AN ASSESSMENT REPORT

ON

HELIBORNE MAGNETIC & RADIOMETRIC SURVEYING

Kemess Area, British Columbia
56°45'N, 126°20'W
NTS 94C/05 & 12, 94D/08 & 09
94A/15, 94H/02

Claims Surveyed:

512344,513659,660,514418-421,958-962,525275,526106,107,210-212,532625,627,628,
630,633,637,556753-766,986,989,991-993

Survey Dates: **October 10th 30th, Dec 14th-20th, 2007**
February 20th – March 6th, 2008

FOR

SERENGETI RESOURCES INC.

Vancouver, B.C.

BY

PETER E. WALCOTT & ASSOCIATES LIMITED

Vancouver, British Columbia

JUNE 2008

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INTRODUCTION.

Between October 10th and 30th, 2007, Geo Data Solution Inc. - GDS - carried out heliborne and radiometric surveying over the Croy Bloom and Kem properties of Serengeti Resources Inc., located some 40 kilometres south southeast of the Kemess porphyry gold-copper mine, British Columbia.

The surveys were flown at a nominal helicopter terrain clearance of 50 metres using a total field magnetic sensor housed in a stinger mounted under the belly of the helicopter and a RSX-5 gamma ray spectrometer bolted on to the inside of the chopper. On these grid the flight lines were spaced 250 metres apart and flown at an azimuth of 45 degrees, with tie lines flown in an orthogonal direction at a spacing of 1000 metres, on the two most southern grids, while the northern block was flown east-west to reflect an apparent change in rock formation strike direction.

The flight blocks, and their respective line directions were laid out by Peter E. Walcott & Associates Limited, who planned, supervised and QC'd the survey.

The survey was part of a three property survey - planned coverage 2322 line kilometers - started on October 10th but shut down due to snow and fog on October 30th with only 59% completed.

The crew mobilized to Kemess on December 14th to give it another try but left on December 22nd with no production.

The crew remobilized on February 20th, 2008 and completed the survey undertaking only magnetics by March 6th after a further week of weather delay – radiometrics meaningless due to snow cover.

An OmniStar Real Time differential GPS navigation system was employed to ensure accurate positioning of the geophysical data with respect to the topographic base maps.

The information from the respective geophysical sensors was used to produce maps of that displayed the magnetic and radiometric properties of the survey area. These are included in the report at a scale of 1:20,000.

PROPERTY, LOCATION & ACCESS.

The Croy Bloom property consists of the following claims:

Tenure #	Claim Name	Hectares	Expiry Date
512344	BLOOM 5	446.354	10-May-10
512346	BLOOM 6	124.974	10-May-10
512350	BLOOM 7	321.886	10-May-10
513659	BLOOM 8	446.128	31-May-10
513660	BLOOM 9	196.317	31-May-10
514417		107.195	14-Oct-10
514418		357.408	20-Apr-11
514420		250.111	14-Oct-10
514421		357.403	20-Apr-11
514953		178.754	23-Mar-11
514954		589.464	23-Mar-11
514955		482.295	23-Mar-11
514956		536.237	23-Mar-11
514958		464.896	23-Mar-10
514959		644.017	23-Mar-10
514960		464.334	23-Mar-11
514961		589.232	23-Mar-11
514962		660.520	23-Mar-11
516035		518.377	23-Mar-11
522168	DC 1	125.205	10-Nov-10
525275	BLOOM 10	446.999	31-Mar-10
526106	BLOOM 11	447.045	31-Mar-10
526107	BLOOM 12	35.774	31-Mar-10
528210		446.528	31-Mar-10
528211		446.735	31-Mar-10
528212		143.020	31-Mar-10
529981		160.815	15-Sep-10
530022		125.053	15-Sep-10
530142		89.296	15-Sep-10
532625		447.278	19-Apr-10
532627		447.408	19-Apr-10
532628		447.527	19-Apr-10
532630		447.632	19-Apr-10
532633		447.744	19-Apr-10
532637		71.659	19-Apr-10

PROPERTY, LOCATION & ACCESS cont'd

Th Kem property consists of the following claims:

Tenure #	Claim Name	Hectares	Expiry Date
556753	KEM 1	441.772	20-Apr-11
556754	KEM 2	441.768	20-Apr-11
556755	KEM 3	247.400	20-Apr-11
556756	KEM 4	441.480	20-Apr-11
556757	KEM 5	441.559	20-Apr-11
556758	KEM 6	441.554	20-Apr-11
556759	KEM 7	441.313	20-Apr-11
556760	KEM 8	441.309	20-Apr-11
556761	KEM 9	352.885	20-Apr-11
556762	KEM 10	441.065	20-Apr-11
556763	KEM 11	441.070	20-Apr-11
556764	KEM 12	423.116	20-Apr-11
556765	KEM 13	440.821	20-Apr-11
556766	KEM 14	352.663	20-Apr-11
556986	KEM 15	440.606	21-Apr-11
556988	KEM 16	440.412	21-Apr-11
556989	KEM 17	440.199	21-Apr-11
556991	KEM 18	422.329	21-Apr-11
556992	KEM 19	440.512	21-Apr-11
556993	KEM 20	52.882	21-Apr-11

The properties are situated in the Omineca Mining Division of British Columbia, the Kem some 15 kilometres east southeast and the Croy Bloom some 85 kilometres southeast of the Kemess Mine respectively.

Access is obtained by chopper from the Kemess Mine where the crew were housed for the duration of the survey.

PREVIOUS WORK

In the late thirties the predecessor of Cominco explored the copper-gold quartz veins on Croydon Creek with underground drifting, and identified a 100 metre long vein running some 3% copper and 10 g/t gold.

Further exploration took place in the 50's and 60's with work by the above, Noranda, Bralorne, Canex & Rio Tinto.

The molybdenum potential of the Davie Creek stock was first recognized by Rio Tinti in 1964. Drilling from 1979 to 1982 by Teck Exploration and Chevron, followed by Teck and Getty intersected widespread low grade Mo mineralization.

In 1990 Teck carried out a large programme of geological mapping, soil and rock sampling and some 90 kilometres of induced polarization surveying, followed by limited drilling.

In 2004- 005 Serengeti did limited rock and soil sampling to check the previously reported geochemical results, followed by some 9 kilometres of induced polarization surveying, some of which was an extension of the Teck coverage.

For more detailed information the reader is referred to reports authored and/or held by Serengeti and to the BC Ministry of Energy, Mines and Petroleum ARIS archive.

GEOLOGY.

The properties are located within the Quesnel Trough – Quesnel Terrane –, a Mesozoic island arc terrane juxtaposed against the ancestral North American continental margin.

Here the Quesnel Trough is bounded on the west by rocks of the Stikine Terrane across the Ingenika Fault System, and to the east across the Swannell Fault by the Cassiar Terrane, Upper Proterozoic rocks of the Ingenika Group.

In this area it comprises a volcanic and sedimentary package of Middle Triassic to Lower Jurrassic Takla Group, and a poorly defined sedimentary and volcanic suite belonging to the Pennsylvanian to Permian Lay Range assemblage.

On the Croy Bloom the Takla Group andesites hve been intruded by fine grained diorite plugs/sills and pyroxenites. In the Bloom cirque the rocks show moderate propylitization and widespread malachite and chalcopyrite mineralization over some 1800 by 1600 metres in area coincident with a strong copper/gold soil anomaly.

For further information the reader is referred to the many assessment reports found in the B.C. Ministry of Mines, Energy and Petroleum Resources ARIS archive and to reports written and/or held by Serengeti Resources.

PURPOSE.

The purpose of the survey as to (a) better define and further highlight potential intrusive bodies, indicated by magnetic highs on previously flown government regional airborne surveys, with the use of heliborne magnetics, and (b) to map the alteration with the aid of radiometrics, all in the search for copper-gold mineralization – alkalic porphyry copper-gold mineralization is known to occur in the margins of magnetic highs in association with iron-oxides enriched intrusions.

SURVEY SPECIFICATIONS.

The magnetic survey was carried out using an optically pumped cesium vapour magnetometer manufactured by Geometrics of San Jose, California. This instrument was mounted in a stinger - boom - attached to the belly of the helicopter. Corrections for the diurnal were made by comparison with a GSM-19 Overhauser magnetometer base station manufactured by GEM Systems of Metropolitan Toronto, Ontario.

The radiometric survey was carried out using a Radiation Solutions RSX-5 spectrometer – 256 channel spectrometer – mounted on the floor of the helicopter. Its downward-looking crystal size is 16 litres, while its upward-looking one is 4 litres. It records at a rate of 1 Hz. And furnishes total, potassium, uranium and thorium counts.

Navigation and flight path recovery were obtained using a real time differentially corrected OmniStar System.

As mentioned previously the survey was discontinued due to inclement weather and heavy snowfall in late October 2007, and completed in early March 2008.

Thus 562 line kilometres of magnetics and 208 line kilometers of radiometrics were flown on the Kem property, while 518 kilometres of magnetics were completed over the Croy Bloom.

DISCUSSION OF RESULTS.

Croy Bloom. The results of the magnetic survey are dominated by a large northwesterly trending magnetic high whose causative source(s) would appear to be the complex intrusions of the Hogem Batholith. Within this a similarly striking linear feature can be seen presumably reflecting a mafic dyke. This feature is more apparent on the plot of the calculated vertical gradient. A similar feature can be seen along the western extremity of the more northerly coverage.

Of more interest are the two circular-like highs in the southern portion of the coverage.

Kem. The southern block is dominated by a northly trending dyke-like feature cutting across the middle of the block, and flanked to the west by broader areas of higher magnetic relief. Again as above this feature is more clearly defined on the plot of the vertical gradient.

The linear features from the eastern side of the area of higher magnetics, as seen on the first derivative plot, pinch out to the north as can be seen from the magnetic coverage of the northern block.

On this latter plot several northwesterly trending highs are clearly discernible.

The radiometric survey, which was only completed on the southern block before poor weather caused suspension of the survey, would appear to exhibit somewhat suspect results based on the pattern within the large circular-like high on the west, seen on all channels, that could be attributable to elevation and snow cover.

Two areas of higher K/Th ratio can be seen near the eastern edge of the survey area with the more southerly on the flank of an isolated oblate magnetic feature.

SUMMARY, CONCLUSIONS & RECOMMENDATIONS.

Between October 10th and 30th , December 13th and 20th, 2007 and February 20th to March 6th, 2008 at the request of Serengeti Resources, Geo Data Solutions Inc. undertook heliborne magnetic and partial radiometric surveying over the Crow Bloom and Kem Properties, located in the north eastern part of the Quesnel Trough, some 85 and 15 kilometres southeast of the Kemess Mine respectively.

Due to inclement weather, normally expected at that time of year, the survey was a long time in completion data undergoing two postponements and the discontinuing of the radiometric portion.

The magnetic survey located a number of magnetic highs on both properties generally indicative of intrusions in this area.

The radiometric survey on the Kem appeared to indicate the presence of two interesting potassium high thorium low features in the southern section on the margins of possible intrusives – suggested by the magnetics- indicative of potassic alteration.

As previously flown EM and magnetic coverage is available for the northwestern portion of the Croy Bloom holdings this data should be merged with the current set for more comprehensive maps of the property. It should then be studied with the results of other existing work on the property in order to plan the direction of further work.

In the case of the Kem property the results should be studied with the other limited data available in an effort to define areas for follow-up prospecting.

Respectfully submitted,

PETER E. WALCOTT & ASSOCIATES LTD.

Peter E. Walcott, P.Eng.
Geophysicist

Vancouver, B.C.
June 2008

APPENDIX I

COST OF SURVEY.

GDS undertook the surveys on a kilometer basis - $69.00 per line kilometer for magnetics and radiometrics, and $59.00 per line kilometer for magnetics only.

Mobilization and standby charges ($5000.00 per day) were extra so that the total cost of services provided by GDS was $156,800.00. This was proportioned $74,208.29 to Croy Bloom and $82,591.71 to Kem on a kilometer basis.

