



Till Geochemistry in the Sawn Lake Area, Southern Buffalo Head Hills, Alberta (NTS 84B/13)

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Abstract

The Sawn Lake map area (NTS 84B/13) lies within the southern Buffalo Head Hills in north-central Alberta. This area covers the northwestern part of the Buffalo Head Hills kimberlite field, within which 38 kimberlites have been discovered since 1997. Till occurs near the surface throughout much of the area.

This report presents geochemical results for the <63 µm fraction of 67 till samples and 1 glaciofluvial sand sample from the Sawn Lake map area. Fifty-four of the till samples and the glaciofluvial sample were collected in 2002. Twelve till samples discussed in this report were collected before 2002 and analyzed (reanalyzed) along with the 2002 samples. Kimberlite-indicator mineral (KIM) data from these samples were released previously.

Tills of the Sawn Lake area typically contain about 40% clay, 30% silt and 30% sand. Intriguing compositional differences exist between ablation till (ice-stagnation deposits) and non-ablation till (which includes basal till). On average, the ablation till has higher MgO, CaO, calcite and dolomite values, whereas the non-ablation till has higher Mo, U, Sb and Se values. These differences may reflect a higher component of Cretaceous shale, particularly organic-rich shale, in the basal till component of the non-ablation till compared to a somewhat greater amount of limestone and dolomite debris, derived from distant Paleozoic strata, in the ablation till.

1 Introduction

1.1 Overview

The Sawn Lake map area (NTS 84B/13) covers the northwestern part of the Buffalo Head Hills kimberlite field, within which 38 kimberlites have been discovered since 1997. Approximately two-thirds of these kimberlites contain diamonds, with estimated grades of up to 55 carats per hundred tonnes (Hood and McCandless, 2004). Nineteen (50%) of the known kimberlites within the Buffalo Head Hills kimberlite field occur within the Sawn Lake map area (Hood and McCandless, 2004).

The primary impetus for the Alberta Geological Survey (AGS) to undertake till sampling in the Sawn Lake area was to collect information on kimberlite-indicator mineral (KIM) dispersal within a known kimberlite field to

- help diamond explorers optimize exploration programs elsewhere in northern Alberta;
- assess the effectiveness of regional till KIM surveys compared to regional stream-sediment KIM surveys; and
- provide information that may lead to the discovery of additional diamondiferous kimberlites in the Sawn Lake area.

In addition to the KIM samples, which were processed to concentrate heavy minerals, a second set of samples was collected in 2002 for geochemical analyses of the <63 µm fraction. These geochemical results form the basis of this report.

This report provides geochemical data for the <63 µm fraction of 68 sediment samples collected within the Sawn Lake map area: 55 till samples collected in 2002, 1 glaciofluvial sand sample collected in 2002, and 12 till samples collected by the AGS prior to 2002. Prior et al. (2005) discussed heavy-mineral concentration and KIM grain-picking results for the 2002 samples. Prior (2007) documented the results of microprobe analyses of heavy mineral grains from the 2002 survey. Keith (2004) reported on microprobe analyses of Cr-rich amphiboles and clinopyroxenes obtained from a subset of the 2002 till samples. In addition, Prior et al. (2003a, b) presented preliminary KIM results.

1.2 Location and Physiography

The Buffalo Head Hills of north-central Alberta form a northerly trending upland region lying between the Peace River Lowland (Cadotte Plain) to the west and the Wabasca Lowland (Loon Lake Plain) to the east (Pettapiece, 1986; Figure 1). The Sawn Lake map area (NTS 84B/13) lies within the southern Buffalo Head Hills, approximately 50 km northwest of the community of Red Earth Creek. In general, the western two-thirds of the survey area are characterized by a relatively flat upland with hummocky terrain dissected by meltwater channels and intermittent bogs. The eastern third of the area lies on the gently east-sloping flanks of the Buffalo Head Hills. Maximum elevation is 820 m above mean sea level, almost 300 m above the Wabasca Lowland to the east. Oil and gas production occurs in the region, and some areas of forest have been logged.

2 Till and Glaciofluvial Sand Sampling in the Sawn Lake Area Before 2002

Surface till and glaciofluvial sediment samples collected by AGS within the Sawn Lake map area prior to 2002, for KIM processing and geochemical analyses, are listed in Table 1. All of these samples were collected adjacent to roads. The samples reported by Eccles et al. (2001) were collected as part of a regional KIM sampling program covering the Peerless Lake 1:250 000 map area (NTS 84B). The

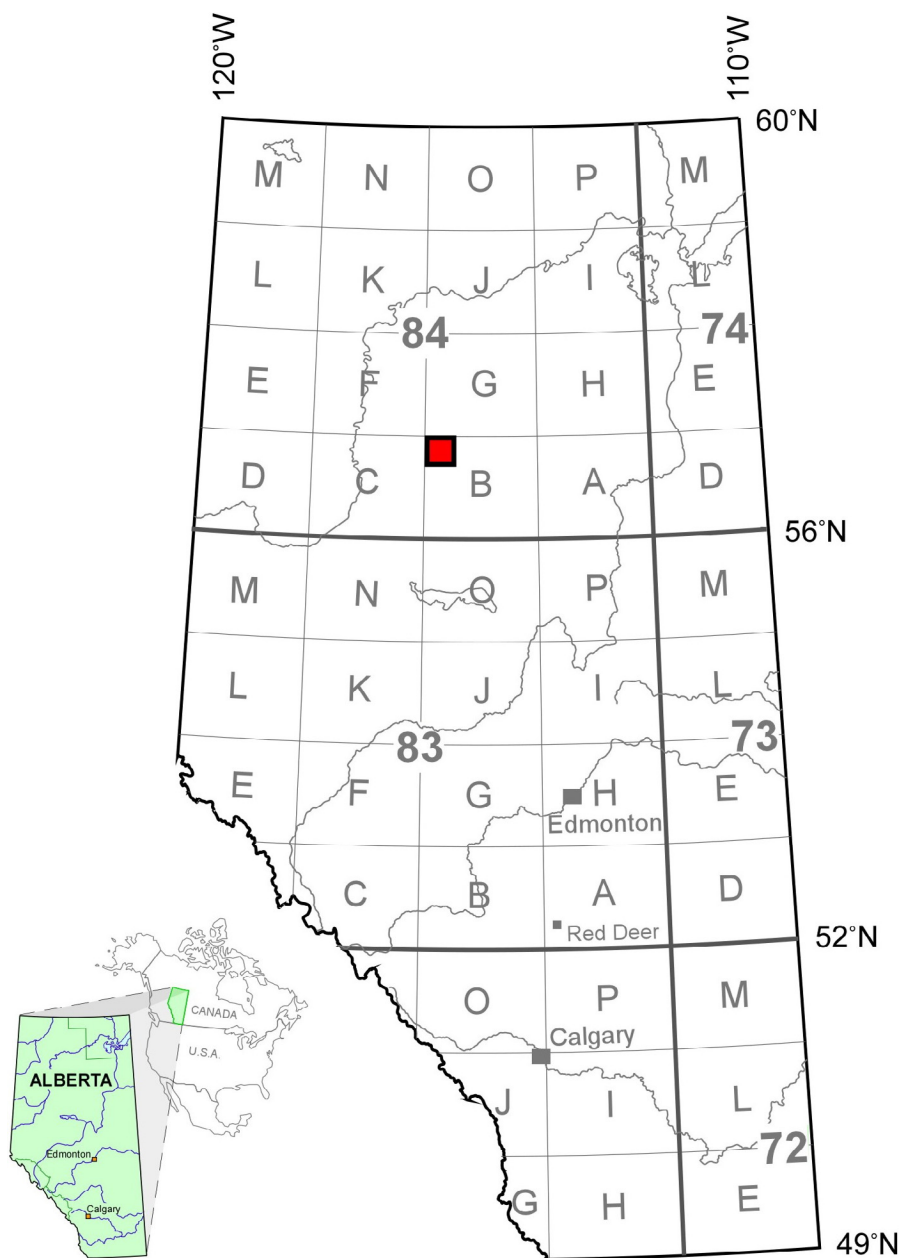


Figure 1. Location of the Sawn Lake map area (NTS 84B/13).

remaining samples listed in Table 1 were collected as part of the AGS surficial mapping program. Interestingly, sample NAT95-134, which returned 152 possible pyrope grains, was collected in 1995 before the discovery of kimberlites in the Buffalo Head Hills (Fenton and Pawlowicz, 1997).

Geochemical analyses of the 2002 Sawn Lake area samples were undertaken by Acme Laboratories of Vancouver (see Section 5 for a description of methods). In addition, archived pulps of 12 previously collected till samples (NAT96-216, NAT98-260, RE98-84B-36-001, RE98-84B-37-001, RE98-84B-39-001, RE98-84B-40-001, RE98-84B-41-001, RE98-84B-45-001, RE98-84B-53-001, RE98-84B-165-001, 1401G and 1402G) were retrieved from storage and submitted to Acme in the same sample batch as the 2002 samples. The Acme data for the pre-2002 samples are used to augment the results obtained from the 2002 samples.

Table 1. Till and sand samples with indicator-mineral data, collected from map area 84B/13 before 2002.

Year	Material Sampled	Number of Field Samples	First and Last Sample Number	Sample Collection Reference
1995	Till	2	NAT95-134 NAT95-146	Fenton and Pawlowicz (1997); Pawlowicz et al. (1998)
1996	Till	1	NAT96-216	Pawlowicz et al. (1998)
1998	Till	1	NAT98-260	Fenton and Pawlowicz (2001)
1998	Till and glaciofluvial sand	17	RE98-84B-35-001 RE98-84B-165-001	Eccles et al. (2001)
2001	Till	2	1401 1402	Samples collected by M. Fenton and J. Pawlowicz (AGS)

3 Geology

3.1 Bedrock Geology

3.1.1 Sedimentary Rocks

The Buffalo Head Hills are underlain by Cretaceous strata of the Western Canada Sedimentary Basin (Figure 2). Maps by Green et al. (1970) and Hamilton et al. (1999) show the area near Sawn Lake to be underlain by the dark grey shale and silty shale of the Upper Cretaceous Smoky Group. However, recent palynological results indicate that the uppermost part of the Buffalo Head Hills in the Sawn Lake area is underlain by Upper Campanian rocks, including sandstone, correlative with the Wapiti Formation (Pawlowicz et al., 2005a, b). Stratigraphic markers in the lower part of the Upper Cretaceous succession indicate nearly horizontal dips in the Sawn Lake area (Chen and Olson, 2005).

3.1.2 Kimberlites

The Buffalo Head Hills kimberlite field, which occurs in the southern Buffalo Head Hills and the adjacent Loon Lake Plain (Loon River lowland) to the east (Figure 2), contains a minimum of 38 occurrences of kimberlite (Hood and McCandless, 2004). These kimberlites are hosted by a Cretaceous succession composed dominantly of marine shales of the Shaftesbury Formation and Smoky Group, which are separated by deltaic to marine sandstones of the Dunvegan Formation (Green et al., 1970; Hamilton et al., 1999). Some kimberlite pipes of the Buffalo Head Hills field are quite large, up to 40 hectares, based on drillhole information and geophysical modelling (Skelton et al., 2003). Three kimberlites are exposed at surface and several of the kimberlites form bedrock highs, which may be accompanied by topographic highs due to their greater resistance to weathering and glacial erosion relative to the poorly indurated Cretaceous sedimentary rocks. In general, kimberlites of the Buffalo Head Hills field consist primarily of crater facies, juvenile lapilli-rich, olivine (crystal) tuffs (Boyer et al., 2003; Eccles, 2004). Perovskite (U-Pb) dates obtained on three Buffalo Head Hills kimberlites indicate emplacement ages of 86 ± 3 , 87 ± 3 and 88 ± 5 Ma for kimberlites K7A, K5 and K14, respectively (Carlson et al., 1999).

Of the 38 kimberlites within the Buffalo Head Hills field, 26 are known to contain diamonds. Kimberlites in the northern part of this field tend to have higher diamond contents. The northern group of kimberlites includes K252, which has the highest known diamond content in the field, with an estimated grade of 55 carats per hundred tonnes (Hood and McCandless, 2004).

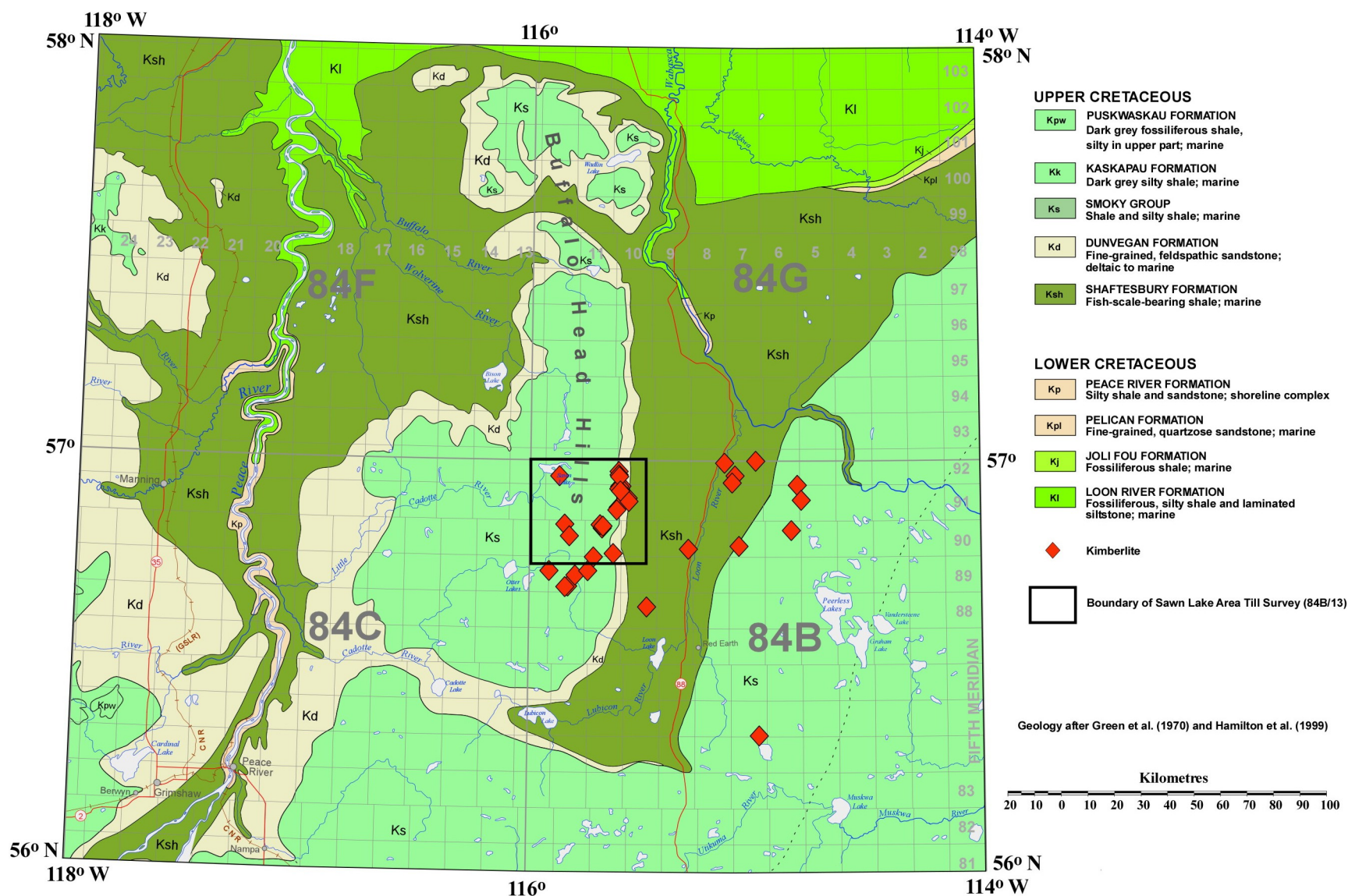


Figure 2. Bedrock geology of the Buffalo Head Hills area (NTS 84B, C, F and G).

3.2 Surficial Geology

3.2.1 Surficial Materials

The surficial geology of the southeastern Buffalo Head Hills (NTS 84B/NW), which includes the Sawn Lake (NTS 84B/13) area, has been mapped at 1:100 000 scale (Paulen et al., 2003). Subsequent detailed 1:50 000 mapping of the Sawn Lake area (Trommelen, 2004; Trommelen et al., 2006) provides excellent detail on the distribution of surficial sediments within the study area. The present surficial geology in the region is largely the result of the advance and retreat of the Late Wisconsin Laurentide Ice Sheet (Lostwood Glaciation; Fenton, 1984). Drift thickness throughout the area ranges from thin (<1 m) veneers, with rare bedrock exposures, to greater than 60 m (Pawlowicz and Fenton, 2005).

Much of the Sawn Lake area is covered by moraine (till), of which there are two dominant types:

- **Basal till:** Basal till occurs at the surface along the flanks of the Buffalo Head Hills and in the Wabasca Lowland. The till is characterized by nonsorted diamicton with a silty clay matrix that is commonly fissile and compact, and contains 1%–5% clasts ranging in size from granules to boulders. Indurated clasts are typically faceted and glacially polished. Topographically, the deposits form flat, low-relief plains. This material is interpreted as till deposited directly by glacial ice without transport or modification by water (cf. Dreimanis, 1990). Due to the silty clay texture of the till and generally low topographic gradient, the water table is often perched and the moraine plains host numerous Holocene fens and peat bogs (Trommelen, 2004; Paulen et al., 2006).
- **Ablation till:** A considerable region of hummocky terrain, with circular or ‘doughnut’ morphology, occurs on the uplands of the Buffalo Head Hills (stagnant-ice moraine). The material consists of nonsorted diamicton with a matrix ranging from sandy silt to silty clay. The matrix is typically poorly compacted and local sand lenses (medium to coarse grained) are common. The diamicton contains 5%–10% clasts, with indurated clasts that are more angular and less polished than the faceted clasts of basal till. The ablation till may be weakly stratified, likely due to the presence of more water during deposition. Topographically, the stagnant-ice moraine is typified by undulating to hummocky terrain consisting of roughly equidimensional hills and depressions. Relief is often greater than 2 m, which creates a landscape significantly different from areas covered by basal till. Stagnant-ice moraine, thought to represent glacial sedimentation during glacial retreat and ice stagnation, may include glaciofluvial and glaciolacustrine material in addition to till. The stagnant-ice moraine often forms doughnuts, consisting of a roughly circular hill composed of till with a central depression infilled with lacustrine sediments and subsequent bog peat (Trommelen, 2004; Paulen et al., 2006).

Glacial meltwater valley systems, extending for up to 20 km in length, are found throughout the survey area. These valleys, up to 300 m wide and 50 m deep, have significant negative topographic relief on the landscape that exceeds the local relief of hummocky topography. Ice-contact sediment occurs in the form of small kames (up to 0.5 km across), eskers (averaging 1 km in length) and small crevasse-fill deposits. These ice-contact deposits consist of poorly sorted, massive to crudely stratified gravel, sand and minor silt. Glaciolacustrine sediments are rare in the Sawn Lake region but occur in the nearby Loon Lake Plain (Paulen et al., 2003). Colluvium, in the form of slumped deposits, generally occurs as a veneer along several of the main valleys in the study area. Modern fluvial sediment is dominantly fine grained with organic detritus and minor gravel and sand in more developed streams. Organic deposits occur throughout the map area in regions of poor surface drainage, such as moraine plains, and in depressions within stagnant-ice moraine (Trommelen 2004; Paulen et al., 2006). Pre-Laurentide, quartzite-bearing gravels have been identified beneath a veneer of glacial sediments in the southwestern part of the Sawn Lake map area (Trommelen, 2004; Trommelen et al., 2006).

3.2.2 Late Wisconsin Glacial History

Figure 3 is a reconstruction of Late Wisconsin ice flow in northern Alberta. Glacial advances in northern Alberta originated from the Laurentide Ice Sheet, which generally flowed southwest across central Alberta (Fulton, 1989; Fenton et al., 2003). According to regional studies, ice advanced to its Late Wisconsin limit approximately 23–24 ka and retreated from the Buffalo Head Hills by 11 ka (^{14}C ; Dyke et al., 2002, 2003; Dyke, 2004). Local evidence for the southwesterly flow of the Late Wisconsin Laurentide Ice Sheet across the Sawn Lake area during the glacial maximum includes

- a sculpted crag-and-tail feature at the K5 kimberlite outcrop (Skelton et al., 2003; Paulen et al., 2003);
- poorly developed flutings, trending west-southwest, formed in the upper part of the Buffalo Head Hills in a local area where the drift forms only a thin (<2 m) veneer over the Cretaceous mudstone (Paulen et al., 2003); and
- striae on a polished surface of the K6 kimberlite outcrop, indicating south-southwest glacial flow (R. Paulen, pers. comm., 2005).

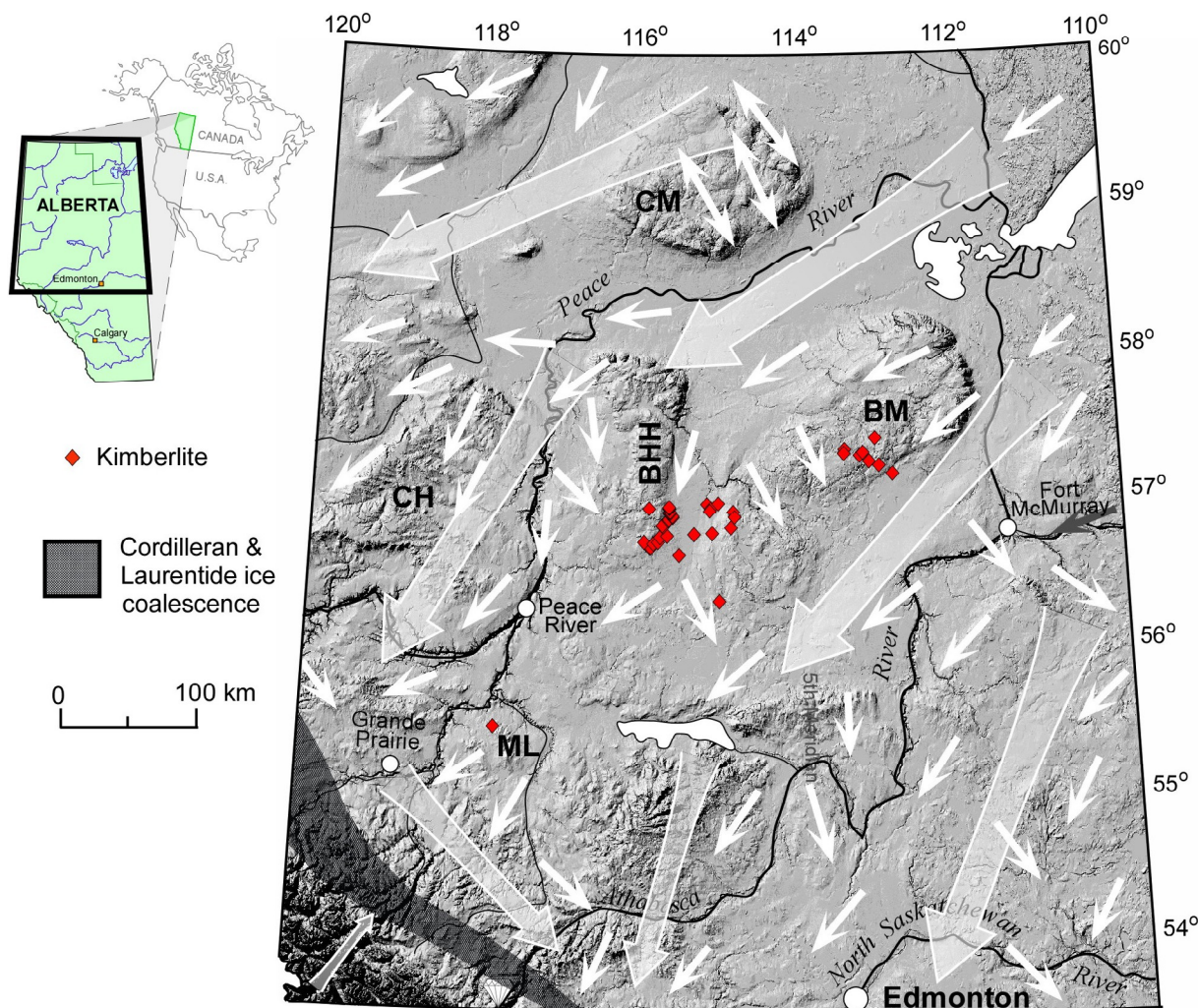


Figure 3. Flow of the Laurentide Ice Sheet during the Late Wisconsin (from Fenton et al., 2003). Large arrows indicate ice flow at glacial maximum (derived from Prest et al., 1968; Fulton, 1989); and smaller arrows indicate general flow directions of latest Late Wisconsin ice (Mathews, 1980; Klassen 1989; R. Paulen, pers. comm., 2005). Abbreviations: CH, Clear Hills; CM, Caribou Mountains; BHH, Buffalo Head Hills; BM, Birch Mountains; ML, Mountain Lake.

Recession of the western margin of the Laurentide Ice Sheet began around 14 ka (^{14}C ; Dyke, 2004). Saint-Onge (1972) indicated that drainage of the Lesser Slave Lake valley occurred about 11 000 years ago, based on a bulk gyttja date of $11\,400 \pm 190$ years before present (^{14}C ; GSC-1049; Lowdon et al., 1971). Recently, precision ^{14}C accelerator mass spectrometry (AMS) dates on seeds and wood obtained from the base of lake cores in the Utikuma Lake area support this minimum deglacial age (Squires et al., 2006). During glacial retreat, the ice margin retreated down drainage, essentially ponding all meltwater in proglacial lakes and trapping the terrestrial and meltwater drainage from the recently deglaciaded eastern Cordillera and Foothills (cf. Mathews, 1980). This created an unstable ice margin. Surging ice lobes advanced and retreated within the proglacial lakes, modifying or obliterating older streamlined landforms and creating strongly fluted terrain in the lowlands. Ice was often confined by topography and deglacial streamlined landforms commonly deviate considerably from glacial maximum flow directions. Sometime after glacial maximum, southward-flowing ice (Peace River lobe) in the northern Peace River valley advanced out of the Peace River valley from the northwest and flowed over the southwestern flank of the Buffalo Head Hills (Mathews, 1980; R. Paulen, pers. comm., 2005). This southeasterly surge was deflected by a large mass of surging ice that was flowing south-southwest along the Loon River valley. It is likely that thinner ice stagnated on top of the Buffalo Head Hills, while thicker ice in the valleys continued to actively flow (R. Paulen, pers. comm., 2005).

