Detrital Petrology and Provenance of the Logan Canyon Formation Sandstones,

Scotian Basin

By Kerry A. Wallace

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Abstract

There were two main objectives for this study. The first, to understand the detrital mineral assemblages at different depths in a group of wells in the Central Scotian Basin, eastern Canada. The second, to determine the provenance and see how the results change between the wells, as well as different stratigraphic levels. Samples were taken from the middle to upper part of the Logan Canyon Formation for study.

Heavy minerals were separated, and mineral identification was completed using a scanning electron microscope (SEM) with energy dispersive spectroscopy (EDS). This provided information on the detrital heavy mineral assemblages in each of the samples. The main heavy detrital minerals in these samples are tournaline, garnet, zircon, ilmenite, chromite and TiO_2 minerals (identified as rutile).

Previous provenance studies in the area suggest three main sources relating to four Cretaceous river systems, used for transportation. These three sources are: the Grenville Appalachians, the main Appalachians, which includes New Brunswick, potentially northern Nova Scotia and Newfoundland, and the Meguma Terrane. Minerals in the samples were compared to those anticipated to be found from these three sources and it appears that there is major input from the main Appalachians and Meguma Terrane. This indicates that the use of the Sable River and small local rivers from the Meguma Terrane were main sources of the detrital minerals.

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1. Introduction

The Scotian basin is located offshore Nova Scotia (Fig. 1) and is a passive continental margin basin. Its formation is a result of rifting that took place in the Triassic (McIver, 1972; Given, 1977; Wade and MacLean, 1990). Terrigenous clastic sediments were transported southwestwardly into the basin. Sources suggest input of sediments from two main rivers that have previously drained uplifted areas of the Atlantic Canada region. These rivers are the Sable and Banquereau rivers. The Appalachians and southern Labrador are therefore considered as main source areas of detrital minerals that are present in the studied stratigraphic units (Zhang et al., 2014).



Figure 1: Map of the Scotian Basin showing the studied wells. Modified from Weston et al. (2012).

The units of interest are the Lower Cretaceous Cree, Marmora and Sable Members of the Logan Canyon Formation. This formation hosts sandy deltaic members that have been known to show a presence of oil and gas (Karim et al., 2008). Detrital minerals and lithic clasts give insight to potential source rocks which helps to formulate correct provenance interpretations for the deposited sedimentary detritus.

2. Geological setting

2.1 Regional Geology

The studied wells are Cohasset A-52, Sable Island 2H-58, Sable Island 3H-58, Sable Island 5H-58, Sable Island E-48 and Sable O-47. These wells are located on the western side of Sable Island in the Sable Subbasin offshore Nova Scotia (Fig. 2).

During the late Jurassic – early Cretaceous, increased sedimentation rates and the prograding Sable Delta complex caused the Sable Subbasin to experience widespread listric faulting due to mobilization of deeply buried salt deposits from increased sediment load. This mobilization also aided in the expansion of syndepositional faults as well as sediment sinks in the Jurassic and Tertiary (CNSOPB, 2000).

Within the Logan Canyon Formation four distinct members are found in the studied wells. These are the Marmora, Sable, Cree and Naskapi Members and are listed by increasing depth. This formation is Albian to Aptian in age (100.5 Ma to 125 Ma), which is part of the Cretaceous. The two main lithologies that make up this formation are sandstone and shale.

Deposited first is the Naskapi Member which is the lowest transgressive shale unit of the Logan Canyon Formation. It is comprised of shales of varying colors as well as interbedded zones of sandy and silty sediment. Above the Naskapi Member is the Cree Member. It is made up of thick sandstone, coarsening upwards, but also with fine grained material near the top, and is interbedded with shales and thin layers of siltstone. Next is the Sable Member, which is the second shaly unit of the Logan Canyon Formation and its formation was caused by a more rapid transgression which in turn led to numerous thin siltstone and sandstone beds to be deposited. Finally, the Marmora Member, which is found at the top of the formation, is similar to the Cree Member with thick sandstones and also with fine material in the upper part (Wade and MacLean, 1990).



Figure 2: Stratigraphic column of the Scotian Basin. Study interval outlined in red. Modified from Weston et al. (2012).

2.2 Well History

Drilling for the Sable Island wells (2H-58, 3H-58, 5H-58, E-48, and O-47) commenced in 1971 by Mobil-Tetco at the western end of Sable Island in the West Sable oil and gas field. The Cohasset well is located south-west of Sable Island in the Cohasset oil field. Drilling started in 1993 by Petro-Canada. (CNSOPB, 2000).

3. Methods

3.1 Sample collection

Twelve representative Samples were taken from cores archived in CNSOPB Geoscience Research Centre in Dartmouth. Desired core intervals were fine-grained sandy areas. When possible, broken rock (rubble) was taken, roughly 50 grams, for sample. Samples were placed into individual bags and labelled. In two places, rubble was not present, so slabs were cut off the backside of the core.

3.2 Heavy mineral separation

The >63<180 μ m fraction was mixed with deionized water in a Nalgene bottle on a shaking table to begin the cleaning process. This helps to separate finer material that is stuck to the grains. The bottle is then placed into an ultrasonic bath for a couple of minutes and stirred to break up any clumps. This mixture is then poured onto a 53 μ m sieve for "wet sieving". Any remaining material less than 53 μ m is washed away through the sieve using more deionized water. Each sample is thoroughly rinsed and then put in the oven to dry. Once dry, roughly 5 grams of each sample was divided into individual tubes (~5-8 tubes were needed per sample). A heavy liquid of sodium polytungstate solution, which had a specific gravity of 2.985 was added. This liquid is useful because it allows minerals that have a specific gravity more than that of the liquid to sink, while anything less will float. All tubes were then agitated so that the grains were all mixed together and then put into a centrifuge. The samples were centrifuged for 3 minutes allowing for the separation to occur.

Liquid nitrogen was used to freeze the bottom of the tubes, where the heavy minerals were. The light fraction was poured out on to a 53 μ m sieve to remove the heavy liquid and then washed and put into the oven to dry. When the bottom of the tube was melted the material was also poured onto a 53 μ m sieve and rinsed to remove any remaining heavy liquid. Both the heavy fraction and light fraction were dried and then weighed. The process was repeated a second time to improve the results of the separation and remove any remaining light material that was caught up with the heavy fraction. The heavy fraction was then sent off the Vancouver Petrographics to be made into polished thin sections.

3.3 Scanning Electron Microscope (SEM)

Ten of the twelve polished thin sections were analyzed using the TESCAN MIRA 3 LMU Variable Pressure Schottky Field Emission Scanning Electron Microscope at the Regional Analytical Center at Saint Mary's University. It is equipped with an Oxford INCA X-max 80 mm² silicon drift detector (SDD) which was used to obtain chemical analyses. The SEM has a maximum resolution of 1.2 nm at 30 kV. Along with Energy Dispersive Spectroscopy (EDS) mineral analyses, detailed images of the samples were captured using back-scattered electron (BSE) imaging. Selected grains were analyzed with an acquisition time of 30-45 seconds with an electron beam size of about 10 microns.

3.4 Petrographic Microscope

A Nikon Eclipse 50iPOL Petrographic Microscope was used as a verification tool for mineral grain identification when EDS analyses were inadequate. Optical properties of grains were observed in plane polarized and cross polarized light.

3.5 Modal composition of detrital minerals using BSE images

EDS chemical analyses, and brightness in BSE images were used to identify detrital minerals in each sample. Selected detrital minerals were counted, and for grains without analyses, the brightness of the grain in the image was used for identification purposes. Brightness in the images depends on the average atomic number of elements within the mineral. Unfortunately, this system is not useful for minerals that have similar atomic numbers, for example albite has a value of 10.71 and quartz has a value of 10.80. Both minerals appear to have the same or almost the same brightness in BSE images. In cases such as these, morphological features were used as a tool for identification. Indistinguishable grains have been left out of the count. Results of the point counting have been listed in Table 1 and they are represented using pie diagrams.

3.6 Software Used

The main software used for the creation of all figures and appendices for this project was CorelDRAW. Unique programs were created by Dr. Xiang Yang from the Regional Analytical Centre at Saint Mary's University to aid in development of the appendices and figures. Grapher 3 was used to develop pie diagrams for mineral point counting representations and MinPet was used to create all binary and ternary plots. Finally, Logplot was used to create stratigraphic columns for all wells in this study using similar symbols as in Gould et al. (2011).

4. Results

4.1 Stratigraphy and Lithofacies

The ten studied samples were plotted onto stratigraphic columns by increasing depth (Fig. 3). Wells were drilled by Petro-Canada (Cohasset A-52) and Mobil-Tecto (all Sable Island wells).

The eight studied samples represent four main lithofacies based on the scheme of Gould et al. (2010). These facies are 0, 2, 4 and 5. Within these facies are multiple subfacies based on different characteristics within the group.

Sample Cohasset A-52 (2084.36 m) is a fine-grained sandstone that falls in the facies 0, which is described as prodeltaic turbidites. Rocks of this facies are generally thin bedded fine-grained sandstone with interbedded mudstones, but occasionally coarse-grained beds are present. Bioturbation is uncommon in this facies. More specifically, this sample is described as subfacies 0g, in which interbedded mudstone is absent, and its subfacies is transitional to river-mouth sandstones of facies 9. Sample Sable Island 5H-58

(1579.04 m) is a fine sandstone with siltstone beds which also falls within facies 0. This unit has upwards of 40% interbedded mudstone. This sample has not been classified into a particular subfacies.

Samples Sable Island 5H-58 (1577.68 m) and Sable Island O-47 (1886.47 m) are both sandstones in facies 2. Facies 2 contains both sandstone and mudstone beds that were deposited in a shoreface environment. They are described as having sparse to complete bioturbation. Sample 1886.47 m is in the subfacies 2b, which is a predominantly mudstone facies with 10-60% sandstone. It commonly is bioturbated. Sample 1577.68 m is subfacies 2c. Contrary to subfacies 2b, subfacies 2c is dominantly fine sandstone (60-95%) with much less mudstone. It is similar to subfacies 2b in that it has common bioturbation.

Samples Cohasset A-52 (2221.17 m), Sable Island 2H-58 (1599.95 m), Sable Island 3H-58 (2001.12 m) and Sable Island 5H-58 (1904.11 m) are sandstones of facies 4. This facies is composed of mainly sandstone and has a described depositional environment of tidal estuary to fluvial. Sample 2001.12 m has not been assigned to any subfacies. Samples 2221.17 m and 1599.95 m fall in subfacies 40, which is a fine sandstone that occasionally contains mud drapes and has sparse to common bioturbation including *Ophiomorpha*. Sample 1904.11 m is from subfacies 4x, which characteristically is cross bedded. This subfacies is generally medium to coarse grained sandstone. Mud drapes are not present in this subfacies, and neither is bioturbation. Intraclasts of mudstone and coal are present.

Samples Sable Island 3H-58 (1804.40 m) and Sable Island E-48 (2245.21 m) are sandstones from facies 5. This facies is predominantly made up of sandstone but some

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mud beds and laminae are present. It was deposited on sandy or mixed sand and mud tidal flats cut by tidal channels. Depositional environments differ between subfacies. Sample 1804.40 m is from subfacies 5b, deposited in mixed sand and mud intertidal flats. The subfacies is made up of 20-75% fine grained sandstone. Shells and subvertical burrows have been noted within this subfacies, producing abundant bioturbation. Sample 2245.21 m is from subfacies 5s. This subfacies is deposited in sand flats in intertidal to subtidal zones, and is made up of over 95% fine grained sandstone that is occasionally cross-bedded. Bioturbation in this subfacies is described as sparse to moderate.



Figure 3: Stratigraphic columns correlated by members. Samples shown in red.



Figure 3 continued: Stratigraphic columns correlated by members. Samples shown in red.

4.2. Chemical composition of detrital minerals from the Heavy Mineral fraction

4.2.1 Introduction

Heavy minerals are considered to be all the minerals with a specific gravity > 2.9. In this study such minerals identified include: tourmaline, garnet, zircon, chromite, ilmenite and TiO₂. In addition, some light minerals (specific gravity < 2.9) have been found and studied as well. Such minerals include micas, quartz and feldspars. The presence of light minerals in heavy mineral fraction is due to insufficient separation. Often this is because the light minerals can become stuck to the heavy minerals and then they are brought into the heavy fraction.

4.2.2 Tourmaline

Henry and Guidotti (1985) and Kassoli-Fournaraki and Michailidis (1994) defined several types of tournaline based on chemical composition that were interpreted in terms of different types of sources. These are: 1) Li-rich pegmatites and aplites, 2) Lipoor granites, 3) Fe-rich qz-tourmaline rocks, 4) Metapelites and metapsammites with Al saturating phase, 5) Metapelites and metapsammites lacking Al-saturating phase, 6) Metapelites and calc-silicate rocks, 7) Meta-ultramafic rocks, Cr and V-rich metasedimentary rocks, 8) Metacarbonates and metapyroxenites, 9) Ca-rich metapelites, and 10) Ca-poor metapelites and metapsammites. Pe-Piper et al. (2009) used natural clusters in chemical composition of the tourmalines analysed from Lower Cretaceous sandstones from Scotian Basin to identify four types of tourmaline. The fields of Kassoli-Fournaraki and Michailidis (1994) were used to identify the likely provenance of these four types. Type 1 has a granitic source, type 2 a metapelitic and calc-silicate rock source, type 3 a meta-ultramafic source, and type 4 a metapelitic and psammitic source. The first set of diagrams (Fig. 4) are based on $Ca - Mg - Fe^{2+}$, while the second (Fig. 5) is based on Al – Mg – Fe²⁺.

Tourmaline analyses from sample 2084.29 m from Cohasset A-52 (Cree Member) plot in fields 2, 8 and 10 (Fig. 4A). These same analyses are plotted as Type 1, 3 and 4 (Fig. 5A). Analyses from sample 2221.17 m (Cree Member) from the same well plot in the same fields, but one analysis plots in the Type 2 field (Fig. 5A). For both samples, the majority of the analyses plot in field 10 (Fig. 4A), and as Type 4 of tourmaline (Fig. 5A).

Sample 1599.95 m from Sable Island 2H-58 (Marmora Member) has analyses plotting in fields 1, 2, 9 and 10, with most analyses in field 10 (Fig. 4B). Most of these analyses plot as Type 4, fewer as Type 1 and 3, one as Type 2 (Fig. 5B).

Sample 1804.40 m from Sable Island 3H-58 (Marmora Member) has analyses plotting in fields 2 and 10, with the majority in the latter (Fig. 4C). These analyses plot as Type 1 and 4, with fewer as Type 3 (Fig. 5C). Sample 2001.12 m from the same well (Sable Member) has analyses plotting in fields 2 and 10, with the majority falling in field 10 (Fig. 4C). These analyses plot mostly as Type 4 and only one in each of field 1 and 3 (Fig. 5C).

Sample 1577.68 m from Sable Island 5H-58 (Marmora Member) has tourmaline analyses plotting in fields 2, 8 and 10, with the most found in field 10 (Fig. 4D). Most of these analyses plot as Type 4, fewer as Type 1, and only three and four analyses as Types 2 and 3, respectively (Fig. 5D). The analyses in sample 1579.04 m from this well (Marmora Member) plot in fields 2, 9 and 10 with most in field 10 (Fig. 4D). These analyses plot as Type 4 and fewer as Type 1 and 3 (Fig. 5D). The last sample for this well is 1904.11 m (Cree Member). The analyses from this sample plot in fields 2 and 10 with the majority in the latter field (Fig. 4D). The majority of the analyses plot as Type 4 with lesser amount of Type 1 and 3, and only 1 as Type 2 (Fig. 5D).

Sample 2245.21 m from Sable Island E-48 (Cree Member) has analyses plotting in fields 2 and 10 with the majority falling in the latter (Fig. 4E). These analyses plot mostly as Type 4 with fewer analyses as Types 1 and 3 (Fig. 5E).

Sample 1886.47 m from Sable Island O-47 (Cree Member) has tournaline analyses plotting in fields 2, 8, 9 and 10, with most of the analyses in field 10 (Fig. 4F). These analyses plot mostly as Types 4 with rare analyses plotting as Types 1 and 3 (Fig. 5F).



Figure 4: Chemical variations in tourmaline based on $Ca - Mg - Fe^{2+}$.



- 8. Metacarbonate and metapyroxenite
- 9. Ca-rich metapelite
- 10. Ca-poor metapelite, -psammite, or type 3





Figure 5: Chemical variation in tourmaline based on AI – Mg – Fe²⁺. Fields after Kassoli-Fournaraki & Michailidis (1994). Types after Pe-Piper et al. (2009).



Figure 5 continued: Chemical variation in tourmaline based on AI – Mg – Fe²⁺. Fields after Kassoli-Fournaraki & Michailidis (1994). Types after Pe-Piper et al. (2009).

4.2.3 Garnet

The garnet group has the general formula $X_3Y_2Z_3O_{12}$. Six common end-member species are recognized: pyrope (Mg₃Al₂Si₃O₁₂), almandine (Fe₃Al₂Si₃O₁₂), spessartine (Mn₃Al₂Si₃O₁₂), grossular (Ca₃Al₂Si₃O₁₂), andradite (Ca₃Fe³⁺₂Si₃O₁₂), and uvarovite (Ca₃Cr₂Si₃O₁₂). Fairly complete and continuous compositional variation occurs between two groups of end-members: pyrope-almandine-spessartine and uvarovite-grossularandradite. There is also a third group: grossular-andradite.

Garnet analyses were plotted on 3 different ternary plots. The first diagram is divided up into 7 fields (groups) by Keulen et al. (2012) and Keulen and Heijboer (2011) based on metamorphic facies of garnets. The grain analyses are plotted by their endmember compositions where XMg=Pyrope, XCa= Grossular and XFeMn= Spessartine + Almandine. The group 1 field is for analyses that have undergone very high pressure metamorphism or kimberlitic garnets. Group 2 are analyses from felsic granulite rocks, where sources can include granites, granodiorite, pelites, semipelitic rocks or metasedimentary rocks. Garnets in group 3 are mostly from felsic amphibolite sources. Group 4 has 3 possible sources which include: charnockites, calcium-rich or more intermediate felsic amphibolites (e.g. semipelite), or felsic rocks that have experienced eclogite facies metamorphism. Group 5 garnets are from either low temperature eclogites or intermediate to mafic amphibolites. Group 6 analyses are higher temperature eclogites than those of group 5, or are from mafic granulites and garnet amphibolites. Lastly, group 7 garnets are from anorthositic or calc-silicate sources. Keulen et al. (2012) used this classification scheme to determine the provenance of garnet grains in West Greenland.

For the classification of the garnets analyzed in Scotian Basin, Pe-Piper et al. (2009) used two ternary diagrams: almandine-spessartine-grossular for garnets with <10% pyrope (Fig.13) and almandine-pyrope-grossular for garnets with <10% spessartine (Fig.14). Three types were distinguished based on natural clusters of analyses in these diagrams. Possible source areas for different garnets were proposed based on analyses of garnet in bedrock in southeastern Canada. This approach was further developed by Dutuc et al. (2017) who used the source area data of Pe-Piper et al. (2009) and added analyses from a wide range of rock types reported by Deer et al. (1992). This allowed nine types to be identified, termed G1 to G9, several of which were not recognized in the Scotian Basin.

Garnet analyses from sample 2084.29 m from Cohasset A-52 (Cree Member) plot in fields 2, 3, 4 and 6, with the majority being in group 4 (Fig. 6A). There are three analyses in this sample that have pyrope less than 10%. Two of these plot in the G1 group while the other plots just outside of the G2 group (Fig. 7A). There are five analyses from this sample that have spessartine less than 10%. Three of these analyses plot as G2 type, while the other two are G3 type (Fig. 8A). The analyses from sample 2221.17 m (Cree Member) also plot in fields 2, 3, 4 and 6, but has a fairly equal spread of analyses between fields 3, 4 and 6 with much less in field 2 (Fig. 6A). The analyses from this sample that have less than 10% pyrope plot both as G1 and G2 types with a couple plotting in just open space (Fig. 7A). The analyses that have less than 10% spessartine mostly plot as G2 type with a few plotting as G3 type garnets (Fig. 8A).

Sample 1599.95 m from Sable Island 2H-58 (Marmora Member) has most analyses plotting in field 3, but has a few analyses in fields 4, 6 and 7 (Fig. 6B). All of these analyses except two plot as G1 type grains in the less than 10% pyrope diagram (Fig. 7B). Most of the analyses with less than 10% spessartine plot as G2 type. One analysis plots as G3 type, while another does not plot in any of the fields (Fig. 8B).

No garnet analyses were found in sample 2001.12 m from Sable Island 3H-58 (Sable Member). Garnet analyses from sample 1804.40 m (Marmora Member) plot in fields 1, 2, 3, 4 and 6 with the majority plotting in field 3 (Fig. 6C). There is only one analysis that has less than 10% pyrope and it does not plot as any of the fields for potential sources (Fig. 7C). Most of the analyses with less than 10% spessartine plot as G2 type with a few plotting as G3 type (Fig. 8C).

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No analyses were found in sample 1579.04 m from Sable Island 5H-58 (Marmora Member). Analyses from sample 1577.68 m (Marmora Member) plotted in fields 3, 6 and 7, while analyses from sample 1904.11 m (Cree Member) plotted in fields 2, 3, 4, 6 and 7 (Fig. 6D). One analysis from sample 1577.68 m had less than 10% pyrope and it did not plot in any of the source indicating fields (Fig. 7D). Out of four analyses from sample 1904.11 m that have less than 10% pyrope, three plotted as G2 type grains with the other as G1 type (Fig. 7D). Two analyses from sample 1577.68 m that have less than 10% spessartine plot as G2 type, and the third does not plot as any type (Fig. 8D). Most of the analyses in sample 1904.11 m that have less than 10% spessartine plot as G2 type with a few as G3 type garnets (Fig. 8D).

Sample 2245.21 m from Sable Island E-48 (Cree Member) has analyses that plot in fields 2, 3, 4 and 6 with the majority in field 3 (Fig. 6E). Most of the analyses that have less than 10% pyrope in this sample plot as type G2 with only a few as type G1 (Fig. 7E). Many more of the analyses have less than 10% spessartine. Eight analyses from this sample plot as G3 type, while there are more than twice that amount that plot as G2 type garnets (Fig. 8E).

Sample 1886.47 m from Sable Island O-47 (Cree Member) has only 4 garnet analyses. Two of these plot in field 3, while the other two analyses plot in fields 2 and 6 (Fig. 6F). Only one of these analyses has pyrope less than 10% and it plots as type G1 (Fig. 7F). Two analyses from this sample are found to have less than 10% spessartine. One analysis plots as type G2, while the other plots as G3 type garnets (Fig. 8F).



Figure 6: Chemical variation of garnet. Analyses are plotted by their end-member compositions: XMg= Pyrope; XFeMn= Spessartine + Almandine; XCa= Grossular. Fields are after Keulen et al. (2012), and Keulen and Heijboer (2011).



Figure 7: Chemical variation in garnet projected onto the Almandine-Grossular-Spessartine plane, for garnets with < 10% Pyrope. Type fields after Dutuc et al. (2017).



Figure 8: Chemical variation in garnet projected onto the Almandine-Grossular-Pyrope plane, for garnets with < 10% Spessartine. Type fields after Dutuc et al. (2017).

4.2.4 Chromite and Spinel

Chromite is a member of the Spinel mineral group which contains other minerals such as spinel, hercynite, gahnite, galaxite each distinguished by their Al₂O₃ and Cr₂O₃ content. For simplicity, all mineral grains containing significant Cr₂O₃ and Al₂O₃ < 23 wt% have been given the name chromite. The analyses of these grains were plotted together in three different diagrams. The first diagram (Fig. 9) is a ternary plot based on the elements Fe³⁺, Cr and Al with fields after Stevens (1944). The second diagram (Fig. 10) divides the analyses into three fields based on their source rock. These source rock fields are: boninites, alpine-type peridotites and abyssal peridotites. The alpine-type field encompasses both of the other fields, so the diagram analyses has been modified to indicate clearly the boninite and abyssal peridotite fields. The fields for this plot were created by Cameron et al. (1979), Dick and Bryan (1979) and Dick and Bullen (1984). The last plot is the discrimination diagram of Pearce et al. (2000) showing the fields defined by chromite which are from boninite, island-arc tholeiite or mid-ocean ridge basalt origin rock (Fig. 11).

The chromite analyses from sample 2084.29 m of the Cohasset A-52 well (Cree Member) have a fairly even spread of analyses within the Al-chromite and Cr-spinel fields with a few more in the Al-chromite field (Fig. 9A). In the same figure, the majority of the analyses from Sample 2221.17 m from the same well (Cree Member) plot as Al-chromite. Just over half of the amount also plot in the Cr-spinel field, and there is an outlier that plots just into the Cr-magnetite field (Fig. 9A). Many of the chromite analyses from sample 2084.29 m plot mostly in the field of abyssal peridotites rather than boninites (Fig. 10A). The same analyses plot fairly evenly between the island-arc

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tholeiite and MORB fields with just a few more plotting in the island arc field (Fig. 11A). Sample 2221.17 m follows the same trend as sample 2084.29 m for Fig. 10A. The majority of the chromite analyses plot as island-arc tholeiites in Fig. 11A, with a few in the MORB field and minimal amounts in the boninite field.

Sample 1599.95 m from Sable Island 2H-58 (Marmora Member) has the majority of the analyses plotting as Cr-spinel with 2 in the Al-chromite field and one plotting as Fe-chromite (Fig. 9B). Most of the analyses plot as abyssal peridotites. Only one analysis plots along the edge of the boninite field (Fig. 10B). All chromite analyses from this sample plot in the MORB field of the source indicating diagram with the exception of one island-arc tholeiite analysis (Fig. 11B).

The analyses from sample 1804.40 m from Sable Island 3H-58 (Marmora Member) are spread fairly evenly between the Al-chromite and Cr-spinel fields of Fig. 9C. Sample 2001.12 m from the same well also displays a fairly even spread of analyses plotting as Al-chromite and Cr-spinel in Fig. 9C, with a few extra in the latter. There are also two outliers which plot as Fe-chromite and as Cr-magnetite. In Fig. 10C for sample 1804.40 m, a few analyses plot in the abyssal peridotite field, but only one plots in the boninite field. Most of the analyses plot as MORB in Fig. 11C with about half of that amount plotting in the island-arc tholeiite field and none as boninite. Sample 2001.12 m also has very few analyses in the field of abyssal peridotite but no analyses are found in the boninite field (Fig. 10C). In Fig. 11C, most of the analyses plot as island-arc tholeiites with almost half of the amount also plotting as MORB analyses and only one as a boninite.

For sample 1577.68 m from Sable Island 5H-58 (Marmora Member) all of the analyses except one plot as Cr-spinel, with the exception plotting as Al-chromite (Fig. 9D). For sample 1579.04 m from the same well (Marmora Member), most of the analyses plot as Cr-spinel, two as Al-chromite and one just in the field of Fe-chromite (Fig. 9D). Analyses from sample 1904.11 m (Cree Member) plot fairly evenly between Al-chromite and Cr-spinel although there are a few more in the former. Two analyses from this sample also plot as Fe-chromite (Fig. 9D). The majority of the chromite analyses from sample 1577.67 m plot as abyssal peridotites (Fig. 10D). In Fig. 11D for sample 1577.04 m, all but one of the analyses plot as MORB with the exception plotting in the field of island-arc tholeiites. Sample 1579.04 m from Sable Island 5H-58 also has the majority of analyses plotting in the abyssal peridotite field (Fig. 10D). There is an even spread of analyses between the island-arc tholeiite and MORB fields in Fig. 11D. Only two analyses plot as boninites. Sample 1904.11 m has more analyses plotting as abyssal peridotites rather than as boninites although there are a few in the latter (Fig. 10D). The analyses are fairly evenly spread throughout all three fields of Fig. 11D.

The chromite analyses from sample 2245.21 m of Sable Island E-48 (Cree Member) mostly plot in the Al-chromite field, with some in the Cr-spinel field and much only a few within the fields of Fe-chromite and Cr-magnetite (Fig. 9E). The sample has more analyses plotting as boninites rather than abyssal periodites although generally the majority of the analyses plot outside of those two fields and plots as general alpine-type peridodites for Fig. 10E. In the source indicating diagram, most of the analyses plot as island-arc tholeiites with about half of that amount also plotting as boninites and a few less plotting as MORB (Fig. 11E).



Figure 9: Chemical variation in chromite and spinel. Fields after Stevens (1994).



Figure 10: Chemical variation in chromite and spinel. Fields after Cameron et al. (1979), Dick and Bryan (1979), and Dick and Bullen (1984).



Figure 11: Chemical variation in chromite and spinel. Fields after Pearce et al. (2000).

Sample 1806.47 m from Sable Island O-47 (Cree Member) has an even spread of chromite analyses between Al-chromite and Cr-spinel with one outlier that plots as Fechromite (Fig. 9F). Three analyses from this sample plot as abyssal peridotites and only one as boninite (Fig. 10F). Most of these analyses plot as island-arc tholeiites in the source indicating diagram and half of that amount falling in the MORB field (Fig. 11F).

4.2.5 Biotite

The analyses from unaltered dark mica grains were plotted on a binary plot from Deer et al. (1992) of Al^{IV} vs Fe/(Fe+Mg) to classify the analysed grains into biotite and phlogopite. The analyses were then plotted on a biplot to further determine whether their source was from peraluminous granites, igneous, or metamorphic rocks, with fields after Fleet (2003). Analyses that plotted in the igneous field source were then replotted on a ternary diagram of MgO-FeO-Al₂O₃ to determine whether their igneous source rock was alkali, calc-alkali or peraluminous, with fields taken after Abdel-Rahmen (1994).

From the Cohasset A-52 well, there were no analyses from grains of dark mica in sample 2084.29 m (Cree Member). One analysis was found in sample 2221.17 m (Cree Member) and it plots as biotite (Fig. 12A). This analysis also plots in-between the igneous and metamorphic fields (Fig. 13A).

Sample 1599.95 m from Sable Island 2H-58 (Marmora Member) has all analyses plotting in the biotite field (Fig. 12B). These analyses have a fairly even number of analyses plotting within both the igneous and metamorphic source fields, whereas three analyses plot outside the two fields (Fig. 13B). From the seven analyses that plot in the igneous field, three plot as calc-alkali, two as alkali and two as peraluminous (Fig. 14).



Figure 12: Chemical variations in biotite and phlogopite based on AI^{V} vs Fe/(Fe+Mg). Nomenclature from Deer et al. (1992).


Figure 13: Chemical variations in biotite showing potential rock type sources for biotite. Fields after Fleet (2003).



Figure 14: Fields showing chemical discrimination of igneous biotite based on data taken from Abdel Rahmen (1994); A=alkali, C=calc-alkali, P=peraluminous.

From the Sable Island 3H-58 well, no analyses of dark mica were found in sample 2001.12 m (Sable Member). One analysis found from sample 1804.40 m (Marmora Member) classified as biotite and plotted outside of the igneous field (Figs. 12C and 13C).

All analyses of dark mica from this well plot as biotite (Fig. 12D). Sample 1577.68 m (Marmora Member) from Sable Island 5H-58 has two biotite analyses, neither of which plots in any of the fields (Fig. 13D). From the 6 plotted analyses of biotite from sample 1579.04 m (Marmora Member), two analyses plot in the igneous field, one in the metamorphic fields and three outside any field (Fig. 13D). From the two biotite analyses from sample 1904.11 m (Cree Member), one plots just outside the peraluminous granite field and the other in the igneous field (Fig. 13D). The igneous biotite analysis from 1904.11 m and one of the igneous analyses from 1579.04 m plot in the peraluminous

field, while the other igneous analysis from 1579.04 m plots in the calc-alkali field (Fig. 14).

Sample 2245.21 m from Sable Island E-48 (Cree Member) has six analyses of dark mica, four of which plot as phlogopite and two as biotite (Fig. 12E). These six analyses all plot in the igneous field of the source indicating diagram (Fig. 13E). Four of these analyses plot in the calc-alkali field, while the other two plot in the peraluminous field (Fig. 14).

Sample 1886.47 m from Sable Island O-47 (Cree Member) has all analyses plotting as biotite except for one, which plots just on the line between biotite and phlogopite (Fig. 12F). Seven of the analyses plot in the igneous field, four in the metamorphic field and the rest do not plot in any fields (Fig. 13F). For the igneous analyses, three plot in the calc-alkali field and the other four in the peraluminous field (Fig. 14).

4.2.6 Muscovite

The detrital white mica in the studied rocks is muscovite. Muscovite grains are fairly rare in these samples due to the mineral itself being a light detrital mineral (specific gravity < 2.9). This means that it is generally removed from samples during heavy mineral separation. Nevertheless, the analysed grains were plotted to determine whether they are from igneous or metasedimentary source rocks, with fields after Reynolds et al. (2010).

None of the analyses from both samples from the Cohasset A-52 well (Cree Member) plot within either the metsedimentary or igneous source fields (Fig. 15A).



Figure 15: Al^t a.f.u vs K a.f.u variation in muscovite. Fields are from Reynolds et al. (2010).

Sample 1599.95 m from Sable Island 2H-58 (Marmora Member) has the majority of its muscovite grain analyses plotting in the metasedimentary source rock field with only one plotting in the igneous source rock field. Two other analyses plot outside of both of the source indicating fields (Fig. 21B).

For sample 1804.40 m from Sable Island 3H-58 well (Marmora Member), most of the muscovite analyses plot outside of the field boundaries, but there are four analyses that plot within the metasedimentary field and two that plot on the boundary of the igneous field (Fig. 15C). From the same well, sample 2001.12 m (Sable Member) has analyses plotting in the metasedimentary field and a few outside of the zones (Fig. 15C).

None of the analyses from samples 1577.68 m and 1579.04 m (both Marmora Member) from Sable Island 5H-58 plot into any of the fields (Fig. 15D). Out of the three analyses from sample 1904.11 m (Cree Member) of the same well, only one plots in the igneous field, while the other two plot outside of both fields (Fig. 15D).

Sample 2245.21 m from Sable Island E-48 (Cree Member) has one muscovite analysis that plots in the metasedimentary field, one along the boundary line of the same field, and a few that plot outside both fields (Fig. 15E).

There is only one analysis of muscovite plotted for sample 1886.47 m from Sable Island O-47 (Cree Member) and it plots outside of both of fields (Fig. 15F).

4.2.7 Feldspars

The chemical analyses of K-feldspar, albite and other plagioclase group minerals were plotted on ternary diagrams to show the chemical variations of the analysed grains based on K-Na-Ca compositions. These are also light minerals meaning that these



Figure 16: Ternary plots showing chemical variations of feldspars based on K-Na-Ca composition.

mineral analyses are much less common throughout the studied polished thin sections made from heavy mineral separates.

All the analyses of K-feldspar plot in the sanidine field which also includes orthoclase. Many of these analyses plot at the apex for orthoclase. Similarly, all of the samples have at least one analysis plotting in the albite field. Most of these analyses plot at the apex meaning that they are 100%, or very close, Na endmembers. The rest of the plagioclase analyses plot as oligoclase which are found in samples 2084.29 m and 2221.17 m of Cohasset A-52, 2001.12 m from Sable Island 3H-58, 1579.04 m and 1904.11 m from Sable Island 5H-58, and 2245.21 m from Sable Island E-48 (Figs 16A-F).

4.2.8 Chlorite

Chlorite is another light mineral, and all chlorite analyses from all samples have been plotted on a binary plot of FeO^t/MgO vs SiO₂/Al₂O₃ with a logarithmic scale. Three fields are present in this diagram after Weir-Murphy (2004) and Pe-Piper and Weir-Murphy (2008) indicating whether the analyses are diagenetic, or detrital derived from metamorphic or igneous source rocks.

None of the analyses from any of the samples plot as diagenetic. Most analyses from both samples 2084.29 m and 2221.17 m from the Cohasset A-52 well (Cree Member) plot in the metamorphic field (Fig. 17).

Similarly, all analyses from sample 1599.95 m from Sable Island 2H-58 (Marmora Member) also plot in the metamorphic field (Fig. 17).

The chlorite analyses of sample 1804.40 m (Marmora Member) from the Sable Island 3H-58 well plot in both metamorphic and igneous fields. Sample 2001.12 m (Sable Member) from the same well has only one chlorite analysis, and it does not plot within any of the three fields (Fig. 17).

The chlorite analyses from both sample 1577.68 m and 1579.04 m (both Marmora Member) from Sable Island 5H-58 plot in the metamorphic field (Fig. 17). Sample 1904.11 m from the same well (Cree Member) has analyses plotted in both the metamorphic and igneous fields (Fig. 17).

Sample 2245.21 m from the Sable Island E-48 (Cree Member) well has all of its chlorite analyses plotting in the metamorphic field with the exception of one that just sits slightly outside the field (Fig. 17).



Figure 17: Binary plot of FeO^t/MgO vs SiO₂/Al₂O₃ showing chemical variation in chlorite. Discrimination diagram from Weir-Murphy (2004), with discrimination fields after Pe-Piper and Weir-Murphy (2008).

Sample 1886.47 m from Sable Island O-47 (Cree Member) contains the most chlorite. It is present in both the metamorphic and igneous fields with the majority plotting within the metamorphic fields. Some of the many analyses also plot just outside of both fields (Fig. 17).

4.2.9 Titanium minerals

Four types of titanium minerals were identified throughout the studied samples. Type 1 is a detrital Fe-Ti oxide, ilmenite, which is often found as pure ilmenite or can also be altering to TiO₂ minerals. Type 2 is detrital TiO₂ grains. Authigenic TiO₂ grains are Type 3. Type 4 is the detrital diagenetic TiO₂ because it is a grain that has diagenetically formed in a different sedimentary basin and was then transported to the current basin making it a detrital grain. TiO₂ minerals may be rutile, anatase or brookite, but for simplicity these grains will only be referred to as TiO₂.

Ilmenite was differentiated from TiO₂ grains based on the FeO content of the grain. When FeO had values of 7 wt% or more the grains were given the name Ilmenite. Ilmenite typically has around 45 to 59 wt% TiO₂ and around 37 to 47 wt% FeO with minor amounts of MnO. When Ilmenite grains had values of FeO between 7 and 37 wt% and values of TiO₂ above 59 wt% they are referred to as altered ilmenite and are given the abbreviation "Ilm".

Type 2 grains are homogeneous with a smooth surface. Typically they are rounded or have broken embayed edges from destruction during transport (Fig. 18B). These are easily seen at a low magnification. Some detrital grains are found in lithic clasts associated with quartz (Fig. 18A). Type 3 grains can be seen with a rough surface or are homogeneous (Fig. 18C). They typically have straight edges (Fig. 18D) and are



Sable Island E-48 2245.21 (Fig. A9.17)



Sable Island E-48 2245.21 (Fig. A9.60)



Sable Island E-48 2245.21 (Fig. A9.5)



Sable Island 5H-58 1577.67 (Fig. A6.7)



Sable Island A-52 2084.29 (Fig. A1.40)



Sable Island 5H-58 1577.68 (Fig. A6.47)

Figure 18: Representative BSE images of TiO_2 grains from the studied samples. A) Detrital TiO_2 in a lithic clast, B) Isolated detrital TiO_2 grain with rounded, broken/embayed edges, C) Authigenic TiO_2 (non-homogeneous surface), D) Authigentic TiO_2 showing straight edges, E) Detrital diagenetic TiO_2 showing acicular trellis-type structure, F) Detrital diagenetic TiO_2 showing acicular trellis-type structure with quartz inclusions.

often better viewed with a higher magnification due to their generally smaller size. Type

4 grains are often more rounded in shape and have a more fibrous or acicular trellis type

form (Fig. 18E). Their delicate structures are commonly preserved from pore filling quartz (Ledger, 2014) or quartz inclusions that were present in the detrital ilmenite precursor (Pe-Piper et al., 2005) (Fig. 18F).

4.2.10 Modal abundance of detrital minerals

From Scanning Electron Microscopy analyses and point counting (Table 1) with the use of Back-Scatter Electron images, the detrital mineral assemblages for each of the studied samples were identified (Table 2). The detrital mineral assemblages remains fairly consistent between samples but with a few variations. The main detrital minerals found throughout the samples are: K-feldspar, plagioclase group minerals, biotite, muscovite, zircon, chromite, tourmaline, garnet, ilmenite, monazite, apatite, and Type 2 TiO₂. Minor detrital minerals include: cordierite, chloritoid, Fe-oxide/hydroxide, staurolite, Type 4 TiO₂ and probably xenotime and are collectively referred to as others. The stratigraphic variation in modal composition from all of the wells are shown in Figs. 19-26. Data used for creation of the stratigraphic columns are based on depth, formation, member, core number, facies, gamma ray logging, lithology and sample number.

Table 1. Selected detrital mineral point counting based on BSE images from polished thin sections of the heavy mineral fraction. Table shows counts of detrital K-feldspar, albite + plagioclase group, biotite, muscovite, zircon, spinel + chromite, tourmaline, garnet, ilmenite, monazite, apatite and others (including cordierite, chloritoid, Fe-oxide/hydroxide, staurolite, Type 4 TiO₂ and xenotime).

Well Name		Total	K-	Albite +	Biotite	Muscovite	Zircon	Spinel +	Tourmaline	Garnet	Ilmenite	Monazite	Apatite	TiO ₂	Others
		detrital	fe lds par	Plagioclase				Chromite							
		mine ral													
		grains													
Cohasset A-52	Count	308	3	6	16	9	53	34	47	8	83	5	13	21	10
2084.29	Percentage	100	0.97	1.95	5.19	2.92	17.21	11.04	15.26	2.60	26.95	1.62	4.22	6.82	3.25
Cohasset A-52	Count	290	3	5	5	9	52	47	48	23	42	7	9	29	11
2221.17	Percentage	100	1.03	1.72	1.72	3.10	17.93	16.21	16.55	7.93	14.48	2.41	3.10	10.00	3.79
Sable Island 2H-58	Count	616	2	2	39	10	50	14	82	15	314	13	4	36	35
1599.95	Percentage	100	0.32	0.32	6.33	1.62	8.12	2.27	13.31	2.44	50.97	2.11	0.65	5.84	5.68
Sable Island 3H-58	Count	404	2	1	6	19	73	24	42	11	169	12	1	34	10
1804.40	Percentage	100	0.50	0.25	1.49	4.70	18.07	5.94	10.40	2.72	41.83	2.97	0.25	8.42	2.48
Sable Island 3H-58	Count	189	7	8	7	8	12	15	7	0	94	1	1	16	13
2001.12	Percentage	100	3.70	4.23	3.70	4.23	6.35	7.94	3.70	0.00	49.74	0.53	0.53	8.47	6.88
Sable Island 5H-58	Count	476	5	5	4	9	61	10	72	4	234	16	0	38	18
1577.68	Percentage	100	1.05	1.05	0.84	1.89	12.82	2.10	15.13	0.84	49.16	3.36	0.00	7.98	3.78
Sable Island 5H-58	Count	318	9	7	34	13	38	10	14	0	174	4	1	9	5
1579.04	Percentage	100	2.83	2.20	10.69	4.09	11.95	3.14	4.40	0.00	54.72	1.26	0.31	2.83	1.57
Sable Island 5H-58	Count	356	5	4	16	3	91	32	30	18	116	7	4	24	6
1904.11	Percentage	100	1.40	1.12	4.49	0.84	25.56	8.99	8.43	5.06	32.58	1.97	1.12	6.74	1.69
Sable Island E-48	Count	437	6	3	7	2	193	68	39	31	11	8	22	34	13
2245.21	Percentage	100	1.37	0.69	1.60	0.46	44.16	15.56	8.92	7.09	2.52	1.83	5.03	7.78	2.97
Sable Island O-47	Count	351	7	1	45	8	32	9	24	4	155	13	13	31	9
1886.47	Percentage	100	1.99	0.28	12.82	2.28	9.12	2.56	6.84	1.14	44.16	3.70	3.70	8.83	2.56

Counts have been normalized to 100% to show percentages.

Table 2. Mineral assemblages based on BSE images

Well name	Depth (m)	Member	Detrital minerals
Cohasset A-52	2084.29	Cree	Ab, Ap, Bdy, Bt, Chr, Feohy,
			Grt, Ilm, Kfs, Mnz, Ms, Olig,
			Qz, Spl, TiO ₂ , Tur, Xtm, Zrn
Cohasset A-52	2221.17	Cree	Ab, Al-phos-sulf, Ap, Bt, Chr,
			Crd, Fl, Grt, Ilm, Kfs, Mnz, Ms,
			Olig, Qz, Spl, St, TiO ₂ , Tur,
			Zrn
Sable Island 2H-58	1599.95	Marmora	Ab, Al-phos, Ap, Bt, Chr,
			Feohy, Grt, Ilm, Kfs, Ky, Mag,
			Mnz, Ms, Qz, Spl, St, Ti O_2 , Tur,
			Xtm, Zrn
Sable Island 3H-58	1804.40	Marmora	Ab, Al-phos-sulf, Ap, Bt, Chr,
			Grt, Ilm, Kfs, Mnz, Ms, Pb, Qz,
	2001.12	0.11	Spl, St, TiO ₂ , Tur, Xtm, Zrn
Sable Island 3H-58	2001.12	Sable	Ab, Ap, Bt, Chr, Feohy, Fl, Ilm,
			Kfs, Mnz, Ms, Olig, Qz, Spl, St,
Calila Jalan 1 511 50	1577 (0	Manual	110_2 , $10r$, $2rn$
Sable Island 5H-58	15/7.08	Marmora	Ab, Bt, Chr, Grt, Ilm, Kis, Minz,
			Mis, QZ, Spi, St, $11O_2$, 1 ur, Atm,
Soble Island 511 59	1570.04	Manmana	ZIII Ab An Dt Chr Ilm Kfo Lm
Sable Islalid 5H-58	1379.04	warmora	Ab, Ap, Di , $Chr, hhh, Kis, Lin,$ Mno Mo Olio Oz Spl. St
			Ti Ω_2 Tur Zrn
Sable Island 5H 58	100/ 11	Cree	Ab Al phos sulf Ap Bt Chr
Sable Island 511-56	1704.11	Citt	Cld Grt Ilm Kfs Mnz Ms
			Olig Oz Spl St TiO ₂ Tur
			Xtm. Zrn
Sable Island E-48	2245.21	Cree	Ab, Al-phos, Ap, Bt, Chr. Grt.
			Ilm. Kfs. Mnz. Ms. Olig. Oz.
			Spl, TiO ₂ , Tur, Xtm, Zrn
Sable Island O-47	1886.47	Cree	Ab, Al-phos, Ap, Bt, Chr, Grt,
			Ilm, Kfs, Mnz, Ms, Qz, TiO ₂ ,
			Tur, Xtm, Zrn



Figure 19: Stratigraphic column based on Gould et al. (2011) showing the location of studied samples. Lithofacies nomenclature from Gould et al. (2010).



Figure 20: Stratigraphic column of core 1 from the Sable Island 2H-58 well. Formation and member picks are from Wade and MacLean (1993). Modal abundance of detrital minerals shown in the corresponding pie diagram. Gamma ray plot is not depth corrected. Modified from Nagle (2018).



Figure 21: Stratigraphic column of core 2 from the Sable Island 3H-58 well. Formation and member picks are from Wade and MacLean (1993). Modal abundance of detrital minerals shown in the corresponding pie diagram. Gamma ray plot is not depth corrected. Modified from Nagle (2018).



Figure 22: Stratigraphic column of core 3 from the Sable Island 3H-58 well. Formation and member picks are from Wade and MacLean (1993). Modal abundance of detrital minerals shown in the corresponding pie diagram. Gamma ray plot is not depth corrected. Modified from Nagle (2018).



Figure 23: Stratigraphic column of core 2 from the Sable Island 5H-58 well. Formation and member picks are from Wade and MacLean (1993). Modal abundance of detrital minerals shown in the corresponding pie diagram. Gamma ray plot is not depth corrected. Modified from Nagle (2018).



Figure 24: Stratigraphic column of core 3 from the Sable Island 5H-58 well. Formation and member picks are from Wade and MacLean (1993). Modal abundance of detrital minerals shown in the corresponding pie diagram. Gamma ray plot is not depth corrected. Modified from Nagle (2018).





Figure 25: Stratigraphic column of core 1 from the Sable Island E-48 well. Formation and member picks are from Wade and MacLean (1993). Modal abundance of detrital minerals shown in the corresponding pie diagram. Gamma ray plot is not depth corrected.



Figure 26: Stratigraphic column of core 1 from the Sable Island O-47 well. Formation and member picks are from Wade and MacLean (1993). Modal abundance of detrital minerals shown in the corresponding pie diagram. Gamma ray plot is not depth corrected.

5.0 Discussion

5.1 Detrital minerals

5.1.1 Cree Member (Wells: A-52, 5H-58, E-48 and O-47)

The dominant detrital minerals in sample 2084.29 m and sample 2221.17 m from Cohasset A-52 are tourmaline, chromite, zircon and ilmenite. These samples contain hardly any feldspars, micas, monazite or apatite.

The main detrital minerals in sample 1904.11 m from Sable Island 5H-58 are ilmenite and zircon with minor amounts of biotite, chromite, tourmaline, garnet and TiO₂. There is an insignificant amount of feldspars, muscovite, monazite and apatite in this sample.

Sample 2245.21 m from Sable Island E-48 is the only sample for this well. Its dominant detrital minerals include zircon and chromite with lesser amounts of tourmaline, garnet, apatite and TiO₂. Insignificant detrital minerals in this sample are feldspars, micas, ilmenite and monazite. This sample contains the smallest amount of ilmenite grains in all of the studied samples while also having the most zircon grains from all of the samples.

Sample 1886.47 m is the only sample from Sable Island O-47. The main detrital minerals in this sample are ilmenite and biotite with lesser amounts of zircon, tourmaline and TiO₂. Insignificant detrital minerals in this sample include feldspars, muscovite, chromite, garnet, monazite and apatite.

5.1.2 Sable Member (Well: 3H-58)

Sample 2001.12 m from Sable Island 3H-58 has one main detrital mineral which is ilmenite. It contains lesser amounts of chromite, zircon and TiO₂ with insignificant amounts of feldspars, micas, tourmaline, monazite and apatite. No garnet was found in this sample.

5.1.3 Marmora Member (Wells: 2H-58, 3H-58 and 5H-58)

Sample 1599.95 m is the only sample in the Sable Island 2H-58 well. The main detrital minerals include ilmenite and tourmaline with minor amounts of zircon and biotite. This sample contains hardly any feldspars, muscovite, chromite, garnet, monazite and apatite.

The dominant detrital minerals from sample 1804.40 m of Sable Island 3H-58 are ilmenite, tourmaline and zircon with minor amounts of chromite and TiO₂. Feldspars, micas, garnet, monazite or apatite are very rare.

The dominant detrital minerals from sample 1577.68 m of Sable Island 5H-58 include ilmenite, zircon and tourmaline with minor TiO₂ and hardly any feldspars, micas, chromite, garnet and monazite. There was no apatite found in this sample. Sample 1579.04 m is from the same well and its main detrital minerals are ilmenite, zircon and biotite with lesser amounts of muscovite, chromite and tourmaline. There are insignificant amounts of feldspars, monazite, apatite and TiO₂, and no garnet was found in this sample.

5.2 Lithic clasts

Lithic clasts are key when trying to understand the provenance of rocks, because they are direct evidence of the source rocks from where the minerals originated. Throughout the studied samples lithic clasts are quite common, but generally appear to be from the same types of rocks. The main types of lithic clasts found throughout the samples are metasedimentary clasts of pelites and schists. These clasts typically are composed of minerals such as quartz, TiO₂ minerals (probably rutile), chlorite and/or muscovite. Fig. 27A shows a lithic clast of a pelite which seems to be the most common type of lithic clast throughout all of the samples. A lithic clast of a schist is seen in Fig. 27B, and this type of lithic clast appears to be the second most common type. Fig. 27C is a lithic clast of a shale composed of fine grained chorite and muscovite with some later siderite precipitation. Lastly, Fig. 27D shows a lithic clast of an ophiolite. This appears to be the only one of its kind from the sites analysed, but it is a very informative lithic clast. It is composed of chromite and chlorite. This lithic clast indicates clearly its origin which in this case is from the Appalachians of western Newfoundland or Quebec.



Sable Island 2H-58 1599.95 m (Fig. A3.25)

Sable Island E-48 2245.21 m (Fig. A9.17)



Sable Island 3H-58 2001.12 m (Fig. A5.30)

Sable Island 3H-58 2001.12 m (Fig. A5.21)

Figure 27: Representative BSE images of lithic clasts from the studied samples. A) Lithic clast of a pelite, B) Lithic clast of a schist, C) Lithic clast of a shale, D) Lithic clast of an ophiolite.

TiO₂ minerals are very abundant components of most of the lithic clasts throughout the samples. To determine the TiO₂ polymorph present in these lithic clasts, preliminary Raman spectroscopy analyses have been completed to identify whether the grains are rutile, brookite or anatase. The preliminary results show that rutile is the most common polymorph in these lithic clasts throughout the studied samples (Fig. 28) and the studied clasts appear to be from schists and pelites.



Figure 28: Representative BSE images of lithic clasts containing TiO_2 and their respective Raman spectroscopy analyses showing that the TiO_2 polymorph is rutile.

5.3 Sediment sources

Previous provenance studies in the Scotian Basin have suggested that distinct paleorivers had transported detritus from three separate source areas in the Lower Cretaceous to build the deltas we see at present in the Scotian Basin (Figure. 29). The three areas suggested for this input of detrital material are: 1) the Meguma terrane, 2) the Grenville terrane, and 3) the main Appalachians. Sediment from the Meguma terrane would have been transported by small local rivers from the source area into the Central and Western Scotian Basin. The Banquereau River is a large river that came from the north and potentially transported material from the western Newfoundland part of the Appalachians into the Eastern part of the Scotian Basin. Sediments from the Gulf of St. Lawrence in the main Appalachian region, and the Grenville terrane were brought by the Sable River, which was a large river that deposited in the Central Scotian Basin. Lastly, sediments derived from the New Brunswick part of the main Appalachians are suggested to have been transported by a river derived from the area which now contains the Bay of Fundy and deposited material into the Southwestern part of the Scotian Basin. The study area focuses on six wells; Cohasset A-52, Sable Island 2H-58, Sable Island 3H-58, Sable Island E-48 and Sable Island O-47. These wells are located in the central part of the Scotian Basin which suggests that the small local rivers from the Meguma terrane and the large Sable River may be of great importance for input of detritus. Table 3 shows the minerals used as provenance indicators.



Figure 29: Map showing potential source areas and their respective paleoriver paths modified from Zhang et al. (2014).

Provenance	Potential Source Rock							
Indicators	I	gneous	Metamorphic					
	Felsic	Mafic/Metamafic	Metasedimentary	Other				
Lithic Clasts			\checkmark					
Tourmaline		√		\checkmark				
Garnet			\checkmark	\checkmark				
Chromite		\checkmark						
Feldspars		√	\checkmark	\checkmark				
Biotite			\checkmark	\checkmark				
Muscovite			\checkmark					
Chlorite		\checkmark	\checkmark	\checkmark				
Ilmenite		√	\checkmark	\checkmark				
Rutile			\checkmark	\checkmark				

Table 3: Minerals used as provenance indicators with their respective potential source rocks.

5.3.1 Anticipated minerals from the sources

Each of the source areas has signature minerals associated with it (Table 4), and

understanding the provenance is made easier by looking at the anticipated minerals of

each of the sources.

Table 4.	Anticipated	detrital m	ninerals an	d lithic clast	s from eacl	n of the	sources	based on	previous
studies.									

Sources	Minerals	Lithic Clasts
Meguma Terrane	• Tourmaline (Type 4)	Metapelites
	• Garnet (G1)	
	• Muscovite (Igneous)	
Main Appalachians	• Chromite $(TiO_2 > 0.2 \text{ wt }\%)$	Metapelites
	from Newfoundland, < 0.2	Ophiolites
	wt % from Quebec)	_
	• Tourmaline (Type 4)	
	Muscovite	
	(Metasedimentary)	
	Ultrastable polycyclic	
	minerals i.e zircon	
Grenville terrane	• Garnet (G2 and G3)	Medium-high grade
		metasedimentary
		rocks i.e schist

For the Meguma Terrane, the anticipated detrital minerals include tourmaline, garnet and muscovite. Tourmaline grains from this area are typically Type 4 grains associated with pelites. G1 garnets are suggestive of this region. These are spessartine garnets which are rich in manganese and are associated with contact metamorphism. Igneous muscovite is the most common type of muscovite from the Meguma Terrane. It is sourced from peraluminous granites such as the South Mountain Batholith.

The main Appalachian source anticipated minerals include chromite, tourmaline, zircon and muscovite. Tourmaline grains from this source are also mainly Type 4 grains. Muscovite is typically from metasedimentary rather than igneous. Ultrastable minerals such as zircon and chromite are also anticipated to be sourced from this region mainly from the Gulf of Saint Lawrence, where there are Carboniferous sedimentary basins. Depending on the TiO₂ content in the chromite a more specific location can be identified. Grains with < 0.2 wt% TiO₂ are suggested to be from the Quebec side of the Appalachians, while anything above 0.2 wt% are suggested to come from the western Newfoundland part of the Appalachians. Generally the lithic clasts anticipated from this source region are metapelites that also supply tourmaline, and ophiolites containing a lot of chromite.

For the Grenville source area the main anticipated detrital mineral is garnet. These garnets are commonly G2 and G3 type grains. These grains are classified as almandine, which is an iron-rich garnet. In terms of lithic clasts, the main type anticipated types are medium to high grade metasedimentary rocks such as schists.

5.3.2 Tourmaline

Throughout the studied samples, Type 4 tourmaline grains are clearly the dominant type of tourmaline grain. Type 4 grains are indicative of metamorphic origins such as metapelites and metapsammites. Lesser amounts of Type 1 are common as well. Rare type 2 and 3 grains have been noted with the latter being a bit more common. These are all comparable with analyses from the Thebaud field (Pe-Piper et al., 2009). Type 4 tourmaline grains suggest input from both the Sable River and also from local Meguma Rivers.

5.3.3 Garnet

Garnets plot in Type G1, G2 and G3 fields. Their analyses are comparable to those from Pe-Piper et al. (2009). Type G1 garnets are from felsic plutonic and low grade metamorphic rocks. Analyses are comparable to those of Meguma terrane granites and metasediments and are mainly spessartine. Type G2 garnets are from ultramafic and metamafic rocks. Analysis from some of the studied samples show similar results to those of the Grenville metagabbros and anorthosites which would have been sourced using the Sable River and these are mainly grains of almandine. Type G3 garnets include source rocks of high grade intermediate metamorphic rocks and felsic plutonic rocks. Similarities here also show a suggestive origin from the Grenville terrane.

5.3.4 Biotite

The majority of the samples have biotite grains of igneous origin with only minor inputs from metamorphic sources. This suggests a Meguma source through the small local rivers.

5.3.5 Chromite

The amount of chromite and spinel grains analysed in these samples is much more than seen in previous studies of the area. A higher percentage of TiO_2 has been noted in many of the analyses, which increases the number of grains showing MORB-like origin. Some concern was brought by this observation, but the grains with higher amounts of TiO₂ appear to be homogenous clean grains with no evidence of potential inclusions of Ti-bearing minerals. Also, the points analysed on the grains are generally in the middle, so there does not appear to be any influence of surrounding grains containing titanium. Chromite and spinel grains are likely sourced from the western Newfoundland Appalachians and therefore would have been transported via the Banquereau River. The analyses from this study compare more to those from Newfoundland Appalachians than those of the Quebec Appalachians. Chromite grains are often polycyclic, meaning that they have been transported into different sedimentary basins on more than one occasion. The Sable and Banquereau Rivers travels through a region of Carboniferous sedimentary basins containing a large amount of chromite. It is possible that this material was picked up from these basins by these rivers and transported near the central and slightly eastern part of the Scotian Basin. Since chromite has a fairly high density, these grains would likely be deposited early on, and therefore would be present in proximal wells such as the wells of this study.

5.3.6 Muscovite

Pe-Piper et al. (2009) suggests distinction between metamorphic and igneous origin of muscovite grains is based on the Al and K content. Using their parameters, peraluminous granites have K content of around 1.8 a.f.u and Al content of 5.5 a.f.u. This

is different from the late leucogranites which contain roughly the same amount of K but have lower amount of Al at around 5 a.f.u. Meguma metasediments have similar amounts of Al content but a range of K from roughly 1-1.6 a.f.u. From these parameters, the few igneous grains appear to be late leucogranites. Many of the analyses from Sable Island 2H-58, Sable Island 3H-58, Sable Island E-48 and Sable Island O-47 have grains that plot roughly in the area comparable with Meguma metasediments. Overall, the dominant type of muscovite grains in these samples are of metamorphic origin, likely from Appalachian metasedimentary rocks.

5.3.7 Lithic Clasts

Lithic clasts found throughout the samples include metasedimentary rocks such as pelites and schists, as well as shales and an ophiolite clast. Medium to high grade metasedimentary lithic clasts such as schists are indicative of input from the Sable River. The pelite lithic clasts commonly contain TiO₂ minerals in them which is suggestive of an Appalachian source. Similarly, the ophiolite clast suggests an Appalachian source based on the presence of chromite.

6.0 Conclusions

1) The main heavy detrital minerals in the upper Logan Canyon Formation are ilmenite, zircon, tourmaline, garnet and chromite.

2) The most common lithic clasts are metasedimentary rocks such as metapelites and schists. These suggest imput from the Appalachians.

3) Ultrastable polycyclic minerals such as zircon and chromite that are sourced from Carboniferous basins in the Gulf of Saint Lawrence are most common in the Cree Member samples.

4) The dominant sources, based on the collected data and comparison to previous studies in the area, are suggested to be from the Appalachians and the Meguma Terrane. This indicates supply from the Sable River draining the Gulf of Saint Lawrence/Appalachian region, as well as small local rivers draining the Meguma Terrane.

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Appendix A1: BSE images and EDS mineral analyses for sample Cohasset A-52 2084.29 m



Figure A1.1: Cohasset A-52 (2084.29 m)



22:Quartz 1:Zircon 23:Siderite + 2:TiO₂ 3:Tourmaline 24:TiO₂ + 25:Quartz 4:Albite 26:Tourmaline 5:"Ilmenite" 27:Chromite 6:"Ilmenite" 7:Pyrite 28:Siderite + 29:Siderite 8:Siderite 30:Quartz 9:"Ilmenite" 10:Chromite 31:TiO₂ + 11:"Ilmenite" 32:Chromite 12:TiO₂ + 13:Pyrite 14:Calcite + 15:Quartz 16:TiO₂ + 17:TiO₂ + Chlorite 18:Siderite $19:TiO_2 + Quartz$ 20:Ilmenite 21:"Ilmenite"

Figure A1.2: Cohasset A-52 (2084.29 m) (SEM) site 1 (Table A1.1)



Figure A1.3: Cohasset A-52 (2084.29 m) site 1.1 (Table A1.1). A fragment of sandstone made up of detrital muscovite (1) and ilmenite (2,4,5) in calcite (3) and siderite (6) cement.



Figure A1.4: Cohasset A-52 (2084.29 m) site 1.2 (Table A1.1). Detrital quartz (3), diagenetic TiO_2 (pos. a) in calcite (2,4) cement with some chlorite and pyrite (5).



1:Pyrite 2:"Ilmenite" 3:Calcite + TiO₂ 4:Ilmenite + 5:Siderite 6:Calcite 7:Pyrite

Figure A1.5: Cohasset A-52 (2084.29 m) site 1.3 (Table A1.1). A fragment of sandstone that contains detrital ilmenite (2,4) and cement made up of calcite (3,6), siderite (5) and pyrite (1,7).



Figure A1.6: Cohasset A-52 (2084.29 m) site 1.4 (Table A1.1). ? A lithic clast made up of TiO_2 (2) blebs and stringers associated with quartz (1,3).



Figure A1.7: Cohasset A-52 (2084.29 m) site 1.5 (Table A1.1). A fragment of sandstone that contains detrital guartz (3) and a variety of diagenetic minerals: calcite, siderite, chlorite and kaolinite.

4:Chlorite + 5:Kaolinite



1:Calcite + 2:TiO₂ 3:Siderite +

Figure A1.8: Cohasset A-52 (2084.29 m) site 1.6 (Table A1.1). A fragment of cement made up of calcite (1), siderite prisms (3) and diagenetic TiO_2 .



1:"Ilmenite" + 24:Quartz 2:"Ilmenite" 25:Pyrite 3:Zircon 26:Calcite + 4:Mix 27:Ilmenite 5:Chromite 28:Quartz + 6:"Ilmenite" Ilmenite 7:TiO₂ + 29:Siderite 30:"Ilmenite" 8:Zircon 31:Quartz + 5 9:Calcite + 32:Ilmenite Ilmenite 33:TiO₂ 10:Quartz 34:Quartz 11:Siderite + 12:Tourmaline 35:"Ilmenite" 13:"Ilmenite" 36:Siderite + 14:TiO₂ 37:Ilmenite 38:Chlorite + TiO₂ 15:Pyrite 16:Chlorite + 39:Tourmaline 17:"Ilmenite" + 18:Siderite + 19:Pyrite 20:Pyrite

Figure A1.9: Cohasset A-52 (2084.29 m) (SEM) site 2 (Table A1.1)



1:"Ilmenite" 2:"Ilmenite" 3:Pyrite 4:Quartz 5:"Ilmenite" 6:TiO₂ 7:Zircon o2 8:Quartz 9:Monazite 10:Quartz 11:Apatite 12:"Ilmenite" + 13:TiO₂ + 14:Calcite + 15:Zircon 16:Garnet 17:Calcite + 18:Apatite 19:Siderite 20:TiO₂ 21:Spinel

22: TiO_2 23: TiO_2 + 24:Zircon + 25:IImenite26:Quartz27:Zircon28: TiO_2 + Quartz29:"IImenite" + 30:Zircon31:Siderite32: TiO_2 + 33:Quartz

Figure A1.10: Cohasset A-52 (2084.29 m) (SEM) site 3 (Table A1.1)



Figure A1.11: Cohasset A-52 (2084.29 m) (SEM) site 4 (Table A1.1)



1:TiO₂ 21:TiO₂ 2:Siderite + 22:Quartz Biotite 23:"Ilmenite" 3:K-Feldspar 24:Quartz 4:Zircon 25:TiO₂ + 5:TiO₂ Muscovite 6:Siderite + Biotite 7:"Ilmenite" 8:TiO₂ 9:Siderite 10:Quartz 11:Siderite + 12:Quartz 13:TiO₂ 14:Pyrite 15:Spinel 16:Garnet 17:Quartz + TiO₂ + 18:Tourmaline 19:Quartz 20:Siderite

Figure A1.12: Cohasset A-52 (2084.29 m) (SEM) site 5 (Table A1.1)



21:Tourmaline 1:Zircon 2:Calcite + 22:"Ilmenite" 3:Garnet 23:"Ilmenite" 4:Tourmaline 24:Calcite + 5:Pyrite Ilmenite 6:Calcite + 25:TiO₂ + 7:Quartz 26:Chlorite + TiO₂ 8:TiO₂ + 27:Apatite 9:"Ilmenite" 28:Zircon 10:Siderite + 29:Calcite + 11:Ilmenite 30:Oligoclase 12:Quartz 31:Spinel 13:"Ilmenite" 32:TiO₂ 14:Quartz 33:Spinel 15:Apatite 34:"Ilmenite" + 16:Siderite + 35:TiO₂ Biotite 36:Ilmenite 17:Quartz 18:"Ilmenite" + 19:Pyrite 20:Ilmenite

Figure A1.13: Cohasset A-52 (2084.29 m) (SEM) site 6 (Table A1.1)



1:Ilmenite 19:Apatite 2:Quartz 20:Ilmenite 3:Siderite 21:Tourmaline 4:Zircon 22:Pyrite 5:Calcite + 23:Quartz Ilmenite 24:Pyrite 6:TiO₂ + 25:"Ilmenite" Quartz 26:TiO₂ 27:Tourmaline 7:Siderite + 8:Zircon + 28:Chlorite 9:"Ilmenite" 29:Quartz 10:Tourmaline 30:TiO₂ + Chlorite 11:Spinel 31:Siderite + 12:Tourmaline 32:Ilmenite 13:Zircon 14:Siderite + Chlorite 15:Siderite 16:Pyrite 17:Spinel 18:Zircon

Figure A1.14: Cohasset A-52 (2084.29 m) (SEM) site 7 (Table A1.1)



20:Quartz + 1:Pyrite Muscovite 2:Siderite 21:"Ilmenite" 3:Mix 22:Spinel 4:Muscovite + 23:Albite Ilmenite 24:Quartz 5:Tourmaline 25:"Ilmenite" 6:Tourmaline 26:Quartz 7:Chromite 27:"Ilmenite" 8:Quartz 28:Pyrite 9:Chromite 29:Pyrite 10:TiO₂ + 30:Quartz Chlorite 11:TiO₂ + 12:Chlorite + Biotite 13:Apatite 14:Tourmaline 15:Siderite 16:Quartz + Ilmenite 17:Chlorite + Biotite 18:TiO₂ 19:Apatite

Figure A1.15: Cohasset A-52 (2084.29 m) (SEM) site 8 (Table A1.1)



1:Chlorite + Kaolinite 2:Pyrite 3:Chlorite + Muscovite 4:Pyrite + 5:Chlorite + Pyrite + 6:Siderite

Figure A1.16: Cohasset A-52 (2084.29 m) site 8.1 (Table A1.1). A fragment of sandstone made up of diagenetic kaolinite (1), chlorite, pyrite, siderite (6) prisms and partly chloritized detrital muscovite (3).



Figure A1.17: Cohasset A-52 (2084.29 m) site 8.2 (Table A1.1). A fragment of sandstone made up of diagenetic siderite (4), chlorite and kaolinite (5) and late pyrite (1,3).

1:Pyrite 2:Pyrite + Chlorite 3:Pyrite 4:Siderite 5:Kaolinite + Chlorite



1:Tourmaline 2:Pyrite 3:Chlorite + Biotite 4:Quartz 5:"Ilmenite" 6:Zircon 7:Pyrite 8:Féoxide/hydroxide 27:"Ilmenite" 9:Chromite 10:Siderite + 11:TiO₂ 12:Garnet 13:Chromite 14:TiO₂ + Quartz 15:Calcite + 16:Pyrite + 17:TiO₂ 18:Zircon +

19:Ilmenite 20:Pyrite 21:Siderite + 22:Quartz 23:Zircon 24:Tourmaline 25:Siderite + 26:Chlorite + Biotite 28:Chromite 29:Quartz 30:Pyrite 31:Calcite + 32:TiO₂ + 33:TiO₂ 34:Zircon + 35:"Ilmenite" 36:Pyrite 37:K-Feldspar

Figure A1.18: Cohasset A-52 (2084.29 m) (SEM) site 9 (Table A1.1)



Figure A1.19: Cohasset A-52 (2084.29 m) site 9.1 (Table A1.1). A fragment of cement made up of chloritized mica (2,3) often cut by siderite prisms (1,4).



Figure A1.20: Cohasset A-52 (2084.29 m) (SEM) site 10 (Table A1.1)



1:Siderite + Apatite 2:Chlorite + Muscovite 3:Chlorite + Mica

Figure A1.21: Cohasset A-52 (2084.29 m) site 10.1 (Table A1.1). Similar to Figure 19.



Figure A1.22: Cohasset A-52 (2084.29 m) site 10.2 (Table A1.1). A fragment of sandstone made up of detrital quartz (1), tourmaline (3) and a TiO_2 grain.



Figure A1.23: Cohasset A-52 (2084.29 m) site 10.3 (Table A1.1). A fragment of sandstone made up of detrital quartz (2), ilmenite (1) and diagenetic pyrite (4), calcite and chlorite (3).



1:TiO₂ + 2:Quartz 3:Muscovite

Figure A1.24: Cohasset A-52 (2084.29 m) site 10.4 (Table A1.1). A fragment of sandstone made up of detrital quartz (2), muscovite (3) and TiO_2 (1).



1:Baddeleyite 2:Calcite + Chlorite 3:Albite

Figure A1.25: Cohasset A-52 (2084.29 m) site 10.5 (Table A1.1). A fragment of sandstone made up of a detrital albite grain (3) probably with a baddeleyite (1) inclusion and a piece of cement made up of calcite and chlorite (2).



1:Pyrite + 22:Chromite 2:Tourmaline 23:TiO₂ 3:Spinel 24:Fe-4:Siderite oxide/hydroxide ? 5:Quartz 25:Ilmenite + 6:Chromite Chlorite 7:Apatite 26:Pyrite 8:Zircon 27:Quartz 9:"Ilmenite" 28:Apatite 10:Pyrite 29:Tourmaline 11:Quartz 30:TiO₂ 12:Ilmenite 31:TiO₂ + 13:Pyrite + 32:"Ilmenite" Calcite 33:Calcite + 14:Calcite + Ilmenite 15:"Ilmenite" 16:Siderite + Chlorite 17:"Ilmenite" 18:Quartz 19:Ilmenite 20:"Ilmenite" 21:Zircon +

Figure A1.26: Cohasset A-52 (2084.29 m) (SEM) site 11 (Table A1.1)



Figure A1.27: Cohasset A-52 (2084.29 m) site 11.1 (Table A1.1). A fragment of sandstone made up of detrital quartz (1) and diagenetic calcite (4), siderite (5) and TiO_2 (3, pos. a).



Figure A1.28: Cohasset A-52 (2084.29 m) (SEM) site 12 (Table A1.1)



Figure A1.29: Cohasset A-52 (2084.29 m) site 12.1 (Table A1.1). A fragment of sandstone probably made up of single plastically deformed grain of mica (3,4) that has been chloritized and prisms of calcite (1) and siderite (2) cross-cutting the chlorite. The siderite postdates the calcite (pos. a).



Figure A1.30: Cohasset A-52 (2084.29 m) site 12.2 (Table A1.1). A fragment of the cement made up of chlorite (1) cross-cut by siderite prisms (2,3).



Figure A1.31: Cohasset A-52 (2084.29 m) (SEM) site 13 (Table A1.1)



Figure A1.32: Cohasset A-52 (2084.29 m) site 13.1 (Table A1.1). Diagenetic calcite (3) appears to postdate diagenetic TiO_2 (4, pos. a).



Figure A1.33: Cohasset A-52 (2084.29 m) site 13.2 (Table A1.1). A piece of the cement made up of chlorite cross-cut by siderite prisms (2,3).

1:Siderite + 2:Chlorite + Siderite + 3:Chlorite +



1:Muscovite + 2:Muscovite + TiO₂ 3:TiO₂ + 4:Quartz +

Figure A1.34: Cohasset A-52 (2084.29 m) site 13.3 (Table A1.1). A lithic clast made up of muscovite (1,2), quartz and TiO_2 (3) blebs in a general preferred orientation.



24:Tourmaline 1:Zircon $2:TiO_2$ 25:TiO₂ 3:Tourmaline 26:Pyrite 27:"Ilmenite" + 4:Zircon + 5:Tourmaline 28:Chromite 29:Quartz 6:Pyrite 7:Quartz 30:"Ilmenite" 8:TiO₂ 9:Zircon 10:Zircon 11:Tourmaline 12:Siderite + Chlorite + Calcite ? 13:Ilmenite 14:Pyrite 15:Monazite 16:Quartz 17:TiO₂ + 18:Monazite 19:Siderite + 20:Tourmaline 21:Apatite 22:TiO₂ + 23:"Ilmenite"

Figure A1.35: Cohasset A-52 (2084.29 m) (SEM) site 14 (Table A1.1)



1:Quartz 2:TiO₂ 3:Zircon +TiO₂ 4:TiO₂ + Zircon

Figure A1.36: Cohasset A-52 (2084.29 m) site 14.1 (Table A1.1). A rounded lithic clast made up of quartz (1) and TiO_2 (2) with zircon inclusions (2,3).



Figure A1.37: Cohasset A-52 (2084.29 m) site 14.2 (Table A1.1). A highly altered ilmenite (3) to TiO_2 (3, pos. a) partly surounded by calcite (2) cement.



1:Chromite $20:TiO_2 + Quartz$ 2:Pyrite 21:Ilmenite + 3:Tourmaline Calcite 4:Quartz + 22:Quartz Ilmenite 23:TiO₂ + Chlorite $24:TiO_2 + Chlorite$ 5:Chromite 6:Calcite + 25:Chromite 7:"Ilmenite" 26:Quartz 8:Tourmaline 27:Tourmaline 9:Garnet 28:Quartz + 10:Tourmaline Biotite 11:TiO₂ 12:"Ilmenite" + 13:Quartz 14:Pyrite 15:TiO, 16:Feoxide/hydroxide 17:Monazite 18:"Ilmenite" 19:Siderite + Biotite

Figure A1.38: Cohasset A-52 (2084.29 m) (SEM) site 15 (Table A1.1)



Figure A1.39: Cohasset A-52 (2084.29 m) site 15.1 (Table A1.1). A fragment of sandstone made up detrital quartz (3,4) and diagenetic calcite (2) and TiO_2 (1) blebs and ropes that probably cross-cut all available pathways (crystal outlines, fracture, etc.)



Figure A1.40: Cohasset A-52 (2084.29 m) site 15.2 (Table A1.1). Probably a diagenetic TiO_2 (2, pos. a) grain with voids filled with clays (1).



1:Siderite 2:Calcite + Chlorite 3:Quartz

Figure A1.41: Cohasset A-52 (2084.29 m) site 15.3 (Table A1.1). Siderite (1) appears to postdate calcite and chlorite (2, pos. a)



1:Pyrite + 2:Siderite + 3:Chlorite + Muscovite

Figure A1.42: Cohasset A-52 (2084.29 m) site 15.4 (Table A1.1). Plastically deformed partly chloritized muscovite (3) grain is cross-cut by siderite (2) prisms and pyrite (1) framboids.



Figure A1.43: Cohasset A-52 (2084.29 m) site 15.5 (Table A1.1). A lithic clast made up of quartz (2) and probably an altered ilmenite grain that now consists of TiO_2 blebs (1,3).



1:Ilmenite 2:"Ilmenite" + 3:Calcite

Figure A1.44: Cohasset A-52 (2084.29 m) site 15.6 (Table A1.1). A sandstone fragment that consists of a fractured partly altered ilmenite grain (1,2) and diagenetic calcite (3) filling all created free space. The margin of the grain has probably been thickened due to continuous TiO_2 precipitation.



Figure A1.45: Cohasset A-52 (2084.29 m) site 15.7 (Table A1.1). Detrital quartz (1) and diagenetic calcite (2) and TiO_2 (3).



Figure A1.46: Cohasset A-52 (2084.29 m) (SEM) site 22:Quartz 16 (Table A1.1)



Figure A1.47: Cohasset A-52 (2084.29 m) site 16.1 (Table A1.1). Probably a detrital TiO_2 grain with some diagenetic chlorite in the voids (1,2) or a lithic clast from a schist.

 $1:TiO_2$ + Chlorite $2:TiO_2$ + Chlorite



Figure A1.48: Cohasset A-52 (2084.29 m) (SEM) site 17 (Table A1.1)



1:"Ilmenite" 22:Quartz 2:Quartz 23:Siderite 3:Quartz 24:Quartz + TiO₂ 4:TiO₂ + 25:Tourmaline 5:Zircon 26:Siderite 6:Garnet 27:Ilmenite 7:Tourmaline 28:TiO₂ 8:Zircon + 9:TiO₂ + Chlorite 10:Siderite 11:TiO₂ + Chlorite 12:Pyrite 13:Quartz 14:TiO₂ + 15:TiO₂ 16:Tourmaline 17:Chromite + 18:TiO₂ + Quartz 19:Zircon + 20:Quartz 21:Zircon

Figure A1.49: Cohasset A-52 (2084.29 m) (SEM) site 18 (Table A1.1)



1:TiO₂ + 2:Quartz + TiO₂

Figure A1.50: Cohasset A-52 (2084.29 m) site 18.1 (Table A1.1). ? Lithic clast of fine grained slate.



1:Quartz + Muscovite 2:Pyrite 3:"Ilmenite" + 4:Tourmaline 5:"Ilmenite" 6:TiO₂ 7:Calcite + 8:Chromite 9:Zircon 10:Zircon 11:Zircon 12:"Ilmenite" 13:TiO₂ + 14:Tourmaline 15:Ilmenite 16:Spinel 17:TiO₂ 18:Tourmaline 19:Zircon 20:Quartz 21:Ilmenite + Calcite 23:Ilmenite

24:Zircon 25:"Ilmenite" 26:Siderite + Chlorite 27:Siderite 28:Ilmenite

Figure A1.51: Cohasset A-52 (2084.29 m) (SEM) site 22:Chromite 19 (Table A1.1)



1:Quartz + 2:Calcite + Pyrite 3:Pyrite

Figure A1.52: Cohasset A-52 (2084.29 m) site 19.1 (Table A1.1). Detrital quartz (1), diagenetic calcite (2) and late pyrite (3).



Figure A1.53: Cohasset A-52 (2084.29 m) site 19.2 (Table A1.1). Diagenetic calcite (2), TiO_2 (3) and late pyrite (1).



23:Siderite + 2:Siderite + Quartz 24:Siderite + 3:"Ilmenite" + 25:Zircon + 26:Quartz 27:Quartz 5:Tourmaline 28:TiO₂ + 8:Quartz + TiO₂ 10:Tourmaline 11:"Ilmenite" + 12:"Ilmenite" + 14:Calcite + 15:"Ilmenite" + 16:"Ilmenite" + 18:"Ilmenite" 19:Calcite +

Figure A1.54: Cohasset A-52 (2084.29 m) (SEM) site 20 (Table A1.1)



Figure A1.55: Cohasset A-52 (2084.29 m) site 20.1 (Table A1.1). Highly fractured ilmenite grain (3,4) replaced by TiO_2 (2) with calcite (1) filling all the empty space.



Figure A1.56: Cohasset A-52 (2084.29 m) site 20.2 (Table A1.1). A lithic clast made up of muscovite (1), quartz (3) and TiO_2 grains (2).



1:Quartz + 2:TiO₂ + Xenotime 3:TiO₂ + 4:TiO₂ + Quartz

Figure A1.57: Cohasset A-52 (2084.29 m) site 20.3 (Table A1.1). A ?detrital rounded TiO_2 (2,3,4) grain of trellis pattern with quartz (1) and xenotime inclusions.

Sample	Site	Position	Mineral	SiO2	Ti02	AI203	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	шi	D Soos	V205	Cr203	CoO	0 N	ZnO	Y203	ZrO2	Nb205	Ag2O	BaO	La2O3	Ce2O3	Nd2O3	Gd2O3	Dy2O3	HfO2	WO3	ThO2	Total	Actual Total
2084.29	1	1	Zrn	30.98																			67.51									1.52			100	124
2084.29	1	2	TiO ₂	0.78	96.68	1.41	1.12																												100	104
2084.29	1	3	Tur	38.72	0.85	30.01	6.08		8.13	0.44	2.78							_																	87	99
2084.29	1	4	Ab "llm"	69.57	75 22	18.50	24.67				11.92						_	_																	100	04
2084.29	1	5	"lim"	0.77	75.33	0.49	24.07																												100	92
2084.29	1	7	Pv	0.11	0.35	0.43	27.96							71.69																					100	232
2084.29	1	8	Sd				49.47	1.38	2.47	2.68																									56	59
2084.29	1	9	"llm"	0.90	76.89	0.91	20.24	0.46		0.35					C).25																			100	98
2084.29	1	10	Chr		0.52	15.17	24.83		9.14									50.3	34																100	110
2084.29	1	11	"llm"	0.77	87.98		7.57	0.61									3.	08																	100	78
2084.29	1	12	TiO ₂ +	1.11	92.08	2.06	3.60			0.36				74.04			_	0.7	79																100	100
2084.29	1	13	Py	4.54		4.04	28.19	0.04		00.00				/1.81	04.00			_				-													100	235
2084.29	1	14	07	1.54	0.30	1.31	2.45	0.84		69.83					24.03		_	-							-										100	123
2084.29	1	16	TiO ₂ +	1.09	95.86	1.86	0.64			0.55																									100	108
2084.29	1	17	TiO ₂ + Chl	9.56	58.02	4.64	1.48		0.72	9.13		2.07	9.43		4.95																				100	115
2084.29	1	18	Sd				47.25	4.52	0.62	3.61																									56	59
2084.29	1	19	TiO ₂ + Qz	7.27	89.02	1.49	1.81			0.41																									100	101
2084.29	1	20	llm		52.96		43.45	0.74	2.84																										100	108
2084.29	1	21	"llm"	0.77	74.81		21.83	2.34		0.24																									100	102
2084.29	1	22	Qz	99.27		0.37	0.36	1.00														-													100	115
2084.29	1	23	Sd +	1 72	06.20	0.50	96.38	1.32		1.12			1.18					_		-															100	60
2004.29	1	24	07	100.00	90.20	0.59	1.49																												100	120
2084 29	1	26	Tur	38.39	1 07	31.48	8.98		4 81		2 27																								87	99
2084.29	1	27	Chr	00.00	0.72	7.17	37.84		1.64									52.6	64																100	102
2084.29	1	28	Sd +		0.79		88.21	1.72	2.69	4.98			1.61																						100	60
2084.29	1	29	Sd				53.41	0.94	0.55	1.10																									56	59
2084.29	1	30	Qz	100.00																															100	122
2084.29	1	31	TiO ₂ +	0.80	96.20	0.50				0.60					1.89		_	_																	100	63
2084.29	1	32	Chr	40.00	0.67	12.33	16.83		5.50		0.40	0.04					_	64.6	66																100	11
2004.29	1.1	2	IVIS	49.00	0.96 52.04	20.57	3.02	0.50	2.57	0.97	0.40	9.01																							95	104
2084.29	11	- 2	Cal		0.46		42.43	0.59	0.32	42 23					10.42																				56	70
2084.29	1.1	4	"llm"		71.60		26.88	0.84	0.02	0.68					10.12																				100	91
2084.29	1.1	5	"llm"		60.47		38.02	1.09		0.42																									100	93
2084.29	1.1	6	Sd		0.59		39.69	2.83	7.12	5.77																									56	60
2084.29	1.2	1	TiO ₂ +	1.28	95.91	1.02	1.39			0.40																									100	104
2084.29	1.2	2	Cal		0.39		1.54	0.55		38.83					14.68																				56	76
2084.29	1.2	3	Qz	100.00			1.05								10.00			_																	100	120
2084.29	1.2	4	Ual DV + Chl +	2 71	4.61	0.00	1.05	0.38		38.57	0.07			47.80	10.00			_	-	<u> </u>															100	136
2084.29	1.2	1	Pv	2.11	4.01	0.90	28.24			13.05	0.97			71 74	1.03				-	-	+														100	225
2084.29	1.3	2	., "llm"		87.71		12.29							1 1.74				-		<u> </u>															100	83
2084.29	1.3	3	Cal + TiO ₂		31.00		2.06	0.83		44.50					21.62																				100	87
2084.29	1.3	4	llm +		52.13		42.71	0.76	3.47	0.93																									100	104
2084.29	1.3	5	Sd				49.86	3.42		2.73																									56	55
2084.29	1.3	6	Cal				1.12			39.88					15.00																				56	76
2084.29	1.3	7	Ру	0.35			28.02			2.40				69.23			_	-	-	-															100	215
2084.29	1.4	1		99.40	0.60		0.57											_	-		-														100	121
2004.29	1.4	2	07 +	00.77	30.40	2.05	1.02		0.00			-						+	+	<u> </u>	<u> </u>														100	112
2084.29	1.4	1	Sd	30.11	1.00	2.90	54.95	0.59	0.90	0.46								-	-	1	1	1													56	58
2084.29	1.5	2	Cal				0.67	0.25		42.96					12.12					1	1														56	72
2084.29	1.5	3	Qz +	97.81		1.07	0.29					0.82																							100	119
2084.29	1.5	4	Chl +	47.15		19.90	22.53		9.16	0.53	0.74																								100	90
2084.29	1.5	5	Kin	48.47		36.03	1.29			0.22																									86	89

Sample	Site	Position	Mineral	SiO2	Ti02	AI203	FeO	OuM	OĝM	CaO	Na2O	K20	P205	SO3	щī	Sc203	V205	Cr203	CoO	OiN	ZnO	Y203	ZrO2	Nb2O5	Ag2O	BaO	La2O3	Ce2O3	Nd2O3	Gd2O3	Dy203	HfO2	WO3	ThO2	Total	Actual Total
2084.29	1.	6 1	Cal +				2.47	0.72		68.21					28.60																				100	78
2084.29	1.	6 2	TiO ₂		99.50					0.50																					,				100	97
2084.29	1.	6 3	Sd +	2.32	1.54	2.31	67.19	3.04	11.09	12.52																					ı — — — — — — — — — — — — — — — — — — —				100	62
2084.29		2 1	"llm" +	0.54	70.89	0.72	25.69	0.50	1.67																						ł				100	98
2084.29		2 2	"lim"	00.00	/1.40	0.50	27.32		0.49	0.29													07.50								ł	4.50			100	94
2084.29		2 3	∠m Mix	30.90	27 70	2 27	0.46					0.56											67.52									1.58			100	118
2084.29		2 4	Chr	57.65	0.41	16.90	18 77		11 59			0.00						52 33																	100	111
2004.23		2 6	"lim"		74.61	10.30	25 39		11.55							-		52.55																	100	96
2084.29		2 7	TiO ₂ +	0.88	91.60	2.01	4.73			0.31								0.47																	100	90
2084.29		2 8	Zrn	30.91																			69.09												100	125
2084.29		2 9	Cal + Ilm		21.19	0.77	17.88	1.26		43.71					15.19																1				100	89
2084.29		2 10	Qz	99.40		0.41						0.19																							100	123
2084.29		2 11	Sd +		1.10	0.85	81.45	2.39	7.81	6.40																									100	62
2084.29		2 12	Tur	38.08	0.82	33.85	7.52		4.55	0.35	1.84																								87	104
2084.29		2 13	"llm"	0.92	76.22	1.74	19.42	1.69																							,				100	100
2084.29		2 14	TiO ₂		94.78		5.22																											$ \longrightarrow $	100	108
2084.29		2 15	Py				28.18							71.82																					100	235
2084.29		2 16	Chl +	45.65	1.00	29.56	18.79	0.44	2.77	0.71		1.07																			ł				100	73
2084.29		2 1/	"lim" +	2.33	69.31	2.91	23.33	1.77		0.35			4.40																		ł				100	91
2084.29		2 18	50+	2.38	0.04	1.81	89.48	1.30	1.41	2.18			1.43	74.00																	ł				100	222
2084.29		2 20	Py Py		0.21		28.49							71.30																			-		100	233
2004.29		2 20	Zro	31.03			20.13							/1.0/									68.07												100	121
2084.29		2 22	07	100.00																			00.37												100	121
2084 29		2 23	Pv	100.00			27 74	0.52		0.31				71 43																					100	226
2084.29		2 24	Qz	100.00				0.02		0.01				711.10																					100	121
2084.29		2 25	Py				28.22			0.74				71.04																					100	220
2084.29		2 26	Cal +	1.30	1.96		2.24	0.72		77.05					16.72																				100	68
2084.29		2 27	llm		51.83		43.85	0.69	3.24	0.40																									100	103
2084.29		2 28	Qz + Ilm	48.18	37.04	0.80	12.67	1.32																											100	118
2084.29		2 29	Sd		0.33		44.78	2.61	3.71	3.06																							1.51		56	60
2084.29		2 30	"llm"	0.70	71.06		26.77	1.47																							,				100	97
2084.29		2 31	Qz +	95.20			0.42			2.21					2.17																·				100	115
2084.29		2 32	llm		52.44		42.94	0.56	3.71	0.34																					,				100	104
2084.29		2 33	TiO ₂	0.62	97.72		1.66																								ł				100	106
2084.29		2 34	QZ	100.00	62.02		22.02	1.04	1 22																						ł				100	122
2084.29		2 35	"IIM"		63.82		33.82	1.04	1.32	7 4 0			4.54																						100	97
2004.29		2 30	50 +		E1 E0		44.22	0.74	2.00	7.10			1.51																						100	107
2004.23		2 38	Chl + TiO.	21 14	51.00	12.66	10.72	0.74	2 25	0.30		1 75																							100	100
2084.29		2 30	Tur	38.05	0.91	32.78	7.07		5.73	0.51	1.94																				†	\rightarrow			87	102
2084.29		3 1	"llm"	0.65	75.26	520	22.70	1.39	0.70	0.01							1														, — †	-+		-+	100	96
2084.29		3 2	"llm"		64.11		33.70	1.57	0.62																										100	98
2084.29		3 3	Py		0.21	1	28.25							71.54								1													100	236
2084.29		3 4	Qz	100.00																															100	126
2084.29		3 5	"llm"		67.41	0.51	29.71	0.77	1.60																										100	105
2084.29		3 6	TiO ₂		99.61		0.39																												100	111
2084.29		3 7	Zrn	30.63																			69.37												100	127
2084.29		3 8	Qz	100.00													-														,				100	125
2084.29		3 9	Mnz				L			1.29			38.33		-0.78										2.28		15.56	31.40	11.93		·				100	103
2084.29		3 10	Qz	100.00													-														<u> </u>				100	126
2084.29		3 11	Ap	4.67	00.42	0.42	0.07			48.44			44.67		6.89			0.01													<u> </u>	\rightarrow		\rightarrow	100	129
2084.29		3 12		1.25	86.43	2.10	8.97			0.45						_	-	0.81													 	\rightarrow			100	101
2004.29		0 13		1.06	97.39	0.50	1.03	0.02	0.74	70 45					12 52																<u> </u>	\rightarrow		\rightarrow	100	68
2084.29		3 14	Zrn	30.74		0.59	4.39	0.93	0.74	10.45					13.55		+					-	67.02		\vdash						ł	2 1 9		-+	100	126
2004.29		3 16	Grt	40.72		21 / 9	24 70	2.04	6.26	4 71													01.00									2.10		_	100	117
2004.29		0 10		1 4U.7Z		1 4 1.40	124.19	2.04	0.20	4.71							-																			

Sample	Site	Position	Mineral	Si02	Ti02	AI2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	so3	u.	CI Sc203	V205	Cr203	CoO	NiO	ZnO	Y203	ZrO2	Nb2O5	Ag2O	BaO	La2O3	Ce2O3	Nd2O3	Gd2O3	Dy2O3	HfO2	WO3	ThO2	Total	Actual Total
2084.29	:	3 17	Cal +	1.42	18.12	0.86	2.74	0.72		62.90					13.24																				100	72
2084.29	:	3 18	Ap							48.25			44.09		6.63																		1.03	$ \longrightarrow $	100	126
2084.29		3 19	Sd	0.81	400.00		45.53	2.37	3.85	3.43																									56	59
2084.29		3 20	TIO ₂		100.00	20.05	12 74		12.05									22.00																	100	109
2084.29		3 22	TiO		97.38	0.66	1.32		13.95				0.64					32.00																	100	108
2084.29		3 23	TiO ₂ +	39.12	53.89	4.34	2.33			0.32			0.01																						100	110
2084.29	:	3 24	Zrn +	30.51	0.45										1.41								67.63												100	123
2084.29	;	3 25	llm		51.35		47.26	0.53	0.86																										100	105
2084.29	:	3 26	Qz	100.00																															100	123
2084.29		3 27	Zrn	31.00																			69.00												100	123
2084.29		3 28	110 ₂ + QZ	33.80	62.88	1.61	1.12	0.42	2.00			0.60						0.40																	100	102
2004.29		29	7ro	20.70	13.22	1.76	21.10	0.42	2.06									0.46					60.21												100	122
2084.29		3 31	Sd	30.73			51 44	0 49	1 27	1.98			0.81										03.21												56	61
2084.29		3 32	TiO ₂ +	1.10	92.50	2.40	2.55			0.49			0.0.					0.96																	100	99
2084.29	:	3 33	Qz	100.00																															100	121
2084.29	4	1 1	Zrn	30.70																			67.55									1.75			100	125
2084.29	4	1 2	Xtm			0.07	00.07						41.30	=			-		1.35			49.69								2.59	5.06			\rightarrow	100	106
2084.29	4	1 3	Py	0.46	0.00	0.22	28.28							71.04																					100	230
2084.29	4	4	Py "Ilm"	0.50	0.28		28.19	0.00	1 15					/1.53				-																	100	235
2084.29		1 6	Sd	1.06	00.39	0.58	42.91	3.03	4 48	3 94																									56	63
2084.29	4	4 7	TiO ₂		99.26	0.00	0.74	0.00		0.01																								_	100	110
2084.29	4	1 8	TiO ₂		99.23		0.77																												100	90
2084.29	4	1 9	TiO ₂ + Ms	19.01	63.13	12.82	0.70		0.61			3.73																							100	115
2084.29	4	10	Qz	100.00																															100	129
2084.29	4	1 11	Grt	39.65		20.60	20.87	10.89	1.98	6.00																									100	122
2084.29	4	1 12	Mix	5.46	90.16	3.30	0.51					0.56																							100	115
2084.29		+ 13	Q2 + 110 ₂ Zro	30.64	0.53	0.59	0.44																68.38												100	125
2084.29		1 15	Sd	30.04	0.63		50.93	2.54		1.19			0.70										00.00												56	64
2084.29	4	1 16	"llm"	0.62	72.05		26.49	0.52		0.32																									100	97
2084.29		1 17	Qz	99.72			0.28																												100	126
2084.29	4	18	Zrn	30.99																			69.01												100	125
2084.29	4	1 19	Ab	69.54		18.71					11.76																								100	124
2084.29	4	1 20	Sd TiO	1.09	0.31	0.81	53.04	0.36		0.39	0.67					0.00																			56	63
2084.29		+ 21	110 ₂ +	0.62	94.76	1.42	1.00			0.67	0.07			71.67		0.26																			100	233
2084.29		1 23	Sd	0.82	0.58		40.04	2.41	7.44	4.70				71.07																					56	64
2084.29	4	1 24	TiO ₂ +	1.56	91.54	2.12	2.47			0.40	0.45		1.22			0.23																			100	101
2084.29	4	1 25	Cal + Py				20.09			26.73				48.19	4.99																				100	134
2084.29	4	4 26	Chr		0.77	22.97	13.71		17.23									45.32																	100	114
2084.29	4	1 27	Qz	100.00																															100	125
2084.29	4	1 28	Chr		0.37	20.86	17.75	0.07	8.53	0.39					00.40			51.49			0.62														100	109
2084.29	4	1 29	Cal +	95 60	0.50	12.02	2.13	0.67	0.22	75.02		0.26			22.18			-																	100	111
2084.29		+ <u>30</u>	TiO	0.59	96.80	0.73	1.88		0.32	0.32		0.30																							100	108
2084.29		5 2	Sd + Bt	24.02	1.08	15.58	46.66	1.73	7.67	2.18		1.08					1	1																	100	69
2084.29	(5 3	Kfs	65.36		17.90	0.35				0.41	15.17														0.81									100	125
2084.29		5 4	Zrn	30.97							_												69.03												100	130
2084.29	1	5 5	TiO ₂		100.00																													\square	100	116
2084.29	(5 6	Sd + Bt	12.73	1.39	6.38	53.77	2.56	10.07	11.85		1.25												0.07											100	58
2084.29			"IIM"	0.58	74.75	0.62	21.82								-		-							2.22										\rightarrow	100	91
2084.29		8	NU ₂	0.71	99.54		0.46	2.51	4 50	3.62							+								<u> </u>									\rightarrow	56	63
2084.29		5 10	07	98.90	0.55	1 10	44.00	2.31	4.59	3.03			<u> </u>		\vdash		+	+							-	-								-	100	122
2084.29		5 11	Sd +	3.39		2.17	76.69	3.11	7.55	6.40								0.70																	100	53

Soldel S 1 Dec Bool Dec	Sample	Site	Position	Mineral	SiO2	Ti02	AI2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	so3	ш	CI Sc203	V205	Cr203	CoO	NiO	ZnO	Y203	ZrO2	Nb2O5	Ag2O	BaO	La2O3	Ce2O3	Nd2O3	Gd2O3	Dy2O3	HfO2	WO3	ThO2	Total	Actual Total
20022 0 1 <td>2084.29</td> <td>5</td> <td>12</td> <td>Qz</td> <td>98.93</td> <td></td> <td>0.61</td> <td>0.47</td> <td></td> <td>100</td> <td>122</td>	2084.29	5	12	Qz	98.93		0.61	0.47																												100	122
MANA M	2084.29	5	13	TiO ₂		100.00																														100	108
Bits 0 Disc. Disc. <t< td=""><td>2084.29</td><td>5</td><td>14</td><td>Py</td><td></td><td></td><td></td><td>28.15</td><td></td><td></td><td></td><td></td><td></td><td></td><td>71.85</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>\vdash</td><td></td><td></td><td></td><td>100</td><td>233</td></t<>	2084.29	5	14	Py				28.15							71.85																	\vdash				100	233
Solar 0 1 </td <td>2084.29</td> <td>5</td> <td>15</td> <td>Spl</td> <td>44 74</td> <td></td> <td>31.77</td> <td>14.76</td> <td>0.40</td> <td>13.85</td> <td>0.00</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>39.62</td> <td></td> <td>──┤</td> <td></td> <td></td> <td>\rightarrow</td> <td>100</td> <td>110</td>	2084.29	5	15	Spl	44 74		31.77	14.76	0.40	13.85	0.00								39.62													──┤			$ \rightarrow $	100	110
Singer Distant Singer	2084.29	5	10		41.71	24.96	21.96	21.39	0.49	11.82	2.62	0.20	0.52																			├				100	110
Subset Single Single<	2084.29	5	18		38.30	24.00	33.00	5.86		6.43	0.49	1 90	0.52																							87	105
b b	2084.29	5	19	Qz	99.69	0.00	00.00	0.31		0.40	0.45	1.50																								100	128
Symbol Symbol<	2084.29	5	20	Sd	0.85		0.52	46.49	2.31	3.28	2.55																									56	63
bit bit <td>2084.29</td> <td>5</td> <td>21</td> <td>TiO₂</td> <td></td> <td>100.00</td> <td></td> <td>100</td> <td>112</td>	2084.29	5	21	TiO ₂		100.00																														100	112
200420 5 2 Tm 0 0 0 0 <td>2084.29</td> <td>5</td> <td>22</td> <td>Qz</td> <td>99.72</td> <td>0.28</td> <td></td> <td>100</td> <td>127</td>	2084.29	5	22	Qz	99.72	0.28																														100	127
2848 5 24 02 0000 23 0.00 23 0.00 0.02 0.00 0	2084.29	5	23	"llm"		62.95		35.56	0.88	0.61																						↓				100	103
2002 0 100 0 <td>2084.29</td> <td>5</td> <td>24</td> <td>Qz</td> <td>100.00</td> <td></td> <td>0.05</td> <td></td> <td>\vdash</td> <td></td> <td></td> <td></td> <td>100</td> <td>128</td>	2084.29	5	24	Qz	100.00		0.05																									\vdash				100	128
Abox Abox <th< td=""><td>2084.29</td><td>5</td><td>25</td><td>TIO₂ + Ms</td><td>8.79</td><td>87.07</td><td>2.35</td><td>0.64</td><td></td><td></td><td>0.26</td><td></td><td>0.89</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>00.04</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>──┤</td><td></td><td></td><td>\rightarrow</td><td>100</td><td>113</td></th<>	2084.29	5	25	TIO ₂ + Ms	8.79	87.07	2.35	0.64			0.26		0.89											00.04								──┤			\rightarrow	100	113
Sold all Sold all Add all Diff All	2084.29	6	1	Zm	31.39		2.06	2 22	0.00	0.66	72.25		0.60			14.26								68.61								\vdash				100	69
Solder 20 6 1 hr 377 0.00 27 0.00 77.42 0.	2084.29	6	2	Grt	40.76	0.37	21.09	23.32	0.88	5.68	8 22		0.00			14.20																				100	113
Sampa Sampa <th< td=""><td>2084.29</td><td>6</td><td>4</td><td>Tur</td><td>37.75</td><td>0.90</td><td>32.72</td><td>10.38</td><td>0.74</td><td>3.05</td><td>0.22</td><td>2.20</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>87</td><td>98</td></th<>	2084.29	6	4	Tur	37.75	0.90	32.72	10.38	0.74	3.05	0.22	2.20																								87	98
Base of b C C N	2084.29	6	5	Py				28.58							71.42																					100	223
200429 6 7 00 100	2084.29	6	6	Cal +				1.61			67.50					30.89																				100	83
2084.20 6 8 10.0 1.20 96.11 1.26 96.11 1.26 1.00 100	2084.29	6	7	Qz	100.00																															100	120
208420 6 9 1m ² 0.11 1.10 1.	2084.29	6	8	TiO ₂ +	1.20	95.11	1.26	2.43																								↓				100	103
288428 6 10 14.7 42.8 2.8 6.6 6.51 1	2084.29	6	9	"llm"	0.81	74.97		23.18	0.70		0.34																					──┤				100	95
2084.20 6 11 0<	2084.29	6	10	Sd +	2.55	1.10	1.03	79.68	2.96	6.16	6.51																					\vdash				100	62
3084.20 6 1/2 0 1/2 0 1/2 0 1/2 0 1/2 0 1/2 0 1/2 0 1/2 0 1/2 0 1/2 0 1/2 0 1/2 <td>2084.29</td> <td>6</td> <td>11</td> <td>lim O=</td> <td>00.74</td> <td>54.77</td> <td></td> <td>43.86</td> <td>1.37</td> <td></td> <td>├</td> <td></td> <td></td> <td></td> <td>100</td> <td>102</td>	2084.29	6	11	lim O=	00.74	54.77		43.86	1.37																							├				100	102
1098420 1 02 1 02 4 0	2084.29	6	12	UZ "Ilm"	99.74	62.10		35.58	2.23																							<u> </u>				100	98
1994 20 6 15 0 10 6 100 69 100	2084.29	6	14	Qz	99.09	02.13	0.91	33.30	2.20																											100	117
109429 6 15 244 5.1 1 1 1 1 1 1 1 1 100 <t< td=""><td>2084.29</td><td>6</td><td>15</td><td>Ap</td><td>00.00</td><td></td><td>0.01</td><td></td><td></td><td></td><td>48.35</td><td></td><td></td><td>44.22</td><td></td><td>7.43</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>_</td><td>100</td><td>121</td></t<>	2084.29	6	15	Ap	00.00		0.01				48.35			44.22		7.43																			_	100	121
1004 29 6 17 Qz 99 30 0.37 -	2084.29	6	16	Sd + Bt	13.74	1.45	6.74	63.06	2.30	8.65	2.45		1.61																							100	69
2084 28 6 18 11m ⁺ 1.34 81.22 1.86 1.60 0.23 6.74 1.00	2084.29	6	17	Qz	99.63	0.37																														100	123
2084.29 6 9 Py 0.45 31.41 0.50 0.23 6 67.40 1	2084.29	6	18	"llm" +	1.34	81.22	1.86	15.06		0.52																										100	97
2084 28 6 201 m 55.65 41.81 27.4 m	2084.29	6	19	Ру		0.45		31.41	0.50		0.23				67.40																	\vdash				100	159
2004.29 6 21 1/u ² 37.2 0.97 33.61 0.78 2.18 0.26 1.95 1 <th1< th=""> 1 1</th1<>	2084.29	6	20	llm -	07.05	55.45		41.81	2.74																							──┤				100	105
2004.29 6 23 1m² 6 1m² 6 1m²	2084.29	6	21	l ur	37.25	0.97	33.61	10.78		2.18	0.26	1.95																				\vdash				8/	104
1000 1200 1200 1200 1200 1200 1200 1200	2084.29	6	22	"llm"	0.70	61.50	0.52	26.90	3 47								_															<u> </u>				100	90
2084.29 6 25 TOQ_++ 0.84 93.74 1.66 3.51 0 0.35 0 0.05 0 0.05 0 0.05 0 0.05 0 0.05 0 0.05 0 0.05 0 0.05 0 0.05 0 0.05 0 0.05 0 <td>2084.29</td> <td>6</td> <td>24</td> <td>Cal + Ilm</td> <td></td> <td>17.15</td> <td></td> <td>23.55</td> <td>1.93</td> <td>0.55</td> <td>35.39</td> <td></td> <td></td> <td></td> <td></td> <td>21.43</td> <td></td> <td>100</td> <td>82</td>	2084.29	6	24	Cal + Ilm		17.15		23.55	1.93	0.55	35.39					21.43																				100	82
2084.29 6 26 Ch + TiO2 38.85 10.31 27.36 16.37 3.71 1.51 1.89 44.32 5.94 0 0 0 0 0 100 103 2084.29 6 27 Ap 0.54 49.21 44.32 5.94 0 0 0 0 100 100 102 2084.29 6 28 Cat + 3.64 0.60 0.57 7.14 20.05 0 0 0 0 100 122 2084.29 6 30 0ig 65.51 21.27 2.79 10.09 0.33 0 0 0 0 100 122 2084.29 6 30 0ig 65.51 21.27 10.09 0.33 0 0 0 0 100 112 2084.29 6 32 Dio 0.33 0.75 0.42 0 0 22.54 0 0 0 100 115 2084.29 6 34 Tim* + 1.18 84.87<	2084.29	6	25	TiO ₂ +	0.84	93.74	1.56	3.51	1.00	0.00	0.35					211.10																			_	100	99
2084.29 6 27 Ap 0.54 49.21 44.32 5.94 0 0 0 0 0 100 120 2084.29 6 28 Zm 30.89 0.37 20.05 0 68.74 0 0 100 120 2084.29 6 30 Olig 65.51 21.27 2.09 10.9 0.33 20.05 0 0 0 0 0 100 122 2084.29 6 30 Olig 65.51 21.27 2.09 10.9 0.33 0 0 0 0 0 0 100 122 2084.29 6 33 Spl 0.39 36.26 15.79 10.90 0.33 0 0 32.05 0 0 0 0 100 112 2084.29 6 33 Spl 0.44 44.32 17.19 0 0 32.05 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 <th< td=""><td>2084.29</td><td>6</td><td>26</td><td>Chl + TiO₂</td><td>38.85</td><td>10.31</td><td>27.36</td><td>16.37</td><td></td><td>3.71</td><td></td><td>1.51</td><td>1.89</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>100</td><td>103</td></th<>	2084.29	6	26	Chl + TiO ₂	38.85	10.31	27.36	16.37		3.71		1.51	1.89																							100	103
2084.29 6 28 Zm 30.89 0.37 -	2084.29	6	27	Ар	0.54						49.21			44.32		5.94																				100	120
2084.29 6 29 Cal + Cal / 0.00 0.57 7.14 20.05 Cal / 0.00 Cal / 0.00 70 700 722 2084.29 6 30 Oig 65.51 21.27 2.79 10.09 0.33 0.00 0.01 0.01 122 2084.29 6 31 Spl 0.03 36.26 15.79 15.50 0.01 15.50 0.01 142 2084.29 6 32 TO2 100.00 0.03 0.02 2.79 10.09 0.33 0.00 22.54 0.01 0.01 0.01 141 2084.29 6 33 Spl 0.42 44.42 15.81 17.19 0.02 22.54 0.01 0.01 0.01 100 111 2084.29 6 35 TO2 97.48 2.20 0.31 0.01 0.01 0.01 0.01 100 103 2084.29 6 35 TO2 97.48 2.20 0.31 0.01 0.01 0.01 0.01 0.01 0.01 2084.29 7 2.02 99.61 0.39 0.97 0.01 0.01 0.01 0.01 0.01 0.01	2084.29	6	28	Zrn	30.89			0.37																68.74												100	122
2084.29 6 30 Olig 65.51 21.27 2.79 10.0 0.33 0 0 0 0 100 120 2084.29 6 31 Spl 0.39 36.26 15.50 0 32.05 0 0 100 111 2084.29 6 32 TO ₂ 100.00 0 17.19 0 0 22.54 0 0 0 100 111 2084.29 6 33 Spl 0.42 44.42 15.30 0.75 0.42 0 0 0 0 100 101 2084.29 6 35 TrO ₂ 97.48 2.20 0.31 0 0 0 0 0 0 100 103 2084.29 6 35 TrO ₂ 97.48 2.20 0.31 0 0 0 0 0 0 100 103 2084.29 7 1 llm 57.18 42.03 0.79 0 0 0 0 0 0 100 103 2084.29 7 3 Sd	2084.29	6	29	Cal +				3.64	0.60	0.57	75.14					20.05																\vdash				100	72
2084.29 6 31 Sp1 0.39 36.26 15.90 15.00 100 110 111 2084.29 6 32 Sp1 0.42 44.42 15.43 17.19 100 111 2084.29 6 33 Sp1 0.42 44.42 15.43 17.19 100 114 2084.29 6 34 Time* 118 84.87 1.95 0.42 17.19 100 115 2084.29 6 34 Time* 118 84.87 1.95 0.42 100 <td< td=""><td>2084.29</td><td>6</td><td>30</td><td>Olig</td><td>65.51</td><td></td><td>21.27</td><td>15 70</td><td></td><td></td><td>2.79</td><td>10.09</td><td>0.33</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>──┤</td><td></td><td></td><td></td><td>100</td><td>122</td></td<>	2084.29	6	30	Olig	65.51		21.27	15 70			2.79	10.09	0.33																			──┤				100	122
2084.29 6 33 Pid 0.42 44.42 15.43 17.19 100 100 115 2084.29 6 34 "llm" + 1.18 84.87 1.95 0.42 4.42 15.43 17.19 100 100 115 2084.29 6 34 "llm" + 1.18 84.87 1.95 0.42 4.42 15.43 17.19 100 122 204.29 7 3 5 1.00 100 122 204.29 7 5 2.23 1.90 .9	2084.29	6	31	Spi		0.39	36.26	15.79		15.50									32.05													\vdash				100	114
2084.29 6 34 11m* + 1.18 84.7 1.95 0.42 1.03 0.75 0.42 0.04	2084.29	6	32	NO ₂		0.42	11 12	15.43		17 10									22.54													<u> </u>				100	115
2084.29 6 35 TiO2 97.48 2.20 0.31 100 103 2084.29 6 36 llm 59.92 37.97 2.11 100 103 2084.29 7 1 11m 57.18 42.03 0.79 100 103 2084.29 7 2 Qz 99.61 0.39 100 100 102 2084.29 7 2 Qz 99.61 0.39 100 100 100 100 100 102 2084.29 7 2 Qz 99.61 0.39 100 100 102 100 102 2084.29 7 3 Sd 52.23 1.59 1.20 0.97 100 122 100 122 2084.29 7 4 Zm 30.98 100 100 120 100 120 2084.29 7 5 Cal + IIm 28.25 21.05 1.21 39.75 9.74 100 100 100 150 100 115 <	2084.29	6	34	"llm" +	1.18	84.87	1.95	10.83		0.75	0.42								22.04																	100	104
2084.29 6 36 Im 59.92 37.97 2.11 1 1 100 98 2084.29 7 1 Im 57.18 42.03 0.79 100 122 100 122 100 122 100 122 100 122 100 122 100 122 100 122 100 122 100 122 100 122 100 122 100 122 100 123 100 <	2084.29	6	35	TiO ₂		97.48		2.20			0.31																									100	103
2084.29 7 1 Im 57.18 42.03 0.79 1 100 103 2084.29 7 2 Qz 99.61 0.39 - - - - - 100 103 2084.29 7 3 Gd 52.23 1.59 1.20 0.97 - - - - - - 100 122 2084.29 7 3 Gd 52.23 1.59 1.20 0.97 - - - - - - - - 69.02 - - - - 66 61 - - - 100 123 2084.29 7 4 Zm 30.98 - - - - - 69.02 - - 100 123 2084.29 7 5 Cal + Ilm 28.25 21.06 1.21 39.75 9.74 - - - 100 155 2084.29 7 6 TO ₂ + Qz 24.6 75.4 <	2084.29	6	36	Ilm		59.92		37.97	2.11																											100	98
2084.29 7 2 Qz 99.61 0.39 0.97	2084.29	7	1	llm		57.18		42.03	0.79																											100	103
2084.29 7 3 Sd 52.23 1.9 1.20 0.97 0 69.02 0 69.02 0 100 123 2084.29 7 4 Zm 30.98 - - - - - 100 123 2084.29 7 5 Cal + llm 28.25 21.05 1.21 39.75 9.74 - - - 100 123 2084.29 7 6 TiO ₂ + O ₂ 24.46 75.54 - - - - - 100 100 85 2084.29 7 6 TiO ₂ + O ₂ 24.46 75.54 - - - - - 100 155 2084.29 7 7 Sd + 5.95 4.52 64.8 4.14 6.87 12.04 - - - 100 155 2084.29 7 7 Sd + 5.95 4.52 66.48 4.14 6.87 12.04 - - 100 155 2084.29 7 Sd + 5.95 4.52 66.48 0.79 0.79 - -	2084.29	7	2	Qz	99.61			0.39																												100	122
2084.29 7 4 Zm 30.98 100 123 2084.29 7 5 Cal + llm 28.25 21.05 1.21 39.75 9.74 6 69.02 6 6 100 123 2084.29 7 6 TiO ₂ + Qz 24.46 75.54 9.74 6 6 6 100 85 2084.29 7 7 Sd + 5.95 4.52 64.8 4.14 6.87 12.04 6 100 100 155 2084.29 7 7 Sd + 5.95 4.52 66.48 4.14 6.87 12.04 0 0 0 100 100 155 2084.29 7 7 Sd + 5.95 4.52 66.48 0.79 0 0 0 0 100 100 155 2084.29 7 8 Zm + 28.88 1.03 0.58 0.79 0 0 0 0 100 115	2084.29	7	3	Sd				52.23	1.59	1.20	0.97																					\vdash			\rightarrow	56	61
ZUB4.29 / b Gal + lim Z82.50 21.05 1.21 39.75 9.74 0 0 85 2084.29 7 6 TiO_2 + Qz 24.46 75.54 100 85 2084.29 7 7 Stat 5.95 4.52 66.48 4.14 6.87 12.04 100 156 2084.29 7 7 Stat 5.95 4.52 66.48 4.14 6.87 12.04 100 156 2084.29 7 7 Stat 5.95 4.52 66.48 0.79 100 156	2084.29	7	4	Zrn	30.98	00.67		01.0-										-						69.02								\vdash			\rightarrow	100	123
2084.29 7 7 5.95 4.52 66.48 4.14 6.87 12.04 100 115 2084.29 7 7 5.95 4.52 66.48 4.14 6.87 12.04 100 101 2084.29 7 7 8/2 m + 29.88 1.03 0.58 0.79 100 115	2084.29	7	5	Cai + Ilm	24.40	28.25		21.05	1.21		39.75					9.74																\vdash			\rightarrow	100	85
2084.29 7 8 2 m + 28.88 1.03 0.58 0.79	2084.29	- /	5	11U ₂ + QZ	24.46	/ 5.54	4.52	66.49	1 1 4	6.87	12.04																					⊢ –			\rightarrow	100	56
	2084.29	7	8	Zrn +	29.88		1.02	0.58	4.14	0.07	0.79													65.96				-					1 76		-+	100	115

Sample	Site	Position	Mineral	SiO2	Ti02	AI203	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	ш	ō	Sc2O3	V205	Cr203	CoO	NiO	ZnO	Y2O3	ZrO2	Nb2O5	Ag2O	BaO	La2O3	Ce2O3	Nd2O3	Gd2O3	Dy2O3	HfO2	WO3	ThO2	Total	Actual Total
2084.29	7	9	"llm"	0.70	74.21		23.97	1.11																												100	73
2084.29	7	10	Tur	36.24	2.43	25.95	16.90		2.07	0.82	2.58																									87	103
2084.29	7	11	Spl		0.50	31.81	15.28		16.05										36.36																⊢ –	100	113
2084.29	7	12	Tur	35.41	1.72	30.28	10.21		4.23	0.33	1.82				3.00									60.40											<u> </u>	87	76
2084.29	7	14	200 Sd + Cbl	30.67	0.85	7.82	57 53	3.04	11 30	6 16		0.72												09.13											<u> </u>	100	67
2084.29	7	15	Sd	12.57	0.00	1.02	51 25	0.86	2.36	1.53		0.72																								56	60
2084.29	7	16	Py	0.33			28.35	0.00	2.00	1.00				71.32																						100	228
2084.29	7	17	Spl			31.72	21.10		12.05										35.14																	100	108
2084.29	7	18	Zrn	30.81																				69.19												100	124
2084.29	7	19	Ap							48.56			44.41		5.92																			1.11	\vdash	100	127
2084.29	7	20	lim Tur	20.27	52.25	22.74	43.95	0.78	3.02	0.50	2.40																								⊢ →	100	108
2084.29	7	21		0.30	0.65	32.71	27.03		5.94	0.52	2.10			71 /0																					\vdash	100	230
2084.29	7	23	Q7	100.00			21.55			0.10				71.43																						100	122
2084.29	7	24	Py		0.33		28.15							71.53																						100	231
2084.29	7	25	"llm"		88.96		9.83		0.79	0.41																										100	92
2084.29	7	26	TiO ₂	0.92	99.08																															100	106
2084.29	7	27	Tur	38.21	1.14	31.22	9.32		4.46	0.50	2.14																								\vdash	87	101
2084.29	7	28	Chl	29.46		25.11	22.23	0.46	6.97			0.77																							<u> </u>	85	99
2084.29	7	30	UZ TiO _n + Chl	7.65	78 87	5.04	6.03		1.86	0.26		0.29																							<u> </u>	100	121
2084.29	7	31	Sd +	1.00	0.96	0.01	95.33	0.84		1.20		0.20	1.67																							100	59
2084.29	7	32	llm		54.65		41.80	0.60	2.69	0.26																										100	102
2084.29	8	1	Ру		0.21		28.39							71.40																						100	232
2084.29	8	2	Sd		0.52		46.46	2.27	3.77	2.98																										56	61
2084.29	8	3	Mix	2.41	88.70	3.55	1.71			0.84	0.62		0.88			0.37			0.91																$ \longrightarrow $	100	79
2084.29	8	4	Ms + IIm	43.69	29.16	16.94	5.93		0.89	0.54	2.05	1.63		0.84								0.39													<u> </u>	100	91
2084.29	8	5	Tur	38.10	0.62	28 35	9.18		7 36	0.50	2.00																									87	104
2084.29	8	7	Chr	00.10	0.34	16.26	15.04	2.48	9.70	0.38	2.01								54.80			0.99														100	111
2084.29	8	8	Qz	100.00																																100	129
2084.29	8	9	Chr		0.43	14.90	33.08		5.88										44.43			1.28														100	110
2084.29	8	10	TiO ₂ + Chl	6.84	87.21	3.25	1.81					0.89																							\vdash	100	112
2084.29	8	11	TiO ₂ +	0.71	94.20	1.63	1.56			1.07			0.82																						⊢ →	100	106
2084.29	8	12	Chi + Bt	36.29	1.63	23.04	30.47	0.62	5.27	1.19		1.50	45 20		5 37																					100	91
2084.29	8	14	Tur	37.80	1.42	30.75	7.78		6.23	1.06	1.97		43.23		5.57																					87	103
2084.29	8	15	Sd				50.85	0.89	1.69	1.89			0.67																							56	61
2084.29	8	16	Qz + Ilm	66.08	23.09		10.24	0.60																												100	105
2084.29	8	17	Chl + Bt	44.00	1.18	29.37	19.27		4.33	0.81		1.04																							\square	100	78
2084.29	8	18	TiO ₂		100.00		0.07			10.0-			18.0-																						\vdash	100	107
2084.29	8	19	Ap O M-	00.00	0.40	04.74	0.60		0.00	48.62		0.50	45.62		5.16																				⊢ →	100	120
2084.29	8	20	UZ + MS	68.23	60.15	21.74	25.56	5 20	0.99			6.58																							<u> </u>	100	97
2084.29	8	22	Spl		1.35	34 23	28.26	5.25	11.63										24 54																<u> </u>	100	110
2084.29	8	23	Ab	68.82	1.00	18.91	20.20		11.00	0.51	11.75								2																	100	123
2084.29	8	24	Qz	100.00																																100	123
2084.29	8	25	"llm"		75.89	0.57	23.54																													100	100
2084.29	8	26	Qz	98.89		0.49	0.63																												⊢−−∔	100	121
2084.29	8	27	"llm"	0.25	69.07		28.60	2.32						74.00																					┝──┤	100	99
2084.29	8	28	Py Py	0.35	0.28		28.11	0.32						71.26																					┝──┤	100	231
2084.29	0 8	30	07	100.00	0.34		21.13	0.32						1.01																						100	125
2084.29	8.1	1	Chl + Kln	48.05	1.65	31.33	12.84		3.51	0.41	0.37	1.84																								100	96
2084.29	8.1	2	Py				28.23							71.77																						100	221
2084.29	8.1	3	Chl + Ms	43.26	2.21	24.46	21.52		6.26			2.29																								100	89
2084.29	8.1	4	Pv +	2.36		1.75	27.82		0.41			0.15		67.53																						100	193
Sample	Site	Position	Mineral	SiO2	Ti02	AI2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	⊾ D	Sc2O3	V205	Cr203	CoO	NiO	ZnO	Y203	ZrO2	Nb2O5	Ag2O	BaO	La2O3	Ce2O3	Nd2O3	Gd2O3	Dy203	HfO2	WO3	ThO2	Total	Actual Total	
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2084.29	8.	1 5	Chl + Py +	27.68	1.82	16.78	29.70		3.54	0.58		1.73		18.17																					100	86	
2084.29	8.	1 6	Sd	0.10	0.00		51.85	0.60	1.82	1.72				70.70																	\vdash				56	57	
2084.29	0.4 8 1	2 2	Py + Chl	12.63	0.33	7 26	20.72		2.96	0.68		0.70		40.80																	\vdash				100	117	
2084.29	8.2	2 3	Py	0.83	0.39	0.47	29.57		0.29	0.21	0.29	0.70		67.95																					100	181	
2084.29	8.2	2 4	Sd		0.65		45.26	1.45	4.59	4.05																									56	58	
2084.29	8.2	2 5	Kln + Chl	53.61	1.01	34.26	7.97		1.75	0.62		0.78																							100	66	
2084.29	9	9 1	Tur	37.96	0.70	32.03	1.04		10.35	1.22	1.95			=	1.75																+				87	106	
2084.29		3 2	Py Cbl + Bt	35.32	0.50	10.60	27.82	0.50	8 86	0.73		2.05		/1.68																					100	237	
2084.29		9 4	Qz	99.71	2.17	13.03	0.29	0.30	0.00	0.75		2.05																							100	126	
2084.29	9	9 5	"llm"		63.12		35.09	0.81	0.98																										100	101	
2084.29	ç	96	Zrn	30.89																			69.11												100	127	
2084.29	9	9 7	Py				28.34							71.66																	\vdash				100	240	
2084.29		9 8	Feohy		0.74	10.00	98.42		0.70	0.84								EE 40													\vdash				100	63	
2084.29		9 9	Sd +			10.29	25.53	9 40	0.70	8 4 2			1.85					55.4Z																	100	64	
2084.29		9 11	TiO ₂		99.25		0.75	0.40	1.04	0.42			1.00																						100	114	
2084.29	ę	9 12	Grt	40.71		20.76	24.95	1.11	4.77	7.70																									100	120	
2084.29	9	9 13	Chr			18.84	18.06		11.91									51.19													\square				100	113	
2084.29		9 14	TiO ₂ + Qz	47.06	52.49	5.00	0.45	0.00		07.04					00.55																\vdash				100	120	
2084.29		15	Cal +	2.83		5.08	2.79	0.90		0.25	1 99	0.14		68 85	20.55																				100	230	
2084.29		9 17	TiO ₂	1.20	100.00	0.01	21.01			0.20	1.00	0.14		00.00																					100	101	
2084.29	9	9 18	Zrn +	27.11		1.82	0.62			2.84					2.87	1.16							63.58												100	95	
2084.29	ę	9 19	llm		52.48		44.42	0.67	2.01	0.41																									100	110	
2084.29	9	9 20	Py			4 70	35.08	0.24		0.22				64.47																	\vdash				100	190	
2084.29		3 21	Sd +	6.16		4.72	76.14	2.85	4./1	4.71		0.70																			\vdash				100	125	
2084.29		9 22	Zrn	31.72																			68.28												100	119	
2084.29		9 24	Tur	38.00	0.58	30.92	8.51		6.19	0.60	2.21												00.20												87	102	
2084.29	9	9 25	Sd +	2.55		2.14	80.77	3.11	6.29	5.15																									100	63	
2084.29	9	9 26	Chl + Bt	38.78	1.75	22.13	26.19	0.56	7.49	0.78		2.32																			\vdash				100	70	
2084.29		9 27	"llm"	0.70	67.44	0.57	30.07	1.21	40.40							-		40.40													├ ─┤				100	97	
2084.29		20	07	100.00		10.10	20.02		13.40									40.40																	100	122	
2084.29		9 30	Py	0.72	0.35	0.38	30.72		0.28	0.43				67.11																					100	193	
2084.29	9	3 31	Cal +	16.19		5.31	18.55	1.13	2.15	44.40		2.84			9.43																				100	80	
2084.29	9	32	TiO ₂ +	2.13	90.65	2.65	1.73			0.83			1.28					0.72													\vdash				100	91	
2084.29		9 33	TiO ₂	00.00	100.00	0.77				0.40	-			-	1.00								00.44								\vdash				100	108	
2084.29		3 35	<u>∠ui +</u> "llm"	30.80	86.38	0.77	13.62			0.42			-		1.00	+						-	00.14								\vdash				100	87	
2084.29		3 36	Py		00.00		28.33							71.67																					100	231	
2084.29	ę	37	Kfs	68.32		16.75						14.93																							100	126	
2084.29	9.1	1 1	Sd + Chl	8.12	1.00	4.68	68.78	3.00	10.24	3.05		0.59						0.55													\vdash				100	62	
2084.29	9.1	1 2	Chl + Bt	37.58	1.90	19.35	28.01		8.84	0.92		3.06			0.3	3															\vdash				100	54	
2084.29	9.	1 3	Chi + Bt	39.25	2.05	21.97	25.21	3 16	8.08	0.40	-	3.03		-		+															\vdash				100	87	
2084.29	J. 1(1	Ilm	5.30	53.34	2.04	41.87	0.68	3.49	0.61																									100	110	
2084.29	1(2	Mix	12.23	1.63	6.31	58.25	3.25	11.56	5.42		1.34																							100	69	
2084.29	1(3 3	TiO ₂		99.40		0.60																												100	94	
2084.29	1() 4	Ар							48.28			44.06		6.59																$ \longrightarrow $		1.07		100	131	
2084.29	10	5	Mix	36.22	51.02	4.41	2.07			0.39			3.65		2.24																\vdash				100	98	
2084.29	10	<u>ט ו</u> ד ו	Cal +	1.30		0.91	8 55	0.71	0 90	49.62			44.87		26 75	+				-								-			\vdash				100	87	
2084.29	1(5 8	Qz + Ms	64.72		13.57	14.41	0.73	1.03	1.35		4.20			20.70	1						1													100	56	
2084.29	1() 9	Py				28.22							71.78																					100	245	
2084.29	10	10	Sd	0.53			46.59	3.27	2.00	2.88			0.73																						56	63	