Peter E. Walcott & Associates Limited laid out and supervised the survey with a proportional cost of $10,200.00, proportioned $5,000.00 to Croy Bloom and $5,200.00 to Kem.

After a 10% administrative fee was added by Serengeti the total cost for filing on the Croy Bloom was $87,218.11 and for Kem $96,481.90.

PERSONNEL EMPLOYED ON SURVEY.

Name	Occupation	Address	Dates
Peter E. Walcott	Geophysicist	Peter E. Walcott & Assoc. 608- 1540 W. 2nd Ave., Vancouver, B.C. V6J 1H2	May, 14th – 16th, 07,Sep 28th - Oct. 30th , 07 Mar. 1st - 6th, 08 June18th-27th,08
A.Walcott	"	"	May 14th - 16th Nov 10th –11th, 07 Mar. 11th, 2008 June 26th, 2008
Geodata Solutions	Listed in their reports		Oct. 15th – 31st. 2007 Dec 14th -20th, 2007 Feb. 20th – Mar 6th, 2008 April 2nd- 12th, 08

CERTIFICATION.

I, Peter E. Walcott, of 605 Rutland Court, Coquitlam, British Columbia, hereby certify that:

1. I am graduate of the University of Toronto in 1962 with a B.A.Sc. in Engineering Physics, Geophysics Option.

2. I have been practicing my profession for the last forty five years.

3. I am a member of the Association of Professional Engineers of British Columbia and Ontario.

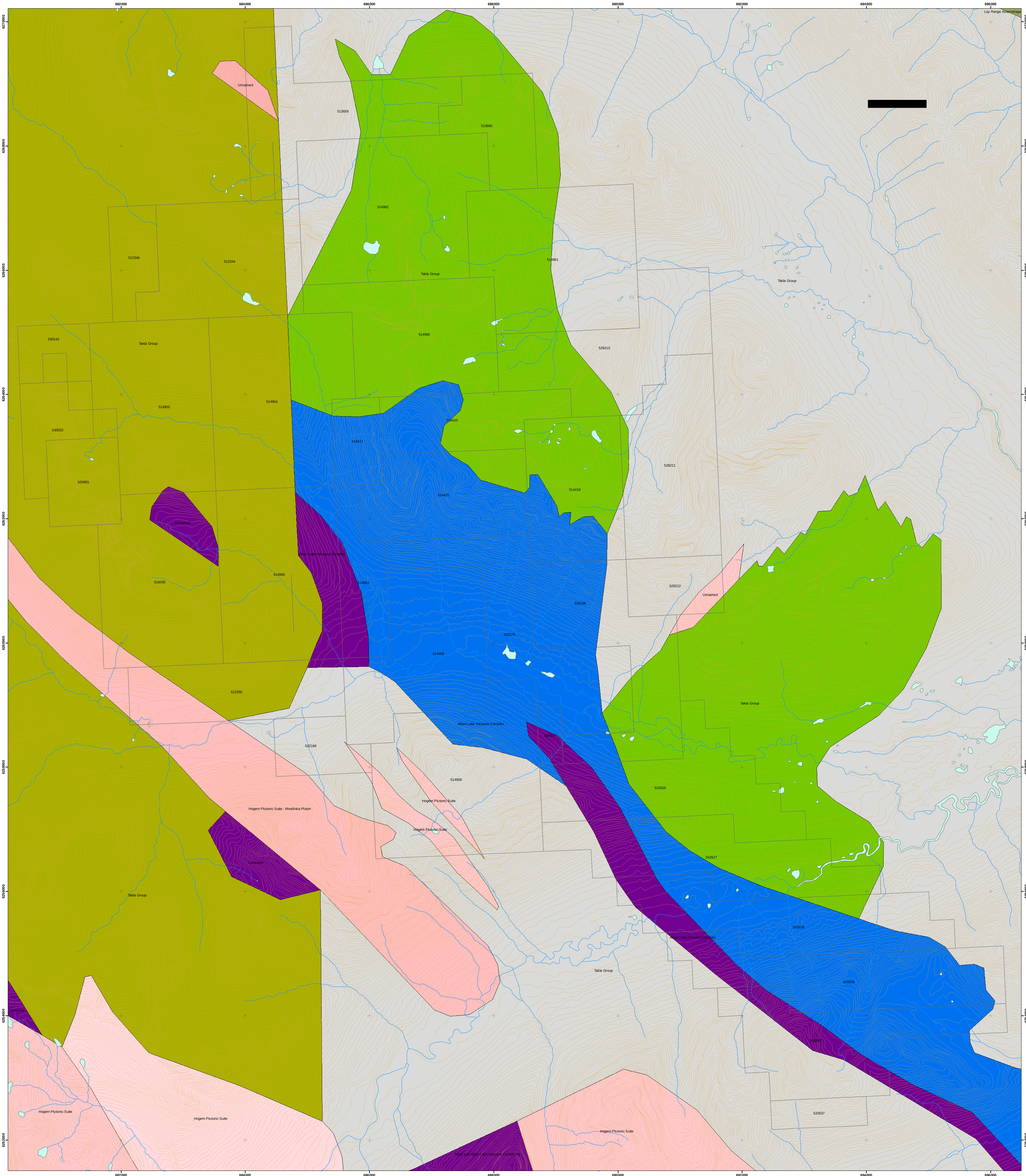
4. I hold no interest, direct or indirect, in Serengeti Resources Inc., nor do I expect to receive any.

Peter E.Walcott, P.Eng.

Vancouver, B.C.
June 2008

SERENGETI RESOURCES INC

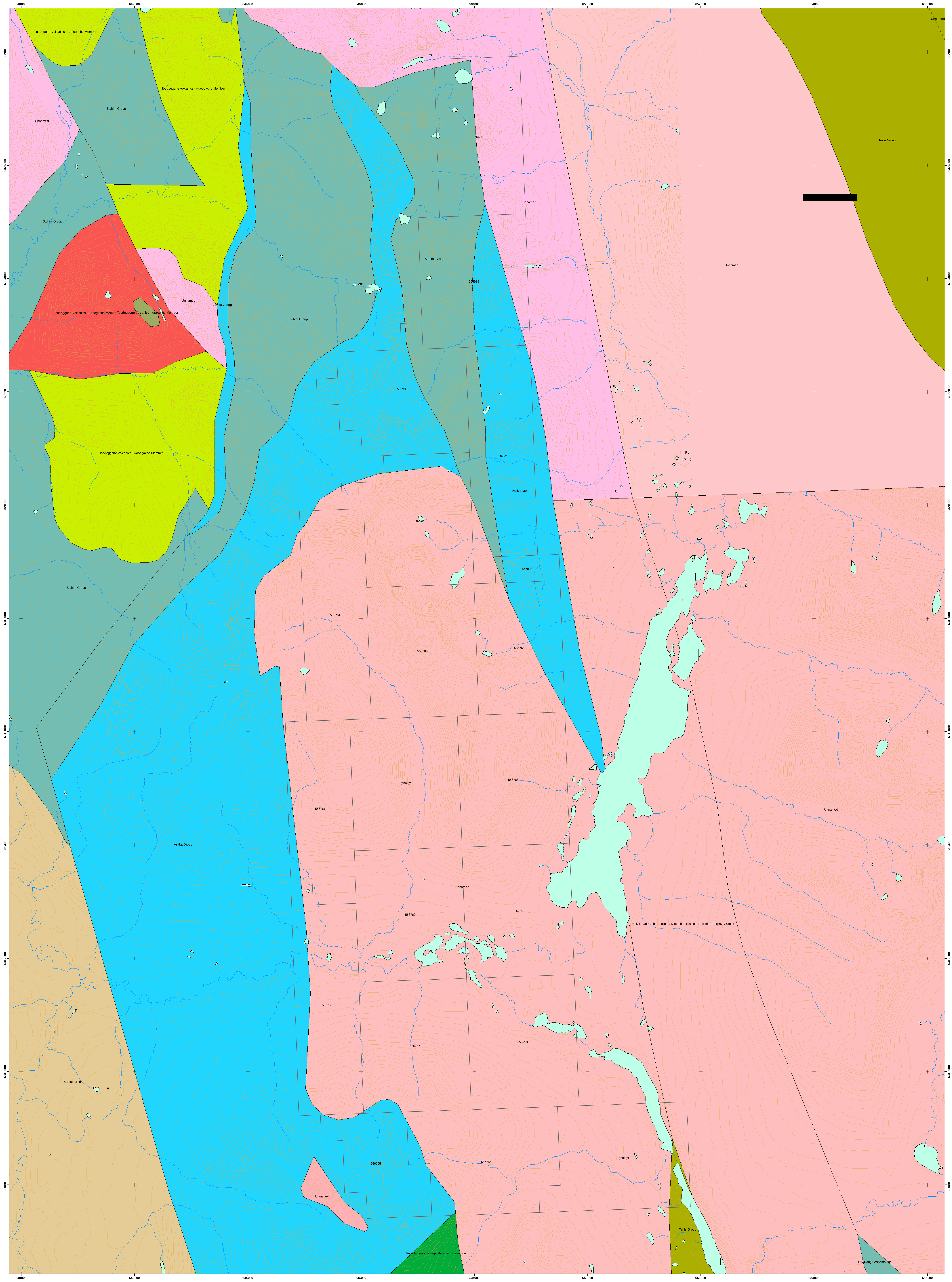
PROPERTY LOCATION MAP -Croy Bloom , Kem 1 & 2



