Surficial geology and till geochemistry of Weasel Lake map area (105G/13), east-central Yukon

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ABSTRACT

Weasel Lake map area (105G/13) is located at the northwestern end of the Finlayson Lake belt (displaced Yukon-Tanana Terrane) and extends northward into ancient North American rocks. Several volcanogenic massive sulphide deposits including: Wolverine, Kudz Ze Kayah, Fyre Lake and the Ice, have been discovered in this part of Yukon-Tanana Terrane, which makes this region one of the most prospective areas of Yukon. Limited outcrop exposure, due to widespread Quaternary cover, has made prospecting challenging in many parts of this terrane, including Weasel Lake map area. Surficial geological mapping and till geochemical sampling was conducted in the map area to better understand its mineral potential. Ice-flow over the area trended at approximately 305° and remained topographically unobstructed through the last glacial maximum. As a result, basal till was deposited across most of the map area. Late glacial deposition of glaciofluvial sediment and meltout till was more common in the northeast part of the map and along the Pelly River. Results of the till geochemical sampling program highlighted anomalies in base-metal elements, platinum/palladium indicators, as well as a gold indicator suite, suggestive of epithermal mineralization.

RÉSUMÉ

La région de Weasel Lake (105G/13) se trouve à l'extrémité nord-ouest de la ceinture de Finlayson Lake (terrane de Yukon-Tanana exotique) et s'étend vers le nord dans des roches de l'Amérique du Nord ancienne. Plusieurs gîtes de sulfures massifs volcanogènes, comprenant les gisements Wolverine, Kudz Ze Kayah, Fyre Lake et Ice, ont été découverts dans cette partie du terrane de Yukon-Tanana, ce qui fait de cette région l'une des plus prometteuses du Yukon. Les affleurements limités, en raison d'une couverture étendue de dépôts quaternaires, ont compliqué la prospection dans de nombreuses parties de ce terrane, y compris la région de Weasel Lake. La cartographie géologique des dépôts superficiels et l'échantillonnage géochimique des tills ont été réalisés dans la région afin de mieux comprendre son potentiel minéral. L'écoulement glaciaire sur la région avait une orientation d'environ 305°, sans rencontrer d'obstacle topographique tout au long du dernier pléniglaciaire. Par conséquent, un till de fond s'est déposé sur la majeure partie de la région. Un dépôt tardiglaciaire de sédiments fluvio-glaciaires et d'un till de fusion était plus commun dans la partie nord-est de la carte et le long de la rivière Pelly. Les résultats du programme d'échantillonnage géochimique des tills ont mis en lumière des anomalies dans les métaux communs, les minéraux indicateurs de platine/palladium, de même que dans un cortège indicateur d'or, évoquant une minéralisation d'origine épithermale.

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INTRODUCTION

This paper provides the initial results for a till geochemistry and surficial geological mapping program in Weasel Lake map area (105G/13; Fig. 1). On-going exploration for base metals in the Finlayson Lake district has focused in areas of well exposed uplands and in drift covered lowlands. Large tracts of the northern part of Finlayson Lake map area are covered by glacial drift, which has less than ten percent bedrock exposure. An important tool for regional exploration in the Finlayson district has been the regional stream sediment geochemical database (RGS, Hornebrook and Friske, 1988). This database contributed to the discovery of the Wolverine deposit by revealing an anomalous zinc value in stream sediments. However, in areas of low relief, the concentration of streams is lower and many of the drainages have insufficient energy to erode through the glacial sediment cover to bedrock. Therefore, the RGS data is more sparse and somewhat diluted compared to data derived from the surrounding mountainous terrain (Fig. 2). The integration of till geochemical sampling and surficial geology provides geoscience information that is an alternative to the RGS data.

The 2000 surficial geology and till geochemistry sampling program aimed to define the mineral potential of the northwestern part of the Finlayson Lake map area (105G/13). This project is centred on the northwestern part of the displaced portion of Yukon-Tanana Terrane and straddles the Finlayson Lake fault zone into ancient North American rocks.

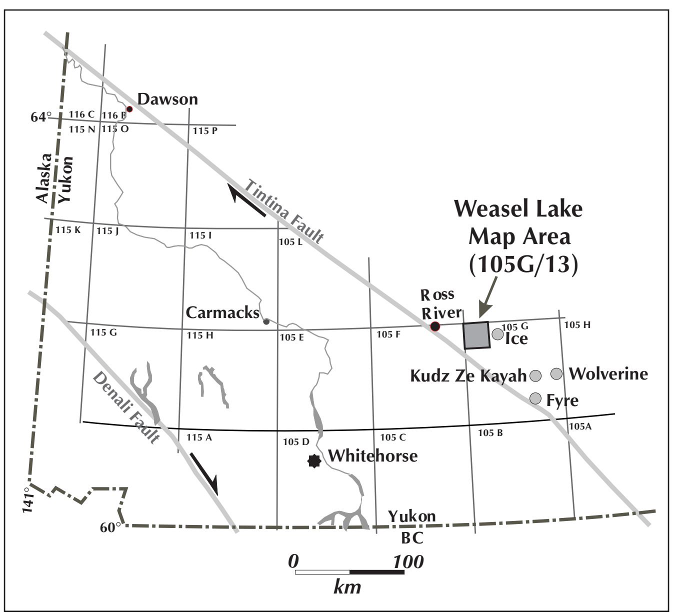

Figure 1. *Location of Weasel Lake map area. Local mineral deposits in Finlayson Lake map area (105G) are also indicated.*

PHYSIOGRAPHY AND GEOLOGIC SETTING

Weasel Lake map area is located in east-central Yukon, approximately 40 km east of Ross River (Fig. 1). The area lies within the Yukon plateau and is bound by the Pelly River and the Robert Campbell highway along the southern border. Low to moderate relief characterizes the map area (Fig. 3). Many drainages within the study area are internally drained, creating numerous small lakes. Drainages that exit the map area either flow north into the Ross River or south into the Pelly River. Local plateaus rise as much as 210 m above the lakes and in most places not more than 90 m. Highlands along the eastern border of the map rise 600 m above the lowlands, reaching a maximum elevation of 1685 m above sea level.

SOIL, VEGETATION AND PERMAFROST

Vegetation changes are a reflection of soil moisture conditions created by micro-topographic changes and surficial geology. Most low plateaus and valley bottoms consist of mixed white and black spruce with an understorey of willow and dwarf birch. Moisture traps are created in local depressions and are characterized by poor soil development, moss accumulations, black spruce, willow and a high permafrost table. Low relief landforms are better drained and typically have dry soils, well developed soil horizons, a low permafrost table, thin moss mats, white spruce, aspen and minor grass cover. Large, poorly drained areas blanket the inter-plateau valleys, especially in the southern two-thirds of the map area, and occur locally near many of the lakes. These areas have low-density black spruce forests with thick sphagnum accumulations, tussocks, willow, and commonly have standing water. South and southeast facing slopes are dominated by well drained soils, no permafrost, grasslands, aspen and varieties of shrubs. Numerous ages of fire-kill forests are present. The soil moisture conditions usually decrease in these areas due to the decreased insolation cover that results with the loss of spruce trees. This also results in a lower permafrost table for these areas.

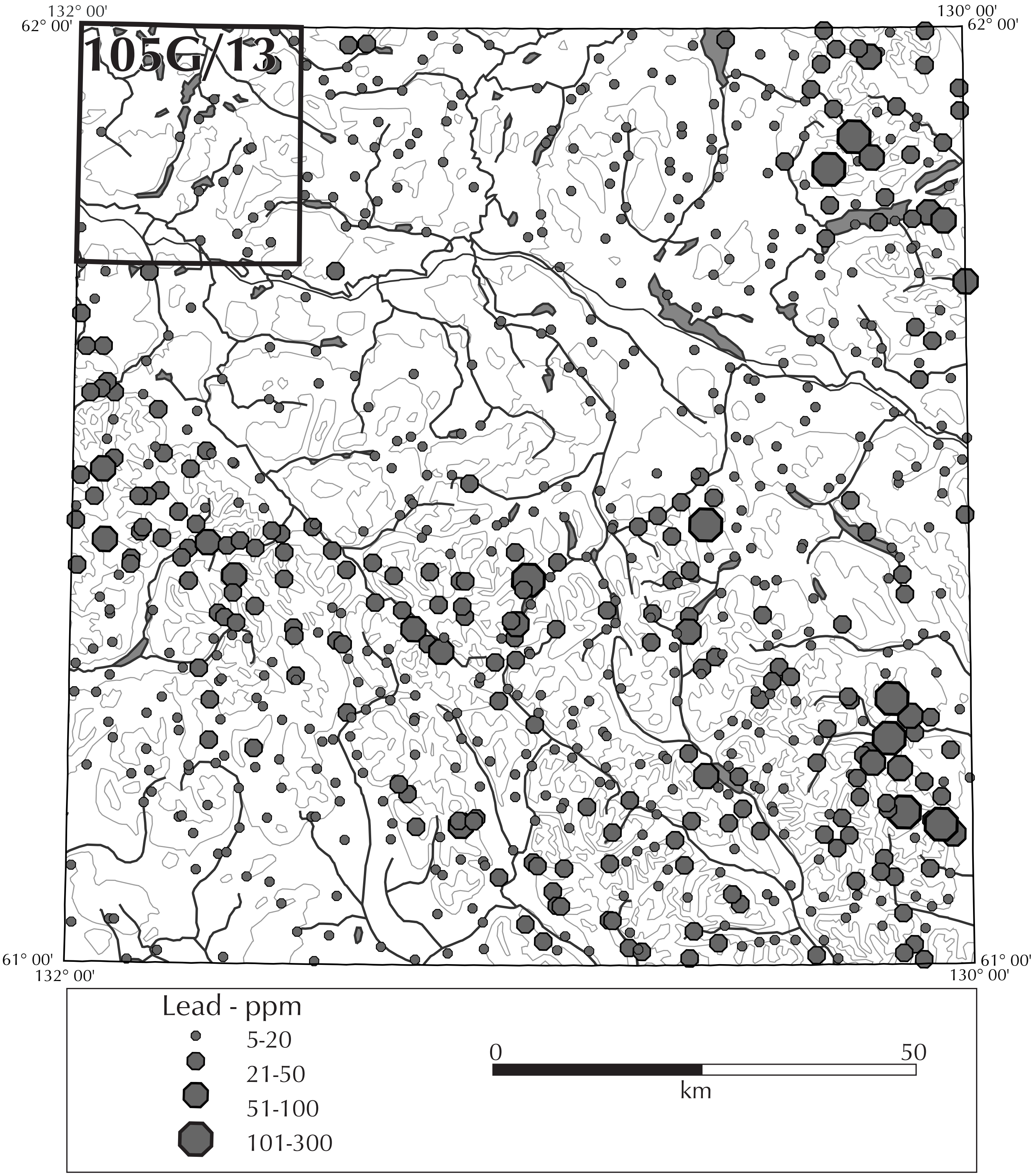

Figure 2. *The regional stream sediment geochemistry (RGS) for lead, Finlayson Lake map area (after Hornebrook and Friske, 1988). Note how anomalies are concentrated in areas of high topographic relief.*

Figure 3. The physiography of Weasel Lake map area, as shown in the above aerial photo, is characterized by low relief, numerous lakes and poor drainage.

