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Preliminary Release of Kimberlite-Indicator Mineral Data from National Geochemical Reconnaissance Stream Survey Sample 84C-2004-BS-1004, Haig Lake area (NTS 84C/16), Southern Buffalo Head Hills, Alberta

Alberta Energy and Utilities Board
Alberta Geological Survey

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Abstract

In 2004, a National Geochemical Reconnaissance Survey (NGR) stream sediment and stream water geochemical survey was undertaken by the Geological Survey of Canada (GSC) and Alberta Geological Survey (AGS) in the northern and southern parts of the Buffalo Head Hills of north-central Alberta. Results from the 2004 survey augment NGR data obtained in the Buffalo Head Hills area during 2001, 2002 and 2003.

Preliminary kimberlite-indicator mineral data are released in this report for stream sediment bulk sample 84C-2004-BS-1004, collected in 2004 within the Haig Lake (84C/16) map area. The reader is cautioned that

(i) data from other samples collected in the area are not contained within this report,
(ii) not all of the data from sample 84C-2004-BS-1004 are provided, and
(iii) the data that are reported have not been subjected to all of the usual NGR quality control checks.

However, the results for sample 84C-2004-BS-1004 are believed to have mineral exploration significance, and an early release of information was deemed appropriate.

The source of the kimberlite-indicator mineral grains recovered from sample 84C-2004-BS-1004 may remain to be discovered. The nearest known kimberlite is located 30 km to the east.

1 Introduction

In 2004, a National Geochemical Reconnaissance Survey (NGR) stream sediment and stream water geochemical survey was undertaken by the Geological Survey of Canada (GSC) and Alberta Geological Survey (AGS) in the northern and southern parts of the Buffalo Head Hills of north-central Alberta. The 2004 survey included the collection of samples in the Haig Lake map area (NTS 84C/16) in the southern Buffalo Head Hills (Figure 1). Results from the 2004 survey augment NGR data obtained in the Buffalo Head Hills area during 2001, 2002 and 2003 (Friske et al., 2003; McCurdy et al., 2004). The Buffalo Head Hills Upland forms a northerly trending region lying between the Peace River Lowland (Cadotte Plain) to the west and the Wabasca Lowland (Loon Lake Plain) to the east (Pettapiece, 1986). Access to sample sites was mainly by helicopter from La Crete for the northern survey area, and Red Earth Creek for the southern survey area.

Partial, preliminary kimberlite-indicator mineral data from sample 84C-2004-BS-1004 are released in this report. Sample 84C-2004-BS-1004 is a bulk sample composed mainly of sand-sized material collected in the Haig Lake map area (84C/16) in the southern Buffalo Head Hills (Figure 2, Figure 3). The reader is cautioned that

(i) data from other NGR samples collected in the area (2004 and pre-2004) are not contained within this report,
(ii) not all of the data from sample 84C-2004-BS-1004 are provided, and
(iii) the data that are reported have not been subjected to all of the usual NGR quality control checks.

However, the results for sample 84C-2004-BS-1004 are believed to have mineral exploration significance and an early release of information was deemed appropriate.

This NGR project is aligned with Alberta's plan for a multi-year, multi-disciplinary geochemical and indicator mineral study in the northern part of the province. The Geological Survey of Canada, under the Targeted Geoscience Initiative II (TGI II) and Northern Resources Development Program, and the Alberta Energy and Utilities Board/Alberta Geological Survey (EUB/AGS) funded the 2004 survey. Analytical results and field observations contribute to building a national geochemical database for resource assessment, mineral exploration, geological mapping and environmental studies. Sample collection, preparation procedures and analytical methods are strictly specified and carefully monitored to ensure consistent and reliable results regardless of the area, the collection year or the analytical laboratory undertaking the analyses.