4 Field Program

4.1 Sample Distribution

The planned till-sample distribution was based on a minimum density of one sample per 16 km^2 , with higher density of up to one sample per 2 km^2 in the area near the K4 kimberlite complex. Existing AGS till samples with KIM analyses (Table 1), collected along roads in map area 84B/13 prior to 2002, were incorporated into the sampling plan to avoid duplication.

During the 2002 sampling program, till samples were collected from 55 sites, an average density of approximately one sample per 16 km^2 (Figure 4). Inclusion of 12 pre-2002 till samples increases the data density, mainly in the central part of the area near the K4 kimberlite complex (K4A, K4B and K4C kimberlites). In addition to the till samples, one sand-rich sample (2022M) of glaciofluvial (ice-advance proglacial outwash) material was collected beneath 2 m of till.

4.2 Sample Collection

Travel to sites in 2002 was by trucks, four-wheel-drive all-terrain vehicles, foot traverses and a helicopter flight (one site). Access to field sites away from roads was commonly along seismic lines. At each sampling site (except for those with roadcuts) a pit was dug, generally to a depth at which the till matrix contains calcite as determined by reaction with dilute (10%) HCl. The limit of intense in situ leaching of matrix calcite commonly occurs at a depth 10–30 cm below the first appearance of limestone clasts (Figure 5; cf. Dreimanis, 1957; Merritt and Muller, 1959). The till KIM sample was then collected from the bottom of the pit over a 20 to 30 cm interval. Sampling depth intervals typically varied from as shallow as 55–75 cm to as deep as 130–150 cm. The KIM till sample was added to a labelled 23 litre (5 gallon) plastic pail until the pail was nearly full. The weight of the KIM samples delivered to the lab for processing generally varied between 25 and 35 kg. In addition to the KIM sample, a 1–2 kg till sample was collected near the bottom of the pit and placed in a labelled plastic bag for geochemical analyses of the $<63\text{ }\mu\text{m}$ fraction. Each pair of KIM and associated geochemical samples was assigned the same four numbers, with a suffix of M for the KIM (mineralogy) sample and a suffix of G for the geochemical sample (e.g., 2001M and 2001G). Once sampling was completed, the pit was filled in. One pair of glaciofluvial sand samples (2022M and 2022G) was collected during the 2002 program in a manner similar to that described for the till samples. Sample descriptions are provided in Prior et al. (2005).

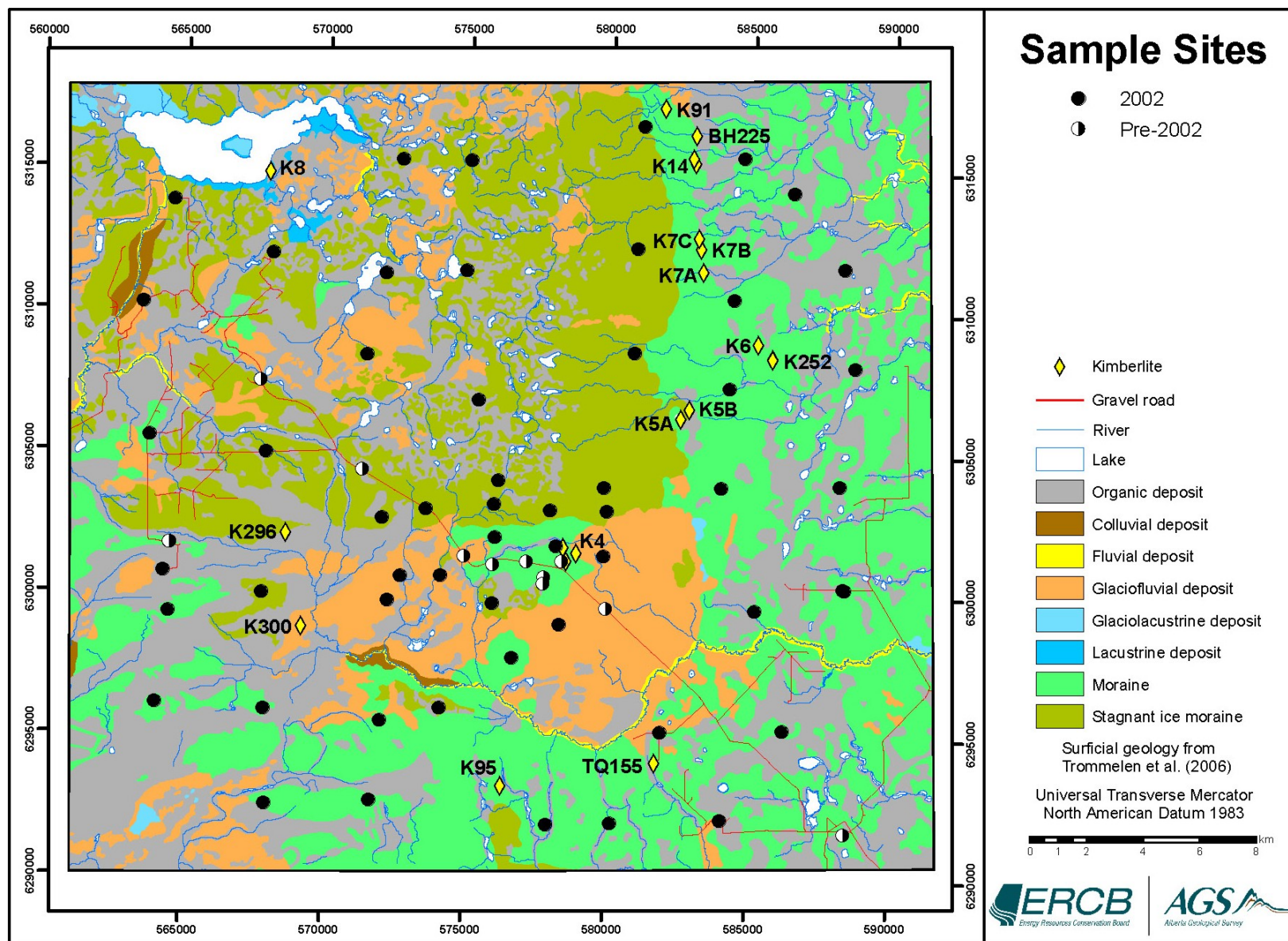


Figure 4. Sawn Lake (NTS 84B/13) till survey, southern Buffalo Head Hills, Alberta: 2002 and pre-2002 sample sites.



Figure 5. Clasts in a vertical till exposure (sample site 2525), indicated by coloured arrows (red, igneous; yellow, oxidized mudstone; blue, limestone); shovel handle marked in centimetres; 80 cm mark on handle, below which carbonate clasts are present, is at ~80 cm below ground surface.

5 Laboratory Methods

5.1 Initial Sample Preparation

5.1.1 2002 Samples

Initial sample preparation of the 55 samples collected in 2002 was performed at the AGS laboratory in Edmonton. Samples were air dried at room temperature before being manually disaggregated using a porcelain mortar and pestle. Then, the samples were sieved using nested 2 mm, 1 mm and 63 μm (250 Tyler mesh) stainless-steel sieves. The <63 μm fraction was split into material for external geochemical analysis and material to be archived. Analytical splits of the <63 μm samples, along with laboratory duplicates (<63 μm sample splits) and standard samples, were shipped to Acme Analytical Laboratories (Acme), Vancouver, British Columbia for geochemical analyses.

5.1.2 Pre-2002 Samples

Archived <63 μm sample material from the 12 pre-2002 AGS samples (NAT96-216, NAT98-260, 1401G, 1402G, and the RE98 series samples) were retrieved from storage and submitted to Acme for geochemical analyses in the same batch as the 2002 samples.

5.2 Analytical Procedures

5.2.1 Fusion ICP-ES Multi-Element Analyses, LECO Infrared Adsorption Determination of C and S, and Gravimetric Determination of Loss-on-Ignition (Acme Group 4A)

Acme carried out fusion digestion of the samples, followed by inductively coupled plasma–emission spectrometry (ICP-ES) analysis, to determine abundances of SiO₂, Al₂O₃, Fe₂O₃ (total Fe), MgO, CaO, Na₂O, K₂O, P₂O₅, MnO, Cr₂O₃, Ba, Ni and Sc (Appendix 1). A 0.2 g sample aliquot was weighed into a graphite crucible and mixed with 1.5 g of LiBO₂ flux, then the flux-sample charge was heated in a muffle furnace for 15 minutes at 1050°C. The molten mixture was removed and immediately poured into 100 mL of 5% HNO₃ (ACS-grade nitric acid in demineralized water). The solution was shaken for 2 hours, and then an aliquot was poured into a polypropylene test tube. Sample solutions were aspirated into a Jarrel Ash Atomcomp Model 975 ICP emission spectrometer (J. Gravel, pers. comm., 2004).

For C and S determinations, 0.1 g of sample pulp (and added flux) was ignited at >1650°C in an induction furnace. Released C and S were measured by infrared adsorption using a LECO C244 carbon-sulphur analyzer. The results represent the total amount of C and S in all forms (J. Gravel, pers. comm., 2004).

For loss-on-ignition (LOI) determinations, a 1 g sample split was ignited for 90 minutes at 950°C, cooled in a desiccator, and then weighted; the difference is expressed as per cent loss-on-ignition (J. Gravel, pers. comm., 2004).

5.2.2 Fusion ICP-MS Multi-Element Analyses (Acme Group 4B)

Acme completed fusion digestion of the samples, followed by inductively coupled plasma–mass spectrometry (ICP-MS) analysis using the following methodology.

A 0.2 g sample aliquot was weighed into a graphite crucible and mixed with 1.5 g of LiBO₂ flux. The flux-sample charge was heated in a muffle furnace for 15 minutes at 1050°C, then the molten mixture was removed and immediately poured into 100 mL of 5% HNO₃ (ACS-grade nitric acid in demineralized water). The solution was shaken for 2 hours, then an aliquot was poured into a polypropylene test tube. Sample solutions were aspirated into a Perkin-Elmer Elan 6000 ICP mass spectrometer (J. Gravel, pers. comm., 2004). Determinations were made for the following 29 elements: Co, Cs, Ga, Hf, Nb, Rb, Sn, Sr, Ta, Th, U, V, W, Zr, Y, La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu (Appendix 1).

5.2.3 Four-Acid ICP-ES/MS Multi-Element Analyses (Acme Group 1EX)

Acme completed four-acid digestion of the samples, followed by inductively coupled plasma–emission spectrometry (ICP-ES) and inductively coupled plasma–mass spectrometry (ICP-MS) analyses using the following methodology. Splits of 0.25 g were weighed into Teflon test tubes. A 10 mL aliquot of the acid solution (2:2:1:1 H₂O-Hf-HClO₄-HNO₃) was added, heated until fuming on a hot plate and taken to dryness. A 7.5 mL aliquot of 50% HCl was added to the residue and heated in a hot-water bath (~95°C) for 30 minutes. After cooling, the solutions were transferred to polypropylene test tubes and made up to a 10 mL volume with 5% HCl (J. Gravel, pers. comm., 2004). Solutions were analyzed by ICP-ES (Jarrel Ash AtomComp 800 ICP emission spectrometer) and ICP-MS (Perkin Elmer Elan 6000 ICP mass spectrometer). Elements with high concentrations, including major elements, were reported by ICP-ES, whereas elements with low concentrations (e.g., Be, Hf and Ta) were reported by ICP-MS. Elements that can span a broad range of concentrations (e.g., Cu, Pb and Zn) were reported by ICP-MS when low and by ICP-ES when high (J. Gravel, pers. comm., 2004, 2005). The concentrations of 41 elements were determined: Ag, Al, As, Au, Ba, Be, Bi, Ca, Cd, Ce, Co, Cr, Cu, Fe, Hf, K, La, Li, Mg, Mn, Mo, Na, Nb, Ni, P, Pb, Rb, S, Sb, Sc, Sn, Sr, Ta, Th, Ti, U, V, W, Y, Zn and Zr (Appendix 1).

5.2.4 Aqua Regia ICP-ES/MS Multi-Element Analyses (Acme Group 1F)

Acme completed aqua-regia digestion of the samples, followed by inductively coupled plasma–emission spectrometry (ICP-ES) and inductively coupled plasma–mass spectrometry (ICP-MS) analyses using the following methodology. The Acme version of aqua regia (equal proportions of HCl, HNO₃ and demineralized H₂O) was added to each sample split (7.5 g or 1.0 g) in a ratio of 6 mL of aqua regia to 1 g of sample. Samples were digested for one hour in a hot-water bath (90°–95°C), then diluted to a 20:1 mL/g final ratio (J. Gravel, pers. comm., 2001). Concentrations were determined for 63 elements: Ag, Al, As, Au, B, Ba, Be, Bi, Ca, Cd, Ce, Co, Cr, Cs, Cu, Dy, Er, Eu, Fe, Ga, Gd, Ge, Hf, Hg, Ho, In, K, La, Li, Lu, Mg, Mn, Mo, Na, Nb, Nd, Ni, P, Pb, Pr, Rb, Re, S, Sb, Sc, Se, Sm, Sn, Sr, Ta, Tb, Te, Th, Ti, Tl, Tm, U, V, W, Y, Yb, Zn and Zr (Appendix 1).

All sample solutions were analyzed by both ICP-ES and ICP-MS. ICP-ES values were reported for several elements if concentrations exceeded laboratory-determined crossover values; otherwise, ICP-MS results were reported. If the range of values for any of these elements in a batch of samples brackets the threshold value, then reported results include both ICP-ES determinations (values > threshold) and ICP-MS determinations (values < threshold). For certain elements, including Au, Sc, Tl, S, Hg, Se, Te, Ga, the incompatible trace elements (such as Y, Zr, Nb, U) and the rare-earth elements (except La), only the results from the ICP-MS were reported (J. Gravel, pers. comm., 2001).

5.2.5 Texture Analyses

Texture analyses were performed at the AGS laboratory in Edmonton. Samples were dried overnight in an oven at 40°C. The distribution of particle sizes >63 µm was determined by sieving. The size distribution of the <63 µm fraction was obtained by measuring the variation in density with time of a suspension of the sample in a dilute sodium hexametaphosphate solution (the sodium hexametaphosphate acts as a dispersing agent). Fifty grams of the <2 mm sample fraction were mixed with 125 mL of 4% sodium hexametaphosphate solution in a 1000 mL cylinder. After 1 minute of agitation, distilled water was added until the total volume was 1000 mL. Hydrometer readings were taken at 2 hours, 4 hours, 8 hours and 24 hours after agitation. A computer program was used to calculate the proportions of silt and clay in the sample, based on the density measurements (Appendix 1).

5.2.6 Carbonate Mineralogy Analyses

Carbonate mineralogy (Chittick) analyses were performed at the AGS laboratory in Edmonton. For each sample, a 1 g split of the <63 µm material was added to a flask, then 15 mL of 6N HCl were added and the volume of produced CO₂ was recorded at predetermined intervals over a period of time (normally 35 minutes). With the aid of a computer program, the percentage of calcite and dolomite in the sample was calculated based on the volume measurements (Appendix 1).

6 Analytical Data Quality

6.1 Lower Detection Limits

Elements that returned values below the lower analytical detection limit in routine samples by the various analytical methods are listed in Tables 2–5. All of the Au values by four-acid ICP-ES/MS and all of the W values by aqua regia ICP-ES/MS are below the lower detection limits. Seventy-two per cent of the four-acid ICP-ES/MS results for S are below the lower detection limits, as are 31% of the Sn values by ICP-ES/MS. Determinations that are above, but close to, the lower detection limits are likely to exhibit poor accuracy and precision.

Table 2. Elements for which fusion ICP-ES and LECO (total C and S) analyses (Acme method code 4A) returned values below lower detection limits.

Parameter	Ni (ppm)	S (total; %)
LDL ¹	20	0.01
Number of samples	68	68
Values < LDL	3	3
Percentage < LDL	4.4	4.4

¹ lower detection limit

Table 3. Elements for which Acme fusion ICP-MS analyses (Acme method code 4B) returned values below lower detection limits.

Parameter	Sn (ppm)	W (ppm)
LDL ¹	1	0.1
Number of samples	68	68
Values < LDL	21	1
Percentage < LDL	30.9%	1.5%

¹ lower detection limit

Table 4. Elements for which Acme four-acid ICP-ES/MS analyses (Acme method code 1EX) returned values below lower detection limits.

Parameter	Au (ppm)	S (%)	Be (ppm)	Cd (ppm)
LDL ¹	1	0.1	1	0.1
Number of samples	68	68	68	68
Values < LDL	68	49	5	3
Percentage < LDL	100%	72.1%	7.4%	4.4%

¹ lower detection limit

Table 5. Elements for which Acme aqua-regia ICP-ES/MS analyses returned values below lower detection limits.

Parameter	W (ppm)	S (%)	Se (ppm)	Te (ppm)
LDL ¹	0.1	0.01	0.1	0.02
Number of samples	68	68	68	68
Values < LDL	68	12	2	1
Percentage < LDL	100%	17.6%	2.9%	1.5%

¹ lower detection limit

6.2 Certified Reference Material

6.2.1 Percentage Recovery

To estimate the analytical accuracy of the analyses, three samples of CANMET certified reference material (standard) Till-2 were introduced into the sample batch at the AGS laboratory in Edmonton prior to shipping. Results for the Till-2 standard obtained by Acme are compared to the recommended values provided by CANMET using percentage recovery values (Tables 6–9). Percentage recovery, which represents a measure of accuracy, is defined by the following equation (cf. Ziegler and Combs, 1997):

$$\text{Percentage recovery} = 100 \times C_M/C_A,$$

where

C_M = the measured concentration of the standard sample

C_A = the actual concentration of the standard sample (recommended or provisional value)

Percentage recovery values near 100% indicate a high degree of accuracy.

If 50% or less of the results for an element were below the lower detection limit (LDL), the <LDL values were set to $0.5 \times \text{LDL}$ for the percentage recovery calculation. If more than 50% of the results for an element were below the LDL, the percentage recovery was not calculated. In addition, the Till-2 standard is not adequately characterized for some elements, thereby precluding percentage recovery calculations.

Percentage recovery values for determinations by ICP-ES (following fusion) are generally within 5% of 100%. Percentage recovery values for determinations by fusion ICP-ES/MS and four-acid ICP-ES/MS are generally within 15% of 100%. Low percentage recovery values (<85%) by four-acid ICP-ES/MS for Zr, Hf, Be, Y, Ta, Nb, U, W and Ti largely reflect limited digestion of oxide minerals by the four-acid method.

Many of the percentage recovery values are below 75% for the determinations by aqua-regia ICP-ES/MS. Aqua regia provides only partial digestion of silicates and oxides.

Table 6. Summary of fusion ICP-ES and gravimetric (loss-on-ignition) percentage recovery results for three CANMET Till-2 samples (Acme method code 4A).

Average Percentage Recovery for Till-2	Oxides, Elements and Loss-on-Ignition (LOI)
≤50%	
>50% and ≤75%	
>75% and ≤85%	Cr ₂ O ₃
>85% and ≤95%	K ₂ O
>95% and ≤105%	Ba, P ₂ O ₅ , Al ₂ O ₃ , TiO ₂ , SiO ₂ , MnO, Na ₂ O, MgO, CaO, Fe ₂ O ₃ , LOI, Ni
>105% and ≤115%	Sc
>115% and ≤125%	
>125% and ≤150%	
>150%	

Table 7. Summary of fusion ICP-MS percentage recovery results for three CANMET Till-2 samples (Acme method code 4B).

Average Percentage Recovery for Till-2	Elements
≤50%	
>50% and ≤75%	
>75% and ≤85%	
>85% and ≤95%	Cs, Zr, Hf, U, Co
>95% and ≤105%	Nb, Rb, Tb, Ce, Ta, Lu, Y, V, Th
>105% and ≤115%	Sr, Sm, Yb, La, Er, Nd
>115% and ≤125%	W
>125% and ≤150%	Eu
>150%	

Table 8. Summary of four-acid ICP-ES/MS percentage recovery results for three CANMET Till-2 samples (Acme method code 1EX).

Average Percentage Recovery for Till-2	Elements
≤50%	Zr, Hf, Be, Y
>50% and ≤75%	Ta, Nb
>75% and ≤85%	U, W, Ti
>85% and ≤95%	Cr, Sb, Rb, Cd, Sc, Mg, Al, Ce
>95% and ≤105%	Sr, Zn, P, K, Ca, Co, Ba, Fe, Mo, La, Th, Li, Ag, V, As, Pb, Cu, Ni, Mn, Na
>105% and ≤115%	
>115% and ≤125%	Bi
>125% and ≤150%	
>150%	

Table 9. Summary of aqua-regia ICP-ES/MS percentage recovery results for three CANMET Till-2 samples (Acme method code 1F).

Average Percentage Recovery for Till-2	Elements
≤50%	Na, Sr, K, Ca, Ba, Ti, W, Al, Sc
>50% and ≤75%	Cr, U, Sb V, Au, Th, Mg, La, P
>75% and ≤85%	Pb, Hg, As, Li, Fe, Zn
>85% and ≤95%	Mn, Cd, Mo, Co
>95% and ≤105%	Cu, Ni
>105% and ≤115%	
>115% and ≤125%	Ag
>125% and ≤150%	Bi
>150%	

6.2.2 Relative Standard Deviation

For data sets with replicate determinations of a particular standard sample (e.g., Till-2), the relative standard deviation (RSD) provides a measure of precision. The RSD is defined by the following equation:

$$\text{RSD} = s/x,$$

where

RSD = relative standard deviation

s = standard deviation

x = mean of replicate determinations

Low RSD values indicate a high degree of precision.

If 50% or less of the results for an element were below the lower detection limit (LDL), the <LDL values were set to 0.5 x LDL for the RSD calculation. If more than 50% of the results for an element were below the LDL, the RSD was not calculated.

Most of the RSD values for determinations by ICP-ES (following fusion) are below 2%. The RSD values for determinations by fusion ICP-MS, four-acid ICP-ES/MS and aqua-regia ICP-ES/MS are generally less than 5%, although values of up to 10% are not uncommon (Tables 10–13).

Table 10. Summary of 1) fusion ICP-ES, 2) LECO (total C and S), and 3) gravimetric (loss-on-ignition) relative standard deviation (RSD) results for three CANMET Till-2 samples (Acme method code 4A).

Average RSD for Till-2	Oxides, Elements and Loss-on-Ignition (LOI)
≤2%	MnO, Fe ₂ O ₃ , SiO ₂ , Al ₂ O ₃ , TiO ₂ , Na ₂ O, Ba, CaO, K ₂ O, MgO
>2% and ≤5%	Cr ₂ O ₃ , C, LOI, Sc
>5% and ≤10%	P ₂ O ₅
>10% and ≤20%	Ni
>20% and ≤50%	S
>50%	

Table 11. Summary of fusion ICP-MS relative standard deviation (RSD) results for three CANMET Till-2 samples (Acme method code 4B).

Average RSD for Till-2	Elements
≤2%	Lu, La, Nd, Ce, V, Th, Nb, W, Zr
>2% and ≤5%	Ga, Pr, Sr, Eu, Hf, Rb, Co, Y
>5% and ≤10%	Ta, Ho, Cs, Gd, Er, Tb, Tm, Sm, Yb, Dy
>10% and ≤20%	Sn, U
>20% and ≤50%	
>50%	

Table 12. Summary of four-acid ICP-ES/MS relative standard deviation (RSD) results for three CANMET Till-2 samples (Acme method code 1EX).

Average RSD for Till-2	Elements
≤2%	Sc, Ag, Sb, Mg, Zn, Fe, Zr, V, Pb, Al, Ca, Sr, K, Mn, Na, Ni
>2% and ≤5%	P, U, Cu, Rb, Sn, Li, Th, Ba, Co, Nb, Ce, La, Mo, Cr, Ti
>5% and ≤10%	Y, As, Hf, W, Bi, Ta
>10% and ≤20%	
>20% and ≤50%	Cd, Be
>50%	

Table 13. Summary of aqua-regia ICP-ES/MS relative standard deviation (RSD) results for three CANMET Till-2 samples (Acme method code 1F).

Average RSD for Till-2	Elements
≤2%	Ca, Cu, Fe, V, Mn, Mo, K, Zn
>2% and ≤5%	P, Mg, Na, Sb, Cr, Ni, Al, Co, Ti, Sr, Ag, La, Ba, Sc, Tl, As, U, Th, Li, Bi, W
>5% and ≤10%	Cd, Pb, Hg, Ga
>10% and ≤20%	Se
>20% and ≤50%	Au, B, Te, S
>50%	

6.3 Laboratory Duplicate Pairs

6.3.1 Relative Percentage Difference

The batch of samples submitted to Acme included four ‘blind’ laboratory duplicate pairs created by splitting <63 µm sample material at the AGS laboratory. Analytical results for these duplicate pairs are summarized in Tables 14–17, in which the relative percentage difference (RPD) represents a measure of precision (cf. Ziegler and Combs, 1997; Zimmerman et al., 2001). The RPD for a set of duplicate-pair results is defined by the following equation:

$$RPD = 100 \times |C_1 - C_2| / C_X$$

where

RPD = relative percentage difference

$|C_1 - C_2|$ = absolute value of the difference between the two concentrations

C_X = mean of the two results

If values below the lower detection limit (LDL) were returned for an element in both samples of a duplicate pair, that pair was removed from the RPD calculation for that element. If a given duplicate pair returned one value below the LDL and one measurable value, then the <LDL value was set to 0.5 x LDL for the purpose of the RPD calculation.