***Figure 5.** Some of the youngest geologic units consist of Tertiary volcanic rocks in the north-central part of the map area. The cliff in this photo is approximately 15 m high.*

GEOLOGIC SETTING

Regional

Weasel Lake map area is located at the northwestern end of the displaced portion of Yukon-Tanana Terrane. Yukon-Tanana Terrane in the map area consists of Devonian/Mississippian quartzite and micaceous schist in contact with Carboniferous and Permian basalt, diorite, gabbro, greenstone, argillite and minor serpentinite (Fig. 4; Gordey and Makepeace, 1999). The outcropping serpentinite had not previously been mapped and can be found at the following UTM coordinates: 350200E 6863900N. The Finlayson Lake fault zone separates *in situ* Cassiar platform rocks from Yukon-Tanana Terrane (Fig. 4). Rocks north of the fault zone are poorly exposed. The most prevalent outcrops consist of lower Tertiary mafic basalt flows, necks and dykes (Fig. 5). Graphitic bedrock and a conglomerate unit were noted in the northwest corner of the map area in a region of undocumented geology.

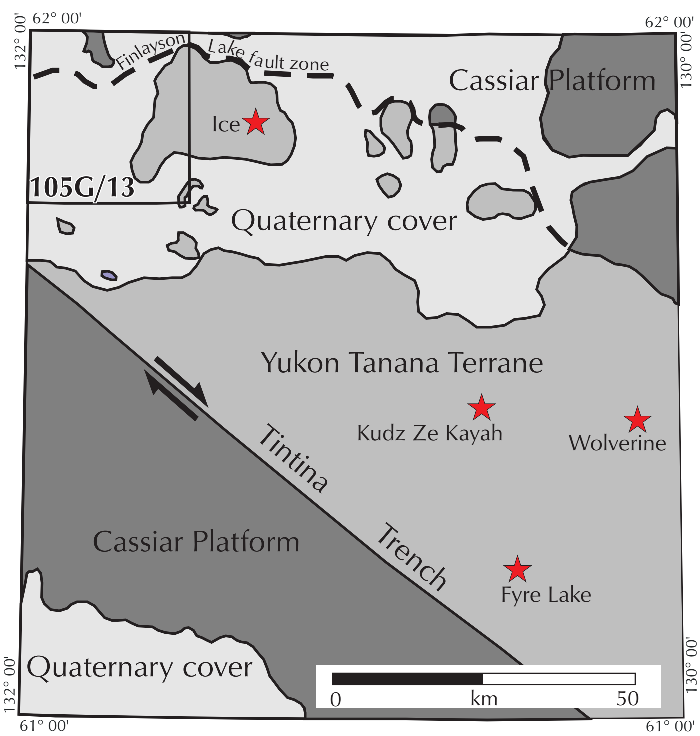

***Figure 4.** Geologic terranes of Finlayson Lake map area. Much of Weasel Lake map area consists of Yukon-Tanana Terrane. The northern third consists of Cassiar Platform or the ancient North American continental margin.*

Deposits

The Ice deposit (Fig. 1) is located 15 km east of Weasel Lake map area in igneous and sedimentary rocks of the Campbell Range belt. The deposit is categorized as a Cyprus-Besshi-style volcanogenic massive sulphide (VMS) deposit with a resource calculation of 4.5 million tonnes grading at 1.48% copper with minor gold, silver and cobalt (Fonseca, pers. comm., 2000).

MINFILE occurrences

Four mineral occurrences are located in Weasel Lake map area (105G 049, 050, 051 and 111; Yukon MINFILE, 1997). Drilling was conducted on the Dot property in 1977 (105G 051; Yukon MINFILE, 1997). The prospect was initially staked after mineralized float was found near a small diorite body. It is considered to be a VMS target.

Limited results have been reported from the remaining three prospects and are categorized as unknown occurrence types.

Mineral occurrences in the surrounding map areas include the Dol, Reno, Fault, Fred and Addison prospects immediately to the east of Weasel Lake map area and south of the Ice deposit (Yukon MINFILE, 1997). These are presumed to be VMS and sedimentary-exhalative (SEDEX) style occurrences located from aeromagnetic anomalies or by identifying mineralized float. To the north of Weasel Lake map area is the Bojo occurrence (105J 028; Yukon MINFILE, 1997), which is located in Selwyn Basin. These claims were staked based on airborne EM-magnetic anomalies and were projected to cover Anvil-type stratigraphy (Yukon MINFILE, 1997). To the west of Weasel Lake map area is the Bruce Lake occurrence (105F 050). Bruce Lake is considered to be an ultramafic-related prospect with its major commodities being Cu, Au and Ag (Yukon MINFILE, 1997). South of Weasel Lake map area is the Eldorado showing (105G 048), which is an ultramafic-related asbestos occurrence (Yukon MINFILE, 1997). The prospect was found by identifying mineralized float in an area of 12 m of overburden.

SURFICIAL GEOLOGY

The surficial geology component of the study consisted of terrain mapping at 1:50 000 scale. Examination of pre-existing surficial geology maps (Jackson, 1994) of the Pelly River area, provided the initial background for this larger-scale mapping program. Air photos at a scale of 1:40 000 were used in the map generation.

Six types of surficial deposit associations were observed in the map area including: organics, alluvium, colluvium, glaciolacustrine, glaciofluvial and glacial deposits (till). Bedrock accounted for less than ten percent of the total map area. General observations indicate that basal till is most widely distributed, whereas glaciofluvial and alluvial deposits occupy some valley bottoms and are particularly common in the northeast part of the map area. Colluvium is more common along the eastern border of the map, where the relief is steeper (Bond, 2000).

ORGANIC DEPOSITS

Organic deposits occur as a post-glacial accumulation of peat and decomposed woody debris. The spatial distribution of these deposits is wide ranging and varies according to topography. Widespread organic deposits are found near the base of the upland that borders the east side of the map area. Locally distributed organic deposits occur in the many small drainages that have limited catchments, marginal to lakes where drainage is poor, and on flat surfaces that have old growth black spruce forests. Permafrost is commonly within one metre of the surface and standing water may be present where surface permafrost has melted. Minor alluvium may be interbedded within the organic accumulation.

ALLUVIAL DEPOSITS

Alluvial deposits occur as post-glacial accumulations of fluvially deposited silt, sand and gravel. Two types of alluvial deposits have been classified and include: sand and gravel deposited along active stream beds, which may be subjected to seasonal flooding, and silt and sand deposited by low-volume streams that have poorly defined channels. The latter includes streams from small catchments or artisian sources that have limited energy for erosion and deposit fine-grained sediment. Landform associations include: alluvial fans, floodplains in small drainages, and low relief areas at the base of high relief north- or west-facing slopes.

Actively deposited coarse-grained alluvium is most common along the Pelly River and in one drainage located in the northeast part of the map area (Bond, 2000). Fine-grained alluvium is common in the east-central part of the map area.

COLLUVIAL DEPOSITS

Colluvium consists of any surficial deposit or bedrock that is remobilized by physical and chemical weathering and transported downslope under gravitational forces. Sediment that is commonly amassed in colluvial deposits includes: fractured bedrock, till and organics. The amount of each component depends on the topographic setting. Colluviation will be enhanced on north- and west-facing slopes where permafrost is commonly present.

Slopes that are prone to surface deposit colluviation are located intermittently along the eastern edge of the map area. Isolated colluvial deposits were also found on the flanks of small uplands elsewhere in the study area. These are commonly associated with resistant bedrock outcrops of basalt and greenstone, which create relatively steep slopes.

Figure 6. *Aerial photo of an esker in central Weasel Lake map area.*

GLACIOLACUSTRINE DEPOSITS

Glaciolacustrine deposits occur as deglacial accumulations of clay and silt that are deposited into lake basins by glacial meltwater. The deposits occur as laminated varves of clay, silt and minor sand. Sporadic drop-stones and coarse-grained mudflow deposits may be present if the lake was proximal to the ice sheet.

Glaciolacustrine deposits are found at depth in the Quaternary stratigraphy along the Pelly River (Jackson, 1994).

GLACIOFLUVIAL DEPOSITS

Glaciofluvial deposits are deposited by glacial meltwater and consist of regionally derived accumulations of sand and gravel. These types of deposits are found in two general sedimentary environments: proximal deposition in contact with the former glacier (glaciofluvial complexes) and distal deposition of outwash plains or channel deposits (glaciofluvial plains and terraces). Glaciofluvial complexes include landforms such as eskers, kames and kettled outwash surfaces (Fig. 6).

Glaciofluvial deposits are common along the Pelly River and in the northeastern part of the map area (Bond, 2000).

GLACIAL TILL

Glacial till consists of sediment that is deposited directly from the glacial ice. Deposition can occur at the base of the glacier in the form of basal till, or by a melting glacier as an ablation till. A till is loosely defined as a poorly sorted mixture of gravel, sand and mud deposited by a glacier (Eyles, 1983). There are, however, a wide range of depositional environments in which poorly sorted sediments are produced. These are especially important to be aware of since different tills will have different transport distances associated with them. The three most common types of till observed in the study area were basal lodgement, basal meltout and ablation tills. Basal lodgement and basal meltout tills are deposited directly from the base of the ice sheet and consist of sediment that has relatively short transport distances ranging from 1–8 km. This is the primary medium sampled for till geochemistry studies. In contrast, ablation tills are deposited where a melting ice sheet remained stagnant

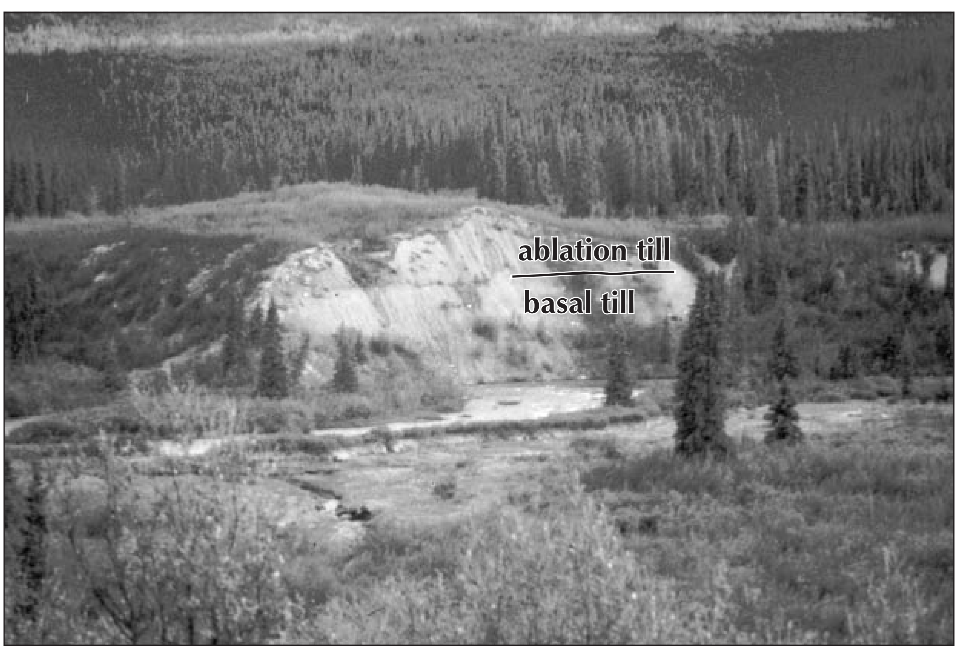

Figure 7. *Stream-cut exposure showing ablation till (deglacial sediment) overlying basal till (glacial maximum sediment) in the upper McMillan River valley, northeast of Weasel Lake map area.*

for an extended period of time. This allows for extensive thicknesses of meltout debris to be deposited. Ablation till is a collection of sediment that is composed of material carried within different levels of the former ice sheet. Initially, when the ice begins to melt, a basal meltout till is deposited. As the ice continues to melt, sediment that is carried within the ice (englacial) and sediment carried on the surface of the ice sheet (supra-glacial) is deposited onto the basal strata (Fig. 7). Blocks of glacial ice are also incorporated into the sediment package and create a hummocky topography after melting. Sediment derived from the englacial and supraglacial strata of the former ice sheet is typically far travelled and not representative of underlying bedrock.