Table A1.1: Scanning Electron Microscope chemical analyses of 2084.29 m from Cohasset A-52 well

Sample	Site	Position	Mineral	SiO2	Ti02	AI2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	ш	ō	Sc2O3	V205	Cr203	CoO	NiO	ZnO	Y2O3	ZrO2	Nb2O5	Ag2O	BaO	La2O3	Ce2O3	Nd2O3	Gd2O3	Dy2O3	Hf02	WO3	ThO2	Total	Actual Total
2084.29	10) 11	"lim"		70.05		29.95																													100	100
2084.29	10) 12	Chl	25.99		18.90	28.49		11.62																											85	102
2084.29	10) 13	llm + Chl	14.27	54.64	7.08	19.12		4.65			0.24																								100	103
2084.29	10) 14	Qz	100.00																																100	127
2084.29	10) 15	Py		05.04		28.19			0.21				71.60																						100	232
2084.29	10	10		2.01	95.81	1.00	3.93	4.00	2.02	0.26																								2 72		100	100
2064.29	10	18	50 + Pv	3.01	0.65	1.63	28.46	4.90	3.93	3.07				71 54																				3.13		100	238
2084 29	10	19	Feohy + Chl +	4 94	0.61	2.65	75 20			1.63				71.04																				14 98		100	71
2084.29	10	20	Chl + Bt ?	43.12	0.59	29.12	16.43		6.96	1.08	2.71																							11.00		100	102
2084.29	10	21	Qz + Sd	91.97			6.93		0.48	0.62																										100	120
2084.29	10) 22	llm		51.71		43.92	0.66	2.95	0.75																										100	113
2084.29	10	23	Ру		0.29		28.21			0.14				71.35																						100	248
2084.29	10	24	Bdy		0.61																			98.65									0.74			100	134
2084.29	10	25	Ab	68.59		18.34					11.83				1.24																					100	128
2084.29	10.1	1	Sd + Ap		0.71		88.18	1.12	3.79	4.97			1.23																							100	59
2084.29	10.1	1 2	Chl + Ms	49.15	1.31	34.17	7.91		2.72	0.04		1.95			2.79																					100	94
2084.29	10.1		Chi + Mica	38.61	3.22	21.28	24.93		7.67	0.84		3.46																								100	90
2084.29	10.2	2 1	QZ TIO	99.61	0.39	0.79	2.05			0.25			0.01																							100	122
2004.29	10.2	2 2	Tur	38.36	94.13	30.70	2.00		4 84	0.55	2 12		0.91																							87	103
2084.29	10.2	3 1	llm +	1 44	48.00	0.96	38.35	2 1 9	5.54	3.54	2.42																									100	77
2084.29	10.3	3 2	Qz	99.00	10.00	0.74	00.00	2.10	0.01	0.01		0.26																								100	118
2084.29	10.3	3 3	Cal + Chl	1.39		0.66	1.74	0.64		57.84					37.74																					100	90
2084.29	10.3	3 4	Py				28.31							71.69																						100	225
2084.29	10.4	1 1	TiO ₂ +	0.50	96.28		3.22																													100	102
2084.29	10.4	1 2	Qz	99.15	0.52		0.33																													100	121
2084.29	10.4	1 3	Ms	50.02	0.89	29.01	2.40		1.83			8.47			2.37																					95	110
2084.29	10.5	5 1	Bdy		0.66																			98.28									1.06			100	124
2084.29	10.5	5 2	Cal + Chl	1.18		0.81	2.19	0.44		47.79	1.06				46.53																					100	113
2084.29	10.5	5 3	Ab	69.51	0.40	18.64	00.07				11.85			00.00																						100	116
2084.29	11		Py +	27.44	2.10	27.49	29.87		7.24	1.62	2.06			68.03											-											07	0/
2004.29	11		Sol	37.44	0.66	27.40	16.22		15.82	1.02	2.00								27.26																	100	111
2084.29	11	1 4	Sd		0.57	40.14	46.06	5 40	1.81	2 73									21.20																	56	58
2084.29	11	1 5	Qz	100.00			10.00	0.10		2.70																										100	120
2084.29	11	6	Chr		0.54	23.70	30.68		7.55										37.52																	100	105
2084.29	11	1 7	Ар				0.55			47.63			43.98		6.58																			1.26		100	122
2084.29	11	1 8	Zrn	31.35																				68.65												100	122
2084.29	11	1 9	"llm"	0.71	75.97		21.44	1.87																												100	95
2084.29	11	1 10	Py				28.13							71.87																						100	221
2084.29	11	1 11	Qz	99.68			0.32		0.05	0.0-																										100	120
2084.29		12		0.40	59.70		35.07	2.54	2.33	0.35				44.95	0.50																					100	100
2084.29	11	13	Py + Cal	0.49			21.44	0.43	0.70	26.74				44.35	6.56																					100	72
2004.29	14	14	"llm"		72 47		26.54	0.05	1.02	13.00					21.05					-																100	94
2084.29	11	1 16	Sd + Cbl	11 93	1.09	8.63	61 15	1 15	7.53	2.46		0.52																						5 55		100	71
2084.29	11	1 17	"llm"	11.00	92.30	0.00	7.70		7.00	2.10		0.02								-														0.00		100	108
2084.29	11	1 18	Qz	98.57	0.37										1.06																					100	107
2084.29	11	1 19	llm		59.05		33.98	6.97																												100	102
2084.29	11	20	"llm"		62.75		36.07	1.18																												100	94
2084.29	11	1 21	Zrn +	29.71		1.18	0.79			1.34							0.55							66.44												100	104
2084.29	11	1 22	Chr			28.54	22.42		11.48										37.56																	100	110
2084.29	11	23	TiO ₂		100.00																				L											100	112
2084.29	11	24	Feohy?		0.66		95.85	1.28		1.11			1.09																							100	63
2084.29	11	25	IIM + Chl	6.19	63.65	3.94	24.00	1.28		0.07		0.93		00.50											<u> </u>											100	103
2084.29	11	26	Py OF	0.35	0.47		32.28			0.37				66.53																						100	129
2084.29	11	1 27	luz	100.00			1																		1											100	124

Sample	Site	Position	Mineral	SiO2	Ti02	AI2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	Ŀ	ō	Sc2O3	V205	Cr203	CoO	NiO	ZnO	Y203	ZrO2	Nb2O5	Ag2O	BaO	La203	Ce2O3	Nd2O3	Gd2O3	Dy2O3	Hf02	WO3	ThO2	Total	Actual Total
2084.29	11	28	Ap							49.22			45.23		5.55																					100	126
2084.29	11	29	Tur	37.91	0.51	32.12	7.05		6.61	0.80	2.00																									87	102
2084.29	11	30	TiO ₂		95.81		0.81										0.75								2.63											100	110
2084.29	11	31	TiO ₂ +	1.20	94.83	2.02	1.59	4.07		0.37																								\vdash	ł	100	98
2084.29	11	32	"lim"		69.82	0.49	28.32	1.37	1.04	44.70					44.00																			\vdash	ł	100	101
2084.29	11 1	33		100.00	21.90		17.10	1.17	1.04	44.73					14.00																				\rightarrow	100	121
2084 29	11 1	2	Rv +	3 27	0.45		27 48							68 79																				$ \rightarrow$, ——+	100	221
2084.29	11.1	3	TiO ₂	0.21	99.12		0.59			0.29				00.70																						100	106
2084.29	11.1	4	Cal		0.55		2.21	0.38		40.97					11.89																					56	71
2084.29	11.1	5	Sd +		2.20		85.61	4.92	1.14	6.12																										100	57
2084.29	12	1	Mnz	2.42		0.66	i						36.18		-0.83													13.76	34.28	13.52						100	103
2084.29	12	2	Py				28.41							71.59																					,	100	227
2084.29	12	3	TiO ₂	0.51	99.49																															100	110
2084.29	12	4	Tur	37.97	0.61	33.91	6.84		5.29	0.36	2.03																									87	105
2084.29	12	5	Spl Chi i Dh i	24.27	1.50	43.87	20.10	1.00	15.62	4.50		2.04							20.41															<u> </u>	-+	100	117
2084.29	12	0		31.27	1.52	10.14	28 30	0.24	1.17	1.52		2.94		71 46																					-+	100	240
2084 20	12	8	Sd + Chl	15 17	1 40	10.22	59 11	1.69	9 04	3 37				7 1.40																					-+	100	69
2084,29	12	9	Sd	0.54	0.34	10.22	51.24	0.81	0.82	1.46			0.78																							56	62
2084.29	12	10	"llm"		84.85	0.54	14.61																													100	83
2084.29	12	11	Qz + Sd + Chl	55.64	0.89	1.03	34.64	1.20	3.68	2.92																										100	90
2084.29	12	12	Qz	98.83	0.38	0.53	0.26																													100	125
2084.29	12	13	Sd				51.94	0.64	0.68	2.73																									,	56	62
2084.29	12	14	Zrn +	28.60		0.98	0.92			1.64					3.00									63.00									1.85		,	100	102
2084.29	12	15	Qz +	93.61		4.29	1.26		0.84																										·	100	122
2084.29	12	16	Zrn +	28.48	0.64	1.74	1.59			2.15		0.54					0.65							64.75											<u> </u>	100	102
2084.29	12	1/	ChI + Bt ?	43.15	1.19	24.31	24.87		3.38	0.60		2.51	0.70																					<u> </u>	ł	100	49
2004.29	12	10	110 ₂ +	0.00	95.44	1.53	19 50		16 74	0.40			0.79						22.20															┌──┤	+	100	104
2084.29	12	20	Zrn	31.08	0.55	41.70	10.59		10.74										22.39					68.92										<u> </u>	t	100	121
2084.29	12	21	Zrn	30.50																				69.50										$ \rightarrow$		100	120
2084.29	12	22	"llm"		63.93		34.20	1.87																												100	99
2084.29	12	23	Kfs	65.94	0.48	17.84					0.62	15.11																								100	118
2084.29	12	24	"llm"	0.86	84.65	0.54	13.95																													100	95
2084.29	12	25	llm		55.73		42.19	2.08																											,	100	106
2084.29	12	26	"llm"	0.62	72.55	0.68	26.15																													100	94
2084.29	12.1	1	Cal	0.48		0.50	2.34	0.49	0.42	42.79					9.49																			\vdash		56	68
2084.29	12.1	2	Sd +	4.//	0.05	2.59	22.47	4.22	9.88	5.06		1.00							0.40															<u> </u>	<u> </u>	100	63
2084.29	12.1	3	Chi + Mica	41.40	1.24	24.14	23.47		8.68	0.49		3.64							0.40																	100	04 81
2084.29	12.1	4		32.67	1.24	22 10	27.00		2 79	0.09		0.41			3.03																			\rightarrow	t	85	41
2084.29	12.2	2	Sd +	10.06		5.78	64.00	3.38	10.45	5.58		0.77			0.00																			$ \rightarrow$		100	60
2084.29	12.2	3	Sd +	7.82		4.90	70.91	2.29	7.94	6.14																										100	59
2084.29	13	1	Py				27.76	0.49						71.74																						100	232
2084.29	13	2	Sd	0.79	0.31		44.51	2.03	4.58	3.77																										56	62
2084.29	13	3	TiO ₂	0.97	95.41	0.98	1.07																	1.56												100	106
2084.29	13	4	Zrn	30.59																				68.08									1.33		,	100	126
2084.29	13	5	Tur	37.92	0.85	33.67	5.67		6.23	0.69	1.97																							µ	<u> </u>	87	102
2084.29	13	6	Qz	99.63	70.0	0.57	0.37																											<u> </u>	<u> </u>	100	123
2084.29	13	7	"IIM" +	1.13	79.34	2.72	16.51	1.00	2.45	0.29																								<u> </u>	\rightarrow	100	98 00
2084.29	13	8	Tur	37.00	01.92	32 12	33.99	1.93	2.15		2.20																								\rightarrow	97	99
2084.29	13	9 10	"llm" +	1 00	76.52	33.13	17 58		0.90		2.20				4 00																			$ \rightarrow$	-+	100	39
2084,29	13	11	Zrn	30,95	10.02		11.00		0.00						4.00									67.49									1.56		-+	100	127
2084.29	13	12	Ар							49.27			44.33		6.40																					100	125
2084.29	13	13	Py				28.35							71.65																						100	227
2084.29	13	14	Qz	99.65			0.35																													100	127

Sample	Site	Position	Mineral	SiO2	Ti02	AI2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	s03	ш	ō	Sc203	V205	Cr203	CoO	NiO	ZnO	Y2O3	ZrO2	Nb2O5	Ag2O	BaO	La2O3	Ce2O3	Nd2O3	Gd2O3	Dy2O3	Hf02	WO3	ThO2	Total	Actual Total
2084.29	13	3 15	TiO ₂ +	0.94	88.04	1.50	3.02			5.24	0.56		0.70																							100	88
2084.29	13	3 16	TiO ₂ +	2.73	94.58	1.63	0.65					0.42																								100	111
2084.29	13	3 17	"llm" +	0.62	73.30	1.35	23.10		0.78										0.86															<u> </u>	⊢—	100	104
2084.29	13	3 18	Tur	36.28	0.90	28.50	11.27		6.53	1.35	2.17																							⊢ −−	⊢ −−+	87	103
2084.29	13	3 19	Feohy	00.07	4 47	44.70	98.57	4.47	5.04	1.43		0.00																						<u> </u>	r+	100	62
2084.29	13	20	Sd + Bt ?	22.97	1.47	14.73	27.09	1.47	5.84	2.45		0.66		71 72																					ł	100	220
2084.29	13	2 22	Fy Sd + Cbl	1.48	1.04	0.94	79.72	2.80	6 66	6 17			1 20	11.73																						100	61
2084 29	13	23	Sd + Chl	2.58	0.82	1 70	77 74	1 72	10.26	5 18			1.20																							100	59
2084.29	13	3 24	Sd + Chl	2.43	0.66	1.40	88.15	1.04	2.11	4.21																							_		i – †	100	63
2084.29	13	3 25	Qz + TiO ₂	65.25	34.75																												1		· · · · ·	100	125
2084.29	13	3 26	Qz + TiO ₂	62.69	33.47	0.53	3.03			0.27																										100	117
2084.29	13	3 27	TiO ₂ + Chl ?	3.18	89.74	1.75	4.98					0.35																							1	100	103
2084.29	13.1	1	Py +		0.62		28.90			5.41				65.07																						100	172
2084.29	13.1	2	Py	0.19	0.61		28.22			1.39				69.59																						100	220
2084.29	13.1	3	Cal				1.16	0.25		34.87					19.72																		⊢	 	⊢	56	85
2084.29	13.1	4	TiO ₂ +	1.06	94.25	1.34	2.10			1.24																								<u> </u>	 +	100	97
2084.29	13.2		50 +	17.77	1.49	10.05	56.62	2.38	8.24	2.98		0.48		2.01				-																	<u> </u>	100	68
2084.29	13.2	2	CH + 50 +	30.23	2.10	18.93	39.47	0.46	3.99	0.84		0.77		3.21																			-+		-+	100	73
2004.29	13.2	2 1	Me +	50.61	1 31	20.90	5 10		1.51	0.34	0.34	8.53			/ 31																			<u> </u>		100	03
2084.29	13.3	3 2	Ms + TiO	44.29	8.76	26.90	5.07		1.38		0.34	8.83			4.43																					100	114
2084.29	13.3	3 3	TiO ₂ +	5.44	88.09	0.41	6.06																										_		i – †	100	102
2084.29	13.3	3 4	Qz +	97.74	1.38	0.42	0.46																												-	100	111
2084.29	14	l 1	Zrn	31.12																				68.88												100	126
2084.29	14	1 2	TiO ₂	0.50	98.75		0.76																												1	100	112
2084.29	14	l 3	Tur	37.32	0.84	34.03	9.12	0.30	3.37		2.03																									87	105
2084.29	14	4	Zrn +	29.00		0.91	0.69			1.24							0.59							65.99									1.59		⊢	100	116
2084.29	14	5	Tur	37.99	0.50	33.18	2.11		9.62	1.92	1.68																							 	⊢	87	106
2084.29	14	6	Py	00.54			28.72							71.28																					ı — +	100	239
2084.29	14		Qz TiO	99.51	08.02		0.30			0.18																								<u> </u>		100	131
2004.29	14		7rp	30.82	90.92		0.44																	60.18											r – †	100	129
2004.23	14	10	Zm	31.07																				68.93											t	100	125
2084.29	14	11	Tur	37.54	0.70	32.93	12.00		1.78		2.05													00.00												87	105
2084.29	14	12	Sd + Chl + Cal?	10.78	0.67	5.63	27.41	1.32	6.62	35.20		0.49			11.88																					100	71
2084.29	14	I 13	llm		54.91		43.23	0.99	0.87																										1	100	109
2084.29	14	14	Ру				28.22							71.56					0.21																	100	239
2084.29	14	15	Mnz							1.96			36.02	1.72	0.35						0.04					3.19		14.88	31.02	10.82						100	108
2084.29	14	16	Qz	100.00																																100	129
2084.29	14	17	TiO ₂ +	4.69	94.40		0.92																										⊢	 	⊢	100	102
2084.29	14	18	Mnz	1.51		0.00	00.00	0.00	4.00	0.50	<u> </u>	0.07	36.41		1.00						-0.05							13.87	35.62	13.15				⊢ – –	⊢	100	110
2084.29	14	19	Sd +	4.51	0.00	3.23	80.82	2.89	4.38	3.52	0.00	0.65							0.44															<u> </u>	r	100	65
2084.29	14	20	1 ur	38.23	0.83	32.81	6.34		5.85	47.91	2.23		42.00		7 10				0.41															1.00	r+	100	102
2084.29	14	1 22	πρ TiO. +	0.94	87.08	2.56	3.92			0.28	0.56		43.90		4.66																			1.09		100	95
2084 29	14	1 23	"lim"	0.34	68.33	2.30	30.15	1.52		0.20	0.30				4.00																				t	100	99
2084.29	14	24	Tur	38.13	1.24	33.19	8.04	1.02	4.34		2.07																									87	102
2084.29	14	25	TiO ₂		100.00																														1	100	110
2084.29	14	26	Py				28.04							71.96																						100	237
2084.29	14	27	"llm" +	1.11	64.82	0.67	31.51	0.87	0.65	0.38			-		-					-							-	-								100	93
2084.29	14	28	Chr		0.64	23.09	28.62		9.53										38.12																	100	113
2084.29	14	29	Qz	100.00														L																	$ \longrightarrow $	100	126
2084.29	14	30	"llm"		79.61	<u> </u>	20.39				L			L				L							L								,l	µ	⊢	100	94
2084.29	14.1	1	Qz	99.71	0.29		0.00																											⊢ – –	⊢ −−∔	100	120
2084.29	14.1	2	TIU ₂	0.72	98.61	0.04	0.68																	60.44									 	┌──┤	ł	100	99
2084.29	14.1	3		28.89	10.36	0.64	-																	10.00									ł	<u> </u>	 	100	116
2004.29	14.1	4	$110_{2} + 2111$	10.10	00.00	1					1			1		1	1	1						119.90	1							1				100	92

2002 100 90000 9000 9000 <th< th=""><th>Sample</th><th>Site</th><th>Position</th><th>Mineral</th><th>SiO2</th><th>Ti02</th><th>AI203</th><th>FeO</th><th>MnO</th><th>MgO</th><th>CaO</th><th>Na2O</th><th>K20</th><th>P205</th><th>so3</th><th>ш</th><th>ō</th><th>Sc2O3</th><th>V205</th><th>Cr203</th><th>CoO</th><th>NiO</th><th>ZnO</th><th>Y203</th><th>ZrO2</th><th>Nb205</th><th>Ag2O</th><th>BaO</th><th>La2O3</th><th>Ce2O3</th><th>Nd2O3</th><th>Gd2O3</th><th>Dy203</th><th>HfO2</th><th>WO3</th><th>ThO2</th><th>Total</th><th>Actual Total</th></th<>	Sample	Site	Position	Mineral	SiO2	Ti02	AI203	FeO	MnO	MgO	CaO	Na2O	K20	P205	so3	ш	ō	Sc2O3	V205	Cr203	CoO	NiO	ZnO	Y203	ZrO2	Nb205	Ag2O	BaO	La2O3	Ce2O3	Nd2O3	Gd2O3	Dy203	HfO2	WO3	ThO2	Total	Actual Total
2HAZ 1/2 <th>2084.29</th> <th>14.2</th> <th>2 1</th> <th>TiO₂</th> <th></th> <th>100.00</th> <th></th> <th>100</th> <th>105</th>	2084.29	14.2	2 1	TiO ₂		100.00																															100	105
2014.20 10.1 0.00 10.4 10.0 <	2084.29	14.2	2 2	Cal				1.62	0.59		41.48					12.31																					56	70
303000 10 1000000000000000000000000000000000000	2084.29	14.2	2 3	"llm"	0.68	85.41	0.47	13.14			0.30																								\vdash		100	96
Above No. Above A	2084.29	15	5 1	Chr			23.07	17.77		13.41										45.75															\vdash	<u> </u>	100	115
Addity is Addity is <t< td=""><td>2084.29</td><td>1:</td><td>2</td><td>Py</td><td>00.00</td><td>0.50</td><td>00.70</td><td>28.46</td><td></td><td>0.00</td><td>0.44</td><td>0.05</td><td></td><td></td><td>/1.54</td><td></td><td></td><td></td><td></td><td>0.00</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>\vdash</td><td></td><td>100</td><td>234</td></t<>	2084.29	1:	2	Py	00.00	0.50	00.70	28.46		0.00	0.44	0.05			/1.54					0.00															\vdash		100	234
Addega of the second	2084.29	10	3		38.89	70.00	30.70	7.19		6.68	0.44	2.35								0.26					2 1 2										H	_	100	07
Description	2084 29	15	5 5	Chr	13.33	0.85	15.28	30.61		4 32	0.55									48 94					2.12										$ \rightarrow$		100	108
200420 15 71m² 000 72m² 157 100	2084.29	15	5 6	Cal +	5.54	0.00	1.54	7.06	0.61	0.85	57.69					26.72				10.01															$ \rightarrow $		100	88
20042 16 0 fm 3067 200 2005 2	2084.29	15	5 7	"llm"	0.97	79.20		18.75	1.08																												100	97
200429 15 0 Ga 3905 20041 75 0 Ga 77 0 Ga 73	2084.29	15	5 8	Tur	37.71	2.09	26.62	8.73		8.55	0.65	2.64																									87	106
200429 15 10 10 2.00 1.0	2084.29	15	5 9	Grt	39.95		20.41	22.64	6.36	2.31	8.33																										100	123
2884 9 15 11 T0, 0.00	2084.29	15	5 10	Tur	37.91	0.64	31.11	7.87		6.46	0.75	2.26																									87	108
288429 15 16 17 18.57 17.8 17.1 0.33 17.8 17.0 10	2084.29	15	5 11	TiO ₂	0.60	97.58	0.66	1.16																											$ \longrightarrow $		100	113
2000-200 15 12 00 10 10 100 <td>2084.29</td> <td>15</td> <td>5 12</td> <td>"llm" +</td> <td>0.77</td> <td>84.57</td> <td>1.75</td> <td>11.47</td> <td>1.11</td> <td></td> <td>0.33</td> <td></td> <td>\longrightarrow</td> <td></td> <td>100</td> <td>95</td>	2084.29	15	5 12	"llm" +	0.77	84.57	1.75	11.47	1.11		0.33																								$ \longrightarrow $		100	95
2008-20 15 14 P/O 0.05 200-2 16 1 <th1< th=""> 1 <th1< th=""> <th1< th=""></th1<></th1<></th1<>	2084.29	15	5 13	Qz	99.73	0.27																													\vdash		100	130
2000000000000000000000000000000000000	2084.29	1:	0 14	Py	0.00	0.35	4.05	28.20							/1.45																				\vdash		100	244
1000000000000000000000000000000000000	2004.29	10	10	TIO ₂	0.00	95.64	1.00	1.03	1 40		2.61			2.11																					<u> </u>	_	100	94 63
2004 20 16 18 1m² 7005 200 20 16 10 20 171 000 70 001 70 2004 20 16 19 3k+8 15 34 16 2 25 50 70 16 0	2084 29	14	10	Mnz				33.19	1.49		2.01			37 47		-0 47													14 75	29.58	11 21				\vdash	5 79	100	101
198 198 <td>2084 29</td> <td>15</td> <td>18</td> <td>"llm"</td> <td></td> <td>70.65</td> <td></td> <td>26.59</td> <td>2 4 4</td> <td></td> <td>0.33</td> <td></td> <td></td> <td>01.41</td> <td></td> <td>0.47</td> <td></td> <td>14.70</td> <td>20.00</td> <td>11.21</td> <td></td> <td></td> <td></td> <td>\rightarrow</td> <td>0.75</td> <td>100</td> <td>98</td>	2084 29	15	18	"llm"		70.65		26.59	2 4 4		0.33			01.41		0.47													14.70	20.00	11.21				$ \rightarrow$	0.75	100	98
199429 15 20 TrO, + OZ 104 86.03 0.97 0 54.2 0 <td>2084.29</td> <td>15</td> <td>5 19</td> <td>Sd + Bt</td> <td>15.34</td> <td>1.62</td> <td>7.35</td> <td>59.27</td> <td>1.61</td> <td>9.58</td> <td>3.72</td> <td></td> <td>1.52</td> <td></td> <td>\square</td> <td></td> <td>100</td> <td>71</td>	2084.29	15	5 19	Sd + Bt	15.34	1.62	7.35	59.27	1.61	9.58	3.72		1.52																						\square		100	71
1000000000000000000000000000000000000	2084.29	15	5 20	TiO ₂ + Qz	10.41	88.03	0.59	0.97			-		-																								100	83
200429 15 20 C ₂ 1000 10 10 10 100 <	2084.29	15	5 21	Ilm + Cal		41.17		38.93	2.34		12.14					5.42																					100	104
2004.20 15 23 TO ₂ + Ch 6.83 8.26 4.21 0.43 0.82 3.74 0.63 0.63 0.00 9 2004.20 15 26 TO ₂ + Ch 1.44 2.92 0.71 0.63 0.82 3.74 0.63 0.60 1.00 <td>2084.29</td> <td>15</td> <td>5 22</td> <td>Qz</td> <td>100.00</td> <td></td> <td>100</td> <td>125</td>	2084.29	15	5 22	Qz	100.00																																100	125
2004 29 15 24 To, + Ch 6.83 78.66 42 23 32.7 0.71 1.05 0.62 3.47 0.63 0.63 0.63 0.63 0.63 0.61 0.00 11 0.00 11 2004 29 15 25 (Dr 1.44 22.9 2.64 11.73 0.71 0.74 0.74 0.63 0.63 0.61 0.63 0.61 0.70 0.70 0.70 0.76 0.70 0.70 0.70 0.70 0.74 0.74 0.63 <th< td=""><td>2084.29</td><td>15</td><td>5 23</td><td>TiO₂ + Chl</td><td>6.45</td><td>82.30</td><td>4.12</td><td>2.49</td><td></td><td>4.21</td><td></td><td></td><td>0.43</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>\square</td><td></td><td>100</td><td>97</td></th<>	2084.29	15	5 23	TiO ₂ + Chl	6.45	82.30	4.12	2.49		4.21			0.43																						\square		100	97
2004.29 15 26 27 144 22.91 6.73 0.91 1.64 97.44	2084.29	15	5 24	TiO ₂ + Chl	6.83	78.56	4.22	3.72		0.71		1.05			0.82	3.47							0.63														100	100
2004 29 15 26 (32 99 71 0.29 1 0 0 1 0 0 1 0 1 0 0 1 0 0 1 0 0 1 0 0 1 0 0 1 0 0 1 0 1 0	2084.29	15	5 25	Chr		1.44	22.91	26.49		11.73										37.44																	100	113
2004.29 15 2/10r 38.34 1.04 0.73 0.91 0.94	2084.29	15	5 26	Qz	99.71	0.29	00.70	5.04		0.70	0.04	4.04																							\vdash		100	126
Jobel 20 Jist Josel 20 Jist Josel 20 Jose 20 <thjose 20<="" th=""> <thjose 20<="" th=""> <thjose< td=""><td>2084.29</td><td>18</td><td>21</td><td>Tur On t Dt</td><td>38.34</td><td>1.04</td><td>32.72</td><td>5.61</td><td></td><td>6.73</td><td>0.91</td><td>1.64</td><td>1.00</td><td></td><td>0.72</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>\vdash</td><td></td><td>100</td><td>107</td></thjose<></thjose></thjose>	2084.29	18	21	Tur On t Dt	38.34	1.04	32.72	5.61		6.73	0.91	1.64	1.00		0.72																				\vdash		100	107
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	2084.29	15 1	20	$U_2 + B_1$ TiO ₂ + Sd +	5 25	83.17	0.45	10.76		3.94	0.94	0.40	1.60		0.73																						100	03
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	2084.29	15.1	2	Cal +	1.68	00.17	0.40	2.54	0.81	0.54	64.05					29.51																			$ \rightarrow$		100	83
2094 29 15.1 d $Q_2 +$ 85.5 13.20 0.52 0.75 0.19 71.61 0.36 0.36 0.36 0.100 1 2094 29 15.2 1 TrO ₂ + 0.26 95.81 3.2 1.48 0.19 71.61 0.36 0.65<	2084.29	15.1	3	Qz	99.71			0.29			-																								\square		100	119
2024/29 15.1 5 Py 0.38 27.47 0.19 71.61 0.36 0 <th< td=""><td>2084.29</td><td>15.1</td><td>4</td><td>Qz +</td><td>85.53</td><td>13.20</td><td>0.52</td><td>0.75</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>\square</td><td></td><td>100</td><td>114</td></th<>	2084.29	15.1	4	Qz +	85.53	13.20	0.52	0.75																											\square		100	114
2024.29 15.2 1 TO ₂ + 1.22 9.5.8 1.32 1.48 100 6 2034.29 15.2 2 TO ₂ + 0.56 93.67 2.92 2.11 0.32 0.51 100	2084.29	15.1	5	Py		0.38		27.47			0.19				71.61					0.36																	100	226
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	2084.29	15.2	2 1	TiO ₂ +	1.22	95.98	1.32	1.48																													100	61
2084.29 15.3 15.4 16.4 16.4	2084.29	15.2	2 2	TiO ₂ +	0.56	93.57	2.92	2.11			0.32									0.51																	100	100
2084.29 15.3 2 Cal + Ch 8.29 5.12 2.38 0.63 0.76 1.04 22.24 1 0.21 0.26 68.63 1 1 1 1 1 0.26 4.91 1 1 1 0.26 1 1 1 0.21 0.26 4.91 1 1 0.26 1 1 1 0.26 1 1 0.26 1 1 0.21 0.27 0.27 2.27 2.27	2084.29	15.3	3 1	Sd				53.80	0.54		1.65																								$ \longrightarrow $	\rightarrow	56	58
2084.29 15.3 3/LZ 99.49 0.32 0.36 0.37 0.36 0.37	2084.29	15.3	3 2	Cal + Chl	8.29		5.12	2.38	0.63		59.53		0.76	1.04		22.24																			\vdash		100	77
2084.29 15.4 $1 Py +$ 0.72 0.30 29.88 0.21 0.26 66.53 0.61 0.61 0.00	2084.29	15.3	3 3	Qz	99.49		0.20	0.32			0.18	0.00			co co																				<u> </u>		100	120
2004.29 15.4 3 Ch1 + Ms 41.07 403 13.8 11.14 0.57 4.91 0.00<	2084.29	15.4	1 1 2	Py+	7.01	1.26	0.30	29.88	2.01	8 5 1	0.21	0.26	0.86		08.63																				\vdash	+	100	191
2084.29 15.5 100^{-} 40.0^{-} 40.0^{-} 10.0^{-} 10.0^{-} 100^{-} <td>2004.29</td> <td>15.4</td> <td>1 3</td> <td>Chl + Me</td> <td>1.91</td> <td>1.20</td> <td>10.38</td> <td>18.01</td> <td>2.01</td> <td>0.01</td> <td>4.01</td> <td></td> <td>1 01</td> <td></td> <td>-</td> <td>100</td> <td>04</td>	2004.29	15.4	1 3	Chl + Me	1.91	1.20	10.38	18.01	2.01	0.01	4.01		1 01																							-	100	04
2084.29 15.5 2 QZ 99.50 0.50 100	2084 29	15.5	1		1.04	97.73	0.47	0.76		11.14	0.55		4.31																						$ \rightarrow$		100	101
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	2084.29	15.5	5 2	Q7	99.50	0.50	0.11	0.70																											$ \rightarrow$		100	120
2084.29 15.6 1 Im 48.69 47.88 2.69 0.75	2084.29	15.5	5 3	TiO ₂ +	3.56	95.31		1.12																													100	92
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	2084.29	15.6	5 1	llm		48.69		47.88	2.69		0.75																										100	104
2084.29 15.6 3 Cal 0.71 0.78 0.49 35.35 18.66 0 0 0 56 8 2084.29 15.7 1 QZ 100.0 0 0 0 0 0 100 110 110 100 110 100 110 100 110 100 110 100 110 100 110 100 110 100 110 100 110 100 110 100 110 100 110 100 110 100 110 100 110 100 <td>2084.29</td> <td>15.6</td> <td>6 2</td> <td>"llm" +</td> <td>0.87</td> <td>67.32</td> <td>0.69</td> <td>29.21</td> <td>0.98</td> <td></td> <td>0.93</td> <td></td> <td>_</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>100</td> <td>86</td>	2084.29	15.6	6 2	"llm" +	0.87	67.32	0.69	29.21	0.98		0.93																			_							100	86
2084.29 15.7 1 Qz 10.00 - - - - - - - - - - 100 11 2084.29 15.7 2 Cal - 1.60 0.30 0.38 6.08 17.65 - - - - 6.6 8 6 56 8 8 - 100 11 - - - 6 56 8 8 0.73 - - - - - - 6 0 0 0 100 11 2084.29 16 1 "Ilm" 61.57 36.78 0.89 0.77 - - - - - - 100 <t< td=""><td>2084.29</td><td>15.6</td><td>3</td><td>Cal</td><td></td><td>0.71</td><td></td><td>0.78</td><td>0.49</td><td></td><td>35.35</td><td></td><td></td><td></td><td></td><td>18.66</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>\square</td><td></td><td>56</td><td>86</td></t<>	2084.29	15.6	3	Cal		0.71		0.78	0.49		35.35					18.66																			\square		56	86
2084.29 15.7 2 [Cal 1.60 0.30 0.38 36.08 17.65 0 0 0 56 8 2084.29 15.7 3 TiO2+ 0.92 95.87 1.10 1.38 0.73 0 0 0 0 0 0 0 0 100	2084.29	15.7	1	Qz	100.00		L								L									L											\square	\rightarrow	100	119
2084.29 15.7 31102+ 0.29 95.87 1.10 1.38 0.73 100 <td>2084.29</td> <td>15.7</td> <td>2</td> <td>Cal</td> <td></td> <td></td> <td></td> <td>1.60</td> <td>0.30</td> <td>0.38</td> <td>36.08</td> <td></td> <td></td> <td></td> <td> </td> <td>17.65</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td> </td> <td></td> <td>\vdash</td> <td></td> <td>56</td> <td>82</td>	2084.29	15.7	2	Cal				1.60	0.30	0.38	36.08					17.65																			\vdash		56	82
2084.29 16 2 Qz 100 36.76 0.89 0.77 15.06 38.97 0 0 100	2084.29	15.7	3	110 ₂ +	0.92	95.87	1.10	1.38	0.00	0 ==	0.73																								\vdash	\rightarrow	100	104
zoor.es io zoor.es io zoor.es io	2084.29	16			100.00	61.57		36.78	0.89	0.77																									\vdash		100	99
2004.23 10 31.20 14.77 15.00 30.97 67.55 1.61 100 100 2084.29 16 4 Zm 30.84 1.61 100	2084.29	10	2	942	100.00		21.20	14 77		15.00										20 07															\vdash	\rightarrow	100	121
	2084.29	16	3	7m	30.84		31.20	14.77		10.00										30.97					67 55	1								1.61	\vdash		100	128
I 2084.291 161 5111m I I 53.161 I 42.451 0.691 3.341 0.361 I I I I I I I I I I I I I I I I I I I	2084.29	16	5 5	llm	00.04	53.16		42.45	0.69	3.34	0.36														51.00									1.01			100	109

Sample	Site	Position	Mineral	Si02	Ti02	AI2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	LL.	CI Sc203	V205	Cr203	CoO	NiO	ZnO	Y2O3	ZrO2	Nb2O5	Ag2O	BaO	La2O3	Ce2O3	Nd2O3	Gd2O3	Dy2O3	HfO2	WO3	ThO2	Total	Actual Total
2084.29	10	6 6	Sd				54.88	0.55		0.57																									56	62
2084.29	10	6 7	"llm" +	1.13	67.00		24.91	1.03		3.06					2.88																				100	40
2084.29	10	6 8	St +	29.87	0.53	55.96	9.59	0.43	0.88												2.74														100	117
2084.29	1	6 9	Chr			17.74	17.64		12.74									51.87																	100	113
2084.29	10	6 10	llm		52.03		44.26	0.77	2.62	0.32																									100	109
2084.29	1	6 11	TiO ₂ +	2.76	96.42		0.81																												100	103
2084.29	1	6 12	llm		52.64		45.08	0.47	1.81																										100	105
2084.29	1	6 13	Tur	38.12	0.67	28.79	9.83		6.45	0.30	2.84																								87	101
2084.29	1	6 14	Qz + Ilm	31.11	47.38		20.77	0.47		0.27								_																	100	114
2084.29	10	6 15	Sd				46.64	1.80	4.13	3.43																									56	61
2084.29	1	6 16	Py				28.31							71.69				-																	100	229
2084.29	10	6 17	Tur	38.16	1.38	31.93	8.58		4.71	0.28	1.95																								87	101
2084.29	1	6 18	"llm"	0.63	70.92	0.56	26.68		1.20																										100	98
2084.29	10	6 19	Py	0.23			28.48							71.29																					100	229
2084.29	10	6 20	Chl + llm	9.52	71.93	7.16	9.04		2.35																						-				100	102
2084.29	1	6 21	Cal + IIm +	1.41	23.36	0.64	18.07	0.92	1.07	45.57					8.96		_																		100	76
2084.29	10	6 22	QZ	100.00											\vdash		-	-					00.07												100	125
2084.29	10	b 23	∠rn	31.03	07.00	0.00	00.00	4.00	0.00								+						68.97												100	123
2084.29	10	0 24	nim" +	1.22	67.63	0.60	28.06	1.86	0.63						\vdash		+	20.01		<u> </u>										<u> </u>					100	92
2084.29	10	0 25		0.40	0.61	24.93	24.84		11.00			0.00						38.61																	100	01
2004.29	10.	1 1		0.40	70.99	5.71	10.20		1.20	0.25		0.26						-																	100	91
2004.29	10.	7 1	7m	21.42	00.00	7.04	10.20		2.32	0.20							-	-					60 E0												100	94 120
2004.29	1	7 2	ZIII	27.01	0.05	22 50	6.22		E 02	0.76	1 02												00.00												07	103
2004.29	1	7 3	Zrn	30.84	0.95	33.50	0.23		5.95	0.70	1.03												60.16												100	124
2004.23	1	7 A	07	00.04		0.73																	03.10												100	124
2084 29	1	7 5	TiO _o +	1 47	97 95	0.75	0.58																												100	99
2084 29	1	7 6	TiO ₂ +	1.22	88.64	1.95	1 90			1 19	0.93		0.86		3 31																				100	83
2084 29	1	7 7	07	99.39	0.61	1.00	1.00				0.00		0.00		0.01																				100	123
2084.29	1	7 8	Tur	37.76	1.26	29.33	8.29		7.07	1.04	2.24																								87	102
2084.29	1	7 9	Tur	37.85	0.40	32.17	3.04		9.00	0.92	2.24				1.39																				87	105
2084.29	1	7 10	Pv				28.47							71.53																					100	239
2084.29	1	7 11	Tur	41.64	1.99	30.99	4.25		4.00	0.81	1.31				2.01																				87	102
2084.29	1	7 12	Sd				50.88	1.16	1.36	2.60																									56	64
2084.29	1	7 13	Sd		0.52		51.69	1.58		2.22																									56	63
2084.29	1	7 14	Zrn	30.64																			69.36												100	129
2084.29	1	7 15	Qz +	97.62		1.61						0.77																							100	123
2084.29	1	7 16	Ilm + Chl	12.20	57.39	10.17	11.65	0.37	6.60	0.71			0.90																						100	104
2084.29	1	7 17	Zrn +	29.16		0.64				1.45						0.90)						67.86												100	106
2084.29	1	7 18	"llm"	0.64	73.44		24.92	0.99																											100	97
2084.29	1	7 19	Tur	38.75	0.56	28.53	8.74		7.60		2.82																								87	105
2084.29	1	7 20	"llm"		67.33		31.05	0.95	0.68																										100	93
2084.29	1	7 21	Zrn	30.59	0.38														L				67.67									1.36			100	127
2084.29	1	7 22	Grt	36.79	1.38	19.61	7.20	29.39		2.17					3.47			-																	100	119
2084.29	1	7 23	TiO ₂ +	1.09	93.59	1.33	2.84			0.44								0.71																	100	98
2084.29	18	8 1	"llm"		76.71	0.66	22.63																												100	94
2084.29	18	B 2	Qz	100.00																															100	125
2084.29	1	8 3	Qz	100.00													-	-	L																100	127
2084.29	18	8 4	TiO ₂ +	1.67	93.05	1.09	3.84			0.36																									100	90
2084.29	1	B 5	Zrn	30.94																			67.48									1.57			100	131
2084.29	1	8 6	Grt	40.61		20.86	25.75	0.74	5.61	6.42	0.1						-		<u> </u>	L															100	122
2084.29	1	8 7	1 uř	38.34	0.92	31.38	5.36		7.99	0.60	2.41				\vdash		+						00 70												87	107
2084.29	1	8 8		28.64	00.01	2.00	0.46		0.40	7.13					2.00		+				\vdash		63.76												100	110
2084.29	10	b 9		4.74	88.01	2.06	0.99	0.00	2.13	0.00					2.06		+	+																	100	113
2084.29		0 10		2.07	05.40	4.67	52.58	2.80		0.62					\vdash		+																		56	04
2004.29	10	0 11		2.07	95.49	1.07	20.60							70.04	\vdash		+	+																	100	23/
2084.29	10	0 12	Py	0.51		0.50	28.68			0.05				70.81			-				\vdash														100	234
2084.29	1	o 13	192	99.16		0.59	1			0.25							1	1	1											1	1				100	120

Sample	Site	Position	Mineral	SiO2	Ti02	AI2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	ш	ō	Sc2O3	V205	Cr203	CoO	0N N	ZnO	Y203	ZrO2	Nb205	Ag2O	BaO	La2O3	Ce2O3	Nd2O3	Gd2O3	Dy2O3	HfO2	WO3	ThO2	Total	Actual Total
2084.29	18	3 14	TiO ₂ +		93.85													2.96							3.18											100	114
2084.29	1	3 15	TiO ₂		100.00																														$ \rightarrow $	100	110
2084.29	1	3 16	Tur	37.85	1.10	32.86	7.87		4.89	0.32	2.11																								<u> </u>	87	105
2084.29	1	3 17	Chr +	2.75	1.42	2.37	45.91	5.31	0.86										35.99		0.82	4.57													$ \longrightarrow $	100	112
2004.29	1	0 10	7ro 1	15.00	63.01	1 1 2	0.59			1 76							1.01							67 72											rt	100	100
2084.29	1	3 20	07	100.00		1.15				1.70							1.01							01.13												100	124
2084.29	1	3 21	Zrn	30.99																				69.01												100	127
2084.29	1	3 22	Qz	100.00																															1	100	126
2084.29	1	3 23	Sd				42.82	1.28	7.02	4.88																										56	63
2084.29	1	3 24	Qz + TiO ₂	60.94	38.73		0.34																													100	115
2084.29	1	3 25	Tur	37.94	1.11	33.83	7.20		4.40	0.53	1.98																							⊢	⊢	87	103
2084.29	1	3 26	Sd	0.60			42.79	2.01	7.84	2.77																								<u> </u>	<u> </u>	56	59
2084.29	1	3 27	IIM		52.21		43.81	0.71	3.28	0.25															1.00									<u> </u>		100	107
2084.29	18	20		4 17	97.04	2.80	0.79			0.35															1.02										rt	100	103
2084.29	18.	1 2	$Q_{z} + TiQ_{z}$	80.32	19.68	2.00	0.01			0.21																										100	114
2084.29	1	9 1	Qz + Ms	62.42	0.34	23.69	3.01		2.14			8.40																								100	123
2084.29	1	2	Py				28.31							71.69																						100	237
2084.29	1	3 3	"llm" +	1.77	74.41	1.71	19.72		2.39																											100	85
2084.29	1	9 4	Tur	38.60	0.63	34.21	5.57		5.84	0.51	1.64																									87	107
2084.29	1	9 5	"llm"		64.39		32.59	0.46	1.99	0.56																								⊢	⊢──┤	100	112
2084.29	1	96	TiO ₂	0.70	98.88		0.42																												 +	100	116
2084.29	1		Cal +		1.65	10 70	3.37	1.11	0.83	81.31					11.72			0.49	10 10																$ \longrightarrow $	100	116
2084.29	1	2 Q	Zrn	31.23	0.37	13.70	20.22		0.75									0.40	40.40					68 77										<u> </u>	ł	100	133
2084.29	1	3 10	Zrn	30.78																				69.22												100	132
2084.29	1	9 11	Zrn	31.32																				68.68												100	129
2084.29	1	9 12	"llm"		65.94		32.65	1.14		0.27																										100	104
2084.29	1	9 13	TiO ₂ +	1.17	89.52	4.05	1.68			1.83	0.56		0.82			0.37																				100	104
2084.29	1	9 14	Tur	38.81	1.17	29.86	6.54		7.60		3.03																							L	$ \longrightarrow $	87	107
2084.29	1	9 15	llm		51.75		40.24	0.83	4.00	3.19																									⊢──┤	100	111
2084.29	1	16	Spi		0.85	32.24	20.76		14.65										31.50															<u> </u>	r+	100	112
2084.29	1	1 12	TIU ₂	37.01	0.70	33 /3	8.03		3 73	0.36	1.06																								-+	87	109
2084.29	1	10	Zrn	30.89	0.70	33.43	0.93		3.13	0.30	1.90													69.11											t	100	128
2084.29	1	20	Qz	100.00																				00.11												100	126
2084.29	1	21	Ilm + Cal		40.96		17.52	0.74	0.94	29.03					10.81																					100	95
2084.29	1	22	Chr			23.12	17.97		12.47										46.44																1	100	114
2084.29	1	23	llm		58.30		35.77	1.07	4.86																											100	107
2084.29	1	9 24	Zrn	31.07																				68.93										⊢	⊢	100	124
2084.29	1	25	"llm"	17.00	76.51	10.17	23.49		10.10																									<u> </u>	<u> </u>	100	99
2084.29	1	26	Sd + Chl	17.90	1.01	10.17	50.94	2.04	12.18	4.41		1.34																						<u> </u>	<u> </u>	100	63
2084.29	1	2/	Jum	0.62	51.66		43.62	0.58	2.33	1.23																									$ \rightarrow $	100	113
2084.23	19	1 1	Q7 +	97 42	51.00		0.38	0.00	3.03	2 20																										100	117
2084.29	19.	1 2	Cal + Pv	07.12			3.71	0.75		84.18				0.76	10.60																					100	62
2084.29	19.	1 3	Py				27.99	0.36						71.66																					1	100	226
2084.29	19.	2 1	Py		0.68		28.22				0.44			70.66																						100	225
2084.29	19.:	2 2	Cal		0.66		1.78	0.38		42.84					10.35																			íШ	μŪ	56	69
2084.29	19.:	2 3	TiO ₂ +	1.24	89.71	4.57	1.51			1.71	0.70					0.55																		⊢−−−∔	$ \rightarrow $	100	98
2084.29	2) 1	Py Od to Ob/		0.07	E 05	28.34	0.01	0.50					71.66		-																		┝──┤	⊢−−┤	100	242
2084.29	2	1 2	Sa + Chi	9.37	0.85	5.67	07.98	2.21	8.53	5.39						<u> </u>						<u> </u>		<u> </u>										┌───┤	ł	100	100
2084.29	2) 4		0.92	92.30	2.23	1 81		0.00	0.90	0.54		1 12									<u> </u>												<u> </u>	-+	100	98
2084.29	2) 5	Tur	37.97	0.59	33.77	5.27		6.67	0.97	1.76		1.12																							87	106
2084.29	2) 6	Qz	100.00	5.00				2.07	2.07															1											100	131
2084.29	2) 7	Zrn	31.03																				68.97												100	129

Sample	Site	Position	SiO2	Ti02	AI2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	so3	ш	ō	Sc203	V205	Cr203	CoO	OiN	ZnO	Y203	ZrO2	Nb2O5	Ag2O	BaO	La2O3	Ce2O3	Nd2O3	Gd2O3	Dy203	Hf02	WO3	ThO2	Total Actual Total
2084.29	20	8 Qz + TiO ₂	81.86	18.14																														1	00 135
2084.29	20	9 Sd		0.44		53.38	2.18																												56 66
2084.29	20	10 Tur	38.03	0.64	33.68	5.69		6.44	0.54	1.98																									87 109
2084.29	20	11 "llm" +	3.04	69.40	2.08	23.99	0.56		0.48		0.44																							1	00 108
2084.29	20	12 "llm" +	0.92	83.57	2.10	13.08			0.33																									1	00 102
2084.29	20	13 Qz	100.00																															1	00 131
2084.29	20	14 Cal +				2.21	1.02		70.83					25.94																				1	00 83
2084.29	20	15 "llm" +	0.73	76.38	1.69	20.24			0.33									0.64																1	00 105
2084.29	20	16 "llm" +	0.74	69.85	1.06	27.13	0.79		0.42																									1	00 106
2084.29	20	17 Qz	100.00																															1	00 130
2084.29	20	18 "llm"		70.64		28.61	0.40		0.35																									1	.00 99
2084.29	20	19 Cal +				1.63	0.88		66.90					30.59																\square				1	00 87
2084.29	20	20 llm		53.00		42.80	0.85	3.36																										1	.00 113
2084.29	20	21 TiO ₂ +	3.21	95.58		1.21																												1	00 112
2084.29	20	22 Cal +	0.96		0.66	17.57	1.17	2.74	56.15					20.75																				1	00 81
2084.29	20	23 Sd + Qz	11.05			83.70	1.26	2.08	1.92																									1	.00 69
2084.29	20	24 Sd +		1.05		87.96	6.09		4.90																									1	.00 62
2084.29	20	25 Zrn +	27.52	0.58	0.82	0.69			1.68	0.44				3.07		0.54							62.89									1.77		1	.00 107
2084.29	20	26 Qz	100.00																															1	.00 128
2084.29	20	27 Qz	100.00																											\square				1	.00 129
2084.29	20	28 TiO ₂ +	15.09	78.36	3.73	1.16								1.66																				1	.00 101
2084.29	20.1	1 Cal +				1.54	0.81		70.66					26.98																\square				1	.00 76
2084.29	20.1	2 TiO ₂ +	1.15	95.26	1.26	0.98			1.35																					L					.00 105
2084.29	20.1	3 llm +		52.98		41.88	0.56	1.82	2.76																					⊢′				1	.00 102
2084.29	20.1	4 Ilm + Cal		44.48		39.72	0.71	1.81	4.12					9.17																					.00 106
2084.29	20.2	1 Ms + Chl	54.55	0.56	27.40	5.02		2.04			10.43																				—			1	00 111
2084.29	20.2	2 TiO ₂	0.79	97.68		1.53																								└── ┘	$ \rightarrow $	\rightarrow		1	00 103
2084.29	20.2	3 Qz	99.68	0.32																										—	⊢ –			1	00 120
2084.29	20.2	4 TiO ₂	0.74	98.15		1.11																								—	⊢ –			1	00 89
2084.29	20.3	1 Qz +	98.40	1.60																										<u> </u>	L			1	00 117
2084.29	20.3	$2 \text{ TiO}_2 + \text{Xtm}$	6.86	60.84		0.50			1.31			13.75		2.98								11.18								1.15	1.92			1	00 97
2084.29	20.3	3 TiO ₂ +	19.29	76.67	2.82	0.50					0.72																			—	 	$ \rightarrow $		1	00 108
2084.29	20.3	4 TiO ₂ + Qz	11.22	87.78	0.50	0.51																								1	1			1	00 107

Appendix A2: BSE images and EDS mineral analyses for sample Cohasset A-52 2221.17 m

					5
site 1	site 2	site 3	site 4	site 5	Ē
site 6	site 7	site 8	site 9	site 10	-
site 11	site 12	site 13	site 14	site 15	2
site 16	site 17	site 18	site 19	site 20	2-2
				1 cm	1.5

Figure A2.1: Cohasset A-52 (2221.17 m)



Figure A2.2: Cohasset A-52 (2221.17 m) (SEM) site 2 1 (Table A2.1)



Figure A2.3: Cohasset A-52 (2221.17 m) (SEM) site 1.1 (Table A2.1). Probably a lithic clast of sagenetic TiO_2 (5) that has been modified by authigenic precipitation of TiO_2 (1).



1:Calcite + 2:Ilmenite + 3:"Ilmenite" +

Figure A2.4: Cohasset A-52 (2221.17 m) (SEM) site 1.2 (Table A2.1). Partly altered highly embayed detrital ilmenite grain (2,3) surrounded by calcite cement.



1:Muscovite 2:"Ilmenite" + 3:"Ilmenite" + 4:"Ilmenite" + Chlorite

Figure A2.5: Cohasset A-52 (2221.17 m) (SEM) site 1.3 (Table A2.1). Subhedral partially altered ilmenite (3) grain with muscovite (1) inclusions.



Figure A2.6: Cohasset A-52 (2221.17 m) (SEM) site 1.4 (Table A2.1). A fragment of cement made up of siderite (3) and quartz (2).



1:Tourmaline 21:Quartz $2:TiO_2$ 22:Siderite + Chlorite 3:Quartz 4:Garnet 23:Siderite 24:Ilmenite 5:TiO₂ 6:"Ilmenite" 25:Quartz 26:Siderite 7: Calcite + 27:"Ilmenite" 8:TiO₂ + 28:Quartz 9:Tourmaline 29:TiO₂ 10:Siderite + 30:Muscovite Chlorite 11:Zircon 12:Siderite 13:TiO₂ + 14:TiO₂ + 15:TiO₂ + Chlorite 16:Tourmaline 17:Mix 18:TiO₂ + Chlorite 19:Chromite 20:Ilmenite

Figure A2.7: Cohasset A-52 (2221.17 m) (SEM) site 2 (Table A2.1)



Figure A2.8: Cohasset A-52 (2221.17 m) (SEM) site 2.1 (Table A2.1). A detrital garnet crystal.



17:Spinel 18:TiO₂ 2:Siderite + Chlorite 19:Zircon 3:Apatite 20:Siderite 4:"Ilmenite" + 21:Staurolite 5:Calcite + 22:"Ilmenite" 23:TiO₂ + 6:TiO₂ + Quartz 24:Siderite + 7:Chromite Chlorite 8:Quartz 25:TiO₂ 9:Ilmenite + 26:TiO₂ Chlorite 27:Tourmaline 10:Quartz + 28:Ilmenite 29:TiO₂ + 11:Chlorite + Chlorite Ilmenite 12:Ilmenite 13:TiO₂ 14:Siderite 15:Zircon 16:Tourmaline

Figure A2.9: Cohasset A-52 (2221.17 m) (SEM) site 3 (Table A2.1)



1:Albite 2:"Ilmenite" + 3:TiO₂ + Chlorite 4:Quartz + Muscovite

Figure A2.10: Cohasset A-52 (2221.17 m) (SEM) site 3.1 (Table A2.1). A lithic clast made up of albite (1), quartz, muscovite, partly altered ilmenite (2), TiO_2 (3) and probably chlorite (3).



1:Chlorite + 20:Ilmenite Ilmenite 21:Tourmaline 2:Calcite + 22:Zircon + 3:Siderite 23:Spinel 24:TiO₂ 5:TiO₂ + 25:Quartz 26:"Ilmenite" + 6:Ilmenite 7:TiO₂ + Chlorite 27:Zircon 28:Biotite 9:TiO₂ + Quartz 29:Siderite 10:Garnet 11:Monazite 12:Quartz 13:Tourmaline 15:"Ilmenite" + Chlorite 16:TiO₂ + 17:Zircon 18:Tourmaline

Figure A5.11: Cohasset A-52 (2221.17 m) (SEM) site 4 (Table A2.1)



1:Siderite + 19:Zircon Chlorite 20:Barite + 2:Tourmaline Quartz 3:Quartz + TiO₂ 21:Zircon 22:Quartz 4:TiO₂ + 5:Calcite + TiO₂ 23:Tourmaline 24:Chlorite 6:"Ilmenite' + 25:Ilmenite + 7:Garnet 26:TiO₂ + 8:Mix 27:Apatite 9:Chromite 28:Apatite 10:Calcite 29:Muscovite + 11:TiO₂ + TiO₂ Quartz 30:Ilmenite 12:TiO₂ 31:TiO₂ 13:Quartz + Muscovite 14:Tourmaline 15:Garnet 16:Zircon 17:Mix 18:Tourmaline

Figure A2.12: Cohasset A-52 (2221.17 m) (SEM) site 5 (Table A2.1)



1:Monazite + Quartz + TiO_2 + Chlorite 2:TiO_2 3:Quartz + Muscovite 4:Monazite + TiO_2 5:Monazite + Quartz + TiO_2

Figure A2.13: Cohasset A-52 (2221.17 m) (SEM) site 5.1 (Table A2.1). Lithic clast made up of quartz, muscovite, and TiO₂ (4,5) often associated with monazite (4,5).



1:"Ilmenite" + 2:Muscovite + Chlorite 3:"Ilmenite" + 4:"Ilmenite" + 5:Muscovite + "Ilmenite" 6:"Ilmenite" +

Figure A2.14: Cohasset A-52 (2221.17 m) (SEM) site 5.2 (Table A2.1). Lithic clast made up of partly altered small grain of ilmenite, muscovite and chlorite.



Figure A2.15: Cohasset A-52 (2221.17 m) (SEM) site 5.3 (Table A2.1). Three fragments: a) a fragment of cement made up of siderite prisms (6) and calcite mixed with chlorite (4,5); b) a fragment made up of TiO_2 blebs (1) in calcite (2) and pyrite (3) cement, c) fragment of sandstone made up of relics of ilmenite (7,9) in calcite cement.



Figure A2.16: Cohasset A-52 (2221.17 m) (SEM) site 6 (Table A2.1)



1:Calcite + Chlorite 2:"Ilmenite" + 3:TiO₂ + Chlorite 4:TiO₂ + Chlorite 5:TiO₂ + Chlorite 6:Ilmenite +

Figure A2.17: Cohasset A-52 (2221.17 m) (SEM) site 6.1 (Table A2.1). Relics of partly altered ilmenite (2,6) in calcite and chlorite cement.



19:Calcite + TiO₂ 2:Apatite 20:Zircon 3:Apatite 21:"Ilmenite" 4:Siderite + 22:TiO₂ Chlorite 23:Quartz 24:Chromite 25:Tourmaline 7:Siderite 26:Chlorite + 8:Quartz Biotite 9:"Ilmenite" + 27:Spinel 10:Muscovite + Chlorite 11:Zircon 12:TiO₂ + 13:Calcite + TiO₂ 14:TiO₂ + Chlorite 15:TiO₂ 16:"Ilmenite" + Chlorite 17:TiO₂ + Quartz 18:TiO₂ +

Figure A2.18: Cohasset A-52 (2221.17 m) (SEM) site 7 (Table A2.1)







Figure A2.20: Cohasset A-52 (2221.17 m) (SEM) site 7.2 (Table A2.1). A lithic clast made up of TiO_2 (1) and quartz (3).



Figure A2.21: Cohasset A-52 (2221.17 m) (SEM) site 7.3 (Table A2.1). Fragments of partly altered ilmenite (2,3,pos a) in calcite cement (3).

 $1:TiO_2 +$ 2:Ilmenite +3:Calcite4:Ilmenite +



1:Siderite 20:Quartz + 2:Garnet 21:TiO₂ + Quartz 3:Fluorite + 22:Tourmaline Ilmenite 23:"Ilmenite" + 4:Siderite 24:Pyrite 5:Ilmenite + 25:TiO₂ + 6:Tourmaline 26:Quartz 7:Siderite 8:"Ilmenite" 9:Albite 10:TiO₂ 11:Spinel 12:Siderite + Chlorite 13:TiO₂ + 14:Chromite 15:Tourmaline 16:"Ilmenite" + Chlorite 17:"Ilmenite" 18:Albite 19:Monazite

Figure A2.22: Cohasset A-52 (2221.17 m) (SEM) site 8 (Table A2.1)



Figure A2.23: Cohasset A-52 (2221.17 m) (SEM) site 8.1 (Table A2.1). Detrital grains of ilmenite (5), apatite (4,6) in calcite and pyrite cement. It is not clear if the TiO_2 grains (e.g. 1) are detrital or diagenetic.



1:Zircon 2:Calcite 3:TiO₂ + 4:Tourmaline 5:Tourmaline 6:Spinel + 7:Spinel + 8:Al-phosphate 27:Chromite -sulfate 9:Zircon 10:Garnet 11:Quartz 12:Siderite 13:Tourmaline 14:TiO₂ + 15:Zircon + 16:TiO₂ + 17:Tourmaline 18:"Ilmenite" + 19:Chromite 20:Ilmenite +

Muscovite 21:Chromite 22:"Ilmenite" + 23:Siderite 24:Chromite 25:Quartz 26:TiO₂ 28:Siderite 29:"Ilmenite" 30:Garnet 31:"Ilmenite" + Chlorite 32:Tourmaline 33:Chromite 34:Ilmenite 35:"Ilmenite" + 36:TiO₂

Figure A2.24: Cohasset A-52 (2221.17 m) (SEM) site 9 (Table A2.1)



Figure A2.25: Cohasset A-52 (2221.17 m) (SEM) site 9.1 (Table A2.1). Partly altered detrital ilmenite (2,4) with muscovite (3) inclusions.



1:TiO₂ + Kaolinite $2:TiO_2$ 3:"Ilmenite" 4:Spinel 5:Chromite 6:Siderite 7:Zircon 8:Chromite 9:TiO₂ + 10:Spinel 11:"Ilmenite" 12:Quartz 13:Zircon 14:Garnet 15:"Ilmenite" + 16:Zircon 17:Muscovite 18:Chromite 19:Mix 20:TiO₂ +

21:Chromite 22:"Ilmenite" + 23:Ilmenite + 24:Tourmaline 25:Calcite + Chlorite 26:"Ilmenite" + 27:Zircon 28:Siderite 29:Zircon + 30:Zircon 31:"Ilmenite" 32:Zircon 33:Chromite 34:Spinel 35:Quartz 36:TiO₂ + Kaolinite 37:"Ilmenite" + 38:Garnet

Figure A2.26: Cohasset A-52 (2221.17 m) (SEM) site 10 (Table A2.1)



Figure A2.27: Cohasset A-52 (2221.17 m) (SEM) site 10.1 (Table A2.1). Highly embayed detrital $TiO_2(2,3)$ grain.



Figure A2.28: Cohasset A-52 (2221.17 m) (SEM) site 10.2 (Table A2.1). A fragment of cement made up of calcite (1,5), siderite prisms (3) and pyrite (2,4).



22:Tourmaline 23:Chromite 24:Siderite + Chlorite 25:Chromite 26:Calcite

Figure A2.29: Cohasset A-52 (2221.17 m) (SEM) site 11 (Table A2.1)



1:Quartz 2:"Ilmenite" + 3:Quartz + Kaolinite 4:TiO₂ 5:Chlorite + "Ilmenite" + 6:TiO₂

Figure A2.30: Cohasset A-52 (2221.17 m) (SEM) site 11.1 (Table A2.1). Partly altered ilmenite (2) grain with quartz and probably kaolinite and chlorite (1,3,5) inclusions.



1:Siderite + 21:"Ilmenite" Chlorite 22:Zircon 2:Chromite 23:TiO₂ 3:TiO₂ 24:Zircon 4:Chlorite 25:"Ilmenite" + 5:TiO₂ Chlorite 26:K-Feldspar 6:Quartz + 7:Garnet 8:Quartz + 9:TiO₂ + Chlorite 10:Zircon 11:Tourmaline 12:TiO₂ + 13:"Ilmenite" 14:Siderite + Chlorite 15:Cordierite? 16:Zircon 17:TiO₂ $18:TiO_{2} + Chlorite$ 19:Calcite 20:"Ilmenite" +

Figure A2.31: Cohasset A-52 (2221.17 m) (SEM) site 12 (Table A2.1)



1:Calcite + Chlorite 2:TiO₂ + 3:Quartz + TiO₂ 4:TiO₂ + Chlorite

Figure A2.32: Cohasset A-52 (2221.17 m) (SEM) site 12.1 (Table A2.1). Fragment of ?cement made up of TiO_2 , chlorite and quartz.



1:Tourmaline 2:Apatite $3:TiO_2$ + Muscovite 4:Tourmaline 5:Zircon + 6:Zircon 7:Siderite + 8:Ilmenite +Chlorite 9:Chromite 10:Tourmaline 11:"Ilmenite" 12:"Ilmenite" + $13:TiO_2$ + Calcite 14:"Ilmenite" + Chlorite 15:Siderite + 16:Zircon 17:"Ilmenite" + Chlorite 18:Calcite 19:Pyrite 20:Calcite

Figure A2.33: Cohasset A-52 (2221.17 m) (SEM) site 13 (Table A2.1)



1:TiO₂ 2:Muscovite + TiO₂ 3:Kaolinite + Chlorite + TiO₂ + 4:Pyrite + Chlorite $5:TiO_2$ +

Figure A2.34: Cohasset A-52 (2221.17 m) (SEM) site 13.1 (Table A2.1). A lithic clast made up of TiO_2 (1) blebs in a matrix made up of clays.



1:Zircon 20:Chromite 2:Calcite 21:Tourmaline 3:TiO₂ 22:Garnet 4:Tourmaline 23:"Ilmenite" 24:"Ilmenite" + 5:TiO₂ + 25:Zircon 6:Pyrite 26:Spinel 7:Zircon 27:Mix 8:Tourmaline 28:Chlorite + 9:Ilmenite + Biotite + Chlorite + 29:Ilmenite 10:Tourmaline 30:Zircon 11:Ilmenite 31:"Ilmenite" 12:TiO₂ + 32:Calcite Chlorite 33:Garnet 13:"Ilmenite" 34:TiO₂ + 14:Zircon 15:Quartz 16:"Ilmenite" + 17:Siderite + Chlorite 18:Tourmaline 19:Chlorite +

Figure A2.35: Cohasset A-52 (2221.17 m) (SEM) site 14 (Table A2.1)



Figure A2.36: Cohasset A-52 (2221.17 m) (SEM) site 14.1 (Table A2.1). A fragment that consists of a detrital garnet (2) grain and cement made up of calcite (1,4) and kaolinite (5,6).



1:Ilmenite + K-feldspar 2:Pyrite 3:Ilmenite + Chlorite 4:"Ilmenite" 5:Siderite 6:Chromite 7:"Ilmenite" + 8:TiO₂ + 9:TiO₂ + 10:Pyrite 11:Mix 12:Quartz 13:TiO₂ + 14:Quartz 15:TiO₂ + 16:Zircon 17:Zircon 18:"Ilmenite" 19:"Ilmenite" +

20:Pyrite 21:Chromite + 22:Siderite 23:Garnet 24:Garnet 25:Albite 26:TiO₂ + 27:TiO₂ 28:Pyrite 29:Quartz + 30:TiO₂ + 31:Quartz + Chlorite

Figure A2.37: Cohasset A-52 (2221.17 m) (SEM) site 15 (Table A2.1)



1:Muscovite 2:TiO₂ + Muscovite 3:Muscovite + TiO₂ + 4:Muscovite + TiO₂

Figure A2.38: Cohasset A-52 (2221.17 m) (SEM) site 15.1 (Table A2.1). Diagenetic TiO_2 (2) precipitating along detrital muscovite (1,4) cleavage planes.



Figure A2.39: Cohasset A-52 (2221.17 m) (SEM) site 16 (Table A2.1)



1:Calcite 2:Oligoclase 3:Contaminant 4:Kaolinite + Calcite

Figure A2.40: Cohasset A-52 (2221.17 m) (SEM) site 16.1 (Table A2.1). Cement made up of calcite (1) and kaolinite (4) containing relics of plagioclase (2).



Figure A2.41: Cohasset A-52 (2221.17 m) (SEM) site 16.2 (Table A2.1). Lithic clast made up of small, in preferred orientation, TiO_2 (2,5) grains in a matrix of quartz (1,6) and chlorite.

1:Quartz 2:TiO₂ + 3:Chlorite + 4:TiO₂ + Chlorite + 5:TiO₂ + 6:Quartz +



Figure A2.42: Cohasset A-52 (2221.17 m) (SEM) site 17 (Table A2.1)



1:Tourmaline 21:"Ilmenite" 2:TiO₂ 22:Tourmaline 3:Tourmaline 23:TiO₂ + Chlorite 4:Tourmaline 24:Zircon 5:K-Feldspar 25:Quartz 6:Siderite + 26:TiO₂ + 7:"Ilmenite" + 27:Calcite + 8:TiO₂ + Chlorite Chlorite 28:TiO₂ + 9:Quartz 29:Ilmenite + 10:Zircon + 11:TiO₂ 12:TiO₂ 13:Tourmaline 14:"Ilmenite" 15:Quartz 16:"Ilmenite" 17:"Ilmenite" 18:Muscovite 19:TiO₂ +

Figure A2.43: Cohasset A-52 (2221.17 m) (SEM) site 18 (Table A2.1)



24:Tourmaline 25:Ilmenite + Chlorite 3:TiO₂ + Quartz 26:Zircon 27:Chromite + 28:TiO₂ + Quartz 29:Quartz + TiO, 30:Tourmaline 31:"Ilmenite" + 32:TiO₂ + 33:Tourmaline 34:Chromite 35:"Ilmenite" + 36:"Ilmenite" + 37:Siderite 38:"Ilmenite" + Chlorite 39:Tourmaline 40:"Ilmenite" + Chlorite 41:Mix 17:TiO₂ + Quartz

Figure A2.44: Cohasset A-52 (2221.17 m) (SEM) site 19 (Table A2.1)



1:TiO₂ + Chlorite 2:Quartz 3:Calcite + Quartz 4:Ilmenite + Garnet 5:Garnet 6:Calcite + Chlorite 7:Kaolinite +

Figure A2.45: Cohasset A-52 (2221.17 m) (SEM) site 19.1 (Table A2.1). Two fragments: a) quartz (2) and TiO_2 (1); b) detrital garnet (5) associated with cement of calcite, quartz, chlorite and kaolinite (3,6,7)



1:TiO₂ + Quartz 2:"Ilmenite" 3:"Ilmenite" 4:Zircon 5:Spinel 6:TiO₂ + 7:Monazite 8:TiO₂ + Chlorite + 27:TiO₂ + 9:TiO₂ + Quartz 10:"Ilmenite" + Chlorite 11:TiO₂ 12:TiO₂ + 13:Tourmaline 14:Apatite 15:Chromite 16:TiO₂ 17:K-Feldspar 18:Garnet 19:"Ilmenite" 20:Calcite

21:Siderite 22:Siderite + Chlorite 23:TiO₂ 24:Quartz 25:Zircon 26:Calcite 28:Siderite +

Figure A2.46: Cohasset A-52 (2221.17 m) (SEM) site 20 (Table A2.1)



Figure A2.47: Cohasset A-52 (2221.17 m) (SEM) site 20.1 (Table A2.1). Partly altered detrital ilmenite (2,5) in calcite (4) cement.



Figure A2.48: Cohasset A-52 (2221.17 m) (SEM) site 20.2 (Table A2.1). Blebs and ropes of TiO_2 associated with quartz (2,6).

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0,0001.17	1 1	7m 1	40.22		17.00	1.67				0.57	2.02			4.02		-							22.10			<u> </u>		-			<u> </u>	100 0	0
2221.17	1 1	Zm +	40.32	04.92	17.38	0 1.07			0.52	0.57	2.92			4.03									33.10			<u> </u>					<u> </u>	100 9	9
2221.17	1 2	110 ₂	0.94	94.63	1.00	41 49	0.20	7 40	0.52																	<u> </u>					⊢ →	100 7	0
2221.17	1 3	Su TiO	1.20	07.00	0.63	41.40	0.39	7.42	6.70		0.21															<u> </u>						100 1	10
2221.17	1 4	110 ₂	1.29	97.00	0.02	22.42	0.45	0.00			0.21				0.24											<u> </u>					⊢	100 11	13
2221.17	1 0	1000 + Mo	52.07	73.10	0.04	23.42	0.45	0.90		2.40	6 44			2.20	0.31											<u> </u>						100 10	20
2221.17	1 0	MS	52.97	400.00	27.65	0.69		0.48		3.48	6.44			3.29												<u> </u>					⊢	95 12	44
2221.17	1 /		-	100.00	0.50	5.00	0.77	0.00	50.04					04.04												<u> </u>			<u> </u>	\vdash	⊢	100 11	14
2221.17	1 8			14.34	0.56	5.36	0.77	0.82	53.94					24.21												—					<u> </u>	100 9	2
2221.17	1 9	Chr			27.80	22.45		10.21										39.54								⊢					⊢ →	100 11	12
2221.17	1 10	llm + Cal	05.00	45.35	04.50	37.04	0.58	1.99	9.75					5.30								-				<u> </u>					⊢ →	100 10	75
2221.17	1 11	Chi	25.69	0.51	21.58	24.29	0.35	12.58			1 00															⊢						### 10	<u>J4</u>
2221.17	1 12		4.92	80.86	2.76	10.46		5.04	0.05		1.00															<u> </u>			ļļ	\square		100 7	1
2221.17	1 13	Grt	42.06	1.14	28.33	19.03	0.05	5.81	2.25		1.38															<u> </u>			└── /	\square	0.40	100 6	4
2221.17	1 14	Su +	5.01		0.20	03.90	0.85	10.80	10.16								\vdash	20 50			-		-			<u> </u>			\vdash	+	3.42	100 6	4
2221.17	1 15	TIO I CH	4.67	00.91	30.92	14.80	<u> </u>	15.70	0.50									38.58			<u> </u>		-			<u> </u>			<u> </u>	\vdash	\vdash	100 11	<u>1/</u>
2221.17	1 10		4.37	90.01	2.03	1.22	2.10		0.58				-				\vdash				-		-			<u> </u>			\vdash	+		100 10	15
2221.17	1 1/		10.05	01.12	0.79	53.79	3.16	0 1 1	7 70				<u> </u>										<u> </u>			<u> </u>	I		\vdash	\vdash	┢──┤	100 10	12
2221.17	1 10		10.95	1.34	0.00	66.24	0.62	0.13	11 02																	<u> </u>			┝──┦	\vdash	┢──┥	100 5	+
2221.17	1 19	50 T	3.39		3.51	41.00	0.03	6 10	7 40				<u> </u>								<u> </u>					<u> </u>			┝──┤	\vdash	├ ──┤	56 6	<u>-</u>
2221.17	1 20	07	00.66		+	41.90	0.49	0.12	1.48												<u> </u>					<u> </u>			\vdash	\vdash	┌──┤	100 11	22
2221.17	1 21	"llm" i Chl	39.00	00.00	0.70	17.54	0.50																			<u> </u>						100 12	20
2221.17	1 22		1.00	00.00	1.04	70.76	0.59	14.20	11 51			1 16														<u> </u>					<u> </u>	100 9	1
2221.17	1 23		0.60		0.25	26 70		14.30	11.51			1.10	72.26													<u> </u>						100 0	<u>- 1</u>
2221.17	1 25	Mix	6.07	0.53	6.14	20.73	-	0.54	55.80				12.20	28 //																	<u> </u>	100 10	20
2221.17	1 26	"llm" + Chl	1 32	73.67	1 1 11	23.90		0.54	33.00					20.44																		100 9	14
2221.17	11 1		0.75	92.90	1.58	4 48			0.29																	<u> </u>						100 10	-
2221.17	11 2	TiO ₂	0.70	02.50	1.00	2.01	-		0.20					5.45																		100 10	20
2221.17	11 3		0.83	0/ 78	0.70	3.60	-							3.43																	<u> </u>	100 8	20
2221.17	11 1		1.05	03.22	0.00	1 50			0.44																							100 0	13
2221.17	1.1 4		1.00	95.22	0.03	4.05	-		0.44																							100 3	71
2221.17	1.1 3		1.50	0.88	0.70	2.30	0.69	0.58	65 15					20.85																<u> </u> −	┌──┤	100 7	20
2221.17	1.2 1	llm +		51.68		15.46	0.03	1.85	0.47					23.05																	<u> </u>	100 0	13
2221.17	1.2 2	"llm" +	1.42	73.74		20.71	0.54	1.00	2.24																						<u> </u>	100 11	10
2221.17	13 1	Ms	47 19	1 76	30.55	2 16	-	1 33	2.24	0.67	9.53			1.81																		95 10	22
2221.17	13 2	"llm" +	4 96	72 74	0.61	20.82	0.87	1.00		0.07	0.00			1.01																		100 8	20
2221.17	1.3 3	"llm" +	0.68	70.20	0.01	28.12	1.00																			[]						100 9	18
2221 17	1.3 4	"llm" + Chl	5.57	79.25	3.36	9.98	0.63		0.41		0.80																					100 7	<u>/1</u>
2221 17	14 1	Sd +	0.01	0.65	0.00	72 60	0.90	12 26	12.54		0.00	1.07																				100 6	5
2221.17	1.4 2	Qz	98.68	0.00	0.75	0.57		0																							-+	100 12	27
2221.17	1.4 3	Sd				42.96	0.55	5.49	7.00																							56 6	0
2221.17	2 1	Tur	39.04	0.38	34.22	6.37		5.26		1.73			1	1												í	l					87 10	03
2221.17	2 2	TiO ₂	0.96	95.49	1.00	2.54																				í						100 10	00
2221.17	2 3	Qz	100.00										1																		-+	100 12	26
2221.17	2 4	Grt	40.81		20.93	24.32	0.99	7.14	5.81																	í	l					100 12	22
2221.17	2 5	TiO ₂		100.00	1																					i						100 11	14
2221.17	2 6	"llm"	1	65.54		31.18	3.28						1																			100 10	04
2221.17	2 7	Cal +		8.81		11.45	0.55	0.89	65.13					13.18																		100 7	4
2221.17	2 8	TiO ₂ +	20.57	70.48	5.09	2.98			0.53		0.35															í						100 9	4
2221.17	2 9	Tur	37.88	0.97	33.98	5.59		6.08	0.67	1.82				1																		87 10	09
2221.17	2 10	Sd + Chl	1.41	0.53		65.04	1.31	16.96	14.75				1	1												í	l					100 6	6
2221.17	2 11	Zrn	30.75		1									1									67.65							1.61		100 13	34
2221.17	2 12	Sd		0.40		40.40		7.34	7.86																	<u> </u>						56 6	;3
2221.17	2 13	TiO ₂ +	0.76	94.62	1.89	1.48			1.25																	1						100 10	03
2221.17	2 14	TiO ₂ +	0.57	97.01	0.62	1.53			0.26					1																		100 11	12
2221.17	2 15	TiO ₂ + Chl	17,99	65.35	9,41	0.74		1.30			3.03		1	2.19																		100 11	18
2221.17	2 16	Tur	37.36	0.90	32.27	4.46		7.30	0.56	2.21			1	1.95						<u> </u>												87 10	09

Sample	Site Position	Mineral	SiO2	TiO2	AI2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	ш	ō	Sc203	V205	Cr203	CoO	NiO	ZnO	SrO	ZrO2	Nb2O5	Ag2O	BaO	La2O3	Ce2O3	Nd2O3	HfO2	WO3	Total Actual T≏tal	lotal	
2221.17	2 17	Mix	1.46		0.65	36.75		7.23	41.33					12.59																		100 69)	
2221.17	2 18	TiO ₂ + Chl	1.06	97.22	0.61	1.11																										100 105	5	
2221.17	2 19	Chr		0.37	29.08	16.18		14.89										39.48														100 117	7	
2221.17	2 20	llm		50.66		45.67	0.58	2.30	0.80																							100 113	3	
2221.17	2 21	Qz	99.52		0.48																											100 128	8	
2221.17	2 22	Sd + Chl	14.48		12.66	52.70	0.00	11.86	8.30																						4.50	100 78	5	
2221.17	2 23	50		40.71		42.48	0.63	5.20	0.13																						1.50	20 03	5	
2221.17	2 24	07	100.00	49.71		41.70	5.90		2.01																							100 100	5	
2221.17	2 25	64 62	100.00			40.55	0.77	5 69	8 00																							56 61	-	
2221.17	2 27	"llm"		71 16		26 35	2.03	5.05	0.33																							100 98	2	
2221.17	2 28	Qz	99.71	71.10		0.29	2.00		0.40																							100 12/	4	
2221.17	2 29	TiO ₂	0.55	98.72		0.73																										100 10;	3	
2221.17	2 30	Ms	48.78	0.63	27.01	5.08		1.75		0.81	6.87			4.08																		95 104	4	
2221.17	2.1 1	Grt	40.70	0.35	21.07	24.12	1.00	6.96	5.79																							100 121	1	
2221.17	2.1 2	Grt	40.38		21.16	24.76	1.11	6.83	5.77																							100 123	3	
2221.17	3 1	TiO ₂		100.00																												100 111	1	
2221.17	3 2	Sd + Chl	4.75		2.60	68.55		10.89	13.22																							100 40	ງີ	
2221.17	3 3	Ар							48.58			44.61		6.80																		100 131	1	
2221.17	3 4	"llm" +	1.04	90.60	1.95	5.24			0.55									0.62														100 101	1	
2221.17	3 5	Cal + Chl	1.91		1.47	4.38		1.02	70.28					20.94																		100 70)	
2221.17	3 6	TiO ₂ + Qz	9.58	89.51		0.67					0.24																					100 117	7	
2221.17	3 7	Chr		0.34	22.03	24.10		11.79							-			41.74														100 118	8	
2221.17	3 8	Qz	100.00	54.40	0.04	00.50	4.0.4	0.04			0.05																					100 132	2	
2221.17	3 9		4.65	54.42	2.21	33.53	4.04	0.91			0.25																					100 102	2	
2221.17	3 10	$QZ + IIO_2 +$	64.65	29.98	4.12	1.25	0.05	0.00	0.45	0.00	0.00																					100 112	4	
2221.17	3 11		33.29	14.15	16.51	25.42	2 10	8.09	0.45	0.62	0.82																					100 94	4	
2221.17	3 12	TiO	0.57	09.00		41.90	3.19		0.30																							100 114	2	
2221.17	3 14	NO ₂	0.37	90.00		1.43	0.50	6 1/	4 96																						2.68	56 66	-	
2221.17	3 15	Zrn	30.95			40.30	0.50	0.14	4.30														69.05								2.00	100 124	5	
2221.17	3 16	Tur	38 79	0.47	32 64	7 13		5 90		2 07													00.00									87 106	6	
2221.17	3 17	Spl	00.10	0.54	38.07	19.97		16.24		2.01								25.19														100 11	5	
2221.17	3 18	TiO ₂		100.00																												100 110	0	
2221.17	3 19	Zrn	31.05			0.40																	68.55									100 127	7	
2221.17	3 20	Sd				40.50	0.51	6.85	6.52																						1.61	56 64	4	
2221.17	3 21	St	28.88	0.56	56.09	12.16		1.05	0.24												1.01											100 120	0	
2221.17	3 22	"llm"		71.52		28.02												0.46														100 98	3	
2221.17	3 23	TiO ₂ +	0.88	92.33	2.01	2.11			1.51			0.72						0.43														100 102	2	
2221.17	3 24	Sd + Chl	3.93		2.56	66.52		15.62	11.37											<u> </u>												100 66	;	
2221.17	3 25	TiO ₂	_	99.70	4				0.30											<u> </u>												100 113	3	
2221.17	3 26	TiO ₂		100.00																<u> </u>												100 114	4	
2221.17	3 27	Tur	37.90	1.50	32.53	7.88	0.50	4.71	0.38	2.09																						87 108	8	
2221.17	3 28		1.00	52.23	0.44	44.81	2.50		0.46																							100 112	2	
2221.17	3 29		1.28	97.19	10.44	1.10				11 01																						100 110	0	
2221.17	31 2	7.0 "llm" +	5 10	64 66	10.02	28 40	1 75			11.01																						100 120	4	
2221.17	31 3		2.66	04.00	0.52	20.49	1.75																									100 104	4	
2221.17	31 4	07 + Ms	86.29	0.57	7.93	0.85		0.57			2 71			1 07																		100 13	2	
2221 17	4 1	Chl + llm	22.55	35.69	11 58	15 46		14.33	0.39		2.71			1.07																		100 100	9	
2221.17	4 2	Cal +	1.07	00.00	11.00	29.47	0.73	3.49	54.24					11.00																		100 68	3	
2221.17	4 3	Sd				41.43	0.57	6.14	7.86																							56 61		
2221.17	4 4	TiO ₂		99.48		0.52														1												100 109	9	
2221.17	4 5	TiO ₂ +		97.02		0.41			2.58																							100 108	8	
2221.17	4 6	Ilm		54.45		44.63		0.92																								100 92	2	
2221.17	4 7	TiO ₂ + Chl	5.15	90.09	2.86	0.54			0.43		0.94																					100 108	8	
2221.17	4 8	Py		0.23		30.15			0.39				68.82								0.41											100 207	7	
Sample	Site	Position	Mineral	SiO2	Ti02	AI2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	ш	ū	Sc2O3	V205	Cr203	CoO	NiO	ZnO	SrO	ZrO2	Nb2O5	Ag2O	BaO	La203	Ce2O3	Nd2O3	HfO2	WO3	Total	Actual Total
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2221.17	4	9	TiO ₂ + Qz	13.48	85.97		0.55																										100	114
2221.17	4	10	Grt	39.51		20.95	13.94	21.88		3.71																							100	113
2221.17	4	11	Mnz							1.05			37.02													2.81		15.74	31.65	11.73			100	101
2221.17	4	12	Qz	100.00																													100	122
2221.17	4	13	Tur	37.90	2.05	28.77	4.58		9.74	2.47	1.49																						87	100
2221.17	4	14	TiO	0.64	95.13		1.78																		2.46								100	106
2221 17	4	15	"llm" + Chl	1 69	70.81	1 45	26.05																										100	81
2221 17	4	16	TiO ₂ +	0.86	92.83	0.47	5 42			0.42																							100	85
2221 17	4	17	Zrn	30.55	02.00	0.17	0.12			0.12														69.45									100	122
2221.17	4	18	Tur	36.39	1.00	33 43	3.61		7 78	1 4 5	1 57				1 77									00.40									87	105
2221.17	4	10	TiO	00.00	00.00	00.40	0.01		1.10	1.40	1.07				1.77						1												100	108
2221.17	4	20	110 ₂		52.03		42 72	0.54	2.01	0.92																							100	100
2221.17	4	20	Tur	20.24	0.72	22.72	43.72	0.54	2.01	0.02	2.04										-										\rightarrow		07	100
2221.17	4	21	1 UF 7m -	38.21	0.72	33.72	6.06		5.93	0.33	2.04						0.94							69.14									8/	1102
2221.17	4	22	2111 +	29.32		0.02	40.00		40.00	1.00							0.04		00.70					00.14									100	110
2221.17	4	23	Spi		00.44	39.76	12.80		18.60										28.78														100	115
2221.17	4	24			99.41		0.59														-												100	111
2221.17	4	25	Qz	100.00			10 - 1																										100	126
2221.17	4	26	"llm" +	15.15	61.87	8.34	10.54		2.33	0.33		1.02							0.42												\rightarrow	\rightarrow	100	97
2221.17	4	27	Zrn	30.84			0.52																	68.64							\rightarrow	\rightarrow	100	124
2221.17	4	28	Bt	41.56	2.51	17.20	17.32		10.29		0.46	6.66																					96	64
2221.17	4	29	Sd				35.53	0.34	7.91	12.21																					\rightarrow		56	60
2221.17	5	1	Sd + Chl	10.04	0.89	5.40	59.15	0.66	12.36	10.67		0.83																			\rightarrow	\rightarrow	100	59
2221.17	5	2	Tur	38.19	0.80	31.13	7.05		6.87	0.57	2.39																						87	103
2221.17	5	3	Qz + TiO ₂	87.25	11.00	0.63	0.78		0.35																								100	115
2221.17	5	4	TiO ₂ +	1.46	91.61	1.54	2.79			0.49									0.57													1.54	100	92
2221.17	5	5	Cal + TiO ₂		13.77		3.95	0.58		60.33					21.37																		100	83
2221.17	5	6	"llm' +	1.42	78.01	1.66	15.94		0.64	0.43								1.91															100	104
2221.17	5	7	Grt	41.69		22.02	19.59	1.03	10.65	5.02																							100	121
2221.17	5	8	Mix	30.06	41.49	16.20	7.24		2.51	0.64		1.84																					100	92
2221.17	5	9	Chr		0.37	12.37	24.96		8.62										53.69													_	100	115
2221.17	5	10	Cal	1.11		0.95	1.58		0.30	40.30					11.75																		56	77
2221.17	5	11	TiO ₂ + Qz	42.91	57.09																												100	116
2221 17	5	12	TiO		99.32		0.68																										100	111
2221 17	5	13	07 + Ms	78 31	0.36	14 34	2 41		1.03		0.28	3.26																			_		100	112
2221.17	5	14	Tur	38.51	0.33	30.25	5 18		9.07	1 49	2.18	0.20																				-	87	105
2221 17	5	15	Grt	40.02	0.00	20.83	28 58	3.07	1 72	5 77	2.10																						100	117
2221.17	5	16	Zrn	31.00		20.00	20.00	0.07	1.72	0.11														69.00									100	122
2221 17	5	17	Mix	16.28	64 78	7.85	7.66		0.76	0.48		2 1 9												00.00							_		100	102
2221.17	5	18	Tur	37.06	0.53	31.20	7.00		6.56	0.40	2.05	2.13									-						-				_		87	102
2221.17	5	19	Zrn	31.03	0.00	01.20	1.00		0.00	0.71	2.00								0.46					68 51									100	122
2221.17	5	20	Brt + Oz	26.42		4 55	0.56					1 25		24.63					0.40	-0.09				00.01		4	2.68					-	100	118
2221 17	5	21	Zrn	30.83			0.00					1.20	1							0.00	1	-		69 17		7	2.00				-	-	100	125
2221.17	5	22	07	100.00										<u> </u>					l		1	1	l	33.17								-	100	125
2221.17	0 5	22	Tur	40.66	0.51	27 69	8 00		7 15	0.76	2.24			<u> </u>						-						\vdash					\rightarrow	\rightarrow	87	106
2221.17	5	24	Chl	24 78	0.01	23.65	28.25	0.44	7.13	0.70	2.24																				_		###	100
2221.17	5	25	llm	24.70	51 51	20.00	16.62	0.44	7.00	1.02																							100	104
2221.17	5	20		1 1 2	05.00	1.07	40.02	0.05		7.47					1.04																		100	105
2221.17	5	20	1102 +	1.12	00.02	1.27	2.30			1.47					7.00																		100	100
2221.17	5	27	Ар	0.52			0.40		0.00	48.25			44.14		7.09						-											\rightarrow	100	123
2221.17	5	28	Ap M TO	04.05	00.05	10.01	0.46		0.32	48.76	0.41	F 45	45.17	I	5.29				I				I			\vdash						-+	100	123
2221.17	5	29	IVIS + 110 ₂	34.29	32.33	19.61	3.99	0.11	1.33	0.01	U.41	5.43		L	2.62						<u> </u>					\vdash					\rightarrow	\rightarrow	100	89
2221.17	5	30	IIM		51.60		43.74	0.48	3.81	0.36			I								I					\vdash						\rightarrow	100	108
2221.17	5	31	TIO ₂		99.22		0.78															L										\rightarrow	100	107
2221.17	5.1	1	$Mnz + Qz + TiO_2 + Chl$	24.20	10.29	2.08	3.05		0.80				28.73		-0.07														20.62	10.31			100	95
2221.17	5.1	2	TiO ₂		99.52		0.48																										100	114
2221.17	5.1	3	Qz + Ms	83.63	1.17	8.75	0.87		0.46		0.32	2.92			1.88																		100	126
2221.17	5.1	4	Mnz + TiO ₂	0.80	48.15								22.30														T		17.12	11.63	T	T	100	98
2221.17	5.1	5	$Mnz + Qz + TiO_2$	8.71	7.43								30.87		0.48						0.30							14.33	26.95	10.93			100	115

Sample	Site	Mineral	SiO2	Ti02	AI2O3	FeO	MnO	MgO	CaO	Na2O K2O	P205	SO3	ш	C	Sc2O3	V205	Cr2O3	CoO	NiO	ZnO	SrO	ZrO2	Nb2O5	Ag2O	BaO	La2O3	Ce2O3	Nd2O3	HfO2	WO3	Total Actual Total
2221.17	5.2	"llm" +	1.27	70.76	0.84	25.56	1.57																								100 101
2221.17	5.2	2 Ms + Chl	51.69	1.52	28.02	7.59		5.03	0.85	2.	53		2.76																		100 82
2221.17	5.2	3 "llm" +	0.86	70.72	0.46	25.63	1.88		0.44																						100 102
2221.17	5.2	1 "llm" +	8.21	60.47	4.40	22.99	1.80	1.13	0.32	0.	68																				100 101
2221.17	5.2	5 Ms + "IIm"	46.92	8.39	23.12	10.78		3.63	0.77	3.	31		3.08																		100 74
2221.17	5.2	3 "llm" +	2.19	68.10	0.82	27.84	1.05					_																			100 96
2221.17	5.3	TiO ₂ +	0.78	95.13	1.53	1.12			1.44																						100 112
2221.17	5.3	2 Cal +				1.43			77.79				20.78																		100 73
2221.17	5.3	3 Py + Cal		0.36		23.29			15.62			52.52	8.21																		100 173
2221.17	5.3	1 Mix	34.68	5.60	13.80	18.34		11.28	7.28	4.	96	_	4.05																		100 55
2221.17	5.3	5 Cal + Chl	1.65		0.75	3.37		1.02	67.64	0.	20	_	25.36																		100 83
2221.17	5.3	Sd		10 -0		40.94	0.78	6.31	6.66																					1.31	56 62
2221.17	5.3	/ llm +		48.76		43.28	1.31		6.65			_																			100 108
2221.17	5.3	3 Cal +				1.91	0.52		76.08			-	21.50																		100 76
2221.17	5.3	9 IIM +		55.56	-	36.22	1.28	2.43	4.51			_																			100 87
2221.17	6	Zrn	30.84		-	44.70	0.07	4 70	05.00			-	10.04									69.16			-						100 119
2221.17	6		4.00	07.00	0.00	11.79	0.27	1.76	25.93				16.24				0.04														56 76
2221.17	0		1.90	01.20	2.00	100	0.44	4.00	0.01	0.50							0.01														100 94
2221.17	6		37.10	0.73	27.09	25.50	0.60	4.30	0.49	2.30		-																			67 50
2221.17	6			00.20		0.90	0.00	11.02	0.07																						100 105
2221.17	6	7 64	-	99.20	-	20.00	0.69	0 20	7.05			-																			56 59
2221.17	6	Chr		0.46	10.66	10.22	0.00	11 42	7.05								10.22														100 110
2221.17	6		10.16	43.62	11 16	20.75		11.43	0.59	0.49		-					49.23														100 90
2221.17	6 1	Chr	13.10	40.02	15 54	28.22		7.10	0.55	0.43							49 14														100 107
2221.17	6 1	Zrn	30.75	0.66	10.04	20.22		7.10									40.14					68 59									100 121
2221.17	6 1	2 "llm"	00.70	63.76		33.05	2 71		0.49													00.00									100 99
2221 17	6 1	3 An		00.10		00.00	2		48 70		44.8	2	6.48																		100 124
2221.17	6 1	l Tur	38.35	0.92	32.63	5.82		6.63	0.75	1.91		-	0.10																		87 101
2221.17	6 1	5 Qz	100.00																												100 121
2221.17	6 1	Sd			0.41	41.10	0.40	7.06	7.03																						56 61
2221.17	6 1	7 Qz	100.00																												100 120
2221.17	6 1	3 TiO ₂ +	1.38	95.49		0.53							2.60																		100 101
2221.17	6 1) Cal +	1.09	2.00	0.59	2.90	0.68	0.77	61.10				30.86																		100 86
2221.17	6.1	Cal + Chl	1.47		1.15	1.35			64.73				31.31																		100 87
2221.17	6.1	2 "llm" +	1.01	65.99	0.70	29.29	2.71		0.28																						100 100
2221.17	6.1	3 TiO ₂ + Chl	24.98	30.39	13.18	24.12		6.03	0.57	0.50				0.24																	100 87
2221.17	6.1	TiO ₂ + Chl	5.59	82.01	3.65	5.12		1.82	0.63		1.1	В																			100 99
2221.17	6.1	5 TiO ₂ + Chl	24.05	36.19	13.23	18.71		6.54	0.73								0.54														100 92
2221.17	6.1	3 llm +	0.73	59.23		36.57	2.49	0.49									0.49														100 103
2221.17	7	Qz	100.00																												100 118
2221.17	7	2 Ap							48.23		44.2	5	6.38																	1.15	100 119
2221.17	7	3 Ар				0.43			47.15		43.5	6	8.85																		100 123
2221.17	7	Sd + Chl	2.56		1.38	68.90	0.69	15.55	10.91																						100 53
2221.17	7	TiO ₂		98.96		0.71			0.33																						100 106
2221.17	7	i TiO ₂	0.70	98.41		0.90																									100 105
2221.17	7	7 Sd	0.81		0.50	38.39		8.92	7.39																						56 60
2221.17	7	3 Qz	99.68			0.32																									100 123
2221.17	7) "llm" +	0.93	76.61	1.33	18.26	1.21		1.02					I			0.64														100 89
2221.17	7 1	Ms + Chl	82.38	0.32	9.05	2.49		0.96		2.	96		1.69				I	L		0.14											100 103
2221.17	7 1	Zrn	31.16									-	1									68.84									100 122
2221.17	7 1:	2 1102 +	7.02	89.95	1.45	0.54			0.28					I			0.76														100 105
2221.17	7 1	Cal + TiO ₂		4.24	-	3.00	0.64		67.95			_	24.16				ļ														100 77
2221.17	7 1	TiO ₂ + Chl	2.07	95.36	1.46	1.11			L					<u> </u>																	100 102
2221.17	7 1	TiO ₂		99.55		0.45																									100 106
2221.17	7 1	S "llm" + Chl	1.48	69.05	0.72	28.12			0.39					0.23																	100 91
2221.17	7 1	TiO ₂ + Qz	13.04	86.38		0.58																									100 109

Sample	Site Position	Mineral	SiO2	Ti02	AI2O3	FeO	MnO	OgM	CaO	Na2O	K20	P205	SO3	ш	C	Sc2O3	V205	Cr203	CoO	NiO	ZnO	SrO	ZrO2	Nb2O5	Ag2O	BaO	La203	Ce2O3	Nd2O3	HfO2	WO3	Total Actual	Total
2221.17	7 18	TiO ₂ +	3.21	93.28	1.28	1.55			0.28		0.40																					100 9	99
2221.17	7 19	Cal + TIO ₂		28.70	1	3.26	0.41		42.96					24.67																		100 9	94
2221.17	7 20	Zrn "Ilm"	31.00	70.46	0.69	0.45	1.00		0.50								-						68.55									100 1	29
2221.17	7 21	TIO	0.57	00.36	0.00	23.60	1.99		0.50																							100 0	90
2221.17	7 23	07	00.62	99.30	0.38	0.04																										100 1	125
2221.17	7 24	Chr	33.02	2.27	1.25	58,16	0.88	2.24									0.58	34.63														100 1	106
2221.17	7 25	Tur	38.19	0.72	31.47	8.64		5.41	0.50	2.06																						87 1	103
2221.17	7 26	Chl + Bt	40.72	2.58	22.01	23.53	0.50	6.51	0.88		3.27																					100	72
2221.17	7 27	Spl		0.63	32.55	18.76		14.84										33.22														100 1	12
2221.17	7.1 1	Zrn	31.05																				68.95									100 1	27
2221.17	7.1 2	Qz +	92.71		4.30	1.20		0.42			1.38																					100 1	16
2221.17	7.1 3	TiO ₂ +	1.35	94.55	0.70	2.98			0.42																							100 8	86
2221.17	7.1 4	TiO ₂ +	6.53	84.45	2.79	5.23			0.47		0.54						-															100 9	97
2221.17	7.2 1			99.59		0.41																										100 1	12
2221.17	7.2 2	110 ₂	00.50	99.16		0.84											-															100 1	12
2221.17	7.2 3		99.59	0.41	0.50	1 70			1 40								-															100 1	112
2221.17	73 1		+	90.24	0.53	1.79	0.52	1 02	1.43								+															100 1	13
2221.17	73 3	Cal		0.49		45.02	0.52	1.95	38.99					14 35																		56 /	80
2221.17	7.3 4	llm +		49.58		45 15	0.46	1 75	3.06					14.55																		100 1	108
2221.17	8 1	Sd		10.00		41.65	0.79	4.91	6.56																						2.09	56 €	60
2221.17	8 2	Grt	39.81		21.03	27.17	3.68	2.09	6.22																							100 1	17
2221.17	8 3	FI + IIm		47.11		8.13	0.42		23.89					20.45																		100 9	98
2221.17	8 4	Sd				41.95	0.81	6.71	6.53																							56 6	61
2221.17	8 5	llm +		51.11		45.45	0.69	1.73	1.03																							100 1	03
2221.17	86	Tur	38.45	0.79	30.45	7.46		6.90	0.70	2.25																						87 1	01
2221.17	8 7	Sd		0.36		42.53	2.13	6.04	3.64																						1.30	56 e	62
2221.17	88	"llm"		64.45	0.52	32.43	1.00	1.61																								100 9	99
2221.17	8 9	Ab	69.68	00.74	18.36					11.95																					4.00	100 1	19
2221.17	8 10			98.74	00.74	47.50		44.07									-	00.44													1.26	100 1	107
2221.17	8 11	Spi Sd i Chi	22.60	0.39	33.71	17.59		14.87	0.22		1 00							33.44														100 1	59
2221.17	8 13		1.06	06.82	0.00	42.02		10.32	0.33		1.00																					100 0	00
2221.17	8 14	Chr	1.00	0.43	11 49	15.91	1 49	12 54	0.25									58 15														100 1	110
2221.17	8 15	Tur	39.07	0.40	30.77	6.63	1.40	8 10		2 44								00.10														87 1	101
2221.17	8 16	"llm" + Chl	4.60	85.99	2.46	3.21		3.73																								100 1	111
2221.17	8 17	"llm"	0.59	68.29		30.37	0.75																									100 8	89
2221.17	8 18	Ab	67.69		19.95				1.29	11.06																						100 1	22
2221.17	8 19	Mnz	2.09									37.94		-0.56													7.91	31.95	20.67			100 9	99
2221.17	8 20	Qz +	89.33		0.67	1.58			4.44			3.98																				100 1	23
2221.17	8 21	TiO ₂ + Qz	25.13	72.30	0.40	1.70		_	0.47						I		1	L		I												100 1	18
2221.17	8 22	Tur	37.44	0.72	29.03	10.93		5.72	0.50	2.66																						87 1	06
2221.17	8 23	"llm" +	1.14	79.80	0.74	17.74	0.58						04.05		-		-															100 9	97
2221.17	8 24	Py Tio	40.45	70.07	5.40	27.73		0.00	7.87		0.00		64.39	0.40			-															100 1	88
2221.17	8 25	11U ₂ +	10.15	18.07	5.16	2.62		0.08			0.89			2.42			+															100 1	127
2221.17	8 20		100.00	01.07		1 02			2.00								1 20							2 72								100 1	112
2221.17	81 2	Pv	0.24	0.21	+	27.89			0.48				71 10				1.30							2.13								100 7	233
2221.17	81 3	Cal	0.24	0.21	+	1 84		0.41	41.93				11.19	11 82			+															56 -	76
2221.17	8.1 4	Ap	0.52	0.38		1.04		0.71	48.75			44.41		4.40	1.53		1															100 1	122
2221.17	8.1 5	llm		45.40		50.97	2.69		0.94						1					1												100 1	103
2221.17	8.1 6	Ар	0.66	0.54		0.40			47.49	0.35		44.83		4.11	1.64																	100 1	27
2221.17	9 1	Zrn	31.13																				68.87									100 1	19
2221.17	92	Cal	0.63	4.14	0.53	1.51	0.23	0.31	33.54					15.11																		56 8	85
2221.17	93	TiO ₂ +	0.65	87.99	1.90	1.55			1.10	1.09	0.43	1.30		2.65	0.69			0.65		L												100 9	98
2221.17	9 4	Tur	37.82	0.81	32.05	11.99		1.80	0.35	2.18																						87 1	02

Table A2.1: Scanning Electron Microscope chemical analyses of 2221.17 m from Cohasset A-52 well.

Sample	Site Position	Mineral	SiO2	TiO2	AI2O3	FeO	MnO	OgM	CaO	Na2O	K20	P205	SO3	H	CI	Sc2O3	V205	Cr2O3	CoO	NiO	ZnO	SrO	ZrO2	Nb2O5	Ag2O	BaO	La203	Ce2O3	Nd2O3	HfO2	WO3	Total	Actual Total
2221.17	9 5	Tur	38.56	0.84	32.11	5.04		7.60	0.36	2.51																						87	104
2221.17	96	Spl +		3.73	17.95	29.99		9.76										38.57														100	110
2221.17	9 7	Spl +	3.13	2.03	7.17	45.28		1.48	0.62								0.70	35.60			1.55										2.45	100	100
2221.17	98	Al Phos-sulf			33.34	1.04			2.07	0.52		30.36	7.01	2.43	0.25							10.35					3.44	7.17	2.02			100	105
2221.17	9 9	Zrn	31.15																				68.85									100	126
2221.17	9 10	Grt	40.18	0.35	20.81	28.56	0.48	1.27	8.36																							100	122
2221.17	9 11	QZ	100.00	0.40		40.45	0.40	0.40	0.07																						0.00	100	128
2221.17	9 12	50	07.00	0.49	24.00	40.45	0.46	6.13	0.37	4.04							-														2.08	00	54
2221.17	9 13		37.99	0.95	34.06	5.32		6.27	0.77	1.64		0.00																				8/	104
2221.17	9 14	TIO ₂ +	1.02	92.12	2.65	2.01			0.84	0.53		0.83		0.40									04.05									100	90
2221.17	9 15		33.34	04.40	4.07	0.45			0.44					2.16									64.05									100	101
2221.17	9 16	TIU ₂ +	2.14	94.48	1.37	1.01		5.00	0.41	0.54																						100	101
2221.17	9 17	IUF "Ilmo" :	37.73	0.54	30.37	10.21		5.23	0.41	2.51																						8/	50
2221.17	9 10	Chr	2.10	00.47	22.59	0.00	0.94	11 16										16 10														100	112
2221.17	9 19	Um i Mo	22.26	40.62	16 14	14 15	1.52	0.94		0.42	2.61						-	40.49														100	112
2221.17	9 20	Chr	22.30	40.03	11 85	19.15	1.00	10.62		0.43	3.01						+	58.00			-											100	112
2221.17	9 21	"llm" +	1 26	8/ //	1 70	11 /2		10.02	0.47								<u> </u>	0.71			<u> </u>											100	90
2221.17	9 22	Sd Sd	1.20	04.44	1.70	44.07	2 75	5 36	3.82								+	0.71			-											56	59
2221.17	9 24	Chr			12 11	21.37	2.15	10.15	0.02								-	56.37			<u> </u>											100	106
2221.17	9 25	07	99.62		12.11	0.38		10.10										00.07														100	119
2221.17	9 26	TiO-	00.02	95 51		0.68											1 51														2 30	100	107
2221.17	9 27	Chr		0.48	26.37	18.80		13.02									1.01	41 33													2.00	100	113
2221.17	9 28	Sd	0.94	0.40	20.57	40.53	0.93	5.49	5.98									0.32													1.81	56	61
2221.17	9 29	"llm"	0.04	65.66		32 53	1 05	0.40	0.00									0.02													1.01	100	98
2221 17	9 30	Grt	39.97	00.00	20.81	30.44	0.84	1 78	6 1 6																							100	116
2221.17	9 31	"llm" + Chl	1 19	76.56	1 05	20.95	0.04	1.70	0.10																							100	98
2221 17	9 32	Tur	38.21	0.41	30.34	5.98		9.05	0.88	2 14																						87	103
2221.17	9 33	Chr	00.21	0.41	28.13	17.32		14.52	0.00	2.14							0.40	39.62														100	115
2221.17	9 34	Ilm		51.93	20.10	43.85	0.56	2.89	0.76								0.10	00.02														100	110
2221.17	9 35	"llm" +	1.24	69.04	0.54	29.18																										100	98
2221.17	9 36	TiO		97.26		1.00								1.74																		100	89
2221.17	9.1 1	Ms	42.62	3.77	29.36	4.10		0.79		0.48	8.62		2.94	2.33																		95	124
2221.17	9.1 2	"llm"	0.50	66.64		29.43	3.43						-																			100	105
2221.17	9.1 3	Ms + "Ilm"	36.18	20.97	24.84	7.61	0.47	1.08		0.41	5.91			2.52																		100	114
2221.17	9.1 4	"llm"	0.56	72.56	0.59	23.86	2.43			-																						100	104
2221.17	10 1	TiO ₂ + Kln	39.79	41.46	14.03	1.52		0.52			0.87			1.80																		100	114
2221.17	10 2	TiO ₂		99.48		0.52																										100	110
2221.17	10 3	"llm"		80.98		19.02																										100	95
2221.17	10 4	Spl		0.33	47.03	13.92		18.88										19.84														100	114
2221.17	10 5	Chr			26.23	20.32		13.33										40.13														100	115
2221.17	10 6	Sd	0.85		0.45	39.98		8.34	6.38																							56	63
2221.17	10 7	Zrn	30.72																				69.28									100	129
2221.17	10 8	Chr			20.53	16.99		13.53										48.96														100	116
2221.17	10 9	TiO ₂ +	0.84	92.67	1.62	1.86			1.41	0.60		0.70			0.30																	100	99
2221.17	10 10	Spl			32.40	19.12		12.35										36.13														100	113
2221.17	10 11	"llm"	0.83	82.99	0.56	15.62																										100	98
2221.17	10 12	Qz	100.00														L															100	129
2221.17	10 13	Zrn	31.29																				68.71									100	128
2221.17	10 14	Grt	43.90		39.35	12.44	0.30	1.97		2.05																						100	105
2221.17	10 15	"llm" +	1.10	91.64	0.93	5.82			0.50								L															100	107
2221.17	10 16	Zrn	30.93														-						69.07									100	126
2221.17	10 17	Ms	54.36	0.36	19.86	7.33		6.54			6.19						L	0.34			L											95	98
2221.17	10 18	Chr			16.55	14.66		12.57									<u> </u>	56.23														100	112
2221.17	10 19	Mix	19.59	55.99	10.38	6.24		1.66	0.58	0.39	1.67			3.50			I				L											100	113
2221.17	10 20	TiO ₂ +	1.53	93.99	0.74	3.74											<u> </u>															100	100
2221.17	10 21	Chr		0.71	16.97	25.34		9.40									<u> </u>	47.59														100	113
2221.17	10 22	"llm" +	1.71	65.12	0.76	30.39	1.17	0.86									1															100	100

Sample Site Position	Mineral	SiO2	Ti02	AI2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	щį	ū	Sc2O3	V205	Cr203	CoO	NiO	ZnO	SrO	ZrO2	Nb2O5	Ag2O	BaO	La203	Ce2O3	Nd2O3	HfO2	WO3 Total	Actual Total
2221.17 10 23	llm +		50.62		45.29		2.67	1.42																						10	JO 110
2221.17 10 24	Tur	37.35	0.84	32.68	8.20		5.12	0.82	1.99																					8	7 104
2221.17 10 25	Cal + Chl	5.84		2.72	5.72		2.07	64.14		0.46		1	9.06																	10)0 74
2221.17 10 26	"llm" +	1.29	68.80	0.85	28.35	0.72																								10)0 85
2221.17 10 27	Zrn	30.74																				69.26								10)0 123
2221.17 10 28	Sd		0.39		41.31	0.53	5.97	7.07			0.72																			5	6 60
2221.17 10 29	Zrn +	30.79	0.58	1.21	2.00			0.43					2.23							0.46		62.31								10)0 98
2221.17 10 30	Zrn	30.98																				69.02								10)0 122
2221.17 10 31	"llm"		70.54	0.51	27.18		1.77																							1()0 96
2221.17 10 32	Zrn	30.87																				69.13								10)0 121
2221.17 10 33	Chr			13.61	17.66		8.83										59.90													10	0 107
2221.17 10 34	Spl		0.38	39.31	12.87		19.00										28.43													10)0 113
2221.17 10 35	Qz	99.47	0.53																											10	0 123
2221.17 10 36	TiO₂ + KIn +	33.26	36.77	22.92	0.76			0.45	3.00	0.87			1.97																	10	0 111
2221 17 10 37	"llm" +	5.77	65.21	4 16	22 73		1.87			0.25																				10	0 97
2221.17 10 38	Grt	30.03	00.21	19 44	20.51	8 71	0.57	10.43		0.20							0.41													10	0 116
2221 17 10 1 1	TiO ₀ +	00.00	95.18	2 22	1 1 2	0.71	0.07	0.66			0.79						0.41													10	10 107
2221.17 10.1 1		1 21	02.10	1.07	5.14			0.00			0.19							-											-	10	100 100
2221.17 10.1 2	TiO :	1.31	92.13	1.07	1 20			0.52																					\vdash	4/	109
2221.17 10.1 3	11U ₂ +	0.50	95.57	2.49	1.29		0.51	0.06					0.50					-	-							-				10	10 106
2221.17 10.2 1	Cal	0.58		0.57	1.78		0.51	40.63				1	2.50		_			l												5	0 /8 00 00(
2221.17 10.2 2	Py	0.72	0.00	0.57	29.21	4.04	0.70	0.79				68.71																		10	0 201
2221.17 10.2 3	50	04.05	0.38	40.00	40.22	1.04	0.72	7.64				00.40			-															0	0 64
2221.17 10.2 4	Py + Chi	24.05	0.67	18.32	18.94		0.73	0.89				36.40	0.04																	10	0 120
2221.17 10.2 5	Cal				1.79		0.42	43.58				1	0.21																	5	6 73
2221.17 11 1	Sd				42.33	0.63	4.89	6.28																						1.8/ 5	6 58
2221.17 11 2	Zrn +	29.20		1.36	0.86			1.78						(0.69							66.12								10	0 105
2221.17 11 3	Qz	100.00			10.07																									10	0 119
2221.17 11 4	Cal				13.87		2.13	26.62				1	3.38																	5	6 72
2221.17 11 5	Sd				44.99	0.98	4.86	3.62																						1.55 5	6 61
2221.17 11 6	Mnz										34.72		0.87						-0.09					1.10		17.60	35.71	10.09		10	0 109
2221.17 11 7	TiO ₂		98.14		1.86																									10	0 108
2221.17 11 8	Chr			18.88	14.44		9.68										56.30			0.70										10	JO 108
2221.17 11 9	Zrn +	28.45		0.72	0.52			1.22					1.71	(0.61							66.77								10	JO 113
2221.17 11 10	Bt +	39.18	7.90	23.44	16.80		3.79	2.79	0.59	5.52																				10	JO 83
2221.17 11 11	Zrn	31.02																				68.98								10	JO 121
2221.17 11 12	TiO ₂ +	2.89	95.40	1.04	0.66																									10	00 108
2221.17 11 13	Qz	100.00																												10)0 123
2221.17 11 14	"llm" +	1.75	92.64	0.90	4.70																									10)0 97
2221.17 11 15	"llm" +	1.50	86.32	1.46	10.18			0.54																						10)0 93
2221.17 11 16	Sd +	1.28			74.47		15.25	9.01																						10	0 62
2221.17 11 17	TiO ₂		96.67		0.69																		2.64							1(00 106
2221.17 11 18	Cal				1.58	0.46	0.48	39.04				1	4.44																	5	6 74
2221.17 11 19	Tur	38.32	0.89	31.66	7.46		6.17	0.63	1.88																					8	7 98
2221.17 11 20	Chr			15.77	26.92		8.58										48.73													1(0 104
2221.17 11 21	"llm"		76.12		23.88																									1(0 91
2221.17 11 22	Tur	37.71	0.55	33.27	11.06		2.27		2.14																					8	7 99
2221.17 11 23	Chr		0.35	9.77	14.66	4.02	9.64										60.37			1.19										1(00 108
2221.17 11 24	Sd + Chl	13.24	0.63	7.47	59.66	0.88	10.60	6.57		0.47							0.47													1(0 72
2221.17 11 25	Chr		0.34	19.55	18.97		11.23								(0.50	49.40													10	00 110
2221.17 11 26	Cal	0.84		0.46	2.17		0.69	36.13	l	l		1	5.70					1	l						l	l				5	6 82
2221.17 11.1 1	Qz	99.13	0.58	1	0.29					İ															l					10	0 129
2221.17 11.1 2	"llm" +	0.77	72.86	0.56	24.24	1.56	i			l									1											1(0 102
2221.17 11.1 3	Qz + Kln	91.10	6.97	1	1.93																									10	0 114
2221.17 11.1 4	TiO ₂	0.59	96.55	0.75	2.11									- 1																10	00 105
2221 17 11 1 5	Chl + "llm" +	25.09	33 74	11.52	23.34	1.00	2.98	0.57		1 77																				10	0 68
2221 17 11 1 6	TiΩ_	20.00	97.50	11.52	2 50	1.00	2.50	0.07		1								l								l				10	10 111
2221.17 11.1 0	Sd + Chl	3 1 1	0.72	1.91	60.84		13.66	10.85							-+															10	10 58
2221.17 12 1	Ou + OIII Chr	3.11	0.72	15.61	24 14		0.57	19.05							-		50.04													10	10 102
1Z Z	UIII	1	0.05	113.01	124.14		9.57										JU.U4	L	1							1		1			100

Table A2.1: Scanning Electron Microscope chemical analyses of 2221.17 m from Cohasset A-52 well.

