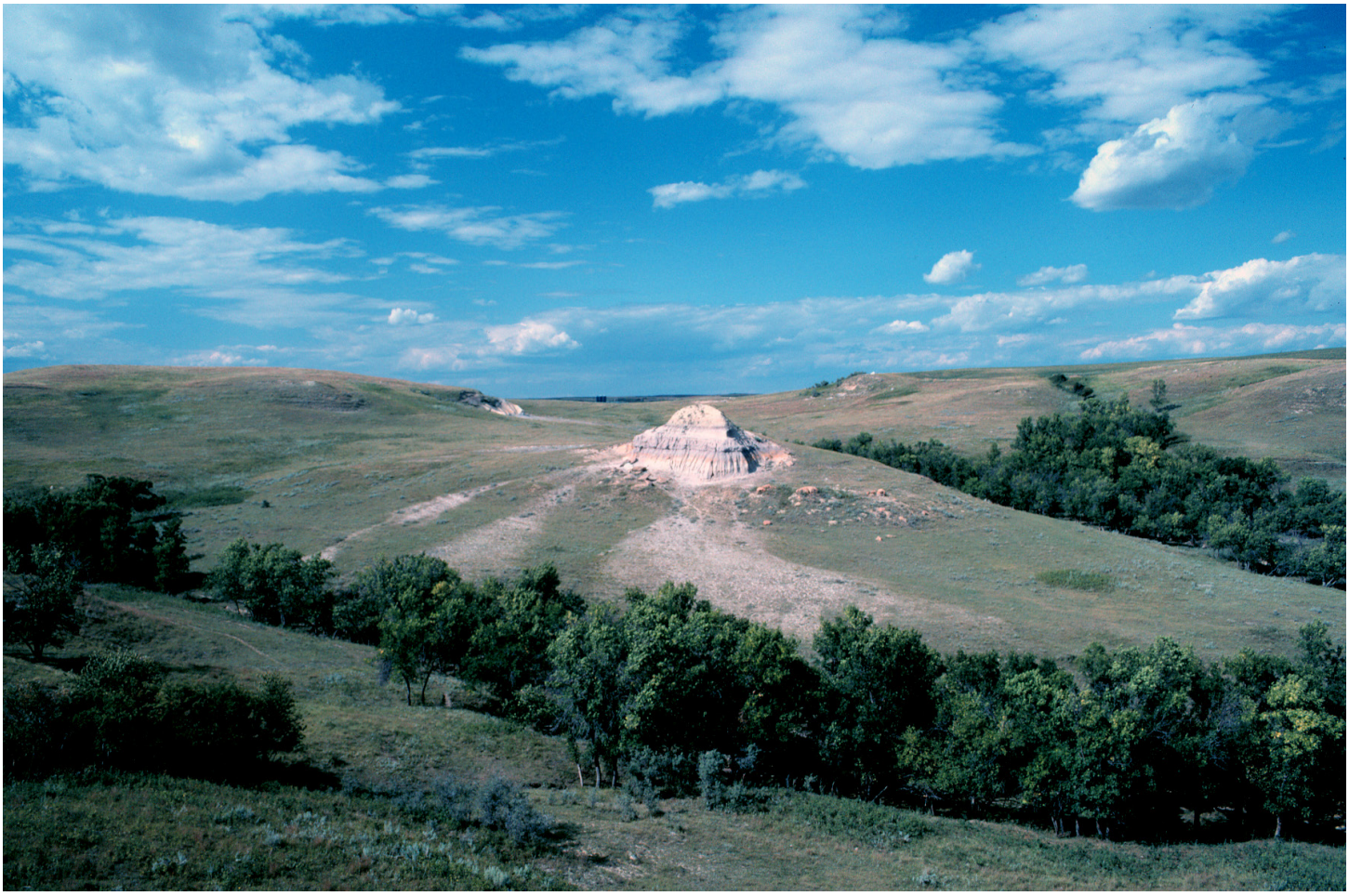
THE ALUMINA CONTENT OF THE BEAR DEN MEMBER (GOLDEN VALLEY FORMATION) AND THE RHAME BED (SLOPE FORMATION) IN WESTERN NORTH DAKOTA

by

Edward C. Murphy



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Contents

On the cover: The Golden Valley Formation exposed in a small butte north of Marshall in Dunn County.

Illustrations

Table

INTRODUCTION

The vast majority of oil wells that are being drilled in the Williston Basin employ hydraulic fracturing as a completion technique. These wells use, on average, three to five million pounds of proppant, be it natural sand or ceramic beads, to keep these fractures open. Because of the tremendous amount of product utilized in North Dakota, the North Dakota Geological Survey undertook: 1) a study to find sand deposits in North Dakota that would meet the criteria and could be used as natural proppant and 2) a study to find local clay resources that could be utilized in the manufacture of ceramic proppant. The results of the sand study were reported by Anderson (2011). In the clay study, we focused on kaolinite deposits because high-aluminum kaolinite is one of the main ingredients in ceramic proppant.

GEOLOGY

Approximately three fourths of North Dakota is covered by glacial deposits (Figure 1). Till is the dominant glacial sediment and consists of a mixture of sand, silt, clay, pebbles, and boulders. The clays in till are a mixture of montmorillonite, illite, kaolinite, and chlorite which are an accurate reflection of the mineralogy of the clays that dominate the Paleocene and Cretaceous rocks in North Dakota that were ground into till by the glaciers. The Fort Union Group (Paleocene) dominates the landscape of southwestern North Dakota, is nonmarine (except for the Cannonball Formation), and consists of alternating sandstone, siltstone, mudstone, claystone, and lignite. Several studies in the 1960s and 1970s used x-ray diffraction to analyze samples from the Bullion Creek and Sentinel Butte Formations (Fort Union Group). These studies determined that montmorillonite and illite were the dominant clays with lesser amounts of chlorite and kaolinite (Chew and Boyd, 1960; Sigsby, 1966; Emanuel et al., 1976; Brekke, 1979). Emanuel and others (1976) determined that 87 rock samples from the Bullion Creek Formation were predominantly illite and montmorillonite with lesser amounts of kaolinite and chlorite and seven samples from the Sentinel Butte Formation were predominantly montmorillonite. Brekke (1979) analyzed 26 rock samples from the Bullion Creek and Sentinel Butte Formations and determined montmorillonite was the dominant clay mineral in both formations. He also noted that illite and chlorite occur in approximately equal amounts, accompanied by minor amounts of kaolinite. Murphy and others (1993) attempted to differentiate between Fort Union and White River strata using clay mineralogy. However, they found sodium montmorillonite was the dominant clay mineral in 24 samples from these rock units. Chew and Boyd (1960) reported that the basal Chadron Formation (Chalky Buttes Member) was kaolinite rich, but did not provide supportive evidence.

There are two kaolinite-rich stratigraphic units exposed at the surface in North Dakota, the Bear Den Member of the Golden Valley Formation and the Rhame Bed of the Slope Formation (Figures 2 and 3). These stratigraphic units are dazzling white, gold, purple, and/or light gray in color; range from claystone, mudstone, siltstone, sandstone, and occasionally lignite; are 10-40 feet thick; Paleocene in age; and are thought to have formed as a result of intensive leaching during a prolonged period of weathering (Murphy, 2009). The Bear Den Member is latest Paleocene in age. The prolonged and/or intensive weathering that lead to the creation of the kaolinite clays occurred just prior to the beginning of the Eocene Epoch some 55.8 million years ago. The weathering phenomenon that created the Rhame Bed occurred approximately 61 million years ago during mid-Paleocene time (Figure 4).

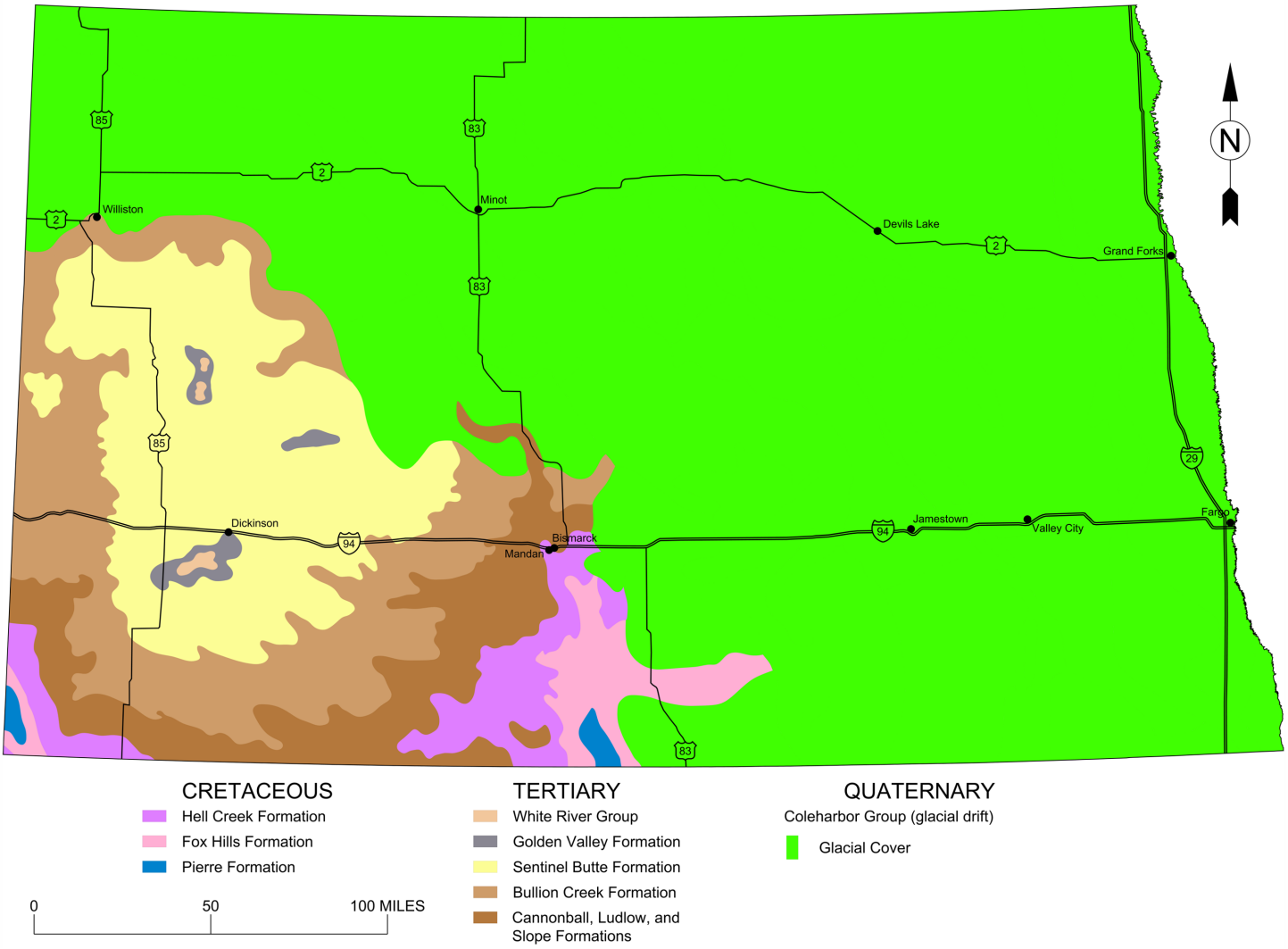


Figure 1. Generalized surface geology map of North Dakota.

PREVIOUS STUDIES

A number of studies have been undertaken over the years to determine the clay mineralogy or alumina (aluminum oxide) content of clays and claystones in North Dakota. Many of these studies focused on either the Bear Den Member of the Golden Valley Formation or the Rhame Bed of the Slope Formation in North Dakota. The North Dakota Geological Survey began studying clays as early as 1892. The Fourth Biennial Report of the North Dakota Geological Survey, published in 1906, dealt entirely with the clay resources of North Dakota. The Bear Den Member was the focus of many of these early studies and was called the "white fire clays" by Leonard (1906) and either the "white clays" or the "white high grade clays" by Clapp and Babcock (1906).

In 1942, the Minerals Development Corporation built a plant at Marmarth to produce alumina from bentonites in the Hell Creek Formation. The plant used technology developed by professors at the University of North Dakota. However, the plant was shut down after only a few months of operation due to low alumina production (Clarke, 1948).

Figure 2. An outcrop of the Rhame Bed in Grant County. The silcrete at the top of the bed forms the low, flat lying surface that extends into the slope of the hill in the background.

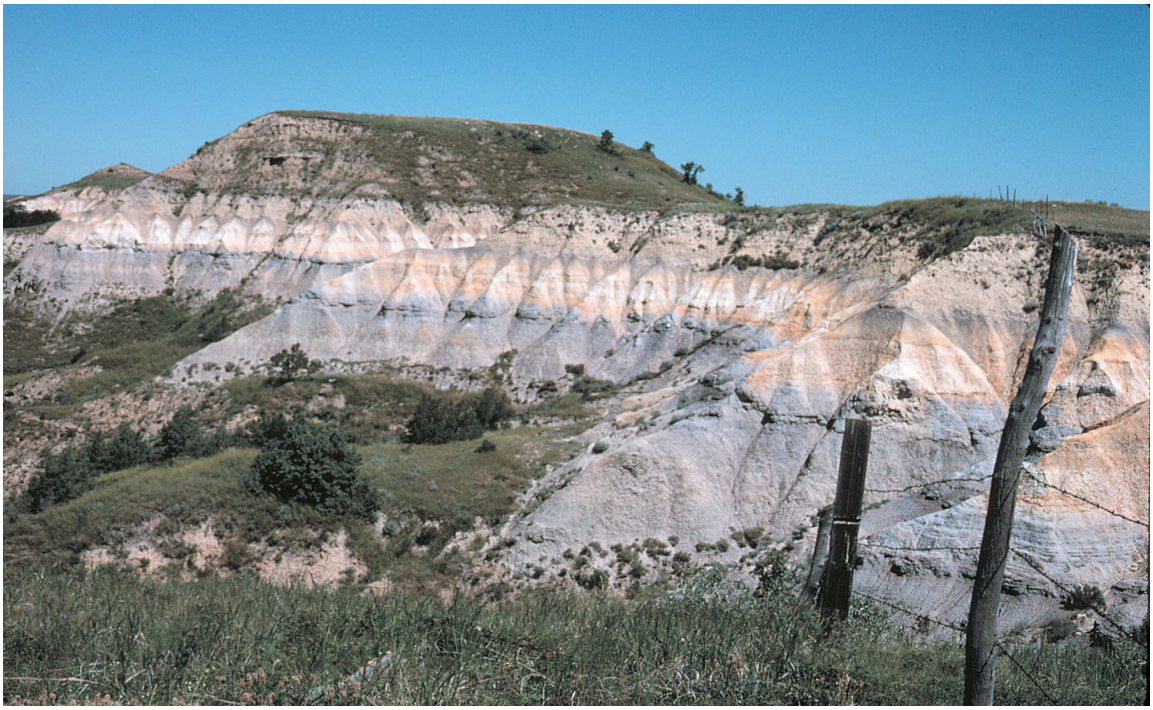


Figure 3. An outcrop of the brightly colored Bear Den Member in Dunn County. The brown colored rocks of the upper member of the Golden Valley Formation (the Camels Butte Member) are exposed in the background.

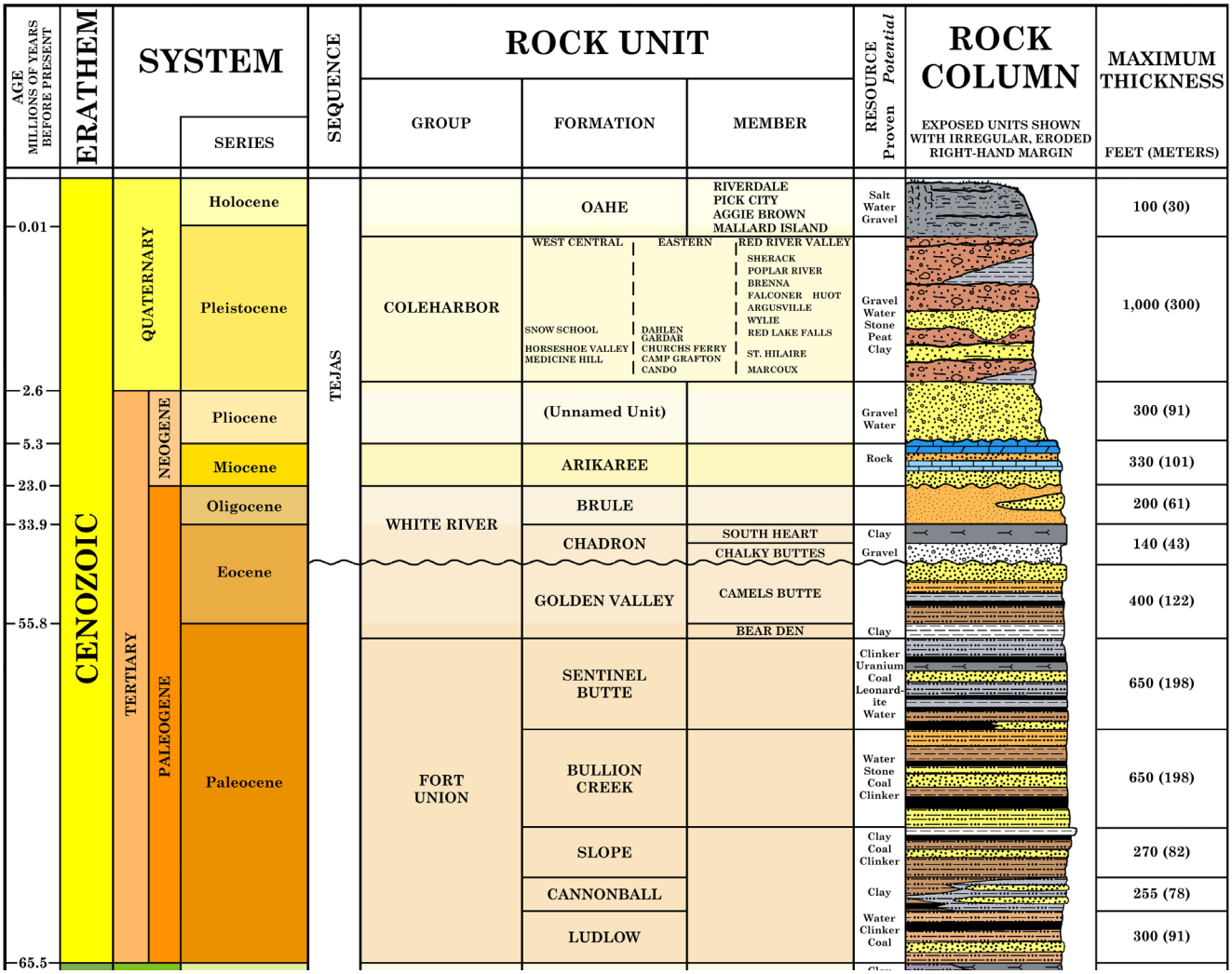


Figure 4. The Cenozoic portion of the stratigraphic column of North Dakota (modified from Murphy et al., 2009). The white bed at the top of the Slope Formation on this stratigraphic column is the Rhame Bed.

In 1948, Fremont Clarke (U.S. Bureau of Mines) reported on the alumina content of claystones in the White River Group from the Chalky Buttes in Slope County and the South Heart Little Badlands in Stark County, the Hell Creek Formation in the Little Missouri River Badlands near Marmarth in Slope County, and from the Sentinel Butte Formation northwest of Belfield in Billings County. Clarke collected 417 clay samples, 408 of which were bentonites. A majority of his samples came from the South Heart Member of the Chadron Formation (White River Group) in the South Heart Little Badlands and the Chalky Buttes (what he called the "upper bed"). He determined the aluminum oxide concentrations of these claystones ranged from 16-22%.

The Great Northern Railway Company published a report in 1958 entitled *Williston Basin Clays*. The company collected more than a dozen samples and drilled several test holes adjacent to outcrops of the Bear Den Member in Mountrail County. They referred to the rocks that would later be named the Bear Den Member as the "White Earth Clay" and were aware they occurred in the lower part of the Golden Valley Formation. They determined the bed was up to 30 feet thick and contained 21-26% alumina.

In 1959, the North Dakota Geological Survey published a report on the alumina potential of claystones in western and central North Dakota by Miller Hansen. Hansen collected 125 claystone samples from the Bullion Creek and Slope Formations (known at that time as the Tongue River and Ludlow Formations) and the Bear Den Member of the Golden Valley Formation at 44 localities. Thirty of those samples came from an extended Bear Den deposit where the Hebron Brick Company was mining clay. Hansen reported the alumina content for the Bullion Creek samples ranged from 10-15% and the Bear Den samples had an upper range of 25.3%.

Freas (1959, 1962) studied the Bear Den Member of the Golden Valley Formation near Dickinson and mapped and sampled the Rhame Bed along 28 square miles of Deep Creek in Slope County. He mapped the Golden Valley Formation over an area of approximately 1,000 square miles and collected nearly 400 rock samples. Freas concluded the Bear Den contained, on average, 66% kaolinite, 27% illite, and 7% montmorillonite. He noted the percentage of kaolinite tended to decrease vertically downward through the Bear Den Member and montmorillonite was the dominant constituent of the mixed clays both above and below that rock unit. Only fifty-two of the clay sample localities are plotted on a geologic map in his reports. His project was supported by the Northern Pacific Railway Company.

In 1960 and 1961, the Northern Pacific Railway Company reported the results of an investigation concerning the thickness and alumina content of the Bear Den Member of the Golden Valley Formation in western North Dakota (Chew and Boyd, 1960; Chew, 1961). The Chew and Boyd study focused on Stark, Hettinger, and southern Dunn counties. The Chew study covered an area of approximately 600 square miles in Mercer and northern Dunn counties. These studies analyzed the alumina content of 53 claystone samples (including some collected by Freas) and mapped the Golden Valley/Sentinel Butte contact throughout the study areas. Bed thickness, extent, alumina content, and 15 resource blocks were plotted on maps of the area. Their resource blocks have a combined area of 43 square miles, contain 867 million tons of Bear Den claystone, and a weighted alumina average range of 18.8-24.1%. Throughout the entire study area, alumina ranged from 18.4-29.8% and bed thickness from 5-21 feet. Chew and Boyd (1960) also reported the alumina content of five Rhame Bed samples along Deep Creek in an area mapped and sampled by Freas. The alumina content of these samples averaged 21.4%. Chew and Boyd concluded that the main controls on the alumina content of the samples were the clay mineralogy and the percentage of clay minerals. Unfortunately, neither the Freas nor the Chew and Boyd samples were tied to measured sections. Even with this major shortcoming, the Northern Pacific Railway Company studies were the most thorough investigations of the alumina content of the Bear Den Member up until the time of the 2011 North Dakota Geological Survey study.

Hickey (1977) did the most comprehensive mapping of the Golden Valley Formation that had been done up to that point and presented it at a scale of 1:250,000. His map did not extend far enough south to include outcrops of the Bear Den Member in central and southern Grant County. Hickey's study focused on the stratigraphy and paleontology of the Golden Valley Formation, but he did analyze 11 clay samples. He reported the overlying Camels Butte Member contained 12% kaolinite, 46% montmorillonite, 36% illite, and 6% chlorite; the Bear Den Member 65% kaolinite, 16% montmorillonite, 18% illite, and 1% chlorite; and the underlying Sentinel Butte Formation 17% kaolinite, 76% montmorillonite, 7% illite, and a trace of chlorite.

Wehrfritz (1978) mapped occurrences of the Rhame Bed in Bowman and Slope counties and measured two dozen geologic sections from outcrops in that area. Although Wehrfritz's thesis is a thorough stratigraphic study of the Rhame Bed, she did not attempt to determine the chemistry or the clay mineralogy of the bed.

Prichard (1980) measured eight geologic sections, augured 34 holes, and studied the cuttings of eight additional drill holes while investigating the Bear Den Member in an 85 square-mile-area of northwestern Mercer County. Prichard used x-ray diffraction to determine the clay mineralogy of 110 samples he collected from the Golden Valley and Sentinel Butte Formations. As a result, Prichard's thesis is the single best source of information on the stratigraphic variability of kaolinite in the lower Camels Butte Member, the Bear Den Member, and the upper Sentinel Butte Formation in a localized area. Prichard determined that the overlying Camels Butte Member contained 6% kaolinite, 54% montmorillonite, 31% illite, and 9% chlorite; the Bear Den Member 66% kaolinite, 18% montmorillonite, 16% illite, and no chlorite; and the underlying Sentinel Butte Formation 11% kaolinite, 57% montmorillonite, 29% illite, and 3% of chlorite. These percentages match Freas (1962) and Hickey (1977) very well for the Golden Valley Formation, but less so for the montmorillonite and illite content of the Sentinel Butte Formation. In general, the percentage of kaolinite decreased with stratigraphic depth from the top of the member, but it was not a consistent decline. Chemical analysis was performed on 18 of the samples using a microprobe and scanning electron microscope. Ten of these samples came from one location (GV-12) and demonstrated a general decline in alumina content down through the Bear Den Member.

Both the Bear Den Member and Rhame Bed have been utilized in North Dakota for the manufacture of ceramics. The Hebron Brick Company has been manufacturing bricks using claystone from the Bear Den Member since 1904. The Dickinson Fire and Pressed Brick Company began mining the Bear Den Member along the Heart River south of Dickinson in the early 1900s, but ceased operation in the late 1930s. In the 1960s, the Dickinson Clay Products Company produced ceramic sewer pipe and tiles from Bear Den Member claystones, but that plant was short lived due to competition from plastic sewer pipe. Claystone from the Bear Den Member as well as the Rhame Bed were also used to make pottery (Murphy, 1995).

Over the years, the North Dakota Geological Survey has mapped most of the Golden Valley Formation at a scale of 1:24,000. In only a handful of these maps, the Bear Den and Camels Butte Members have been mapped as separate units. In contrast, the Rhame Bed has only been mapped at a scale of 1:63,000 in portions of Slope and Bowman counties and at a scale of 1:125,000

throughout the remainder of its extent in Golden Valley, Adams, Grant, and Morton counties. The total tonnage of Bear Den and Rhame strata was determined by: 1) calculating the total area from existing maps using ArcInfo, 2) using an average outcrop width of 5,000 feet for the Rhame Bed in areas where the contact of the Slope Formation and the overlying Bullion Creek Formation were mapped at 1:125,000 feet, 3) using an average thickness of 15 feet and an average weight of 43 pounds per cubic foot, and 4) assuming one-third of the total tonnage was economically mineable. As a result, it was calculated there are over 1.7 billion tons of mineable kaolinite-rich rock within the Rhame Bed and Bear Den Member.

FIELDWORK

In early 2011, five claystone samples were collected from the Bear Den Member of the Golden Valley Formation in Mercer and Morton counties and analyzed for clay mineralogy and chemistry using x-ray diffraction and x-ray fluorescence. The alumina content of these samples ranged from 26-38%, encouraging further study. Potential sample sites were then identified on 1:20,000 scale black and white aerial photographs (stereo pairs) as well as on GoogleEarth and compared to geologic surface maps. Outcrops that appeared to contain either bed were then field investigated. In addition, county roads and trails were traversed in areas where the Golden Valley/Sentinel Butte or Bullion Creek/Slope contacts had been mapped in hopes of finding outcrops that due to size, partial vegetated cover, or slope were not visible on aerial photographs. As a result of the fieldwork, 232 additional rock additional samples (120 Rhame Bed, 99 Bear Den, 7 Bullion Creek, 3 Camels Butte, and 3 Sentinel Butte) were collected at 61 study sites across southwestern North Dakota from September 2011 to January 2012 (Appendix A). In areas of limited outcrop, only one or two samples were collected (Figure 5). In areas of good rock exposure, up to a dozen samples were collected along a vertical profile to determine stratigraphic variation in kaolinite and alumina content at a given location (Figure 6). An entrenching tool was used to dig back six inches or more into the outcrop to reach fresh exposures. After the sample was obtained, the depression was backfilled with waste rock and tamped into place.

Typically, both the Bear Den and the Rhame Bed are relatively easy to identify in the field because they are more brightly colored than the surrounding rocks, form relatively steep nonvegetated slopes, the kaolinite-rich claystones and mudstones are greasy to the touch, the Bear Den Member often contains tiny iron oxide and iron sulfide spheres, and both beds are often capped by a siliceous layer (silcrete) that tends to form low, flat-topped hills and buttes. However, local variations in the color of either of these beds or the adjacent beds can make it more difficult to identify them in the field. Locally, the color of the Bear Den or Rhame Bed can be subdued or drab to the point they do not contrast with the surrounding rock. In addition, there are occasionally other brightly colored beds within the Fort Union Group that can be mistaken for these on a local basis.

Wehrfritz (1978) identified the siliceous layer at the top of the Rhame Bed as a silcrete. Previously it had been commonly termed a pseudo-quartzite. Silcrete is a silica-rich layer that typically occurs at the top of a paleosol (an ancient soil horizon). Since the work of Wehrfritz, the brightly colored beds of the Bear Den and Rhame Bed have generally been interpreted to be paleosols. Silcrete is generally considered to have formed in a hot, arid climate where silica was dissolved and redeposited (Figures 7 and 8). Stems, some that have been identified as *Equisetum* (horsetail),

Figure 5. Examples of two claystone samples collected during this project. Roughly twice as much sample was collected in the field as is shown in this photograph. Samples were submitted to the Center for Nanoscale Science and Engineering Laboratory at North Dakota State University prior to this photo.

are common in both the silcrete at the top of the Rhame Bed as well as the Taylor Bed (the name given to the silcrete at the top of the Bear Den Mbr.). These silcretes are unique in the North Dakota stratigraphic column. As a result, when a layer of silcrete is present in outcrop it positively identifies the presence of either of these two kaolin-rich beds. Because the silcrete is so resistant to weathering, chunks of silcrete (float or lag) can be found throughout portions of western North Dakota lying on rocks up to 70 million years old.

LABORATORY ANALYSIS

The Center for Nanoscale Science and Engineering Laboratory (CNSEL) at North Dakota State University analyzed the chemistry and the clay mineralogy of the samples. Due to funding limits, only 197 of the 232 samples were submitted to the laboratory for x-ray fluorescence analysis (XRF) and 42 samples for x-ray diffraction (XRD) analysis. Preference was given to those Bear Den and Rhame Bed samples that were obtained from vertical profiles.

In the CNSEL, as received samples for XRF analysis were ground using an automated mortar and pestle for 30 minutes. An aliquot part was taken from the ground material and used to make fused

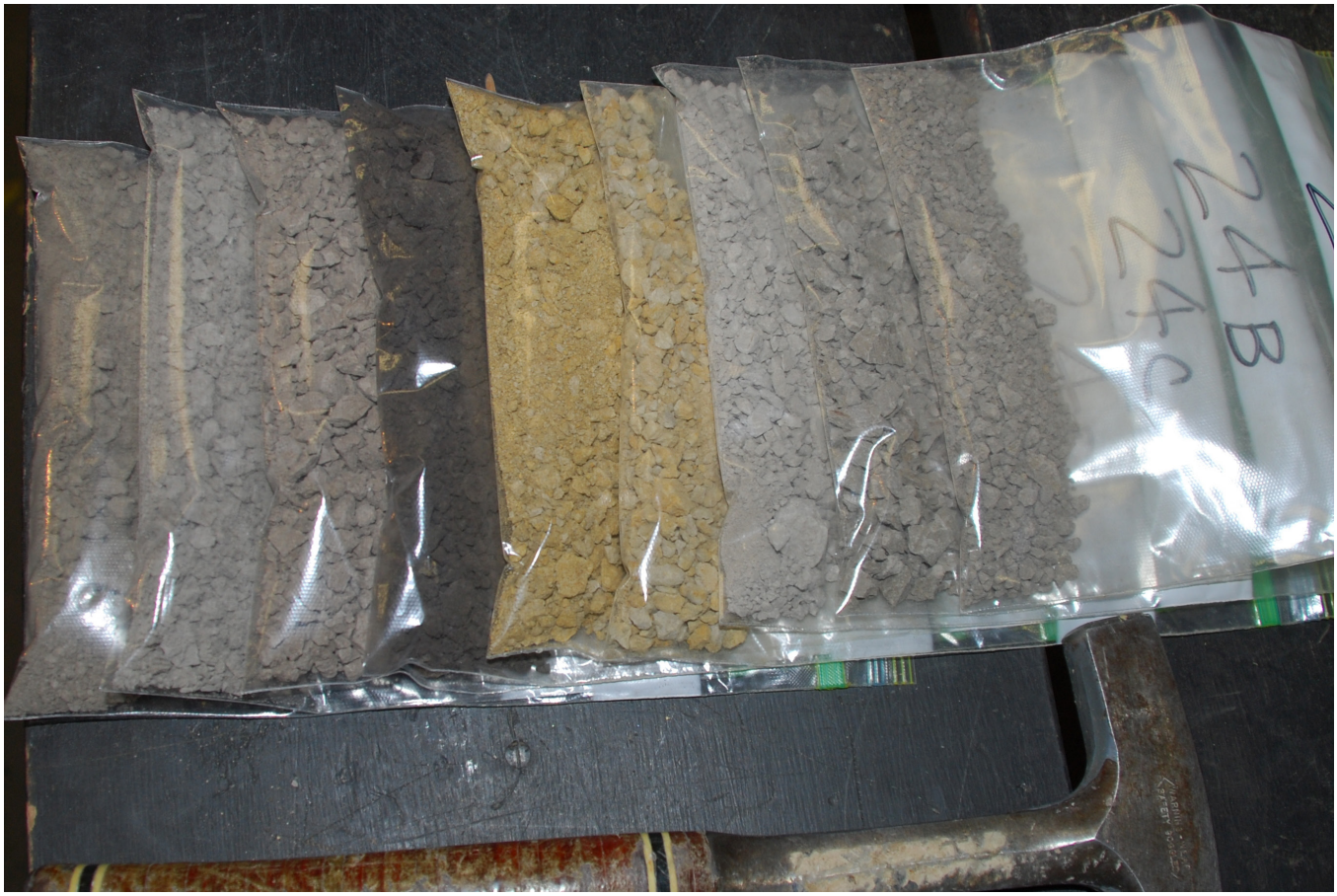


Figure 6. Samples 24a-24i prior to submittal to NDSU. Sample 24a was taken from the top of the Bear Den Member (far right) and Sample 24i was taken from just below the Bear Den Member in the Sentinel Butte Formation (far left). Samples were lightly crushed before they were submitted to the laboratory.

beads by the borate fusion method. Semi-quantitative elemental analyses were performed on the fused beads using a Wavelength-Dispersive X-Ray Fluorescence Spectrometer (Rigaku - ZSX Primus) equipped with a 4 kW Rhodium X-Ray tube. An additional aliquot portion was obtained from the ground sample material and used to determine mass loss between room temperature and 1000°C by thermogravimetric analysis (TGA). TGA was used to determine loss on ignition (LOI) values which were applied to the final data for all analyzed samples. To be consistent with how industry reports alumina values, the TGA values were removed and the mass percent was recalculated.

As received samples were ground using an automated mortar and pestle for 30 minutes for XRD analysis. The resulting powder was fractioned to clay sized particles and an oriented clay specimen was prepared. An XRD pattern was collected from 2-50° 2θ with a 0.02° step size and 1.0 second count time on a Rigaku Ultima IV X-Ray Diffractometer with Cu-Kα radiation operated at 40kV and 44mA. Crystalline phases were identified by computer search-match procedures, which employ the ICDD Powder Diffraction File, using MDI Jade 9.0 software.

Figure 7. A layer of silcrete tops the Rhame Bed in Adams County.

Figure 8. The surface of the silcretes range from earthy to vitreous due to the polishing action of wind and often contain stem molds or casts.

ALUMINA CONTENT

The alumina content of 90 Bear Den samples ranged from 7.3-33.8% with a mean alumina content of 20.4% (Appendicies B and C). Silica in these samples ranged from 53.6-90.3% with a mean of 72.5%. These samples had an iron oxide mean of 3.02% and potassium oxide mean of 1.49%. The only other oxide that occasionally reached the 1% concentration level was titanium oxide with a mean of 0.95% and a maximum concentration of 2.75% (Table 1).

The alumina content of 92 Rhame Bed samples ranged from 6.1-27.2% with a mean alumina content of 17.6% (Table 2, Figure 9, Appendicies B and C). Silica in these samples ranged from 62.7-90.9 % with a mean of 75.6 %. The iron oxide content of these samples had a mean of 1.8%, much less that of the Bear Den Member. This is not surprising because Rhame Bed outcrops do not typically have the visible iron (iron oxide staining or pyrite and limonite spherules) observed at Bear Den outcrops. Rhame Bed samples had a mean potassium oxide concentration of 2.1%, a titanium oxide mean of 0.76%, and a titanium oxide maximum of 1.2%.

In comparison, 15 samples obtained from the Slope, Bullion Creek, and Sentinel Butte Formations contained less alumina than the Bear Den Member, but roughly the same amount as the Rhame Bed (17.8%) with a mean silica value of 72.3% (Appendicies B and C).

Vertical alumina profiles were constructed for each locality where three or more samples were analyzed. This resulted in the creation of 30 profiles (15 Bear Den Member and 15 Rhame Bed). In addition, eight of these profiles also incorporate analyses from either above or below the kaolin-rich beds. Alumina in both the Bear Den and the Rhame Bed was more than twice as likely to increase vertically through the outcrop as it was to decrease. The trend lines in ten Bear Den and ten Rhame Bed profiles increased, they decreased in four Bear Den and four Rhame Bed profiles, and each stratigraphic unit had one trend line that was relatively flat. These trends were also evident when both the Bear Den Member and the Rhame Bed were split into three parts; an upper (the top five feet below the base of the silcrete), a middle (5-15 feet below the base of the silcrete), and a lower (the basal five feet). The mean of the alumina content increased from the upper part down through the lower part of both rock units (Table 2 and Figure 9). The mean alumina values increased from 20% to 21% to 22% going from the upper to the lower Bear Den as silica fluctuated from 73.9% to 71.6% to 71.9% through this same zone. The average alumina values do not have as consistent a pattern in the Rhame Bed going from 16.4% in the upper part of the bed to 18.8% in both the middle and lower (Table 2). Silica, on the other hand, consistently decreased from the upper to the lower part of the bed going from 77.4% to 74.3% to 73.1%.

The results of this study conflict somewhat with those of Prichard (1980) who generally found alumina concentrations decreased stratigraphically through the Bear Den Member. This may have resulted from Prichard's relatively few chemical analyses and/or his localized study area in north-western Mercer County. It should be noted that Site 19 (of this study) is adjacent to two of Prich-ard's localities, but has an increasing alumina profile.

Weighted alumina values were generated for each sample by multiplying the alumina mass percent value by the thickness of the lithologic layer they were obtained from. A weighted mean alumina

Table 1. The Mean of Oxides by Stratigraphic Unit or Position Within That Unit.

	BEAR DEN MEMBER				USB	LBC	RHAME BED				US
	Upper	Middle	Lower	All	All	All	Upper	Middle	Lower	All	All
	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %
Na2O	0.182	0.215	0.335	0.202	0.307	0.514	0.156	0.206	0.150	0.186	0.315
MgO	0.503	0.540	0.320	0.535	0.624	2.838	0.765	0.875	1.358	0.869	0.802
Al2O3	19.683	21.021	22.118	20.415	19.639	15.814	16.434	18.789	18.820	17.621	18.787
SiO2	73.903	71.589	71.913	72.543	73.598	70.090	77.406	74.270	73.107	75.624	73.934
P2O5	0.033	0.042	0.034	0.039	0.032	0.094	0.032	0.046	0.053	0.041	0.064
SO3	0.458	0.263	0.379	0.377	0.629	0.538	0.525	0.302	0.184	0.387	0.236
Cl	0.002	0.002	0.003	0.002	0.000	0.003	0.002	0.002	0.001	0.002	0.001
K2O	1.345	1.564	1.300	1.494	1.717	2.500	1.801	2.343	2.579	2.101	2.292
CaO	0.308	0.151	0.077	0.212	0.059	3.808	0.415	0.264	0.693	0.399	0.240
TiO2	0.965	0.982	0.900	0.952	0.804	0.742	0.778	0.764	0.747	0.765	0.723
V2O5	0.032	0.036	0.031	0.034	0.030	0.020	0.022	0.027	0.030	0.025	0.024
Cr2O3	0.011	0.012	0.011	0.011	0.012	0.009	0.009	0.011	0.012	0.010	0.011
MnO	0.011	0.015	0.012	0.016	0.014	0.060	0.007	0.013	0.017	0.012	0.012
Fe2O3	2.422	3.414	2.433	3.019	2.367	2.807	1.487	1.921	2.077	1.794	2.373
Co2O3	0.002	0.002	0.002	0.002	0.002	0.003	0.002	0.002	0.002	0.002	0.004
NiO	0.013	0.014	0.015	0.014	0.014	0.015	0.015	0.014	0.015	0.015	0.017
CuO	0.012	0.014	0.013	0.013	0.013	0.013	0.011	0.012	0.014	0.012	0.013
ZnO	0.004	0.006	0.009	0.006	0.011	0.010	0.008	0.009	0.011	0.009	0.021
Ga2O3	0.004	0.004	0.005	0.004	0.003	0.003	0.003	0.003	0.003	0.003	0.004
As2O3	0.002	0.002	0.002	0.002	0.002	0.001	0.001	0.002	0.002	0.002	0.003
Br	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000
Rb2O	0.008	0.010	0.009	0.009	0.009	0.014	0.012	0.014	0.014	0.013	0.014
SrO	0.008	0.009	0.007	0.009	0.009	0.010	0.008	0.009	0.010	0.009	0.012
Y2O3	0.002	0.002	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.003
ZrO2	0.035	0.033	0.027	0.034	0.028	0.033	0.040	0.034	0.031	0.036	0.035
Nb2O5	0.002	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001
MoO3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BaO	0.039	0.045	0.036	0.043	0.068	0.043	0.040	0.050	0.054	0.046	0.045
HfO2	0.005	0.005	0.005	0.005	0.003	0.004	0.006	0.005	0.004	0.005	0.006
PbO	0.002	0.004	0.001	0.003	0.000	0.006	0.003	0.003	0.003	0.003	0.001
ThO2	0.000	0.001	0.000	0.001	0.000	0.001	0.001	0.001	0.001	0.001	0.000
Pa	0.002	0.003	0.002	0.003	0.003	0.004	0.004	0.005	0.004	0.004	0.005
U3O8	0.000	0.001	0.000	0.000	0.000	0.002	0.001	0.001	0.001	0.001	0.000

USB = Upper Sentinel Butte Fm., LBC =Lower Bullion Creek Fm., US = Upper Slope Fm.

value was then calculated for the Bear Den Member or the Rhame Bed at each sample locality. These weighted alumina results, along with a contour map of the elevation at the top of the Rhame Bed and the Bear Den Member, were published for 47 localities in southwestern North Dakota (Murphy, 2012). Weighted alumina outcrop values ranged from 14-25% for the Bear Den Member and 13-25% for the Rhame Bed. The majority of Bear Den outcrops (12 of 17) averaged at or above 20% alumina while only 8 of 30 Rhame Bed outcrops averaged that high.

Table 2. The Alumina Content of the Bear Den Member, Rhame Bed, and Adjacent Strata							
		Al_2O_3				SiO_2	
	Analyses	Low	High	Mean	Low	High	Mean
BEAR DEN MEMBER	90	7.3	33.8	20.4	53.6	90.3	72.5
Upper Bear Den	26	11.0	27.4	19.7	64.3	84.9	73.9
Middle Bear Den	44	7.3	33.8	21.0	53.6	90.3	71.6
Lower Bear Den	5	13.8	32.1	22.1	61.5	81.1	71.9
Upper SENTINEL BUTTE FM	3	19.0	20.2	19.6	71.8	75.1	73.6
Lower BULLION CREEK FM	6	13.9	19.6	15.8	60.5	82.7	70.1
RHAME BED	92	6.1	27.2	17.6	62.7	87.2	75.6
Upper Rhame Bed	44	6.1	27.2	16.4	65.5	90.2	77.4
Middle Rhame Bed	35	10.2	25.4	18.8	64.2	87.2	74.3
Lower Rhame Bed	9	15.8	23.0	18.8	62.7	78.1	73.1
Upper SLOPE FM	6	17.2	20.4	18.8	68.8	75.8	73.9

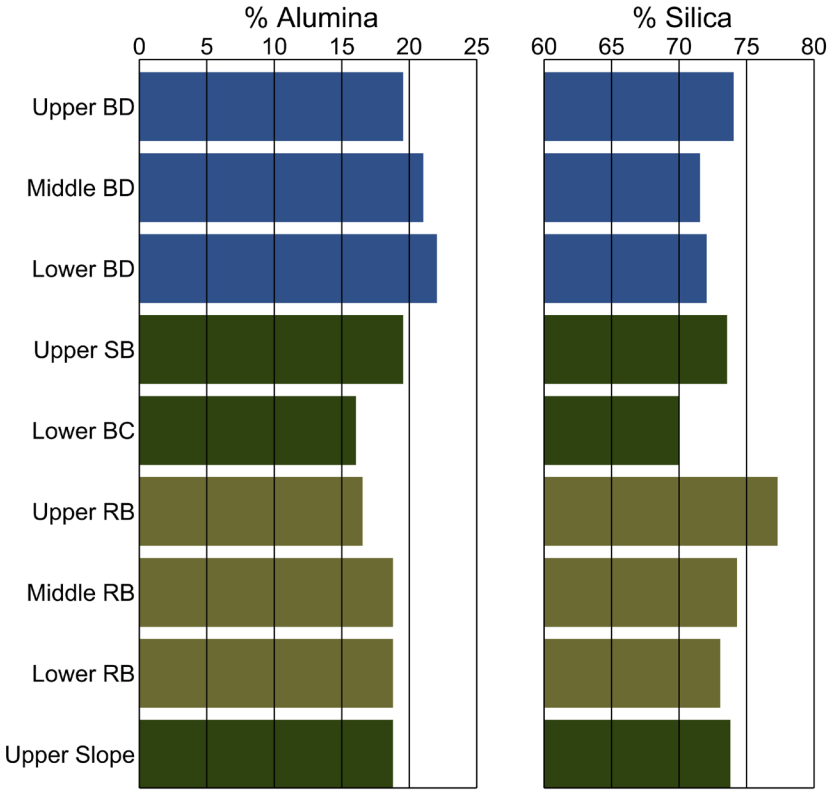


Figure 9. Average alumina and silica profiles for Paleocene rocks in western North Dakota. BD=Bear Den Mbr., SB=Sentinel Butte Fm., BC=Bullion Creek Fm., RB=Rhame Bed.

The alumina values from this study were presented in a series of 100K (Murphy, 2013a-h) and 24K (Murphy, 2013i-p) maps for western North Dakota. In addition, alumina values from Hansen (1959), Chew and Boyd (1960), and Prichard (1980) were also plotted on these maps.

STUDY AREAS

The study sites were split into five areas, two Bear Den and three Rhame Bed, to facilitate recognition of general lithologic characteristics and alumina patterns. Groupings primarily followed along 100k map borders. Bear Den Member outcrops were split into two groups; a Dickinson and a Killdeer area (named after the primary 100k sheets). Rhame Bed outcrops were split into three groups; Bowman, Mott, and Elgin (Figure 10).

Bear Den – Killdeer Area

The Killdeer Area includes eight Bear Den Member sample sites within the Killdeer 100K map sheet along with one sample site in each of the Glen Ullin, Dickinson, and Belfield sheets (Figure 10). Most sample localities in this area occur within a ten-mile-radius of the town of Dodge or along the edge of the Russian Spring Creek Escarpment.

The Bear Den Member averages about 20 feet thick in this area and the dominant lithologies are white to orange/white mudstone and claystone (Figures 11-20). As is typical of the Bear Den throughout western North Dakota, the upper contact was generally exposed, but the lower contact was not. Occasionally color zones could be traced from location to location (such as between sites 22 and 24). Typically, however, individual lithologic beds, aside from the Taylor and the Alamo Bluff, could not be traced across a large area. There is a thin, dark gray to black claystone present in the Bear Den Member at site 24 that appears to correlate to a thicker, black claystone at sites 18 and 19 as well as in section 34 (T146N, R90W). The black claystone in section 34 was collected in 2010 and found to contain 38% alumina and 46% of the clay minerals were determined to be kaolinite. That same layer contained 25-34% alumina in samples 22F, 18D, and 19D. In general, the northeast corner of this area contained the highest average weighted alumina concentrations found in the study. The majority of the outcrops in this area are at or near the base of small, flat-topped buttes. Overburden may be excessive away from the edges of these hills and buttes.

The lithologic colors used in the measured sections for figures 11-20, as well as 21-78, reflect the true color of the bed. This was done to make it easier for future workers to locate beds in question in the field.

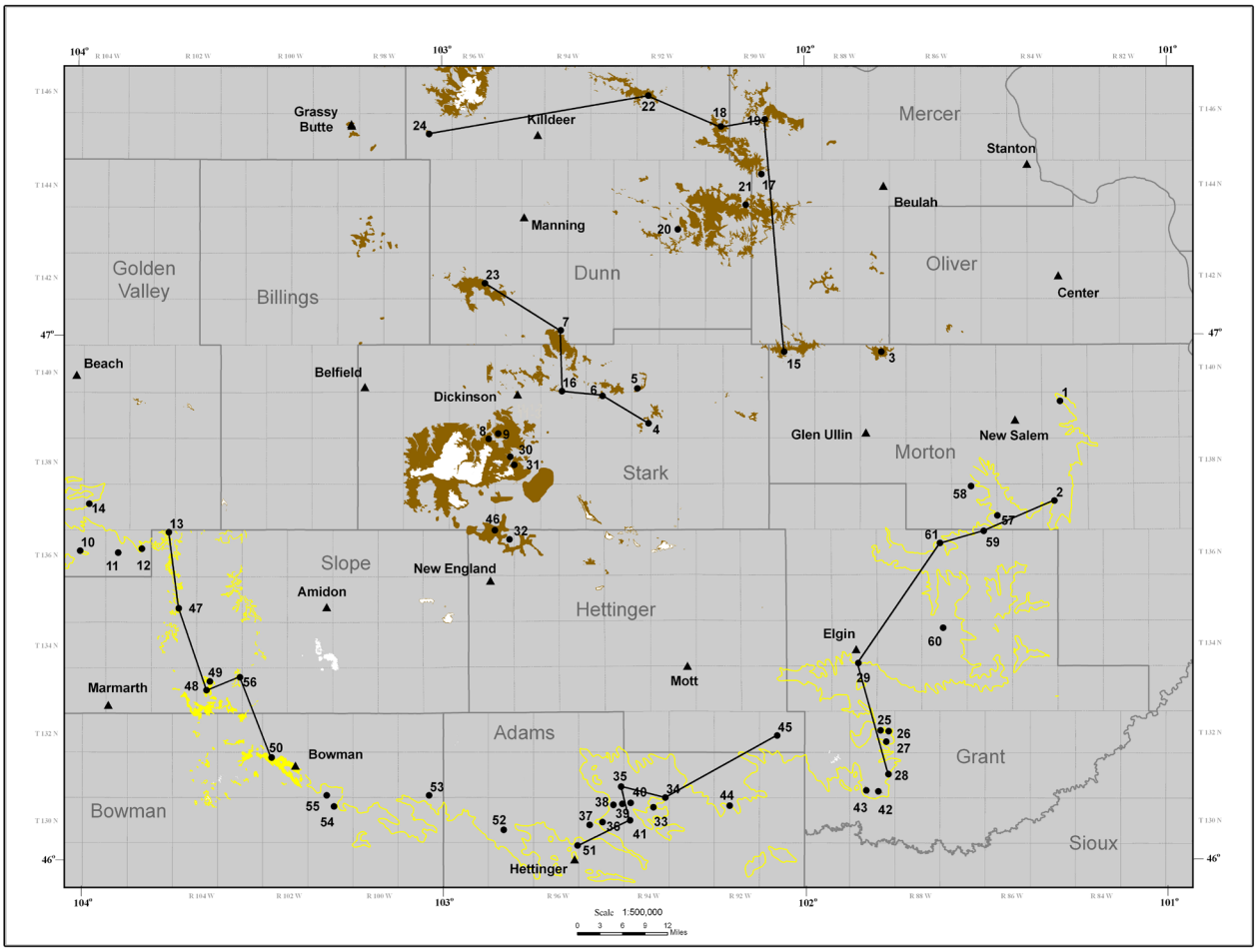


Figure 10. Location map of the sample sites (numbered black dots) in this study. The cross sections noted in the section traces are displayed in Figures 11, 21, 34, 48, and 62. The Golden Valley Formation is shown in brown and the upper contact of the Slope Formation (Rhame Bed) in yellow.

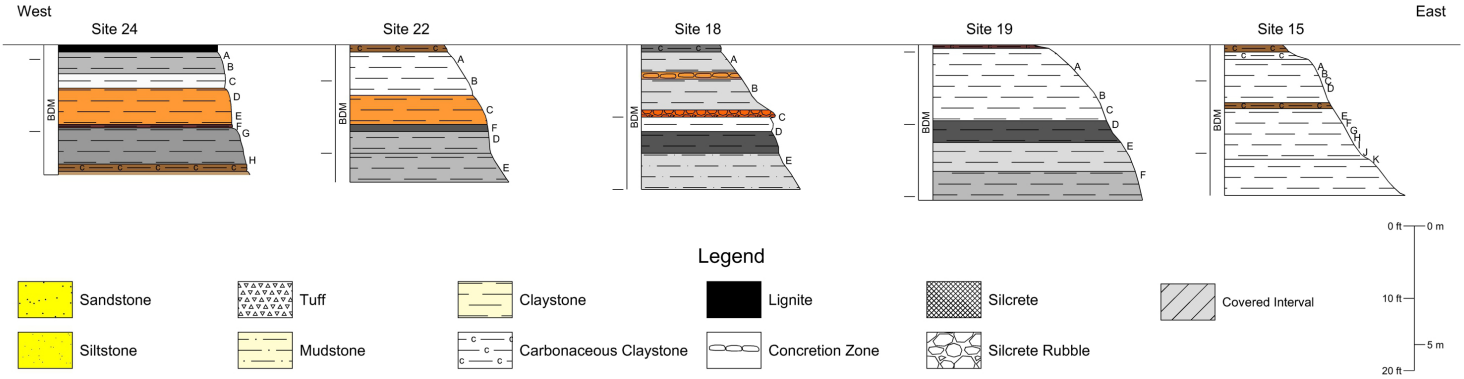


Figure 11. Geologic cross-section of selected sample sites in northern Dunn, western Mercer, and northwestern Morton counties. See Figure 10 for location map. The following abbreviations are used for figures 11-76; CBM – Camels Butte Member, BDM - Bear Den Member, TSB – Sentinel Butte Formation, TBC – Bullion Creek Formation, RB – Rhame Bed, and TS Slope Formation.

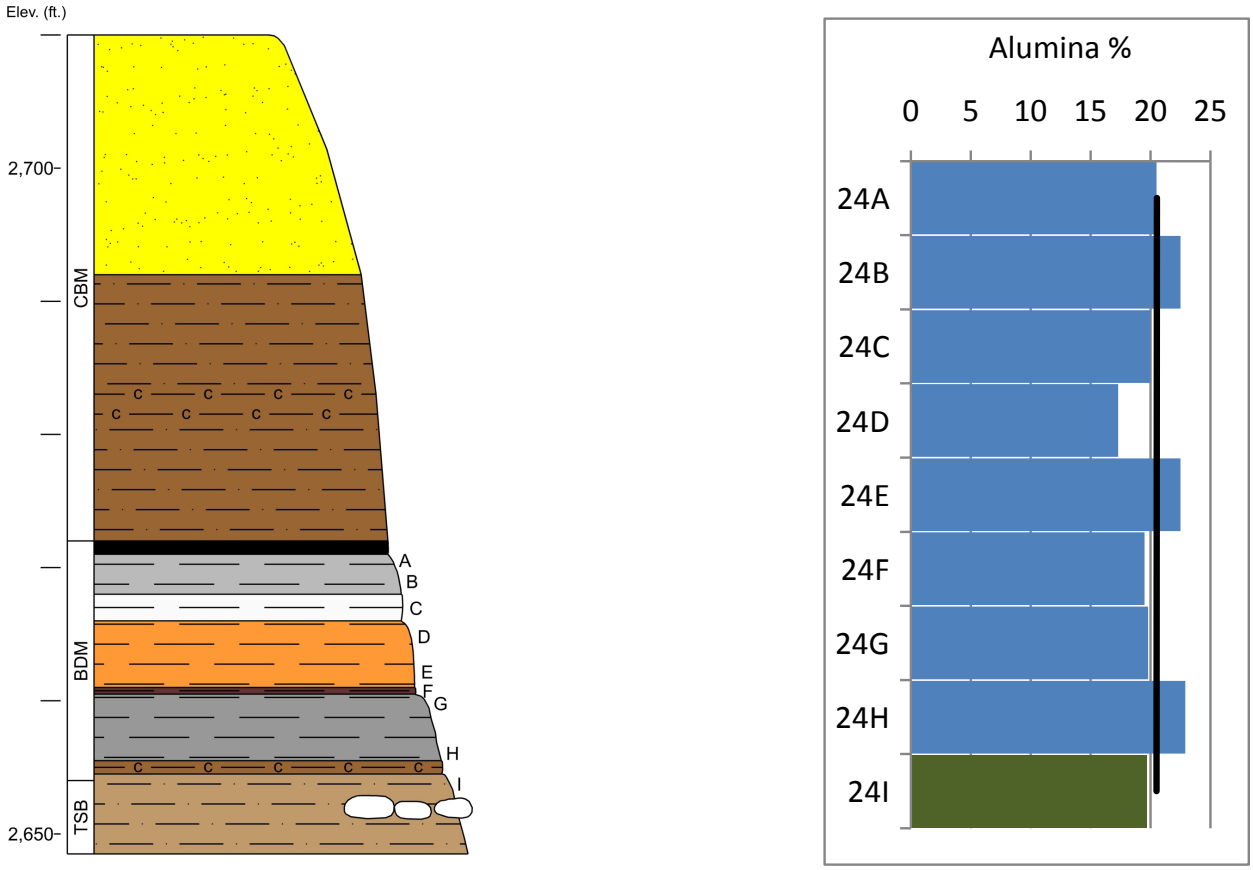
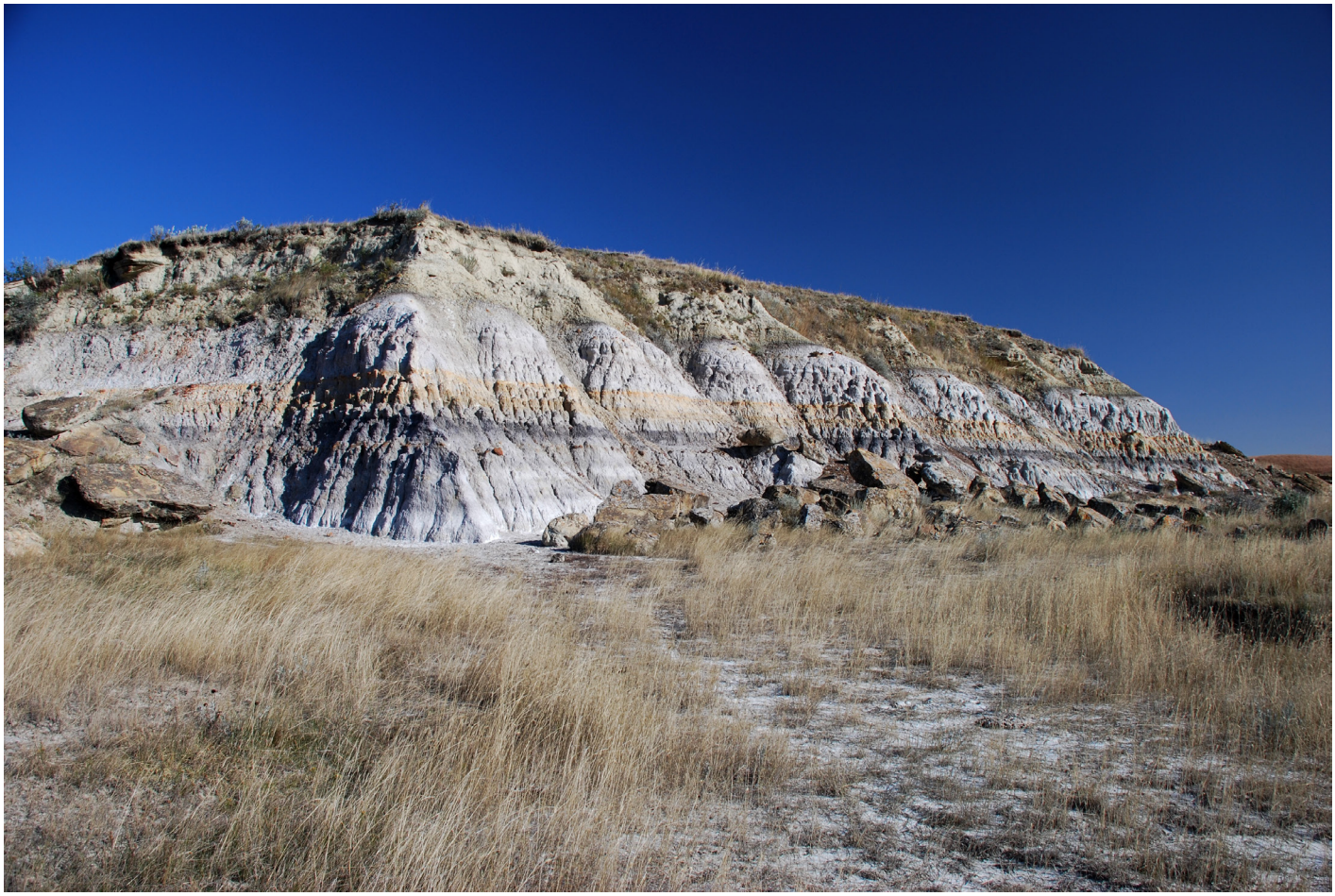


Figure 12. Photograph, measured section, and alumina profile for Sample Site 24 (T145N, R97W section 16, NW/SE/SE). See Figure 10 for location map and Figure 11 legend for lithology.



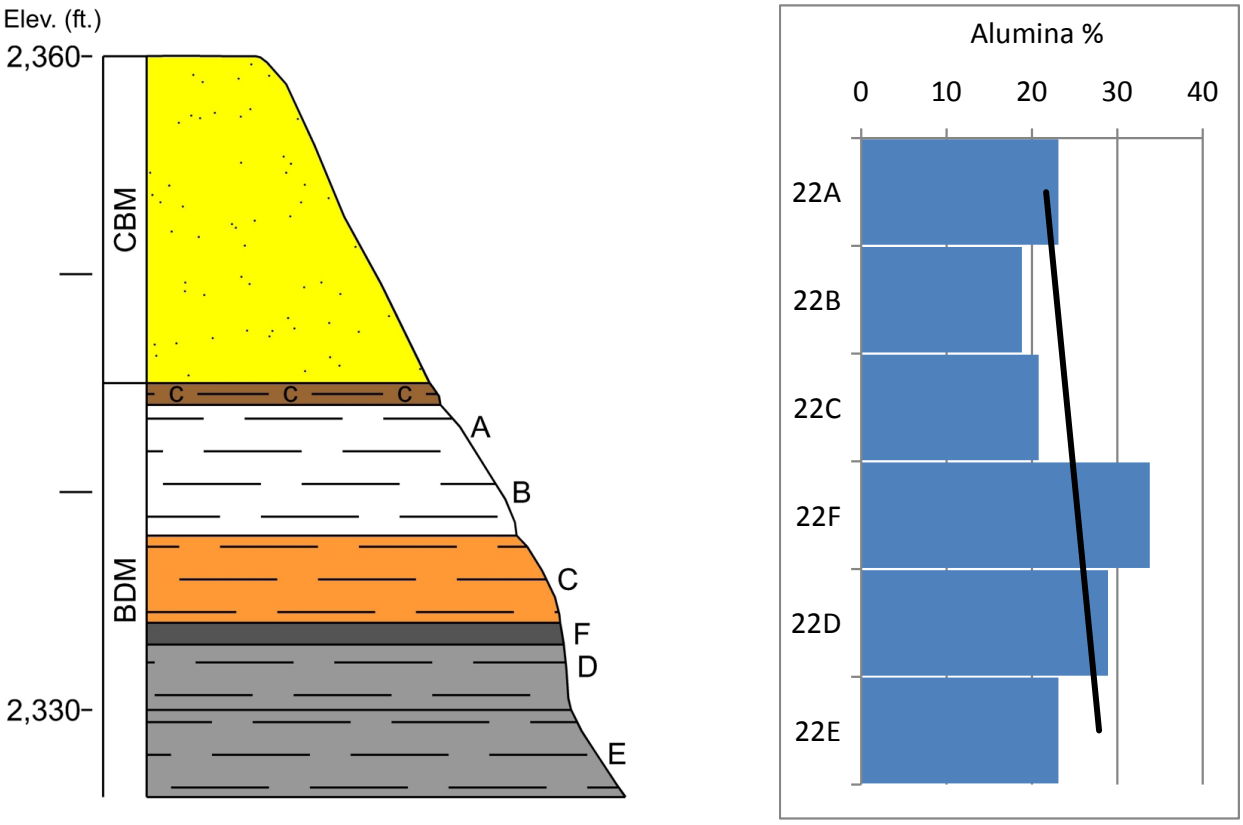


Figure 13. Photograph, measured section, and alumina profile for Sample Site 22. See Figure 10 for location map and Figure 11 legend for lithology (T146N, R92W, Section 20, NE/NW/SE).

Figure 14. Photograph, measured section, and alumina profile for Sample Site 18 (T145, R91W, Section 12, NE/SW/SE). See Figure 10 for location map and Figure 11 legend for lithology.

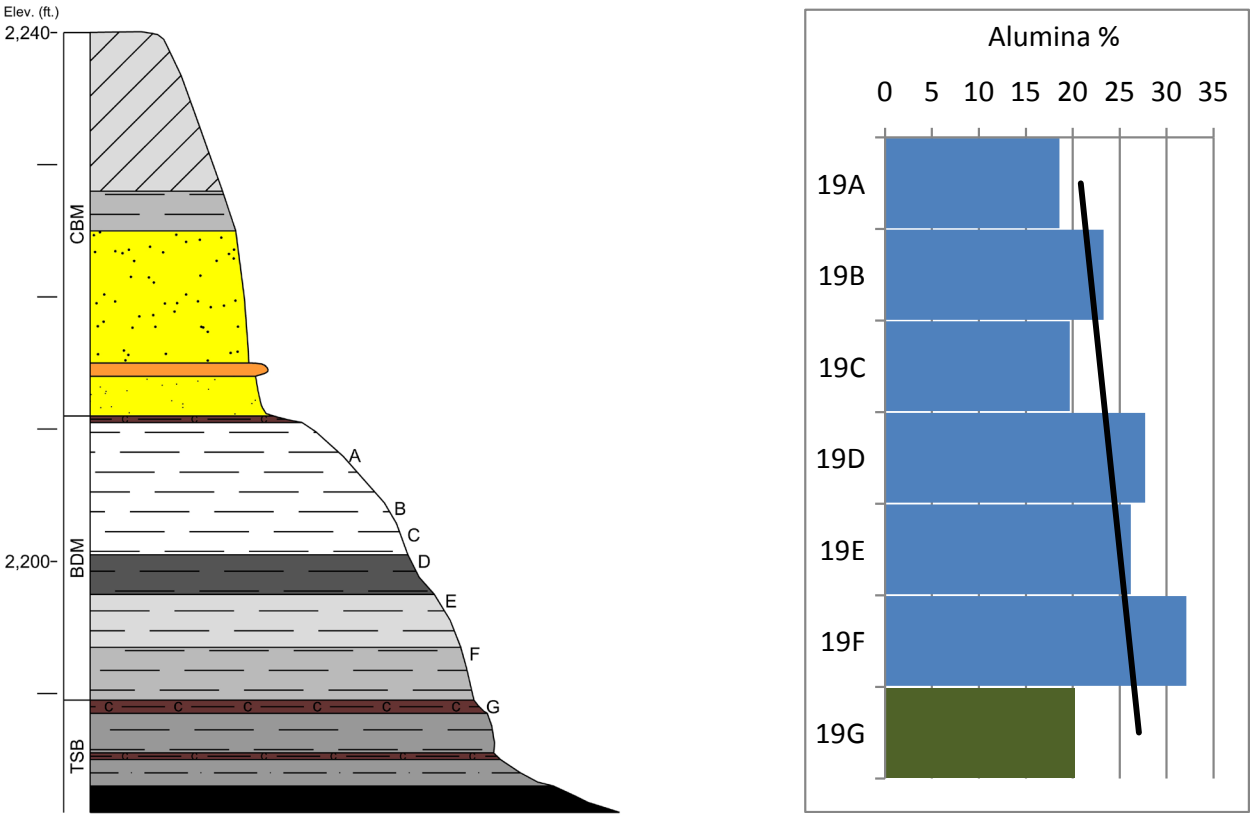


Figure 15. Photograph, measured section, and alumina profile for Sample Site 19 (T145N, R90W, Section 11, SE/SE/NW). See Figure 10 for location map and Figure 11 legend for lithology.

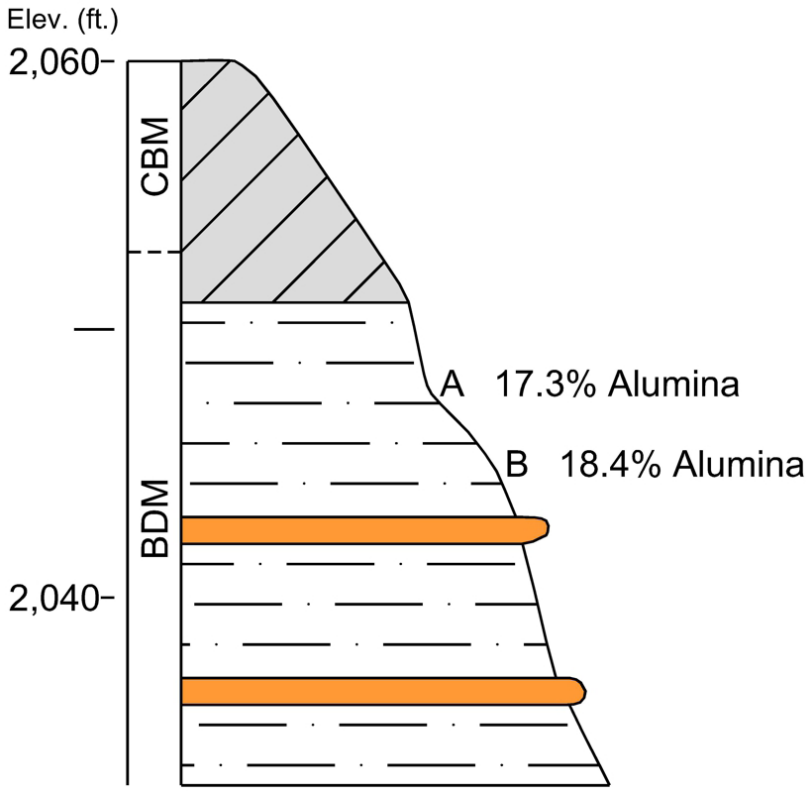


Figure 16. Photograph and measured section of Sample Site 17 (T144N, R90W, Section 18, NE/NW/NE). See Figure 10 for location map and Figure 11 legend for lithology.

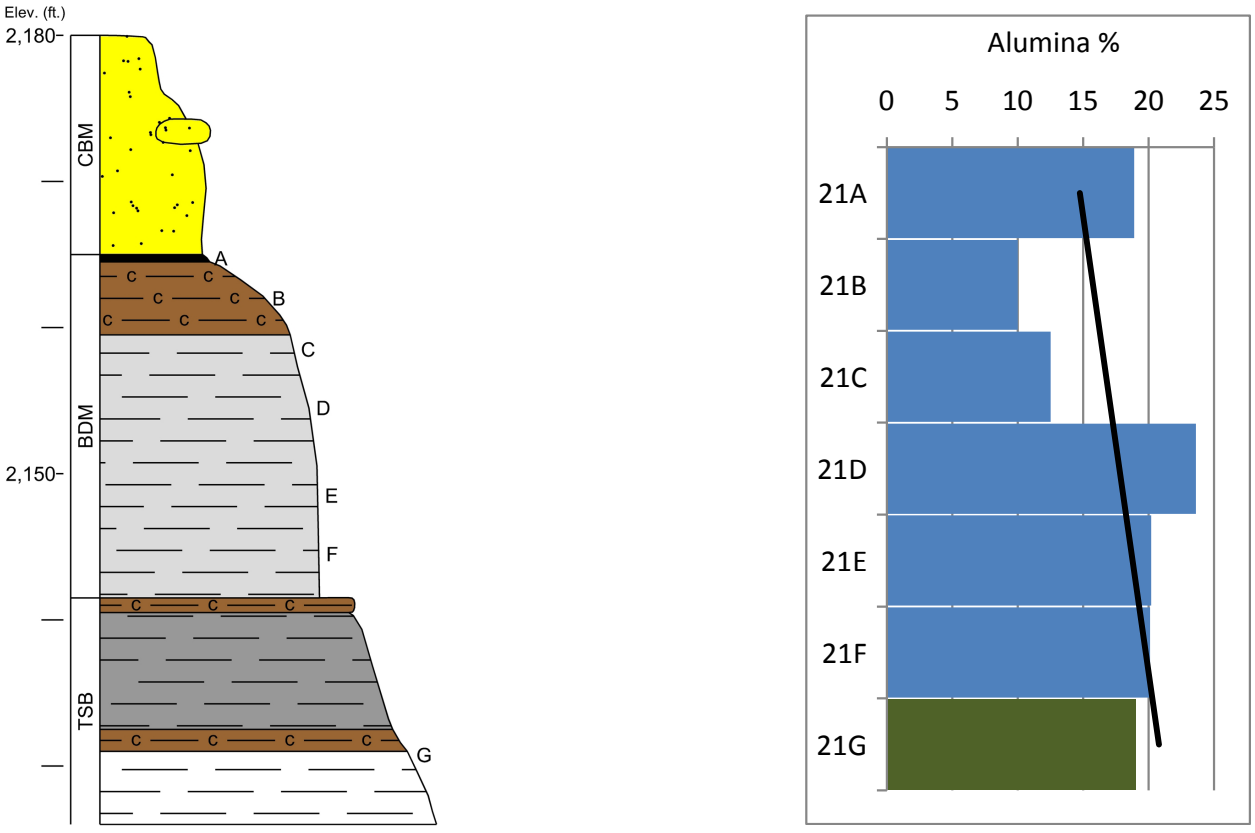
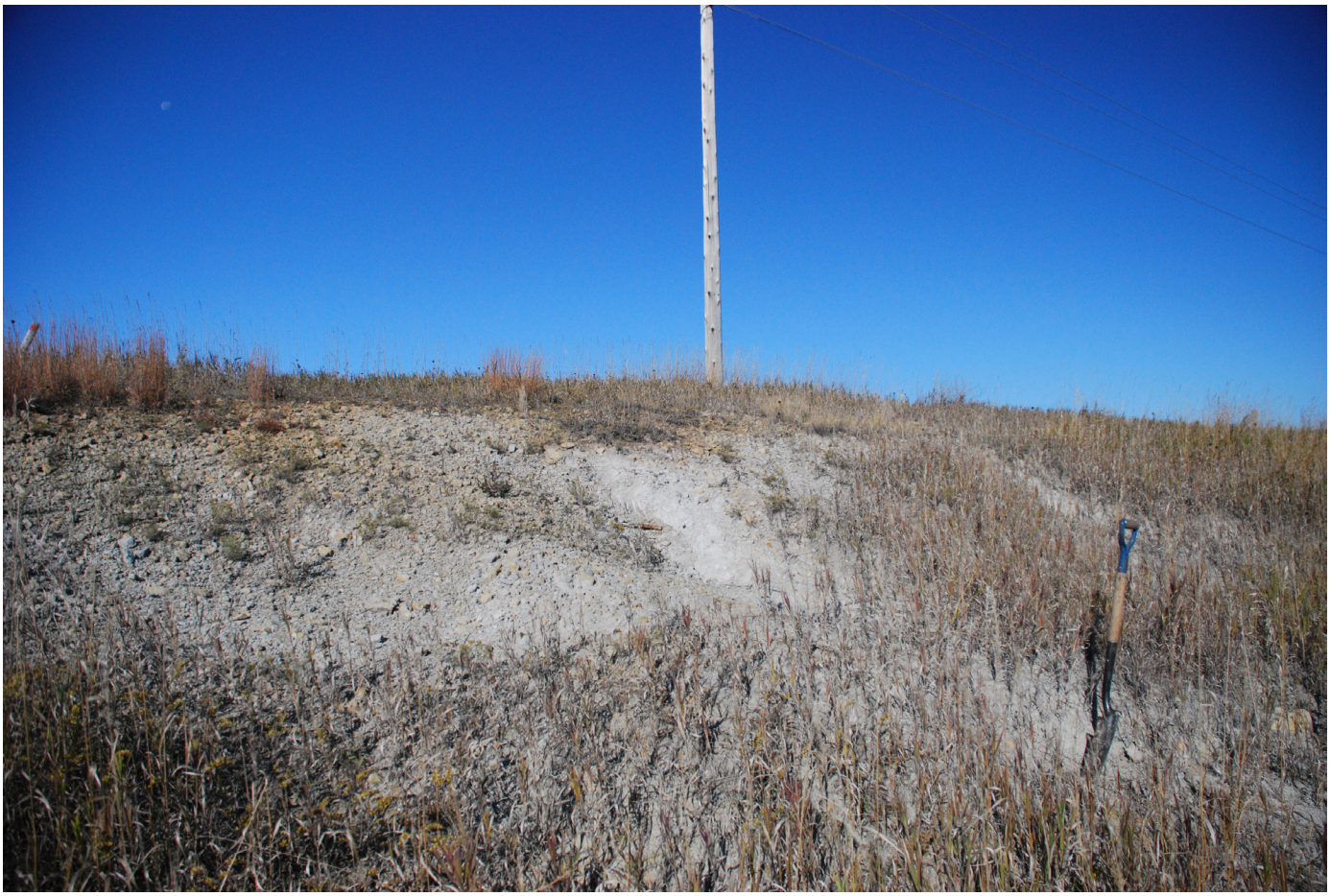


Figure 17. Photograph, measured section, and alumina profile for Sample Site 21 (T144N, R91W, Section 36, NW/SW/NW). See Figure 10 for location map and Figure 11 legend for lithology.



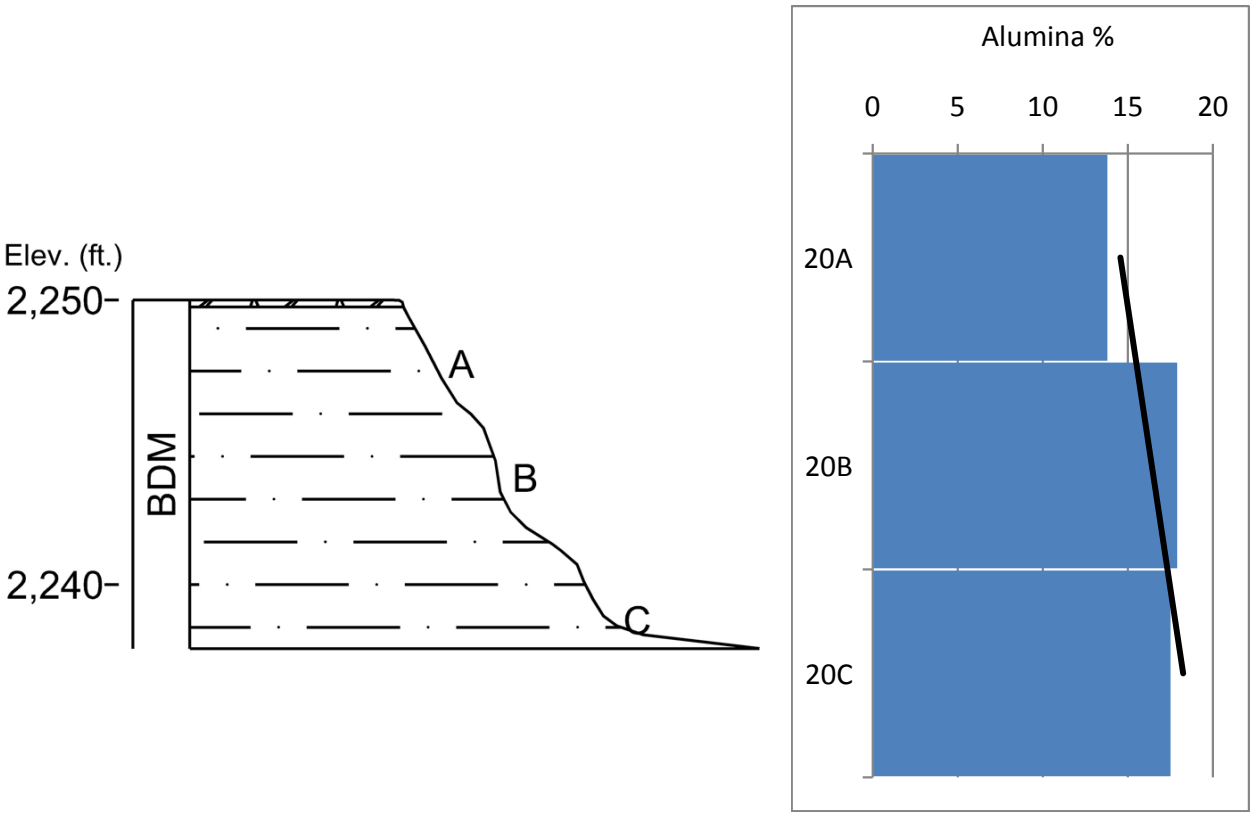


Figure 18. Photograph, measured section, and alumina profile for Sample Site 20 (T143N, R92W, Section 21, NE/SE/SW). See Figure 10 for location map and Figure 11 legend for lithology.

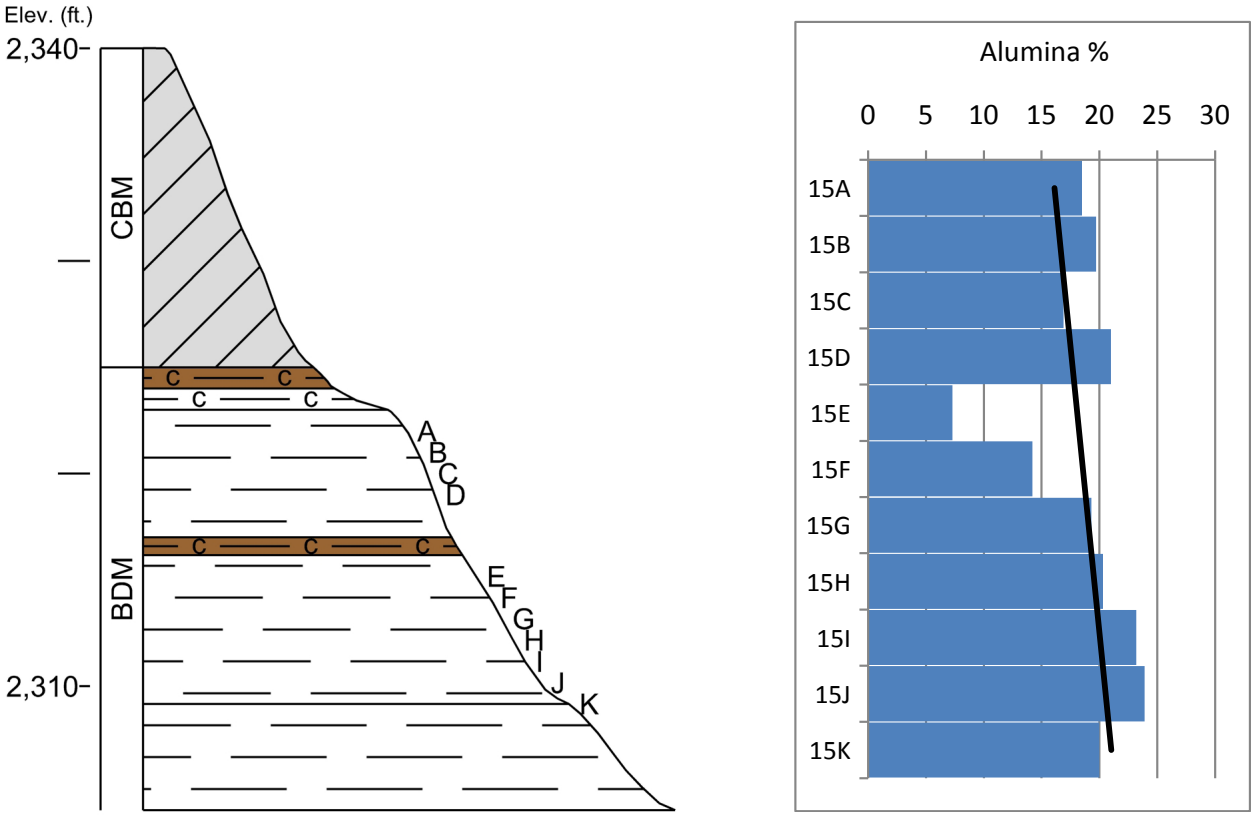


Figure 19. Photograph, measured section, and alumina profile for Sample Site 15 (T140N, R90W, Section 4, NW/SW/SW). See Figure 10 for location map and Figure 11 legend for lithology.

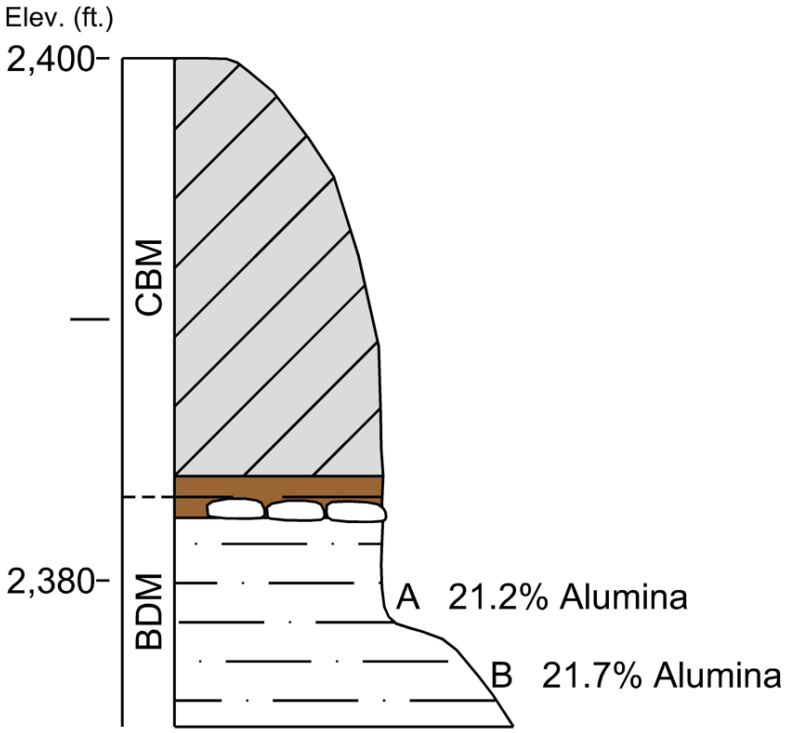


Figure 20. Photograph and measured section of Sample Site 3 (T140N, R88W, Section 4, NW/NW/SE). See Figure 10 for location map and Figure 11 legend for lithology.

Bear Den – Dickinson Area

The Dickinson Area includes 10 Bear Den Member sample sites within the Dickinson 100K map sheet along with two sample localities in the Killdeer 100K sheet (Figures 10, 21-33). All of these sample localities are within a 20-mile radius of the town of Dickinson. Most outcrops in this area occur within either the South Heart Badlands, the edge of the Russian Spring Creek Escarpment, or on isolated buttes.

The Bear Den Member is at least 15 feet thick in this area and the sample sites appear to have little in common regarding outcrop appearance. Sites 6 and 16 were fresh construction cuts so the colors that are typically associated with weathering (oxidation) on an outcrop face were absent. The rocks were poorly exposed at Site 4 and therefore subtle changes would not have been detectable.

Alumina content tends to be higher along the northern and southern portions of the area. The Bear Den Member appears to be close to the surface (based upon white (nonsaline) soils in plowed fields and small surface outcrops) in an area south of Dickinson A drilling program in sections 28-33 (T139N, R96W) is needed to determine the alumina content, overburden thickness, and influence of the South Heart Syncline on the dip of the rocks in this area.

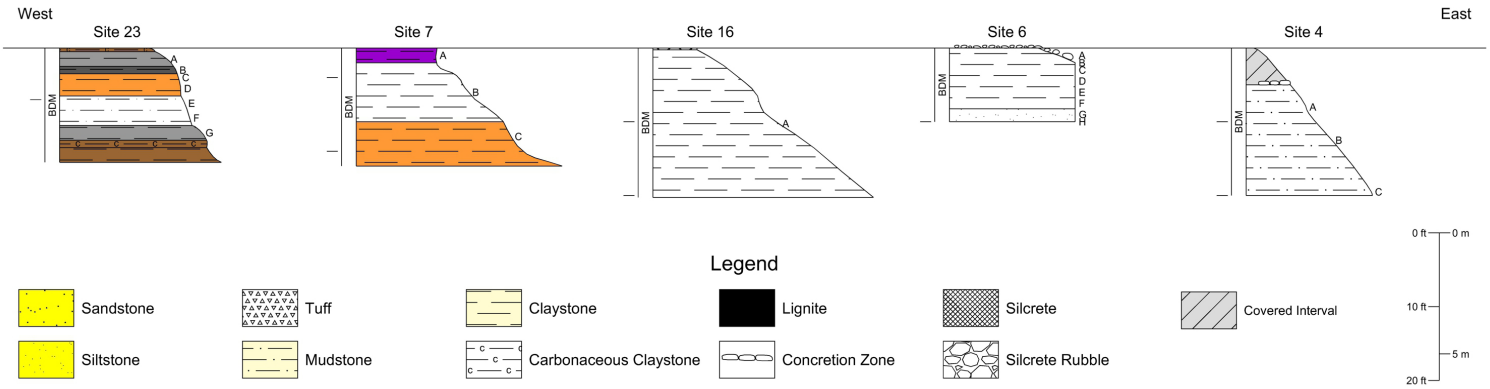


Figure 21. Geologic cross section of selected sample sites in southern Dunn and northeastern Stark counties. See Figure 10 for location map.

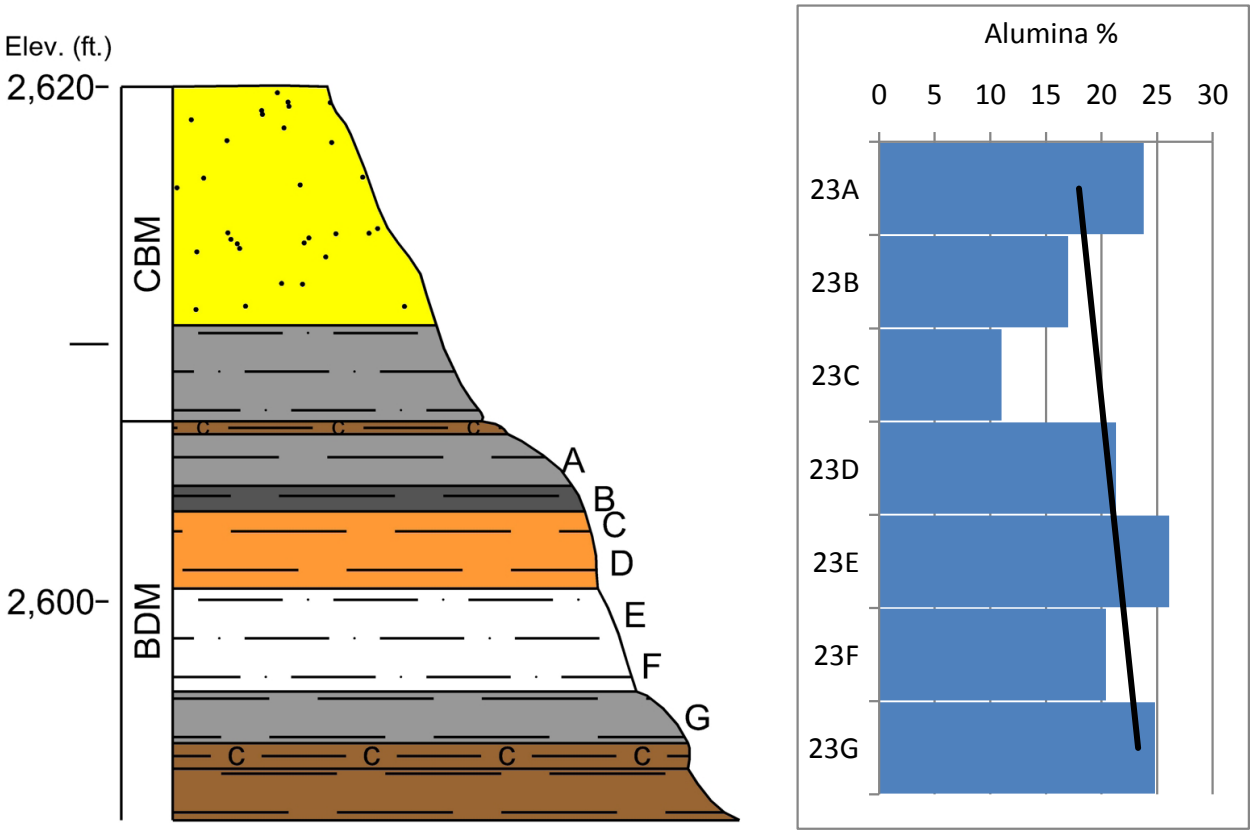


Figure 22. Photograph, measured section, and alumina profile for Sample Site 23 (T142N, R96W, Section 29, NE/NE/SW). See Figure 10 for location map and Figure 21 legend for lithology.

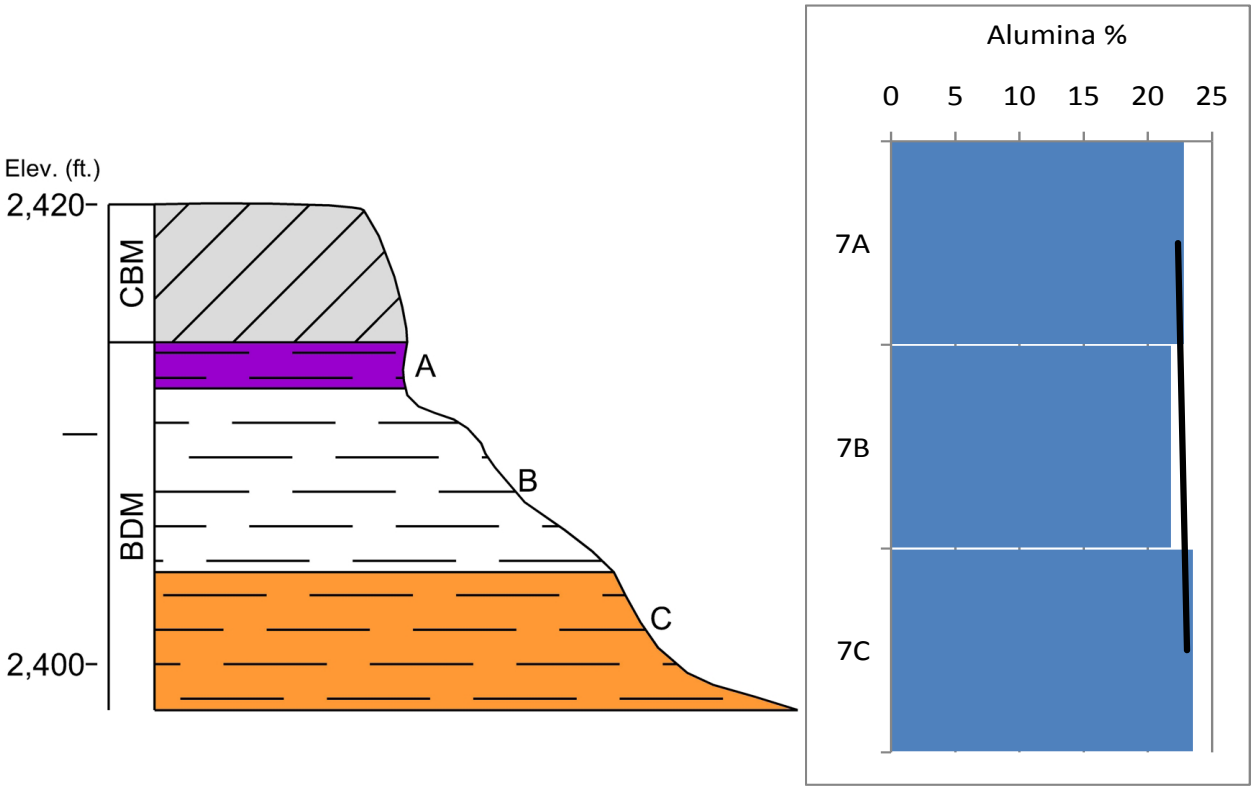


Figure 23. Photograph, measured section, and alumina profile for Sample Site 7 (T141N, R95W, Section 25, NW/NW/NW). See Figure 10 for location map and Figure 21 legend for lithology.

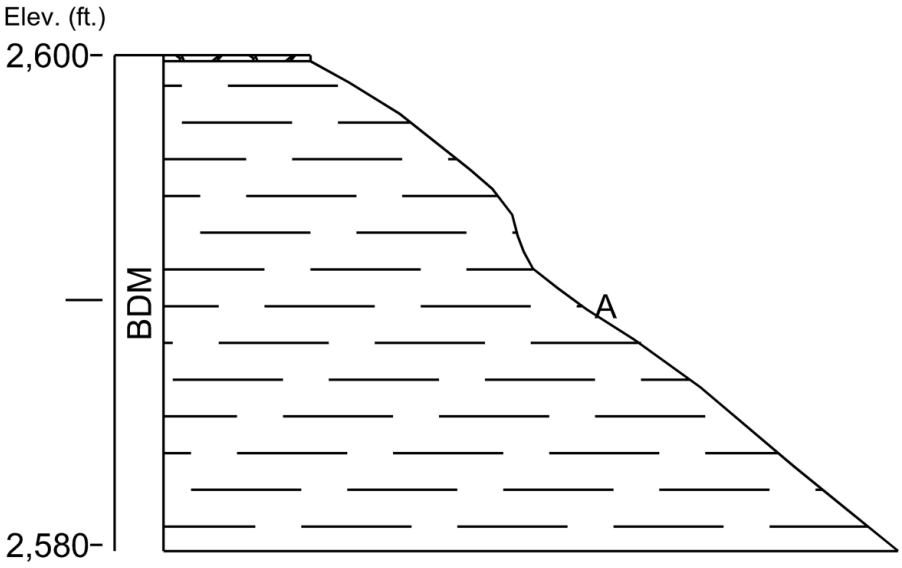


Figure 24. Photograph and measured section of Sample Site 16 (T140N, R95W, Section 33, SE/NW/SE). See Figure 10 for location map and Figure 21 legend for lithology.

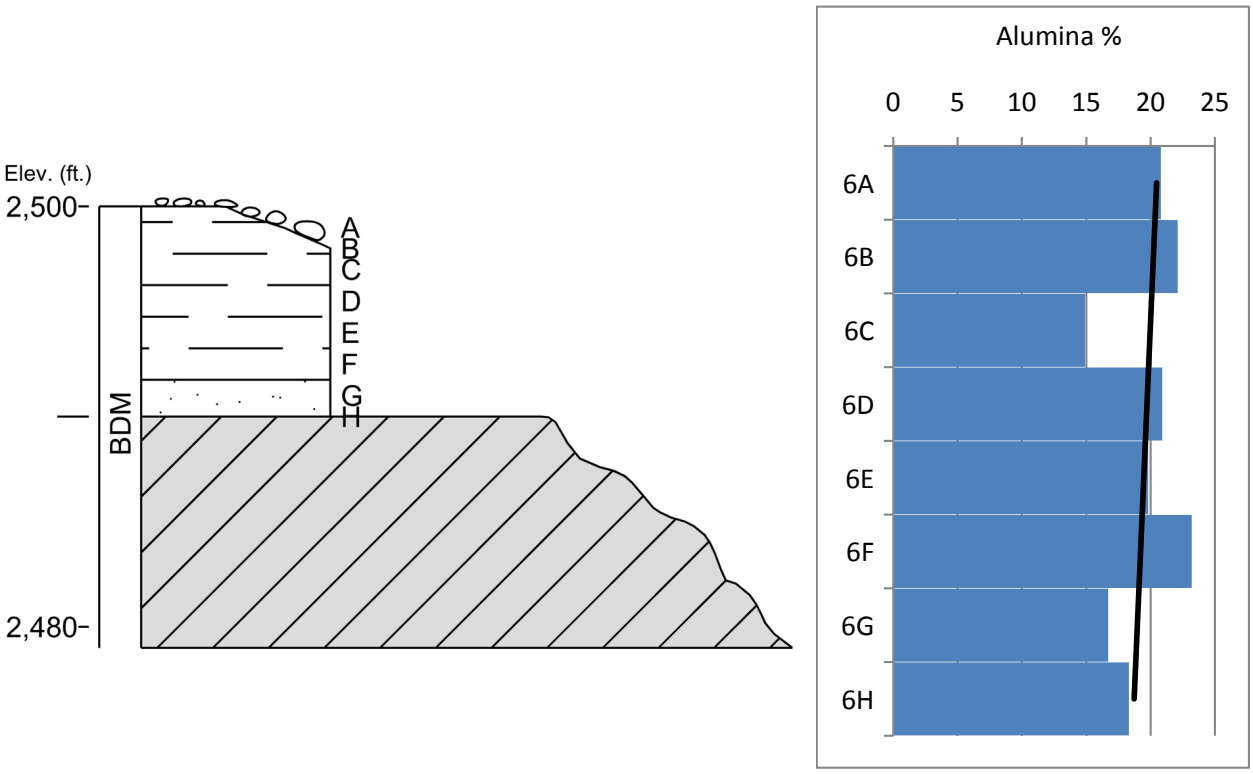


Figure 25. Photograph, measured section, and alumina profile for Sample Site 6 (T139N, R94W, Section 4, NW/NW/NW). See Figure 10 for location map and Figure 21 legend for lithology.

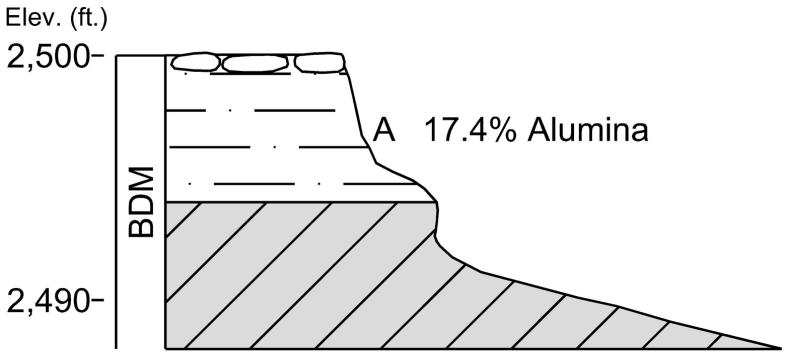


Figure 26. Photograph and measured section of Sample Site 5 (T140N, R93W, Section 31, SE/SE/SW). See Figure 10 for location map and Figure 21 legend for lithology.

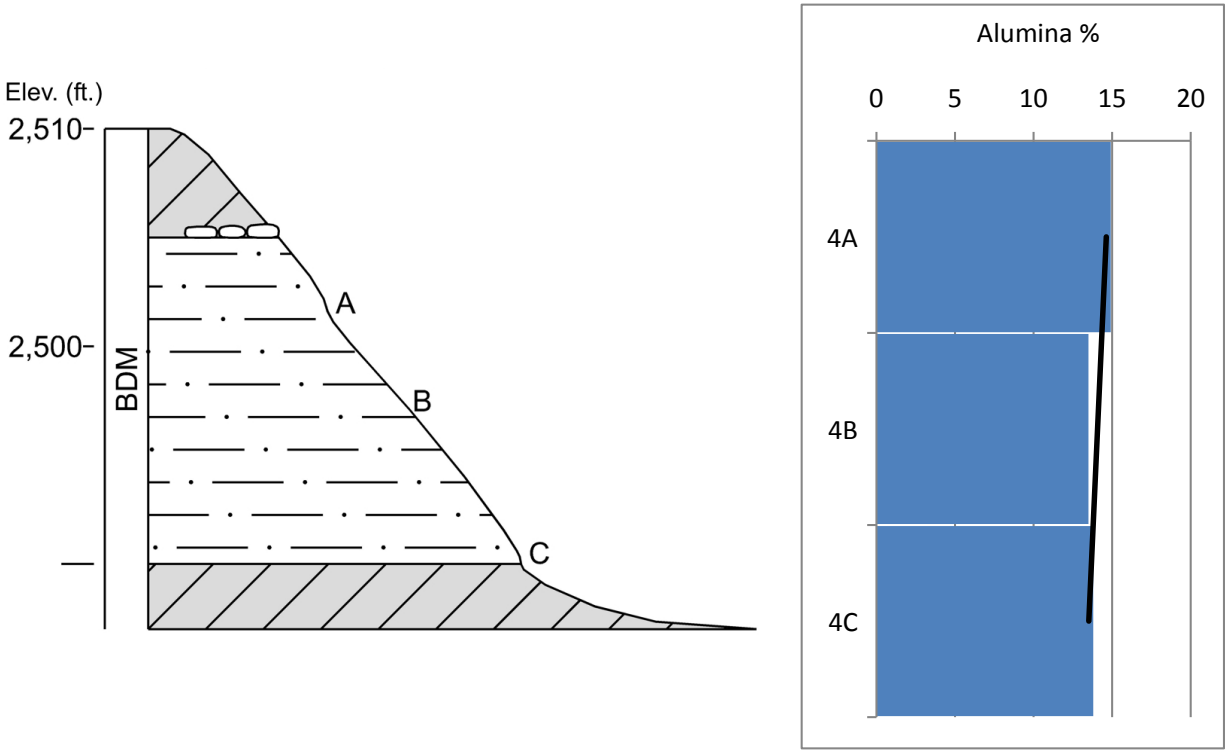


Figure 27. Photograph, measured section, and alumina profile for Sample Site 4 (T139N, R93W, Section 21, SE/SW/SW). See Figure 10 for location map and Figure 21 legend for lithology.

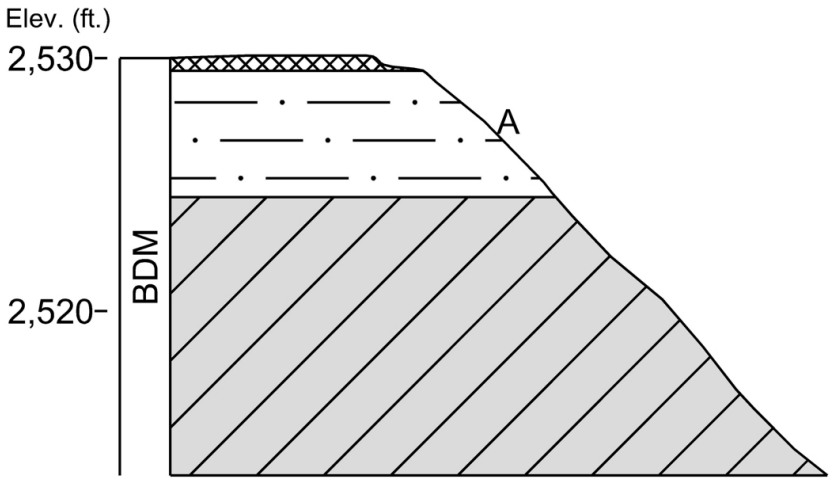


Figure 28. Photograph and measured section of Sample Site 8 (T138N, R97W, Section 1, NE/NW/NW). See Figure 10 for location map and Figure 21 legend for lithology.

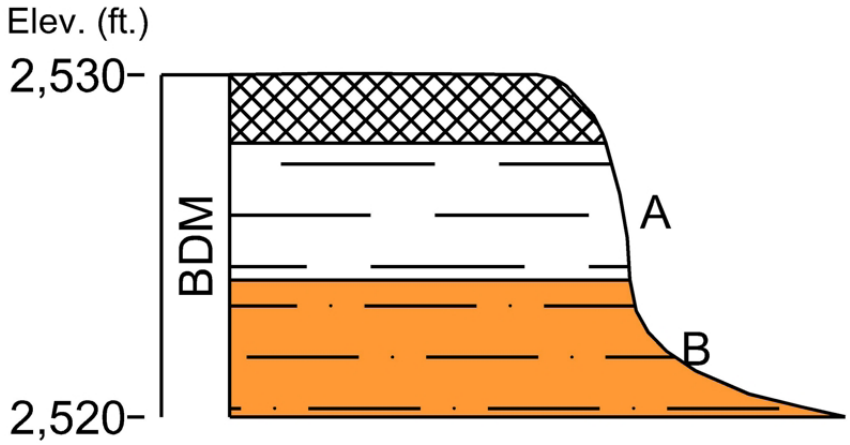
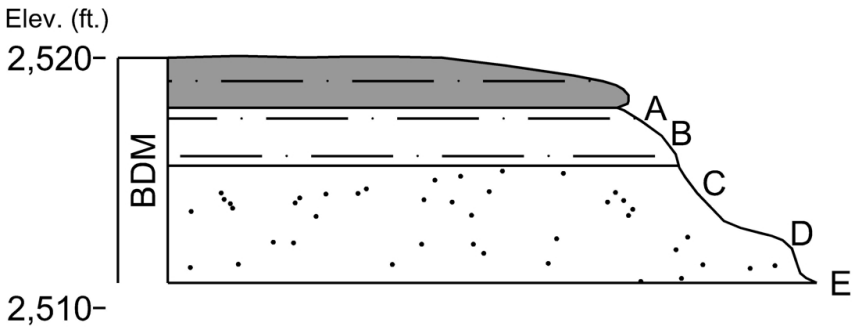


Figure 29. Photograph and measured section of Sample Site 9 (T139N, R97W, Section 36, NE/NE/SW). See Figure 10 for location map and Figure 21 legend for lithology.



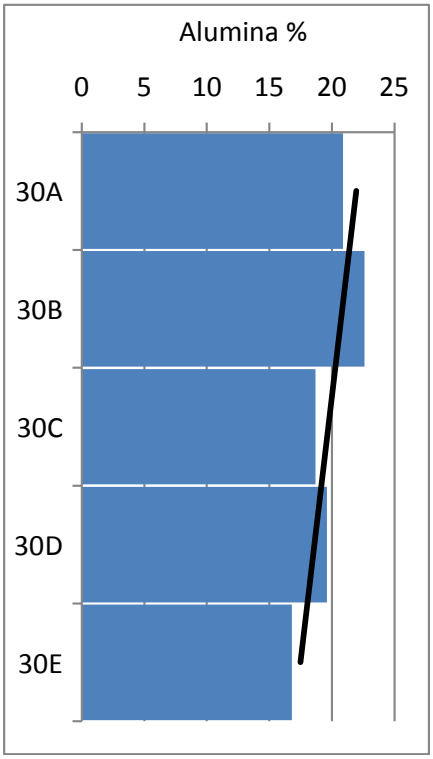


Figure 30. Photograph, measured section, and alumina profile for Sample Site 30 (T138N, R96W, Section 16, NE/SE/NW). See Figure 10 for location map and Figure 21 legend for lithology.

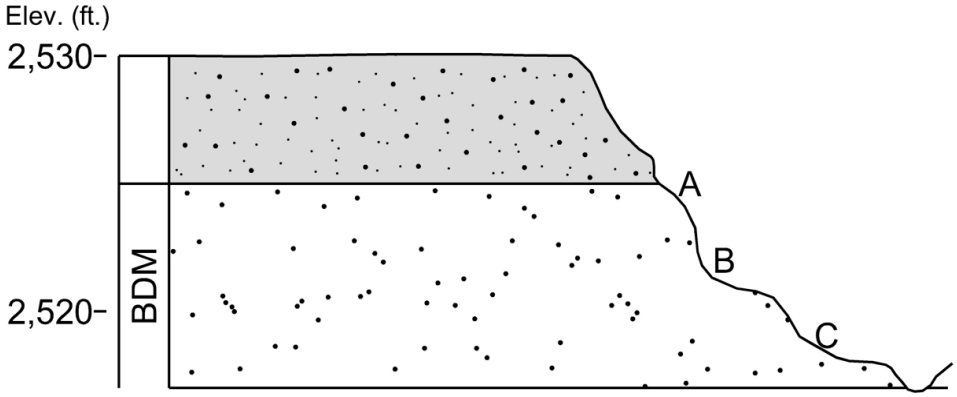


Figure 31. Photograph and measured section of Sample Site 31 (T138N, R96W, Section 21, NE/NW/NW). See Figure 10 for location map and Figure 21 legend for lithology.

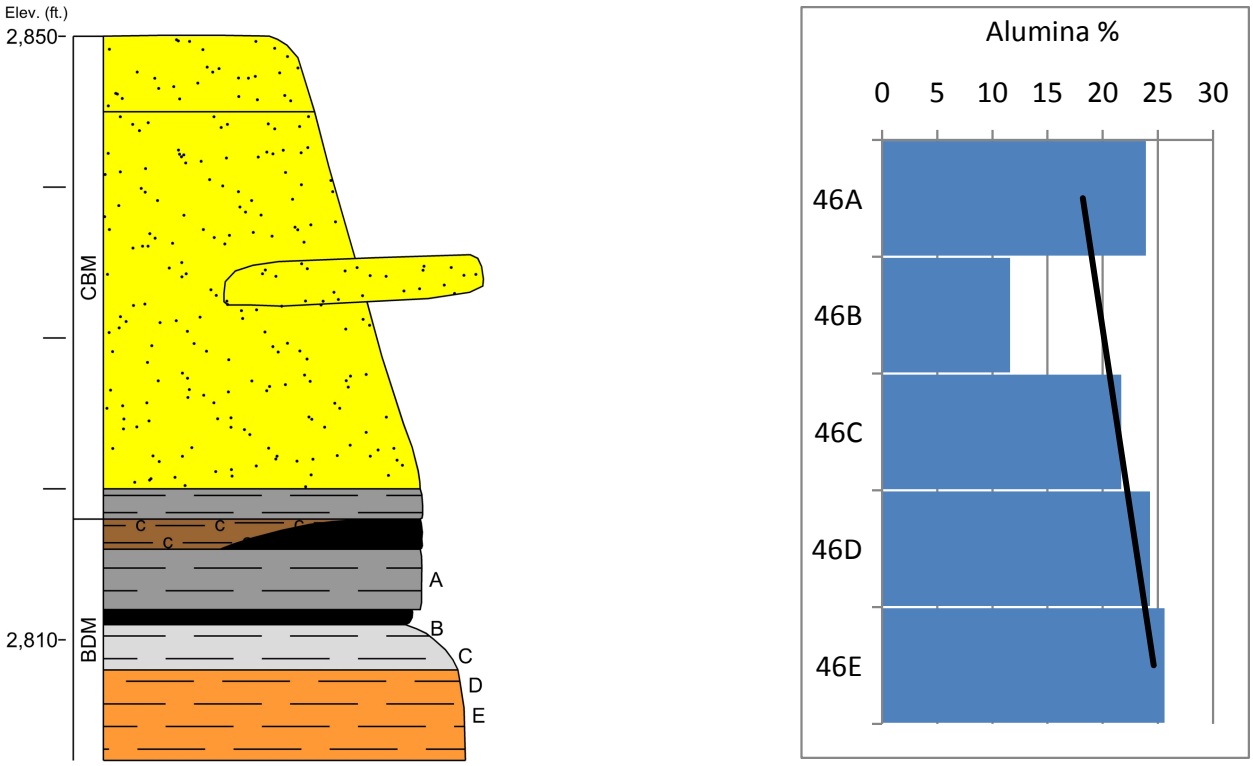


Figure 32. Photograph, measured section, and alumina profile for Sample Site 46 (T137N, R97W, Section 36, NW/NW/SE). See Figure 10 for location map and Figure 21 legend for lithology.

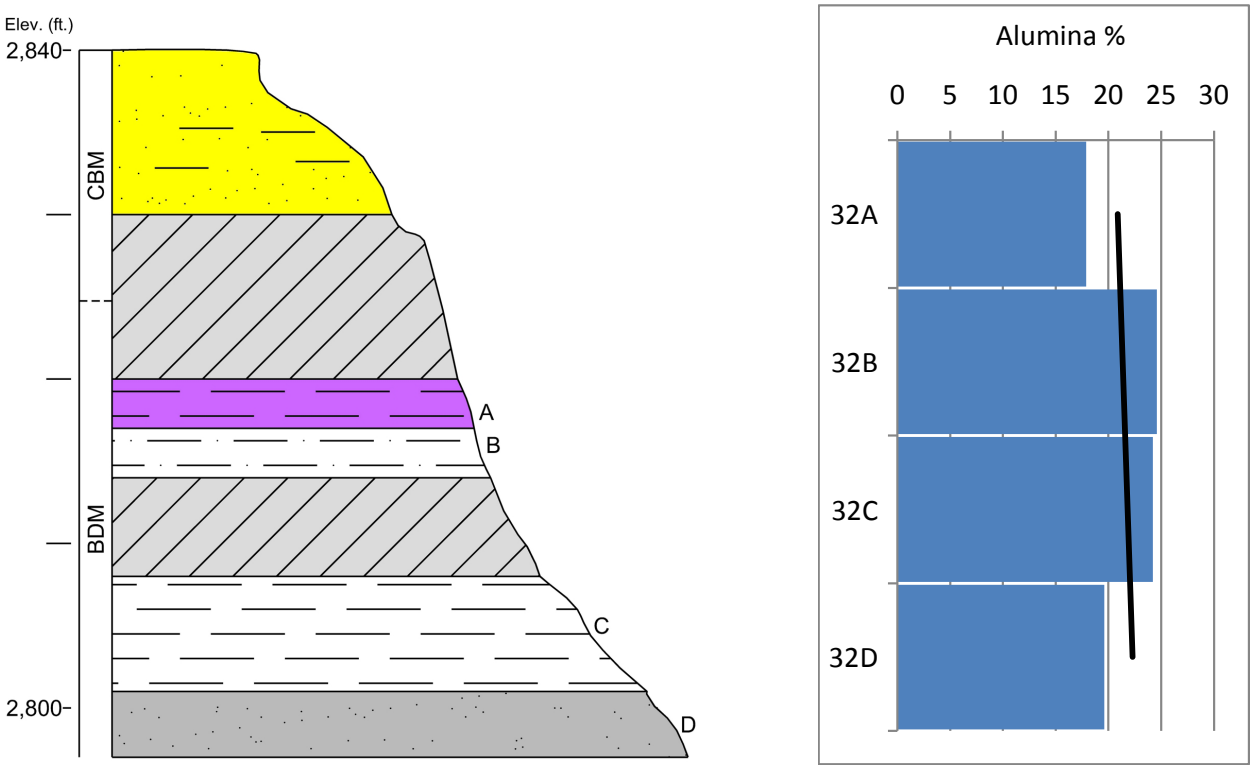


Figure 33. Photograph, measured section, and alumina profile for Sample Site 32 (T136N, R97W, Section 11, SE/SE/NE). See Figure 10 for location map and Figure 21 legend for lithology.

Rhame Bed – Bowman Area

The Bowman Area contains 13 Rhame Bed sample sites, eight within the Bowman 100K map sheet and five within the adjoining Belfield 100K sheet (Figures 10, 34-47). The sites primarily fall along a northwest-southeast trending line that reflects the outcrop pattern of the Rhame Bed in this area. The best outcrops occur in the Little Missouri River Badlands and along Deep Creek. Outcrops are limited south and east of the town of Bowman.

The Rhame Bed is 15-22 feet thick in the four sample sites where the basal contact is exposed (sites 15, 49, 50, 58 – Figures 39-41, 43). Several other sites consist of a silcrete top underlain by 2-10 feet of white to dazzling white mudstone (Figures 37, 42, and 44). The Rhame Bed ranges from dazzling white to dull white to light gray in color in contrast to the more brightly colored Bear Den Member. This color contrast is evident when comparing Figure 13 to Figure 40. The weighted alumina content for sample sites in this area ranged from 13-18% with an average of 16%. Mining would likely be limited along Deep Creek and the Little Missouri River Badlands due to overburden thickness. Overburden is minimal on the low-lying silcrete-capped buttes west of the town of Bowman.

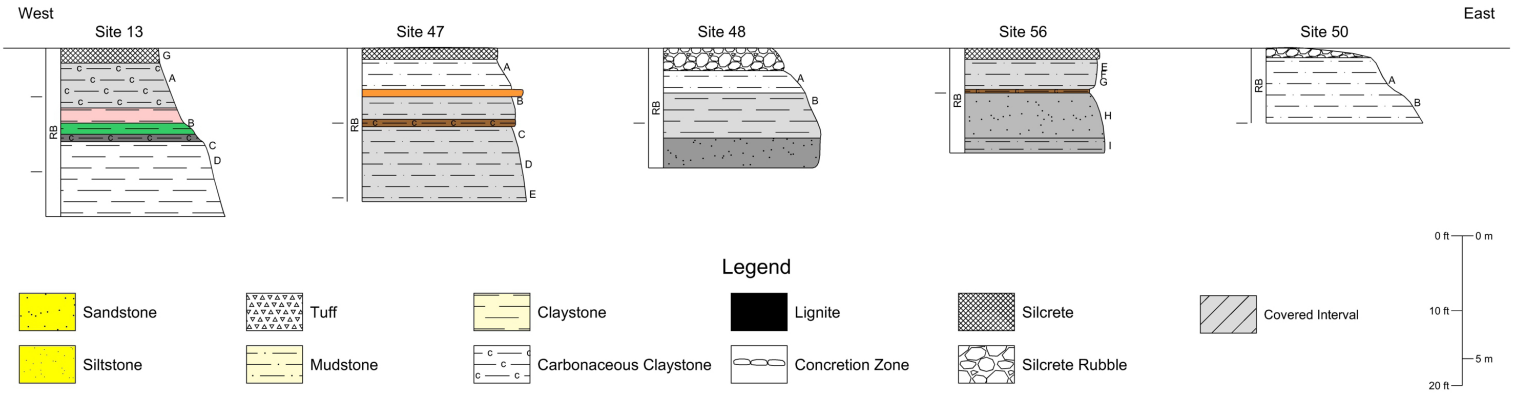


Figure 34. Geologic cross-section of selected sample sites in Slope and Bowman counties. See Figure 10 for location map.

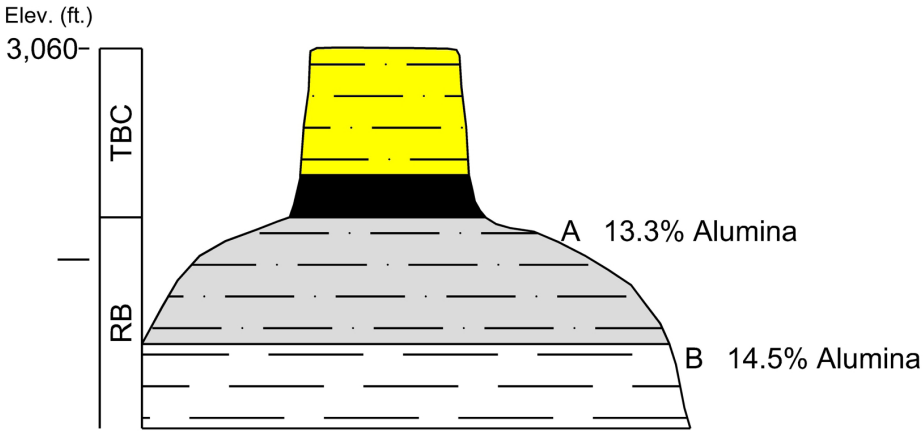


Figure 35. Photograph and measured section of Sample Site 14 (T137N, R105W, Section 19, SE/NW/NW. See Figure 10 for location map and Figure 34 legend for lithology.

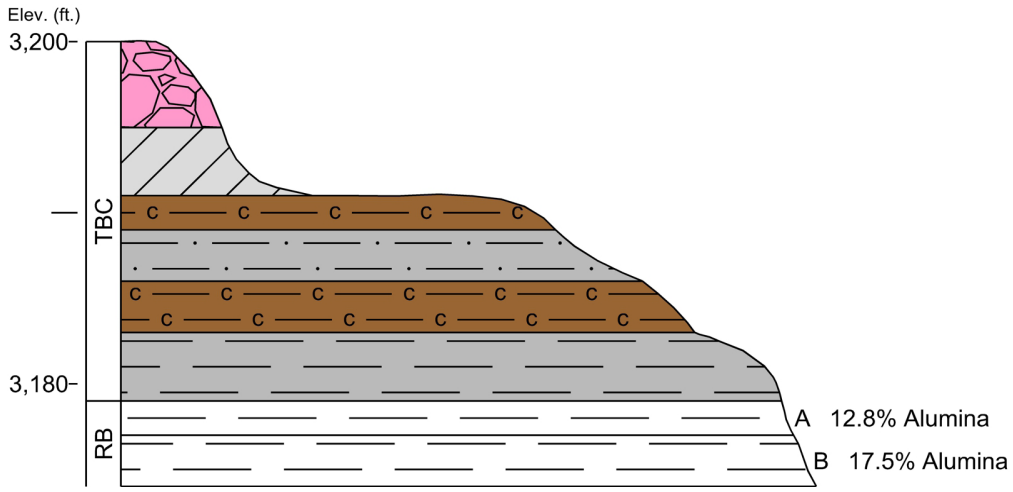


Figure 36. Photograph and measured section of Sample Site 10 (T136N, R106W, Section 28, SW/NW/NW). See Figure 10 for location map and Figure 34 legend for lithology.

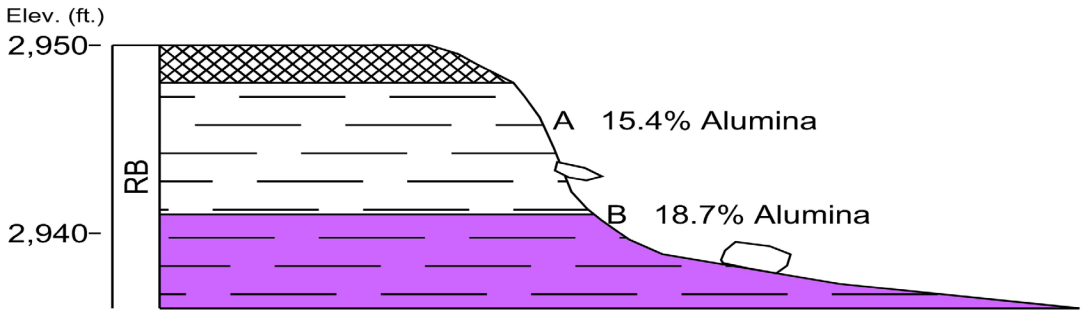


Figure 37. Photograph and measured section of Sample Site 11 (T136N, R106W, Section 13, SE/SE/NE). See Figure 10 for location map and Figure 34 legend for lithology.

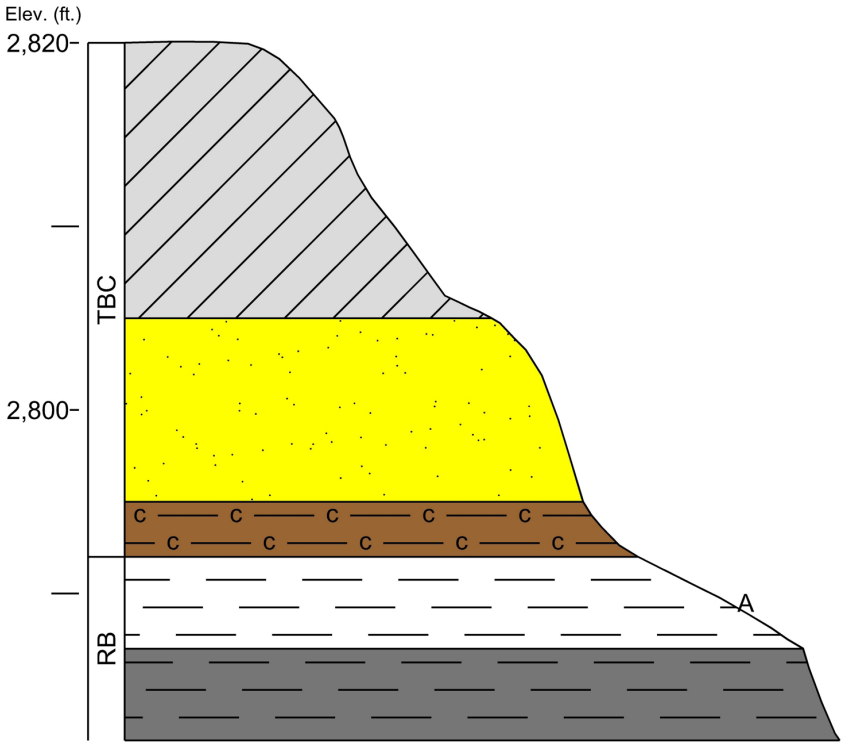


Figure 38. Photograph and measured section of Sample Site 12 (T136N, R105W, Section 11, NE/SE/SW). See Figure 10 for location map and Figure 34 legend for lithology.

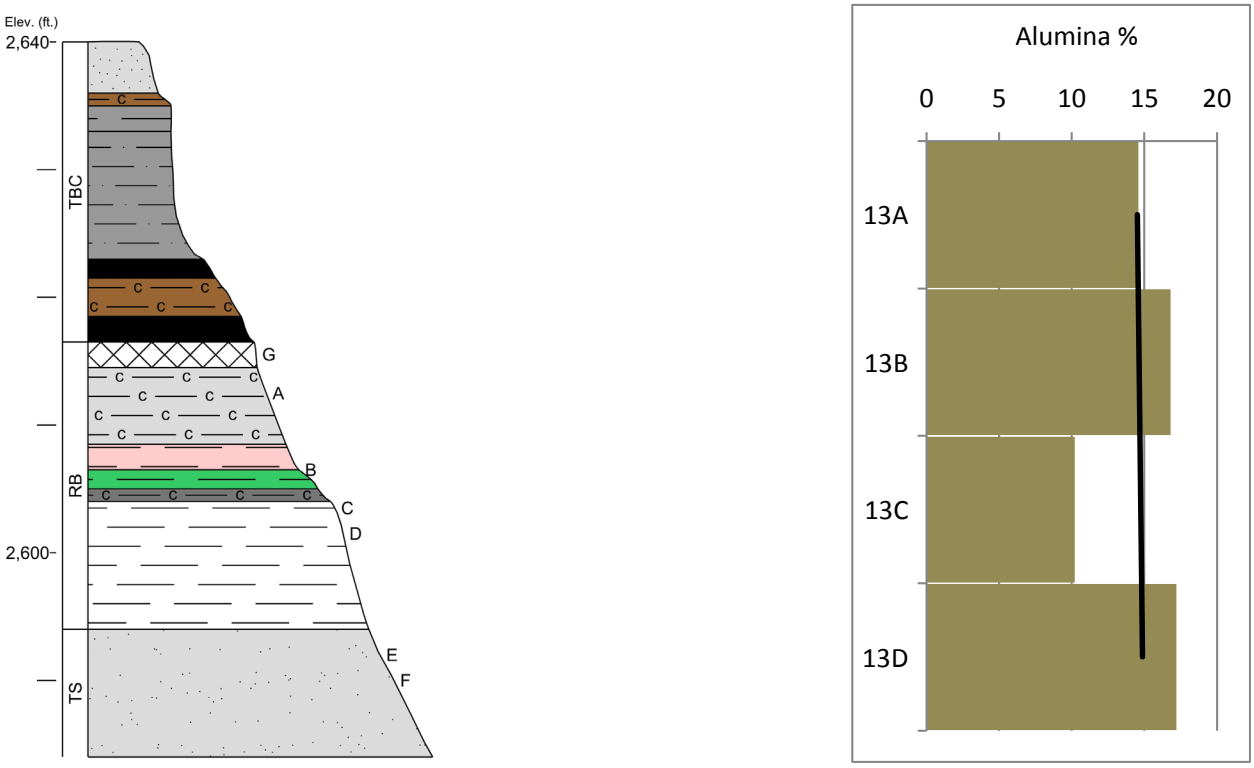


Figure 39. Photograph, measured section, and alumina profile for Sample Site 13 (T136N, R104W, Section 5, NW/NE/NE). See Figure 10 for location map and Figure 34 legend for lithology.