In Weasel Lake map area, basal tills have been categorized into two divisions based on presumed thickness. Basal till veneers are less than one metre in thickness and are commonly found on plateau summits and on slopes that faced into the direction of glacial flow. Basal till blankets are greater than one metre in thickness and are often mapped in local depressions and on slopes that are in the lee direction to the advancing ice sheet. Basal till blankets are widespread across the map area (Bond, 2000).

Ablation tills are mapped as till complexes and also include minor deposition by glaciofluvial processes. Till complexes are common in the northeast part of the map area and are often located near glaciofluvial complexes.

QUATERNARY GEOLOGIC HISTORY

The late Wisconsinan McConnell glaciation and the current Holocene interglacial period are the most recent Quaternary events to impact the Weasel Lake area. These two periods can account for the current surficial geological setting.

McCONNELL GLACIATION

Ice accumulation in east-central Yukon occurred in the Selwyn mountains at the divide with the Northwest Territories, and in the Pelly Mountains to the south (Fig. 8). Weasel Lake map area is located approximately 75 km northwest of a regional ice divide that developed during the last glaciation (Jackson, 1994). The ice divide (Fig. 8) corresponds roughly with the current hydrologic divide between Yukon River and Liard River drainages.

Ice flow through the Weasel Lake area at glacial maximum was between 300° and 310°. Streamlined landforms such as crag and tails, and glacial grooves in bedrock, provide the evidence for the ice flow history. No variations in ice flow due to topographic control were noted. It is presumed that during glacial maximum, ice

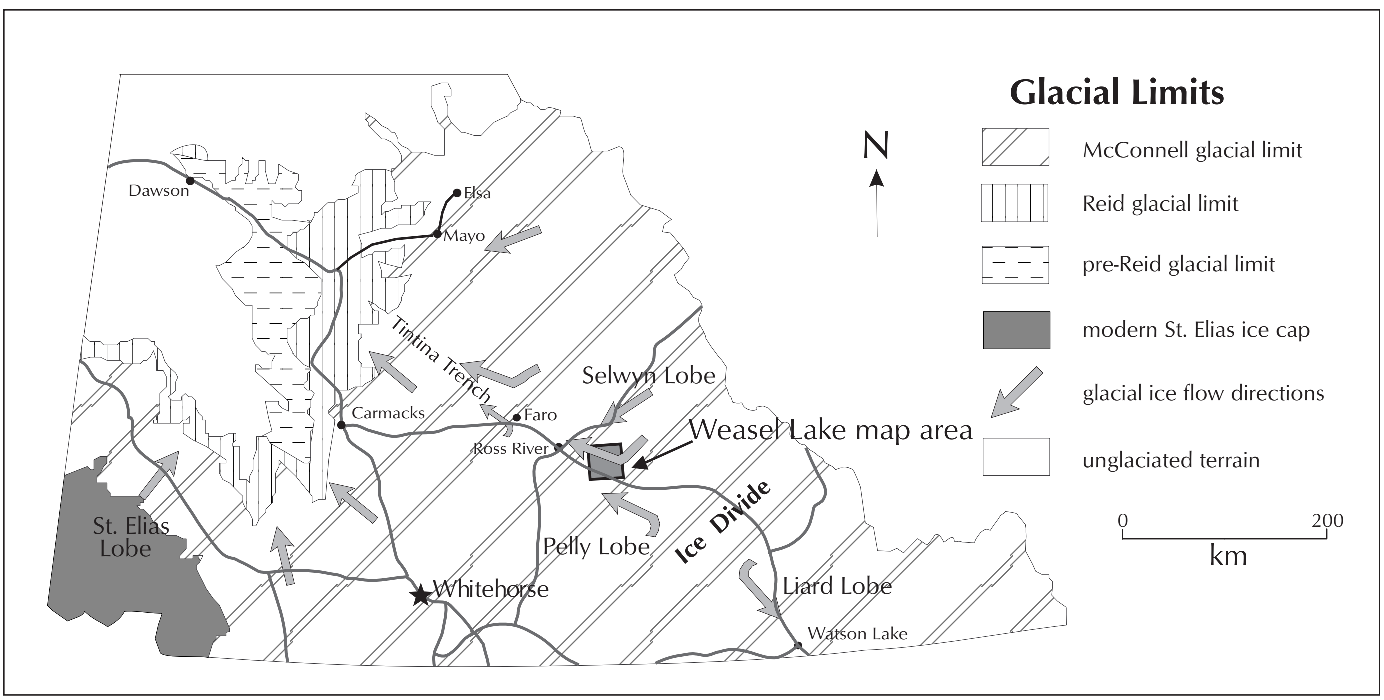

Figure 8. *Glacial limits, ice centres and ice-flow patterns for southern Yukon.*

flow was relatively rapid because of the low topographic relief. The abundance of streamlined landforms also supports this conclusion.

During the waning stages of the glaciation, the ice sheet thinned and became topographically controlled. Evidence of valley-confined ice-flow is present only in the southeast corner of the map area where the topography is higher. Some late stage fluctuations in ice flow occurred in the northeast corner of the map area where stagnating ice persisted.

The Pelly River valley was a focus for glacial deposition at the end of the McConnell glaciation. Stagnating ice persisted in the valley, and as a result, deposited thick packages of meltout debris. As a regional topographic low, the valley also acted as a major conduit for meltwater drainage. The combination of deposition and drainage resulted in a damming of meltwater and the creation of pro-glacial lakes. A succession of lakes, in contact with the ice, formed as the ice retreated east towards Finlayson Lake. Finlayson Lake is dammed behind one of these sediment accumulations and is a remnant of the post-glacial environment.

HOLOCENE

Holocene erosion has been most significant in the Pelly River valley. Incision into the deglacial sediment package has created a series of terraces bordering the modern floodplain. Drainages emanating from the eastern highlands have also incised into glacial deposits. Elsewhere in the map area, erosion has been minimal due to the overall low hydrologic flow.

SURVEY METHODOLOGY

SAMPLE COLLECTION

Initial work consisted of compiling and evaluating existing surficial geology maps, bedrock geology maps, geophysical maps and MINFILE occurrences. Air photographic interpretation also preceded fieldwork and provided a guide to the distribution of surficial deposits.

Fieldwork was based from camps established on ten different lakes in the map area (Fig. 9). Access to the area and between camps was provided by a Beaver floatplane. A Zodiac was used to access traverse starting points. No roads, other than the Robert Campbell highway in the southwest corner of the map area, are present within the study area. All samples were collected during daily foot traverses from the lakeshore. Till samples were collected along crude traverse lines oriented perpendicular to sub-perpendicular to the former ice-flow direction. This enabled maximum geochemical coverage of the underlying geology.

At each sample station, a 2-kg bulk sediment sample was collected for geochemical analysis. Emphasis was placed on sampling basal lodgement till, although colluviated basal till and basal meltout till were also collected. Hand excavation was used to expose the C-horizon sediment or unweathered parent material (Fig. 10). On average, the pit depth was 55 cm. Natural exposures were uncommon in the map area. In addition to the 2-kg bulk sample, fifty pebbles were collected in a separate bag to be used for a lithological record.

Figure 9. *Typical base-camp in the northern part of Weasel Lake map area.*

Figure 10. *Hand pit exposing a basal lodgement till in the study area. This is ideal surficial sediment for till geochemistry studies. On well drained sites such as this, the organic horizon is thin and permafrost is usually absent near the surface.*

The following information was recorded onto data sheets at each sample site: UTM coordinates, elevation, slope, aspect, surficial map unit, topographic position, bedrock, drainage, vegetation, soil properties (i.e., density, oxidation, depth and presence of permafrost), matrix properties (i.e., percent matrix, colour and texture), and a basic clast shape description (Fig. 11).

Additional information that was recorded in the field included the location of outcrops (some samples were taken), general bedrock descriptions, and presence and orientation of glacial ice-flow features.

SAMPLE PREPARATION AND ANALYSIS

Till samples were dried, sieved and assayed by Acme Analytical Laboratories in Vancouver, British Columbia. Sample preparation included drying 1 kg of sample at 60 °C, followed by splitting and sieving to produce a –63 micron or –230 mesh fraction. A 30 g sample of the –63 micron fraction was subsequently analysed for 37 elements by aqua regia digestion – Ultratrace-ICP mass spectrometer. This method offers near total precious and base metal data, but acts as a partial leach for rock-forming elements. As a result, the measured element concentrations for Cr, Fe, Mg, S, Sr and Ti are lower than the actual concentrations in the till. Detection limits for the elements are shown in Table 1.

Figure 11. *Site data was recorded on field forms that were later entered into an Access database. This type of information will be integrated into the digital surficial geology map for release in 2001.*

QUALITY CONTROL

METHODOLOGY

Distinguishing geochemical trends caused by geological changes from those variations due to sampling or analytical errors is important for reliably interpreting regional till geochemical data (Bobrowsky et al., 1998). The quality control methodology for this project was adapted from the British Columbia Geological Survey. In every block of 20 samples, two field duplicates and one control standard were inserted. The control standards are CANMET reference standards collected and prepared at the Mineral Resources Division of the Geological Survey of Canada. They are inserted into the data set for use as 'known' samples to test the precision of the analytical lab. The field duplicates consist of an additional sample collected at random from one in every ten till sampling stations. These duplicates are used to test geochemical variation within the till. No analytical duplicates (sieved splits) were included because Acme Analytical conducted both the processing and the assaying. In total, the quality control consisted of 16 pairs of field duplicates and 9 control standards in the 175 samples collected.

