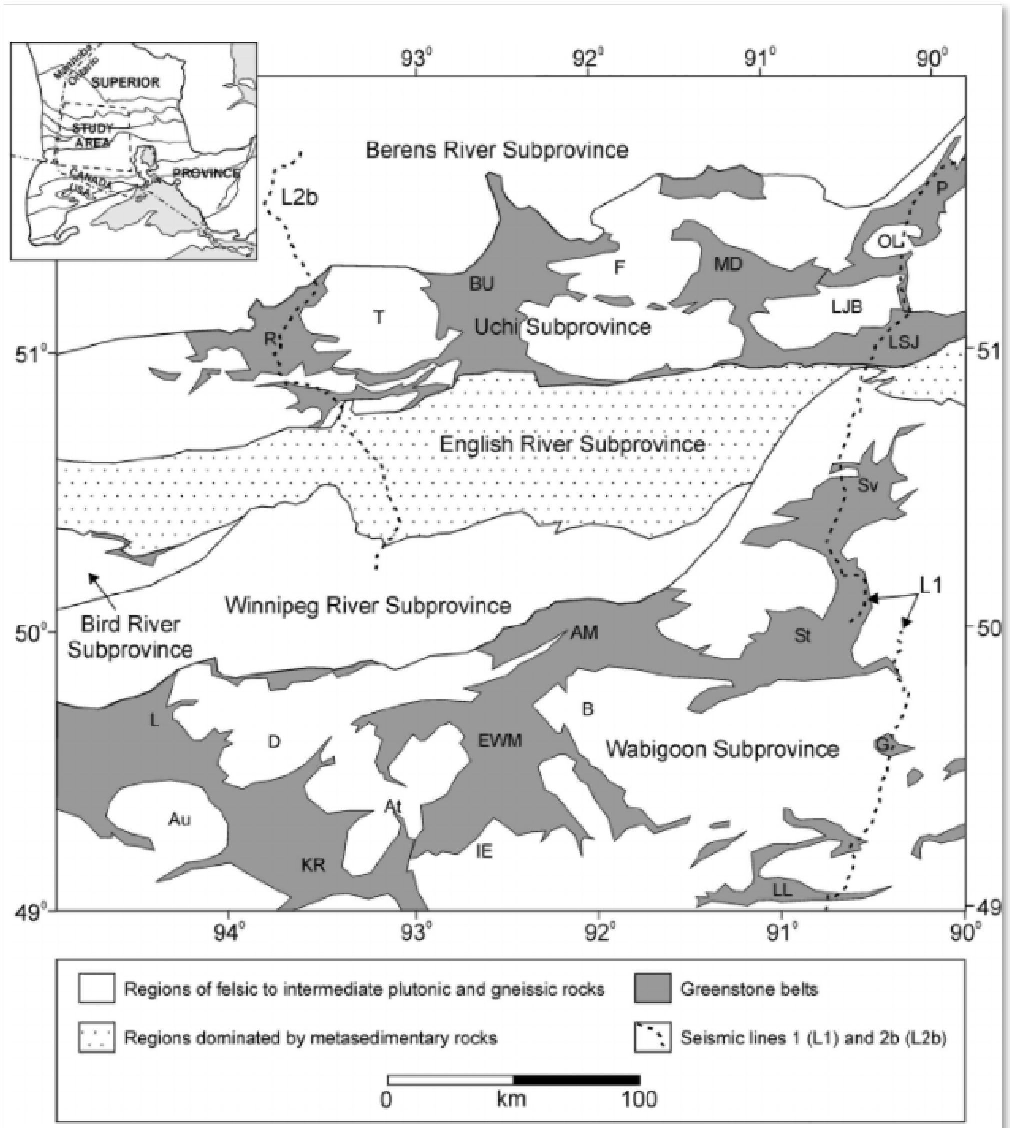
Uus2mv Mafic volcanic rocks: foliated, massive to pillowed basalt, amphibolite, and associated gabbroic rocks, locally plagioclase-phyric near Springpole and Pakwash lakes; lesser associated intermediate to felsic flows, tuff and wacke near Dixie Lake

Tbe12tn

Tbe12tn Tonalite: massive to weakly foliated biotite-tonalite to trondhjemite±diorite typically associated with, or intrusive into, <2.47 Ga Confederation assemblage.

Ywo48mv

Ywo48mv **Woman assemblage** (ca. 2870 Ma) Mafic volcanic rocks: massive to pillowed tholeiitic and calc-alkalic basaltic flows, capped locally by two metre thick marble (off property).



Schematic map of the Western Superior Province in the area of study. AM, Abram-Minnitaki greenstone belt; At, Atikwa batholith; Au, Aulneau batholith; B, Basket Lake batholith; BU, Birch-Uchi greenstone belt; D, Dryberry batholith; EWM, Eagle-Wabigoon-Manitou greenstone belt; F, Fawcett Lake batholith; G, Garden Lake greenstone belt; IE, Irene-Eltrut batholith; KR, Kakagi-Rowan greenstone belt; L, Lake of the Woods greenstone belt; LJB, Lake St. Joseph batholith; LL, Lumby Lake greenstone belt; LSJ, Lake St. Joseph greenstone belt; MD, Meen-Dempster greenstone belt; OL, Ochig Lake pluton; P, Pickle Lake greenstone belt; R, Red Lake greenstone belt; St, Sturgeon Lake greenstone belt; Sv, Savant Lake greenstone belt; T, Trout Lake batholith.

Figure 6 Schematic map, Western Superior Province

From Hrabi & Cruden, 2006

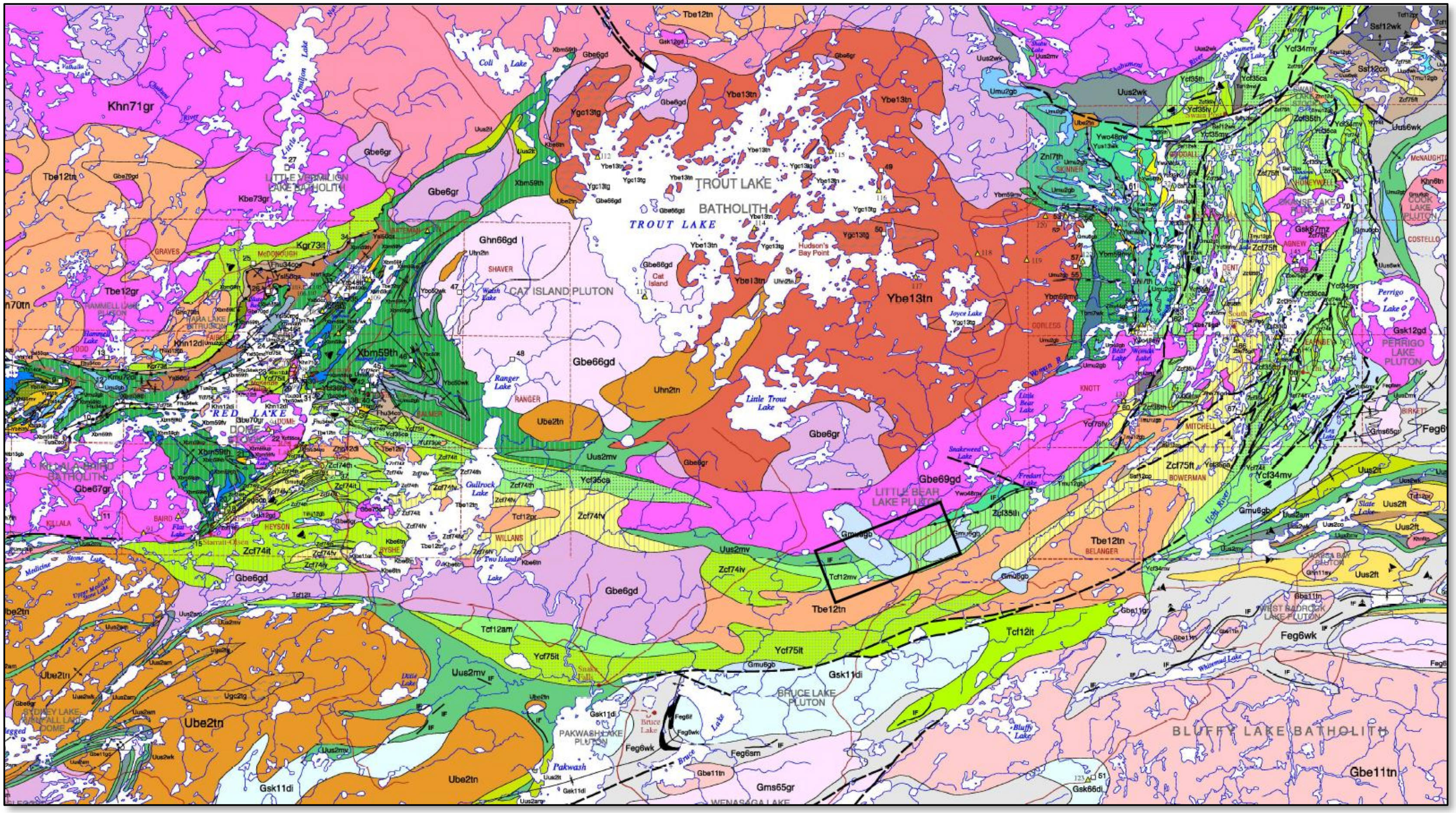


Figure 7 Regional geology

From GSC OF_4256-2004. Property area outlined in black

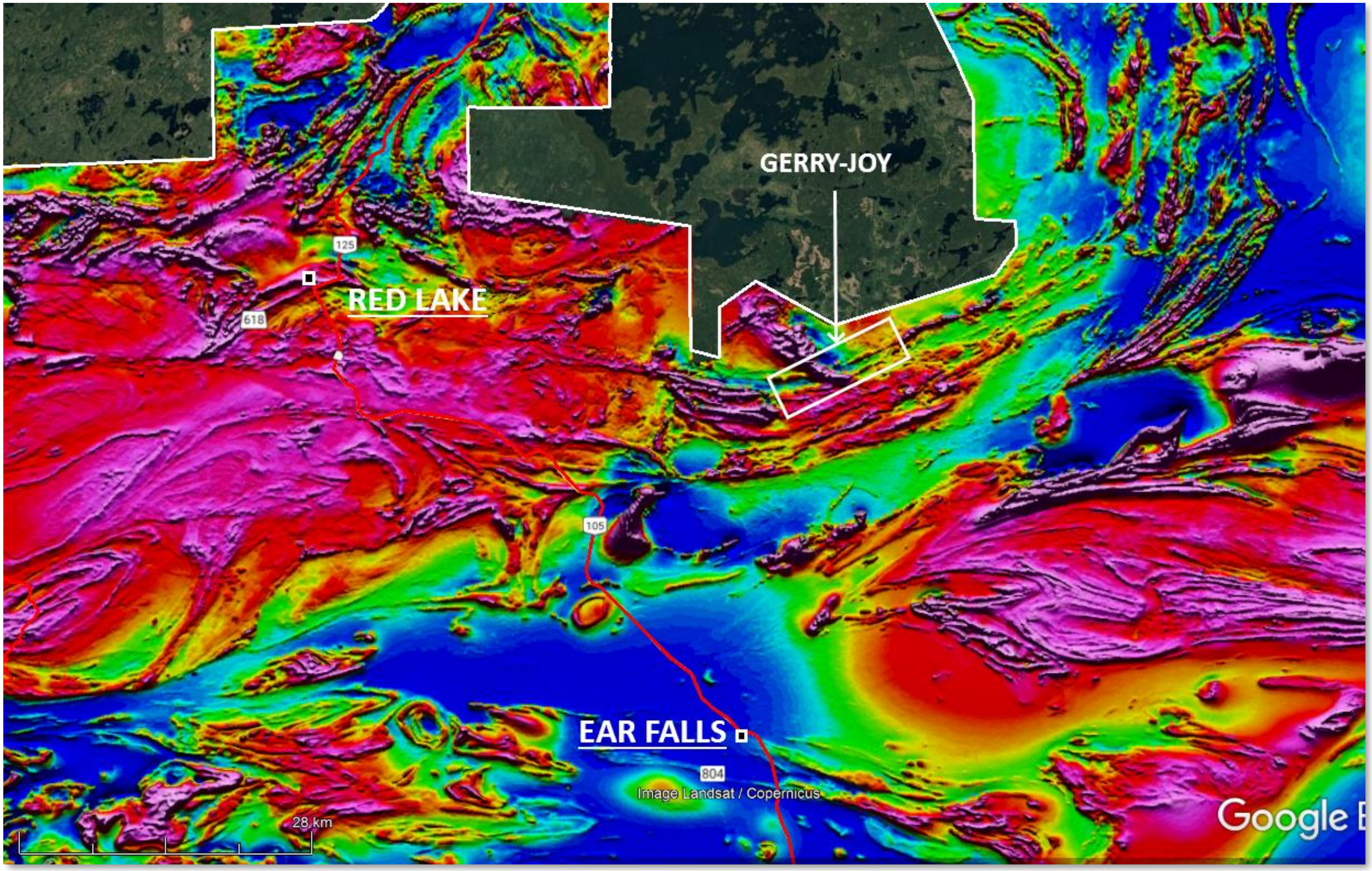


Figure 8 Regional residual magnetic data

“The Confederation Lake greenstone belt lies within the Superior Province, the largest of the structural provinces of the Canadian Shield. The Superior Province can be divided into “terranes” and “domains” and the currently favoured subdivision (Stott et al., 2010) has the Confederation Lake belt in the Uchi Domain within the North Caribou Terrane (figure 7-1). The Uchi Domain is characterized by numerous greenstone belts composed of generally submarine calc- alkaline, island-arc volcanic rocks and associated sedimentary rocks, separated by “granitoid” rocks that form generally oval masses. The term granitoid encompasses pre-volcanic gneissic basement complexes, often migmatized and remobilized as domes, as well as post-volcanic felsic plutons, usually of granodiorite to trondhjemite composition.

“The northeastern part of the Confederation Lake belt has been well mapped and its volcanology has been well studied by Thurston (1985), and the southern limit of mapping lies just north of the Garnet property (ENE of Gerry-Joy – ed.). The remainder of the belt has only been mapped at a reconnaissance level; the overburden thickness increases westwards as the terminal moraine is approached, making detailed mapping impossible.

“Thurston’s (1985) mapping has divided the volcanic rocks of the northern Confederation Lake belt into three cycles. The youngest, cycle 3, occupies the core of a complex synclinorium. The oldest, cycle 1, occupies the outer parts of the synclinorium. Cycle 2 is host to a number of gold occurrences and deposits, while all the base metal massive sulphide occurrences and deposits are in cycle 3. Figure 7-2 shows the regional geology (“Geology of Ontario”, available on the MNDM website, with everything except the cycle 3 volcanics and their internal mafic and felsic intrusions “greyed out” as being unrelated to the Garnet property and its mineralization. To the north and east of the Garnet property, Thurston’s (1985) map was used to delineate cycle 3, while to the west of Garnet Lake, the limits of cycle 3 have simply been extrapolated along strike. It will be noted that in this southwestern part of the belt, cycle 2 is thin and discontinuous, and cycle 1 is absent.

“On the basis of limited field mapping carried out in the late fall of 2016, the core of the greenstone belt…” (in the area near Gerry-Joy) “…forms an asymmetric graben that has been folded into a tight syncline. The asymmetry comes from the fact that the volcanics filling the northwest side of the graben are dominantly mafic, while those on the southeast side are dominantly felsic tuffs, agglomerates and lavas.” (Bowdidge, 2019)

Geological mapping by Confederation/Tribute/Noranda and Pistol Bay was assessed. Bowdidge (2019) suggested “…… that there is a matching anticline on the southeast flank of the belt.

“Internal intrusions (i.e. those within the cycle 3 volcanic rocks) include later granitic rocks and gabbro, that have pierced the core of the synclinal belt. There are also intrusive bodies of quartz-feldspar porphyry (QFP), most of which are too small to show on the map.

“Within the volcanic sequence of cycle 3, there are one or two time-stratigraphic horizons that signify quiescent periods during the submarine volcanic activity; these allow the development of hydrothermal convective cells that can lead to the formation of volcanogenic massive sulphide (VMS) mineralization on the sea floor. On a regional scale, these time horizons are marked by chert or chert-magnetite iron formation, and occasionally, by calc-silicate metasedimentary rocks (which may be carbonate-facies iron formations).

“Like most other greenstone belts in the Canadian Shield and elsewhere, the Confederation Lake belt has been affected by polyphase deformation, folding, faulting and shearing as well as greenschist to locally amphibolite facies regional metamorphism during the Kenoran orogeny.at approximately 2.72 Ga. Volcanic activity took place in the early stages of the orogenic event, which resulted from collisions between microcontinents. Precise dating in recent years has shown that microcontinent collisions took place at slightly different times over the Superior Province, so that the Kenoran orogeny effectively migrated from north to south between the dates 2.68 and 2.72 Ga (Percival et al., 2006).”

4.1 Regional Quaternary Geology

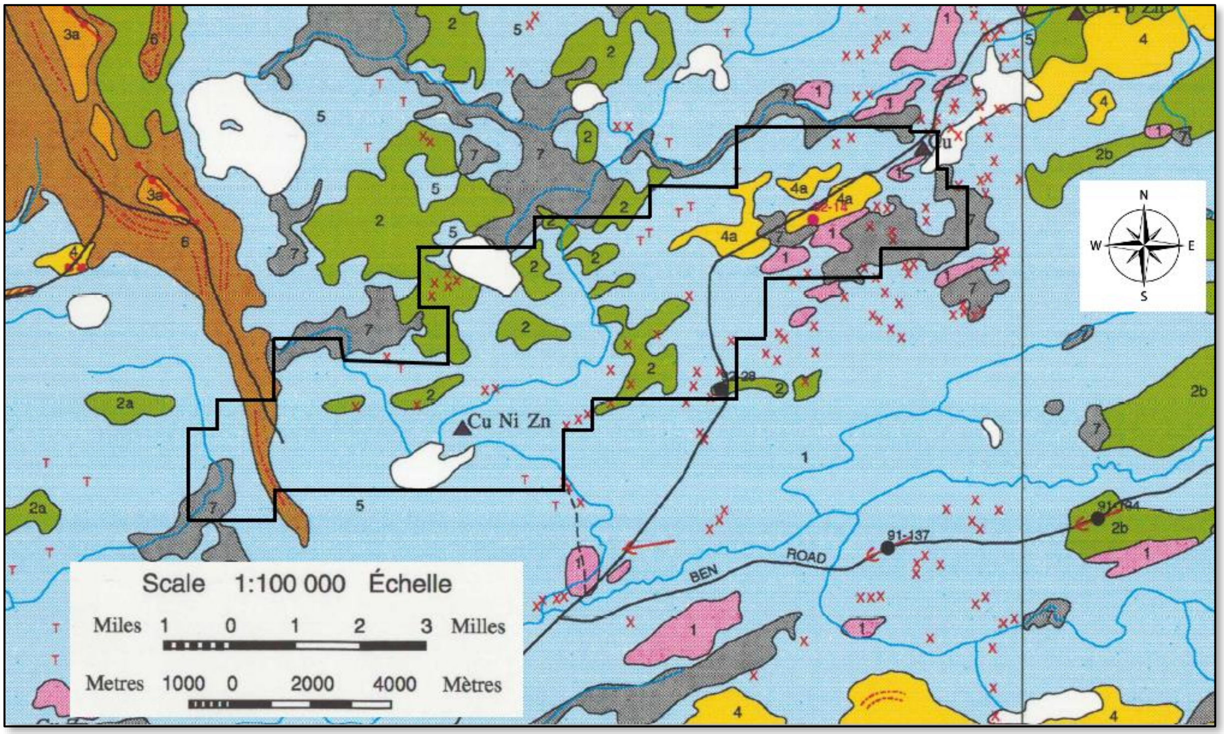


Figure 9 Quaternary Geology

From OF_2876 GSC Regional Surficial Geology

Much of the property is underlain by fluviolacustrine and fluvial sediments (blue), with extensive, locally deep (>20 m) laminated to varved clay, silt and sand.

Scattered till (green) forms hummocky exposures, and may be gravelly to boulder, sand to sandy-silt, 1-6 m thick, covering bedrock.

Yellow areas denote fluvioglacial 'outwash' deposits of sand and gravel may represent old sub-glacial water courses and be esker or kame like in morphology.

Grey organic deposits occur across the property.

In the west of the property, the north-south trending Lac Seul moraine (brown) is flanked by shoreline, ice-edge deposits.

The extent of the 'deep water' deposits, flat plain topography and orientation of fluvioglacial deposits suggests significant west south-west fluvial transport and episodic breaching of glacial dammed lake(s). Overburden type and depth are not conducive to obtaining relevant, meaningful results from 'regular' soil sampling of the substrate. Conditions improve eastwards, with increasing preservation of till (green), but geochemical sampling of the unconsolidated surface material is not recommended unless orientation surveys are carried out.

5.0 PROPERTY GEOLOGY

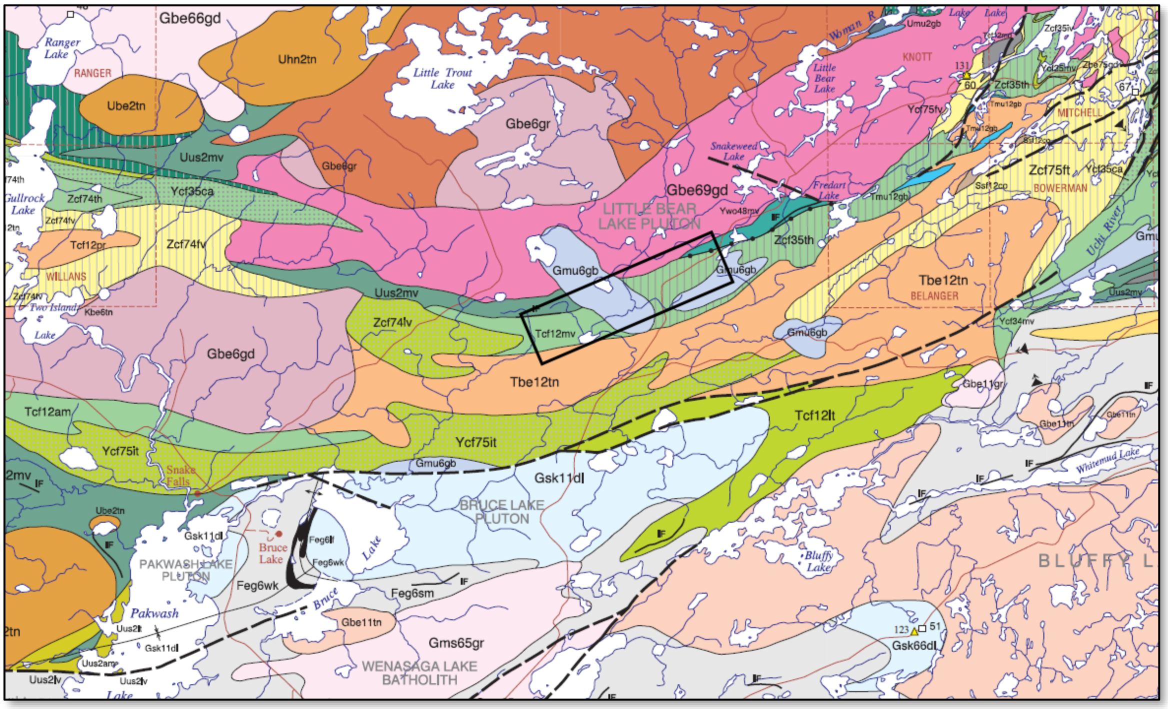


Figure 10 Area Geology

The property lies within the black rectangle

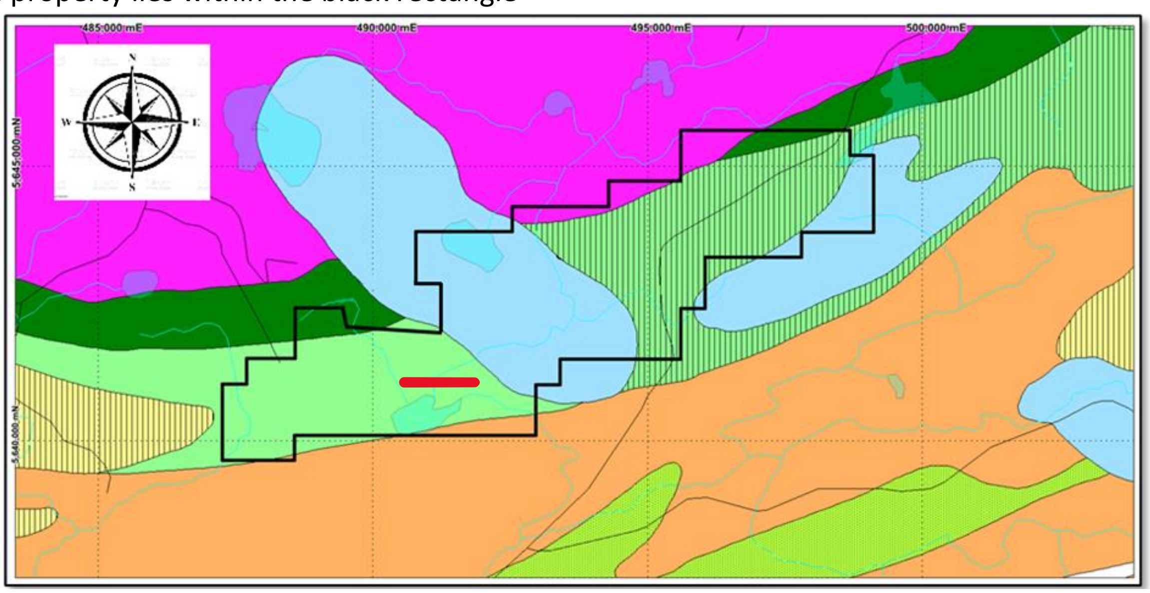


Figure 11 Property Geology

From GSC P3460, with legend above. Claim block outlined. Approximate locations of Joy - Willow - Caravelle zones shown as red line.

