ASSESSMENT REPORT ON THE 2014 AIRBORNE GEOPHYSICAL SURVEY OF THE NANA CLAIMS

WHITEHORSE MINING DISTRICT – NTS 115D/ 11

Latitude 60° 41’ N, Longitude 135° 22’ W

UTM NAD 83 ZONE 8: 480500E, 6728000N

WORK DONE ON

NANA 1-4	YB57721-724
NANA 5-8	YC54395- 398
NANA 10	YC54400
NANA 17- 18	YC66377- 378
NANA 19-26	YC66711-718

SURVEY CONDUCTED JULY 23RD 2014

REPORT BY DANIÈLE HÉON, P. GEO.

WHITEHORSE, OCTOBER 15 2014

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SUMMARY

The Nana property consists of 32 quartz claims in two claim blocks registered in the Whitehorse Mining District., located on NTS map sheet 115D/ 11. This report documents the results of the one day of an airborne geophysical survey consisting of magnetic and radiometric surveys.

The property is located north of the Whitehorse Copper Belt, approximately 6 km west of the western boundary of the City of Whitehorse, and approximately 6 km northwest of Fish Lake. Regional mapping shows the property to overlie Triasssic sediments of the Aksala Fm, Hancock member, the same stratigraphy that hosts the skarn deposits of the Whitehorse Copper Belt. The regional map showed these sediments to be intruded by a Cretaceous diorite of the Whitehorse Suite, but the field work showed the sediments to be intruded instead by the Eocene Annie Ned biotite granite. Skarn occurs at and near this contact.

LOCATION AND ACCESS

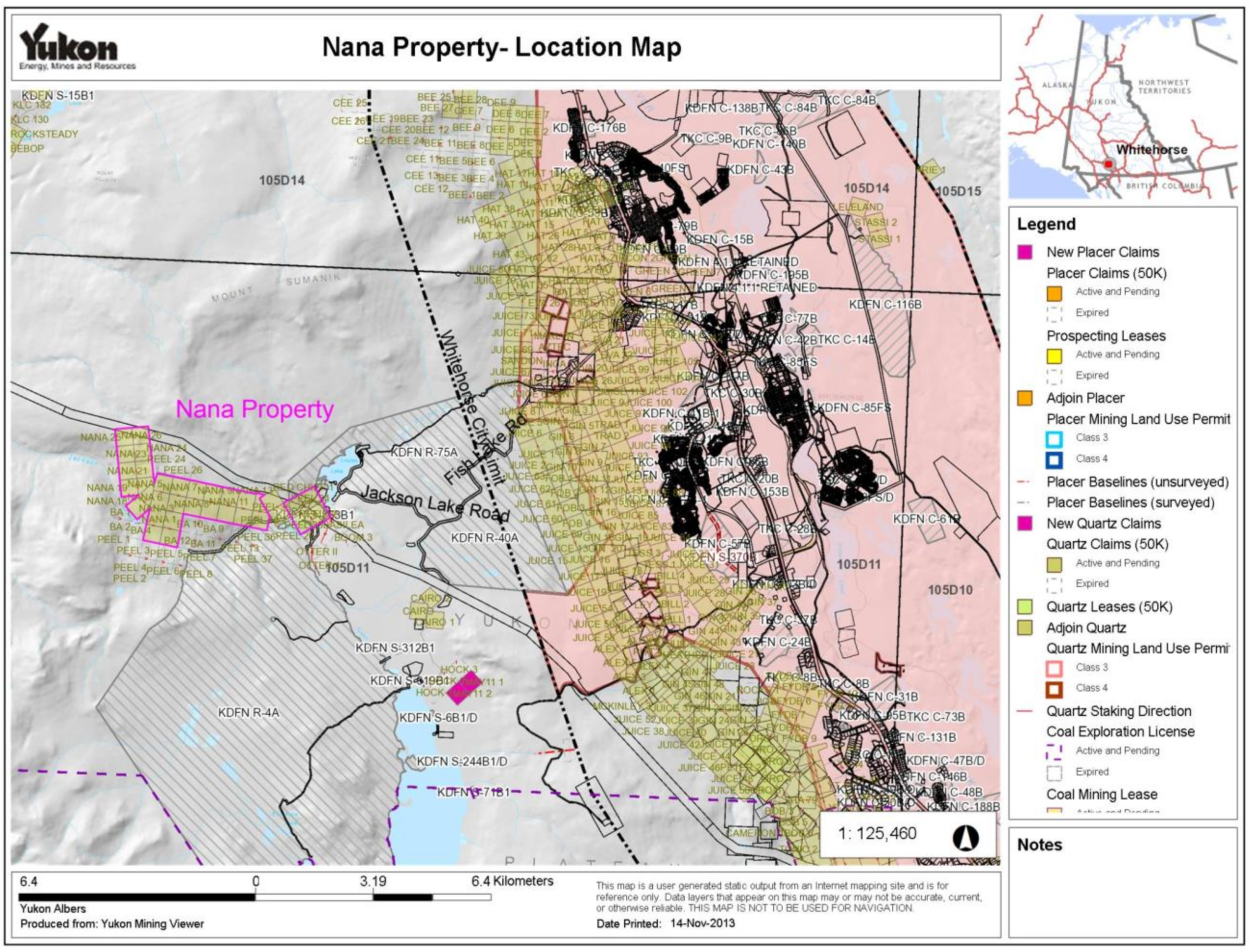


FIGURE 1 - GENERAL LOCATION MAP- NANA CLAIMS

The property is located north of the Whitehorse Copper Belt, approximately 6 km west of the western boundary of the City of Whitehorse, and approximately 6 km northwest of Fish Lake, on NTS map sheet 115D/11 (Figure 1). The claims are located north of Jackson Creek. Access to the property is from Jackson Lake road, which branches off from the Fish Lake road. Turning left at the first main intersection (at the bottom of a long hill), this road forks again after a few 100 meters. Taking then the right hand fork crosses the creek that flows into Jackson Lake. This road eventually skirts the northern shore of Fraser Lake. The road to the property branches off from that road and climbs to higher elevations via a steep and rough road suitable for 4X4 vehicule. The center of the property lies approximately at Latitude 60° 41' N, Longitude 135° 22' W, or UTM NAD 83 ZONE 8: 480500E, 6728000N.

CLAIM DATA

The Nana property consists of 32 quartz claims distributed in 2 blocks of contiguous mineral claims registered in the Whitehorse Mining District. The claims are in 50/50 partnership between H. Coyne & Sons and Sid McKeown. A total of 23 claims are being renewed for one additional year. The claim map is in Appendix A. The detailed claim data is found in Appendix B. The summary claim data is as follows:

Claim name	Grant number	Expiry date	New expiry date pending acceptance of this filing
Nana 1 to 4	YB54721 - 724	Nov 20 2015	Nov 20 2016
Nana 5 to 12	YC54395 - 402	Nov 20 2015	Nov 20 2016
Nana 13	YC54403	Nov 20 2015	
Nana 14	YC54404	Nov 20 2015	Nov 20 2016
Nana 15-16	YC54405-406	Nov 20 2015	
Nana 17 to 18	YC66377 -378	Nov 20 2015	Nov 20 2016
Nana 19	YC86711	Nov 20 2014	Nov 20 2015
Nana 20	YC66712	Nov 20 2015	Nov 20 2016
Nana 21 to 26	YC66713 - 718	Nov 20 2014	Nov 20 2015
Peel 18 to 19	YB66841 - 842		
Peel 32 to 35	YB66855 - 858		

TABLE 1 SUMMARY CLAIM DATA

GEOLOGY

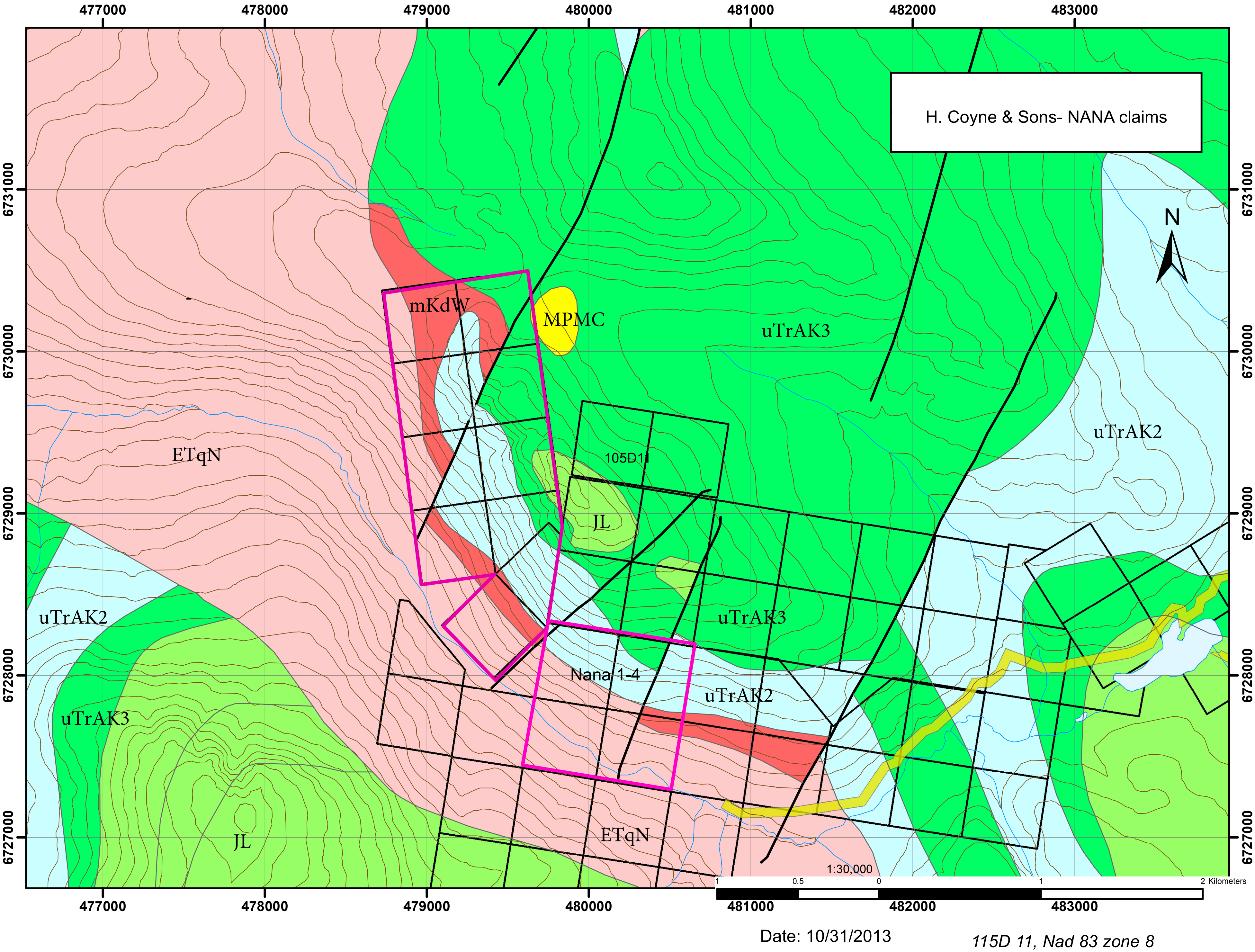
According to the regional geology map (YGS digital map), the area of interest is underlain by rocks of Stikine terrane (one of the Intermontane Terranes), interpreted to represent mid-Paleozoic to early Mesozoic magmatic arc rocks and associated sediments which were formed outboard of the western edge of the Laurentian craton (Israel et al, 2011). The oldest rocks in the area belong to the upper Triassic Lewes River Group, a sequence of arc-related volcanic, volcaniclastic and sedimentary rocks. More specifically, the property is underlain mainly by the Hancock (unit uTrAK2) and Mandanna (uTrAK3) members of the Aksala Formation (uTrAK), consisting mainly of clastic sediments and limestone (see Figure 3 for detailed lithological descriptions), interpreted to document the waning stages of the Lewes River arc.

These sediments are uncomformably overlain by Jurassic clastic rocks of the Laberge Formation (unit JL), the basal unit of the Whitehorse Trough, which is interpreted to be a syn-accretionary sedimentary basin that developed during Early to Middle Jurassic convergence of the Intermontane terranes.

The sedimentary sequence is intruded by the post-accretionary mid Cretaceous calc-alkaline batholiths of the Whitehorse Suite. The Cu-Mo-Au skarns of the Whitehorse Copper Belt occur at the contact between the Cretaceous Whitehorse Batholith (granodiorite to diorite, unit mKdW) and the limey sediments of the Aksala Formation, Hancock member (uTrAK2). This same geological setting is present on the Nana Claims.

The sequence is intruded by the Tertiary Annie Ned Granite (unit ETqN) of the Nisling Range Suite.

FIGURE 2 - REGIONAL GEOLOGY-



H. Coyne & Sons- NANA claims
N
mKdW
MPMC
uTrAK3
uTrAK2
105D11
JL
ETqN
Nana 1-4
uTrAK2
uTrAK3
uTrAK3
uTrAK2
JL
ETqN
477000
478000
479000
480000
481000
482000
483000
6731000
6730000
6729000
6728000
6727000
1:30,000
1
0.5
0
1
2 Kilometers
Date: 10/31/2013
115D 11, Nad 83 zone 8

AGE	UNIT	NAME	DESCRIPTION
MIOCENE TO PLIOCENE	MPMC	MPMC: MILES CANYON	dark red to brown weathering, columnar jointed olivine basalt flows, commonly amygdaloidal and vesicular; ultramafic xenoliths **(Miles Canyon Basalt)**
EARLY TERTIARY	ETqN	ETN: NISLING RANGE SUITE	leucocratic, biotite granite; miarolitic alaskite; saccharoidal textured, mafic-poor biotite granite; biotite-hornblende granite to leucocratic granodiorite with sparse, white, alkali feldspar phenocrysts; biotite quartz monzonite **(Nisling Range Suite, Nisling Range Alaskite, Coffee Creek Granite, Annie Ned Granite)**
MID-CRETACEOUS	mKdW	mKW: WHITEHORSE SUITE	hornblende diorite, biotite-hornblende quartz diorite and mesocratic, often strongly magnetic, hypersthene-hornblende diorite, quartz diorite and gabbro **(Whitehorse Suite, Coast Intrusions)**
LOWER AND MIDDLE JURASSIC, HETTANGIAN TO BAJOCIAN	JL	JL: LABERGE	poorly sorted, medium bedded to massive arkosic sandstone and minor shale with interbeds and thick members of resistant heterolithic pebble and boulder conglomerate; recessive, dark brown weathering, thin bedded, dark brown to greenish, silty shale **(Laberge Gp.)**
UPPER TRIASSIC, CARNIAN TO NORIAN	uTrAK	uTrAK: AKSALA	mixed clastic-carbonate assemblage divisible into three dominant facies including calcareous greywacke (1), locally thick carbonate (2) and red-coloured clastics (3) **(Aksala)**
UPPER TRIASSIC, CARNIAN TO NORIAN	uTrAK2	uTrAK: AKSALA	massive to thick bedded limestone; minor thin bedded argillaceous to sooty limestone; coarsely crystalline, massive dolostone; minor laminated chert; massive to poorly bedded, limestone conglomerate debris flows and fanglomerate **(Hancock mb. of Aksala)**
UPPER TRIASSIC, CARNIAN TO NORIAN	uTrAK3	uTrAK: AKSALA	red weathering, medium bedded, green and red greywacke and pebble conglomerate; red shale partings and minor interbedded, red, bioturbated siltstone; crystal-rich greywacke and shale; coarse-grained, tan to brown, massive, lithic arenite **(Mandanna mb. of Aksala)**

FIGURE 3 - LEGEND REGIONAL GEOLOGY (FROM YGS WEBSITE)

PREVIOUS WORK

The area has seen several phases of exploration work targeting skarn mineralization, with the earliest reference dating from 1972. These work programs are not summarized here but a complete reference list of assessment reports is listed in the Reference section. The historical work in the area is summarized in Minfile 105D 076 (Appendix C).

A cursory review of historical work shows that calc-silicate (actinolite-diopside) skarn and magnetite skarn occur on the property, with the highest Au and Cu grades being associated with the calc-silicate skarn. Bismuthinite has been reported or assumed to be the source of the anomalous bismuth values.

Previous work consists of several phases of magnetic and geochemical surveys followed up by trenching and drilling. Most of the work has been focused on the area now covered by the Nana 1 to 8 claims. Very little work appears to have been conducted over the Nana 17 to 26 claims.

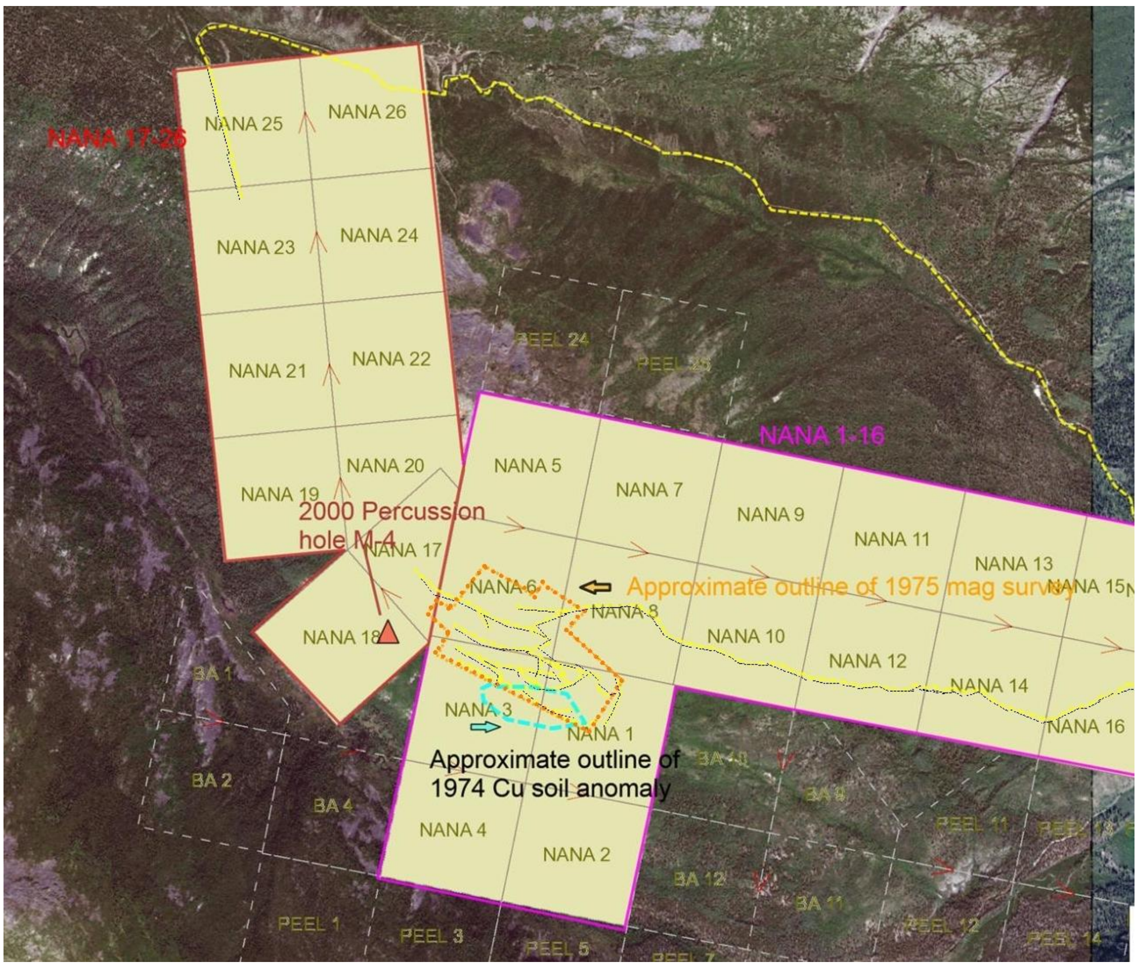


FIGURE 4- PREVIOUS WORK BY PREVIOUS OPERATORS

The previous work done by former operators is summarized in Figure 4. The yellow lines show the roads, trenches and access to drilled areas, where the bulk of the exploration work has taken place. The orange stippled line defines the approximate outline of the 1975 magnetic survey. The light blue dashed line represents the approximate location of a copper soil anomaly (1974), with soils grading > 80 ppm Cu. This anomaly appears to be open to the west- northwest. Both these surveys barely spill over into the area covered by claims Nana 17 to 26. One percussion hole (in 2000) on then claim Marie-4 (coinciding with claim Nana 18?) returned values of 7.9% Cu, 286 ppm Ag, and 1935 ppb Au. One drill hole was reported at northern end on Nana 23. Other work was done outside of this area of interest but is not summarized here.