Table 1. *Detection limits for the elements analysed by ICP-MS in this study.*

Element	Detection limit		Element	Detection limit	
Au	0.2	ppb	**Mo**	0.01	ppm
Ag	2	ppb	**Na**	0.001	%
Al	0.01	%	**Ni**	0.1	ppm
As	0.1	ppm	**P**	0.001	%
B	1	ppm	**Pb**	0.01	ppm
Ba	0.5	ppm	**S**	0.02	%
Bi	0.02	ppm	**Sb**	0.02	ppm
Ca	0.01	%	**Sc**	0.1	ppm
Cd	0.01	ppm	**Se**	0.1	ppm
Co	0.1	ppm	**Sr**	0.5	ppm
Cr	0.5	ppm	**Te**	0.02	ppm
Cu	0.01	ppm	**Th**	0.1	ppm
Fe	0.01	%	**Ti**	0.001	%
Hg	5	ppb	**Tl**	0.02	ppm
Ga	0.02	ppm	**U**	0.1	ppm
K	0.01	%	**V**	2	ppm
La	0.5	ppm	**W**	0.2	ppm
Mg	0.01	%	**Zn**	0.1	ppm
Mn	1	ppm			

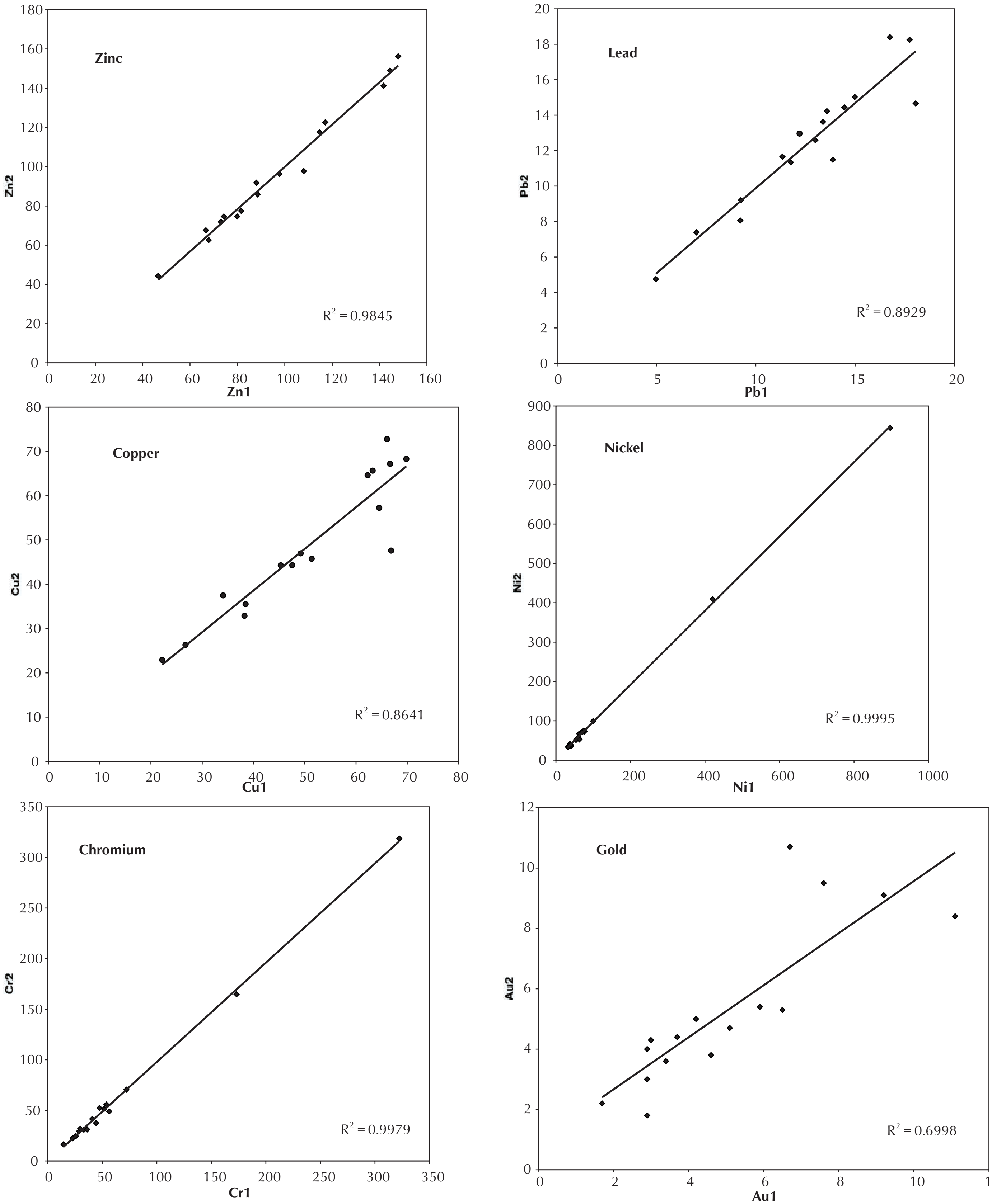

Figure 12. *Bivariate scatter plots of the field duplicate data for selected elements.*

Scattered plots of the field duplicate pairs were generated to facilitate quality control evaluation (Fig. 12). The results show good correlation between the field duplicate pairs, with the correlation coefficients ranging from 0.6998 to 0.9995. The degree of correlation depends somewhat on the presence of anomalous outliers in the data set. For nickel and chromium, the correlation coefficients are higher for this reason. Gold shows the least amount of correlation within the field duplicates. This is expected because of the nugget effect.

TILL GEOCHEMISTRY – DATA INTERPRETATION

The elements presented here are considered to be significant for exploration purposes in the Weasel Lake area. The results, with the exception of one sample site (JB00-155), are media specific and compare only basal till or colluviated basal till. This ensures that the parent materials sampled are local in origin. Transport distances are on the order of tens of metres to a few kilometres depending on the sample setting. See Appendix I for a sample location map and the related element concentration maps.

COPPER

The 175 samples collected and analysed by ICP-MS provided copper concentrations ranging from 11.72 ppm to 128.73 ppm. The samples generated a mean of 47.47 ppm; the median value is 44.29 ppm. The four highest values, corresponding to values above the 97^{th} percentile, are discussed below.

The highest concentration of copper, 128 ppm, is recorded from a basal till sample collected in the northwest corner of the map area from station JB00-156. The sample was collected from a till veneer (48 cm thick) that overlies graphitic schist bedrock. The colour of the till strongly reflected its dark bedrock source. The source area for the elevated copper is most likely within a hundred metres 'up ice-flow' of the sample station. The significance of this value may be rated somewhat lower than lesser values that occur in thick till because of the proximity of bedrock to the surface. In other words, the geochemistry of the till and the bedrock may not vary significantly and this is not an especially high value for a bedrock assay. Further sampling of bedrock and till in this area is warranted to verify this assumption.

The second highest copper value, 110 ppm, is obtained from station JB00-046. This sample was collected from an area with a high permafrost table. A frost boil was sampled that had the texture of a basal till. The matrix, however, had a micaceous feel, and numerous angular clasts were found. It is believed that this sample may be derived from fault gouge and as a result, is composed of local bedrock. Similar to JB00-156, the significance of this sample may be rated lower than a sample derived from thicker till cover.

Figure 13. *Exposure of basal till in the western part of Weasel Lake map area. The section thickness is approximately 40 m.*

The third highest copper value, 96 ppm, was obtained from a basal till sample collected from station JB00-064. This station is located on the former Neck claims. A source for this anomaly is likely located within two kilometres in the up-ice flow direction of the sample station. This station also boasts appreciably high mercury, zinc and silver values.

The fourth highest concentration of copper, 94 ppm, was recorded from a basal till sample collected at station JB00-050. The station is located down-ice flow from the ASSIST claims, which is a likely source area for the anomaly. This station also has a relatively high silver concentration.

ZINC

Zinc concentrations ranged from 43.8 ppm to 348.6 ppm. A mean value of 103.57 ppm and a median value of 97.05 ppm result from this distribution. The five highest values (>97^{th} percentile) are discussed below.

The highest concentration of zinc, 348 ppm, was collected from a basal till sample in the central part of the map area at station JB00-047. A potential source for the anomaly may be derived from the ASSIST claims that are located in the up-ice flow direction. The source may also be located closer to the sample station. Zinc values from JB00-050 and 051, immediately down-ice flow of the ASSIST claims, are not elevated in zinc, which suggests the potential source for JB00-047 is nearby. Follow-up sampling should be completed to confirm this.

The second highest concentration of zinc, 337 ppm, was recorded from a colluviated basal till veneer collected from station JB00-006. The source for the till sampled at this station is most likely to have a local origin. A potential source probably lies within one kilometre up-ice flow. Outcrop in the vicinity also suggests a thin surficial cover and a local origin for the anomaly.

The third highest zinc anomaly, 210 ppm, was recorded from station JB00-156, which also had the highest copper value. As mentioned previously, this sample was derived from a thin till cover and therefore the geochemistry is a direct indication of local bedrock geochemistry. This station is located in ancient North American rocks of the Cassiar Platform and therefore SEDEX-style mineralization may be the target for this anomaly.

The fourth highest zinc anomaly, 187 ppm, is recorded from station JB00-127. This anomaly is located proximal to an extensive Tertiary basalt outcrop at the north end of Weasel Lake. No other elements are anomalous with this sample. An origin for the anomaly is likely north of the Pin claims.

The fifth highest concentration of zinc, 171 ppm, was recorded from a 40-m exposure of basal till at station JB00-076 (Fig. 13). A high percentage of graphitic or black shale clasts occur within the till and some oxidized clasts were also present. A source for the anomaly is most likely to be between JB00-076 and JB00-084. JB00-084 is 2.5 km up-ice flow from the sample station and only weakly anomalous in zinc. Similar clasts in till were also found less than 1 km away at JB00-077. The geochemistry at this sample station is weakly anomalous in zinc (134 ppm). Relatively high lead and silver were also associated with JB00-076.

LEAD

The mean concentration of lead in the 175 samples was 13.34 ppm. The median value was 12.93 ppm. The four highest lead values, corresponding to values above the 97th percentile, are discussed below.

The highest concentration of lead, 36 ppm, is recorded from a basal till sample collected in the northwest corner of the map from station JB00-159. The source area for the elevated lead is most likely within 2 km in the up-ice flow direction. Numerous angular and subangular clasts were noted within the till, which suggests a relatively proximal source. Two additional anomalous lead values (22 ppm) were encountered nearby at stations JB00-155 and JB00-157.

The second highest concentration of lead, 30 ppm, was collected from station JB00-054 in the central part of the map area. The sample was taken from a veneer of basal till, which suggests a proximal source for the anomaly, probably within 1 km.

The third highest lead value, 24 ppm, was collected from station JB00-076. This site was discussed previously and has an anomalous zinc concentration (171 ppm).

The fourth highest concentration of lead, 23 ppm, was collected from station JB00-048. The anomaly may be originating from the ASSIST claims, which are located 2 km from the station. Numerous strongly oxidized clasts were noted within the soil profile.

GOLD

Gold concentrations were calculated as part of the ICP-MS process and were not derived from fire assay. The mean and median concentrations of gold are 5.14 ppb and 4.7 ppb, respectively. Values ranged from 0.9 ppb to 28.9 ppb for the 175 samples analysed. The four highest gold values are discussed below.

The highest concentration of gold, 28.9 ppb, was recorded from a mudflow-like deposit in the northwest corner of the map area at station JB00-155. The sample was collected on a small peninsula in a lake that was noted to have a highly oxidized soil, visible from a distance. A source for the anomaly is either from a small valley that drains into the lake from the west, or possibly at depth beneath the peninsula. The highest values for each of As (484.5 ppm), Sb (151.37 ppm), Hg (21020 ppb), Tl (1 ppm) and Ag (1374 ppb) originate from this sample station.