Sample	Site Position	Mineral	SiO2	Ti02	AI2O3	FeO	MnO	OgM	CaO	Na2O	K20	P205	SO3	ш	C	Sc203	V205	Cr203	CoO	NiO	ZnO	SrO	ZrO2	Nb2O5	Ag2O	BaO	La203	Ce2O3	Nd2O3	HfO2	WO3 Total	Actual	Total
2221.17	12 3	TiO ₂		96.90		3.10																									10	JO 1	07
2221.17	12 4	Chl	28.31		21.23	28.92		5.58	0.35									0.61													##	## 8	85
2221.17	12 5	TiO ₂	0.54	99.46																											10	JO 1	11
2221.17	12 6	Qz +	94.23	5.77																											10	JO 1	26
2221.17	12 7	Grt	39.95		20.94	32.64	0.34	3.39	2.73																						10	კე 1	19
2221.17	12 8	Qz +	94.86	0.71	2.58	1.22					0.63																				10	კე 1	16
2221.17	12 9	TiO ₂ + Chl	2.25	93.14	1.81	2.46			0.33																						10	30 5	97
2221.17	12 10	Zrn	30.69																				67.65							1.65	10	JO 1	28
2221.17	12 11	Tur	37.90	0.48	32.27	7.11		6.41	0.90	1.94																					8	7 1	03
2221.17	12 12	TiO ₂ +	3.49	95.15		1.36																									10	JO 1	05
2221.17	12 13	"llm"		73.83	0.48	25.05	0.64																								10	30 5	95
2221.17	12 14	Sd + Chl	3.41	0.93	1.79	66.84		14.67	12.36																						10	JO F	62
2221.17	12 15	Crd?	57.12	1.14	27.46	4.98		6.76	1.16	1.39																					10	JO 1	04
2221.17	12 16	Zrn	30.54																				69.46								10	JO 1	19
2221.17	12 17	TiO ₂		97.94																				2.06							10	კი 1	07
2221.17	12 18	TiO ₂ + Chl	1.45	87.84	0.87	0.64			4.20					5.00																	10	30 5	93
2221.17	12 19	Cal	0.67		0.46	13.67		2.13	28.37					10.69																	5	6 7	74
2221.17	12 20	"llm" +	25.10	63.57	4.23	4.76		2.34																							10	JO 1	02
2221.17	12 21	"llm"		66.49		32.30	0.58	0.63																_							10	JO 🤅	97
2221.17	12 22	Zrn	30.82																				67.68							1.50	10	JO 1	26
2221.17	12 23	TiO ₂		100.00																											10	JO 1	08
2221.17	12 24	Zrn	31.11																				68.89								10	JO 1	22
2221.17	12 25	"llm" + Chl	11.97	71.90	6.09	5.84		1.27	1.05		1.15	0.74																			10	JO 🤉	93
2221.17	12 26	Kfs	64.93		17.32				2.41	0.81	14.53																				10	JO 1	16
2221.17 1	2.1 1	Cal + Chl	1.29	1.25	0.79	2.23		0.61	67.79					26.04																	10	30 E	81
2221.17 1	2.1 2	TiO ₂ +	4.91	91.85	1.67	1.57																									10	JO 8	86
2221.17 1	2.1 3	Qz + TiO ₂	63.66	35.88		0.47																									10	JO 1	24
2221.17 1	2.1 4	TiO ₂ + Chl	15.77	58.08	9.81	10.64		5.69																							10	JO 1	09
2221.17	13 1	Tur	38.53	0.54	33.56	1.27		9.92	1.33	1.84																					8	7 1	02
2221.17	13 2	Ар							48.74			45.04		6.21																	10	JO 1	25
2221.17	13 3	TiO ₂ + Ms	27.21	49.01	12.37	2.82		1.01			5.04			2.54																	10	JO 1	15
2221.17	13 4	Tur	37.71	1.01	33.53	6.45		5.78	0.41	2.11																					8	7 1	06
2221.17	13 5	Zrn +	32.50		5.68	0.87			1.62		1.27			1.84		1.46							53.79		0.97						10	JO 1	04
2221.17	13 6	Zrn	31.18																				68.82								10	JO 1	27
2221.17	13 7	Sd +	4.01		2.30	72.05	0.83	9.26	7.75																						3.80 10	JO 6	68
2221.17	13 8	Ilm +Chl	20.11	37.25	11.69	27.14	0.43	2.35	0.39		0.64																				10)0 e	90
2221.17	13 9	Chr		0.40	13.00	20.75		11.66										54.18													10	JO 1	12
2221.17	13 10	Tur	38.17		29.60	8.04		7.59	1.45	2.16																					8	7 1	103
2221.17	13 11	"llm"		74.18		24.82	0.99																								10)0 é	97
2221.17	13 12	"llm" +	1.39	83.90	1.24	13.01			0.46				$ \downarrow \downarrow$						L	<u> </u>											10	<u>)0 </u>	97
2221.17	13 13	TiO ₂ + Cal		33.39		2.24			44.49					19.88																	10	30 8	83
2221.17	13 14	"llm" + Chl	1.42	71.15	1.25	26.18																									10	30 6	86
2221.17	13 15	Sd +				49.27	0.73	5.80	29.04					12.23						<u> </u>											2.92 10	<u>JU 6</u>	ö7
2221.17	13 16	Zrn	30.64																L	<u> </u>			69.36								10	<u>J0 1</u>	21
2221.17	13 17	"llm" + Chl	0.91	76.62	0.66	21.08	0.74							10.0-																	10	<u>J0 9</u>	91
2221.17	13 18	Cal	0.45		0.43	3.49		0.66	40.62				74.44	10.35																	5	<u>6 6</u>	86
2221.17	13 19	Py				28.56							/1.44																		10	J0 2	234
2221.17	13 20		0.5.1		0.40	2.26	0.00	0.57	42.27					10.90						<u> </u>											5	<u>6 6</u>	09
2221.17	13 21		2.54	00.00	2.10	69.35	0.88	8.21	16.91																							4	46
2221.17	13 22	110 ₂ +	0.75	92.89	0.89	2.31		2.22	3.16	0.20				254																			00
2221.17	13 23		43.50	C4 40	31.98	5.04		2.22	0.36	0.30				2.54																	- 8		92
2221.17	13 24	TiO TiO	0.29	01.43	3.72	1.79			9.69					15.09																-		10 1	111
2221.17	3.1 1		0.54	98.84	22.70	0.62		4 57			7 4 0		\vdash	0.75																		1 10	110
2221.17	3.1 2		44.15	17.83	23.18	2.80		1.5/	0.40	0.44	1.12			2.15					-	1						-			-		- 10	1 1	19
2221.17	3.1 3	$\overline{NIII + OII + IIO_2 + OII}$	43.47	17.63	20.40	27.00		1.85	0.46	0.44	2.58		62.65													1			1				59 19F
2221.17	3.1 4		4.78	0.95	2.79	21.26		1.22			0.35		02.05																	-		1 10	CO
2221.17	3.1 5	11U ₂ +	1.44	90.67	0.58	1.04					0.27									1											10	JU 1	11

Table A2.1: Scanning Electron Microscope chemical analyses of 2221.17 m from Cohasset A-52 well.

····································	Sample	osition	dineral	SiO2	TiO2	AI2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	ш	ō	Sc203	V205	Cr203	CoO	NiO	ZnO	SrO	ZrO2	Vb2O5	Ag2O	BaO	La203	Ce2O3	Nd2O3	HfO2	WO3	Total	Actual Total
Direction Direction <thdirection< th=""> <thdirection< th=""> <thd< td=""><td>2221 17 1</td><td>/ 1</td><td></td><td>30.75</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>-</td><td></td><td></td><td></td><td></td><td>60.25</td><td>-</td><td></td><td></td><td>_</td><td>•</td><td>-</td><td></td><td></td><td>100</td><td>121</td></thd<></thdirection<></thdirection<>	2221 17 1	/ 1		30.75															-					60.25	-			_	•	-			100	121
2010 10 100 <td>2221.17 1</td> <td>4 2</td> <td>Cal</td> <td>50.75</td> <td></td> <td></td> <td>5.19</td> <td></td> <td>1.11</td> <td>39.76</td> <td></td> <td></td> <td></td> <td></td> <td>9.93</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>03.25</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>56</td> <td>72</td>	2221.17 1	4 2	Cal	50.75			5.19		1.11	39.76					9.93									03.25									56	72
S2117 Id S <td>2221.17 1</td> <td>4 3</td> <td>TiO₂</td> <td></td> <td>97.47</td> <td></td> <td>0.86</td> <td></td> <td>1.67</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>100</td> <td>112</td>	2221.17 1	4 3	TiO ₂		97.47		0.86																		1.67								100	112
1 1	2221.17 1	4 4	Tur	39.72	0.71	28.04	8.36		7.91	0.65	1.60																						87	114
22117 14 15 14 17 18 17 18	2221.17 1	4 5	TiO ₂ +	1.14	95.03	1.40	1.46			0.46			0.52																				100	107
22117 14 72m 142 72m 142 72m 144 72m 144 72m 144 70m 72m 72m <td>2221.17 1</td> <td>4 6</td> <td>Py</td> <td></td> <td></td> <td></td> <td>28.51</td> <td></td> <td></td> <td>0.33</td> <td></td> <td></td> <td></td> <td>71.16</td> <td></td> <td>100</td> <td>230</td>	2221.17 1	4 6	Py				28.51			0.33				71.16																			100	230
22117 14 15 15 15 16 16 17 100 100	2221.17 1	4 7	Zrn	31.26																				68.74									100	129
22211 141 0 m / L ⁴ 1/m 4.30 1/m 4.30 1/m 4.30 1/m	2221.17 1	4 8	Tur	38.89	0.61	32.98	5.14		7.00	0.74	1.64																						87	107
Solution Dial	2221.17 1	4 9	llm + Chl +	17.69	34.36	8.76	34.30	0.63	2.55	0.48	0.58	0.66																					100	86
Solar Solar <th< td=""><td>2221.17 1</td><td>4 10</td><td></td><td>37.73</td><td>0.58</td><td>33.80</td><td>8.68</td><td>1 10</td><td>3.91</td><td>0.26</td><td>1.97</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>87</td><td>108</td></th<>	2221.17 1	4 10		37.73	0.58	33.80	8.68	1 10	3.91	0.26	1.97																						87	108
222117 1413 Thr 000 71.8 001 00	2221.17 1	4 11		1 17	95.95	0.87	44.20	1.10	0.74						2.12																		100	103
matrix 14 14 2m 1	2221.17 1	4 12	"llm"	0.66	71 16	0.07	27.64	0.54							2.12																		100	103
22217 141 150 2 1	2221.17 1	4 14	Zrn	30.99	71.10		27.04	0.04																69.01									100	126
2221.71 141 (6 1m ⁻¹) 104 63.8 20.01	2221.17 1	4 15	Qz	100.00																													100	128
2221.71 141 1784 + Ch 1641 1.71 1083 0.28 0.28 0.28 0.27 <td>2221.17 1</td> <td>4 16</td> <td>"llm" +</td> <td>10.04</td> <td>63.88</td> <td></td> <td>26.08</td> <td></td> <td>100</td> <td>99</td>	2221.17 1	4 16	"llm" +	10.04	63.88		26.08																										100	99
2221.71 44 16 Tur 37.86 0.40 35.71 127.8 147 1	2221.17 1	4 17	Sd + Chl	16.54	1.17	10.83	50.28	1.02	12.33	6.47		1.35																					100	34
2221.71 1419 Chi+ 35.01 1.75 f 21.81 33.74 6.28 0.43 0.4	2221.17 1	4 18	Tur	37.58	0.40	33.71	12.58	0.37	0.37		1.97																						87	104
2221.17 142.01	2221.17 1	4 19	Chl +	35.01	1.75	21.81	33.74		6.29	0.43	0.54	0.43							40.05														100	79
Zddi.10 Hd Zddi.07	2221.17 1	4 20	Chr	20.20	0.39	20.82	29.40		8.54	0.74	4.07								40.85														100	110
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	2221.17 1	4 21	Grt	38.39	0.64	20.82	23 38	1 37	0.83	5.93	1.97																						100	117
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	2221.17 1	4 22	"llm"	41.23	71.04	0.67	27.68	1.57	0.61	5.95																							100	98
2221.77 14 (25)Zm 31.20 10 10 10 10 10 100 113 2221.77 14 (25)Zm 31.53 15.72 14.64 300 2.13 21.07 14 (25)Zm 77.86 </td <td>2221.17 1</td> <td>4 24</td> <td>"llm" +</td> <td>0.76</td> <td>79.45</td> <td>1.37</td> <td>17.40</td> <td></td> <td>0.01</td> <td>0.57</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>0.44</td> <td></td> <td>100</td> <td>93</td>	2221.17 1	4 24	"llm" +	0.76	79.45	1.37	17.40		0.01	0.57									0.44														100	93
2221.71 14 26 Spl 14.42 12.82 16.06 27.28 27.28 0 0 100 113 2221.71 14 26 Chi 14.64 23.81 12.60 2.45 0	2221.17 1	4 25	Zrn	31.20																				68.80									100	118
2221.71 14 (27 Mx 31.53 15.72 14.64 3.09 2.13 2.12 8.75 0.0 0 100 144 2221.71 14 (29 llm 76.55 22.45 10.60 12.42 3.51 0 <	2221.17 1	4 26	Spl			41.42	13.25		18.05										27.28														100	113
2221.17 14.28 Ch1+8t+ 3.25 3.48 10.60 12.42 3.51 1	2221.17 1	4 27	Mix	31.53		15.72	14.64	3.09	2.13	24.12					8.75																		100	114
2221.17 14.29 Imm T C55 23.45 Imm	2221.17 1	4 28	Chl + Bt +	32.59	3.49	14.06	23.33		10.60	12.42		3.51																					100	63
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	2221.17 1	4 29	llm		76.55		23.45																										100	96
2221.17 14 31 Imm 0.72 7.9.36 0.73 0.50 9.75 13.82 0.00	2221.17 1	4 30	Zrn	31.24			0.40																	68.36									100	128
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	2221.17 1	4 31	"llm"	0.72	75.36	0.73	23.19		0.50	00.75			-		40.00																		100	98
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	2221.17 1	4 32	Grt	41.40		21.00	1.93	0.92	10.00	39.75					13.82																		100	120
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	2221.17 1	4 33	TiΩ. +	1 54	97 11	0.60	0.49	0.02	10.90	1.01		0.27																					100	111
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	2221.17 14	1 1	Cal	1.54	37.11	0.00	0.93			43.00		0.21			12 07																		56	75
12221.17 14.1 3 kin 47.10 36.84 0 0 2.06 0 0 0 0 0 0 0 0 86 105 2221.17 14.1 5 kin 48.40 37.22 0.38 0 9.38 0 0 0 0 0 0 0 0 86 104 2221.17 14.1 6 kin 47.69 35.50 0.82 1.99 0.64 0 0 0 0 0 86 100 86 100 82 0.64 0 0 0 0 0 0 86 100 82 0.64 0 0 0 0 22 0 86 100 82 0.64 0 0 0 0 0 0 22 22 28.74 0.64 0<	2221.17 14.	1 2	Grt	40.50		20.78	20.71	3.95	3.26	10.80					12.07																		100	120
1221.17 14.1 4 Cal 0.37 1.91 44.34 C 9.38 C C C C C C C S C S C <thc< th=""> C <thc< th=""> <thc< td="" th<=""><td>2221.17 14.</td><td>1 3</td><td>KIn</td><td>47.10</td><td></td><td>36.84</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>2.06</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>86</td><td>105</td></thc<></thc<></thc<>	2221.17 14.	1 3	KIn	47.10		36.84									2.06																		86	105
2221.17 14.1 5 Kn 48.40 37.22 0.38 0 </td <td>2221.17 14.</td> <td>1 4</td> <td>Cal</td> <td></td> <td></td> <td>0.37</td> <td>1.91</td> <td></td> <td></td> <td>44.34</td> <td></td> <td></td> <td></td> <td></td> <td>9.38</td> <td></td> <td>56</td> <td>71</td>	2221.17 14.	1 4	Cal			0.37	1.91			44.34					9.38																		56	71
2221.17 14.1 6 Kin 47.69 35.0 0.82 199 0.64 0	2221.17 14.	1 5	Kln	48.40		37.22				0.38																							86	104
1221.17 15 1 lm + Kts 32.44 32.26 13.83 13.15 3.45 0.86 0.57 3.28 0.64 0 0 0 0 0 22 2221.17 15 2 Py 0.27 28.74 0.24 0.24 70.76 0 0 0 0 0 20 100 82 2221.17 15 3 lm + Ch 30.11 17.01 18.44 22.60 0.38 10.41 0.36 0.59 0 <t< td=""><td>2221.17 14.</td><td>1 6</td><td>Kln</td><td>47.69</td><td></td><td>35.50</td><td></td><td></td><td></td><td>0.82</td><td></td><td></td><td></td><td></td><td>1.99</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>86</td><td>100</td></t<>	2221.17 14.	1 6	Kln	47.69		35.50				0.82					1.99																		86	100
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	2221.17 1	5 1	llm + Kfs	32.14	32.26	13.63	13.15		3.45	0.86	0.57	3.28		70 70		0.64																	100	82
1221.17 15 5 min + Cin 30.11 17.10 16.4 220.0 0.59 0.59 0 0 0 0 0 93 2221.17 15 4 11m* 73.74 0.52 25.74 0 <t< td=""><td>2221.17 1</td><td>5 2</td><td>ry Im i Chi</td><td>0.27</td><td>17.40</td><td>10.44</td><td>28.74</td><td>0.20</td><td>10.44</td><td>0.24</td><td>0.50</td><td></td><td></td><td>10.76</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td><u> </u></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>100</td><td>225</td></t<>	2221.17 1	5 2	ry Im i Chi	0.27	17.40	10.44	28.74	0.20	10.44	0.24	0.50			10.76								<u> </u>											100	225
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	2221.17 1	5 1	"lim"	30.11	73.74	0.52	22.00	0.38	10.41	0.36	0.59																						100	94
Instruction	2221.17 1	5 5	Sd		13.14	0.52	40 12	0.67	6 30	7 40																						1 51	56	64
2221.17 15 7 11m* + 2.99 84.87 3.75 6.91 0.65 0.83 0 0.00 0 0 0 97 2221.17 15 8 TO2 + 7.90 87.91 2.38 1.05 0.76 0	2221.17 1	5 6	Chr			13.18	19.33	0.07	11.16	7.40									56.33													1.51	100	112
2221.17 15 8 $TO_2 +$ 7.90 87.91 2.38 1.06 0 0.76 0 0 0 0 0 0 0 0 100 114 2221.17 15 9 TO_2 + 0.89 92.88 1.82 1.89 0.81 0.44 1.27 0	2221.17 1	5 7	"llm" +	2.99	84.87	3.75	6.91			0.65			0.83																				100	97
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	2221.17 1	5 8	TiO ₂ +	7.90	87.91	2.38	1.05					0.76																					100	114
2221.17 15 10 Py 0.22 30.03 0.25 69.50 0 0 0 0 100 226 2221.17 15 11 Mix 26.71 1.30 0.05 0.48 47.84 0.69 0.23 20.35 0 </td <td>2221.17 1</td> <td>5 9</td> <td>TiO₂ +</td> <td>0.89</td> <td>92.88</td> <td>1.82</td> <td>1.89</td> <td></td> <td></td> <td>0.81</td> <td>0.44</td> <td></td> <td>1.27</td> <td></td> <td>100</td> <td>99</td>	2221.17 1	5 9	TiO ₂ +	0.89	92.88	1.82	1.89			0.81	0.44		1.27																				100	99
2221.17 15 11 Mix 26.71 1.30 2.05 0.48 47.84 0.69 0.23 20.35 100 96 2221.17 15 12 Qz 100.00 100 96 2221.17 15 13 Qz 100.00 100 96 2221.17 15 13 TO2 + 0.90 90.72 1.68 1.87 0.78 0.78 2.18 0.25 0.90 98 2221.17 15 14 Qz 99.03 0.97 100 98 2221.17 15 15 TO2 + 0.70 97.59 1.71 100 100 122	2221.17 1	5 10	Py		0.22		30.03			0.25				69.50																			100	226
2221.17 15 12 Qz 100.00 Image: Constraint of the constraint of	2221.17 1	5 11	Mix	26.71		1.30	2.05	0.35	0.48	47.84	0.69	0.23			20.35																		100	96
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	2221.17 1	5 12	Qz	100.00																		L											100	125
2221.17 15 14 UZ 99.03 0.97 0.97 1.01 122 2221.17 15 15 TiO2 + 0.70 97.59 1.71 0 0 0 0 0 100 122 2221.17 15 16 TiO2 + 0.70 97.59 1.71 0 0 0 0 0 100 100 100 108 2221.17 15 16 TiO2 + 30.71 0 0 0 0 0 100 125 2221.17 15 17 Zm 31.05 0 0 0 0 0 120 125 2221.17 15 18 TiMe* 60.37 37.92 1.71 0 0 0 0 0 0 100 125 2221.17 15 18 TiMe* 60.37 37.92 1.71 0 0 0 0 0 0 0 100 125	2221.17 1	5 13	TiO ₂ +	0.90	90.72	1.68	1.87			1.08	0.54		0.78		2.18	0.25						L											100	98
12221.17 15 16 2m 0.70 97.59 1.71 100 108 2221.17 15 16 Zm 30.71 1 <td>2221.17 1</td> <td>5 14</td> <td>Qz</td> <td>99.03</td> <td>0.97</td> <td></td> <td>4 71</td> <td></td> <td>100</td> <td>122</td>	2221.17 1	5 14	Qz	99.03	0.97		4 71																										100	122
Image: Construction of the system Solution	2221.1/ 1	5 15	11U ₂ + 7m	0.70	97.59		1./1											+						67.00							1.00		100	108
2221.17 15 18 "IIIm" 60.37 37.92 1.71 100 123	2221.17 1	5 17	∠III 7m	30.71					-				-										-	68.05							1.93		100	129
	2221.17 1	5 18	2 "Ilm"	31.05	60.37		37.92	1.71														-		00.95									100	99

Sample Site Position Mineral	Si02	Ti02	AI2O3	FeO	MnO	MgO	CaO	Na2O	K2O	P205	SO3	ш	C	Sc2O3	V205	Cr2O3	CoO	NiO	ZnO	SrO	ZrO2	Nb2O5	Ag2O	BaO	La203	Ce2O3	Nd2O3	HfO2	WO3	Total Actual Total
2221.17 15 19 "llm" +	1.96	74.21		21.91	1.92																									100 84
2221.17 15 20 Py	0.35	0.21		28.72							70.72																			100 226
2221.17 15 21 Chr +	1.18	0.86	14.47	19.03	0.93	5.39										56.64			1.51											100 109
2221.17 15 22 Sd	1.01		0.68	40.28	0.59	8.84	4.61																							56 59
2221.17 15 23 Grt	40.46		21.62	33.83	0.46	3.10	0.54																							100 118
2221.17 15 24 Grt	40.37		20.20	27.89	1.34	3.34	6.86																							100 115
2221.17 15 25 Ab	67.78		18.98	1.38		0.37		11.49																						100 121
2221.17 15 26 TiO ₂ +	0.74	71.94	0.69	1.35			6.18					19.10																		100 129
2221.17 15 27 TiO ₂		100.00																												100 106
2221.17 15 28 Pv				28.64			0.15				71.21																			100 237
2221 17 15 29 07 +	87.46		3.85	0.58			1 92		0.36			5.82																		100 118
2221 17 15 30 TiO +	1.00	03 25	2.05	1.80			0.03		0.00	0.97		0.02																		100 102
2221.17 15 30 110 ₂ +	02.22	33.23	2.00	2 11		0.00	0.33		0.59	0.37																				100 102
2221.17 15 51 Q2 + 011	50.41	0.55	3.27	5.11		2.07			0.30																					05 106
2221.17 15.1 1 Mis	20.25	E0.00	10.11	1.00		3.07			9.42																					95 100
2221.17 13.1 2 11U ₂ + MS	20.35	56.20	12.30	4.82		1.91			2.41		I	4 70					+									-				100 104
2221.17 15.1 3 MS + 110 ₂ +	23.63	54.61	11.65	2.41		1.66			4.32		I	1.72																		100 116
2221.17 15.1 4 Ms + TiO ₂ +	43.85	16.59	24.24	3.20		2.10			7.82		I	2.21																		100 115
2221.17 16 1 TiO ₂		99.53		0.47																										100 104
2221.17 16 2 Sd +	1.24			75.14	2.27	9.63	8.50																						3.23	100 62
2221.17 16 3 Mix	14.28	0.54	11.35	2.49		0.70	41.00		0.34			29.31																		100 98
2221.17 16 4 TiO ₂	0.74	97.28		1.99																										100 97
2221.17 16 5 Grt	40.81	0.38	21.18	22.49	0.41	6.05	8.68																							100 117
2221.17 16 6 Mix	76.19		0.86	15.63		4.35	2.97																							100 79
2221.17 16 7 TiO ₂ + Chl	7.91	74.73	4.40	0.62					1.14	4.61																4.38	2.22			100 101
2221.17 16 8 "llm" +	14.19	67.44	7.70	7.69		1.38	0.41		1.19	-																				100 75
2221 17 16 9 07	100.00																													100 120
2221 17 16 10 "lim"	100.00	92.04		7.52	0.45																									100 89
2221 17 16 11 Grt	39.41	0.34	20.78	15.48	20.67	0.89	2 4 1																							100 111
2221 17 16 12 TiO-	00.11	98.95	20.70	1.05	20.07	0.00	2.11																							100 104
2221.17 16 12 TiO	1.00	07.01	0.42	0.57																										100 104
	1.09	97.91	0.42	1 0.57			40.52					12.66																		F6 72
2221.17 10 14 Cal	100.00		-	1.01			40.55					13.00																		100 119
	100.00	05.05	0.00	0.00			0.05																							100 116
2221.17 16 16 110 ₂ +	1.01	95.65	0.96	2.03			0.35														07.47							4.45		100 104
2221.17 16 17 Zm	31.08	0.00	04.00	0.00		7.00	4 70	4.50													67.47							1.45		100 122
2221.17 16 18 Iur	37.78	0.93	31.36	6.30		7.33	1.72	1.58																						87 100
2221.17 16 19 Ms + IIO ₂	42.84	16.85	26.85	0.90		1.05	0.57		6.98			3.95																		100 115
2221.17 16 20 Grt	41.18		21.78	22.59	0.54	7.22	6.69																							100 116
2221.17 16 21 Chr			5.52	16.37		12.32										65.79														100 106
2221.17 16 22 Sd				41.27	0.79	3.34	8.13																						2.46	56 60
2221.17 16.1 1 Cal				0.90			37.63					17.47																		56 85
2221.17 16.1 2 Olig	63.98		17.36	0.37			5.88	11.26				1.15																		100 121
2221.17 16.1 3 Contaminant	13.30		3.16	2.21		0.75	16.40	1.42	0.95			13.96					I												###	100 103
2221.17 16.1 4 Kln + Cal	49.10		36.94	0.68			10.91					2.37																		100 86
2221.17 16.2 1 Qz	99.51	0.49										L																		100 126
2221.17 16.2 2 TiO ₂ +	2.69	96.87		0.44																										100 111
2221.17 16.2 3 Chl +	39.60	1.24	21.30	30.47		6.26	0.75		0.39																					100 64
2221.17 16.2 4 TiO ₂ + Chl +	31.47	22.71	17.80	22.63		4.48	0.43		0.49																					100 68
2221.17 16.2 5 TiO ₂ +	1.45	97.29	0.48	0.53			0.25																							100 110
2221.17 16.2 6 Qz +	96.03	0.38	2.58	0.43		l l			0.58		İ																			100 125
2221.17 17 1 Sd		5.00	1	41.26	1.05	4.31	9.37		2.00		1	1					1						-							56 59
2221 17 17 2 Sd				41.55	0.52	6.54	7 40										1													56 58
2221 17 17 3 Tur	38.07	0.67	32 78	5.92	0.02	6.70	0.81	2.05			1						1													87 102
2221 17 17 4 Zrn	30.72	0.07	102.70	0.02		0.70	0.01	2.00			1						1				69.28									100 125
2221 17 17 5 Cal	00.72		1	1 70		0.38	30 35				1	14 4 8					1				55.20		-		l					56 79
2221 17 17 6 TiO	-	100.00	1	1.19		0.00	00.00				1	1-7.40					1						-							100 111
2221.17 17 0 1102 2221.17 17 7 Ilm (Chi	12 77	50.00	11.22	15.01	0.47		0.40					 					+						-							100 91
	13.77	39.02	11.33	15.01	0.47		0.40		0.05		<u> </u>						+								<u> </u>					100 91
2221.17 17 8 $10_2 + QZ$	∠0.33	/ 6.81	1.46	1.15				1	0.25		1	1					1								1					100 102

Sample	Site	Position	Mineral	SiO2	Ti02	AI2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	ш	CI	Sc2O3	V205	Cr2O3	CoO	NiO	ZnO	SrO	ZrO2	Nb2O5	Ag2O	BaO	La203	Ce2O3	Nd2O3	HfO2	WO3	Total Actual Total
2221.17	17	9	llm		52.61		44.54	0.55	1.86	0.44																							100 108
2221.17	17	10	Chr		0.59	19.59	31.33		6.00										42.50														100 107
2221.17	17	11	Sd + Chl	26.10	0.76	16.23	44.25	0.62	8.43	3.61																							100 50
2221.17	17	12	Ms +	74.70		16.77	1.16					7.37																					100 107
2221.17	17	13	Zrn	30.83																				69.17									100 119
2221.17	1/	14	11O ₂ +	1.91	90.52	2.46	1.63			0.51			0.81		2.16																		100 94
2221.17	17	15	Zrn O TIO	31.02	40.40	0.50	0.00																	68.98									100 121
2221.17	17	16		79.71	19.10	0.53	0.66			40.40		-	44.57		7.00								-				-						100 118
2221.17	1/	17	Ap	27.62	0.90	22.60	0.44		2.20	48.43	1.00		44.57		7.00																		100 124
2221.17	10	2	Tio	37.03	0.00	33.09	9.44		3.20	0.25	1.99																						100 06
2221.17	10	2	TIU2	29.00	93.97	2.24	2.01		5.02	0.60	1.04																						97 101
2221.17	10	4	Tur	20.09	0.97	22.00	6.20		5.02	0.03	1.94																						87 101
2221.17	18	5	Kfs	66.26	0.55	17.83	0.55		5.50	0.50	0.83	15.09																					100 116
2221.17	18	6	Sd +	2.12		11100	73.76	1.01	8.74	14.37	0.00	10.00																					100 48
2221.17	18	7	"llm" +	5.53	84.36	3.80	5.35		0.52			0.44																					100 105
2221.17	18	8	TiO ₂ + Chl	12.05	77.83	7.09	1.79					1.23																					100 99
2221.17	18	9	Qz	97.47		0.75	1.02		0.76																								100 119
2221.17	18	10	Zrn +	29.44		1.45	0.95			1.76					2.21		0.60							61.53							2.07		100 95
2221.17	18	11	TiO ₂	0.64	99.09					0.27																							100 106
2221.17	18	12	TiO ₂		100.00																												100 106
2221.17	18	13	Tur	37.82	2.37	30.51	6.80		6.49	0.88	2.12																						87 101
2221.17	18	14	"llm"		72.42		26.94		0.64																								100 95
2221.17	18	15	Qz	100.00																													100 122
2221.17	18	16	"llm"		71.08		27.45	1.48																									100 97
2221.17	18	17	"llm"		66.81		31.32	1.87																									100 86
2221.17	18	18	Ms	48.50	0.51	28.84	2.52		1.62			9.71			3.30																		95 115
2221.17	18	19	TiO ₂ +	0.91	93.64	2.29	2.81			0.36																							100 101
2221.17	18	20	Cal +	13.33	1.01	6.46	16.55		4.59	45.32					12.73																		100 86
2221.17	18	21	-11m- Tur	20.71	79.10	0.65	20.25		7.00	0.70	0.15																						100 96
2221.17	10	22		2 2 4	0.67	2 72	3.72		1.23	0.70	2.15																						100 09
2221.17	10	23	7m	21 10	90.04	2.73	3.15			0.24														69.00									100 90
2221.17	18	25	07	100.00																				00.30									100 123
2221.17	18	26	TiO ₂ +	9.07	82 50	5 75	1 1 1					1 57																					100 113
2221.17	18	27	Cal + Chl	3.60	02.00	2.06	6.52		1 67	64 72		0.25			21 17																		100 77
2221.17	18	28	TiO ₂ +	1.19	77.65	0.89	2.41			14.09		0.20			3.77																		100 103
2221.17	18	29	llm +		50.80		44.47	0.76	2.59	1.38																							100 107
2221.17	19	1	Chr			17.02	25.24		9.86										47.88														100 108
2221.17	19	2	Grt	39.54		19.99	15.23	18.92	0.49	5.83																							100 114
2221.17	19	3	TiO ₂ + Qz	30.96	69.04																												100 116
2221.17	19	4	Chr		0.62	12.05	14.24	1.62	6.92										64.56														100 105
2221.17	19	5	Tur	37.64	1.08	32.46	9.52		3.78	0.50	2.03									L													87 103
2221.17	19	6	Zrn	30.39																L				67.90							1.71		100 130
2221.17	19	7	Qz	100.00																													100 126
2221.17	19	8	"llm " +	2.13	82.13	2.22	13.17			0.35																							100 102
2221.17	19	9		44.40	97.29	0.87	0.91		40.05	0.32		0.51	0.61								<u> </u>												100 108
2221.17	19	10		14.19	1.45	10.38	23.91	1 1 4	10.35	9.21		0.51								-	+											2.01	100 71
2221.17	10	12		1.99		1.32	70.04	0.86	9.32	12.01											+											3.91	100 58
2221.17	19	13	Chr	1.00		10.45	18.37	1.50	9 14	12.02									58 61		+	1 94											100 113
2221.17	19	14	Cal			10.40	2.19	1.00	0.54	39.93					13.34				30.01	-		1.54											56 77
2221.17	19	15	"llm"	0.60	65.71		32.39	1.29																									100 93
2221.17	19	16	TiO ₂ +	1.57	92.61	1.85	1.86			0.58	0.53		1.01								1												100 102
2221.17	19	17	TiO ₂ + Qz	28.97	70.70		0.33																										100 118
2221.17	19	18	TiO ₂ +	0.63	95.12	1.72	0.80			0.86			0.88																				100 101
2221.17	19	19	Grt	40.46		20.58	21.84	9.26	1.44	6.42										1											1		100 114

Sample	Site Position	Mineral	SiO2	Ti02	AI2O3	FeO	MnO	OgM	CaO	Na2O	K20	P205	SO3	F	C	Sc2O3	V205	Cr2O3	CoO	NiO	ZnO	SrO	ZrO2	Nb2O5	Ag2O	BaO	La2O3	Ce2O3	Nd2O3	HfO2	WO3	Total	Actual Total
2221.17	19 20	Zrn	30.76																				69.24									100	121
2221.17	19 21	TiO ₂ + Qz	11.65	87.96	0.39																											100	111
2221.17	19 22	TiO ₂	0.62	97.57		1.81																										100	106
2221.17	19 23	Cal				8.76		1.84	31.17					14.23																		56	73
2221.17	19 24	Tur	38.33	1.23	30.98	7.92		5.79	0.71	2.04																						87	101
2221.17	19 25	llm + Chl	20.40	35.40	12.96	26.05	1.01	3.80	0.37																							100	83
2221.17	19 26	Zrn	31.30	0.57	04.04	40.00		7 70										47.00					68.70									100	122
2221.17	19 27	Unr +	2.69	0.57	24.64	16.93		1.18	0.44									47.39														100	96
2221.17	19 20	$10_2 + 0_2$	20.43	71.95	0.63	0.57			0.41																							100	110
2221.17	19 29	$QZ + HO_2$	58.24	41.76	07.77	7 70		0.00	0.00	4.57																						100	110
2221.17	10 21	"llm" i	2 17	1.00	21.11	25.42	2 50	0.30	2.39	1.57																						100	01
2221.17	10 22		12.24	72.61	0.55	20.45	3.50		0.03		0.25			2.22																		100	01
2221.17	19 32	Tur	38.02	0.85	20.12	9.20		6 71	0.40	2 20	0.55			2.22																		87	10/
2221.17	10 3/	Chr	30.02	0.05	16.00	10.00		11 73	0.03	2.20								50.82													-	100	113
2221.17	19 35	"llm" +	1.68	72 70	1 03	23.48	0.85	11.75	0.26									50.02														100	95
2221 17	19 36	"llm" +	5.86	67.55	3 18	7 18	0.00		0.20					2.35										13.88								100	112
2221.17	19 37	Sd	0.00	07.00	0.10	41.36	1.06	5.13	6.79					2.00										10.00							1.66	56	61
2221.17	19 38	"llm" + Chl	3.85	64.31	1.69	28.00		2.14									1															100	97
2221.17	19 39	Tur	39.20	0.47	31.83	8.61		5.09		1.80																						87	102
2221.17	19 40	"llm" + Chl	8.27	80.11	4.12	4.92		2.35			0.23																					100	110
2221.17	19 41	Mix	53.20		14.50	6.50	16.11		8.33					1.37																		100	118
2221.17	19.1 1	TiO ₂ + Chl	4.58	88.80	2.22	3.40		0.99																								100	104
2221.17	19.1 2	Qz	100.00																													100	128
2221.17	19.1 3	Cal + Qz	30.70		0.46	1.77	0.89	0.56	46.22					19.41																		100	98
2221.17	19.1 4	llm + Grt	8.26	43.94	3.51	26.75	15.72		1.82																							100	116
2221.17	19.1 5	Grt	38.86	0.85	19.71	8.14	19.98		10.23					2.22																		100	121
2221.17	19.1 6	Cal + Chl	6.22		4.78	2.45	0.44	0.57	62.79					22.76																		100	85
2221.17	19.1 7	Kln +	48.10		31.17	6.43		1.51	6.64		2.88			3.27																		100	85
2221.17	20 1	TiO ₂ + Qz	46.33	52.74	0.93																											100	119
2221.17	20 2	"llm"	0.78	73.06	0.62	21.04	0.77																3.73									100	96
2221.17	20 3	"llm"		70.62		29.38																										100	99
2221.17	20 4	Zrn	30.74																				69.26									100	129
2221.17	20 5	Spl	1.00	1.32	33.44	19.87		14.89	4.54									30.48														100	116
2221.17	20 6	11O ₂ +	1.39	91.62	1.28	1.21			4.51			00.00		0.00											0.07		45.07	04 70	10.00			100	110
2221.17	20 7		40.04	70.40	4.04	0.45		0.40	1.14		0.77	38.03		-0.90											2.87		15.07	31.73	12.06			100	107
2221.17	20 8	$TiO_2 + Chi +$	12.81	79.46	4.34	2.15		0.48	0.54		0.77																					100	80
2221.17	20 9	$IIO_2 + QZ$	39.19	57.05	1.31	1.91		0.00	0.54																							100	70
2221.17	20 10		4.68	85.61	2.60	5.70		0.90	0.51																							100	114
2221.17	20 11		1.25	02.59	1 4 2	2.12			0.70	0.51		1.00			0.22																	100	00
2221.17	20 12	Tio ₂ +	20 00	92.00	21.42	2.13		5 74	0.70	0.51	0.22	1.00			0.23																	97	99
2221.17	20 13	1ui An	30.09	1.90	31.30	0.15		5.74	47.04	2.10	0.55	44.01		6 60																		100	120
2221.17	20 14	Chr			28.98	19.07		13.87	47.94			44.91		0.09				38.08														100	115
2221.17	20 16	TiO-		99 44	20.00	0.56		10.07										00.00														100	111
2221.17	20 17	Kfs	66.47	00.44	17 50	0.00					15.61																				-	100	115
2221.17	20 18	Grt	41 28		22.08	21.36	3.01	10.60	1.66		10.01																					100	118
2221.17	20 19	"llm"	41.20	69.51	22.00	29.91	0.58	10.00	1.00																							100	101
2221.17	20 20	Cal	1			3.09		0.49	37.18					15.25																		56	81
2221.17	20 21	Sd	0.63			40.64	0.62	5.70	6.86													-									1.56	56	61
2221.17	20 22	Sd + Chl	12.51		4.98	58.78	0.98	13.25	9.50						l																	100	63
2221.17	20 23	TiO ₂		100.00																												100	109
2221.17	20 24	Qz	100.00																													100	125
2221.17	20 25	Zrn	30.84																				69.16									100	126
2221.17	20 26	Cal				1.80		0.46	38.38					15.36																		56	82
2221.17	20 27	TiO ₂ +	1.41	87.35	2.35	1.95			1.28	0.91	0.23	0.98		3.30	0.24																	100	101
2221.17	20 28	Sd +	1.22	0.63		71.29	0.60	13.76	12.50																							100	60

Sample	Site	Position		Mineral	SiO2	Ti02	AI2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	ш	ō	Sc2O3	V205	Cr2O3	CoO	NiO	ZnO	SrO	ZrO2	Nb205	Ag2O	BaO	La203	Ce2O3	Nd2O3	HfO2	WO3	Total	Actual Total
2221.17	20.1	1	TiO ₂ +		0.81	95.81	1.26	0.89			1.23																							100	111
2221.17	20.1	2	llm +			50.76		41.70	0.78	3.07	3.70																							100	107
2221.17	20.1	3	Cal			0.65		0.89	0.27		37.70					16.48																		56	84
2221.17	20.1	4	Cal +		1.16	2.97		1.03			66.82					28.01																		100	84
2221.17	20.1	5	llm +			52.24		42.83	0.82	2.90	1.22																							100	109
2221.17	20.2	1	TiO ₂ +		1.24	97.78	0.39	0.59																										100	107
2221.17	20.2	2	Qz +		94.57	0.68	3.25	0.67					0.83																					100	115
2221.17	20.2	3	TiO ₂ +		2.64	95.76	0.90	0.70																										100	104
2221.17	20.2	4	TiO ₂ +		7.70	86.22	1.67	1.42					0.29			2.70																		100	102
2221.17	20.2	5	TiO ₂ +		8.47	90.12	0.65	0.76																										100	107
2221.17	20.2	6	Qz +		97.41	1.47	0.76	0.35																										100	119

Table A2.1: Scanning Electron Microscope chemical analyses of 2221.17 m from Cohasset A-52 well.

Appendix A3: BSE images and EDS mineral analyses for sample Sable Island 2H-58 1599.95 m

•	125 M 5.	and the second			Tom RG		3
*							2
							0
	site 1	site 2	site 3	site 4	site 5		F
	site 6	site 7	site 8	site 9	site 10		S
	site 11	site 12	site 13	site 14	site 15		T
	site 16	site 17	site 18	site 19	site 20		8
							1
							I
						1 cm	て

Figure A3.1: Sable Island 2H-58 (1599.95 m)



1:Kyanite 2:"Ilmenite" 3:Chromite 4:Zircon 5:TiO₂ + 6:Staurolite 7:TiO₂ + 8:Tourmaline 9:"Ilmenite" 10:Ilmenite 11:TiO₂ 12:TiO₂ 13:TiO₂ + K-Feldspar 14:Siderite + 15:Chlorite 16:Ilmenite 17:"Ilmenite" 18:Quartz 19:Zircon 20:Zircon 21:TiO₂ + 22:Tourmaline 23:Tourmaline 24:Ilmenite

25:"Ilmenite" 26:Zircon 27:Ilmenite 28:Chlorite 29:Tourmaline 30:Zircon 31:Quartz + TiO, 32:"Ilmenite" 33:Tourmaline 34:Ilmenite 35:Tourmaline 36: 37:Garnet 38:"Ilmenite" 39:"Ilmenite" 40:Ilmenite 41:Ilmenite 42:Ilmenite 43:TiO₂ + 44:Ilmenite 45:Zircon 46:"Ilmenite" 47:Zircon 48:Ilmenite 49:Tourmaline

Figure A3.2: Sable Island 2H-58 (1599.95 m) (SEM) site 1 (Table A3.1)



Figure A3.3: Sable Island 2H-58 (1599.95 m) (SEM) site 1.1 (Table A3.1). Partly altered ilmenite grain.

1:"Ilmenite" 2:"Ilmenite" 3:Ilmenite 4:TiO₂ 5:"Ilmenite"



Figure A3.4: Sable Island 2H-58 (1599.95 m) (SEM) site 1.2 (Table A3.1). Partly altered ilmenite grain with muscovite (1) inclusion.



Figure A3.5: Sable Island 2H-58 (1599.95 m) (SEM) site 1.3 (Table A3.1). Partly altered ilmenite grain.

1:Ilmenite 2:Ilmenite 3:"Ilmenite" 4:"Ilmenite"



1:Ilmenite 2:Magnetite + Ilmenite

Figure A3.6: Sable Island 2H-58 (1599.95 m) (SEM) site 1.4 (Table A3.1). Magnetite with exsolution of ilmenite (1,2).



Figure A3.7: Sable Island 2H-58 (1599.95 m) (SEM) site 1.5 (Table A3.1). Lithic clast that is made up of quartz (1,4), muscovite (3) and TiO_2 growing along a fabric.



1:TiO₂ 2:"Ilmenite" 3:Tourmaline 4:Ilmenite 5:Apatite 6:Ilmenite 7:Tourmaline 8:Quartz + TiO₂ 9:Zircon 10:"Ilmenite" + 11:"Ilmenite" 12:TiO₂ 13:Quartz 14:TiO₂ 15:Ilmenite 16:TiO₂ + 17:Siderite + 18:"Ilmenite" 19:Zircon 20:Quartz + TiO₂ + 21:"Ilmenite' 22:Ilmenite 23:"Ilmenite" 24:Ilmenite

25:Quartz +Ilmenite + 26:Zircon 27:Siderite + 28:Ilmenite 29:Quartz + TiO₂ 30:Siderite + 31:Ilmenite 32:Muscovite + TiO₂ 33:Staurolite 34:Ilmenite 35:Ilmenite 36:Biotite 37:Siderite + 38:Siderite + 39:Ilmenite 40:Ilmenite 41:"Ilmenite" 42:"Ilmenite" 43:Ilmenite 44:Staurolite 45:Ilmenite 46:Siderite + 47:TiO₂ + 48:Siderite + 49:Biotite 50:Spinel

Figure A3.8: Sable Island 2H-58 (1599.95 m) (SEM) site 2 (Table A3.1)



1:TiO₂ 2:Ilmenite 3:TiO₂ 4:Apatite 5:"Ilmenite" 6:Ilmenite 7:TiO₂ 8:Quartz 9:TiO₂ + 10:Tourmaline 11:Tourmaline 12:Quartz 13:"Ilmenite" 14:Tourmaline 15:TiO₂ + 16:TiO₂ 17:Ilmenite 18:TiO₂ 19:Ilmenite 20:Ilmenite 21:Chlorite + Biotite

22:Zircon 23:Staurolite 24:Ilmenite + 25:Tourmaline 26:Ilmenite 27:"Ilmenite" 28:Ilmenite + Quartz 29:Muscovite + TiO_2 30:Ilmenite+ 31:"Ilmenite" 32:"Ilmenite"

Figure A3.9: Sable Island 2H-58 (1599.95 m) (SEM) site 3 (Table A3.1)



1:Quartz 22:Chlorite + 2:Siderite + Biotite + 3:TiO₂ 23:"Ilmenite" 24:Biotite 4:TiO₂ + 25:"Ilmenite" 5:Tourmaline 26:Siderite + 6:Tourmaline 27:Ilmenite 7:Garnet 28:Ilmenite + 8:TiO₂ 29:Tourmaline 9:Tourmaline 30:Ilmenite 10:Ilmenite 11:Zircon 12:Siderite + 13:Chlorite + Biotite + 14:Chlorite + Biotite + 15:Quartz 16:TiO₂ + Quartz 17:"Ilmenite" 18:TiO₂ + 19:TiO₂ + 20:Tourmaline 21:"Ilmenite" +

Figure A3.10: Sable Island 2H-58 (1599.95 m) (SEM) site 4 (Table A3.1)



1:"Ilmenite" 20:TiO₂ 2:"Ilmenite" 21:TiO₂ + 22:"Ilmenite" 4:"Ilmenite" 23:Zircon 5:Chlorite + 24:Quartz 25:"Ilmenite" 6:"Ilmenite" 26:Ilmenite 27:Biotite 8:Ilmenite 28:TiO₂ 29:Ilmenite 10:Ilmenite + 30:Ilmenite K-Feldspar 31:K-Feldspar + 11:TiO₂ + TiO₂ 13:"Ilmenite" 14:TiO₂ + Quartz 15:Tourmaline 16:"Ilmenite" 17:Tourmaline

Figure A3.11: Sable Island 2H-58 (1599.95 m) (SEM) site 5 (Table A3.1)



1:"Ilmenite" 2:TiO₂ + 3:TiO₂ 4:TiO₂ + K-Feldspar 5:TiO₂ + 6:Ilmenite 7: 8:Zircon 9:Spinel 10:Ilmenite 11:Siderite + 12:Zircon 13:"Ilmenite" 14:Siderite + 15:TiO₂ 16:Ilmenite + Quartz 17:Ilmenite 18:Ilmenite 19:Tourmaline

20:Biotite 21:Ilmenite 22:Ilmenite 23:Ilmenite 24:Ilmenite 25:Biotite 26:Chlorite 27:Tourmaline 28:"Ilmenite" 29:Tourmaline 30:Siderite + 31:TiO₂ 32:Ilmenite 33:"Ilmenite" 34:Siderite + 35:Quartz + TiO₂ 36:Biotite 37:Zircon 38:Ilmenite 39:Ilmenite

Figure A3.12: Sable Island 2H-58 (1599.95 m) (SEM) site 6 (Table A3.1)



1:Tourmaline 2:"Ilmenite" 3:TiO₂ + 4:Ilmenite 5:TiO₂ + 6:K-Feldspar 7:Zircon 8:"Ilmenite" 9:Quartz + 10:"Ilmenite" 11:"Ilmenite" 12:Ilmenite 13:TiO₂ + K-Feldspar 14:"Ilmenite" + 15:Ilmenite 16:Ilmenite 17:"Ilmenite" 18:"Ilmenite" 19:"Ilmenite" 20:Ilmenite 21:"Ilmenite" 22:Siderite + 24:TiO₂ + Quartz 47:Tourmaline

25:Chromite 26:"Ilmenite" 27:"Ilmenite" 28:Chlorite + Biotite 29:Tourmaline 30:Ilmenite 31:"Ilmenite" 32:Ilmenite 33:Zircon + 34:TiO₂ + 35:Siderite + 36:TiO₂ 37:Tourmaline 38:"Ilmenite" 39:Albite 40:TiO₂ + Quartz 41:Quartz 42:Ilmenite 43:TiO₂ + K-Feldspar 44:Quartz + 45:Ilmenite 23:Quartz + TiO₂ 46:TiO₂ + Chlorite

Figure A3.13: Sable Island 2H-58 (1599.95 m) (SEM) site 7 (Table A3.1)



1:"Ilmenite" 2:TiO 3:Ilmenite 4:Biotite 5:Siderite + 6:Chlorite 7:Ilmenite 8:TiO₂ 9:Siderite + 10:Tourmaline 11:Tourmaline 12:TiO₂ + 13:Garnet 14:Quartz + TiO₂ 15:TiO₂ + 16:"Ilmenite" 17:TiO₂ 18:"Ilmenite" 19:Siderite + 20:Ilmenite 21:Tourmaline

22:"Ilmenite" + 23: 24:Quartz 25:Ilmenite 26:TiO₂ 27:Tourmaline 28:Ilmenite 29:Siderite + 30:"Ilmenite" 31:Tourmaline 32:"Ilmenite" 33:Muscovite 34:Biotite

Figure A3.14: Sable Island 2H-58 (1599.95 m) (SEM) site 8 (Table A3.1)



1:Zircon 21:"Ilmenite" 2:TiO₂ + 22:Tourmaline K-Feldspar 23:"Ilmenite" 3:Ilmenite 24:TiO₂ + K-4:Garnet Feldspar 5:Ilmenite 25:Zircon 6:TiO₂ 26:"Ilmenite" 7:Tourmaline 27:Ilmenite 8:Zircon 28:Ilmenite 29:"Ilmenite" 9:Garnet 30:"Ilmenite" 10:"Ilmenite" 31:TiO₂ + 11:TiO₂ + 32:TiO₂ + 12:Ilmenite 13:TiO₂ 33:Staurolite 14:"Ilmenite" 34:Tourmaline 15:Zircon 35:Ilmenite 16:Ilmenite 36:Monazite 17:"Ilmenite" 37:Ilmenite 18:Tourmaline 38:Chlorite + 19:Quartz 39:Ilmenite 40:"Ilmenite" 20:TiO₂ + 41:Quartz

Figure A3.15: Sable Island 2H-58 (1599.95 m) (SEM) site 9 (Table A3.1)



1:Muscovite 2:TiO₂ + Muscovite 3:Xenotime 4:TiO₂ 5:Monazite + TiO₂ 6:TiO₂ +

Figure A3.16: Sable Island 2H-58 (1599.95 m) (SEM) site 9.1 (Table A3.1). Lithic clast that is made up of muscovite (1) and areas of probably secondary minerals: TiO_2 (6), xenotime (3) and TiO_2 (4) + monazite (5). Metasedimentary.



1:Ilmenite 2:Tourmaline 3:Ilmenite 4:Garnet 5:TiO₂ 6:"Ilmenite" 7:Biotite 8:Biotite 9:TiO₂ + 10:"Ilmenite" 11:Ilmenite 12:Kyanite 13:Ilmenite 14:"Ilmenite" 15:Zircon 16:Tourmaline 17:Tourmaline 18:Ilmenite 19:Ilmenite 20:Tourmaline 21:Ilmenite 22:Ilmenite + 23:TiO₂ 24:Ilmenite

25:Quartz + TiO₂ + 26:TiO₂ + 27:Quartz + 28:"Ilmenite" 29:Tourmaline 30:Ilmenite 31:Ilmenite 32:"Ilmenite" 33:Tourmaline 34:"Ilmenite" 35:"Ilmenite" 36:Ilmenite 37:Ilmenite 38:"Ilmenite" 39:Zircon 40:Quartz 41:Ilmenite 42:Ilmenite 43:"Ilmenite" 44:Chromite + Quartz 45:Tourmaline

Figure A3.17: Sable Island 2H-58 (1599.95 m) (SEM) ²/₂ site 10 (Table A3.1)



1:Quartz + TiO₂ 2:"Ilmenite" + 3:Ilmenite 4:Ilmenite 5:"Ilmenite" 6:Spinel 7:Ilmenite 8:TiO₂ 9:"Ilmenite" 10:Ilmenite + Quartz 11:Zircon 12:Quartz 13:Garnet 14:Zircon 15:Quartz 16:"Ilmenite" 17:Quartz 18:TiO₂ + 19:TiO₂ + Quartz 20:Siderite + 21:Siderite + 22:Quartz 23:Ilmenite 24:Ilmenite 25:Ilmenite

26:"Ilmenite" 27:"Ilmenite" 28:Ilmenite 29:TiO₂ + 30:TiO₂ + 31:Chromite 32:"Ilmenite" 33:Ilmenite 34:"Ilmenite" 35:Chlorite + Biotite 36:Ilmenite 37:Ilmenite 38:Garnet 39:Muscovite 40:TiO₂ + 41:Siderite + 42:Biotite 43:"Ilmenite" 44:Ilmenite 45:Ilmenite 46:Siderite + 47:Ilmenite 48:Quartz 49:Ilmenite 50:Ilmenite 51:"Ilmenite" 52:TiO₂

Figure A3.18: Sable Island 2H-58 (1599.95 m) (SEM) ^{24:1} site 11 (Table A3.1)



Figure A3.19: Sable Island 2H-58 (1599.95 m) (SEM) site 11.1 (Table A3.1). A grain of Fe-oxide/hydroxide (1,2).

1:Fe-oxide/hydroxide + Apatite + 2:Fe-oxide/hydroxide



1:TiO₂ 2:TiO₂ 3:Zircon 4:"Ilmenite" 5:Ilmenite 6:"Ilmenite" 7:TiO₂ + 8:Tourmaline 9:Ilmenite 10:TiO₂ 11:Quartz 12:Siderite + 13:Ilmenite 14:"Ilmenite" 15:Ilmenite 16:TiO₂ + 17:TiO₂ + 18:"Ilmenite" 19:Ilmenite 20:Ilmenite 21:Tourmaline

22:"Ilmenite" 23:"Ilmenite" 24:"Ilmenite" 25:Al-Phosphate 26:Muscovite + TiO₂ 27:"Ilmenite" 28:"Ilmenite" 29:Chlorite 30:"Ilmenite" 31:Spinel 32:Tourmaline 33:Zircon 34:Ilmenite 35:"Ilmenite" 36:TiO₂ + 37:Ilmenite 38:Tourmaline 39:Ilmenite 40:Ilmenite 41:Ilmenite 42:Staurolite 43:Quartz

Figure A3.20: Sable Island 2H-58 (1599.95 m) (SEM) site 12 (Table A3.1)



Figure A3.21: Sable Island 2H-58 (1599.95 m) (SEM) site 12.1 (Table A3.1). Similar to Figure 19.

1:Fe-oxide/hydroxide + Apatite 2:Fe-oxide/hydroxide +



1:TiO₂ 2:Monazite 3:Monazite 4:TiO₂ 5:Quartz 6:TiO₂ + 7:Quartz + 8:Muscovite 9:Monazite 10:Monazite

Figure A3.22: Sable Island 2H-58 (1599.95 m) (SEM) site 12.2 (Table A3.1). Lithic clast made up of guartz (5,7) and muscovite (8). Monazite (2,3,9,10) and TiO₂ (1,4) appear to be filling voids and fractures. Metasedimentary



1:"Ilmenite" 25:"Ilmenite" 2:Quartz 26:Ilmenite 3:TiO₂ + Quartz 27:"Ilmenite" 4:Biotite 5:Quartz 6:TiO₂ + Quartz 30:Tourmaline 7:"Ilmenite" 8:TiO₂ + Quartz 32:Staurolite 9:Ilmenite 10:Tourmaline 11:TiO₂ + 12:Ilmenite 13:Muscovite 14:Staurolite 15:"Ilmenite" 16:Ilmenite 17:Quartz + 18:Tourmaline 19:Siderite + 20:"Ilmenite" 21:TiO₂ + 22:Tourmaline 47:Fe-24:Ilmenite

28:"Ilmenite" 29:Garnet 31:Tourmaline 33:Tourmaline 34:Staurolite 35:"Ilmenite" 36:Ilmenite 37:Biotite 38:Ilmenite 39:Zircon 40:Tourmaline 41:"Ilmenite" 42:Zircon 43:Ilmenite 44:Ilmenite 45:TiO₂ + 46:Ilmenite oxide/hydroxide 48:TiO, + 49:Ilmenite

Figure A3.23: Sable Island 2H-58 (1599.95 m) (SEM) 23:Spinel site 13 (Table A3.1)



Figure A3.24: Sable Island 2H-58 (1599.95 m) (SEM) site 13.1 (Table A3.1). Lithic clast made up of quartz (2) and TiO_2 minerals (1,3). Metasedimentary.



1:Monazite + Quartz + 2:TiO₂ 3:Quartz + 4:Quartz + TiO₂ + Chlorite 5:Xenotime + Quartz 6:Xenotime + Quartz

Figure A3.25: Sable Island 2H-58 (1599.95 m) (SEM) site 13.2 (Table A3.1). Lithic clast made up of quartz (3), chlorite (4) and TiO_2 (2). Xenotime (5,6) and monazite appear to be later and fill pores.



Figure A3.26: Sable Island 2H-58 (1599.95 m) (SEM) site 13.3 (Table A3.1). Lithic clast made up of quartz (2,3) and TiO_2 (1,4) Metasedimentary.



Figure A3.27: Sable Island 2H-58 (1599.95 m) (SEM) site 13.4 (Table A3.1). Fe-oxide/hydroxide grain.

1:Fe-oxide/hydroxide + 2:Fe-oxide/hydroxide +



1:Monazite + TiO₂ 4:TiO₂ + Monazite 5:TiO₂ + Monazite

Figure A3.28: Sable Island 2H-58 (1599.95 m) (SEM) site 13.5 (Table A3.1). Lithic clast composed of mostly TiO₂ with some monazite (1,4,5). Metasedimentary.



1:"Ilmenite" 2:Siderite + 3:Biotite 4:TiO₂ + 5:Quartz 6:Siderite + 7:Chromite 8:Al-Phosphate 9:Ilmenite 10:Garnet 11:Zircon 12:Tourmaline 13:TiO₂ + 14:"Ilmenite" 15:Staurolite 16:Ilmenite 17:Ilmenite 18:Ilmenite 19:"Ilmenite" + 20:Tourmaline 21:Ilmenite 22:Tourmaline 23:Zircon 24:Quartz

25:"Ilmenite" 26:Zircon 27:TiO₂ + 28:Zircon 29:Tourmaline 30:Tourmaline 31:TiO₂ 32:TiO₂ + 33:Zircon + 34:Siderite 35:Tourmaline 36:Ilmenite 37:Apatite 38:Tourmaline 39:Apatite 40:"Ilmenite" 41:TiO₂ + 42:Ilmenite 43:Ilmenite 44:Ilmenite 45:TiO₂ + 46:"Ilmenite"

Figure A3.29: Sable Island 2H-58 (1599.95 m) (SEM) site 14 (Table A3.1)



Figure A3.30: Sable Island 2H-58 (1599.95 m) (SEM) site 14.1 (Table A3.1). Lithic clast made up of TiO_2 (2,3,4) and quartz (1). Metasedimentary.



Figure A3.31: Sable Island 2H-58 (1599.95 m) (SEM) site 14.2 (Table A3.1). Cement of siderite and chlorite (4) with some detrital quartz (1,3).

1:Quartz 2:Mix 3:Quartz + 4:Siderite + Chlorite



1:TiO₂ 2:Chlorite + TiO₂ 3:Chlorite + TiO₂ +

Figure A3.32: Sable Island 2H-58 (1599.95 m) (SEM) site 14.3 (Table A3.1). Lithic clast made up of TiO_2 and chlorite. Metasedimentary.



Figure A3.33: Sable Island 2H-58 (1599.95 m) (SEM) site 14.4 (Table A3.1). Cement of siderite (3), pyrite (1) filling voids, and detrital quartz (2).

1:Pyrite + Quartz 2:Quartz 3:Siderite



Figure A3.34: Sable Island 2H-58 (1599.95 m) (SEM) site 14.5 (Table A3.1). This may be a detrital ilmenite crystal with quartz inclusions (1) completely replaced by TiO_2 . Some of the quartz inclusions have necks (pos. a) that suggest igneous origin.



Figure A3.35: Sable Island 2H-58 (1599.95 m) (SEM) site 15 (Table A3.1)

1:"Ilmenite" 2:"Ilmenite" 3:"Ilmenite" 4:Tourmaline 5:TiO₂ + 6:TiO₂ + Quartz 7:Chlorite + Biotite 8:Zircon 9:Siderite + Quartz + 10:"Ilmenite" 11:Ilmenite 12:"Ilmenite" 13:"Ilmenite" 14:Monazite 15:"Ilmenite" 16:TiO, 17:Quartz + Ilmenite 18:Staurolite 19:Ilmenite 20:Quartz + Ilmenite 21:"Ilmenite"

22:Tourmaline 23:Ilmenite 24:Tourmaline 25:Quartz 26:Quartz + TiO₂ 27:"Ilmenite" 28:"Ilmenite" 29:Ilmenite + 30:Tourmaline 31:Zircon 32:Tourmaline 33:Quartz + 34:"Ilmenite" 35:Garnet 36:"Ilmenite" 37:Tourmaline 38:Quartz + TiO₂ 39:Ilmenite 40:Garnet 41:Ilmenite 42:Quartz 43:Spinel 44:Ilmenite 45:Siderite + 46:TiO₂ + 47:Quartz + TiO₂ 48:Ilmenite 49:Ilmenite 50:Ilmenite



1:Quartz 2:Feoxide/hydroxide + 3:Mix

Figure A3.36: Sable Island 2H-58 (1599.95 m) (SEM) site 15.1 (Table A3.1). Lithic clast made up of elongated small prisms of Feoxide/hydroxide (2) set in a very fine grained mixture that appears to contain muscovite and chlorite(3). Metasedimentary.



1:"Ilmenite" 23:TiO₂ 2:Quartz + 24:TiO₂ 3:TiO₂ + 25:"Ilmenite" 4:"Ilmenite" 26:Staurolite 5:Ilmenite 27:Tourmaline 6:Chlorite 28:Ilmenite 7:Siderite + 29:Ilmenite 8:Ilmenite + 30:Monazite 9:Tourmaline 31:Ilmenite 10:Quartz + 32:Tourmaline + 33:"Ilmenite" TiO₂ 11:Ilmenite 34:"Ilmenite" 12:TiO₂ + 35:TiO₂ + Quartz 13:Tourmaline 36:Staurolite 14:K-Feldspar 37:Chlorite 15:Ilmenite 38:Ilmenite 16:Chromite 39:TiO₂ 17:Ilmenite 40:Ilmenite 18:Zircon 41:Chromite 19:Quartz 42:TiO₂ 20:Tourmaline 43:"Ilmenite" 21:Ilmenite 44:TiO₂ + Quartz 45:TiO₂ + 46:Ilmenite

Figure A3.37: Sable Island 2H-58 (1599.95 m) (SEM) $^{22:TiO_{\rm 2}}$ site 16 (Table A3.1)



Figure A3.38: Sable Island 2H-58 (1599.95 m) (SEM) site 16.1 (Table A3.1). Cement (1,2) and detrital quartz (3).



Figure A3.39: Sable Island 2H-58 (1599.95 m) (SEM) site 16.2 (Table A3.1). Partly altered ilmenite (1,3) detrital grain.

1:"Ilmenite" + 2:TiO₂ + 3:"Ilmenite"



2:TiO₂ 3:Ilmenite + 4:Zircon 5:Zircon 6:Tourmaline 7:Ilmenite 8:"Ilmenite" 9:Quartz 10:Ilmenite 11:Tourmaline o5 12:Ilmenite 13:Ilmenite **o**4 14:TiO₂ + ? 15:Garnet + 16:TiO₂ 17:Chromite 18:TiO₂ + 19:"Ilmenite" + 20:"Ilmenite" 21:"Ilmenite"

1:TiO₂ + Quartz 22:"Ilmenite" 23:TiO₂ 24:Ilmenite 25:Tourmaline 26:Ilmenite 27:Ilmenite 28:Zircon 29:Quartz 30:Ilmenite 31:"Ilmenite"

Figure A3.40: Sable Island 2H-58 (1599.95 m) (SEM) site 17 (Table A3.1)



Figure A3.41: Sable Island 2H-58 (1599.95 m) (SEM) site 17.1 (Table A3.1). Partly altered to TiO₂ ilmenite grain. This grain also appears to be cut by TiO_2 veinlets (2).



1:TiO₂ + 2:"Ilmenite" + 3:TiO₂ +

Figure A3.42: Sable Island 2H-58 (1599.95 m) (SEM) site 17.2 (Table A3.1). A completely altered ilmenite grain or a grain of metasedimentary TiO_2 .



1:Siderite + 22:TiO₂ + Quartz 2:Ilmenite 23:Zircon 3:Ilmenite 24:Siderite + 4:Ilmenite 25:TiO₂ 5:Ilmenite 26:Ilmenite 6:Ilmenite 27:Ilmenite 7:Quartz + 28:Ilmenite + 8:Ilmenite 9:Ilmenite 10:Tourmaline 11:"Ilmenite" 12:TiO₂ 13:Siderite + 14:"Ilmenite" 15:Quartz 16:TiO₂ + 17:"Ilmenite" 18:Monazite 19:TiO₂ 20:Staurolite

Figure A3.43: Sable Island 2H-58 (1599.95 m) (SEM) site 18 (Table A3.1)



Figure A3.44: Sable Island 2H-58 (1599.95 m) (SEM) site 18.1 (Table A3.1). An altered ilmenite grain (3) and siderite (1) cement with bright spots (2).



Figure A3.45: Sable Island 2H-58 (1599.95 m) (SEM) site 18.2 (Table A3.1). Cement made up of siderite (1), probably chlorite and muscovite (2) and mixtures of siderite and bright mineral spots (3) of probably Fe-rich siderite.

1:Siderite + 2:Chlorite + Muscovite 3:Mix



Figure A3.46: Sable Island 2H-58 (1599.95 m) (SEM) site 18.3 (Table A3.1). Lithic clast made up of TiO_2 (2) and muscovite (1). Metasedimentary.



Figure A3.47: Sable Island 2H-58 (1599.95 m) (SEM) site 18.4 (Table A3.1). Cement made up of mixtures of siderite and bright spots (2,3) probably Fe-rich siderite and detrital quartz (1).


Figure A3.48: Sable Island 2H-58 (1599.95 m) (SEM) site 19 (Table A3.1)



Figure A3.49: Sable Island 2H-58 (1599.95 m) (SEM) site 20 (Table A3.1)

Sample	Site	Position	Mineral	SiO2	Ti02	AI203	FeO	MnO	MgO	CaO	Na2O	K20	P205	so3	ш	ū	Sc203	V205	Cr203	0 N	CoO	ZnO	SrO	Y203	ZrO2	Nb205	Ag2O	Sn02	BaO	La203	Ce203	Nd2O3	Hf02	W03	ThO2	Yb2O3	Pr203	Nd2O3	Gd203	Dv203	Er203	UO3	Total	Actual Total
1599.95	1	1	Ky	37.41		59.62	1.02								1.95																												100	160
1599.95	1	2	"lĺm"	0.77	86.79	0.61	10.23																											1.61									100	112
1599.95	1	3	Chr		2.01	8.11	45.37		5.69									0.55	38.27																								100	144
1599.95	1	4	Zrn	30.57																					67.47								1.96										100	171
1599.95	1	5	TiO ₂ +	0.81	94.83	0.57	3.79																																				100	127
1599.95	1	6	St	29.67	0.64	54.83	13.26		1.60																															-	_		100	154
1599.95	1	/	TIO ₂ +	20.20	92.34	22.00	7.66		4 00		2.14																													-			100	111
1599.95	1	0	"llm"	1.07	0.74	32.90	15.51		4.60		2.14									-												-							-	-			0/	122
1599.95	1	10	llm	1.07	53.31	1.15	45.29	1.40																																			100	143
1599.95	1	11	TiO ₂		100.00		10.20	1.10																																			100	143
1599.95	1	12	TiO ₂		100.00	1																																					100	149
1599.95	1	13	TiO ₂ + Kfs	16.91	68.99	11.43	0.46					2.21																															100	146
1599.95	1	14	Sd +	3.31		2.39	85.34	2.49	1.38	3.26			1.82																														100	81
1599.95	1	15	Chl	19.99	0.53	29.44	28.69		6.35																															_			85	138
1599.95	1	16	llm	1.00	53.31		44.25	2.44																																-			100	149
1599.95	1	1/	"lim"	1.02	84.97	1.30	11.15	1.56																								-								-			100	127
1599.95	1	10	Zm	30.98																					69.02		-	-	-			-											100	169
1599.95	1	20	Zm	30.84	0.45																				68.71									_									100	171
1599.95	1	21	TiO ₂ +	3.79	92.43	0.53									3.25																												100	71
1599.95	1	22	Tur	38.19	1.01	32.98	5.72		6.47	0.77	1.86																																87	142
1599.95	1	23	Tur	36.99	0.86	31.42	6.62		6.08	0.51	2.38				2.13																												87	150
1599.95	1	24	Ilm		51.98		47.08		0.94																															_			100	156
1599.95	1	25	"lim" Zro	21.09	62.63		36.51	0.86												-				-	69.02							-								-	_		100	144
1599.95	1	20	ZIII Ilm	31.06	59.85		38.88	0.67	0.59																00.92							-								-	-		100	109
1599.95	1	28	Chl	24.24	0.65	36.02	21.55	0.60	1.94																																		85	153
1599.95	1	29	Tur	38.00	1.63	30.73	6.83		6.83	1.22	1.77																																87	146
1599.95	1	30	Zm	31.09																					68.91																		100	175
1599.95	1	31	Qz + TiO ₂	65.80	34.20																																						100	169
1599.95	1	32	"llm"		67.82		30.92											1.26																					_	_			100	135
1599.95	1	33	Tur	37.15	0.90	31.49	6.21	4.05	6.36	0.75	2.01				2.13					-												-							-	-			87	151
1599.95	1	34	lim Tur	27.24	57.13	26 56	41.62	1.25	0.10	2.52	1.67									-								-	-			-		-						+			07	140
1599.95	1	36	Tui	21.91	0.52	18.68	10.72		26.40	2.52	1.07								22.29																					-			100	155
1599.95	1	37	Grt	38.74	0.42	20.74	24.63	14.94	0.53										LL.LO																								100	163
1599.95	1	38	"llm"	1.06	81.30	0.56	17.08																																				100	137
1599.95	1	39	"llm"	0.59	75.55		23.86																																				100	124
1599.95	1	40	Ilm		52.16		42.84	5.00																								_							_	-			100	151
1599.95	1	41	Ilm		51.19		46.98	1.83	4.05																														-	-			100	151
1599.95	1	42	TiO. +	1.80	89.88	4.62	2 17	0.75	1.55				1.53															-															100	127
1599.95	1	44	Ilm	1.00	52.09	1.02	46.64	0.54	0.73				1.00																														100	150
1599.95	1	45	Zm	31.00																					69.00																		100	171
1599.95	1	46	"llm"	0.56	64.56	i.	33.36	1.51																																			100	140
1599.95	1	47	Zm	31.00		L _														<u> </u>					69.00															\perp			100	171
1599.95	1	48	lim	00.00	53.02	04.00	42.35	0.61	2.71		4.70							1.31	<u> </u>					-																1			100	151
1599.95	1	49	Chi	38.20	1 1 4	34.63	9.78	0.33	2.36	2.52	1.70				4.24					-				-																+			8/	139
1599,95	1	51	Ilm	42.03	53,92	30.30	45.00	1.08	13.70	3.32	1.40				4.54				1	1												-							1	+			100	149
1599.95	1	52	TiO ₂ + Oz	27.29	53.13	12.95	1.56	1	0.46						4.61				1	1																			1	1			100	133
1599.95	1	53	TiO ₂ +	0.84	88.37	2.17	2.48			0.37	0.78		1.34	0.65	2.30				0.70)																							100	123
1599.95	1	54	TiO ₂ +	6.54	83.14	4.05	0.46		0.62	L		0.87			4.33																									\perp			100	164
1599.95	1	55	TiO ₂ +	5.99	84.01	4.69	3.75		1.56	-									I					<u> </u>											-					1	_		100	150
1599.95	1	56	Chl	27.85	02.01	21.29	22.04	0.61	13.20	-									<u> </u>	+				-																1	_		85	111
1599.95	1.1	2	"llm"		93.61	1	30.05	2 20		<u> </u>					<u> </u>			-	<u> </u>	1					\vdash			\rightarrow	\rightarrow		-+	-			\vdash				1	+	+		100	98
1599,95	1.1	- 2	llm		52,59		43,19	4.22												1																			1	1			100	103
1599.95	1.1	4	TiO ₂		96.14		3.86																																	1			100	103
1599.95	1.1	5	"llm"		92.97		7.03																																				100	78
1599.95	1.2	1	Ms + TiO ₂	47.91	13.56	23.43	6.60		2.15		0.52	5.82																												1			100	104
1599.95	1.2	2	TiO ₂	7.00	97.87	4.00	2.13		0.52	-		0.55			-				<u> </u>	+				<u> </u>																1			100	105
1599.95	1.2	3	'IIM" + IIm	7.63	63.16	4.20	23.96	12.02	0.50	-		0.56			-				<u> </u>	+				-																+			100	97
1599.95	1.3	2	llm		54.01	1	34.80	10.64							-			-	-	+									-		+	+							+	+	+		100	103
1599.95	1.3	3	"llm"		90.56		9.44	1 .0.04										1	1	1																			1	1			100	100
1599.95	1.3	4	"llm"		85.85		14.15																																				100	87
1599.95	1.4	1	llm		54.92		43.54	1.54																					-														100	107

Sample	Site Position	Mineral	SiO2	Ti02	AI2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	S03	ш	σ	Sc203	CO24	NIO Cr203	ç	zno	SrO	Y203	ZrO2	Nb2O5	Ag2O	2005	BaO La2O3	Ce2O3	Nd2O3	Hf02	W03	ThO2	Yb2O3	Pr2O3	Nd2O3 Gd2O3	000	Dy203	n03	Total Actual Total
1599.95	1.4 2	Mag + Ilm		27.18		71.09	0.72								-+	1.	01		+		-	1	<u> </u>	 	\vdash	-+		-					<u> </u>			+		+	100 104
1599.95	1.5 1	Qz	99.70	0.30											_		_		_	_						_										+			100 122
1599.95	1.5 2	Mc	45.25	99.53	22.75	0.57		0.42		1.02	0.26			4 77					-																	+			05 112
1599.95	1.5 3	07	98.64	1.36	33.15	0.57		0.43		1.03	0.30			4.11																						+		-	100 121
1599.95	2 1	TiO ₂	1.47	96.92	0.81	0.81																														+		-	100 134
1599.95	2 2	"llm"		65.12		33.03	1.85																																100 137
1599.95	2 3	Tur	37.40	1.13	32.17	5.40		6.47	0.54	2.11				1.77																									87 141
1599.95	2 4	llm		55.63		42.55	1.82										_		_																	+			100 143
1599.95	2 5	Ар		50.07		40.07	0.00		48.98			44.93		6.09	_	_	-				-					_										+-			100 168
1599.95	2 0	Tur	26.56	53.67	24.92	43.97	2.36	2.64	1.57	2.02							-																			+			97 140
1599.95	2 8	Qz + TiO ₂	57.75	41.00	0.50	0.75		3.04	1.57	2.02																										+		+	100 157
1599.95	2 9	Zm	32.95		2.96	1.06					0.61												62.42													-		-	100 156
1599.95	2 10	"llm" +		62.17		29.48	5.86	2.49																															100 144
1599.95	2 11	"llm"	1.00	77.88	0.86	19.81												0.43																		+		_	100 140
1599.95	2 12	TiO ₂		99.51		0.49									_		_		_	_						_										+			100 154
1599.95	2 13	UZ TIO	99.40	0.60		4 97									_		_		_	-	-					_										+			100 172
1599.95	2 15	Ilm		57.48		39.85	1.30	1.37																												+		+	100 120
1599.95	2 16	TiO ₂ +	1.52	92.19	1.68	3.10	1.00	1.07										1.51																		+		-	100 130
1599.95	2 17	Sd +				93.78	0.81		4.18			1.23																											100 82
1599.95	2 18	"llm"		88.29	0.70	11.01																																	100 131
1599.95	2 19	Zm	30.49		1.61	1.16			1.39														65.35													—			100 128
1599.95	2 20	Qz + TiO ₂ +	55.02	36.83	4.25	1.04			0.55		1.11			1.75	_	_	_		-							_										+			100 160
1599.95	2 21	lim +	3.67	50.75	3.11	4.04	0.83		0.55						-		-									-										+			100 129
1599.95	2 23	"llm"	0.67	62.70		35.97	0.66																													+		-	100 146
1599.95	2 24	llm		56.27		43.14	0.59																													1			100 143
1599.95	2 25	Qz +llm +	58.35	26.28	5.26	6.13	0.60				1.41			1.98																									100 171
1599.95	2 26	Zrn	31.03																				68.97													\perp			100 173
1599.95	2 27	Sd +		0.81		92.51	1.53		1.98			2.04		1	.13		_		_	_																+			100 89
1599.95	2 28		97.02	12.07		44.28	2.01								-	_			-		-					-		-								+		+	100 150
1599.95	2 30	Sd +	9.16	0.70	6.82	74.71	2.99		2.47	1.21		1.93																								+			100 89
1599.95	2 31	Ilm	0.10	57.67	0.02	40.77	1.56		2.0			1.00																								-		-	100 145
1599.95	2 32	Ms + TiO ₂	32.84	33.57	20.79	1.32		0.92		0.58	5.72			4.26																					1				100 161
1599.95	2 33	St	29.90	0.57	54.83	12.97		1.10												0.64	1															\perp			100 154
1599.95	2 34	llm		53.81		44.75	1.44								_	_	_		_	_						_										+		_	100 147
1599.95	2 35	IIM Pt	20.67	49.63	10.62	48.04	1.43	0.90			0.27				_	_	-		-	-						_			-							+		+-	100 145
1599.95	2 30	Sd +	8 17	1 12	3.88	75.13	1 22	1 49	1.82		0.63	2 16																			4.38					+		+	100 83
1599.95	2 38	Sd +	0.17	0.62	0.00	58.53	1.63	1.10	13.02	1.02	0.00	18.27																			6.91					+		-	100 92
1599.95	2 39	llm		52.14		45.53	2.33																																100 146
1599.95	2 40	llm		51.64	_	46.84	0.90	0.62																												\perp			100 144
1599.95	2 41	"llm"	0.62	61.25		36.33	1.80								_	_	_		_	_		-				_										+		—	100 134
1599.95	2 42	"lim"		<u>66.01</u>		33.99									_	_	-					-				_										+		+	100 138
1599.95	2 43	St	29.26	0.80	54.87	13.69		1.39													+	1		1				-	+				1			+-			100 152
1599.95	2 45	Ilm		46.71		51.08	2.21																													-		-	100 141
1599.95	2 46	Sd +	9.95		7.05	75.04	1.48	1.57	3.06			1.85																										_	100 82
1599.95	2 47	TiO ₂ +	0.77	92.52	2.15	2.94			0.49			1.14					_				-			-		_			<u> </u>							+		+	100 131
1599.95	2 48	Sd +	8.30	1.17	3.65	78.83	1.55	4.05	0.95		0.83			0	.66		_		_	_																—		——	100 92
1599.95	2 49	Bt	39.97	3.41	14.87	22.01		8.71			7.03						2	7 26																		+			96 136
1599.95	3 1	TiO		100.00	41.42	14.01		17.22									- 2	1.50																		+		-	100 153
1599.95	3 2	llm		56.96		41.21	1.83																													+		-	100 146
1599.95	3 3	TiO ₂		100.00																																			100 151
1599.95	3 4	Ар							48.58			43.82		6.41					+		1			<u> </u>							1.19					+		+	100 174
1599.95	3 5	"llm"	3.97	81.91	2.47	11.66	0.00								_				+	_	-	1	<u> </u>	<u> </u>	\vdash	_							<u> </u>			+		+	100 128
1599.95	3 6			52.11		47.20	0.69								_		_			_	+	-	-	-		_										+		+-	100 148
1599.95	3 9	07	100.00	100.00	-														-		+	1	-	1		-										+	_	+	100 148
1599.95	3 9	TiO ₂ +	1.06	92.83	0.89	2.39												0.86	+		1	1		1					1		1.97		1			+		+	100 131
1599.95	3 10	Tur	36.32	1.20	31.52	4.09		8.15	2.26	1.25	0.22			1.98																									87 141
1599.95	3 11	Tur	37.74	1.02	33.13	7.68		4.99	0.30	2.15																										-			87 134
1599.95	3 12	Qz	99.63			0.37															-		<u> </u>	<u> </u>		_			<u> </u>				<u> </u>			—		_	100 161
1599.95	3 13	"lim"	00.55	61.85	00.00	34.04	4.11	7.00	0.00	0.00					_		_		_		+		-	-	-	_										+		+	100 139
1599.95	3 14	i ur	38.58	U.84	33.63	4.05	1	/.33	0.32	Z.26											1	1	1	1				1	1	1			1						18/ 133

Sample	Site	Position	Mineral	SiO2	Ti02	AI203	FeO	MnO	MgO	CaO	Na2O	K20	P205	so3	ш	ō	Sc203	V205	Cr203	QIN	C00	ZnO	SrO	Y203	Zr02	Nb2O5	Ag2O	SnO2	BaO	La203	Ce2O3	Nd2O3	Hf02	WO3	ThO2	Yb2O3	Pr203	Nd2O3	Gd2O3	Dy203	Er203	UO3	Total	Actual Total
1599.95	3	15	TiO ₂ +	0.88	93.69	0.82	3.87	·					0.74																														100	127
1599.95	3	16	TiO ₂		98.61	0.44	0.95	i																																			100	137
1599.95	3	17	llm		53.73		45.48	0.79																																			100	149
1599.95	3	18	TiO ₂		100.00																																						100	149
1599.95	3	19	llm		50.51		40.93	3.53						5.03																													100	154
1599.95	3	20	llm Old Di	0.57	59.44		38.30	1.69																																	_	-	100	146
1599.95	3	21	Chi + Bt	29.80	0.85	17.14	44.68		5.99			1.09				0.45									00.00															-	_	-	100	64
1599.95	3	22	Zrn St	30.91	0.46	56.06	12.64		1.07					-				-				1.50			69.09			-						-		_					-	-	100	165
1599.95	3	23	llm ±	15.40	44.84	9 70	26.14	1.88	1.60			0.36										1.50																					100	118
1599.95	3	25	Tur	39.35	0.93	31 64	6.35	1.00	6.25	0.30	2 17	0.00																															87	138
1599.95	3	26	Ilm	00.00	56.44	01.01	40.63	2.93	0.20	0.00	2.17																																100	142
1599.95	3	27	"llm"		64.05		34.02	1.93																																			100	132
1599.95	3	28	llm + Qz	20.11	45.42		33.10	1.37																																			100	150
1599.95	3	29	Ms + TiO ₂	35.21	34.22	19.50	1.84	ł	2.24		0.58	6.40																															100	154
1599.95	3	30	llm+	1.13	52.02	0.81	44.33	0.46	1.25																																		100	138
1599.95	3	31	"llm"	0.91	77.72	0.71	20.09	0.56																																			100	131
1599.95	3	32	"llm"	100.00	77.15	0.67	19.74	2.43																																	_		100	125
1599.95	4	1	QZ	100.00	0.07	1.50	01.40	2.10					2.05	1 22																				7.40									100	154
1599.95	4	2	Ju + Ti∩.	2.31	96.02	0.81	1 02	3.19		-	-		2.05	1.33			-											-					$\left \right $	1.10		_			 	1	+	+	100	126
1599.95	4	3	TiO ₂ +	1.24	89.02	0.01	3.63		1	-	1	1		1			-+									5.80							\vdash	1.36					1	1	+	+	100	143
1599,95	4	5	Tur	36.57	0.83	31.25	5.92		7.02	0.95	2.09	1		1	2.37											0.00													1	1		1	87	137
1599.95	4	6	Tur	37.89	1.22	33.20	8.51		4.07		2.11																													1			87	130
1599.95	4	7	Grt	40.76		21.74	21.98	0.69	7.15	7.68																																	100	147
1599.95	4	8	TiO ₂		97.44		2.56	i																																			100	142
1599.95	4	9	Tur	37.40	1.31	32.24	7.40)	6.07	0.47	2.12																																87	136
1599.95	4	10	Ilm		55.69		43.05	1.26																																	_	-	100	141
1599.95	4	11	Zm	30.93										-											69.07																_		100	166
1599.95	4	12	Sd +	24.20	2.42	16.00	85.64	6.63	0.93	5.42	0.01	2.05	1.37																							_					_		100	08
1599.95	4	14		32 75	2.12	10.92	12.06	89.0	1 25	0.56	0.91	3.05																								-							100	111
1599.95	4	15	Q7	100.00	1.57	15.05	42.50	0.00	1.25	0.40		1.40																															100	165
1599.95	4	16	TiO ₂ + Qz	9.90	80.70	2.94	2.69)		0.46			0.83		2.47																												100	122
1599.95	4	17	"llm"		62.28		36.71	1.01																																			100	135
1599.95	4	18	TiO ₂ +	0.97	89.47	0.87	2.50)						2.73	3.45																												100	108
1599.95	4	19	TiO ₂ +	1.07	91.23	3.15	2.09)		0.53	0.55		1.38																														100	120
1599.95	4	20	Tur	38.18	1.04	32.96	5.93	6	6.31	0.42	2.15																																87	132
1599.95	4	21	"IIm" +	3.83	87.77	2.32	6.07	0.44	0.70		0.04	0.50																													_		100	137
1599.95	4	22	Chi + Bt +	37.26	3.24	16.85	35.08	0.41	2.78		0.81	3.58																								_				-			100	130
1599.95	4	23	Bt	39.10	3.66	16.98	23 36	0.43	8.22			4 69						-																									96	128
1599.95	4	25	"llm"	33.10	66.37	10.50	32.25	0.66	0.71			4.03																															100	120
1599.95	4	26	Sd +	1.40	0.83		85.98	5.78	0.71	3.51			2.50																														100	81
1599.95	4	27	Ilm		50.53		47.87	1.01	0.59																																		100	138
1599.95	4	28	llm +	0.75	59.61	0.53	37.95	0.48	0.69																																		100	128
1599.95	4	29	Tur	39.00	2.06	26.41	7.80)	7.80	2.87	1.05																																87	129
1599.95	4	30	Ilm		53.60	-	45.64	0.76																																		+	100	136
1599.95	5	1	"llm"		64.81		35.19	4 47																																-	-	-	100	126
1599.95	5	2		1.61	03.10	2.76	35.43	1.47		0.52			1.52					_															\vdash						-	1	+	1	100	101
1599.95	5	3	"llm"	1.31	75.58	0.96	22.09	1.37		0.32			1.00	-			-	-															\vdash	_					1	1	-	+	100	126
1599,95	5	5	Chl + Bt	38,44	0.38	20.77	28.25	9,06	2.32	0.78		1		1																									1	1		1	100	151
1599.95	5	6	"llm"	0.63	65.86		32.90	0.61																																			100	131
1599.95	5	7	Zrn	30.68																					69.32																		100	160
1599.95	5	8	llm		51.91		48.09	1																																			100	140
1599.95	5	9	Zrn	30.69																					67.73								1.58										100	167
1599.95	5	10	IIm + Kfs	12.55	59.96	7.05	15.52	1.39				0.30			3.22																										_	_	100	141
1599.95	5	11	TIO ₂ +	8.73	81.82	4.63	1.25	4	0.54	-		1.26			1.77			_		<u> </u>														_					<u> </u>	1	-	+	100	149
1599.95	C a	12	"IIm"		62.15		35.00	0.07		<u> </u>	-						-+	_																-					 	1	+	+	100	140
1599.95	5	14	TiO ₂ + O7	27.50	70.75	1.31	0.44	0.87	1	-			-	1																							-		1	1	-	1	100	151
1599,95	5	15	Tur	40.12	0.82	30.71	6.24		6.65	0.32	2,15			1																										1		1	87	131
1599.95	5	16	"llm"		70.02		29.98		1.50																																		100	120
1599.95	5	17	Tur	38.26	1.22	32.61	7.25	i	5.32	0.28	2.06																																87	130
1599.95	5	18	Zm	31.23																					68.77																		100	155
1599.95	5	19	Ilm		52.58		46.19	1.23	<u> </u>		<u> </u>			<u> </u>																										1		-	100	133
1599.95	5	20	1102		100.00	0.01	0.07		I	-	-				0.01																								-	1		+	100	136
1599.95	5	21	11U ₂ +	5.96	88.21	2.64	U.95	1	1	1	1	1	1	1	Z.24						1	1		1		1													1	1	_	1	100	13/

Sample	Position Mineral	Si02	Ti02	AI203	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	LL.	ō	Sc203	V205	Cr203	QN	00 C00	ZnO	SrO	Y203	ZrO2	Nb2O5	Ag2O	Sn02	BaO	La2O3	Ce2O3	Nd2O3	Hf02	WO3	ThO2	Yb203	Pr203	Nd2O3	Gd2O3	Dy203	Er203	n03	Total Actual Total
1599.95 5	22 "Ilm"		60.79		37.99	1.22																																	\rightarrow	1	00 128
1599.95 5	23 Zm	31.05																					68.95	i 📃															\rightarrow	1	00 153
1599.95 5	24 Qz	100.00																																						1	00 153
1599.95 5	25 "llm"		60.13		38.78	1.08																																	-+	1	00 132
1599.95 5	26 IIm	00.00	51.42	44.04	47.14	1.44	5.00			7.05																													\rightarrow	1	00 138
1599.95 5	27 Bt	39.36	3.44	14.24	25.96		5.96			7.05																										\rightarrow	-		\rightarrow		00 130
1599.95 5	20 IIm		54.47		43.74	1 78																														_				-+;	00 138
1599.95 5	30 llm		53 55		44.82	1.63																																			00 140
1599.95 5	31 Kfs + TiO ₂	33.58	33.53	22.99	0.60	1.00			2.06	4.20			3.05																											- 7	00 138
1599.95 6	1 "llm"		62.80		30.25	6.96																																		-	00 136
1599.95 6	2 TiO ₂ +	0.84	92.19	2.33	2.46	0.00		0.52			1.66																													-	00 129
1599.95 6	3 TiO ₂		99.27		0.73																																			1	00 146
1599.95 6	4 TiO ₂ + Kfs	26.11	49.97	16.83	1.41				0.60	0.43			4.65																										_	1	00 127
1599.95 6	5 TiO ₂ +	3.89	87.99	2.67	1.44								4.01																											1	00 88
1599.95 6	6 Ilm		54.07		40.31	5.62																																		1	00 151
1599.95 6	7	37.80	28.93	27.43	2.50				0.40				2.93																											1	00 141
1599.95 6	8 Zm	30.79																					69.21																	1	00 175
1599.95 6	9 Spl		0.47	32.76	14.04		17.06										35.68						<u> </u>	-	-									-	<u> </u>				\rightarrow	$-+^1$	00 161
1599.95 6	10 llm	0.0-	53.23		46.06	0.70		1.0-																-								-		-	<u> </u>				\rightarrow	$-+^1$	00 156
1599.95 6	11 Sd +	2.29		1.93	80.06	4.73		1.30			2.32												05.67								0.40	7.37			<u> </u>	\rightarrow			\rightarrow	-+	00 116
1599.95 6	12 Zm	29.22	04.51	0.86	1.17	0.00		1.29															65.37								2.10			<u> </u>	<u> </u>	\rightarrow			\rightarrow	-+	00 160
1599.95 6	13 "IIM"	1.45	64.54	4.04	34.78	0.68		4.55			2.52										_			-								_		-					\rightarrow	<u>+</u>	00 90
1599.95 6	14 50 +	1.45	3.88	1.24	18.55	7.80		4.55			2.52																											-	\rightarrow		00 09
1599.95 6	16 llm ± Oz	21.08	/0.23		27.84	1.84																														_				-+;	00 151
1599.95 6	17 llm	21.00	53.56		45.80	0.64															-															\rightarrow			-+	-+7	00 152
1599.95 6	18 llm		53.74		41.27	4.99																																		-	00 153
1599.95 6	19 Tur	37.34	0.75	33.84	9.50		3.52	0.23	1.83																																87 137
1599.95 6	20 Bt	34.39	2.24	13.84	29.98	0.54	10.43			4.58																													_		96 96
1599.95 6	21 llm		53.02		46.10	0.88																																		1	00 144
1599.95 6	22 IIm		53.46		45.05	1.49																																		1	00 146
1599.95 6	23 Ilm		51.32		46.86	0.62	1.20																																	1	00 143
1599.95 6	24 IIm		51.56		41.76	6.68																																	\rightarrow	1	00 149
1599.95 6	25 Bt	38.77	2.88	16.54	29.36		2.40		0.70	5.35																													\rightarrow		96 135
1599.95 6	26 Chl	27.28		20.24	30.30		7.18																																		85 111
1599.95 6	27 Tur	38.13	0.44	33.92	9.15		3.38		1.97																														\rightarrow	-	87 144
1599.95 6	28 "lim"	27.72	60.59	24.04	38.96	0.44	4.96	0.20	1.02																														\rightarrow	<u> </u>	00 142
1599.95 6	29 10	2 20	1 20	34.04	71.00	1.61	4.00	1.59	1.92		1.07	12 72									-											2.45				$ \rightarrow$	-	-	-+		00 108
1599.95 6	31 TiO.	2.30	08.80	1.07	1 11	1.01	0.94	1.50			1.97	13.73									-											3.40				$ \rightarrow $;	00 153
1599.95 6	32 llm		54 50		43.78	1 72																																			00 150
1599.95 6	33 "llm"		65.22		33.80	0.98																																		1	00 139
1599.95 6	34 Sd +		1.36		92.04	1.42		2.07			1.71			1.40																										1	00 90
1599.95 6	35 Qz + TiO ₂	59.60	39.98		0.42																																		_	1	00 164
1599.95 6	36 Bt	36.13	3.42	14.54	31.60		2.45			7.34				0.51																									_		96 136
1599.95 6	37 Zm	30.83																					69.17																	1	00 172
1599.95 6	38 Ilm		51.73		46.54	1.73																																	\rightarrow	1	00 146
1599.95 6	39 llm		50.80		46.39	2.81																		-	I														\rightarrow	1	00 146
1599.95 7	1 Tur	37.61	1.53	32.25	4.87		7.66	1.28	1.80															-	-									-	<u> </u>				\rightarrow	-+	87 137
1599.95 7	2 "IIM"	7.00	61.00	4.07	36.99	2.01																		-											-	\rightarrow			\rightarrow	-+	00 139
1599.95 7	3 11U ₂ +	7.00	89.46	1.85	1.68	0.55																		-								_		-	<u> </u>				\rightarrow	+	00 118
1599.95 /	4 IIM	6.02	54.42	2.10	45.07	0.52				1.04											_			1	-											\rightarrow	_		\rightarrow	\pm	00 143
1599.95 7	5 H/fc	66.42	00.70	17.96	1.00					15.72											-															_	-				00 163
1599.95 7	7 7m	30.74		17.00						10.72													67.82	,	1						1 44	_		<u> </u>	<u> </u>	\rightarrow			+	\pm	00 175
1599,95 7	8 "Ilm"	55.74	66.66		32.13	1.21																	07.02	1	1												-		+	-+7	00 139
1599.95 7	9 Qz +	79.42	1.54	12.41	1.61				0.44				4.58																												00 139
1599.95 7	10 "llm"	0.70	72.99		25.62	0.68																	1	1	1														+	1	00 140
1599.95 7	11 "llm"		62.93		35.97	1.11																																		1	00 147
1599.95 7	12 IIm		59.23		37.45	3.33																																		1	00 151
1599.95 7	13 TiO ₂ + Kfs	14.27	71.04	7.70	1.70		0.49			2.83			1.96															-		-										1	00 159
1599.95 7	14 "llm" +	0.60	67.44	0.60	25.74	5.01														0.62																				1	00 146
1599.95 7	15 llm		57.39		41.24	0.65	0.71																															[1	00 149
1599.95 7	16 llm		57.00		41.88	0.50	0.61																		L														\rightarrow	1	00 147
1599.95 7	17 "llm"	1.17	61.45		36.41	0.96																		-										I		$ \rightarrow$			\rightarrow	1	00 139
1599.95 7	18 "llm"		60.47		38.86	0.67														\vdash				-	-											$ \rightarrow$			\rightarrow	$-+^1$	00 143
1599.95 7	19 "llm"	4.05	65.11		33.83	1.06																		-												\rightarrow			\rightarrow	-+	00 142
1599.95 7	∠U∏Im	1.08	53.41	1	42.14	3.37																		1										1	1	_			_		153

ample	Site	sition	ineral	si02	102	203	eO	AnO	AgO	caO	a20	(20	205	503	ш	ū	:203	205	r203	NiO	000	nO	SrO	203	îr02	0205	g20	nO2	3aO	203	a2O3	1203	ffO2	V03	hO2	o2O3	r203	1203	1203	/203	1203	103	otal ctual otal
ő		P	Σ	0,	<u> </u>	₹	-	~	~	0	z	-	۵.	0,			õ	>	0	_	Ŭ	~		~		ž	<	S		Ľ	Ŭ	ž	-	>	-	≻	۵.	ž	Q	Δ'	ш		- <-
1599.95	7	21	"llm"	0.62	66.90		31.74	0.73		0.00																								0.75								1	00 145
1599.95	7	22	07 + TiO	72.00	26.52		92.04	2.45		0.83							-																	2.75							-	1	00 94
1599.95	7	24	TiO ₂ + Qz	26.05	67.40	3.01	3.54																																		-	1	00 145
1599.95	7	25	Chr		0.52	12.61	31.84		5.79										49.25																							1	00 141
1599.95	7	26	"llm"		61.40		37.18	0.53	0.89																																	1	00 139
1599.95	7	27	"llm"	0.73	69.30		28.98	0.99																																		1	00 134
1599.95	7	28	Chl + Bt	31.55	3.56	14.46	43.82		4.45			2.16																													_	1	00 101
1599.95	7	29	Tur	35.69	1.80	30.51	4.40		8.45	1.99	1.82				2.34																												87 141
1599.95	7	30	IIM "IIm"		50.61		46.93	1.44	1.01									-																							-	1	00 147
1599.95	7	32	llm		53 31		34.40	2.68	0.90								-																								-	1	00 140
1599.95	7	33	Zm +	28.03	0.63	1.66	1.77	2.00		1.89					2.01		0.72								63.30															-		1	00 131
1599.95	7	34	TiO ₂ +	1.26	91.85	1.73	3.91												1.24																							1	00 123
1599.95	7	35	Sd +		1.54		85.99	3.38		2.79			1.90																					4.40								1	00 89
1599.95	7	36	TiO ₂		96.03		3.97																																			1	00 123
1599.95	7	37	Tur	36.22	1.34	30.43	8.93		6.38	2.54	1.17																															1	87 136
1599.95	7	38	"llm"		80.93	10.07	19.07									_																									_	1	00 133
1599.95	7	39		22.62	76.68	18.87	0.69				11.87																														-	1	00 102
1599.95	7	40	07	99.68	70.00		0.09										-	-					_					_											-		-	1	00 160
1599.95	7	42	Ilm	00.00	59.34		38.52	2.14																																		1	00 135
1599.95	7	43	TiO ₂ + Kfs	17.02	65.01	9.52	1.22		0.68		0.45	2.90			3.20																											1	00 152
1599.95	7	44	Qz +	92.46	5.45		2.09																																			1	00 140
1599.95	7	45	llm		57.88		39.18	1.52																										1.42								1	00 142
1599.95	7	46	TiO ₂ + Chl	17.53	65.36	13.11	1.13		0.00	0.04	4.40				2.86																										_	1	00 143
1599.95		47	lur "llm"	36.10	1.40	30.86	9.14	1.06	6.06	2.31	1.12						-	-										-											-		-	1	00 132
1599.95	8	2	TiQo	1.95	95.66	1.16	1.23	1.00																																		1	00 132
1599.95	8	3	llm		52.72		46.55	0.73																																		1	00 143
1599.95	8	4	Bt	39.44	2.33	17.88	22.56		8.67		0.72	4.40																														1	96 77
1599.95	8	5	Sd +	14.47	1.34	6.60	70.77	1.36	3.84			1.60																														1	00 54
1599.95	8	6	Chl	24.23		22.32	22.17		13.19						3.09																										_	1	85 144
1599.95	8	7	IIm TiO	0.60	52.85		45.67	1.48										-																							_	1	00 150
1599.95	0	0	Sd +	0.60	99.40		90.89	4.07		2 72			1.67																										_		-	1	00 88
1599.95	8	10	Tur	38.68	0.76	33.76	6.03	4.07	5.78	0.39	1.61		1.07																														B7 140
1599.95	8	11	Tur	38.65	0.67	34.12	6.23		5.36		1.97																															1	87 136
1599.95	8	12	TiO ₂ +	3.14	93.88	1.40	1.25					0.33																														1	00 141
1599.95	8	13	Grt	39.46		21.00	17.24	15.20	2.13	4.97																															_	1	00 151
1599.95	8	14	$Qz + TiO_2$	70.80	28.55		0.66									_		_																							-	1	00 110
1599.95	0	15	110 ₂ +		93.90		24.04	2 20																																		1	00 124
1599.95	8	17	TiO		99.54		0.46	0.00																																ľ		1	00 145
1599.95	8	18	"llm"	0.82	82.27	1.52	12.92	2.48																																		1	00 138
1599.95	8	19	Sd +	3.28	1.07	1.30	83.65	5.22		3.02			2.45																													1	00 87
1599.95	8	20	llm		59.96		38.78	1.26																																		1	00 138
1599.95	8	21	lur "llm"	36.96	0.99	30.75	5.75	0.55	7.39	1.01	1.90				2.25			\rightarrow									$\left \right $											\rightarrow					6/ 142
1599.95	ک و	22	unu. +	4.39	79.04	35.05	12.21	0.58			2.22																								-		-	-+				1	00 134
1599.95	8	23	Qz	99.65		55.95	0.35				2.23				+	-	+	-								1										1							00 164
1599.95	8	25	llm		54.49		44.22	1.30																																		1	00 140
1599.95	8	26	TiO ₂		100.00																																	_				1	00 141
1599.95	8	27	Tur	37.94	0.62	34.34	7.55		4.56	0.26	1.73																															1	87 130
1599.95	8	28	Ilm		53.92		42.21	3.87																																		1	00 142
1599.95	8	29	50 + "Ilm"	4.26	74.05	1.48	80.38	2.11					1.86			-		-																8.21				\rightarrow				1	00 121
1599.95	8	31	Tur	37.25	1,18	31.60	6.38		6.12	0.50	2.18				1.80											1		_								1		\rightarrow			-+		87 142
1599.95	8	32	"llm"	0.82	71.50	0.93	26.28	0.46		2.00																1										1		-+			-	1	00 135
1599.95	8	33	Ms	45.70	0.79	29.91	1.99		2.38			10.03			4.21																											1	95 141
1599.95	8	34	Bt	37.17	3.64	14.55	26.71		9.00			4.93						Ţ																									96 124
1599.95	9	1	Zm	30.54	70.01				0.05			4.00			1.52										67.94																	1	00 167
1599.95	9	2	IIU ₂ + Kfs	11.46	/8.90	5.13	0.61	0.70	0.65			1.28			1.96	_																										1	00 145
1599.95	9		Grt	37.74	0.07 0.85	20.72	47.00	25.84	1 47	1 92					\vdash		-+	-										_	$ \rightarrow $						-		-	\rightarrow	_	-			00 143
1599.95	9	5	llm	01.14	56.29	1 20.72	42.95	0.76		1.02																1									1	1		-				1	00 140
1599.95	9	6	TiO ₂		99.50		0.50																																			1	00 141
1599.95	9	7	Tur	41.49	0.54	35.34	8.66		0.96																													_				1	87 157
1599.95	9	8	Zm	30.82																		1			69.18																	1	00 148

Sample	Site	Position	SiO2	Ti02	AI203	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	⊾ D	Sc203	V205	Cr203	0N N	000	ZnO	sro	Y203	ZrO2	Nb2O5	Ag2O	Sn02	BaO La2O3	Ce203	Nd2O3	Hf02	WO3	ThO2	Yb203	Pr203	Nd2O3	Gd2O3	Dy203	Er203	UO3 Total	Actual Total
1599.95	9	9 Grt	41.20		20.96	23.41	0.61	6.97	6.86																				_										100) 152
1599.95	9	10 "llm"		60.23		35.45	4.02							0.30)													_	_										100) 139
1599.95	9	11 TiO ₂ +	2.41	87.77	2.49	2.19			0.47						-		0.74	-					3.94																100) 119
1599.95	9	12 llm		53.57		43.53	0.64	2.26							-														-										100) 145
1599.95	9	13 IIU ₂	0.50	100.00		00.00	0.05																					_	_										100	J 149
1599.95	9	14 IIM 15 Zro	20.55	62.46		36.33	0.65								-								60.42			_	-	-	-										100	142
1500.05	9	16 llm	30.37	52.46		37.04	0.60																05.43																100	0 145
1599.95	9	17 "llm"		63.66		33.95	0.96	1 43																															100	0 134
1599.95	9	18 Tur	38.23	0.75	33.70	7.80	0.00	4.37		2.17																													87	132
1599.95	9	19 Qz	99.53	0.47	00.70	1.00		1.07		2.17																													100	0 161
1599.95	9	20 TiO ₂ +	1.34	89.27	2.01	5.34			0.46			1.59																											100	0 120
1599.95	9	21 "llm"		69.61		26.35		4.04																															100	0 118
1599.95	9	22 Tur	37.07	0.97	32.69	4.81		7.10	0.64	1.80				1.92																									87	133
1599.95	9	23 "llm"	0.70	68.44	0.62	30.24																																	100	J 110
1599.95	9	24 TiO ₂ + Kfs	13.02	73.35	8.45	0.63					2.27			2.29																									100	J 145
1599.95	9	25 Zrn	30.81																				67.72							1.47									100	J 163
1599.95	9	26 "Ilm"		60.77		38.73	0.51								1	1		I									_	_	+										100) 132
1599.95	9	27 Ilm		57.34		37.60	5.06								+	-											_	_	+										100	J 137
1599.95	9	28 IIm		54.18	0.00	45.22	0.60								+	-	-			\vdash							_	_	+										100	J 139
1599.95	9	29 "IIm"		80.19	0.68	19.13	4.000								+	+				\vdash			<u> </u>	\vdash			_	_	-										100	J 126
1599.95	9	30 IIM	2.07	86.04	3.02	31.38	4.93					1 22		4.62	1	+									-	-+			+										- 100	0 65
1500.05	9	32 TiO +	0.74	96.77	0.80	2.73						1.33		4.03	1-	1							-						+			-							100	/ 05
1500.05	9	33 St	30.30	0.67	55.02	13.00		0.81							+	+	-							\vdash	-		-	_	+									-	100	0 151
1599.95	9	34 Tur	38 14	0.07	30.89	6.87		7.46	0.30	2 46																-													87	137
1599.95	9	35 llm	00.11	52.96	00.00	45.60	1.44	1.10	0.00	2.10																												_	100	0 146
1599.95	9	36 Mnz		02.00					2.15			34.06	1.58	-0.08													16.	35 32.1	8 10.57			2.69							100	0 136
1599.95	9	37 llm		52.15		44.20	0.47	3.18																															100	0 142
1599.95	9	38 Chl +	40.55	0.88	13.45	40.53	0.59	2.09		1.52	0.38																												100	0 97
1599.95	9	39 llm		54.35		42.40	3.24																																100) 142
1599.95	9	40 "llm"		63.55		34.52	1.93																																100) 132
1599.95	9	41 Qz	99.55			0.45																																	100	J 165
1599.95	9.1	1 Ms	46.05	4.14	32.33	1.19		0.73		0.51	8.47			1.58																									95	, 108
1599.95	9.1	2 TiO ₂ + Ms	25.03	48.70	16.94	0.82				0.38	4.88			3.25															_										100) 111
1599.95	9.1	3 Xtm	1.79	2.78								37.12			_							45.73											3.95			1.60	3.65	3.38	100) 116
1599.95	9.1	4 110 ₂	1.34	97.19	0.77	0.42			0.00		0.29	00.40		0.00	-										4.40			00.0	~						7.04				100) 106
1599.95	9.1	5 Minz + 1102	0.72	19.25	0.00	0.40			0.92		1.00	38.46		-0.38											4.49			29.3	5						7.91				100	0 105
1599.95	9.1	6 11U ₂ +	9.72	61.23	0.00	42.69	0.77	1 1 2			1.90				-											-	_		-										100	0 133
1500.05	10	2 Tur	36.96	0.70	32.76	5 95	0.77	6.37	0.42	1 92				1 03														-											87	135
1599.95	10	3 llm	50.50	51.83	52.70	47 55		0.62	0.42	1.52				1.55																									100	0 134
1599.95	10	4 Grt	40.78		21.03	23.13	0.98	7.10	6.98																														100	0 149
1599.95	10	5 TiO ₂	4.26	95.12	0.62																																		100	0 141
1599.95	10	6 "Ilm"		65.39	0.81	30.15	2.09	1.56																															100) 127
1599.95	10	7 Bt	37.94	2.18	16.40	22.05		8.04		0.45	5.90			3.03																									96	131
1599.95	10	8 Bt	39.45	1.20	21.44	21.74		7.22			4.95																												96	, 84
1599.95	10	9 TiO ₂ +	1.10	94.06	1.28	2.13									1	<u> </u>	1.43	I					L																100) 128
1599.95	10	10 "llm"		65.94		33.34	0.72								-	-													-										100) 136
1599.95	10	11 llm		56.40		41.33	2.27								-	-											_		+										100) 140
1599.95	10	12 Ky	36.45	0.39	57.65	1.08	5.00			0.38				4.04	+	-	-			$\left \right $							-	_	+										100	1 159
1599.95	10	13 IIM		52.18		42.53	5.29								+	+				\vdash			<u> </u>	\vdash			_	_	-										100	J 141
1599.95	10	14 IIM 15 Zm	20.02	63.22		31.55	5.22		0.76						0.50	1							60.62						+			-							100	129
1599.95	10	15 ZIII 16 Tur	29.02	1.52	21.54	7 1 1		6.22	0.76	2 1 2					0.59								69.63																07	120
1500.05	10	17 Tur	36.21	1.33	30.17	6.82		6.06	0.73	2.12				3.50																									87	137
1599.95	10	18 llm	00.21	53.19	00.17	45.80		1.00	0.00	2.20				0.00																									100	0 138
1599.95	10	19 llm		53.28		45.51	1.21																																100	0 140
1599.95	10	20 Tur	37.85	1.97	27.40	10.51		5.79	1.10	2.39																													87	128
1599.95	10	21 Ilm		53.05		45.58	0.81	0.55																															100) 141
1599.95	10	22 Ilm +	6.34	49.71	3.45	36.92	3.07				0.51																												100	J 147
1599.95	10	23 TiO ₂		95.80	1.47	2.73																																	100	J 29
1599.95	10	24 Ilm		58.41		40.51	1.08								1	1																							100) 137
1599.95	10	25 Qz + TiO ₂ +	64.22	28.09	4.89	2.80			0.05						+	-		<u> </u>									_		+										100	J 131
1599.95	10	26 TiO ₂ +	3.11	85.46	3.50	3.04			0.67		0.00	1.27		2.96	+	+				$\left \right $						_	_		+										100	111
1599.95	10	2/ UZ +	83.39	1.46	7.63	1.11	0.60				2.22			4.18	+	+				\vdash			<u> </u>	\vdash			_	_	-										100	J 144
1599.95	10	20 Tur	27.05	/1.46	21.02	27.94	0.60	5.24	0.50	2.14					1	+													+		_	-							100	133
1500 05	10	20 Ilm	37.00	51.93	31.02	44 52	3.60	0.04	0.52	4.11					1	1	-										-	-	-			-		\vdash		-			100	0 140
1000.00	10	001000		01.07		17.00	0.00																						_											

Sample	Site	Position	Mineral	SiO2	TiO2	AI2O3	FeO	OuM	MgO	CaO	Na2O	K2O	P205	SO3	Ŀ	G	Sc203	V205	Cr203	NiO	C00	ZnO	SrO	Y203	ZrO2	Nb2O5	Ag2O	SnO2	BaO	LazU3	Ce2O3	Nd2O3	Hf02	WO3	ThO2	Yb2O3	Pr203	Nd2O3	Gd2O3	Dy203	Er203	U03	I otal Actual Total
1599.95	10	31	llm		54.03		44.65	1.32																																		1	00 140
1599.95	10	32	"llm"		63.73		33.01	3.26																																		1	00 128
1599.95	10	33	Tur	36.07	1.47	30.06	11.35		4.92	1.35	1.77																															8	37 133
1599.95	10	34	"llm"		65.09		34.40	0.51																																		1	00 128
1599.95	10	35	"llm"		90.91	1.11	7.98																					_														1	00 115
1599.95	10	36	IIm		54.56		43.78	0.86	0.80																																	- 1	00 130
1599.95	10	20	"llm"		54.10		24.05	1.79								-	-						_					-		-									-		-		00 142
1500.05	10	30	Zm	20.68	04.71	0.73	0.60	1.03		0.59						-									68.40																	1	00 140
1599.95	10	40	07	99.32	0.32	0.75	0.36			0.55													-		00.40																	1	00 158
1599.95	10	41	llm	00.02	52.08		43.97	0.48	2 98										0.49																							1	00 135
1599.95	10	42	llm		52.00		41 42	5.67	2.00										0.10																							1	00 137
1599.95	10	43	"llm"		71.06		27.55	1.39																																		1	00 122
1599.95	10	44	Chr + Qz	11.34	0.89	11.93	18.20		11.18		0.58								45.89																							1	00 115
1599.95	10	45	Tur	38.00	0.93	32.70	7.27		5.46	0.64	1.99																															3	37 128
1599.95	11	1	Qz + TiO ₂	66.05	29.94	0.64	0.71								2.66																											1	00 163
1599.95	11	2	"llm" +	5.43	76.80	3.17	13.49		0.47		0.63																															1	00 148
1599.95	11	3	llm		58.23		39.11	1.36	1.31																																	1	00 156
1599.95	11	4	llm		55.59		42.48	1.64		0.28																																1	00 158
1599.95	11	5	"llm"	0.83	85.48	0.62	13.07									_						\vdash						\rightarrow		-+						<u> </u>						1	00 136
1599.95	11	6	Spl			45.48	14.30		18.11							_			22.11			-						_		_												1	00 164
1599.95	11	7	IIM	0.40	49.35		49.33	0.76	0.56							_											\vdash						\vdash			<u> </u>					-+		00 154
1599.95	11	8	110 ₂	0.49	98.56		0.94									_												_		-												1	00 156
1599.95	11	9		10.10	60.75	0.65	36.30	2.96								-	-						_					-											_		-	- 1	00 130
1599.95	11	11	7m	31.50	54.41	9.65	19.03	4.60								-									68.41			-		-									_			1	00 170
1599.95	11	12	07	100.00												-							-		00.41																-	1	00 173
1599.95	11	13	Grt	38.92		20.80	25.87	10.78	2.18	1.45																																1	00 161
1599.95	11	14	Zm	30.55			0.47																		68.98																	1	00 173
1599.95	11	15	Qz	100.00																																						1	00 171
1599.95	11	16	"llm"	1.22	85.35	1.77	11.65																																			1	00 142
1599.95	11	17	Qz	100.00																																						1	00 171
1599.95	11	18	TiO ₂ +	4.49	94.96		0.55																																			1	00 158
1599.95	11	19	TiO ₂ + Qz	19.81	76.80	0.91	2.47																																			1	00 147
1599.95	11	20	Sd +				89.22	4.85		3.93			2.00																													1	00 87
1599.95	11	21	Sd +	1.25	0.70	1.00	84.84	6.60		3.75			2.56			_																										- 1	00 89
1599.95	11	22	QZ IIm	99.24	0.76		40.75	1.00								-	-						_					-											_		-		00 179
1599.95	11	23	llm		54.05		42.75	3.21								-							_						-		-	-									-	1	00 159
1599.95	11	25	llm		53.62		44.71	1.00	0.68																														-			1	00 156
1599.95	11	26	"llm"	0.69	75.75	0.58	22.10		0.88																																	1	00 133
1599.95	11	27	"llm"		67.49		30.34	2.17																																		1	00 147
1599.95	11	28	llm		52.03		46.93	0.41	0.62																																	1	00 157
1599.95	11	29	TiO ₂ +	1.18	91.90	2.55	2.57			0.58			1.22																													1	00 103
1599.95	11	30	TiO ₂ +	5.63	89.77	3.10	0.97					0.53																														1	00 142
1599.95	11	31	Chr		0.88	24.12	14.39		12.37										48.24																							1	00 156
1599.95	11	32	lin lim	1.33	54.00	1.95	11.42	154							\vdash	-			0.82		 						+	+		+			\vdash	1./5		<u> </u>						-+	00 145
1599.95	11	3/	"llm"		62.25		34 74	2.01													-										-					-						-	00 147
1500 05	11	34	Chl + Bt	20.20	3 22	13.52	30.25	2.31	8 11			1 00									<u> </u>							-+						4 27		<u> </u>			-	-		1	00 107
1599,95	11	36	Ilm	23.23	52.09	10.00	47.34	0.57	0.74			1.30																-+						1.21					-		-+	1	00 155
1599.95	11	37	llm		56.87		40.15	2.99													1															1			-		-	1	00 152
1599.95	11	38	Grt	39.65		21.18	27.71	1.24	3.76	6.46											1								1													1	00 164
1599.95	11	39	Ms	56.70	0.56	20.96	2.66		3.11		0.35	7.57			3.10																											ę	95 166
1599.95	11	40	TiO ₂ +	0.90	87.91	2.33	3.19			0.50			1.23		3.94																											1	00 128
1599.95	11	41	Sd +		0.84		91.96	2.50		3.07			1.63																											T		1	00 87
1599.95	11	42	Bt	37.50	1.54	19.98	19.55		8.39			5.76			3.29																											ę	96 105
1599.95	11	43	"llm"		60.63		38.42	0.95																			\vdash															1	00 144
1599.95	11	44	llm		50.00		48.25	0.65	1.10							_					<u> </u>							_						_	l	<u> </u>							00 148
1599.95	11	45	IIM IIM		56.60		39.10	4.30		1.00			4.00			_																	$ \rightarrow $									-+	00 00
1599.95	11	46	- DC		0.73		94.79	1.81	-	1.39			1.28			\rightarrow					-						⊢ – -									<u> </u>					-	-1^{1}	00 144
1599.95	11	4/	07	00.64	00.01		0.36	4.01													-						+				-					-					-+	-1	00 171
1599.95	11	49	Ilm	35.04	51.39		47.43	1.18									-				 															<u> </u>					-+	1	00 146
1599.95	11	50	llm		52.41		44.90	0.60	2.09							+	-				1							+		+												1	00 148
1599.95	11	51	"llm"	0.76	71.90	0.69	24.10	2.55																																		1	00 136
1599.95	11	52	TiO ₂		96.69		3.31																																			1	00 148
1599.95	11.1	1	Feohy + Ap	+	1.08		87.26	5.14		3.91			2.60																										_			1	00 60
1599.95	11.1	2	Feohy		0.80		98.55	0.65																																T		1	00 60

Sample	Site	Wineral	si02	Ti02	AI2O3	0 E O	MnO	MgO	CaO	Na2O	K20	P205	SO3	u.	ō	Sc203	V205	Cr203	QIN	CoO	ZnO	sro	Y203	Zr02	Nb2O5	Ag2O	Sn02	BaO	La203	Ce203	Nd2O3	Hf02	W03	ThO2	Yb203	Pr203	Nd2O3 Gd2O3	Dv203	Er203	no3	Dotal Actual	Total
1599.95	12	2 102	0.43	99.00		0.57									-+		_			_	+				-	+												+		+	100 1	148
1599.95	12	2 7m	20.01	100.00											-		-			_				60.00				_										+		+	100 1	149
1599.95	12	4 "llm"	0.61	69.02		28.46	1 92																	09.09	, 													-		+	100 1	137
1599.95	12	5 Ilm	0.01	53.69		43.35	2.42	0.55																																-	100 1	147
1599.95	12	6 "IIm"		61.19		37.76	0.50	0.55																																-	100 1	141
1599.95	12	7 TiO ₂ +	3.65	91.16	2.06	3.13																																			100 1	151
1599.95	12	8 Tur	37.87	1.08	32.36	4.44		7.24	0.21	2.15				1.65																											87 1	147
1599.95	12	9 Ilm		51.62		46.07	2.31																																		100 1	152
1599.95	12	10 TiO ₂		100.00																																		_		_	100 1	156
1599.95	12	11 Qz	100.00																																			_	_	—	100 1	174
1599.95	12	12 Sd +		0.98		84.77	5.46		7.30			1.48			_		_																					-	-	+-	100 1	87
1599.95	12	1.3 IIII 1.4 "IIm"		62.16		49.15	0.64	2.96							-																							-	-	+	100 1	146
1599.95	12	15 llm		58.79		40.00	1.21	2.50																																+	100 1	147
1599.95	12	16 TiO ₂ +	0.88	91.82	1.67	3.10			0.40	0.50		1.63																												-	100 1	139
1599.95	12	17 TiO ₂ +	2.17	85.64	1.87	2.73								7.58																											100	40
1599.95	12	18 "Ilm"		66.05		32.32	1.63																																		100 1	138
1599.95	12	19 Ilm		52.65		45.62	0.80	0.93																																_	100 1	149
1599.95	12 1	20 IIm	07.07	49.66	00.07	48.88	0.71	0.74	0.00	0.47					_																							_	_	—	100 1	150
1599.95	12	≤ i l ur 22 "llm"	37.97	74.40	29.97	9.01		0.00	0.89	2.17					-+										-							\vdash						+		+	8/ 1	1/13
1599.95	12	22 IIII 23 "IIm"	0.54	74.19		27.44	1.54								-		-			-																		-		-	100 1	135
1599.95	12	24 "Ilm"		72.57	0.51	23.82	3.11																																	-	100 1	135
1599.95	12	25 Al-Phos			34.53	0.99			1.17			35.13		-0.84								3.24							8.85	13.19	3.74										100 1	132
1599.95	12 :	26 Ms + TiO ₂	35.52	30.09	21.58	3.56		1.01			6.17			2.08																											100 1	136
1599.95	12 :	27 "llm"		60.02		38.39	0.91	0.68																																_	100 1	143
1599.95	12 :	28 "Ilm"		66.78		28.64	3.30								_		_				1.27																	-		—	100 1	134
1599.95	12 1	29 Chl	26.08	0.49	20.93	25.21	0.55	11.73							_		_																					-	-	—	85 1	134
1599.95	12	30 1IM		0.74	25.69	38.08	0.68	14.06										22 21																				-		+-	100 1	144
1599.95	12	32 Tur	36.76	0.66	31.78	8.96		5.74	1.25	1.84								33.31																				-		-	87 1	144
1599.95	12	33 Zrn	41.27	0.50		0.00			0.60															57.63	3																100 1	153
1599.95	12	34 Ilm		51.58		45.20	3.23																																		100 1	153
1599.95	12	35 "Ilm"		74.53		21.78		3.69																																_	100 1	145
1599.95	12	36 TiO ₂ +		93.78		6.22									_																									_	100 1	127
1599.95	12	37 llm		54.47		43.91	1.61																															_	_	—	100 1	149
1599.95	12	38 I ur	37.79	0.84 50.20	33.73	8.71	2.95	3.52	0.38	2.04					_		_																					-	-	+	8/ 1	140
1599.95	12	40 llm		52.38		46.70	0.91								-		-																					-		-	100 1	147
1599.95	12	41 llm		58.96		39.22	0.70	1.12																																+	100 1	139
1599.95	12	42 St	29.74	0.82	54.23	12.79		1.32													1.10																				100 1	156
1599.95	12 -	43 Qz	100.00																																					_	100 1	168
1599.95	12	14 TiO ₂	2.57	95.75	1.39						0.29																											_		_	100 1	148
1599.95	12 4	15 I ur 16 Illee	36.91	1.19	25.52	14.05	0.74	5.66	1.72	1.95					_																							-		+	8/ 1	138
1599.95	12	17 "llm"		66 13		40.70	0.74								-		-			-																				+	100 1	140
1599.95	12	48 Zrn +	25.47	0.69	1.25	0.81	0.00		0.98					3.88	-	1.39								63.27	,								2.27							+	100 1	134
1599.95	12.1	1 Feohy + Ap		1.10		92.66			4.04			2.19																													100	62
1599.95	12.1	2 Feohy +	3.59	0.98	2.67	75.83	8.21	1.26	5.15		0.39	1.92																								-					100	64
1599.95	12.2	1 TiO ₂	1.44	97.95		0.61																																1		+	100 1	108
1599.95	12.2	2 Mnz	1.00			1.35			0.52			34.31		0.94	-+	-+			-0.24		+				-		_	1	3.22	34.48		\vdash				4.05	11.38	+	_	+	100 1	102
1599.95	12.2	4 TiO	4.30	06.04	0.52	0.60	-		0.47			35.40		0.07	-+	-+	-+		0.23									1	4.06	34.31		\vdash					10.50	+		+	100 1	107
1599.95	12.2	5 Qz	100.00	30.01	0.00	0.00									+										1				-									1		+	100 1	121
1599.95	12.2	6 TiO ₂ +	4.01	92.32	1.96	0.77					0.94				-										1													1		+	100 1	105
1599.95	12.2	7 Qz +	97.24	1.92	0.61						0.23																														100 1	121
1599.95	12.2	8 Ms	48.58	0.70	27.63	4.28		1.92		0.66	9.22			2.02																											95 1	105
1599.95	12.2	9 Mnz	1.22			0.73			0.72			36.34	0.86	0.07					0.27									1	3.52	33.87							12.41	1		+	100	99
1599.95	12.2	10 Mnz		00.55		00.00	0.75					36.11		-0.40	_		_		0.12									1	2.98	34.94		\vdash				3.81	12.44	1		+	100 1	105
1599.95	13	1 1Im*	08.00	60.55	0.20	38.69	0.75		\vdash						-		_			_					-							\vdash						+		+	100 1	143
1599.95	13	3 TiO ₀ + O7	44.88	54.50	0.39	0.62									-+		-								-				-			\vdash				-		1		+	100 1	153
1599.95	13	4 Bt	37.34	3.68	14.33	25.93	0.46	8.90			5.36				+																							1		+	96 1	117
1599.95	13	5 Qz	99.36	. , ,	0.64																																	Ĺ			100 1	171
1599.95	13	6 TiO ₂ + Qz	11.66	87.60		0.73																								-							_				100 1	143
1599.95	13	7 "llm"	0.79	69.77	0.55	28.25		0.64																																+	100 1	135
1599.95	13	8 TiO ₂ + Qz	42.28	57.72																					-													1	_	_	100 1	165
1599.95	13	9 Ilm		51.57		45.27	2.36	0.80													1																	1			100 1	148