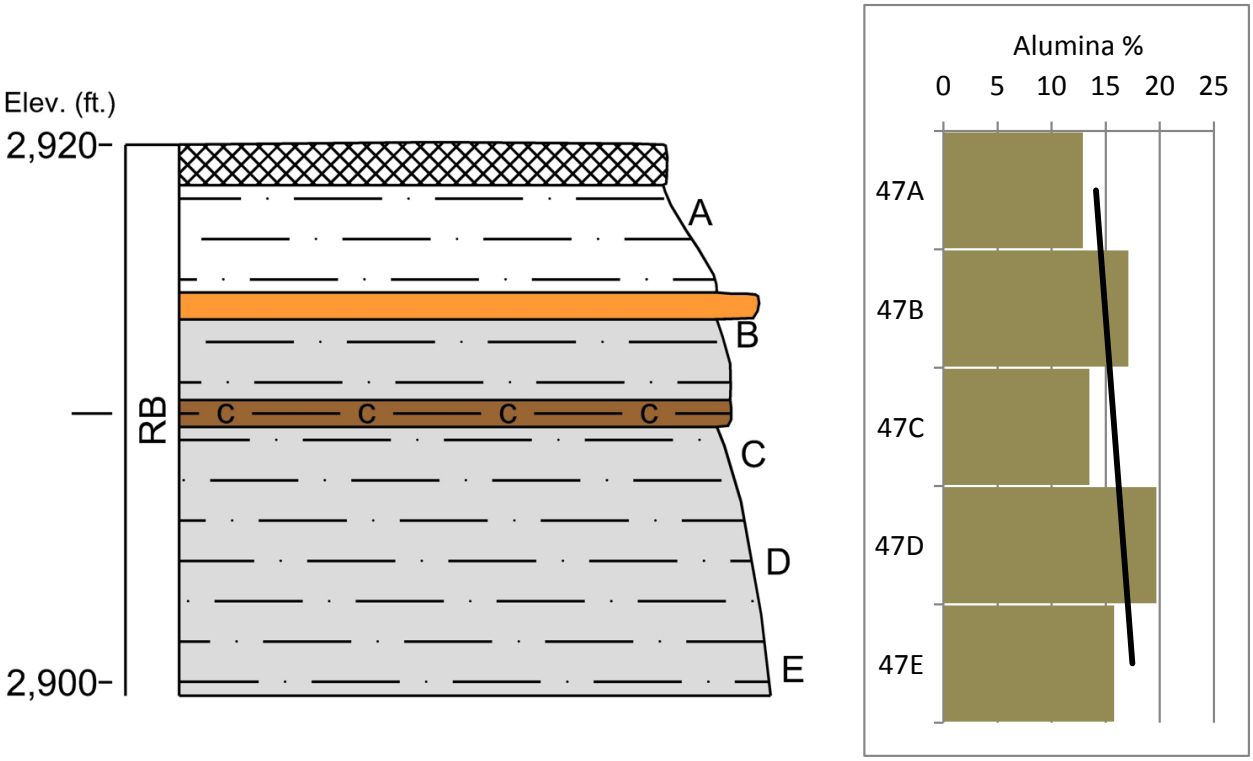
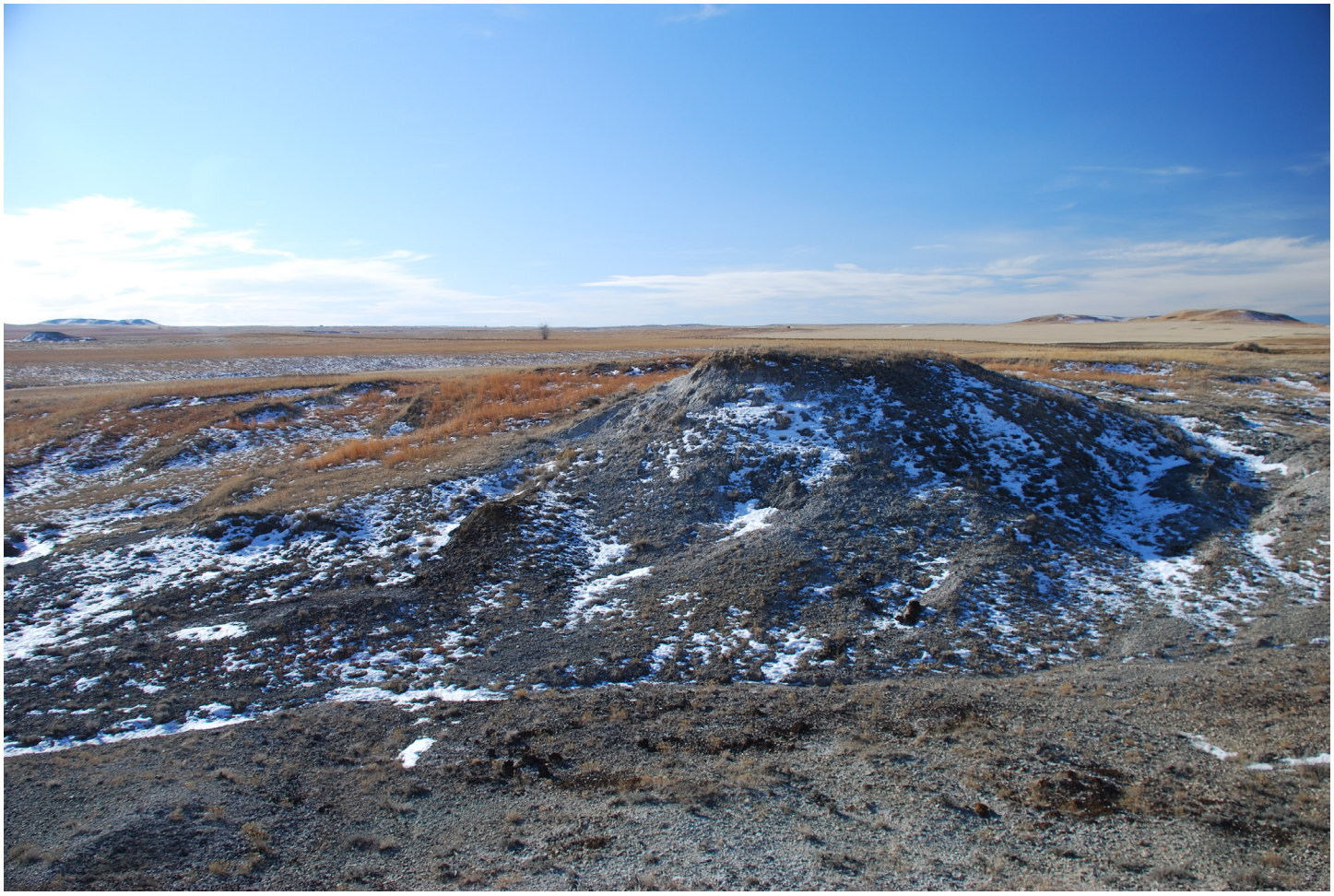


Figure 40. Photograph, measured section, and alumina profile for Sample Site 47 (T135N, R104W, Section 28, SE/NE/SE). See Figure 10 for location map and Figure 34 legend for lithology.



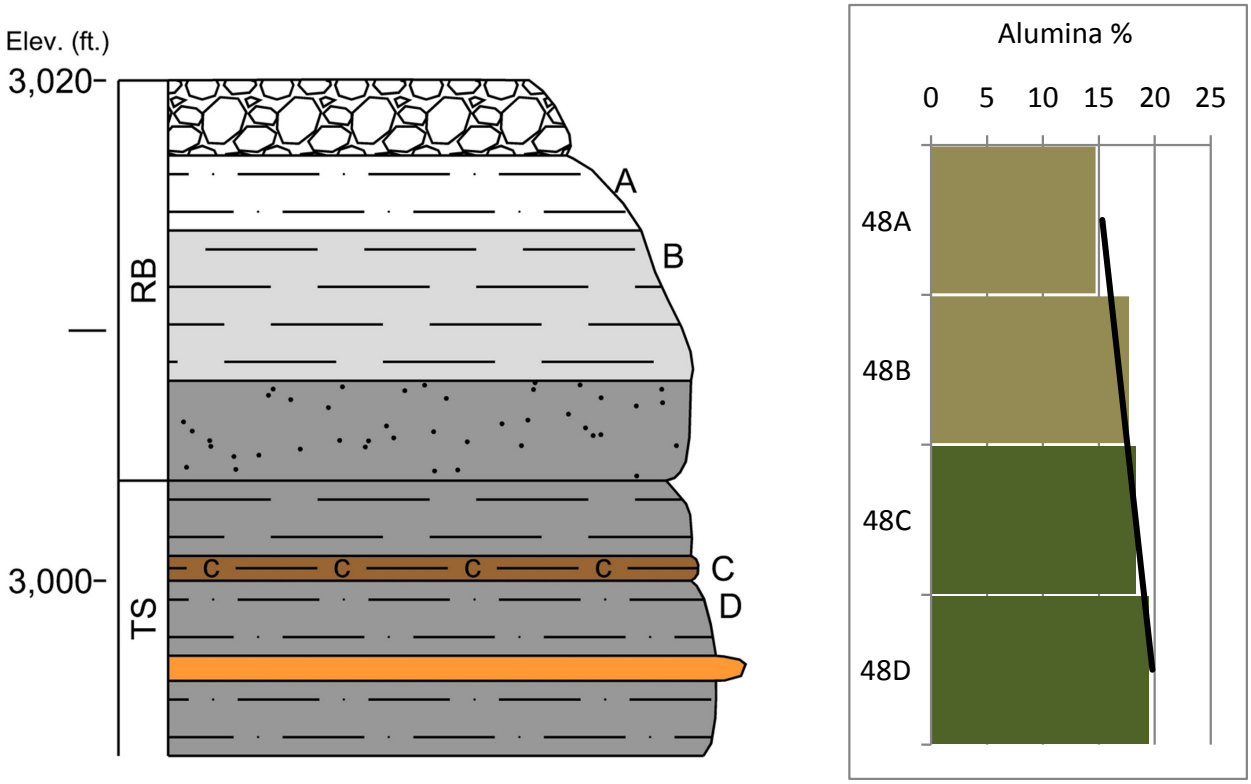


Figure 41. Photograph, measured section, and alumina profile for Sample Site 48 (T133N, R103W, Section 28, SE/NW/NW). See Figure 10 for location map and Figure 34 legend for lithology.

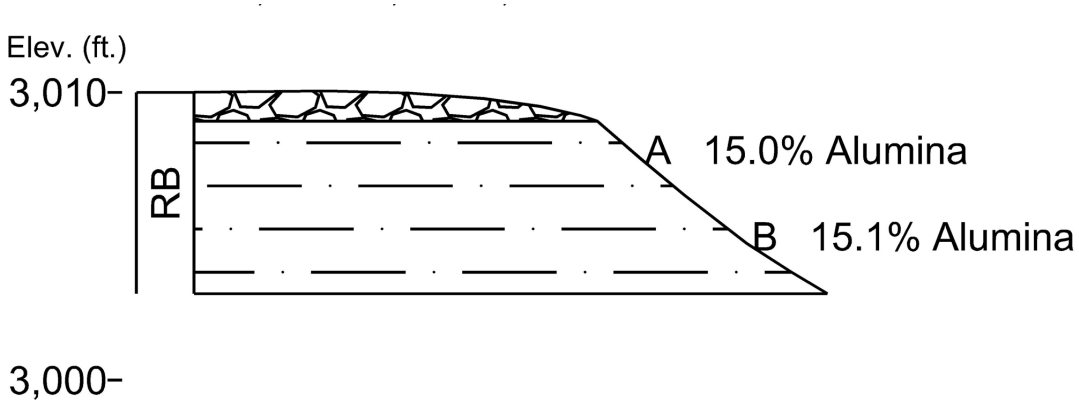
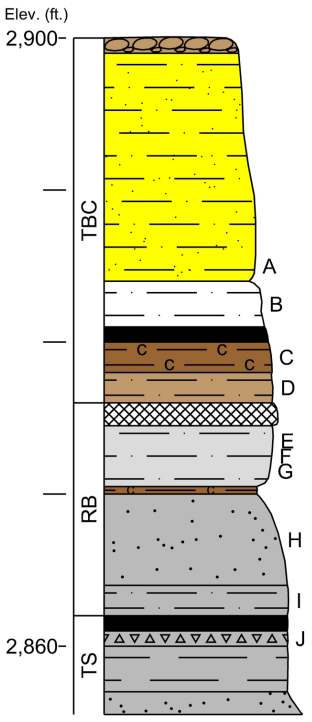


Figure 42. Photograph and measured section of Sample Site 49 (T133N, R103W, Section 16, NW/SW/SW). See Figure 10 for location map and Figure 34 legend for lithology.



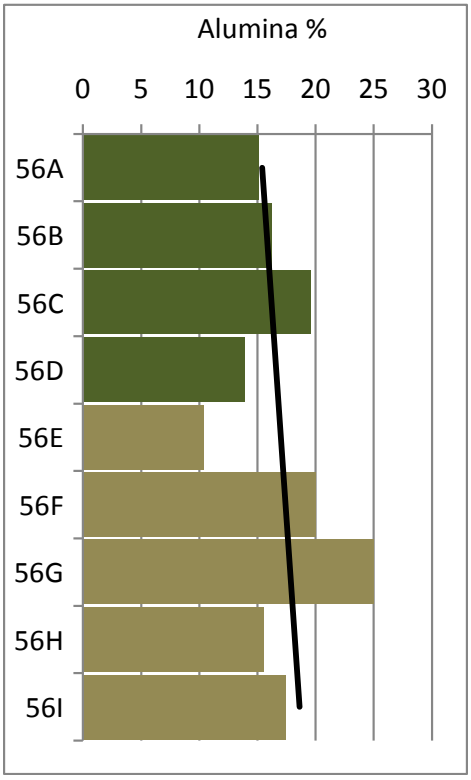


Figure 43. Photograph, measured section, and alumina profile for Sample Site 56 (T133N, R103W, Section 12, NE/SE/SW). See Figure 10 for location map and Figure 34 legend for lithology.

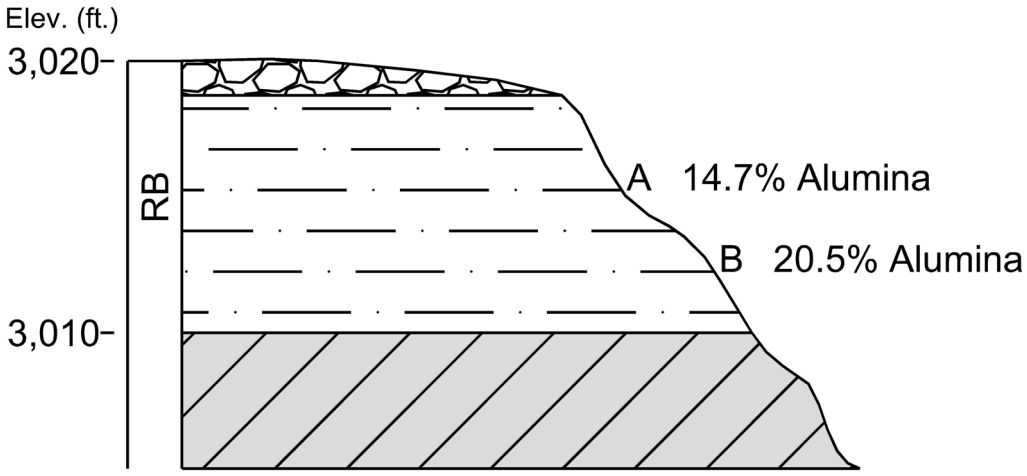


Figure 44. Photograph and measured section of Sample Site 50 (T131N, R102W, Section 6, SW/NE/SE). See Figure 10 for location map and Figure 34 legend for lithology.

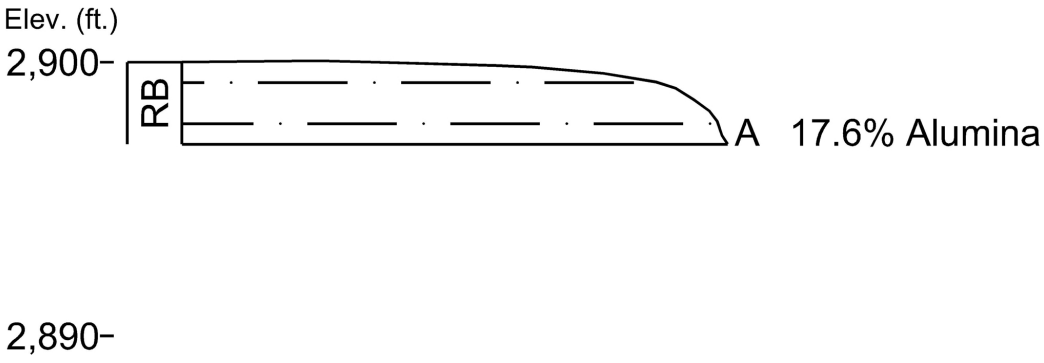
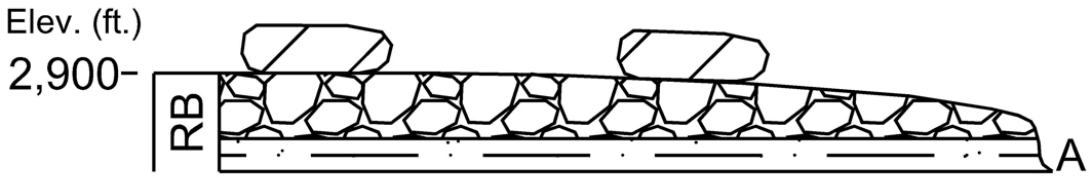


Figure 45. Photograph and measured section of Sample Site 55 (T130N, R101W, Section 4, NE/NW/NE). See Figure 10 for location map and Figure 34 legend for lithology.



2,890-

Figure 46. Photograph and measured section of Sample Site 54 (T130N, R101W, Section 11, SW/NW/NW). See Figure 10 for location map and Figure 34 legend for lithology.

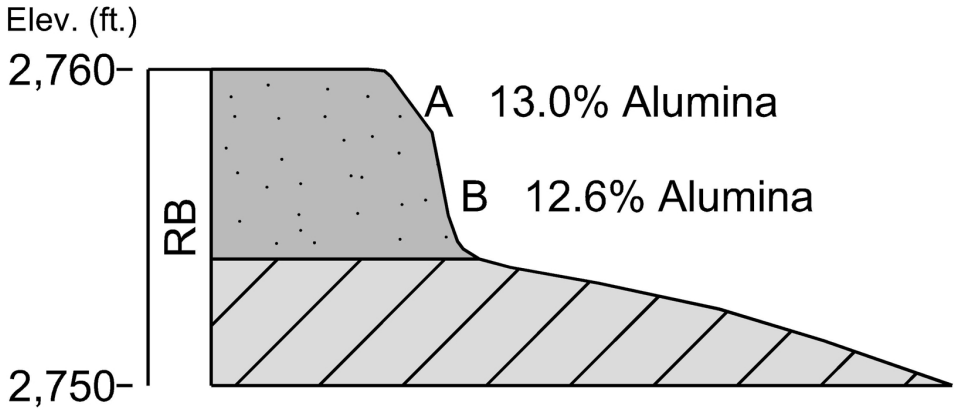


Figure 47. Photograph and measured section of Sample Site 53 (T131N, R99W, Section 34, SE/SW/SE). See Figure 10 for location map and Figure 34 legend for lithology.

Rhame Bed – Mott

Thirteen Rhame Bed sample sites fall within the Mott 100K map sheet (Figures 10, 48-61). This area contains the most densely spaced sample sites of any area, with nine sites all occurring within a six-mile-radius in central Adams County. Five of these sites are in road cuts and the others occur along the tops or sides of small, isolated buttes.

Partial exposures of the Rhame Bed are 10-20 feet thick in this area. The Rhame Bed averages 17 feet thick at the only two sites (sites 18 and 34) where the basal contact is exposed. The color on outcrop in this area tends to be subdued in comparison to the dazzling white outcrops along Deep Creek in Slope County. Organics are also more plentiful (carbonaceous mudstones) in this area than in the Bowman area. The weighted alumina content of sites within this study area ranged from 16-25% with an average of 20%. Sites 36 and 37 (Figures 51 and 52) are in an area where the silcrete layer forms a relatively level plateau and the Rhame Bed could be mined with little or no overburden. The section northwest of sample site 44 (Figure 60) also appears to be an area with relatively thin overburden.

Sample site 52 is a good example of how difficult it can be to identify either the Rhame Bed or the Bear Den Member in a limited outcrop when silcrete is absent (Figure 49). The dull white to light pink mudstone is the right color, has the right surface texture, and is greasy to the touch. However, it occurs approximately 300 feet higher in elevation than the adjacent Rhame Bed sites. As a result, it was identified in the field as the Rhame Bed with a question mark. For that reason, it was not analyzed and its elevation was not used to construct a contour map at the top of the Rhame Bed (Murphy, 2012).

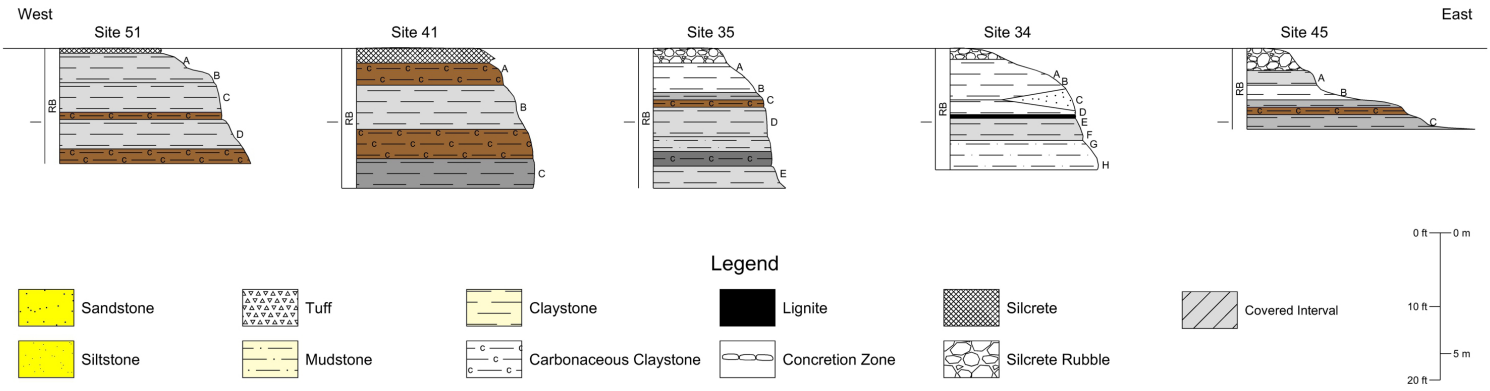


Figure 48. Geologic cross-section of selected sample sites in Adams and southeastern Hettinger counties. See Figure 10 for location map.

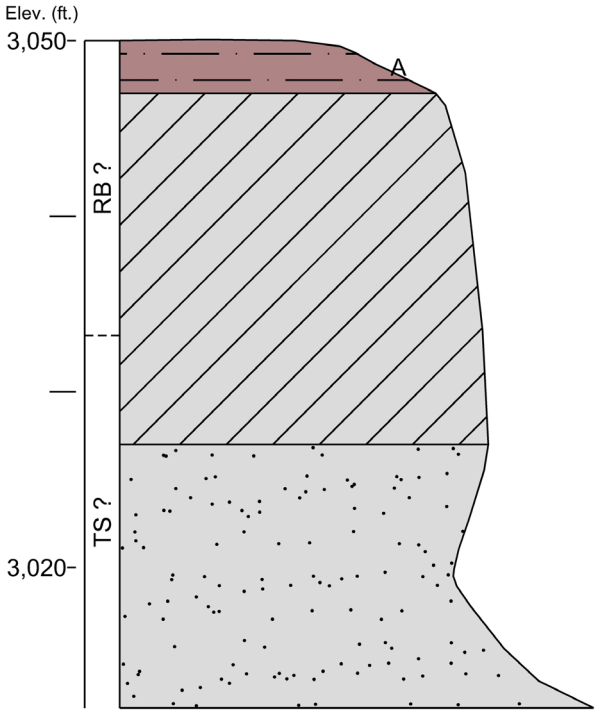


Figure 49. Photograph and measured section of Sample Site 52 (T130N, R97W, Section 29, NW/NE/NW). See Figure 10 for location map and Figure 48 legend for lithology.

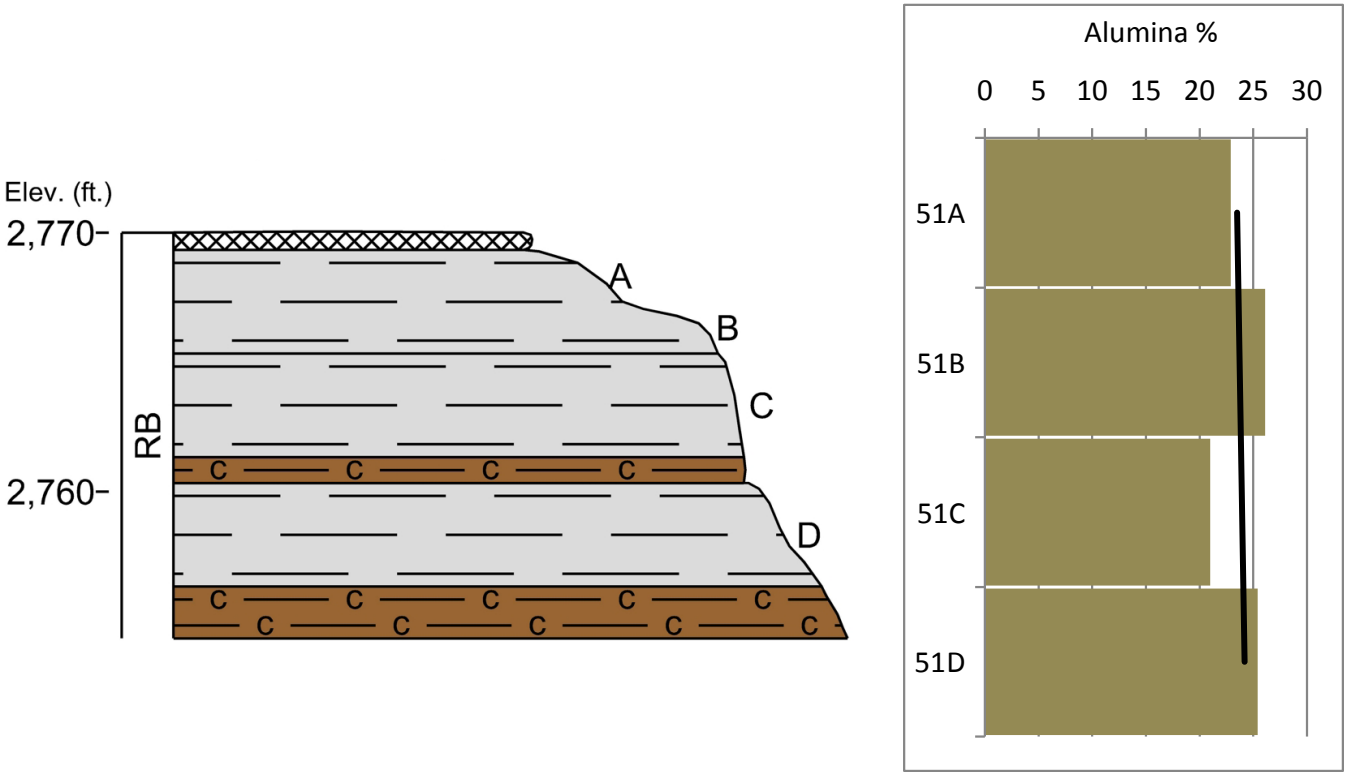


Figure 50. Photograph, measured section, and alumina profile for Sample Site 51 (T129N, R96W, Section 1, NE/NE/NE). See Figure 10 for location map and Figure 48 legend for lithology.

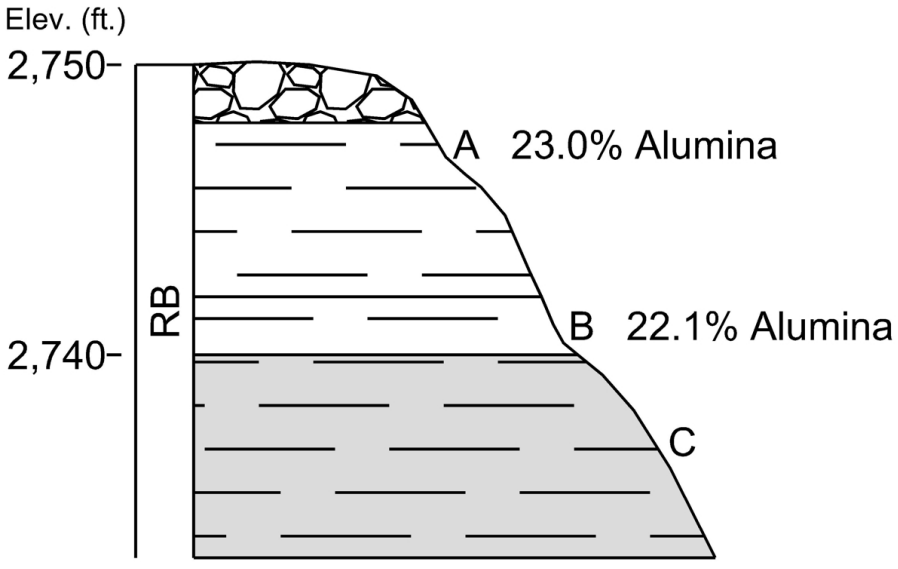


Figure 51. Photograph and measured section of Sample Site 37 (T130N, R95W, Section 21, SW/NE/SE). See Figure 10 for location map and Figure 48 legend for lithology.

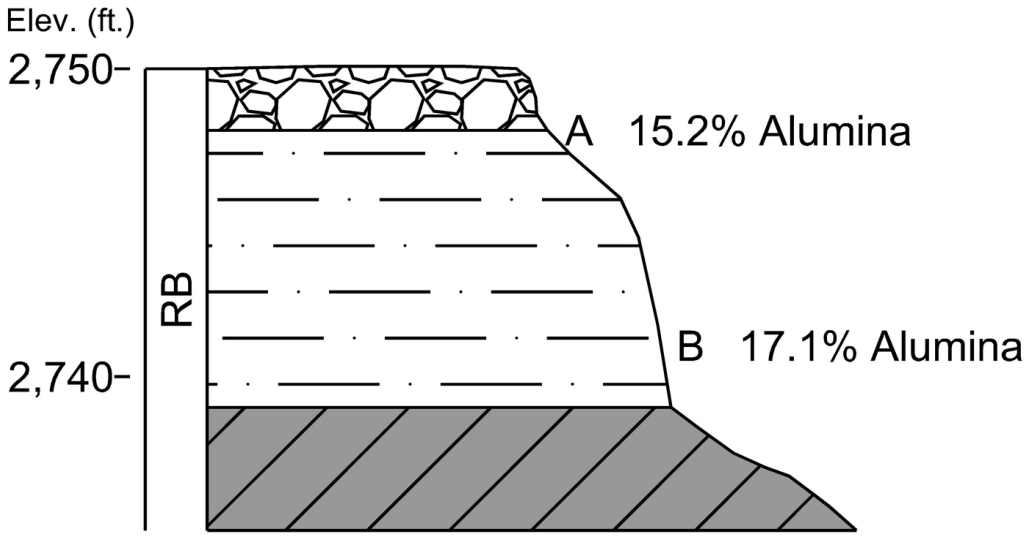


Figure 52. Photograph and measured section of Sample Site 36 (T130N, R95W, Section 21, SW/NE/SE). See Figure 10 for location map and Figure 48 legend for lithology.

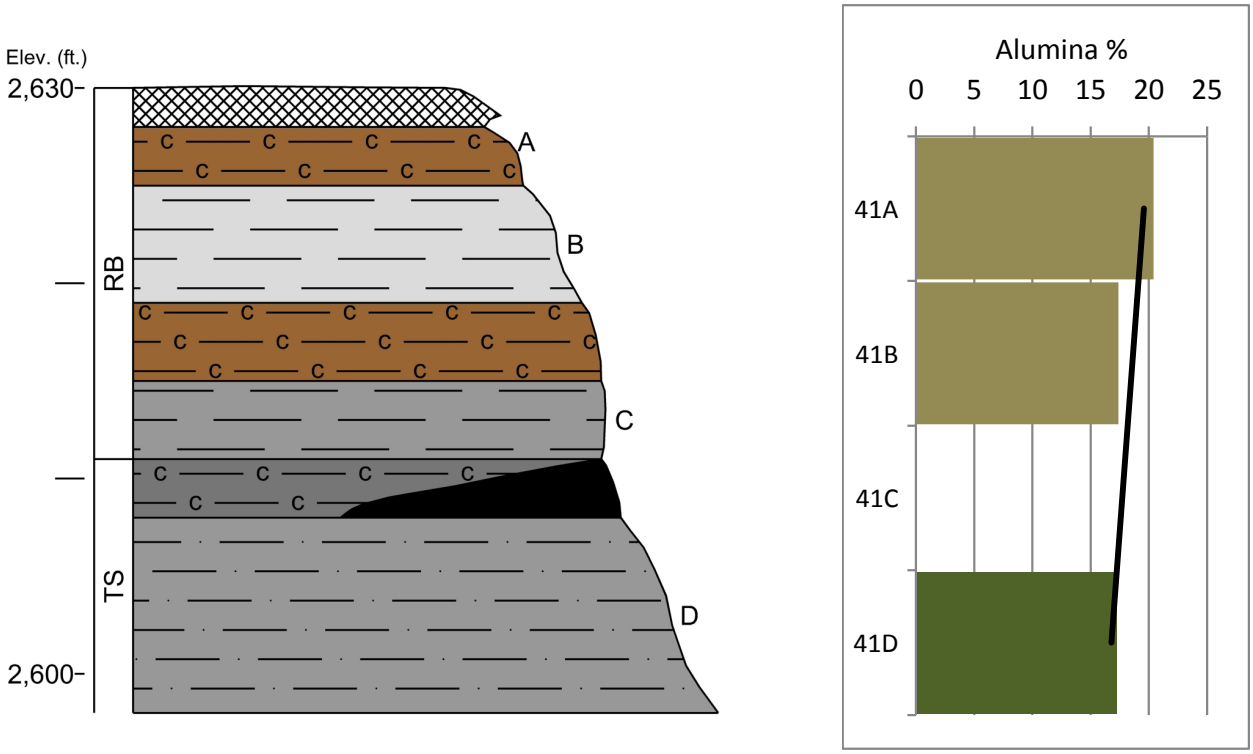


Figure 53. Photograph, measured section, and alumina profile for Sample Site 41 (T130N, R94W, Section 7, SW/NW/NW). See Figure 10 for location map and Figure 48 legend for lithology.

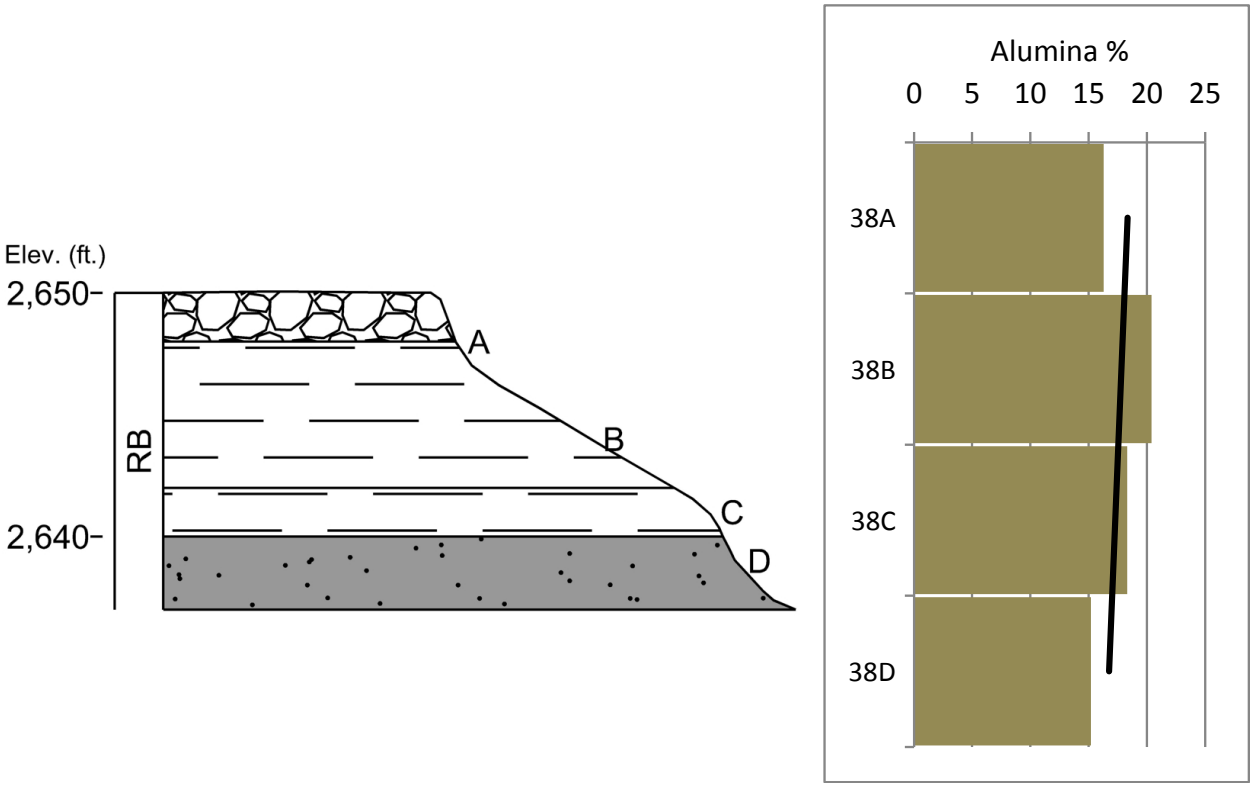


Figure 54. Photograph, measured section, and alumina profile for Sample Site 38 (T130N, R95W, Section 1, NW/NW/SW). See Figure 10 for location map and Figure 48 legend for lithology.

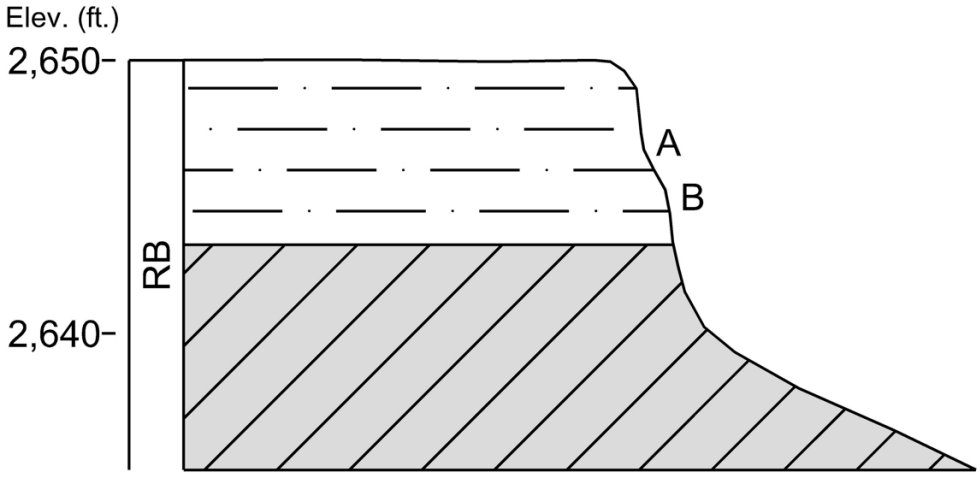


Figure 55. Photograph and measured section of Sample Site 39 (T130N, R95W, Section 1, NW/NE/SW). See Figure 10 for location map and Figure 48 legend for lithology.

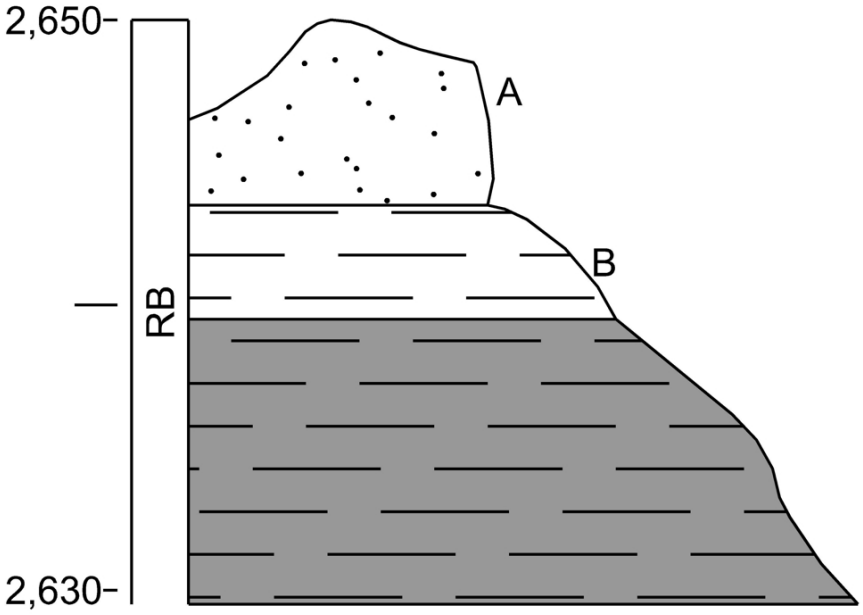


Figure 56. Photograph and measured section of Sample Site 40 (T130N, R95W, Section 1, NW/NE/SW). See Figure 10 for location map and Figure 48 legend for lithology.

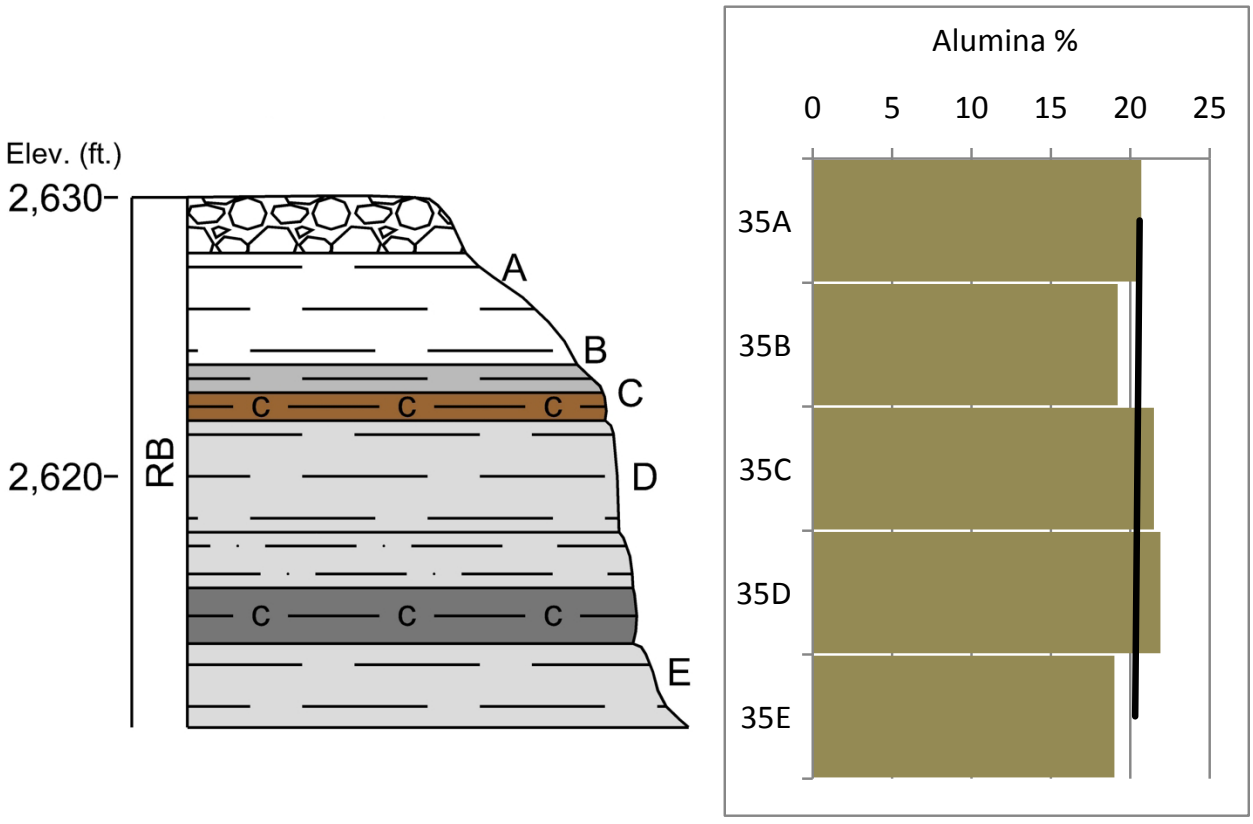
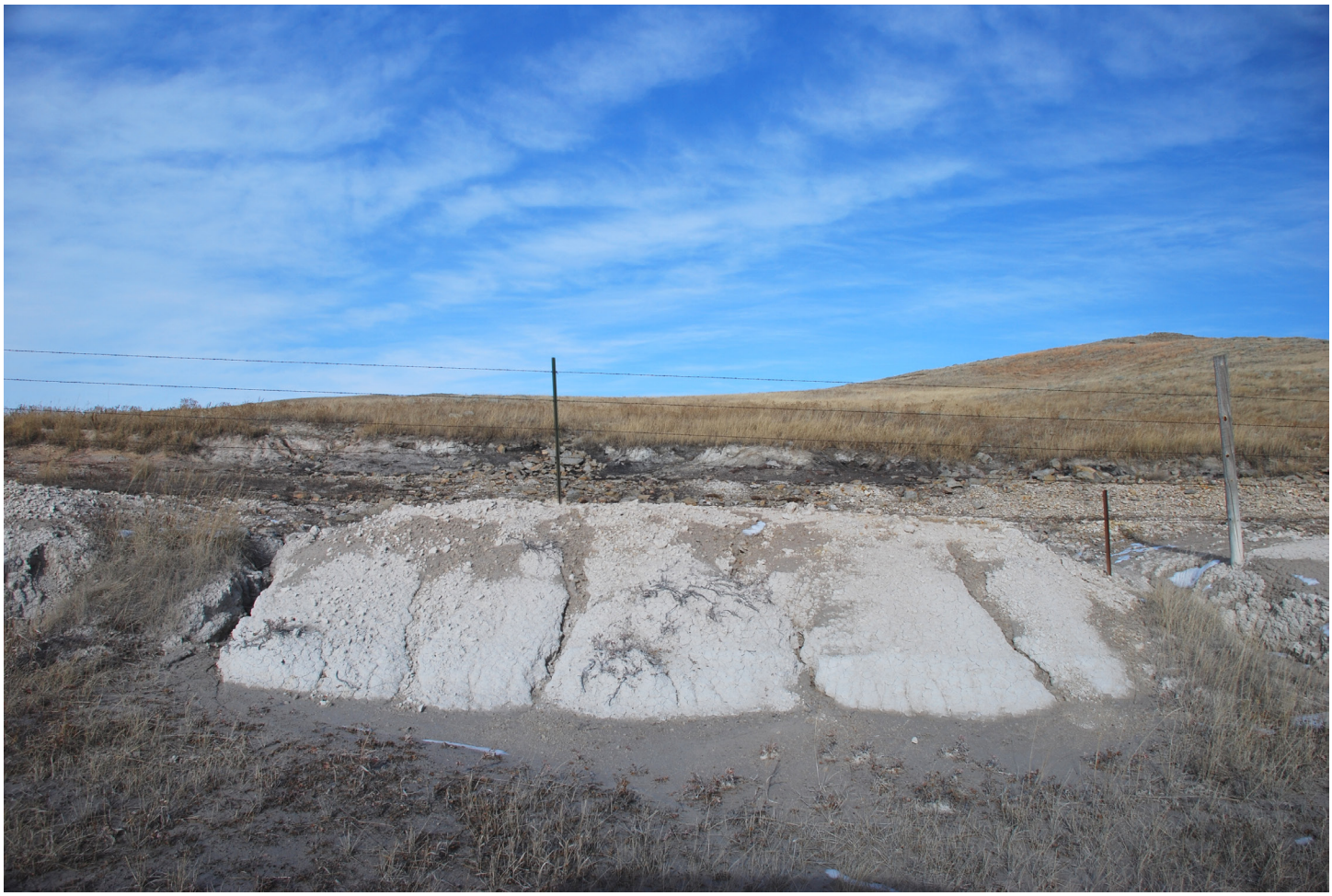


Figure 57. Photograph, measured section, and alumina profile for Sample Site 35 (T131N, R95W, Section 22, SE/SW/SE). See Figure 10 for location map and Figure 48 legend for lithology.



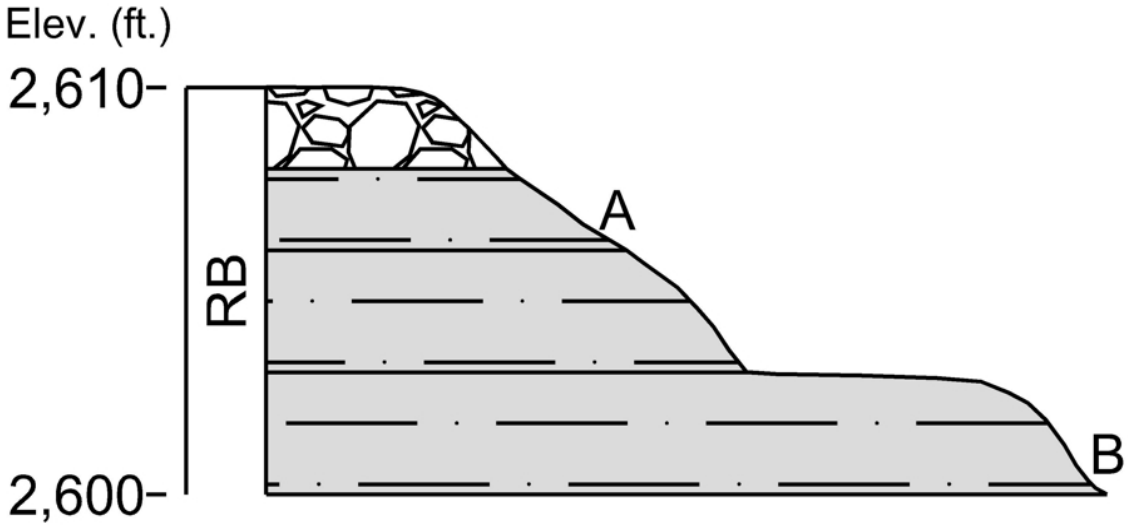


Figure 58. Photograph and measured section of Sample Site 33 (T130N, R94W, Section 11, NE/NW/NW). See Figure 10 for location map and Figure 48 legend for lithology.

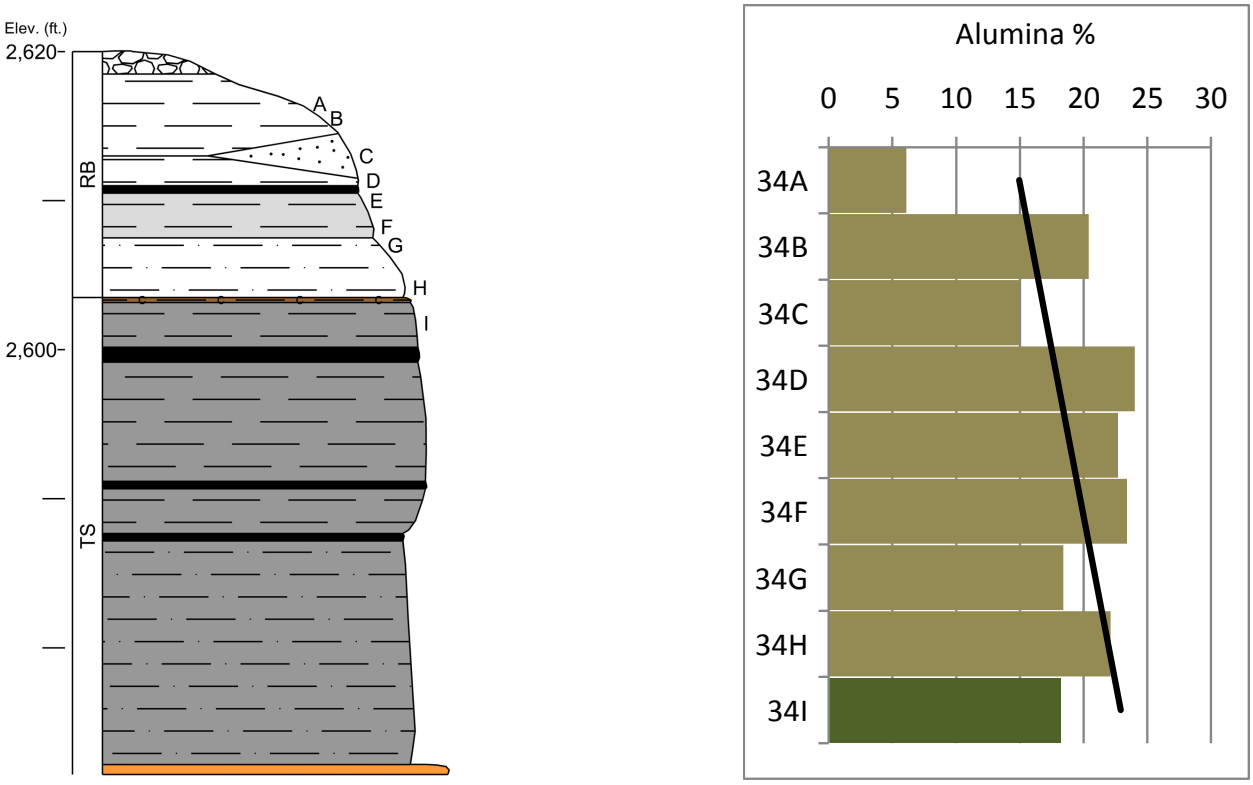


Figure 59. Photograph, measured section, and alumina profile for Sample Site 34 (T130N, R94W, Section 1, SW/SW/NW). See Figure 10 for location map and Figure 48 legend for lithology.

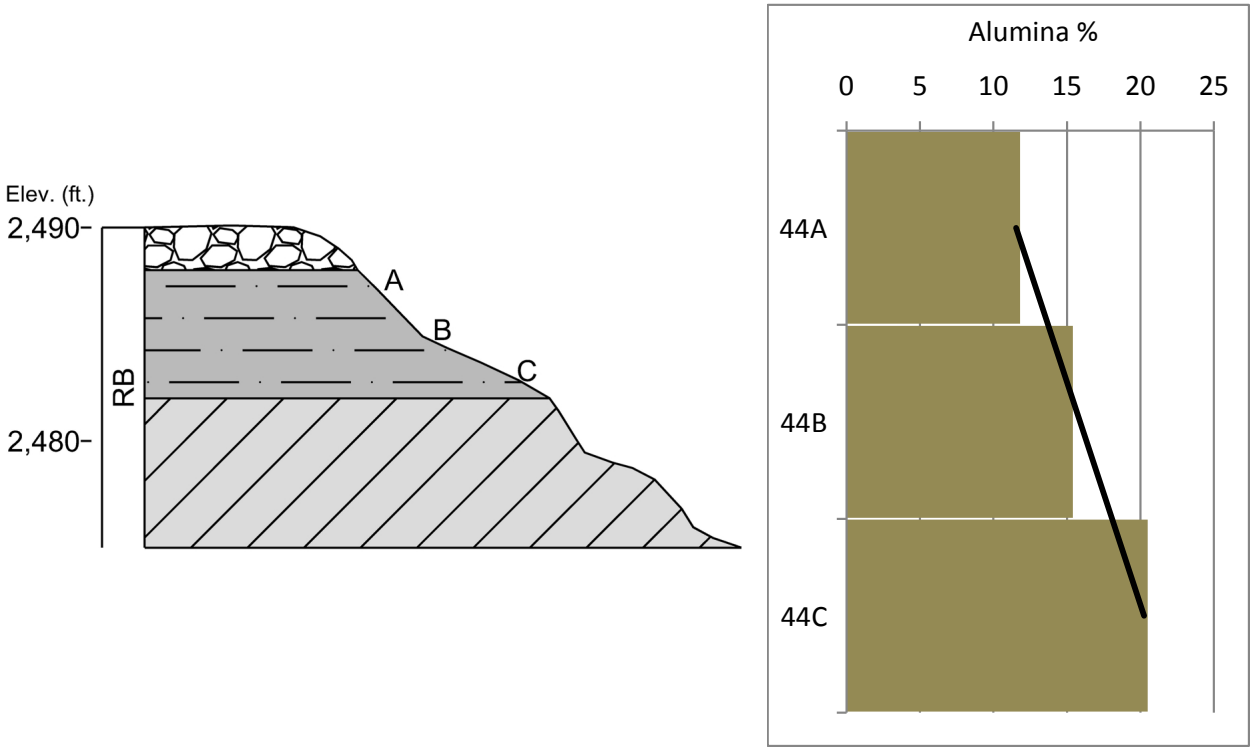


Figure 60. Photograph, measured section, and alumina profile for Sample Site 44 (T130N, R92W, Section 9, NW/NW/NW). See Figure 10 for location map and Figure 48 legend for lithology.

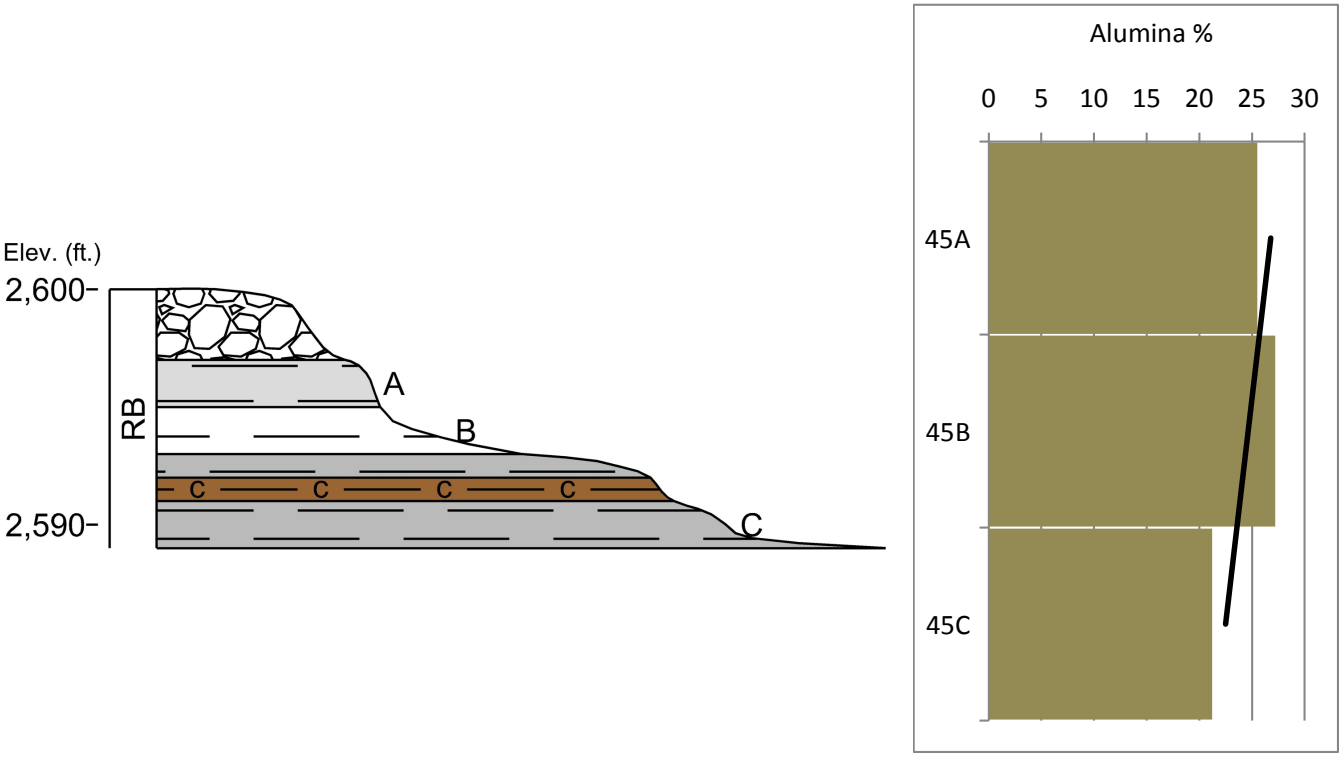


Figure 61. Photograph, measured section, and alumina profile for Sample Site 45 (T132N, R91W, Section 22, SE/SW/SW). See Figure 10 for location map and Figure 48 legend for lithology.

Rhame Bed – Elgin

The Elgin Area contains 12 Rhame Bed sample sites. Six sites occur within the Elgin 100K map sheet and six occur within the adjacent Glen Ullin sheet (Figures 10, 62-76). In addition, there are two Bear Den Member sample sites at the top of Pretty Rock Butte in Grant County. These Bear Den outcrops are of interest because they are the furthest southeast occurrences of this stratigraphic unit. Many of the Rhame Bed sample sites in this area occur along road cuts. Site 1 is the furthest northeast exposure of the Rhame Bed encountered during this project (Figure 76). The sample sites follow a southwest-northeast trend that roughly parallels the Rhame Bed outcrop pattern in this part of the state.

The basal contact of the Rhame Bed is exposed at only 3 of 12 study sites in this area. At those three sites the Rhame Bed has an average thickness of 19 feet. The Rhame Bed tends to be more brightly colored with more distinctive layering in central Grant County and southern Morton County than in other areas, but that might be a misperception created by better developed outcrops. The weighted alumina content for the Rhame Bed in this area ranges from 13-20% with an average alumna content of 17%.

The alumina content of a Bear Den Member outcrop at the top of Pretty Rock Butte (Site 43) ranged from 16 to 26% with an average weighted alumina value of 20% (Figure 63). In addition to being the furthest southeast exposure of the Bear Den Member in North Dakota, this is also the only locality where we have the Bear Den and the Rhame Bed in close proximity. The Rhame Bed (Site 28) occurs 300 feet below the Bear Den Member (Site 43) approximately three miles northeast of Pretty Rock Butte (Figure 10). Ignoring regional dip, this implies the Sentinel Butte and Bullion Creek Formations are only 300 feet thick in this area. The limited Bear Den outcrops on Pretty Rock Butte appear to be flat lying, but there are silcrete blocks present as float 50 feet above the dazzling white mudstones at Site 42 (Figure 64). In the absence of multiple Bear Den or post-Bear Den silcretes, this suggests Bear Den strata has been let down in this area.

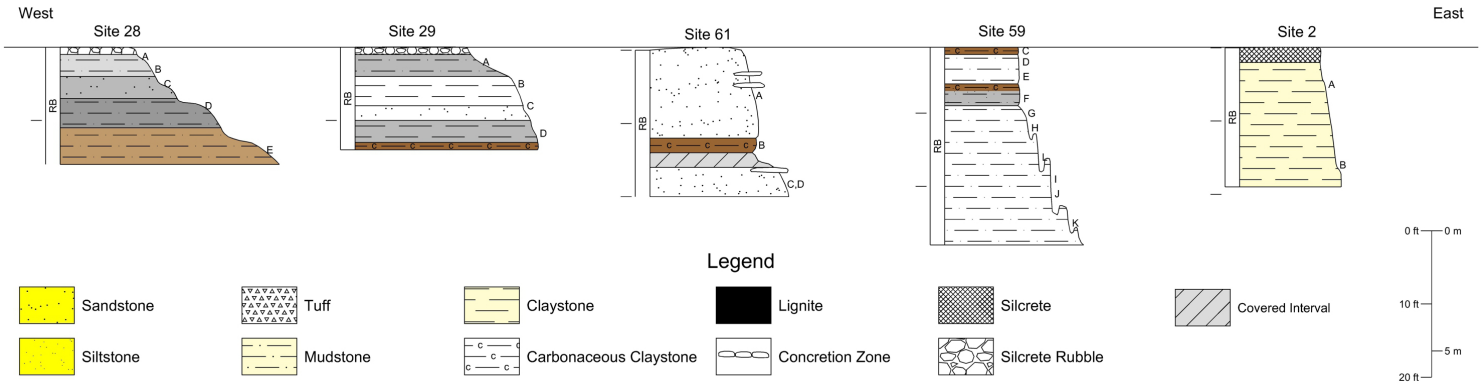
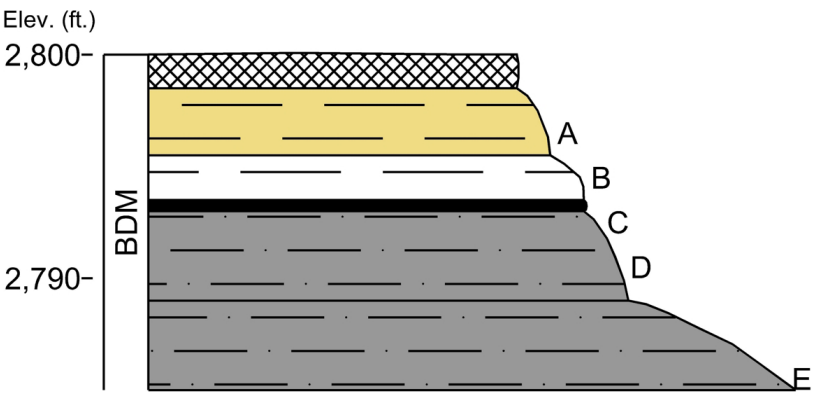


Figure 62. Geologic cross-section of selected sample sites in Grant and Morton counties. See Figure 10 for location map.



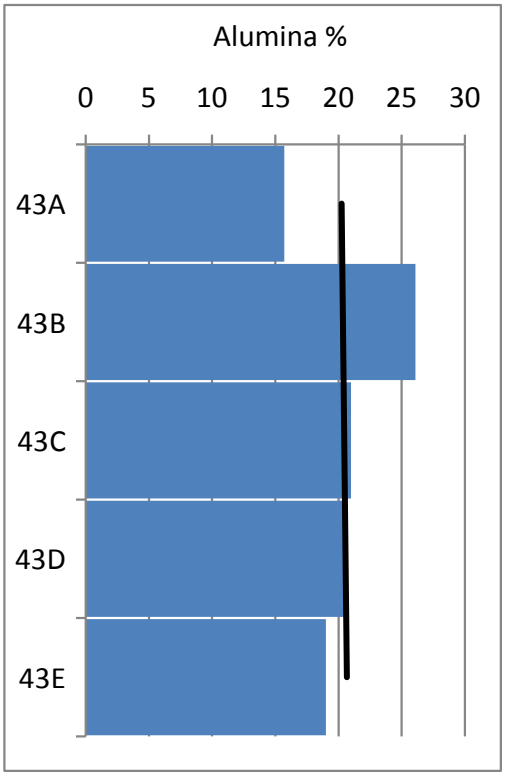


Figure 63. Photograph, measured section, and alumina profile for Sample Site 43 (T131N, R89W, Section 33, NE/NE/NE). See Figure 10 for location map and Figure 62 legend for lithology.

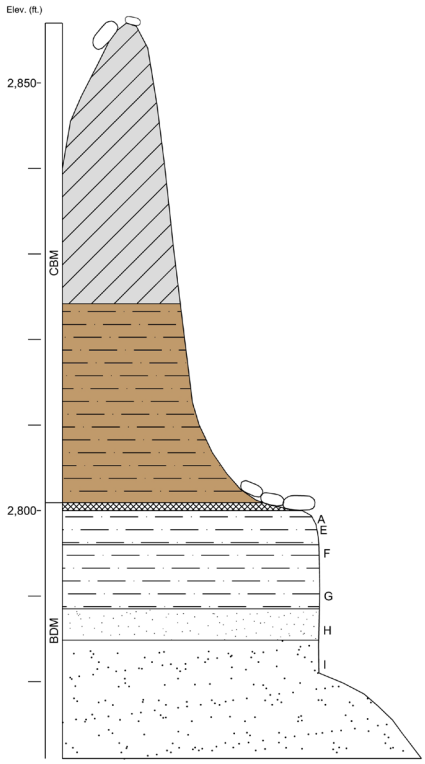


Figure 64. Photograph and measured section of Sample Site 42 (T131N, R89W, Section 34, NW/NE/NW). See Figure 10 for location map and Figure 62 legend for lithology.

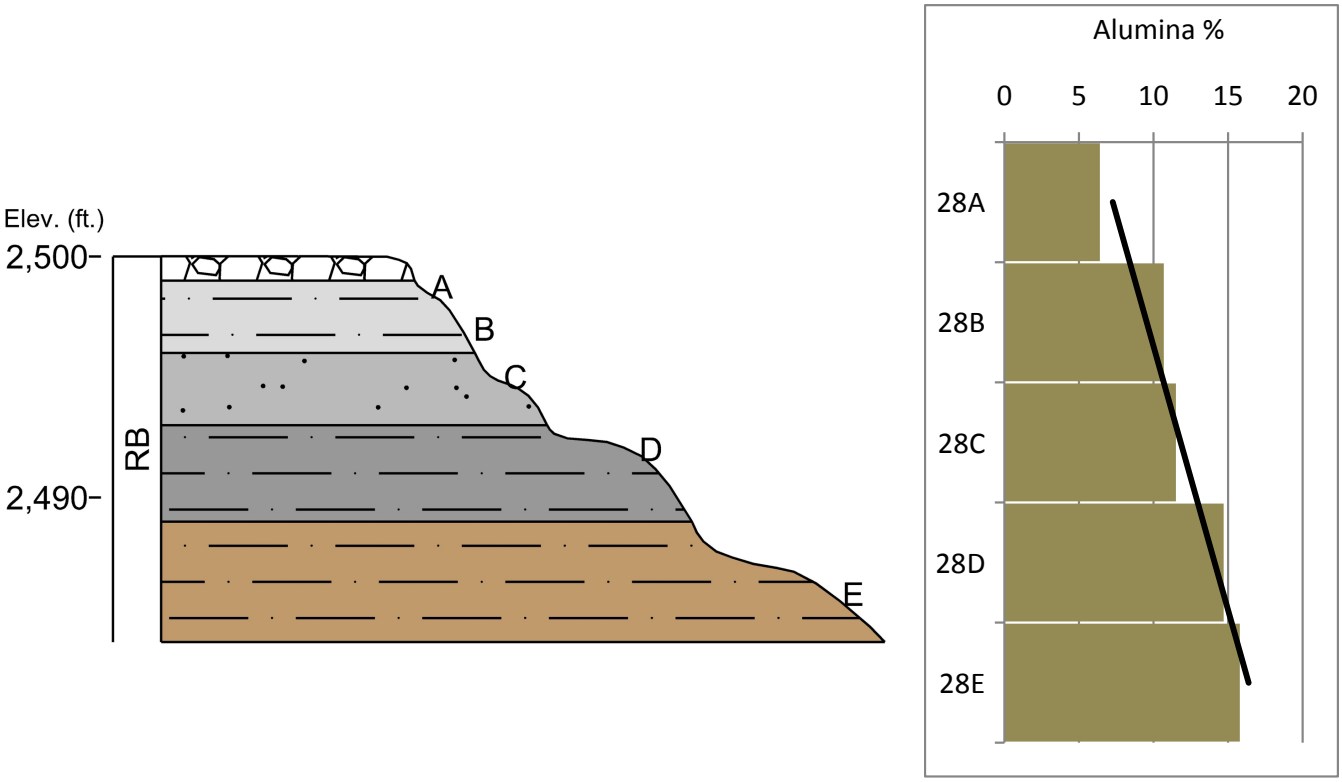


Figure 65. Photograph, measured section, and alumina profile for Sample Site 28 (T131N, R89W, Section 13, NW/SW/SW). See Figure 10 for location map and Figure 62 legend for lithology.

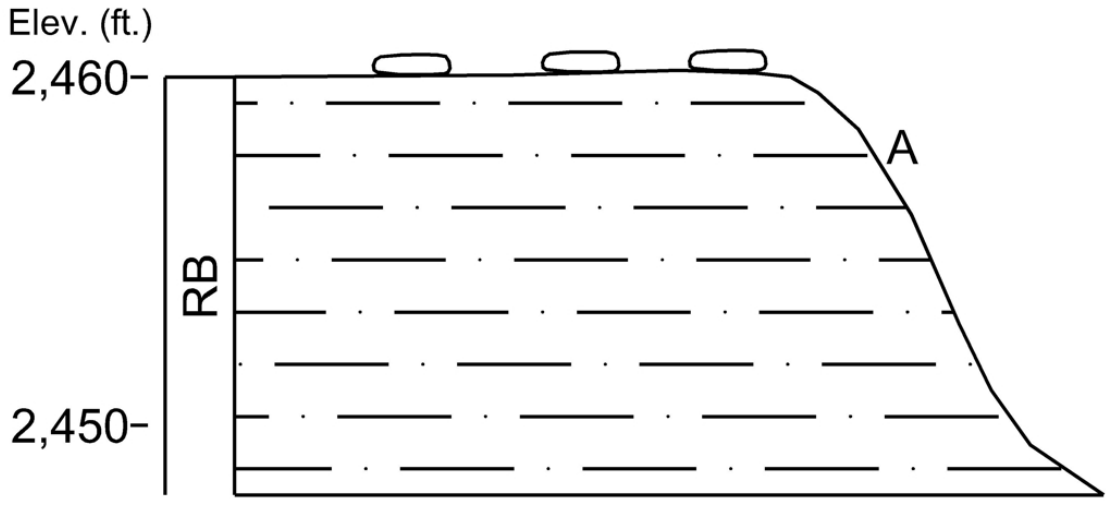


Figure 66. Photograph and measured section of Sample Site 27 (T132N, R89W, Section 22, NE/NE/SE). See Figure 10 for location map and Figure 62 legend for lithology.

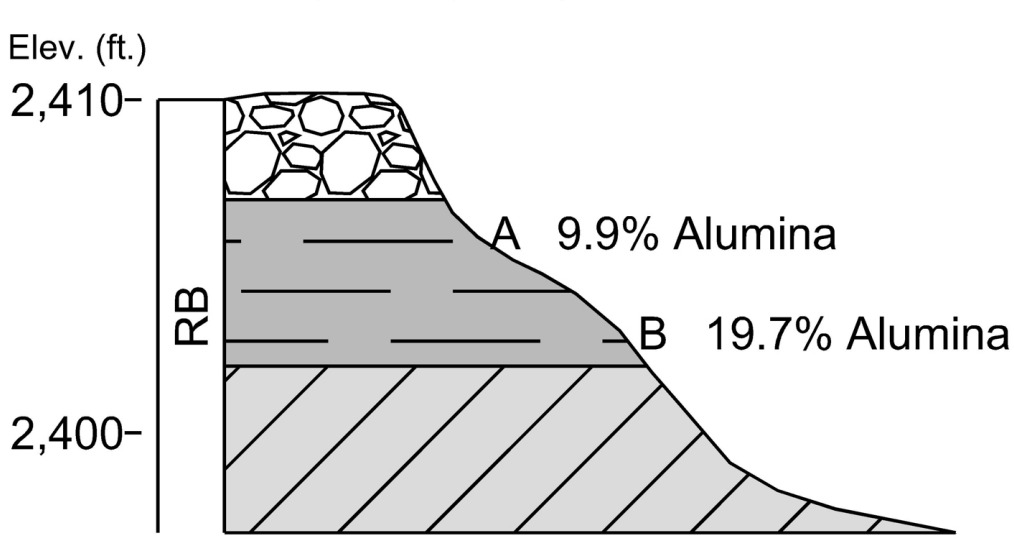


Figure 67. Photograph and measured section of Sample Site 26 (T132N, R89W, Section 3, NW/NW/NW). See Figure 10 for location map and Figure 62 legend for lithology.

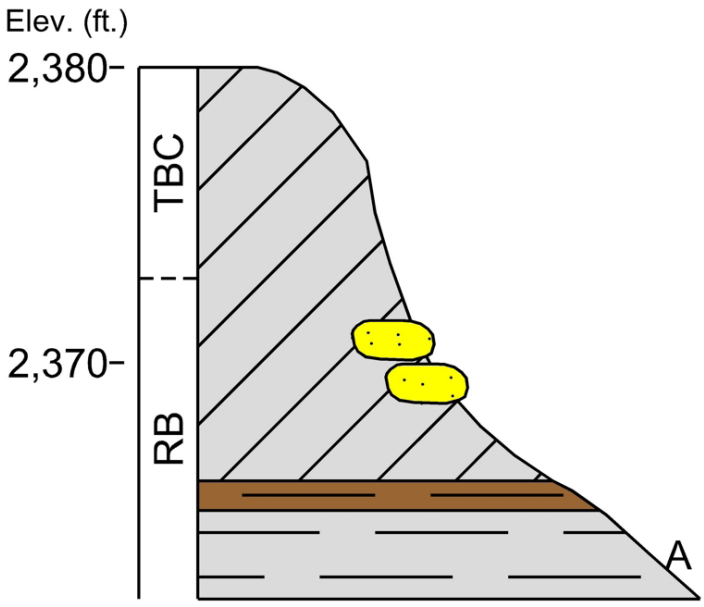


Figure 68. Photograph and measured section of Sample Site 25 (T133N, R89W, Section 35, NW/SE/NW). See Figure 10 for location map and Figure 62 legend for lithology.

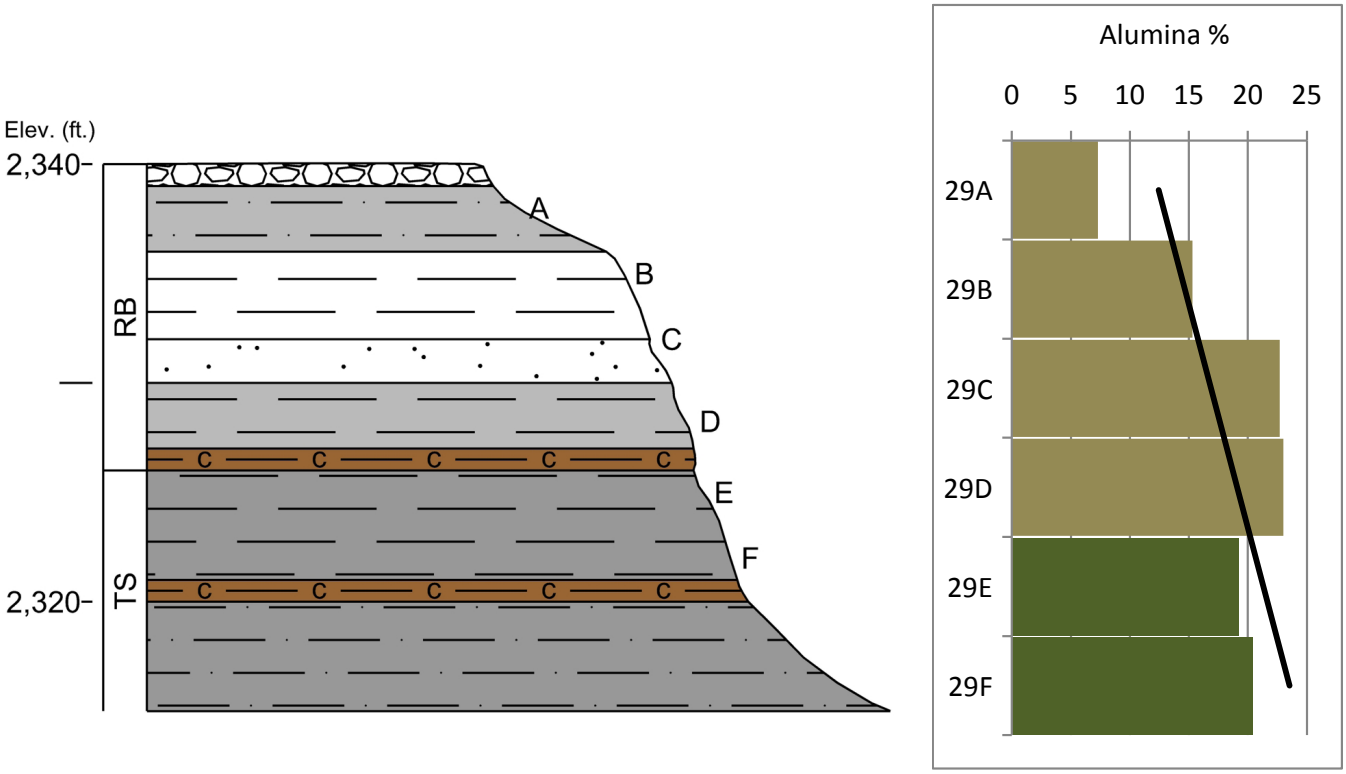


Figure 69. Photograph, measured section, and alumina profile for Sample Site 29 (T134N, R89W, Section 34, SE/SW/NE). See Figure 10 for location map and Figure 62 legend for lithology.

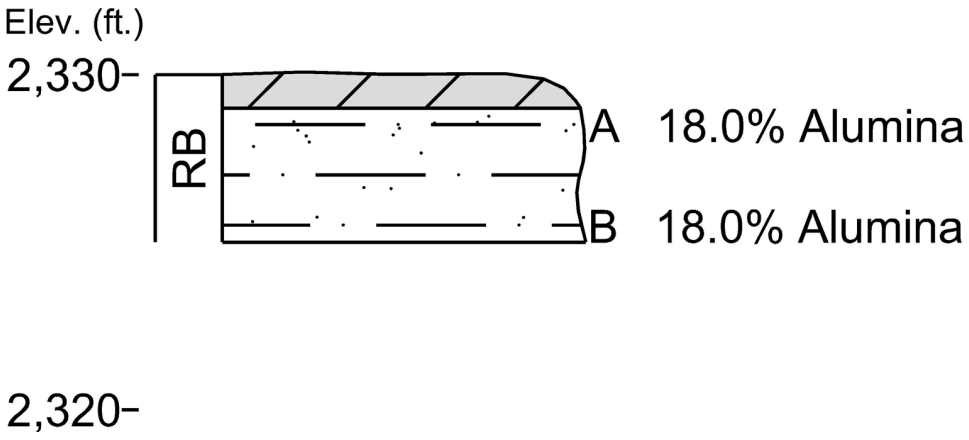


Figure 70. Photograph and measured section of Sample Site 60 (T134N, R87W, Section 11, NW/SW/SW). See Figure 10 for location map and Figure 62 legend for lithology.

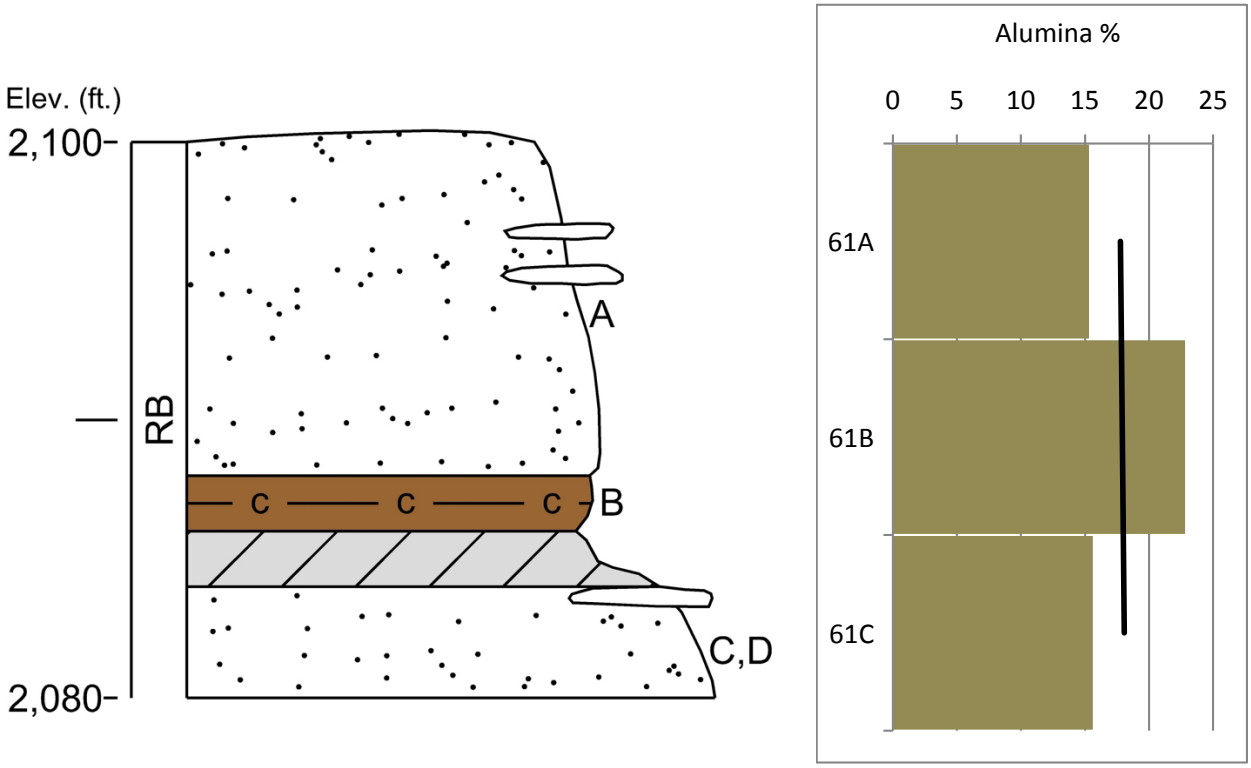
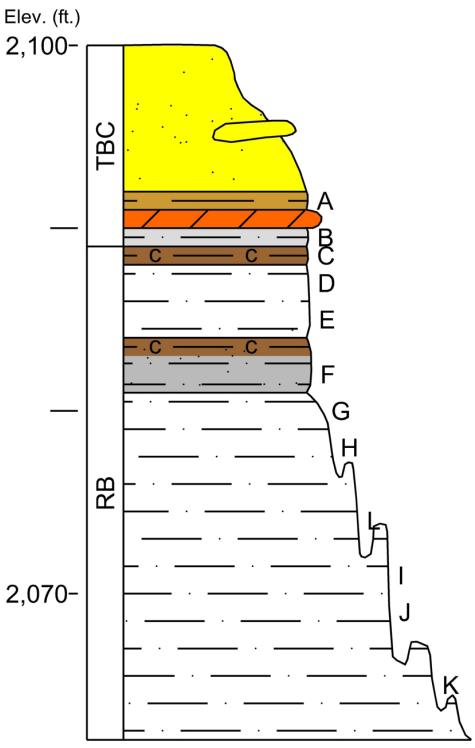


Figure 71. Photograph, measured section, and alumina profile for Sample Site 61 (T136N, R87W, Section 16, NW/NW/NE). See Figure 10 for location map and Figure 62 legend for lithology.



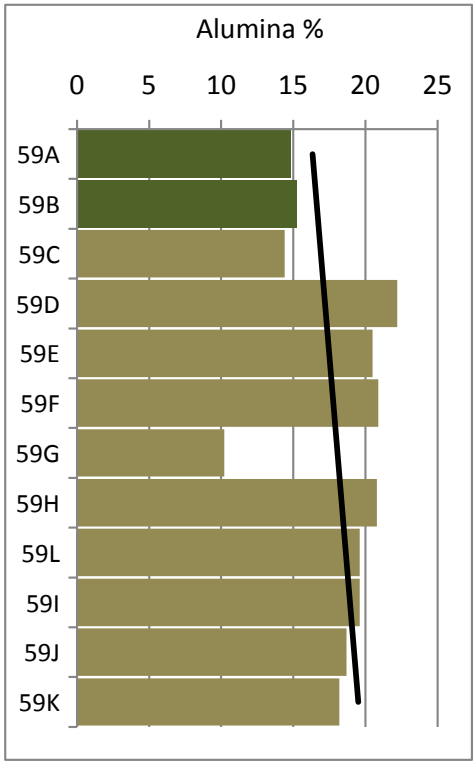


Figure 72. Photograph, measured section, and alumina profile for Sample Site 59 (T137N, R86W, Section 35, SW/SE/SE). See Figure 10 for location map and Figure 62 legend for lithology.

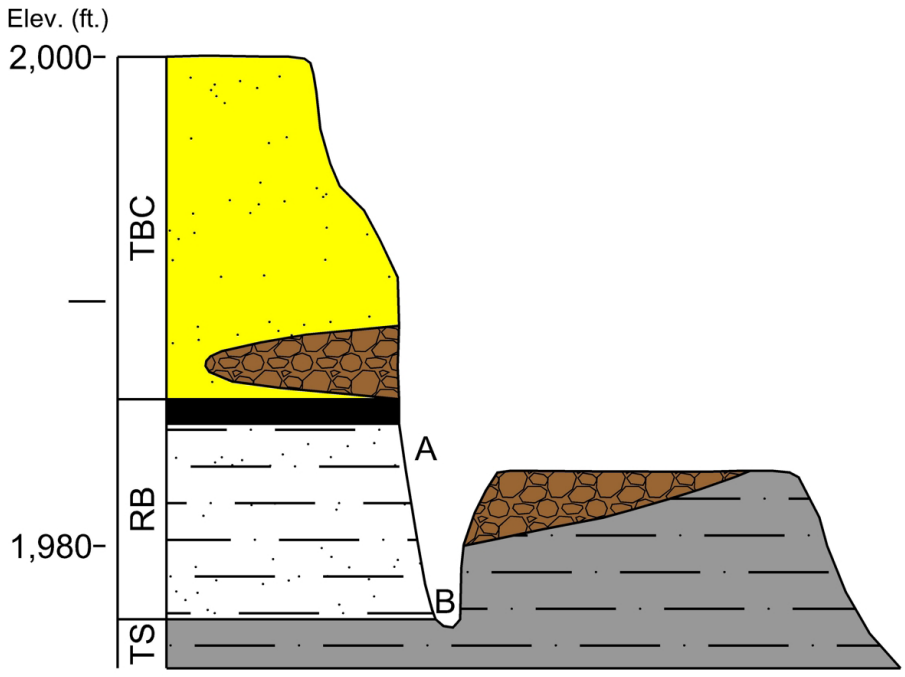


Figure 73. Photograph and measured section of Sample Site 57 (T137N, R86W, Section 25, SE/NW/NE). See Figure 10 for location map and Figure 62 legend for lithology.

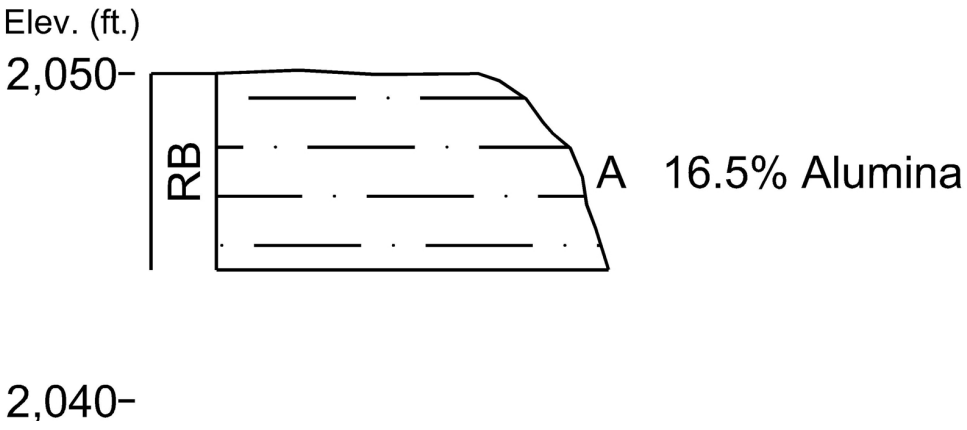
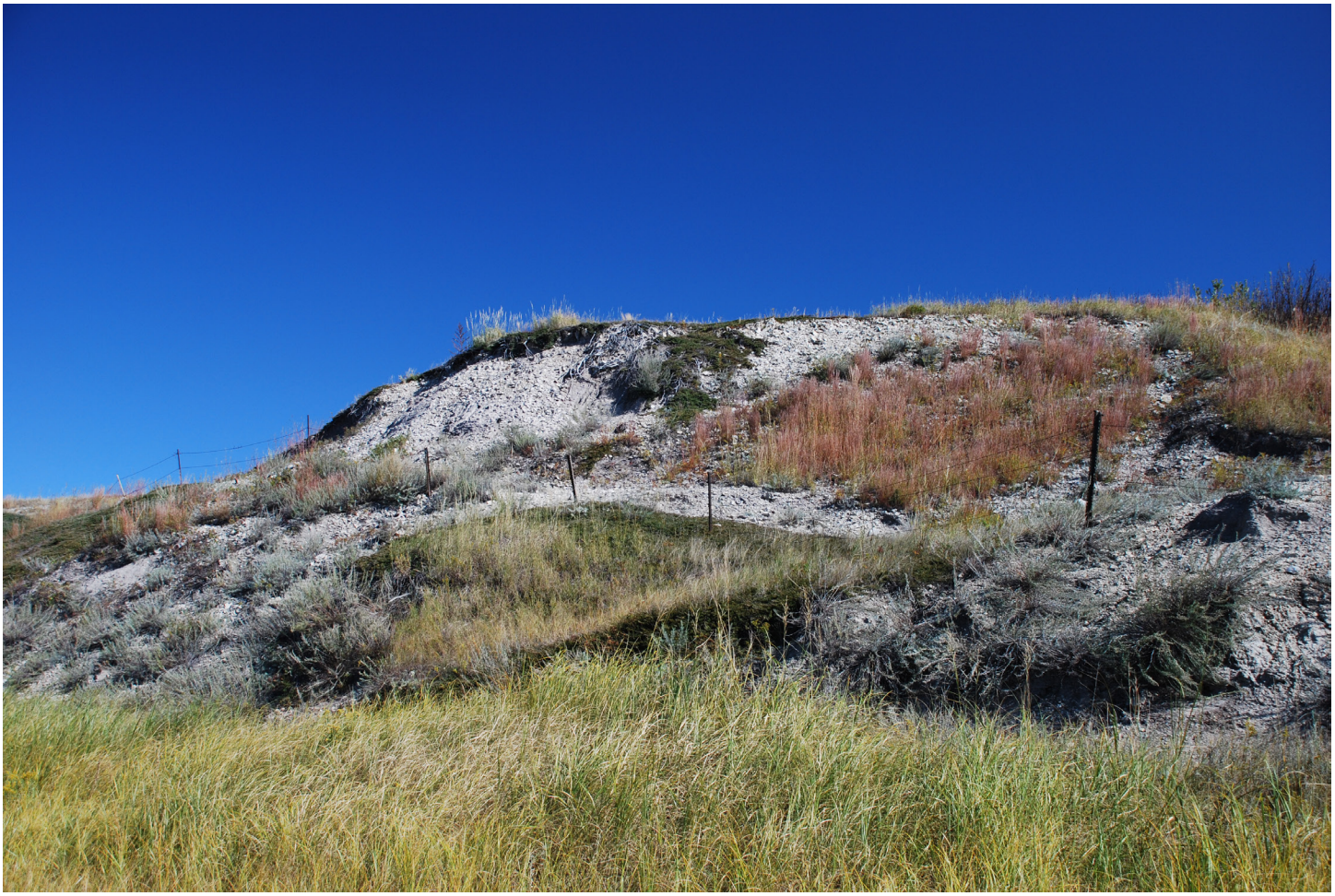


Figure 74. Photograph and measured section of Sample Site 58 (T137N, R86W, Section 4, SW/NW/SW). See Figure 10 for location map and Figure 62 legend for lithology.



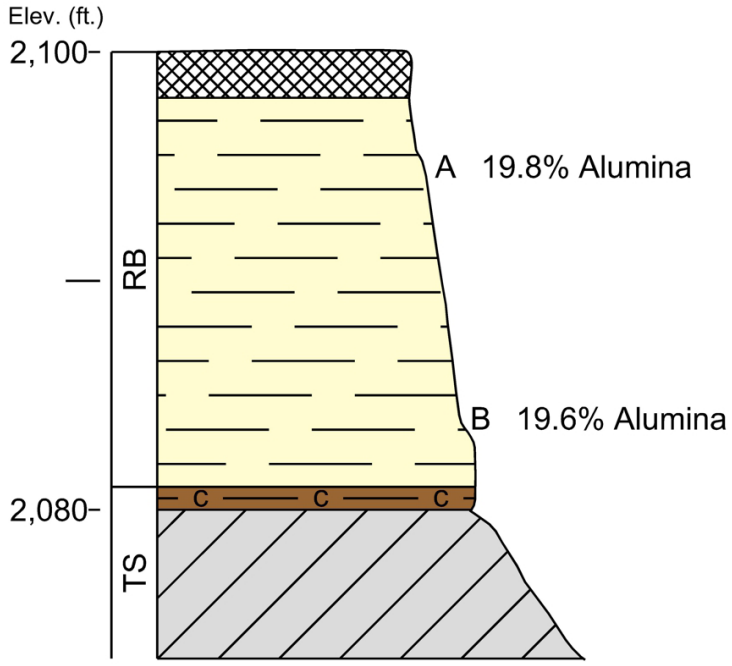


Figure 75. Photograph and measured section of Sample Site 2 (T137N, R84W, Section 17, NW/NW/NW). See Figure 10 for location map and Figure 62 legend for lithology.

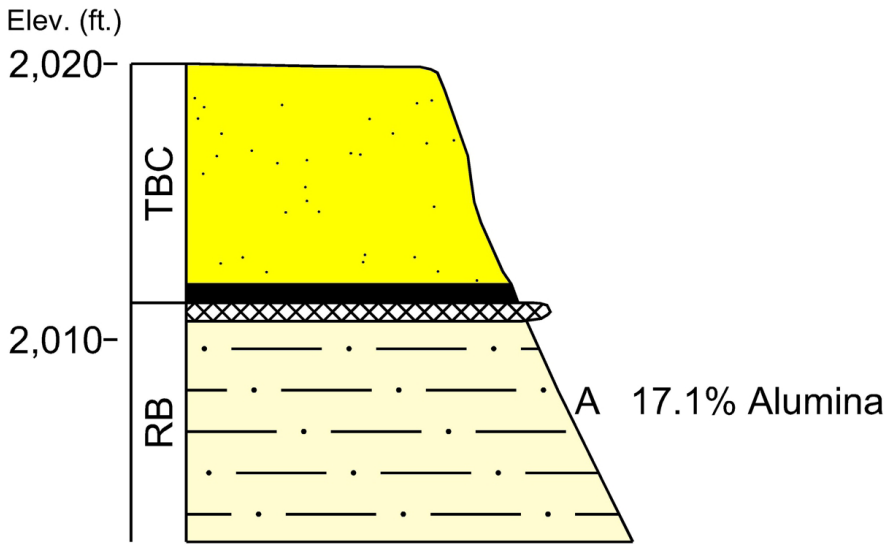


Figure 76. Photograph and measured section of Sample Site 1 (T139N, R83W, Section 10, SW/SE). See Figure 10 for location map and Figure 62 legend for lithology.

CLAY MINERALOGY

The XRD results indicate the dominant clay minerals in these samples are kaolinite, illite, chlorite, and smectite. These findings are very much in line with the results of previous clay studies of these rock units. The dominant nonclay minerals are quartz, feldspar, anatase, goethite, and dolomite. The presence of anatase is consistent with titantium oxide concentrations of up to 2.8% in samples as determined by XRF analysis. The lab was not able to quantify clay mineralogy using peak heights, but instead interpreted them to determine relative abundance. This was accomplished by profile fitting to distinguish between overlapping peaks, drawing a horizontal line at the midpoint of the maximum peak height, and designating the area below that horizontal line as the "peak area." The resulting peak area was presented as abundance trends in a series of graphs (Appendix D). As with the alumina and silica concentrations, clay mineralogy was plotted in vertical profiles to enable trends to be identified. Because relative abundance was plotted on the XRD profiles rather than absolute values, as in the case of the XRF profiles, it is understandably more difficult to identify consistent patterns in regards to clay mineralogy.

Several of the clay mineralogy abundance trends do not appear to fit well with the alumina trends or what is known of the general clay mineralogy of these units. However, the clay abundance trends for site 22 do, in general, fit the anticipated trend (Figures 13 and 77). Kaolinite appears to be relatively high throughout the Bear Den Member profile and smectite increases in the lower stratigraphic samples as would be expected. The highest smectite trend occurs in sample 22F (black claystone). As previously noted, this black Bear Den Member claystone can be traced through northeastern Dunn County and into northwestern Mercer County (samples 18D, 19D, and 22F). All three samples contained not only some of the highest diffraction peaks for kaolinite, but also the highest for smectite. In the field these samples were uniquely waxy in appearance with a much different texture than the surrounding rocks. These black claystones may well be a smectite layer that was partially converted to kaolinite by intense weathering. At all three sites, the alumina content increased in this layer in comparison to the adjacent beds.

At Site 4, the alumina values remained relatively constant, decreasing slightly with distance from the top of the Bear Den Member (Figure 27). The clay mineralogy trends also remained relatively constant for both kaolinite and smectite. Kaolinite did decrease slightly between samples 4A and 4B (Appendix D).

The clay mineralogy abundance trend for Site 41 displays an interesting pattern. While the alumina trend for this site decreases stratigraphically down through the Rhame Bed, the kaolinite content is lowest and the smectite content is highest in sample 41A. Sample 41A is a very carbonaceous claystone that underlies the silcrete and there was no indication that this was a swelling clay.

The clay mineralogy trends for Site 56 also do not fit the anticipated pattern (Figure 78). The higher kaolinite content appears to occur in claystones and mudstones near the base of the Bullion Creek Formation and not in the upper Rhame Bed. In addition, the smectite concentrations appear relatively stable across this stratigraphic interval. Lateral sampling at this locality, as well as throughout the study, would determine if any of these are localized effects.

Though other factors may be significant, phase abundance is one of the primary contributions to diffraction peak intensity. A comparison of peak intensity between Rhame Bed and Bear Den samples reveals some interesting groupings (Figure 79). Of the 23 peak intensities noted on the graph for kaolinite, 17 are from the Bear Den Member (4A, 4B, 4C, 15J, 18A, 18B, 18C, 18D, 18E, 19D, 19E, 19F, 22A, 22B, 22D, 22E, and 22F) and only one is from the Rhame Bed (29B). The other five kaolinite intensity peaks are attributable to the Sentinel Butte Formation (19G), the Bullion Creek Formation (56C and 56D), and the Slope Formation (29E and 29F). The majority of swelling clay peak intensities (80%) also came from Bear Den samples (15E, 15J, 18D, 19F, 19D, 22D, 22E, and 22F). Only two Rhame Bed samples (28E and 56F) were in this group (Figure 79). However, three of the Bear Den samples were from a black claystone that was identified in the field as an altered bentonite.

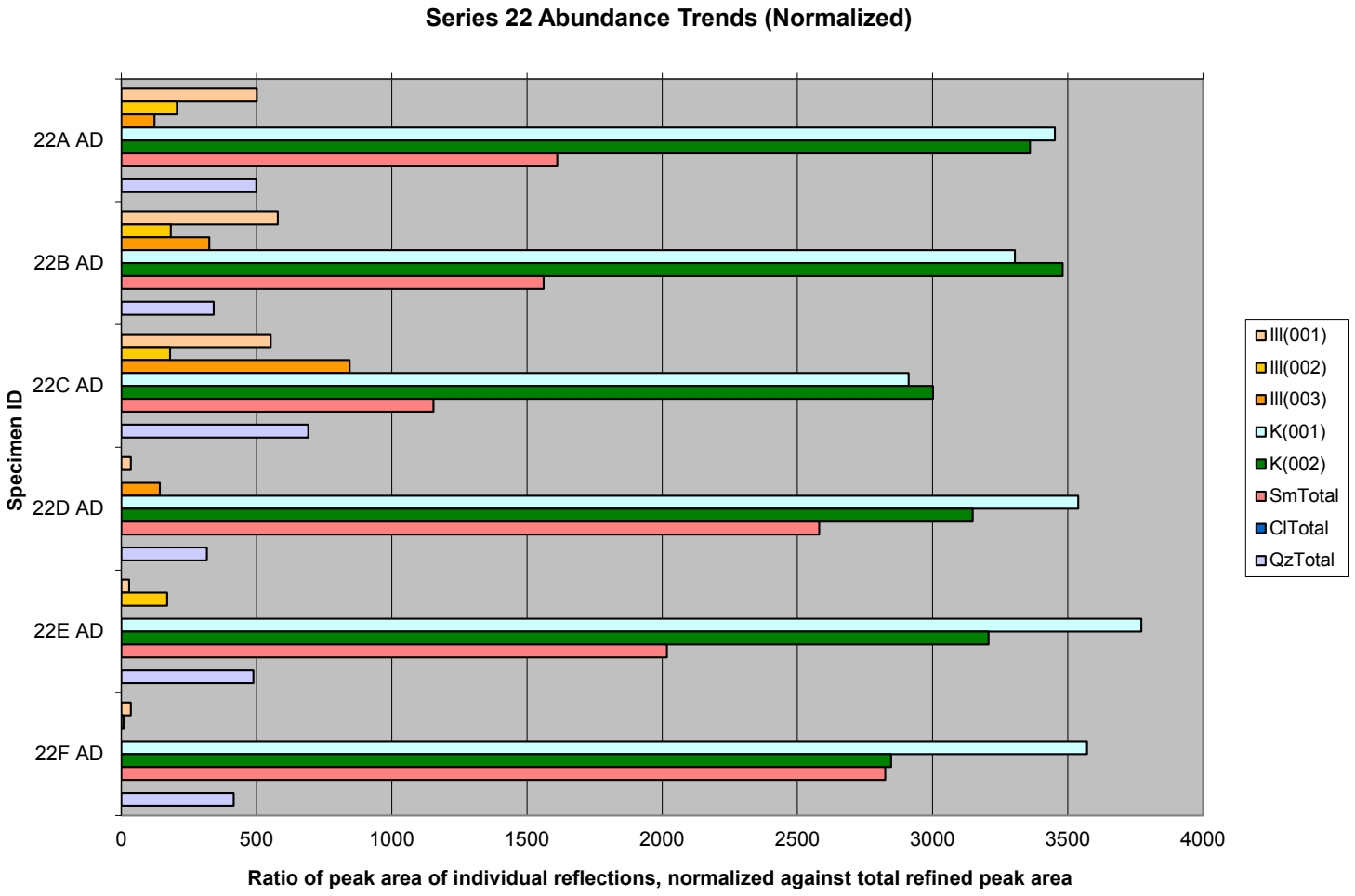


Figure 77. Clay mineralogy abundance trends for Site 22 (Grier and Jarabek, 2013).

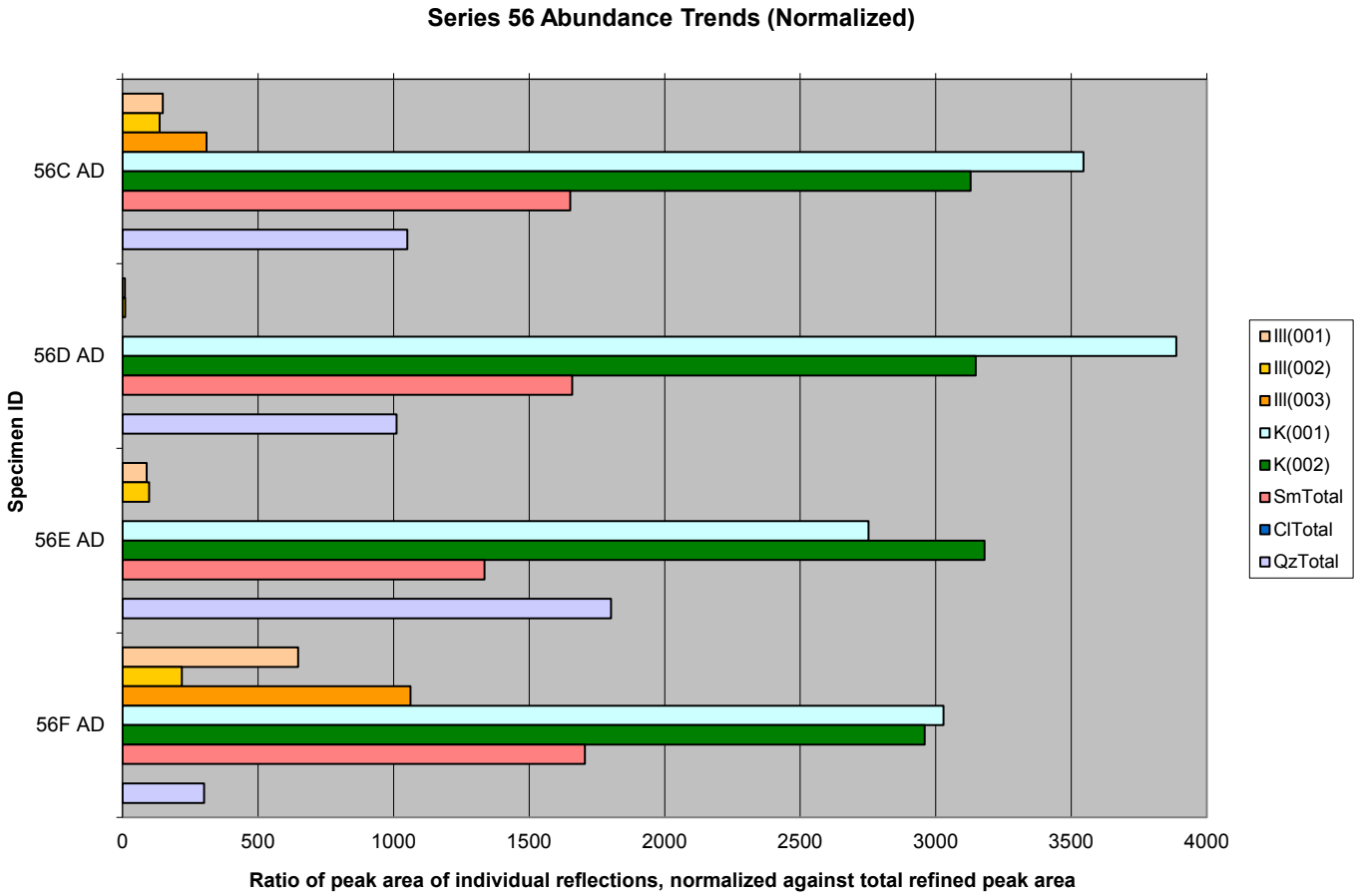


Figure 78. Clay mineralogy abundance trends for Site 56 (Grier and Jarabek, 2013).

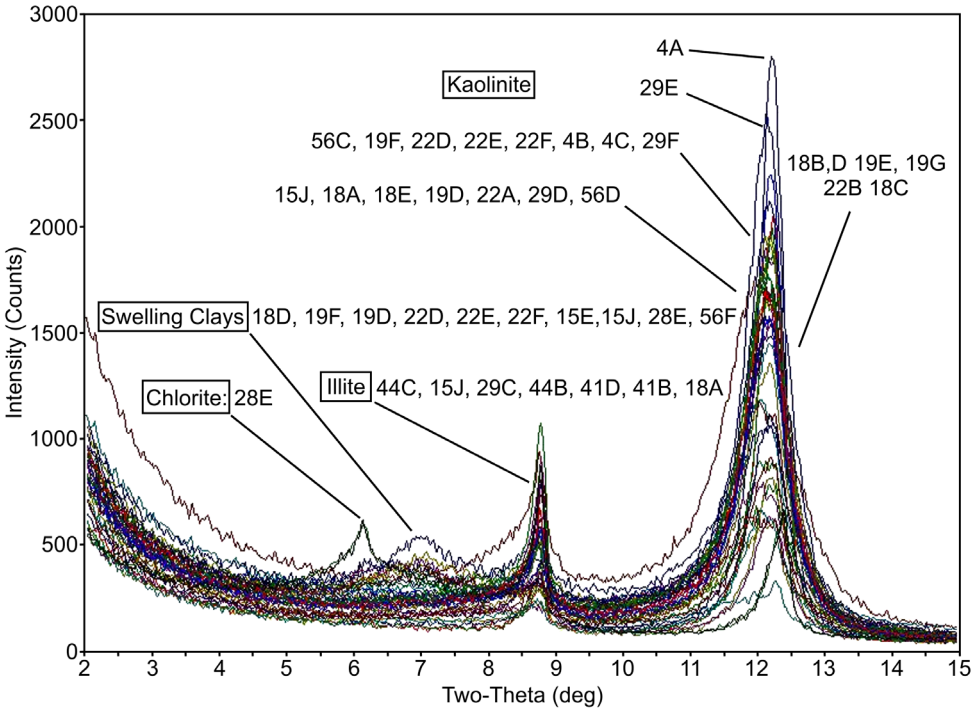


Figure 79. Basal spacings of the air-dried oriented mount clay specimens (Grier and Jarabek, 2013). The specimens producing the highest diffraction peaks for each clay type are noted.

Additional Clay Analyses

Plotting the clay mineralogy abundance trends was somewhat of a novel approach and those trends do not appear to closely follow the alumina values for a given sample site. In an effort to generate additional information on the relationship between alumina and kaolinite at these sites, eight clay samples (18A-18D and 29A, B, D, F) were submitted to the Energy and Environmental Research Center at the University of North Dakota (EERC). These sample sites were chosen because Site 18 is in the Bear Den Member and the alumina content decreases with depth while site 29 is in the Rhame Bed and the alumina content increases with depth.

The EERC performed XRD analysis on the clay samples to determine clay mineralogy. In order for EERC to obtain semi-quantitative data on the clays: 1) bulk XRD analysis was run on the samples before the clays were separated and additional XRD analyses were run on the clay portion and 2) the smectite content was determined using methylene blue. The quartz content was determined by XRD methods using a reference intensity ratio method (RIR) which is considered semi-quantitative. Full profile refinements (Reitveld Refinements) were not done since the structure of the clays cannot be modeled for smectites and mix-layered clays. Peaks were identified in the diffractogram for all mineral phases. The reference intensity ratio was used for each of the identified minerals listed by the International Center for Diffraction Data (ICDD). The RIR number for each mineral is the ratio of the peak intensity (height) for the mineral of interest to the peak intensity of corundum (Al_2O_3). This method relies on a single peak for each mineral. Preferred orientation of a mineral can affect the peak height (Eylands, 2013).

The smectite content was determined using a methylene blue titration method (Fityus et al., 2000) in which methylene blue is added to a constantly stirred sample. The amount of smectite can be determined by how much methylene blue is absorbed by the clay minerals. A small but known amount of methylene blue is added to a small amount of sample and the color is noted. If there is no color change, then more methylene blue is added and the color is noted. The process is repeated until the color change occurs. In the case of little or no smectite, the color will turn blue immediately, in which case more clay sample is added. Fityus and others (2000) provide a chart relating milligrams of methylene blue added to the amount of smectite present, which was used as the results for the amount of smectite found in each of the samples. The process was repeated three times for each sample to ensure consistency (Eylands, 2013).

Using these procedures EERC determined the Bear Den samples averaged 33% quartz, 27% illite, 23% kaolinite, 10% smectite, and 7% other minerals; the Rhame Bed samples averaged 47% quartz, 22% illite, 19% kaolinite, 9% smectite, and 3% other minerals; and the one Slope Formation sample contained 32% quartz, 21% illite, 19% kaolinite, 8% smectite, and 20% other minerals (Table 3). The high percentage of other minerals in the Slope Formation sample was due to potassium feldspar.

These XRD results for both sites were plotted vertically and compared to the alumina results (Figure 80). Surprisingly, the smectite and smectite/quartz profiles appear to fit the alumina profile best for Sample Site 18 and the illite and smectite trend lines best parallel the alumina trend line. Understandably, the Site 18 quartz profile is a mirror image of the alumina profile i.e.,

Table 3. Alumina, clay mineralogy, and quartz concentrations for sample sites 18 and 29 (modified from Eylands and Mibeck, 2013).

Sample	Alumina %	Kaolinite %	Illite %	Smectite %	Quartz %	Other %	Kaolinite/ Quartz	Smectite/ Quartz
18A	27.4	22.5	27	11.5	30.6	8.4	0.735294118	0.375816993
18B	24.0	26	29.1	10.6	34.3	0	0.758017493	0.309037901
18C	20.4	19.7	23.3	7.8	36.6	12.6	0.538251366	0.213114754
18D	25.2	25.2	26.8	11.2	29.8	7	0.845637584	0.375838926
29A	7.3	17.2	19.3	8.6	53.8	1.1	0.319702602	0.159851301
29B	15.3	16.7	23.8	5.7	50.3	3.5	0.332007952	0.11332008
29D	23.0	21.9	24.4	13.3	36.1	4.3	0.606648199	0.368421053
29F	20.4	18.8	21.2	7.7	32.4	19.9	0.580246914	0.237654321

as quartz increases alumina decreases and vice versa (Figure 80). There are no good fits for the alumina profile for Site 29. If the kaolinite content of 29A was lower, the kaolinite profile would be a good fit for alumina at this site. The mirror image of the quartz profile probably comes closest and would be a good fit if the quartz content in 29F was slightly higher. The quartz trend line is opposite the alumina trend line at this site. The alumina/quartz and smectite/quartz trend lines parallel that of alumina at site 29.

CONCLUSIONS

The alumina concentrations in the Bear Den Member ranged from 7-34% in individual samples and from 16-25% in mean weighted values. The alumina concentrations in the Rhame Bed ranged from 6-27% in individual samples and from 13-25% in mean weighted values. Alumina concentrations in these beds appear to be relatively evenly spaced across Hettinger, Stark, Dunn, Mercer, and Morton counties. The highest concentrations in the Rhame Bed occur in central Adams County and the highest concentrations in the Bear Den Member occur in northeastern Dunn and northwestern Mercer counties. However, additional sampling may reveal patterns that were not discernible at this sampling density. Also, this study did not attempt to determine lateral variability in alumina within a given outcrop because that would have required collecting significantly more samples or reducing the areal extent of the sampling program to concentrate in a more localized area.

It was assumed in the field that the whitest, cleanest claystones would contain the most alumina. That is, the most highly weathered or bleached claystones would have the highest percentage of clay minerals that had been converted to kaolinite and therefore the highest percentage of alumina. As it turned out, outcrop appearance was not an accurate means of predicting alumina content. That may well be a result of fluctuating silt content. Claystones that appeared to be clean under routine field examination may well be silty claystones where the increase in silica content effectively reduces the alumina content. In addition, the clay mineralogy may be more complex than had previously been thought.

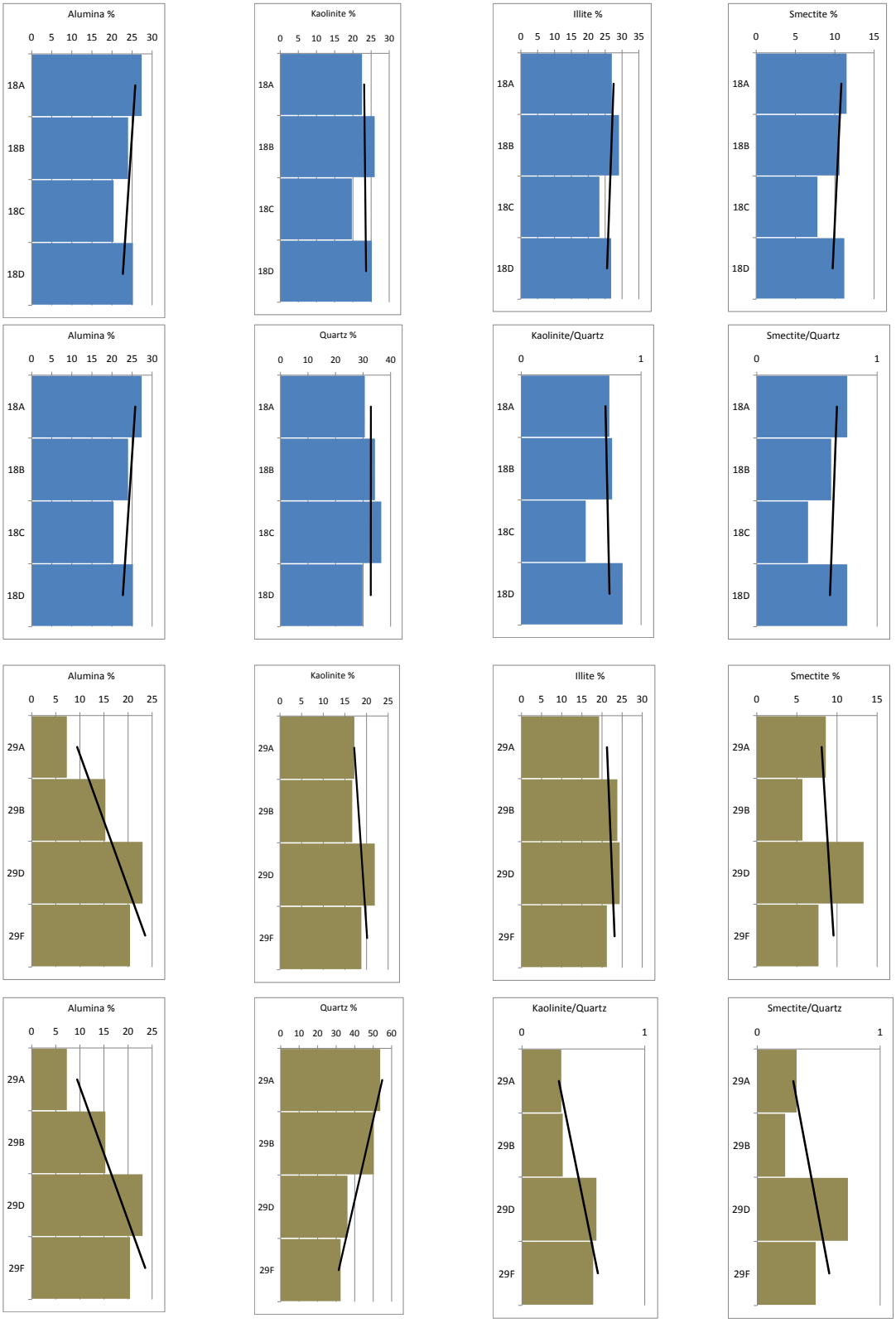


Figure 80. A comparison of the alumina profiles and trend lines to the clay mineralogy and quartz profiles for Sample Sites 18 and 29.

Some previous studies had hypothesized that the percentage of kaolinite would be highest at the top of the bed, would systematically decrease to the base of the bed, and alumina values would follow the same trend. A handful of analyses collected along stratigraphic profiles from these previous works seemed to support this hypothesis. However, this study found alumina was more than twice as likely to increase along a stratigraphic profile of the Bear Den or the Rhame Bed than it was to decrease. As a result, no benefit would be gained by preferentially mining just the tops of these beds for alumina.

Where exposed, it is often relatively difficult to pick the basal contact of the Bear Den Member or the Rhame Bed in outcrop. While the upper contact is generally sharp and clear, the basal contact is often gradational, reflecting the waning edges of the weathering horizon. In some cases, the basal contact chosen in the field was later shifted up or down one bed to coincide with the decrease in alumina (in anticipation that it was reflecting a similar decrease in kaolinite). However, the XRD results did not consistently show a decrease in kaolinite at these same horizons. For example, the clay mineralogy abundance trends for Site 29 demonstrate increasing kaolinite content in samples 29A-29D, coinciding with increasing alumina content through that same interval. Unfortunately for this line of reasoning, the kaolinite trend of sample 29E appears to be increasing when it should be decreasing. The increasing smectite trend for sample 29F along with a slight decrease in kaolinite content suggests the basal contact of the Rhame Bed should be shifted between 29E and 29F (rather than 29D and 29E). However, there were no field observations that would support that shift.

Almost four times as many samples were collected as initially budgeted. Since alumina was the focus of the study, it was determined that it was best to spend the majority of money on XRF analysis and spend whatever money was left over on XRD analysis. It was assumed that variations in the alumina content within the Bear Den Member and the Rhame Bed could be directly attributable to fluctuations in the percentage of kaolinite. However, without knowledge of the fluctuating silt content it was difficult to interpret the initial XRD profiles. In addition to XRD analysis of the clay fraction, the EERC results demonstrate that future studies should run bulk XRD analysis and methylene blue titration or any additional methods that will help to determine, on a quanitiative or semi-quantitative basis, the clay minerals that are present in these stratigraphic units.