These pathfinder elements support an epithermal gold deposit geochemical model. In this model As, Sb, Hg and Tl surround and overlie the Au ore-bearing zone (Hoffman, 1986). If this style of mineralization existed, then the strong presence of these indicator elements suggests that the potential Au ore-bearing zone may be intact at depth or immediately west of this pathfinder element anomaly. A knob of bedrock was noted immediately west of this sample site and consisted of what appeared to be a conglomerate. Similar fragments of a conglomerate were also noted in the soil sample taken at JB00-155. Re-examination of this outcrop and the pebbles within the sample material should be undertaken. The matrix within the conglomerate pebbles appears to have an angular texture and it is presently unclear whether it is of sedimentary origin or hydrothermal fluid origin. A possible source for the hydrothermal fluid may be related to the Tertiary extrusives in the area. Major faults in the area that would assist in the migration of fluids include the Finlayson Lake fault zone. See the section on mercury for more information about this station.

The second highest concentration of gold, 13.8 ppb, was collected from JB00-047. This sample site was mentioned earlier and has elevated Zn, Pb and Cd concentrations.

The third highest concentration of gold, 12.7 ppb, was collected from an area of elevated Cu, Ni and Cr. The sample was collected at station JB00-110 from the tail of a crag and tail landform; the crag consisted of an outcrop of quartzite. Numerous angular clasts were noted in the till which suggests a strong geochemical influence from local bedrock.

The fourth highest concentration of gold, 12.0 ppb, was recorded from station JB00-050. This sample site is located immediately down-ice flow of the ASSIST claims. This sample also has elevated Cu (94 ppm) and Ag (1006 ppb) values.

SILVER

Concentration of silver ranged from 35 ppb to 1374 ppb. Mean and median values of 283.14 ppb and 231 ppb, respectively, are present. The three highest values are discussed below.

The highest silver value, 1374 ppb, was recorded from station JB00-155 and was discussed earlier in the section on gold.

The second highest silver value, 1153 ppb, was obtained from station JB00-076. This station was also discussed earlier as it has relatively high zinc and lead concentrations.

The third highest silver value, 1023 ppb, was recorded from station JB00-106 in the south-central part of the map area. Numerous angular clasts were noted in the soil profile, which suggests a relatively proximal source for the anomaly.

MERCURY

The 175 samples collected provided mercury concentrations ranging from 5 ppb to 21020 ppb. The samples generated a mean of 326.68 ppb and a median of 152 ppb. The outlying value of 21020 ppb accounts for the large difference between the mean and median. The four highest mercury values are discussed below.

The highest concentration of mercury, 21,020 ppb, located at JB00-155, has been discussed under the gold section.

Presently, it is uncertain which state mercury occurs in in the surficial environment at station JB00-155. The state may provide some clues about a source for the anomaly. Mercury in the form of cinnabar would have the ability to be transported as a heavy mineral; cinnabar is the most stable state for mercury in a mudflow environment. Alternatively, mercury may be transported as a vapour along brecciated zones within faults. The sample was derived from a soil matrix of clayey sand, which may have acted as a trap for a secondary concentration of mercury vapour being dispersed from beneath the sample site. The third possibility is that mercury was transported in groundwater as a soluble form of mercury to form a hydromorphic anomaly. This may put the source area to the west of the station where there is a small drainage and some topographic relief. This would be a similar source area as the mudflow hypothesis.

The clayey texture of the matrix at this station has a waxy feeling that resembles the texture of fault gouge. If this material is fault gouge, then it is probable that its surface expression lies some distance from its original source area. Initial work should concentrate upslope from the anomalous station and in the small drainage to the west-northwest.

The next four highest mercury values, 1981 ppb, 1970 ppb, 1164 ppb and 1062 ppb are clustered 6 km southeast of JB00-155 at stations JB00-062, JB00-063, JB00-074, and JB00-064, respectively. These stations are located in the vicinity of the Finlayson Lake fault zone and are adjacent to the Tertiary mafic volcanics. Zinc values in the 90th percentile range are also associated with these high mercury anomalies. A source for these anomalies is uncertain and may be related to the Finlayson Lake fault zone. Additional epithermal gold prospects should be considered in the northwestern part of Weasel Lake map area.

CHROMIUM

Chromium concentrations ranged from a minimum of 11.7 ppm to a maximum of 367.9 ppm for the samples included in this report. A mean value of 52.96 ppm and a median value of 40.25 ppm result from this distribution. The highest four values are discussed below.

The highest concentration of chromium, 367 ppm, was recorded from station JB00-046. The sample was collected from a frost boil and may consist of fault gouge material that was brought to surface by cryoturbation. This station was discussed in the section on copper.

A cluster of high chromium values is recorded in the east-central part of the map area. Mafic basalts underlie the area and outcrop is relatively abundant. The highest values from this area were 328 ppm, 322 ppm, and 250 ppm, recorded from stations JB00-114, JB00-112 and JB00-111, respectively. All samples were collected down-ice flow from local outcrops and therefore are likely representative of local geology. Corresponding anomalous nickel values are also present at these stations. Assaying did not include platinum group elements.

NICKEL

Nickel concentrations range from 13 ppm to 897 ppm for the samples discussed in this report. The mean nickel concentration is 81.36 ppm and the median value is 58.25 ppm. The four highest nickel values, corresponding to the 97th percentile of the data set, are discussed below. A reminder that for rock forming elements such as nickel, chromium, iron and magnesium, this method acts as a partial digestion. Therefore actual nickel values measured in the till and presented below are lower than true concentrations.

The highest concentrations of nickel are clustered in an area of outcropping mafic basalt in the east-central part of the map area at station JB00-112. Anomalous chromium values are also present at these sites. The highest nickel value, 897 ppm, is derived from basal till located on a till ridge down-ice flow from a basalt crag. A source for the anomaly is likely located within 1.5 km of the sample station, towards the bedrock crag.

The next three highest nickel concentrations, 433 ppm, 411 ppm and 338 ppm, are located within 2 km of JB00-112. These sample stations are JB00-114, JB00-110 and JB00116 respectively. The source for these anomalies is derived locally from the outcropping mafic basalts.

An oxidized basalt erratic was sampled between stations JB00-013 and JB00-014 in the south-central part of the map area. Assay results from a standard rock assay using ICP-ES returned values of 1478 ppm nickel, 871 ppm chromium and 19.93% magnesium.

SUMMARY AND RECOMMENDATIONS

This study integrated surficial geology mapping with till geochemical sampling as a drift exploration program. The aim of this data is to provide a good regional-scale study of the mineral potential for this drift-covered region.

Much of the area is overlain by till, glaciofluvial deposits, alluvium, colluvium and deposits of organics. Sporadic outcrops are found throughout the map area and are more common in the highlands along the eastern boundary. Permafrost is localized to poorly drained areas and on north- and west-facing slopes. Much of the till coverage in the map area consists of basal lodgement or basal meltout till. These deposits are ideal for till geochemistry. Ablation till is more common in the northeast part of the map area and is unsuitable for till geochemistry.

During the McConnell glaciation, ice flowed northwest between 300° and 310° over the study area. The source for the ice was the northern part of the Cordilleran ice sheet, and an ice divide located east of Finlayson Lake. The ice-flow direction varied little during the glaciation. Some deviations occurred during deglaciation when the ice became valley-confined in the highlands along the eastern boundary of the map area. Post-glacial erosion has been mostly restricted to the Pelly River and to local drainages emanating from the highlands. Overall, little displacement or erosion of the glacial sediment has occurred within the map area.

A total of 175 bulk basal till samples were collected from Weasel Lake map area for the till geochemistry study. The till sample density averaged one per 4 km^2 for the total survey area. This level of sample density provides a high level of regional information for future exploration.

The samples taken for geochemical analysis were representative of either basal till or colluviated basal till. ICP-MS instrumentation combined with an aqua-regia digestion were used to analyse the –230 mesh fraction of the till samples. The geochemical results indicated numerous anomalies in base metals, gold and platinum group pathfinders. They include:

- Potential epithermal gold mineralization in the northwest corner of the map area. This is supported by a multi-element anomaly in Hg, Sb, Ag, As, Au and Tl at station JB00-155. This may be related to the Finlayson Lake fault zone and Tertiary mafic volcanics in the area.
- Base metal anomalies in zinc and copper in the western part of the map area. Anomalies occur both within Yukon-Tanana Terrane and in ancient North American rocks of the Cassiar Platform. Most anomalies are not associated with current claim holdings in the area.
- Clusters of platinum group element pathfinders in the northeast part of the map area. These coincide with mafic basalts.

ACKNOWLEDGEMENTS

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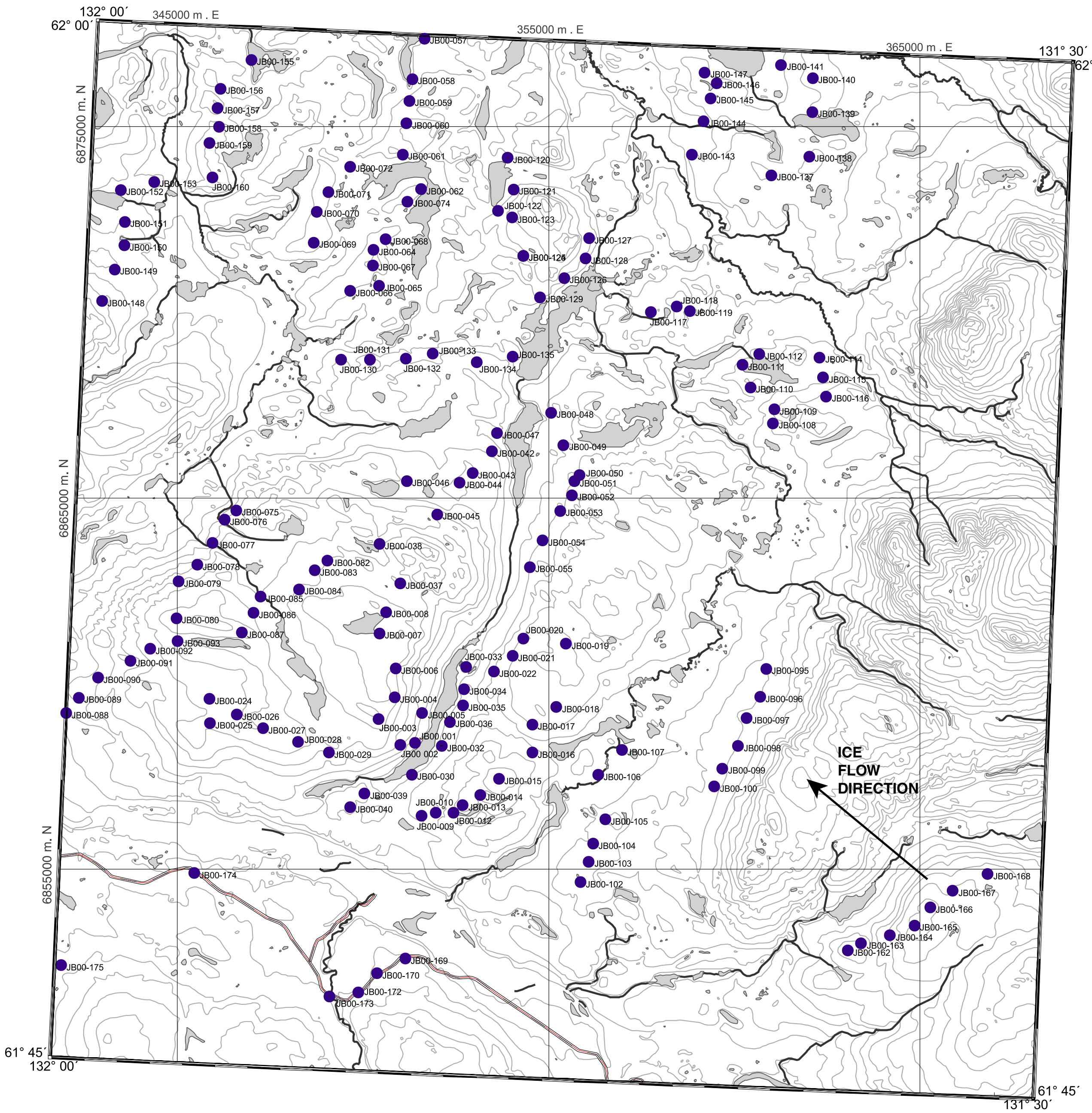
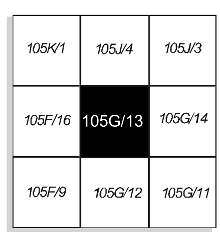
APPENDIX 1