Analytical differences between the laboratory duplicate pairs should reflect 1) the homogeneity of the sieved samples and 2) the analytical precision (low values indicating a high level of homogeneity and analytical precision). The RPD values for major-oxide determinations at Acme by ICP-ES (following fusion) are generally less than 5%. For the other methods, most RPD values are less than 10%.

Table 14. Summary of 1) fusion followed by ICP-ES, 2) LECO (total C and S), and 3) gravimetric (loss-on-ignition) relative percentage difference (RPD) results for four laboratory duplicate pairs (Acme method code 4A).

Average RPD for Laboratory Duplicate Pairs	Oxides, Elements and Loss-on-Ignition (LOI)
≤5%	Sc, SiO ₂ , Ba, TiO ₂ , Al ₂ O ₃ , CaO, Fe ₂ O ₃ , MgO, LOI, K ₂ O, Na ₂ O, Cr ₂ O ₃ , C
>5% and ≤10%	MnO, P ₂ O ₅ , Ni
>10% and ≤20%	
>20% and ≤50%	S
>50% and ≤100%	

Table 15. Summary of fusion ICP-MS relative percentage difference (RPD) results for four laboratory duplicate pairs (Acme method code 4B).

Average RPD for Laboratory Duplicate Pairs	Elements
≤5%	Ta, V, La, Pr, Rb, Dy, Y, Zr, Ho, Hf, Ce, Th
>5% and ≤10%	Sr, Nb, Gd, Ga, Tb, Er, Lu, Nd, Co, Tm, Sm
>10% and ≤20%	Eu, Cs, Yb, U
>20% and ≤50%	W
>50% and ≤100%	
>100%	Sn

Table 16. Summary of four-acid ICP-ES/MS relative percentage difference (RPD) results for laboratory duplicate pairs (four duplicate pairs except for S, for which there is one usable duplicate pair; Acme method code 1EX).

Average RPD for Laboratory Duplicate Pairs	Elements
≤5%	As, Bi, Ta, V, Li, Mg, Ba, Al, Na, Ca, Nb, Th, La, Ni, Zr, Ti, Ce, Fe, Y
>5% and ≤10%	Co, Cr, P, Sn, Zn, Hf, Mn, Sr, K, Rb, W, Pb, Mo
>10% and ≤20%	U, Sb, Cu, Ag, Cd, Sc
>20% and ≤50%	Be
>50% and ≤100%	S

Table 17. Summary of aqua-regia ICP-MS relative percentage difference (RPD) results for laboratory duplicate pairs (four duplicate pairs except for S, for which there are three usable duplicate pairs; Acme method code 1F).

Average RPD for Laboratory Duplicate Pairs	Elements
≤5%	Fe, Ca, Mg, Ga, La, Zn, Sr, Mo, P, Sb, Mn, Cr, Ni
>5% and ≤10%	Ag, Tl, Cu, Al, V, Hg, As, Co, Th, Cd, Sc, Ba
>10% and ≤20%	Li, Pb, K, U, Na, Bi
>20% and ≤50%	Te, Se, S, B, Au, Ti
>50% and ≤100%	

7 Discussion

7.1 Till Stratigraphy

Based on the results of an auger-coring program, Fenton et al. (2006b) identified two distinct till units in the Sawn Lake area based on stratigraphic relationships and geochemical results: an upper (surface) till and a lower till. At some of the coring sites, the two till units are separated from one another by intervening glaciofluvial and glaciolacustrine sediments. The lower till, in some cores, exhibited a weathering profile similar to that seen in the modern surficial sediments, indicating a prolonged nonglacial period. Geochemical criteria listed by Fenton et al. (2006b) to distinguish the upper till from the lower till include lower Ti values (generally <0.7% TiO₂ in the upper till), higher Ca values (generally >2.4% CaO in the upper till) and greater dolomite contents (generally >3.0% in the upper till).

The relationships between TiO₂, CaO and dolomite contents obtained from the 2002 Sawn Lake area till samples are shown in Figures 6 and 7. The majority of samples have characteristics typical of the upper till unit. Samples with low (<0.7%) TiO₂ values (typical of the upper till) and low CaO (<2.4%) and dolomite (<3.0%) contents (typical of the lower till) probably represent upper till material from which some of the carbonate has been leached.

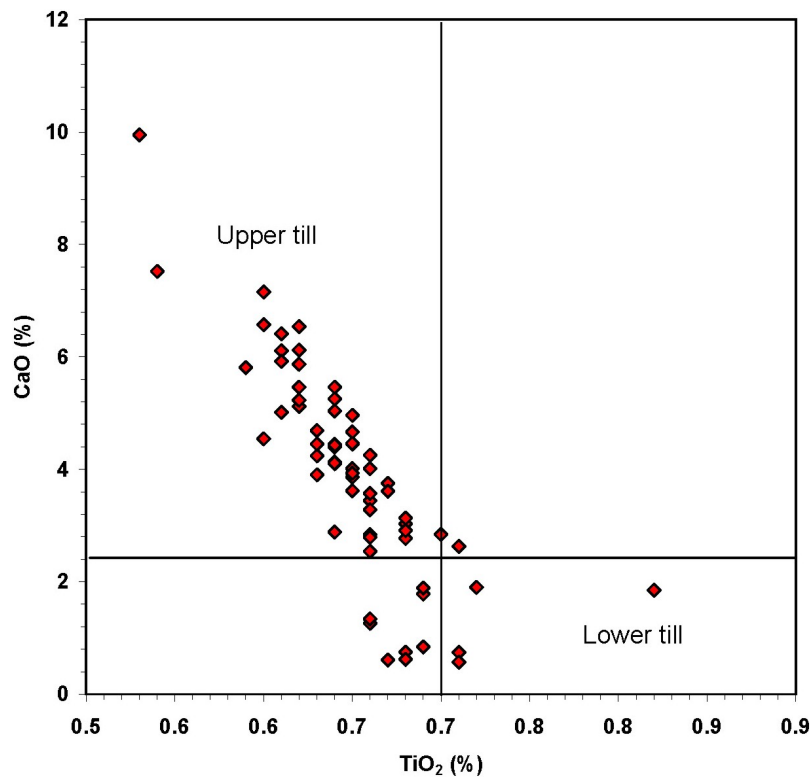


Figure 6. Binary diagram showing TiO_2 and CaO contents in till from the Sawn Lake area. Discrimination boundaries from Fenton et al. (2006b).

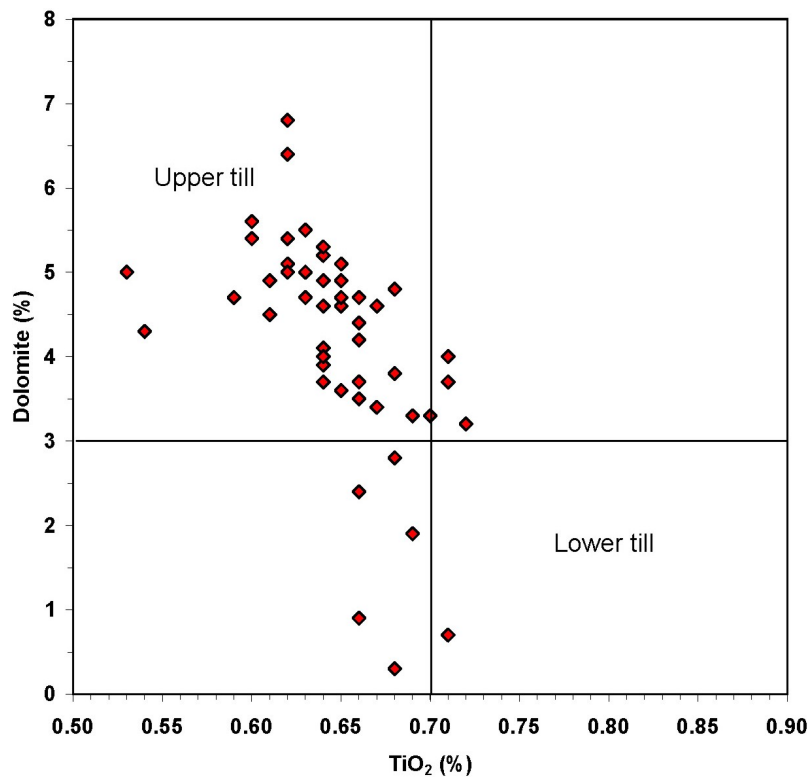


Figure 7. Binary diagram showing TiO_2 and dolomite contents in till from the Sawn Lake area. Discrimination boundaries from Fenton et al. (2006b).

7.2 Till Geochemistry and Kimberlites

7.2.1 Background

Previous studies have demonstrated that geochemical surveying of till and soil may be successfully applied to diamond (kimberlite) exploration (McClenaghan and Kjarsgaard, 2001; Seneshen et al., 2005). However, B- and C-horizon samples collected on traverses across and near the K4B kimberlite in the Sawn Lake area, reported by Fenton et al. (2006a), did not reveal the presence of the kimberlite (although elevated Mg/Fe, Ni/V and B values were detected in organic soils collected during the same sampling program).

If kimberlite-related geochemical anomalies exist in till near some of the kimberlites in the Sawn Lake area, the sample spacing is a principal factor governing the probability of detecting one or more the anomalies. During focused sampling programs, the spacing between samples can be 100 m or less. In contrast, the distances between the till samples discussed in this report are commonly 1–4 km.

7.2.2 Element Selection

Kimberlite pathfinder elements in till may include Mg, Ni, Cr, Co, V, Mn, Fe, La, Ce, Nd, Sm, Nb, Ti, P, Ba, Ta, Hf, Zr and Sr (e.g., McClenaghan and Kjarsgaard, 2001). The effectiveness of a particular element as a pathfinder will depend, in part, on the contrast between 1) that element in kimberlite and 2) that element in the hostrocks and up-ice country rocks from which the majority of the till is derived. The kimberlites' hostrocks and the country rocks in the Buffalo Head Hills consist largely of Cretaceous marine shale. Comparisons of average kimberlite composition (Mitchell, 1986) and average Buffalo Head Hills kimberlite composition (Eccles and Luth, 2003) to average shale composition (Krauskopf, 1979) indicate that Mg, Cr, Ni and Nb may provide the greatest anomaly contrasts in this geological setting.

7.2.3 Till Geochemistry and Kimberlite-Indicator Mineral Counts

The abundance of KIM grains in till at a given site may serve as a proxy for the proportion of kimberlite incorporated within the till during glaciation. However, the igneous abundance and type of kimberlite-indicator minerals vary widely between kimberlites in the Buffalo Head Hills (Hood and McCandless, 2003, 2004), and olivine in some of the kimberlites has undergone alteration to serpentine and carbonate (Eccles et al., 2004).

The Mg, Cr, Ni and Nb contents in the <63 µm fraction of the till are plotted against KIM counts (picked pyrope, Cr-diopside, eclogitic garnet, olivine, picroilmenite and chromite grains; Prior et al., 2005) normalized to a 30 kg sample in Figures 8 to 11. No correlations are evident in these diagrams.

7.2.4 Areal Distribution of Mg, Cr, Ni and Nb

The MgO, Cr, Ni and Nb values in near-surface tills of the Sawn Lake area are shown in Figures 12–15. No significant relationships between these elements and the known kimberlites are evident (note that the till sample spacing used in this survey was not designed to investigate relationships between kimberlites and till geochemistry).

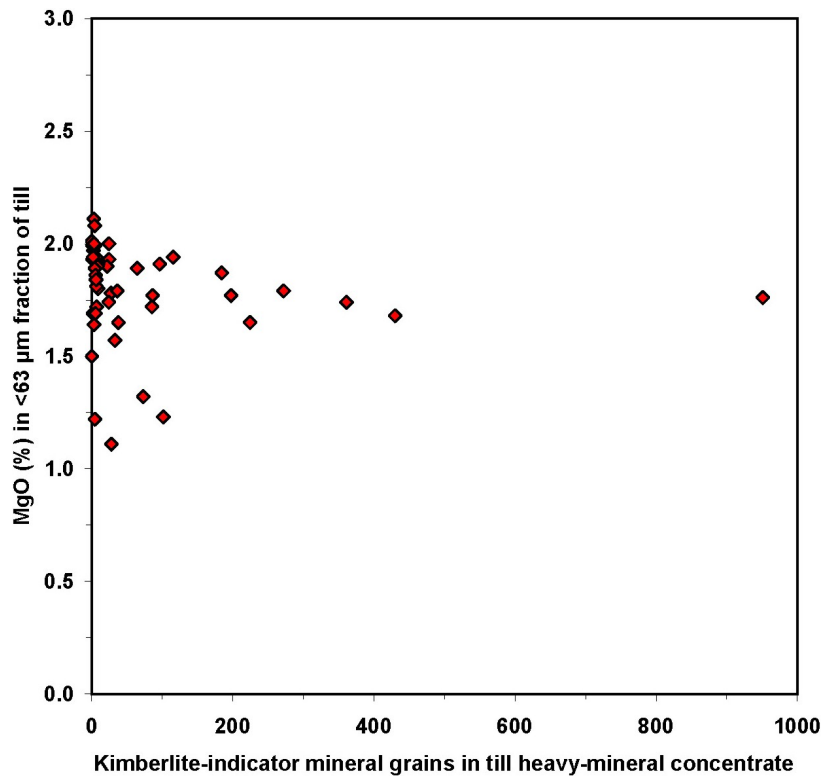


Figure 8. Binary diagram showing KIM grains (sum of all picked grains normalized to 30 kg field sample) in till heavy-mineral concentrates versus MgO values in the <63 µm fraction of till geochemical samples.

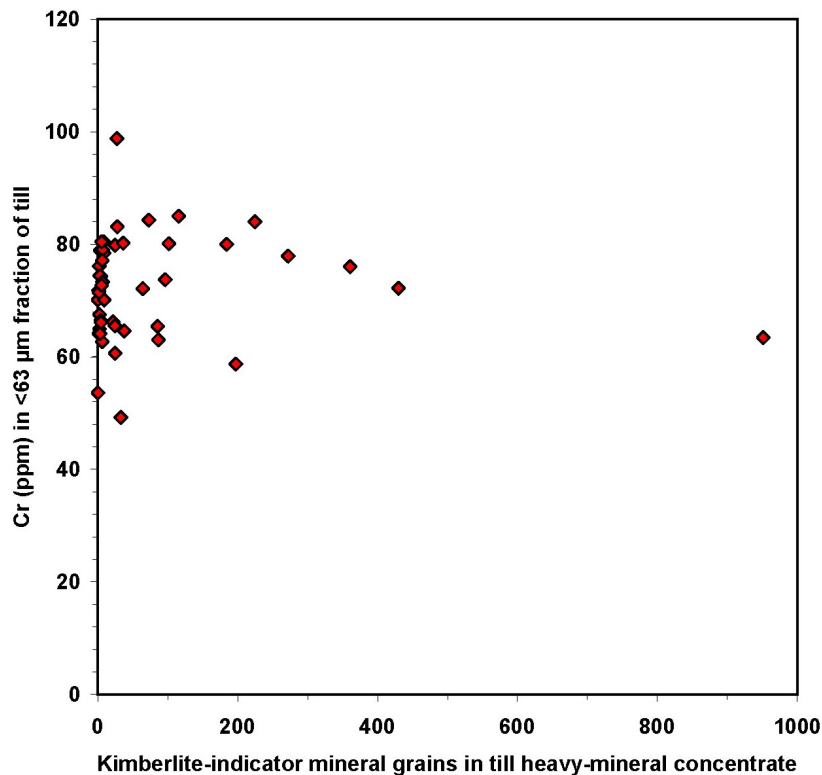


Figure 9. Binary diagram showing KIM grains (sum of all picked grains normalized to 30 kg field sample) in till heavy-mineral concentrates versus Cr values (four-acid ICP-MS) in the <63 µm fraction of till geochemical samples.

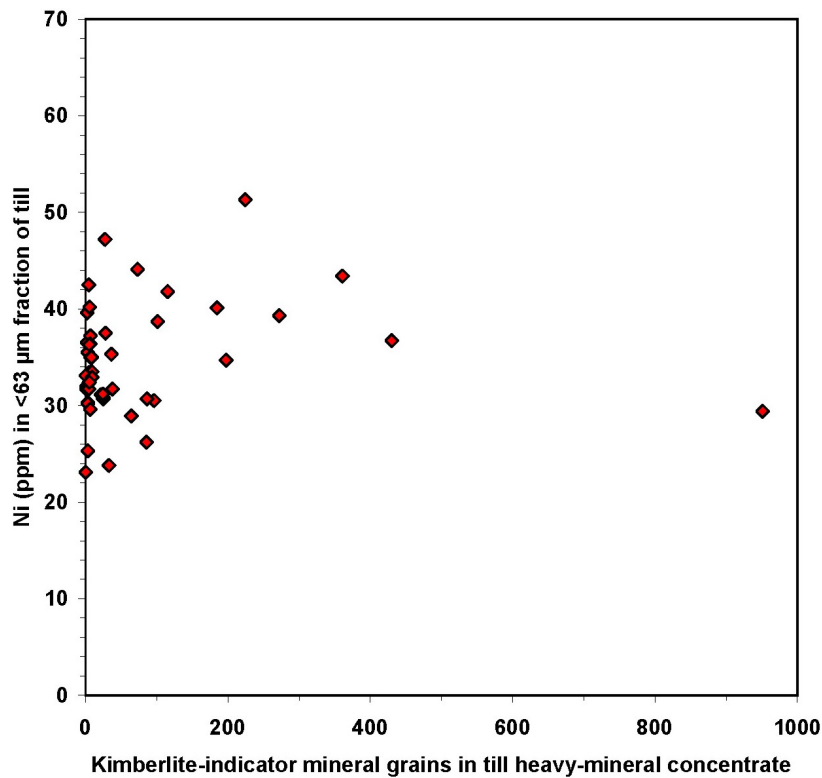


Figure 10. Binary diagram showing KIM grains (sum of all picked grains normalized to 30 kg field sample) in till heavy-mineral concentrates versus Ni values (four-acid ICP-MS) in the <63 µm fraction of till geochemical samples.

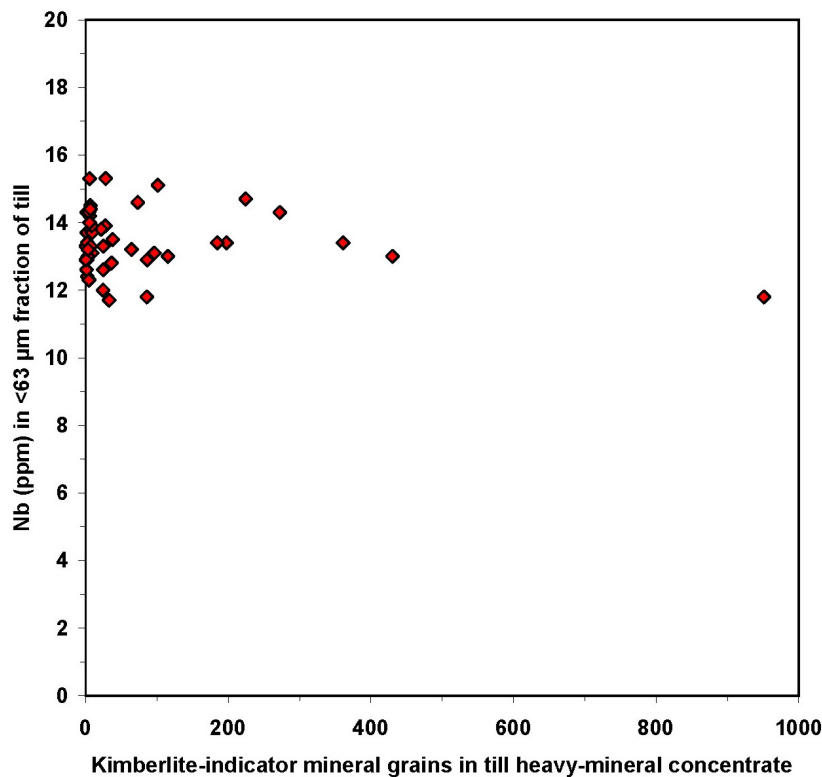


Figure 11. Binary diagram showing KIM grains (sum of all picked grains normalized to 30 kg field sample) in till heavy-mineral concentrates versus Nb values in the <63 µm fraction of till geochemical samples.

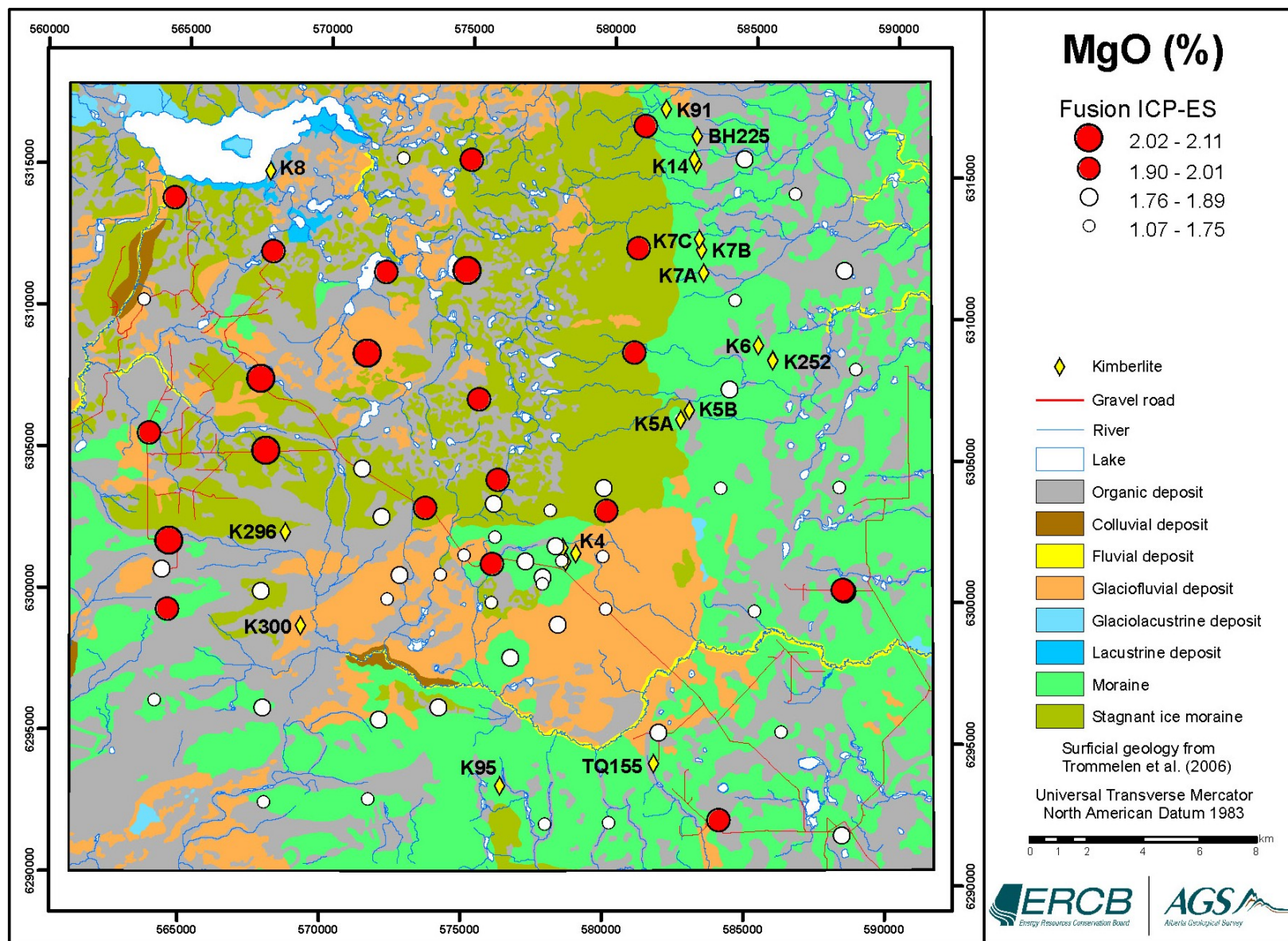


Figure 12. Areal distribution of MgO in till of the Sawn Lake map area.