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Appendix A

Sample Locations

SAMPLES

	Township	Sect		Elevation Outcrop Top	Stratigraphic Unit	Sample	Lithologic Description	Ft Below Top of BDM or RB	XRF Analysis	XRD Analysis	Camels Butte	Bear Den	Sentinel Butte	Bullion Creek	Rhame Bed	Slope
Site 1	T139N, R83W	10	sw/se	2,020	Rhame Bed	1A	gry/wht sndy mdst	3	X						1	
Site 2	T137N, R84W	17	nw/nw/nw	2,100	Rhame Bed	2A	gry/wht clyst	3	X							
Site 2	T137N, R84W	17	nw/nw/nw		Rhame Bed	2B	gry/wht clyst	14	X						2	
Site 3	T140N, R88W	4	nw/nw/se		Bear Den Mbr	3A	wht/orng clyst	3	X							
Site 3	T140N, R88W	4	nw/nw/se		Bear Den Mbr	3B	wht/orng clyst	6	X			2				
Site 4	T139N, R93W	21	se/sw/sw	2,510	Bear Den Mbr	4A	wht/orng sndy clyst	3	X							
Site 4	T139N, R93W	21	se/sw/sw		Bear Den Mbr	4B	wht/orng sndy clyst	8	X							
Site 4	T139N, R93W	21	se/sw/sw		Bear Den Mbr	4C	wht/orng sndy clyst	15	X			3				
Site 5	T140N, R93W	3	se/se/se	2,517	Bear Den Mbr	5A	wht mdst, FeO	3	X			1				
Site 6	T139N, R94W	4	nw/nw/nw	2,500	Bear Den Mbr	6A	brt wht clyst	1	X							
Site 6	T139N, R94W	4	nw/nw/nw		Bear Den Mbr	6B	brt wht clyst	2	X							
Site 6	T139N, R94W	4	nw/nw/nw		Bear Den Mbr	6C	brt wht clyst	3	X							
Site 6	T139N, R94W	4	nw/nw/nw		Bear Den Mbr	6D	brt wht clyst	4.5	X							
Site 6	T139N, R94W	4	nw/nw/nw		Bear Den Mbr	6E	brt wht clyst	6	X							
Site 6	T139N, R94W	4	nw/nw/nw		Bear Den Mbr	6F	brt wht clyst	7.5	X							
Site 6	T139N, R94W	4	nw/nw/nw		Bear Den Mbr	6G	brt wht slst	9	X							
Site 6	T139N, R94W	4	nw/nw/nw		Bear Den Mbr	6H	brt wht slst	10	X			8				
Site 7	T141N, R95W	25	nw/nw/nw	2,420	Bear Den Mbr	7A	purp clyst	1	X							
Site 7	T141N, R95W	25	nw/nw/nw		Bear Den Mbr	7B	wht clyst	6	X							
Site 7	T141N, R95W	25	nw/nw/nw		Bear Den Mbr	7C	gold clyst	12	X			3				
Site 8	T138N, R97W	1	ne/nw/nw	2,537	Bear Den Mbr	8A	wht sndy mdst	2				1				
Site 9	T139N, R97W	36	ne/ne/se	2,530	Bear Den Mbr	9A	brt wht clyst	2								
Site 9	T139N, R97W	36	ne/ne/se		Bear Den Mbr	9B	gold clyst	6				2				
Site 10	T136N, R106W	28	sw/nw/nw	3,200	Rhame Bed	10A	wht clyst	2	X							
Site 10	T136N, R106W	28	sw/nw/nw		Rhame Bed	10B	gry/wht clyst, FeO	4	X						2	
Site 11	T136N, R106W	13	se/se/ne	2,950	Rhame Bed	11A	brt wht clyst	2	X							
Site 11	T136N, R106W	13	se/se/ne		Rhame Bed	11B	purp/wht clyst	7	X						2	
Site 12	T136N, R105W	11	ne/se/sw	2,820	Rhame Bed	12A	brt wht clyst	2							1	
Site 13	T136N, R104W	5	nw/ne/ne	2,640	Rhame Bed	13A	brn clyst	2	X							
Site 13	T136N, R104W	5	nw/ne/ne		Rhame Bed	13B	popcorn tex clyst	8	X							
Site 13	T136N, R104W	5	nw/ne/ne		Rhame Bed	13C	wht clyst	11	X							
Site 13	T136N, R104W	5	nw/ne/ne		Rhame Bed	13D	wht clyst	13	X							
Site 13	T136N, R104W	5	nw/ne/ne		Rhame Bed	13E	gry/wht slst, FeO	17								
Site 13	T136N, R104W	5	nw/ne/ne		Rhame Bed	13F	gry/wht slst, FeO	21								
Site 13	T136N, R104W	5	nw/ne/ne		Rhame Bed	13G	purp slst, silcrete	0	X						7	

SAMPLES

	Township	Sect		Elevation Outcrop Top	Stratigraphic Unit	Sample	Lithologic Description	Ft Below Top of BDM or RB	XRF Analysis	XRD Analysis	Camels Butte	Bear Den	Sentinel Butte	Bullion Creek	Rhame Bed	Slope
Site 14	T137N, R105W	19	se/nw/nw	3,060	Rhame Bed	14A	gry/wht mdst	2	X							
Site 14	T137N, R105W	19	se/nw/nw		Rhame Bed	14B	brt wht clyst	8	X						2	
Site 15	T140N, R90W	4	nw/sw/sw	2,340	Bear Den Mbr	15A	gry/wht clyst, FeO	1	X							
Site 15	T140N, R90W	4	nw/sw/sw		Bear Den Mbr	15B	gry/wht clyst, FeO	2	X							
Site 15	T140N, R90W	4	nw/sw/sw		Bear Den Mbr	15C	gry/wht clyst, FeO	3	X							
Site 15	T140N, R90W	4	nw/sw/sw		Bear Den Mbr	15D	gry/wht clyst, FeO	4	X							
Site 15	T140N, R90W	4	nw/sw/sw		Bear Den Mbr	15E	gry/wht clyst, FeO	8	X							
Site 15	T140N, R90W	4	nw/sw/sw		Bear Den Mbr	15F	gry/wht clyst, FeO	9	X							
Site 15	T140N, R90W	4	nw/sw/sw		Bear Den Mbr	15G	gry/wht clyst, FeO	10	X							
Site 15	T140N, R90W	4	nw/sw/sw		Bear Den Mbr	15H	gry/wht clyst, FeO	11	X							
Site 15	T140N, R90W	4	nw/sw/sw		Bear Den Mbr	15I	gry/wht clyst, FeO	12	X							
Site 15	T140N, R90W	4	nw/sw/sw		Bear Den Mbr	15J	gry/wht clyst, FeO	13	X							
Site 15	T140N, R90W	4	nw/sw/sw		Bear Den Mbr	15K	gry/wht clyst, FeO	14	X			11				
Site 16	T140N, R95W	33	se/sw/se	2,607	Bear Den Mbr	16A	brt wht clyst, FeO	10				1				
Site 17	T144N, R90W	18	ne/nw/ne	2,060	Bear Den Mbr	17A	wht mdst	3	X							
Site 17	T144N, R90W	18	ne/nw/ne		Bear Den Mbr	17B	wht mdst	6	X			2				
Site 18	T145N, R91W	12	ne/sw/se	2,160	Bear Den Mbr	18A	gry/wht clyst	2	X							
Site 18	T145N, R91W	12	ne/sw/se		Bear Den Mbr	18B	gry/wht clyst, FeO	6	X							
Site 18	T145N, R91W	12	ne/sw/se		Bear Den Mbr	18C	wht clyst	10	X							
Site 18	T145N, R91W	12	ne/sw/se		Bear Den Mbr	18D	gry clyst, gyp stringers	12	X							
Site 18	T145N, R91W	12	ne/sw/se		Bear Den Mbr	18E	gry/wht/gold clyst, FeO	16	X			5				
Site 19	T145N, R90W	11	ne/ne/sw	2,240	Bear Den Mbr	19A	gry/wht/gold clyst, FeO	3	X							
Site 19	T145N, R90W	11	ne/ne/sw		Bear Den Mbr	19B	gry/wht/gold clyst, FeO	7	X							
Site 19	T145N, R90W	11	ne/ne/sw		Bear Den Mbr	19C	brt wht, clyst, FeO spheres	9	X							
Site 19	T145N, R90W	11	ne/ne/sw		Bear Den Mbr	19D	gry clyst	11	X							
Site 19	T145N, R90W	11	ne/ne/sw		Bear Den Mbr	19E	gry/wht/orng clyst, FeO	14	X							
Site 19	T145N, R90W	11	ne/ne/sw		Sentinel Butte	19F	gry clyst	18	X							
Site 19	T145N, R90W	11	ne/ne/sw		Sentinel Butte	19G	gry clyst	22	X			5	2			
Site 20	T143N, R92W	21	ne/se/sw	2,250	Bear Den Mbr	20A	brt wht clyst-mudst, FeO	2	X							
Site 20	T143N, R92W	21	ne/se/sw		Bear Den Mbr	20B	brt wht clyst-mudst, FeO	6	X							
Site 20	T143N, R92W	21	ne/se/sw		Bear Den Mbr	20C	brt wht clyst-mudst, FeO	11	X			3				
Site 21	T144N, R91W	36	nw/sw/nw	2,180	Camels Butte Mbr	21A	brn clyst, carb	6 (above)	X							
Site 21	T144N, R91W	36	nw/sw/nw		Camels Butte Mbr	21B	brn clyst, carb	5 (above)	X							
Site 21	T144N, R91W	36	nw/sw/nw		Bear Den Mbr	21C	gry/wht clyst, FeO, gyp	1	X							
Site 21	T144N, R91W	36	nw/sw/nw		Bear Den Mbr	21D	gry/wht clyst, FeO, gyp	5	X							

SAMPLES

	Township	Sect		Elevation Outcrop Top	Stratigraphic Unit	Sample	Lithologic Description	Ft Below Top of BDM or RB	XRF Analysis	XRD Analysis	Camels Butte	Bear Den	Sentinel Butte	Bullion Creek	Rhame Bed	Slope
Site 21	T144N, R91W	36	nw/sw/nw		Bear Den Mbr	21E	gry/wht clyst, FeO, gyp	11	X							
Site 21	T144N, R91W	36	nw/sw/nw		Bear Den Mbr	21F	gry/wht clyst, FeO, gyp	15	X							
Site 21	T144N, R91W	36	nw/sw/nw		Sentinel Butte	21G	gry/wht clyst, FeO	26	X		2	4	1			
Site 22	T146N, R92W	20	ne/nw/se	2,360	Bear Den Mbr	22A	brt wht clyst	1	X							
Site 22	T146N, R92W	20	ne/nw/se		Bear Den Mbr	22B	brt wht clyst	4	X							
Site 22	T146N, R92W	20	ne/nw/se		Bear Den Mbr	22C	gry/orng clyst, FeO	8	X							
Site 22	T146N, R92W	20	ne/nw/se		Bear Den Mbr	22D	gry/dk gry clyst	11	X							
Site 22	T146N, R92W	20	ne/nw/se		Bear Den Mbr	22E	gry clyst	12	X							
Site 22	T146N, R92W	20	ne/nw/se		Bear Den Mbr	22F	dk brn/blk clyst, carb	16	X			6				
Site 23	T142N, R96W	29	ne/ne/sw	2,620	Bear Den Mbr	23A	gry clyst	1	X							
Site 23	T142N, R96W	29	ne/ne/sw		Bear Den Mbr	23B	dk gry clyst	2.5	X							
Site 23	T142N, R96W	29	ne/ne/sw		Bear Den Mbr	23C	yel/orng clyst, FeO	3.5	X							
Site 23	T142N, R96W	29	ne/ne/sw		Bear Den Mbr	23D	yel/orng clyst, FeO	5	X							
Site 23	T142N, R96W	29	ne/ne/sw		Bear Den Mbr	23E	brt wht mdst, sndy	7	X							
Site 23	T142N, R96W	29	ne/ne/sw		Bear Den Mbr	23F	brt wht mdst, sndy	9	X							
Site 23	T142N, R96W	29	ne/ne/sw		Bear Den Mbr	23G	gry clyst, plant frags	11	X			7				
Site 24	T145N, R97W	16	nw/se/se	2,710	Bear Den Mbr	24A	gry clyst	1	X							
Site 24	T145N, R97W	16	nw/se/se		Bear Den Mbr	24B	gry clyst	2.5	X							
Site 24	T145N, R97W	16	nw/se/se		Bear Den Mbr	24C	brt wht clyst	4	X							
Site 24	T145N, R97W	16	nw/se/se		Bear Den Mbr	24D	wht/orng clyst	6	X							
Site 24	T145N, R97W	16	nw/se/se		Bear Den Mbr	24E	wht/orng clyst	9	X							
Site 24	T145N, R97W	16	nw/se/se		Bear Den Mbr	24F	dk gry/blk clyst, carb	10	X							
Site 24	T145N, R97W	16	nw/se/se		Bear Den Mbr	24G	gry clyst, gyp	11	X							
Site 24	T145N, R97W	16	nw/se/se		Bear Den Mbr	24H	gry clyst, gyp	14	X							
Site 24	T145N, R97W	16	nw/se/se		Bear Den Mbr	24I	tan mdst, silty, leaf fossils	18	X			9				
Site 25	T133N, R89W	35	nw/se/nw	2,380	Rhame Bed	25A	gry clyst	3							1	
Site 26	T132N, R89W	3	nw/nw/nw	2,410	Rhame Bed	26A	gry/wht clyst to mdst	1	X							
Site 26	T132N, R89W	3	nw/nw/nw		Rhame Bed	26B	gry/wht clyst to mdst	4	X						2	
Site 27	T132N, R89W	22	ne/ne/se	2,460	Rhame Bed	27A	brt wht to gry mdst, FeO	2				2			1	
Site 28	T131N, R89W	13	nw/sw/sw	2,500	Rhame Bed	28A	gry/wht mdst	0.5	X							
Site 28	T131N, R89W	13	nw/sw/sw		Rhame Bed	28B	gry/wht mdst	2	X							
Site 28	T131N, R89W	13	nw/sw/sw		Rhame Bed	28C	gry/wht mdst-ss, FeO	4	X							
Site 28	T131N, R89W	13	nw/sw/sw		Rhame Bed	28D	gry mdst, interbedded	7	X							
Site 28	T131N, R89W	13	nw/sw/sw		Rhame Bed	28E	yel/brn mdst, interbedded	13	X						5	
Site 29	T134N, R89W	34	se/sw/ne	2,340	Rhame Bed	29A	gry/wht mdst	1	X							

SAMPLES

	Township	Sect		Elevation Outcrop Top	Stratigraphic Unit	Sample	Lithologic Description	Ft Below Top of BDM or RB	XRF Analysis	XRD Analysis	Camels Butte	Bear Den	Sentinel Butte	Bullion Creek	Rhame Bed	Slope
Site 29	T134N, R89W	34	se/sw/ne		Rhame Bed	29B	brt wht clyst	4	X							
Site 29	T134N, R89W	34	se/sw/ne		Rhame Bed	29C	brt wht clyst	7	X							
Site 29	T134N, R89W	34	se/sw/ne		Rhame Bed	29D	gry to gry/wht clyst	12	X							
Site 29	T134N, R89W	34	se/sw/ne		Rhame Bed	29E	gry to dk gry/brn clyst, carb	14	X							
Site 29	T134N, R89W	34	se/sw/ne		Rhame Bed	29F	gry to dk gry/brn clyst, carb	17	X						6	
Site 30	T138N, R96W	16	ne/se/nw	2,520	Bear Den Mbr	30A	brt wht-gry mdst	0.5	X							
Site 30	T138N, R96W	16	ne/se/nw		Bear Den Mbr	30B	brt wht-gry mdst	1	X							
Site 30	T138N, R96W	16	ne/se/nw		Bear Den Mbr	30C	brt wht-gry mdst	3	X							
Site 30	T138N, R96W	16	ne/se/nw		Bear Den Mbr	30D	brt wht-gry mdst, sandy, FeO	5	X							
Site 30	T138N, R96W	16	ne/se/nw		Bear Den Mbr	30E	brt wht-gry mdst, sandy	7	X			5				
Site 31	T138N, R96W	21	ne/nw/nw	2,530	Bear Den Mbr	31A	brt wht, ss, FeO, cly filled frac	0.5								
Site 31	T138N, R96W	21	ne/nw/nw		Bear Den Mbr	31B	brt wht, ss, FeO, cly filled frac	3								
Site 31	T138N, R96W	21	ne/nw/nw		Bear Den Mbr	31C	brt wht, ss, FeO, cly filled frac	8							3	
Site 32	T136N, R97W	11	se/se/ne	2,840	Bear Den Mbr	32A	purp/gry clyst	2	X							
Site 32	T136N, R97W	11	se/se/ne		Bear Den Mbr	32B	wht/orng clyst, FeO	4	X							
Site 32	T136N, R97W	11	se/se/ne		Bear Den Mbr	32C	wht clyst	15	X							
Site 32	T136N, R97W	11	se/se/ne		Bear Den Mbr	32D	gry/wht slst, FeO	21	X			4				
Site 33	T130N, R94W	11	ne/nw/nw	2,610	Rhame Bed	33A	gry/wht mdst	1								
Site 33	T130N, R94W	11	ne/nw/nw		Rhame Bed	33B	gry/wht mdst	7							2	
Site 34	T130N, R94W	1	sw/sw/nw	2,620	Rhame Bed	34A	wht clyst	2	X							
Site 34	T130N, R94W	1	sw/sw/nw		Rhame Bed	34B	wht clyst	3	X							
Site 34	T130N, R94W	1	sw/sw/nw		Rhame Bed	34C	wht ss	4	X							
Site 34	T130N, R94W	1	sw/sw/nw		Rhame Bed	34D	wht clyst	6	X							
Site 34	T130N, R94W	1	sw/sw/nw		Rhame Bed	34E	gry/wht clyst, carb, plant frags	7	X							
Site 34	T130N, R94W	1	sw/sw/nw		Rhame Bed	34F	gry/wht clyst, carb, plant frags	9.5	X							
Site 34	T130N, R94W	1	sw/sw/nw		Rhame Bed	34G	wht/brn mdst, slty	11	X							
Site 34	T130N, R94W	1	sw/sw/nw		Rhame Bed	34H	wht/brn mdst, slty	14	X							
Site 34	T130N, R94W	1	sw/sw/nw		Rhame Bed	34I	gry clyst, carb	16	X						9	
Site 35	T131N, R95W	22	se/sw/se	2,630	Rhame Bed	35A	gry/wht clyst	1	X							
Site 35	T131N, R95W	22	se/sw/se		Rhame Bed	35B	gry/wht clyst	4	X							
Site 35	T131N, R95W	22	se/sw/se		Rhame Bed	35C	gry clyst, carb	5	X							
Site 35	T131N, R95W	22	se/sw/se		Rhame Bed	35D	gry/wht clyst	8	X							
Site 35	T131N, R95W	22	se/sw/se		Rhame Bed	35E	gry/wht clyst	15	X						5	
Site 36	T130N, R95W	21	sw/ne/se	2,750	Rhame Bed	36A	gry/wht mdst	2	X							

SAMPLES

	Township	Sect		Elevation Outcrop Top	Stratigraphic Unit	Sample	Lithologic Description	Ft Below Top of BDM or RB	XRF Analysis	XRD Analysis	Camels Butte	Bear Den	Sentinel Butte	Bullion Creek	Rhame Bed	Slope
Site 36	T130N, R95W	21	sw/ne/se		Rhame Bed	36B	gry/wht mdst	7	X						2	
Site 37	T130N, R95W	21	sw/ne/se	2,750	Rhame Bed	37A	wht clyst	3	X							
Site 37	T130N, R95W	21	sw/ne/se		Rhame Bed	37B	gry clyst	7	X							
Site 37	T130N, R95W	21	sw/ne/se		Rhame Bed	37C	gry/wht clyst	11							3	
Site 38	T130N, R95W	1	nw/nw/sw	2,650	Rhame Bed	38A	wht clyst	2	X							
Site 38	T130N, R95W	1	nw/nw/sw		Rhame Bed	38B	wht clyst	4	X							
Site 38	T130N, R95W	1	nw/nw/sw		Rhame Bed	38C	gry clyst	7	X							
Site 38	T130N, R95W	1	nw/nw/sw		Rhame Bed	38D	gry ss, sltst	9	X						4	
Site 39	T130N, R95W	1	nw/ne/sw	2,650	Rhame Bed	39A	wht mdst	3								
Site 39	T130N, R95W	1	nw/ne/sw		Rhame Bed	39B	wht mdst	5							2	
Site 40	T130N, R95W	1	nw/ne/sw	2,650	Rhame Bed	40A	wht ss	1								
Site 40	T130N, R95W	1	nw/ne/sw		Rhame Bed	40B	wht clyst	7							2	
Site 41	T130N, R94W	7	sw/nw/nw	2,630	Rhame Bed	41A	dk brn/blk clyst, carb	2	X							
Site 41	T130N, R94W	7	sw/nw/nw		Rhame Bed	41B	gry/wht clyst	6	X							
Site 41	T130N, R94W	7	sw/nw/nw		Rhame Bed	41C	gry clyst	15								
Site 41	T130N, R94W	7	sw/nw/nw		Rhame Bed	41D	gry/wht mdst	25	X						4	
Site 42	T131N, R89W	34	nw/ne/nw	2,810	Bear Den Mbr	42A	brt wht mdst	1								
Site 42	T131N, R89W	34	nw/ne/nw		Bear Den Mbr	42E	mdst	2								
Site 42	T131N, R89W	34	nw/ne/nw		Bear Den Mbr	42F	mdst	5								
Site 42	T131N, R89W	34	nw/ne/nw		Bear Den Mbr	42G	mdst	10								
Site 42	T131N, R89W	34	nw/ne/nw		Bear Den Mbr	42H	slst	14								
Site 42	T131N, R89W	34	nw/ne/nw		Bear Den Mbr	42I	ss	18				6				
Site 43	T131N, R89W	33	ne/ne/ne	2,850	Bear Den Mbr	43A	yel/brn clyst	2	X							
Site 43	T131N, R89W	33	ne/ne/ne		Bear Den Mbr	43B	brt wht clyst	4	X							
Site 43	T131N, R89W	33	ne/ne/ne		Bear Den Mbr	43C	gry mdst, carb	6	X							
Site 43	T131N, R89W	33	ne/ne/ne		Bear Den Mbr	43D	gry mdst, carb	8	X							
Site 43	T131N, R89W	33	ne/ne/ne		Bear Den Mbr	43E	gry mdst-slst	13	X			5				
Site 44	T130N, R92W	9	nw/nw/nw	2,490	Rhame Bed	44A	gry wht clyst to mdst	2	X							
Site 44	T130N, R92W	9	nw/nw/nw		Rhame Bed	44B	gry wht clyst to mdst	4	X							
Site 44	T130N, R92W	9	nw/nw/nw		Rhame Bed	44C	gry wht clyst to mdst	6	X						3	
Site 45	T132N, R91W	22	se/sw/sw	2,600	Rhame Bed	45A	gry wht clyst to mdst	1	X							
Site 45	T132N, R91W	22	se/sw/sw		Rhame Bed	45B	wht clyst	3	X							
Site 45	T132N, R91W	22	se/sw/sw		Rhame Bed	45C	gry clyst, some carb zones	7	X						3	
Site 46	T137N, R97W	36	nw/nw/se	2,850	Camels Butte Mbr	46A	gry clyst	3 (above)	X							
Site 46	T137N, R97W	36	nw/nw/se		Bear Den Mbr	46B	gry wht clyst, FeO	1	X							

SAMPLES

	Township	Sect		Elevation Outcrop Top	Stratigraphic Unit	Sample	Lithologic Description	Ft Below Top of BDM or RB	XRF Analysis	XRD Analysis	Camels Butte	Bear Den	Sentinel Butte	Bullion Creek	Rhame Bed	Slope
Site 46	T137N, R97W	36	nw/nw/se		Bear Den Mbr	46C	gry wht clyst, FeO	3	X							
Site 46	T137N, R97W	36	nw/nw/se		Bear Den Mbr	46D	orng/gry clyst, FeO, polys	4	X							
Site 46	T137N, R97W	36	nw/nw/se		Bear Den Mbr	46E	orng/gry clyst, FeO, polys	6	X		1	4				
Site 47	T135N, R104W	28	se/ne/se	2,920	Rhame Bed	47A	wht/gry clyst-mdst, sandy	1	X							
Site 47	T135N, R104W	28	se/ne/se		Rhame Bed	47B	wht/gry brn mdst, sandy base	7	X							
Site 47	T135N, R104W	28	se/ne/se		Rhame Bed	47C	gry/wht/orng mdst, FeO	10	X							
Site 47	T135N, R104W	28	se/ne/se		Rhame Bed	47D	gry/wht/orng mdst, slight FeO	14	X							
Site 47	T135N, R104W	28	se/ne/se		Rhame Bed	47E	gry/wht/orng mdst, slight FeO	18	X						5	
Site 48	T133N, R103W	28	se/nw/nw	3,020	Rhame Bed	48A	gry/orng/wht mdst sandy	1	X							
Site 48	T133N, R103W	28	se/nw/nw		Rhame Bed	48B	gry/wht clyst	4	X							
Site 48	T133N, R103W	28	se/nw/nw		Rhame Bed	48C	dk brn blk clyst, carb	17	X							
Site 48	T133N, R103W	28	se/nw/nw		Rhame Bed	48D	gry mdst, silty	18	X						4	
Site 49	T133N, R103W	16	nw/sw/sw	3,010	Rhame Bed	49A	wht/gry mdst, some FeO	1	X							
Site 49	T133N, R103W	16	nw/sw/sw		Rhame Bed	49B	wht/gry mdst, some FeO	4	X						2	
Site 50	T131N, R102W	6	sw/ne/se	3,020	Rhame Bed	50A	wht/gry mdst, some FeO	3	X							
Site 50	T131N, R102W	6	sw/ne/se		Rhame Bed	50B	wht/gry mdst, some FeO	6	X						2	
Site 51	T129N, R96W	1	ne/ne/ne		Rhame Bed	51A	yel/gry clyst	1	X							
Site 51	T129N, R96W	1	ne/ne/ne		Rhame Bed	51B	yel/gry clyst	3	X							
Site 51	T129N, R96W	1	ne/ne/ne		Rhame Bed	51C	gry clyst, carb	6	X							
Site 51	T129N, R96W	1	ne/ne/ne		Rhame Bed	51D	gry/wht clyst	11	X						4	
Site 52	T130N, R97W	29	nw/ne/nw	3,020	Rhame Bed	52A	gry/wht pink mdst, FeO root conc.	1							1	
Site 53	T131N, R99W	34	se/sw/se	2,760	Rhame Bed	53A	gry/wht sltst, FeO spheres	1	X							
Site 53	T131N, R99W	34	se/sw/se		Rhame Bed	53B	gry/wht sltst, FeO spheres	4	X						2	
Site 54	T130N, R101W	11	sw/nw/nw	2,900	Rhame Bed	54A	wht mdst, slty	1							1	
Site 55	T130N, R101W	4	ne/nw/ne	2,900	Rhame Bed	55A	wht mdst, slty	3	X						1	
Site 56	T133N, R103W	12	ne/se/sw	2,900	Bullion Ck	56A	yel/brn mdst, FeO chips	9 (above)	X							
Site 56	T133N, R103W	12	ne/se/sw		Bullion Ck	56B	wht mdst	6.5 (above)	X							
Site 56	T133N, R103W	12	ne/se/sw		Bullion Ck	56C	dk brn clyst, carb	3 (above)	X							
Site 56	T133N, R103W	12	ne/se/sw		Bullion Ck	56D	gry/brn mdst, rootlets	1 (above)	X							
Site 56	T133N, R103W	12	ne/se/sw		Rhame Bed	56E	wht/gry sltst, rootlets	2.5	X							
Site 56	T133N, R103W	12	ne/se/sw	Type Section	Rhame Bed	56F	wht/gry sltst, rootlets	3	X							
Site 56	T133N, R103W	12	ne/se/sw		Rhame Bed	56G	wht/gry sltst, rootlets	4	X							
Site 56	T133N, R103W	12	ne/se/sw		Rhame Bed	56H	gry ss, sltst, slty, carb zones	9	X							
Site 56	T133N, R103W	12	ne/se/sw		Rhame Bed	56I	brn mdst, carb	13	X							

SAMPLES

	Township	Sect		Elevation Outcrop Top	Stratigraphic Unit	Sample	Lithologic Description	Ft Below Top of BDM or RB	XRF Analysis	XRD Analysis	Camels Butte	Bear Den	Sentinel Butte	Bullion Creek	Rhame Bed	Slope
Site 56	T133N, R103W	12	ne/se/sw		Rhame Bed	56J	tuffaceous lense in coal	15						4	6	
Site 57	T137N, R86W	25	se/nw/ne	2,000	Rhame Bed	57A	gry/wht mdst, sandy	1								
Site 57	T137N, R86W	25	se/nw/ne		Rhame Bed	57B	gry mdst, lig lenses	8							2	
Site 58	T137N, R86W	4	sw/nw/sw		Rhame Bed	58A	gry wht mdst, some FeO	3							1	
Site 59	T137N, R86W	35	sw/se/se	2,100	Bullion Ck	59A	gold mdst, FeO conc	3 (above)	X							
Site 59	T137N, R86W	35	sw/se/se		Bullion Ck	59B	gry wht mdst	1 (above)	X							
Site 59	T137N, R86W	35	sw/se/se		Bullion Ck	59C	dk gry clyst, carb, paper shale	1 (above)	X							
Site 59	T137N, R86W	35	sw/se/se		Rhame Bed	59D	gry wht mdst, some FeO	1	X							
Site 59	T137N, R86W	35	sw/se/se		Rhame Bed	59E	gry wht mdst, some FeO	3	X							
Site 59	T137N, R86W	35	sw/se/se		Rhame Bed	59F	gry mdst, sandy mid, carb zones	7	X							
Site 59	T137N, R86W	35	sw/se/se		Rhame Bed	59G	brt wht mdst, FeO fracs&spheres, roots	8	X							
Site 59	T137N, R86W	35	sw/se/se		Rhame Bed	59H	brt wht mdst, FeO fracs&spheres, roots	12	X							
Site 59	T137N, R86W	35	sw/se/se		Rhame Bed	59I	brt wht mdst, FeO fracs&spheres, roots	18	X							
Site 59	T137N, R86W	35	sw/se/se		Rhame Bed	59J	brt wht mdst, FeO fracs&spheres, roots	22	X							
Site 59	T137N, R86W	35	sw/se/se		Rhame Bed	59K	brt wht mdst, FeO fracs&spheres, roots	26	X							
Site 59	T137N, R86W	35	sw/se/se		Rhame Bed	59L	brt wht mdst, FeO fracs&spheres, roots	16	X					3	9	
Site 60	T134N, R87W	11	nw/sw/sw	2,340	Rhame Bed	60A	brt wht mdst, sandy	2	X							
Site 60	T134N, R87W	11	nw/sw/sw		Rhame Bed	60B	brt wht ss, clyey	5	X						2	
Site 61	T136N, R87W	16	nw/nw/ne	2,100	Rhame Bed	61A	brt wht ss, FeO conc spheres	4	X							
Site 61	T136N, R87W	16	nw/nw/ne		Rhame Bed	61B	dark brn clyst, carb paper shale	13	X							
Site 61	T136N, R87W	16	nw/nw/ne		Rhame Bed	61C	brt wht ss, FeO conc spheres	18	X							
Site 61	T136N, R87W	16	nw/nw/ne		Rhame Bed	61D	ss weathering rind	20	X		0	0	0	0	4	0
											3	99	3	7	120	0
															232 total samples	

Appendix B

Chemistry

		1A			2A			2B	
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.0483	0.0251	**0.0510**	0.0843	0.0249	**0.0893**	0.1124	0.0238	**0.1196**
MgO	0.2843	0.0216	**0.3003**	0.6662	0.0225	**0.7057**	0.5478	0.0221	**0.5828**
Al2O3	16.2034	0.0186	**17.1156**	18.7031	0.0194	**19.8113**	18.4578	0.0197	**19.6366**
SiO2	75.9399	0.0330	**80.2154**	70.3797	0.0318	**74.5500**	70.5811	0.0319	**75.0887**
P2O5	0.0238	0.0042	**0.0251**	0.0282	0.0043	**0.0299**	0.0366	0.0042	**0.0389**
SO3	0.0388	0.0072	**0.0410**	0.0963	0.0070	**0.1020**	0.0894	0.0071	**0.0951**
Cl	0.0037	0.0096	**0.0039**	0.0051	0.0093	**0.0054**	0.0000	0.0095	**0.0000**
K2O	0.8047	0.0039	**0.8500**	2.3325	0.0044	**2.4707**	2.0434	0.0043	**2.1739**
CaO	0.1450	0.0052	**0.1532**	0.0858	0.0051	**0.0909**	0.0852	0.0052	**0.0906**
TiO2	0.5205	0.0358	**0.5498**	0.6229	0.0364	**0.6598**	0.7886	0.0358	**0.8390**
V2O5	0.0196	0.0055	**0.0207**	0.0204	0.0055	**0.0216**	0.0352	0.0055	**0.0375**
Cr2O3	0.0091	0.0015	**0.0096**	0.0091	0.0015	**0.0096**	0.0129	0.0016	**0.0137**
MnO	0.0040	0.0024	**0.0042**	0.0033	0.0024	**0.0035**	0.0060	0.0024	**0.0064**
Fe2O3	0.5244	0.0049	**0.5539**	1.2233	0.0049	**1.2958**	1.0427	0.0049	**1.1093**
Co2O3	0.0011	0.0018	**0.0012**	0.0013	0.0018	**0.0014**	0.0017	0.0018	**0.0018**
NiO	0.0145	0.0014	**0.0153**	0.0129	0.0014	**0.0137**	0.0140	0.0014	**0.0149**
CuO	0.0105	0.0012	**0.0111**	0.0109	0.0012	**0.0115**	0.0149	0.0012	**0.0159**
ZnO	0.0096	0.0010	**0.0101**	0.0058	0.0010	**0.0061**	0.0107	0.0010	**0.0114**
Ga2O3	0.0024	0.0011	**0.0025**	0.0042	0.0011	**0.0044**	0.0037	0.0011	**0.0039**
As2O3	0.0000	0.0010	**0.0000**	0.0024	0.0010	**0.0025**	0.0016	0.0010	**0.0017**
Br	0.0002	0.0007	**0.0002**	0.0000	0.0007	**0.0000**	0.0003	0.0007	**0.0003**
Rb2O	0.0046	0.0007	**0.0049**	0.0148	0.0007	**0.0157**	0.0108	0.0007	**0.0115**
SrO	0.0030	0.0007	**0.0032**	0.0044	0.0007	**0.0047**	0.0089	0.0007	**0.0095**
Y2O3	0.0000	0.0008	**0.0000**	0.0017	0.0008	**0.0018**	0.0021	0.0008	**0.0022**
ZrO2	0.0153	0.0006	**0.0162**	0.0280	0.0006	**0.0297**	0.0295	0.0006	**0.0314**
Nb2O5	0.0002	0.0008	**0.0002**	0.0015	0.0008	**0.0016**	0.0012	0.0008	**0.0013**
MoO3	0.0000	0.0008	**0.0000**	0.0000	0.0008	**0.0000**	0.0000	0.0008	**0.0000**
BaO	0.0334	0.0140	**0.0353**	0.0484	0.0139	**0.0513**	0.0497	0.0147	**0.0529**
HfO2	0.0027	0.0039	**0.0028**	0.0043	0.0038	**0.0046**	0.0042	0.0039	**0.0045**
PbO	0.0024	0.0020	**0.0025**	0.0000	0.0020	**0.0000**	0.0000	0.0020	**0.0000**
ThO2	0.0000	0.0014	**0.0000**	0.0000	0.0013	**0.0000**	0.0009	0.0014	**0.0010**
Pa	0.0008	0.0011	**0.0008**	0.0051	0.0011	**0.0054**	0.0031	0.0011	**0.0033**
U3O8	0.0000	0.0002	**0.0000**	0.0000	0.0002	**0.0000**	0.0004	0.0002	**0.0004**
TGA:	5.3300			5.5940			6.0030		
Total:	100.0000			100.0000			100.0000		

	3A			3B			4A		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.1353	0.0250	**0.1442**	0.1085	0.0260	**0.1159**	0.0795	0.0245	**0.0833**
MgO	0.7695	0.0229	**0.8201**	0.6970	0.0232	**0.7444**	0.2126	0.0213	**0.2228**
Al2O3	19.8573	0.0202	**21.1642**	20.2815	0.0206	**21.6604**	14.2453	0.0175	**14.9317**
SiO2	67.6395	0.0314	**72.0912**	67.7392	0.0316	**72.3447**	76.4352	0.0326	**80.1182**
P2O5	0.0360	0.0042	**0.0384**	0.0379	0.0042	**0.0405**	0.0274	0.0042	**0.0287**
SO3	0.0733	0.0072	**0.0781**	0.0717	0.0072	**0.0766**	0.0413	0.0070	**0.0433**
Cl	0.0052	0.0095	**0.0055**	0.0000	0.0099	**0.0000**	0.0019	0.0092	**0.0020**
K2O	1.9624	0.0043	**2.0916**	1.9705	0.0044	**2.1045**	1.2033	0.0039	**1.2613**
CaO	0.1764	0.0053	**0.1880**	0.1547	0.0053	**0.1652**	0.0896	0.0052	**0.0939**
TiO2	0.8069	0.0353	**0.8600**	0.7483	0.0366	**0.7992**	0.7043	0.0360	**0.7382**
V2O5	0.0310	0.0055	**0.0330**	0.0313	0.0055	**0.0334**	0.0181	0.0056	**0.0190**
Cr2O3	0.0117	0.0015	**0.0125**	0.0096	0.0016	**0.0102**	0.0092	0.0015	**0.0096**
MnO	0.0205	0.0024	**0.0218**	0.0063	0.0025	**0.0067**	0.0150	0.0024	**0.0157**
Fe2O3	2.1576	0.0298	**2.2996**	1.6411	0.0051	**1.7527**	2.2245	0.0292	**2.3317**
Co2O3	0.0012	0.0018	**0.0013**	0.0010	0.0018	**0.0011**	0.0013	0.0018	**0.0014**
NiO	0.0125	0.0014	**0.0133**	0.0139	0.0014	**0.0148**	0.0130	0.0014	**0.0136**
CuO	0.0102	0.0012	**0.0109**	0.0108	0.0012	**0.0115**	0.0091	0.0012	**0.0095**
ZnO	0.0040	0.0010	**0.0043**	0.0047	0.0010	**0.0050**	0.0060	0.0010	**0.0063**
Ga2O3	0.0030	0.0011	**0.0032**	0.0037	0.0012	**0.0039**	0.0024	0.0011	**0.0025**
As2O3	0.0000	0.0010	**0.0000**	0.0022	0.0010	**0.0023**	0.0004	0.0010	**0.0004**
Br	0.0004	0.0007	**0.0004**	0.0007	0.0007	**0.0007**	0.0000	0.0007	**0.0000**
Rb2O	0.0115	0.0007	**0.0123**	0.0109	0.0007	**0.0116**	0.0058	0.0007	**0.0061**
SrO	0.0068	0.0007	**0.0073**	0.0088	0.0007	**0.0094**	0.0051	0.0007	**0.0053**
Y2O3	0.0024	0.0008	**0.0026**	0.0008	0.0008	**0.0009**	0.0010	0.0007	**0.0010**
ZrO2	0.0261	0.0007	**0.0278**	0.0251	0.0007	**0.0268**	0.0154	0.0006	**0.0161**
Nb2O5	0.0018	0.0008	**0.0019**	0.0012	0.0008	**0.0013**	0.0001	0.0008	**0.0001**
MoO3	0.0000	0.0008	**0.0000**	0.0001	0.0008	**0.0001**	0.0000	0.0008	**0.0000**
BaO	0.0506	0.0140	**0.0539**	0.0426	0.0145	**0.0455**	0.0298	0.0144	**0.0312**
HfO2	0.0033	0.0039	**0.0035**	0.0043	0.0039	**0.0046**	0.0040	0.0038	**0.0042**
PbO	0.0038	0.0020	**0.0040**	0.0019	0.0020	**0.0020**	0.0007	0.0019	**0.0007**
ThO2	0.0010	0.0014	**0.0011**	0.0000	0.0014	**0.0000**	0.0008	0.0013	**0.0008**
Pa	0.0038	0.0011	**0.0040**	0.0035	0.0011	**0.0037**	0.0013	0.0010	**0.0014**
U3O8	0.0000	0.0002	**0.0000**	0.0004	0.0002	**0.0004**	0.0000	0.0002	**0.0000**
TGA:	6.1750			6.3660			4.5970		
Total:	100.0000			100.0000			100.0000		

	4B			4C			5A		
	Mass %	Det. Lim.	Mass %	Mass %	Det. Lim.	Mass %	Mass %	Det. Lim.	Mass %
Na2O	0.0941	0.0239	**0.0984**	0.0601	0.0245	**0.0629**	0.1248	0.0241	**0.1320**
MgO	0.1609	0.0215	**0.1682**	0.1798	0.0208	**0.1883**	0.2979	0.0217	**0.3152**
Al2O3	12.9544	0.0169	**13.5440**	13.1617	0.0168	**13.7809**	16.4780	0.0183	**17.4332**
SiO2	77.4682	0.0329	**80.9939**	77.4522	0.0327	**81.0958**	73.1131	0.0320	**77.3512**
P2O5	0.0316	0.0041	**0.0330**	0.0264	0.0042	**0.0276**	0.0317	0.0043	**0.0335**
SO3	0.1263	0.0070	**0.1321**	0.1740	0.0071	**0.1822**	0.2229	0.0071	**0.2358**
Cl	0.0000	0.0094	**0.0000**	0.0000	0.0094	**0.0000**	0.0000	0.0096	**0.0000**
K2O	1.2405	0.0040	**1.2970**	1.0715	0.0039	**1.1219**	1.6743	0.0041	**1.7714**
CaO	0.0297	0.0051	**0.0311**	0.0480	0.0051	**0.0503**	0.1397	0.0052	**0.1478**
TiO2	0.5742	0.0345	**0.6003**	0.5234	0.0340	**0.5480**	0.9379	0.0356	**0.9923**
V2O5	0.0183	0.0053	**0.0191**	0.0230	0.0052	**0.0241**	0.0401	0.0053	**0.0424**
Cr2O3	0.0097	0.0015	**0.0101**	0.0088	0.0015	**0.0092**	0.0129	0.0015	**0.0136**
MnO	0.0178	0.0023	**0.0186**	0.0080	0.0024	**0.0084**	0.0145	0.0024	**0.0153**
Fe2O3	2.8008	0.0298	**2.9283**	2.6667	0.0050	**2.7922**	1.2740	0.0294	**1.3479**
Co2O3	0.0021	0.0018	**0.0022**	0.0008	0.0018	**0.0008**	0.0014	0.0018	**0.0015**
NiO	0.0126	0.0013	**0.0132**	0.0118	0.0014	**0.0124**	0.0126	0.0014	**0.0133**
CuO	0.0109	0.0012	**0.0114**	0.0108	0.0012	**0.0113**	0.0096	0.0012	**0.0102**
ZnO	0.0056	0.0010	**0.0059**	0.0039	0.0010	**0.0041**	0.0058	0.0010	**0.0061**
Ga2O3	0.0015	0.0011	**0.0016**	0.0012	0.0011	**0.0013**	0.0007	0.0011	**0.0007**
As2O3	0.0000	0.0010	**0.0000**	0.0000	0.0010	**0.0000**	0.0076	0.0010	**0.0080**
Br	0.0006	0.0007	**0.0006**	0.0000	0.0007	**0.0000**	0.0000	0.0007	**0.0000**
Rb2O	0.0064	0.0007	**0.0067**	0.0057	0.0007	**0.0060**	0.0066	0.0007	**0.0070**
SrO	0.0045	0.0006	**0.0047**	0.0036	0.0006	**0.0038**	0.0081	0.0007	**0.0086**
Y2O3	0.0011	0.0007	**0.0012**	0.0000	0.0007	**0.0000**	0.0020	0.0007	**0.0021**
ZrO2	0.0181	0.0006	**0.0189**	0.0230	0.0006	**0.0241**	0.0410	0.0006	**0.0434**
Nb2O5	0.0001	0.0007	**0.0001**	0.0000	0.0007	**0.0000**	0.0000	0.0008	**0.0000**
MoO3	0.0007	0.0008	**0.0007**	0.0000	0.0008	**0.0000**	0.0000	0.0008	**0.0000**
BaO	0.0466	0.0137	**0.0487**	0.0343	0.0136	**0.0359**	0.0574	0.0143	**0.0607**
HfO2	0.0051	0.0037	**0.0053**	0.0038	0.0038	**0.0040**	0.0036	0.0038	**0.0038**
PbO	0.0023	0.0019	**0.0024**	0.0024	0.0019	**0.0025**	0.0000	0.0020	**0.0000**
ThO2	0.0000	0.0013	**0.0000**	0.0006	0.0013	**0.0006**	0.0001	0.0013	**0.0001**
Pa	0.0018	0.0010	**0.0019**	0.0011	0.0010	**0.0012**	0.0027	0.0010	**0.0029**
U3O8	0.0004	0.0002	**0.0004**	0.0002	0.0002	**0.0002**	0.0000	0.0002	**0.0000**
TGA:	4.3530			4.4930			5.4790		
Total:	100.0000			100.0000			100.0000		

	6A			6B			6C		
	Mass %	Det. Lim.	Mass %	Mass %	Det. Lim.	Mass %	Mass %	Det. Lim.	Mass %
Na2O	0.1213	0.0244	**0.1291**	0.1104	0.0227	**0.1183**	0.0719	0.0239	**0.0756**
MgO	0.4536	0.0201	**0.4829**	0.0854	0.0184	**0.0916**	0.0396	0.0192	**0.0416**
Al2O3	19.4987	0.0201	**20.7566**	20.6083	0.0193	**22.0923**	14.1422	0.0174	**14.8707**
SiO2	69.9837	0.0319	**74.4983**	68.5311	0.0299	**73.4658**	77.5423	0.0327	**81.5368**
P2O5	0.0319	0.0042	**0.0340**	0.0292	0.0038	**0.0313**	0.0264	0.0043	**0.0278**
SO3	0.1220	0.0073	**0.1299**	0.1462	0.0064	**0.1567**	0.1376	0.0072	**0.1447**
Cl	0.0000	0.0096	**0.0000**	0.0000	0.0087	**0.0000**	0.0000	0.0094	**0.0000**
K2O	1.6893	0.0041	**1.7983**	1.5035	0.0036	**1.6118**	0.9064	0.0038	**0.9531**
CaO	0.0605	0.0052	**0.0644**	0.0654	0.0048	**0.0701**	0.0579	0.0051	**0.0609**
TiO2	0.8322	0.0361	**0.8859**	0.7807	0.0321	**0.8369**	1.1360	0.0349	**1.1945**
V2O5	0.0303	0.0055	**0.0323**	0.0265	0.0049	**0.0284**	0.0263	0.0054	**0.0277**
Cr2O3	0.0105	0.0015	**0.0112**	0.0104	0.0014	**0.0111**	0.0091	0.0015	**0.0096**
MnO	0.0047	0.0024	**0.0050**	0.0048	0.0022	**0.0051**	0.0021	0.0024	**0.0022**
Fe2O3	0.9637	0.0048	**1.0259**	1.2562	0.0044	**1.3467**	0.8905	0.0047	**0.9364**
Co2O3	0.0013	0.0018	**0.0014**	0.0004	0.0016	**0.0004**	0.0017	0.0018	**0.0018**
NiO	0.0114	0.0014	**0.0121**	0.0104	0.0012	**0.0112**	0.0107	0.0014	**0.0113**
CuO	0.0099	0.0012	**0.0105**	0.0089	0.0011	**0.0095**	0.0097	0.0012	**0.0102**
ZnO	0.0049	0.0010	**0.0052**	0.0031	0.0009	**0.0033**	0.0023	0.0010	**0.0024**
Ga2O3	0.0031	0.0011	**0.0033**	0.0034	0.0010	**0.0036**	0.0026	0.0011	**0.0027**
As2O3	0.0002	0.0010	**0.0002**	0.0035	0.0009	**0.0038**	0.0000	0.0010	**0.0000**
Br	0.0005	0.0007	**0.0005**	0.0007	0.0006	**0.0007**	0.0008	0.0007	**0.0008**
Rb2O	0.0097	0.0007	**0.0103**	0.0075	0.0006	**0.0080**	0.0059	0.0007	**0.0062**
SrO	0.0068	0.0007	**0.0072**	0.0074	0.0006	**0.0079**	0.0044	0.0006	**0.0046**
Y2O3	0.0015	0.0008	**0.0016**	0.0014	0.0007	**0.0015**	0.0012	0.0007	**0.0013**
ZrO2	0.0315	0.0006	**0.0335**	0.0276	0.0006	**0.0296**	0.0281	0.0006	**0.0295**
Nb2O5	0.0016	0.0008	**0.0017**	0.0010	0.0007	**0.0011**	0.0027	0.0007	**0.0028**
MoO3	0.0003	0.0008	**0.0003**	0.0000	0.0007	**0.0000**	0.0000	0.0008	**0.0000**
BaO	0.0460	0.0140	**0.0490**	0.0427	0.0125	**0.0458**	0.0320	0.0138	**0.0337**
HfO2	0.0046	0.0038	**0.0049**	0.0040	0.0035	**0.0043**	0.0030	0.0038	**0.0032**
PbO	0.0008	0.0019	**0.0009**	0.0000	0.0018	**0.0000**	0.0056	0.0019	**0.0059**
ThO2	0.0000	0.0013	**0.0000**	0.0007	0.0012	**0.0007**	0.0007	0.0013	**0.0007**
Pa	0.0033	0.0011	**0.0035**	0.0023	0.0010	**0.0025**	0.0010	0.0010	**0.0011**
U3O8	0.0001	0.0002	**0.0001**	0.0000	0.0002	**0.0000**	0.0002	0.0002	**0.0002**
TGA:	6.0600			6.7170			4.8990		
Total:	100.0000			100.0000			100.0000		

	6D			6E			6F		
	Mass %	Det. Lim.	Mass %	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.0827	0.0249	**0.0884**	0.0831	0.0235	**0.0882**	0.1196	0.0241	**0.1282**
MgO	0.3958	0.0196	**0.4232**	0.0737	0.0203	**0.0782**	0.5999	0.0208	**0.6428**
Al2O3	19.5808	0.0201	**20.9377**	18.6454	0.0197	**19.7832**	21.6552	0.0211	**23.2053**
SiO2	69.7335	0.0319	**74.5661**	71.9341	0.0325	**76.3234**	66.4569	0.0321	**71.2140**
P2O5	0.0276	0.0043	**0.0295**	0.0306	0.0044	**0.0325**	0.0397	0.0044	**0.0425**
SO3	0.1958	0.0075	**0.2094**	0.0730	0.0072	**0.0775**	0.1090	0.0075	**0.1168**
Cl	0.0000	0.0097	**0.0000**	0.0000	0.0099	**0.0000**	0.0000	0.0098	**0.0000**
K2O	1.4604	0.0042	**1.5616**	1.5067	0.0040	**1.5986**	2.0158	0.0044	**2.1601**
CaO	0.0757	0.0052	**0.0809**	0.0578	0.0052	**0.0613**	0.1122	0.0055	**0.1202**
TiO2	0.7103	0.0377	**0.7595**	0.8289	0.0365	**0.8795**	0.8687	0.0368	**0.9309**
V2O5	0.0122	0.0059	**0.0130**	0.0279	0.0055	**0.0296**	0.0387	0.0056	**0.0415**
Cr2O3	0.0109	0.0015	**0.0117**	0.0100	0.0016	**0.0106**	0.0105	0.0016	**0.0113**
MnO	0.0029	0.0024	**0.0031**	0.0042	0.0024	**0.0045**	0.0053	0.0025	**0.0057**
Fe2O3	1.1032	0.0050	**1.1797**	0.8400	0.0049	**0.8913**	1.1366	0.0050	**1.2180**
Co2O3	0.0014	0.0018	**0.0015**	0.0012	0.0018	**0.0013**	0.0010	0.0019	**0.0011**
NiO	0.0119	0.0014	**0.0127**	0.0115	0.0014	**0.0122**	0.0120	0.0014	**0.0129**
CuO	0.0108	0.0012	**0.0115**	0.0111	0.0012	**0.0118**	0.0119	0.0012	**0.0128**
ZnO	0.0036	0.0010	**0.0038**	0.0036	0.0010	**0.0038**	0.0054	0.0010	**0.0058**
Ga2O3	0.0026	0.0011	**0.0028**	0.0033	0.0011	**0.0035**	0.0052	0.0012	**0.0056**
As2O3	0.0015	0.0010	**0.0016**	0.0008	0.0010	**0.0009**	0.0006	0.0010	**0.0006**
Br	0.0000	0.0007	**0.0000**	0.0001	0.0007	**0.0001**	0.0002	0.0007	**0.0002**
Rb2O	0.0077	0.0007	**0.0082**	0.0089	0.0007	**0.0094**	0.0112	0.0007	**0.0120**
SrO	0.0063	0.0007	**0.0067**	0.0063	0.0007	**0.0067**	0.0092	0.0007	**0.0099**
Y2O3	0.0009	0.0008	**0.0010**	0.0009	0.0008	**0.0010**	0.0009	0.0008	**0.0010**
ZrO2	0.0298	0.0007	**0.0319**	0.0383	0.0006	**0.0406**	0.0237	0.0007	**0.0254**
Nb2O5	0.0018	0.0008	**0.0019**	0.0012	0.0008	**0.0013**	0.0013	0.0008	**0.0014**
MoO3	0.0001	0.0008	**0.0001**	0.0007	0.0008	**0.0007**	0.0000	0.0008	**0.0000**
BaO	0.0395	0.0141	**0.0422**	0.0388	0.0140	**0.0412**	0.0611	0.0142	**0.0655**
HfO2	0.0049	0.0038	**0.0052**	0.0040	0.0039	**0.0042**	0.0022	0.0040	**0.0024**
PbO	0.0016	0.0020	**0.0017**	0.0000	0.0020	**0.0000**	0.0007	0.0020	**0.0008**
ThO2	0.0000	0.0014	**0.0000**	0.0004	0.0014	**0.0004**	0.0000	0.0014	**0.0000**
Pa	0.0029	0.0011	**0.0031**	0.0024	0.0011	**0.0025**	0.0045	0.0011	**0.0048**
U3O8	0.0002	0.0002	**0.0002**	0.0000	0.0002	**0.0000**	0.0005	0.0002	**0.0005**
TGA:	6.4810			5.7510			6.6800		
Total:	100.0000			100.0000			100.0000		

	6H			7A			7B		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.0669	0.0222	**0.0709**	0.1552	0.0244	**0.1694**	0.1638	0.0253	**0.1752**
MgO	0.0345	0.0199	**0.0366**	0.0664	0.0210	**0.0725**	0.4984	0.0205	**0.5332**
Al2O3	17.2402	0.0193	**18.2685**	20.9349	0.0211	**22.8473**	20.3590	0.0205	**21.7821**
SiO2	74.5114	0.0331	**78.9558**	67.4309	0.0323	**73.5905**	68.1210	0.0319	**72.8824**
P2O5	0.0277	0.0044	**0.0293**	0.0244	0.0045	**0.0266**	0.0404	0.0043	**0.0432**
SO3	0.1269	0.0073	**0.1345**	0.1470	0.0076	**0.1604**	0.1534	0.0073	**0.1641**
Cl	0.0034	0.0096	**0.0036**	0.0038	0.0098	**0.0042**	0.0011	0.0095	**0.0012**
K2O	0.9092	0.0040	**0.9634**	0.2111	0.0037	**0.2304**	1.3604	0.0041	**1.4555**
CaO	0.0641	0.0054	**0.0679**	0.2281	0.0053	**0.2489**	0.0280	0.0052	**0.0300**
TiO2	0.7390	0.0362	**0.7831**	1.1387	0.0357	**1.2427**	0.8034	0.0358	**0.8596**
V2O5	0.0234	0.0056	**0.0248**	0.0199	0.0056	**0.0217**	0.0314	0.0055	**0.0336**
Cr2O3	0.0094	0.0016	**0.0100**	0.0088	0.0016	**0.0096**	0.0123	0.0015	**0.0132**
MnO	0.0052	0.0024	**0.0055**	0.0048	0.0025	**0.0052**	0.0066	0.0024	**0.0071**
Fe2O3	0.4931	0.0050	**0.5225**	1.1404	0.0050	**1.2446**	1.7644	0.0050	**1.8877**
Co2O3	0.0002	0.0018	**0.0002**	0.0000	0.0019	**0.0000**	0.0000	0.0018	**0.0000**
NiO	0.0119	0.0014	**0.0126**	0.0125	0.0014	**0.0136**	0.0118	0.0014	**0.0126**
CuO	0.0117	0.0012	**0.0124**	0.0105	0.0012	**0.0115**	0.0105	0.0012	**0.0112**
ZnO	0.0029	0.0010	**0.0031**	0.0034	0.0010	**0.0037**	0.0024	0.0010	**0.0026**
Ga2O3	0.0019	0.0012	**0.0020**	0.0053	0.0012	**0.0058**	0.0046	0.0011	**0.0049**
As2O3	0.0000	0.0010	**0.0000**	0.0000	0.0010	**0.0000**	0.0007	0.0010	**0.0007**
Br	0.0003	0.0007	**0.0003**	0.0008	0.0007	**0.0009**	0.0003	0.0007	**0.0003**
Rb2O	0.0047	0.0007	**0.0050**	0.0008	0.0007	**0.0009**	0.0081	0.0007	**0.0087**
SrO	0.0034	0.0007	**0.0036**	0.0038	0.0007	**0.0041**	0.0079	0.0007	**0.0084**
Y2O3	0.0008	0.0008	**0.0009**	0.0021	0.0008	**0.0023**	0.0007	0.0008	**0.0008**
ZrO2	0.0466	0.0007	**0.0494**	0.0553	0.0007	**0.0604**	0.0320	0.0007	**0.0342**
Nb2O5	0.0013	0.0008	**0.0014**	0.0026	0.0008	**0.0028**	0.0011	0.0008	**0.0012**
MoO3	0.0002	0.0008	**0.0002**	0.0000	0.0008	**0.0000**	0.0000	0.0008	**0.0000**
BaO	0.0064	0.0149	**0.0068**	0.0088	0.0144	**0.0096**	0.0338	0.0142	**0.0362**
HfO2	0.0088	0.0039	**0.0093**	0.0059	0.0039	**0.0064**	0.0058	0.0039	**0.0062**
PbO	0.0011	0.0020	**0.0012**	0.0025	0.0020	**0.0027**	0.0004	0.0020	**0.0004**
ThO2	0.0004	0.0014	**0.0004**	0.0008	0.0014	**0.0009**	0.0009	0.0014	**0.0010**
Pa	0.0018	0.0011	**0.0019**	0.0004	0.0011	**0.0004**	0.0021	0.0011	**0.0022**
U3O8	0.0000	0.0002	**0.0000**	0.0001	0.0002	**0.0001**	0.0003	0.0002	**0.0003**
TGA:	5.6290			8.3700			6.5330		
Total:	100.0000			100.0000			100.0000		

	7B			7C			10A		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.1638	0.0253	**0.1752**	0.3338	0.0251	**0.3576**	0.3132	0.0256	**0.3250**
MgO	0.4984	0.0205	**0.5332**	0.7320	0.0207	**0.7842**	0.9812	0.0217	**1.0183**
Al2O3	20.3590	0.0205	**21.7821**	21.9647	0.0211	**23.5319**	12.3309	0.0164	**12.7967**
SiO2	68.1210	0.0319	**72.8824**	64.1718	0.0310	**68.7506**	77.3617	0.0325	**80.2840**
P2O5	0.0404	0.0043	**0.0432**	0.0315	0.0043	**0.0338**	0.0261	0.0042	**0.0271**
SO3	0.1534	0.0073	**0.1641**	0.2387	0.0073	**0.2557**	0.4908	0.0072	**0.5093**
Cl	0.0011	0.0095	**0.0012**	0.0000	0.0098	**0.0000**	0.0000	0.0094	**0.0000**
K2O	1.3604	0.0041	**1.4555**	2.2080	0.0042	**2.3656**	2.3238	0.0040	**2.4116**
CaO	0.0280	0.0052	**0.0300**	0.0366	0.0053	**0.0392**	0.0435	0.0050	**0.0451**
TiO2	0.8034	0.0358	**0.8596**	0.9080	0.0365	**0.9728**	0.6737	0.0353	**0.6991**
V2O5	0.0314	0.0055	**0.0336**	0.0519	0.0056	**0.0556**	0.0198	0.0053	**0.0205**
Cr2O3	0.0123	0.0015	**0.0132**	0.0110	0.0016	**0.0118**	0.0081	0.0015	**0.0084**
MnO	0.0066	0.0024	**0.0071**	0.0063	0.0024	**0.0068**	0.0051	0.0024	**0.0053**
Fe2O3	1.7644	0.0050	**1.8877**	2.4838	0.0051	**2.6610**	1.6480	0.0048	**1.7103**
Co2O3	0.0000	0.0018	**0.0000**	0.0001	0.0019	**0.0001**	0.0007	0.0018	**0.0007**
NiO	0.0118	0.0014	**0.0126**	0.0112	0.0014	**0.0120**	0.0132	0.0014	**0.0137**
CuO	0.0105	0.0012	**0.0112**	0.0106	0.0012	**0.0114**	0.0133	0.0012	**0.0138**
ZnO	0.0024	0.0010	**0.0026**	0.0022	0.0010	**0.0024**	0.0056	0.0010	**0.0058**
Ga2O3	0.0046	0.0011	**0.0049**	0.0041	0.0012	**0.0044**	0.0022	0.0011	**0.0023**
As2O3	0.0007	0.0010	**0.0007**	0.0108	0.0010	**0.0116**	0.0014	0.0010	**0.0015**
Br	0.0003	0.0007	**0.0003**	0.0003	0.0007	**0.0003**	0.0003	0.0007	**0.0003**
Rb2O	0.0081	0.0007	**0.0087**	0.0135	0.0007	**0.0145**	0.0198	0.0007	**0.0205**
SrO	0.0079	0.0007	**0.0084**	0.0083	0.0007	**0.0089**	0.0055	0.0006	**0.0057**
Y2O3	0.0007	0.0008	**0.0008**	0.0007	0.0008	**0.0007**	0.0016	0.0007	**0.0017**
ZrO2	0.0320	0.0007	**0.0342**	0.0204	0.0007	**0.0219**	0.0273	0.0006	**0.0283**
Nb2O5	0.0011	0.0008	**0.0012**	0.0017	0.0008	**0.0018**	0.0010	0.0007	**0.0010**
MoO3	0.0000	0.0008	**0.0000**	0.0000	0.0008	**0.0000**	0.0000	0.0008	**0.0000**
BaO	0.0338	0.0142	**0.0362**	0.0616	0.0142	**0.0660**	0.0313	0.0142	**0.0325**
HfO2	0.0058	0.0039	**0.0062**	0.0046	0.0039	**0.0049**	0.0021	0.0038	**0.0022**
PbO	0.0004	0.0020	**0.0004**	0.0064	0.0021	**0.0069**	0.0000	0.0019	**0.0000**
ThO2	0.0009	0.0014	**0.0010**	0.0001	0.0014	**0.0001**	0.0004	0.0013	**0.0004**
Pa	0.0021	0.0011	**0.0022**	0.0047	0.0011	**0.0050**	0.0080	0.0010	**0.0083**
U3O8	0.0003	0.0002	**0.0003**	0.0005	0.0002	**0.0005**	0.0006	0.0002	**0.0006**
TGA:	6.5330			6.6600			3.6400		
Total:	100.0000			100.0000			100.0000		

	10B			11A			11B		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.2543	0.0271	**0.2671**	0.0999	0.0241	**0.1046**	0.1171	0.0244	**0.1240**
MgO	1.2599	0.0224	**1.3236**	0.6732	0.0215	**0.7045**	0.7937	0.0226	**0.8404**
Al2O3	16.6562	0.0186	**17.4977**	14.6802	0.0174	**15.3633**	17.6985	0.0193	**18.7389**
SiO2	70.7121	0.0317	**74.2844**	75.1408	0.0324	**78.6370**	71.4103	0.0320	**75.6081**
P2O5	0.0299	0.0043	**0.0314**	0.0208	0.0043	**0.0218**	0.0277	0.0042	**0.0293**
SO3	0.3772	0.0072	**0.3963**	0.0757	0.0069	**0.0792**	0.0905	0.0072	**0.0958**
Cl	0.0003	0.0095	**0.0003**	0.0000	0.0094	**0.0000**	0.0041	0.0094	**0.0043**
K2O	2.7907	0.0042	**2.9317**	1.8609	0.0040	**1.9475**	1.7044	0.0040	**1.8046**
CaO	0.0580	0.0052	**0.0609**	0.1649	0.0051	**0.1726**	0.1992	0.0053	**0.2109**
TiO2	0.5777	0.0365	**0.6069**	0.7317	0.0359	**0.7657**	0.6877	0.0365	**0.7281**
V2O5	0.0191	0.0056	**0.0201**	0.0134	0.0056	**0.0140**	0.0138	0.0057	**0.0146**
Cr2O3	0.0102	0.0015	**0.0107**	0.0090	0.0015	**0.0094**	0.0090	0.0015	**0.0095**
MnO	0.0069	0.0024	**0.0072**	0.0056	0.0023	**0.0059**	0.0045	0.0024	**0.0048**
Fe2O3	2.2953	0.0049	**2.4113**	1.9310	0.0049	**2.0209**	1.5362	0.0050	**1.6265**
Co2O3	0.0013	0.0018	**0.0014**	0.0003	0.0018	**0.0003**	0.0008	0.0018	**0.0008**
NiO	0.0133	0.0014	**0.0140**	0.0114	0.0014	**0.0119**	0.0132	0.0014	**0.0140**
CuO	0.0113	0.0012	**0.0119**	0.0103	0.0012	**0.0108**	0.0145	0.0012	**0.0153**
ZnO	0.0069	0.0010	**0.0072**	0.0030	0.0010	**0.0031**	0.0044	0.0010	**0.0047**
Ga2O3	0.0025	0.0011	**0.0026**	0.0044	0.0011	**0.0046**	0.0040	0.0011	**0.0042**
As2O3	0.0000	0.0010	**0.0000**	0.0000	0.0010	**0.0000**	0.0000	0.0010	**0.0000**
Br	0.0000	0.0007	**0.0000**	0.0000	0.0007	**0.0000**	0.0007	0.0007	**0.0007**
Rb2O	0.0212	0.0007	**0.0223**	0.0144	0.0007	**0.0151**	0.0173	0.0007	**0.0183**
SrO	0.0061	0.0007	**0.0064**	0.0056	0.0007	**0.0059**	0.0085	0.0007	**0.0090**
Y2O3	0.0012	0.0008	**0.0013**	0.0016	0.0007	**0.0017**	0.0011	0.0008	**0.0012**
ZrO2	0.0227	0.0007	**0.0238**	0.0376	0.0006	**0.0394**	0.0296	0.0006	**0.0313**
Nb2O5	0.0010	0.0008	**0.0010**	0.0018	0.0008	**0.0019**	0.0015	0.0008	**0.0016**
MoO3	0.0000	0.0008	**0.0000**	0.0006	0.0008	**0.0006**	0.0000	0.0008	**0.0000**
BaO	0.0389	0.0141	**0.0409**	0.0405	0.0137	**0.0424**	0.0392	0.0141	**0.0415**
HfO2	0.0050	0.0038	**0.0053**	0.0040	0.0038	**0.0042**	0.0062	0.0038	**0.0066**
PbO	0.0037	0.0020	**0.0039**	0.0047	0.0019	**0.0049**	0.0040	0.0020	**0.0042**
ThO2	0.0001	0.0014	**0.0001**	0.0007	0.0013	**0.0007**	0.0006	0.0014	**0.0006**
Pa	0.0079	0.0011	**0.0083**	0.0053	0.0010	**0.0055**	0.0053	0.0011	**0.0056**
U3O8	0.0000	0.0002	**0.0000**	0.0006	0.0002	**0.0006**	0.0006	0.0002	**0.0006**
TGA:	4.8090			4.4460			5.5520		
Total:	100.0000			100.0000			100.0000		

	13A			13B			13C		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.0894	0.0241	**0.0937**	0.3358	0.0251	**0.3508**	0.2987	0.0236	**0.3071**
MgO	0.8930	0.0217	**0.9360**	1.7118	0.0228	**1.7884**	0.4503	0.0210	**0.4629**
Al2O3	13.9648	0.0174	**14.6373**	16.0398	0.0182	**16.7577**	9.9440	0.0155	**10.2219**
SiO2	74.9031	0.0325	**78.5098**	68.7169	0.0311	**71.7925**	83.1882	0.0334	**85.5133**
P2O5	0.0264	0.0041	**0.0277**	0.1417	0.0045	**0.1480**	0.0226	0.0040	**0.0232**
SO3	0.0631	0.0069	**0.0661**	0.3288	0.0072	**0.3435**	0.2618	0.0070	**0.2691**
Cl	0.0003	0.0094	**0.0003**	0.0033	0.0093	**0.0034**	0.0000	0.0093	**0.0000**
K2O	2.4904	0.0044	**2.6103**	3.4858	0.0046	**3.6418**	1.0858	0.0039	**1.1161**
CaO	0.1049	0.0052	**0.1100**	0.2369	0.0052	**0.2475**	0.1132	0.0051	**0.1164**
TiO2	0.9197	0.0350	**0.9640**	0.6481	0.0355	**0.6771**	0.8192	0.0347	**0.8421**
V2O5	0.0238	0.0053	**0.0249**	0.0235	0.0054	**0.0245**	0.0126	0.0053	**0.0130**
Cr2O3	0.0091	0.0015	**0.0095**	0.0093	0.0015	**0.0097**	0.0083	0.0015	**0.0085**
MnO	0.0030	0.0024	**0.0031**	0.0214	0.0024	**0.0224**	0.0050	0.0023	**0.0051**
Fe2O3	1.7618	0.0049	**1.8466**	3.8074	0.0303	**3.9778**	0.9239	0.0048	**0.9497**
Co2O3	0.0003	0.0018	**0.0003**	0.0007	0.0019	**0.0007**	0.0016	0.0017	**0.0016**
NiO	0.0118	0.0014	**0.0124**	0.0146	0.0014	**0.0153**	0.0132	0.0013	**0.0136**
CuO	0.0122	0.0012	**0.0128**	0.0139	0.0012	**0.0145**	0.0104	0.0011	**0.0107**
ZnO	0.0043	0.0010	**0.0045**	0.0157	0.0010	**0.0164**	0.0058	0.0010	**0.0060**
Ga2O3	0.0066	0.0011	**0.0069**	0.0030	0.0011	**0.0031**	0.0011	0.0011	**0.0011**
As2O3	0.0000	0.0010	**0.0000**	0.0011	0.0010	**0.0011**	0.0000	0.0010	**0.0000**
Br	0.0002	0.0007	**0.0002**	0.0001	0.0007	**0.0001**	0.0004	0.0007	**0.0004**
Rb2O	0.0189	0.0007	**0.0198**	0.0199	0.0007	**0.0208**	0.0118	0.0007	**0.0121**
SrO	0.0058	0.0007	**0.0061**	0.0128	0.0007	**0.0134**	0.0043	0.0006	**0.0044**
Y2O3	0.0014	0.0008	**0.0015**	0.0022	0.0008	**0.0023**	0.0035	0.0007	**0.0036**
ZrO2	0.0338	0.0006	**0.0354**	0.0300	0.0007	**0.0313**	0.0508	0.0006	**0.0522**
Nb2O5	0.0029	0.0008	**0.0030**	0.0013	0.0008	**0.0014**	0.0022	0.0007	**0.0023**
MoO3	0.0000	0.0008	**0.0000**	0.0000	0.0008	**0.0000**	0.0000	0.0008	**0.0000**
BaO	0.0378	0.0141	**0.0396**	0.0742	0.0140	**0.0775**	0.0293	0.0137	**0.0301**
HfO2	0.0058	0.0038	**0.0061**	0.0020	0.0039	**0.0021**	0.0041	0.0037	**0.0042**
PbO	0.0042	0.0019	**0.0044**	0.0067	0.0020	**0.0070**	0.0038	0.0019	**0.0039**
ThO2	0.0000	0.0013	**0.0000**	0.0011	0.0014	**0.0011**	0.0008	0.0013	**0.0008**
Pa	0.0068	0.0011	**0.0071**	0.0063	0.0011	**0.0066**	0.0045	0.0010	**0.0046**
U3O8	0.0006	0.0002	**0.0006**	0.0002	0.0002	**0.0002**	0.0000	0.0002	**0.0000**
TGA:	4.5940			4.2840			2.7190		
Total:	100.0000			100.0000			100.0000		

	13D			13G			14A		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.2094	0.0254	**0.2189**	0.0663	0.0228	**0.0678**	0.1753	0.0243	**0.1824**
MgO	1.0848	0.0228	**1.1341**	0.4298	0.0203	**0.4393**	0.8464	0.0191	**0.8807**
Al2O3	16.4152	0.0182	**17.1619**	6.0215	0.0136	**6.1542**	12.7565	0.0168	**13.2731**
SiO2	69.6660	0.0314	**72.8351**	88.2546	0.0340	**90.1993**	77.5265	0.0328	**80.6660**
P2O5	0.0532	0.0043	**0.0556**	0.0239	0.0042	**0.0244**	0.0228	0.0043	**0.0237**
SO3	0.1441	0.0073	**0.1507**	0.1192	0.0069	**0.1218**	0.1437	0.0072	**0.1495**
Cl	0.0000	0.0094	**0.0000**	0.0000	0.0092	**0.0000**	0.0026	0.0095	**0.0027**
K2O	3.2174	0.0046	**3.3637**	1.2599	0.0039	**1.2877**	1.6585	0.0042	**1.7257**
CaO	0.1009	0.0052	**0.1055**	0.0434	0.0049	**0.0444**	0.1190	0.0052	**0.1238**
TiO2	0.6544	0.0358	**0.6842**	0.7036	0.0341	**0.7191**	0.9414	0.0353	**0.9795**
V2O5	0.0203	0.0054	**0.0212**	0.0159	0.0052	**0.0162**	0.0216	0.0055	**0.0225**
Cr2O3	0.0097	0.0015	**0.0101**	0.0069	0.0015	**0.0071**	0.0086	0.0015	**0.0090**
MnO	0.0420	0.0024	**0.0439**	0.0042	0.0023	**0.0043**	0.0054	0.0024	**0.0056**
Fe2O3	3.8636	0.0301	**4.0393**	0.7569	0.0046	**0.7736**	1.7357	0.0048	**1.8060**
Co2O3	0.0000	0.0019	**0.0000**	0.0000	0.0017	**0.0000**	0.0013	0.0018	**0.0014**
NiO	0.0135	0.0014	**0.0141**	0.0106	0.0013	**0.0108**	0.0112	0.0014	**0.0117**
CuO	0.0133	0.0012	**0.0139**	0.0106	0.0011	**0.0108**	0.0104	0.0012	**0.0108**
ZnO	0.0076	0.0010	**0.0079**	0.0018	0.0010	**0.0018**	0.0035	0.0010	**0.0036**
Ga2O3	0.0028	0.0011	**0.0029**	0.0009	0.0011	**0.0009**	0.0036	0.0011	**0.0037**
As2O3	0.0050	0.0010	**0.0052**	0.0001	0.0010	**0.0001**	0.0027	0.0010	**0.0028**
Br	0.0000	0.0007	**0.0000**	0.0002	0.0007	**0.0002**	0.0002	0.0007	**0.0002**
Rb2O	0.0193	0.0007	**0.0202**	0.0113	0.0007	**0.0115**	0.0194	0.0007	**0.0202**
SrO	0.0073	0.0007	**0.0076**	0.0034	0.0006	**0.0035**	0.0055	0.0007	**0.0057**
Y2O3	0.0024	0.0008	**0.0025**	0.0019	0.0007	**0.0019**	0.0017	0.0008	**0.0018**
ZrO2	0.0297	0.0007	**0.0311**	0.0528	0.0006	**0.0540**	0.0298	0.0006	**0.0310**
Nb2O5	0.0012	0.0008	**0.0013**	0.0017	0.0007	**0.0017**	0.0032	0.0008	**0.0033**
MoO3	0.0000	0.0008	**0.0000**	0.0002	0.0008	**0.0002**	0.0000	0.0008	**0.0000**
BaO	0.0546	0.0141	**0.0571**	0.0328	0.0134	**0.0335**	0.0392	0.0139	**0.0408**
HfO2	0.0049	0.0039	**0.0051**	0.0055	0.0036	**0.0056**	0.0050	0.0038	**0.0052**
PbO	0.0000	0.0020	**0.0000**	0.0000	0.0019	**0.0000**	0.0000	0.0019	**0.0000**
ThO2	0.0000	0.0014	**0.0000**	0.0001	0.0013	**0.0001**	0.0008	0.0013	**0.0008**
Pa	0.0066	0.0011	**0.0069**	0.0036	0.0010	**0.0037**	0.0065	0.0011	**0.0068**
U3O8	0.0000	0.0002	**0.0000**	0.0005	0.0002	**0.0005**	0.0000	0.0002	**0.0000**
TGA:	4.3510			2.1560			3.8920		
Total:	100.0000			100.0000			100.0000		

	14B			15A			15B		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.1143	0.0226	**0.1194**	0.2334	0.0261	**0.2528**	0.2506	0.0250	**0.2691**
MgO	0.1181	0.0182	**0.1234**	0.6031	0.0209	**0.6533**	0.6423	0.0207	**0.6896**
Al2O3	13.9149	0.0170	**14.5336**	17.1085	0.0193	**18.5323**	18.3749	0.0196	**19.7285**
SiO2	78.1756	0.0324	**81.6515**	66.4800	0.0317	**72.0127**	66.5683	0.0317	**71.4720**
P2O5	0.0236	0.0041	**0.0246**	0.0275	0.0043	**0.0298**	0.0239	0.0044	**0.0257**
SO3	0.0906	0.0070	**0.0946**	0.1882	0.0075	**0.2039**	0.6095	0.0076	**0.6544**
Cl	0.0032	0.0090	**0.0033**	0.0000	0.0099	**0.0000**	0.0032	0.0097	**0.0034**
K2O	1.3221	0.0039	**1.3809**	0.8251	0.0040	**0.8938**	1.1438	0.0040	**1.2281**
CaO	0.0776	0.0050	**0.0810**	0.2868	0.0053	**0.3107**	0.2410	0.0053	**0.2587**
TiO2	0.6138	0.0335	**0.6411**	0.7285	0.0361	**0.7891**	0.6368	0.0359	**0.6837**
V2O5	0.0196	0.0051	**0.0205**	0.0340	0.0054	**0.0368**	0.0281	0.0055	**0.0302**
Cr2O3	0.0078	0.0015	**0.0081**	0.0097	0.0016	**0.0105**	0.0107	0.0016	**0.0115**
MnO	0.0045	0.0023	**0.0047**	0.0273	0.0024	**0.0296**	0.0109	0.0025	**0.0117**
Fe2O3	1.1339	0.0048	**1.1843**	5.6531	0.0317	**6.1236**	4.4265	0.0303	**4.7526**
Co2O3	0.0012	0.0017	**0.0013**	0.0002	0.0020	**0.0002**	0.0038	0.0019	**0.0041**
NiO	0.0107	0.0013	**0.0112**	0.0117	0.0015	**0.0127**	0.0129	0.0014	**0.0139**
CuO	0.0100	0.0011	**0.0104**	0.0118	0.0012	**0.0128**	0.0109	0.0012	**0.0117**
ZnO	0.0027	0.0010	**0.0028**	0.0029	0.0011	**0.0031**	0.0038	0.0011	**0.0041**
Ga2O3	0.0019	0.0011	**0.0020**	0.0031	0.0012	**0.0034**	0.0030	0.0012	**0.0032**
As2O3	0.0006	0.0010	**0.0006**	0.0000	0.0011	**0.0000**	0.0000	0.0011	**0.0000**
Br	0.0005	0.0007	**0.0005**	0.0003	0.0007	**0.0003**	0.0002	0.0007	**0.0002**
Rb2O	0.0100	0.0007	**0.0104**	0.0068	0.0008	**0.0074**	0.0086	0.0008	**0.0092**
SrO	0.0034	0.0006	**0.0035**	0.0067	0.0007	**0.0073**	0.0221	0.0007	**0.0237**
Y2O3	0.0023	0.0007	**0.0024**	0.0016	0.0008	**0.0017**	0.0016	0.0008	**0.0017**
ZrO2	0.0454	0.0006	**0.0474**	0.0324	0.0007	**0.0351**	0.0274	0.0007	**0.0294**
Nb2O5	0.0011	0.0007	**0.0012**	0.0010	0.0008	**0.0011**	0.0002	0.0008	**0.0002**
MoO3	0.0008	0.0008	**0.0008**	0.0006	0.0009	**0.0006**	0.0002	0.0009	**0.0002**
BaO	0.0234	0.0134	**0.0244**	0.0234	0.0140	**0.0253**	0.0586	0.0140	**0.0629**
HfO2	0.0058	0.0037	**0.0061**	0.0038	0.0040	**0.0041**	0.0045	0.0040	**0.0048**
PbO	0.0007	0.0019	**0.0007**	0.0026	0.0021	**0.0028**	0.0064	0.0020	**0.0069**
ThO2	0.0000	0.0013	**0.0000**	0.0006	0.0014	**0.0006**	0.0006	0.0014	**0.0006**
Pa	0.0032	0.0010	**0.0033**	0.0018	0.0011	**0.0020**	0.0034	0.0011	**0.0036**
U3O8	0.0000	0.0002	**0.0000**	0.0006	0.0002	**0.0006**	0.0004	0.0002	**0.0004**
TGA:	4.2570			7.6830			6.8610		
Total:	100.0000			100.0000			100.0000		

	15C			15D			15E		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.2017	0.0261	**0.2189**	0.3164	0.0247	**0.3415**	0.1653	0.0224	**0.1696**
MgO	0.6408	0.0204	**0.6953**	1.1254	0.0201	**1.2145**	0.0327	0.0178	**0.0336**
Al2O3	15.5414	0.0186	**16.8642**	19.4996	0.0203	**21.0436**	7.1069	0.0144	**7.2929**
SiO2	64.3723	0.0313	**69.8514**	61.5943	0.0305	**66.4713**	88.0439	0.0340	**90.3478**
P2O5	0.0323	0.0045	**0.0351**	0.0435	0.0042	**0.0469**	0.0216	0.0041	**0.0222**
SO3	0.6584	0.0077	**0.7144**	0.2578	0.0073	**0.2782**	0.1410	0.0071	**0.1447**
Cl	0.0036	0.0096	**0.0039**	0.0006	0.0096	**0.0007**	0.0000	0.0093	**0.0000**
K2O	1.1635	0.0041	**1.2625**	2.7589	0.0043	**2.9774**	0.1376	0.0035	**0.1412**
CaO	0.2160	0.0053	**0.2344**	0.1217	0.0053	**0.1313**	0.0268	0.0050	**0.0275**
TiO2	0.5714	0.0357	**0.6200**	0.6890	0.0364	**0.7436**	0.9534	0.0341	**0.9783**
V2O5	0.0290	0.0054	**0.0315**	0.0386	0.0055	**0.0417**	0.0170	0.0052	**0.0174**
Cr2O3	0.0098	0.0016	**0.0106**	0.0120	0.0016	**0.0130**	0.0058	0.0015	**0.0060**
MnO	0.0355	0.0025	**0.0385**	0.0137	0.0025	**0.0148**	0.0027	0.0023	**0.0028**
Fe2O3	8.5629	0.0318	**9.2917**	6.0292	0.0319	**6.5066**	0.6713	0.0046	**0.6889**
Co2O3	0.0007	0.0021	**0.0008**	0.0007	0.0020	**0.0008**	0.0017	0.0017	**0.0017**
NiO	0.0124	0.0015	**0.0135**	0.0111	0.0015	**0.0120**	0.0119	0.0013	**0.0122**
CuO	0.0116	0.0013	**0.0126**	0.0128	0.0012	**0.0138**	0.0105	0.0011	**0.0108**
ZnO	0.0042	0.0011	**0.0046**	0.0040	0.0011	**0.0043**	0.0023	0.0010	**0.0024**
Ga2O3	0.0019	0.0012	**0.0021**	0.0036	0.0012	**0.0039**	0.0016	0.0011	**0.0016**
As2O3	0.0020	0.0011	**0.0022**	0.0000	0.0011	**0.0000**	0.0012	0.0010	**0.0012**
Br	0.0006	0.0007	**0.0006**	0.0003	0.0007	**0.0003**	0.0003	0.0007	**0.0003**
Rb2O	0.0086	0.0008	**0.0093**	0.0179	0.0008	**0.0193**	0.0006	0.0007	**0.0006**
SrO	0.0071	0.0007	**0.0077**	0.0124	0.0007	**0.0134**	0.0025	0.0006	**0.0026**
Y2O3	0.0005	0.0008	**0.0005**	0.0005	0.0008	**0.0005**	0.0039	0.0007	**0.0040**
ZrO2	0.0340	0.0007	**0.0369**	0.0177	0.0007	**0.0191**	0.0633	0.0006	**0.0650**
Nb2O5	0.0002	0.0008	**0.0002**	0.0014	0.0008	**0.0015**	0.0018	0.0007	**0.0018**
MoO3	0.0003	0.0009	**0.0003**	0.0002	0.0009	**0.0002**	0.0003	0.0008	**0.0003**
BaO	0.0273	0.0142	**0.0296**	0.0684	0.0141	**0.0738**	0.0151	0.0133	**0.0155**
HfO2	0.0025	0.0041	**0.0027**	0.0018	0.0041	**0.0019**	0.0065	0.0037	**0.0067**
PbO	0.0000	0.0021	**0.0000**	0.0032	0.0021	**0.0034**	0.0001	0.0019	**0.0001**
ThO2	0.0000	0.0015	**0.0000**	0.0004	0.0014	**0.0004**	0.0000	0.0013	**0.0000**
Pa	0.0032	0.0011	**0.0035**	0.0059	0.0011	**0.0064**	0.0000	0.0010	**0.0000**
U3O8	0.0005	0.0002	**0.0005**	0.0000	0.0002	**0.0000**	0.0003	0.0002	**0.0003**
TGA:	7.8440			7.3370			2.5500		
Total:	100.0000			100.0000			100.0000		

	15F			15G			15H		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.2219	0.0242	**0.2336**	0.2555	0.0253	**0.2753**	0.3279	0.0244	**0.3504**
MgO	0.0587	0.0195	**0.0618**	0.4555	0.0203	**0.4909**	0.1067	0.0209	**0.1140**
Al2O3	13.5343	0.0171	**14.2468**	17.8902	0.0192	**19.2785**	19.0192	0.0199	**20.3242**
SiO2	77.9122	0.0331	**82.0137**	67.9130	0.0318	**73.1829**	68.3183	0.0319	**73.0060**
P2O5	0.0238	0.0043	**0.0251**	0.0227	0.0042	**0.0245**	0.0292	0.0043	**0.0312**
SO3	0.2398	0.0074	**0.2524**	0.4525	0.0074	**0.4876**	0.2201	0.0074	**0.2352**
Cl	0.0000	0.0096	**0.0000**	0.0016	0.0095	**0.0017**	0.0042	0.0095	**0.0045**
K2O	0.2483	0.0037	**0.2614**	0.6365	0.0039	**0.6859**	1.2007	0.0041	**1.2831**
CaO	0.0522	0.0052	**0.0549**	0.0730	0.0052	**0.0787**	0.0519	0.0052	**0.0555**
TiO2	1.0171	0.0357	**1.0706**	0.8867	0.0353	**0.9555**	0.8769	0.0358	**0.9371**
V2O5	0.0267	0.0054	**0.0281**	0.0298	0.0055	**0.0321**	0.0283	0.0054	**0.0302**
Cr2O3	0.0082	0.0015	**0.0086**	0.0104	0.0015	**0.0112**	0.0115	0.0015	**0.0123**
MnO	0.0035	0.0024	**0.0037**	0.0075	0.0024	**0.0081**	0.0123	0.0024	**0.0131**
Fe2O3	1.5444	0.0050	**1.6257**	4.0614	0.0050	**4.3766**	3.2494	0.0296	**3.4723**
Co2O3	0.0018	0.0018	**0.0019**	0.0000	0.0019	**0.0000**	0.0013	0.0018	**0.0014**
NiO	0.0102	0.0014	**0.0107**	0.0113	0.0014	**0.0122**	0.0103	0.0014	**0.0110**
CuO	0.0119	0.0012	**0.0125**	0.0113	0.0012	**0.0122**	0.0101	0.0012	**0.0108**
ZnO	0.0028	0.0010	**0.0029**	0.0025	0.0010	**0.0027**	0.0031	0.0010	**0.0033**
Ga2O3	0.0029	0.0011	**0.0031**	0.0038	0.0012	**0.0041**	0.0045	0.0012	**0.0048**
As2O3	0.0000	0.0010	**0.0000**	0.0017	0.0010	**0.0018**	0.0000	0.0010	**0.0000**
Br	0.0000	0.0007	**0.0000**	0.0000	0.0007	**0.0000**	0.0006	0.0007	**0.0006**
Rb2O	0.0018	0.0007	**0.0019**	0.0047	0.0007	**0.0051**	0.0085	0.0007	**0.0091**
SrO	0.0067	0.0007	**0.0071**	0.0065	0.0007	**0.0070**	0.0058	0.0007	**0.0062**
Y2O3	0.0028	0.0008	**0.0030**	0.0008	0.0008	**0.0009**	0.0009	0.0008	**0.0010**
ZrO2	0.0455	0.0006	**0.0479**	0.0337	0.0007	**0.0363**	0.0310	0.0007	**0.0331**
Nb2O5	0.0018	0.0008	**0.0019**	0.0016	0.0008	**0.0017**	0.0016	0.0008	**0.0017**
MoO3	0.0002	0.0008	**0.0002**	0.0000	0.0008	**0.0000**	0.0002	0.0008	**0.0002**
BaO	0.0117	0.0139	**0.0123**	0.0177	0.0139	**0.0191**	0.0335	0.0142	**0.0358**
HfO2	0.0045	0.0038	**0.0047**	0.0047	0.0039	**0.0051**	0.0056	0.0039	**0.0060**
PbO	0.0025	0.0020	**0.0026**	0.0005	0.0020	**0.0005**	0.0027	0.0020	**0.0029**
ThO2	0.0000	0.0013	**0.0000**	0.0005	0.0014	**0.0005**	0.0003	0.0014	**0.0003**
Pa	0.0009	0.0011	**0.0009**	0.0011	0.0011	**0.0012**	0.0024	0.0011	**0.0026**
U3O8	0.0000	0.0002	**0.0000**	0.0001	0.0002	**0.0001**	0.0000	0.0002	**0.0000**
TGA:	5.0010			7.2010			6.4210		
Total:	100.0000			100.0000			100.0000		

	15I			15J			15K		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.3000	0.0253	**0.3237**	0.3286	0.0254	**0.3565**	0.2308	0.0283	**0.2638**
MgO	0.6753	0.0209	**0.7286**	0.7505	0.0211	**0.8142**	0.1380	0.0221	**0.1577**
Al2O3	21.4594	0.0208	**23.1518**	22.0031	0.0215	**23.8707**	17.4625	0.0201	**19.9617**
SiO2	62.9466	0.0311	**67.9109**	59.5617	0.0300	**64.6174**	48.1846	0.0287	**55.0807**
P2O5	0.0312	0.0043	**0.0337**	0.0321	0.0044	**0.0348**	0.1357	0.0048	**0.1551**
SO3	0.1561	0.0072	**0.1684**	0.2206	0.0075	**0.2393**	0.1805	0.0075	**0.2063**
Cl	0.0000	0.0096	**0.0000**	0.0035	0.0095	**0.0038**	0.0000	0.0099	**0.0000**
K2O	1.5220	0.0041	**1.6420**	1.6006	0.0043	**1.7365**	1.6103	0.0043	**1.8408**
CaO	0.0699	0.0053	**0.0754**	0.0825	0.0053	**0.0895**	0.3370	0.0055	**0.3852**
TiO2	0.8101	0.0380	**0.8740**	0.8622	0.0366	**0.9354**	0.7349	0.0374	**0.8401**
V2O5	0.0209	0.0059	**0.0225**	0.0406	0.0055	**0.0441**	0.0458	0.0056	**0.0524**
Cr2O3	0.0130	0.0016	**0.0140**	0.0132	0.0016	**0.0143**	0.0114	0.0016	**0.0130**
MnO	0.0129	0.0024	**0.0139**	0.0180	0.0025	**0.0195**	0.0729	0.0026	**0.0833**
Fe2O3	4.5298	0.0298	**4.8871**	6.5349	0.0319	**7.0896**	18.1361	0.0068	**20.7317**
Co2O3	0.0044	0.0019	**0.0047**	0.0000	0.0020	**0.0000**	0.0000	0.0024	**0.0000**
NiO	0.0115	0.0014	**0.0124**	0.0118	0.0015	**0.0128**	0.0119	0.0016	**0.0136**
CuO	0.0112	0.0012	**0.0121**	0.0118	0.0012	**0.0128**	0.0110	0.0014	**0.0126**
ZnO	0.0023	0.0011	**0.0025**	0.0036	0.0011	**0.0039**	0.0039	0.0012	**0.0045**
Ga2O3	0.0044	0.0012	**0.0048**	0.0040	0.0012	**0.0043**	0.0031	0.0014	**0.0036**
As2O3	0.0000	0.0011	**0.0000**	0.0000	0.0011	**0.0000**	0.0061	0.0012	**0.0070**
Br	0.0001	0.0007	**0.0001**	0.0003	0.0007	**0.0003**	0.0002	0.0008	**0.0002**
Rb2O	0.0095	0.0007	**0.0103**	0.0102	0.0008	**0.0111**	0.0107	0.0009	**0.0122**
SrO	0.0100	0.0007	**0.0108**	0.0115	0.0007	**0.0125**	0.0212	0.0008	**0.0242**
Y2O3	0.0017	0.0008	**0.0018**	0.0010	0.0008	**0.0011**	0.0022	0.0009	**0.0025**
ZrO2	0.0253	0.0007	**0.0273**	0.0232	0.0007	**0.0252**	0.0174	0.0008	**0.0199**
Nb2O5	0.0021	0.0008	**0.0023**	0.0016	0.0008	**0.0017**	0.0011	0.0009	**0.0013**
MoO3	0.0000	0.0008	**0.0000**	0.0001	0.0009	**0.0001**	0.0002	0.0010	**0.0002**
BaO	0.0470	0.0140	**0.0507**	0.0340	0.0149	**0.0369**	0.0851	0.0147	**0.0973**
HfO2	0.0073	0.0040	**0.0079**	0.0039	0.0040	**0.0042**	0.0040	0.0045	**0.0046**
PbO	0.0016	0.0020	**0.0017**	0.0031	0.0021	**0.0034**	0.0000	0.0024	**0.0000**
ThO2	0.0009	0.0014	**0.0010**	0.0007	0.0014	**0.0008**	0.0010	0.0016	**0.0011**
Pa	0.0030	0.0011	**0.0032**	0.0030	0.0011	**0.0033**	0.0036	0.0013	**0.0041**
U3O8	0.0004	0.0002	**0.0004**	0.0000	0.0002	**0.0000**	0.0000	0.0002	**0.0000**
TGA:	7.3100			7.8240			12.5200		
Total:	100.0000			100.0000			100.0000		

	17A			17B			18A		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.1049	0.0243	**0.1106**	0.1537	0.0234	**0.1631**	0.1260	0.0255	**0.1378**
MgO	0.5051	0.0217	**0.5327**	0.6043	0.0226	**0.6412**	0.7111	0.0242	**0.7776**
Al2O3	16.4320	0.0185	**17.3303**	17.3349	0.0190	**18.3927**	25.0445	0.0226	**27.3869**
SiO2	74.4030	0.0325	**78.4701**	70.6279	0.0319	**74.9376**	60.8033	0.0306	**66.4902**
P2O5	0.0326	0.0043	**0.0344**	0.0424	0.0044	**0.0450**	0.0381	0.0044	**0.0417**
SO3	0.1555	0.0071	**0.1640**	0.2451	0.0072	**0.2601**	0.0958	0.0074	**0.1048**
Cl	0.0064	0.0092	**0.0067**	0.0000	0.0095	**0.0000**	0.0000	0.0099	**0.0000**
K2O	1.3913	0.0040	**1.4673**	1.5827	0.0041	**1.6793**	1.8021	0.0042	**1.9706**
CaO	0.0795	0.0052	**0.0838**	0.0589	0.0051	**0.0625**	0.0689	0.0054	**0.0753**
TiO2	0.7366	0.0350	**0.7769**	0.7887	0.0352	**0.8368**	1.0028	0.0369	**1.0966**
V2O5	0.0291	0.0053	**0.0307**	0.0333	0.0054	**0.0353**	0.0379	0.0056	**0.0414**
Cr2O3	0.0100	0.0015	**0.0105**	0.0110	0.0015	**0.0117**	0.0113	0.0016	**0.0124**
MnO	0.0026	0.0024	**0.0027**	0.0118	0.0024	**0.0125**	0.0044	0.0025	**0.0048**
Fe2O3	0.7851	0.0047	**0.8280**	2.6084	0.0299	**2.7676**	1.5806	0.0051	**1.7284**
Co2O3	0.0009	0.0018	**0.0010**	0.0000	0.0018	**0.0000**	0.0009	0.0019	**0.0010**
NiO	0.0121	0.0014	**0.0128**	0.0144	0.0014	**0.0153**	0.0133	0.0014	**0.0145**
CuO	0.0117	0.0012	**0.0123**	0.0132	0.0012	**0.0140**	0.0126	0.0012	**0.0138**
ZnO	0.0021	0.0010	**0.0022**	0.0032	0.0010	**0.0034**	0.0062	0.0010	**0.0068**
Ga2O3	0.0027	0.0011	**0.0028**	0.0026	0.0011	**0.0028**	0.0049	0.0012	**0.0054**
As2O3	0.0000	0.0010	**0.0000**	0.0000	0.0010	**0.0000**	0.0017	0.0010	**0.0019**
Br	0.0005	0.0007	**0.0005**	0.0008	0.0007	**0.0008**	0.0004	0.0007	**0.0004**
Rb2O	0.0078	0.0007	**0.0082**	0.0090	0.0007	**0.0096**	0.0108	0.0007	**0.0118**
SrO	0.0078	0.0007	**0.0082**	0.0066	0.0007	**0.0070**	0.0069	0.0007	**0.0075**
Y2O3	0.0027	0.0007	**0.0029**	0.0048	0.0008	**0.0051**	0.0014	0.0008	**0.0015**
ZrO2	0.0393	0.0006	**0.0415**	0.0404	0.0006	**0.0429**	0.0229	0.0007	**0.0250**
Nb2O5	0.0011	0.0007	**0.0012**	0.0011	0.0008	**0.0012**	0.0009	0.0008	**0.0010**
MoO3	0.0005	0.0008	**0.0005**	0.0001	0.0008	**0.0001**	0.0000	0.0008	**0.0000**
BaO	0.0407	0.0138	**0.0429**	0.0387	0.0142	**0.0411**	0.0313	0.0150	**0.0342**
HfO2	0.0076	0.0037	**0.0080**	0.0038	0.0039	**0.0040**	0.0026	0.0039	**0.0028**
PbO	0.0029	0.0019	**0.0031**	0.0030	0.0020	**0.0032**	0.0000	0.0020	**0.0000**
ThO2	0.0009	0.0013	**0.0009**	0.0007	0.0014	**0.0007**	0.0000	0.0014	**0.0000**
Pa	0.0021	0.0010	**0.0022**	0.0029	0.0011	**0.0031**	0.0035	0.0011	**0.0038**
U3O8	0.0001	0.0002	**0.0001**	0.0003	0.0002	**0.0003**	0.0001	0.0002	**0.0001**
TGA:	5.1830			5.7510			8.5530		
Total:	100.0000			100.0000			100.0000		

	18B			18C			18D		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.1439	0.0269	**0.1553**	0.1480	0.0242	**0.1577**	0.1992	0.0256	**0.2183**
MgO	0.7188	0.0232	**0.7756**	0.5094	0.0221	**0.5426**	0.5952	0.0241	**0.6522**
Al2O3	22.2254	0.0214	**23.9805**	19.1280	0.0197	**20.3756**	23.0337	0.0222	**25.2385**
SiO2	64.7381	0.0313	**69.8505**	69.6867	0.0314	**74.2319**	62.9799	0.0313	**69.0085**
P2O5	0.0490	0.0044	**0.0529**	0.0311	0.0042	**0.0331**	0.0304	0.0044	**0.0333**
SO3	0.0665	0.0073	**0.0718**	0.0631	0.0072	**0.0672**	0.0821	0.0074	**0.0900**
Cl	0.0000	0.0098	**0.0000**	0.0000	0.0095	**0.0000**	0.0000	0.0100	**0.0000**
K2O	1.8298	0.0043	**1.9743**	1.6438	0.0041	**1.7510**	0.8576	0.0041	**0.9397**
CaO	0.0839	0.0053	**0.0905**	0.1106	0.0051	**0.1178**	0.2476	0.0054	**0.2713**
TiO2	1.0493	0.0363	**1.1322**	1.0961	0.0351	**1.1676**	1.1486	0.0366	**1.2585**
V2O5	0.0382	0.0055	**0.0412**	0.0290	0.0053	**0.0309**	0.0363	0.0056	**0.0398**
Cr2O3	0.0114	0.0016	**0.0123**	0.0101	0.0015	**0.0108**	0.0113	0.0016	**0.0124**
MnO	0.0059	0.0024	**0.0064**	0.0060	0.0024	**0.0064**	0.0047	0.0025	**0.0052**
Fe2O3	1.5443	0.0050	**1.6663**	1.2829	0.0046	**1.3666**	1.9194	0.0052	**2.1031**
Co2O3	0.0015	0.0018	**0.0016**	0.0008	0.0018	**0.0009**	0.0011	0.0019	**0.0012**
NiO	0.0166	0.0014	**0.0179**	0.0124	0.0014	**0.0132**	0.0129	0.0014	**0.0141**
CuO	0.0131	0.0012	**0.0141**	0.0108	0.0012	**0.0115**	0.0146	0.0012	**0.0160**
ZnO	0.0191	0.0010	**0.0206**	0.0059	0.0010	**0.0063**	0.0056	0.0011	**0.0061**
Ga2O3	0.0054	0.0011	**0.0058**	0.0035	0.0011	**0.0037**	0.0066	0.0012	**0.0072**
As2O3	0.0000	0.0010	**0.0000**	0.0000	0.0010	**0.0000**	0.0024	0.0011	**0.0026**
Br	0.0003	0.0007	**0.0003**	0.0003	0.0007	**0.0003**	0.0003	0.0007	**0.0003**
Rb2O	0.0119	0.0007	**0.0128**	0.0100	0.0007	**0.0107**	0.0085	0.0008	**0.0093**
SrO	0.0072	0.0007	**0.0078**	0.0075	0.0007	**0.0080**	0.0106	0.0007	**0.0116**
Y2O3	0.0060	0.0008	**0.0065**	0.0022	0.0007	**0.0023**	0.0000	0.0008	**0.0000**
ZrO2	0.0264	0.0007	**0.0285**	0.0310	0.0006	**0.0330**	0.0249	0.0007	**0.0273**
Nb2O5	0.0009	0.0008	**0.0010**	0.0023	0.0008	**0.0024**	0.0021	0.0008	**0.0023**
MoO3	0.0001	0.0008	**0.0001**	0.0000	0.0008	**0.0000**	0.0000	0.0008	**0.0000**
BaO	0.0536	0.0142	**0.0578**	0.0333	0.0143	**0.0355**	0.0172	0.0149	**0.0189**
HfO2	0.0068	0.0039	**0.0073**	0.0059	0.0038	**0.0063**	0.0072	0.0040	**0.0079**
PbO	0.0037	0.0020	**0.0040**	0.0033	0.0019	**0.0035**	0.0000	0.0021	**0.0000**
ThO2	0.0003	0.0014	**0.0003**	0.0000	0.0013	**0.0000**	0.0001	0.0014	**0.0001**
Pa	0.0034	0.0011	**0.0037**	0.0028	0.0010	**0.0030**	0.0032	0.0011	**0.0035**
U3O8	0.0001	0.0002	**0.0001**	0.0002	0.0002	**0.0002**	0.0007	0.0002	**0.0008**
TGA:	7.3190			6.1230			8.7360		
Total:	100.0000			100.0000			100.0000		

	18E			19A			19B		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.2576	0.0236	**0.2741**	0.2256	0.0243	**0.2369**	0.2053	0.0256	**0.2223**
MgO	0.4122	0.0226	**0.4386**	0.6874	0.0201	**0.7219**	0.6618	0.0207	**0.7167**
Al2O3	17.5315	0.0190	**18.6541**	17.7192	0.0192	**18.6075**	21.4989	0.0212	**23.2808**
SiO2	69.7303	0.0317	**74.1954**	71.9326	0.0324	**75.5388**	60.8458	0.0306	**65.8889**
P2O5	0.0291	0.0043	**0.0310**	0.0307	0.0042	**0.0322**	0.0327	0.0042	**0.0354**
SO3	0.1636	0.0074	**0.1741**	0.2603	0.0074	**0.2734**	0.1730	0.0074	**0.1873**
Cl	0.0000	0.0093	**0.0000**	0.0054	0.0093	**0.0057**	0.0000	0.0098	**0.0000**
K2O	1.1550	0.0039	**1.2290**	1.3031	0.0040	**1.3684**	1.5320	0.0042	**1.6590**
CaO	0.0838	0.0052	**0.0892**	0.0771	0.0052	**0.0810**	0.0550	0.0054	**0.0596**
TiO2	0.9035	0.0351	**0.9614**	0.9003	0.0356	**0.9454**	1.0044	0.0358	**1.0876**
V2O5	0.0281	0.0054	**0.0299**	0.0284	0.0054	**0.0298**	0.0351	0.0056	**0.0380**
Cr2O3	0.0097	0.0015	**0.0103**	0.0091	0.0016	**0.0096**	0.0113	0.0016	**0.0122**
MnO	0.0188	0.0024	**0.0200**	0.0053	0.0024	**0.0056**	0.0244	0.0025	**0.0264**
Fe2O3	3.5330	0.0293	**3.7592**	1.8851	0.0049	**1.9796**	6.1209	0.0303	**6.6282**
Co2O3	0.0010	0.0018	**0.0011**	0.0000	0.0018	**0.0000**	0.0062	0.0019	**0.0067**
NiO	0.0137	0.0014	**0.0146**	0.0116	0.0014	**0.0122**	0.0122	0.0015	**0.0132**
CuO	0.0100	0.0012	**0.0106**	0.0105	0.0012	**0.0110**	0.0121	0.0012	**0.0131**
ZnO	0.0042	0.0010	**0.0045**	0.0032	0.0010	**0.0034**	0.0028	0.0011	**0.0030**
Ga2O3	0.0038	0.0011	**0.0040**	0.0038	0.0011	**0.0040**	0.0032	0.0012	**0.0035**
As2O3	0.0008	0.0010	**0.0008**	0.0000	0.0010	**0.0000**	0.0020	0.0011	**0.0022**
Br	0.0003	0.0007	**0.0003**	0.0009	0.0007	**0.0009**	0.0003	0.0007	**0.0003**
Rb2O	0.0094	0.0007	**0.0100**	0.0125	0.0007	**0.0131**	0.0099	0.0008	**0.0107**
SrO	0.0067	0.0007	**0.0071**	0.0070	0.0007	**0.0074**	0.0068	0.0007	**0.0074**
Y2O3	0.0012	0.0008	**0.0013**	0.0011	0.0008	**0.0012**	0.0004	0.0008	**0.0004**
ZrO2	0.0344	0.0007	**0.0366**	0.0362	0.0007	**0.0380**	0.0267	0.0007	**0.0289**
Nb2O5	0.0014	0.0008	**0.0015**	0.0022	0.0008	**0.0023**	0.0021	0.0008	**0.0023**
MoO3	0.0000	0.0008	**0.0000**	0.0000	0.0008	**0.0000**	0.0001	0.0009	**0.0001**
BaO	0.0314	0.0142	**0.0334**	0.0532	0.0138	**0.0559**	0.0489	0.0141	**0.0530**
HfO2	0.0040	0.0039	**0.0043**	0.0056	0.0038	**0.0059**	0.0062	0.0040	**0.0067**
PbO	0.0007	0.0020	**0.0007**	0.0059	0.0020	**0.0062**	0.0000	0.0021	**0.0000**
ThO2	0.0004	0.0014	**0.0004**	0.0001	0.0014	**0.0001**	0.0010	0.0014	**0.0011**
Pa	0.0023	0.0011	**0.0025**	0.0025	0.0011	**0.0026**	0.0042	0.0011	**0.0045**
U3O8	0.0000	0.0002	**0.0000**	0.0000	0.0002	**0.0000**	0.0005	0.0002	**0.0005**
TGA:	6.0180			4.7740			7.6540		
Total:	100.0000			100.0000			100.0000		

	19C			19D			19E		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.4093	0.0243	**0.4354**	0.2670	0.0255	**0.2940**	0.1892	0.0267	**0.2059**
MgO	0.1016	0.0202	**0.1081**	0.5700	0.0212	**0.6277**	0.5120	0.0207	**0.5573**
Al2O3	18.5360	0.0194	**19.7198**	25.1507	0.0228	**27.6969**	24.1022	0.0220	**26.2323**
SiO2	70.4685	0.0320	**74.9689**	58.3534	0.0303	**64.2609**	62.4115	0.0309	**67.9271**
P2O5	0.0318	0.0042	**0.0338**	0.0343	0.0044	**0.0378**	0.0321	0.0043	**0.0349**
SO3	0.5094	0.0073	**0.5419**	0.1146	0.0073	**0.1262**	0.1924	0.0074	**0.2094**
Cl	0.0003	0.0095	**0.0003**	0.0000	0.0100	**0.0000**	0.0000	0.0100	**0.0000**
K2O	1.4843	0.0040	**1.5791**	0.8215	0.0039	**0.9047**	1.2042	0.0041	**1.3106**
CaO	0.0645	0.0052	**0.0686**	0.1813	0.0053	**0.1997**	0.0591	0.0053	**0.0643**
TiO2	1.0927	0.0357	**1.1625**	1.0094	0.0362	**1.1116**	0.9844	0.0363	**1.0714**
V2O5	0.0318	0.0054	**0.0338**	0.0351	0.0056	**0.0386**	0.0295	0.0056	**0.0321**
Cr2O3	0.0115	0.0015	**0.0122**	0.0112	0.0016	**0.0123**	0.0108	0.0016	**0.0118**
MnO	0.0049	0.0024	**0.0052**	0.0239	0.0025	**0.0263**	0.0044	0.0025	**0.0048**
Fe2O3	1.1094	0.0048	**1.1803**	4.1093	0.0303	**4.5253**	2.0238	0.0051	**2.2027**
Co2O3	0.0006	0.0018	**0.0006**	0.0032	0.0019	**0.0035**	0.0014	0.0019	**0.0015**
NiO	0.0117	0.0014	**0.0125**	0.0123	0.0014	**0.0136**	0.0131	0.0014	**0.0143**
CuO	0.0109	0.0012	**0.0116**	0.0143	0.0012	**0.0158**	0.0093	0.0012	**0.0101**
ZnO	0.0028	0.0010	**0.0030**	0.0054	0.0010	**0.0059**	0.0040	0.0010	**0.0044**
Ga2O3	0.0035	0.0011	**0.0037**	0.0057	0.0012	**0.0063**	0.0055	0.0012	**0.0060**
As2O3	0.0003	0.0010	**0.0003**	0.0002	0.0011	**0.0002**	0.0017	0.0010	**0.0018**
Br	0.0007	0.0007	**0.0007**	0.0007	0.0007	**0.0008**	0.0001	0.0007	**0.0001**
Rb2O	0.0101	0.0007	**0.0107**	0.0064	0.0008	**0.0070**	0.0107	0.0007	**0.0117**
SrO	0.0079	0.0007	**0.0084**	0.0098	0.0007	**0.0108**	0.0074	0.0007	**0.0080**
Y2O3	0.0025	0.0007	**0.0027**	0.0017	0.0008	**0.0019**	0.0007	0.0008	**0.0008**
ZrO2	0.0347	0.0006	**0.0369**	0.0204	0.0007	**0.0225**	0.0222	0.0007	**0.0242**
Nb2O5	0.0009	0.0008	**0.0010**	0.0025	0.0008	**0.0027**	0.0014	0.0008	**0.0015**
MoO3	0.0001	0.0008	**0.0001**	0.0000	0.0008	**0.0000**	0.0000	0.0008	**0.0000**
BaO	0.0436	0.0140	**0.0464**	0.0176	0.0145	**0.0194**	0.0380	0.0143	**0.0414**
HfO2	0.0052	0.0038	**0.0055**	0.0059	0.0039	**0.0065**	0.0046	0.0039	**0.0050**
PbO	0.0024	0.0019	**0.0026**	0.0139	0.0085	**0.0153**	0.0000	0.0020	**0.0000**
ThO2	0.0000	0.0013	**0.0000**	0.0028	0.0020	**0.0031**	0.0000	0.0014	**0.0000**
Pa	0.0028	0.0010	**0.0030**	0.0001	0.0014	**0.0001**	0.0039	0.0011	**0.0042**
U3O8	0.0004	0.0002	**0.0004**	0.0024	0.0011	**0.0026**	0.0004	0.0002	**0.0004**
TGA:	6.0030			9.1930			8.1200		
Total:	100.0000			100.0000			100.0000		

	19F			19G			20A		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.4247	0.0249	**0.4736**	0.3041	0.0251	**0.3267**	0.064189	0.02378	**0.069**
MgO	0.6171	0.0218	**0.6882**	0.0845	0.0197	**0.0908**	0.091073	0.01909	**0.0979**
Al2O3	28.8088	0.0244	**32.1276**	18.7929	0.0198	**20.1907**	12.82506	0.01715	**13.78639**
SiO2	55.1714	0.0302	**61.5271**	69.9469	0.0324	**75.1495**	70.56714	0.03211	**75.85662**
P2O5	0.0363	0.0045	**0.0405**	0.0298	0.0044	**0.0320**	0.025117	0.00436	**0.027**
SO3	0.3316	0.0077	**0.3698**	0.3735	0.0073	**0.4013**	3.913735	0.00854	**4.207096**
Cl	0.0045	0.0100	**0.0050**	0.0000	0.0098	**0.0000**	0.002605	0.00951	**0.0028**
K2O	0.6578	0.0041	**0.7336**	0.9674	0.0040	**1.0394**	0.390155	0.00375	**0.4194**
CaO	0.0982	0.0055	**0.1095**	0.0595	0.0053	**0.0639**	3.0804	0.00553	**3.311297**
TiO2	1.0168	0.0373	**1.1339**	0.7951	0.0359	**0.8542**	1.09074	0.0362	**1.172499**
V2O5	0.0328	0.0057	**0.0366**	0.0226	0.0055	**0.0243**	0.018884	0.00552	**0.0203**
Cr2O3	0.0121	0.0016	**0.0135**	0.0107	0.0016	**0.0115**	0.008372	0.00157	**0.009**
MnO	0.0047	0.0025	**0.0052**	0.0059	0.0024	**0.0063**	0.003163	0.00242	**0.0034**
Fe2O3	2.3448	0.0051	**2.6149**	1.5403	0.0049	**1.6549**	0.831661	0.00484	**0.893999**
Co2O3	0.0032	0.0019	**0.0036**	0.0020	0.0018	**0.0022**	0.000558	0.00182	**0.0006**
NiO	0.0152	0.0015	**0.0170**	0.0135	0.0014	**0.0145**	0.01107	0.00139	**0.0119**
CuO	0.0122	0.0013	**0.0136**	0.0094	0.0012	**0.0101**	0.009675	0.0012	**0.0104**
ZnO	0.0165	0.0011	**0.0184**	0.0117	0.0010	**0.0126**	0.002326	0.00102	**0.0025**
Ga2O3	0.0078	0.0012	**0.0087**	0.0044	0.0011	**0.0047**	0.002233	0.00114	**0.0024**
As2O3	0.0028	0.0011	**0.0031**	0.0009	0.0010	**0.0010**	0	0.00102	**0**
Br	0.0005	0.0007	**0.0006**	0.0001	0.0007	**0.0001**	0.000558	0.00069	**0.0006**
Rb2O	0.0060	0.0008	**0.0067**	0.0069	0.0007	**0.0074**	0.00214	0.00073	**0.0023**
SrO	0.0070	0.0007	**0.0078**	0.0102	0.0007	**0.0110**	0.010047	0.0007	**0.0108**
Y2O3	0.0010	0.0008	**0.0011**	0.0020	0.0008	**0.0021**	0.001395	0.00076	**0.0015**
ZrO2	0.0169	0.0007	**0.0189**	0.0315	0.0007	**0.0338**	0.048281	0.00065	**0.0519**
Nb2O5	0.0013	0.0008	**0.0015**	0.0013	0.0008	**0.0014**	0.002698	0.00077	**0.0029**
MoO3	0.0000	0.0009	**0.0000**	0.0000	0.0008	**0.0000**	0	0.00081	**0**
BaO	0.0114	0.0148	**0.0127**	0.0435	0.0139	**0.0467**	0.012466	0.0143	**0.0134**
HfO2	0.0047	0.0041	**0.0052**	0.0036	0.0039	**0.0039**	0.007721	0.00386	**0.0083**
PbO	0.0000	0.0021	**0.0000**	0.0000	0.0020	**0.0000**	0.002512	0.00198	**0.0027**
ThO2	0.0000	0.0014	**0.0000**	0.0000	0.0014	**0.0000**	0.000558	0.00137	**0.0006**
Pa	0.0018	0.0011	**0.0020**	0.0021	0.0011	**0.0023**	0.000465	0.00107	**0.0005**
U3O8	0.0001	0.0002	**0.0001**	0.0007	0.0002	**0.0007**	0	0.0002	**0**
TGA:	10.3300			6.9230			6.973		
Total:	100.0000			100.0000			100		

	20B			20C			21A		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.0853	0.0243	**0.0919**	0.0899	0.0245	**0.0952**	0.3609	0.0248	**0.3896**
MgO	0.3234	0.0193	**0.3483**	0.0502	0.0187	**0.0531**	1.3730	0.0229	**1.4821**
Al2O3	16.6236	0.0190	**17.9053**	16.5771	0.0187	**17.5458**	17.5116	0.0193	**18.9029**
SiO2	69.1527	0.0320	**74.4843**	75.3146	0.0325	**79.7157**	63.0923	0.0306	**68.1048**
P2O5	0.0274	0.0043	**0.0295**	0.0241	0.0043	**0.0255**	0.0703	0.0042	**0.0759**
SO3	2.0448	0.0079	**2.2025**	0.1104	0.0072	**0.1168**	1.5484	0.0077	**1.6714**
Cl	0.0000	0.0097	**0.0000**	0.0000	0.0098	**0.0000**	0.0010	0.0095	**0.0011**
K2O	0.7390	0.0039	**0.7960**	0.7882	0.0038	**0.8343**	3.2257	0.0043	**3.4820**
CaO	1.4612	0.0054	**1.5739**	0.0746	0.0052	**0.0790**	0.4108	0.0053	**0.4434**
TiO2	0.9035	0.0356	**0.9732**	0.7011	0.0360	**0.7421**	0.6696	0.0373	**0.7228**
V2O5	0.0241	0.0055	**0.0260**	0.0256	0.0053	**0.0271**	0.0197	0.0057	**0.0213**
Cr2O3	0.0097	0.0016	**0.0105**	0.0087	0.0015	**0.0092**	0.0108	0.0015	**0.0117**
MnO	0.0362	0.0024	**0.0390**	0.0042	0.0024	**0.0044**	0.0120	0.0024	**0.0130**
Fe2O3	1.2512	0.0302	**1.3477**	0.6061	0.0047	**0.6415**	4.1518	0.0300	**4.4817**
Co2O3	0.0038	0.0018	**0.0041**	0.0024	0.0018	**0.0025**	0.0019	0.0019	**0.0021**
NiO	0.0221	0.0014	**0.0238**	0.0128	0.0014	**0.0135**	0.0114	0.0014	**0.0123**
CuO	0.0092	0.0012	**0.0099**	0.0094	0.0012	**0.0099**	0.0113	0.0012	**0.0122**
ZnO	0.0070	0.0010	**0.0075**	0.0029	0.0010	**0.0031**	0.0076	0.0010	**0.0082**
Ga2O3	0.0023	0.0011	**0.0025**	0.0029	0.0011	**0.0031**	0.0043	0.0012	**0.0046**
As2O3	0.0000	0.0010	**0.0000**	0.0005	0.0010	**0.0005**	0.0004	0.0010	**0.0004**
Br	0.0000	0.0007	**0.0000**	0.0000	0.0007	**0.0000**	0.0003	0.0007	**0.0003**
Rb2O	0.0038	0.0007	**0.0041**	0.0044	0.0007	**0.0047**	0.0173	0.0007	**0.0187**
SrO	0.0031	0.0007	**0.0033**	0.0028	0.0007	**0.0030**	0.0145	0.0007	**0.0156**
Y2O3	0.0043	0.0008	**0.0046**	0.0007	0.0007	**0.0007**	0.0002	0.0008	**0.0002**
ZrO2	0.0674	0.0007	**0.0726**	0.0260	0.0006	**0.0275**	0.0196	0.0007	**0.0212**
Nb2O5	0.0006	0.0008	**0.0006**	0.0009	0.0008	**0.0009**	0.0006	0.0008	**0.0006**
MoO3	0.0000	0.0008	**0.0000**	0.0000	0.0008	**0.0000**	0.0006	0.0008	**0.0006**
BaO	0.0274	0.0140	**0.0295**	0.0353	0.0138	**0.0374**	0.0790	0.0144	**0.0853**
HfO2	0.0055	0.0039	**0.0059**	0.0014	0.0038	**0.0015**	0.0029	0.0039	**0.0031**
PbO	0.0022	0.0020	**0.0024**	0.0003	0.0019	**0.0003**	0.0041	0.0020	**0.0044**
ThO2	0.0010	0.0014	**0.0011**	0.0006	0.0013	**0.0006**	0.0002	0.0014	**0.0002**
Pa	0.0000	0.0011	**0.0000**	0.0006	0.0011	**0.0006**	0.0057	0.0011	**0.0062**
U3O8	0.0000	0.0002	**0.0000**	0.0005	0.0002	**0.0005**	0.0001	0.0002	**0.0001**
TGA:	7.1580			5.5210			7.3600		
Total:	100.0000			100.0000			100.0000		

	21B			21C			21D		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.0896	0.0243	**0.0940**	0.0597	0.0226	**0.0629**	0.1408	0.0256	**0.1536**
MgO	0.3181	0.0208	**0.3337**	0.3150	0.0196	**0.3321**	1.0437	0.0212	**1.1386**
Al2O3	9.5770	0.0156	**10.0455**	11.8386	0.0152	**12.4809**	21.6221	0.0215	**23.5879**
SiO2	81.4354	0.0334	**85.4185**	77.6473	0.0312	**81.8599**	57.9761	0.0306	**63.2471**
P2O5	0.0269	0.0041	**0.0282**	0.0220	0.0038	**0.0232**	0.0349	0.0043	**0.0381**
SO3	0.5497	0.0074	**0.5766**	0.5062	0.0065	**0.5337**	0.7400	0.0075	**0.8073**
Cl	0.0009	0.0093	**0.0009**	0.0000	0.0083	**0.0000**	0.0000	0.0100	**0.0000**
K2O	0.4620	0.0037	**0.4846**	0.3468	0.0033	**0.3656**	1.9084	0.0042	**2.0819**
CaO	0.0582	0.0051	**0.0610**	0.1017	0.0045	**0.1072**	0.1739	0.0054	**0.1897**
TiO2	0.7689	0.0347	**0.8065**	0.7914	0.0304	**0.8343**	0.6977	0.0363	**0.7611**
V2O5	0.0176	0.0053	**0.0185**	0.0221	0.0047	**0.0233**	0.0357	0.0056	**0.0389**
Cr2O3	0.0076	0.0015	**0.0080**	0.0069	0.0013	**0.0073**	0.0115	0.0016	**0.0125**
MnO	0.0052	0.0024	**0.0055**	0.0048	0.0021	**0.0051**	0.0173	0.0025	**0.0189**
Fe2O3	1.9022	0.0049	**1.9952**	3.0913	0.0043	**3.2590**	7.1262	0.0321	**7.7741**
Co2O3	0.0004	0.0018	**0.0004**	0.0025	0.0016	**0.0026**	0.0017	0.0020	**0.0019**
NiO	0.0123	0.0014	**0.0129**	0.0103	0.0012	**0.0109**	0.0133	0.0015	**0.0145**
CuO	0.0123	0.0012	**0.0129**	0.0086	0.0010	**0.0091**	0.0124	0.0013	**0.0135**
ZnO	0.0035	0.0010	**0.0037**	0.0045	0.0009	**0.0047**	0.0115	0.0011	**0.0126**
Ga2O3	0.0026	0.0011	**0.0027**	0.0022	0.0010	**0.0023**	0.0047	0.0012	**0.0051**
As2O3	0.0008	0.0010	**0.0008**	0.0000	0.0009	**0.0000**	0.0000	0.0011	**0.0000**
Br	0.0006	0.0007	**0.0006**	0.0000	0.0006	**0.0000**	0.0003	0.0007	**0.0003**
Rb2O	0.0033	0.0007	**0.0035**	0.0020	0.0006	**0.0021**	0.0124	0.0008	**0.0135**
SrO	0.0039	0.0006	**0.0041**	0.0023	0.0006	**0.0024**	0.0071	0.0007	**0.0077**
Y2O3	0.0039	0.0007	**0.0041**	0.0023	0.0007	**0.0024**	0.0009	0.0008	**0.0010**
ZrO2	0.0520	0.0006	**0.0545**	0.0454	0.0006	**0.0479**	0.0208	0.0007	**0.0227**
Nb2O5	0.0009	0.0007	**0.0009**	0.0014	0.0007	**0.0015**	0.0007	0.0008	**0.0008**
MoO3	0.0000	0.0008	**0.0000**	0.0003	0.0007	**0.0003**	0.0000	0.0009	**0.0000**
BaO	0.0097	0.0140	**0.0102**	0.0127	0.0121	**0.0134**	0.0382	0.0147	**0.0417**
HfO2	0.0090	0.0037	**0.0094**	0.0050	0.0033	**0.0053**	0.0036	0.0041	**0.0039**
PbO	0.0003	0.0019	**0.0003**	0.0000	0.0017	**0.0000**	0.0061	0.0021	**0.0067**
ThO2	0.0006	0.0013	**0.0006**	0.0003	0.0012	**0.0003**	0.0000	0.0015	**0.0000**
Pa	0.0012	0.0010	**0.0013**	0.0004	0.0009	**0.0004**	0.0039	0.0011	**0.0043**
U3O8	0.0005	0.0002	**0.0005**	0.0000	0.0002	**0.0000**	0.0000	0.0002	**0.0000**
TGA:	4.6630			5.1460			8.3340		
Total:	100.0000			100.0000			100.0000		

	21E			21F			21G		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.1303	0.0252	**0.1386**	0.1542	0.0250	**0.1631**	0.1014	0.0248	**0.1084**
MgO	0.8281	0.0203	**0.8810**	1.0295	0.0208	**1.0888**	0.5937	0.0202	**0.6344**
Al2O3	18.9414	0.0200	**20.1506**	19.0504	0.0196	**20.1470**	17.7813	0.0194	**19.0000**
SiO2	69.2606	0.0316	**73.6823**	67.9068	0.0315	**71.8157**	69.1207	0.0320	**73.8580**
P2O5	0.0324	0.0042	**0.0345**	0.0565	0.0043	**0.0598**	0.0278	0.0043	**0.0297**
SO3	0.2031	0.0074	**0.2161**	0.1732	0.0071	**0.1832**	0.3477	0.0073	**0.3715**
Cl	0.0023	0.0094	**0.0025**	0.0063	0.0094	**0.0067**	0.0000	0.0096	**0.0000**
K2O	1.8460	0.0041	**1.9639**	2.7990	0.0045	**2.9601**	1.2038	0.0040	**1.2863**
CaO	0.0535	0.0052	**0.0569**	0.0963	0.0053	**0.1018**	0.0585	0.0052	**0.0625**
TiO2	0.6064	0.0375	**0.6451**	0.8176	0.0352	**0.8647**	0.6924	0.0353	**0.7399**
V2O5	0.0140	0.0057	**0.0149**	0.0335	0.0055	**0.0354**	0.0284	0.0054	**0.0303**
Cr2O3	0.0116	0.0015	**0.0123**	0.0112	0.0016	**0.0118**	0.0109	0.0015	**0.0116**
MnO	0.0085	0.0024	**0.0090**	0.0096	0.0024	**0.0101**	0.0116	0.0024	**0.0124**
Fe2O3	1.9334	0.0303	**2.0568**	2.2475	0.0050	**2.3769**	3.4838	0.0305	**3.7226**
Co2O3	0.0000	0.0019	**0.0000**	0.0000	0.0019	**0.0000**	0.0015	0.0019	**0.0016**
NiO	0.0121	0.0014	**0.0129**	0.0122	0.0014	**0.0129**	0.0118	0.0014	**0.0126**
CuO	0.0102	0.0012	**0.0108**	0.0106	0.0012	**0.0112**	0.0118	0.0012	**0.0126**
ZnO	0.0033	0.0010	**0.0035**	0.0101	0.0010	**0.0107**	0.0058	0.0010	**0.0062**
Ga2O3	0.0032	0.0011	**0.0034**	0.0032	0.0011	**0.0034**	0.0022	0.0012	**0.0024**
As2O3	0.0016	0.0010	**0.0017**	0.0000	0.0010	**0.0000**	0.0024	0.0010	**0.0026**
Br	0.0004	0.0007	**0.0004**	0.0000	0.0007	**0.0000**	0.0004	0.0007	**0.0004**
Rb2O	0.0116	0.0007	**0.0123**	0.0168	0.0007	**0.0178**	0.0060	0.0007	**0.0064**
SrO	0.0073	0.0007	**0.0078**	0.0107	0.0007	**0.0113**	0.0055	0.0007	**0.0059**
Y2O3	0.0012	0.0008	**0.0013**	0.0009	0.0008	**0.0009**	0.0009	0.0008	**0.0010**
ZrO2	0.0331	0.0007	**0.0352**	0.0255	0.0007	**0.0270**	0.0258	0.0007	**0.0276**
Nb2O5	0.0008	0.0008	**0.0008**	0.0019	0.0008	**0.0020**	0.0011	0.0008	**0.0012**
MoO3	0.0000	0.0008	**0.0000**	0.0000	0.0008	**0.0000**	0.0000	0.0008	**0.0000**
BaO	0.0333	0.0144	**0.0354**	0.0568	0.0144	**0.0601**	0.0424	0.0137	**0.0453**
HfO2	0.0055	0.0039	**0.0059**	0.0032	0.0039	**0.0034**	0.0047	0.0039	**0.0050**
PbO	0.0000	0.0020	**0.0000**	0.0054	0.0020	**0.0057**	0.0000	0.0020	**0.0000**
ThO2	0.0004	0.0014	**0.0004**	0.0016	0.0014	**0.0017**	0.0000	0.0014	**0.0000**
Pa	0.0031	0.0011	**0.0033**	0.0059	0.0011	**0.0062**	0.0015	0.0011	**0.0016**
U3O8	0.0004	0.0002	**0.0004**	0.0006	0.0002	**0.0006**	0.0000	0.0002	**0.0000**
TGA:	6.0010			5.4430			6.4140		
Total:	100.0000			100.0000			100.0000		

	22A			22B			22C		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.2815	0.0248	**0.3026**	0.2191	0.0255	**0.2335**	0.2379	0.0265	**0.2589**
MgO	0.1194	0.0204	**0.1284**	0.5586	0.0200	**0.5953**	0.0958	0.0211	**0.1043**
Al2O3	21.4569	0.0211	**23.0660**	17.6646	0.0193	**18.8258**	19.0810	0.0203	**20.7686**
SiO2	66.4070	0.0317	**71.3869**	70.8888	0.0322	**75.5486**	66.0348	0.0319	**71.8753**
P2O5	0.0343	0.0042	**0.0369**	0.0334	0.0042	**0.0356**	0.0485	0.0043	**0.0528**
SO3	0.2103	0.0073	**0.2261**	0.1023	0.0073	**0.1090**	0.0747	0.0075	**0.0813**
Cl	0.0042	0.0096	**0.0045**	0.0020	0.0097	**0.0021**	0.0000	0.0100	**0.0000**
K2O	1.7641	0.0043	**1.8964**	1.6601	0.0042	**1.7692**	1.2697	0.0042	**1.3820**
CaO	0.0722	0.0054	**0.0776**	0.0648	0.0052	**0.0691**	0.1291	0.0053	**0.1405**
TiO2	0.9342	0.0363	**1.0043**	0.8959	0.0356	**0.9548**	1.1222	0.0366	**1.2214**
V2O5	0.0296	0.0055	**0.0318**	0.0250	0.0055	**0.0266**	0.0300	0.0056	**0.0326**
Cr2O3	0.0102	0.0016	**0.0110**	0.0108	0.0016	**0.0115**	0.0090	0.0016	**0.0098**
MnO	0.0035	0.0024	**0.0038**	0.0038	0.0024	**0.0041**	0.0481	0.0024	**0.0523**
Fe2O3	1.5554	0.0050	**1.6720**	1.5687	0.0050	**1.6718**	3.5525	0.0304	**3.8667**
Co2O3	0.0018	0.0018	**0.0019**	0.0009	0.0018	**0.0010**	0.0044	0.0019	**0.0048**
NiO	0.0112	0.0014	**0.0120**	0.0122	0.0014	**0.0130**	0.0134	0.0014	**0.0146**
CuO	0.0111	0.0012	**0.0119**	0.0099	0.0012	**0.0106**	0.0116	0.0012	**0.0126**
ZnO	0.0040	0.0010	**0.0043**	0.0053	0.0010	**0.0056**	0.0084	0.0011	**0.0091**
Ga2O3	0.0039	0.0012	**0.0042**	0.0002	0.0012	**0.0002**	0.0037	0.0012	**0.0040**
As2O3	0.0000	0.0010	**0.0000**	0.0000	0.0010	**0.0000**	0.0007	0.0011	**0.0008**
Br	0.0006	0.0007	**0.0006**	0.0000	0.0007	**0.0000**	0.0002	0.0007	**0.0002**
Rb2O	0.0110	0.0007	**0.0118**	0.0104	0.0007	**0.0111**	0.0095	0.0008	**0.0103**
SrO	0.0073	0.0007	**0.0079**	0.0088	0.0007	**0.0094**	0.0080	0.0007	**0.0087**
Y2O3	0.0010	0.0008	**0.0011**	0.0012	0.0008	**0.0013**	0.0017	0.0008	**0.0019**
ZrO2	0.0245	0.0007	**0.0263**	0.0325	0.0007	**0.0346**	0.0297	0.0007	**0.0323**
Nb2O5	0.0012	0.0008	**0.0013**	0.0016	0.0008	**0.0017**	0.0019	0.0008	**0.0021**
MoO3	0.0001	0.0008	**0.0001**	0.0006	0.0008	**0.0006**	0.0002	0.0009	**0.0002**
BaO	0.0517	0.0143	**0.0556**	0.0375	0.0141	**0.0400**	0.0387	0.0143	**0.0421**
HfO2	0.0043	0.0039	**0.0046**	0.0046	0.0039	**0.0049**	0.0057	0.0040	**0.0062**
PbO	0.0020	0.0020	**0.0022**	0.0041	0.0020	**0.0044**	0.0006	0.0020	**0.0006**
ThO2	0.0009	0.0014	**0.0010**	0.0013	0.0014	**0.0014**	0.0000	0.0014	**0.0000**
Pa	0.0040	0.0011	**0.0043**	0.0030	0.0011	**0.0032**	0.0025	0.0011	**0.0027**
U3O8	0.0006	0.0002	**0.0006**	0.0000	0.0002	**0.0000**	0.0002	0.0002	**0.0002**
TGA:	6.9760			6.1680			8.1260		
Total:	100.0000			100.0000			100.0000		

	22D			22E			22F		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.3512	0.0263	**0.3868**	0.4189	0.0258	**0.4528**	0.3241	0.0259	**0.3672**
MgO	0.0994	0.0216	**0.1095**	0.0938	0.0207	**0.1014**	0.6324	0.0222	**0.7165**
Al2O3	26.2805	0.0236	**28.9471**	21.3556	0.0211	**23.0859**	29.8311	0.0252	**33.7991**
SiO2	60.0810	0.0312	**66.1773**	66.5976	0.0320	**71.9935**	52.8026	0.0299	**59.8262**
P2O5	0.0349	0.0046	**0.0384**	0.0327	0.0043	**0.0354**	0.0382	0.0045	**0.0433**
SO3	0.0784	0.0075	**0.0864**	0.3115	0.0073	**0.3367**	0.0746	0.0076	**0.0845**
Cl	0.0000	0.0103	**0.0000**	0.0000	0.0099	**0.0000**	0.0000	0.0103	**0.0000**
K2O	0.6796	0.0041	**0.7486**	0.7670	0.0039	**0.8291**	0.7225	0.0041	**0.8186**
CaO	0.0912	0.0054	**0.1004**	0.0957	0.0052	**0.1035**	0.2500	0.0056	**0.2832**
TiO2	0.9660	0.0376	**1.0640**	0.9286	0.0365	**1.0038**	1.0603	0.0383	**1.2013**
V2O5	0.0317	0.0057	**0.0349**	0.0295	0.0056	**0.0319**	0.0385	0.0059	**0.0436**
Cr2O3	0.0098	0.0016	**0.0108**	0.0101	0.0016	**0.0109**	0.0109	0.0016	**0.0123**
MnO	0.0056	0.0025	**0.0062**	0.0047	0.0024	**0.0051**	0.0051	0.0026	**0.0058**
Fe2O3	1.9634	0.0053	**2.1626**	1.7378	0.0051	**1.8786**	2.3576	0.0053	**2.6712**
Co2O3	0.0007	0.0019	**0.0008**	0.0013	0.0019	**0.0014**	0.0019	0.0020	**0.0022**
NiO	0.0139	0.0014	**0.0153**	0.0129	0.0014	**0.0139**	0.0131	0.0015	**0.0148**
CuO	0.0124	0.0013	**0.0137**	0.0105	0.0012	**0.0114**	0.0132	0.0013	**0.0150**
ZnO	0.0066	0.0011	**0.0073**	0.0044	0.0010	**0.0048**	0.0060	0.0011	**0.0068**
Ga2O3	0.0053	0.0012	**0.0058**	0.0050	0.0012	**0.0054**	0.0072	0.0012	**0.0082**
As2O3	0.0000	0.0011	**0.0000**	0.0006	0.0010	**0.0007**	0.0000	0.0011	**0.0000**
Br	0.0005	0.0007	**0.0006**	0.0003	0.0007	**0.0003**	0.0004	0.0007	**0.0004**
Rb2O	0.0052	0.0008	**0.0057**	0.0053	0.0007	**0.0057**	0.0057	0.0008	**0.0065**
SrO	0.0064	0.0007	**0.0071**	0.0070	0.0007	**0.0076**	0.0105	0.0007	**0.0119**
Y2O3	0.0015	0.0008	**0.0017**	0.0021	0.0008	**0.0023**	0.0000	0.0008	**0.0000**
ZrO2	0.0249	0.0007	**0.0274**	0.0326	0.0007	**0.0352**	0.0184	0.0007	**0.0208**
Nb2O5	0.0016	0.0008	**0.0018**	0.0012	0.0008	**0.0013**	0.0012	0.0008	**0.0014**
MoO3	0.0004	0.0009	**0.0004**	0.0002	0.0008	**0.0002**	0.0000	0.0009	**0.0000**
BaO	0.0269	0.0147	**0.0296**	0.0320	0.0142	**0.0346**	0.0235	0.0149	**0.0266**
HfO2	0.0025	0.0040	**0.0028**	0.0046	0.0039	**0.0050**	0.0042	0.0041	**0.0048**
PbO	0.0049	0.0021	**0.0054**	0.0006	0.0020	**0.0007**	0.0054	0.0021	**0.0061**
ThO2	0.0005	0.0014	**0.0005**	0.0000	0.0014	**0.0000**	0.0009	0.0015	**0.0010**
Pa	0.0009	0.0011	**0.0010**	0.0008	0.0011	**0.0009**	0.0004	0.0012	**0.0005**
U3O8	0.0001	0.0002	**0.0001**	0.0000	0.0002	**0.0000**	0.0002	0.0002	**0.0002**
TGA:	9.2120			7.4950			11.7400		
Total:	100.0000			100.0000			100.0000		

	23A			23B			23C		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.3782	0.0256	**0.4103**	0.2136	0.0256	**0.2273**	0.1383	0.0250	**0.1442**
MgO	1.9499	0.0215	**2.1156**	0.4838	0.0193	**0.5149**	0.0438	0.0189	**0.0457**
Al2O3	21.8923	0.0216	**23.7528**	15.9642	0.0187	**16.9888**	10.5662	0.0156	**11.0135**
SiO2	59.2954	0.0304	**64.3348**	74.2745	0.0328	**79.0415**	81.4229	0.0335	**84.8694**
P2O5	0.0442	0.0043	**0.0480**	0.0337	0.0043	**0.0359**	0.0230	0.0041	**0.0240**
SO3	1.2112	0.0078	**1.3141**	0.2248	0.0074	**0.2392**	0.4579	0.0071	**0.4773**
Cl	0.0011	0.0099	**0.0012**	0.0000	0.0095	**0.0000**	0.0000	0.0095	**0.0000**
K2O	2.5055	0.0046	**2.7184**	0.2014	0.0036	**0.2143**	0.1663	0.0035	**0.1733**
CaO	0.7694	0.0056	**0.8348**	0.1015	0.0051	**0.1080**	0.2930	0.0051	**0.3054**
TiO2	0.7648	0.0371	**0.8298**	1.1116	0.0356	**1.1829**	1.2700	0.0345	**1.3238**
V2O5	0.0373	0.0056	**0.0405**	0.0374	0.0054	**0.0398**	0.0245	0.0054	**0.0255**
Cr2O3	0.0100	0.0016	**0.0109**	0.0079	0.0015	**0.0084**	0.0077	0.0015	**0.0080**
MnO	0.0149	0.0025	**0.0162**	0.0028	0.0024	**0.0030**	0.0083	0.0023	**0.0087**
Fe2O3	3.1259	0.0053	**3.3916**	1.1886	0.0049	**1.2649**	1.4066	0.0048	**1.4661**
Co2O3	0.0041	0.0019	**0.0044**	0.0010	0.0018	**0.0011**	0.0002	0.0018	**0.0002**
NiO	0.0143	0.0014	**0.0155**	0.0143	0.0014	**0.0152**	0.0114	0.0014	**0.0119**
CuO	0.0146	0.0012	**0.0158**	0.0123	0.0012	**0.0131**	0.0106	0.0012	**0.0110**
ZnO	0.0107	0.0011	**0.0116**	0.0029	0.0010	**0.0031**	0.0018	0.0010	**0.0019**
Ga2O3	0.0046	0.0012	**0.0050**	0.0044	0.0011	**0.0047**	0.0020	0.0011	**0.0021**
As2O3	0.0041	0.0011	**0.0044**	0.0051	0.0010	**0.0054**	0.0019	0.0010	**0.0020**
Br	0.0006	0.0007	**0.0007**	0.0008	0.0007	**0.0008**	0.0001	0.0007	**0.0001**
Rb2O	0.0160	0.0008	**0.0174**	0.0008	0.0007	**0.0008**	0.0012	0.0007	**0.0012**
SrO	0.0088	0.0007	**0.0096**	0.0037	0.0007	**0.0039**	0.0029	0.0006	**0.0030**
Y2O3	0.0008	0.0008	**0.0009**	0.0036	0.0008	**0.0038**	0.0027	0.0007	**0.0028**
ZrO2	0.0165	0.0007	**0.0179**	0.0524	0.0006	**0.0558**	0.0568	0.0006	**0.0592**
Nb2O5	0.0016	0.0008	**0.0017**	0.0012	0.0008	**0.0013**	0.0024	0.0007	**0.0025**
MoO3	0.0000	0.0009	**0.0000**	0.0000	0.0008	**0.0000**	0.0000	0.0008	**0.0000**
BaO	0.0611	0.0144	**0.0663**	0.0156	0.0139	**0.0166**	0.0101	0.0137	**0.0105**
HfO2	0.0041	0.0040	**0.0045**	0.0045	0.0038	**0.0048**	0.0056	0.0038	**0.0058**
PbO	0.0000	0.0021	**0.0000**	0.0000	0.0020	**0.0000**	0.0000	0.0019	**0.0000**
ThO2	0.0003	0.0014	**0.0003**	0.0001	0.0013	**0.0001**	0.0001	0.0013	**0.0001**
Pa	0.0046	0.0011	**0.0050**	0.0002	0.0011	**0.0002**	0.0007	0.0010	**0.0007**
U3O8	0.0000	0.0002	**0.0000**	0.0004	0.0002	**0.0004**	0.0001	0.0002	**0.0001**
TGA:	7.8330			6.0310			4.0610		
Total:	100.0000			100.0000			100.0000		