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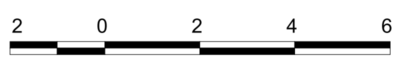
Sample Locations



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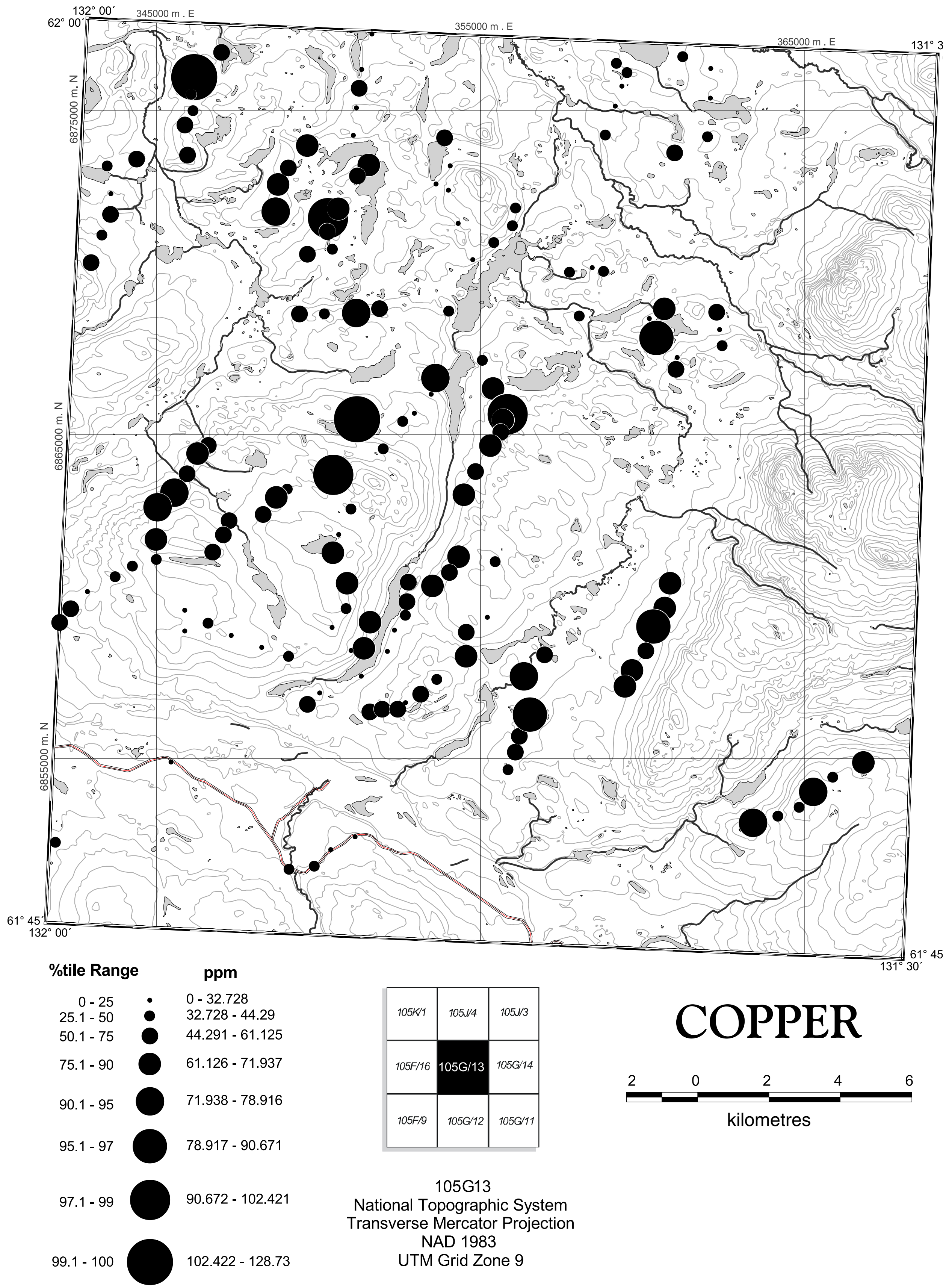
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ppm
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44.291 - 61.125
75.1 - 90
61.126 - 71.937
90.1 - 95
71.938 - 78.916
95.1 - 97
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97.1 - 99
90.672 - 102.421
99.1 - 100
102.422 - 128.73
105K/1
105J/4
105J/3
105F/16
105G/13
105G/14
105F/9
105G/12
105G/11
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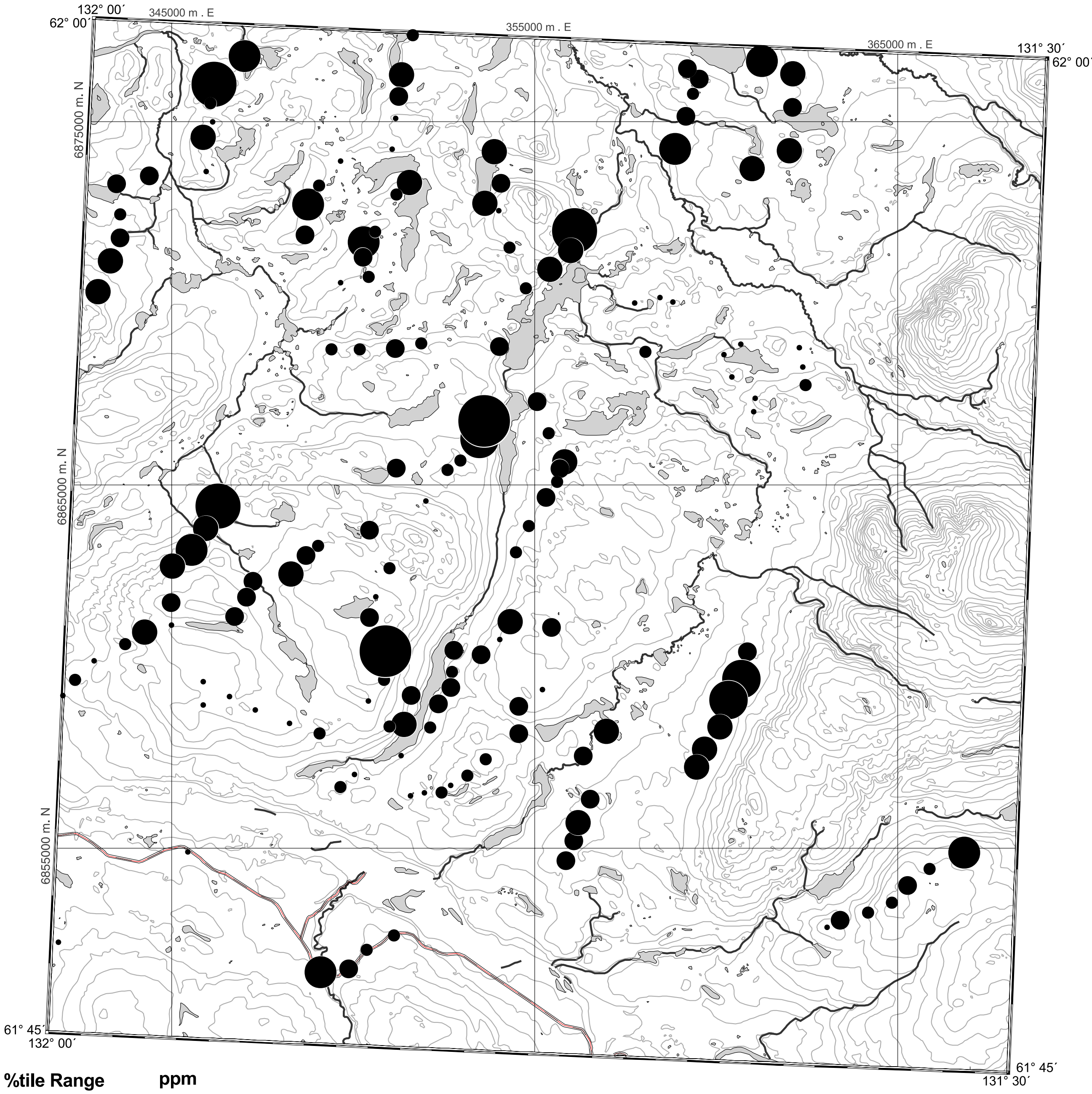

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95.1 - 97	162.721 - 168.982
97.1 - 99	168.983 - 262.552
99.1 - 100	262.553 - 348.6

