

# EXPLORATION TARGETS

DETERMINED FROM SPECTROMETRIC DATA

IN THE LAC LE MOYNE AND RIVIÈRE KOKSOAK  
AREAS, CHURCHILL PROVINCE

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## Introduction

The *Ministère des Ressources naturelles et de la Faune du Québec* announces the publication of new geophysical data (D'Amours and Intissar, 2012a and b). Pursuing its objective of outlining strategic areas for mineral exploration work, Géologie Québec carried out two new airborne gamma ray spectrometry surveys over part of the Labrador Trough and the Core Zone in the southeast Churchill Province in 2011 (Figure 1). The surveys cover 38 map sheets at a scale of 1:50,000, for a total surface area of 28,000 km<sup>2</sup>. Each of these new publications comes with a report describing all the technical aspects of the survey, a set of geophysical maps at 1:50,000 scale, and the related digital data (available as document numbers DP 2011-06 and DP 2011-07 via **E-Sigeom (Examine)** at the following address: [http://sigeom.mrnf.gouv.qc.ca/signet/classes/11102\\_indexAccueil?l=a](http://sigeom.mrnf.gouv.qc.ca/signet/classes/11102_indexAccueil?l=a)).

This promotional document presents the results of a qualitative and quantitative interpretation of the gamma ray spectrometry data acquired by these two surveys. New exploration targets were identified, and ten uranium-dominant targets are presented in this document (Figures 2, 3 and 4; Table 1).

## Regional geological context and mineral potential

The southeast Churchill Province comprises three major geological entities: the Core Zone in the centre, representing reworked Archean and Proterozoic craton, bounded to the west and east by the deformed Proterozoic sequences of the New Québec (Labrador Trough) and Torngat orogens respectively (Figure 1). The geophysical surveys carried out in 2011 cover the north-central part of the Labrador Trough and overlap the Core Zone in the east.

The Labrador Trough is a folded Paleoproterozoic (2.17 to 1.87 Ma) volcano-sedimentary belt, largely thrust to the southwest over the Archean craton of the Superior Province during the New Québec Orogen. It

extends for 850 km in a NNW-SSE direction, from the Grenville Front to Ungava Bay in the north. It comprises an autochthonous zone in discordant contact with the Superior Province to the west, and several allochthonous zones separated by regional thrust faults (Clark and Wares, 2004). The rocks of the Labrador Trough are divided into several formations and groups assigned to the Kaniapiscou Supergroup (Frarey and Duffell, 1964). The eastern part of the Trough, corresponding to the Rachel-Laporte Zone, is underlain by metamorphic rocks, mainly schists and amphibolites, equivalent to the Kaniapiscou Supergroup units. Regional thrust faults separate the Rachel-Laporte Zone from the Kaniapiscou Supergroup in the west and the Core Zone in the east.

The Labrador Trough has been the subject of many mapping and exploration projects due to its diversified economic potential. The southern Trough was first known for its iron potential. Subsequent exploration work led to the discovery of many showings containing a wide range of mineralization in various geological contexts (Clark and Wares, 2004). The main uranium showings in the Labrador Trough are stratiform or vein type. The stratiform-type showings are concentrated mainly in the sedimentary sequences of the autochthonous part of the Trough, or further west, in bands of Proterozoic sedimentary rocks (Sakami Formation) discordantly overlying the Archean basement of the Superior Province. Vein-style mineralization is concentrated in the Lac Castignon area, east of Lac Cambrien, just a little south of the new geophysical surveys. This type of mineralization is found near thrust faults and is associated with fracture zones (Clark and Wares, 2004). Also worth mentioning are the Nb-Th and rare earth showings associated with carbonatites, just east of Lac Le Moyne (Eldor property: Commerce Resources Corporation website), in the southern part of the area covered by the new geophysical surveys.