	23D			23E			23F		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.1938	0.0263	**0.2143**	0.1984	0.0262	**0.2160**	0.1687	0.0252	**0.1804**
MgO	0.9086	0.0217	**1.0048**	0.5032	0.0210	**0.5477**	0.0640	0.0203	**0.0684**
Al2O3	19.2873	0.0207	**21.3285**	23.9446	0.0224	**26.0630**	19.1181	0.0201	**20.4461**
SiO2	48.4933	0.0282	**53.6253**	62.9281	0.0312	**68.4954**	70.8562	0.0324	**75.7780**
P2O5	0.0660	0.0045	**0.0730**	0.0345	0.0043	**0.0375**	0.0253	0.0044	**0.0271**
SO3	0.2224	0.0074	**0.2459**	0.1340	0.0073	**0.1459**	0.1283	0.0073	**0.1372**
Cl	0.0000	0.0097	**0.0000**	0.0036	0.0098	**0.0039**	0.0000	0.0098	**0.0000**
K2O	1.4975	0.0043	**1.6560**	1.1050	0.0041	**1.2028**	0.9493	0.0040	**1.0152**
CaO	0.1809	0.0053	**0.2000**	0.0557	0.0054	**0.0606**	0.0395	0.0053	**0.0422**
TiO2	0.8425	0.0367	**0.9317**	0.8265	0.0368	**0.8996**	0.6622	0.0352	**0.7082**
V2O5	0.0477	0.0055	**0.0527**	0.0264	0.0056	**0.0287**	0.0261	0.0054	**0.0279**
Cr2O3	0.0119	0.0016	**0.0132**	0.0110	0.0016	**0.0120**	0.0089	0.0016	**0.0095**
MnO	0.0695	0.0026	**0.0768**	0.0030	0.0025	**0.0033**	0.0028	0.0024	**0.0030**
Fe2O3	18.4704	0.0352	**20.4251**	1.9725	0.0049	**2.1470**	1.3603	0.0049	**1.4548**
Co2O3	0.0029	0.0023	**0.0032**	0.0012	0.0019	**0.0013**	0.0011	0.0018	**0.0012**
NiO	0.0120	0.0016	**0.0133**	0.0123	0.0014	**0.0134**	0.0110	0.0014	**0.0118**
CuO	0.0123	0.0014	**0.0136**	0.0094	0.0012	**0.0102**	0.0119	0.0012	**0.0127**
ZnO	0.0017	0.0012	**0.0019**	0.0033	0.0010	**0.0036**	0.0038	0.0010	**0.0041**
Ga2O3	0.0040	0.0013	**0.0044**	0.0046	0.0012	**0.0050**	0.0032	0.0011	**0.0034**
As2O3	0.0000	0.0012	**0.0000**	0.0000	0.0010	**0.0000**	0.0000	0.0010	**0.0000**
Br	0.0004	0.0008	**0.0004**	0.0000	0.0007	**0.0000**	0.0005	0.0007	**0.0005**
Rb2O	0.0077	0.0009	**0.0085**	0.0071	0.0007	**0.0077**	0.0059	0.0007	**0.0063**
SrO	0.0096	0.0008	**0.0106**	0.0059	0.0007	**0.0064**	0.0030	0.0007	**0.0032**
Y2O3	0.0008	0.0009	**0.0009**	0.0006	0.0008	**0.0006**	0.0011	0.0008	**0.0012**
ZrO2	0.0180	0.0008	**0.0199**	0.0234	0.0007	**0.0255**	0.0244	0.0006	**0.0261**
Nb2O5	0.0005	0.0009	**0.0005**	0.0011	0.0008	**0.0012**	0.0005	0.0008	**0.0005**
MoO3	0.0000	0.0010	**0.0000**	0.0000	0.0008	**0.0000**	0.0002	0.0008	**0.0002**
BaO	0.0413	0.0144	**0.0457**	0.0457	0.0144	**0.0497**	0.0227	0.0144	**0.0243**
HfO2	0.0043	0.0045	**0.0048**	0.0044	0.0039	**0.0048**	0.0031	0.0038	**0.0033**
PbO	0.0065	0.0023	**0.0072**	0.0030	0.0020	**0.0033**	0.0011	0.0020	**0.0012**
ThO2	0.0000	0.0016	**0.0000**	0.0013	0.0014	**0.0014**	0.0000	0.0013	**0.0000**
Pa	0.0033	0.0012	**0.0036**	0.0023	0.0011	**0.0025**	0.0019	0.0011	**0.0020**
U3O8	0.0001	0.0002	**0.0010**	0.0000	0.0002	**0.0000**	0.0000	0.0002	**0.0000**
TGA:	9.5700			8.1280			6.4950		
Total:	100.0000			100.0000			100.0000		

	23G			24A			24B		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.2923	0.0277	**0.3143**	0.2066	0.0249	**0.2239**	0.1616	0.0267	**0.1760**
MgO	1.1042	0.0214	**1.1872**	0.0221	0.0196	**0.0240**	0.0363	0.0201	**0.0395**
Al2O3	23.0970	0.0220	**24.8336**	18.8894	0.0201	**20.4735**	20.6505	0.0209	**22.4953**
SiO2	61.3237	0.0304	**65.9345**	69.3773	0.0326	**75.1951**	66.8591	0.0321	**72.8321**
P2O5	0.0588	0.0045	**0.0632**	0.0250	0.0041	**0.0271**	0.0195	0.0044	**0.0212**
SO3	0.1123	0.0074	**0.1207**	0.5837	0.0077	**0.6327**	0.3023	0.0074	**0.3293**
Cl	0.0009	0.0097	**0.0010**	0.0000	0.0099	**0.0000**	0.0000	0.0098	**0.0000**
K2O	3.5142	0.0048	**3.7784**	0.0682	0.0036	**0.0739**	0.1181	0.0037	**0.1286**
CaO	0.1786	0.0055	**0.1920**	0.1108	0.0052	**0.1201**	0.0473	0.0053	**0.0515**
TiO2	0.8727	0.0369	**0.9383**	1.4385	0.0364	**1.5591**	0.9704	0.0351	**1.0571**
V2O5	0.0478	0.0056	**0.0514**	0.0249	0.0055	**0.0270**	0.0252	0.0056	**0.0274**
Cr2O3	0.0136	0.0016	**0.0146**	0.0067	0.0016	**0.0073**	0.0079	0.0016	**0.0086**
MnO	0.0065	0.0025	**0.0070**	0.0027	0.0024	**0.0029**	0.0063	0.0024	**0.0069**
Fe2O3	2.1321	0.0052	**2.2924**	1.3886	0.0050	**1.5050**	2.5158	0.0052	**2.7405**
Co2O3	0.0019	0.0019	**0.0020**	0.0023	0.0018	**0.0025**	0.0000	0.0019	**0.0000**
NiO	0.0166	0.0014	**0.0178**	0.0116	0.0014	**0.0126**	0.0115	0.0014	**0.0125**
CuO	0.0362	0.0012	**0.0389**	0.0115	0.0012	**0.0125**	0.0095	0.0012	**0.0103**
ZnO	0.0184	0.0011	**0.0198**	0.0014	0.0010	**0.0015**	0.0021	0.0010	**0.0023**
Ga2O3	0.0039	0.0012	**0.0042**	0.0075	0.0011	**0.0081**	0.0053	0.0012	**0.0058**
As2O3	0.0056	0.0010	**0.0060**	0.0000	0.0010	**0.0000**	0.0022	0.0010	**0.0024**
Br	0.0003	0.0007	**0.0003**	0.0004	0.0007	**0.0004**	0.0006	0.0007	**0.0006**
Rb2O	0.0174	0.0007	**0.0187**	0.0006	0.0007	**0.0006**	0.0011	0.0007	**0.0012**
SrO	0.0154	0.0007	**0.0166**	0.0028	0.0007	**0.0030**	0.0020	0.0007	**0.0022**
Y2O3	0.0038	0.0008	**0.0041**	0.0019	0.0008	**0.0021**	0.0011	0.0008	**0.0012**
ZrO2	0.0148	0.0007	**0.0159**	0.0567	0.0007	**0.0615**	0.0363	0.0007	**0.0395**
Nb2O5	0.0003	0.0008	**0.0003**	0.0034	0.0008	**0.0037**	0.0020	0.0008	**0.0022**
MoO3	0.0000	0.0008	**0.0000**	0.0000	0.0008	**0.0000**	0.0000	0.0008	**0.0000**
BaO	0.1063	0.0150	**0.1143**	0.0062	0.0143	**0.0067**	0.0000	0.0143	**0.0000**
HfO2	0.0045	0.0040	**0.0048**	0.0066	0.0039	**0.0071**	0.0043	0.0039	**0.0047**
PbO	0.0000	0.0020	**0.0000**	0.0052	0.0020	**0.0056**	0.0000	0.0020	**0.0000**
ThO2	0.0006	0.0014	**0.0006**	0.0000	0.0014	**0.0000**	0.0007	0.0014	**0.0008**
Pa	0.0066	0.0011	**0.0071**	0.0000	0.0011	**0.0000**	0.0002	0.0011	**0.0002**
U3O8	0.0000	0.0002	**0.0000**	0.0005	0.0002	**0.0005**	0.0001	0.0002	**0.0001**
TGA:	6.9930			7.7370			8.2010		
Total:	100.0000			100.0000			100.0000		

	24C			24D			24E		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.2629	0.0269	**0.2818**	0.1904	0.0248	**0.2035**	0.1943	0.0248	**0.2091**
MgO	0.4732	0.0205	**0.5072**	0.4274	0.0198	**0.4569**	0.8320	0.0211	**0.8952**
Al2O3	18.6688	0.0199	**20.0099**	16.2032	0.0185	**17.3215**	20.9529	0.0213	**22.5457**
SiO2	69.6020	0.0316	**74.6018**	69.5161	0.0319	**74.3139**	61.1395	0.0305	**65.7874**
P2O5	0.0345	0.0041	**0.0370**	0.0395	0.0043	**0.0422**	0.0443	0.0044	**0.0477**
SO3	0.5160	0.0073	**0.5531**	0.7026	0.0075	**0.7511**	0.3578	0.0075	**0.3850**
Cl	0.0000	0.0097	**0.0000**	0.0050	0.0092	**0.0053**	0.0021	0.0097	**0.0023**
K2O	0.9441	0.0039	**1.0119**	1.0891	0.0039	**1.1643**	2.4887	0.0045	**2.6779**
CaO	0.0344	0.0052	**0.0369**	0.0414	0.0051	**0.0443**	0.0612	0.0053	**0.0659**
TiO2	0.7677	0.0362	**0.8229**	0.8151	0.0350	**0.8713**	0.8586	0.0364	**0.9239**
V2O5	0.0287	0.0055	**0.0308**	0.0363	0.0053	**0.0388**	0.0517	0.0055	**0.0556**
Cr2O3	0.0096	0.0016	**0.0103**	0.0115	0.0015	**0.0123**	0.0143	0.0016	**0.0154**
MnO	0.0234	0.0024	**0.0251**	0.0122	0.0024	**0.0130**	0.0138	0.0025	**0.0148**
Fe2O3	1.7998	0.0299	**1.9291**	4.3189	0.0311	**4.6170**	5.7687	0.0319	**6.2072**
Co2O3	0.0019	0.0018	**0.0020**	0.0007	0.0019	**0.0007**	0.0021	0.0020	**0.0023**
NiO	0.0130	0.0014	**0.0139**	0.0103	0.0014	**0.0110**	0.0135	0.0015	**0.0145**
CuO	0.0104	0.0012	**0.0112**	0.0107	0.0012	**0.0114**	0.0123	0.0013	**0.0132**
ZnO	0.0026	0.0010	**0.0028**	0.0025	0.0010	**0.0027**	0.0116	0.0011	**0.0125**
Ga2O3	0.0038	0.0011	**0.0041**	0.0031	0.0012	**0.0033**	0.0047	0.0012	**0.0051**
As2O3	0.0049	0.0010	**0.0052**	0.0032	0.0010	**0.0034**	0.0019	0.0011	**0.0020**
Br	0.0000	0.0007	**0.0000**	0.0000	0.0007	**0.0000**	0.0005	0.0007	**0.0005**
Rb2O	0.0063	0.0007	**0.0068**	0.0060	0.0007	**0.0064**	0.0154	0.0008	**0.0166**
SrO	0.0180	0.0007	**0.0193**	0.0076	0.0007	**0.0081**	0.0071	0.0007	**0.0076**
Y2O3	0.0012	0.0008	**0.0013**	0.0021	0.0008	**0.0022**	0.0006	0.0008	**0.0006**
ZrO2	0.0313	0.0007	**0.0335**	0.0427	0.0007	**0.0457**	0.0206	0.0007	**0.0222**
Nb2O5	0.0014	0.0008	**0.0015**	0.0015	0.0008	**0.0016**	0.0018	0.0008	**0.0019**
MoO3	0.0003	0.0008	**0.0003**	0.0001	0.0008	**0.0001**	0.0002	0.0009	**0.0002**
BaO	0.0314	0.0140	**0.0337**	0.0267	0.0141	**0.0285**	0.0516	0.0146	**0.0555**
HfO2	0.0050	0.0038	**0.0054**	0.0030	0.0039	**0.0032**	0.0042	0.0040	**0.0045**
PbO	0.0000	0.0020	**0.0000**	0.0032	0.0020	**0.0034**	0.0000	0.0021	**0.0000**
ThO2	0.0000	0.0014	**0.0000**	0.0000	0.0014	**0.0000**	0.0020	0.0014	**0.0021**
Pa	0.0007	0.0011	**0.0007**	0.0016	0.0011	**0.0017**	0.0051	0.0011	**0.0055**
U3O8	0.0005	0.0002	**0.0005**	0.0002	0.0002	**0.0002**	0.0000	0.0002	**0.0000**
TGA:	6.7020			6.4560			7.0650		
Total:	100.0000			100.0000			100.0000		

	24F			24G			24H		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.3817	0.0304	**0.4868**	0.3817	0.0267	**0.4033**	0.3829	0.0252	**0.4137**
MgO	0.5209	0.0236	**0.6643**	1.0978	0.0207	**1.1600**	0.1708	0.0210	**0.1845**
Al2O3	15.3073	0.0218	**19.5222**	18.7446	0.0196	**19.8072**	21.2335	0.0209	**22.9405**
SiO2	56.4400	0.0345	**71.9807**	67.6595	0.0311	**71.4952**	65.4890	0.0315	**70.7538**
P2O5	0.0786	0.0054	**0.1002**	0.0377	0.0043	**0.0398**	0.0321	0.0042	**0.0347**
SO3	0.2127	0.0089	**0.2713**	0.5341	0.0074	**0.5644**	0.7694	0.0076	**0.8312**
Cl	0.0000	0.0117	**0.0000**	0.0029	0.0094	**0.0031**	0.0081	0.0094	**0.0087**
K2O	0.5121	0.0047	**0.6531**	3.5359	0.0047	**3.7364**	2.3962	0.0045	**2.5888**
CaO	0.0623	0.0063	**0.0795**	0.0237	0.0052	**0.0250**	0.0287	0.0053	**0.0310**
TiO2	2.1545	0.0444	**2.7478**	0.9904	0.0359	**1.0465**	0.7912	0.0366	**0.8548**
V2O5	0.0652	0.0068	**0.0831**	0.0375	0.0054	**0.0396**	0.0303	0.0055	**0.0327**
Cr2O3	0.0172	0.0019	**0.0219**	0.0124	0.0015	**0.0131**	0.0112	0.0016	**0.0121**
MnO	0.0280	0.0029	**0.0357**	0.0182	0.0024	**0.0192**	0.0182	0.0024	**0.0197**
Fe2O3	2.3543	0.0061	**3.0025**	1.3549	0.0299	**1.4317**	1.0391	0.0302	**1.1226**
Co2O3	0.0053	0.0022	**0.0068**	0.0023	0.0018	**0.0024**	0.0022	0.0018	**0.0024**
NiO	0.0229	0.0017	**0.0292**	0.0153	0.0014	**0.0162**	0.0139	0.0014	**0.0150**
CuO	0.0407	0.0015	**0.0519**	0.0238	0.0012	**0.0252**	0.0152	0.0012	**0.0164**
ZnO	0.0156	0.0013	**0.0199**	0.0171	0.0010	**0.0181**	0.0118	0.0010	**0.0128**
Ga2O3	0.0050	0.0014	**0.0064**	0.0044	0.0011	**0.0047**	0.0031	0.0011	**0.0033**
As2O3	0.0000	0.0013	**0.0000**	0.0000	0.0010	**0.0000**	0.0034	0.0010	**0.0037**
Br	0.0000	0.0009	**0.0000**	0.0006	0.0007	**0.0006**	0.0000	0.0007	**0.0000**
Rb2O	0.0029	0.0009	**0.0037**	0.0205	0.0007	**0.0217**	0.0132	0.0007	**0.0143**
SrO	0.0165	0.0008	**0.0210**	0.0086	0.0007	**0.0091**	0.0081	0.0007	**0.0087**
Y2O3	0.0140	0.0009	**0.0179**	0.0011	0.0008	**0.0012**	0.0011	0.0008	**0.0012**
ZrO2	0.0505	0.0008	**0.0644**	0.0206	0.0006	**0.0218**	0.0190	0.0007	**0.0205**
Nb2O5	0.0024	0.0010	**0.0030**	0.0015	0.0008	**0.0016**	0.0006	0.0008	**0.0007**
MoO3	0.0000	0.0010	**0.0000**	0.0004	0.0008	**0.0004**	0.0000	0.0008	**0.0000**
BaO	0.0854	0.0182	**0.1089**	0.0716	0.0146	**0.0757**	0.0586	0.0143	**0.0633**
HfO2	0.0035	0.0048	**0.0045**	0.0044	0.0038	**0.0046**	0.0041	0.0039	**0.0044**
PbO	0.0072	0.0024	**0.0092**	0.0038	0.0019	**0.0040**	0.0000	0.0020	**0.0000**
ThO2	0.0000	0.0017	**0.0000**	0.0004	0.0014	**0.0004**	0.0000	0.0014	**0.0000**
Pa	0.0006	0.0013	**0.0008**	0.0074	0.0011	**0.0078**	0.0038	0.0011	**0.0041**
U3O8	0.0027	0.0002	**0.0034**	0.0000	0.0002	**0.0000**	0.0003	0.0002	**0.0003**
TGA:	21.5900			5.3650			7.4410		
Total:	100.0000			100.0000			100.0000		

	24I			26A			26B		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.4528	0.0263	**0.4872**	0.0532	0.0236	**0.0552**	0.073287	0.02686	**0.0803**
MgO	1.0654	0.0207	**1.1463**	0.5573	0.0189	**0.5779**	1.147774	0.0211	**1.2576**
Al2O3	18.3339	0.0197	**19.7268**	9.5062	0.0150	**9.8576**	17.97586	0.01978	**19.6959**
SiO2	66.7163	0.0315	**71.7850**	83.0900	0.0337	**86.1617**	59.91742	0.03087	**65.6507**
P2O5	0.0324	0.0042	**0.0349**	0.0293	0.0044	**0.0304**	0.03459	0.00449	**0.0379**
SO3	1.0345	0.0077	**1.1131**	0.0711	0.0073	**0.0737**	4.392133	0.00903	**4.8124**
Cl	0.0000	0.0095	**0.0000**	0.0000	0.0095	**0.0000**	0	0.01015	**0**
K2O	2.6272	0.0042	**2.8268**	0.9554	0.0039	**0.9907**	1.943531	0.00427	**2.1295**
CaO	0.0457	0.0052	**0.0492**	0.0564	0.0051	**0.0585**	2.868431	0.00579	**3.1429**
TiO2	0.7594	0.0359	**0.8171**	0.8516	0.0347	**0.8831**	0.704855	0.03803	**0.7723**
V2O5	0.0338	0.0054	**0.0364**	0.0224	0.0053	**0.0232**	0.025372	0.00572	**0.0278**
Cr2O3	0.0109	0.0016	**0.0117**	0.0074	0.0015	**0.0077**	0.009401	0.00162	**0.0103**
MnO	0.0226	0.0024	**0.0243**	0.0029	0.0024	**0.0030**	0.00429	0.00254	**0.0047**
Fe2O3	1.6016	0.0048	**1.7233**	1.0819	0.0048	**1.1219**	1.957038	0.00531	**2.1443**
Co2O3	0.0030	0.0018	**0.0032**	0.0025	0.0018	**0.0026**	0.000821	0.00193	**0.0009**
NiO	0.0144	0.0014	**0.0155**	0.0122	0.0014	**0.0127**	0.012777	0.00146	**0.014**
CuO	0.0152	0.0012	**0.0164**	0.0105	0.0012	**0.0109**	0.012595	0.00126	**0.0138**
ZnO	0.0130	0.0010	**0.0140**	0.0021	0.0010	**0.0022**	0.006936	0.00107	**0.0076**
Ga2O3	0.0025	0.0011	**0.0027**	0.0039	0.0011	**0.0040**	0.005476	0.00119	**0.006**
As2O3	0.0021	0.0010	**0.0023**	0.0000	0.0010	**0.0000**	0	0.00108	**0**
Br	0.0000	0.0007	**0.0000**	0.0000	0.0007	**0.0000**	0	0.00073	**0**
Rb2O	0.0123	0.0007	**0.0132**	0.0077	0.0007	**0.0080**	0.015789	0.00077	**0.0173**
SrO	0.0087	0.0007	**0.0094**	0.0043	0.0007	**0.0045**	0.028202	0.0007	**0.0309**
Y2O3	0.0022	0.0008	**0.0024**	0.0031	0.0007	**0.0032**	0.000548	0.00081	**0.0006**
ZrO2	0.0217	0.0007	**0.0234**	0.0591	0.0006	**0.0613**	0.020535	0.00069	**0.0225**
Nb2O5	0.0005	0.0008	**0.0005**	0.0016	0.0008	**0.0017**	0.001369	0.00081	**0.0015**
MoO3	0.0001	0.0008	**0.0001**	0.0000	0.0008	**0.0000**	0	0.00086	**0**
BaO	0.1028	0.0137	**0.1106**	0.0307	0.0136	**0.0318**	0.091632	0.01459	**0.1004**
HfO2	0.0000	0.0039	**0.0000**	0.0077	0.0038	**0.0080**	0.004928	0.00408	**0.0054**
PbO	0.0000	0.0020	**0.0000**	0.0020	0.0019	**0.0021**	0.00502	0.00207	**0.0055**
ThO2	0.0001	0.0014	**0.0001**	0.0000	0.0013	**0.0000**	0.000821	0.00144	**0.0009**
Pa	0.0037	0.0011	**0.0040**	0.0022	0.0010	**0.0023**	0.00502	0.00113	**0.0055**
U3O8	0.0001	0.0002	**0.0001**	0.0001	0.0002	**0.0001**	0.000548	0.00021	**0.0006**
TGA:	7.0610			3.5650			8.733		
Total:	100.0000			100.0000			100.0000		

	28A			28B			28C		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.0268	0.0217	**0.0275**	0.0486	0.0226	**0.0504**	0.0482	0.0226	**0.0499**
MgO	0.2932	0.0197	**0.3007**	0.3590	0.0207	**0.3724**	0.2943	0.0200	**0.3044**
Al2O3	6.2187	0.0133	**6.3784**	10.3064	0.0154	**10.6924**	11.0895	0.0153	**11.4708**
SiO2	88.3294	0.0340	**90.5982**	82.8278	0.0336	**85.9299**	82.2301	0.0326	**85.0575**
P2O5	0.0224	0.0042	**0.0230**	0.0239	0.0042	**0.0248**	0.0233	0.0040	**0.0241**
SO3	0.0543	0.0068	**0.0557**	0.0662	0.0070	**0.0687**	0.0796	0.0067	**0.0823**
Cl	0.0000	0.0091	**0.0000**	0.0070	0.0091	**0.0073**	0.0000	0.0090	**0.0000**
K2O	0.3931	0.0036	**0.4032**	0.5905	0.0037	**0.6126**	1.3902	0.0039	**1.4380**
CaO	0.1589	0.0049	**0.1630**	0.2120	0.0051	**0.2199**	0.1079	0.0049	**0.1116**
TiO2	1.1020	0.0342	**1.1303**	0.8887	0.0338	**0.9220**	0.3842	0.0330	**0.3974**
V2O5	0.0145	0.0053	**0.0149**	0.0177	0.0053	**0.0184**	0.0109	0.0050	**0.0113**
Cr2O3	0.0069	0.0015	**0.0071**	0.0067	0.0015	**0.0069**	0.0070	0.0014	**0.0072**
MnO	0.0022	0.0023	**0.0023**	0.0042	0.0023	**0.0044**	0.0066	0.0022	**0.0068**
Fe2O3	0.7409	0.0046	**0.7599**	0.9088	0.0047	**0.9428**	0.8874	0.0046	**0.9179**
Co2O3	0.0013	0.0017	**0.0013**	0.0008	0.0018	**0.0008**	0.0004	0.0017	**0.0004**
NiO	0.0112	0.0013	**0.0115**	0.0113	0.0013	**0.0117**	0.0109	0.0013	**0.0113**
CuO	0.0102	0.0011	**0.0105**	0.0109	0.0012	**0.0113**	0.0088	0.0011	**0.0091**
ZnO	0.0015	0.0010	**0.0015**	0.0018	0.0010	**0.0019**	0.0017	0.0009	**0.0018**
Ga2O3	0.0026	0.0011	**0.0027**	0.0017	0.0011	**0.0018**	0.0014	0.0011	**0.0014**
As2O3	0.0000	0.0010	**0.0000**	0.0000	0.0010	**0.0000**	0.0000	0.0009	**0.0000**
Br	0.0001	0.0007	**0.0001**	0.0002	0.0007	**0.0002**	0.0002	0.0006	**0.0002**
Rb2O	0.0024	0.0007	**0.0025**	0.0043	0.0007	**0.0045**	0.0066	0.0007	**0.0068**
SrO	0.0034	0.0006	**0.0035**	0.0033	0.0006	**0.0034**	0.0035	0.0006	**0.0036**
Y2O3	0.0047	0.0007	**0.0048**	0.0027	0.0007	**0.0028**	0.0016	0.0007	**0.0017**
ZrO2	0.0565	0.0006	**0.0580**	0.0547	0.0006	**0.0568**	0.0371	0.0006	**0.0384**
Nb2O5	0.0025	0.0007	**0.0026**	0.0046	0.0007	**0.0048**	0.0003	0.0007	**0.0003**
MoO3	0.0001	0.0008	**0.0001**	0.0000	0.0008	**0.0000**	0.0002	0.0008	**0.0002**
BaO	0.0124	0.0134	**0.0127**	0.0164	0.0137	**0.0170**	0.0334	0.0130	**0.0346**
HfO2	0.0091	0.0036	**0.0093**	0.0045	0.0037	**0.0047**	0.0052	0.0036	**0.0054**
PbO	0.0036	0.0018	**0.0037**	0.0044	0.0019	**0.0046**	0.0025	0.0018	**0.0026**
ThO2	0.0008	0.0013	**0.0008**	0.0003	0.0013	**0.0003**	0.0006	0.0013	**0.0006**
Pa	0.0012	0.0010	**0.0012**	0.0000	0.0010	**0.0000**	0.0023	0.0010	**0.0024**
U3O8	0.0003	0.0002	**0.0003**	0.0005	0.0002	**0.0005**	0.0000	0.0002	**0.0000**
TGA:	2.5040			3.6100			3.3240		
Total:	100.0000			100.0000			100.0000		

	28D			28E			29A		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.1166	0.0242	**0.1224**	0.1229	0.0262	**0.1364**	0.0368	0.0224	**0.0378**
MgO	1.0076	0.0218	**1.0581**	5.1450	0.0253	**5.7105**	0.0443	0.0173	**0.0455**
Al2O3	13.9832	0.0175	**14.6838**	14.2566	0.0180	**15.8235**	7.1445	0.0139	**7.3415**
SiO2	73.1434	0.0316	**76.8079**	56.5192	0.0297	**62.7308**	87.9987	0.0338	**90.4257**
P2O5	0.0736	0.0043	**0.0773**	0.1472	0.0046	**0.1634**	0.0193	0.0040	**0.0198**
SO3	0.6522	0.0074	**0.6849**	0.1479	0.0073	**0.1641**	0.0625	0.0071	**0.0642**
Cl	0.0003	0.0097	**0.0003**	0.0000	0.0099	**0.0000**	0.0000	0.0092	**0.0000**
K2O	2.7546	0.0045	**2.8926**	3.4739	0.0049	**3.8557**	0.4077	0.0036	**0.4189**
CaO	0.4975	0.0053	**0.5224**	4.3791	0.0060	**4.8604**	0.0434	0.0050	**0.0446**
TiO2	0.6146	0.0355	**0.6454**	0.5670	0.0371	**0.6293**	0.8314	0.0346	**0.8543**
V2O5	0.0259	0.0054	**0.0272**	0.0205	0.0057	**0.0228**	0.0083	0.0053	**0.0085**
Cr2O3	0.0092	0.0015	**0.0097**	0.0086	0.0016	**0.0095**	0.0064	0.0014	**0.0066**
MnO	0.0074	0.0024	**0.0078**	0.0880	0.0025	**0.0977**	0.0024	0.0023	**0.0025**
Fe2O3	2.1627	0.0050	**2.2711**	5.0374	0.0055	**5.5910**	0.5563	0.0046	**0.5716**
Co2O3	0.0000	0.0018	**0.0000**	0.0026	0.0020	**0.0029**	0.0004	0.0017	**0.0004**
NiO	0.0124	0.0014	**0.0130**	0.0143	0.0015	**0.0159**	0.0112	0.0013	**0.0115**
CuO	0.0130	0.0012	**0.0137**	0.0115	0.0013	**0.0128**	0.0097	0.0011	**0.0100**
ZnO	0.0085	0.0010	**0.0089**	0.0120	0.0011	**0.0133**	0.0016	0.0010	**0.0016**
Ga2O3	0.0000	0.0011	**0.0000**	0.0026	0.0012	**0.0029**	0.0018	0.0011	**0.0019**
As2O3	0.0003	0.0010	**0.0003**	0.0038	0.0011	**0.0042**	0.0000	0.0010	**0.0000**
Br	0.0002	0.0007	**0.0002**	0.0000	0.0007	**0.0000**	0.0000	0.0007	**0.0000**
Rb2O	0.0152	0.0007	**0.0160**	0.0191	0.0008	**0.0212**	0.0032	0.0007	**0.0033**
SrO	0.0098	0.0007	**0.0103**	0.0102	0.0007	**0.0113**	0.0018	0.0006	**0.0018**
Y2O3	0.0033	0.0008	**0.0035**	0.0023	0.0008	**0.0026**	0.0030	0.0007	**0.0031**
ZrO2	0.0424	0.0007	**0.0445**	0.0183	0.0007	**0.0203**	0.0852	0.0006	**0.0876**
Nb2O5	0.0013	0.0008	**0.0014**	0.0005	0.0008	**0.0006**	0.0055	0.0007	**0.0057**
MoO3	0.0000	0.0008	**0.0000**	0.0000	0.0009	**0.0000**	0.0000	0.0008	**0.0000**
BaO	0.0545	0.0141	**0.0572**	0.0765	0.0145	**0.0849**	0.0107	0.0135	**0.0110**
HfO2	0.0078	0.0038	**0.0082**	0.0035	0.0042	**0.0039**	0.0063	0.0037	**0.0065**
PbO	0.0034	0.0020	**0.0036**	0.0000	0.0021	**0.0000**	0.0015	0.0019	**0.0015**
ThO2	0.0008	0.0014	**0.0008**	0.0000	0.0015	**0.0000**	0.0000	0.0013	**0.0000**
Pa	0.0063	0.0011	**0.0066**	0.0071	0.0012	**0.0079**	0.0002	0.0010	**0.0002**
U3O8	0.0009	0.0002	**0.0009**	0.0003	0.0002	**0.0003**	0.0000	0.0002	**0.0000**
TGA:	4.7710			9.9020			2.6840		
Total:	100.0000			100.0000			100.0000		

	29B			29C			29D		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.0607	0.0242	**0.0634**	0.0706	0.0262	**0.0751**	0.0817	0.0260	**0.0884**
MgO	0.5529	0.0191	**0.5776**	0.9236	0.0212	**0.9831**	0.6267	0.0207	**0.6784**
Al2O3	14.6837	0.0176	**15.3389**	21.3155	0.0208	**22.6883**	21.2256	0.0209	**22.9774**
SiO2	76.2219	0.0326	**79.6225**	66.0285	0.0315	**70.2812**	66.4325	0.0320	**71.9153**
P2O5	0.0257	0.0041	**0.0268**	0.0265	0.0043	**0.0282**	0.0398	0.0045	**0.0431**
SO3	0.0633	0.0070	**0.0661**	0.0575	0.0074	**0.0612**	0.0971	0.0072	**0.1051**
Cl	0.0042	0.0094	**0.0044**	0.0004	0.0095	**0.0004**	0.0000	0.0100	**0.0000**
K2O	1.7737	0.0041	**1.8528**	2.7944	0.0043	**2.9744**	1.2965	0.0040	**1.4035**
CaO	0.0931	0.0051	**0.0973**	0.1266	0.0054	**0.1348**	0.1834	0.0054	**0.1985**
TiO2	0.9533	0.0349	**0.9958**	0.7028	0.0358	**0.7481**	0.7633	0.0364	**0.8263**
V2O5	0.0221	0.0053	**0.0231**	0.0256	0.0055	**0.0273**	0.0391	0.0055	**0.0423**
Cr2O3	0.0082	0.0015	**0.0086**	0.0105	0.0016	**0.0112**	0.0136	0.0016	**0.0147**
MnO	0.0058	0.0024	**0.0061**	0.0054	0.0024	**0.0057**	0.0091	0.0025	**0.0099**
Fe2O3	1.1292	0.0048	**1.1796**	1.7309	0.0049	**1.8424**	1.4232	0.0051	**1.5407**
Co2O3	0.0006	0.0018	**0.0006**	0.0004	0.0019	**0.0004**	0.0030	0.0019	**0.0032**
NiO	0.0110	0.0014	**0.0115**	0.0116	0.0014	**0.0124**	0.0133	0.0014	**0.0144**
CuO	0.0094	0.0012	**0.0098**	0.0091	0.0012	**0.0097**	0.0155	0.0012	**0.0168**
ZnO	0.0024	0.0010	**0.0025**	0.0028	0.0010	**0.0030**	0.0055	0.0010	**0.0059**
Ga2O3	0.0047	0.0011	**0.0049**	0.0030	0.0012	**0.0032**	0.0033	0.0012	**0.0036**
As2O3	0.0003	0.0010	**0.0003**	0.0006	0.0010	**0.0006**	0.0000	0.0010	**0.0000**
Br	0.0000	0.0007	**0.0000**	0.0004	0.0007	**0.0004**	0.0004	0.0007	**0.0004**
Rb2O	0.0113	0.0007	**0.0118**	0.0191	0.0007	**0.0203**	0.0099	0.0007	**0.0107**
SrO	0.0065	0.0006	**0.0068**	0.0074	0.0007	**0.0079**	0.0114	0.0007	**0.0123**
Y2O3	0.0023	0.0007	**0.0024**	0.0013	0.0008	**0.0014**	0.0009	0.0008	**0.0010**
ZrO2	0.0435	0.0006	**0.0454**	0.0253	0.0007	**0.0269**	0.0340	0.0007	**0.0368**
Nb2O5	0.0021	0.0008	**0.0022**	0.0007	0.0008	**0.0007**	0.0017	0.0008	**0.0018**
MoO3	0.0003	0.0008	**0.0003**	0.0000	0.0008	**0.0000**	0.0001	0.0008	**0.0001**
BaO	0.0270	0.0140	**0.0282**	0.0352	0.0146	**0.0375**	0.0303	0.0143	**0.0328**
HfO2	0.0042	0.0038	**0.0044**	0.0050	0.0039	**0.0053**	0.0042	0.0039	**0.0046**
PbO	0.0008	0.0019	**0.0008**	0.0005	0.0020	**0.0005**	0.0069	0.0020	**0.0075**
ThO2	0.0004	0.0013	**0.0004**	0.0003	0.0014	**0.0003**	0.0009	0.0014	**0.0010**
Pa	0.0042	0.0010	**0.0044**	0.0072	0.0011	**0.0077**	0.0032	0.0011	**0.0035**
U3O8	0.0003	0.0002	**0.0003**	0.0004	0.0002	**0.0004**	0.0000	0.0002	**0.0000**
TGA:	4.2710			6.0510			7.6240		
Total:	100.0000			100.0000			100.0000		

	29E			29F			30A		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.0587	0.0246	**0.0628**	0.1259	0.0266	**0.1356**	0.2882	0.0259	**0.3116**
MgO	0.0862	0.0197	**0.0922**	0.6310	0.0196	**0.6797**	0.6046	0.0227	**0.6536**
Al2O3	17.9489	0.0197	**19.1969**	18.9049	0.0201	**20.3642**	19.2867	0.0199	**20.8502**
SiO2	72.0986	0.0326	**77.1117**	69.2998	0.0324	**74.6492**	64.8064	0.0308	**70.0602**
P2O5	0.0304	0.0044	**0.0325**	0.0539	0.0044	**0.0581**	0.0347	0.0043	**0.0375**
SO3	0.1118	0.0074	**0.1196**	0.1118	0.0074	**0.1204**	2.1823	0.0080	**2.3592**
Cl	0.0000	0.0098	**0.0000**	0.0000	0.0099	**0.0000**	0.0000	0.0097	**0.0000**
K2O	1.0291	0.0040	**1.1007**	1.3608	0.0041	**1.4658**	1.5203	0.0040	**1.6435**
CaO	0.1411	0.0053	**0.1509**	0.1153	0.0053	**0.1242**	1.3404	0.0054	**1.4491**
TiO2	0.6804	0.0360	**0.7277**	0.7051	0.0364	**0.7595**	0.8084	0.0361	**0.8739**
V2O5	0.0299	0.0055	**0.0320**	0.0281	0.0056	**0.0303**	0.0371	0.0056	**0.0401**
Cr2O3	0.0117	0.0016	**0.0125**	0.0125	0.0016	**0.0135**	0.0119	0.0016	**0.0129**
MnO	0.0053	0.0025	**0.0057**	0.0065	0.0025	**0.0070**	0.0157	0.0024	**0.0170**
Fe2O3	1.1302	0.0051	**1.2088**	1.3123	0.0050	**1.4136**	1.4202	0.0302	**1.5353**
Co2O3	0.0030	0.0018	**0.0032**	0.0053	0.0018	**0.0057**	0.0000	0.0018	**0.0000**
NiO	0.0133	0.0014	**0.0142**	0.0196	0.0014	**0.0211**	0.0136	0.0014	**0.0147**
CuO	0.0112	0.0012	**0.0120**	0.0110	0.0012	**0.0118**	0.0120	0.0012	**0.0130**
ZnO	0.0085	0.0010	**0.0091**	0.0393	0.0010	**0.0423**	0.0019	0.0010	**0.0020**
Ga2O3	0.0029	0.0011	**0.0031**	0.0041	0.0012	**0.0044**	0.0033	0.0011	**0.0036**
As2O3	0.0030	0.0010	**0.0032**	0.0029	0.0010	**0.0031**	0.0000	0.0010	**0.0000**
Br	0.0005	0.0007	**0.0005**	0.0006	0.0007	**0.0007**	0.0003	0.0007	**0.0003**
Rb2O	0.0064	0.0007	**0.0068**	0.0085	0.0007	**0.0092**	0.0084	0.0007	**0.0091**
SrO	0.0074	0.0007	**0.0079**	0.0096	0.0007	**0.0103**	0.0101	0.0007	**0.0109**
Y2O3	0.0013	0.0008	**0.0014**	0.0035	0.0008	**0.0038**	0.0014	0.0008	**0.0015**
ZrO2	0.0427	0.0007	**0.0457**	0.0340	0.0007	**0.0366**	0.0313	0.0007	**0.0338**
Nb2O5	0.0013	0.0008	**0.0014**	0.0007	0.0008	**0.0008**	0.0006	0.0008	**0.0007**
MoO3	0.0002	0.0008	**0.0002**	0.0000	0.0008	**0.0000**	0.0000	0.0008	**0.0000**
BaO	0.0266	0.0142	**0.0285**	0.0162	0.0150	**0.0175**	0.0482	0.0142	**0.0521**
HfO2	0.0061	0.0039	**0.0065**	0.0071	0.0039	**0.0076**	0.0052	0.0039	**0.0056**
PbO	0.0000	0.0020	**0.0000**	0.0000	0.0020	**0.0000**	0.0038	0.0020	**0.0041**
ThO2	0.0005	0.0014	**0.0005**	0.0003	0.0014	**0.0003**	0.0010	0.0014	**0.0011**
Pa	0.0017	0.0011	**0.0018**	0.0034	0.0011	**0.0037**	0.0028	0.0011	**0.0030**
U3O8	0.0000	0.0002	**0.0000**	0.0000	0.0002	**0.0000**	0.0003	0.0002	**0.0003**
TGA:	6.5010			7.1660			7.4990		
Total:	100.0000			100.0000			100.0000		

	30B			30C			30D		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.2341	0.0249	**0.2527**	0.1152	0.0240	**0.1223**	0.1150	0.0244	**0.1227**
MgO	0.7005	0.0230	**0.7563**	0.2916	0.0219	**0.3096**	0.4187	0.0227	**0.4465**
Al2O3	20.9153	0.0210	**22.5818**	17.5767	0.0188	**18.6639**	18.3939	0.0195	**19.6170**
SiO2	63.5922	0.0310	**68.6592**	72.9054	0.0326	**77.4148**	69.1229	0.0316	**73.7193**
P2O5	0.0388	0.0044	**0.0419**	0.0298	0.0041	**0.0316**	0.0351	0.0044	**0.0374**
SO3	1.0712	0.0078	**1.1565**	0.0960	0.0071	**0.1019**	0.0822	0.0071	**0.0877**
Cl	0.0000	0.0098	**0.0000**	0.0000	0.0095	**0.0000**	0.0000	0.0098	**0.0000**
K2O	1.9100	0.0043	**2.0622**	1.0101	0.0039	**1.0726**	1.4476	0.0041	**1.5439**
CaO	0.6266	0.0055	**0.6765**	0.2763	0.0052	**0.2934**	0.0948	0.0052	**0.1011**
TiO2	0.8654	0.0368	**0.9343**	0.6763	0.0370	**0.7181**	0.7929	0.0354	**0.8456**
V2O5	0.0440	0.0055	**0.0475**	0.0206	0.0058	**0.0219**	0.0412	0.0053	**0.0439**
Cr2O3	0.0128	0.0016	**0.0138**	0.0103	0.0015	**0.0109**	0.0118	0.0015	**0.0126**
MnO	0.0383	0.0025	**0.0413**	0.0384	0.0024	**0.0408**	0.1038	0.0024	**0.1107**
Fe2O3	2.4185	0.0308	**2.6112**	1.0034	0.0298	**1.0655**	2.9587	0.0050	**3.1555**
Co2O3	0.0012	0.0019	**0.0013**	0.0008	0.0018	**0.0008**	0.0021	0.0019	**0.0022**
NiO	0.0150	0.0014	**0.0162**	0.0151	0.0014	**0.0160**	0.0176	0.0014	**0.0188**
CuO	0.0118	0.0012	**0.0127**	0.0103	0.0012	**0.0109**	0.0134	0.0012	**0.0143**
ZnO	0.0028	0.0010	**0.0030**	0.0025	0.0010	**0.0027**	0.0099	0.0010	**0.0106**
Ga2O3	0.0016	0.0012	**0.0017**	0.0022	0.0011	**0.0023**	0.0028	0.0011	**0.0030**
As2O3	0.0007	0.0010	**0.0008**	0.0000	0.0010	**0.0000**	0.0023	0.0010	**0.0025**
Br	0.0002	0.0007	**0.0002**	0.0006	0.0007	**0.0006**	0.0007	0.0007	**0.0007**
Rb2O	0.0107	0.0007	**0.0116**	0.0059	0.0007	**0.0063**	0.0084	0.0007	**0.0090**
SrO	0.0075	0.0007	**0.0081**	0.0057	0.0007	**0.0060**	0.0061	0.0007	**0.0065**
Y2O3	0.0025	0.0008	**0.0027**	0.0004	0.0008	**0.0004**	0.0022	0.0008	**0.0023**
ZrO2	0.0273	0.0007	**0.0295**	0.0297	0.0006	**0.0315**	0.0318	0.0007	**0.0339**
Nb2O5	0.0012	0.0008	**0.0013**	0.0003	0.0008	**0.0003**	0.0015	0.0008	**0.0016**
MoO3	0.0000	0.0008	**0.0000**	0.0000	0.0008	**0.0000**	0.0000	0.0008	**0.0000**
BaO	0.0579	0.0144	**0.0625**	0.0421	0.0138	**0.0447**	0.0410	0.0142	**0.0437**
HfO2	0.0031	0.0040	**0.0033**	0.0033	0.0038	**0.0035**	0.0038	0.0039	**0.0041**
PbO	0.0040	0.0020	**0.0043**	0.0043	0.0019	**0.0046**	0.0000	0.0020	**0.0000**
ThO2	0.0014	0.0014	**0.0015**	0.0000	0.0013	**0.0000**	0.0005	0.0014	**0.0005**
Pa	0.0037	0.0011	**0.0040**	0.0014	0.0011	**0.0015**	0.0023	0.0011	**0.0024**
U3O8	0.0000	0.0002	**0.0000**	0.0006	0.0002	**0.0006**	0.0000	0.0002	**0.0000**
TGA:	7.3800			5.8250			6.2350		
Total:	100.0000			100.0000			100.0000		

	30E			32A			32B		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.0947	0.0245	**0.1000**	0.0587	0.0182	**0.0628**	0.0850	0.0248	**0.0924**
MgO	0.3196	0.0216	**0.3373**	0.3382	0.0220	**0.3617**	0.4132	0.0239	**0.4493**
Al2O3	15.9309	0.0184	**16.8143**	16.7117	0.0191	**17.8735**	22.6397	0.0211	**24.6161**
SiO2	73.1537	0.0320	**77.2103**	72.7247	0.0326	**77.7805**	64.5639	0.0312	**70.2002**
P2O5	0.0409	0.0044	**0.0432**	0.0275	0.0043	**0.0294**	0.0216	0.0044	**0.0235**
SO3	0.0683	0.0072	**0.0721**	0.0689	0.0073	**0.0737**	0.1626	0.0075	**0.1768**
Cl	0.0000	0.0095	**0.0000**	0.0026	0.0074	**0.0028**	0.0029	0.0097	**0.0031**
K2O	1.5274	0.0040	**1.6121**	0.1757	0.0037	**0.1879**	0.6718	0.0039	**0.7305**
CaO	0.0966	0.0051	**0.1020**	0.2871	0.0053	**0.3071**	0.0825	0.0052	**0.0897**
TiO2	0.6870	0.0353	**0.7251**	1.2576	0.0354	**1.3450**	0.8942	0.0363	**0.9723**
V2O5	0.0344	0.0053	**0.0363**	0.0213	0.0055	**0.0228**	0.0338	0.0056	**0.0368**
Cr2O3	0.0111	0.0015	**0.0117**	0.0084	0.0015	**0.0090**	0.0093	0.0016	**0.0101**
MnO	0.0524	0.0024	**0.0553**	0.0081	0.0024	**0.0087**	0.0075	0.0025	**0.0082**
Fe2O3	2.5476	0.0050	**2.6889**	1.6851	0.0302	**1.8022**	2.2837	0.0307	**2.4831**
Co2O3	0.0053	0.0018	**0.0056**	0.0011	0.0018	**0.0012**	0.0002	0.0019	**0.0002**
NiO	0.0175	0.0014	**0.0185**	0.0139	0.0014	**0.0149**	0.0131	0.0014	**0.0142**
CuO	0.0110	0.0012	**0.0116**	0.0111	0.0012	**0.0119**	0.0113	0.0012	**0.0123**
ZnO	0.0120	0.0010	**0.0127**	0.0069	0.0010	**0.0074**	0.0028	0.0010	**0.0030**
Ga2O3	0.0044	0.0011	**0.0046**	0.0049	0.0011	**0.0052**	0.0053	0.0012	**0.0058**
As2O3	0.0012	0.0010	**0.0013**	0.0021	0.0010	**0.0022**	0.0014	0.0010	**0.0015**
Br	0.0002	0.0007	**0.0002**	0.0000	0.0007	**0.0000**	0.0002	0.0007	**0.0002**
Rb2O	0.0079	0.0007	**0.0083**	0.0011	0.0007	**0.0012**	0.0049	0.0007	**0.0053**
SrO	0.0077	0.0007	**0.0081**	0.0025	0.0007	**0.0027**	0.0044	0.0007	**0.0048**
Y2O3	0.0018	0.0008	**0.0019**	0.0024	0.0008	**0.0026**	0.0000	0.0008	**0.0000**
ZrO2	0.0436	0.0006	**0.0460**	0.0554	0.0007	**0.0593**	0.0294	0.0007	**0.0320**
Nb2O5	0.0001	0.0008	**0.0001**	0.0051	0.0008	**0.0055**	0.0013	0.0008	**0.0014**
MoO3	0.0000	0.0008	**0.0000**	0.0000	0.0008	**0.0000**	0.0000	0.0008	**0.0000**
BaO	0.0624	0.0140	**0.0659**	0.0132	0.0140	**0.0141**	0.0186	0.0142	**0.0202**
HfO2	0.0048	0.0038	**0.0051**	0.0043	0.0039	**0.0046**	0.0037	0.0039	**0.0040**
PbO	0.0000	0.0020	**0.0000**	0.0000	0.0020	**0.0000**	0.0000	0.0020	**0.0000**
ThO2	0.0000	0.0013	**0.0000**	0.0001	0.0014	**0.0001**	0.0006	0.0014	**0.0007**
Pa	0.0010	0.0011	**0.0011**	0.0000	0.0011	**0.0000**	0.0021	0.0011	**0.0023**
U3O8	0.0004	0.0002	**0.0004**	0.0000	0.0002	**0.0000**	0.0000	0.0002	**0.0000**
TGA:	5.2540			6.5000			8.0290		
Total:	100.0000			100.0000			100.0000		

	32C			32D			34A		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.1612	0.0252	**0.1742**	0.0928	0.0267	**0.0991**	0.0124	0.0227	**0.0126**
MgO	0.6458	0.0236	**0.6979**	0.3972	0.0222	**0.4241**	0.2818	0.0195	**0.2875**
Al2O3	22.3540	0.0213	**24.1558**	18.3107	0.0192	**19.5514**	5.9315	0.0130	**6.0514**
SiO2	61.2489	0.0306	**66.1857**	67.9216	0.0314	**72.5240**	89.1108	0.0342	**90.9118**
P2O5	0.0469	0.0044	**0.0507**	0.0311	0.0043	**0.0332**	0.0217	0.0040	**0.0221**
SO3	0.2929	0.0074	**0.3165**	0.2369	0.0072	**0.2529**	0.0500	0.0069	**0.0510**
Cl	0.0000	0.0098	**0.0000**	0.0011	0.0095	**0.0012**	0.0000	0.0093	**0.0000**
K2O	2.1878	0.0043	**2.3641**	1.4984	0.0040	**1.5999**	0.5282	0.0037	**0.5389**
CaO	0.0368	0.0052	**0.0398**	0.0406	0.0052	**0.0434**	0.1110	0.0050	**0.1132**
TiO2	0.8989	0.0362	**0.9713**	0.8218	0.0354	**0.8775**	1.1277	0.0337	**1.1505**
V2O5	0.0421	0.0055	**0.0455**	0.0383	0.0054	**0.0409**	0.0188	0.0052	**0.0192**
Cr2O3	0.0111	0.0016	**0.0120**	0.0147	0.0015	**0.0157**	0.0059	0.0015	**0.0060**
MnO	0.0283	0.0024	**0.0306**	0.0263	0.0024	**0.0281**	0.0028	0.0023	**0.0029**
Fe2O3	4.4039	0.0314	**4.7588**	4.0807	0.0305	**4.3572**	0.6641	0.0046	**0.6775**
Co2O3	0.0002	0.0019	**0.0002**	0.0009	0.0019	**0.0010**	0.0004	0.0017	**0.0004**
NiO	0.0178	0.0014	**0.0192**	0.0155	0.0014	**0.0166**	0.0111	0.0013	**0.0113**
CuO	0.0115	0.0012	**0.0124**	0.0168	0.0012	**0.0179**	0.0137	0.0011	**0.0140**
ZnO	0.0119	0.0011	**0.0129**	0.0107	0.0010	**0.0114**	0.0024	0.0010	**0.0024**
Ga2O3	0.0048	0.0012	**0.0052**	0.0030	0.0011	**0.0032**	0.0021	0.0011	**0.0021**
As2O3	0.0000	0.0011	**0.0000**	0.0000	0.0010	**0.0000**	0.0001	0.0010	**0.0001**
Br	0.0000	0.0007	**0.0000**	0.0001	0.0007	**0.0001**	0.0010	0.0007	**0.0010**
Rb2O	0.0117	0.0008	**0.0126**	0.0074	0.0007	**0.0079**	0.0054	0.0007	**0.0055**
SrO	0.0099	0.0007	**0.0107**	0.0159	0.0007	**0.0170**	0.0046	0.0006	**0.0047**
Y2O3	0.0022	0.0008	**0.0024**	0.0018	0.0008	**0.0019**	0.0023	0.0007	**0.0023**
ZrO2	0.0216	0.0007	**0.0233**	0.0343	0.0007	**0.0366**	0.0755	0.0006	**0.0770**
Nb2O5	0.0019	0.0008	**0.0021**	0.0006	0.0008	**0.0006**	0.0028	0.0007	**0.0029**
MoO3	0.0000	0.0008	**0.0000**	0.0000	0.0008	**0.0000**	0.0000	0.0008	**0.0000**
BaO	0.0585	0.0143	**0.0632**	0.0269	0.0143	**0.0287**	0.0205	0.0134	**0.0209**
HfO2	0.0028	0.0040	**0.0030**	0.0044	0.0039	**0.0047**	0.0078	0.0036	**0.0080**
PbO	0.0056	0.0020	**0.0061**	0.0014	0.0020	**0.0015**	0.0009	0.0019	**0.0009**
ThO2	0.0014	0.0014	**0.0015**	0.0001	0.0014	**0.0001**	0.0000	0.0013	**0.0000**
Pa	0.0040	0.0011	**0.0043**	0.0019	0.0011	**0.0020**	0.0012	0.0010	**0.0012**
U3O8	0.0000	0.0002		0.0002	0.0002	**0.0002**	0.0007	0.0002	**0.0007**
TGA:	7.4590			6.3460			1.9810		
Total:	100.0000			100.0000			100.0000		

	34B			34C			34D		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.0429	0.0241	**0.0457**	0.0184	0.0224	**0.0192**	0.0653	0.0242	**0.0698**
MgO	0.4801	0.0222	**0.5109**	0.3345	0.0211	**0.3498**	0.8180	0.0234	**0.8746**
Al2O3	19.2036	0.0194	**20.4350**	14.3441	0.0175	**15.0006**	22.4793	0.0213	**24.0336**
SiO2	70.5511	0.0321	**75.0752**	78.3401	0.0327	**81.9251**	64.6526	0.0309	**69.1228**
P2O5	0.0269	0.0042	**0.0286**	0.0242	0.0040	**0.0253**	0.0317	0.0042	**0.0339**
SO3	0.0390	0.0073	**0.0415**	0.0600	0.0072	**0.0627**	0.0459	0.0070	**0.0491**
Cl	0.0016	0.0094	**0.0017**	0.0074	0.0093	**0.0077**	0.0118	0.0094	**0.0126**
K2O	1.6102	0.0042	**1.7134**	1.1771	0.0039	**1.2310**	2.7498	0.0045	**2.9399**
CaO	0.1966	0.0053	**0.2092**	0.1124	0.0051	**0.1175**	0.2668	0.0053	**0.2853**
TiO2	0.6564	0.0359	**0.6985**	0.4246	0.0345	**0.4440**	0.7768	0.0351	**0.8305**
V2O5	0.0120	0.0056	**0.0128**	0.0128	0.0053	**0.0134**	0.0293	0.0054	**0.0313**
Cr2O3	0.0085	0.0015	**0.0090**	0.0068	0.0015	**0.0071**	0.0105	0.0015	**0.0112**
MnO	0.0039	0.0024	**0.0041**	0.0042	0.0023	**0.0044**	0.0056	0.0024	**0.0060**
Fe2O3	1.0170	0.0049	**1.0822**	0.6702	0.0048	**0.7009**	1.4429	0.0050	**1.5427**
Co2O3	0.0002	0.0018	**0.0002**	0.0000	0.0018	**0.0000**	0.0016	0.0018	**0.0017**
NiO	0.0103	0.0014	**0.0110**	0.0117	0.0013	**0.0122**	0.0114	0.0014	**0.0122**
CuO	0.0101	0.0012	**0.0108**	0.0097	0.0012	**0.0101**	0.0100	0.0012	**0.0107**
ZnO	0.0019	0.0010	**0.0020**	0.0005	0.0010	**0.0005**	0.0025	0.0010	**0.0027**
Ga2O3	0.0031	0.0011	**0.0033**	0.0021	0.0011	**0.0022**	0.0039	0.0011	**0.0042**
As2O3	0.0000	0.0010	**0.0000**	0.0009	0.0010	**0.0009**	0.0000	0.0010	**0.0000**
Br	0.0008	0.0007	**0.0008**	0.0006	0.0007	**0.0006**	0.0000	0.0007	**0.0000**
Rb2O	0.0109	0.0007	**0.0116**	0.0069	0.0007	**0.0072**	0.0186	0.0007	**0.0199**
SrO	0.0070	0.0007	**0.0074**	0.0033	0.0006	**0.0035**	0.0089	0.0007	**0.0095**
Y2O3	0.0015	0.0007	**0.0016**	0.0011	0.0007	**0.0011**	0.0012	0.0008	**0.0013**
ZrO2	0.0369	0.0006	**0.0393**	0.0266	0.0006	**0.0278**	0.0238	0.0006	**0.0254**
Nb2O5	0.0009	0.0008	**0.0010**	0.0002	0.0007	**0.0002**	0.0016	0.0008	**0.0017**
MoO3	0.0002	0.0008	**0.0002**	0.0000	0.0008	**0.0000**	0.0000	0.0008	**0.0000**
BaO	0.0296	0.0139	**0.0315**	0.0142	0.0136	**0.0148**	0.0497	0.0140	**0.0531**
HfO2	0.0047	0.0038	**0.0050**	0.0062	0.0037	**0.0065**	0.0019	0.0038	**0.0020**
PbO	0.0031	0.0019	**0.0033**	0.0006	0.0019	**0.0006**	0.0032	0.0019	**0.0034**
ThO2	0.0000	0.0013	**0.0000**	0.0000	0.0013	**0.0000**	0.0011	0.0014	**0.0012**
Pa	0.0028	0.0010	**0.0030**	0.0030	0.0010	**0.0031**	0.0069	0.0011	**0.0074**
U3O8	0.0002	0.0002	**0.0002**	0.0000	0.0002	**0.0000**	0.0004	0.0002	**0.0004**
TGA:	6.0260			4.3760			6.4670		
Total:	100.0000			100.0000			100.0000		

	34E			34F			34G		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.0859	0.0252	**0.0927**	0.0933	0.0247	**0.1010**	0.0478	0.0240	**0.0507**
MgO	0.6782	0.0232	**0.7315**	0.5692	0.0231	**0.6161**	0.3208	0.0221	**0.3401**
Al2O3	21.0722	0.0209	**22.7280**	21.5914	0.0214	**23.3688**	17.3950	0.0189	**18.4420**
SiO2	65.5301	0.0315	**70.6790**	65.2338	0.0311	**70.6040**	73.6921	0.0321	**78.1274**
P2O5	0.0324	0.0044	**0.0349**	0.0285	0.0044	**0.0309**	0.0275	0.0042	**0.0292**
SO3	0.1244	0.0073	**0.1342**	0.1056	0.0072	**0.1143**	0.0708	0.0069	**0.0751**
Cl	0.0000	0.0099	**0.0000**	0.0017	0.0097	**0.0018**	0.0000	0.0095	**0.0000**
K2O	1.9883	0.0043	**2.1445**	1.8048	0.0042	**1.9534**	1.1826	0.0040	**1.2538**
CaO	0.5706	0.0054	**0.6154**	0.5094	0.0053	**0.5513**	0.1432	0.0052	**0.1518**
TiO2	0.9768	0.0364	**1.0536**	0.9125	0.0359	**0.9876**	0.6773	0.0346	**0.7181**
V2O5	0.0412	0.0055	**0.0444**	0.0479	0.0053	**0.0518**	0.0213	0.0053	**0.0226**
Cr2O3	0.0125	0.0016	**0.0135**	0.0121	0.0015	**0.0131**	0.0102	0.0015	**0.0108**
MnO	0.0037	0.0025	**0.0040**	0.0050	0.0024	**0.0054**	0.0033	0.0024	**0.0035**
Fe2O3	1.4458	0.0050	**1.5594**	1.3122	0.0050	**1.4202**	0.6125	0.0048	**0.6494**
Co2O3	0.0000	0.0019	**0.0000**	0.0001	0.0018	**0.0001**	0.0012	0.0018	**0.0013**
NiO	0.0122	0.0014	**0.0132**	0.0138	0.0014	**0.0149**	0.0117	0.0013	**0.0124**
CuO	0.0121	0.0012	**0.0131**	0.0135	0.0012	**0.0146**	0.0107	0.0012	**0.0113**
ZnO	0.0049	0.0010	**0.0053**	0.0075	0.0010	**0.0081**	0.0042	0.0010	**0.0044**
Ga2O3	0.0054	0.0012	**0.0058**	0.0042	0.0011	**0.0045**	0.0024	0.0011	**0.0025**
As2O3	0.0000	0.0010	**0.0000**	0.0032	0.0010	**0.0035**	0.0020	0.0010	**0.0021**
Br	0.0006	0.0007	**0.0006**	0.0007	0.0007	**0.0008**	0.0005	0.0007	**0.0005**
Rb2O	0.0129	0.0007	**0.0139**	0.0115	0.0007	**0.0125**	0.0065	0.0007	**0.0069**
SrO	0.0134	0.0007	**0.0144**	0.0118	0.0007	**0.0128**	0.0042	0.0006	**0.0044**
Y2O3	0.0018	0.0008	**0.0019**	0.0015	0.0008	**0.0016**	0.0015	0.0007	**0.0016**
ZrO2	0.0277	0.0007	**0.0299**	0.0292	0.0006	**0.0316**	0.0293	0.0006	**0.0311**
Nb2O5	0.0006	0.0008	**0.0007**	0.0017	0.0008	**0.0018**	0.0000	0.0007	**0.0000**
MoO3	0.0000	0.0008	**0.0000**	0.0001	0.0008	**0.0001**	0.0006	0.0008	**0.0006**
BaO	0.0479	0.0145	**0.0517**	0.0592	0.0140	**0.0641**	0.0368	0.0139	**0.0390**
HfO2	0.0043	0.0039	**0.0046**	0.0043	0.0038	**0.0047**	0.0042	0.0038	**0.0045**
PbO	0.0047	0.0020	**0.0051**	0.0000	0.0020	**0.0000**	0.0000	0.0019	**0.0000**
ThO2	0.0000	0.0014	**0.0000**	0.0000	0.0014	**0.0000**	0.0000	0.0013	**0.0000**
Pa	0.0044	0.0011	**0.0047**	0.0041	0.0011	**0.0044**	0.0025	0.0010	**0.0027**
U3O8	0.0000	0.0002	**0.0000**	0.0002	0.0002	**0.0002**	0.0002	0.0002	**0.0002**
TGA:	7.2850			7.6060			5.6770		
Total:	100.0000			100.0000			100.0000		

	34H			34I			35A		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.0827	0.0244	**0.0889**	0.0671	0.0255	**0.0713**	0.0264	0.0242	**0.0283**
MgO	0.5001	0.0229	**0.5377**	0.7399	0.0224	**0.7858**	0.4802	0.0197	**0.5154**
Al2O3	20.5174	0.0203	**22.0579**	17.1038	0.0190	**18.1652**	19.3124	0.0202	**20.7299**
SiO2	67.7573	0.0316	**72.8447**	71.4006	0.0322	**75.8314**	70.9996	0.0320	**76.2109**
P2O5	0.0349	0.0042	**0.0375**	0.0345	0.0041	**0.0366**	0.0296	0.0043	**0.0318**
SO3	0.0641	0.0071	**0.0689**	0.0576	0.0073	**0.0612**	0.1255	0.0074	**0.1347**
Cl	0.0037	0.0095	**0.0040**	0.0000	0.0096	**0.0000**	0.0001	0.0097	**0.0001**
K2O	1.7786	0.0043	**1.9121**	2.1084	0.0041	**2.2392**	0.6400	0.0039	**0.6870**
CaO	0.2831	0.0053	**0.3044**	0.4134	0.0053	**0.4391**	0.1408	0.0052	**0.1511**
TiO2	0.8398	0.0354	**0.9029**	0.7163	0.0368	**0.7608**	0.5009	0.0352	**0.5377**
V2O5	0.0353	0.0055	**0.0379**	0.0102	0.0057	**0.0108**	0.0221	0.0054	**0.0237**
Cr2O3	0.0132	0.0015	**0.0142**	0.0093	0.0015	**0.0099**	0.0106	0.0015	**0.0114**
MnO	0.0037	0.0024	**0.0040**	0.0058	0.0024	**0.0062**	0.0028	0.0024	**0.0030**
Fe2O3	0.9506	0.0049	**1.0220**	1.3102	0.0048	**1.3915**	0.7526	0.0049	**0.8078**
Co2O3	0.0015	0.0018	**0.0016**	0.0033	0.0018	**0.0035**	0.0013	0.0018	**0.0014**
NiO	0.0135	0.0014	**0.0145**	0.0169	0.0014	**0.0180**	0.0161	0.0014	**0.0173**
CuO	0.0138	0.0012	**0.0148**	0.0116	0.0012	**0.0123**	0.0113	0.0012	**0.0121**
ZnO	0.0084	0.0010	**0.0090**	0.0213	0.0010	**0.0226**	0.0103	0.0010	**0.0111**
Ga2O3	0.0014	0.0011	**0.0015**	0.0035	0.0011	**0.0037**	0.0012	0.0011	**0.0013**
As2O3	0.0000	0.0010	**0.0000**	0.0000	0.0010	**0.0000**	0.0005	0.0010	**0.0005**
Br	0.0007	0.0007	**0.0008**	0.0000	0.0007	**0.0000**	0.0003	0.0007	**0.0003**
Rb2O	0.0106	0.0007	**0.0114**	0.0159	0.0007	**0.0169**	0.0047	0.0007	**0.0050**
SrO	0.0101	0.0007	**0.0109**	0.0131	0.0007	**0.0139**	0.0054	0.0007	**0.0058**
Y2O3	0.0022	0.0008	**0.0024**	0.0024	0.0008	**0.0026**	0.0008	0.0008	**0.0009**
ZrO2	0.0313	0.0006	**0.0336**	0.0361	0.0006	**0.0383**	0.0402	0.0006	**0.0432**
Nb2O5	0.0013	0.0008	**0.0014**	0.0009	0.0008	**0.0010**	0.0007	0.0008	**0.0008**
MoO3	0.0000	0.0008	**0.0000**	0.0003	0.0008	**0.0003**	0.0000	0.0008	**0.0000**
BaO	0.0451	0.0142	**0.0485**	0.0381	0.0142	**0.0405**	0.0181	0.0139	**0.0194**
HfO2	0.0038	0.0038	**0.0041**	0.0054	0.0038	**0.0057**	0.0051	0.0039	**0.0055**
PbO	0.0043	0.0020	**0.0046**	0.0043	0.0019	**0.0046**	0.0007	0.0020	**0.0008**
ThO2	0.0007	0.0014	**0.0007**	0.0000	0.0013	**0.0000**	0.0003	0.0014	**0.0003**
Pa	0.0028	0.0011	**0.0030**	0.0063	0.0011	**0.0067**	0.0010	0.0011	**0.0011**
U3O8	0.0001	0.0002	**0.0001**	0.0004	0.0002	**0.0004**	0.0004	0.0002	**0.0004**
TGA:	6.9840			5.8430			6.8380		
Total:	100.0000			100.0000			100.0000		

	35B			35C			35D		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.0648	0.0260	**0.0693**	0.0546	0.0263	**0.0587**	0.0768	0.0252	**0.0816**
MgO	1.0359	0.0194	**1.1085**	0.8849	0.0208	**0.9512**	0.8896	0.0203	**0.9446**
Al2O3	17.9805	0.0194	**19.2402**	20.0442	0.0201	**21.5457**	20.6164	0.0204	**21.8916**
SiO2	69.1243	0.0317	**73.9669**	66.0323	0.0315	**70.9788**	67.0620	0.0315	**71.2100**
P2O5	0.0389	0.0043	**0.0416**	0.0287	0.0045	**0.0309**	0.0331	0.0042	**0.0352**
SO3	0.6561	0.0075	**0.7021**	1.2917	0.0077	**1.3885**	0.0788	0.0073	**0.0837**
Cl	0.0021	0.0095	**0.0023**	0.0000	0.0097	**0.0000**	0.0000	0.0097	**0.0000**
K2O	1.4644	0.0040	**1.5670**	1.8521	0.0043	**1.9908**	3.0419	0.0046	**3.2300**
CaO	0.4555	0.0053	**0.4874**	0.9073	0.0055	**0.9753**	0.1031	0.0053	**0.1095**
TiO2	0.8374	0.0358	**0.8961**	0.5974	0.0371	**0.6422**	0.6281	0.0359	**0.6669**
V2O5	0.0376	0.0054	**0.0402**	0.0105	0.0058	**0.0113**	0.0201	0.0055	**0.0213**
Cr2O3	0.0111	0.0015	**0.0119**	0.0100	0.0015	**0.0108**	0.0091	0.0016	**0.0097**
MnO	0.0416	0.0024	**0.0445**	0.0041	0.0024	**0.0044**	0.0047	0.0024	**0.0050**
Fe2O3	1.4834	0.0297	**1.5873**	1.1939	0.0050	**1.2833**	1.4483	0.0050	**1.5379**
Co2O3	0.0130	0.0018	**0.0139**	0.0007	0.0018	**0.0007**	0.0010	0.0018	**0.0011**
NiO	0.0370	0.0014	**0.0396**	0.0122	0.0014	**0.0131**	0.0115	0.0014	**0.0122**
CuO	0.0116	0.0012	**0.0124**	0.0124	0.0012	**0.0133**	0.0112	0.0012	**0.0119**
ZnO	0.0370	0.0010	**0.0396**	0.0045	0.0010	**0.0048**	0.0072	0.0010	**0.0076**
Ga2O3	0.0048	0.0011	**0.0051**	0.0034	0.0011	**0.0037**	0.0030	0.0011	**0.0032**
As2O3	0.0000	0.0010	**0.0000**	0.0034	0.0010	**0.0037**	0.0007	0.0010	**0.0007**
Br	0.0000	0.0007	**0.0000**	0.0006	0.0007	**0.0006**	0.0007	0.0007	**0.0007**
Rb2O	0.0117	0.0007	**0.0125**	0.0124	0.0007	**0.0133**	0.0183	0.0007	**0.0194**
SrO	0.0118	0.0007	**0.0126**	0.0064	0.0007	**0.0069**	0.0046	0.0007	**0.0049**
Y2O3	0.0040	0.0008	**0.0043**	0.0025	0.0008	**0.0027**	0.0021	0.0008	**0.0022**
ZrO2	0.0335	0.0007	**0.0359**	0.0254	0.0007	**0.0273**	0.0307	0.0007	**0.0326**
Nb2O5	0.0018	0.0008	**0.0019**	0.0011	0.0008	**0.0012**	0.0017	0.0008	**0.0018**
MoO3	0.0003	0.0008	**0.0003**	0.0007	0.0008	**0.0008**	0.0000	0.0008	**0.0000**
BaO	0.0407	0.0141	**0.0435**	0.0239	0.0147	**0.0257**	0.0567	0.0140	**0.0602**
HfO2	0.0024	0.0039	**0.0026**	0.0060	0.0039	**0.0065**	0.0056	0.0039	**0.0059**
PbO	0.0043	0.0020	**0.0046**	0.0000	0.0020	**0.0000**	0.0017	0.0020	**0.0018**
ThO2	0.0019	0.0014	**0.0020**	0.0000	0.0014	**0.0000**	0.0000	0.0014	**0.0000**
Pa	0.0035	0.0011	**0.0037**	0.0035	0.0011	**0.0038**	0.0059	0.0011	**0.0063**
U3O8	0.0002	0.0002	**0.0002**	0.0000	0.0002	**0.0000**	0.0005	0.0002	**0.0005**
TGA:	6.5470			6.9690			5.8250		
Total:	100.0000			100.0000			100.0000		

	35E			36A			36B		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.0989	0.0254	**0.1045**	0.0520	0.0239	**0.0545**	0.0704	0.0240	**0.0742**
MgO	1.3211	0.0211	**1.3964**	0.1084	0.0194	**0.1135**	0.6804	0.0200	**0.7175**
Al2O3	17.9689	0.0190	**18.9926**	14.5184	0.0176	**15.2038**	16.1829	0.0183	**17.0646**
SiO2	67.0229	0.0309	**70.8412**	76.8773	0.0326	**80.5065**	72.6840	0.0321	**76.6442**
P2O5	0.0356	0.0043	**0.0376**	0.0304	0.0042	**0.0318**	0.0337	0.0043	**0.0355**
SO3	0.3166	0.0075	**0.3346**	0.0816	0.0070	**0.0855**	0.3181	0.0072	**0.3354**
Cl	0.0000	0.0096	**0.0000**	0.0000	0.0094	**0.0000**	0.0058	0.0094	**0.0061**
K2O	3.9649	0.0049	**4.1908**	1.9160	0.0040	**2.0064**	2.4365	0.0042	**2.5693**
CaO	0.2249	0.0054	**0.2377**	0.0911	0.0051	**0.0954**	0.0638	0.0051	**0.0673**
TiO2	0.6044	0.0372	**0.6388**	0.6416	0.0347	**0.6719**	0.6766	0.0357	**0.7135**
V2O5	0.0207	0.0056	**0.0219**	0.0152	0.0054	**0.0159**	0.0209	0.0055	**0.0220**
Cr2O3	0.0103	0.0015	**0.0109**	0.0090	0.0015	**0.0094**	0.0080	0.0015	**0.0084**
MnO	0.0072	0.0025	**0.0076**	0.0056	0.0024	**0.0059**	0.0046	0.0024	**0.0049**
Fe2O3	2.8270	0.0301	**2.9881**	0.9935	0.0048	**1.0404**	1.4992	0.0049	**1.5809**
Co2O3	0.0023	0.0019	**0.0024**	0.0001	0.0018	**0.0001**	0.0016	0.0018	**0.0017**
NiO	0.0120	0.0014	**0.0127**	0.0125	0.0014	**0.0131**	0.0112	0.0014	**0.0118**
CuO	0.0126	0.0012	**0.0133**	0.0100	0.0012	**0.0105**	0.0113	0.0012	**0.0119**
ZnO	0.0152	0.0010	**0.0161**	0.0057	0.0010	**0.0060**	0.0092	0.0010	**0.0097**
Ga2O3	0.0036	0.0012	**0.0038**	0.0024	0.0011	**0.0025**	0.0028	0.0011	**0.0029**
As2O3	0.0044	0.0010	**0.0046**	0.0030	0.0010	**0.0031**	0.0042	0.0010	**0.0044**
Br	0.0006	0.0007	**0.0006**	0.0005	0.0007	**0.0005**	0.0001	0.0007	**0.0001**
Rb2O	0.0213	0.0007	**0.0225**	0.0121	0.0007	**0.0127**	0.0141	0.0007	**0.0149**
SrO	0.0089	0.0007	**0.0094**	0.0032	0.0007	**0.0033**	0.0057	0.0007	**0.0060**
Y2O3	0.0026	0.0008	**0.0027**	0.0024	0.0007	**0.0025**	0.0040	0.0008	**0.0042**
ZrO2	0.0216	0.0007	**0.0228**	0.0538	0.0006	**0.0563**	0.0415	0.0006	**0.0438**
Nb2O5	0.0013	0.0008	**0.0014**	0.0011	0.0008	**0.0011**	0.0010	0.0008	**0.0011**
MoO3	0.0000	0.0008	**0.0000**	0.0004	0.0008	**0.0004**	0.0000	0.0008	**0.0000**
BaO	0.0672	0.0143	**0.0710**	0.0328	0.0138	**0.0343**	0.0321	0.0143	**0.0339**
HfO2	0.0040	0.0039	**0.0042**	0.0069	0.0038	**0.0072**	0.0048	0.0038	**0.0051**
PbO	0.0000	0.0020	**0.0000**	0.0000	0.0019	**0.0000**	0.0000	0.0020	**0.0000**
ThO2	0.0011	0.0014	**0.0012**	0.0007	0.0013	**0.0007**	0.0000	0.0013	**0.0000**
Pa	0.0078	0.0011	**0.0082**	0.0039	0.0010	**0.0041**	0.0045	0.0011	**0.0047**
U3O8	0.0004	0.0002	**0.0004**	0.0007	0.0002	**0.0007**	0.0000	0.0002	**0.0000**
TGA:	5.3900			4.5080			5.1670		
Total:	100.0000			100.0000			100.0000		

	37A			37B			38A		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.0745	0.0251	**0.0813**	0.0608	0.0239	**0.0652**	0.0504	0.0252	**0.0529**
MgO	0.7623	0.0211	**0.8317**	0.6874	0.0198	**0.7374**	0.6977	0.0193	**0.7325**
Al2O3	21.0795	0.0209	**22.9985**	20.6078	0.0204	**22.1069**	15.5175	0.0181	**16.2905**
SiO2	62.9955	0.0310	**68.7304**	67.4651	0.0312	**72.3727**	74.5422	0.0322	**78.2554**
P2O5	0.0296	0.0043	**0.0323**	0.0299	0.0043	**0.0321**	0.0249	0.0043	**0.0261**
SO3	1.7606	0.0079	**1.9209**	0.1051	0.0070	**0.1127**	0.0597	0.0069	**0.0627**
Cl	0.0000	0.0097	**0.0000**	0.0000	0.0095	**0.0000**	0.0014	0.0093	**0.0015**
K2O	1.4457	0.0041	**1.5773**	1.8796	0.0042	**2.0163**	1.8110	0.0041	**1.9012**
CaO	1.1829	0.0055	**1.2906**	0.1391	0.0051	**0.1492**	0.2215	0.0052	**0.2325**
TiO2	0.8014	0.0363	**0.8744**	0.7694	0.0349	**0.8254**	1.0345	0.0349	**1.0860**
V2O5	0.0253	0.0055	**0.0276**	0.0291	0.0053	**0.0312**	0.0258	0.0053	**0.0271**
Cr2O3	0.0097	0.0016	**0.0106**	0.0088	0.0015	**0.0094**	0.0081	0.0015	**0.0085**
MnO	0.0127	0.0025	**0.0139**	0.0062	0.0024	**0.0066**	0.0087	0.0024	**0.0091**
Fe2O3	1.3391	0.0294	**1.4610**	1.2747	0.0290	**1.3674**	1.1127	0.0292	**1.1681**
Co2O3	0.0037	0.0019	**0.0040**	0.0017	0.0018	**0.0018**	0.0000	0.0018	**0.0000**
NiO	0.0187	0.0014	**0.0204**	0.0123	0.0014	**0.0132**	0.0136	0.0014	**0.0143**
CuO	0.0097	0.0012	**0.0106**	0.0103	0.0012	**0.0110**	0.0091	0.0012	**0.0096**
ZnO	0.0084	0.0010	**0.0092**	0.0089	0.0010	**0.0095**	0.0028	0.0010	**0.0029**
Ga2O3	0.0053	0.0011	**0.0058**	0.0046	0.0011	**0.0049**	0.0056	0.0011	**0.0059**
As2O3	0.0014	0.0010	**0.0015**	0.0000	0.0010	**0.0000**	0.0011	0.0010	**0.0012**
Br	0.0006	0.0007	**0.0007**	0.0005	0.0007	**0.0005**	0.0000	0.0007	**0.0000**
Rb2O	0.0099	0.0007	**0.0108**	0.0131	0.0007	**0.0140**	0.0124	0.0007	**0.0130**
SrO	0.0125	0.0007	**0.0136**	0.0090	0.0007	**0.0097**	0.0075	0.0006	**0.0079**
Y2O3	0.0017	0.0008	**0.0019**	0.0016	0.0008	**0.0017**	0.0027	0.0007	**0.0028**
ZrO2	0.0401	0.0007	**0.0437**	0.0359	0.0006	**0.0385**	0.0334	0.0006	**0.0351**
Nb2O5	0.0020	0.0008	**0.0022**	0.0010	0.0008	**0.0011**	0.0027	0.0007	**0.0028**
MoO3	0.0000	0.0008	**0.0000**	0.0000	0.0008	**0.0000**	0.0003	0.0008	**0.0003**
BaO	0.0119	0.0146	**0.0130**	0.0433	0.0137	**0.0464**	0.0397	0.0140	**0.0417**
HfO2	0.0066	0.0039	**0.0072**	0.0040	0.0038	**0.0043**	0.0033	0.0038	**0.0035**
PbO	0.0000	0.0020	**0.0000**	0.0053	0.0019	**0.0057**	0.0000	0.0019	**0.0000**
ThO2	0.0014	0.0014	**0.0015**	0.0007	0.0013	**0.0007**	0.0004	0.0013	**0.0004**
Pa	0.0031	0.0011	**0.0034**	0.0041	0.0011	**0.0044**	0.0042	0.0010	**0.0044**
U3O8	0.0000	0.0002	**0.0000**	0.0001	0.0002	**0.0001**	0.0001	0.0002	**0.0001**
TGA:	8.3440			6.7810			4.7450		
Total:	100.0000			100.0000			100.0000		

	38B			38C			38D		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.0767	0.0255	**0.0816**	0.0578	0.0227	**0.0613**	0.0464	0.0240	**0.0487**
MgO	0.7240	0.0202	**0.7703**	0.1012	0.0194	**0.1073**	0.4451	0.0188	**0.4672**
Al2O3	19.1738	0.0198	**20.3996**	17.3067	0.0190	**18.3423**	14.5201	0.0174	**15.2425**
SiO2	69.4804	0.0315	**73.9224**	73.8580	0.0326	**78.2775**	76.5001	0.0326	**80.3058**
P2O5	0.0279	0.0042	**0.0297**	0.0258	0.0043	**0.0273**	0.0236	0.0043	**0.0248**
SO3	0.1730	0.0074	**0.1841**	0.0766	0.0071	**0.0812**	0.1900	0.0071	**0.1995**
Cl	0.0000	0.0096	**0.0000**	0.0000	0.0097	**0.0000**	0.0014	0.0095	**0.0015**
K2O	1.8478	0.0041	**1.9659**	1.3014	0.0041	**1.3793**	1.7632	0.0040	**1.8509**
CaO	0.2543	0.0053	**0.2706**	0.0694	0.0052	**0.0735**	0.0953	0.0051	**0.1000**
TiO2	0.8343	0.0355	**0.8876**	0.5625	0.0352	**0.5962**	0.5251	0.0344	**0.5512**
V2O5	0.0258	0.0055	**0.0274**	0.0199	0.0054	**0.0211**	0.0183	0.0053	**0.0192**
Cr2O3	0.0104	0.0016	**0.0111**	0.0081	0.0015	**0.0086**	0.0088	0.0015	**0.0092**
MnO	0.0049	0.0024	**0.0052**	0.0036	0.0024	**0.0038**	0.0034	0.0024	**0.0036**
Fe2O3	1.2370	0.0049	**1.3161**	0.8408	0.0299	**0.8911**	0.9900	0.0047	**1.0393**
Co2O3	0.0000	0.0018	**0.0000**	0.0007	0.0018	**0.0007**	0.0002	0.0018	**0.0002**
NiO	0.0111	0.0014	**0.0118**	0.0108	0.0014	**0.0114**	0.0103	0.0013	**0.0108**
CuO	0.0093	0.0012	**0.0099**	0.0102	0.0012	**0.0108**	0.0109	0.0012	**0.0114**
ZnO	0.0023	0.0010	**0.0025**	0.0021	0.0010	**0.0022**	0.0018	0.0010	**0.0019**
Ga2O3	0.0032	0.0011	**0.0034**	0.0032	0.0011	**0.0034**	0.0035	0.0011	**0.0037**
As2O3	0.0000	0.0010	**0.0000**	0.0000	0.0010	**0.0000**	0.0000	0.0010	**0.0000**
Br	0.0006	0.0007	**0.0006**	0.0000	0.0007	**0.0000**	0.0004	0.0007	**0.0004**
Rb2O	0.0131	0.0007	**0.0139**	0.0084	0.0007	**0.0089**	0.0092	0.0007	**0.0097**
SrO	0.0102	0.0007	**0.0109**	0.0035	0.0007	**0.0037**	0.0050	0.0006	**0.0052**
Y2O3	0.0009	0.0008	**0.0010**	0.0013	0.0008	**0.0014**	0.0015	0.0007	**0.0016**
ZrO2	0.0324	0.0007	**0.0345**	0.0494	0.0006	**0.0524**	0.0418	0.0006	**0.0439**
Nb2O5	0.0011	0.0008	**0.0012**	0.0008	0.0008	**0.0008**	0.0007	0.0007	**0.0007**
MoO3	0.0001	0.0008	**0.0001**	0.0000	0.0008	**0.0000**	0.0001	0.0008	**0.0001**
BaO	0.0254	0.0147	**0.0270**	0.0228	0.0141	**0.0242**	0.0291	0.0140	**0.0306**
HfO2	0.0042	0.0039	**0.0045**	0.0058	0.0038	**0.0061**	0.0062	0.0037	**0.0065**
PbO	0.0022	0.0020	**0.0023**	0.0003	0.0020	**0.0003**	0.0055	0.0019	**0.0058**
ThO2	0.0005	0.0014	**0.0005**	0.0002	0.0013	**0.0002**	0.0000	0.0013	**0.0000**
Pa	0.0035	0.0011	**0.0037**	0.0025	0.0011	**0.0027**	0.0033	0.0010	**0.0035**
U3O8	0.0006	0.0002	**0.0006**	0.0003	0.0002	**0.0003**	0.0006	0.0002	**0.0006**
TGA:	6.0090			5.6460			4.7390		
Total:	100.0000			100.0000			100.0000		

	41A			41B			41D		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.0982	0.0253	**0.1066**	0.0616	0.0237	**0.0650**	0.0880	0.0245	**0.0928**
MgO	1.1451	0.0212	**1.2426**	0.0976	0.0200	**0.1030**	0.9717	0.0194	**1.0249**
Al2O3	18.7957	0.0207	**20.3957**	16.5214	0.0184	**17.4331**	16.3486	0.0187	**17.2439**
SiO2	66.1537	0.0324	**71.7853**	74.0381	0.0324	**78.1240**	69.8691	0.0316	**73.6953**
P2O5	0.0357	0.0045	**0.0387**	0.0284	0.0042	**0.0300**	0.0367	0.0042	**0.0387**
SO3	0.1832	0.0075	**0.1988**	0.0926	0.0071	**0.0977**	0.4505	0.0072	**0.4752**
Cl	0.0004	0.0101	**0.0004**	0.0000	0.0097	**0.0000**	0.0047	0.0092	**0.0050**
K2O	2.6254	0.0045	**2.8489**	1.8782	0.0042	**1.9819**	3.5204	0.0047	**3.7132**
CaO	0.1811	0.0056	**0.1965**	0.0848	0.0052	**0.0895**	0.0295	0.0052	**0.0311**
TiO2	0.8073	0.0399	**0.8760**	0.5987	0.0362	**0.6317**	0.6777	0.0356	**0.7148**
V2O5	0.0189	0.0061	**0.0205**	0.0146	0.0056	**0.0154**	0.0202	0.0053	**0.0213**
Cr2O3	0.0114	0.0016	**0.0124**	0.0081	0.0015	**0.0085**	0.0091	0.0015	**0.0096**
MnO	0.0068	0.0025	**0.0074**	0.0063	0.0024	**0.0067**	0.0064	0.0024	**0.0068**
Fe2O3	1.8813	0.0053	**2.0414**	1.1827	0.0049	**1.2480**	2.6003	0.0047	**2.7427**
Co2O3	0.0015	0.0019	**0.0016**	0.0012	0.0018	**0.0013**	0.0019	0.0018	**0.0020**
NiO	0.0125	0.0015	**0.0136**	0.0115	0.0014	**0.0121**	0.0121	0.0014	**0.0128**
CuO	0.0124	0.0013	**0.0135**	0.0106	0.0012	**0.0112**	0.0129	0.0012	**0.0136**
ZnO	0.0063	0.0011	**0.0068**	0.0113	0.0010	**0.0119**	0.0100	0.0010	**0.0106**
Ga2O3	0.0065	0.0012	**0.0071**	0.0024	0.0011	**0.0025**	0.0025	0.0011	**0.0026**
As2O3	0.0000	0.0011	**0.0000**	0.0016	0.0010	**0.0017**	0.0049	0.0010	**0.0052**
Br	0.0004	0.0007	**0.0004**	0.0004	0.0007	**0.0004**	0.0004	0.0007	**0.0004**
Rb2O	0.0200	0.0008	**0.0217**	0.0118	0.0007	**0.0124**	0.0176	0.0007	**0.0186**
SrO	0.0105	0.0007	**0.0114**	0.0058	0.0007	**0.0061**	0.0075	0.0007	**0.0079**
Y2O3	0.0012	0.0008	**0.0013**	0.0016	0.0008	**0.0017**	0.0024	0.0008	**0.0025**
ZrO2	0.0246	0.0007	**0.0267**	0.0429	0.0006	**0.0453**	0.0319	0.0006	**0.0336**
Nb2O5	0.0019	0.0008	**0.0021**	0.0010	0.0008	**0.0011**	0.0008	0.0008	**0.0008**
MoO3	0.0000	0.0009	**0.0000**	0.0000	0.0008	**0.0000**	0.0000	0.0008	**0.0000**
BaO	0.0996	0.0150	**0.1081**	0.0456	0.0137	**0.0481**	0.0596	0.0141	**0.0629**
HfO2	0.0022	0.0041	**0.0024**	0.0043	0.0038	**0.0045**	0.0045	0.0038	**0.0047**
PbO	0.0036	0.0021	**0.0039**	0.0000	0.0019	**0.0000**	0.0000	0.0020	**0.0000**
ThO2	0.0000	0.0014	**0.0000**	0.0007	0.0013	**0.0007**	0.0000	0.0014	**0.0000**
Pa	0.0076	0.0011	**0.0082**	0.0042	0.0011	**0.0044**	0.0062	0.0011	**0.0065**
U3O8	0.0000	0.0002	**0.0000**	0.0001	0.0002	**0.0001**	0.0000	0.0002	**0.0000**
TGA:	7.8450			5.2300			5.1920		
Total:	100.0000			100.0000			100.0000		

	43A			43B			43C		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.0599	0.0248	**0.0633**	0.1203	0.0248	**0.1302**	0.1662	0.0250	**0.1783**
MgO	0.0831	0.0198	**0.0878**	0.7795	0.0210	**0.8436**	1.2393	0.0210	**1.3297**
Al2O3	14.8913	0.0180	**15.7286**	24.0890	0.0219	**26.0709**	19.6155	0.0204	**21.0460**
SiO2	75.8766	0.0329	**80.1426**	62.9463	0.0311	**68.1252**	65.9706	0.0314	**70.7816**
P2O5	0.0336	0.0044	**0.0355**	0.0344	0.0044	**0.0372**	0.0405	0.0043	**0.0434**
SO3	0.0487	0.0071	**0.0514**	0.0626	0.0073	**0.0678**	0.0938	0.0074	**0.1006**
Cl	0.0025	0.0096	**0.0026**	0.0000	0.0100	**0.0000**	0.0207	0.0099	**0.0222**
K2O	0.9197	0.0040	**0.9714**	2.0266	0.0044	**2.1933**	3.2129	0.0044	**3.4472**
CaO	0.2677	0.0052	**0.2827**	0.1854	0.0053	**0.2007**	0.3552	0.0055	**0.3811**
TiO2	0.9938	0.0356	**1.0497**	0.8442	0.0365	**0.9137**	0.7666	0.0366	**0.8225**
V2O5	0.0293	0.0054	**0.0310**	0.0446	0.0055	**0.0483**	0.0343	0.0056	**0.0368**
Cr2O3	0.0098	0.0015	**0.0103**	0.0116	0.0016	**0.0126**	0.0131	0.0016	**0.0141**
MnO	0.0297	0.0024	**0.0314**	0.0050	0.0025	**0.0054**	0.0053	0.0025	**0.0057**
Fe2O3	1.3110	0.0301	**1.3847**	1.1090	0.0050	**1.2002**	1.4676	0.0051	**1.5746**
Co2O3	0.0046	0.0018	**0.0049**	0.0007	0.0019	**0.0008**	0.0017	0.0018	**0.0018**
NiO	0.0152	0.0014	**0.0161**	0.0128	0.0014	**0.0138**	0.0162	0.0014	**0.0174**
CuO	0.0116	0.0012	**0.0123**	0.0103	0.0012	**0.0112**	0.0143	0.0012	**0.0153**
ZnO	0.0052	0.0010	**0.0055**	0.0038	0.0010	**0.0041**	0.0078	0.0010	**0.0084**
Ga2O3	0.0041	0.0011	**0.0043**	0.0042	0.0012	**0.0045**	0.0041	0.0012	**0.0044**
As2O3	0.0044	0.0010	**0.0047**	0.0034	0.0010	**0.0037**	0.0056	0.0010	**0.0060**
Br	0.0007	0.0007	**0.0007**	0.0005	0.0007	**0.0005**	0.0015	0.0007	**0.0016**
Rb2O	0.0060	0.0007	**0.0063**	0.0115	0.0007	**0.0124**	0.0216	0.0007	**0.0232**
SrO	0.0067	0.0007	**0.0071**	0.0087	0.0007	**0.0094**	0.0128	0.0007	**0.0137**
Y2O3	0.0022	0.0008	**0.0023**	0.0006	0.0008	**0.0007**	0.0041	0.0008	**0.0044**
ZrO2	0.0304	0.0006	**0.0321**	0.0180	0.0007	**0.0195**	0.0197	0.0007	**0.0211**
Nb2O5	0.0025	0.0008	**0.0026**	0.0010	0.0008	**0.0011**	0.0009	0.0008	**0.0010**
MoO3	0.0004	0.0008	**0.0004**	0.0000	0.0008	**0.0000**	0.0000	0.0008	**0.0000**
BaO	0.0188	0.0143	**0.0199**	0.0546	0.0146	**0.0591**	0.0784	0.0147	**0.0841**
HfO2	0.0055	0.0038	**0.0058**	0.0057	0.0039	**0.0062**	0.0037	0.0039	**0.0040**
PbO	0.0000	0.0020	**0.0000**	0.0000	0.0020	**0.0000**	0.0000	0.0020	**0.0000**
ThO2	0.0001	0.0014	**0.0001**	0.0000	0.0014	**0.0000**	0.0012	0.0014	**0.0013**
Pa	0.0014	0.0011	**0.0015**	0.0036	0.0011	**0.0039**	0.0079	0.0011	**0.0085**
U3O8	0.0004	0.0002	**0.0004**	0.0000	0.0002	**0.0000**	0.0000	0.0002	**0.0000**
TGA:	5.3230			7.6020			6.7970		
Total:	100.0000			100.0000			100.0000		

	43D			43E			44A		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.1336	0.0241	**0.1420**	0.1870	0.0251	**0.1970**	0.0503	0.0241	**0.0528**
MgO	0.9801	0.0206	**1.0419**	1.8030	0.0203	**1.8993**	0.8653	0.0196	**0.9077**
Al2O3	19.3027	0.0199	**20.5209**	17.9964	0.0193	**18.9572**	11.2949	0.0160	**11.8482**
SiO2	68.6453	0.0312	**72.9774**	67.4484	0.0310	**71.0491**	78.4021	0.0329	**82.2429**
P2O5	0.0338	0.0042	**0.0359**	0.0646	0.0042	**0.0681**	0.0250	0.0042	**0.0262**
SO3	0.0755	0.0071	**0.0803**	0.0862	0.0072	**0.0908**	0.1529	0.0071	**0.1604**
Cl	0.0053	0.0098	**0.0056**	0.0035	0.0096	**0.0037**	0.0019	0.0094	**0.0020**
K2O	2.5670	0.0045	**2.7290**	3.3563	0.0046	**3.5355**	1.2781	0.0039	**1.3407**
CaO	0.1245	0.0052	**0.1324**	0.1713	0.0053	**0.1804**	1.0412	0.0053	**1.0922**
TiO2	0.7708	0.0357	**0.8194**	0.7218	0.0366	**0.7603**	1.1363	0.0350	**1.1920**
V2O5	0.0261	0.0055	**0.0277**	0.0381	0.0056	**0.0401**	0.0174	0.0054	**0.0182**
Cr2O3	0.0100	0.0015	**0.0106**	0.0121	0.0015	**0.0127**	0.0067	0.0015	**0.0070**
MnO	0.0043	0.0024	**0.0046**	0.0111	0.0024	**0.0117**	0.0039	0.0024	**0.0041**
Fe2O3	1.2180	0.0302	**1.2949**	2.8119	0.0302	**2.9620**	0.9156	0.0048	**0.9604**
Co2O3	0.0008	0.0018	**0.0008**	0.0000	0.0019	**0.0000**	0.0031	0.0018	**0.0032**
NiO	0.0131	0.0014	**0.0139**	0.0155	0.0014	**0.0163**	0.0132	0.0014	**0.0138**
CuO	0.0124	0.0012	**0.0132**	0.0147	0.0012	**0.0155**	0.0096	0.0012	**0.0101**
ZnO	0.0086	0.0010	**0.0091**	0.0146	0.0010	**0.0154**	0.0017	0.0010	**0.0018**
Ga2O3	0.0031	0.0011	**0.0033**	0.0031	0.0011	**0.0033**	0.0021	0.0011	**0.0022**
As2O3	0.0007	0.0010	**0.0007**	0.0072	0.0010	**0.0076**	0.0000	0.0010	**0.0000**
Br	0.0019	0.0007	**0.0020**	0.0003	0.0007	**0.0003**	0.0005	0.0007	**0.0005**
Rb2O	0.0140	0.0007	**0.0149**	0.0178	0.0007	**0.0187**	0.0092	0.0007	**0.0097**
SrO	0.0073	0.0007	**0.0078**	0.0182	0.0007	**0.0192**	0.0071	0.0007	**0.0074**
Y2O3	0.0021	0.0008	**0.0022**	0.0013	0.0008	**0.0014**	0.0030	0.0007	**0.0031**
ZrO2	0.0207	0.0006	**0.0220**	0.0224	0.0007	**0.0236**	0.0516	0.0006	**0.0541**
Nb2O5	0.0011	0.0008	**0.0012**	0.0011	0.0008	**0.0012**	0.0028	0.0008	**0.0029**
MoO3	0.0000	0.0008	**0.0000**	0.0008	0.0008	**0.0008**	0.0001	0.0008	**0.0001**
BaO	0.0544	0.0145	**0.0578**	0.0791	0.0145	**0.0833**	0.0199	0.0141	**0.0209**
HfO2	0.0056	0.0038	**0.0060**	0.0024	0.0039	**0.0025**	0.0083	0.0038	**0.0087**
PbO	0.0027	0.0020	**0.0029**	0.0153	0.0020	**0.0161**	0.0025	0.0019	**0.0026**
ThO2	0.0005	0.0014	**0.0005**	0.0008	0.0014	**0.0008**	0.0008	0.0013	**0.0008**
Pa	0.0052	0.0011	**0.0055**	0.0058	0.0011	**0.0061**	0.0031	0.0010	**0.0033**
U3O8	0.0003	0.0002	**0.0003**	0.0000	0.0002	**0.0000**	0.0000	0.0002	**0.0000**
TGA:	5.9360			5.0680			4.6700		
Total:	100.0000			100.0000			100.0000		

	44B			44C			45A		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.1024	0.0245	**0.1084**	0.1259	0.0251	**0.1351**	0.2724	0.0256	**0.2962**
MgO	0.8718	0.0199	**0.9225**	1.2124	0.0204	**1.3010**	0.7871	0.0208	**0.8560**
Al2O3	14.5580	0.0176	**15.4054**	19.1026	0.0200	**20.4990**	23.4380	0.0218	**25.4888**
SiO2	71.4604	0.0319	**75.6203**	66.1600	0.0313	**70.9962**	61.5572	0.0308	**66.9435**
P2O5	0.0246	0.0043	**0.0260**	0.0260	0.0043	**0.0279**	0.0280	0.0045	**0.0304**
SO3	1.9371	0.0075	**2.0499**	0.3216	0.0073	**0.3451**	0.7877	0.0078	**0.8566**
Cl	0.0000	0.0095	**0.0000**	0.0000	0.0098	**0.0000**	0.0000	0.0099	**0.0000**
K2O	2.0940	0.0043	**2.2159**	3.0602	0.0046	**3.2839**	1.7363	0.0043	**1.8882**
CaO	1.2078	0.0053	**1.2781**	0.1408	0.0053	**0.1511**	0.4261	0.0055	**0.4634**
TiO2	0.8805	0.0353	**0.9318**	0.7804	0.0355	**0.8374**	0.8593	0.0365	**0.9345**
V2O5	0.0198	0.0054	**0.0210**	0.0325	0.0054	**0.0349**	0.0434	0.0056	**0.0472**
Cr2O3	0.0073	0.0015	**0.0077**	0.0099	0.0015	**0.0106**	0.0129	0.0016	**0.0140**
MnO	0.0043	0.0024	**0.0045**	0.0109	0.0024	**0.0117**	0.0097	0.0025	**0.0105**
Fe2O3	1.1575	0.0049	**1.2249**	2.0331	0.0050	**2.1817**	1.8358	0.0312	**1.9964**
Co2O3	0.0057	0.0018	**0.0060**	0.0045	0.0018	**0.0048**	0.0040	0.0019	**0.0044**
NiO	0.0244	0.0014	**0.0258**	0.0155	0.0014	**0.0166**	0.0252	0.0014	**0.0274**
CuO	0.0102	0.0012	**0.0108**	0.0112	0.0012	**0.0120**	0.0103	0.0012	**0.0112**
ZnO	0.0177	0.0010	**0.0187**	0.0183	0.0010	**0.0196**	0.0174	0.0010	**0.0189**
Ga2O3	0.0039	0.0011	**0.0041**	0.0056	0.0011	**0.0060**	0.0023	0.0012	**0.0025**
As2O3	0.0000	0.0010	**0.0000**	0.0008	0.0010	**0.0009**	0.0000	0.0010	**0.0000**
Br	0.0004	0.0007	**0.0004**	0.0006	0.0007	**0.0006**	0.0000	0.0007	**0.0000**
Rb2O	0.0133	0.0007	**0.0141**	0.0192	0.0007	**0.0206**	0.0098	0.0007	**0.0107**
SrO	0.0064	0.0007	**0.0068**	0.0057	0.0007	**0.0061**	0.0104	0.0007	**0.0113**
Y2O3	0.0036	0.0008	**0.0038**	0.0015	0.0008	**0.0016**	0.0005	0.0008	**0.0005**
ZrO2	0.0411	0.0006	**0.0435**	0.0258	0.0007	**0.0277**	0.0179	0.0007	**0.0195**
Nb2O5	0.0018	0.0008	**0.0019**	0.0017	0.0008	**0.0018**	0.0014	0.0008	**0.0015**
MoO3	0.0000	0.0008	**0.0000**	0.0003	0.0008	**0.0003**	0.0000	0.0008	**0.0000**
BaO	0.0315	0.0140	**0.0333**	0.0447	0.0142	**0.0480**	0.0463	0.0147	**0.0504**
HfO2	0.0065	0.0038	**0.0069**	0.0085	0.0039	**0.0091**	0.0053	0.0039	**0.0058**
PbO	0.0026	0.0019	**0.0028**	0.0007	0.0020	**0.0008**	0.0064	0.0020	**0.0070**
ThO2	0.0000	0.0013	**0.0000**	0.0004	0.0014	**0.0004**	0.0001	0.0014	**0.0001**
Pa	0.0043	0.0011	**0.0046**	0.0070	0.0011	**0.0075**	0.0029	0.0011	**0.0031**
U3O8	0.0001	0.0002	**0.0001**	0.0000	0.0002	**0.0000**	0.0000	0.0002	**0.0000**
TGA:	5.5010			6.8120			8.0460		
Total:	100.0000			100.0000			100.0000		

	45B			45C			46A		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.3882	0.0264	**0.4195**	0.2393	0.0248	**0.2550**	0.1813	0.0246	**0.1957**
MgO	0.9733	0.0215	**1.0517**	0.9342	0.0206	**0.9954**	0.8612	0.0213	**0.9295**
Al2O3	25.1661	0.0224	**27.1930**	19.8822	0.0201	**21.1837**	22.1015	0.0211	**23.8539**
SiO2	60.5914	0.0307	**65.4716**	66.7404	0.0314	**71.1094**	62.6069	0.0310	**67.5707**
P2O5	0.0399	0.0044	**0.0431**	0.0466	0.0044	**0.0497**	0.0380	0.0044	**0.0410**
SO3	0.2862	0.0073	**0.3092**	0.2268	0.0073	**0.2416**	0.2486	0.0072	**0.2683**
Cl	0.0000	0.0098	**0.0000**	0.0001	0.0097	**0.0001**	0.0010	0.0099	**0.0011**
K2O	2.7220	0.0046	**2.9412**	2.9181	0.0046	**3.1091**	2.5294	0.0046	**2.7299**
CaO	0.0832	0.0053	**0.0899**	0.0756	0.0054	**0.0805**	0.5026	0.0054	**0.5425**
TiO2	0.6925	0.0387	**0.7483**	0.7850	0.0383	**0.8364**	0.9445	0.0365	**1.0194**
V2O5	0.0367	0.0060	**0.0397**	0.0250	0.0060	**0.0266**	0.0361	0.0056	**0.0390**
Cr2O3	0.0133	0.0016	**0.0144**	0.0130	0.0015	**0.0138**	0.0118	0.0016	**0.0127**
MnO	0.0073	0.0025	**0.0079**	0.0064	0.0024	**0.0068**	0.0103	0.0025	**0.0111**
Fe2O3	1.3363	0.0050	**1.4439**	1.7921	0.0050	**1.9094**	2.3984	0.0301	**2.5886**
Co2O3	0.0021	0.0019	**0.0023**	0.0002	0.0019	**0.0002**	0.0046	0.0019	**0.0050**
NiO	0.0204	0.0014	**0.0220**	0.0126	0.0014	**0.0134**	0.0125	0.0014	**0.0135**
CuO	0.0124	0.0012	**0.0134**	0.0126	0.0012	**0.0134**	0.0117	0.0012	**0.0126**
ZnO	0.0209	0.0010	**0.0226**	0.0077	0.0010	**0.0082**	0.0099	0.0010	**0.0107**
Ga2O3	0.0052	0.0012	**0.0056**	0.0046	0.0011	**0.0049**	0.0037	0.0012	**0.0040**
As2O3	0.0000	0.0010	**0.0000**	0.0072	0.0010	**0.0077**	0.0019	0.0010	**0.0020**
Br	0.0004	0.0007	**0.0004**	0.0000	0.0007	**0.0000**	0.0009	0.0007	**0.0010**
Rb2O	0.0146	0.0007	**0.0158**	0.0170	0.0007	**0.0181**	0.0125	0.0007	**0.0135**
SrO	0.0108	0.0007	**0.0117**	0.0100	0.0007	**0.0107**	0.0107	0.0007	**0.0116**
Y2O3	0.0001	0.0008	**0.0001**	0.0009	0.0008	**0.0010**	0.0000	0.0008	**0.0000**
ZrO2	0.0145	0.0007	**0.0157**	0.0176	0.0007	**0.0188**	0.0227	0.0007	**0.0245**
Nb2O5	0.0007	0.0008	**0.0008**	0.0017	0.0008	**0.0018**	0.0021	0.0008	**0.0023**
MoO3	0.0000	0.0008	**0.0000**	0.0000	0.0008	**0.0000**	0.0000	0.0008	**0.0000**
BaO	0.0905	0.0142	**0.0978**	0.0686	0.0144	**0.0731**	0.0802	0.0147	**0.0866**
HfO2	0.0056	0.0039	**0.0061**	0.0038	0.0039	**0.0040**	0.0038	0.0040	**0.0041**
PbO	0.0055	0.0020	**0.0059**	0.0000	0.0020	**0.0000**	0.0000	0.0020	**0.0000**
ThO2	0.0000	0.0014	**0.0000**	0.0000	0.0014	**0.0000**	0.0006	0.0014	**0.0006**
Pa	0.0059	0.0011	**0.0064**	0.0067	0.0011	**0.0071**	0.0044	0.0011	**0.0047**
U3O8	0.0000	0.0002	**0.0000**	0.0001	0.0002	**0.0001**	0.0000	0.0002	**0.0000**
TGA:	7.4540			6.1440			7.3460		
Total:	100.0000			100.0000			100.0000		

	46B			46C			46D		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.0390	0.0236	**0.0407**	0.0527	0.0257	**0.0568**	0.0642	0.0246	**0.0699**
MgO	0.1683	0.0179	**0.1758**	0.2981	0.0204	**0.3213**	0.0742	0.0209	**0.0808**
Al2O3	11.1379	0.0161	**11.6339**	20.0931	0.0204	**21.6542**	22.3290	0.0214	**24.3102**
SiO2	81.4769	0.0336	**85.1049**	68.4056	0.0321	**73.7201**	62.8193	0.0311	**68.3933**
P2O5	0.0184	0.0043	**0.0192**	0.0200	0.0044	**0.0215**	0.0287	0.0044	**0.0313**
SO3	0.1540	0.0071	**0.1609**	0.1836	0.0071	**0.1979**	0.2723	0.0075	**0.2965**
Cl	0.0000	0.0095	**0.0000**	0.0000	0.0097	**0.0000**	0.0022	0.0097	**0.0024**
K2O	0.2030	0.0035	**0.2120**	0.6597	0.0039	**0.7110**	1.0500	0.0041	**1.1432**
CaO	0.1127	0.0050	**0.1177**	0.1609	0.0053	**0.1734**	0.0804	0.0054	**0.0875**
TiO2	0.8399	0.0345	**0.8773**	0.7008	0.0375	**0.7552**	0.7768	0.0363	**0.8457**
V2O5	0.0190	0.0053	**0.0198**	0.0168	0.0059	**0.0181**	0.0404	0.0056	**0.0440**
Cr2O3	0.0087	0.0015	**0.0091**	0.0109	0.0015	**0.0117**	0.0111	0.0016	**0.0121**
MnO	0.0020	0.0024	**0.0021**	0.0060	0.0024	**0.0065**	0.0108	0.0024	**0.0118**
Fe2O3	1.4484	0.0047	**1.5129**	2.0759	0.0051	**2.2372**	4.1786	0.0312	**4.5494**
Co2O3	0.0006	0.0018	**0.0006**	0.0010	0.0018	**0.0011**	0.0014	0.0019	**0.0015**
NiO	0.0127	0.0014	**0.0133**	0.0118	0.0014	**0.0127**	0.0135	0.0014	**0.0147**
CuO	0.0107	0.0012	**0.0112**	0.0090	0.0012	**0.0097**	0.0114	0.0012	**0.0124**
ZnO	0.0031	0.0010	**0.0032**	0.0040	0.0010	**0.0043**	0.0036	0.0011	**0.0039**
Ga2O3	0.0021	0.0011	**0.0022**	0.0028	0.0012	**0.0030**	0.0042	0.0012	**0.0046**
As2O3	0.0011	0.0010	**0.0011**	0.0000	0.0010	**0.0000**	0.0068	0.0011	**0.0074**
Br	0.0000	0.0007	**0.0000**	0.0002	0.0007	**0.0002**	0.0005	0.0007	**0.0005**
Rb2O	0.0018	0.0007	**0.0019**	0.0054	0.0007	**0.0058**	0.0060	0.0008	**0.0065**
SrO	0.0030	0.0006	**0.0031**	0.0044	0.0007	**0.0047**	0.0061	0.0007	**0.0066**
Y2O3	0.0022	0.0007	**0.0023**	0.0011	0.0008	**0.0012**	0.0014	0.0008	**0.0015**
ZrO2	0.0526	0.0006	**0.0549**	0.0329	0.0007	**0.0355**	0.0310	0.0007	**0.0337**
Nb2O5	0.0017	0.0007	**0.0018**	0.0008	0.0008	**0.0009**	0.0012	0.0008	**0.0013**
MoO3	0.0002	0.0008	**0.0002**	0.0002	0.0008	**0.0002**	0.0000	0.0009	**0.0000**
BaO	0.0120	0.0136	**0.0125**	0.0246	0.0141	**0.0265**	0.0181	0.0145	**0.0197**
HfO2	0.0042	0.0038	**0.0044**	0.0027	0.0039	**0.0029**	0.0049	0.0040	**0.0053**
PbO	0.0000	0.0019	**0.0000**	0.0035	0.0020	**0.0038**	0.0000	0.0021	**0.0000**
ThO2	0.0001	0.0013	**0.0001**	0.0000	0.0014	**0.0000**	0.0000	0.0014	**0.0000**
Pa	0.0000	0.0010	**0.0000**	0.0014	0.0011	**0.0015**	0.0018	0.0011	**0.0020**
U3O8	0.0009	0.0002	**0.0009**	0.0010	0.0002	**0.0011**	0.0002	0.0002	**0.0002**
TGA:	4.2630			7.2090			8.1500		
Total:	100.0000			100.0000			100.0000		

	46E			47A			47B		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.1629	0.0243	**0.1765**	0.1812	0.0251	**0.1905**	0.1015	0.0252	**0.1068**
MgO	0.8723	0.0211	**0.9451**	0.9570	0.0201	**1.0060**	1.1045	0.0202	**1.1625**
Al2O3	23.6030	0.0219	**25.5717**	12.3013	0.0166	**12.9309**	16.2618	0.0182	**17.1160**
SiO2	59.5938	0.0304	**64.5647**	75.2509	0.0327	**79.1024**	69.3563	0.0314	**72.9997**
P2O5	0.0469	0.0045	**0.0508**	0.0275	0.0042	**0.0289**	0.0403	0.0043	**0.0424**
SO3	0.3625	0.0074	**0.3927**	1.0071	0.0077	**1.0586**	1.1434	0.0076	**1.2035**
Cl	0.0000	0.0098	**0.0000**	0.0035	0.0094	**0.0037**	0.0056	0.0093	**0.0059**
K2O	2.2961	0.0043	**2.4876**	1.6995	0.0041	**1.7865**	3.4755	0.0047	**3.6581**
CaO	0.1535	0.0054	**0.1663**	0.8117	0.0053	**0.8532**	0.7421	0.0054	**0.7811**
TiO2	0.8445	0.0404	**0.9149**	0.6354	0.0350	**0.6679**	0.6444	0.0360	**0.6783**
V2O5	0.0388	0.0063	**0.0420**	0.0202	0.0053	**0.0212**	0.0152	0.0055	**0.0160**
Cr2O3	0.0138	0.0016	**0.0150**	0.0082	0.0015	**0.0086**	0.0083	0.0015	**0.0087**
MnO	0.0187	0.0025	**0.0203**	0.0066	0.0024	**0.0069**	0.0063	0.0024	**0.0066**
Fe2O3	4.1260	0.0314	**4.4702**	2.0767	0.0050	**2.1830**	1.9168	0.0298	**2.0175**
Co2O3	0.0000	0.0020	**0.0000**	0.0026	0.0018	**0.0027**	0.0030	0.0018	**0.0032**
NiO	0.0122	0.0015	**0.0132**	0.0117	0.0014	**0.0123**	0.0122	0.0014	**0.0128**
CuO	0.0111	0.0013	**0.0120**	0.0099	0.0012	**0.0104**	0.0131	0.0012	**0.0138**
ZnO	0.0048	0.0011	**0.0052**	0.0029	0.0010	**0.0031**	0.0067	0.0010	**0.0071**
Ga2O3	0.0040	0.0012	**0.0043**	0.0028	0.0011	**0.0029**	0.0020	0.0011	**0.0021**
As2O3	0.0126	0.0011	**0.0136**	0.0024	0.0010	**0.0025**	0.0000	0.0010	**0.0000**
Br	0.0006	0.0007	**0.0006**	0.0009	0.0007	**0.0009**	0.0005	0.0007	**0.0005**
Rb2O	0.0162	0.0008	**0.0176**	0.0118	0.0007	**0.0124**	0.0181	0.0007	**0.0190**
SrO	0.0108	0.0007	**0.0117**	0.0083	0.0007	**0.0087**	0.0103	0.0007	**0.0108**
Y2O3	0.0003	0.0008	**0.0003**	0.0021	0.0008	**0.0022**	0.0029	0.0008	**0.0031**
ZrO2	0.0227	0.0007	**0.0246**	0.0479	0.0006	**0.0504**	0.0276	0.0007	**0.0290**
Nb2O5	0.0013	0.0008	**0.0014**	0.0012	0.0008	**0.0013**	0.0017	0.0008	**0.0018**
MoO3	0.0005	0.0009	**0.0005**	0.0004	0.0008	**0.0004**	0.0000	0.0008	**0.0000**
BaO	0.0601	0.0147	**0.0651**	0.0282	0.0141	**0.0296**	0.0716	0.0138	**0.0754**
HfO2	0.0050	0.0041	**0.0054**	0.0071	0.0038	**0.0075**	0.0041	0.0039	**0.0043**
PbO	0.0000	0.0021	**0.0000**	0.0000	0.0020	**0.0000**	0.0054	0.0020	**0.0057**
ThO2	0.0010	0.0014	**0.0011**	0.0003	0.0014	**0.0003**	0.0011	0.0014	**0.0012**
Pa	0.0052	0.0011	**0.0056**	0.0034	0.0011	**0.0036**	0.0064	0.0011	**0.0067**
U3O8	0.0000	0.0002	**0.0000**	0.0005	0.0002	**0.0005**	0.0004	0.0002	**0.0004**
TGA:	7.6990			4.8690			4.9910		
Total:	100.0000			100.0000			100.0000		

	47C			47D			47E		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.1520	0.0243	**0.1573**	0.1522	0.0245	**0.1601**	0.2071	0.0244	**0.2168**
MgO	0.8813	0.0195	**0.9118**	1.3815	0.0207	**1.4534**	0.9699	0.0199	**1.0151**
Al2O3	13.0249	0.0168	**13.4750**	18.7714	0.0197	**19.7488**	15.0919	0.0178	**15.7959**
SiO2	76.4710	0.0327	**79.1134**	66.2925	0.0307	**69.7441**	73.7003	0.0321	**77.1383**
P2O5	0.0255	0.0041	**0.0264**	0.0290	0.0043	**0.0305**	0.0284	0.0042	**0.0297**
SO3	0.2311	0.0072	**0.2391**	0.1777	0.0073	**0.1869**	0.2955	0.0073	**0.3093**
Cl	0.0000	0.0095	**0.0000**	0.0000	0.0096	**0.0000**	0.0024	0.0094	**0.0025**
K2O	3.2322	0.0046	**3.3439**	4.2258	0.0049	**4.4458**	2.5643	0.0044	**2.6839**
CaO	0.0344	0.0052	**0.0356**	0.0741	0.0052	**0.0780**	0.0849	0.0052	**0.0889**
TiO2	0.6810	0.0342	**0.7045**	0.5789	0.0360	**0.6090**	0.5592	0.0355	**0.5853**
V2O5	0.0141	0.0054	**0.0146**	0.0246	0.0054	**0.0259**	0.0208	0.0053	**0.0218**
Cr2O3	0.0068	0.0015	**0.0070**	0.0090	0.0016	**0.0095**	0.0079	0.0015	**0.0083**
MnO	0.0054	0.0024	**0.0056**	0.0068	0.0024	**0.0072**	0.0059	0.0024	**0.0062**
Fe2O3	1.7387	0.0048	**1.7988**	3.0850	0.0048	**3.2456**	1.8623	0.0050	**1.9492**
Co2O3	0.0019	0.0018	**0.0020**	0.0030	0.0019	**0.0032**	0.0000	0.0018	**0.0000**
NiO	0.0112	0.0014	**0.0116**	0.0130	0.0014	**0.0137**	0.0123	0.0014	**0.0129**
CuO	0.0101	0.0012	**0.0104**	0.0158	0.0012	**0.0166**	0.0126	0.0012	**0.0132**
ZnO	0.0046	0.0010	**0.0048**	0.0123	0.0010	**0.0129**	0.0073	0.0010	**0.0076**
Ga2O3	0.0018	0.0011	**0.0019**	0.0043	0.0012	**0.0045**	0.0028	0.0011	**0.0029**
As2O3	0.0000	0.0010	**0.0000**	0.0158	0.0011	**0.0166**	0.0000	0.0010	**0.0000**
Br	0.0001	0.0007	**0.0001**	0.0005	0.0007	**0.0005**	0.0007	0.0007	**0.0007**
Rb2O	0.0231	0.0007	**0.0239**	0.0241	0.0007	**0.0254**	0.0148	0.0007	**0.0155**
SrO	0.0091	0.0007	**0.0094**	0.0075	0.0007	**0.0079**	0.0060	0.0007	**0.0063**
Y2O3	0.0010	0.0008	**0.0010**	0.0016	0.0008	**0.0017**	0.0024	0.0008	**0.0025**
ZrO2	0.0245	0.0006	**0.0253**	0.0178	0.0007	**0.0187**	0.0381	0.0006	**0.0399**
Nb2O5	0.0014	0.0008	**0.0014**	0.0010	0.0008	**0.0011**	0.0000	0.0008	**0.0000**
MoO3	0.0002	0.0008	**0.0002**	0.0000	0.0008	**0.0000**	0.0000	0.0008	**0.0000**
BaO	0.0561	0.0144	**0.0580**	0.0789	0.0141	**0.0830**	0.0310	0.0144	**0.0324**
HfO2	0.0027	0.0038	**0.0028**	0.0042	0.0039	**0.0044**	0.0049	0.0038	**0.0051**
PbO	0.0042	0.0019	**0.0043**	0.0161	0.0021	**0.0169**	0.0036	0.0019	**0.0038**
ThO2	0.0002	0.0013	**0.0002**	0.0012	0.0014	**0.0013**	0.0000	0.0013	**0.0000**
Pa	0.0090	0.0010	**0.0093**	0.0099	0.0011	**0.0104**	0.0057	0.0011	**0.0060**
U3O8	0.0004	0.0002	**0.0004**	0.0000	0.0002	**0.0000**	0.0000	0.0002	**0.0000**
TGA:	3.3400			4.9490			4.4570		
Total:	100.0000			100.0000			100.0000		

	48A			48B			48C		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.2522	0.0250	**0.2661**	0.3536	0.0240	**0.3740**	0.6292	0.0260	**0.6659**
MgO	0.4946	0.0190	**0.5218**	0.8494	0.0205	**0.8984**	0.3037	0.0210	**0.3214**
Al2O3	13.9215	0.0176	**14.6881**	16.7181	0.0188	**17.6820**	17.2522	0.0191	**18.2576**
SiO2	75.6939	0.0324	**79.8619**	70.7917	0.0320	**74.8734**	69.4816	0.0323	**73.5310**
P2O5	0.0245	0.0043	**0.0258**	0.0357	0.0043	**0.0378**	0.0869	0.0046	**0.0920**
SO3	0.7848	0.0075	**0.8280**	0.4714	0.0073	**0.4986**	0.1599	0.0075	**0.1692**
Cl	0.0000	0.0096	**0.0000**	0.0003	0.0094	**0.0003**	0.0000	0.0099	**0.0000**
K2O	1.2937	0.0040	**1.3649**	2.3027	0.0044	**2.4355**	2.1441	0.0044	**2.2691**
CaO	0.4995	0.0052	**0.5270**	0.1221	0.0052	**0.1291**	0.3318	0.0055	**0.3511**
TiO2	0.5353	0.0348	**0.5648**	0.7054	0.0352	**0.7461**	0.6827	0.0368	**0.7225**
V2O5	0.0163	0.0053	**0.0172**	0.0246	0.0055	**0.0260**	0.0314	0.0055	**0.0332**
Cr2O3	0.0078	0.0015	**0.0082**	0.0096	0.0015	**0.0102**	0.0102	0.0016	**0.0108**
MnO	0.0063	0.0024	**0.0066**	0.0073	0.0024	**0.0077**	0.0176	0.0025	**0.0186**
Fe2O3	1.1447	0.0294	**1.2077**	2.0092	0.0049	**2.1250**	3.1718	0.0052	**3.3567**
Co2O3	0.0000	0.0018	**0.0000**	0.0009	0.0018	**0.0010**	0.0031	0.0019	**0.0033**
NiO	0.0113	0.0014	**0.0119**	0.0110	0.0014	**0.0116**	0.0175	0.0014	**0.0185**
CuO	0.0105	0.0012	**0.0111**	0.0116	0.0012	**0.0123**	0.0134	0.0012	**0.0142**
ZnO	0.0017	0.0010	**0.0018**	0.0066	0.0010	**0.0070**	0.0164	0.0011	**0.0174**
Ga2O3	0.0022	0.0011	**0.0023**	0.0015	0.0011	**0.0016**	0.0032	0.0012	**0.0034**
As2O3	0.0027	0.0010	**0.0029**	0.0051	0.0010	**0.0054**	0.0000	0.0011	**0.0000**
Br	0.0008	0.0007	**0.0008**	0.0003	0.0007	**0.0003**	0.0005	0.0007	**0.0005**
Rb2O	0.0068	0.0007	**0.0072**	0.0117	0.0007	**0.0124**	0.0140	0.0008	**0.0148**
SrO	0.0033	0.0007	**0.0035**	0.0084	0.0007	**0.0089**	0.0156	0.0007	**0.0165**
Y2O3	0.0009	0.0007	**0.0010**	0.0015	0.0008	**0.0016**	0.0018	0.0008	**0.0019**
ZrO2	0.0344	0.0006	**0.0363**	0.0414	0.0007	**0.0438**	0.0306	0.0007	**0.0324**
Nb2O5	0.0005	0.0008	**0.0005**	0.0012	0.0008	**0.0013**	0.0009	0.0008	**0.0009**
MoO3	0.0005	0.0008	**0.0005**	0.0005	0.0008	**0.0005**	0.0000	0.0008	**0.0000**
BaO	0.0208	0.0141	**0.0219**	0.0284	0.0148	**0.0300**	0.0561	0.0143	**0.0594**
HfO2	0.0065	0.0038	**0.0069**	0.0025	0.0039	**0.0026**	0.0077	0.0040	**0.0082**
PbO	0.0000	0.0019	**0.0000**	0.0000	0.0020	**0.0000**	0.0036	0.0021	**0.0038**
ThO2	0.0006	0.0013	**0.0006**	0.0005	0.0014	**0.0005**	0.0003	0.0014	**0.0003**
Pa	0.0024	0.0010	**0.0025**	0.0040	0.0011	**0.0042**	0.0050	0.0011	**0.0053**
U3O8	0.0002	0.0002	**0.0002**	0.0004	0.0002	**0.0004**	0.0001	0.0002	**0.0001**
TGA:	5.2190			5.4510			5.5070		
Total:	100.0000			100.0000			100.0000		

	48D			49A			49B		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.8132	0.0252	**0.8611**	0.0671	0.0231	**0.0705**	0.0248	0.0260	**0.0260**
MgO	1.8021	0.0211	**1.9084**	0.7411	0.0199	**0.7782**	0.6964	0.0202	**0.7294**
Al2O3	18.4060	0.0194	**19.4913**	14.3024	0.0176	**15.0177**	14.4035	0.0177	**15.0868**
SiO2	64.9580	0.0309	**68.7881**	76.5152	0.0327	**80.3419**	76.0859	0.0326	**79.6953**
P2O5	0.1213	0.0045	**0.1285**	0.0254	0.0043	**0.0267**	0.0244	0.0041	**0.0256**
SO3	0.4419	0.0075	**0.4680**	0.0439	0.0068	**0.0461**	0.1589	0.0072	**0.1664**
Cl	0.0000	0.0097	**0.0000**	0.0065	0.0094	**0.0068**	0.0020	0.0095	**0.0021**
K2O	2.7995	0.0046	**2.9646**	1.5159	0.0040	**1.5917**	1.7820	0.0041	**1.8665**
CaO	0.3228	0.0054	**0.3418**	0.2969	0.0051	**0.3118**	0.4072	0.0052	**0.4265**
TiO2	0.6185	0.0382	**0.6550**	0.5522	0.0357	**0.5798**	0.5804	0.0354	**0.6079**
V2O5	0.0164	0.0059	**0.0174**	0.0060	0.0056	**0.0063**	0.0209	0.0053	**0.0219**
Cr2O3	0.0110	0.0016	**0.0117**	0.0079	0.0015	**0.0083**	0.0081	0.0015	**0.0085**
MnO	0.0280	0.0024	**0.0297**	0.0076	0.0023	**0.0080**	0.0058	0.0023	**0.0061**
Fe2O3	3.8955	0.0304	**4.1252**	1.0227	0.0294	**1.0738**	1.1283	0.0048	**1.1818**
Co2O3	0.0070	0.0019	**0.0074**	0.0001	0.0018	**0.0001**	0.0000	0.0018	**0.0000**
NiO	0.0174	0.0014	**0.0184**	0.0102	0.0014	**0.0107**	0.0110	0.0014	**0.0115**
CuO	0.0124	0.0012	**0.0131**	0.0094	0.0012	**0.0099**	0.0110	0.0012	**0.0115**
ZnO	0.0199	0.0011	**0.0211**	0.0020	0.0010	**0.0021**	0.0016	0.0010	**0.0017**
Ga2O3	0.0043	0.0012	**0.0046**	0.0022	0.0011	**0.0023**	0.0024	0.0011	**0.0025**
As2O3	0.0034	0.0010	**0.0036**	0.0007	0.0010	**0.0007**	0.0000	0.0010	**0.0000**
Br	0.0008	0.0007	**0.0008**	0.0003	0.0007	**0.0003**	0.0002	0.0007	**0.0002**
Rb2O	0.0180	0.0008	**0.0191**	0.0098	0.0007	**0.0103**	0.0111	0.0007	**0.0116**
SrO	0.0132	0.0007	**0.0140**	0.0049	0.0007	**0.0051**	0.0044	0.0007	**0.0046**
Y2O3	0.0033	0.0008	**0.0035**	0.0016	0.0007	**0.0017**	0.0013	0.0007	**0.0014**
ZrO2	0.0233	0.0007	**0.0247**	0.0435	0.0006	**0.0457**	0.0474	0.0006	**0.0496**
Nb2O5	0.0008	0.0008	**0.0009**	0.0010	0.0008	**0.0010**	0.0012	0.0008	**0.0013**
MoO3	0.0006	0.0009	**0.0006**	0.0001	0.0008	**0.0001**	0.0004	0.0008	**0.0004**
BaO	0.0599	0.0143	**0.0634**	0.0308	0.0138	**0.0323**	0.0404	0.0137	**0.0423**
HfO2	0.0058	0.0040	**0.0061**	0.0054	0.0038	**0.0057**	0.0032	0.0038	**0.0034**
PbO	0.0000	0.0020	**0.0000**	0.0000	0.0019	**0.0000**	0.0031	0.0019	**0.0032**
ThO2	0.0011	0.0014	**0.0012**	0.0005	0.0013	**0.0005**	0.0006	0.0013	**0.0006**
Pa	0.0063	0.0011	**0.0067**	0.0036	0.0010	**0.0038**	0.0032	0.0010	**0.0034**
U3O8	0.0000	0.0002	**0.0000**	0.0001	0.0002	**0.0001**	0.0000	0.0002	**0.0000**
TGA:	5.5680			4.7630			4.5290		
Total:	100.0000			100.0000			100.0000		