Sample	Site	Position	SiO2	Ti02	AI2O3	FeO	MnO	OgM	CaO	Na2O	K20	P205	SO3	⊾ ō	Sc203	V205	Cr203	0N	CoO	ZnO	SrO	Y203	ZrO2	Nb2O5	Ag2O	SnO2	BaO	La2O3	Ce2O3	Nd2O3	Hf02	WO3	ThO2	Yb203	Pr203	Nd2O3	Gd2O3	Dy203	Er203	U03 Total	Actual Total
1599.9	5 13	10 Tur	37.51	0.70	30.76	11.55		3.95	0.57	1.97																														8	7 134
1599.9	5 13	11 TiO ₂ +	6.15	89.09	2.95	1.37	4.07				0.44																													10	0 130
1599.9	5 13	12 IIII 13 Me	47.74	0.56	34.82	42.30	4.21	0.50		0.73	7 57			1 78																										01	5 142
1599.9	5 13	14 St	29.58	0.80	54.47	13.82		1.33		0.75	1.51			1.70																										10	0 154
1599.9	5 13	15 "llm"		70.41	0.72	28.35	0.52																																	10	0 126
1599.9	5 13	16 llm		54.98		42.23	2.79																																	10	0 147
1599.9	5 13	17 Qz +	94.17	5.83																																				10	0 168
1599.9	13	18 Iur	36.83	1.30	25.81	97.41	5.27	8.33	3.23	0.95		2.45																												10	/ 143 0 86
1599.9	5 13	20 "llm"	1.45	74.14		24.71	5.21	1.16	3.30			2.43																												10	0 135
1599.9	5 13	21 TiO ₂ +	0.74	90.19	0.51	6.56	0.63																									1.38								10	0 105
1599.9	5 13	22 Tur	38.07	1.26	31.07	4.03		8.24	0.76	1.93				1.64																										87	7 146
1599.9	5 13	23 Spl		0.41	43.04	13.09		17.96									25.50																							10	0 158
1599.9	13	24 IIm 25 "IIm"	0.54	52.39		45./1	1.90																																	10	0 147
1599.9	5 13	26 llm	0.54	53.20		45.48	0.70	0.62																																10	0 150
1599.9	5 13	27 "Ilm"		69.58		29.83	0.59																																	10	0 136
1599.9	5 13	28 "Ilm"	1.15	85.61	2.76	6.49				0.51							0.82															2.66								10	0 139
1599.9	5 13	29 Grt	39.10	0.45	20.32	15.19	18.78	1.36	4.80	0.00					<u> </u>																									10	0 163
1599.9	13	30 Tur	38.25	1.24	30.12	10.66	\vdash	1.10	0.48	2.32					-																			_						87	7 140
1599.9	5 13	32 St	28.38	0.83	55.65	13.91		1.22	0.77	2.10																														10	0 155
1599.9	5 13	33 Tur	38.39	0.88	32.85	7.50		5.30	0.24	1.84																														87	7 134
1599.9	5 13	34 St	29.74	0.71	54.33	13.68		1.54																																10	0 152
1599.9	5 13	35 "llm"		61.48		37.78	0.74	0.74																																10	0 133
1599.9	5 13	37 Bt	37.61	2.62	19.18	19.49	0.74	8.47			8.63																													96	6 143 6 144
1599.9	5 13	38 Ilm		53.74		44.23	2.02				0.00																													10	0 143
1599.9	5 13	39 Zrn	30.45		0.40	0.49									0.43								65.86								2.36									10	0 148
1599.9	5 13	40 Tur	37.75	1.18	33.36	6.46	4 70	5.76	0.53	1.96																														87	7 136
1599.9	5 13	41 1m	31.10	65.90		32.37	1.73																68 90																	10	0 155
1599.9	5 13	43 Ilm	01.10	53.24		45.23	1.53																00.00																	10	0 147
1599.9	5 13	44 Ilm		54.45		42.49	3.06																																	10	0 144
1599.9	5 13	45 TiO ₂ +	1.07	88.30	2.38	3.36			0.53			1.41												2.95																10	0 124
1599.9	5 13	46 llm		53.92		43.65	2.43		1.67																															10	0 148
1599.9	5 13	48 TiO ₂ +	0.77	92.09	0.60	6.53			1.07																							-		_						10	0 116
1599.9	5 13	49 llm		57.47		39.83	0.73	1.97																																10	0 147
1599.9	5 13.1	1 TiO ₂	0.42	99.12		0.46																																		10	0 107
1599.9	5 13.1	2 Qz	99.59	00.10	0.41	0.00																																		10	0 120
1599.9	5 13.1	1 Mnz + Oz +	64.63	3.66		0.80			1 99			13.83	1.82	1 19															8 74							3.31				10	0 110
1599.9	5 13.2	2 TiO ₂	1.68	97.03	0.46	0.82																																		10	0 106
1599.9	5 13.2	3 Qz +	95.12	0.87	0.65				0.38			1.53																	1.45											10	0 117
1599.9	5 13.2	4 Qz + TiO ₂ +	49.44	18.15	23.01	2.86		0.32	0.44	0.65	0.05	05.07	0.84	4.73					0.70			44.40															0.07	4.05		10	0 101
1599.9	5 13.2	5 Xtm + QZ	25.23	3.58					0.61		0.65	35.97		2.53	-				0.72			41.46	-					_				_		2.64			2.87	4.05		10	0 103
1599.9	5 13.3	1 TiO ₂	1.10	95.41					0.01			20.00		0.10					0.01			00.20										3.48		2.01			1.02	0.02		10	0 107
1599.9	5 13.3	2 Qz	99.07	0.93																																				10	0 122
1599.9	5 13.3	3 Qz	99.42	0.44							0.14																													10	0 121
1599.9	13.3	4 110 ₂ + Qz	29.88	68.37	0.89	84.01	6 52		3.47			2 72		1./5	-																		-							10	0 62
1599.9	5 13.4	2 Feohy +	1.17	1.11	0.00	84.15	7.18		3.89			2.46																												10	0 60
1599.9	5 13.5	1 Mnz + TiO2		45.43	1.12	2.24			2.88			22.67	1.77	0.77															17.42							5.71				10	0 87
1599.9	5 13.5	2 TiO ₂ +	1.52	87.52	2.59	3.33			0.57	0.53		1.46												2.47																10	0 93
1599.9	5 13.5	3 TiO ₂ +	1.87	83.71	2.36	3.52			0.52	0.53		1.16		3.97										2.37	1.21				14 75											10	0 87
1599.9	5 13.5	5 TiO ₂ + Mnz	1.30	47.59	9.19	2.53			2.84			20.49		0.87	1		1								1.21				13.55			2.94								10	0 79
1599.9	5 13.5	6 TiO ₂ +	1.48	86.78	2.43	2.91			0.46	0.49		1.12		4.32																										10	0 90
1599.9	5 14	1 "llm"		72.11		22.75	5.14																																	10	0 108
1599.9	14	2 Sd +	22.91	1.11	1.36	65.68 18.0F	3.93	6.67	3.10	0.66	6 31	1.91		3 30											-															10	97 3 112
1599.9	5 14	4 TiO ₂ +	1.29	90.94	2.86	2.39	1.43	0.07	0.47	0.00	0.31	1.61		5.50			0.43								-															10	0 131
1599.9	5 14	5 Qz	100.00																																					10	0 170
1599.9	5 14	6 Sd +	1.75		1.44	84.47	5.07		2.96			1.87			<u> </u>																	2.43								10	0 89
1599.9	5 14	7 Chr	0.65	0.93	23.14	26.20		7.03				26.24		0.07			41.26			0.79	2.54							6.69	12 02	7 27										10	0 145
1099.9	14	0 AI-PHUS			1 33.23							30.31		0.07	1	1				1	2.31				1			0.00	13.02	1.31										110	01 100

Sample	Site	Position Mineral	Si02	TiO2	AI2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	⊾ D	Sc203	V205	Cr2O3	NiO	CoO	ZnO	SrO	Y203	ZrO2	Nb2O5	Ag2O	SnO2	BaO	Ce2O3	Nd2O3	Hf02	WO3	ThO2	Yb2O3	Pr203	Nd2O3	Gd2O3	Dy203	Er203	UO3 Total	Actual Total
1599.95	14	9 llm		54.89		43.17	1.94																																10	0 149
1599.95	14	10 Grt	39.33		20.95	30.60	6.03	2.19	0.90																														10	0 156
1599.95	14	11 Zm	30.63																				69.37																10	0 164
1599.95	14	12 Tur	38.67	0.82	33.42	6.31		5.67	0.39	1.71																													87	7 134
1599.95	14	13 TiO ₂ +	3.51	93.07	1.89	1.53																																	10	0 131
1599.95	14	14 "llm"		72.93	0.59	26.48																																	10	0 119
1599.95	14	15 St	30.32	0.81	57.13	10.43		0.47												0.85										_									10	0 152
1599.95	14	16 llm		59.48		38.98	0.79			0.75																				_									10	0 140
1599.95	14	17 lim		54.16		44.59	1.26																					-		-									10	0 148
1599.95	14	18 lim	10.01	51.98		45.22	0.64	2.16																						-									10	0 149
1599.95	14	19 "lim" +	19.04	44.28		35.57	1.11																							-									10	0 165
1599.95	14	20 Tur	38.14	45.05	32.92	1.73	0.67	8.95	0.84	1.97				1.85												-		-		-									8/	145
1599.95	14	21 IIII 22 Tur	20 42	40.90	22.51	0 / 0	0.07	4.22		2.09																				-									07	7 130
1599.95	14	23 7m	30.92	1.20	52.51	0.40		4.20		2.00													69.01							-									10	0 167
1599.95	14	24 07	100.00																				03.01																10	0 168
1599.95	14	25 "llm"	2.83	66 51	1 74	28.92																																	10	0 135
1599.95	14	26 Zm	30.52																				67.95							1.53									10	0 170
1599.95	14	27 TiO ₂ +		92.25		7.75									1											+				1.20	1								10	0 115
1599.95	14	28 Zrn	27.59		0.77	0.62			1.51						1.01								68.50																10	0 139
1599.95	14	29 Tur	37.98	0.75	33.01	8.10		4.84	0.34	1.98																													87	7 134
1599.95	14	30 Tur	38.23	1.24	32.52	5.60		6.75	0.66	1.98																													87	7 133
1599.95	14	31 TiO ₂	0.91	97.73	0.51	0.86																																	10	0 137
1599.95	14	32 TiO ₂ +	3.96	91.82	2.19	1.80					0.23																												10	0 137
1599.95	14	33 Zrn +	25.70	0.56	1.05				1.71					4.81	1.01								63.27						_	1.89									10	0 120
1599.95	14	34 Sd				53.21	1.64		1.15																				_										56	3 80
1599.95	14	35 Tur	37.01	0.72	32.54	6.64		5.78	0.51	1.76				2.04														_	-	_									87	/ 13/
1599.95	14	36 IIm		51.86		47.31		0.84	40.00			45.40		5.04															_	-									10	0 136
1599.95	14	37 Ap	27.67	1 17	24.22	5.26		6 16	40.90	2.01		45.12		5.91																									07	7 137
1599.95	14	30 An	57.07	1.17	34.23	6.34		0.10	40.20	1.37		38.46		8 55																	5.00								10	0 63
1599.95	14	40 "Ilm"		65.30		32.05	2.66		10.20	1.07		00.10		0.00																	0.00								10	0 136
1599.95	14	41 TiO ₂ +	10.47	85.10	1.52	0.99								1.93																									10	0 123
1599.95	14	42 IIm		44.78		50.51	2.60	2.11																															10	0 142
1599.95	14	43 Ilm		53.73		43.16	3.11																																10	0 145
1599.95	14	44 IIm		54.29		44.35	1.35																																10	0 148
1599.95	14	45 TiO ₂ +	3.13	89.64	1.52	3.20			0.51		0.29	1.71																											10	0 137
1599.95	14	46 "llm"	1.48	60.03	0.66	33.40	4.43																						_										10	0 141
1599.95	14.1	1 Qz	100.00																									_	_	-									10	0 120
1599.95	14.1	2 TiO ₂ +	1.02	91.41	2.98	2.63			0.51			1.45																	_	-									10	0 96
1599.95	14.1	3 TIO ₂ +	1.27	90.93	3.47	2.59			0.51			1.22																	-	-									10	0 94
1599.95	14.2	1 07	00 40	32.50	2.15	0.60			0.07			1.14																											10	0 121
1599.95	14.2	2 Mix	2 60		1.58	79.81	3.93		1.33			1 75																			9.00								10	0 73
1599.95	14.2	3 Qz +	93.58		1.00	5.42	0.00		1.00																						0.00								10	0 105
1599.95	14.2	4 Sd + Chl	3.87		2.35	85.80	2.62	0.90	2.53			1.93																											10	0 63
1599.95	14.3	1 TiO ₂		99.37		0.63																																	10	0 107
1599.95 1	14.3	2 Chl + TiO ₂	19.02	62.80	10.06	5.57		0.81	0.29		1.46															Ţ													10	0 101
1599.95	14.3	3 Chl + TiO ₂ +	17.59	55.60	9.23	13.48		0.56		0.76		1.20			I														_	-	1.58								10	0 86
1599.95	14.4	1 Py + Qz	17.66			27.31			0.19				54.85		I														-	-	-								10	0 153
1599.95	14.4	2 Qz	99.62			0.38																							-	-	-								10	U 121
1599.95	14.4	3 50	00.50	1.40		52.84	1.74		1.43																			_	_	-									10	3 59
1599.95	14.5	2 10	98.52	1.48	0.70	1.07						0.50			-											-+			+	+									10	0 122
1599.95	14.5	3 TiO ₂ +	0.12	80.13	0.70	0.73			1 27			0.00	-		1													5	8	-	1				2 20	_			10	0 99
1599.95	14.5	4 TiO ₂		99.05	0.07	0.95			1.21			0.7 1																0.							2.20				10	0 90
1599.95	15	1 "Ilm"		61.97		35.28	2.75								1																								10	0 148
1599.95	15	2 "Ilm"	1.41	79.28	1.22	17.20	0.88																																10	0 132
1599.95	15	3 "Ilm"	0.58	65.46	0.86	32.39	0.71																																10	0 142
1599.95	15	4 Tur	37.09	1.04	33.19	3.33		7.73	0.98	1.73				1.91																									87	7 148
1599.95	15	5 TiO ₂ +	6.67	87.61	3.50	1.49					0.73									μĪ										-									10	0 151
1599.95	15	6 TiO ₂ + Qz	45.17	54.02		0.81									I														-	-									10	0 162
1599.95	15	7 Chl + Bt	37.80	2.05	19.68	28.49	0.44	6.49		0.65	4.42												00.00						_	-									10	U 123
1599.95	15	8 Zm	31.07	1.00	0.70	EE 00	1.40				1.50												68.93					_		+	2.45								10	0 108
1599.95	15	3 30 + Q2 +	21.99	74.22	9.76	18 00	3.62	4.44			1.59																_		-	-	3.15								10	0 133
1599.95	15	11 llm	0.79	54.04	0.05	40.44	5.52	1.01							1											-+			-	+	1								10	0 144
1599.95	15	12 "Ilm"	0.71	78.42	0.59	19.66	0.62								1											-				1									10	0 133
	4.5	13 "llm"	2.35	80.15	0.63	14.79	0.99	0.50							1		0.58														1								10	0 131

Sample	Site	Position	Mineral	Si02	Ti02	AI203	FeO	MnO	MgO	CaO	Na2O	K20	P205	so3	ш	ō	Sc2O3	V205	Cr203	0i N	C00	ZnO	sro	Y203	ZrO2	Nb2O5	Ag2O	Sn02	RaO	La203	Ce203	Nd2O3	Hf02	W03	ThO2	Yb2O3	Pr203	Nd2O3	60203	Dy203	Er203	003	Actual Total
1599.95	15	14	IVINZ	<u> </u>	6E 00		24.44	2.20					31.21								-	+						_	1	1.0/ 3	2.00	13.12				-		-+	+		+	$-\frac{1}{4}$	00 130
1599.95	15	15			65.30		31.41	3.29										_																					_		-+		00 132
1599.95	15	16	110 ₂	44.00	100.00		40.05	0.75										_																					_		-+		00 140
1599.95	15	17		44.80	35.34	40.04	19.05	0.75	4.00									_				0.00							_										-		-+	-	00 155
1599.95	15	18	St	33.32	0.88	49.64	13.83	0.00	1.63									_				0.69							_										_		-+		00 146
1599.95	15	19		44.00	49.98		47.96	2.06																					_										-		\rightarrow		00 140
1599.95	15	20	Qz + IIm	44.22	30.62		25.15	0.00	4.07																				_					-					-		-+		00 140
1599.95	15	21	Turn	0.56	63.51	00.00	33.76	0.80	1.37	4.57	4.00																		_										_		-+	-+"	00 142
1599.95	15	22	Ilm	37.95	52.47	20.09	0.47	5.01	7.00	1.57	1.90							_											-										-		-		00 141
1599.95	15	23	Tur	20.22	52.47	24.04	42.51	5.01	5.01		2.20							_											-										-			\pm	00 141
1599.95	15	24		30.33	1.01	31.91	7.00		0.45	0.26	2.29							_																				-	-	-			00 171
1599.95	15	25		50.01	40.40	0.92	0.99		0.45	0.30																													-				00 171
1500.05	15	20	"llm"	55.01	60.31		37.10	2.59								-		_															-				-		-			-1	00 138
1500.05	15	28	"lim"	7 74	62.58		28.24	1.43																																	-	-1	00 140
1500.05	15	20	llm +	1.14	58.16		34.86	2 73																																		-1	00 140
1599.95	15	30	Tur	37.63	1 04	33.32	8.56	2.70	3.96	0.62	1.87																															1	87 137
1599.95	15	31	Zm	30.91	1.01	00.02	0.00		0.00	0.02	1.07														69.09																_	1	00 166
1599.95	15	32	Tur	37.73	1.31	33.18	8.21		4.17	0.39	2.01														00.00																-	1	87 140
1599.95	15	33	Qz +	80.38	6.80	8.08	0.92			0.00		2.28			1.54																											1	00 151
1599.95	15	34	"llm"	0.57	62.32		35.74	1.37																																		1	00 136
1599.95	15	35	Grt	39.24		21.07	32.35	3.81	2.43	1.08											1					1																1	00 158
1599.95	15	36	"llm"		65.47		32.58	1.95																																	-	1	00 134
1599.95	15	37	Tur	37.87	0.99	32.77	6.30		6.30	0.75	2.03																															1	87 138
1599.95	15	38	Qz + TiO ₂	43.44	46.36	6.74	0.56		0.45			2.45																														1	00 146
1599.95	15	39	llm		55.92		42.34	1.74																																		1	00 126
1599.95	15	40	Grt	39.34		17.71	10.08	23.84		9.04																																1	00 151
1599.95	15	41	llm		59.94		33.35	3.05	3.67																																	1	00 129
1599.95	15	42	Qz	100.00																																						1	00 165
1599.95	15	43	Spl			51.52	12.36		19.41										16.72																							1	00 154
1599.95	15	44	llm		51.64		46.87	0.63	0.86																																	1	00 147
1599.95	15	45	Sd +	17.34	1.89	9.29	64.38	0.98	2.42	0.61		0.91	2.17																												$ \rightarrow $	1	00 78
1599.95	15	46	TiO ₂ +	2.56	89.75	1.61	6.07																																_			1	00 133
1599.95	15	47	Qz + TiO ₂	75.08	24.92																																		_		\rightarrow	1	00 159
1599.95	15	48	llm		53.82		43.21	2.97																															_		\rightarrow		00 141
1599.95	15	49	llm		53.57		45.94	0.48																															_		_	!	00 138
1599.95	15	50	llm		53.81		44.36	1.84																																	\rightarrow	-1	00 144
1599.95	15.1	1	Qz	99.28	0.31	4.45	0.41	0.00		4.00			4.40	0.00															_					0.40					_		+	$-\frac{1}{4}$	00 123
1599.95	15.1	2	Feony +	2.04	1.45	1.15	85.84	3.06	5 72	1.03	0.07	2.62	1.43	0.90	5.01														_					3.10					_		+		00 60
1599.95	15.1	3	IVIIX	20.00	2.03	15.22	51.13	0.54	5.73	0.41	0.97	2.02			5.91			_											_										-		-		00 149
1500.05	16	2	07.1	02.62	00.10	2.30	1 15				0.24	0.27													2.46				-										-				00 171
1599.95	16	3	TiO. +	6 27	85 78	2.10	3.37				0.54	0.27													2.40																		00 154
1599.95	16	4	"llm"	0.62	61 22	2.20	36.68	0.65	0.83			0.20													2.00																-	1	00 152
1599.95	16	5	llm	0.02	53.10		44.76	2.14	0.00																																-	1	00 159
1599.95	16	6	Chl	25.94		20.90	27.89		10.27																																	1	85 125
1599.95	16	7	Sd +	3.50	0.94	2.80	82.13	2.23	0.87	1.23			1.56																					4.73								1	00 109
1599.95	16	8	llm +	3.50	56.87	3.25	34.64	1.74																																	_	1	00 130
1599.95	16	9	Tur	37.88	0.83	32.33	7.30		6.21	0.70	1.77																												T			8	87 155
1599.95	16	10	Qz + TiO ₂	66.81	23.57	3.62	4.14		1.87																																	1	00 163
1599.95	16	11	llm		52.69		45.81	1.50																																		1	00 163
1599.95	16	12	TiO ₂ +	0.75	94.00	1.58	2.20			0.43			1.04								<u> </u>	$ \downarrow \downarrow$				L		_													\rightarrow	1^{\prime}	00 141
1599.95	16	13	Tur	38.04	0.92	32.83	7.03		5.79	0.39	2.00										<u> </u>	$ \square$						_	-		_								_		\rightarrow		87 153
1599.95	16	14	Kfs	64.34		18.30					1.36	13.75																2	.24										_		\rightarrow		00 179
1599.95	16	15	llm		53.77		45.35	0.88																															_		_		00 161
1599.95	16	16	Chr		0.64	27.27	15.16		6.18										49.85			0.91							_												_	- 1	00 157
1599.95	16	1/	lim 7	00.70	59.31		38.52	2.17																	00.00				_					-					-		-+		00 147
1599.95	16	18	<u>2m</u>	30.78	0.20	2.40	0.96		0.20																69.22				_										_		+		00 101
1599.95	10	20	Tur	36.27	0.30	32 50	5.74		7.50	214	1 21					_					-	+					+							-				-+	+		+	\pm	87 1/19
1500.05	16	21	llm	30.70	52.02	32.00	37.00	10.07	1.00	2.14	1.01										-					-		-			-		-						+		+		00 157
1599.95	16	22	TiO	1 43	96.14	0.85	1 57	10.97													<u> </u>					1					-		-						+		+		00 130
1599.95	16	23	TiO ₂	1.43	96.11	0.00	3.89														+					1					-								+		+	-1	00 137
1599.95	16	24	TiO ₂		100.00		0.00																										-						+	-	+	± 1	00 164
1599,95	16	25	"llm"		63.25		35.54	1.21													1					1					-										-	1	00 154
1599.95	16	26	St	29.22	0.56	55.47	13.41		1.34																	1													+			1	00 165
1599.95	16	27	Tur	38.47	0.74	29.86	8.23		6.57	0.52	2.61																															1	87 149
1599.95	16	28	llm		53.13		45.67	1.21																																		1	00 158
1599.95	16	29	llm		57.36		40.58	0.78	1.28		-					_	_	_				1											_			_	_			-		1	00 158

Sample	Site	Position	Mineral	Si02	Ti02	AI2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	L	ō	Sc203	V205	Cr2O3	QN	000	ZnO	SrO	Y203	ZrO2	Nb2O5	Ag2O	Sn02	BaO	La203	Ce2O3	Nd2O3	Hf02	W03	ThO2	Yb2O3	Pr203	Nd2O3	Gd203	Dy203	Er203	n03	Total Actual Total
1599.95	16	30 1	Mnz		=0.4-					0.73			37.22		-0.14					<u> </u>	<u> </u>				<u> </u>	-	2.19		_	15.55	31.30	13.15			l		<u> </u>		_			\rightarrow	100 148
1599.95	16	31	lim Tur i	40.00	53.87	26.57	39.73	6.39	44.00	4.00	0.40									<u> </u>		-			<u> </u>	-	-									 		+	_			\rightarrow	100 157
1599.95	10	32	1 ur + "Ilm"	43.69	3.55	20.57	9.91	0.72	(1.93	1.89	2.46					_				<u> </u>					<u> </u>	1	-		-					_		 		-+	-			-+	100 146
1599.95	16	34 "	"llm"		66 75	0.55	31.80	0.73												-	-				-	-	1	<u> </u>	-					_		-		-+				-+	100 144
1599,95	16	35 1	TiO ₂ + Qz	29.18	65.05	3,30	2.07	0.30		0.41										-	1				-	1	1											-+				-+	100 153
1599.95	16	36 5	St	29.76	0.66	54.86	13.30		1.43	0.11						_					1						1															\rightarrow	100 160
1599.95	16	37 (Chl	25.53		22.81	24.78		11.89												1						1															\rightarrow	85 131
1599.95	16	38 I	llm		49.68		45.58	4.74																																		-	100 153
1599.95	16	39 1	TiO ₂	1.90	96.83	0.98						0.29																															100 159
1599.95	16	40 I	llm		54.01		45.46	0.54																																			100 156
1599.95	16	41 (Chr			18.62	21.69		11.83										47.86																								100 163
1599.95	16	42 1	TiO ₂		95.73		4.27	0.00																																		\rightarrow	100 158
1599.95	16	43		22.00	74.54	1.66	30.46	2.63				0.21				-													-					_								\rightarrow	100 150
1599.95	16	44	$TiO_2 + QZ$	4 33	85.92	4.43	3.04			0.46		0.31	1.31						0.51																							-+	100 107
1599.95	16	46 1	llm	1.00	59.85	1.10	37.87	2.28		0.10			1.01						0.01																							-	100 150
1599.95	16.1	1 5	Sd		0.84		50.92	1.66		1.80			0.78																													-	56 61
1599.95	16.1	21	Mix	2.84	0.74	2.66	78.26	2.89		0.88			1.32	0.83																				9.58								_	100 78
1599.95	16.1	3 (Qz	99.49			0.51																																				100 123
1599.95	16.2	1 "	"llm" +	1.02	77.04		21.43	0.51																																			100 101
1599.95	16.2	2 1	TiO ₂ +	1.25	91.69	2.61	2.41			0.42			1.62																														100 101
1599.95	16.2	3		19.16	01.01		21.37	1.22																					_									-	_				100 101
1599.95	17	2 1		0.71	90.67		8.62																						-					_					-				100 108
1599.95	17	31	Ilm +	4.02	58.98	2.72	31.16	2.55				0.56				-													-					_					-		-	-	100 146
1599.95	17	4 2	Zm	30.33	0.44																				69.24	i l																	100 183
1599.95	17	5 2	Zm	30.91																					69.09)																	100 181
1599.95	17	6 1	Tur	38.31	1.16	32.70	6.84		5.90		2.09																																87 149
1599.95	17	71	llm		57.73		39.46	2.82																					_														100 152
1599.95	17	8 "	"llm" O=	1.18	88.65	2.17	4.23												1.51															2.25									100 148
1599.95	17	10 1	UZ Ilm	99.40	52.60	0.60	45.38	2.02																					-													\rightarrow	100 103
1599.95	17	11 1	Tur	38.73	0.39	34.29	8.98	2.02	3.03		1.58																															-	87 144
1599.95	17	12	llm		52.92		46.50	0.58	0.00																																		100 148
1599.95	17	13 I	llm		58.91		38.37	2.72																																			100 145
1599.95	17	14 1	TiO ₂ + ?	7.70	78.74	8.50	1.55			0.34			0.91		2.26																												100 137
1599.95	17	15 (Grt +	39.82	0.60	20.65	15.77	10.83	1.30	11.03																																	100 167
1599.95	17	16 1	TiO ₂	0.79	96.60	0.99	1.62		0.00										00.00																				_			\rightarrow	100 159
1599.95	17	18 1		7 18	83.10	3.80	29.70		9.02						3.56				32.00										-					_				-+	-			-	100 101
1599.95	17	19 "	"llm" +	3.00	62.23	0.87	24.38	0.48	0.43	0.38	0.67			1.13	6.42																											-	100 139
1599.95	17	20 "	"llm"	0.00	64.56	0.01	30.09	4.61	0.75	0.00	0.07			1.10	0.12																												100 145
1599.95	17	21 "	"llm"	1.45	88.06	2.30	6.85												1.34																								100 146
1599.95	17	22 "	"llm"		63.16		35.62	1.22																																		_	100 146
1599.95	17	23 1	TiO ₂	0.78	98.76		0.46																																				100 158
1599.95	17	24 1	llm 		52.56		46.52	0.92							1.00																												100 156
1599.95	17	25	lur	37.79	0.87	33.61	5.09	0.75	6.04		1.88				1.72																								_				8/ 148
1599.95	17	20 1	llm		55.74		40.01	0.75	1.41																									_					-				100 155
1599.95	17	28 2	Zm	31.02	55.74		40.12	4.14																	68.98																		100 176
1599.95	17	29 (Qz	99.70	0.30																																						100 175
1599.95	17	30 I	llm		51.50		44.31	4.19																																			100 154
1599.95	17	31 "	"llm"		60.32		33.63	6.05																																			100 143
1599.95	17.1	1 "	"llm" +	2.32	85.60	1.90	10.18																																				100 85
1599.95	17.1	2 1	TiO ₂		99.02		0.68										0.30																										100 106
1599.95	17.2	1 7	11U ₂ +	1.20	88.62	2.34	4.04												1.68	-		-			-		-							2.13			-	<u> </u>				\rightarrow	100 100
1599.95	17.2	2	TiO. +	0.91	89.70	2.07	3.00												1 35										-					2 /0								\rightarrow	100 94
1599.95	18	1 5	Sd +	5.51	0.76	2.07	89.42	3.29		4.08			2.45								1		-			1	1		-					10				-+			-	-+	100 92
1599.95	18	21	llm		59.94		38.62	1.43													1					1	1																100 155
1599.95	18	3	llm		54.92		44.10		0.98																														-			_	100 155
1599.95	18	4 1	llm		53.40		43.17	0.53	2.89																																		100 159
1599.95	18	5 I	llm		52.53		46.71	0.76														1	l			1	1											<u> </u>				\rightarrow	100 158
1599.95	18	6 1		04.01	53.20		45.01	1.80			0.55				0.02					-		-			-	-	-											<u> </u>	_			\rightarrow	100 156
1599.95	18	2 1	uz + Ilm	94.24	1.62		13 20	2.62			0.53	-			3.09	-										+	1		-							+		-+				\rightarrow	100 170
1599.95	18	91	llm		49.16		49.14	1.71					-	-					-		1					1	1					-				1	-	-+			-	-+	100 153
1599.95	18	10 1	Tur	36.17	1.06	31.46	4.41		7.03	0.25	2.00				4.62																							1					87 148

Sample	Site	Position	SiO2	Ti02	AI203	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	⊾ D	Sc203	V205	Cr2O3	NiO	CoO	ZnO	SrO	Y203	ZrO2	Nb2O5	Ag2O	Sn02	BaO	Ce203	Nd2O3	Hf02	WO3	ThO2	Yb2O3	Pr203	Nd2O3	Gd2O3	Dy203	Er203	n03	Total	Actual Total
1599.95	18	11 "llm"		73.16		25.03	1.81																						_										1	00	120
1599.95	18	12 TiO ₂		99.51		0.49																							_										1	00	154
1599.95	18	13 Sd +		1.01		88.01	4.41		3.72			2.86																_		-									1	00	86
1599.95	18	14 "llm"		69.48		29.43	0.51	0.59																						-									1	00	138
1599.95	18	15 Qz	100.00																																				1	00	172
1599.95	18	16 TiO ₂ +	3.90	80.94	4.90	2.49			0.64			1.47		5.66								_						_		_									1	00	100
1599.95	18	17 "llm"	0.62	83.07		15.86		0.45					1.07																											00	128
1599.95	18	18 Mnz	0.83						0.52			33.10	1.37	0.20	-			0.09									21.	33 34.	J1 8.84	-										00	155
1599.95	18	19 TiO ₂		99.47		0.53									-													_		-										00	153
1599.95	18	20 St	29.06	0.57	54.76	13.20		1.74							-					0.66								_		-										00	161
1599.95	18	21 Sd +	1.15	0.86	0.91	88.60	2.94		3.14			2.41		2.60														_	_										1	00	407
1599.95	10	22 1102 + 02	15.59	01.30	1 20	0.50			1.50					2.00									62.45					_		-									1.50 1	00	15/
1599.95	10	23 2111	20.13	0.65	1.30	0.97	2.20		1.52			2.07	1.01	3.12									03.45					_		-	0.05								1.52 1	00	110
1599.95	10	24 SU +	5.04	07.55	3.79	100	3.29					2.07	1.01		-							-		-		1 20		-		-	9.05								- 1	00	149
1599.95	10	25 Hm		51.33		47.00	0.97								-							-				1.35		-		-									1	00	153
1599.95	10	20 IIII		51.14		47.35	0.07	0.92							-							-						-											1	00	157
1599.95	10	20 llm i	1 22	52.0E	0.70	47.44	2.95	0.03														-						-											1	00	155
1509.05	18.1	1 Sd +	1.22	1 28	0.75	85 30	6.16		5.05			2 21																											1	00	61
1599.95	18.1	2 Mix		1.20	0.65	79.89	5.94		1.84			2.51																			8 10								1	00	73
1599.95	18.1	3 "llm"		93.32	0.00	6.25	0.43					2.01			1								-				-			1	0.10					1			1	00	102
1599.95	18.2	1 Sd +		1.02	1	85.57	6.55		4.36			2.50				1										-													1	00	61
1599.95	18.2	2 Chl + Ms	34.27	0.73	27.90	25.58	1.13	0.48	1.14		5.69	0.84		2.23		1															1								1	00	95
1599.95	18.2	3 Mix	1.37	1.26	1.33	81.74	4.32		2.29			2.26			1											ţ					5.41						1		1	00	70
1599.95	18.3	1 Ms	46.04	1.83	32.82	0.61		0.80		0.97	9.19			2.75	1	1										Ţ														95	111
1599.95	18.3	2 TiO ₂		99.51		0.49																																	1	00	107
1599.95	18.4	1 Qz	99.57			0.43																																	1	00	123
1599.95	18.4	2 Sd +		0.78		82.80	4.02		1.77			2.37																			8.26								1	00	71
1599.95	18.4	3 Sd +		0.59		87.92	5.56		3.36			2.58																											1	00	60
1599.95	19	1 "llm"	0.84	63.88		33.84	1.44																																1	00	140
1599.95	19	2 Tur	38.13	0.81	33.22	5.71		6.66	0.49	1.99																													1	87	138
1599.95	19	3 Ilm		57.37		40.38		2.25																															1	.00	139
1599.95	19	4 IIm		54.75		40.87	4.38																																1	.00	149
1599.95	19	5 Zm	30.93																				67.21							1.86									1	.00	174
1599.95	19	6 Ilm		57.22		40.91	1.87																																1	.00	144
1599.95	19	7 Grt	38.26	0.42	20.69	26.85	13.38		0.40																														1	00	159
1599.95	19	8 Grt	41.22	1.02	18.34	5.11			34.31																														1	00	160
1599.95	19	9 Qz	100.00																																				1	00	176
1599.95	19	10 "llm"		64.15		33.70	0.70	1.46																															1	00	148
1599.95	19	11 Tur	37.93	1.29	32.79	7.67		5.22	0.52	1.57																				_										37	142
1599.95	19	12 Mix	34.45	24.66	29.50	5.01	0.88		0.27	0.45		1.58		3.20	-													_		-									1	00	135
1599.95	19	13 llm		50.19	0.53	44.59	0.75	3.95							-													_		_									1	00	154
1599.95	19	14 I ur	37.86	0.44	33.38	10.31	0.55	2.84		2.18					-							_						_		-										37	141
1599.95	19	15 Sd +	05.04	1.16	40.05	82.85	2.55		0.66	44.00		5.54			-											_		_		-	7.25									00	112
1599.95	19	16 AD	05.04	5.63	16.95	0.37				11.29		0.71		2.50															_	-										00	147
1599.95	10	10 100	3.55	51.44	0.96	0.23	0.70	0.54						2.50	-							-						-		-									1	00	140
1599.95	19	19 07	100.00	51.41		41.55	0.72	0.54							-									-		-		_		+				<u> </u>		-	-			00	171
1500.05	10	20 IIm	100.00	53 //		44.74	1.81								1	-						-			-	-				1	-			-		-				00	148
1599.95	10	21 llm		62.67		37 22	1.01								1	1						-	-	-						1	1			<u> </u>		1	-		1	00	133
1599.95	19	22 Tur	37.65	02.07	31.66	37.33		5.06		2.24					1							-	-	-	-					+				<u> </u>		1	-			87	137
1599.95	19	23 Zm	31.41	0.02	51.00	0.00		0.00		2.27					1	1						-	68.59		-	-				1	1								-1	00	169
1599.95	20	1 Qz +	90.80	9.20	1																		-0.00							1						1			1	00	163
1599.95	20	2 "Ilm"		61.25		36.97	0.59									1.20										-													1	00	143
1599.95	20	3 TiO ₂ + Qz	27.35	70.56	0.58									1.51	1	1														1	1					1	1		1	00	169
1599.95	20	4 Qz +	92.13	4.06	1.11	2.34		0.36							1	1														1	1			1		1	1		1	00	169
1599.95	20	5 llm		53.28		45.46	0.72	0.55																															1	00	156
1599.95	20	6 Spl			49.04	13.46		18.95									18.56																						1	.00	160
1599.95	20	7 St	30.07	0.91	54.94	12.56		1.52																															1	00	160
1599.95	20	8 IIm		56.85		37.65	5.50																																1	00	150
1599.95	20	9 TiO ₂ +	0.90	92.25	2.07	2.57			0.49			1.21					0.51																						1	00	136
1599.95	20	10 Zm	31.68		1.05																		67.27																1	00	172
1599.95	20	11 Tur	37.79	1.15	33.02	8.75		4.35		1.94																														37	141
1599.95	20	12 Zm	30.61																				69.39					_											1	00	171
1599.95	20	13 TiO ₂ +	8.72	85.45	2.63	2.78					0.41				L	I													_	-	I	l	l	L		I	I		1	00	140
1599.95	20	14 TiO ₂ +		94.53	1.71	2.75			0.33	0.68					-	I														1	I			I		I	I		1	00	114
1599.95	20	15 Zm	30.73												-								69.27					_	_	-				L			l		1	00	170
1599.95	20	16 "llm"		62.30	0.17	36.88	0.82								<u> </u>						-+								_					<u> </u>		<u> </u>	I		1	00	136
1599.95	20	1/ TiO ₂ +	6.41	78.80	6.18	2.88			0.43			1.45		3.84	1															1	1								1	00	/9

Sample	Site	Position	Si02	Ti02	AI203	FeO	MnO	OgM	CaO	Na2O	K20	P205	so3	u.	ō	Sc203	V205	Cr2O3	QI	CoO	ZnO	SrO	Y203	Zr02	Nb2O5	Ag2O	SnO2	BaO	La203	Ce2O3	Nd2O3	Hf02	W03	ThO2	Yb203	Pr203	Nd2O3	Gd2O3	Dy203	Er203	UO3	Total	Actual Total
1599.95	20	18 TiO ₂ +	0.91	93.47	1.40	2.73			0.51			0.97																														100	124
1599.95	20	19 "llm"		64.66		34.77	0.57	·																																		100	136
1599.95	20	20 Qz	100.00																																							100	166
1599.95	20	21 "llm"		68.03		30.52	1.45																																			100	134

Appendix A4: BSE images and EDS mineral analyses for sample Sable Island 3H-58 1804.40 m



Figure A4.1: Sable Island 3H-58 (1804.40 m)



1:"Ilmenite" + 2:Tourmaline 3:"Ilmenite" 4:Ilmenite 5:Ilmenite 6:Tourmaline 7:"Ilmenite" 8:Zircon 9:Mix ("Ilmenite") 10:Zircon 11:Ilmenite + 12:TiO₂ + 13:Ilmenite 14:TiO₂ + 15:Ilmenite 16:TiO₂ 17:Quartz 18:Tourmaline 19:Monazite 20:"Ilmenite" + 21:Ilmenite 22:Zircon

23:Zircon 24:"Ilmenite" 25:Zircon 26:"Ilmenite" + 27:"Ilmenite" + 28:TiO₂ + 29:Ilmenite 30:Garnet 31:Zircon 32:Quartz 33:Zircon 34:Ilmenite + 35:Spinel + 36:Ilmenite 37:Zircon 38:Pyrite 39:Garnet 40:Ilmenite 41:Ilmenite 42:"Ilmenite" 43:TiO₂ 44:Ilmenite 45:TiO₂ + Quartz

Figure A4.2: Sable Island 3H-58 (1804.40 m) (SEM) site 1 (Table A4.1)



Figure A4.3: Sable Island 3H-58 (1804.40 m) (SEM) site 1.1 (Table A4.1). Almost completely altered detrital ilmenite (4) to TiO_2 (2,3).

1:Lead + TiO_2 2:TiO₂ + 3:TiO₂ + 4:"Ilmenite" + 5:TiO₂ + Kaolinite



1:TiO₂ 2:Ilmenite + Quartz 3:Muscovite + Kaolinite + 4:"Ilmenite" 5:Quartz + Ilmenite

Figure A4.4: Sable Island 3H-58 (1804.40 m) (SEM) site 1.2 (Table A4.1). A fragment of sandstone made up of altered ilmenite (4) to TiO_2 (1), some quartz (5) and muscovite partly altered to kaolinite (3).



Figure A4.5: Sable Island 3H-58 (1804.40 m) (SEM) site 2 (Table A4.1)



Figure A4.6: Sable Island 3H-58 (1804.40 m) (SEM) site 2.1 (Table A4.1). A fragment of chlorite (1,4) postdating the growth of pyrite (2,3).



1:TiO₂ 2:Ilmenite + 3:TiO₂ + Chlorite 4:TiO₂

Figure A4.7: Sable Island 3H-58 (1804.40 m) (SEM) site 2.2 (Table A4.1). Very small relics of ilmenite (2) in a mixture of TiO_2 (1) and chlorite (3).



1:Quartz 2:"Ilmenite" + $3:TiO_2$ + Quartz 4:Muscovite 5:"Ilmenite" + 6:Chlorite +

Figure A4.8: Sable Island 3H-58 (1804.40 m) (SEM) site 2.3 (Table A4.1). TiO₂ (3) in trellis pattern and some altered ilmenite relics (2,5) all mixed with ?inclusions of quartz (1,3), muscovite (4) and chlorite (6).



1:Quartz 2:Quartz 3:TiO₂ + Quartz 4:Muscovite $5:TiO_2$ + Quartz $6:TiO_2$ 7:Quartz + $8:TiO_2$ + Xenotime

Figure A4.9: Sable Island 3H-58 (1804.40 m) (SEM) site 2.4 (Table A4.1). A lithic clast made up of quartz (1,2), some muscovite (4) and TiO_2 (5,6) with xenotime (8) inclusions, ?Schist.



1:Quartz 2:Quartz + TiO_2 3:Ilmenite 4:Ilmenite 5:Zircon + 6:Chromite 7:Spinel 8:Ilmenite 9:TiO₂ + 10:TiO₂ 11:Ilmenite + 12:"Ilmenite" + Muscovite 13:Ilmenite + 14:Quartz + 15:Ilmenite 16:"Ilmenite" 17:Quartz + 18:Quartz 19:Zircon 20:Pyrite

 $21:TiO_2 +$ 22:Tourmaline 23:Chromite 24:Mix 25:Pyrite + 26:Ilmenite 27:TiO_2 +

Figure A4.10: Sable Island 3H-58 (1804.40 m) (SEM) site 3 (Table A4.1)



Figure A4.11: Sable Island 3H-58 (1804.40 m) (SEM) site 3.1 (Table A4.1). Similar to Figure 8.



Figure A4.12: Sable Island 3H-58 (1804.40 m) (SEM) site 3.2 (Table A4.1). A fragment of diagenetic TiO_2 .



Figure A4.13: Sable Island 3H-58 (1804.40 m) (SEM) site 3.3 (Table A4.1). ? A rounded Itihic clast made up of TiO_2 (1), quartz (3) with monazite crystallite, and muscovite (4) in a matrix of siderite,

1:TiO₂ 2:Siderite + Chlorite 3:Quartz + Monazite 4:Muscovite 5:Chlorite + Mica



Figure A4.14: Sable Island 3H-58 (1804.40 m) (SEM) site 3.4 (Table A4.1). Similar to Figure 11.



Figure A4.15: Sable Island 3H-58 (1804.40 m) (SEM) site 4 (Table A4.1)



1:Quartz 2:TiO₂ + 3:TiO₂ + Zircon 4:Muscovite +

Figure A4.16: Sable Island 3H-58 (1804.40 m) (SEM) site 4.1 (Table A4.1). ?Detrital diagenetic TiO_2 with quartz and muscovite (inclusions).



Figure A4.17: Sable Island 3H-58 (1804.40 m) (SEM) site 4.2 (Table A4.1). A fragment of sandstone made up of TiO_2 blebs (3,4) and very small ilmenite relics (2,6).



 $1:TiO_2 +$ $2:TiO_2 + Chlorite +$ Biotite $3:TiO_2 +$

Figure A4.18: Sable Island 3H-58 (1804.40 m) (SEM) site 4.3 (Table A4.1). ?Rounded lithic clast made up of TiO_2 (1,3) in a matrix of chlorite and biotite (2).



Figure A4.19: Sable Island 3H-58 (1804.40 m) (SEM) site 4.4 (Table A4.1). ?Lithic clast made up of quartz (1) and TiO_2 (3).



24:Spinel 25:Chromite + Chlorite

Figure A4.20: Sable Island 3H-58 (1804.40 m) (SEM) $^{\rm 23:Quartz}$ + site 5 (Table A4.1)



Figure A4.21: Sable Island 3H-58 (1804.40 m) (SEM) site 5.1 (Table A4.1). Diagenetic TiO_2 .



Figure A4.22: Sable Island 3H-58 (1804.40 m) (SEM) site 5.2 (Table A4.1). Lithic clast made up of quartz (2) and TiO₂ (1,3).



1:Garnet 22:Ilmenite 2:"Ilmenite" + 23:TiO₂ 3:Chromite 24:Pyrite + 4:Ilmenite 25:Chlorite + 5:Garnet Biotite 6:"Ilmenite" 26:Zircon 7:TiO₂ + 27:"Ilmenite" + Muscovite 28:Zircon 8:Ilmenite 29:Zircon 9:Ilmenite 30:Zircon 10:Quartz + 31:Zircon 32:Tourmaline TiO₂ 11:Quartz + 33:Ilmenite + 34:TiO₂ + TiO₂ Muscovite 12:Zircon 35:Quartz 13:Ilmenite 36:Zircon 14:Quartz 15:"Ilmenite" + 16:Tourmaline 17:Pyrite 18:Zircon + 19:Tourmaline 20:Monazite 21:Albite

Figure A4.23: Sable Island 3H-58 (1804.40 m) (SEM) 2 site 6 (Table A4.1)



 $1:TiO_2 +$ $2:Quartz + TiO_2$ 3:IImenite + Quartz 4:Quartz +5:Quartz

Figure A4.24: Sable Island 3H-58 (1804.40 m) (SEM) site 6.1 (Table A4.1). A fragment of sandstone made up of detrital quartz (4,5) and an almost completely altered ilmenite (3) grain to TiO₂.



Figure A4.25: Sable Island 3H-58 (1804.40 m) (SEM) site 6.2 (Table A4.1). Diagenetic TiO_2 (1,2) with straight crystal outlines.



1:Pyrite 2:Chlorite + 3:Pyrite 4:Chlorite + Mica

Figure A4.26: Sable Island 3H-58 (1804.40 m) (SEM) site 6.3 (Table A4.1). Chloritized mica with postdating pyrite (1,3).



Figure A4.27: Sable Island 3H-58 (1804.40 m) (SEM) site 6.4 (Table A4.1). An almost completely altered detrital ilmenite (1,4) grain.



Figure A4.28: Sable Island 3H-58 (1804.40 m) (SEM) site 6.5 (Table A4.1). Detrital quartz with quartz overgrowth (pos.a).



1:Zircon 2:TiO₂ + 3:Ilmenite 4:TiO₂ + Muscovite 5:TiO₂ + 6:Mix 7:Ilmenite 8:Quartz 9:Ilmenite + 10:Ilmenite 11:Ilmenite 12:Zircon 13:Quartz + Chlorite 14:TiO₂ + 15:TiO₂ + 16:"Ilmenite" 17:Spinel

Figure A4.29: Sable Island 3H-58 (1804.40 m) (SEM) site 7 (Table A4.1)



1:Quartz 2:TiO₂ + 3:TiO₂ 4:Quartz + TiO₂

Figure A4.30: Sable Island 3H-58 (1804.40 m) (SEM) site 7.1 (Table A4.1). Lithic clast made up of quartz (1) and broken to small pieces of TiO_2 (2,3). ?Foliation.



Figure A4.31: Sable Island 3H-58 (1804.40 m) (SEM) site 7.2 (Table A4.1). Detrital ilmenite grain (1,2) with chloritized silicate inclusions (2).

1:Ilmenite 2:Ilmenite + Chlorite 3:Ilmenite



3:Tourmaline 10:"Ilmenite" + 15:"Ilmenite" 16:"Ilmenite" +

Figure A4.32: Sable Island 3H-58 (1804.40 m) (SEM) site 8 (Table A4.1)



Figure A4.33: Sable Island 3H-58 (1804.40 m) (SEM) site 8.1 (Table A4.1). Detrital $TiO_2(2,4)$ with silicate inclusions (1,3).



Figure A4.34: Sable Island 3H-58 (1804.40 m) (SEM) site 8.2 (Table A4.1). TiO_2 (2,3,4) crystals with cellular texture and with some kaolinite (1) between the TiO_2 .



Figure A4.35: Sable Island 3H-58 (1804.40 m) (SEM) site 8.3 (Table A4.1). Detrital TiO_2 grain with pyrite (2) filling probably a void.



1:Ilmenite 2:"Ilmenite" 3:Ilmenite 4:Tourmaline 5:Zircon 6:Chlorite + Biotite 7:TiO₂ 8:Tourmaline 9:Monazite 10:Ilmenite 11:Tourmaline 12:Ilmenite 13:TiO₂ + Muscovite 14:"Ilmenite" + Quartz 15:Ilmenite 16:Quartz 17:"Ilmenite" + 18:Ilmenite 19:Ilmenite + 20:Ilmenite 21:Tourmaline

Figure A4.36: Sable Island 3H-58 (1804.40 m) (SEM) site 9 (Table A4.1)



1:Quartz 2:TiO₂ 3:Chlorite + 4:TiO₂ 5:Muscovite

Figure A4.37: Sable Island 3H-58 (1804.40 m) (SEM) site 9.1 (Table A4.1). ?Lithic clast made up of TiO_2 (2), quartz (1), chlorite (3) and muscovite (5).



Figure A4.38: Sable Island 3H-58 (1804.40 m) (SEM) ^{23:Pyrite} site 10 (Table A4.1)



Figure A4.39: Sable Island 3H-58 (1804.40 m) (SEM) site 10.1 (Table A4.1). Similar to Figure 34.


1:Quartz + 2:TiO₂ 3:Chlorite + Mica

Figure A4.40: Sable Island 3H-58 (1804.40 m) (SEM) site 10.2 (Table A4.1). Similar to Figure 19.



1:Quartz 2:K-Feldspar 3:TiO₂ 4:TiO₂ 5:TiO₂ + Chlorite 6:Chlorite + TiO₂ + K-Feldspar ?

Figure A4.41: Sable Island 3H-58 (1804.40 m) (SEM) site 10.3 (Table A4.1). Similar to Figure 19.



Figure A4.42: Sable Island 3H-58 (1804.40 m) (SEM) site 10.4 (Table A4.1). A fragment made up of TiO_2 blebs.



25:Spinel 2:K-Feldspar 26:"Ilmenite" + 3:"Ilmenite" + Chlorite 4:Ilmenite + 27:Ilmenite 5:Ilmenite 28:TiO₂ + 6:Mix 29:"Ilmenite" 7:Ilmenite 30:Ilmenite 8:Tourmaline 31:TiO₂ 9:Ilmenite + 10:Zircon + 11:Monazite 12:TiO₂ 13:Quartz + TiO₂ 14:Zircon + 15:TiO₂ + 16:Ilmenite 17:Pyrite 18:TiO₂ + Chlorite 19:TiO₂ + 20:"Ilmenite" 21:TiO₂ + 22:TiO₂ + Quartz 23:Tourmaline 24:"Ilmenite"

Figure A4.43: Sable Island 3H-58 (1804.40 m) (SEM) site 11 (Table A4.1)



1:Pyrite 2:Muscovite + Chlorite 3:Pyrite + Chlorite 4:Pyrite 5:Quartz +

Figure A4.44: Sable Island 3H-58 (1804.40 m) (SEM) site 11.1 (Table A4.1). A fragment of sandstone made up of quartz (5), muscovite (2), chlorite and late pyrite (1,4).



1:Quartz 2:Muscovite 3:TiO₂ + Quartz 4:TiO₂ + Quartz

Figure A4.45: Sable Island 3H-58 (1804.40 m) (SEM) site 11.2 (Table A4.1). ?Lithic clast made up of quartz (1), muscovite (2) and TiO_2 blebs (3,4).



 $1:TiO_2$ $2:TiO_2 +$ 3:Xenotime + $4:TiO_2$ 5:Chlorite + Xenotime 6:Quartz + 7:Chlorite + Muscovite8:Muscovite

Figure A4.46: Sable Island 3H-58 (1804.40 m) (SEM) site 11.3 (Table A4.1). 1) Similar to Figure 42 (1); 2) Lithic clast made up of TiO_2 (4), quartz (6), muscovite (8), chlorite (5,7) and xenotime (3).



Figure A4.47: Sable Island 3H-58 (1804.40 m) (SEM) site 11.4 (Table A4.1). ?Metasedimentary lithic clast made up of TiO_2 (2), quartz (1) and muscovite (4). TiO_2 (3) appears to have modified edges from later reprecipitation of TiO_2 .

1:Quartz + TiO₂ 2:TiO₂ + 3:TiO₂ + 4:Muscovite



Figure A4.48: Sable Island 3H-58 (1804.40 m) (SEM) site 11.5 (Table A4.1). Detrital TiO_2 (2,3) with plagioclase inclusion (1).



Figure A4.49: Sable Island 3H-58 (1804.40 m) (SEM) site 12 (Table A4.1)



1:Quartz + TiO₂ 2:"Ilmenite" 3:Spinel 4:Tourmaline 5:Ilmenite 6:Quartz 7:"Ilmenite" 8:"Ilmenite" + 9:Ilmenite + 10:Ilmenite 11:Ilmenite 12:Pyrite 13:Zircon 14:"Ilmenite" + Chlorite 15:Zircon + 16:"Ilmenite" 17:Apatite 18:Tourmaline 19:Ilmenite 20:"Ilmenite" + Quartz 21:TiO₂ + 22:TiO₂ + Muscovite 23:TiO₂ + 24:"Ilmenite"

25:Zircon 26:Tourmaline 27:Ilmenite 28:"Ilmenite" 29:"Ilmenite" 30:Zircon 31:Quartz + Ilmenite 32:"Ilmenite" +

Figure A4.50: Sable Island 3H-58 (1804.40 m) (SEM) site 13 (Table A4.1)



Figure A4.51: Sable Island 3H-58 (1804.40 m) (SEM) site 13.1 (Table A4.1). A fragment of diagenetic TiO_2 .



Figure A4.52: Sable Island 3H-58 (1804.40 m) (SEM) $\begin{array}{c} 23:Chlorite \\ 24:TiO_2 + ?Kaolinite \end{array}$ site 14 (Table A4.1)



1:Monazite 2:Ilmenite 3:TiO₂ + 4:Garnet 5:Ilmenite + 6:"Ilmenite" + 7:Quartz 8:Ilmenite 9:Ilmenite + 10:"Ilmenite" + 11:TiO₂ 12:Ilmenite + 13:Zircon 14:Mix 15:"Ilmenite" 16:Ilmenite 17:Zircon 18:Pyrite + 19:"Ilmenite"

Figure A4.53: Sable Island 3H-58 (1804.40 m) (SEM) ^{19: Internite} 20:Quartz + TiO₂



1:Chlorite + Feldspar ? 2:Quartz + Chlorite + 3:"Ilmenite" + 4:Monazite + Chlorite +

Figure A4.54: Sable Island 3H-58 (1804.40 m) (SEM) site 15.1 (Table A4.1). A fragment of sandstone made up of altered ilmenite (3) with monazite and chlorite inclusions (4), altered ?feldspar (1), quartz (2), and chlorite.



1:Titanite 2:Quartz 3:TiO₂ 4:Muscovite 5:Muscovite + Chlorite + Monazite 6:Ilmenite

Figure A4.55: Sable Island 3H-58 (1804.40 m) (SEM) site 15.2 (Table A4.1). ?A rounded lithic clast made up of quartz (2) with titanite (1) inclusion, muscovite (4) partly chloritized and with monazite inclusions (5), ilmenite (6) and TiO_2 (3) blebs.



1:"Ilmenite" + 23:Ilmenite + Quartz 24:Quartz 2:Ilmenite 25:"Ilmenite" 3:Ilmenite 26:"Ilmenite" 4:Zircon + 27:Monazite 5:Tourmaline 28:Ilmenite 6:Zircon 29:"Ilmenite" + 7:Spinel 30:"Ilmenite" + 8:TiO₂ Chlorite 31:"Ilmenite" 9:Zircon 10:Zircon 32:Quartz 11:"Ilmenite" + 33:Ilmenite Chlorite 12:Zircon 13:Ilmenite 14:Ilmenite + 15:Tourmaline 16:Ilmenite 17:"Ilmenite" + 18:Zircon + 19:TiO₂ + Quartz 20:Tourmaline 21:TiO₂ + Quartz 22:Quartz +

Figure A4.56: Sable Island 3H-58 (1804.40 m) (SEM) site 16 (Table A4.1)



1:"Ilmenite" + 2:Ilmenite + Chlorite 3:Ilmenite + Kaolinite + 4:"Ilmenite" + Chlorite 5:"Ilmenite" + Chlorite

Figure A4.57: Sable Island 3H-58 (1804.40 m) (SEM) site 16.1 (Table A4.1). Partly altered detrital ilmenite with chlorite and kaolinite patches.



22:Zircon 1:Ilmenite 2:Chromite 23:Ilmenite 3:Chlorite + 24:?TiO₂ + Chlorite 4:"Ilmenite" + 25:Ilmenite + 5:Zircon 26:Quartz 6:Quartz 7:"Ilmenite" + 8:Tourmaline 9:TiO₂ + 10:"Ilmenite" 11:"Ilmenite" 12:"Ilmenite" 13:"Ilmenite" + Muscovite 14:Zircon 15:"Ilmenite" + 16:Zircon 17:"Ilmenite" + Muscovite 18:Quartz + TiO₂ 20:Zircon 21:Chromite

1:TiO₂

Figure A4.58: Sable Island 3H-58 (1804.40 m) (SEM) site 17 (Table A4.1)



Figure A4.59: Sable Island 3H-58 (1804.40 m) (SEM) site 17.1 (Table A4.1). 1) Detrital TiO₂ (1); 2) ?round lithic clast made up of muscovite (2), quartz (3) and TiO₂ elongated blebs (4).



Figure A4.60: Sable Island 3H-58 (1804.40 m) (SEM) site 17.2 (Table A4.1). Highly altered detrital ilmenite (1) to TiO_2 (2) associated with siderite and chlorite (4,5).



1:Biotite + TiO₂ 24:Tourmaline 2:"Ilmenite" + 25:Quartz + Chlorite 26:Tourmaline 27:Zircon + 3:Tourmaline 28:Quartz 4:Chromite 5:TiO₂ 29:Ilmenite 30:Ilmenite 6:"Ilmenite" 7:"Ilmenite" + 8:Ilmenite 9:TiO₂ + 10:Quartz + 11:Zircon + 12:"Ilmenite" 13:Tourmaline 14:Chlorite + 15:TiO₂ + 16:"Ilmenite" 17:Zircon + 18:Ilmenite 19:Zircon 20:Ilmenite 21:Spinel

Figure A4.61: Sable Island 3H-58 (1804.40 m) (SEM) 22:TiO₂ + Muscovite site 18 (Table A4.1) 23:"Ilmenite" +



1:Ilmenite 2:Mica + 3:TiO₂ + 4:Quartz 5:TiO₂ + 6:Chlorite + Biotite + TiO₂ 7:Chlorite + Biotite $8:TiO_2$ +

Figure A4.62: Sable Island 3H-58 (1804.40 m) (SEM) site 18.1 (Table A4.1). 1) fragment of sandstone made up of ilmenite (1) altering to TiO_2 (3), quartz and mica relics (2); 2) ropey diagenetic TiO_2 (5,8) associated with mica and chlorite (6,7).



Figure A4.63: Sable Island 3H-58 (1804.40 m) (SEM) site 18.2 (Table A4.1). A fragment made up of elongated blebs of TiO_2 (2,3) associated with domains of muscovite (4), K-Feldspar and chlorite (2,3).

 $1:TiO_2$ $2:TiO_2 + ?K-Feldspar + Chlorite$ $3:TiO_2 + ?K-Feldspar + Chlorite$ 4:Muscovite +



Figure A4.64: Sable Island 3H-58 (1804.40 m) (SEM) site 19 (Table A4.1)



Figure A4.65: Sable Island 3H-58 (1804.40 m) (SEM) site 19.1 (Table A4.1). Blebs (4) and ropes (3) of TiO_2 associated with detrital biotite (1) and chlorite (2) with ?albite relics.



1:TiO₂ 2:Muscovite + TiO₂ + 3:Chlorite + 4:Muscovite $5:TiO_2$ +

Figure A4.66: Sable Island 3H-58 (1804.40 m) (SEM) site 19.2 (Table A4.1). TiO_2 ropes (1,5) and TiO_2 blebs associated with muscovite (4) and chlorite (3).



1:Garnet 23:"Ilmenite" 2:"Ilmenite" 24:Spinel 3:Zircon 25:Ilmenite 4:TiO₂ + 26:Zircon Muscovite 27:Ilmenite 28:"Ilmenite" 5:Zircon 29:Tourmaline 6:Chlorite + 30:"Ilmenite" + Albite + 7:"Ilmenite" 31:Tourmaline 8:"Ilmenite" 32:"Ilmenite" 33:"Ilmenite" + 9:TiO₂ 34:"Ilmenite" + 10:Ilmenite 11:Pyrite 12:Muscovite 13:"Ilmenite" + 14:Ilmenite + 15:Spinel 16:"Ilmenite" + Chlorite 17:Chlorite + 18:Ilmenite 19:Zircon + 20:"Ilmenite" 21:"Ilmenite" 22:Zircon

Figure A4.67: Sable Island 3H-58 (1804.40 m) (SEM) site 20 (Table A4.1)



Figure A4.68: Sable Island 3H-58 (1804.40 m) (SEM) site 20.1 (Table A4.1). ?Detrital muscovite (2) entirely replaced by TiO_2 (1,2).



Figure A4.69: Sable Island 3H-58 (1804.40 m) (SEM) site 20.2 (Table A4.1). Similar to Figure 16.

1:Quartz 2:Chlorite + Plagioclase 3:Chlorite + Plagioclase 4:Chlorite + Plagioclase $5:TiO_2$ + $6:TiO_2$ +



Figure A4.70: Sable Island 3H-58 (1804.40 m) (SEM) site 20.3 (Table A4.1). A fragment of diagenetic TiO_2 with voids and ropes (pos.a).



1:Pyrite 2:Quartz 3:Pyrite 4:Pyrite 5:Pyrite 6:Chlorite + K-Feldspar + Pyrite

Figure A4.71: Sable Island 3H-58 (1804.40 m) (SEM) site 20.4 (Table A4.1). A fragment of sandstone made up of quartz (2), K-Feldspar and chlorite (6) and late pyrite framboids (3,4) and crystals (1,5).



Figure A4.72: Sable Island 3H-58 (1804.40 m) (SEM) site 20.5 (Table A4.1). Partly altered ilmenite (1) grain to TiO_2 (2).



Figure A4.73: Sable Island 3H-58 (1804.40 m) (SEM) site 20.6 (Table A4.1). A fragment made up of blebs and ropes of TiO_2 associated with quartz (1) and chlorite domains (1,3).

1:Quartz + 2:TiO₂ + 3:TiO₂ + Chlorite



2:Zircon 2:Zircon 3:"Ilmenite" 4:Zircon 5:Quartz 6:"Ilmenite" + Quartz 7:Chlorite + Albite 8:?Staurolite 9:Ilmenite 10:"Ilmenite" 11:"Ilmenite" + Muscovite 12:"Ilmenite" + Chlorite 13:"Ilmenite" + Chlorite 14:Contaminant 15:"Ilmenite" 16:TiO₂ + 17:Tourmaline 18:Ilmenite 19:TiO₂ + 20:Mix 21:"Ilmenite"

Figure A4.74: Sable Island 3H-58 (1804.40 m) (SEM) site 21 (Table A4.1)



Figure A4.75: Sable Island 3H-58 (1804.40 m) (SEM) site 21.1 (Table A4.1). Blebs of TiO_2 (1) associated with muscovite (2) and chlorite.

1:TiO₂ 2:Muscovite + TiO₂ 3:Chlorite + Muscovite + TiO₂



1:Chlorite + K-Feldspar 2:Chlorite + K-Feldspar 3:TiO₂ + 4:TiO₂ + 5:TiO₂ +

Figure A4.76: Sable Island 3H-58 (1804.40 m) (SEM) site 21.2 (Table A4.1). Blebs and ropes of TiO_2 associated with partly chloritized detrital K-Feldspar (1,2).



Figure A4.77: Sable Island 3H-58 (1804.40 m) (SEM) site 21.3 (Table A4.1). Similar to Figure 47.

1:Quartz 2:TiO₂ + Quartz 3:TiO₂ +



1:Zircon 22:Ilmenite + 2:Ilmenite 23:TiO₂ + 3:TiO₂ + 24:Tourmaline Muscovite 25:TiO₂ + 4:Zircon + 26:Tourmaline 5:Quartz 27:Ilmenite 6:Pyrite 28:"Ilmenite" 7:"Ilmenite" + 29:Xenotime Chlorite 30:Zircon 8:"Ilmenite" 31:Pyrite 9:"Ilmenite" + 10:Ilmenite 11:Pyrite 12:Pyrite 13:Quartz + 14:Quartz + TiO₂ 15:Mix 16:Zircon + 17:Ilmenite 19:Zircon 20:"Ilmenite" +

Figure A4.78: Sable Island 3H-58 (1804.40 m) (SEM) ^{21:Tourmaline} site 22 (Table A4.1)



Figure A4.79: Sable Island 3H-58 (1804.40 m) (SEM) site 22.1 (Table A4.1). Similar to Figure 8.

Sample	Site	Position	Mineral	SiO2	Ti02	AI203	FeO	MnO	OgM	CaO	Na2O	К2О	P205	SO3	ш	ō	Sc2O3	V205	Cr2O3	CoO	NiO	ZnO	SrO	Y203	ZrO2	Ag2O	BaO	La2O3 Ce2O3	000	Nd203	Gd2O3	Dy203	Yb2O3	Hf02	Ta205	WO3	ThO2	PbO	Actual Total
1804.40	1	1	"llm" +	3.44	87.0	3.95	3.46			0.51			1.63																									1	00 74
1804.40	1	2	Tur	37.90	1.0	2 32.40	8.67	0.70	4.77	0.37	1.88																		_	_	_	_						1	37 100
1804.40	1	3	"lim"		52.5	00 76	34.77	2.73																					-									1	JU 101
1804.40	1	- 4	llm		51.0	0	46.11	2.86																														1	00 107
1804.40	1	6	Tur	37.47	0.9	9 30.32	5.91	2.00	7.52	0.55	2.54				1.70																								37 105
1804.40	1	7	"lim"	0.59	70.6	0.96	26.21	1.60																														1	00 102
1804.40	1	8	Zm	31.02		_																			68.98													1	00 125
1804.40	1	9	Mix ("Ilm")	9.52	67.6	58 7.35	6.45		0.74	0.47	0.54	0.28	1.14		5.83														_									1	00 92
1804.40	1	10	Zm Im	31.30	E1 6	0	45.00	0.76	4 57																68.70				-			-						1	JU 121
1804.40	1	12	TiO ₂ +	0.66	92.3	2 2.46	2.60	0.76	1.57	0.78			1.18																									1	00 91
1804.40	1	13	llm		51.6	51	47.55		0.84																													1	00 108
1804.40	1	14	TiO ₂ +	1.13	91.6	64 2.43	2.91			0.51			1.38																									1	00 91
1804.40	1	15	llm		59.9	95	37.99	2.06																														1	00 104
1804.40	1	16	TiO ₂		99.0)4	0.96																						_									1	JO 107
1804.40	1	1/	QZ Tur	99.62	0.3	38	0.56		4.52	0.55	2.01																			-	-	-						1	JU 125
1804.40	1	19	Mnz	57.17	0.5	52.22	5.50		4.32	1.07	2.01		36.44		-0.04											4.53		15.23 30.	93	11.8	4							1	00 103
1804.40	1	20	"llm" +	0.73	73.2	4 0.68	23.83	1.52																														1	00 97
1804.40	1	21	llm		49.6	68	48.44	1.88																														1	00 107
1804.40	1	22	Zm	30.72																					69.28													1	00 121
1804.40	1	23	Zm	30.73																					69.27				_									1	JO 122
1804.40	1	24	"lim" Zro	21.14	75.1	2	24.88																		69 96				-									1	JU 96 00 121
1804.40	1	20	"llm" +	0.94	94.2	7 0.74	4.05																		00.00		_											1	00 86
1804.40	1	27	"llm" +	5.34	81.4	3 5.92	5.78		0.54				0.99																									1	00 90
1804.40	1	28	TiO ₂ +	1.84	91.0	2.30	2.35			0.54			1.97																									1	00 90
1804.40	1	29	llm		51.1	3	47.10	1.16	0.61																													1	00 106
1804.40	1	30	Grt	40.06		21.16	30.88	0.94	5.42	1.53																			_									1	00 112
1804.40	1	31	Zm O-	30.90																					69.10				-		-	-						1	00 118
1804.40	1	32	QZ Zm	30.60											1 28										68.12				-									1	00 121
1804.40	1	34	llm +	30.00	51.8	35	44.32	0.64	3.20						1.20										00.12													1	00 105
1804.40	1	35	Spl +	1.66	1.5	53 7.80	46.04		1.36										40.36			1.25																1	00 90
1804.40	1	36	llm		58.6	6	39.78	1.56																														1	00 99
1804.40	1	37	Zm	30.66		_																			69.34				_	_								1	JO 120
1804.40	1	38	Py	40.02	0.2	25 20.97	28.48	0.00	7.05	7.60				71.26															_									1	00 224
1804.40	1	40	lim	40.92	51.6	5 20.07	48.34	0.00	7.05	7.09																											-	1	00 105
1804.40	1	41	llm		54.7	6	43.84	1.40																														1	00 105
1804.40	1	42	"lim"		87.9	97	11.18	0.86																														1	00 103
1804.40	1	43	TiO ₂		99.5	57	0.43																															1	00 107
1804.40	1	44	llm Tio : O-	40.07	51.1	1	47.52	0.83	0.53																					_	-		+					1	30 104
1804.40	1	45	HU ₂ + QZ	13.97	85.4	0.61	1.15							24.22										\vdash			_		-		-	-	-	-				50.05 1	JU 112
1804.40	1.1	2	TiO ₂ +	0.87	91.0	9 2.60	2.97	-		0.70	0.61		1.16	24.23													-			-	+	1	1	-				1	00 89
1804.40	1.1	3	TiO ₂ +	0.84	92.2	2.42	2.61			0.61			1.28																			1	1	1				1	00 97
1804.40	1.1	4	"llm" +	16.94	53.6	61 7.69	18.99		2.23	0.55																												1	00 83
1804.40	1.1	5	TiO ₂ + Kln	39.57	28.3	35 27.08	3.92		0.59			0.50																										1	00 68
1804.40	1.2	1	TIO ₂	00.47	99.3	34	0.66	0.00																\vdash					_	_	_	-		I				1	JU 103
1804.40	1.2	2	IIM + QZ	23.47	41.8	0 22 44	33.79	0.89	1 22		0.46	2 40			5.61														_		+	-	-					1	JU 120
1804.40	1.2	4	"llm"	45.04	61.2	21	2.20	1.01	1.22		0.40	5.40			J.01														+		+	1	+					1	00 104
1804.40	1.2	5	Qz + IIm	41.74	35.5	57	22.29	0.39																								1						1	00 125
1804.40	2	1	"llm" +	0.85	65.5	58	29.87	2.90	0.53													0.28																1	00 91
1804.40	2	2	"lim"	0.73	92.4	14	6.83	Ţ																									1					1	00 85
1804.40	2	3	Spl +	0.77	1.4	6 28.39	38.68	0.65	4.48					70.07					25.58											_	-	-	+					1	00 101
1804.40	2	4 F	Py Chl + Bt	0.28	0.4	19 00	28.98		4 50		0 00	0.00		70.27																	-	-	+			1 97		1	JU 218
1804.40	2	с А	Zm	30.63	1.2	0 10.09	0.38		4.50		0.69	0.96													68 75						+	1	+			1.07		1	00 122
1804.40	2	7	llm	00.00	51.3	32	47.38	1.30																	00.70				+		1	1	1					1	00 107
1804.40	2	8	TiO ₂		97.6	60	2.40																															1	00 111
1804.40	2	9	"llm"		84.7	8 0.45	14.77																															1	00 88
1804.40	2	10	Tur	36.62	1.0	2 31.02	10.82		2.84		2.30				2.39																	1						1	7 105

10 0.00 0.00 0.0	Sample	Site	Position	Mineral	SiO2	Ti02	AI2O3	FeO	MnO	OgM	CaO	Na2O	K20	P205	SO3	ш	ū	Sc2O3	V205	Cr203	CoO	NiO	ZnO	SrO	Y203	ZrO2	Ag2O	BaO	La203	Ce2O3	Pr203	Nd2O3	Gd2O3	Dy203	Yb203	Hf02	Ta205	WO3	ThO2	PbO	Actual Total
	1804.40	2	11	I Grt	40.00	0.33	20.46	23.56	3.72	2.57	9.37																													1	JO 117
No. 0. No. 0.<	1804.40	2	12	2 "IIm" +	1.29	85.97	2.57	8.71						0.69	0.77																									1)0 101
	1804.40	2	13	3 TiO ₂		97.73		2.27		1.07																														1	0 107
000000 01 01000 000000 0100000 01000000 010000000 01000000000 01000000000000000 0100000000000000000000000000000000000	1804.40	2	14	1 "lim"		63.09		35.65	0.00	1.27																														10	0 97
No.40 N N N N	1804.40	2	15	s "llm" +	1 27	53.52 90.05	1.05	42.49	3.99		0.20	0.50		0.76		2.55				0.45											-									10	10 102
10000 2 10000 90000 9000 9000 9	1804.40	2	17	7 TiO ₀ + Oz	8.52	80.36	5.16	2.33			0.55	0.55		0.70		3.63				0.43																				10	0 106
1000000000000000000000000000000000000	1804.40	2	18	3 Qz	99.61	0.39	0.10	2.00								0.00																								1	0 120
9000000000000000000000000000000000000	1804.40	2	19	9 TiO ₂	0.55	98.90		0.56																																1	0 106
900000 2 1000000 9000000 9000000 9000000000 9000000000000000000000000000000000000	1804.40	2	20) llm		51.14		47.79	0.58	0.49																														1	0 108
90000 2 2 00000 0.01 0.0	1804.40	2	21	I llm		53.02		45.98	1.01																															10	JO 106
000000 001<	1804.40	2	22	2 Grt	40.06	0.41	21.03	24.74	1.21	4.18	8.38																													10	JO 113
Diama Diama <th< td=""><td>1804.40</td><td>2.1</td><td>1</td><td>I Chl</td><td>32.19</td><td>0.88</td><td>15.70</td><td>31.69</td><td></td><td>3.21</td><td></td><td>0.65</td><td>0.67</td><td></td><td>70.00</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>8</td><td>5 75</td></th<>	1804.40	2.1	1	I Chl	32.19	0.88	15.70	31.69		3.21		0.65	0.67		70.00																									8	5 75
BANG Col AND AND <td>1804.40</td> <td>2.1</td> <td>2</td> <td></td> <td>0.56</td> <td>0.39</td> <td>0.25</td> <td>28.68</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>70.93</td> <td></td> <td>-</td> <td></td> <td>10</td> <td>10 221</td>	1804.40	2.1	2		0.56	0.39	0.25	28.68							70.93													-												10	10 221
1984 2 1 0	1804.40	2.1		1 Chl	31.97	1.05	14 47	20.35	-	4 34		0.52	0.93		10.32													_												8	5 69
1940 2 2 1	1804.40	2.2	1	1 TiO ₂	01.07	95.02	0.73	3.05		1.01	0.40	0.02	0.00	0.81																										1	00 88
1004.0 22 3 10 40 50 50 50 5	1804.40	2.2	2	2 llm +		57.52		21.46	6.89						1.27								12.86																	1	0 100
101400 201 101 201 101 201 101 <t< td=""><td>1804.40</td><td>2.2</td><td>3</td><td>3 TiO₂ + Chl</td><td>15.91</td><td>61.63</td><td>5.38</td><td>7.41</td><td></td><td></td><td>0.56</td><td>0.85</td><td>0.29</td><td></td><td></td><td>7.96</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>1</td><td>0 68</td></t<>	1804.40	2.2	3	3 TiO ₂ + Chl	15.91	61.63	5.38	7.41			0.56	0.85	0.29			7.96																								1	0 68
1940. 23 102 <td>1804.40</td> <td>2.2</td> <td>4</td> <td>1 TiO₂</td> <td></td> <td>95.57</td> <td>1.11</td> <td>2.78</td> <td></td> <td>0.55</td> <td></td> <td>1</td> <td>JO 82</td>	1804.40	2.2	4	1 TiO ₂		95.57	1.11	2.78												0.55																				1	JO 82
Name Name <th< td=""><td>1804.40</td><td>2.3</td><td>1</td><td>I Qz</td><td>98.94</td><td>1.06</td><td>1.0-</td><td>01.07</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>1</td><td>10 116</td></th<>	1804.40	2.3	1	I Qz	98.94	1.06	1.0-	01.07																																1	10 116
000000 0000000 00000000 000000000000000000000000000000000000	1804.40	2.3	2	2 "IIM" +	3.77	61.30	1.80	31.37	1.75																			_			-									1	10 93
10040 23 1004 20 104 200 100 <td>1804.40</td> <td>2.3</td> <td></td> <td>1 Me</td> <td>21.13</td> <td>1 06</td> <td>31 71</td> <td>0.82</td> <td></td> <td></td> <td></td> <td>1 37</td> <td>7 32</td> <td></td> <td></td> <td>3.24</td> <td></td> <td>0</td> <td>5 110</td>	1804.40	2.3		1 Me	21.13	1 06	31 71	0.82				1 37	7 32			3.24																								0	5 110
19040 23 0 0 1 <td>1804.40</td> <td>2.3</td> <td></td> <td>5 "llm" +</td> <td>8.91</td> <td>62.88</td> <td>0.74</td> <td>25.18</td> <td>2.29</td> <td></td> <td></td> <td>1.57</td> <td>1.52</td> <td></td> <td></td> <td>3.24</td> <td></td> <td>1</td> <td>0 95</td>	1804.40	2.3		5 "llm" +	8.91	62.88	0.74	25.18	2.29			1.57	1.52			3.24																								1	0 95
1944. 2 1 Q 995. 0.7 8 1 1 1 1	1804.40	2.3	6	6 Chl +	41.06	3.05	15.14	29.53		4.61		1.08	1.77			3.75																								1	00 89
1984.0 24 2 2 2 2 2 2 4 5 4 5 4 5 4 5 5 6 6 6 6 <td>1804.40</td> <td>2.4</td> <td>1</td> <td>I Qz</td> <td>99.61</td> <td>0.39</td> <td></td> <td>10</td> <td>0 116</td>	1804.40	2.4	1	I Qz	99.61	0.39																																		10	0 116
1904.0 24 3 10 0 1 0 0 1 0 0 1 0 0 1 0<	1804.40	2.4	2	2 Qz	99.53	0.47																																		1	0 116
1004.80 24 4 hs 654 0.6 202 1.50 1.00 8.70 4.85 <	1804.40	2.4	3	3 TiO ₂ + Qz	30.34	65.73	2.80	0.57					0.55																											10)0 115
Banda 24 B DO-L-UZ Sama DA-L-UZ	1804.40	2.4	4	4 Ms	45.94	0.66	32.02	1.25		0.50		1.01	8.78			4.85																								g	5 113
100440 2.4 7/2* 4.23 7/2* 4.24 7/2* 4.24 7/2* 4.24 7/2* 4.24 7/2* 4.24 7/2* 4.24 7/2* 4.24 7/2* 4.24 7/2* 4.24 7/2* 4.24 7/2* 4.24 7/2* 4.24 7/2* 4.24 7/2* 4.24 4.24 4.24 7/2* 4.24 7/2* 4.24 7/2* 4.24 7/2* 4.24 7/2* 4.24 7/2* 4.24 7/2* 4.24 7/2* 4.24 7/2*	1804.40	2.4	5		13.88	62.44								11.07		-0.31														8.61		4.31								10	10 96
196440 2.4 8 10.2 93.1 0.36 0.33 0.4 1.62 0.4	1804.40	2.4	7	7 07 +	0.50	99.50 7.68																																		1	0 102
104.0 3 102 931 0.8 0	1804.40	2.4	8	3 TiO ₂ + Xtm	1.35	52.18					1.63			19.55		2.04									21.56									1.70						1	0 110
190440 3 2 2 170 1.31 1.3	1804.40	3	1	I Qz	99.31	0.36		0.33																																1	0 118
1004.0 3 3 1004.0 3 1004.0 3 1004.0 3 5 7 904.0 5 7 904.0 5 7 904.0 5 7 904.0 3 5 7 904.0 3 5 7 904.0 3 6 7 904.0 4 9 7 904.0 4 9 7 904.0 4 9 7 904.0 3 9 7 904.0 3 9 7 904.0 3 9 7 904.0 4 <td>1804.40</td> <td>3</td> <td>2</td> <td>2 Qz + TiO₂</td> <td>54.99</td> <td>43.70</td> <td></td> <td>1.31</td> <td></td> <td>10</td> <td>0 113</td>	1804.40	3	2	2 Qz + TiO ₂	54.99	43.70		1.31																																10	0 113
1984.40 3 4 Imm 53.27 45.16 1.57 0 4.12 0 4.12 0 6.57 0 0 0 100 100 100 100 <td>1804.40</td> <td>3</td> <td>3</td> <td>3 llm +</td> <td></td> <td>51.46</td> <td></td> <td>45.16</td> <td>1.96</td> <td>1.42</td> <td></td> <td>10</td> <td>JO 106</td>	1804.40	3	3	3 llm +		51.46		45.16	1.96	1.42																														10	JO 106
1004.00 3 5/2m+ 20.84 1 0.34 4.12 1 0 65/1 1 0 1 1000 120 1004.00 3 7/5pl 4 43.01 1.39 17.59 1 4.3.1 4.3.1 4.3.1 1 1 4.3.1 1000 120 1000 110 1000 110 1000 110 1000 110 1000 110 1000 110 1000 110 1000 110 1000 110 1000 110 1000 110 1000 110 1000 110 1000 110 1000 110 1000 100	1804.40	3	4	1 llm		53.27		45.16	1.57																															10)0 107
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	1804.40	3	5	5 Zm +	29.84		05.00	47.40		40.54		0.34				4.12				40.44						65.71														10	10 129
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	1804.40	3	7				25.92	17.16		17.50										27 00																				1	10 111
1304.40 3 9 TO, + 0.4 92.7 1.1 1.15 0 <td>1804.40</td> <td>3</td> <td>, 8</td> <td>3 llm</td> <td></td> <td>52.56</td> <td>41.00</td> <td>45.65</td> <td>1.79</td> <td>17.55</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>21.55</td> <td></td> <td>1</td> <td>0 102</td>	1804.40	3	, 8	3 llm		52.56	41.00	45.65	1.79	17.55										21.55																				1	0 102
1904.0 3 10 00 97.0 97.0 43.0 0	1804.40	3	9	9 TiO ₂ +	0.94	92.07	4.11	1.49			0.25			1.15																										1	0 96
1904.0 3 11 Im+ 52.2 45.49 0.73 1.66 Image: constraint of the second	1804.40	3	10) TiO ₂		97.87		2.13			-																													1	0 109
1304.40 3 142/11m ² + Ms 10.19 70.38 7.00 10.31 0.82 0.83 0<	1804.40	3	11	I llm +		52.22		45.49	0.73	1.56																														1	0 110
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	1804.40	3	12	2 "Ilm" + Ms	10.19	70.38	7.00	11.03	0.00	0.82		0.58																						\vdash						1	10 93
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	1804.40	3	13		04.81	2 52.43		43.75	0.63	3.19	0.89					1 72																								1	10 107
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	1804.40	3	15	5 llm	34.0 I	2.30 59.47	1	38.55	1.97		0.00					1.72												-												1	0 101
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	1804.40	3	16	6 "llm"		71.11	0.67	26.77	1.45																															1	00 98
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	1804.40	3	17	7 Qz +	94.97	3.49										1.54																								1	0 123
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	1804.40	3	18	3 Qz	99.25		0.47	0.27																																1	JO 120
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	1804.40	3	19	9 Zm	30.32											2.06										66.11										1.51				1)0 125
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	1804.40	3	20) Py	4.0.1	04 70	0.00	28.76			0.50			4.50	71.24																									1	10 222
NOV-TWO S1 22 [101 07.2 07.	1804.40	3	21	1 110 ₂ +	1.04	91.78	2.22	2.89	-	5.66	0.50	1.04		1.56		1.01															-									1	7 100
Inc. 10 Social Construction Social Constructing Social Construction	1804.40	3	22	3 Chr	31.23	0.42	19 49	30.13		9.11	0.30	1.94				1.91				40.61													-							1	0 107
1804.40 3 25 Py+ 0.96 0.41 0.74 38.25 0.49 58.69 0.47 0 0 150 100 150 1804.40 3 26 Image: 100 minipage (100 minipag	1804.40	3	24	1 Mix	5.67	81.56	1.18	2.93		0.52	0.25	0.87			0.67	6.34				70.01																				1	0 107
1804.40 3 26 lm 57.56 40.01 2.43 0 0.73 0	1804.40	3	25	5 Py +	0.96	0.41	0.74	38.25				0.49			58.69		0.47																							1	0 150
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	1804.40	3	26	3 llm		57.56		40.01	2.43																															1	0 102
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	1804.40	3	27	7 TiO ₂ +	0.79	95.73	1.54	1.21						0.73																										1	JO 100
13804-40 3.1 2 (UZ 98/25) 0.63 0.54 0.38 0.21 0 0 0 100 112 1804.40 3.1 3 (Tro_+ 0.96 92.47 3.68 1.92 0.97 0 0 0 0 0 100 112 1804.40 3.1 3 (Tro_+ 1.12 3.32 1.51 1.12 0.97 0 0 0 0 0 100 100 100 100 100 100 100 100 0	1804.40	3.1	1	1 TiO ₂ +	0.63	94.55	2.49	1.50					0.7	0.83																				\vdash						1	10 92
100-1901 001 901 001 001 001 001 001 001 001	1804.40	3.1	2		98.25	0.63	0.54	0.38					0.21	0.07																				\vdash						1	10 112
	1804.40	3.1	3	1 TiO ₂ +	1 12	93.03	3.08	1.92	-					0.97														_			-		-							10	0 91

Sample Site Position	SiO2	Ti02	AI2O3	FeO	OuM	MgO	CaO	Na2O	K20	P205	SO3	Ч	CI	Sc2O3	V205	Cr2O3	CoO	NiO	ZnO	SrO	Y203	ZrO2	Ag2O	BaO	La203	0000	Nd2O3	Gd2O3	Dy203	Yb2O3	HfO2	Та2О5	80M	ThO2	Total	Actual Total
1804.40 3.2 1 TiO ₂ +	6.14	82.40	4.13	4.56			0.51	0.55	0.44	1.27																									100	J 85
1804.40 3.2 2 TiO ₂ +	0.88	92.14	1.91	2.78			0.61			1.68																									100) 94
1804.40 3.2 3 TiO ₂ +	4.52	84.57	4.26	2.97			0.45			1.40		1.85																							100	J 94
1804.40 3.2 4 TiO ₂ +	3.23	88.82	3.37	2.96			0.50			1.11																_		_							100	J 93
1804.40 3.3 1 TiO ₂		99.27		0.73																						_		_							100) 104
1804.40 3.3 2 Sd + Chl	37.85	0.99	13.12	42.48	0.51	3.97	0.31	0.77																		_			_						100) 91
1804.40 3.3 3 Qz + Mnz	61.63	4.05	5.87	1.10			0.92		1.20	12.88		0.43													8	16	3.7	'5							100) 105
1804.40 3.3 4 Ms	46.57	0.77	32.44	2.48		0.51		0.45	9.48			2.30														_	_		-						95	107
1804.40 3.3 5 Chl + Mica	45.86	0.96	14.52	30.16		3.08		1.19	4.22	0.70																_	_	_							100) /5
1804.40 3.4 1 110 ₂ +	0.94	94.81	2.15	1.37			0.27			0.73													-			_	-	-	-						100	98
1804.40 3.4 2 110 ₂ +	0.02	96.47	2.05	1.21			0.27			0.91							-						-					-	-						100	90
1804.40 <u>3.4</u> <u>3 1102</u> +	21.20	55.20	2.05	1.22						0.01												69.71				-			-						100	110
1804.40 4 1 2111	31.29	56.22		40.00	2 70																	00.71				_		-							100	100
1804.40 4 3 OZ + TIO	52.28	47 19		0.53	2.70																														100	0 119
1804.40 4 4 TiO	OL.LO	98.38		1.62																															100	0 102
1804.40 4 5 TiQ ₂	1.86	97.60		0.54																															100	0 106
1804.40 4 6 Tur +	50.42	0.89	34.03	7.79		4.26		2.27	0.34																										100	0 101
1804.40 4 7 TiO ₂ +	0.69	91.97	2.96	2.63			0.44			1.30																									100	0 95
1804.40 4 8 llm		55.72		43.53	0.75																														100	0 101
1804.40 4 9 llm		53.74		45.33	0.93																														100	0 106
1804.40 4 10 Zm	30.82	0.58																				68.60													100) 123
1804.40 4 11 Qz +	90.86	0.41	4.40	3.00		0.42			0.92																										100) 116
1804.40 4 12 Tur	37.11	0.61	33.91	12.57		0.77		2.02																											87	102
1804.40 4 13 Zrn +	28.46			1.02			1.11					1.86		0.60								65.41								1.53					100) 91
1804.40 4 14 Qz	99.37	0.63																																	100	J 127
1804.40 4 15 TiO ₂ +	2.92	91.78	1.67	1.09								2.53																							100) 114
1804.40 4 16 Tur	37.93	1.47	28.11	9.85		6.79	0.43	2.43																					_						87	103
1804.40 4 17 Qz + TiO ₂	86.08	13.42	0.50																							_			_						100) 120
1804.40 4 18 llm		52.92		46.41	0.67																					_		_	_						100) 105
1804.40 4 19 TiO ₂ +	0.82	93.93	1.19	3.15	0.00											0.91										_	_		-						100) 97
1804.40 4 20 "IIm"	0.00	69.50	0.86	26.74	2.90		0.40																			_	_	_							100) 97
1804.40 4 21 1Im +	0.92	79.05	1.04	17.11	1.45		0.43																			-	_	-	-						100	90
1804.40 4.1 1 UZ	99.66	05.61	0.62	1.65																															100	1 101
1804.40 4.1 2 110 ₂ + 1804.40 4.1 3 TiO ₂ + 7m	18.87	51 22	7 37	8.43		0.79		0.84	0.63			2 97										8.88				-									100	0 102
1804.40 4.1 4 Ms +	48.72	1 21	26.54	4 75		2.12		0.55	7.66	3.44		2.07										0.00			2	04									100	0 102
1804.40 4.2 1 TiO	40.72	94.06	20.04	5.94		2.12		0.00	1.00	0.44		2.50													2.										100	0 101
1804.40 4.2 2 "lim"		25.98		72.67	1.35													-																	100	0 96
1804.40 4.2 3 TiO ₂		96.08		3.92																															100	0 103
1804.40 4.2 4 TiO ₂		96.93		3.07																															100	0 101
1804.40 4.2 5 "llm"	1.15	89.13		5.31								4.41																							100	0 44
1804.40 4.2 6 "Ilm"		37.98		61.10	0.92																														100	0 100
1804.40 4.3 1 TiO ₂ +	0.77	91.74	2.96	2.70			0.52			1.31																									100) 94
1804.40 4.3 2 TiO ₂ + Chl + Bt	38.58	27.07	10.67	16.97		2.27			4.43																										100) 89
1804.40 4.3 3 TiO ₂ +	0.95	90.70	4.00	2.56			0.49			1.31																									100) 95
1804.40 4.4 1 Qz	99.60	0.40																																	100	J 119
1804.40 4.4 2 Mix	45.43	29.36	1.67	0.37			21.39					1.78									L					_			-						100) 120
1804.40 4.4 3 TiO ₂		100.00							L																	+			-						100) 104
1804.40 4.4 4 Qz +	95.00	0.58	2.13	1.87					0.42					-							-					+			-	-					100) 115
1804.40 5 1 Qz	99.69	0.31	0.00	0.77			0.50															00.40				_		-	-		1.00				100) 120
1804.40 5 2 Zm	29.42		0.62	0.77			0.52							0.49								66.18				_	_	_	-		1.99				100) 113
1804.40 5 3 Zm +	27.63	00.07	0.61	0.61			1.70							1.00		4.00						68.46				_	_	-							100	98
1904.40 5 4 1111 +	1.50	08.97	2.48	0.70		0.47			2.02			1.40		-		1.20								_		+		-	-	-					100	J 34
1804.40 5 5 QZ +	05.49	50 /0	9.01	40.19	0.01	0.47			2.82			1.42																	-	-	1				100	1 120
1804.40 5 7 "llm"		88 27		11 72	0.01	0.00								-			-				-					+			+	-	1				100	0 87
1804.40 5 8 "llm"		65.83		28.84	5 33				-												-					+			1		1				100	2 101
1804.40 5 9 Mpz		00.00		20.04	0.00		1 03			35.34	0.94	-0.52		-									1.86		13 93 31	30 3	60 12 5	3	+		1				100	0 103
1804.40 5 10 Spl			31.48	18.08		14.02	1.00			30.34	0.34	-0.02		-		36.42		-			-				.5.55 51.		55 12.0		1		1		-		100	0 107
1804.40 5 11 Zm	29,83						0.60		1		i											69.57				1					1				100	0 109
1804.40 5 12 llm		53.58		44.84	0.99	0.59	0.00																								1				100	0 103
1804.40 5 13 "llm"		65.27		31.95	2.78																														100	0 93
1804.40 5 14 Zm	30.93																					69.07				Ĺ									100) 118
1804.40 5 15 "Ilm"		64.19		34.69	1.12																														100) 99

Sample	Site	Position	Mineral	SiO2	TiO2	AI2O3	FeO	OuM	MgO	CaO	Na2O	K20	P205	SO3	ш	ū	Sc2O3	V205	Cr203	CoO	NiO	ZnO	SrO	Y203	ZrO2	Ag2O	BaO	La2O3	Ce2O3	Pr203	Nd2O3	Gd2O3	Dy203	Yb2O3	Hf02	Ta205	WO3	ThO2	PbO	Actual Total
1804.40	5	16	Ms	47.80	1.26	23.93	5.05		2.96		0.33	9.98			3.68																									95 111
1804.40	5	17	llm		51.23		46.22	2.06	0.50																										_	-			1	00 106
1804.40	5	10	TiO ₂ +	0.90	91.19	4.98	1.62	0.39		0.37			0.94																										1	00 107
1804.40	5	20	TiO ₂		99.53		0.47																																1	00 109
1804.40	5	21	Qz	99.31	0.28		0.41	0.50	0.40																										_	_			1	00 123
1804.40	5	22	IIM Qz +	95.09	52.06	1.09	44.19	0.58	3.18						1.39							0.23														-			1	00 108
1804.40	5	24	Spl			41.81	11.35		18.69										28.14																				1	00 113
1804.40	5	25	Chr + Chl	5.28	2.50	3.48	52.99	0.88											33.58			1.29														_			1	00 91
1804.40	5.1	2	TiO ₂ + Chl	9.07	71.08 01.10	6.06 5.19	11.58		0.82	0.30	0.61		0.77																						_	-			1	00 95
1804.40	5.2	1	TiO ₂	1.14	100.00	0.13	1.55			0.00			0.54														_												1	00 105
1804.40	5.2	2	Qz	100.00																																			1	00 119
1804.40	5.2	3	TiO ₂	40.00	99.21		0.79								1.00																					_			1	00 104
1804.40	6	2	Grt	42.66	0.69	31.00	2.18	1.51	14.86	3.13	1.43				4.06																					-			1	00 104
1804.40	6	3	Chr	0.07	0.39	23.20	17.56	1.01	12.94									0.43	45.48																				1	00 111
1804.40	6	4	llm		51.48		47.75	0.77																												_			1	00 105
1804.40	6	5	Grt	43.87	1.16	30.54	9.02	2.50	11.18	1.89	2.35																								_	-			1	00 102
1804.40	6	7	TiO₂ + Ms	17.64	71.89	6.56	1.83	3.59	0.48		0.44	1.17															_		-							-			1	00 96
1804.40	6	8	llm		55.88		43.64	0.48																															1	00 102
1804.40	6	9	llm		53.72		44.75	0.73	0.79																														1	00 111
1804.40	6	10	$Qz + TiO_2$ $Oz + TiO_2$	90.30	9.14	0.68	0.56																												_	-			1	00 121
1804.40	6	12	Zm	30.76	42.04	0.00	0.00																		69.24														1	00 112
1804.40	6	13	llm		48.82		49.29	1.89																															1	00 107
1804.40	6	14	Qz	100.00	70.47			0.04																											_	_			1	00 121
1804.40	6	15	"lim" + Tur	38.32	/6.1/	32.57	21.82	0.81	8 17	1 27	1 91																									-			1	00 91
1804.40	6	17	Py	00.02	0.02	02.01	28.58		0.17	1.21	1.01			71.42																									1	00 221
1804.40	6	18	Zrn +	28.78			0.77			1.27							0.80								68.38														1	00 104
1804.40	6	19	Tur	37.47	1.24	33.00	9.05		4.20	1.25	2.04		25.00	0.02	4 4 4						0.00							15.00	20.02		10.40				_	-		4.10	1	37 101
1804.40	6	20	Ab	69.20		18.49	0.49			1.55	11.83		33.00	0.65	1.11						0.22							15.06	50.95		10.49					-		4.12	1	00 104
1804.40	6	22	llm		53.84		43.15	3.01																															1	00 105
1804.40	6	23	TiO ₂		100.00	0.05						0.00		50 70																						_			1	00 110
1804.40	6	24	Py + Cbl + Bt	2.41	0.28	16.93	30.74		3 1 2		4.47	0.22		7 68																							1.14		1	00 167
1804.40	6	26	Zm	30.59	0.05	10.55	0.40		0.12		0.00	1.00		7.00											69.00														1	00 122
1804.40	6	27	"llm" +		93.06		6.94																													_			1	00 89
1804.40	6	28	Zm	30.66																					69.34										_	-			1	00 121
1804.40	6	29	Zm	31.03			0.76	-		0.37															67.11		_	-	-					1	.39	-			1	00 121
1804.40	6	31	Zm	30.45	0.48		0.48																		68.59														1	00 121
1804.40	6	32	Tur	38.28	1.12	33.66	5.37	0.70	6.04	0.52	2.01																									_			1	37 99
1804.40	6	33	TiO ₂ + Ms	13.01	53.81	7.98	44.23	0.76	1.21		0.42	1.30																								+			1	00 104
1804.40	6	35	Qz	100.00		1.00	2.07				0.72																												1	00 121
1804.40	6	36	Zm	30.50		0.57				0.36															68.57														1	00 109
1804.40	6.1	1	TiO ₂ +	2.62	96.63	0.27	0.75																												_	-			1	00 104
1804.40	6.1	3	llm + Qz	35.43	48.40	0.37	13.59	1.91		0.68																										+			1	00 105
1804.40	6.1	4	Qz +	89.07	0.49	2.21	3.71		4.52																														1	00 122
1804.40	6.1	5	Qz	98.91	0.55		0.54																										_						1	00 118
1804.40	6.2	2	TIO ₂		100.00		\vdash																										-			-			1	00 105
1804.40	6.3	1	Py	1.05	.00.00		28.64							70.31																									1	00 217
1804.40	6.3	2	Chl +	39.55	0.58	19.73	35.70		2.97		0.57	0.90																											1	00 86
1804.40	6.3	3	Py Chi i Miao	27.00	0.27	17.60	28.10		2.07		0.62	1.01		71.63																			_			_	1.50		1	00 220
1804.40	6.3	4	"Ilm"	37.06	1.19	17.60	37.05		3.87		0.63	1.01																									1.59		1	00 78
1804.40	6.4	2	TiO ₂		98.92		1.08																																1	00 104
1804.40	6.4	3	"llm"		75.98		24.02	_								_					_					_													1	00 94

Sample	Site	Position	Mineral	SiO2	TiO2 Al2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	Ŀ	ō	Sc2O3	V205	Cr203	CoO	NiO	ZnO	SrO	Y203	ZrO2	Ag2O	BaO	La203	00790	Pr203	00701	Gd2O3	Dy203	Yb2O3	Hf02	Ta205	WO3	ThO2	PbO	Actual Total
1804.40	6.4	4	"lim"		91.02	8.98																																10	0 89
1804.40	6.5	1	Qz	99.69	0.31																							_		_	_							10	0 120
1804.40	6.5	2	Qz Zm	99.68	0.32																			60.10				_		_	-							10	0 120
1804.40	7	2	ZIII TiQ ₂ +	30.61	96.99	1.31							1.70											69.19				-			-		-					10	0 110
1804.40	7	3	llm		51.85	45.86	0.50	1.78																														10	0 106
1804.40	7	4	TiO ₂ + Ms	17.62	73.02 7.20	0.77				0.57	0.82																											10	0 109
1804.40	7	5	TiO ₂ +	3.57	93.81	0.39			2.23																													10	0 108
1804.40	7	6	Mix	28.75	18.56 14.2	7 31.12	0.45	3.51	0.37	0.62																		_		_	_					2.36		10	0 98
1804.40	7	/		09.92	0.20 0.6	44.22	3.35																			-		-		-	-							10	0 110
1804.40	7	9	llm +	30.02	54.01	43.21	0.55	2.24																							-							10	0 104
1804.40	7	10	llm		54.14	43.81	2.05																															10	0 102
1804.40	7	11	llm		55.42	43.61	0.97																															10	0 104
1804.40	7	12	Zm	31.00	0.00 10.0						0.00													69.00				_										10	0 121
1804.40	7	13	QZ + Chi	64.95	0.60 16.2	14.54		1.43	-		2.22			1 90														-		-	-	-			-			10	0 100
1804.40	7	14	TiO ₂ +	1.81	95.97 1.04	1.19								1.05														-			-							10	0 109
1804.40	7	16	"lim"		93.90	6.10																																10	0 92
1804.40	7	17	Spl		0.38 48.10	6 12.82	1	8.88										19.76																				10	0 112
1804.40	7.1	1	Qz	98.85	0.47 0.69	9																						_		_	_							10	0 118
1804.40	7.1	2	TiO ₂ +	4.00	94.11 1.6	5					0.23																	-		_								10	0 102
1804.40	7.1	4	Ω_2 Qz + TiQ ₂	80.24	18.95 0.8	1		-	-																-	-		-			-	-			-			10	0 115
1804.40	7.2	1	lim		53.31	44.74	1.95																															10	0 105
1804.40	7.2	2	llm + Chl	17.80	49.63 10.1	7 19.15		1.77		0.56		0.92																										10	0 94
1804.40	7.2	3	lim		54.42	43.15	2.01											0.42																				10	0 104
1804.40	8	1	Tur Tio	36.82	0.84 32.3	7 5.60		6.24	0.48	2.25	0.22	4 00		2.18														_		_	-							8	102
1804.40	8	- 2	TIU ₂ +	28.11	92.08 2.4	2 2.71		3.00	0.30	1.83		1.38														-		-		-	-							10	J 95 7 102
1804.40	8	4	TiO ₂ +	2.50	89.71 3.0	7 2.12		0.00	0.49	1.00		1.46						0.65																				10	0 83
1804.40	8	5	llm		57.66	40.77	1.56																															10	0 109
1804.40	8	6	Qz	100.00																											_							10	0 125
1804.40	8	7	"llm"		69.85	28.87	1.01								0.27													_			_							10	0 105
1804.40	8	8	lim "lim"		57.66	39.53	2.81	-	-																	-		-		-	-	-	-		-			10	0 104
1804.40	8	10	"llm" +	16.92	54.30 7.1	3 15.56	0.45	3.11	0.40	0.85	0.55	1.13																			-							10	0 96
1804.40	8	11	Qz	100.00																																		10	0 121
1804.40	8	12	TiO ₂		99.47	0.53																									_							10	0 105
1804.40	8	13	IIm	0.58	54.05	42.23	2.88								0.27													_		_	-							10	0 97
1804.40	8	14	lim "lim"		53.87	44.32	1.81	-	-																	-		-		-	-	-	-		-			10	0 103
1804.40	8	16	"llm" +	1.73	72.11 1.7	2 24.44	2.74																								-							10	0 91
1804.40	8	17	TiO ₂ +	1.66	90.67 2.72	2 2.93			0.49			1.53																										10	0 94
1804.40	8	18	TiO ₂ +		94.60 1.5	1 2.16			0.35			0.78						0.60										_		$-\Gamma$								10	0 89
1804.40	8	19	TIO ₂ +	0.76	92.10 2.72	2 2.38		2 47	0.63	0.00	1.00	1.41		6.44								-				_		+		-+	\rightarrow					0.47		10	0 400
1804.40	8.1	2	TiO ₀ +	38.77	4.8∠ 21.3	5 2 46		2.41	0.37	0.93	1.03	1 28		o.41				0 47										+			+		\rightarrow			2.17		10	0 93
1804.40	8.1	3	Mix	34.11	4.78 17.0	24.96	-+	3.12	0.50	2.83	0.75			11.96				0.17										+			-				-			10	0 105
1804.40	8.1	4	TiO ₂ +	0.61	92.18 2.5	2.29			0.59			1.34						0.49																				10	0 92
1804.40	8.1	5	Mix	34.85	13.80 17.9	18.94		2.39		2.02	1.26			8.33				0.41																				10	0 102
1804.40	8.2	1	TiO ₂ + Kln	25.68	49.31 22.14	1 1.44			0.37			0.84			0.23			0.55										_										10	0 84
1804.40	8.2	2	$TiO_2 + TiO_2	1.33	90.38 2.8	+ 2.00			0.43			1.46						0.55										+			-							10	187 88 0
1804.40	8.2	4	TiO ₂ +	3.45	87.25 4.1	2.11			0.59			1.66						0.83								-					-							10	0 81
1804.40	8.3	1	TiO ₂	0.62	93.97 1.20	2.42			0.38			0.94						0.47																				10	0 93
1804.40	8.3	2	Py		1.75	27.58							70.67																									10	0 228
1804.40	8.3	3	TiO ₂	0.72	94.47 1.24	1 2.49			0.07			0.82			0.26													+	_	-+	\rightarrow							10	0 81
1804.40	8.3	4	IIU ₂		50.07 1.3	2.35			0.37			0.82							$\left - \right $									+			-							10	J 92 0 00
1804.40	9	2	"llm"	0.81	94.46	4.72																						+			+		\rightarrow		-			10	0 97
1804.40	9	3	llm	0.01	52.09	46.44	1.48																															10	0 103
1804.40	9	4	Tur	37.55	0.59 31.8	8.39		5.85	0.70	2.04																							_					8	/ 99
1804.40	9	5	Zm	30.68																				69.32				-		_	-+		\rightarrow					10	0 121
1804.40	9	6	Chl + Bt	46.42	1.50 17.8	2 19.91		7.24		0.95	2.68			3.49																								10	0 108

Sample	Site	Position	Mineral	SiO2	Ti02	AIZU3	FeO MnO	OgM	CaO	Na2O	K20	P205	SO3	F	ö	Sc2O3	V205	Cr203	CoO	NiO	OuZ	SrO	Y203	ZrO2	Ag2O	BaO	La203 Ce203	Pr203	Nd2O3	Gd2O3	Dy203	Yb2O3	Hf02	Ta205	WO3	ThO2	PbO	Actual Total
1804.40	9	7	7 TiO ₂		100.00																																10	0 111
1804.40	9	8	3 Tur	36.15	1.18 32	2.29	8.78	3.71	0.29	2.23				2.38														_	_								87	7 106
1804.40	9	9	9 Mnz	0.79	54.00		47.40	0.00	1.11			38.46		-0.08						-0.25							14.62 29.9	4	11.78	1						3.64	10	0 101
1804.40	9	10		26.94	51.99	102	47.19	0.82	0.69	1.05				1 70												-			_								10	7 104
1804.40	9	1:		30.04	57.91	1.02	0.23 40.95 1.1	3.64	0.00	1.95				1.79																			_				10	0 104
1804.40	9	13	3 TiO ₂ + Ms	43.74	17.06 27	.62	0.90	0.39)	0.81	7.36			2.11																							10	0 114
1804.40	9	14	1 "Ilm" + Qz	7.08	81.35 4	1.00	6.26	1.32	2																												10	0 105
1804.40	9	15	5 llm		53.62		45.76	0.63	5																												10	0 106
1804.40	9	16	6 Qz	99.73	0.27																							_	_								10	0 123
1804.40	9	17	7 "llm" +	1.40	71.25 1	.39	25.96	20			-																	-	_								10	0 87
1804.40	9	10			50.99		47.18 1.8	33	:																												10	0 107
1804.40	9	20) llm		53.34		45.48 1.1	8	,																	-							_				10	0 102
1804.40	9	2'	1 Tur	37.05	0.50 33	3.76	9.08	2.82	2	1.91				1.89																							87	7 100
1804.40	9	22	2 Qz +	97.18	0.54 ().75	1.53																														10	0 111
1804.40	9	23	3 Mnz	0.72					1.82			37.24		-0.34													11.82 27.9	5	11.78	1						9.01	10	0 99
1804.40	9	24	1 Zm	31.12	50.70		44.00 0.0	7 0.07																68.88				_	_								10	0 118
1804.40	9	2:		99.52	0.48		44.60 0.6	0.97																				-									10	0 100
1804.40	9.1	2	2 TiO ₂	33.32	99.60		0.40																														10	0 105
1804.40	9.1	~	3 Chl +	31.14	1.41 23	3.41	35.83	7.11		1.11																											10	0 94
1804.40	9.1	4	4 TiO ₂		100.00																																10	0 105
1804.40	9.1	Ę	5 Ms	46.80	1.04 30).84	1.62	0.45	i	1.26	8.08			4.92														_		_							95	5 116
1804.40	10		IZm ZTiO +	30.67	83 55	07	1 9/	-				1 30		4 64										69.33	_			-	_	-							10	0 123
1804.40	10		3 Spl	0.42	0.71 34	.84	14.67	13.34	ł			1.00		4.04				36.44																			10	0 113
1804.40	10	4	1 "lim"		84.65		15.35																														10	0 96
1804.40	10	Ę	5 Qz	100.00																																	10	0 122
1804.40	10	6	6 Py		0.24	- 1	28.58	-					71.18																								10	0 231
1804.40	10				59.06		33.09 7.8	15		-																		-	-				_				10	0 103
1804.40	10	(a llm	0.50	59.96		44.62 0.7 32.44 7.1	0																													10	0 106
1804.40	10	10) TiO ₂ +	1.31	98.27		0.41																														10	0 109
1804.40	10	11	1 Tur	37.35	1.11 33	3.58	10.78	2.29)	1.89																											87	7 100
1804.40	10	12	2 llm		55.73		42.57 1.7	0																				_									10	0 105
1804.40	10	13	3 "lim"	400.00	72.29		27.71	-																		_				-							10	0 95
1804.40	10	14	5 Zm	30.78																				69.22		_							_				10	0 121
1804.40	10	16	6 Spl	00.70	0.38 47	.26	12.55	18.71										21.10						OU.LL													10	0 111
1804.40	10	17	7 "llm" +	2.72	74.31 1	.74	21.23																														10	0 94
1804.40	10	18	3 Grt	42.32	0.91 31	.68	20.86	0.72	0.68	2.84																											10	0 97
1804.40	10	19		50.00	99.31		0.69	4.40	0.0	4.00	0.00		0.00	5.00												_											10	0 106
1804.40	10	20		50.62	53.66	1.69	45.46 0.9	1.10	0.34	1.08	0.68		0.63	5.0 <u>9</u>	_										-			-		1	+						10	0 103
1804.40	10	22	2 "llm" + Qz	11.31	72.53	.50	4.16			0.48				4.02																L							10	0 89
1804.40	10	23	3 Py	0.18			28.94						70.88																								10	0 217
1804.40	10	24	1 Qz	99.21			0.79		-																				_	-							10	0 124
1804.40	10 1	25		1 00	55.18	1	43.80 0.4	2 0.61	0.00	-		1 50														_			_	-							10	0 107
1804.40	10.1		$110_2 + 100_2 + 100_$	3.11	92.02 3	3.24	1.34	-	0.30	1		1.70									-							+	-	1	+					-	10	0 71
1804.40	10.1	3	3 TiO ₂ +	1.26	92.11 3	3.53	1.29		0.27			1.54																									10	0 94
1804.40	10.2		1 Qz +	93.31	6.69																																10	0 119
1804.40	10.2	2	2 TiO ₂		100.00			_																													10	0 104
1804.40	10.2		3 Chl + Mica	40.70	3.35 22	2.59	20.49	5.13	0.66	0.93	1.90			4.24														-	_	-							10	0 100
1804.40	10.3		Kfs	99.60	0.40	69		-	-	0.60	15.10																			1	+						10	0 119
1804.40	10.3	1	3 TiO ₂	0.51	98.48	.33	1.01		1	0.00	10.10																			1							10	0 104
1804.40	10.3	4	1 TiO ₂		99.24		0.76																														10	0 103
1804.40	10.3	ę	5 TiO ₂ + Chl	11.60	64.67 5	5.20	9.45	1.12	0.49	0.60	0.94	1.09		4.84												_				\vdash	\square						10	0 99
1804.40	10.3	6	6 Chl +TiO ₂ + Kfs ?	34.25	15.06 13	3.44	22.71	2.51		1.92	2.04			8.06												_		_	_	-							10	0 96
1804.40	10.4			1.18	98.32		0.50	+														1						-		-	$\left \right $						10	0 100
1804.40	10.4		3 TiO ₂	0.88	98.11 (0.46	0.56	-	1	<u> </u>															-			+		1							10	0 98
1804.40	11		I Pv	5.00			28.81						71.19																								10	0 221

Sample	Site	Mineral	SiO2	TiO2	AI2O3	FeO	MnO	ОбМ	CaO	Na2O	K20	P205	SO3	ш	CI	Sc2O3	V205	Cr203	CoO	0 N	ZnO	SrO	Y203	ZrO2	Ag2O	BaO	La203 Ce203	Pr203	Nd2O3	Gd2O3	Dy203	Yb203	HfO2	Ta205	WO3	ThO2	Oqd	Total Actual Total
1804.40	11	2 Kfs	65.56		17.96						15.23															1.24											1	00 118
1804.40	11	3 "llm" +	1.14	81.86	5 1.89	15.11																															1	00 92
1804.40	11	4 lim +		52.59	2	43.68	2 19	3.04							0.47											_											1	00 104
1804.40	11	6 Mix	41.07	55.00	31.78	13.90	2.15			0.67			12.58		0.47																						1	00 91
1804.40	11	7 llm		51.16	3	46.37	1.86	0.61																													1	00 107
1804.40	11	8 Tur	38.44	0.94	33.26	4.41		7.30	0.30	2.35																												87 102
1804.40	11	9 llm +		53.36	3	43.38	0.57	2.69																													1	00 109
1804.40	11 1	10 Zm +	29.96	0.41					0.07			27.00		2.16										67.47	2.27		14.07 22.52		11 57								1	00 127
1804.40	11 1	12 TiO		100.00)				0.97			37.00		-0.19						-					2.21		14.97 32.55		11.57								1	00 102
1804.40	11 *	13 Qz + TiO ₂	67.41	32.59	9																																1	00 116
1804.40	11 1	14 Zm +	26.12		1.24	0.65			3.35					2.96		1.49								61.55									2.63				1	00 87
1804.40	11 *	15 TiO ₂ +	1.92	97.67	7	0.41																															1	00 111
1804.40	11 1	16 llm		52.16	3	44.97	2.87						74.00																								1	00 109
1804.40	11 *	17 PY 18 TiO ₂ + CM	18.09	59.50	11 62	28.58		1 / 2		0.47			(1.22	4 82												_							_				1	00 116
1804.40	11 1	19 TiO ₂ +	2.26	92.63	3 1.45	1.75		1.43		0.47				1.91		-			\vdash						-						\vdash						1	00 107
1804.40	11 2	20 "Ilm"		60.53	3	37.12	2.35																														1	00 102
1804.40	11 2	21 TiO ₂ +		97.49	9												1.85	0.66																	_		1	00 106
1804.40	11 2	22 TiO ₂ + Qz	37.99	61.43	3	0.58		7.01	0.07	0.05																											1	00 115
1804.40	11 2	23 Tur 24 "llm"	38.00	0.84	1 30.92	6.43	1 10	7.83	0.66	2.33					\vdash																							8/ 97
1804.40	11 2	24 IIII 25 Spl		91.49	46.69	13.01	1.10	18 29									0.40	21.60		-						-							_	-			1	00 01
1804.40	11 2	26 "Ilm" + Chl	21.21	43.24	1 9.29	21.21		3.10	0.67	0.63	0.65						0.40	21.00																			1	00 94
1804.40	11 2	27 llm		52.69)	42.24	5.07																														1	00 106
1804.40	11 2	28 TiO ₂ +	0.78	95.30	1.64	2.27																															1	00 96
1804.40	11 2	29 "llm"		61.13	3	36.91	1.96																														1	00 100
1804.40	11 3		0.94	54.27	-	43.64	2.09																											-			1	00 107
1804.40	11 1	1 Pv	0.04	0.35	5	28.52							71 14																								1	00 221
1804.40	11.1	2 Ms + Chl	49.54	0.44	1 26.46	10.09		3.23		0.48	5.56		1.79	2.39																							1	00 102
1804.40	11.1	3 Py + Chl	13.75	0.80	8.92	38.30		0.64		5.66	0.67		30.96		0.31																						1	00 91
1804.40	11.1	4 Py	0.20	0.41	1	28.36							71.02																								1	00 222
1804.40	11.1	5 Qz +	97.25		0.60	1.19							0.96																								1	00 120
1804.40	11.2	1 QZ 2 Me	98.79	1.21	1 28.46	1.87		1 07		0.30	9.66			2.61																							1	00 117
1804.40	11.2	3 TiO ₂ + Qz	14.36	85.09	20.40	0.55		1.57		0.50	5.00			2.01																							1	00 108
1804.40	11.2	4 TiO ₂ + Qz	23.92	76.08	3																																1	00 112
1804.40	11.3	1 TiO ₂		93.96	6	6.04																															1	00 103
1804.40	11.3	2 TiO ₂ +	2.49	93.83	3 0.96	2.72																															1	00 96
1804.40	11.3	3 Xtm +	8.25	4.84	1	0.90			1.50			35.31		2.08					1.04				38.07							3.21	4.81						1	00 99
1804.40	11.3	5 Chl + Xtm	20.79	2 00	10.23	3.86		1 74	0.55	0.61	0.39	24 55		4 00					0.99				27.61							2.68							1	00 103
1804.40	11.3	6 Qz +	89.88	1.25	3.76	3.72		0.54	0.00	0.01	0.84								5.00				27.01														1	00 107
1804.40	11.3	7 Chl + Ms	40.40	1.49	9 19.07	27.05		3.63	0.41	1.79	0.96			5.21																							1	00 96
1804.40	11.3	8 Ms	44.65	0.78	32.14	3.34		0.46		1.54	8.05			4.06																								95 107
1804.40	11.4	1 UZ + TIO ₂	82.45	17.22	1 1 10	0.33					0.51				\vdash																							00 121
1804.40	11.4	3 TiO ₂ +	3.22	94.94	0.59	1.65					0.51																										1	00 103
1804.40	11.4	4 Ms	52.36	4.68	3 21.12	4.59		0.95		0.91	5.33			5.05									1				-											95 108
1804.40	11.5	1 TiO ₂ + Pl	45.14	27.34	18.08	0.69			6.97	0.72	1.07																										1	00 98
1804.40	11.5	2 TiO ₂ +	0.79	95.23	3 1.64	2.34													μŢ												μŢ	T					1	00 92
1804.40	11.5	3 TiO ₂	0.81	95.28	3 1.64	2.26																															1	00 92
1804.40	12	1 Zm +	29.71	50 10		1.08	0.42	0.00	0.93															67.85														00 107
1804.40	12	3 Tur	36.70	0.71	29.90	13.16	1.03	3.80	0.58	2,14																												87 100
1804.40	12	4 llm		53.03	3	38.74	8.23		2.20																												1	00 105
1804.40	12	5 "Ilm" + Chl	22.02	40.70	9.56	13.98		2.07		2.42	0.94			7.95				0.36																			1	00 107
1804.40	12	6 "llm"	0.63	74.64	0.51	24.22																															1	00 92
1804.40	12	/ 110 ₂		98.20	2	1.80		0.45																		_												00 107
1804.40	12	9 "llm" +		54.04	1	42.62	0.55	2.15											\vdash												\vdash							00 106
1804.40	12	10 TiO ₂		99.50)	0.50	0.00	2.13								-	-																				1	00 108
1804.40	12	11 Pv +	5.94	0.26	6 4.66	29.06				0.38	0.84		58.85																								1	00 183