Despite several mapping programmes, most were of a reconnaissance nature with limited exposures noted. Much of the area is covered by unconsolidated sediments, and geological information was obtained from drilling and correlation with magnetic and to a lesser extent electromagnetic data, extending higher quality geological data west from Garnet and Fredart lakes.

Overall, the supracrustal sequence trends east-west to ENE-WSW, forming a steeply south-dipping homoclinal feature. However, analysis of drill logs suggests second to third order folding.

Northern areas of Gerry-Joy are underlain by a suite of largely mafic volcanic rocks, basalt, amphibolite and gabbro with elsewhere, intercalated intermediate to felsic flows and tuffs. The assemblage has been previously assigned to Cycle I, but this has fallen out of favour, and is instead presumed to fall within Cycle II. It may be correlate with the Narrow Lake assemblage to the north-east, in Skinner, Dent and Corless townships and/or the mafic suite on and around Dixie Lake to the west.

West and central areas are underlain by Confederation assemblage largely mafic volcanic (basaltic) rocks, and central to east areas Agnew sequence tholeiitic mafic volcanic rocks; this despite magnetic data indicating the sequences are along strike and essentially the same. Within both, three, possibly four iron formation sequences with associated chloritic sediments, wacke and minor felsic volcanic lithologies trend through the assemblage and the Agnew, again suggesting the main hosts are similar in age and composition.

Far southern claims are underlain by <2.47 Ga massive to foliated biotite tonalite to trondhjemite which has intruded the above lithologies, whilst in the north, the supracrustal sequence has been modified by the intrusion of the Little Bear batholith, a granodiorite-quartz monzonite dated at ca. 2722 Ga.

Two large gabbroic bodies cover central and eastern portions of the property, with the former dividing the western Confederation mafic volcanic sequence from the eastern Agnew. Similar gabbroic bodies in the region have been dated at ca. <2699 Ga.

Mineralisation

The property is underlain by five zones, Joy, Diamond Willow, Creek, Caravelle, and South, with the Caravelle and Joy, aka New Zone aka Noranda, containing the highest grade zones. The following is largely taken from MNDM MDI files.

1. Caravelle Zone Easting: 492031 Northing: 5641177

1969-1970 Caravelle Mines drilled five holes totalling 693.7 m as a follow up to a regional airborne survey on the eastern portion of the property. 1978-1985 Selco carried out ground mag, HLEM and UTEM geophysical surveys on the property. 11 DDH's totalling 1145 m were drilled to test targets generated. 1990-1992 Noranda acquired the Joy property and completed ground mag. and HLEM geophysical surveys. In 1992, a 4-hole DDH programme totalling 968.3 m was completed. 1993-1995 Noranda, Major General Resources, Pathfinder Resources and ?Noranda drilled 18 DDH totalling 6040m. The *south*-Caravelle horizon was 'enhanced' by surface PEM but was not tested.

AFRI# 52K14NE0028/2.16247 52K14NE/2.17026

Mineralisation is hosted in an intermediate-(felsic) pyroclastic rock between mafic volcanic rocks and an intermediate intrusion. Best intercept was:

1970 - DDH J-2: BEST 4.44% Zn and 0.22%Cu over 1.1 m i.e. 251.4-255 (3.6 FT).

2. 'New Zone' aka Big Falls/Joy Zone aka Big Falls *Easting:* 491526 *Northing:* 5641411

1969-1970 Caravelle Mines drilled 5 holes totalling 693.7 m as a follow up to a regional airborne survey on the eastern portion of the property. 1978-1985 Selco carried out ground mag, HLEM and UTEM geophysical surveys on the property. 11 DDH's totalling 1145 m were drilled to test targets. 1990-1992 Noranda acquired the Joy property and completed ground mag. and HLEM geophysical surveys. In 1992 a four-hole DDH programme totalling 968.3 m was completed. In 1993-1995 Noranda, Major General Resources and Pathfinder Resources drilled 18 DDH totalling 6,040m.

AFRI# 52K14NE0028/2.16247 & 52K14NE/2.17026

1978-85 Selco best DDH intersection was 3.01% Cu, 0.20% Zn/5.7m, 1990-1992: Noranda, hole J-92-1 returned an intersection of 4.01% Cu, 0.17% Zn, and 0.49 opt Ag over 3.35 m. 1993 2.26% Cu, 1.81% Zn/ 4.2 m. 1995 2.39% Cu, 0.35% Zn over 0.3 m

<u>Ore Reserves Data</u>

Zone	Year	Category	Tonnes	Reference	Comments
New Zone	1994	inferred mineral resource	272150	OFR6146, p. 52 and AFRI# 52K14NE0028	Grade: 4% combined Cu-Zn (300 000 tons)

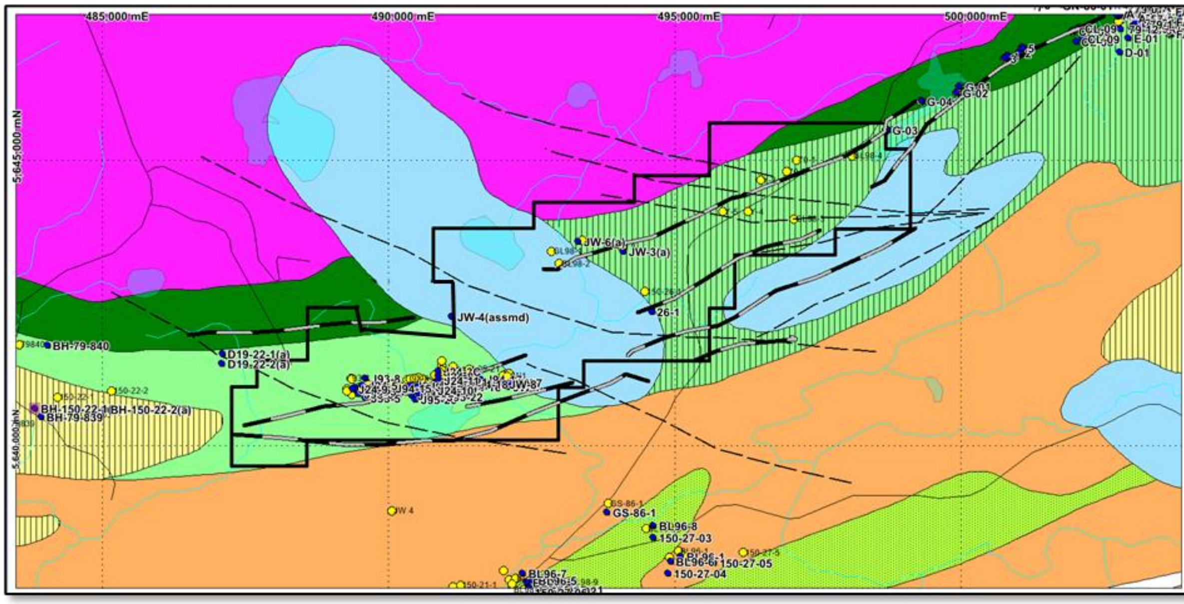


Figure 12 Property geology with IF

Geology, with main iron formations (b/w lines largely interpreted from geophysics) and drilling.

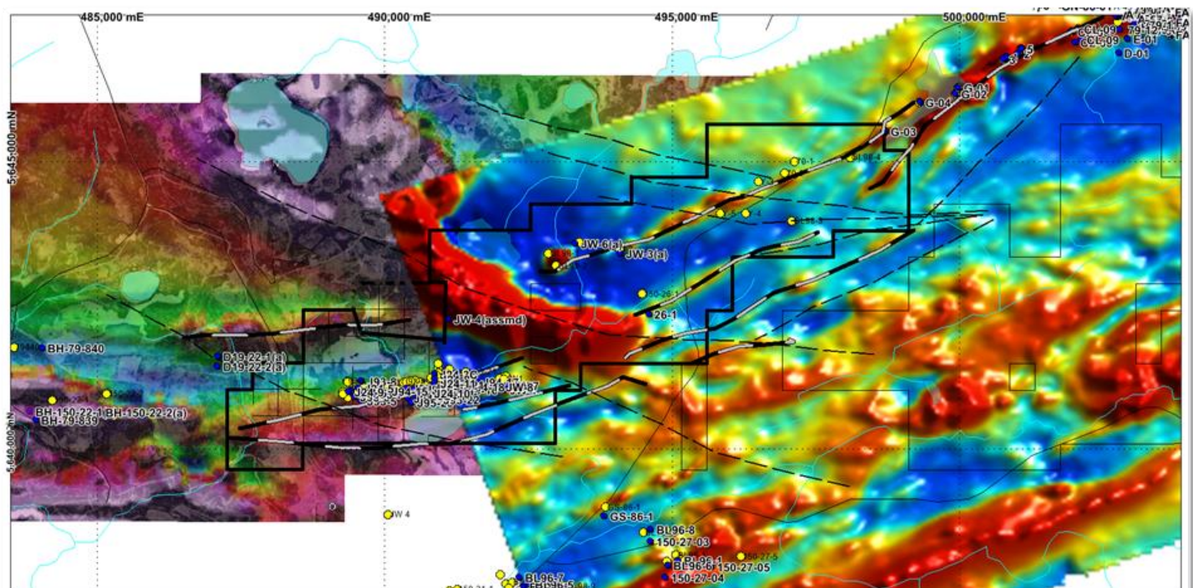


Figure 13 Property area magnetic data

Regional residual magnetic data overlain by 2017 Pistol Bay airborne enhanced gradient. magnetic data. Note the fairly well-defined gabbro in the centre of the property.

Drill holes as yellow (government) and blue (TGM db) dots. In several instances, the same hole has a different location (see below for more information).

6.0 DEPOSIT TYPES

Targets within this portion of the Confederation Belt are orogenic gold systems with Archæan greenstone.

“Orogenic lode gold deposits of Middle Archæan to Tertiary age are arguably the predominant gold deposit type in metamorphic belts, and include several giant (>250 t Au) and numerous world-class (>100 t Au) examples. Their defining characteristics and spatial and temporal distributions are now relatively well documented, such that other gold deposit types can be compared and contrasted against them. They form as an integral part of the evolution of subduction-related accretionary or collisional terranes in which the host-rock sequences were formed in arcs, back arcs, or accretionary prisms. Current unknowns for orogenic gold deposits include the following: (1) the precise tectonic setting and age of mineralization in many provinces, particularly in Palaeozoic and older metamorphic belts; (2) the source of ore fluids and metals;(3) the precise architecture of the hydrothermal systems, particularly the relationship between first- and lower-order structures; and (4) the specific depositional mechanisms for gold, particularly for high-grade deposits.” Groves et al., 2003

7.0 RESULTS

From 9-11th June, 2021, on behalf of Trillium Gold Mines Inc., Precision GeoSurveys Inc. of Langley B.C. flew a high resolution helicopter-borne magnetic gradiometer survey over the western portion of the Gerry-Joy claim block, 'Joy West'.

The survey was flown at 50 metre line spacing at a heading of 000°/180°; tie lines were flown at 500 metre spacing at a heading of 090°/270°. A total of 267 line km was flown, with a total area of 12.01 ha. An additional one km was flown to retain data from flight lines flown outside the survey block margins for efficiency.

Figure 14 Plan View – Joy-West survey block

Flight lines are shown in yellow.

Survey Block	Area (km²)	Line Type	No. of Lines Planned	No. of Lines Completed	Line Spacing (m)	Line Orientation (UTM grid)	Total Planned Line km	Total Actual km Flown
Joy West	12.0	Survey	105	105	50	000°/180°	240	241
		Tie	9	9	500	090°/270°	26	26
		Total:	**114**	**114**			**266**	**267**

Specifics of the geophysical equipment and processing are provided in the accompanying report by Precision GeoSurveys Inc., author, S. Walker, M.Sc., P. Geo. This includes polygon co-ordinates for the survey block (in Appendix A)

Figure 15 Gerry Joy claims and & RTP 12.5 m contours

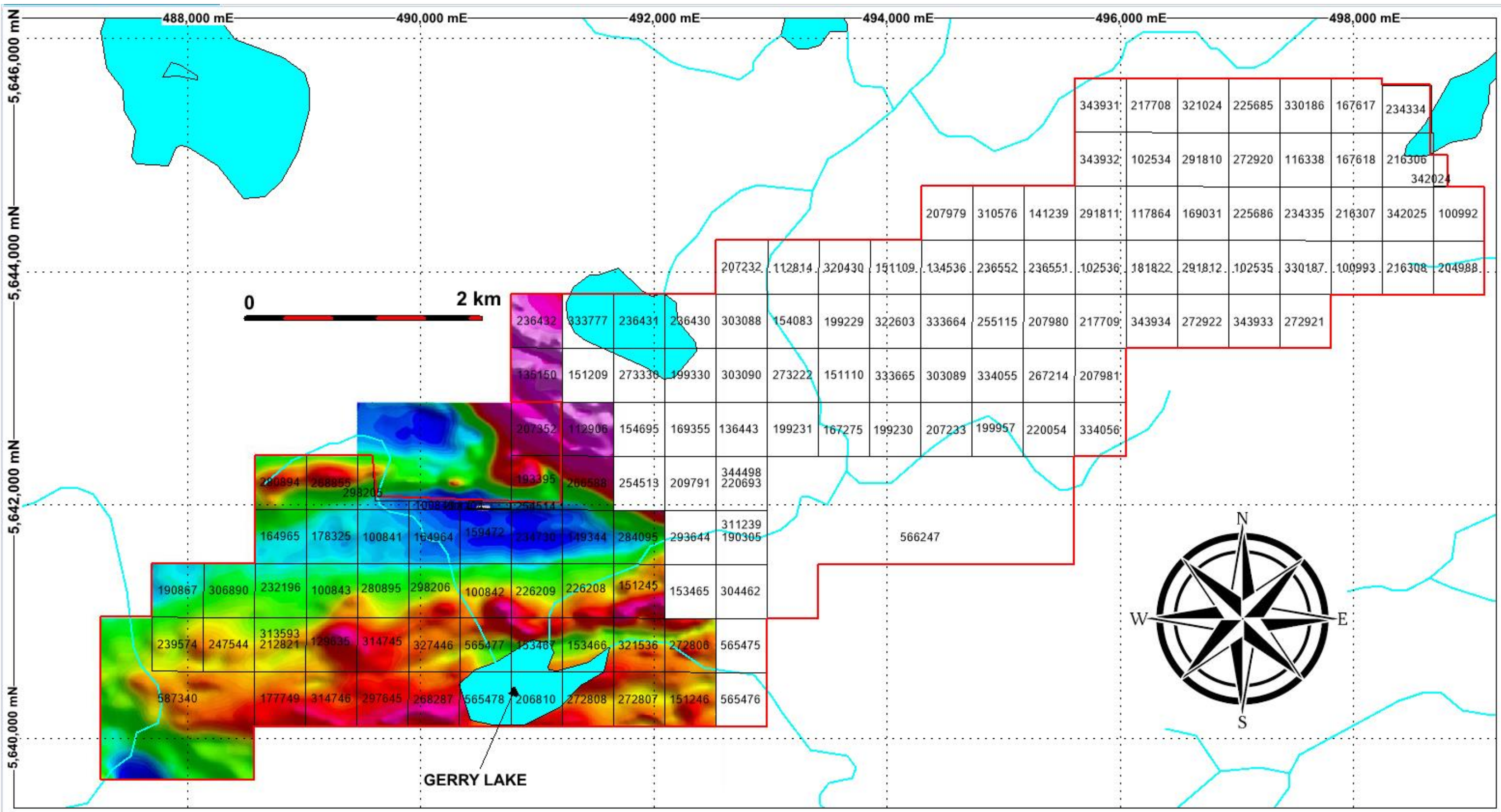


Figure 16 Gerry-Joy claims and 12.5 m RTP

Legend(s) for TGM magnetic data are provided with the relevant jpegs in Appendix I

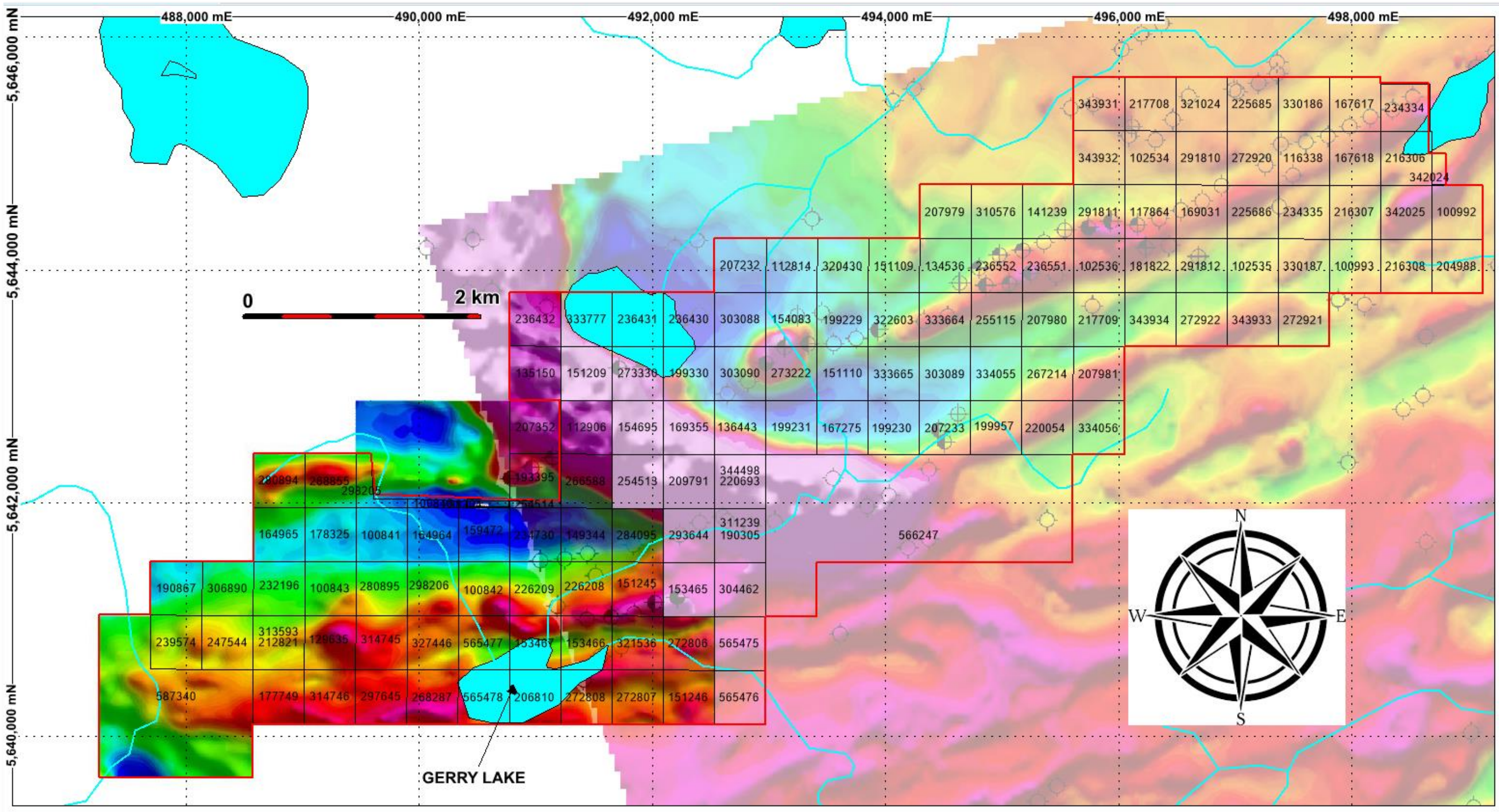


Figure 17 Gerry-Joy 12.5 m and PST Mag.