	50A			50B			51A		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.0752	0.0254	**0.0791**	0.0730	0.0258	**0.0771**	0.0922	0.0248	**0.0996**
MgO	0.7412	0.0196	**0.7795**	0.9253	0.0201	**0.9774**	0.1449	0.0207	**0.1566**
Al2O3	13.9884	0.0175	**14.7104**	19.4497	0.0197	**20.5447**	21.2322	0.0210	**22.9416**
SiO2	75.7138	0.0329	**79.6216**	67.2876	0.0313	**71.0759**	66.0894	0.0312	**71.4102**
P2O5	0.0233	0.0043	**0.0245**	0.0275	0.0042	**0.0290**	0.0327	0.0044	**0.0353**
SO3	0.2707	0.0073	**0.2847**	1.3196	0.0078	**1.3939**	0.7346	0.0076	**0.7937**
Cl	0.0111	0.0096	**0.0117**	0.0056	0.0094	**0.0059**	0.0027	0.0096	**0.0029**
K2O	1.5304	0.0040	**1.6094**	2.3833	0.0044	**2.5175**	1.3116	0.0042	**1.4172**
CaO	0.7748	0.0053	**0.8148**	0.9677	0.0054	**1.0222**	0.4497	0.0055	**0.4859**
TiO2	0.6890	0.0356	**0.7246**	0.6995	0.0357	**0.7389**	0.8913	0.0386	**0.9631**
V2O5	0.0180	0.0055	**0.0189**	0.0221	0.0055	**0.0233**	0.0218	0.0061	**0.0236**
Cr2O3	0.0074	0.0015	**0.0078**	0.0092	0.0016	**0.0097**	0.0126	0.0016	**0.0136**
MnO	0.0111	0.0024	**0.0117**	0.0042	0.0024	**0.0044**	0.0032	0.0025	**0.0035**
Fe2O3	1.1222	0.0299	**1.1801**	1.3549	0.0048	**1.4312**	1.3913	0.0051	**1.5033**
Co2O3	0.0017	0.0018	**0.0018**	0.0027	0.0018	**0.0028**	0.0016	0.0018	**0.0017**
NiO	0.0114	0.0014	**0.0120**	0.0119	0.0014	**0.0126**	0.0107	0.0014	**0.0116**
CuO	0.0095	0.0012	**0.0100**	0.0111	0.0012	**0.0117**	0.0093	0.0012	**0.0101**
ZnO	0.0015	0.0010	**0.0016**	0.0017	0.0010	**0.0018**	0.0031	0.0010	**0.0034**
Ga2O3	0.0037	0.0011	**0.0039**	0.0028	0.0011	**0.0030**	0.0047	0.0012	**0.0051**
As2O3	0.0000	0.0010	**0.0000**	0.0000	0.0010	**0.0000**	0.0000	0.0010	**0.0000**
Br	0.0006	0.0007	**0.0006**	0.0000	0.0007	**0.0000**	0.0000	0.0007	**0.0000**
Rb2O	0.0107	0.0007	**0.0113**	0.0153	0.0007	**0.0162**	0.0099	0.0007	**0.0107**
SrO	0.0060	0.0007	**0.0063**	0.0060	0.0007	**0.0063**	0.0089	0.0007	**0.0096**
Y2O3	0.0013	0.0008	**0.0014**	0.0016	0.0008	**0.0017**	0.0015	0.0008	**0.0016**
ZrO2	0.0290	0.0006	**0.0305**	0.0253	0.0007	**0.0267**	0.0304	0.0007	**0.0329**
Nb2O5	0.0015	0.0008	**0.0016**	0.0018	0.0008	**0.0019**	0.0028	0.0008	**0.0030**
MoO3	0.0010	0.0008	**0.0011**	0.0000	0.0008	**0.0000**	0.0000	0.0008	**0.0000**
BaO	0.0268	0.0141	**0.0282**	0.0469	0.0141	**0.0495**	0.0411	0.0141	**0.0444**
HfO2	0.0044	0.0038	**0.0046**	0.0044	0.0039	**0.0047**	0.0084	0.0039	**0.0091**
PbO	0.0023	0.0019	**0.0024**	0.0031	0.0020	**0.0033**	0.0024	0.0020	**0.0026**
ThO2	0.0000	0.0013	**0.0000**	0.0014	0.0014	**0.0015**	0.0004	0.0014	**0.0004**
Pa	0.0035	0.0011	**0.0037**	0.0049	0.0011	**0.0052**	0.0034	0.0011	**0.0037**
U3O8	0.0002	0.0002	**0.0002**	0.0000	0.0002	**0.0000**	0.0000	0.0002	**0.0000**
TGA:	4.9080			5.3300			7.4510		
Total:	100.0000			100.0000			100.0000		

	51B			51C			51D		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.1088	0.0234	**0.1182**	0.0751	0.0255	**0.0805**	0.0879	0.0262	**0.0952**
MgO	0.7700	0.0207	**0.8364**	0.1100	0.0206	**0.1179**	0.7634	0.0203	**0.8272**
Al2O3	23.9860	0.0218	**26.0536**	19.5410	0.0199	**20.9506**	23.4571	0.0220	**25.4184**
SiO2	63.1203	0.0312	**68.5613**	70.2099	0.0323	**75.2744**	63.1739	0.0306	**68.4559**
P2O5	0.0354	0.0044	**0.0385**	0.0362	0.0044	**0.0388**	0.0376	0.0044	**0.0407**
SO3	0.0826	0.0072	**0.0897**	0.1082	0.0074	**0.1160**	0.1133	0.0073	**0.1228**
Cl	0.0095	0.0094	**0.0103**	0.0012	0.0098	**0.0013**	0.0000	0.0098	**0.0000**
K2O	1.6006	0.0041	**1.7386**	1.0243	0.0040	**1.0982**	1.9944	0.0043	**2.1612**
CaO	0.1089	0.0053	**0.1183**	0.0939	0.0053	**0.1007**	0.0717	0.0053	**0.0777**
TiO2	0.7439	0.0366	**0.8080**	0.7430	0.0363	**0.7966**	0.8280	0.0369	**0.8972**
V2O5	0.0342	0.0056	**0.0372**	0.0292	0.0055	**0.0313**	0.0338	0.0057	**0.0366**
Cr2O3	0.0122	0.0016	**0.0132**	0.0098	0.0016	**0.0105**	0.0130	0.0016	**0.0141**
MnO	0.0053	0.0025	**0.0058**	0.0061	0.0024	**0.0065**	0.0051	0.0024	**0.0055**
Fe2O3	1.3231	0.0049	**1.4371**	1.1558	0.0051	**1.2392**	1.5521	0.0050	**1.6819**
Co2O3	0.0018	0.0018	**0.0020**	0.0018	0.0018	**0.0019**	0.0023	0.0018	**0.0025**
NiO	0.0126	0.0014	**0.0137**	0.0117	0.0014	**0.0125**	0.0142	0.0014	**0.0154**
CuO	0.0098	0.0012	**0.0106**	0.0112	0.0012	**0.0120**	0.0131	0.0012	**0.0142**
ZnO	0.0041	0.0010	**0.0045**	0.0046	0.0010	**0.0049**	0.0172	0.0010	**0.0186**
Ga2O3	0.0034	0.0012	**0.0037**	0.0034	0.0012	**0.0036**	0.0049	0.0011	**0.0053**
As2O3	0.0000	0.0010	**0.0000**	0.0000	0.0010	**0.0000**	0.0014	0.0010	**0.0015**
Br	0.0005	0.0007	**0.0005**	0.0002	0.0007	**0.0002**	0.0005	0.0007	**0.0005**
Rb2O	0.0119	0.0007	**0.0129**	0.0073	0.0007	**0.0078**	0.0127	0.0007	**0.0138**
SrO	0.0087	0.0007	**0.0095**	0.0081	0.0007	**0.0087**	0.0082	0.0007	**0.0089**
Y2O3	0.0004	0.0008	**0.0004**	0.0000	0.0008	**0.0000**	0.0000	0.0008	**0.0000**
ZrO2	0.0209	0.0007	**0.0227**	0.0378	0.0007	**0.0405**	0.0220	0.0007	**0.0238**
Nb2O5	0.0015	0.0008	**0.0016**	0.0008	0.0008	**0.0009**	0.0000	0.0008	**0.0000**
MoO3	0.0000	0.0008	**0.0000**	0.0000	0.0008	**0.0000**	0.0000	0.0008	**0.0000**
BaO	0.0346	0.0143	**0.0376**	0.0288	0.0141	**0.0309**	0.0451	0.0146	**0.0489**
HfO2	0.0042	0.0039	**0.0046**	0.0047	0.0039	**0.0050**	0.0057	0.0039	**0.0062**
PbO	0.0048	0.0020	**0.0052**	0.0048	0.0020	**0.0051**	0.0000	0.0020	**0.0000**
ThO2	0.0004	0.0014	**0.0004**	0.0004	0.0014	**0.0004**	0.0000	0.0014	**0.0000**
Pa	0.0036	0.0011	**0.0039**	0.0023	0.0011	**0.0025**	0.0049	0.0011	**0.0053**
U3O8	0.0000	0.0002	**0.0000**	0.0006	0.0002	**0.0006**	0.0006	0.0002	**0.0007**
TGA:	7.9360			6.7280			7.7160		
Total:	100.0000			100.0000			100.0000		

	53A			53B			55A		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.0567	0.0241	**0.0591**	0.0851	0.0230	**0.0879**	0.0269	0.0258	**0.0288**
MgO	0.4757	0.0186	**0.4955**	0.5378	0.0180	**0.5558**	0.6820	0.0197	**0.7289**
Al2O3	12.4978	0.0165	**13.0187**	12.2022	0.0165	**12.6107**	16.4334	0.0189	**17.5623**
SiO2	78.8745	0.0325	**82.1618**	79.7750	0.0329	**82.4454**	67.5675	0.0316	**72.2091**
P2O5	0.0225	0.0040	**0.0234**	0.0218	0.0043	**0.0225**	0.0279	0.0044	**0.0298**
SO3	0.0796	0.0070	**0.0829**	0.0685	0.0071	**0.0708**	2.7506	0.0082	**2.9396**
Cl	0.0000	0.0092	**0.0000**	0.0000	0.0095	**0.0000**	0.0000	0.0098	**0.0000**
K2O	2.0236	0.0041	**2.1079**	2.3191	0.0043	**2.3967**	1.7153	0.0041	**1.8331**
CaO	0.4647	0.0050	**0.4841**	0.1382	0.0051	**0.1428**	2.0466	0.0055	**2.1872**
TiO2	0.4267	0.0338	**0.4445**	0.4561	0.0349	**0.4714**	0.6250	0.0364	**0.6679**
V2O5	0.0122	0.0051	**0.0127**	0.0114	0.0053	**0.0118**	0.0184	0.0055	**0.0197**
Cr2O3	0.0066	0.0015	**0.0069**	0.0067	0.0015	**0.0069**	0.0093	0.0016	**0.0099**
MnO	0.0071	0.0023	**0.0074**	0.0083	0.0024	**0.0086**	0.0190	0.0025	**0.0203**
Fe2O3	0.9028	0.0046	**0.9404**	0.9836	0.0048	**1.0165**	1.4201	0.0301	**1.5177**
Co2O3	0.0000	0.0017	**0.0000**	0.0007	0.0018	**0.0007**	0.0092	0.0019	**0.0098**
NiO	0.0107	0.0013	**0.0111**	0.0125	0.0013	**0.0129**	0.0339	0.0014	**0.0362**
CuO	0.0108	0.0011	**0.0112**	0.0102	0.0012	**0.0105**	0.0117	0.0012	**0.0125**
ZnO	0.0014	0.0010	**0.0015**	0.0027	0.0010	**0.0028**	0.0330	0.0010	**0.0353**
Ga2O3	0.0010	0.0011	**0.0010**	0.0010	0.0011	**0.0010**	0.0028	0.0012	**0.0030**
As2O3	0.0012	0.0010	**0.0013**	0.0000	0.0010	**0.0000**	0.0000	0.0010	**0.0000**
Br	0.0004	0.0007	**0.0004**	0.0000	0.0007	**0.0000**	0.0006	0.0007	**0.0006**
Rb2O	0.0094	0.0007	**0.0098**	0.0114	0.0007	**0.0118**	0.0102	0.0007	**0.0109**
SrO	0.0041	0.0006	**0.0043**	0.0059	0.0006	**0.0061**	0.0237	0.0007	**0.0253**
Y2O3	0.0014	0.0007	**0.0015**	0.0013	0.0007	**0.0013**	0.0022	0.0008	**0.0023**
ZrO2	0.0414	0.0006	**0.0431**	0.0373	0.0006	**0.0386**	0.0429	0.0007	**0.0458**
Nb2O5	0.0004	0.0007	**0.0004**	0.0007	0.0007	**0.0007**	0.0018	0.0008	**0.0019**
MoO3	0.0000	0.0008	**0.0000**	0.0000	0.0008	**0.0000**	0.0000	0.0008	**0.0000**
BaO	0.0550	0.0131	**0.0573**	0.0519	0.0139	**0.0536**	0.0419	0.0140	**0.0448**
HfO2	0.0067	0.0036	**0.0070**	0.0059	0.0037	**0.0061**	0.0078	0.0039	**0.0083**
PbO	0.0011	0.0019	**0.0011**	0.0014	0.0019	**0.0014**	0.0047	0.0020	**0.0050**
ThO2	0.0002	0.0013	**0.0002**	0.0000	0.0013	**0.0000**	0.0000	0.0014	**0.0000**
Pa	0.0034	0.0010	**0.0035**	0.0040	0.0010	**0.0041**	0.0037	0.0011	**0.0040**
U3O8	0.0000	0.0002	**0.0000**	0.0006	0.0002	**0.0006**	0.0000	0.0002	**0.0000**
TGA:	4.0010			3.2390			6.4280		
Total:	100.0000			100.0000			100.0000		

	56A			56B			56C		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.2154	0.0270	**0.2424**	0.3041	0.0237	**0.3184**	0.3024	0.0254	**0.3303**
MgO	4.5208	0.0225	**5.0876**	1.0792	0.0201	**1.1298**	0.6089	0.0215	**0.6650**
Al2O3	13.4267	0.0182	**15.1100**	15.5012	0.0181	**16.2281**	17.9259	0.0204	**19.5781**
SiO2	55.4659	0.0300	**62.4195**	72.6373	0.0323	**76.0433**	69.6582	0.0332	**76.0784**
P2O5	0.1709	0.0050	**0.1923**	0.0337	0.0041	**0.0353**	0.0315	0.0046	**0.0344**
SO3	1.6844	0.0081	**1.8956**	0.2981	0.0072	**0.3121**	0.2985	0.0077	**0.3260**
Cl	0.0000	0.0104	**0.0000**	0.0000	0.0095	**0.0000**	0.0028	0.0102	**0.0031**
K2O	2.6032	0.0048	**2.9296**	2.8799	0.0042	**3.0149**	0.7598	0.0041	**0.8298**
CaO	6.1934	0.0063	**6.9699**	0.1442	0.0052	**0.1510**	0.1231	0.0056	**0.1344**
TiO2	0.5540	0.0385	**0.6235**	0.6345	0.0349	**0.6642**	0.8693	0.0375	**0.9494**
V2O5	0.0220	0.0058	**0.0248**	0.0139	0.0054	**0.0145**	0.0160	0.0058	**0.0175**
Cr2O3	0.0091	0.0017	**0.0102**	0.0069	0.0015	**0.0072**	0.0083	0.0016	**0.0091**
MnO	0.0602	0.0026	**0.0678**	0.0553	0.0024	**0.0579**	0.0041	0.0025	**0.0045**
Fe2O3	3.7808	0.0056	**4.2548**	1.7862	0.0290	**1.8700**	0.8295	0.0052	**0.9060**
Co2O3	0.0035	0.0020	**0.0039**	0.0008	0.0018	**0.0008**	0.0005	0.0019	**0.0006**
NiO	0.0134	0.0015	**0.0151**	0.0119	0.0014	**0.0125**	0.0133	0.0015	**0.0145**
CuO	0.0128	0.0013	**0.0144**	0.0104	0.0012	**0.0109**	0.0110	0.0013	**0.0120**
ZnO	0.0132	0.0011	**0.0149**	0.0092	0.0010	**0.0096**	0.0064	0.0011	**0.0070**
Ga2O3	0.0028	0.0012	**0.0032**	0.0016	0.0011	**0.0017**	0.0046	0.0012	**0.0050**
As2O3	0.0000	0.0011	**0.0000**	0.0000	0.0010	**0.0000**	0.0032	0.0011	**0.0035**
Br	0.0004	0.0008	**0.0005**	0.0006	0.0007	**0.0006**	0.0004	0.0007	**0.0004**
Rb2O	0.0155	0.0008	**0.0174**	0.0159	0.0007	**0.0166**	0.0057	0.0008	**0.0062**
SrO	0.0131	0.0007	**0.0147**	0.0061	0.0007	**0.0064**	0.0050	0.0007	**0.0055**
Y2O3	0.0019	0.0008	**0.0021**	0.0012	0.0008	**0.0013**	0.0018	0.0008	**0.0020**
ZrO2	0.0225	0.0007	**0.0253**	0.0319	0.0006	**0.0334**	0.0450	0.0007	**0.0492**
Nb2O5	0.0004	0.0009	**0.0004**	0.0014	0.0008	**0.0015**	0.0013	0.0008	**0.0014**
MoO3	0.0000	0.0009	**0.0000**	0.0000	0.0008	**0.0000**	0.0004	0.0009	**0.0004**
BaO	0.0416	0.0155	**0.0468**	0.0416	0.0146	**0.0435**	0.0163	0.0151	**0.0178**
HfO2	0.0020	0.0043	**0.0023**	0.0038	0.0038	**0.0040**	0.0049	0.0041	**0.0053**
PbO	0.0042	0.0022	**0.0047**	0.0045	0.0019	**0.0047**	0.0000	0.0021	**0.0000**
ThO2	0.0003	0.0015	**0.0003**	0.0000	0.0013	**0.0000**	0.0010	0.0014	**0.0011**
Pa	0.0050	0.0012	**0.0056**	0.0053	0.0011	**0.0056**	0.0018	0.0011	**0.0020**
U3O8	0.0004	0.0002	**0.0005**	0.0002	0.0002	**0.0002**	0.0001	0.0002	**0.0001**
TGA:	11.1400			4.4790			8.4390		
Total:	100.0000			100.0000			100.0000		

	56D			56E			56F		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.1910	0.0247	**0.2022**	0.2522	0.0235	**0.2643**	0.1980	0.0258	**0.2121**
MgO	0.3585	0.0196	**0.3796**	0.4879	0.0188	**0.5113**	0.7939	0.0197	**0.8503**
Al2O3	13.1411	0.0171	**13.9135**	9.8967	0.0156	**10.3709**	18.6681	0.0197	**19.9935**
SiO2	78.0718	0.0332	**82.6602**	81.5885	0.0336	**85.4974**	68.5070	0.0319	**73.3708**
P2O5	0.0322	0.0042	**0.0341**	0.0244	0.0042	**0.0256**	0.0341	0.0043	**0.0365**
SO3	0.4640	0.0073	**0.4913**	0.8730	0.0073	**0.9148**	0.7403	0.0075	**0.7929**
Cl	0.0000	0.0094	**0.0000**	0.0019	0.0094	**0.0020**	0.0006	0.0097	**0.0006**
K2O	0.1486	0.0036	**0.1573**	0.4187	0.0037	**0.4388**	1.5958	0.0042	**1.7091**
CaO	0.1177	0.0051	**0.1246**	0.0420	0.0051	**0.0440**	0.1200	0.0052	**0.1285**
TiO2	1.1245	0.0347	**1.1906**	0.9661	0.0347	**1.0124**	0.6754	0.0357	**0.7234**
V2O5	0.0166	0.0054	**0.0176**	0.0200	0.0053	**0.0210**	0.0279	0.0054	**0.0299**
Cr2O3	0.0071	0.0015	**0.0075**	0.0073	0.0015	**0.0076**	0.0098	0.0015	**0.0105**
MnO	0.0036	0.0024	**0.0038**	0.0066	0.0023	**0.0069**	0.0077	0.0024	**0.0082**
Fe2O3	0.6535	0.0049	**0.6919**	0.7073	0.0285	**0.7412**	1.8243	0.0302	**1.9538**
Co2O3	0.0026	0.0018	**0.0027**	0.0043	0.0017	**0.0045**	0.0019	0.0019	**0.0020**
NiO	0.0155	0.0014	**0.0164**	0.0178	0.0013	**0.0187**	0.0148	0.0014	**0.0159**
CuO	0.0108	0.0012	**0.0114**	0.0107	0.0012	**0.0112**	0.0105	0.0012	**0.0112**
ZnO	0.0043	0.0010	**0.0046**	0.0072	0.0010	**0.0075**	0.0134	0.0010	**0.0143**
Ga2O3	0.0034	0.0011	**0.0036**	0.0019	0.0011	**0.0020**	0.0033	0.0011	**0.0035**
As2O3	0.0000	0.0010	**0.0000**	0.0005	0.0010	**0.0005**	0.0132	0.0010	**0.0141**
Br	0.0003	0.0007	**0.0003**	0.0002	0.0007	**0.0002**	0.0000	0.0007	**0.0000**
Rb2O	0.0000	0.0007	**0.0000**	0.0045	0.0007	**0.0047**	0.0101	0.0007	**0.0108**
SrO	0.0038	0.0007	**0.0040**	0.0042	0.0006	**0.0044**	0.0070	0.0007	**0.0075**
Y2O3	0.0042	0.0007	**0.0044**	0.0027	0.0007	**0.0028**	0.0018	0.0008	**0.0019**
ZrO2	0.0559	0.0006	**0.0592**	0.0548	0.0006	**0.0574**	0.0374	0.0007	**0.0401**
Nb2O5	0.0026	0.0008	**0.0028**	0.0031	0.0007	**0.0032**	0.0007	0.0008	**0.0007**
MoO3	0.0004	0.0008	**0.0004**	0.0000	0.0008	**0.0000**	0.0000	0.0008	**0.0000**
BaO	0.0013	0.0142	**0.0014**	0.0144	0.0138	**0.0151**	0.0341	0.0140	**0.0365**
HfO2	0.0076	0.0038	**0.0080**	0.0059	0.0037	**0.0062**	0.0011	0.0039	**0.0012**
PbO	0.0054	0.0019	**0.0057**	0.0019	0.0019	**0.0020**	0.0000	0.0020	**0.0000**
ThO2	0.0007	0.0013	**0.0007**	0.0000	0.0013	**0.0000**	0.0000	0.0014	**0.0000**
Pa	0.0000	0.0010	**0.0000**	0.0010	0.0010	**0.0011**	0.0040	0.0011	**0.0043**
U3O8	0.0002	0.0002	**0.0002**	0.0003	0.0002	**0.0003**	0.0000	0.0002	**0.0000**
TGA:	5.5510			4.5720			6.6290		
Total:	100.0000			100.0000			100.0000		

	56G			56H			56I		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.2525	0.0277	**0.2765**	0.1635	0.0252	**0.1728**	0.1534	0.0262	**0.1625**
MgO	1.1476	0.0208	**1.2568**	0.5280	0.0189	**0.5582**	1.1390	0.0200	**1.2067**
Al2O3	22.8501	0.0220	**25.0234**	14.6395	0.0177	**15.4757**	16.4683	0.0187	**17.4468**
SiO2	61.0016	0.0309	**66.8035**	75.0215	0.0327	**79.3064**	69.5043	0.0315	**73.6340**
P2O5	0.0325	0.0044	**0.0356**	0.0317	0.0042	**0.0335**	0.0548	0.0044	**0.0581**
SO3	0.9947	0.0077	**1.0893**	0.7035	0.0075	**0.7437**	0.3625	0.0074	**0.3840**
Cl	0.0000	0.0100	**0.0000**	0.0088	0.0094	**0.0093**	0.0000	0.0097	**0.0000**
K2O	2.1861	0.0046	**2.3940**	1.7411	0.0042	**1.8405**	3.4121	0.0048	**3.6148**
CaO	0.0792	0.0054	**0.0867**	0.0553	0.0052	**0.0585**	0.1362	0.0053	**0.1443**
TiO2	0.5791	0.0368	**0.6342**	0.5781	0.0356	**0.6111**	0.6861	0.0360	**0.7269**
V2O5	0.0289	0.0056	**0.0316**	0.0166	0.0054	**0.0175**	0.0233	0.0056	**0.0247**
Cr2O3	0.0097	0.0016	**0.0106**	0.0095	0.0015	**0.0100**	0.0098	0.0016	**0.0104**
MnO	0.0103	0.0025	**0.0113**	0.0082	0.0024	**0.0087**	0.0070	0.0024	**0.0074**
Fe2O3	1.9853	0.0313	**2.1741**	0.9416	0.0297	**0.9954**	2.2573	0.0050	**2.3914**
Co2O3	0.0036	0.0019	**0.0039**	0.0022	0.0018	**0.0023**	0.0025	0.0018	**0.0027**
NiO	0.0179	0.0014	**0.0196**	0.0120	0.0014	**0.0127**	0.0109	0.0014	**0.0116**
CuO	0.0111	0.0012	**0.0122**	0.0105	0.0012	**0.0111**	0.0111	0.0012	**0.0118**
ZnO	0.0281	0.0011	**0.0308**	0.0072	0.0010	**0.0076**	0.0081	0.0010	**0.0086**
Ga2O3	0.0041	0.0012	**0.0045**	0.0017	0.0011	**0.0018**	0.0037	0.0011	**0.0039**
As2O3	0.0021	0.0011	**0.0023**	0.0014	0.0010	**0.0015**	0.0008	0.0010	**0.0009**
Br	0.0004	0.0007	**0.0004**	0.0002	0.0007	**0.0002**	0.0008	0.0007	**0.0008**
Rb2O	0.0151	0.0008	**0.0165**	0.0089	0.0007	**0.0094**	0.0172	0.0007	**0.0182**
SrO	0.0060	0.0007	**0.0066**	0.0050	0.0007	**0.0053**	0.0078	0.0007	**0.0083**
Y2O3	0.0018	0.0008	**0.0020**	0.0026	0.0007	**0.0028**	0.0039	0.0008	**0.0041**
ZrO2	0.0173	0.0007	**0.0190**	0.0512	0.0006	**0.0541**	0.0273	0.0007	**0.0289**
Nb2O5	0.0002	0.0008	**0.0002**	0.0005	0.0008	**0.0005**	0.0011	0.0008	**0.0012**
MoO3	0.0000	0.0008	**0.0000**	0.0002	0.0008	**0.0002**	0.0000	0.0008	**0.0000**
BaO	0.0384	0.0146	**0.0420**	0.0374	0.0140	**0.0395**	0.0555	0.0145	**0.0588**
HfO2	0.0058	0.0040	**0.0064**	0.0056	0.0038	**0.0059**	0.0050	0.0039	**0.0053**
PbO	0.0000	0.0020	**0.0000**	0.0000	0.0019	**0.0000**	0.0008	0.0020	**0.0009**
ThO2	0.0005	0.0014	**0.0005**	0.0000	0.0013	**0.0000**	0.0000	0.0014	**0.0000**
Pa	0.0050	0.0011	**0.0055**	0.0030	0.0011	**0.0032**	0.0068	0.0011	**0.0072**
U3O8	0.0000	0.0002	**0.0000**	0.0006	0.0002	**0.0006**	0.0004	0.0002	**0.0004**
TGA:	8.6850			5.4030			5.6080		
Total:	100.0000			100.0000			100.0000		

	58A			59A			59B		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.9889	0.0272	**1.0330**	0.7529	0.0281	**0.8488**	1.0380	0.0285	**1.1408**
MgO	2.4338	0.0210	**2.5423**	4.6270	0.0228	**5.2165**	4.1388	0.0220	**4.5486**
Al2O3	15.8363	0.0181	**16.5424**	13.1610	0.0179	**14.8376**	13.8434	0.0180	**15.2142**
SiO2	67.5100	0.0311	**70.5198**	53.6467	0.0296	**60.4811**	57.1928	0.0297	**62.8563**
P2O5	0.0981	0.0044	**0.1025**	0.1257	0.0047	**0.1417**	0.1158	0.0043	**0.1273**
SO3	0.2015	0.0072	**0.2105**	0.0650	0.0072	**0.0733**	0.1154	0.0072	**0.1268**
Cl	0.0000	0.0096	**0.0000**	0.0000	0.0101	**0.0000**	0.0109	0.0098	**0.0120**
K2O	3.6403	0.0047	**3.8026**	3.4228	0.0050	**3.8588**	3.8298	0.0050	**4.2090**
CaO	0.4296	0.0053	**0.4488**	7.9607	0.0064	**8.9749**	5.9080	0.0061	**6.4930**
TiO2	0.5516	0.0361	**0.5762**	0.4447	0.0389	**0.5014**	0.4748	0.0375	**0.5218**
V2O5	0.0184	0.0054	**0.0192**	0.0183	0.0059	**0.0206**	0.0215	0.0057	**0.0236**
Cr2O3	0.0096	0.0015	**0.0100**	0.0091	0.0017	**0.0103**	0.0087	0.0016	**0.0096**
MnO	0.0209	0.0024	**0.0218**	0.0916	0.0026	**0.1033**	0.1139	0.0025	**0.1252**
Fe2O3	3.8127	0.0304	**3.9827**	4.2026	0.0057	**4.7380**	3.9851	0.0051	**4.3797**
Co2O3	0.0022	0.0019	**0.0023**	0.0035	0.0020	**0.0039**	0.0031	0.0019	**0.0034**
NiO	0.0144	0.0014	**0.0150**	0.0141	0.0015	**0.0159**	0.0140	0.0015	**0.0154**
CuO	0.0104	0.0012	**0.0109**	0.0128	0.0013	**0.0144**	0.0122	0.0013	**0.0134**
ZnO	0.0160	0.0010	**0.0167**	0.0119	0.0011	**0.0134**	0.0116	0.0011	**0.0127**
Ga2O3	0.0029	0.0011	**0.0030**	0.0029	0.0013	**0.0033**	0.0022	0.0012	**0.0024**
As2O3	0.0020	0.0010	**0.0021**	0.0000	0.0011	**0.0000**	0.0017	0.0011	**0.0019**
Br	0.0000	0.0007	**0.0000**	0.0004	0.0008	**0.0004**	0.0004	0.0007	**0.0004**
Rb2O	0.0219	0.0007	**0.0229**	0.0195	0.0008	**0.0220**	0.0215	0.0008	**0.0236**
SrO	0.0102	0.0007	**0.0107**	0.0136	0.0007	**0.0153**	0.0116	0.0007	**0.0128**
Y2O3	0.0009	0.0008	**0.0009**	0.0016	0.0009	**0.0018**	0.0014	0.0008	**0.0015**
ZrO2	0.0200	0.0007	**0.0209**	0.0134	0.0007	**0.0151**	0.0149	0.0007	**0.0164**
Nb2O5	0.0004	0.0008	**0.0004**	0.0004	0.0009	**0.0004**	0.0000	0.0008	**0.0000**
MoO3	0.0001	0.0008	**0.0001**	0.0000	0.0009	**0.0000**	0.0000	0.0009	**0.0000**
BaO	0.0491	0.0145	**0.0513**	0.0630	0.0152	**0.0710**	0.0717	0.0148	**0.0788**
HfO2	0.0054	0.0039	**0.0056**	0.0020	0.0043	**0.0023**	0.0036	0.0041	**0.0040**
PbO	0.0000	0.0020	**0.0000**	0.0054	0.0022	**0.0061**	0.0008	0.0021	**0.0009**
ThO2	0.0015	0.0014	**0.0016**	0.0004	0.0015	**0.0005**	0.0026	0.0015	**0.0029**
Pa	0.0083	0.0011	**0.0087**	0.0070	0.0012	**0.0079**	0.0086	0.0011	**0.0095**
U3O8	0.0000	0.0002	**0.0000**	0.0000	0.0002	**0.0000**	0.0003	0.0002	**0.0003**
TGA:	4.2680			11.3000			9.0100		
Total:	100.0000			100.0000			100.0000		

	59C			59D			59E		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.9209	0.0260	**0.9690**	0.6134	0.0280	**0.6530**	1.0067	0.0274	**1.0676**
MgO	1.5980	0.0206	**1.6815**	2.1036	0.0208	**2.2396**	2.2997	0.0221	**2.4387**
Al2O3	13.6588	0.0172	**14.3728**	20.8053	0.0206	**22.1501**	19.3705	0.0199	**20.5416**
SiO2	71.3836	0.0321	**75.1154**	61.5458	0.0304	**65.5237**	61.6979	0.0304	**65.4279**
P2O5	0.1275	0.0044	**0.1342**	0.0593	0.0043	**0.0631**	0.1575	0.0043	**0.1670**
SO3	0.0875	0.0071	**0.0921**	0.1102	0.0074	**0.1173**	0.0739	0.0074	**0.0784**
Cl	0.0048	0.0097	**0.0051**	0.0018	0.0096	**0.0019**	0.0000	0.0102	**0.0000**
K2O	2.7569	0.0045	**2.9010**	3.4038	0.0044	**3.6238**	3.4126	0.0047	**3.6189**
CaO	0.5657	0.0053	**0.5953**	0.2207	0.0054	**0.2350**	0.4791	0.0055	**0.5081**
TiO2	0.5614	0.0356	**0.5907**	0.7094	0.0387	**0.7552**	0.7645	0.0363	**0.8107**
V2O5	0.0204	0.0054	**0.0215**	0.0277	0.0059	**0.0295**	0.0381	0.0056	**0.0404**
Cr2O3	0.0086	0.0015	**0.0090**	0.0136	0.0016	**0.0145**	0.0116	0.0016	**0.0123**
MnO	0.0194	0.0024	**0.0204**	0.0288	0.0024	**0.0307**	0.0476	0.0025	**0.0505**
Fe2O3	3.1215	0.0294	**3.2847**	4.0317	0.0303	**4.2923**	4.7084	0.0050	**4.9931**
Co2O3	0.0056	0.0018	**0.0059**	0.0069	0.0019	**0.0073**	0.0030	0.0020	**0.0032**
NiO	0.0207	0.0014	**0.0218**	0.0242	0.0014	**0.0258**	0.0184	0.0014	**0.0195**
CuO	0.0100	0.0012	**0.0105**	0.0157	0.0012	**0.0167**	0.0150	0.0012	**0.0159**
ZnO	0.0201	0.0010	**0.0211**	0.0293	0.0010	**0.0312**	0.0213	0.0011	**0.0226**
Ga2O3	0.0029	0.0011	**0.0031**	0.0037	0.0012	**0.0039**	0.0041	0.0012	**0.0043**
As2O3	0.0027	0.0010	**0.0028**	0.0048	0.0011	**0.0051**	0.0000	0.0011	**0.0000**
Br	0.0005	0.0007	**0.0005**	0.0000	0.0007	**0.0000**	0.0003	0.0007	**0.0003**
Rb2O	0.0160	0.0007	**0.0168**	0.0169	0.0007	**0.0180**	0.0158	0.0008	**0.0168**
SrO	0.0128	0.0007	**0.0135**	0.0140	0.0007	**0.0149**	0.0184	0.0007	**0.0195**
Y2O3	0.0025	0.0008	**0.0026**	0.0037	0.0008	**0.0039**	0.0028	0.0008	**0.0030**
ZrO2	0.0349	0.0007	**0.0367**	0.0159	0.0007	**0.0169**	0.0154	0.0007	**0.0163**
Nb2O5	0.0004	0.0008	**0.0004**	0.0011	0.0008	**0.0012**	0.0009	0.0008	**0.0010**
MoO3	0.0003	0.0008	**0.0003**	0.0000	0.0008	**0.0000**	0.0000	0.0009	**0.0000**
BaO	0.0497	0.0146	**0.0523**	0.1067	0.0146	**0.1136**	0.1001	0.0146	**0.1062**
HfO2	0.0055	0.0039	**0.0058**	0.0056	0.0040	**0.0060**	0.0027	0.0040	**0.0029**
PbO	0.0000	0.0019	**0.0000**	0.0000	0.0020	**0.0000**	0.0053	0.0020	**0.0056**
ThO2	0.0003	0.0014	**0.0003**	0.0006	0.0014	**0.0006**	0.0009	0.0014	**0.0010**
Pa	0.0051	0.0011	**0.0054**	0.0049	0.0011	**0.0052**	0.0059	0.0011	**0.0063**
U3O8	0.0001	0.0002	**0.0001**	0.0000	0.0002	**0.0000**	0.0004	0.0002	**0.0004**
TGA:	4.9680			6.0710			5.7010		
Total:	100.0000			100.0000			100.0000		

	59F			59G			59H		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	1.0714	0.0265	**1.1407**	0.1539	0.0231	**0.1593**	0.3276	0.0257	**0.3502**
MgO	2.5967	0.0219	**2.7648**	0.0375	0.0183	**0.0388**	0.6034	0.0210	**0.6450**
Al2O3	19.6653	0.0201	**20.9381**	9.8675	0.0152	**10.2142**	19.4124	0.0201	**20.7501**
SiO2	60.2990	0.0304	**64.2018**	84.2043	0.0337	**87.1626**	67.3555	0.0313	**71.9972**
P2O5	0.1529	0.0047	**0.1628**	0.0202	0.0042	**0.0209**	0.0296	0.0044	**0.0316**
SO3	0.2511	0.0075	**0.2673**	0.0490	0.0070	**0.0507**	0.0758	0.0072	**0.0810**
Cl	0.0045	0.0098	**0.0048**	0.0009	0.0094	**0.0009**	0.0027	0.0097	**0.0029**
K2O	3.3523	0.0048	**3.5693**	0.3283	0.0036	**0.3398**	1.2708	0.0041	**1.3584**
CaO	0.3701	0.0054	**0.3941**	0.0861	0.0051	**0.0891**	0.0875	0.0053	**0.0935**
TiO2	0.7390	0.0368	**0.7868**	1.0602	0.0342	**1.0974**	0.9024	0.0359	**0.9646**
V2O5	0.0445	0.0055	**0.0474**	0.0190	0.0053	**0.0197**	0.0289	0.0056	**0.0309**
Cr2O3	0.0131	0.0016	**0.0139**	0.0102	0.0015	**0.0106**	0.0111	0.0016	**0.0119**
MnO	0.0425	0.0025	**0.0452**	0.0087	0.0024	**0.0090**	0.0557	0.0024	**0.0595**
Fe2O3	5.1142	0.0319	**5.4452**	0.6352	0.0047	**0.6575**	3.2731	0.0301	**3.4987**
Co2O3	0.0024	0.0020	**0.0026**	0.0018	0.0017	**0.0019**	0.0018	0.0019	**0.0019**
NiO	0.0194	0.0015	**0.0207**	0.0118	0.0014	**0.0122**	0.0115	0.0014	**0.0123**
CuO	0.0152	0.0013	**0.0162**	0.0097	0.0012	**0.0100**	0.0113	0.0012	**0.0121**
ZnO	0.0206	0.0011	**0.0219**	0.0025	0.0010	**0.0026**	0.0032	0.0010	**0.0034**
Ga2O3	0.0043	0.0012	**0.0046**	0.0013	0.0011	**0.0013**	0.0029	0.0012	**0.0031**
As2O3	0.0025	0.0011	**0.0027**	0.0010	0.0010	**0.0010**	0.0018	0.0010	**0.0019**
Br	0.0000	0.0007	**0.0000**	0.0002	0.0007	**0.0002**	0.0005	0.0007	**0.0005**
Rb2O	0.0165	0.0008	**0.0176**	0.0038	0.0007	**0.0039**	0.0088	0.0007	**0.0094**
SrO	0.0161	0.0007	**0.0171**	0.0043	0.0006	**0.0044**	0.0073	0.0007	**0.0078**
Y2O3	0.0013	0.0008	**0.0014**	0.0017	0.0007	**0.0018**	0.0006	0.0008	**0.0006**
ZrO2	0.0176	0.0007	**0.0187**	0.0594	0.0006	**0.0615**	0.0325	0.0007	**0.0347**
Nb2O5	0.0002	0.0008	**0.0002**	0.0018	0.0007	**0.0019**	0.0010	0.0008	**0.0011**
MoO3	0.0003	0.0009	**0.0003**	0.0001	0.0008	**0.0001**	0.0000	0.0008	**0.0000**
BaO	0.0777	0.0151	**0.0827**	0.0178	0.0135	**0.0184**	0.0255	0.0145	**0.0273**
HfO2	0.0022	0.0041	**0.0023**	0.0064	0.0037	**0.0066**	0.0049	0.0039	**0.0052**
PbO	0.0003	0.0021	**0.0003**	0.0009	0.0019	**0.0009**	0.0000	0.0020	**0.0000**
ThO2	0.0015	0.0014	**0.0016**	0.0000	0.0013	**0.0000**	0.0007	0.0014	**0.0007**
Pa	0.0059	0.0011	**0.0063**	0.0006	0.0010	**0.0006**	0.0018	0.0011	**0.0019**
U3O8	0.0006	0.0002	**0.0006**	0.0002	0.0002	**0.0002**	0.0006	0.0002	**0.0006**
TGA:	6.0790			3.3940			6.4470		
Total:	100.0000			100.0000			100.0000		

	59I			59J			59K		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.2944	0.0243	**0.3131**	0.3133	0.0251	**0.3324**	0.3560	0.0256	**0.3783**
MgO	0.6992	0.0200	**0.7436**	0.6213	0.0206	**0.6591**	0.7092	0.0208	**0.7536**
Al2O3	18.4343	0.0195	**19.6052**	17.6208	0.0193	**18.6922**	17.1385	0.0192	**18.2119**
SiO2	70.6372	0.0321	**75.1235**	71.4739	0.0321	**75.8199**	71.1861	0.0321	**75.6446**
P2O5	0.0360	0.0043	**0.0383**	0.0337	0.0043	**0.0357**	0.0333	0.0044	**0.0354**
SO3	0.0586	0.0071	**0.0623**	0.0661	0.0074	**0.0701**	0.1107	0.0074	**0.1176**
Cl	0.0030	0.0095	**0.0032**	0.0000	0.0097	**0.0000**	0.0039	0.0096	**0.0041**
K2O	1.5058	0.0042	**1.6014**	1.8122	0.0043	**1.9224**	1.9998	0.0043	**2.1250**
CaO	0.1398	0.0052	**0.1487**	0.1328	0.0054	**0.1409**	0.1488	0.0053	**0.1581**
TiO2	0.7317	0.0378	**0.7782**	0.8139	0.0359	**0.8634**	0.8079	0.0367	**0.8585**
V2O5	0.0203	0.0059	**0.0216**	0.0414	0.0054	**0.0439**	0.0331	0.0056	**0.0352**
Cr2O3	0.0123	0.0016	**0.0131**	0.0123	0.0016	**0.0130**	0.0118	0.0016	**0.0125**
MnO	0.0055	0.0024	**0.0059**	0.0078	0.0024	**0.0083**	0.0084	0.0024	**0.0089**
Fe2O3	1.3132	0.0048	**1.3966**	1.1456	0.0299	**1.2153**	1.3645	0.0303	**1.4500**
Co2O3	0.0008	0.0018	**0.0008**	0.0027	0.0018	**0.0029**	0.0046	0.0018	**0.0049**
NiO	0.0101	0.0014	**0.0107**	0.0159	0.0014	**0.0169**	0.0212	0.0014	**0.0225**
CuO	0.0120	0.0012	**0.0128**	0.0123	0.0012	**0.0131**	0.0139	0.0012	**0.0148**
ZnO	0.0034	0.0010	**0.0036**	0.0168	0.0010	**0.0178**	0.0201	0.0010	**0.0214**
Ga2O3	0.0035	0.0011	**0.0037**	0.0028	0.0011	**0.0030**	0.0040	0.0011	**0.0042**
As2O3	0.0011	0.0010	**0.0012**	0.0000	0.0010	**0.0000**	0.0021	0.0010	**0.0022**
Br	0.0005	0.0007	**0.0005**	0.0002	0.0007	**0.0002**	0.0006	0.0007	**0.0006**
Rb2O	0.0087	0.0007	**0.0093**	0.0084	0.0007	**0.0089**	0.0095	0.0007	**0.0101**
SrO	0.0099	0.0007	**0.0105**	0.0093	0.0007	**0.0099**	0.0124	0.0007	**0.0132**
Y2O3	0.0011	0.0008	**0.0012**	0.0012	0.0008	**0.0013**	0.0013	0.0008	**0.0014**
ZrO2	0.0315	0.0007	**0.0335**	0.0340	0.0007	**0.0361**	0.0322	0.0007	**0.0342**
Nb2O5	0.0002	0.0008	**0.0002**	0.0007	0.0008	**0.0007**	0.0007	0.0008	**0.0007**
MoO3	0.0000	0.0008	**0.0000**	0.0000	0.0008	**0.0000**	0.0000	0.0008	**0.0000**
BaO	0.0486	0.0140	**0.0517**	0.0532	0.0145	**0.0564**	0.0644	0.0145	**0.0684**
HfO2	0.0018	0.0039	**0.0019**	0.0074	0.0039	**0.0078**	0.0037	0.0039	**0.0039**
PbO	0.0000	0.0020	**0.0000**	0.0041	0.0020	**0.0044**	0.0000	0.0020	**0.0000**
ThO2	0.0006	0.0014	**0.0006**	0.0005	0.0014	**0.0005**	0.0002	0.0014	**0.0002**
Pa	0.0029	0.0011	**0.0031**	0.0032	0.0011	**0.0034**	0.0031	0.0011	**0.0033**
U3O8	0.0000	0.0002	**0.0000**	0.0001	0.0002	**0.0001**	0.0003	0.0002	**0.0003**
TGA:	5.9720			5.7320			5.8940		
Total:	100.0000			100.0000			100.0000		

	59L			60A			60B		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.3692	0.0260	**0.3929**	0.0743	0.0248	**0.0798**	0.1341	0.0247	**0.1424**
MgO	0.8425	0.0204	**0.8966**	0.1105	0.0202	**0.1186**	0.0773	0.0201	**0.0821**
Al2O3	18.4417	0.0194	**19.6253**	16.7729	0.0190	**18.0078**	16.9838	0.0195	**18.0356**
SiO2	69.8109	0.0321	**74.2914**	71.6072	0.0327	**76.8796**	73.1424	0.0326	**77.6722**
P2O5	0.0391	0.0044	**0.0416**	0.0283	0.0044	**0.0304**	0.0392	0.0043	**0.0416**
SO3	0.0939	0.0074	**0.0999**	0.0959	0.0073	**0.1030**	0.3255	0.0076	**0.3457**
Cl	0.0000	0.0098	**0.0000**	0.0000	0.0100	**0.0000**	0.0073	0.0097	**0.0078**
K2O	1.4832	0.0042	**1.5784**	1.1188	0.0041	**1.2012**	1.4233	0.0042	**1.5114**
CaO	0.3556	0.0053	**0.3784**	1.4675	0.0055	**1.5755**	0.1255	0.0053	**0.1333**
TiO2	0.8254	0.0361	**0.8784**	0.6785	0.0362	**0.7285**	0.7613	0.0358	**0.8084**
V2O5	0.0324	0.0054	**0.0345**	0.0284	0.0055	**0.0305**	0.0224	0.0055	**0.0238**
Cr2O3	0.0116	0.0015	**0.0123**	0.0102	0.0016	**0.0110**	0.0110	0.0016	**0.0117**
MnO	0.0189	0.0024	**0.0201**	0.0075	0.0024	**0.0081**	0.0080	0.0024	**0.0085**
Fe2O3	1.4956	0.0048	**1.5916**	1.0326	0.0049	**1.1086**	0.9866	0.0050	**1.0477**
Co2O3	0.0010	0.0018	**0.0011**	0.0000	0.0018	**0.0000**	0.0000	0.0018	**0.0000**
NiO	0.0119	0.0014	**0.0127**	0.0115	0.0014	**0.0123**	0.0121	0.0014	**0.0128**
CuO	0.0117	0.0012	**0.0125**	0.0102	0.0012	**0.0110**	0.0100	0.0012	**0.0106**
ZnO	0.0043	0.0010	**0.0046**	0.0022	0.0010	**0.0024**	0.0042	0.0010	**0.0045**
Ga2O3	0.0030	0.0011	**0.0032**	0.0027	0.0012	**0.0029**	0.0022	0.0011	**0.0023**
As2O3	0.0009	0.0010	**0.0010**	0.0024	0.0010	**0.0026**	0.0012	0.0010	**0.0013**
Br	0.0006	0.0007	**0.0006**	0.0008	0.0007	**0.0009**	0.0012	0.0007	**0.0013**
Rb2O	0.0085	0.0007	**0.0090**	0.0042	0.0007	**0.0045**	0.0066	0.0007	**0.0070**
SrO	0.0091	0.0007	**0.0097**	0.0120	0.0007	**0.0129**	0.0063	0.0007	**0.0067**
Y2O3	0.0010	0.0008	**0.0011**	0.0008	0.0008	**0.0009**	0.0017	0.0008	**0.0018**
ZrO2	0.0320	0.0007	**0.0341**	0.0326	0.0007	**0.0350**	0.0304	0.0007	**0.0323**
Nb2O5	0.0009	0.0008	**0.0010**	0.0003	0.0008	**0.0003**	0.0009	0.0008	**0.0010**
MoO3	0.0003	0.0008	**0.0003**	0.0000	0.0008	**0.0000**	0.0003	0.0008	**0.0003**
BaO	0.0553	0.0141	**0.0588**	0.0253	0.0149	**0.0272**	0.0352	0.0147	**0.0374**
HfO2	0.0038	0.0039	**0.0040**	0.0032	0.0039	**0.0034**	0.0053	0.0039	**0.0056**
PbO	0.0017	0.0020	**0.0018**	0.0000	0.0020	**0.0000**	0.0000	0.0020	**0.0000**
ThO2	0.0009	0.0014	**0.0010**	0.0000	0.0014	**0.0000**	0.0006	0.0014	**0.0006**
Pa	0.0020	0.0011	**0.0021**	0.0010	0.0011	**0.0011**	0.0018	0.0011	**0.0019**
U3O8	0.0000	0.0002	**0.0000**	0.0000	0.0002	**0.0000**	0.0004	0.0002	**0.0004**
TGA:	6.0310			6.8580			5.8320		
Total:	100.0000			100.0000			100.0000		

	61A			61B			61C		
	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**	Mass %	Det. Lim.	**Mass %**
Na2O	0.1603	0.0238	**0.1681**	0.2964	0.0332	**0.3925**	0.2391	0.0247	**0.2527**
MgO	0.5459	0.0191	**0.5726**	0.9578	0.0253	**1.2683**	0.4395	0.0197	**0.4645**
Al2O3	14.6307	0.0173	**15.3471**	17.1915	0.0240	**22.7642**	14.7433	0.0180	**15.5834**
SiO2	75.0928	0.0323	**78.7698**	50.3217	0.0352	**66.6336**	71.2201	0.0321	**75.2783**
P2O5	0.0304	0.0041	**0.0319**	0.0406	0.0055	**0.0538**	0.0578	0.0042	**0.0611**
SO3	0.0602	0.0070	**0.0631**	0.2138	0.0096	**0.2831**	0.0619	0.0071	**0.0654**
Cl	0.0010	0.0092	**0.0010**	0.0013	0.0127	**0.0017**	0.0000	0.0095	**0.0000**
K2O	2.0235	0.0042	**2.1226**	2.2158	0.0055	**2.9340**	1.3270	0.0040	**1.4026**
CaO	0.1385	0.0050	**0.1453**	0.9568	0.0072	**1.2669**	0.0440	0.0052	**0.0465**
TiO2	0.5089	0.0352	**0.5338**	0.5387	0.0477	**0.7133**	0.8177	0.0365	**0.8643**
V2O5	0.0159	0.0053	**0.0167**	0.0242	0.0072	**0.0321**	0.0126	0.0057	**0.0133**
Cr2O3	0.0102	0.0015	**0.0107**	0.0100	0.0020	**0.0132**	0.0163	0.0015	**0.0172**
MnO	0.0166	0.0023	**0.0174**	0.0179	0.0032	**0.0237**	0.1117	0.0024	**0.1181**
Fe2O3	1.9155	0.0294	**2.0093**	2.5133	0.0400	**3.3280**	5.3337	0.0052	**5.6376**
Co2O3	0.0010	0.0018	**0.0011**	0.0063	0.0024	**0.0084**	0.0073	0.0018	**0.0077**
NiO	0.0138	0.0013	**0.0145**	0.0319	0.0019	**0.0423**	0.0142	0.0014	**0.0150**
CuO	0.0097	0.0012	**0.0102**	0.0132	0.0016	**0.0175**	0.0117	0.0012	**0.0124**
ZnO	0.0111	0.0010	**0.0116**	0.0247	0.0014	**0.0327**	0.0081	0.0010	**0.0086**
Ga2O3	0.0024	0.0011	**0.0025**	0.0027	0.0016	**0.0036**	0.0025	0.0012	**0.0026**
As2O3	0.0000	0.0010	**0.0000**	0.0054	0.0014	**0.0072**	0.0013	0.0010	**0.0014**
Br	0.0010	0.0007	**0.0010**	0.0008	0.0009	**0.0011**	0.0000	0.0007	**0.0000**
Rb2O	0.0106	0.0007	**0.0111**	0.0137	0.0010	**0.0182**	0.0073	0.0007	**0.0077**
SrO	0.0097	0.0006	**0.0102**	0.0244	0.0009	**0.0323**	0.0065	0.0007	**0.0069**
Y2O3	0.0001	0.0007	**0.0001**	0.0103	0.0010	**0.0137**	0.0018	0.0008	**0.0019**
ZrO2	0.0184	0.0006	**0.0193**	0.0175	0.0009	**0.0232**	0.0553	0.0007	**0.0585**
Nb2O5	0.0000	0.0007	**0.0000**	0.0002	0.0010	**0.0003**	0.0000	0.0008	**0.0000**
MoO3	0.0004	0.0008	**0.0004**	0.0000	0.0011	**0.0000**	0.0003	0.0008	**0.0003**
BaO	0.0930	0.0138	**0.0976**	0.0608	0.0188	**0.0805**	0.0592	0.0136	**0.0626**
HfO2	0.0043	0.0037	**0.0045**	0.0021	0.0052	**0.0028**	0.0061	0.0039	**0.0064**
PbO	0.0029	0.0019	**0.0030**	0.0000	0.0027	**0.0000**	0.0010	0.0020	**0.0011**
ThO2	0.0000	0.0013	**0.0000**	0.0014	0.0019	**0.0018**	0.0002	0.0014	**0.0002**
Pa	0.0033	0.0010	**0.0035**	0.0045	0.0015	**0.0060**	0.0016	0.0011	**0.0017**
U3O8	0.0000	0.0002	**0.0000**	0.0000	0.0003	**0.0000**	0.0000	0.0002	**0.0000**
TGA:	4.6680			24.4800			5.3910		
Total:	100.0000			100.0000			100.0000		

	61D		
	Mass %	Det. Lim.	**Mass %**
Na2O	1.9948	0.0272	**2.1455**
MgO	0.4642	0.0192	**0.4993**
Al2O3	14.7423	0.0181	**15.8562**
SiO2	67.1285	0.0313	**72.2006**
P2O5	0.0521	0.0044	**0.0560**
SO3	1.6657	0.0077	**1.7916**
Cl	0.0112	0.0095	**0.0120**
K2O	1.4106	0.0041	**1.5172**
CaO	0.0912	0.0052	**0.0981**
TiO2	0.7512	0.0350	**0.8080**
V2O5	0.0251	0.0053	**0.0270**
Cr2O3	0.0137	0.0015	**0.0147**
MnO	0.0875	0.0024	**0.0941**
Fe2O3	4.3856	0.0052	**4.7170**
Co2O3	0.0025	0.0019	**0.0027**
NiO	0.0135	0.0014	**0.0145**
CuO	0.0110	0.0012	**0.0118**
ZnO	0.0078	0.0010	**0.0084**
Ga2O3	0.0027	0.0012	**0.0029**
As2O3	0.0000	0.0010	**0.0000**
Br	0.0002	0.0007	**0.0002**
Rb2O	0.0078	0.0007	**0.0084**
SrO	0.0063	0.0007	**0.0068**
Y2O3	0.0018	0.0008	**0.0019**
ZrO2	0.0385	0.0007	**0.0414**
Nb2O5	0.0007	0.0008	**0.0008**
MoO3	0.0000	0.0008	**0.0000**
BaO	0.0499	0.0142	**0.0537**
HfO2	0.0021	0.0039	**0.0023**
PbO	0.0027	0.0020	**0.0029**
ThO2	0.0006	0.0014	**0.0006**
Pa	0.0026	0.0011	**0.0028**
U3O8	0.0006	0.0002	**0.0006**
TGA:	7.0250		
Total:	100.0000		

Appendix C

Chemistry by Unit

BEAR DEN MEMBER	3a	3b	4a	4b	4c	5a	6a	6b	6c
	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %
Na2O	0.1442	0.1159	0.0833	0.0984	0.0629	0.1320	0.1291	0.1183	0.0756
MgO	0.8201	0.7444	0.2228	0.1682	0.1883	0.3152	0.4829	0.0916	0.0416
Al2O3	21.1642	21.6604	14.9317	13.5440	13.7809	17.4332	20.7566	22.0923	14.8707
SiO2	72.0912	72.3447	80.1182	80.9939	81.0958	77.3512	74.4983	73.4658	81.5368
P2O5	0.0384	0.0405	0.0287	0.0330	0.0276	0.0335	0.0340	0.0313	0.0278
SO3	0.0781	0.0766	0.0433	0.1321	0.1822	0.2358	0.1299	0.1567	0.1447
Cl	0.0055	0.0000	0.0020	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
K2O	2.0916	2.1045	1.2613	1.2970	1.1219	1.7714	1.7983	1.6118	0.9531
CaO	0.1880	0.1652	0.0939	0.0311	0.0503	0.1478	0.0644	0.0701	0.0609
TiO2	0.8600	0.7992	0.7382	0.6003	0.5480	0.9923	0.8859	0.8369	1.1945
V2O5	0.0330	0.0334	0.0190	0.0191	0.0241	0.0424	0.0323	0.0284	0.0277
Cr2O3	0.0125	0.0102	0.0096	0.0101	0.0092	0.0136	0.0112	0.0111	0.0096
MnO	0.0218	0.0067	0.0157	0.0186	0.0084	0.0153	0.0050	0.0051	0.0022
Fe2O3	2.2996	1.7527	2.3317	2.9283	2.7922	1.3479	1.0259	1.3467	0.9364
Co2O3	0.0013	0.0011	0.0014	0.0022	0.0008	0.0015	0.0014	0.0004	0.0018
NiO	0.0133	0.0148	0.0136	0.0132	0.0124	0.0133	0.0121	0.0112	0.0113
CuO	0.0109	0.0115	0.0095	0.0114	0.0113	0.0102	0.0105	0.0095	0.0102
ZnO	0.0043	0.0050	0.0063	0.0059	0.0041	0.0061	0.0052	0.0033	0.0024
Ga2O3	0.0032	0.0039	0.0025	0.0016	0.0013	0.0007	0.0033	0.0036	0.0027
As2O3	0.0000	0.0023	0.0004	0.0000	0.0000	0.0080	0.0002	0.0038	0.0000
Br	0.0004	0.0007	0.0000	0.0006	0.0000	0.0000	0.0005	0.0007	0.0008
Rb2O	0.0123	0.0116	0.0061	0.0067	0.0060	0.0070	0.0103	0.0080	0.0062
SrO	0.0073	0.0094	0.0053	0.0047	0.0038	0.0086	0.0072	0.0079	0.0046
Y2O3	0.0026	0.0009	0.0010	0.0012	0.0000	0.0021	0.0016	0.0015	0.0013
ZrO2	0.0278	0.0268	0.0161	0.0189	0.0241	0.0434	0.0335	0.0296	0.0295
Nb2O5	0.0019	0.0013	0.0001	0.0001	0.0000	0.0000	0.0017	0.0011	0.0028
MoO3	0.0000	0.0001	0.0000	0.0007	0.0000	0.0000	0.0003	0.0000	0.0000
BaO	0.0539	0.0455	0.0312	0.0487	0.0359	0.0607	0.0490	0.0458	0.0337
HfO2	0.0035	0.0046	0.0042	0.0053	0.0040	0.0038	0.0049	0.0043	0.0032
PbO	0.0040	0.0020	0.0007	0.0024	0.0025	0.0000	0.0009	0.0000	0.0059
ThO2	0.0011	0.0000	0.0008	0.0000	0.0006	0.0001	0.0000	0.0007	0.0007
Pa	0.0040	0.0037	0.0014	0.0019	0.0012	0.0029	0.0035	0.0025	0.0011
U3O8	0.0000	0.0004	0.0000	0.0004	0.0002	0.0000	0.0001	0.0000	0.0002

BEAR DEN MEMBER	6d	6e	6f	6g	6h	7a	7b	7c	15a
	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %
Na2O	0.0884	0.0882	0.1282	0.0588	0.0709	0.1694	0.1752	0.3576	0.2528
MgO	0.4232	0.0782	0.6428	0.0482	0.0366	0.0725	0.5332	0.7842	0.6533
Al2O3	20.9377	19.7832	23.2053	16.7434	18.2685	22.8473	21.7821	23.5319	18.5323
SiO2	74.5661	76.3234	71.2140	79.5778	78.9558	73.5905	72.8824	68.7506	72.0127
P2O5	0.0295	0.0325	0.0425	0.0296	0.0293	0.0266	0.0432	0.0338	0.0298
SO3	0.2094	0.0775	0.1168	0.6912	0.1345	0.1604	0.1641	0.2557	0.2039
Cl	0.0000	0.0000	0.0000	0.0000	0.0036	0.0042	0.0012	0.0000	0.0000
K2O	1.5616	1.5986	2.1601	0.9624	0.9634	0.2304	1.4555	2.3656	0.8938
CaO	0.0809	0.0613	0.1202	0.2339	0.0679	0.2489	0.0300	0.0392	0.3107
TiO2	0.7595	0.8795	0.9309	0.9280	0.7831	1.2427	0.8596	0.9728	0.7891
V2O5	0.0130	0.0296	0.0415	0.0337	0.0248	0.0217	0.0336	0.0556	0.0368
Cr2O3	0.0117	0.0106	0.0113	0.0118	0.0100	0.0096	0.0132	0.0118	0.0105
MnO	0.0031	0.0045	0.0057	0.0068	0.0055	0.0052	0.0071	0.0068	0.0296
Fe2O3	1.1797	0.8913	1.2180	0.5009	0.5225	1.2446	1.8877	2.6610	6.1236
Co2O3	0.0015	0.0013	0.0011	0.0011	0.0002	0.0000	0.0000	0.0001	0.0002
NiO	0.0127	0.0122	0.0129	0.0136	0.0126	0.0136	0.0126	0.0120	0.0127
CuO	0.0115	0.0118	0.0128	0.0123	0.0124	0.0115	0.0112	0.0114	0.0128
ZnO	0.0038	0.0038	0.0058	0.0058	0.0031	0.0037	0.0026	0.0024	0.0031
Ga2O3	0.0028	0.0035	0.0056	0.0020	0.0020	0.0058	0.0049	0.0044	0.0034
As2O3	0.0016	0.0009	0.0006	0.0000	0.0000	0.0000	0.0007	0.0116	0.0000
Br	0.0000	0.0001	0.0002	0.0002	0.0003	0.0009	0.0003	0.0003	0.0003
Rb2O	0.0082	0.0094	0.0120	0.0050	0.0050	0.0009	0.0087	0.0145	0.0074
SrO	0.0067	0.0067	0.0099	0.0085	0.0036	0.0041	0.0084	0.0089	0.0073
Y2O3	0.0010	0.0010	0.0010	0.0019	0.0009	0.0023	0.0008	0.0007	0.0017
ZrO2	0.0319	0.0406	0.0254	0.0703	0.0494	0.0604	0.0342	0.0219	0.0351
Nb2O5	0.0019	0.0013	0.0014	0.0007	0.0014	0.0028	0.0012	0.0018	0.0011
MoO3	0.0001	0.0007	0.0000	0.0008	0.0002	0.0000	0.0000	0.0000	0.0006
BaO	0.0422	0.0412	0.0655	0.0397	0.0068	0.0096	0.0362	0.0660	0.0253
HfO2	0.0052	0.0042	0.0024	0.0076	0.0093	0.0064	0.0062	0.0049	0.0041
PbO	0.0017	0.0000	0.0008	0.0027	0.0012	0.0027	0.0004	0.0069	0.0028
ThO2	0.0000	0.0004	0.0000	0.0008	0.0004	0.0009	0.0010	0.0001	0.0006
Pa	0.0031	0.0025	0.0048	0.0005	0.0019	0.0004	0.0022	0.0050	0.0020
U3O8	0.0002	0.0000	0.0005	0.0000	0.0000	0.0001	0.0003	0.0005	0.0006

BEAR DEN MEMBER	15b	15c	15d	15e	15f	15g	15h	15i	15j
	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %
Na2O	0.2691	0.2189	0.3415	0.1696	0.2336	0.2753	0.3504	0.3237	0.3565
MgO	0.6896	0.6953	1.2145	0.0336	0.0618	0.4909	0.1140	0.7286	0.8142
Al2O3	19.7285	16.8642	21.0436	7.2929	14.2468	19.2785	20.3242	23.1518	23.8707
SiO2	71.4720	69.8514	66.4713	90.3478	82.0137	73.1829	73.0060	67.9109	64.6174
P2O5	0.0257	0.0351	0.0469	0.0222	0.0251	0.0245	0.0312	0.0337	0.0348
SO3	0.6544	0.7144	0.2782	0.1447	0.2524	0.4876	0.2352	0.1684	0.2393
Cl	0.0034	0.0039	0.0007	0.0000	0.0000	0.0017	0.0045	0.0000	0.0038
K2O	1.2281	1.2625	2.9774	0.1412	0.2614	0.6859	1.2831	1.6420	1.7365
CaO	0.2587	0.2344	0.1313	0.0275	0.0549	0.0787	0.0555	0.0754	0.0895
TiO2	0.6837	0.6200	0.7436	0.9783	1.0706	0.9555	0.9371	0.8740	0.9354
V2O5	0.0302	0.0315	0.0417	0.0174	0.0281	0.0321	0.0302	0.0225	0.0441
Cr2O3	0.0115	0.0106	0.0130	0.0060	0.0086	0.0112	0.0123	0.0140	0.0143
MnO	0.0117	0.0385	0.0148	0.0028	0.0037	0.0081	0.0131	0.0139	0.0195
Fe2O3	4.7526	9.2917	6.5066	0.6889	1.6257	4.3766	3.4723	4.8871	7.0896
Co2O3	0.0041	0.0008	0.0008	0.0017	0.0019	0.0000	0.0014	0.0047	0.0000
NiO	0.0139	0.0135	0.0120	0.0122	0.0107	0.0122	0.0110	0.0124	0.0128
CuO	0.0117	0.0126	0.0138	0.0108	0.0125	0.0122	0.0108	0.0121	0.0128
ZnO	0.0041	0.0046	0.0043	0.0024	0.0029	0.0027	0.0033	0.0025	0.0039
Ga2O3	0.0032	0.0021	0.0039	0.0016	0.0031	0.0041	0.0048	0.0048	0.0043
As2O3	0.0000	0.0022	0.0000	0.0012	0.0000	0.0018	0.0000	0.0000	0.0000
Br	0.0002	0.0006	0.0003	0.0003	0.0000	0.0000	0.0006	0.0001	0.0003
Rb2O	0.0092	0.0093	0.0193	0.0006	0.0019	0.0051	0.0091	0.0103	0.0111
SrO	0.0237	0.0077	0.0134	0.0026	0.0071	0.0070	0.0062	0.0108	0.0125
Y2O3	0.0017	0.0005	0.0005	0.0040	0.0030	0.0009	0.0010	0.0018	0.0011
ZrO2	0.0294	0.0369	0.0191	0.0650	0.0479	0.0363	0.0331	0.0273	0.0252
Nb2O5	0.0002	0.0002	0.0015	0.0018	0.0019	0.0017	0.0017	0.0023	0.0017
MoO3	0.0002	0.0003	0.0002	0.0003	0.0002	0.0000	0.0002	0.0000	0.0001
BaO	0.0629	0.0296	0.0738	0.0155	0.0123	0.0191	0.0358	0.0507	0.0369
HfO2	0.0048	0.0027	0.0019	0.0067	0.0047	0.0051	0.0060	0.0079	0.0042
PbO	0.0069	0.0000	0.0034	0.0001	0.0026	0.0005	0.0029	0.0017	0.0034
ThO2	0.0006	0.0000	0.0004	0.0000	0.0000	0.0005	0.0003	0.0010	0.0008
Pa	0.0036	0.0035	0.0064	0.0000	0.0009	0.0012	0.0026	0.0032	0.0033
U3O8	0.0004	0.0005	0.0000	0.0003	0.0000	0.0001	0.0000	0.0004	0.0000

BEAR DEN MEMBER	15k	17A	17B	18A	18B	18C	18D	18E	19A
	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %
Na2O	0.2638	0.1106	0.1631	0.1378	0.1553	0.1577	0.2183	0.2741	0.2369
MgO	0.1577	0.5327	0.6412	0.7776	0.7756	0.5426	0.6522	0.4386	0.7219
Al2O3	19.9617	17.3303	18.3927	27.3869	23.9805	20.3756	25.2385	18.6541	18.6075
SiO2	55.0807	78.4701	74.9376	66.4902	69.8505	74.2319	69.0085	74.1954	75.5388
P2O5	0.1551	0.0344	0.0450	0.0417	0.0529	0.0331	0.0333	0.0310	0.0322
SO3	0.2063	0.1640	0.2601	0.1048	0.0718	0.0672	0.0900	0.1741	0.2734
Cl	0.0000	0.0067	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0057
K2O	1.8408	1.4673	1.6793	1.9706	1.9743	1.7510	0.9397	1.2290	1.3684
CaO	0.3852	0.0838	0.0625	0.0753	0.0905	0.1178	0.2713	0.0892	0.0810
TiO2	0.8401	0.7769	0.8368	1.0966	1.1322	1.1676	1.2585	0.9614	0.9454
V2O5	0.0524	0.0307	0.0353	0.0414	0.0412	0.0309	0.0398	0.0299	0.0298
Cr2O3	0.0130	0.0105	0.0117	0.0124	0.0123	0.0108	0.0124	0.0103	0.0096
MnO	0.0833	0.0027	0.0125	0.0048	0.0064	0.0064	0.0052	0.0200	0.0056
Fe2O3	20.7317	0.8280	2.7676	1.7284	1.6663	1.3666	2.1031	3.7592	1.9796
Co2O3	0.0000	0.0010	0.0000	0.0010	0.0016	0.0009	0.0012	0.0011	0.0000
NiO	0.0136	0.0128	0.0153	0.0145	0.0179	0.0132	0.0141	0.0146	0.0122
CuO	0.0126	0.0123	0.0140	0.0138	0.0141	0.0115	0.0160	0.0106	0.0110
ZnO	0.0045	0.0022	0.0034	0.0068	0.0206	0.0063	0.0061	0.0045	0.0034
Ga2O3	0.0036	0.0028	0.0028	0.0054	0.0058	0.0037	0.0072	0.0040	0.0040
As2O3	0.0070	0.0000	0.0000	0.0019	0.0000	0.0000	0.0026	0.0008	0.0000
Br	0.0002	0.0005	0.0008	0.0004	0.0003	0.0003	0.0003	0.0003	0.0009
Rb2O	0.0122	0.0082	0.0096	0.0118	0.0128	0.0107	0.0093	0.0100	0.0131
SrO	0.0242	0.0082	0.0070	0.0075	0.0078	0.0080	0.0116	0.0071	0.0074
Y2O3	0.0025	0.0029	0.0051	0.0015	0.0065	0.0023	0.0000	0.0013	0.0012
ZrO2	0.0199	0.0415	0.0429	0.0250	0.0285	0.0330	0.0273	0.0366	0.0380
Nb2O5	0.0013	0.0012	0.0012	0.0010	0.0010	0.0024	0.0023	0.0015	0.0023
MoO3	0.0002	0.0005	0.0001	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000
BaO	0.0973	0.0429	0.0411	0.0342	0.0578	0.0355	0.0189	0.0334	0.0559
HfO2	0.0046	0.0080	0.0040	0.0028	0.0073	0.0063	0.0079	0.0043	0.0059
PbO	0.0000	0.0031	0.0032	0.0000	0.0040	0.0035	0.0000	0.0007	0.0062
ThO2	0.0011	0.0009	0.0007	0.0000	0.0003	0.0000	0.0001	0.0004	0.0001
Pa	0.0041	0.0022	0.0031	0.0038	0.0037	0.0030	0.0035	0.0025	0.0026
U3O8	0.0000	0.0001	0.0003	0.0001	0.0001	0.0002	0.0008	0.0000	0.0000

BEAR DEN MEMBER	A9B	A9C	19D	19E	19F	20A	20B	20C	21A
	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %
Na2O	0.2223	0.4354	0.2940	0.2059	0.4736	0.0690	0.0919	0.0952	0.3896
MgO	0.7167	0.1081	0.6277	0.5573	0.6882	0.0979	0.3483	0.0531	1.4821
Al2O3	23.2808	19.7198	27.6969	26.2323	32.1276	13.7864	17.9053	17.5458	18.9029
SiO2	65.8889	74.9689	64.2609	67.9271	61.5271	75.8566	74.4843	79.7157	68.1048
P2O5	0.0354	0.0338	0.0378	0.0349	0.0405	0.0270	0.0295	0.0255	0.0759
SO3	0.1873	0.5419	0.1262	0.2094	0.3698	4.2071	2.2025	0.1168	1.6714
Cl	0.0000	0.0003	0.0000	0.0000	0.0050	0.0028	0.0000	0.0000	0.0011
K2O	1.6590	1.5791	0.9047	1.3106	0.7336	0.4194	0.7960	0.8343	3.4820
CaO	0.0596	0.0686	0.1997	0.0643	0.1095	3.3113	1.5739	0.0790	0.4434
TiO2	1.0876	1.1625	1.1116	1.0714	1.1339	1.1725	0.9732	0.7421	0.7228
V2O5	0.0380	0.0338	0.0386	0.0321	0.0366	0.0203	0.0260	0.0271	0.0213
Cr2O3	0.0122	0.0122	0.0123	0.0118	0.0135	0.0090	0.0105	0.0092	0.0117
MnO	0.0264	0.0052	0.0263	0.0048	0.0052	0.0034	0.0390	0.0044	0.0130
Fe2O3	6.6282	1.1803	4.5253	2.2027	2.6149	0.8940	1.3477	0.6415	4.4817
Co2O3	0.0067	0.0006	0.0035	0.0015	0.0036	0.0006	0.0041	0.0025	0.0021
NiO	0.0132	0.0125	0.0136	0.0143	0.0170	0.0119	0.0238	0.0135	0.0123
CuO	0.0131	0.0116	0.0158	0.0101	0.0136	0.0104	0.0099	0.0099	0.0122
ZnO	0.0030	0.0030	0.0059	0.0044	0.0184	0.0025	0.0075	0.0031	0.0082
Ga2O3	0.0035	0.0037	0.0063	0.0060	0.0087	0.0024	0.0025	0.0031	0.0046
As2O3	0.0022	0.0003	0.0002	0.0018	0.0031	0.0000	0.0000	0.0005	0.0004
Br	0.0003	0.0007	0.0008	0.0001	0.0006	0.0006	0.0000	0.0000	0.0003
Rb2O	0.0107	0.0107	0.0070	0.0117	0.0067	0.0023	0.0041	0.0047	0.0187
SrO	0.0074	0.0084	0.0108	0.0080	0.0078	0.0108	0.0033	0.0030	0.0156
Y2O3	0.0004	0.0027	0.0019	0.0008	0.0011	0.0015	0.0046	0.0007	0.0002
ZrO2	0.0289	0.0369	0.0225	0.0242	0.0189	0.0519	0.0726	0.0275	0.0212
Nb2O5	0.0023	0.0010	0.0027	0.0015	0.0015	0.0029	0.0006	0.0009	0.0006
MoO3	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0006
BaO	0.0530	0.0464	0.0194	0.0414	0.0127	0.0134	0.0295	0.0374	0.0853
HfO2	0.0067	0.0055	0.0065	0.0050	0.0052	0.0083	0.0059	0.0015	0.0031
PbO	0.0000	0.0026	0.0153	0.0000	0.0000	0.0027	0.0024	0.0003	0.0044
ThO2	0.0011	0.0000	0.0031	0.0000	0.0000	0.0006	0.0011	0.0006	0.0002
Pa	0.0045	0.0030	0.0001	0.0042	0.0020	0.0005	0.0000	0.0006	0.0062
U3O8	0.0005	0.0004	0.0026	0.0004	0.0001	0.0000	0.0000	0.0005	0.0001

BEAR DEN MEMBER	21B	21C	21D	21E	21F	22A	22B	22C	22D
	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %
Na2O	0.0940	0.0629	0.1536	0.1386	0.1631	0.3026	0.2335	0.2589	0.3868
MgO	0.3337	0.3321	1.1386	0.8810	1.0888	0.1284	0.5953	0.1043	0.1095
Al2O3	10.0455	12.4809	23.5879	20.1506	20.1470	23.0660	18.8258	20.7686	28.9471
SiO2	85.4185	81.8599	63.2471	73.6823	71.8157	71.3869	75.5486	71.8753	66.1773
P2O5	0.0282	0.0232	0.0381	0.0345	0.0598	0.0369	0.0356	0.0528	0.0384
SO3	0.5766	0.5337	0.8073	0.2161	0.1832	0.2261	0.1090	0.0813	0.0864
Cl	0.0009	0.0000	0.0000	0.0025	0.0067	0.0045	0.0021	0.0000	0.0000
K2O	0.4846	0.3656	2.0819	1.9639	2.9601	1.8964	1.7692	1.3820	0.7486
CaO	0.0610	0.1072	0.1897	0.0569	0.1018	0.0776	0.0691	0.1405	0.1004
TiO2	0.8065	0.8343	0.7611	0.6451	0.8647	1.0043	0.9548	1.2214	1.0640
V2O5	0.0185	0.0233	0.0389	0.0149	0.0354	0.0318	0.0266	0.0326	0.0349
Cr2O3	0.0080	0.0073	0.0125	0.0123	0.0118	0.0110	0.0115	0.0098	0.0108
MnO	0.0055	0.0051	0.0189	0.0090	0.0101	0.0038	0.0041	0.0523	0.0062
Fe2O3	1.9952	3.2590	7.7741	2.0568	2.3769	1.6720	1.6718	3.8667	2.1626
Co2O3	0.0004	0.0026	0.0019	0.0000	0.0000	0.0019	0.0010	0.0048	0.0008
NiO	0.0129	0.0109	0.0145	0.0129	0.0129	0.0120	0.0130	0.0146	0.0153
CuO	0.0129	0.0091	0.0135	0.0108	0.0112	0.0119	0.0106	0.0126	0.0137
ZnO	0.0037	0.0047	0.0126	0.0035	0.0107	0.0043	0.0056	0.0091	0.0073
Ga2O3	0.0027	0.0023	0.0051	0.0034	0.0034	0.0042	0.0002	0.0040	0.0058
As2O3	0.0008	0.0000	0.0000	0.0017	0.0000	0.0000	0.0000	0.0008	0.0000
Br	0.0006	0.0000	0.0003	0.0004	0.0000	0.0006	0.0000	0.0002	0.0006
Rb2O	0.0035	0.0021	0.0135	0.0123	0.0178	0.0118	0.0111	0.0103	0.0057
SrO	0.0041	0.0024	0.0077	0.0078	0.0113	0.0079	0.0094	0.0087	0.0071
Y2O3	0.0041	0.0024	0.0010	0.0013	0.0009	0.0011	0.0013	0.0019	0.0017
ZrO2	0.0545	0.0479	0.0227	0.0352	0.0270	0.0263	0.0346	0.0323	0.0274
Nb2O5	0.0009	0.0015	0.0008	0.0008	0.0020	0.0013	0.0017	0.0021	0.0018
MoO3	0.0000	0.0003	0.0000	0.0000	0.0000	0.0001	0.0006	0.0002	0.0004
BaO	0.0102	0.0134	0.0417	0.0354	0.0601	0.0556	0.0400	0.0421	0.0296
HfO2	0.0094	0.0053	0.0039	0.0059	0.0034	0.0046	0.0049	0.0062	0.0028
PbO	0.0003	0.0000	0.0067	0.0000	0.0057	0.0022	0.0044	0.0006	0.0054
ThO2	0.0006	0.0003	0.0000	0.0004	0.0017	0.0010	0.0014	0.0000	0.0005
Pa	0.0013	0.0004	0.0043	0.0033	0.0062	0.0043	0.0032	0.0027	0.0010
U3O8	0.0005	0.0000	0.0000	0.0004	0.0006	0.0006	0.0000	0.0002	0.0001

BEAR DEN MEMBER	22E	22F	23A	23B	23C	23D	23E	23F	23G
	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %
Na2O	0.4528	0.3672	0.4103	0.2273	0.1442	0.2143	0.2160	0.1804	0.3143
MgO	0.1014	0.7165	2.1156	0.5149	0.0457	1.0048	0.5477	0.0684	1.1872
Al2O3	23.0859	33.7991	23.7528	16.9888	11.0135	21.3285	26.0630	20.4461	24.8336
SiO2	71.9935	59.8262	64.3348	79.0415	84.8694	53.6253	68.4954	75.7780	65.9345
P2O5	0.0354	0.0433	0.0480	0.0359	0.0240	0.0730	0.0375	0.0271	0.0632
SO3	0.3367	0.0845	1.3141	0.2392	0.4773	0.2459	0.1459	0.1372	0.1207
Cl	0.0000	0.0000	0.0012	0.0000	0.0000	0.0000	0.0039	0.0000	0.0010
K2O	0.8291	0.8186	2.7184	0.2143	0.1733	1.6560	1.2028	1.0152	3.7784
CaO	0.1035	0.2832	0.8348	0.1080	0.3054	0.2000	0.0606	0.0422	0.1920
TiO2	1.0038	1.2013	0.8298	1.1829	1.3238	0.9317	0.8996	0.7082	0.9383
V2O5	0.0319	0.0436	0.0405	0.0398	0.0255	0.0527	0.0287	0.0279	0.0514
Cr2O3	0.0109	0.0123	0.0109	0.0084	0.0080	0.0132	0.0120	0.0095	0.0146
MnO	0.0051	0.0058	0.0162	0.0030	0.0087	0.0768	0.0033	0.0030	0.0070
Fe2O3	1.8786	2.6712	3.3916	1.2649	1.4661	20.4251	2.1470	1.4548	2.2924
Co2O3	0.0014	0.0022	0.0044	0.0011	0.0002	0.0032	0.0013	0.0012	0.0020
NiO	0.0139	0.0148	0.0155	0.0152	0.0119	0.0133	0.0134	0.0118	0.0178
CuO	0.0114	0.0150	0.0158	0.0131	0.0110	0.0136	0.0102	0.0127	0.0389
ZnO	0.0048	0.0068	0.0116	0.0031	0.0019	0.0019	0.0036	0.0041	0.0198
Ga2O3	0.0054	0.0082	0.0050	0.0047	0.0021	0.0044	0.0050	0.0034	0.0042
As2O3	0.0007	0.0000	0.0044	0.0054	0.0020	0.0000	0.0000	0.0000	0.0060
Br	0.0003	0.0004	0.0007	0.0008	0.0001	0.0004	0.0000	0.0005	0.0003
Rb2O	0.0057	0.0065	0.0174	0.0008	0.0012	0.0085	0.0077	0.0063	0.0187
SrO	0.0076	0.0119	0.0096	0.0039	0.0030	0.0106	0.0064	0.0032	0.0166
Y2O3	0.0023	0.0000	0.0009	0.0038	0.0028	0.0009	0.0006	0.0012	0.0041
ZrO2	0.0352	0.0208	0.0179	0.0558	0.0592	0.0199	0.0255	0.0261	0.0159
Nb2O5	0.0013	0.0014	0.0017	0.0013	0.0025	0.0005	0.0012	0.0005	0.0003
MoO3	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002	0.0000
BaO	0.0346	0.0266	0.0663	0.0166	0.0105	0.0457	0.0497	0.0243	0.1143
HfO2	0.0050	0.0048	0.0045	0.0048	0.0058	0.0048	0.0048	0.0033	0.0048
PbO	0.0007	0.0061	0.0000	0.0000	0.0000	0.0072	0.0033	0.0012	0.0000
ThO2	0.0000	0.0010	0.0003	0.0001	0.0001	0.0000	0.0014	0.0000	0.0006
Pa	0.0009	0.0005	0.0050	0.0002	0.0007	0.0036	0.0025	0.0020	0.0071
U3O8	0.0000	0.0002	0.0000	0.0004	0.0001	0.0001	0.0000	0.0000	0.0000

BEAR DEN MEMBER	24A	24B	24C	24D	24E	24F	24G	24H	30A
	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %
Na2O	0.2239	0.1760	0.2818	0.2035	0.2091	0.4868	0.4033	0.4137	0.3116
MgO	0.0240	0.0395	0.5072	0.4569	0.8952	0.6643	1.1600	0.1845	0.6536
Al2O3	20.4735	22.4953	20.0099	17.3215	22.5457	19.5222	19.8072	22.9405	20.8502
SiO2	75.1951	72.8321	74.6018	74.3139	65.7874	71.9807	71.4952	70.7538	70.0602
P2O5	0.0271	0.0212	0.0370	0.0422	0.0477	0.1002	0.0398	0.0347	0.0375
SO3	0.6327	0.3293	0.5531	0.7511	0.3850	0.2713	0.5644	0.8312	2.3592
Cl	0.0000	0.0000	0.0000	0.0053	0.0023	0.0000	0.0031	0.0087	0.0000
K2O	0.0739	0.1286	1.0119	1.1643	2.6779	0.6531	3.7364	2.5888	1.6435
CaO	0.1201	0.0515	0.0369	0.0443	0.0659	0.0795	0.0250	0.0310	1.4491
TiO2	1.5591	1.0571	0.8229	0.8713	0.9239	2.7478	1.0465	0.8548	0.8739
V2O5	0.0270	0.0274	0.0308	0.0388	0.0556	0.0831	0.0396	0.0327	0.0401
Cr2O3	0.0073	0.0086	0.0103	0.0123	0.0154	0.0219	0.0131	0.0121	0.0129
MnO	0.0029	0.0069	0.0251	0.0130	0.0148	0.0357	0.0192	0.0197	0.0170
Fe2O3	1.5050	2.7405	1.9291	4.6170	6.2072	3.0025	1.4317	1.1226	1.5353
Co2O3	0.0025	0.0000	0.0020	0.0007	0.0023	0.0068	0.0024	0.0024	0.0000
NiO	0.0126	0.0125	0.0139	0.0110	0.0145	0.0292	0.0162	0.0150	0.0147
CuO	0.0125	0.0103	0.0112	0.0114	0.0132	0.0519	0.0252	0.0164	0.0130
ZnO	0.0015	0.0023	0.0028	0.0027	0.0125	0.0199	0.0181	0.0128	0.0020
Ga2O3	0.0081	0.0058	0.0041	0.0033	0.0051	0.0064	0.0047	0.0033	0.0036
As2O3	0.0000	0.0024	0.0052	0.0034	0.0020	0.0000	0.0000	0.0037	0.0000
Br	0.0004	0.0006	0.0000	0.0000	0.0005	0.0000	0.0006	0.0000	0.0003
Rb2O	0.0006	0.0012	0.0068	0.0064	0.0166	0.0037	0.0217	0.0143	0.0091
SrO	0.0030	0.0022	0.0193	0.0081	0.0076	0.0210	0.0091	0.0087	0.0109
Y2O3	0.0021	0.0012	0.0013	0.0022	0.0006	0.0179	0.0012	0.0012	0.0015
ZrO2	0.0615	0.0395	0.0335	0.0457	0.0222	0.0644	0.0218	0.0205	0.0338
Nb2O5	0.0037	0.0022	0.0015	0.0016	0.0019	0.0030	0.0016	0.0007	0.0007
MoO3	0.0000	0.0000	0.0003	0.0001	0.0002	0.0000	0.0004	0.0000	0.0000
BaO	0.0067	0.0000	0.0337	0.0285	0.0555	0.1089	0.0757	0.0633	0.0521
HfO2	0.0071	0.0047	0.0054	0.0032	0.0045	0.0045	0.0046	0.0044	0.0056
PbO	0.0056	0.0000	0.0000	0.0034	0.0000	0.0092	0.0040	0.0000	0.0041
ThO2	0.0000	0.0008	0.0000	0.0000	0.0021	0.0000	0.0004	0.0000	0.0011
Pa	0.0000	0.0002	0.0007	0.0017	0.0055	0.0008	0.0078	0.0041	0.0030
U3O8	0.0005	0.0001	0.0005	0.0002	0.0000	0.0034	0.0000	0.0003	0.0003

BEAR DEN MEMBER	30B	30C	30D	30E	32A	32B	32C	32D	43A
	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %
Na2O	0.2527	0.1223	0.1227	0.1000	0.0628	0.0924	0.1742	0.0991	0.0633
MgO	0.7563	0.3096	0.4465	0.3373	0.3617	0.4493	0.6979	0.4241	0.0878
Al2O3	22.5818	18.6639	19.6170	16.8143	17.8735	24.6161	24.1558	19.5514	15.7286
SiO2	68.6592	77.4148	73.7193	77.2103	77.7805	70.2002	66.1857	72.5240	80.1426
P2O5	0.0419	0.0316	0.0374	0.0432	0.0294	0.0235	0.0507	0.0332	0.0355
SO3	1.1565	0.1019	0.0877	0.0721	0.0737	0.1768	0.3165	0.2529	0.0514
Cl	0.0000	0.0000	0.0000	0.0000	0.0028	0.0031	0.0000	0.0012	0.0026
K2O	2.0622	1.0726	1.5439	1.6121	0.1879	0.7305	2.3641	1.5999	0.9714
CaO	0.6765	0.2934	0.1011	0.1020	0.3071	0.0897	0.0398	0.0434	0.2827
TiO2	0.9343	0.7181	0.8456	0.7251	1.3450	0.9723	0.9713	0.8775	1.0497
V2O5	0.0475	0.0219	0.0439	0.0363	0.0228	0.0368	0.0455	0.0409	0.0310
Cr2O3	0.0138	0.0109	0.0126	0.0117	0.0090	0.0101	0.0120	0.0157	0.0103
MnO	0.0413	0.0408	0.1107	0.0553	0.0087	0.0082	0.0306	0.0281	0.0314
Fe2O3	2.6112	1.0655	3.1555	2.6889	1.8022	2.4831	4.7588	4.3572	1.3847
Co2O3	0.0013	0.0008	0.0022	0.0056	0.0012	0.0002	0.0002	0.0010	0.0049
NiO	0.0162	0.0160	0.0188	0.0185	0.0149	0.0142	0.0192	0.0166	0.0161
CuO	0.0127	0.0109	0.0143	0.0116	0.0119	0.0123	0.0124	0.0179	0.0123
ZnO	0.0030	0.0027	0.0106	0.0127	0.0074	0.0030	0.0129	0.0114	0.0055
Ga2O3	0.0017	0.0023	0.0030	0.0046	0.0052	0.0058	0.0052	0.0032	0.0043
As2O3	0.0008	0.0000	0.0025	0.0013	0.0022	0.0015	0.0000	0.0000	0.0047
Br	0.0002	0.0006	0.0007	0.0002	0.0000	0.0002	0.0000	0.0001	0.0007
Rb2O	0.0116	0.0063	0.0090	0.0083	0.0012	0.0053	0.0126	0.0079	0.0063
SrO	0.0081	0.0060	0.0065	0.0081	0.0027	0.0048	0.0107	0.0170	0.0071
Y2O3	0.0027	0.0004	0.0023	0.0019	0.0026	0.0000	0.0024	0.0019	0.0023
ZrO2	0.0295	0.0315	0.0339	0.0460	0.0593	0.0320	0.0233	0.0366	0.0321
Nb2O5	0.0013	0.0003	0.0016	0.0001	0.0055	0.0014	0.0021	0.0006	0.0026
MoO3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0004
BaO	0.0625	0.0447	0.0437	0.0659	0.0141	0.0202	0.0632	0.0287	0.0199
HfO2	0.0033	0.0035	0.0041	0.0051	0.0046	0.0040	0.0030	0.0047	0.0058
PbO	0.0043	0.0046	0.0000	0.0000	0.0000	0.0000	0.0061	0.0015	0.0000
ThO2	0.0015	0.0000	0.0005	0.0000	0.0001	0.0007	0.0015	0.0001	0.0001
Pa	0.0040	0.0015	0.0024	0.0011	0.0000	0.0023	0.0043	0.0020	0.0015
U3O8	0.0000	0.0006	0.0000	0.0004	0.0000	0.0000	0.0000	0.0002	0.0004

BEAR DEN MEMBER	43B	43C	43D	43E	46A	46B	46C	46D	46E	Mean
	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	
Na2O	0.1302	0.1783	0.1420	0.1970	0.1957	0.0407	0.0568	0.0699	0.1765	0.2021
MgO	0.8436	1.3297	1.0419	1.8993	0.9295	0.1758	0.3213	0.0808	0.9451	0.5350
Al2O3	26.0709	21.0460	20.5209	18.9572	23.8539	11.6339	21.6542	24.3102	25.5717	20.4146
SiO2	68.1252	70.7816	72.9774	71.0491	67.5707	85.1049	73.7201	68.3933	64.5647	72.5426
P2O5	0.0372	0.0434	0.0359	0.0681	0.0410	0.0192	0.0215	0.0313	0.0508	0.0385
SO3	0.0678	0.1006	0.0803	0.0908	0.2683	0.1609	0.1979	0.2965	0.3927	0.3773
Cl	0.0000	0.0222	0.0056	0.0037	0.0011	0.0000	0.0000	0.0024	0.0000	0.0016
K2O	2.1933	3.4472	2.7290	3.5355	2.7299	0.2120	0.7110	1.1432	2.4876	1.4937
CaO	0.2007	0.3811	0.1324	0.1804	0.5425	0.1177	0.1734	0.0875	0.1663	0.2121
TiO2	0.9137	0.8225	0.8194	0.7603	1.0194	0.8773	0.7552	0.8457	0.9149	0.9521
V2O5	0.0483	0.0368	0.0277	0.0401	0.0390	0.0198	0.0181	0.0440	0.0420	0.0339
Cr2O3	0.0126	0.0141	0.0106	0.0127	0.0127	0.0091	0.0117	0.0121	0.0150	0.0114
MnO	0.0054	0.0057	0.0046	0.0117	0.0111	0.0021	0.0065	0.0118	0.0203	0.0156
Fe2O3	1.2002	1.5746	1.2949	2.9620	2.5886	1.5129	2.2372	4.5494	4.4702	3.0194
Co2O3	0.0008	0.0018	0.0008	0.0000	0.0050	0.0006	0.0011	0.0015	0.0000	0.0016
NiO	0.0138	0.0174	0.0139	0.0163	0.0135	0.0133	0.0127	0.0147	0.0132	0.0141
CuO	0.0112	0.0153	0.0132	0.0155	0.0126	0.0112	0.0097	0.0124	0.0120	0.0131
ZnO	0.0041	0.0084	0.0091	0.0154	0.0107	0.0032	0.0043	0.0039	0.0052	0.0061
Ga2O3	0.0045	0.0044	0.0033	0.0033	0.0040	0.0022	0.0030	0.0046	0.0043	0.0040
As2O3	0.0037	0.0060	0.0007	0.0076	0.0020	0.0011	0.0000	0.0074	0.0136	0.0017
Br	0.0005	0.0016	0.0020	0.0003	0.0010	0.0000	0.0002	0.0005	0.0006	0.0004
Rb2O	0.0124	0.0232	0.0149	0.0187	0.0135	0.0019	0.0058	0.0065	0.0176	0.0091
SrO	0.0094	0.0137	0.0078	0.0192	0.0116	0.0031	0.0047	0.0066	0.0117	0.0085
Y2O3	0.0007	0.0044	0.0022	0.0014	0.0000	0.0023	0.0012	0.0015	0.0003	0.0019
ZrO2	0.0195	0.0211	0.0220	0.0236	0.0245	0.0549	0.0355	0.0337	0.0246	0.0339
Nb2O5	0.0011	0.0010	0.0012	0.0012	0.0023	0.0018	0.0009	0.0013	0.0014	0.0015
MoO3	0.0000	0.0000	0.0000	0.0008	0.0000	0.0002	0.0002	0.0000	0.0005	0.0001
BaO	0.0591	0.0841	0.0578	0.0833	0.0866	0.0125	0.0265	0.0197	0.0651	0.0425
HfO2	0.0062	0.0040	0.0060	0.0025	0.0041	0.0044	0.0029	0.0053	0.0054	0.0049
PbO	0.0000	0.0000	0.0029	0.0161	0.0000	0.0000	0.0038	0.0000	0.0000	0.0032
ThO2	0.0000	0.0013	0.0005	0.0008	0.0006	0.0001	0.0000	0.0000	0.0011	0.0007
Pa	0.0039	0.0085	0.0055	0.0061	0.0047	0.0000	0.0015	0.0020	0.0056	0.0026
U3O8	0.0000	0.0000	0.0003	0.0000	0.0000	0.0009	0.0011	0.0002	0.0000	0.0005

Upper BEAR DEN MEMBER	3a	4a	5a	6a	6b	6c	6d	7a	15a
	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %
Na2O	0.1442	0.0833	0.1320	0.1291	0.1183	0.0756	0.0884	0.1694	0.2528
MgO	0.8201	0.2228	0.3152	0.4829	0.0916	0.0416	0.4232	0.0725	0.6533
Al2O3	21.1642	14.9317	17.4332	20.7566	22.0923	14.8707	20.9377	22.8473	18.5323
SiO2	72.0912	80.1182	77.3512	74.4983	73.4658	81.5368	74.5661	73.5905	72.0127
P2O5	0.0384	0.0287	0.0335	0.0340	0.0313	0.0278	0.0295	0.0266	0.0298
SO3	0.0781	0.0433	0.2358	0.1299	0.1567	0.1447	0.2094	0.1604	0.2039
Cl	0.0055	0.0020	0.0000	0.0000	0.0000	0.0000	0.0000	0.0042	0.0000
K2O	2.0916	1.2613	1.7714	1.7983	1.6118	0.9531	1.5616	0.2304	0.8938
CaO	0.1880	0.0939	0.1478	0.0644	0.0701	0.0609	0.0809	0.2489	0.3107
TiO2	0.8600	0.7382	0.9923	0.8859	0.8369	1.1945	0.7595	1.2427	0.7891
V2O5	0.0330	0.0190	0.0424	0.0323	0.0284	0.0277	0.0130	0.0217	0.0368
Cr2O3	0.0125	0.0096	0.0136	0.0112	0.0111	0.0096	0.0117	0.0096	0.0105
MnO	0.0218	0.0157	0.0153	0.0050	0.0051	0.0022	0.0031	0.0052	0.0296
Fe2O3	2.2996	2.3317	1.3479	1.0259	1.3467	0.9364	1.1797	1.2446	6.1236
Co2O3	0.0013	0.0014	0.0015	0.0014	0.0004	0.0018	0.0015	0.0000	0.0002
NiO	0.0133	0.0136	0.0133	0.0121	0.0112	0.0113	0.0127	0.0136	0.0127
CuO	0.0109	0.0095	0.0102	0.0105	0.0095	0.0102	0.0115	0.0115	0.0128
ZnO	0.0043	0.0063	0.0061	0.0052	0.0033	0.0024	0.0038	0.0037	0.0031
Ga2O3	0.0032	0.0025	0.0007	0.0033	0.0036	0.0027	0.0028	0.0058	0.0034
As2O3	0.0000	0.0004	0.0080	0.0002	0.0038	0.0000	0.0016	0.0000	0.0000
Br	0.0004	0.0000	0.0000	0.0005	0.0007	0.0008	0.0000	0.0009	0.0003
Rb2O	0.0123	0.0061	0.0070	0.0103	0.0080	0.0062	0.0082	0.0009	0.0074
SrO	0.0073	0.0053	0.0086	0.0072	0.0079	0.0046	0.0067	0.0041	0.0073
Y2O3	0.0026	0.0010	0.0021	0.0016	0.0015	0.0013	0.0010	0.0023	0.0017
ZrO2	0.0278	0.0161	0.0434	0.0335	0.0296	0.0295	0.0319	0.0604	0.0351
Nb2O5	0.0019	0.0001	0.0000	0.0017	0.0011	0.0028	0.0019	0.0028	0.0011
MoO3	0.0000	0.0000	0.0000	0.0003	0.0000	0.0000	0.0001	0.0000	0.0006
BaO	0.0539	0.0312	0.0607	0.0490	0.0458	0.0337	0.0422	0.0096	0.0253
HfO2	0.0035	0.0042	0.0038	0.0049	0.0043	0.0032	0.0052	0.0064	0.0041
PbO	0.0040	0.0007	0.0000	0.0009	0.0000	0.0059	0.0017	0.0027	0.0028
ThO2	0.0011	0.0008	0.0001	0.0000	0.0007	0.0007	0.0000	0.0009	0.0006
Pa	0.0040	0.0014	0.0029	0.0035	0.0025	0.0011	0.0031	0.0004	0.0020
U3O8	0.0000	0.0000	0.0000	0.0001	0.0000	0.0002	0.0002	0.0001	0.0006

Upper BEAR DEN MEMBER	15b	15c	15d	17A	18A	19A	20A	22A	23A
	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %
Na2O	0.2691	0.2189	0.3415	0.1106	0.1378	0.2369	0.0690	0.3026	0.4103
MgO	0.6896	0.6953	1.2145	0.5327	0.7776	0.7219	0.0979	0.1284	2.1156
Al2O3	19.7285	16.8642	21.0436	17.3303	27.3869	18.6075	13.7864	23.0660	23.7528
SiO2	71.4720	69.8514	66.4713	78.4701	66.4902	75.5388	75.8566	71.3869	64.3348
P2O5	0.0257	0.0351	0.0469	0.0344	0.0417	0.0322	0.0270	0.0369	0.0480
SO3	0.6544	0.7144	0.2782	0.1640	0.1048	0.2734	4.2071	0.2261	1.3141
Cl	0.0034	0.0039	0.0007	0.0067	0.0000	0.0057	0.0028	0.0045	0.0012
K2O	1.2281	1.2625	2.9774	1.4673	1.9706	1.3684	0.4194	1.8964	2.7184
CaO	0.2587	0.2344	0.1313	0.0838	0.0753	0.0810	3.3113	0.0776	0.8348
TiO2	0.6837	0.6200	0.7436	0.7769	1.0966	0.9454	1.1725	1.0043	0.8298
V2O5	0.0302	0.0315	0.0417	0.0307	0.0414	0.0298	0.0203	0.0318	0.0405
Cr2O3	0.0115	0.0106	0.0130	0.0105	0.0124	0.0096	0.0090	0.0110	0.0109
MnO	0.0117	0.0385	0.0148	0.0027	0.0048	0.0056	0.0034	0.0038	0.0162
Fe2O3	4.7526	9.2917	6.5066	0.8280	1.7284	1.9796	0.8940	1.6720	3.3916
Co2O3	0.0041	0.0008	0.0008	0.0010	0.0010	0.0000	0.0006	0.0019	0.0044
NiO	0.0139	0.0135	0.0120	0.0128	0.0145	0.0122	0.0119	0.0120	0.0155
CuO	0.0117	0.0126	0.0138	0.0123	0.0138	0.0110	0.0104	0.0119	0.0158
ZnO	0.0041	0.0046	0.0043	0.0022	0.0068	0.0034	0.0025	0.0043	0.0116
Ga2O3	0.0032	0.0021	0.0039	0.0028	0.0054	0.0040	0.0024	0.0042	0.0050
As2O3	0.0000	0.0022	0.0000	0.0000	0.0019	0.0000	0.0000	0.0000	0.0044
Br	0.0002	0.0006	0.0003	0.0005	0.0004	0.0009	0.0006	0.0006	0.0007
Rb2O	0.0092	0.0093	0.0193	0.0082	0.0118	0.0131	0.0023	0.0118	0.0174
SrO	0.0237	0.0077	0.0134	0.0082	0.0075	0.0074	0.0108	0.0079	0.0096
Y2O3	0.0017	0.0005	0.0005	0.0029	0.0015	0.0012	0.0015	0.0011	0.0009
ZrO2	0.0294	0.0369	0.0191	0.0415	0.0250	0.0380	0.0519	0.0263	0.0179
Nb2O5	0.0002	0.0002	0.0015	0.0012	0.0010	0.0023	0.0029	0.0013	0.0017
MoO3	0.0002	0.0003	0.0002	0.0005	0.0000	0.0000	0.0000	0.0001	0.0000
BaO	0.0629	0.0296	0.0738	0.0429	0.0342	0.0559	0.0134	0.0556	0.0663
HfO2	0.0048	0.0027	0.0019	0.0080	0.0028	0.0059	0.0083	0.0046	0.0045
PbO	0.0069	0.0000	0.0034	0.0031	0.0000	0.0062	0.0027	0.0022	0.0000
ThO2	0.0006	0.0000	0.0004	0.0009	0.0000	0.0001	0.0006	0.0010	0.0003
Pa	0.0036	0.0035	0.0064	0.0022	0.0038	0.0026	0.0005	0.0043	0.0050
U3O8	0.0004	0.0005	0.0000	0.0001	0.0001	0.0000	0.0000	0.0006	0.0000

Upper BEAR DEN MEMBER	23B	23C	24A	24B	24C	43A	43B	46A	Mean
	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %
Na2O	0.2273	0.1442	0.2239	0.1760	0.2818	0.0633	0.1302	0.1957	0.1820
MgO	0.5149	0.0457	0.0240	0.0395	0.5072	0.0878	0.8436	0.9295	0.5034
Al2O3	16.9888	11.0135	20.4735	22.4953	20.0099	15.7286	26.0709	23.8539	19.6833
SiO2	79.0415	84.8694	75.1951	72.8321	74.6018	80.1426	68.1252	67.5707	73.9031
P2O5	0.0359	0.0240	0.0271	0.0212	0.0370	0.0355	0.0372	0.0410	0.0333
SO3	0.2392	0.4773	0.6327	0.3293	0.5531	0.0514	0.0678	0.2683	0.4584
Cl	0.0000	0.0000	0.0000	0.0000	0.0000	0.0026	0.0000	0.0011	0.0017
K2O	0.2143	0.1733	0.0739	0.1286	1.0119	0.9714	2.1933	2.7299	1.3453
CaO	0.1080	0.3054	0.1201	0.0515	0.0369	0.2827	0.2007	0.5425	0.3078
TiO2	1.1829	1.3238	1.5591	1.0571	0.8229	1.0497	0.9137	1.0194	0.9654
V2O5	0.0398	0.0255	0.0270	0.0274	0.0308	0.0310	0.0483	0.0390	0.0316
Cr2O3	0.0084	0.0080	0.0073	0.0086	0.0103	0.0103	0.0126	0.0127	0.0106
MnO	0.0030	0.0087	0.0029	0.0069	0.0251	0.0314	0.0054	0.0111	0.0115
Fe2O3	1.2649	1.4661	1.5050	2.7405	1.9291	1.3847	1.2002	2.5886	2.4215
Co2O3	0.0011	0.0002	0.0025	0.0000	0.0020	0.0049	0.0008	0.0050	0.0016
NiO	0.0152	0.0119	0.0126	0.0125	0.0139	0.0161	0.0138	0.0135	0.0131
CuO	0.0131	0.0110	0.0125	0.0103	0.0112	0.0123	0.0112	0.0126	0.0117
ZnO	0.0031	0.0019	0.0015	0.0023	0.0028	0.0055	0.0041	0.0107	0.0044
Ga2O3	0.0047	0.0021	0.0081	0.0058	0.0041	0.0043	0.0045	0.0040	0.0038
As2O3	0.0054	0.0020	0.0000	0.0024	0.0052	0.0047	0.0037	0.0020	0.0018
Br	0.0008	0.0001	0.0004	0.0006	0.0000	0.0007	0.0005	0.0010	0.0005
Rb2O	0.0008	0.0012	0.0006	0.0012	0.0068	0.0063	0.0124	0.0135	0.0081
SrO	0.0039	0.0030	0.0030	0.0022	0.0193	0.0071	0.0094	0.0116	0.0083
Y2O3	0.0038	0.0028	0.0021	0.0012	0.0013	0.0023	0.0007	0.0000	0.0016
ZrO2	0.0558	0.0592	0.0615	0.0395	0.0335	0.0321	0.0195	0.0245	0.0353
Nb2O5	0.0013	0.0025	0.0037	0.0022	0.0015	0.0026	0.0011	0.0023	0.0016
MoO3	0.0000	0.0000	0.0000	0.0000	0.0003	0.0004	0.0000	0.0000	0.0001
BaO	0.0166	0.0105	0.0067	0.0000	0.0337	0.0199	0.0591	0.0866	0.0392
HfO2	0.0048	0.0058	0.0071	0.0047	0.0054	0.0058	0.0062	0.0041	0.0049
PbO	0.0000	0.0000	0.0056	0.0000	0.0000	0.0000	0.0000	0.0000	0.0019
ThO2	0.0001	0.0001	0.0000	0.0008	0.0000	0.0001	0.0000	0.0006	0.0004
Pa	0.0002	0.0007	0.0000	0.0002	0.0007	0.0015	0.0039	0.0047	0.0025
U3O8	0.0004	0.0001	0.0005	0.0001	0.0005	0.0004	0.0000	0.0000	0.0002

Middle BEAR DEN MEMBER	3b	4b	6e	6f	6g	6h	7b	7c	15e
	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %
Na2O	0.1159	0.0984	0.0882	0.1282	0.0588	0.0709	0.1752	0.3576	0.1696
MgO	0.7444	0.1682	0.0782	0.6428	0.0482	0.0366	0.5332	0.7842	0.0336
Al2O3	21.6604	13.5440	19.7832	23.2053	16.7434	18.2685	21.7821	23.5319	7.2929
SiO2	72.3447	80.9939	76.3234	71.2140	79.5778	78.9558	72.8824	68.7506	90.3478
P2O5	0.0405	0.0330	0.0325	0.0425	0.0296	0.0293	0.0432	0.0338	0.0222
SO3	0.0766	0.1321	0.0775	0.1168	0.6912	0.1345	0.1641	0.2557	0.1447
Cl	0.0000	0.0000	0.0000	0.0000	0.0000	0.0036	0.0012	0.0000	0.0000
K2O	2.1045	1.2970	1.5986	2.1601	0.9624	0.9634	1.4555	2.3656	0.1412
CaO	0.1652	0.0311	0.0613	0.1202	0.2339	0.0679	0.0300	0.0392	0.0275
TiO2	0.7992	0.6003	0.8795	0.9309	0.9280	0.7831	0.8596	0.9728	0.9783
V2O5	0.0334	0.0191	0.0296	0.0415	0.0337	0.0248	0.0336	0.0556	0.0174
Cr2O3	0.0102	0.0101	0.0106	0.0113	0.0118	0.0100	0.0132	0.0118	0.0060
MnO	0.0067	0.0186	0.0045	0.0057	0.0068	0.0055	0.0071	0.0068	0.0028
Fe2O3	1.7527	2.9283	0.8913	1.2180	0.5009	0.5225	1.8877	2.6610	0.6889
Co2O3	0.0011	0.0022	0.0013	0.0011	0.0011	0.0002	0.0000	0.0001	0.0017
NiO	0.0148	0.0132	0.0122	0.0129	0.0136	0.0126	0.0126	0.0120	0.0122
CuO	0.0115	0.0114	0.0118	0.0128	0.0123	0.0124	0.0112	0.0114	0.0108
ZnO	0.0050	0.0059	0.0038	0.0058	0.0058	0.0031	0.0026	0.0024	0.0024
Ga2O3	0.0039	0.0016	0.0035	0.0056	0.0020	0.0020	0.0049	0.0044	0.0016
As2O3	0.0023	0.0000	0.0009	0.0006	0.0000	0.0000	0.0007	0.0116	0.0012
Br	0.0007	0.0006	0.0001	0.0002	0.0002	0.0003	0.0003	0.0003	0.0003
Rb2O	0.0116	0.0067	0.0094	0.0120	0.0050	0.0050	0.0087	0.0145	0.0006
SrO	0.0094	0.0047	0.0067	0.0099	0.0085	0.0036	0.0084	0.0089	0.0026
Y2O3	0.0009	0.0012	0.0010	0.0010	0.0019	0.0009	0.0008	0.0007	0.0040
ZrO2	0.0268	0.0189	0.0406	0.0254	0.0703	0.0494	0.0342	0.0219	0.0650
Nb2O5	0.0013	0.0001	0.0013	0.0014	0.0007	0.0014	0.0012	0.0018	0.0018
MoO3	0.0001	0.0007	0.0007	0.0000	0.0008	0.0002	0.0000	0.0000	0.0003
BaO	0.0455	0.0487	0.0412	0.0655	0.0397	0.0068	0.0362	0.0660	0.0155
HfO2	0.0046	0.0053	0.0042	0.0024	0.0076	0.0093	0.0062	0.0049	0.0067
PbO	0.0020	0.0024	0.0000	0.0008	0.0027	0.0129	0.0004	0.0069	0.0001
ThO2	0.0000	0.0000	0.0004	0.0000	0.0008	0.0012	0.0010	0.0001	0.0000
Pa	0.0037	0.0019	0.0025	0.0048	0.0005	0.0004	0.0022	0.0050	0.0000
U3O8	0.0004	0.0004	0.0000	0.0005	0.0000	0.0019	0.0003	0.0005	0.0003

Middle BEAR DEN MEMBER	15f	15g	15h	15i	15j	15k	17B	18B	18C
	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %
Na2O	0.2336	0.2753	0.3504	0.3237	0.3565	0.2638	0.1631	0.1553	0.1577
MgO	0.0618	0.4909	0.1140	0.7286	0.8142	0.1577	0.6412	0.7756	0.5426
Al2O3	14.2468	19.2785	20.3242	23.1518	23.8707	19.9617	18.3927	23.9805	20.3756
SiO2	82.0137	73.1829	73.0060	67.9109	64.6174	55.0807	74.9376	69.8505	74.2319
P2O5	0.0251	0.0245	0.0312	0.0337	0.0348	0.1551	0.0450	0.0529	0.0331
SO3	0.2524	0.4876	0.2352	0.1684	0.2393	0.2063	0.2601	0.0718	0.0672
Cl	0.0000	0.0017	0.0045	0.0000	0.0038	0.0000	0.0000	0.0000	0.0000
K2O	0.2614	0.6859	1.2831	1.6420	1.7365	1.8408	1.6793	1.9743	1.7510
CaO	0.0549	0.0787	0.0555	0.0754	0.0895	0.3852	0.0625	0.0905	0.1178
TiO2	1.0706	0.9555	0.9371	0.8740	0.9354	0.8401	0.8368	1.1322	1.1676
V2O5	0.0281	0.0321	0.0302	0.0225	0.0441	0.0524	0.0353	0.0412	0.0309
Cr2O3	0.0086	0.0112	0.0123	0.0140	0.0143	0.0130	0.0117	0.0123	0.0108
MnO	0.0037	0.0081	0.0131	0.0139	0.0195	0.0833	0.0125	0.0064	0.0064
Fe2O3	1.6257	4.3766	3.4723	4.8871	7.0896	20.7317	2.7676	1.6663	1.3666
Co2O3	0.0019	0.0000	0.0014	0.0047	0.0000	0.0000	0.0000	0.0016	0.0009
NiO	0.0107	0.0122	0.0110	0.0124	0.0128	0.0136	0.0153	0.0179	0.0132
CuO	0.0125	0.0122	0.0108	0.0121	0.0128	0.0126	0.0140	0.0141	0.0115
ZnO	0.0029	0.0027	0.0033	0.0025	0.0039	0.0045	0.0034	0.0206	0.0063
Ga2O3	0.0031	0.0041	0.0048	0.0048	0.0043	0.0036	0.0028	0.0058	0.0037
As2O3	0.0000	0.0018	0.0000	0.0000	0.0000	0.0070	0.0000	0.0000	0.0000
Br	0.0000	0.0000	0.0006	0.0001	0.0003	0.0002	0.0008	0.0003	0.0003
Rb2O	0.0019	0.0051	0.0091	0.0103	0.0111	0.0122	0.0096	0.0128	0.0107
SrO	0.0071	0.0070	0.0062	0.0108	0.0125	0.0242	0.0070	0.0078	0.0080
Y2O3	0.0030	0.0009	0.0010	0.0018	0.0011	0.0025	0.0051	0.0065	0.0023
ZrO2	0.0479	0.0363	0.0331	0.0273	0.0252	0.0199	0.0429	0.0285	0.0330
Nb2O5	0.0019	0.0017	0.0017	0.0023	0.0017	0.0013	0.0012	0.0010	0.0024
MoO3	0.0002	0.0000	0.0002	0.0000	0.0001	0.0002	0.0001	0.0001	0.0000
BaO	0.0123	0.0191	0.0358	0.0507	0.0369	0.0973	0.0411	0.0578	0.0355
HfO2	0.0047	0.0051	0.0060	0.0079	0.0042	0.0046	0.0040	0.0073	0.0063
PbO	0.0026	0.0005	0.0029	0.0017	0.0034	0.0193	0.0032	0.0040	0.0035
ThO2	0.0000	0.0005	0.0003	0.0010	0.0008	0.0000	0.0007	0.0003	0.0000
Pa	0.0009	0.0012	0.0026	0.0032	0.0033	0.0011	0.0031	0.0037	0.0030
U3O8	0.0000	0.0001	0.0000	0.0004	0.0000	0.0041	0.0003	0.0001	0.0002

Middle BEAR DEN MEMBER	18D	A9B	A9C	19D	19E	20B	20C	22B	22C
	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %
Na2O	0.2183	0.2223	0.4354	0.2940	0.2059	0.0919	0.0952	0.2335	0.2589
MgO	0.6522	0.7167	0.1081	0.6277	0.5573	0.3483	0.0531	0.5953	0.1043
Al2O3	25.2385	23.2808	19.7198	27.6969	26.2323	17.9053	17.5458	18.8258	20.7686
SiO2	69.0085	65.8889	74.9689	64.2609	67.9271	74.4843	79.7157	75.5486	71.8753
P2O5	0.0333	0.0354	0.0338	0.0378	0.0349	0.0295	0.0255	0.0356	0.0528
SO3	0.0900	0.1873	0.5419	0.1262	0.2094	2.2025	0.1168	0.1090	0.0813
Cl	0.0000	0.0000	0.0003	0.0000	0.0000	0.0000	0.0000	0.0021	0.0000
K2O	0.9397	1.6590	1.5791	0.9047	1.3106	0.7960	0.8343	1.7692	1.3820
CaO	0.2713	0.0596	0.0686	0.1997	0.0643	1.5739	0.0790	0.0691	0.1405
TiO2	1.2585	1.0876	1.1625	1.1116	1.0714	0.9732	0.7421	0.9548	1.2214
V2O5	0.0398	0.0380	0.0338	0.0386	0.0321	0.0260	0.0271	0.0266	0.0326
Cr2O3	0.0124	0.0122	0.0122	0.0123	0.0118	0.0105	0.0092	0.0115	0.0098
MnO	0.0052	0.0264	0.0052	0.0263	0.0048	0.0390	0.0044	0.0041	0.0523
Fe2O3	2.1031	6.6282	1.1803	4.5253	2.2027	1.3477	0.6415	1.6718	3.8667
Co2O3	0.0012	0.0067	0.0006	0.0035	0.0015	0.0041	0.0025	0.0010	0.0048
NiO	0.0141	0.0132	0.0125	0.0136	0.0143	0.0238	0.0135	0.0130	0.0146
CuO	0.0160	0.0131	0.0116	0.0158	0.0101	0.0099	0.0099	0.0106	0.0126
ZnO	0.0061	0.0030	0.0030	0.0059	0.0044	0.0075	0.0031	0.0056	0.0091
Ga2O3	0.0072	0.0035	0.0037	0.0063	0.0060	0.0025	0.0031	0.0002	0.0040
As2O3	0.0026	0.0022	0.0003	0.0002	0.0018	0.0000	0.0005	0.0000	0.0008
Br	0.0003	0.0003	0.0007	0.0008	0.0001	0.0000	0.0000	0.0000	0.0002
Rb2O	0.0093	0.0107	0.0107	0.0070	0.0117	0.0041	0.0047	0.0111	0.0103
SrO	0.0116	0.0074	0.0084	0.0108	0.0080	0.0033	0.0030	0.0094	0.0087
Y2O3	0.0000	0.0004	0.0027	0.0019	0.0008	0.0046	0.0007	0.0013	0.0019
ZrO2	0.0273	0.0289	0.0369	0.0225	0.0242	0.0726	0.0275	0.0346	0.0323
Nb2O5	0.0023	0.0023	0.0010	0.0027	0.0015	0.0006	0.0009	0.0017	0.0021
MoO3	0.0000	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0006	0.0002
BaO	0.0189	0.0530	0.0464	0.0194	0.0414	0.0295	0.0374	0.0400	0.0421
HfO2	0.0079	0.0067	0.0055	0.0065	0.0050	0.0059	0.0015	0.0049	0.0062
PbO	0.0000	0.0000	0.0026	0.0153	0.0000	0.0024	0.0003	0.0044	0.0006
ThO2	0.0001	0.0011	0.0000	0.0031	0.0000	0.0011	0.0006	0.0014	0.0000
Pa	0.0035	0.0045	0.0030	0.0001	0.0042	0.0000	0.0006	0.0032	0.0027
U3O8	0.0008	0.0005	0.0004	0.0026	0.0004	0.0000	0.0005	0.0000	0.0002

Middle BEAR DEN MEMBER	22D	22F	23D	23E	23F	23G	24D	24E	24F
	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %
Na2O	0.3868	0.3672	0.2143	0.2160	0.1804	0.3143	0.2035	0.2091	0.4868
MgO	0.1095	0.7165	1.0048	0.5477	0.0684	1.1872	0.4569	0.8952	0.6643
Al2O3	28.9471	33.7991	21.3285	26.0630	20.4461	24.8336	17.3215	22.5457	19.5222
SiO2	66.1773	59.8262	53.6253	68.4954	75.7780	65.9345	74.3139	65.7874	71.9807
P2O5	0.0384	0.0433	0.0730	0.0375	0.0271	0.0632	0.0422	0.0477	0.1002
SO3	0.0864	0.0845	0.2459	0.1459	0.1372	0.1207	0.7511	0.3850	0.2713
Cl	0.0000	0.0000	0.0000	0.0039	0.0000	0.0010	0.0053	0.0023	0.0000
K2O	0.7486	0.8186	1.6560	1.2028	1.0152	3.7784	1.1643	2.6779	0.6531
CaO	0.1004	0.2832	0.2000	0.0606	0.0422	0.1920	0.0443	0.0659	0.0795
TiO2	1.0640	1.2013	0.9317	0.8996	0.7082	0.9383	0.8713	0.9239	2.7478
V2O5	0.0349	0.0436	0.0527	0.0287	0.0279	0.0514	0.0388	0.0556	0.0831
Cr2O3	0.0108	0.0123	0.0132	0.0120	0.0095	0.0146	0.0123	0.0154	0.0219
MnO	0.0062	0.0058	0.0768	0.0033	0.0030	0.0070	0.0130	0.0148	0.0357
Fe2O3	2.1626	2.6712	20.4251	2.1470	1.4548	2.2924	4.6170	6.2072	3.0025
Co2O3	0.0008	0.0022	0.0032	0.0013	0.0012	0.0020	0.0007	0.0023	0.0068
NiO	0.0153	0.0148	0.0133	0.0134	0.0118	0.0178	0.0110	0.0145	0.0292
CuO	0.0137	0.0150	0.0136	0.0102	0.0127	0.0389	0.0114	0.0132	0.0519
ZnO	0.0073	0.0068	0.0019	0.0036	0.0041	0.0198	0.0027	0.0125	0.0199
Ga2O3	0.0058	0.0082	0.0044	0.0050	0.0034	0.0042	0.0033	0.0051	0.0064
As2O3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0060	0.0034	0.0020	0.0000
Br	0.0006	0.0004	0.0004	0.0000	0.0005	0.0003	0.0000	0.0005	0.0000
Rb2O	0.0057	0.0065	0.0085	0.0077	0.0063	0.0187	0.0064	0.0166	0.0037
SrO	0.0071	0.0119	0.0106	0.0064	0.0032	0.0166	0.0081	0.0076	0.0210
Y2O3	0.0017	0.0000	0.0009	0.0006	0.0012	0.0041	0.0022	0.0006	0.0179
ZrO2	0.0274	0.0208	0.0199	0.0255	0.0261	0.0159	0.0457	0.0222	0.0644
Nb2O5	0.0018	0.0014	0.0005	0.0012	0.0005	0.0003	0.0016	0.0019	0.0030
MoO3	0.0004	0.0000	0.0000	0.0000	0.0002	0.0000	0.0001	0.0002	0.0000
BaO	0.0296	0.0266	0.0457	0.0497	0.0243	0.1143	0.0285	0.0555	0.1089
HfO2	0.0028	0.0048	0.0048	0.0048	0.0033	0.0048	0.0032	0.0045	0.0045
PbO	0.0054	0.0061	0.0143	0.0033	0.0012	0.0000	0.0112	0.0000	0.0092
ThO2	0.0005	0.0010	0.0072	0.0014	0.0000	0.0006	0.0034	0.0021	0.0000
Pa	0.0010	0.0005	0.0000	0.0025	0.0020	0.0071	0.0000	0.0055	0.0008
U3O8	0.0001	0.0002	0.0036	0.0000	0.0000	0.0000	0.0017	0.0000	0.0034

Middle BEAR DEN MEMBER	24G	43C	43D	43E	46B	46C	46D	46E	Mean
	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %
Na2O	0.4033	0.1783	0.1420	0.1970	0.0407	0.0568	0.0699	0.1765	0.2146
MgO	1.1600	1.3297	1.0419	1.8993	0.1758	0.3213	0.0808	0.9451	0.5401
Al2O3	19.8072	21.0460	20.5209	18.9572	11.6339	21.6542	24.3102	25.5717	21.0208
SiO2	71.4952	70.7816	72.9774	71.0491	85.1049	73.7201	68.3933	64.5647	71.5888
P2O5	0.0398	0.0434	0.0359	0.0681	0.0192	0.0215	0.0313	0.0508	0.0419
SO3	0.5644	0.1006	0.0803	0.0908	0.1609	0.1979	0.2965	0.3927	0.2627
Cl	0.0031	0.0222	0.0056	0.0037	0.0000	0.0000	0.0024	0.0000	0.0015
K2O	3.7364	3.4472	2.7290	3.5355	0.2120	0.7110	1.1432	2.4876	1.5635
CaO	0.0250	0.3811	0.1324	0.1804	0.1177	0.1734	0.0875	0.1663	0.1510
TiO2	1.0465	0.8225	0.8194	0.7603	0.8773	0.7552	0.8457	0.9149	0.9816
V2O5	0.0396	0.0368	0.0277	0.0401	0.0198	0.0181	0.0440	0.0420	0.0360
Cr2O3	0.0131	0.0141	0.0106	0.0127	0.0091	0.0117	0.0121	0.0150	0.0119
MnO	0.0192	0.0057	0.0046	0.0117	0.0021	0.0065	0.0118	0.0203	0.0147
Fe2O3	1.4317	1.5746	1.2949	2.9620	1.5129	2.2372	4.5494	4.4702	3.4140
Co2O3	0.0024	0.0018	0.0008	0.0000	0.0006	0.0011	0.0015	0.0000	0.0017
NiO	0.0162	0.0174	0.0139	0.0163	0.0133	0.0127	0.0147	0.0132	0.0142
CuO	0.0252	0.0153	0.0132	0.0155	0.0112	0.0097	0.0124	0.0120	0.0142
ZnO	0.0181	0.0084	0.0091	0.0154	0.0032	0.0043	0.0039	0.0052	0.0064
Ga2O3	0.0047	0.0044	0.0033	0.0033	0.0022	0.0030	0.0046	0.0043	0.0041
As2O3	0.0000	0.0060	0.0007	0.0076	0.0011	0.0000	0.0074	0.0136	0.0019
Br	0.0006	0.0016	0.0020	0.0003	0.0000	0.0002	0.0005	0.0006	0.0004
Rb2O	0.0217	0.0232	0.0149	0.0187	0.0019	0.0058	0.0065	0.0176	0.0097
SrO	0.0091	0.0137	0.0078	0.0192	0.0031	0.0047	0.0066	0.0117	0.0089
Y2O3	0.0012	0.0044	0.0022	0.0014	0.0023	0.0012	0.0015	0.0003	0.0021
ZrO2	0.0218	0.0211	0.0220	0.0236	0.0549	0.0355	0.0337	0.0246	0.0331
Nb2O5	0.0016	0.0010	0.0012	0.0012	0.0018	0.0009	0.0013	0.0014	0.0015
MoO3	0.0004	0.0000	0.0000	0.0008	0.0002	0.0002	0.0000	0.0005	0.0002
BaO	0.0757	0.0841	0.0578	0.0833	0.0125	0.0265	0.0197	0.0651	0.0452
HfO2	0.0046	0.0040	0.0060	0.0025	0.0044	0.0029	0.0053	0.0054	0.0051
PbO	0.0040	0.0000	0.0136	0.0161	0.0000	0.0038	0.0000	0.0000	0.0042
ThO2	0.0004	0.0013	0.0029	0.0008	0.0001	0.0000	0.0000	0.0011	0.0008
Pa	0.0078	0.0085	0.0005	0.0061	0.0000	0.0015	0.0020	0.0056	0.0026
U3O8	0.0000	0.0000	0.0055	0.0000	0.0009	0.0011	0.0002	0.0000	0.0007

Lower BEAR DEN MEMBER	4c	18E	19F	22E	24H	Mean
	Mass %	**Mass %**	**Mass %**	**Mass %**	**Mass %**	**Mass %**
Na2O	**0.0629**	**0.2741**	**0.4736**	**0.4528**	**0.4137**	0.3354
MgO	**0.1883**	**0.4386**	**0.6882**	**0.1014**	**0.1845**	0.3202
Al2O3	**13.7809**	**18.6541**	**32.1276**	**23.0859**	**22.9405**	22.1178
SiO2	**81.0958**	**74.1954**	**61.5271**	**71.9935**	**70.7538**	71.9131
P2O5	**0.0276**	**0.0310**	**0.0405**	**0.0354**	**0.0347**	0.0338
SO3	**0.1822**	**0.1741**	**0.3698**	**0.3367**	**0.8312**	0.3788
Cl	**0.0000**	**0.0000**	**0.0050**	**0.0000**	**0.0087**	0.0027
K2O	**1.1219**	**1.2290**	**0.7336**	**0.8291**	**2.5888**	1.3005
CaO	**0.0503**	**0.0892**	**0.1095**	**0.1035**	**0.0310**	0.0767
TiO2	**0.5480**	**0.9614**	**1.1339**	**1.0038**	**0.8548**	0.9004
V2O5	**0.0241**	**0.0299**	**0.0366**	**0.0319**	**0.0327**	0.0310
Cr2O3	**0.0092**	**0.0103**	**0.0135**	**0.0109**	**0.0121**	0.0112
MnO	**0.0084**	**0.0200**	**0.0052**	**0.0051**	**0.0197**	0.0117
Fe2O3	**2.7922**	**3.7592**	**2.6149**	**1.8786**	**1.1226**	2.4335
Co2O3	**0.0008**	**0.0011**	**0.0036**	**0.0014**	**0.0024**	0.0019
NiO	**0.0124**	**0.0146**	**0.0170**	**0.0139**	**0.0150**	0.0146
CuO	**0.0113**	**0.0106**	**0.0136**	**0.0114**	**0.0164**	0.0127
ZnO	**0.0041**	**0.0045**	**0.0184**	**0.0048**	**0.0128**	0.0089
Ga2O3	**0.0013**	**0.0040**	**0.0087**	**0.0054**	**0.0033**	0.0045
As2O3	**0.0000**	**0.0008**	**0.0031**	**0.0007**	**0.0037**	0.0017
Br	**0.0000**	**0.0003**	**0.0006**	**0.0003**	**0.0000**	0.0002
Rb2O	**0.0060**	**0.0100**	**0.0067**	**0.0057**	**0.0143**	0.0085
SrO	**0.0038**	**0.0071**	**0.0078**	**0.0076**	**0.0087**	0.0070
Y2O3	**0.0000**	**0.0013**	**0.0011**	**0.0023**	**0.0012**	0.0012
ZrO2	**0.0241**	**0.0366**	**0.0189**	**0.0352**	**0.0205**	0.0271
Nb2O5	**0.0000**	**0.0015**	**0.0015**	**0.0013**	**0.0007**	0.0010
MoO3	**0.0000**	**0.0000**	**0.0000**	**0.0002**	**0.0000**	0.0000
BaO	**0.0359**	**0.0334**	**0.0127**	**0.0346**	**0.0633**	0.0360
HfO2	**0.0040**	**0.0043**	**0.0052**	**0.0050**	**0.0044**	0.0046
PbO	**0.0025**	**0.0007**	**0.0000**	**0.0007**	**0.0000**	0.0008
ThO2	**0.0006**	**0.0004**	**0.0000**	**0.0000**	**0.0000**	0.0002
Pa	**0.0012**	**0.0025**	**0.0020**	**0.0009**	**0.0041**	0.0021
U3O8	**0.0002**	**0.0000**	**0.0001**	**0.0000**	**0.0003**	0.0001