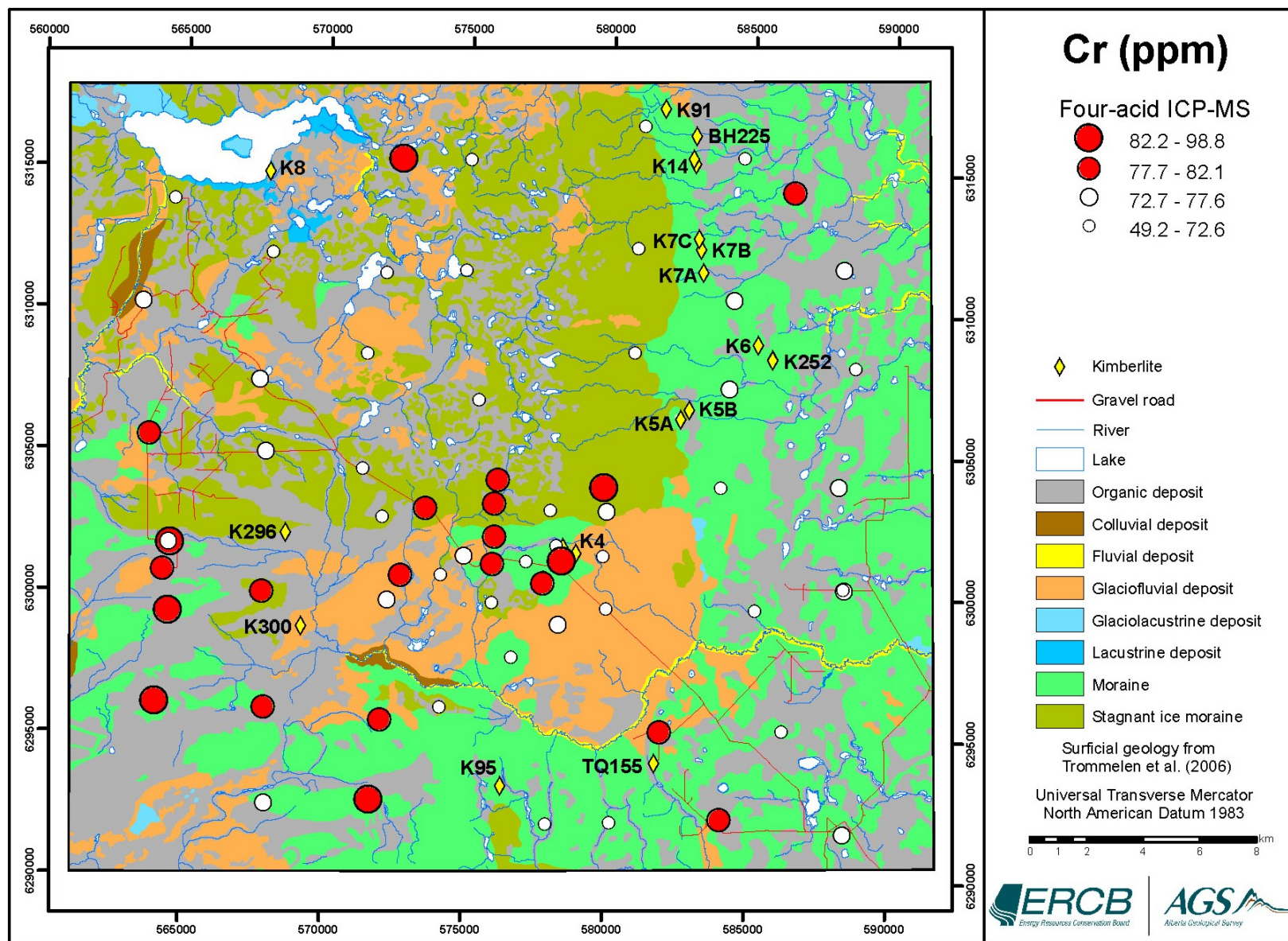


Figure 13. Areal distribution of Cr in till of the Sawn Lake map area.

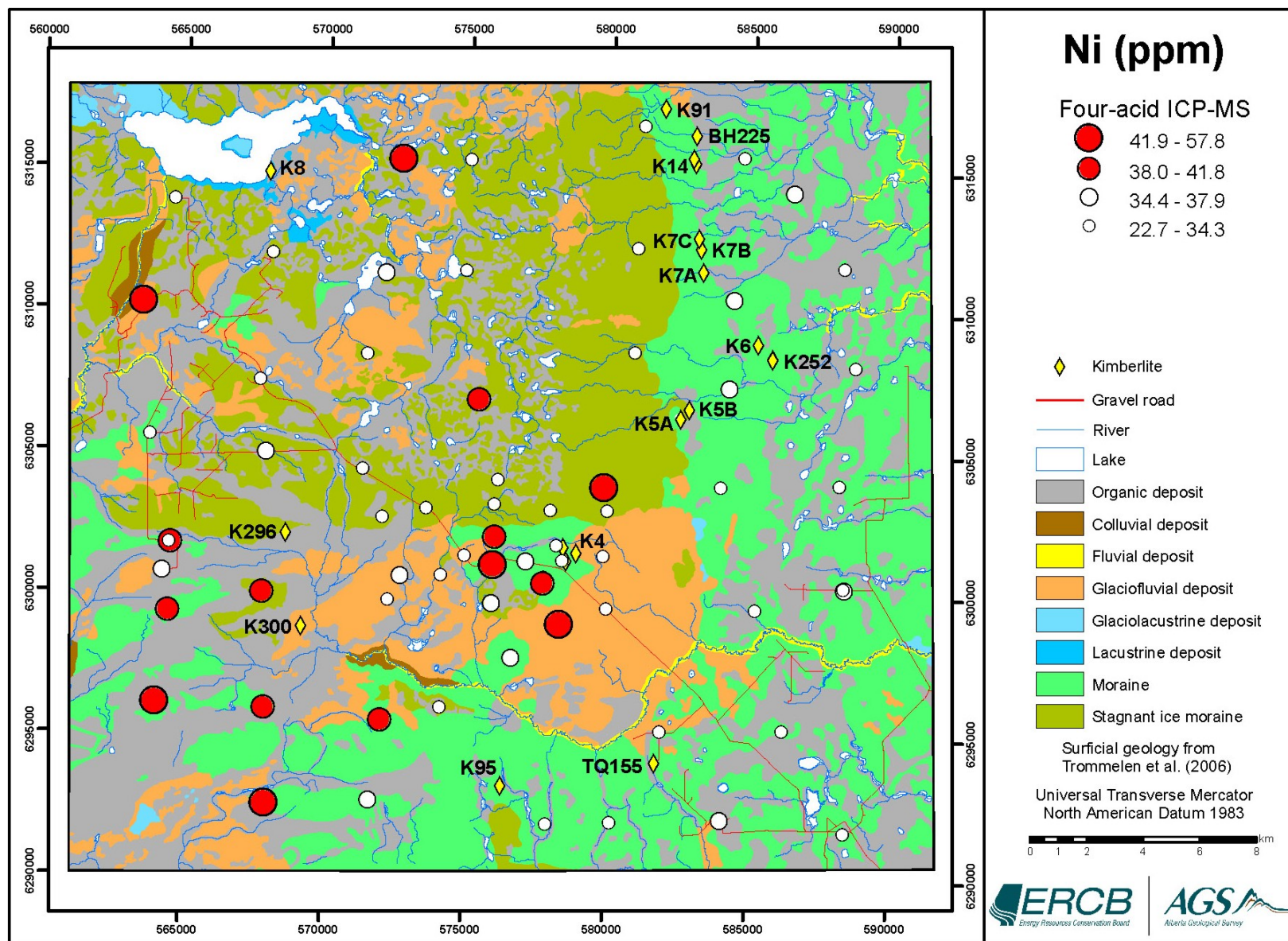


Figure 14. Areal distribution of Ni in till of the Sawn Lake map area.

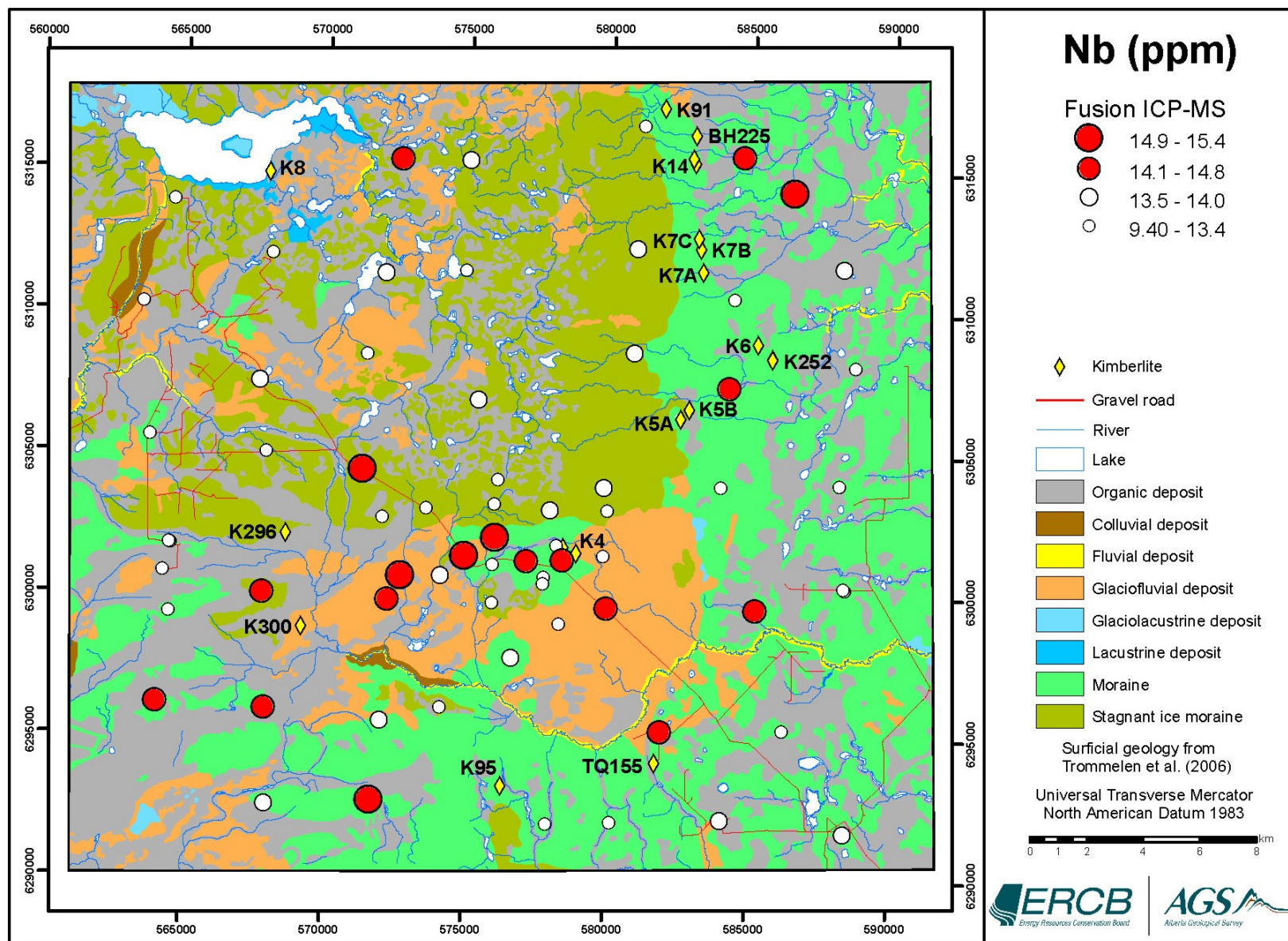


Figure 15. Areal distribution of Nb in till of the Sawn Lake map area.

7.3 Till Geochemistry and Till Types

Alberta Energy and Utilities Board/Alberta Geological Survey Map 314 (Trommelen et al., 2006), which shows the surficial geology of the Sawn Lake map area at a scale of 1:50 000, has been used to characterize individual till samples as being collected from ablation till or non-ablation till. On Map 314, ablation till dominates within areas mapped as stagnant-ice moraine (map unit MS), whereas non-ablation till (which includes basal till) dominates within areas mapped as moraine (map unit M; Trommelen, 2004; Trommelen et al., 2006; R. Paulen, pers. comm., 2010). Twenty-four samples are classified as ablation till and 35 samples are classified as non-ablation till. Eight samples were not classified because they were collected either 1) from till beneath glaciofluvial sediments or 2) near unit contacts.

Histograms of Mo and U in ablation till and non-ablation till are presented in Figure 16; these elements are plotted against each other in Figure 17. The figures show that samples of ablation till generally returned lower Mo and U values than samples of non-ablation till. A map of Mo values in till of the Sawn Lake area shows generally lower values in the northwestern part of the map area, where ice-stagnation deposits dominate the surficial geology (Figure 18). Median values for selected oxides and elements in ablation till and non-ablation till of the Sawn Lake area are listed in Table 18. Note that the ablation till has higher MgO, CaO, calcite and dolomite median values, whereas the non-ablation till (which includes basal till) has higher Mo, U, Sb and Se median values.

A plausible explanation for this relationship is that the non-ablation till contains a significant amount of basal till derived mainly from Cretaceous shale containing elevated Mo, U, Sb, Hg and Se values, particularly organic-rich shale such as the Second White Specks Formation (Dufresne et al., 2001; Fraser, 2005). In contrast, the ablation till may contain a somewhat greater amount of far-travelled material, including Paleozoic limestone and dolomite.

7.4 Till Texture

Results of texture analyses of samples collected in 2002 indicate that tills in the Sawn Lake area typically contain about 40% clay, 30% silt and 30% sand (Table 19 and Appendix 1). The median values indicate that ablation till tends to have slightly higher sand content and slightly lower silt and clay contents than the non-ablation till, but there is considerable overlap in the data.

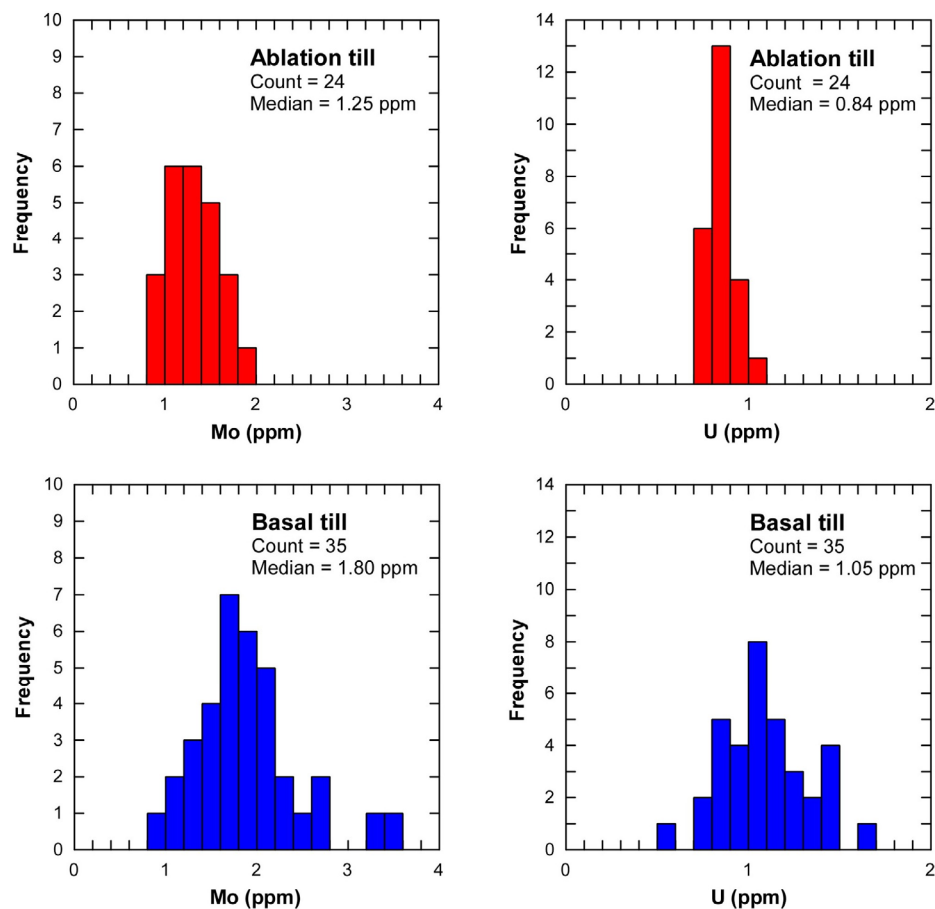


Figure 16. Histograms of Mo and U in samples of ablation till and non-ablation till from the Sawn Lake area.

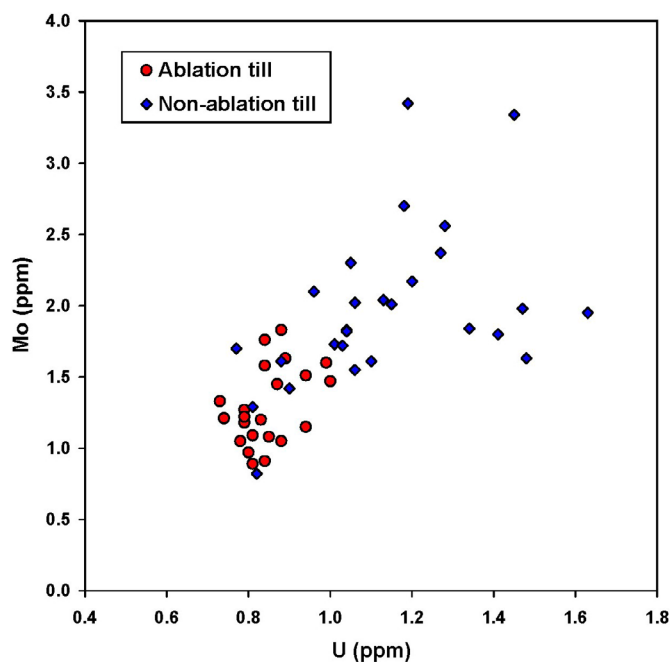


Figure 17. Plot of U versus Mo in samples of ablation till and non-ablation till from the Sawn Lake area.

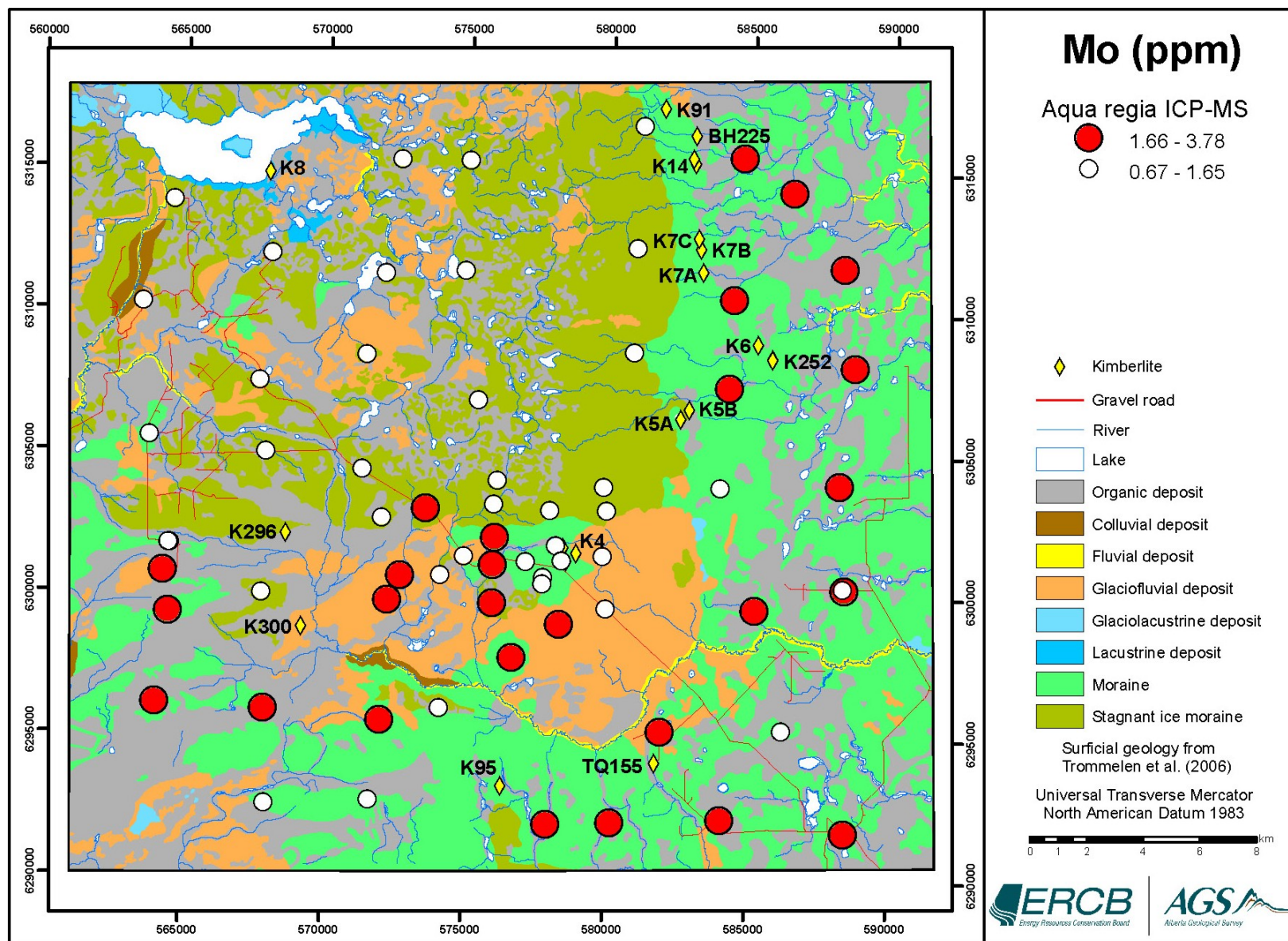


Figure 18. Distribution of Mo in till of the Sawn Lake map area.

Table 18. Comparison of geochemical data obtained from ablation till and non-ablation till.

Component	Method	Ablation till median (n = 24)	Non-ablation till median (n = 35)
MgO	Fusion-ICP	1.91%	1.77%
CaO	Fusion-ICP	4.42%	3.75%
Mo	Aqua regia-ICP-MS	1.25 ppm	1.80 ppm
U	Aqua regia-ICP-MS	0.84 ppm	1.05 ppm
Sb	Aqua regia-ICP-MS	0.39 ppm	0.47 ppm
Se	Aqua regia-ICP-MS	0.2 ppm	0.4 ppm
Calcite	Chittick	3.6%	2.8%
Dolomite	Chittick	4.9%	3.7%

Table 19. Comparison of textural data obtained from ablation and basal till.

Component	Size Range	Ablation till median (n = 22)	Non-ablation till median (n = 27)
Sand	0.063 to 1 mm	31.1%	27.1%
Silt	4 to 63 µm	29.7%	32.1%
Clay	<4 µm	39.3%	40.3%

8 References

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Appendix 1 – Analytical Data

Explanatory Notes

Unit: Refers to map unit (sediment type) on Alberta Energy and Utilities Board/Alberta Geological Survey Map 314 (Trommelen et al., 2006), as follows:

M: moraine (includes basal till)

MS: stagnant-ice moraine (ablation till)

FG: glaciofluvial

unknown: sample from either 1) an area mapped as glaciofluvial (including samples of till collected beneath glaciofluvial material), or 2) a location near the mapped boundary between different moraine units on Map 314

1EX: four-Acid ICP-ES/MS analysis (Acme Group 1EX)

1F: aqua-regia ICP-ES/MS analysis (Acme Group 1F)

4A: fusion ICP-ES analysis of oxides, Ba, Ni and Sc, LECO analysis of C and S and gravimetric analysis of loss-on-ignition (Acme Group 4A)

4B: fusion ICP-MS analysis (Acme Group 4B)

