

ASSESSMENT REPORT ON THE 2014 AIRBORNE GEOPHYSICAL SURVEY OF THE WHITEHORSE COPPER BELT CLAIMS, YUKON

WHITEHORSE MINING DISTRICT – NTS 115D/ 11 AND 14

Latitude 60.65° N, Longitude 135.1° W / UTM NAD 83 ZONE 8: 492500E, 6728000N

WORK DONE ON

Grant No.	Claim Label	GRANT No.	Claim Label	Grant No.	Claim Label	GRANT No.	Claim Label
85566	JAN 1	Y 52115-116	EMILY 3-4	YC54444	JACK 1	YC66293-306	JUICE 112-125
YC37798-805	ALEX 1-8	YD59260-274	EVA 1-15	76497-500	HEATHER 1-4	76403	KEN 1
YC40298	ATA 79	YD59279-282	EVA 20-23	YC37796-797	HOWARD 1-2	82027-030	LEY 1-4
76180	BETTY 3	YD59289-298	EVA 24-33	YC46556-574	JUICE 1-18	76178	MARGARET 1
76770	BILL 1	YD29626-630	FOB 1-5	YC46575-581	JUICE 20-26	77664-666	PARKE 1-3
Y 52112-113	BILL 10-11	YC08850-867	GIN 1-18	YC46583	JUICE 28	Y 12210	PARKE 4
76771-777	BILL 2-8	YD59258-259	GIN 19-20	YC46585-589	JUICE 30-34	Y 52114	PARKE 5
Y 52111	BILL 9	YC08842-849	GIN 21-28	YC46592-595	JUICE 37-40	76395-398	TESS 1-4
76094	BOB 3	YC19491-495	GIN 44-48	YC66222-236	JUICE 41-55	Y 29677-678	TESS 7-8
76096	BOB 5	75711-712	GLADYS 3-4	YC66238	JUICE 57	YD59244	TOM 17
76097	BOB 6	YB57537-556	HAT 1-20	YC66240-245	JUICE 59-64	YD59246	TOM 19
72699	BONZO	YB58021-026	HAT 21-26	YC66248-268	JUICE 67-87	YD59248	TOM 21
73783-784	BORNITE 1-2	YB58049-056	HAT 27-34	YC66270	JUICE 89	YD59256	TOM 29
75982	CAMERON 1	YB58139-140	HAT 35-36	YC66272	JUICE 91	YC39077-092	TONIC 1-16
76179	DOROTHY 2	YB66395-398	HAT 37-40	YC66274	JUICE 93	YD59283-288	TONY 1-6
91827-28	EMIDELL 12-13	YC18449-452	HAT 41-44	YC66276	JUICE 95	YD59299-303	TRAD 1-5
91879	EMIDELL 14	YC18696	HAT 46	YC66278-287	JUICE 97-106	74157	ZIRCON 4
75709-710	EMILY 1-2	YC18853-854	HAT 47-48	YC66290-291	JUICE 109-110		

SURVEY CONDUCTED JULY 23RD 2014

REPORT BY DANIELÈ HÉON, P. GEO. AND PRECISION GEOSURVEYS INC

FOR H. COYNE & SONS

WHITEHORSE, JUNE 16 2015

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SUMMARY

The Whitehorse Copper Belt property consists of 372 quartz claims registered in the Whitehorse Mining District, located on NTS map sheet 115D/10, 11 and 14. This report documents the results of the high resolution airborne magnetic and radiometric survey conducted by Precision GeoSurveys on July 23, 2014.

The property is located at the western edge of the City of Whitehorse and straddles the contact between Triassic sediments of the Lewes River Group, Aksala Fm, Hancock member, and the Cretaceous Whitehorse Batholith. This intrusive contact hosts the copper (gold-moly) skarns deposits of the Whitehorse Copper Belt, a 30 km-long northwest trending belt of calc-silicate and magnetite copper skarn occurrences, deposits and former mines.

The survey was conducted over the claim block in order to potentially delineate new magnetic targets as well as possible porphyry-type targets.

LOCATION AND ACCESS

The property roughly defines the Whitehorse Copper Belt, a 30 km-long belt of copper skarn deposits and former mines. The claims are spread over NTS map sheets 105D 10, 11 and 14 and the property is centered roughly at latitude 60.65° N, and longitude 135.1° W / or at UTM coordinates 492500E, 6728000N, NAD 83 ZONE 8.

The property is within the Whitehorse city limits, and access to the Copper Belt claims is via various roads branching from the Alaska Highway, which eventually connect to the Copper Haul Road, a dirt road which parallels the Alaska Highway for a major portion of the mineralized trend.

Figure 1 shows the location of the claims and of the survey area with respect to geographic features.

Whitehorse is a urban center providing all the services and amenities needed to support an exploration and mining venture. The Whitehorse airport is located 3 km east of the eastern edge of the claim block. Several helicopter charter companies maintain charter services throughout the year.

CLAIM DATA

The Whitehorse Copper Belt property consists of 372 contiguous quartz claims registered in the Whitehorse Mining District under Grouping Certificate No. HW07119. The property holdings also include 9 leases and 18 Crown Grants. The claim map is shown in Appendix A. The detailed claim data is found in Appendix B. A total 112 claims are being renewed for 1 year and 4 claims are being renewed for two years. Work was done over 320 claims; these are listed in Appendix C.

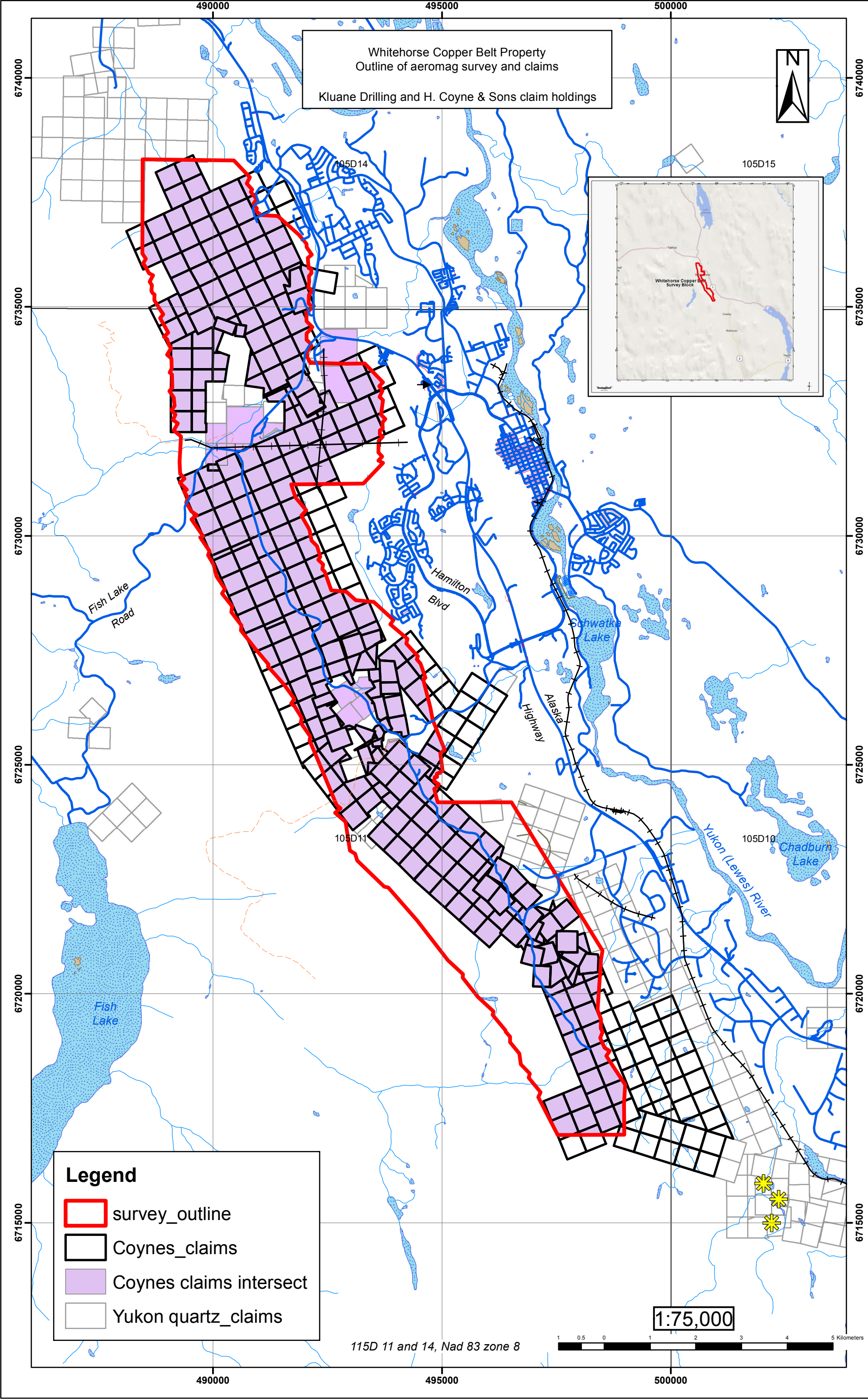


Figure 1 Location Map

GEOLOGY

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, volcanoclastic 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, interpreted to document the waning stages of the Lewes River arc.

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 along a 30 km belt defined by the contact between the mid-Cretaceous Whitehorse batholith and sedimentary rocks of the Upper Triassic Aksala Formation, Hancock Member (Lewes River Group) (Unit uTrAK2) (Morrison, 1981 and Colpron, 2011). at the contact between the Cretaceous Whitehorse Batholith (granodiorite to diorite, unit mKdW) and the limey sediments of the Aksala Formation, Hancock member (uTrAK2). The regional geology map, seen in Figure 2 , shows the property outline with respect to the regional geology.

The deposits of the Copper Belt are generally hosted in embayments and irregularities in the contact as well as in pendants of sediments within the batholith.

The Whitehorse Batholith is described as a grey, medium to coarse-grained, generally equigranular, biotite-hornblende granodiorite. The marginal phase of the batholith, which many of the deposits, is of dioritic composition, generally massive and equigranular but locally sheared.

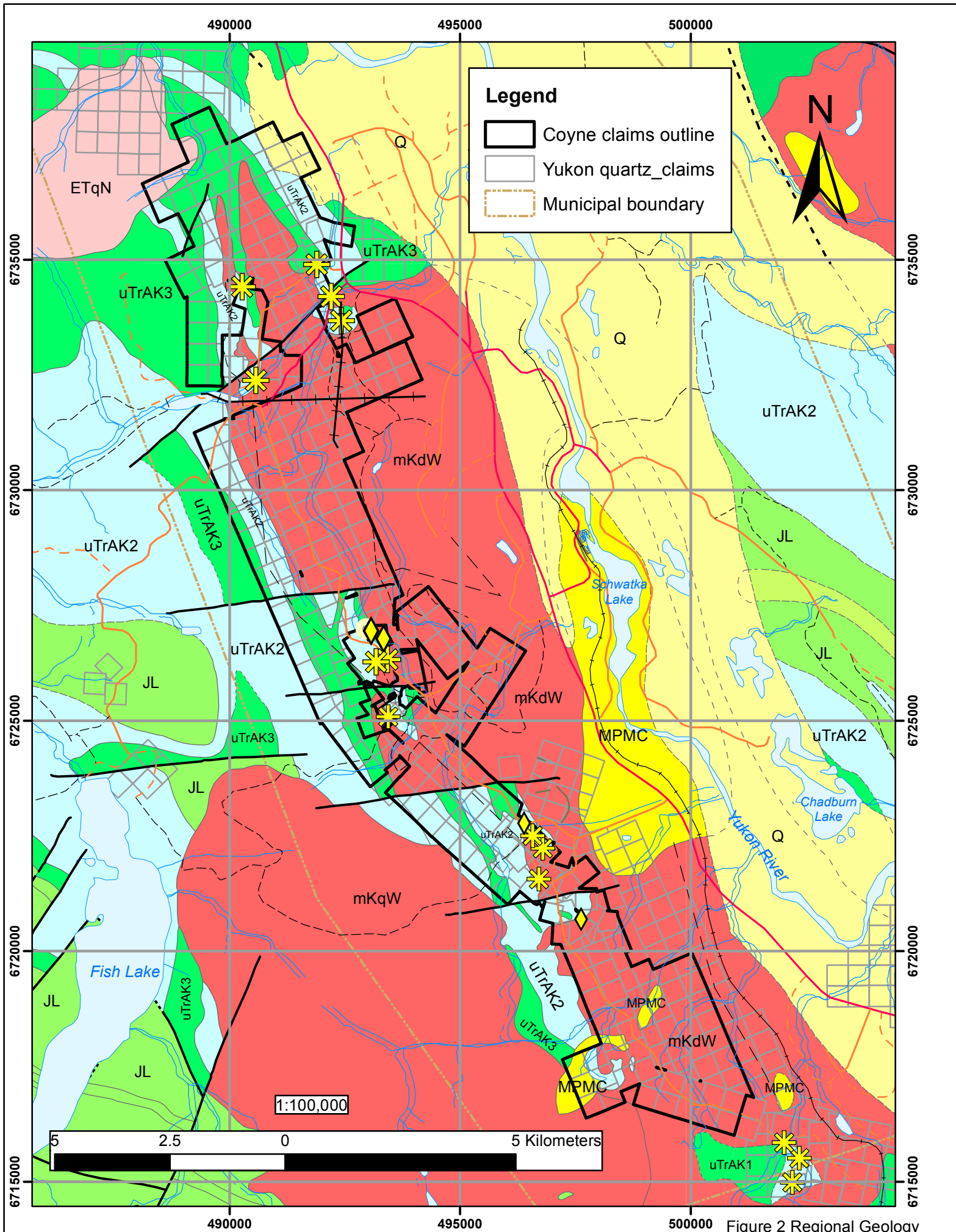
The Aksala Formation is described as a mixed clastic-carbonate assemblage. The Hancock member is characterized in the area of interest by massive to thick- bedded limestone, minor thin-bedded argillaceous limestone, coarsely crystalline massive dolostone , siltstone and calcareous sandstone.

The mines of the Whitehorse Copper belt were all hosted in skarn or in the adjacent intrusion responsible for the skarning (endoskarn). Skarns form by the interaction of a hot, fluid-rich granitic magma and the lime- or limestone/dolostone-bearing sedimentary rocks it intrudes. Two types of skarns hosts the copper deposits of the Whitehorse Copper Belt: magnetite (or iron) skarn and calc-silicate skarn.

Both intrusive and sedimentary rocks have been skarnified near the intrusive contact. Altered diorite showing skarn mineralogy and/or alteration (mainly garnet, epidote, diopside, actinolite, calcite, thulite) is labeled in drill logs as 'endoskarn'. Sedimentary lithologies such as sandstone, siltstone, calcareous sandstone or siltstone and limestone have been metamorphosed to siliceous hornfels or quartzite, biotite-rich pelitic hornfels, calc-silicate hornfels, marble, and skarn of variable mineralogy (mainly garnet $\pm$ epidote, diopside, tremolite/wollastonite, calcite, with lesser actinolite, quartz, feldspar, thulite) depending on the original composition.

Economic minerals consist dominantly of chalcopyrite and bornite, with lesser chalcocite, malachite and rare native copper. Valleriite is a copper mineral characteristic of iron skarns. Molybdenite is common in certain deposits. Some scheelite has been observed. Pyrite and/ or pyrrhotite are abundant in the hornfels and marble facies. In surface samples, azurite, chrysocolla and a black copper oxide, possibly tenorite/ melaconite, have been observed in addition to the minerals listed above.

According to Dave Tenney, former Chief Geologist at Whitehorse Copper Mines (pers. com., 2013), the prospective horizon at the Little Chief deposit was near the contact between the thick bedded limestone and underlying quartzite unit. The most favourable geometry was where the bedding was oriented parallel to the contact.



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

It is beyond the scope of this report to summarize the extensive work done in the Whitehorse Copper Belt over more than 100 years of mineral exploration and mining activity. The reader is referred to the reference section which lists comprehensive compilations as well as technical and historical summaries. A thorough compilation of all historical work is recommended.

2014 SURVEY AND RESULTS

A high resolution airborne magnetic and radiometric survey over most of the claim block was conducted by Precision GeoSurveys of Vancouver B.C on July 23, 2014. A line was re-flown on August 12, 2014.

A total of 264 line-km were flown at 200m line spacing, with the lines oriented E-W, a favourable orientation to intersect the local geology. The results of this survey are attached in Appendix E. A detailed interpretation is still pending.

Signed, in Whitehorse, June 16, 2015

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 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.

Whitehorse, June 16 2015

Danièle Héon, P. Geo.

REFERENCES

General references on the Whitehorse Copper Belt:

Cockfield W.E. and Bell A.H., 1928. Whitehorse District, Yukon, Geological Survey of Canada Paper 44-14.

Colpron, M. (comp.), 2011. Geological compilation of Whitehorse trough - Whitehorse (105D), Lake Laberge (105E), and part of Carmacks (115I), Glenlyon (105L), Aishihik Lake (115H), Quiet Lake (105F) and Teslin (105C) (1:250 000-scale). Yukon Geological Survey, Geoscience Map 2011-1, 3 maps, legend and appendices.

Dobrowolsky, H. and Ingram, R., 1993. A History of the Whitehorse Copper Belt. Open File 1993-1 (I), Exploration and Geological Services Division, Yukon Region, Indian and Northern Affairs Canada.

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Kindle, E.D., 1964. Copper and iron resources, Whitehorse Copper Belt, Yukon Territory, GSC Paper 63-41.

Mackay, G., Diment, R. And Falkiner, J., Mackay, Falkiner and Associates 1993. Whitehorse Copper Belt: A Simplified Technical History. EGSD Open File 1993-2 (I), Exploration and Geological Services Division, Yukon Region, Indian and Northern Affairs Canada.

McConnell, R. G., 1909. The Whitehorse Copper Belt, Yukon Territory. Canada Department of Mines, Geological Survey Branch, No 1050.

Morrison, G.W., 1981. Setting and Origin of Skarn Deposits in the Whitehorse Copper Belt, Yukon, vols 1 & 2, Ph. D. Memoir, University of Western Ontario.

Tenney, D., 1981. The Whitehorse Copper Belt: Mining, Exploration and Geology (1967-1980). Bulletin 1, Exploration and Geological Services Division, Yukon Region, Indian and Northern Affairs Canada.

Watson, P.H., 1984. The Whitehorse Copper Belt- A Compilation. Open File 1984-1, 1:25 000 map, Exploration and Geological Services, Yukon Region, Indian and Northern Affairs Canada.