In 2013, a very short field traverse targeted a contact prospective for skarn mineralization, in an area apparently underexplored. Ground-truthing the regional geology confirmed the presence of skarn mineralogy along and near the contact between the Aksala Fm, Hancock member, and the Tertiary granite and not the Cretaceous diorite, as displayed in the regional geology map. The position of this prospective contact was also refined, in the area visited. No sulphides were found in the few skarn occurrences observed. The Cretaceous diorite does not appear to be as extensive as what is outlined on the regional geology map, at least not on claims Nana 17 to 19. It is possible that the diorite/ Hancock member contact is mineralized elsewhere on the property.

2014 Survey

An airborne magnetic and radiometric survey over the western part of the claims was conducted by Precision GeoSurveys of Vancouver B.C.

Description of work

A total of 44 line-km were flown at 200m line spacing, with the lines oriented E-W, a favourable orientation to survey the western part of the property.

Results

See ttached geophysical survey report, Appendix E

Signed, in Whitehorse, October 15 2014

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Danièle Héon, P. Geo.

STATEMENT OF QUALIFICATIONS

I, Danièle Héon, of:

12 Marigold Place
Whitehorse, Yukon
Y1A 6A2

do hereby declare that;

- I am an independent contracting geologist.
- I graduated with a Bachelor of Science degree from McGill University in Montréal in 1984.
- I have worked as a geologist since graduation from University and in the Yukon since 1990.
- I am a member in good standing of the Ordre des Géologues du Québec (OGQ), no. 1510, and of the Association of Professional Engineers and Geoscientists of BC (APEGBC), no. 38518.
- I have planned and supervised the work described herein.
- I am the author of this report.
- This report is intended to satisfy assessment requirements only.

Danièle Héon, P. Geo.

REFERENCES

Boggaram, G., 1973, Drill logs Lunar property, holes 1 to 4, assessment report 091127.

Clarke, J., 1997, Assessment report for the exploration work on the Nana 1-4 quartz mining claims, for Sid McKeown, assessment report 093896.

Clarke, J., 1997, Assessment report for the exploration work on the Prospector 1-4 quartz mining claims, for Sid McKeown, assessment report 093898.

Clarke, J., 1998, Report on the 1998 Assessment work on the Banana Property, for Brian Scott, assessment report 093936

Clarke, J., 2007, Assessment report for the exploration work on the Nana property, for Sid McKeown, assessment report 094812.

Doherty, R.A., 2000, Assessment report- Trenching and Reclamation Work completed on the Red Chief 2, Protector 3, Nana 1&2 and Ba 7&8 claims, assessment report 094127.

Doherty, R.A., 2001, Assessment report- Trenching, Sampling, Road and Reclamation Work completed on the Red Chief 2, Peel 20, Ba 7, 8 & 14 and Marie 4 claims, assessment report 094262.

Doherty, R.A., 2008, Assessment report: diamond drilling on the Nana property, assessment report 095094

Hureau, A., 1986, EIP 86-001, Diamond drilling report, Ruth 1-4 claims, for E. Kreft, assessment report 091899.

Hureau, A., 1986, EIP 86-001, Diamond drilling report, Ruth 1-4 claims, E. Kreft,, report filed for Exploration Incentive Program, assessment report 093090.

Keyser, H.J., 1996, Report on the 1996 Geochemical Assessment work on the Banana Property, Pacific Galleon Mining Corp., assessment report 093515.

Keyser, H.J., 1996, Report on the 1996 Geochemical Assessment work on the Banana Property, Pacific Galleon Mining Corp., assessment report 093546.

Kreft , E., 1979 Log of hole X3, Claim Grouse 4, assessment report 091128.

Kreft , E., 1985, Drilling, Blasting and assaying on Lunar 1 to 8 and Gear 1,2,4 and 6 claims, assessment report 091537.

Percival, D.W., 1983, Diamond drill logs, Lunar, Gear, Grouse and Ray claims, Whitehorse Copper Mines, assessment report 091479

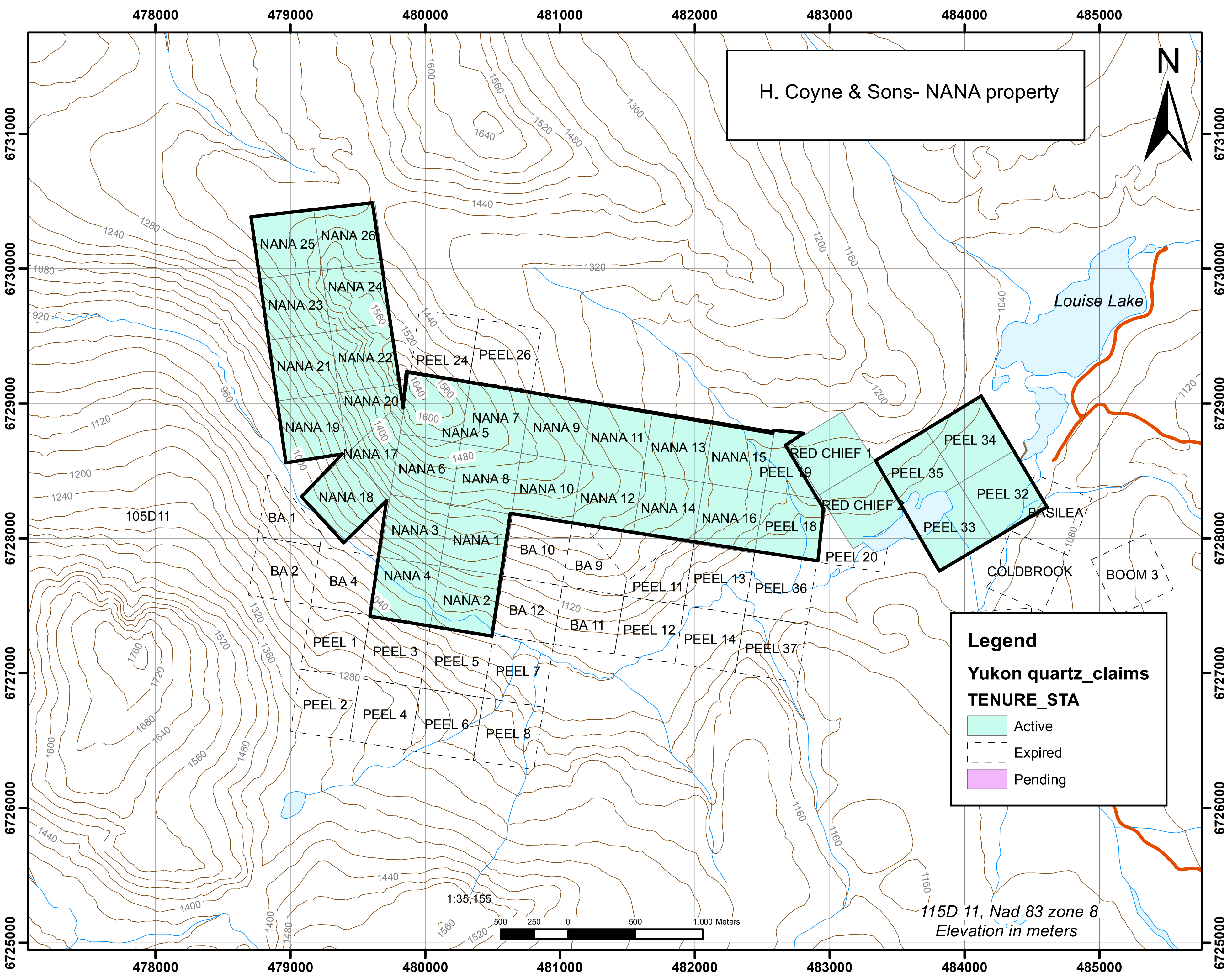
Tenney, D., 1974, Geochemical Report Parther #1 Claim Y76839, Kreft-Takacs property, Whitehorse Copper Mines, assessment report 061284

Digital data as provided by the Yukon Geological Survey and government agencies, in particular:

- Deklerk, R. (compiler), 2003. Yukon MINFILE 2003 – A database of mineral occurrences. Yukon Geological Survey. And Yukon MINFILE, 2012. Yukon MINFILE – A database of mineral occurrences. Yukon Geological Survey, http://www.geology.gov.yk.ca/databases_gis.html
- Gordey, S.P., Makepeace, A.J., (compilers), , **2003-9(D)**, Open File (Geological - Bedrock); Yukon Digital Geology (version 2) Yukon Geological Survey.
- Israel, S. et al, 1991, Overview of Yukon Geology, http://www.geology.gov.yk.ca/pdf/Bedrock_Full_Overview.pdf

- Mineral Claims (Yukon Mining Recorder) http://www.yukonminingrecorder.ca/
- Geomatics Yukon for regional shape file data: http://geomaticsyukon.ca/data/datasets
- Yukon Geological Survey, 2011. YGS Mapmaker online http://maps.gov.yk.ca/imf.jsp?site=YGS

APPENDIX A- CLAIM MAP


H. Coyne & Sons- NANA property
N
Louise Lake
Legend
Yukon quartz_claims
TENURE_STA
Active
Expired
Pending
115D 11, Nad 83 zone 8
Elevation in meters
1:35,155
500 250 0 500 1,000 Meters
105D11
NANA 1
NANA 2
NANA 3
NANA 4
NANA 5
NANA 6
NANA 7
NANA 8
NANA 9
NANA 10
NANA 11
NANA 12
NANA 13
NANA 14
NANA 15
NANA 16
NANA 17
NANA 18
NANA 19
NANA 20
NANA 21
NANA 22
NANA 23
NANA 24
NANA 25
NANA 26
PEEL 1
PEEL 2
PEEL 3
PEEL 4
PEEL 5
PEEL 6
PEEL 7
PEEL 8
PEEL 11
PEEL 12
PEEL 13
PEEL 14
PEEL 18
PEEL 19
PEEL 20
PEEL 24
PEEL 26
PEEL 32
PEEL 33
PEEL 34
PEEL 35
PEEL 36
PEEL 37
RED CHIEF 1
RED CHIEF 2
BA 1
BA 2
BA 4
BA 9
BA 10
BA 11
BA 12
BASILEA
COLDBROOK
BOOM 3
478000
479000
480000
481000
482000
483000
484000
485000
6725000
6726000
6727000
6728000
6729000
6730000
6731000

APPENDIX B- CLAIM DATA

Grant Number	Claim Name	Claim Number	Claim Owner	Claim Expiry Date	New expiry date	$ work applied	renewal fee
YB57721	NANA	1	Sid McKeown - 50%, H. Coyne & Sons Ltd. - 50%	11/20/2015	11/20/16	$100	$5.00
YB57722	NANA	2	Sid McKeown - 50%, H. Coyne & Sons Ltd. - 50%	11/20/2015	11/20/16	$100	$5.00
YB57723	NANA	3	Sid McKeown - 50%, H. Coyne & Sons Ltd. - 50%	11/20/2015	11/20/16	$100	$5.00
YB57724	NANA	4	Sid McKeown - 50%, H. Coyne & Sons Ltd. - 50%	11/20/2015	11/20/16	$100	$5.00
YC54395	NANA	5	Sid McKeown - 50%, H. Coyne & Sons Ltd. - 50%	11/20/2015	11/20/16	$100	$5.00
YC54396	NANA	6	Sid McKeown - 50%, H. Coyne & Sons Ltd. - 50%	11/20/2015	11/20/16	$100	$5.00
YC54397	NANA	7	Sid McKeown - 50%, H. Coyne & Sons Ltd. - 50%	11/20/2015	11/20/16	$100	$5.00
YC54398	NANA	8	Sid McKeown - 50%, H. Coyne & Sons Ltd. - 50%	11/20/2015	11/20/16	$100	$5.00
YC54399	NANA	9	Sid McKeown - 50%, H. Coyne & Sons Ltd. - 50%	11/20/2015	11/20/16	$100	$5.00
YC54400	NANA	10	Sid McKeown - 50%, H. Coyne & Sons Ltd. - 50%	11/20/2015	11/20/16	$100	$5.00
YC54401	NANA	11	Sid McKeown - 50%, H. Coyne & Sons Ltd. - 50%	11/20/2015	11/20/16	$100	$5.00
YC54402	NANA	12	Sid McKeown - 50%, H. Coyne & Sons Ltd. - 50%	11/20/2015	11/20/16	$100	$5.00
YC54403	NANA	13	Sid McKeown - 50%, H. Coyne & Sons Ltd. - 50%	11/20/2015			
YC54404	NANA	14	Sid McKeown - 50%, H. Coyne & Sons Ltd. - 50%	11/20/2015	11/20/16	$100	$5.00
YC54405	NANA	15	Sid McKeown - 50%, H. Coyne & Sons Ltd. - 50%	11/20/2015			
YC54406	NANA	16	Sid McKeown - 50%, H. Coyne & Sons Ltd. - 50%	11/20/2015			
YC66377	NANA	17	Sid McKeown - 50%, H. Coyne & Sons Ltd. - 50%	11/20/2015	11/20/16	$100	$5.00
YC66378	NANA	18	Sid McKeown - 50%, H. Coyne & Sons Ltd. - 50%	11/20/2015	11/20/16	$100	$5.00
YC66711	NANA	19	Sid McKeown - 50%, H. Coyne & Sons Ltd. - 50%	**11/20/2014**	**11/20/15**	$100	$5.00
YC66712	NANA	20	Sid McKeown - 50%, H. Coyne & Sons Ltd. - 50%	11/20/2015	11/20/16	$100	$5.00
YC66713	NANA	21	Sid McKeown - 50%, H. Coyne & Sons Ltd. - 50%	**11/20/2014**	**11/20/15**	$100	$5.00
YC66714	NANA	22	Sid McKeown - 50%, H. Coyne & Sons Ltd. - 50%	**11/20/2014**	**11/20/15**	$100	$5.00
YC66715	NANA	23	Sid McKeown - 50%, H. Coyne & Sons Ltd. - 50%	**11/20/2014**	**11/20/15**	$100	$5.00
YC66716	NANA	24	Sid McKeown - 50%, H. Coyne & Sons Ltd. - 50%	**11/20/2014**	**11/20/15**	$100	$5.00
YC66717	NANA	25	Sid McKeown - 50%, H. Coyne & Sons Ltd. - 50%	**11/20/2014**	**11/20/15**	$100	$5.00
YC66718	NANA	26	Sid McKeown - 50%, H. Coyne & Sons Ltd. - 50%	**11/20/2014**	**11/20/15**	$100	$5.00
YB66841	PEEL	18	Sid McKeown - 50%, H. Coyne & Sons Ltd. - 50%	11/20/2015			
YB66842	PEEL	19	Sid McKeown - 50%, H. Coyne & Sons Ltd. - 50%	11/20/2015			
YB66855	PEEL	32	Sid McKeown - 50%, H. Coyne & Sons Ltd. - 50%	11/20/2015			
YB66856	PEEL	33	Sid McKeown - 50%, H. Coyne & Sons Ltd. - 50%	11/20/2015			
YB66857	PEEL	34	Sid McKeown - 50%, H. Coyne & Sons Ltd. - 50%	11/20/2015			
YB66858	PEEL	35	Sid McKeown - 50%, H. Coyne & Sons Ltd. - 50%	11/20/2015			
					total :	$2,300	$115.00

APPENDIX C- MINFILE

YUKON MINFILE
YUKON GEOLOGICAL SURVEY
WHITEHORSE

MINFILE: 105D 076
NAME: JACKSON
STATUS: DRILLED PROSPECT
TECTONIC ELEMENT: WHITEHORSE TROUGH
DEPOSIT TYPE: Cu Skarn

NTS MAP SHEET: 105D\11
LATITUDE: 60º 41' 24" N
LONGITUDE: 135º 21' 52" W

OTHER NAME(S): GROUSE
MAJOR COMMODITIES: COPPER, GOLD
MINOR COMMODITIES: BISMUTH, SILVER
TRACE COMMODITIES: LEAD, MOLYBDENUM

CLAIMS (PREVIOUS & CURRENT)

BA, BEAVER, DIANNE, FALCON, GEAR, GROUSE, MARIE, NANA, PEEL, PROCTOR, RAVEN, RUTH

WORK HISTORY

Staked as Grouse cl 1-4, and cl 7-14 (Y63484) in Jul/70 by S. Takacs and E. Kreft, who added small blocks of fringe claims annually, including Gear cl 1-6 (Y91133) in Sep/74. Explored with hand trenching and bulldozer trenching in 1970-72; with geological mapping, magnetic surveying and 6 drill holes (445 m) by New Jersey Zinc Corporation Ltd (Grouse #4 and Ray #2 claims) under a brief option in 1972; and with more mapping, geochemical surveys and bulldozer trenching in 1974, a magnetic survey and 6 drill holes (427 m) on the Gear claims in 1975 and 4 drill holes (472.4 m) in 1976 by Whitehorse Copper Mines Ltd under option. Takacs drilled one hole (34.7 m) in 1979, 6 holes (36.0 m) in 1981, trenched in 1982, drilled 3 holes (92.4 m) in 1983, trenched and drilled 3 holes (35 m) in 1984 and added the Raven cl 1-2 (YA93376) to the south in Sep/85. Kreft tied on the Ruth cl 1-4 (YA94118) and Beaver cl 1 (YA93146) in Aug/85 and Jan/86, respectively, and together with Takacs performed geological mapping, bulldozer trenching and drilled 4 holes (455 m) on the Ruth claims. A. Olsson staked Dianne cl 1-3 (YB27625) in Jul/90 and trenched in 1991.

S.J. Takacs restaked the occurrence as Marie cl 1-4 (YB37478) in Sep/92. The Falcon cl 1-10 (YB46474) were staked nearby by R. Voisine in Oct/93. In Jul/95 D. Olsson staked Dianne cl 1-3 (YB57989) 1.5 km northwest of the Marie claims.

S. McKeown staked Nana cl 1-4 (YB57721) 1 km to the southeast in Jun/95 and Protector cl 1-4 (YB58180) 1.5 km to the east (midway between this occurrence and Minfile Occurrenc #105D 079) in Sept/95. In May/96 Pacific Galleon Mining Corp optioned the Nana and Protector claims from McKeown and staked Ba cl 1-10 (YB66861) and Peel cl 1-37 (YB66824). In Jul/96 McKeown carried out trenching, rock geochemical sampling and grid development on the Nana and Protector claims.

In the summer of 1996 Pacific Galleon Mining Corp completed a data compilation, reconnaissance prospecting and soil geochemistry program over their claim holdings. In May/98 ownership of the Ba and Peel claims was transferred to B. Carter who carried out prospecting and geochemical (rock and soil) sampling with B. Scott, before subsequently transferring title to Scott in Sep/98.

In Sep/99, Scott transferred ownership of the Ba, Peel and Marie (previously transferred to him by Takacs in Oct/97) claims to McKeown who immediately carried out trenching (Protector cl 3), reclamation (Red Chief cl 2) and soil geochemical sampling (Nana cl 1, 2 and Ba cl 7, 8).