RHAME BED	1a	2a	2b	10a	10b	11a	11b	13a	13b
	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %
Na2O	0.0510	0.0893	0.1196	0.3250	0.2671	0.1046	0.1240	0.0937	0.3508
MgO	0.3003	0.7057	0.5828	1.0183	1.3236	0.7045	0.8404	0.9360	1.7884
Al2O3	17.1156	19.8113	19.6366	12.7967	17.4977	15.3633	18.7389	14.6373	16.7577
SiO2	80.2154	74.5500	75.0887	80.2840	74.2844	78.6370	75.6081	78.5098	71.7925
P2O5	0.0251	0.0299	0.0389	0.0271	0.0314	0.0218	0.0293	0.0277	0.1480
SO3	0.0410	0.1020	0.0951	0.5093	0.3963	0.0792	0.0958	0.0661	0.3435
Cl	0.0039	0.0054	0.0000	0.0000	0.0003	0.0000	0.0043	0.0003	0.0034
K2O	0.8500	2.4707	2.1739	2.4116	2.9317	1.9475	1.8046	2.6103	3.6418
CaO	0.1532	0.0909	0.0906	0.0451	0.0609	0.1726	0.2109	0.1100	0.2475
TiO2	0.5498	0.6598	0.8390	0.6991	0.6069	0.7657	0.7281	0.9640	0.6771
V2O5	0.0207	0.0216	0.0375	0.0205	0.0201	0.0140	0.0146	0.0249	0.0245
Cr2O3	0.0096	0.0096	0.0137	0.0084	0.0107	0.0094	0.0095	0.0095	0.0097
MnO	0.0042	0.0035	0.0064	0.0053	0.0072	0.0059	0.0048	0.0031	0.0224
Fe2O3	0.5539	1.2958	1.1093	1.7103	2.4113	2.0209	1.6265	1.8466	3.9778
Co2O3	0.0012	0.0014	0.0018	0.0007	0.0014	0.0003	0.0008	0.0003	0.0007
NiO	0.0153	0.0137	0.0149	0.0137	0.0140	0.0119	0.0140	0.0124	0.0153
CuO	0.0111	0.0115	0.0159	0.0138	0.0119	0.0108	0.0153	0.0128	0.0145
ZnO	0.0101	0.0061	0.0114	0.0058	0.0072	0.0031	0.0047	0.0045	0.0164
Ga2O3	0.0025	0.0044	0.0039	0.0023	0.0026	0.0046	0.0042	0.0069	0.0031
As2O3	0.0000	0.0025	0.0017	0.0015	0.0000	0.0000	0.0000	0.0000	0.0011
Br	0.0002	0.0000	0.0003	0.0003	0.0000	0.0000	0.0007	0.0002	0.0001
Rb2O	0.0049	0.0157	0.0115	0.0205	0.0223	0.0151	0.0183	0.0198	0.0208
SrO	0.0032	0.0047	0.0095	0.0057	0.0064	0.0059	0.0090	0.0061	0.0134
Y2O3	0.0000	0.0018	0.0022	0.0017	0.0013	0.0017	0.0012	0.0015	0.0023
ZrO2	0.0162	0.0297	0.0314	0.0283	0.0238	0.0394	0.0313	0.0354	0.0313
Nb2O5	0.0002	0.0016	0.0013	0.0010	0.0010	0.0019	0.0016	0.0030	0.0014
MoO3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0006	0.0000	0.0000	0.0000
BaO	0.0353	0.0513	0.0529	0.0325	0.0409	0.0424	0.0415	0.0396	0.0775
HfO2	0.0028	0.0046	0.0045	0.0022	0.0053	0.0042	0.0066	0.0061	0.0021
PbO	0.0025	0.0000	0.0000	0.0000	0.0039	0.0049	0.0042	0.0044	0.0070
ThO2	0.0000	0.0000	0.0010	0.0004	0.0001	0.0007	0.0006	0.0000	0.0011
Pa	0.0008	0.0054	0.0033	0.0083	0.0083	0.0055	0.0056	0.0071	0.0066
U3O8	0.0000	0.0000	0.0004	0.0006	0.0000	0.0006	0.0006	0.0006	0.0002

RHAME BED	13c	13d	14a	14b	26A	26B	28A	28B	28C
	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %
Na2O	0.3071	0.2189	0.1824	0.1194	0.0552	0.0803	0.0275	0.0504	0.0499
MgO	0.4629	1.1341	0.8807	0.1234	0.5779	1.2576	0.3007	0.3724	0.3044
Al2O3	10.2219	17.1619	13.2731	14.5336	9.8576	19.6959	6.3784	10.6924	11.4708
SiO2	85.5133	72.8351	80.6660	81.6515	86.1617	65.6507	90.5982	85.9299	85.0575
P2O5	0.0232	0.0556	0.0237	0.0246	0.0304	0.0379	0.0230	0.0248	0.0241
SO3	0.2691	0.1507	0.1495	0.0946	0.0737	4.8124	0.0557	0.0687	0.0823
Cl	0.0000	0.0000	0.0027	0.0033	0.0000	0.0000	0.0000	0.0073	0.0000
K2O	1.1161	3.3637	1.7257	1.3809	0.9907	2.1295	0.4032	0.6126	1.4380
CaO	0.1164	0.1055	0.1238	0.0810	0.0585	3.1429	0.1630	0.2199	0.1116
TiO2	0.8421	0.6842	0.9795	0.6411	0.8831	0.7723	1.1303	0.9220	0.3974
V2O5	0.0130	0.0212	0.0225	0.0205	0.0232	0.0278	0.0149	0.0184	0.0113
Cr2O3	0.0085	0.0101	0.0090	0.0081	0.0077	0.0103	0.0071	0.0069	0.0072
MnO	0.0051	0.0439	0.0056	0.0047	0.0030	0.0047	0.0023	0.0044	0.0068
Fe2O3	0.9497	4.0393	1.8060	1.1843	1.1219	2.1443	0.7599	0.9428	0.9179
Co2O3	0.0016	0.0000	0.0014	0.0013	0.0026	0.0009	0.0013	0.0008	0.0004
NiO	0.0136	0.0141	0.0117	0.0112	0.0127	0.0140	0.0115	0.0117	0.0113
CuO	0.0107	0.0139	0.0108	0.0104	0.0109	0.0138	0.0105	0.0113	0.0091
ZnO	0.0060	0.0079	0.0036	0.0028	0.0022	0.0076	0.0015	0.0019	0.0018
Ga2O3	0.0011	0.0029	0.0037	0.0020	0.0040	0.0060	0.0027	0.0018	0.0014
As2O3	0.0000	0.0052	0.0028	0.0006	0.0000	0.0000	0.0000	0.0000	0.0000
Br	0.0004	0.0000	0.0002	0.0005	0.0000	0.0000	0.0001	0.0002	0.0002
Rb2O	0.0121	0.0202	0.0202	0.0104	0.0080	0.0173	0.0025	0.0045	0.0068
SrO	0.0044	0.0076	0.0057	0.0035	0.0045	0.0309	0.0035	0.0034	0.0036
Y2O3	0.0036	0.0025	0.0018	0.0024	0.0032	0.0006	0.0048	0.0028	0.0017
ZrO2	0.0522	0.0311	0.0310	0.0474	0.0613	0.0225	0.0580	0.0568	0.0384
Nb2O5	0.0023	0.0013	0.0033	0.0012	0.0017	0.0015	0.0026	0.0048	0.0003
MoO3	0.0000	0.0000	0.0000	0.0008	0.0000	0.0000	0.0001	0.0000	0.0002
BaO	0.0301	0.0571	0.0408	0.0244	0.0318	0.1004	0.0127	0.0170	0.0346
HfO2	0.0042	0.0051	0.0052	0.0061	0.0080	0.0054	0.0093	0.0047	0.0054
PbO	0.0039	0.0000	0.0000	0.0007	0.0021	0.0055	0.0037	0.0046	0.0026
ThO2	0.0008	0.0000	0.0008	0.0000	0.0000	0.0009	0.0008	0.0003	0.0006
Pa	0.0046	0.0069	0.0068	0.0033	0.0023	0.0055	0.0012	0.0000	0.0024
U3O8	0.0000	0.0000	0.0000	0.0000	0.0001	0.0006	0.0003	0.0005	0.0000

RHAME BED	28D	28E	29A	29B	29C	29D	34A	34B	34C
	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %
Na2O	0.1224	0.1364	0.0378	0.0634	0.0751	0.0884	0.0126	0.0457	0.0192
MgO	1.0581	5.7105	0.0455	0.5776	0.9831	0.6784	0.2875	0.5109	0.3498
Al2O3	14.6838	15.8235	7.3415	15.3389	22.6883	22.9774	6.0514	20.4350	15.0006
SiO2	76.8079	62.7308	90.4257	79.6225	70.2812	71.9153	90.9118	75.0752	81.9251
P2O5	0.0773	0.1634	0.0198	0.0268	0.0282	0.0431	0.0221	0.0286	0.0253
SO3	0.6849	0.1641	0.0642	0.0661	0.0612	0.1051	0.0510	0.0415	0.0627
Cl	0.0003	0.0000	0.0000	0.0044	0.0004	0.0000	0.0000	0.0017	0.0077
K2O	2.8926	3.8557	0.4189	1.8528	2.9744	1.4035	0.5389	1.7134	1.2310
CaO	0.5224	4.8604	0.0446	0.0973	0.1348	0.1985	0.1132	0.2092	0.1175
TiO2	0.6454	0.6293	0.8543	0.9958	0.7481	0.8263	1.1505	0.6985	0.4440
V2O5	0.0272	0.0228	0.0085	0.0231	0.0273	0.0423	0.0192	0.0128	0.0134
Cr2O3	0.0097	0.0095	0.0066	0.0086	0.0112	0.0147	0.0060	0.0090	0.0071
MnO	0.0078	0.0977	0.0025	0.0061	0.0057	0.0099	0.0029	0.0041	0.0044
Fe2O3	2.2711	5.5910	0.5716	1.1796	1.8424	1.5407	0.6775	1.0822	0.7009
Co2O3	0.0000	0.0029	0.0004	0.0006	0.0004	0.0032	0.0004	0.0002	0.0000
NiO	0.0130	0.0159	0.0115	0.0115	0.0124	0.0144	0.0113	0.0110	0.0122
CuO	0.0137	0.0128	0.0100	0.0098	0.0097	0.0168	0.0140	0.0108	0.0101
ZnO	0.0089	0.0133	0.0016	0.0025	0.0030	0.0059	0.0024	0.0020	0.0005
Ga2O3	0.0000	0.0029	0.0019	0.0049	0.0032	0.0036	0.0021	0.0033	0.0022
As2O3	0.0003	0.0042	0.0000	0.0003	0.0006	0.0000	0.0001	0.0000	0.0009
Br	0.0002	0.0000	0.0000	0.0000	0.0004	0.0004	0.0010	0.0008	0.0006
Rb2O	0.0160	0.0212	0.0033	0.0118	0.0203	0.0107	0.0055	0.0116	0.0072
SrO	0.0103	0.0113	0.0018	0.0068	0.0079	0.0123	0.0047	0.0074	0.0035
Y2O3	0.0035	0.0026	0.0031	0.0024	0.0014	0.0010	0.0023	0.0016	0.0011
ZrO2	0.0445	0.0203	0.0876	0.0454	0.0269	0.0368	0.0770	0.0393	0.0278
Nb2O5	0.0014	0.0006	0.0057	0.0022	0.0007	0.0018	0.0029	0.0010	0.0002
MoO3	0.0000	0.0000	0.0000	0.0003	0.0000	0.0001	0.0000	0.0002	0.0000
BaO	0.0572	0.0849	0.0110	0.0282	0.0375	0.0328	0.0209	0.0315	0.0148
HfO2	0.0082	0.0039	0.0065	0.0044	0.0053	0.0046	0.0080	0.0050	0.0065
PbO	0.0036	0.0000	0.0015	0.0008	0.0005	0.0075	0.0009	0.0033	0.0006
ThO2	0.0008	0.0000	0.0000	0.0004	0.0003	0.0010	0.0000	0.0000	0.0000
Pa	0.0066	0.0079	0.0002	0.0044	0.0077	0.0035	0.0012	0.0030	0.0031
U3O8	0.0009	0.0003	0.0000	0.0003	0.0004	0.0000	0.0007	0.0002	0.0000

RHAME BED	34D	34E	34F	34G	34H	35A	35B	35C	35D
	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %
Na2O	0.0698	0.0927	0.1010	0.0507	0.0889	0.0283	0.0693	0.0587	0.0816
MgO	0.8746	0.7315	0.6161	0.3401	0.5377	0.5154	1.1085	0.9512	0.9446
Al2O3	24.0336	22.7280	23.3688	18.4420	22.0579	20.7299	19.2402	21.5457	21.8916
SiO2	69.1228	70.6790	70.6040	78.1274	72.8447	76.2109	73.9669	70.9788	71.2100
P2O5	0.0339	0.0349	0.0309	0.0292	0.0375	0.0318	0.0416	0.0309	0.0352
SO3	0.0491	0.1342	0.1143	0.0751	0.0689	0.1347	0.7021	1.3885	0.0837
Cl	0.0126	0.0000	0.0018	0.0000	0.0040	0.0001	0.0023	0.0000	0.0000
K2O	2.9399	2.1445	1.9534	1.2538	1.9121	0.6870	1.5670	1.9908	3.2300
CaO	0.2853	0.6154	0.5513	0.1518	0.3044	0.1511	0.4874	0.9753	0.1095
TiO2	0.8305	1.0536	0.9876	0.7181	0.9029	0.5377	0.8961	0.6422	0.6669
V2O5	0.0313	0.0444	0.0518	0.0226	0.0379	0.0237	0.0402	0.0113	0.0213
Cr2O3	0.0112	0.0135	0.0131	0.0108	0.0142	0.0114	0.0119	0.0108	0.0097
MnO	0.0060	0.0040	0.0054	0.0035	0.0040	0.0030	0.0445	0.0044	0.0050
Fe2O3	1.5427	1.5594	1.4202	0.6494	1.0220	0.8078	1.5873	1.2833	1.5379
Co2O3	0.0017	0.0000	0.0001	0.0013	0.0016	0.0014	0.0139	0.0007	0.0011
NiO	0.0122	0.0132	0.0149	0.0124	0.0145	0.0173	0.0396	0.0131	0.0122
CuO	0.0107	0.0131	0.0146	0.0113	0.0148	0.0121	0.0124	0.0133	0.0119
ZnO	0.0027	0.0053	0.0081	0.0044	0.0090	0.0111	0.0396	0.0048	0.0076
Ga2O3	0.0042	0.0058	0.0045	0.0025	0.0015	0.0013	0.0051	0.0037	0.0032
As2O3	0.0000	0.0000	0.0035	0.0021	0.0000	0.0005	0.0000	0.0037	0.0007
Br	0.0000	0.0006	0.0008	0.0005	0.0008	0.0003	0.0000	0.0006	0.0007
Rb2O	0.0199	0.0139	0.0125	0.0069	0.0114	0.0050	0.0125	0.0133	0.0194
SrO	0.0095	0.0144	0.0128	0.0044	0.0109	0.0058	0.0126	0.0069	0.0049
Y2O3	0.0013	0.0019	0.0016	0.0016	0.0024	0.0009	0.0043	0.0027	0.0022
ZrO2	0.0254	0.0299	0.0316	0.0311	0.0336	0.0432	0.0359	0.0273	0.0326
Nb2O5	0.0017	0.0007	0.0018	0.0000	0.0014	0.0008	0.0019	0.0012	0.0018
MoO3	0.0000	0.0000	0.0001	0.0006	0.0000	0.0000	0.0003	0.0008	0.0000
BaO	0.0531	0.0517	0.0641	0.0390	0.0485	0.0194	0.0435	0.0257	0.0602
HfO2	0.0020	0.0046	0.0047	0.0045	0.0041	0.0055	0.0026	0.0065	0.0059
PbO	0.0034	0.0051	0.0000	0.0000	0.0046	0.0008	0.0046	0.0000	0.0018
ThO2	0.0012	0.0000	0.0000	0.0000	0.0007	0.0003	0.0020	0.0000	0.0000
Pa	0.0074	0.0047	0.0044	0.0027	0.0030	0.0011	0.0037	0.0038	0.0063
U3O8	0.0004	0.0000	0.0002	0.0002	0.0001	0.0004	0.0002	0.0000	0.0005

RHAME BED	35E	36A	36B	37A	37B	38A	38B	38C	38D
	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %
Na2O	0.1045	0.0545	0.0742	0.0813	0.0652	0.0529	0.0816	0.0613	0.0487
MgO	1.3964	0.1135	0.7175	0.8317	0.7374	0.7325	0.7703	0.1073	0.4672
Al2O3	18.9926	15.2038	17.0646	22.9985	22.1069	16.2905	20.3996	18.3423	15.2425
SiO2	70.8412	80.5065	76.6442	68.7304	72.3727	78.2554	73.9224	78.2775	80.3058
P2O5	0.0376	0.0318	0.0355	0.0323	0.0321	0.0261	0.0297	0.0273	0.0248
SO3	0.3346	0.0855	0.3354	1.9209	0.1127	0.0627	0.1841	0.0812	0.1995
Cl	0.0000	0.0000	0.0061	0.0000	0.0000	0.0015	0.0000	0.0000	0.0015
K2O	4.1908	2.0064	2.5693	1.5773	2.0163	1.9012	1.9659	1.3793	1.8509
CaO	0.2377	0.0954	0.0673	1.2906	0.1492	0.2325	0.2706	0.0735	0.1000
TiO2	0.6388	0.6719	0.7135	0.8744	0.8254	1.0860	0.8876	0.5962	0.5512
V2O5	0.0219	0.0159	0.0220	0.0276	0.0312	0.0271	0.0274	0.0211	0.0192
Cr2O3	0.0109	0.0094	0.0084	0.0106	0.0094	0.0085	0.0111	0.0086	0.0092
MnO	0.0076	0.0059	0.0049	0.0139	0.0066	0.0091	0.0052	0.0038	0.0036
Fe2O3	2.9881	1.0404	1.5809	1.4610	1.3674	1.1681	1.3161	0.8911	1.0393
Co2O3	0.0024	0.0001	0.0017	0.0040	0.0018	0.0000	0.0000	0.0007	0.0002
NiO	0.0127	0.0131	0.0118	0.0204	0.0132	0.0143	0.0118	0.0114	0.0108
CuO	0.0133	0.0105	0.0119	0.0106	0.0110	0.0096	0.0099	0.0108	0.0114
ZnO	0.0161	0.0060	0.0097	0.0092	0.0095	0.0029	0.0025	0.0022	0.0019
Ga2O3	0.0038	0.0025	0.0029	0.0058	0.0049	0.0059	0.0034	0.0034	0.0037
As2O3	0.0046	0.0031	0.0044	0.0015	0.0000	0.0012	0.0000	0.0000	0.0000
Br	0.0006	0.0005	0.0001	0.0007	0.0005	0.0000	0.0006	0.0000	0.0004
Rb2O	0.0225	0.0127	0.0149	0.0108	0.0140	0.0130	0.0139	0.0089	0.0097
SrO	0.0094	0.0033	0.0060	0.0136	0.0097	0.0079	0.0109	0.0037	0.0052
Y2O3	0.0027	0.0025	0.0042	0.0019	0.0017	0.0028	0.0010	0.0014	0.0016
ZrO2	0.0228	0.0563	0.0438	0.0437	0.0385	0.0351	0.0345	0.0524	0.0439
Nb2O5	0.0014	0.0011	0.0011	0.0022	0.0011	0.0028	0.0012	0.0008	0.0007
MoO3	0.0000	0.0004	0.0000	0.0000	0.0000	0.0003	0.0001	0.0000	0.0001
BaO	0.0710	0.0343	0.0339	0.0130	0.0464	0.0417	0.0270	0.0242	0.0306
HfO2	0.0042	0.0072	0.0051	0.0072	0.0043	0.0035	0.0045	0.0061	0.0065
PbO	0.0000	0.0000	0.0000	0.0000	0.0057	0.0000	0.0023	0.0003	0.0058
ThO2	0.0012	0.0007	0.0000	0.0015	0.0007	0.0004	0.0005	0.0002	0.0000
Pa	0.0082	0.0041	0.0047	0.0034	0.0044	0.0044	0.0037	0.0027	0.0035
U3O8	0.0004	0.0007	0.0000	0.0000	0.0001	0.0001	0.0006	0.0003	0.0006

RHAME BED	41A	41B	44A	44B	44C	45A	45B	45C	47A
	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %
Na2O	0.1066	0.0650	0.0528	0.1084	0.1351	0.2962	0.4195	0.2550	0.1905
MgO	1.2426	0.1030	0.9077	0.9225	1.3010	0.8560	1.0517	0.9954	1.0060
Al2O3	20.3957	17.4331	11.8482	15.4054	20.4990	25.4888	27.1930	21.1837	12.9309
SiO2	71.7853	78.1240	82.2429	75.6203	70.9962	66.9435	65.4716	71.1094	79.1024
P2O5	0.0387	0.0300	0.0262	0.0260	0.0279	0.0304	0.0431	0.0497	0.0289
SO3	0.1988	0.0977	0.1604	2.0499	0.3451	0.8566	0.3092	0.2416	1.0586
Cl	0.0004	0.0000	0.0020	0.0000	0.0000	0.0000	0.0000	0.0001	0.0037
K2O	2.8489	1.9819	1.3407	2.2159	3.2839	1.8882	2.9412	3.1091	1.7865
CaO	0.1965	0.0895	1.0922	1.2781	0.1511	0.4634	0.0899	0.0805	0.8532
TiO2	0.8760	0.6317	1.1920	0.9318	0.8374	0.9345	0.7483	0.8364	0.6679
V2O5	0.0205	0.0154	0.0182	0.0210	0.0349	0.0472	0.0397	0.0266	0.0212
Cr2O3	0.0124	0.0085	0.0070	0.0077	0.0106	0.0140	0.0144	0.0138	0.0086
MnO	0.0074	0.0067	0.0041	0.0045	0.0117	0.0105	0.0079	0.0068	0.0069
Fe2O3	2.0414	1.2480	0.9604	1.2249	2.1817	1.9964	1.4439	1.9094	2.1830
Co2O3	0.0016	0.0013	0.0032	0.0060	0.0048	0.0044	0.0023	0.0002	0.0027
NiO	0.0136	0.0121	0.0138	0.0258	0.0166	0.0274	0.0220	0.0134	0.0123
CuO	0.0135	0.0112	0.0101	0.0108	0.0120	0.0112	0.0134	0.0134	0.0104
ZnO	0.0068	0.0119	0.0018	0.0187	0.0196	0.0189	0.0226	0.0082	0.0031
Ga2O3	0.0071	0.0025	0.0022	0.0041	0.0060	0.0025	0.0056	0.0049	0.0029
As2O3	0.0000	0.0017	0.0000	0.0000	0.0009	0.0000	0.0000	0.0077	0.0025
Br	0.0004	0.0004	0.0005	0.0004	0.0006	0.0000	0.0004	0.0000	0.0009
Rb2O	0.0217	0.0124	0.0097	0.0141	0.0206	0.0107	0.0158	0.0181	0.0124
SrO	0.0114	0.0061	0.0074	0.0068	0.0061	0.0113	0.0117	0.0107	0.0087
Y2O3	0.0013	0.0017	0.0031	0.0038	0.0016	0.0005	0.0001	0.0010	0.0022
ZrO2	0.0267	0.0453	0.0541	0.0435	0.0277	0.0195	0.0157	0.0188	0.0504
Nb2O5	0.0021	0.0011	0.0029	0.0019	0.0018	0.0015	0.0008	0.0018	0.0013
MoO3	0.0000	0.0000	0.0001	0.0000	0.0003	0.0000	0.0000	0.0000	0.0004
BaO	0.1081	0.0481	0.0209	0.0333	0.0480	0.0504	0.0978	0.0731	0.0296
HfO2	0.0024	0.0045	0.0087	0.0069	0.0091	0.0058	0.0061	0.0040	0.0075
PbO	0.0039	0.0000	0.0026	0.0028	0.0008	0.0070	0.0059	0.0000	0.0000
ThO2	0.0000	0.0007	0.0008	0.0000	0.0004	0.0001	0.0000	0.0000	0.0003
Pa	0.0082	0.0044	0.0033	0.0046	0.0075	0.0031	0.0064	0.0071	0.0036
U3O8	0.0000	0.0001	0.0000	0.0001	0.0000	0.0000	0.0000	0.0001	0.0005

RHAME BED	50B	51A	51B	51C	51D	53A	53B	55A	56E
	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %
Na2O	0.0771	0.0996	0.1182	0.0805	0.0952	0.0591	0.0879	0.0288	0.2643
MgO	0.9774	0.1566	0.8364	0.1179	0.8272	0.4955	0.5558	0.7289	0.5113
Al2O3	20.5447	22.9416	26.0536	20.9506	25.4184	13.0187	12.6107	17.5623	10.3709
SiO2	71.0759	71.4102	68.5613	75.2744	68.4559	82.1618	82.4454	72.2091	85.4974
P2O5	0.0290	0.0353	0.0385	0.0388	0.0407	0.0234	0.0225	0.0298	0.0256
SO3	1.3939	0.7937	0.0897	0.1160	0.1228	0.0829	0.0708	2.9396	0.9148
Cl	0.0059	0.0029	0.0103	0.0013	0.0000	0.0000	0.0000	0.0000	0.0020
K2O	2.5175	1.4172	1.7386	1.0982	2.1612	2.1079	2.3967	1.8331	0.4388
CaO	1.0222	0.4859	0.1183	0.1007	0.0777	0.4841	0.1428	2.1872	0.0440
TiO2	0.7389	0.9631	0.8080	0.7966	0.8972	0.4445	0.4714	0.6679	1.0124
V2O5	0.0233	0.0236	0.0372	0.0313	0.0366	0.0127	0.0118	0.0197	0.0210
Cr2O3	0.0097	0.0136	0.0132	0.0105	0.0141	0.0069	0.0069	0.0099	0.0076
MnO	0.0044	0.0035	0.0058	0.0065	0.0055	0.0074	0.0086	0.0203	0.0069
Fe2O3	1.4312	1.5033	1.4371	1.2392	1.6819	0.9404	1.0165	1.5177	0.7412
Co2O3	0.0028	0.0017	0.0020	0.0019	0.0025	0.0000	0.0007	0.0098	0.0045
NiO	0.0126	0.0116	0.0137	0.0125	0.0154	0.0111	0.0129	0.0362	0.0187
CuO	0.0117	0.0101	0.0106	0.0120	0.0142	0.0112	0.0105	0.0125	0.0112
ZnO	0.0018	0.0034	0.0045	0.0049	0.0186	0.0015	0.0028	0.0353	0.0075
Ga2O3	0.0030	0.0051	0.0037	0.0036	0.0053	0.0010	0.0010	0.0030	0.0020
As2O3	0.0000	0.0000	0.0000	0.0000	0.0015	0.0013	0.0000	0.0000	0.0005
Br	0.0000	0.0000	0.0005	0.0002	0.0005	0.0004	0.0000	0.0006	0.0002
Rb2O	0.0162	0.0107	0.0129	0.0078	0.0138	0.0098	0.0118	0.0109	0.0047
SrO	0.0063	0.0096	0.0095	0.0087	0.0089	0.0043	0.0061	0.0253	0.0044
Y2O3	0.0017	0.0016	0.0004	0.0000	0.0000	0.0015	0.0013	0.0023	0.0028
ZrO2	0.0267	0.0329	0.0227	0.0405	0.0238	0.0431	0.0386	0.0458	0.0574
Nb2O5	0.0019	0.0030	0.0016	0.0009	0.0000	0.0004	0.0007	0.0019	0.0032
MoO3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
BaO	0.0495	0.0444	0.0376	0.0309	0.0489	0.0573	0.0536	0.0448	0.0151
HfO2	0.0047	0.0091	0.0046	0.0050	0.0062	0.0070	0.0061	0.0083	0.0062
PbO	0.0033	0.0026	0.0052	0.0051	0.0000	0.0011	0.0014	0.0050	0.0020
ThO2	0.0015	0.0004	0.0004	0.0004	0.0000	0.0002	0.0000	0.0000	0.0000
Pa	0.0052	0.0037	0.0039	0.0025	0.0053	0.0035	0.0041	0.0040	0.0011
U3O8	0.0000	0.0000	0.0000	0.0006	0.0007	0.0000	0.0006	0.0000	0.0003

RHAME BED	56F	56G	56H	56I	58A	59C	59D	59E	59F
	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %
Na2O	0.2121	0.2765	0.1728	0.1625	1.0330	0.9690	0.6530	1.0676	1.1407
MgO	0.8503	1.2568	0.5582	1.2067	2.5423	1.6815	2.2396	2.4387	2.7648
Al2O3	19.9935	25.0234	15.4757	17.4468	16.5424	14.3728	22.1501	20.5416	20.9381
SiO2	73.3708	66.8035	79.3064	73.6340	70.5198	75.1154	65.5237	65.4279	64.2018
P2O5	0.0365	0.0356	0.0335	0.0581	0.1025	0.1342	0.0631	0.1670	0.1628
SO3	0.7929	1.0893	0.7437	0.3840	0.2105	0.0921	0.1173	0.0784	0.2673
Cl	0.0006	0.0000	0.0093	0.0000	0.0000	0.0051	0.0019	0.0000	0.0048
K2O	1.7091	2.3940	1.8405	3.6148	3.8026	2.9010	3.6238	3.6189	3.5693
CaO	0.1285	0.0867	0.0585	0.1443	0.4488	0.5953	0.2350	0.5081	0.3941
TiO2	0.7234	0.6342	0.6111	0.7269	0.5762	0.5907	0.7552	0.8107	0.7868
V2O5	0.0299	0.0316	0.0175	0.0247	0.0192	0.0215	0.0295	0.0404	0.0474
Cr2O3	0.0105	0.0106	0.0100	0.0104	0.0100	0.0090	0.0145	0.0123	0.0139
MnO	0.0082	0.0113	0.0087	0.0074	0.0218	0.0204	0.0307	0.0505	0.0452
Fe2O3	1.9538	2.1741	0.9954	2.3914	3.9827	3.2847	4.2923	4.9931	5.4452
Co2O3	0.0020	0.0039	0.0023	0.0027	0.0023	0.0059	0.0073	0.0032	0.0026
NiO	0.0159	0.0196	0.0127	0.0116	0.0150	0.0218	0.0258	0.0195	0.0207
CuO	0.0112	0.0122	0.0111	0.0118	0.0109	0.0105	0.0167	0.0159	0.0162
ZnO	0.0143	0.0308	0.0076	0.0086	0.0167	0.0211	0.0312	0.0226	0.0219
Ga2O3	0.0035	0.0045	0.0018	0.0039	0.0030	0.0031	0.0039	0.0043	0.0046
As2O3	0.0141	0.0023	0.0015	0.0009	0.0021	0.0028	0.0051	0.0000	0.0027
Br	0.0000	0.0004	0.0002	0.0008	0.0000	0.0005	0.0000	0.0003	0.0000
Rb2O	0.0108	0.0165	0.0094	0.0182	0.0229	0.0168	0.0180	0.0168	0.0176
SrO	0.0075	0.0066	0.0053	0.0083	0.0107	0.0135	0.0149	0.0195	0.0171
Y2O3	0.0019	0.0020	0.0028	0.0041	0.0009	0.0026	0.0039	0.0030	0.0014
ZrO2	0.0401	0.0190	0.0541	0.0289	0.0209	0.0367	0.0169	0.0163	0.0187
Nb2O5	0.0007	0.0002	0.0005	0.0012	0.0004	0.0004	0.0012	0.0010	0.0002
MoO3	0.0000	0.0000	0.0002	0.0000	0.0001	0.0003	0.0000	0.0000	0.0003
BaO	0.0365	0.0420	0.0395	0.0588	0.0513	0.0523	0.1136	0.1062	0.0827
HfO2	0.0012	0.0064	0.0059	0.0053	0.0056	0.0058	0.0060	0.0029	0.0023
PbO	0.0000	0.0000	0.0000	0.0009	0.0000	0.0000	0.0000	0.0056	0.0003
ThO2	0.0000	0.0005	0.0000	0.0000	0.0016	0.0003	0.0006	0.0010	0.0016
Pa	0.0043	0.0055	0.0032	0.0072	0.0087	0.0054	0.0052	0.0063	0.0063
U3O8	0.0000	0.0000	0.0006	0.0004	0.0000	0.0001	0.0000	0.0004	0.0006

RHAME BED	59G	59H	59I	59J	59K	59L	60A	60B	61A
	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %
Na2O	0.1593	0.3502	0.3131	0.3324	0.3783	0.3929	0.0798	0.1424	0.1681
MgO	0.0388	0.6450	0.7436	0.6591	0.7536	0.8966	0.1186	0.0821	0.5726
Al2O3	10.2142	20.7501	19.6052	18.6922	18.2119	19.6253	18.0078	18.0356	15.3471
SiO2	87.1626	71.9972	75.1235	75.8199	75.6446	74.2914	76.8796	77.6722	78.7698
P2O5	0.0209	0.0316	0.0383	0.0357	0.0354	0.0416	0.0304	0.0416	0.0319
SO3	0.0507	0.0810	0.0623	0.0701	0.1176	0.0999	0.1030	0.3457	0.0631
Cl	0.0009	0.0029	0.0032	0.0000	0.0041	0.0000	0.0000	0.0078	0.0010
K2O	0.3398	1.3584	1.6014	1.9224	2.1250	1.5784	1.2012	1.5114	2.1226
CaO	0.0891	0.0935	0.1487	0.1409	0.1581	0.3784	1.5755	0.1333	0.1453
TiO2	1.0974	0.9646	0.7782	0.8634	0.8585	0.8784	0.7285	0.8084	0.5338
V2O5	0.0197	0.0309	0.0216	0.0439	0.0352	0.0345	0.0305	0.0238	0.0167
Cr2O3	0.0106	0.0119	0.0131	0.0130	0.0125	0.0123	0.0110	0.0117	0.0107
MnO	0.0090	0.0595	0.0059	0.0083	0.0089	0.0201	0.0081	0.0085	0.0174
Fe2O3	0.6575	3.4987	1.3966	1.2153	1.4500	1.5916	1.1086	1.0477	2.0093
Co2O3	0.0019	0.0019	0.0008	0.0029	0.0049	0.0011	0.0000	0.0000	0.0011
NiO	0.0122	0.0123	0.0107	0.0169	0.0225	0.0127	0.0123	0.0128	0.0145
CuO	0.0100	0.0121	0.0128	0.0131	0.0148	0.0125	0.0110	0.0106	0.0102
ZnO	0.0026	0.0034	0.0036	0.0178	0.0214	0.0046	0.0024	0.0045	0.0116
Ga2O3	0.0013	0.0031	0.0037	0.0030	0.0042	0.0032	0.0029	0.0023	0.0025
As2O3	0.0010	0.0019	0.0012	0.0000	0.0022	0.0010	0.0026	0.0013	0.0000
Br	0.0002	0.0005	0.0005	0.0002	0.0006	0.0006	0.0009	0.0013	0.0010
Rb2O	0.0039	0.0094	0.0093	0.0089	0.0101	0.0090	0.0045	0.0070	0.0111
SrO	0.0044	0.0078	0.0105	0.0099	0.0132	0.0097	0.0129	0.0067	0.0102
Y2O3	0.0018	0.0006	0.0012	0.0013	0.0014	0.0011	0.0009	0.0018	0.0001
ZrO2	0.0615	0.0347	0.0335	0.0361	0.0342	0.0341	0.0350	0.0323	0.0193
Nb2O5	0.0019	0.0011	0.0002	0.0007	0.0007	0.0010	0.0003	0.0010	0.0000
MoO3	0.0001	0.0000	0.0000	0.0000	0.0000	0.0003	0.0000	0.0003	0.0004
BaO	0.0184	0.0273	0.0517	0.0564	0.0684	0.0588	0.0272	0.0374	0.0976
HfO2	0.0066	0.0052	0.0019	0.0078	0.0039	0.0040	0.0034	0.0056	0.0045
PbO	0.0009	0.0000	0.0000	0.0044	0.0000	0.0018	0.0000	0.0000	0.0030
ThO2	0.0000	0.0007	0.0006	0.0005	0.0002	0.0010	0.0000	0.0006	0.0000
Pa	0.0006	0.0019	0.0031	0.0034	0.0033	0.0021	0.0011	0.0019	0.0035
U3O8	0.0002	0.0006	0.0000	0.0001	0.0003	0.0000	0.0000	0.0004	0.0000

RHAME BED	61B	61C	MEAN
	Mass %	Mass %	Mass %
Na2O	0.3925	0.2527	0.1862
MgO	1.2683	0.4645	0.8688
Al2O3	22.7642	15.5834	17.6212
SiO2	66.6336	75.2783	75.6237
P2O5	0.0538	0.0611	0.0406
SO3	0.2831	0.0654	0.3867
Cl	0.0017	0.0000	0.0019
K2O	2.9340	1.4026	2.1010
CaO	1.2669	0.0465	0.3987
TiO2	0.7133	0.8643	0.7649
V2O5	0.0321	0.0133	0.0246
Cr2O3	0.0132	0.0172	0.0103
MnO	0.0237	0.1181	0.0121
Fe2O3	3.3280	5.6376	1.7942
Co2O3	0.0084	0.0077	0.0020
NiO	0.0423	0.0150	0.0150
CuO	0.0175	0.0124	0.0121
ZnO	0.0327	0.0086	0.0090
Ga2O3	0.0036	0.0026	0.0033
As2O3	0.0072	0.0014	0.0015
Br	0.0011	0.0000	0.0004
Rb2O	0.0182	0.0077	0.0132
SrO	0.0323	0.0069	0.0087
Y2O3	0.0137	0.0019	0.0020
ZrO2	0.0232	0.0585	0.0363
Nb2O5	0.0003	0.0000	0.0013
MoO3	0.0000	0.0003	0.0001
BaO	0.0805	0.0626	0.0464
HfO2	0.0028	0.0064	0.0052
PbO	0.0000	0.0011	0.0030
ThO2	0.0018	0.0002	0.0007
Pa	0.0060	0.0017	0.0041
U3O8	0.0000	0.0000	0.0007

Upper RHAME BED	1a	2a	10a	10b	11a	11b	13a	14a	26A
	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %
Na2O	0.0510	0.0893	0.3250	0.2671	0.1046	0.1240	0.0937	0.1824	0.0552
MgO	0.3003	0.7057	1.0183	1.3236	0.7045	0.8404	0.9360	0.8807	0.5779
Al2O3	17.1156	19.8113	12.7967	17.4977	15.3633	18.7389	14.6373	13.2731	9.8576
SiO2	80.2154	74.5500	80.2840	74.2844	78.6370	75.6081	78.5098	80.6660	86.1617
P2O5	0.0251	0.0299	0.0271	0.0314	0.0218	0.0293	0.0277	0.0237	0.0304
SO3	0.0410	0.1020	0.5093	0.3963	0.0792	0.0958	0.0661	0.1495	0.0737
Cl	0.0039	0.0054	0.0000	0.0003	0.0000	0.0043	0.0003	0.0027	0.0000
K2O	0.8500	2.4707	2.4116	2.9317	1.9475	1.8046	2.6103	1.7257	0.9907
CaO	0.1532	0.0909	0.0451	0.0609	0.1726	0.2109	0.1100	0.1238	0.0585
TiO2	0.5498	0.6598	0.6991	0.6069	0.7657	0.7281	0.9640	0.9795	0.8831
V2O5	0.0207	0.0216	0.0205	0.0201	0.0140	0.0146	0.0249	0.0225	0.0232
Cr2O3	0.0096	0.0096	0.0084	0.0107	0.0094	0.0095	0.0095	0.0090	0.0077
MnO	0.0042	0.0035	0.0053	0.0072	0.0059	0.0048	0.0031	0.0056	0.0030
Fe2O3	0.5539	1.2958	1.7103	2.4113	2.0209	1.6265	1.8466	1.8060	1.1219
Co2O3	0.0012	0.0014	0.0007	0.0014	0.0003	0.0008	0.0003	0.0014	0.0026
NiO	0.0153	0.0137	0.0137	0.0140	0.0119	0.0140	0.0124	0.0117	0.0127
CuO	0.0111	0.0115	0.0138	0.0119	0.0108	0.0153	0.0128	0.0108	0.0109
ZnO	0.0101	0.0061	0.0058	0.0072	0.0031	0.0047	0.0045	0.0036	0.0022
Ga2O3	0.0025	0.0044	0.0023	0.0026	0.0046	0.0042	0.0069	0.0037	0.0040
As2O3	0.0000	0.0025	0.0015	0.0000	0.0000	0.0000	0.0000	0.0028	0.0000
Br	0.0002	0.0000	0.0003	0.0000	0.0000	0.0007	0.0002	0.0002	0.0000
Rb2O	0.0049	0.0157	0.0205	0.0223	0.0151	0.0183	0.0198	0.0202	0.0080
SrO	0.0032	0.0047	0.0057	0.0064	0.0059	0.0090	0.0061	0.0057	0.0045
Y2O3	0.0000	0.0018	0.0017	0.0013	0.0017	0.0012	0.0015	0.0018	0.0032
ZrO2	0.0162	0.0297	0.0283	0.0238	0.0394	0.0313	0.0354	0.0310	0.0613
Nb2O5	0.0002	0.0016	0.0010	0.0010	0.0019	0.0016	0.0030	0.0033	0.0017
MoO3	0.0000	0.0000	0.0000	0.0000	0.0006	0.0000	0.0000	0.0000	0.0000
BaO	0.0353	0.0513	0.0325	0.0409	0.0424	0.0415	0.0396	0.0408	0.0318
HfO2	0.0028	0.0046	0.0022	0.0053	0.0042	0.0066	0.0061	0.0052	0.0080
PbO	0.0025	0.0000	0.0000	0.0039	0.0049	0.0042	0.0044	0.0000	0.0021
ThO2	0.0000	0.0000	0.0004	0.0001	0.0007	0.0006	0.0000	0.0008	0.0000
Pa	0.0008	0.0054	0.0083	0.0083	0.0055	0.0056	0.0071	0.0068	0.0023
U3O8	0.0000	0.0000	0.0006	0.0000	0.0006	0.0006	0.0006	0.0000	0.0001

Upper RHAME BED	26B	28A	28B	28C	29A	29B	34A	34B	35A
	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %
Na2O	0.0803	0.0275	0.0504	0.0499	0.0378	0.0634	0.0126	0.0457	0.0283
MgO	1.2576	0.3007	0.3724	0.3044	0.0455	0.5776	0.2875	0.5109	0.5154
Al2O3	19.6959	6.3784	10.6924	11.4708	7.3415	15.3389	6.0514	20.4350	20.7299
SiO2	65.6507	90.5982	85.9299	85.0575	90.4257	79.6225	90.9118	75.0752	76.2109
P2O5	0.0379	0.0230	0.0248	0.0241	0.0198	0.0268	0.0221	0.0286	0.0318
SO3	4.8124	0.0557	0.0687	0.0823	0.0642	0.0661	0.0510	0.0415	0.1347
Cl	0.0000	0.0000	0.0073	0.0000	0.0000	0.0044	0.0000	0.0017	0.0001
K2O	2.1295	0.4032	0.6126	1.4380	0.4189	1.8528	0.5389	1.7134	0.6870
CaO	3.1429	0.1630	0.2199	0.1116	0.0446	0.0973	0.1132	0.2092	0.1511
TiO2	0.7723	1.1303	0.9220	0.3974	0.8543	0.9958	1.1505	0.6985	0.5377
V2O5	0.0278	0.0149	0.0184	0.0113	0.0085	0.0231	0.0192	0.0128	0.0237
Cr2O3	0.0103	0.0071	0.0069	0.0072	0.0066	0.0086	0.0060	0.0090	0.0114
MnO	0.0047	0.0023	0.0044	0.0068	0.0025	0.0061	0.0029	0.0041	0.0030
Fe2O3	2.1443	0.7599	0.9428	0.9179	0.5716	1.1796	0.6775	1.0822	0.8078
Co2O3	0.0009	0.0013	0.0008	0.0004	0.0004	0.0006	0.0004	0.0002	0.0014
NiO	0.0140	0.0115	0.0117	0.0113	0.0115	0.0115	0.0113	0.0110	0.0173
CuO	0.0138	0.0105	0.0113	0.0091	0.0100	0.0098	0.0140	0.0108	0.0121
ZnO	0.0076	0.0015	0.0019	0.0018	0.0016	0.0025	0.0024	0.0020	0.0111
Ga2O3	0.0060	0.0027	0.0018	0.0014	0.0019	0.0049	0.0021	0.0033	0.0013
As2O3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0003	0.0001	0.0000	0.0005
Br	0.0000	0.0001	0.0002	0.0002	0.0000	0.0000	0.0010	0.0008	0.0003
Rb2O	0.0173	0.0025	0.0045	0.0068	0.0033	0.0118	0.0055	0.0116	0.0050
SrO	0.0309	0.0035	0.0034	0.0036	0.0018	0.0068	0.0047	0.0074	0.0058
Y2O3	0.0006	0.0048	0.0028	0.0017	0.0031	0.0024	0.0023	0.0016	0.0009
ZrO2	0.0225	0.0580	0.0568	0.0384	0.0876	0.0454	0.0770	0.0393	0.0432
Nb2O5	0.0015	0.0026	0.0048	0.0003	0.0057	0.0022	0.0029	0.0010	0.0008
MoO3	0.0000	0.0001	0.0000	0.0002	0.0000	0.0003	0.0000	0.0002	0.0000
BaO	0.1004	0.0127	0.0170	0.0346	0.0110	0.0282	0.0209	0.0315	0.0194
HfO2	0.0054	0.0093	0.0047	0.0054	0.0065	0.0044	0.0080	0.0050	0.0055
PbO	0.0055	0.0089	0.0046	0.0026	0.0124	0.0008	0.0009	0.0033	0.0008
ThO2	0.0009	0.0037	0.0003	0.0006	0.0015	0.0004	0.0000	0.0000	0.0003
Pa	0.0055	0.0008	0.0000	0.0024	0.0000	0.0044	0.0012	0.0030	0.0011
U3O8	0.0006	0.0012	0.0005	0.0000	0.0002	0.0003	0.0007	0.0002	0.0004

Upper RHAME BED	36A	37A	38A	38B	41A	44A	44B	45A	45B
	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %
Na2O	0.0545	0.0813	0.0529	0.0816	0.1066	0.0528	0.1084	0.2962	0.4195
MgO	0.1135	0.8317	0.7325	0.7703	1.2426	0.9077	0.9225	0.8560	1.0517
Al2O3	15.2038	22.9985	16.2905	20.3996	20.3957	11.8482	15.4054	25.4888	27.1930
SiO2	80.5065	68.7304	78.2554	73.9224	71.7853	82.2429	75.6203	66.9435	65.4716
P2O5	0.0318	0.0323	0.0261	0.0297	0.0387	0.0262	0.0260	0.0304	0.0431
SO3	0.0855	1.9209	0.0627	0.1841	0.1988	0.1604	2.0499	0.8566	0.3092
Cl	0.0000	0.0000	0.0015	0.0000	0.0004	0.0020	0.0000	0.0000	0.0000
K2O	2.0064	1.5773	1.9012	1.9659	2.8489	1.3407	2.2159	1.8882	2.9412
CaO	0.0954	1.2906	0.2325	0.2706	0.1965	1.0922	1.2781	0.4634	0.0899
TiO2	0.6719	0.8744	1.0860	0.8876	0.8760	1.1920	0.9318	0.9345	0.7483
V2O5	0.0159	0.0276	0.0271	0.0274	0.0205	0.0182	0.0210	0.0472	0.0397
Cr2O3	0.0094	0.0106	0.0085	0.0111	0.0124	0.0070	0.0077	0.0140	0.0144
MnO	0.0059	0.0139	0.0091	0.0052	0.0074	0.0041	0.0045	0.0105	0.0079
Fe2O3	1.0404	1.4610	1.1681	1.3161	2.0414	0.9604	1.2249	1.9964	1.4439
Co2O3	0.0001	0.0040	0.0000	0.0000	0.0016	0.0032	0.0060	0.0044	0.0023
NiO	0.0131	0.0204	0.0143	0.0118	0.0136	0.0138	0.0258	0.0274	0.0220
CuO	0.0105	0.0106	0.0096	0.0099	0.0135	0.0101	0.0108	0.0112	0.0134
ZnO	0.0060	0.0092	0.0029	0.0025	0.0068	0.0018	0.0187	0.0189	0.0226
Ga2O3	0.0025	0.0058	0.0059	0.0034	0.0071	0.0022	0.0041	0.0025	0.0056
As2O3	0.0031	0.0015	0.0012	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Br	0.0005	0.0007	0.0000	0.0006	0.0004	0.0005	0.0004	0.0000	0.0004
Rb2O	0.0127	0.0108	0.0130	0.0139	0.0217	0.0097	0.0141	0.0107	0.0158
SrO	0.0033	0.0136	0.0079	0.0109	0.0114	0.0074	0.0068	0.0113	0.0117
Y2O3	0.0025	0.0019	0.0028	0.0010	0.0013	0.0031	0.0038	0.0005	0.0001
ZrO2	0.0563	0.0437	0.0351	0.0345	0.0267	0.0541	0.0435	0.0195	0.0157
Nb2O5	0.0011	0.0022	0.0028	0.0012	0.0021	0.0029	0.0019	0.0015	0.0008
MoO3	0.0004	0.0000	0.0003	0.0001	0.0000	0.0001	0.0000	0.0000	0.0000
BaO	0.0343	0.0130	0.0417	0.0270	0.1081	0.0209	0.0333	0.0504	0.0978
HfO2	0.0072	0.0072	0.0035	0.0045	0.0024	0.0087	0.0069	0.0058	0.0061
PbO	0.0000	0.0000	0.0000	0.0023	0.0039	0.0026	0.0028	0.0070	0.0059
ThO2	0.0007	0.0015	0.0004	0.0005	0.0000	0.0008	0.0000	0.0001	0.0000
Pa	0.0041	0.0034	0.0044	0.0037	0.0082	0.0033	0.0046	0.0031	0.0064
U3O8	0.0007	0.0000	0.0001	0.0006	0.0000	0.0000	0.0001	0.0000	0.0000

Upper RHAME BED	47A	48A	48B	49A	49B	50A	51A	51B	53A
	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %
Na2O	0.1905	0.2661	0.3740	0.0705	0.0260	0.0791	0.0996	0.1182	0.0591
MgO	1.0060	0.5218	0.8984	0.7782	0.7294	0.7795	0.1566	0.8364	0.4955
Al2O3	12.9309	14.6881	17.6820	15.0177	15.0868	14.7104	22.9416	26.0536	13.0187
SiO2	79.1024	79.8619	74.8734	80.3419	79.6953	79.6216	71.4102	68.5613	82.1618
P2O5	0.0289	0.0258	0.0378	0.0267	0.0256	0.0245	0.0353	0.0385	0.0234
SO3	1.0586	0.8280	0.4986	0.0461	0.1664	0.2847	0.7937	0.0897	0.0829
Cl	0.0037	0.0000	0.0003	0.0068	0.0021	0.0117	0.0029	0.0103	0.0000
K2O	1.7865	1.3649	2.4355	1.5917	1.8665	1.6094	1.4172	1.7386	2.1079
CaO	0.8532	0.5270	0.1291	0.3118	0.4265	0.8148	0.4859	0.1183	0.4841
TiO2	0.6679	0.5648	0.7461	0.5798	0.6079	0.7246	0.9631	0.8080	0.4445
V2O5	0.0212	0.0172	0.0260	0.0063	0.0219	0.0189	0.0236	0.0372	0.0127
Cr2O3	0.0086	0.0082	0.0102	0.0083	0.0085	0.0078	0.0136	0.0132	0.0069
MnO	0.0069	0.0066	0.0077	0.0080	0.0061	0.0117	0.0035	0.0058	0.0074
Fe2O3	2.1830	1.2077	2.1250	1.0738	1.1818	1.1801	1.5033	1.4371	0.9404
Co2O3	0.0027	0.0000	0.0010	0.0001	0.0000	0.0018	0.0017	0.0020	0.0000
NiO	0.0123	0.0119	0.0116	0.0107	0.0115	0.0120	0.0116	0.0137	0.0111
CuO	0.0104	0.0111	0.0123	0.0099	0.0115	0.0100	0.0101	0.0106	0.0112
ZnO	0.0031	0.0018	0.0070	0.0021	0.0017	0.0016	0.0034	0.0045	0.0015
Ga2O3	0.0029	0.0023	0.0016	0.0023	0.0025	0.0039	0.0051	0.0037	0.0010
As2O3	0.0025	0.0029	0.0054	0.0007	0.0000	0.0000	0.0000	0.0000	0.0013
Br	0.0009	0.0008	0.0003	0.0003	0.0002	0.0006	0.0000	0.0005	0.0004
Rb2O	0.0124	0.0072	0.0124	0.0103	0.0116	0.0113	0.0107	0.0129	0.0098
SrO	0.0087	0.0035	0.0089	0.0051	0.0046	0.0063	0.0096	0.0095	0.0043
Y2O3	0.0022	0.0010	0.0016	0.0017	0.0014	0.0014	0.0016	0.0004	0.0015
ZrO2	0.0504	0.0363	0.0438	0.0457	0.0496	0.0305	0.0329	0.0227	0.0431
Nb2O5	0.0013	0.0005	0.0013	0.0010	0.0013	0.0016	0.0030	0.0016	0.0004
MoO3	0.0004	0.0005	0.0005	0.0001	0.0004	0.0011	0.0000	0.0000	0.0000
BaO	0.0296	0.0219	0.0300	0.0323	0.0423	0.0282	0.0444	0.0376	0.0573
HfO2	0.0075	0.0069	0.0026	0.0057	0.0034	0.0046	0.0091	0.0046	0.0070
PbO	0.0000	0.0000	0.0109	0.0000	0.0032	0.0024	0.0026	0.0052	0.0011
ThO2	0.0003	0.0006	0.0000	0.0005	0.0006	0.0000	0.0004	0.0004	0.0002
Pa	0.0036	0.0025	0.0005	0.0038	0.0034	0.0037	0.0037	0.0039	0.0035
U3O8	0.0005	0.0002	0.0042	0.0001	0.0000	0.0002	0.0000	0.0000	0.0000

Upper RHAME BED	53B	55A	56E	56F	56G	59C	59D	Mean
	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %
Na2O	0.0879	0.0288	0.2643	0.2121	0.2765	0.9690	0.6530	0.1562
MgO	0.5558	0.7289	0.5113	0.8503	1.2568	1.6815	2.2396	0.7654
Al2O3	12.6107	17.5623	10.3709	19.9935	25.0234	14.3728	22.1501	16.4340
SiO2	82.4454	72.2091	85.4974	73.3708	66.8035	75.1154	65.5237	77.4063
P2O5	0.0225	0.0298	0.0256	0.0365	0.0356	0.1342	0.0631	0.0322
SO3	0.0708	2.9396	0.9148	0.7929	1.0893	0.0921	0.1173	0.5252
Cl	0.0000	0.0000	0.0020	0.0006	0.0000	0.0051	0.0019	0.0019
K2O	2.3967	1.8331	0.4388	1.7091	2.3940	2.9010	3.6238	1.8009
CaO	0.1428	2.1872	0.0440	0.1285	0.0867	0.5953	0.2350	0.4153
TiO2	0.4714	0.6679	1.0124	0.7234	0.6342	0.5907	0.7552	0.7781
V2O5	0.0118	0.0197	0.0210	0.0299	0.0316	0.0215	0.0295	0.0218
Cr2O3	0.0069	0.0099	0.0076	0.0105	0.0106	0.0090	0.0145	0.0094
MnO	0.0086	0.0203	0.0069	0.0082	0.0113	0.0204	0.0307	0.0074
Fe2O3	1.0165	1.5177	0.7412	1.9538	2.1741	3.2847	4.2923	1.4870
Co2O3	0.0007	0.0098	0.0045	0.0020	0.0039	0.0059	0.0073	0.0019
NiO	0.0129	0.0362	0.0187	0.0159	0.0196	0.0218	0.0258	0.0151
CuO	0.0105	0.0125	0.0112	0.0112	0.0122	0.0105	0.0167	0.0114
ZnO	0.0028	0.0353	0.0075	0.0143	0.0308	0.0211	0.0312	0.0079
Ga2O3	0.0010	0.0030	0.0020	0.0035	0.0045	0.0031	0.0039	0.0034
As2O3	0.0000	0.0000	0.0005	0.0141	0.0023	0.0028	0.0051	0.0012
Br	0.0000	0.0006	0.0002	0.0000	0.0004	0.0005	0.0000	0.0003
Rb2O	0.0118	0.0109	0.0047	0.0108	0.0165	0.0168	0.0180	0.0122
SrO	0.0061	0.0253	0.0044	0.0075	0.0066	0.0135	0.0149	0.0080
Y2O3	0.0013	0.0023	0.0028	0.0019	0.0020	0.0026	0.0039	0.0019
ZrO2	0.0386	0.0458	0.0574	0.0401	0.0190	0.0367	0.0169	0.0396
Nb2O5	0.0007	0.0019	0.0032	0.0007	0.0002	0.0004	0.0012	0.0017
MoO3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0003	0.0000	0.0001
BaO	0.0536	0.0448	0.0151	0.0365	0.0420	0.0523	0.1136	0.0405
HfO2	0.0061	0.0083	0.0062	0.0012	0.0064	0.0058	0.0060	0.0056
PbO	0.0014	0.0050	0.0020	0.0159	0.0000	0.0000	0.0000	0.0032
ThO2	0.0000	0.0000	0.0000	0.0000	0.0005	0.0074	0.0006	0.0006
Pa	0.0041	0.0040	0.0011	0.0000	0.0055	0.0003	0.0052	0.0037
U3O8	0.0006	0.0000	0.0003	0.0043	0.0000	0.0054	0.0000	0.0006

Middle RHAME BED	13b	13c	13d	14b	28D	29C	34C	34D	34E
	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %
Na2O	0.3508	0.3071	0.2189	0.1194	0.1224	0.0751	0.0192	0.0698	0.0927
MgO	1.7884	0.4629	1.1341	0.1234	1.0581	0.9831	0.3498	0.8746	0.7315
Al2O3	16.7577	10.2219	17.1619	14.5336	14.6838	22.6883	15.0006	24.0336	22.7280
SiO2	71.7925	85.5133	72.8351	81.6515	76.8079	70.2812	81.9251	69.1228	70.6790
P2O5	0.1480	0.0232	0.0556	0.0246	0.0773	0.0282	0.0253	0.0339	0.0349
SO3	0.3435	0.2691	0.1507	0.0946	0.6849	0.0612	0.0627	0.0491	0.1342
Cl	0.0034	0.0000	0.0000	0.0033	0.0003	0.0004	0.0077	0.0126	0.0000
K2O	3.6418	1.1161	3.3637	1.3809	2.8926	2.9744	1.2310	2.9399	2.1445
CaO	0.2475	0.1164	0.1055	0.0810	0.5224	0.1348	0.1175	0.2853	0.6154
TiO2	0.6771	0.8421	0.6842	0.6411	0.6454	0.7481	0.4440	0.8305	1.0536
V2O5	0.0245	0.0130	0.0212	0.0205	0.0272	0.0273	0.0134	0.0313	0.0444
Cr2O3	0.0097	0.0085	0.0101	0.0081	0.0097	0.0112	0.0071	0.0112	0.0135
MnO	0.0224	0.0051	0.0439	0.0047	0.0078	0.0057	0.0044	0.0060	0.0040
Fe2O3	3.9778	0.9497	4.0393	1.1843	2.2711	1.8424	0.7009	1.5427	1.5594
Co2O3	0.0007	0.0016	0.0000	0.0013	0.0000	0.0004	0.0000	0.0017	0.0000
NiO	0.0153	0.0136	0.0141	0.0112	0.0130	0.0124	0.0122	0.0122	0.0132
CuO	0.0145	0.0107	0.0139	0.0104	0.0137	0.0097	0.0101	0.0107	0.0131
ZnO	0.0164	0.0060	0.0079	0.0028	0.0089	0.0030	0.0005	0.0027	0.0053
Ga2O3	0.0031	0.0011	0.0029	0.0020	0.0000	0.0032	0.0022	0.0042	0.0058
As2O3	0.0011	0.0000	0.0052	0.0006	0.0003	0.0006	0.0009	0.0000	0.0000
Br	0.0001	0.0004	0.0000	0.0005	0.0002	0.0004	0.0006	0.0000	0.0006
Rb2O	0.0208	0.0121	0.0202	0.0104	0.0160	0.0203	0.0072	0.0199	0.0139
SrO	0.0134	0.0044	0.0076	0.0035	0.0103	0.0079	0.0035	0.0095	0.0144
Y2O3	0.0023	0.0036	0.0025	0.0024	0.0035	0.0014	0.0011	0.0013	0.0019
ZrO2	0.0313	0.0522	0.0311	0.0474	0.0445	0.0269	0.0278	0.0254	0.0299
Nb2O5	0.0014	0.0023	0.0013	0.0012	0.0014	0.0007	0.0002	0.0017	0.0007
MoO3	0.0000	0.0000	0.0000	0.0008	0.0000	0.0000	0.0000	0.0000	0.0000
BaO	0.0775	0.0301	0.0571	0.0244	0.0572	0.0375	0.0148	0.0531	0.0517
HfO2	0.0021	0.0042	0.0051	0.0061	0.0082	0.0053	0.0065	0.0020	0.0046
PbO	0.0070	0.0039	0.0000	0.0007	0.0036	0.0005	0.0006	0.0034	0.0051
ThO2	0.0011	0.0008	0.0000	0.0000	0.0008	0.0003	0.0000	0.0012	0.0000
Pa	0.0066	0.0046	0.0069	0.0033	0.0066	0.0077	0.0031	0.0074	0.0047
U3O8	0.0002	0.0000	0.0000	0.0000	0.0009	0.0004	0.0000	0.0004	0.0000

Middle RHAME BED	34F	35B	35C	35D	36B	37B	38C	38D	41B
	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %
Na2O	0.1010	0.0693	0.0587	0.0816	0.0742	0.0652	0.0613	0.0487	0.0650
MgO	0.6161	1.1085	0.9512	0.9446	0.7175	0.7374	0.1073	0.4672	0.1030
Al2O3	23.3688	19.2402	21.5457	21.8916	17.0646	22.1069	18.3423	15.2425	17.4331
SiO2	70.6040	73.9669	70.9788	71.2100	76.6442	72.3727	78.2775	80.3058	78.1240
P2O5	0.0309	0.0416	0.0309	0.0352	0.0355	0.0321	0.0273	0.0248	0.0300
SO3	0.1143	0.7021	1.3885	0.0837	0.3354	0.1127	0.0812	0.1995	0.0977
Cl	0.0018	0.0023	0.0000	0.0000	0.0061	0.0000	0.0000	0.0015	0.0000
K2O	1.9534	1.5670	1.9908	3.2300	2.5693	2.0163	1.3793	1.8509	1.9819
CaO	0.5513	0.4874	0.9753	0.1095	0.0673	0.1492	0.0735	0.1000	0.0895
TiO2	0.9876	0.8961	0.6422	0.6669	0.7135	0.8254	0.5962	0.5512	0.6317
V2O5	0.0518	0.0402	0.0113	0.0213	0.0220	0.0312	0.0211	0.0192	0.0154
Cr2O3	0.0131	0.0119	0.0108	0.0097	0.0084	0.0094	0.0086	0.0092	0.0085
MnO	0.0054	0.0445	0.0044	0.0050	0.0049	0.0066	0.0038	0.0036	0.0067
Fe2O3	1.4202	1.5873	1.2833	1.5379	1.5809	1.3674	0.8911	1.0393	1.2480
Co2O3	0.0001	0.0139	0.0007	0.0011	0.0017	0.0018	0.0007	0.0002	0.0013
NiO	0.0149	0.0396	0.0131	0.0122	0.0118	0.0132	0.0114	0.0108	0.0121
CuO	0.0146	0.0124	0.0133	0.0119	0.0119	0.0110	0.0108	0.0114	0.0112
ZnO	0.0081	0.0396	0.0048	0.0076	0.0097	0.0095	0.0022	0.0019	0.0119
Ga2O3	0.0045	0.0051	0.0037	0.0032	0.0029	0.0049	0.0034	0.0037	0.0025
As2O3	0.0035	0.0000	0.0037	0.0007	0.0044	0.0000	0.0000	0.0000	0.0017
Br	0.0008	0.0000	0.0006	0.0007	0.0001	0.0005	0.0000	0.0004	0.0004
Rb2O	0.0125	0.0125	0.0133	0.0194	0.0149	0.0140	0.0089	0.0097	0.0124
SrO	0.0128	0.0126	0.0069	0.0049	0.0060	0.0097	0.0037	0.0052	0.0061
Y2O3	0.0016	0.0043	0.0027	0.0022	0.0042	0.0017	0.0014	0.0016	0.0017
ZrO2	0.0316	0.0359	0.0273	0.0326	0.0438	0.0385	0.0524	0.0439	0.0453
Nb2O5	0.0018	0.0019	0.0012	0.0018	0.0011	0.0011	0.0008	0.0007	0.0011
MoO3	0.0001	0.0003	0.0008	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000
BaO	0.0641	0.0435	0.0257	0.0602	0.0339	0.0464	0.0242	0.0306	0.0481
HfO2	0.0047	0.0026	0.0065	0.0059	0.0051	0.0043	0.0061	0.0065	0.0045
PbO	0.0000	0.0046	0.0000	0.0018	0.0000	0.0057	0.0003	0.0058	0.0000
ThO2	0.0000	0.0020	0.0000	0.0000	0.0000	0.0007	0.0002	0.0000	0.0007
Pa	0.0044	0.0037	0.0038	0.0063	0.0047	0.0044	0.0027	0.0035	0.0044
U3O8	0.0002	0.0002	0.0000	0.0005	0.0000	0.0001	0.0003	0.0006	0.0001

Middle RHAME BED	44C	45C	47B	47C	47D	50B	51C	51D	56H
	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %
Na2O	0.1351	0.2550	0.1068	0.1573	0.1601	0.0771	0.0805	0.0952	0.1728
MgO	1.3010	0.9954	1.1625	0.9118	1.4534	0.9774	0.1179	0.8272	0.5582
Al2O3	20.4990	21.1837	17.1160	13.4750	19.7488	20.5447	20.9506	25.4184	15.4757
SiO2	70.9962	71.1094	72.9997	79.1134	69.7441	71.0759	75.2744	68.4559	79.3064
P2O5	0.0279	0.0497	0.0424	0.0264	0.0305	0.0290	0.0388	0.0407	0.0335
SO3	0.3451	0.2416	1.2035	0.2391	0.1869	1.3939	0.1160	0.1228	0.7437
Cl	0.0000	0.0001	0.0059	0.0000	0.0000	0.0059	0.0013	0.0000	0.0093
K2O	3.2839	3.1091	3.6581	3.3439	4.4458	2.5175	1.0982	2.1612	1.8405
CaO	0.1511	0.0805	0.7811	0.0356	0.0780	1.0222	0.1007	0.0777	0.0585
TiO2	0.8374	0.8364	0.6783	0.7045	0.6090	0.7389	0.7966	0.8972	0.6111
V2O5	0.0349	0.0266	0.0160	0.0146	0.0259	0.0233	0.0313	0.0366	0.0175
Cr2O3	0.0106	0.0138	0.0087	0.0070	0.0095	0.0097	0.0105	0.0141	0.0100
MnO	0.0117	0.0068	0.0066	0.0056	0.0072	0.0044	0.0065	0.0055	0.0087
Fe2O3	2.1817	1.9094	2.0175	1.7988	3.2456	1.4312	1.2392	1.6819	0.9954
Co2O3	0.0048	0.0002	0.0032	0.0020	0.0032	0.0028	0.0019	0.0025	0.0023
NiO	0.0166	0.0134	0.0128	0.0116	0.0137	0.0126	0.0125	0.0154	0.0127
CuO	0.0120	0.0134	0.0138	0.0104	0.0166	0.0117	0.0120	0.0142	0.0111
ZnO	0.0196	0.0082	0.0071	0.0048	0.0129	0.0018	0.0049	0.0186	0.0076
Ga2O3	0.0060	0.0049	0.0021	0.0019	0.0045	0.0030	0.0036	0.0053	0.0018
As2O3	0.0009	0.0077	0.0000	0.0000	0.0166	0.0000	0.0000	0.0015	0.0015
Br	0.0006	0.0000	0.0005	0.0001	0.0005	0.0000	0.0002	0.0005	0.0002
Rb2O	0.0206	0.0181	0.0190	0.0239	0.0254	0.0162	0.0078	0.0138	0.0094
SrO	0.0061	0.0107	0.0108	0.0094	0.0079	0.0063	0.0087	0.0089	0.0053
Y2O3	0.0016	0.0010	0.0031	0.0010	0.0017	0.0017	0.0000	0.0000	0.0028
ZrO2	0.0277	0.0188	0.0290	0.0253	0.0187	0.0267	0.0405	0.0238	0.0541
Nb2O5	0.0018	0.0018	0.0018	0.0014	0.0011	0.0019	0.0009	0.0000	0.0005
MoO3	0.0003	0.0000	0.0000	0.0002	0.0000	0.0000	0.0000	0.0000	0.0002
BaO	0.0480	0.0731	0.0754	0.0580	0.0830	0.0495	0.0309	0.0489	0.0395
HfO2	0.0091	0.0040	0.0043	0.0028	0.0044	0.0047	0.0050	0.0062	0.0059
PbO	0.0008	0.0000	0.0057	0.0043	0.0164	0.0033	0.0051	0.0000	0.0000
ThO2	0.0004	0.0000	0.0012	0.0002	0.0169	0.0015	0.0004	0.0000	0.0000
Pa	0.0075	0.0071	0.0067	0.0093	0.0013	0.0052	0.0025	0.0053	0.0032
U3O8	0.0000	0.0001	0.0004	0.0004	0.0104	0.0000	0.0006	0.0007	0.0006

Middle RHAME BED	59E	59F	59G	59H	59I	59J	59L	Mean
	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %
Na2O	1.0676	1.1407	0.1593	0.3502	0.3131	0.3324	0.3929	0.2058
MgO	2.4387	2.7648	0.0388	0.6450	0.7436	0.6591	0.8966	0.8750
Al2O3	20.5416	20.9381	10.2142	20.7501	19.6052	18.6922	19.6253	18.7889
SiO2	65.4279	64.2018	87.1626	71.9972	75.1235	75.8199	74.2914	74.2704
P2O5	0.1670	0.1628	0.0209	0.0316	0.0383	0.0357	0.0416	0.0458
SO3	0.0784	0.2673	0.0507	0.0810	0.0623	0.0701	0.0999	0.3020
Cl	0.0000	0.0048	0.0009	0.0029	0.0032	0.0000	0.0000	0.0022
K2O	3.6189	3.5693	0.3398	1.3584	1.6014	1.9224	1.5784	2.3433
CaO	0.5081	0.3941	0.0891	0.0935	0.1487	0.1409	0.3784	0.2637
TiO2	0.8107	0.7868	1.0974	0.9646	0.7782	0.8634	0.8784	0.7637
V2O5	0.0404	0.0474	0.0197	0.0309	0.0216	0.0439	0.0345	0.0271
Cr2O3	0.0123	0.0139	0.0106	0.0119	0.0131	0.0130	0.0123	0.0106
MnO	0.0505	0.0452	0.0090	0.0595	0.0059	0.0083	0.0201	0.0132
Fe2O3	4.9931	5.4452	0.6575	3.4987	1.3966	1.2153	1.5916	1.9212
Co2O3	0.0032	0.0026	0.0019	0.0019	0.0008	0.0029	0.0011	0.0019
NiO	0.0195	0.0207	0.0122	0.0123	0.0107	0.0169	0.0127	0.0142
CuO	0.0159	0.0162	0.0100	0.0121	0.0128	0.0131	0.0125	0.0124
ZnO	0.0226	0.0219	0.0026	0.0034	0.0036	0.0178	0.0046	0.0091
Ga2O3	0.0043	0.0046	0.0013	0.0031	0.0037	0.0030	0.0032	0.0034
As2O3	0.0000	0.0027	0.0010	0.0019	0.0012	0.0000	0.0010	0.0017
Br	0.0003	0.0000	0.0002	0.0005	0.0005	0.0002	0.0006	0.0003
Rb2O	0.0168	0.0176	0.0039	0.0094	0.0093	0.0089	0.0090	0.0143
SrO	0.0195	0.0171	0.0044	0.0078	0.0105	0.0099	0.0097	0.0087
Y2O3	0.0030	0.0014	0.0018	0.0006	0.0012	0.0013	0.0011	0.0019
ZrO2	0.0163	0.0187	0.0615	0.0347	0.0335	0.0361	0.0341	0.0343
Nb2O5	0.0010	0.0002	0.0019	0.0011	0.0002	0.0007	0.0010	0.0012
MoO3	0.0000	0.0003	0.0001	0.0000	0.0000	0.0000	0.0003	0.0001
BaO	0.1062	0.0827	0.0184	0.0273	0.0517	0.0564	0.0588	0.0496
HfO2	0.0029	0.0023	0.0066	0.0052	0.0019	0.0078	0.0040	0.0049
PbO	0.0056	0.0003	0.0009	0.0000	0.0000	0.0044	0.0018	0.0027
ThO2	0.0010	0.0016	0.0000	0.0007	0.0006	0.0005	0.0010	0.0010
Pa	0.0063	0.0063	0.0006	0.0019	0.0031	0.0034	0.0021	0.0047
U3O8	0.0004	0.0006	0.0002	0.0006	0.0000	0.0001	0.0000	0.0006

LOWER RHAME BED	2b	28E	29D	34G	34H	35E	47E	56I	59K	Mean
	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %
Na2O	0.1196	0.1364	0.0884	0.0507	0.0889	0.1045	0.2168	0.1625	0.3783	0.1496
MgO	0.5828	5.7105	0.6784	0.3401	0.5377	1.3964	1.0151	1.2067	0.7536	1.3579
Al2O3	19.6366	15.8235	22.9774	18.4420	22.0579	18.9926	15.7959	17.4468	18.2119	18.8205
SiO2	75.0887	62.7308	71.9153	78.1274	72.8447	70.8412	77.1383	73.6340	75.6446	73.1072
P2O5	0.0389	0.1634	0.0431	0.0292	0.0375	0.0376	0.0297	0.0581	0.0354	0.0525
SO3	0.0951	0.1641	0.1051	0.0751	0.0689	0.3346	0.3093	0.3840	0.1176	0.1838
Cl	0.0000	0.0000	0.0000	0.0000	0.0040	0.0000	0.0025	0.0000	0.0041	0.0012
K2O	2.1739	3.8557	1.4035	1.2538	1.9121	4.1908	2.6839	3.6148	2.1250	2.5793
CaO	0.0906	4.8604	0.1985	0.1518	0.3044	0.2377	0.0889	0.1443	0.1581	0.6927
TiO2	0.8390	0.6293	0.8263	0.7181	0.9029	0.6388	0.5853	0.7269	0.8585	0.7472
V2O5	0.0375	0.0228	0.0423	0.0226	0.0379	0.0219	0.0218	0.0247	0.0352	0.0296
Cr2O3	0.0137	0.0095	0.0147	0.0108	0.0142	0.0109	0.0083	0.0104	0.0125	0.0117
MnO	0.0064	0.0977	0.0099	0.0035	0.0040	0.0076	0.0062	0.0074	0.0089	0.0168
Fe2O3	1.1093	5.5910	1.5407	0.6494	1.0220	2.9881	1.9492	2.3914	1.4500	2.0768
Co2O3	0.0018	0.0029	0.0032	0.0013	0.0016	0.0024	0.0000	0.0027	0.0049	0.0023
NiO	0.0149	0.0159	0.0144	0.0124	0.0145	0.0127	0.0129	0.0116	0.0225	0.0146
CuO	0.0159	0.0128	0.0168	0.0113	0.0148	0.0133	0.0132	0.0118	0.0148	0.0139
ZnO	0.0114	0.0133	0.0059	0.0044	0.0090	0.0161	0.0076	0.0086	0.0214	0.0109
Ga2O3	0.0039	0.0029	0.0036	0.0025	0.0015	0.0038	0.0029	0.0039	0.0042	0.0032
As2O3	0.0017	0.0042	0.0000	0.0021	0.0000	0.0046	0.0000	0.0009	0.0022	0.0017
Br	0.0003	0.0000	0.0004	0.0005	0.0008	0.0006	0.0007	0.0008	0.0006	0.0005
Rb2O	0.0115	0.0212	0.0107	0.0069	0.0114	0.0225	0.0155	0.0182	0.0101	0.0142
SrO	0.0095	0.0113	0.0123	0.0044	0.0109	0.0094	0.0063	0.0083	0.0132	0.0095
Y2O3	0.0022	0.0026	0.0010	0.0016	0.0024	0.0027	0.0025	0.0041	0.0014	0.0023
ZrO2	0.0314	0.0203	0.0368	0.0311	0.0336	0.0228	0.0399	0.0289	0.0342	0.0310
Nb2O5	0.0013	0.0006	0.0018	0.0000	0.0014	0.0014	0.0000	0.0012	0.0007	0.0009
MoO3	0.0000	0.0000	0.0001	0.0006	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
BaO	0.0529	0.0849	0.0328	0.0390	0.0485	0.0710	0.0324	0.0588	0.0684	0.0543
HfO2	0.0045	0.0039	0.0046	0.0045	0.0041	0.0042	0.0051	0.0053	0.0039	0.0045
PbO	0.0000	0.0000	0.0075	0.0000	0.0046	0.0000	0.0038	0.0148	0.0000	0.0034
ThO2	0.0010	0.0000	0.0010	0.0000	0.0007	0.0012	0.0000	0.0009	0.0002	0.0006
Pa	0.0033	0.0079	0.0035	0.0027	0.0030	0.0082	0.0060	0.0000	0.0033	0.0042
U3O8	0.0004	0.0003	0.0000	0.0002	0.0001	0.0004	0.0000	0.0072	0.0003	0.0010

Upper SENTINEL BUTTE Fm.

	19G	21G	24I	MEAN
	Mass %	**Mass %**	**Mass %**	**Mass %**
Na2O	**0.3267**	**0.1084**	**0.4872**	0.3074
MgO	**0.0908**	**0.6344**	**1.1463**	0.6238
Al2O3	**20.1907**	**19.0000**	**19.7268**	19.6392
SiO2	**75.1495**	**73.8580**	**71.7850**	73.5975
P2O5	**0.0320**	**0.0297**	**0.0349**	0.0322
SO3	**0.4013**	**0.3715**	**1.1131**	0.6286
Cl	**0.0000**	**0.0000**	**0.0000**	0.0000
K2O	**1.0394**	**1.2863**	**2.8268**	1.7175
CaO	**0.0639**	**0.0625**	**0.0492**	0.0585
TiO2	**0.8542**	**0.7399**	**0.8171**	0.8037
V2O5	**0.0243**	**0.0303**	**0.0364**	0.0303
Cr2O3	**0.0115**	**0.0116**	**0.0117**	0.0116
MnO	**0.0063**	**0.0124**	**0.0243**	0.0143
Fe2O3	**1.6549**	**3.7226**	**1.7233**	2.3669
Co2O3	**0.0022**	**0.0016**	**0.0032**	0.0023
NiO	**0.0145**	**0.0126**	**0.0155**	0.0142
CuO	**0.0101**	**0.0126**	**0.0164**	0.0130
ZnO	**0.0126**	**0.0062**	**0.0140**	0.0109
Ga2O3	**0.0047**	**0.0024**	**0.0027**	0.0033
As2O3	**0.0010**	**0.0026**	**0.0023**	0.0020
Br	**0.0001**	**0.0004**	**0.0000**	0.0002
Rb2O	**0.0074**	**0.0064**	**0.0132**	0.0090
SrO	**0.0110**	**0.0059**	**0.0094**	0.0088
Y2O3	**0.0021**	**0.0010**	**0.0024**	0.0018
ZrO2	**0.0338**	**0.0276**	**0.0234**	0.0283
Nb2O5	**0.0014**	**0.0012**	**0.0005**	0.0010
MoO3	**0.0000**	**0.0000**	**0.0001**	0.0000
BaO	**0.0467**	**0.0453**	**0.1106**	0.0675
HfO2	**0.0039**	**0.0050**	**0.0000**	0.0030
PbO	**0.0000**	**0.0000**	**0.0000**	0.0000
ThO2	**0.0000**	**0.0000**	**0.0001**	0.0000
Pa	**0.0023**	**0.0016**	**0.0040**	0.0026
U3O8	**0.0007**	**0.0000**	**0.0001**	0.0003

Lower BULLION CREEK Fm.	56A	56B	56C	56D	59A	59B	MEAN
	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %
Na2O	0.2424	0.3184	0.3303	0.2022	0.8488	1.1408	0.5138
MgO	5.0876	1.1298	0.6650	0.3796	5.2165	4.5486	2.8379
Al2O3	15.1100	16.2281	19.5781	13.9135	14.8376	15.2142	15.8136
SiO2	62.4195	76.0433	76.0784	82.6602	60.4811	62.8563	70.0898
P2O5	0.1923	0.0353	0.0344	0.0341	0.1417	0.1273	0.0942
SO3	1.8956	0.3121	0.3260	0.4913	0.0733	0.1268	0.5375
Cl	0.0000	0.0000	0.0031	0.0000	0.0000	0.0120	0.0025
K2O	2.9296	3.0149	0.8298	0.1573	3.8588	4.2090	2.4999
CaO	6.9699	0.1510	0.1344	0.1246	8.9749	6.4930	3.8080
TiO2	0.6235	0.6642	0.9494	1.1906	0.5014	0.5218	0.7418
V2O5	0.0248	0.0145	0.0175	0.0176	0.0206	0.0236	0.0198
Cr2O3	0.0102	0.0072	0.0091	0.0075	0.0103	0.0096	0.0090
MnO	0.0678	0.0579	0.0045	0.0038	0.1033	0.1252	0.0604
Fe2O3	4.2548	1.8700	0.9060	0.6919	4.7380	4.3797	2.8067
Co2O3	0.0039	0.0008	0.0006	0.0027	0.0039	0.0034	0.0025
NiO	0.0151	0.0125	0.0145	0.0164	0.0159	0.0154	0.0150
CuO	0.0144	0.0109	0.0120	0.0114	0.0144	0.0134	0.0127
ZnO	0.0149	0.0096	0.0070	0.0046	0.0134	0.0127	0.0104
Ga2O3	0.0032	0.0017	0.0050	0.0036	0.0033	0.0024	0.0032
As2O3	0.0000	0.0000	0.0035	0.0000	0.0000	0.0019	0.0009
Br	0.0005	0.0006	0.0004	0.0003	0.0004	0.0004	0.0004
Rb2O	0.0174	0.0166	0.0062	0.0000	0.0220	0.0236	0.0143
SrO	0.0147	0.0064	0.0055	0.0040	0.0153	0.0128	0.0098
Y2O3	0.0021	0.0013	0.0020	0.0044	0.0018	0.0015	0.0022
ZrO2	0.0253	0.0334	0.0492	0.0592	0.0151	0.0164	0.0331
Nb2O5	0.0004	0.0015	0.0014	0.0028	0.0004	0.0000	0.0011
MoO3	0.0000	0.0000	0.0004	0.0004	0.0000	0.0000	0.0001
BaO	0.0468	0.0435	0.0178	0.0014	0.0710	0.0788	0.0432
HfO2	0.0023	0.0040	0.0053	0.0080	0.0023	0.0040	0.0043
PbO	0.0047	0.0047	0.0000	0.0057	0.0061	0.0009	0.0055
ThO2	0.0003	0.0000	0.0011	0.0007	0.0005	0.0029	0.0006
Pa	0.0056	0.0056	0.0020	0.0000	0.0079	0.0095	0.0040
U3O8	0.0005	0.0002	0.0001	0.0002	0.0000	0.0003	0.0018

Upper SLOPE Fm.	29E	29F	34I	41D	48C	48D	MEAN
	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %
Na2O	0.0628	0.1356	0.0713	0.0928	0.6659	0.8611	0.3149
MgO	0.0922	0.6797	0.7858	1.0249	0.3214	1.9084	0.8021
Al2O3	19.1969	20.3642	18.1652	17.2439	18.2576	19.4913	18.7865
SiO2	77.1117	74.6492	75.8314	73.6953	73.5310	68.7881	73.9345
P2O5	0.0325	0.0581	0.0366	0.0387	0.0920	0.1285	0.0644
SO3	0.1196	0.1204	0.0612	0.4752	0.1692	0.4680	0.2356
Cl	0.0000	0.0000	0.0000	0.0050	0.0000	0.0000	0.0008
K2O	1.1007	1.4658	2.2392	3.7132	2.2691	2.9646	2.2921
CaO	0.1509	0.1242	0.4391	0.0311	0.3511	0.3418	0.2397
TiO2	0.7277	0.7595	0.7608	0.7148	0.7225	0.6550	0.7234
V2O5	0.0320	0.0303	0.0108	0.0213	0.0332	0.0174	0.0242
Cr2O3	0.0125	0.0135	0.0099	0.0096	0.0108	0.0117	0.0113
MnO	0.0057	0.0070	0.0062	0.0068	0.0186	0.0297	0.0123
Fe2O3	1.2088	1.4136	1.3915	2.7427	3.3567	4.1252	2.3731
Co2O3	0.0032	0.0057	0.0035	0.0020	0.0033	0.0074	0.0042
NiO	0.0142	0.0211	0.0180	0.0128	0.0185	0.0184	0.0172
CuO	0.0120	0.0118	0.0123	0.0136	0.0142	0.0131	0.0128
ZnO	0.0091	0.0423	0.0226	0.0106	0.0174	0.0211	0.0205
Ga2O3	0.0031	0.0044	0.0037	0.0026	0.0034	0.0046	0.0036
As2O3	0.0032	0.0031	0.0000	0.0052	0.0000	0.0036	0.0025
Br	0.0005	0.0007	0.0000	0.0004	0.0005	0.0008	0.0005
Rb2O	0.0068	0.0092	0.0169	0.0186	0.0148	0.0191	0.0142
SrO	0.0079	0.0103	0.0139	0.0079	0.0165	0.0140	0.0118
Y2O3	0.0014	0.0038	0.0026	0.0025	0.0019	0.0035	0.0026
ZrO2	0.0457	0.0366	0.0383	0.0336	0.0324	0.0247	0.0352
Nb2O5	0.0014	0.0008	0.0010	0.0008	0.0009	0.0009	0.0010
MoO3	0.0002	0.0000	0.0003	0.0000	0.0000	0.0006	0.0002
BaO	0.0285	0.0175	0.0405	0.0629	0.0594	0.0634	0.0454
HfO2	0.0065	0.0076	0.0057	0.0047	0.0082	0.0061	0.0065
PbO	0.0000	0.0000	0.0046	0.0000	0.0038	0.0000	0.0014
ThO2	0.0005	0.0003	0.0000	0.0000	0.0003	0.0012	0.0004
Pa	0.0018	0.0037	0.0067	0.0065	0.0053	0.0067	0.0051
U3O8	0.0000	0.0000	0.0004	0.0000	0.0001	0.0000	0.0001

Appendix D

Clay Mineralogy by X-Ray Diffraction

Clay Mineralogy by X-Ray Diffraction

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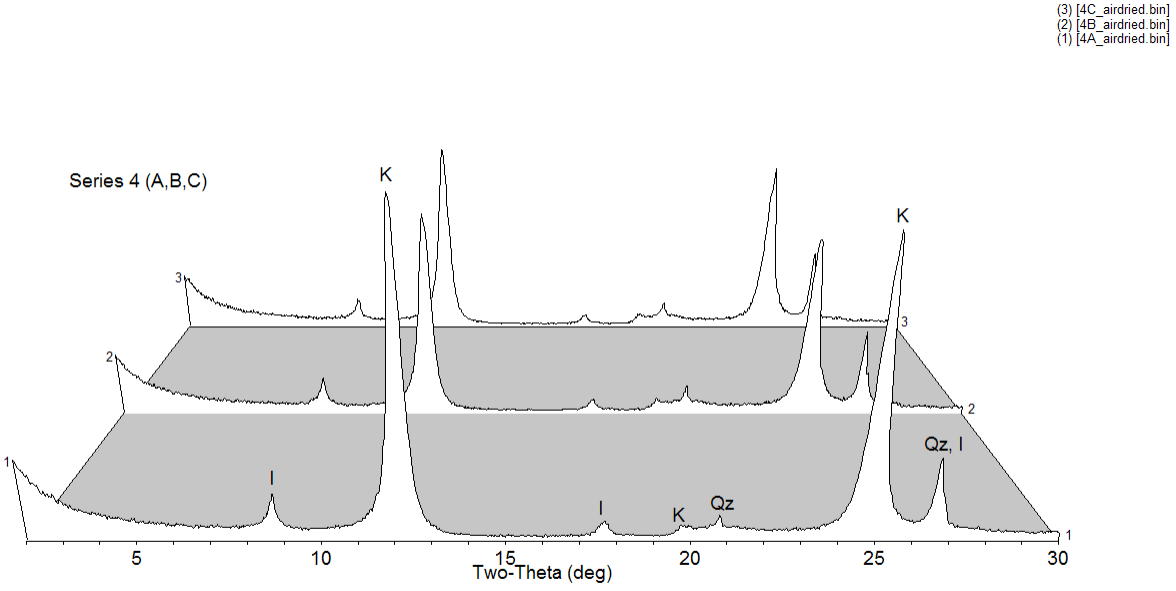
Center for Nanoscale Science & Engineering
North Dakota State University
June 30, 2013

Qualitative XRD Results
The mineralogical results for crystalline phases, as determined by XRD, are given below.

Sample Series 4 (4A, 4B, 4C)

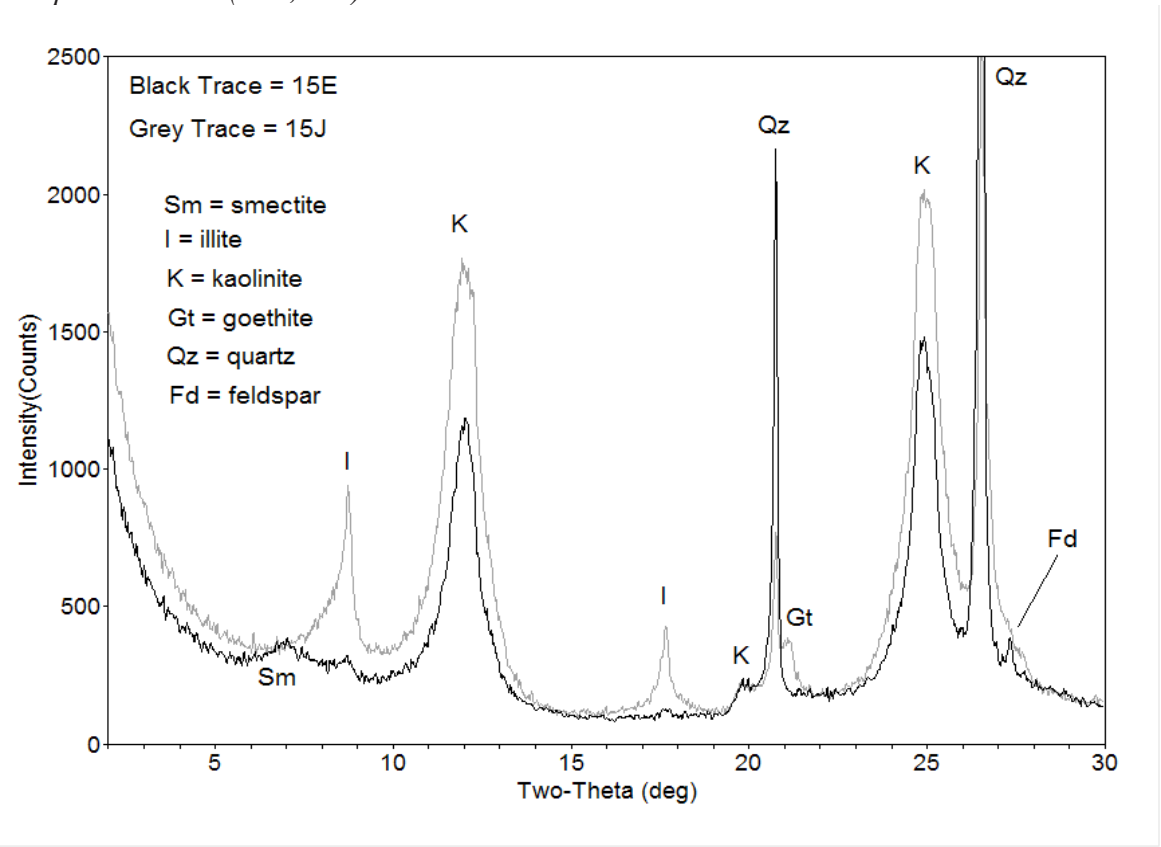


Clay Minerals **Mica-illite** and **kaolinite** were present, with kaolinite being the dominant phase. Presence of very poorly ordered smectite or other large basal spacing clays is also possible. No glycolation performed on these samples to confirm or deny.

Non-Clay Minerals Minor **quartz**.

Qualitative Trends Noted: Kaolinite peaks higher in 4A than in 4B and 4C, which had very similar peak heights. Otherwise, these three samples are remarkably similar by x-ray diffraction.

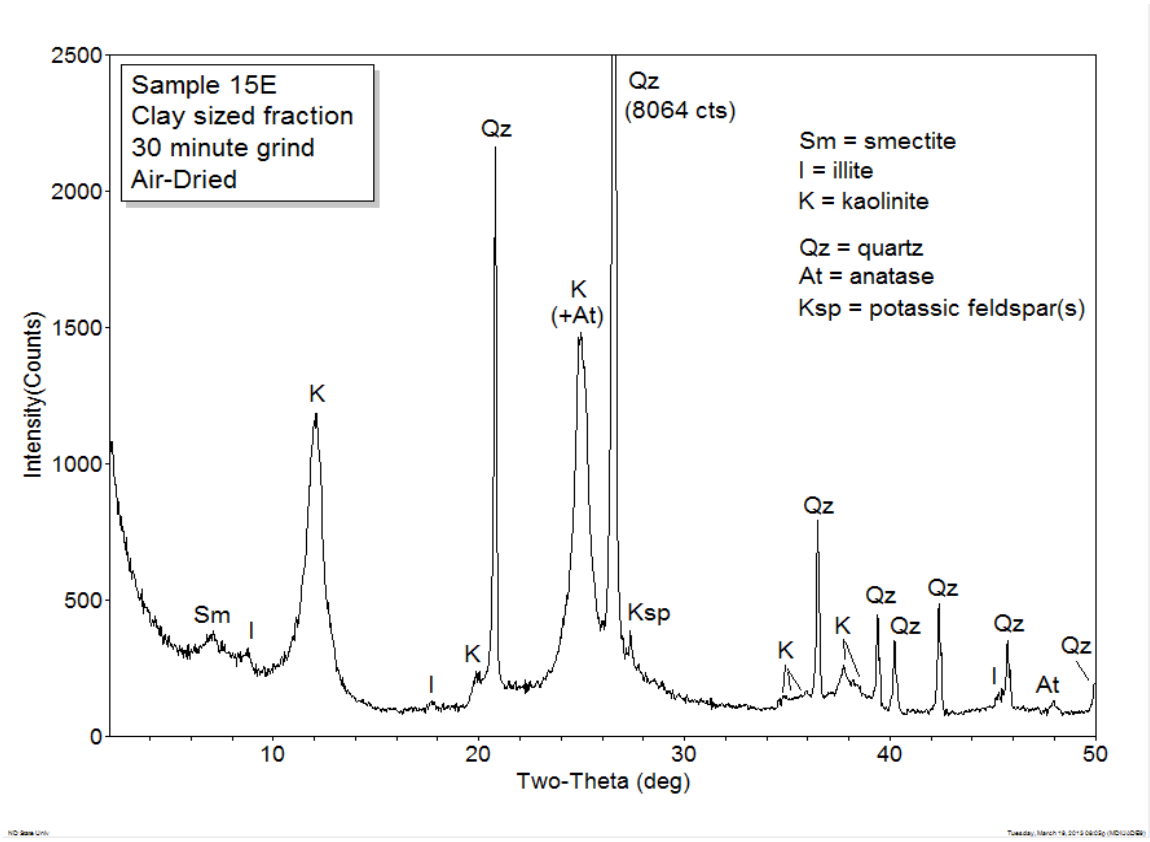
Sample Series 15 (15E, 15J)

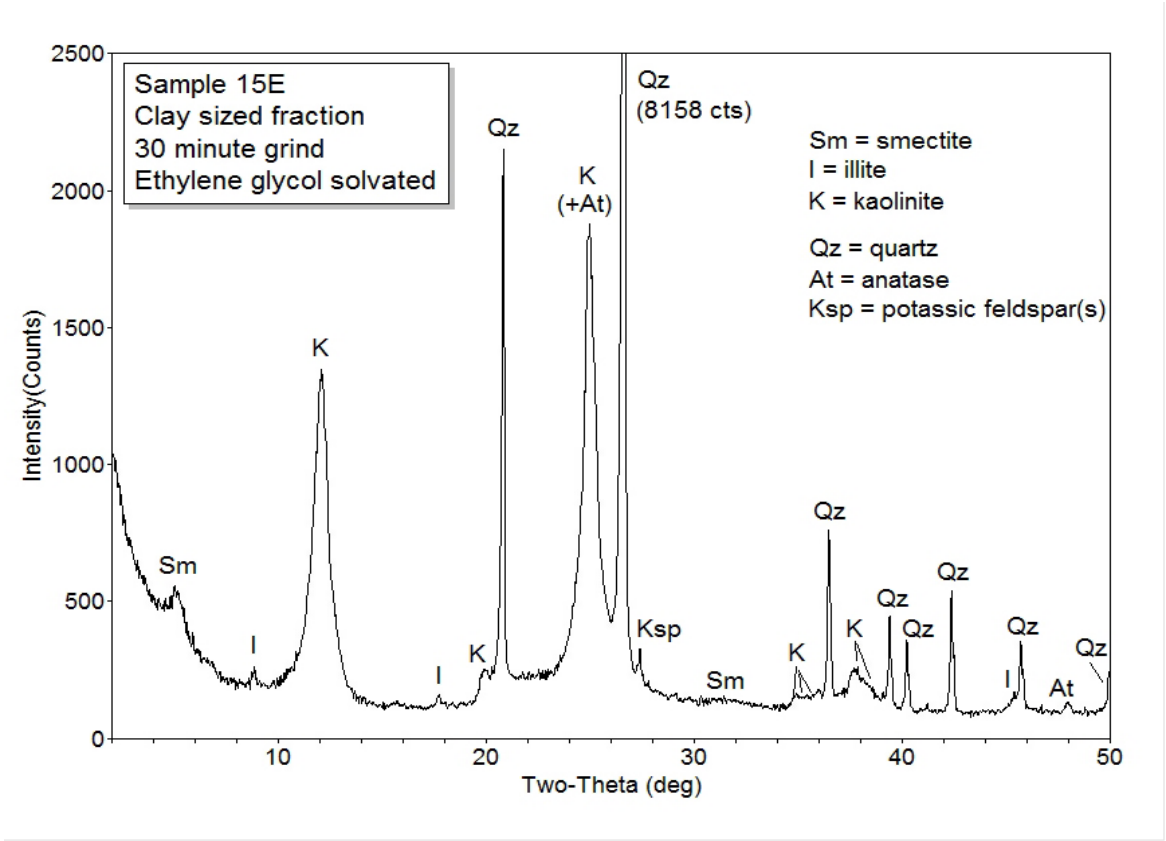


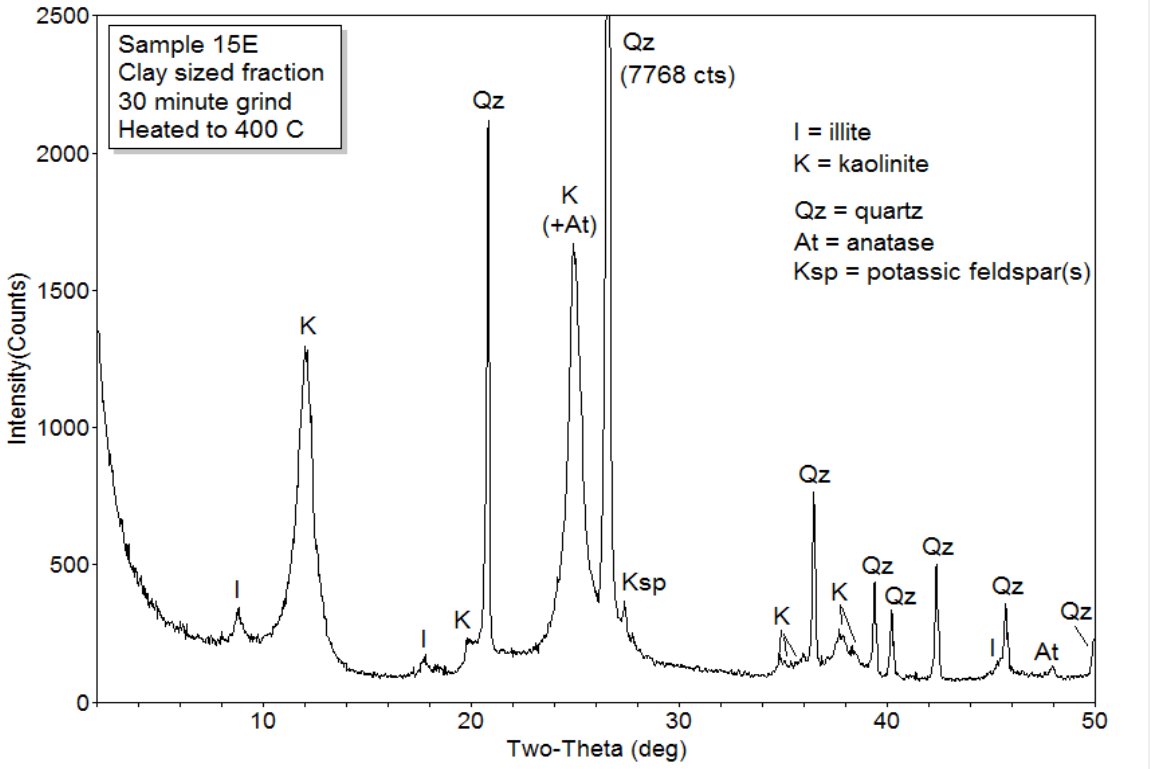
Clay Minerals **Kaolinite** was the dominant phase in both scans. Major illite present in 15E, and minor to trace amounts of illite present in 15J. Presence of smectite positively confirmed by glycolation treatment in 15E.

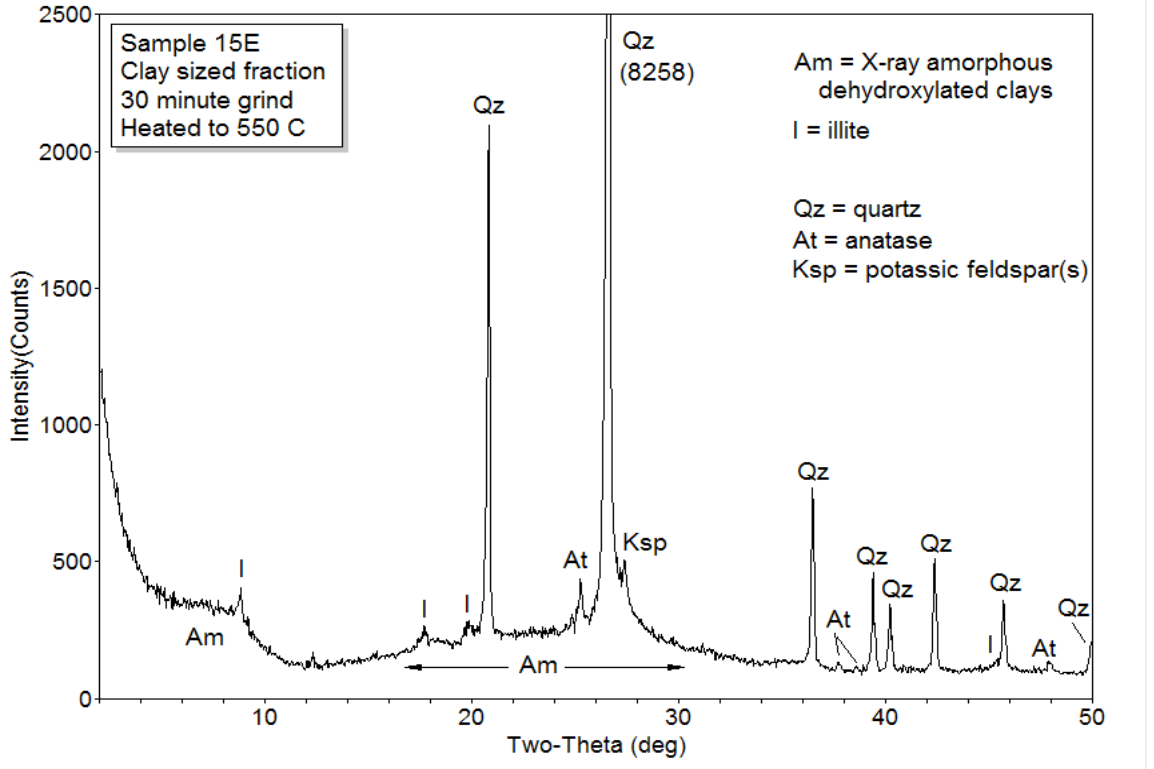
Diffraction patterns before and after glycolation treatment for sample 15J show a significant change over the low angle range of approximately 4-9 degrees 2-theta. The low angle "tail" visible for the illite (001) peak is not present after solvation with ethylene glycol, and the background at lower angles (4-6 degrees or so) shows a slight elevation following treatment, without producing a distinct diffraction maxima at 5.2 degrees, as would be expected for pure smectite. There is also a change in the background between 21-26 degrees 2-theta. This would suggest the presence of a swelling clay such as interlayered illite-smectite with a very low smectite component. However, glycolation treatment also produced a significant change in the (001) peak of kaolinite in sample 15J. Following treatment, this reflection has increased peak height, reduced peak width, and position shift, perhaps corresponding to the dehydration of an associated 10 Angstrom species (halloysite?) that contributed intensity to the low angle side of K(001) prior to glycolation. See note at end of this section regarding 10 Angstrom halloysite.

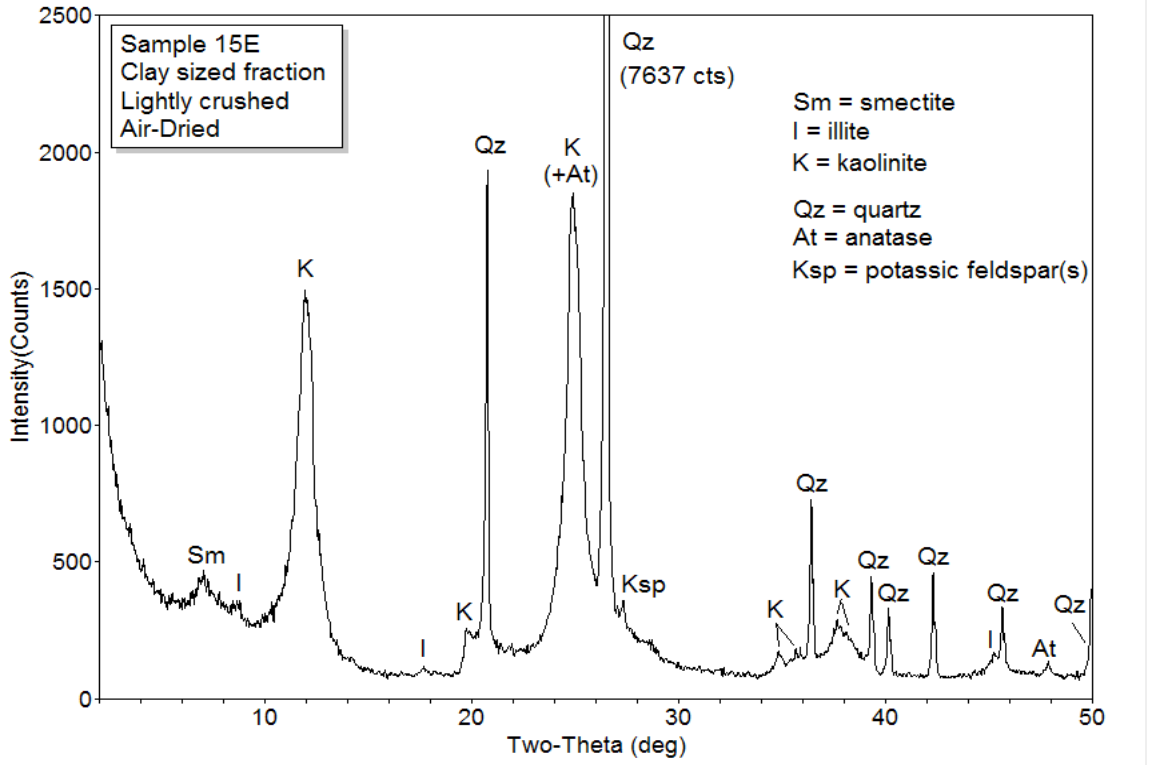
Non-Clay Minerals **Quartz** present in both samples. Trace amounts of **potassic feldspar** were noted in sample 15E, and **goethite** was observed in sample 15J (converted to **maghemite** during heat treatment). Minor **anatase**, suggested by a weak and otherwise unaccounted reflection near 48 degrees, was confirmed by thermal treatment, which revealed the characteristic reflection of anatase near 25.2 degrees following disappearance of the overlapping kaolinite (002) reflection.

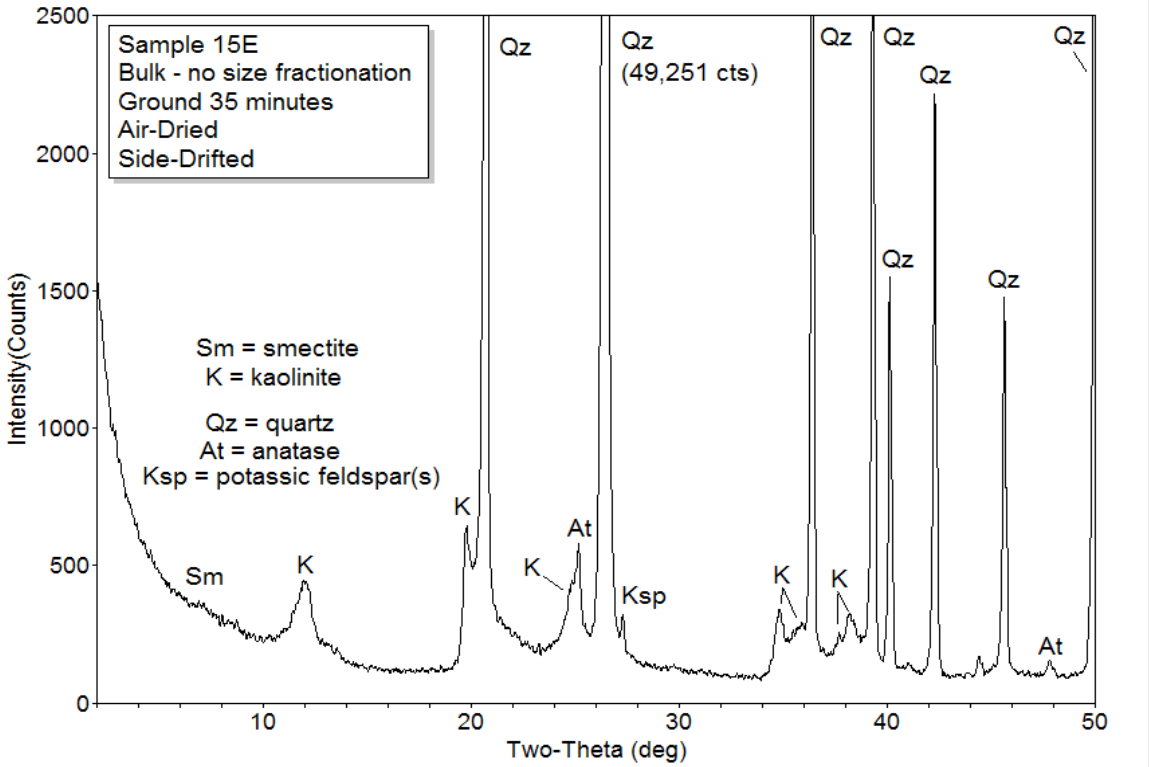

Sample 15E
Clay sized fraction
30 minute grind
Air-Dried
Qz
(8064 cts)
Sm = smectite
I = illite
K = kaolinite
Qz = quartz
At = anatase
Ksp = potassic feldspar(s)
Intensity(Counts)
Two-Theta (deg)
Sm
I
K
Qz
K
(+At)
Ksp
At

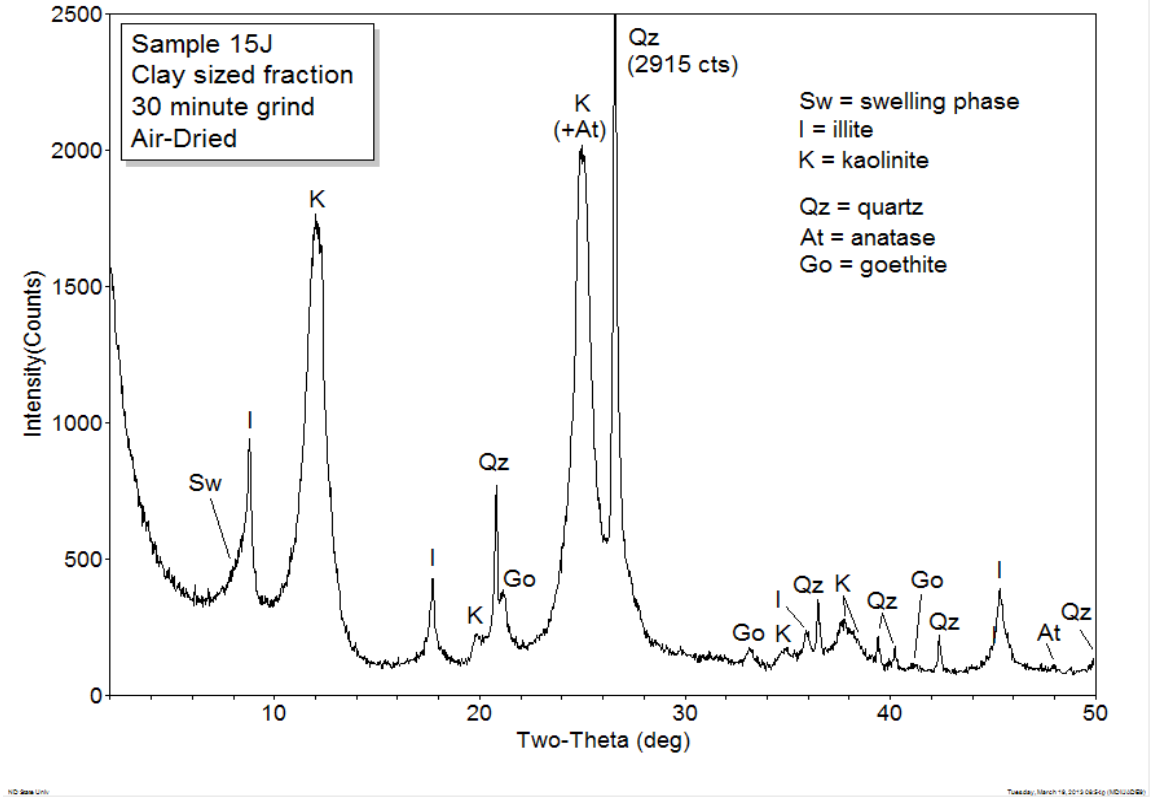

Sample 15E
Clay sized fraction
30 minute grind
Ethylene glycol solvated
Qz
(8158 cts)
Sm = smectite
I = illite
K = kaolinite
Qz = quartz
At = anatase
Ksp = potassic feldspar(s)
Intensity(Counts)
Two-Theta (deg)
Sm
I
K
Qz
K
(+At)
Ksp
At

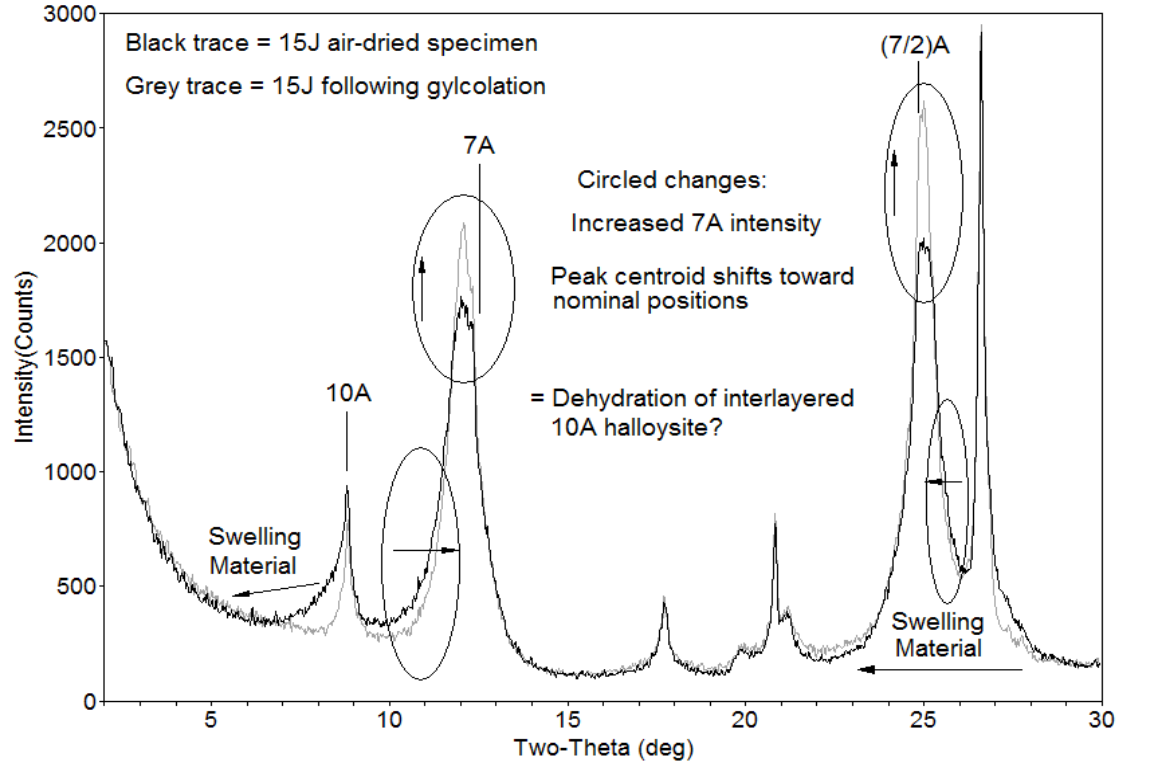

Sample 15E
Clay sized fraction
30 minute grind
Heated to 400 C
Qz
(7768 cts)
I = illite
K = kaolinite
Qz = quartz
At = anatase
Ksp = potassic feldspar(s)
Intensity(Counts)
Two-Theta (deg)


Sample 15E
Clay sized fraction
30 minute grind
Heated to 550 C
Qz
(8258)
Am = X-ray amorphous
dehydroxylated clays
I = illite
Qz = quartz
At = anatase
Ksp = potassic feldspar(s)
Intensity(Counts)
Two-Theta (deg)

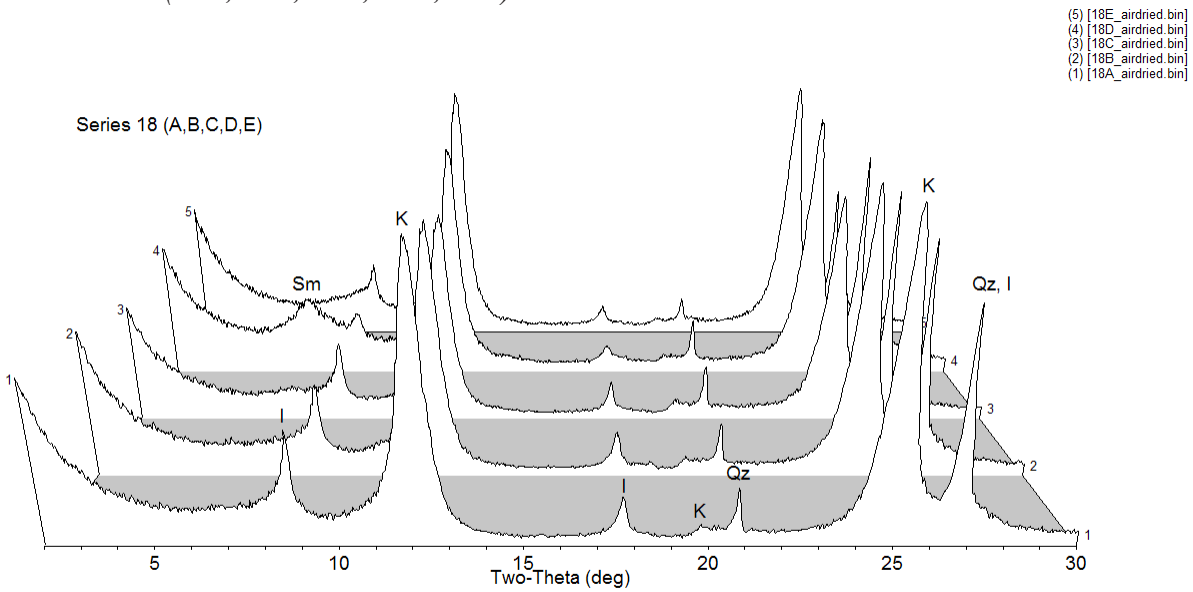

Sample 15E
Clay sized fraction
Lightly crushed
Air-Dried
Qz
(7637 cts)
Sm = smectite
I = illite
K = kaolinite
Qz = quartz
At = anatase
Ksp = potassic feldspar(s)
Intensity(Counts)
Two-Theta (deg)
Sm
I
K
Qz
K
(+At)
Ksp
At

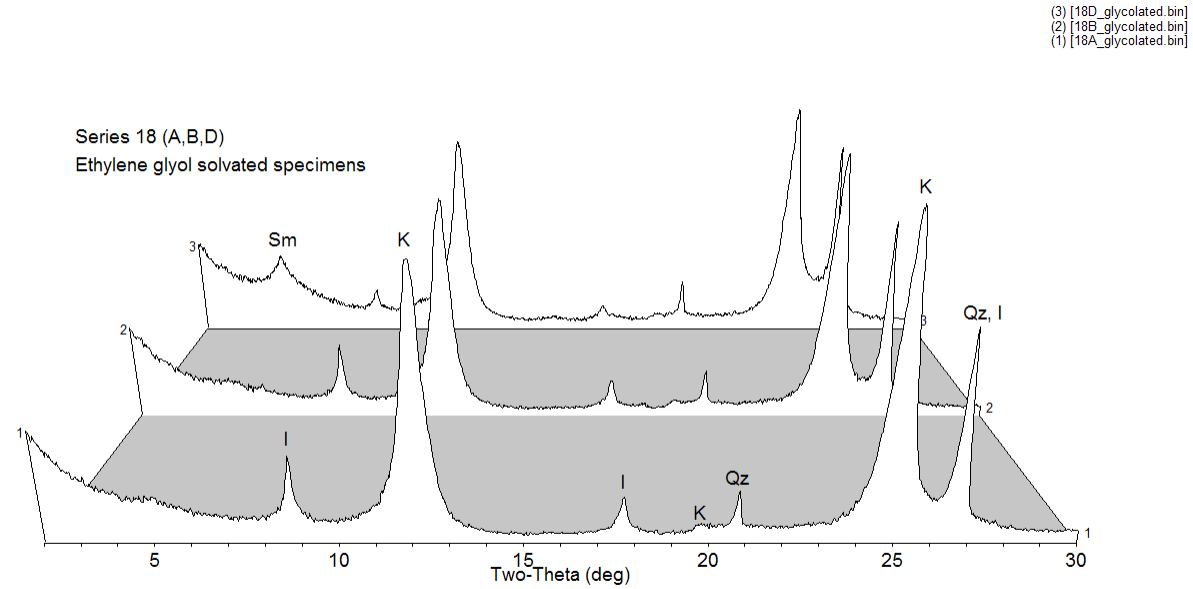

Sample 15E
Bulk - no size fractionation
Ground 35 minutes
Air-Dried
Side-Drifted
Qz
(49,251 cts)
Sm = smectite
K = kaolinite
Qz = quartz
At = anatase
Ksp = potassic feldspar(s)
Intensity(Counts)
Two-Theta (deg)
Sm
K
At
Ksp


Sample 15J
Clay sized fraction
30 minute grind
Air-Dried
Qz
(2915 cts)
K
(+At)
Sw = swelling phase
I = illite
K = kaolinite
Qz = quartz
At = anatase
Go = goethite
Intensity(Counts)
Two-Theta (deg)
Sw
I
K
I
Qz
K
Go
Go
K
I
Qz
K
Qz
Go
Qz
I
At
Qz


Black trace = 15J air-dried specimen
Grey trace = 15J following gylcolation
7A
(7/2)A
Circled changes:
Increased 7A intensity
Peak centroid shifts toward
nominal positions
= Dehydration of interlayered
10A halloysite?
10A
Swelling
Material
Swelling
Material
Intensity(Counts)
Two-Theta (deg)

Sample Series 18 (18A, 18B, 18C, 18D, 18E)

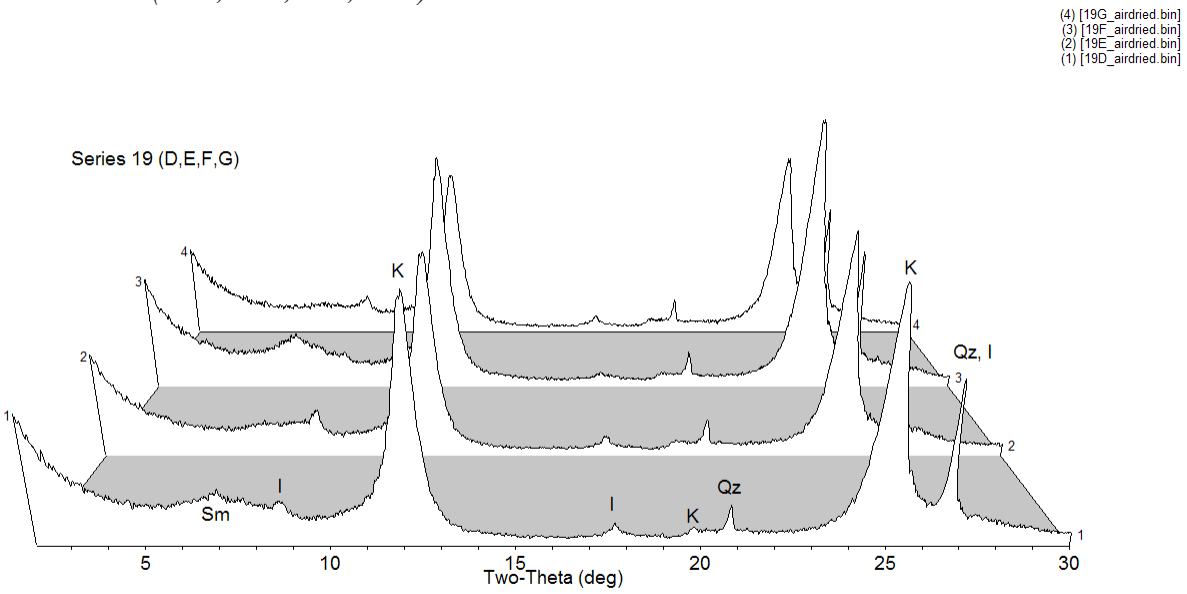




Clay Minerals **Smectite**, **mica-illite**, and **kaolinite** were present in all samples. Kaolinite was dominant in all cases, with peak heights decreasing toward the center at sample 18C. Minor illite peak heights decrease from 18A through 18D, rising again in 18E. Smectite was confirmed by treatment with ethylene glycol in samples 18A, 18B, and 18D. By comparison within this sample set, poorly ordered smectite is probable in all five samples. **Chlorite** was also present in amounts near the detection limit in sample 18B.

Non-Clay Minerals **Quartz**. Minor **anatase** revealed in heat treated specimens of 18A, 18B, and 18D. Based on the weak reflection near 48 degrees 2-theta, anatase is also probable in 18C, and possible in 18E.

Sample Series 19 (19D, 19E, 19F, 19G)



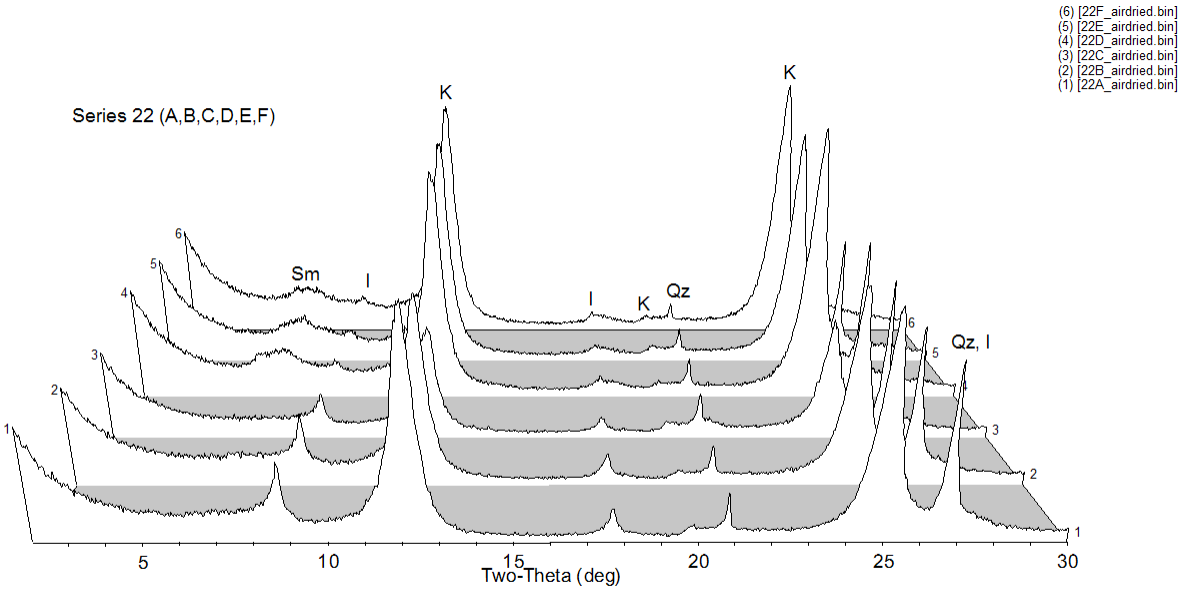
Clay Minerals

Smectite, **mica-illite**, and **kaolinite** were present in all samples. Kaolinite was dominant in all cases, with the highest reflection in sample 19F. Mica-illite peak heights are uniformly low. Smectite was confirmed by treatment with ethylene glycol in sample 19F, and apparent in the air-dried specimens of the other samples in this series. Variation among smectite diffraction intensity contributions at low angles are the primary differences among this series of samples.

Non-Clay Minerals

Quartz. Minor **anatase** likely in all samples, based on the weak reflection near 48 degrees 2-theta, and confirmed at 25.2 degrees 2-theta by heat treatment of sample 19F.