2 Geological Setting

The stream from which sample 84C-2004-BS-1004 was collected drains an area of glaciofluvial sediment, stagnant ice moraine (ablation till) and eolian sand (Paulen et al., 2004). The underlying bedrock consists of Upper Cretaceous shale and silty shale of the marine Smoky Group (Green et al., 1970; Hamilton et al, 1999; Figure 2)

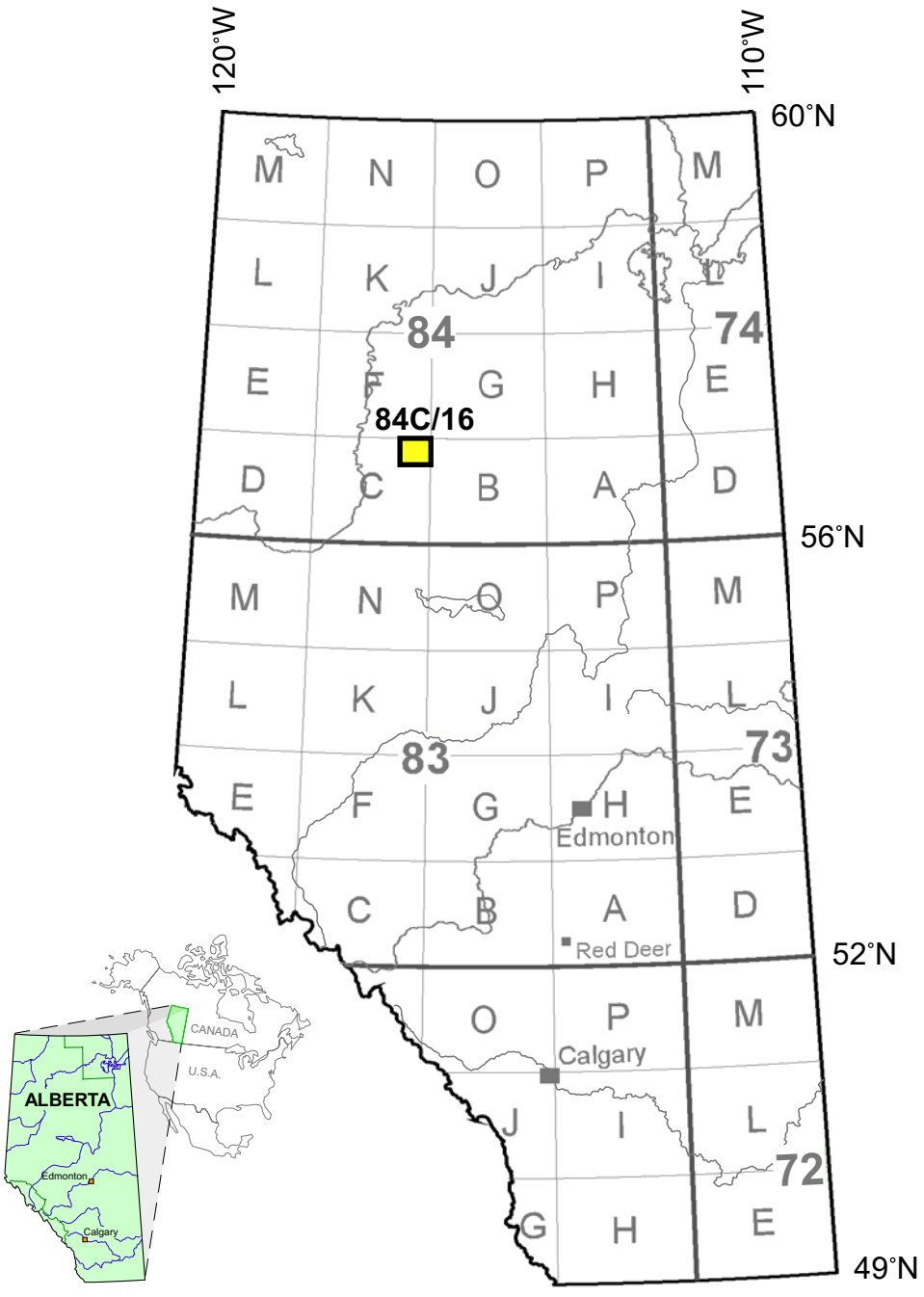

Figure 1. Alberta map showing location of the Haig Lake map area (84C/16).