During 2000, McKeown carried out road rehabilation and resampling of historic trenching on Ba cl 14; relocated and resampled trenches and core stored at old drill sites on Ba cl 7 and 8; and carried out road work and hand held percussion drilling (no specifics) on Marie cl 4.

GEOLOGY

An actinolite-diopside-magnetite skarn up to 30 m thick occurs at the contact between Upper Triassic Lewes River Group limestone and siltstone, and various phases of a mid Cretaceous or younger intrusion. Trenching exposed a 9.8 m wide zone that strikes north, dips vertically and contains minor pyrrhotite, pyrite, chalcopyrite and bornite which assayed 0.39% in a chip sample. The best intersection in the 1972 drilling was 0.26% Cu, 6.9 g/t Ag and 0.17 g/t Au across 0.76 m. An intersection of 5.6% Cu & 270.8 g/t Ag across 6 m was obtained in one 1975 hole but the others were essentially barren. One of the 1976 holes cut bismuthinite in actinolite skarn, which assayed 5.8% Bi and 85.7 g/t Au across 0.4 m and 0.75% Bi, 9.9 g/t Au and 6.9 g/t Ag across 4.6 m. Assays of up to 0.55 g/t Au and 34.6 g/t Ag over 0.3 m of magnetite skarn were reported from the 1983 drilling. The 1986 drilling did not intersect any significant gold values but one hole did contain minor copper, zinc and tungsten mineralization. (The majority of previous drilling was centred around the present day Nana claims.)

S. McKeown staked the Nana and Protector claims in part to cover dimension stone deposits. Pacific Galleon Mining Corp concentrated their efforts in the centre and western portions of their claim holdings. Soil sampling outlined anomalous Au, Cu and As values in the area of previous drilling success. A single-sample low order gold in soil anomaly (53 ppb) was identified in the central part of the claim block. The sample also contained elevated concentrations of Cu and As. McKeown's work failed to detect any additional mineralization during sampling in 1996. Grab sampling by Scott in 1998 in the vicinity of old workings, confirmed previous results and returned gold values up to 1 343 ppb Au from the Ba cl 8. Sampling completed by McKeown in 1999 was not submitted for analysis.

Selective and limited sampling of historic core in 2000 returned anomalous copper values from two skarnified sections of core located on Ba cl 7 (5 175 ppm and 64 078 ppm) although no description of the core sampled was provided. A separate sample of weakly calcareous skarn or hornfels, collected on Ba cl 8 from core taken from DDH KT-8, returned 40 140.9 ppb Au with 38 591 ppm Bi and anomalous levels of Mo, Cu and Pb. Samples of variably mineralized skarn and quartz-sulfide veins from the trench on Ba cl 14 returned high values for copper and gold, with peak values of 62 957 ppm and 18 138.4 ppb respectively. A single sample of sulfide rich material from Marie cl 4 returned 79 034 ppm Cu with 1 935.2 ppb Au and 286 ppm Ag.

REFERENCES

KREFT, E. and TAKACS, S., Sep/79. Assessment Report *#091128 by E. Kreft.

KREFT, E., Apr/84. Assessment Report *#091537 by E. Kreft.

KREFT, E., Jan/87. Assessment Report *#091899 by A. Hureau.

KREFT, E., 1986. Yukon Exploration Incentive Program Report #093090 by A. Hureau

MCKEOWN, S., Oct/97. Assessment Report #093896 by J. Clarke.

McKEOWN, S., Oct/97. Assessment Report #093898 by J. Clarke.

McKEOWN, S., May/2000. Assessment Report #094127 by R.A. Doherty.

McKEOWN, S., May/2001. Assessment Report #094262 by R.A. Doherty.

MINERAL INDUSTRY REPORT, 1971-72, p. 52; 1974, p. 143-144; 1975, p. 101-104; 1976, p. 152

PACIFIC GALLEON MINING CORP., Nov/96. Assessment Report #093515 by H.J. Keyser.

PACIFIC GALLEON MINING CORP., Dec/96. Assessment Report #093546 by H.J. Keyer.

SCOTT, B., Nov/98. Assessment Report #093936 by J. Clarke.

TAKACS, S. and KREFT, E., Jan/73. Assessment Report #091127 by G. Boggaram.

WHITEHORSE COPPER MINES LTD, 1974. Assessment Report *#061284 by D. Tenney.

WHITEHORSE COPPER MINES LTD, Aug/83. Assessment Report *#091479 by P.W. Percival.

YUKON EXPLORATION AND GEOLOGY 1983, p. 161; 1984, p. 73.

YUKON EXPLORATION 1985-86, p. 169-170.

APPENDIX D- STATEMENT OF EXPENDITURES

Nana claims Grouping HW07535

Statement of Expenditures

	incl GST
Airborne survey	$1,848.00
survey planning and report	$457.28
printing	$35.00
total	$2,340.28

Signed in Whitehorse,
Wednesday October 15th, 2014

Danièle Héon, P. Geo.

APPENDIX E- AIRBORNE GEOPHYSICAL SURVEY

Precision GeoSurveys

AIRBORNE GEOPHYSICAL SURVEY REPORT

Nana and Whitehorse Copper Belt Survey Blocks
Prepared for H.Coyne and Sons

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October 2014

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1.0 Introduction

This report outlines the geophysical survey operations and data processing procedures taken during the high resolution airborne magnetic and radiometric survey flown at the Nana and Whitehorse Copper Belt (WCB) survey blocks for H.Coyne and Sons. The survey blocks are located west of Whitehorse, Yukon (Figure 1). The geophysical survey was flown on July 23, 2014. A line was re-flown on August 12, 2014 for the WCB block.

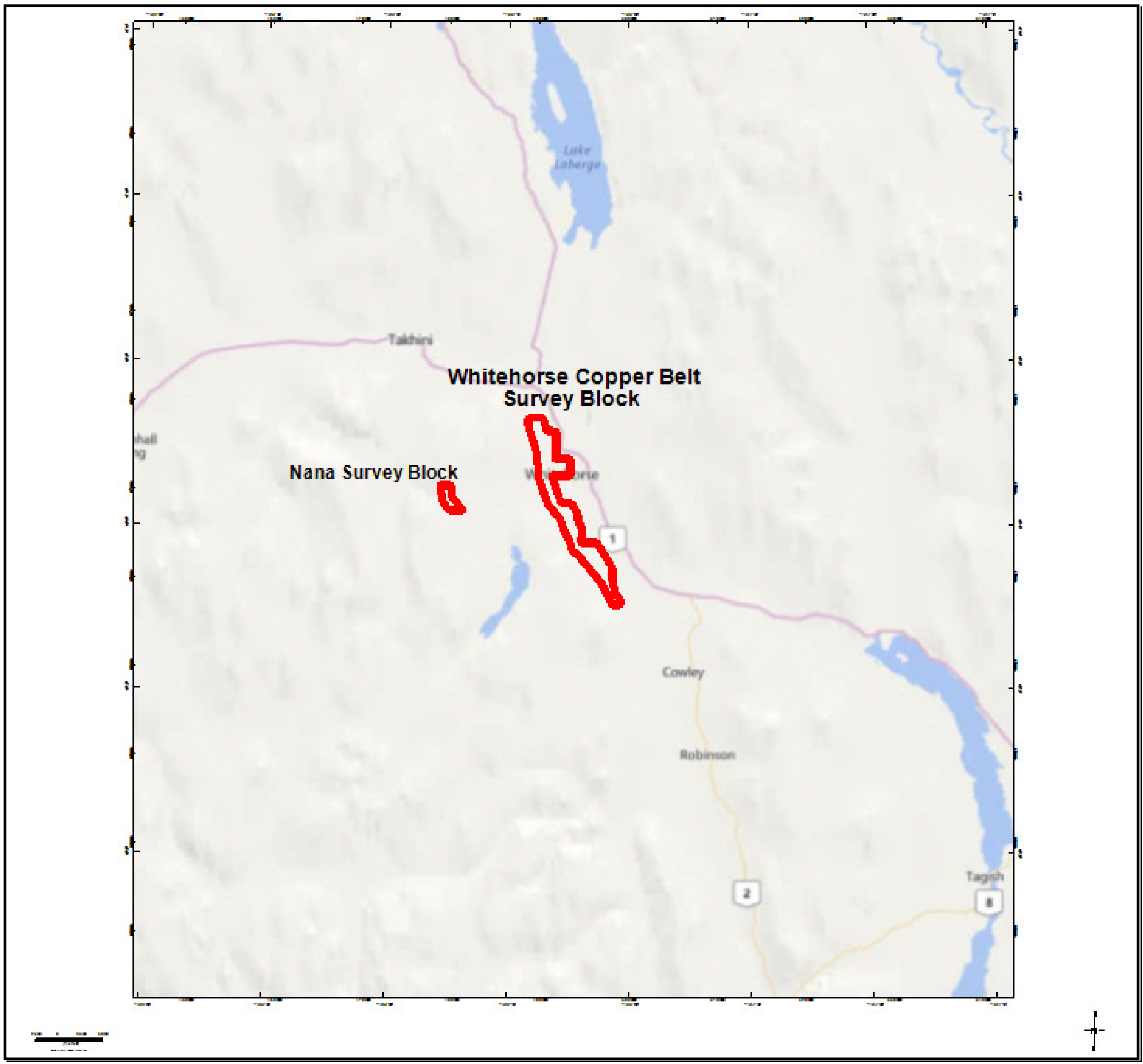

Figure 1: Nana and WCB survey blocks location map.

1.1 Survey Area

The Nana block is approximately 17 km west of Whitehorse airport. It covers an irregular area of 1.3 km by 2.8 km (Figure 2). The Nana survey block was flown at 100 meter spacing at a 090°/270° heading; the tie lines were flown at 1000 meter spacing at a heading of 000°/180° for a total of 44 line km (Figures 3 and 4).

Figure 2: Nana survey block boundary in red.

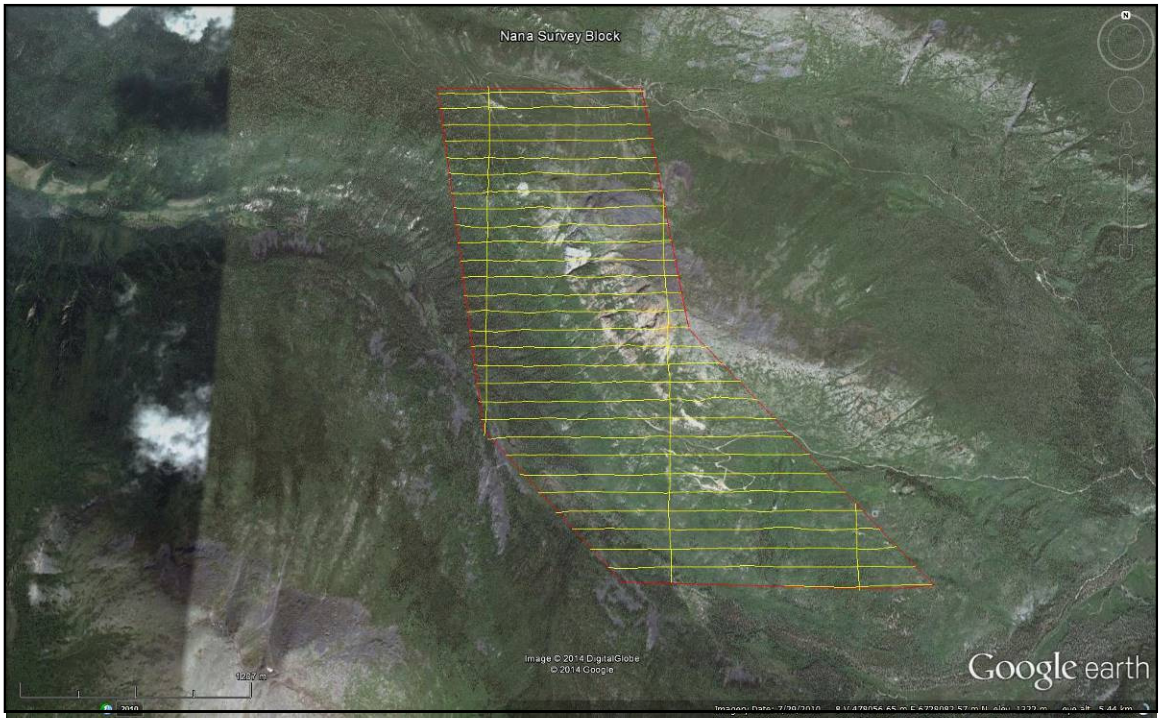

Figure 3: Plan View – Nana survey block with actual survey and tie lines outlined in yellow, and the block boundary in red.

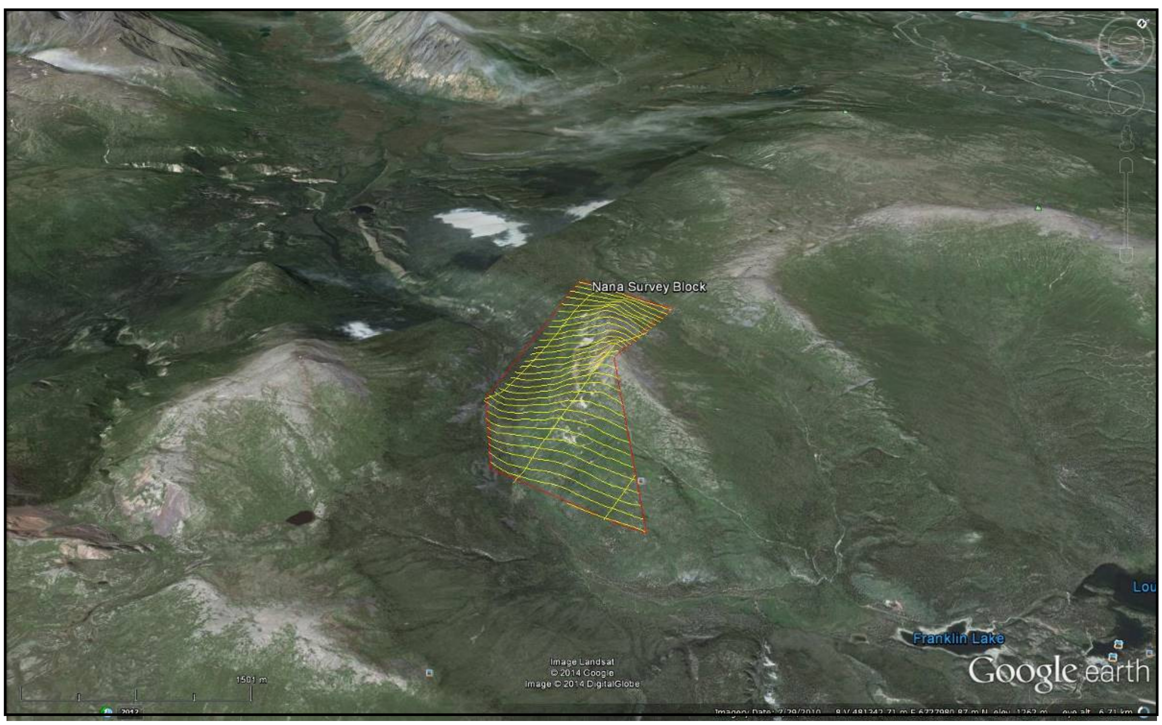

Figure 4: Terrain View – Nana survey block with actual survey and tie lines outlined in yellow, and the block boundary in red.

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1.2 Survey Specifications

The geodetic system used for this survey is WGS 84 and the area is contained in zone 8N. A total of 308 line km was flown (Figure 8 and 9). The survey data acquisition specifications and coordinates for the survey are specified as follows (Tables 1 to 3).

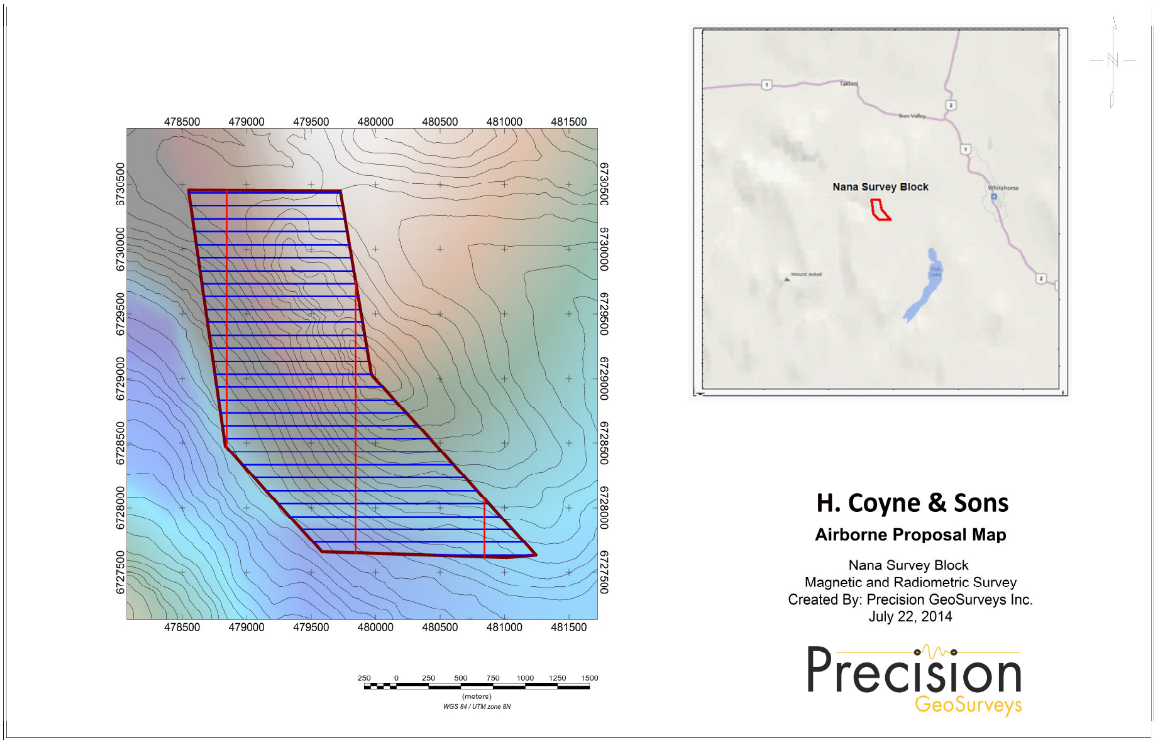

Figure 8: Survey map of Nana survey area showing outlines of proposed survey and tie lines.