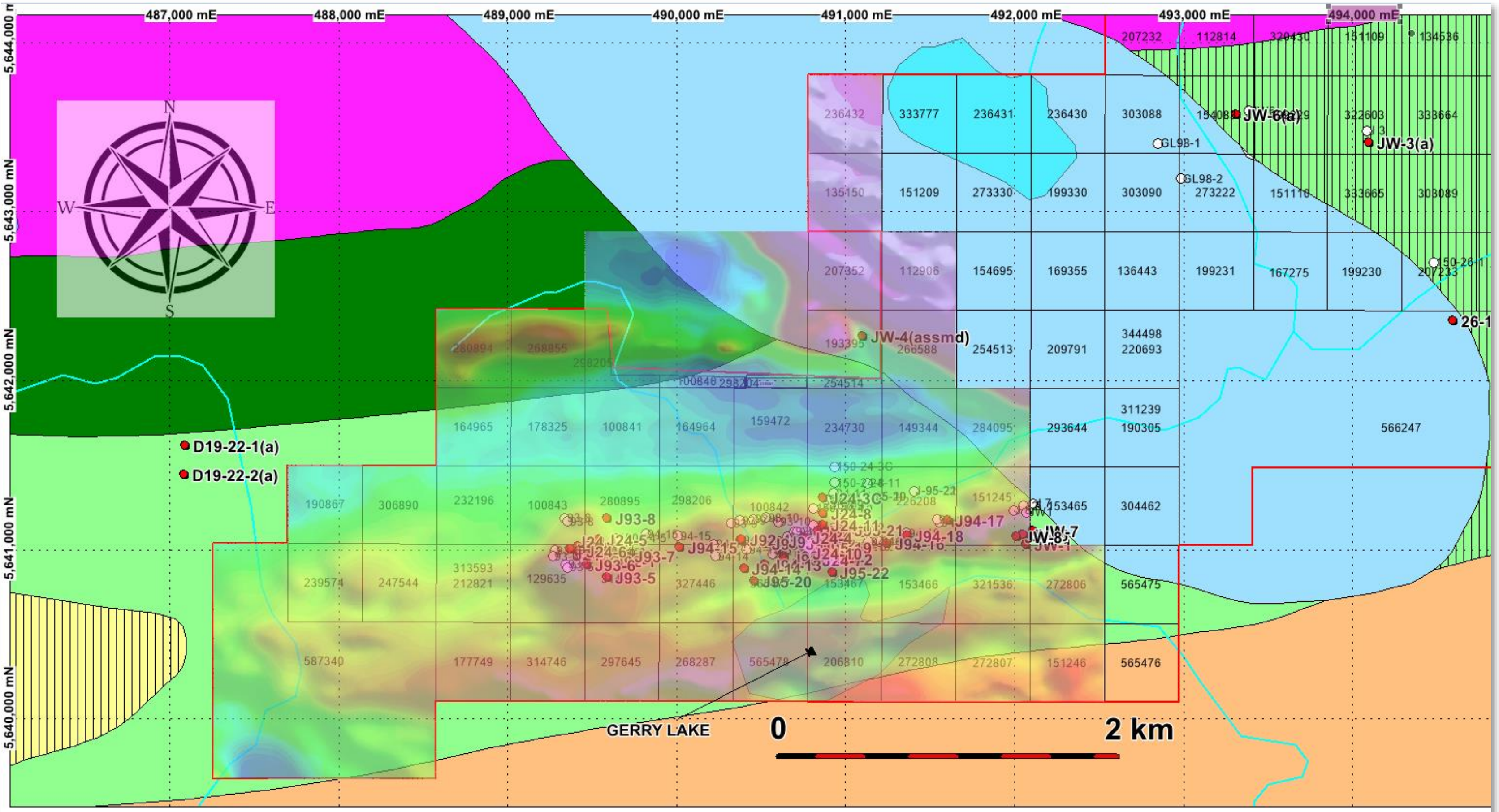


Figure 18 Property Geology, DD & 12.5 m RTP

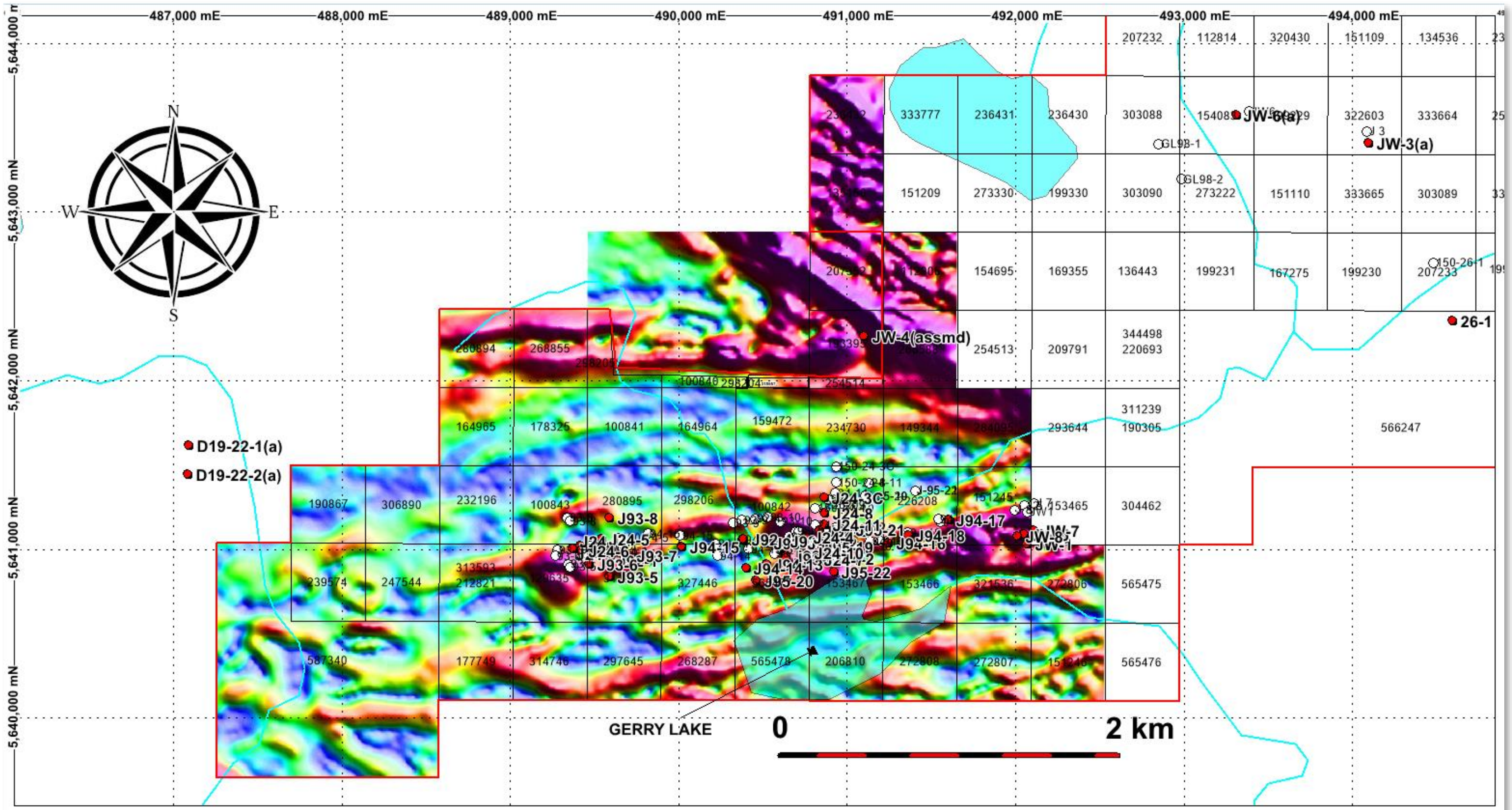


Figure 19 Gerry-Joy Horizontal gradient

8.0 CONCLUSIONS

- An overlay of the Pistol Bay airborne magnetic data and TGM data indicates an accurate data mesh.
- The property-bisecting gabbro has a much smaller extent than as depicted on regional geology maps, rather, appearing as a wide dyke-like feature, and probably fault controlled.
- The Little Bear Lake pluton (magenta) has a gradational boundary with the mafic volcanic sequence which is partially mafic-ultramafic, this based more on drilling information than magnetic data. East of the gabbro, the mafic volcanic sequence extends farther north than displayed in the regional magnetic data, and may form partially preserved strata in the pluton or be dyke- or sill-like granitoid within the mafic volcanic sequence, some of which, based on local drilling, hosts interflow sediments that are commonly sulphidic/conductive.
- There is little difference in magnetic intensity between the mafic volcanic rocks in the north, and the intermediate-mafic volcanic rocks underlying much of the property.
- (Silicate and sulphide-facies) iron formations are hosted within mafic-intermediate and to a lesser extent, (felsic)-intermediate volcanic units. Three, perhaps four ENE-trending iron formations are clearly defined on the TGM and Pistol Bay surveys.
- The Joy, Diamond-Willow, and to the east, Caravelle mineralised zones are defined by one, perhaps two iron formation sequences. It's possible, the stratigraphy here is tight to near isoclinally folded and there is merely a single iron formation sequence.
- The published regional geology has divided the property between a (western, Heyson-assigned) unsubdivided, largely mafic volcanic unit and (eastern) Agnew sequence volcanic rocks, but there is no clear evidence to indicate such exists, and it's quite possible the sequences are of the same age. The gabbro does not appear to separate different lithologies or suites.
- The tonalite body in the south of the property clearly contains considerable (relict) supracrustal sequence. The lack of drilling in this area was based on drilling east and west on adjacent properties, where intercepts of tonalite and supracrustal rocks indicated partial to near complete destruction of the altered supracrustal assemblage by the 'intrusion'/gneiss. South of the property, the 'tonalite' may have oxidised sulphidic sediments, resulting in 'meta'-oxide facies iron formation sequences. Chargeability EM indicates there are still po-bearing layers.
- The EM data suggests that much of the po-py mineralisation is hosted by silicate- to oxide-facies iron formations as intraflow or interbedded mafic volcanic-derived sediments.
- The main structural trends are a) roughly east-west, parallel to stratigraphy, and b) a later set of fractures, slightly curvilinear, a WNW-ESE trending, partially controlling the NW-SE aligned gabbro. Drill logs indicate low to moderate strain.
- There is a slight WNW-ESE ENE-WSW re-orientation to some of the magnetic highs and PST chargeability anomalies, and thus may be conducive to minor re-mobilisation of sulphides and/or conductive host fluid.
- In many instances, drill hole locations are mislocated by as much as 300 metres, and caution is advised. Drill hole locations from the Pistol Bay/Trillium 'database' and the government drill hole database, downloaded from Google Earth can also have differing locations.

- If the gabbroic bodies are as the GSC OF reports younger than 2.7 Ga, they may post-date what is believed to be the main gold mineralising event, ca. 2730-2710 Ma. Intrusion into the Confederation sequence would re-distribute or remove mineralisation.

9.0 RECOMMENDATIONS

Locate old drill collars to tie in gold and base metal intercepts

Run a check for any outcrops in the area of the iron formation and the contacts with the host mafic volcanic sequence.

If possible, better define the undifferentiated ?-Heyson mafic volcanics in the west and determine if they are in fact Agnew sequence. A modest programme of lithogeochemical sampling would suffice.

Age-date the supracrustals.

Correlate the new, TGM airborne with electromagnetic anomalies located by the PST survey and previous ground work by Selco, Noranda and Erzgesellschaft.

Run a geochemical survey over the western Gerry-Joy claims to determine the suitability of a chosen method to locate gold under deep overburden, and especially over any anomalous gold intercepts from drilling on Joy and Willow zones.

Check on the gabbro as a potential mineralised host by either mapping or geochemical sampling over a portion (including its contacts).

Respectfully Submitted,

T.N.J. Hughes, P. Geo.

Proposed Budget

Item	Days	Base Cost	Total
Mapping, Prospecting and Sampling			
Project Geologist	10	700	7000
Junior geologist	10	350	3500
Room and board	10	300	3000
Transportation			
Truck, gas	10	150	1500
ATV	5	350	1750
Soil Geochemical Sampling			
2 technicians	30	400	12000
Room and board	30	300	9000
Transportation - truck, gas			
	30	125	3750
	Number		
Soil Analyses @ $55/sample	800	55	44000
Lithological Analyses	300	45	13500
Line Cutting 20 km	20	900	18000
Induced Polarization Survey 20 km	15	2000	30000
Reports and Maps	10	700	7000
Contingencies	15%		23100
Total Proposed Budget			**Can$177100**

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Wilson, A.W.G. and Johnston, J.F.E. (1904) Report on a traverse through the Severn River; Geological Survey of Canada 16, Part A, 143-152.

12.0 STATEMENT OF QUALIFICATIONS

I, Toby Hughes of Vancouver, B.C. declare that:

- I graduated with an Hons. B.Sc. Geology, from Dundee University, Scotland in 1980

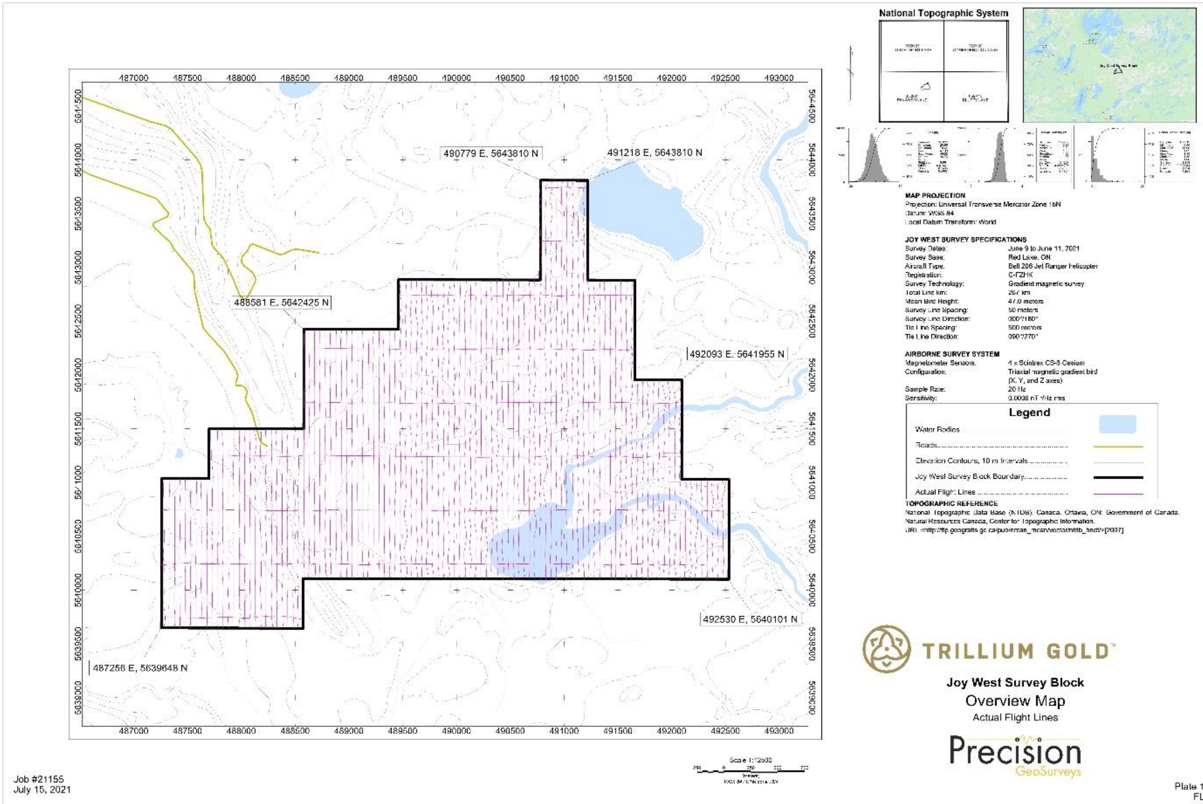
- I have worked as an exploration geologist for 41 years since graduation.

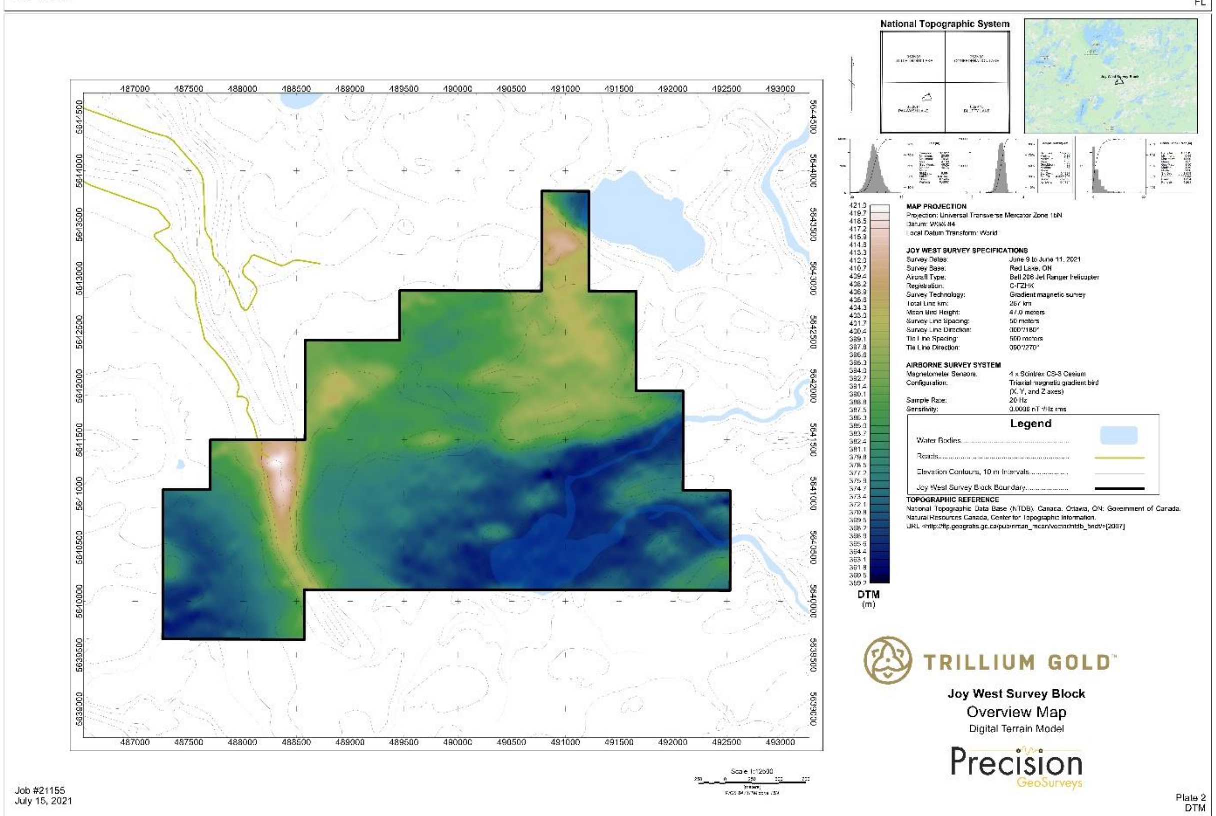
- I am a Practicing Geologist in good standing with Professional Geoscientists Ontario, No. 1318

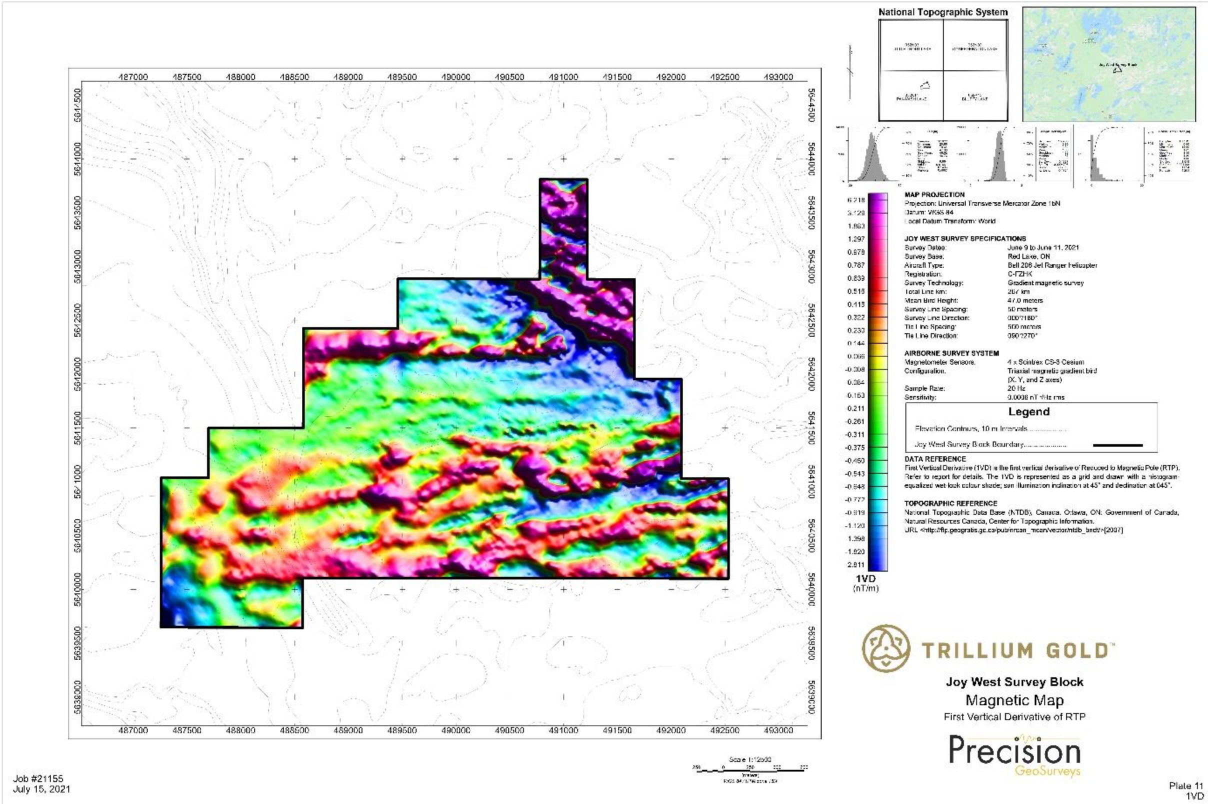
T. Hughes, P. Geo.