Sample	Site Position	Mineral	SiO2	Ti02	AI2O3	FeO	OuM	OgM	CaO	Na2O	K20	P205	sos	ш	ō	Sc2O3	V205	Cr203	CoO	NiO	ZnO	SrO	Y203	ZrO2	Ag2O	Opg	La203 Ce203	Pr203	Nd2O3	Gd2O3	Dy203	Yb203	Hf02	Та205	WO3	ThO2	PbO	Actual Total
1804.40	12 12	2 "Ilm"		81.36	1.00	16.78		0.86																													1	00 96
1804.40	12 13	3 "Ilm" +	1.09	84.47	1.43	7.21				0.83				4.44				0.52								_							\rightarrow	\rightarrow		 +	10	00 80
1804.40	12 14	1 llm		52.71		46.28	1.01							0.50																						+	10	00 107
1804.40	12 15		06.07	90.55		2.33				0.60				6.53												-										-+	10	00 47
1904.40	12 10	7 Tur	29.24	13.13	24.45	7.00		4 92		1.60																								+		<u> </u>	1	00 112
1804.40	12 17		5 30	0.69	34.43	1.09		4.03		1.60			-		-																		-	\rightarrow		-+	1	00 107
1804.40	12 10	1102 1 02	0.55	65.84	0.45	33.16			-		-				-																	-					10	00 107
1804.40	12 20) TiO ₂ +	2.38	89.84	1.82	0.84					0.41			4.71																				-			10	00 117
1804.40	13 1	1 Qz + TiO ₂	86.37	13.63																												-	-	-			10	00 111
1804.40	13 2	2 "Ilm"		61.81		33.36	4.83																														10	00 99
1804.40	13 3	3 Spl		0.63	55.26	10.56		20.38										13.17																			10	00 111
1804.40	13 4	4 Tur	37.40	1.13	31.72	7.80		6.05	0.78	2.12																										$ \rightarrow $	8	37 100
1804.40	13 5	5 llm		52.92		43.28	3.80																											\rightarrow			10	00 106
1804.40	13 6	6 Qz	100.00																							_								\rightarrow		 +	10	00 122
1804.40	13 7	r "iim"	0.07	70.30	0.00	28.91	0.79	0.05	0.55			0.70														+						\rightarrow	-+	\rightarrow		+	10	00 88
1804.40	13 8	3 IIM" +	6.87	79.04	3.33	8.81	0.45	0.65	0.55			0.76		-												+						\rightarrow	-+	\rightarrow		\rightarrow	10	00 110
1804.40	13 10) llm		53.01		45.19	0.43	3.33							-		-	-								+						\rightarrow	-+	-+		-+	1	00 109
1804 40	13 11	l llm		53 17		44,81	2.02												-							+						\rightarrow	-	\rightarrow		-+	1	00 109
1804.40	13 12	2 Py		0.32		28.18	2.02				-	71	.49				-	-	-					-								-		\rightarrow		t	1	00 237
1804.40	13 13	3 Zm	30.62								+	- † '	1				-+							67.80		+				l			1.58	-		-+	1	00 127
1804.40	13 14	1 "llm" + Chl	8.61	72.51	7.13	5.42		0.53	0.43	0.43		0.65		3.78				0.51																			1	00 106
1804.40	13 15	5 Zm +	29.42	0.60		0.43			0.65						1	0.61								68.28													10	00 113
1804.40	13 16	6 "llm"		71.50		28.50																														$ \rightarrow $	10	00 97
1804.40	13 17	7 Ap							48.88		4	5.06		6.07																						 +	10	00 121
1804.40	13 18	3 Tur	37.58	1.50	31.51	7.05		6.20	1.22	1.95			_		-	-										_						\rightarrow	\rightarrow	\rightarrow		ł	8	37 101
1804.40	13 19) m	40.54	53.32	0.00	45.19	0.81	0.67		4.00	0.74			0.70												_										+	10	00 108
1804.40	13 20		18.51	59.17	8.63	8.51		0.66		1.08	0.74		_	2.70	-	-										-							-	\rightarrow		-+	10	00 103
1804.40	13 21		13 77	68.62	8.00	1.40		0.54	0.29	0.68	1 27			5.05	-											-								\rightarrow		-+	1	00 101
1804.40	13 23	3 TiO ₂ +	4.22	90.44	2.43	2.30		0.04	0.25	0.00	1.21	0.61		0.00																			-	-+		t	1	00 94
1804.40	13 24	1 "llm"		62.82		32.74	4.44																											-			1	00 96
1804.40	13 25	5 Zm	30.92																					67.51									1.57				10	00 117
1804.40	13 26	6 Tur	37.04	0.94	28.66	6.15		8.39	1.84	1.73				2.24																							8	87 97
1804.40	13 27	7 llm		54.75		44.35	0.90																													<u> </u>	10	00 99
1804.40	13 28	3 "Ilm"		66.68	0.51	32.16	0.65																											\rightarrow			10	00 97
1804.40	13 29	9 "llm"		62.22		36.75	1.03																			_										r+	10	00 95
1804.40	13 30) Zm	31.03		0.04	0.00							_											68.97		_								\rightarrow		+	10	00 115
1804.40	13 31	I QZ + IIM	/8.44	16.84	0.81	3.92	2.44						_													-							\rightarrow	\rightarrow		<u> </u>	10	00 108
1804.40	13 1 1	1 TiO ₂ +	5.35	80.52	4 79	7.89	2.41		0.34		-	1 10																				-	-	-+		-+	10	00 85
1804.40	13.1 2	2 TiO ₂ +	1.65	89.57	2.89	3.75			0.33			1.16						0.65															-	-			10	00 97
1804.40	13.1 3	3 TiO ₂ +	1.51	90.78	3.54	2.67			0.35			1.14																						-			1	00 96
1804.40	14 1	I Chr		0.54	27.54	15.53		14.64										41.75																			1	00 106
1804.40	14 2	2 Qz + TiO ₂	64.42	32.42	1.14	2.03																				Ţ											1	00 97
1804.40	14 3	3 Py +	1.21	0.39	0.82	31.91			[65	5.67	[[[[T]								μĪ		[]		1	00 174
1804.40	14 4	1 llm		51.22		45.58	3.20										_									_						\rightarrow	$ \rightarrow $	\rightarrow		$ \rightarrow$	1	00 101
1804.40	14 5	5 Tur	37.31	0.92	33.45	9.48		3.57	0.31	1.95								FF 00								+					\vdash	\rightarrow	\rightarrow	\rightarrow		<u> </u>	8	37 99
1804.40	14 6			0.55	12.52	22.09	0.00	8.85			-+						\rightarrow	oo.99								+					\vdash	\rightarrow	\rightarrow	\rightarrow		<u> </u>	10	00 105
1804.40	14 /	3 TiO ₂ +	6.02	48.62	3 00	00.38 2.75	0.99		0.34				-+	2.28	-	-	-		-	-						+						\rightarrow	\rightarrow	-+		-+	1	00 104
1804.40	14 9	Al Phos-sulf	0.00	04.00	33.20	2.10			2 41		3	0.73 7	7 27	1.98	-							10.11					3.56 7.07		1.63								10	00 99
1804.40	14 10) lim		56.27	00.20	38.57	5.15		2.11			0.70 7		1.00								10.11					0.00 1.01		1.00							_	10	00 105
1804.40	14 11	I Grt	43.13	3.82	28.75	14.26		6.51	0.63	2.91																t							\neg				1	00 99
1804.40	14 12	2 Mnz	1.17								3	5.85		0.37						0.01					2.13		16.47 32.60		11.40				-				1	00 101
1804.40	14 13	3 TiO ₂ +	1.00	90.92	3.30	2.21			0.56			1.44						0.57								Ţ											1	00 98
1804.40	14 14	1 "llm"		74.95	0.76	23.36	0.78										_				0.16					\rightarrow								\rightarrow		<u> </u>	1	00 95
1804.40	14 15	5 TIO ₂ + Qz	32.77	62.34	1.07	1.78								2.04												+					\vdash			\rightarrow		+	1	00 109
1804.40	14 16		1.27	94.69	0.75	1.41								1.87												+						\rightarrow	-+	\rightarrow		\rightarrow	1	00 97
1804.40	14 1/	R IIm		97.56 58.02	0.49	1.94	1.01										\rightarrow									+						\rightarrow	\rightarrow	\rightarrow		-+	10	00 87
1804.40	14 10	Grt	39 77	0.49	20.81	13 21	19.54	4 88	1.31								-									+						\rightarrow	-+	\rightarrow		+	1	00 109
	13) llm	55.11	53.86	20.01	44.53	1.62	00	1.01	-																+						-		-+			1	00 101
1804.40	14 20																																					

Sample	Site	Position	Mineral	SiO2	TiO2 Al2O3	FeO	MnO	Обм	CaO	Na2O	K20	P205	SO3	ъ	ō	Sc2O3	V205	Cr203	CoO	NiO	ZnO	SrO	Y203	ZrO2	Ag2O	BaO	La203	Ce2O3	Pr203	Nd2O3	Gd2O3	Dy203	Yb203	Hf02	Ta205	WO3	ThO2	PbO	Actual Total
1804.40	14	22	2 Py			28.	81			0.54			70.65																									1	00 210
1804.40	14	23	3 Chl	29.35	1.04 19.4	43 17.	26 0.6	2 17.30																														8	35 97
1804.40	14	24	I TiO ₂ + ?KIn	15.24	69.55 10.8	82 1.	99			0.34				2.05																								1	00 90
1804.40	15	1	Mnz			_	_		1.25			36.94	1.15	-0.49											1.72		17.56 3	1.81		10.07								1	00 100
1804.40	15	2	2 llm		49.72	46.	04 4.23	3																														1	00 102
1804.40	15	3	B TiO ₂ +	4.26	86.83 2.1	82 3.	58			0.72	0.29		1.50																									1	00 65
1804.40	15	4	Grt	41.31	21.3	33 23.	03 0.54	1 5.78	8.00																													1	00 114
1804.40	15	5	5 llm +		54.46	41.	73 0.70	3.05																														1	00 107
1804.40	15	6	5 "llm" +	1.63	68.58 1.2	25 25.	66 2.8	3																														1	00 80
1804.40	15		uz	100.00	50.00										-																							1	00 120
1804.40	15	8			59.32	38.	30 2.3	3 1.05																														1	00 99
1904.40	15	10	"lim" +	22.50	40.12 121	F2 15	76	2.24	0.40	0.60	0.51			4.05																								1	00 106
1804.40	15	11	TiO	20.00	99.40	0.	60	2.04	0.40	0.05	0.01			4.00												-												1	00 99
1804 40	15	12	llm +		54.07	42	65 0.6	2 62																														1	00 102
1804.40	15	13	3 Zm	30.90																				69.10														1	00 114
1804.40	15	14	Mix	59.98	0.85 12.1	15 17.	00	2.01		0.99	3.09	0.94		2.98																								1	00 102
1804.40	15	15	5 "llm"	0.82	81.89	15.	23 2.0	5																														1	00 96
1804.40	15	16	6 llm		55.05	42.	01 2.94	1																														1	00 99
1804.40	15	17	7 Zm	30.92																				69.08														1	00 118
1804.40	15	18	8 Py +	0.62	0.48 0.	56 36.	58			1.50	0.69		59.28		0.27																							1	00 114
1804.40	15	19) "llm"		70.47	27.	80	1.73																														1	00 96
1804.40	15	20	Qz + TiO ₂	61.85	37.83	0.	33																															1	00 110
1804.40	15.1	1	Chl + Feld?	42.69	0.91 13.	76 24.	98	2.72		2.09	4.72			8.13																								1	00 99
1804.40	15.1	2	2 Qz + Chl +	79.17	0.52 6.9	93 9.	70	1.04		0.38	2.26																											1	00 110
1804.40	15.1	3	3 "IIm" +	1.37	81.34 0.4	44 15.	44 1.4	0.01	4.50		4.04	04.05		0.07														0.00	0.00	7.04								1	00 97
1804.40	15.1	4	Mnz + CnI +	23.48	4.22 10.4	43 3.	74	0.91	1.50		4.24	21.85		2.37													1	6.63	3.32	7.31								1	00 91
1804.40	15.2	1		33.30	34.25 3.	16 0.	73	-	25.88					2.62														-	-									1	00 111
1804.40	15.2	2		99.03	97.88	0	0/																															1	00 121
1804.40	15.2	4	L Ms	48.46	0.58 271	66 4	22	1.69			10.18			2 20														-											100
1804 40	15.2	5	Ms + Chl + Mnz	45.48	26.9	96 5	20	1.34		0.72	7.83	4 34		4.86														3 26										1	00 107
1804.40	15.2	6	6 llm		51.42	44.	12 4.4	3																														1	00 101
1804.40	16	1	"llm" + Qz	17.08	79.09 0.1	75 3.	08																															1	00 103
1804.40	16	2	2 llm		54.88	44.	30 0.8	2																														1	00 101
1804.40	16	3	3 llm		51.06	47.	45 1.49	9																														1	00 104
1804.40	16	4	Zrn +	29.09	0.0	64 1.	34		1.12							0.55								67.26														1	00 106
1804.40	16	5	5 Tur	37.98	0.97 28.4	47 7.	39	8.74	1.86	1.59																												8	37 99
1804.40	16	6	6 Zm	30.74		_	_																	69.26														1	00 118
1804.40	16	7	/ Spl		0.45 46.4	45 13.	15	18.43										21.52																				1	00 107
1804.40	16	8	3 110 ₂	00 70	100.00	_																		00.75														1	00 104
1804.40	16	9	Zm	30.76	0.48	_																		68.75														1	00 118
1004.40	10	10	/ 2111	30.90	70.10 51	00 4	40	0.71	0.20			0.06												69.10				-										1	00 117
1804.40	16	12	Zm	30.31	0.45	4.		0.71	0.30			0.30		2 70										66 55				-										1	00 110
1804.40	16	13	3 llm	00.01	59.44	39	07 14	9	1					20						-				50.00					-									1	00 98
1804.40	16	14	llm +		51.94	45.	53 0.7	1.83	<u> </u>																													1	00 102
1804.40	16	15	5 Tur	38.61	0.84 30.	81 5.	02	8.61	0.34	2.77																												8	37 98
1804.40	16	16	8 IIm		53.17	41.	92 4.9	1																														1	00 101
1804.40	16	17	' "llm" +	1.03	86.94	12.	03																															1	00 92
1804.40	16	18	3 Zm +	27.60	0.70 0.9	97 1.	12		1.23					3.08		0.95								64.35				[[1	00 76
1804.40	16	19	TiO ₂ + Qz	26.83	72.78	0.	39																															1	00 116
1804.40	16	20) Tur	36.84	0.62 32.	85 9.	53	3.00		2.24				1.92																								8	87 101
1804.40	16	21	$IIO_2 + Qz$	17.00	76.22 2.	54 1.	04		0.51	0.41				2.28																								1	00 111
1804.40	16	22	QZ +	98.13	0.33 1.1	12 0.	42	0.00																														1	00 120
1804.40	16	23	1 m +	00.40	53.45	42.	12 0.62	2 3.81																								\vdash						1	00 106
1804.40	16	24	- U/2	96.10	3.90	24	69 1 0	-																		-			-									1	00 122
1804.40	10	20	"lim"	0 00	76.62 4	30 24	11																				-		-+			\vdash						1	
1804.40	16	20	Mnz	0.00	10.02 1.	<u></u> 21.		1	0.57			36.81		0.18						-0.03					2 57	-	16 72 3	1 37	-	11.08			-					1	00 100
1804.40	16	28	3 IIm	5.15	52.86	43	52 3 6	>	3.01			55.01		0.10						0.00							10.72 0											1	00 104
1804.40	16	29) "llm" +	0.90	67.57 1.	14 26.	95 2.7	0.67			l																	- 1										1	00 98
1804.40	16	30) "llm" + Chl	12.25	71.95 7.	58 6.	75	0.63	0.30	0.55																												1	00 97
1804.40	16	31	"llm"		90.14 1.3	35 8.	51																															1	00 82
1804.40	16	32	Qz	99.33	0.31	0.	35																															1	00 119

Sample	Site	Position	Mineral	SiO2	TiO2	AI2O3	FeO	MnO	OgM	CaO	Na2O	K2O	P205	SO3	Ч	ū	Sc2O3	V205	Cr203	CoO	NiO	OuZ	SrO	Y203	ZrO2	Ag2O	BaO	La203	Ce2O3	Pr203	Nd2O3	Gd2O3	Dy203	Yb2O3	Hf02	Ta205	WO3	ThO2	PbO	I otal Actual Total
1804.40	16	33	llm		49.95		47.83	2.22																															1	00 104
1804.40	16.1	1	"llm" +	1.30	83.27	0.59	14.84		1.05	0.05	0.50			0.70																									1	00 97
1804.40	16.1	2	lim + Chi	16.58	52.98	10.31	13.38		1.35	0.25	0.58			0.78	3.80																								1	00 98
1904.40	16.1	3	"llm" + Chl	32.07	67.90	2 24	25.95		1.01		1.54				5.34											-													1	00 97
1804.40	16.1	5	"llm" + Chl	7.71	62.94	4.31	23.90	0.82				0.31																											1	00 93
1804.40	17	1	llm		49.28		43.63	7.09				0.0.																											1	00 100
1804.40	17	2	Chr		0.57	25.94	23.88		11.18										38.42																				1	00 104
1804.40	17	3	Chl + Bt	43.09	0.46	18.66	29.65		3.49		1.75	2.91																											1	00 94
1804.40	17	4	"llm" +	1.46	82.25	1.08	14.79	0.43																															1	00 86
1804.40	17	5	Zm	31.07	0.40																				67.48										1.45				1	00 123
1904.40	17	7	U2	4.00	70.05	2 10	19.25	2.60																															1	00 119
1804.40	17	8	Tur	37.97	1.09	32.17	6.47	0.00	6.55	0.81	1.94																													37 101
1804.40	17	9	TiO ₂ +	0.89	90.62	2.74	2.70			0.67			1.82						0.57																				1	00 99
1804.40	17	10	"llm"		73.85		25.00	0.89								0.26																							1	00 104
1804.40	17	11	"lim"		63.17		35.59	0.95								0.29																							1	00 104
1804.40	17	12	"lim"	21.00	63.05	16 70	36.95		2.14		0.70	0.44																											1	00 99
1804.40	17	13	7ro	31.88	21.52	10.70	25.08		3.11		0.70	0.41													67.82		-								1 47				1	00 122
1804.40	17	15	"llm" +	30.70	60.25		26.79	11.49														1.47			01.00										1.47				1	00 101
1804.40	17	16	Zm	30.78																					69.22														1	00 114
1804.40	17	17	"Ilm" + Ms	19.93	48.94	9.21	13.78		1.33	0.33	1.08	1.01			4.39																								1	00 93
1804.40	17	18	Qz + TiO ₂	67.62	32.38																																		1	00 121
1804.40	17	19	TiO ₂	00.05	100.00																				07.54										4.04				1	00 103
1804.40	17	20	Chr	30.65	0.57	15 75	19 99		11 72										51 98						67.51										1.04				1	00 121
1804.40	17	22	Zm	31.28	0.07	10.10	10.00												01.00						68.72														1	00 115
1804.40	17	23	llm		53.90		45.13	0.97																															1	00 96
1804.40	17	24	?TiO ₂ + Chl	2.71	87.96	2.99	3.81			0.50	0.72		1.30																										1	00 84
1804.40	17	25	llm +		53.11		43.06	0.65	3.18																														1	00 103
1804.40	17 1	26	QZ TIO	98.97	0.65	0.59	0.38																																1	00 116
1804.40	17.1	2	Ms	46 84	0.45	31 21	1.55		1 04		0.48	10.04			3 40																									95 113
1804.40	17.1	3	Qz	98.87	1.13		1.00		1.01		0.10	10.01			0.10																								1	00 117
1804.40	17.1	4	TiO ₂ +	6.05	93.34		0.61																																1	00 102
1804.40	17.1	5	Qz + TiO ₂	86.05	13.95																																		1	00 115
1804.40	17.2	1	"llm" +	11.43	61.61	5.30	12.39		2.01	0.34	1.09			0.96	4.88																								1	00 90
1804.40	17.2	- 2		1.40	92.37	1.93	2.95			0.57			1.41														_												1	00 96
1804.40	17.2	4	Sd + Chl	35.90	4.72	11.46	43.24		3.79	0.47	0.89		1.20																										1	00 88
1804.40	17.2	5	Sd + Chl	36.06	2.54	12.80	43.18	0.48	3.27		1.67																												1	00 89
1804.40	18	1	Bt + TiO ₂	43.58	5.40	14.66	29.64		3.15			3.58																											1	00 35
1804.40	18	2	"llm" + Chl	3.95	84.40	2.89	6.47		= 00	0.46	0.07	0.26	1.57																										1	00 92
1804.40	18	3	Tur	38.28	0.93	32.56	7.80		5.03	0.38	2.02							0.40	47 40								_													57 99
1804.40	18	4	TiO ₂		99.27	00.00	0.73		0.03								-	0.40	47.49															_					1	00 104
1804.40	18	6	"llm"		61.41		37.60	0.99																															1	00 102
1804.40	18	7	"llm" +	17.60	52.09	8.73	17.96		2.22	0.53	0.60	0.27																											1	00 91
1804.40	18	8	llm		53.05		43.77	3.18																															1	00 103
1804.40	18	9	110 ₂ +	1.79	92.13	1.01	2.96					0.07			2.10		-			$\left - \right $													$\left - \right $						1	00 101
1804.40	18	10	QZ +	91.87	4.83	1.89	0.54			0.02		0.87			2 20		0.62								62 71										1 00				1	00 117
1804.40	18	12	"llm"	20.02	69.23	1.10	29.86	0.91		0.33					2.30		0.03								00.71	-									1.39				1	00 98
1804.40	18	13	Tur	37.84	1.50	31.41	12.10		2.08	0.23	1.83																													37 100
1804.40	18	14	Chl +	36.06	2.17	12.34	44.10	0.42	3.94		0.97				-													_											1	00 93
1804.40	18	15	TiO ₂ +	1.39	97.48	0.47	0.66																																1	00 104
1804.40	18	16	"llm"	07 70	93.71	0.05	6.29			4 70							1.07								60.05		_												1	00 85
1804.40	18	1/	∠+ Ilm	21.13	55 28	0.95	43.25	1 47		1.72							1.24								08.35							-							1	00 92
1804.40	18	19	Zm	30.78	00.20		10.20								1.24										67.98														1	00 121
1804.40	18	20	llm		57.10		41.12	1.22	0.56																														1	00 100
1804.40	18	21	Spl		0.54	30.55	17.57		11.20										40.13																				1	00 105
1804.40	18	22	TiO ₂ + Ms	14.83	71.18	6.36	2.81		0.67	0.5	0.75	2.55	1.59				<u> </u>																						1	00 101
1804.40	18	23	"IIM" + Ms	8.62	68.55	7.35	9.25		1.02	0.51	0.79	0.66	3.24																										1	00 68

Sample	Site	Position	Mineral	SiO2	TiO2	0011	MnO	OpM	CaO	Na2O	K20	P205	SO3	Ŀ	ū	Sc2O3	V205	Cr203	CoO	Ņ	ZnO	SrO	Y203	ZrO2	Ag20 BaO	La203	Ce2O3	Pr203	Nd2O3	Gd2O3	Dy203	Yb2O3	Hf02	Ta205	WO3	ThO2	Od 1	Total Actual Total
1804.40	18	24	Tur	38.41	0.65 30	.86	8.26	6.	.26 0.53	2.02																												87 97
1804.40	18	25	Qz +	91.16	5.94 2	.17	7.00	-	00 0.7	4.04	0.72																										1	00 116
1804.40	18	20	7m +	33.54	32	51	2.31	D .	1 2	1.94	0.88													54 52													1	87 97 00 108
1804.40	18	28	Qz	99.68	0.32		2.01		1.12		0.00													01.02													1	00 118
1804.40	18	29	llm		52.52	4	46.52 0.	96																													1	00 102
1804.40	18	30	llm		54.17	4	45.08 0.	75																													1	00 99
1804.40	18.1	2	llm Mico I	42.29	55.17	80 3	39.04 5.	30	05	1 16	2.15			4.26																-							1	00 102
1804.40	18.1	3	TiO ₂ +	42.38	90.41 2	.00 2	4.17	3.	0.4	1.10	3.13	1.36		4.30																							1	00 93
1804.40	18.1	4	Qz	99.48	0.52																																1	00 121
1804.40	18.1	5	TiO ₂ +	1.11	91.04 2	.98	2.87	_	0.46	6		1.53																									1	00 93
1804.40	18.1	6	ChI + Bt + TiO ₂	34.39	22.27 12	13 2	22.13	2.	.50 0.43	3	2.70			3.17	0.28																						1	00 74
1804.40	18.1	8	TiΩ₂ +	44.63	92.16 2	22	3.22	3.	0.3	6	3.07	1.43																									1	00 44
1804.40	18.2	1	TiO ₂	0.55	99.00		0.45																														1	00 106
1804.40	18.2	2	TiO ₂ + ?Kfs + Chl	18.55	59.44 8	.89	3.02	0.	.67		3.62	3.09		2.72																							1	00 102
1804.40	18.2	3	TiO ₂ + ?Kts + Chl	13.62	69.77 6	.01	2.94	0.	.52	0.25	2.62			4.53																							1	00 106
1804.40	10.2	4	TiO ₂ +	1.23	91.74 1	.00	2.79		0.5	0.35	9.01	1.04		3.21				0.79		-																	1	00 89
1804.40	19	2	Tur	36.29	1.58 29	.20	4.40	8.	.99 1.98	1.67				2.88				011 0																				87 101
1804.40	19	3	"llm"		63.33	3	35.17 0.	97 0.	.53																												1	00 95
1804.40	19	4	llm TiO : O-	40.05	52.77	4	14.79 2.	43																													1	00 104
1804.40	19	5 6	IIO ₂ + QZ	16.35	54.40		13.48 2	12																													1	00 112
1804.40	19	7	Chr		0.56 23	.19 2	21.67	11.	.10									43.49																			1	00 108
1804.40	19	8	TiO ₂		100.00																																1	00 108
1804.40	19	9	Zm	30.92																				69.08													1	00 120
1804.40	19	10	Chl +	5.92	1.69 16	31 2	28.04 0.	35 3.	.24	4.30	0.73			11.33																							1	00 111
1804.40	19	12	Zm	30.93	03.42 3	.00 2	27.00																	65.89									3.18				1	00 123
1804.40	19	13	"llm"		61.95	3	35.04 1.	70									1.31																				1	00 99
1804.40	19	14	Tur	36.53	0.92 30	.44	6.90	6.	.72 0.73	2.30				2.46																								87 101
1804.40	19	15	Qz + TiO ₂	76.91	21.70 0	.78	0.61	_	44	0.00	0.00			0.05																							1	00 99
1804.40	19	10	lim + Ms	21.43	57.22	.49	3.40	82	.41	0.96	2.33			3.85																							1	00 100
1804.40	19	18	TiO ₂ +	2.56	91.99 2	.13	2.91	<i></i>	0.4	2																											1	00 98
1804.40	19	19	"llm" +	6.08	83.12 3	.23	7.12	0.	.46																												1	00 88
1804.40	19	20	"llm" +	2.37	72.11 2	.57 2	21.17 0.	30	10			1.00																									1	00 71
1804.40	19	21	lim + "lim" + Ms	28.58	34.99 13	73 1	13.09	35 1.	73 0.3	1.08	1.63	0.84		3 97																							1	00 101
1804.40	19	23	"llm" +	0.61	77.32 0	.52 2	20.14 1.4	40		1.00	1.00	0.01		0.01																							1	00 95
1804.40	19.1	1	Bt	37.70	2.69 13	.77 1	17.63	12.	.64	0.39	7.31			3.88																							1	96 113
1804.40	19.1	2	Chl + ?Ab	40.27	1.63 19	75 2	28.39	2.	.25	2.10	0.38	4.47		5.23																							1	00 92
1804.40	19.1	3		2.26	01.68 2	.41	2.79		0.5	2		1.17		2.25				0.76																			1	00 100
1804.40	19.2	1	TiO ₂	0.96	98.32	.01	0.72		0.0	1		1.00						0.70																			1	00 105
1804.40	19.2	2	Ms + TiO ₂ +	43.61	13.61 26	.30	2.77	0.	.84	0.79	6.34			5.74																							1	00 113
1804.40	19.2	3	Chl +	36.32	3.21 24	75 2	28.93	5.	.89	0.91																											1	00 97
1804.40	19.2	4	Ms	49.88	2.01 25	.81	5.75	2.	.35	0.71	6.24			2.25																-							1	95 102
1804.40	20	1	Grt	39.54	0.44 21	.45	31.30 2.	93 2	86 1.8	,	0.23																										1	00 105
1804.40	20	2	"llm"		80.86	1	17.72	1.	.42																												1	00 89
1804.40	20	3	Zm	30.71																				69.29													1	00 118
1804.40	20	4	TiO ₂ + Ms	30.53	58.27 4	.81	0.87	0.	.35	0.58	1.21	-		3.39										00.00			-										1	00 113
1804.40	20	5	Chl + Ab +	26.59	4 82 13	36 3	26.13	2	90 0.3	6 97	0.28	<u> </u>		17.64										68.93		+	+			-							1	00 120
1804.40	20	7	"llm"	20.03	64.86	3	32.54 2.	31		0.31	0.20			17.04	0.29																						1	00 102
1804.40	20	8	"llm"		62.58	3	35.73 1.	69																													1	00 100
1804.40	20	9	TiO ₂		98.33		1.67					<u> </u>													_												1	00 89
1804.40	20	10	lim Pv		52.68	4	12.22 2.	12 2.	.98	+			71 52											\vdash		-	-									+	1	00 232
1804.40	20	12	Ms	47.06	1.12 29	.13	2.44	1.	.39	0.88	9.39		71.00	3.59									1			1	1			1								95 117
1804.40	20	13	"llm" +	3.54	82.17 3	.35	4.76		0.4	3		1.10	0.69	3.91																							1	00 90
1804.40	20	14	llm +		52.76	4	14.59 0.	55 2.	.09																												1	00 105

Sample	Site	Position	Mineral	SiO2	TiO2 Al2O3	FeO	MnO	MgO	Na2O	K20	P205	SO3	ш	CI	Sc2O3	V205	Cr203	CoO	NiO	ZnO	SrO	Y2O3	ZrO2 Ad2O	BaO	La203	Ce2O3	Pr203	Nd2O3	Gd2O3	Dy203	Yb2O3	Hf02	Ta205	WO3	ThO2	Total	Actual Total
1804.40	20	15	Spl		0.60 31.1	4 21.58	1	3.19									33.49																			100	108
1804.40	20	16	"Ilm" + Chl	7.53	73.92 4.9	1 10.20		0.76 0	39 0.64	0.25	1.39	00.40		0.00																					⊢	100	92
1804.40	20	1/	Chi +	26.82	0.74 15.9	25.46	9.51	0.61	3.37	3.63		23.19		0.23																					r	100	87
1804.40	20	19	Zrn +	30.43	33.05	31.00	0.51						1.66										67 91													100	117
1804.40	20	20	"lim"	00.10	91.03	8.35		0.62					1.00										01.01													100	83
1804.40	20	21	"llm"		64.06 0.5	2 34.97	0.44																													100	97
1804.40	20	22	Zrn	31.05																			67.44									1.50				100	120
1804.40	20	23	"llm"		96.67	3.33																													<u> </u>	100	103
1804.40	20	24	Spl		36.5	5 15.72	1	5.52	-								32.21																		<u> </u>	100	107
1804.40	20	25	IIM Zro	30.96	58.69	39.04	2.21		-														69.04													100	110
1804.40	20	27	llm	50.50	55.28	43.07	0.73	0.92															03.04													100	99
1804.40	20	28	"llm"		85.43	14.57																														100	66
1804.40	20	29	Tur	37.57	0.39 33.8	9 11.37		1.84	1.95	5																										87	89
1804.40	20	30	"llm" +	0.68	75.24 0.7	5 22.44	0.45	0.45																												100	91
1804.40	20	31	Tur	38.07	0.42 31.3	9 5.03		7.72 0	74 1.82	2			1.83																							87	101
1804.40	20	32	"lim"	2.00	65.59	33.99	0.42		61 0.50		1 10		2.70											_												100	96
1804.40	20	34	"lim" +	0.80	84.00 0.4	7 13 07	0.67	0	01 0.30	,	1.10		2.70				-							-					-				-			100	85
1804.40	20.1	1	TiO ₂ +	6.00	92.39 0.7	4 0.51	0.07			0.36																										100	104
1804.40	20.1	2	TiO ₂ + Ms	22.17	56.32 10.3	0 1.51		0.74	0.46	2.75			5.74																							100	116
1804.40	20.1	3	TiO ₂	1.32	98.03	0.65																														100	102
1804.40	20.2	1	Qz	99.37	0.63																															100	121
1804.40	20.2	2	Chl + Pl	37.18	1.75 14.1	3 34.86	-	5.26	1.71	0.92			4.20												-										<u> </u>	100	91
1804.40	20.2	3		29.85	1.71 12.2	33.62		2.80	4.30	0.34			13.12												-											100	102
1804.40	20.2		TiO _o +	3.34	90.46 1.5	3 2.09		3.03	37	0.41			2.21																							100	105
1804.40	20.2	6	TiO ₂ +	9.78	84.32 2.6	9 2.67		0	54				2.2.1																							100	101
1804.40	20.3	1	TiO ₂ +		86.60 3.1	3.38		0	39		1.38																							5.07		100	86
1804.40	20.3	2	TiO ₂ +	1.06	89.13 2.3	1 2.94		0	44		1.47		2.65																							100	95
1804.40	20.3	3	TiO ₂ +		89.49 2.8	4 2.68		0	34		1.20	0.83																						2.63		100	85
1804.40	20.4	1	Py O-	00.00	0.50	27.95	_		1.09	0.00		70.46																							<u> </u>	100	219
1804.40	20.4	- 2	QZ Pv	98.32	0.71	3 0.65			1.04	0.20		63 30																					-			100	118
1804.40	20.4	4	Pv	0.25	0.45	29.76			0.71	0.30		68.83																								100	197
1804.40	20.4	5	Py	0.20	0.44	28.58			0.54	4		70.44																								100	216
1804.40	20.4	6	Chl + Kfs + Py	19.47	1.19 13.2	9 28.22		0.56	4.37	2.64		29.93		0.33																						100	94
1804.40	20.5	1	lim		50.07	47.99	1.94																													100	103
1804.40	20.5	2	TiO ₂	1.00	97.83	2.17	0.05			-										0.50					-									1.05	<u> </u>	100	105
1804.40	20.5	3	-'lim' +	1.68	77.95 1.3	2 16.16	0.65													0.59														1.65		100	67
1804.40	20.5	1	07 +	90.66	7 98 0.5	0.86			-																											100	114
1804.40	20.6	2	TiO ₂ +	5.62	81.61 3.8	0 5.92		0.61 0	50 0.67		1.27																									100	92
1804.40	20.6	3	TiO ₂ + Chl	20.04	49.99 11.3	4 14.52		1.42 0	48 0.91	0.39	0.92																									100	85
1804.40	21	1	Zm +	26.81	1.0	0.56		1	92						1.20					0.19			68.33													100	91
1804.40	21	2	Zm	30.95	75.07				_											0.09			67.50	_								1.46			\vdash	100	118
1804.40	21	3	"IIM"	21.02	/5.37 0.6	9 22.19	1.42		_	+										0.32			69.09	_			\vdash								-+	100	96
1804.40	21	4	07	98.68	1.0		_			0.20	-					-		-					06.98								-		-		<u> </u>	100	11/
1804.40	21	6	"llm" + Qz	30.39	54.90 0.9	6 12.29	0.99		0.46	0.23						-									1						-					100	97
1804.40	21	7	Chl + Ab	34.64	1.74 12.6	1 38.74		3.50	3.34	0.42			5.02																							100	100
1804.40	21	8	St?	28.80	42.9	3 20.02	4.61	3.58																												100	98
1804.40	21	9	llm		53.26	45.05	1.02	0.67		-	L														<u> </u>										\vdash	100	104
1804.40	21	10	"llm"	0.55	90.83 0.6	3 7.68		4.07												0.31															<u> </u>	100	96
1804.40	21	11	"lim" + Mis	39.06	41.65 0.4	3 27 90	1 1 2	1.87	0.90	0.13	<u> </u>		4.99	\vdash		-+								+			\vdash				\rightarrow				r	100	99
1804.40	21	13	"llm" + Chl	11.59	65.97 7.2	7 11.37	1.10	1.70 0	52	0.48	0.94									0.16					-										-+	100	95
1804.40	21	14	Contaminant	4.04	1.95 2.1	2 41.87			1.23	1 0.40	1.09									5.15					1									47.69		100	65
1804.40	21	15	"llm"		85.81	14.19																														100	88
1804.40	21	16	TiO ₂ +	4.91	84.19 5.2	7 3.43		0	33		1.50									0.36																100	75
1804.40	21	17	Tur	31.55	0.97 29.6	0 10.66	0.56	1.63 6	43 1.70)			3.47							0.44				_											\vdash	87	97
1804.40	21	18	lim TiO	1.02	52.34	45.59	0.64	1.21	40	+	0.00	0.60	0.70				0.50			0.23				_							-				<u> </u>	100	105
1804.40	21	19	Miy	1.92	40.07 4.0	5 6 11		1 47	49	+	0.98	0.63	2.18			-	0.52			0.15				-							-					100	91
1804.4	<u> </u>	20	IVIIX	38.18	49.07 4.2	0.11		1.47		1										U.32					1	1										100	111

Sample	Site	Position	Mineral	SiO2	TiO2	AI2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	ш	ū	Sc2O3	V205	Cr203	CoO	NiO	ZnO	SrO	Y203	ZrO2	Ag2O	BaO	La203	Ce2O3	Pr203	Nd2O3	Gd2O3	Dy203	Yb203	HO2	Ta205	WO3	ThO2	PbO	Total Actual Total
1804.40	21	21	"llm"		63.89		34.96	0.70														0.45																	1	100 102
1804.40	21	22	Zm	30.88																		0.37			68.74															100 123
1804.40	21.1	1	TiO ₂	0.54	99.46																																			100 104
1804.40	21.1	2	Ms + TiO ₂	44.78	11.45	27.37	1.96		1.87			8.59			3.68							0.31																		100 114
1804.40	21.1	3	Chl + Ms + TiO ₂	36.74	18.23	20.01	20.03		2.51		1.21	1.28																										$ \rightarrow $		100 52
1804.40	21.2	1	Chl + Kfs	40.42	3.80	18.28	30.46		3.98		1.58	1.49																										$ \rightarrow $		100 54
1804.40	21.2	2	Chl + Kfs	45.11	4.11	18.85	24.43		3.61		1.05	2.83																										<u> </u>		100 71
1804.40	21.2	3	TiO ₂ +	0.97	92.40	2.30	2.50			0.41			1.12									0.30														_		⊢		00 89
1804.40	21.2	4	TIO ₂ +	1.16	91.79	2.08	2.77			0.42			1.03	0.73								0.01																⊢ →		00 83
1804.40	21.2	5	TiO ₂ +	1.93	89.08	2.24	3.61		0.52	0.52			1.52						0.58																			⊢	<u> </u>	00 92
1804.40	21.3	1	Qz	97.35	2.65		0.09															0.20																<u> </u>		100 118
1804.40	21.3	2		11.32	87.41	0.57	0.98															0.29																<u> </u>		100 104
1004.40	21.3	3	7m	4.95	93.55	0.57	0.95									-		-				0.65			60.47					-			_	_	_	-		r+	+	100 101
1004.40	22	2		30.00	E2 00		44.04	1.09	0.62													0.05			00.47											_				100 124
1804.40	22		TiO ₂ + Ms	33.02	29.57	23.09	2.34	1.00	0.02		1 1 1	6 1 9			4 27	-			-			0.50								-		-			-	-		-+		100 119
1804.40	22	4	7m +	38.41	0.80	20.00	2.01		0.10		0.48	0.10		5 13	1.2.7										52 15															100 105
1804.40	22	5	Q7	99.71	0.29		2.00				0.10			0.10											02.10															100 120
1804.40	22	6	Pv		0.28		28.54							71.18																										100 217
1804.40	22	7	"llm" + Chl	18.76	57.47	8.44	12.87		0.87	0.33	0.73	0.53																											-	100 81
1804.40	22	8	"llm"		64.29		34.74	0.97																																100 95
1804.40	22	9	"llm" +	1.01	85.37	1.37	8.50								3.33							0.42																		100 93
1804.40	22	10	llm		54.75		43.19	2.06																															1	100 104
1804.40	22	11	Py		0.38		28.56							71.06																									1	100 225
1804.40	22	12	Py				28.59							71.25								0.16																1		100 225
1804.40	22	13	Qz +	94.33	0.67	2.13	1.30					0.39		0.79								0.37																		100 107
1804.40	22	14	Qz + TiO ₂	77.79	22.21																																	$ \rightarrow $		100 122
1804.40	22	15	Mix	67.02	16.90	8.69	1.00		0.39		0.49	2.51			2.99																							<u> </u>		100 118
1804.40	22	16	Zrn +	28.17		1.03	1.36			1.26							0.59					0.24			65.15								_	2	.21	_		⊢		100 103
1804.40	22	17	llm		52.25		43.38	4.37																														⊢ →		100 100
1804.40	22	18	TIO ₂		98.33		1.67																															⊢	<u> </u>	100 100
1804.40	22	19	Zm	30.82		0.70		4.05	1.00																69.18										_			⊢		00 119
1804.40	22	20	"IIM" +	1.00	65.04	0.79	30.31	1.65	1.22	0.05	4.00																								-			<u> </u>		00 98
1804.40	22	21	iur Ilm i	37.95	0.95 53.34	33.30	5.40	0.64	0.50	0.95	1.83					-		-												-			-	-	_	-		r+	+	87 99
1804.40	22	22	TiO- +	2.63	88 53	2 90	3.56	0.04	3.20	0.61			1 21						0.57																	-				100 89
1804.40	22	23	Tur	36.95	00.00	2.50	16.30			0.01	2 4 4		1.21			-			0.57											-			-	-		-				87 96
1804.40	22	25	TiO ₂ +	3 10	92.09	1 18	1.05				2.44				2.51							0.08																		100 92
1804 40	22	26	Tur	36.78	0.66	32.43	9.64		3.26		2 29				1.93							0.00												_						87 99
1804 40	22	27	Ilm	00.10	48 73	02.10	41 21	9.82	0.20		2.20				1.00							0.24																		100 100
1804.40	22	28	"llm"		79.50		18.44	1.86														0.20														-			-	100 84
1804.40	22	29	Xtm		0.46								39.92							1.49		0		45.76								1.52	5.38 2	.87	2	2.60			-	100 104
1804.40	22	30	Zm	30.63	2.10																				69.37										1					100 116
1804.40	22	31	Py	0.21	0.41		28.25							70.98								0.15																		100 226
1804.40	22.1	1	TiO ₂ + Chl + Feld	28.65	31.39	12.23	17.83		1.96		1.45	0.59			5.90																								-	100 91
1804.40	22.1	2	Chl + Bt	40.99	1.73	18.13	25.47		1.87		2.44	0.82			8.55																								-	100 81
1804.40	22.1	3	TiO ₂ + Chl	20.65	52.19	8.97	15.92		0.99		0.74	0.53																												100 77
1804.40	22.1	4	TiO ₂ +	3.83	89.54	2.44	4.19																																	100 50
1804.40	22.1	5	TiO ₂ + Chl	20.08	52.35	8.86	12.31		1.26		0.98	0.38			3.77	T			T																			Ē		100 81

Appendix A5: BSE images and EDS mineral analyses for sample Sable Island 3H-58 2001.12 m



Figure A5.1: Sable Island 3H-58 (2001.12 m)



1:TiO₂ + 21:Mix 2:Siderite 22:Albite 3:Siderite 23:Calcite 24:Siderite 4:Quartz 5:Siderite + 25:Quartz Chlorite 26:Siderite 6:Chromite 27:Mix 7:"Ilmenite" 28:Ilmenite 8:TiO₂ 29:Siderite 9:Calcite 30:Quartz 31:Calcite 10:Siderite 32:"Ilmenite" + 11:Calcite 12:"Ilmenite" + 33:Quartz + 34:Siderite + 13:Chlorite + 35:Calcite 14:Siderite 36:?Muscovite + 15:Calcite Chlorite 16:TiO₂ + 17:"Ilmenite" + 37:Albite 38:Siderite + 18:TiO₂ + 19:TiO₂ + Muscovite 20:TiO₂ +

Figure A5.2: Sable Island 3H-58 (2001.12 m) (SEM) site 1 (Table (A5.1)



Figure A5.3: Sable Island 3H-58 (2001.12 m) (SEM) site 1.1 (Table A5.1). Ilmenite grain (1,4) almost completely altered to TiO_2 (2,3). The cement consists of calcite (7) and zoned siderite (6,8).

1:"Ilmenite" + 2: TiO_2 + 3: TiO_2 4:"Ilmenite" 5:Chlorite + 6:Siderite 7:Calcite 8:Siderite


1:"Ilmenite" 2:"Ilmenite" 3:Chlorite + Muscovite 4:TiO₂ 5:TiO₂ 6:Ilmenite

Figure A5.4: Sable Island 3H-58 (2001.12 m) (SEM) site 1.2 (Table A5.1). Ilmenite crystal (1,2,6) with inclusions of partially altered muscovite to chlorite (3) and almost completely replaced by TiO_2 (4.5).



Figure A5.5: Sable Island 3H-58 (2001.12 m) (SEM) site 1.3 (Table A5.1). Ilmenite grain (3,4,5) altering to TiO_2 (6). Cement: calcite (1) and siderite (2) that postdates calcite.

1:Calcite + 2:Siderite 3:"Ilmenite" 4:"Ilmenite" 5:"Ilmenite" 6:TiO₂



Figure A5.6: Sable Island 3H-58 (2001.12 m) (SEM) site 1.4 (Table A5.1). Cement: zoned siderite prisms (1,2) postdating calcite (3,4). The siderite appears to become Fe-rich (1) towards the rim (2).



1:Ilmenite + Chlorite 2:TiO₂ + 3:Quartz 4:TiO₂ + Quartz 5:Quartz +

Figure A5.7: Sable Island 3H-58 (2001.12 m) (SEM) site 1.5 (Table A5.1). Ilmenite grain with quartz inclusions (5) mostly replaced by TiO_2 (2,3).



1:Chlorite + Muscovite 2:Siderite + 3:Siderite 4:Chlorite + Muscovite

Figure A5.8: Sable Island 3H-58 (2001.12 m) (SEM) site 1.6 (Table A5.1). Lithic clast made up of muscovite and chlorite (1,4) and late siderite (2,3).



Figure A5.9: Sable Island 3H-58 (2001.12 m) (SEM) site 2 (Table (A5.1)



1:Muscovite 2:TiO₂ + 3:Muscovite 4:Quartz + 5:Muscovite + Chlorite $6:TiO_2$

Figure A5.10: Sable Island 3H-58 (2001.12 m) (SEM) site 2.1 (Table A5.1). Detrital ilmenite grain with muscovite (1,3) and quartz (4) inclusions almost completely altered to TiO_2 minerals (6).



Figure A5.11: Sable Island 3H-58 (2001.12 m) (SEM) site 3 (Table (A5.1)



1:Ilmenite 2:Quartz 3:Ti O_2 4:Ti O_2 + 5:Ilmenite 6:"Ilmenite"

Figure A5.12: Sable Island 3H-58 (2001.12 m) (SEM) site 3.1 (Table A5.1). Ilmenite grain with quartz (2) inclusions partly replaced by TiO_2 (3,4).



1:Quartz + K-Feldspar 2:Siderite 3:Calcite 4:Siderite 5:Calcite

Figure A5.13: Sable Island 3H-58 (2001.12 m) (SEM) site 3.2 (Table A5.1). Felsic igneous lithic clast (1) rimmed by siderite prisms (2,4) in calcite (3,5) and siderite cement.



5:Oligoclase 8:Quartz + TiO₂ 10:"Ilmenite" 15:"Ilmenite" 16:"Ilmenite" + 17:"Ilmenite" + 18:Siderite + 21:"Ilmenite" 22:"Ilmenite"

Figure A5.14: Sable Island 3H-58 (2001.12 m) (SEM) site 4 (Table (A5.1)



25:"Ilmenite" 26:"Ilmenite" 27:Chromite 28:"Ilmenite" 29:Siderite + 30:"Ilmenite"

Figure A5.15: Sable Island 3H-58 (2001.12 m) (SEM) site 5 (Table (A5.1)



1:Siderite 2:Calcite 3:Chromite + 4:"Ilmenite" 5:TiO₂ 6:TiO₂ 7:Calcite 8:Quartz 9:TiO₂ 10:"Ilmenite" 11:Calcite 12:Siderite + 13:Quartz + TiO₂ 14:Siderite + 15:TiO₂ 16:Fe-oxide/hydroxide 17:Mix 18:TiO₂ + Chlorite 19:Chlorite + 20:Siderite + 21:Siderite

Figure A5.16: Sable Island 3H-58 (2001.12 m) (SEM) site 6 (Table (A5.1)



Figure A5.17: Sable Island 3H-58 (2001.12 m) (SEM) 21:TiO₂ + site 7 (Table (A5.1)



1:Ilmenite 2:Chlorite + Muscovite 3:TiO₂ + 4:TiO₂ + 5:TiO₂ 6:Chlorite + TiO₂

Figure A5.18: Sable Island 3H-58 (2001.12 m) (SEM) site 7.1 (Table A5.1). A pseudomorph of ilmenite (pos. a) made up of TiO_2 , and probably chloritized muscovite inclusions.



Figure A5.19: Sable Island 3H-58 (2001.12 m) (SEM) site 8 (Table (A5.1)



1:Siderite + 2:Siderite + 3:Quartz 4:Siderite 5:TiO₂ + 6:Siderite 7:TiO₂ + 8:"Ilmenite" 9:TiO₂ + 10:"Ilmenite" + 11:Chromite 12:Quartz 13:TiO₂ + 14:Siderite 15:Tourmaline 16:Pyrite 17:Spinel + Siderite 18:TiO₂ +

Figure A5.20: Sable Island 3H-58 (2001.12 m) (SEM) site 9 (Table (A5.1)



Figure A5.21: Sable Island 3H-58 (2001.12 m) (SEM) site 9.1 (Table A5.1). Lithic clast made up of chromite (2,4) and magnesian chlorite (1). Ophiolite.

3:Chlorite + Chromite 4:Chromite



1:TiO₂ + 22:Pyrite 2:TiO₂ + 23:Quartz + TiO₂/"Ilmenite" 3:Calcite 4:Pyrite 24:Siderite + 5:Siderite + Chlorite 6:Quartz 7:"Ilmenite" 8:Siderite 9:Oligoclase 10:TiO₂ 11:Ilmenite 12:TiO₂ + 13:Ilmenite 14:Calcite 15:Siderite + 16:Siderite + 17:Quartz 18:Siderite + 19:Ilmenite 20:Tourmaline

Figure A5.22: Sable Island 3H-58 (2001.12 m) (SEM) 21:TiO₂ + site 10 (Table (A5.1)



1:"Ilmenite" 2:TiO₂ 3:Quartz 4:TiO₂ 5:Quartz + Ilmenite

Figure A5.23: Sable Island 3H-58 (2001.12 m) (SEM) site 10.1 (Table A5.1). Ilmenite grain (1) with quartz (5) almost completely replaced by TiO_2 (2,4). Long ilmenite relics and quartz appear to predate the TiO_2 (4) minerals.



1:Quartz 19:Ilmenite 2:Siderite 20:Siderite 3:Calcite 21:Ilmenite 4:Ilmenite 22:TiO₂ + 5:TiO₂ 23:Chlorite + 6:TiO₂ + 24:"Ilmenite" 25:Calcite 7:TiO₂ 8:"Ilmenite" 9:K-Feldspar 10:TiO₂ + 11:Quartz 12:Ilmenite 13:Ilmenite 14:Siderite + 15:Pyrite 16:Chlorite + Biotite 17:Calcite 18:Siderite

Figure A5.24: Sable Island 3H-58 (2001.12 m) (SEM) site 11 (Table (A5.1)



Figure A5.25: Sable Island 3H-58 (2001.12 m) (SEM) site 11.1 (Table A5.1). Probably a detrital K-feldspar (6) is replaced by chlorite (2,3,5) and later by siderite (4).



1:"Ilmenite" $2:TiO_2$ 3:Ilmenite 4:Calcite 5:Quartz 6:Siderite + Chlorite 7:TiO₂ + 8:Quartz 9:TiO₂ 10:Quartz 11:Ilmenite 12:Calcite 13:Siderite 14:Fe-oxide/hydroxide 15:Calcite 16:TiO₂ + 17:Ilmenite 18:"Ilmenite" 19:Mix

Figure A5.26: Sable Island 3H-58 (2001.12 m) (SEM) site 12 (Table (A5.1)



1:Ilmenite + 2:"Ilmenite" + 3:Chlorite + Kaolinite 4:Chlorite + Kaolinite 5:Kaolinite + Chlorite 6:Chlorite + Muscovite

Figure A5.27: Sable Island 3H-58 (2001.12 m) (SEM) site 12.1 (Table A5.1). 1) Probably a K-feldspar grain is replaced by kaolinite and ?later by chlorite. 2) An ilmenite grain (1) partly replaced by TiO_2 (1,2).



1:TiO₂ + 23:"Ilmenite" 2:TiO₂ + 24:Quartz 25:"Ilmenite" 3:TiO₂ + 26:Quartz + 4:Ilmenite 27:TiO₂ + 5:Siderite 28:Siderite + 6:Calcite 29:"Ilmenite" 7:TiO₂ 30:Zircon 8:Quartz 31:Chlorite + 9:Quartz Biotite 10:Chromite 11:Spinel 12:Spinel 13:TiO₂ 14:"Ilmenite" 15:TiO₂ + 16:"Ilmenite" 17:TiO₂ + 18:Quartz 19:Apatite 20:"Ilmenite" 21:Ilmenite 22:"Ilmenite"

Figure A5.28: Sable Island 3H-58 (2001.12 m) (SEM) site 13 (Table (A5.1)



1:Tourmaline 19:"Ilmenite" 2:TiO₂ 20:Quartz 3:TiO₂ 21:Siderite + 22:Quartz + 4:TiO₂ + Chlorite? 5:"Ilmenite" 23:Zircon 6:Siderite 24:Tourmaline 7:TiO₂ + 25:Quartz 8:TiO₂ 9:Tourmaline 10:Quartz 11:Calcite 12:TiO₂ 13:Tourmaline 14:K-Feldspar 15:Siderite 16:Quartz 17:Siderite +

Figure A5.29: Sable Island 3H-58 (2001.12 m) (SEM) site 14 (Table (A5.1)



1:Muscovite 2:Chlorite + Muscovite 3:Siderite + 4:Siderite 5:Chlorite + Muscovite 6:Muscovite

Figure A5.30: Sable Island 3H-58 (2001.12 m) (SEM) site 14.1 (Table A5.1). Lithic clast made up of chlorite (2), muscovite (1,6) and late siderite (3,4). Shale.



1:TiO₂ 22: Siderite + 2:Quartz Chlorite 3:Siderite + 23:"Ilmenite" 24:Calcite 4:Fluorite 5:TiO₂ + Quartz 6:Quartz 7:Monazite 8:Chlorite + Biotite 9:"Ilmenite" + Chlorite 10:Zircon 11:TiO₂ + Chlorite 12:TiO₂ + 13:Siderite 14:TiO₂ + Quartz 15:Calcite 16:TiO₂ + 17:TiO₂ 18:Quartz 19:TiO₂ 20:"Ilmenite" 21:TiO₂ +

Figure A5.31: Sable Island 3H-58 (2001.12 m) (SEM) site 15 (Table (A5.1)



1:Chlorite + Ilmenite 2:"Ilmenite" + 3:Muscovite + TiO_2 4:Ti O_2 5:Chlorite + Ilmenite 6:Ti O_2 +

Figure A5.32: Sable Island 3H-58 (2001.12 m) (SEM) site 15.1 (Table A5.1). Ilmenite grain (1,2,5) with muscovite (3) and quartz with necks (pos.a) inclusions almost completely replaced by TiO_2 minerals.



Figure A5.33: Sable Island 3H-58 (2001.12 m) (SEM) site 16 (Table (A5.1)



1:Quartz 2:TiO₂ + 3:Ilmenite + Chlorite 4:Chlorite +TiO₂ + Muscovite 5:TiO₂ + 6:Chlorite +TiO₂ + Muscovite 7:Ilmenite + Chlorite $8:TiO_2$ + 9:Chlorite +TiO₂ + Muscovite

Figure A5.34: Sable Island 3H-58 (2001.12 m) (SEM) site 16.1 (Table A5.1). Ilmenite crystal (3) with quartz (1) and muscovite (4,9) inclusions.



1:Siderite 2:Siderite 3:Chlorite + Muscovite 4:Siderite

Figure A5.35: Sable Island 3H-58 (2001.12 m) (SEM) site 16.2 (Table A5.1). Siderite prisms cemented muscovite grains that have been replaced earlier by chlorite (3).



1:TiO₂ 2:Chlorite + Muscovite 3:Siderite 4:Chlorite + Muscovite 5:Siderite 6:Muscovite 7:Quartz

Figure A5.36: Sable Island 3H-58 (2001.12 m) (SEM) site 16.3 (Table A5.1). Lithic clast made up of quartz (7), muscovite (6), chlorite (4) and late siderite (3,5). Shale.



Figure A5.37: Sable Island 3H-58 (2001.12 m) (SEM) 21:Siderite + Chlorite site 17 (Table (A5.1) 22:Calcite



1:Biotite + Chlorite + Quartz 2:TiO₂ 3:Biotite + Chlorite + Quartz 4:TiO₂ + 5:TiO₂ + 6:Biotite + Chlorite + Quartz

Figure A5.38: Sable Island 3H-58 (2001.12 m) (SEM) site 17.1 (Table A5.1). Lithic clast made up of TiO₂ (4,5) minerals and mica probably biotite (1,3,6) altering to chlorite and quartz.

site 18 (Table (A5.1)



21:Siderite + 22:Zircon



1:"Ilmenite" 2:Calcite 3:Chromite 4:Siderite + 5:Ilmenite 6:Calcite 7:Quartz 8:TiO₂ + 9:Ilmenite 10:TiO₂ + 11:"Ilmenite" 12:Ilmenite 13:Calcite + Siderite 14:Zircon 15:Quartz 16:Quartz 17:Calcite 18:"Ilmenite"

 $\begin{array}{l} 19:\text{TiO}_2\\ 20:"\text{IImenite"}\\ 21:"\text{IImenite"}\\ 22:\text{Siderite} +\\ 23:\text{Siderite}\\ 24:\text{Oligoclase}\\ 25:\text{TiO}_2 +\\ 26:\text{Siderite} +\\ \text{Chlorite}\\ 27:\text{Quartz} \end{array}$

Figure A5.40: Sable Island 3H-58 (2001.12 m) (SEM) site 19 (Table (A5.1)



Figure A5.41: Sable Island 3H-58 (2001.12 m) (SEM) site 19.1 (Table A5.1). This site consists of calcite and zoned siderite cement, and a detrital grain of altered biotite (5).

1:Calcite 2:Calcite 3:Siderite 4:Calcite 5:Chlorite + Biotite + 6:Siderite +



Figure A5.42: Sable Island 3H-58 (2001.12 m) (SEM) site 20 (Table (A5.1)

ble	(I)	ion		Ñ	Ñ)3		0	0	C	0	0)5	e			33)5	33	0	33	ğ	J 5	33	33	J 3	က္	72	a	al al
Sam	Site	Posit	Mine	SiO	TiO	AI2C	Fe(Mn	Mg	Cat	Na2	K2(P2C	SO		U U	Sc2(V2C	Cr2(Zn(As2(ZrO	Nb2(La2(Ce2(Nd2(MO	ThC	Tot	Actu Toti
2001.12	,	1 1	TiO ₂ +	1.48	91.84	1.96	2.90			1.13			0.69																100	90
2001.12		1 2	2 Sd				44.00	1.21	4.29	5.43			1.06																56	59
2001.12		1 3	3 Sd	00 55			41.43	0.43	7.57	5.76			0.81																56	59
2001.12		1 4 1 5		99.55		1 20	0.45	1 60	0.26	Q 1 1			1 2 2																100	<u> 117</u> 60
2001.12		1 6	S Chr	2.34		27 65	18.31	1.09	9.20	0.11			1.55						43 74										100	103
2001.12		1 7	/ "IIm"	0.74	87.31	1.43	9.39	0.73	10.00	0.39									10.7 1										100	86
2001.12	,	1 8	^B TiO ₂		99.34		0.66																						100	102
2001.12	•	1 9	0 Cal				0.69			41.75					13.55														56	73
2001.12		1 10) Sd				36.99	2.56	6.10	10.34																			56	59
2001.12		1 11			70 /7		0.52	1 21		40.12					15.36														56	78
2001.12		। ।∠ 1 1२	$\frac{11111}{2}$ + $\frac{11111}{2}$ + $\frac{11111}{2}$	31 50	/3.4/	24 00	22.29	4.24	3 27	3 40		1 25								0.01									100	94 85
2001.12		1 14	Sd	01.00	0.49	24.00	38.79	1.11	8.31	7.30		1.20								0.01									56	61
2001.12	,	1 15	5 Cal				0.94	0.42		43.14					11.50														56	72
2001.12		1 16	⁶ TiO ₂ +	0.82	93.30	1.71	2.09			1.40			0.69																100	96
2001.12		1 17	' "IIm" +	2.61	85.02	1.50	10.57			0.30																			100	82
2001.12		1 18	$B TiO_2 +$	3.92	91.24	3.02	1.82					~ ~ ~																	100	103
2001.12		1 19	$11O_2 + MS$	22.31	59.29	11.10	2.86		0.68	4 07		3.78	0.04						0.50										100	104
2001.12		I 20 1 21	Mix	0.73	93.25	1.63	1.89		0.84	1.07		1 06	0.84						0.59										100	97 97
2001.12		1 22	P Ab	66.75	04.00	20.09	0.01		0.04	1.56	11.16	1.90																	100	116
2001.12	,	1 23	B Cal				1.24	0.82	0.36	46.18					7.40														56	63
2001.12	•	1 24	Sd				41.52	0.41	7.34	5.98			0.76																56	59
2001.12		1 25	5 Qz	99.71			0.29																						100	119
2001.12		1 26		16.41	0.63	7 56	39.35	1.04	7.74	7.24		0.00																	56	60
2001.12		1 27 1 28	RIIM	10.41	53.82	1.00	14.92	1 92	1.70	0.05		0.99																	100	106
2001.12		1 29) Sd		00.02		42.63	0.41	8.45	3.91			0.60																56	62
2001.12		1 30) Qz	99.60			0.40																						100	119
2001.12	•	1 31	Cal				1.23	0.62		45.99					8.16														56	67
2001.12		1 32	2 "IIm" +	1.98	83.67	2.13	11.34		0.43	0.46																			100	94
2001.12		1 33 1 34		95.90		1.15	2.95	1 88	8 20	7.01			1 17																100	94 62
2001.12		1 35	i Cal	2.35		1.45	1.36	0.55	0.20	42.97			1.17		11.11														56	72
2001.12		1 36	6 ?Ms + Chl	50.73	0.95	23.40	18.06		2.37			4.49																	100	81
2001.12		1 37	Ab	68.52		18.82	0.56			0.56	11.54																		100	123
2001.12		1 38	8 Sd +	8.00		1.64	70.11	1.84	9.62	8.79																			100	66
2001.12	1.1	1 1 1 7		0.79	11.54	1.12	19.60	0.63		0.32																			100	143
2001.12	1.	ע 2 1 2	$10_2 +$		95.19		4.04			0.20																			100	131 132
2001.12	1.1	1 4	"IIm"	0.84	78.56	1.41	17.40	1.42		0.37																			100	133
2001.12	1.1	1 5	5 Chl + Bt	42.54	2.54	30.01	21.19		2.52	0.57		0.63																	100	113
2001.12	1.1	1 6	Sd Sd		0.80		40.25	2.02	6.01	6.92																			56	90
2001.12	1.1	1 7	Cal		0.53	A 15	0.98	0.45	0.10	37.97					16.07														56	117
2001.12	1.1	1 8 • c	3 Sd "Ilm"	0 77	0.54	0.40	41.56	2.37	2.18	3.31																	5.64		56	103
2001.12	1.2	∠ 1 2 2	2 "IIm"	0.77	00.00	0.00	25 08	00. <i>i</i> 4 72		0.34																			100	141 71
2001.12	1.2	2 3	B Chl + Ms	45.95	7.43	31.22	8.68	τ.Ι Δ	1.83	0.41	0.40	4.07																	100	121
2001.12	1.2	2 4	TiO ₂		99.21		0.79			-																			100	158
2001.12	1.2	2 5	5 TiO ₂		99.31		0.69																						100	156
2001.12	1.2	2 6	6 IIm		55.27		30.20	12.86												1.67									100	152
2001.12	1.3	3 1	Cal +		0.00		2.07	1.21	0.04	80.31					16.41														100	97
2001.12	1.0	י 2 כ 2	2 00 8 "Ilm"		U.30 62 25		31.00 31.05	1.UZ 5.Q1	9.01	7.94																			00 100	90 150
2001.12	1.0		11111		02.20		51.35	0.01									1								<u> </u>				100	103

$\begin{array}{c c c c c c c c c c c c c c c c c c c $		Ζ	
			100 100
2001.12 1.3 4 1111 0.14 10.21 0.09 21.02 1.00 1 <t< td=""><td></td><td></td><td>100 139</td></t<>			100 139
2001.12 1.3 5 IIII 2001.12 1.3 6 TiO ₂ 98.50 1.22 0.28			100 140
2001.12 1.4 1 Sd 0.44 40.52 0.77 7.63 6.64			56 91
2001.12 1.4 2 Sd 0.34 38.53 0.77 10.38 5.99			56 90
2001.12 1.4 3 Cal + 2.39 1.26 77.69 18.67 18.67			100 101
2001.12 1.4 4 Cal + 1.66 0.95 73.53 23.85 23.85			100 110
2001.12 1.5 1 IIm + Chl 30.36 15.91 15.01 30.54 2.90 1.40 0.62 Image: Comparison of the second secon		3.27	100 79
2001.12 1.5 2 TiO ₂ + 2.86 92.86 1.36 2.24 0.68			100 148
2001.12 1.5 3 QZ 99.24 0.40 0.36 1.00			100 168
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$			
2001.12 1.5 5 02 + 95.10 0.59 0.59 0.51 0.59 0.59 0.51 0.59 0.59 0.51 0.59 0.59 0.51 0.59 0.59 0.51 0.59 0.59 0.51 0.59 0.59 0.51 0.59 0.59 0.51 0.59 0.59 0.59 0.51 0.59 0.59 0.59 0.59 0.59 0.59 0.59 0.59			100 109
2001.12 1.6 2 Sd + 2.23 1.18 69.21 2.58 9.43 9.39		5.99	100 96
2001.12 1.6 3 Sd 39.91 1.26 8.09 6.74			56 89
2001.12 1.6 4 ChI + Ms 45.10 0.69 25.45 23.41 2.59 0.59 2.16 2.16			100 117
2001.12 2 1 Zrn 30.42 0.58 69.00	 		100 118
2001.12 2 2 Py + 0.96 0.33 28.85 0.33 0.16 69.37			100 209
2001.12 2 3 Cal 0.90 0.54 43.45 11.11 11			56 70
2001.12 2 4 IIO ₂ 98.05 1.62 0.33			100 106
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$			
$\frac{2001.12}{2001.12} = 2 \ \overline{0} \ $			100 113
2001.12 2 8 Qz 99.69 0.31 2.00 2.20 2.00 2.20 2.00 2.20 2.00 2.20 2.00 2.20 2.00 2.20 2.00 2.20 2.00 2.20 2.00 2.20 2.00 2.20 2.00 2.20 2.00			100 121
2001.12 2 9 Ilm 55.22 43.73 1.05			100 103
2001.12 2 10 TiO ₂ + Qz 10.23 88.80 0.75 0.23 0.23 0.23			100 110
2001.12 2 11 Sd + 1.59 69.31 1.97 14.28 12.85 69.31 1.97 14.28 12.85			100 59
2001.12 2 12 Sd 37.53 1.23 9.06 8.18			56 59
2001.12 2 13 IIm 52.62 44.59 0.61 1.68 0.50	 		100 97
2001.12 2 14 Kfs + TiO ₂ 70.53 19.31 5.43 2.28 0.35 2.10	 		100 79
2001.12 2 15 Sd 37.60 1.05 9.11 8.23			56 59
2001.12 2 10 TIO ₂ 99.55 0.47 0 70			
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$			56 64
2001.12 2 19 Sd 37.82 1.26 7.60 7.21		2.11	56 63
2001.12 2 20 Cal 1.23 0.74 47.19 6.84			56 64
2001.12 2 21 Sd + Chl 2.35 0.76 1.25 73.73 1.87 11.78 8.26			100 62
2001.12 2 22 "Ilm" + 8.43 64.53 4.97 18.46 2.23 1.38	 		100 95
2001.12 2 23 Sd 37.88 1.22 8.76 8.15			56 61
2001.12 2 24 Cal 0.63 46.07 9.31 2001.12 2 25 Ma 44.02 0.20 24.22 2.96 1.00 0.71 7.54 2.25			56 68
2001.12 2 20 IVIS 44.03 0.39 24.22 2.00 1.99 0.71 7.34 3.25 5.20 2001.12 2 26 TiO2 100.00 <td></td> <td></td> <td>100 107</td>			100 107
2001.12 2 20 100.00 <			85 161
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	 		100 125
2001.12 2.1 3 Ms 44.23 1.10 31.10 1.34 0.49 0.31 6.43	 		85 148
2001.12 2.1 4 Qz + 97.83 0.78 0.59 0.51 0.29			100 175
2001.12 2.1 5 Ms + ChI 52.88 2.65 34.38 4.39 0.78 0.62 0.36 1.20 2.73			100 119
2001.12 2.1 6 TiO ₂ 99.44 0.56			100 151
2001.12 3 1 IIm 50.38 48.52 1.10	 		100 100
2001.12 3 2 Sd + 2.15 1.11 70.63 2.07 13.06 10.97 4.00 2001.12 3 2 Sd + 2.15 1.11 70.63 2.07 13.06 10.97 1			100 59
2001.12 3 3 50 14.10 8.10 60.07 2.68 7.69 5.60 1.09 1.09 1.09 1.09 2001.12 3 4 Spl 30.57 16.78 14.66<	 		
2001.12 3 4 50.37 10.70 14.00 14.00 60.17 2001.12 3 5 7m 30.86 60.17 60.17 60.17			
2001.12 3 6 Cal 0.74 47.71 7.55 0.814			56 64
2001.12 3 7 Sd 38.89 1.11 8.18 7.82 IIII IIIIIIIIIIIIIIIIIIIIIIIIIIIIIII			56 59

Sample	Site	Position	Mineral	SiO2	Ti02	AI2O3	Le O Le O	OuM	OgM	CaO	Na2O	K20	P205	SO3	ш	Ū	Sc2O3	V205	Cr2O3	ZnO	As203	ZrO2	Nb2O5	La2O3	Ce2O3	Nd2O3	WO3	ThO2		Actual Total
2001.12	3	8	TiO ₂ +	1.07	90.09	1.70	6.17	0.45		0.52																		1	00	95
2001.12	3	9	TiO ₂		100.00																							1	00	105
2001.12	3	10	Qz	99.57			0.43																					1	00	120
2001.12	3	11	Sd +	3.11		2.49	68.40	5.83	2.59	2.80																	14.78	1	00	74
2001.12	3	12	$TiO_2 +$	3.88	88.14	3.38	3.13			0.80									0.67											87
2001.12	პ ვ	13			80.17	0.91	18.41	1 85	6.94	0.51			2 12															1		89 62
2001.12	3	14	Qz	99.16			0.84	1.00	0.34	10.40			2.42															1	00	117
2001.12	3	16	Cal				1.36	0.53		46.13					7.99													5	6	66
2001.12	3	5 17	Qz + Ms?	81.79		12.21	1.98					4.01																1	00	118
2001.12	3	18	TiO ₂		96.86		2.86			0.27																		1	00	103
2001.12	3.1	1		08 7/	59.92		38.64	1.44																				1		14/
2001.12	3.1	3	TiO	0.62	93.09	2.96	1.79			0.76			0.79															1		148
2001.12	3.1	4	$TiO_2 +$	1.47	93.95	1.78	2.02			0.78																		1	00	145
2001.12	3.1	5	IIm		59.68		38.52	1.37		0.43																		1	00	145
2001.12	3.1	6	"llm"		62.89		34.33	2.78																				1	00	145
2001.12	3.2	1	Qz + Kfs	94.66		2.82	1.02	0.40	7 77			1.50	0.00																00	172
2001.12	3.2	2 2 3	S0 Cal				43.16	0.46	1.11	3.92			0.69		8.02													5 F	6	90
2001.12	3.2	. 3 2 4	Sd				39.21	1.48	6.77	8.54					0.02													5	6	87
2001.12	3.2	2 5	Cal				1.22	0.42		46.49					7.87													5	6	98
2001.12	4	. 1	Zrn	31.21																		68.79						1	00	115
2001.12	4	. 2	Sd	2.21		1.26	37.84	1.05	7.17	6.47																		5	6	61
2001.12	4 4	· 3 . 4	Su Cal	0.77			38.00	1.04	8.UZ	7.50 47.75					6 59													C F	6	58 61
2001.12	4	5	Olig	63.63		22.40	0.38	0.02		4.16	9.12	0.30			0.00													1		115
2001.12	4	. 6	Sd +				76.93	1.17	9.79	9.74			2.37															1	00	58
2001.12	4	. 7	"llm"		86.41		13.59																					1	00	91
2001.12	4	. 8	$Qz + TiO_2$	79.26	18.51	1.11	1.12	4.05	7.07	0 55																			00	107
2001.12	4 1	· 9 10	50 "IIm"		60 42		41.33	1.05	1.07	6.55																				57 03
2001.12	4	11	Zrn	31.09	00.42		07.07	1.7 1														68.91						1	00	114
2001.12	4	12	Sd				44.17	0.77	5.44	4.79			0.83															5	6	59
2001.12	4	13	TiO ₂ +		90.59	0.87	1.75			1.01	0.61		0.80		2.62												1.75	1	00	80
2001.12	4		Zrn +	28.84	05 70	1.17	0.84	0.07		0.90							1.03					67.22						1	00	97
2001.12	4 1	15	"llm" +	1 10	85.79	1 52	13.34	0.87	1 56																					<u>70</u> 95
2001.12	4	17	"llm" +	4.83	81.91	2.79	8.86		0.58	0.37			0.66															1	00	83
2001.12	4	18	Sd +			0.84	71.72	4.69	6.16	8.18																	8.41	1	00	63
2001.12	4	19	Cal				1.53	0.73		47.45					6.29													5	6	62
2001.12	4	20	Cal		61.00		1.37	0.59		47.95					6.09													5	6	63
2001.12	4 1	21	"llm"		78 98	1 03	37.36	1.65	0 72																			1		<u>100</u> 91
2001.12	4	23	TiO ₂ +	1.24	91.82	0.64	6.00		0.72	0.30																		1	00	83
2001.12	4	24	Ab	71.04		16.82	0.64			1.31	9.99	0.21																1	00	113
2001.12	5	1	Olig	63.82		22.43	0.40			4.12	9.23																	1	00	111
2001.12	5	2	TiO ₂ +	1.16	95.98	0.68	2.19																					1	00	94
2001.12	5		"IIM"	0.94	78.25	0.63	19.10	0 5 6	1.08																				00	82
2001.12	כ 5	4 5 5	$TiO_{2} +$	0.87	94 86	1 33	47.27	0.00		0 00																			0	91
2001.12	5	6	Sd +	10.51	0.75	5.41	68.03	2.93	7.88	4.50																		1	00	60
2001.12	5	7	"llm"	0.68	67.04	_	31.06	0.85	-	0.36																		1	00	88
2001.12	5	8	TiO ₂ +	1.12	91.16	1.78	3.82			0.43																	1.69	1	00	90
2001.12	5	9	TiO ₂ +	6.95	83.31	6.54	1.51			0.71			0.99															1	00	90

Sample	Site Position	Mineral	SiO2		Ti02	AI2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	LL.	ū	Sc2O3	V205	Cr2O3	ZnO	As2O3	ZrO2	Nb205	La2O3	Ce2O3	Nd2O3	WO3	ThO2	Total	Actual Total
2001.12	5 10 0)z	98	.89	1.11																								100	117
2001.12	5 11 T	iO ₂	2	.32	97.68																								100	105
2001.12	5 12 5	d					42.73	0.41	7.25	4.87			0.74																56	58
2001.12	5 13 0	al					1.79	0.80		48.26					5.15													l	56	59
2001.12	5 14 0	al					1.81	0.82		48.89					4.47														56	60
2001.12	5 15 0	al	1	00		0.51	1.02	0.32	664	47.84					6.83														56	64
2001.12	5 10 3	al	I	.09		0.51	1 49	0.80	0.04	50.89					2 82														56	59
2001.12	5 18 0)Z	97	.27		0.82	1.01	0.00		0.30			0.60		2.02														100	107
2001.12	5 19 T	iO ₂ +	0	.92	92.93	1.67	2.33			1.10			1.05																100	98
2001.12	5 20 5	t	25	.99	0.66	50.85	15.27		1.07	5.55										0.59									100	71
2001.12	5 21 "	lm"			72.05	0.52	26.49	0.55		0.39																			100	80
2001.12	5 22 5	d +	1	.45		0.84	70.64	2.65	9.81	11.05																	3.57	l	100	61
2001.12	5 23 0)Z	99	.64		10.11	0.36				44.50																		100	118
2001.12	5 24 F	D m"	69	.61	92.75	18.41	0.41	0.46		0.42	11.58																		100	86
2001.12	5 26 "	lm"	0	66	70 45	0.55	27 76	0.40		0.43																			100	09 95
2001.12	5 27 0	hr		.00	70.10	24.43	13.89	0.10	13.30										48.38										100	100
2001.12	5 28 "	lm"			67.68		30.05	2.27																					100	94
2001.12	5 29 5	d +					77.05	1.62	8.33	10.51			2.48															1	100	59
2001.12	5 30 "	lm"			60.30		38.23	0.75	0.72																			ļ	100	77
2001.12	6 1 5	d					43.46	0.50	8.04	3.99																			56	59
2001.12				0.4	0.00	0.04	0.93	0.39	4 00	44.71		0 50			9.97				45.04										56	67
2001.12		nr + Im"	1	.84	0.98	3.94	39.61	0.46	1.82			0.58							45.24										100	94
2001.12	6 5 T	inn iOc			99.10		0.90	0.40																					100	95
2001.12	6 6 7	iO_2	0	54	98 14		1.32																						100	104
2001.12	6 7 0		U	.0-	00.14		1.30	0.61		47.14					6.96														56	63
2001.12	6 8 0)Z	99	.54			0.46																						100	116
2001.12	6 9 T	iO ₂			99.12		0.88																						100	102
2001.12	6 10 "	lm"			66.16		30.83	3.01																				ļ	100	95
2001.12	6 11 0	al					0.60		0.68	45.65					9.07													l	56	67
2001.12	6 12 5						77.11	1.02	9.70	9.98			2.19															<u></u>	100	60
2001.12	6 13 0	$Z + IIO_2$	59	.90	39.53	0.05	0.57	1 0 0	6.05	0 1 1			0.50															[100	118
2001.12	6 14 C		1	.50	05 21	0.85	1 60	1.93	0.35	9.11			2.52										ົງງວ						100	63 109
2001.12	6 16 F		0	.02	95.51		1.00	0.48								0.31							2.20				11 21		100	100
2001.12	6 17 N	lix	10	.45	38.47	2.73	9.70	0.70	1.84	3.85		0.78	1.46	10.81	8.78	0.40				10.75							11.21		100	63
2001.12	6 18 T	$iO_2 + Chl$	11	.20	75.49	4.64	5.73		0.60	1.04		1.30																	100	81
2001.12	6 19 C	;hl +	34	.95		22.16	32.26	1.09	2.26	1.59	0.59	1.55															3.55		100	72
2001.12	6 20 5	d +					68.84	7.02	4.20	5.95																	13.99		100	71
2001.12	6 21 5	d	0	.67			42.12	0.54	6.58	5.33			0.77																56	60
2001.12	6 22 k	fs	65	.79		17.68	0.34		~ = ~	- 10	0.54	15.64																	100	116
2001.12	6 23 M	ln d	44	.44		32.21	8.20	6 00	0.52	0.42		0.22															17.04	(86	93
2001.12	7 1 C		2	10	00 42	1 57	68.20	6.92	3.10	3.94																	17.84		100	12
2001.12	7 2 1	10 ₂ +	<u> </u>	. 10	90.43	1.57	4.05	0.65	0.50	0.35 47 52					6 30														56	60
2001.12	7 4 5	d +					71.33	4.33	6.91	7.20					0.00												10.22		100	66
2001.12	7 5 N	lix	41	.68	3.14	18.87	29.97		4.18	1.03		1.12																	100	44
2001.12	7 6 7	iO ₂ +	1	.01	95.53	1.47	1.18			0.80																			100	100
2001.12	7 7 5	d + Qz	16	.95		10.28	55.88	1.53	10.47	3.57	0.85	0.47																	100	79
2001.12	7 8 N	lix	38	.06	1.69	19.12	27.45	0.53	9.95	0.75	0.57	1.88																	100	76
2001.12	7 9 7	iO ₂ +	1	.47	92.47	1.96	1.93			0.85			0.84						0.48										100	97
2001.12	7 10 1	m			57.27		39.31	3.42		40.04					0.04														100	101
2001.12	/ 11 (al					0.38			40.61					9.01														56	b/

Sample	Site Position	Mineral	SiO2	Ti02	AI2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	LL	Ū	Sc2O3	V205	Cr2O3	ZnO	As2O3	ZrO2	Nb2O5	La2O3	Ce2O3	Nd2O3	WO3	ThO2	Total	Actual Total
2001.12	7 12	2 Qz + TiO ₂	61.08	36.42		0.40			2.10																			100	122
2001.12	7 1:	3 TiO ₂ +	2.16	89.09	2.21	6.05	0.49																					100	99
2001.12	7 14	4 "IIm"	0.70	69.38	1	28.63	0.93		0.35																			100	91
2001.12	7 1	5 "Ilm"		66.30		32.22	1.03		0.45																			100	100
2001.12	7 10	5 "IIM" 7 "IIm" +	12 10	70.03	5 20	22.99		0.80	0.38		1 37																	100	92
2001.12	7 18	8 llm	12.10	53.65	5.23	44.80	1.55	0.00	1.05		1.37																	100	102
2001.12	7 19	9 Zrn	31.14			0.57															68.29							100	118
2001.12	7 20	D TiO ₂	0.51	97.54	0.46	1.16			0.34																			100	92
2001.12	7 2'	1 TiO ₂ +		94.30	1.07	4.03			0.60																			100	34
2001.12	7 22	2 "IIm"	1.47	73.16	2.52	21.46	0.81		0.58																			100	92
2001.12	7.1		38.00	57.87	18 25	40.15	1.25	1 65	0.73	0.74	1 10																	100	142
2001.12	7.1	$3 \operatorname{Ti}\Omega_{2} +$	1.02	95.66	1.39	1.12		4.05	0.81	0.74	1.10																	100	151
2001.12	7.1	4 TiO ₂ +	0.83	96.34	1.05	1.10			0.68																			100	154
2001.12	7.1	$5 \operatorname{TiO}_{2}^{2}$	0.87	96.02	0.99	1.21			0.90																			100	152
2001.12	7.1 ($6 \text{ Chl} + \text{TiO}_2$	27.29	33.68	13.27	20.96		3.16	0.92		0.72																	100	84
2001.12	8	1 Chr		0.72	18.51	27.05		11.52										42.20										100	107
2001.12	8		65.19	44.04	17.70	0.52			0.04	1.47	13.53			1.58														100	119
2001.12	8	$3 QZ + 11O_2$	50.23	44.81	2.75	1.09			0.31		0.79																	100	113
2001.12	8	5 IIm	100.00	55.19		43.53	1.28																					100	102
2001.12	8 (6 Chr		1.27	21.85	26.66		7.49										42.74										100	104
2001.12	8	7 TiO ₂		100.00																								100	104
2001.12	8	3 IIm		58.88		40.53	0.59																					100	99
2001.12	8 9		24 15	55.60	12 66	43.31	1.09	5.06	2 80		1 9 9																	100	9/
2001.12	8 1 [°]	1 "Ilm"	4.81	61.83	13.00	24.14	0.50	0.30	2.03		1.00										8.73							100	100
2001.12	8 12	2 Cal				1.61	0.92		47.20					6.27														56	62
2001.12	8 1:	3 "Ilm"	0.77	68.91		28.37	0.99		0.96																			100	88
2001.12	8 14	4 Cal	0.40		4.00	1.34	0.72	40.00	48.61		0.40	4.00		5.34														56	60
2001.12	8 1:	50 + S IIm	3.18	59 42	1.86	73.67	2.05	10.20 2 14	7.31		0.40	1.32																100	62 07
2001.12	8 1	7 Cal		00.42		1.78	0.90	2.17	47.84					5.48														56	59
2001.12	8 18	8 IIm		54.80		42.07	0.74	2.38																				100	99
2001.12	8 19	9 TiO ₂ +	5.02	85.19	4.05	4.89			0.85																			100	75
2001.12	8 20) "IIm"	1.30	83.21	1.89	13.18			0.42																			100	94
2001.12	8 2	$1 1 O_2$	0.47	98.64	0.45	0.43			0.46																			100	104
2001.12	0 24 0 ·	1 Sd +	3 20	90.97	1 94	2.37	6.00	2 4 2	2.65		0 4 9															17 74		100	00 74
2001.12	9	2 Sd +	0.20		0.75	68.47	1.77	13.38	12.73		0.40															2.92		100	60
2001.12	9 :	3 Qz	99.66			0.34																						100	117
2001.12	9 4	4 Sd				34.37	1.95	3.66	16.01																			56	56
2001.12	9 ($5 \text{ TiO}_2 +$	2.24	90.58	2.13	2.90		0.00	1.44			0.71																100	88
2001.12	9 0		5 22	95 12	2 0 2	39.41	1.11	8.06	1.42		0.20	0 71																56	5/
2001.12	9	R "IIm"	1 12	83 42	2 21	3.27			0.95		0.39	0.71						0.75										100	04 96
2001.12	9 9	9 TiO ₂ +	1.86	89.83	3.25	2.01			1.23			1.17						0.65										100	94
2001.12	9 10) "IIm" +	11.18	70.28	5.44	10.77		1.65	0.67																			100	93
2001.12	9 1 ⁻	1 Chr			18.25	18.47		9.92	0.40									52.97										100	103
2001.12	9 12	2 Qz	99.66	07.00	4 00	0.34			A 4 0			0.00		0.00														100	118
2001.12	9 1;	3 110 ₂ + 1 Sd	0.68	87.08	1.69	2.68	1 00	5 50	1.16			3.33		3.38														100	91
2001.12	9 1	5 Tur	37.74	0.87	31.38	8.94	1.03	5.53	0.69	1.85		0.12																87	98
2001.12	9 10	бРу		-		26.36		_	-	-			73.64															100	132

	۵. ۵	ion		8	<u>N</u>	03		0	0	0	0	0)5	<u></u>			033 03)2	33	0	D3	50	05	03	03	03	33	02	a	lal al
Sam	Sit	Posit	Mine	SiC	TiO	AI20	Ъe(Mn	Mg	Ca	Na2	K2	P20	SO	LL.	Ū	Sc2(V20	Cr2(Zn(As2(ZrC	Nb2(La2(Ce2	Nd2(MC	ThO	Tot	Actu Tot
2001.12		9 17	Spl + Sd		1.03	1.43	54.40	1.00	1.64	0.38									40.11										100	99
2001.12	1	9 18	TiO ₂ +	8.23	84.00	2.12	3.15																2.50						100	95
2001.12		9 19	Sd	0.86			39.71	1.37	6.75	7.32					4 40														56	60
2001.12	Q	9 20	QZ	97.78	0.38	15 10	0.79		27.67						1.42				5 71										100	120
2001.12	9.	<u> </u>	Chr	20.40	0.30	1.84	54.19	0.90	1.98									0.68	39.70										100	146
2001.12	9.	1 3	Chl + Chr	36.82	00	17.58	6.34		35.50										3.76										100	139
2001.12	9.	1 4	Chr	1.52	1.02	0.91	56.91	1.48	2.00	0.47								0.58	35.12										100	141
2001.12	1	0 1	TiO ₂ +	2.80	92.87	1.15	2.34			0.56		0.27																	100	89
2001.12	1	$\frac{0}{2}$	$TiO_2 +$	4.85	90.01	2.33	2.02			0.46		0.33			4 4 7 4														100	92
2001.12	1						28.86			40.78				71 1/	14.71														50 100	/5 218
2001.12	1	$\frac{0}{0}$	Sd + Chl	23.19		15.02	47.98	1.77	5.30	3.51		0.72		7 1.14													2.51		100	81
2001.12	1	0 6	Qz	99.62			0.38																						100	118
2001.12	1	0 7	′"IIm"		65.30		34.03	0.67																					100	93
2001.12	1	8 0	Sd	00.04		00.40	43.20	0.96	5.52	5.54	<u> </u>		0.78																56	57
2001.12	1	0 0 10		63.91	05 22	22.18	0.45			4.06	9.11	0.28																	100	111
2001.12	1		llm	1.50	95.33		<i>2.70</i> <i>4</i> 3 71	0.62	3 20	0.46																			100	97
2001.12	1	0 12	$TiO_2 +$	1.57	93.25	2.19	1.57	0.02	0.20	0.51			0.91																100	71
2001.12	1	0 13	llm		40.03		57.00	1.06	1.15	0.76																			100	97
2001.12	1	0 14	Cal				1.58	0.94		45.46					8.01														56	64
2001.12	1	0 15	Sd +	10.10		6.50	69.07	2.24	8.41	3.69																			100	66
2001.12	1	$\begin{array}{c c} 0 & 16 \\ \hline 0 & 17 \\ \hline \end{array}$	Sd +	1.53			71.42	2.49	10.59	11.65																	2.32		100	60
2001.12	1	0 18	QZ Sd +	2.06			70.69	1 71	13 34	12 19																			100	115 59
2001.12	1	0 19		2.00	52.86		42.98	0.56	3.60	12.10																			100	101
2001.12	1	0 20	Tur	38.39	0.36	24.81	12.83		2.10	0.51	0.92	0.97			6.11														87	73
2001.12	1	0 21	TiO ₂ +	3.58	85.57	3.58	5.37		0.55	0.66			0.69																100	96
2001.12	1	0 22	Py	0.19			28.81							71.00															100	221
2001.12	1	$\frac{0}{23}$	$Qz + TiO_2/"IIm"$	72.78	23.55		3.68	E 70	1 10	4.07				0.05		0.25											00.11		100	116
2001.12	ו 10	0 Z4 1 1	"Ilm"	0.84	88 41		00.45	0.65	1.40	4.37				0.95		0.35											20.11		100	150
2001.12	10.	1 2	TiO ₂		99.53		0.47	0.00																					100	153
2001.12	10.	1 3	Qz	99.54	0.46																								100	175
2001.12	10.	1 4	TiO ₂		99.50		0.50																						100	152
2001.12	10.	1 5	Qz + IIm	50.02	43.73		6.25																						100	166
2001.12	1	1 1	QZ	98.97			1.03	0.46	7.01	5 1 2			0 69																100	110
2001.12	1	1 <u>2</u> 1 <u>3</u>	Cal				41.03	0.40	7.91	48 78			0.00		4 52														56	58
2001.12	. 1	1 4			52.18		47.28	0.111	0.54	10.110																			100	101
2001.12	1	1 5	TiO ₂	1.30	97.98		0.43			0.29																			100	105
2001.12	1	1 6	TiO ₂ +	3.89	86.18	3.49	5.57			0.87																			100	66
2001.12	1	1 7	TiO ₂		98.79		1.21																						100	97
2001.12	1	1 8	IIm"	C1 OC	60.24	17.00	36.37	1.69	0.56	1.14	0.07	10.10																	100	95
2001.12	1 1	1 9 1 10		01.90	02 71	17.89	0.01 2 10		0.0X	1 06	0.07	12.19	1 02																	03 02
2001.12	1	1 11	Qz	98.78	JZ.1	0.55	0.67			1.00			1.02																100	119
2001.12	1	1 12	llm		52.05	0.00	43.08	0.71	4.16																				100	107
2001.12	1	1 13	IIm		53.37		44.21	2.42																					100	105
2001.12	1	1 14	Sd +	2.57		1.53	73.69	1.88	10.59	9.75																			100	62
2001.12	1	1 15		20.64	4 4 0	47 47	28.66		7 40	0.00	0.70	2.20		/1.34															100	219
2001.12	1	1 10 1 17	Chi + Bl	39.64	1.18	17.47	30.12 1 <i>4</i> 7	0 62	1.43	U.98 45 02	υ./Ծ	2.39			8 80														56	65
2001.12	1	1 18	Sd				38.62	0.94	8.16	8.27					5.05														56	59
		1	1	,				1	i	i	1	1	1	1			,		i i		,					e	,		1	I

	Site	Sition	ineral	SiO2	LiO2	1203	LeO	Oun	Оби	CaO	Ja20	K20	205	SO3	ш	Ū	c203	/205	rr203	SnO	s203	ZrO2	b205	a2O3	e2O3	d2O3	NO3	⁻ hO2	Fotal	ctual Total
ů N		۲ ۲	Σ			4				•	2						S		0		4		Z	Ľ	O	Z			Г—	
2001.12	1' 1'	1 19 1 20	llm Sd		51.70		45.27	0.70	2.33	8.03																			100	103
2001.12	1 <i>°</i>	1 21	llm		53.23		41.85	4.91	0.11	0.00																			100	101
2001.12	11	1 22	2 TiO ₂ +	1.91	91.28	2.60	2.34			1.01			0.86																100	91
2001.12	11	1 23 1 24	Chl +	37.60	2.31	20.67	30.21		7.50	0.59	0.61	0.51															1.80		100	81
2001.12	1 · 1 ·	i 24 1 25	Cal		09.44	1.10	0.68			43.87					11.45												1.09		56	93 71
2001.12	11.1	1 1	"llm" +	1.05	75.69	1.11	18.83	2.86		0.47																			100	134
2001.12	11.1	1 2	Chl +	39.49	1.08	17.49	32.07	~ 10	6.87	0.88		2.11																	100	131
2001.12	11.	1 3 1 ⊿	Schi +	39.75	0.47	18.85	33.13	0.49	5.62 0.26	1.19		0.49																	100	91
2001.12	11.1	· - 1 5	Chl +	39.37	1.20	18.18	31.11	1.15	7.12	0.84		2.19																	100	122
2001.12	11.1	1 6	Kfs	62.33	0.38	18.39	5.83		0.83		1.84	10.40																	100	145
2001.12	12	2 1	"llm"		64.31		32.77	2.91		0.4.4																			100	96
2001.12	1∡ 10	2 2 2 3	llm		97.60		1.96	0.60		0.44																			100	105
2001.12	12	2 4	Cal		51.54		0.95	0.00		49.35					5.21														56	60
2001.12	12	2 5	Qz	99.49			0.51																						100	121
2001.12	12	$\frac{2}{2}$ $\frac{6}{7}$	Sd + Chl	6.31	00.00	4.20	64.83	2.18	8.60	9.20			0.07														4.68		100	65
2001.12	12	27 28	$10_2 +$	99 72	93.30	1.89	0.28			0.88			0.87																100	92
2001.12	12	2 9	TiO ₂	00.12	98.76		0.20			0.34																			100	103
2001.12	12	2 10	Qz	100.00			-																						100	116
2001.12	12	2 11	IIm		50.19		48.44	0.74	1.06	0.31					7 1 4														100	100
2001.12	12 12	2 12 2 13	Sd				1.41 41 21	0.71	8 82	46.47					7.41														56 56	62 57
2001.12	12	2 14	Feohy				99.30	0.70	0.02	0.00																			100	57
2001.12	12	2 15	Cal				0.67			47.96					7.36														56	63
2001.12	12	2 16	$TiO_2 +$	2.97	89.39	4.02	2.74	0.60	<u></u>	0.87																			100	87
2001.12	<u>ء ا</u> 12	2 17 2 18	IIM S "IIm"	3.04	44.62	1.61	22.48	0.63	3.82	0.54																			100	88 75
2001.12	12	2 19	Mix	20.10	49.95	12.57	13.10		2.10	0.82		0.57	0.80																100	69
2001.12	12	2 20	Kln +	52.28		32.92	12.21		2.10	0.48																			100	71
2001.12	12	2 21 1 1	"llm"	0.73	61.24	1 56	36.89	0.72	0 77	0.41																			100	93
2001.12	12.	1 1 1 2	2 "IIm" +	7.06	62.04	5.08	16.57	1.18	1.28	1.46								1.55									3.79		100	101
2001.12	12.′	1 3	Chl + Kln	52.55		36.31	9.38		1.30	0.47																			100	118
2001.12	12.1	1 4	Chl + Kln	41.00		20.15	31.27		5.62	1.16		0.81																	100	79
2001.12	12.1	1 5 1 6	Chl + Ms	54.97 49.65		39.87 34 53	4.26		0.50	0.40		0 43			2 52														100	129
2001.12	13	3 1	$TiO_2 +$	2.42	88.53	2.99	4.22		1110	0.98		0.10	0.85		2.02														100	92
2001.12	13	3 2	$TiO_2^- +$	4.55	87.64	3.79	2.44			0.79			0.79																100	90
2001.12	13	3 3	TiO ₂ +	3.04	88.51	2.90	1.94	~ ~ ~ ~		0.69			0.81		2.10														100	90
2001.12	1:	3 4 3 5	llm Sd	0.02	53.24		44./1	2.05	5 30	1 27			0 68																100	104
2001.12	13	3 0 3 6	Cal	0.32			1.61	0.03	5.50	45.11			0.00		8.43														56	64
2001.12	13	3 7	TiO ₂		99.04		0.96																						100	104
2001.12	13	3 8	Qz	99.43			0.57																						100	96
2001.12	13	3 9 3 1∩	QZ Chr	100.00		26 57	15 00		10 30										<u>17 05</u>										100	115 00
2001.12	13	3 11	Spl		0.61	40.70	17.72		16.36										24.61										100	103
2001.12	13	3 12	Spl		0.45	31.95	19.62		14.02										33.95										100	103
2001.12	13	3 13	TiO ₂		98.78	0.54	1.22																						100	86
2001.12	13	3 14 3 15	TiO ₂ +	0.60	81.31 93.53	0.51 1 85	17.59			0 75			0.85													-			100 100	97 92
L		0															1		1		1			1		1				~_

nple	ite		leral 0	03	02	503		Q	O D	Og	50	0	05	03	ш		203	05	203	Q	203	03	205	203	203	203	03	02)tal	tual otal
Sar	S S S S S S S S S S S S S S S S S S S	ол Ол	Ni		Ē	AI2	Ľ	Σ	Σ	Ŭ	Ž	Ц Ц Ц	P2	Š		U	SC SC	V2	Ö	Ż	As:	Z	ND ND	La(Ce	,pN	3		<u> </u>	AC
2001.12	13 1	16 "Ilm"			88.03		11.05	0.60		0.32																		1	00	87
2001.12	13 1	$17 \text{ TiO}_2 + 12 \text{ O}_2$		3.07	87.68	2.60	4.78			1.04			0.83															1	00	68
2001.12	13 1	18 QZ		100.00				0.00		40.07			44.00		0.00														00	117
2001.12	13 1	19 Ap		1.00	00.40	1.60	10.00	0.28		48.67			44.69		6.36													1	00	121
2001.12	13 2	20 IIM 21 IIm		1.89	82.48 51.27	1.03	12.39	1.13	2.01	0.49								1 1 1										1		99
2001.12	13 2	21 22 " m"			63 78		44.13	0.57	2.91									1.14										1		07
2001.12	13 2	22 "IIm"			65 31		33 36	0.07	0.05																			1		97
2001.12	13 2	23 mm 24 Q7		100 00	00.01		00.00	1.00																				1	00	116
2001.12	13 2	25 "Ilm"		100.00	64.48		33.79	0.85					0.88															1	00	91
2001.12	13 2	26 Qz +		82.65		4.79	7.06		1.49	0.51	0.52	0.32			2.66													1	00	103
2001.12	13 2	27 TiO ₂ +		4.96	84.02	5.21	4.36			0.58		-	0.87															1	00	79
2001.12	13 2	28 Sd +		14.69		8.50	63.14	2.41	6.15	4.62		0.48																1	00	65
2001.12	13 2	29 "Ilm"			61.40		34.75	3.85																				1	00	95
2001.12	13 3	30 Zrn		30.56																		69.44						1	00	111
2001.12	13 3	31 Chl + E	3t	41.68	2.06	19.67	23.68	0.39	7.74			4.78																1	00	94
2001.12	14	1 Tur		38.22	0.59	32.16	7.59		5.82	0.26	2.36																	8	37	95
2001.12	14	2 TiO ₂			99.47		0.53																					1	00	102
2001.12	14	3 TiO ₂			100.00																							1	00	103
2001.12	14	4 TiO ₂ +		3.11	87.06	2.86	4.44			1.07			0.73						0.74									1	00	83
2001.12	14	5 "Ilm"		3.72	66.26	2.37	26.42	1.22																				1	00	84
2001.12	14	6 Sd					39.60	1.45	7.57	7.38																		5	56	59
2001.12	14	7 TiO ₂ +		3.43	91.29	1.51	2.69		0.84	0.24																		1	00	103
2001.12	14	8 TiO ₂		0.74	97.90		1.36																					1	00	102
2001.12	14	9 Tur		37.41	0.38	30.08	2.41		10.16	1.57	1.97				3.01													8	37	101
2001.12	14 1	10 Qz		99.67			0.33	0.05		40.00					4 07														00	117
2001.12				0.00	05.07	4 40	1.89	0.85		48.89					4.37													5	b6	58
2001.12		$12 \Pi O_2$		0.80	95.37	1.48	1.64		F 00	0.70	4 00																			96
2001.12	14 1	13 I Ur 14 1/fo		38.72	0.70	33.06	1.20		5.38		1.89	12.02		1.00	0.74					1 50								2	37	96
2001.12	14	14 NIS 15 Sd		00.00	1.41	10.23	1.03	1 05	6 77	5 86		13.92		1.90	2.74					1.33								ין ק		90 57
2001.12		16 Oz		99.22			42.32	1.05	0.77	5.00																		1		115
2001.12	14 1	17 Sd + C	hl	12 03	0.86	7 34	63 54	1 73	7 17	6 86		0 48																1		64
2001.12	14 1	18 Qz	/1 II	99.63	0.00	7.01	0.37	1.7.0		0.00		0.10																1	00	115
2001.12	14 1	19 "Ilm"			64.74		34.25	1.01																				1	00	87
2001.12	14 2	20 Qz		99.68			0.32																					1	00	114
2001.12	14 2	21 Sd +		2.19		0.97	76.52	1.87	8.62	8.41			1.41															1	00	57
2001.12	14 2	22 Qz + C	hl?	67.18	1.01	13.53	14.73		1.75	0.54	0.49	0.77																1	00	78
2001.12	14 2	23 Zrn		31.03																		68.97						1	00	112
2001.12	14 2	24 Tur		38.38	0.77	30.33	9.92		5.20		2.41																	3	37	91
2001.12	14 2	25 Qz		99.56			0.44																					1	00	112
2001.12	14.1	1 Ms		44.19	0.43	26.80	3.96		0.81		0.48	8.33																8	35	153
2001.12	14.1	2 Chl + I	VIS	42.57	0.77	25.22	25.93	0 5 4	2.78	1.07		1.67																	00	111
2001.12	14.1	3 Sd +		6.72		2.95	66.68	2.54	11.76	9.36																	4 70			93
2001.12	14.1	4 50 5 Chl + N	10	0.69		0.44	38.20	1.02	7.26	6.68		1 40															1.70			91
2001.12	14.1		VIS	44.17	0 / 2	24.90	20.00		2.94	1.02	0.21	1.40			1 40															113
2001.12	14.1			40.00	0.43	∠0.00 ∩ ՋՋ	2.01		0.19	በ ፍን	0.31	<i>I</i> .IZ			1.40												1 56		00	07
2001.12	15	$2 \cap 7$		00 63	30.00	0.00	∠.00 ∩ 37			0.52																	1.50	1		110
2001.12	15	2 QZ 3 Sd +		2 51		1 47	63 77	4 59	9 90	17 75																		1	00	59
2001.12	15	4 FI		<u> </u>		1.71	1.22	0.51	0.00	63 49	<u>೧ ५</u> ०				34 18		<u> </u>											1	00	84
2001.12	15	5 TiO ₂ +	Qz	29.48	69.62		0.38			0.51					2.1.10													1	00	109
2001.12	15	6 Qz		99.54			0.46																					1	00	116
2001.12	15	7 Mnz		2.02						0.99			32.95		-0.15									12.83	29.43	10.74		11.20 1	00	99
2001.12	15	8 Chl + E	Bt	36.63	2.61	16.04	32.96		7.86	0.68		3.22																1	00	81

		1	8	1		1	I		i	1	<u> </u>						1	1				1		ve	1					
		uo	ิเล	N	\sim	33			\circ		0	\sim	2	m)3	Ŋ)3	\sim	03	2)5)3)3)3	e	<u>N</u> -		ש ש
<u> </u>	Site	siti	Del	Ö	Ö	5 5	e	4nC	١g	(aC	a2(20	50	Ö	LL.	Ū	i2C	50	Ч С	ZnC	%2C	Õ	020	IZC	92C	120	Q	O H		ota
Sa	0)	Ро	ž	S	F	AI		2	2	0	Z	x		0)			Ň	>	ō		As	N	Ž		ŭ	Z	5		- <	₹⊢
2001 12	15	9	"llm" + Chl	10 20	74 45	7 32	6 6 1		1 1 3			0 29																1		101
2001.12	15	10	Zrn	30.37	0.55	1.02	0.56					0.20										68.52						1		112
2001.12	15	11	$TiO_2 + Chl$	5.85	88.73	3.66	1.44			0.33												00102						1		88
2001.12	15	12	$TiO_2 + Cini$	19.69	72.34	5.69	1.11			0.26		0.90																1		105
2001.12	15	13	Sd	0.72	12.01	0.00	38.23	1 1 3	8.32	7 60		0.00																5	6	59
2001.12	15	14	$TiO_{a} + O_{7}$	19.72	79 75		0.47		0.02	1.00																		1		104
2001.12	15	15	Cal	10.70	10.10		1 19	0 54		48 00					6 28													۲	50 6	61
2001.12	15	16	$TiO_{2} +$	0.98	93 17	1 99	1.10	0.07		1 01			0.89		0.20													1	10 10	88
2001.12	15	17		0.00	97 54	1.00	1.00			0.27			0.00															1	<u>วก</u>	80
2001.12	15	18	Ω_2	100.00	57.04		1.40			0.21																		1		114
2001.12	15	19	TiO	0.94	97 09	0.83	1 1 4																					1		100
2001.12	15	20	"llm"	7 43	80.35	2.61	8.02		0.58			1 01																1	00 00	87
2001.12	15	21	$TiO_{2} +$	10.86	79 73	7 05	1 78		0.00			0.58																1		100
2001 12	15	22	Sd + Chl	23 20	0.58	13 23	49 95	1 69	4 92	2 4 9		1 28															2 66	1	00 00	65
2001.12	15	23	"Ilm"	20.20	70.89	10.20	26.92	2.18	1.02	2.10		1.20															2.00	1	20	87
2001.12	15	24	Cal		70.00		0.59	2.10		48.54					6.87													5	i6	61
2001.12	15.1	1	Chl + llm	22.69	36.07	16.21	19.32		4.01	0.51			1.19		0.01													1)0	152
2001.12	15.1	2	"llm" +	4.94	85.98	2.67	5.92		0.49																			1	. OC	144
2001.12	15.1	3	$Ms + TiO_2$	45.76	11.48	30.06	2.58		0.94		0.73	8.45																1	. OC	159
2001.12	15.1	4	TiO ₂	0.50	98.74		0.76																					1	00	155
2001.12	15.1	5	Chl + Ilm	28.01	19.82	20.34	27.17		4.66																			1	. OC	150
2001.12	15.1	6	TiO ₂ +		85.16		0.81			0.62			4.06												3.81	1.50	4.05	1	. OC	149
2001.12	16	1	Qz	99.55			0.45																					1	00	121
2001.12	16	2	"llm" +	14.04	69.99	8.93	4.90		1.05	0.68		0.41																1	00	91
2001.12	16	3	TiO ₂ +	1.08	92.33	2.13	2.17			1.14	0.50		0.65															1	00	99
2001.12	16	4	TiO ₂ +	2.01	90.55	2.13	3.48			0.83			1.00															1	00	85
2001.12	16	5	"Bt"	49.88	0.46	29.86	10.07		1.79			7.94																10	00	80
2001.12	16	6	Sd + Qz	41.73		1.79	45.82	1.07	5.56	4.03																		1	00	83
2001.12	16	7	Cal				0.65	0.44		48.44					6.47													5	6	63
2001.12	16	8	Sd				38.94	0.86	10.05	6.15																		5	6	61
2001.12	16	9	Kln + TiO ₂	46.82	13.60	29.08	6.50		1.59	0.81	0.51	1.09																10	00	86
2001.12	16	10	TiO ₂ +		90.35		9.65																					10)0 C	101
2001.12	16	11	Chl + Bt	39.51	1.01	22.05	31.17		2.90	1.33		2.03																1	00	71
2001.12	16	12	Py			10.00	28.49							71.04							0.48							10		217
2001.12	16	13	ChI + Bt	34.65	1.26	16.69	36.95	0 50	4.56	1.20		2.54		1.10	= 00					1.06								10		63
2001.12	16	14			74.00	0.00	1.45	0.59		48.88					5.08													5	06	59
2001.12	16	15		24.00	74.99	0.66	21.38	2.59	2.62	0.37			0.75															10		94
2001.12	16	10		24.23	30.48	10.12	24.22 4.60		3.03 7.20	00.0	1.00		0.75																	00 02
2001.12	10	10		31.99	0.03	33.20	4.09	0 15	1.39	0.09 12 70	1.90				10 70														56 16	30 65
2001.12	10	10	Chl + Rt	VV 30	1 10	24 62	21.13	0.40	2 77	40.7U 1 ∩1		1 20			10.70														יט חח	66
2001.12	16	20		Λ 50	05 26	27.03 1 52	27.03		۲.۱۱	1.01		1.20																1	00 00	
2001.12	16	20		0.00	Q/ 2/	1.00	2.11			1 10			0.82															1	<u>ว</u> ก	03
2001.12	16	22	Ω_2	100.00	57.27	1.00	2.07			1.10			0.02															1		117
2001.12	16	23	Sd				37.48	1.29	8.98	8.24														<u></u>				<u> </u>	i6	59
2001.12	16	24	"IIm"	1.27	79.98	1.73	16.55	0		0.47																		1	20	87
2001.12	16.1	1	Qz	99.63	0.37																			[1	20	179
2001.12	16.1	2	TiO ₂ +	1.14	95.78	1	2.57			0.51																		1	00	159
2001.12	16.1	3	Ilm + Chl	19.80	50.22	11.16	16.68		1.07	0.60		0.46																1	00 ·	115
2001.12	16.1	4	$Chl + TiO_2 + Ms$	48.15	13.71	28.59	4.87		1.39	0.91	0.46	1.92																1	00	135
2001.12	16.1	5	$\overline{\text{TiO}_2}$ +	4.82	92.08	0.56	2.27			0.26																		10	00	158
2001.12	16.1	6	_ Chl + TiO ₂ + Ms	33.48	37.02	19.68	4.72		2.92	0.65	0.35	1.19											••••••					1	00	150
2001.12	16.1	7	Ilm + Chl	13.80	63.22	7.53	13.50		1.14	0.46		0.36																10	00	115
2001.12	16.1	8	TiO ₂ +	1.36	96.53		2.11																					1	00	156

Sample	Site	Mineral	SiO2	TiO2	AI2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	LL	Ū	Sc2O3	V205	Cr2O3	ZnO	As2O3	ZrO2	Nb2O5	La2O3	Ce2O3	Nd2O3	WO3	ThO2	Total	Actual Total
2001.12	16.1	9 Chl + TiO ₂ + Ms	51.95	8.17	24.91	7.31		1.48	0.84	0.50	1.95			2.89														100	130
2001.12	16.2	1 Sd				39.69	1.02	7.98	7.31																			56	90
2001.12	16.2	2 Sd	0.85	0.42		39.41	2.59	3.28	3.57																	5.89		56	103
2001.12	16.2	3 Chl + Ms	46.01	1.24	26.70	20.32		2.71	0.74	0.53	1.77																	100	123
2001.12	16.2	4 Sd	0.54	0.91		40.60	1.99	6.23	5.73																			56	91
2001.12	16.3	1 TiO ₂		98.38		1.30			0.32																			100	153
2001.12	16.3	2 Chl + Ms	45.69	0.80	27.83	20.92		2.29	0.95	0.43	1.09																	100	115
2001.12	16.3	3 Sd		0.55)	38.06	1.24	8.43	7.71																			56	89
2001.12	16.3	4 Chl + Ms	47.14	1.07	28.36	15.91		5.08			2.44																	100	143
2001.12	16.3	5 Sd	0.85			39.59	1.52	7.79	6.25																			56	90
2001.12	16.3	6 Ms	43.42	0.38	28.46	3.32		0.79		0.61	5.81		0.63	1.58														85	157
2001.12	16.3	7 Qz	99.36			0.64																						100	176
2001.12	17	1 "llm"		64.83)	33.79	1.38																					100	101
2001.12	17	2 Qz +	93.33		4.97	0.76					0.94																	100	112
2001.12	17	3 Sd	0.59			44.60	0.78	6.36	3.67																			56	58
2001.12	17	4 Chr	3.39	~~~~	27.25	19.09		7.57	~					~				42.18	0.52									100	96
2001.12	1/	$5 IIO_2 +$	1.29	90.35	3.49	1.64			0.77					2.47														100	96
2001.12	1/	6 "IIm"	0.64	64.28	00.44	34.25	0.82	0 54		0.50	0.00																	100	96
2001.12	17	$7 \text{ MS} + 110_2$	46.36	22.20	23.11	0.95		0.51		0.58	6.28																	100	115
2001.12	1/	8 QZ + MS	76.84	00.07	16.55	1.61	4 00	0.44		0.65	3.91																	100	108
2001.12	17			63.37		35.00	1.63		40.04					4.40														100	100
2001.12	17	10 Cal 11 "Ilm"	1 05	00.00	0.57	1.23	0.67		49.94					4.16														50	60
2001.12	17	11 IIM 12 Chr	1.05	86.98		11.40		11 00										27 50										100	90
2001.12	17		5 21	71 50	29.22	10.97	0 75	14.23	0.20		0.00							37.30										100	100
2001.12	17		0.31 1.67	1 .50	4.10	70.21	0.75	10 70	0.39		0.28																	100	69
2001.12	17	14 JU + 15 Ilm	1.07	1.09 53 34	1.07	10.21	0.81	12.70	10.97																			100	102
2001.12	17	16 Cal		55.54	•	45.65	0.01		18 80					5 17														56	50
2001.12	17	$17 \text{ Ti}\Omega_{2} +$	4 32	89 51	1 69	3.54	0.04	0.60	40.03		0 35			5.17														100	97
2001.12	17	18 llm	1.02	54 69	1.00	44 57	0 74	0.00			0.00																	100	99
2001.12	17	19 Cal		01.00		1.63	0.57		47.03					6.77														56	60
2001.12	17	20 TiO ₂		95.26	0.51	3.80			0.42					0														100	99
2001.12	17	21 Sd + Chl	34.45	0.70	20.26	36.18	1.04	3.46	2.59		1.32																	100	60
2001.12	17	22 Cal				1.45	0.74		46.03					7.77														56	61
2001.12	17	23 "Ilm" +	10.46	73.70	4.78	4.54		0.70	0.97	0.78	1.07			3.00														100	93
2001.12	17	24 TiO ₂ +	7.56	80.20	5.58	3.78		0.68	0.78		0.45	0.97																100	88
2001.12	17	25 IIm + Ms	43.63	12.17	14.94	20.13		4.13	0.75		4.25																	100	76
2001.12	17.1	1 Bt + Chl + Qz	50.10	1.61	16.43	21.77		3.64	0.81		5.65																	100	113
2001.12	17.1	2 TiO ₂		96.68		1.23			0.27													1.82						100	159
2001.12	17.1	3 Bt + Chl + Qz	50.54	1.19	15.36	22.31		4.27	0.97		5.36																	100	124
2001.12	17.1	4 TiO ₂ +	2.12	91.34	2.77	2.20			0.59			0.98																100	145
2001.12	17.1	5 TiO ₂ +	0.86	96.38	1.11	1.37			0.27																			100	154
2001.12	17.1	6 Bt + Chl + Qz	49.38	3.89	14.86	21.37		4.02	1.01		5.47																	100	118
2001.12	18	1 "IIm"		60.57	,	33.48	5.95																					100	95
2001.12	18	2 "Ilm"	3.91	87.58	1.75	6.75																						100	80
2001.12	18	3 IIm		57.36	;	41.26	1.38																					100	97
2001.12	18	4 Zrn	30.53	_ -																	69.47							100	115
2001.12	18	5 TiO_2		99.56		0.44																						100	102
2001.12	18	6 Qz	100.00																									100	118
2001.12	18	7 Qz	99.69			0.31																						100	118
2001.12	18	$8 1 O_2 + Qz$	17.18	81.41		1.07			0.34																			100	92
2001.12	18	9 1 O ₂ +	0.67	94.02	1.27	3.33			0.70																			100	98

Φ	2					•				-		_				m		~		m		10	m	m	m				
hdu	bite	Jere	02	i02	203	e O	Oul	lgO	aO	a20	20	205	03	LL.	ū	503	205	203	Ou	203	r02	20	203	503	1203	03	102	otal	stua otal
Sa			S	F	All		Σ	Σ	O	Ž	X	ŭ	S			S S C	\geq	С С	N	As	Ā	qN	Га	Ce	Zq	3	È	Ĕ	Α̈́́
2001.12	18 1	0 Sd +		0.6	1	71.48	2.04	12.15	10.74																	2.98		100	57
2001.12	18 1	1 IIm		55.8	6	41.26	2.88																					100	100
2001.12	18 1	2 TiO ₂	0.6	99.3	9																							100	102
2001.12	18 1	3 Chr	6.58	3 0.5	7 27.54	27.30		8.03			0.37							28.66	0.96									100	97
2001.12	18 1	4 Sd +	1.9			68.57	2.18	12.57	11.69																	3.09		100	59
2001.12	18 1	5 Sd				43.37	0.60	7.60	3.75			0.67																56	57
2001.12	18 1	$\frac{6}{10_2}$ +	3.50) 92.0	8 1.75	5 1.64					1.04																	100	98
2001.12	18 1	7 Zrn +	29.34		0.88	<u> </u>	4.00	~ = =	1.04							0.51					67.21							100	94
2001.12	18 1	8 "IIM" +	5.6	3 69.6 7 02 1		18.29	1.38	0.57	0.40		0.27	0 00																100	90
2001.12		9 ΠO_2 +	0.9	y 93.	2 2.30	1.89		1 2 1	0.89		2.67	0.82																100	93
2001.12	10 2		20.3	<u>ک.</u> ا	0 13.47	19.03	2 08	4.24	0.00		2.07															2 07		100	59 60
2001.12	18 2	22 7m	31.6	\ \		09.04	2.00	12.55	11.10												68 34					5.21		100	119
2001.12	10 2	1 "IIm"	1.5	807	6 1 46	15 24	0.59		0.37												00.04							100	77
2001.12	19	2 Cal	1.00	00.1		1.48	0.75		46.99					6.78														56	60
2001.12	19	3 Chr		0.4	6 17.40	25.54	00	9.43	10100					00				47.17										100	101
2001.12	19	4 Sd +	1.80	0.6	0.89	77.13	1.77	8.83	7.68			1.23																100	59
2001.12	19	5 IIm		55.7	6	43.44	0.80																					100	99
2001.12	19	6 Cal				1.16	0.57		49.15					5.11														56	60
2001.12	19	7 Qz	100.00)																								100	116
2001.12	19	8 TiO ₂ +	2.32	2 90.4	8 3.76	5 1.92			0.57			0.94																100	98
2001.12	19	9 Ilm		53.8	1	43.81	1.18	1.20																				100	102
2001.12	19 1	0 TiO ₂ +		94.9	2 1.50	1.20			0.61																	1.77		100	91
2001.12	19 1	1 "IIm"	3.0	78.0	4 2.48	8 16.05					0.42																	100	92
2001.12	19 1	2 IIm		50.4	9	49.03	0.48																					100	100
2001.12	19 1	3 Cal + Sd	~ ~ ~			23.32	1.87	1.79	59.07					13.96							~~~~							100	62
2001.12	19 1	4 Zrn	30.79) 7	0.00	0.40					0.00										69.21							100	113
2001.12	19 1	5 QZ	98.3		0.83	0.48 0.48					0.32																	100	114
2001.12	19		99.43	1		0.51	0.57		17 57					6 20														100 56	115 60
2001.12	19	7 Cai 8 "Ilm"	0.8/	1 80 /	8 0.86	1.57			47.57					0.29														100	00 81
2001.12	19		0.0	98.7	8 0.00	0.78	1.44		0.30																			100	97
2001.12	19 2	0 "IIm"	1.3	5 88 7	7 2 24	7 09			0.54																			100	90
2001.12	19 2	21 "IIm"	1.00	63.9	3	32.85	3.22		0.01																			100	91
2001.12	19 2	22 Sd +				68.38	5.80	1.77	2.67	0.87																20.51		100	71
2001.12	19 2	23 Sd				40.07	1.21	7.48	7.24																			56	57
2001.12	19 2	24 Olig	64.73	3	21.51	0.40			3.32	9.84	0.20																	100	114
2001.12	19 2	25 TiO ₂ +	5.42	2 88.9	1 3.43	8 1.51			0.44		0.29																	100	97
2001.12	19 2	26 Sd + Chl	35.8	6 1.7	2 22.32	2 33.43	0.89	3.16	1.81		0.82																	100	80
2001.12	19 2	27 Qz	99.49	9		0.51																						100	118
2001.12	19.1	1 Cal				1.06	0.34		44.65					9.95														56	101
2001.12	19.1	2 Cal				1.28	0.79		44.95					8.98														56	97
2001.12	19.1	3 Sd				39.47	1.47	8.23	6.83																			56	88
2001.12	19.1						0.62	<u> </u>	48.56	~		o 45		5.70														56	92
2001.12	19.1		36.49	1.2	5 16.52	30.51	4 00	6.23	3.1/	U.48	2.89	2.45																100	118
2001.12	19.1			5 / 1	1	10.39	1.23	1.40	9.50			60.1														<u> </u>		100	90 04
2001.12	20 20	$2 \text{ Ti} \Omega_2 +$	1 1/	04.0 02 0	0 1 55	43.21	0.72	1.40	1 22									0 16										100	34 25
2001.12	20	$\frac{2}{3}$ TiO ₂ +	<u>3</u> 0'	<u>9</u> 3 <u>9</u> 3(6 3 00	0.68			1.20		0 22							0.40										100	100
2001.12	20	4 Kfs	65.9	2	17.75	6.00 6 0.41					15.92																	100	111
2001.12	20	5 IIm		59.7	5	38.08	0.49	1.68																				100	93
2001.12	20	6 Sd +	7.30)	4.69	70.70	2.19	8.76	6.36																			100	61

I					1		•				-	1		1			1	1			1 1		1	1		1	1			
Sample	Site	Position	Mineral	SiO2	TiO2	AI2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	Ŀ	C	Sc2O3	V205	Cr203	ZnO	As2O3	ZrO2	Nb205	La2O3	Ce2O3	Nd2O3	WO3	ThO2	Total	Actual Total
2001.12	20	7 Qz	1	00.00								-																	100	112
2001.12	20	8 Py					28.90							71.10															100	213
2001.12	20	9 Cal					1.63	0.62		48.43					5.32														56	58
2001.12	20	10 "llm"		0.68	62.45		35.44	0.89	0.54																				100	94
2001.12	20	11 Chl +	Bt	36.78	0.67	15.83	32.77		7.09	0.91		1.27															4.69		100	85
2001.12	20	12 "Ilm" -	F	3.48	87.38	2.65	5.89			0.60																			100	76
2001.12	20	13 Sd					43.15	2.34	5.06	3.11																	2.34		56	57
2001.12	20	14 TiO ₂			100.00																								100	103
2001.12	20	15 "llm"			62.35		35.31	1.94		0.40																			100	98
2001.12	20	16 Cal					1.17	0.41		40.47					13.95														56	74
2001.12	20	17 "llm"			67.36	0.56	28.78	3.30																					100	95
2001.12	20	18 Qz		98.93	0.33		0.74																						100	116
2001.12	20	19 Cal					1.17	0.64		48.71					5.47														56	59
2001.12	20	20 "llm"			62.61		36.26	0.77		0.36																			100	94
2001.12	20	21 Cal								50.05					5.95														56	59
2001.12	20	22 Sd +		7.17		4.53	69.13	1.48	9.16	6.65		0.62	1.26																100	63
2001.12	20	23 Py					30.48			0.26				69.26															100	189

Appendix A6: BSE images and EDS mineral analyses for sample Sable Island 5H-58 1577.68 m



Figure A6.1: Sable Island 5H-58 (1577.68 m)



1:K-Feldspar 30:Tourmaline 61:TiO₂ + 31:Ilmenite 62:Tourmaline 32:"Ilmenite" 63:K-Feldspar 2:Pyrite 3:Ilmenite 4:Ilmenite 33:Tourmaline 64:TiO, 5:Tourmaline 34:Ilmenite 35:Ilmenite 6:Ilmenite + 7:"Ilmenite" 36:Quartz 8:Ilmenite 37:Ilmenite 38:Ilmenite 9:Ilmenite 10:Ilmenite 39:Monazite 11:TiO₂+ 40:Zircon 12:?Greigite 41:Ilmenite 42:"Ilmenite" 13:Quartz 43:Pyrite 14:Ilmenite 15:TiO₂+ 44:TiO₂ 16:Quartz 45:Ilmenite 46:"Ilmenite" 17:TiO₂ 47:"Ilmenite" 18:TiO₂+ 48:"Ilmenite" 19:Ilmenite 49:Pyrite 20:Quartz 50:Ilmenite 21:TiO₂ 51:TiO₂ + 22:TiO₂+ 52:Pyrite + 23:Ilmenite 53:Ilmenite 24:Pyrite 54:Quartz 25:TiO,+ 55:TiO₂ 26:Ilmenite + 27:"Ilmenite" 56:"Ilmenite" 57:TiO, + 28:Quartz 58:Ilmenite 29:Quartz + 59:TiO, Chlorite 60:Tourmaline +

Figure A6.2: Sable Island 5H-58 (1577.68 m) (SEM) site 1 (Table A6.1)



Figure A6.3: Sable Island 5H-58 (1577.68 m) (SEM) site 1.1 (Table A8.1). A fragment of a sandstone (lithic clast) made up of TiO_2 , rare zircon (1) and probably a mixture of clays (chlorite + illite probably).