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

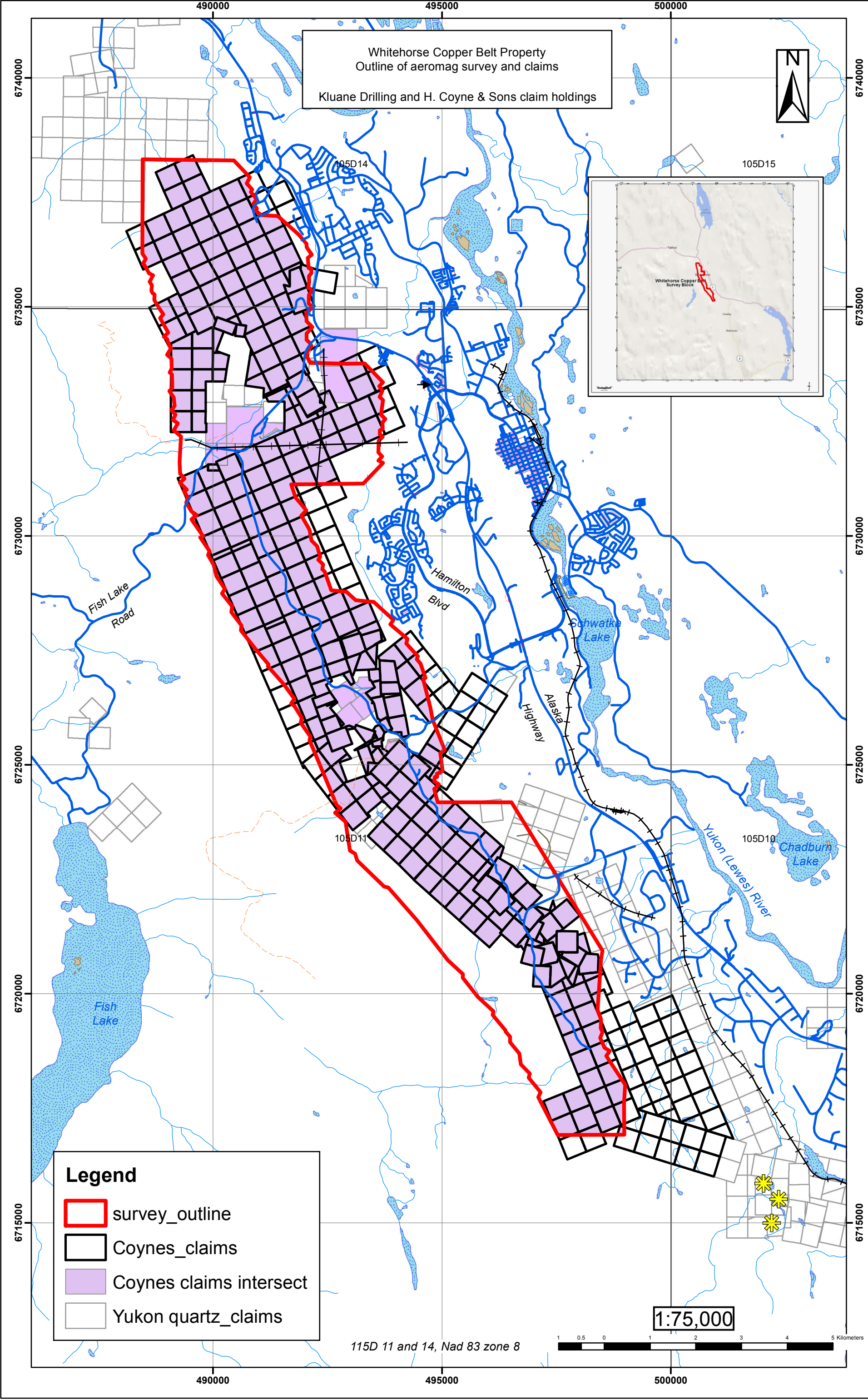


Figure 1 Location Map

APPENDIX B- CLAIM DATA

District	Grant Number	Reg Type	Claim Name	Claim Number	Claim Owner	NTS Map Number	Claim ExpiryDate	New expiry date	\$ work applied	renewal cost	renewal years
Whitehorse	YC66303	Quartz	JUICE	122	Kluane Drilling Ltd. - 100%	105D11	1/10/2016	1/10/2018	\$200	\$10.00	2 years
Whitehorse	YC66304	Quartz	JUICE	123	Kluane Drilling Ltd. - 100%	105D11	1/10/2016	1/10/2018	\$200	\$10.00	2 years
Whitehorse	YC46580	Quartz	JUICE	25	Kluane Drilling Ltd. - 100%	105D11	3/16/2016	3/16/2018	\$200	\$10.00	2 years
Whitehorse	YC46581	Quartz	JUICE	26	Kluane Drilling Ltd. - 100%	105D11	3/16/2016	3/16/2018	\$200	\$10.00	2 years
Whitehorse	YC40298	Quartz	ATA	79	H. Coyne & Sons - 100%	105D11	1/1/2017	1/1/2018	\$100	\$5.00	1 year
Whitehorse	Y 52111	Quartz	BILL	9	H. Coyne & Sons - 100%	105D11	1/1/2017	1/1/2018	\$100	\$5.00	1 year
Whitehorse	Y 52112	Quartz	BILL	10	H. Coyne & Sons - 100%	105D11	1/1/2017	1/1/2018	\$100	\$5.00	1 year
Whitehorse	Y 52115	Quartz	EMILY	3	H. Coyne & Sons - 100%	105D11	1/1/2017	1/1/2018	\$100	\$5.00	1 year
Whitehorse	Y 52116	Quartz	EMILY	4	H. Coyne & Sons - 100%	105D11	1/1/2017	1/1/2018	\$100	\$5.00	1 year
Whitehorse	77665	Quartz	PARKE	2	H. Coyne & Sons - 100%	105D11	1/1/2017	1/1/2018	\$100	\$5.00	1 year
Whitehorse	Y 12210	Quartz	PARKE	4	H. Coyne & Sons - 100%	105D11	1/1/2017	1/1/2018	\$100	\$5.00	1 year
Whitehorse	Y 52114	Quartz	PARKE	5	H. Coyne & Sons - 100%	105D11	1/1/2017	1/1/2018	\$100	\$5.00	1 year
Whitehorse	85088	Quartz	PITT	4	H. Coyne & Sons - 100%	105D11	1/1/2017	1/1/2018	\$100	\$5.00	1 year
Whitehorse	Y 20334	Quartz	PITT	5	H. Coyne & Sons - 100%	105D11	1/1/2017	1/1/2018	\$100	\$5.00	1 year
Whitehorse	Y 29677	Quartz	TESS	7	H. Coyne & Sons - 100%	105D11	1/1/2017	1/1/2018	\$100	\$5.00	1 year
Whitehorse	Y 29678	Quartz	TESS	8	H. Coyne & Sons - 100%	105D11	1/1/2017	1/1/2018	\$100	\$5.00	1 year
Whitehorse	YC08850	Quartz	GIN	1	Brian R. Sauer - 100%	105D11	1/3/2017	1/3/2018	\$100	\$5.00	1 year
Whitehorse	YC08851	Quartz	GIN	2	Brian R. Sauer - 100%	105D11	1/3/2017	1/3/2018	\$100	\$5.00	1 year
Whitehorse	YC08852	Quartz	GIN	3	Brian R. Sauer - 100%	105D11	1/3/2017	1/3/2018	\$100	\$5.00	1 year
Whitehorse	YC08853	Quartz	GIN	4	Brian R. Sauer - 100%	105D11	1/3/2017	1/3/2018	\$100	\$5.00	1 year
Whitehorse	YC08854	Quartz	GIN	5	Brian R. Sauer - 100%	105D11	1/3/2017	1/3/2018	\$100	\$5.00	1 year
Whitehorse	YC08855	Quartz	GIN	6	Brian R. Sauer - 100%	105D11	1/3/2017	1/3/2018	\$100	\$5.00	1 year
Whitehorse	YC08856	Quartz	GIN	7	Brian R. Sauer - 100%	105D11	1/3/2017	1/3/2018	\$100	\$5.00	1 year
Whitehorse	YC08857	Quartz	GIN	8	Brian R. Sauer - 100%	105D11	1/3/2017	1/3/2018	\$100	\$5.00	1 year
Whitehorse	YC08858	Quartz	GIN	9	Brian R. Sauer - 100%	105D11	1/3/2017	1/3/2018	\$100	\$5.00	1 year
Whitehorse	YC08859	Quartz	GIN	10	Brian R. Sauer - 100%	105D11	1/3/2017	1/3/2018	\$100	\$5.00	1 year
Whitehorse	YC08860	Quartz	GIN	11	Brian R. Sauer - 100%	105D11	1/3/2017	1/3/2018	\$100	\$5.00	1 year
Whitehorse	YC08861	Quartz	GIN	12	Brian R. Sauer - 100%	105D11	1/3/2017	1/3/2018	\$100	\$5.00	1 year
Whitehorse	YC08862	Quartz	GIN	13	Brian R. Sauer - 100%	105D11	1/3/2017	1/3/2018	\$100	\$5.00	1 year
Whitehorse	YC08863	Quartz	GIN	14	Brian R. Sauer - 100%	105D11	1/3/2017	1/3/2018	\$100	\$5.00	1 year
Whitehorse	YC08864	Quartz	GIN	15	Brian R. Sauer - 100%	105D11	1/3/2017	1/3/2018	\$100	\$5.00	1 year

District	Grant Number	Reg Type	Claim Name	Claim Number	Claim Owner	NTS Map Number	Claim ExpiryDate	New expiry date	\$ work applied	renewal cost	renewal years
Whitehorse	YC08865	Quartz	GIN	16	Brian R. Sauer - 100%	105D11	1/3/2017	1/3/2018	\$100	\$5.00	1 year
Whitehorse	YC08866	Quartz	GIN	17	Brian R. Sauer - 100%	105D11	1/3/2017	1/3/2018	\$100	\$5.00	1 year
Whitehorse	YC08867	Quartz	GIN	18	Brian R. Sauer - 100%	105D11	1/3/2017	1/3/2018	\$100	\$5.00	1 year
Whitehorse	YC46556	Quartz	JUICE	1	Kluane Drilling Ltd. - 100%	105D11	3/16/2017	3/16/2018	\$100	\$5.00	1 year
Whitehorse	YC46557	Quartz	JUICE	2	Kluane Drilling Ltd. - 100%	105D11	3/16/2017	3/16/2018	\$100	\$5.00	1 year
Whitehorse	YC46558	Quartz	JUICE	3	Kluane Drilling Ltd. - 100%	105D11	3/16/2017	3/16/2018	\$100	\$5.00	1 year
Whitehorse	YC46559	Quartz	JUICE	4	Kluane Drilling Ltd. - 100%	105D11	3/16/2017	3/16/2018	\$100	\$5.00	1 year
Whitehorse	YC46560	Quartz	JUICE	5	Kluane Drilling Ltd. - 100%	105D11	3/16/2017	3/16/2018	\$100	\$5.00	1 year
Whitehorse	YC46561	Quartz	JUICE	6	Kluane Drilling Ltd. - 100%	105D11	3/16/2017	3/16/2018	\$100	\$5.00	1 year
Whitehorse	YC46562	Quartz	JUICE	7	Kluane Drilling Ltd. - 100%	105D11	3/16/2017	3/16/2018	\$100	\$5.00	1 year
Whitehorse	YC46563	Quartz	JUICE	8	Kluane Drilling Ltd. - 100%	105D11	3/16/2017	3/16/2018	\$100	\$5.00	1 year
Whitehorse	YC46564	Quartz	JUICE	9	Kluane Drilling Ltd. - 100%	105D11	3/16/2017	3/16/2018	\$100	\$5.00	1 year
Whitehorse	YC46565	Quartz	JUICE	10	Kluane Drilling Ltd. - 100%	105D11	3/16/2017	3/16/2018	\$100	\$5.00	1 year
Whitehorse	YC46566	Quartz	JUICE	11	Kluane Drilling Ltd. - 100%	105D11	3/16/2017	3/16/2018	\$100	\$5.00	1 year
Whitehorse	YC46567	Quartz	JUICE	12	Kluane Drilling Ltd. - 100%	105D11	3/16/2017	3/16/2018	\$100	\$5.00	1 year
Whitehorse	YC46568	Quartz	JUICE	13	Kluane Drilling Ltd. - 100%	105D11	3/16/2017	3/16/2018	\$100	\$5.00	1 year
Whitehorse	YC46569	Quartz	JUICE	14	Kluane Drilling Ltd. - 100%	105D11	3/16/2017	3/16/2018	\$100	\$5.00	1 year
Whitehorse	YC46570	Quartz	JUICE	15	Kluane Drilling Ltd. - 100%	105D11	3/16/2017	3/16/2018	\$100	\$5.00	1 year
Whitehorse	YC46571	Quartz	JUICE	16	Kluane Drilling Ltd. - 100%	105D11	3/16/2017	3/16/2018	\$100	\$5.00	1 year
Whitehorse	YC46572	Quartz	JUICE	17	Kluane Drilling Ltd. - 100%	105D11	3/16/2017	3/16/2018	\$100	\$5.00	1 year
Whitehorse	YC46573	Quartz	JUICE	18	Kluane Drilling Ltd. - 100%	105D11	3/16/2017	3/16/2018	\$100	\$5.00	1 year
Whitehorse	YC46574	Quartz	JUICE	19	Kluane Drilling Ltd. - 100%	105D11	3/16/2017	3/16/2018	\$100	\$5.00	1 year
Whitehorse	YC46575	Quartz	JUICE	20	Kluane Drilling Ltd. - 100%	105D11	3/16/2017	3/16/2018	\$100	\$5.00	1 year
Whitehorse	YD59229	Quartz	TOM	2	Chris Davis - 100%	105D10	5/11/2017	5/11/2018	\$100	\$5.00	1 year
Whitehorse	YD59230	Quartz	TOM	3	Chris Davis - 100%	105D10	5/11/2017	5/11/2018	\$100	\$5.00	1 year
Whitehorse	YD59231	Quartz	TOM	4	Chris Davis - 100%	105D10	5/11/2017	5/11/2018	\$100	\$5.00	1 year
Whitehorse	YD59232	Quartz	TOM	5	Chris Davis - 100%	105D10	5/11/2017	5/11/2018	\$100	\$5.00	1 year
Whitehorse	YD59233	Quartz	TOM	6	Chris Davis - 100%	105D10	5/11/2017	5/11/2018	\$100	\$5.00	1 year
Whitehorse	YD59234	Quartz	TOM	7	Chris Davis - 100%	105D10	5/11/2017	5/11/2018	\$100	\$5.00	1 year
Whitehorse	YD59235	Quartz	TOM	8	Chris Davis - 100%	105D10	5/11/2017	5/11/2018	\$100	\$5.00	1 year
Whitehorse	YD59236	Quartz	TOM	9	Chris Davis - 100%	105D10	5/11/2017	5/11/2018	\$100	\$5.00	1 year

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Whitehorse	YD59237	Quartz	TOM	10	Chris Davis - 100%	105D10	5/11/2017	5/11/2018	\$100	\$5.00	1 year
Whitehorse	YD59238	Quartz	TOM	11	Chris Davis - 100%	105D10	5/11/2017	5/11/2018	\$100	\$5.00	1 year
Whitehorse	YD59239	Quartz	TOM	12	Chris Davis - 100%	105D10	5/11/2017	5/11/2018	\$100	\$5.00	1 year
Whitehorse	YD59240	Quartz	TOM	13	Chris Davis - 100%	105D10	5/11/2017	5/11/2018	\$100	\$5.00	1 year
Whitehorse	YD59241	Quartz	TOM	14	Chris Davis - 100%	105D10	5/11/2017	5/11/2018	\$100	\$5.00	1 year
Whitehorse	YD59242	Quartz	TOM	15	Chris Davis - 100%	105D10	5/11/2017	5/11/2018	\$100	\$5.00	1 year
Whitehorse	YD59244	Quartz	TOM	17	Chris Davis - 100%	105D10	5/11/2017	5/11/2018	\$100	\$5.00	1 year
Whitehorse	YD59245	Quartz	TOM	18	Chris Davis - 100%	105D10	5/11/2017	5/11/2018	\$100	\$5.00	1 year
Whitehorse	YD59246	Quartz	TOM	19	Chris Davis - 100%	105D10	5/11/2017	5/11/2018	\$100	\$5.00	1 year
Whitehorse	YD59247	Quartz	TOM	20	Chris Davis - 100%	105D10	5/11/2017	5/11/2018	\$100	\$5.00	1 year
Whitehorse	YD59248	Quartz	TOM	21	Chris Davis - 100%	105D10	5/11/2017	5/11/2018	\$100	\$5.00	1 year
Whitehorse	YD59249	Quartz	TOM	22	Chris Davis - 100%	105D10	5/11/2017	5/11/2018	\$100	\$5.00	1 year
Whitehorse	YD59250	Quartz	TOM	23	Chris Davis - 100%	105D10	5/11/2017	5/11/2018	\$100	\$5.00	1 year
Whitehorse	YD59251	Quartz	TOM	24	Chris Davis - 100%	105D10	5/11/2017	5/11/2018	\$100	\$5.00	1 year
Whitehorse	YD59252	Quartz	TOM	25	Chris Davis - 100%	105D10	5/11/2017	5/11/2018	\$100	\$5.00	1 year
Whitehorse	YD59253	Quartz	TOM	26	Chris Davis - 100%	105D10	5/11/2017	5/11/2018	\$100	\$5.00	1 year
Whitehorse	YD59254	Quartz	TOM	27	Chris Davis - 100%	105D10	5/11/2017	5/11/2018	\$100	\$5.00	1 year
Whitehorse	YD59255	Quartz	TOM	28	Chris Davis - 100%	105D10	5/11/2017	5/11/2018	\$100	\$5.00	1 year
Whitehorse	YD59256	Quartz	TOM	29	Chris Davis - 100%	105D11	5/11/2017	5/11/2018	\$100	\$5.00	1 year
Whitehorse	YD59258	Quartz	GIN	19	Chris Davis - 100%	105D11	5/21/2017	5/21/2018	\$100	\$5.00	1 year
Whitehorse	YD59259	Quartz	GIN	20	Chris Davis - 100%	105D11	5/21/2017	5/21/2018	\$100	\$5.00	1 year
Whitehorse	YD59228	Quartz	TOM	1	Chris Davis - 100%	105D10	5/21/2017	5/21/2018	\$100	\$5.00	1 year
Whitehorse	YD59243	Quartz	TOM	16	Chris Davis - 100%	105D10	5/21/2017	5/21/2018	\$100	\$5.00	1 year
Whitehorse	YD59266	Quartz	EVA	7	Chris Davis - 100%	105D11	6/10/2017	6/10/2018	\$100	\$5.00	1 year
Whitehorse	YD59271	Quartz	EVA	12	Chris Davis - 100%	105D11	6/11/2017	6/11/2018	\$100	\$5.00	1 year
Whitehorse	YD59272	Quartz	EVA	13	Chris Davis - 100%	105D11	6/11/2017	6/11/2018	\$100	\$5.00	1 year
Whitehorse	YD59274	Quartz	EVA	15	Chris Davis - 100%	105D11	6/14/2017	6/14/2018	\$100	\$5.00	1 year
Whitehorse	YD59279	Quartz	EVA	20	Chris Davis - 100%	105D11	6/14/2017	6/14/2018	\$100	\$5.00	1 year
Whitehorse	YD59280	Quartz	EVA	21	Chris Davis - 100%	105D11	6/14/2017	6/14/2018	\$100	\$5.00	1 year
Whitehorse	YD59281	Quartz	EVA	22	Chris Davis - 100%	105D11	6/14/2017	6/14/2018	\$100	\$5.00	1 year
Whitehorse	YD59282	Quartz	EVA	23	Chris Davis - 100%	105D11	6/14/2017	6/14/2018	\$100	\$5.00	1 year