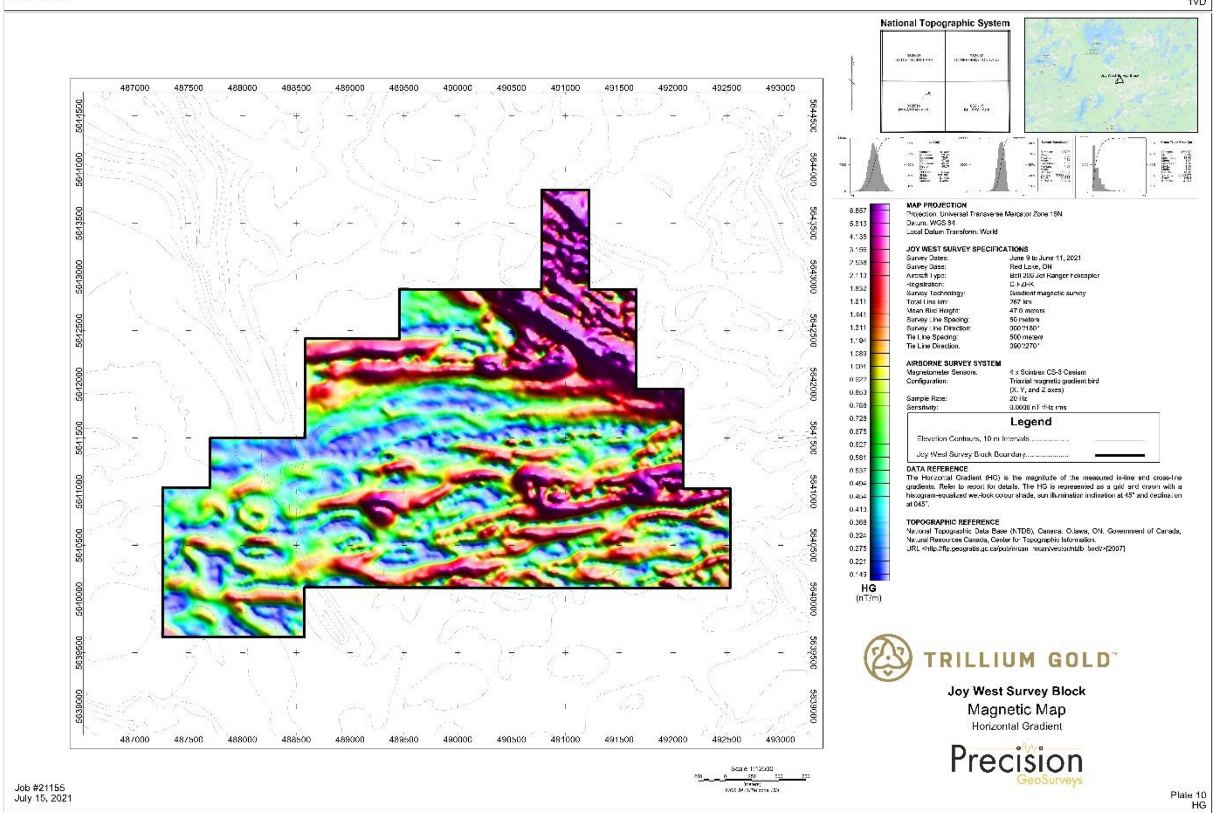
Dated this day, 9.11.21

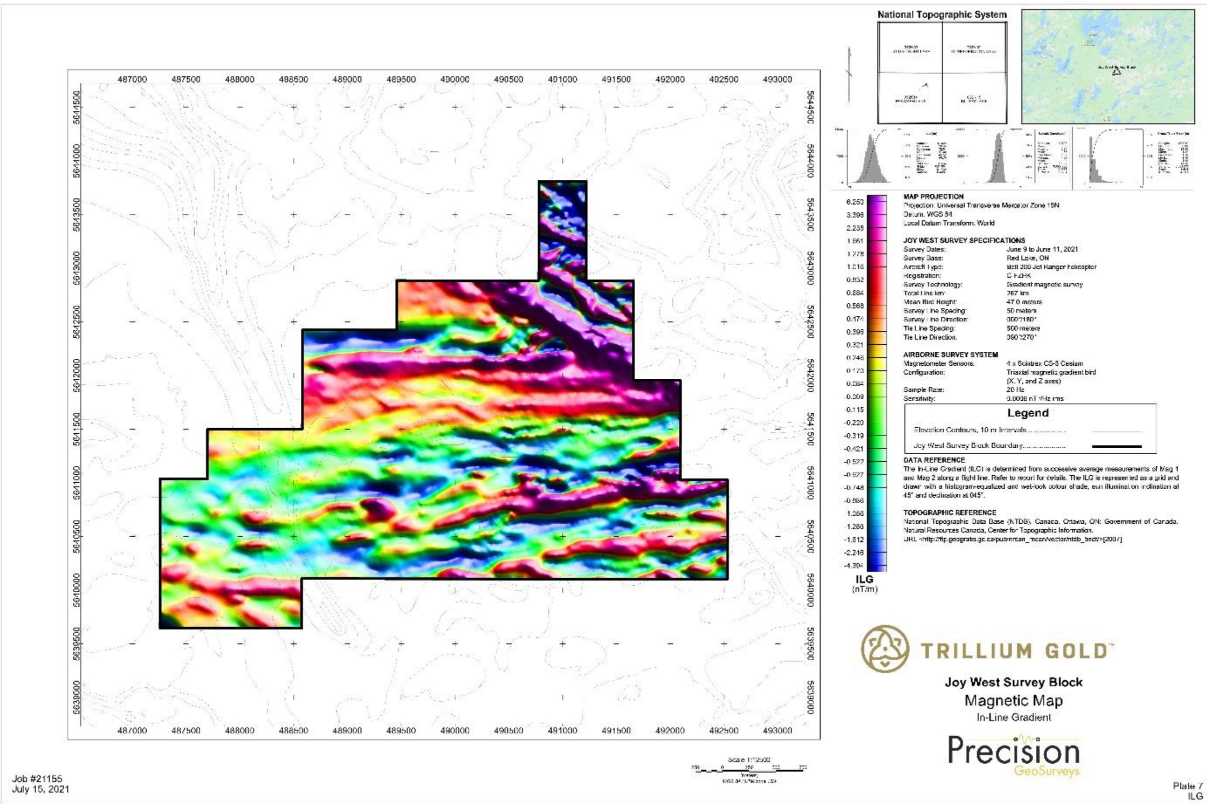
APPENDIX I **Airborne Survey jpegs**

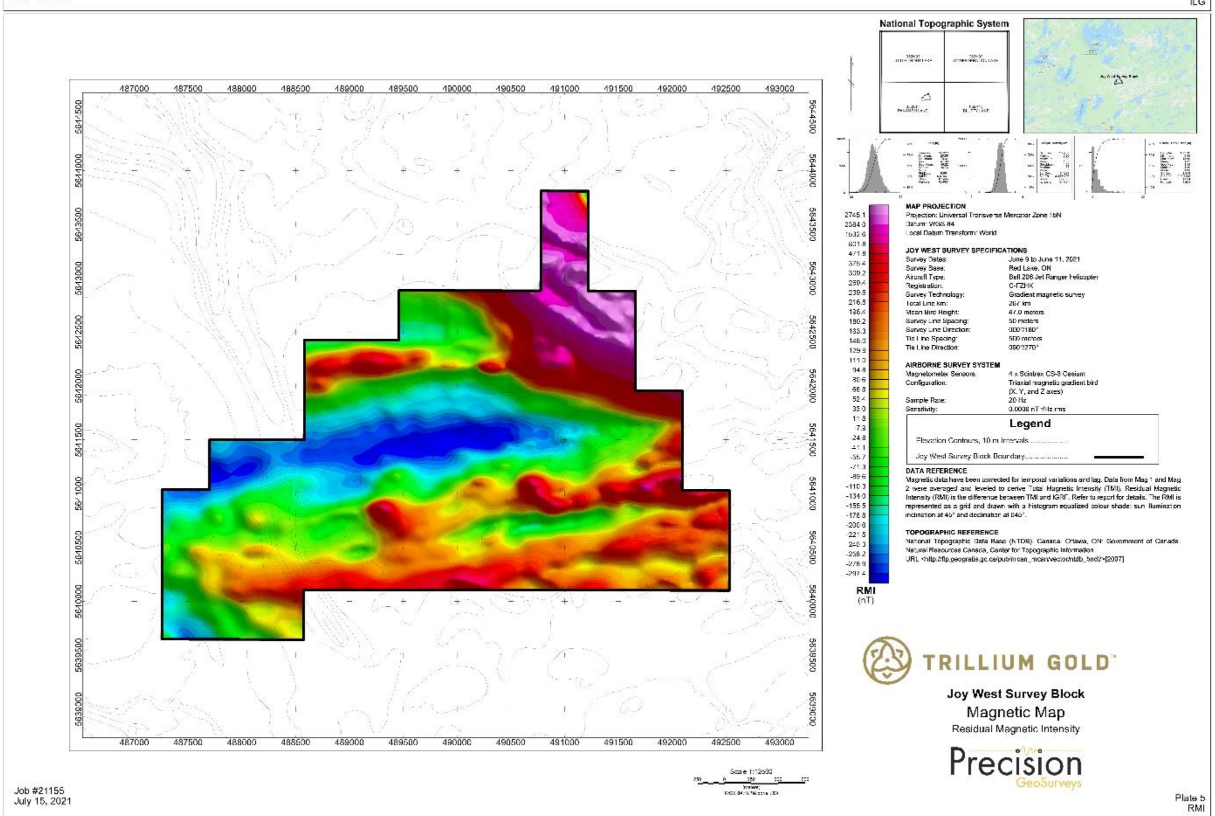


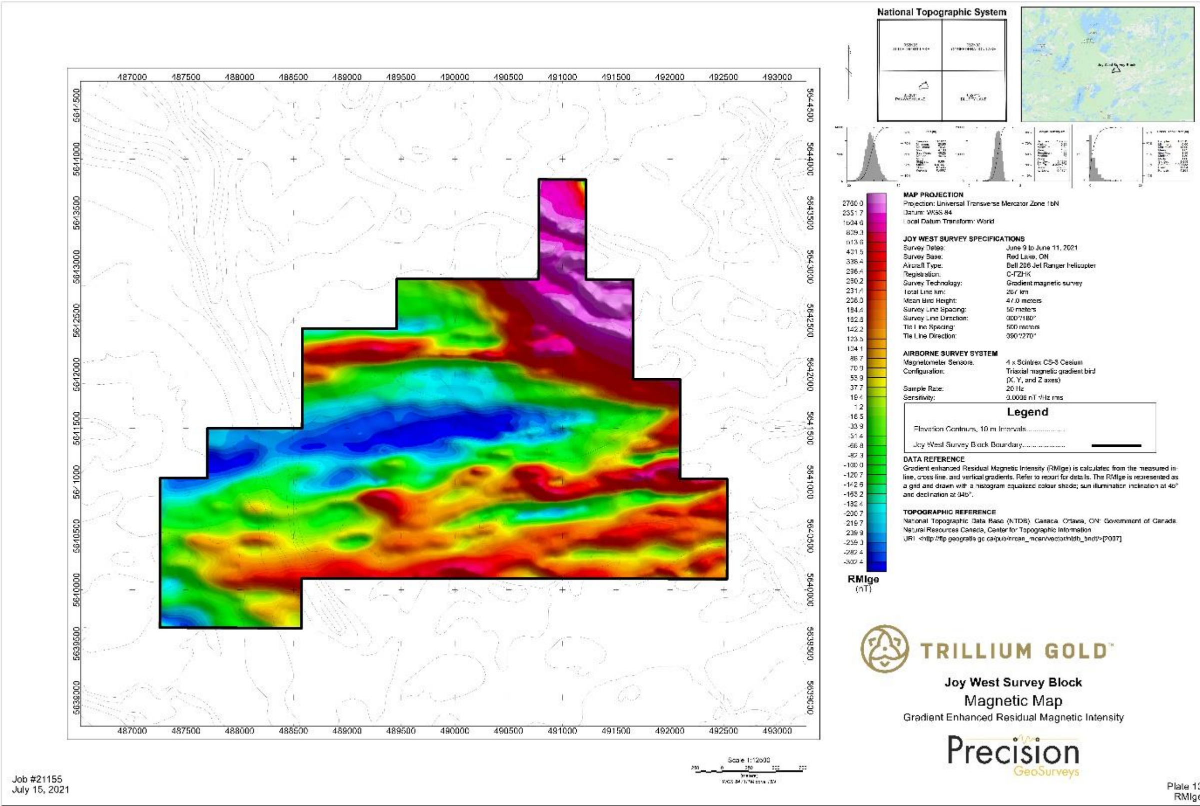


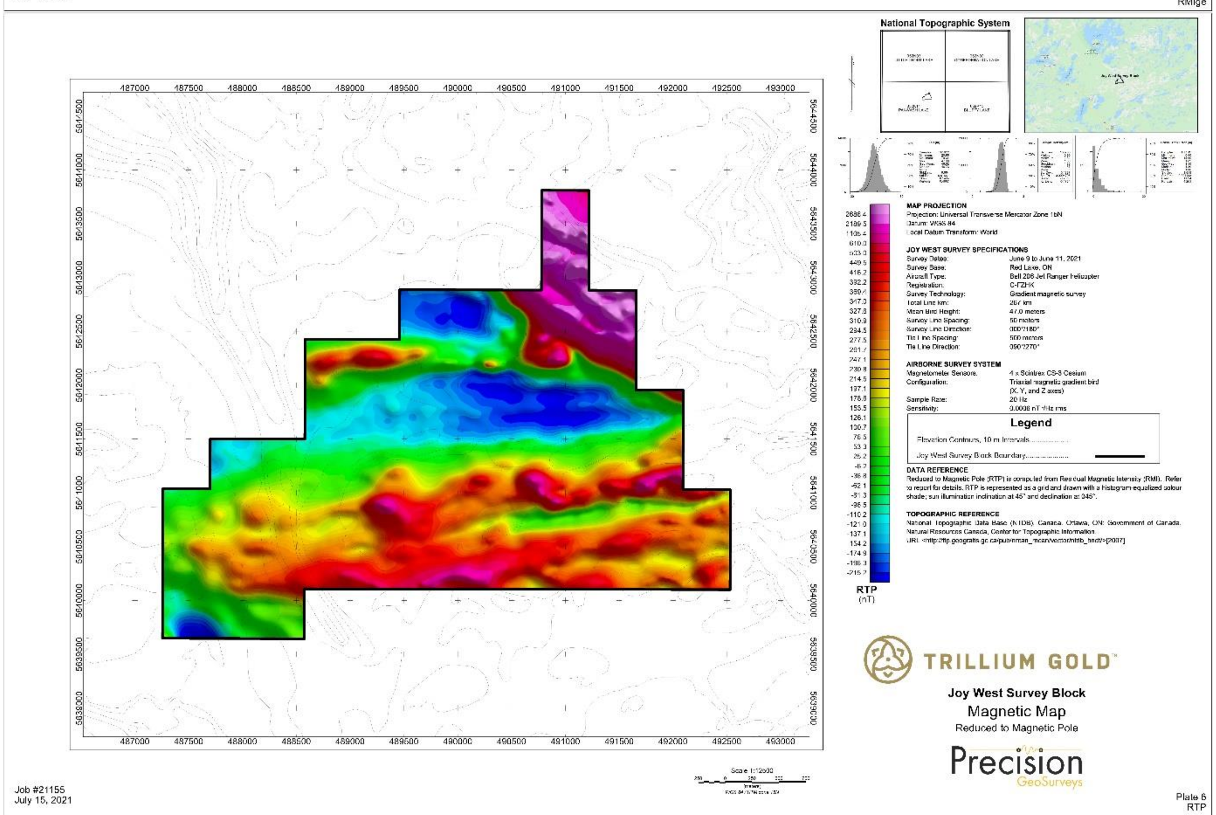

National Topographic System
MAP PROJECTION
Projection: Universal Transverse Mercator Zone 15N
Datum: WGS 84
Local Datum Transform: World
JOY WEST SURVEY SPECIFICATIONS
Survey Dates: June 9 to June 11, 2021
Survey Base: Red Lake, ON
Aircraft Type: Bell 206 Jet Ranger helicopter
Registration: C-FZHK
Survey Technology: Gradient magnetic survey
Total Line km: 267 km
Mean Bird Height: 47.0 meters
Survey Line Spacing: 50 meters
Survey Line Direction: 000°/180°
Tie Line Spacing: 500 meters
Tie Line Direction: 090°/270°
AIRBORNE SURVEY SYSTEM
Magnetometer Sensors: 4 x Scintrex CS-3 Cesium
Configuration: Triaxial magnetic gradient bird (X, Y, and Z axes)
Sample Rate: 20 Hz
Sensitivity: 0.0006 nT √Hz rms
Legend
Elevation Contours, 10 m Intervals
Joy West Survey Block Boundary
DATA REFERENCE
First Vertical Derivative (1VD) is the first vertical derivative of Reduced to Magnetic Pole (RTP). Refer to report for details. The 1VD is represented as a grid and drawn with a histogram-equalized wet-look colour shade; sun illumination inclination at 45° and declination at 045°.
TOPOGRAPHIC REFERENCE
National Topographic Data Base (NTDB), Canada. Ottawa, ON: Government of Canada, Natural Resources Canada, Center for Topographic Information.
URL <http://ftp.geogratis.gc.ca/pub/nrcan_rncan/vector/ntdb_bndt/>[2007]
1VD
(nT/m)
TRILLIUM GOLD
Joy West Survey Block
Magnetic Map
First Vertical Derivative of RTP
Precision GeoSurveys
Job #21155
July 15, 2021
Plate 11
1VD

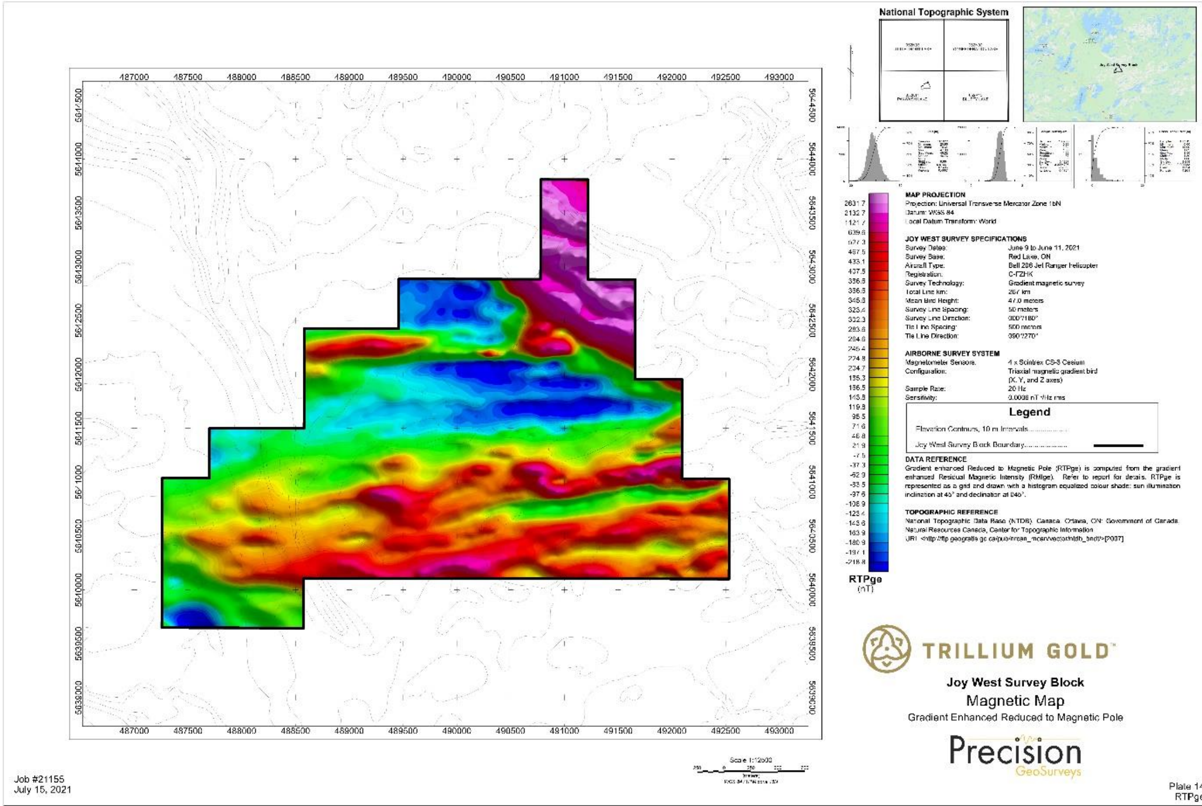

National Topographic System
MAP PROJECTION
Projection: Universal Transverse Mercator Zone 15N
Datum: WGS 84
Local Datum Transform: World
JOY WEST SURVEY SPECIFICATIONS
Survey Dates: June 9 to June 11, 2021
Survey Base: Red Lake, ON
Aircraft Type: Bell 206 Jet Ranger helicopter
Registration: C-FZHK
Survey Technology: Gradient magnetic survey
Total Line km: 267 km
Mean Bird Height: 47.0 meters
Survey Line Spacing: 50 meters
Survey Line Direction: 000°/180°
Tie Line Spacing: 500 meters
Tie Line Direction: 090°/270°
AIRBORNE SURVEY SYSTEM
Magnetometer Sensors: 4 x Scintrex CS-3 Cesium
Configuration: Triaxial magnetic gradient bird (X, Y, and Z axes)
Sample Rate: 20 Hz
Sensitivity: 0.0006 nT √Hz rms
Legend
Elevation Contours, 10 m Intervals
Joy West Survey Block Boundary
DATA REFERENCE
The Horizontal Gradient (HG) is the magnitude of the measured in-line and cross-line gradients. Refer to report for details. The HG is represented as a grid and drawn with a histogram-equalized wet-look colour shade, sun illumination inclination at 45° and declination at 045°.
TOPOGRAPHIC REFERENCE
National Topographic Data Base (NTDB), Canada. Ottawa, ON. Government of Canada, Natural Resources Canada, Center for Topographic Information.
URL <http://ftp.geogratis.gc.ca/pub/nrcan_rncan/vector/ntdb_bndt/>[2007]
HG
(nT/m)
TRILLIUM GOLD
Joy West Survey Block
Magnetic Map
Horizontal Gradient
Precision GeoSurveys
Job #21155
July 15, 2021
Plate 10
HG

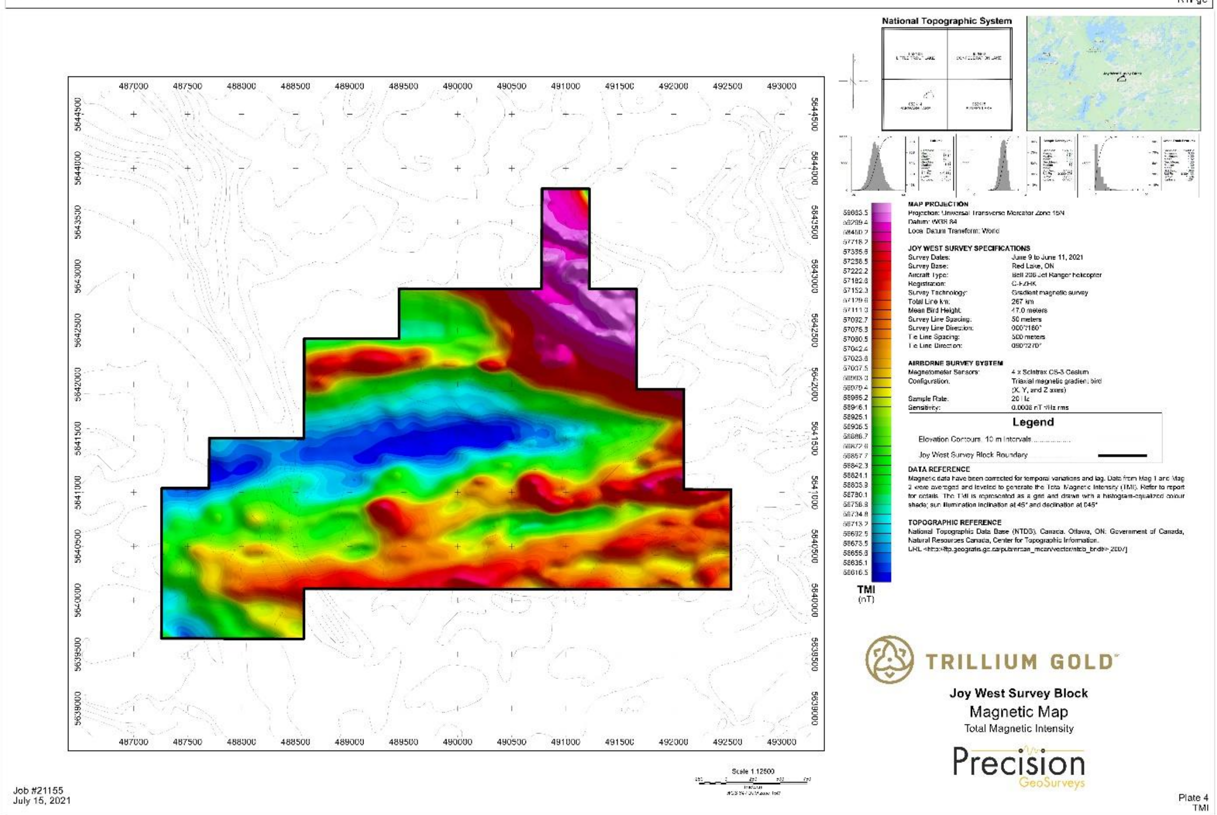

National Topographic System
MAP PROJECTION
Projection: Universal Transverse Mercator Zone 15N
Datum: WGS 84
Local Datum Transform: World
JOY WEST SURVEY SPECIFICATIONS
Survey Dates: June 9 to June 11, 2021
Survey Base: Red Lake, ON
Aircraft Type: Bell 206 Jet Ranger helicopter
Registration: C-FZHK
Survey Technology: Gradient magnetic survey
Total Line km: 267 km
Mean Bird Height: 47.0 meters
Survey Line Spacing: 50 meters
Survey Line Direction: 000°/180°
Tie Line Spacing: 500 meters
Tie Line Direction: 090°/270°
AIRBORNE SURVEY SYSTEM
Magnetometer Sensors: 4 x Scintrex CS-3 Cesium
Configuration: Triaxial magnetic gradient bird (X, Y, and Z axes)
Sample Rate: 20 Hz
Sensitivity: 0.0006 nT √Hz rms
Legend
Elevation Contours, 10 m Intervals
Joy West Survey Block Boundary
DATA REFERENCE
The In-Line Gradient (ILG) is determined from successive average measurements of Mag 1 and Mag 2 along a flight line. Refer to report for details. The ILG is represented as a grid and drawn with a histogram-equalized and wet-look colour shade, sun illumination inclination at 45° and declination at 045°.
TOPOGRAPHIC REFERENCE
National Topographic Data Base (NTDB). Canada. Ottawa, ON: Government of Canada. Natural Resources Canada, Center for Topographic Information.
URL <http://ftp.geogratis.gc.ca/pub/nrcan_rncan/vector/ntdb_bndt/>[2007]
ILG
(nT/m)
TRILLIUM GOLD
Joy West Survey Block
Magnetic Map
In-Line Gradient
Precision
GeoSurveys
Job #21155
July 15, 2021
Plate 7
ILG

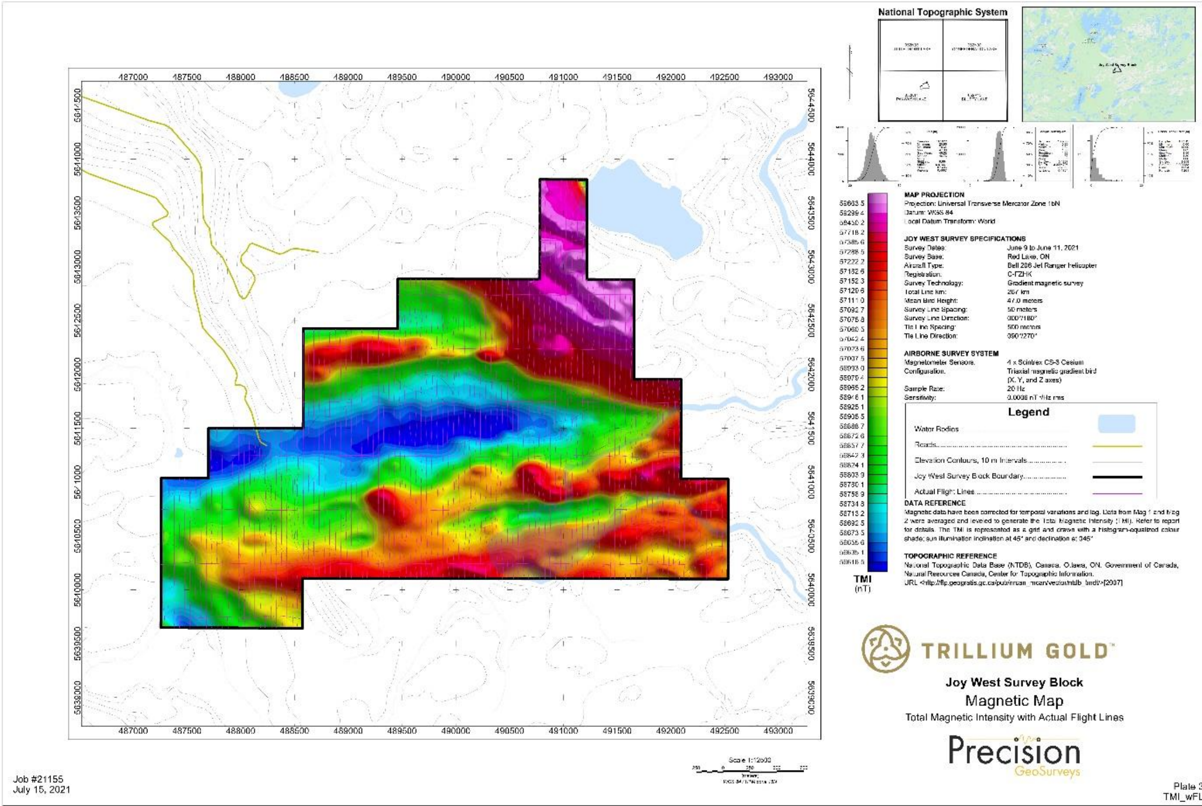

National Topographic System
MAP PROJECTION
Projection: Universal Transverse Mercator Zone 15N
Datum: WGS 84
Local Datum Transform: World
JOY WEST SURVEY SPECIFICATIONS
Survey Dates: June 9 to June 11, 2021
Survey Base: Red Lake, ON
Aircraft Type: Bell 206 Jet Ranger helicopter
Registration: C-FZHK
Survey Technology: Gradient magnetic survey
Total Line km: 267 km
Mean Bird Height: 47.0 meters
Survey Line Spacing: 50 meters
Survey Line Direction: 000°/180°
Tie Line Spacing: 500 meters
Tie Line Direction: 090°/270°
AIRBORNE SURVEY SYSTEM
Magnetometer Sensors: 4 x Scintrex CS-3 Cesium
Configuration: Triaxial magnetic gradient bird (X, Y, and Z axes)
Sample Rate: 20 Hz
Sensitivity: 0.0006 nT √Hz rms
Legend
Elevation Contours, 10 m Intervals
Joy West Survey Block Boundary
DATA REFERENCE
Magnetic data have been corrected for temporal variations and lag. Data from Mag 1 and Mag 2 were averaged and leveled to derive Total Magnetic Intensity (TMI). Residual Magnetic Intensity (RMI) is the difference between TMI and IGRF. Refer to report for details. The RMI is represented as a grid and drawn with a histogram equalized colour shade; sun illumination inclination at 45° and declination at 045°.
TOPOGRAPHIC REFERENCE
National Topographic Data Base (NTDB). Canada. Ottawa, ON: Government of Canada. Natural Resources Canada, Center for Topographic Information.
URL <http://ftp.geogratis.gc.ca/pub/nrcan_rncan/vector/ntdb_bndt/>[2007]
RMI
(nT)
TRILLIUM GOLD
Joy West Survey Block
Magnetic Map
Residual Magnetic Intensity
Precision
GeoSurveys
Job #21155
July 15, 2021
Plate 5
RMI