1:Zircon 2:TiO₂ + Clay 3:TiO₂ + 4:Chlorite + Clay 5:TiO₂ + 6:TiO₂ +



1:Chlorite + 2:Chlorite + TiO_2 + 3:"Ilmenite" 4:Chlorite + 5:Chlorite + TiO_2 +

Figure A6.4: Sable Island 5H-58 (1577.68 m) (SEM) site 1.2 (Table A6.1). A lithic clast (rounded) made up of TiO_2 blebs, altered ilmenite and inclusions of probably muscovite (1,4,5).



2:TiO₂ + Quartz 3:TiO₂ + Clay 4:TiO₂ + 5:TiO₂ +

1:Quartz

Figure A6.5: Sable Island 5H-58 (1577.68 m) (SEM) site 1.3 (Table A6.1). Mineral aggregates made up of a) blebs of TiO_2 (2) and quartz (1) and b) clay (3) and TiO_2 (4,5). ?Lithic clast.


Figure A6.6: Sable Island 5H-58 (1577.68 m) (SEM) site 1.4 (Table A6.1). Diagenetic TiO_2 (?fossil) with straight outlines.



Figure A6.7: Sable Island 5H-58 (1577.68 m) (SEM) site 1.5 (Table A6.1). Detrital TiO_2 (1,2).



 $\begin{array}{l} 1:\text{TiO}_2 + \text{Quartz} \\ 2:\text{Quartz} + \text{TiO}_2 \\ 3:\text{TiO}_2 + \text{Quartz} \end{array}$

Figure A6.8: Sable Island 5H-58 (1577.68 m) (SEM) site 1.6 (Table A6.1). A fragment made up of TiO_2 (1,3) and quartz (2). Foliation?



1:Ilmenite + Chlorite 2:"Ilmenite" + Chlorite

Figure A6.9: Sable Island 5H-58 (1577.68 m) (SEM) site 1.7 (Table A6.1). Detrital altered ilmenite with chlorite inclusions (1).



1:Chlorite + 2:Chlorite + 3:TiO₂ 4:Pyrite + 5:"Ilmenite" +

Figure A6.10: Sable Island 5H-58 (1577.68 m) (SEM) site 1.8 (Table A6.1). Lithic clast made up of chlorite (1,2), altered ilmenite (5), TiO_2 (3) with straight crystal outlines and pyrite (4).



27:Tourmaline 28:"Ilmenite" 2:Ilmenite 29:Ilmenite 3:"Ilmenite" 30:TiO₂ 4:Zircon 5:Ilmenite + 31:Ilmenite Chlorite 32:Zircon 6:Quartz 33:TiO₂ + 34:Tourmaline 35:TiO₂ 36:"Ilmenite" 9:Tourmaline 37:"Ilmenite" 10:Tourmaline 38:Ilmenite 11:Monazite 12:K-Feldspar 39:Staurolite 13:Pyrite 40:Tourmaline 14:Quartz 41:TiO₂+ 15:Ilmenite 42:TiO₂ 16:"Ilmenite" 43:Tourmaline 17:Ilmenite 44:TiO₂+ 18:Xenotime 45:Pyrite 19:"Ilmenite" 46:Ilmenite 20:"Ilmenite" + 47:TiO₂+ 21:Quartz 48:Zircon 22:"Ilmenite" 49:TiO₂ + 23:Ilmenite 50:Tourmaline 24:TiO₂ 51:Monazite 25:TiO₂ + 52:Zircon 26:"Ilmenite"

Figure A6.11: Sable Island 5H-58 (1577.68 m) (SEM) site 2 (Table A6.1)



1:Biotite 2:Muscovite $3:TiO_2 +$ $4:TiO_2 +$ $5:TiO_2 +$ Muscovite

Figure A6.12: Sable Island 5H-58 (1577.68 m) (SEM) site 2.1 (Table A6.1). Lithic clast made up of muscovite (2), biotite (1), and TiO_2 (4) subparallel slender crystals. Schist.



Figure A6.13: Sable Island 5H-58 (1577.68 m) (SEM) site 2.2 (Table A6.1). Altered detrital ilmenite grain.



Figure A6.14: Sable Island 5H-58 (1577.68 m) (SEM) site 2.3 (Table A6.1). Lithic clast made up of TiO_2 small crystals and altered biotite (3). Schist.



Figure A6.15: Sable Island 5H-58 (1577.68 m) (SEM) site 2.4 (Table A6.1). A lithic clast made up of TiO_2 probably derived from the alteration of an ilmenite grain with zircon inclusions (4,5) and a matrix consisting of quartz, chlorite (1) and very small grains of monazite (3).

1:Quartz + Chlorite 2:TiO₂ + Quartz 3:Quartz + Monazite 4:Zircon 5:Zircon + $6:TiO_2$ + Quartz



1:TiO₂ + Chlorite 2:Tourmaline 3:Quartz + Chlorite + Kaolinite

Figure A6.16: Sable Island 5H-58 (1577.68 m) (SEM) site 2.5 (Table A6.1). Detrital tourmaline (proximal source) grain (2) with inclusions of TiO_2 (1) and silicate inclusions (3).



1:Zircon 2:Pyrite + Quartz 3:Pyrite 4:Quartz + TiO₂ 5:"Ilmenite" 6:"Ilmenite" + Chlorite 7:Ilmenite 8:TiO₂+ 9:Pyrite 10:Quartz + 11:TiO₂+ 12:Ilmenite 13:Chromite 14:Quartz 15:"Ilmenite" 16:Tourmaline 17:TiO₂ 18:Ilmenite 19:"Ilmenite" + 20:Quartz 21:Tourmaline 22:Quartz 23:Garnet 24:TiO₂ 25:Tourmaline 26:Ilmenite

27:Quartz 28:TiO₂ + 29:Ilmenite 30:Ilmenite 31:Muscovite 32:Ilmenite 33:Pyrite 34:Tourmaline 35:Pyrite 36:Ilmenite 37:Spinel 38:Quartz + TiO₂ 39:Quartz 40:TiO₂+ 41:"Ilmenite" 42:"Ilmenite" 43:Quartz 44:TiO₂ + 45:Xenotime 46:Quartz 47:"Ilmenite" 48:Quartz 49:TiO₂+ 50:Ilmenite 51:Ilmenite 52:Pyrite 53:Ilmenite 54:Pyrite +

Figure A6.17: Sable Island 5H-58 (1577.68 m) (SEM) site 3 (Table A6.1)



Figure A6.18: Sable Island 5H-58 (1577.68 m) (SEM) site 3.1 (Table A6.1). Lithic clast made up of TiO_2 (2) blebs, quartz (1) and muscovite (3)



Figure A6.19: Sable Island 5H-58 (1577.68 m) (SEM) site 3.2 (Table A6.1). Partly altered detrital ilmenite grain.

1:Ilmenite 2:"Ilmenite" + 3:"Ilmenite"



Figure A6.20: Sable Island 5H-58 (1577.68 m) (SEM) site 3.3 (Table A6.1). Diagenetic ?ropey TiO_2 (3) surrounds detrital ilmenite (1,2) grains.



1:Zircon 27:"Ilmenite" 2:Tourmaline 28:Zircon 3:Quartz 29:Zircon 4:Ilmenite 30:TiO₂ 5:"Ilmenite" 31:Ilmenite 6:TiO₂+ 32:Ilmenite 7:Tourmaline 33:TiO₂ 8:"Ilmenite" 34:Ilmenite 9:Pyrite 35:Ilmenite 10:Tourmaline 36:Ilmenite 11:Tourmaline 37:Ilmenite 12:TiO₂ 38:Zircon 13:TiO₂+ 39:Ilmenite 14:TiO₂+ 40:"Ilmenite" 15:Tourmaline 41:"Ilmenite" 42:Monazite 16:Zircon 43:Ilmenite 17:Pyrite 44:Pyrite 18:TiO₂ + 45:Zircon Quartz 46:Ilmenite 19:Ilmenite 47:"Ilmenite" 20:Spinel 48:"Ilmenite" 21:TiO₂ 49:Ilmenite 22:Ilmenite 50:Tourmaline 23:Spinel 51:Ilmenite + Quartz 24:"Ilmenite" 51:Ilm 25:Ilmenite + Quartz 26:Quartz

Figure A6.21: Sable Island 5H-58 (1577.68 m) (SEM) site 4 (Table A6.1)



1:Ilmenite + 2:"Ilmenite" + 3:Quartz 4:Quartz + Muscovite 5:TiO₂ + Quartz

Figure A6.22: Sable Island 5H-58 (1577.68 m) (SEM) site 4.1 (Table A6.1). Lithic clast made up of detrital partly altered ilmenite (1,2) with quartz (3) inclusions in a matrix of quartz and mica (4).



Figure A6.23: Sable Island 5H-58 (1577.68 m) (SEM) site 4.2 (Table A6.1). Diagenetic blebs of TiO_2 (1) and subhedral, straight crystal outlines, rutile cement (2).



Figure A6.24: Sable Island 5H-58 (1577.68 m) (SEM) site 4.3 (Table A6.1). Lithic clast made up of partly altered ilmenite grain in a chlorite matrix. Schist.



Figure A6.25: Sable Island 5H-58 (1577.68 m) (SEM) site 4.4 (Table A6.1). Diagenetic crystals of TiO_2 (1,3) with ?wrinkle (corroded, uneven) texture.

 $1:TiO_2$ 2:Chlorite + $3:TiO_2$



1:Ilmenite 20:Garnet 2:"Ilmenite" 21:"Ilmenite" 22:"Ilmenite" 3:Ilmenite + Quartz 23:Ilmenite 24:Ilmenite o20 4:TiO₂ + 25:Tourmaline 5:Zircon 6:Ilmenite 26:Ilmenite 27:"Ilmenite" 7:Tourmaline 28:Pyrite 8:Ilmenite 29:TiO₂+ 9:"Ilmenite" 10:Tourmaline 30:Quartz + 11:Quartz + TiO₂ Pyrite? 12:Zircon 13:Zircon 14:Zircon 15:Staurolite 16:"Ilmenite" 17:Muscovite + Ilmenite? 18:Tourmaline 19:TiO₂

Figure A6.26: Sable Island 5H-58 (1577.68 m) (SEM) site 5 (Table A6.1)



Figure A6.27: Sable Island 5H-58 (1577.68 m) (SEM) site 5.1 (Table A6.1). A very fine grained rounded fragment made up of diagenetic TiO_2 + chlorite. Detrital cement from a schist?

1:Chlorite + 2:TiO₂ + Chlorite 3:Chlorite + TiO₂



Figure A6.28: Sable Island 5H-58 (1577.68 m) (SEM) site 5.2 (Table A6.1). Diagenetic TiO_2 (2) cement.



1:Chlorite + 2:TiO₂ + 3:Muscovite + TiO₂ 4:Chlorite + Muscovite

Figure A6.29: Sable Island 5H-58 (1577.68 m) (SEM) site 5.3 (Table A6.1). Lithic clast made up of TiO_2 (2) crystals in a matrix of chlorite and mica (1,3).



1:"Ilmenite" + 2:TiO₂ 3:"Ilmenite" + 4:Ilmenite +

Figure A6.30: Sable Island 5H-58 (1577.68 m) (SEM) site 5.4 (Table A6.1). Partly altered detrital ilmenite (1,4) grain with TiO₂ (2) blebs.



Figure A6.31: Sable Island 5H-58 (1577.68 m) (SEM) site 6 (Table A6.1)



1:TiO₂ + 2:Quartz + TiO₂ 3:TiO₂ +

Figure A6.32: Sable Island 5H-58 (1577.68 m) (SEM) site 6.1 (Table A6.1). Diagenetic TiO_2 (1,3) with wrinkle texture (corroded, uneven fractures).



Figure A6.33: Sable Island 5H-58 (1577.68 m) (SEM) site 6.2 (Table A6.1). Partly altered ilmenite (1) grain with quartz (2) and kaolinite (3) in a chloritic matrix (4). ?Lithic clast (schist).



1:Chlorite + Muscovite 2:TiO₂ + 3:TiO₂ + 4:TiO₂ + Chlorite +

Figure A6.34: Sable Island 5H-58 (1577.68 m) (SEM) site 6.3 (Table A6.1). A fractured TiO_2 (2,3) grain in a chloritic matrix (schist).



1:Chlorite + Muscovite 2:Zircon

Figure A6.35: Sable Island 5H-58 (1577.68 m) (SEM) site 6.4 (Table A6.1). Lithic clast made up of chlorite and muscovite (1) with zircon inclusion. Schist.



Figure A6.36: Sable Island 5H-58 (1577.68 m) (SEM) site 6.5 (Table A6.1). TiO₂ (2,3) crystals with cellular texture and with chlorite inclusions (1).



1:Zircon 25:Tourmaline 2:Pyrite + 26:Ilmenite 3:Quartz 27:Zircon 4:Ilmenite 28:"Ilmenite" 5:Pyrite 29:TiO₂+ 6:Tourmaline 30:Ilmenite 7:Staurolite 31:Mix 8:TiO₂ 32:Pyrite 9:"Ilmenite" 33:Quartz 10:Quartz + TiO₂ 11:Ilmenite 12:"Ilmenite" + 13:TiO₂ + 14:Quartz + Pyrite 15:"Ilmenite" + 16:Tourmaline 17:Ilmenite 18:Monazite 19:Quartz 20:Mix 21:Chlorite + 22:Pyrite 23:Ilmenite 24:Pyrite +

Figure A6.37: Sable Island 5H-58 (1577.68 m) (SEM) ^{23:IIn} site 7 (Table A6.1) ^{24:Py}



1:Kaolinite + 2:TiO₂ + 3:Kaolinite + 4:TiO₂ + Quartz + 5:Kaolinite + $6:TiO_2$ + 7:Quartz

Figure A6.38: Sable Island 5H-58 (1577.68 m) (SEM) site 7.1 (Table A6.1). a) a fragment that is a mixture of kaolinite (1,3,5), TiO_2 (2) and quartz (?lithic clast); b) lithic clast made up of quartz (7) and TiO_2 (6). Both are probably lithic clasts from a schist.



Figure A6.39: Sable Island 5H-58 (1577.68 m) (SEM) site 7.2 (Table A6.1). a) detrital ilmenite grain (1,2); b) detrital diagenetic TiO_2 grain (3) (rounded, TiO_2 crystallites supported by several small inclusions.

1:"Ilmenite" + 2:"Ilmenite" + 3:TiO₂ +



1:Monazite 2:Ilmenite 3:"Ilmenite" + 4:Tourmaline 5:Ilmenite 6:TiO₂ + 7:Tourmaline 8:Zircon 9:Quartz 10:Pyrite 11:Pyrite 12:Ilmenite 13:Tourmaline 33:Quartz + 14:"Ilmenite" + TiO₂ 15:Ilmenite 16:TiO₂ 17:Quartz 18:Pyrite 19:Quartz 20:Pyrite 21:"Ilmenite"

22:Ilmenite 23:Ilmenite 24:Pyrite 25:Quartz 26:Pyrite 27:Ilmenite 28:"Ilmenite" 29:TiO₂ + Quartz 30:Tourmaline 31:Ilmenite 32:"Ilmenite'

Figure A6.40: Sable Island 5H-58 (1577.68 m) (SEM) site 8 (Table A6.1)



Figure A6.41: Sable Island 5H-58 (1577.68 m) (SEM) site 8.1 (Table A6.1). Similar to Figure 27.

1:Chlorite + 2:Chlorite + TiO₂ + 3:TiO₂ + Chlorite



1:Muscovite + Chlorite 2:"Ilmenite" + 3:Quartz 4:Ti O_2 + 5:"Ilmenite" +

Figure A6.42: Sable Island 5H-58 (1577.68 m) (SEM) site 8.2 (Table A6.1). Partly altered detrital ilmenite (2,5) grain with quartz (3) and altered muscovite (1) inclusions.



25:Ilmenite 26:"Ilmenite" + 27:Tourmaline 28:Garnet 29:Ilmenite + 30:Pyrite

Figure A6.43: Sable Island 5H-58 (1577.68 m) (SEM) site 9 (Table A6.1)



1:TiO₂ 2:Chlorite + 3:Quartz 4:TiO₂

Figure A6.44: Sable Island 5H-58 (1577.68 m) (SEM) site 9.1 (Table A6.1). TiO₂ subhedral grains (1,4) associated with quartz (3) and clay minerals (2). ?Lithic clast (schist).



1:Zircon + 20:Tourmaline 2:Tourmaline 21:Quartz 22:"Ilmenite" 4:Quartz 23:Ilmenite 5:Monazite 24:Quartz + TiO₂ 6:Ilmenite 25: 7:"Ilmenite" 26: 8:"Ilmenite" 27:Quartz 9:Zircon 28:Mix 10:TiO₂ + 29:Ilmenite 30:Zircon + Quartz 31:Quartz 11:Zircon 32:Tourmaline 12:Zircon 33:Pyrite 13:Ilmenite 14:Ilmenite + Quartz + 15:Pyrite 16:Zircon 17:Zircon

Figure A6.45: Sable Island 5H-58 (1577.68 m) (SEM) site 10 (Table A6.1)



1:TiO₂ 2:Kaolinite + TiO₂ 3:"Ilmenite"

Figure A6.46: Sable Island 5H-58 (1577.68 m) (SEM) site 10.1 (Table A6.1). Detrital altered ilmenite grain.



Figure A6.47: Sable Island 5H-58 (1577.68 m) (SEM) site 10.2 (Table A6.1). TiO₂ grains in trellis pattern (3), and some altered ilmenite relics (1,4), all with quartz (2) and chlorite mixtures.

1:"Ilmenite" 2:Quartz 3:TiO₂ + 4:"Ilmenite" 5:Chlorite + TiO₂ +



Figure A6.48: Sable Island 5H-58 (1577.68 m) (SEM) site 10.3 (Table A6.1). TiO₂ (1) with ropey texture cuts a matrix made up of quartz (2) and clays. ?Lithic clast (schist).



1:TiO₂ + 2:Quartz + TiO₂ 3:Quartz + 4:Chlorite + 5:TiO₂ + Chlorite +

Figure A6.49: Sable Island 5H-58 (1577.68 m) (SEM) site 10.4 (Table A6.1). Slender crystals of TiO_2 (1,5), some with ropey texture, cut matrix made up of quartz (2,3), and chlorite (4) mixed with other clays or altering muscovite. Lithic clast (schist).



Figure A6.50: Sable Island 5H-58 (1577.68 m) (SEM) site 10.5 (Table A6.1). Detrital xenotime (1) and probably an altered ilmenite (2).



Figure A6.51: Sable Island 5H-58 (1577.68 m) (SEM) site 10.6 (Table A6.1). Slender crystals of TiO_2 (1) in a matrix made up of quartz (2,3) and muscovite (1). Rounded?

 $1:TiO_2$ + Muscovite 2:Quartz + TiO_2 3:Quartz +



1:Monazite 22:Zircon $2:TiO_2$ + 23:Pyrite ? 3:Quartz 24:"Ilmenite" + 25:TiO₂+ 4:Pyrite 5:Monazite 26:"Ilmenite" 6:Zircon 7:Zircon 8:Zircon 9:Ilmenite 10:Pyrite + Quartz + 11:Tourmaline 12:Ilmenite 13:Quartz + TiO₂ 14:TiO₂+ 15:"Ilmenite" 16:"Ilmenite" 17:Quartz 18:Pyrite 19:Chlorite + 20:Ilmenite + 21:Zircon

Figure A6.52: Sable Island 5H-58 (1577.68 m) (SEM) site 11 (Table A6.1)



Figure A6.53: Sable Island 5H-58 (1577.68 m) (SEM) site 11.1 (Table A6.1). TiO₂ grain with checker-board pattern (1,2) and probably with some chloritized muscovite relics (3).



1:TiO₂ 2:Chlorite + TiO₂ + 3:"Ilmenite" 4:"Ilmenite"

Figure A6.54: Sable Island 5H-58 (1577.68 m) (SEM) site 11.2 (Table A6.1). Partly altered ilmenite (3,4) and with chloritized inclusions (2).



2:"Ilmenite" 3:Pyrite 4:TiO₂ 5:Tourmaline 6:TiO₂ + 7:Ilmenite 8:Tourmaline 9:Zircon 10:TiO₂+ 11:"Ilmenite" 12:Pyrite 13:Pyrite 14:"Ilmenite" 15:Ilmenite 16:TiO₂ + 17:"Ilmenite" 18:Zircon 19:Ilmenite 20:Ilmenite 21:Albite 22:Quartz + Ilmenite 23:Ilmenite 24:Zircon

25:Xenotime 26:Zircon 27:Zircon 28:Tourmaline 29:"Ilmenite"

Figure A6.55: Sable Island 5H-58 (1577.68 m) (SEM) 23 site 12 (Table A6.1)



1:Chlorite + Albite 2:Muscovite + ?Ilmenite 3:TiO₂ +

Figure A6.56: Sable Island 5H-58 (1577.68 m) (SEM) site 12.1 (Table A6.1). A network of TiO_2 (3) blebs with chloritized inclusions (1) and in a muscovite-rich (2) matrix. Plithic clast



24:Quartz 1:Zircon $2:TiO_2$ 25:Ilmenite 26:Ilmenite 27:"Ilmenite" 4:Pyrite 28:Quartz 5:"Ilmenite" 29:Spinel 6:Zircon 7:Tourmaline 30:Tourmaline 31:Quartz 32:Pyrite 9:Pyrite 33:Ilmenite 10:Pyrite + 34:Ilmenite 11:Pyrite 35:Ilmenite 12:Pyrite + 36:Ilmenite 13:Chlorite + 37:Pyrite + 14:Ilmenite 38:Pyrite + 15:Ilmenite 39:Mix 16:Zircon + 40:Pyrite 17:TiO₂+ 41:TiO₂ + 18:Quartz 19:Ilmenite 20:"Ilmenite" 21:"Ilmenite" 22:Monazite

Figure A6.57: Sable Island 5H-58 (1577.68 m) (SEM) $^{23:Quartz + TiO_2}$ site 13 (Table A6.1)



Figure A6.58: Sable Island 5H-58 (1577.68 m) (SEM) site 13.1 (Table A6.1). Rounded lithic clast of probably schist cement.



Figure A6.59: Sable Island 5H-58 (1577.68 m) (SEM) site 13.2 (Table A6.1). Similar to Figure 47.

1:Quartz 2:TiO₂ + Quartz 3:Chlorite +



1:Pyrite + 25:Pyrite 2:Mix 26:Ilmenite 3:Tourmaline 27:"Ilmenite" 28:"Ilmenite" 4:"Ilmenite" 5:Pyrite + ? 29:Pyrite 6:Mix 30:TiO₂+ 7:Zircon 8:Ilmenite 9:Ilmenite 10:Tourmaline 11:Ilmenite 12:Tourmaline 13:Ilmenite 14:Quartz + TiO₂ 15:Zircon 16:Ilmenite + 17:Zircon 18:Tourmaline 19:Quartz 20:Zircon 21:Zircon 22:"Ilmenite" 23:"Ilmenite" 24:Tourmaline

Figure A6.60: Sable Island 5H-58 (1577.68 m) (SEM) ²²/₂₄ site 14 (Table A6.1)



Figure A6.61: Sable Island 5H-58 (1577.68 m) (SEM) site 14.1 (Table A6.1). Pyrite framboids (1) in a matrix made up of chloritized muscovite (3). Lithic clast.

1:Pyrite + 2:Pyrite 3:Muscovite + Pyrite + Chlorite



Figure A6.62: Sable Island 5H-58 (1577.68 m) (SEM) site 14.2 (Table A6.1). Similar to Figure 53.



1:Muscovite + Chlorite 2:Ilmenite 3:Quartz 4:Muscovite

Figure A6.63: Sable Island 5H-58 (1577.68 m) (SEM) site 14.3 (Table A6.1). Detrital ilmenite grain with quartz inclusions (3) and associated with muscovite (1,4).



1:Muscovite 2:Quartz 3:"Ilmenite" 4:Quartz +

Figure A6.64: Sable Island 5H-58 (1577.68 m) (SEM) site 14.4 (Table A6.1). Lithic clast made up of partly altered ilmenite (3) set in a matrix of muscovite (1) and quartz (2). Schist.



1:Quartz 2:TiO₂ 3:TiO₂ + Chlorite +

Figure A6.65: Sable Island 5H-58 (1577.68 m) (SEM) site 14.5 (Table A6.1). A network of TiO_2 (2) blebs in a quartz (1) and probably chlorite (3) matrix. Lithic clast.



1:Ilmenite 2:Ilmenite + 3:TiO₂+ 4:Tourmaline 5:Quartz + TiO₂ + 6:"Ilmenite" 7:Ilmenite 8:Ilmenite 9:K-Feldspar + 10:Pyrite 11:Tourmaline 12:Ilmenite 13:Quartz 14:TiO₂ 15:Zircon 16:Pyrite 17:Tourmaline 18:Pyrite 19:Pyrite 20:"Ilmenite" 21:Mix 22:"Ilmenite" + 23:Tourmaline

24:Ilmenite + Quartz + 25:Ilmenite 26:Quartz + TiO₂ 27:Ilmenite 28:"Ilmenite" 29:Ilmenite 30:TiO₂+ 31:Ilmenite 32:"Ilmenite" + 33:"Ilmenite" 34:"Ilmenite" + 35:Pyrite + ? 36:?Greigite 37:Spinel

Figure A6.66: Sable Island 5H-58 (1577.68 m) (SEM) site 15 (Table A6.1)



Figure A6.67: Sable Island 5H-58 (1577.68 m) (SEM) site 15.1 (Table A6.1). A lithic clast made up of quartz (3), subhedral grains of TiO_2 (2) and a patch of slender crystals of K-feldspar (1). Lithic clast.



1:TiO₂ + 2:Chlorite + 3:TiO₂ + Chlorite

Figure A6.68: Sable Island 5H-58 (1577.68 m) (SEM) site 15.2 (Table A6.1). Similar to Figure 54.



 $1:TiO_2 + Quartz$ 25:Pyrite $2:TiO_2$ 26:Ilmenite3:Quartz27:Ilmenite4:Ilmenite28:"Ilmenite" +5:Ilmenite29:Ilmenite" +6:Ilmenite29:Ilmenite7:Tourmaline30:Mix $8:Quartz + TiO_2$ 31:Biotite9:Ilmenite31:Biotite10:Pyrite ?11:Ilmenite12:Ilmenite13:Tourmaline14:"Ilmenite"15:Tourmaline16:?Greigite17:Tourmaline18:Zircon19:Ilmenite19:Ilmenite $20:TiO_2$ 21:Ilmenite +22:Quartz

Figure A6.69: Sable Island 5H-58 (1577.68 m) (SEM) 23:Zircon site 16 (Table A6.1) 24:Quartz



1:Xenotime + TiO_2 2:Chlorite + Feldspar 3:TiO₂ +

Figure A6.70: Sable Island 5H-58 (1577.68 m) (SEM) site 16.1 (Table A6.1). Similar to Figure 65.



Figure A6.71: Sable Island 5H-58 (1577.68 m) (SEM) site 16.2 (Table A6.1). Similar to Figure 48.

1:TiO₂ + 2:TiO₂ + 3:Chlorite + Feldspar 4:TiO₂ +



Figure A6.72: Sable Island 5H-58 (1577.68 m) (SEM) site 16.3 (Table A6.1). Pyrite (2,3) rim on detrital quartz (1) with muscovite inclusions.



Figure A6.73: Sable Island 5H-58 (1577.68 m) (SEM) site 17 (Table A6.1)



Figure A6.74: Sable Island 5H-58 (1577.68 m) (SEM) site 17.1 (Table A6.1). Partly altered ilmenite (1) with chloritized silicate (?feldspar) inclusions.



Figure A6.75: Sable Island 5H-58 (1577.68 m) (SEM) site 17.2 (Table A6.1). A patch of small partly altered ilmenite (2) grains in a matrix of quartz (1). Lithic clast (quartzite?).

1:Quartz 2:"Ilmenite" + Quartz



Figure A6.76: Sable Island 5H-58 (1577.68 m) (SEM) site 18 (Table A6.1)



Figure A6.77: Sable Island 5H-58 (1577.68 m) (SEM) site 18.1 (Table A6.1). Similar to Figure 65.


1:Ilmenite + 2:Ilmenite + Chlorite + 3:"Ilmenite" 4:Ilmenite + Kaolinite + Chlorite +

Figure A6.78: Sable Island 5H-58 (1577.68 m) (SEM) site 18.2 (Table A6.1). Partly altered detrital ilmenite grain (1,2) with silicate inclusions.



Figure A6.79: Sable Island 5H-58 (1577.68 m) (SEM) site 19 (Table A6.1)

1:Ilmenite 2:TiO₂ + Quartz 3:TiO₂+ 4:"Ilmenite" 5:TiO₂ + Quartz 6:Mix 7:Pyrite 8:Quartz 9:Quartz 10:Pyrite 11:Quartz 12:Monazite 13:TiO₂ + 14:Pyrite 15:Tourmaline 16:"Ilmenite" 17:Ilmenite 18:Ilmenite



1:TiO₂ + Quartz 2:Quartz 3:TiO₂ + Chlorite 4:Quartz + TiO₂

Figure A6.80: Sable Island 5H-58 (1577.68 m) (SEM) site 19.1 (Table A6.1). A rounded, foliated lithic clast of a rutile. Network of blebs in a matrix of quartz (2) probably mixed with chlorite.



1:Ilmenite 2:"Ilmenite" + Chlorite 3:"Ilmenite" + Chlorite 4:Mix 5:Ilmenite

Figure A6.81: Sable Island 5H-58 (1577.68 m) (SEM) site 19.2 (Table A6.1). Ilmenite (1,5) grain with chlorite (2,3) along cleavage planes.



1:Ilmenite 22:Spinel 2:"Ilmenite" + 23:TiO₂ 3:Ilmenite 24:Chromite 4:Monazite 25:Zircon 5:TiO₂ + Quartz 26:Pyrite 6:Tourmaline 27:Ilmenite 7:Tourmaline 28:Tourmaline 8:Ilmenite 29:"Ilmenite" 9:TiO₂ + 30:Quartz 31:Ilmenite 10:Quartz + 32:Spinel + 11:Ilmenite 12:Quartz + TiO₂ + 13:Pyrite 14:Pyrite 15:Ilmenite + Chlorite 16:Ilmenite 17:Quartz 18:"Ilmenite" 19:Zircon 20:Pyrite 21:Zircon

Figure A6.82: Sable Island 5H-58 (1577.68 m) (SEM) site 20 (Table A6.1)



1:Pyrite 2:Quartz + Pyrite + Chlorite

Figure A6.83: Sable Island 5H-58 (1577.68 m) (SEM) site 20.1 (Table A6.1). A patch made up of pyrite framboids (1) and small grains of quartz mixed with chlorite (2).

Sample	Site	Position	Mineral	Si02	Ti02	Al2O3 FeO	MnO	MgO	CaO	Na2O	К2О	P205	SO3	ш	ū	Sc203	V205	Cr203	CoO	NiO	ZnO	As203	sro	ZrO2	Nb2O5	Ag2O	BaO	La203	Ce2O3	Nd2O3	Gd2O3	Tb2O3	Dy203	Er203	Yb203	H02	Ta205	WO3	PbO	ThO2	OsO2 Total	Actual Total
1577.7	1	1 Kfs		66.78	0.41	17.55				1.68	13.58																														100	3 116
1577.7	1	2 Py			0.31	28.61	2 5 9						71.08											-	_	_						-	_						-	-+	100) 221
1577.7	1	4 IIm			63.46	33.01	3.53										ľ																							-	100	0 97
1577.7	1	5 Tur		37.55	1.14	32.75 8.73	3	4.28	0.31	2.24																													_	_	87	100
1577.7	1	6 llm +		29.19	28.54	11.89 25.84	1 0.70	3.84			0.70													_	_	_															100) 69
1577.7	1	7 "IIM" 8 IIm		0.64	50.43	0.82 31.39	0.72	1 20																		_					-	-	_			_				-	100	0 103
1577.7	1	9 Ilm			51.87	46.34	1.79	1.20																																	100	0 105
1577.7	1	10 llm			52.30	45.74	1.95																	_		_															100	J 106
1577.7	1	11 TiO ₂ +	+	0.92	91.73	2.89 2.03	3					1.14	00.00		0.04			1.29						_		_												4.00			100) 98
1577.7	1	12 /Grg 13 Oz		96.32	0.69	2 38 0.83	2						33.03		0.34																-		-		-	_		4.20		-	100	0 102
1577.7	1	14 llm		1.11	53.45	43.16	2.28																																		100	0 105
1577.7	1	15 TiO2 -	+	3.47	88.28	2.12 6.13	3																																		100) 94
1577.7	1	16 Qz		100.00	100.00																			_		_						_								-	100) 122
15//./	1	17 TiO ₂		6.02	100.00	0.00 1.11																		_																	100) 107
1577.7	1	19 Ilm	r	0.03	55.36	43.20	1 45														-				_		-				-			-					+	+	100	0 105
1577.7	1	20 Qz		99.61	0.39	+3.20																																			100	0 122
1577.7	1	21 TiO ₂			100.00								_																			T		T		T				T	100) 107
1577.7	1	22 TiO ₂ -	+	1.06	92.39	1.75 3.28	3		0.39			1.12									<u> </u>						<u> </u>												\rightarrow	\rightarrow	100) 92
1577.7		23 IIm			54.11	43.36	5 1.15	1.38					62.00											_		_												1 00	+	+	100) 108
1577.7	1	25 TiO	+	2.29	95.16	1.18 1.37	,						03.90								1						1				-		-	-	-		1	1.33	+	+	100	0 108
1577.7	1	26 llm +		54.94	21.89	8.95 6.49	9	0.94		0.97	0.57			5.25																									-	_	100	0 116
1577.7	1	27 "llm"			84.29	1.06 14.65	5																									_								_	100) 103
1577.7	1	28 Qz	CH	100.00	4.62	2.64																		_		_						_	_							-+	100) 126
1577.7	1	29 Q2 + 30 Tur	Ghi	37.56	4.62	32.56 4.72	>	7.68	1.24	1.99																										-					87	106
1577.7	1	31 llm			53.13	45.17	0.67	1.03																																	100) 112
1577.7	1	32 "Ilm"			63.82	35.28	0.90																	_		_						_								\rightarrow	100	<u>) 103</u>
1577.7	1	33 Tur 34 Ilm		38.74	0.94	32.95 6.20	1 05	5.94		2.23														-							-		-			-				+	100	105
1577.7	1	35 llm			51.85	45.03	0.90	2.22																																	100	0 109
1577.7	1	36 Qz		100.00																				_		_						_							_	_	100) 125
1577.7	1	37 llm			50.60	45.27	4.13														0.02			_	_	_						_	_							-+	100) 107
1577.7	1	39 Mnz		2.13	55.57	35.00	5 5.50					36.06		0.10			-				0.02					3.42		14.14	32.71	11.44											100	0 102
1577.7	1	40 Zrn		30.32	0.63	0.67	,		0.95															67.4	3																100	J 106
1577.7	1	41 llm		0.70	49.21	50.04	0.76																	_		_														_	100) 107
1577.7	1	42 11m 43 Pv		0.76	0.39	30.83	3 2.28						64.63																								1	1.52			100	0 188
1577.7	1	44 TiO ₂			91.73	2.18 4.01	i					2.08																											-		100	0 97
1577.7	1	45 llm			53.51	43.64	2.85																																	_	100) 106
1577.7	1	46 "llm"		0.01	62.76	36.54	0.70																	_	_	_						_	_							-+	100) 102
1577.7	1	48 "llm"		0.91	69.61	0.72 29.67	0.02										_																								100	0 94
1577.7	1	49 Py				29.09	9						70.91																												100) 232
1577.7	1	50 Ilm			56.31	40.47	3.22																	_		_															100) 103
15//./	1	52 Pv +	+	0.95 1 45	85.82	0.92 39 7/	1			0.63	0.41		1.13		0.50		-				-	-		+	-		-				-	-	-		+	+		4.72	+	+	100	0 134
1577.7	1	53 Ilm		1.43	57.54	40.52	0.92	1.03		0.00			50.04		0.00																							2	\pm	_	100	100
1577.7	1	54 Qz		100.00																																			\neg	エ	100	J 122
1577.7	1	55 TiO ₂			100.00	25.07	1 20					1	1	1					<u> </u>					_	_	_	I				_				_				\rightarrow	\rightarrow	100) 105
1577.7	1	57 TiO.	±	1 70	82.32	3.64 6.79	1.39		0.41	0.83		1.24														_					-	-	_							-	100	<u>1 98</u>
1577.7	1	58 llm	,	4.75	59.59	38.39	2.02		0.41	0.00		1.24					_																								100	0 99
1577.7	1	59 TiO ₂			98.48	1.52	2																																		100	J 110
1577.7	1	60 Tur +		41.95	1.71	26.05 15.86	6	1.54		2.84	0.40			9.63										_		_														_	100) 99
1577.7		61 TiO ₂ ·	+	13.76	75.43	3.14 5.18	3	2.49	4.76	4.00													+	_		_													+	\rightarrow	100) 104
15777		63 Kfs		37.97	1.02	25.66 10.07	+	8.64	1./1	1.93	15.41								-	-	-	-				_	0.85				-		-	-			-	-	-+	+	87 10r	100
1577.7	1	64 TiO ₂		00.00	100.00					0.12													1				0.00												\neg	\neg	100	0 109
1577.7	1.1	1 Zrn		28.50	1.32	0.57 1.37	'		0.99															67.2	5																100) 146
1577.7	1.1	2 TiO ₂	+ Clay	30.56	28.36	11.04 24.04	-	3.51	0.63		1.42							0.44	<u> </u>		-			_		_	<u> </u>												\rightarrow	\rightarrow	100) 107
1577.7	1.1	3 TiO ₂	+ Clov	1.08	91.98	2.57 2.64		4.00	0.61		2 4 4	1.11									-	-	+ +	_	_	_	<u> </u>					_			-+	_		2 60	\rightarrow	\rightarrow	100) 126
1577.7	1.1	5 TiO-	+	42.79	91.21	2.20 3.24	1	4.09	0.61		2.11	1.39				-					1			-			-				\rightarrow						-	2.00	+	+	100	0 126
1577.7	1.1	6 TiO ₂	+	1.48	91.87	2.50 2.62	2		0.51			1.02							-		1						1				-+			-+			-		+	+	100	0 130
1577.7	1.2	1 Chl +		38.52	2.77	15.48 28.33	3	2.64	0.89	0.68	1.30			4.69																							4	4.69	_	_	100	130
1577.7	1.2	2 Chl +	TiO ₂ +	35.06	11.59	13.04 23.82	2	2.66	0.98	0.71	1.86			5.16																							Ę	5.11			100	J 136
1577.7	1.2	3 "llm"			93.71	6.29	91								1																										100	JI 139

Sample	Site	Mineral	si02	TiO2	AI2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	ш	ū	Sc2O3	V205	Cr203	CoO	NiO	ZnO	As203	SrO	Y203	ZrO2	Nb2O5	Ag2O	BaO	La203	Ce2O3	Nd2O3	Gd2O3	Tb203	Dy203	Er203	Yb203	Щ02	Ta205	WO3	PbO	ThO2	OsO2 Total	Actual Total
1577.7	1.2	4 Chl +	37.14	2.02	13.44	31.62		2.81	0.90	0.81	0.55			4.19																								6	6.52			10	0 126
1577.7	1.2	5 Chl + TiO ₂ +	26.06	24.57	8.93	28.46		1.71	0.89	0.40	1.87			2.32																								4	1.80			100	0 109
1577.7	1.3	1 QZ 2 TiO ₂ + Oz	<u>99.57</u> 5.14	93.08	0.96	0.82																															-					100	0 139
1577.7	1.3	3 TiO ₂ + Clav	42.37	11.08	27.49	11.47		0.86		0.84	0.68			5.20																	_										-	10	0 111
1577.7	1.3	4 TiO ₂ +	1.13	92.70	1.47	3.18		0.00	0.35		0.00	1.17		0.20																												10	0 131
1577.7	1.3	5 TiO ₂ +		91.73	1.18	3.90			0.59			2.60																														10	0 129
1577.7	1.4	1 TiO ₂ +	0.78	93.11	1.79	2.41			0.37			0.92	0.62																													100	0 129
1577.7	1.4	2 TiO ₂ +	0.71	93.89	1.13	2.58			0.35			0.76	0.58																													100	0 130
1577.7	1.4	3 TIO ₂ +	0.98	93.36	2.07	3.27			0.28			1.03															-					_		-			-					100	0 1/2
1577.7	1.5	2 TiO ₂ +	0.30	97.57	0.53	1.17																																				10	0 144
1577.7	1.5	3 Py		0.51		28.61							70.87																													10	0 311
1577.7	1.6	1 TiO ₂ + Qz	7.22	92.14		0.65																																				100	0 144
1577.7	1.6	2 Qz + TiO ₂	95.89	3.24	0.47	0.41																															_					100	0 164
1577.7	1.0	1 llm + Chl	26.23	10.87	13.45	31.42		1.70		2.67				8.53																			-					5	5.13			10	0 136
1577.7	1.7	2 "Ilm" + Chl	8.07	74.80	4.27	10.70			0.42	0.71		1.04		2.00																								Ĭ				10	0 127
1577.7	1.8	1 Chl +	39.80	0.58	23.11	20.82		1.95	<u> </u>	2.97	0.29			7.19			\vdash		-																			3	3.29			100	0 134
1577.7	1.0	3 TiO ₂	34.61	98.88	15.08	1.12		3.11		3.59	0.55			10.43												-						-					-	2				10	0 144
1577.7	1.8	4 Py +	0.94	0.98	0.32	29.14			0.16	0.88			67.57																													10	0 288
1577.7	1.8	5 "llm" +	1.65	68.53	0.87	28.17			0.26	0.52																																10	0 132
1577.7	2	1 TiO ₂		54.79		13 58	0.86	0.77																													-					100	0 108
1577.7	2	3 "IIm"		67.95		30.75	1.30	0.77																																		100	0 99
1577.7	2	4 Zrn	30.93																						69.07																	10	0 120
1577.7	2	5 llm + Chl	95.83	2 31	1.44	38.36	2.81				0.27																-					_	-	-			-					100	0 103
1577.7	2	7 TiO ₂	33.03	100.00	0.02	0.77					0.21																															10	0 108
1577.7	2	8 TiO ₂		99.12		0.88																																				10	0 107
1577.7	2	9 Tur	38.19	0.64	33.03	8.84		4.17		2.13																																87	/ 102
1577.7	21	0 Tur 1 Mnz	39.09		29.32	8.05		7.78	1.35	2.76		39.73															3 76		12.96	30.07	12 12	_		-			-					10	103
1577.7	2 1	2 Kfs	66.08	0.45	17.54				1.00	1.03	14.90	00.10															0.10		12.00	00.07												100	0 122
1577.7	21	3 Py	0.34			28.82							70.84																													100	0 226
1577.7	21	4 QZ 5 Ilm	100.00	58.25		38.60	3.15															_				_	-	_				_	-	-	-						-	100	0 105
1577.7	21	6 "llm"		62.60	0.97	34.90		1.53																																		10	0 103
1577.7	21	7 IIm	9.36	55.26		31.94	3.43					40.40							1 42	0.77	,			44.70								2 00	1.00	5 40		2 20	_					100	0 110
1577.7	21	9 "llm"	0.68	71.16	0.87	26.47	0.81					40.19							1.45	0.77				44.70				-				2.00	1.02	5.10		5.20					-	10	0 100
1577.7	22	0 "Ilm" +	1.67	61.50	1.44	32.21	2.42	0.76																																		10	0 100
1577.7	22	1 Qz	99.53	0.47		26.40		1.09																			_	_						_			_					100	0 123
1577.7	22	3 IIm		56.61		42.36	1.03	1.00																																		10	0 102
1577.7	22	4 TiO ₂		99.45		0.55																																				10	0 106
1577.7	22	25 TiO ₂ +	9.88	81.54	6.12	1.13					1.33																															100	0 108
1577.7	22	26 - 11m" 27 Tur	37 90	69.11	31.20	28.58	2.31	7.42	0.74	2.22												-					-							-					-			100	<u>J 97</u> 7 103
1577.7	22	8 "Ilm"	57.50	63.63	020	33.90	1.25	1.22	5.17																																	10	0 99
1577.7	22	9 IIm		53.84		45.59	0.57		— T																		_							_		_	_				_	100	0 106
15//.7	23		1 10	55 92	0.78	38.60	3.51										-		-								-					_	-	-			_					100	0 106
1577.7	23	2 Zm	30.75	55.52	0.70	30.00	0.01																		69.25																	10	0 123
1577.7	23	3 TiO ₂ +	39.78	51.68	5.36	1.87					1.31																															10	0 112
1577.7	23	4 Tur	38.17	0.97	33.02	5.42		7.06		2.37																											_					87	101
1577.7	23	6 "IIm"		77.67		21.80	0.53												-																-		-		-			10	0 92
1577.7	23	57 "llm"		73.87	0.65	23.28	1.85		0.35																																	100	0 98
1577.7	23	IB IIm	28.07	52.80	55.50	47.20		1.00																			_							_		_	_					100	0 106
1577.7	24	0 Tur	28.97	0.74	33.03	5.78		6.58	0.72	1.96									-									-				-							-			100	7 101
1577.7	24	1 TiO ₂ +	1.00	90.43	1.98	4.68		0.00	0.43			1.48																														10	0 90
1577.7	24	2 TiO ₂	0.94	99.06																																						10	0 104
1577.7	24	3 Tur	38.86	05.5.	32.28	7.47		5.79	0.45	2.15							\square				+				\vdash	T	[[]		[[[-F				87	99
15//.7	24	1102+	1.59	95.54	1.15	1.72							48 78						-																			2	2 00			100	0 137
1577.7	24	6 IIm	0.00	53.43	0.09	43.34	0.70	2.54					20.70																									2				100	0 110
1577.7	24	7 TiO ₂ +	4.36	90.99	1.28	3.36																																				10	0 104
1577.7	24	8 Zrn	28.97	04.41	1.16	1.11			1.00							1.08									64.59								_			2	.10	-	_			100	0 109
13//./	L 2 4	1002 +	17.93	01.41	1	U.00									1		i i		i		1																					110	J 113

Sample	Site	Mineral	Si02	TiO2	AI2O3 FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	Ŀ	ō	Sc203	0070	CoO		ZnO		As203 SrO	Y203	ZrO2	Nb205	Ag2O	BaO	La203	Ce203	Nd2O3	Gd2O3	Tb203	Dy203	Er203	Yb203	Hf02	Ta205	WO3	Db0	0s02	Total
1577.7	2	50 Tur	36.97	1.16	28.70 7.20)	7.27	0.64	2.54				2.53																											87 10
1577.7	2	51 Mnz						1.54			38.28		0.16			_	_	_		_					2.99	1	5.51	30.22	11.30										_	100 10
1577.7	2	52 Zrn	31.45	4.44	36.05 13.06		3.67	0.45	1.24	0.46						-	_	_					68.55																	100 12
1577.7	2	54 Mix	28.86	10.81	12.88 30.08	3	2.24	0.45	2.71	0.40			8.25																								4.18			100 8
1577.7	2	55 Tur	36.63	0.95	32.60 6.82	2	5.24		2.25				2.51					_		_																				87 10
1577.7	2	56 Zm	30.08	1.43	24 22 14 06	2	5.69		0.25	4.45			2.22			_		_		-		_	66.56												1.93					100 11
1577.7	2.1	2 Ms	50.11	0.46	28.03 3.27	7	1.95		0.35	8.20			2.98			-											-													95 14
1577.7	2.1	3 TiO ₂ +	14.52	71.75	8.34 2.21	1	0.77		0.59	1.83																														100 11
1577.7	2.1	4 TiO ₂ +	1.25	97.45	0.45 0.63	3				0.21																														100 14
1577.7	2.1	5 TiO ₂ + Ms	18.33	61.96	11.21 1.39	9	0.69		1.02	2.16			3.23			_	_	_		_																			_	100 15
1577.7	2.2	1 TiO ₂ +	1.02	91.65	1.88 4.02	2		0.43			1.00					_		_	_	-			-		-												1 76		_	100 12
1577.7	2.3	1 TiO ₂ +	0.83	97.35	0.38 1.29	9		0.54			1.13																										1.70			100 12
1577.7	2.3	2 TiO ₂ +	1.52	95.16	1.00 1.63	3		0.70																																100 13
1577.7	2.3	3 Bt	47.75	1.89	13.23 24.47	7	2.84		0.98	4.84																														96 10
1577.7	2.4	1 Qz + Chl	76.59	0.57	8.44 9.32	2	3.90			1.19						_	_	_		_			-																_	100 15
1577.7	2.4	3 Oz + Mnz	33.73	53.23	0.43	,					24 72		-0.16			-		-									9 21	22 78	8 97											100 14
1577.7	2.4	4 Zrn	30.45	1.22																			68.33																	100 16
1577.7	2.4	5 Zrn +	29.17	4.03	0.49	9		0.36		_						_	_	+			_		65.96	-	1	\vdash	_									$\left - \right $			_	100 15
15/7.7	2.4	6 11U ₂ + QZ 1 TiO + Chl	20.05	27.85	0.34	+ 2.02	1.82	0.47	0.00				$ \rightarrow $			+	+	_		+			+			\vdash				\vdash					-				_	100 15
1577.7	2.5	2 Tur	38,56	0.36	34.63 8.93	3 2.33	3.05	0.25	1.22							+		+				+	+	1	1	+			_				-						+	87 12
1577.7	2.5	3 Qz + Chl + Kln	85.18		10.59 2.57	7	1.07	0.25	0.33																															100 14
1577.7	3	1 Zrn	29.91	0.69	0.98	3		0.61				40.46	2.40	1	0.58		_	_		_	_		67.92																_	100 11
1577.7	3	2 Py + Q2 3 Pv	0.71	0.00	34.83	3						64.47	2.49		-		_	-					-				-		_											100 14
1577.7	3	4 Qz + TiO ₂	51.67	47.58	0.75	5																																		100 10
1577.7	3	5 "Ilm"		88.17	11.83	3										_	_	_		_			_																_	100 10
1577.7	3	6 "llm" + Chi 7 llm	11.04	50.53	6.27 14.20	2.06	0.80		0.80							_		-	_						-		_													100 9
1577.7	3	8 TiO ₂ +	7.58	88.67	1.90 1.27	7				0.58																														100 11
1577.7	3	9 Py **	1.27	0.48	43.82	2						51.82											_														2.61		_	100 12
1577.7	3	10 Qz +	93.77	0.43	2.90	7						2.91				-	_	-			-		-																	100 11
1577.7	3	12 llm	0.21	53.72	43.73	3 1.26	1.29									_																							-	100 10
1577.7	3	13 Chr		0.49	14.82 17.31	1	7.30									60	.08																							100 10
1577.7	3	14 Qz	100.00	66.67	22.22											_	_	_		_		_	_																_	100 12
1577.7	3	16 Tur	37.23	0.74	31.35 7.67	7	6.89	1.00	2.11																															87 10
1577.7	3	17 TiO ₂		100.00)																																			100 10
1577.7	3	18 llm	1 47	53.20	43.77	7 0.70	2.33									_	_	_		_			-																_	100 10
1577.7	3	20 Qz	100.00	03.74	1.52 12.07																								_										-	100 12
1577.7	3	21 Tur	38.74	0.87	33.81 6.91	1	4.61		2.05																															87 10
1577.7	3	22 Qz	100.00		21.02.20.75	4 29	2.26	1.02								_	_	_		_		_	_																_	100 11
1577.7	3	24 TiO ₂	39.03	99.41	0.59	9 4.30	2.20	1.52																																100 10
1577.7	3	25 Tur	38.48	0.97	31.39 6.92	2	6.96		2.29																															87 10
1577.7	3	26 llm	00.50	53.98	42.97	3.05											_	_		_	_		-																_	100 10
1577.7	3	28 TiO ₂ +	8.62	77.23	5.76 4.33	3			0.65				3.42			-													-										-	100 12
1577.7	3	29 llm		58.58	39.73	3 1.69			0.00																															100 10
1577.7	3	30 llm	47.07	51.98	45.42	2 0.75	1.86		0.70	0.55										T																				100 10
1577.7	3	31 MS 32 Ilm	47.27	59.88	31.82 3.67	5 1.91	0.73		0.70	9.58						-		-									-				-									100 10
1577.7	3	33 Py		0.38	30.03	3						69.59																												100 20
1577.7	3	34 Tur	38.12	0.96	33.23 6.92	2	5.40	0.32	2.05			67.62				_	_	_		_			-														0.06		-	87 10
1577.7	3	36 IIm		57.23	41.05	5 1.72						07.03																	-								0.90		-	100 10
1577.7	3	37 Spl			40.41 14.64	1	13.76									31	.18																							100 11
1577.7	3	38 Qz + TiO ₂	48.28	47.38	2.09 1.92	2				0.33						_	_	_		_	_		-																_	100 11
1577.7	3	40 TiO ₂ +	100.00	92,29	1.31 5.75	0.65										-	-	-		+		1	1	1	1															100 12
1577.7	3	41 "Ilm"		78.53	19.41	1 2.06																	1																	100 9
1577.7	3	42 "Ilm"	00.61	62.62	36.72	2 0.66				0.07										_						\vdash				H										100 10
1577.7	3	43 Qz	99.24	0.48	1.81 2.07	7				0.27	1 1 1					_		+		+		+	+	+	-	+				\vdash										100 12
1577.7	3	45 Xtm	13.11	1 3.44	1.01 3.07						38.99						-	-				38.8	0		1					3.33		7.83	5.87	5.18						100 11
1577.7	3	46 Qz	100.00																																					100 12
1577.7	3	47 I"llm"		86.07	1.15 12.19	0.59			1		1											1	1	1	1										1	1				100 9

Table A6.1: Scanning Electron Microscope chemical analyses of 1577.68 m from Sable Island 5H-58 well.

Sample	Site Position	Mineral	SiO2	Ti02		AI203	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	Ŀ	ō	Sc203	0.27	Cr203	014	ZnO	Ae 203	SrO	Y203	ZrO2	Nb2O5 Aq2O	BaO	La203	Ce203	Nd2O3	Gd2O3	Tb203	Dy203	Er203	Yb2O3	Hf02	Ta2O5		PHOS	0s02	Total Actual Total
1577.7	3 48	Qz	99.	43 0	.57																	T																			100 12
1577.7	3 49	110 ₂ +	1.	35 91	.28	2.79	2.94	1.40		0.66			0.98				-+	_		+	+	+														-			+	+	100 89
1577.7	3 50	llm		56	.49	-	42.05	1.46	3.09								-	-		-	-	+					-					-	-			-			-		100 10
1577.7	3 52	Py	0.	98 0	.55	0.55	34.63	1.01	0.00		1.54			61.75																											100 14
1577.7	3 53	llm		53	.76		41.93	4.31														_													_						100 10
1577.7	3 54	Py +	5.	95 0	.61	3.87	30.25		0.41		0.51	0.35		58.06				_		-	_	-					-					_	_		_			_	_		100 19
1577.7	3.1 2	TiO ₂ +	2.	28 95	.48	1.16	0.75					0.33									_																				100 14
1577.7	3.1 3	Ms	54.	84 0	.86 2	25.07	2.97		0.84		0.30	7.52			2.61																										95 15
1577.7	3.2 1	llm		56	.65		32.53	10.82												_		_						_							_						100 13
1577.7	3.2 2	"llm" + "llm"	0.	70 91	.23	1.26	6.04 24 10	0.77										_		_		_					-								_				_		100 13
1577.7	3.3 1	llm		57	.66		40.69	1.66																																	100 13
1577.7	3.3 2	llm		53	.20		45.24	1.56														_																			100 13
1577.7	3.3 3	TiO ₂	0.	88 90	.85	2.74	2.95			0.66			1.35					0	.58	_		_			00.50													_			100 119
1577.7	4 1	Zm Tur	31.	47 66 0	74 3	32.78	6.08		6.12	0.61	2.01						-	-		-	-	+			68.53							-	-			-			-		87 10
1577.7	4 3	Qz	100.	00		2.70	0.00		0.12	0.01	2.01																														100 13
1577.7	4 4	llm		55	.81		42.80	0.50	1.40									_		_	_	_					_								_				_		100 114
1577.7	4 5	TiO +		68	.84	4.62	2 68	0.52					1 25				_	-		+	_	+					-					-	-	-	-	-	_		_		100 10
1577.7	4 7	Tur	38	07 0	.98 .3	30.71	7.24		6.98	0.66	2.36		1.23					+		+		+						1						-					+	+	87 11
1577.7	4 8	"llm"	12.	04 70	.82	7.14	10.00		0.00																																100 11
1577.7	4 9	Py	0.	43 0	.43	0.40	37.63		5.00	0.00	1.00		<u> </u>	61.10	\vdash					-		+					-	-			H			_		_				-	100 19
1577.7	4 10	Tur	38.	19 1	69 3	30.55	4 31		5.99 8.98	1.57	1.83									-		-										_	_		-	-			_		87 10
1577.7	4 12	TiO ₂	1.	05 97	.81	0.00	1.14		0.00	1.07								_																							100 11:
1577.7	4 13	TiO ₂ +	1.	24 92	.58	2.13	2.40											1.	.65																						100 103
1577.7	4 14	TiO ₂ +	2.	60 93	.17	1.21	3.02																																		100 100
1577.7	4 15	Tur	39.	14 0	.79 3	32.22	5.55		7.12	0.70	2.17									_		_			00.70		_														87 10
1577.7	4 16	2m Pv	30.	51			28.42			0.73				70.97				-		-		0.6	61		68.76							-	-						-		100 11
1577.7	4 18	TiO ₂ + Qz	21.	67 77	.69		0.65							10.01								- 0.1	0.																		100 119
1577.7	4 19	llm		52	.37		44.67	0.60	2.37																																100 11
1577.7	4 20	Spl		0	.54 4	18.90	14.09		18.34									18	.13	-	_	-					-					_	_		_			-	_		100 11
1577.7	4 21	IIO ₂		59	85		38 72	1 43										_	_	-	_	-				_						-							_		100 10
1577.7	4 23	Spl		0	.46 4	14.77	13.52	1.10	18.33									22	.92																						100 110
1577.7	4 24	"llm"		62	.69		32.58	4.73														_																			100 10
1577.7	4 25	IIm + Qz	18.	28 49	.98	0.61	27.47	3.67									_	_		-	-	_					-	-				_	_		_	_			_		100 112
1577.7	4 27	"llm"	50.	62	.05	0.73	36.27	0.95																																	100 10
1577.7	4 28	Zrn	30.	98																					69.02																100 12
1577.7	4 29	Zrn	34.	63	60		2.42	0.62												-	_	-			65.37							_	_								100 12
1577.7	4 30	IIm	0.	51	49		45 77	0.62	2 17									-		-		-										_	_		-				-		100 10
1577.7	4 32	llm		53	.82		41.50	4.68	2																																100 110
1577.7	4 33	TiO ₂	2.	09 95	.60	1.20	1.11																																		100 112
1577.7	4 34	llm		52	.62		47.38	1.05	0.95						\vdash		-+	_		+	+	+														-			+	+	100 10
1577.7	4 35	llm		54	.01		43.92	0.65	1.32											+		+		1				1				-	-		-					-	100 10
1577.7	4 37	llm		58	.44		37.09	2.70	1.78																																100 10
1577.7	4 38	Zrn	30.	82 60	24		44.00	0 00	0.05						2.10		-+	+		+	+	+	_	-	67.08		-									-			+	+	100 11
1577.7	4 39	"llm"		65	.36		34.04	0.60	0.95									+		+	+	+					-	1						-		-			+	+	100 11
1577.7	4 41	"llm"		65	.71		34.29																																		100 10
1577.7	4 42	Mnz			3	32.55	2.03	2.04		1.73			28.30	8.25	0.27					+	-	1.8	80 10.09)	+		_	5.68	9.29		\vdash								_	+	100 10
1577.7	4 43	Pv	0.	40 0	.28		44.96	3.04						70.13				-		+		13	21				-	1						-					+	+	100 112
1577.7	4 45	Zrn	31.	11																		1.			68.89																100 12
1577.7	4 46	llm "llm"		51	.42		47.06	0.81	0.71								-+	_		+	+	+														-			+	+	100 11
1577.7	4 47	"llm"		67	.10		32.75	1.82						1				+		+		+					-	1						\rightarrow		-+			+	+	100 10
1577.7	4 49	llm		55	.97		38.67	5.36																																	100 10
1577.7	4 50	Tur	38.	49 1	.00 3	33.01	6.64		5.77		2.09		-		5.00			+		+	-	+			+		-				\vdash					_			+	+	87 10
15//./	4 51	1111 + QZ	17.	∠1 51 58 56	60	0.70	40.42	1.40	1.88		0.87				5.30					+	-	+					-	-	-											-	100 82
1577.7	4.1 2	"llm" +	1.	53 61	.82		35.01	1.64																																	100 13
1577.7	4.1 3	Qz	98.	43 1	.10		0.48				0.05	0.00	<u> </u>		\vdash					+	+	+									μŢ							1	+	+-	100 16
1577.7	4.1 4	UZ + MS TiO ₂ + O7	83.	20 60	36	0.40	2.26				0.35	2.01	-		\vdash			+		+		+	-	-	+			-	-							-+			+	+	100 15
1577 7	4.2 1	TiO ₂ +	20.	66 92	.25	0.87	5.23									-				+	-	+		1				1						-	-					+	100 14
1577.7	4.2 2	TiO ₂ +	0.	93 92	.72	2.10	2.45											1.	.80																						100 13

Sample	Site	Position	Si02	Ti02	AI203	LeO	MnO MgO	CaO	Na2O	K20	P205	SO3	ш	ō	Sc203	V205	Cr203	CoO	NiO	ZnO	As203	SrO	Y203	ZrO2	Nb205	Ag2O	BaO	La203	Ce2O3	Nd2O3	Gd2O3	Tb203	Dy203	Er203	Yb203	Hf02	Ta205	WO3	Od St	0s02	Total Actual Total
1577.7	4.3	1 Chl	26.95	0.77	20.66 25	.10	0.38 10.87			0.27																															85 132
1577.7	4.3	2 Qz 3 "llm"	100.00	60.45	34	.89	4.66																																		100 162
1577.7	4.3	4 TiO ₂ +	1.05	96.86	0.56 1	.52																																			100 144
1577.7	4.4	1 TiO ₂	0.83	97.05	0.46 1	.25	0.40																																	_	100 144
1577.7	4.4	2 Chl + 3 TiO.	41.70	2.15	15.93 30	.15	4.25		0.91	1.41			3.50																										_		100 118
1577.7	5	1 llm		51.69	47	.33	0.97																																		100 109
1577.7	5	2 "IIm"	11.40	60.46	5 49 47	.95	0.59		0.77		1.04									-																	2	54		_	100 100
1577.7	5	4 TiO ₀ +	13.21	59.82	5.48 17	.04	0.69		0.77		1.24																										3	.51	_	-	100 102
1577.7	5	5 Zrn	30.47																					69.53																	100 127
1577.7	5	6 llm	29.15	52.59	22.92 5	.52	1.89	0.51	2.02																														_	_	100 110
1577.7	5	8 llm	30.15	50.66	48	.04	1.25	0.51	2.02																																100 110
1577.7	5	9 "Ilm"		66.52	31	.76	1.73																																		100 100
1577.7	5	10 Tur 11 Oz + TiO.	38.56	1.06	32.46 7	.09	5.58	0.93	2.25																															_	100 110
1577.7	5	12 Zrn	30.51	01.00	0.00			0.00																67.78												1.72					100 136
1577.7	5	13 Zrn	31.29			_														_				68.71																_	100 130
15777	5	14 Zm 15 St	29.04	0.88	54.96 13	48	1.65											-	-	+				69.46																-	100 129
1577.7	5	16 "llm"	20.04	64.34	33	.61	2.05																																		100 108
1577.7	5	17 Ms + Ilm?	42.99	12.93	20.37 8	.80	2.34	0.70	0.66	7.82			4.08										-																	_	87 100
1577.7	5	19 TiO ₂	0.62	99.38	31.20 5	.07	7.50	0.76	1.04																																100 110
1577.7	5	20 Grt	41.86		20.67 3	.32	0.49	33.66																																	100 120
1577.7	5	21 "llm"		69.59	29	.26	1.16																																	_	100 96
1577.7	5	23 llm		53.12	43	.52	0.67 2.69																																		100 101
1577.7	5	24 llm		53.39	44	.59	2.01																																		100 113
1577.7	5	25 Tur 26 Ilm	37.68	1.24	30.95 9	.04	5.32	0.74	2.03											-																			_	-	87 111
1577.7	5	27 "Ilm"		62.69	34	.81	2.50																																		100 105
1577.7	5	28 Py	2.50	0.56	29	.58						67.36																												_	100 213
1577.7	5	29 TiO ₂ + 30 Oz + Pv2	4.03	90.91	1.83 2	.66	0.56	i				16 11																													100 103
1577.7	5.1	1 Chl +	36.73	5.10	14.69 26	.58	2.42		1.90	1.67		10.11	5.03																								5	.87			100 128
1577.7	5.1	2 TiO ₂ + Chl	4.76	83.24	3.46 7	.45					1.09																														100 128
1577.7	5.1	3 Chl + TiO ₂	21.43	21.22	10.31 30	.19	1.37	0.29	2.17			0.73	6.46							-																	5	.83		_	100 133
1577.7	5.2	2 TiO ₂ +	1.79	97.84	0	.37																																			100 164
1577.7	5.2	3 TiO ₂ +	4.22	95.78																																					100 145
1577.7	5.3	1 Chl +	40.48	8.14	10.72 23	.74	1.99	1	0.84	6.19			3.54																								4	.36			100 88
1577.7	5.3	2 TiO ₂ +	3.47	90.55	1.38 3	.80	2.64		0.44	0.81			4.07							-																			_	_	100 140
1577.7	5.3	4 Chl + Ms	39.30	2.82	12.92 28	.44	2.61		1.13	3.20			3.78							-																	5	.90	_	-	100 100
1577.7	5.4	1 "llm" +	1.26	71.77	1.39 23	.12	2.45																																		100 121
1577.7	5.4	2 TiO ₂	0.52	98.84	1.67 7	.64	0.52	0.40			1.01						0.40	<u> </u>																					_	_	100 140
15//./	5.4 5.4	4 llm +	1.63	56.00	0.58 36	.85	4.94	0.46			1.21						0.40	-		+		-											_							+	100 12
1577.7	6	1 Zrn	30.82																					69.18																	100 122
1577.7	6	2 Mnz 3 Mix	1.91	3.46	1.07 0	.74	3.84		1.01	4.60	36.45		0.44						0.24	1						1.17		16.08	31.22	10.69										_	100 104
1577.7	6	4 TiO ₂ +	7.42	85.64	4.83 1	.73	3.04	0.38	1.01	4.00																															100 101
1577.7	6	5 Qz	100.00			_																																			100 122
1577.7	6	6 "llm" 7 Pv	1.23	62.24	0.88.28	.76						68 66								-												_							-	-	100 98
1577.7	6	8 "Ilm" +	3.19	73.00	1.80 22	.00						00.00																													100 200
1577.7	6	9 llm	00.64	54.57	44	.55	0.88													-																				_	100 100
1577.7	6	11 Py ? **	1.23		46	.96			0.83			48.88																									2	.10			100 12:
1577.7	6	12 Qz	100.00																																						100 124
1577.7	6	13 llm 14 llm		53.52	45	.24	3.09			-								-		1															$\left - \right $				_	-	100 100
1577.7	6	15 Py	1.14	33.32	0.89 28	.99			0.89			68.10																													100 180
1577.7	6	16 Qz + IIm	59.30	24.73	0.70 14	.64	0.64				4 70									-															\vdash				_		100 110
15777	6	1/ 1102+ 18 Zrn	1.16	91.09	4.37 1	.62					1.76								-	-		-		68.40			_					_									100 102
1577.7	6	19 Chl + Bt	37.51	0.97	18.25 27	.34	3.00		2.01	2.80			5.38											50.70													2	.74			100 100
1577.7	6	20 "IIm"	4.00	64.91	33	.65	1.45	0.00			0.01							<u> </u>		1		<u> </u>				\vdash]			—Т				⊢–⊺						100 104
1577.7	6	21 110 ₂ + 22 llm	1.89	53.48	2.53 3	.09	2.42	0.68			0.91			-				-	-	+												_		-						-	100 84

Sample	Site	Position	Mineral	Si02	Ti02	AI2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	S03	ш	c	Sc2O3	V205	Cr203	CoO	NiO	SnO	As203	SrO	Y203	ZrO2	Nb205	Ag2O	BaO	La203	Ce2O3	Nd2O3	Gd2O3	Tb2O3	Dy203	Er203	Yb2O3	Hf02	Ta205	WO3	PbO	ThO2	OsO2 Total	Actual Total
1577.	7 6	6 23	TiO ₂ + Qz	27.85	71.63		0.53																																				10	0 118
1577.	7 6	24	llm Oz	100.00	55.37		41.13	2.12	1.38						_					+	-	+												_									10	0 108
1577	7 6.1	25	TiO ₂ +	5.81	85.66	4.05	2,13			0.40					1.94					+	-																		-			-	10	0 141
1577.	7 6.1	2	Qz + TiO ₂	70.91	28.07	0.59	0.43			0.15										1													-						-				10	0 167
1577.	7 6.1	3	TiO ₂ +	1.92	95.44	0.86	1.79																																				10	0 139
1577.	7 6.2	1	"llm"	04.45	64.52		33.55	1.93		T											<u> </u>			\square									T			T			[10	0 137
15/7.	7 6.2	2 3	uz + Kln +	94.43 46.85	4.69	34.24	0.88		0.49		0.62				3.60			-		-																						-	10	0 132
1577.	7 6.2	2 4	Chl +	37.85	1.42	14.81	36.49		3.91		1.46				4.06																												10	0 114
1577.	7 6.3		Chl + Ms	39.72	2.09	14.37	29.44		3.34	0.07	1.71	1.28	1.01		4.58					+	-							_						-	_					3.48			10	0 110
1577	7 63	2 3	TiO ₂ +	1.87	87.29	2.56	2.47			0.45			1.31		2.95				0.80		-													-					-			-	10	0 133
1577.	7 6.3	3 4	TiO ₂ + Chl +	17.52	59.47	12.59	8.78			0.10		0.44	1.21						0.00														-						- †				10	0 122
1577.	7 6.4	1	Chl + Ms	36.72	0.47	20.48	18.92		2.17		2.96	4.02			11.41																								1	2.84		ļ	10	0 154
1577.	7 6.4	2	Zrn	31.20	5.24	21.62	21.00		12.22	0.40	0.56									-	-					66.82											1	1.98				-	10	0 170
1577.	7 6.5	2	TiO ₂ +	1.89	89.85	2.77	2.60		12.32	0.40	0.00		1.18	0.86																												+	10	0 112
1577.	7 6.5	i 3	TiO ₂ +	1.49	91.17	2.07	2.48			0.47			1.10	1.22																													10	0 133
1577.	7 7	1	Zrn	31.41	0.01	0.55	44.01				0.70			50.40		0.00				-	<u> </u>		_		_	68.59								_			_	1		4.07		Ţ	10	0 121
15/7.	$\frac{7}{7}$	3	Py + Qz	1.99 96.98	0.94	0.57	41.01				0.70			52.42		0.39				-																				1.97	-	-	10	0 113
1577.	7 7	4	llm	00.00	58.68		23.11								18.22																												10	0 10
1577.	7 7	5	Py Tur	27 42	1 25	24.22	28.41		0.60	2.61	1.51			71.59						-														-								\rightarrow	10	0 228
1577.	7 7	7	St	29.72	0.58	<u>24.22</u> 56.54	12.28		9.00	2.01	1.51																																10	0 112
1577.	7 7	8	TiO ₂		98.80		1.20																																				10	0 105
1577.	7 7	9	"llm"	40.00	64.74	1.00	34.60	0.66												-	-													_								_	10	0 102
1577	7 7	10	uz + 1102 Ilm	49.06	47.10	1.08	2.76	6.57												+	-												-					-		-		+	10	0 105
1577.	7 7	12	"llm" +	1.71	69.93	1.12	25.81	1.43																																			10	0 99
1577.	7 7	13	TiO ₂ +	9.15	82.70	4.52	2.52					1.12													_																	Ţ	10	0 104
1577.	7 7	14	Qz + Py	80.74	67.14	1.04	6.32	0.65	1.02					12.94						+	-												_	-+								-	10	0 132
1577.	7 7	16	Tur	37.10	1.03	31.21	4.35	0.05	7.70	0.90	2.28				2.43																												87	/ 104
1577.	7 7	17	llm		54.86		42.19	2.95		1.04			07.00															0.00		45.04	00.47	10.00		_								Ţ	10	0 108
1577.1	7 7	18	Qz	100.00						1.24			31.83							+							-	2.20		15.81	32.47	10.39	-	-			-	-				+	10	0 125
1577.	7 7	20	Mix	25.65	47.11	8.20	9.20		0.92		1.16	1.39			6.36			1																									10	0 107
1577.	7 7	21	Chl +	29.74	0.62	24.02	30.68		7.84		1.80			E0 E4	5.93					-	-	+												_			-+					\rightarrow	10	0 106
1577.1	7 7	23	llm	1.23	57.73		41.69	0.58						50.51							L		L																				10	0 108
1577.	7 7	24	Py +	1.55	0.89	0.73	38.41				0.15			55.64		0.38																							1	2.40			10	0 109
1577.	7 7	25	lur	38.37	1.05	33.30	6.25	1 55	5.85		2.17							-		-	-													_									87	105
1577.	7 7	27	Zrn	30.99	0.54																					68.47																	10	0 126
1577.	7 7	28	"llm"	1.50	69.75	0.00	30.25			0.10		0.00								+	-																	1		1			10	0 102
15//.	7 7	29	11U2 +	4.56	90.01	2.83	1.78	1 20		0.49		0.33								-	-											_	-	-								+	10	0 107
1577.	7 7	31	Mix	57.33	0.59	8.37	15.76	1.23	4.55		1.81	1.10		10.50																													10	0 101
1577.	7 7	32	Py	0.40	0.54		32.16			T				66.89						-				\square												T			<u> </u>	— T			10	0 203
15//.	7 7.1	33	u∠ Kln+	46.34	0.75	35.67	4,70				7.06	0.90			4.58					+		+												-			-+					+	10	0 123
1577.	7 7.1	2	"llm" +	6.82	86.09	1.89	5.20																																				10	0 138
1577.	7 7.1	3	Kin +	48.63	2.09	38.20	0.59				7.38	1.00			2.12					+	-												_	-+								-	10	0 152
1577	7 7 1	4	Kin +	48.71	0.57	34.10	2.07		0.77		5.42	1.38	0.73		2.35					+	-																-		-			-	10	0 136
1577.	7 7.1	6	TiO ₂ +	13.62	74.41	4.55	3.18		0.97		0.36	0.77	5.10		2.14																												10	0 140
1577.	7 7.1	7	Qz	98.20	0.48	0.75	0.59	1.02						0.72					0.01		-												_	_								Ţ	10	0 161
15/7.	/ /.2 7 7.3	2 2	"IIM" +	1.07	70.32	0.69	25.80	1.38											0.65	2	-								-					-						2.14		-	10	0 132
1577.	7 7.2	2 3	TiO ₂ +	8.27	81.19	4.55	2.42					0.90			2.67																												10	0 145
1577.	7 8	1	Mnz				10.0-			0.66			36.39		0.41					-										17.48	32.90	9.33									2	2.84	10	0 106
1577.	7 8	2	IIM "IIm" +	10.32	55.51 71.52	7.94	40.06	4.43		0.39										+	-												-									-	10	0 89
1577.	7 8	3 4	Tur	38.97	0.51	33.47	4.42		7.11	0.41	2.11																																87	102
1577.	7 8	5	llm Tio	0.55	54.44	1.05	44.21	1.35	0.70				4.05		0.01					-	-				_									_		\neg	_					Ţ	10	0 106
15/7.		6 7	Tur	6.56 38.79	/5./3	4.66	6.07		0.72	0.57	1.87		1.35		3.64			\vdash		-	-																_						10	J 102
1577.	7 8	8 8	Zrn	30.88	0.70	32.07	0.07		0.14	0.57	1.07															69.12																	10	0 126
1577.	7 8	9	Qz	100.00			00.45				0.00												_		_					_		_	_	_			\neg					Ţ	10	0 126
1577.		3 11	Py Pv				30.42 28.86				0.32			09.27 71.14																													10	0 239

Sample	Site Position	Mineral	Si02	TiO2	AI2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	ч	CI	Sc203	V205	Cr2O3	CoO	NiO	ZnO	As203	SrO	Y203	ZrO2	Nb2O5	Ag2O	BaO	La203	Ce2O3	Nd2O3	Gd2O3	Tb203	Dy2O3	Er203	Yb2O3	Hf02	Ta205	WO3	ThO2	0s02	Total ctual Total
1577.7	8 12	llm		51.40		47.59		1.00																							_		_							-		100 108
1577.7	8 13	Tur	37.95	0.82	29.44	7.86		7.74	1.08	2.10																																87 107
1577.7	8 14	"llm" + llm	10.93	52.78	7.84	14.65 45.17	2.05				1./1				_														-												-	100 113
1577.7	8 16	TiO ₂	2.80	96.64		0.56																																				100 113
1577.7	8 17	Qz	100.00	0.79	0.26	20.69							69 19																											_	$ \rightarrow $	100 128
1577.7	8 19	Qz	100.00	0.78	0.30	30.00							00.10																													100 200
1577.7	8 20	Py		0.29		28.53							71.18																													100 237
1577.7	8 21	llm		55.01		42.88	2.12																																		-	100 100
1577.7	8 23	llm		54.96		42.57	0.76	1.71																																		100 109
1577.7	8 24	Py Qz	99.54	0.27		28.60							/1.13																												-	100 232
1577.7	8 26	Py				29.15							70.85																													100 221
1577.7	8 27	llm "llm"		51.14		45.71 26.78	3.16												-									_												-	+	100 108
1577.7	8 29	TiO ₂ + Qz	15.51	78.53	3.68	0.98					1.29																															100 113
1577.7	8 30	Tur	38.56	1.00	32.44	6.51	4.00	6.07	0.37	2.04																																87 104
1577.7	8 32	"llm'	1.00	73.43		25.15	1.42																																			100 91
1577.7	8 33	Qz + TiO ₂	76.68	21.25	0.98	0.82					0.27																													_		100 128
1577.7	8.1 1	Chl + Chl + TiO. +	34.86	2.32	15.39	29.97		2.93	0.63	1.73	0.94			5.70					<u> </u>			\vdash																	5.53 3.75	+	+	100 117
1577.7	8.1 3	$TiO_2 + Chl$	5.22	82.11	4.47	6.67		1.55	0.31	3.10	0.55	1.21		10.55																									3.75			100 137
1577.7	8.2 1	Ms + Chl	50.33	1.25	21.75	7.04		3.58		0.44	9.58			6.03																												100 154
1577.7	8.2 2	"llm" +	1.02	74.26		24.72																																				100 127
1577.7	8.2 4	TiO ₂ +	2.96	95.72		1.32																																				100 102
1577.7	8.2 5	"llm" +	1.69	69.51	0.61	27.53	0.67				_																															100 130
1577.7	9 1	Mnz							1.78			34.52	1.14	0.46						0.12							3.48	1	4.81	32.27 1	0.94									3.93		100 106
1577.7	9 3	Qz	100.00																																							100 124
1577.7	9 4	TiO ₂	100.00	99.36		0.64																																			+	100 107
1577.7	9 5	Tur	36.21	0.71	33.67	13.08		1.04		2.27																																87 101
1577.7	9 7	"llm" +	5.59	75.66	2.22	15.69	0.84						44.54		0.50				-																				6.07	_		100 95
1577.7	9 9	Im	0.90	51.47	1.04	46.43	0.71	1.38					41.54		0.50																								0.07			100 129
1577.7	9 10	Chr		0.90	21.62	24.64		10.92										41.92																								100 114
1577.7	9 11	Qz + TiQa	100.00	46.44		1.71																																				100 126
1577.7	9 13	"llm"		60.49		38.04	1.47																																			100 103
1577.7	9 14	TiO ₂ +	0.83	91.86	2.51	3.04		4.00	0.50	4.75	0.50	1.26		7.04																										_		100 100
1577.7	9 15	IIM + "IIM"	18.23	66.41	7.68	32.37	1.22	1.28		1.75	0.58			7.91																												100 101
1577.7	9 17	"llm" +	1.84	61.88	1.05	34.59	0.64																																			100 101
1577.7	9 18	Iur Qz + Zrn	38.53	0.45	0.69	7.13		6.17	0.29	2.25															16.41																-	100 119
1577.7	9 20	Zrn	31.90	0.67		0.70			0.54																66.18																	100 114
1577.7	9 21	Grt Ilm	40.78	52.26	21.29	24.41	0.75	6.70	6.07										-									_												-	+	100 118
1577.7	9 23	Tur	38.75	0.66	31.09	6.78		6.76	0.80	2.16																																87 102
1577.7	9 24	llm llm		55.22		47.81	0.87								0.36																									_	$ \rightarrow $	100 108
1577.7	9 26	"llm" +	11.56	65.97	5.72	14.80	0.02	1.49	0.45						0.00																											100 91
1577.7	9 27	Tur	37.51	0.64	31.22	6.18	0.00	6.60	0.61	2.16				2.08																												87 106
1577.7	9 29	llm +	2.02	58.94	0.82	34.42	3.79	9.00	J.24																																	100 103
1577.7	9 30	Py	0.40	00.05		29.05							70.95						-																					_		100 226
1577.7	9.1 1	TIO ₂ Chl +	30.64	98.85	13.16	31.05		2.15	0.36	3.22	0.58			10.47																									5.89			100 143
1577.7	9.1 3	Qz	98.68	0.50		0.82																																				100 159
1577.7	9.1 4	TiO ₂	27.04	99.48	1 32	0.52			2.22					3.10		1.00									58.24		1 22	_	-								1 87			+	+	100 143
1577.7	10 2	Tur	37.95	1.14	32.11	8.67		4.69	0.36	2.08				3.10		1.09									30.24		1.22										+.07					87 103
1577.7	10 3	TiO ₂		93.39		6.61																							Ţ													100 106
1577.7	10 4	Qz Mnz	99.48	0.52	33.46	3.31			6.09			34.31	9.62	1.01					+				9.27							2.93				_		_				+	\vdash	100 124
1577.7	10 6	llm		54.13	50.70	45.12		0.75	0.00			5	0.02										5.21																			100 113
1577.7	10 7	"lim" "lim"		63.08		35.39	1.53								-				<u> </u>			\vdash				-		_	_									\vdash		_	\vdash	100 107
1577.7	10 0	Zrn	30.94	01.78		30.00	1.43																		69.06																	100 125
1577.7	10 10	TiO ₂ + Qz	30.68	66.14	2.01	0.55					0.62											ΙT							T													100 122

ample	Site	sition	ineral	8i02	TiO2	1203	-eO	AnO	٨gO	caO	a20	ć 20	205	503	ш	CI	:203	205	r203	000	NiO	ZnO	s203	sro	203	ro2	o2O5	g20	3aO	a2O3	=203 1203	d2O3	⁵² 03	y203	r2O3	o2O3	#O2	a205	VO3	0qc	h02	s02	otal al Total
ю ой		ĕ	Σ			<	_	_	_	Ŭ	2	_	μ.				õ	^	0	Ľ			<		~	14	z	4	_	r,	οz	U	F		ш	7	-	Ĥ	1	_	_	0	Actu
15//./	10	11 <u>Zr</u>	'n	31.15																				-		68.85						-	-									-	100 129
1577.7	10	13 IIn	n	31.10	55.42		42.56	2.02																		00.90						1										-	100 129
1577.7	10	14 IIn	n + Qz +	12.79	57.86	8.00	11.73		1.04		1.44				7.13																												100 113
1577.7	10	15 Py	/				28.47							71.53																												1	100 243
1577.7	10	16 Zr	'n	30.06																						68.03						-	-				1.90					1	100 131
1577.7	10	18 P	/	31.39			28.96					-		71 04												00.01																	100 235
1577.7	10	19 Q	z + TiO₂	63.68	36.32		20.00																																				100 121
1577.7	10	20 Tu	ur _	38.00	0.86	32.07	9.28		4.32	0.38	2.10																																87 103
1577.7	10	21 Q:	z	100.00																													_									-	100 123
1577.7	10	22 "III	<u>m"</u>		66.19		33.23	0.58																								-										- 1	100 100
1577.7	10	24 0:	τ + ΤίΩο	77 44	20.60	0.72	40.40																																				100 107
1577.7	10	25	2 1 1102	4.06	0.58	0.72	12.78				(0.42 3	30.61	34.27																_		1									17	7.28	100 142
1577.7	10	26		1.30	71.61		8.58																				17.43											1.07				1	100 112
1577.7	10	27 Q	z	99.12	0.53		0.36																									_										1	100 130
1577.7	10	28 Mi	lX n	17.42	5/ 20	10.76	30.80	5.81	0.67			2.90																				-											100 119
1577.7	10	30 Zr	m +	33.67	1.13	5.32	1.21	0.01							2.95											55.72																1	100 108
1577.7	10	31 Q;	z	100.00																																						1	100 130
1577.7	10	32 Tu	ur .	38.25		31.86	0.81		10.55	1.05	1.90			74.00	2.58							-										+	-	-									87 106
1577.7	10	1 Ti	/ 0-	0.61	98.28		28.62							/1.38																		-										-	100 233
1577.7	10	2 KI	$n + TiO_{0}$	29.00	38.98	23.06	4.46				0 71				3 79																												100 108
1577.7	10	3 "11	m"	20.00	74.74	20.00	25.26				0.11				0.10																											1	100 96
1577.7	10	1 "III	m"		62.49		26.06	11.45																																		1	100 105
1577.7	10	2 Q;	z	99.48	0.52																											_										1	100 128
1577.7	10	3 Ti	0 ₂ +	5.13	90.19	2.31	1.99	0.05			(0.38																				_	-]	100 108
1577.7	10	4 11	m bl + TiO₂ +	33.66	0.52	13.07	23.30	8.95	2 75	0.28	2 11	1 50			0.28																	-							4 67			-	100 106
1577.7	10	1 Ti	0.+	1.14	92.18	4.50	1.55		2.15	0.20	2.11	1.50			5.20				0.62																				4.07			-	100 103
1577.7	10	2 Q;	z+	92.96	0.70	1.78	4.12		0.44										0.0-																							-	100 121
1577.7	10	3 Cł	hl +	34.35	1.54	12.68	34.04		2.15		1.87 (0.59			6.10																								6.66			1	100 99
1577.7	10	1 Ti	O ₂ +	4.13	90.78	2.25	2.23		0.61																																	1	100 109
1577.7	10	2 Q;	z + TiO ₂	82.24	15.11	1.05	1.19		0.40																							_	_									1	100 124
1577.7	10	4 CF	z + hl +	38.72	2.65	3.71	26.35		3.52	0.47	1 09	1 41		0.67	6 18	0.25																-							3.89				100 118
1577.7	10	5 Ti	O ₂ + Chl +	14.69	77.10	3.71	3.40		0.74	0.47	1.05	0.36		0.07	0.10	0.25																							5.05			-	100 110
1577.7	11	1 Xt	m									3	39.24							1.04					49.10							2.83	3	5.63				2.15				1	100 115
1577.7	11	2 "11	<u>m"</u>	0.84	69.45		8.91																								18.54	4	_					2.25	0.01			1	100 112
1577.7	11	3 Cr	ni+ O i Mo	38.63	1.48	17.15	26.89		2.59		1.18	1.58	1./1	1.55	4.23																	-							3.01				100 72
1577.7	11	2 0:	$\sigma_2 + TiO_2$	85.17	13.27	0.86	0.39					1.41						_														-										-	100 128
1577.7	11	3 Q2	z +	94.32	1.16	2.78	0.81				0	0.92																				-										1	100 123
1577.7	11	1 M	nz	1.60		32.18	1.35					3	35.64		0.31									4.67						8.23	12.87 3.15	5										1	100 103
1577.7	11	2 Ti	O ₂ +	1.71	90.29	4.07	2.37						1.56																													1	100 97
1577.7	11	3 Q;	z	100.00			00.47							74.50																		_	_									1	100 121
1577.7	11	4 P) 5 Mi	/ NZ			-	28.47			1.43			35.45	1.03	-0.39							+	-			-	-			16.68	31.60 10 14	5	-	-							1.05		100 230
1577.7	11	6 Zr	'n	30.75								Ì			0.00											69.25				. 0.00	2	-										1	100 125
1577.7	11	7 Zr	'n	30.61																						69.39																1	100 123
1577.7	11	8 Žr	<u>n</u>	30.91	59.74	<u> </u>	40.04	1 20				-				$\left - \right $	-					+	-			69.09						-	-	-	$\left \right $							-	100 126
1577.7	11	10 P	/+ Qz +	24.13	0.97	5.02	29.83	1.28			(0.52		36.56								1	1			1	1					+	1	1				1	2.98				100 110
1577.7	11	11 Tu	ur	38.32	1.06	32.94	5.84		6.31	0.58	1.95																																87 104
1577.7	11	12 IIn	n		52.98		42.92	0.91	3.18													1	1										1	1								1	100 108
1577.7	11	13 Q	z + TiO ₂	77.00	22.44		0.55			⊢ − -												-	I	<u> </u>								+	1					<u> </u>				1	100 123
1577.7	11	14 Ti	U ₂ +		92.57	1.95	5.48	1 17		\vdash												+	-	\vdash								+	-	-						_		1	100 79
1577.7	11	16 "III	m"		65.30	0.85	30.00	1.15					-									1	1									+	-	-	$\left \right $					-			100 103
1577.7	11	17 Q	z	99.44	0.56		1																															1					100 126
1577.7	11	18 Py	·		0.48		28.56							70.96		μŢ						1	<u> </u>									+	1		\square							1	100 227
1577.7	11	19 Ch	ni +	39.76	0.73	16.14	37.59		4.54	\vdash	1.24				6 20							+		-								+	1	-	$\left - \right $			<u> </u>	<u> </u>			-1	100 87
1577.7	11	21 7r	'n	30.82	02.78	0.47	9.49		1.23		1.22				0.39							1	1			69.18						1	1	1				1					100 108
1577.7	11	22 Zr	'n	30.26			0.80																			68.94																	100 113
1577.7	11	23 Py	/?**			1.11	44.43							49.68								1										_	1						4.78			1	100 146
1577.7	11	24 "III	<u>m" +</u>	1.04	67.74	1.22	27.99	1.11	1.95						2.14							+	-									+	-	-	$\left \right $					-		- 1	100 99
1577.7	11	26 "	02 T m"	0.00	85.04	0.90	14.06								3.17							+	-									1	1	+									100 83
1577.7	11	1 Ti	02+	1.23	91.47	0.58	4.30	1							2.42							1	1			1	1					1	1	1								-	100 99
1577.7	11	2 Ti	0,		97.62	0.46	1.92																																			1	100 102

Sample	Site	Position	Si02	Ti02	AI203	MnO	OgM	CaO	K20	P205	s03	ш	C	Sc203	V205	Cr203	CoO	NiO	ZnO	As203	SrO	Y203	ZrO2	Nb2O5	Ag2O	BaO	La203	Ce2O3	Nd2O3	Gd2O3	Tb203	Dy203	Er203	Yb203	Hf02	Ta205	DPP 0	ThO2	0s02	Total Actual Total
1577.7	11	3 TiO ₂ + Chl	9.64	81.88	4.71 2.	17	0.54		1.05	5																														100 107
1577.7	11	1 TiO ₂	04.00	98.80	1.	20	0.00		07 4 54	_																														100 111
1577.7	11	3 "IIm"	31.33	22.08	0.64 18	47	3.93	0.	67 1.5	-										_																				100 73
1577.7	11	4 "Ilm"	2.02	67.95	0.93 29.	10																																		100 100
1577.7	12	1 Py	0.20	0.32	28.	46	-				71.02																													100 242
1577.7	12	2 11m	0.67	0.77	0.44 31	23 2.5. BO	(0.26			66.06									-																				100 110
1577.7	12	4 TiO ₂		97.96	1.	55 0.49	9																																	100 111
1577.7	12	5 Tur	38.12	1.17	31.62 8.	87	4.80	0.30 2	11	_																														87 106
15//./	12	6 1 iO ₂ +	8.24	77.83	4.00 5.	96 0.03	8 2 5 8	0.	98 0.34	+		3.52																												100 109
1577.7	12	8 Tur	37.18	1.09	33.68 9.	49	3.02	0.32 2	23																															87 104
1577.7	12	9 Zrn	30.54							_													69.46																	100 125
15//./	12	10 IIO ₂ +	2.67	92.89	1.04 3.	39	B																																	100 106
1577.7	12	12 Py	5.38	0.89	3.56 30.	50 2.00					57.44																									2.	23			100 167
1577.7	12	13 Py	0.66	0.61	0.42 35.	20	1.00				61.76																									1.	36			100 136
15//.7	12	14 IIM 15 IIM		55.89	35.	1.29 13 2.68	9 1.62 B		-	1	1																											-	1	100 102
1577.7	12	16 TiO ₂ +	7.50	79.58	5.00 4.	39		0.63	0.43	3 1.13	1.34																													100 93
1577.7	12	17 "llm"	00.1-	67.53	30.	18 2.29	9	0.00															00.15						_											100 98
15//.7	12	18 Zm 19 llm	29.15	0.78	40	67 4.3	5	0.88		-													69.19																	100 107
1577.7	12	20 Ilm		57.23	40.	38 2.39	9																																	100 107
1577.7	12	21 Ab	74.57	10.40	15.22	50 1 20	2	10	20																															100 126
1577.7	12	23 Ilm	00.03	53.13	43.	31 3.56	6																																	100 129
1577.7	12	24 Zrn	27.91		0.78 0.	95		1.38				3.04		0.69									65.24																	100 87
1577.7	12	25 Xtm 26 Zrn	31.24			-				40.04							1.20			_		48.76	68 76							3.35	_	6.64								100 110
1577.7	12	27 Zrn	30.37		0.	76		0.50															66.41												1.96					100 120
1577.7	12	28 Tur	37.36	1.17	32.56 11.	68	2.33	1.	91										0.00																		5.0	_		87 103
1577.7	12	29 "IIm" 1 Chl + Ab	31.55	62.01	13.94 28	59 <u>3.8</u> 4 74	2.66	3	33 0.99	9		11.09							3.28																	2.	5.2 85	8		100 95
1577.7	12	2 Ms + ?IIm	49.76	6.90	23.94 5.	79	1.55	0	69 7.87	7	1.05	2.46																												100 100
1577.7	12	3 TiO ₂ +	2.15	96.05	0.74 1.	06																	60 50																	100 107
1577.7	13	2 TiO ₂	30.47	97.27	2	73														_			69.53									_	_							100 126
1577.7	13	3 Mix	48.43	21.24	18.60 4.	75	0.88	0	66 1.62	2		3.82																												100 100
1577.7	13	4 Py		0.45	0.29 29.	34	-	0	56		69.36																													100 213
1577.7	13	6 Zrn	31.02	00.77	32.	+0 0.73	5																67.07												1.91					100 100
1577.7	13	7 Tur	38.00	0.86	30.42 3.	18	9.07	0.99 1	93			2.55																												87 101
1577.7	13	8 TiO ₂	0.00	99.30	0.	70					00.04																										~			100 107
1577.7	13	10 Pv +	3.72	1.95	0.74 37.	20 91		0.37 0	93		54.38																									1.0	69			100 147
1577.7	13	11 Py		0.33	28.	73					70.94																													100 225
1577.7	13	12 Py +	0.61	2.50	16 19 33.	45	2.87	0.64 1	80 0.73	7	61.67																													100 160
1577.7	13	14 llm	.1.03	52.31	43.	21 4.48	8	0.04 1.																																100 105
1577.7	13	15 llm	26.00	54.59	43.	51 0.7	1 1.19	1.65		-		2.60		0.05									64.94							\vdash				I			+			100 108
1577.7	13	17 TiO ₂ +	3.25	93.80	1.40 1.	21	+	1.00	0.35	5		3.00		0.30									04.04														-		1	100 107
1577.7	13	18 Qz	95.24	4.30	0.46																																			100 123
1577.7	13	19 llm 20 "llm"		53.48	45.	62 0.90	7		-	+																											_	-		100 108
1577.7	13	20 IIII 21 "IIm"		71.44	27.	08 1.04	4																																	100 90
1577.7	13	22 Mnz				_		1.18		38.27		-1.61													4.87		13.84	31.84	11.60											100 101
1577.7	13	23 Qz + TiO ₂	54.98	45.02		_	-		-	-																											_	-		100 119
1577.7	13	25 IIm	100.00	54.05	44.	46 0.7	1 0.78																																	100 120
1577.7	13	26 IIm		50.52	44.	81 0.89	9 3.79																																	100 111
15//.7	13	27 (Im" 28 Qz	99.38	61.71	37.	4/ 0.83	5		-	+																											_			100 103
1577.7	13	29 Spl	00.00	0.50	40.81 22.	67	15.24									20.78																								100 116
1577.7	13	30 Tur	38.31	0.56	35.14 6.	42	4.69	0.28 1	60	-																											_	_		87 106
1577.7	13	32 Py	100.00		28.	55					71.45																													100 240
1577.7	13	33 llm		58.01	41.	35 0.63	3																																	100 104
1577.7	13	34 llm 35 llm		52.33	45.	13 1.83	3 0.71		-	1																											_	-	-	100 110
1577.7	13	36 llm		55.51	44.	92 0.69	9 0.88																																	100 109
1577.7	13	37 Pv +	1.48	1.35	0.65 54.	43		0	75	1	31.79		0.88																	I T						8.	67		1	100 113

nple	ite	ition ieral	02	02	03 90	Q	go	O	20	20	05	ß	ц.		203	05	203	00	io	õ	203	ō	03	02	205	20	30	0	203		503	203	03	203	02	205	03	0	02	1	ital I Total
Sar	S	Mir Pos	ö	F	AD AD	Σ	Σ	Ö	Ř	×	P2	Ø,		Ŭ	SS	<22	5	Ő	z	Ż	As:	s	Y2	z	g	Ag	<u>n</u> ja	č	8 3		P Cq	Ż	ς μ	Υp	Ť	Ta	>	⊡ i	Ê Č	Ĥ	Actua
1577.7	13	38 Py +	0.70	0.87	0.74 39.2	5	1.00		0.83	0.92	5	4.22	5.67	0.37																	_	_					3.03			10	00 02
1577.7	13	40 Py	0.97	0.69	34.8	4	1.09		1.55	0.02	6	3.49	3.07																											10	00 108
1577.7	13	41 TiO ₂ +	11.15	72.77	5.63 8.6	5	1.00			0.79																						_	_							10	00 75
1577.7	13	1 Chl + Ab	33.43	1.00	14.98 33.1	7	3.14	0.50	1.99	0.40		_	6.63			-												_		-		_	_	_	-	-	5.26			10	00 72
1577.7	13	3 Chl + TiO ₀	23.60	20.30	9.49 33.6	2	2.50	0.78	0.91	0.59		-	4.48			-												-				-	-				4.32			10	00 100
1577.7	13	1 Qz	98.66	1.34		-																																		10	00 126
1577.7	13	2 TiO ₂ + Qz	36.54	61.92	0.78 0.7	6																						_												10	JO 117
1577.7	13	3 Chl +	41.57	1.21	19.08 24.7	8	2.58	0.49	1.06	0.89	5	2.87	3.62															_		-	_	_	_				2.58			10	00 156
1577.7	14	2 Mix	57.14	11.18	20.03 6.3	5	1.52		0.50	2.46		0.82																									2.50			10	00 100
1577.7	14	3 Tur	38.12	0.98	32.97 4.0	9	7.87	1.09	1.89																			_			_		_							8	7 103
1577.7	14	4 "IIM" 5 Pv + 2	1 19	63.45	2 09 47 1	4 7.22	-	-	6.72	1 15	3	8.58																		-		-	-				3 17			10	00 94
1577.7	14	6 Mix	20.20	54.30	11.69 7.0	7	0.67		1.00	0.62			4.44																											10	00 97
1577.7	14	7 Zrn	28.13	51.20	1.22 1.0	8		1.35				_	2.50									-		65.72				_	_	_	_	_	_	_						10	<u>J0 112</u>
1577.7	14	9 llm	1.94	59.63	37.2	8	1.15																																	10	00 103
1577.7	14	10 Tur	38.00	1.06	33.29 7.7	5	5.39		1.51																			_		_										8	7 104
1577.7	14	11 lim 12 Tur	37.32	53.95	29 85 16 5	8 1.58	5		2.26			-				-												-	-			-	-	-	-					10	37 104
1577.7	14	13 llm	01.02	52.07	44.1	3 0.73	3.07		2.20																															10	00 109
1577.7	14	14 Qz + TiO ₂	83.26	11.66	5.0	8																																		10	JO 107
1577.7	14	15 Zrn 16 llm +	31.05	51 10	30.6	0 1 77	,															-		68.95				_		-	_	_	_	-	_	-				10	00 108
1577.7	14	17 Zrn	30.83	51.10	30.0	0 1.77																		69.17																10	00 123
1577.7	14	18 Tur	39.61	0.66	29.83 3.6	9	10.06	1.07	2.09			_																		_	_	_	_	_		_				8	7 101
1577.7	14	19 Qz 20 Zm	31.40			-						-				-						-		68.60						-	-	-			-					10	00 121
1577.7	14	21 Zrn	29.51		0.9	7		1.23							1.05									67.25																10	00 100
1577.7	14	22 "Ilm"	-	62.69	36.1	8	1.13															-						_		_	_	_	_		_					10	30 101
1577.7	14	23 11m 24 Tur	38.15	86.21	32.07 6.8	5	7.12	0.64	2.17													-																		8	37 99
1577.7	14	25 Py		0.30	28.3	1					7	1.39																												10	00 227
1577.7	14	26 llm 27 "llm"	_	50.64	47.3	5 2.01		-				_				-												_		-		_	_	-						10	<u>J0 109</u>
1577.7	14	28 "Ilm"		66.98	29.8	7 0.88	0.82				1.44																													10	00 98
1577.7	14	29 Py	_		30.2	4			0.39		6	9.37																_		_		_	_	_						10	00 213
1577.7	14	30 TiO ₂ +	0.66	91.70	8.3	0			0.00		F	2.55		0.20		_												-		_	_		-				2.05			10	JO 88
1577.7	14	2 Py	0.00	0.30	27.9	9		0.45	0.33		7	1.23		0.29																							3.05			10	00 235
1577.7	14	3 Ms + Py + Chl	44.56	0.83	23.79 13.4	3	1.35	i	0.50	2.79	1	1.24	1.50																	_			_	_		_				10	30 110
1577.7	14	2 Cbl +	40.92	2.12	28.3	2	2 90		1.34	2 21	(0.53	4 18															-				_	-				2 20			10	00 99
1577.7	14	3 TiO ₂	10.02	99.54	0.4	6	2.00		1.01	2.2.1																											2.20			10	00 110
1577.7	14	1 Ms + Chl	50.87	1.39	22.71 13.3	3	2.11		0.55	9.04																		_		_										10	00 73
1577.7	14	2 lim 3 Oz	99.44	54.45	42.8	5 1.48	5									-				1.21										-		-			-					10	00 125
1577.7	14	4 Ms	49.33	0.69	28.24 4.7	0	0.78		0.79	7.53			2.94																											9	5 113
1577.7	14	1 Ms	52.26	0.64	26.87 3.1	3	0.83		0.50	7.60			3.17									-						_			_	_	_	_		_				9	15 119
1577.7	14	3 "Ilm"	0.57	62.42	35.4	9 1.51																																		10	00 102
1577.7	14	4 Qz +	93.69	5.60	0.7	1																																		10	JO 122
1577.7	15	1 Qz	99.50	0.50	0.00	6						_																_		-	_	_	_							10	JU 125
1577.7	15	3 TiO ₂ + Chl +	10.39	74.98	343 97	0	0.62			0.89		-																-					-							10	00 102
1577.7	15	1 llm	10.00	52.86	45.6	6 0.63	0.85			0.00																														10	00 112
1577.7	15	2 llm +	14.57	60.25	7.27 14.8	4	1.33	0.46	0.94	0.34												-						_			_	_	_							10	30 100
1577.7	15	3 110 ₂ +	38.02	94.26	0.85 2.9	5	7.52	0.57	2.51			-																-		-		_	-							10	37 106
1577.7	15	5 Qz + TiO ₂ +	61.69	30.74	4.75 1.3	4	1.52	0.57	2.01	1.49																														10	00 120
1577.7	15	6 "Ilm"		61.54	37.6	6 0.80)																																	10	00 108
1577.7	15	7 llm 8 llm	-	56.88	46.9	5 0.70	0.70					-				-																								10	00 109
1577.7	15	9 Kfs + TiO ₂	50.97	22.57	13.28 3.3	7	0.70		0.52	9.29																														10	00 113
1577.7	15	10 Py			28.7	2					7	1.28																												10	0 235
1577.7	15	11 l'ur 12 llm	37.44	0.86	25.35 14.0	1 6 0.62	5.95	1.52	1.86					_						+							_	_		+	+	+	+	-	-	-				8	00 108
1577.7	15	13 Qz	99.39	0.61		- 0.02	0.07																																	10	00 120
1577.7	15	14 TiO ₂	0.89	98.49	0.6	2		<u> </u>																							$-\Gamma$						\square			10	00 106
1577.7	15	15 Zrn 16 Pv	30.72	0.41	36.0	6		<u> </u>			6	2.64				_			<u> </u>	-	<u> </u>			69.28				_	_	+	+	+	+	-	-		$\left \right $		_	10	<u>J0 114</u>
1577.7	15	17 Tur	38.06	1.07	32.98 6.1	3	6.12	0.42	2.24		0.	04			-	-				1	1	1					_	-	-		-1-	+	+	+	+	+				8	37 102

Sample	Site	Position	Mineral	SiO2	Ti02	AI203	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	ш	ū	Sc2O3	V205	Cr203	CoO	NiO	ZnO	As203	SrO	Y203	ZrO2	Nb205	Ag2O	BaO	La203	Ce2O3		G02U3	000	Er203	Yb203	Hf02	Ta205	WO3	PbO	ThO2	USUz 1~1	tual Total
1577.7	15	18 0			0.70		20.15	_						70.15																			_	-		_					+	- 11	<u>8</u>
1577.7	15	10 P	y V		0.70		29.15	3						70.15																				t								1/	00 230
1577.7	15	20 "	lim"	1.52	67.32	44.40	28.18	3 2.97	7	0.00	0.01	0.57																				_	_	_	_	_						1(00 90
1577.7	15	21 N 22 II	/lix llm" +	2.37	60.17 84.57	3.94	7.35	5	0.58	0.36	0.81	0.57	1.18																					-								- 10	00 99
1577.7	15	23 T	ur	38.46	0.73	33.74	5.36	6	6.06	0.52	2.13																															8	7 103
1577.7	15	24 II 25 II	m + Qz +	9.45	49.02	2.06	37.14	0.93	3 0.77 1			0.63																					-		-	-						- 10	00 106 00 109
1577.7	15	26 C	Qz + TiO ₂	51.67	39.87	3.86	1.48	3				0.74			2.39																											10	00 122
1577.7	15	27 II	m		57.30		40.00	2.70)																								_				_					10	00 107
1577.7	15	28 I	m	2.07	51.21		46.71	3.05																																		1/	00 102
1577.7	15	30 T	"iO ₂ +	0.95	93.07	2.10	2.88	3					1.00																													10	JO 101
1577.7	15	31 II 32 "I	m Ilm" +	11.83	58.68	6.35	9.67	0.89	9			0.52																				_	_	-	_	_	_	_			+	10	00 86
1577.7	15	33 "	llm"	0.93	63.69	0.00	31.90	2.96	6			0.02							0.53																						_	10	00 106
1577.7	15	34 "I	llm" +	28.03	45.08	1.65	24.92	2 1.98	3					40.72		0.49						0.46										_					_		7 00		_	10	00 109
1577.7	15	36 ?	Grg *	1.61	1.04	0.85	63.55	5						23.16		0.40						0.40																	9.40		_	10	00 93
1577.7	15	37 S	Spl	64.22	0.94	45.17	13.06	6	17.86			14 27							22.95			0.11										_	_	-	_	_		-			+	1(00 113
1577.7	15	2 T	iO ₂	04.52	99.50	17.04	2.07					14.57										-0.11																				10	00 111
1577.7	15	3 C	Qz	99.68			0.32	2																																		10	00 128
1577.7	15	1 T	iO ₂ +	0.88	94.66	26.12	2.10		1.68		0.67	1.80	0.85		3.66																		_	-		_					+	10	00 85
1577.7	15	3 T	"iO ₂ + Chl	21.76	51.86	11.34	11.42	2	1.48		0.56	0.97	0.61		5.00																											10	00 90
1577.7	16	1 T	"iO ₂ + Qz	19.27	76.94	1.36	2.44	L .																																		10	00 100
1577.7	16	2 T	'iO ₂	05.05	98.90	0.70	1.10	2	_			0.07																					_		_	_	_				—	10	00 107
1577.7	16	4 11	im	95.05	51.79	2.15	46.91	1.30)			0.07																														1/	00 105
1577.7	16	5 II	m		54.30		41.84	3.86	6																							_	_	_	_	_						1(00 106
1577.7	16	6 II 7 T	m 'ur	37.30	0.55	32.92	45.57	4.05	>		2.62																															- 10	37 98
1577.7	16	8 C	Dz + TiO ₂	86.72	12.79		0.49	9																																		10	00 120
1577.7	16	9 II 10 P	m Pv ? **	1 14	54.82	0.91	44.47	0.71	1		7 16			46 45																			_	+					3 17		+	10	00 89
1577.7	16	11 II	m	1.14	52.93	0.51	45.84	1.24	1		7.10			40.45																									5.17		_	10	00 104
1577.7	16	12 II	m	37.26	51.76	25.00	44.43	3	3.81	1.82	2 21																					-	_	-	_	_	-				\rightarrow	10	20 101
1577.7	16	14 "	llm"	57.20	67.26	20.00	30.50	2.25	5	1.02	2.21																															10	00 96
1577.7	16	15 T	ur Gra*	37.69	0.61	33.81	4.60	7	7.19	1.17	1.92	1 30		33.20		0.43																	_	-		_			8 03		+	8	<u>i7 100</u>
1577.7	16	17 T	'ur	38.73	0.67	32.54	9.74	l I	3.37		1.95	1.50		00.20		0.40																							0.33			8	37 101
1577.7	16	18 Z	ľrn m	30.46	58.02		35.12	5 95																		69.54						_	_	+	_	_					—	10	00 129
1577.7	16	20 T	"iO ₂	0.80	92.04	1.52	3.68	3	,				1.23	0.73													1															1/	00 97
1577.7	16	21 II	m +	23.76	24.70	15.38	14.36	6	1.00		3.05	0.37			14.01																								3.36			1(00 108
1577.7	16	22 C	lz Im	<u>98.85</u> 26.75		1.14	0.71			1.27		0.25			4.42		0.66									65.05							-	+		-						- 10	00 93
1577.7	16	24 C)z	100.00																																			0.10			1(00 117
1577.7	16	25 P 26 II	'y m	0.79	55.79		39.70 43.25	5	0.96					56.42																		-	-	+	-	-			2.16			- 10	00 168
1577.7	16	27 II	m	28.29	0.95					0.71					3.85											66.19	1															10	00 65
1577.7	16	28 "I 29 II	llm" + Chl m	11.10	68.70 57.15	6.29	10.06	5 2.20	1.90	0.53		0.44	0.96																				_	+		-					+	10	<u>00 93</u>
1577.7	16	30 N	Лix	39.64	2.18	10.54	19.47	/	0.56			0.71		26.90																												10	00 126
1577.7	16	31 B	8t (tm + TiO₂	9 20	4.75	17.91	16.51		9.79			9.27	32 34		2 1/					1 30					37.02							2	13	+	-						+	9	6 112 00 104
1577.7	16	2 C	Chl + Feld	40.96	1.57	13.40	22.72	2	3.04		1.73	2.32	52.54		10.01					1.50					57.02								10						4.24			10	00 91
1577.7	16	3 T	"iO ₂ +	1.49	95.53	0.69	0.72	2																								_							1.56			10	00 111
1577.7	16	1 T	10 ₂ +	1.66	91.22	3.85	2.14	,					1.13																			_	_	-	_	_	-	-			+	10	00 103
1577.7	16	3 C	Chl + Feld	40.43	1.21	17.73	22.42	2	2.34		1.88	0.80	1.17		9.33																								3.85			1/	00 88
1577.7	16	4 T	"iO ₂ +	1.22	91.41	4.77	1.53	3					1.07																													10	00 103
1577.7	16	1 C	2z +	89.97	0.20	4.78	0.97	1				1.48		71.06	2.80																	_	_	_	_	_	_	_			+	10	00 131 00 237
1577.7	16	3 P	ý		0.33		28.62	2						71.05																												10	00 238
1577.7	17	1 P	γ)z +	01.80	0.64		28.49	9	+					71.51	2.55								-									+	+	+	+	-	-				+	10	<u>JO 225</u>
1577.7	17	3 P	<u>у</u>	31.09	0.04		28.68	ŝ						71.32	2.00																											10	00 230
1577.7	17	4 Z	m	30.90	1 20	20.04	6 70		7.50	0.01	1.02															69.10							_	-				-			-+	10	00 120
1577.7	17	5 I 6 T	ui "iO ₂ +	1.89	91.22	0.88	6.01		7.53	0.91	1.92										-	1					1					+	1	+	+	+	+	1			+	1/	00 90
1577.7	17	7 "	llm"	0.75	61.20	0.66	34.85	2.53	3																		1															10	00 100

Sample	Site	Position	Mineral	Si02	TiO2	AI2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	F	CI	Sc2O3	V205	Cr203	CoO	NiO	ZnO	As203	SrO	Y203	ZrO2	Nb2O5	Ag2O	BaO	La2O3	Ce203	Nd2O3	Gd2O3	Tb203	Dy203	Er203	Yb203	Hf02	Ta205	WO3	PbO	ThO2	OsO2 Total	ctual Total
1577 7	17	81	lm		52.74		45.25	2.02												+														_	-				_		_		10	ĕ /0_104
1577.7	17	9 1	ру		52.74		28.69	2.02						71.31																													10	0 220
1577.7	17	10 1	lm Fur	37 62	54.42	33.07	43.85	1.73	7.29	0.41	2.04				2.15					<u> </u>																			_		-		10	0 102
1577.7	17	12	ΓiO ₂ +	2.53	88.17	2.81	3.90		1.20	0.62	2.04		1.37		2.10				0.61																								10	0 95
1577.7	17	13	ΓiO ₂ +	1.99	94.19	1.35	2.05			0.42																																	10	0 102
1577.7	17	14	llm"		61.28		37.13	0.64	0.95																																		10	0 104
1577.7	17	16 (Ωz	99.50	0.50		23.23	2.00																																			10	0 125
1577.7	17	17	ΓiO ₂ +	1.83	90.79	1.70	3.88			0.42	0.68								0.70																								10	0 87
1577.7	17	18 1	Py Im	1.31	0.34		28.17	1.02						71.49																				-		-				-			10	0 233
1577.7	17	20 0	Qz + TiO ₂	77.40	22.60			1.02																																			10	0 122
1577.7	17	21 (Chl + TiO ₂	30.91	16.65	16.06	27.66		2.34		1.19	0.54			4.66																												10	0 94
1577.7	17	22	ГіО ₂ +	3.50	86.96	3.08	4.34	0.64	0.76	0.80			1.32							-		-													_	_		_			_		10	0 82
1577.7	17	24 (Qz + IIm	39.35	49.51	1.09	10.05	0.04	0.70																																		10	0 98
1577.7	17	25	lm		51.59		46.90	0.69	0.81																									_									10	0 105
1577.7	17	2 (Chl +	39.71	4.22	18.08	32.61	4.60	2.98		1.36	1.05																															10	0 85
1577.7	17	3	ΓiO ₂ +	1.92	84.56	3.02	1.79			4.14			4.56																														10	0 105
1577.7	17	2 '	<u>2z</u> 'llm" + Oz	100.00	64 99	1 10	14 27																											-		-			-			-	10	0 126
1577.7	18	1	ΓiO ₂ +	0.86	92.44	2.00	2.73			0.69			1.28																														10	0 90
1577.7	18	2)	Ktm	2.14	00.07	0.00	00.07	4.07					40.52							1.60	1.16	6			48.05								2.16		4.37								10	0 101
1577.7	18	4	'llm" 'llm" +	6.41	72.36	4.22	8.52	1.07		0.50	2.02	0.30	1.01	4.66																					-						_		10	0 95
1577.7	18	5	Гur	38.01	1.10	31.45	10.39		3.63		2.43																																87	7 102
1577.7	18	6	fur 'llm"	37.88	0.84	34.06	4.53	6.55	6.97	0.60	2.12																							-	-								87	0 84
1577.7	18	8 1	Ру				28.45							71.55																													10	0 231
1577.7	18	9	IIm" FiO + Chl	7.84	61.76	3.72	37.40	0.84			1 44			1 72	1 23																												10	0 97
1577.7	18	11	"llm" + Chl	16.68	43.40	8.88	27.29	1.13	0.73		1.19	0.70		1.72	4.20																												10	0 94
1577.7	18	12	Im	0.70	51.44		46.50	2.06			4.04			00.00																													10	0 108
1577.7	18	131	-y Im	0.70	53.26		45.44	1.30			1.61			62.08																										-			10	0 148
1577.7	18	15	'llm"		63.14		35.19	1.68														_																					10	0 101
1577.7	18	16 I 17 I	lm lm		53.54		45.16	1.30																									_	_	_	-			_				10	0 109
1577.7	18	18	Fur	38.46	0.88	33.10	5.89		6.31	0.39	1.97																																87	7 102
1577.7	18	20 2	IIM" Zrn	2.39	60.75	1.39	33.04		2.44																	68.95							_	_									10	0 99
1577.7	18	21 2	Zrn	29.96			0.61																			69.43																	10	0 108
1577.7	18	22 2	Zrn	30.74	0.84	31.01	6.85		7.06		2 76															69.26								-						-		-	10	0 124
1577.7	18	24 1	lm	00.10	52.74	01.01	40.91	6.35	1.00		2.10																																10	0 108
1577.7	18	25 1	lm Pv		53.78		45.14	1.08						71 20								-												_	_			_					10	0 109
1577.7	18	27 (ý Qz	99.56	0.23		0.44							11.23																													10	0 121
1577.7	18	28 0	Qz + TiO ₂	63.25	36.75																																						10	0 122
1577.7	18	1	I_1O_2 $I_1D_2 + T_1O_2 +$	37 94	99.36	25.81	0.64				1.58	0.93		4 15	7.08																			-	-		_						10	0 110
1577.7	18	3	ΓiO ₂ + Chl	5.65	88.21	3.62	1.85				0.66	0.55		4.15	7.00																												10	0 104
1577.7	18	11	lm +	1.15	57.83	0.51	37.53	2.99																																			10	0 104
1577.7	18	21	lm + Chl +	15.43	44.53	7.87	28.02	1.56	0.56		1.34	0.69								-														-	-	-	_				-		10	0 97
1577.7	18	41	lm + Kln + Chl +	21.24	38.79	10.82	25.66	0.99	0.88		0.88	0.75																															10	0 81
1577.7	19	2		18.46	59.53		37.80	2.67																																			10	0 105
1577.7	19	3		3.09	90.30	4.09	1.99			0.53																																	10	0 77
1577.7	19	4	'llm"		61.60		36.61	1.79																																			10	0 102
1577.7	19	5	riO ₂ + Qz	18.20	79.64	0.54	1.62													<u> </u>														_	_	_		_	_		_		10	0 111
1577.7	19	7	Py	21.67	51.65	15.63	33.16							65.81																										1.04			10	0 92
1577.7	19	8 (Ωz	100.00										_	_		_		_	—														_	_	_							10	0 128
15/7.7	19	10	AC Py	0.88		0.32	29.48				0.77	0.28		68.28						+		-						_					\vdash		-+	-	-	-					10	0 208
1577.7	19	11 (Qz	100.00		1.0																																					10	0 125
1577.7	19	12 1	Mnz FiOo +	9.52	86.03	2.74	5.68			0.93			32.75	_	-0.37					 	0.27	1								14.96	29.21	11.17	\vdash						+		+		10	0 98
1577.7	19	14	Py	3.17	00.33	2.14	29.01			0.43			1.03	70.99																													10	0 235
1577.7	19	15		37.45	0.75	32.31	8.33		5.00	0.44	2.01							0.71		1		1																					87	7 102

Sample	Site	Mineral	si02	Ti02	AI2O3	FeO	Oum	OgM	CaO	Na2O	K20	P205	so3	LL.	C	Sc203	V205	Cr203	CoO	NiO	ZnO	As203	SrO	Y203	ZrO2	Nb2O5	Ag2O	BaO	La203	Ce2O3	Nd2O3	Gd2O3	Tb2O3	Dy203	Er203	Yb203	Hf02	Ta205 W03	PbO	ThO2	0s02	Actual Total
1577.7	19 16	"lim"	1.09	63.93		33.18	1.81																										_							-		100 99
1577.7	19 17	llm		51.03		45.07	2.91	1.00																									_									100 108
1577.7	19 18	llm		52.53		45.26		2.21																									_						_			100 110
1577.7	19 1	TiO ₂ + Qz	11.07	88.08		0.84																																				100 113
1577.7	19 2	Qz	96.28	3.72																													_						_			100 124
1577.7	19 3	TiO ₂ + Chl	4.03	92.57	1.23	1.84					0.34																															100 107
1577.7	19 4	Qz + TiO ₂	67.26	31.93		0.82																																				100 121
1577.7	19 1	llm		51.70		46.65	1.64																																			100 108
1577.7	19 2	"Ilm" + Chl	10.52	68.86	9.13	6.51			0.39			1.08		3.50																												100 104
1577.7	19 3	"Ilm" + Chl	16.87	58.93	13.45	8.75		0.58	0.34			1.09																											-			100 95
1577.7	19 4	Mix	13.72	62.63	10.01	10.00		0.48		0.50		1.05																					_					1.6	2			100 85
1577.7	19 5	llm		50.80		45.08	4.12	1.10																																		100 108
15//./	20 1	lim	4.07	57.57	1.00	40.38	0.56	1.49																															_			100 106
15//./	20 2	"IIM" +	1.37	87.50	1.62	9.45	0.02	-													4.40							-				-	-	-								100 88
1577.7	20 3	Moz		50.69		40.65	0.03		2 42			26.00	2.27	0.57							1.45						2 02		14 67	21 42	10.99		-									100 100
1577.7	20 4		25 70	62.27		0.95		-	2.42	-		30.00	2.37	-0.57													2.02		14.07	31.42	10.00			-	-				-			100 104
1577.7	20 5	Tur	27.22	03.37	22.25	10.70		2.01		1 9/												-						-				-	-	-					-			97 101
1577.7	20 0	Tur	27.45	1.95	25.07	11.22		7.42	0.71	2.47																						-	-	-					-			97 102
1577.7	20 8	Ilm	37.43	57.03	23.07	/1 02		1.42	0.71	2.47		-								-													-	-								100 103
1577.7	20 0	TiO	6.00	96 75	2.26	2 12		1.05					0.97																				-	-								100 100
1577.7	20 10	07.1	0.00	4.02	2.02	1 21					1.05		0.07														-					-	-	-					-			100 100
1577.7	20 10	U(2 T	00.99	51.81	3.03	1.21	0.67	3.47			1.05																-	-				-	-	-					-			100 123
1577.7	20 12		78.50	18.20	1 10	1 57	0.07	5.47	0.63	-				-																			-	-								100 122
1577.7	20 12	Q2 + 1102 +	1 1 1	0.91	0.42	27.27			0.05	0.47			50 10																				-	-				1.6	2			100 142
1577.7	20 13	Pv	0.79	0.01	0.42	28 77		-		0.47		-	70.44																					-				1.0	3			100 210
1577.7	20 15	llm + Chl	34.24	13.25	16.26	25.56		2.55		2.09	0.34		10.44	5.72																												100 104
1577.7	20 16	Ilm	01.21	54.30	10.20	44.79	0.91	2.00		2.00	0.01			0.72																												100 113
1577.7	20 17	QZ	100.00	01.00		11.70	0.01																																			100 128
1577.7	20 18	"llm"		65.59		32.28	2.14																																			100 105
1577.7	20 19	Zrn	28.34						1.29							1.12									69.24																	100 102
1577.7	20 20	Py				30.99							69.01																													100 209
1577.7	20 21	Zrn	30.48																						69.52																	100 129
1577.7	20 22	Spl		0.89	50.07	11.21		20.14										17.69																								100 121
1577.7	20 23	TiO ₂	0.78	95.48	0.82	1.84												1.07																								100 98
1577.7	20 24	Chr		1.22	25.23	33.07		8.17									0.87	31.44																								100 113
1577.7	20 25	Zrn	31.12																						68.88																	100 127
1577.7	20 26	Py				28.71							71.29																													100 236
1577.7	20 27	Ilm		53.19		44.13	2.68																																			100 113
1577.7	20 28	Tur	38.11	1.01	30.51	7.84		6.68	0.73	2.12																													_			87 108
1577.7	20 29	"llm"	3.74	74.40	2.83	18.27		0.76																									_									100 106
1577.7	20 30	QZ	95.90	4.10		40.07	0.50																										_						-			100 129
15//./	20 31	lim Col i	2.64	52.47	244	43.97	3.56											52.07			1 00							-					-			-			-			100 113
1577.7	20 32	Dy	2.04	1.16	2.11	38.92	1.27					-	71.04	-				52.07			1.83							-+							-	-			-	-		100 84
1577.7	20 1	DZ L BV L CH	65.04	0.44	4.09	20.90		0.54			0.62		17.50							-		-										-	-	-	-	-				1		100 233
15/7.7	20 2	Q2 + Fy + GII	03.04	0.44	4.90	10.79		0.54			0.02		17.59									-					-					-	-	-					-	-		100 142
* Gra = Greiaite	(Fe ₃ S ₄)																																									
** (Fe:S = 1:1):	?Incomplete	formation of pyrite during ea	rly diagenesis					<u> </u>																								T	— T	— T	T	— F				I		

Appendix A7: BSE images and EDS mineral analyses for sample Sable Island 5H-58 1579.04 m



Figure A7.1: Sable Island 5H-58 (1579.04 m)



1:Zircon 22:K-Feldspar 2:Zircon 23:Tourmaline 3:Ilmenite 24:Quartz 4:Ilmenite 25:Siderite + 5:"Ilmenite" 26:Siderite 6:"Ilmenite" 27:Quartz 7:Ilmenite 28:Siderite + 8:Ilmenite 29:"Ilmenite" 9:Ilmenite 30:Quartz 10:Chromite 31:Ilmenite 11:Chromite 12:"Ilmenite" 13:Ilmenite 14:Kaolinite + 15:TiO₂ 16:Quartz 17:Siderite 18:TiO₂ 19:Siderite + 20:TiO₂ + Quartz 21:Quartz + TiO₂

Figure A7.2: Sable Island 5H-58 (1579.04 m) (SEM) site 1 (Table A7.1)



Figure A7.3: Sable Island 5H-58 (1579.04 m) (SEM) site 1.1 (Table A7.1). Lithic clast made up of quartz (2), TiO_2 (1) and some chlorite (3). Schist.