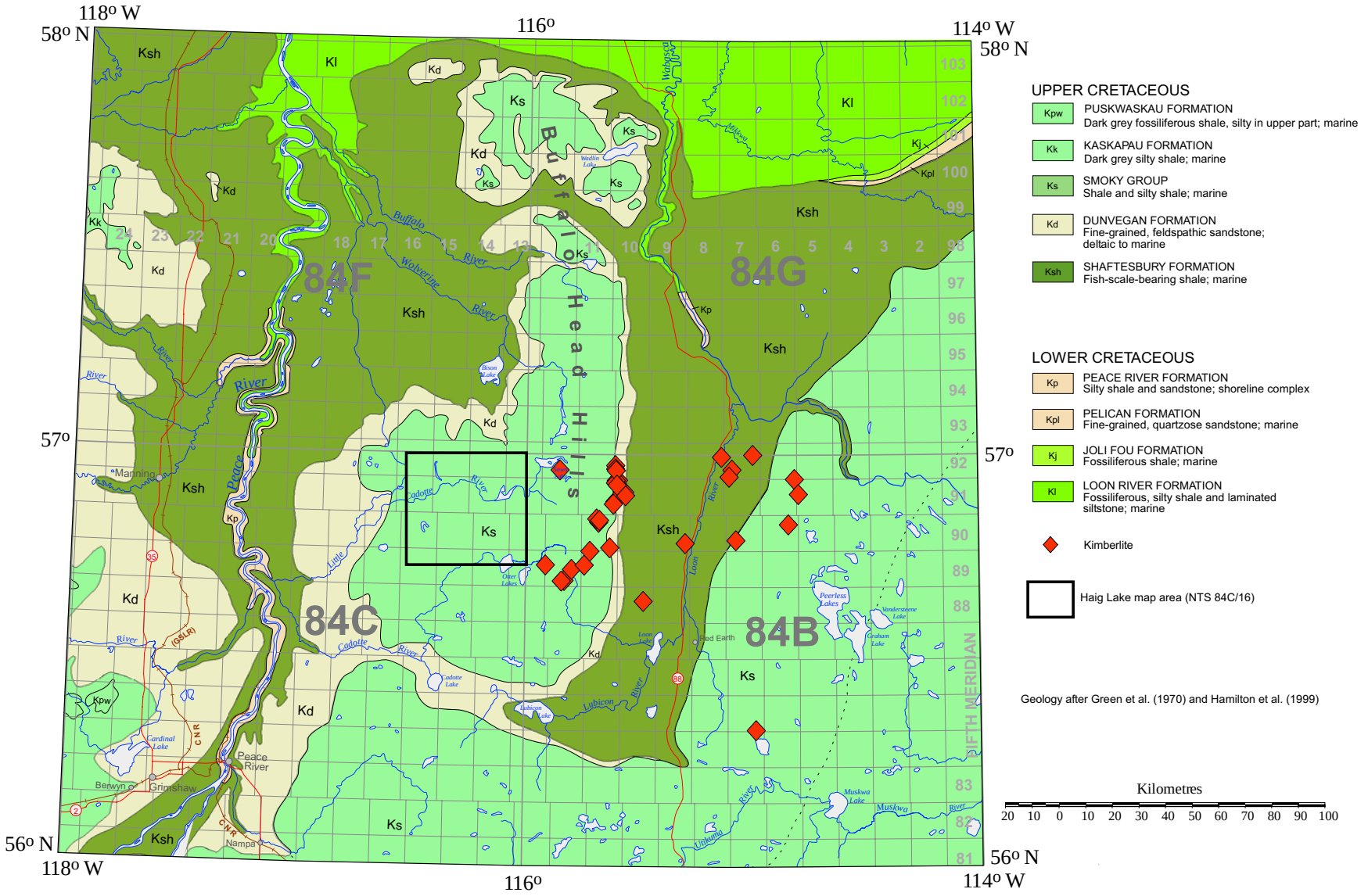

Figure 2. Bedrock geology of the Buffalo Head Hills area (NTS 84B, C, F and G).