Sample Series 22



Clay Minerals

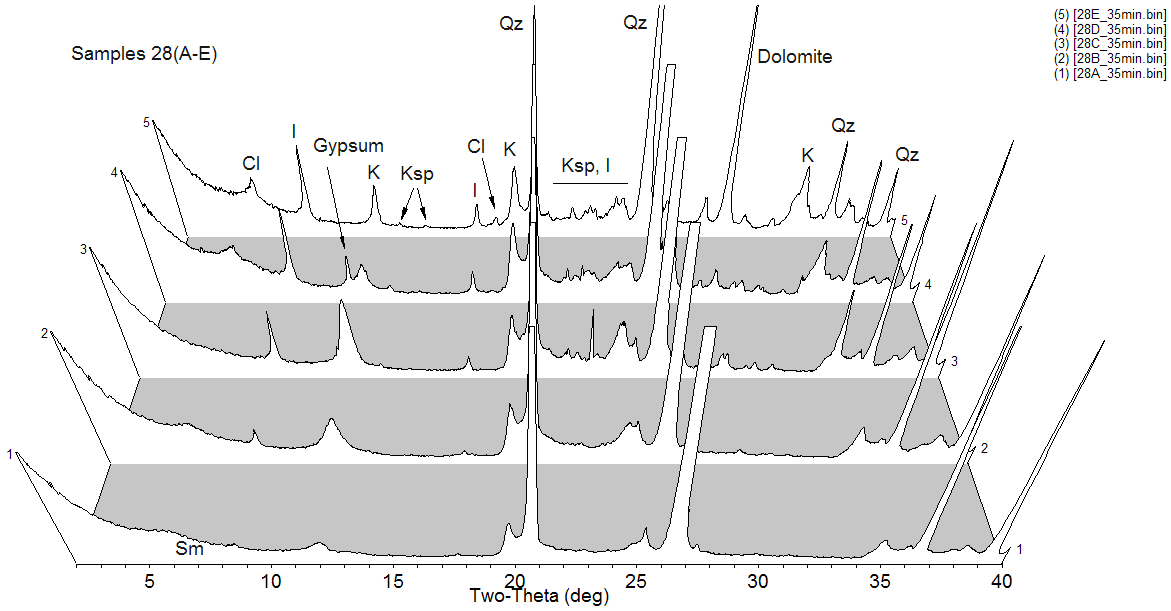
Smectite, **mica-illite**, and **kaolinite** were present in all samples. Kaolinite was dominant in all cases, with peak heights decreasing from sample 22A through 22C, then increasing and holding relatively constant through samples 22D-22F. Minor illite peak heights vary from minor in samples 22A through 22C to weak in samples 22D through 22F. Smectite was confirmed by treatment with ethylene glycol in sample 22F, and apparent in the air-dried specimens of all other samples of this series with the possible exception of 22C.

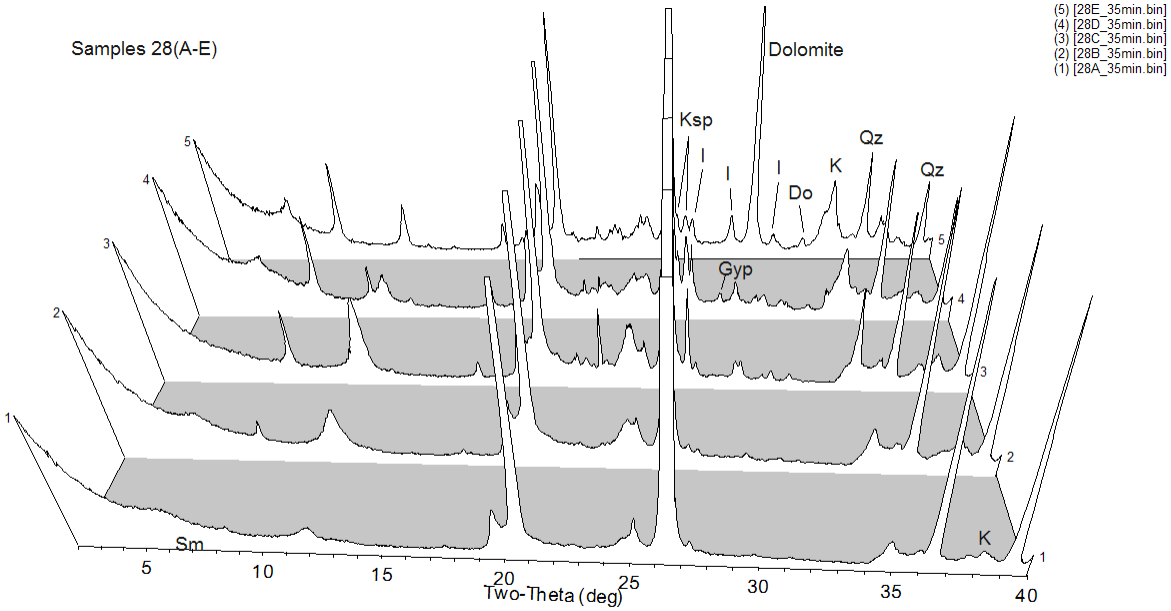
Non-Clay Minerals

Quartz and potassic feldspar. Minor **anatase** revealed in the heat treated specimen of 22F. Based on the weak reflection near 48 degrees 2-theta, anatase is also probable in the remainder of the samples. One specimen (22C) has a weak, broad reflection near 21.1 degrees 2-theta. This is near the characteristic line of goethite, but there are no unaccounted additional reflections present to confirm. This is also the position that poorly-ordered hydrated silica phases produce reflections, often in assemblages rich in bentonite.

Qualitative Trends Noted

The first three of these specimens (22A-22C) share a common assemblage according to XRD data (low smectite, minor illite, dominant kaolinite in a decreasing series; quartz, feldspar, anatase). The primary variation in this set of three is the decreasing intensity of kaolinite. The second set of three (22D-22F) also bear remarkable similarity as a separate assemblage (notably higher amounts of smectite relative to 22A-22C, very low amounts of illite, relatively constant kaolinite; quartz, feldspar, anatase), with less variation among them compared to 22A-22C.

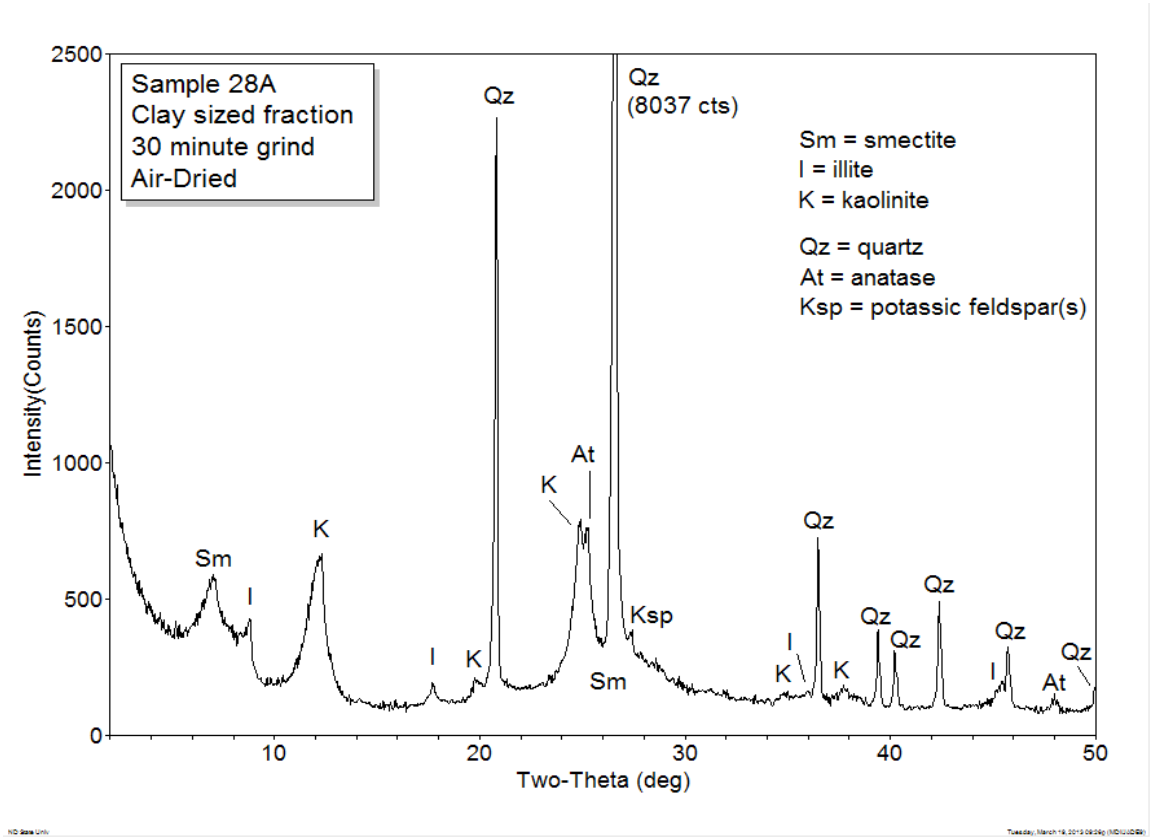




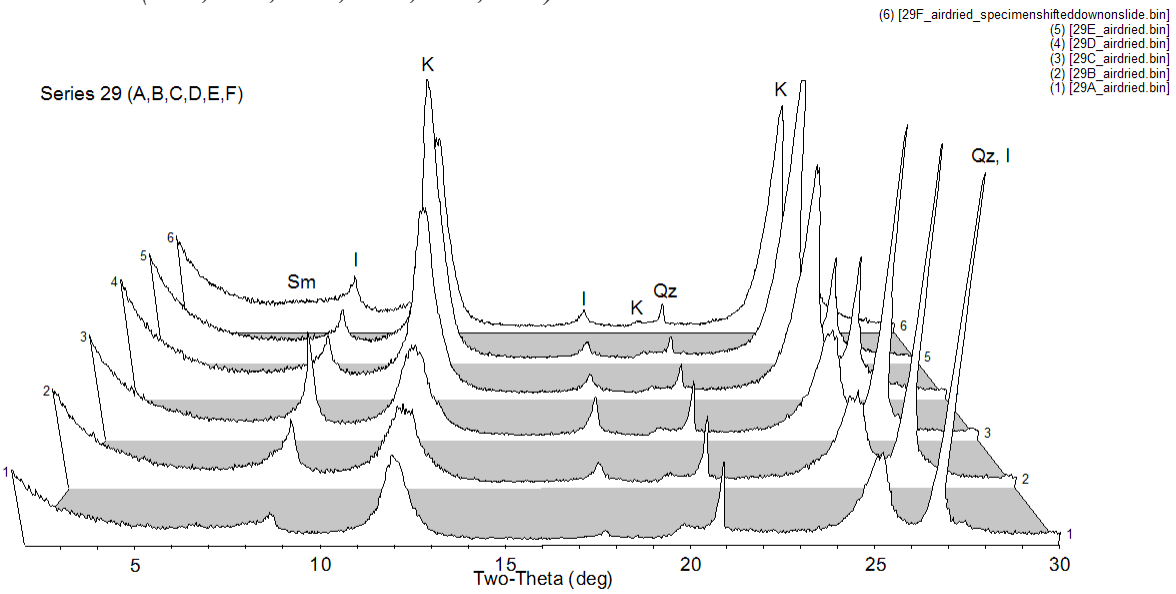
Clay Minerals

Smectite, **mica-illite**, and **kaolinite** were present in all samples. Smectite was apparent in each of these ground bulk samples. (Note: the above series of diffractograms are from random orientation specimens that were "side-drifted" into aluminum well mounts, rather than prepared on glass slides.) Mica-illite begins in sample 28A with fairly broad peaks typical of soil illite. Samples 28C-E all have sharp peaks corresponding to the 10A phase, suggesting the possibility of a micaceous phase. Kaolinite is only the major phase in samples 28B and 28C, where smectite is also present in significant proportions. **Chlorite** is present in samples 28D and 28E.

Non-Clay Minerals **Quartz**. **Potassic feldspar** in all samples; trace amounts in 28A and 28B and significant amounts in 28C-E. 28D had minor **gypsum** present, and 28E had major **dolomite** present. **Anatase** was found in samples 28A, 28B, and 28D. The non-clay mineral assemblage represented in these samples sets this series apart from the rest of the samples in this study.



Sample Series 29 (29A, 29B, 29C, 29D, 29E, 29F)



Clay Minerals

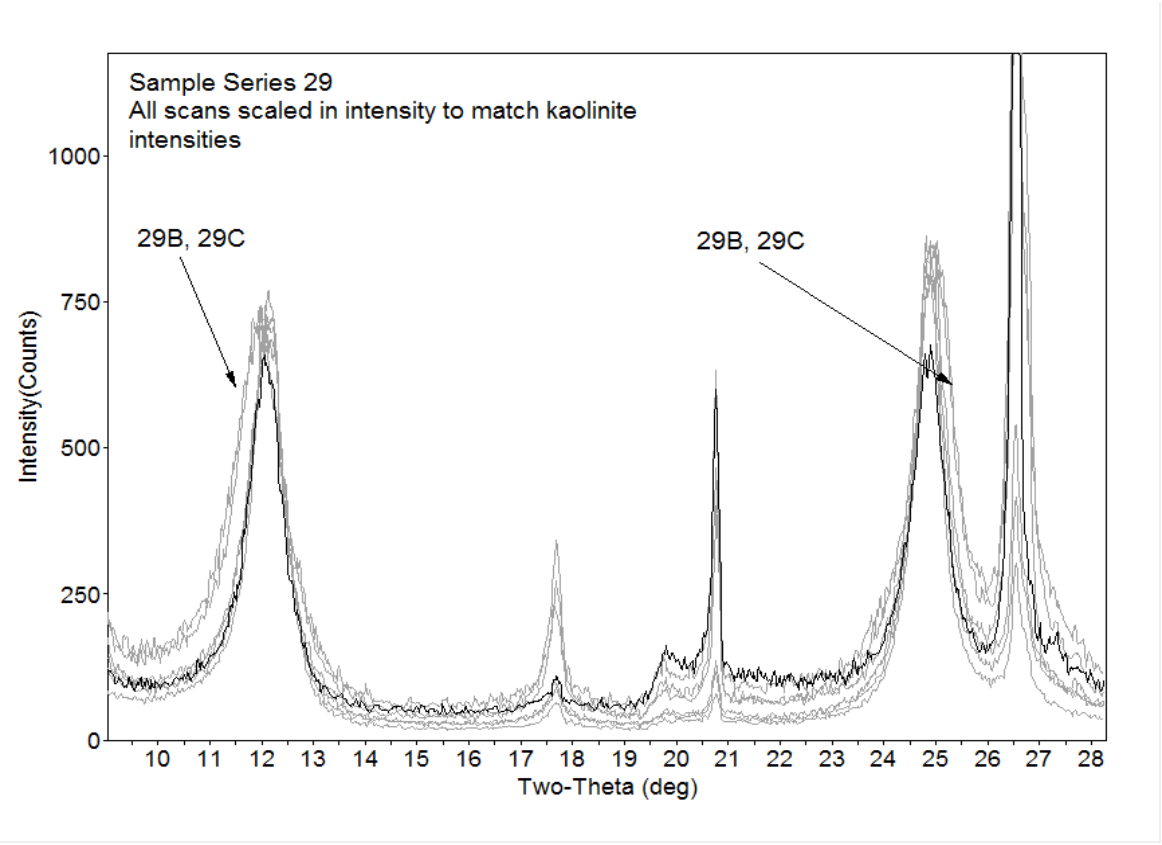
Mica-illite and **kaolinite** were present in varying abundances in this series of samples. The presence of a swelling phase such as **smectite** was confirmed by treatment with ethylene glycol in samples 29C and 29D, by careful study of the background levels at low angles. The effect was relatively subdued, suggesting low abundances of swelling material.

Non-Clay Minerals

Quartz. Trace occurrences of **potassic feldspars** observed in some specimens of this series. Anatase positively identified near the detection limit in heat treated specimens of samples 29C and 29D. Based on the weak reflection of **anatase** near 48 degrees 2-theta, anatase is likely in small amounts in each of these samples.

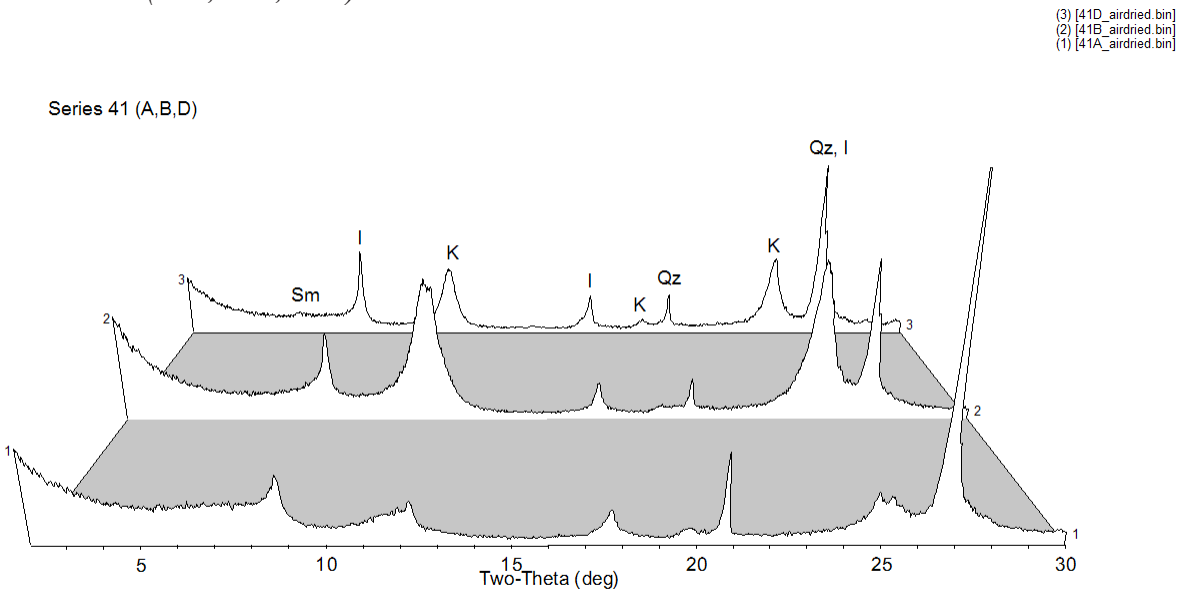
Qualitative Trends Noted

As with sample series 22, this series appears to have two different assemblages, separated into two groups of three samples. The early set (29A-29C) consist of minor swelling material, rising amounts of illite from 29A to 29C (concurrent with narrower illite peaks, suggesting higher long-range order), dominant kaolinite; quartz, feldspar, and anatase. The kaolinite peaks in the air-dried specimens of samples 29B and 29C are noteworthy, and treated in a separate following figure. Visual observation shows these reflections to be notably broader than their conterparts in 29D-F (and even 29A). The kaolinite reflections in the specimen of 29C that was subjected to solvation with ethylene glycol resembles the kaolinite reflections of 29D-F (and 29A). See the following figure. The second set of samples (29D-F) show consistent illite levels, higher but varying kaolinite peak heights (highest from sample 29E), as well as significantly reduced levels of quartz relative to samples 29A-C.



Air-dried specimens of samples 29B and 29C display 7 Angstrom ("kaolinite") peaks that would follow Mering rules if interlayering was present between the 7A phase(s) and a 10A phase, such as hydrated halloysite. That is, the (001) kaolinite reflection is shifted toward a higher d-spacing / lower 2-theta value, which would be consistent with an interference pattern between reflections generated by a 7A (001) reflection near 12.5 degrees 2-theta and a 10A (001) reflection near 8.8 degrees 2-theta. Similarly, the 7A (002) peak shifts toward a lower d-spacing / higher 2-theta value, which would be consistent with an interference pattern between the 7A (002) reflection near 25 degrees 2-theta and the 10A (003) near 26.6 degrees 2-theta. Following treatment with ethylene glycol, the 7A reflections in sample 29C conform to the peak width and shape of the remaining air-dried specimens. This may suggest dehydration of an interlayered 10A halloysite during glycolation.

Sample Series 41 (41A, 41B, 41D)



Clay Minerals

Mica-illite and **kaolinite** were present in varying abundances in this series of samples. The presence of a swelling phase such as **smectite** was apparent in the air-dried specimens of 41A and 41D; possible also in 41B. Sample 41A appears to be dominated by a very poorly ordered swelling phase (see large, very broad rises in background between 5 and 10 degrees 2-theta, and again between 10 and 14 degrees 2-theta). Trace amounts of **chlorite** are possible in all three samples, and suggested by peaks near 25.2 degrees 2-theta that don't have corresponding significant intensity near 48 degrees 2-theta to suggest anatase.

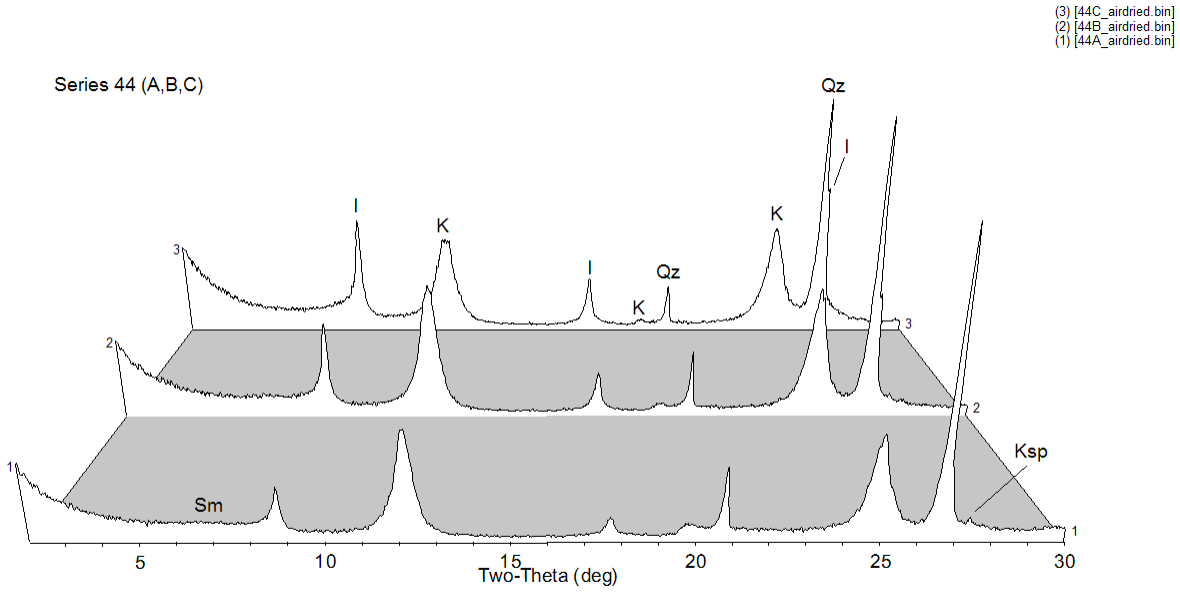
Non-Clay Minerals

Quartz.

Qualitative Trends Noted

These three samples, while containing the same general families of phyllosilicate mineral species, differ considerably from each other. If there are any distinctions that draw attention to similarities, then it would be the distinctiveness of sample 41A over against 41B and 41D: the large contributions from a poorly ordered swelling phase, the very low kaolinite content, together with the relatively high abundance of quartz set this sample apart from samples 41B and 41D.

Sample Series 44 (44A, 44B, 44C)



Clay Minerals

Mica-illite and **kaolinite** were present in varying abundances in this series of samples. The minor presence of a swelling phase such as **smectite** was suggested for these samples, based on slight rises in the low angular region of the diffraction patterns.

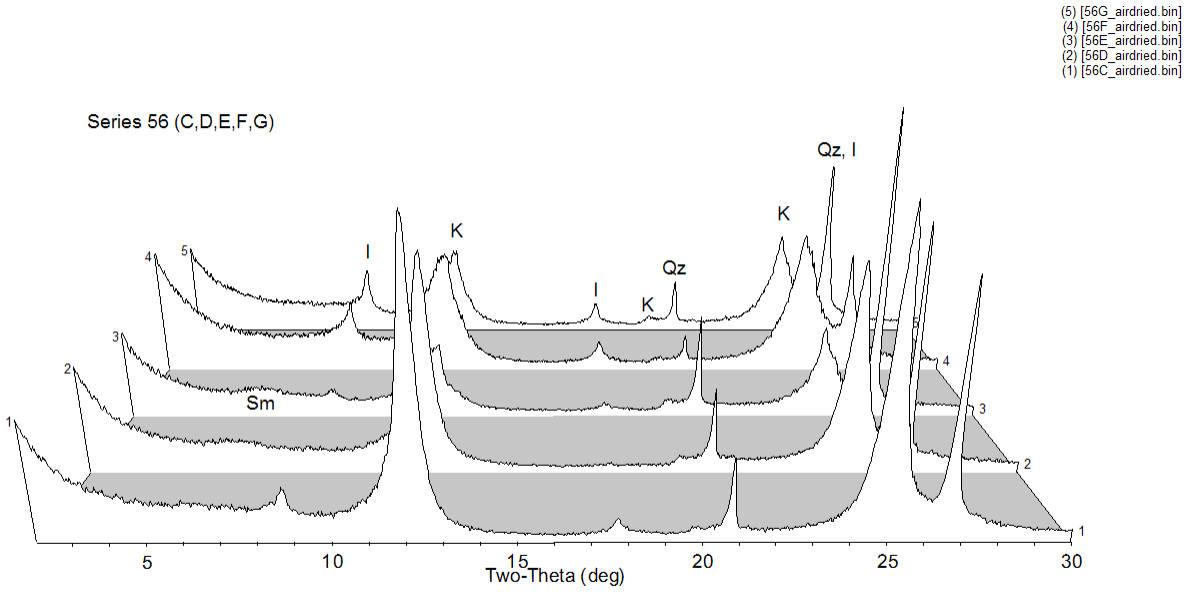
Non-Clay Minerals

Quartz. Trace occurrences of **potassic feldspars** observed in some specimens of this series. Based on the weak reflection of **anatase** near 48 degrees 2-theta, anatase may be present in trace amounts in each of these samples.

Qualitative Trends Noted

As with the broadened kaolinites noted in samples 29B and 29C, the kaolinite (001) and (002) reflections from the air-dried specimen of sample 44C are notably broadened, and shifted toward 10A (001) and (003) reflections, respectively. This may again suggest the presence of an interlayered 10A species such as mica-illite or hydrated halloysite. Illite increases continuously from sample 44A to 44C. Quartz abundance appears relatively constant throughout this sample series.

Sample Series 56 (56C, 56D, 56E, 56F, 56G)



Clay Minerals

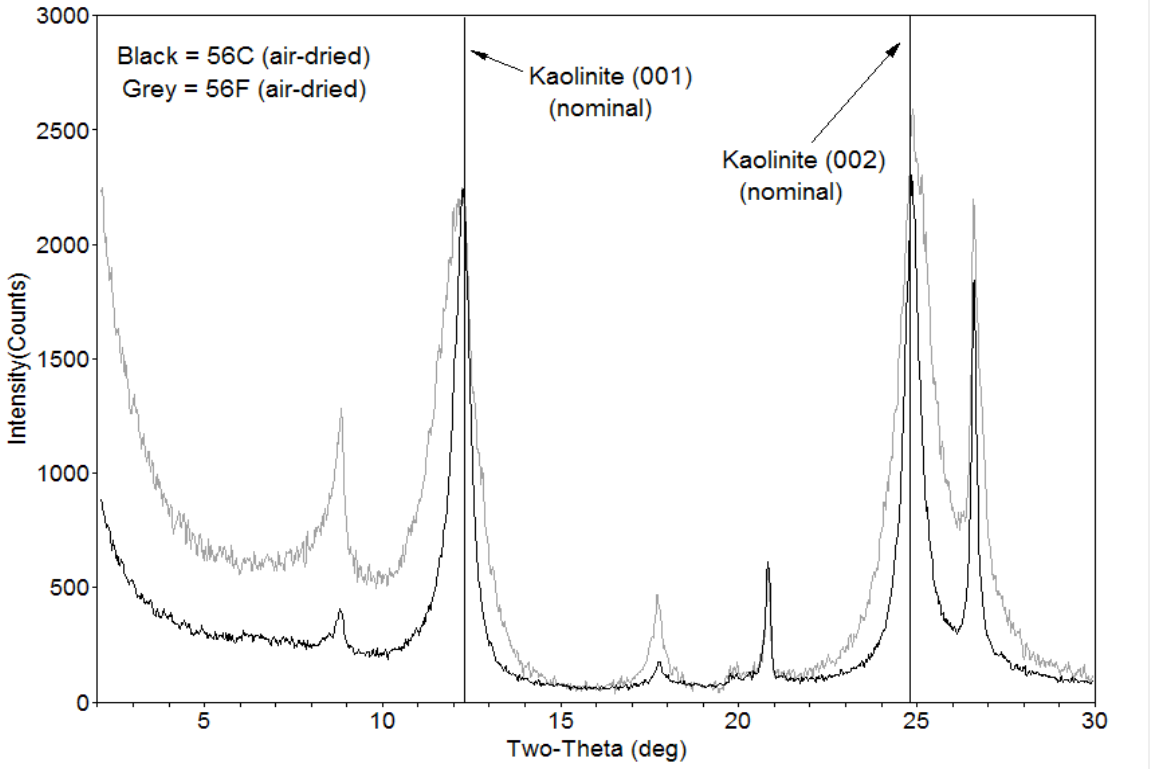
Mica-illite and **kaolinite** were present in varying abundances in this series of samples. Kaolinite was the dominant phase throughout the series. The presence of a swelling phase such as **smectite** was apparent in the air-dried specimens of samples 56C-56E, and possible in the remaining samples. Notably, samples 56D and 56E contain the lowest peak heights of mica-illite found among this entire study, with the level of mica-illite nearing the detection limit for sample 56D.

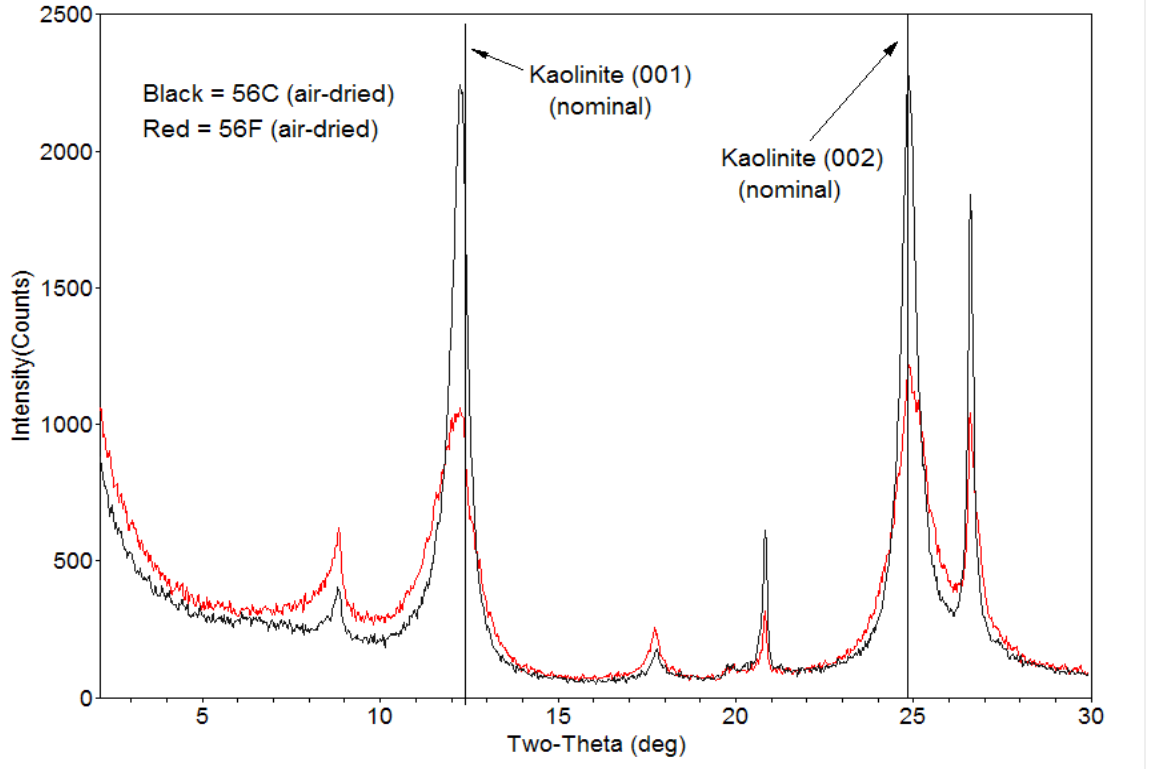
Non-Clay Minerals

Quartz. Based on the weak reflection of **anatase** near 48 degrees 2-theta, trace amounts of anatase are possible in samples 56C, 56D, 56E, and perhaps 56F, though unlikely in 56G.

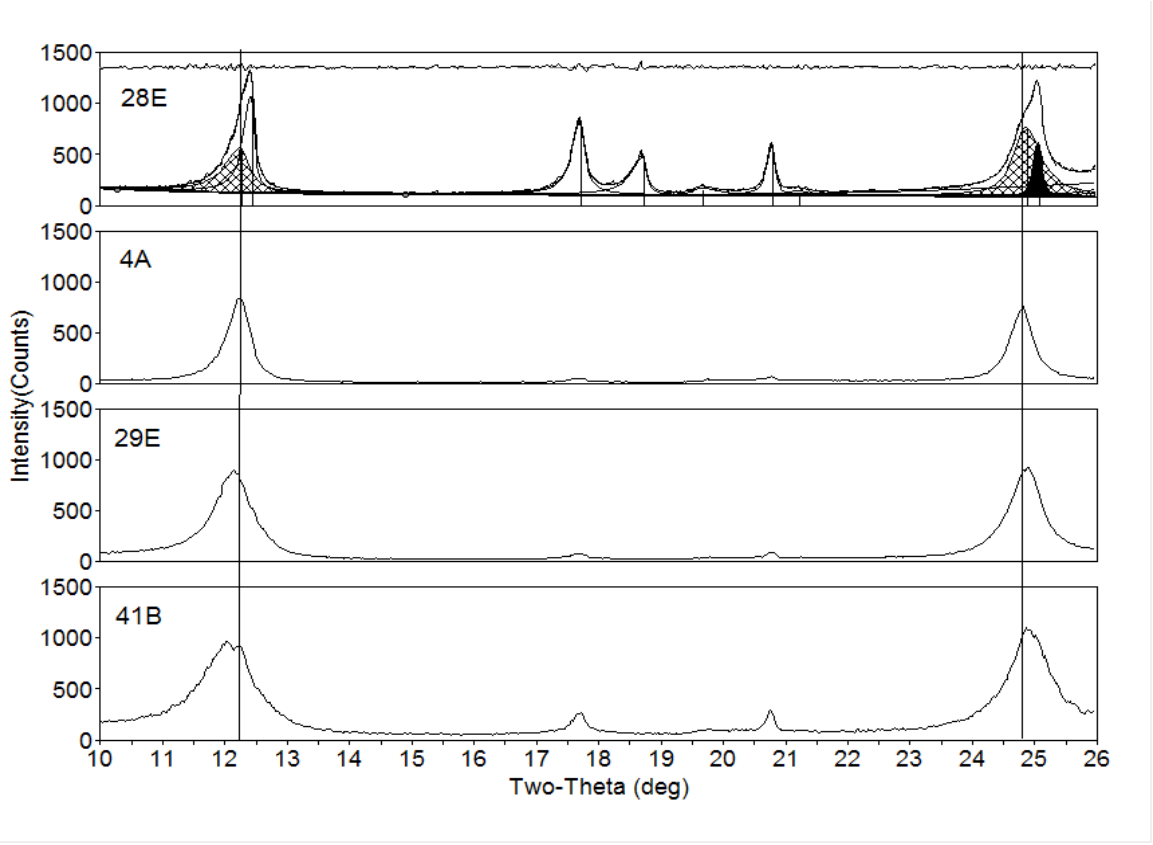
Qualitative Trends Noted

Once again, the character of the kaolinite peaks is the major differentiating factor in this series of samples. Samples 56C-56E contain consistent quartz levels, higher than those of 56F and 56G. Similarly, Sample 56C-56E share in common very low levels of mica-illite relative to 56F and 56G. Additionally, the peak heights of the kaolinite (001) and (002) reflections decrease continuously from sample 56C to 56E, then increase again in 56F, only to decrease finally in 56G. Despite this apparent grouping that would separate 56C-56E from 56F and 56G, the variation among kaolinite peak broadening breaks between 56D and 56E. Both samples 56C and 56D have relatively narrow kaolinite peak widths, while 56E through 56G have markedly broadened reflections, once again shifted outwards, toward positions consistent with neighboring (001) and (003) reflections of a 10A phase such as mica-illite or 10A halloysite.


Black = 56C (air-dried)
Grey = 56F (air-dried)
Kaolinite (001)
(nominal)
Kaolinite (002)
(nominal)
Intensity(Counts)
Two-Theta (deg)
0
500
1000
1500
2000
2500
3000
5
10
15
20
25
30


Black = 56C (air-dried)
Red = 56F (air-dried)
Kaolinite (001)
(nominal)
Kaolinite (002)
(nominal)
Intensity(Counts)
Two-Theta (deg)
0
500
1000
1500
2000
2500
5
10
15
20
25
30

XRPD peak shifts of 7 Å phase relative to nominal positions. A zero-offset was applied to both scans to align the 26.6 °2θ peak of quartz. Kaolinite (001) and (002) nominal positions are marked according to PDF entry 58-2001, at positions 12.347 °2θ (7.1628 Å) and 24.848 °2θ (3.5804 Å), accordingly. While the {00l} reflections of kaolinite in sample 56C is not greatly broadened, as its counterpart in sample 56G, it still shows peak shift of the (001) toward 10Angstroms, and the (002) toward a (003) reflection of a 10A phase. This Mering shift, if it is so, is more pronounced for the (001) of kaolinite, due to a greater separation between the interfering 12.5 degree and 8.8 degree (001) reflection of the 7A and 10A species, respectively. The separation between the 25 degree (002) of the 7A kaolinite and the 26.6 degree (003) of the alleged 10A interlayered phase is a lesser separation, resulting in a slightly peak position offset.



Comparison of diffractograms from samples bearing a variety of 7A phyllosilicates found in this study. Sample 28E includes chlorite. Sample 4A displays a nearly ideal kaolinite relative to peak positions from the PDF reference pattern. Sample 29E appears to show significant Mering Rule peak displacement. Finally, sample 41B appears to be perhaps bimodal, with distinct or graded populations of kaolinites of varying amounts of proposed interlayering with a 10A species.

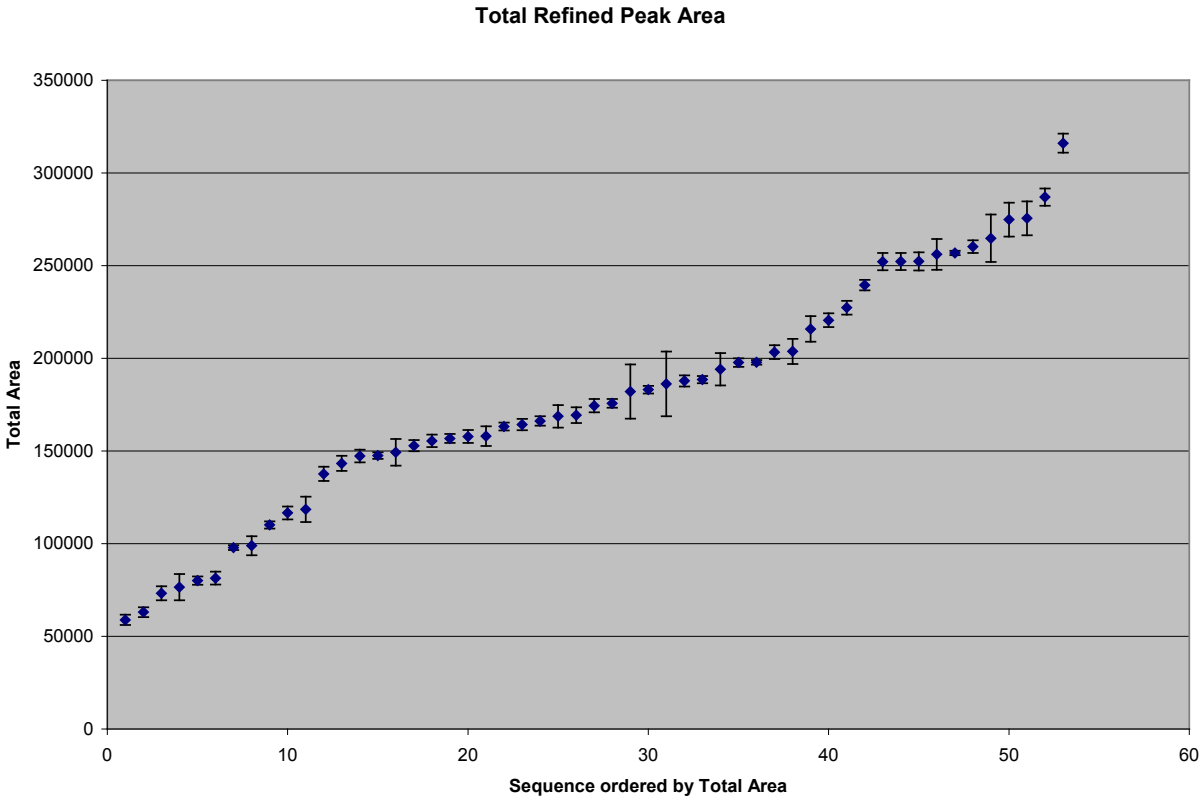
Relative Phase Abundance Results

Diffraction profiles were fit according to the phases identified during the qualitative analyses. The primary goal was to account for the diffraction intensities of the identified peaks, rather than to accurately model the whole patterns. Whole pattern fitting was attempted briefly, based on Powder Diffraction File standard pattern overlays. However, this method proved inaccurate at best, especially regarding the kaolinite patterns, which exhibited asymmetric peak shifts from ideal positions.

Backgrounds were manually selected for each pattern prior to peak profile fitting. Note that for the low angle region, especially corresponding to the swelling clays with basal peaks below 10 degrees 2-theta, fitting the background can introduce considerable variability. In many cases, for example, extremely broad diffraction maxima from the range of basal spacings present in a population of smectitic material may appear as a gradual elevation of the background across many degrees, rather than a distinct peak, or even a discernable "bulge" in the background. Solvation with ethylene glycol often reveals the presence of swelling clays, as the glycol sets a fixed basal spacing.

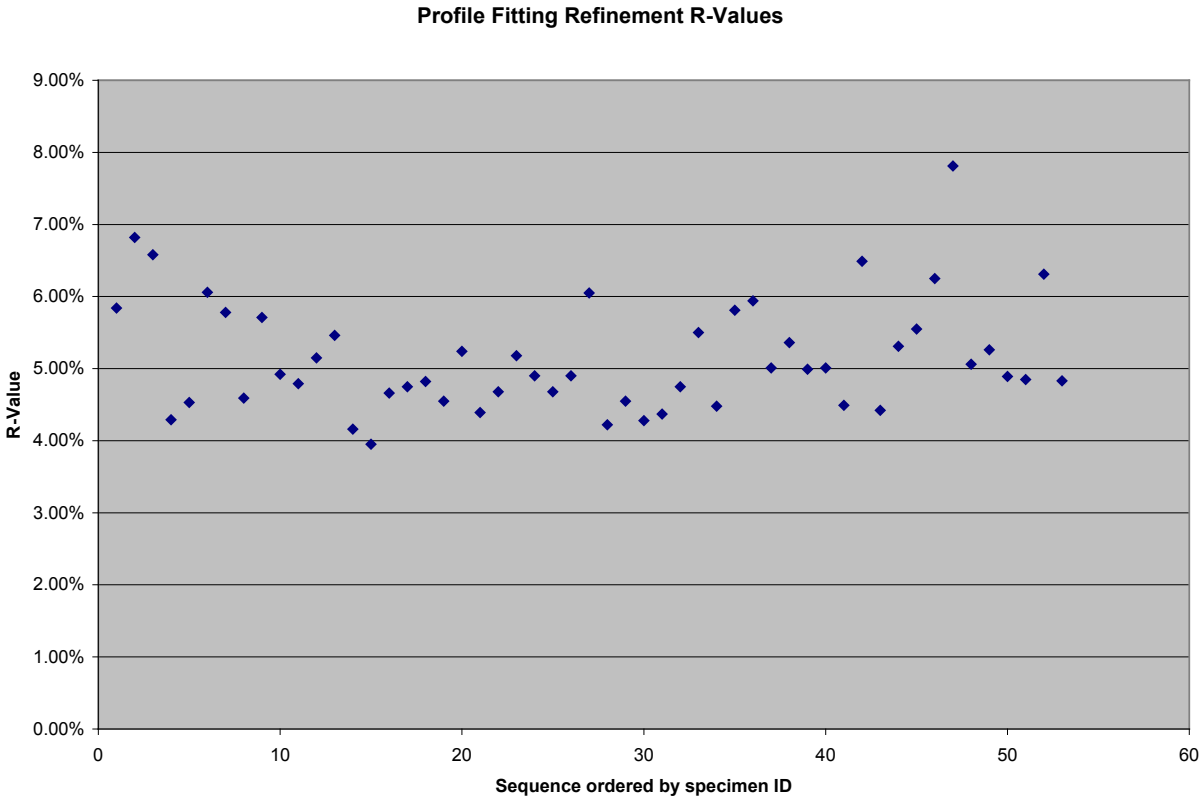
An additional factor introducing variability is the nature of the specimen mounts chosen. Standard oriented "smears" of clay-sized material were rolled out onto glass slides. In addition to the variability caused by the degree of preferential orientation achieved (a function of particle size and shape), the thickness of the specimens above the glass slide may vary. Materials that transfer as a very thin smear are at risk of violating the need for "infinite x-ray thickness." That is, at higher angles especially, samples thinner than several tens of micrometers may not contain the full penetration of the x-rays. In this case, the sampled volume will not be uniform across specimens. In this study, the risk of this condition was minimized by uniform handling by a single technician preparing all of the specimen mounts.

In a further effort to minimize the effects of variable specimen mount thickness, the relative abundance charts shown below correspond to individual peak areas normalized against the total area of peaks fit in their corresponding diffraction patterns (that is, all peaks between 2 and 30 degrees 2-theta).

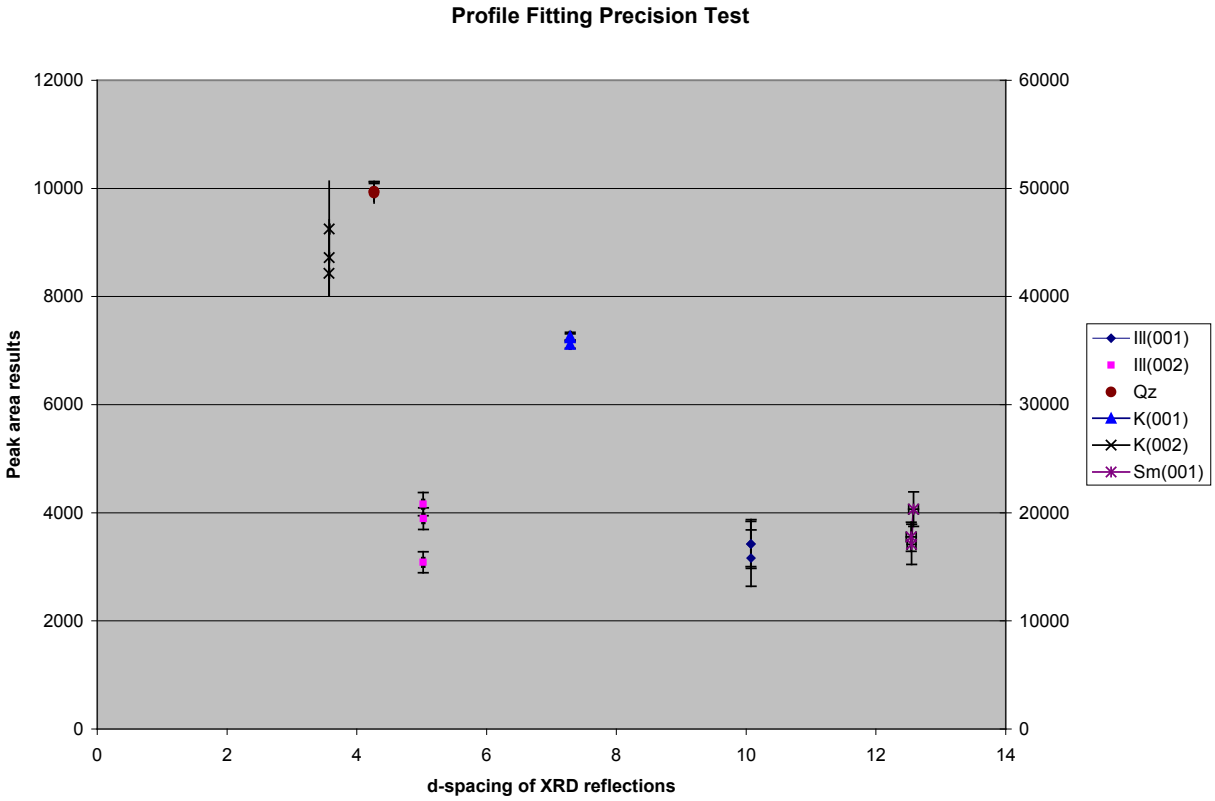


The total fit peak area for each diffractogram is given above, sorted from least to greatest. It is not surprising that the lowest total areas correspond to the fits done for specimen mounts that had been heated to 550 C. This heat treatment collapses the long range ordering of the kaolinite, and the corresponding X-ray amorphous material was accounted for in the background profile.

Beyond that explanation, the remainder of the specimen demonstrate a range of a little over twofold in total peak area above background. This range may be due to inherent sample effects -(higher abundance of strongly diffracting phases, for example), and/or bulk specimen effects, such as thickness of the sampled volume. As such, peak area values for individual analytes were normalized against the total peak area of their corresponding profile-fit diffraction patterns.



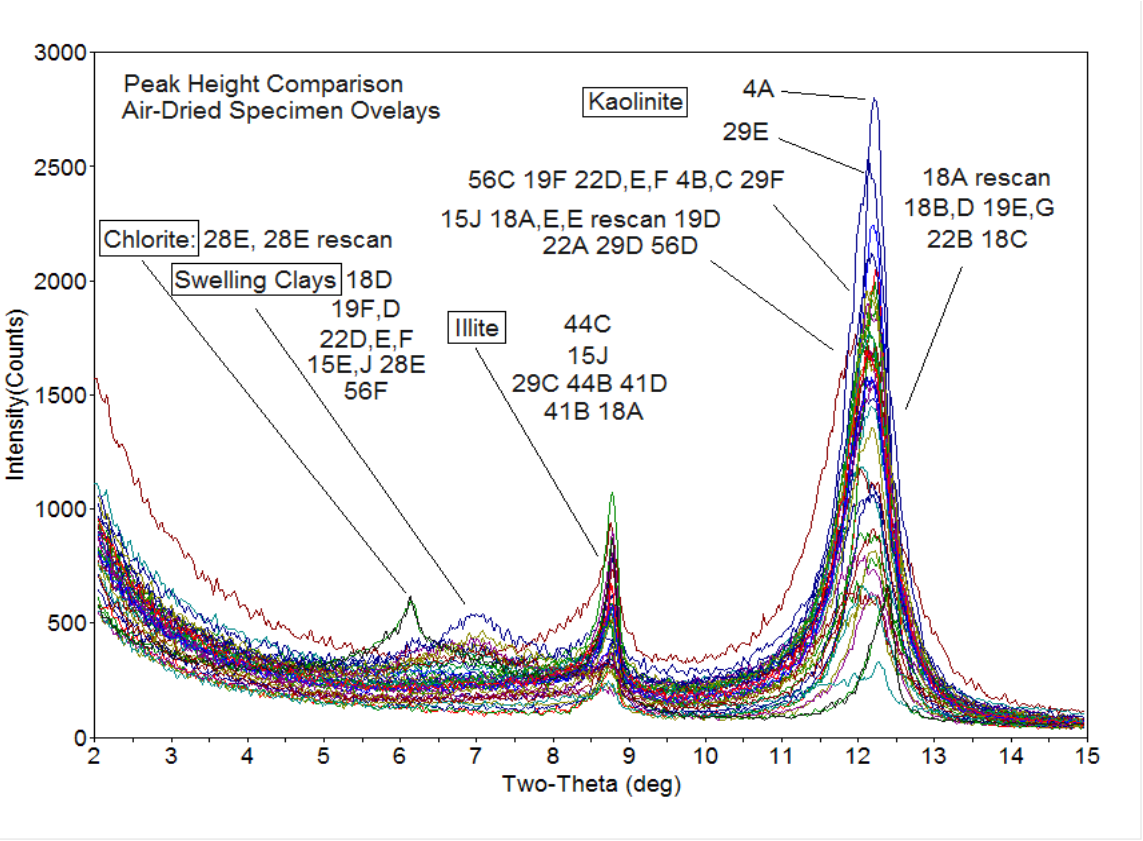
Refinement R-values for each specimen subjected to profile fitting. The R-value is a measure of the closeness of the match between the experimental and calculated peaks. With no values above 10%, these are within acceptable range.



Precision test of the profile fitting method used: three replicate attempts to fit peak profiles of the same diffraction trace (sample 28A, air dried; see fit profiles below). The same number of simulated peaks, in the same locations, were introduced in each trial prior to refinement against the experimental data.

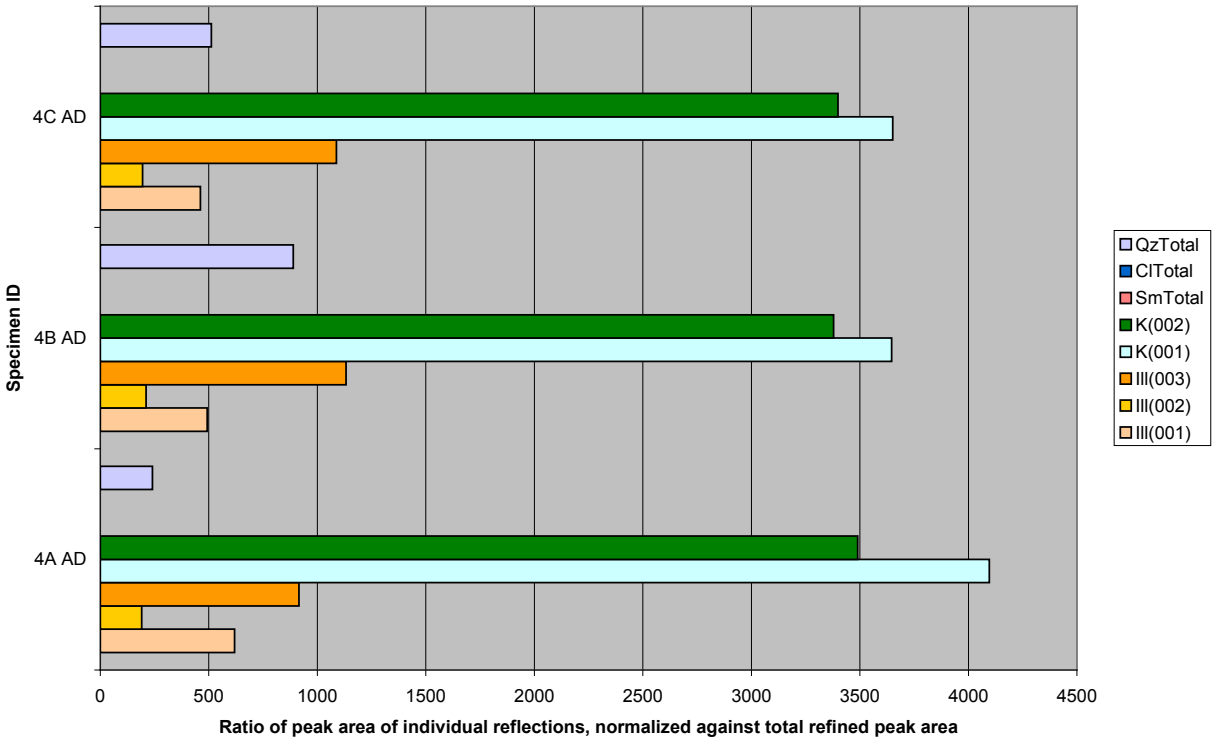
Note the close precision of the Qz and Kaolinite (001) peak areas. These two have the least interferences with other overlapping peaks. For those with significant overlap, low intensities, and poorly defined diffraction maxima, the range of peak area results is considerably increased. In particular, correlation between the closely overlapping reference peak of quartz and the illite (003) peak (both near 26.6 degrees 2-theta) caused difficulty in most cases producing peak fits that made visual/qualitative sense. In several cases the degrees of freedom in fitting these overlapping peaks were temporarily restrained or reset prior to final refinement.

Peak area trends for each sample series are given below, followed by the individual profile fitting experiments used to generate these data. Note for example, that sample 18A is represented by four experiments: the first three exploring the use of broad peaks to represent swelling phyllosilicate contributions, and a fourth representing a separate specimen mount. Because series 15 and 28 each only contain two samples with standardized oriented mounts, their relative abundances may be observed in the overlay patterns given.

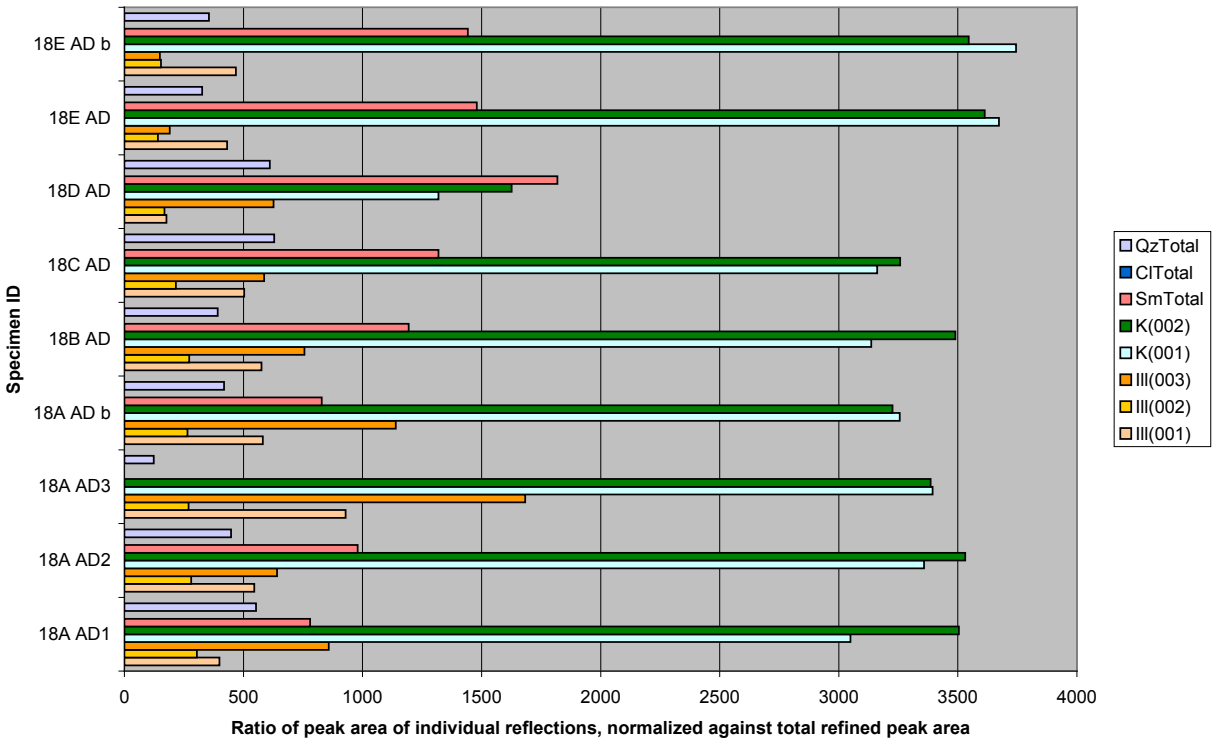


Visual overlay comparison of basal spacings in the full set of air-dried oriented mount specimens. The specimens producing the highest diffraction peaks for each respective clay type are noted. Though other factors may be significant, phase abundance is one of the primary contributions to diffraction peak intensity.

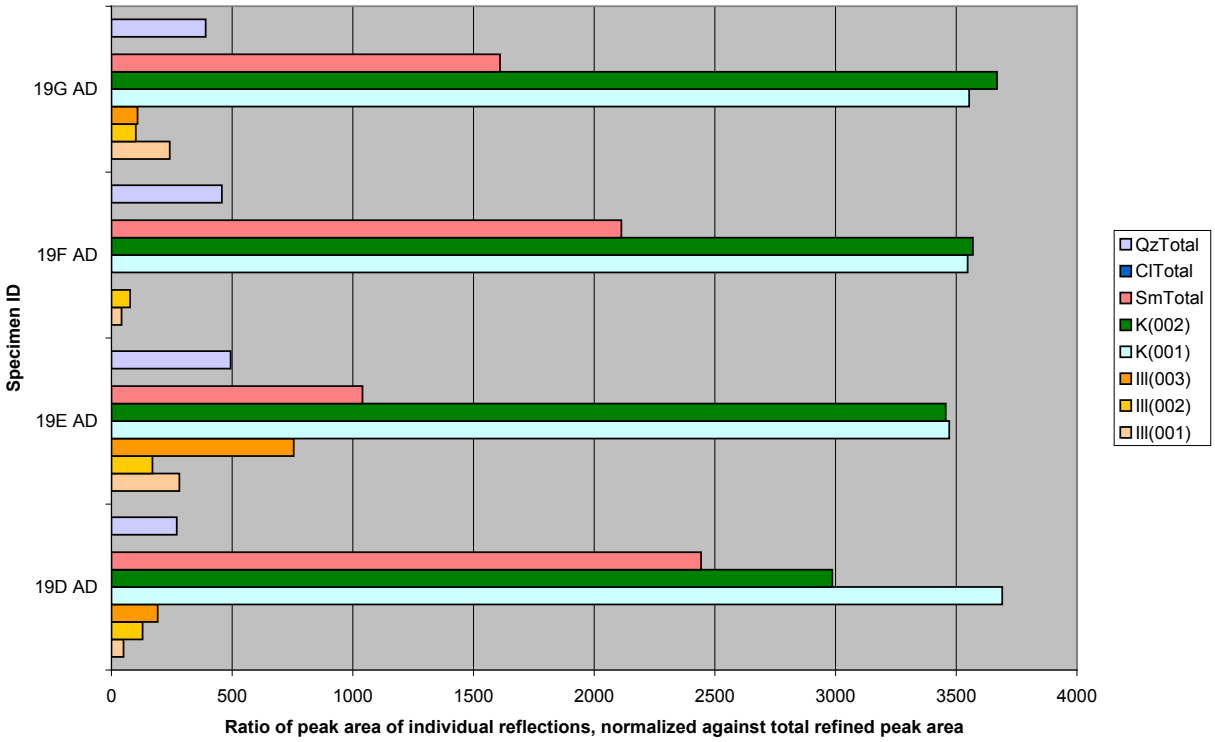
Series 4 Abundance Trends (Normalized)



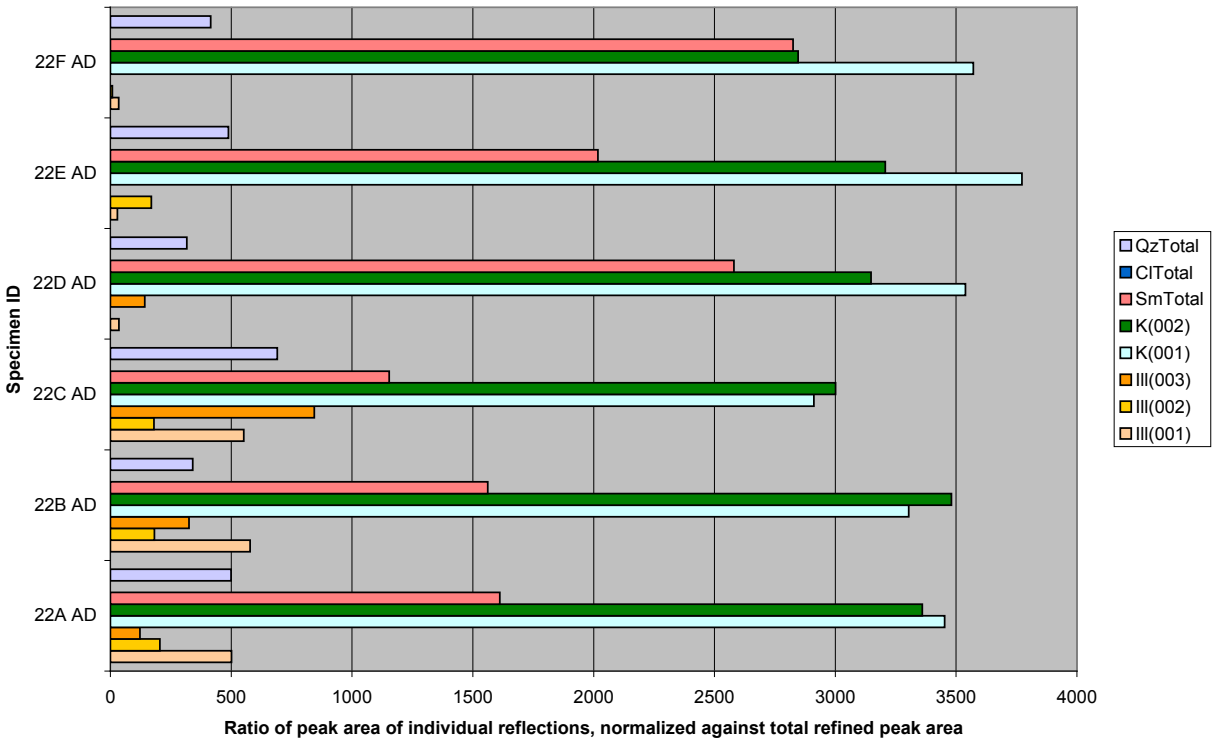
Series 18 Abundance Trends (Normalized)

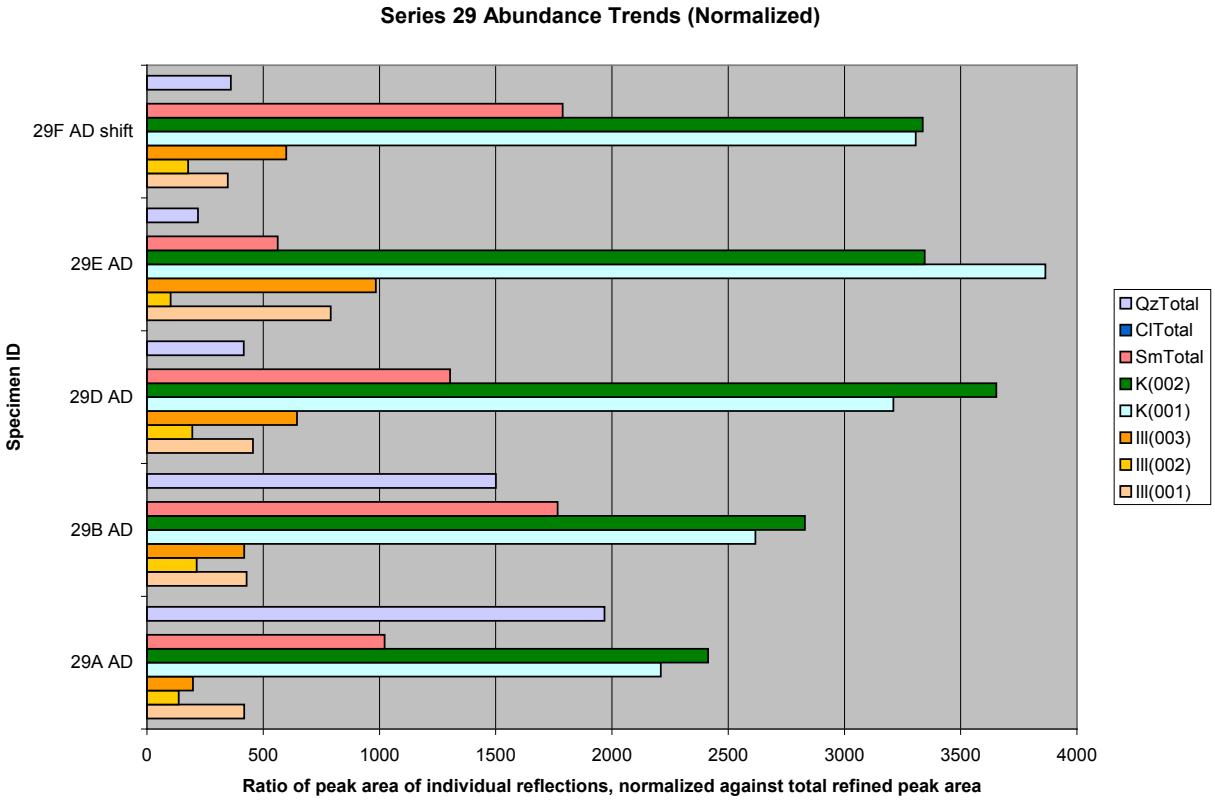


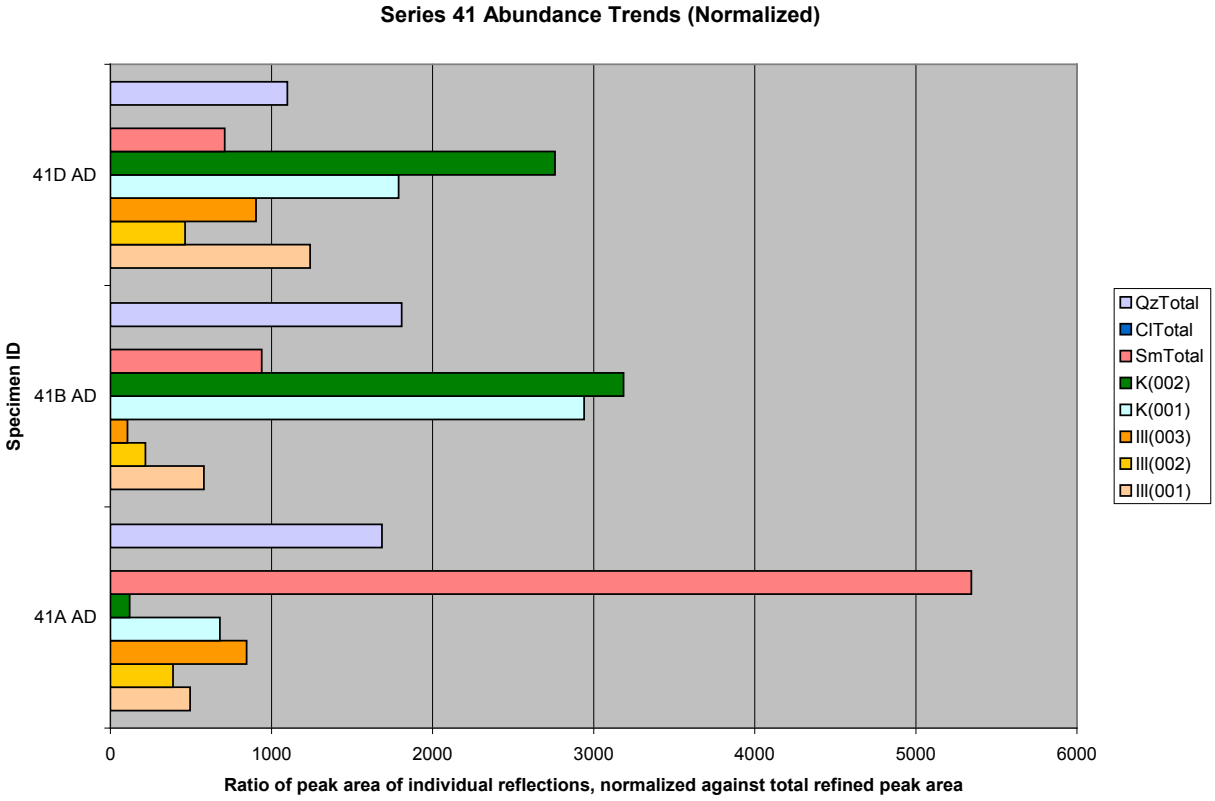
Series 19 Abundance Trends (Normalized)

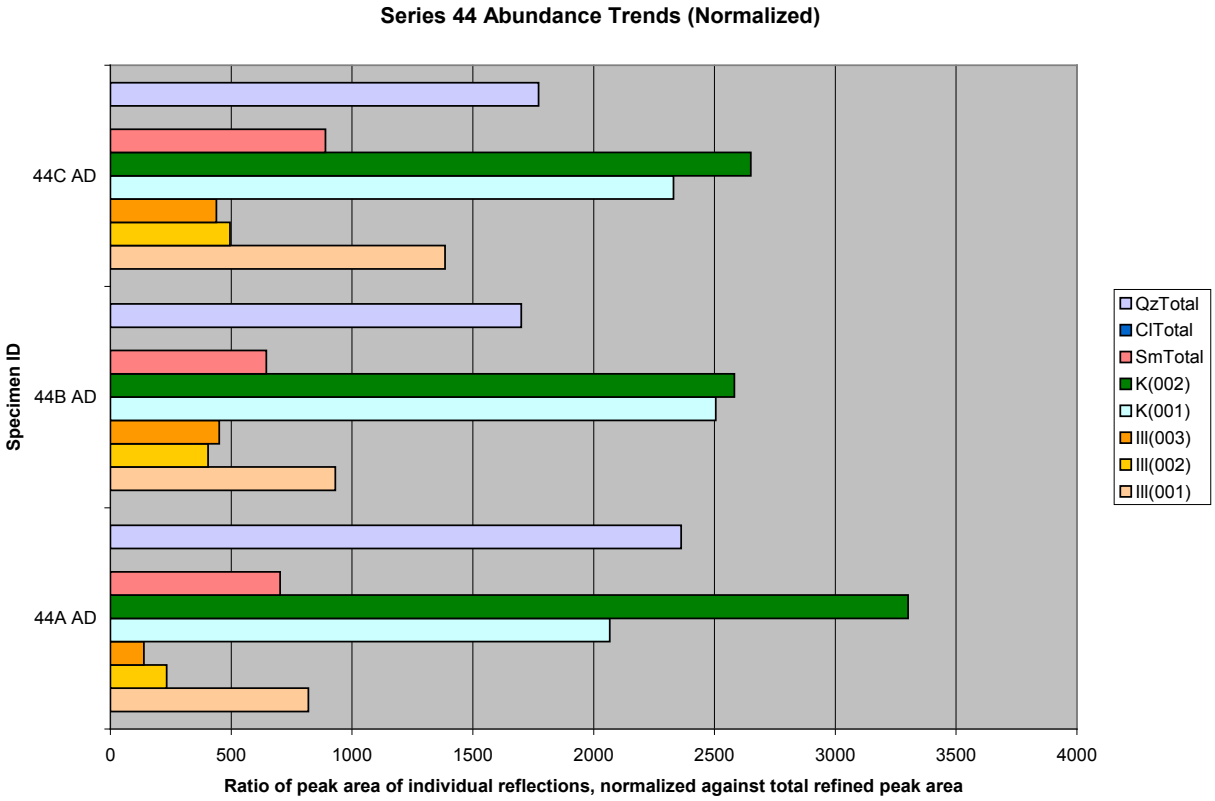


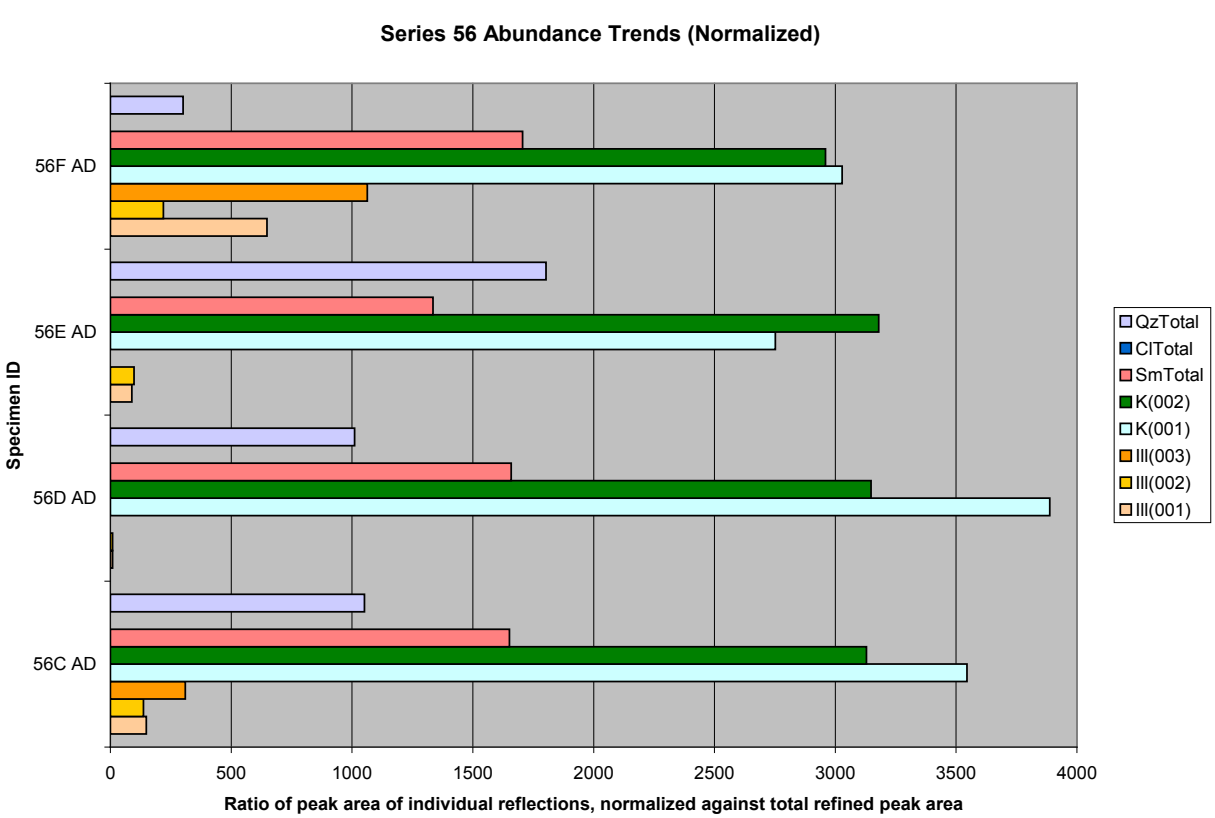
Series 22 Abundance Trends (Normalized)

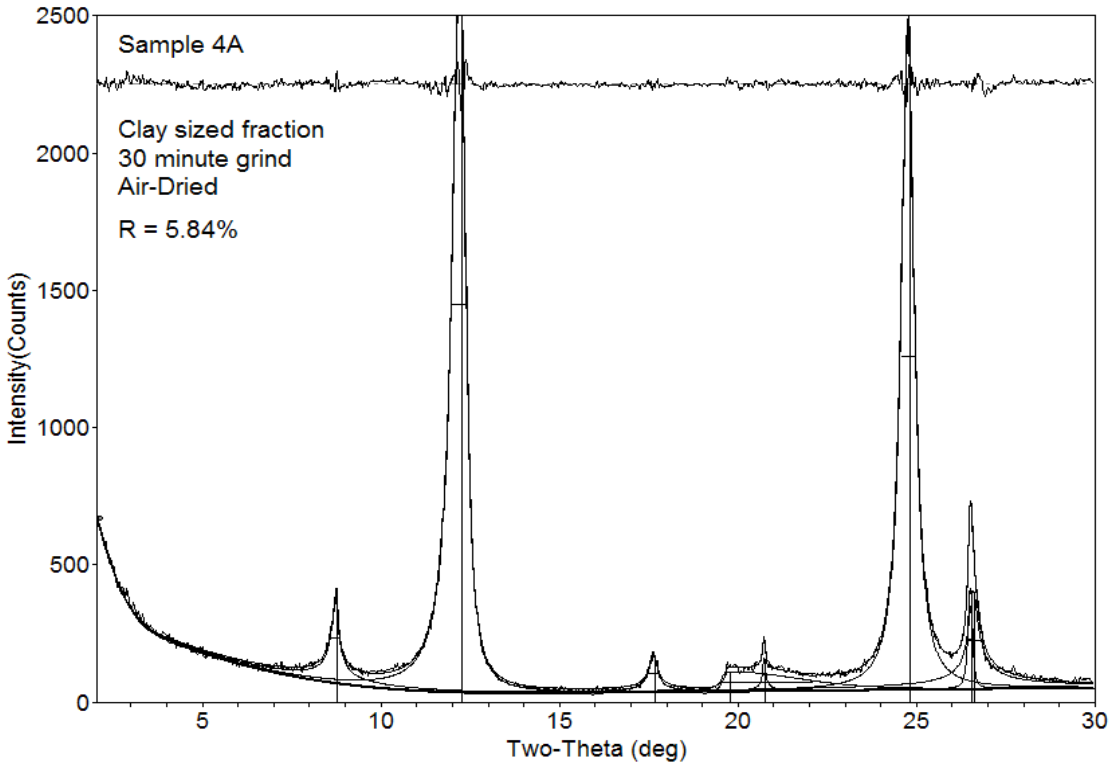


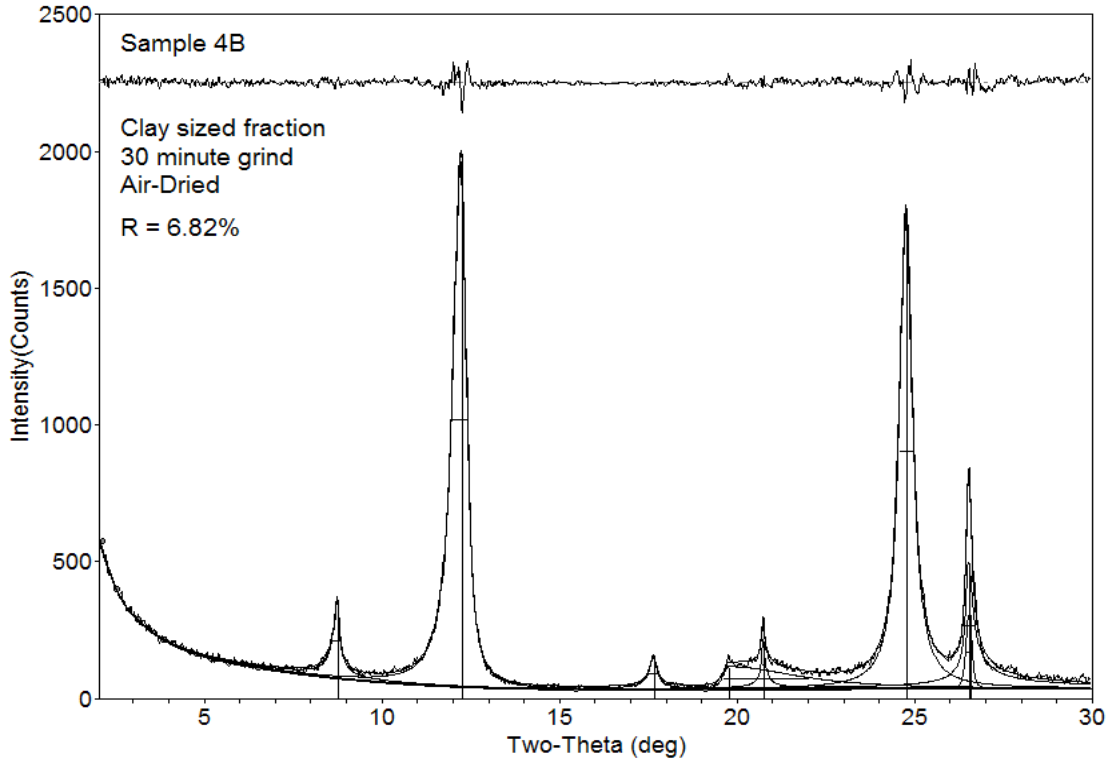

Series 29 Abundance Trends (Normalized)
29F AD shift
29E AD
29D AD
29B AD
29A AD
Specimen ID
0
500
1000
1500
2000
2500
3000
3500
4000
Ratio of peak area of individual reflections, normalized against total refined peak area
QzTotal
ClTotal
SmTotal
K(002)
K(001)
Ill(003)
Ill(002)
Ill(001)

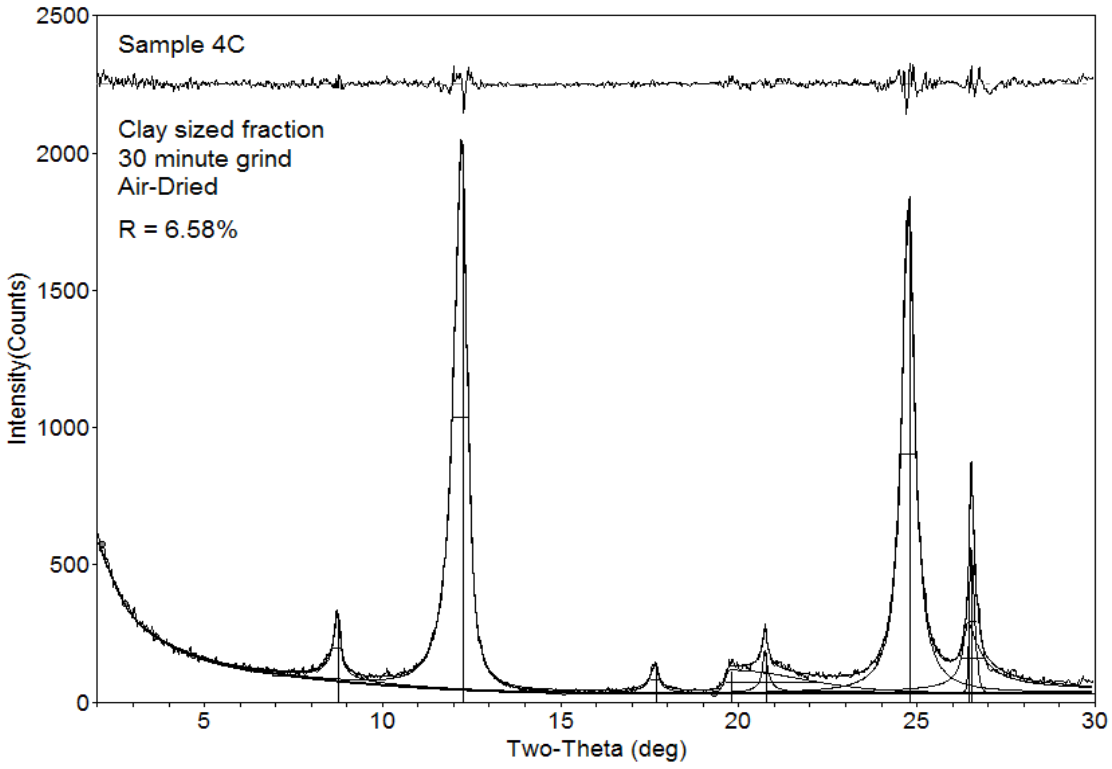

Series 41 Abundance Trends (Normalized)
41D AD
41B AD
41A AD
Specimen ID
0
1000
2000
3000
4000
5000
6000
Ratio of peak area of individual reflections, normalized against total refined peak area
QzTotal
ClTotal
SmTotal
K(002)
K(001)
Ill(003)
Ill(002)
Ill(001)

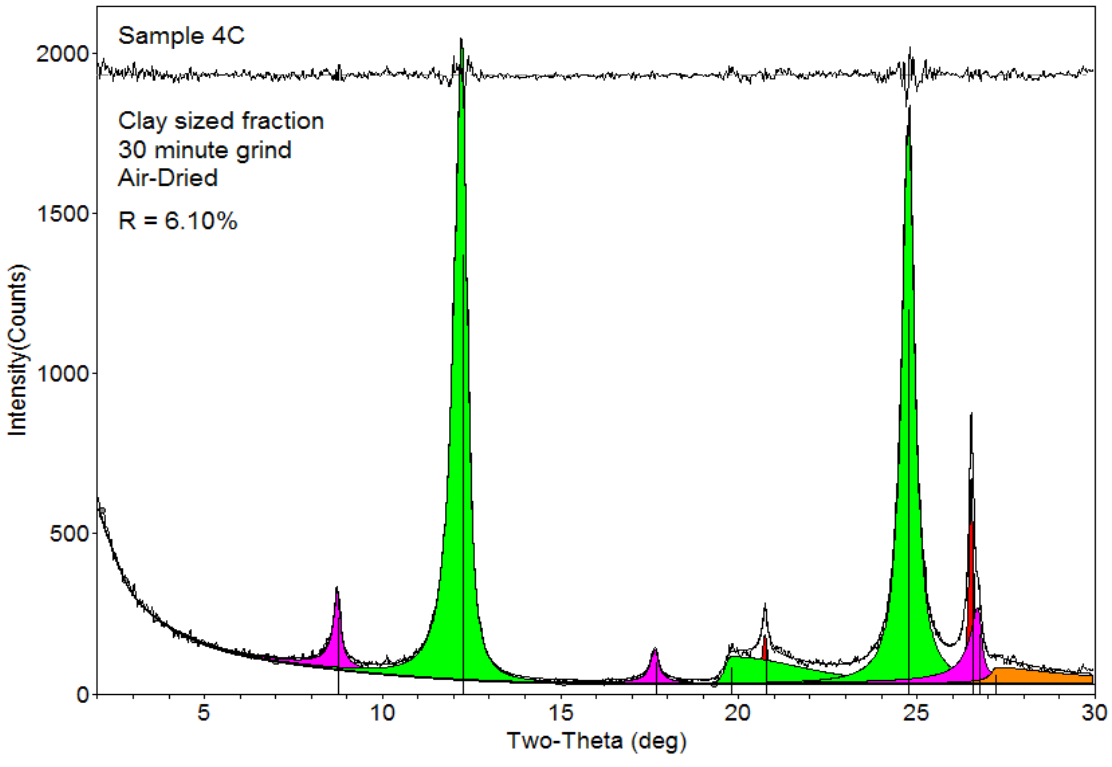

Series 44 Abundance Trends (Normalized)
Specimen ID
44C AD
44B AD
44A AD
0
500
1000
1500
2000
2500
3000
3500
4000
Ratio of peak area of individual reflections, normalized against total refined peak area
QzTotal
ClTotal
SmTotal
K(002)
K(001)
Ill(003)
Ill(002)
Ill(001)

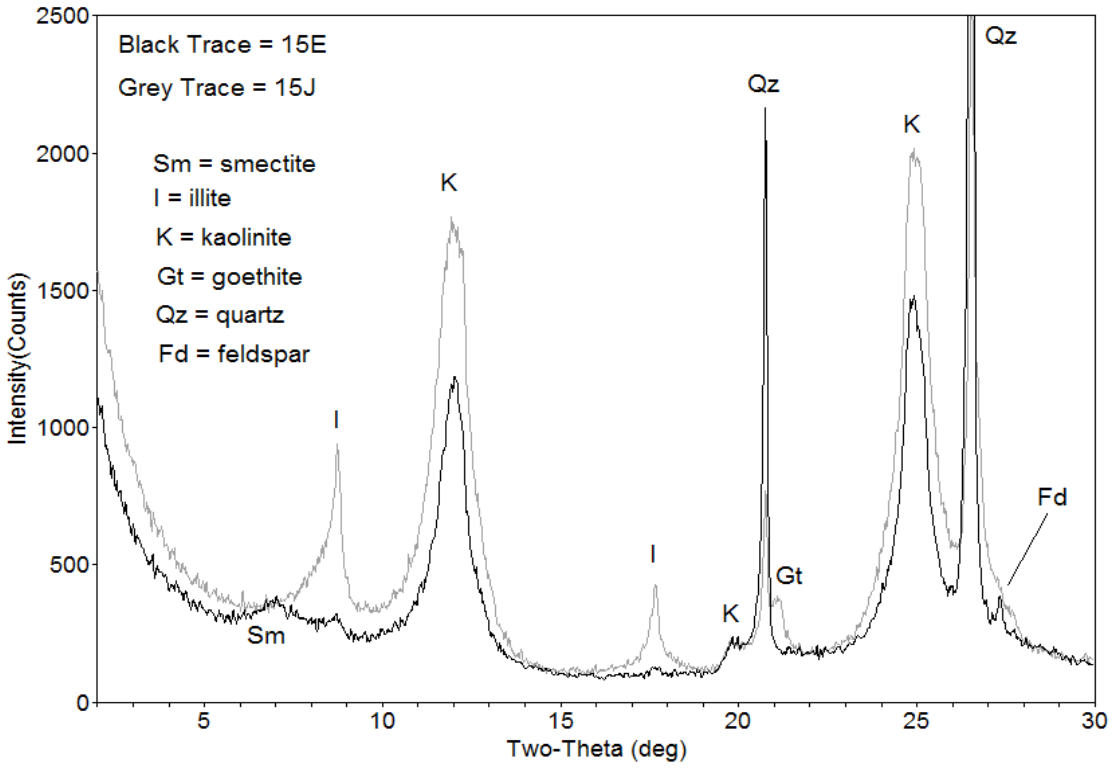

Series 56 Abundance Trends (Normalized)
Specimen ID
56F AD
56E AD
56D AD
56C AD
0
500
1000
1500
2000
2500
3000
3500
4000
Ratio of peak area of individual reflections, normalized against total refined peak area
QzTotal
ClTotal
SmTotal
K(002)
K(001)
Ill(003)
Ill(002)
Ill(001)

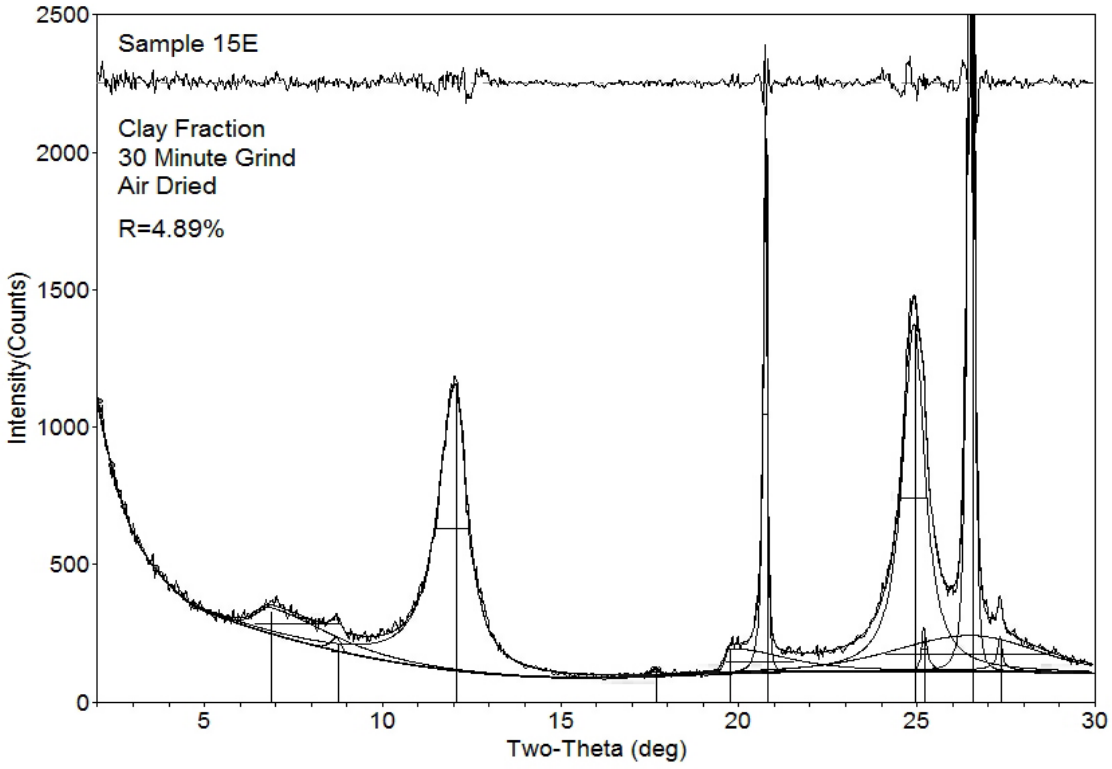

Sample 4A
Clay sized fraction
30 minute grind
Air-Dried
R = 5.84%
Intensity(Counts)
Two-Theta (deg)

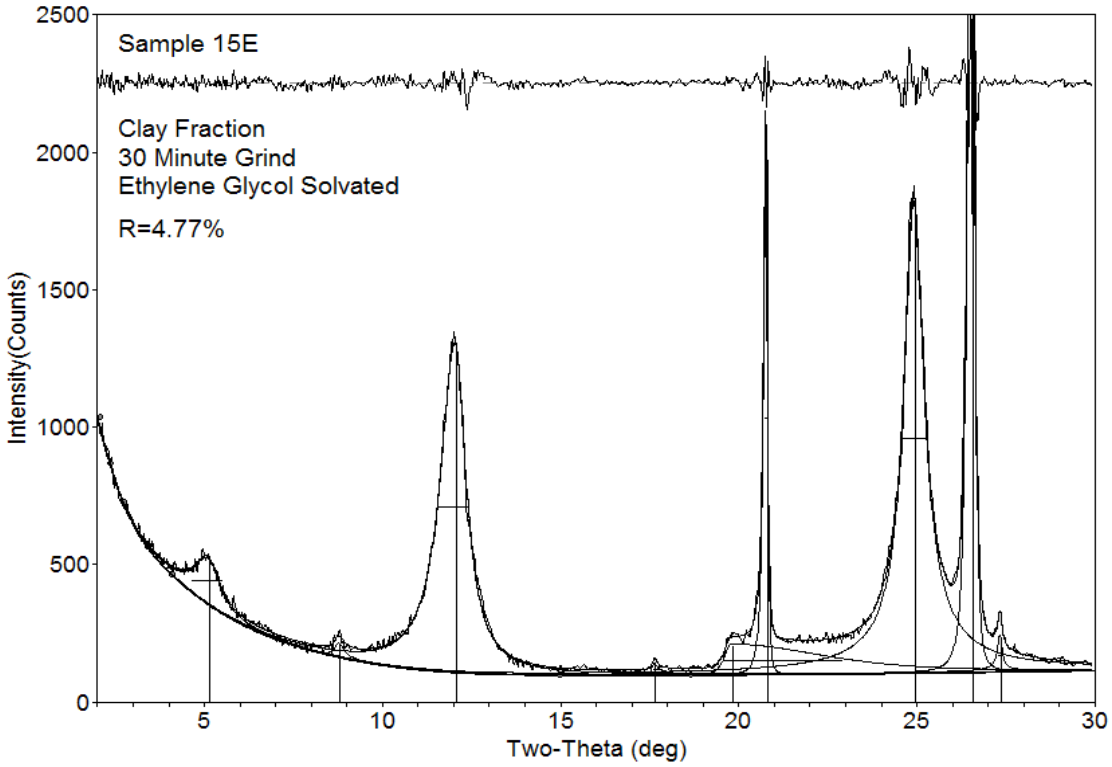

Sample 4B
Clay sized fraction
30 minute grind
Air-Dried
R = 6.82%
Intensity(Counts)
Two-Theta (deg)

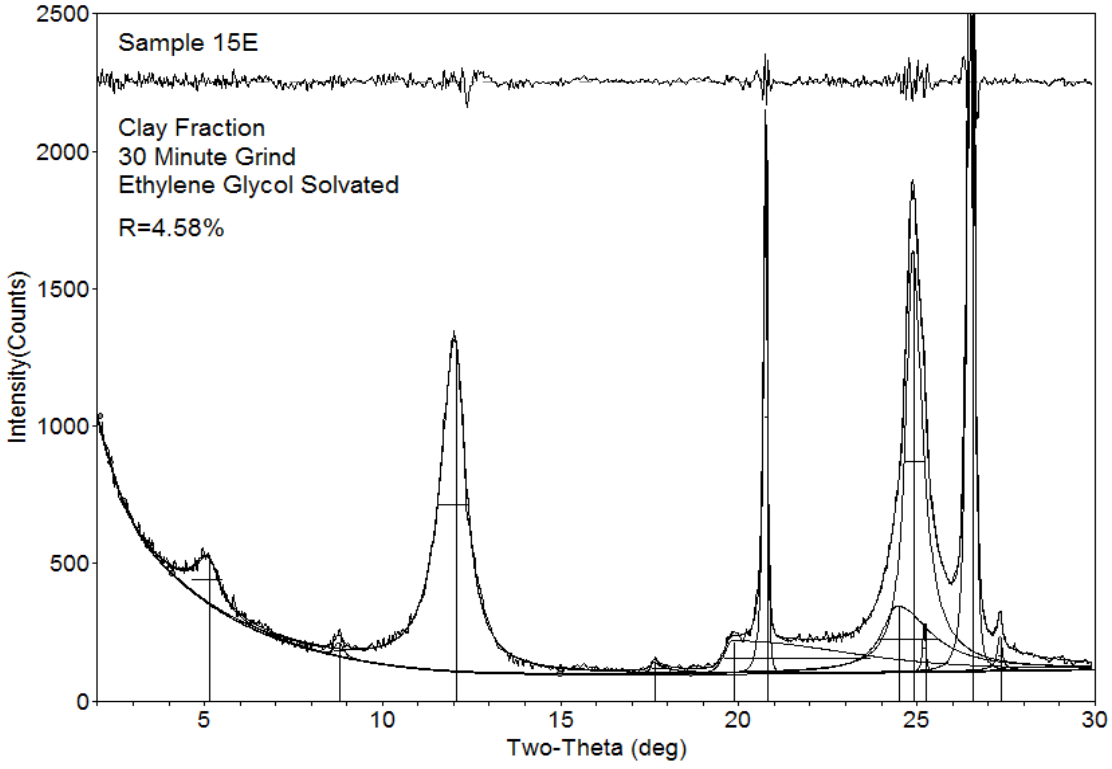

Sample 4C
Clay sized fraction
30 minute grind
Air-Dried
R = 6.58%
Intensity(Counts)
Two-Theta (deg)

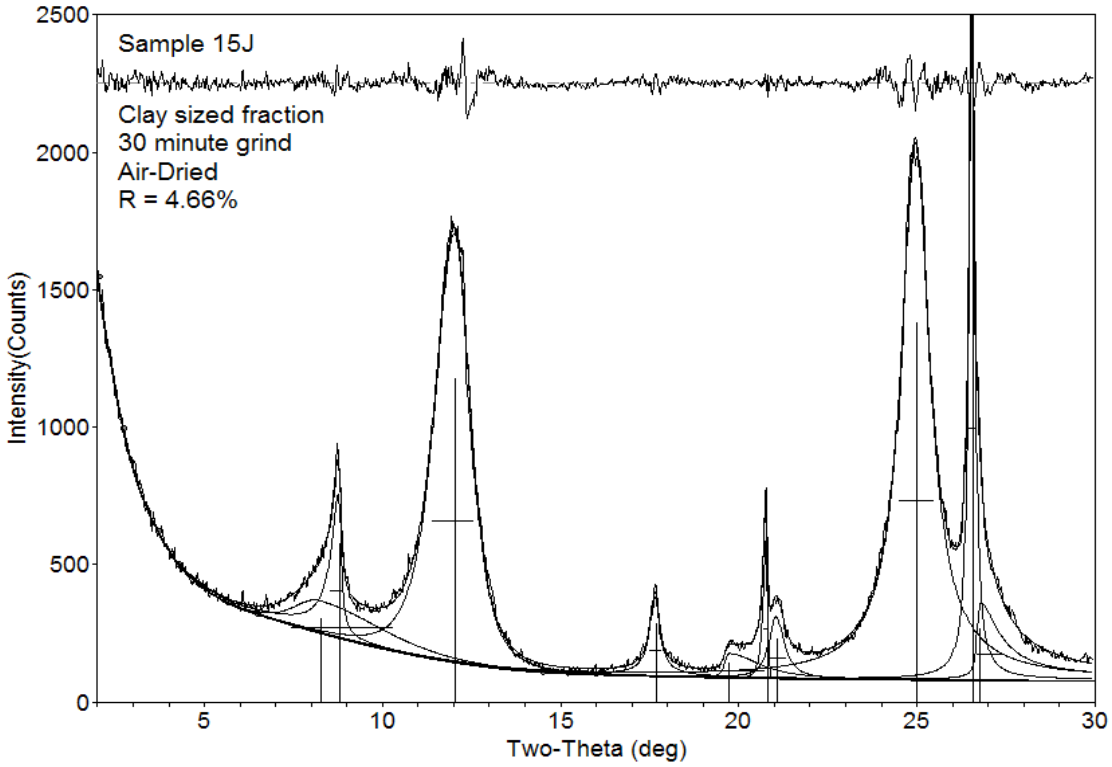

Sample 4C
Clay sized fraction
30 minute grind
Air-Dried
R = 6.10%
Intensity(Counts)
Two-Theta (deg)

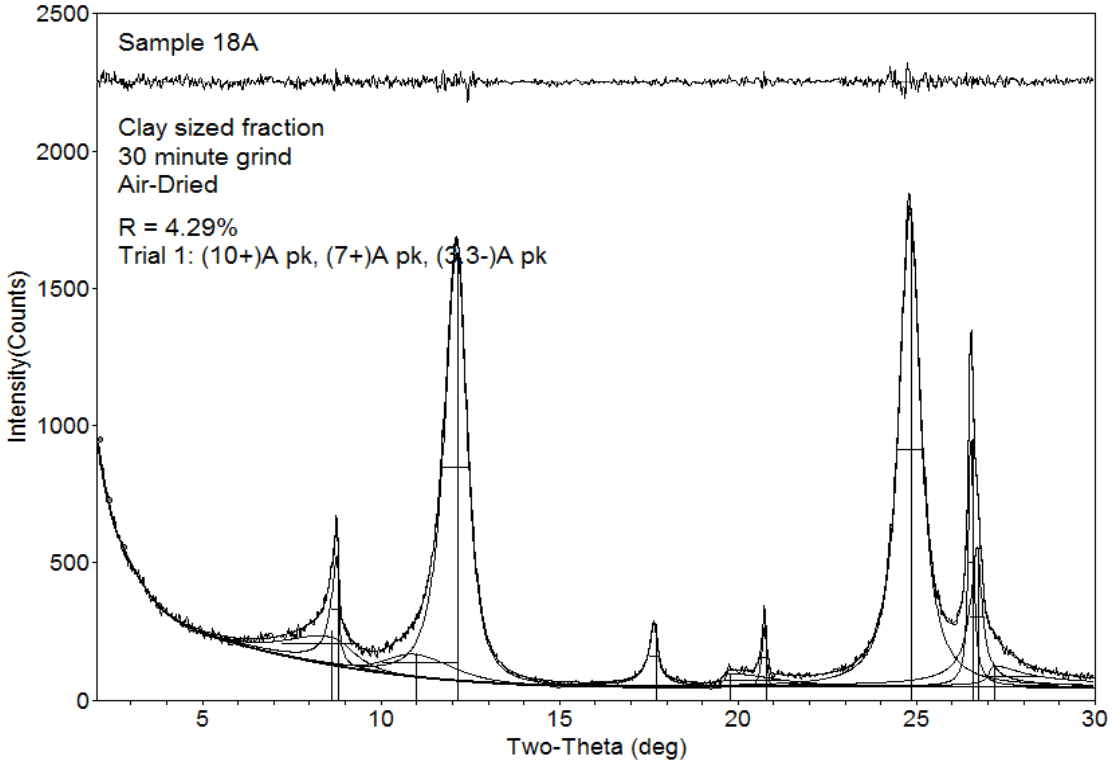

Black Trace = 15E
Grey Trace = 15J
Sm = smectite
I = illite
K = kaolinite
Gt = goethite
Qz = quartz
Fd = feldspar
Intensity(Counts)
Two-Theta (deg)
Sm
I
K
Qz
Gt
Fd

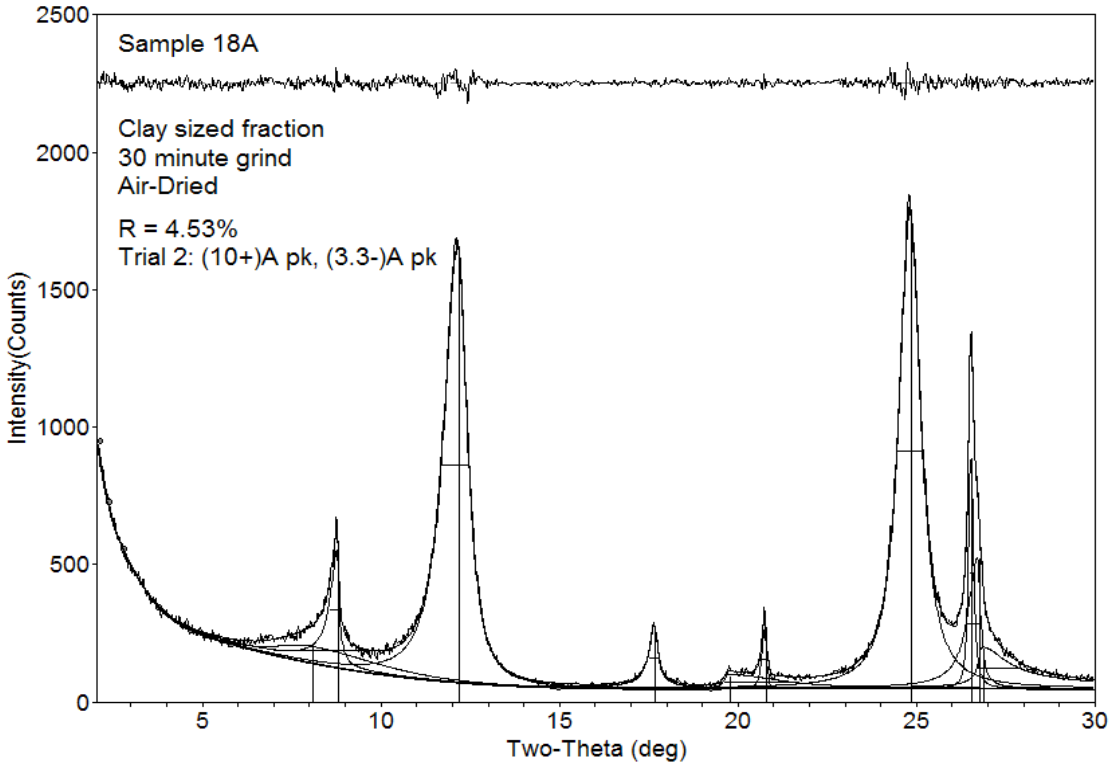

Sample 15E
Clay Fraction
30 Minute Grind
Air Dried
R=4.89%
Intensity(Counts)
Two-Theta (deg)

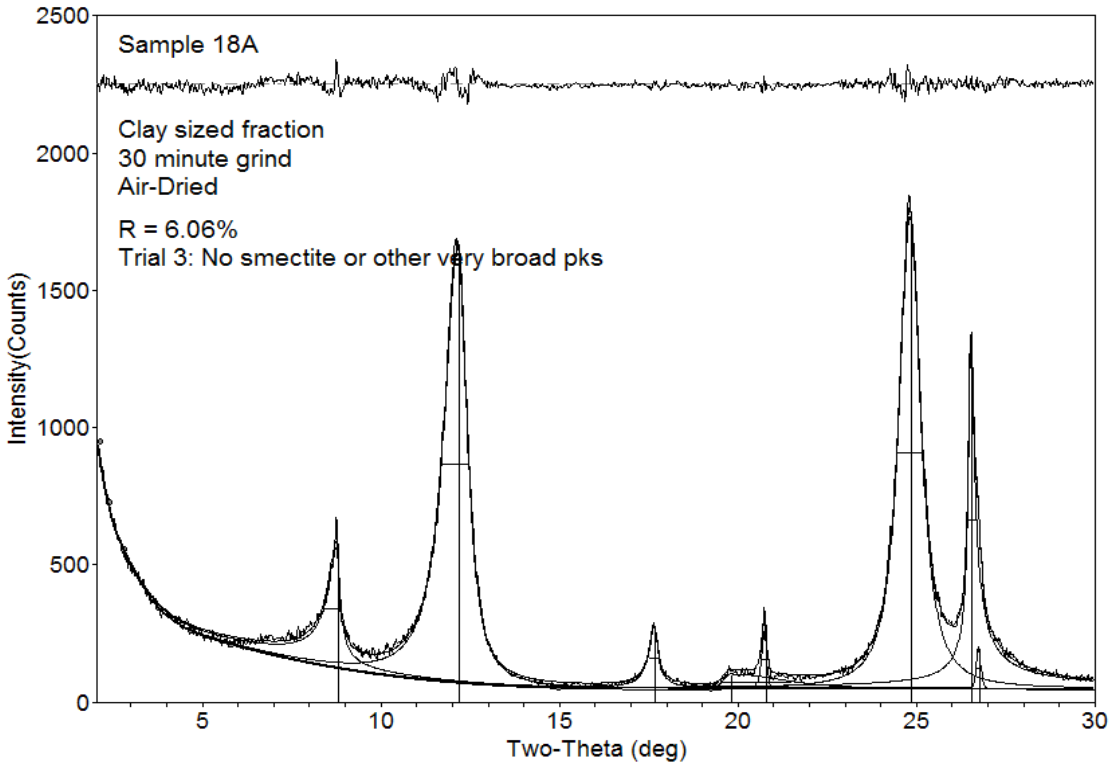

Sample 15E
Clay Fraction
30 Minute Grind
Ethylene Glycol Solvated
R=4.77%
Intensity(Counts)
Two-Theta (deg)
0
500
1000
1500
2000
2500
5
10
15
20
25
30

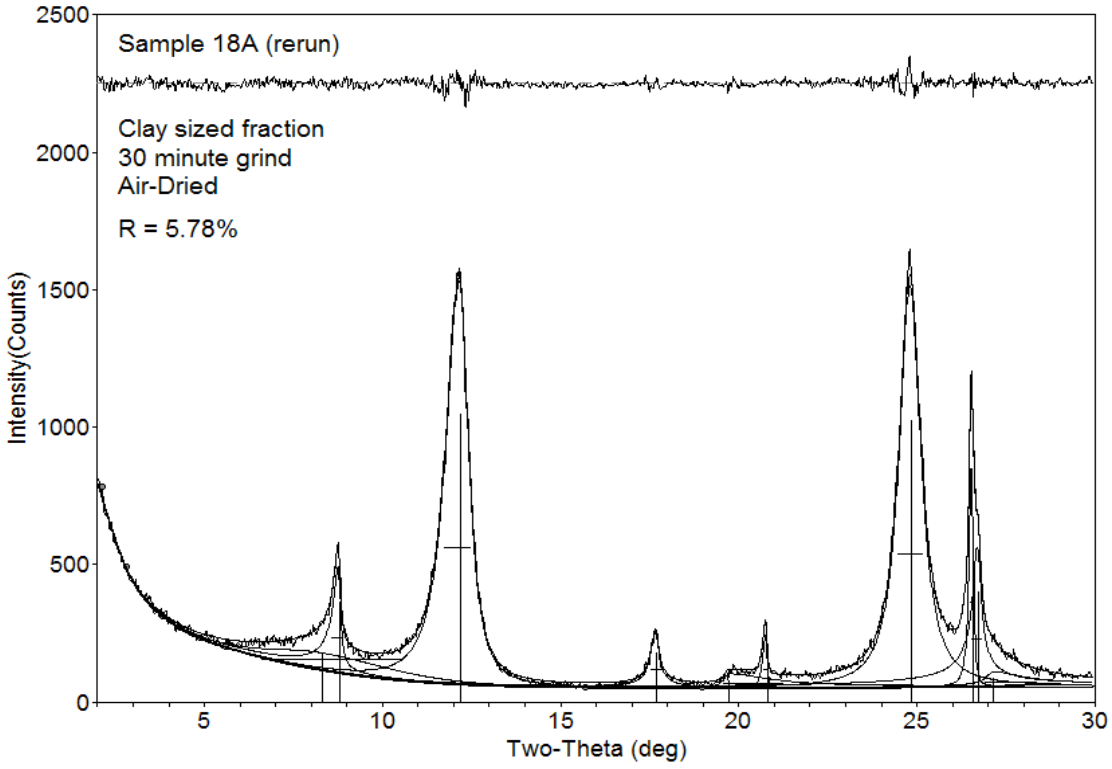

Sample 15E
Clay Fraction
30 Minute Grind
Ethylene Glycol Solvated
R=4.58%
Intensity(Counts)
Two-Theta (deg)
0
500
1000
1500
2000
2500
5
10
15
20
25
30

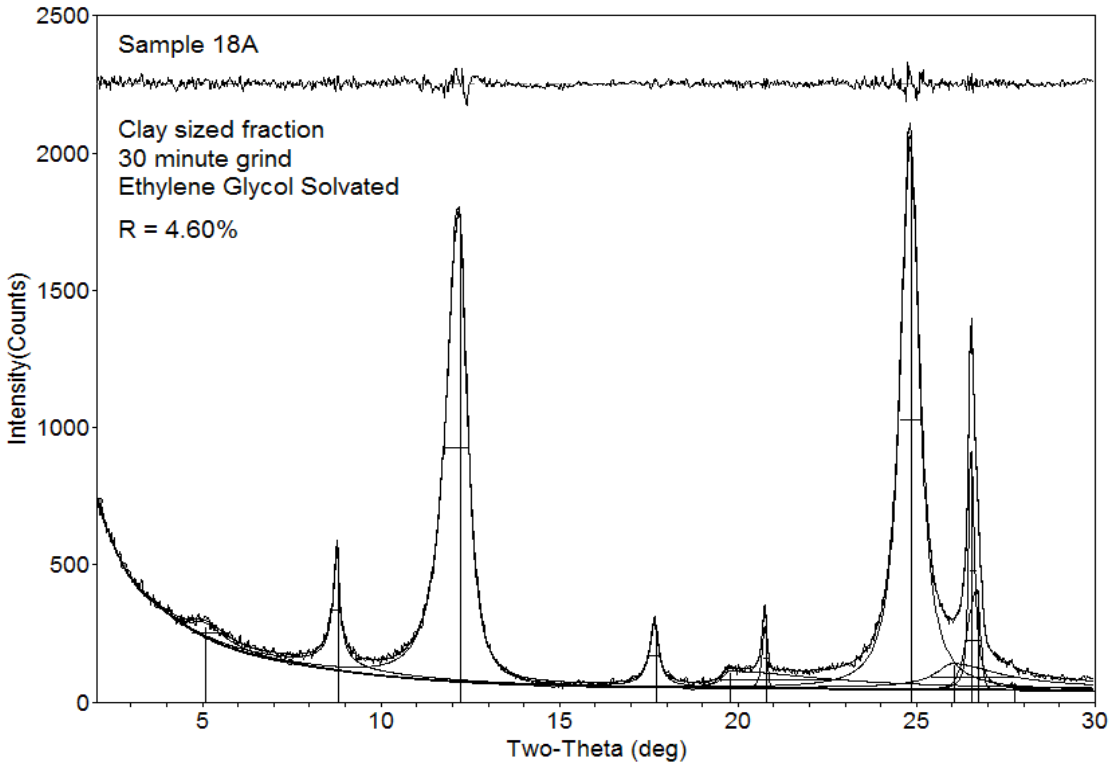

Sample 15J
Clay sized fraction
30 minute grind
Air-Dried
R = 4.66%
Intensity(Counts)
Two-Theta (deg)
2500
2000
1500
1000
500
0
5
10
15
20
25
30

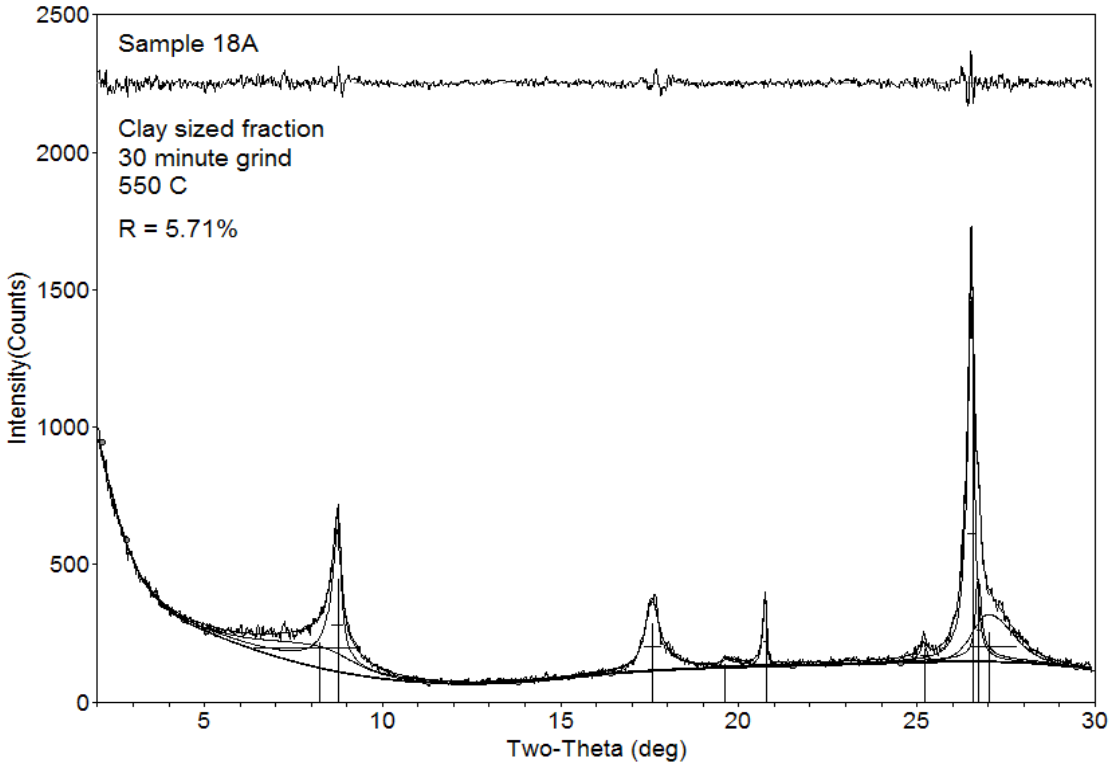

Sample 18A
Clay sized fraction
30 minute grind
Air-Dried
R = 4.29%
Trial 1: (10+)A pk, (7+)A pk, (3.3-)A pk
Intensity(Counts)
Two-Theta (deg)
2500
2000
1500
1000
500
0
5
10
15
20
25
30

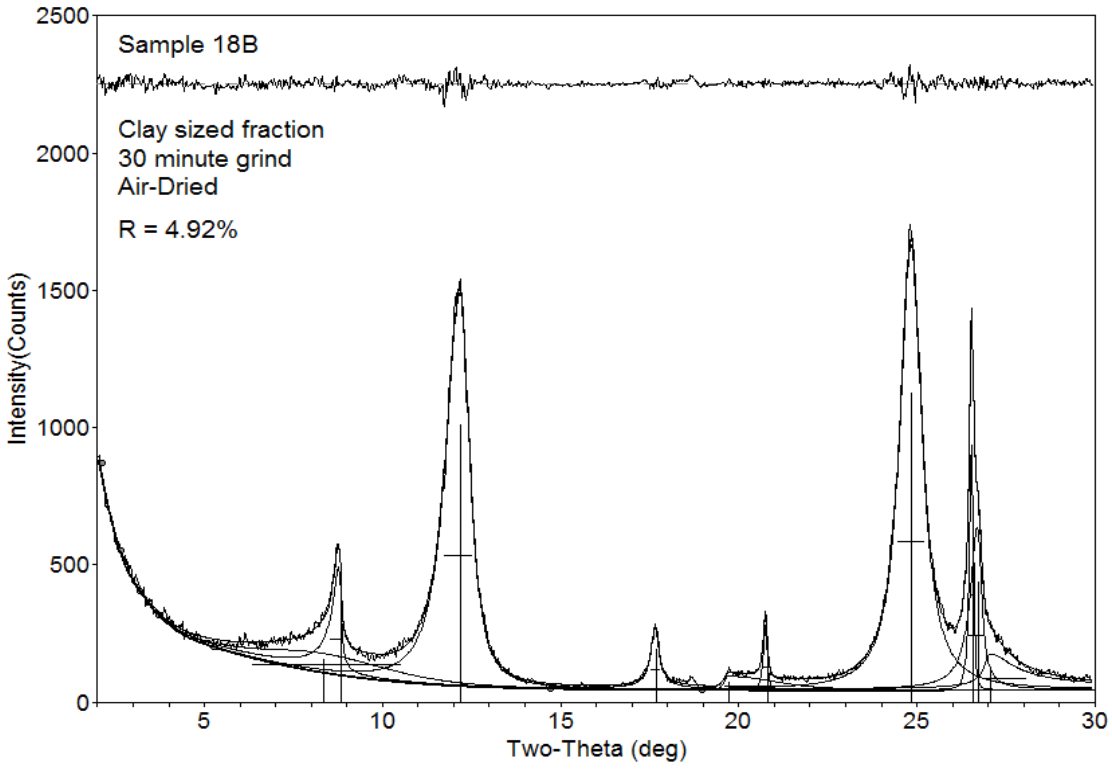

Sample 18A
Clay sized fraction
30 minute grind
Air-Dried
R = 4.53%
Trial 2: (10+)A pk, (3.3-)A pk
Intensity(Counts)
Two-Theta (deg)
2500
2000
1500
1000
500
0
5
10
15
20
25
30

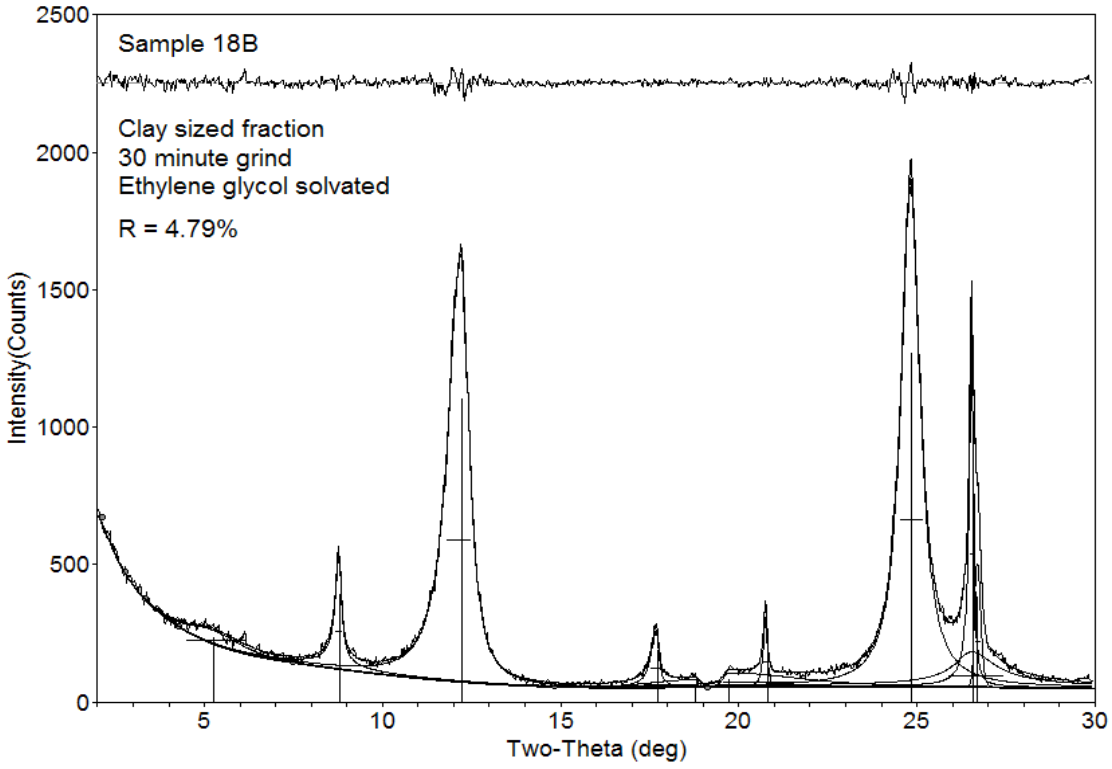

Sample 18A
Clay sized fraction
30 minute grind
Air-Dried
R = 6.06%
Trial 3: No smectite or other very broad pks
Intensity(Counts)
Two-Theta (deg)
0
500
1000
1500
2000
2500
5
10
15
20
25
30

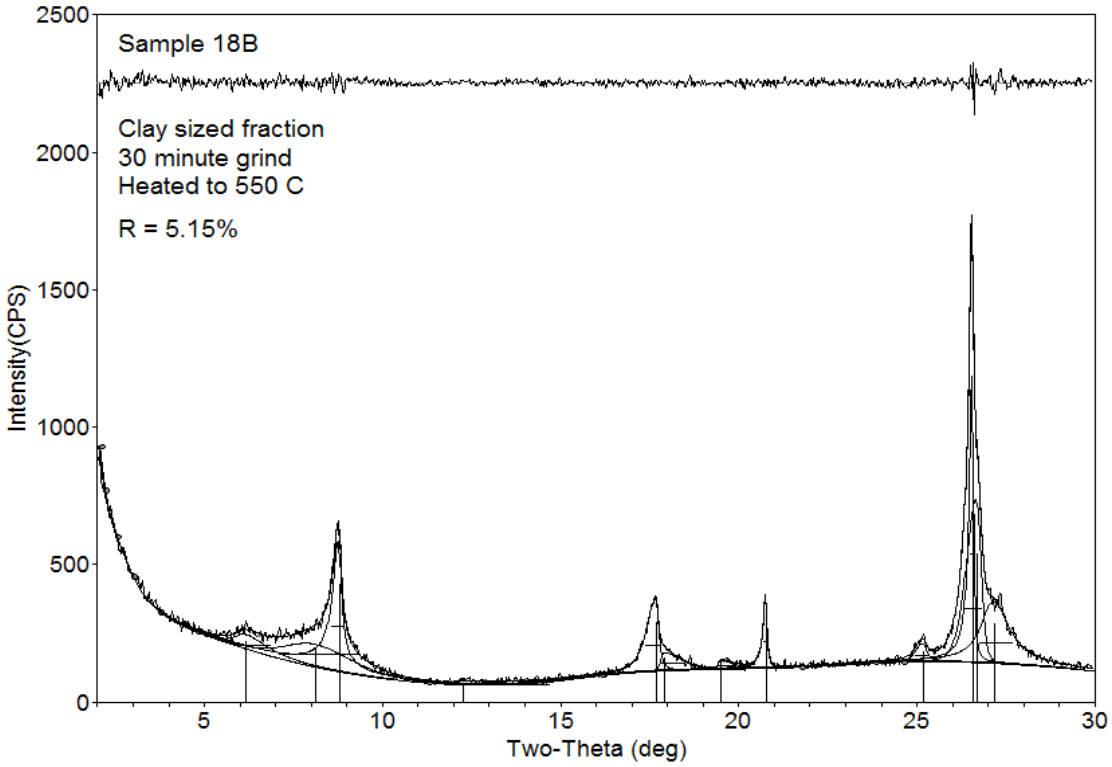

Sample 18A (rerun)
Clay sized fraction
30 minute grind
Air-Dried
R = 5.78%
Intensity(Counts)
Two-Theta (deg)
0
500
1000
1500
2000
2500
5
10
15
20
25
30

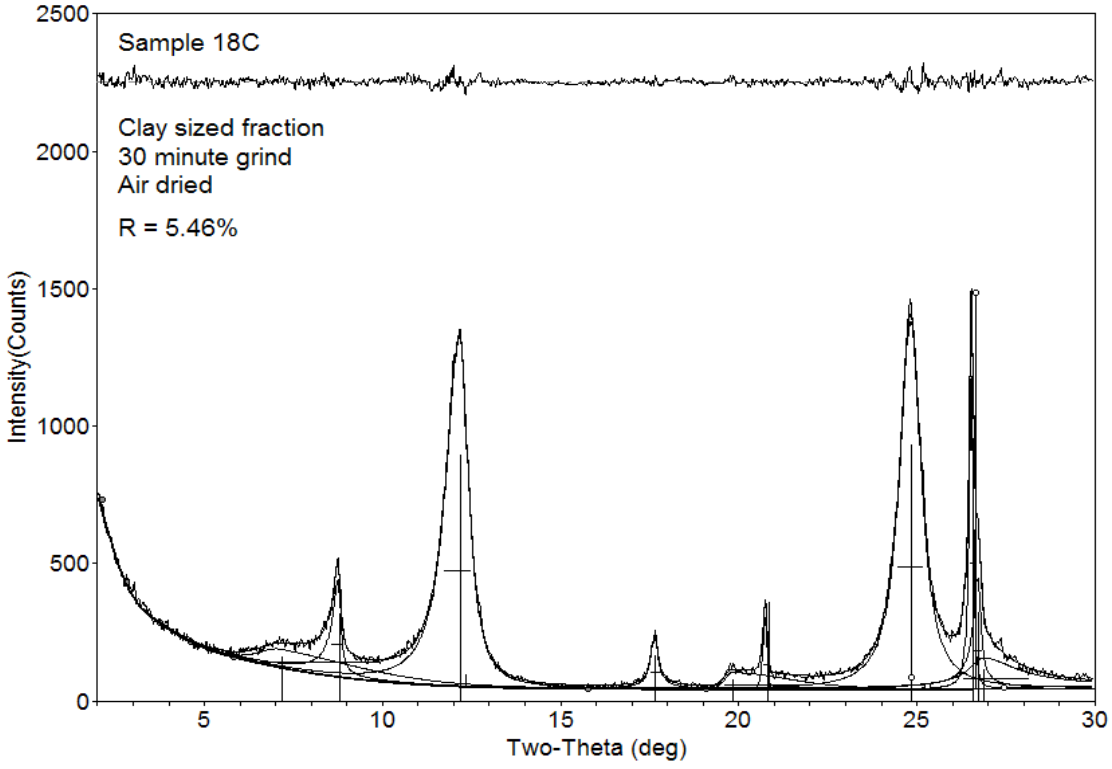

Sample 18A
Clay sized fraction
30 minute grind
Ethylene Glycol Solvated
R = 4.60%
Intensity(Counts)
Two-Theta (deg)
0
500
1000
1500
2000
2500
5
10
15
20
25
30