1:TiO₂ 2:Quartz 3:TiO₂ + Chlorite +



1:Quartz 2:Pyrite + $3:TiO_2 + Quartz$ 4:Quartz + 5:Ilmenite 6:Quartz + Siderite 7:Ilmenite 8:Chlorite + Muscovite + Kaolinite 9:Quartz 10:TiO₂ + 11:Zircon 12:Ilmenite 13:Siderite + 14:Ilmenite 15:Muscovite + 16:TiO₂ 17:Pyrite

Figure A7.4: Sable Island 5H-58 (1579.04 m) (SEM) site 2 (Table A7.1)



Figure A7.5: Sable Island 5H-58 (1579.04 m) (SEM) site 2.1 (Table A7.1). Detrital quartz (2) cemented with siderite (3,4), fibrous chlorite (5,6) and kaolinite (1).



Figure A7.6: Sable Island 5H-58 (1579.04 m) (SEM) site 2.2 (Table A7.1). A fragment made up of TiO_2 (1,2) and quartz (3).



Figure A7.7: Sable Island 5H-58 (1579.04 m) (SEM) site 2.3 (Table A7.1). A piece of sandstone made up of detrital quartz (1), muscovite (4) and late diagenetic pyrite (2,5) and siderite (3).

1:Quartz 2:Pyrite 3:Siderite + 4:Muscovite 5:Pyrite +



1:Quartz 19:Siderite + 20:"Ilmenite" 2:TiO₂ + Chlorite 21:Ilmenite 22:Quartz 3:Siderite 23:Quartz 4:Zircon 24:Siderite 5:Ilmenite 25:Ilmenite 6:Ilmenite 26:TiO₂ + Kaolinite 7:Chlorite + 27:Siderite + TiO₂ 28:Quartz 8:Ilmenite 29:Siderite + 9:Spinel Chlorite 10:Pyrite 11:"Ilmenite" + 12:K-Feldspar 13:Chlorite + Biotite 14:Ilmenite 15:Quartz 16:Siderite + 17:Ilmenite 18:Quartz

Figure A7.8: Sable Island 5H-58 (1579.04 m) (SEM) site 3 (Table A7.1)



Figure A7.9: Sable Island 5H-58 (1579.04 m) (SEM) site 3.1 (Table A7.1). Lithic clast made up of TiO_2 (1) and quartz (2,3).



1:Chlorite + Biotite 2:Chlorite + Kaolinite + 3:Siderite + 4:Chlorite + Biotite

Figure A7.10: Sable Island 5H-58 (1579.04 m) (SEM) site 3.2 (Table A7.1). Partly chloritized detrital biotite (1,4) with some kaolinite (2) predating diagenetic siderite prisms (3).



1:TiO₂ 2:Chlorite + Muscovite + 3:Quartz 4:TiO₂





20:Quartz 1:Quartz 21:Ilmenite 2:Ilmenite 3:Ilmenite 22:Quartz 4:Pyrite + 23:TiO₂ + Kaolinite + Quartz 5:Quartz + 24:Tourmaline Muscovite 25:Siderite + 6:Siderite 26:Siderite + 7:Siderite + 27:Zircon 8:Quartz 28:Ilmenite 9:Kaolinite + 29:"Ilmenite" + Chlorite + 30:Siderite + 10:Ilmenite + 31:Quartz 11:Pyrite 32:Quartz + 12:Biotite + Monazite Siderite 33:Spinel 13:Ilmenite 34:Pyrite 14:Siderite + 35:Siderite + 15:Tourmaline Kaolinite + 16:TiO₂ + Kaolinite + Chlorite 17:TiO₂ + 18:Pyrite 19:Pyrite +

Figure A7.12: Sable Island 5H-58 (1579.04 m) (SEM) ¹ site 4 (Table A7.1)



Figure A7.13: Sable Island 5H-58 (1579.04 m) (SEM) site 4.1 (Table A7.1). Similar to Figure 10.

1:Quartz 2:Siderite 3:Chlorite + Kaolinite + Mica 4:Chlorite + Biotite



1:Pyrite 2:Chlorite + 3:Pyrite 4:Pyrite 5:Pyrite + 6:Mica + Chlorite + Kaolinite

Figure A7.14: Sable Island 5H-58 (1579.04 m) (SEM) site 4.2 (Table A7.1). A fragment of sandstone made up of framboids of pyrite (1,3,4,5) associated with chloritized mica and kaolinite (2,6).



Figure A7.15: Sable Island 5H-58 (1579.04 m) (SEM) site 4.3 (Table A7.1).A cluster of siderite prisms (2) associated with K-Feldspar (3), and biotite and predating pyrite (1).



Figure A7.16: Sable Island 5H-58 (1579.04 m) (SEM) site 5 (Table A7.1)



1:Albite 21:Chlorite + 2:Pyrite Biotite 3:Ilmenite 22:Zircon 4:Quartz 23:Pyrite 5:Barite 24:Ilmenite 6:"Ilmenite" 25:Siderite + 7:Siderite + 26:Quartz 8:"Ilmenite" 27:Siderite 9:Siderite + 28:Pyrite Kaolinite 29:Pyrite 10:Quartz 30:Siderite 11:Limonite 31:Siderite + 12:Ilmenite 32:Siderite 13:Pyrite 33:Quartz 14:Siderite + 34:Zircon 15:Siderite + 35:Pyrite 16:Chlorite + 36:Siderite + Pyrite Chlorite 17:"Ilmenite" 37:Ilmenite 18:Albite 38:"Ilmenite" + 19:"Ilmenite" 39:Ilmenite 20:Quartz 40:Quartz

Figure A7.17: Sable Island 5H-58 (1579.04 m) (SEM) site 6 (Table A7.1)



1:Siderite 2:Siderite + Chlorite 3:Biotite + 4:Siderite + Chlorite 5:Chlorite + Biotite 6:Ilmenite 7:Siderite + Muscovite 8:Siderite + Chlorite 9:Quartz + 10:Siderite + Chlorite 11:Siderite + Chlorite 12:Siderite + Chlorite 13:Quartz 14:TiO₂ + 15:"Ilmenite" 34:Ilmenite

16:Ilmenite 17:Muscovite + 18:"Ilmenite" 19:Quartz 20:Pyrite + Chlorite + 21:Quartz 22:Zircon 23:Zircon 24:Chlorite + Biotite 25:Ilmenite 26:Siderite + 27:Quartz 28:Ilmenite 29:Siderite + Chlorite 30:Oligoclase 31:Siderite + Chlorite + 32:"Ilmenite" 33:Siderite

Figure A7.18: Sable Island 5H-58 (1579.04 m) (SEM) site 7 (Table A7.1)



Figure A7.19: Sable Island 5H-58 (1579.04 m) (SEM) site 7.1 (Table A7.1). A cluster of siderite prisms (2,3) associated with small grains of probably detrital quartz (3).



Figure A7.20: Sable Island 5H-58 (1579.04 m) (SEM) site 7.2 (Table A7.1). A very fine grained rounded fragment made up of diagenetic TiO_2 (2,3) and siderite (1).



o 1:Siderite + 22:Ilmenite Chlorite 23:Siderite 2:Ilmenite 24:Ilmenite 3:Ilmenite 25:Ilmenite 4:Contaminant 26:Quartz 5:"Ilmenite" 27:Quartz 6:Siderite + 28:Siderite + Chlorite Chlorite 7:Ilmenite 29:Siderite + 8:Siderite + Chlorite Chlorite 30:Chlorite 9:Siderite 31:Zircon 10:Pyrite 32:Pyrite 11:Ilmenite 33:Quartz 12:Zircon 34:Pyrite + 13:Biotite 35:Quartz + 14:Ilmenite 36:Tourmaline 15:Siderite + 37:Biotite + Chlorite 16:Ilmenite 17:Pyrite 18:Siderite + Chlorite 19:Siderite + Chlorite 20:Quartz

21:Ilmenite

Figure A7.21: Sable Island 5H-58 (1579.04 m) (SEM) site 8 (Table A7.1)

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1:Quartz 19:Albite 2:Quartz 3:Siderite + 4:"Ilmenite" 5:Siderite 6:Quartz 7:Ilmenite 8:Ilmenite 9:Quartz 10:"Ilmenite" + Chlorite 11:Quartz + Chlorite 12:Quartz 13:Siderite + Quartz 14:Oligoclase 15:Siderite + 16:Siderite + Quartz 17:Siderite + Chlorite 18:Quartz

20:Siderite + Chlorite 21:Pyrite + 22:Pyrite 23:Quartz 24:Quartz 25:Ilmenite 26:Siderite + Chlorite 27:"Ilmenite" + Chlorite 28:Tourmaline 29:Pyrite + 30:"Ilmenite" 31:"Ilmenite" 32:Zircon 33:Pyrite 34:TiO₂ + Muscovite

Figure A7.22: Sable Island 5H-58 (1579.04 m) (SEM) site 9 (Table A7.1)



1:Quartz 2:Siderite + 3:Muscovite 4:Quartz 5:Siderite + 6:Quartz 7:Kaolinte +Chlorite 8:Siderite + 9:Pyrite + 10:Quartz

Figure A7.23: Sable Island 5H-58 (1579.04 m) (SEM) site 9.1 (Table A7.1). Detrital quartz grains (1,4,6,10) and muscovite relics (3) cemented with siderite (5,8), kaolinite (7) and rare pyrite (9).



1:Quartz + 2:TiO₂ + Clay 3:TiO₂ + Clay 4:TiO₂ + 5:Quartz + Clay

Figure A7.24: Sable Island 5H-58 (1579.04 m) (SEM) site 9.2 (Table A7.1). Detrital quartz grains (1,5) cemented with clays and TiO₂ (2,3,4).



1:TiO₂ + 21:Pyrite 22:Quartz + Pyrite + Chlorite 23:Ilmenite 2:Ilmenite 24:Pyrite 3:Ilmenite 25:Spinel 4:"Ilmenite" 26:Quartz 5:Ilmenite 27:Zircon 6:Siderite + 28:Tourmaline Chlorite 29:Biotite 7:Chlorite + 30:Ilmenite 8:Quartz 31:Siderite + Chlorite 9:Zircon 32:TiO₂ + 10:Pyrite 33:Quartz 11:Siderite 12:Siderite 34:Siderite + Chlorite 13:Quartz 35:Zircon 36:Siderite + Chlorite 14:Zircon 37:"Ilmenite" 15:Ilmenite 16:"Ilmenite" 38:Siderite + Chlorite + Chlorite 39:K-Feldspar 17:Siderite + 40:Quartz Chlorite 41:Quartz 18:Quartz 19:"Ilmenite" 20:Siderite +

Figure A7.25: Sable Island 5H-58 (1579.04 m) (SEM) Chlorite site 10 (Table A7.1)



1:Pyrite + Chlorite + 2:Quartz 3:Tourmaline 4:Siderite + Chlorite 5:Siderite + Chlorite 6:Quartz 7:Zircon 8:Ilmenite 9:Siderite + 10:Chlorite + 11:Zircon 12:Zircon 13:TiO₂ 14:"Ilmenite" 15:"Ilmenite" 16:Siderite + Quartz 17:Kaolinite 18:Siderite + Chlorite 19:"Ilmenite" + 20:Siderite

22:Ilmenite 23:"Ilmenite" + 24:Ilmenite 25:"Ilmenite" 26:Ilmenite 27:Quartz 28:Ilmenite 29:Siderite + 30:Pyrite 31:TiO₂ + Chlorite 32:Chromite 33:Ilmenite 34:Pyrite 35:Siderite + Chlorite 36:Siderite + Chlorite 37:Siderite + Chlorite 38:"Ilmenite" + Chlorite 39:Siderite + 40:TiO₂ + 41:Quartz 42:Ilmenite 43:Staurolite

Figure A7.26: Sable Island 5H-58 (1579.04 m) (SEM) 21:Ilmenite site 11 (Table A7.1)



Figure A7.27: Sable Island 5H-58 (1579.04 m) (SEM) site 11.1 (Table A7.1). ?Detrital diagenetic TiO₂.



1:Quartz 2:Siderite + 3:Chlorite 4:Kaolinte + Chlorite + Muscovite 5:Siderite + Pyrite 6:Quartz

Figure A7.28: Sable Island 5H-58 (1579.04 m) (SEM) site 11.2 (Table A7.1). Detrital quartz (1,6) and muscovite (4) cemented with siderite (2), chlorite (3) and pyrite (5).



1:Chlorite + Ilmenite 2:"Ilmenite" + 3:Chlorite + Ilmenite

Figure A7.29: Sable Island 5H-58 (1579.04 m) (SEM) site 11.3 (Table A7.1). ?Lithic clast made up of pieces of ilmenite (2,3) in chlorite (1) or highly altered detrital ilmenite grain.



Figure A7.30: Sable Island 5H-58 (1579.04 m) (SEM) site 11.4 (Table A7.1). Altered detrital grain.



24:Ilmenite 25:Quartz 26:Siderite + Chlorite 3:K-Feldspar 27:"Ilmenite" 28:Ilmenite 6:Siderite + 29:TiO₂ 30:Ilmenite 31:Quartz 32:Pyrite 33:Siderite + Chlorite 11:Siderite 34:Tourmaline 12:Ilmenite 14:Ilmenite 15:Siderite 17:"Ilmenite" 19:Siderite + Chlorite 20:Quartz + Chlorite 21:Ilmenite 22:Siderite

Figure A7.31: Sable Island 5H-58 (1579.04 m) (SEM) ^{22:Siderite} 23:Ilmenite



Figure A7.32: Sable Island 5H-58 (1579.04 m) (SEM) site 12.1 (Table A7.1). Detrital zircon (1) and diagenetic TiO_2 (2) with ropey texture resembling a net, and rare pyrite (3) crystallites.



1:Ilmenite + 23:Siderite 2:Quartz + 24:Quartz Muscovite + 25:Siderite + Pyrite Chlorite 3:Siderite + 26:TiO₂ + 4:Ilmenite 27:K-Feldspar 5:Ilmenite 28:Monazite 6:Zircon 29:Pyrite 7:"Ilmenite" 30:Ilmenite 8:Zircon 31:Zircon 9:Ilmenite 32:Siderite + 10:Ilmenite Chlorite 11:Quartz 33:Siderite + 12:Pyrite Chlorite 13:"Ilmenite" 34:Ilmenite 14:Ilmenite 35:"Ilmenite" 15:Siderite + Chlorite 16:Chlorite + Biotite 17:Siderite + Chlorite 18:Quartz 19:"Ilmenite" 20:TiO₂ + Chlorite 21:Quartz 22:Siderite + Chlorite +

Figure A7.33: Sable Island 5H-58 (1579.04 m) (SEM) Pyrite site 13 (Table A7.1)



1:Quartz 2:Chlorite + 3:"Ilmenite" 4:Quartz 5:Chlorite + 6:Pyrite 7:Siderite 8:TiO₂ + 9:Quartz 10:Pyrite 11:Ilmenite 12:Ilmenite 13:Siderite 14:Quartz 15:Siderite + 16:Zircon 17:Siderite + Biotite 18:Zircon 19:Biotite 20:Siderite

21:Siderite 22:Ilmenite 23:Ilmenite 24:"Ilmenite" 25:Quartz 26:Siderite + Chlorite 27:Tourmaline 28:Siderite + 29:Pyrite 30:Zircon 31:"Ilmenite" + Chlorite + 32:Ilmenite 33:"Ilmenite" + Chlorite 34:Pyrite 35:Siderite 36:Chlorite

Figure A7.34: Sable Island 5H-58 (1579.04 m) (SEM) site 14 (Table A7.1)



1:Ilmenite 20:Quartz 2:Spinel 21:TiO₂ 3:TiO₂ 22:"Ilmenite" 4:Quartz 23:Ilmenite 5:Siderite + 24:"Ilmenite" Chlorite 25:TiO₂ 6:Pyrite 26:Siderite 7:Siderite + 27:Albite Chlorite 28:Siderite 8:Siderite + 29:Ilmenite Chlorite 30:Quartz 9:Quartz 31:Chlorite + 10:Siderite + Biotite + Chlorite 32:"Ilmenite" 11:Siderite + Chlorite 12:Siderite 13:"Ilmenite" 14:Siderite + Chlorite 15:Ilmenite 16:Ilmenite 17:Zircon 18:Siderite + Chlorite 19:K-Feldspar

Figure A7.35: Sable Island 5H-58 (1579.04 m) (SEM) site 15 (Table A7.1)



1:TiO₂ 2:TiO₂ + Muscovite + Monazite 3:Muscovite 4:TiO₂ + Kaolinite

Figure A7.36: Sable Island 5H-58 (1579.04 m) (SEM) site 15.1 (Table A7.1). A fragment of cement made up mostly of TiO₂ (1), and kaolinite (4) with relics of muscovite (3) and monazite (2) probably late.



1:Chlorite + 17:Zircon Biotite + 18:Ilmenite 2:Quartz + 19:Quartz 20:TiO₂ + Quartz TiO₂ 3:"Ilmenite" + 21:"Ilmenite" 4:Siderite + 22:Quartz 23:Siderite + Biotite Chlorite 5:Siderite 6:Quartz 24:Ilmenite 25:Zircon + 7:Siderite + 26:Siderite + 8:Albite Chlorite

Chlorite 9:"Ilmenite" 10:Quartz + 27:Quartz + 28:Siderite + Siderite + Chlorite 11:Quartz 29:"Ilmenite" 12:Siderite + 30:"Ilmenite" + 13:Siderite 31:Siderite 14:Zircon 15:Siderite + 32:Biotite 33:Chlorite + Chlorite 16:Siderite + Biotite +

Figure A7.37: Sable Island 5H-58 (1579.04 m) (SEM) site 16 (Table A7.1)


1:Chlorite + Biotite 2:K-feldspar 3:Siderite + 4:Quartz 5:Quartz + Chlorite + Muscovite

Figure A7.38: Sable Island 5H-58 (1579.04 m) (SEM) site 16.1 (Table A7.1). Detrital K-Feldspar (2), quartz (4) and partly chloritized micas, biotite and muscovite (1,5) cemented with siderite (3).



1:Chlorite + 2:Zircon 3:Siderite 4:Quartz 5:Siderite + Chlorite 6:Siderite + 7:Quartz + TiO₂ 8:Zircon 9:Ilmenite 10:Zircon 11:Quartz 12:Quartz 13:Pyrite 14:Siderite 15:Quartz 16:Siderite + 17:Quartz 18:"Ilmenite" + Chlorite 19:"Ilmenite" + 20:Quartz 21:"Ilmenite" 22:Pyrite

23:Pyrite 24:Tourmaline 25:Siderite + Chlorite 26:Ilmenite 27:Siderite + Chlorite 28:"Ilmenite" 29:Quartz 30:Pyrite 31:Ilmenite 32:Quartz + Muscovite 33:Quartz 34:Siderite + Chlorite 35:Chlorite + Biotite 36:Chlorite + Biotite + Siderite 37:Chlorite + Biotite + Siderite

Figure A7.39: Sable Island 5H-58 (1579.04 m) (SEM) site 17 (Table A7.1)



1:Siderite 2:Biotite 3:Chlorite + Muscovite 4:Biotite +

Figure A7.40 (2): Sable Island 5H-58 (1579.04 m) (SEM) site 17.1 (Table A7.1). Mechanically deformed partly chloritized micas, biotite and muscovite, (2,3,4) and late diagenetic siderite prisms (1).



1:"Ilmenite" 16:Quartz 2:Quartz 17:Ilmenite 3:Siderite + 18:Ilmenite 4:Chlorite + 19:Quartz **Biotite** 20:Chromite 5:Siderite + 21:TiO₂ **Biotite** 22:"Ilmenite" 6:"Ilmenite" 23:TiO₂ 7:Siderite + 24:Quartz Apatite 25:TiO₂ + 8:Siderite 26:Quartz 9:Quartz + 27:Siderite + 10:Chlorite + Chlorite Biotite 28:Ilmenite 11:Zircon 29:Siderite 12:Ilmenite 30:Ilmenite 13:Siderite + 31:Ilmenite Chlorite 32:Pyrite + 14:Quartz + Chlorite Kaolinite 15:Siderite

Figure A7.41: Sable Island 5H-58 (1579.04 m) (SEM) site 18 (Table A7.1)



1:Monazite 2:Quartz 3:Siderite 4:Ilmenite 5:Quartz 6:Siderite + Chlorite 7:Pyrite 8:Quartz 9:Siderite 10:Ilmenite 11:"Ilmenite" 12:Quartz 13:Tourmaline 14:Siderite + Chlorite 15:Ilmenite 16:Ilmenite 17:"Ilmenite" 18:Siderite 19:Quartz 20:Quartz

21:Ilmenite + 22:Spinel 23:Pyrite 24:"Ilmenite" 25:Ilmenite 26:Pyrite 27:Quartz 28:Pyrite 29:Ilmenite 30:Ilmenite 31:Chlorite + Biotite 32:Siderite + Muscovite 33:K-Feldspar 34:Tourmaline 35:"Ilmenite" 36:Ilmenite + 37:"Ilmenite" + Muscovite

Figure A7.42: Sable Island 5H-58 (1579.04 m) (SEM) site 19 (Table A7.1)



1:Pyrite 2:Pyrite 3:Kaolinite + 4:Pyrite +

Figure A7.43: Sable Island 5H-58 (1579.04 m) (SEM) site 19.1 (Table A7.1). A fragment of sandstone made up of pyrite grains (1,2,4) in contact with diagenetic kaolinite (3).



1:Chlorite + Biotite + 2:Siderite 3:Siderite + 4:Chlorite + Biotite +

Figure A7.44: Sable Island 5H-58 (1579.04 m) (SEM) site 19.2 (Table A7.1). Partly chloritized detrital biotite grains (1,4) with late diagenetic siderite prisms growing along their cleavage planes (2,3).



1:Chlorite + Kaolinite 2:Siderite + 3:Siderite 4:Chlorite + Biotite

Figure A7.45: Sable Island 5H-58 (1579.04 m) (SEM) site 19.3 (Table A7.1). Similar to Figures 40, 44.



24:Pyrite 1:Ilmenite 2:Chlorite + 25:Chromite 26:Quartz + TiO **Biotite** 3:"Ilmenite" 27:Quartz 4:K-Feldspar 28:Siderite + 5:Pyrite Chlorite 6:Quartz 29:Siderite + 7:Zircon Chlorite 8:"Ilmenite" + 30:Quartz 9:Zircon 31:Quartz + 10:Quartz Muscovite 11:Ilmenite 32:Pyrite 12:Ilmenite 33:Quartz 34:Quartz + 13:TiO₂ 35:"Ilmenite" 14:"Ilmenite" 36:Quartz + 15:Ilmenite 16:"Ilmenite" 37:Ilmenite 17:Tourmaline 38:Siderite 18:"Ilmenite" 19:Pyrite 20:Ilmenite 21:Quartz + Chlorite 22:Zircon 23:Ilmenite

Figure A7.46: Sable Island 5H-58 (1579.04 m) (SEM) ²/₂ site 20 (Table A7.1)



Figure A7.47: Sable Island 5H-58 (1579.04 m) (SEM) site 20.1 (Table A7.1). Similar to Figures 40, 44.

1:Siderite 2:Siderite + 3:Chlorite + Biotite 4:Kaolinite + Chlorite 5:Chlorite + Biotite

Sample	Site	Position	Mineral	SiO2	TiO2	AI2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	ш	ū	V205	Cr203	CoO	NiÖ	CnO	ZnO	SrO	ZrO2	Ag2O	BaO	La203	Ce203	Nd2O3	Hf02	WO3	Total	Actual Total
1579.04	1	1 1	Zrn	31.12																				66.16						2.72		100	60
1579.04	1	1 2	Zrn	31.11			0.71																	68.18							!`	100	59
1579.04	1		lim lim	+	51.13		47.02	1.86	1.07																						[_]	100	51
1579.04	1	1 5	"llm"		5∠.81 61.22		45.42	2.03	1.07																						—— <u> </u>	100	2∠
1579.04	1	1 6	"llm"		62.36		35.90	1.74																							-+	100	45
1579.04	1	1 7	llm		52.25		44.97		2.77																							100	52
1579.04	1	18	llm		52.06		44.78		3.17																							100	51
1579.04	1	19	llm		58.38		36.98	4.63																								100	50
1579.04	1	1 10	Chr	4.55		21.63	16.66	5.05	13.68									48.02				1 70										100	54
1579.04	1	1 11	Unr "Ilm"	1.55	64.10	5.54	31.03	5.05	1.61									53.51				1.72										100	47
1579.04	1	1 13	llm		50.65		45.88	0.67	2 80																							100	52
1579.04	1	1 14	Kln +	58.64	4.62	26.67	2.01	0.01	2.25		0.80				5.00																	100	52
1579.04	1	1 15	TiO ₂		99.17		0.83																									100	53
1579.04	1	1 16	Qz	99.41			0.59																									100	59
1579.04	1	1 17	Sd				50.81	1.13	1.01	2.13			0.92																			56	28
1579.04	1	1 18	TiO ₂		99.32		0.68																									100	51
1579.04	1	1 19	<u>Sd +</u>	2.53	02.40	1.18	84.08	1.35	6.05	4.80																						100	30
1579.04	1	1 20	$10_2 + QZ$	5.92	92.46	0.61	1.02																									100	49
1579.04	1	1 21	QZ + HO ₂	92.07	7.55	17.64	0.42					15.82														0.79					+	100	57
1579.04	1	1 23	Tur	36.45		29.92	1.67		11.14	2.51	1.39	15.02			3.91											0.73						87	51
1579.04	1	1 24	Qz	99.43			0.57																								-	100	62
1579.04	1	1 25	Sd +	2.08	0.81		88.47	2.21	1.40	3.41			1.62																			100	31
1579.04	1	1 26	Sd				43.19	5.32		2.96			1.40																		3.14	56	31
1579.04	1	1 27	Qz	99.56			0.44	0.50		5 70																					[.]	100	61
1579.04	1	1 28	Sd +	3.15	1.11	1.51	83.13	3.52	0.04	5.73			1.84																			100	30
1579.04	1	1 29		07.28	1 52		26.09		0.91																							100	60
1579.04	1	1 31	Ilm	2 75	52.00		42.69	2.56						-																		100	54
1579.04	1.1	1 1	TiO ₂	2.70	99.36		0.64	2.00																								100	107
1579.04	1.1	1 2	Qz	99.05		0.54	0.41																									100	122
1579.04	1.1	1 3	TiO ₂ + Chl +	11.73	74.86	8.81	1.26		0.81						2.53																1	100	105
1579.04	2	2 1	Qz	100.00																												100	55
1579.04	2	2 2	Py +	0.94		0.86	30.51				1.72			64.19																	1.79	100	72
1579.04	2	2 3	$TiO_2 + Qz$	12.33	83.72	1.69	2.25		4 70			0.00			4 70																'	100	38
1579.04	2	2 4	QZ +	58.77	7.32	8.58	16.20	1 28	1.73			2.60			4.78																	100	33
1579.04	2	2 6	Oz + Sd	83 49	0.57	1 17	13 69	1.20	0.55			0.53		-																		100	49
1579.04	2	2 7	Ilm	00.10	55.66		42.42	1.92	0.00			0.00																				100	48
1579.04	2	28	Chl + Ms + Kln	48.64		33.40	9.13		0.69	0.46	0.92	2.30			4.46																	100	48
1579.04	2	29	Qz	100.00																												100	58
1579.04	2	2 10	TiO ₂ +	11.71	82.98	3.12	2.20																									100	51
1579.04	2	2 11	Zrn	31.22	54.05		45.05																	68.78								100	58
1579.04	2	2 12	lim Od -	4.07	54.05	4.04	45.95	2.00	4 70	0.07			0.00																			100	49
1579.04		2 13	50 +	4.27	51 72	4.24	80.32	3.60	1.70	3.87			2.00																			100	<u> </u>
1579.04	2	2 15	Ms +	70.84	0.61	14.67	6.21	1.50	0.98		0.50	3.37			2.82																-+	100	46
1579.04	2	2 16	TiO ₂		99.09		0.91																									100	50
1579.04	2	2 17	Py				28.61							71.39																	-	100	110
1579.04	2.1	1 1	Kln +	50.59	0.36	37.32	4.36				0.91	0.63			5.82							-	_									100	96
1579.04	2.1	1 2	Qz	99.60		4.6.1	0.40	4.00	0.4-	0.55																					!`	100	124
1579.04	2.1		50 +	2.73		1.34	88.11	1.08	3.17	3.57			1 1 4																			100	62
1579.04	2.1	1 5	Ou + Chl + Bt	1.93	0.54	25.73	18 19	1.08	1.41	∠.ŏ4	0.76	3.05	1.44		3.66																	100	87
1579.04	2.1	1 6	Chl	30.11	0.54	21.93	22.14		3.83		1.40	0.54			5.04																+	85	91
1579.04	2.2	2 1	TiO ₂	0.99	97.58	0.47	0.71		0.00	0.25		0.04			0.04																	100	108

Sample	Site	Position	Mineral	Si02	TiO2	AI2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	ш	ō	V205	Cr203	CoO	NiO	CuO	ZnO	SrO	ZrO2	Ag2O	BaO	La203	Ce2O3	Nd2O3	Hf02	WO3	Total Actual Total
1579.04	2.2	2 2	TiO ₂ +	1.41	97.36	0.49	0.74																									100 108
1579.04	2.2	2 3	Qz +	95.57	0.97		3.46																									100 120
1579.04	2.3	3 1	Qz	99.59			0.41																									100 121
1579.04	2.3	3 2	Py	1.11		0.51	29.22							69.17																		100 217
1579.04	2.3	3 3	Sd +	2.63	0.00	1.37	81.01	2.65	1.44	3.27	0.40	7.00	1.52		0.00																6.11	100 66
1579.04	2.3	3 4	IVIS Dv. i	47.64	2.69	29.69	1.91		1.61	0.20	0.49	7.90		40.09	3.06																2.06	95 110
1579.04	2.3	2 2	Py +	4.00		2.40	37.00		0.56	0.30	0.65	0.43		49.06																	3.90	100 57
1579.04	3	2 2	TiO ₂ + Chl	3 21	93 70	1 48	1 26					0 34																				100 50
1579.04		3 3	Sd	0.21	50.10	1.40	50.26	1 47	0.95	2.28		0.04	1 04																			56 28
1579.04	3	3 4	Zrn	30.98			00.20		0.00	2.20														69.02								100 57
1579.04	3	3 5	llm		50.74		46.92	2.34																								100 49
1579.04	3	3 6	llm		52.77		42.85	4.38																								100 50
1579.04	3	37	Chl + TiO ₂	14.25	67.44	9.28	7.20		1.05		0.78																					100 33
1579.04	3	38	llm		54.10		44.65	1.25																								100 50
1579.04	3	39	Spl			42.17	18.48		14.83									24.52														100 49
1579.04	3	3 10	Py	0.43			28.93							70.64																		100 100
1579.04	3	3 11	"llm" +	0.98	68.20	0.98	28.03	1.81			0.70	45.07																				100 46
1579.04	3	3 12	KIS Chi i Bt	66.01	0.04	17.50	0.63		5.01	0.52	0.79	15.07			7.02																	100 56
1579.04	3	2 1/	Ulli + Di Ilm	33.07	0.04	21.71	20.02	1 / 1	5.21	0.55	0.00	2.11			7.03																	100 46
1579.04		3 15	07	99.45	30.04		0.55	1.41																								100 56
1579.04	3	3 16	Sd +	5.01		2.63	75.04	1.31	10.83	5.18																						100 28
1579.04	3	3 17	Ilm	0.01	54.95	2.00	42.25	2.79	10.00	0.10																						100 47
1579.04	3	3 18	Qz	100.00																												100 55
1579.04	3	3 19	Sd +	14.24		1.36	76.45	1.20	2.63	2.63			1.49																			100 31
1579.04	3	3 20	"llm"		77.15	0.78	22.07																									100 44
1579.04	3	3 21	llm		58.18		40.00	0.87	0.94																							100 46
1579.04	3	3 22	Qz	99.50			0.50																									100 54
1579.04	3	3 23	Qz	99.56			0.44																									100 55
1579.04	3	3 24	Sd		54.45	0.86	47.98	1.69	0.00	3.07																					2.40	56 28
1579.04	3	3 25	lim Tio i Kin	45.74	51.45	44.70	47.87		0.68		0.75				4.00																	100 48
1579.04	3	3 20		15.74	65.81	11.76	1.91	7.66	0.06		0.75	0.00			4.03																11 50	100 43
1579.04	3	3 28	07	99.41		3.25	0.53	7.00	0.96			0.62																			11.56	100 54
1579.04		3 29	Sd + Chl	2 43		1 53	86.63	1 93	1 96	3 64			1.89																			100 28
1579.04	31	1 1	TiO ₂	1.40	98 24	1.00	0.73	1.00	1.50	0.04			1.00																			100 106
1579.04	3.1	1 2	Qz	99.61	00.21		0.39																									100 123
1579.04	3.1	1 3	Qz +	95.85	1.16	1.97	0.42					0.60																				100 121
1579.04	3.2	2 1	Chl + Bt	39.69	0.71	27.43	15.76		4.09		0.71	1.97			9.64																	100 110
1579.04	3.2	2 2	Chl + Kln +	48.57	0.69	34.08	7.61		1.40	0.26	0.44	1.03			5.91																	100 104
1579.04	3.2	2 3	Sd +	2.01	0.71		90.12	2.34	1.66	3.16																						100 61
1579.04	3.2	2 4	Chl + Bt	41.77	1.10	22.60	21.41		9.45		0.71	2.95																				100 77
1579.04	3.3	3 1	TiO ₂		98.95		1.05																									100 108
1579.04	3.3	3 2	Chl + Ms +	52.61	2.67	27.99	5.86		1.51		0.47	3.59		1.56	3.74																	100 91
1579.04	3.3	3 3	Qz	99.09	0.55		0.37																									100 123
1579.04	3.3	3 4		00.44	99.21		0.79																									100 106
1579.04	4	+ 1	QZ IIm	99.41	55 12		0.59	0.70																								100 46
1579.04	4	† <u> </u>	llm		51 22		44.17	0.70																								100 40
1579.04	4	1 4	Pv + Kln +	63 20	0.61	12 79	9.82	3.10			1 77	1.02		10.80																		100 44
1579.04	4	1 5	Qz + Ms	85.37	0.73	7.07	1.43		0.50			2.24		10.00	2.66																	100 50
1579.04	4	1 6	Sd				50.28	0.69	3.01	2.02																						56 28
1579.04	4	4 7	Sd +	6.08		3.43	75.73	1.62	4.95	3.20																					4.98	100 31
1579.04	4	4 8	Qz	99.47			0.53																									100 57
1579.04	4	4 9	Kln + Chl +	50.51		34.94	10.60		1.80		0.86	1.29																				100 40
1579.04	4	4 10	llm +		54.09		43.84	0.65	1.42																							100 49
1579.04	4	4 11	Py				28.84							71.16																		100 99

Sample	Site	Position	Mineral	SiO2	TiO2	AI2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	ш	ō	V205	Cr203	CoO	NiO	CuO	ZnO	SrO	ZrO2	Ag2O	BaO	La203	Ce2O3	Nd2O3	Hf02	WO3	Total	Actual Total
1579.04		4 12	Bt + Sd	27.25	2.73	11.94	44.42		7.25	1.48		4.94																				100	31
1579.04		4 13	llm		52.16		46.14		1.70																							100	47
1579.04		4 14	Sd +	13.18	1.07	7.95	69.74	1.06	3.91	2.81		1.36			0.10																	100	30
1579.04		4 15	Tur	36.59	1.37	29.83	7.09		7.05		2.59				2.48																	87	46
1579.04		4 16	$IIO_2 + KIN + CNI$	25.90	45.39	18.55	3.54		0.52		0.83				5.28																	100	48
1579.04		4 17		3.06	96.30		0.64							50.12																	1.07	100	48
1579.04		4 10	Py +	1 29	0.41	0.67	59.50							34 12		0.67															3.86	100	45
1579.04		4 20	07	99.21		0.07	0.79							04.12		0.07															0.00	100	45
1579.04		4 21	Ilm	00.21	54.04		44.62		1.34																							100	45
1579.04		4 22	Qz	99.05			0.95																									100	51
1579.04		4 23	TiO ₂ + Qz	18.27	80.98		0.75																									100	48
1579.04		4 24	Tur	37.45	0.64	32.32	10.57		3.83		2.18																					87	43
1579.04		4 25	Sd +	7.96	1.52	3.08	71.38	1.45	3.84	3.26				1.52								0.62									5.39	100	28
1579.04		4 26	Sd +	3.59		1.91	84.58	3.59		4.60			1.72																			100	27
1579.04		4 27	Zrn	30.84	40.04		40.05		4.40															69.16								100	
1579.04		4 28	lim "lim" i	1.60	49.34	2.01	48.35	1.14	1.18																							100	47
1579.04		4 30	Sd +	23.09	02.02	7.00	68 48	0.92				0.51	1																			100	37
1579.04		4 31	Qz	99.56		7.00	0.44	0.32				0.01																				100	54
1579.04		4 32	Qz + Mnz	49.75		5.20							17.58		0.25												5.13	14.72	7.37			100	44
1579.04		4 33	Spl			49.59	13.69		18.72									17.99														100	49
1579.04		4 34	Py				22.58							53.70							23.72											100	86
1579.04		4 35	Sd + Kln +	12.46	1.40	5.93	67.23	1.25	7.26	2.80		1.66																				100	27
1579.04	4.	1 1	Qz	99.49			0.51																									100	122
1579.04	4.	1 2	Sd				48.71	0.73	4.23	2.33																						56	61
1579.04	4.	1 3	Chi + Kin + Mica	50.89	0.83	34.64	9.12		2.64			1.89																				100	94
1579.04	4.	1 4		49.62	0.83	31.55	10.87		4.13			3.00		66.67																		100	106
1579.04	4.	2 2	Py Chl+	48.25		25.01	33.33		1.50		0.84	2.40		2 70																	3.45	100	70
1579.04	4	2 3	Pv	40.23		25.51	29.60		1.50		0.04	2.40		70.40																	3.43	100	222
1579.04	4.	2 4	Pv				32.59							66.35																	1.06	100	194
1579.04	4.	2 5	Py +			0.55	57.64							33.64		1.20															6.97	100	109
1579.04	4.	2 6	Mica + Chl + Kln	51.61	0.77	29.72	10.40		1.41		0.45	3.14																			2.51	100	88
1579.04	4.	3 1	Ру				23.30							54.12							22.57											100	192
1579.04	4.	32	Sd				51.09	0.94	1.20	1.94			0.83																			56	60
1579.04	4.	3 3	Kfs	65.62	0.70	17.66	0.71		0.40			15.35														0.66						100	120
1579.04	4.	3 4	Bt	39.03	2.73	18.71	22.42		8.12		0.54	4.99																				96	
1579.04	4.	3 5	BL	40.43	3.30	16.27	19.57		9.66		0.51	6.20		71 15																		96	00
1579.04		5 2	ry "llm"		60.89		20.00							71.15																		100	41
1579.04		5 3	Qz	99.39	00.00		0.61																									100	52
1579.04		5 4	Sd + Kln	20.87		6.08	65.36	1.51	3.38	2.79																						100	30
1579.04		5 5	llm		52.32		44.95	2.73																								100	44
1579.04		56	Py				28.69							71.31																		100	97
1579.04		57	Sd +	11.85	0.87	5.82	67.31	1.28	2.95	1.96		0.90																			7.06	100	32
1579.04		5 8	llm		55.34		41.53	3.13											<u> </u>													100	44
1579.04		5 9	lim Od - Obl	E 00	56.48	0.40	41.61	4.05	1.91	0.04		0.10																				100	45
15/9.04		5 10 5 14	Sa + Chi Sd + Chi	5.02	1.07	3.49	81.66	1.25	3.85	3.21		0.46																			0 10	100	28
1579.04		5 12		7.37	0.75	4.41	71 02	2.42	ວ.54 1.82	2.59		1.09																			0.19	100	36
1579.04		5 13	07	99.45	0.75	5.95	0.55	2.43	1.02	0.00		1.00																			11.00	100	55
1579.04		5 14	Sd + Kln	3.53		1.84	82.10		8.03	4.50																						100	27
1579.04		5 15	llm	2.50	54.48		44.67		0.85				-																			100	47
1579.04		5 16	Chl + Bt	33.10	2.71	14.25	38.89		8.01			3.04																				100	27
1579.04		5 17	llm		53.87		41.98	0.68	3.47																							100	47
1579.04	-	5 18	Ilm		52.35		45.36	2.29																								100	47
1579.04		5 19	Sd +	1.51			85.41	3.40		7.49		0.62	1.58																			100	26
1579.04		5 20	llm		53.67		46.33																									100	46

ample	Site	osition	lineral	Si02	TiO2	N203	FeO	MnO	MgO	CaO	Va2O	K20	205	SO3	ш	ū	/205	cr2O3	CoO	NiO	CuO	ZnO	SrO	ZrO2	\g20	BaO	a203	e203	d2O3	Щ02	W03	Total	Vctual Total
0	5	<u> </u>	≥	1 1 2		0.74	28.00		_	-	~		ш.	60.15				0	-		-				\vdash			0	z		_	100	
1579.04	5	5 22 5	d d	1.12		0.74	53.16	1.00		1.84				09.15															\vdash			56	25
1579.04	5	5 23 I	m		57.11		40.45	2.44																								100	46
1579.04	5	5 24 5	Sd				48.96	1.89	1.24	2.97			0.95																			56	27
1579.04	5	5 25 0	Qz	99.54			0.46																		⊢				\square			100	56
1579.04	5	26 5	sd + Kin	2.65		1.31	89.35	1.45	2.58	2.65				71.02											⊢−−+				┝──┦			100	28
1579.04	5	28 5	ry Dv				28.00							71.03											├──┼				┝──┦			100	101
1579.04	6	5 1 A	y Nb	68.08		19.42	0.44			1.08	10.99			71.51														(100	59
1579.04	6	6 2 F	γ				28.26							71.74														I				100	109
1579.04	6	6 3 I	m		54.41		44.38		1.21																							100	52
1579.04	6	6 4 C	Qz	100.00																												100	60
1579.04	6	6 5 E	Brt											36.77					0.19				2.64			60.40			\square	$ \rightarrow $		100	59
1579.04	6	6 6	llm"	0.40	62.05		37.12	4.00	0.83	0.00															⊢−−∔			'	\vdash	 		100	49
1579.04	6		60 +	2.19	65.05		89.10	1.80	1.64	3.86			1.41			0.40									⊢−−+				\vdash	r		100	31
1579.04	6		iini Sd + Kln	9.56	65.05	6.73	52.55	2.00								0.40		2 32										I	<u>⊢</u> –		12.61	100	18
1579.04	6	10 0	07	99.37		0.70	0.63	1.47										2.02											⊢ −		12.01	100	62
1579.04	6	5 11 L	.m	00.01			77.93	2.17					1.70	1.11																	17.09	100	40
1579.04	6	6 12 I	lm		51.57		45.19	0.77	2.46																							100	53
1579.04	6	6 13 F	у	0.71			35.54							62.18																	1.56	100	90
1579.04	6	5 14 5	Sd +	3.15			86.86	2.50	3.25	4.24																						100	31
1579.04	6	6 15 S	Sd +	6.81		2.14	77.33		9.31	4.40															⊢				\vdash	⊢		100	34
1579.04	6	6 16 C	Chl + Py	34.13	04.00	12.21	29.68	4.00	1.43		3.22	2.16		17.19											⊢−−∔			'	\vdash	 		100	36
1579.04	6		lim"	60.16	64.39	17.75	34.32	1.29			7 20	2.25			2.25										⊢−−+				\vdash	r		100	52
1579.04	6	10 /	llm"	09.10	70 73	17.75	27 78				1.30	2.35			2.35		1 4 9											I	\vdash			100	52
1579.04	6	3 20 0)7	100.00	10.10		21.10										1.40												⊢ −			100	62
1579.04	6	5 21 0	c- Chl + Bt	30.35	1.45	15.96	37.38		7.23	0.91		3.76																			2.97	100	39
1579.04	6	6 22 Z	Irn	31.21																				68.79								100	62
1579.04	6	6 23 F	у	0.65			32.73				0.84			65.78																		100	89
1579.04	6	6 24 I	m		52.64		44.60	0.89	1.87																$ \longrightarrow $							100	55
1579.04	6	5 25 5	Sd +	7.02		4.94	79.67	2.38	2.86	2.62		0.51													⊢				\vdash	I		100	33
1579.04	6	260	JZ Vd	99.13			0.87	1.65	0.60																⊢				└── ┦		7.54	100	63
1579.04	6	2/ 2		0.41			40.1Z 28.20	1.05	0.69					71 30														I	┝──┦		7.54	100	113
1579.04	6	20 F	y Pv	0.41			29.01							70.99														(├			100	111
1579.04	6	30 5	, Sd				51.21	0.51	2.04	2.25				10.00																		56	30
1579.04	6	5 31 5	Sd +	1.41	3.51		84.53	3.54		5.15			1.87															1				100	31
1579.04	6	5 32 5	Sd		0.39		43.78	1.29	0.87	0.35			0.87																		8.44	56	39
1579.04	6	6 33 C	Qz	99.56			0.44																									100	61
1579.04	6	6 34 Z	Irn	30.97																				69.03	⊢				\vdash	 		100	60
1579.04	6	35 F	y Sd L Chi	1.00	0.32	1.54	29.04	1 24	2.16	2 17			1.50	68.86											⊢−−∔				├ ──┤		1.79	100	101
1579.04	6	37 1		1.96	49.84	1.54	47 51	2.65	2.10	3.17			1.50												\vdash				⊢ − −	ł		100	52
1579.04	6	3 38	llm" +	1.87	86.48	3.49	6.64	2.00									-	1.53											<u>⊢</u>	<u>+</u>		100	41
1579.04	6	5 39 II	m		54.98	0.10	40.55	0.70	3.77																				<u> </u>			100	51
1579.04	6	6 40 C	Ωz	99.40			0.60																									100	60
1579.04	7	15	Sd	0.78			51.36	0.80		0.87																					2.20	56	31
1579.04	7	28	Sd + Chl	11.82		8.92	55.85	6.12	2.20		1.11			1.35											\vdash					\square	12.63	100	39
1579.04	7	<u>3</u> E	St +	37.41	1.10	23.68	20.97		1.19	1.13	1.16	8.61			4.74										⊢−−∔				\vdash	⊢−−−∔		100	34
1579.04	7		id + Chl	2.26	2.24	1.50	85.92	1.76	3.16	3.73		1.40	1.66	0.70								-			┝──┤			<u> </u>	┝──┦	⊢ −−		100	30
1579.04	7		m +Bt	28.29	2.34	17.95	38.19		0.86	2.14		1.49		2.13											┝──┼				<u>⊢</u>	 	ł	100	20
1579.04	7	7 7 9	d + Ms	9.00	-+3.03	3 97	78 76	1 91	2 44	2 75		1.09																·	\vdash			100	32
1579.04	7	88	Sd + Chl	5.89		3.17	80.97	2.41	2.31	3.67		1.00	1.58																			100	32
1579.04	7	90	Qz +	91.43	0.65	0.77	1.79		0.60					0.63	4.14																	100	59
1579.04	7	10 5	Sd + Chl	1.59		1.17	87.73	1.55	2.36	4.11			1.49																			100	31
1579.04	7	11 5	Sd + Chl	2.12		1.25	83.53	2.12	1.19	4.83																					4.95	100	34

Sample	Site	Position	Mineral	Si02	TiO2	AI2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	ш	ō	V205	Cr203	CoO	NiO	CnO	ZnO	SrO	ZrO2	Ag2O	BaO	La203	Ce2O3	Nd2O3	Hf02	WO3	Total	Actual Total
1579.04	7	12	 Sd + Chl	5.42		4.08	83.10		4.08	3.32																		-				100	33
1579.04	7	7 13	Qz	100.00																												100	62
1579.04	7	7 14	TiO ₂ +		96.64		3.36																									100	47
1579.04	7	15	"llm"		62.67		35.44	1.89																								100	51
1579.04		16	lim Ma	40.04	53.48	04.44	45.42	1.10	4.57		0.70	0.00			2.04																	100	54
1579.04	- 1	17	IVIS +	48.31	70.00	31.14	4.25	1 40	1.57		0.73	8.89			3.91																	100	48
1579.04	- / 7	10	07	100.00	70.99		27.01	1.40																								100	59
1579.04	7	20	Pv + Chl +	6.99	0.73	3.39	28.73				1.37	0.39		58.40																		100	80
1579.04	7	21	Qz	99.36			0.64																									100	61
1579.04	7	22	Zrn	30.93																				69.07								100	59
1579.04	7	23	Zrn	31.16																				68.84								100	60
1579.04	7	24	Chl + Bt	33.54		19.38	39.07	0.80	1.85	1.62	1.23	2.51																				100	35
1579.04		25	llm		53.70		44.23	2.06																								100	52
1579.04		26	Sd +	6.14		3.40	80.63	1.67	3.65	3.06			1.45																			100	32
1579.04	7	7 20	QZ IIm	99.50	52.04		0.44	2.25																								100	59
1579.04	7	20	Sd + Chl	12.85	0.75	7 40	68 10	1.03	3 17	2 22		0.95																			3 53	100	36
1579.04	7	30	Olia	59.15	0.70	20.47	2.16	1.00	0.17	3.70	9.15	0.43			4.94																0.00	100	61
1579.04	7	31	Sd + Chl	2.83	2.20	1.73	80.67	1.63	4.84	3.96	1.54	0.60																				100	32
1579.04	7	32	"llm"		61.13		36.04	0.75	2.08																							100	50
1579.04	7	7 33	Sd	0.74			43.59	1.61	0.66	3.68			3.23																		2.50	56	34
1579.04	7	34	llm		49.16		44.91	5.15			0.78																					100	51
1579.04	7.1	1	Qz	98.37			1.63	. = 0																								100	116
1579.04	7.1	2	Sd +	5.52	0.68	3.20	82.77	1.73	1.10	3.02		0.56	1.44																			100	62
1579.04	7.1		50 +	3.68	2.06	2.27	80.81	1.96	1 21	3.23		0.40	1.05																		7.01	100	60
1579.04	7.2			2.07	2.90	0.99	3.80	1.42	1.31	1.00			1.16																		7.91	100	09
1579.04	7.2	2 3	TiO ₂		93.06	0.60	3.66											-			-			2.66				-				100	83
1579.04	8	3 1	Sd + Chl	5.29	1.00	2.55	74.12	2.42	3.47	1.07		0.70												2.00							9.38	100	40
1579.04	8	3 2	Ilm	0.20	51.88	2.00	46.97	1.16	0.11			0.10																			0.00	100	54
1579.04	8	3 3	llm		56.66		41.51	1.83																								100	51
1579.04	8	3 4	Contaminant	14.21		5.53	42.01							2.05	3.65																32.56	100	18
1579.04	8	3 5	"llm"		92.51		7.49																									100	45
1579.04	8	36	Sd + Chl	2.10		1.74	87.56	2.63		4.00			1.97																			100	30
1579.04	8			4 40	51.03	4.00	48.40	0.57	4.05	0.05			4.04																			100	52
1579.04	0	2 0	Sd + Chi	1.40		1.30	52.08	2.05	1.25	2.95			1.04																			56	20
1579.04	8	10	Pv				29.01	2.05		0.37				70.99																		100	109
1579.04	8	3 11	llm		58.51		40.75	0.73						10.00																		100	50
1579.04	8	3 12	Zrn	31.28																				68.72								100	58
1579.04	8	3 13	Bt	36.99	2.45	16.66	27.33		6.84		0.66	5.06																				96	45
1579.04	8	3 14	llm		51.95		48.05																									100	51
1579.04	8	3 15	Sd + Chl	3.78		2.07	78.54	1.62	5.30	3.20																					5.49	100	33
1579.04	8	3 16	llm		50.37		47.15	2.47																								100	52
1579.04	8	3 17	Py Sd. Chi	E 46		2.67	29.36	2.02	1 27	E 46				70.64																		100	108
1579.04	0	2 10		5.40		3.67	78.45	3.92	7.23	5.40																						100	33
1579.04	8	3 20	07	99.57		4.03	0.43		1.25	4.07																						100	61
1579.04	8	3 21	Ilm	00.01	52.57		44.94	2.49																								100	52
1579.04	8	3 22	Ilm		55.53		42.48	1.99																								100	49
1579.04	8	3 23	Sd				50.64	2.44		2.10			0.82										_									56	30
1579.04	8	3 24	Ilm		50.69		47.26	2.06																								100	52
1579.04	8	3 25	llm		50.95		48.20	0.84											L													100	51
1579.04	8	3 26	uz	98.70		0.75	0.54																									100	57
1579.04	8	5 27	QZ Sd I Chl	99.47		2.46	0.53	1 40	1 74	2.22			1.60						-													100	21
1579.04	8 8	2 20		4.91		2.40	82 76	2.81	1.71	2.23			1.02						-													100	31
1579.04	8	3 30	Chl	26.83		21.26	24.64	2.01	12.27	0.10			1.47																			85	51

ample	Site	sition	ineral	802	02	1203	e0	AnO	VgO	CaO	la2O	(20	205	803	ш	ō	205	r203	000	NiO	Ono	Quz	Sro	r02	g20	3aO	a2O3	e203	d2O3	#02	VO3 Total	ctual Total
ő		۲ ۲	Σ	0,		<	_	~	~	0	2	-	<u>а</u>	~			>	C	0	_	0			IN	<	ш	Ľ	Ō	Ž	-	> -	< ⁻
1579.04	1	B 31	Zrn	30.42		0.00	0.83				1.04			57.00										68.75							100	58
1579.04	_	5 32	Py O7	1.44		0.90	34.93				4.04			57.22																	1.47 100	60
1579.04		D 30 R 32	QZ Pv +	99.30			30.41				0.82			65.02																	2 07 100	84
1579.04		8 35	07 +	96.13		1.82	1 15				0.02	0.43		00.02																	100	58
1579.04		8 36	Tur	42.51		31.55	6.54		1.09		0.86	0.10			4.45																87	50
1579.04		B 37	Bt +	38.85		11.26	38.10	1.21		1.60	0.73	8.26																			100	41
1579.04	•	9 1	Qz	99.47			0.53																								100	61
1579.04		9 2	Qz	99.51			0.49																								100	61
1579.04		9 3	Sd +	20.91	00.05	6.51	60.03	1.11	2.10	1.70	0.96	0.66		1.01																	5.01 100	39
1579.04	-	9 4	"lim"	0.74	63.35)	34.91	1.00	2.42	2.40																					100	49
1579.04			07	99.46			49.35	0.74	3.43	2.40																					100	60
1579.04		9 7	llm	99.40	52 70		47.30																								100	51
1579.04		9 8	llm		58.62		38.09	3.29																							100	50
1579.04	9	9 9	Qz	100.00																											100	58
1579.04		9 10	"Ilm" + Chl	11.65	64.50	6.08	16.87					0.89																			100	39
1579.04	1	9 11	Qz + Chl	96.69		2.64	0.67																								100	55
1579.04		9 12	Qz	98.54			1.46																								100	58
1579.04		9 13	Sd + Qz	5.21		00.00	84.45	2.57	2.04	3.17	10.00	0.73	1.84																1		100	31
1579.04		9 14	Olig	65.63		20.60	0.62		1 07	2.52	10.63																				5.04 100	57
1579.04		9 10	50 +	9.47		2.35	70.57	1.62	1.87	3.80																					5.94 100	20
1579.04		9 10	Sd + Q2 Sd + Chl	9.40		1 99	80.50	1.02	3.57	2 43																					7 32 100	32
1579.04		9 18	07	99.37		1.00	0.63	1.20	0.01	2.40																					100	57
1579.04		9 19	Ab	68.26		18.40	0.91				10.84				1.59																100	56
1579.04		9 20	Sd + Chl	2.53		1.28	82.31	1.77	2.68	2.75																					6.68 100	33
1579.04		9 21	Py +	2.12	0.62	2.79	36.42				6.00			47.88																	4.16 100	43
1579.04		9 22	Ру				29.03							70.97																	100	102
1579.04		9 23	Qz	99.16			0.84																								100	60
1579.04		9 24	Qz	99.32	50.40		0.68	0.40																							100	59
1579.04		9 25	IIM Sd I Chi	21.17	56.42	11 55	40.12	3.46	4 17	2.00	1 1 0	1.04																			100	
1579.04		9 20	"llm" + Chl	1.50	83.66	2 23	12.61		4.17	2.99	1.10	1.94																			100	47
1579.04		9 28	Tur	36.93	1.18	33.25	6.00		6.61	1.32	1.71																				87	50
1579.04	9	9 29	Py +	1.97			44.51		0.0.1					53.52																	100	10
1579.04		9 30	"llm"	0.72	62.80)	33.81	2.67																							100	45
1579.04	Ţ.	9 31	"llm"	0.86	63.82	2	31.13	4.19																							100	48
1579.04		9 32	Zrn	30.89																				69.11							100	57
1579.04		9 33	Py				29.89				0.37			69.74																	100	105
1579.04		9 34	TIO ₂ + Ms	19.16	61.60	10.13	1.14		0.73		0.73	2.90			3.61																100	55
1579.04	9.	1 1	S4 +	99.14		1.24	08.0	1.62	2 04	3 33			1 20																+		100	65
1579.04	9.	1 3	Ms	46.25	0.41	29.62	4 03	1.02	2.94	J.JZ	0.82	8 10	1.30		4 46														1		95	122
1579.04	. 9	1 4	Qz	98.97	0.41	20.02	1.03		1.01		0.02	0.10			0																100	130
1579.04	9.	1 5	Sd +	6.73		4.65	82.54	1.70	1.97	2.40																			1		100	67
1579.04	9.	1 6	Qz	99.08			0.92																								100	131
1579.04	9.	1 7	Kln + Chl	47.24		36.54	10.12		1.22		0.98	0.26			3.64																100	98
1579.04	9.	1 8	Sd +	2.53		1.24	80.78	5.25	1.42	7.18			1.61																		100	65
1579.04	9.	1 9	Py +	1.81		0.51	32.73			0.23	0.80	0.19		60.92															1		2.83 100	186
1579.04	9.	1 10	QZ	98.31	1 1 1 1	0.83	0.86		0.44																\vdash						100	129
1579.04	9.	2 1		95.53	1.04	1.28	1.74		0.41		0.00	2.00			5.00																100	130
1579.04	9.		$TiO_2 + Clay$	10.01	70.52	0.55	1.42		0.04		0.90	2.29			00.C										\vdash						100	116
1579.04	9.	2 /		1 72	06 50	0.72	0.69					0.32																	1		100	115
1579.04	9.	2 5	$\Omega_2 + Clav$	79.86	0.72	12 20	4 58		1 17		0.36	1.01																			100	121
1579.04	11		TiO ₂ + Chl	1.97	95.26	0.86	1.90		1.17		0.00	1.01																	1		100	52
1579.04	1		llm	1.07	56.89	0.00	39.77	2,16	1.18																				1		100	51
.0.0.04		- 1 - 4	10000		, 00.00			20																-					•			

Table A7.1: Scanning Electron Microscope chemical analyses of 1579.04 m from Sable Island 5H-58 well

Sample	Site	Dosition	Mineral	Si02	TiO2	AI2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	s03	ш	ō	V205	Cr203	CoO	NiO	CuO	ZnO	SrO	ZrO2	Ag2O	BaO	La2O3	Ce203	Nd2O3	Hf02	WO3	Total	Actuar Total
1579.04	10	3 1	Im		57.98		41.45	0.57																								100	49
1579.04	10) 4 "	llm"		61.35		37.78	0.87																								100	49
1579.04	10) 51	lm		53.72		44.58	0.98	0.72																					$ \rightarrow $		100	50
1579.04	10	0 6 5	Sd + Chl	10.62	0.04	7.74	68.96		3.61	3.21	1.01	1.29																'		 	4.56	100	33
1579.04	10		201 +	37.66	2.94	22.07	33.10		2.12	0.69	1.04	0.38																I		ł		100	45 57
1579.04	10) 97	2rn	30.71			0.62																	68.67				(100	52
1579.04	10) 10 F	γ				28.95							71.05																		100	103
1579.04	10) 11 5	Sd		0.46		45.40	4.00		5.26			0.88																			56	28
1579.04	10) 12 5	Sd	1.05			46.92	2.32		5.71																						56	27
1579.04	10	0 13 0	Qz	100.00			0.54																	00.00						 		100	57
1579.04	10		1m	30.84	E4 40		0.54	2.00																68.62								100	58
1579.04	10	16	llm" + Chl	1 58	92.03	1 44	41.00	3.90										0.67														100	49
1579.04	10) 17 5	Sd + Chl	4.82	02.00	2.84	84.95	2.74	1.64	3.01								0.07														100	29
1579.04	10) 18 (Qz	100.00																										1		100	57
1579.04	10) 19 "	llm"		72.14		27.86																									100	44
1579.04	10	20 5	Sd + Chl	10.36	1.52	6.45	57.65	0.93	2.66	10.77		0.50	9.17																	$ \rightarrow $		100	34
1579.04	10) 21 F	Py	00.04		4.00	31.79				0.00			68.21														'		 		100	94
1579.04	10	22 0	JZ + Py +	68.04	51 19	1.62	18.38				0.88			7.51																	3.56	100	49
1579.04	10) 24 F	P _V		51.10		28.67							71.33														(100	106
1579.04	10	25 5	Spl			28.34	22.56		8.22									40.88														100	50
1579.04	10	26 0	Qz	99.55			0.45																									100	58
1579.04	10) 27 Z	Irn	30.49																				69.51								100	58
1579.04	10	28 1	Tur	38.65	0.77	30.89	6.53		7.10	0.71	2.35	- 10																		⊢		87	47
1579.04	10	29 E	3t	40.27	2.34	15.28	18.38	4.00	12.24			7.48																			\rightarrow	96	44
1579.04	10	30	IM Sd ± Cbl	15 16	0.86	11 //	47.98	1.63	5.51	3.06																		I		ł		100	35
1579.04	10	32 1		0.90	91 13	3.50	2 78		5.51	0.63			1.06															· · · · ·				100	43
1579.04	10	33 0	Qz	99.41			0.59																									100	59
1579.04	10	34 5	Sd + Chl	9.75		5.03	73.13	1.14	6.55	4.40																						100	32
1579.04	10) 35 Z	Irn	31.09																				68.91								100	57
1579.04	10	36 5	Sd + Chl	19.53		12.29	60.86		3.27	1.69		2.37																		⊢	\rightarrow	100	36
1579.04	10) 3/ "	lim" Sd. i. Chi	2.27	62.55	1.26	35.26	2.01	2.19	4.10																						100	4/
1579.04	10	1 30 0		2.37		18.44	07.51	2.91	1.72	4.13	0.56	15 22																I				100	54
1579.04	10) 400	Dz	100.00		10.44					0.50	13.22																(100	58
1579.04	10) 41 (Qz	100.00																											-	100	58
1579.04	11	I 1 F	Py + Chl +	10.59		4.29	34.08		1.60	3.23	4.75	1.06	2.91	37.49																		100	52
1579.04	11	20	Ωz	99.42			0.58												L											⊢		100	62
1579.04	11		Tur Chi	36.45	1.07	31.25	5.13	0.00	7.03	0.88	2.50	0.40			2.69																1.00	87	53
1579.04	11		sd + Chi	1.48	+	4.75	76 14	2.26	3.90	3.49	1.14	0.49																			4.80	100	34
1579.04	11	60		100.00		1.00	70.14	2.20	5.52	1.72																		· · · · ·			10.02	100	63
1579.04	11	I 7 Z	Zrn	31.62																				68.38								100	62
1579.04	11	I 8 I	lm		52.28		44.44	3.28																								100	55
1579.04	11	95	Sd +	1.76			87.91	1.57	2.55	4.53			1.67																			100	32
1579.04	11	1 10 0	Chl +	34.23	3.07	15.06	31.35		2.93		1.63	0.92			5.56															⊢	5.25	100	52
1579.04	11		(m (m	30.97																				69.03								100	63
1579.04	11		 TiO-	31.17	99.04		0.96																	00.83						 	+	100	56
1579.04	11	1 14	llm"		61.05		34.61	4.34														-								<u>+</u>		100	54
1579.04	11	1 15 "	llm"		92.80		6.39	0.81																								100	53
1579.04	11	165	Sd + Qz	20.92			69.17	3.67		4.36			1.88																			100	38
1579.04	11	I 17 K	Kin	45.84		33.80	2.34				0.65	-			3.36		_					_										86	53
1579.04	11	185	Sd + Chl	2.72		1.21	84.48	3.63	1.51	4.78			1.66																	$ \rightarrow $		100	33
1579.04	11	1 19	lim" +	29.29	20.94	12.29	28.55	4.00	2.61	0.07	1.91		4.40		4.41													<u> </u>			\rightarrow	100	48
15/9.04	11	1 2015	bu				00.62	1.82		2.37			1.18						1													00	31

Sample	Site	Dosition	Mineral	Si02	TiO2	AI2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	Ŀ	ū	V205	Cr2O3	CoO	NiO	CuO	ZnO	SrO	ZrO2	Ag2O	BaO	La2O3	Ce203	Nd2O3	Hf02	W03	Total Actual Total
1579.04	1	1 21	llm		45.39		52.96	0.59	1.06																			-				100 55
1579.04	1	1 22	llm		53.44		44.01	2.54																								100 52
1579.04	1	1 23	"llm" +	1.37	87.62	1.59	9.41																									100 50
1579.04	1	1 24	llm		51.97		43.99	0.63	3.42																							100 54
1579.04	1	1 25	"llm"		62.82		35.00	1.16	1.02																							100 50
1579.04	1	1 26	llm		51.22		46.01	0.85	1.91																							100 54
1579.04	1	1 27	Qz	97.37	50.40	0.61	2.02		0.04																						\rightarrow	100 59
1579.04	1	1 28	lim Od -	0.44	53.12	4.50	46.25	0.70	0.64	0.40			4 70																			100 47
1579.04	1	1 29	50 + Dv	3.11		1.52	83.78	3.73		6.13			1.72	62.10																		100 31
1579.04	1	1 31	F y TiO ₂ + Chl	2.24	86.24	1.67	2 96			0.44				02.19	6.45																	100 42
1579.04	1	1 32	Chr	2.24	0.51	12.94	20.37		6 70	0.44					0.43			59 49														100 52
1579.04	1	1 33	llm		51.66	12.04	46.81		1.54									00.40														100 54
1579.04	1	1 34	Py		0.52		28.23							71.24																		100 115
1579.04	1	1 35	Sd + Chl	2.30		2.10	83.15	1.53	1.51	1.59			1.88																		5.94	100 35
1579.04	1	1 36	Sd + Chl	16.86		10.74	60.49	1.48	1.21		0.82	0.80																			7.60	100 41
1579.04	1	1 37	Sd + Chl	2.64		1.83	79.37	1.15	6.07	4.13																					4.81	100 35
1579.04	1	1 38	"Ilm" + Chl	0.87	73.38	0.73	24.06	0.96																								100 52
1579.04	1	1 39	Sd +	4.35		1.43	87.68	2.07		2.74			1.73																			100 33
1579.04	1	1 40	TiO ₂ +	1.06	95.18		3.76																									100 55
1579.04	1	1 41	Qz	99.37			0.63																									100 62
1579.04	1	1 42	lim	00.70	53.36	55.00	45.98	0.66	4.40																							100 53
1579.04	1	1 43	St	29.79	0.87	33.00	12.19		1.49																							100 54
1579.04	11.		TIO ₂		98.23		1.77																									100 114
1579.04	11.	1 2	TIO ₂		98.34		1.00																									100 115
1579.04	11.	2 1	07	00.61	91.39		0.01																									100 99
1579.04	11.	$\frac{2}{2}$ 2	Sd ±	1 70			80.85	1 77		11 15			1 53																			100 130
1579.04	11	2 3	Chl	28.68		20.83	25.16	0.45	9 24	11.15	0.65		1.55																			85 98
1579.04	11.	2 4	Kln + Chl + Ms	49.92		33.15	8.96	0.10	1.00		0.74	2.31			3.93																	100 95
1579.04	11.	2 5	Sd + Py				54.22		0.73	1.59	0.47			31.79																	11.20	100 83
1579.04	11.	2 6	Qz	98.91			1.09																									100 131
1579.04	11.	3 1	Chl + Ilm	28.46	13.65	11.40	31.28		3.01		2.43				6.14																3.63	100 102
1579.04	11.	3 2	"llm" +	12.48	65.66	4.86	14.77		1.27		0.96																					100 101
1579.04	11.	3 3	Chl + Ilm	17.53	48.73	6.95	18.15		1.67		1.55				5.42																	100 103
1579.04	11.	4 1	"llm"	0.58	65.84		32.28	1.30																								100 107
1579.04	11.	4 2	"lim"	0.59	74.56	0.45	23.45	0.96																								100 106
1579.04	1	$\frac{2}{2}$ 1		2.01	51.79	2.26	45.94	2.27					1.20	1 40																		100 53
1579.04	1	2 2	HO ₂ + Chi	5.21	00.00	2.30	3.00				0.67	15 20	1.29	1.40																		100 48
1579.04	1	2 1	llm	05.00	52.67	11.10	44 77	2 55			0.07	10.20																			-+	100 52
1579.04	1	2 5	llm		55.04		43.85	1.11																								100 51
1579.04	1	2 6	Sd +	5.18	0.85	1.54	84.42	1.13	1.92	3.39			1.57																			100 32
1579.04	1	2 7	Zrn	30.77			0.67																	68.56								100 61
1579.04	1	2 8	TiO ₂ +	3.13	85.68	4.18	3.19			0.67			1.48	1.67																		100 48
1579.04	1	2 9	Sd			0.63	41.77	1.02	1.80	0.83																					9.93	56 38
1579.04	1	2 10	Qz	99.26			0.74																									100 62
1579.04	1	2 11	Sd	0.98			50.32	2.55		2.15																						56 30
1579.04	1	2 12	llm		59.94		38.12	1.94																							$ \rightarrow $	100 53
1579.04	1	2 13	Zrn	31.63	54.05		0.82																	67.56							\longrightarrow	100 61
15/9.04		2 14	lim Sd		54.25		45.75	0 70	4.54	0.70																					2.40	100 53
1579.04		2 15	50		0.50		45.54	0.73	4.51	2.73				70.04																	2.49	100 110
1579.04	1	2 10	ry "llm"		75.30		20.52		1 17					10.94																	1 76	100 113
1579.04	1	2 18	Pv		15.50		28.72		1.17					71 28																	1.70	100 47
1579.04	1	2 19	Sd + Chl	6.61		3.23	66.13	2.10	1.11			0.48	1.59	11.20																	18.75	100 41
1579.04	1	2 20	Qz + Chl	91.44	2.59	3.31	0.96	20	0.54			1.16																				100 55
1579.04	1	2 21	llm		51.98		44.24	3.79																								100 54

Sample	Site	Position	Mineral	SiO2	TiO2	AI2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	ш	ū	V205	Cr203	CoO	Ŋ	CuO	ZnO	SrO	ZrO2	Ag2O	BaO	La203	Ce2O3	Nd2O3	Hf02	WO3	Total	Actual Total
1579.04	12	2 22	Sd				49.64	3.95		2.41																						56	29
1579.04	12	2 23	llm		48.69		49.66	1.64																								100	54
1579.04	12	2 24	llm Or	00.40	53.24		44.77	1.99													-											100	54
1579.04	12	2 25	QZ Sd ± Cbl	99.49	0.66	10.38	62 31	0.92	3.52	2 31		2 / 2																				100	38
1579.04	12	2 27	"llm"	17.40	62.76	10.50	35.74	0.32	5.52	2.51		2.42					1.50															100	49
1579.04	12	2 28	llm		52.25		46.28	1.46																								100	53
1579.04	12	2 29	TiO ₂		98.73		1.27																									100	52
1579.04	12	2 30	llm		59.69		38.67	1.64																								100	51
1579.04	12	2 31	Qz	99.43			0.57																									100	62
1579.04	12	2 32	Py Od - Obl	04.05	4.00	40.55	28.53		4.00	0.70	4.40	4.00		/1.4/																		100	112
1579.04	12	2 33	Sa + Chi Tur	24.05	1.28	32 42	54.6Z		4.02	0.70	2.08	1.66			2 1 1																	87	54
1579.04	12.1	1 1	Zrn	31.07	0.70	52.42	0.70		7.00	0.74	2.00				2.11									68.23								100	130
1579.04	12.1	1 2	TiO₂+	2.75	84.33	3.69	3.14			0.69			1.37	1.57	1.90			0.56														100	102
1579.04	12.1	1 3	Py +	0.63	2.80	0.35	29.34				1.51			65.37																		100	204
1579.04	13	3 1	llm		52.05		42.56	0.66	4.73																							100	52
1579.04	13	32	Qz + Ms + Py	68.22	0.85	20.65	1.24		0.50		0.83	4.57			3.13																	100	56
1579.04	13	3 3	Sd +	5.71	0.87	1.24	81.61	3.47	1.27	4.13			1.71																			100	32
1579.04	13	3 4	llm		52.24		46.86	0.90																								100	51
1579.04	10	3 5	IIM Zro	20.01	56.08		40.55	3.30																69.22								100	49
1579.04	13	3 0	2111 "llm"	30.91	71 41		27.68	0.90																00.33								100	50
1579.04	13	3 8	Zrn	31.26	71.41		21.00	0.00																68.74								100	62
1579.04	13	3 9	llm	01.20	49.86		49.08	1.06																00.11								100	54
1579.04	13	3 10	llm		50.53		48.22	1.25																								100	54
1579.04	13	3 11	Qz	100.00																												100	62
1579.04	13	3 12	Ру				28.52							71.48																		100	111
1579.04	13	3 13	"llm"		60.46		32.23	7.32																								100	52
1579.04	13	3 14	IIM Sd. i. Chl	5 21	51.88	2.57	46.08	2.03		5 50		0.56	1 27																			100	22
1579.04	10	3 16		41.20	1 08	23.21	20.57	3.45	7 01	5.59	1 10	4.02	1.37																			100	18
1579.04	13	3 17	Sd + Chl	11.66	0.91	4.75	70.41		7.42	3.42	1.10	1.42																				100	33
1579.04	13	3 18	Qz	99.49			0.51																									100	61
1579.04	13	3 19	"llm"		66.44		31.40	2.16																								100	51
1579.04	13	3 20	TiO2 + Chl	1.81	95.35	0.85	1.70					0.30																				100	53
1579.04	13	3 21	Qz	100.00		10.00	10 -0																									100	59
1579.04	13	3 22	Sd + ChI + Py	17.60		10.38	43.72	0.81	9.83	0.86	0.84		0.04	10.90																	5.07	100	48
1579.04	10	3 23	50 07	00.45			40.50	1.01	0.92	0.62			0.91																		12.05	100	50
1579.04	13	3 25	Sd + Chl	2.17		1.69	82.45	1,56	2.96	2,87			1.69																		4,62	100	31
1579.04	13	3 26	TiO ₂ +	0.86	94.72	1.82	2.18		2.00	0.41																						100	42
1579.04	13	3 27	Kfs	66.61		17.41						15.98																				100	56
1579.04	13	3 28	Mnz							0.73			37.74		-0.87										2.01		10.93	34.32	15.15			100	48
1579.04	13	3 29	Py				29.09					_		70.91																		100	105
1579.04	13	3 30	llm	0.68	56.49		40.78	2.05											<u> </u>													100	50
1579.04	13	3 31	Zrn	30.34		0.00	0.90		7 47	0.40														68.76								100	60
1579.04	13	3 32 3 33		10.00	1 22	8.03 10.10	54 55	0 07	0.52	3.40		2.26							<u> </u>													100	38
1579.04	13	3 34	llm	19.01	52.38	10.10	44 18	0.58	9.02 2.86	1.00		2.20							<u> </u>													100	54
1579.04	13	3 35	"llm"		82.29	1.36	16.35	0.00	2.00																							100	47
1579.04	14	4 1	Qz	99.43			0.57																									100	61
1579.04	14	4 2	Chl +	38.93		16.97	38.17		3.57		1.09	1.28																				100	42
1579.04	14	4 3	"llm"		74.11		23.36	2.53																								100	49
1579.04	14	4 4	Qz	99.49			0.51												<u> </u>													100	59
1579.04	14	4 5	ChI +	39.57	0.82	26.55	27.58	0.64	1.80	0.87	0.80	1.36		74.00							-											100	39
1579.04	14	4 0	ry Sd				20.11	0.60	3 1 2	2 02				/1.23					<u> </u>													56	28
1579.04	14	4 8	TiO ₂ +	0.95	90.62	2.08	4.38	0.00	0.10	2.00								1.97														100	45
				2.50		0																											

Sample	Site	Position	Mineral	SiO2	TiO2	AI2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	soa	ш	CI	V205	Cr203	CoO	0!N	CuO	ZnO	SrO	ZrO2	Ag2O	BaO	La2O3	Ce2O3	Nd2O3	Hf02	WO3	Total	Actual Total
1579.04	14	4 9 1 10	Qz Pv	100.00			20.20							70.80																		100	57
1579.04	1/	1 11	llm		/0.81		48.01	2.18						70.00																		100	50
1579.04	14	1 12	llm		52 20		46.66	1 14																								100	50
1579.04	14	1 13	Sd	0.81	02.20		47.92	0.59	3 72	2.96																						56	30
1579.04	14	4 14	Qz	100.00				0.00	0.72	2.00																						100	58
1579.04	14	4 15	Sd +	3.94		2.49	84.68	0.90	4.01	3.97																						100	31
1579.04	14	1 16	Zrn	31.21																				68.79								100	60
1579.04	14	4 17	Sd + Bt	22.06	1.54	9.88	51.76		7.10	1.24		3.58																			2.85	100	27
1579.04	14	1 18	Zrn	30.37			0.58																	69.05								100	57
1579.04	14	4 19	Bt	35.32	3.82	15.69	22.32		12.69	1.05		5.12																				96	39
1579.04	14	4 20	Sd				51.57	1.00		2.37			1.06																			56	28
1579.04	14	4 21	Sd				51.38	1.50		1.93			1.19																			56	28
1579.04	14	4 22	llm		52.82		43.46	0.74	2.99																							100	50
1579.04	14	4 23	llm		55.49		40.67	3.85																								100	50
1579.04	14	4 24	"llm" +	0.94	81.11	1.59	16.36																									100	48
1579.04	14	4 25	Qz	99.24			0.76																									100	59
1579.04	14	4 26	Sd + Chl	2.28		1.78	84.22	1.68	4.22	4.36			1.47																			100	30
1579.04	14	4 27	Tur	36.86		30.15	5.80		7.40		2.61			1.73	2.44																	87	51
1579.04	14	4 28	Sd +	8.89		1.58	75.41	3.30		3.45			1.90																		5.47	100	34
1579.04	14	1 29	Py	04.40			29.10							70.90										00.07								100	110
1579.04	14	1 30	Zrn	31.13	50.05	44.00	40.00	0.75		4.00			7.00									0.05		68.87								100	59
1579.04	14	4 31		5.19	50.05	11.32	18.00	0.75		1.30			1.22									0.05										100	41
1579.04	14	+ 32	IIIII "Ilm" i Chi	1.26	51.99	1 1 0	42.71	5.30																								100	52
1579.04	1/	+ 33		1.30	71.92	1.10	29.01	0.54						71.02																		100	111
1579.04	14	1 35	Sd +	1.83			88.87	2 11	1 56	3 73			1 90	71.35																		100	29
1579.04	14	1 36	Chl	25.97		20.43	25.87	0.48	12 25	0.70			1.00																			85	48
1579.04	15	5 1	llm	20.07	55 99	20.40	42.89	1 12	12.20																							100	40
1579.04	15	5 2	Sol		00.00	19 92	33.35		8.30									38 43														100	50
1579.04	15	5 3	TiO ₂	0.94	97.93	10.02	1.14		0.00									00.10														100	50
1579.04	15	5 4	Qz	100.00																												100	57
1579.04	15	5 5	Sd + Chl	2.58		1.49	81.59	1.90	1.32	1.11		0.82	1.40																		7.78	100	34
1579.04	15	5 6	Py				28.33							71.67																		100	106
1579.04	15	5 7	Sd + Chl	1.85		1.47	90.80	2.59		3.29																						100	29
1579.04	15	5 8	Sd + Chl	5.28		2.51	80.52		6.47	5.22																						100	30
1579.04	15	5 9	Qz	99.61			0.39																									100	58
1579.04	15	5 10	Sd + Chl	2.50	0.72	2.02	78.55	2.02	0.96	0.77																					12.46	100	38
1579.04	15	5 11	Sd + Chl	2.88		1.96	84.59	2.78	1.67	4.38			1.73																			100	31
1579.04	15	5 12	Sd				53.93	1.11		0.95																						56	28
1579.04	15	5 13	"llm"		68.20		31.80																								10.1	100	49
1579.04	15	14	Sa + Chi	14.43	1.64	8.28	56.02	1.64	3.80	0.69		1.37							<u> </u>												12.14	100	31
1579.04	15	15	lim lim		53.35		45.42	1.23																								100	51
1579.04	10		7rp	20.60	32.94		40.64	1.22						I	<u> </u>									60 02								100	52
1579.04	10	1 1/	∠iii Sd + Cbl	30.00 7 8/		2.51	0.57	1 70		2 20		0 82	1 3/						-					00.03								100	20
1579.04	10	10	Kfs	65.20	0.78	17.84	0.78	1.70		2.23	1 48	13.92	1.54																			100	54
1579.04	15	5 20	07	100.00	0.70	17.04	0.70				1.40	15.55																				100	57
1579.04	15	5 21	TiO ₂	0.68	98.34		0.98																									100	50
1579.04	15	5 22	"llm"	5.00	61.32		38.68																									100	47
1579.04	15	5 23	llm		54.07		45.29	0.64																								100	48
1579.04	15	5 24	"llm"		72.96		27.04																									100	49
1579.04	15	5 25	TiO ₂	0.84	98.49		0.67							1																		100	54
1579.04	15	5 26	Sd				46.38	1.00	0.86	1.36		0.34																			6.06	56	31
1579.04	15	5 27	Ab	69.26		18.27	0.66				11.81																					100	61
1579.04	15	5 28	Sd				53.82	0.69		1.49																						56	29
1579.04	15	5 29	Ilm		51.27		47.45		1.27																							100	51
1579.04	15	5 30	Qz	99.39			0.61																									100	59
1579.04	15	5 31	Chl + Bt +	48.55	0.90	16.12	28.62		1.82	0.79	1.10	2.10																				100	39

Sample	Site	Position	Mineral	Si02	TiO2	AI2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	ш	c	V205	Cr203	CoO	NiO	CuO	ZnO	SrO	ZrO2	Ag2O	BaO	La203	Ce2O3	Nd2O3	Hf02	WO3	Total	Actual Total
1579.04	1	5 32 "I	lm"		76.08	1.79	22.13																									100	45
1579.04	15.	1 1 T	iO ₂		98.99		1.01																									100	116
1579.04	15.	1 2 T	iO ₂ + Ms + Mnz	18.74	46.51	10.28	1.70		1.32	1.27		2.64	8.48		0.48													6.59	2.00			100	113
1579.04	15.	1 3 N	ls	51.76	1.71	27.32	2.91		2.72		0.42	5.80			2.37																	95	116
1579.04	15.	1 4 T	iO ₂ + Kln	8.27	80.52	6.27	1.36					0.52			3.06																	100	117
1579.04	1	<u>6 1 C</u>	hl + Bt +	39.58	1.45	19.74	21.08		7.93		1.29	3.93			5.02																	100	55
1579.04	1	6 2 C	$z + TiO_2$	85.19	10.14	2.03	0.99								1.65																	100	61
1579.04	1	6 3 "	lm" +	1.13	76.78	1.25	17.42	3.41	10 -0																							100	50
1579.04	1	6 4 5	id + Bt	22.01	0.81	13.29	48.86	0.92	10.72	1.43		1.95	0.00																		4.05	100	37
1579.04	1	6 5 5		07.40		4.04	47.33	1.24	0.64	1.29		0.00	0.86																		4.65	56	36
1579.04	1		<u> </u>	97.13		1.01	0/ /0	2.07		4.56		0.32	2.27																			100	22
1579.04	1	6 8 4	h h	67.03		10.52	04.40	3.91		4.50	11.83		2.21																			100	63
1579.04	1	6 9 "	lm"	07.33	63 79	13.52	34 77	1 44			11.05																					100	53
1579.04	1	6 10 0)z + Sd +	71.90	0.75	5 47	15.24	0.77	0.75	0.58	0.63	0.41		0.78	2.73																	100	54
1579.04	1	6 11 0)z	99.49	0.10	0.11	0.51	0.11	0.70	0.00	0.00	0		0.10	2.70																	100	63
1579.04	1	6 12 S	id +	3.71		3.63	73.88	3.33	1.03	4.06			1.49																		8.88	100	37
1579.04	1	6 13 S	id				51.21		2.62	2.18																						56	31
1579.04	1	6 14 Z	m	30.80																				69.20								100	61
1579.04	1	6 15 S	id + Chl	10.93		5.53	71.98	0.96	6.03	3.05		1.52																				100	33
1579.04	1	6 16 S	id + Chl	9.34	1.08	4.90	67.56	2.54	3.16	1.00		1.03																			9.39	100	39
1579.04	1	6 17 Z	rn	30.69																				69.31								100	61
1579.04	1	6 18 II	m		51.91		43.94	0.76	3.40																							100	54
1579.04	1	6 19 C)z	100.00																												100	62
1579.04	1	6 20 T	iO ₂ + Qz	27.62	71.25		1.14																									100	55
1579.04	1	6 21 "	lm"		64.81		33.50	1.69																								100	51
1579.04	1	6 22 0		99.30		0.00	0.70	1.00	5 75	0.04																					0.04	100	63
1579.04	1	6 23 5	d + Chl	3.88	50.07	2.86	/8.31	1.38	5.75	3.91																					3.91	100	32
1579.04	1	6 24 11	m iro i	20.21	52.37		45.79	1.84							1 76									67.20								100	55
1579.04	1	6 26 9	d + Chl	2.52		1 31	83.55	3.74	1 16	6 33			1.40		1.70									07.30								100	33
1579.04	1	6 27 0		93.14		3.72	0.52	3.74	1.10	0.55	2 20	0.42	1.40																			100	61
1579.04	1	6 28 5	d + Chl	2.36		1 01	88.38	2 65		3 72	2.20	0.42	1 89																			100	32
1579.04	1	6 29 "	lm"	2.00	94.46		5.54	2.00		0.72			1.00																			100	54
1579.04	1	6 30 "I	lm" +	1.14	80.24	2.16	16.45																									100	51
1579.04	1	6 31 S	id			0.89	39.30	0.72	0.52	0.47																					14.11	56	41
1579.04	1	6 32 B	t	44.86	1.58	24.87	12.63		6.67		0.58	4.81																				96	53
1579.04	1	6 33 C	chl + Bt +	32.12	1.89	14.79	32.41	0.62	8.89		0.96	4.05			4.26																	100	52
1579.04	1	6 34 II	m		43.16		50.27	1.96	4.61																							100	55
1579.04	1	6 35 II	m		49.56		49.13	1.31																								100	54
1579.04	1	6 36 T	ur	36.34	0.59	31.93	6.01	0.00	6.22	0.54	1.99	0.5.1			3.37																	87	55
1579.04	10	0 3/ 5		11.84	1.00	8.35	07.43	0.90	4.75	5.05	1.14	0.54			6.00																	100	33
1579.04	10.	1 1 0	/III + Bl	38.54	0.44	17.76	21.24	0.36	8.63		0.72	4.3/			6.02																	100	114
1579.04	10.	1 2 0	.15 .15	3.51	0.41	1 02	0.99	2 38	1 72	3.62	0.90	14.55	1.46																		3 12	100	68
1579.04	16	1 4 0)7	99.43	0.00	1.32	0.57	2.00	1.72	5.02			1.40																		5.42	100	132
1579.04	16	1 5 0	7 + Chl + Ms +	77 46		13 73	3.27		0.73		0.50	2 4 9			1.82																	100	93
1579.04	1	7 1 0	hl +	31.07	1.14	18.23	38.75		7.62	1.34	1.37	0.48																				100	33
1579.04	1	7 2 Z	rn	31.36														-						68.64								100	62
1579.04	1	7 3 S	id				46.04	1.03	4.07	2.27																					2.59	56	34
1579.04	1	7 4 G)z	99.48			0.52															-										100	64
1579.04	1	7 5 S	id + Chl	10.21		5.36	75.56	1.05	4.57	2.34		0.91																				100	34
1579.04	1	7 6 S	id +	9.32		1.22	80.26	3.02	1.40	4.78																						100	33
1579.04	1	7 7 C	z + TiO ₂	64.96	32.84	1.16	1.04																									100	57
1579.04	1	7 8 Z	rn	30.89																				67.31						1.80		100	63
1579.04	1	/ 9	m	04.65	51.89		45.16	0.72	1.03								1.21							00.05								100	55
15/9.04	1	/ 10 Z	rn	31.06			0.94																	68.00								100	61
1579.04	1	/ 11 G	Z	99.27			0.73																									100	61

Sample		Site	Mineral	Si02	TiO2	AI2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	Ŀ	C	V205	Cr2O3	CoO	NiO	CuO	ZnO	SrO	ZrO2	Ag2O	BaO	La2O3	Ce2O3	Nd2O3	Hf02	WO3	Total	Actual Total
1579.0)4	17 1	2 Qz	99.61			0.39							71 42																		100	62
1579.0	14	17 1	L Sd				48 39	0.69	1 39	1 52			0.83	71.42																	3 17	56	32
1579.0)4	17 1	Qz	99.51			0.49	0.00	1.00	1.02			0.00																		0.17	100	62
1579.0)4	17 1	6 Sd +	9.02		2.31	78.06	2.40	2.46	3.37		0.70	1.67																			100	33
1579.0)4	17 1	′ Qz	100.00																												100	61
1579.0)4	17 1	3 "Ilm" + Chl	1.02	63.85	0.76	32.61	0.80	0.96																							100	50
1579.0)4	17 1	9 "llm" +	0.90	76.27	1.25	21.58																									100	46
1579.0)4	17 2) Qz	100.00																												100	61
1579.0)4	17 2	l "llm"		73.14		24.73		2.13					74.00																		100	45
1579.0	14	17 2	2 Py	0.41			28.34							71.66																		100	116
1579.0	14	17 2	i Tur	37.64		32.51	13 36		0.08		2.51			10.12																		87	51
1579 (14	17 2	Sd + Chl	1 94		1.35	84 76	3.88	0.30	5 85	2.51		2 22																			100	32
1579.0)4	17 2	6 IIm		54.19		45.18	0.63		0.00																						100	54
1579.0)4	17 2	Sd + Chl	25.38		6.80	59.41		3.88	3.62	0.91																					100	38
1579.0)4	17 2	3 "llm"		63.20		31.74	5.06																								100	54
1579.0)4	17 2	Qz	100.00																												100	63
1579.0)4	17 3) Py				28.80							71.20																		100	117
1579.0)4	17 3	llm		53.14		43.55	3.31																								100	54
1579.0	04	1/ 3	Qz + Ms	85.90		9.61	0.98		0.52			2.98																				100	61
1579.0	14	17 3		100.00		2.24	74.01	1 70	4.45	2.02																					10.90	100	20
1579.0	14	17 3		28.86	1 1 1	2.24	37 25	0.72	6.58	2.03	0.95	4 83																			3 69	100	50
1579 (14	17 3	Chl + Bt + Sd	21.23	1 12	10.01	52.23	0.72	10.00	1 28	0.87	2 22																			0.00	100	45
1579.0)4	17 3	Chl + Bt + Sd	33.93	1.62	16.88	33.28	0.12	10.53		0.76	3.00																				100	46
1579.0)4 1	7.1	Sd				53.61	0.67	0.62	1.10																						56	66
1579.0)4 1	7.1	2 Bt	36.77	1.76	15.46	20.58		10.50		0.67	5.92			4.33																	96	111
1579.0)4 1	7.1	B Chl + Ms	51.99		33.32	5.31		1.76	0.81		1.85	0.80		4.16																	100	83
1579.0)4 1	7.1	Bt +	39.07	1.89	17.01	20.62	0.42	11.12		0.57	5.64			3.65																	100	113
1579.0)4	18	"llm"		79.19		20.81																									100	48
1579.0	04	18	Qz	100.00		0.00	04.04		0.07	0.01																					4.00	100	61
1579.0	14	10		4.42	1.57	2.90	81.81	0.50	3.37	3.21	0.62	2 02																			4.29	100	51
1579.0	14	18		26.50	2 49	15.04	41.89	0.59	4 13	1.03	0.03	5 35			3 10																	100	21
1579.0)4	18	6 "IIm"	20.00	62.97	10.00	35.38		1.65	1.00		0.00			0.10																	100	49
1579.0)4	18	'Sd + Ap	1.54			90.09	3.38		3.64			1.35																			100	30
1579.0)4	18	3 Sd				45.50	2.65	0.61	1.83			0.85																		4.56	56	33
1579.0)4	18) Qz +	95.16	3.34	0.64	0.62									0.24																100	59
1579.0)4	18 1) Chl + Bt	36.96		19.21	36.29		4.14		0.95	2.45																				100	46
1579.0)4	18 1	Zrn	30.95																				69.05								100	63
1579.0	14	18 1		0.00	53.03	4.00	45.35	0.94	0.68	40.00			4.40																			100	55
1579.0	14	18 1		2.38		1.68	14.56	9.59		10.39		0.54	1.40																			100	31
1579.0	/**	18 1	Sd	90.46		2.20	41.83	1 72		0.36		0.04	1.67																		10.42	56	30
1579.0)4	18 1	S Qz	99 47			0.53	1.72		0.00			1.07																		10.42	100	63
1579.0)4	18 1	/ IIm	00.47	52.73		43.74	3.53																								100	54
1579.0)4	18 1	3 Ilm		53.98		45.31	2.20	0.71																							100	54
1579.0)4	18 1	Qz	100.00																												100	61
1579.0)4	18 2) Chr		0.62	50.42	14.20		18.69									16.07														100	56
1579.0)4	18 2	TiO ₂		99.06		0.94																									100	53
1579.0)4	18 2	2 "llm"		60.22		37.81	1.96																								100	50
1579.0)4	18 2			98.51		1.49																									100	54
1579.0	14	18 2		100.00	00.01	0.00	0.15			0.00			4.04	0.07				4.00							-							100	61
15/9.0	14	18 2	110 ₂ +	1.10	89.91	2.29	2.15			0.60			1.61	0.97				1.36														100	48
1579.0	14 14	18 2		99.22	-	260	70.00	1 /7	4.00	2 71																					6.05	100	33
1579.0	4	18 2		3.10	59 72	2.00	39.04	1.47	1 24	2.11																					0.05	100	49
1579.0)4	18 2	Sd		00.72		48.33	2.08	0.76	3.93			0.91																			56	30

Sample	Site	Position	Mineral	Si02	TiO2	AI2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	s03	ш	ō	V205	Cr203	CoO	Ŋ	CuO	ZnO	SrO	ZrO2	Ag2O	BaO	La2O3	Ce203	Nd2O3	Hf02	WO3	Total	Actual Total
1579.04	18	30 II	m	0.78	50.79		47.08	1.34																								100	50
1579.04	18	3 31 II	m		58.95		39.50	1.55																	⊢				⊢ →			100	50
1579.04	18	3 32 P	y + Chl	13.68		7.25	34.87		0.55		0.65	1.30		35.23												┝──┦		I	<u> </u>		6.46	100	58
1579.04	19	1 N	/nz				20.52						36 75	71.40	-0.18					0.18					2 60	⊢ →	16.52	32.55	11.58			100	50
1579.04	19	20	Qz	99.40			0.60						00.70		0.10					0.10					2.00		10.02	02.00	11.00			100	59
1579.04	19) 3 S	Sd				44.62	2.94		4.20			1.26																	_	2.98	56	29
1579.04	19) 4 II	m		50.44		47.29	2.27																								100	50
1579.04	19	9 5 C	Qz	99.21			0.79																		⊢ →			µ]	⊢			100	58
1579.04	19	9 6 S	Sd + Chl	1.69		1.45	84.68	3.98		6.78			1.42	70.07											⊢ – –	┝──┦		┍───┦	i —			100	29
1579.04	19		y)7	99.08			29.03							70.97												├ ──┦		ł				100	59
1579.04	19	95	22 Sd	33.00		0.69	49.11	0.87	2.30	3.03																		ł				56	29
1579.04	19	10 11	m		54.15	0.00	44.87	0.98	2.00	0.00																		<u> </u>				100	51
1579.04	19) 11 "	llm"		76.28	1.28	19.83	0.89																	í l						1.71	100	48
1579.04	19) 12 C	Ωz	100.00																												100	60
1579.04	19	9 13 T	ur	38.31	0.52	32.18	4.92		8.18	0.59	2.29														$ \longrightarrow $				\vdash	$ \longrightarrow $		87	50
1579.04	19	9 14 S	Sd + Chl	1.41	0.88		88.69	1.11	3.70	4.22															⊢ – –	\square		<u> </u>	⊢			100	31
1579.04	19	15 11	m		53.76		44.48	0.67	1.09																┝──┤	┝──┦			i —			100	55
1579.04	19	10 11	m Ilm"		53.07		40.33	2.31																	r	┝──┦		ł	ił			100	54 70
1579.04	19	18 5	Sd		05.04		46 41	1.31	1 04	2 73			1 04												<u> </u>			ł		_	3 48	56	32
1579.04	19	19 0	Qz	100.00			.0.11			2.70																		<u> </u>		_	0.10	100	60
1579.04	19	20 C	Qz	100.00																												100	60
1579.04	19) 21 II	m +	1.16	53.77		42.96	1.29			0.83																					100	46
1579.04	19	22 S	Spl			48.58	13.22		18.36									19.83														100	54
1579.04	19) 23 P	у				28.21							70.82											⊢ – –				⊢		0.96	100	106
1579.04	19	24 "	llm"		61.41		38.59																		⊢ – –	\square		<u> </u>	⊢			100	51
1579.04	19	25 1	m		53.72		34.87	11.41						70.45											<u> </u>	┝──┤		⊢ −−−	i — —			100	52
1579.04	19	20 P	y)7	00 /7			29.55							70.45											r	┝──┦		ł	ił			100	60
1579.04	19	27 G	v V	33.47			28 47							71.53														t				100	115
1579.04	19	29 11	m		53.20		43.99	2.81						1 1.00																		100	53
1579.04	19) 30 II	m		54.27		42.56	3.18																						_		100	53
1579.04	19) 31 C	Chl + Bt	38.73	3.23	18.97	23.93		9.33	0.65	0.73	4.44																				100	50
1579.04	19	32 S	6d + Ms	17.27		8.54	62.06	1.12	6.84	2.53		1.63													⊢ – –				\vdash			100	28
1579.04	19	9 33 K	(fs	65.56		18.15	0.50		1.05	0.40	0.82	14.97													⊢ – –				⊢			100	60
1579.04	19	34 1	ur Ilm"	37.55	1.14	32.70	8.26	0.57	4.85	0.48	2.04														⊢ −−+	┝──┦		l		\rightarrow		87	51
1579.04	19	36 11	m +	1.05	54 65		30.09	1.85																		├ ──┦		ł	+			100	49 50
1579.04	19	37 "	llm" + Ms	19.61	55.57	14.05	8.83	1.00		0.43		1.52													-+			ł	(100	42
1579.04	19	38 0	Chl +	46.39	0.89	31.62	17.39		2.25		0.98	0.47																t		_		100	43
1579.04	19	39 S	Sd				52.28	1.30		1.38			1.04																			56	28
1579.04	19	40 T	"iO ₂ +	0.99	92.28	3.00	2.77	-					0.95												шJ				\square			100	43
1579.04	19	9 41 C	Chl + Bt	43.80	1.36	23.54	20.26		6.93		0.75	3.36																				100	48
1579.04	19	9 42 T	iO ₂ +	6.56	76.08	3.49	3.97		0.76	1.21			1.04		6.38							0.51			⊢ – –				⊢			100	40
1579.04	19.1	1 P	у	0.04			28.87				5.00	0.00		71.13											⊢ – –	\square		<u> </u>	⊢			100	243
1579.04	19.1		ry (In I	0.34		25.05	26.41				5.26	0.26		67.73	1 05					<u> </u>					$ \rightarrow $	├ ──┦		I	<u> </u>	\rightarrow	4.02	100	70
1579.04	19.1	3 K	NII + DV +	46.99		30.85	4.42				5 58	1.00		31.08	4.85	0.28				<u> </u>					<u> </u>	⊢ ł		ł	i+	\rightarrow	4.0Z	100	86
1579.04	19,2		chl + Bt +	39,51	3.25	18.93	23.65	0.41	9.49		0.47	4.29		51.00		5.20									-+			ł	(100	106
1579.04	19.2	2 2 5	Sd		00		50.46	0.57	4.15	0.82		0	-															t				56	66
1579.04	19.2	2 3 5	Sd +	8.41	0.91	3.67	77.44	1.27	4.39	2.74		1.17																				100	69
1579.04	19.2	2 4 C	Chl + Bt +	39.86	3.94	18.78	22.46	0.54	9.30		0.49	4.62																				100	103
1579.04	19.3	3 1 C	Chl + Kln	46.32		29.91	17.87		4.67		0.72	0.51													⊢			µ]	i —			100	96
1579.04	19.3	2 2	id +	1.63		0.81	86.09	0.68	6.15	2.04															⊢ – –	⊢]			i —	\rightarrow	2.60	100	68
1579.04	19.3		od Shi u Pt	40.79	2.05	10.07	46.37	1.00	5.25	2.17	0.62	2 70													⊢ −−↓	⊢		l	i — - I	\rightarrow	1.20	56	68
1579.04	19.3	40	m + Bt	40.78	2.05	19.87	24.83 11 17	1 74	8.13		0.62	3.12								<u> </u>					r	┝──┤		ł	i			100	14
1010.04	20	/1 1/11			1 00.10		77.7/	1.74						L							L											100	77

Sample	Site	Positior	Si02	TiO2	AI203	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	ш	ō	V205	Cr203	CoO	NiO	CuO	ZnO	SrO	ZrO2	Ag2O	BaO	La2O3	Ce2O3	Nd2O3	Hf02	WO3	Total	Actual Total
1579.04	20	2 Chl + Bt	37.84	1.88	19.26	22.75		9.37		0.78	3.61			4.50																	100	46
1579.04	20	3 "llm"		61.40		38.60																									100	49
1579.04	20	4 Kfs	60.64	0.54	21.49	2.33				1.07	9.98			3.96																	100	50
1579.04	20	5 Py				33.90							64.33																	1.76	100	88
1579.04	20	6 Qz	99.53			0.47																									100	59
1579.04	20	7 Zrn	31.19			0.67																	68.14								100	58
1579.04	20	8 "llm" +	4.10	67.89	3.28	24.73																									100	45
1579.04	20	9 Zrn	31.25																				68.75								100	58
1579.04	20	10 Qz	98.87			1.13																									100	60
1579.04	20	11 IIm		52.84		45.70	1.46																								100	51
1579.04	20	12 IIm		59.23		39.36	1.42																								100	47
1579.04	20	13 TiO ₂		98.47	0.90	0.64																									100	50
1579.04	20	14 "llm"		61.86		35.70	2.44																								100	48
1579.04	20	15 llm		58.30		39.68	2.01																								100	49
1579.04	20	16 "llm"		81.52	2.83	12.75																								2.90	100	48
1579.04	20	17 Tur	44.92	0.49	32.18	7.67		0.88	0.38	0.49																					87	41
1579.04	20	18 "llm"		66.41		31.32	2.27																								100	47
1579.04	20	19 Py				28.76							71.24																		100	110
1579.04	20	20 IIm		53.08		41.37	3.65	0.83													1.08										100	52
1579.04	20	21 Qz + Chl	97.58	0.50	0.57	1.35																									100	56
1579.04	20	22 Zrn	28.96		0.79	0.92			0.79														68.55								100	55
1579.04	20	23 IIm		53.76		44.64	0.80	0.80																							100	51
1579.04	20	24 Py				28.61							71.39																		100	111
1579.04	20	25 Chr			28.23	17.52		14.63									39.63														100	55
1579.04	20	26 Qz + TiO ₂	69.65	29.32		1.03																									100	60
1579.04	20	27 Qz	99.28			0.72																									100	61
1579.04	20	28 Sd + Chl	10.54		7.02	67.96	1.35	5.39	1.44																					6.31	100	37
1579.04	20	29 Sd + Chl	9.17		6.60	75.69	0.97	4.19	3.38																						100	33
1579.04	20	30 Qz	99.20			0.80																									100	61
1579.04	20	31 Qz + Ms	86.68		9.17	1.74					2.42																				100	55
1579.04	20	32 Py	0.92		0.36	29.48							69.24																		100	100
1579.04	20	33 Qz	99.53			0.47																									100	59
1579.04	20	34 Qz +	95.53		0.82	3.65																									100	53
1579.04	20	35 "llm"		67.08		31.10	1.82																								100	48
1579.04	20	36 Qz +	95.87		2.87	0.77					0.49																				100	57
1579.04	20	37 IIm		50.67		47.87	1.46																								100	51
1579.04	20	38 Sd				50.76	2.82		2.41																						56	27
1579.04	20.1	1 Sd				47.15		4.97	3.88																						56	64
1579.04	20.1	2 Sd +	2.88		1.74	58.82	0.88	3.27	2.89	0.77			21.23																	7.51	100	82
1579.04	20.1	3 Chl + Bt	35.54	1.69	19.05	24.28	0.36	8.49	0.59	1.07	3.06			5.87																	100	102
1579.04	20.1	4 Kln + Chl	46.68	2.18	34.92	6.69		2.41		0.91	0.47			5.73																	100	111
1579.04	20.1	5 Chl + Bt	34.33	1.87	16.81	33.27	0.42	9.24		0.56	3.51																				100	103

Appendix A8: BSE images and EDS mineral analyses for sample Sable Island 5H-58 1904.11 m

•			15204				5
	site 1	site 2	site 3	site 4	site 5		1
	site 6	Site 7	site 8	site 9	site 10		
	site 11	site 12	site 13	site 14	site 15		06
	site 16	site 17	site 18	site 19	site 20		8-1
							5
					1 c	2m	い

Figure A8.1: Sable Island 5H-58 (1904.11 m)



2:Tourmaline 3:Zircon 4:Zircon 5:Zircon 6:Zircon 7:"Ilmenite" + 8:Siderite + 9:"Ilmenite" 10:"Ilmenite" + 11:Siderite + 12:Quartz 13:"Ilmenite" 14:"Ilmenite" + 16:Muscovite + 17:Siderite 18:Siderite 19:Monazite 20:TiO₂ +

Figure A8.2: Sable Island 5H-58 (1904.11 m) (SEM) site 1 (Table A8.1)



1:Zircon 22:TiO₂ + 2:Zircon 23:Mix 3:Zircon 24:TiO₂ 4:Zircon 25:TiO₂ + 5:TiO₂ 26:TiO₂ + 6:Chromite 27:TiO₂ + 7:TiO₂ 28:Siderite 8:"Ilmenite" 29:Chlorite + 9:"Ilmenite" 30:TiO₂+ 10:"Ilmenite" 31:Quartz 11:TiO₂ 32:TiO₂ 12:TiO₂ + 33:Ilmenite 13:Siderite 34:Tourmaline 14:Tourmaline 35:Mix 15:Tourmaline 36:Quartz 16:Biotite 17:"Ilmenite" + 18:TiO₂ 19:"Ilmenite" 20:Quartz 21:TiO₂ +

Figure A8.3: Sable Island 5H-58 (1904.11 m) (SEM) site 2 (Table A8.1)



Figure A8.4: Sable Island 5H-58 (1904.11 m) (SEM) site 2.1 (Table A8.1). Ilmenite crystal completely replaced by TiO_2 needles leaving some voids between them. The TiO_2 mineral shows open trellis texture.



Figure A8.5: Sable Island 5H-58 (1904.11 m) (SEM) site 2.2 (Table A8.1). Original ilmenite grain with quartz inclusions now completely replaced by TiO_2 .

1:Quartz + 2:TiO₂ + Quartz 3:Quartz +



Figure A8.6: Sable Island 5H-58 (1904.11 m) (SEM) site 2.3 (Table A8.1). Original ilmenite grain completely altered to TiO_2 minerals.



Figure A8.7: Sable Island 5H-58 (1904.11 m) (SEM) site 2.4 (Table A8.1). Mixture of quartz (2) and probably diagenetic TiO_2 crosscutting the quartz.



Figure A8.8: Sable Island 5H-58 (1904.11 m) (SEM) site 3 (Table A8.1)



Figure A8.9: Sable Island 5H-58 (1904.11 m) (SEM) site 4 (Table A8.1)



1:Chlorite + Biotite 2:Siderite + 3:Quartz 4:Siderite 5:Quartz + Chlorite + Biotite

Figure A8.10: Sable Island 5H-58 (1904.11 m) (SEM) site 4.1 (Table A8.1). Siderite cementing quartz (3) and probably partly chloritized biotite (1). Felsic lithic clast.



23:TiO₂ 1:Ilmenite 2:TiO₂ + 24:"Ilmenite" 3:Tourmaline 25:Quartz 4:"Ilmenite" 26:Ilmenite 5:Chromite 27:TiO₂ 6:Zircon 28:Quartz + 7:"Ilmenite" 29:"Ilmenite" 8:"Ilmenite" 30:TiO₂ 9:Ilmenite 31:Siderite + 10:Ilmenite 32:"Ilmenite" 11:Ilmenite 33:Quartz 12:Siderite + 34:"Ilmenite" Chlorite 35:Zircon 13:Siderite + 36:Chromite 14:Monazite + 37:Chromite Quartz 38:Siderite + 15:TiO₂ Chlorite 16:Quartz + 39:TiO₂ + 17:"Ilmenite" 18:"Ilmenite" 19:Staurolite 20:Siderite 21:"Ilmenite" + 22:"Ilmenite"

Figure A8.11: Sable Island 5H-58 (1904.11 m) (SEM) site 5 (Table A8.1)



Figure A8.12: Sable Island 5H-58 (1904.11 m) (SEM) site 5.1 (Table A8.1). Ilmenite grain (2,3) mostly replaced by TiO_2 .



Figure A8.13: Sable Island 5H-58 (1904.11 m) (SEM) site 6 (Table A8.1)

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24:"Ilmenite"



1:Zircon 25:Chloritoid 2:Zircon 26:Zircon 27:"Ilmenite" 28:Ilmenite 4:Quartz 5:TiO₂ + 29:Zircon 30:Spinel o26:Siderite + 31:"Ilmenite" 7:Ilmenite 32:Siderite 8:Zircon 33:Kaolinite 9:Quartz 34:Zircon 10:Zircon 35:Mix 11:Garnet 36:Tourmaline 37:Mix 13:Quartz 38:Albite 14:Garnet 39:Siderite + 15:Siderite + 16:"Ilmenite" + 40:Chlorite + Biotite 41:"Ilmenite" 17:Ilmenite + 18:Garnet 19:TiO₂ + 20:TiO₂ 21:?"Ilmenite" 22:"Ilmenite" 23:Tourmaline

Figure A8.14: Sable Island 5H-58 (1904.11 m) (SEM) site 7 (Table A8.1)



1:TiO₂ 2:"Ilmenite" 3:TiO₂ 4:Muscovite

Figure A8.15: Sable Island 5H-58 (1904.11 m) (SEM) site 7.1 (Table A8.1). Two grains: a) a detrital ilmenite grain (2) associated with muscovite (4). Both together make a lithic clast (IIm + Ms); b) an almost 50 μ m long TiO₂ grain that may be detrital.



Figure A8.16: Sable Island 5H-58 (1904.11 m) (SEM) site 7.2 (Table A8.1). Fine relics of an ilmenite grain (higher brightness) replaced by TiO_2 minerals.



1:Ilmenite 25:TiO₂ 2:TiO₂ 26:Chlorite + 3:"Ilmenite" Biotite + Siderite 4:TiO₂ + 27:TiO₂ 5:Siderite + 28:Zircon 29:Zircon 6:Zircon 7:Tourmaline 30:Mix 8:Siderite 31:"Ilmenite" 9:Kaolinite 10:Siderite 11:Zircon 12:Tourmaline 13:Tourmaline 14:Quartz 15:Siderite + Chlorite 16:Siderite + Chlorite 17:Ilmenite 18:Siderite + 19:"Ilmenite" 21:Siderite + 22:Tourmaline 23:"Ilmenite" 24:"Ilmenite"

Figure A8.17: Sable Island 5H-58 (1904.11 m) (SEM) site 8 (Table A8.1)



Figure A8.18: Sable Island 5H-58 (1904.11 m) (SEM) site 8.1 (Table A8.1). Detrital ilmenite grain partly replaced by TiO_2 .



Figure A8.19: Sable Island 5H-58 (1904.11 m) (SEM) site 8.2 (Table A8.1). Ilmenite partly replaced by TiO₂.

1:"Ilmenite" 2:"Ilmenite" +



1:Siderite 2:Siderite 3:Chlorite + Biotite

Figure A8.20: Sable Island 5H-58 (1904.11 m) (SEM) site 8.3 (Table A8.1). Probably a deformed biotite grain replaced by chlorite (3) and siderite (1,2).



Figure A8.21: Sable Island 5H-58 (1904.11 m) (SEM) site 8.4 (Table A8.1). A partly chloritized biotite grain (2) that later has also been partly replaced by siderite (1).



9 1:Chromite 22:Quartz 2:Tourmaline 23:TiO₂ 3:Quartz + 24:TiO₂ TiO₂ 25:"Ilmenite" 4:Zircon 26:Siderite + 5:"Ilmenite" 27:TiO₂ 6:Siderite 28:"Ilmenite" + 7:TiO₂ + 29:Tourmaline 8:TiO₂ 30:Al-phosphate-9:"Ilmenite" sulfate + 31:Chromite 10:Zircon 11:Zircon 32:TiO₂ 12:TiO₂ 33:Siderite 13:TiO₂ + 34:Siderite + 14:"Ilmenite" + Chlorite 15:Tourmaline 35:Tourmaline 16:"Ilmenite" + 36:Quartz + 37:Quartz 17:Ilmenite 38:Albite 18:Garnet 20:Quartz 21:Siderite

Figure A8.22: Sable Island 5H-58 (1904.11 m) (SEM) site 9 (Table A8.1)



22:"Ilmenite" 1:Zircon 2:TiO₂ + 23:Quartz 24:"Ilmenite" 3:Quartz 25:"Ilmenite" 4:?Ilmenite" + 26:"Ilmenite" 5:Siderite 27:TiO₂ + 6:Chromite 28:"Ilmenite" 7:"Ilmenite" 8:"Ilmenite" + 29:"Ilmenite" 9:"Ilmenite" 30:Quartz 10:Chromite 31:Siderite 11:Zircon 32:"Ilmenite" 12:Ilmenite 33:Ilmenite 13:TiO₂ + 34:"Ilmenite" 14:TiO₂ 15:TiO₂ 16:Muscovite 17:TiO₂ 18:Siderite + 19:Mix 20:Zircon

Figure A8.23: Sable Island 5H-58 (1904.11 m) (SEM) site 10 (Table A8.1)



Figure A8.24: Sable Island 5H-58 (1904.11 m) (SEM) site 10.1 (Table A8.1). Ilmenite grain with inclusions (pos. a) is partly replaced by TiO_2 .