Serengeti Resources Inc.
Croy Property
Regional Geology

0 1,250 2,500 5,000 Meters

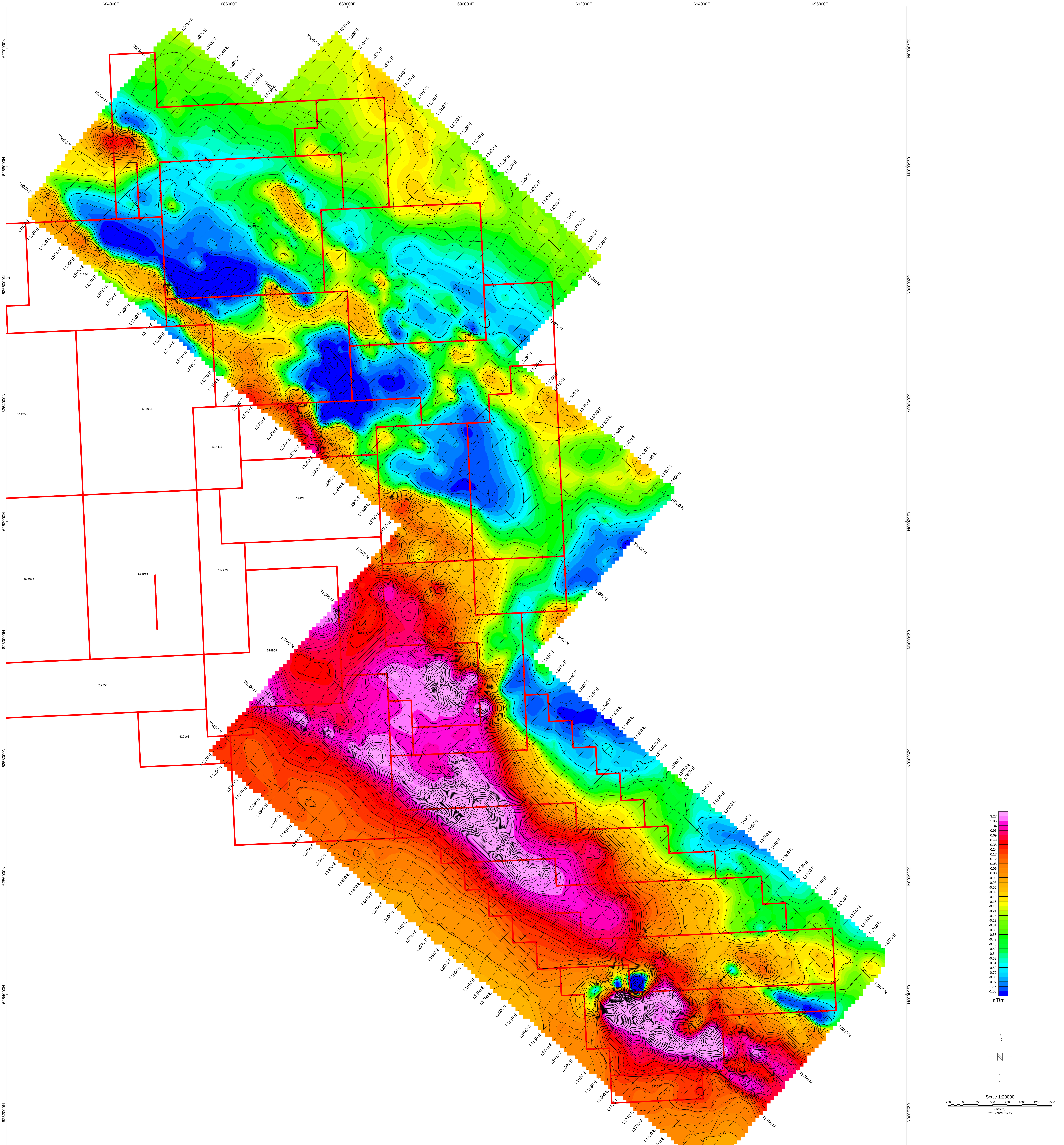
After BCGS,2008



Serengeti Resources Inc.
Kemess Property
Regional Geology

0 1,250 2,500 5,000 Meters

After BCGS,2008

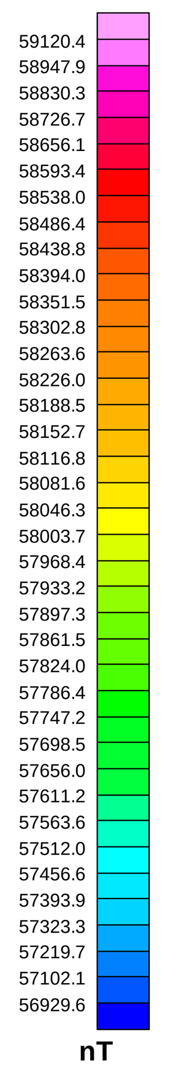


SERENGETI RESOURCES INC.

AIRBORNE MAGNETIC SURVEY
CONTOURS OF TMI
(nT)

CROY PROPERTY
JUNE 3,2008
SURVEY BY GDS

PETER E. WALCOTT & ASSOCIATES LIMITED

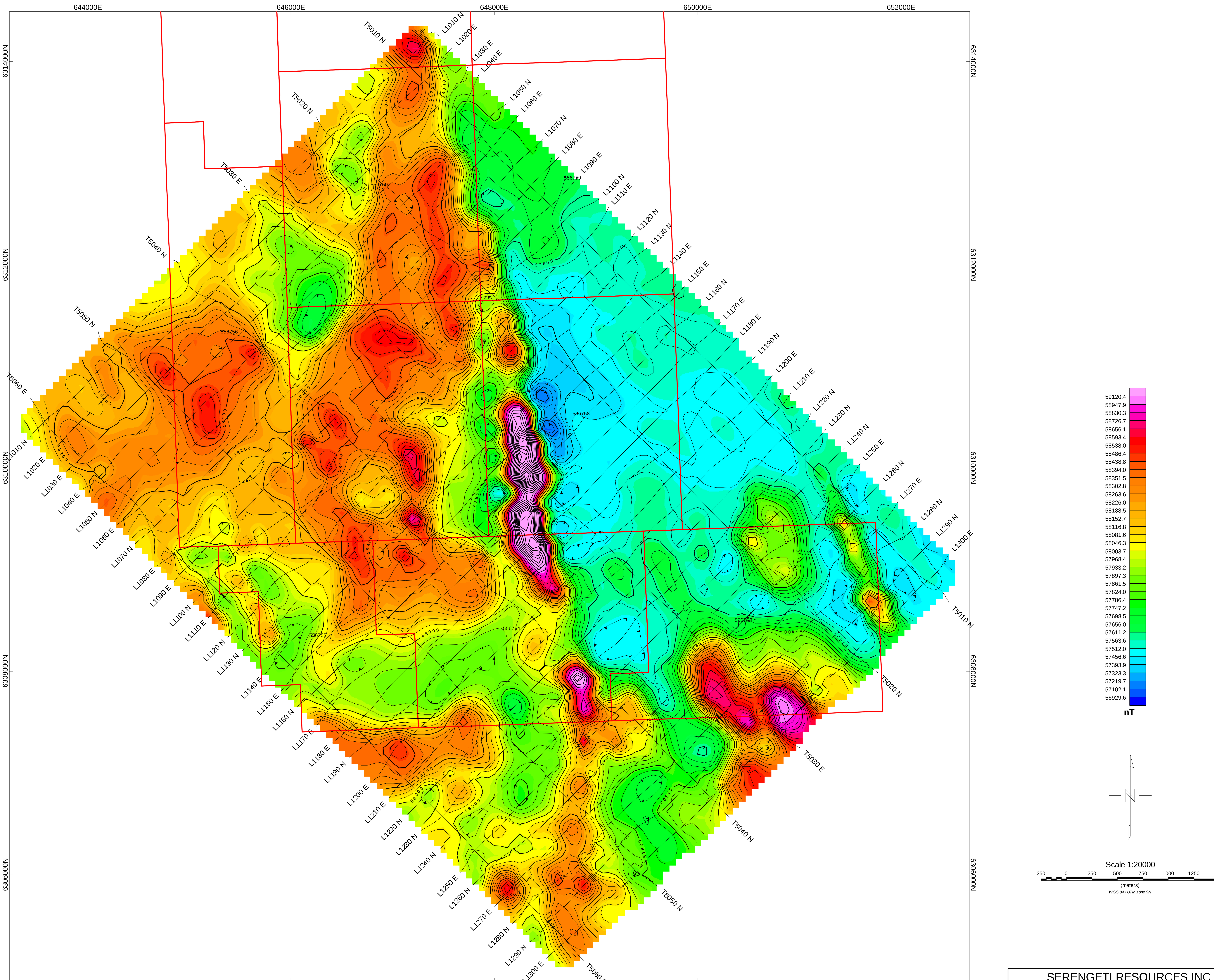


SERENGETI RESOURCES INC.

AIRBORNE MAGNETIC SURVEY
CONTOURS OF TMI
(nT)

KEMESS 1 PROPERTY
JUNE 3,2008
SURVEY BY GDS

PETER E. WALCOTT & ASSOCIATES LIMITED

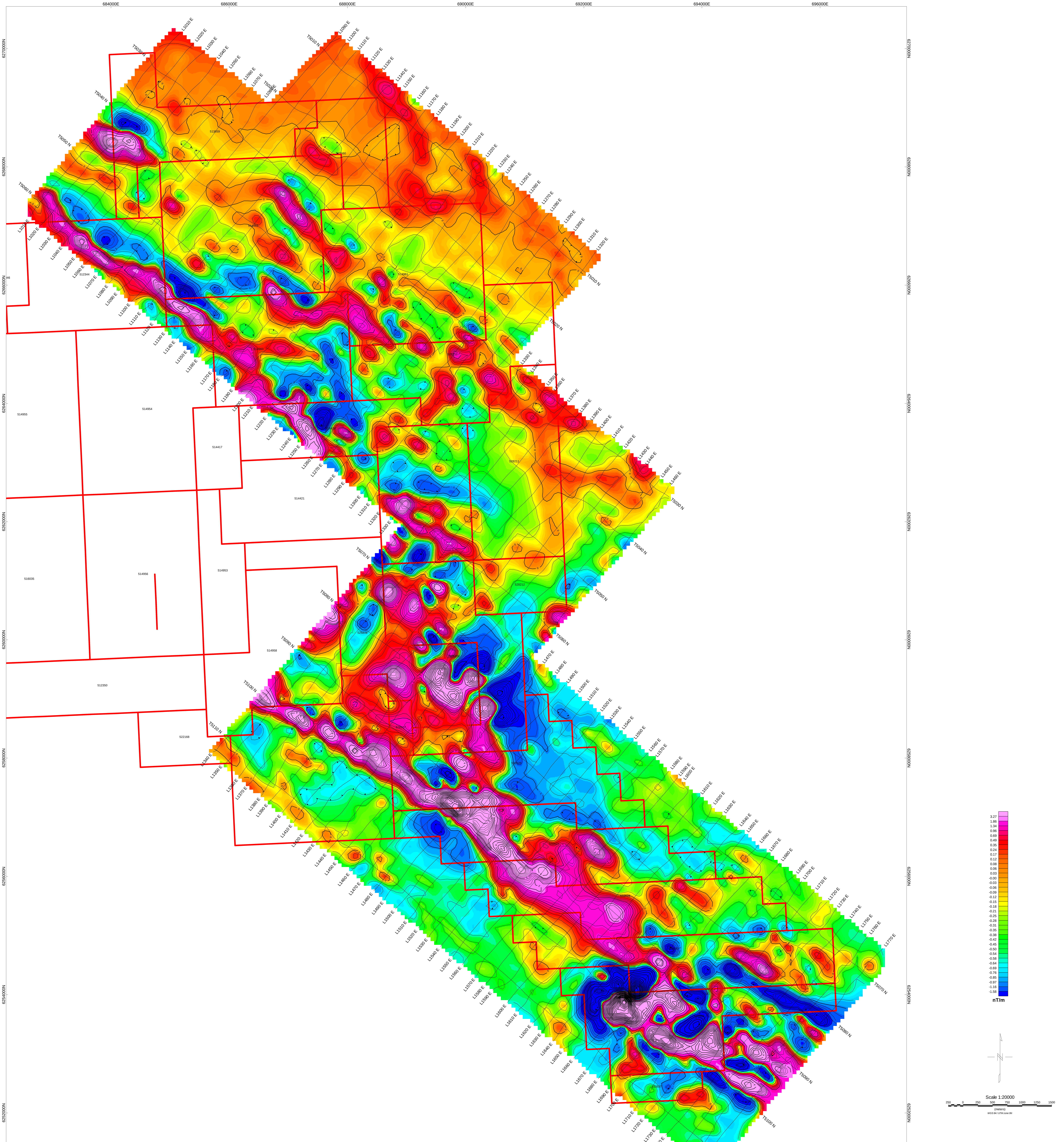


SERENGETI RESOURCES INC.

AIRBORNE MAGNETIC SURVEY
CONTOURS OF TMI
(nT)

KEMESS 2 PROPERTY
JUNE 3,2008
SURVEY BY GDS

PETER E. WALCOTT & ASSOCIATES LIMITED



SERENGETI RESOURCES INC.