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Whitehorse	YD59260	Quartz	EVA	1	Chris Davis - 100%	105D11	6/24/2017	6/24/2018	\$100	\$5.00	1 year
Whitehorse	YD59261	Quartz	EVA	2	Chris Davis - 100%	105D11	6/24/2017	6/24/2018	\$100	\$5.00	1 year
Whitehorse	YD59262	Quartz	EVA	3	Chris Davis - 100%	105D11	6/24/2017	6/24/2018	\$100	\$5.00	1 year
Whitehorse	YD59263	Quartz	EVA	4	Chris Davis - 100%	105D11	6/24/2017	6/24/2018	\$100	\$5.00	1 year
Whitehorse	YD59264	Quartz	EVA	5	Chris Davis - 100%	105D11	6/24/2017	6/24/2018	\$100	\$5.00	1 year
Whitehorse	YD59265	Quartz	EVA	6	Chris Davis - 100%	105D11	6/24/2017	6/24/2018	\$100	\$5.00	1 year
Whitehorse	YD59267	Quartz	EVA	8	Chris Davis - 100%	105D11	6/24/2017	6/24/2018	\$100	\$5.00	1 year
Whitehorse	YD59268	Quartz	EVA	9	Chris Davis - 100%	105D11	6/24/2017	6/24/2018	\$100	\$5.00	1 year
Whitehorse	YD59269	Quartz	EVA	10	Chris Davis - 100%	105D11	6/24/2017	6/24/2018	\$100	\$5.00	1 year
Whitehorse	YD59270	Quartz	EVA	11	Chris Davis - 100%	105D11	6/24/2017	6/24/2018	\$100	\$5.00	1 year
Whitehorse	YD59273	Quartz	EVA	14	Chris Davis - 100%	105D11	6/24/2017	6/24/2018	\$100	\$5.00	1 year
Whitehorse	YD59289	Quartz	EVA	24	Chris Davis - 100%	105D11	6/24/2017	6/24/2018	\$100	\$5.00	1 year
Whitehorse	YD59290	Quartz	EVA	25	Chris Davis - 100%	105D11	6/24/2017	6/24/2018	\$100	\$5.00	1 year
Whitehorse	YD59291	Quartz	EVA	26	Chris Davis - 100%	105D11	6/24/2017	6/24/2018	\$100	\$5.00	1 year
Whitehorse	YD59292	Quartz	EVA	27	Chris Davis - 100%	105D11	6/24/2017	6/24/2018	\$100	\$5.00	1 year
Whitehorse	YD59293	Quartz	EVA	28	Chris Davis - 100%	105D11	6/24/2017	6/24/2018	\$100	\$5.00	1 year
Whitehorse	YD59294	Quartz	EVA	29	Chris Davis - 100%	105D11	6/24/2017	6/24/2018	\$100	\$5.00	1 year
Whitehorse	YD59295	Quartz	EVA	30	Chris Davis - 100%	105D11	6/24/2017	6/24/2018	\$100	\$5.00	1 year
Whitehorse	YD59296	Quartz	EVA	31	Chris Davis - 100%	105D11	6/24/2017	6/24/2018	\$100	\$5.00	1 year
Whitehorse	YD59297	Quartz	EVA	32	Chris Davis - 100%	105D11	6/24/2017	6/24/2018	\$100	\$5.00	1 year
Whitehorse	YD59298	Quartz	EVA	33	Chris Davis - 100%	105D11	6/24/2017	6/24/2018	\$100	\$5.00	1 year
Whitehorse	YD59283	Quartz	TONY	1	Chris Davis - 100%	105D11	6/24/2017	6/24/2018	\$100	\$5.00	1 year
Whitehorse	YD59284	Quartz	TONY	2	Chris Davis - 100%	105D11	6/24/2017	6/24/2018	\$100	\$5.00	1 year
Whitehorse	YD59285	Quartz	TONY	3	Chris Davis - 100%	105D11	6/24/2017				
Whitehorse	YD59286	Quartz	TONY	4	Chris Davis - 100%	105D11	6/24/2017				
Whitehorse	YD59287	Quartz	TONY	5	Chris Davis - 100%	105D11	6/24/2017				
Whitehorse	YD59288	Quartz	TONY	6	Chris Davis - 100%	105D11	6/24/2017				
Whitehorse	YD59299	Quartz	TRAD	1	Chris Davis - 100%	105D11	6/24/2017				
Whitehorse	YD59300	Quartz	TRAD	2	Chris Davis - 100%	105D11	6/24/2017				
Whitehorse	YD59301	Quartz	TRAD	3	Chris Davis - 100%	105D11	6/24/2017				
Whitehorse	YD59302	Quartz	TRAD	4	Chris Davis - 100%	105D11	6/24/2017				

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Whitehorse	YD59303	Quartz	TRAD	5	Chris Davis - 100%	105D11	6/24/2017				
Whitehorse	YC66297	Quartz	JUICE	116	Kluane Drilling Ltd. - 100%	105D11	10/10/2017				
Whitehorse	YC66298	Quartz	JUICE	117	Kluane Drilling Ltd. - 100%	105D11	10/10/2017				
Whitehorse	YC66299	Quartz	JUICE	118	Kluane Drilling Ltd. - 100%	105D11	10/10/2017				
Whitehorse	YC66300	Quartz	JUICE	119	Kluane Drilling Ltd. - 100%	105D11	10/10/2017				
Whitehorse	YC66301	Quartz	JUICE	120	Kluane Drilling Ltd. - 100%	105D11	10/10/2017				
Whitehorse	YC66302	Quartz	JUICE	121	Kluane Drilling Ltd. - 100%	105D11	10/10/2017				
Whitehorse	YC66305	Quartz	JUICE	124	Kluane Drilling Ltd. - 100%	105D11	10/10/2017				
Whitehorse	YC66306	Quartz	JUICE	125	Kluane Drilling Ltd. - 100%	105D11	10/10/2017				
Whitehorse	YD29626	Quartz	FOB	1	Chris Davis - 100%	105D11	11/2/2017				
Whitehorse	YD29627	Quartz	FOB	2	Chris Davis - 100%	105D11	11/2/2017				
Whitehorse	YD29628	Quartz	FOB	3	Chris Davis - 100%	105D11	11/2/2017				
Whitehorse	YD29629	Quartz	FOB	4	Chris Davis - 100%	105D11	11/2/2017				
Whitehorse	YD29630	Quartz	FOB	5	Chris Davis - 100%	105D11	11/2/2017				
Whitehorse	YC18853	Quartz	HAT	47	Kluane Drilling Ltd. - 100%	105D11	11/11/2017				
Whitehorse	YC18854	Quartz	HAT	48	Kluane Drilling Ltd. - 100%	105D11	11/11/2017				
Whitehorse	YC08849	Quartz	GIN	28	Josh Bailey - 100%	105D11	12/2/2017				
Whitehorse	YC37796	Quartz	HOWARD	1	Ron Stack - 100%	105D11	12/29/2017				
Whitehorse	YC37797	Quartz	HOWARD	2	Ron Stack - 100%	105D11	12/29/2017				
Whitehorse	76180	Quartz	BETTY	3	H. Coyne & Sons - 100%	105D11	1/1/2018				
Whitehorse	76094	Quartz	BOB	3	H. Coyne & Sons - 100%	105D11	1/1/2018				
Whitehorse	76096	Quartz	BOB	5	H. Coyne & Sons - 100%	105D11	1/1/2018				
Whitehorse	76097	Quartz	BOB	6	H. Coyne & Sons - 100%	105D11	1/1/2018				
Whitehorse	73783	Quartz	BORNITE	1	H. Coyne & Sons - 100%	105D11	1/1/2018				
Whitehorse	73784	Quartz	BORNITE	2	H. Coyne & Sons - 100%	105D14	1/1/2018				
Whitehorse	75982	Quartz	CAMERON	1	H. Coyne & Sons - 100%	105D11	1/1/2018				
Whitehorse	76179	Quartz	DOROTHY	2	H. Coyne & Sons - 100%	105D11	1/1/2018				
Whitehorse	91827	Quartz	EMIDELL	12	H. Coyne & Sons - 100%	105D11	1/1/2018				
Whitehorse	91828	Quartz	EMIDELL	13	H. Coyne & Sons - 100%	105D11	1/1/2018				
Whitehorse	91879	Quartz	EMIDELL	14	H. Coyne & Sons - 100%	105D11	1/1/2018				
Whitehorse	75709	Quartz	EMILY	1	H. Coyne & Sons - 100%	105D11	1/1/2018				

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Whitehorse	75710	Quartz	EMILY	2	H. Coyne & Sons - 100%	105D11	1/1/2018				
Whitehorse	75711	Quartz	GLADYS	3	H. Coyne & Sons - 100%	105D11	1/1/2018				
Whitehorse	75712	Quartz	GLADYS	4	H. Coyne & Sons - 100%	105D11	1/1/2018				
Whitehorse	76178	Quartz	MARGARET	1	H. Coyne & Sons - 100%	105D11	1/1/2018				
Whitehorse	74157	Quartz	ZIRCON	4	H. Coyne & Sons - 100%	105D14	1/1/2018				
Whitehorse	YC39077	Quartz	TONIC	1	H. Coyne & Sons - 100%	105D11	2/22/2018				
Whitehorse	YC39078	Quartz	TONIC	2	H. Coyne & Sons - 100%	105D11	2/22/2018				
Whitehorse	YC39079	Quartz	TONIC	3	H. Coyne & Sons - 100%	105D11	2/22/2018				
Whitehorse	YC39080	Quartz	TONIC	4	H. Coyne & Sons - 100%	105D11	2/22/2018				
Whitehorse	YC39081	Quartz	TONIC	5	H. Coyne & Sons - 100%	105D11	2/22/2018				
Whitehorse	YC39082	Quartz	TONIC	6	H. Coyne & Sons - 100%	105D11	2/22/2018				
Whitehorse	YC39083	Quartz	TONIC	7	H. Coyne & Sons - 100%	105D11	2/22/2018				
Whitehorse	YC39084	Quartz	TONIC	8	H. Coyne & Sons - 100%	105D11	2/22/2018				
Whitehorse	YC39085	Quartz	TONIC	9	H. Coyne & Sons - 100%	105D11	2/22/2018				
Whitehorse	YC39086	Quartz	TONIC	10	H. Coyne & Sons - 100%	105D11	2/22/2018				
Whitehorse	YC39087	Quartz	TONIC	11	H. Coyne & Sons - 100%	105D11	2/22/2018				
Whitehorse	YC39088	Quartz	TONIC	12	H. Coyne & Sons - 100%	105D11	2/22/2018				
Whitehorse	YC39089	Quartz	TONIC	13	H. Coyne & Sons - 100%	105D11	2/22/2018				
Whitehorse	YC39090	Quartz	TONIC	14	H. Coyne & Sons - 100%	105D11	2/22/2018				
Whitehorse	YC39091	Quartz	TONIC	15	H. Coyne & Sons - 100%	105D11	2/22/2018				
Whitehorse	YC39092	Quartz	TONIC	16	H. Coyne & Sons - 100%	105D11	2/22/2018				
Whitehorse	YC39093	Quartz	TONIC	17	H. Coyne & Sons - 100%	105D11	2/22/2018				
Whitehorse	YC39094	Quartz	TONIC	18	H. Coyne & Sons - 100%	105D11	2/22/2018				
Whitehorse	YC39095	Quartz	TONIC	19	H. Coyne & Sons - 100%	105D11	2/22/2018				
Whitehorse	YC39096	Quartz	TONIC	20	H. Coyne & Sons - 100%	105D11	2/22/2018				
Whitehorse	YC39097	Quartz	TONIC	21	H. Coyne & Sons - 100%	105D11	2/22/2018				
Whitehorse	YC39098	Quartz	TONIC	22	H. Coyne & Sons - 100%	105D11	2/22/2018				
Whitehorse	YC39099	Quartz	TONIC	23	H. Coyne & Sons - 100%	105D11	2/22/2018				
Whitehorse	YC39100	Quartz	TONIC	24	H. Coyne & Sons - 100%	105D11	2/22/2018				
Whitehorse	YC37798	Quartz	ALEX	1	Ron Stack - 100%	105D11	12/29/2018				
Whitehorse	YC37799	Quartz	ALEX	2	Ron Stack - 100%	105D11	12/29/2018				

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Whitehorse	YC37800	Quartz	ALEX	3	Ron Stack - 100%	105D11	12/29/2018				
Whitehorse	YC37801	Quartz	ALEX	4	Ron Stack - 100%	105D11	12/29/2018				
Whitehorse	YC37802	Quartz	ALEX	5	Ron Stack - 100%	105D11	12/29/2018				
Whitehorse	YC37803	Quartz	ALEX	6	Ron Stack - 100%	105D11	12/29/2018				
Whitehorse	YC37804	Quartz	ALEX	7	Ron Stack - 100%	105D11	12/29/2018				
Whitehorse	YC37805	Quartz	ALEX	8	Ron Stack - 100%	105D11	12/29/2018				
Whitehorse	YC19486	Quartz	GIN	39	Kluane Drilling Ltd. - 100%	105D11	1/1/2019				
Whitehorse	YC19487	Quartz	GIN	40	Kluane Drilling Ltd. - 100%	105D11	1/1/2019				
Whitehorse	YC19488	Quartz	GIN	41	Kluane Drilling Ltd. - 100%	105D11	1/1/2019				
Whitehorse	YC19489	Quartz	GIN	42	Kluane Drilling Ltd. - 100%	105D11	1/1/2019				
Whitehorse	YC19490	Quartz	GIN	43	Kluane Drilling Ltd. - 100%	105D11	1/1/2019				
Whitehorse	YC19491	Quartz	GIN	44	Kluane Drilling Ltd. - 100%	105D11	1/1/2019				
Whitehorse	YB57537	Quartz	HAT	1	Kluane Drilling Ltd. - 100%	105D14	11/11/2019				
Whitehorse	YB57538	Quartz	HAT	2	Kluane Drilling Ltd. - 100%	105D14	11/11/2019				
Whitehorse	YB57539	Quartz	HAT	3	Kluane Drilling Ltd. - 100%	105D14	11/11/2019				
Whitehorse	YB57540	Quartz	HAT	4	Kluane Drilling Ltd. - 100%	105D14	11/11/2019				
Whitehorse	YB57541	Quartz	HAT	5	Kluane Drilling Ltd. - 100%	105D14	11/11/2019				
Whitehorse	YB57542	Quartz	HAT	6	Kluane Drilling Ltd. - 100%	105D14	11/11/2019				
Whitehorse	YB57543	Quartz	HAT	7	Kluane Drilling Ltd. - 100%	105D14	11/11/2019				
Whitehorse	YB57544	Quartz	HAT	8	Kluane Drilling Ltd. - 100%	105D14	11/11/2019				
Whitehorse	YB57545	Quartz	HAT	9	Kluane Drilling Ltd. - 100%	105D14	11/11/2019				
Whitehorse	YB57546	Quartz	HAT	10	Kluane Drilling Ltd. - 100%	105D14	11/11/2019				
Whitehorse	YB57547	Quartz	HAT	11	Kluane Drilling Ltd. - 100%	105D14	11/11/2019				
Whitehorse	YB57548	Quartz	HAT	12	Kluane Drilling Ltd. - 100%	105D14	11/11/2019				
Whitehorse	YB57549	Quartz	HAT	13	Kluane Drilling Ltd. - 100%	105D14	11/11/2019				
Whitehorse	YB57550	Quartz	HAT	14	Kluane Drilling Ltd. - 100%	105D14	11/11/2019				
Whitehorse	YB57551	Quartz	HAT	15	Kluane Drilling Ltd. - 100%	105D14	11/11/2019				
Whitehorse	YB57552	Quartz	HAT	16	Kluane Drilling Ltd. - 100%	105D14	11/11/2019				
Whitehorse	YB57553	Quartz	HAT	17	Kluane Drilling Ltd. - 100%	105D14	11/11/2019				
Whitehorse	YB57554	Quartz	HAT	18	Kluane Drilling Ltd. - 100%	105D14	11/11/2019				
Whitehorse	YB57555	Quartz	HAT	19	Kluane Drilling Ltd. - 100%	105D14	11/11/2019				

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Whitehorse	YB57556	Quartz	HAT	20	Kluane Drilling Ltd. - 100%	105D14	11/11/2019				
Whitehorse	YB66395	Quartz	HAT	37	Kluane Drilling Ltd. - 100%	105D14	11/11/2019				
Whitehorse	YB66396	Quartz	HAT	38	Kluane Drilling Ltd. - 100%	105D14	11/11/2019				
Whitehorse	YB66397	Quartz	HAT	39	Kluane Drilling Ltd. - 100%	105D14	11/11/2019				
Whitehorse	YB66398	Quartz	HAT	40	Kluane Drilling Ltd. - 100%	105D14	11/11/2019				
Whitehorse	YC18449	Quartz	HAT	41	Kluane Drilling Ltd. - 100%	105D14	11/11/2019				
Whitehorse	YC18450	Quartz	HAT	42	Kluane Drilling Ltd. - 100%	105D14	11/11/2019				
Whitehorse	YC18451	Quartz	HAT	43	Kluane Drilling Ltd. - 100%	105D14	11/11/2019				
Whitehorse	YC18452	Quartz	HAT	44	Kluane Drilling Ltd. - 100%	105D14	11/11/2019				
Whitehorse	YC18695	Quartz	HAT	45	Kluane Drilling Ltd. - 100%	105D14	11/11/2019				
Whitehorse	YC18696	Quartz	HAT	46	Kluane Drilling Ltd. - 100%	105D14	11/11/2019				
Whitehorse	64183	Quartz	ZIRCON	2	H. Coyne & Sons - 100%	105D14	11/11/2019				
Whitehorse	76774	Quartz	BILL	5	H. Coyne & Sons - 100%	105D11	1/1/2020				
Whitehorse	76775	Quartz	BILL	6	H. Coyne & Sons - 100%	105D11	1/1/2020				
Whitehorse	76776	Quartz	BILL	7	H. Coyne & Sons - 100%	105D11	1/1/2020				
Whitehorse	76777	Quartz	BILL	8	H. Coyne & Sons - 100%	105D11	1/1/2020				
Whitehorse	Y 52113	Quartz	BILL	11	H. Coyne & Sons - 100%	105D11	1/1/2020				
Whitehorse	85566	Quartz	JAN	1	H. Coyne & Sons - 100%	105D11	1/1/2020				
Whitehorse	YC66240	Quartz	JUICE	59	Kluane Drilling Ltd. - 100%	105D11	1/1/2020				
Whitehorse	YC66241	Quartz	JUICE	60	Kluane Drilling Ltd. - 100%	105D11	1/1/2020				
Whitehorse	76397	Quartz	TESS	3	H. Coyne & Sons - 100%	105D11	1/1/2020				
Whitehorse	76398	Quartz	TESS	4	H. Coyne & Sons - 100%	105D11	1/1/2020				
Whitehorse	YC66262	Quartz	JUICE	81	Kluane Drilling Ltd. - 100%	105D11	1/10/2020				
Whitehorse	YC66263	Quartz	JUICE	82	Kluane Drilling Ltd. - 100%	105D11	1/10/2020				
Whitehorse	YC66264	Quartz	JUICE	83	Kluane Drilling Ltd. - 100%	105D11	1/10/2020				
Whitehorse	YC66265	Quartz	JUICE	84	Kluane Drilling Ltd. - 100%	105D11	1/10/2020				
Whitehorse	YC66266	Quartz	JUICE	85	Kluane Drilling Ltd. - 100%	105D11	1/10/2020				
Whitehorse	YC66267	Quartz	JUICE	86	Kluane Drilling Ltd. - 100%	105D11	1/10/2020				
Whitehorse	YC66268	Quartz	JUICE	87	Kluane Drilling Ltd. - 100%	105D11	1/10/2020				
Whitehorse	YC66269	Quartz	JUICE	88	Kluane Drilling Ltd. - 100%	105D11	1/10/2020				
Whitehorse	YC66270	Quartz	JUICE	89	Kluane Drilling Ltd. - 100%	105D11	1/10/2020				