Sum: total of the oxides, Ba, Ni, Sc and loss-on-ignition determined by the Acme 4A analytical methods

na: not analyzed or not applicable

1–2 mm sand (%): proportion of 1–2 mm sand in entire sample

.063–1 mm sand (%): proportion of 0.063–1 mm sand in the <1 mm fraction

4–63 µm silt (%): proportion of 4–63 µm silt sand in the <1 mm fraction

<4 µm clay (%): proportion of <4 µm clay the <1 mm fraction

.05–1 mm sand (%): proportion of 0.05–1 mm sand in the <1 mm fraction

2–50 µm silt (%): proportion of 2–50 µm silt sand in the <1 mm fraction

<2 µm clay (%): proportion of <2 µm clay the <1 mm fraction

Sample Number	Year Sampled	UTM Easting	UTM Northing	Datum	Unit	Material	Comment	Acme File	SiO2_4A_%	Al2O3_4A_%
2001G	2002	568009	6311986	UTM NAD83	MS	Till	routine sample	A205262	63.38	11.5
2002G	2002	564508	6313845	UTM NAD83	MS	Till	routine sample	A205262	64.31	10.98
2003G	2002	579834	6301421	UTM NAD83	unknown	Till	routine sample	A205262	55.68	9.13
2004G	2002	578296	6298995	UTM NAD83	unknown	Till	routine sample	A205262	63.37	11.62
2005G	2002	578163	6301765	UTM NAD83	M	Till	routine sample	A205262	60.57	10.45
2006G	2002	575921	6299720	UTM NAD83	MS	Till	routine sample	A205262	62.32	11.53
2007G	2002	574097	6300675	UTM NAD83	unknown	Till	routine sample	A205262	66.08	11.97
2021G	2002	588382	6300329	UTM NAD83	M	Till	routine sample	A205262	63.51	12.57
2022G	2002	576097	6301257	UTM NAD83	FG	Sand	routine sample	A205262	72.86	6.96
2023G	2002	580195	6292009	UTM NAD83	M	Till	routine sample	A205262	59.81	11.2
2024G	2002	577935	6291933	UTM NAD83	M	Till	routine sample	A205262	58.16	10.72
2104G	2002	588144	6303996	UTM NAD83	M	Till	routine sample	A205262	61.46	11.8
2105G	2002	588330	6300369	UTM NAD83	M	Till	routine sample	A205262	63.01	12.35
2106G	2002	575995	6302043	UTM NAD83	M	Till	routine sample	A205262	66.9	12.96
2107G	2002	571995	6302689	UTM NAD83	MS	Till	routine sample	A205262	59.57	11.27
2108G	2002	585214	6299571	UTM NAD83	M	Till	routine sample	A205262	61.68	11.67
2109G	2002	573540	6303026	UTM NAD83	MS	Till	routine sample	A205262	61.24	12.01
2110G	2002	567868	6304968	UTM NAD83	MS	Till	routine sample	A205262	60.37	11.98
2111G	2002	563741	6305523	UTM NAD83	M	Till	routine sample	A205262	62.82	11.96
2151G	2002	584089	6292167	UTM NAD83	M	Till	routine sample	A205262	63.22	12.33
2152G	2002	586237	6295339	UTM NAD83	M	Till	routine sample	A205262	70.31	9.26
2153G	2002	581921	6295246	UTM NAD83	M	Till	routine sample	A205262	64.84	12.62
2154G	2002	576075	6304059	UTM NAD83	MS	Till	routine sample	A205262	62.23	12.15
2155G	2002	575958	6303213	UTM NAD83	MS	Till	routine sample	A205262	63.48	12.11
2156G	2002	563456	6310223	UTM NAD83	MS	Till	routine sample	A205262	69.16	11.74
2501G	2002	564273	6300732	UTM NAD83	M	Till	routine sample	A205262	61.2	12.43
2502G	2002	572218	6299784	UTM NAD83	unknown	Till	routine sample	A205262	62.81	11.96
2503G	2002	579821	6303852	UTM NAD83	MS	Till	routine sample	A205262	64.29	12.12
2504G	2002	579937	6303017	UTM NAD83	MS	Till	routine sample	A205262	61.82	11.47
2505G	2002	577938	6303014	UTM NAD83	MS	Till	routine sample	A205262	65.38	11.7
2506G	2002	574968	6315342	UTM NAD83	MS	Till	routine sample	A205262	63.72	11.37
2507G	2002	574856	6311448	UTM NAD83	MS	Till	routine sample	A205262	60.43	12
2508G	2002	575358	6306886	UTM NAD83	MS	Till	routine sample	A205262	61.06	11.39
2509G	2002	584326	6310533	UTM NAD83	M	Till	routine sample	A205262	64.69	11.57
2510G	2002	580830	6308619	UTM NAD83	MS	Till	routine sample	A205262	64.45	11.19
2511G	2002	564059	6296083	UTM NAD83	M	Till	routine sample	A205262	63.47	13.89
2512G	2002	588651	6308170	UTM NAD83	M	Till	routine sample	A205262	62.28	10.33
2513G	2002	572019	6311323	UTM NAD83	MS	Till	routine sample	A205262	61.71	11.45
2514G	2002	571391	6308445	UTM NAD83	MS	Till	routine sample	A205262	60.49	11.47
2515G	2002	567985	6292543	UTM NAD83	M	Till	routine sample	A205262	61.4	12.67
2516G	2002	567900	6295898	UTM NAD83	M	Till	routine sample	A205262	63.23	12.91
2517G	2002	576642	6297798	UTM NAD83	M	Till	routine sample	A205262	64.12	10.32
2518G	2002	572027	6295531	UTM NAD83	M	Till	routine sample	A205262	63.76	13.42
2519G	2002	574123	6296000	UTM NAD83	MS	Till	routine sample	A205262	66.22	10.51
2520G	2002	584615	6315547	UTM NAD83	M	Till	routine sample	A205262	63.92	11.43
2522G	2002	581079	6316630	UTM NAD83	unknown	Till	routine sample	A205262	63.12	10.74
2523G	2002	580900	6312307	UTM NAD83	MS	Till	routine sample	A205262	63.19	11.45
2524G	2002	588214	6311674	UTM NAD83	M	Till	routine sample	A205262	62.26	11.88
2525G	2002	584210	6307402	UTM NAD83	M	Till	routine sample	A205262	63.39	12.21
2526G	2002	583958	6303888	UTM NAD83	M	Till	routine sample	A205262	63.08	8.14
2527G	2002	567780	6300003	UTM NAD83	MS	Till	routine sample	A205262	64.01	12.67
2528G	2002	572670	6300642	UTM NAD83	unknown	Till	routine sample	A205262	64	12.86
2529G	2002	564477	6299302	UTM NAD83	M	Till	routine sample	A205262	61.94	13.14
2530G	2002	572552	6315352	UTM NAD83	MS	Till	routine sample	A205262	64.94	13.19
2531G	2002	586410	6314337	UTM NAD83	M	Till	routine sample	A205262	63.56	12.69
2557G	2002	571676	6292707	UTM NAD83	M	Till	routine sample	A205262	69.18	12.6
1401G	2001	577736	6300645	UTM NAD83	M	Till	routine sample	A205262	59.7	10.63
1402G	2001	577715	6300416	UTM NAD83	M	Till	routine sample	A205262	67.85	12.47
NAT98-260	1998	564527	6301717	UTM NAD83	M	Till	routine sample	A205262	63.14	14.97
RE98-84B-165-001	1998	564478	6301720	UTM NAD83	M	Till	routine sample	A205262	58.97	12.58
RE98-84B-36-001	1998	567629	6307494	UTM NAD83	MS	Till	routine sample	A205262	59.75	11.74
RE98-84B-37-001	1998	571275	6304387	UTM NAD83	MS	Till	routine sample	A205262	63.64	12.09
RE98-84B-39-001	1998	574913	6301372	UTM NAD83	unknown	Till	routine sample	A205262	69.92	12.13
RE98-84B-40-001	1998	577120	6301197	UTM NAD83	M	Till	routine sample	A205262	63.12	11.9
RE98-84B-41-001	1998	578381	6301237	UTM NAD83	M	Till	routine sample	A205262	70.66	11.99
RE98-84B-45-001	1998	579959	6299567	UTM NAD83	unknown	Till	routine sample	A205262	70.64	10.65
RE98-84B-53-001	1998	588460	6291732	UTM NAD83	M	Till	routine sample	A205262	63.47	11.44
NAT96-216	1996	575926	6301076	UTM NAD83	M	Till	routine sample	A205262	61.11	13.31
4902G	na	na	na	na	na	na	lab duplicate of 2004G	A205262	62.78	11.78
4909G	na	na	na	na	na	na	lab duplicate of 2153G	A205262	65.04	12.46
4913G	na	na	na	na	na	na	lab duplicate of 2505G	A205262	65.32	11.84
4914G	na	na	na	na	na	na	lab duplicate of 2524G	A205262	62.6	12.09
2521G	na	na	na	na	na	na	standard CANMET Till-2	A205262	60.76	15.75
2541G	na	na	na	na	na	na	standard CANMET Till-2	A205262	60.18	15.95
2558G	na	na	na	na	na	na	standard CANMET Till-2	A205262	60.58	15.9

Sample Number	Fe2O3_4A_%	MgO_4A_%	CaO_4A_%	Na2O_4A_%	K2O_4A_%	TiO2_4A_%	P2O5_4A_%	MnO_4A_%	Cr2O3_4A_%	Ba_4A_ppm	Ni_4A_ppm	Sc_4A_ppm	LOI_4A_%	Sum_4A_%	Total C_4A_%	Total S_4A_%	Co_4B_ppm
2001G	4.71	1.97	4.13	0.61	2.06	0.64	0.17	0.05	0.0097	701	40	10	10.6	99.91	1.52	0.03	11.2
2002G	4.7	1.93	4.45	0.66	1.93	0.65	0.16	0.05	0.0093	716	34	12	10	99.91	1.59	0.03	11.9
2003G	3.73	1.67	9.95	0.56	1.54	0.53	0.17	0.05	0.0078	662	23	9	16.7	99.79	4.01	0.06	11.5
2004G	4.85	1.88	3.93	0.61	2.06	0.65	0.18	0.04	0.0103	820	40	10	10.6	99.9	1.62	0.04	12.7
2005G	4.03	1.76	6.57	0.67	1.74	0.6	0.17	0.04	0.0088	662	< 20	9	12.6	99.28	2.17	0.05	9.7
2006G	4.59	1.68	5.04	0.62	1.85	0.64	0.18	0.05	0.0102	809	20	10	11.3	99.91	1.85	0.05	13.3
2007G	5.18	1.37	1.89	0.62	2.08	0.69	0.2	0.04	0.0104	736	44	12	9.1	99.31	0.98	0.03	11
2021G	4.56	1.94	3.03	0.62	2.15	0.68	0.19	0.05	0.0105	760	69	10	10.5	99.9	2.17	0.81	13.3
2022G	3.58	1.7	3.95	0.84	1.44	0.67	0.17	0.06	0.009	698	< 20	13	6.9	99.22	1.27	0.05	7.3
2023G	4.61	1.72	6.41	0.57	1.85	0.61	0.14	0.04	0.0091	734	23	9	12.2	99.26	2.29	0.07	10.5
2024G	6.81	1.74	5.81	0.57	1.85	0.59	0.17	0.07	0.0085	732	31	9	12.7	99.29	2.18	0.06	10.5
2104G	4.44	1.69	5.25	0.55	1.86	0.64	0.17	0.03	0.0092	843	27	10	11.7	99.69	2.07	0.05	7.8
2105G	4.81	1.99	4.01	0.63	2.12	0.66	0.17	0.05	0.0098	705	57	11	9.8	99.7	1.5	0.41	12.7
2106G	5.41	1.23	0.75	0.62	2.02	0.68	0.19	0.04	0.011	717	46	11	8.4	99.3	0.76	0.02	9.7
2107G	4.51	1.89	6.11	0.58	1.82	0.61	0.16	0.04	0.0092	710	60	9	12	98.65	1.95	0.04	12
2108G	5.39	1.69	4.43	0.56	1.91	0.64	0.18	0.02	0.0099	774	35	10	11.4	99.67	1.66	0.06	12.1
2109G	4.76	2	4.69	0.58	2.09	0.63	0.19	0.04	0.0099	747	37	10	11.3	99.63	1.7	0.03	11.1
2110G	4.78	2.11	5.87	0.58	2.06	0.62	0.16	0.07	0.0096	748	27	10	11.2	99.89	2.05	0.03	14.9
2111G	4.7	2	3.9	0.65	2.03	0.63	0.17	0.04	0.0096	721	23	10	10.4	99.39	1.6	0.03	10.3
2151G	5.01	1.9	3.75	0.63	2.07	0.67	0.19	0.05	0.0096	766	28	10	10	99.92	1.72	0.06	13
2152G	3.47	1.5	3.62	0.82	1.71	0.65	0.18	0.03	0.0083	690	25	10	8.3	99.93	1.23	0.63	8.1
2153G	5	1.81	2.63	0.63	2.15	0.71	0.19	0.03	0.0101	798	36	11	9.2	99.92	1.13	0.05	9.6
2154G	4.9	1.99	4.44	0.63	2.02	0.64	0.19	0.04	0.0096	769	< 20	10	10.6	99.92	1.56	0.03	11.9
2155G	4.99	1.8	3.86	0.63	1.86	0.65	0.18	0.05	0.0099	719	37	13	10.2	99.91	1.42	0.03	11.5
2156G	4.93	1.22	1.26	0.74	1.95	0.66	0.16	0.04	0.0095	802	33	12	7.6	99.57	0.87	0.02	11.9
2501G	4.91	1.79	4.66	0.6	1.97	0.65	0.17	0.04	0.01	765	35	11	11.4	99.92	1.62	0.04	12.1
2502G	4.94	1.72	4.25	0.63	1.94	0.66	0.19	0.04	0.0098	854	101	12	10.5	99.76	1.66	0.04	11.6
2503G	5.01	1.78	2.88	0.64	1.89	0.64	0.19	0.05	0.0101	714	49	13	10.2	99.78	1.36	0.03	12.9
2504G	4.49	1.91	5.46	0.63	1.74	0.62	0.17	0.04	0.0088	697	52	12	11.2	99.65	1.86	0.02	9.6
2505G	4.79	1.65	2.84	0.64	1.94	0.66	0.16	0.06	0.0097	692	39	10	10	99.91	1.27	< .01	11
2506G	4.45	1.93	4.1	0.64	1.93	0.64	0.15	0.04	0.0096	699	36	10	10.8	99.87	1.57	0.02	9.6
2507G	4.73	2.01	5.46	0.59	1.96	0.64	0.16	0.05	0.01	722	38	10	11.8	99.93	1.95	0.05	14.1
2508G	4.7	1.93	5.12	0.62	1.99	0.62	0.14	0.07	0.0103	666	40	10	12.2	99.93	2.03	0.05	13.7
2509G	4.8	1.72	3.57	0.66	1.99	0.66	0.19	0.05	0.0106	850	49	10	9.9	99.91	1.48	0.06	11.4
2510G	4.56	1.9	4.4	0.66	1.94	0.64	0.19	0.04	0.01	683	37	10	9.8	99.86	1.6	0.02	10.2
2511G	5.54	1.32	0.74	0.65	2.03	0.71	0.16	0.04	0.012	859	40	13	11.2	99.87	0.87	0.02	11.1
2512G	3.95	1.64	6.54	0.66	1.83	0.62	0.16	0.03	0.0093	910	26	9	11.7	99.85	2.22	0.06	8.5
2513G	4.45	1.94	5.23	0.61	1.92	0.62	0.16	0.05	0.01	650	39	10	11.6	99.84	2.02	0.05	13
2514G	4.45	2.08	6.12	0.6	1.84	0.62	0.15	0.05	0.0101	694	40	10	11.9	99.86	1.97	0.03	9.5
2515G	5.39	1.74	3.61	0.69	1.96	0.67	0.18	0.06	0.0114	805	44	11	11.4	99.89	1.58	0.04	13.7
2516G	5.32	1.79	2.84	0.58	2.28	0.7	0.18	0.05	0.0121	1253	52	12	9.8	99.84	1.45	0.06	14.4
2517G	4.56	1.77	5.01	0.69	1.87	0.61	0.16	0.06	0.0091	930	39	11	10.6	99.89	2.28	0.06	13.4
2518G	5.54	1.87	1.9	0.7	2.24	0.72	0.18	0.05	0.0115	858	36	12	9.4	99.89	1.07	0.05	13.3
2519G	4.25	1.77	4.01	0.75	1.92	0.65	0.16	0.04	0.0085	677	33	9	9.5	99.87	1.58	0.04	11
2520G	4.68	1.89	4.1	0.63	2.05	0.64	0.17	0.04	0.0099	757	30	10	10.2	99.85	1.48	0.62	10
2522G	4.36	1.91	4.54	0.64	1.93	0.6	0.18	0.05	0.0091	723	40	11	11.7	99.87	2.18	0.05	10.4
2523G	4.71	1.91	4.24	0.59	1.93	0.63	0.15	0.05	0.0097	721	34	12	10.9	99.84	1.75	0.04	12.5
2524G	4.66	1.86	4.46	0.56	1.99	0.65	0.17	0.04	0.0104	858	36	10	11.2	99.84	1.68	0.09	9.8
2525G	4.99	1.84	3.28	0.59	2.15	0.66	0.18	0.05	0.0105	811	45	11	10.4	99.85	1.48	0.02	13.5
2526G	3.22	1.57	7.52	0.72	1.55	0.54	0.14	0.03	0.0071	629	26	7	13.3	99.89	3.25	0.06	7.7
2527G	5.13	1.84	2.79	0.59	2.08	0.66	0.16	0.04	0.0106	778	75	11	9.8	99.87	1.43	0.05	11.7
2528G	4.92	1.82	2.54	0.58	1.91	0.66	0.17	0.04	0.0108	1332	36	11	10.2	99.86	1.15	0.06	12.8
2529G	5.25	1.94	3.13	0.72	1.99	0.68	0.18	0.05	0.0114	1071	43	12	10.7	99.86	1.27	0.05	14.5
2530G	5.31	1.65	1.78	0.65	2.2	0.69	0.19	0.05	0.0115	825	48	12	9.1	99.86	1.27	0.01	13.1
2531G	4.95	1.69	2.77	0.58	2	0.68	0.16	0.03	0.0107	1039	33	11	10.6	99.84	1.47	0.04	10.4
2557G	5.01	1.11	0.57	0.65	1.96	0.71	0.15	0.03	0.0107	725	35	13	7.8	99.87	0.88	0.03	9.4
1401G	4.42	1.84	7.15	0.59	1.88	0.6	0.16	0.05	0.0094	702	33	9	12.8	99.91	2.38	0.05	10.9
1402G	5.29	1.23	0.84	0.65	1.97	0.69	0.14	0.04	0.0107	711	41	14	8.6	99.86	0.74	0.02	11.1
NAT98-260	4.98	1.77	1.85	1.75	1.97	0.82	0.14	0.04	0.0165	1039	41	12	8.3	99.87	0.49	0.02	13.4
RE98-84B-165-001	5.41	2.06	4.96	0.74	2.04	0.65	0.16	0.05	0.0108	699	43	11	12.2	99.91	1.66	0.01	13.1
RE98-84B-36-001	4.63	2.11	5.92	0.57	2.13	0.61	0.19	0.04	0.0094	688	37	10	12.1	99.88	2.13	0.04	11.2
RE98-84B-37-001	4.6	1.83	3.44	0.63	2.13	0.66	0.14	0.04	0.0095	692	34	11	10.6	99.89	1.91	0.05	12.1
RE98-84B-39-001	4.73	1.16	0.61	0.62	2.03	0.67	0.11	0.02	0.01	660	31	13	7.8	99.89	0.65	0.03	8.9
RE98-84B-40-001	4.82	1.82	4.11	0.61	2.09	0.64	0.15	0.05	0.0101	717	38	10	10.5	99.9	1.74	0.05	11.8
RE98-84B-41-001	4.63	1.12	0.62	0.68	2.15	0.68	0.07	0.03	0.0105	680	77	11	7.2	99.93	0.68	< .01	8.5
RE98-84B-45-001	4.04	1.07	1.34	0.82	1.96	0.66	0.1	0.06	0.0089	706	22	10	8.5	99.93	1.81	< .01	11
RE98-84B-53-001	4.65	1.83	4.45	0.59	2.03	0.63	0.17	0.05	0.0095	795	44	10	10.5	99.92	1.93	0.09	13.3
NAT96-216	6.05	1.92	2.91	0.87	2.01	0.68	0.18	0.13	0.0113	841	56	13	10.6	99.89	1.14	0.03	25.1
4902G	5	1.96	4.07	0.65	2.12	0.65	0.14	0.04	0.0101	830	45	10	10.6	99.9	1.69	0.04	13.9
4909G	4.94	1.84	2.62	0.64	2.31	0.72	0.18	0.04	0.0106	780	35	11	9	99.89	1.18	0.06	10.3
4913G	4.92	1.67	2.89	0.66	1.97	0.65	0.15	0.06	0.0101	694	45	10	9.7	99.93	1.34	0.04	9.4
4914G	4.61	1.83	4.39	0.58	2.03	0.66	0.17	0.04	0.01	854	33	10	10.8	99.91	1.64	0.11	9.6
2521G	5.55	1.91	1.32	2.18	2.94	0.87	0.18	0.1	0.0089	518	29	14	8.2	99.83	1.75	0.04	15
2541G	5.55	1.84	1.29	2.21	2.86	0.88	0.16	0.1									

Sample Number	Cs_4B_ppm	Ga_4B_ppm	Hf_4B_ppm	Nb_4B_ppm	Rb_4B_ppm	Sn_4B_ppm	Sr_4B_ppm	Ta_4B_ppm	Th_4B_ppm	U_4B_ppm	V_4B_ppm	W_4B_ppm	Zr_4B_ppm	Y_4B_ppm	La_4B_ppm	Ce_4B_ppm	Pr_4B_ppm
2001G	4.1	16.7	6.9	12.4	78.8	< 1	120.3	0.9	11.5	2.2	124	1.4	243.6	27	33.6	61.5	7.09
2002G	4	15.4	8.9	12.6	79	< 1	121.6	1	11.4	2.3	119	1.8	317.6	29.1	32.7	61.3	7.26
2003G	3.6	12.8	7.5	10.5	64.7	< 1	136.7	0.8	8.4	2.6	97	1.3	259.8	24.9	28.3	52.4	6.36
2004G	4.4	16.2	7.3	12.6	80.5	< 1	129.2	0.9	9.7	3	149	1.4	238	25.8	33.5	60.6	7.1
2005G	3.6	13.4	7.5	11.8	68.1	< 1	133.1	0.9	8.6	2.5	112	1.5	242.2	26.8	30.9	56.7	6.73
2006G	4.8	16.9	7.1	13	77.3	1	128.8	0.9	10.5	3.3	137	1.6	252.1	29.7	32.4	60.9	7.28
2007G	5	16.3	7.9	13.8	90.5	2	111	1	10.2	3.3	141	1.7	281.7	31.1	35.3	64.9	7.92
2021G	4.5	16.4	5.9	12.9	87.5	1	138.9	1	11.3	4.3	145	1.2	227	27.6	34.1	61.7	7.45
2022G	1.7	8.1	25.1	12.1	48.2	< 1	124.8	0.9	11.8	3.9	68	1.1	936.1	35.3	35.6	70.1	8.25
2023G	4.2	15.4	6.6	11.8	75.9	< 1	136.9	0.9	8.8	3.6	119	0.9	231.7	26.1	32	59.1	7.07
2024G	4.9	13.8	6.5	12	78.2	< 1	134.6	0.9	10.7	3.1	120	0.9	231.6	26.4	31.5	58.1	6.85
2104G	5.6	15	6.5	13	84.6	2	145.1	1	11	3.7	135	1.2	240.7	29.6	33.2	59.6	7.46
2105G	4.5	15.7	6.7	12.6	88.1	2	150.3	0.9	12.1	4	128	1.4	243.9	28.4	34.6	63.8	7.69
2106G	5.1	19.2	8.8	15.1	91.6	2	118	0.9	15.2	3.4	146	1.4	284.4	44.4	45	81.2	10.75
2107G	4.9	15.6	7.3	13.2	81.7	2	142	1	11.1	3.2	125	2.4	267.1	29.7	34.8	63.9	7.83
2108G	5.5	16	6.9	14.3	90.9	3	147.1	1	11.1	4	139	1.7	251.9	30.6	34.5	63.1	7.59
2109G	5.7	14.5	6.2	13.3	93.2	3	134.2	1	12	3.6	129	1.2	237.3	29.3	35.7	63.9	8.01
2110G	4.7	16.6	7.4	13	93.8	2	147.9	0.9	13.4	3.2	124	1.5	239.5	28.2	35.9	66.3	7.94
2111G	4.1	16.3	7.1	13	85.5	1	136.7	0.9	10.6	3.2	125	1.5	248.4	28.4	33.8	62	7.65
2151G	5.2	17	7.1	13.9	92.2	1	147.4	1	12.7	3.7	133	1	237	28.1	33.5	59.8	7.43
2152G	3.3	12.1	8.3	12.9	65.8	< 1	152.1	0.9	9	3.7	92	0.9	283.4	27	28.5	52.2	6.45
2153G	5.6	19.7	6.6	14.5	96.9	< 1	128.5	1.1	10.7	3.1	146	1.1	219.5	30.4	35.8	64	8.03
2154G	3.7	16.6	6.5	12.3	82.1	< 1	131.8	0.9	12.6	2.6	126	1	231.9	27.6	33.7	61.2	7.66
2155G	3.8	16.3	7.3	13.1	78.7	1	119.5	1	11.9	2.9	126	1.3	274.5	30.3	35.3	63.1	8.16
2156G	4.2	17.3	8.9	13.3	78.9	1	115.8	0.9	13.5	3	118	1.2	296.5	42.6	42.8	70.6	9.64
2501G	5	17.5	7	12.8	84.3	1	135.3	1	13.5	2.6	138	0.7	228.4	28.3	34.4	62.2	7.85
2502G	4.2	16.3	7.6	14.1	81.2	2	123.2	1	13.2	2.7	138	0.9	252.8	28.2	36	65.9	8.14
2503G	4	19.2	8	13.9	81.5	1	119.3	1	15.9	2.6	136	1.2	289.4	31.4	37.3	68.3	8.3
2504G	3.2	16.9	8.4	13.1	71.1	1	132.5	0.9	10.7	3.4	118	1.1	272.5	28.2	33.9	61.2	7.74
2505G	4.5	14.3	7.2	13.5	88.1	< 1	121.2	0.9	11.3	3.2	119	0.8	258.6	31.2	36.9	63.2	8.24
2506G	4.7	16.1	7.2	13.7	89.6	< 1	140.9	0.9	10.5	2.6	130	0.4	258.7	28.1	36.5	63.1	7.97
2507G	4.5	14.9	6.2	13.3	86.6	< 1	131.4	0.9	11.8	3.1	133	1.8	221.2	27.5	35.6	64.2	7.61
2508G	5	15.3	6.8	13.4	89.5	< 1	140.9	0.9	12.3	2.7	126	1.3	245.1	29.1	35.9	64.7	7.84
2509G	5.4	16.9	7.6	13.3	89.5	< 1	144	1.1	10.2	2.6	132	0.5	259.2	29.3	34.3	60.5	7.66
2510G	3.9	13.9	7.4	13.8	84.8	1	126.6	0.9	9	3.1	117	0.3	264.8	29.5	34.3	61.6	7.58
2511G	7.5	16.5	6	14.6	100.9	2	115.1	1	11.9	3.9	180	0.5	217.7	37.4	39.7	71.3	9.25
2512G	3.4	13	6.3	13.2	76.5	3	177.4	0.8	11	3.3	119	1	253.3	27.3	32.1	55.7	6.66
2513G	4	15.8	6.6	13.8	86.7	3	141	0.8	11	3.5	131	0.8	255.6	29.2	35.5	64.3	7.7
2514G	2.8	13.1	5.7	12.3	69.4	3	141.7	0.7	8.7	2.5	118	< .1	226.5	26.3	32.9	58.2	6.94
2515G	4.9	14.1	5.3	13.4	82.4	< 1	142.7	0.9	10.2	2.2	142	0.4	207.9	28.1	32.4	60.4	7.07
2516G	5.8	15.7	6.1	14.3	95.2	< 1	153	0.9	10.5	3.1	180	0.8	224.8	29.7	35.9	63	7.67
2517G	4.4	12.8	7.2	13.4	78.6	< 1	131	0.9	10.9	3.6	118	1.3	281.8	28.7	33.6	60.5	7.22
2518G	5.8	15.1	5.8	13.4	95.5	2	143.1	0.8	9.9	3.4	169	0.8	215.2	28.2	33.8	59.1	7.18
2519G	4.6	12.6	6.6	12.9	75.9	2	122.2	1.1	9.7	3.1	104	1.8	254.1	28	31.9	57	7.11
2520G	5.7	14.7	6.5	14.3	91	2	168.2	1.1	10.5	3.7	133	1	251.5	28.5	33.6	59.7	7.33
2522G	4.6	13.3	7.5	12.6	77.2	2	126.4	1	11.1	2.2	108	1.9	268.9	27.7	32.2	59.3	7.4
2523G	4.6	15.6	6.8	13.7	82.8	2	128.4	1.1	11.6	3.2	126	1.9	262.4	29.9	34.3	60.4	7.46
2524G	6.1	15.7	6.4	14	90.9	1	161.3	1	12.1	3.1	147	1.4	239.6	30.1	35.4	63	7.77
2525G	5.3	15.4	6.2	14.4	92.5	2	132	1	10.9	3	147	1.7	244.4	30.1	35.7	64.9	7.64
2526G	3.7	9.8	6.3	11.7	60.9	1	157.2	0.9	8.6	2	88	1.8	229.3	26.8	28.3	49.2	6.31
2527G	5.8	15.8	6.5	14.2	96.7	2	128.2	1.1	12.2	3.5	150	1.2	244.6	35.3	40	67.9	8.93
2528G	6.2	17.9	6.7	15.4	88.1	2	161.5	1.2	12	3	163	1.9	237.2	31.8	38.6	66	8.17
2529G	6.2	16.6	6	13	85.8	2	149.8	0.9	11.5	2.8	151	1.5	214.6	28.6	34	62.4	7.53
2530G	6.1	17.8	7.1	14.7	98.5	2	123.8	1.1	12.8	3.3	155	1.7	256.1	32.4	40	71.9	8.71
2531G	6.5	17.1	7.3	15.3	93.5	2	147.7	1.1	11.5	3.5	163	1.3	245.3	31.8	37.5	65.4	8.3
2557G	5.1	14.2	7.6	15.3	77.9	3	105.6	1.1	12.1	2.8	128	1.5	264.1	35	38.6	71.7	9
1401G	4.3	14.8	6.8	12.7	77	< 1	136.4	0.9	9	2.9	118	1.5	235.5	27.1	31.8	58.5	6.78
1402G	5.5	17.6	8.6	13.1	84.9	< 1	110.9	1	12.3	3.4	140	2	270.6	43.8	44.8	75.4	10.38
NAT98-260	3.2	16.8	5.8	9.4	59	2	278.6	0.8	5.7	2.6	127	1.2	186.9	21.4	23.9	45.4	5.53
RE98-84B-165-001	4.1	16.7	5.6	12.4	78.5	3	157.2	1	9.4	2.9	138	1.5	191.4	26.2	31.7	60	7.32
RE98-84B-36-001	4.8	15.2	6.4	13.7	86.5	3	145.5	1	11.5	2.9	132	1.1	220.3	26.6	35.7	67.8	8.03
RE98-84B-37-001	5.6	15.5	6.7	15	96	3	132.2	1	10.8	3.8	135	1.9	246.5	28.9	36.7	67.1	7.97
RE98-84B-39-001	5	16.9	7.8	15.4	91.5	2	114	1.1	11.8	2.7	142	2.1	294.2	28.7	35.7	70	8.14
RE98-84B-40-001	4.8	16	6.8	14.2	87.2	3	127.6	1	11.6	3	135	2.1	240	30.5	36.6	70.4	8.53
RE98-84B-41-001	5	17.1	7.9	14.8	99.1	2	107.6	1.1	12.1	3.6	132	1.3	287.3	23.6	34.3	67.4	7.36
RE98-84B-45-001	4.5	16.1	8.3	14.1	120.5	2	122.8	1	8	3.1	110	1.9	281.5	22.4	30.3	59.6	6.5
RE98-84B-53-001	4.7	16.4	7	13.4	83.1	1	152.9	0.9	10	2.7	140	1.3	236.6	28.8	34.4	66.4	7.69
NAT96-216	3.6	17.6	4.8	10.4	72.7	2	133.4	0.9	8.8	3	136	2.2	181.4	25.9	27.5	60.2	6.33
4902G	3.7	15.2	7.6	13.9	82.2	4	137	0.9	10	3.2	148	1	244.3	28.6	33.5	65.6	7.53
4909G	5.9	17.2	6.3	15.7	97.3	< 1	134.5	1.1	10.4	3.7	145	0.9	218.8	30.8	36.2	68	7.91
4913G	3.9	14.9	6.8	13.1	81.3	< 1	117	0.9	11.1	2.7	123	0.4	245.9	31.7	36.6	66	8.35
4914G	5.7	15.5	6.3	14.4	88	< 1	148.2	1	10.7	3.6	145	1.1	223.7	29.7	33.9	63.6	7.77
2521G	11.1	19.7	9.7	19	146.2	5	159.1	1.9	19.4	4.7	78	6.2	351.7	38.9	48.5	97.3	10.59
2541G	9.9	20.5	10.4	19	135.5	6	151.5	1.8	19.3	5.6	79	6	361.2	42.5	48.8	98.4	10.94
2558G	10.5	19.9	10.4	19.3	134.7	6	151.9	2	19.1	5.8	78	6.1	349.3	39.1	48.6	98.2	11.18