AIRBORNE MAGNETIC SURVEY
CONTOURS OF 1VD TMI
(nT)

CROY PROPERTY
JUNE 3,2008
SURVEY BY GDS

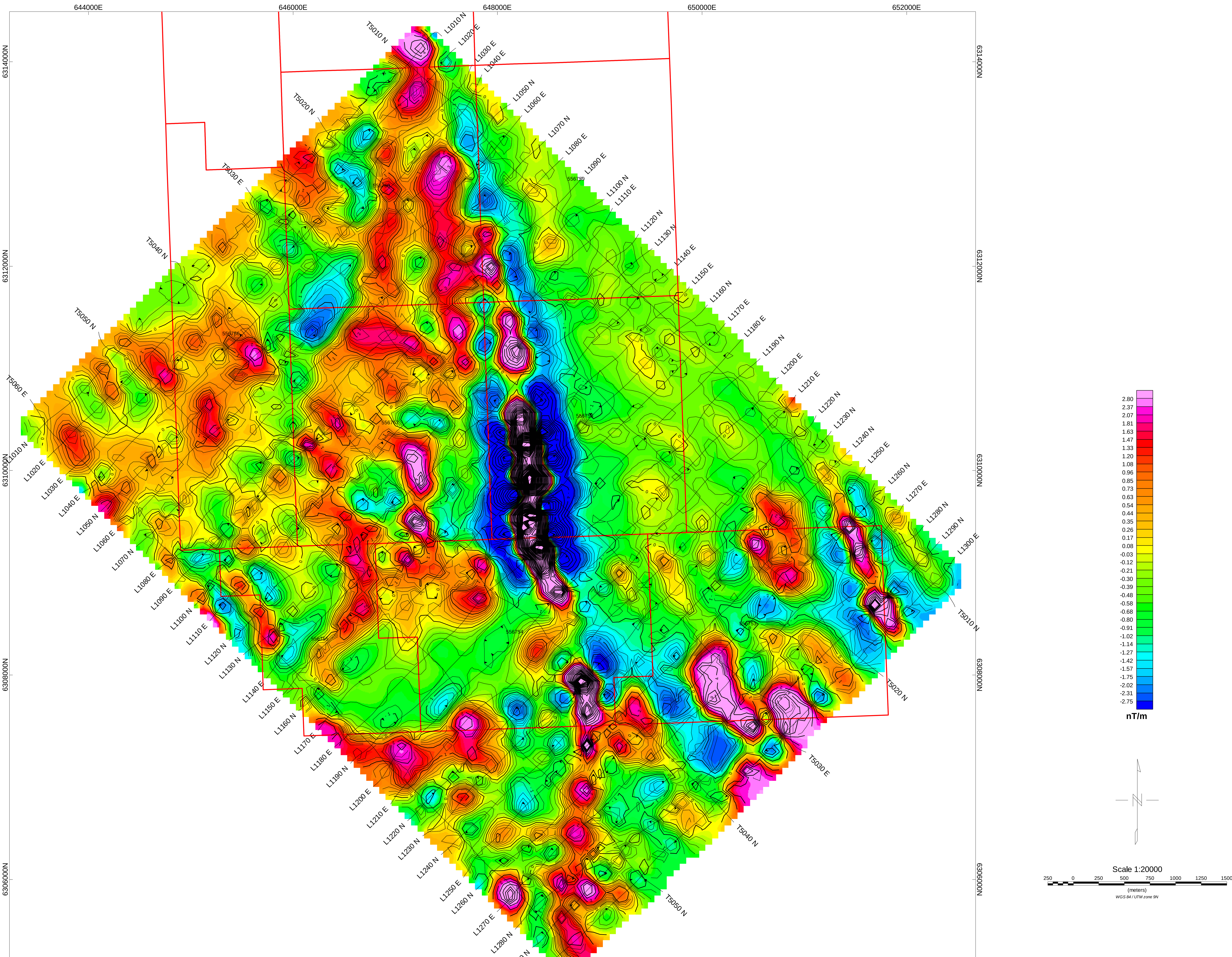
PETER E. WALCOTT & ASSOCIATES LIMITED

SERENGETI RESOURCES INC.

AIRBORNE MAGNETIC SURVEY
CONTOURS OF 1VD TMI
(nT)

KEMESS 1 PROPERTY
JUNE 3,2008
SURVEY BY GDS

PETER E. WALCOTT & ASSOCIATES LIMITED

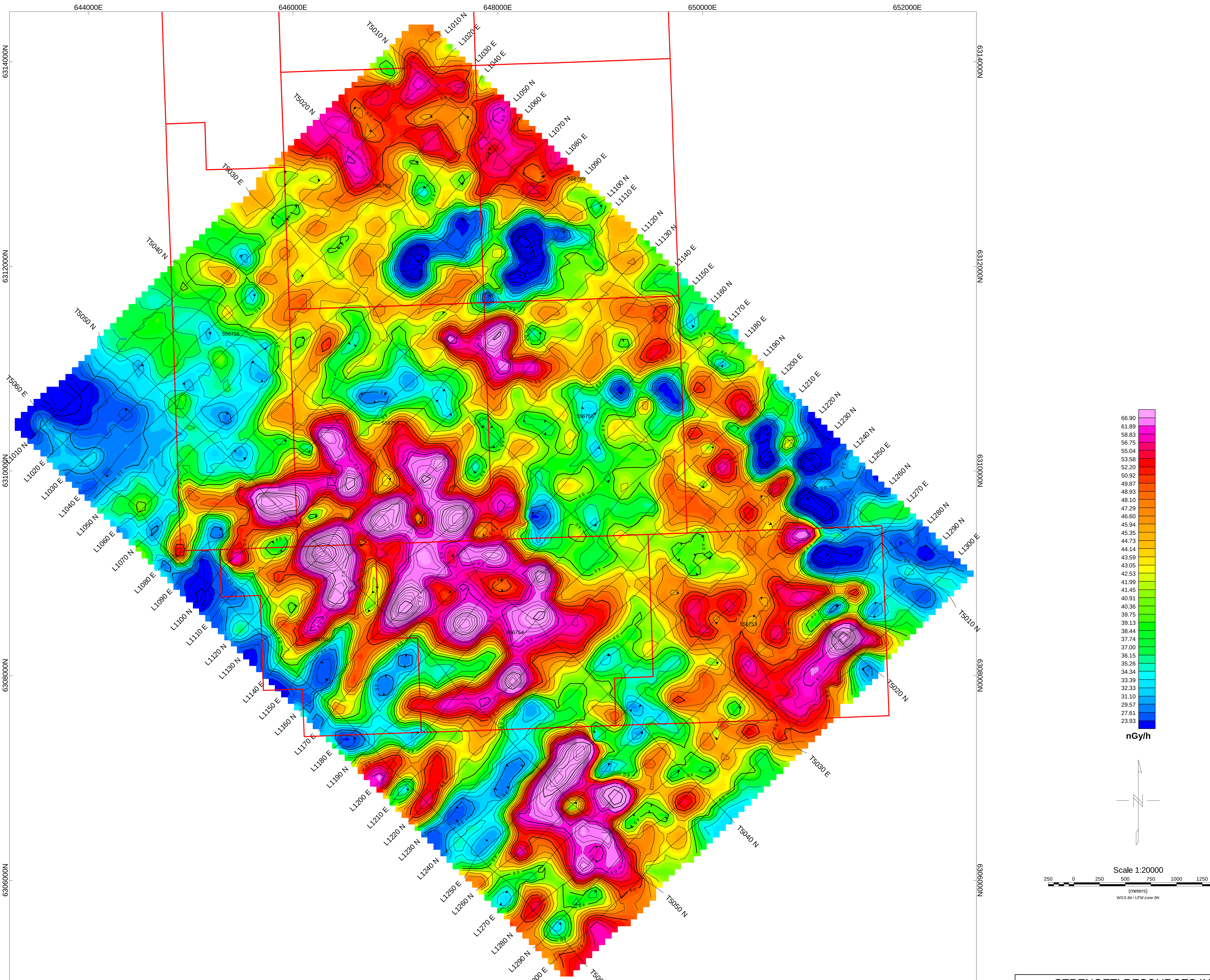


SERENGETI RESOURCES INC.

AIRBORNE MAGNETIC SURVEY
CONTOURS OF 1VD TMI
(nT)

KEMESS 2 PROPERTY
JUNE 3,2008
SURVEY BY GDS

PETER E. WALCOTT & ASSOCIATES LIMITED

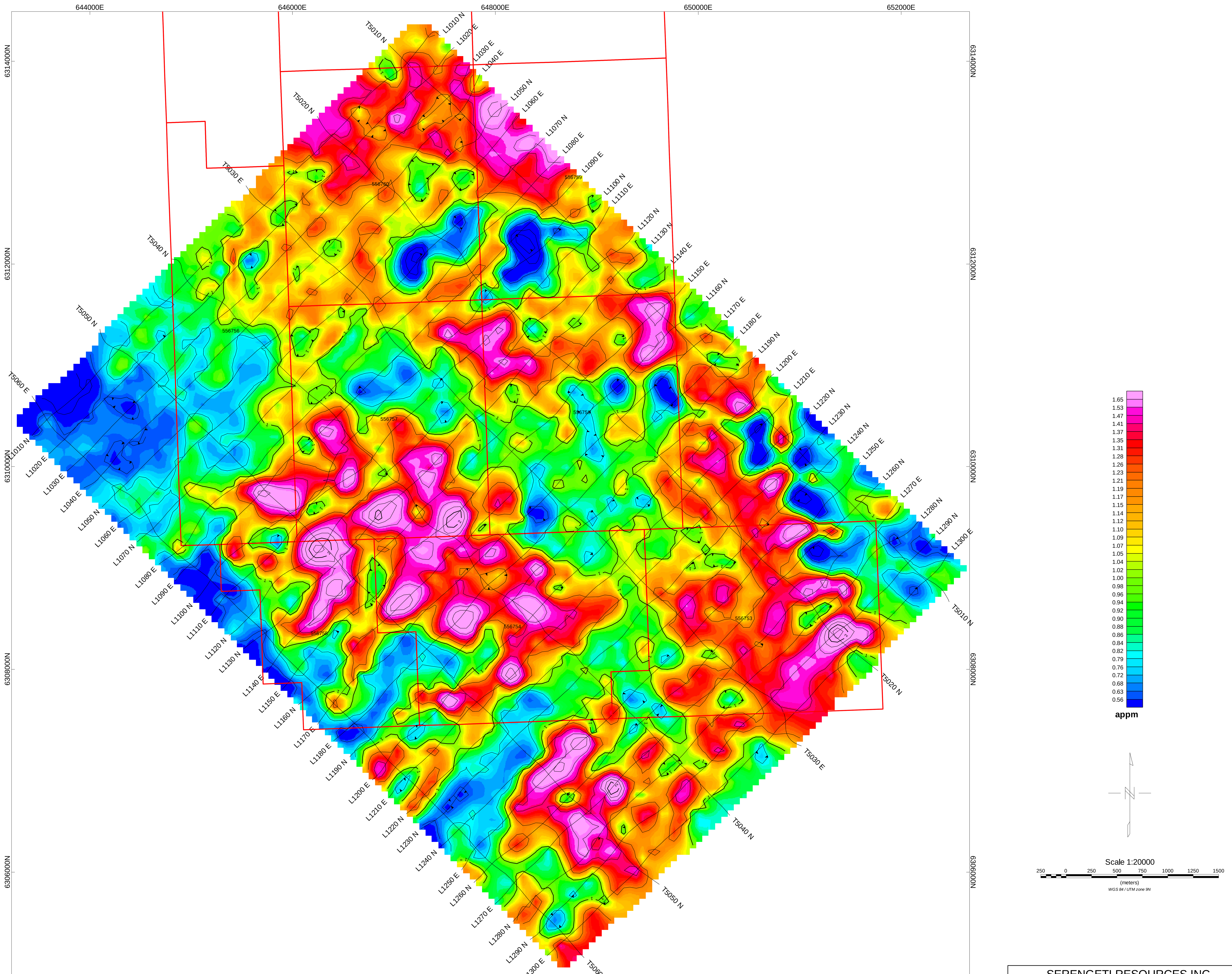


SERENGETI RESOURCES INC.