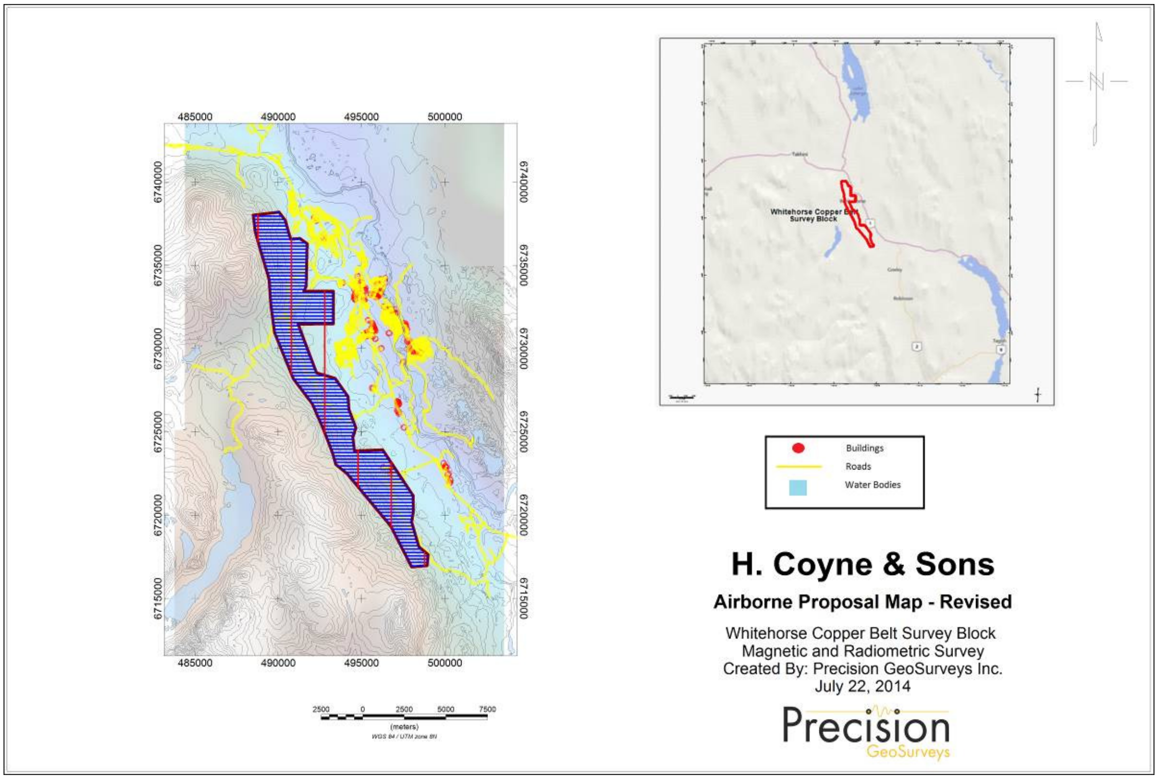

Figure 9: Survey map of WCB survey area showing outlines of proposed survey and tie lines.

Survey Block(s)	Area (km^2)	Planned Line Spacing (m)	Planned Survey Line (km)	Planned Tie Line (km)	Survey Line Orientation	Nominal Survey Height (m)	Actual Survey Height (m)	Total Planned Line (km)	Total Actual Flown (km)
Nana	3.9	100	39	5	090°/270°	40	38.7	44	44
WCB	47.4	200	237	25	090°/270°	40	42.1	262	264
Total	51.3							306	308

Table 1: Survey area flight line specifications.

Longitude	Latitude	Easting	Northing	N/S	E/W
135.34337694	60.68395804	481244.29	6727634.82	N	W
135.34756744	60.68377664	481014.98	6727616.22	N	W
135.37378770	60.68410111	479583.37	6727659.61	N	W
135.38760643	60.69140621	478833.47	6728477.67	N	W
135.39304172	60.70914071	478548.39	6730454.66	N	W
135.37145833	60.70913941	479725.91	6730448.46	N	W
135.36687936	60.69641166	479967.61	6729029.24	N	W

Table 2: Nana survey block polygon coordinates using WGS 84 in zone 8N.

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2.0 Geophysical Data

Geophysical data are collected in a variety of ways and are used to aid in determination of geology, mineral deposits, oil and gas deposits, geotechnical investigations, contaminated land sites and UXO detection.

For the purposes of this survey, airborne magnetic and radiometric data were collected to serve in the exploration for potential gold and copper deposits.

2.1 Magnetic Data

Magnetic surveying is probably the most common airborne survey type to be conducted for both mineral and hydrocarbon exploration. The type of survey specifications, instrumentation, and interpretation procedures depend on the objectives of the survey. Typically magnetic surveys are performed for:

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

2.2 Radiometric Data

Radiometric surveys detect and map natural radioactive emanations, called gamma rays, from rocks and soils. All detectable gamma radiation from earth materials come from the natural decay products of three primary elements; uranium (U), thorium (Th), and potassium (K). The purpose of radiometric surveys is to determine either the absolute or relative amounts of U, Th, and K in surface rocks and soils which are then useful in mapping lithology, alteration, and structure.

3.0 Survey Operations

Precision GeoSurveys flew the survey out of Whitehorse, YT. The experience of the pilot helped to ensure that the data quality objectives were met and that the safety of the flight crew was never compromised given the potential risks involved in airborne geophysical surveying. Field processing and quality control checks were done daily.

3.1 Operations Base and Crew

The base of operation for this survey was at Whitehorse airport, YT. It is located 5.0 km east of the WCB survey block and 18.0 km east of the Nana survey block (Figure 10).

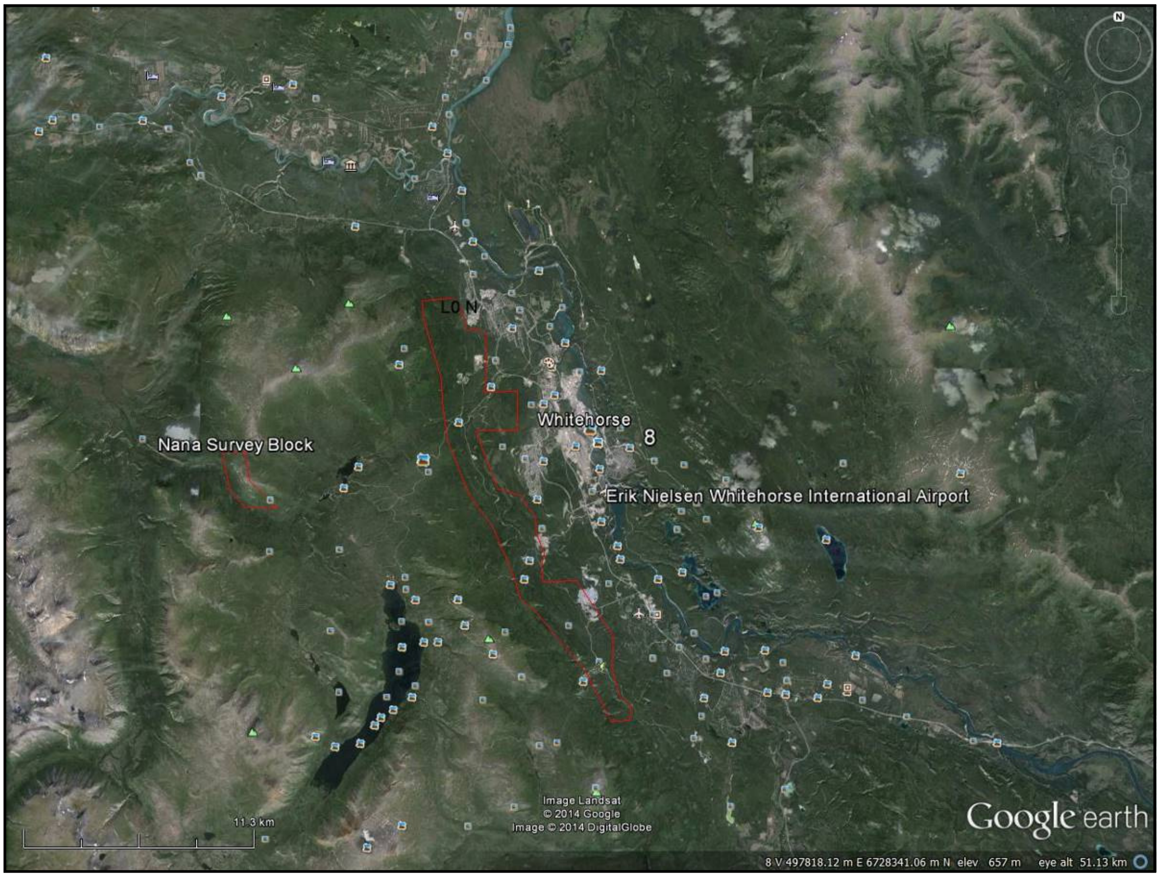


Figure 10: Map showing Whitehorse international airport; base of operation.

The Precision geophysical crew consisted of four members:

Don Plattel– Pilot
Erik Keyser - Operator
Jenny Poon – Geophysicist and data processor
Lea Wood - Geophysicist and data processor

The survey was flown on July 23, 2014. A suspicious magnetic anomaly found on Line 480 in the WCB block was re-reflown on August 12, 2014 and the anomaly was confirmed to be real. The survey did not encounter any delays.

3.2 Base Station Specifications

Two base station magnetometers were set up before the survey to ensure that diurnal magnetic activity was recorded during the survey flights. In this case, two GEM GSM 19T base stations (Figures 11 and 12), GEM 2 (Serial # 2105650) and GEM 4 (Serial # 2065370), were located in the bushes along Fish Lake road (see Table 4 and Figure 13).

Station name	Easting/ Northing	Longitude/ Latitude	Datum/ Projection
GEM 2 (Serial # 2105650)	0491883E, 6733280N	135° 08' 55.82" W 60° 44' 05.99" N	WGS 84, Zone 8N
GEM 4 (Serial # 2065370)	0491884E, 6733281N	135° 08' 55.75" W 60° 44' 06.02" N	WGS 84, Zone 8N

Table 4: Base station specifications.

Base station readings were reviewed at regular intervals to ensure that no data were collected during periods with high diurnal activity (greater than 5 nT per minute). The magnetic base stations were installed at a magnetically noise-free area, away from metallic items such as ferrous objects, vehicles, or power lines that could affect the survey data.

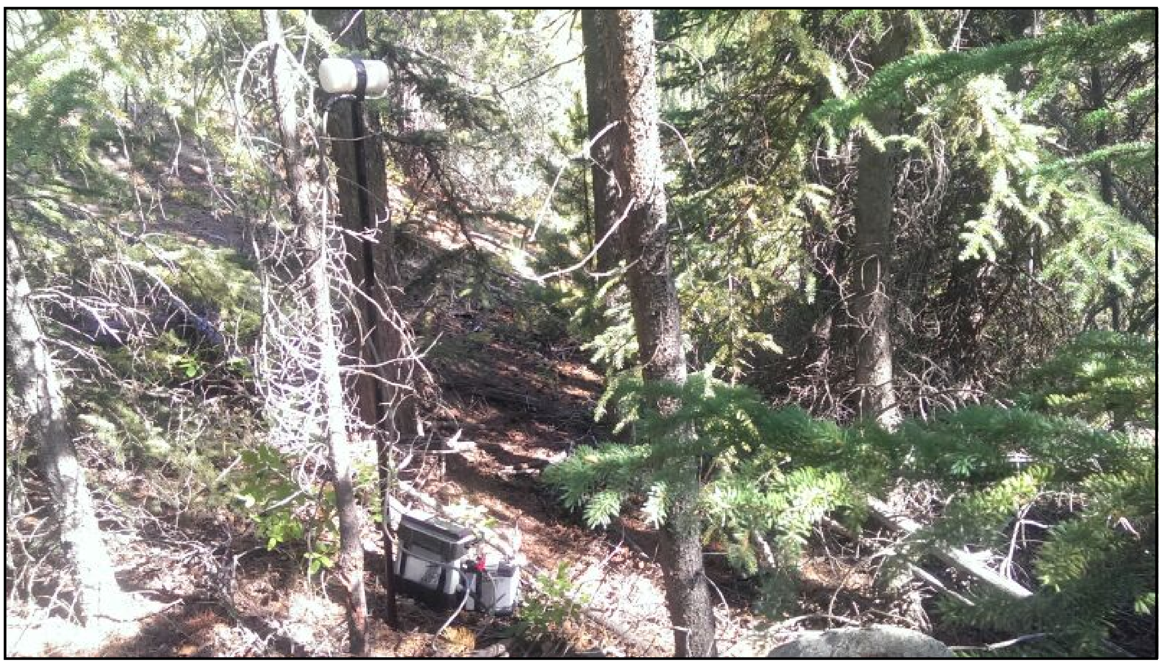


Figure 11: GEM 2 magnetic base station location.

Figure 12: GEM 4 magnetic base station location.

Figure 13: GEM 2 and GEM 4 magnetic base station locations along Fish Lake road.

The diurnal magnetic variations recorded by the stationary base stations were removed from the magnetic data recorded in flight to ensure that the anomalies seen were real and not due to solar activity.

3.3 Field Processing and Quality Control

On a flight-by-flight basis, the survey data were transferred from the helicopter's data acquisition system onto a USB flash drive and copied onto a field data processing laptop. The raw data files were in PEI binary data format and were converted into Geosoft GDB database format. Using Geosoft Oasis Montaj 8.2, the quality of the data was inspected to see if it met the contract specifications (Table 5). Navigational accuracy (left/right or up/down) for all survey and tie lines were within contract specifications (Figure 14), and no re-flights were required due to navigational error. All suspect anomalies, especially those found on a single flight line, were re-flown. Re-flight lines were a minimum of 2000 m long, so that survey line re-flights crossed at least two tie lines, and tie line re-flights crossed at least 5 survey lines. All data were confirmed and verified by a geophysicist. The crew re-flew one suspicious WCB line on August 12, 2014.

Specification	Parameter	Details
Line Spacing	Position	Flight line deviation from flight path by more than 15 m left/ right for 1 km or more.
Height		Flight line deviation from height by more than 15 up/down with a nominal flight height of 40 m above ground for 1 km or more.
GPS		Any flight lines where 3 or less GPS satellites received for distances of greater than 1 km, provided signal loss is not due to topography.
Diurnal Variations	Magnetics	Non-linear magnetic diurnal variations exceed 10nT from a linear chord of length one (1) minute.
Normalized 4th Difference		Magnetic data exceeding 0.2 nT peak to peak for distances greater than 1 km or more (provided noise is not due to geological or cultural features).
Test Line Data	Radiometrics	If signal from the four spectrometer windows (K, Th, U, and TC) over the test line vary by more than 12%, the flights shall be re-flown or suspended.

Table 5: Contract re-flight specifications.

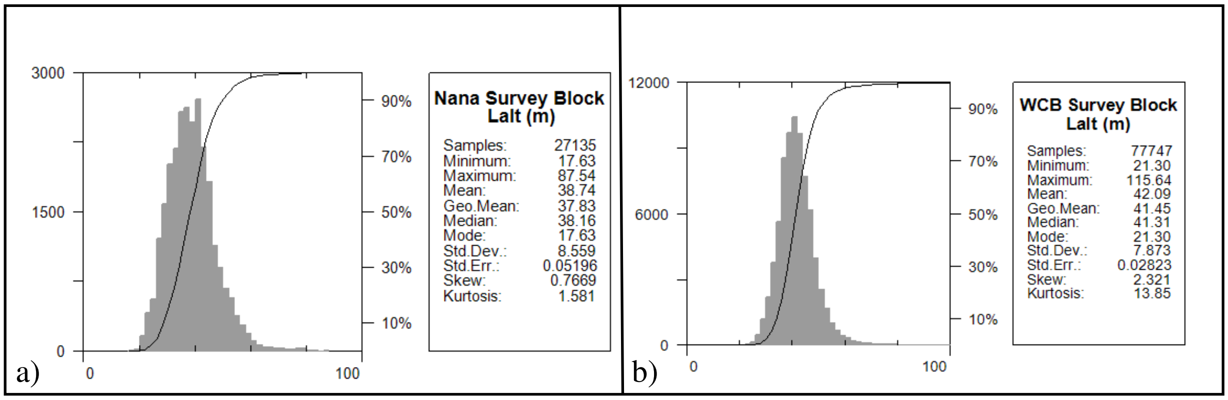


Figure 14: Histogram showing survey elevation vertically above ground. a) Nana survey block. b) WCB survey block.

4.0 Aircraft and Equipment

All geophysical and subsidiary equipment are carefully installed on Precision GeoSurveys aircraft. For this survey, a magnetometer, a spectrometer, a data acquisition system, laser altimeter, magnetic compensation system, a pilot guidance unit (PGU), and magnetic base stations were required to carry out the survey and collect quality, high resolution data. The survey magnetometer was carried in an approved "stinger" configuration to enhance flight safety and improve data quality in this mountainous terrain.

4.1 Aircraft

Precision GeoSurveys flew the Nana and WCB survey blocks using a Eurocopter AS350 helicopter (Figure 15), registration C-GOHK. The Nana survey lines were flown at a nominal line spacing of one hundred (100) meters and the tie lines were flown at one thousand (1000) meters spacing. The WCB survey lines were flown at a nominal line spacing of two hundred (200) meters and the tie lines were flown at two thousand (2000) meters spacing for both the magnetometer and spectrometer.

Figure 15: Eurocopter AS350 helicopter equipped with mag stinger for magnetic data acquisition, and internal spectrometer crystals for radiometric data acquisition.

4.2 Equipment

4.2.1 AGIS

The Airborne Geophysical Information System, AGIS, (Figure 16), is the main computer used in data recording, data synchronizing, displaying real-time QC data for the geophysical operator, and the generation of navigation information for the pilot and operator display system. Information such as magnetic field, total gamma count, counts of various radioelements (K, U, Th, etc.), temperature, cosmic radiation, barometric pressure, atmospheric humidity and survey altitude can all be monitored on the AGIS monitor for immediate QC.

Figure 16: AGIS operator display installed in the Eurocopter AS350.

The AGIS was manufactured by Pico Envirotec; therefore the system uses standardized Pico software and external sensors are connected to the system via RS-232 serial communication cables. The AGIS data format is easily converted into Geosoft or ASCII file formats by a supplied conversion program called PEIView. Additional Pico software allows for post or real time magnetic compensation and survey quality control procedures.

4.2.2 Magnetometer

The airborne magnetic sensor used by Precision GeoSurveys is a Scintrex cesium vapor CS-3 magnetometer. The system was housed in a front mounted "stinger" (Figure 17). The CS-3 is a high sensitivity/low noise magnetometer with automatic hemisphere switching and a wide voltage range, the static noise rating for the unit is +/- 0.01 nT. On the AGIS monitor the operator can view the raw magnetic response, the magnetic fourth difference, compensated and uncompensated data, aircraft position, and the survey altitude for immediate QC of the magnetic data. The magnetic data are recorded at 10 Hz. A magnetic compensator is also used to remove noise created by the movement of the helicopter as it pitches, rolls and yaws within the Earth's geomagnetic field.

Figure 17: View of the mag stinger.

4.2.3 Spectrometer

The IRIS, or Integrated Radiometric Information System, is a fully integrated, gamma radiation detection system containing 12.6 litres of NaI (T1) synthetic downward looking crystals and 4.2 litres of NaI (T1) synthetic upward looking crystals (Figure 18) with 256 channel output at 1 Hz sampling rate. The downward-looking crystals are designed to measure gamma rays from below the aircraft and are equipped with upward-shielding high density RayShield® gamma-attenuating blankets to minimize cosmic and solar gamma noise. The upward looking crystal measures solar gamma radiation from above the survey helicopter and a 6 mm thick lead plate is used for downward-shielding. Real time data acquisition, navigation and communication tasks are integrated into a single unit that is installed in the rear cabin of the aircraft as indicated below.