District	Grant Number	Reg Type	Claim Name	Claim Number	Claim Owner	NTS Map Number	Claim ExpiryDate	New expiry date	\$ work applied	renewal cost	renewal years
Whitehorse	YC66271	Quartz	JUICE	90	Kluane Drilling Ltd. - 100%	105D11	1/10/2020				
Whitehorse	YC66272	Quartz	JUICE	91	Kluane Drilling Ltd. - 100%	105D11	1/10/2020				
Whitehorse	YC66273	Quartz	JUICE	92	Kluane Drilling Ltd. - 100%	105D11	1/10/2020				
Whitehorse	YC66274	Quartz	JUICE	93	Kluane Drilling Ltd. - 100%	105D11	1/10/2020				
Whitehorse	YC66275	Quartz	JUICE	94	Kluane Drilling Ltd. - 100%	105D11	1/10/2020				
Whitehorse	YC66276	Quartz	JUICE	95	Kluane Drilling Ltd. - 100%	105D11	1/10/2020				
Whitehorse	YC66277	Quartz	JUICE	96	Kluane Drilling Ltd. - 100%	105D11	1/10/2020				
Whitehorse	YC66278	Quartz	JUICE	97	Kluane Drilling Ltd. - 100%	105D11	1/10/2020				
Whitehorse	YC66279	Quartz	JUICE	98	Kluane Drilling Ltd. - 100%	105D11	1/10/2020				
Whitehorse	YC66280	Quartz	JUICE	99	Kluane Drilling Ltd. - 100%	105D11	1/10/2020				
Whitehorse	YC66281	Quartz	JUICE	100	Kluane Drilling Ltd. - 100%	105D11	1/10/2020				
Whitehorse	YC66282	Quartz	JUICE	101	Kluane Drilling Ltd. - 100%	105D11	1/10/2020				
Whitehorse	YC66283	Quartz	JUICE	102	Kluane Drilling Ltd. - 100%	105D11	1/10/2020				
Whitehorse	YC66284	Quartz	JUICE	103	Kluane Drilling Ltd. - 100%	105D11	1/10/2020				
Whitehorse	YC66285	Quartz	JUICE	104	Kluane Drilling Ltd. - 100%	105D11	1/10/2020				
Whitehorse	YC66286	Quartz	JUICE	105	Kluane Drilling Ltd. - 100%	105D11	1/10/2020				
Whitehorse	YC66287	Quartz	JUICE	106	Kluane Drilling Ltd. - 100%	105D11	1/10/2020				
Whitehorse	YB58139	Quartz	HAT	35	Kluane Drilling Ltd. - 100%	105D14	11/11/2020				
Whitehorse	YB58140	Quartz	HAT	36	Kluane Drilling Ltd. - 100%	105D14	11/11/2020				
Whitehorse	76770	Quartz	BILL	1	H. Coyne & Sons - 100%	105D11	1/1/2021				
Whitehorse	76771	Quartz	BILL	2	H. Coyne & Sons - 100%	105D11	1/1/2021				
Whitehorse	76772	Quartz	BILL	3	H. Coyne & Sons - 100%	105D11	1/1/2021				
Whitehorse	76773	Quartz	BILL	4	H. Coyne & Sons - 100%	105D11	1/1/2021				
Whitehorse	YC66248	Quartz	JUICE	67	Kluane Drilling Ltd. - 100%	105D11	1/1/2021				
Whitehorse	YC66249	Quartz	JUICE	68	Kluane Drilling Ltd. - 100%	105D11	1/1/2021				
Whitehorse	YC66250	Quartz	JUICE	69	Kluane Drilling Ltd. - 100%	105D11	1/1/2021				
Whitehorse	YC66251	Quartz	JUICE	70	Kluane Drilling Ltd. - 100%	105D11	1/1/2021				
Whitehorse	YC66252	Quartz	JUICE	71	Kluane Drilling Ltd. - 100%	105D11	1/1/2021				
Whitehorse	YC66253	Quartz	JUICE	72	Kluane Drilling Ltd. - 100%	105D11	1/1/2021				
Whitehorse	YC66254	Quartz	JUICE	73	Kluane Drilling Ltd. - 100%	105D11	1/1/2021				
Whitehorse	YC66255	Quartz	JUICE	74	Kluane Drilling Ltd. - 100%	105D11	1/1/2021				

District	Grant Number	Reg Type	Claim Name	Claim Number	Claim Owner	NTS Map Number	Claim ExpiryDate	New expiry date	\$ work applied	renewal cost	renewal years
Whitehorse	YC66256	Quartz	JUICE	75	Kluane Drilling Ltd. - 100%	105D11	1/1/2021				
Whitehorse	YC66257	Quartz	JUICE	76	Kluane Drilling Ltd. - 100%	105D11	1/1/2021				
Whitehorse	YC66258	Quartz	JUICE	77	Kluane Drilling Ltd. - 100%	105D11	1/1/2021				
Whitehorse	YC66259	Quartz	JUICE	78	Kluane Drilling Ltd. - 100%	105D11	1/1/2021				
Whitehorse	YC66260	Quartz	JUICE	79	Kluane Drilling Ltd. - 100%	105D11	1/1/2021				
Whitehorse	YC66261	Quartz	JUICE	80	Kluane Drilling Ltd. - 100%	105D11	1/1/2021				
Whitehorse	76403	Quartz	KEN	1	H. Coyne & Sons - 100%	105D11	1/1/2021				
Whitehorse	82027	Quartz	LEY	1	H. Coyne & Sons - 100%	105D11	1/1/2021				
Whitehorse	82028	Quartz	LEY	2	H. Coyne & Sons - 100%	105D11	1/1/2021				
Whitehorse	82029	Quartz	LEY	3	H. Coyne & Sons - 100%	105D11	1/1/2021				
Whitehorse	82030	Quartz	LEY	4	H. Coyne & Sons - 100%	105D11	1/1/2021				
Whitehorse	77664	Quartz	PARKE	1	H. Coyne & Sons - 100%	105D11	1/1/2021				
Whitehorse	77666	Quartz	PARKE	3	H. Coyne & Sons - 100%	105D11	1/1/2021				
Whitehorse	76395	Quartz	TESS	1	H. Coyne & Sons - 100%	105D11	1/1/2021				
Whitehorse	76396	Quartz	TESS	2	H. Coyne & Sons - 100%	105D11	1/1/2021				
Whitehorse	YC66242	Quartz	JUICE	61	Kluane Drilling Ltd. - 100%	105D11	1/10/2021				
Whitehorse	YC66243	Quartz	JUICE	62	Kluane Drilling Ltd. - 100%	105D11	1/10/2021				
Whitehorse	YC66244	Quartz	JUICE	63	Kluane Drilling Ltd. - 100%	105D11	1/10/2021				
Whitehorse	YC66245	Quartz	JUICE	64	Kluane Drilling Ltd. - 100%	105D11	1/10/2021				
Whitehorse	YC66290	Quartz	JUICE	109	Kluane Drilling Ltd. - 100%	105D11	1/10/2021				
Whitehorse	YC66291	Quartz	JUICE	110	Kluane Drilling Ltd. - 100%	105D11	1/10/2021				
Whitehorse	YC66293	Quartz	JUICE	112	Kluane Drilling Ltd. - 100%	105D11	1/10/2021				
Whitehorse	YC66294	Quartz	JUICE	113	Kluane Drilling Ltd. - 100%	105D11	1/10/2021				
Whitehorse	YC66295	Quartz	JUICE	114	Kluane Drilling Ltd. - 100%	105D11	1/10/2021				
Whitehorse	YC66296	Quartz	JUICE	115	Kluane Drilling Ltd. - 100%	105D11	1/10/2021				
Whitehorse	YC46576	Quartz	JUICE	21	Kluane Drilling Ltd. - 100%	105D11	3/16/2021				
Whitehorse	YC46577	Quartz	JUICE	22	Kluane Drilling Ltd. - 100%	105D11	3/16/2021				
Whitehorse	YC46578	Quartz	JUICE	23	Kluane Drilling Ltd. - 100%	105D11	3/16/2021				
Whitehorse	YC46579	Quartz	JUICE	24	Kluane Drilling Ltd. - 100%	105D11	3/16/2021				
Whitehorse	YC46582	Quartz	JUICE	27	Kluane Drilling Ltd. - 100%	105D11	3/16/2021				
Whitehorse	YC46583	Quartz	JUICE	28	Kluane Drilling Ltd. - 100%	105D11	3/16/2021				

District	Grant Number	Reg Type	Claim Name	Claim Number	Claim Owner	NTS Map Number	Claim ExpiryDate	New expiry date	\$ work applied	renewal cost	renewal years
Whitehorse	YC46584	Quartz	JUICE	29	Kluane Drilling Ltd. - 100%	105D11	3/16/2021				
Whitehorse	YC46585	Quartz	JUICE	30	Kluane Drilling Ltd. - 100%	105D11	3/16/2021				
Whitehorse	YC46586	Quartz	JUICE	31	Kluane Drilling Ltd. - 100%	105D11	3/16/2021				
Whitehorse	YC46587	Quartz	JUICE	32	Kluane Drilling Ltd. - 100%	105D11	3/16/2021				
Whitehorse	YC46588	Quartz	JUICE	33	Kluane Drilling Ltd. - 100%	105D11	3/16/2021				
Whitehorse	YC46589	Quartz	JUICE	34	Kluane Drilling Ltd. - 100%	105D11	3/16/2021				
Whitehorse	YC46592	Quartz	JUICE	37	Kluane Drilling Ltd. - 100%	105D11	3/16/2021				
Whitehorse	YC46593	Quartz	JUICE	38	Kluane Drilling Ltd. - 100%	105D11	3/16/2021				
Whitehorse	YC46594	Quartz	JUICE	39	Kluane Drilling Ltd. - 100%	105D11	3/16/2021				
Whitehorse	YC46595	Quartz	JUICE	40	Kluane Drilling Ltd. - 100%	105D11	3/16/2021				
Whitehorse	YB58021	Quartz	HAT	21	Kluane Drilling Ltd. - 100%	105D14	11/11/2021				
Whitehorse	YB58022	Quartz	HAT	22	Kluane Drilling Ltd. - 100%	105D14	11/11/2021				
Whitehorse	YB58023	Quartz	HAT	23	Kluane Drilling Ltd. - 100%	105D14	11/11/2021				
Whitehorse	YB58024	Quartz	HAT	24	Kluane Drilling Ltd. - 100%	105D14	11/11/2021				
Whitehorse	YB58025	Quartz	HAT	25	Kluane Drilling Ltd. - 100%	105D14	11/11/2021				
Whitehorse	YB58026	Quartz	HAT	26	Kluane Drilling Ltd. - 100%	105D14	11/11/2021				
Whitehorse	YB58049	Quartz	HAT	27	Kluane Drilling Ltd. - 100%	105D14	11/11/2021				
Whitehorse	YB58050	Quartz	HAT	28	Kluane Drilling Ltd. - 100%	105D14	11/11/2021				
Whitehorse	YB58051	Quartz	HAT	29	Kluane Drilling Ltd. - 100%	105D14	11/11/2021				
Whitehorse	YB58052	Quartz	HAT	30	Kluane Drilling Ltd. - 100%	105D14	11/11/2021				
Whitehorse	YB58053	Quartz	HAT	31	Kluane Drilling Ltd. - 100%	105D14	11/11/2021				
Whitehorse	YB58054	Quartz	HAT	32	Kluane Drilling Ltd. - 100%	105D14	11/11/2021				
Whitehorse	YB58055	Quartz	HAT	33	Kluane Drilling Ltd. - 100%	105D14	11/11/2021				
Whitehorse	YB58056	Quartz	HAT	34	Kluane Drilling Ltd. - 100%	105D11	11/11/2021				
Whitehorse	YC08842	Quartz	GIN	21	Josh Bailey - 100%	105D11	12/2/2021				
Whitehorse	YC08843	Quartz	GIN	22	Josh Bailey - 100%	105D11	12/2/2021				
Whitehorse	YC08844	Quartz	GIN	23	Josh Bailey - 100%	105D11	12/2/2021				
Whitehorse	YC08845	Quartz	GIN	24	Josh Bailey - 100%	105D11	12/2/2021				
Whitehorse	YC08846	Quartz	GIN	25	Josh Bailey - 100%	105D11	12/2/2021				
Whitehorse	YC08847	Quartz	GIN	26	Josh Bailey - 100%	105D11	12/2/2021				
Whitehorse	YC08848	Quartz	GIN	27	Josh Bailey - 100%	105D11	12/2/2021				

District	Grant Number	Reg Type	Claim Name	Claim Number	Claim Owner	NTS Map Number	Claim ExpiryDate	New expiry date	\$ work applied	renewal cost	renewal years
Whitehorse	YC54444	Quartz	JACK	1	H. Coyne & Sons - 100%	105D11	12/5/2021				
Whitehorse	72699	Quartz	BONZO		H. Coyne & Sons - 100%	105D11	1/1/2022				
Whitehorse	YC19484	Quartz	GIN	37	Kluane Drilling Ltd. - 100%	105D11	1/1/2022				
Whitehorse	YC19492	Quartz	GIN	45	Kluane Drilling Ltd. - 100%	105D11	1/1/2022				
Whitehorse	YC19493	Quartz	GIN	46	Kluane Drilling Ltd. - 100%	105D11	1/1/2022				
Whitehorse	YC19494	Quartz	GIN	47	Kluane Drilling Ltd. - 100%	105D11	1/1/2022				
Whitehorse	YC19495	Quartz	GIN	48	Kluane Drilling Ltd. - 100%	105D11	1/1/2022				
Whitehorse	76497	Quartz	HEATHER	1	H. Coyne & Sons - 100%	105D11	1/1/2022				
Whitehorse	76498	Quartz	HEATHER	2	H. Coyne & Sons - 100%	105D11	1/1/2022				
Whitehorse	76499	Quartz	HEATHER	3	H. Coyne & Sons - 100%	105D11	1/1/2022				
Whitehorse	76500	Quartz	HEATHER	4	H. Coyne & Sons - 100%	105D11	1/1/2022				
Whitehorse	YC66222	Quartz	JUICE	41	Kluane Drilling Ltd. - 100%	105D11	1/1/2022				
Whitehorse	YC66223	Quartz	JUICE	42	Kluane Drilling Ltd. - 100%	105D11	1/1/2022				
Whitehorse	YC66224	Quartz	JUICE	43	Kluane Drilling Ltd. - 100%	105D11	1/1/2022				
Whitehorse	YC66225	Quartz	JUICE	44	Kluane Drilling Ltd. - 100%	105D11	1/1/2022				
Whitehorse	YC66226	Quartz	JUICE	45	Kluane Drilling Ltd. - 100%	105D11	1/1/2022				
Whitehorse	YC66227	Quartz	JUICE	46	Kluane Drilling Ltd. - 100%	105D11	1/1/2022				
Whitehorse	YC66228	Quartz	JUICE	47	Kluane Drilling Ltd. - 100%	105D11	1/1/2022				
Whitehorse	YC66229	Quartz	JUICE	48	Kluane Drilling Ltd. - 100%	105D11	1/1/2022				
Whitehorse	YC66230	Quartz	JUICE	49	Kluane Drilling Ltd. - 100%	105D11	1/1/2022				
Whitehorse	YC66231	Quartz	JUICE	50	Kluane Drilling Ltd. - 100%	105D11	1/1/2022				
Whitehorse	YC66232	Quartz	JUICE	51	Kluane Drilling Ltd. - 100%	105D11	1/1/2022				
Whitehorse	YC66233	Quartz	JUICE	52	Kluane Drilling Ltd. - 100%	105D11	1/1/2022				
Whitehorse	YC66234	Quartz	JUICE	53	Kluane Drilling Ltd. - 100%	105D11	1/1/2022				
Whitehorse	YC66235	Quartz	JUICE	54	Kluane Drilling Ltd. - 100%	105D11	1/1/2022				
Whitehorse	YC66236	Quartz	JUICE	55	Kluane Drilling Ltd. - 100%	105D11	1/1/2022				
Whitehorse	YC66237	Quartz	JUICE	56	Kluane Drilling Ltd. - 100%	105D11	1/1/2022				
Whitehorse	YC66238	Quartz	JUICE	57	Kluane Drilling Ltd. - 100%	105D11	1/1/2022				
Whitehorse	YC66239	Quartz	JUICE	58	Kluane Drilling Ltd. - 100%	105D11	1/1/2022				
Whitehorse	YC19485	Quartz	GIN	38	Kluane Drilling Ltd. - 100%	105D11	1/1/2023				
									\$12,000	\$600.00	

APPENDIX C- CLAIMS WORKED

GRANT No.	CLAIM LABEL		GRANT No.	CLAIM LABEL
85566	JAN 1		YC54444	JACK 1
YC37798-805	ALEX 1-8		76497-500	HEATHER 1-4
YC40298	ATA 79		YC37796-797	HOWARD 1-2
76180	BETTY 3		YC46556-574	JUICE 1-18
76770	BILL 1		YC46575-581	JUICE 20-26
Y 52112-113	BILL 10-11		YC46583	JUICE 28
76771-777	BILL 2-8		YC46585-589	JUICE 30-34
Y 52111	BILL 9		YC46592-595	JUICE 37-40
76094	BOB 3		YC66222-236	JUICE 41-55
76096	BOB 5		YC66238	JUICE 57
76097	BOB 6		YC66240-245	JUICE 59-64
72699	BONZO		YC66248-268	JUICE 67-87
73783-784	BORNITE 1-2		YC66270	JUICE 89
75982	CAMERON 1		YC66272	JUICE 91
76179	DOROTHY 2		YC66274	JUICE 93
91827-28	EMIDELL 12-13		YC66276	JUICE 95
91879	EMIDELL 14		YC66278-287	JUICE 97-106
75709-710	EMILY 1-2		YC66290-291	JUICE 109-110
Y 52115-116	EMILY 3-4		YC66293-306	JUICE 112-125
YD59260-274	EVA 1-15		76403	KEN 1
YD59279-282	EVA 20-23		82027-030	LEY 1-4
YD59289-298	EVA 24-33		76178	MARGARET 1
YD29626-630	FOB 1-5		77664-666	PARKE 1-3
YC08850-867	GIN 1-18		Y 12210	PARKE 4
YD59258-259	GIN 19-20		Y 52114	PARKE 5
YC08842-849	GIN 21-28		76395-398	TESS 1-4
YC19491-495	GIN 44-48		Y 29677-678	TESS 7-8
75711-712	GLADYS 3-4		YD59244	TOM 17
YB57537-556	HAT 1-20		YD59246	TOM 19
YB58021-026	HAT 21-26		YD59248	TOM 21
YB58049-056	HAT 27-34		YD59256	TOM 29
YB58139-140	HAT 35-36		YC39077-092	TONIC 1-16
YB66395-398	HAT 37-40		YD59283-288	TONY 1-6
YC18449-452	HAT 41-44		YD59299-303	TRAD 1-5
YC18696	HAT 46		74157	ZIRCON 4
YC18853-854	HAT 47-48			

APPENDIX D-STATEMENT OF EXPENDITURES

Whitehorse Copper Belt claims Grouping HW07119

Statement of Expenditures

	incl GST
Airborne survey	\$11,004.00
survey planning and report	\$989.63
printing	\$40.00
total	\$12,033.63

120 claims years

Signed in Whitehorse,
Wednesday October 1st, 2014

Danièle Héon, P. Geo.