AIRBORNE RADIOMETRIC SURVEY
CONTOURS OF TOTAL COUNTS
(nGy/h)

KEMESS 2 PROPERTY
JUNE 3,2008
SURVEY BY GDS

PETER E. WALCOTT & ASSOCIATES LIMITED

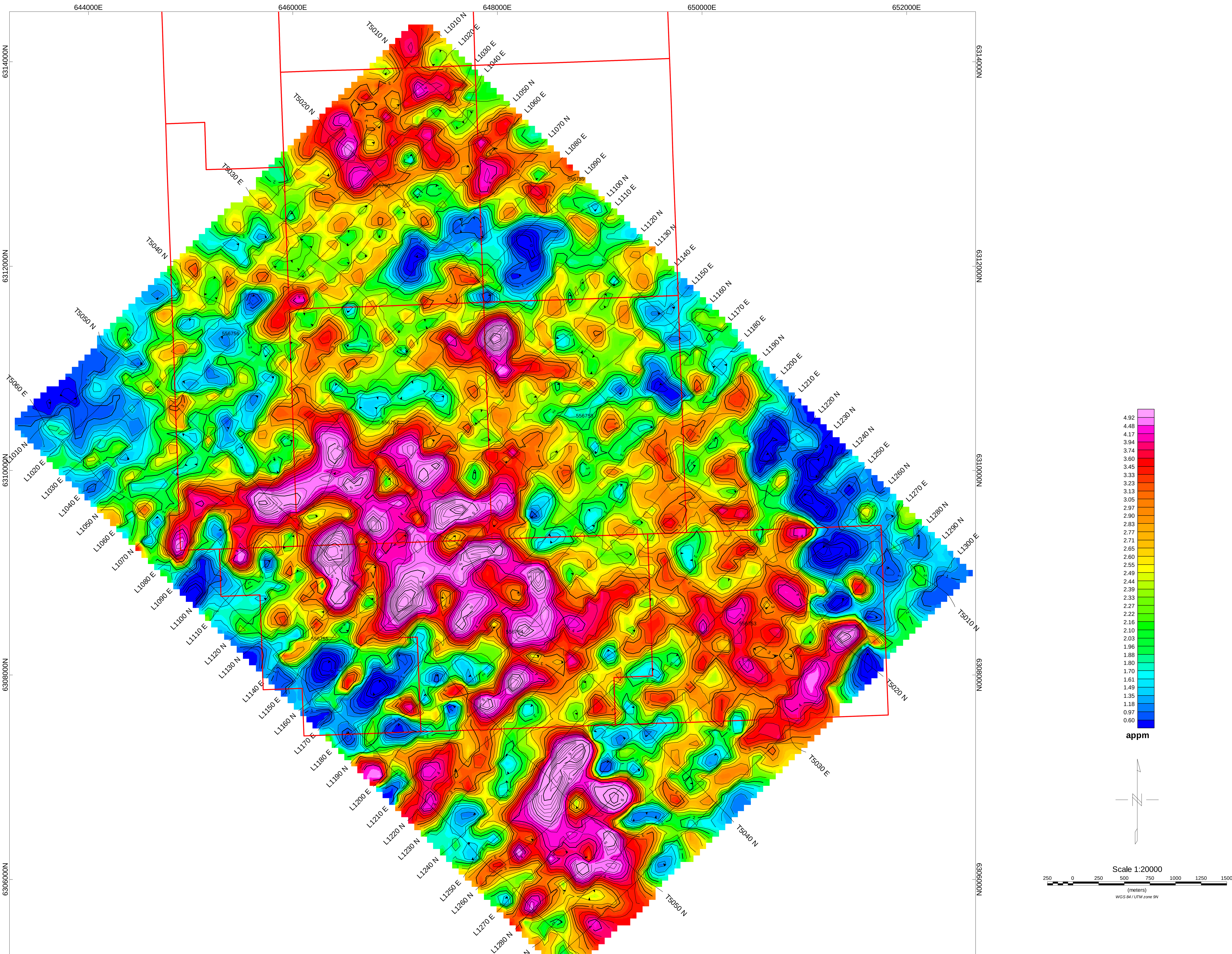


SERENGETI RESOURCES INC.

AIRBORNE RADIOMETRIC SURVEY
CONTOURS OF POTASSIUM
(appm)

KEMESS 2 PROPERTY
JUNE 3,2008
SURVEY BY GDS

PETER E. WALCOTT & ASSOCIATES LIMITED

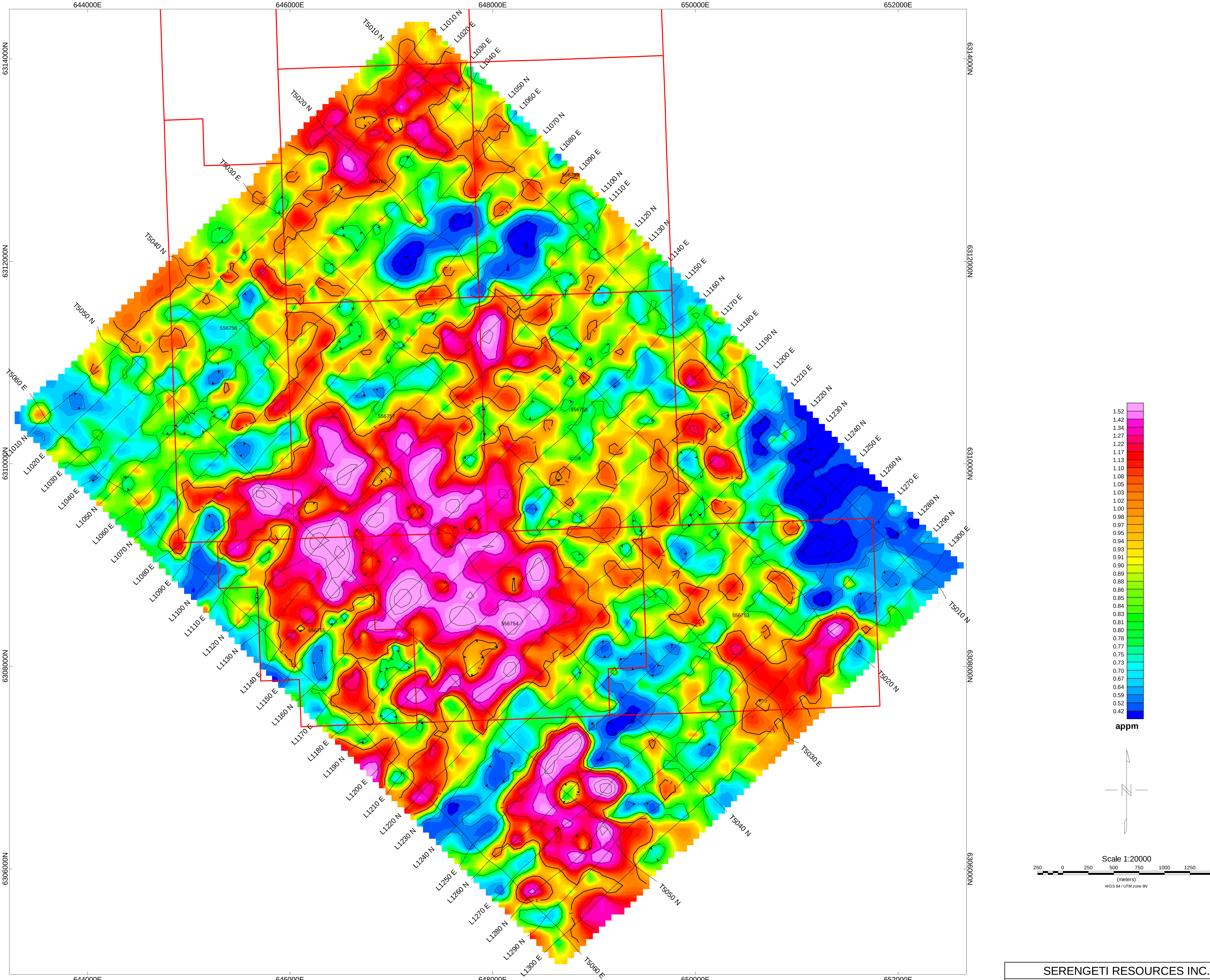


SERENGETI RESOURCES INC.

AIRBORNE RADIOMETRIC SURVEY
CONTOURS OF THORIUM
(appm)

KEMESS 2 PROPERTY
JUNE 3,2008
SURVEY BY GDS

PETER E. WALCOTT & ASSOCIATES LIMITED



SERENGETI RESOURCES INC.

AIRBORNE RADIOMETRIC SURVEY
CONTOURS OF URANIUM
(appm)

KEMESS 2 PROPERTY
JUNE 3,2008
SURVEY BY GDS

PETER E. WALCOTT & ASSOCIATES LIMITED

APPENDIX II

===========

GEO DATA SOLUTONS INC.
SURVEY SPECIFICATIONS

1.0 SURVEY SPECIFICATIONS

The airborne survey and noise specifications for the **SERENGETI** survey are as follows:

a) traverse line spacing and direction:

- traverse line spacing: 250 metres
- traverse line direction: see maps

b) control line spacing and direction

- control line spacing: 1 000 metres
- control line direction: perpendicular to traverse line

c) terrain clearance

- helicopter nominal terrain clearance: 50 metres
- magnetometer nominal terrain clearance: 50 metres

d) magnetic diurnal variation

- A maximum tolerance of 3.0 nT (peak to peak) deviation from a long chord equivalent to a period of one minute for the magnetometer base station

e) magnetometer noise envelope

- in-flight noise envelope could not exceed 0.5 nT, for straight and level flight
- base station noise envelope could not exceed 0.1 nT

f) Re-flights and turns

- all reflights of line segments intersected at least two control lines

2.0 AIRCRAFT, EQUIPMENT AND PERSONNEL

2.1 Aircraft and Geophysical On-Board Equipment

Aircraft: Bell 206B LR C-GKAX (figure 2)
Mean Survey Speed: 40 m/sec
Nominal Ground Clearance: 50 metres

Magnetometer: Geometrics cesium vapour sensor, stinger installation, sensitivity of 0.001 nT, sampling rate of 0.1 sec., ambient range 20,000 to 100,000 nT. The general noise level was kept below 0.01 nT. Nominal sensor height of 50 metres above ground.

Gamma-ray Spectrometric: Radiation Solutions RSX-5
Downward-looking crystal: 16 litres
Upward-looking crystal: 4 litres
Self-calibrating and automatic gain control which eliminates the use of radioactive sources in the field
Recording at a rate of 1 Hz, the:

- total, potassium, uranium and thorium counts
- entire 256 channel spectra

Digital Acquisition System: RMS Data Acquisition System

Radar Altimeter: TRA-3 000, accuracy 5%, sensitivity one foot, range 0 to 2,500 feet, 1 sec. recording interval

Electronic Navigation: Real-Time Differentially Corrected Omnistar System, 1.0 sec. recording interval, accuracy of ±5 metres

2.2 Ground Equipment

Magnetometer: One GEM GSM-19 Overhauser magnetometer base station was mounted in a magnetically quiet area. The base station measured the total intensity of the earth's magnetic field in units of 0.01 nT at intervals of 1 second, within a noise envelope of 0.10 nT. The base station magnetometer was located near the base of operation.

Ancillary Equipment: Computer workstation, complement of spare parts and test equipment

2.3 Personnel

The general management of the project was monitored offsite by Mr. Mouhamed Moussaoui, **GDS**'s President. Mr. Saleh Elmoussaoui was responsible for the field data processing to ensure that the work was carried out according to contractual specifications. The final data evaluation and processing will be carried out at the Laval **GDS** office by Mr. Elmoussaoui and Mr. François Caty.

Survey crew and office personnel are listed in table 3.

Table 3: Field and Office Crew

Position	Name
Project Manager	Mr. Mouhamed Moussaoui, P.Eng.
Data quality control	Mr. Saleh Elmoussaoui
Field Operator	Mr. Pierre Filion
Pilot	Mr. Julien Leclerc Mr. Gregory Coupechoux
Final Processing	To be done
Survey Report	To be written

3.0 DATA ACQUISITION

The following tests and calibrations were performed prior to the commencement and during the survey flying:

- Altimeter calibration
- Figure of Merit (FOM)
- AGS calibrations for
  - Compton stripping coefficients;
  - aircraft and cosmic backgrounds;
  - height attenuation coefficient;
  - radioelement sensitivities;
  - radon removal parameters.

These calibrations and tests were flown near the survey site, as part of the start-up and monitoring procedures and near the Breckenridge test site for the spectrometer.

After each acquisition day, profiles were examined as a preliminary assessment of the noise level. Altimeter deviations from the prescribed flying altitudes were also closely examined as well as the magnetic diurnal activity, as recorded by the base station.

All digital data were verified for validity and continuity. Data from the helicopter and base station were transferred to the PC's hard disk. Basic statistics were generated for each parameter recorded, including minimum, maximum and mean values, standard deviation and any null values. Editing of all recorded parameters for spikes or datum shifts was done, followed by final data verification via an interactive graphic screen with on-screen editing and interpolation routines.

The quality of the GPS navigation was controlled on a daily basis by recovering the helicopter flight path.