105K/1	105J/4	105J/3
105F/16	105G/13	105G/14
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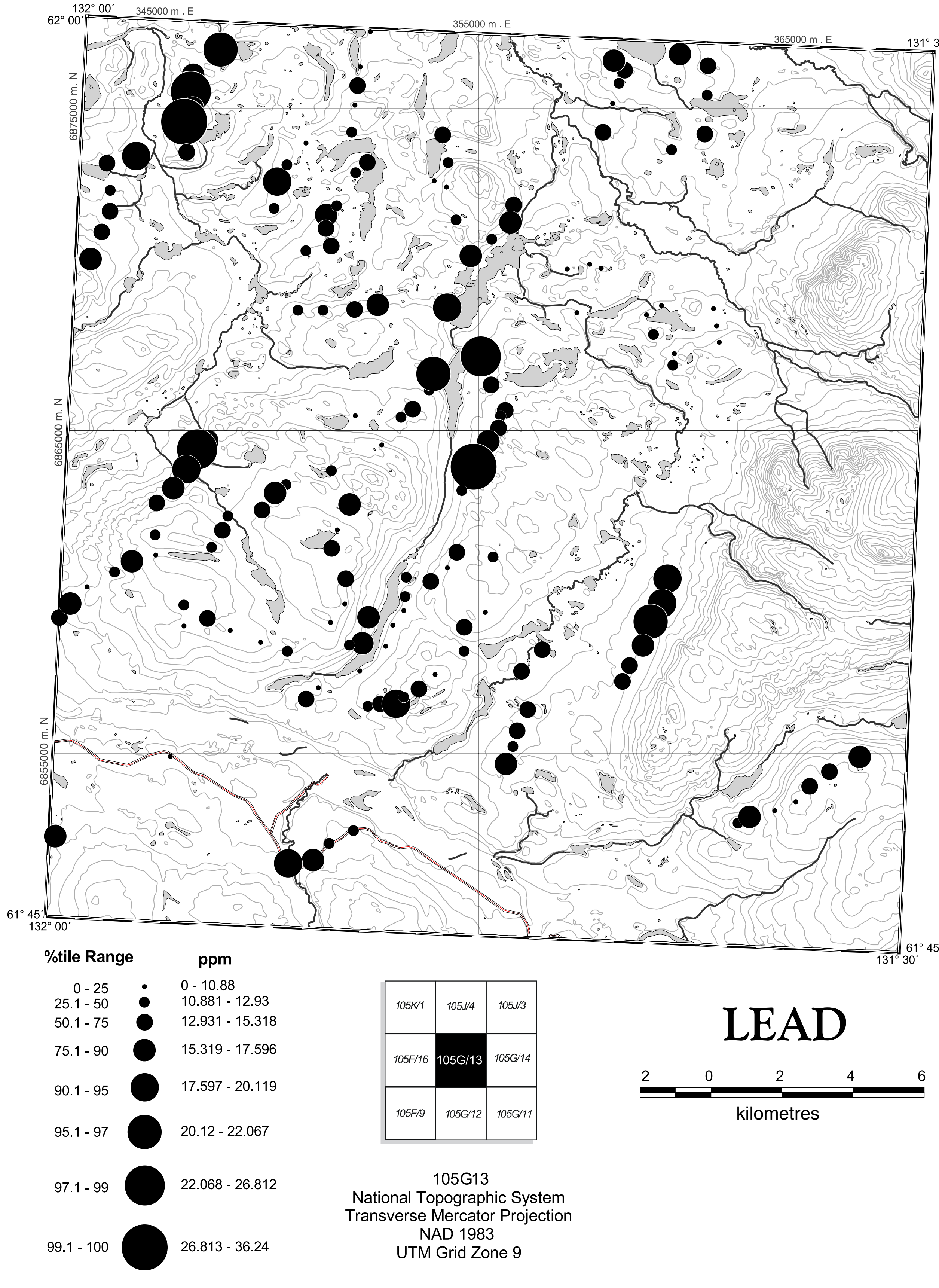

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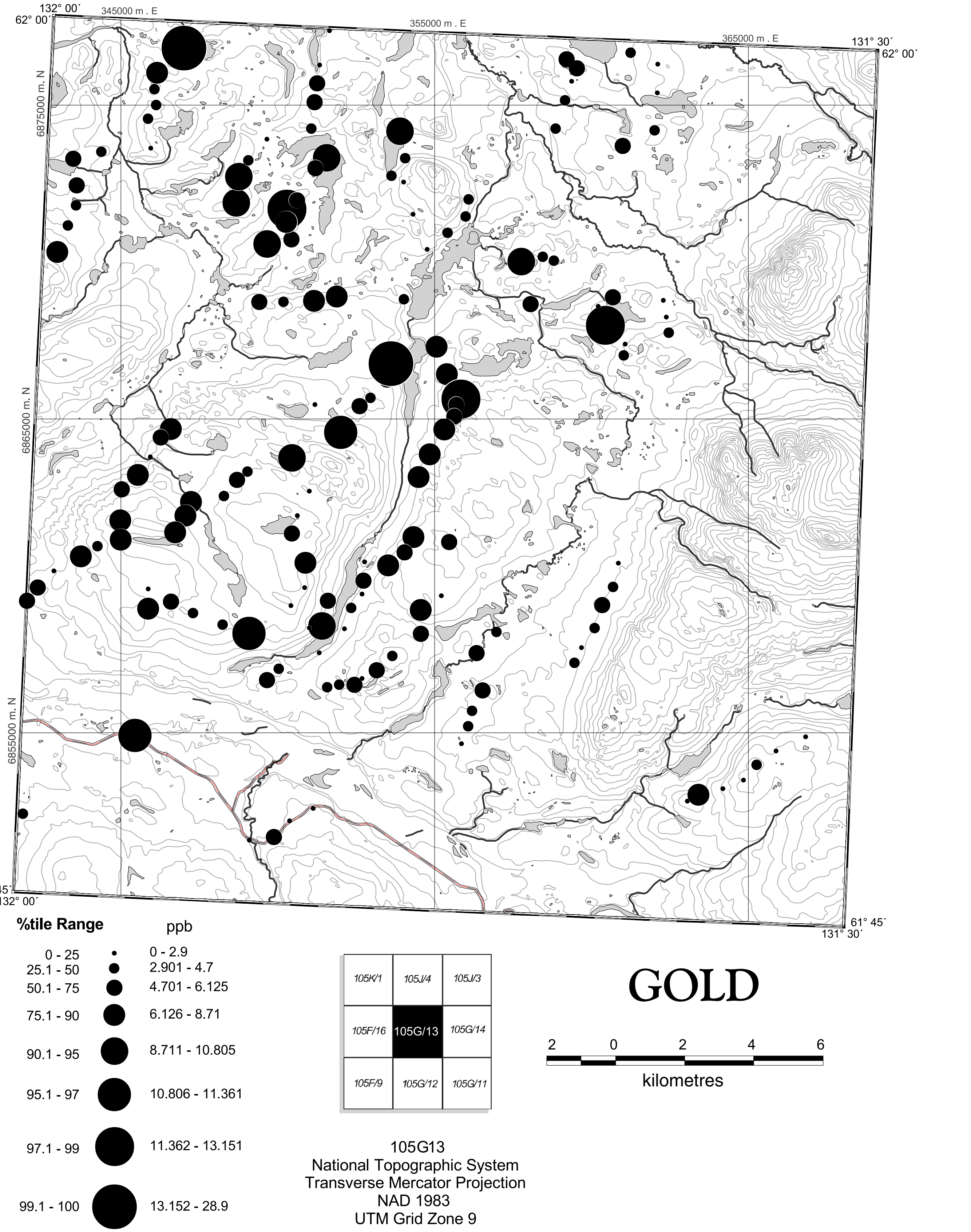
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ppb
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2.901 - 4.7
50.1 - 75
4.701 - 6.125
75.1 - 90
6.126 - 8.71
90.1 - 95
8.711 - 10.805
95.1 - 97
10.806 - 11.361
97.1 - 99
11.362 - 13.151
99.1 - 100
13.152 - 28.9
105K/1
105J/4
105J/3
105F/16
105G/13
105G/14
105F/9
105G/12
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GOLD
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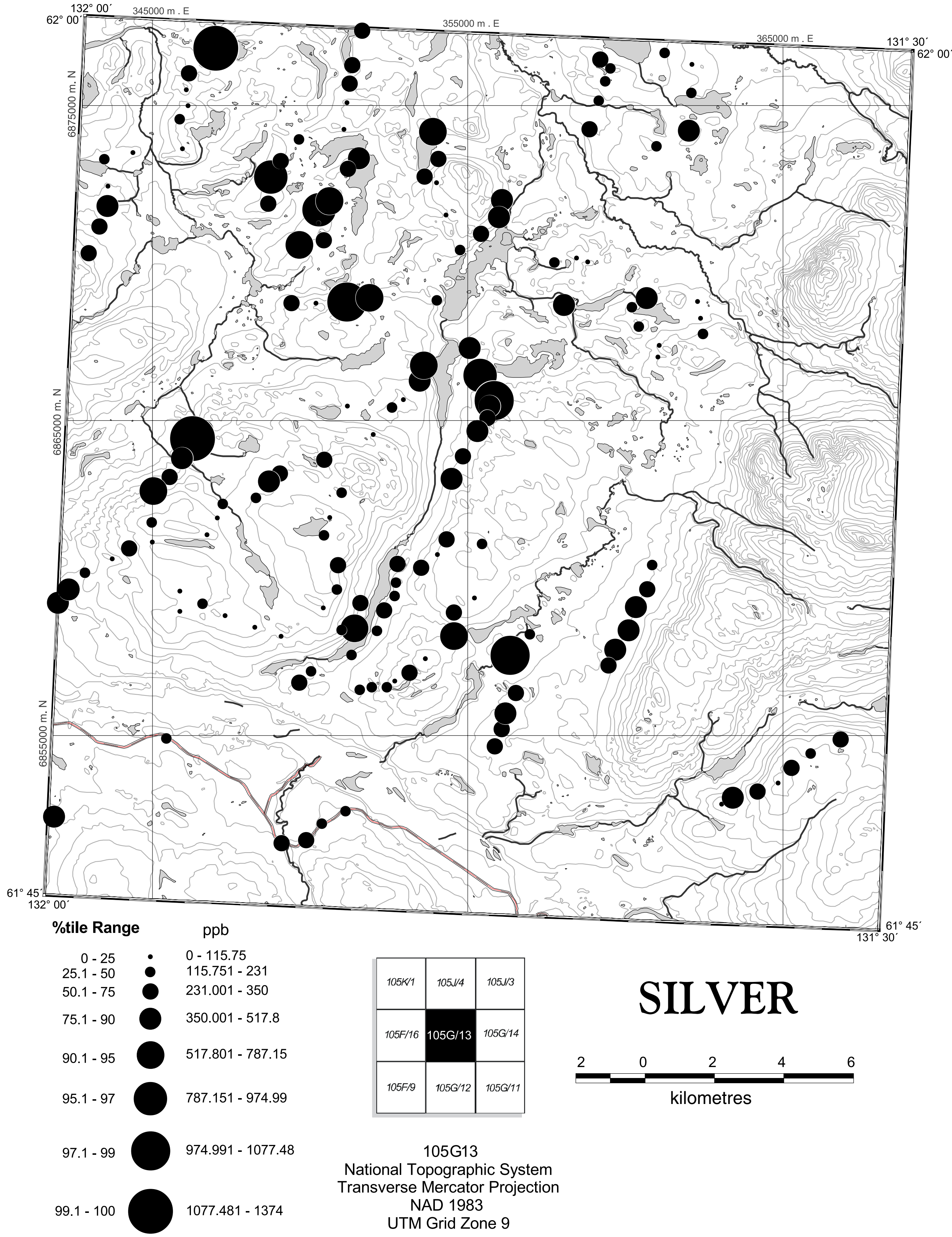
kilometres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105K/1
105J/4
105J/3
105F/16
105G/13
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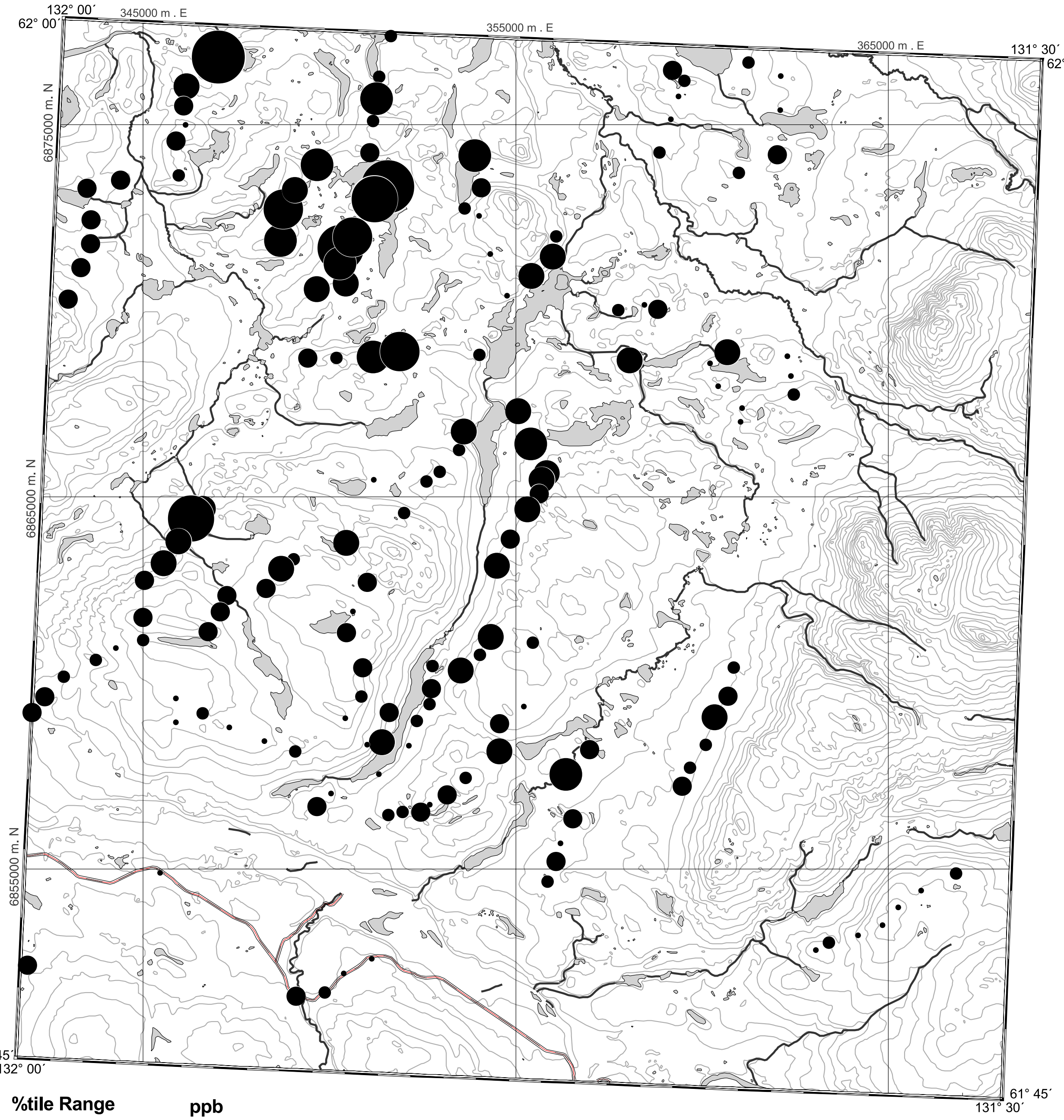