Sample Number	Nd_4B_ppm	Sm_4B_ppm	Eu_4B_ppm	Gd_4B_ppm	Tb_4B_ppm	Dy_4B_ppm	Ho_4B_ppm	Er_4B_ppm	Tm_4B_ppm	Yb_4B_ppm	Lu_4B_ppm	Mo_1EX_ppm	Cu_1EX_ppm	Pb_1EX_ppm	Zn_1EX_ppm	Ag_1EX_ppm	Ni_1EX_ppm
2001G	28.4	4.9	1.05	4.6	0.69	4.37	0.84	2.57	0.42	2.46	0.42	1.9	26.5	19.5	91	0.2	31.6
2002G	28.8	5.1	1.1	4.58	0.7	4.27	0.97	2.55	0.43	2.74	0.45	2.1	25.8	19.1	84	0.2	30.7
2003G	25.8	4.7	0.98	4.26	0.61	3.45	0.79	2.36	0.37	2.63	0.4	1	27.1	15.6	65	0.3	29.1
2004G	27.6	5.4	1.03	4.6	0.69	4.3	0.93	2.53	0.38	2.45	0.42	3.9	27.4	20	98	0.2	42.6
2005G	27.9	5	0.94	3.94	0.67	3.63	0.87	2.46	0.35	2.35	0.39	1.6	25.5	18.5	85	0.2	29.4
2006G	30.1	5.1	1.09	4.76	0.7	4.25	1.05	2.81	0.41	2.88	0.43	1.9	27.5	20.9	101	0.2	36.7
2007G	31.9	5.9	1.32	4.75	0.74	4.25	1	2.83	0.44	3.02	0.5	1.6	31.2	19	96	0.2	32.9
2021G	29.1	5	1.15	4.64	0.72	4.19	0.93	2.64	0.38	2.69	0.46	2	26.5	19	100	0.2	36.5
2022G	32.6	6.1	1.04	5.19	0.78	4.75	1.15	3.29	0.56	3.51	0.63	1.2	15.3	15.8	54	0.2	18.8
2023G	28.7	5	1.11	4.27	0.7	3.67	0.87	2.37	0.37	2.48	0.4	2.3	24	17.7	84	0.2	26.2
2024G	28.4	5.2	0.99	4.12	0.66	3.92	0.92	2.41	0.38	2.54	0.46	3.4	25.5	18.1	87	0.2	31.2
2104G	28.5	5.4	1.12	4.75	0.79	4.34	1	2.78	0.41	2.95	0.45	2	28	16.8	83	0.3	30.3
2105G	30.8	5.6	1.15	5.05	0.72	4.14	0.93	2.81	0.37	2.72	0.41	1.9	23.4	19.3	90	0.2	31.7
2106G	42	8.1	1.75	7.25	1.04	6.01	1.42	3.88	0.58	3.58	0.59	1.8	29.2	19.6	98	0.2	38.7
2107G	32.1	5.5	1.12	4.89	0.75	4.08	0.99	2.73	0.39	2.61	0.41	1.7	23.9	17.1	91	0.2	28.9
2108G	32.3	5.3	1.2	5.17	0.79	4.72	1.05	2.74	0.42	2.86	0.45	2.4	29.3	17.1	86	0.2	31.8
2109G	31.3	5.5	1.16	4.96	0.78	4.33	0.92	2.58	0.41	2.61	0.39	1.8	27.1	18.7	93	0.2	30.8
2110G	31	5.2	1.22	4.55	0.69	4.06	0.93	2.58	0.38	2.49	0.43	1.8	25.4	18.9	87	0.2	35.5
2111G	30.6	5.8	1.13	4.88	0.8	4.27	1	2.74	0.42	2.66	0.4	1.6	26.2	18.5	91	0.2	30.2
2151G	29.6	5.4	1.28	4.55	0.75	4.04	0.95	2.84	0.36	2.71	0.41	2.7	27	19.9	105	0.2	35
2152G	25.2	4.7	1.01	3.89	0.65	3.62	0.89	2.57	0.4	2.69	0.44	1.7	20.1	16.3	76	0.2	23.1
2153G	30.9	6.2	1.24	4.81	0.77	4.75	1.03	2.73	0.42	2.63	0.46	1.8	27.7	19.1	106	0.2	29.6
2154G	29.3	6	1.04	4.43	0.72	3.99	0.97	2.63	0.39	2.47	0.39	1.7	25.5	18.6	94	0.1	33.4
2155G	30.3	6	1.22	4.38	0.77	4.29	0.95	2.79	0.4	2.75	0.43	1.4	27.3	18.4	94	0.2	33.5
2156G	37.3	7.5	1.47	6.1	0.95	4.93	1.26	3.59	0.51	3.39	0.54	1.1	28.2	18.7	93	0.2	42.5
2501G	30.2	6.4	1.13	4.49	0.78	4.21	0.96	2.6	0.41	2.82	0.41	2.1	26.4	17.8	94	0.2	35.3
2502G	29.8	5.1	1.23	4.95	0.75	4.25	0.99	2.83	0.4	2.71	0.42	1.7	26.7	18.9	99	0.2	33
2503G	30.7	5.8	1.24	5.4	0.86	4.49	1.05	2.99	0.42	2.96	0.43	1.7	32.2	23.3	112	0.3	47.2
2504G	30.4	5.4	1.07	4.49	0.76	4.19	0.99	2.7	0.42	2.75	0.4	1.2	26.6	17.5	81	0.2	30.5
2505G	33.3	6.8	1.48	5.42	0.88	5.07	1.04	3.13	0.47	3.14	0.44	1.6	25.4	15.8	75	0.1	31.7
2506G	31.3	5.9	1.24	5.27	0.79	4.91	0.97	2.93	0.43	2.86	0.46	1.3	26.7	17.8	85	0.2	32
2507G	30.8	5.6	1.15	5.06	0.78	4.3	0.92	2.75	0.4	2.78	0.43	1.5	26.7	17.6	89	0.1	33.1
2508G	32.2	5.5	1.23	5.19	0.81	4.66	0.93	2.72	0.44	2.69	0.44	1.4	30.5	18.4	93	0.2	39.6
2509G	30.8	6.2	1.19	5.63	0.85	5.02	0.94	2.88	0.44	3.29	0.51	3	29.4	18.7	99	0.1	37.2
2510G	31.8	5.9	1.28	4.59	0.79	4.51	0.9	2.73	0.38	2.91	0.49	1.7	26.7	17.3	83	0.1	31.1
2511G	37.4	7.7	1.87	6.76	1.09	6.25	1.25	3.85	0.5	3.64	0.55	3	37.1	19.6	113	0.2	44.1
2512G	26.8	5.4	1	4.7	0.72	4.49	0.81	2.5	0.38	2.6	0.4	2.4	24.4	15.6	79	0.2	25.3
2513G	32.4	5.8	1.25	4.62	0.78	4.77	0.84	2.69	0.4	2.89	0.44	1.2	25.7	16.9	79	0.1	35
2514G	27.8	5.1	1.05	4.16	0.69	4.14	0.87	2.31	0.38	2.3	0.38	1.6	23.9	15.6	75	0.2	32.3
2515G	27	5.7	1.18	4.49	0.79	4.34	0.91	2.6	0.38	2.62	0.42	2.4	32	18.5	99	0.2	43.4
2516G	29.8	5.5	1.32	5.16	0.79	4.38	0.9	2.75	0.39	2.55	0.47	3.9	29.4	19.8	112	0.1	39.3
2517G	28	5.8	1.21	5.01	0.76	4.7	0.84	2.62	0.42	2.75	0.48	2.6	31.2	19	83	0.2	34.7
2518G	29.4	5.5	1.29	4.65	0.75	4.16	0.86	2.46	0.41	2.61	0.42	4.3	33	18.7	110	0.1	40.1
2519G	28.8	6	1.23	4.75	0.73	4.33	0.85	2.73	0.4	2.78	0.41	1.6	24.7	16.9	87	0.1	30.7
2520G	28.7	5.6	1.2	5.01	0.77	4.52	0.96	2.66	0.43	2.77	0.44	2.5	25.3	16.6	97	0.2	31.7
2522G	28.3	6.1	1.18	4.73	0.78	4.53	0.91	2.84	0.39	2.86	0.43	1.4	25.3	15.7	79	0.2	29.2
2523G	28.5	5.5	1.13	4.57	0.85	4.67	0.9	3.07	0.43	2.9	0.46	1.6	27.7	17.5	87	0.2	32.9
2524G	28.3	5.8	1.18	4.95	0.77	4.87	0.98	2.79	0.38	3	0.45	2.3	26.2	16.4	87	0.1	32.4
2525G	30.7	6	1.19	4.62	0.8	4.49	0.91	2.86	0.45	2.63	0.4	2.8	28.5	19.7	102	0.2	36.4
2526G	25.8	5.2	1.11	4.15	0.69	4.13	0.78	2.54	0.35	2.54	0.4	1	24.1	13	68	0.3	23.8
2527G	35.2	7.5	1.37	5.56	0.88	5.62	1.07	3.47	0.52	3.1	0.48	2.1	31.8	18.6	95	0.2	40.2
2528G	31.4	6.4	1.24	5.06	0.83	5.09	0.94	3.13	0.48	3.42	0.46	2.1	30.1	20.3	106	0.1	35.8
2529G	28.6	6.2	1.3	4.85	0.85	4.93	0.97	2.83	0.43	2.7	0.45	2.1	33.5	18.2	113	0.1	41.8
2530G	32.8	6.7	1.47	5.75	0.96	5.06	0.97	3.08	0.44	3	0.48	1.9	33.2	18.6	101	0.2	51.3
2531G	32.5	6.7	1.33	5.11	0.92	4.85	0.96	2.98	0.47	3.09	0.47	2.3	30.6	16.7	100	0.1	36.3
2557G	35.2	7.6	1.52	6.37	1.05	6.24	1.18	3.48	0.51	3.77	0.55	2.1	33.5	21.2	107	0.2	37.5
1401G	28	4.6	1.09	4.66	0.67	4.09	0.95	2.49	0.41	2.42	0.41	2.2	25.8	17.7	84	0.2	28.8
1402G	44.9	8.5	1.75	7.81	1.1	6.24	1.41	3.92	0.58	3.77	0.62	1.7	34.5	21.3	96	0.3	38.2
NAT98-260	21.9	5	1.08	4.14	0.61	3.71	0.71	1.95	0.31	2.2	0.35	1.2	40.3	12	102	0.2	39.1
RE98-84B-165-001	29	6.2	1.2	4.41	0.77	4.17	0.84	2.51	0.39	2.46	0.4	1.7	34.9	14.3	91	0.1	32.3
RE98-84B-36-001	31.1	6.8	1.21	5.11	0.79	4.27	0.92	2.81	0.41	2.62	0.41	1.9	28.5	14.6	89	0.2	27.4
RE98-84B-37-001	31.7	6.3	1.12	4.3	0.78	4.43	0.94	2.46	0.44	2.49	0.45	1.3	27.3	14.7	86	0.1	30.1
RE98-84B-39-001	32.7	6.5	1.29	4.64	0.8	4.56	0.97	2.72	0.43	2.63	0.39	1.9	32.2	17.6	95	0.1	31.1
RE98-84B-40-001	32.4	5.7	1.31	4.81	0.85	4.75	1.01	2.65	0.45	2.68	0.45	1.5	26.3	15.7	88	0.2	34.7
RE98-84B-41-001	28	5.6	0.91	3.38	0.68	3.9	0.82	2.31	0.37	2.26	0.41	1.8	26	16.4	91	0.1	32
RE98-84B-45-001	25.7	5.4	0.88	3.31	0.63	3.59	0.75	2.22	0.39	2.34	0.37	1	20.7	13.8	163	0.2	22.7
RE98-84B-53-001	30.4	6.1	1.18	4.58	0.8	4.27	0.94	2.66	0.45	2.54	0.46	2.9	27.5	16.2	94	0.2	32.1
NAT96-216	25.7	5.3	1.23	4.29	0.72	3.95	0.87	2.42	0.35	2.4	0.43	1.9	40.2	19.4	110	0.2	57.8
4902G	32.2	6.3	1.2	4.68	0.82	4.34	0.88	2.57	0.45	2.71	0.39	4.2	37.1	17.1	94	0.2	42.9
4909G	33.2	5.7	1.28	4.63	0.8	4.84	0.97	2.79	0.43	2.92	0.51	1.9	30.2	16.2	100	0.2	27.9
4913G	33.5	6.2	1.22	4.6	0.85	4.83	1.03	2.76	0.42	2.9	0.47	1.3	29	15.3	79	0.2	34.6
4914G	31.2	6.1	1.23	4.84	0.76	4.55	0.95	2.49	0.41	2.49	0.47	2.2	29.3	16.3	95	0.1	32.1
2521G	41.4	8.7	1.45	6.3	1.1	6.26	1.3	3.91	0.56	3.84	0.6	13.1	152.1	31.6	123	0.2	33.2
2541G	41.1	7.8	1.35	6.93	1.23	7.37	1.42	4.4	0.63	4.38	0.6	14.2	152.8	31.7	125	0.2	32.3
2558G	41.5	7.6	1.36	7.05	1.24	7.11	1.28	4.06	0.56	3.85	0.6	14.3	159.6	32.4	124	0.2	

Sample Number	Co_1EX_ppm	Mn_1EX_ppm	Fe_1EX_%	As_1EX_ppm	U_1EX_ppm	Au_1EX_ppm	Th_1EX_ppm	Sr_1EX_ppm	Cd_1EX_ppm	Sb_1EX_ppm	Bi_1EX_ppm	V_1EX_ppm	Ca_1EX_%	P_1EX_%	La_1EX_ppm	Cr_1EX_ppm	Mg_1EX_%	Ba_1EX_ppm
2001G	12	407	3.29	12	2.6	< 1	9.9	126	0.4	0.8	0.2	125	2.74	0.08	34	64.9	1.13	748
2002G	12	415	3.33	12	2.3	< 1	9.2	122	0.2	0.8	0.2	118	2.91	0.081	33.9	60.6	1.09	758
2003G	9	398	2.69	10	2	< 1	7.9	128	0.2	0.7	0.2	92	6.63	0.074	29.1	52.3	0.93	674
2004G	13	367	3.5	16	2.8	< 1	9.8	128	0.3	1	0.2	149	2.58	0.077	33.7	72.6	1.07	848
2005G	9	335	3.13	13	2.5	< 1	10.1	139	0.2	0.8	0.2	112	4.38	0.087	34.8	63.4	1.01	746
2006G	12	402	3.26	12	2.7	< 1	10.2	119	0.4	0.9	0.2	133	3.3	0.086	34.3	72.2	0.94	815
2007G	10	328	3.57	13	2.6	< 1	10.2	107	0.1	0.8	0.2	140	1.27	0.09	35.2	71.8	0.78	729
2021G	12	377	3.19	7	3.4	< 1	9.6	138	0.4	0.8	0.2	149	2.03	0.083	34.3	76.1	1.12	458
2022G	7	464	2.65	12	2.7	< 1	11	125	0.3	0.6	0.1	65	2.61	0.088	40	41.8	0.97	738
2023G	8	307	3.12	13	2.8	< 1	9.6	131	0.2	0.7	0.2	119	4.11	0.077	32.6	65.4	0.95	728
2024G	9	581	4.3	12	3	< 1	9.1	136	0.3	0.8	0.2	118	3.86	0.08	33.3	65.5	1	750
2104G	7	241	3.25	13	2.4	< 1	9.5	139	0.2	0.9	0.2	142	3.53	0.082	34.2	74.4	0.99	883
2105G	12	418	3.29	13	3.2	< 1	9.7	140	0.3	0.9	0.2	132	2.52	0.079	31.5	71.8	1.08	686
2106G	9	293	3.75	14	2.8	< 1	11.7	99	0.1	0.8	0.2	147	0.53	0.087	41.3	80.1	0.7	727
2107G	9	360	3.24	11	2.3	< 1	9.6	125	0.2	0.8	0.2	121	3.95	0.079	32.9	72.1	1.05	736
2108G	11	172	3.69	13	2.8	< 1	9.4	130	0.2	0.9	0.2	137	2.9	0.085	31.5	71.4	0.95	761
2109G	10	340	3.38	13	2.6	< 1	10.7	122	0.3	0.8	0.2	133	3.09	0.085	34.5	79.8	1.15	751
2110G	14	540	3.28	11	2.4	< 1	9.5	134	0.2	0.8	0.2	125	3.74	0.076	33.3	74.4	1.16	763
2111G	11	278	3.28	11	2.5	< 1	9.9	124	0.3	0.8	0.2	128	2.48	0.085	33.9	78.9	1.1	763
2151G	12	412	3.58	14	2.9	< 1	10	143	0.3	0.9	0.2	143	2.45	0.085	35.6	80.4	1.08	775
2152G	7	240	2.47	11	2.6	< 1	7.6	139	0.2	0.8	0.2	94	2.31	0.075	26.3	53.6	0.84	580
2153G	10	254	3.42	14	2.9	< 1	10.3	122	0.3	0.7	0.2	146	1.68	0.085	33.4	79	1	793
2154G	12	341	3.34	12	2.5	< 1	9.8	123	0.1	0.8	0.2	131	2.82	0.079	31.8	78.8	1.1	770
2155G	11	385	3.45	13	2.4	< 1	10	114	0.2	0.9	0.2	132	2.49	0.082	36.4	78.4	1	719
2156G	11	370	3.6	12	2.5	< 1	10.7	111	< .1	0.7	0.2	126	0.89	0.088	42.1	74.3	0.73	792
2501G	12	367	3.45	13	2.7	< 1	9.9	121	0.3	0.8	0.2	140	3.1	0.08	33.2	80.2	1.06	739
2502G	11	375	3.56	17	2.5	< 1	10.1	117	0.2	1.2	0.2	136	2.81	0.083	34.1	76.1	1.01	841
2503G	14	482	4.33	15	3	< 1	12.8	140	0.3	0.9	0.3	139	2.05	0.098	41.7	98.8	1.11	859
2504G	9	335	3.3	12	2.7	< 1	10	132	0.2	0.7	0.2	119	3.59	0.08	33.3	73.7	1.1	695
2505G	8	441	3.29	12	2.2	< 1	10.4	103	0.1	0.6	0.2	120	1.96	0.073	35.8	64.6	0.91	713
2506G	9	305	3.21	13	2.2	< 1	9.8	115	0.2	0.6	0.2	124	2.83	0.079	33.2	64.1	1.08	703
2507G	13	380	3.2	12	2.2	< 1	10.4	119	0.2	0.8	0.2	131	3.83	0.082	33.5	70.1	1.15	744
2508G	14	523	3.54	14	2.2	< 1	10.4	120	0.2	0.9	0.2	127	3.62	0.085	33.9	67.5	1.11	729
2509G	12	358	3.66	14	2.7	< 1	10.6	132	0.3	1	0.2	137	2.51	0.092	35.1	73.3	0.97	911
2510G	9	326	3.25	12	2.3	< 1	9.9	111	0.1	0.7	0.2	124	3.08	0.085	33	66.2	1.07	717
2511G	12	269	3.91	17	2.8	< 1	10.6	104	0.2	1.2	0.2	182	0.54	0.083	37.7	84.3	0.77	863
2512G	6	250	2.76	11	2.7	< 1	9.1	152	0.3	0.7	0.2	122	4.48	0.082	30.5	64.1	0.93	894
2513G	12	426	2.94	11	2.1	< 1	9.4	114	0.1	0.7	0.2	118	3.5	0.078	30.9	62.7	1.05	646
2514G	9	372	2.96	10	2.1	< 1	9.8	126	0.1	0.8	0.2	122	4.11	0.077	32.5	66.4	1.14	703
2515G	15	458	3.59	14	2.3	< 1	9.4	121	0.3	1	0.2	143	2.48	0.09	31.5	76	0.95	780
2516G	14	369	3.51	18	2.9	< 1	10	134	0.3	1	0.2	175	1.9	0.081	32.9	77.9	0.97	1111
2517G	13	436	3.09	14	2.5	< 1	9.9	116	0.3	0.8	0.2	117	3.29	0.083	31.2	58.7	0.94	920
2518G	14	399	3.66	19	2.8	< 1	9.8	127	0.2	1.1	0.2	173	1.33	0.092	34.1	80	1.04	826
2519G	11	359	2.98	12	2.1	< 1	9.1	112	0.3	0.7	0.2	112	2.67	0.075	29.8	63	0.95	679
2520G	9	299	3.13	13	2.9	< 1	9.3	137	0.3	0.8	0.2	128	2.61	0.081	28.8	66.1	0.97	721
2522G	9	395	2.94	10	2.1	< 1	9.1	110	0.2	0.6	0.2	115	2.99	0.073	28.5	63.5	1.01	657
2523G	11	363	3.11	12	2.2	< 1	10.4	111	0.2	0.7	0.2	121	2.68	0.08	30.1	70.1	0.98	712
2524G	9	297	3.01	14	2.7	< 1	9.5	130	0.2	1	0.2	145	2.85	0.077	29.6	72.7	0.96	861
2525G	14	436	3.36	15	2.5	< 1	10.6	116	0.3	0.9	0.2	147	2.13	0.081	30.7	77.1	0.95	796
2526G	5	229	2.12	11	1.8	< 1	6.9	126	0.3	0.7	0.1	83	4.73	0.067	23.2	49.2	0.79	647
2527G	11	342	3.58	14	2.5	< 1	10.4	111	0.1	0.8	0.2	149	1.82	0.078	34.5	80.4	0.95	791
2528G	13	279	3.34	16	2.2	< 1	10.4	138	0.3	0.9	0.2	154	1.62	0.075	32.9	79.5	0.95	1166
2529G	14	430	3.6	15	2.3	< 1	8.9	135	0.2	1	0.2	152	2.05	0.088	29	85	1.04	974
2530G	13	461	3.69	15	2.7	< 1	11.2	110	0.2	0.9	0.3	153	1.28	0.087	36	84	0.94	802
2531G	9	276	3.37	16	2.6	< 1	9.9	127	0.2	0.9	0.2	163	1.86	0.082	31.8	80.4	0.94	925
2557G	12	247	3.68	16	2.9	< 1	11.7	105	< .1	0.9	0.3	138	0.39	0.08	37.4	83.1	0.61	772
1401G	10	412	3.24	12	2.3	< 1	9.2	132	0.4	0.8	0.2	120	4.87	0.077	32.9	61.6	1.06	719
1402G	10	316	3.73	15	3	< 1	12.3	112	0.1	0.9	0.2	144	0.6	0.074	49	79.7	0.72	755
NAT98-260	12	351	3.44	16	1.6	< 1	5.3	255	0.2	1.1	0.1	121	1.25	0.077	20.4	83.9	0.96	1007
RE98-84B-165-001	11	376	3.54	11	2	< 1	8	131	0.3	0.9	0.2	125	3.15	0.075	28.1	75.1	1.08	697
RE98-84B-36-001	9	341	3.23	12	2.2	< 1	9.2	125	0.2	0.7	0.2	125	3.88	0.072	30.2	73.5	1.12	670
RE98-84B-37-001	10	372	3.2	10	2.2	< 1	9	111	0.2	0.7	0.2	127	2.25	0.066	30.5	69.7	0.98	641
RE98-84B-39-001	8	192	3.49	14	3.1	< 1	11.6	105	0.1	0.9	0.2	133	0.41	0.064	33.4	75.5	0.61	698
RE98-84B-40-001	10	328	3.23	11	2.3	< 1	9.5	109	0.3	0.8	0.2	124	2.55	0.069	30.9	72.4	0.93	677
RE98-84B-41-001	9	271	3.51	11	2.6	< 1	11	110	< .1	0.7	0.2	122	0.42	0.052	33.8	84.2	0.61	760
RE98-84B-45-001	10	517	2.87	7	2.3	< 1	6.8	107	0.3	0.4	0.2	102	0.89	0.057	26.4	62.9	0.57	741
RE98-84B-53-001	11	387	3.23	13	2.6	< 1	8.8	131	0.3	0.7	0.2	128	2.91	0.076	30.9	74.8	0.98	787
NAT96-216	23	1011	3.6	12	2.1	< 1	7.5	129	0.2	1.3	0.2	133	1.86	0.085	25.7	78.5	1	832
4902G	13	379	3.46	16	2.7	< 1	10	125	0.3	1	0.2	146	2.66	0.08	33.4	72.9	1.06	824
4909G	10	268	3.36	14	2.4	< 1	9.9	114	0.2	0.9	0.2	142	1.72	0.08	32.7	72.3	0.98	767
4913G	9	491	3.48	12	2.5	< 1	10.9	111	0.1	0.7	0.2	120	1.92	0.069	36.3	71.1	0.9	690
4914G	10	317	3.37	14	3	< 1	9.7	143	0.3	1.1	0.2	148	2.96	0.083	33.2	75.6	1.01	854
2521G	14	787	3.77	25	4.5	< 1	17.9	135	0.3	0.7	4.7	76	0.86	0.07	42	62.8	1.01	510
2541G	15	816	3.75	26	4.3	< 1	19	140	0.3	0.7	4.6	77	0.88	0.072	45.8			