APPENDIX E- GEOPHYSICAL SURVEY

The contents of the original report were edited to remove any specific reference to the survey done on a different claim block (Nana claims).

AIRBORNE GEOPHYSICAL SURVEY REPORT



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

Jenny Poon, B.Sc., G.I.T.
Precision GeoSurveys Inc.
www.precisiongeosurveys.com
355 Burrard St, Vancouver BC
Canada V6C 2G8
604-484-9402

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.

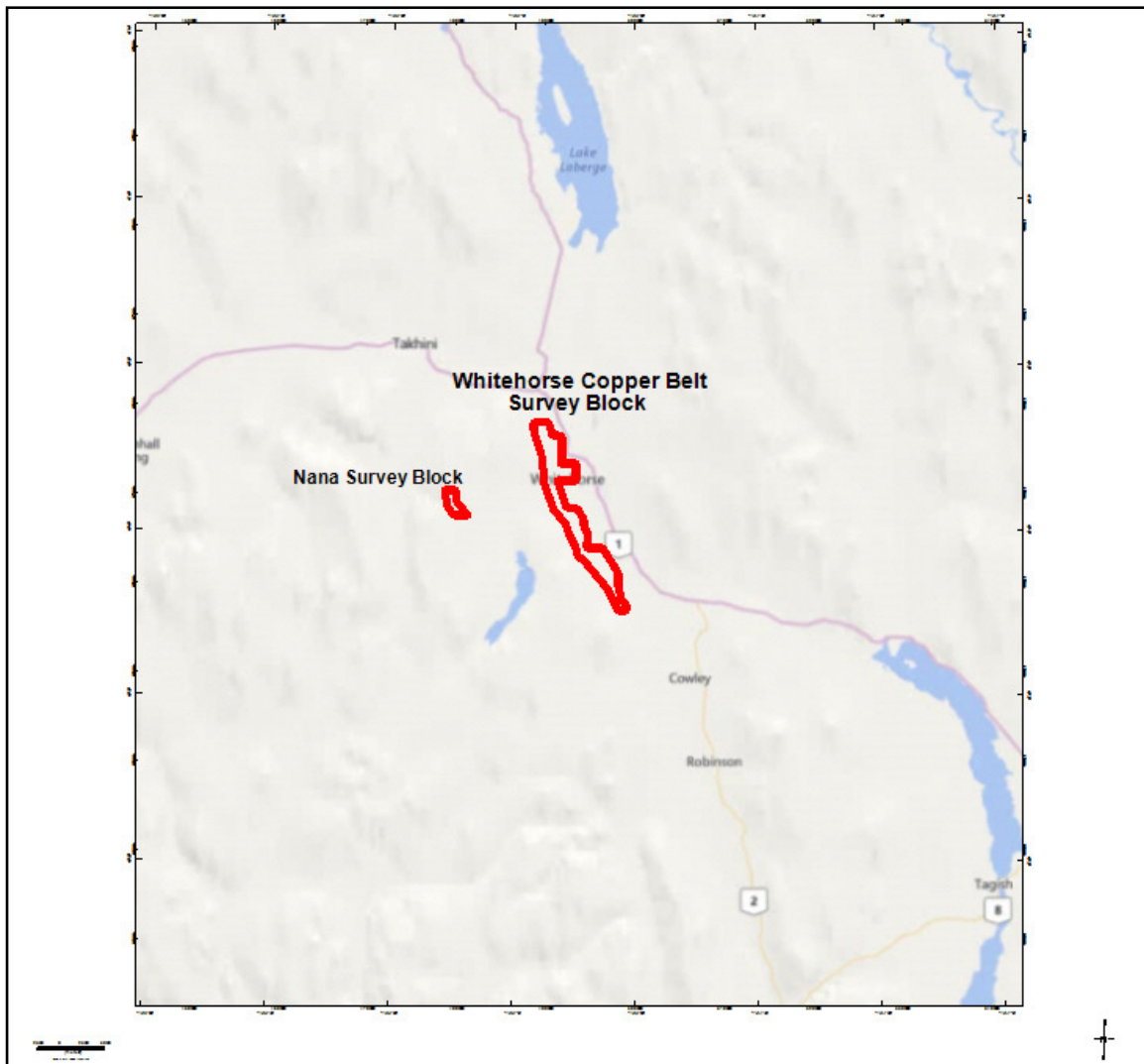


Figure 1: Nana and WCB survey blocks location map.

The WCB block is approximately 5.5 km west of Whitehorse airport. It covers an irregular area of 3.7 km by 22.4 km (Figure 5). A total of 264 line kilometers of was flown.



Figure 5: WCB survey block boundary in red.

The WCB survey block was flown at 200 meter spacing at a 090°/270° heading; the tie lines were flown at 2000 meter spacing at a heading of 000°/180° (Figures 6 and 7).

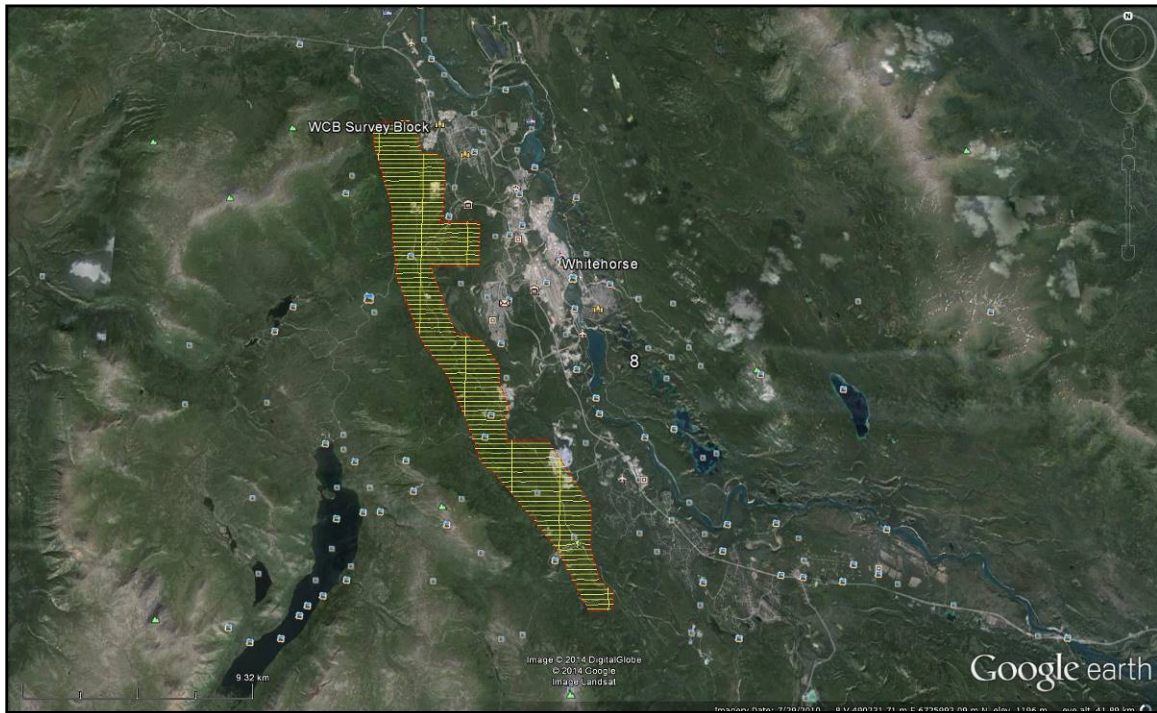


Figure 6: Plan View – WCB survey block with actual survey and tie lines outlined in yellow, and the block boundary in red.

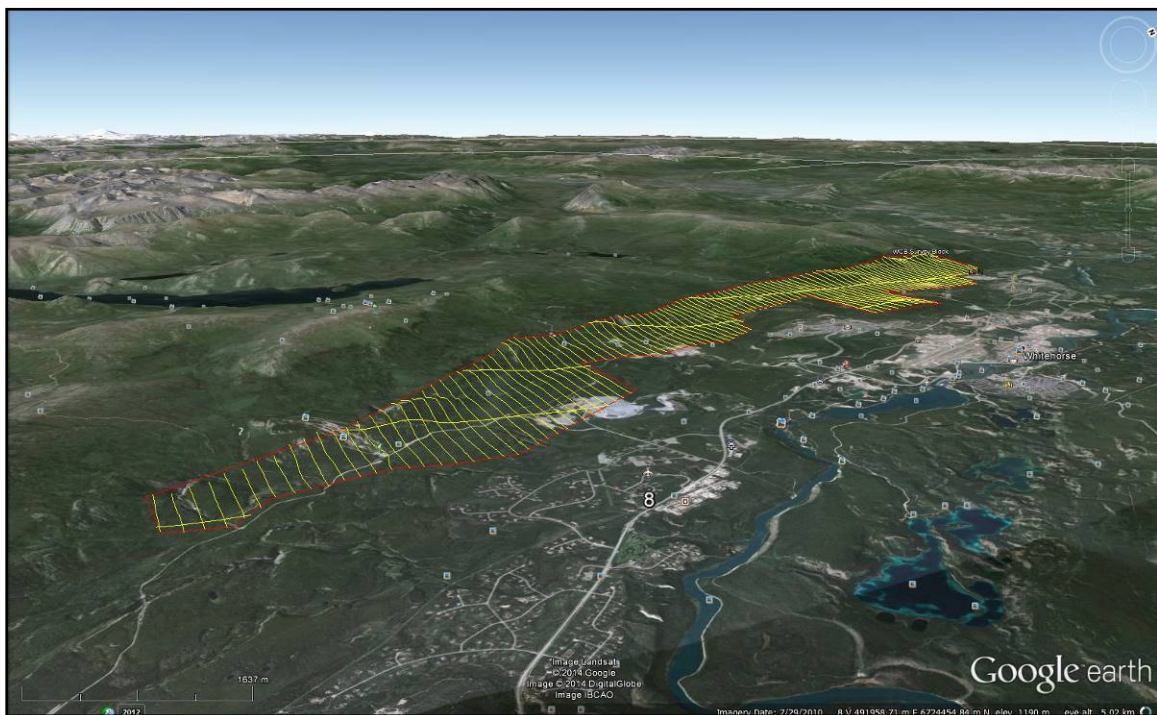


Figure 7: Terrain View – WCB survey block with actual survey and tie lines outlined in yellow, and the block boundary in red.

A total of 308 line kilometers of magnetic and radiometric data were flown on the two blocks; this total includes tie lines and survey lines.

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).

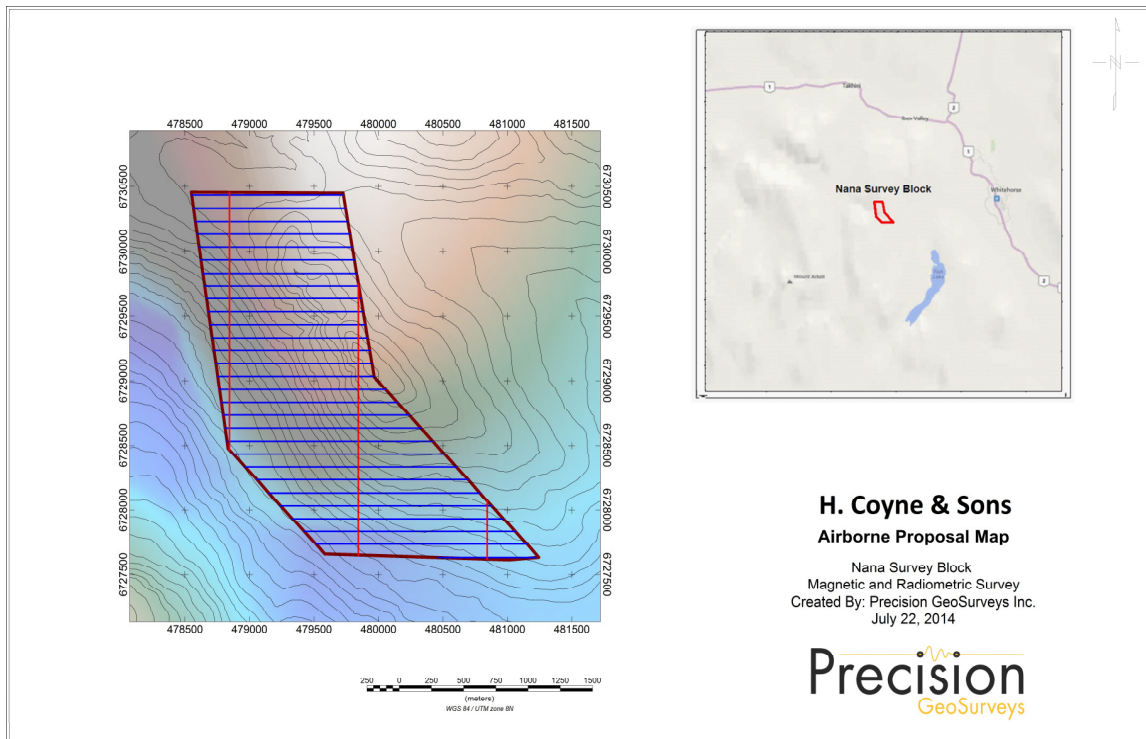


Figure 8: Survey map of Nana survey area showing outlines of proposed survey and tie lines.

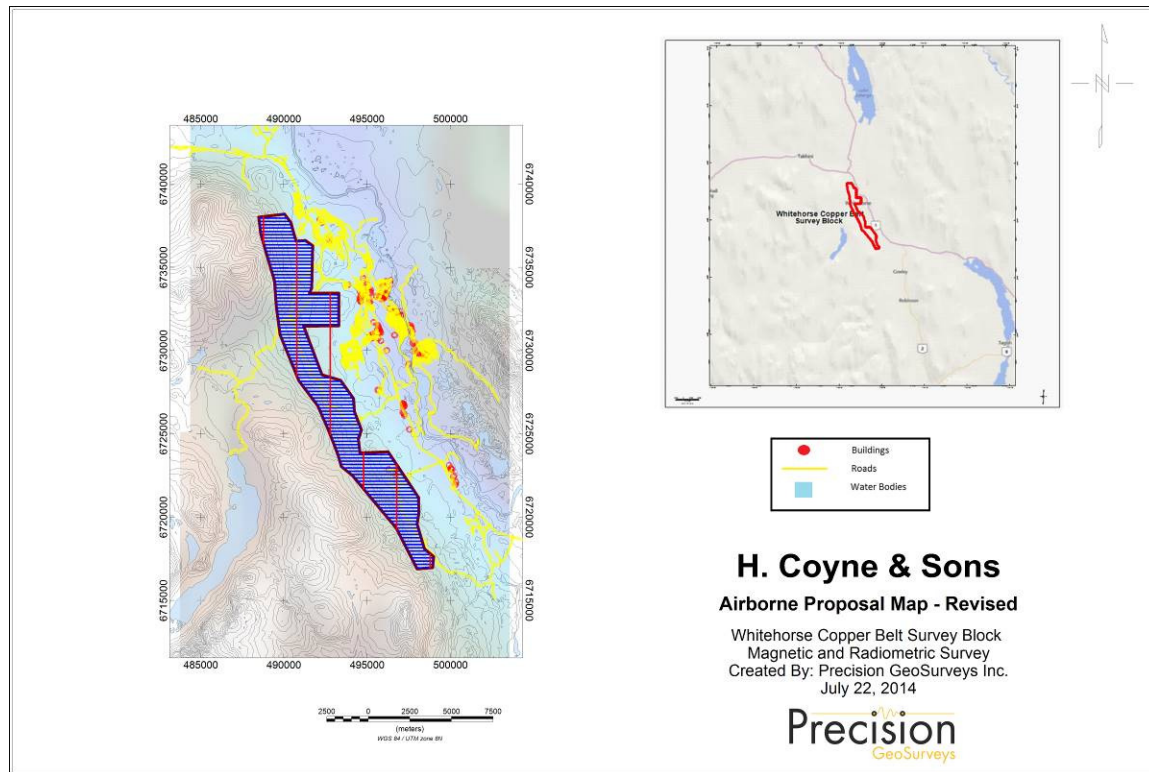


Figure 9: Survey map of WCB survey area showing outlines of proposed survey and tie lines.

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.

Longitude	Latitude	Easting	Northing	N/S	E/W
135.17624902	60.77472943	490399.51	6737709.01	N	W
135.17017282	60.76447514	490727.91	6736566.16	N	W
135.15980498	60.76484702	491292.77	6736605.57	N	W
135.15184503	60.76213585	491726.26	6736303.44	N	W
135.15269039	60.73921340	491673.72	6733749.76	N	W
135.15520807	60.73649907	491536.43	6733448.03	N	W
135.12286110	60.73657749	493300.21	6733452.93	N	W
135.12295865	60.71892609	493290.97	6731487.49	N	W
135.16162849	60.71871447	491180.90	6731467.88	N	W
135.14118858	60.69252086	492290.16	6728547.84	N	W
135.12070431	60.68958700	493407.69	6728219.43	N	W
135.10637082	60.67965115	494188.55	6727111.23	N	W
135.10557963	60.67281925	494231.31	6726350.16	N	W
135.09780828	60.66294895	494653.74	6725250.46	N	W
135.10108513	60.65773009	494474.16	6724668.97	N	W
135.09934505	60.65105147	494568.23	6723925.01	N	W
135.09948970	60.65051266	494559.68	6723865.15	N	W
135.06821746	60.65107095	496269.94	6723925.01	N	W
135.03501464	60.62635725	498084.18	6721170.55	N	W
135.03467648	60.61777398	498101.63	6720215.46	N	W
135.03638765	60.61225179	498007.56	6719599.76	N	W
135.02857574	60.59874114	498435.13	6718094.73	N	W
135.01825692	60.59459490	498999.51	6717632.96	N	W
135.01951304	60.58862405	498931.10	6716967.67	N	W
135.03652457	60.58792914	497999.01	6716890.71	N	W
135.05950930	60.60995400	496741.97	6719344.93	N	W
135.10742246	60.63817920	494123.56	6722491.81	N	W
135.11979916	60.64312477	493448.01	6723044.23	N	W
135.12325862	60.64888576	493259.88	6723685.57	N	W
135.12688118	60.65394619	493063.20	6724249.96	N	W
135.13410635	60.66284570	492669.84	6725241.91	N	W
135.14596585	60.67585193	492025.07	6726692.21	N	W
135.16669903	60.68922344	490896.30	6728183.56	N	W
135.18749804	60.71408389	489767.53	6730955.89	N	W
135.19182262	60.72944864	489536.64	6732667.86	N	W
135.19362773	60.74303019	489442.58	6734181.44	N	W
135.20313472	60.75853059	488929.50	6735908.81	N	W
135.20916337	60.76849617	488604.55	6737020.48	N	W
135.21127779	60.77739928	488493.38	6738012.43	N	W
135.18279121	60.77905716	490044.83	6738192.42	N	W

Table 3: WCB survey block polygon coordinates using WGS 84 in zone 8N.

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).