The Core Zone is composed of Archean to Proterozoic gneisses, migmatites, intrusive rocks, paragneisses and amphibolites, all metamorphosed to amphibolite and granulite facies and injected by Proterozoic granitoids. The Core Zone is not nearly as well known as the Labrador Trough, particularly the area covered by the new geophysical surveys where only regional-scale geological reconnaissance work has been carried out.

Consequently, the economic potential of the area is unknown. During the summer of 2011, the field verification of a strong spectrometric anomaly led to the discovery of a new uranium showing (Urani 22; Figures 2, 3 and 4; MRNF, 2011). Mineralization is hosted by whitish granite that cuts across a sequence of migmatitic paragneisses.

### **Uranium exploration targets determined using spectrometric data**

Interpreting gamma ray spectrometric data requires a good understanding of geomorphology and the Quaternary environment, since a large part of the measured gamma rays come from the upper 30 centimetres of the ground (IAEA-TECDOC-1363, 2003). It is therefore important to know the relationship between surface materials and underlying bedrock. The use of gamma ray spectrometry for mapping and target definition requires an integrated approach combining image enhancement (ternary radioelement images, ratios and normalization) in addition to statistical analysis techniques (cluster analysis, mean difference, supervised classification), as well as integration with other types of airborne geophysical data, such as magnetic and electromagnetic maps.

The exploration targets defined by our work (Figures 2, 3 and 4; Table 1) represent zones where the equivalent-uranium values are among the highest (more than 3.3 ppm, higher than 99.4 % of the survey values, the mean being 0.91 ppm with a standard deviation of 0.68) and where the ternary spectrometric image analysis demonstrates a clear bias (or tendency) towards uraniummarked uranium trend. These values may seem very low, but it must be taken into account that for an airborne survey at an altitude of 100 m, less than 40 % of the measured radiation emanates from a source within a 100-m radius under the sensor, and more than 20% of the measured photons for an infinite source come from lateral distances exceeding 300 m. The "field of measurement" contributing to each reading is thus much greater than the 80-m sampling interval (International Atomic Energy Agency, 2003). A strong anomaly (21.8 ppm) was noted while carrying out the geophysical survey and was subsequently verified in the field by a team of MRNF geologists in the summer of 2011 (the Urani 22 showing, Figures 2, 3 and 4; MRNF, 2011).

Several anomalies (Nos. 1, 3, 4, 8 and 9) occur near the Lac Hérodier Thrust Fault (Clark and Wares, 2004). This fault marks the contact between volcano-sedimentary sequences of the Labrador Trough and their metamorphosed equivalents in the Rachel-Laporte Zone. The three anomalies to the south (Nos. 1, 6 and 8) occur just south of the carbonatite intrusions of the Eldor property (Commerce Resources Corporation website). Anomalies 2 and 7 occur within the Labrador Trough volcano-sedimentary sequence. Finally, anomaly No. 5 is in the Core Zone, just east of the new Urani22 uranium showing discovered in the summer of 2011.