Sample Number	Ti_1EX_%	Al_1EX_%	Na_1EX_%	K_1EX_%	W_1EX_ppm	Zr_1EX_ppm	Ce_1EX_ppm	Sn_1EX_ppm	Y_1EX_ppm	Nb_1EX_ppm	Ta_1EX_ppm	Be_1EX_ppm	Sc_1EX_ppm	Li_1EX_ppm	S_1EX_%	Rb_1EX_ppm	Hf_1EX_ppm
2001G	0.286	6.04	0.491	1.97	0.8	100	61	1.5	19.4	8.6	0.5	1	11	41.4	0.2	85.1	3.3
2002G	0.287	5.68	0.529	1.78	0.8	103.3	61	1.3	19.2	8.4	0.5	2	9	40.7	0.1	79.8	3.5
2003G	0.227	4.68	0.463	1.38	0.6	94.1	51	1.2	17.6	7.6	0.4	1	7	30.2	0.2	63.3	3.1
2004G	0.301	6.07	0.479	1.94	0.9	97.8	63	1.6	19.4	9.1	0.5	2	11	47	< .1	84.5	3.3
2005G	0.278	5.46	0.575	1.77	1.1	96.1	62	1.4	19.1	9.4	0.5	1	9	41.8	< .1	77.5	3.3
2006G	0.299	5.93	0.511	1.85	0.9	92.8	59	1.5	19.7	9.4	0.6	1	11	42.8	< .1	81.4	3.1
2007G	0.322	6.18	0.545	1.94	0.9	99.1	60	1.8	20.5	9.6	0.5	2	11	42.3	0.1	89.6	3.5
2021G	0.314	6.43	0.492	2.05	0.9	96.2	61	1.6	20.1	9.2	0.5	1	11	50.5	0.7	89.5	3.4
2022G	0.27	3.63	0.732	1.31	0.5	135.1	73	0.9	18.7	6.9	0.4	1	6	21	< .1	50.3	4.6
2023G	0.272	5.56	0.472	1.62	0.9	88.9	56	1.4	18.2	8.4	0.5	1	9	41.1	0.1	74.1	2.9
2024G	0.274	5.5	0.462	1.75	0.7	94	58	1.4	20	8.5	0.5	2	9	40.5	0.1	76.1	3.1
2104G	0.312	6.19	0.477	1.73	1.1	96.2	61	1.6	20.5	10	0.5	2	11	42.8	< .1	82.2	3.4
2105G	0.294	5.96	0.507	1.84	0.8	94.1	57	1.6	19.3	8.6	0.5	2	11	45.2	0.4	86	3.1
2106G	0.32	6.56	0.486	1.88	0.9	101.6	71	1.7	30.2	9.2	0.6	2	12	45	< .1	85.9	3.4
2107G	0.27	5.73	0.485	1.75	0.8	92.7	58	1.5	18.4	8.1	0.5	1	9	40.6	0.1	75.4	3.1
2108G	0.277	6.06	0.457	1.69	0.6	91.3	57	1.4	21	8.4	0.5	1	11	40.4	< .1	78.3	3
2109G	0.28	6.31	0.492	1.9	0.8	94.5	61	1.5	20.2	9.1	0.5	3	11	42.1	< .1	89.8	3.3
2110G	0.286	5.97	0.477	1.87	0.9	91.7	61	1.7	19.5	8.2	0.5	2	9	40.6	< .1	82.8	3
2111G	0.295	6.05	0.521	1.91	1	100	62	1.6	20.4	8.7	0.5	2	9	41.9	< .1	83.7	3.3
2151G	0.303	6.3	0.488	1.9	1	101.1	63	1.7	20.7	9.1	0.6	2	11	45.6	< .1	88	3.4
2152G	0.253	4.61	0.666	1.6	0.9	85.2	46	1.1	16.5	7.5	0.5	1	7	33.9	0.7	64.8	2.9
2153G	0.307	6.28	0.49	2.06	1	94.4	60	1.7	20.6	9.9	0.6	2	11	45.1	< .1	92.4	3.1
2154G	0.274	6.13	0.496	1.9	0.8	92.9	59	1.6	19.7	9	0.5	1	11	41.6	< .1	84.6	3.2
2155G	0.279	6.19	0.508	1.8	0.9	94.3	63	1.7	21.3	8.2	0.5	1	11	40.6	< .1	84.1	3.2
2156G	0.287	6.1	0.597	1.9	0.8	106.2	69	1.8	33	8.7	0.5	1	11	39.3	0.1	78.3	3.5
2501G	0.296	6.34	0.453	1.83	0.7	91	61	1.7	20.7	8.2	0.5	2	11	43.3	0.1	80.8	2.9
2502G	0.294	6.11	0.506	1.8	1	105.8	62	1.8	21.2	9.4	0.5	1	11	41.1	0.1	82.1	3.3
2503G	0.304	6.53	0.652	2.22	0.9	127.7	77	1.9	28.4	10.7	0.6	2	14	50.3	0.1	102.4	3.9
2504G	0.283	5.85	0.524	1.73	1	101.4	58	1.4	21.2	9.6	0.5	1	9	40.9	< .1	77.8	3.3
2505G	0.261	5.7	0.499	1.65	0.8	92.9	62	1.7	21.3	8.9	0.5	1	9	44.2	< .1	71.6	3
2506G	0.286	5.66	0.487	1.72	0.9	97.3	61	1.6	18.9	9.6	0.5	1	9	44.4	< .1	72.6	2.8
2507G	0.278	6.08	0.454	1.81	0.9	92.1	63	1.7	19.8	9.1	0.5	< 1	9	45.4	< .1	76.9	2.9
2508G	0.275	5.84	0.487	1.79	0.8	93.8	63	1.5	19.5	9.4	0.5	< 1	9	44.2	< .1	74.9	3
2509G	0.282	5.82	0.55	1.91	0.8	96.6	65	1.5	20.7	10.3	0.5	1	11	49.4	< .1	80.8	3.1
2510G	0.279	5.65	0.509	1.7	0.9	98.4	61	1.5	18.6	9.1	0.5	1	9	42	< .1	69.5	3
2511G	0.338	6.98	0.485	1.81	0.9	98.2	71	1.8	27.7	10.4	0.6	2	13	51.3	< .1	79	3.1
2512G	0.257	5.23	0.499	1.6	0.7	85.4	56	1.3	19	8.5	0.5	1	8	42.9	0.1	67.2	2.7
2513G	0.259	5.58	0.461	1.66	0.7	93.2	58	1.5	18.3	8.7	0.5	2	9	43.5	< .1	68.5	3
2514G	0.269	5.73	0.467	1.66	0.7	91.8	60	1.8	18.1	8.8	0.5	1	9	45.4	< .1	70.7	2.9
2515G	0.304	6.31	0.534	1.69	0.9	83.9	57	1.4	19.7	9.3	0.5	< 1	11	42.9	< .1	71.3	2.8
2516G	0.321	6.45	0.44	1.77	0.8	89.6	60	1.7	19.4	10.7	0.5	1	11	53.6	< .1	81.5	2.9
2517G	0.257	5.19	0.531	1.63	0.6	93.1	57	1.4	18.5	9	0.5	1	8	38.4	< .1	65.8	2.9
2518G	0.344	6.81	0.525	1.83	0.8	91.4	61	1.6	20.4	10.7	0.6	2	12	52.9	< .1	79.1	3.1
2519G	0.276	5.39	0.581	1.61	0.7	88.4	56	1.6	17.7	8.4	0.4	1	8	38.5	< .1	65	2.9
2520G	0.278	5.6	0.471	1.68	0.8	92.8	51	1.5	17.8	9.3	0.5	1	9	44.1	0.5	72.1	2.9
2522G	0.269	5.52	0.477	1.49	0.7	88.8	52	1.3	17.9	7.8	0.5	1	8	37.6	< .1	63.8	2.8
2523G	0.271	5.69	0.499	1.59	0.6	95.3	56	1.4	19.6	8.9	0.5	1	9	39.5	< .1	67.5	3.3
2524G	0.288	6.01	0.451	1.59	0.9	90.6	53	1.5	18.9	9.5	0.5	1	9	47.1	< .1	74.8	3.2
2525G	0.304	6.24	0.467	1.83	0.9	90.4	59	1.6	18.6	9.7	0.5	1	9	45	< .1	78.4	2.9
2526G	0.228	4.17	0.58	1.28	0.5	81.5	42	0.9	15.8	7.6	0.4	1	6	28.5	< .1	51.7	2.6
2527G	0.314	6.44	0.467	1.73	0.7	98.7	62	1.7	24.4	9.9	0.5	1	11	46.2	0.1	79.9	3.2
2528G	0.291	6.29	0.416	1.66	0.8	97.9	59	1.8	20.2	10.4	0.6	2	11	42.9	< .1	76.3	3.2
2529G	0.314	6.64	0.556	1.69	0.8	88.8	55	1.5	19.9	9.3	0.5	< 1	12	42.8	< .1	78.2	2.9
2530G	0.318	6.81	0.487	1.9	0.9	102.1	65	1.8	22.3	10.7	0.6	1	12	47.3	< .1	83.8	3.3
2531G	0.315	6.47	0.447	1.72	0.8	95	57	1.4	20	10.3	0.6	< 1	11	48.5	< .1	78.4	3
2557G	0.331	6.32	0.558	1.89	1	110.5	71	1.8	26.6	12.4	0.6	1	12	44.4	< .1	82.1	3.8
1401G	0.282	5.72	0.491	1.76	0.7	98.4	59	1.4	18.9	8.9	0.5	2	9	38.3	0.2	79	3.1
1402G	0.31	6.66	0.533	1.9	1	121	80	1.8	35.9	10.4	0.6	1	14	45.4	0.3	83.9	3.9
NAT98-260	0.431	7.5	1.353	1.71	0.8	65.3	37	1.2	15.4	6.5	0.4	1	12	33.1	< .1	51.6	2.4
RE98-84B-165-001	0.294	6.25	0.569	1.7	0.7	80.8	49	1.4	17.8	7.7	0.4	2	11	38.3	< .1	67.9	2.8
RE98-84B-36-001	0.283	6.05	0.437	1.71	0.7	90.1	55	1.7	18.5	8.5	0.5	1	9	41.5	< .1	77.4	3.2
RE98-84B-37-001	0.289	6.17	0.464	1.68	0.9	85.8	55	1.6	17.8	8.5	0.5	2	9	41.2	< .1	75.1	3
RE98-84B-39-001	0.294	6.12	0.577	1.88	0.9	103.6	61	1.9	18.3	10.1	0.6	1	12	45.4	< .1	88	3.7
RE98-84B-40-001	0.264	5.84	0.439	1.71	0.9	85.2	57	1.8	19.6	9.8	0.5	1	9	38.9	< .1	73.4	3
RE98-84B-41-001	0.287	6.1	0.58	1.93	0.8	102.9	64	1.7	15.9	9.5	0.5	3	11	44.5	< .1	96.3	3.7
RE98-84B-45-001	0.264	5.52	0.662	1.68	0.7	69	50	1.4	10.9	8.3	0.5	1	7	51	< .1	106.7	2.5
RE98-84B-53-001	0.281	5.91	0.473	1.67	0.8	91.3	55	1.5	19.3	9	0.5	2	9	40.2	< .1	68.7	3.2
NAT96-216	0.314	6.45	0.669	1.75	0.8	76.4	55	1.6	19	7.5	0.4	1	12	39	< .1	68.2	2.7
4902G	0.28	6.06	0.497	1.76	0.9	92	61	1.6	19.9	9.5	0.5	1	9	46.8	0.1	79	3.4
4909G	0.305	6.28	0.476	1.85	0.9	89.2	60	1.8	20	10.2	0.6	1	9	47.4	< .1	82.8	3.3
4913G	0.277	6.02	0.505	1.72	0.7	96.7	64	1.7	22.4	8.9	0.5	1	11	45	< .1	77.4	3.5
4914G	0.301	6.3	0.464	1.73	0.8	92.5	60	1.8	20.8	10	0.5	1	11	47.8	< .1	81.9	3.2
2521G	0.399	7.68	1.666	2.42	3.7	109.2	89	5.2	17.7	13.5	1	2	11	46.6	< .1	122.6	3.8
2541G	0.424	7.82	1.734	2.51	4.2	110.4	97	5	19.6	13.9	1.2	2	11	45.7	< .1	129.7	4.1
2558G	0.441	7.91	1.708	2.45	4	111.8	92	5.3	18.8	14.7	1.1	1	11	48.6	< .1	126.1	4.3

Sample Number	Mo_1F_ppm	Cu_1F_ppm	Pb_1F_ppm	Zn_1F_ppm	Ag_1F_ppb	Ni_1F_ppm	Co_1F_ppm	Mn_1F_ppm	Fe_1F_%	As_1F_ppm	U_1F_ppm	Au_1F_ppb	Th_1F_ppm	Sr_1F_ppm	Cd_1F_ppm	Sb_1F_ppm
2001G	1.51	23.25	13.64	72.4	107	26.6	9.7	360	2.26	9.1	0.94	1.2	6.7	50.9	0.24	0.33
2002G	1.63	21.43	14.21	72.9	99	26	10.1	377	2.48	9.2	0.89	2.2	6.7	51.5	0.25	0.37
2003G	0.77	23.8	11	51	174	27.7	9	380	2.05	7.6	0.73	1.4	4	64.3	0.23	0.31
2004G	3.78	24.46	14.15	85.4	121	35.9	10.3	327	2.56	12.4	1.08	1.1	6.2	59.7	0.29	0.52
2005G	1.29	20.66	12.07	64.7	131	22.2	7.9	296	2.16	8.2	0.81	2.6	5.9	60.2	0.21	0.34
2006G	1.83	24.65	14.47	79.2	133	31.4	11.4	398	2.41	9.9	0.88	1.2	6.3	52.3	0.26	0.45
2007G	1.56	29.26	14.43	85.2	131	27.7	8.9	284	2.75	11.5	0.86	3.9	7.2	34.7	0.15	0.44
2021G	1.95	25.97	13.42	86.5	127	29.7	10.4	335	2.14	9	1.63	0.5	6.2	70.8	0.3	0.43
2022G	1.15	12.48	9.16	41.7	67	15.6	6.5	392	1.94	8.7	0.88	1.2	5.7	37	0.17	0.27
2023G	2.37	23.49	13.97	74.5	127	25.8	8.4	288	2.4	10.5	1.27	1.3	6.6	73.4	0.24	0.42
2024G	2.7	21.9	12.86	68.5	104	23.4	8	516	3.56	8.4	1.18	0.8	5.6	65.9	0.27	0.29
2104G	1.73	27.53	13.27	74.4	180	26.4	6.9	206	2.36	9.9	1.01	1.4	6.6	75.9	0.23	0.5
2105G	1.63	23.64	13.72	76.9	104	29.6	11	406	2.39	9.3	1.48	1.2	6	78.3	0.26	0.42
2106G	1.83	30.03	13.92	84	113	38.1	8.6	246	2.75	10.4	1.04	1.2	8	29.6	0.07	0.5
2107G	1.33	22.1	11.75	67.5	101	25.1	9.3	323	2.25	8.1	0.73	0.7	6.2	55.9	0.2	0.43
2108G	2.3	25.45	12.69	82.4	138	29.3	10.5	141	2.83	10.9	1.05	1.5	6.1	72.4	0.19	0.54
2109G	1.76	25.64	13.32	79.3	135	28.3	9.8	299	2.33	8.7	0.84	1.5	6.7	51.7	0.19	0.41
2110G	1.58	23.28	13.76	76	100	32.6	13.9	526	2.39	8.3	0.84	1.4	6.5	67.9	0.24	0.43
2111G	1.42	23.39	13.06	78.6	106	24.5	9.7	266	2.31	8.6	0.9	2.4	6.4	53.2	0.22	0.41
2151G	2.17	24.86	13.83	82.6	115	29.1	11.9	369	2.4	10.6	1.2	1.3	6.5	74.6	0.29	0.48
2152G	1.55	17.56	10.3	61.8	81	19.6	6.5	205	1.78	8.3	1.06	0.9	4.3	71.2	0.15	0.41
2153G	1.82	27.88	13.68	91.2	125	25.6	9.4	220	2.44	10.3	1.04	1.8	6.7	52.5	0.21	0.47
2154G	1.45	26.02	13.23	83.5	104	28.9	12.1	305	2.44	8	0.87	1.5	6.7	55.8	0.23	0.39
2155G	1.27	24.87	12.73	76.1	113	29.9	10.4	346	2.47	8.5	0.79	1.4	6.7	44	0.14	0.41
2156G	0.91	25.72	12.52	71.5	145	34.3	8.6	304	2.43	8.4	0.84	1.2	7	29.4	0.07	0.39
2501G	1.7	26.4	11.92	83.7	115	30	11.2	346	2.51	9.1	0.77	1.8	6.1	59.8	0.2	0.43
2502G	1.69	25.57	13.23	81.2	106	29.8	10.2	339	2.56	13.6	0.77	1.5	6.2	48.1	0.19	0.65
2503G	1.21	25.44	12.69	75.8	116	34.1	10.8	411	2.53	8.8	0.74	1.6	6.9	41.1	0.13	0.39
2504G	0.97	23.3	10.97	62.7	108	23.6	8	291	2.22	8.2	0.8	1.5	5.9	55.5	0.16	0.32
2505G	1.15	25.47	10.23	65.9	118	30	8.5	435	2.54	8.8	0.94	1.2	6.7	36.8	0.07	0.36
2506G	1.09	24.12	13.98	64.8	122	25.8	8.5	287	2.26	8.6	0.81	1.3	5.7	47.7	0.12	0.32
2507G	1.08	25.23	12.82	74.1	100	29.9	11.7	363	2.29	8.7	0.85	1.2	5.9	53.1	0.22	0.38
2508G	1.05	25.97	12.31	74	109	31.5	12.1	527	2.51	9.4	0.78	1.1	6.1	51.5	0.19	0.41
2509G	2.04	25.45	12.31	80.3	131	29	9.8	345	2.53	10.4	1.13	1.2	6.1	62.5	0.22	0.51
2510G	1.18	24.14	12.1	69.4	120	24.9	8.9	284	2.29	8.8	0.79	1.5	6	45.3	0.14	0.37
2511G	2.56	36.18	15.59	96.5	113	38.3	9.9	253	2.87	12.6	1.28	2.2	6.6	37	0.04	0.59
2512G	1.8	22.89	8.44	66.5	145	22.4	7	224	2.06	8.8	1.41	1.4	5.2	101.5	0.28	0.44
2513G	0.89	25.52	10.9	64.2	117	29	10.9	418	2.25	7.8	0.81	1.5	6.1	50.4	0.18	0.35
2514G	1.22	23.66	10.62	62.3	105	26.9	9.3	365	2.26	8.2	0.79	1.1	5.7	66.1	0.15	0.42
2515G	1.61	30.46	9.23	82.3	178	37.2	14.1	441	2.53	10.3	0.88	51.5	5.3	54.2	0.2	0.44
2516G	3.34	29.89	13.75	97.8	149	35.4	13.4	361	2.72	14.3	1.45	1.4	6.1	80.6	0.23	0.59
2517G	2.1	25.05	14.51	69.9	180	30.9	12.2	426	2.34	10.8	0.96	1.4	5.5	47.3	0.26	0.52
2518G	3.42	30.75	13.57	92.3	132	34.6	12.7	355	2.71	14.6	1.19	1.4	5.9	61.2	0.15	0.58
2519G	1.2	24.35	11.56	75.2	104	25.6	10.3	340	2.22	9.4	0.83	1.3	5.5	44.2	0.21	0.42
2520G	1.98	25.96	11.21	86.7	125	26.1	9.3	281	2.28	10.6	1.47	1	5.3	77.4	0.24	0.45
2522G	0.96	25.69	9.29	69	152	26.9	9.6	356	2.17	7.9	0.86	1.3	5.4	45.6	0.16	0.35
2523G	1.05	26.02	12.43	73.4	149	31.4	10.6	362	2.38	9.4	0.88	1.5	6.6	45.2	0.15	0.41
2524G	1.84	27.28	14.81	82.3	138	30	10.2	292	2.38	11	1.34	1.1	6.2	78.6	0.22	0.55
2525G	2.02	27.46	13.63	88.4	127	33.6	13.2	409	2.43	10.8	1.06	1.4	6.4	54.2	0.24	0.48
2526G	0.82	24.4	8.18	59	275	23.7	6.5	223	1.7	8.1	0.82	1.6	3.7	67.5	0.24	0.45
2527G	1.6	29.89	11.05	81.8	139	36.3	10.8	309	2.67	11.2	0.99	1.4	7.1	46.3	0.09	0.47
2528G	1.84	29.1	13.84	98	104	31.5	12.2	272	2.29	12.1	0.99	1.4	7.4	61.9	0.14	0.53
2529G	1.72	30.88	13.23	89.9	118	34.2	13	430	2.59	11	1.03	1.3	6.4	66.2	0.14	0.53
2530G	1.47	30.53	13.56	88.5	197	46.1	13.4	417	2.69	10.7	1	1.6	7.4	40.1	0.12	0.46
2531G	2.01	27.84	12.18	81.5	127	30	9.2	264	2.48	11.3	1.15	1.4	6.4	67.5	0.16	0.51
2557G	1.61	28.79	14.55	87.2	85	28.8	10.2	209	2.42	10.6	1.1	0.9	7.3	29.5	0.04	0.47
1401G	1.27	20.1	11.85	59.3	108	22.4	8.1	333	2.04	8.1	0.7	1.5	4.9	51.9	0.17	0.22
1402G	1.17	26.47	14	66.7	139	27.2	7.2	239	2.45	9.2	0.97	1.8	7.3	24.6	0.04	0.3
NAT98-260	1.01	34.38	8.3	85.1	94	33.2	10.8	257	2.07	12	0.58	3.3	3	56.1	0.09	0.58
RE98-84B-165-001	1.48	29.79	12.27	80.8	114	30.3	11.2	339	2.59	9.6	0.87	2.6	5.3	59.2	0.13	0.48
RE98-84B-36-001	1.55	22.87	11.44	76.5	113	26.2	9.9	282	2.22	8.8	0.85	1.4	6	57.7	0.18	0.37
RE98-84B-37-001	1.27	23.72	12.34	75	126	28.6	9.9	344	2.37	8.6	0.98	1.1	5.6	49.5	0.15	0.35
RE98-84B-39-001	1.54	25.71	12.85	70.5	47	25	7.2	144	2.39	10.4	1.23	2	6.8	23.9	0.03	0.44
RE98-84B-40-001	1.5	26.33	13.25	84.4	136	32.3	10.8	317	2.44	10.4	1.03	1.8	6.8	47.4	0.18	0.42
RE98-84B-41-001	1.28	19.9	9.68	67.5	85	24.1	7.1	219	2.3	8.4	0.87	2	5.6	21.5	0.03	0.34
RE98-84B-45-001	0.67	11.79	9.05	117.9	136	16.7	9	472	2.08	6.1	1	0.4	3	23.4	0.19	0.1
RE98-84B-53-001	2.64	24.72	13.81	81.4	137	31.7	12	352	2.34	12	1.36	2	6.4	69.8	0.26	0.48
NAT96-216	1.78	37.71	19.06	99.2	127	56.9	25.8	1027	3.11	10.3	0.96	2.2	5.6	50.7	0.3	0.77
4902G	3.76	26.15	15.18	86.8	127	38.4	12.7	337	2.59	13.2	1.34	1.1	6.9	62.7	0.3	0.58
4909G	1.78	27.13	15.7	89.2	138	24.8	9.6	224	2.49	11.6	1.27	3.1	7.7	55.5	0.23	0.48
4913G	1.05	24.07	11.83	64.9	116	30.4	8.9	423	2.56	9.6	0.95	2	6.9	37.8	0.08	0.37
4914G	1.87	25.34	13.61	76.2	145	27.5	9.7	263	2.33	11.6	1.46	1.5	6.7	78.8	0.2	0.54
2521G	12.67	149.65	23.45	108.4	232	31.8	14.1	692	3.27	20.8	3	0.9	10.4	14.9	0.26	0.41
2541G	13.05	148.25	24.25	109.1	223	31.7	13.9	677	3.2	21	2.87	1.4	10.3	14.1	0.27	0.42
2558G	12.88	151.55	26.28	112.6	237	33.1	14.7	695	3.28	22.2	3.09	1.1	11.1	14.8	0.29	0.43