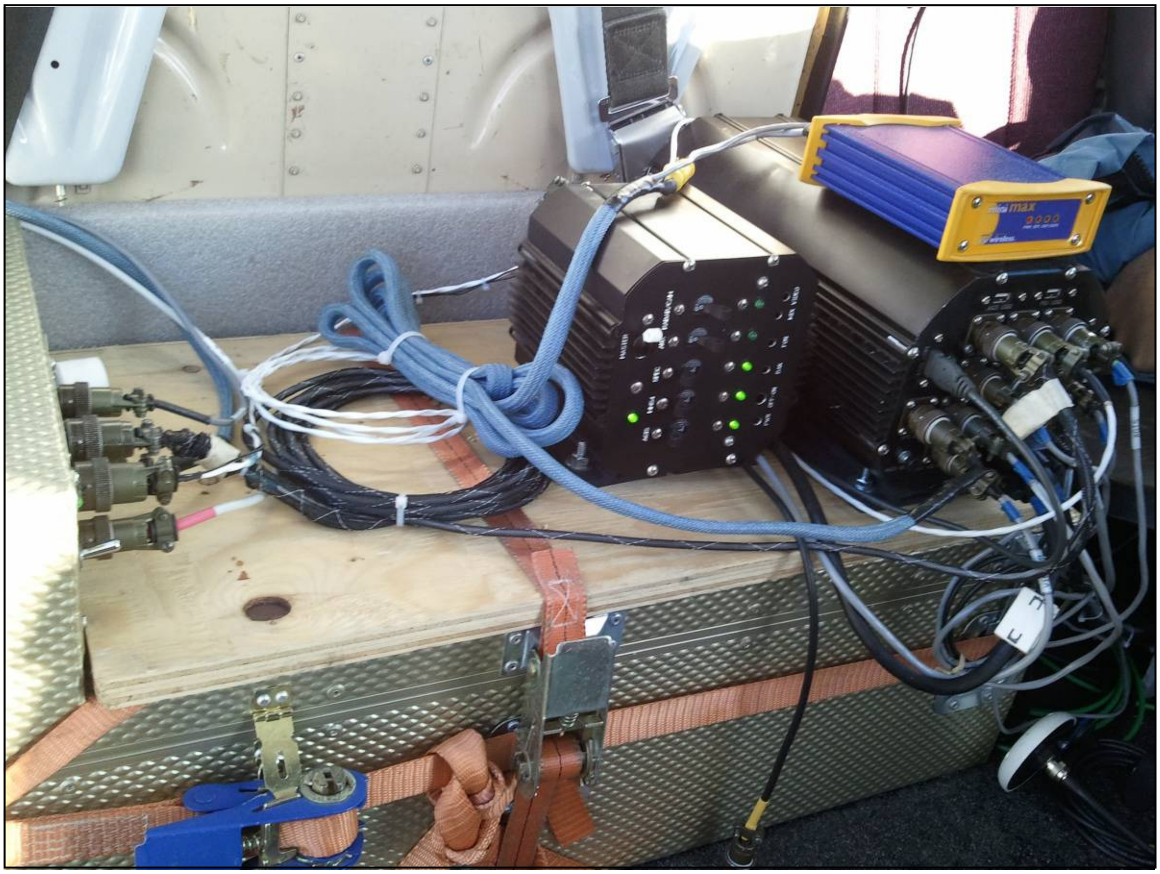


Figure 18: IRIS strapped in the back seat of the Eurocopter AS350.

4.2.4 Base Station

For monitoring and recording of the Earth's diurnal magnetic field variation, Precision GeoSurveys operates two GEM GSM-19T magnetometer base stations continuously throughout the airborne data acquisition operation. The base stations were positioned along Fox Lake road, hidden within the trees and in a region with low magnetic gradient, to give accurate magnetic field readings. The base stations were located in an area away from electric transmission power lines and moving ferrous objects, such as aircraft and motor vehicles that could affect the survey data integrity.

The GEM GSM-19T magnetometer with integrated GPS (Figure 19) or time synchronization uses proton precession technology sampling at a rate of 0.5 Hz. The GSM-19T has an accuracy of +/- 0.2 nT at 1 Hz. Base station data are recorded on the internal solid-state memory, and downloaded onto a field laptop computer using a serial cable and GEMLink 5.0 software. Profile plots of the base station readings are generated and updated at the end of each survey day.

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

4.2.5 Laser Altimeter

The pilot is provided with terrain guidance and clearance information from an Opti-Logic RS800 laser altimeter (Figure 20). This is attached at the aft end of the magnetometer boom. The RS800 sensor 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 of natural surfaces with an accuracy of +/- 1 meter on 1 x 1 m^2 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, the ground clearance data are transmitted to an RS-232 compatible port and recorded and displayed by the AGIS and PGU at 10 Hz.

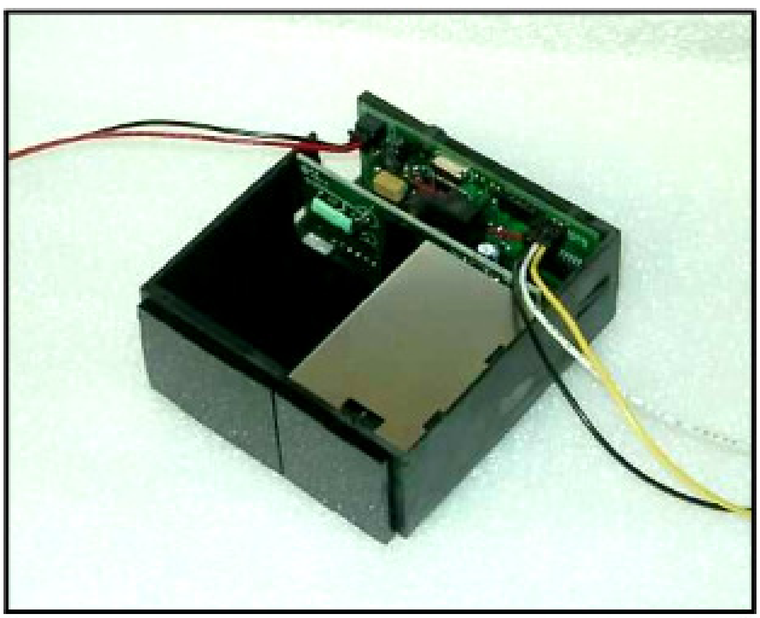


Figure 20: Opti-Logic RS800 laser altimeter.

4.2.6 Pilot Guidance Unit

The PGU (Pilot Guidance Unit) is a graphical display type unit that provides continuous steering and elevation information to the pilot (Figure 21). It is mounted remotely from the data system on top of the helicopter's instrument panel. The PGU assists the pilot in keeping the helicopter on the flight path and at the desired ground clearance.

Figure 21: Pilot Guidance Unit.

The LCD monitor measures 7 inches, with a full VGA 800 x 600 pixel display. The CPU for the PGU is housed in the PC-104 console and uses Windows XP Embedded operating system control, with input from the GPS antenna, laser altimeter, and AGIS.

4.2.7 GPS Navigation System

A Hemisphere GPS Mini Max navigation system integrated with the pilot display (PGU) and AGIS provided navigational information and control. The Hemisphere GPS Mini Max is composed of a receiver with an MGL-3 antenna (Figure 22). It has a position accuracy to within 1 meter and supports SBAS (WAAS, EGNS, and others), Beacon, and Satloc's patented e-Dif.

Figure 22: Hemisphere GPS – Mini Max

A differential correction signal (DGPS –Differential GPS) is applied to the GPS signal received through the MGL-3 antenna and can be applied up to 5 times per second (5 Hz). Therefore, the high- performance Mini Max differential correction provides positional accuracy on the order of 1 meter or less.

5.0 Data Acquisition Equipment Checks and Calibration

Airborne equipment tests were conducted at the start of the survey. There are three tests conducted for the airborne magnetometer: compensation flight, lag test, and heading error test. Gamma ray spectrometer checks and calibrations are also conducted prior to the start of the survey. The three tests conducted were the calibration pad test, cosmic flight test, and the Breckenridge test range.

5.1 Magnetometer Checks

5.1.1 Compensation Flight Test

During aeromagnetic surveying a small but significant amount of noise is introduced to the magnetic data by the aircraft itself, as the magnetometer is within the helicopter's magnetic field. Movement of the aircraft (roll, pitch and yaw) and the permanent magnetization of certain aircraft parts (engine and other ferric objects) contribute to this noise. To remove noise generated by the aircraft a process called magnetic compensation is implemented. The magnetic compensation process starts with a test flight at the beginning of the survey where the aircraft flies in the four orthogonal headings required for the survey (000°/180° and 090°/270° in the case of this survey) at a sufficient altitude (typically > 1,500 m AGL) where the Earth's magnetic field becomes nearly uniform at the scale of the compensation flight. In each heading direction, three specified roll, pitch, and yaw maneuvers are performed by the pilot at constant elevation so that any magnetic variation recorded by the airborne magnetometer can be attributed to the aircraft movement. The variations recorded by these maneuvers provide the data that are required to calculate the necessary parameters for compensating the magnetic data and removing the aircraft noise.

Pre-Compensation					Post-Compensation				
Heading	**Roll**	**Pitch**	**Yaw**	**Total**	**Heading**	**Roll**	**Pitch**	**Yaw**	**Total**
004	6.2859	2.9233	1.4899	10.6991	004	0.2103	0.1767	0.2212	0.6082
093	7.4478	1.9291	1.4977	10.8746	093	0.1361	0.1852	0.1668	0.4881
181	6.1283	3.9263	2.3024	12.3570	181	0.1931	0.1767	0.1228	0.4926
269	3.6515	2.0294	1.4981	7.1790	269	0.1837	0.1814	0.2235	0.5886
Total	23.5135	10.8081	6.7881		**Total**	0.7232	0.7200	0.7343	
FOM = 41.1097 nT					**FOM = 2.1775 nT**				

Table 6: Figure of Merit maneuver test results.

5.1.2 Lag Test

A lag test was performed to determine the relationship between the time the digital reading was recorded by the instrument magnetic sensor and the time for the position fix that the fiducial of the reading was obtained by the GPS system.

The test was flown in the four orthogonal headings over an identifiable magnetic anomaly (ie. Truck, Trailer, etc.) at survey speed and height. A lag of 10 fiducials (1.0 seconds) was determined from the lag test.

5.1.3 Heading Error Test

To determine the magnetic heading effect a cloverleaf pattern flight test was conducted. The cloverleaf test was flown in the same orthogonal headings as the survey and tie lines (000°/180° and 090°/270°) at >1000 m AGL in an area with low magnetic gradient. For all four directions the survey helicopter must pass over the same mid-point all four times at the same elevation (Table 7 and Figure 23).

Line Number	Fiducials	Heading	Mag (nT)	Average (nT)
L000	1006.9	ENE – 077°	56856.4394	
L090	765.5	SSE – 167°	56883.3080	
L180	883.0	WSS - 257°	56868.5514	
L270	679.1	NNW - 347°	56850.2864	
				56864.6463

Table 7: Heading error test data format flown on July 22, 2014.

File Edit Format View Help

```
/Geosoft Heading Correction Table

/
/=Direction:real:i
/=Correction:real
/
/Direction Correction
 000    +8.2069
 090    -18.6617
 180    -3.9051
 270    +14.3599
 360    +8.2069
```

Figure 23: Heading data results in .tbl format in Geosoft table.

5.2 Gamma-ray Spectrometer Checks and Calibrations

Pre-survey calibrations and testing of the GRS-10 airborne gamma-ray spectrometry system were carried out prior to the start of the survey. The calibration of the spectrometer system involved three tests which enabled the conversion of airborne data to ground concentration of natural radioactive elements. These tests were the calibration pad test, cosmic flight test, and the Breckenridge test range. The measurements were made in accordance with IAEA technical report series No. 323, “Airborne Gamma Ray Spectrometer Surveying”, and AGSO Record 1995/60, “A Guide to the Technical Specification for Airborne Gamma-Ray Surveys”.

5.2.1 Calibration Pad Test

The calibration pad test was conducted by Pico Envirotec at the GSC (Geological Survey of Canada) testing facility in Ottawa, Ontario over the approved GSC calibration pad. It is a slab of concrete containing known concentrations of the radioelements (K, Th, and U) and is ideally used to simulate a geological source of radiation. The measurements collected from the calibration pad test are used to determine the Compton scattering and Grasty Backscatter (spectral overlap between element windows) coefficients.

5.2.2 Cosmic Flight Test

While the background source of gamma radiation from the aircraft itself is essentially constant, the amount of signal detected from ground sources varies with ground clearance. As the height of the aircraft increases, the distance between the ground and the spectrometer crystals increase, and the proportion of cosmic radiation in each spectral window increases exponentially due to radiation of cosmic origin. The cosmic flight test is conducted to determine the aircraft's background attenuation coefficients for the detector crystal packs and the cosmic coefficients. The pilot is required to fly over the same location repeatedly in opposite directions starting from 1,500 m to 3,000 m at 500 m intervals for approximately 2 minutes each to collect gamma data used to determine the amount of non-terrestrial gamma signal.

5.2.3 Breckenridge Test Range

The Breckenridge test range is very similar to the cosmic flight test but is conducted at lower elevations (from ground level). The pilot is required to fly over the same location at the following elevations in meters above ground; 30, 50, 100, 150, 200, 250, and 300. As the distance of the aircraft increases away from the radioactive ground source, the source signature exponentially degrades. As a result, this test is used to determine the altitude attenuation coefficients and the radio-element sensitivity of the airborne spectrometer system.

6.0 Data Processing

After all the data were collected from a survey flight several procedures were undertaken to ensure that the data met a high standard of quality. All data were processed using Pico Envirotec software and Geosoft Oasis Montaj 8.2 geophysical processing software along with proprietary processing algorithms.

6.1 Magnetic Processing

The data obtained from the compensation flight test was applied to the raw magnetic data before any further processing and editing. The computer program called PEIComp was used to create a model from the compensation flight test for each survey to remove the noise induced by aircraft movement; this model was applied to each survey flight so the data can be further processed.

Over water or fog, the laser altimeter is unable to record a valid reading and a zero is recorded; therefore all data points recorded at zero were replaced with a nominal height of 40 m. Filtering was then applied to the laser altimeter data to remove vegetation clutter and to show the actual ground clearance. To remove vegetation clutter a Rolling Statistic filter was applied to the laser altimeter data and a low pass filter was used to smooth out the laser altimeter profile to eliminate isolated noise. As a result, filtering the data will yield a more uniform surface in close conformance with the actual terrain. A digital terrain model channel was calculated by subtracting the filtered laser altimeter data from the filtered GPS altimeter data defined by the WGS 84 ellipsoidal height.

The processing of the magnetic data first involved the correction for diurnal variations. Out of the two base stations that were set up, GEM 4 was chosen and used for diurnal corrections. The base station data were edited, plotted and merged into a Geosoft (.gdb) database on a daily basis. The airborne magnetic data were corrected for diurnal variations by subtracting the observed magnetic base station deviations. Following the diurnal correction, a lag correction was applied. A lag correction of 1.0 seconds was applied to the total magnetic field data to compensate for the combination of lag in the recording system and the magnetometer sensor flying 5.70 m ahead of the GPS antenna. Lastly, a heading correction was applied to the data. As a result, after all corrections have been applied the initial Total Magnetic Intensity (TMI) data was generated.

The initial Total Magnetic Intensity (TMI) data from the survey and tie lines were used to level the entire survey dataset. Two forms of leveling were applied to the corrected data: conventional leveling and micro-leveling. There were two components to conventional leveling; the first involved statistical leveling of magnetic data to correct miss ties (intersection errors) followed by specific patterns or trends. For the second component, tie lines were brought to a common regional base value using the mean value of the cross-level error. To obtain the best possible leveled data, individual corrections were edited at selected intersections. Lastly, micro-leveling was applied to the corrected conventional leveled data. This will remove any residual noise related to flight line direction, and any low amplitude component of flight line noise, that still remained in the data after tie line leveling.

6.1.1 IGRF Removal and Calculation of the First Vertical Derivative

The International Geomagnetic Reference Field (IGRF) model is the empirical representation of the Earth's magnetic field (main core field without external sources) collected and disseminated from satellites and from observatories around the world. The IGRF is generally revised and updated every five years by a group of modelers associated with the International Association of Geomagnetism and Aeronomy (IAGA). In this case, the IGRF values were calculated from model year 2010 and the actual survey dates were obtained from the "Date" channel.

With the removal of the IGRF from the observed Total Magnetic Intensity (TMI) a Residual Magnetic Intensity (RMI) was generated. This created a more valid model of individual near surface anomalies and the data will not be referenced to a time which can be easily incorporated into databases of magnetic data acquired in the past or in the future.

The first vertical derivative was computed from the Total Magnetic Intensity (TMI) data. Long wavelengths and vertical rate of change were suppressed in the magnetic field. Therefore, the edges of magnetic anomalies were highlighted and spatial resolution was increased.

6.2 Radiometric Processing

Radiometric surveys map the concentration of radioelements at or near the earth's surface; typically up to 1.5 meters below surface. Thus, the first step which is vital before processing of the airborne radiometric data was to calibrate the spectrometer system. Once calibration of the system was complete, the radiometric data were processed by windowing the full spectrum to create channels for U, K, Th and total count. A 5-point Hanning filter was applied to the Cosmic window before going any further with processing the radiometric data.

Aircraft background and cosmic stripping corrections were applied to all three elements, and total count using the following formula:

$$C_{ac} = C_{lt} - (a_c + b_c * \mathrm{Cos}_f)$$

where: C_{ac} is the background and cosmic corrected channel
C_{lt} is the live time corrected channel
a_c is the aircraft background for this channel
b_c is the cosmic stripping coefficient for this channel
Cos_f is the filtered cosmic channel

The radon backgrounds were first removed followed by Compton stripping. Spectral overlap corrections were applied on to potassium, uranium, and thorium as part of the Compton stripping process. This was done by using the stripping ratios that have been calculated for the spectrometer by prior calibration; this breaks the corrected elemental values down into the apparent radioelement concentrations. Lastly, attenuation corrections were applied to the data which involves nominal survey altitude corrections, in this case for the Nana block, 38.74 metres is applied to total count, potassium, uranium, and thorium data. For the WCB block, 42.09 meters is applied to total count, potassium, uranium, and thorium data for survey altitude corrections.

With all corrections applied to the radiometric data, the final step was to convert the corrected potassium, uranium, and thorium to apparent radioelement concentrations using the following formula:

$$eE = C_{cor} / s$$

where: eE is the element concentration K(%) and equivalent element concentration of U(ppm) & Th(ppm)
s is the experimentally determined sensitivity
C_{cor} is the fully corrected channel

Finally, the natural air exposure rate was determined by using the following formula:

$$E = [(13.08 * K + 5.43 * eU + 2.69 * eTh) / 8.69]$$

where: *E* is the absorption dose rate in μR/h
K is the concentration of potassium (%)
eU is the equivalent concentration of uranium (ppm)
eTh is the equivalent concentration of thorium (ppm)

To calculate for radiometric ratios the guidelines of the IAEA were followed. Due to statistical uncertainties in the individual radioelement measurements, some care was taken in the calculation of the ratio in order to obtain statistically significant values. Following IAEA guidelines, the method of determining ratios of the eU/eTh, eU/K and eTh/K was as follows:

1. Any data points where the potassium concentration was less than 0.25% were neglected.
2. The element with the lowest corrected count rate was determined.
3. The element concentrations of adjacent points on either side of each data point were summed until they exceeded a pre-determined threshold value. This threshold was set to be equivalent to 100 counts of the element with the lowest count rate. Additional minimum arbitrary thresholds of 1.6% for potassium, 20 ppm for thorium, and 30 ppm for uranium were set up to ensure meaningful ratios.
4. The ratios were calculated using the accumulated sums.

With this method, the errors associated with the calculated ratios were minimized and comparable for all data points.

7.0 Deliverables

All digital data are presented on a compact disc (CD) and USB memory stick with the logistic report. The survey data are presented as digital databases, maps, and a report.

7.1 Digital Data

The file format will be provided in two (2) formats, the first will be a .GDB file for use in Geosoft Oasis Montaj, the second format will be a .XYZ file, this is text file. A complete file provided in each format will contain magnetic and radiometric data separately. Full description of the digital data and contents are included in the report (Appendix B).