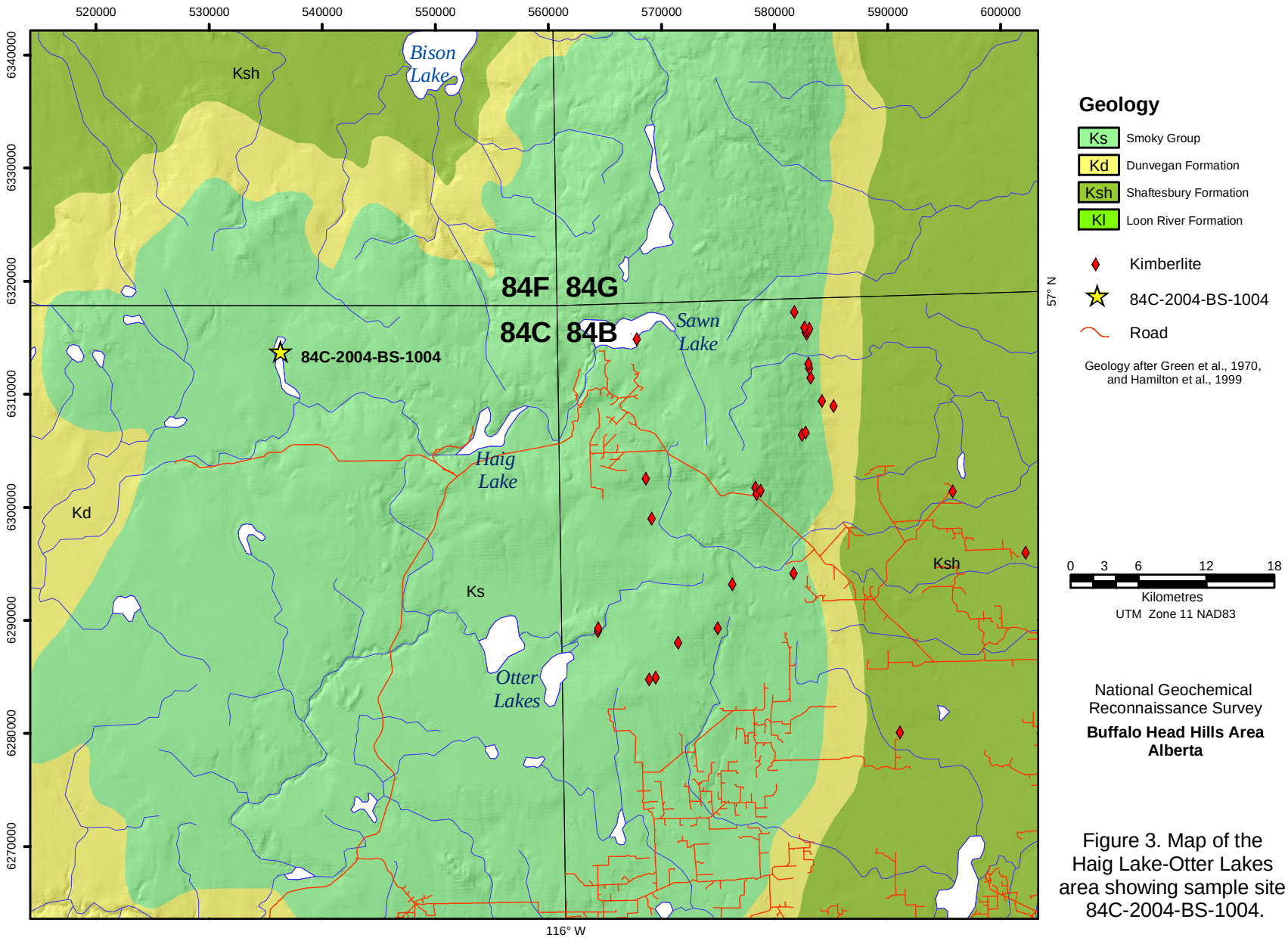

Figure 3. Map of the Haig Lake-Otter Lakes area showing sample site 84C-2004-BS-1004.

3 Sample Description, Methodology and Results

The field description of sample 84C-2004-BS-1004 is presented in Table 1. A photo of the stream from which the sample was collected is presented in Figure 4. Sample collection methods and analytical procedures related to bulk sediment samples for heavy mineral concentrate (HMC) processing and kimberlite-indicator mineral picking are described in Friske et al. (2003) and McCurdy et al. (2004). Sample processing, indicator mineral picking and SEM grain identification were performed by Overburden Drilling Management Limited (ODM) of Nepean, Ontario.