Checking all data for adherence to specifications was carried out during the work field progress.

4.0 DATA COMPILATION AND PROCESSING 6.1 Base maps

Base maps of the survey area were plotted from topographic maps of the Department of Natural Resources Canada at a scale of 1:50 000.

Projection description

Datum:	WGS84
Projection:	Universal Transverse Mercador, UTM Zone 10N
False Easting:	500 000
False Northing:	0
Scale Factor:	0 .9996

4.2 Processing of Base Station data

Recorded magnetic diurnal data from the magnetometer base station were reformatted and loaded into the OASIS database. After initial verification of the integrity of the data from statistical analysis, the appropriate portion of the data was selected to correspond to the exact start and end time of the flight. The data were then checked and corrected for spikes using a fourth difference editing routine. Following this, interactive editing of the data was done, via a graphic editing tool, to remove events caused by man-made disturbances. A small low pass noise filter (9 seconds) was then applied. The final processing step consisted of subtracting the result from the airborne magnetic data as a pre-levelling step. The average of the Total Field Magnetic Intensity measured at the Base Station was 56 846.29 nT.

4.3 Processing of the Positioning Data (GPS)

The raw GPS data were recovered and corrected for spikes. The resulting corrected latitudes and longitudes were then converted to the local map projection and datum (WGS84). A point-to-point speed calculation was then done from the final X-Y coordinates and reviewed as part of the quality control. The flight data were then cut back to the proper survey line limits and a preliminary plot of the flight path was done and compared to the planned flight path to verify the navigation. The positioning data were then exported to the other processing files.

4.4 Processing of the Altimeter data

The altimeter data, which includes the radar altimeter and the GPS elevation values were checked and corrected for spikes using a fourth difference editing routine. A small low pass filter of 2 seconds was then applied to the data. Following this, a digital terrain trace was computed by subtracting the radar altimeter values from the corrected GPS elevation values. All resulting parameters were then checked, in profile form, for integrity and consistency, using a graphic viewing editor.

4.5 Processing of Magnetic data

The airborne magnetic data were reformatted and loaded into the OASIS database. After initial verification of the data by statistical analysis, the values were adjusted for system lag. The data were then checked and corrected for any spikes using a fourth difference editing routine and inspected on the screen using a graphic profile display. Interactive editing, if necessary, was done at this stage. Following this, the long wavelength component of the diurnal was subtracted from the data as a pre-levelling step. A preliminary grid of the values was then created and verified for obvious problems, such as errors in positioning or bad diurnal. Appropriate corrections were then applied to the data, as required.

Following this, the final levelling process was undertaken. This consisted of calculating the positions of the control points (intersections of traverse lines and tie lines), calculating the magnetic differences at the control points and applying a series of levelling corrections to reduce the misclosures to zero. A new grid of the values was then created and checked for residual errors. Any gross errors detected were corrected in the profile database and the levelling process repeated. Finally, a micro levelling routine was applied to the magnetic data

4.6 Total Magnetic Field Grid

The reprocessed total field magnetic grid was calculated from the final reprocessed profiles by a minimum curvature algorithm. The accuracy standard for gridding was that the grid values fit the profile data to within 0.01 nT for 99.99% of the profile data points. For all the blocks, the grid cell size was 62.5 metres.

Minimum curvature gridding provides the smoothest possible grid surface that also honours the profile line data. However, sometimes this can cause narrow linear anomalies cutting across flight lines to appear as a series of isolated spots.

5.0 AGS DATA PROCESSING

The Airborne Gamma-ray Spectrometric data was subjected to primary quality control, complete data reduction, gridding and imaging in the field during the data acquisition phase. The final processing procedure starts by analysing the raw, 256-channel spectra to reduce statistical noise using a spectral component analysis technique (NASVD).

Subsequent processing consists of:

- refining the various parameters used for ROI (region-of-interest) data reduction;
- reducing the whole dataset with increased attention to detail;
- statistical and image evaluation of the reduced data;
- adjustment to the data reduction as necessary;
- applying micro-levelling to the gridded data and transferring adjustments to profile data;
- preparing the required products.

Data Processing Overview

GDS utilizes an ***improved*** methodology for AGS data reduction based on the standard techniques outlined in the following references:

- IAEA-Tecdoc-1363, *Guidelines for radioelement mapping using gamma ray spectrometric data*;
- AGSO Record 1995/60, *A Guide to the Technical Specifications for Airborne Gamma-Ray Surveys*.
- IAEA-TECDOC-1363, "Guidelines for radioelement mapping using gamma ray spectrometry data" (July 2003).

The parameters used for this processing were based on those determined during the calibration and testing phase of the survey (see Appendix A) and on subsequent analysis of the whole AGS data set including background-over-water measurements. The primary AGS data consists of the 256 channel spectra collected at 1 Hz for both the downward-looking (16 litres) and upward-looking (4 litres) crystal packs. The major data reduction stages are:

- NASVD analysis of the 256 channel AGS spectra
- Appropriate filtering of auxiliary data (ground clearance, temperature, pressure and cosmic)
- Calculation of effective height (at STP = "Hstp")
- Background removal (aircraft, cosmic and atmospheric radon)
- Compton stripping (spectral unfolding)
- Adjustment for height attenuation
- Conversion to radioelement ground concentrations (TC, K U, TH)
- Gridding and evaluation
- Calculation of derivative products

Each of the radioelement results: total count (TC); potassium (K); uranium (U); and thorium (TH) were evaluated using statistical and image analysis techniques.

NASVD Statistical Noise Reduction

GDS's personnel have extensive experience with the application of Noise Adjusted Singular Value

Decomposition (NASVD), which was initially developed by Hovgaard and Grasty (1997), and evaluated in depth by Minty (2003). NASVD was applied to both the downward and upward 256-channel spectra in order to reduce statistical noise. A formulation of the method modelled on that of Minty was used.

The noise–reduced spectra were used to extract new TC, K, U and TH and UPU (upward-looking uranium) ROI count rates, which then have less noise than the original raw ROI. For the uranium measurement, in particular, it is possible to achieve a significant reduction in statistical noise.

NASVD analysis results in a more precise measure of the radioelement ground concentrations, which improves the discrimination between different geologic units with similar concentration values. However, no significant improvement occurs for the total count measurement since it already incorporates a major part of the gamma-ray spectrum. The improved maps or images can reveal patterns and shapes previously hidden or barely discernible in the noise.

Filtering

All primary data was edited in the field to eliminate rare instances of spikes, noise or corrupted data points. During data reduction, appropriate filtering was applied to selected AGS fields in order to match measurement parameters to the primary gamma-ray data and/or improve accuracy.

Atmospheric Radon Background Removal

The upward-looking detector method was used to remove the effects of atmospheric radon from the downward spectrometer count rates. The determination of the coefficients to be applied in this process, are described in Appendix A. The upward-looking spectrometer measures count rates in a "uranium" ROI. The statistics of these counts are improved by NASVD analysis.

The atmospheric radon levels during this survey, fell within the expected range of concentrations.

In order to determine the AGS system response to atmospheric radon, a series of data were collected at survey height over the larger lakes in the survey area. All measurement points were at least 500m from shore, which results in negligible gamma contribution from the land. The background-over-water measurements (BOW) were made under a range of times-of-day and weather conditions in order to encounter a range of atmospheric radon concentrations. The resulting data are analyzed to obtain:

(a) Radon response coefficients for use with the upward-looking radon-removal technique;
(b) An improved estimate of the aircraft background.

Micro-Levelling

Complex airborne datasets acquired on parallel lines often exhibit subtle artefacts in the line direction. In the case of AGS data these are mostly due to limitations in the radon removal technique. The upward-looking detector method is generally quite effective but the necessity to use long filters results in loss of sensitivity to shorter wavelength variations. Non-uniform atmospheric radon distribution will also produce errors. These can result in small line-to-line lineations in the gridded data.

Micro levelling is used to filter the primary gridded data in order to reduce or remove long-wavelength noise along survey lines, caused by non-geological effects. For this survey, GDS used a proprietary micro levelling technique. It uses modified median filters that are designed to match the statistical nature of AGS data. Along-line and cross-line directional filters plus clean-up filters are used to isolate and remove this sort of noise from the gridded images. Naudy-type thresholds are used to limit the amplitude of change at any data point.

Once the micro levelling process was applied, colour-shaded images were studied to verify that the residual line noise has been minimised, and that new line noise has not been introduced. The micro level correction grid was reviewed to confirm that no significant geological signal had been removed.

The final stage was to sample the correction grid and apply these corrections to the radioelement profile data.

BRECKENRIDGE RESULTS Bell 206B

Project #: P07-027

Pilot: Christophe Zarakoza
Operator: Pierre Fillion
Compiled By: Saleh Elmoussaoui

Date: August 21, 2007
Location: Ottawa (Ontario)
Helicopter: BELL206
Configuration: mag/Radiometric.

LINE	HSTP	TC	K	TH	U	NO OF POINTS
120	**31.72489**	**1242.067427**	**169.9854**	**33.43566**	**19.7498174**	**160**
150	**39.46254**	**1157.181004**	**154.61**	**30.74898**	**18.816446**	**160**
200	**52.58636**	**1044.882892**	**135.0795**	**27.57034**	**16.4944395**	**160**
300	**79.67799**	**830.9929969**	**101.8893**	**22.58755**	**13.608**	**160**
400	**106.1187**	**677.4289663**	**79.51078**	**18.38615**	**11.1659091**	**160**
500	**131.5065**	**563.9818263**	**63.47365**	**15.04831**	**9.66987599**	**160**
600	**158.8839**	**453.273899**	**50.18947**	**12.14167**	**8.24**	**160**
700	**185.4275**	**368.2913907**	**39.76821**	**10.10143**	**6.86176143**	**160**
800	211.1406	299.6848251	29.77495	8.115942	5.5245098	**160**

LINE	**HSTP**	**ln TC**	**ln K**	**ln TH**	**ln U**	**NO OF POINTS**
120	**31.72489**	**7.12**	**5.14**	**3.51**	**2.98**	**160**
150	**39.46254**	**7.05**	**5.04**	**3.43**	**2.93**	**160**
200	**52.58636**	**6.95**	**4.91**	**3.32**	**2.80**	**160**
300	**79.67799**	**6.72**	**4.62**	**3.12**	**2.61**	**160**
400	**106.1187**	**6.52**	**4.38**	**2.91**	**2.41**	**160**
500	**131.5065**	**6.34**	**4.15**	**2.71**	**2.27**	**160**
600	**158.8839**	**6.12**	**3.92**	**2.50**	**2.11**	**160**
700	**185.4275**	**5.91**	**3.68**	**2.31**	**1.93**	**160**
800	211.1406	**5.70**	**3.39**	**2.09**	**1.71**	**160**

AGS STANDARDS

This section provides information on a range of standard values and terminology used by **GDS** for AGS data acquisition.

Gamma Peak Positions

GDS maintains the gamma-ray spectrometer so that:

- the spectrometer (channel number) versus (gamma energy) relationship is linear and fixed (stable) in the energy range of interest (400 – 3,000 keV).
- the channel versus energy intercept equals zero.

The gamma peak positions thus remain constant and for the most important peaks are:

SOURCE NAME	PEAK ENERGY (keV)	POSITION (channel no.)
Rn (radon / Bi-214)	609	51.1
Cs-137	662	55.5
K (potassium / K-40)	1460	121.5
U (uranium / Bi-214)	1764	147.5
TH (thorium / Tl-208)	2615	218.5

Note that the peak positions are provided to 0.1 channel accuracy.

Energy ROI (Regions of Interest)

The airborne radiometric technique requires measurement of count rates for specific energy regions (ROI or windows) in the natural gamma-ray spectrum. The standard energy regions (in accordance with IAEA 323) and the corresponding channel limits are:

DOWNWARD SPECTROMETER ENERGY ROI				
DESIGNATION	ENERGY LIMIT (keV)		CHANNEL LIMIT (inclusive)	
	Lower	Upper	Lower	Upper
Total Count = **TC**	410	2810	34	233
Potassium = **K**	1370	1570	115	130
Uranium = **U**	1660	1860	139	155
Thorium = **TH**	2410	2810	202	233
Upward Uran. = **UPU**	1660	1860	139	155
Cosmic = **COS**	3200	infinity		

DYNAMIC CALIBRATION RANGE

Dynamic calibration range (dcr) measurements were performed with the helicopter in AGS survey configuration, over the Breckenridge range near Ottawa, on August 21st, 2007.