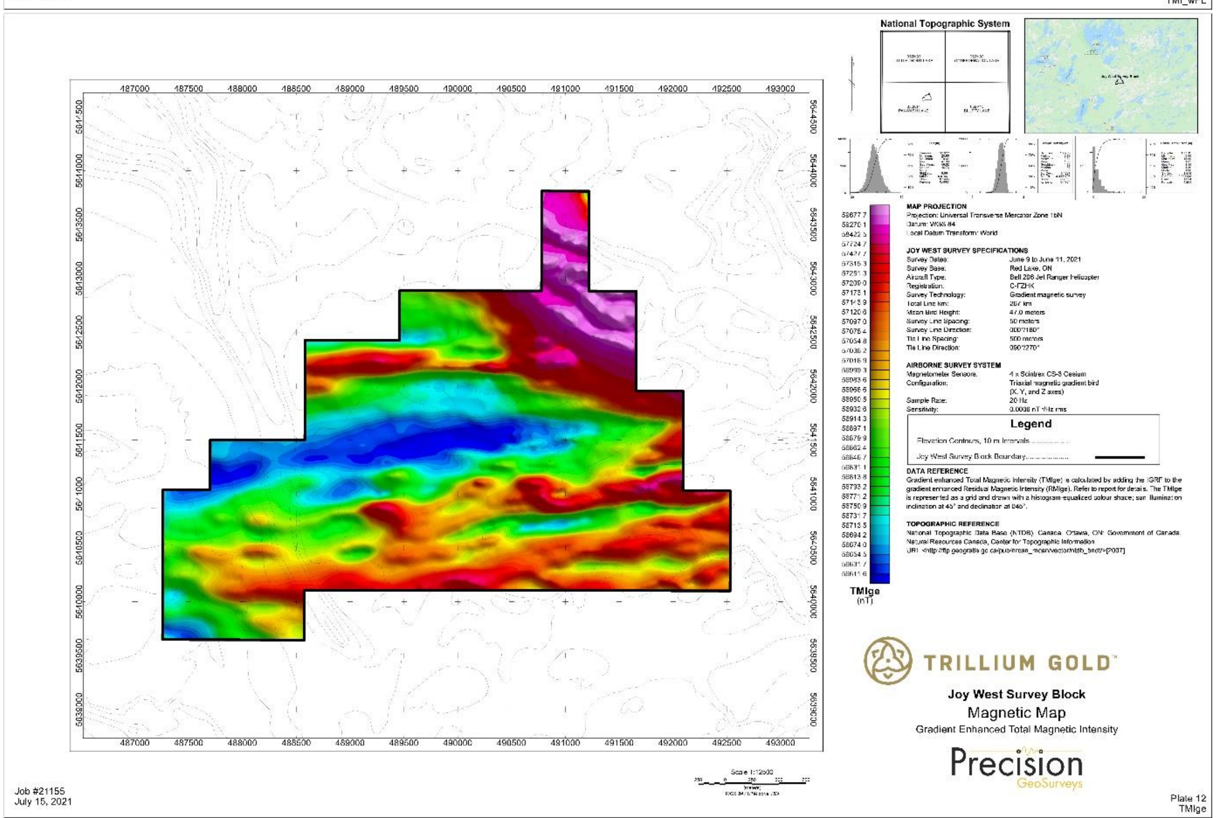

National Topographic System
MAP PROJECTION
Projection: Universal Transverse Mercator Zone 15N
Datum: WGS 84
Local Datum Transform: World
JOY WEST SURVEY SPECIFICATIONS
Survey Dates: June 9 to June 11, 2021
Survey Base: Red Lake, ON
Aircraft Type: Bell 206 Jet Ranger helicopter
Registration: C-FZHK
Survey Technology: Gradient magnetic survey
Total Line km: 267 km
Mean Bird Height: 47.0 meters
Survey Line Spacing: 50 meters
Survey Line Direction: 000°/180°
Tie Line Spacing: 500 meters
Tie Line Direction: 090°/270°
AIRBORNE SURVEY SYSTEM
Magnetometer Sensors: 4 x Scintrex CS-3 Cesium
Configuration: Triaxial magnetic gradient bird (X, Y, and Z axes)
Sample Rate: 20 Hz
Sensitivity: 0.0006 nT √Hz rms
Legend
Elevation Contours, 10 m Intervals
Joy West Survey Block Boundary
DATA REFERENCE
Gradient enhanced Residual Magnetic Intensity (RMIge) is calculated from the measured in-line, cross-line, and vertical gradients. Refer to report for details. The RMIge is represented as a grid and drawn with a histogram equalized colour shade; sun illumination inclination at 45° and declination at 345°.
TOPOGRAPHIC REFERENCE
National Topographic Data Base (NTDB). Canada. Ottawa, ON: Government of Canada. Natural Resources Canada, Center for Topographic Information.
URL <http://ftp.geogratis.gc.ca/pub/nrcan_rncan/vector/ntdb_bndt/>[2007]
RMIge
(nT)
TRILLIUM GOLD
Joy West Survey Block
Magnetic Map
Gradient Enhanced Residual Magnetic Intensity
Precision GeoSurveys
Scale 1:12500
Job #21155
July 15, 2021
Plate 13
RMIge

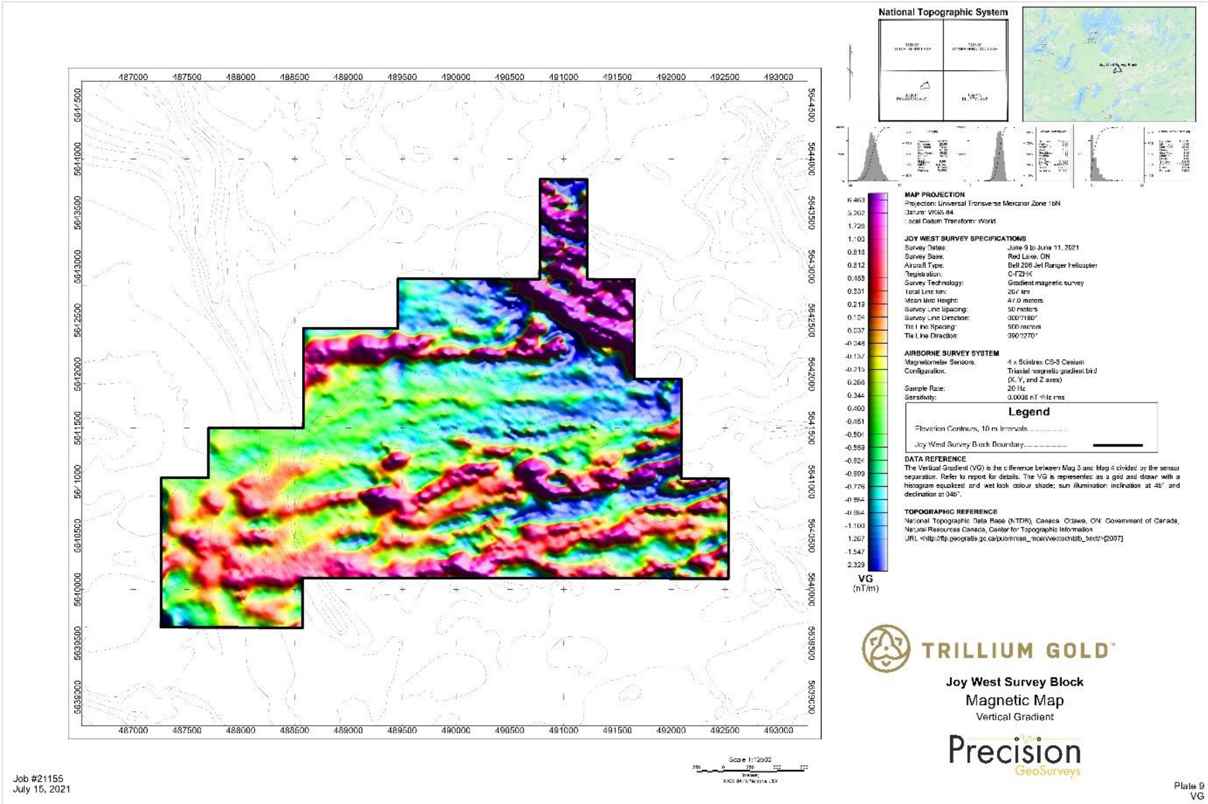

National Topographic System
MAP PROJECTION
Projection: Universal Transverse Mercator Zone 15N
Datum: WGS 84
Local Datum Transform: World
JOY WEST SURVEY SPECIFICATIONS
Survey Dates: June 9 to June 11, 2021
Survey Base: Red Lake, ON
Aircraft Type: Bell 206 Jet Ranger helicopter
Registration: C-FZHK
Survey Technology: Gradient magnetic survey
Total Line km: 267 km
Mean Bird Height: 47.0 meters
Survey Line Spacing: 50 meters
Survey Line Direction: 000°/180°
Tie Line Spacing: 500 meters
Tie Line Direction: 090°/270°
AIRBORNE SURVEY SYSTEM
Magnetometer Sensors: 4 x Scintrex CS-3 Cesium
Configuration: Triaxial magnetic gradient bird (X, Y, and Z axes)
Sample Rate: 20 Hz
Sensitivity: 0.0006 nT √Hz rms
Legend
Elevation Contours, 10 m Intervals
Joy West Survey Block Boundary
DATA REFERENCE
Reduced to Magnetic Pole (RTP) is computed from Residual Magnetic Intensity (RMI). Refer to report for details. RTP is represented as a grid and drawn with a histogram equalized colour shade; sun illumination inclination at 45° and declination at 345°.
TOPOGRAPHIC REFERENCE
National Topographic Data Base (NTDB). Canada. Ottawa, ON: Government of Canada. Natural Resources Canada, Center for Topographic Information.
URL <http://ftp.geogratis.gc.ca/pub/nrcan_rncan/vector/ntdb_bndt/>[2007]
RTP
(nT)
TRILLIUM GOLD
Joy West Survey Block
Magnetic Map
Reduced to Magnetic Pole
Precision GeoSurveys
Scale 1:12500
Job #21155
July 15, 2021
Plate 6
RTP

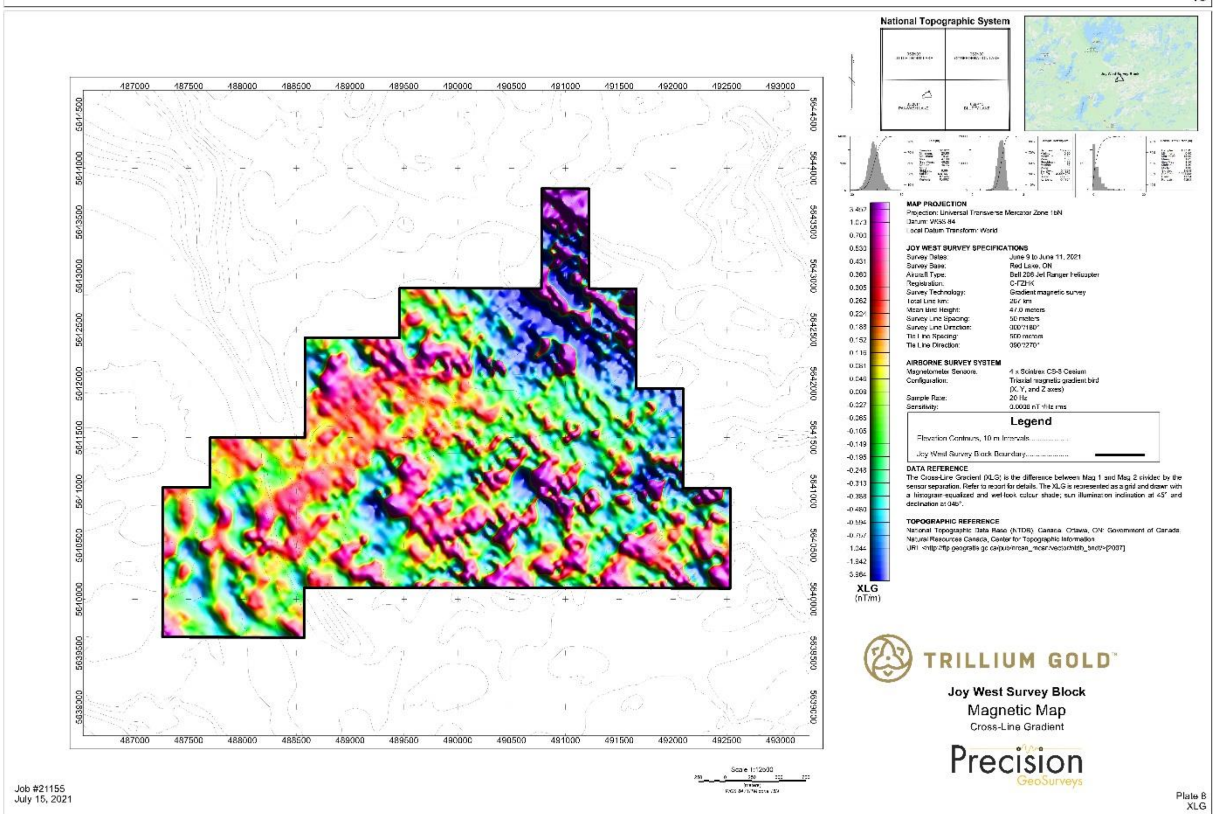

National Topographic System
MAP PROJECTION
Projection: Universal Transverse Mercator Zone 15N
Datum: WGS 84
Local Datum Transform: World
JOY WEST SURVEY SPECIFICATIONS
Survey Dates: June 9 to June 11, 2021
Survey Base: Red Lake, ON
Aircraft Type: Bell 206 Jet Ranger helicopter
Registration: C-FZHK
Survey Technology: Gradient magnetic survey
Total Line km: 267 km
Mean Bird Height: 47.0 meters
Survey Line Spacing: 50 meters
Survey Line Direction: 000°/180°
Tie Line Spacing: 500 meters
Tie Line Direction: 090°/270°
AIRBORNE SURVEY SYSTEM
Magnetometer Sensors: 4 x Scintrex CS-3 Cesium
Configuration: Triaxial magnetic gradient bird (X, Y, and Z axes)
Sample Rate: 20 Hz
Sensitivity: 0.0006 nT √Hz rms
Legend
Elevation Contours, 10 m Intervals
Joy West Survey Block Boundary
DATA REFERENCE
Gradient enhanced Reduced to Magnetic Pole (RTPge) is computed from the gradient enhanced Residual Magnetic Intensity (RMIge). Refer to report for details. RTPge is represented as a grid and drawn with a histogram equalized colour shade; sun illumination inclination at 45° and declination at 045°.
TOPOGRAPHIC REFERENCE
National Topographic Data Base (NTDB). Canada. Ottawa, ON: Government of Canada. Natural Resources Canada, Center for Topographic Information.
RTPge (nT)
TRILLIUM GOLD
Joy West Survey Block
Magnetic Map
Gradient Enhanced Reduced to Magnetic Pole
Precision GeoSurveys
Job #21155
July 15, 2021
Plate 14
RTPge


National Topographic System
MAP PROJECTION
Projection: Universal Transverse Mercator Zone 15N
Datum: WGS 84
Local Datum Transform: World
JOY WEST SURVEY SPECIFICATIONS
Survey Dates: June 9 to June 11, 2021
Survey Base: Red Lake, ON
Aircraft Type: Bell 206 Jet Ranger helicopter
Registration: C-FZHK
Survey Technology: Gradient magnetic survey
Total Line km: 267 km
Mean Bird Height: 47.0 meters
Survey Line Spacing: 50 meters
Survey Line Direction: 000°/180°
Tie Line Spacing: 500 meters
Tie Line Direction: 090°/270°
AIRBORNE SURVEY SYSTEM
Magnetometer Sensors: 4 x Scintrex CS-3 Cesium
Configuration: Triaxial magnetic gradient bird (X, Y, and Z axes)
Sample Rate: 20 Hz
Sensitivity: 0.0006 nT √Hz rms
Legend
Elevation Contours, 10 m Intervals
Joy West Survey Block Boundary
DATA REFERENCE
Magnetic data have been corrected for temporal variations and lag. Data from Mag 1 and Mag 2 were averaged and leveled to generate the Total Magnetic Intensity (TMI). Refer to report for details. The TMI is represented as a grid and drawn with a histogram-equalized colour shade; sun illumination inclination at 45° and declination at 045°
TOPOGRAPHIC REFERENCE
National Topographic Data Base (NTDB). Canada. Ottawa, ON: Government of Canada, Natural Resources Canada, Center for Topographic Information.
TMI (nT)
TRILLIUM GOLD
Joy West Survey Block
Magnetic Map
Total Magnetic Intensity
Precision GeoSurveys
Job #21155
July 15, 2021
Plate 4
TMI


National Topographic System
MAP PROJECTION
Projection: Universal Transverse Mercator Zone 15N
Datum: WGS 84
Local Datum Transform: World
JOY WEST SURVEY SPECIFICATIONS
Survey Dates: June 9 to June 11, 2021
Survey Base: Red Lake, ON
Aircraft Type: Bell 206 Jet Ranger helicopter
Registration: C-FZHK
Survey Technology: Gradient magnetic survey
Total Line km: 267 km
Mean Bird Height: 47.0 meters
Survey Line Spacing: 50 meters
Survey Line Direction: 000°/180°
Tie Line Spacing: 500 meters
Tie Line Direction: 090°/270°
AIRBORNE SURVEY SYSTEM
Magnetometer Sensors: 4 x Scintrex CS-3 Cesium
Configuration: Triaxial magnetic gradient bird (X, Y, and Z axes)
Sample Rate: 20 Hz
Sensitivity: 0.0006 nT √Hz rms
Legend
Water Bodies
Roads
Elevation Contours, 10 m Intervals
Joy West Survey Block Boundary
Actual Flight Lines
DATA REFERENCE
Magnetic data have been corrected for temporal variations and lag. Data from Mag 1 and Mag 2 were averaged and leveled to generate the Total Magnetic Intensity (TMI). Refer to report for details. The TMI is represented as a grid and drawn with a histogram-equalized colour shade; sun illumination inclination at 45° and declination at 345°
TOPOGRAPHIC REFERENCE
National Topographic Data Base (NTDB), Canada. Ottawa, ON. Government of Canada, Natural Resources Canada, Center for Topographic Information.
URL <http://ftp.geogratis.gc.ca/pub/nrcan_rncan/vector/ntdb_bndt/>[2007]
TMI
(nT)
TRILLIUM GOLD
Joy West Survey Block
Magnetic Map
Total Magnetic Intensity with Actual Flight Lines
Precision GeoSurveys
Job #21155
July 15, 2021
Scale 1:12500
Plate 3
TMI_wFL


National Topographic System
MAP PROJECTION
Projection: Universal Transverse Mercator Zone 15N
Datum: WGS 84
Local Datum Transform: World
JOY WEST SURVEY SPECIFICATIONS
Survey Dates: June 9 to June 11, 2021
Survey Base: Red Lake, ON
Aircraft Type: Bell 206 Jet Ranger helicopter
Registration: C-FZHK
Survey Technology: Gradient magnetic survey
Total Line km: 267 km
Mean Bird Height: 47.0 meters
Survey Line Spacing: 50 meters
Survey Line Direction: 000°/180°
Tie Line Spacing: 500 meters
Tie Line Direction: 090°/270°
AIRBORNE SURVEY SYSTEM
Magnetometer Sensors: 4 x Scintrex CS-3 Cesium
Configuration: Triaxial magnetic gradient bird (X, Y, and Z axes)
Sample Rate: 20 Hz
Sensitivity: 0.0006 nT √Hz rms
Legend
Elevation Contours, 10 m Intervals
Joy West Survey Block Boundary
DATA REFERENCE
Gradient enhanced Total Magnetic Intensity (TMIge) is calculated by adding the IGRF to the gradient enhanced Residual Magnetic Intensity (RMIge). Refer to report for details. The TMIge is represented as a grid and drawn with a histogram-equalized colour shade; sun illumination inclination at 45° and declination at 045°.
TOPOGRAPHIC REFERENCE
National Topographic Data Base (NTDB). Canada. Ottawa, ON: Government of Canada. Natural Resources Canada, Center for Topographic Information.
URL <http://ftp.geogratis.gc.ca/pub/nrcan_rncan/vector/ntdb_bndt/>[2007]
TMIge
(nT)
TRILLIUM GOLD
Joy West Survey Block
Magnetic Map
Gradient Enhanced Total Magnetic Intensity
Precision GeoSurveys
Job #21155
July 15, 2021
Scale 1:12500
Plate 12
TMIge


National Topographic System
MAP PROJECTION
Projection: Universal Transverse Mercator Zone 15N
Datum: WGS 84
Local Datum Transform: World
JOY WEST SURVEY SPECIFICATIONS
Survey Dates: June 9 to June 11, 2021
Survey Base: Red Lake, ON
Aircraft Type: Bell 206 Jet Ranger helicopter
Registration: C-FZHK
Survey Technology: Gradient magnetic survey
Total Line km: 267 km
Mean Bird Height: 47.0 meters
Survey Line Spacing: 50 meters
Survey Line Direction: 000°/180°
Tie Line Spacing: 500 meters
Tie Line Direction: 090°/270°
AIRBORNE SURVEY SYSTEM
Magnetometer Sensors: 4 x Scintrex CS-3 Cesium
Configuration: Triaxial magnetic gradient bird (X, Y, and Z axes)
Sample Rate: 20 Hz
Sensitivity: 0.0006 nT √Hz rms
Legend
Elevation Contours, 10 m Intervals
Joy West Survey Block Boundary
DATA REFERENCE
The Vertical Gradient (VG) is the difference between Mag 3 and Mag 4 divided by the sensor separation. Refer to report for details. The VG is represented as a grid and drawn with a histogram equalized and wet look colour shade; sun illumination inclination at 45° and declination at 045°.
TOPOGRAPHIC REFERENCE
National Topographic Data Base (NTDB), Canada. Ottawa, ON: Government of Canada, Natural Resources Canada, Center for Topographic Information
URL <http://ftp.geogratis.gc.ca/pub/nrcan_rncan/vector/ntdb_bndt/>[2007]
VG
(nT/m)
TRILLIUM GOLD
Joy West Survey Block
Magnetic Map
Vertical Gradient
Precision GeoSurveys
Scale 1:12500
Job #21155
July 15, 2021
Plate 9
VG


National Topographic System
MAP PROJECTION
Projection: Universal Transverse Mercator Zone 15N
Datum: WGS 84
Local Datum Transform: World
JOY WEST SURVEY SPECIFICATIONS
Survey Dates: June 9 to June 11, 2021
Survey Base: Red Lake, ON
Aircraft Type: Bell 206 Jet Ranger helicopter
Registration: C-FZHK
Survey Technology: Gradient magnetic survey
Total Line km: 267 km
Mean Bird Height: 47.0 meters
Survey Line Spacing: 50 meters
Survey Line Direction: 000°/180°
Tie Line Spacing: 500 meters
Tie Line Direction: 090°/270°
AIRBORNE SURVEY SYSTEM
Magnetometer Sensors: 4 x Scintrex CS-3 Cesium
Configuration: Triaxial magnetic gradient bird (X, Y, and Z axes)
Sample Rate: 20 Hz
Sensitivity: 0.0006 nT √Hz rms
Legend
Elevation Contours, 10 m Intervals
Joy West Survey Block Boundary
DATA REFERENCE
The Cross-Line Gradient (XLG) is the difference between Mag 1 and Mag 2 divided by the sensor separation. Refer to report for details. The XLG is represented as a grid and drawn with a histogram-equalized and wet-look colour shade; sun illumination inclination at 45° and declination at 045°.
TOPOGRAPHIC REFERENCE
National Topographic Data Base (NTDB), Canada. Ottawa, ON: Government of Canada, Natural Resources Canada, Center for Topographic Information
URL <http://ftp.geogratis.gc.ca/pub/nrcan_rncan/vector/ntdb_bndt/>[2007]
XLG
(nT/m)
TRILLIUM GOLD
Joy West Survey Block
Magnetic Map
Cross-Line Gradient
Precision GeoSurveys
Scale 1:12500
Job #21155
July 15, 2021
Plate 8
XLG

APPENDIX 2

Gerry-Joy Airborne Geophysical Survey Logistics Report

Precision GeoSurveys

AIRBORNE GEOPHYSICAL SURVEY REPORT

Joy West Survey Block

Red Lake, Ontario

Trillium Gold Mines Inc.