### **Références**

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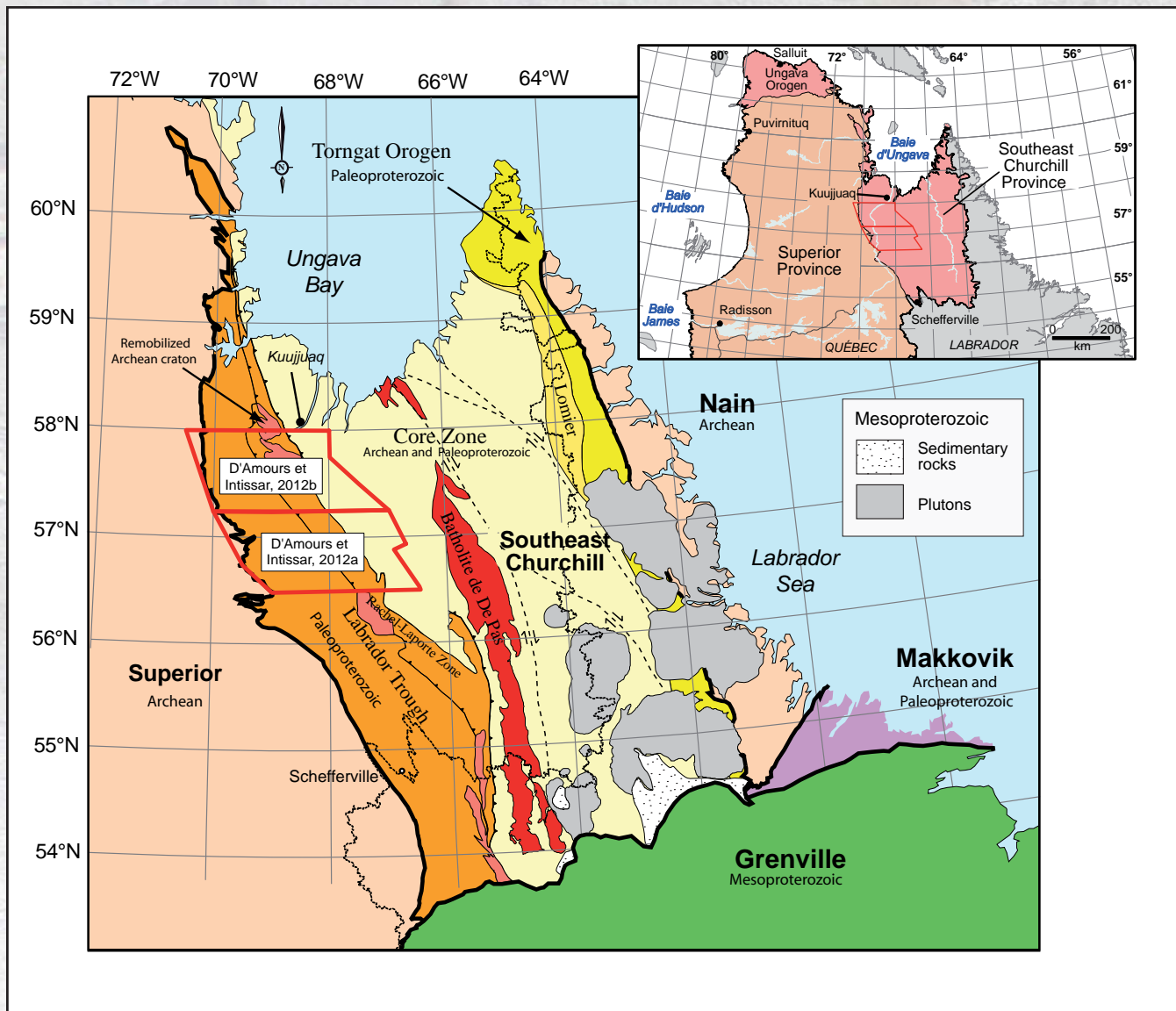


FIGURE 1 – Location of new surveys and geological subdivisions of the southeast Churchill Province.