The range was flown by acquiring data on a series of 9 passes over its 9 km length, at constant ground clearances ranging from 120 to 800 feet. These passes alternated between the land and adjacent fresh water sections of the range. The measurements where used to determine altitude attenuation coefficients and radioelement sensitivities.

Altitude Attenuation

The airborne data from Breckenridge were checked for quality, edited and divided into lines for each pass. Mean values were calculated for each pass over the water. The AGS ROI was then corrected for background (aircraft, cosmic and radon) by subtracting the mean over-water values from the corresponding (same height) over-land data values.

The ground clearance was then converted to an equivalent height at standard temperature and pressure – "$\mathbf{H_{STP}}$". The K, U and TH ROI were corrected for spectral overlap using the stripping coefficients measured. Finally the mean processed values for the over-land portions of the range were calculated. The results of this processing are:

COSMIC CALIBRATION FLIGHT

It is important for the cosmic flight to be conducted in a location that will minimize the presence of airborne radon. This is difficult anywhere over a landmass, since radon is constantly being released from soil and rocks. The cosmic flight was performed over a huge fresh water body.

The purpose of the cosmic flight is to:

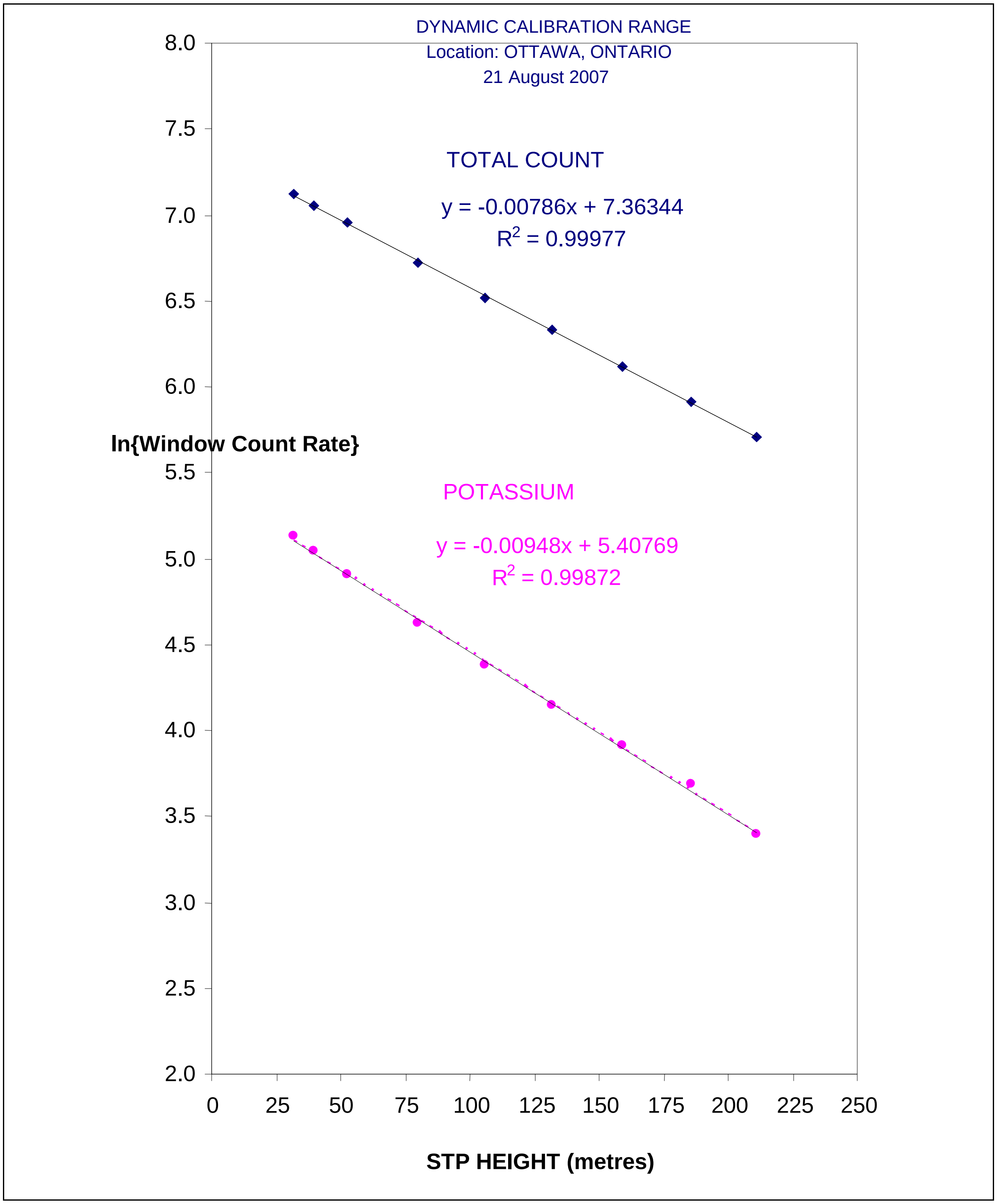
1. perform an accurate measurement of the relationship between the cosmic ROI (all gamma-rays of energy greater than 3.2 MeV) and the lower energy radiometric ROI TC, K, U, TH and upward uranium (UPU)

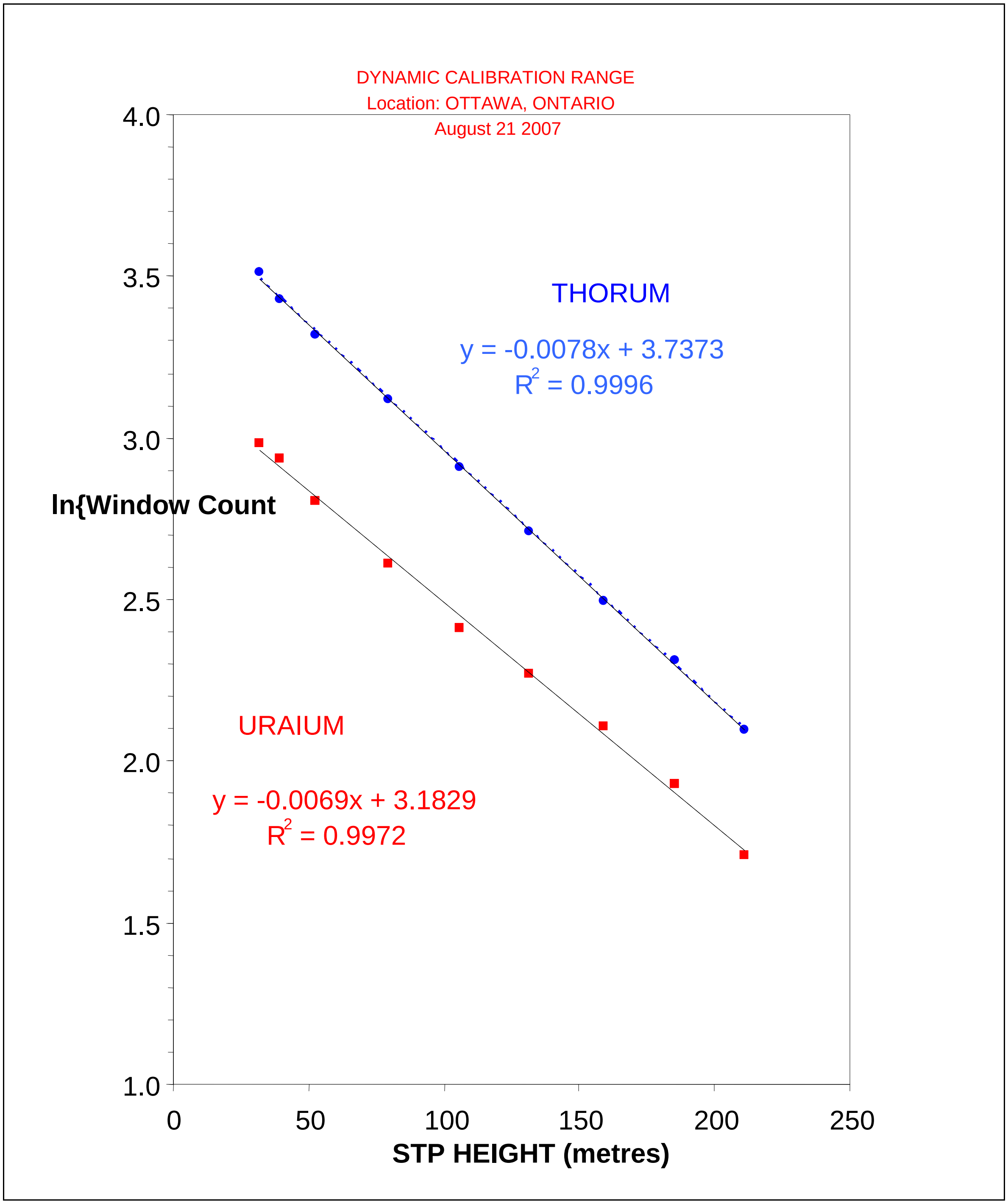
2. provide an ***initial*** measure of the aircraft background.

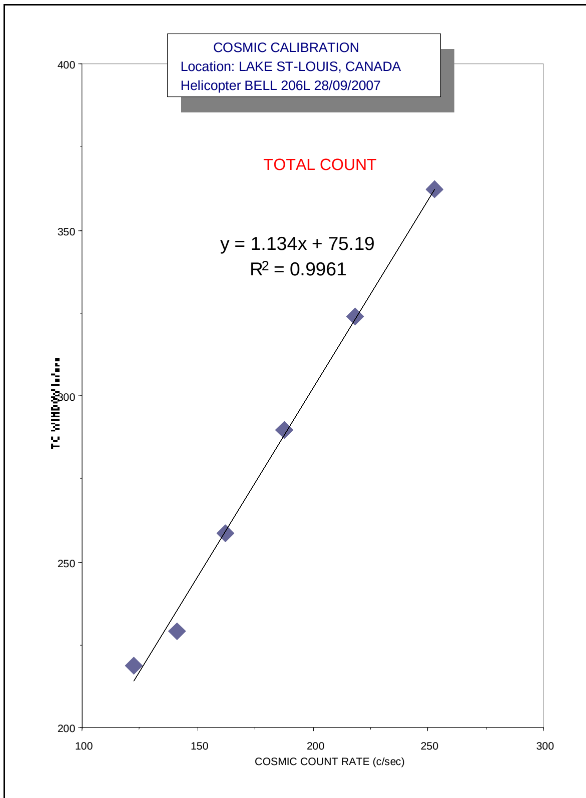
Primary ROI data is re-extracted, when necessary, in order to improve the energy definition. The data for each altitude was evaluated for quality. Mean values were then extracted. They are listed in the table below.