Precision GeoSurveys Inc.
www.precisiongeosurveys.com
Hangar 42 Langley Airport
21330 - 56th Ave., Langley, BC
Canada V2Y 0E5
604-484-9402

Shawn Walker, M.Sc., P.Geo.
August 2021
Job# 21155

Table of Contents

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List of Appendices

List of Joy West Survey Block Plates

1.0 Introduction

This report outlines the geophysical survey operations and data processing procedures taken during the high resolution helicopter-borne magnetic gradiometer survey flown over the Joy West survey block for Trillium Gold Mines Inc. The survey block is located in western Ontario (Figure 1) and it was flown from June 9 to June 11, 2021.

Figure 1: Joy West survey located in Western Ontario.

1.1 Survey Area

The Joy West survey block is centered approximately 50 km east of Red Lake, Ontario (Figure 2).

Figure 2: Joy West survey block east of Red Lake, Ontario.

Joy West was flown at 50 m line spacing at a heading of 000°/180°; tie lines were flown at 500 m spacing at a heading of 090°/270° (Figure 3).

Figure 3: Plan View – Joy West survey block with actual flight lines in yellow and survey block boundary in red.

1.2 Survey Specifications

The geodetic system used for the geophysical survey was WGS 84 in UTM Zone 15N. A total of 267 line km was flown over one survey block with a total area of 12.0 km^2 (Table 1). An additional 1 km was flown to retain data from flight lines flown outside the survey block margins for efficiency. Polygon coordinates for the Joy West survey block are specified in Appendix A.

Survey Block	Area (km^2)	Line Type	No. of Lines Planned	No. of Lines Completed	Line Spacing (m)	Line Orientation (UTM grid)	Total Planned Line km	Total Actual km Flown
Joy West	12.0	Survey	105	105	50	000°/180°	240	241
		Tie	9	9	500	090°/270°	26	26
		Total:	**114**	**114**			**266**	**267**

Table 1: Survey flight line specifications for Joy West.

2.0 Geophysical Data

Geophysical data are collected in a variety of ways and are used for many purposes including aiding in the determination of geology, mineral deposits, oil and gas deposits, geotechnical investigations, contaminated land sites, and UXO (unexploded ordnance) detection.

For the purposes of this survey, airborne gradient magnetic data were collected to serve in geological mapping and exploration for mineral deposits.

2.1 Magnetic Data

Magnetic surveying is the most common airborne geophysical technology used for both mineral and hydrocarbon exploration. Aeromagnetic surveys measure and record the total intensity of the magnetic field at the magnetometer sensor, which is a combination of the desired geomagnetic field as well as influences from the constantly varying solar wind and the aircraft's magnetic field. By subtracting temporal and aircraft magnetic effects, the resulting aeromagnetic maps show the spatial distribution and relative abundance of magnetic minerals - most commonly the iron oxide mineral magnetite - in the upper levels of Earth's crust, which in turn are related to lithology, structure, and alteration of bedrock. Survey specifications, instrumentation, and interpretation procedures depend on the objectives of the survey. Magnetic surveys are typically performed for:

- Geological Mapping - to aid in mapping lithology, structure, and alteration.
- Depth to Basement Mapping - for exploration in sedimentary basins or mineralization associated with the basement surface.

2.1.1 Gradient Magnetic Data

In addition to high resolution total magnetic field data, horizontal and vertical magnetic gradient data were collected by using a triaxial magnetic gradient bird-type system. Direct measurement of the magnetic gradient has the following benefits:

- Enhanced definition of near-surface anomalies.
- Emphasis on short wavelength spatial components of magnetic anomalies from horizontal variations of the gradients.
- Attenuation of long wavelength spatial components associated with regional trends and large scale anomalies.
- Reduction of high frequency temporal variations in the Earth's magnetic field due to micro-pulsations.
- Immunity to diurnal fluctuations.
- Reduction of aircraft/sensor movement errors.

3.0 Aircraft and Equipment

All geophysical and subsidiary equipment were carefully installed on an aircraft by Precision GeoSurveys to collect gradient magnetic data.

3.1 Aircraft

Precision GeoSurveys flew the survey using a Bell 206 Jet Ranger helicopter, registration C-FZHK.

3.2 Geophysical Equipment

The survey aircraft (Figure 4) was equipped with a slung bird-type triaxial magnetic gradient system, data acquisition system, GPS navigation systems, pilot guidance unit (PGU), laser altimeter, barometer, and fluxgate magnetometer. In addition, two magnetic base stations were used to record temporal magnetic variations. Technical specifications for the geophysical equipment are provided in Appendix B.

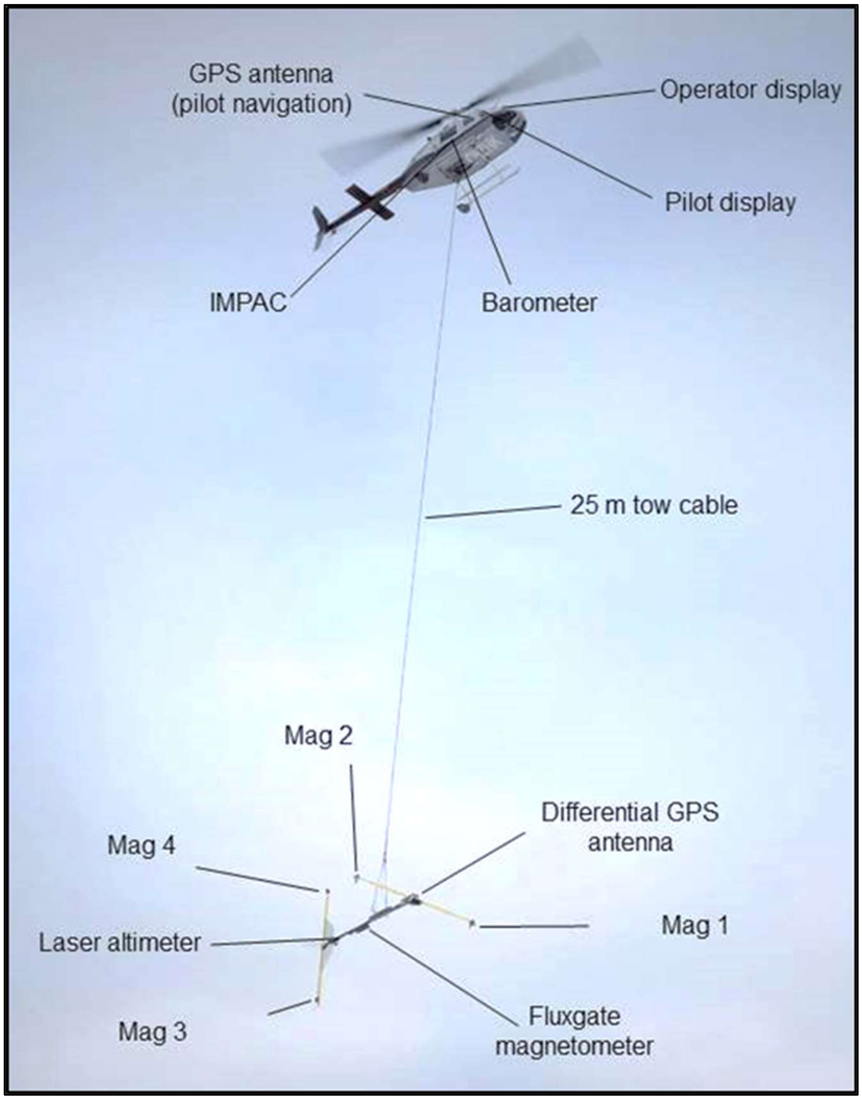

Figure 4: Survey helicopter equipped with geophysical equipment and the triaxial magnetic gradient bird-type configuration slung 25 m below the helicopter.

3.2.1 Triaxial Gradiometer

The primary geophysical technology used on this survey was a slung magnetic gradiometer, custom designed and manufactured by Precision GeoSurveys. The gradiometer bird is constructed completely from non-magnetic and non-conductive materials and provides the required sensor separation for triaxial gradient measurements in stable flight, while incorporating a laser altimeter, fluxgate magnetometer, and a GPS antenna. It is attached to the helicopter by a 25 m long tow cable that eliminates magnetic interference from the aircraft and holds the weight of the system. A shear pin is used as a safety weak link. Magnetic, laser altimeter, attitude, and GPS data are transmitted to the helicopter by wires routed along the tow cable. By design, this gradiometer separates the electronic equipment from the magnetic sensors to allow for cleaner data collection unaffected by electronic noise and the aircraft's magnetic fields. The bird weighs approximately 80 kg and can be disassembled into multiple components for ease of transport.

In total, the gradiometer (Figure 5) contains four Scintrex CS-3 cesium vapor magnetic sensors individually measuring the total magnetic intensity at their respective positions (Table 2). The unique arrangement of the sensors allows direct measurement of the geomagnetic field in the X (cross-line) gradient axis with the two forward sensors (Mag 1 and Mag 2) and the Z (vertical) gradient axis with the two aft sensors (Mag 3 and Mag 4).

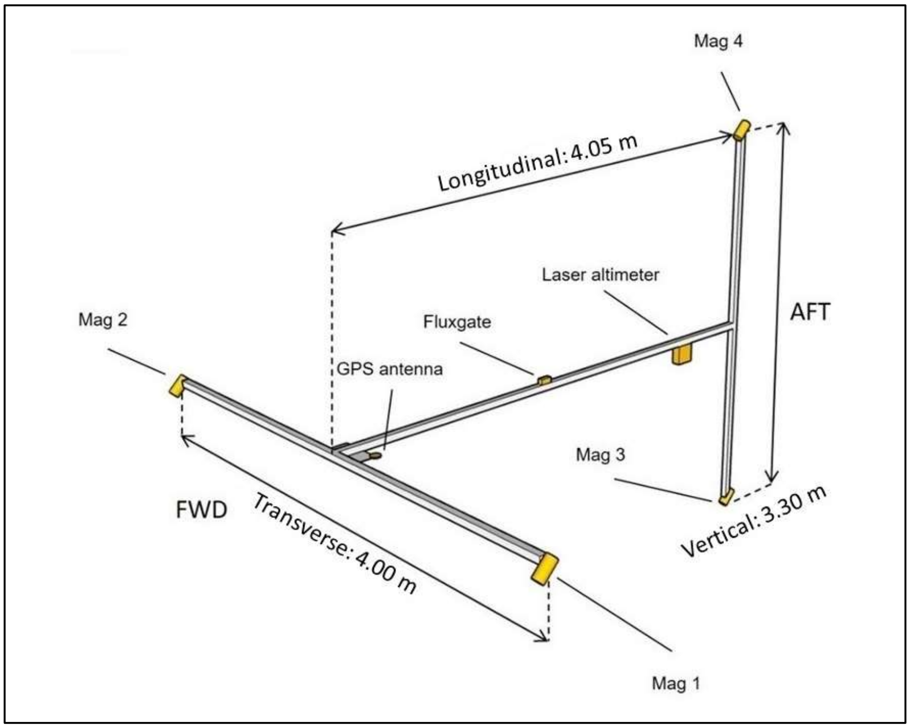

Figure 5: Schematic diagram of magnetic gradiometer system showing triaxial sensor separations. Not to scale.

Position	Location	Model	Serial Number
Mag 1	Forward left	Scintrex CS-3	0706248
Mag 2	Forward right	Scintrex CS-3	2010625
Mag 3	Aft lower	Scintrex CS-3	2105647
Mag 4	Aft upper	Scintrex CS-3	0712302

Table 2: Magnetometer details.

3.2.2 IMPAC

The Integrated Multi-Parameter Acquisition Console (IMPAC) (Figure 6), manufactured by Nuvia Dynamics Inc. (previously Pico Envirotec Inc.), is the main computer used in integrated data recording, data synchronizing, providing real-time quality control data for the geophysical operator display, and the generation of navigation information for the pilot and operator display systems.

Figure 6: IMPAC data acquisition system.

IMPAC uses the Microsoft Windows operating system and geophysical parameters are based on Nuvia's Airborne Geophysical Information System (AGIS) software. Depending on survey specifications, information such as magnetic field, electromagnetic response, total gamma count, counts of various radioelements (K, U, Th, etc.), cosmic radiation, barometric pressure, atmospheric humidity, temperature, aircraft attitude, navigation parameters, and GPS status can all be monitored on the AGIS on-board display (Figure 7).

While in flight, raw magnetic response, magnetic fourth difference, compensated and uncompensated magnetic data, radiometric spectra, EM response, aircraft position, survey altitude, cross track error, and other parameters in accordance with survey specifications are recorded and can be viewed by the geophysical operator for immediate QC (quality control). Additional software allows for post or real time magnetic compensation and radiometric calibration.

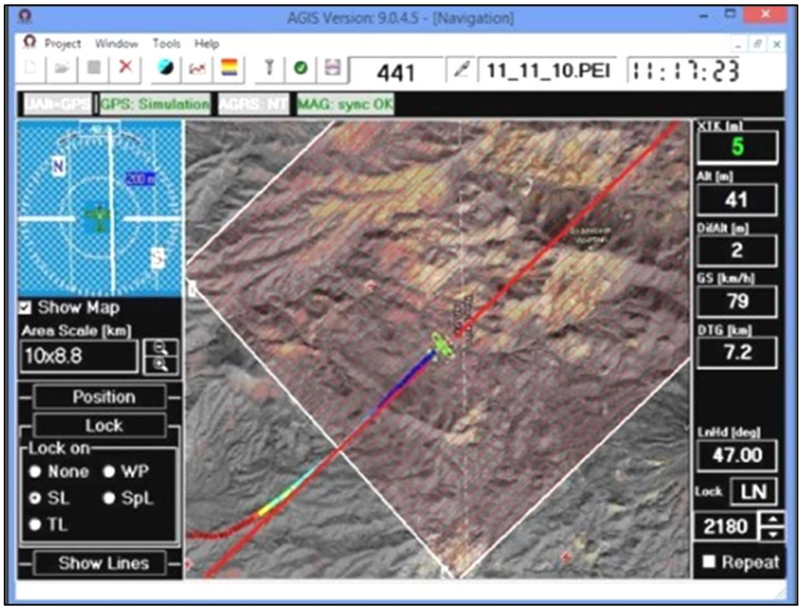

Figure 7: AGIS operator display showing real time flight line recording and navigation parameters. Additional windows display real-time geophysical data to operator.

3.2.3 GPS Navigation System

A Hemisphere R120 GPS receiver and a Novatel GPS antenna on the aircraft integrated with the AGIS navigation system and pilot display (PGU) provide accurate navigational information and control. A Hemisphere R330 GPS receiver (Figure 8) located in the helicopter connected to a Novatel GPS antenna located on the triaxial magnetic gradient bird airframe provides accurate position data for the bird independent of pilot navigation. The R120 and R330 GPS receivers support fast updates and output messages at a rate of up to 20 Hz (20 times per second); delivering sub-meter positioning accuracy in three dimensions for each of the two GPS antenna locations. They support GNSS (GPS/GLONASS) L1 and L2 signals.

The Hemisphere receivers support differential correction methods including L-Band, RTK, SBAS, and Beacon. They employ innovative Hemisphere GPS Eclipse SureTrack technology, which allows phase modeling on satellites that the airborne unit is currently tracking. With SureTrack technology, dropouts are reduced and speed of the signal reacquisitions is increased, enhancing accurate positioning when base corrections are not available.

Figure 8: Hemisphere R330 GPS receiver.

3.2.4 Pilot Guidance Unit

Steering and elevation (ground clearance) information is continuously provided to the pilot by the Pilot Guidance Unit (PGU). The graphical display is mounted on top of the aircraft's instrument panel, remotely from the data acquisition system. The PGU is the primary navigation aid (Figure 9) to assist the pilot in keeping the aircraft on the planned flight path, heading, speed, and at the desired ground clearance.

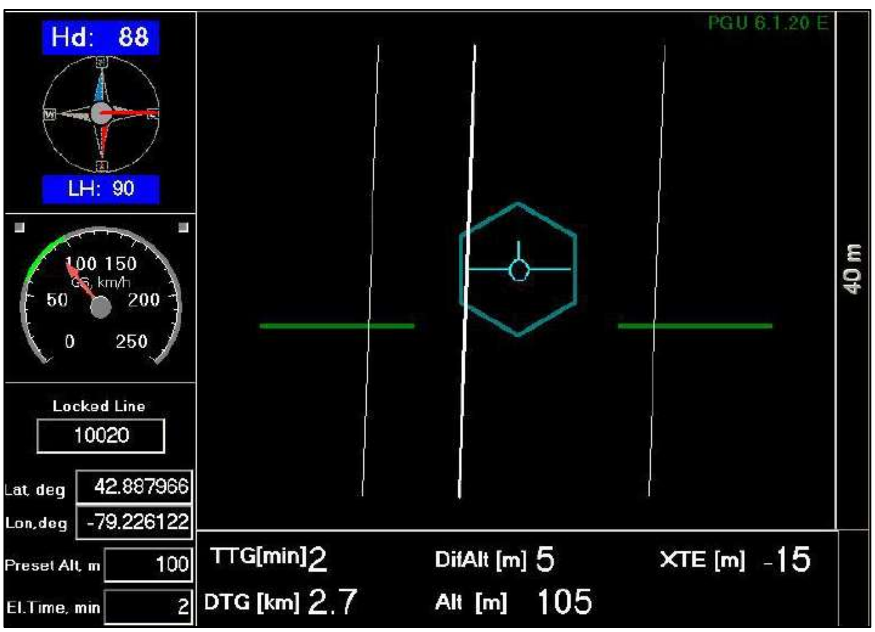

Figure 9: PGU screen displaying navigation information.

PGU information is displayed on a full VGA 600 x 800 pixel 7 inch (17.8 cm) LCD display. The CPU for the PGU is contained in a PC-104 console and uses Microsoft Windows operating system control, with input from the GPS antenna on the aircraft, laser altimeter, and AGIS.

3.2.5 Laser Altimeter

Terrain clearance is measured by an Opti-Logic RS800 Rangefinder laser altimeter (Figure 10) attached to the belly of the forward magnetometer boom. The RS800 laser is a time-of-flight sensor that measures distance by a rapidly modulated and collimated laser beam that creates a dot on the target surface. The maximum range of the laser altimeter is 700 m off natural surfaces with accuracy of ±1 m on 1 x 1 m diffuse target with 50% (±20%) reflectivity. Within the sensor unit, reflected signal light is collected by the lens and focused onto a photodiode. Through serial communications and digital outputs, ground clearance data are transmitted to an RS-232 compatible port and recorded and displayed by the AGIS and PGU at 10 Hz in meters.

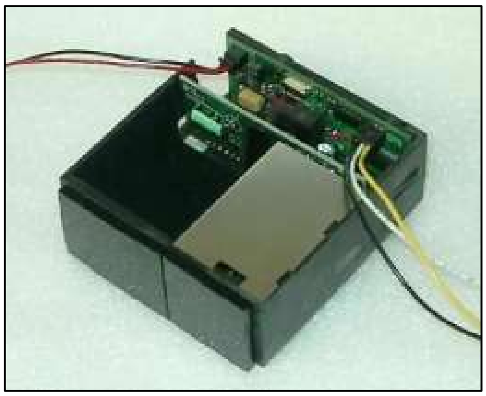

Figure 10: Opti-Logic RS800 Rangefinder laser altimeter.

3.2.6 Magnetometer

The survey was flown with four Scintrex CS-3 split-beam cesium vapor magnetometers (Figure 11) mounted in a non-magnetic and non-conductive slung bird-type configuration. The magnetometers were oriented at 45 degrees with respect to the horizontal to couple with local magnetic field at the Joy West survey area.

Figure 11: View of CS-3 cesium vapor magnetometers.

3.2.7 Fluxgate Magnetometer

As the gradient survey bird travels along a survey line, small attitude changes (pitch, roll, and yaw) are recorded by a triaxial fluxgate magnetometer (Figure 12). The fluxgate consists of three magnetic sensors, X, Y, and Z, operating independently and simultaneously. Each sensor has an analog output corresponding to the directional component of the ambient magnetic field along its axis. Response of the sensors is proportional to the cosine of the angle between the applied field and the sensor's sensitive axis.

Figure 12: Billingsley TFM100G2 triaxial fluxgate magnetometer.

3.2.8 Magnetic Base Station

Temporal variations of Earth's magnetic field, particularly diurnal, were monitored and recorded by two GEM GSM-19T base station magnetometers. They were operated at all times while airborne data were being collected. The base stations were located in an area with low magnetic gradient, away from electric power transmission lines and moving ferrous objects, such as motor vehicles, that could affect the survey data integrity.

The GEM GSM-19T magnetometer (Figure 13) with integrated GPS time synchronization uses proton precession technology with absolute accuracy of ±0.20 nT and sensitivity of 0.15 nT at 1 Hz. Base station magnetic data were recorded on internal solid-state memory and downloaded onto a field laptop computer using a serial cable and GEMLink 5.4 software. Profile plots of the base station readings were generated, updated, and reviewed at the end of each survey day.

Figure 13: GEM GSM-19T proton precession magnetometer.

4.0 Survey Operations

The survey was flown from June 9 to June 11, 2021, in cloudy conditions. The experience of the pilots ensured that data quality objectives were met, and that safety of the flight crew was never compromised given the potential risks involved in airborne geophysical surveying. Field processing and quality control checks were performed daily.

4.1 Operations Base and Crew

The base of operation for the Joy West survey was at the Red Lake Airport (CYRL), Ontario, west of the survey block.

Precision's geophysical crew consisted of three members (Table 3):

Crew Member	Position
Colin Pelton	Helicopter survey pilot and AME
Wendell Huttema, Ph.D.	Geophysical operator and electronics technician
Shawn Walker, M.Sc., P.Geo.	Geophysicist – data processor, mapping, and reporting (off-site)

Table 3: List of survey crew members.

4.2 Magnetic Base Station Specifications

Changes in the Earth's magnetic field over time, such as diurnal variations, magnetic pulsations, and geomagnetic storms, were measured and recorded by two stationary GEM GSM-19T proton precession magnetometers. The magnetic base stations were installed at the Red Lake Airport (Table 4; Figures 14 and 15) in an area of low magnetic interference away from metallic items such as ferromagnetic objects, vehicles, and power lines that could affect the base stations and ultimately the survey data.

Station Name	Easting/Northing	Latitude/Longitude	Datum/Projection
GEM 3 S/N 5081669	444235 m E 5657849 m N	51° 4' 11.081" N 93° 47' 45.28" W	WGS 84, Zone 15N
GEM 4 S/N 2065370	444248 m E 5657882 m N	51° 4' 11.08" N 93° 47' 44.63" W	WGS 84, Zone 15N

Table 4: Magnetic base station locations.

Magnetic readings were reviewed at regular intervals to ensure that no airborne data were collected during periods of high magnetic activity (greater than 10 nT change per minute).