The digital data are represented into grids. The following grids are prepared for the Nana survey block at 25 m cell size listed below:

- Digital terrain model (DTM)
- Total magnetic intensity (TMI)
- Residual magnetic intensity (RMI) – removal of IGRF from TMI
- Calculated vertical gradient (CVG) - first vertical derivative of TMI
- Potassium (%K) - radiometric data in percentage
- Thorium (eTh) - radiometric data in concentrations
- Uranium (eU) - radiometric data in concentrations
- Total count (TCcor) – radiometric data in equivalent dose rate
- Total count (TCexp) – radiometric data in exposure rate
- Thorium over Potassium ratio (eTh/%K) – radiometric ratios
- Uranium over Potassium ratio (eU/%K) – radiometric ratios
- Uranium over Thorium ratio (eU/eTh) – radiometric ratios

The following grids are prepared for the WCB survey block at 50 m cell size listed below:

- Digital terrain model (DTM)
- Total magnetic intensity (TMI)
- Residual magnetic intensity (RMI) – removal of IGRF from TMI
- Calculated vertical gradient (CVG) - first vertical derivative of TMI
- Potassium (%K) - radiometric data in percentage
- Thorium (eTh) - radiometric data in concentrations
- Uranium (eU) - radiometric data in concentrations
- Total count (TCcor) – radiometric data in equivalent dose rate
- Total count (TCexp) – radiometric data in exposure rate
- Thorium over Potassium ratio (eTh/%K) – radiometric ratios
- Uranium over Potassium ratio (eU/%K) – radiometric ratios
- Uranium over Thorium ratio (eU/eTh) – radiometric ratios

7.2 KMZ Grids

The digital data represented into grids 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 both the Nana and WCB survey blocks. The following map products were prepared:

Survey Overview Maps (colour images with elevation contour lines):

- Actual flight lines
- Digital terrain model

Magnetic Maps (colour images with elevation contour lines):

- Total magnetic intensity
- Total magnetic intensity with plotted flight lines
- Residual magnetic intensity
- Calculated vertical gradient of the total magnetic intensity

Radiometric Maps (colour images with elevation contour lines):

- Potassium – percentage
- Thorium – equivalent concentration
- Uranium – equivalent concentration
- Total Count – equivalent dose rate
- Total Count – exposure rate
- Thorium over Potassium ratio
- Uranium over Potassium ratio
- Uranium over Thorium ratio
- Ternary – an element ratio map of K, Th, and U

All maps were prepared in WGS 84 and UTM zone 8N.

7.4 Report

The logistics report provides information on the acquisition procedures, magnetic processing, radiometric processing, and presentation of the Nana and WCB survey blocks data. A pdf copy of the report is included along with the digital data and maps that are provided on the CD and USB stick.

Appendix A

Equipment Specifications

- GEM GSM-19T Proton Precession Magnetometer (Base Station)
- Hemisphere GPS – Mini Max
- Opti-Logic RS800 Laser Altimeter
- Scintrex CS-3 Survey Magnetometer
- Bartington Mag-03 three-axis fluxgate magnetic field sensor
- Pico Envirotec GRS-10 Gamma Spectrometer
- Pico Envirotec AGIS data recorder system (for Navigation, Gamma spectrometer, VLF-EM and Magnetometer Data Acquisition)

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

Configuration Options	15
Cycle Time	999 to 0.5 sec
Environmental	-40 to +60 ° Celsius
Gradient Tolerance	7,000 nT/m
Magnetic Readings	299,593
Operating Range	10, 000 to 120,000 nT
Power	12 V @ 0.62 A
Sensitivity	0.1 nT @ 1 sec
Weight (Console/ Sensor)	3.2 Kg
Integrated GPS	Yes

Hemisphere GPS – Mini Max

GPS Sensor Specifications	Receiver Type	LI, C/A code, with carrier phase smoothing
	Channels	I2-channel, parallel tracking (10-channel when tracking SBAS)
	WAAS Tracking	2-channel, parallel tracking
	Update Rate	1 Hz default, 5 Hz max
	Horizontal Accuracy	< 1 m 95% confidence (DGPS) < 5 m 95% confidence (autonomous, no SA)
	Cold Start	1 min typical
	Antenna Input Impedance	50 Ω
Beacon Sensor Specifications	Channels	2-channel, parallel tracking
	Frequency Range	283.5 to 325 kHz
	Channel Spacing	500 Hz
	MSK Bit Rates	50, 100, and 200 bps
	Operating Modes	Manual, automatic, semi-automatic
	Cold Start Time	< 1 minute typical
	Reacquisition Time	< 2 seconds typical
	Demodulation	Minimum shift keying (MSK)
	Sensitivity	2.5µV for 6dB SNR @ 200 bps
	Dynamic Range	100dB
	Frequency Offset	±8 Hz (~ 27 ppm)
	Adjacent Channel Rejection	61 dB ± 1dB @ fo ± 400 Hz
Communications	Serial ports	2 full duplex
	Interface Level	RS-232C
	Baud Rates	4800, 9600, 19200
	Correction Input/ Output Protocol	RTCM SC-104
	Raw Measurement Data	Proprietary binary (RINEX utility available)
	Timing Output	1 PPS (HCMOS, active high, rising edge sync, 10kΩ, 10pF load)
Environmental	Operating Temperature	-32^{0}C to +74^{0}C
	Storage Temperature	-40^{0}C to +85^{0}C
	Humidity	95% non-condensing
	EMC	FCC Part I 5, Subpart B, Class B CISPR 22
Power	Input Voltage Range	9 to 32 VDC
	Reverse Polarity Protection	Yes
	Power Consumption	3W
	Current Consumption	<250 mA @ 12 VDC
	Antenna Short Circuit Protection	Yes

Opti-Logic RS800 Laser Altimeter

Accuracy	+/- 1 yard
Com. Protocol	RS232-8,N,1
Baud Rate	19200
Raw Data Rate	~200 Hz
Calibrated Data Rate	~10 Hz
Laser	Class I (eye-safe) 905nm +/- 10nm
Power	7-to-9 Vdc
Typical Range	400 yards
Laser Wavelength	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 5 cm x 5 cm)
Data Rate	~200 Hz raw counts for un-calibrated operation ~10 Hz for calibrated operation (averaging algorithm seeks 8 good readings)
Dimensions	32 x 78 x 84 mm (lens face cross section is 32 x 78 mm)
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.

Scintrex CS-3 Survey Magnetometer

Operating Principal	Self-oscillation split-beam Cesium Vapor (non-radioactive Cs-133)
Operating Rage	15,000 to 105,000 nT
Gradient Tolerance	40,000 nT/metre
Operating Zones	10° to 85° and 95° to 170°
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 P-P, 0.1 to 1 Hz bandwidth
Heading Error	+/- 0.25 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	3m (9' 8"), lengths up to 5m (16' 4") available
Operating Temperature	-40°C to +50°C
Humidity	Up to 100%, splash proof
Supply Power	24 to 35 Volts DC
Supply Current	Approx. 1.5A at start up, decreasing to 0.5A at 20°C
Power Up Time	Less than 15 minutes at -30°C

Bartington Mag-03 three-axis fluxgate magnetic field sensor

Number of Axes	3
Bandwidth	0 to 3kHz at 50µT peak
Internal Noise: **Basic version** **Standard version** **Low Noise version**	>10 to 20pTrms/√Hz at 1Hz 6 to ≤10pTrms/√Hz at 1Hz <6pTrms/√Hz at 1Hz
Scaling error (DC)	<±0.5%
Orthogonality error	<0.1°
Alignment error (Z axis to reference face)	<0.1°
Linearity error	<0.0015%
Frequency response	0 to 1kHz maximally flat, ±5% maximum at 1kHz
Input voltage	±12V to ±17V
Supply current	+30mA, -10mA (+1.4mA per 100µT for each axis)
Power supply rejection ratio	5µV/V (-106dB)
Analog output	±10V (±12V supply) swings to within 0.5V of supply voltage
Output impedance	10 Ω
Operating temperature range	-40°C to +70°C
Environmental protection	IP51
Dimensions (W x H x L)	32 x 32 x 152mm
Weight	160g
Enclosure material	Reinforced epoxy
Connector	ITT Cannon DEM-9P-NMB
Mating connector	ITT Cannon DEM-9S-NMB
Mounting	2 x M5 fixing holes

Pico Envirotec GRS-10 Gamma Spectrometer

Crystal volume	12.6 litres of NaI (T1) synthetic downward looking crystals and 4.2 litres of NaI (T1) synthetic upward looking crystals
Resolution	256/512 channels
Tuning	Automatic using peak determination algorithm
Detector	Digital Peak
Calibration	Fully automated detector
Real Time	Linearization and gain stabilization
Communication	RS232
Detectors	Expandable to 10 detectors and digital peak
Count Rate	Up to 60,000 cps per detector
Count Capacity per channel	65545
Energy detection range:	36 KeV to 3 MeV
Cosmic channel	Above 3 MeV
Upward Shielding	RayShield® non-radioactive shielding on downward looking crystals
Downward Shielding	6 mm thick lead plate is used for downward-shielding
Spectra	Collected spectra of 256/512 channels, internal spectrum resolution 1024
Software	Calibration: High voltage adjustment, linearity correction coefficients calculation, and communication test support Real Time Data Collection: Automatic Gain real time control on natural isotopes, and PC based test and calibration software suite
Sensor	Each box containing two (2) gamma detection NaI(Tl) crystals – each 4.2 liters. (256 cu in.) (approx. 100 x 100 x 650 mm) Total volume of approx 8.4 litres or 512 cu in with detector electronics
Spectra Stabilization	Real time automatic corrections on radio nuclei: Th, Ur, K. No implanted sources.

Pico Envirotec AGIS data recorder system
(for Navigation, Gamma spectrometer, VLF-EM and Magnetometer Data Acquisition)

Functions	Airborne Geophysical Information System (AGIS) with integrated Global Positioning System Receiver (GPS) and all necessary navigation guidance software. Inputs for geophysical sensors - portable gamma ray spectrometer GRS-10, MMS4 Magnetometer, Totem 2A EM, A/D converter, temperature probe, humidity probe, barometric pressure probe, and laser altimeter. Output for the 2 line Pilot Indicator
Display	Touch screen with display of 800 x 600 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.
GPS Navigation	Garmin 12-channel, WAAS-enabled
Data Sampling	Sensor dependent
Data Synchronization	Synchronized to GPS position
Data File	PEI Binary data format
Storage	80 GB
Supplied Software	PEIView: Allows fast data Quality Control (QC) Data Format: Geosoft GBN and ASCII output PEIConv: For survey preparation and survey plot after data acquisition
Software	Calibration: High voltage adjustment, linearity correction coefficients calculation, and communication test support Real Time Data Collection: Automatic Gain real time control on natural isotopes and PC based test and calibration software suite
Power Requirements	24 to 32 VDC
Temperature	Operating:-10 to +55 deg C; storage:-20 to +70 deg C

Appendix B

Digital File Descriptions

- Magnetic database description
- Radiometric database description
- Grids
- Maps

Magnetic Database:

Abbreviations used in the GDB files listed below:

Channel	Units	Description
X_WGS84	m	UTM Easting – WGS 84 Zone 8 North
Y_WGS84	m	UTM Northing – WGS 84 Zone 8 North
Lon_deg	deg	Longitude
Lat_deg	deg	Latitude
Date	yyyy/mm/dd	Dates of the survey flight(s)
FLT		Flight Line numbers
STL		Number of satellite(s)
LineNo		Line numbers
GPSfix		GPS fix
GPStime	Hours:min:secs	GPS time (UTC)
Geos_m	m	Geoidal separation
GHead_deg	deg	Heading of the helicopter
XTE_m	M	Flight line cross distance
Galt	m	GPS height – WGS 84 Zone 8 North
Lalt	m	Laser Altimeter readings
DTM	m	Digital Terrain Model
basemag	nT	Base station diurnal data
IGRF		International Geomagnetic Reference Field 2010
Declin	Decimal deg	Calculated declination of magnetic field
Inclin	Decimal deg	Calculated inclination of magnetic field
TMI	nT	Total Magnetic Intensity
RMI	nT	Residual Magnetic Intensity

Radiometric Database:

Abbreviations used in the GDB files listed below:

Channel	Units	Description
X_WGS84	m	UTM Easting – WGS 84 Zone 8 North
Y_WGS84	m	UTM Northing – WGS 84 Zone 8 North
Lon_deg	deg	Longitude
Lat_deg	deg	Latitude
Date	yyyy/mm/dd	Dates of the survey flight(s)
FLT		Flight numbers
STL		Number of satellite(s)
LineNo		Line numbers
GPStime	Hours:min:secs	GPS time (UTC)
Geos_m	m	Geoidal separation
GPSFix		GPS fix
GHead_deg	deg	Heading of the helicopter
XTE_m	m	Flight line cross distance
Galt	m	GPS height – WGS 84 Zone 8 North
Lalt	m	Laser Altimeter readings
DTM	m	Digital Terrain Model
BaroSTP_Kp	KiloPascal	Barometric Altitude (Press and Temp Corrected)
Temp_degC	Degrees C	Air Temperature
Press_kP	KiloPascal	Atmospheric Pressure
COSFILT	counts/sec	Spectrometer - Filtered Cosmic
UPUFILT	counts/sec	Spectrometer – Filtered Upward Uranium
Kcor	%	Equivalent Concentration - Potassium
THcor	ppm	Equivalent Concentration - Thorium
Ucor	ppm	Equivalent Concentration - Uranium
TCcor	µR	Equivalent Dose Rate
TCexp	µR/hour	Exposure Rate - SUM(%k, eU, eTh) * determined factors
THKratio		Spectrometer – eTh/%K ratio
UKratio		Spectrometer – eU/%K ratio
UTHratio		Spectrometer – eU/eTh ratio

Grids: Nana survey block, WGS 84 Datum, Zone 8N

FILE NAME	DESCRIPTION
Nana_DTM_25m.grd	Nana survey block digital terrain model gridded at 25 m cell size
Nana_TMI_25m.grd	Nana survey block total magnetic intensity gridded at 25 m cell size
Nana_RMI_25m.grd	Nana survey block residual magnetic intensity gridded at 25 m cell size
Nana_CVG_25m.grd	Nana survey block calculated vertical gradient of TMI gridded at 25 m cell size
Nana_Kcor_25m.grd	Nana survey block potassium (Kcor) percentage gridded at 25 m cell size
Nana_Thcor_25m.grd	Nana survey block Thorium (Thcor) equivalent concentration gridded at 25 m cell size
Nana_Ucor_25m.grd	Nana survey block Uranium (Ucor) equivalent concentration gridded at 25 m cell size
Nana_TCcor_25m.grd	Nana survey block Total Count (TCcor) equivalent dose rate gridded at 25 m cell size
Nana_TCexp_25m.grd	Nana survey block Total Count (TCexp) exposure rate gridded at 25 m cell size
Nana_ThKratio_25m.grd	Nana survey block thorium over potassium ratio (eTh/%K) gridded at 25 m cell size
Nana_UKratio_25m.grd	Nana survey block uranium over potassium ratio (eU/%K) gridded at 25 m cell size
Nana_UTHratio_25m.grd	Nana survey block uranium over thorium ratio (eU/eTh) gridded at 25 m cell size

Maps: Nana survey block, WGS 84 Datum, Zone 8N (jpegs and pdfs)

FILE NAME	DESCRIPTION
Nana_ActualFlightLines_25m	Nana Survey block plotted actual flown flight lines
Nana_DTM_25m	Nana Survey block digital terrain model gridded at 25 m cell size
Nana_TMI_25m	Nana Survey block total magnetic intensity gridded at 25 m cell size
Nana_TMI_with_FlightLines_25m	Nana Survey block total magnetic intensity with plotted actual flight lines gridded at 25 m cell size
Nana_RMI_25m	Nana Survey block residual magnetic intensity gridded at 25 m cell size
Nana_CVG_25m	Nana Survey block calculated vertical gradient of TMI gridded at 25 m cell size
Nana_%Kcor_25m	Nana Survey block potassium (Kcor) percentage gridded at 25 m cell size
Nana_Thcor_25m	Nana Survey block Thorium (Thcor) equivalent concentration gridded at 25 m cell size
Nana_Ucor_25m	Nana Survey block Uranium (Ucor) equivalent concentration gridded at 25 m cell size
Nana_TCcor_25m	Nana Survey block Total Count (TCcor) equivalent dose rate gridded at 25 m cell size
Nana_TCexp_25m	Nana Survey block Total Count (TCexp) exposure rate gridded at 25 m cell size
Nana_eTh%K_Ratio_25m	Nana Survey block thorium over potassium ratio (eTh/%K) gridded at 25 m cell size
Nana_eU%K_Ratio_25m	Nana Survey block uranium over potassium ratio (eU/%K) gridded at 25 m cell size
Nana_eUeTH_Ratio_25m	Nana Survey block uranium over thorium ratio (eU/eTh) gridded at 25 m cell size
Nana_TernaryMap_25m	Nana Survey block displaying ratios of all three elements (%K, eTh, eU)

Maps: WCB survey block, WGS 84 Datum, Zone 8N (jpegs and pdfs)

FILE NAME	DESCRIPTION
WCB_ActualFlightLines_50m	WCB Survey block plotted actual flown flight lines
WCB_DTM_50m	WCB Survey block digital terrain model gridded at 50 m cell size
WCB_TMI_50m	WCB Survey block total magnetic intensity gridded at 50 m cell size
WCB_TMI_with_FlightLines_50m	WCB Survey block total magnetic intensity with plotted actual flight lines gridded at 50 m cell size
WCB_RMI_50m	WCB Survey block residual magnetic intensity gridded at 50 m cell size
WCB_CVG_50m	WCB Survey block calculated vertical gradient of TMI gridded at 50 m cell size
WCB_%Kcor_50m	WCB Survey block potassium (Kcor) percentage gridded at 50 m cell size
WCB_Thcor_50m	WCB Survey block Thorium (Thcor) equivalent concentration gridded at 50 m cell size
WCB_Ucor_50m	WCB Survey block Uranium (Ucor) equivalent concentration gridded at 50 m cell size
WCB_TCcor_50m	WCB Survey block Total Count (TCcor) equivalent dose rate gridded at 50 m cell size
WCB_TCexp_50m	WCB Survey block Total Count (TCexp) exposure rate gridded at 50 m cell size
WCB_eTh%K_Ratio_50m	WCB Survey block thorium over potassium ratio (eTh/%K) gridded at 50 m cell size
WCB_eU%K_Ratio_50m	WCB Survey block uranium over potassium ratio (eU/%K) gridded at 50 m cell size
WCB_eUeTH_Ratio_50m	WCB Survey block uranium over thorium ratio (eU/eTh) gridded at 50 m cell size
WCB_TernaryMap_50m	WCB Survey block displaying ratios of all three elements (%K, eTh, eU)

Page on Whitehorse Copper Belt, deleted

Appendix C

Nana Survey Block Maps

Survey Overview Maps (colour image with elevation contour lines):

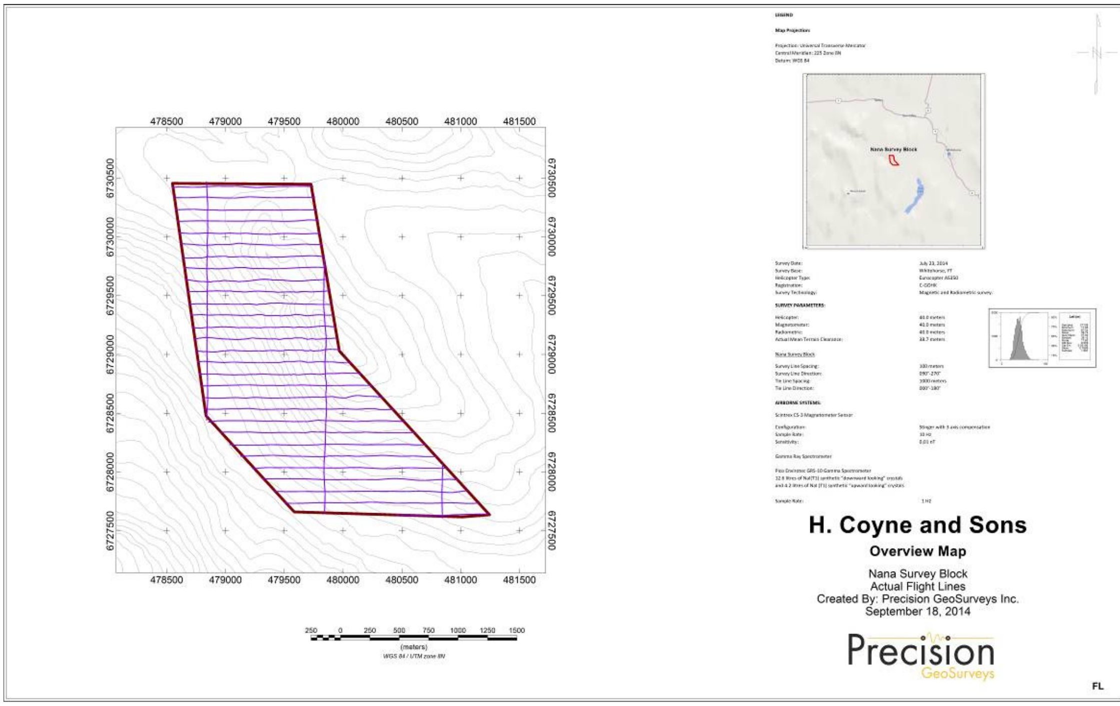
- Flight Lines (FL)
- Digital Terrain Model (DTM)