The numbers of pyrope and chromite grains recovered at ODM from sample 84C-2004-BS-1004 are listed in Table 2. The bulk weight of sample 84C-2004-BS-1004 received by ODM was 17.3 kg.

Table 1. Field description of sample 84C-2004-BS-1004.

Map Area	Haig Lake (NTS 84B/13)
East (UTM)	536390
North (UTM)	6313358
Datum	NAD 27
Zone	11
Stream Width (m)	0.9
Stream Depth (m)	0.3
Sample Date	09/30/04
General Physiography	Hilly
Surface Expression	Hummocky
Drainage Pattern	Dendritic
Site Drainage	Well
Stream Class	Primary
Stream Type	Permanent
Stream Flow	Moderate
Vegetation	Coniferous
HMC Site	Boulder Trap
Site Rating	Good
Clast Shape (%) Rounded, Sub-Angular, Angular, Platy/Flat	20,45,30,5
HMC Site Composition (%) Cobbles, Pebbles, Sand, Silt, Clay, Organic	25,30,40,5,0,0
Clast Lithologies At Site (%)	Black Chert (1%), Limestone (1%), Sandstone (2%), Mudstone (2%), Igneous/Metamorphic (94%)
Bedrock Exposed	No
Boulders Present	Igneous/Metamorphic
Comment	Overnight snow, temperature remained below freezing

Figure 4. Photograph showing the stream channel from which sample 84C-2004-BS-1004 was collected (the stream channel is in the lower left of the photograph; photo by G. Prior with M. McCurdy for scale).

Table 2. Laboratory data from sample 84C-2004-BS-1004. The identification of all reported pyrope and chromite grains have been confirmed by SEM.

Mineral	Size Fraction (mm)	Number of Grains
Pyrope	1.0 to 2.0	0
	0.5 to 1.0	2
	0.25 to 0.5	6*
Chromite	1.0 to 2.0	0
	0.5 to 1.0	12
	0.25 to 0.5	11

*Two of the six pyrope grains have kelyphite rims

4 Discussion

4.1 Glacial Ice Flow History in the Southern Buffalo Head Hills

A reconstruction of Late Wisconsin ice flow in northern Alberta is shown in Figure 5. Glacial advances in northern Alberta originated from the Laurentide Ice Sheet, which generally flowed across central Alberta in a southwesterly direction (Fulton, 1989). According to regional studies, ice advanced to its maximum Late Wisconsin limit approximately 23 to 24 thousand years before present (ka) and retreated from the Buffalo Head Hills by 11 ka (Dyke et al., 2002; 2003). Sometime after glacial maximum, southwardly flowing ice in the northern Peace River Valley advanced out of the Peace River Valley and flowed in a southeasterly direction over the southwestern flank of the Buffalo Head Hills (Mathews, 1980; R. Paulen, pers. comm. 2005).

4.2 Source of Kimberlite-Indicator Grains in Sample 84C-2004-BS-1004

The nearest known kimberlite to the site where sample 84C-2004-BS-1004 was collected, kimberlite K8, is located 30 km to the east near the southeastern shore of Sawn Lake (Figure 3; Skelton et al., 2003; Hood and McCandless, 2004). The sample was collected from a small stream that is not down-drainage from a known kimberlite. There are no known kimberlites in an up-ice direction from the sample site, based upon the ice flow information presented above. Transport of the grains to the catchment area of the stream by glaciofluvial or eolian processes is unlikely. Therefore, there is a reasonable probability that the kimberlite from which the indicator minerals in sample 84C-2004-BS-1004 originated remains to be discovered.