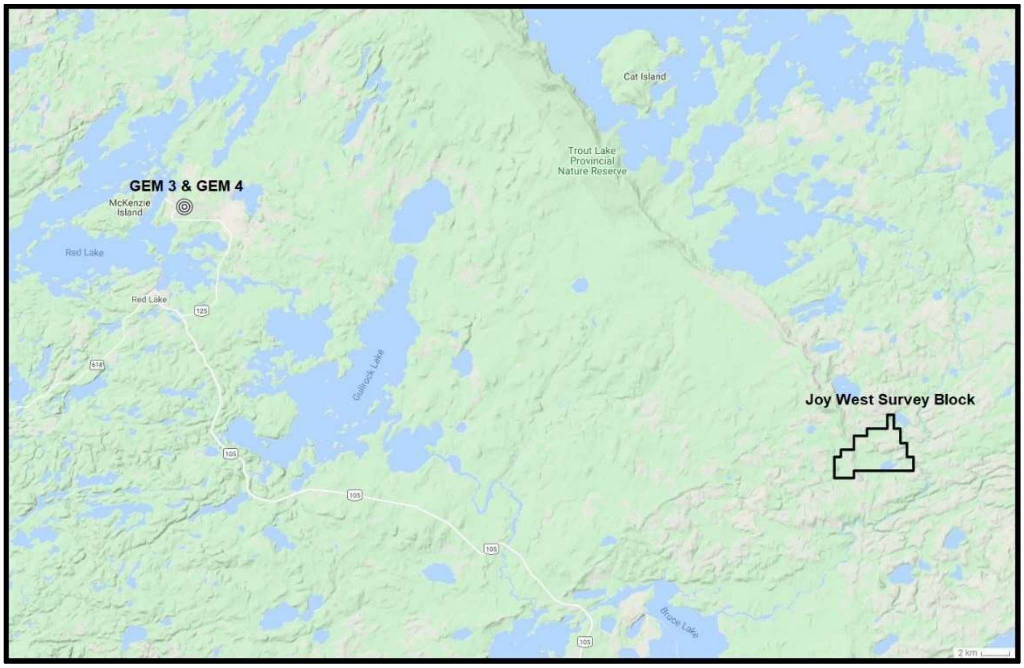

Figure 14: GEM 3 and GEM 4 magnetic base stations located west of the survey block.

Figure 15: GEM 3 (left) and GEM 4 (right) magnetic base stations at the Red Lake Airport, Ontario.

4.3 Field Processing and Quality Control

Survey data were transferred from the aircraft's data acquisition system to a USB memory stick and copied onto a field data processing laptop on a flight by flight basis. The raw data files in PEI binary data format were converted into Geosoft GDB database format. Using Geosoft Oasis

Montaj 9.9.1, the data were inspected to ensure compliance with contract specifications (Table 5; Figures 16 to 18).

Parameter	Specification	Tolerance
Position	Line Spacing	Flight line deviation within 8 m L/R from ideal flight path. No exceedance for more than 1 km.
	Height	Nominal flight height of 40 m above ground level (AGL) with tolerance of ±10 m. No exceedance for more than 1 km, provided deviation is not due to tall trees, topography, mitigation of wildlife/livestock harassment, cultural features, or other obstacles beyond the pilot's control.
	GPS	GPS signals from four or more satellites must be received at all times, except where signal loss is due to topography. No exceedance for more than 1 km.
Magnetics	Temporal/Diurnal Variations	Non-linear temporal magnetic variations within 10 nT of a linear chord of length 5 minutes.
	Normalized 4th Difference	Magnetic data within 0.01 nT peak to peak. No exceedance for distances greater than 1 km or more, provided noise is not due to geological or cultural features.

Table 5: Contract survey specifications.

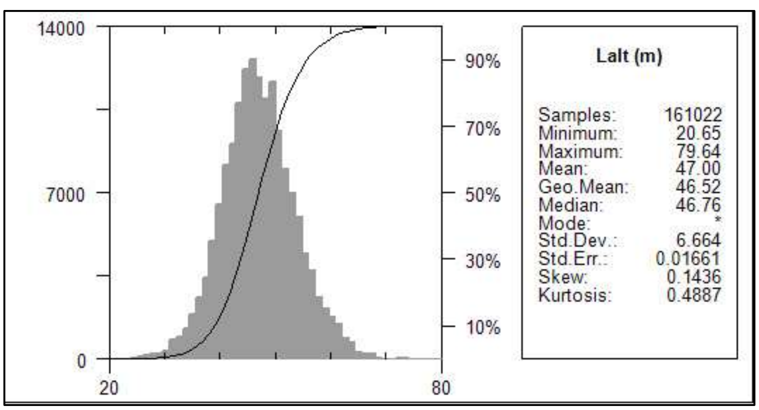

Figure 16: Histogram showing survey bird elevation vertically above ground.

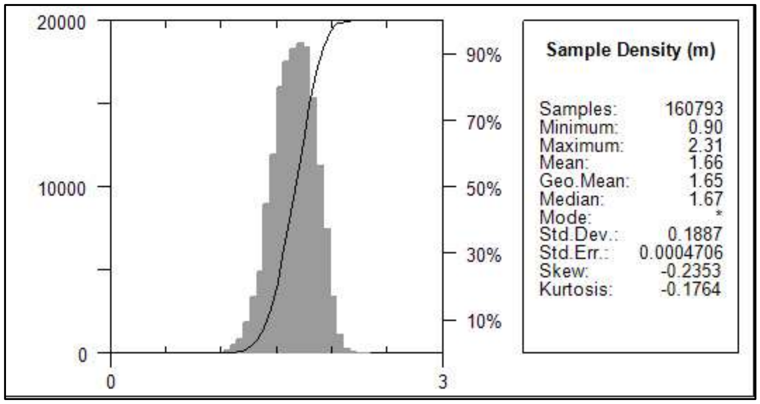

Figure 17: Histogram showing magnetic sample density. Horizontal distance in meters between adjacent in-line measurement locations; magnetic sample frequency 20 Hz.

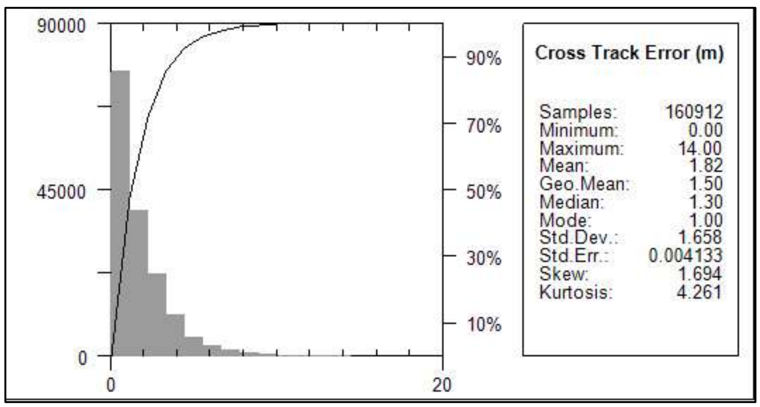

Figure 18: Histogram showing cross track error of survey bird.

5.0 Data Acquisition Equipment Checks

Equipment tests and calibrations were conducted for the laser altimeter and magnetometers at the start of the survey to ensure compliance with contract specifications and to deliver high quality airborne geophysical data. A lag test was conducted for both the laser altimeter and magnetometers. For the airborne magnetometers, a heading error test was flown.

5.1 Laser Altimeter Calibration

The Opti-Logic RS800 laser altimeter used on the survey helicopter was tested and calibrated in accordance with manufacturer's instructions prior to starting the survey. This ensured that heights reported by the laser were accurate within the normal survey operating range.

5.2 Lag Test

A lag test was performed to determine the difference in time the digital reading was recorded for the magnetometers and laser altimeter with the position fix time that the fiducial of the reading was obtained by the GPS system resulting from a combination of system lag and different locations of the various sensors and the GPS antenna. The test was flown in reciprocal headings over identifiable features at survey speed and height to isolate position changes. The resulting data (Table 6) were used to correct for time and position.

Instrument	Source	Lag Fiducial	Correction (sec)
Mag 1	Logging equipment	42	2.1
Mag 2	Logging equipment	42	2.1
Mag 3	Logging equipment	42	2.1
Mag 4	Logging equipment	42	2.1
Laser	Sharp gully	40	2.0

Table 6: Survey lag correction values. Laser altimeter resampled to 20 Hz.

5.3 Heading Correction Test

Optically pumped magnetometers are subject to small errors in the reported total magnetic intensity depending on the direction of flight. For a gradient survey, this heading error is determined for each of the four survey flight directions by comparing the average total magnetic intensity for all four sensors with the average total magnetic intensity reported by the individual sensors. These four differences are then averaged, and the same heading correction is applied to all four sensors in the four flight directions, so that the gradient measurements are not affected. Results of the heading correction analysis are summarized in Table 7.

Heading	Heading Correction (nT)
000°	-0.31
090°	1.07
180°	0.67
270°	-1.43
Total:	**0.00**

Table 7: Heading correction data.

6.0 Data Processing

After all data were collected, several procedures were undertaken to ensure that the data met a high standard of quality. All magnetic data recorded by the AGIS were converted into Geosoft or ASCII file formats using Nuvia Dynamics software. Further processing (Figure 19) was carried out using Geosoft Oasis Montaj 9.9.1 geophysical processing software along with proprietary processing algorithms.

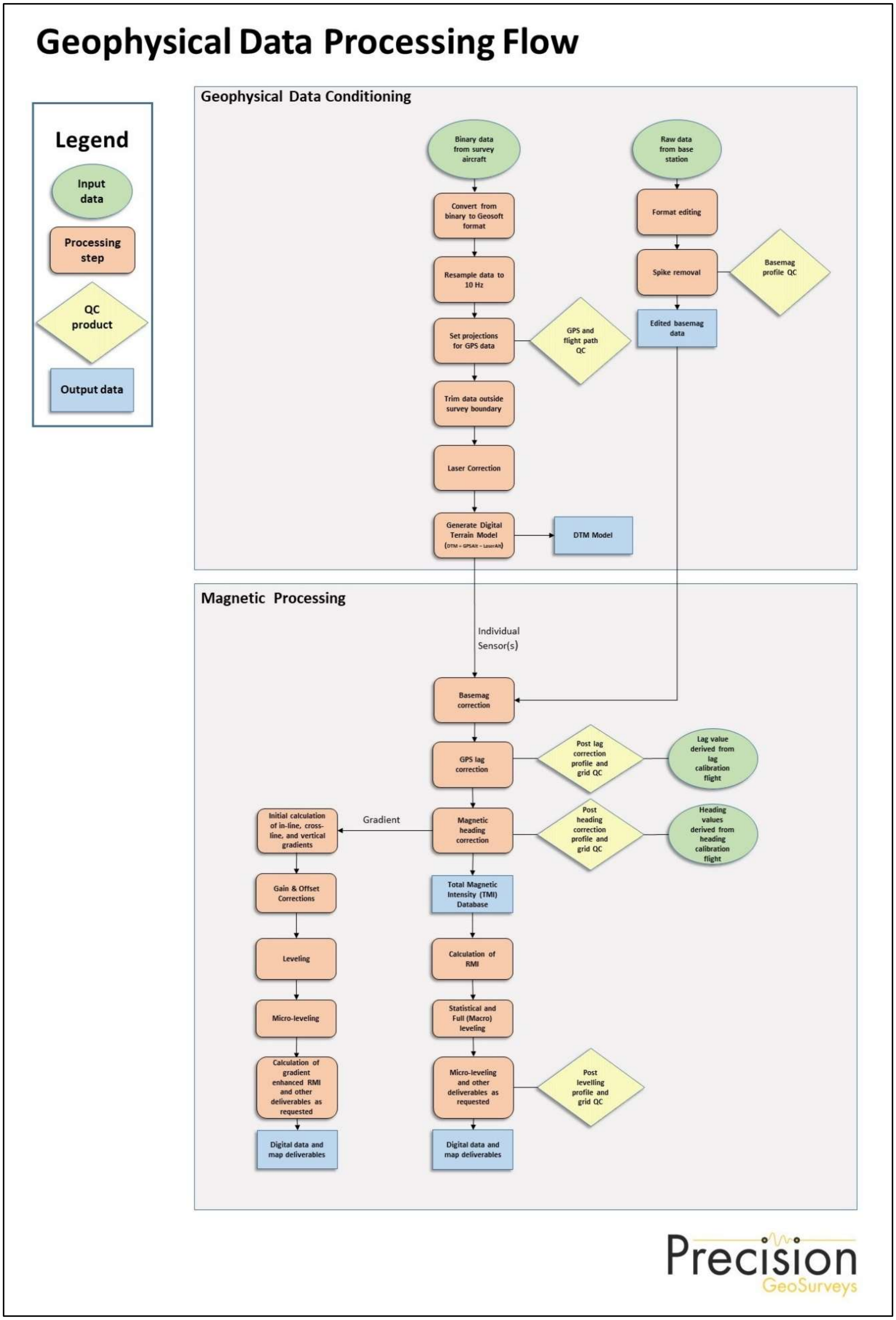

Figure 19: Magnetic data processing flow.

6.1 Position Corrections

In order to collect high resolution geophysical data, the location at which the data were collected and recorded must be accurate.

6.1.1 Lag Correction

A correction for lag error was applied to the geophysical data recorded at each individual sensor to compensate for the combination of lag in the recording system and the sensing instrument flying in a different location from the GPS antenna, as determined during the lag test. Validity of the lag corrections was confirmed by the absence of grid corrugations in adjoining reciprocal lines.

6.2 Flight Height and Digital Terrain Model

Laser altimeters are unable to provide valid data over glassy water or fog which dissipate the laser so that a “zero” reading is obtained. In these cases, estimates of correct height are inserted manually. Dense vegetation generates high frequency variations from leaf and branch reflections. A Rolling Statistics filter is applied to the lag corrected (2.0 seconds lag) laser altimeter data to remove vegetation clutter followed by a Low Pass filter to smooth out the laser altimeter profile to eliminate isolated high frequency noise and generate a surface closely corresponding to the actual ground profile.

A Digital Terrain Model (DTM) channel was calculated by subtracting the processed laser altimeter data from the filtered GPS altimeter data defined by the WGS 84 ellipsoidal height. DTM accuracy is affected by the geometric relationship between the GPS antenna and the laser altimeter as well as flight attitude of the aircraft, slope of the ground, sample density, and satellite geometry.

6.3 Magnetic Processing

Magnetic data from each individual sensor were corrected for temporal variations (including diurnal) and lag. The data were examined for magnetic noise and spikes, which were removed as required. The background magnetic field, International Geomagnetic Reference Field (IGRF) of the Earth was removed. Survey and tie line data of the resulting residual magnetic field were leveled. Magnetic gradients in the X, Y, and Z axes were determined to provide in-line, cross-line, and vertical gradients, respectively.

6.3.1 Temporal Variation Correction

The intensity of Earth’s magnetic field varies with location and time. The time variable, known as diurnal or more correctly temporal variation, is removed from the recorded airborne data to provide the desired magnetic field at a specified location. Magnetic data from base station GEM

3 were used for correcting the airborne magnetic survey data, and GEM 4 data were retained for backup. The data were edited, plotted, and merged into a Geosoft database (.GDB) on a daily basis.

Base station measurements were averaged to establish a magnetic reference datum of 56948.25 nT. Magnetic deviations relative to the reference datum were used to calculate the observed variations of the Earth's magnetic field over time. The airborne magnetic data were then corrected for temporal variations by subtracting the base station deviations from the data collected on the aircraft, effectively removing the effects of diurnal and other temporal variations.

6.3.2 Heading Correction

For each survey heading, changes in the apparent magnetic field due to instrumental heading error are measured and recorded. These values are used to construct a heading table (.TBL) file. For the entire dataset, the overall average magnetic field value was calculated. For each of the four headings, the averages were calculated and then compared to the overall average to determine four values which were used to correct heading and offset errors in each flight direction for each magnetometer.

6.3.3 IGRF Removal

The International Geomagnetic Reference Field (IGRF) model is the empirical representation of Earth's dynamic magnetic field (main core field without external sources) collected and disseminated from satellite data and from magnetic observatories around the world. The IGRF has historically been revised and updated every five years by a group of modellers associated with the International Association of Geomagnetism and Aeronomy (IAGA).

The initial unleveled Residual Magnetic Intensity (RMI) was calculated by taking the difference between the 13th generation IGRF (IGRF-13, released in December 2019) and the non-leveled Total Magnetic Intensity (TMI) to create a more valid model of individual near-surface magnetic anomalies. This model is independent of time to allow for other magnetic data (previous or future) to be more easily incorporated into each survey database.

6.3.4 Leveling and Micro-leveling

Small inconsistencies in flight height and line orientation result in small spatial variabilities in magnetic intensity measured at the intersection points of survey lines and tie lines. Using the initial Residual Magnetic Intensity (RMI) data from the average of Mag 1 and Mag 2 (TMI with the IGRF removed), RMI data from survey and tie lines were leveled to each other. Two types of leveling were applied to the corrected data: conventional leveling and micro-leveling. There were two components to conventional leveling: statistical leveling to level tie lines and full leveling to level survey lines. The statistical leveling method corrected the SL/TL intersection errors that follow a specific pattern or trend. Through the error channel, an algorithm calculated a least-squares trend line and derived a trend error curve, which was then added to the channel to be leveled. The second component was full leveling. This adjusted the magnetic value of the survey lines so that all lines matched the trended tie lines at each intersection point.

Following statistical leveling, micro-leveling was applied to the corrected conventional leveled data. This iterative grid-based process removed low amplitude components of flight line noise that still remained in the data after tie line and survey line leveling and resulted in fully leveled RMI data.

6.4 Magnetic Gradient

When magnetic values are obtained simultaneously from two or more sensors at a fixed separation, gradient of the magnetic field can be measured. Dividing the difference in magnetic values between the sensors by the distance between the sensors yields the magnetic gradient. The units are commonly reported as nT/m and, by convention, positive magnetic polarity is defined as to the north and east, and negative to the south and west. For vertical gradient, positive is defined as downwards. The sensors and the separations that were used to determine the various gradients are listed in Table 8.

Direction	Sensors	Separation (m)
Lateral (X)	Mag 1 and Mag 2	4.00
Longitudinal (Y)	Sequential TMI values (Average of Mag 1 and Mag 2)	1.66*
Vertical (Z)	Mag 3 and Mag 4	3.30

Table 8: Magnetic sensor relationship used to calculate magnetic gradients. Total magnetic intensity (TMI) was determined as the average of Mag 1 and Mag 2, and successive values of the TMI were used to determine the longitudinal (Y axis) gradient.
*average separation between sequential TMI values shown; actual value varied according to aircraft speed.

Because the magnetic field gradient varies more rapidly than total field strength, magnetic gradient provides higher spatial resolution, especially for shallow sources that are smaller than the survey line spacing or linear sources that are parallel to flight lines. Magnetic gradients, as compared to total magnetic intensities, have the additional benefits of being less sensitive to temporal variations and aircraft/sensor movement errors.

6.4.1 Horizontal Gradients

Horizontal magnetic gradients were determined in the in-line (Y axis) and cross-line (X axis) directions. Mag 1 (left) and Mag 2 (right) were used for both directions so that elevations were consistent in both axes. Gradients were calculated with respect to the magnetometer array with units provided as nT/m.

In-line gradient (ILG) is determined from successive average magnetic values of Mag 1 and Mag 2 referenced to the distance between data points in accordance with the following formula:

$$ILG = \frac{a(i+1) - a(i-1)}{d(i+1) + d(i-1)}$$

where: a is the average total magnetic intensity of Mag 1 and Mag 2
d is the distance between measurements
i is the record number for the sample location

Cross-line gradient (XLG) was measured directly by dividing the difference between Mag 1 and Mag 2 by the sensor separation in accordance with the following formula:

$$XLG = \frac{\text{Mag 1} - \text{Mag 2}}{d_x}$$

where: d_x is the transverse sensor separation, 4.00 m

Gain corrections were applied to the initial cross-line gradient. Overall, Mag 1 and Mag 2 should produce the same total magnetic field. If the ratio of the TMI between the sensors does not equal one, a gain correction needs to be applied to account for instrument error and asymmetric magnetic fields. The mean of the ratio between the TMI values for Mag 1 and Mag 2 for each line was calculated and applied to each Mag 2 value along the line. The cross line gradient was then re-calculated from the gain-corrected Mag 2 values.

After correcting for gain in the cross-line gradient, offset corrections were applied. Offsets were determined by subtracting the first difference of the gain-corrected cross-line gradient from the gain-corrected gradient to reduce line-to-line errors (striping) in the gradient grid. The resulting data were then micro-leveled to remove any remaining striping.

Total Horizontal Gradient (HG) is the magnitude of the combined in-line and cross-line gradients. It is used to estimate contact locations of magnetic bodies at shallow depths, reveal anomaly textures, and highlight anomaly-pattern discontinuities. Horizontal Gradient (HG) is calculated as:

$$\text{HG}(x, y) = \sqrt{ILG^2 + XLG^2}$$

where: ILG is the in-line gradient
XLG is the cross-line gradient

6.4.2 Vertical Gradient

Vertical gradient (Z axis) is useful for enhancing shorter wavelength signals; therefore, edges of magnetic anomalies are highlighted, and deep geologic sources in the data are suppressed.

Vertical gradient is determined directly with respect to the magnetometer array of Mag 3 (lower) and Mag 4 (upper) with units provided as nT/m as follows:

$$Vertical\ Gradient = \frac{\text{Mag 3} - \text{Mag 4}}{d_z}$$

where: d_z is the vertical sensor separation, 3.30 m

6.4.3 Calculation of First Vertical Derivative

First Vertical Derivative (1VD) is the first order vertical derivative of the leveled Reduced to Magnetic Pole (RTP) data determined from RMI. It is the vertical rate of change in the magnetic field per unit distance (m). The vertical gradient is used to enhance shorter wavelength signals; therefore, edges of magnetic anomalies are highlighted, and deep geologic sources in the data are suppressed.

The filter, L, used to produce the n^{th} vertical derivative is described by:

$$L(r) = r^n$$

where: r is the radial component in the wavenumber domain

6.4.4 Gradient Enhanced Magnetic Intensity

Using the measured gradients (in-line and cross-line directions), the initial enhanced Total Magnetic Intensity (TMIge) was generated. A Butterworth high-pass filter was applied to this initial enhanced TMI to extract the short wavelength signals and a low-pass filter was applied to the measured TMI to extract the long wavelength signals. These wavelengths are then summed together to generate the final enhanced Total Magnetic Intensity. By subtracting the IGRF, the gradient enhanced Residual Magnetic Intensity (RMIge) was generated.

6.4.5 Gradient Enhanced Reduction to Magnetic Pole

Gradient enhanced Reduced to Magnetic Pole (RTPge) data were determined from the gradient enhanced Residual Magnetic Intensity (RMIge) data. The RTP filter was applied in the Fourier domain and rotates the observed magnetic inclination and declination field to what the field would look like at the north magnetic pole, to allow observation of magnetic trends and patterns independent of magnetic inclination and declination. Eliminating the dipolar nature of magnetic anomalies is useful for interpretation because peak RTP magnetic values can be related to the centre of magnetic rock bodies and asymmetries in the RTP imagery closely reflect true dips and plunges.

Inclination and declination were calculated by using the "Date" channel. The derived values were used in the following formula:

$$RTP\ (\theta) = \frac{[\sin(I) - I\ \cdot \cos(I) \cdot \cos(D - \theta)]^2}{[\sin^2(I_a) + \cos^2(I_a) \cdot \cos^2(D - \theta)] \cdot [\sin^2(I) + \cos^2(I) \cdot \cos^2(D - \theta)]}$$

where: I is geomagnetic inclination in ° from horizontal
D is geomagnetic declination in ° azimuth from magnetic north
I_a is the inclination for amplitude correction (never less than I). Default is ± 20°. If $|I_a|$is specified to be less than$|I|$, it is set to I

7.0 Deliverables

Joy West survey block data are presented as digital databases, maps, and a logistics report.

7.1 Digital Data

Digital files have been provided in three formats:

- GDB file for use in Geosoft Oasis Montaj,
- XYZ file,
- CSV Excel comma separated file.

Full descriptions of the digital data and contents are included in Appendix C.

7.1.1 Grids

The digital data were represented as grids as listed below:

- Digital Terrain Model (DTM)
- Total Magnetic Intensity (TMI)
- Residual Magnetic Intensity (RMI) – removal of IGRF from TMI
- Reduced to Magnetic Pole (RTP) – reduced to magnetic pole of RMI
- In-Line Gradient (ILG)
- Cross-Line Gradient (XLG)
- Vertical Gradient (VG)

- Horizontal Gradient (HG) – total magnitude of the horizontal gradients (in-line and cross-line)
- First Vertical Derivative (1VD) of RTP
- Gradient enhanced Total Magnetic Intensity (TMIge)
- Gradient enhanced Residual Magnetic Intensity (RMIge)
- Gradient enhanced Reduced to Magnetic Pole (RTPge) – reduced to magnetic pole of RMIge

Magnetic data were gridded and displayed using the following Geosoft parameters:

- Gridding method: minimum curvature
- Grid cell size: 12.5 m
- Low-pass desampling factor: 2
- Tolerance: 0.001
- % pass tolerance: 99.99
- Maximum iterations: 100

The gradient and gradient enhanced magnetic grids were drawn with a wet-look colour shade and all other magnetic grids were drawn with a histogram-equalized colour shade. All maps were shaded with the sun illumination inclination at 45° and declination at 045°. DTM grid was drawn with a linear topographic colour scale.