Magnetic Maps (colour image with elevation contour lines):

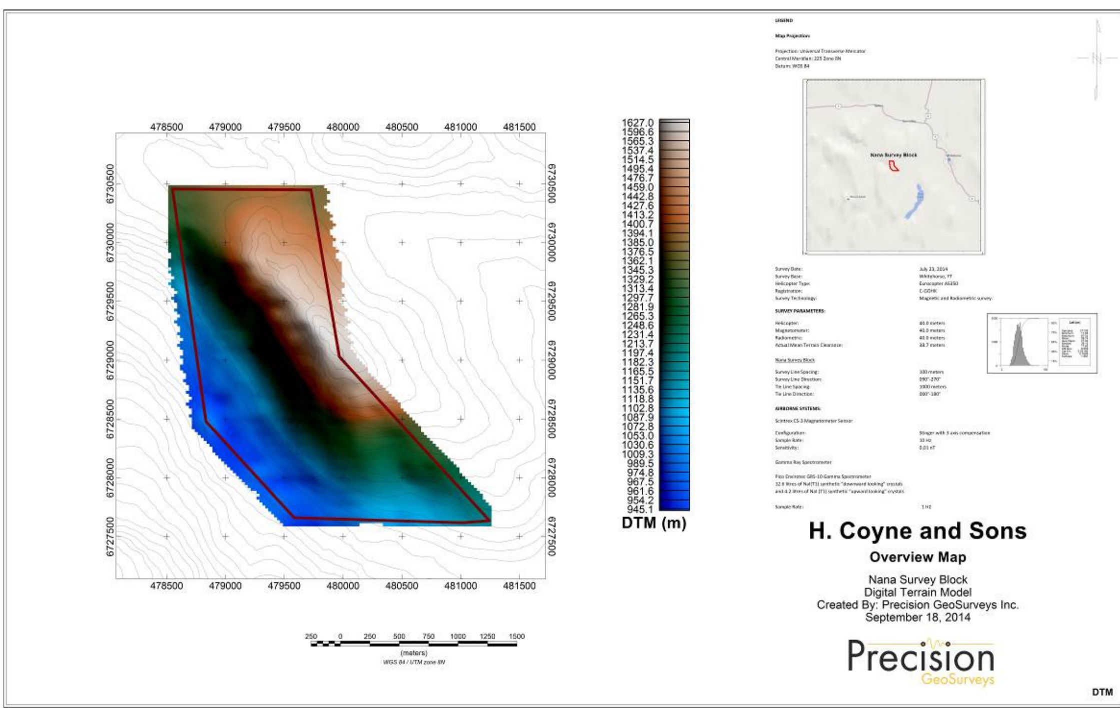
- Total Magnetic Intensity (TMI)
- Total Magnetic Intensity (TMI_wFL) with flight lines
- Residual Magnetic Intensity (RMI)
- Calculated Vertical Gradient (CVG) of TMI

Radiometric Maps (colour image with elevation contour lines):

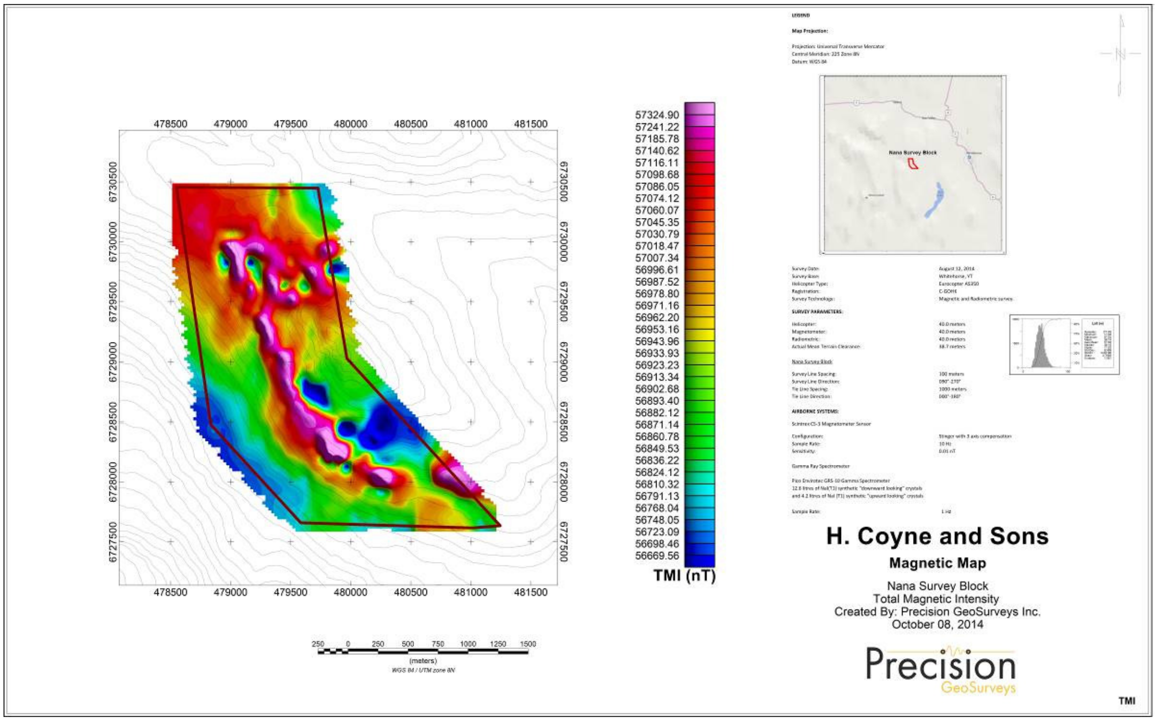
- Potassium – Equivalent Concentration (%K)
- Thorium – Equivalent Concentration (eTh)
- Uranium – Equivalent Concentration (eU)
- Total Count –Equivalent Dose Rate (TCcor)
- Total Count – Exposure Rate (TCexp)
- Thorium over Potassium Ratio - Spectrometer - eTh/%K ratio
- Uranium over Potassium Ratio - Spectrometer - eU/%K ratio
- Uranium over Thorium Ratio - Spectrometer - eU/eTh ratio
- Ternary (TM)



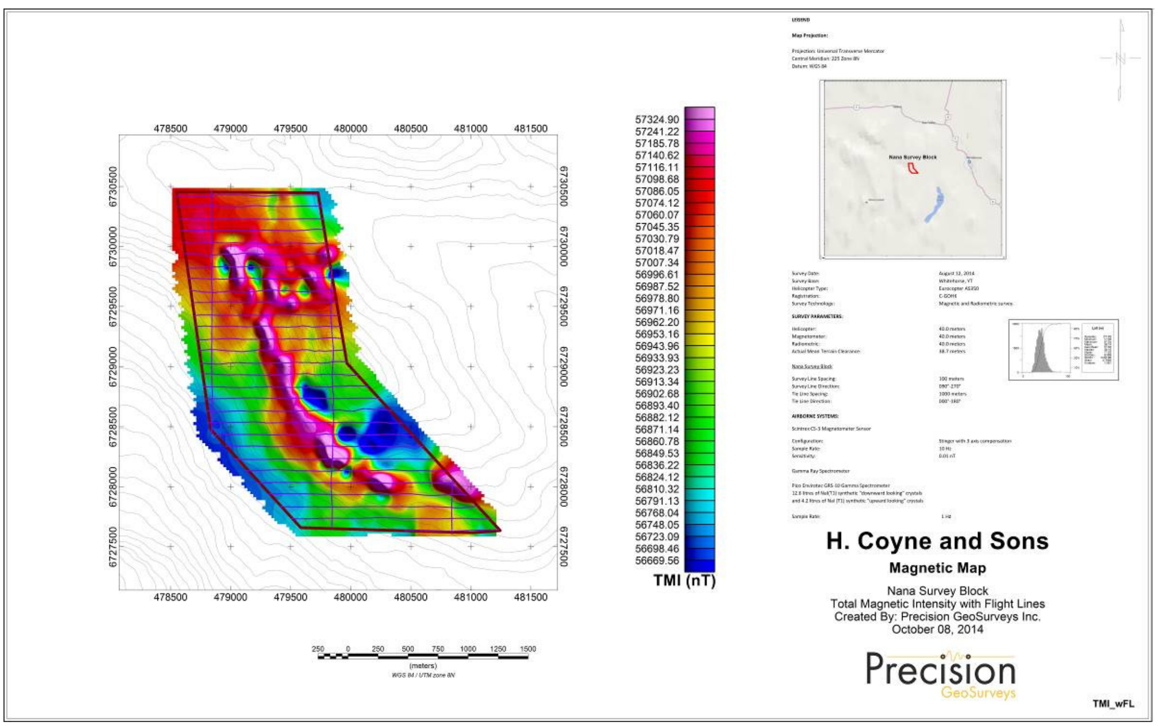
Map 1: Nana survey block actual flight lines.



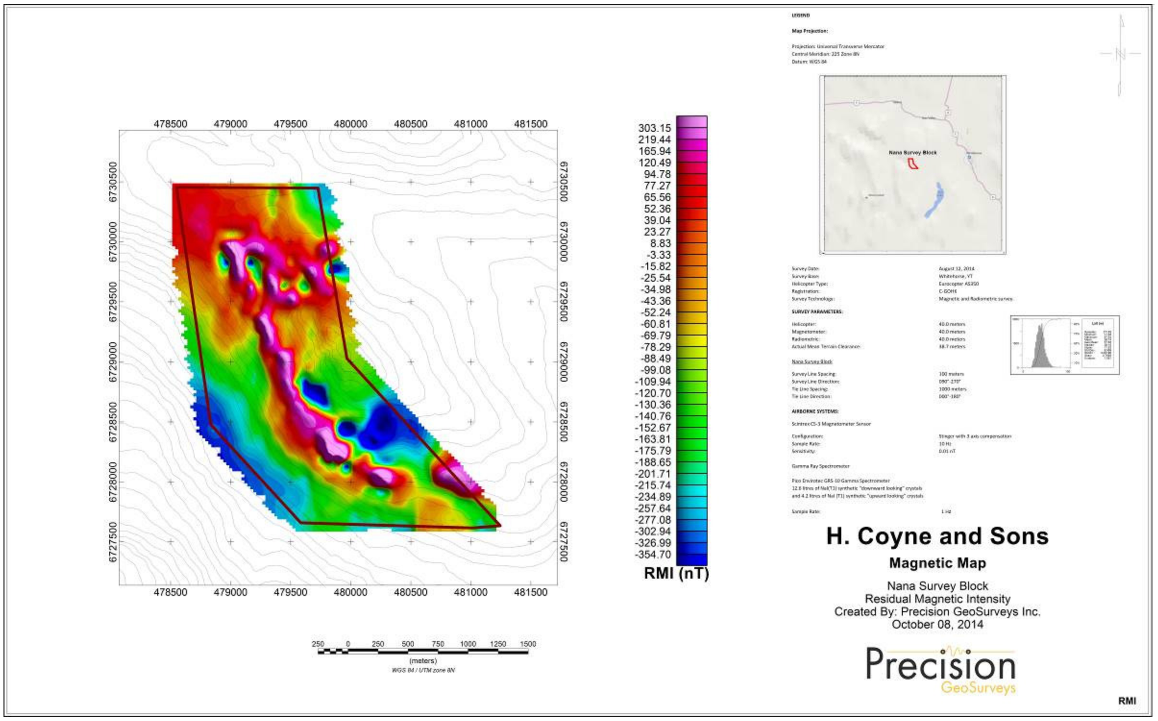
Map 2: Nana survey block digital terrain model.



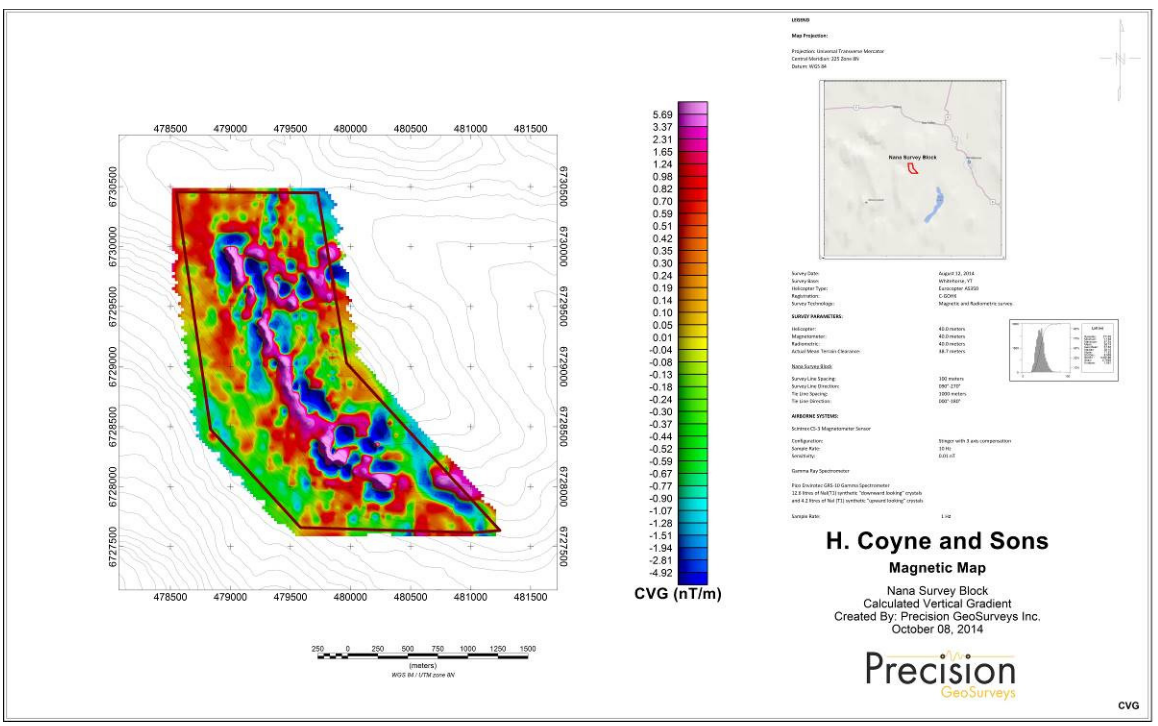
Map 3: Nana survey block total magnetic intensity.



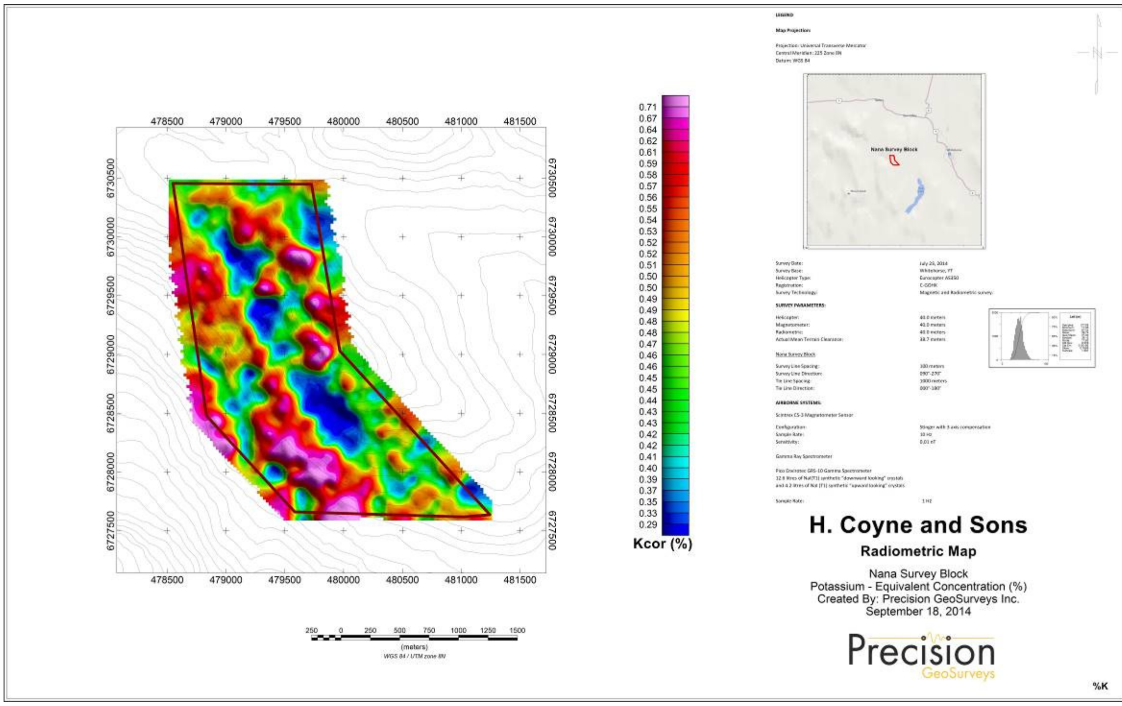
Map 4: Nana survey block total magnetic intensity with plotted actual flight lines.



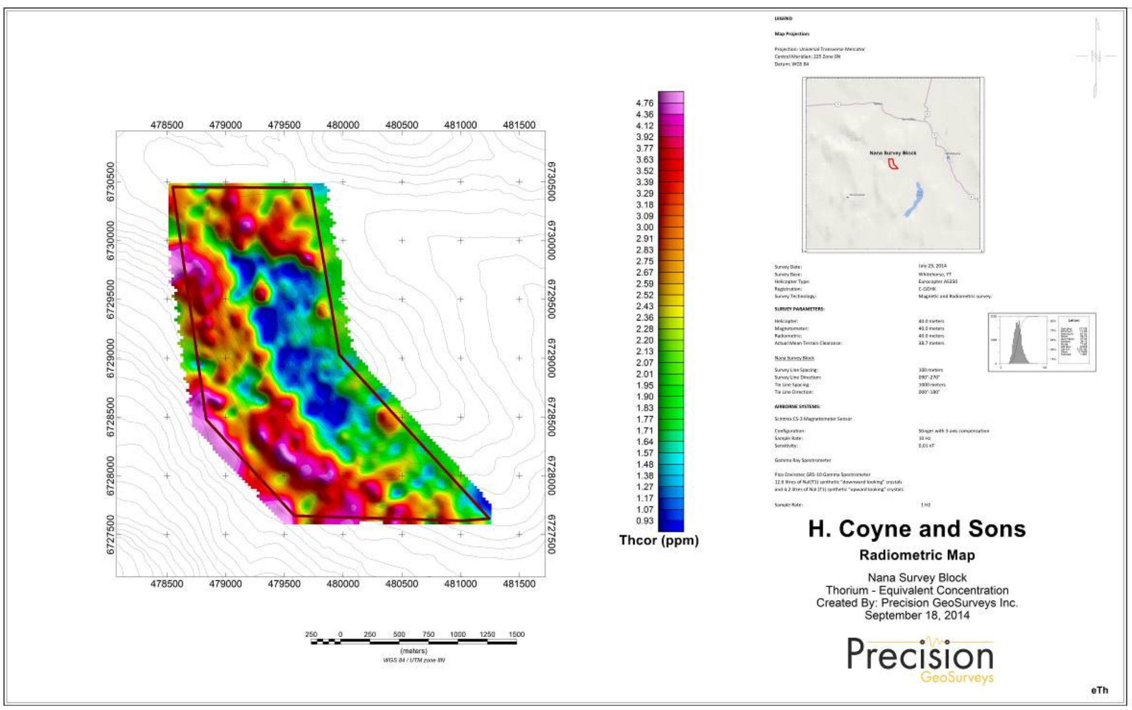
Map 5: Nana survey block residual magnetic intensity.