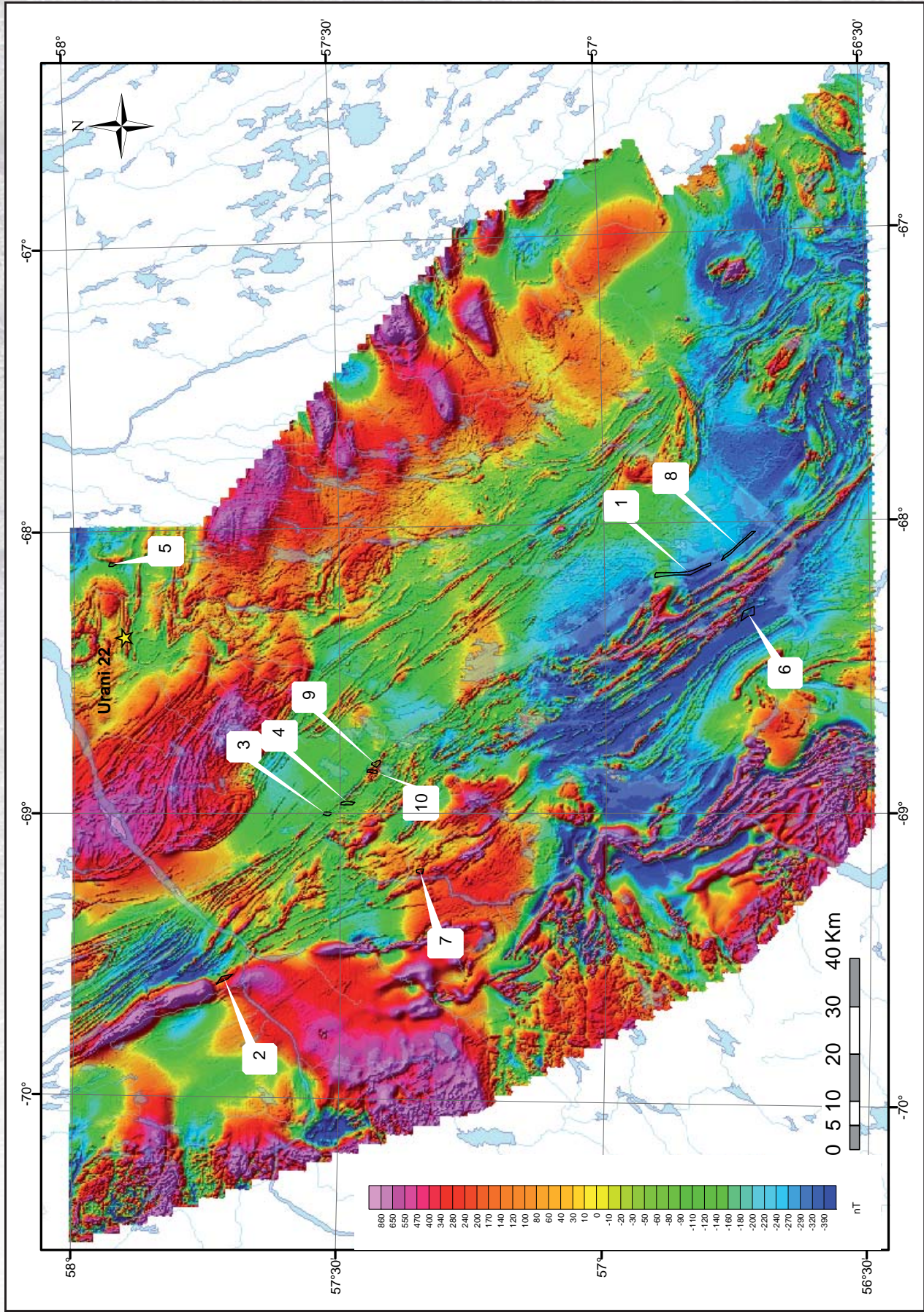
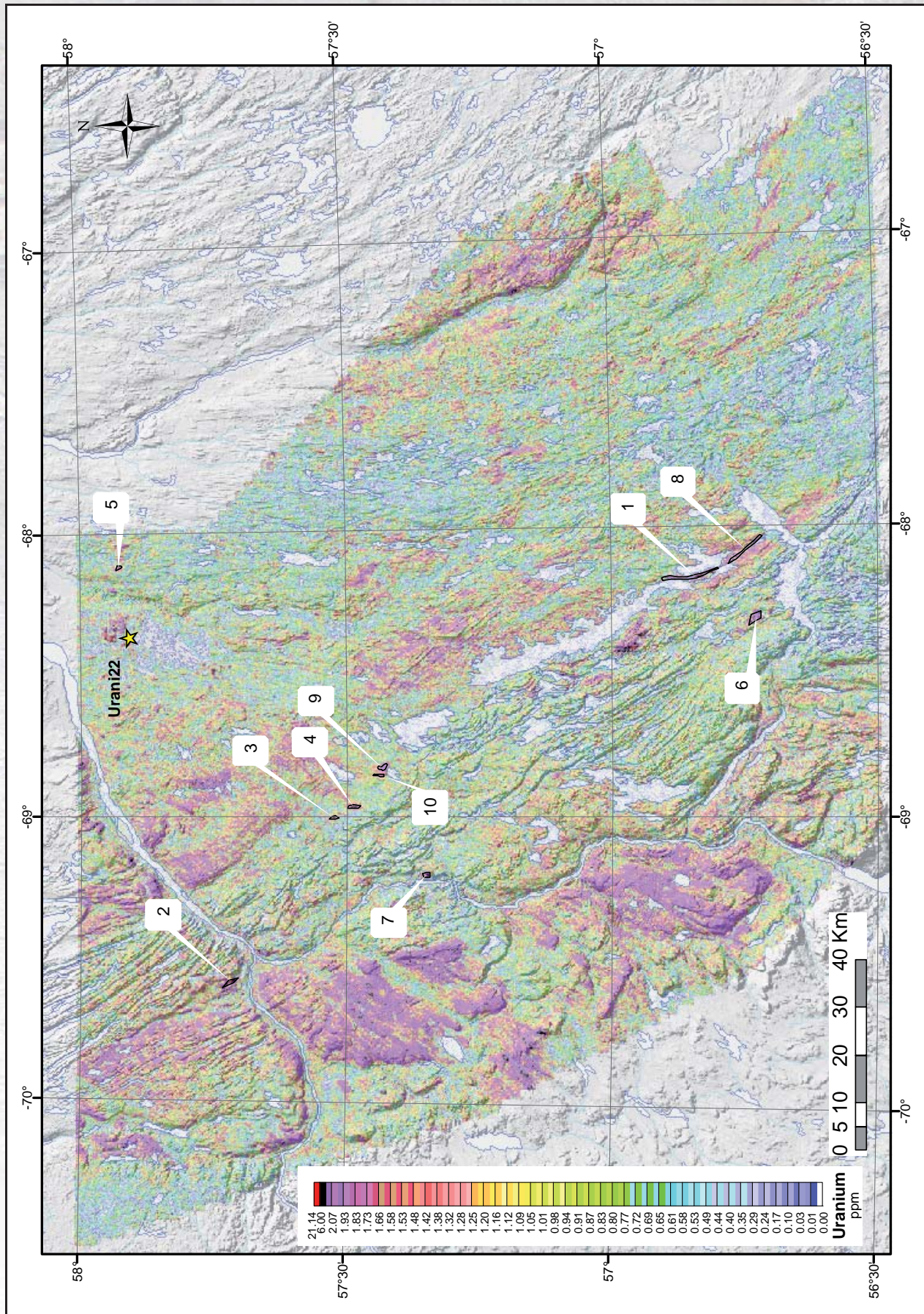
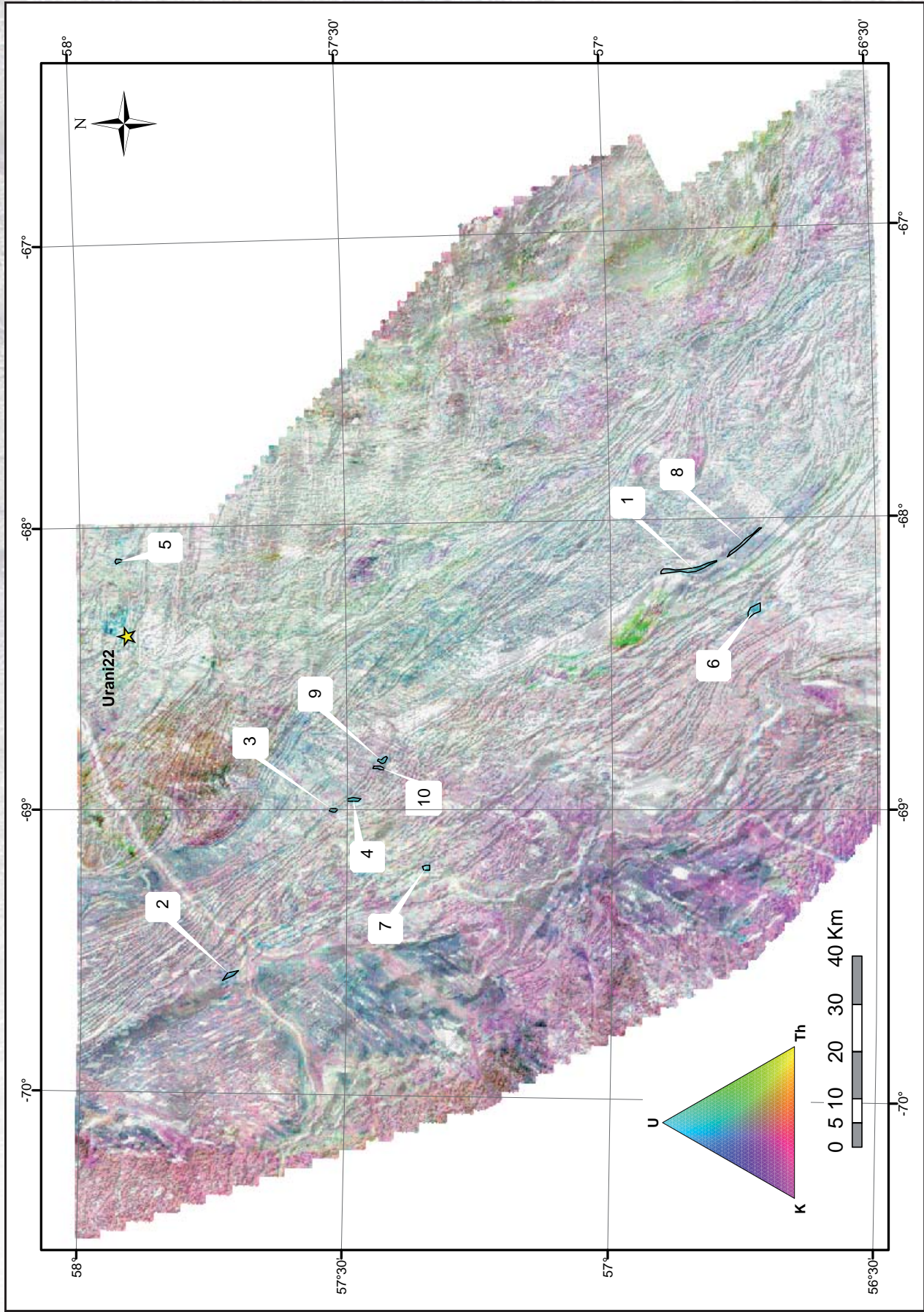


FIGURE 2 – Residual total magnetic field map and uranium exploration targets.



**FIGURE 3** – Equivalent-uranium values (ppm) superimposed on a shaded topographic relief map, and uranium exploration targets.



**FIGURE 4** – Ternary spectrometric image superimposed on a shaded relief map of the first vertical derivative of the magnetic field, and uranium exploration targets.

**TABLE 1** – Summary description of uranium exploration targets. These targets were unstaked as at January 17, 2012.

Target	Area (km <sup>2</sup> )	UTM, NAD 83, zone 20		Average value U (ppm)	Maximum value U (ppm)
		Easting	Northing		
1	6.71	550531	6301733	2.96	9.21
2	2.04	465343	6397551	3.26	7.04
3	1.03	499825	6375878	3.41	6.86
4	1.77	502099	6371753	3.33	6.10
5	0.85	552165	6421027	2.98	5.03
6	4.04	541924	6287624	2.74	4.91
7	1.24	487833	6356402	2.69	4.71
8	3.61	556196	6289686	2.16	4.38
9	1.56	510387	6365579	2.84	4.01
10	1.05	508752	6366408	2.39	3.31