7.2 KMZ

Gridded digital data were exported into .KMZ files which can be displayed using Google Earth. The grids can be draped onto topography and rendered to give a 3D view.

7.3 Maps

Digital maps were created for the Joy West survey block. The following map products were prepared:

Overview Maps (colour images with elevation contour lines):

- Actual flight lines, with topographic features
- DTM

Magnetic Maps (colour images with elevation contour lines):

- TMI, with actual flight lines and topographic features
- TMI
- RMI
- RTP of RMI

- ILG
- XLG
- VG
- HG
- 1VD of RTP

Gradient Enhanced Magnetic Maps (colour images with elevation contour lines):

- TMIge
- RMIge
- RTPge of RMIge

All survey maps were prepared in WGS 84 and UTM Zone 15N.

7.4 Report

A pdf copy of the logistics report is included along with digital data and maps. The report provides information on the data acquisition procedures, data processing, and presentation of the Joy West survey block data.

8.0 Conclusions and Recommendations

The Joy West survey resulted in the collection of 267 line km of high resolution gradient magnetic data over one survey block. The data have been processed and plotted on maps as a representation of the magnetic features of the survey area.

Geophysical data processing, particularly leveling and data interpolation routines, may tend to smooth the original data so that resolution is reduced. In addition, gridding algorithms are not always able to properly calculate grids where flight height between adjacent flight lines varied due to cultural obstacles or steep terrain, where geological structures are acute to flight lines, where line spacing exceeds the size of the causative anomaly, or near grid margins as in "edge effects." Therefore, subtle geophysical features in gridded and derivative-enhanced products or near the survey margins may introduce artifacts and must be evaluated with discretion.

The airborne geophysical data were acquired to map the geophysical characteristics of the survey area, which are in turn related to the distribution of magnetic minerals in the Earth. Magnetic patterns correspond to the concentration and distribution of magnetite and other magnetic minerals in Earth's subsurface. Therefore, the geophysical data will be useful in mapping lithology, structure, and alteration, which will benefit mineral exploration initiatives and geological studies.

Geophysical data are rarely a direct indication of mineral deposits and therefore interpretation and careful integration with existing and new geological, geochemical, and other geophysical data are recommended to maximize value from the survey investment.

Respectfully submitted,
Precision GeoSurveys Inc.

Shawn Walker, P.Geo.
August 2021

Appendix A

Polygon Coordinates

Joy West – WGS 84 Zone 15N

Latitude (deg N)	Longitude (deg W)	Easting (m)	Northing (m)
50.90834	93.18126	487256	5639648
50.92084	93.18126	487260	5641038
50.92084	93.17501	487699	5641037
50.92501	93.17501	487700	5641500
50.92501	93.16251	488578	5641498
50.93334	93.16251	488581	5642425
50.93334	93.15001	489459	5642423
50.93751	93.15001	489460	5642886
50.93751	93.13126	490777	5642884
50.94584	93.13126	490779	5643810
50.94584	93.12501	491218	5643810
50.93751	93.12501	491216	5642883
50.93751	93.11876	491656	5642882
50.92918	93.11876	491654	5641956
50.92918	93.11251	492093	5641955
50.92084	93.11251	492092	5641028
50.92084	93.10626	492531	5641028
50.91251	93.10626	492530	5640101
50.91251	93.16251	488575	5640108
50.90834	93.16251	488574	5639645

Appendix B

Equipment Specifications

- GEM GSM-19T Proton Precession Magnetometer (Magnetic Base Station)
- Hemisphere R120 GPS Receiver (for pilot navigation)
- Hemisphere R330 GPS Receiver (for data recovery)
- Opti-Logic RS800 Rangefinder Laser Altimeter
- Setra Model 276 Barometric Pressure Sensor
- Scintrex CS-3 Survey Magnetometer
- Billingsley TFM100G2 Ultra Miniature Triaxial Fluxgate Magnetometer
- Nuvia Dynamics IMPAC data recorder system (for navigation and geophysical data acquisition)

GEM GSM-19T Proton Precession Magnetometer (Magnetic Base Station)

Sensitivity	0.15 nT @ 1 Hz
Resolution	0.01 nT (gamma), magnetic field and gradient
Absolute Accuracy	±0.2 nT @ 1 Hz
Operating Range	20,000 nT to 120,000 nT
Gradient Tolerance	Over 7,000 nT/m
Operating Ranges	Temperature: -40°C to +50°C Battery Voltage: 10.0 V minimum to 15 V maximum Humidity: up to 90% relative, non-condensing
Storage Temperature	-50°C to +50°C
Dimensions	Console: 223 x 69 x 40 mm Sensor Staff: 4 x 450 mm sections Sensor: 170 x 71 mm dia. Weight: console 2.1 kg, sensor and staff assembly 2.2 kg
Integrated GPS	Yes

Hemisphere R120 GPS Receiver

GPS Sensor	Receiver Type	L1, C/A code, with carrier phase smoothing (Patented COAST technology during differential signal outage
	Channels	12-channel, parallel tracking (10-channel when tracking SBAS)
	Update Rate	Up to 20 Hz position
	Cold Start Time	<60 s
	SBAS Tracking	2-channel, parallel tracking
	Horizontal Accuracy	<0.02 m 95% confidence (RTK 1, 2) <0.28 m 95% confidence (L-Dif 1, 2) <0.6 m 95% confidence (DGPS 1,3) <2.5 m 95% confidence (autonomous, no SA1)
	Differential Options	SBAS, Autonomous, External RTCM, RTK, OmniSTAR (HP/XP)
Beacon Sensor Specifications	Channels	2-channel, parallel tracking
	Frequency Range	283.5 to 325 kHz
	MSK Bit Rates	50, 100, and 200 bps
L-Band Sensor	Channels	Single channel
	Frequency Range	1530 MHz to 1560 MHz
	Satellite Selection	Manual or Automatic (based on location)
	Startup and Satellite Reacquisition Time	15 seconds typical
Communications	Serial Ports	2 full duplex RS232C
	Baud Rates	4800 – 115200
	USB Ports	1 Communications
	Correction I/O Protocol	RTCM SC-104
	Data I/O Protocol	NMEA 0183
	Timing Output	1 PPS (HCMOS, active high, rising edge sync, 10 kΩ, 10 pF load)
	Raw Data	Proprietary binary (RINEX utility available)
Environmental	Operating Temperature	-30°C to +70°C
	Storage Temperature	-40°C to +85°C
	Humidity	95% non-condensing
Power GPS Sensor	Input Voltage Range	8 to 36 VDC
	Power Consumption	3 Watts
	Current Consumption	< 250 mA @ 12 VDC
	Antenna Voltage Output	5.0 VDC

[1]Depends on multipath environment, number of satellites in view, satellite geometry and ionospheric activity.
[2] Up to 5 km baseline length.
[3] Depends also on baseline length.

Hemisphere R330 GPS Receiver

GPS Sensor	Receiver Type	L1 and L2 RTK with carrier phase	
	Channels	12 L1CA GPS 12 L1P GPS 12 L2P GPS 12 L2C GPS 12 L1 GLONASS (with subscription code) 12 L2 GLONASS (with subscription code) 3 SBAS or 3 additional L1CA GPS	
	Update Rate	10 Hz standard, 20 Hz available	
	Cold Start Time	<60 s	
	Warm Start Time 1	30 s (valid ephemeris)	
	Warm Start Time 2	30 s (almanac and RTC)	
	Hot Start Time	10 s typical (valid ephemeris and RTC)	
	Reacquisition	<1 s	
	Differential Options	SBAS, Autonomous, External RTCM, RTK, OmniSTAR (HP/XP)	
Horizontal Accuracy		RMS (67%)	2DRMS (95%)
	RTK [1,2]	10 mm + 1 ppm	20 mm + 2 ppm
	OmniSTAR HP [1,3]	0.1 m	0.2 m
	SBAS (WAAS) [1]	0.3 m	0.6 m
	Autonomous, no SA [1]	1.2 m	2.5 m
L-Band Sensor	Channel	Single channel	
	Frequency Range	1530 MHz to 1560 MHz	
	Satellite Selection	Manual or Automatic (based on location)	
	Startup and Satellite Reacquisition Time	15 seconds typical	
Communications	Serial Ports	2 full duplex RS232	
	Baud Rates	4800 – 115200	
	USB Ports	1 Communications, 1 Flash Drive data storage	
	Correction I/O Protocol	Hemisphere GPS proprietary, RTCM v2.3 (DGPS), RTCM v3 (RTK), CMR, CMR+NMEA 0183, Hemisphere GPS binary	
	Timing Output	1 PPS (HCMOS, active high, rising edge sync, 10 kΩ, 10 pF load)	
	Event Marker Input	HCMOS, active low, falling edge sync, 10 kΩ	
Environmental	Operating Temperature	-40°C to +70°C	
	Storage Temperature	-40°C to +85°C	
	Humidity	95% non-condensing	
Power GPS Sensor	Input Voltage Range	8 to 36 VDC	
	Consumption, RTK	<3.5 W (0.30 A @ 12 VDC typical)	
	Consumption, OmniSTAR	<4.3 W (0.36 A @ 12 VDC typical)	

[1]Depends on multipath environment, number of satellites in view, satellite geometry and ionospheric activity.
[2] Depends also on baseline length.
[3] Requires a subscription from OmniSTAR.

Opti-Logic RS800 Rangefinder Laser Altimeter

Accuracy	±1 m on 1x1 m^2 diffuse target with 50% reflectivity, up to 700 m
Resolution	0.2 m
Communication Protocol	RS232-8, N, 1 ASCII characters
Baud Rate	19200
Data Raw Counts	~200 Hz
Data Calibrated Range	~10 Hz
Data Rate	~200 Hz raw counts for un-calibrated operation; ~10 Hz for calibrated operation (averaging algorithm seeks 8 good readings)
Calibrated Range Units	Feet, Meters, Yards
Laser	Class I (eye-safe), 905 nm ± 10 nm
Power	7 - 9 VDC conditioned required, current draw at full power (~ 1.8 W)
Laser Wavelength	RS100 905 nm ± 10 nm
Laser Divergence	Vertical axis – 3.5 mrad half-angle divergence; Horizontal axis – 1 mrad half-angle divergence; (approximate beam “footprint” at 100 m is 35 cm x 5 cm)
Dimensions	32 x 78 x 84 mm (lens face cross section is 32 x 78 mm)
Weight	<227 g (8 oz)
Casing	RS100/RS400/RS800 units are supplied as OEM modules consisting of an open chassis containing optics and circuit boards. Custom housings can be designed and built on request.

Setra Model 276 Barometric Pressure Sensor

Performance	Accuracy RSS[1] (at constant temp)	±0.25% FS[2]
	Non-Linearity (BSFL)	±0.22% FS
	Hysteresis	0.05% FS
	Non-Repeatability	0.05% FS
	Thermal Effects[3]	Compensated range: 0°C to +55°C (+30°F to +130°F) Zero shift (over compensated range): 1% FS Span shift (over compensated range): 1% FS
	Resolution	Infinite, limited only by output noise level (0.0005% FS)
	Time Constant	10 msecs to reach 90% final output with step function pressure input
	Long Term Stability	0.25% FS / 6 months
Environmental	Temperature	Operating[4]: -18°C to +79°C (0°F to +175°F) Storage: -55°C to +121°C (-65°F to +250°F)
	Vibration	2 g from 5 Hz to 500 Hz
	Shock	50 g (Operating, 1/2 sine 10 ms)
	Acceleration	10 g
Electrical	Circuit	3-Wire[5] (Exc, Out, Com)
	Power Consumption	0.20 W (24 VDC)
	Output Impedance	5 Ω
	Output Noise	<200 µV RMS (0 to 100 Hz)

[1] RSS of non-linearity, hysteresis, and non-repeatability.
[2] FS = 300 mb for 800 – 1100 mb range; 500 for 600 – 1100 mb range; and 20 PSI for 0 to 20 PSIA.
[3] Units calibrated at nominal 70°F. Maximum thermal error computed from this datum.
[4] Operating temperature limits of the electronics only. Pressure media temperatures may be considerable higher or lower.
[5] The separate leads for +EXC, -EXC, +Out, -Out are commoned internally. The shield is connected to the case. For best performance, either the -Exc or -Out should be connected to the case. Unit is calibrated at the factory with -Exc connected to the case. The insulation resistance between all signal leads are tied together and case ground is 10

Scintrex CS-3 Magnetometer

Operating Principal	Self-oscillating split-beam Cesium Vapor (non-radioactive ^{133}Cs)
Operating Range	15,000 nT to 105,000 nT
Gradient Tolerance	40,000 nT/m
Operating Zones	15° to 75° and 105° to 165°
Hemisphere Switching	a) Automatic b) Electronic control actuated by the control voltage levels (TTL/CMOS) c) Manual
Sensitivity	0.0006 nT √Hz rms
Noise Envelope	Typically 0.002 nT peak to peak, 0.1 to 1 Hz bandwidth
Heading Error	±0.20 nT (inside the optical axis to the field direction angle range 15° to 75° and 105° to 165°)
Absolute Accuracy	<2.5 nT throughout range
Output	a) Continuous signal at the Larmor frequency which is proportional to the magnetic field (proportionality constant 3.49857 Hz/nT) sine wave signal amplitude modulated on the power supply voltage b) Square wave signal at the I/O connector, TTL/CMOS compatible
Information Bandwidth	Only limited by the magnetometer processor used
Sensor Head	Diameter: 63 mm (2.5”) Length: 160 mm (6.3”) Weight: 1.15 kg (2.6 lb)
Sensor Electronics	Diameter: 63 mm (2.5”) Length: 350 mm (13.8”) Weight: 1.5 kg (3.3 lb)
Cable, Sensor to Sensor Electronics	3 m (9’ 8”), lengths up to 5 m (16’ 4”) available
Operating Temperature	-40°C to +50°C
Humidity	Up to 100%, splash proof
Supply Power	24 to 35 VDC
Supply Current	Approx. 1.5 A at start up, decreasing to 0.5 A at 20°C
Power Up Time	Less than 15 minutes at -30°C

Billingsley TFM100G2 Ultra Miniature Triaxial Fluxgate Magnetometer

Axial Alignment	Orthogonality better than ±1°
Input Voltage Options	15 to 34 VDC @ 30 mA
Field Measurement Range Options	±100 µT = ±10 V
Accuracy	±0.75% of full scale (0.5% typical)
Linearity	±0.015% of full scale
Sensitivity	100 µV/nT
Scale Factor Temperature Shift	0.007% full scale/°C
Noise	≤12 pT rms/√Hz @ 1 Hz
Output Ripple	3 mV peak to peak @ 2^{nd} harmonic
Analog Output at Zero Field	±0.025 V
Zero Shift with Temperature	±0.6 nT/°C
Susceptibility to Perming	±8 nT shift with ± 5 Gs applied
Output Impedance	332 Ω ± 5%
Frequency Response	3 dB @ >500 Hz (to >4 kHz wide band)
Over Load Recovery	±5 Gs slew <2 ms
Random Vibration	>20 G rms 20 Hz to 2 kHz
Temperature Range	-55°C to +85°C
Acceleration	>60 G
Weight	100 g
Size	3.51 cm x 3.23 cm x 8.26 cm
Connector	Chassis mounted 9 pin male "D" type

Nuvia Dynamics IMPAC data recorder system

(for navigation and geophysical data acquisition)

Functions	Integrated Multi-Parameter Airborne Console (IMPAC) with integrated dual Global Positioning System Receiver (GPS) and all necessary navigation guidance software. Inputs for geophysical sensors - portable gamma ray spectrometer GRS-10/AGRS, MMS4/MMS8 Magnetometer, Herz Totem-2A, A/D converter, temperature/humidity probe, barometric pressure probe, and laser/radar altimeter. Output for the multi-parameter PGU (Pilot Guidance Unit)
Display	Monitor display 600 x 800 pixels; customized keypad and operator keyboard. Multi-screen options for real-time viewing of all data inputs, fiducial points, flight line tracking, and GPS channels by operator
Navigation	Pilot/operator navigation guidance. Software supports preplanned survey flight plan, along survey lines, way-points, preplanned drape profile surfaces
Data Sampling	Sensor dependent
Data Synchronization	Synchronized to GPS position. Supports dual GPS
Data File	PEI Binary data format
Storage	80 GB
Software	DataView: Allows fast data verification and conversion of PEI binary data to Geosoft GBN or ASCII formats MAPConv: For survey preparation, calibration and conversion of maps, and survey plot after data acquisition MAGComp: For calculation of magnetic compensation coefficients AGRS/GRS10 Calibration: High voltage adjustment, linearity correction coefficients calculation, and communication test support AGIS: Real time data acquisition and navigation system. Displays chart/spectrum view in real-time for fast data Quality Control (QC)
Electrical	Multiple ethernet connections, RS232 serial ports, USB ports, and 16-bit differential analog input channels. It can support up to 4 magnetometer sensors
Power Requirement	24 VDC

Appendix C

Digital File Descriptions

- Magnetic Database
- Geosoft Grids
- Maps

Magnetic Database:

Abbreviations used in the GDB/XYZ files listed below:

CHANNEL	UNITS	DESCRIPTION
X_WGS84	m	UTM Easting – WGS84 Zone 15N
Y_WGS84	m	UTM Northing – WGS84 Zone 15N
Lat_deg	Decimal degree	Latitude – WGS84
Lon_deg	Decimal degree	Longitude – WGS84
Date	yyyy/mm/dd	Dates of the survey flight(s) – Local
FLT		Flight number(s)
LineNo		Line numbers
STL		Number of satellite(s)
GPSfix		1 = non-differential 2 = WAAS/SBAS differential
Heading	degree	Heading of the aircraft
GPStime	HH:MM:SS	GPS time (UTC)
Geos_m	m	Geoidal separation
XTE_m	m	Cross track error
Galt	m	GPS height – WGS84 Zone 15N (ASL)
Lalt	m	Laser altimeter readings (AGL)
DTM	m	Digital Terrain Model
Sample_Density	m	Horizontal distance in meters between adjacent measurement locations; sample frequency is 20 Hz
Speed_km_hr	km/hr	Ground speed of aircraft in km/hr
basemag	nT	Base station temporal variation data
IGRF	nT	International Geomagnetic Reference Field, IGRF-13
Declin	Decimal degree	Calculated declination of magnetic field
Inclin	Decimal degree	Calculated inclination of magnetic field
Mag1_Head	nT	Mag 1 – Diurnal, lag, and heading corrected
Mag2_Head	nT	Mag 2 – Diurnal, lag, and heading corrected
Mag3_Head	nT	Mag 3 – Diurnal, lag, and heading corrected
Mag4_Head	nT	Mag 4 - Diurnal, lag, and heading corrected
TMI	nT	Total Magnetic Intensity (average of Mag 1 and Mag 2)
RMI	nT	Residual Magnetic Intensity (average of Mag 1 and Mag 2)
ILG	nT/m	In-Line Gradient (Mag 1 and Mag 2)
XLG	nT/m	Cross-Line Gradient (Mag 1 and Mag 2)
VG	nT/m	Vertical Gradient (Mag 3 and Mag 4)
HG	nT/m	Total horizontal gradient (in-line and cross-line)
TMIge	nT	Gradient enhanced Total Magnetic Intensity
RMIge	nT	Gradient enhanced Residual Magnetic Intensity

Grids:

Joy West, WGS 84 Datum, Zone 15N, cell size at 12.5 m

FILE NAME	DESCRIPTION
21155_JoyWest_DTM_12.5m.grd	Digital Terrain Model gridded at 12.5 m cell size
21155_JoyWest_TMI_12.5m.grd	Total Magnetic Intensity gridded at 12.5 m cell size
21155_JoyWest_RMI_12.5m.grd	Residual Magnetic Intensity gridded at 12.5 m cell size
21155_JoyWest_RTP_12.5m.grd	Reduced to Magnetic Pole of RMI gridded at 12.5 m cell size
21155_JoyWest_ILG_12.5m.grd	Measured In-Line Gradient (Mag 1 and Mag 2) gridded at 12.5 m cell size
21155_JoyWest_XLG_12.5m.grd	Measured Cross-Line Gradient (Mag 1 and Mag 2) gridded at 12.5 m cell size
21155_JoyWest_VG_12.5m.grd	Measured Vertical Gradient (Mag 3 and Mag 4) gridded at 12.5 m cell size
21155_JoyWest_HG_12.5m.grd	Total Horizontal Gradient (in-line and cross-line) gridded at 12.5 m cell size
21155_JoyWest_1VD_12.5m.grd	First Vertical Derivative of RTP gridded at 12.5 m cell size
21155_JoyWest_TMIge_12.5m.grd	Gradient enhanced Total Magnetic Intensity (in-line, cross-line, and vertical gradients) gridded at 12.5 m cell size
21155_JoyWest_RMIge_12.5m.grd	Gradient enhanced Residual Magnetic Intensity (in-line, cross-line, and vertical gradients) gridded at 12.5 m cell size
21155_JoyWest_RTPge_12.5m.grd	Gradient enhanced Reduced to Magnetic Pole of RMIge gridded at 12.5 m cell size

Maps:

Joy West, WGS 84 Datum, Zone 15N (jpegs, pdfs, and georeferenced pdf)

Plate Number	Plate Name	FILE NAME	DESCRIPTION
1	FL	21155_JoyWest_ActualFlightLines	Plotted actual flown flight lines
2	DTM	21155_JoyWest_DTM_12.5m	Digital Terrain Model gridded at 12.5 m cell size
3	TMI_wFL	21155_JoyWest_TMI_wFL_12.5m	Total Magnetic Intensity gridded at 12.5 m cell size with actual flown flight lines
4	TMI	21155_JoyWest_TMI_12.5m	Total Magnetic Intensity gridded at 12.5 m cell size
5	RMI	21155_JoyWest_RMI_12.5m	Residual Magnetic Intensity gridded at 12.5 m cell size
6	RTP	21155_JoyWest_RTP_12.5m	Reduced to Magnetic Pole of RMI gridded at 12.5 m cell size
7	ILG	21155_JoyWest_ILG_12.5m	Measured In-Line Gradient gridded at 12.5 m cell size
8	XLG	21155_JoyWest_XLG_12.5m	Measured Cross-Line Gradient gridded at 12.5 m cell size
9	VG	21155_JoyWest_VG_12.5m	Measured Vertical Gradient gridded at 12.5 m cell size
10	HG	21155_JoyWest_HG_12.5m	Total Horizontal Gradient (in-line and cross-line) gridded at 12.5 m cell size
11	1VD	21155_JoyWest_1VD_12.5m	First Vertical Derivative of RTP gridded at 12.5 m cell size
12	TMIge	21155_JoyWest_TMIge_12.5m	Gradient enhanced Total Magnetic Intensity gridded at 12.5 m cell size
13	RMIge	21155_JoyWest_RMIge_12.5m	Gradient enhanced Residual Magnetic Intensity gridded at 12.5 m cell size
14	RTPge	21155_JoyWest_RTPge_12.5m	Gradient enhanced Reduced to Magnetic Pole of RMIge gridded at 12.5 m cell size

Plates

Joy West Survey Block

- Plate 1: Joy West – Actual Flight Lines (FL)
- Plate 2: Joy West – Digital Terrain Model (DTM)
- Plate 3: Joy West – Total Magnetic Intensity with Actual Flight Lines (TMI_wFL)
- Plate 4: Joy West – Total Magnetic Intensity (TMI)
- Plate 5: Joy West – Residual Magnetic Intensity (RMI)
- Plate 6: Joy West – Reduced to Magnetic Pole (RTP)
- Plate 7: Joy West – In-Line Gradient (ILG)
- Plate 8: Joy West – Cross-Line Gradient (XLG)
- Plate 9: Joy West – Vertical Gradient (VG)
- Plate 10: Joy West – Horizontal Gradient (HG)
- Plate 11: Joy West – First Vertical Derivative (1VD) of RTP
- Plate 12: Joy West – Gradient Enhanced Total Magnetic Intensity (TMIge)
- Plate 13: Joy West – Gradient Enhanced Residual Magnetic Intensity (RMIge)
- Plate 14: Joy West – Gradient Enhanced Reduced to Magnetic Pole (RTPge) of RMIge