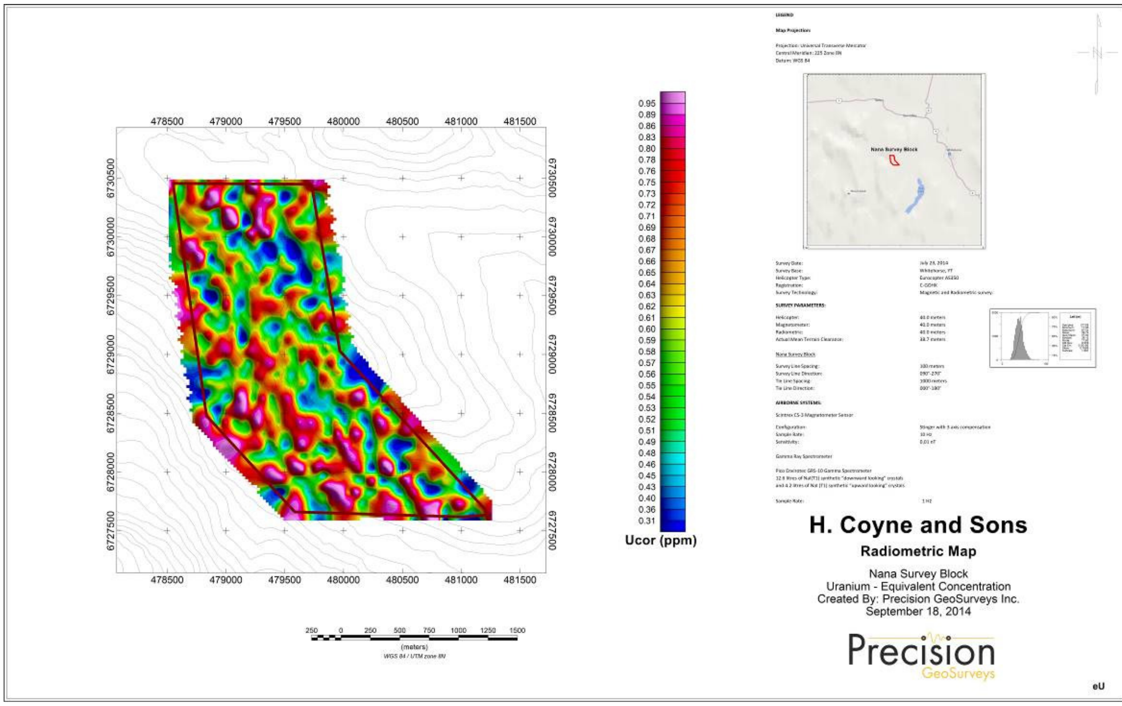
Map 6: Nana survey block calculated vertical gradient of the total magnetic intensity.



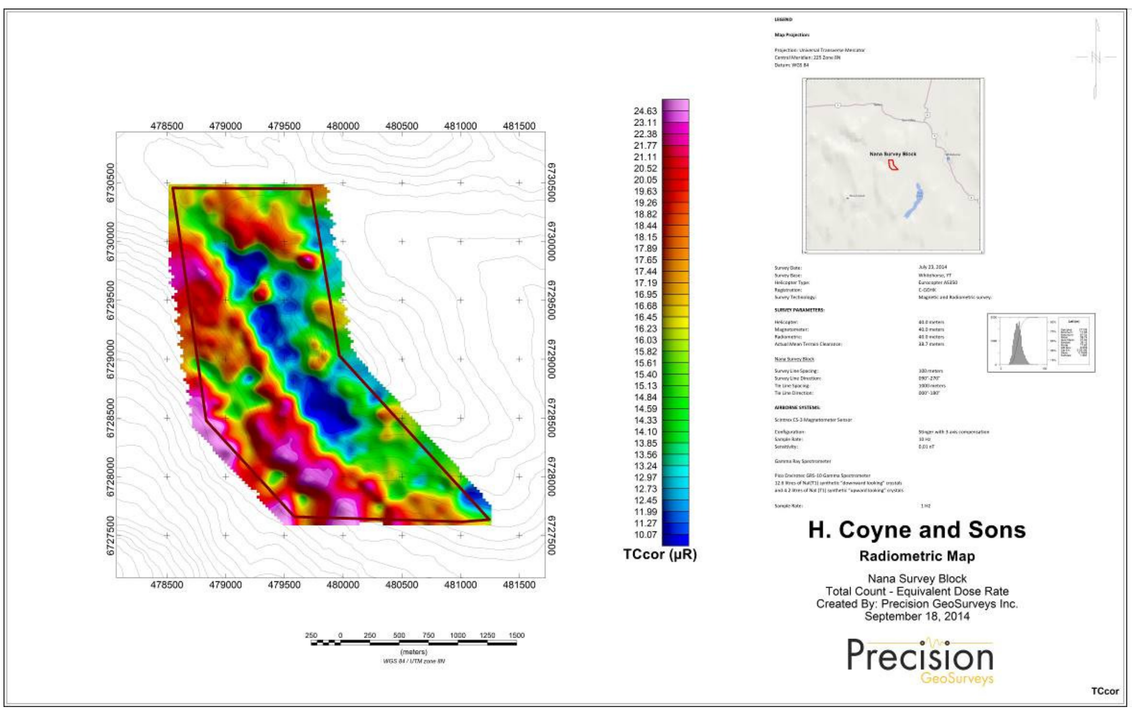
Map 7: Nana survey block potassium – (percentage) equivalent concentration.



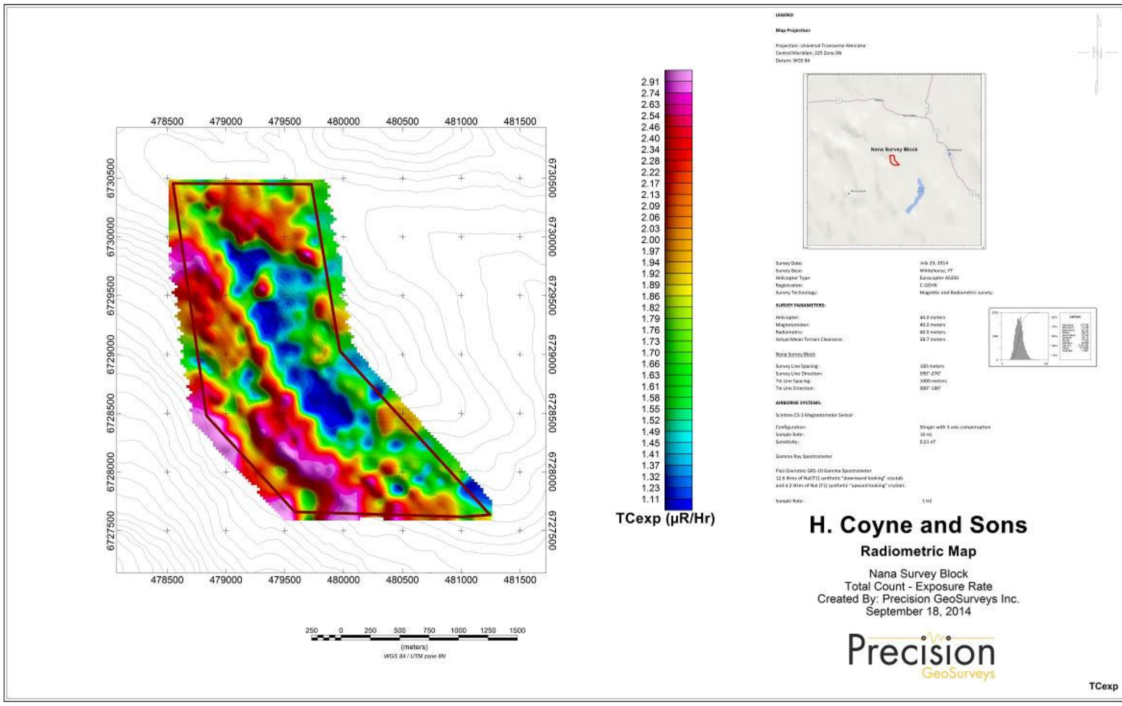
Map 8: Nana survey block thorium – equivalent concentration.



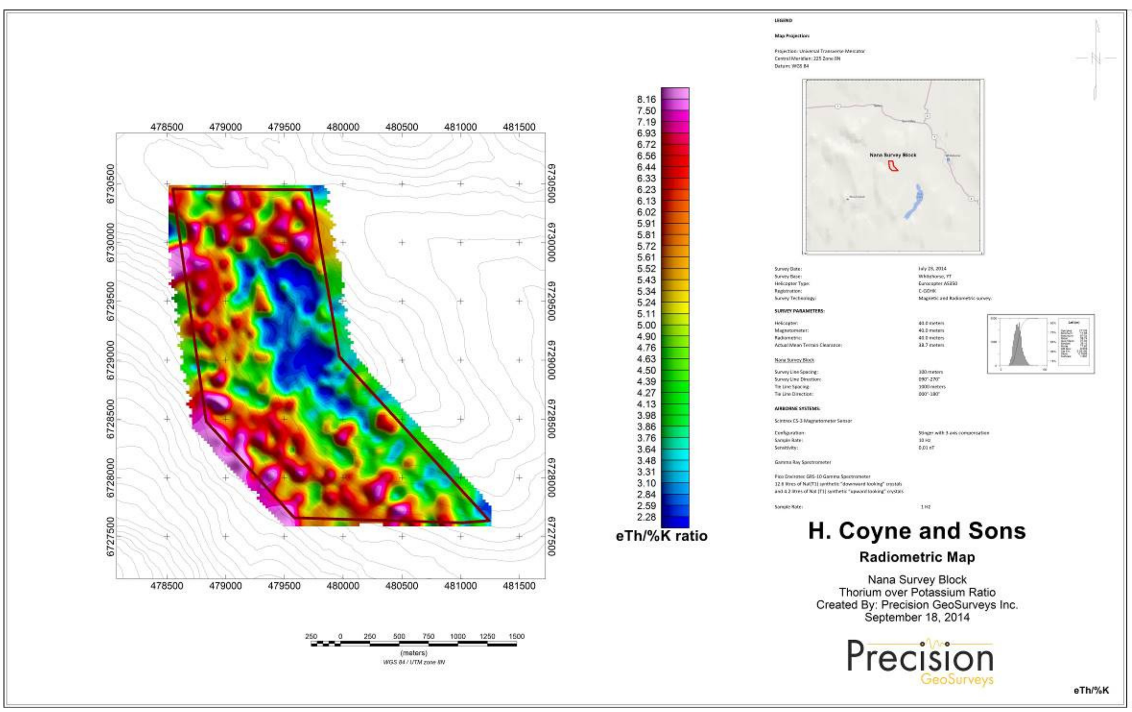
Map 9: Nana survey block uranium – equivalent concentration.



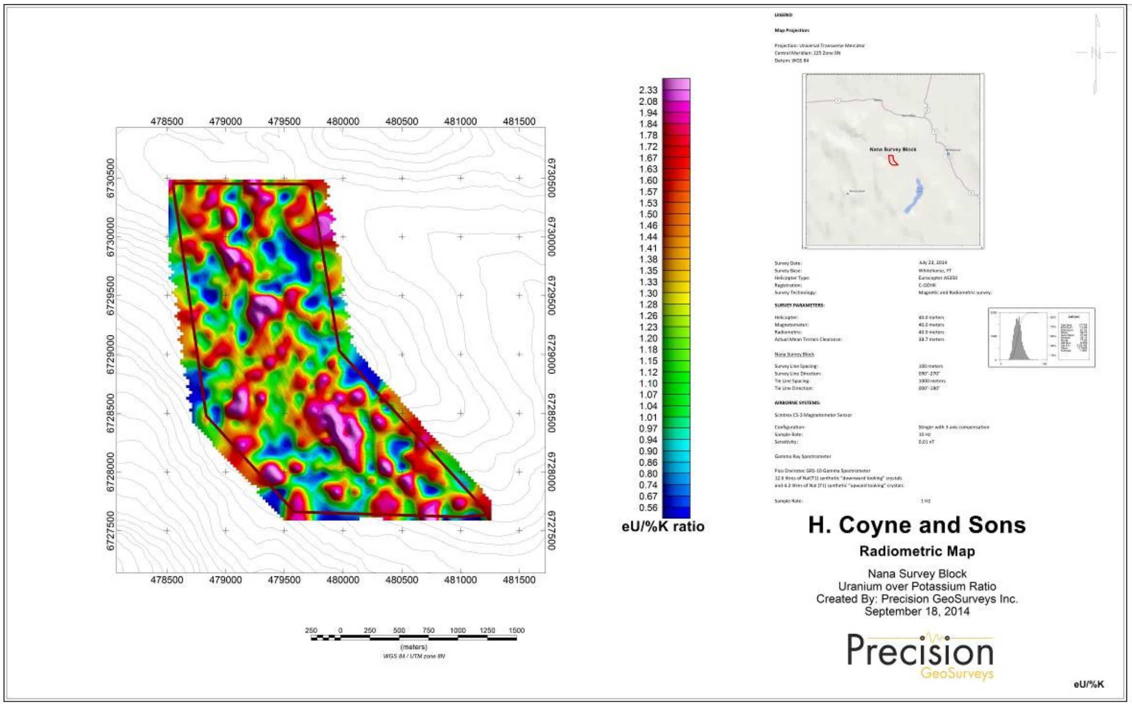
Map 10: Nana survey block total count – equivalent dose rate.



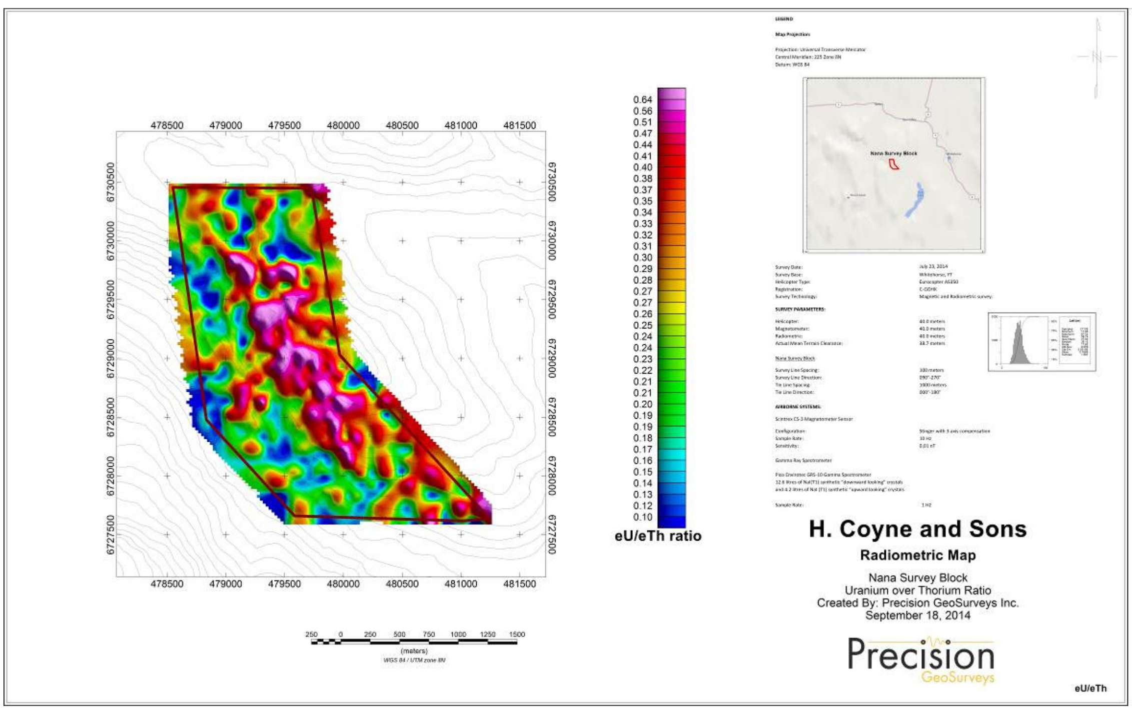
Map 11: Nana survey block total count –exposure rate.



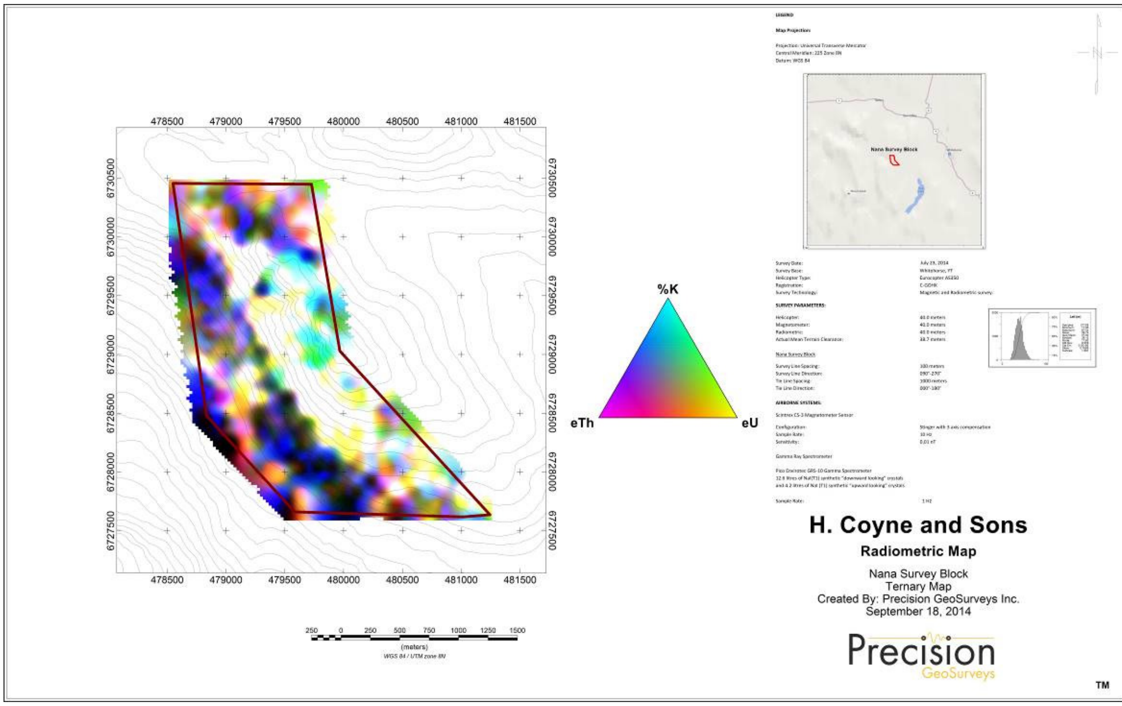
Map 12: Nana survey block thorium over potassium ratio.



Map 13: Nana survey block uranium over potassium ratio.



Map 14: Nana survey block uranium over thorium ratio.



Map 15: Nana survey block ternary map.

Appendix D , Whitehorse Copper Belt, deleted.