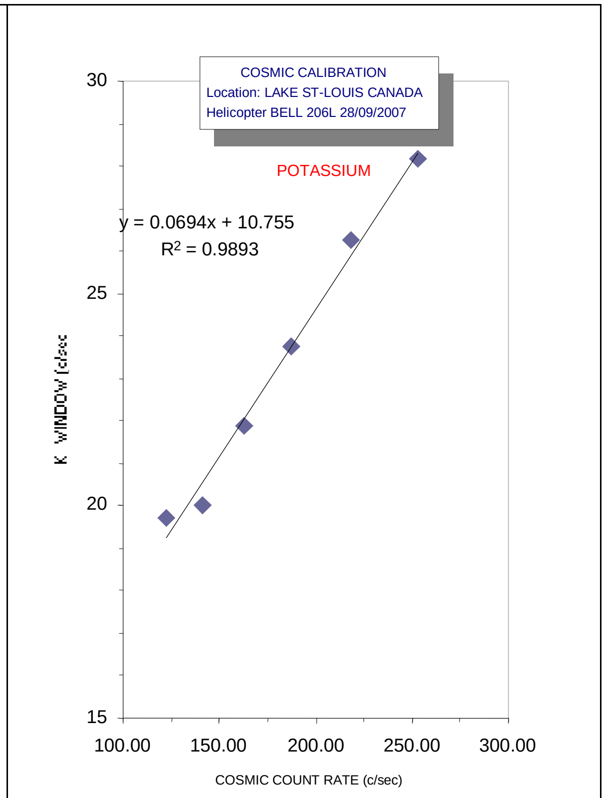
ROI	AIRCRAFT BACKGROUND (cps)	COSMIC COEFFICIENT
TC	75.19	1.134
K	10.75	0.069
U	2.784	0.052
TH	0.015	0.067
Uup	0. 764	0.013

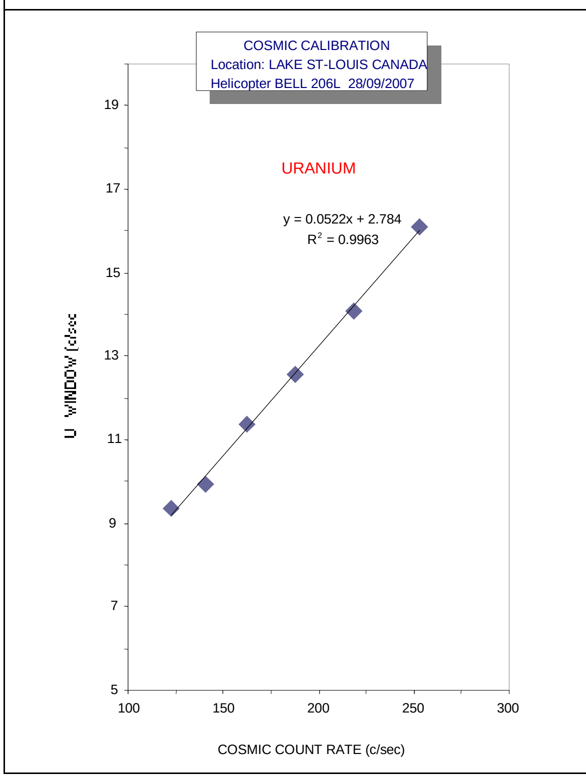
ROI	AIR ATTENUATION (per metre at STP)	SENSITIVITY
TC	-0.00786	20.1
K	-0.00948	71.82
U	-0.0069	11.67
TH	-0.00777	3.68

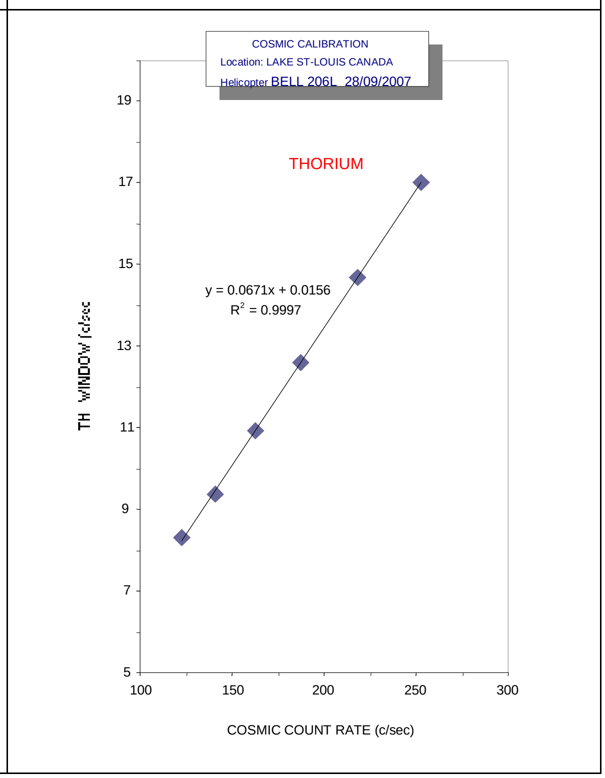

DYNAMIC CALIBRATION RANGE
Location: OTTAWA, ONTARIO
21 August 2007
TOTAL COUNT
y = -0.00786x + 7.36344
R2 = 0.99977
POTASSIUM
y = -0.00948x + 5.40769
R2 = 0.99872
ln{Window Count Rate}
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
0
25
50
75
100
125
150
175
200
225
250
STP HEIGHT (metres)

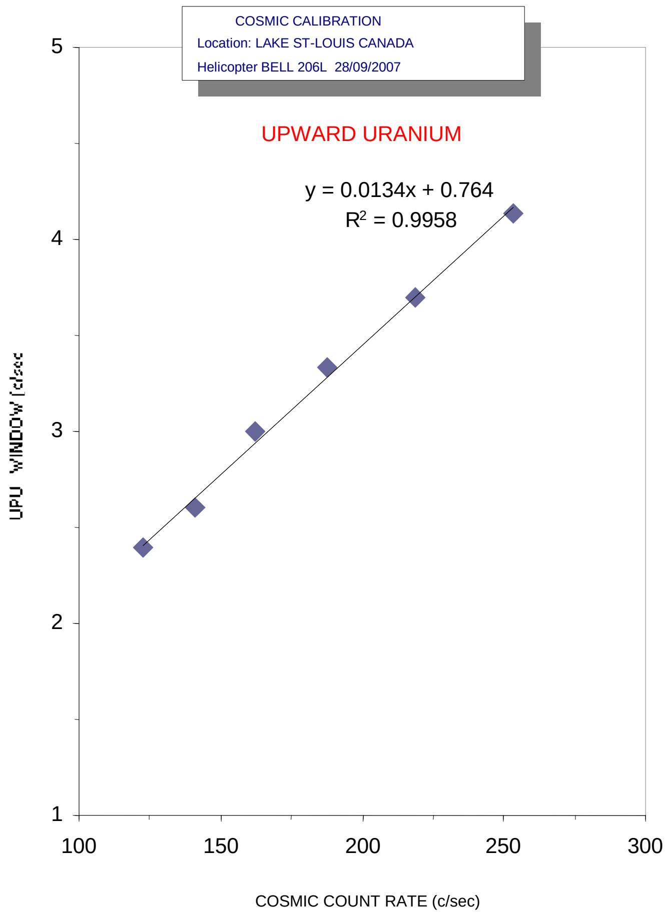

DYNAMIC CALIBRATION RANGE
Location: OTTAWA, ONTARIO
August 21 2007
THORUM
y = -0.0078x + 3.7373
R2 = 0.9996
URAIUM
y = -0.0069x + 3.1829
R2 = 0.9972
ln{Window Count
STP HEIGHT (metres)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0
50
100
150
200
250


COSMIC CALIBRATION
Location: LAKE ST-LOUIS, CANADA
Helicopter BELL 206L 28/09/2007
TOTAL COUNT
y = 1.134x + 75.19
R2 = 0.9961
TC WINDOW
400
350
300
250
200
100
150
200
250
300
COSMIC COUNT RATE (c/sec)

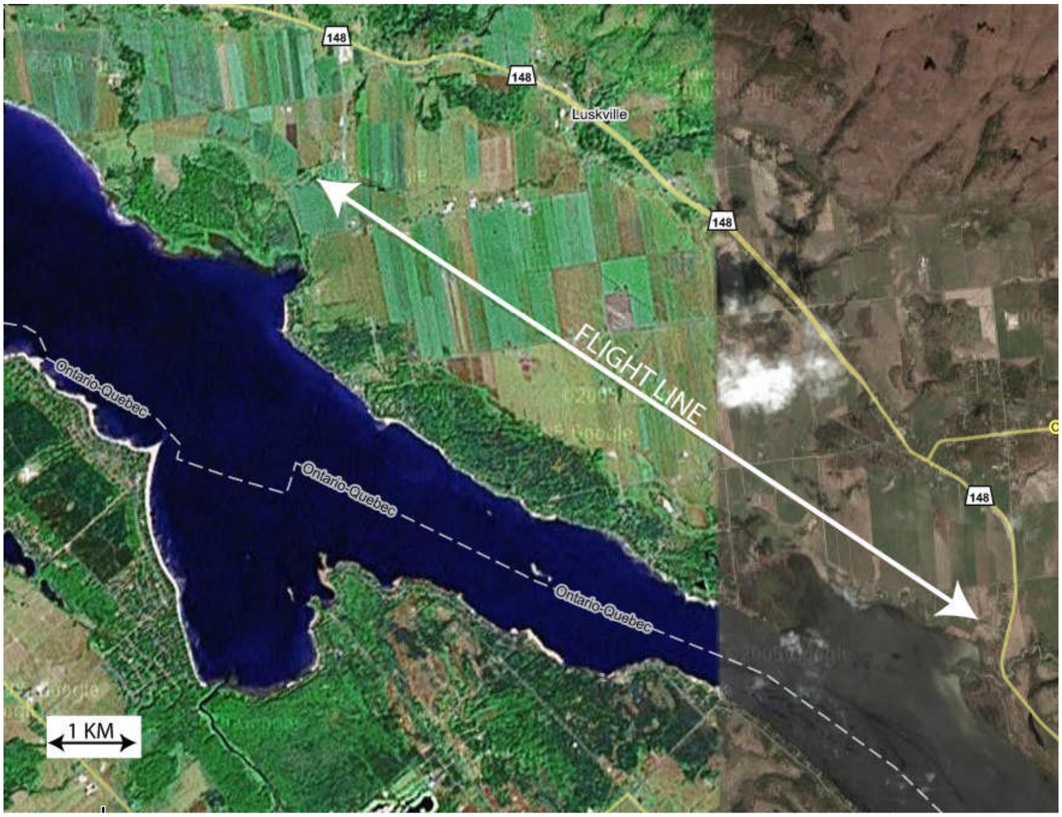

COSMIC CALIBRATION
Location: LAKE ST-LOUIS CANADA
Helicopter BELL 206L 28/09/2007
POTASSIUM
y = 0.0694x + 10.755
R2 = 0.9893
K WINDOW (c/sec
30
25
20
15
100.00
150.00
200.00
250.00
300.00
COSMIC COUNT RATE (c/sec)


COSMIC CALIBRATION
Location: LAKE ST-LOUIS CANADA
Helicopter BELL 206L 28/09/2007
URANIUM
y = 0.0522x + 2.784
R2 = 0.9963
U WINDOW (c/sec
19
17
15
13
11
9
7
5
100
150
200
250
300
COSMIC COUNT RATE (c/sec)


COSMIC CALIBRATION
Location: LAKE ST-LOUIS CANADA
Helicopter BELL 206L 28/09/2007
THORIUM
y = 0.0671x + 0.0156
R2 = 0.9997
TH WINDOW (c/sec
19
17
15
13
11
9
7
5
100
150
200
250
300
COSMIC COUNT RATE (c/sec)


COSMIC CALIBRATION
Location: LAKE ST-LOUIS CANADA
Helicopter BELL 206L 28/09/2007
UPWARD URANIUM
y = 0.0134x + 0.764
R2 = 0.9958
UPU WINDOW (c/sec
COSMIC COUNT RATE (c/sec)
1
2
3
4
5
100
150
200
250
300

BRECKENRIDGE DYNAMIC CALIBRATION RANGE



LOCATION:

- Adjacent to Ottawa River, approximately 12 km northwest of the city of Ottawa.

LAND LINE:

- Geology: Non-marine clay developed from underlying marine clay during the last stages of the Champlain Sea and during subsequent estuarine and fluvial periods. It is probable that the gamma-ray signature of the clay is due to radioactive heavy minerals in the small amount of sandy matter enclosed within it.
- Homogeneity: highly uniform over its length and width.
- Length: 8.8 km.
- Altitude: 68 m ASL

WATER LINE:

- Background-over-water is measured over the adjacent Ottawa River. The water line extends to the west of the above map. Minimum width = 1.5 km. Length = 9 to 10 km.