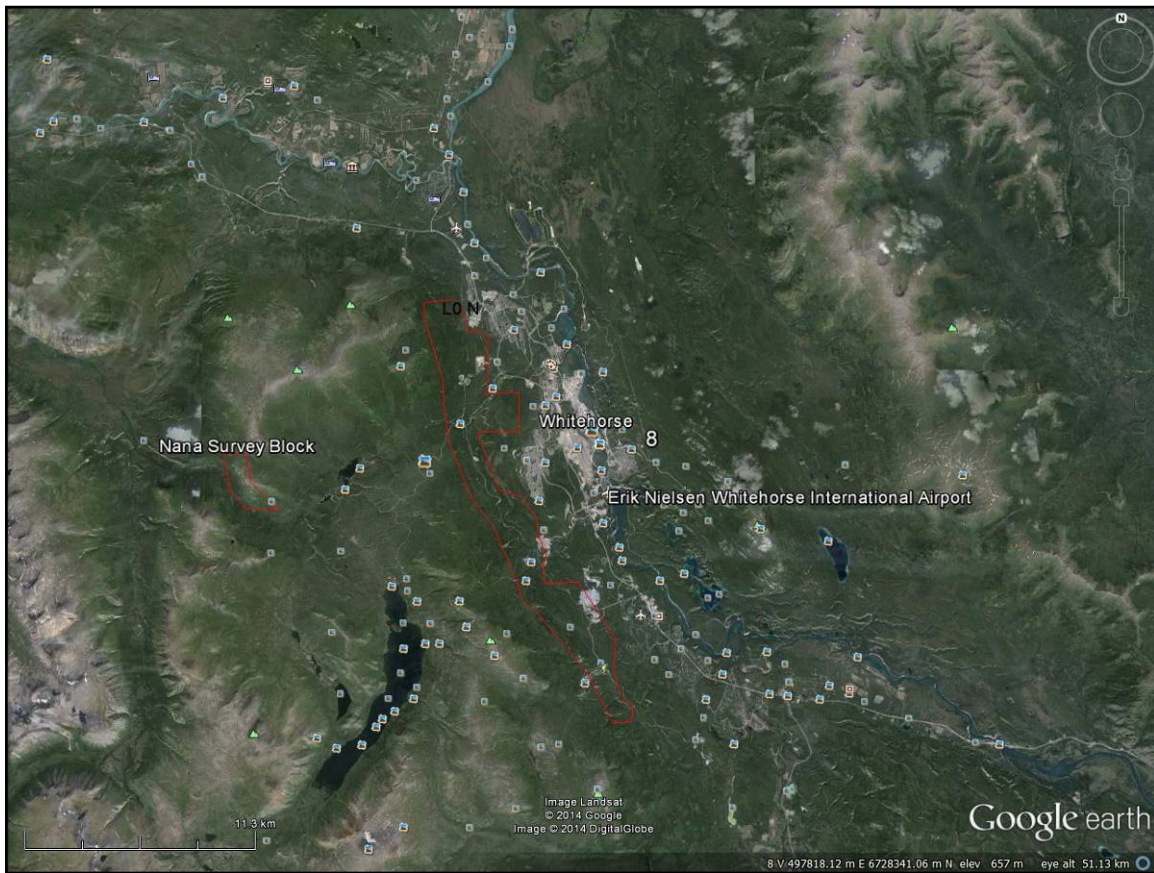


Figure 10: Map showing Whitehorse international airport; base of operation.

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.

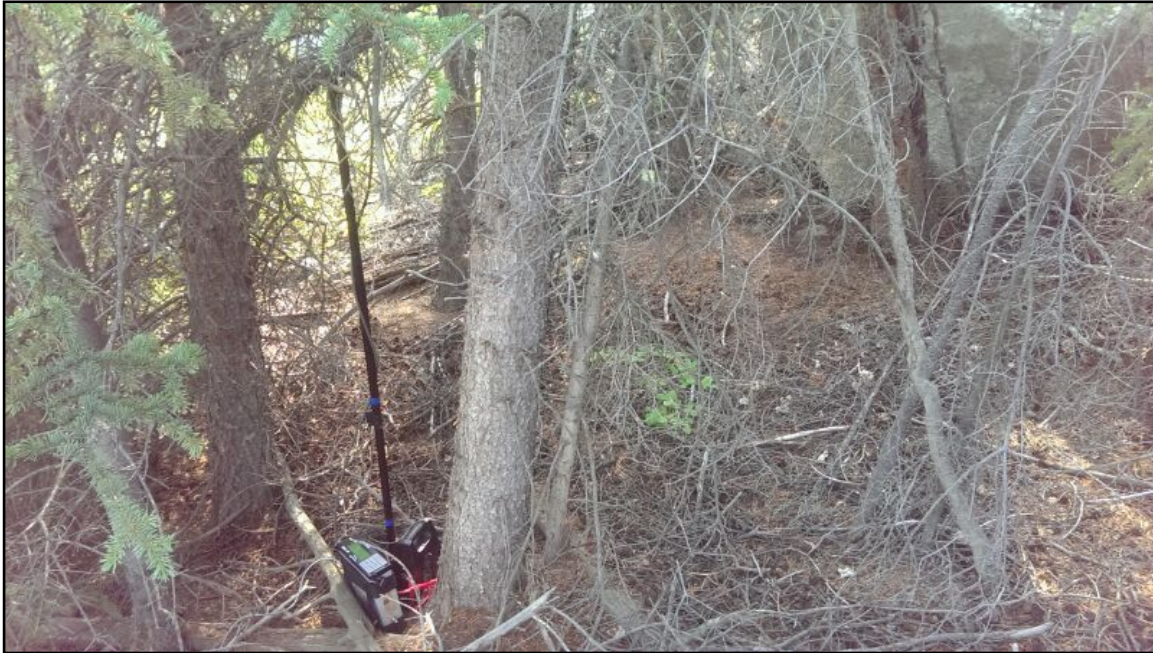


Figure 12: GEM 4 magnetic base station location.

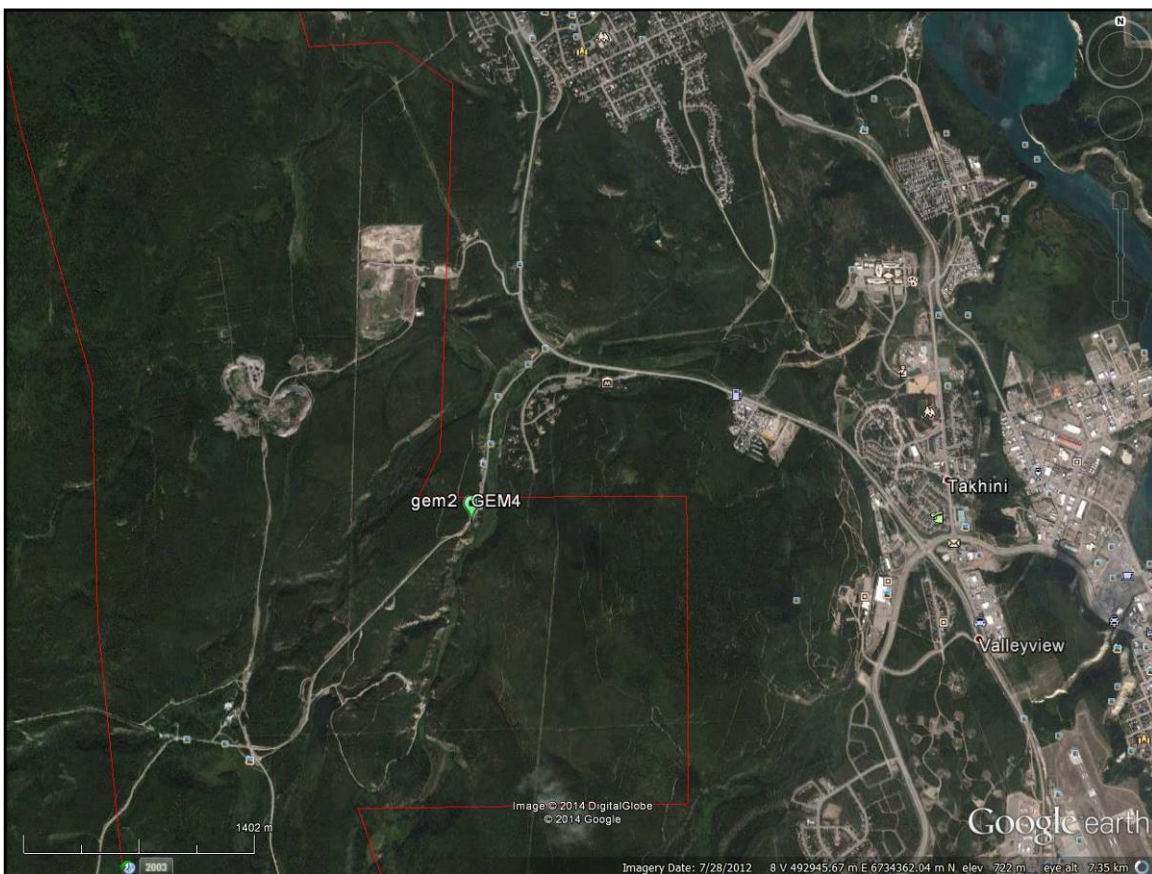


Figure 13: GEM 2 and GEM 4 magnetic base station locations along Fish Lake road.

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 4 th 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.

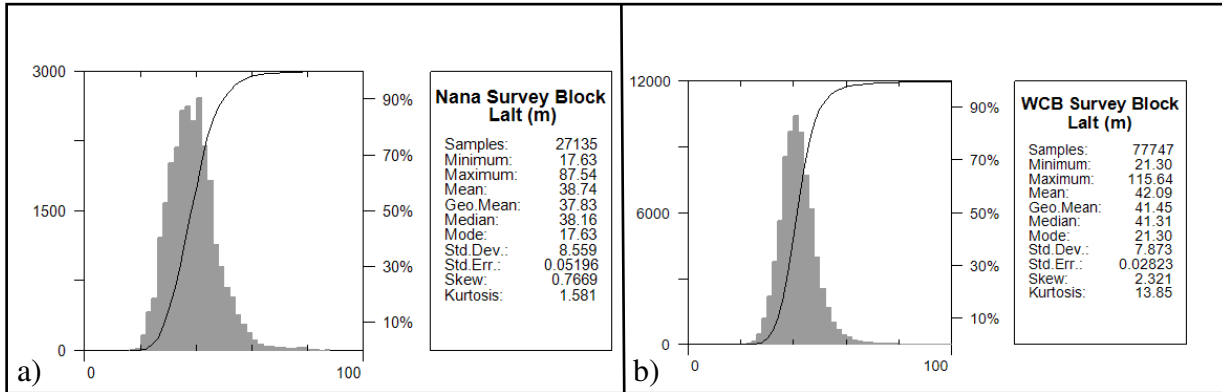


Figure 14: Histogram showing survey elevation vertically above ground. a) Nana survey block. b) WCB survey block.

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.

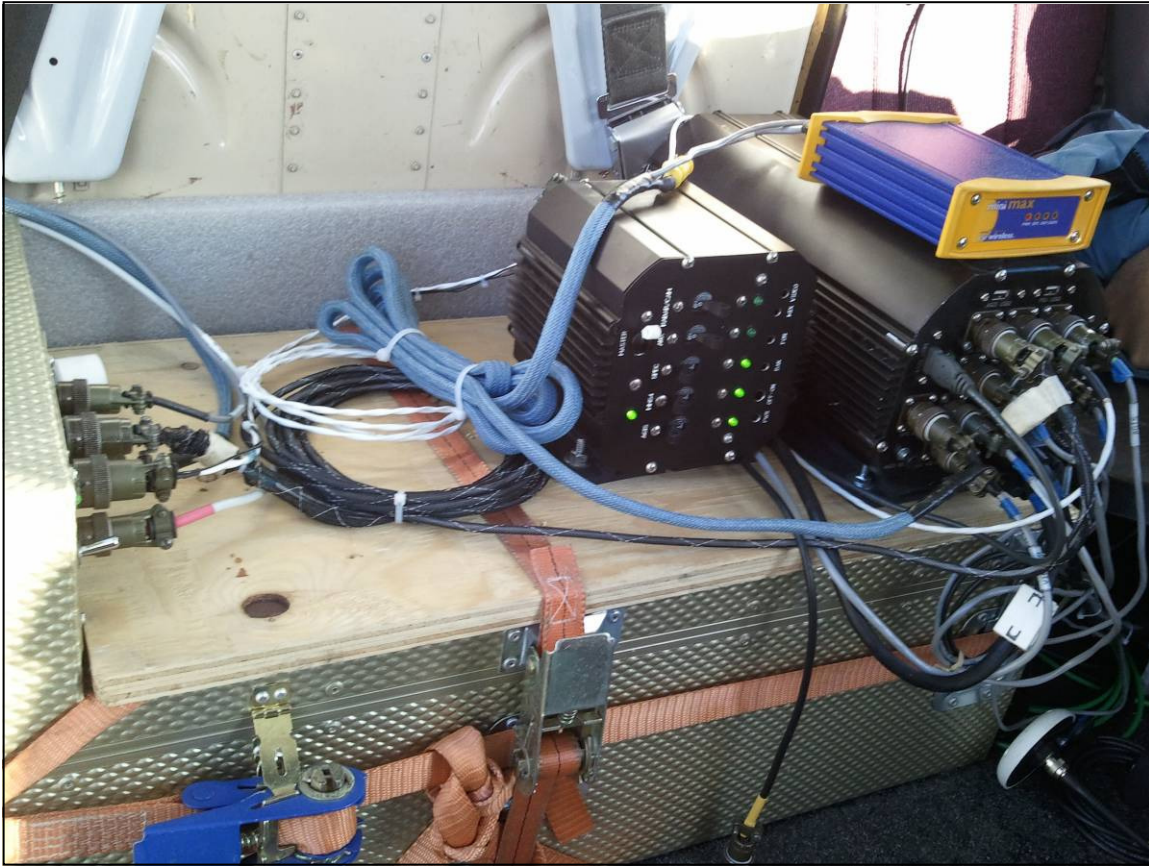


Figure 18: IRIS strapped in the back seat of the Eurocopter AS350.

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 $1 \times 1 \text{ m}^2$ diffuse target with 50% ($\pm 20\%$) 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.

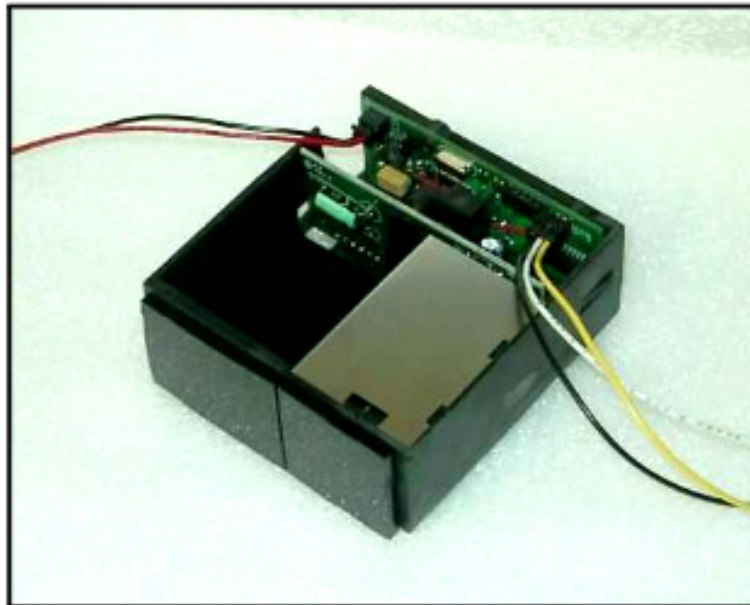


Figure 20: Opti-Logic RS800 laser altimeter.

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.

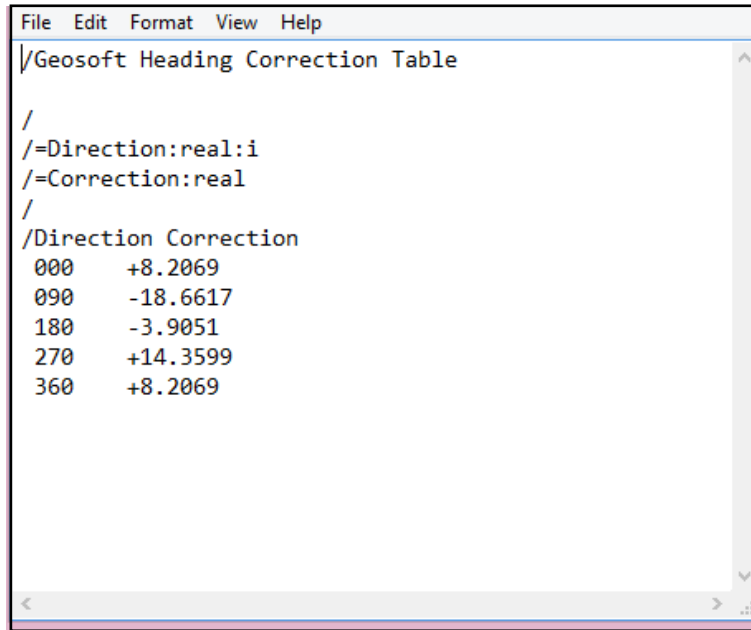
The test was flown in the four orthogonal headings over an identifiable magnetic anomaly (ie. Truck, Trailer, etc.) at survey speed and height. A lag of 10 fiducials (1.0 seconds) was determined from the lag test.

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.