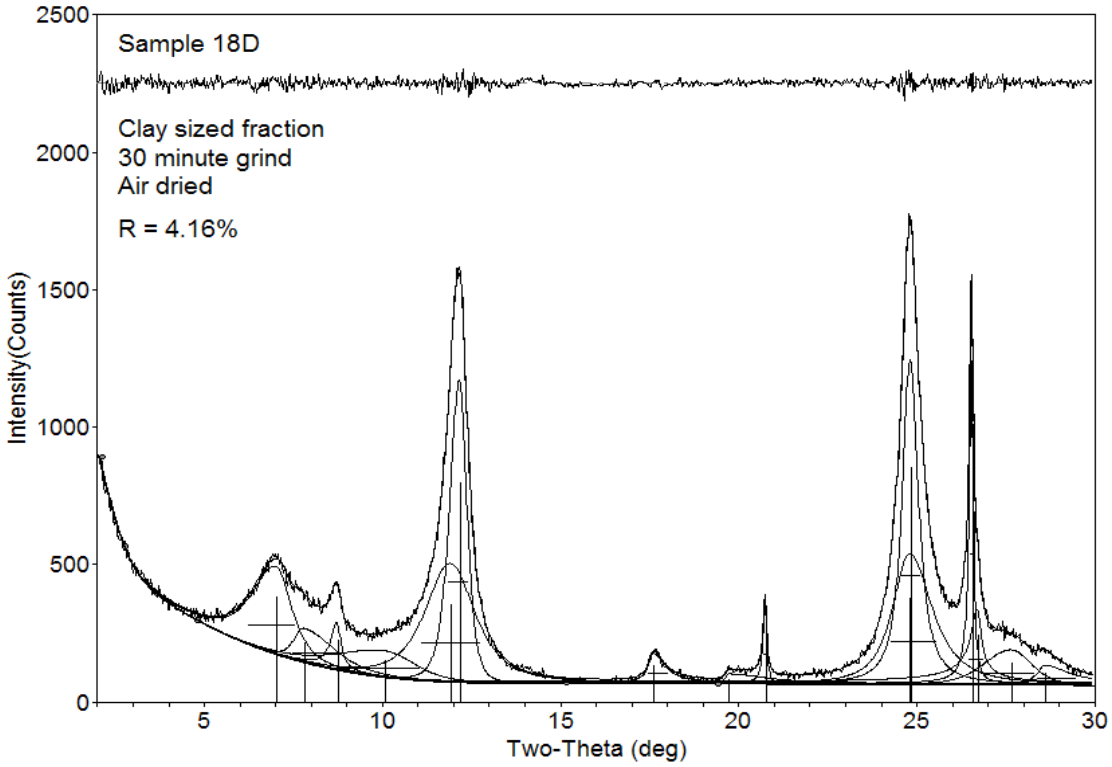

Sample 18A
Clay sized fraction
30 minute grind
550 C
R = 5.71%
Intensity(Counts)
Two-Theta (deg)
0
500
1000
1500
2000
2500
5
10
15
20
25
30

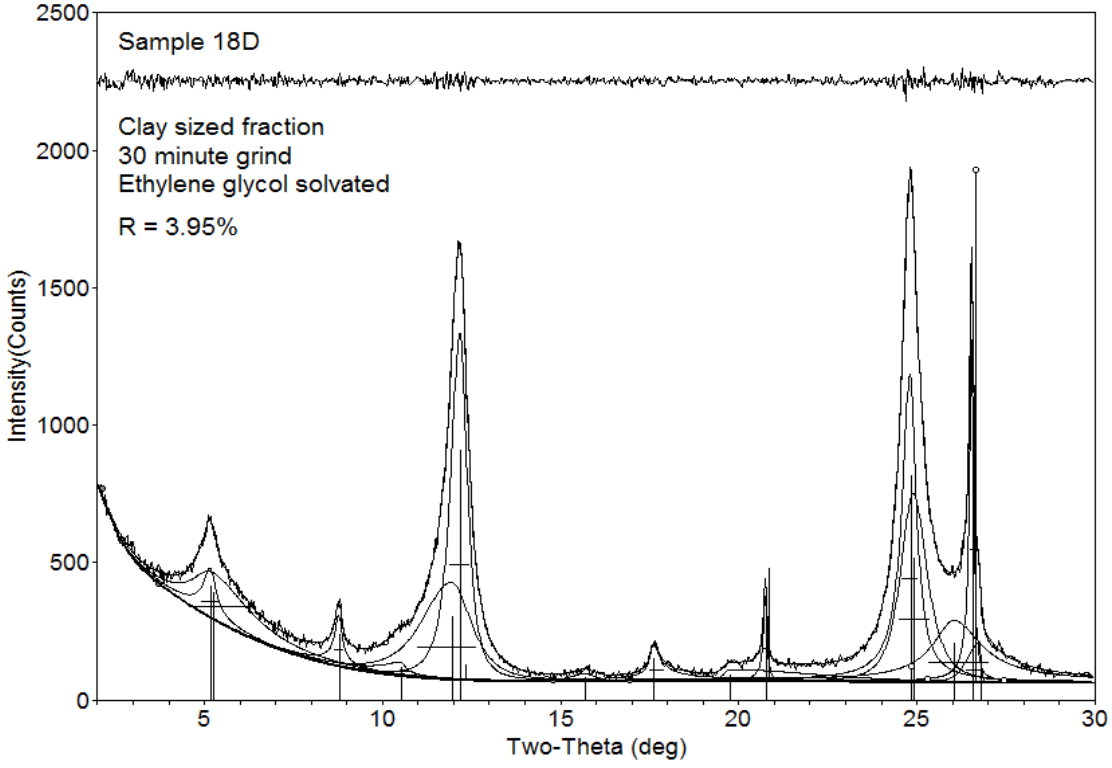

Sample 18B
Clay sized fraction
30 minute grind
Air-Dried
R = 4.92%
Intensity(Counts)
Two-Theta (deg)

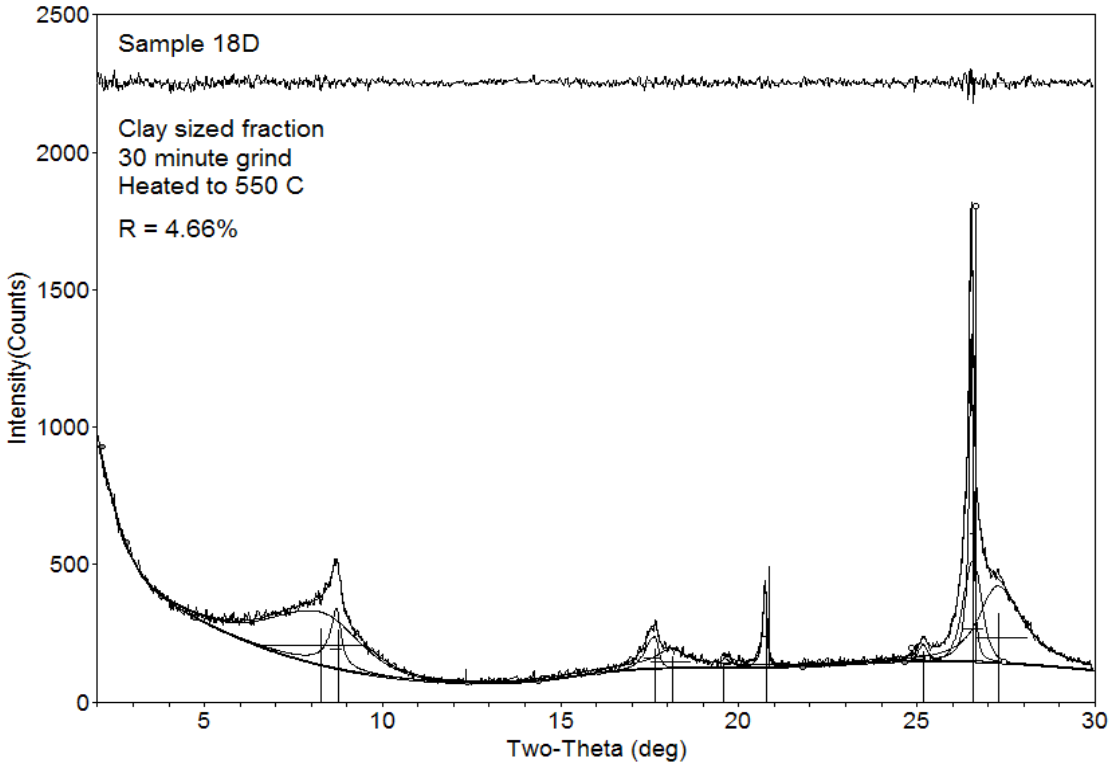

Sample 18B
Clay sized fraction
30 minute grind
Ethylene glycol solvated
R = 4.79%
Intensity(Counts)
Two-Theta (deg)

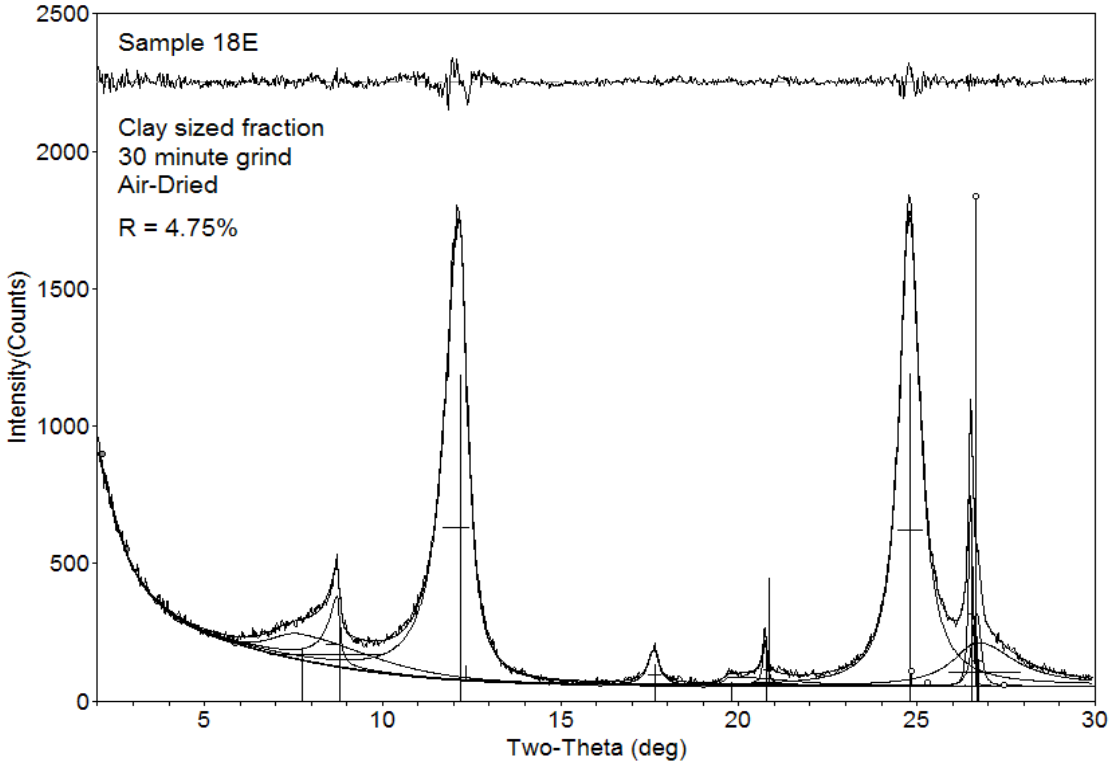

Sample 18B
Clay sized fraction
30 minute grind
Heated to 550 C
R = 5.15%
Intensity(CPS)
Two-Theta (deg)
2500
2000
1500
1000
500
0
5
10
15
20
25
30

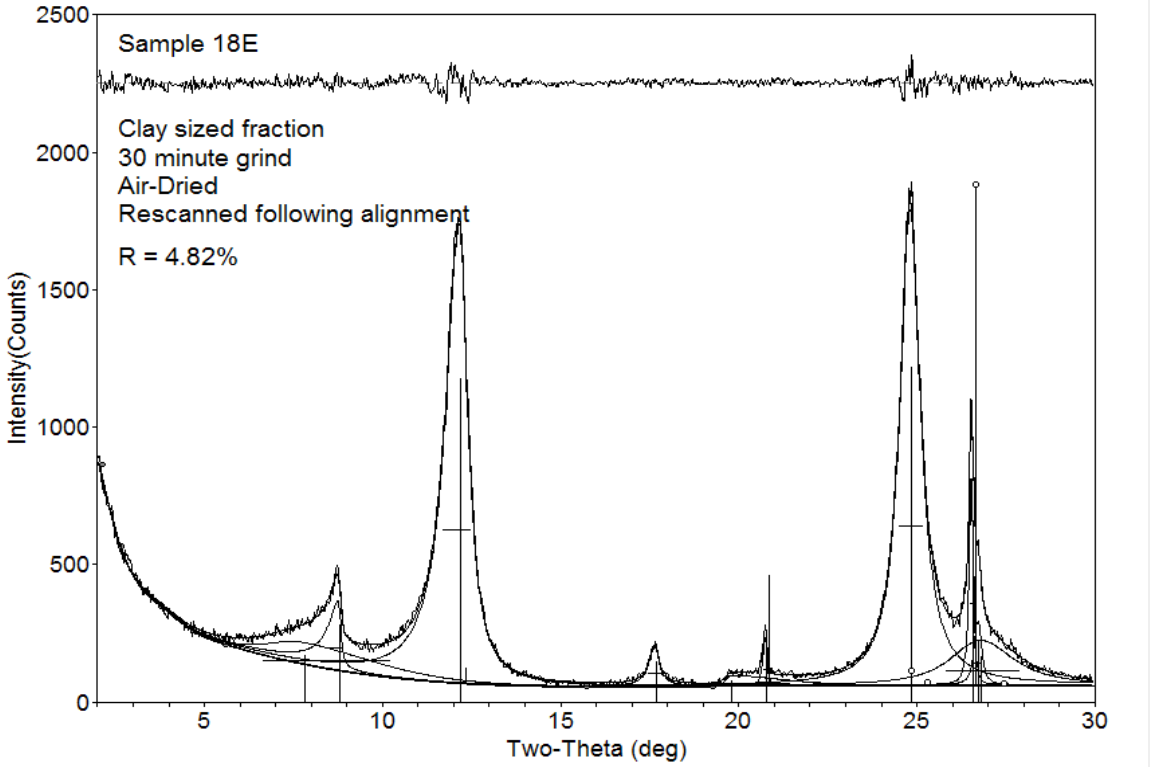

Sample 18C
Clay sized fraction
30 minute grind
Air dried
R = 5.46%
Intensity(Counts)
Two-Theta (deg)
2500
2000
1500
1000
500
0
5
10
15
20
25
30

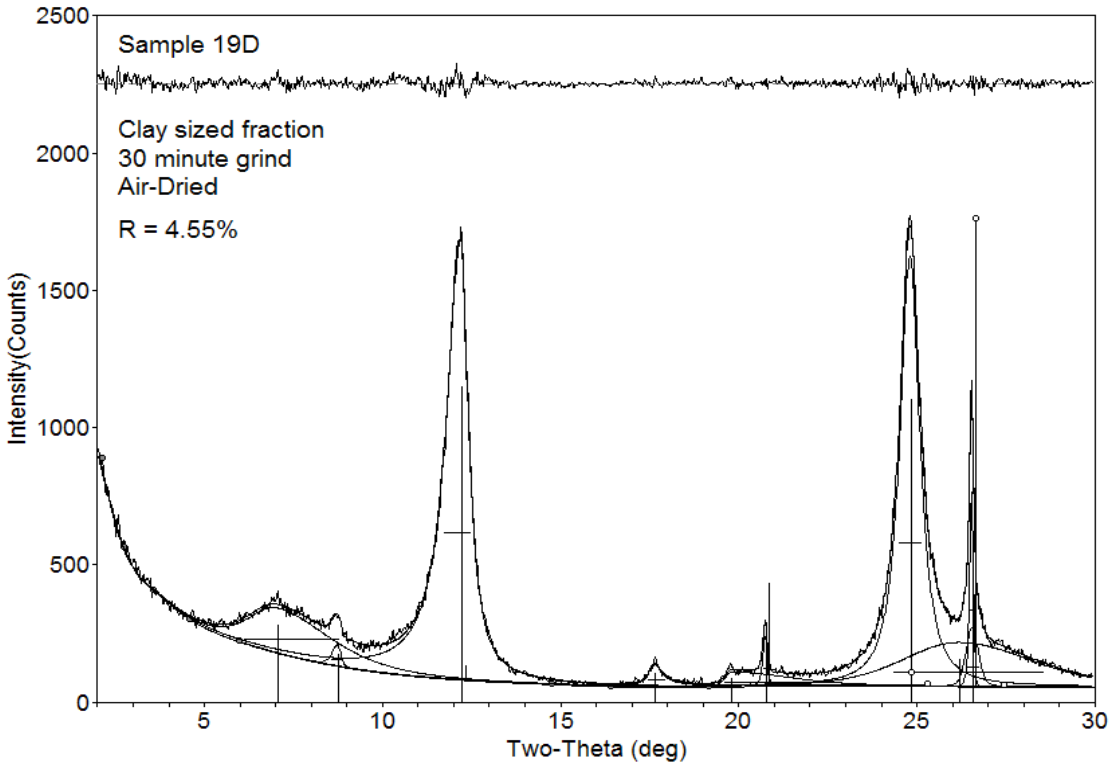

Sample 18D
Clay sized fraction
30 minute grind
Air dried
R = 4.16%
Intensity(Counts)
Two-Theta (deg)

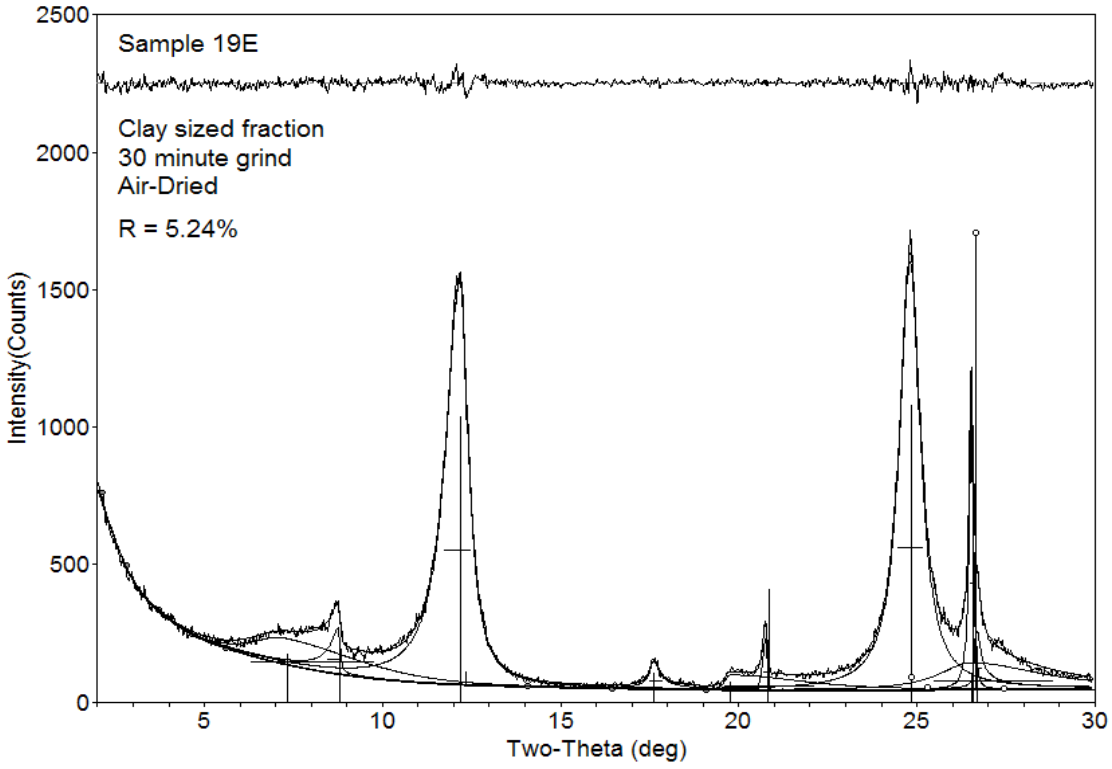

Sample 18D
Clay sized fraction
30 minute grind
Ethylene glycol solvated
R = 3.95%
Intensity(Counts)
Two-Theta (deg)

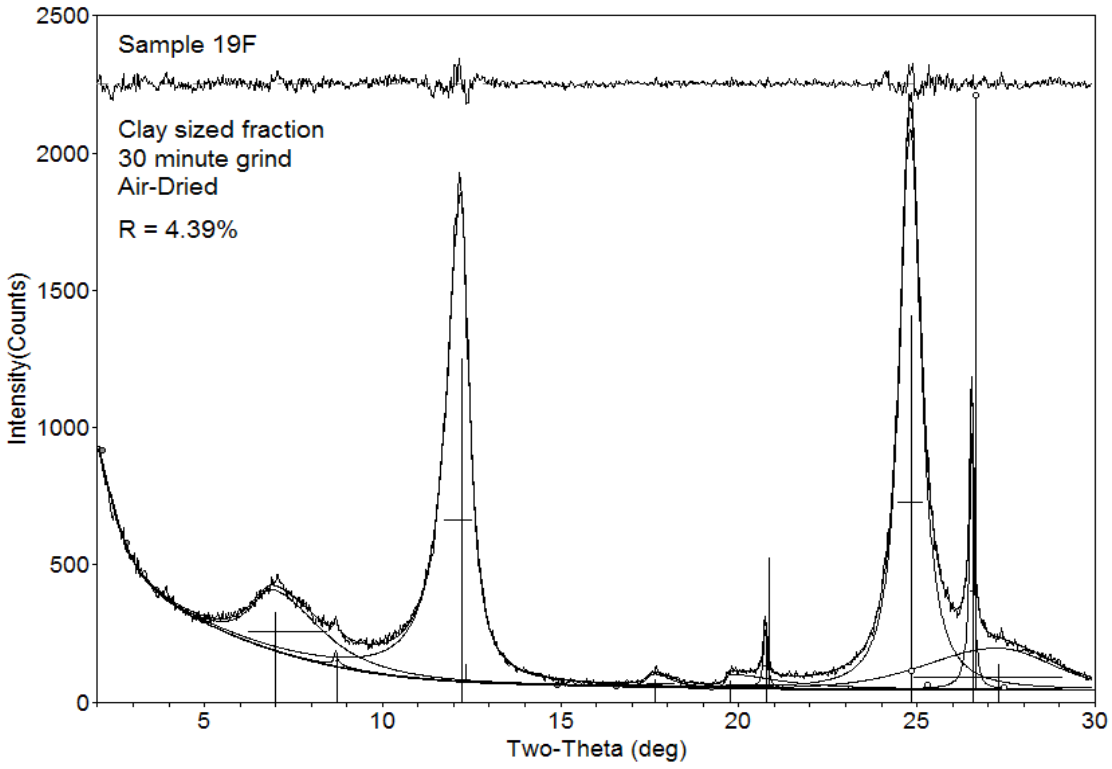

Sample 18D
Clay sized fraction
30 minute grind
Heated to 550 C
R = 4.66%
Intensity(Counts)
Two-Theta (deg)
2500
2000
1500
1000
500
0
5
10
15
20
25
30

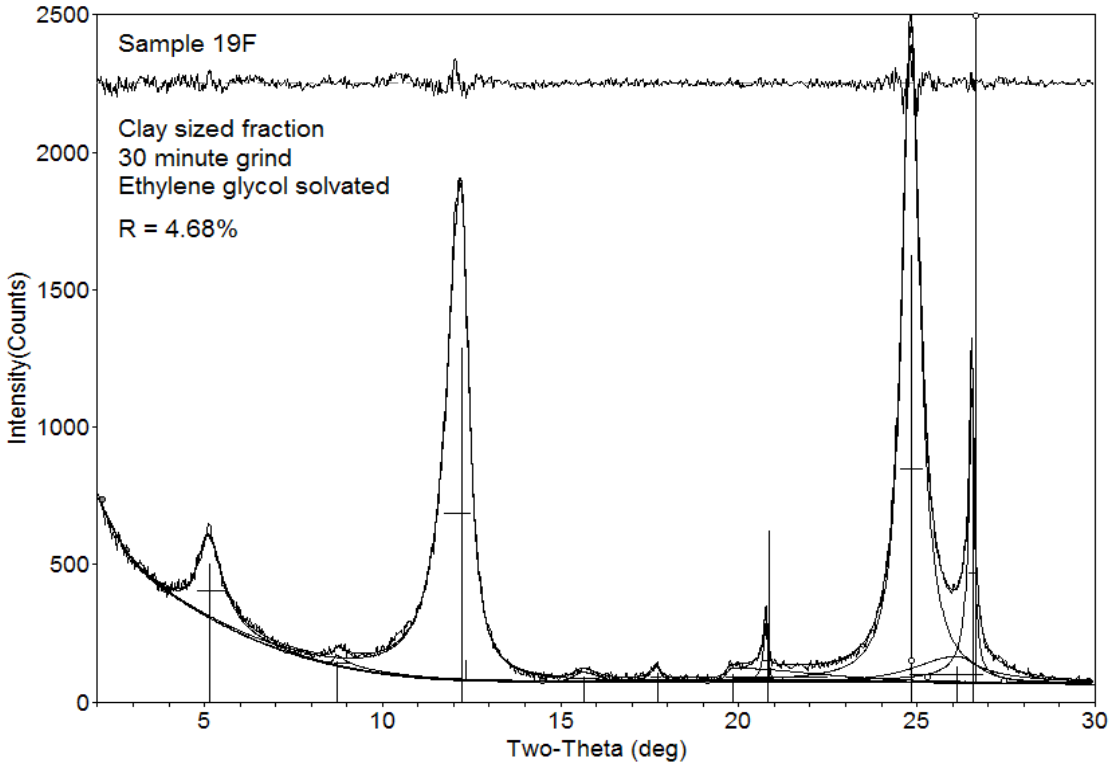

Sample 18E
Clay sized fraction
30 minute grind
Air-Dried
R = 4.75%
Intensity(Counts)
Two-Theta (deg)
2500
2000
1500
1000
500
0
5
10
15
20
25
30

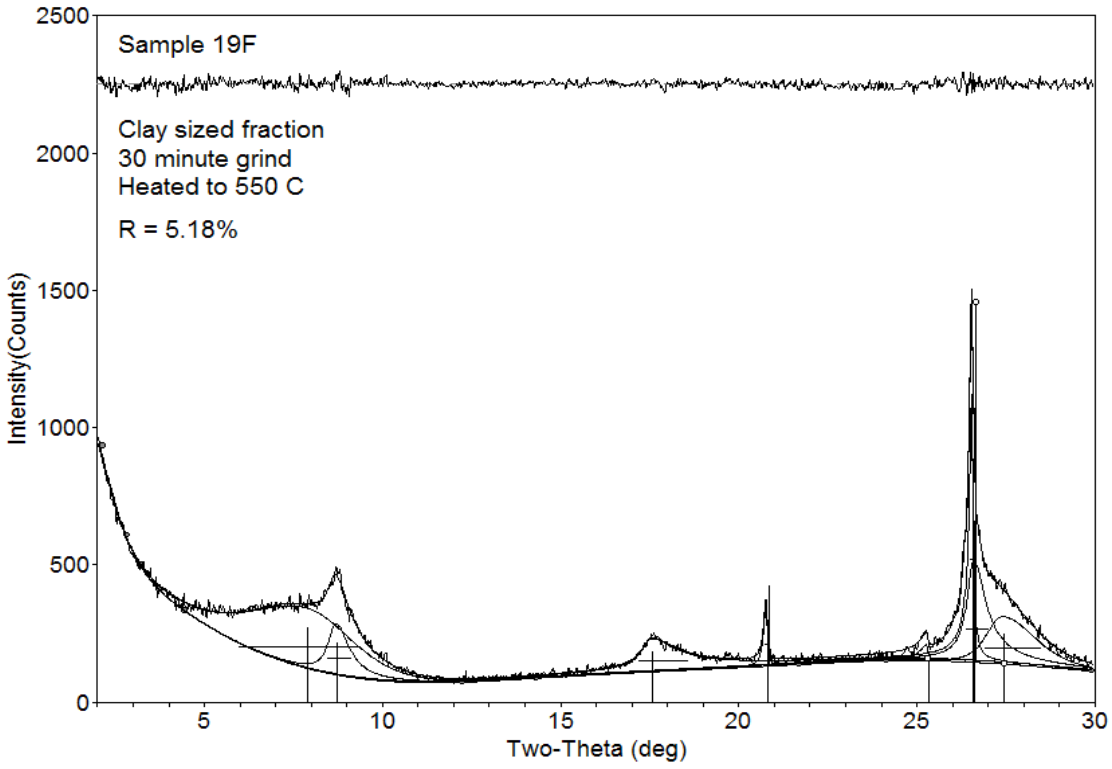

Sample 18E
Clay sized fraction
30 minute grind
Air-Dried
Rescanned following alignment
R = 4.82%
Intensity(Counts)
Two-Theta (deg)
2500
2000
1500
1000
500
0
5
10
15
20
25
30

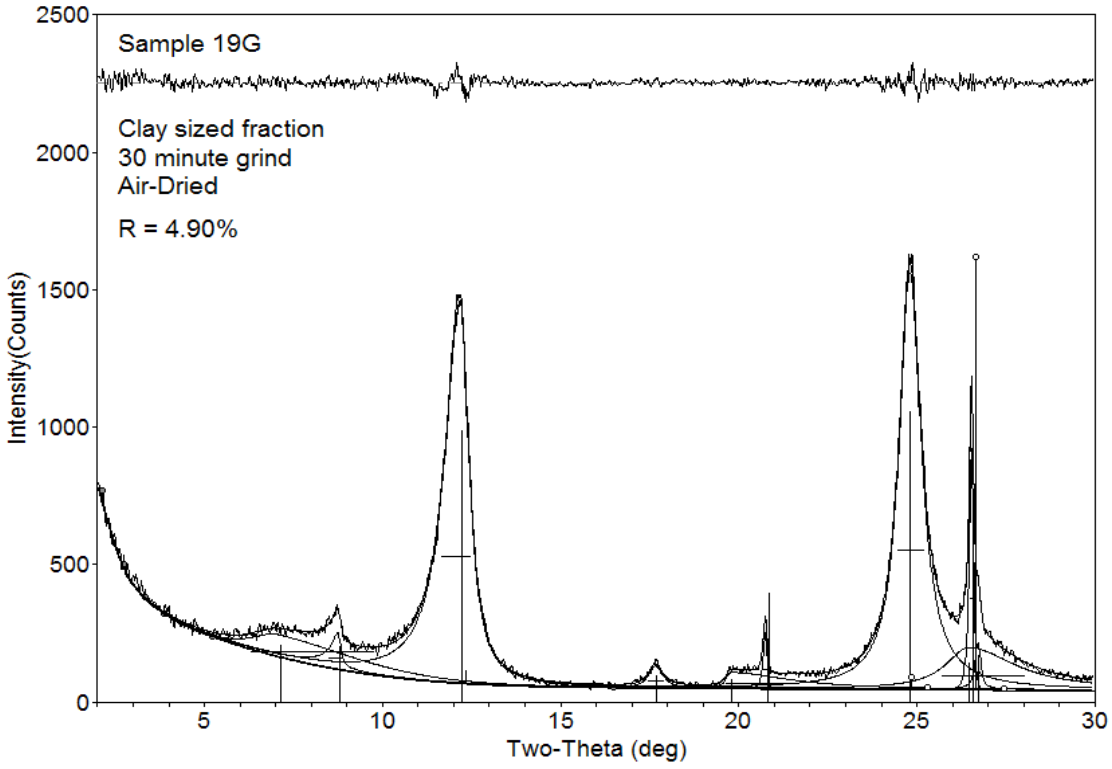

Sample 19D
Clay sized fraction
30 minute grind
Air-Dried
R = 4.55%
Intensity(Counts)
Two-Theta (deg)
2500
2000
1500
1000
500
0
5
10
15
20
25
30

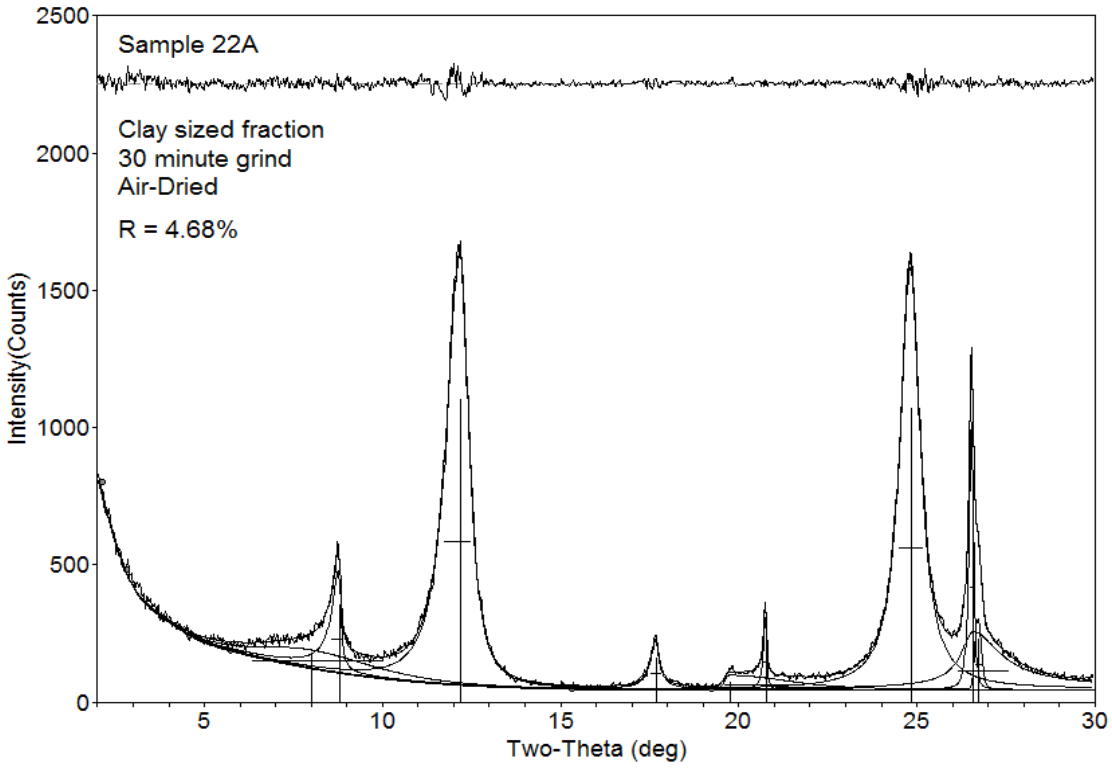

Sample 19E
Clay sized fraction
30 minute grind
Air-Dried
R = 5.24%
Intensity(Counts)
Two-Theta (deg)
2500
2000
1500
1000
500
0
5
10
15
20
25
30

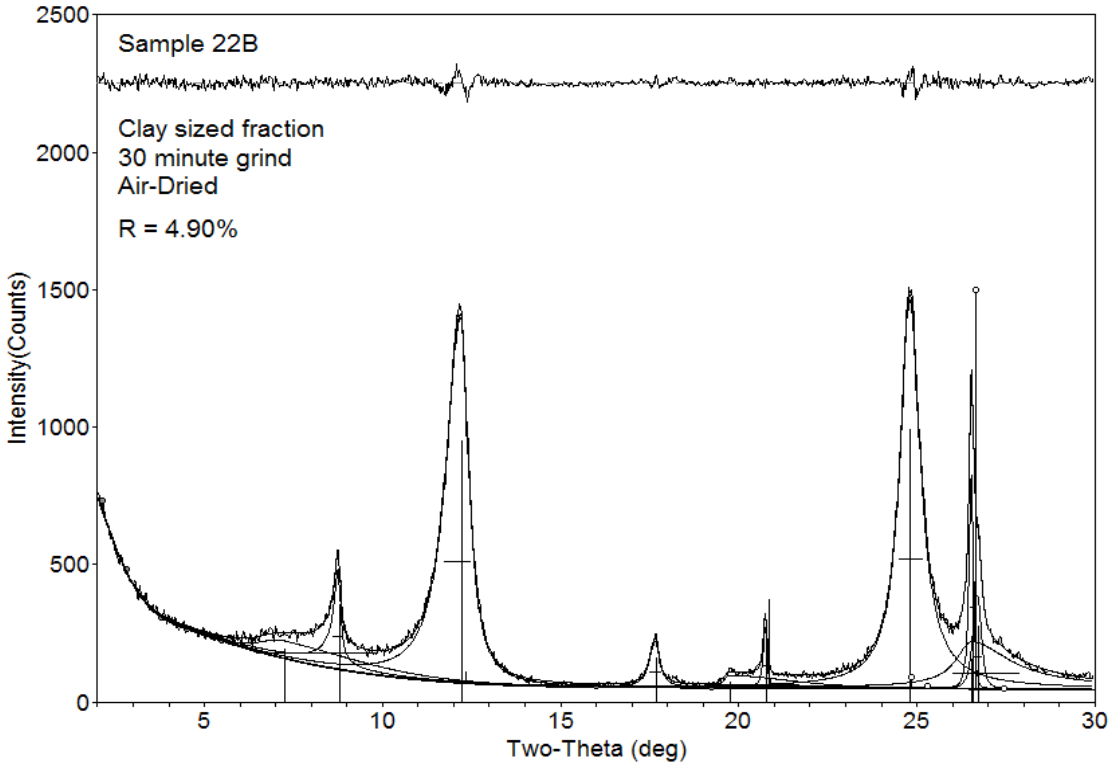

Sample 19F
Clay sized fraction
30 minute grind
Air-Dried
R = 4.39%
Intensity(Counts)
Two-Theta (deg)
0
500
1000
1500
2000
2500
5
10
15
20
25
30

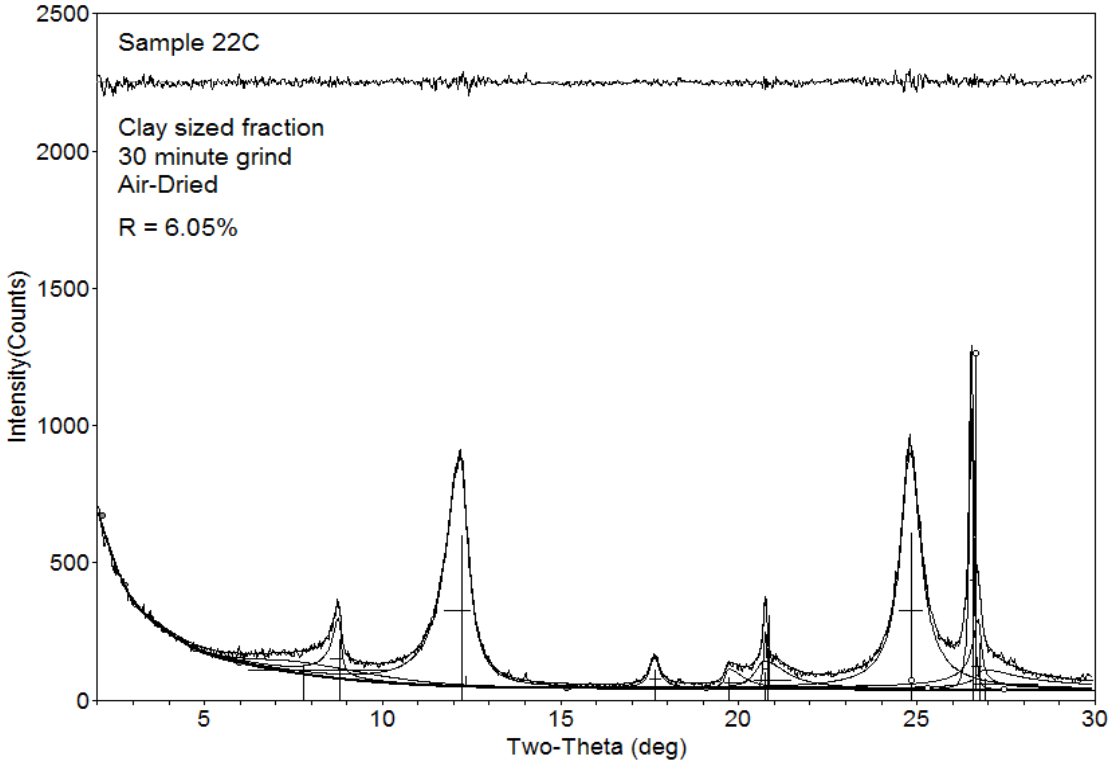

Sample 19F
Clay sized fraction
30 minute grind
Ethylene glycol solvated
R = 4.68%
Intensity(Counts)
Two-Theta (deg)
0
500
1000
1500
2000
2500
5
10
15
20
25
30

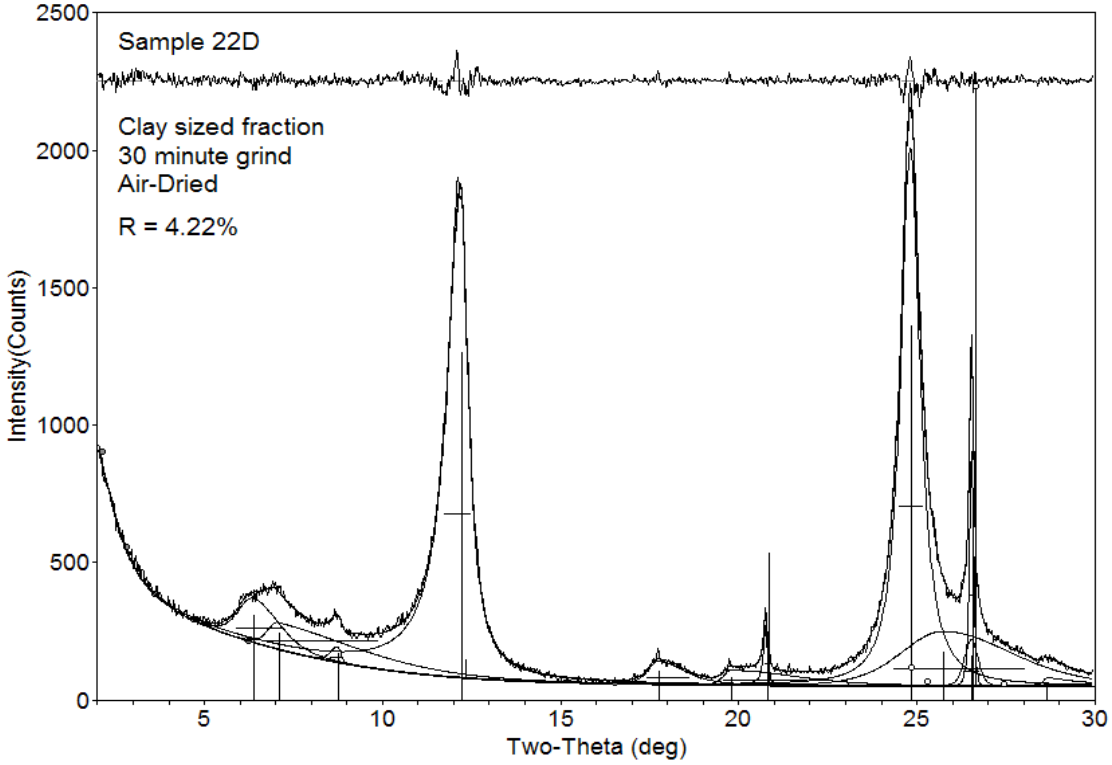

Sample 19F
Clay sized fraction
30 minute grind
Heated to 550 C
R = 5.18%
Intensity(Counts)
Two-Theta (deg)
0
500
1000
1500
2000
2500
5
10
15
20
25
30

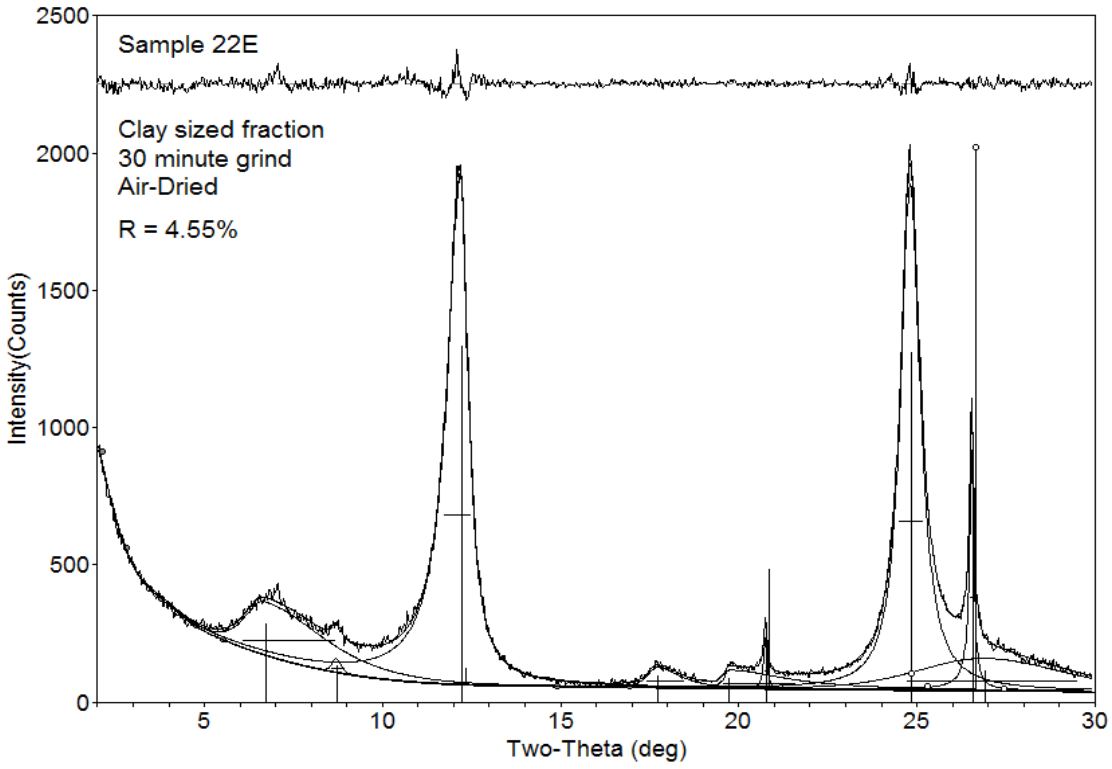

Sample 19G
Clay sized fraction
30 minute grind
Air-Dried
R = 4.90%
Intensity(Counts)
Two-Theta (deg)
0
500
1000
1500
2000
2500
5
10
15
20
25
30

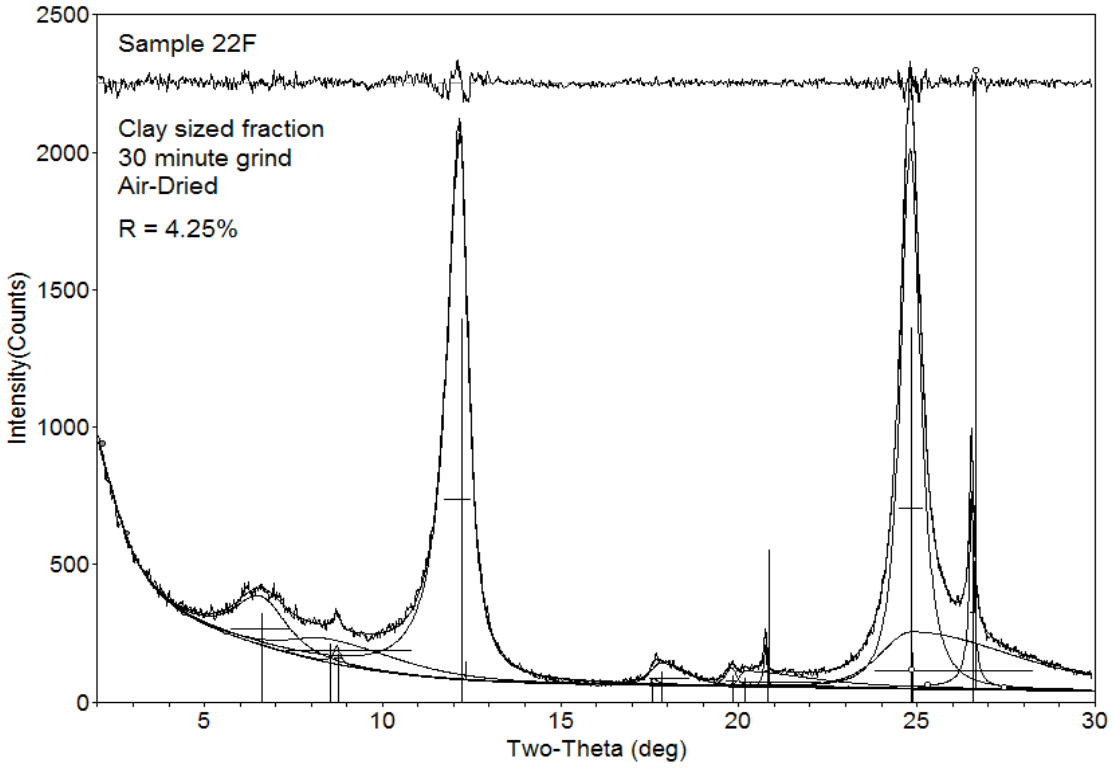

Sample 22A
Clay sized fraction
30 minute grind
Air-Dried
R = 4.68%
Intensity(Counts)
Two-Theta (deg)
2500
2000
1500
1000
500
0
5
10
15
20
25
30

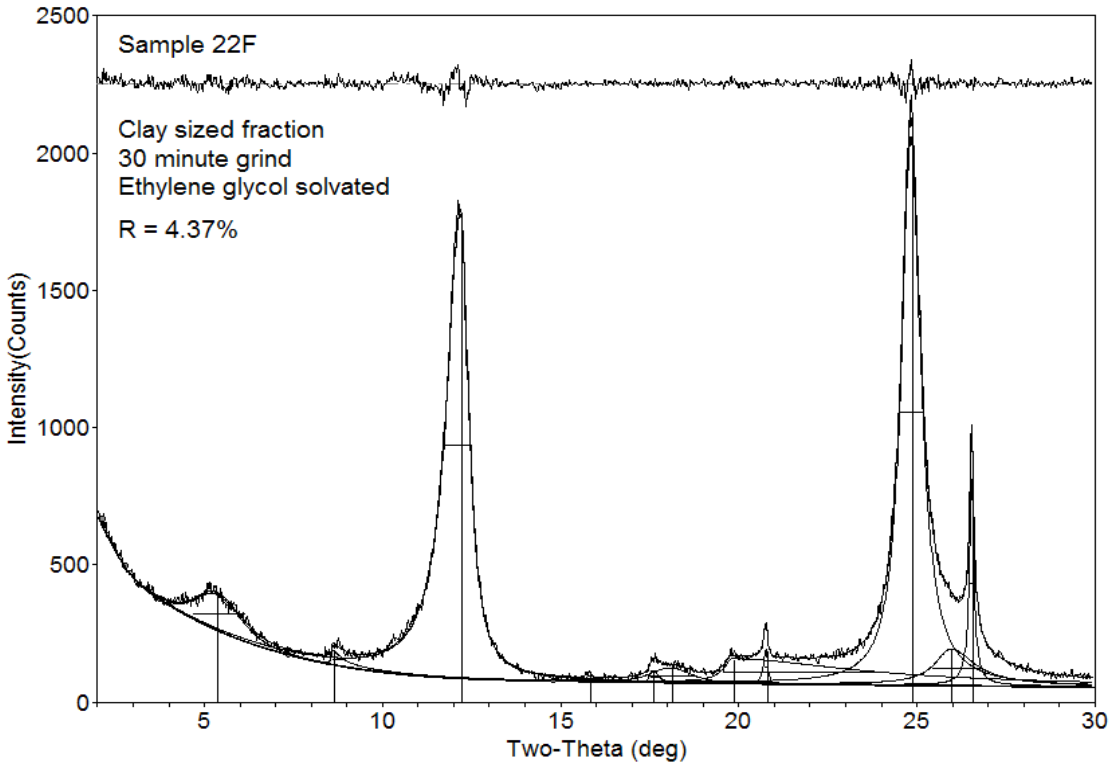

Sample 22B
Clay sized fraction
30 minute grind
Air-Dried
R = 4.90%
Intensity(Counts)
Two-Theta (deg)
2500
2000
1500
1000
500
0
5
10
15
20
25
30

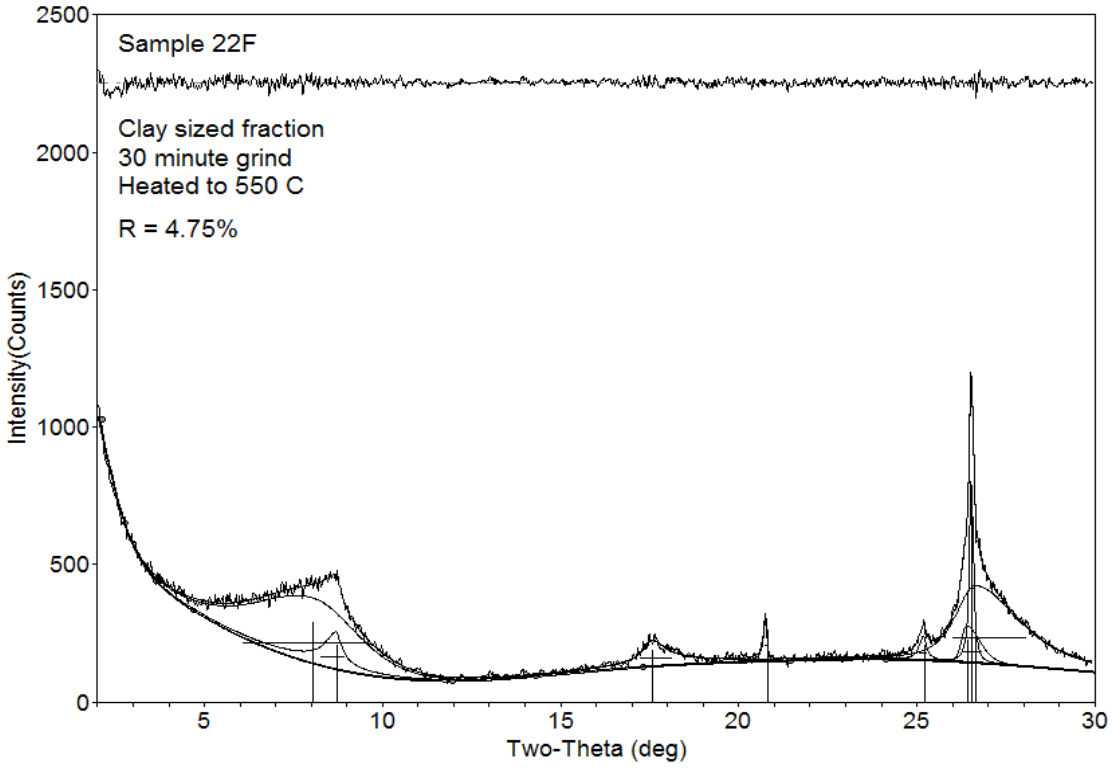

Sample 22C
Clay sized fraction
30 minute grind
Air-Dried
R = 6.05%
Intensity(Counts)
Two-Theta (deg)
0
500
1000
1500
2000
2500
5
10
15
20
25
30

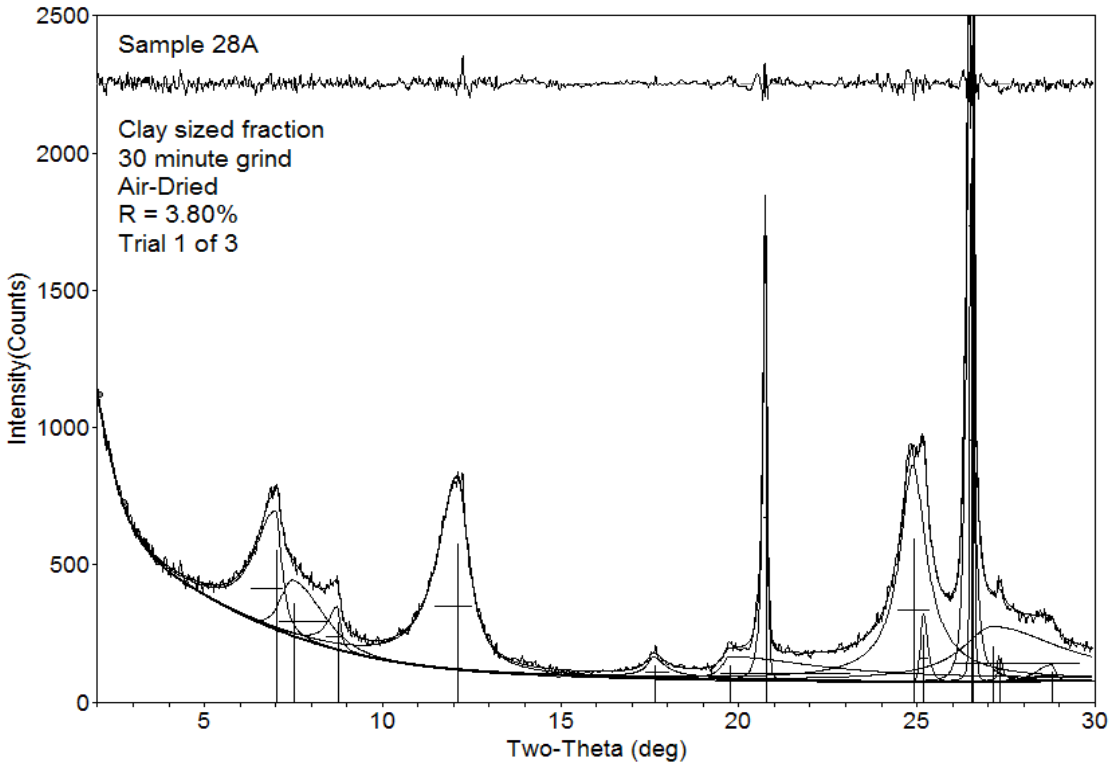

Sample 22D
Clay sized fraction
30 minute grind
Air-Dried
R = 4.22%
Intensity(Counts)
Two-Theta (deg)
0
500
1000
1500
2000
2500
5
10
15
20
25
30

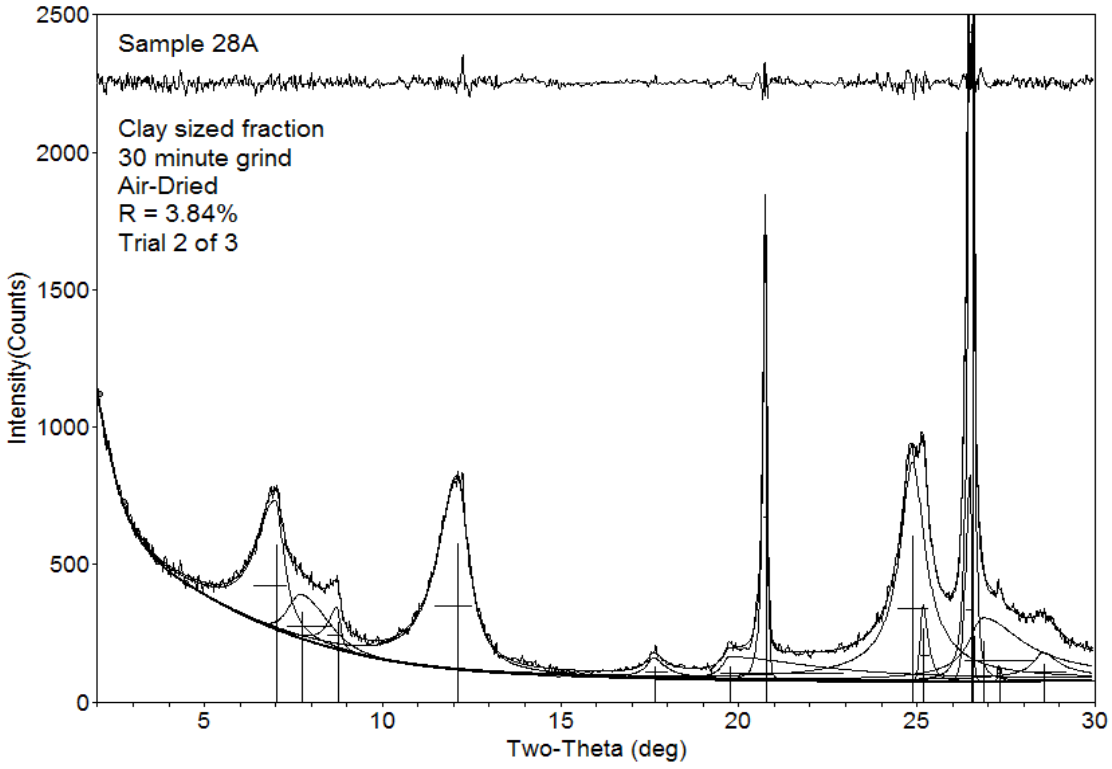

Sample 22E
Clay sized fraction
30 minute grind
Air-Dried
R = 4.55%
Intensity(Counts)
Two-Theta (deg)
2500
2000
1500
1000
500
0
5
10
15
20
25
30

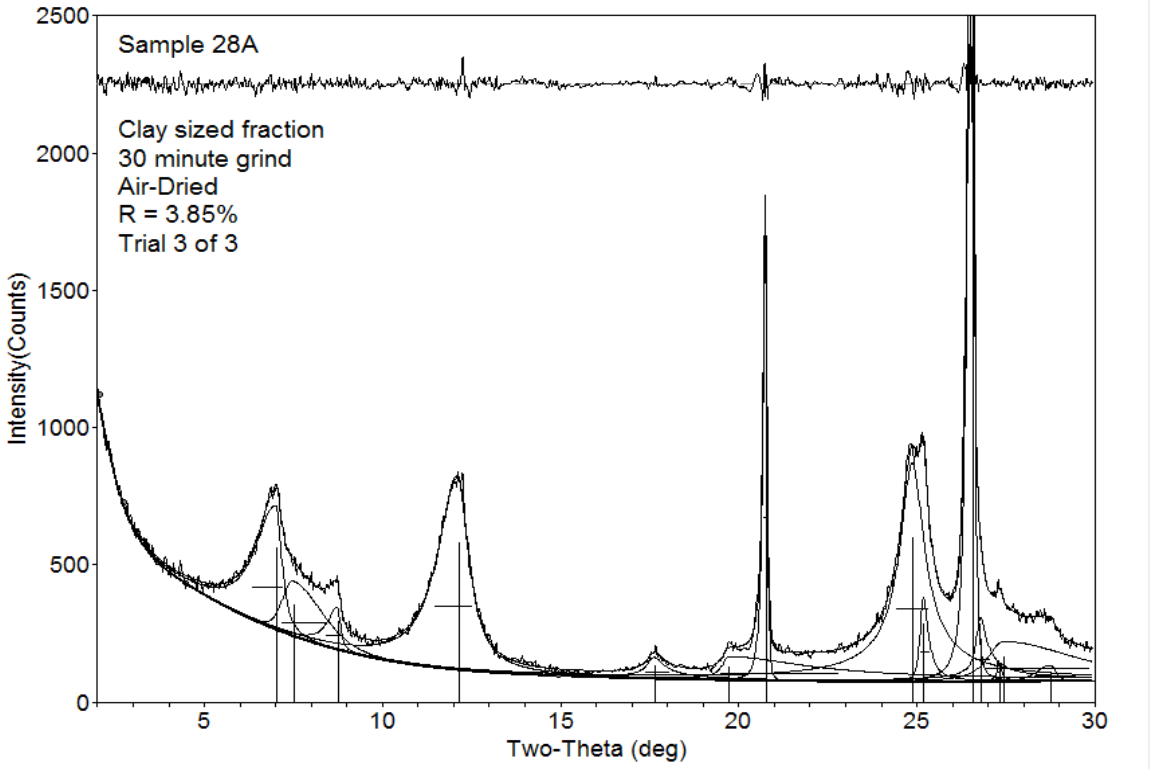

Sample 22F
Clay sized fraction
30 minute grind
Air-Dried
R = 4.25%
Intensity(Counts)
Two-Theta (deg)
2500
2000
1500
1000
500
0
5
10
15
20
25
30

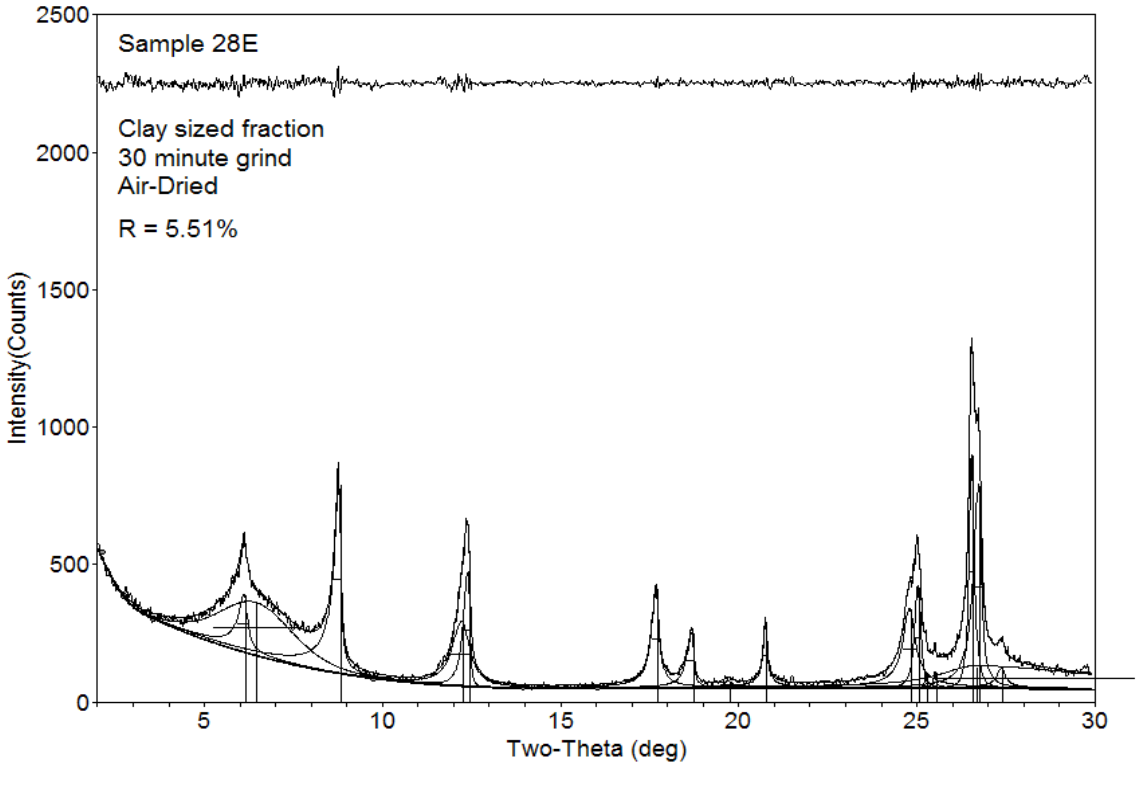

Sample 22F
Clay sized fraction
30 minute grind
Ethylene glycol solvated
R = 4.37%
Intensity(Counts)
Two-Theta (deg)
0
500
1000
1500
2000
2500
5
10
15
20
25
30

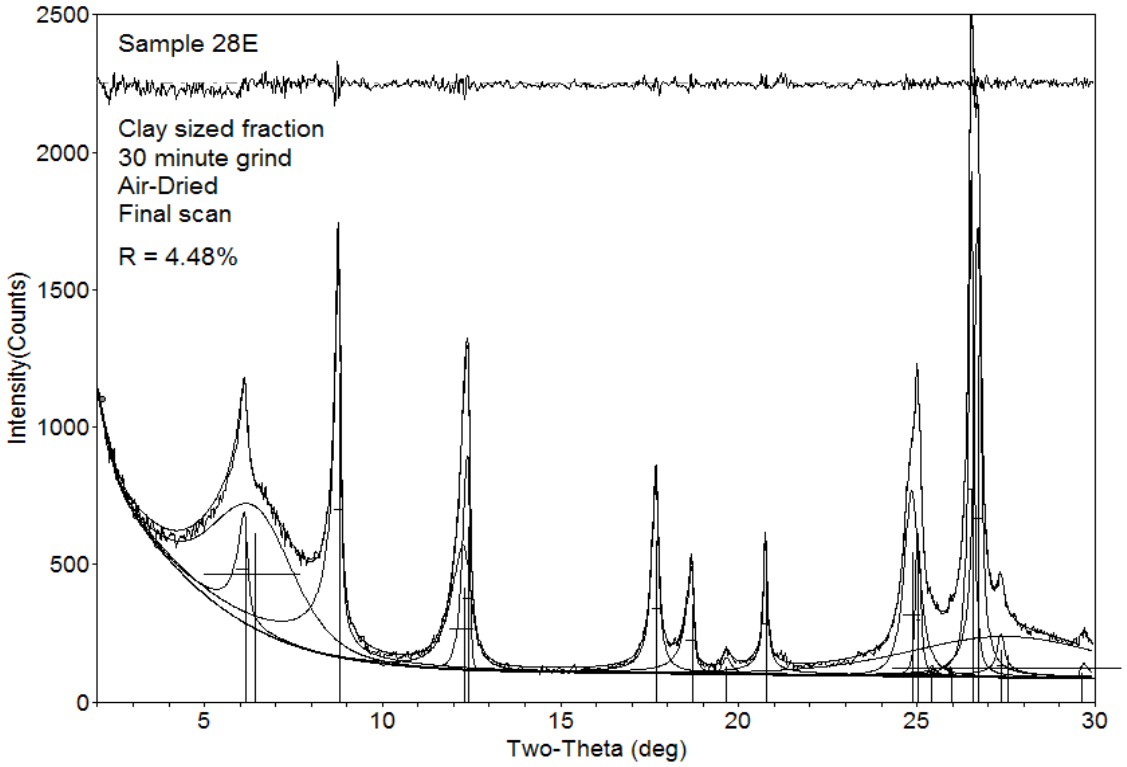

Sample 22F
Clay sized fraction
30 minute grind
Heated to 550 C
R = 4.75%
Intensity(Counts)
Two-Theta (deg)
0
500
1000
1500
2000
2500
5
10
15
20
25
30

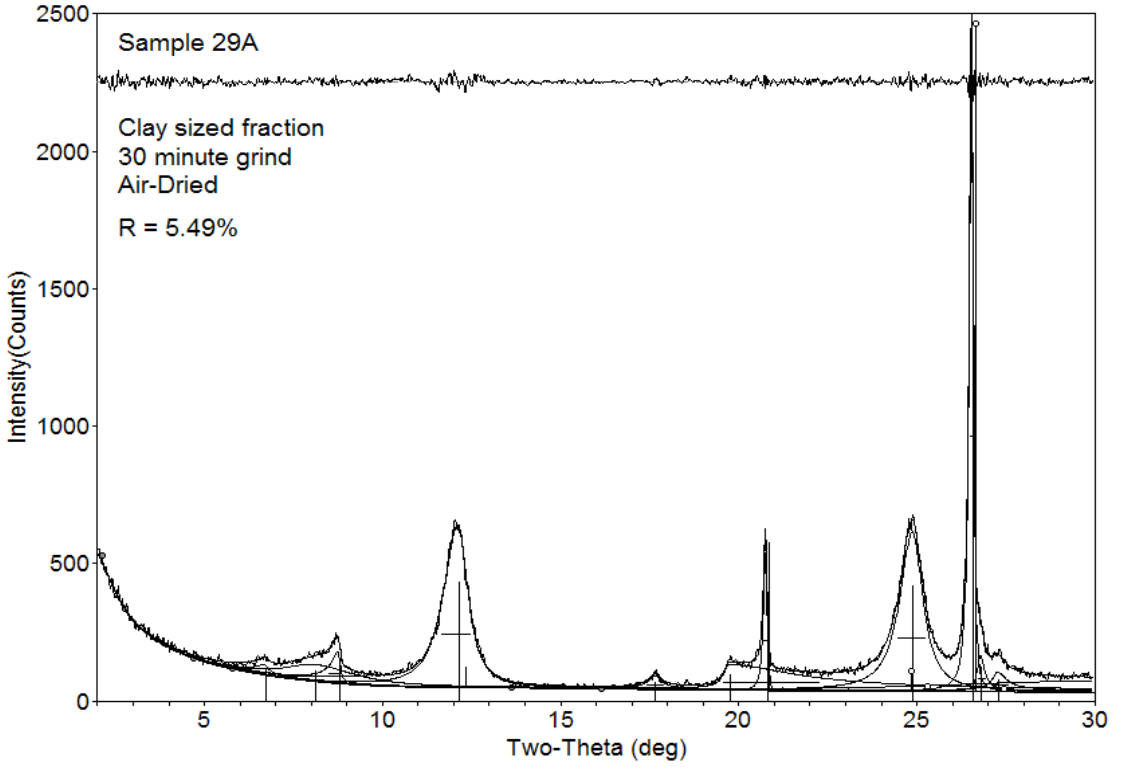

Sample 28A
Clay sized fraction
30 minute grind
Air-Dried
R = 3.80%
Trial 1 of 3
Intensity(Counts)
Two-Theta (deg)
0
500
1000
1500
2000
2500
5
10
15
20
25
30

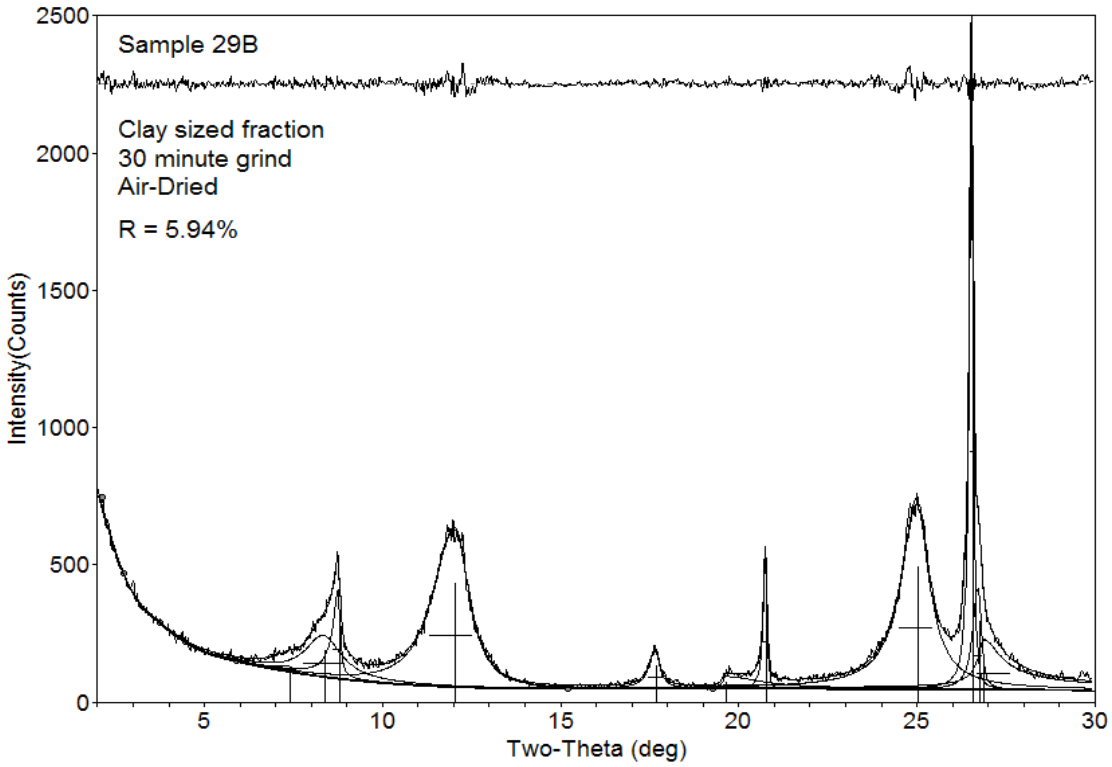

Sample 28A
Clay sized fraction
30 minute grind
Air-Dried
R = 3.84%
Trial 2 of 3
Intensity(Counts)
Two-Theta (deg)
0
500
1000
1500
2000
2500
5
10
15
20
25
30

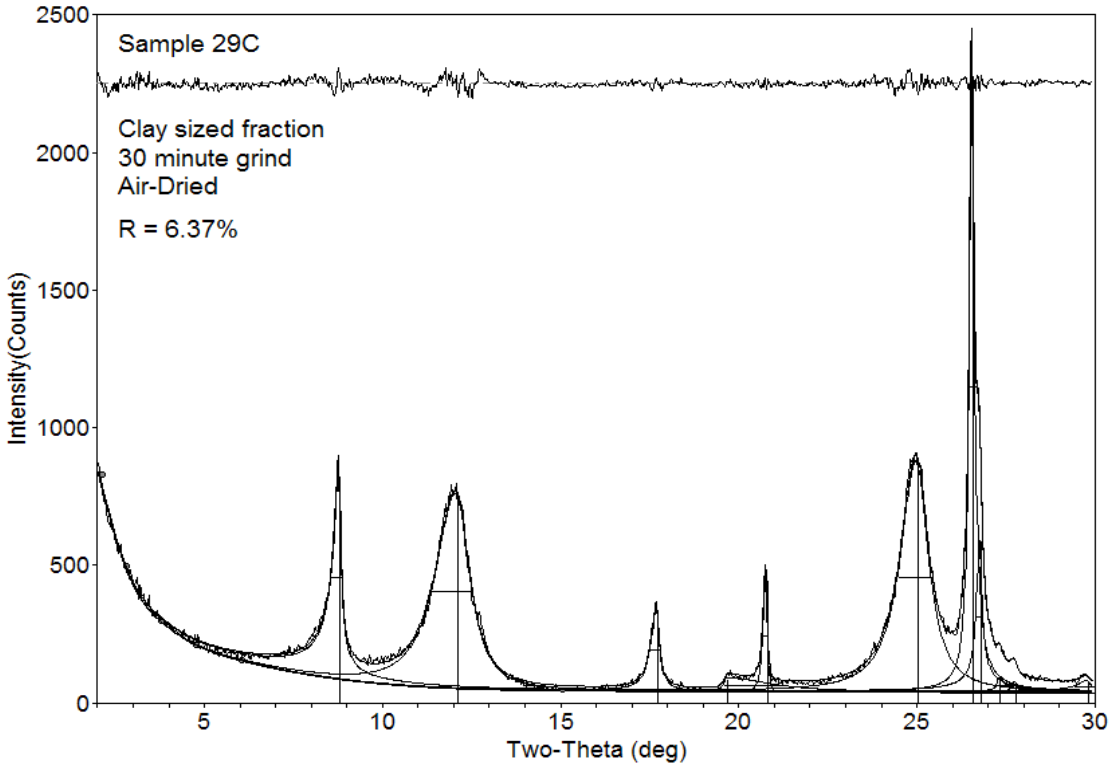

Sample 28A
Clay sized fraction
30 minute grind
Air-Dried
R = 3.85%
Trial 3 of 3
Intensity(Counts)
Two-Theta (deg)
0
500
1000
1500
2000
2500
5
10
15
20
25
30

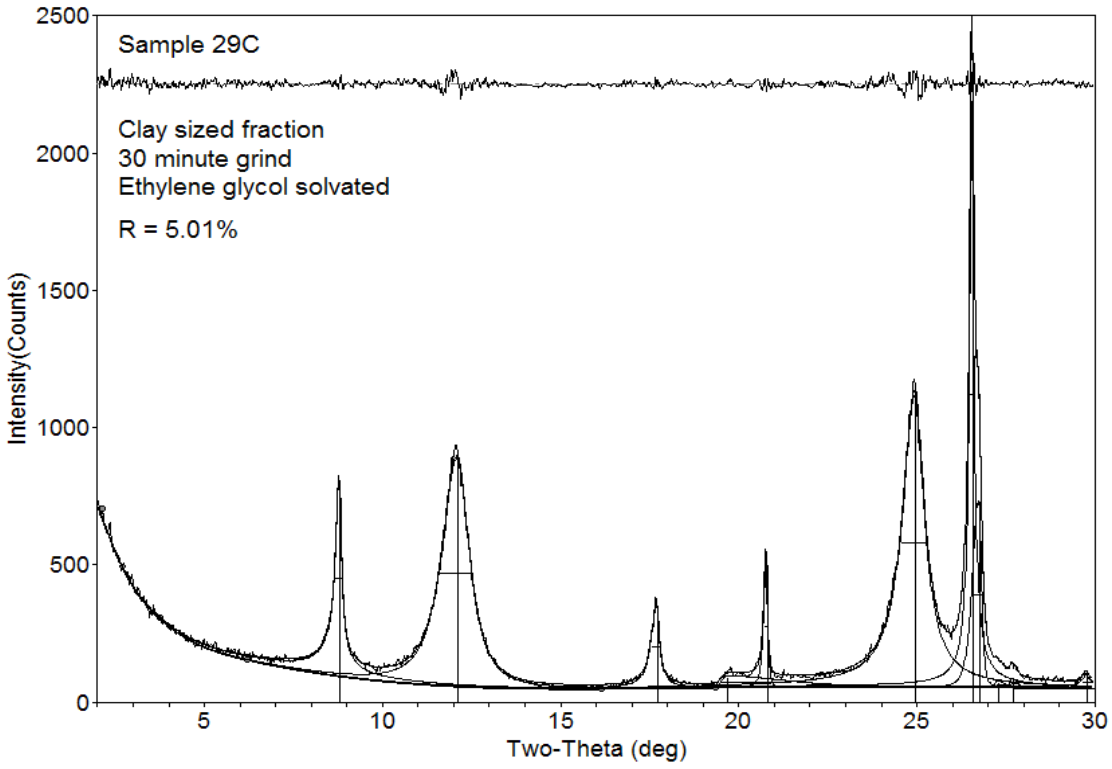

Sample 28E
Clay sized fraction
30 minute grind
Air-Dried
R = 5.51%
Intensity(Counts)
Two-Theta (deg)
0
500
1000
1500
2000
2500
5
10
15
20
25
30

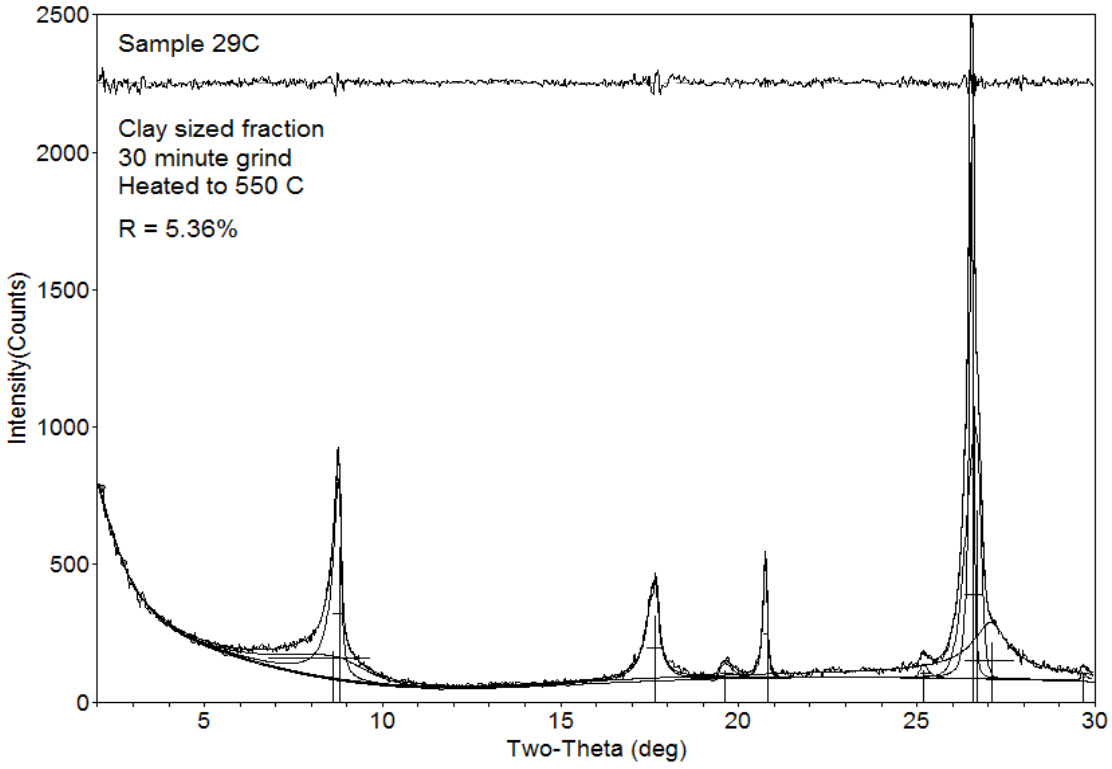

Sample 28E
Clay sized fraction
30 minute grind
Air-Dried
Final scan
R = 4.48%
Intensity(Counts)
Two-Theta (deg)

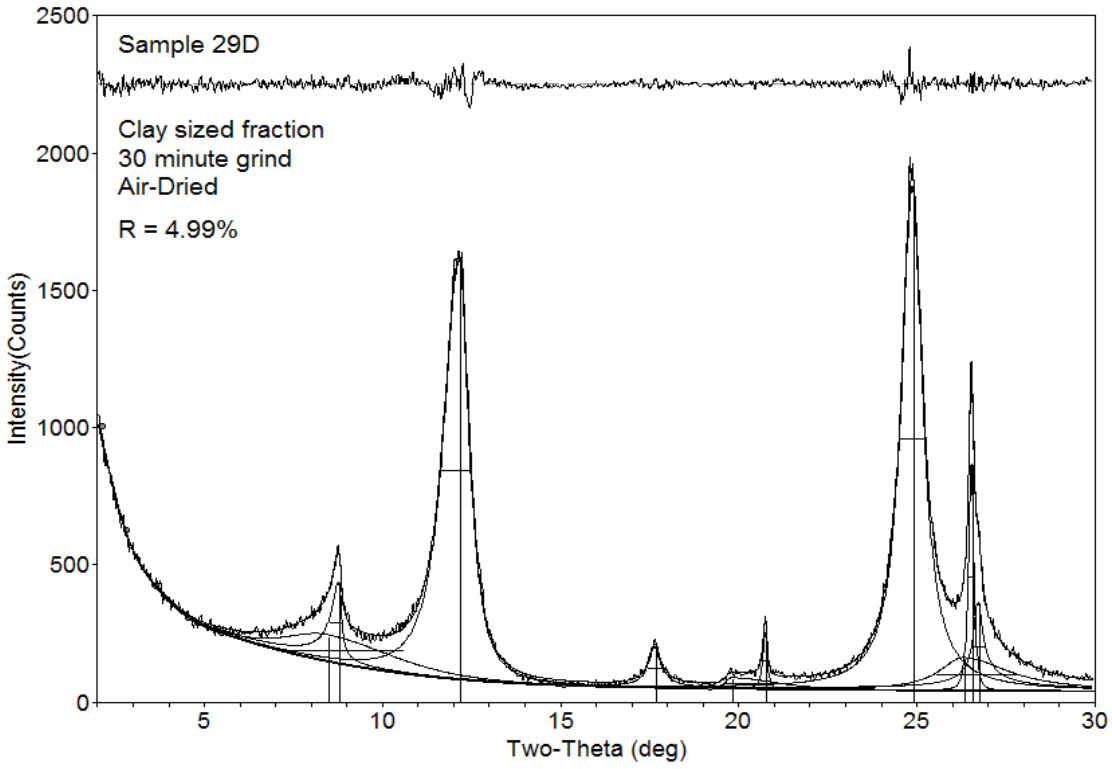

Sample 29A
Clay sized fraction
30 minute grind
Air-Dried
R = 5.49%
Intensity(Counts)
Two-Theta (deg)

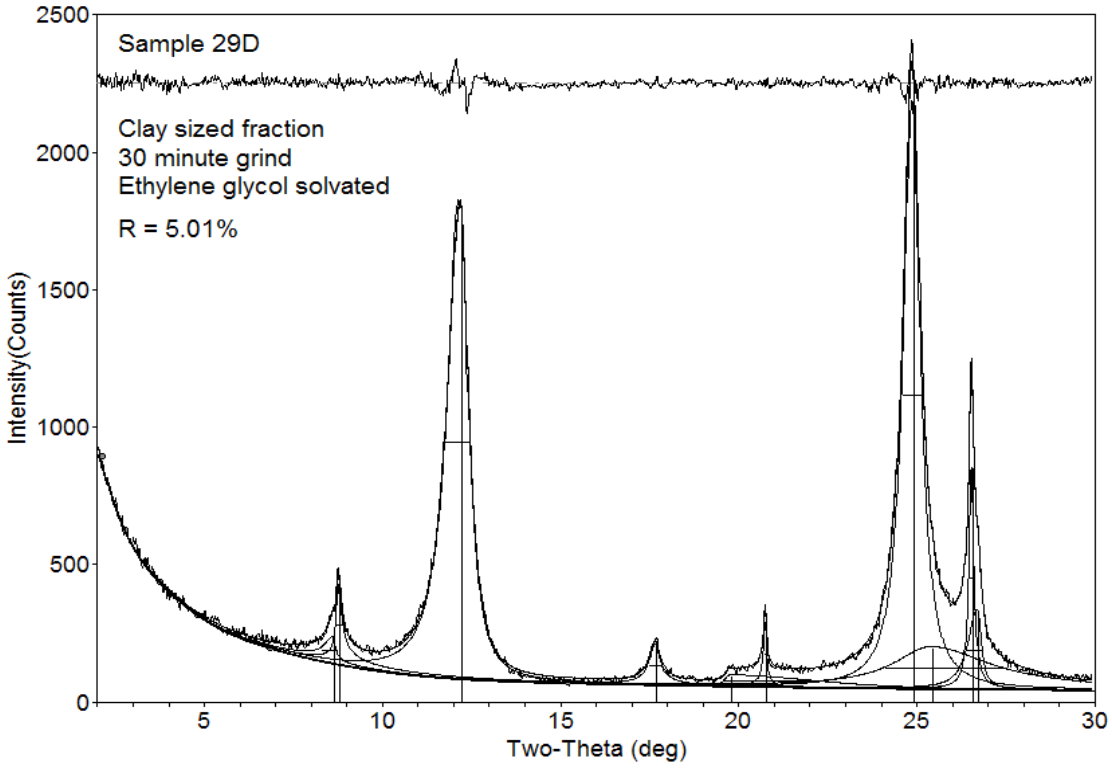

Sample 29B
Clay sized fraction
30 minute grind
Air-Dried
R = 5.94%
Intensity(Counts)
Two-Theta (deg)
0
500
1000
1500
2000
2500
5
10
15
20
25
30

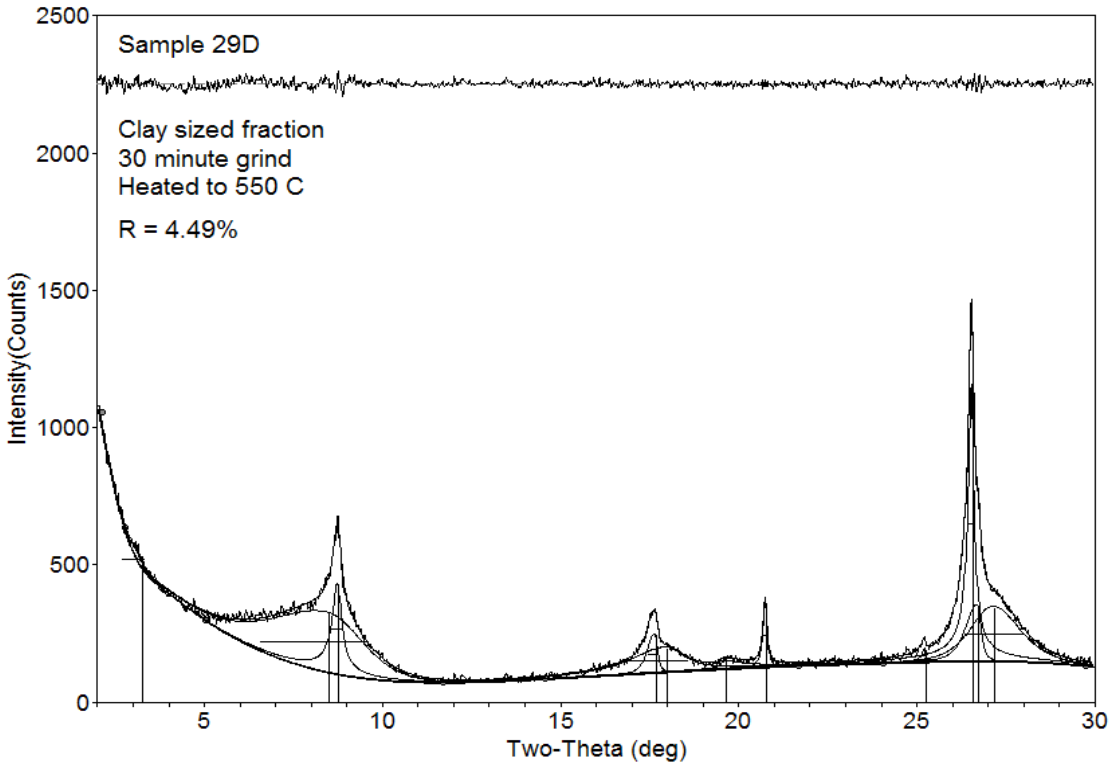

Sample 29C
Clay sized fraction
30 minute grind
Air-Dried
R = 6.37%
Intensity(Counts)
Two-Theta (deg)
0
500
1000
1500
2000
2500
5
10
15
20
25
30

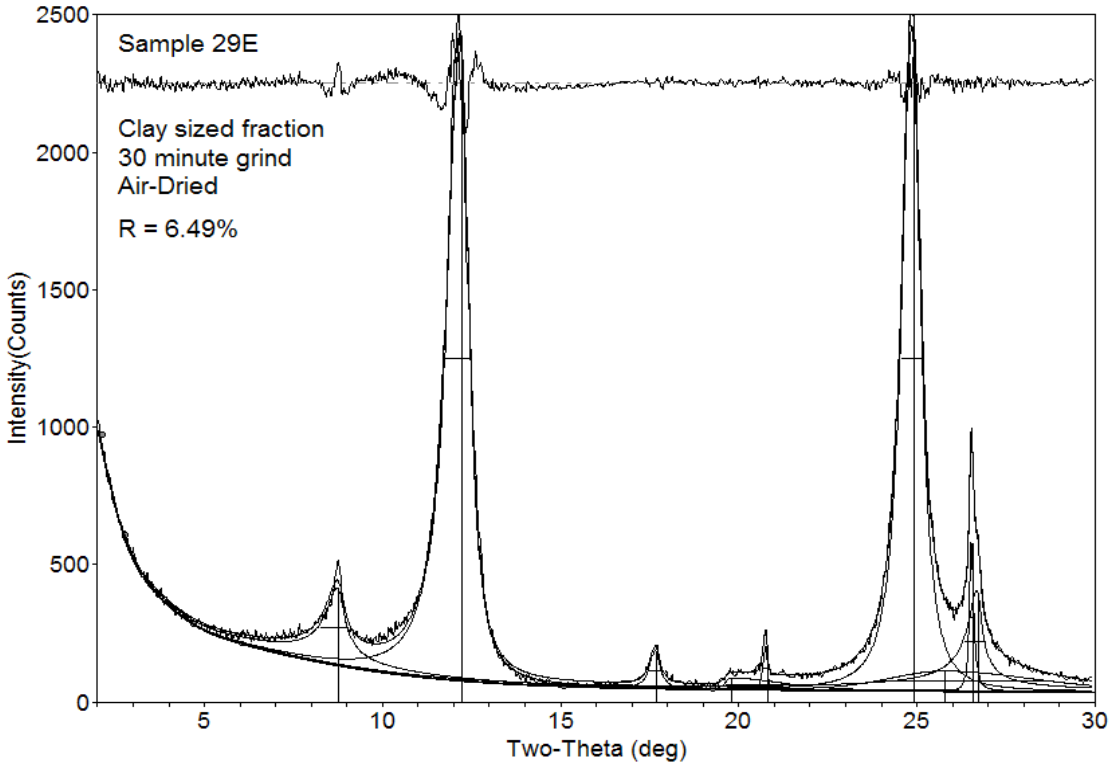

Sample 29C
Clay sized fraction
30 minute grind
Ethylene glycol solvated
R = 5.01%
Intensity(Counts)
Two-Theta (deg)
0
500
1000
1500
2000
2500
5
10
15
20
25
30

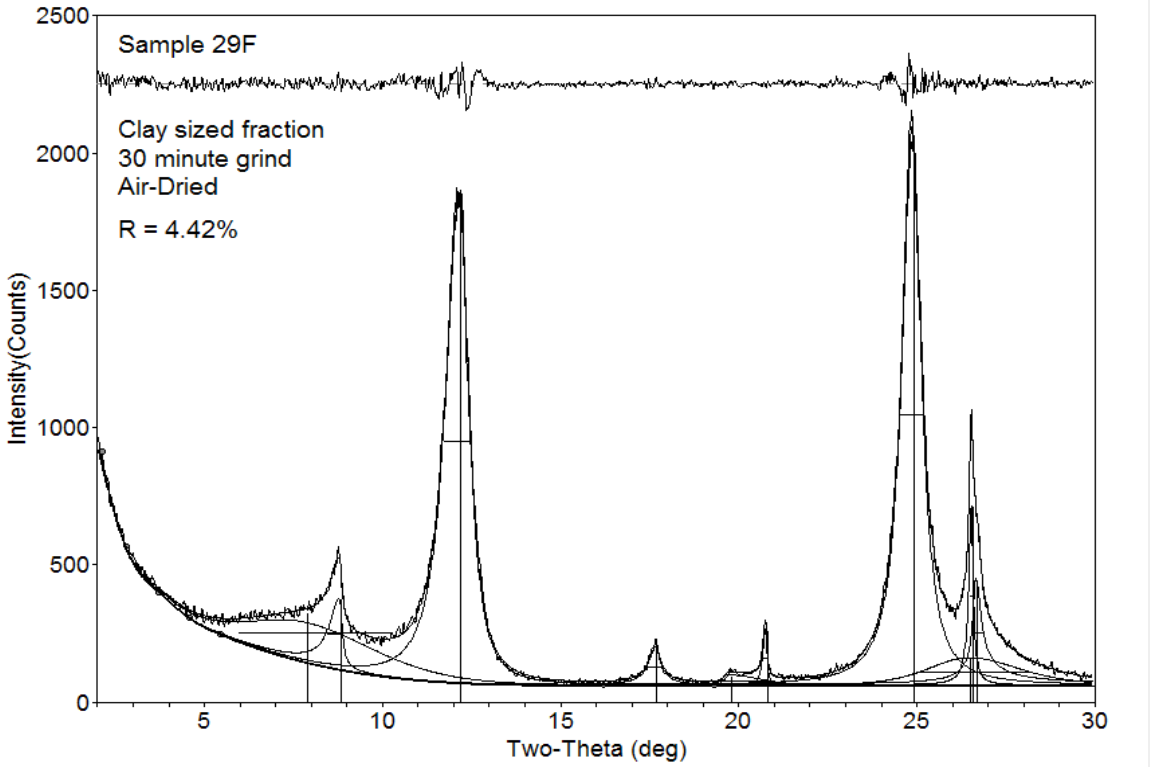

Sample 29C
Clay sized fraction
30 minute grind
Heated to 550 C
R = 5.36%
Intensity(Counts)
Two-Theta (deg)
0
500
1000
1500
2000
2500
5
10
15
20
25
30

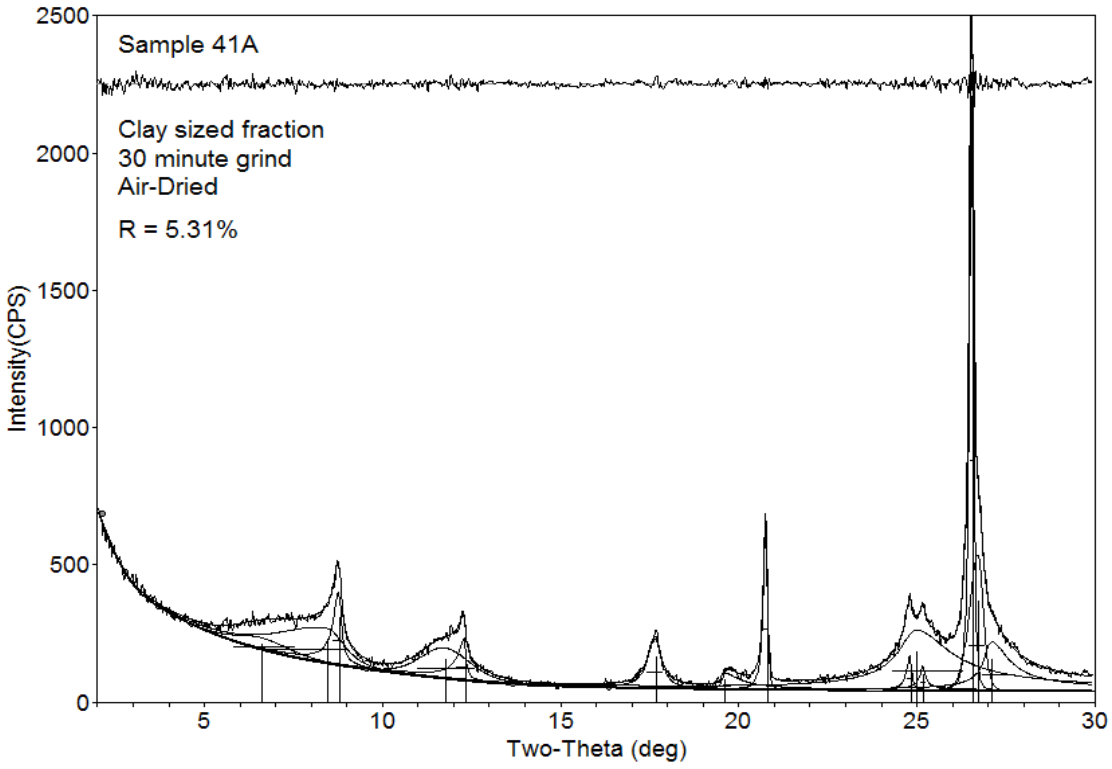

Sample 29D
Clay sized fraction
30 minute grind
Air-Dried
R = 4.99%
Intensity(Counts)
Two-Theta (deg)

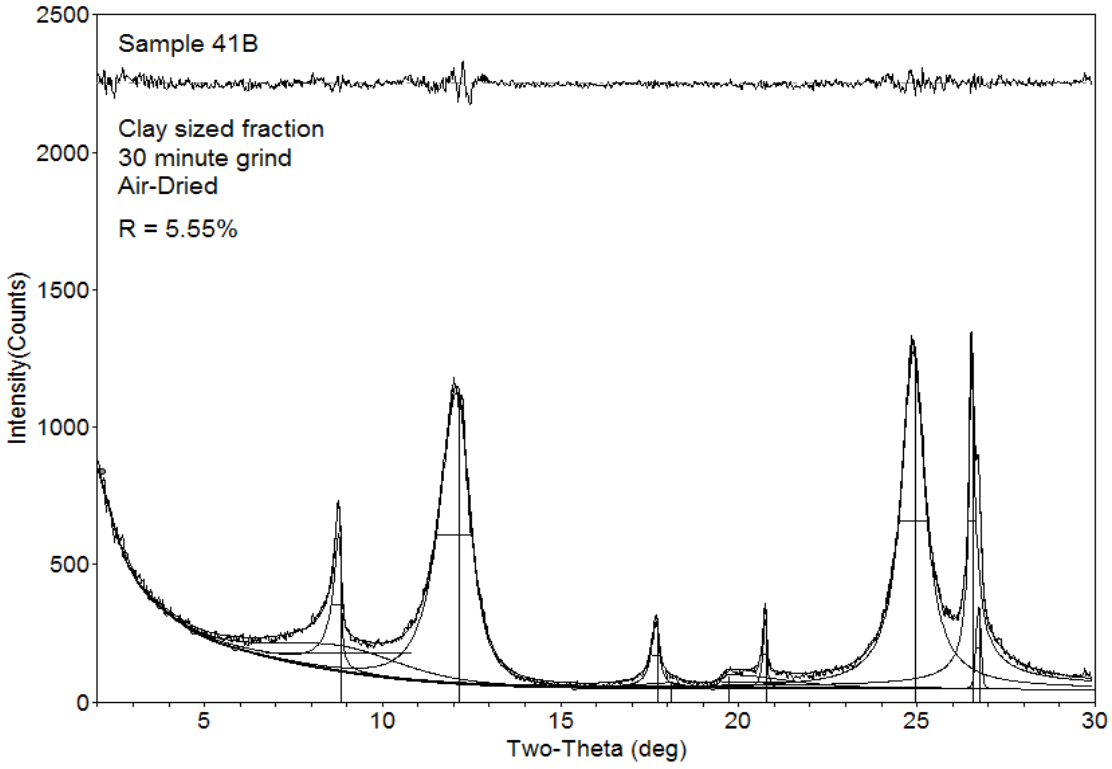

Sample 29D
Clay sized fraction
30 minute grind
Ethylene glycol solvated
R = 5.01%
Intensity(Counts)
Two-Theta (deg)

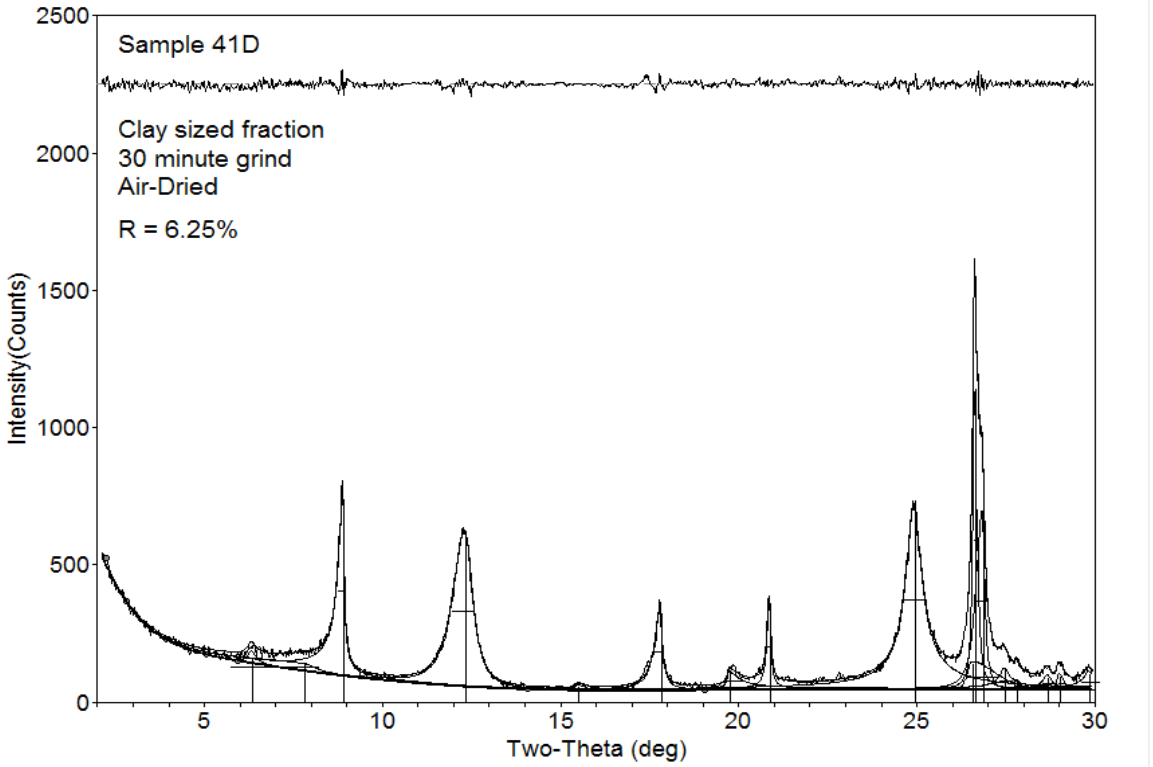

Sample 29D
Clay sized fraction
30 minute grind
Heated to 550 C
R = 4.49%
Intensity(Counts)
Two-Theta (deg)
0
500
1000
1500
2000
2500
5
10
15
20
25
30

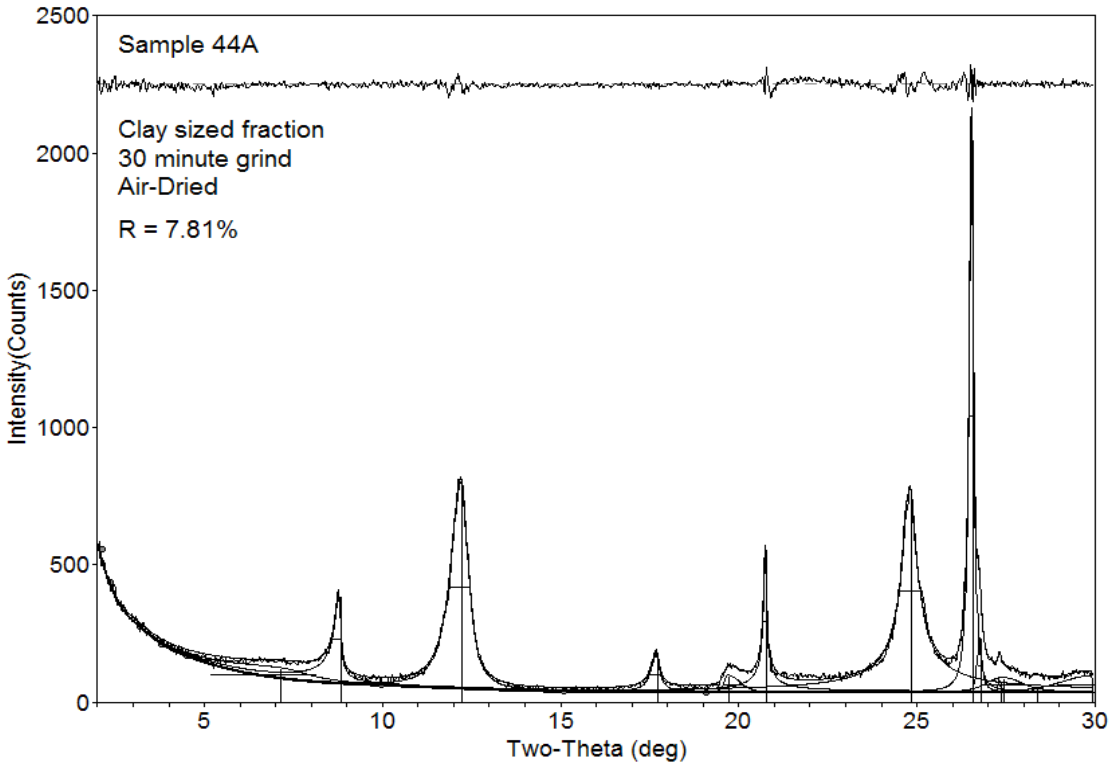

Sample 29E
Clay sized fraction
30 minute grind
Air-Dried
R = 6.49%
Intensity(Counts)
Two-Theta (deg)
0
500
1000
1500
2000
2500
5
10
15
20
25
30

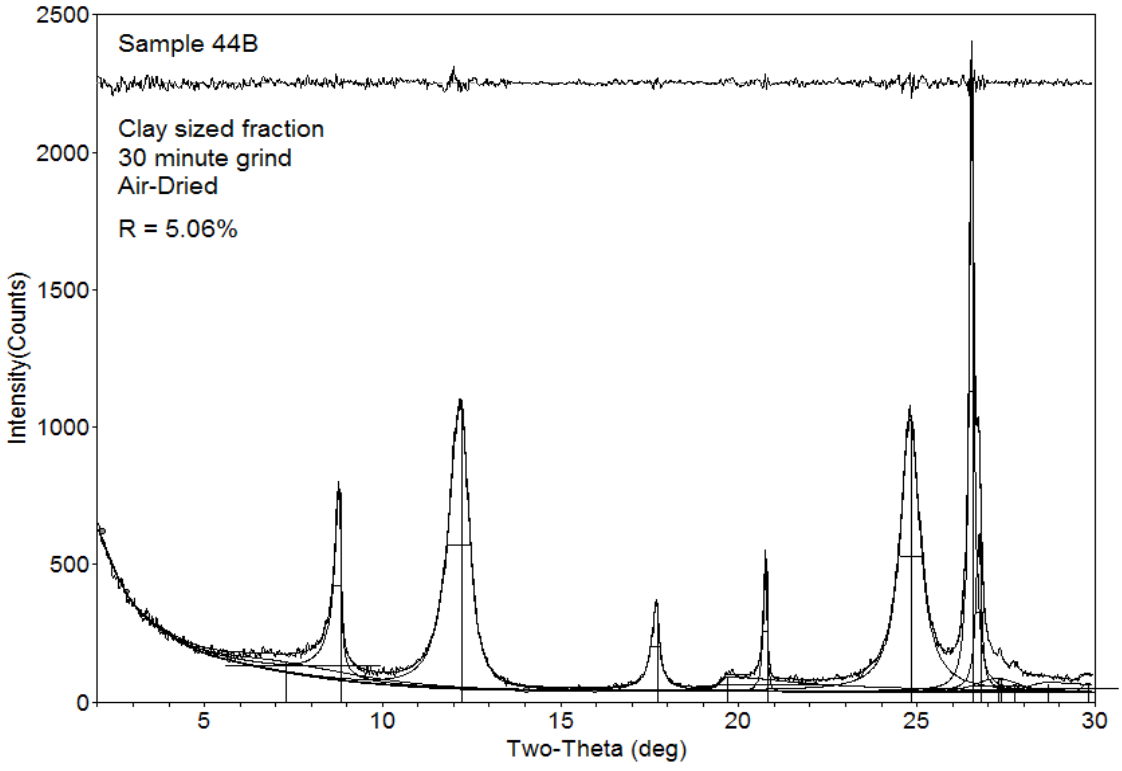

Sample 29F
Clay sized fraction
30 minute grind
Air-Dried
R = 4.42%
Intensity(Counts)
Two-Theta (deg)
2500
2000
1500
1000
500
0
5
10
15
20
25
30

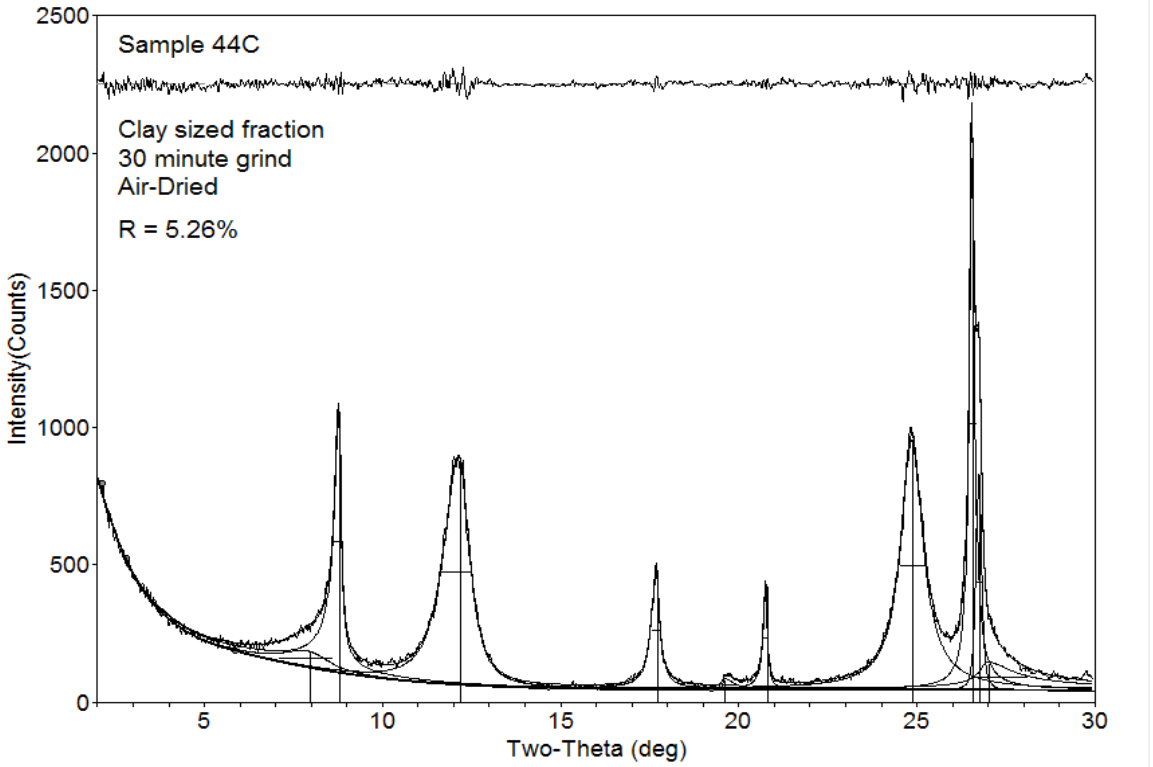

Sample 41A
Clay sized fraction
30 minute grind
Air-Dried
R = 5.31%
Intensity(CPS)
Two-Theta (deg)
0
500
1000
1500
2000
2500
5
10
15
20
25
30

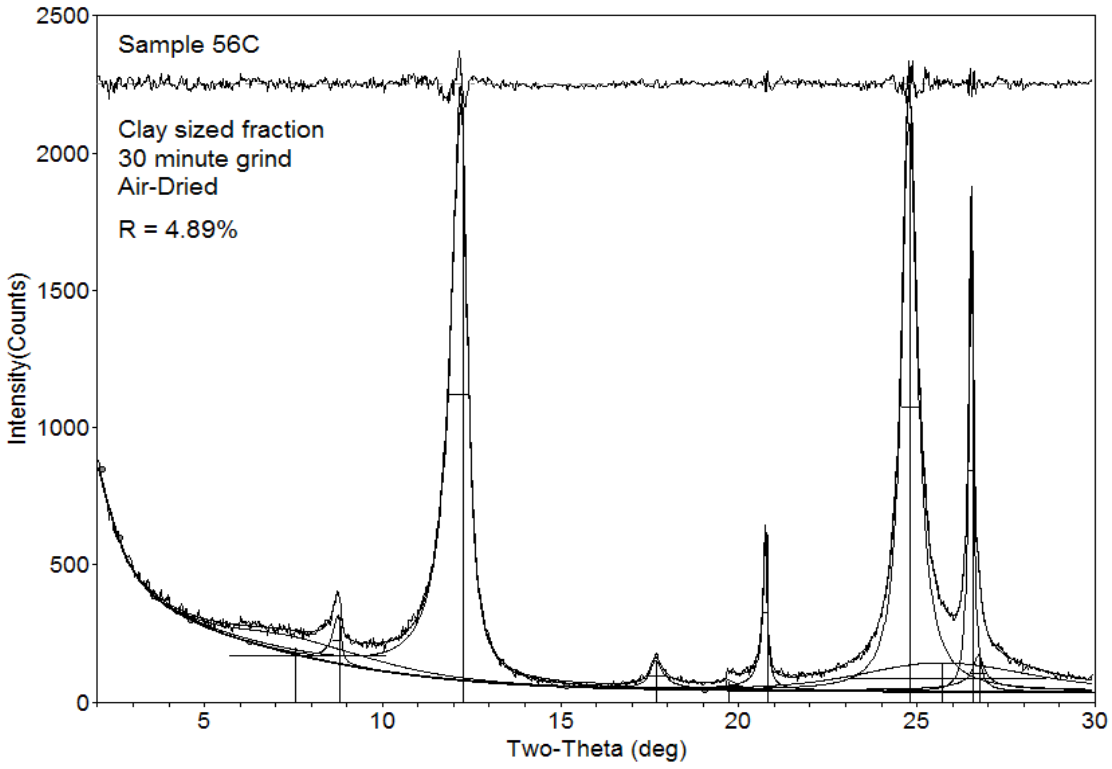

Sample 41B
Clay sized fraction
30 minute grind
Air-Dried
R = 5.55%
Intensity(Counts)
Two-Theta (deg)
0
500
1000
1500
2000
2500
5
10
15
20
25
30

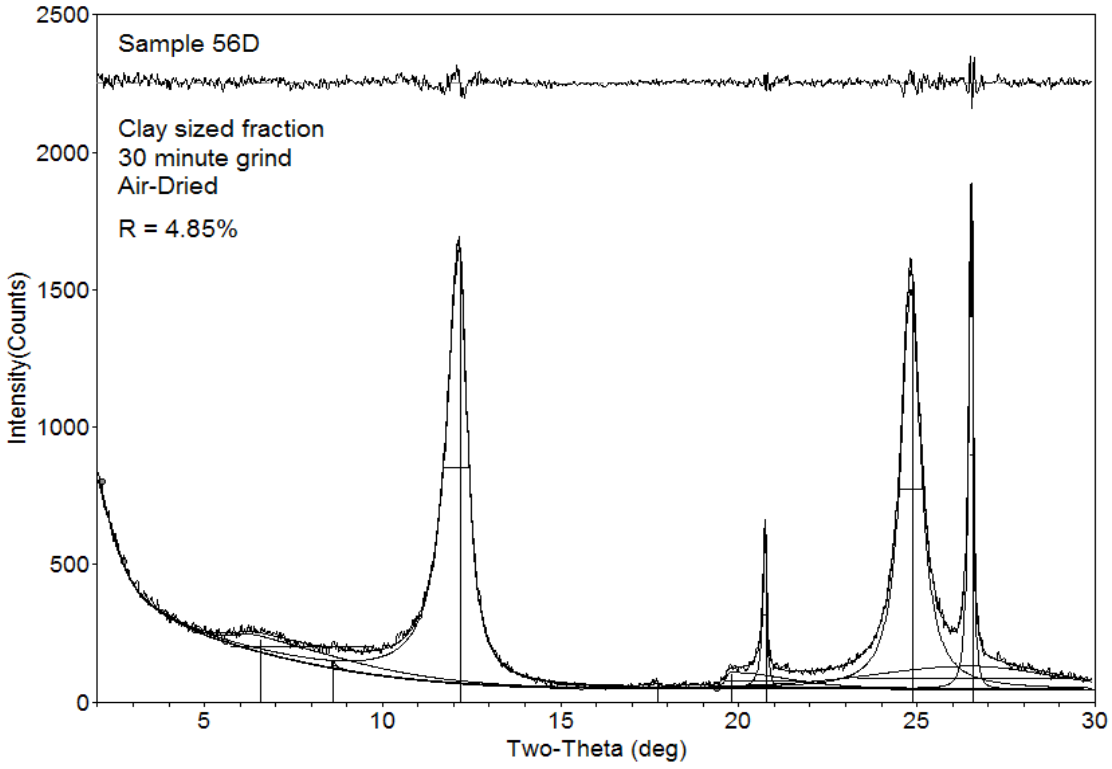

Sample 41D
Clay sized fraction
30 minute grind
Air-Dried
R = 6.25%
Intensity(Counts)
Two-Theta (deg)
2500
2000
1500
1000
500
0
5
10
15
20
25
30

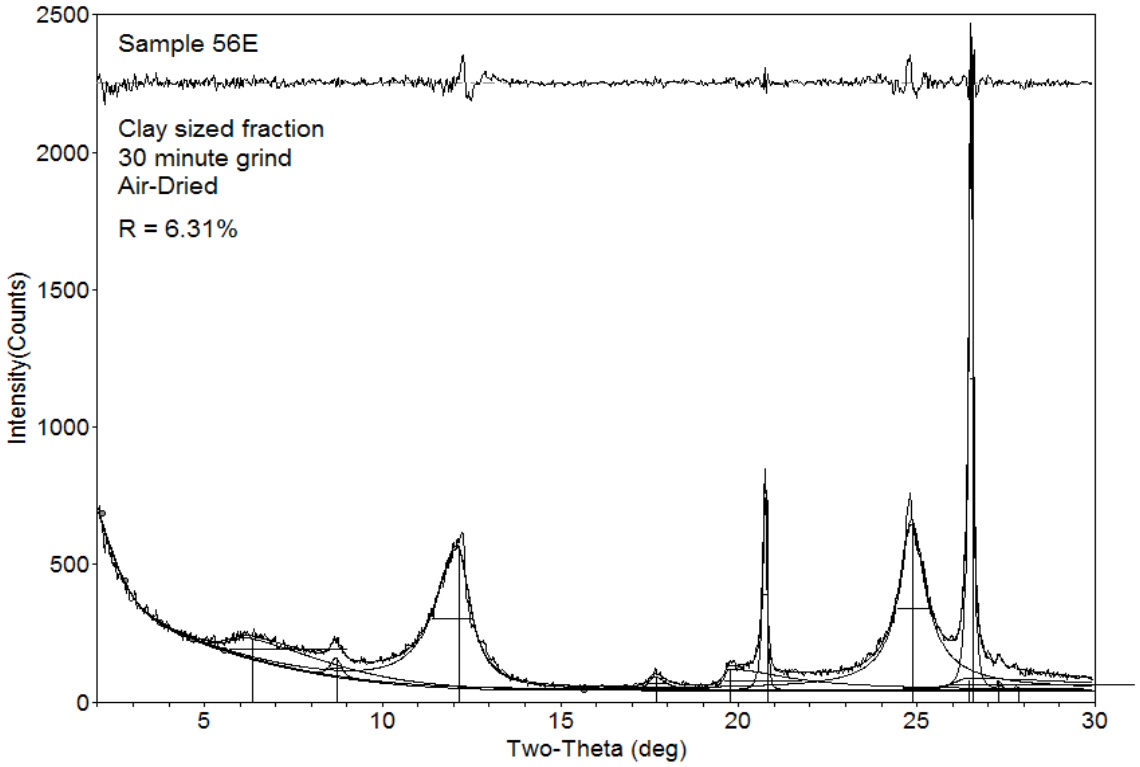

Sample 44A
Clay sized fraction
30 minute grind
Air-Dried
R = 7.81%
Intensity(Counts)
Two-Theta (deg)
0
500
1000
1500
2000
2500
5
10
15
20
25
30

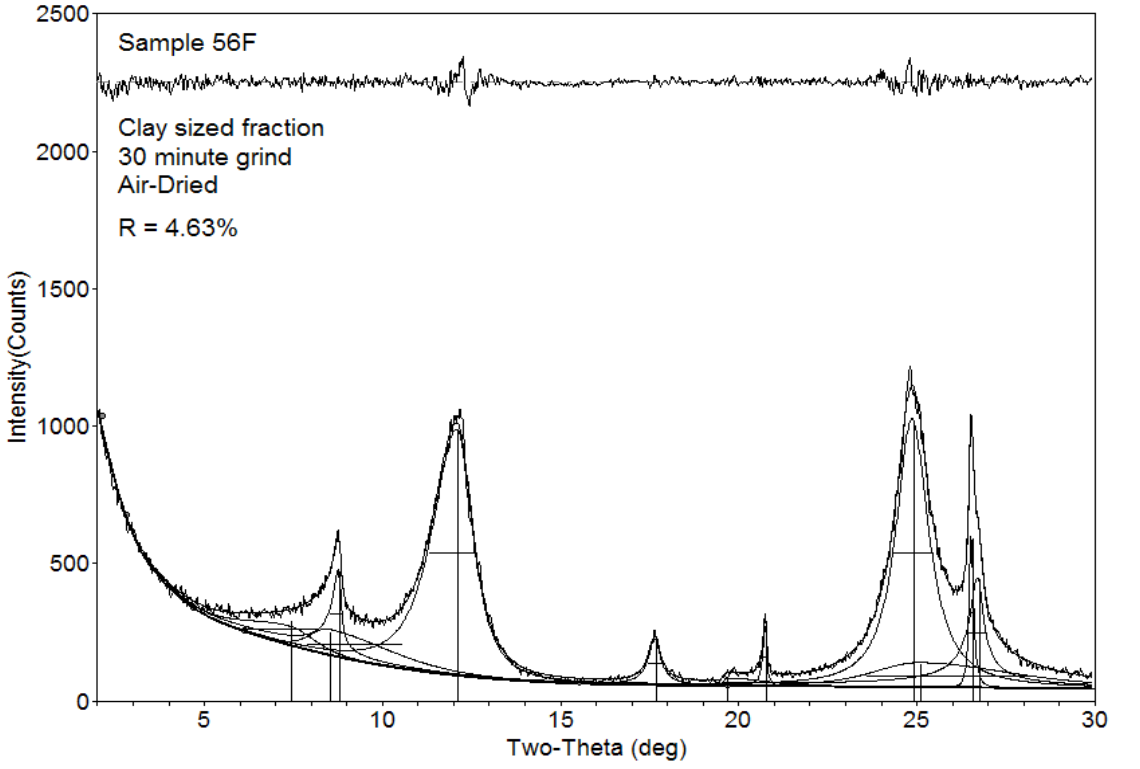

Sample 44B
Clay sized fraction
30 minute grind
Air-Dried
R = 5.06%
Intensity(Counts)
Two-Theta (deg)
0
500
1000
1500
2000
2500
5
10
15
20
25
30

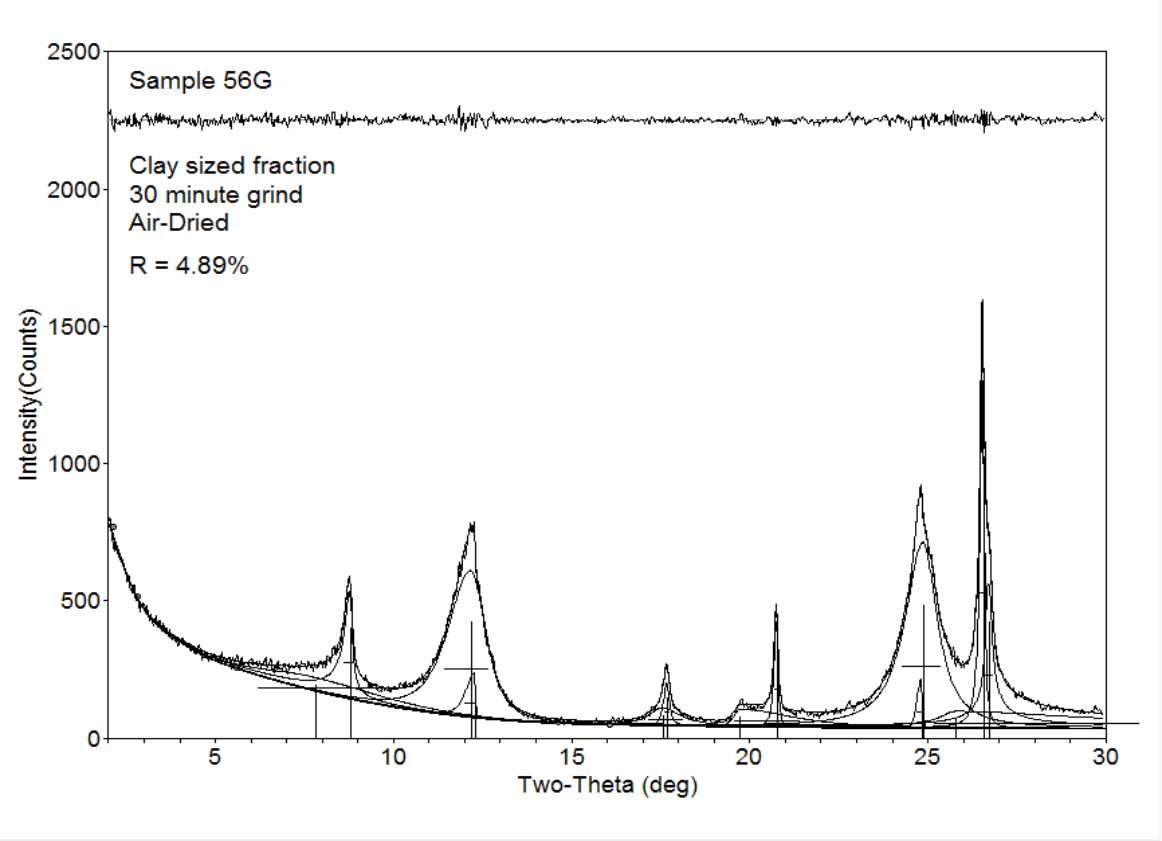

Sample 44C
Clay sized fraction
30 minute grind
Air-Dried
R = 5.26%
Intensity(Counts)
Two-Theta (deg)
2500
2000
1500
1000
500
0
5
10
15
20
25
30


Sample 56C
Clay sized fraction
30 minute grind
Air-Dried
R = 4.89%
Intensity(Counts)
Two-Theta (deg)
0
500
1000
1500
2000
2500
5
10
15
20
25
30


Sample 56D
Clay sized fraction
30 minute grind
Air-Dried
R = 4.85%
Intensity(Counts)
Two-Theta (deg)
0
500
1000
1500
2000
2500
5
10
15
20
25
30


Sample 56E
Clay sized fraction
30 minute grind
Air-Dried
R = 6.31%
Intensity(Counts)
Two-Theta (deg)


Sample 56F
Clay sized fraction
30 minute grind
Air-Dried
R = 4.63%
Intensity(Counts)
Two-Theta (deg)



XRay Diffraction settings for this project:

Focused Beam (Bragg-Brentano Geometry/Mode) with monochromator
Selection Slit: BB (Bragg-Brentano)
Divergence Slit: 2/3 deg
Height Limiting Slit: 10mm
PSA Box Components: 5° V
K-beta filter: No
Scattering Slit: 2/3 deg
Receiving Slit (chosen for good intensity): 0.3mm
Monochromator: Yes, 0.8mm slit with monochromator in bent mode
Copper Anode (Cu-Kα)
40kV; 44mA