Sample Number	Bi_1F_ppm	V_1F_ppm	Ca_1F_%	P_1F_%	La_1F_ppm	Cr_1F_ppm	Mg_1F_%	Ba_1F_ppm	Ti_1F_%	B_1F_ppm	Al_1F_%	Na_1F_%	K_1F_%	W_1F_ppm	Sc_1F_ppm	Tl_1F_ppm
2001G	0.19	27	2.59	0.061	16.7	17.1	0.79	254.7	0.007	7	0.95	0.005	0.13	< .1	3.4	0.2
2002G	0.21	29	2.89	0.066	17.6	17.4	0.82	347.4	0.006	7	0.98	0.005	0.12	< .1	3.5	0.22
2003G	0.15	28	6.66	0.058	14.3	15.6	0.73	355	0.008	4	0.95	0.004	0.08	< .1	2.8	0.17
2004G	0.2	37	2.59	0.059	16.7	20.6	0.77	415.1	0.01	7	1.06	0.005	0.13	< .1	3.6	0.27
2005G	0.17	32	4.35	0.061	15.5	17.6	0.76	244.3	0.009	6	1.06	0.005	0.1	< .1	3.4	0.18
2006G	0.2	32	3.39	0.066	16.7	19.5	0.67	387.8	0.007	6	1.04	0.005	0.1	< .1	3.8	0.23
2007G	0.23	36	1.25	0.073	19.6	21.2	0.51	242.4	0.008	7	1.17	0.004	0.17	< .1	4.5	0.22
2021G	0.21	28	2	0.068	15	18	0.78	205.3	0.006	10	0.92	0.04	0.16	< .1	3.7	0.15
2022G	0.09	22	2.49	0.071	16.7	13.2	0.86	358.4	0.01	5	0.57	0.004	0.08	< .1	2.1	0.14
2023G	0.2	32	4.26	0.059	15.9	18.7	0.71	323	0.009	9	1.09	0.006	0.12	< .1	3.7	0.21
2024G	0.18	25	3.63	0.062	14.7	14.4	0.66	318.1	0.008	5	0.79	0.005	0.08	< .1	3.4	0.18
2104G	0.2	36	3.53	0.067	18.7	20.5	0.69	479	0.005	9	1.18	0.009	0.13	< .1	4	0.22
2105G	0.19	33	2.55	0.064	16	19.3	0.8	214.6	0.006	9	1.1	0.034	0.16	< .1	3.8	0.22
2106G	0.23	37	0.43	0.068	26.1	23.9	0.38	232.2	0.011	6	1.22	0.004	0.13	< .1	4.8	0.22
2107G	0.18	29	3.94	0.059	15.6	17.8	0.76	281.6	0.008	5	0.99	0.006	0.1	< .1	3.7	0.17
2108G	0.18	33	2.89	0.067	17.8	19.6	0.66	363.1	0.007	7	1.03	0.013	0.11	< .1	3.9	0.21
2109G	0.2	29	2.92	0.064	17	18.7	0.78	304.7	0.013	5	1.01	0.006	0.12	< .1	3.7	0.2
2110G	0.2	28	3.74	0.059	16.3	17.7	0.85	350.9	0.009	6	1.03	0.006	0.13	< .1	3.6	0.19
2111G	0.2	29	2.45	0.064	17.5	18	0.81	259	0.01	5	1.02	0.006	0.13	< .1	3.9	0.17
2151G	0.21	32	2.31	0.063	16.9	18.7	0.74	290	0.005	7	1.01	0.011	0.14	< .1	3.9	0.2
2152G	0.14	22	2.25	0.058	10.8	12.5	0.65	147.3	0.012	6	0.61	0.013	0.07	< .1	2.2	0.17
2153G	0.21	30	1.66	0.067	17.7	19.5	0.69	256.5	0.01	6	0.95	0.006	0.14	< .1	4	0.2
2154G	0.19	31	2.8	0.063	17.1	20.7	0.8	322.3	0.016	26	1.09	0.009	0.14	< .1	4.1	0.19
2155G	0.2	33	2.38	0.062	17.9	20.9	0.68	220	0.009	6	1.13	0.005	0.12	< .1	3.9	0.18
2156G	0.18	31	0.71	0.066	27.9	20.7	0.41	387.7	0.01	5	1.07	0.005	0.12	< .1	4.4	0.17
2501G	0.18	34	3.06	0.065	16.8	21.4	0.73	233.7	0.011	6	1.16	0.006	0.13	< .1	4.1	0.17
2502G	0.18	35	2.73	0.064	18.7	21.8	0.71	399.6	0.015	6	1.16	0.006	0.13	< .1	4	0.19
2503G	0.19	34	1.82	0.065	19	22.3	0.73	224.2	0.013	6	1.18	0.006	0.14	< .1	4.5	0.22
2504G	0.17	29	3.44	0.061	16.6	19.7	0.79	223.6	0.008	4	1.08	0.005	0.11	< .1	3.9	0.16
2505G	0.23	38	1.77	0.051	19.9	21.4	0.64	227.2	0.013	7	1.26	0.005	0.14	< .1	4.4	0.18
2506G	0.22	33	2.62	0.059	16.3	17.7	0.78	225.7	0.009	7	1.06	0.004	0.11	< .1	3.8	0.18
2507G	0.23	32	3.47	0.06	16.2	16.9	0.79	249.4	0.005	7	1.12	0.005	0.13	< .1	3.9	0.19
2508G	0.23	35	3.29	0.061	16.2	19.5	0.78	219.1	0.009	8	1.18	0.005	0.13	< .1	4	0.18
2509G	0.23	36	2.25	0.067	16.3	17.6	0.66	312.3	0.015	9	1.08	0.006	0.14	< .1	4	0.22
2510G	0.22	32	2.73	0.066	16.5	17.8	0.75	211.9	0.01	6	1.05	0.004	0.12	< .1	3.9	0.17
2511G	0.28	49	0.45	0.063	20.2	24.2	0.39	279	0.009	3	1.32	0.005	0.13	< .1	5.7	0.2
2512G	0.18	32	4.16	0.066	15.2	16.4	0.65	394.5	0.009	9	0.98	0.007	0.12	< .1	3.8	0.2
2513G	0.21	33	3.29	0.058	16.6	19.2	0.78	207.8	0.012	7	1.16	0.005	0.14	< .1	4	0.17
2514G	0.2	35	3.83	0.061	16.1	20.9	0.85	245.2	0.01	7	1.26	0.006	0.13	< .1	4	0.16
2515G	0.23	33	2.23	0.073	15.3	19	0.6	258.4	0.013	6	1.01	0.005	0.11	< .1	4.6	0.17
2516G	0.26	48	1.79	0.071	16.9	23.6	0.64	573.9	0.016	10	1.25	0.008	0.16	< .1	4.8	0.23
2517G	0.21	33	3.04	0.068	16.4	17	0.7	414.5	0.009	7	0.98	0.005	0.13	< .1	3.7	0.23
2518G	0.25	49	1.16	0.073	16.6	24.4	0.7	262.2	0.014	10	1.3	0.008	0.16	< .1	4.9	0.23
2519G	0.2	30	2.51	0.068	16.5	18	0.72	193.5	0.011	9	0.95	0.006	0.12	< .1	3.7	0.17
2520G	0.23	31	2.52	0.067	12.9	16.9	0.72	193.6	0.01	8	0.97	0.012	0.14	< .1	3.7	0.16
2522G	0.22	31	2.75	0.064	15.3	20.1	0.75	247	0.011	6	1.03	0.005	0.13	< .1	3.6	0.17
2523G	0.25	35	2.67	0.065	18.9	21.9	0.77	259.1	0.014	6	1.18	0.005	0.14	< .1	4.5	0.2
2524G	0.23	40	2.89	0.068	17.6	21.3	0.73	352.8	0.01	10	1.2	0.009	0.15	< .1	4.2	0.22
2525G	0.23	36	1.97	0.068	16.8	22.5	0.66	279.8	0.014	10	1.16	0.006	0.16	< .1	4	0.23
2526G	0.16	24	4.72	0.065	13.5	14.5	0.66	196.4	0.007	7	0.72	0.006	0.07	< .1	2.6	0.15
2527G	0.26	40	1.77	0.067	21.4	24.3	0.68	286.5	0.014	7	1.3	0.006	0.15	< .1	5	0.2
2528G	0.28	34	1.57	0.067	19	20.8	0.61	605.6	0.013	8	1.23	0.006	0.16	< .1	4.2	0.2
2529G	0.24	39	1.94	0.075	16.5	24.1	0.74	419.7	0.006	7	1.23	0.01	0.14	< .1	5	0.2
2530G	0.28	39	1.12	0.072	20.8	24.7	0.62	264.8	0.007	7	1.3	0.006	0.17	< .1	5.1	0.22
2531G	0.24	43	1.77	0.073	17.3	23.5	0.66	385.9	0.008	9	1.26	0.01	0.16	< .1	4.5	0.23
2557G	0.28	30	0.3	0.063	20.8	21.2	0.31	163.3	0.006	4	1.04	0.005	0.11	< .1	4.3	0.19
1401G	0.16	23	4.27	0.055	12.6	13.7	0.67	252.6	0.003	6	0.74	0.004	0.08	< .1	3	0.15
1402G	0.2	30	0.45	0.048	26.8	17.7	0.34	228.8	0.008	4	1.01	0.003	0.08	< .1	4.4	0.17
NAT98-260	0.14	28	0.71	0.057	11	22.7	0.58	262.8	0.014	3	0.85	0.008	0.09	< .1	3.9	0.1
RE98-84B-165-001	0.22	32	3.02	0.065	15.3	21.7	0.78	219	0.013	7	1.11	0.007	0.14	< .1	4.9	0.17
RE98-84B-36-001	0.22	29	3.58	0.058	15.6	18.4	0.79	224.6	0.009	7	0.99	0.006	0.14	< .1	3.7	0.15
RE98-84B-37-001	0.23	36	2.17	0.055	17.4	21.1	0.72	226	0.01	7	1.18	0.007	0.16	< .1	4	0.16
RE98-84B-39-001	0.23	33	0.29	0.043	16.6	20.2	0.33	149	0.007	4	1.13	0.003	0.13	< .1	4.6	0.17
RE98-84B-40-001	0.23	32	2.62	0.064	18.8	20.9	0.71	239.3	0.008	8	1.1	0.006	0.14	< .1	4.3	0.19
RE98-84B-41-001	0.19	32	0.26	0.034	16	22.6	0.33	173.9	0.009	5	1.18	0.004	0.13	< .1	3.8	0.19
RE98-84B-45-001	0.15	33	0.68	0.045	11.9	17.8	0.35	224.1	0.01	5	1.18	0.004	0.17	< .1	2.5	0.1
RE98-84B-53-001	0.23	32	2.8	0.067	15.8	18.5	0.71	299.6	0.006	9	0.97	0.009	0.13	< .1	4	0.2
NAT96-216	0.25	35	1.83	0.073	15.8	23.6	0.74	289.2	0.007	5	1.14	0.006	0.14	< .1	6	0.23
4902G	0.25	39	2.57	0.062	16.8	21	0.78	324	0.005	10	1.02	0.007	0.15	< .1	4	0.29
4909G	0.27	33	1.64	0.069	18.4	20.3	0.71	237.1	0.007	10	1.08	0.007	0.17	< .1	4.4	0.22
4913G	0.22	36	1.76	0.049	20.4	23.6	0.64	225.9	0.007	9	1.27	0.005	0.13	< .1	4.8	0.17
4914G	0.25	39	2.77	0.065	16.6	20.7	0.71	333.4	0.012	12	1.14	0.01	0.14	< .1	4.5	0.22
2521G	5.44	43	0.15	0.054	30	38.5	0.72	99	0.108	2	2.48	0.025	0.32	1.3	4.3	0.32
2541G	5.35	42	0.15	0.054	28.4	37.3	0.69	92.9	0.107	2	2.41	0.026	0.31	1.4	4.2	0.32
2558G	5.8	43	0.15	0.056	30	39.1	0.71	95	0.113	1	2.53	0.026	0.32	1.3	4.5	0.34

Sample Number	S_1F_%	Hg_1F_ppb	Se_1F_ppm	Te_1F_ppm	Ga_1F_ppm	Li_1F_ppm	Calcite (%)	Dolomite (%)	Total Carbonates (%)	Calcite/Dolomite Ratio	1-2 mm Sand (%)	.063-1 mm Sand (%)	4-63 micron Silt (%)	<4 micron Clay (%)	.05-1 mm Sand (%)	2-50 micron Silt (%)	<2 micron Clay (%)
2001G	0.02	57	0.2	0.04	3.1	18	3.8	4.9	8.7	0.78	1.37	28.7	30.3	41.0	31.4	35.5	33.1
2002G	0.03	58	0.4	0.03	3.1	16.8	4.2	5.1	9.2	0.83	1.96	39.3	27.1	33.6	42.4	30.7	26.9
2003G	0.06	80	0.8	0.02	2.8	13.2	13.8	5	18.9	2.75	2.38	42.2	26.9	30.9	44.8	30.2	25.0
2004G	0.03	58	0.6	0.05	3.5	19.3	3.4	4.7	8.1	0.734	1.94	31.9	28.6	39.5	34.6	33.1	32.3
2005G	0.02	60	0.3	0.03	3.1	16.8	7.4	5.6	12.9	1.33	1.58	24.0	37.2	38.8	26.6	41.4	32.0
2006G	0.04	73	0.6	0.04	3.3	16.6	5.4	4.6	10	1.18	1.09	21.4	34.0	44.6	24.1	39.7	36.2
2007G	0.02	84	0.3	0.04	4	16	1.6	1.9	3.4	0.86	2.80	40.6	23.6	35.8	42.5	27.9	29.6
2021G	0.57	63	1.5	0.04	3.5	22.3	2.6	4.8	7.4	0.544	1.26	29.0	28.6	42.4	30.9	36.0	33.1
2022G	0.03	53	0.2	0.02	2	9.2	2.6	5.8	8.4	0.445	na	na	na	na	na	na	na
2023G	0.03	64	0.4	0.04	3.5	19.9	8.4	4.5	12.9	1.85	1.96	29.9	30.2	39.9	32.1	35.9	32.0
2024G	0.03	55	0.4	0.03	2.5	16	6.5	4.7	11.2	1.37	2.32	29.7	32.1	38.2	32.1	35.4	32.5
2104G	0.04	70	0.3	0.05	3.9	23	6.8	3.7	10.5	1.87	1.41	28.0	32.6	39.4	30.2	36.7	33.1
2105G	0.32	51	0.3	0.05	3.7	20.6	2.8	4.4	7.3	0.644	2.33	37.5	33.8	28.7	39.6	38.2	22.2
2106G	< .01	82	0.6	0.05	4.4	16.2	1.2	0.3	1.5	3.58	1.42	28.0	26.7	45.3	29.9	31.8	38.3
2107G	0.03	56	0.1	0.04	3.3	16.8	6.9	4.9	11.8	1.4	1.65	34.7	26.3	39.0	36.9	31.1	32.0
2108G	0.05	77	0.4	0.06	3.5	18.4	4.2	4.1	8.3	1.04	1.47	27.1	26.8	46.1	29.2	31.9	38.9
2109G	0.01	70	0.1	0.03	3.6	18.7	3.6	5.5	9.1	0.675	1.50	29.6	27.7	42.7	31.7	32.5	35.8
2110G	0.02	49	< .1	0.05	3.4	18.3	5.3	6.4	11.7	0.82	1.61	32.9	27.6	39.5	35.0	34.7	30.3
2111G	< .01	52	0.5	0.06	3.5	17.1	2.4	5	7.4	0.475	1.79	29.1	30.3	40.6	31.2	33.3	35.5
2151G	0.04	53	0.3	0.05	3.6	20.6	2.8	4.6	7.4	0.614	1.39	31.0	30.0	39.0	33.2	34.1	32.7
2152G	0.47	40	0.3	0.04	2.2	17.1	1.6	3.6	5.2	0.443	2.14	23.3	42.7	34.0	25.1	46.9	28.0
2153G	< .01	67	0.5	0.06	3.6	20.5	1.7	3.7	5.4	0.453	1.06	18.2	41.5	40.3	19.6	47.2	33.2
2154G	< .01	59	0.1	0.04	3.7	18.2	3.5	5.3	8.7	0.655	1.41	29.1	30.4	40.5	31.4	35.3	33.3
2155G	0.01	57	0.1	0.05	3.9	17.5	3.1	4.7	7.8	0.674	2.63	38.0	25.9	36.1	40.3	29.9	29.8
2156G	< .01	78	0.1	0.03	3.7	15.2	1.2	0.9	2	1.38	1.18	36.6	29.4	34.0	39.3	32.8	27.9
2501G	0.02	59	0.1	0.05	4	16.7	5	4.6	9.5	1.096	1.56	25.9	33.2	40.9	28.1	39.3	32.6
2502G	0.02	62	0.2	0.05	3.8	16.6	4.2	4.7	9	0.89	1.98	28.1	31.7	40.2	30.5	36.6	32.9
2503G	0.01	62	0.1	0.05	4.1	17.3	1.7	3.9	5.6	0.443	1.46	34.8	28.8	36.4	36.7	36.2	27.1
2504G	0.03	55	0.3	0.05	3.7	17.5	5	5.4	10.4	0.93	1.59	33.3	27.5	39.2	35.5	31.4	33.1
2505G	< .01	59	0.3	0.03	4.4	17.1	2.3	3.5	5.8	0.673	1.25	27.5	33.2	39.3	30.2	37.8	32.0
2506G	0.02	60	< .1	0.04	3.5	15.7	3.2	5.3	8.5	0.615	1.20	22.5	35.0	42.5	24.5	41.2	34.3
2507G	0.03	56	0.3	0.06	3.6	16.9	5.3	5.2	10.5	1.02	1.52	27.4	30.5	42.1	29.7	35.2	35.1
2508G	0.02	57	0.2	0.04	3.8	15.8	4.9	5.1	10	0.95	1.55	33.3	29.7	37.0	35.8	34.3	29.9
2509G	0.02	65	0.4	0.06	3.6	17.5	2.8	4.2	7	0.684	1.96	29.9	32.0	38.1	32.5	37.1	30.4
2510G	0.04	62	0.2	0.04	3.4	13.2	3.2	5.3	8.5	0.605	2.01	35.6	29.6	34.8	38.3	34.0	27.7
2511G	< .01	86	0.5	0.07	4.5	16.5	0.8	0.7	1.4	1.13	1.24	20.2	29.8	50.0	22.1	35.6	42.3
2512G	0.04	66	0.4	0.05	3.2	18	7.2	5	12.2	1.46	1.11	27.4	32.7	39.9	30.3	36.2	33.5
2513G	0.03	49	0.2	0.03	3.8	15.9	4.5	5.4	9.9	0.854	1.40	30.9	31.3	37.8	33.4	35.9	30.7
2514G	0.04	41	0.1	0.04	4	19.1	5.1	6.8	11.9	0.75	1.77	29.9	26.6	43.5	32.2	32.0	35.8
2515G	0.02	68	0.4	0.05	3.4	13.9	3.1	3.4	6.5	0.893	1.73	21.8	35.8	42.4	24.3	42.3	33.4
2516G	0.03	71	0.6	0.07	4.2	23.1	2.1	3.3	5.4	0.633	1.43	21.8	28.9	49.3	24.0	36.1	39.9
2517G	0.04	59	0.4	0.06	3.2	15.8	4.8	4.9	9.8	0.989	2.06	39.2	29.4	31.4	41.7	34.7	23.6
2518G	0.02	65	0.4	0.06	4.3	21.9	1.3	3.2	4.5	0.423	0.94	16.8	28.2	55.0	18.9	36.3	44.8
2519G	0.04	48	0.4	0.03	3.3	14.5	3	4.9	7.9	0.614	1.86	38.2	32.2	29.6	39.9	38.7	21.4
2520G	0.47	54	0.5	0.05	3.2	19	2.4	4	6.4	0.604	1.29	33.6	36.5	29.9	37.2	40.6	22.2
2522G	0.04	71	0.4	0.04	3.4	15	3.8	5.4	9.2	0.71	1.82	34.0	32.1	33.9	36.6	36.1	27.3
2523G	0.02	68	0.4	0.04	4	15.2	3.5	4.7	8.2	0.744	1.50	31.3	36.5	32.2	33.8	40.4	25.8
2524G	0.07	61	0.4	0.05	4.1	20.2	4.3	4.6	8.9	0.93	1.32	27.0	31.0	42.0	29.5	35.6	34.9
2525G	0.01	65	0.5	0.05	4	18.5	2.7	3.7	6.3	0.723	1.27	31.0	32.1	36.9	33.4	37.5	29.1
2526G	0.04	75	0.6	0.04	2.5	13.7	9.2	4.3	13.5	2.12	0.59	13.3	59.0	27.7	15.0	64.0	21.0
2527G	0.04	80	0.4	0.05	4.2	18.3	1.7	3.5	5.2	0.493	1.36	27.8	29.4	42.8	30.2	34.8	35.0
2528G	0.04	73	0.3	0.08	3.9	18.8	2.2	2.4	4.6	0.912	0.78	15.4	43.7	40.9	17.6	51.3	31.1
2529G	0.01	64	0.4	0.04	4	17.5	2.4	3.8	6.2	0.643	0.88	22.6	32.4	45.0	23.2	39.8	37.0
2530G	0.01	75	0.4	0.07	4.4	17.5	1.2	3.3	4.5	0.363	1.29	25.3	32.2	42.5	27.7	37.3	35.0
2531G	0.02	66	0.4	0.04	4.2	20.8	2.3	2.8	5.1	0.812	1.49	26.6	31.7	41.7	28.8	36.9	34.3
2557G	0.02	75	0.7	0.06	3.6	12.9	0.8	4	4.8	0.19	0.87	15.2	41.8	43.0	17.8	48.2	34.0
1401G	0.03	54	0.6	0.02	2.4	13.1	na	na	na	na	na	na	na	na	na	na	na
1402G	0.01	104	0.4	0.04	3.1	14.2	na	na	na	na	na	na	na	na	na	na	na
NAT98-260	< .01	57	0.1	0.03	3.6	14.9	na	na	na	na	na	na	na	na	na	na	na
RE98-84B-165-001	0.01	50	0.3	0.04	4.1	18.2	na	na	na	na	na	na	na	na	na	na	na
RE98-84B-36-001	0.02	60	0.3	0.04	3.5	17.4	na	na	na	na	na	na	na	na	na	na	na
RE98-84B-37-001	0.03	47	0.5	0.04	4.1	20.5	na	na	na	na	na	na	na	na	na	na	na
RE98-84B-39-001	< .01	61	0.6	0.05	4	17	na	na	na	na	na	na	na	na	na	na	na
RE98-84B-40-001	0.01	67	0.4	0.04	4	16.9	na	na	na	na	na	na	na	na	na	na	na
RE98-84B-41-001	< .01	41	0.4	0.02	4	16	na	na	na	na	na	na	na	na	na	na	na
RE98-84B-45-001	< .01	15	0.6	< .02	4	17.4	na	na	na	na	na	na	na	na	na	na	na
RE98-84B-53-001	0.02	65	0.5	0.05	3.6	20.1	na	na	na	na	na	na	na	na	na	na	na
NAT96-216	< .01	82	0.7	0.06	4.3	19.4	na	na	na	na	na	na	na	na	na	na	na
4902G	0.03	59	0.7	0.06	3.6	22.4	na	na	na	na	na	na	na	na	na	na	na
4909G	0.01	76	0.6	0.04	3.6	22.8	na	na	na	na	na	na	na	na	na	na	na
4913G	< .01	64	0.4	0.04	4.3	18.3	na	na	na	na	na	na	na	na	na	na	na
4914G	0.06	65	0.3	0.05	4	22	na	na	na	na	na	na	na	na	na	na	na
2521G	0.01	61	0.5	0.02	7.8	40.8	na	na	na	na	na	na	na	na	na	na	na
2541G	0.02	56	0.4	0.02	7.4	37.7	na	na	na	na	na	na	na	na	na	na	na
2558G	0.01	63	0.5	< .02	8.5	40.3	na	na	na	na	na	na	na	na	na	na	na