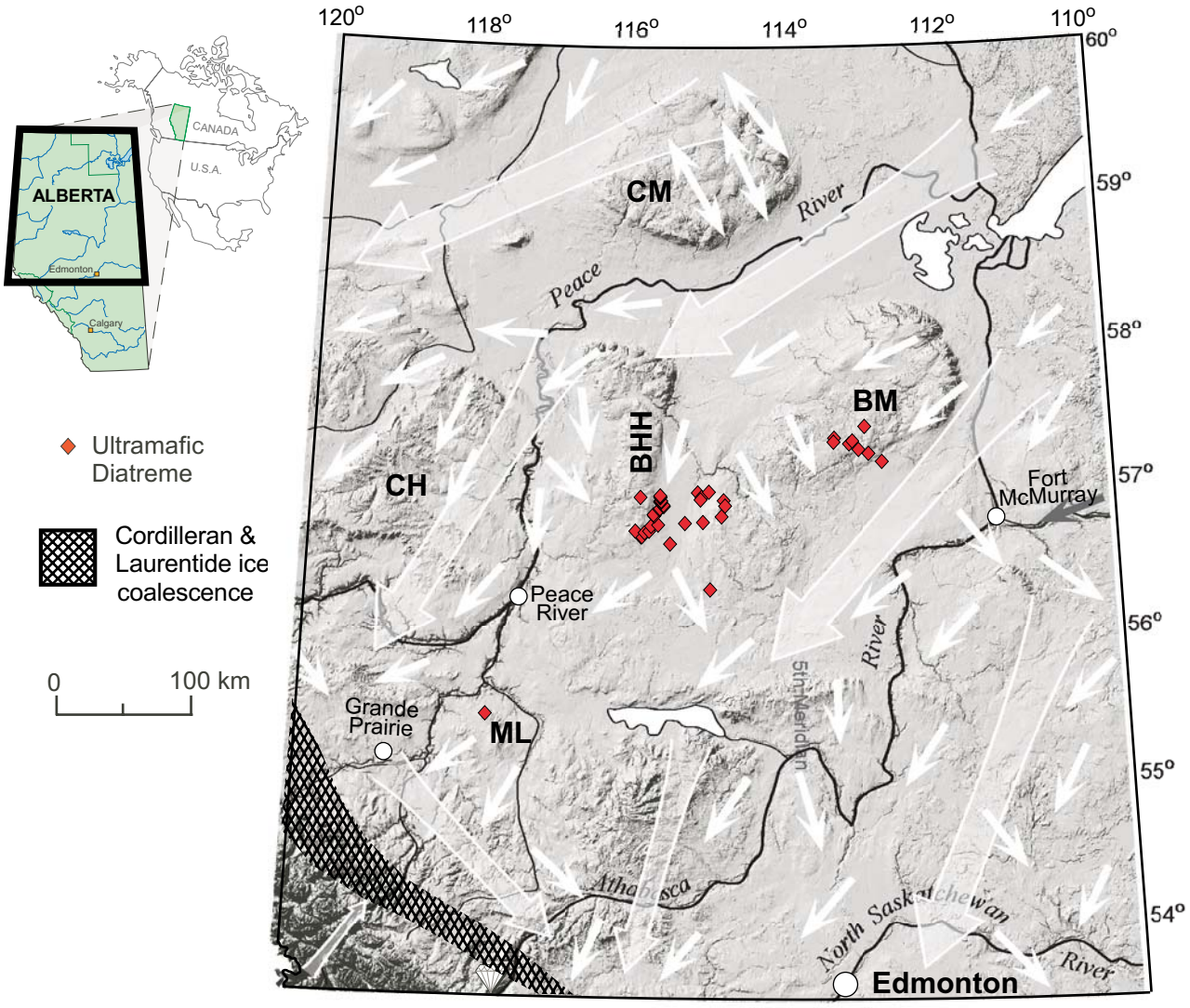

Figure 5. Flow of the Laurentide Ice Sheet during the Late Wisconsin. The large arrows indicate ice flow at glacial maximum (derived from Prest et al., 1968 and Fulton, 1989). The smaller arrows indicate general flow directions of latest Late Wisconsin ice (Mathews, 1980; Klassen 1989; Campbell et al., 2001; Fenton pers. comm., 2002; Paulen, 2002). CH = Clear Hills, CM = Caribou Mountains, BHH = Buffalo Head Hills, BM = Birch Mountains, ML = Mountain Lake.

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