The screenshot shows a window titled 'Geosoft Heading Correction Table'. The table contains the following data:

/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:

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

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 $\mu\text{R/h}$

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	2.5 μ V for 6dB SNR @ 200 bps
	Dynamic Range	100dB
	Frequency Offset	± 8 Hz (~ 27 ppm)
	Adjacent Channel Rejection	61 dB $\pm$ 1dB @ fo $\pm$ 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, 10k Ω , 10pF load)
Environmental	Operating Temperature	-32 $^{\circ}$ C to +74 $^{\circ}$ C
	Storage Temperature	-40 $^{\circ}$ C to +85 $^{\circ}$ 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 Range	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 $\sqrt{\text{Hz}}$ 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 50 μ T peak
Internal Noise: Basic version Standard version Low Noise version	>10 to 20pTrms/ $\sqrt{\text{Hz}}$ at 1Hz 6 to $\leq$ 10pTrms/ $\sqrt{\text{Hz}}$ at 1Hz <6pTrms/ $\sqrt{\text{Hz}}$ at 1Hz
Scaling error (DC)	< $\pm$ 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, $\pm$ 5% maximum at 1kHz
Input voltage	$\pm$ 12V to $\pm$ 17V
Supply current	+30mA, -10mA (+1.4mA per 100 μ T for each axis)
Power supply rejection ratio	5 μ V/V (-106dB)
Analog output	$\pm$ 10V ($\pm$ 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 (Tl) synthetic downward looking crystals and 4.2 litres of NaI (Tl) 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: WCB survey block, WGS 84 Datum, Zone 8N

FILE NAME	DESCRIPTION
WCB_DTM_50m.grd	WCB survey block digital terrain model gridded at 50 m cell size
WCB_TMI_50m.grd	WCB survey block total magnetic intensity gridded at 50 m cell size
WCB_RMI_50m.grd	WCB survey block residual magnetic intensity gridded at 50 m cell size
WCB_CVG_50m.grd	WCB survey block calculated vertical gradient of TMI gridded at 50 m cell size
WCB_Kcor_50m.grd	WCB survey block potassium (Kcor) percentage gridded at 50 m cell size
WCB_Thcor_50m.grd	WCB survey block Thorium (Thcor) equivalent concentration gridded at 50 m cell size
WCB_Ucor_50m.grd	WCB survey block Uranium (Ucor) equivalent concentration gridded at 50 m cell size
WCB_TCcor_50m.grd	WCB survey block Total Count (TCcor) equivalent dose rate gridded at 50 m cell size
WCB_TCexp_50m.grd	WCB survey block Total Count (TCexp) exposure rate gridded at 50 m cell size
WCB_ThKratio_50m.grd	WCB survey block thorium over potassium ratio (eTh/%K) gridded at 50 m cell size
WCB_UKratio_50m.grd	WCB survey block uranium over potassium ratio (eU/%K) gridded at 50 m cell size
WCB_UTHratio_50m.grd	WCB survey block uranium over thorium ratio (eU/eTh) gridded at 50 m cell size

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)

Appendix D

Whitehorse Copper Belt (WCB) Survey Block Maps

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

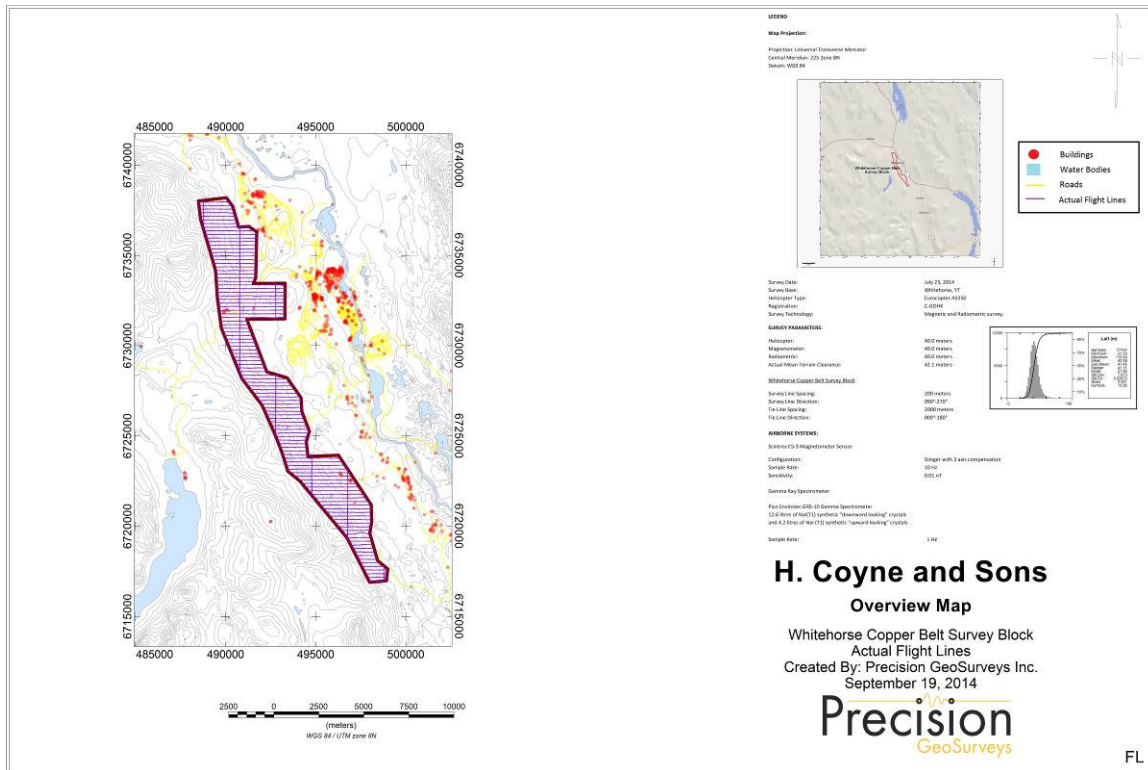
- Flight Lines (FL)
- Digital Terrain Model (DTM)

Magnetic Maps (colour image with elevation contour lines):

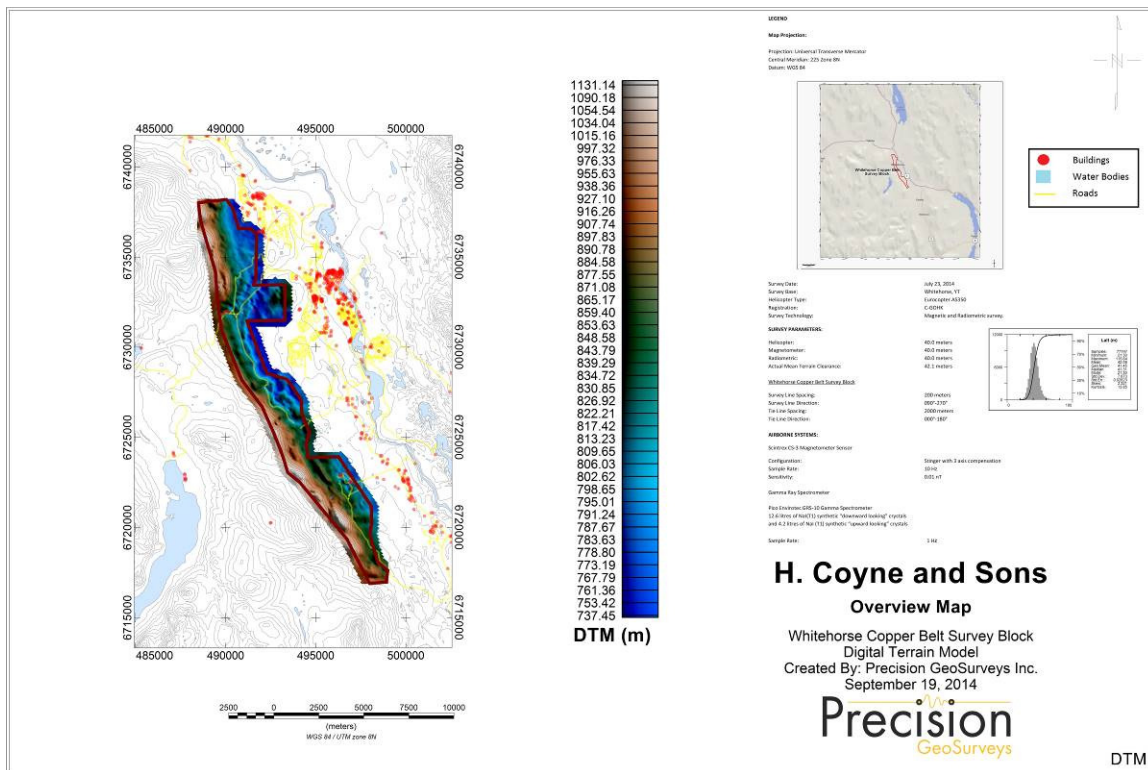
- Total Magnetic Intensity (TMI)
- Total Magnetic Intensity (TMI_wFL) with flight lines
- Residual Magnetic Intensity (RMI)
- Calculated Vertical Gradient (CVG) of TMI

Radiometric Maps (colour image with elevation contour lines):

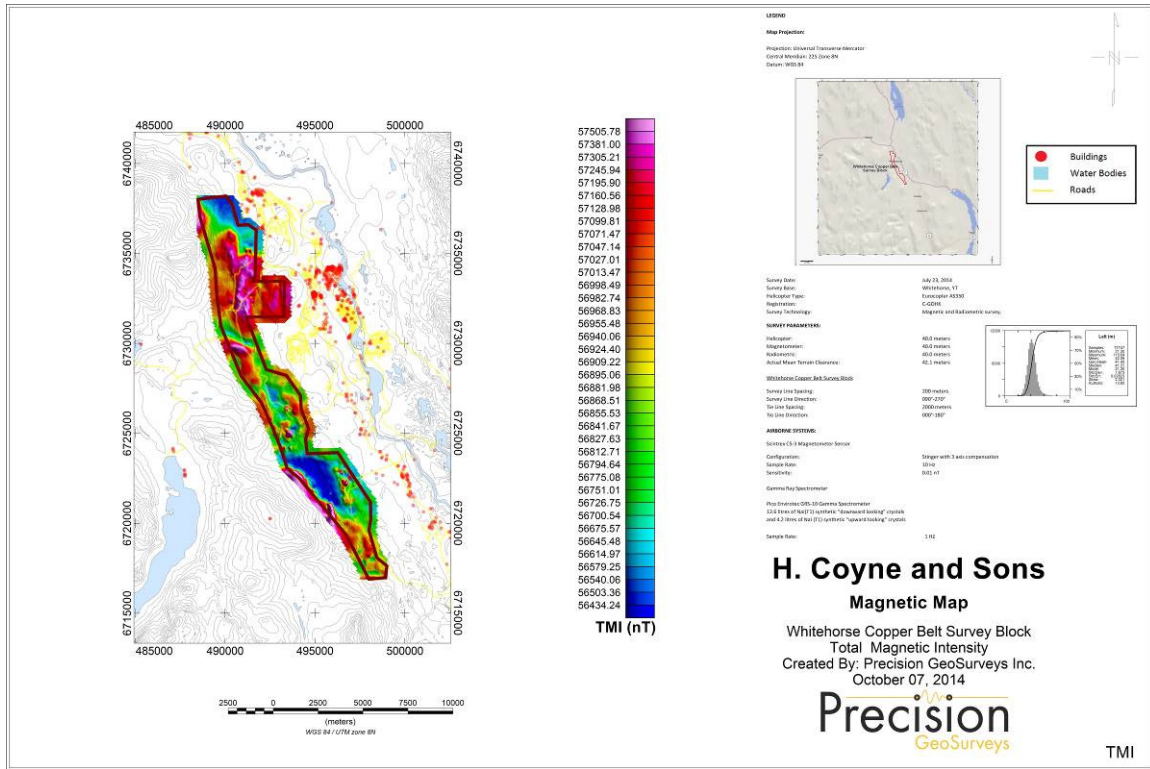
- Potassium – Equivalent Concentration (%K)
- Thorium – Equivalent Concentration (eTh)
- Uranium – Equivalent Concentration (eU)
- Total Count –Equivalent Dose Rate (TCcor)
- Total Count – Exposure Rate (TCexp)
- Thorium over Potassium Ratio - Spectrometer - eTh/%K ratio
- Uranium over Potassium Ratio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



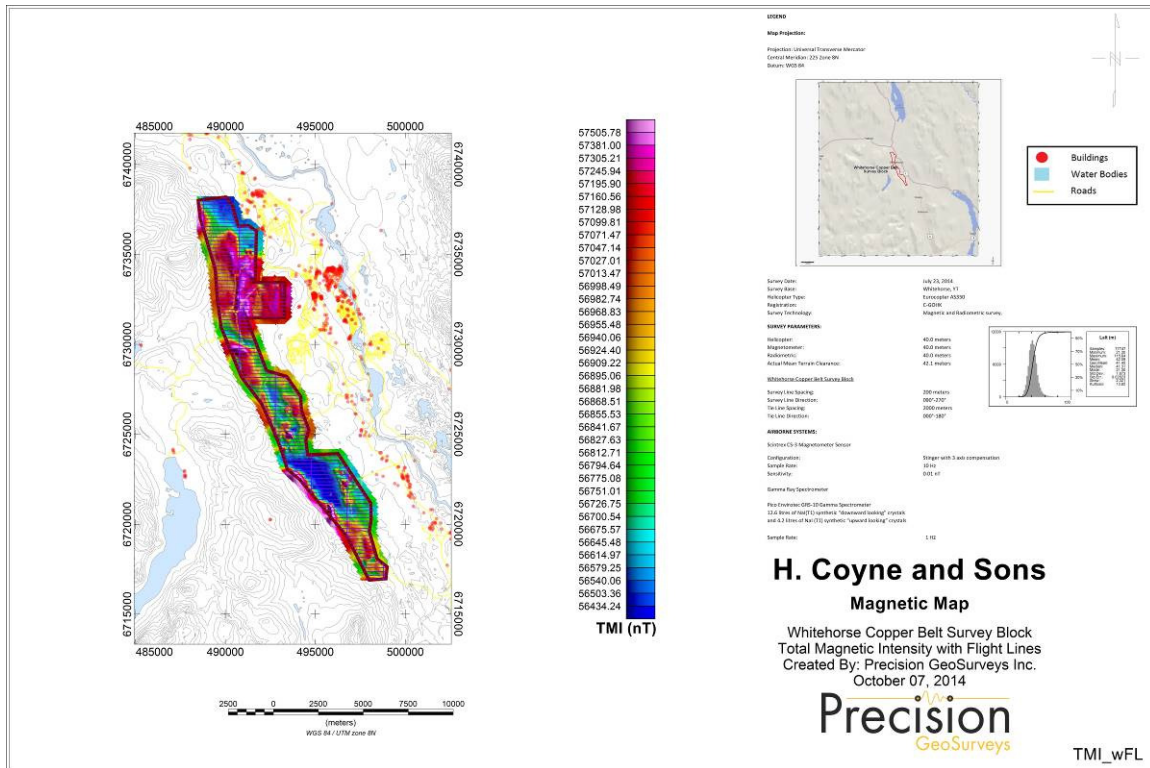
Map 16: WCB survey block actual flight lines.



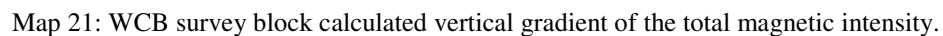
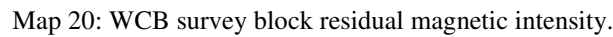
Map 17: WCB survey block digital terrain model.

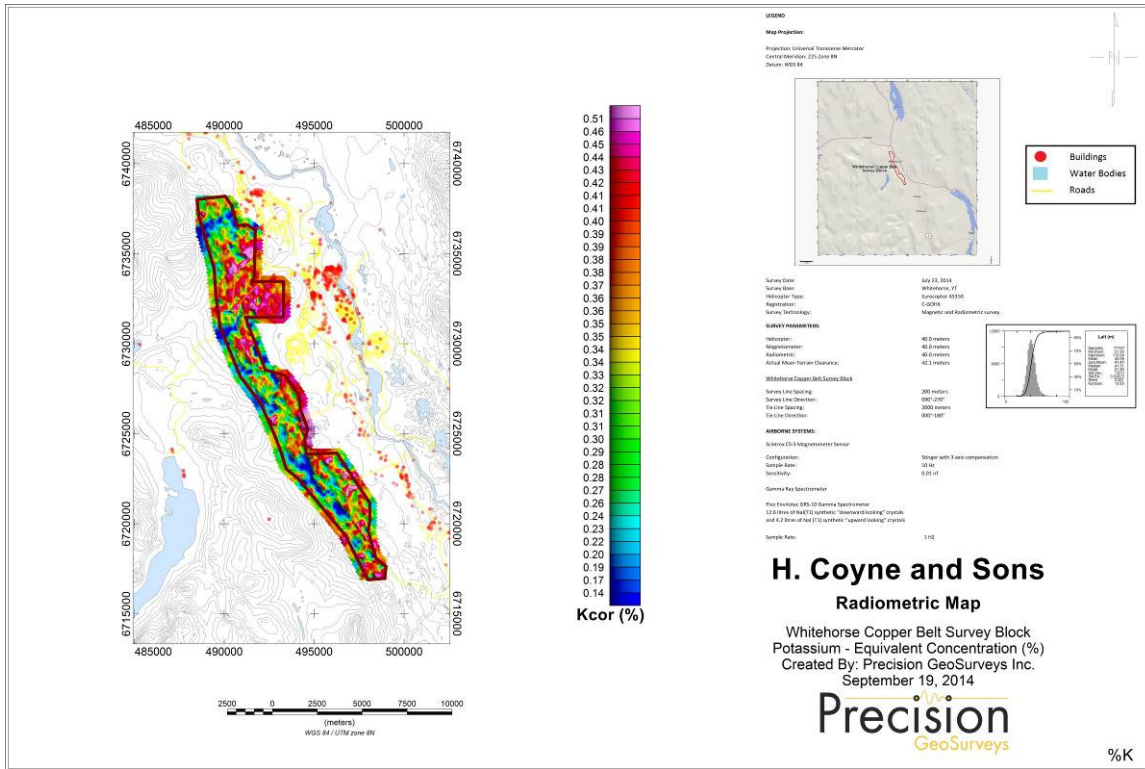


Map 18: WCB survey block total magnetic intensity.

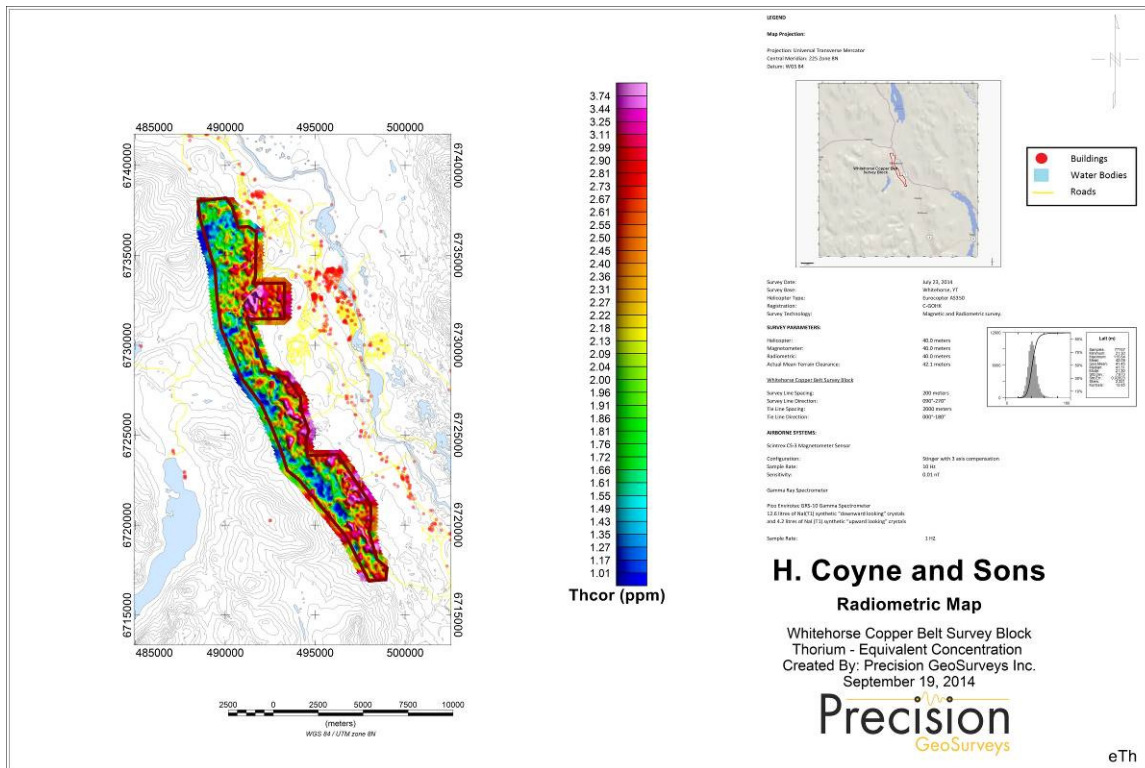


Map 19: WCB survey block total magnetic intensity with plotted actual flight lines.