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95.1 - 97	529.651 - 889.44
97.1 - 99	889.441 - 1498.97
99.1 - 100	1498.971 - 21020

105K/1	105J/4	105J/3
105F/16	105G/13	105G/14
105F/9	105G/12	105G/11

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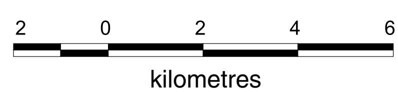
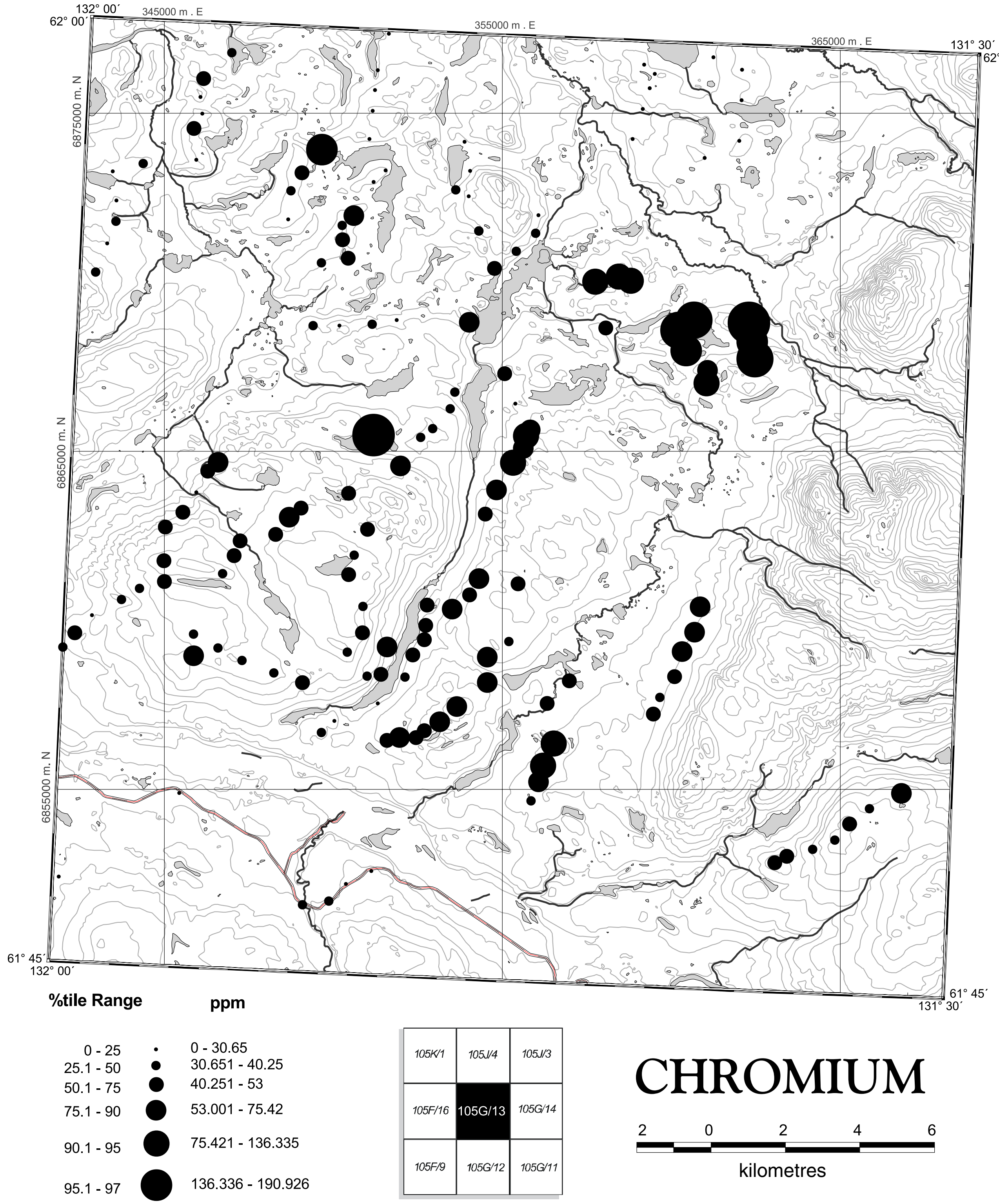
MERCURY





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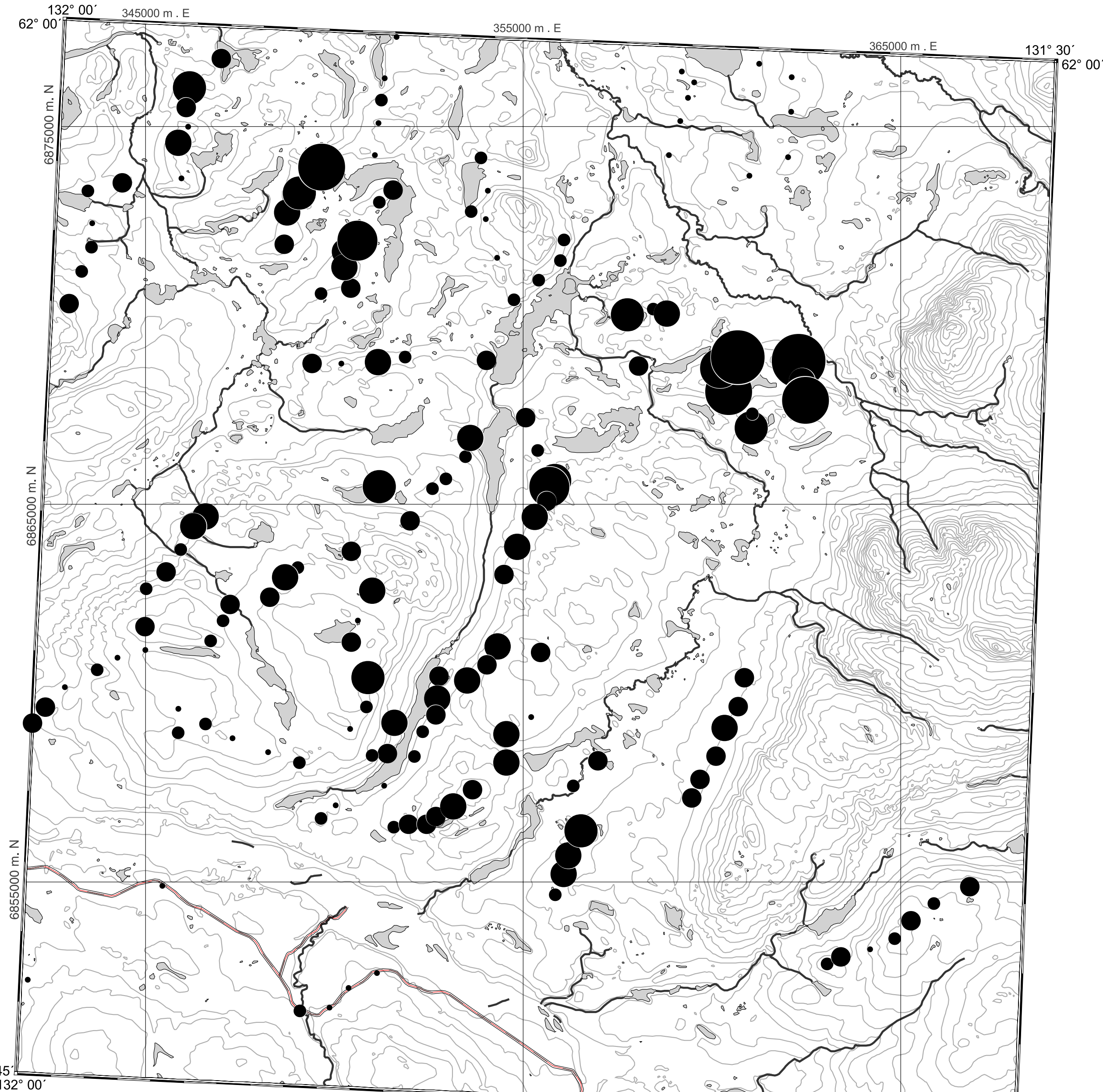

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90.1 - 95	123.481 - 172.745
95.1 - 97	172.746 - 284.4
97.1 - 99	284.401 - 426.089
99.1 - 100	426.09 - 897.2

105K/1	105J/4	105J/3
105F/16	105G/13	105G/14
105F/9	105G/12	105G/11

105G13
National Topographic System
Transverse Mercator Projection
NAD 1983
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NICKEL

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kilometres