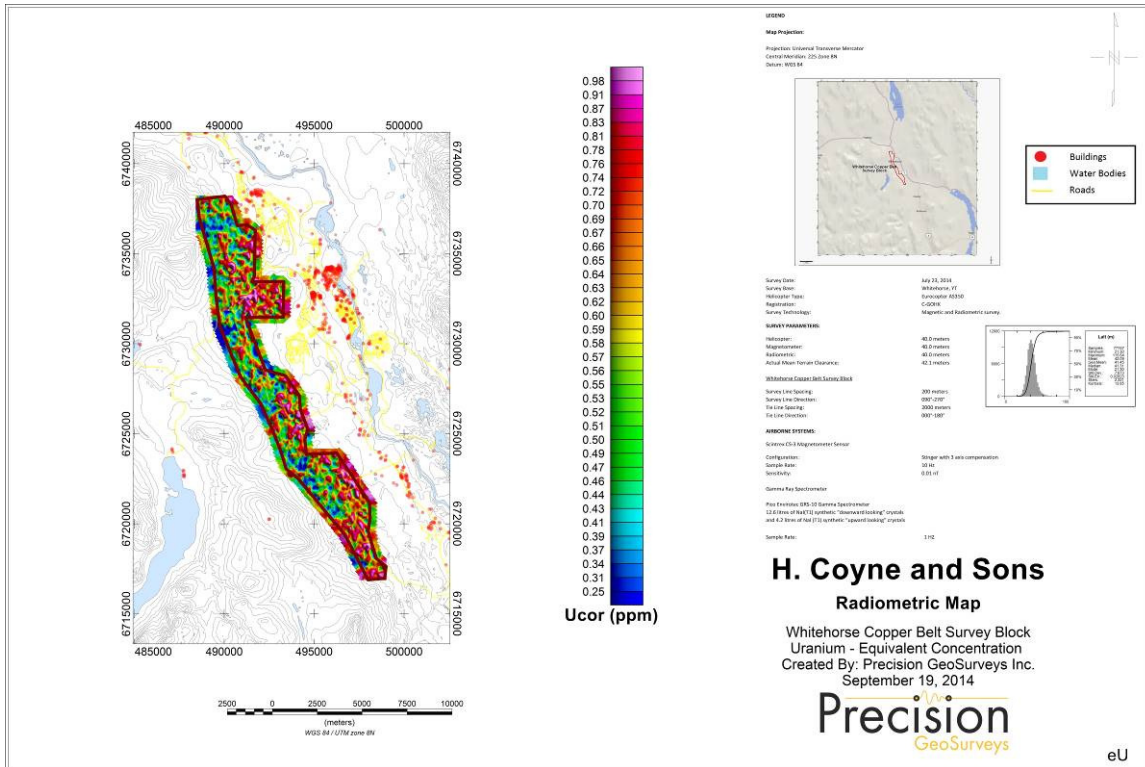




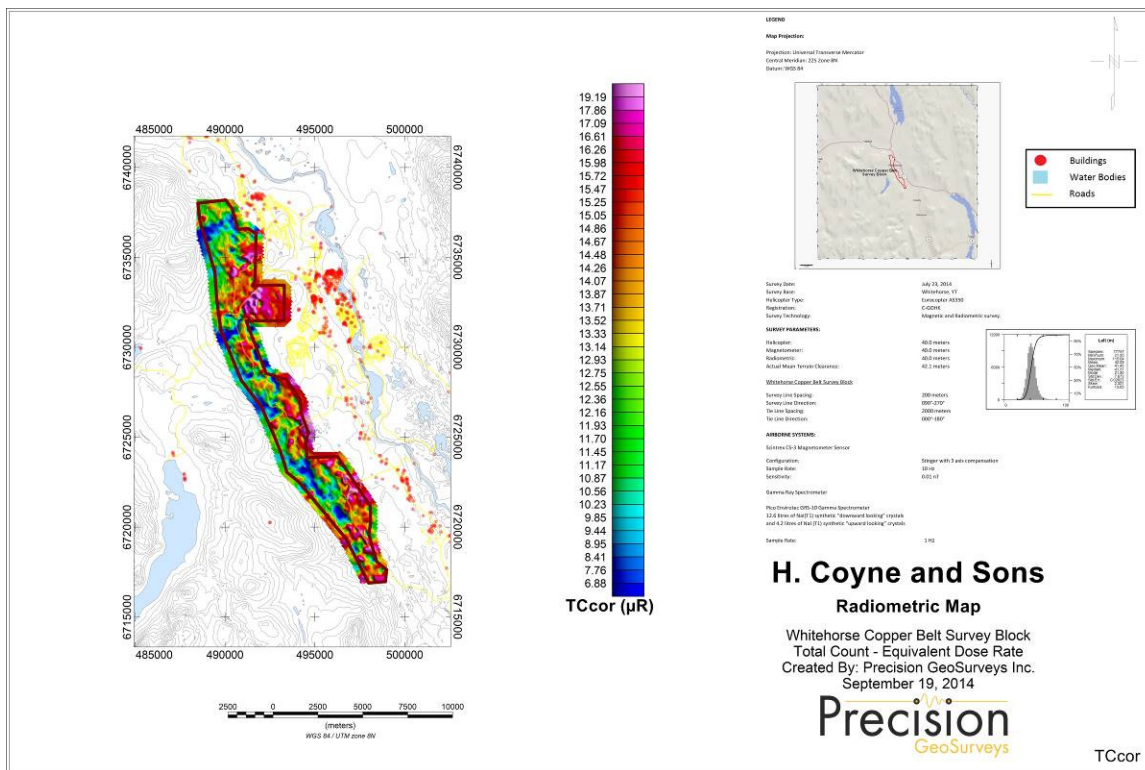
Map 22: WCB survey block potassium – (percentage) equivalent concentration.



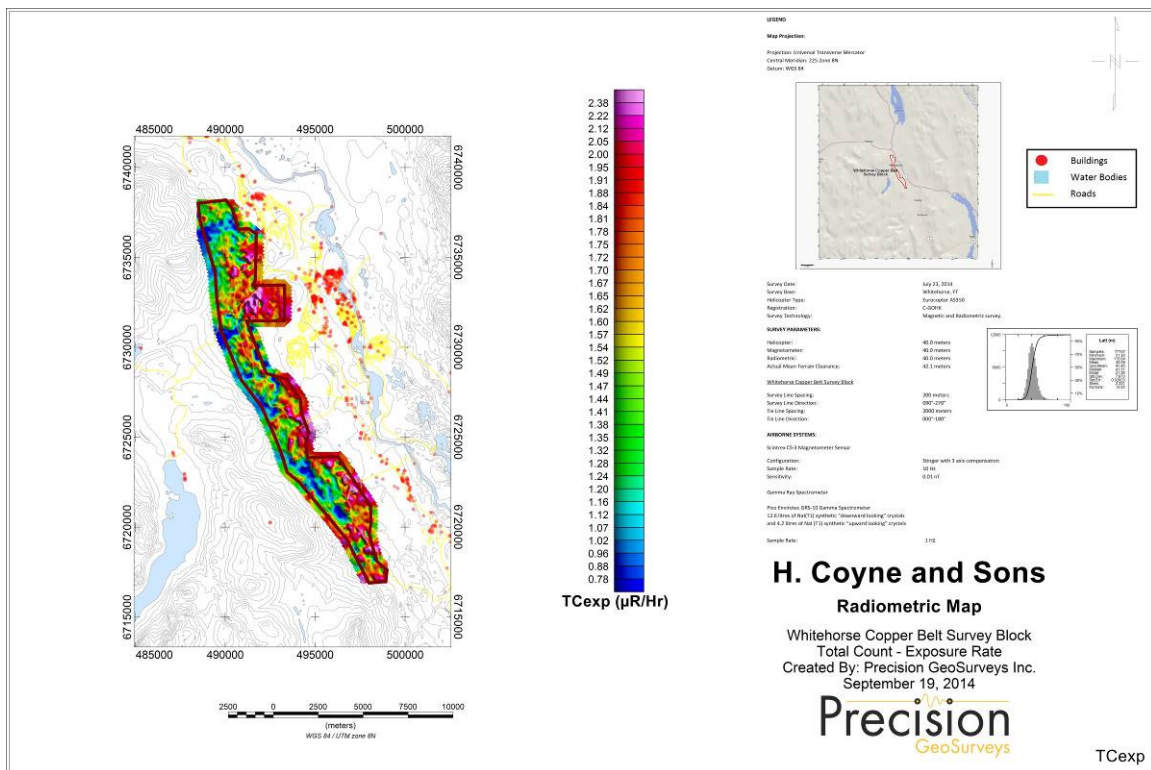
Map 23: WCB survey block thorium – equivalent concentration.



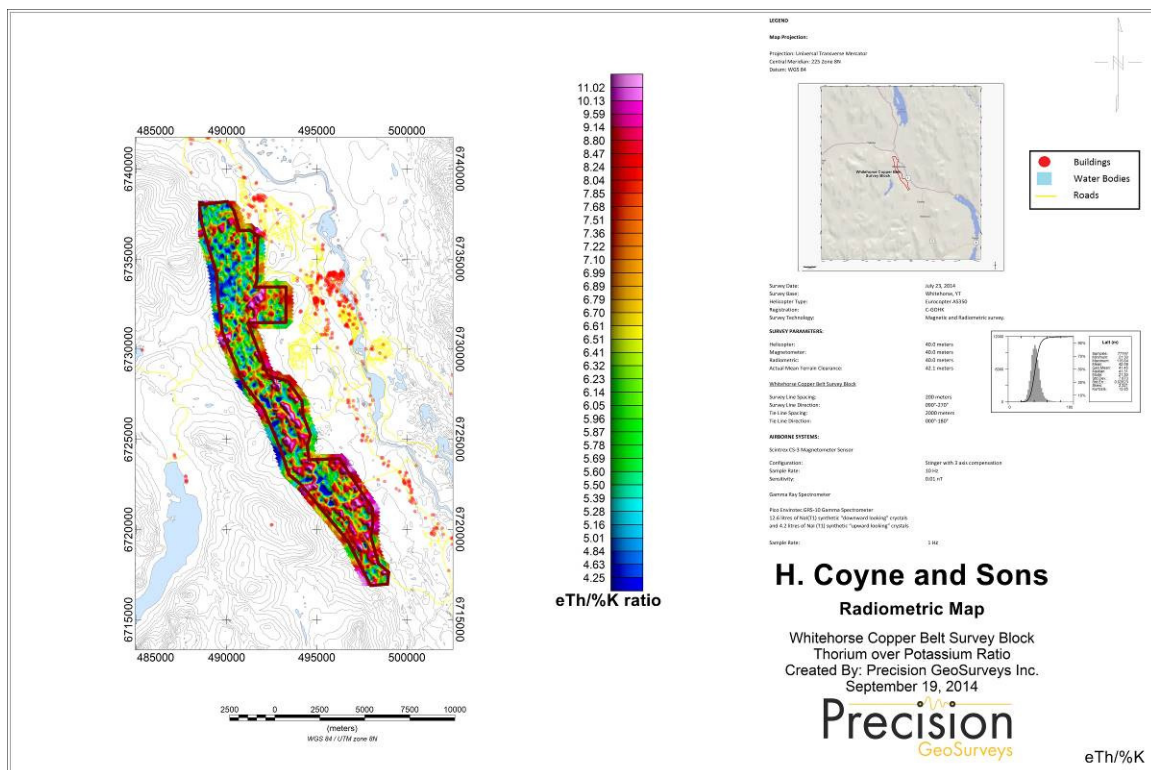
Map 24: WCB survey block uranium – equivalent concentration.



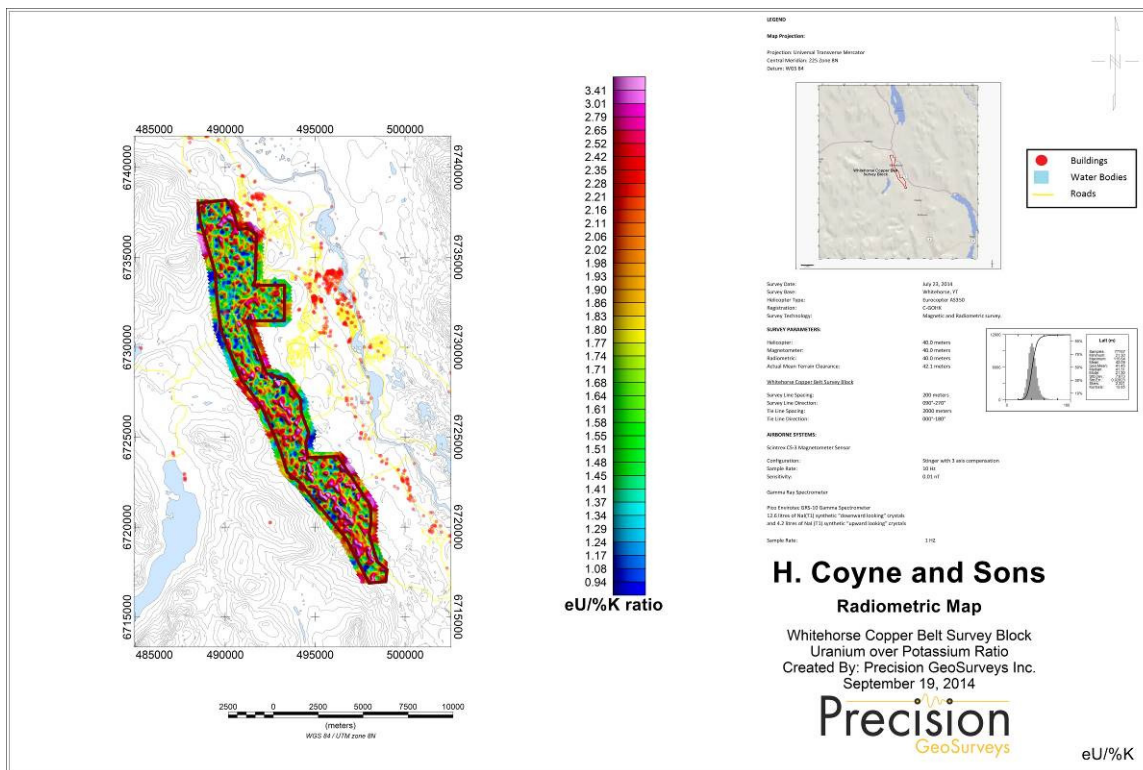
Map 25: WCB survey block total count – equivalent dose rate.



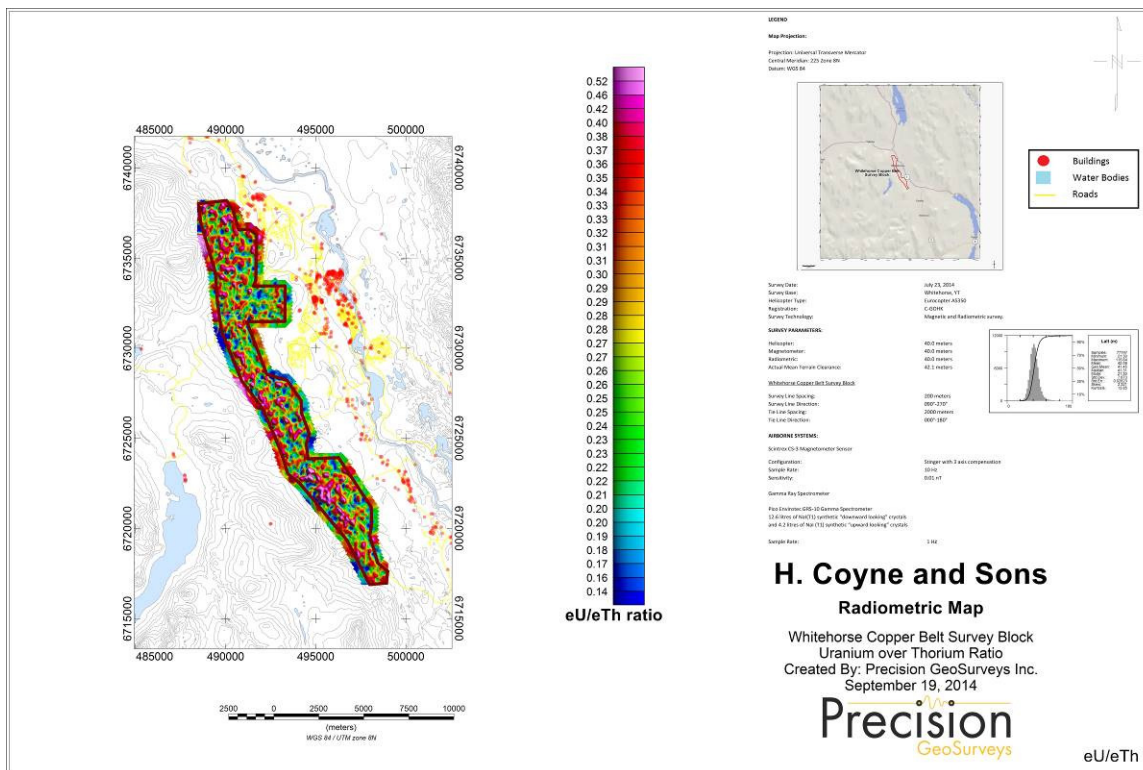
Map 26: WCB survey block total count –exposure rate.



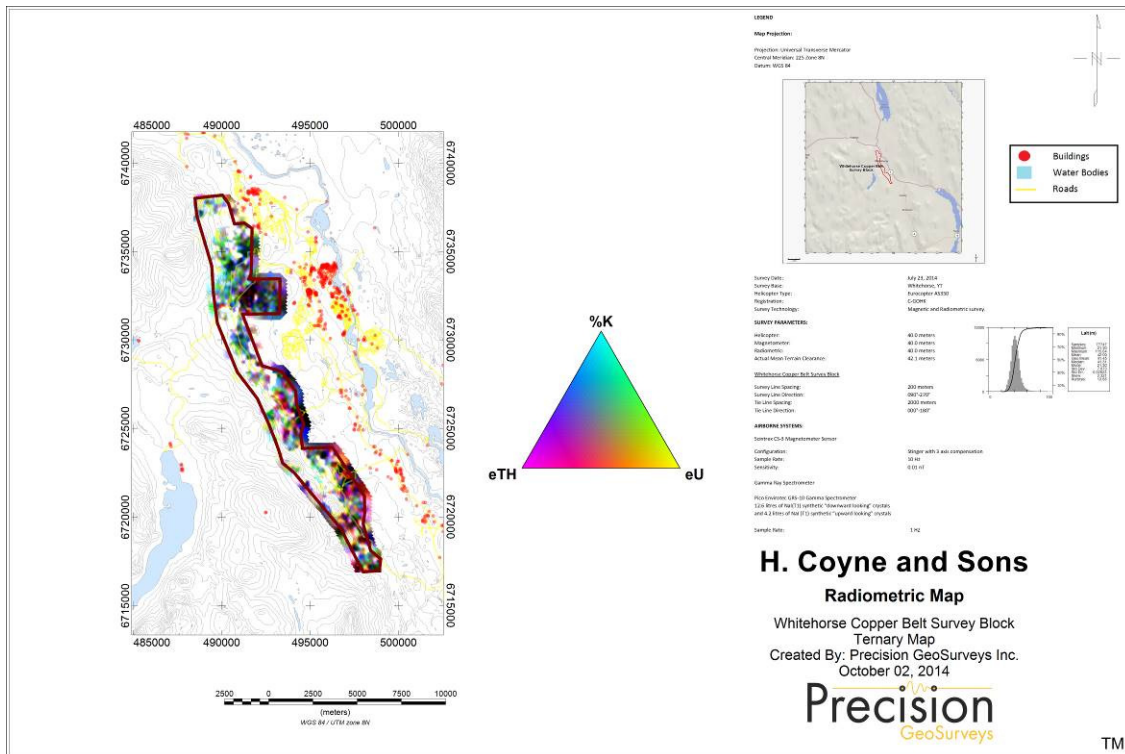
Map 27: WCB survey block thorium over potassium ratio.



Map 28: WCB survey block uranium over potassium ratio.



Map 29: WCB survey block uranium over thorium ratio.



Map 30: WCB survey block ternary map.