1:"Ilmenite" 25:TiO₂ 2:Chlorite 26:Tourmaline 3:Spinel 27:"Ilmenite" 4:"Ilmenite" + 28:Zircon 5:Quartz + 29:TiO₂ 6:TiO₂ + Quartz 7:Chromite 8:Zircon 9:Garnet 10:Siderite + 11:"Ilmenite" + 12:Garnet 13:Garnet 14:"Ilmenite" 15:TiO₂ + 16:Quartz 17:Siderite 18:K-Feldspar 19:TiO₂ 20:Quartz 21:Garnet 22:Quartz 23:"Ilmenite" 24:Monazite

Figure A8.25: Sable Island 5H-58 (1904.11 m) (SEM) site 11 (Table A8.1)



1:Zircon 2:Zircon 3:Ilmenite 4:Mix 5:TiO₂ 6:Tourmaline 7:Zircon 8:TiO₂ 9:Siderite + 10:Siderite + 11:"Ilmenite" + 12:Quartz 13:Zircon 14:Ilmenite 15:Zircon 16:TiO₂ 17:Spinel 18:Quartz 19:Siderite + 20:"Ilmenite" 21:Garnet 22:Zircon 23:Siderite 24:Zircon

Figure A8.26: Sable Island 5H-58 (1904.11 m) (SEM) site 12 (Table A8.1)



1:Zircon 2:Siderite + 3:TiO₂ 4:"Ilmenite" 5:Zircon 6:Zircon 7:"Ilmenite" 8:Tourmaline 9:Siderite + 10:Siderite + 11:Monazite 12:K-Feldspar 13:"Ilmenite" 14:Garnet 15:TiO₂ + 16:Quartz 17:Siderite + 18:Apatite 19:Ilmenite 20:Zircon 21:TiO₂ 22:Siderite 23:K-Feldspar 24:TiO₂

Figure A8.27: Sable Island 5H-58 (1904.11 m) (SEM) site 13 (Table A8.1)

31:Spinel 32:Zircon 33:Chlorite 34:Siderite 35:Chlorite + Biotite 36:TiO₂ + 37:Ilmenite

25:"Ilmenite"

29:Chlorite +

30:"Ilmenite"

26:Quartz 27:Siderite +

28:TiO₂ +

Biotite

25:TiO₂ 26:Siderite + 27:Siderite 28:"Ilmenite"



1:Zircon 2:"Ilmenite" + 3:"Ilmenite" 4:Chlorite + **Biotite** 5:K-Feldspar 6:TiO₂ 7:"Ilmenite" 8:Zircon 9:Zircon 10:"Ilmenite" 11:Garnet 12:Quartz 13:"Ilmenite" + 14:Quartz 15:Spinel 16:Ilmenite 17:"Ilmenite" 18:Siderite + MIRA3 TESCAN 19:"Ilmenite" 20:Zircon

21:Quartz 22:Spinel 23:TiO₂ 24:Quartz 25:Tourmaline 26:Chlorite + Biotite 27:Tourmaline 28:TiO₂ 29:Tourmaline 30:Monazite 31:"Ilmenite" + 32:Zircon 33:Zircon 34:TiO₂ 35:Spinel 36:"Ilmenite" +

Figure A8.28: Sable Island 5H-58 (1904.11 m) (SEM) site 14 (Table A8.1)



1:Quartz 2:Zircon 3:"Ilmenite" + 4:Quartz 5:Chlorite + Biotite 6:"Ilmenite" $7:TiO_2$ 8:Quartz 9:Quartz 10:Siderite + 11:"Ilmenite" 12:Chromite 13:TiO₂ 14:Garnet 15:Tourmaline 16:"Ilmenite" 17:TiO₂ + Muscovite 18:Zircon 19:Siderite+ 20:Zircon 21:TiO₂ 23:"Ilmenite" 24:"Ilmenite"

25:"Ilmenite" 26:Garnet 27:Quartz 28:Quartz 29:TiO₂ 30:TiO₂ + 31:Spinel 32:Zircon 33:Siderite + 34:"Ilmenite"

Figure A8.29: Sable Island 5H-58 (1904.11 m) (SEM) 22:Quartz 23:"Ilmenii 23:"Ilmenii



1:K-Feldspar 2:Monazite 3:Zircon 4:Quartz 5:Siderite 6:"Ilmenite" + 7:Quartz 8:Siderite + 9:TiO₂ 10:"Ilmenite" 11:Albite 12:Quartz 13:"Ilmenite" 14:"Ilmenite" 15:TiO₂ + 16:Chromite 17:Quartz 18:"Ilmenite" 19:Quartz 20:Zircon 21:TiO₂ +

22:Garnet 23:"Ilmenite" + 24:Xenotime 25:Zircon 26:TiO₂ 27:Siderite 28:Zircon 29:Quartz 30:Chromite 31:Siderite + 32:TiO₂ + 33:Chlorite + Biotite

Figure A8.30: Sable Island 5H-58 (1904.11 m) (SEM) site 16 (Table A8.1)



site 17 (Table A8.1)

25:Chromite 26:Quartz 27:TiO₂ 4:Chromite 28:Apatite 5:Siderite + 29:"Ilmenite" 30:Tourmaline 7:"Ilmenite" 31:Chromite 32:Ilmenite 33:Quartz 11:"Ilmenite" + 12:"Ilmenite" + 14:Tourmaline 15:"Ilmenite" + 19:Chlorite + Biotite 20:"Ilmenite" 21:"Ilmenite" + 22:Siderite + 23:Siderite 24:Chlorite + Biotite


1:Quartz 2:Siderite + Quartz 3:"Ilmenite" 4:"Ilmenite" + 5:Siderite + 6:"Ilmenite" 7:Siderite + 8:Siderite + 9:Quartz 10:Siderite 11:Spinel 12:TiO₂ 13:Siderite 14:Quartz 15:Ilmenite 16:Quartz 17:Quartz + Muscovite 18:Tourmaline 19:Zircon

20:Quartz

22:Zircon

25:TiO₂+

23:"Ilmenite"

26:"Ilmenite"

28:"Ilmenite" +

27:Siderite

24:Tourmaline

21:TiO₂

Figure A8.32: Sable Island 5H-58 (1904.11 m) (SEM) site 18 (Table A8.1)



Figure A8.33: Sable Island 5H-58 (1904.11 m) (SEM) 22:Chlorite + Biotite site 19 (Table A8.1)

25:"Ilmenite" 26:Zircon 27:TiO₂ + 28:Chlorite 29:Garnet 6:Chromite 30:Garnet 7:Chlorite + 31:Quartz 32:Chromite 33:TiO₂ 11:"Ilmenite" 13:Chromite 14:Chlorite + Biotite 15:Siderite + 17:Tourmaline

- 18:TiO₂ + 19:Siderite + 20:"Ilmenite" 21:Zircon 23:Quartz
- 24:TiO₂ + Muscovite



1:Zircon 22:Zircon 2:Siderite + 23:Siderite + 3:Spinel 24:"Ilmenite" + 4:"Iİmenite" 25:Zircon 5:Zircon 26:Zircon 6:Zircon 27:Zircon 7:Zircon 28:Zircon 29:"Ilmenite" 8:Garnet 9:Zircon 30:Ilmenite 10:Zircon 31:Siderite 11:Ilmenite 32:Quartz 12:TiO₂ 33:TiO₂ + Muscovite 13:Siderite + 14:Zircon 34:Siderite + 35:Siderite+ 15:Zircon 16:TiO₂ + 36:TiO₂ + 17:Quartz 37:"Ilmenite" 18:Ilmenite + 38:Garnet 19:Siderite + 39:Quartz 20:"Ilmenite" 40:TiO₂ 21:Chlorite + 41:Chromite Biotite 42:Siderite 43:TiO₂

 $44:TiO_2 + Chlorite$

Figure A8.34: Sable Island 5H-58 (1904.11 m) (SEM) site 20 (Table A8.1)

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ample	Site	Aineral	SiO2	TiO2	41203	FeO	MnO	MgO	caO	Va2O	K20	P205	SO3	Ŀ	ū	sc203	V205	Cr2O3	CoO	NiO	ZnO	Y203	ZrO2	1b205	Ag2O	.a2O3	ce203	r203	1d2O3	6d2O3	by203	/b2O3	HfO2	W03	0s02	Total	ual Total
0		<u>∩</u> ≥			40.07	10.07	_			~		_				0						Ĺ		z			J	"	2	U	ц Ц	<i>_</i>	_	-	Ŭ		Act
1904.11	1	1 Chr 2 Tur	37.72	0.54	12.85	13.08		6 33	0.45	2 38								59.47																		100	75
1904.11	1	3 Zm	30.74	0.86	27.51	0.61		0.00	0.45	2.00													67.79													100	82
1904.11	1	4 Zm	30.95																				69.05													100	86
1904.11	1	5 <u>Zrn</u> 6 Zrn	30.93																				69.07													100	- <u>79</u> 80
1904.11	1	7 "llm" +	4.78	87.96	1.74	5.02			0.49														00.00													100	65
1904.11	1	8 Sd +	2.36	1.92		84.61		1.31	8.57			1.23																								100	41
1904.11	1	9 "lim" 10 "lim" +	0.81	83.81	0.93	14.45							0.68	2.73							0.47	,														100	73
1904.11	1	11 Sd +	15.05		9.27	63.61		1.93	5.28	0.83	2.34	1.70																								100	48
1904.11	1	12 Qz	99.27	00.00		0.73	0.00																													100	86
1904.11	1	13 'IIm' 14 "IIm" +	0.64	64.58	0.56	39.28	0.69																													100	64
1904.11	1	15 TiO ₂	0.86	96.18	0.74	2.22																														100	74
1904.11	1	16 Ms + Chl	51.43	1.06	26.30	4.59		3.33	4.04	0.40	9.99			2.89									-													100	
1904.11	1	18 Sd	1.33			46.09		6.14	3.77																											56	41 42
1904.11	1	19 Mnz	1.37						0.73			36.29		0.07											2.88	18.04	32.46		8.16							100	69
1904.11	1	20 TiO ₂ + 21 TiO ₂	2.11	94.59	1.13	2.17																														100	<u>64</u>
1904.11	1	22 IIm	0.55	58.56	0.11	38.88	2.56																													100	71
1904.11	1	23 TiO ₂		100.00																																100	73
1904.11	2	24 Qz 1 Zm	100.00																				67.52										1.65			100	83
1904.11	2	2 Zm	30.74																				69.26													100	83
1904.11	2	3 Zm	31.38																				68.62													100	84
1904.11	2	4 Zm 5 TiO ₂	31.15	100.00																			68.85													100	75
1904.11	2	6 Chr			16.73	16.66		13.62										53.00																		100	75
1904.11	2	7 TiO ₂		100.00		27.42	4 74																-													100	
1904.11	2	9 "Ilm"	0.76	72.33	0.79	19.36	5.18	0.94										0.63																		100	67
1904.11	2	10 "llm"		69.72		28.76	1.52																													100	66
1904.11	2	11 TiO ₂ 12 TiO ₂ +	1.07	98.27	4 95	0.66												0.84																		100	76
1904.11	2	13 Sd	1.08	07.22	0.64	47.28	0.60	1.29	4.26			0.86						0.01																		56	43
1904.11	2	14 Tur	38.46	1.07	33.63	8.09		3.62	0.24	1.89																										87	71
1904.11	2	15 Tur 16 Bt	37.49	0.52	21.53	9.39		3.65		2.32	6.51																									87 96	 60
1904.11	2	17 "llm" +	1.29	81.33	1.74	13.49	2.15																													100	60
1904.11	2	18 TiO ₂		98.26		1.74																														100	73
1904.11	2	20 Qz	100.00	04.02		35.30																														100	84
1904.11	2	21 TiO ₂ +	2.34	91.71	1.30	4.27			0.37																											100	68
1904.11	2	22 TiO ₂ + 23 Mix	20.01	95.73	0.58	0.55	0.77	1.62	3.87	0.83	2.66	0.95																								100	<u>72</u> 56
1904.11	2	24 TiO ₂	20.31	98.59	15.04	1.41	0.11	1.02	5.07	0.00	2.00	0.35																								100	59
1904.11	2	25 TiO ₂ +	13.28	84.27	1.38	1.07			0.77			4.40						0.74																		100	71
1904.11	2	26 TIO ₂ + 27 TiO ₂ +	0.99	92.72	1.64	2.01			0.77			0.95						0.71				-														100	 65
1904.11	2	28 Sd		0.43		45.96		5.92	3.68																											56	43
1904.11	2	29 Chl +	35.08	2.25	18.89	32.55		7.71	0.58		2.94																									100	68
1904.11	2	31 Qz	100.00	00.04																																100	84
1904.11	2	32 TiO ₂	0.75	98.63		0.62																														100	74
1904.11	2	33 IIm 34 Tur	37.01	55.72	32.10	42.91		1.38	0.59	1.88																										100	68
1904.11	2	35 Mix	24.12	1.90	10.57	47.68	0.76	7.66	1.65	0.89	2.70		1.14								0.93	1														100	53
1904.11	2	36 Qz	99.41			0.59																														100	84
1904.11	2.1	1 110 ₂ 2 TiQ ₂		98.43		1.57																														100	145
1904.11	2.1	3 TiO ₂ +	0.82	97.18		2.00																														100	105
1904.11	2.2	1 Qz +	96.94	2.69	0.00	0.37																-														100	181
1904.11	2.2	3 Qz +	96.30	04.76	2.34	0.47					0.32											+											-			100	172
1904.11	2.3	1 TiO ₂ +	0.94	93.34	1.59	2.22			0.84			1.07																								100	146
1904.11	2.3	2 TiO ₂ +	0.82	93.94	1.35	2.03			0.78			1.07										-														100	144
1904.11	2.4	2 Qz	99.66	0.34	0.46	0.04																1														100	181
1904.11	2.4	3 TiO ₂ +	3.79	95.52		0.69																														100	162

Sample	Site	Position Mineral	SiO2	Ti02	AI203	FeO	MnO	MgO	CaO	Na2O	K20	P205	S03	Ŀ	C	Sc2O3	V205	Cr203	CoO	NiO	ZnO	Y203	ZrO2	Nb2O5	Ag2O	La203	Ce2O3	Pr203	Nd2O3	Gd2O3	Dy203	Yb203	HfO2	WO3	0s02	Total	Actual Total
1904.11	3	1 Zrn	31.27																				68.73													100	85
1904.11	3	2 "Ilm"	0.00	75.10	0.64	24.90																														100	64
1904.11	3	3 110 ₂	0.69	97.56	0.61	15.21	0.56																													100	63
1904.11	3	5 Sd +	3.08	00.10	1.74	78.41	0.89	8.57	7.31																											100	44
1904.11	3	6 Bt	37.14	3.62	17.12	21.28		8.09			8.76																									96	76
1904.11	3	7 Sd	1.14		0.64	47.43		5.12	1.67				74.00																							56	44
1904.11	3	9 Qz	99.40			20.32							/1.00																							100	85
1904.11	3	10 Sd +	1.94		1.49	84.39	0.77	1.70	7.51			2.21																								100	42
1904.11	3	11 St	29.60	0.62	54.78	13.16		1.48													0.35															100	77
1904.11	3	12 "lim" +	5.31	80.77	3.38	10.54		11 55										64 62																		100	54
1904.11	3	14 Tur	35.60	0.64	28.52	17.02		11.55		2.74				2.47				34.32																		87	71
1904.11	3	15 Qz	99.33			0.67																														100	86
1904.11	3	16 Sd +	1.43		1.07	85.16	0.71	1.09	8.09			2.45											00.04													100	42
1904.11	4	1 Zm 2 Zm	30.99																				69.01													100	82
1904.11	4	3 Zm	30.94																				67.12										1.94			100	88
1904.11	4	4 Mnz	1.02									34.67		0.14												9.15	34.45	4.37	16.20							100	72
1904.11	4	5 Chr 6 Ilm		58 71	13.20	24.87	0.76	10.26										51.67																		100	68
1904.11	4	7 "llm"	0.74	69.50		28.98	0.78																													100	66
1904.11	4	8 Ap				0.36			48.41			44.07		7.17																						100	87
1904.11	4	9 Chl + Bt	38.94	2.69	19.67	25.15		9.43		0.57	3.55																									100	67
1904.1	4	10 Q2	97.57		1.02	48.01	0.45	0.71	4 53		0.30	1 50																								56	42
1904.11	4	12 Qz +	95.68	1.37	2.44	10.01	0.10	0.71	1.00		0.51	1.00																								100	82
1904.11	4	13 llm		54.37		43.60	0.79	1.24																												100	73
1904.11	4	14 Tur 15 Tur	38.42	0.89	32.54	7.65		5.18	0.46	1.86																										87	72
1904.11	4	16 Chl + Bt	40.27	1.43	25.36	24.85	0.73	5.36	0.57	1.30	1.43																									100	32
1904.11	4	17 Sd		0.54		46.30		5.33	3.83																											56	43
1904.11	4	18 TiO ₂ +	2.76	94.06	1.48	1.70		0.40	0.50		0.70																									100	69
1904.11	4.1	2 Sd +	38.70	2.74	19.66	25.17	1.02	9.49	0.52		3.72	1 0/																								100	91
1904.11	4.1	3 Qz	99.48		1.40	0.52	1.02		0.37			1.34																								100	182
1904.11	4.1	4 Sd				48.75	0.45	0.67	4.42			1.71																								56	89
1904.11	4.1	5 Qz + Chl + Bt	53.82	50.08	16.04	22.99	0.09	5.48		0.61	1.06																									100	145
1904.11	5	2 TiO ₂ +	4.40	82.83	6.28	1.32	9.00					0.97		4.21																						100	71
1904.11	5	3 Tur	37.84	0.62	31.45	7.08		7.21	0.44	2.35																										87	70
1904.11	5	4 "lim"		74.40	00.74	24.00	1.60	44.70										00.50																		100	69
1904.11	5	6 Zm	30.01		29.71	16.00		14.70	0.63									39.59					69.37													100	73
1904.11	5	7 "Ilm"		68.96		30.32		0.73																												100	66
1904.11	5	8 "Ilm"		68.18		28.91	2.91																													100	67
1904.11	5	9 llm 10 llm		55.77		42.48	1.75		-																											100	73
1904.11	5	11 llm		54.00		45.32	0.68																													100	74
1904.11	5	12 Sd + Chl	18.44	0.52	15.49	54.02	3.01	6.64	1.55		0.33	_					_									_									_	100	54
1904.11	5	13 Sd +	1.92	0.69	1.13	81.16		8.34	6.75			24.42														4.00	40.00		44.20							100	43
1904.11	5	14 Min2 + Q2	0.67	98.39		0.94						21.42														4.30	19.90		14.39							100	76
1904.11	5	16 Qz +	84.44	0.33	10.37	0.57				0.42	2.67			1.20																						100	84
1904.11	5	17 "llm"	0.69	75.62		22.89	0.80																													100	68
1904.11	5	18 "IIm" 19 St	30.10	84.29	54 59	15.71		1 75																												100	64
1904.11	5	20 Sd	30.10	0.00	34.33	45.32		5.03	5.64																											56	41
1904.11	5	21 "Ilm" +	0.78	79.41	1.56	16.98	0.61											0.66																		100	68
1904.11	5	22 "Ilm" 23 TiO		70.88		29.12																														100	61
1904.11	5	23 110 ₂		61.69	0.51	35.45		2.35																												100	66
1904.11	5	25 Qz	99.61	000		0.39		0																												100	83
1904.11	5	26 IIm		54.67		44.25	1.08																													100	71
1904.11	5	27 1102 28 Oz ±	05.97	98.51	2.01	1.49				0.01	0.20																									100	61 82
1904.11	5	29 "Ilm"	55.67	62.34	2.01	36.65	1.01			0.91	0.29																									100	67
1904.11	5	30 TiO ₂	1.28	98.72																																100	72
1904.11	5	31 Sd +	1.09	1.14		80.16		10.05	7.56								4.55																			100	41
1904.11	1 5	321°11M°	0.64	/0.61		1 21.22	1										1.53					1	1													100	64

Sample	Site	Position Mineral	SiO2	Ti02	AI203	FeO	MnO	MgO	CaO	Na2O	K20	P205	S03	ш	ū	Sc2O3	V205	Cr203	C00	NiO	ZnO	Y203	ZrO2	Nb205	Ag2O	La2O3	Ce2O3	Pr203	Nd2O3	Gd2O3	Dy203	Yb203	Hf02	WO3	0s02	Total	Actual Total
1904.11	5	33 Qz	100.00																																	100	82
1904.11	5	34 "Ilm"	0.75	74.48		22.79	1.98																00.00													100	63
1904.11	5	35 ∠m 36 Chr	31.01	0.81	18.72	29.77		8.66										42.05					68.99													100	82 75
1904.11	5	37 Chr		0.01	14.97	13.21		10.09									0.66	61.07																		100	72
1904.11	5	38 Sd + Chl	7.58	0.69	3.78	73.04		8.70	5.35		0.86																									100	47
1904.11	5	39 TiO ₂ +	1.20	93.52	2.54	1.71			1.03																											100	61
1904.11	5.1	2 "llm"		87.24		12.11		0.65																												100	133
1904.11	5.1	3 "Ilm"	0.73	89.32		9.94																														100	131
1904.11	6	1 "lim" +	1.27	82.11	0.60	14.63	1.39																													100	50
1904.11	6	2 Zm	30.91																				69.09													100	82
1904.11	6	4 Sd +	2.12		1.30	79.20	2.81	9.22	5.35														03.21													100	42
1904.11	6	5 Sd +	22.42	1.32	10.04	50.91	0.58	8.97	3.37		2.38																									100	52
1904.11	6	6 TiO ₂ +	2.73	92.78	1.85	2.64			4.00			4.64																								100	71
1904.11	6	8 Zm	30.85			49.47			4.92			1.01											68.67													100	83
1904.11	6	9 Zrn	31.25																				68.75													100	82
1904.11	6	10 Qz	100.00	05.07		2.42																-														100	83
1904.11	6	12 Qz	2.51	95.37		2.13											-																			100	63 82
1904.11	6	13 Zm	30.39																				69.61													100	79
1904.11	6	14 Olig	62.77		23.31	0.39			4.72	8.81																							_			100	79
1904.11	6	15 Sd +	2.11	0.67	1.18	78.21	0.67	9.50	7.65									1 16																		100	42
1904.11	6	17 Qz	96.41	00.30	1.17	2.43	0.51	4.30										1.10																		100	78
1904.11	6	18 TiO ₂ +	1.37	92.92	2.03	1.45			0.64			1.60																								100	53
1904.11	6	19 llm +	2.45	59.17	0.69	32.44		1.21						3.40							0.63	5														100	46
1904.11	6	20 QZ 21 Sd + Chl	6.11		3.69	76.01	1.99	4.95	5.13		0.55	1.58																								100	44
1904.11	6	22 llm		59.95	0.00	35.36	0.46	4.24																												100	69
1904.11	6	23 Qz +	87.92	8.78	2.84	0.47																														100	67
1904.11	6	24 "lim" 25 "lim" +	0.80	73.04	2.07	24.00		2.96				1.00		3 35																						100	65 55
1904.11	6	26 "Ilm"	0.89	79.86	2.57	16.48	2.87					1.00		3.30																						100	57
1904.11	6	27 TiO ₂ +	6.74	89.09	3.08	1.09																														100	69
1904.11	7	1 Zm	31.11		1.10	0.07																	68.89										4.00			100	82
1904.11	7	2 Zm 3 TiO ₂	31.71	98.74	1.16	1.26				0.44	0.34												63.86										1.82			100	72
1904.11	7	4 Qz	98.92		0.76						0.32																									100	81
1904.11	7	5 TiO ₂ +	1.86	92.82	0.87	0.89								3.57																						100	46
1904.11	7	6 Sd +	3.34	2.41	2.03	81.54	0.70	1 23	6.99		0.47	2.52																								100	43
1904.11	7	8 Zrn	31.07	30.00		30.30	1.00	1.25															68.93													100	83
1904.11	7	9 Qz	100.00																																	100	81
1904.11	7	10 Zrn	31.09		20.52	24.04	4.00	2.00	40.00														68.91													100	81
1904.11	7	12 Mix	21.62	28.46	6.14	16.82	1.00	1.88	1.42	1.96	0.58		2.30	12.35	0.54							+	5.93													100	24
1904.11	7	13 Qz	100.00																																	100	83
1904.11	7	14 Grt	40.69	0.01	21.12	25.69	0.72	5.95	5.82														<u> </u>													100	79
1904.11	7	16 "llm" +	2.02	74,08	1.13	23.88	0.69	8.35 1.75	8.05						0.29																		_			100	44 65
1904.11	7	17 llm +		57.42		38.71	0.67	3.20							0.20																					100	68
1904.11	7	18 Grt	39.98	00.01	21.20	22.79	8.78	4.98	2.28				0.46	·							0.4-															100	79
1904.11	7	19 1iO ₂ + 20 TiO ₂	2.86	83.01 99.40	0.81	2.01		0.88	0.83				2.16	5.30							2.13	5														100	58 73
1904.11	7	21 ?"llm"	0.87	93.53	1.87	3.73																														100	51
1904.11	7	22 "Ilm"		71.47		26.94	1.59																													100	66
1904.11	7	23 Tur	38.10	0.48	34.19	6.84		5.19	0.25	1.95		45.00		E 00																						87	68
1904.11	7	24 Ap 25 Cld	28.35		43.07	25.46	0.52	2.60	40.04			45.20		5.90								+														100	71
1904.11	7	26 Zrn	28.65		0.52				0.77					1.46		0.53							68.08													100	78
1904.11	7	27 "llm"		74.12		25.03	0.84															-														100	66
1904.11	7	20 IIII 29 Zm	31.65	53.01		40.30	1.14	0.55														-	68.35													100	82
1904.11	7	30 Spl	01.00		40.91	15.13		16.43										27.54					00.00													100	75
1904.11	7	31 "llm"		66.33		31.32	1.70	0.66																												100	65
1904.11	7	32 Sd 33 Kin	48.22	0.57	35.20	45.38		5.34	5.27																											56	42 58
1904.11	7	34 Zrn	31.17	0.07	00.20	1.55																	68.83													100	84

Sample	Site	Position	SiO2	Ti02	AI203	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	Ŧ	CI	Sc2O3	V205	Cr203	CoO	NiO	ZnO	Y203	ZrO2	Nb205	Ag2O	La203	Ce2O3	Pr203	Nd2O3	Gd2O3	Dy203	Yb2O3	HfO2	WO3	0s02	Total	Actual Total
1904.11	7	35 Mix	19.51	74.13	3.93	0.75	5			0.44	1.24																									100	79
1904.11	7	36 Tur	38.76	0.50	32.44	5.01		7.25	0.88	1.64	0.53			0.00																						87	70
1904.11	7	37 MIX 38 Ab	68.68	45.33	15.29	0.72	5	1.37		12.04	3.56			3.96																						100	
1904.11	7	39 Sd +	1.45		0.92	85.50	1.16	1.77	7.14	12.01		2.06																								100	41
1904.11	7	40 Chl + Bt	34.85	4.62	15.06	28.71		9.56			4.23			2.97																						100	45
1904.11	7	41 "Ilm"	0.62	66.55		31.39	0.59	0.86																												100	58
1904.11	7.1	2 "Ilm"		70.79		29.21											-																	-		100	160
1904.11	7.1	3 TiO ₂		99.36		0.64	4																													100	161
1904.11	7.1	4 Ms	51.74	1.24	31.22	2.10)	1.06			5.60			2.04																						95	146
1904.11	7.2	1 1iO ₂ +	0.63	93.14	2.09	3.12	2		0.32			0.70		3.06																						100	131
1904.11	8	1 llm	0.00	57.66	2.02	41.44	0.90					1.01		0.00																						100	68
1904.11	8	2 TiO ₂		99.25		0.75	5																													100	72
1904.11	8	3 "Ilm"	44.00	73.36	0.59	24.51	1.54	0.77	0.40	0.54	4.05																									100	68
1904.11	0 8	4 110 ₂ + 5 Sd +	6.08	0.63	4.60	72.10	1.00	7.11	5.91	0.51	1.05						-																	3.13		100	48
1904.11	8	6 Zm	26.41		1.08	0.99)		1.92					3.04		1.22							65.35													100	71
1904.11	8	7 Tur	37.80	0.77	33.40	6.73	3	5.48	0.90	1.93																										87	72
1904.11	8	8 Sd	46.90	0.38	32.50	47.53	0.68	2.58	4.09		1.69	1.13																								56	43
1904.11	8	10 Sd	40.30	0.00	32.33	45.52	0.38	5.45	4.64		1.03																									56	44
1904.11	8	11 Zm	30.78			0.46	6																67.24										1.51			100	87
1904.11	8	12 Tur	37.34	1.60	29.72	6.89)	7.62	1.94	1.88				0.40																						87	72
1904.11	8	14 Qz	99.55	0.41	33.00	0.45	5	7.00	0.90	1.72				2.42																						100	87
1904.11	8	15 Sd + Chl	3.10		1.73	73.59	0.63	7.71	5.73				7.49																							100	49
1904.11	8	16 Sd + Chl	1.91	0.67	1.18	84.40)	9.02	2.82																											100	45
1904.11	8	17 lim 18 Sd +	2.45	55.66		42.82	1.52	0.20	8 / 2																											100	/3
1904.11	8	19 "Ilm"	2.45	75.37	1.02	23.61	0.03	5.25	0.42																											100	67
1904.11	8	20 Qz	99.49			0.51	1																													100	86
1904.11	8	21 Sd +	12.95	4.02	7.04	63.49	4.04	7.62	3.97	4.04	0.89																									100	42
1904.11	0 8	22 TUI 23 "Ilm"	37.97	65.91	33.49	32.62	1 47	0.29	0.60	1.04							-																	-		100	67
1904.11	8	24 "Ilm"		60.09		39.30	0.61																													100	71
1904.11	8	25 TiO ₂		99.02		0.98	3																													100	75
1904.11	8	26 Chl + Bt + Sd	30.11	2.36	16.08	37.34	1.23	7.98	1.04	0.64	3.23																									100	 73
1904.11	8	28 Zm	29.74	1.22		0.60)																66.68										1.76			100	90
1904.11	8	29 Zrn	30.57			0.66	6																68.76													100	86
1904.11	8	30 Mix	49.31	1.90	32.04	9.80)	3.90			3.06																									100	60
1904.11	8.1	31 'lm'	0.80	73.93	0.49	27.26	1.50	1.21																												100	147
1904.11	8.1	2 "Ilm" +	1.34	82.35	0.50	15.16	0.55														0.10)														100	118
1904.11	8.2	1 "llm" +	8.42	81.57	3.11	5.15	5	0.55	0.62		0.59																									100	148
1904.11	8.2	2 "llm" + 1 Sd	8.97	80.83	3.48	5.01 48.30	1 10	0.48	2 93		0.69																									100	79
1904.11	8.3	2 Sd		0.41		46.28	2.30	4.68	2.33																											56	89
1904.11	8.3	3 Chl + Bt	37.27	2.31	20.72	28.18	3	7.08		0.53	3.90																									100	132
1904.11	8.4	1 Sd	40.75	0.32	25.10	45.74		5.15	4.78		4.20			2.44																						56	91
1904.11	9	1 Chr	42.75	1.03	16.07	21.79	il i	9.22			4.22			3.44				52.93				1														100	79
1904.11	9	2 Tur	37.52	0.57	31.96	7.33	3	6.74	0.57	2.31																										87	73
1904.11	9	3 Qz + TiO ₂	79.79	19.76		0.46	i																													100	86
1904.11	9	4 ∠m 5 "llm"	30.80	61.84		36.30	1 25	0.61															69.20													100	8/
1904.11	9	6 Sd	0.59	0.65		47.08	3	4.70	2.98																											56	45
1904.11	9	7 TiO ₂ +	9.43	89.56		1.01								_							_			_												100	76
1904.11	9	8 TiO ₂	0.60	96.37	1.02	2.01	1.02															+														100	69
1904.11	9	10 Zrn	30.80	14.42		24.50	1.08															+	69.20													100	84
1904.11	9	11 Zrn	30.89																				69.11													100	84
1904.11	9	12 TiO ₂	0.05	99.40	4.00	0.60	2				0.22												I													100	68
1904.11	9	13 110 ₂ + 14 "llm" +	2.05	94.79	2.10	26.75	1 50				0.34											+														100	70
1904.11	9	15 Tur	37.61	0.60	33.24	10.53	3	2.94		2.08	0.04																									87	69
1904.11	9	16 "llm" +	2.29	69.54	0.91	24.45	2.81						-							_																100	68
1904.11	9	1/ IIm 19 Crt	20.75	54.64	20.75	41.96	0.74	2.66	6.20													-														100	73
1304.	. 9	TOTOIL	39./3	1	40.70	40.2	0.00	L.40	0.29																											100	10

Sample	Site	Position	sio2	Ti02	AI203	FeO	Mho	MgO	CaO	Na2O	K20	P205	S03	ĿL.	ō	Sc203	V205	Cr203	CoO	NiO	ZnO	Y203	ZrO2	Nb2O5	Ag2O	La203	Ce203	Pr203	Nd2O3	Gd2O3	Dy203	Yb203	Hf02	W03	0s02	Total	Actual Total
1904.11	9	19 "Ilm"		64.16		34.86		0.98																												100	66
1904.11	9	20 Qz	98.48		0.72	0.79	1 10	0.56	5 14			0.74																								100	<u>83</u>
1904.11	9	21 30 22 Qz	99.51			0.49	1.10	0.00	5.14			0.74																								100	86
1904.11	9	23 TiO ₂	0.83	97.82		1.35																														100	74
1904.11	9	24 TiO ₂	0.02	100.00	0.70	21.12	1.42																													100	- 76
1904.11	9	26 Sd +	3.65	0.85	2.15	82.64	0.76		7.44			2.51																								100	45
1904.11	9	27 TiO ₂		96.30		1.42								2.28																						100	59
1904.11	9	28 "IIm" + 29 Tur	4.69	73.71	2.45	13.26	1.00	8.00	2 19	0.68													4.21													100	 73
1904.11	9	30 Al-phos-sulf	24.02	2.74	17.46	3.08		0.00	2.10	1.00		27.02	11.22																						14.46	100	14
1904.11	9	31 Chr		0.59	15.06	17.09		8.24										58.08			0.94															100	77
1904.11	9	32 1102 33 Sd	0.88	97.54		1.04	3 46		0.54			0.80																								100	
1904.11	9	34 Sd + Chl	18.47	0.11	12.96	56.22	0.91	2.52	4.73	0.77	2.17	1.26																								100	55
1904.11	9	35 Tur	37.56		35.06	11.47		1.36		1.56																										87	69
1904.11	9	36 Qz + 37 Oz	91.50		4.79	1.84		0.69			1.18																									100	81
1904.11	9	38 Ab	68.42		19.10	0.51			0.54	11.42	0.10																									100	83
1904.11	10	1 Zm	30.69	04.70			_	0.05															69.31													100	80
1904.11	10	2 110 ₂ +	2.38	94.72	1.11	1.13	-	0.65																												100	<u></u> 80
1904.11	10	4 ?"llm" +	9.45	75.26	4.93	3.36		6.65	0.35																											100	60
1904.11	10	5 Sd	0.64	0.41		45.12		5.21	4.62																											56	41
1904.11	10	6 Chr 7 "llm"		0.76	20.60	19.80	1.63	9.87										48.97																-		100	68
1904.11	10	8 "Ilm" +	1.45	75.45	1.05	21.21).84	4.55																												100	55
1904.11	10	9 "Ilm"		73.76	0.58	25.65																														100	65
1904.11	10	10 Chr 11 Zrn	31.00		27.43	17.18		12.58										42.80					69.00													100	81
1904.11	10	12 llm	01.00	57.17		41.43	1.40																00.00													100	67
1904.11	10	13 TiO ₂ +	1.87	93.24	0.99	3.90																														100	36
1904.11	10	14 TiO ₂	0.57	97.16	0.73	1.54	-																													100	60
1904.11	10	16 Ms	47.89	0.55	30.36	4.68		0.77			10.74																									95	74
1904.11	10	17 TiO ₂		99.20		0.80																														100	73
1904.11	10	18 S0 + 19 Mix	2.57	64.22	1.82	0.85	-		4.33			1.87		0.95													9.15		4.22							100	70
1904.11	10	20 Zrn	27.20	0.54	0.87				2.25							1.52							67.62													100	68
1904.11	10	21 "Ilm"	4.00	61.08		37.63	1.29																	40.05												100	69
1904.11	10	22 1m	99.61	72.61		0.39			-															18.05										-		100	86
1904.11	10	24 "Ilm"		70.68	0.88	26.28).91	1.26																												100	67
1904.11	10	25 "Ilm"	0.79	72.94	0.66	22.94	2.67																													100	65
1904.11	10	20 TiO ₂ +	8.55	88.28	0.85	1.50	.01	0.82																												100	73
1904.11	10	28 "Ilm"	0.91	88.38	1.78	8.21												0.72																		100	70
1904.11	10	29 "Ilm" 30 Oz	0.97	73.04	0.64	24.39	0.96																													100	66
1904.11	10	31 Sd	33.00	0.68		45.05		5.40	4.87																											56	41
1904.11	10	32 "Ilm"		69.14		29.93	0.93																	-											_	100	67
1904.11	10	33 llm 34 "llm"		51.51	99.0	47.11	1.39	1.30																												100	73
1904.11	10.1	1 TiO ₂ +	1.29	96.29	0.50	1.56		1.00	0.35																											100	156
1904.11	10.1	2 TiO ₂ +	3.43	84.48	3.07	2.81		1.44	0.53			1.15		3.10																						100	114
1904.11	11	1 "llm"	31.50	65.07	0.69	31.25	2.99	6.46	0.54	0.80																										100	61
1904.11	11	3 Spl	51.30	5.45	31.37	15.54		14.52	0.04	0.00								38.57																		100	74
1904.11	11	4 "Ilm" +	1.11	74.42		21.31	_							3.16																						100	44
1904.11	11	5 Qz + 6 TiO ₂ + Qz	93.05 37.51	0.52	3.39	0.31				2.73		1.10										-														100	<u>83</u> 56
1904.11	11	7 Chr	01.01	00.04	1.52	52.76												45.72																		100	68
1904.11	11	8 Zm	29.40		0.68	1.55			0.84							0.80							66.72													100	75
1904.11	11	9 Grt 10 Sd +	39.29		20.80	59.65	1.67	1.04	6.26 2.52		2.00																									100	43
1904.11	11	11 "Ilm" +	1.81	64.90	2.07	27.64			2.02		2.00							0.85																2.72		100	45
1904.11	11	12 Grt	40.10		20.60	27.30	1.52	2.61	4.86				_									_							_							100	77
1904.11	11	13 Grt 14 "Ilm"	40.12	79.12	20.97	32.28	1.20	4.37	1.06																											100	<u>78</u> 67
1904.11	11	15 TiO ₂ +	1.33	94.73	1.08	1.60			0.60			0.74																								100	71

Sample	Site	Position	Mineral	SiO2	Ti02	AI203	FeO	MnO	MgO	CaO	Na2O	K20	P205	S03	ш	C	Sc2O3	V205	Cr203	CoO	QİN	ZnO	Y203	ZrO2	Nb2O5	Ag2O	La203	Ce203	Pr203	Nd2O3	Gd2O3	Dy203	Yb203	Hf02	WO3	0s02	Total	Actual Total
1904.11	11	16 Qz		100.00																																	100	83
1904.11	11	17 Sd					45.71		5.34	4.95																											56	40
1904.11	11	18 Kfs		67.90	00.24	17.81	0.71				3.09	10.48																									100	67
1904.11	11	20 Q7		100.00	99.34		0.00																														100	82
1904.11	11	21 Grt		39.84		21.04	30.28	3.13	4.66	1.05																											100	77
1904.11	11	22 Qz		99.63			0.37																														100	82
1904.11	11	23 "Ilm"			73.24		26.76																														100	62
1904.11	11	24 Mnz		1.17	00.24		0.76			1.05			37.21		-0.75											4.67	14.95	30.28		11.42							100	66 71
1904.11	11	26 Tur		37.24	55.24	32.37	7.24		7.16	0.91	2.08																										87	66
1904.11	11	27 "llm"			60.64		36.50	1.41	1.44																												100	68
1904.11	11	28 Zrn		30.55																				69.45													100	81
1904.11	11	29 TiO ₂		24.00	98.01		1.99																	60.04													100	67
1904.11	12	2 Zm		31.13			0.49																	68.37													100	81
1904.11	12	3 Ilm			49.98		49.31		0.71																												100	68
1904.11	12	4 Mix		9.76	0.58	8.63	70.60		1.27	6.13		1.21	1.81																								100	48
1904.11	12	5 TiO ₂		07.50	97.88	00.00	2.12		0.50	4.00	0.04																										100	61
1904.11	12	6 lur 7 Zm		37.52	0.80	30.22	3.55	0.56	9.53	1.30	2.24				1.84									66.56													100	
1904.11	12	8 TiO ₂		30.30	99.38		0.62	0.50		0.55														00.50													100	75
1904.11	12	9 Sd +		1.54	0.88	0.98	84.54	0.93		9.06			2.07																								100	43
1904.11	12	10 Sd +		2.67		1.36	83.37		9.43	3.17																											100	44
1904.11	12	11 "llm" ·	+	2.17	66.60	1.27	29.95																														100	67
1904.11	12	12 Q2		28.40	0.45					1.36							1.05	-						69.19													100	71
1904.11	12	14 llm		20.10	58.48		38.04	0.57	2.91	1.00							1.00							00.10													100	70
1904.11	12	15 Zrn		30.88			0.64																	66.74										1.74			100	82
1904.11	12	16 TiO ₂		0.48	97.99	0.91	0.62		10.77																												100	71
1904.11	12	17 Spi		00.51		32.81	14.33		16.77										36.09																		100	76
1904.11	12	19 Sd +		17.59	0.78	12.29	57.95	2.20	4.06	3.38	0.82	0.93																									100	49
1904.11	12	20 "Ilm"			66.42		32.47		1.11																												100	66
1904.11	12	21 Grt		39.40		21.18	33.29	0.73	3.91	1.48																											100	76
1904.11	12	22 Zrn		30.75			40.40	0.00		5.05			0.70											67.68										1.57			100	83
1904.11	12	23 30 24 7m		31.08			46.42	0.69		5.35			0.76					-						68.27													100	74
1904.11	12	25 "Ilm"		01.00	68.03		29.94	0.75	1.28															00.27													100	67
1904.11	12	26 Qz		100.00																																	100	81
1904.11	12	27 Sd +		4.41	1.03	1.99	76.24	0.83	7.46	7.48		0.57	4 4 7		0.70																						100	39
1904.11	12	20 TIU ₂ -	+ Bt	33.87	3.50	21.67	2.25		5.61	0.74	0.68	1.65	1.17		2.73																						100	56
1904.11	12	30 "Ilm"	5.	00.01	66.82	21.07	27.89	5.30	0.01		0.00	1.00			0.01																						100	62
1904.11	12	31 Spl				31.38	15.15		15.44										38.04																		100	72
1904.11	12	32 Zrn		29.17		0.92	0.95			0.67							0.93							67.36													100	72
1904.11	12	33 Chi 34 Sd		30.72		22.66	22.40		3.60	3.25	0.77	0.53			2.91																						85 56	58
1904.11	12	35 Chl +	Bt	40.94	2.03	28.05	20.52	0.62	1.52	1.62	0.62	1.39			2.68																						100	57
1904.11	12	36 TiO ₂ -	+	1.76	93.57	1.47	2.91			0.28																											100	63
1904.11	12	37 IIm		07.7	53.85		44.27	0.61	1.27														L	0.5.5													100	73
1904.11	13	1 ∠m 2 ≤d		30.96	0.05	1 66	76 55	5 90		11 89														69.04													100	80 40
1904.11	13	3 TiO ₂		3.00	98.43	1.00	1.57	0.90		11.00																											100	71
1904.11	13	4 "Ilm"		0.77	69.82		27.56	0.89	0.95																												100	66
1904.11	13	5 Zrn		30.95																				69.05													100	82
1904.11	13	6 Zm		31.21	04.20	0.00	11.04																	68.79													100	81
1904.11	13	8 Tur		37,41	04.38	33,43	11.40		2.28		1.98																										87	69
1904.11	13	9 Sd +		2.65		1.39	82.76	2.54	6.20	4.46																											100	43
1904.11	13	10 Sd +		1.71		1.33	84.69	0.79	1.00	8.44			2.03																								100	43
1904.11	13	11 Mnz		0.88		47.51	0.00			2.04		45.70	36.28	2.08	0.93						0.06					4.10	14.81	28.54		10.29							100	71
1904.11	13	12 KIS 13 "Ilm"		66.34	61.21	17.54	37 31	1 48				15.73					-																				100	81 65
1904.11	13	14 Grt		40.41	021	20.79	24.74	1.50	6.44	6.12																											100	78
1904.11	13	15 TiO ₂ -	+	1.40	93.20	1.90	2.74			0.76																											100	59
1904.11	13	16 Qz		99.30			0.70	0.07																													100	84
1904.11	13	1/ Sd +		4.48		2.14	83.05	0.82		9.51			44.60		6.86																						100	42
1904.11	13	19 llm			59.61		37.07	0.72	2.60	40.04			44.00		0.00								l														100	70
1904.11	13	20 Zm		31.10																				68.90													100	85

Sample	Site	Position	Mineral	SiO2	Ti02	AI2O3	FeO	MgO	CaO	Na2O	K20	P205	S03	ш	CI	Sc2O3	V205	Cr203	CoO	NiO	ZnO	Y203	ZrO2	Nb2O5	Ag2O	La203	Ce203	Pr203	Nd2O3	Gd2O3	Dy203	Yb203	Hf02	WO3	0s02	Total Actual Total
1904.11	13	21	TiO ₂		100.00																															100 74
1904.11	13	22	Sd	CC 4C		47.00	44.83	6.06	5.11		46.05																									56 42
1904.11	13	23	TiO ₂	1.62	96.72	0.74	0.40				16.05																									100 62
1904.11	13	25	TiO ₂		98.82		1.18																													100 74
1904.11	13	26	Sd +	4.07		1.43	81.57 1.5	57 3.43	5.53		0.60	1.81																								100 42
1904.11	13	27	Sd "llm"		82.00		45.46	5.26	5.29																											56 43 100 62
1904.11	14	1	Zm	30.85	02.00																		69.15													100 82
1904.11	14	2	"llm" +	0.96	74.16	1.21	21.84 0.6	6 1.17	r																											100 68
1904.11	14	3	"lim"	44.42	88.31	07.47	11.69	4.02		0.70	2.50	0.75		7.57																						100 57
1904.11	14	4	Kfs	65.39	0.41	17.98	9.67	4.93		0.78	3.52	0.75		7.57																						100 70
1904.11	14	6	TiO ₂	1.25	96.27	1.32	1.15																													100 70
1904.11	14	7	"llm" Zee	20.00	73.69		25.38	0.92	2														60.24													100 65
1904.11	14	9	Zm	30.00																			69.09													100 81
1904.11	14	10	"llm"	0.59	66.37		31.73 1.3	31															00.00													100 69
1904.11	14	11	Grt	39.64		20.67	28.50 7.9	95 1.92	1.32		0.5-					— T																				100 79
1904.11	14	12	uz "llm" +	97.09	78.12	1.55	0.81 19.93 0.9	36	+		0.55																									100 84
1904.11	14	14	Qz	99.22	0.78			~																												100 84
1904.11	14	15	Spl		0.55	31.12	19.26	12.74	ŧ									36.33																		100 76
1904.11	14	16	llm "llm"		57.64	0.53	33.78 0.5	56																										7.49		100 72
1904.11	14	18	Sd +	2.01	0.89	1.50	82.47 0.9	91 1.08	9.82			1.33																								100 69
1904.11	14	19	"llm"		73.49		26.51																													100 64
1904.11	14	20	Zm	26.18		0.95	0.79		1.94					3.92		1.02							65.21													100 76
1904.11	14	21	Qz Sol	99.57	0.42	30.55	0.43	10.76										38 59																		100 87
1904.11	14	23	TiO ₂	0.67	98.12	00.00	1.21	10.70										00.00																		100 74
1904.11	14	24	Qz	100.00																																100 84
1904.11	14	25	Tur Cbl i Pt	38.16	0.59	27.84	9.28	7.65	0.92	2.56	2.57																									87 69
1904.11	14	20	Tur	37.65	0.90	33.73	6.26	5.86	0.52	2.08	2.31																									87 70
1904.11	14	28	TiO ₂	0.71	95.57		0.80							2.92																						100 72
1904.11	14	29	Tur	40.66	1.40	27.33	11.82	3.58	5		2.20	25.22													4 47	40.05	22.20		44.07							87 69
1904.11	14	30	"llm" +	0.88	75.57	1.04	21.41 0.6	53				35.32						0.47							1.47	16.25	33.20		11.07							100 72
1904.11	14	32	Zrn	28.57	0.58		0.58		1.22							1.00							68.06													100 72
1904.11	14	33	Zm	29.42	00.40	0.87	0.50	_	1.02														68.68													100 71
1904.11	14	34	TIU ₂ Spl	1.72	96.43	1.35	12 24	12.55										38.24																		100 64
1904.11	14	36	"llm" +	1.87	85.79	1.03	11.31	12.00										00.21																		100 55
1904.11	15	1	Qz	100.00				_																												100 81
1904.11	15	2	Zrn "Ilm" I	31.03	96.01		12.56	-															68.97													100 81
1904.11	15	4	Qz	100.00	00.21		12.50																													100 82
1904.11	15	5	Chl + Bt	28.96	2.59	15.05	35.97 0.6	67 12.84	0.82		3.09																									100 64
1904.11	15	6	"llm"		70.92	0.92	28.10 0.9	98																												100 70
1904.11	15	8	Qz	99.54	90.22	0.05	0.46																													100 73
1904.11	15	9	Qz	100.00																																100 87
1904.11	15	10	Sd +	6.68	0.65	2.39	77.67 0.8	37 2.15	6.83		0.41	2.34																								100 46
1904.11	15	12	Chr		07.34	25.20	19.61	14 17	,								-	40.25																		100 70
1904.11	15	13	TiO ₂		100.00	LUILU	10.01	1111										10.20																		100 75
1904.11	15	14	Grt	39.65		20.18	28.00 4.9	93 1.99	5.25																											100 78
1904.11	15	15	lur "lim"	36.28	89.43	32.61	9.53	3.58	5	2.01				2.21																						87 70
1904.11	15	17	TiO ₂ + Ms	29.71	34.24	22.57	1.47			0.52	5.19			6.31																						100 52
1904.11	15	18	Zm	30.76			0.50																68.74													100 83
1904.11	15	19	Sd+ Zm	3.28		1.65	79.27 0.8	87 8.42	6.51														68.80													100 42
1904.11	15	20	TiO ₂	0.82	96.62	0.71	1.85																00.09													100 69
1904.11	15	22	Qz	100.00																																100 83
1904.11	15	23	"llm"		66.71		28.19 5.1	11																												100 66
1904.11	15	24	"llm"		60.27		36.84 21	0.83																												100 64
1904.11	15	26	Grt	44.10		28.25	22.04	4.98	5	0.64																										100 44
1904.11	15	27	Qz	100.00																																100 82

Sample	Site	Position Mineral	SiO2	Ti02	AI203	FeO	OuM	MgO	CaO	Na2O	K20	P205	SO3	ш	ō	Sc203	V205	Cr203	CoO	OiN	OuZ	Y203	ZrO2	Nb2O5	Ag2O	La203	Ce2O3	Pr2O3	Nd2O3	Gd2O3	Dy203	Yb203	Hf02	W03	0s02	Total	Actual Total
1904.11	15	28 Qz	99.63			0.37																														100	83
1904.11	15	29 1iO ₂ 30 TiO ₂ +	0.98	93.04	1 97	2.20			0.80			1.01																								100	69
1904.11	15	31 Spl	0.30	33.04	33.97	15.34		14.58	0.00			1.01						36.11																		100	75
1904.11	15	32 Zrn	30.58			0.45																	68.97													100	80
1904.11	15	33 Sd +	4.41		2.61	81.86	1.49	2.13	5.64			1.85																								100	42
1904.11	15	34 "IIm"	66.17	67.10	17.76	32.12	0.78			0.50	15 57																									100	63
1904.11	16	2 Mnz	00.17		17.70					0.50	15.57	36.02													2.28	19.32	32.15		10.23							100	71
1904.11	16	3 Zrn	31.42																				68.58													100	81
1904.11	16	4 Qz	99.63			0.37																														100	82
1904.11	16	5 Sd	1.08	64.70	0.60	46.04	0.58	3.91	3.79																											100	42
1904.11	16	7 Qz	99.57	04.70	2.00	0.43	1.14	3.14									-																			100	84
1904.11	16	8 Sd +	10.55	0.66	6.90	67.27	2.88	7.47	3.50		0.76																									100	46
1904.11	16	9 TiO ₂		100.00																																100	74
1904.11	16	10 "llm"	60.29	66.70	0.70	29.74	1.55	1.31		11 70																										100	 91
1904.11	16	12 Qz	100.00		10.04					11.70							-																	-		100	85
1904.11	16	13 "llm"		63.77		31.38	4.02	0.84																												100	63
1904.11	16	14 "lim"		69.42		29.38	0.64	0.56	0.55																											100	67
1904.11	16	15 110 ₂ +	1.82	90.58	1.70	5.32		3 30	0.58									38 / 2																		100	59
1904.11	16	17 Qz	99.45	0.03	0.03	0.55		3.30									-	30.43																		100	82
1904.11	16	18 "Ilm"		61.82		35.82	1.00	1.35																												100	67
1904.11	16	19 Qz	99.66	i		0.34																														100	83
1904.11	16	20 Zrn 21 TiO +	31.30	90.55	2.67	0.72					1.00												66.84										1.86			100	<u>85</u>
1904.11	16	22 Grt	40.52	30.33	21.42	24.25	0.67	6.05	7.10		1.00						-																			100	77
1904.11	16	23 "Ilm" +	1.51	66.29	1.10	29.98	1.12																													100	64
1904.11	16	24 Xtm	3.80	1					1.17			36.09		1.36					0.90			36.23				2.64	6.27		2.69	2.44	3.51	2.90				100	62
1904.11	16	25 Zrn 26 TiO	30.90	99.40		0.60																	69.10													100	<u> </u>
1904.11	16	27 Sd	0.76	33.40		46.66	2.34	0.62	5.63																											56	39
1904.11	16	28 Zrn	30.51			0.48		0.02															69.02													100	82
1904.11	16	29 Qz	100.00																																	100	80
1904.11	16	30 Chr	2.96		7.34	17.70	1.27	6.81	6 70									66.89																		100	69
1904.11	16	32 TiO ₂ +	12.00	77.64	6.64	0.91	0.07	1.13	0.79		2.74																									100	70
1904.11	16	33 Chl + Bt	37.79	1.73	20.71	22.57	0.67	8.82	0.70		2.94			4.08																						100	39
1904.11	17	1 Zrn	30.98																				69.02													100	81
1904.11	17	2 Qz	99.50			0.50																	60.22													100	82
1904.11	17	4 Chr	30.76		24.07	17.56		12.99										45.38					09.22													100	75
1904.11	17	5 Sd +	3.94		2.10	76.20	0.85	7.26	5.93																									3.72		100	46
1904.11	17	6 TiO ₂		100.00																																100	75
1904.11	17	7 "llm"	21.12	76.60		23.40																	60.00													100	62
1904.11	17	9 llm	31.12	52.55		46.85		0.60								-							00.00													100	72
1904.11	17	10 Mix	65.50	15.19	14.70	1.43		0.62			0.50			2.06																						100	48
1904.11	17	11 "Ilm" +	1.64	86.14	2.86	7.13												0.73																1.50		100	65
1904.11	17	12 "lim" +	2.76	81.83	2.60	11.27			0.35	0.63								0.56					68.48													100	57 81
1904.11	17	14 Tur	38.46	0.63	29.31	9.35		6.36		2.89						-							00.40													87	67
1904.11	17	15 "llm" +	0.93	86.29	2.24	10.54																														100	67
1904.11	17	16 Zrn	30.93		\square																		69.07													100	82
1904.11	17	1/ Zm	30.40																				67.56										2.04			100	83
1904.11	17	19 Chl + Bt	30.17	1.90	15.41	16.55		8.78	9.62		5.05	8.54		3.99									00.11													100	50
1904.11	17	20 "Ilm"		65.11		33.42		1.47																												100	67
1904.11	17	21 "Ilm" +	1.18	75.64	2.84	19.26	0.51	0.7-			0.07							0.58																		100	67
1904.11	17	22 Sd +	14.95		3.55	69.95	0.80	2.77	5.84		0.65	1.49																								100	46
1904.11	17	24 Chl + Bt	37.42	3.12	19.96	30.69		6.79	0.62	1.06	0.35																									100	63
1904.11	17	25 Chr		0.76	23.30	14.46		14.59										46.90																		100	70
1904.11	17	26 Qz	100.00	00		0.77																														100	81
1904.11	1/	27 11U ₂	1.07	99.25		0.75			47.54			12 01		7.26													1 1 2									100	/1
1904.11	17	29 "Ilm"	1.07	69.41		29.84	0.75		-1.04			72.31		1.30													1.12									100	61
1904.11	17	30 Tur	38.40	1	28.42	5.91		9.31	0.31	2.78				1.87																						87	68
1904.11	17	31 Chr		0.79	13.21	25.38		7.45									0.62	52.54																		100	72

Sample	Site	Position	Si02 Ti02	AI203	FeO	MnO	MgO	CaO	Na2O	K20	P205	S03	ш	ō	Sc2O3	V205	Cr203	CoO	NiO	ZnO	Y203	ZrO2	Nb205	Ag2O	La2O3	Ce203	Pr203	Nd2O3	Gd2O3	Dy203	Yb203	HfO2	WO3	0s02	Total	Actual Total
1904.1	I 17	32 Ilm	58.	20	39.3	5 2.45																													100	69
1904.1	17	33 Qz	99.41	_	0.5	9																													100	83
1904.1	18	1 Qz 2 Sd + Oz	39.28		52.7	4 1 30	2 40	4 27																											100	80 54
1904.1	1 18	3 "Ilm"	60.20	93	37.4	8 1.58	2.10	1.27																											100	66
1904.1	I 18	4 "llm" +	6.57 86.	73 4.4	9 1.8	4				0.37																									100	70
1904.1	1 18	5 Sd +	3.33	1.8	9 80.4	9	9.55	4.75																											100	43
1904.1	1 18	5 11m - 7 Sd +	4.28 1.	27 51 3.3	5 85.1	3 5 1.51		1.97		0.46	1.77																							\rightarrow	100	43
1904.1	1 18	8 Sd +	17.87 1.	41 9.5	4 55.3	4 1.62	5.57	2.34		1.52																							4.79		100	47
1904.1	1 18	9 Qz	100.00																																100	83
1904.1	1 18	10 Sd		49.5	49.2	2 0.49	0.67	4.69			0.92						20.51																		56	40
1904.1	1 18	12 TiO ₂	1.34 97.	20 0.6	3 0.8	3	13.72										20.01																		100	69
1904.1	I 18	13 Sd			45.3	0 0.43	5.12	5.15																											56	42
1904.1	1 18	14 Qz	100.00		45.0	~																													100	84
1904.1	1 18	15 IIM 16 Qz	99.18	14	45.8	2																					-							\rightarrow	100	84
1904.1	1 18	17 Ms	67.53 0.	71 17.3	5 3.5	4	0.96			2.26			2.65																						95	60
1904.1	18	18 Tur	37.53 1.	63 33.4	3 7.3	0	4.72	0.55	1.84													07.45										1.0.			87	68
1904.1	1 18	19 ∠m 20 Oz	30.92		-	+																67.46										1.61		\rightarrow	100	82
1904.1	1 18	21 TiO ₂	0.52 95.	66	1.7	2						2.11																						_	100	76
1904.1	I 18	22 Zrn	31.30																			68.70													100	84
1904.1	1 18	23 "Ilm"	0.78 88.	50	10.7	2	5.50	0.07	2.00																										100	55
1904.1	1 18	24 Tur 25 TiO ₂ +	1.06 96	<u>31 1.3</u>	8 1.2	4	5.56	0.27	2.09																		-								100	72
1904.1	1 18	26 "Ilm"	0.86 72.	14 0.5	8 26.4	2																													100	62
1904.1	1 18	27 Mix	3.55	1.6	9 71.8	6 0.60	0.90	6.34			1.24	13.83																							100	50
1904.1	1 18	28 "lim" +	1.05 65.	48	31.0	0 2.47																68.85													100	54 82
1904.1	1 19	2 Sd	51.15		45.7	7 0.41	5.15	4.67														00.00													56	40
1904.1	l 19	3 Zrn	31.32		0.4	9																68.19													100	82
1904.1	1 19	4 TiO ₂ +	0.68 91.	71 1.7	7 1.5	8		0.45	0.56		1.02		2.24									60.05										4.50			100	63
1904.1	1 19	5 ZIII 6 Chr	30.44	9.9	0 14.6	7 1 51	7.07										66.86					00.05										1.52			100	73
1904.1	1 19	7 Chl + Bt	36.36 3.	62 18.0	7 28.2	4 0.49	8.78			4.43							00.00																		100	61
1904.1	1 19	8 Zrn	30.58																			69.42													100	83
1904.1	1 19	9 TiO ₂ +	0.93 92.	15 2.5	7 1.6	3		0.98			1.74											68 59													100	69 83
1904.1	1 19	10 2m	66.	13 0.9	3 32.9	4																00.55													100	69
1904.1	l 19	12 TiO ₂	1.61 96.	59 1.0	9 0.7	1																													100	75
1904.1	1 19	13 Chr	22.00 4	23.1	3 20.4	0	12.40	0.50		4.00							44.07																		100	76
1904.1	1 19	15 Sd +	18.25 1.	01 9.9	9 <u>34.5</u> 6 59.8	8 1.61	6.75	2.05		0.49							0.61																	-	100	45
1904.1	1 19	16 Zm	30.55																			69.45													100	79
1904.1	1 19	17 Tur	37.16 1.	37 33.9	2 7.8	3	4.56	0.28	1.87																										87	68
1904.1	1 19 1 10	18 IIU ₂ + 19 Sd +	3.65 83.	UZ 4.0	/ 8.4 0 82 0	8 2 0 96	9.04	5.05									0.79																	\rightarrow	100	6/ 42
1904.1	1 19	20 "Ilm"	68.	27	28.8	7 2.85	3.04	3.03																											100	60
1904.1	1 19	21 Zm	30.61		0.5	0																68.88													100	81
1904.1	19	22 Chl + Bt	28.93 1.	77 15.1	6 37.5	8 1.34	10.59	1.06		3.58																									100	40
1904.1	1 19	24 TiO ₂ + Ms	19.95 59.	82 9.3	1 2.8	4	0.85		0.90	3.26			3.07																					\rightarrow	100	66
1904.1	1 19	25 "Ilm"	0.87 69.	62	27.2	5 2.26																													100	67
1904.1	1 19	26 Zrn	30.61	24 0.0	5 54	5							1.70									67.70													100	75
1904.1	1 19	27 TIO ₂ + 28 Cbl	30.88 1	72 18.9	3 26.0	3	7.43																											\rightarrow	85	45
1904.1	1 19	29 Grt	40.46	21.0	6 25.6	3 1.22	5.57	6.05																											100	77
1904.1	19	30 Grt	40.47	20.7	8 24.3	7 1.36	6.63	6.38																											100	78
1904.1	1 19	31 Qz	100.00	20.6	2 15 4	4	0 00										45.20																		100	84
1904.1	1 19	33 TiO ₂	100.	23.0	5 13.4		0.09										-0.09																	-	100	70
1904.1	1 20	1 Zm	30.95		0.4	5																68.60													100	80
1904.1	20	2 Sd +	1.90	0.9	9 84.7	6	1.31	9.17			1.87						22.42																		100	41
1904.1	20	3 Spi 4 "llm"	79	36.7	/ 14.5 9 18.5	3 1.08	16.50										32.16																	\rightarrow	100	57
1904.1	1 20	5 Zrn	31.01																			68.99													100	80
1904.1	20	6 Zrn	31.01			_																68.99												7	100	79
1904.1	20	/ Zm 8 Grt	31.33	21.6	3 20 4	3 0.26	5.92	10.72														68.67												\rightarrow	100	/9
1304.	u 40	oron	41.04	41.0	J 20.4	0.00	0.03	10.73										L				1													.001	11

1904.11 20 27.0 28.0 0.6 0.6 27.1 0.6 64.02 0.6 0.6 0.2	Sample	Site	Position Mineral	SiO2	Ti02	AI203	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	±.	ū	Sc203	V205	Cr203	CoO	NiO	OuZ	Y203	ZrO2	Nb205	Ag2O	La203	Ce2O3	Pr203	Nd2O3	Gd2O3	Dy203	Yb203	HfO2	WO3	0s02	Total	Actual Total
1994.11 30 0 0 0 0 69.1 0 69.1 0	1904.11	20	9 Zrn	29.28		0.58	0.76			0.84					2.51									64.02										2.02			100	66
1904.11 20 11 10 57.0 42.80 1 </td <td>1904.11</td> <td>20</td> <td>10 Zrn</td> <td>30.89</td> <td></td> <td>69.11</td> <td></td> <td>100</td> <td>79</td>	1904.11	20	10 Zrn	30.89																				69.11													100	79
1904.11 20 12 0.8 - <th< td=""><td>1904.11</td><td>20</td><td>11 lim</td><td></td><td>57.20</td><td></td><td>42.80</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>100</td><td>70</td></th<>	1904.11	20	11 lim		57.20		42.80																														100	70
1904.11 20 1.78 3.31 5.54 1.00 1.77 2.90 1.67 1 <t< td=""><td>1904.11</td><td>20</td><td>12 TiO₂</td><td></td><td>99.12</td><td></td><td>0.88</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>i</td><td></td><td>100</td><td>73</td></t<>	1904.11	20	12 TiO ₂		99.12		0.88																												i		100	73
1904.11 20 14 2m 0.41 m <	1904.11	20	13 Sd +	18.19	1.78	8.31	55.43	1.00	10.73	2.90		1.67																							i		100	52
1904.11 20 157 27.0 0.53 0.49 1.43 0.62 1 3.00 0.97 0 63.79 0 0 0 0.17 0 0 0 0 0 0.17 0 </td <td>1904.11</td> <td>20</td> <td>14 Zrn</td> <td>30.64</td> <td></td> <td></td> <td>0.41</td> <td></td> <td>68.95</td> <td></td> <td>1 1</td> <td></td> <td>100</td> <td>80</td>	1904.11	20	14 Zrn	30.64			0.41																	68.95											1 1		100	80
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	1904.11	20	15 Zm	27.60		0.53	0.49			1.34	0.62				3.00		0.97							63.79										1.67	1		100	76
1904.11 20 17 20 17 2.3 0.5 1.2 0	1904.11	20	16 TiO ₂ +	0.89	92.48	3.74	1.38			0.49			1.01																								100	65
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	1904.11	20	17 Qz	99.66	0.34																														i		100	83
1904.11 20 195.4 8.87 61.28 1.90 7.18 2.30 0.95 1 0.88 3.44 3.58 1 1 1 1 1 1 0.88 3.44 3.58 1 1 0 67.24 1 0 0 1 0 0 1 0 0 1 0 0 1 0 0 1 0 0 1 0 0 1 0 0 1 0 0 1 0 0 1 0 0 1 0 0 1 0 0 <	1904.11	20	18 llm +	1.07	58.33	1.25	36.72	1.42	1.22																										1 1		100	66
190.11 20 20 1m² 6 5.7 3.38 3.54 m	1904.11	20	19 Sd +	15.98	1.54	8.87	61.28	1.90	7.18	2.30		0.95																							i		100	42
1904.11 20 21 Ch + Bt 33.88 2.0 16.21 28.74 9.96 1.11 0.08 3.44 3.58 0	1904.11	20	20 "Ilm"		62.57		33.88	3.54																											1		100	62
1904.11 20 22 30.79 - <	1904.11	20	21 Chl + Bt	33.98	2.30	16.21	28.74		9.96	1.11	0.68	3.44			3.58																						100	51
1904.11 20 23 St.4 1.63 1.63 1.63 9.20 2.81 1.63 1.64 1.64 1.64 1.64 1.64 1.64 1.64 1.64 1.64 1.64 1.64 1.64 1.64 1.64 1.65 1.64 1.65	1904.11	20	22 Zm	30.79																				67.24										1.97			100	86
1904.11 20 24 lm' + 1.86 67.04 1.50 29.61 Image: constraint of the state of	1904.11	20	23 Sd +	16.36	1.83	7.65	60.53		9.20	2.81		1.63																									100	51
1904.11 20 25 30.98 Image: constraint of the state of th	1904.11	20	24 "llm" +	1.85	67.04	1.50	29.61																														100	47
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	1904.11	20	25 Zm	30.98																				67.37										1.65	1		100	85
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	1904.11	20	26 Zm	30.86			0.48																	66.56										2.10			100	87
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	1904.11	20	27 Zm	30.92																				69.08													100	82
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	1904.11	20	28 Zm	30.87																				69.13													100	82
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	1904.11	20	29 "llm"	0.57	72.61		26.81																														100	68
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	1904.11	20	30 llm		54.04		42.14	0.84	2.98																												100	73
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	1904.11	20	31 Sd				43.98	4.38	1.01	5.76			0.87																								56	42
1904.11 20 33 TO ₂ + Ms 1560 72.08 8.72 0.94 2.66 <td< td=""><td>1904.11</td><td>20</td><td>32 Qz</td><td>98.74</td><td></td><td>0.72</td><td>0.54</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>100</td><td>82</td></td<>	1904.11	20	32 Qz	98.74		0.72	0.54																														100	82
1904.11 20 34 54+ 2.31 1.66 84.31 0.75 1.13 7.59 2.24 0 0 0 0 0 0 0 0 1904.11 20 35 5d+ 4.38 2.87 79.56 2.66 1.12 9.42 0 </td <td>1904.11</td> <td>20</td> <td>33 TiO₂ + Ms</td> <td>15.60</td> <td>72.08</td> <td>8.72</td> <td>0.94</td> <td></td> <td></td> <td></td> <td></td> <td>2.66</td> <td></td> <td>100</td> <td>69</td>	1904.11	20	33 TiO ₂ + Ms	15.60	72.08	8.72	0.94					2.66																									100	69
1904.11 20 35 Sd+ 4.38 2.87 79.56 2.66 1.12 9.42 2.78 0	1904.11	20	34 Sd +	2.31		1.66	84.31	0.75	1.13	7.59			2.24																						í T		100	40
1904.11 20 36 TO, + 11.11 80.55 1.98 3.57 - 0 2.78 0 <td>1904.11</td> <td>20</td> <td>35 Sd+</td> <td>4.38</td> <td></td> <td>2.87</td> <td>79.56</td> <td>2.66</td> <td>1.12</td> <td>9.42</td> <td></td> <td>100</td> <td>43</td>	1904.11	20	35 Sd+	4.38		2.87	79.56	2.66	1.12	9.42																											100	43
1904.11 20 37 'llm' 1.05 73.18 1.38 22.71 1.69 Image: Constraint of the cons	1904.11	20	36 TiO ₂ +	11.11	80.55	1.98	3.57								2.78																						100	63
1904.11 20 38 Grt 41.20 0.40 21.23 20.59 0.73 8.86 6.98 <	1904.11	20	37 "llm"	1.05	73.18	1.38	22.71		1.69																												100	68
1904.11 20 39 Qz 100.00 -	1904.11	20	38 Grt	41.20	0.40	21.23	20.59	0.73	8.86	6.98																											100	79
1904.11 20 40 TiO2 97.00 3.00 C Solution	1904.11	20	39 Qz	100.00																																	100	83
1904/11 20 41 Chr 1945 12.59 51.32 51.20 51.32 51.20 51.32 5	1904.11	20	40 TiO ₂		97.00		3.00																														100	70
	1904.11	20	41 Chr			19.45	16.25		12.99										51.32												1						100	74
	1904.11	20	42 Sd		0.69		45.87	0.73	2.14	3.72																					1				2.84		56	43
1904.11 20 43 TIO- 98.91 1.09	1904.11	20	43 TiO ₂		98.91		1.09																								1						100	73
1904.11 20 44 TrO, + Chi 11.80 71.05 9.38 7.77	1904.11	20	44 TiO ₂ + Chl	11.80	71.05	9.38	7.77																								1						100	68

Appendix A9: BSE images and EDS mineral analyses for sample Sable Island E-48 2245.21 m

Fig 2	Fig 3	Fig 4	Fig 5	Fig 6	
(Site 1)	(Site 2)	(Site 3)	(Site 4)	(Site 5)	
Fig 7	Fig 8	Fig 9	Fig 10	Fig 11	
(Site 6)	(Site 7)	(Site 8)	(Site 9)	(Site 10)	
Fig 12	Fig 13	Fig 14	Fig 15	Fig 16	
(Site 11)	(Site 12)	(Site 13)	(Site 14)	(Site 15)	
Fig 17	Fig 18	Fig 19	Fig 20	Fig 21	
(Site 16)	(Site 17)	(Site 18)	(Site 19)	(Site 20)	

Figure A9.1: Scanned thin section of 2245.21 m from Sable Island E-48 showing sites analysed.



30:TiO₂ 1:Barite 58:Apatite 2:Zircon 31:TiO 59:TiO, + 3:Zircon 32:Spinel 60:TiO₂ + 33:Chromite 4:Zircon 61:Apatite 5:Barite 34:"Ilmenite" 62:Biotite 6:Zircon 35:Garnet 63:Pyrite + 7:Zircon 36:Garnet 64:Pyrite 8:Zircon 65:Spinel 37:TiO₂ + 9:Monazite 38:TiO₂ 66:TiO₂ 10:Pyrite 39:Spinel 67:Garnet 11:Pyrite 40:Chromite 12:Pyrite 41:Quartz 13:Pyrite 42:Garnet 14:TiO₂ + 43:Quartz 15:Siderite 44:"Ilmenite" 16:Chromite 45:Garnet 17:TiO₂ 46:TiO₂ 18:Chromite 47:TiO₂ 19:Chromite 48:TiO₂ + Quartz 20:Spinel 49:Garnet 21:Garnet 50:TiO₂ + 22:Apatite 51:TiO₂ 23:Tourmaline 23:Tourmaline 52:"Ilmenite" 24:Tourmaline 53:Biotite 25:TiO₂ 54:Chromite 26:Pyrite 55:Garnet 27:Pyrite 56:TiO₂ 28:Chloritized 57:"Ilmenite" Biotite 29:TiO₂

Figure A9.2: Sable Island E-48 (2245.21 m) (SEM) site 1 (Table A9.1)



Figure A9.3: Sable Island E-48 (2245.21 m) (SEM) site 1.1 (Table A9.1). Lithic clast made up of quartz (3), partly altered ilmenite (4,5) grains and partly altered biotite to chlorite (1).

1:Chlorite + Biotite 2:Mix 3:Quartz 4:"Ilmenite" 5:TiO₂ 6:Muscovite



1:Pyrite 2:Pyrite + 3:Chlorite + Biotite

Figure A9.4: Sable Island E-48 (2245.21 m) (SEM) site 1.2 (Table A9.1). Detrital grain of altered biotite (3) with pyrite (1,2) that has precipitated along the cleavage of the biotite.



1:Chlorite + Biotite 2:Quartz 3:Detrital Diagenetic TiO₂ +

Figure A9.5: Sable Island E-48 (2245.21 m) (SEM) site 1.3 (Table A9.1). Lithic clast made up mostly of detrital diagenetic TiO_2 (3), originally probably ilmenite, with quartz (2) inclusions and probably altered biotite (1).



1:Chlorite + Biotite 2:Biotite

Figure A9.6: Sable Island E-48 (2245.21 m) (SEM) site 1.4 (Table A9.1). Detrital biotite (2) partly altered to chlorite (1).



22:Quartz 1:Barite 2:Tourmaline 23:Zircon 3:"Ilmenite" 24:K-Feldspar 4:Chromite $25:TiO_2$ + Quartz 5:Ilmenite 26:Garnet 6:Pyrite + 27:Tourmaline 7:Biotite 28:Tourmaline 8:Barite 29:Zircon 9:Siderite + 30:TiO₂ + 10: 31:TiO₂ 11:TiO₂ + 32:Zircon 12:TiO₂ 33:Pyrite 13:Chromite 34:Pyrite 14:Barite 35:Pyrite + 15:Garnet 36:Garnet 16:Spinel 37:Hole 17:Pyrite 38:Garnet 18:Zircon 19:Tourmaline 20:Apatite 21:Chromite

Figure A9.7: Sable Island E-48 (2245.21 m) (SEM) site 2 (Table A9.1)



1:?Feoxide/hydroxide + 2:?Feoxide/hydroxide +

Figure A9.8: Sable Island E-48 (2245.21 m) (SEM) site 2.1 (Table A9.1). Possibly a grain of Fe-oxide/hydroxide (1,2).



Figure A9.9: Sable Island E-48 (2245.21 m) (SEM) site 3 (Table A9.1)



1:Quartz 20:Zircon 2:Zircon 21:Apatite 3:Zircon 22:Quartz 4:TiO₂ + 23:TiO₂ 24:Siderite + 5:Pyrite 6:Pyrite +? 25:Zircon 7:Pyrite 26:TiO₂ 8:Zircon 27:Siderite + 9:Quartz 28:Zircon 10:Quartz 29:Zircon 11:Chromite 30:Pyrite 12:Tourmaline 31:Pyrite + 13:Barite 14:Chromite 15:TiO₂ + Pyrite 16:Quartz 17:Pyrite 18:Chromite 19:Zircon

Figure A9.10: Sable Island E-48 (2245.21 m) (SEM) site 4 (Table A9.1)



Figure A9.11: Sable Island E-48 (2245.21 m) (SEM) site 4.1 (Table A9.1). A rounded TiO_2 grain with apparent foliation probably detrital diagenetic.



1:Muscovite + 2:Pyrite + 3:Siderite + Pyrite + 4:Chlorite + 5:Fe-oxide/hydroxide + 6:Fe-oxide/hydroxide +

Figure A9.12: Sable Island E-48 (2245.21 m) (SEM) site 4.2 (Table A9.1). Lithic clast made up of chlorite (4), muscovite (1) and Fe-oxide/hydroxide (5,6) and siderite (3), and containing later pyrite (2).



1:Zircon 22:Apatite 2:Garnet 23:Zircon 3:Chromite 24:Quartz 4:Tourmaline 25:Pyrite + 5:Chromite 26:Barite 6:Zircon 27:Zircon 7:TiO₂ + 28:Garnet 29:Tourmaline 8:Zircon 9:Chromite 30:Pyrite 10:Quartz + TiO, 31:Zircon 32:Zircon 11:Zircon 33:TiO₂ + 12:Barite 34:TiO₂ + 13:Tourmaline 14:Zircon 15:Zircon 16:TiO₂ + 17:TiO₂ 18:Zircon 19:Apatite 20:TiO₂

Figure A9.13: Sable Island E-48 (2245.21 m) (SEM) site 5 (Table A9.1)



2:Muscovite 3:TiO₂ + 6:Muscovite 7:"Ilmenite" + 8:TiO₂ +

Figure A9.14: Sable Island E-48 (2245.21 m) (SEM) site 5.1 (Table A9.1). An altered ilmenite grain (7) that is altering to TiO_2 (1,3,4,5,8) associated with muscovite (2) and containing muscovite inclusions (6)



Figure A9.15: Sable Island E-48 (2245.21 m) (SEM) site 5.2 (Table A9.1). A grain of altered ilmenite (1,2) altering to $TiO_{2}(4,5)$ with trellis texture and muscovite inclusions (3).

1:"Ilmenite" + 2:"Ilmenite" + 3:Muscovite 4:TiO₂ +



Figure A9.16: Sable Island E-48 (2245.21 m) (SEM) site 5.3 (Table A9.1). A detrital grain of TiO_2 (1,2).



1:Quartz 2:TiO₂ + Quartz 3:Quartz 4:Chlorite + Muscovite 5:Chlorite + Muscovite 6:Chlorite + Muscovite

Figure A9.17: Sable Island E-48 (2245.21 m) (SEM) site 5.4 (Table A9.1). A lithic clast made up of quartz (1,3), TiO_2 (2), and chlorite and muscovite (4,5,6). Schist.



1:Pyrite 18:Zircon 2:Pyrite 19:Zircon 3:TiO₂ 20:Zircon 4:Quartz 21:Zircon 22:Zircon 5:TiO₂ 23:Tourmaline 6:Pyrite 24:Siderite + 7:Zircon 25:Tourmaline 8:Quartz 9:Quartz 26:Zircon 27:Barite 10:Garnet 28:Tourmaline 11:Zircon 12:Pyrite + 29:Quartz 30:Pyrite Quartz 31:Chromite 13:Pyrite 14:Siderite + 32:Pyrite contaminant 33:Pyrite 34:Chromite 15:Garnet 16:Chromite 35:Zircon 36:Pyrite 17:Zircon 37:TiO₂

Figure A9.18: Sable Island E-48 (2245.21 m) (SEM) site 6 (Table A9.1)



Figure A9.19: Sable Island E-48 (2245.21 m) (SEM) site 6.1 (Table A9.1). A grain made up of TiO_2 (1,3) blebs and chloritized inclusions (2).



Figure A9.20: Sable Island E-48 (2245.21 m) (SEM) site 6.2 (Table A9.1). Lithic clast made up of quartz (3) and TiO_2 mineral (1,2,4).



Figure A9.21: Sable Island E-48 (2245.21 m) (SEM) site 6.3 (Table A9.1). A lithic clast made up of a rounded TiO_2 (2) grain with inclusions of quartz (3).



Figure A9.22: Sable Island E-48 (2245.21 m) (SEM) site 6.4 (Table A9.1). Isolated grains of TiO_2 (1) and barite (2).



 $\begin{array}{rl} & 21:Zircon\\ & 22:Tourmaline\\ & 23:TiO_2\\ te & 24:Spinel\\ & 25:Zircon\\ & 26:Quartz\\ & 27:Garnet\\ & 28:TiO_2\\ \\ line & 29:Pyrite +\\ & 30:Quartz\\ & 31:TiO_2 + Quartz\\ & 32:Tourmaline\\ \\ + \end{array}$

Figure A9.23: Sable Island E-48 (2245.21 m) (SEM) site 7 (Table A9.1)



Figure A9.24: Sable Island E-48 (2245.21 m) (SEM) site 7.1 (Table A9.1) Fine grained TiO $_{2}$ (1,2,3).



1:Quartz + 2:Pyrite + Quartz 3:"Ilmenite" + Chlorite





Figure A9.26: Sable Island E-48 (2245.21 m) (SEM) site 7.3 (Table A9.1). A rounded grain of TiO_2 (1,2) with wrinkle texture.



Figure A9.27: Sable Island E-48 (2245.21 m) (SEM) site 7.4 (Table A9.1). Lithic clast made up of quartz (2,5), zircon (1), detrital diagenetic TiO_2 (3) and later monazite (4).

1:Zircon 2:Quartz 3:TiO₂ 4:Monazite 5:Quartz



1:Zircon 21:Tourmaline 2:Zircon 22:Quartz o 3:Zircon 23:TiO₂ $4:TiO_2$ 24:Zircon 5:Chlorite 25:Chromite 6:TiO₂ 26:Garnet 27:TiO₂ + 7:Zircon 8:Pyrite 28:Pyrite 9:Zircon 29:Zircon 10:Chromite + 30:Zircon 31:Pyrite 11:TiO₂ 12:Tourmaline 32:Mix 33:Barite 13:Pyrite 34:Zircon 14:Barite 15:Quartz 35: 16:Tourmaline 36:Zircon 37:Zircon 17:Garnet 38:Pyrite + 39: Pyrite 19:Barite 20:Zircon

Figure A9.28: Sable Island E-48 (2245.21 m) (SEM) site 8 (Table A9.1)



Figure A9.29: Sable Island E-48 (2245.21 m) (SEM) site 8.1 (Table A9.1). Cement made up of siderite (2,3) and late barite (1 and pos. a).



1:Zircon 21:Zircon 2:Barite 3:Zircon 4:Zircon 5:Zircon 6:Barite 7:Pyrite 8:TiO₂ 9:Zircon 10:Zircon 11:Zircon 12:Barite 13:Zircon 14:Quartz 15:Zircon 16:Feoxide/hydroxide 37:Chromite 17:"Ilmenite" 18:Zircon 20:Zircon

22:Quartz 23:Quartz 24:Pyrite + 25:Zircon 26:Zircon 27:"Ilmenite" 28:Pyrite 29:Zircon 30:Zircon 31:Tourmaline 32:TiO₂ 33:Pyrite 34:Barite 35:Tourmaline 36:TiO₂ 38:Zircon 39:Barite 40:Zircon 41:Chromite 42:TiO₂

Figure A9.30: Sable Island E-48 (2245.21 m) (SEM) site 9 (Table A9.1)



20:Tourmaline 21:Pyrite + 22:Chromite 23:Zircon 24:Pyrite 25:Zircon 26:TiO₂ + 27:Zircon 28:Quartz 29:Zircon 30:Biotite

Figure A9.31: Sable Island E-48 (2245.21 m) (SEM) site 10 (Table A9.1)



1:Pyrite 19:K-Feldspar 2:Pyrite 20:Quartz 3:Zircon 21:Chromite $4:TiO_2$ 22:Zircon 5:Zircon 23:Pyrite 6:Apatite 24:Zircon 7:TiO₂ + 25:Mix 26:TiO₂ 8:Spinel 27:Quartz 9:Pyrite 28:Siderite 246 10:TiO₂ + Quartz 29:TiO₂ 11:Pyrite 30:Garnet 12:Zircon 31:Barite 13:Pyrite 32:Pyrite + 14:Zircon 33:Pyrite 15:TiO₂ + 34:Tourmaline 16:Pyrite 35:Quartz + TiO₂ 17:Zircon 36:TiO₂ 18:Barite 37:Chromite 38:Pyrite

Figure A9.32: Sable Island E-48 (2245.21 m) (SEM) site 11 (Table A9.1)



Figure A9.33: Sable Island E-48 (2245.21 m) (SEM) site 11.1 (Table A9.1). A lithic clast made up of TiO_2 blebs of varying sizes.



Figure A9.34: Sable Island E-48 (2245.21 m) (SEM) site 11.2 (Table A9.1). A grain of altered ilmenite (1,2).



Figure A9.35: Sable Island E-48 (2245.21 m) (SEM) site 11.3 (Table A9.1) Detrital diagenetic TiO_2 with quartz inclusions (1,3).

1:"Ilmenite" + 2:"Ilmenite" +



Figure A9.36: Sable Island E-48 (2245.21 m) (SEM) site 11.4 (Table A9.1). Cement made up of barite (1), siderite (3) and quartz (2).



Figure A9.37: Sable Island E-48 (2245.21 m) (SEM) site 11.5 (Table A9.1). Lithic clast made up of quartz (4), TiO_2 (2,3) and chlorite matrix (1).

1:Chlorite + 2:TiO₂ + 3:TiO₂ + 4:Quartz



Figure A9.38: Sable Island E-48 (2245.21 m) (SEM) site 11.6 (Table A9.1). A detrital TiO_2 grain (1,3) with some chlorite (2) in areas of dissolution or along cleavage planes.



21:Zircon 1:Zircon 22:Pyrite + 2:Pyrite 23:Mix 3:Chlorite 24:Barite 4:TiO₂ + 25:Zircon 5:Zircon 26:TiO₂ + 6:Spinel 7:Apatite 27:Zircon 28:Zircon 8:Zircon 29:Mix 9:Zircon 10:Pyrite 30:TiO₂ + 11:Zircon 31:Garnet 12:Zircon 32:Barite 13:Zircon 33:TiO₂ 14:TiO₂ + 34:Tourmaline Siderite 15:Siderite + 16:Tourmaline 17:Zircon 18:Pyrite 19:TiO₂ + K-Feldspar 20:K-Feldspar

Figure A9.39: Sable Island E-48 (2245.21 m) (SEM) site 12 (Table A9.1)



Figure A9.40: Sable Island E-48 (2245.21 m) (SEM) site 12.1 (Table A9.1). An altered ilmenite grain (1,2) showing some foliation.



1:Chlorite + Muscovite 2:TiO₂ + 3:Pyrite 4:Quartz + Chlorite + Muscovite 5:Chlorite + Muscovite

Figure A9.41: Sable Island E-48 (2245.21 m) (SEM) site 12.2 (Table A9.1). A rounded lithic clast made up of slender crystals of TiO₂ (2) in a matrix made up of chlorite (1,4,5), muscovite (1,4,5) and quartz (4). Schist.



1:Quartz 2:Pyrite 3:Siderite 4:Fe-oxide/hydroxide + 5:Chlorite + Biotite 6:Pyrite + 7:Pyrite + 8:Quartz +

Figure A9.42: Sable Island E-48 (2245.21 m) (SEM) site 12.3 (Table A9.1). Similar to Figure 12.



Figure A9.43: Sable Island E-48 (2245.21 m) (SEM) site 12.4 (Table A9.1). Fine grained diagenetic TiO₂.



1:Pyrite 20:Quartz + 21:Zircon 2:Chromite + 22:Chromite 3:TiO₂+ 23:Pyrite 4:TiO₂+? $24:TiO_2$ 5:Zircon 25:Quartz 6: 26:Zircon 7:Chromite 27:Zircon 8:Quartz 28:Chromite 9:Spinel 29:Zircon 10:Zircon 11:Pyrite 12:Apatite 13:Zircon 14: 15:TiO₂ + 16:Zircon 17:Chromite 18:TiO₂ + Quartz 19:Zircon

Figure A9.44: Sable Island E-48 (2245.21 m) (SEM) site 13 (Table A9.1)



Figure A9.45: Sable Island E-48 (2245.21 m) (SEM) site 13.1 (Table A9.1). A lithic clast made up of TiO_2 (4) blebs, quartz (1,2,7) and chloritized minerals (3,7). Schist.

1:Quartz + TiO_2 2:Quartz + 3:Chlorite + Kaolinite 4: TiO_2 5: TiO_2 + 6: TiO_2 + 7:Quartz + Muscovite


1:Zircon 20:Zircon 2:Pyrite 21:Tourmaline 3:Chlorite 22:Barite 4:Apatite 23:Zircon 5:Chromite 24:TiO₂ 6:Zircon 25:Siderite 7:TiO₂ 26:Chromite 8:Barite 27:Zircon 9:TiO₂ 28:Pyrite + 29:Zircon 10:Zircon 11:Zircon 30:Zircon 12:Apatite 31:TiO₂ + 13:Zircon Quartz 14:Zircon 32:TiO₂ + 15:Zircon 33:Chromite 16:Biotite 34:Pyrite 17:Apatite 35:Chromite 18:Chlorite 19:Chromite

Figure A9.46: Sable Island E-48 (2245.21 m) (SEM) site 14 (Table A9.1)



Figure A9.47: Sable Island E-48 (2245.21 m) (SEM) site 14.1 (Table A9.1). Similar to Figure 12.

1:Kaolinite + Muscovite 2:Fe-oxide/hydroxide + 3:Chlorite 4:Pyrite 5:Mix



Figure A9.48: Sable Island E-48 (2245.21 m) (SEM) site 14.2 (Table A9.1). Lithic clast made up of zircon (1) and quartz (2) - granite.



Figure A9.49: Sable Island E-48 (2245.21 m) (SEM) site 14.3 (Table A9.1). A lithic clast of TiO_2 (2,3,4) and quartz. (1,4).

1:Quartz 2:TiO₂ 3:TiO₂ 4:TiO₂ + Quartz



23:Quartz 24:Apatite 25:Zircon 26:Chromite 27:Pyrite 28:K-Feldspar + 29:Monazite 30:TiO₂ 31:TiO₂ 10:Tourmaline 32:Pyrite 33:Zircon 12:Tourmaline 34:TiO₂ + Chlorite 35:TiO₂ 36:Pyrite 37:TiO, + 38:Pyrite +

Figure A9.50: Sable Island E-48 (2245.21 m) (SEM) site 15 (Table A9.1)



Figure A9.51: Sable Island E-48 (2245.21 m) (SEM) site 15.1 (Table A9.1). A fragment of cement made up of siderite (3) and pyrite (1,2,4).



1:Xenotime 2:Quartz 3:Chlorite + 4:TiO₂ 5:Xenotime + 6:Mix 7:Xenotime +

Figure A9.52: Sable Island E-48 (2245.21 m) (SEM) site 15.2 (Table A9.1). A lithic clast made up of TiO_2 (4), quartz (2), chlorite (3) and later xenotime (1,5,7).



Figure A9.53: Sable Island E-48 (2245.21 m) (SEM) site 15.3 (Table A9.1). Cement made up of siderite (3,4,6), biotite (5) and later pyrite (2).



1:Zircon 23:Zircon 2:Pyrite 24:Quartz 3:Quartz 25:Zircon 4:Zircon 26:Zircon 27:Fe-5:TiO₂ + oxide/hydroxide 6:Quartz 28:Garnet 29:Siderite + 8:TiO₂ + 30:Zircon 9:Pyrite 31:Pyrite 10:Spinel 32:Zircon 11:Apatite + 33:Zircon 12:Chromite 34:Zircon 13:TiO₂ + 35:Quartz + Quartz 36:Pyrite 14:Zircon 37:Pyrite + 15:Zircon 16:Quartz 17:Zircon 18:K-Feldspar + TiO₂ 19:Quartz 20:Quartz 21:Spinel 22:Zircon

Figure A9.54: Sable Island E-48 (2245.21 m) (SEM) site 16 (Table A9.1)



Figure A9.55: Sable Island E-48 (2245.21 m) (SEM) site 16.1 (Table A9.1). Similar to Figure 17.

1:Quartz 2:Quartz + 3:Chlorite + $4:TiO_2$ + $5:TiO_2$ + Quartz 6:Quartz 7:Chlorite + Muscovite



1:TiO₂ 2:Quartz 3:Quartz + 4:TiO₂ + Quartz 5:Quartz + Kaolinite

Figure A9.56: Sable Island E-48 (2245.21 m) (SEM) site 16.2 (Table A9.1). Similar to Figure 45



22:Chlorite + 23:TiO₂ 24:Oligoclase r + 25:Garnet 26:Zircon 27:Barite 28:Al-phoshatesulfate 29:TiO₂ + ? 30:Apatite 31:TiO₂ + ar

Figure A9.57: Sable Island E-48 (2245.21 m) (SEM) site 17 (Table A9.1)



1:Chlorite + 2:Quartz + TiO_2 + 3:Chlorite +

Figure A9.58: Sable Island E-48 (2245.21 m) (SEM) site 17.1 (Table A9.1). Fine grained quartz and TiO_2 (2) with some chlorite (1,3).



1:TiO₂ + Quartz 2:TiO₂ + Quartz 3:Quartz + TiO₂ 4:TiO₂ + Quartz

Figure A9.59: Sable Island E-48 (2245.21 m) (SEM) site 17.2 (Table A9.1). TiO₂ (1,2,3,4) showing trellis texture with some quartz.



 $6:TiO_2 + Chlorite$

Figure A9.60: Sable Island E-48 (2245.21 m) (SEM) site 17.3 (Table A9.1). A fragment of diagenetic TiO₂.



21:Zircon 1:Zircon 22:Quartz 2:Chloritized 23:Pyrite Biotite 24:Zircon 3:Chromite 25:Zircon 4:Apatite 26:Barite 5:Barite 27:Tourmaline 6:Pyrite 28:Siderite + 7:Zircon 29:Barite 8:Zircon 30:Zircon 9:Zircon 10:Pyrite 31:Zircon 11:Garnet 32:Zircon 12:Quartz + TiO₂ 33:Biotite 34:Pyrite 13:Chromite 35:Barite 14:Monazite 36:Monazite 15:Quartz 37:TiO₂ 16:Barite 38:Quartz 17:Barite 39:Zircon 18:TiO₂ + 40:TiO₂ 19:TiO₂ 41:Apatite 20:Quartz +

Figure A9.61: Sable Island E-48 (2245.21 m) (SEM) site 18 (Table A9.1)



Figure A9.62: Sable Island E-48 (2245.21 m) (SEM) site 19 (Table A9.1)



Figure A9.63: Sable Island E-48 (2245.21 m) (SEM) site 19.1 (Table A9.1). TiO_2 showing trellis texture mixed with some chlorite.



Figure A9.64: Sable Island E-48 (2245.21 m) (SEM) site 20 (Table A9.1)



Figure A9.65: Sable Island E-48 (2245.21 m) (SEM) site 20.1 (Table A9.1). A grain of TiO_2 displaying fine grained and blebby textures.







Figure A9.67: Sable Island E-48 (2245.21 m) (SEM) site 20.3 (Table A9.1). Fe-oxide/hydroxide grain.

1:Fe-oxide/hydroxide 2:Fe-oxide/hydroxide 3:Fe-oxide/hydroxide 4:Fe-oxide/hydroxide



Figure A9.68: Sable Island E-48 (2245.21 m) (SEM) site 20.4 (Table A9.1). Lithic clast made up of quartz (3,4), chlorite (2), muscovite (5) and TiO_2 - ?schist.

Sample	Site	Position	Mineral	SiO2 TIO2	Al2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	S03	LL.	CI	90205 V205	Cr203	CoO	CuO	NiO	ZnO	As203	Y203	olo Z-O2	Ag2O	BaO	La203	Ce2O3	Nd2O3	Hf02	Gd2O3	Dy203	13205	Yb2O3 MoO3	WO3	B2O3	OsO2 Total	Actual Total
2245.21	1	1	Brt	20.88									24.49			_	-	-	-					60	12	45.39								_	-	30.12	100) 111
2245.21	1	3	Zrn	30.69																				69	.12												100) 83
2245.21	1	4	Zrn	30.72									07.40					0.0						69	.28								_		-		100	3 81
2245.21	1	5	Zrn	30.73									37.13					-0.24	4					69	.27	60.88											100	J 75 J 78
2245.21	1	7	Zrn	31.50																				68	.50												100) 78
2245.21	1	8	Zrn	31.14	0.80	1 22						31 31	3.58	.0.28										68	.86		15.76	20.99	8.44								100) 78
2245.21	1	10	Py	0.30	0.00	28.85						51.51	70.85	-0.20													13.70	30.00	0.44								100) 151
2245.21	1	11	Py			28.66							71.34				_	_								_							_				100) 150
2245.21	1	12	Py Pv			28.49							71.51																				_				100) 151
2245.21	1	14	"llm"	1.18 80.74	1.53	14.42	0.47																												1.65	i	100) 65
2245.21	1	15	Feohy	3.07 0.98	12.67	94.44		11 12					1.51			_	57.7	2																_			100) 51
2245.21	1	17	TiO ₂ +	1.41 96.13	1.19	1.26		11112									01.1	-																			100	0 66
2245.21	1	18	Chr		19.15	15.59	1.86	12.72									49.9	6			0.73			_													100) 70
2245.21	1	20	Spl		24.03	20.32		13.80									36.2	6																			100	0 74
2245.21	1	21	Grt	39.27	20.66	34.04	1.47	1.43	3.13																												100) 75
2245.21	1	22	Ap Tur	38.24 0.79	34.22	5 92		5 57	48.87	1 97		44.40		6.05	0.67		+	+	+	-		-		_	_								+	_		+	100	81
2245.21	1	24	Tur	38.27	31.96	10.38		3.78	0.30	2.61																											87	68
2245.21	1	25	TiO ₂	0.59 96.88		2.53							71.00	— T			+	+	+	-	\square	— T	-+				$\vdash \neg$				— T		+			+	100) 51
2245.21	1	20	Py	0.25	1.85	48.21				4.06	0.52		44.93		0.44																						100	0 54
2245.21	1	28	Chloritized Bt	36.55 1.88	20.91	33.31		5.62			1.73																										100) 60
2245.21	1	29	TiO ₂ +	1.06 97.45	0.55	0.93																		_										_			100) 69
2245.21	1	31	TiO ₂	99.43		0.57																															100) 72
2245.21	1	32	Spl	0.60	35.59	18.32		10.37									35.1	2																			100) 72
2245.21	1	33	"llm"	0.93 74.02	20.13	20.33		13.32								1.6	40.2	2																			100	0 62
2245.21	1	35	Grt	40.20	21.01	29.92	2.16	4.50	2.22																												100) 74
2245.21	1	36	Grt TiO ₂ +	39.97 0.47 12.03 85.91	20.68	27.39	0.79	3.92	6.78							_								_	_									_	-		100) 75
2245.21	1	38	TiO ₂	1.65 93.78	2.47	1.53			0.57																												100) 59
2245.21	1	39	Spl		31.99	20.64		11.82									35.5	4	_						_									_	_		100) 72
2245.21	1	40	Qz	99.57	24.95	0.43		11.25									38.1	<i>'</i>																			100) 74) 78
2245.21	1	42	Grt	40.61	20.98	23.44	1.86	5.96	7.14																												100) 73
2245.21	1	43	Qz "llm" +	2.31 70.78		25.23		1.67																													100) 78
2245.21	1	45	Grt	41.04	21.43	22.86	0.61	7.88	6.18																												100) 74
2245.21	1	46	TiO ₂	99.44		0.56											-							_											-		100) 70
2245.21	1	47	TiO ₂ + Qz	25.22 72.21	2.04	0.79					0.53																										100) 72) 73
2245.21	1	49	Grt	39.67	21.17	28.88	1.20	1.02	8.06								_	_								_							_				100) 76
2245.21	1	51	TiO ₂ +	8.19 88.79 98.62	1.38	1.64								-																				-	-		100	0 73
2245.21	1	52	"llm"	74.93		25.07																															100) 62
2245.21	1	53	Bt	35.66 4.96	14.32	14.90		15.75		0.61	6.31			3.48			33.0	2	-															_	-		96	73
2245.21	1	55	Grt	39.06	20.96	35.75	0.55	1.58	2.10								55.5	2																			100) 75
2245.21	1	56	TiO ₂	0.53 99.47		20.00																															100) 68
2245.21	1	58	Ap	79.92		20.08			48.52			44.56		6.55	0.37																						100	J 59 J 79
2245.21	1	59	TiO ₂ +	2.15 95.24	1.10	0.97			0.29		0.25																										100) 69
2245.21	1	60 61	TiO ₂ +	1.10 93.18	1.50	2.03			0.95			0.79		5.68	0.45									_	_									_	1.21		100) 58
2245.21	1	62	Bt	37.50 3.51	16.08	19.13	0.46	9.60	-10.10		9.72	-11.00		0.00																					1.12		96	56
2245.21	1	63	Py +		1.40	42.43				5.52	1.13		49.52				_		-					_	_								_	_			100) 67
2245.21	1	65	Spl	0.60	35.46	19.69		10.95		2.01			64.06				33.3	0																			100	0 108 0 71
2245.21	1	66	TiO ₂	0.67 99.33																				_	_												100) 71
2245.21 2245.21	1.1	67	Grt Chl + Bt	39.92 0.37 39.48 0.57	20.70	27.17 28.00	0.84	4.04 9.93	6.96	1.01	1.11						+	+	+			\vdash				1									1	+	100) 75 0 110
2245.21	1.1	2	Mix	29.20 0.73	17.10	27.49		2.36		2.19	2.14		16.34	2.45																							100) 79
2245.21	1.1	3	Qz "Ilm"	100.00		17 77											-	-	+																-	-	100) 151
2245.21	1.1	4	TiO ₂	98.80		1.20																				1											100) 123
2245.21	1.1	6	Ms	49.00 1.14	25.13	5.42		2.34		0.67	8.41		-	2.90																							95	136
2245.21	1.2	1	Py +	1.63 1.06	1.58	28.52			0.30	0.55			70.93 42.34		0.30		+	+		-					-	1								-	6.23	3	100	y <u>∠83</u> 0 163
2245.21	1.2	3	Chl + Bt	35.96 2.52	19.71	34.32		5.14		0.60	1.75						1																			1	100) 118
2245.21	1.3	1	Chl + Bt	38.66 1.55	26.10	27.55		3.96		0.73	1.45						+	+		-		\vdash				+							-			-	100) 74
6670.6	- L-O		Ser.	0.37												_	-							_									_				100	

Sample	Site	101100	Mineral	SiO2	Ti02	AI2O3	FeO	OuM	MgO	CaO	Na2O	K20	P205	S03	ш	a	Sc203	V205	Cr203	CoO	cuo	NiO	ZnO	As203	Y 203	SrO	ZrO2	Ag2O	BaO	La203	Ce203	Nd2O3	HfO2	Gd2O3	Dy203	Ta205	Yb203	MoO3	WO3	B203	0s02	Total	Actual
2245.21	1.3	3 DD TiO ₂ +		1.14	97.34	0.48	1.04																																		1	100	130
2245.21 2245.21	1.4	2 Bt		36.96	4.49	17.94	18.67		15.30		0.58	3.54			3.06																										-	96	135
2245.21	2	1 Brt												37.41						-0.18									62.78												1	100	71
2245.21 2245.21	2	2 Tur 3 "Ilm"		37.99	0.51	32.09	23.49		5.47		2.35																													-	- 1	87	56
2245.21	2	4 Chr				13.53	28.41		8.05										50.01																						1	100	69
2245.21 2245.21	2	5 llm 6 Pv +			52.84	0.99	44.42	0.72	2.02		2.92	0.29		51.93		0.36																									- 1	100	68 75
2245.21	2	7 Bt		34.44	4.83	11.55	10.10		12.80	1.77	0.91	7.21	3.06		9.33																											96	72
2245.21	2	8 Brt 9 Sd +		1.13		0.88	85.62	1 24		0.67	1.05			36.20						0.08									61.55										7.91			100	76 58
2245.21	2	0 Mix		58.47	2.02	25.37	8.18	1.2.4	0.97	0.01	0.92	0.89		3.18																									7.01		1	100	68
2245.21	2 .	1 TiO ₂ +		8.83	82.97	5.36	1.47					1.37																														100	73
2245.21	2 .	3 Chr			90.90	7.72	24.28		8.29										59.71																						1	100	72
2245.21	2	4 Brt		0.81	0.07	00.50	00.04	0.40	4.00	4.50				34.98						-0.19									64.41												1	100	74
2245.21	2	6 Spl		40.37	0.37	32.60	29.64	0.49	4.02	4.59									30.89																					-		100	70
2245.21	2 .	7 Py					28.72							71.28																											1	100	146
2245.21	2 .	8 Zrn 9 Tur		31.01	1 18	30.49	4 76		7 04	0.53	2 42				3.95												68.99											-				100 87	79
2245.21	2 1	0 Ap		- 5.00	1.10					48.07			44.20		6.58																								1.15			100	81
2245.21	2 2	1 Chr		09.44		21.55	13.44		13.28										51.73																			_				100	71
2245.21	2 2	3 Zrn		30.76		1.11	0.45																				69.24															100	79
2245.21	2 2	4 Kfs		70.36	74.20	15.80	0.77					13.83																													1	100	74
2245.21	2 2	6 Grt		24.93	74.30	20.45	29.35	1.11	2.79	6.40																															1	100	71
2245.21	2 2	7 Tur		37.50	0.78	32.13	5.38		6.46	0.67	1.93				2.14																											87	65
2245.21	2 2	8 Tur 9 Zrn		37.89	0.77	33.69	7.38		5.11		2.17																68.84											-			-	87	62 76
2245.21	2 3	0 TiO ₂ +			89.92	0.55	7.39												0.59																				1.55		1	100	58
2245.21	2 3	1 TiO ₂		0.70	97.23	0.87	1.20								6 80												40.13											-				100	68
2245.21	2 3	3 Py		0.49	1.29	1.21	36.89							62.61	0.09												40.13														1	100	118
2245.21	2 3	4 Py		0.47		0.45	28.45				0.05			71.07		0.74																							44.05		1	100	140
2245.21	2 3	5 Py + 6 Grt		39.20		2.15	35.45		3.29	1.36	3.25			25.93		0.74													-										14.05	-	- 1	100	75
2245.21	2 3	7 Hole			2.39	3.82	64.12																																29.68		1	100	10
2245.21 2245.21	2 3	8 Grt 1 ?Feohv +		39.95 1.92	0.66	20.99	31.50 84.60	0.94	4.01	3.54																													11.46		- 1	100	74 103
2245.21	2.1	2 ?Feohy +		15.86		4.46	57.16		0.55	0.60	0.91	0.89																											19.58		1	100	111
2245.21	3	1 Brt 2 Zrn		29.67	1.85	1.05				0.47				37.69			0.93			0.06							66.03		62.26													100	67
2245.21	3	3 Tur		44.20	1.00	32.74	1.35			0.41	0.92			1.58	6.21		0.00										00.00															87	59
2245.21	3	4 Zrn		31.10										26 72						0.07							68.90		62.25												1	100	72
2245.21	3	6 Py					28.45							71.55						-0.07									03.30												1	100	137
2245.21	3	7 Zrn		30.74																							69.26														1	100	75
2245.21	3	9 Zrn		27.46		1.64				1.37					3.07		1.71										64.75															100	56
2245.21	3 .	0 Zrn		30.70																							69.30														1	100	75
2245.21 2245.21	3 .	1 Py 2 Py			0.29		28.77				0.29			/1.23 69.55																											-+1	100	144
2245.21	3	3 Brt												24.63						-0.12									44.39											31.10	1	100	110
2245.21	3 .	4 Zrn 5 Pv		31.36	0.41		29.30							70.28													68.64		_											_	-+!	100	77
2245.21	3 .	6 Py			0.41		45.11				0.56			53.53		0.80																									1	100	87
2245.21	3 .	7 Spl 8 TiO			97.66	46.94	15.65	-	18.22										19.19																			_				100	67
2245.21	3 .	9 Tur		37.40	0.97	31.83	9.76		4.38	0.65	2.02																															87	61
2245.21	3 2	0 Qz		100.00		04.00	00.00	0.00	0.77	5.00																															1	100	74
2245.21	3 2	2 Tur		39.84		30.78	6.79	0.82	7.66	1.32	1.90																															87	64
2245.21	3 2	3 Hole		4.35	1.36	5.46	48.64				2.07	0.64		1.78	4.03																								31.67		1	100	28
2245.21 2245.21	3 2	4 Chr 5 Qz +		85.61	13.83	15.78	0.56	1.97	11./3										o3.80				0.97															-				100	59 59
2245.21	3 2	6 Chl		25.67		20.71	29.42	0.61	8.59																																	85	60
2245.21	3 2	/ Qz 8 TiO ₂ +		99.63	0.37	7.51	0.84		-						3.09														_												-+!	100	75 57
2245.21	3 2	9 Zrn		30.73	. 5.00		2.04								2.00												69.27															100	73
2245.21	3 3	0 TiO ₂		<u>41 77</u>	100.00	21 40	20 6F	0.44	0.70	5.02																																100	68
2245.21	4	1 Qz		99.02	0.54	21.48	20.00	0.44	0.12	0.44																															1	100	70
2245.21	4	2 Zrn		31.14			0.01	0.42		0.00																	68.86	\vdash	- 1									_			<u> </u>	100	70
2245.21	4	4 ?llm		8.58	83.26	4.22	3.25	0.48		0.90		0.68															07.51															100	51

ample	Site	osition	ineral	sio2	TIO2	1203	FeO	MnO	OgM	CaO	Va2O	K20	205	so3	L.	ō	62O3	/205	51203	CoO	cuo	NiO	ZnO	s203	/203	SrO	zr02	\g2O	BaO	a203	ie203	ld2O3	H02	d2O3	y203	a205	b203	AoO3	NO3	3203	0s02	Total	Votuai Total
0		ď.	2			1		_	_		~		-				0)	-	0					٩	Ĺ			<u> </u>		-	0	z	-	0	6	F	>	~	-				
2245.21	4	5	Py Mix	45.10		18.89	28.59		1.33		2.56	1.49		11.93																											1	100	56
2245.21	4	7	Py	20.67			28.65							71.35													60.22														1	100	135
2245.21	4	9	Qz	100.00																							69.33														1	100	73
2245.21	4	10	Qz	100.00			10.00																																		1	100	74
2245.21	4	11	Chr Tur	37.56	0.63	32.57	19.90		4.56	0.62	1.99								50.61																						- 1	100 87	66
2245.21	4	13	Brt											39.51						-0.06									60.55												1	100	66
2245.21	4	14	Chr TiO ₂ + Pv	3.68	0.90	2.67	35.02	3.29	4.53					14.49		-		-	40.79		_		0.84																			100	64 43
2245.21	4	16	Qz	100.00																																					1	100	74
2245.21	4	17	Py		0.42	11 27	28.42		0.16					71.17		-			62.00																							100	137
2245.21	4	19	Zm	31.02		11.37	17.59		0.10										03.09								68.98														1	100	70
2245.21	4	20	Zrn	30.91																							69.09														1	100	70
2245.21	4	21	Ap Qz	100.00			0.55			46.76			44.10	1.12	5.12	0.63		-			-					1.73															1	100	72
2245.21	4	23	TiO ₂		100.00																																				1	100	66
2245.21	4	24	Sd + Py Zro	30.99	0.70	0.93	76.36							10.11		2.96											69.01												8.94		1	100	50
2245.21	4	26	TiO ₂	0.99	94.75	1.46	2.80																				03.01														1	100	65
2245.21	4	27	Sd +	4.65	0.66	0.99	81.69	0.62	0.82					1.85	T		T		0.76								60.00	-					— T				T		7.95			100	50
2245.21	4	<u>∠8</u> 29	Zm	30.90																							69.10														1	100	77
2245.21	4	30	Py				28.02							71.98		0.01		-	_				_												_						1	100	138
2245.21	4.1	31	Py + TiO ₂ +	0.80	0.39	2.21	2.80					0.39		49.14		0.63	-	-			-																		2.96			100	85
2245.21	4.1	2	TiO ₂ +	4.90	86.36	3.01	2.14					0.31			3.27																										1	100	105
2245.21	4.1	3	TiO ₂ +	4.06	88.85	1.71	2.85		2.40		0.04	0.34			2.19	_		_			0.72																	1.45			1	100	116
2245.21	4.2	2	Py +	51.15	0.53	0.32	32.71		3.40	0.30	1.35	0.01		61.08	4.02						0.72																	1.45	3.72		1	100 :	224
2245.21	4.2	3	Sd + Py +	1.45	0.61	0.77	78.45		0.50		0.70			7.19		3.05																							7.79		1	100	96
2245.21	4.2	4	Chi + Feohy +	28.55	0.81	21.89	35.92		3.53	0.71	1.62	0.46		2.55	5.78	3.77	-	-			-																		7.89		1	100	91
2245.21	4.2	6	Feohy +	3.44	0.79	3.40	67.25				0.92			2.13		2.69																							19.38		1	100	97
2245.21	5	1	Zrn	31.34		21.40	20.28	0.53	1.60	6.03																	68.66														1	100	68
2245.21	5	3	Chr	33.03		18.00	17.38	0.00	12.02	0.03									52.61																						1	100	62
2245.21	5	4	Tur	37.98	0.67	29.22	9.02		6.87	1.11	2.13								50.40																							87	58
2245.21	5	5 6	Zrn	30.27		16.45	20.99		10.40						1.55				52.16								68.18														1	100	73
2245.21	5	7	TiO ₂ +	1.67	87.65	2.92	2.26			0.73			1.01	1.07	2.69												15.00														1	100	56
2245.21	5	8	Zrn Chr	36.73	0.69	8.10	2.08		9.50	0.74		2.95			2.46		0.97		58.88								45.28														1	100	48
2245.21	5	10	Qz + TiO ₂	56.59	39.63	2.62	0.58					0.58																													1	100	71
2245.21	5	11	Zrn Brt	30.93										24.48		_		-		0.08							69.07		45.67											29.77		100	74
2245.21	5	13	Tur	38.09	0.38	30.16	6.21		8.88	0.89	2.38			24.40						0.00									45.07											23.11		87	61
2245.21	5	14	Zrn	31.10		0.70	0.00										0.50										68.90														1	100	73
2245.21	5	15 16	∠rn ?llm or Mix	31.62	88.81	1.15	5.69									-	0.56	-			-						66.43												2.79		1	100	52
2245.21	5	17	?llm or Mix	2.12	93.35	1.70	2.83									_																									1	100	51
2245.21	5	18 19	Zrn Ap	30.88						47.15			44.30		6.48	-		-								2.07	69.12															100	73
2245.21	5	20	TiO ₂	0.73	97.38	0.68	1.21								2																										1	100	62
2245.21	5	21	Zrn	30.85						47.66			44.60		7 41	0.33											69.15														1	100	70
2245.21	5	23	Zrn	31.21						-17.00					1.001	2.00											68.79														1	100	71
2245.21	5	24	Qz	100.00	0.50	0.22	20.07				0.45			66.00	T													-					- T				T		1.05			100	70
2245.21	5	25	Py + Brt	0.39	0.52	0.33	30.97				0.45			24.06						-0.03	-								44.68										1.05	31.29	1	100	104
2245.21	5	27	Zrn	31.18	_	00.5		1.0-	1.0-	0.0-																	68.82														1	100	74
2245.21	5	28	Grt Tur	38.77	0.83	20.53	33.85	4.26	1.62	0.98	2 12				1.89	-	-	-			-																					100 87	67
2245.21	5	30	Py	27.70	5.00	52.00	28.68			5.40	2			71.32																											1	100	139
2245.21	5	31	Zrn	30.45		0.59											0.88										68.08]				100	68
2245.21	5	33	?llm or Mix	7.23	78.81	5.09	7.21		1.66																		00.75														1	100	38
2245.21	5	34	?llm or Mix	10.65	75.25	7.63	1.05					1.69			3.73						\neg																				1	100	56
2245.21	5.1 5.1	1	IIO ₂ Ms	47.03	99.49 0.84	33.78	0.51		0.62		1.34	8.38			1.63	-																									+	95	132
2245.21	5.1	3	TiO ₂ +	2.75	92.17	1.53	3.17		0.37																																1	100	116
2245.21	5.1	4	TIO ₂	1.15	97.90	0.68	0.62					0.27				_		_																								100	132
2245.21	5.1	6	Ms	48.35	1.74	30.14	2.20		1.49		0.85	8.01			2.22																											95	138
2245.21	5.1	7	"llm" +	1.53	88.46	1.52	5.73											\neg																					2.76		1	100	108
2240.21	1 0.1	1 0	HU ₂ T	1.00	90.94	1.19	1.21	1	1	1	1	1	1													1	1	1													1	100	119

Sample	Site	Mineral	sio2	TiO2	AI2O3	FeO	MnO	CaO	Na2O	K20	P205	SO3	L	CI	Sc2O3	V205	Cr203	coO	cuo	NO	ZnO	As203	Y203	SrO	ZrO2	Ag2O	BaO	La203	Ce203	Nd2O3	HfO2	Gd2O3	Dy203	Ta205	Yb203	MoO3 WO3	B203	0s02	Total Actual Total
2245.21	5.2	1 "llm" + 2 "llm" +	6.63	82.38	3.90	6.19 8.71	0.90																												-		+		100 79
2245.21	5.2	3 Ms	52.03	1.59	23.93	5.93	2.07			9.45																													95 133
2245.21	5.2	4 TiO ₂ +	1.64	93.32	1.06	1.84							2.14																								+		100 102
2245.21	5.2	1 TiO ₂	0.55	98.71	0.70	1.33																															+		100 129
2245.21	5.3	2 TiO ₂ +	0.76	97.11	0.75	1.37																																	100 128
2245.21	5.4	1 Qz	100.00	80.20																												_			_		+		100 148
2245.21	5.4	3 Qz	99.31	0.69																																			100 148
2245.21	5.4	4 Chl + Ms	44.36	1.11	26.90	20.55	4.72		0.52	1.84																											1		100 104
2245.21	5.4	5 Chl + Ms 6 Chl + Ms	51.56	0.71	25.56	24.69	3.60		0.49	3.25		2.22	4.70																			-		-	-		+		100 119
2245.21	6	1 Py	40.01	1.54	23.30	28.71	5.00		0.32	1.17		71.29																											100 149
2245.21	6	2 Py				28.47						71.53																									—		100 144
2245.21	6	3 110 ₂ 4 07	100.00	99.48		0.52																										-		-					100 68
2245.21	6	5 TiO ₂ +	1.56	98.44																																			100 70
2245.21	6	6 Py	00.05			28.84						71.16													00.05												+		100 148
2245.21	6	7 Zm 8 Qz	100.00																						69.05												+		100 78
2245.21	6	9 Qz	100.00																																				100 78
2245.21	6	10 Grt	39.87		21.41	29.53	3.53	5.66																	69.90										-+		+	+	100 74
2245.21	6	12 Py + Qz	41.23		1.19	30.32			1.87	0.59		24.80													00.00												\pm		100 24
2245.21	6	13 Py				28.67						71.33																									<u> </u>	-	100 152
2245.21	6	14 Siderite + Contaminant	30.70		20.81	31.36	0.56 2.27	5.22	0.93																							-			-	41.2	<u>s</u>		100 61
2245.21	6	16 Chr	00.10		10.47	14.10	2.51 11.19	U.LL									60.72				1.00																		100 73
2245.21	6	17 Zrn	30.99																						69.01												+		100 81
2245.21	6	18 Zm 19 Zm	30.72																						69.28									-	-		-		100 81
2245.21	6 2	20 Zrn	30.71																						67.51						1.78								100 83
2245.21	6 2	21 Zrn	29.42		0.63			0.60							0.80										68.54										_		—		100 71
2245.21	6 2	22 Zm 23 Tur	30.95	1.09	32.25	6.18	5.78	0.63	1.78				2.03												69.05							_			-		-		100 80 87 68
2245.21	6 2	24 ?Feohy +	2.00	0.77	1.64	69.76					0.88	1.42	2.00	1.51																						22.0	3		100 54
2245.21	6 2	25 Tur	36.91	0.99	31.69	6.63	5.88	0.89	1.75				2.27												00.00										_		+		87 69
2245.21	6 3	26 Zm 27 Brt	30.80									24 47						0.05		-	-				69.20		46.28										29.15		100 82
2245.21	6 2	28 Tur	37.81	1.27	30.15	7.88	6.79	1.51	1.59																														87 68
2245.21	6 2	29 Qz	98.52	0.76		0.72						71.01																							_		+		100 83
2245.21	6 3	31 Chr			21.19	28.80	9.58					/1.21					40.43																				-		100 70
2245.21	6 3	32 Py				28.62						71.38																									1		100 147
2245.21	6	33 Py 34 Chr		0.56	22.81	28.44	12.21					71.56					46.55																				+		100 146
2245.21	6 3	35 Zrn	29.06	0.62	1.13	0.61	12.01	0.99							1.20		40.00								66.38														100 72
2245.21	6 3	36 Py				29.06						70.94																									1		100 144
2245.21	6 3	37 110 ₂ 38 110 ₂	1.82	96.25	0.65	0.82	0.46																									-		-	-		+		100 65
2245.21	6 3	39 Spl		0.71	40.06	16.03	13.16										30.05																						100 73
2245.21	6.1	1 TiO ₂ +	0.64	96.62	1.25	0.74			0.07	4.00	0.74		0.52													\vdash						_		_			+-	<u> </u>	100 129
2245.21	6.1	3 TiO ₂	0.45	4.55	20.78	0.55	3.17		0.65	1.80			2.52																								+	1	100 132
2245.21	6.2	1 TiO ₂		99.59		0.41																															1		100 133
2245.21	6.2	2 TIO ₂	0.76	98.72		0.52																				\vdash						_					+	-	100 133
2245.21	6.2	4 TiO ₂	00.71	99.56		0.44																															1		100 133
2245.21	6.3	1 ?	36.74	3.80	14.26	0.71	18.06	1.69	0.81	0.46			10.20		_																				1		+		100 117
2245.21	6.3	2 TiO ₂	0.69	98.33	1 14	0.74		0.24																								_	-		-		+		100 130
2245.21	6.4	1 TiO ₂	07.21	100.00	1.14	0.45																																	100 133
2245.21	6.4	2 Brt	00.04	64.60	0.05	0.48				0.04		35.08						0.02									64.43								_		+		100 225
2245.21	7	2 TiO ₂ + Q2	23.04	100.00	0.95	2.02				2.01																											-		100 63
2245.21	7	3 Chr		0.51	15.44	27.10	8.65										48.29																						100 69
2245.21	7	4 Zrn 5 Oz	30.84			0.42																			69.16	\vdash								_	_		+	-	100 81 100 79
2245.21	7	6 TiO ₂	39.08	99.21		0.42																															+		100 72
2245.21	7	7 TiO ₂ + Chl	11.11	67.49	8.16	11.11	2.14																														1		100 46
2245.21	7	8 Tur 9 Zrn	37.51	1.38	27.86	9.02	7.50	2.19	1.54										\vdash						60.10	\vdash									+		+	-	87 68
2245.21	7	10 Py	50.30			28.71						71.29													33.10												1		100 150
2245.21	7	11 Py		0.29		28.67						71.04																									+		100 150
2245.21	7	12 Zm 13 Pv +	30.88 0.28	0.20		33 41		-				66.02													69.12	\vdash							+	-+	+		+	+	100 79
2245.21	7 .	14 Pv	0.20	0.23		29.56						70.44																									1		100 142

Sample	Site	Position	Mineral	si02	Ti02	AI2O3	FeO	MnO	OgM	CaO	Na2O	К2О	P205	so3	L	ō	Sc2O3	V205	Cr203	coO	cuO	0 N	Ouz	As203	Y203	sro	ZrO2	Ag2O	BaO	La2O3	Ce203	Nd2O3	HfO2	Gd2O3	Dy203	Ta205	Yb2O3	MoO3	WO3	B203	0s02	Total	Actual
2245.21	7	15	Qz Sd +	99.60 3.28		1.77	0.40	1.05	11.25	6.10																													3.82			100	80 43
2245.21	7	17	Chr			7.36	14.94	3.67	8.86										62.65				2.52																			100	70
2245.21	7	18	Ab Tur	50.15 38.18		39.18	0.71		7.68	1 10	8.01	0.56			1.40																										1	100 87	72 64
2245.21	7	20	TiO ₂	30.10	100.00	32.00	0.20		7.00	1.10	1.05																														-	100	70
2245.21	7	21	Zrn	30.58			- 10																				67.70						1.71								1	100	81
2245.21 2245.21	7	22	TiO ₂	0.68	0.81	0.65	5.43		7.70	1.15	2.11				1.80			-			-																					87	66
2245.21	7	24	Spl		0.63	42.76	16.19		15.10										25.31																							100	68
2245.21	7	25	Zrn Dz	31.22																							68.78														1	100	77
2245.21	7	27	Grt	40.06		21.03	28.83		2.99	7.10																															-	100	72
2245.21	7	28	TiO ₂	1.22	92.27	1.17	3.49																																1.84		1	100	63
2245.21	7	30	Py + Oz	100.00	0.38	0.49	33.01				0.68			63.10						-																			2.34			100	76
2245.21	7	31	TiO ₂ + Qz	33.53	66.47																																					100	74
2245.21	71	32	Tur TiO- +	38.65	1.30	29.15	6.43		8.33	1.16	1.99	1.62																													-	87 100	62 109
2245.21	7.1	2	TiO ₂ +	44.60	48.93	2.81	2.82		0.44			0.41																														100	110
2245.21	7.1	3	TiO ₂ +	29.65	62.56	4.15	1.87					1.77																													1	100	126
2245.21	7.2	2	42 T Py +	10.84	0.80	4.28	27.31		0.37			0.26		55.74																											-	100	208
2245.21	7.2	3	"llm" + Chl	10.53	69.40	7.82	9.77		2.00			0.48			0.00																										_	100	86
2245.21 2245.21	7.3	2	TIO ₂ +	3.33	87.00	2.07	4.40						0.64		3.20										-										+	-	$\left \right $		1.65			100	96 122
2245.21	7.4	1	Zrn	31.04	22.50		0.00																				68.96															100	147
2245.21	7.4	2	Qz	100.00	100.00																																					100	147
2245.21	7.4	4	Mnz	1.92	5.55					1.37			31.69	0.95	2.49													1.62		13.43	29.61	11.38									-	100	124
2245.21	7.4	5	Qz	97.48	2.52																																				1	100	149
2245.21	8	2	Zrn Zrn	30.48																	-						69.52															100	72
2245.21	8	3	Zrn	30.73																							69.27															100	72
2245.21	8	4	TiO ₂ + Chl	1.22	95.05	0.96	2.77		2.50																																1	100	35
2245.21	8	6	TiO ₂	20.93	100.00	22.04	20.00		3.30																																-	100	66
2245.21	8	7	Zrn	30.20							1.00																68.05						1.75									100	79
2245.21	8	8	Py Zrn	31.10		0.49	32.53				1.98			65.01													68.90												-			100	75
2245.21	8	10	Chr		2.33	24.72	30.52		9.10										33.33																							100	68
2245.21	8	11	TiO ₂ Tur	38.73	100.00	31.60	6.72		6.48	0.47	1.93																														1	100 87	70 63
2245.21	8	13	Py				6.94							51.24									41.82																			100	125
2245.21	8	14	Brt	100.00										24.88						0.10	_								46.05											28.97	1	100	108
2245.21	8	16	ur	37.59	0.82	32.41	6.50		6.66	1.25	1.77																															87	66
2245.21	8	17	Grt	40.07		20.51	23.67	5.33	3.53	6.89																																100	74
2245.21	8	18	Zrn Brt	31.23										22.50	-	_		-		0.23	-						66.67		43.92				2.10							33.36		100	106
2245.21	8	20	Zrn	30.85																							69.15															100	78
2245.21	8	21	Tur Dz	37.84	0.86	33.15	3.58		7.32	0.57	1.64				2.04			-			-																				-+	87	66
2245.21	8	23	TiO ₂	100.00	91.64		8.36																																			100	68
2245.21	8	24	Zrn	30.86		12 29	13 73		8.00										63.07				0.02				69.14								<u> </u>	-						100	76
2245.21	8	26	Grt	40.12		21.20	26.65	1.90	4.85	5.28									03.97				0.95																			100	73
2245.21	8	27	TiO ₂ +	0.64	95.29	1.32	1.31			0.57			0.87																												4	100	61
2245.21	8	28	Py Zrn	31.16			28.47							/1.53							-						68.84															100	73
2245.21	8	30	Zrn	30.90			0.53																				68.56															100	73
2245.21	8	31	Py	10.12	0.70	15 50	28.54		2 72		0.75	0.24		71.46		0.77					_																		4.02		1	100	138
2245.21	8	33	Brt	19.13	0.79	10.08	0.64		2.12		0.75	0.34		37.35		J.17				-0.06									62.06										4.03		-	100	72
2245.21	8	34	Zrn	30.81	1.00	04.15	0.11		4.55		0.71	4		0.04				-									69.19															100	77
2245.21 2245.21	8	35	viix Zrn	31.34	1.53	21.17	8.16		1.55		0.79	1./1		2.26				-									68.66								1							100	55 74
2245.21	8	37	Zrn	30.87																							69.13															100	74
2245.21	8	38	Py + Pv	2.08		1.93	38.22				3.18	0.67		53.92 39.15		0.34								1.71											-					_		100	79 47
2245.21	8.1	1	Brt	0.00		0.00					0.00			35.90		5.54				-0.03						1.74			62.39													100	177
2245.21	8.1	2	Sd				34.62	4.79	15.44	0.44								T		T			T					-]	1.15						<u> </u>	\vdash	ΗŢ		T	T	F	56	75
2245.21	8.1	1	Zrn	30.81			40.20	1.38	2.98	0.44																	69.19														-	100	71
2245.21	9	2	Brt	a		A								37.29						-0.16									62.87													100	68
2245.21	9	3	∠rn 7rn	29.61		0.55				0.73							1.35	-									69.11 68.21								+	-				-		100	62 62
2245.21	9	5	Zrn	30.79						0.04							1.00										69.21															100	71

ample	Site	osition	Aineral	SiO2	TiO2	4I2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	S03	Ŀ	ō	3c2O3	V205	5/203	coO	cuo	NiO	ZnO	4s203	Y 203	SrO	ZrO2	Ag2O	BaO	.a203	ce203	44203	HfO2	3d2O3	0y2O3	fa205	′b2O3	MoO3	W03	B2O3	0s02	Total	Actual
2245.2		L.	∠ Pd			`					_			24.40					Ŭ	0.01				`				-	47.51	-	-	~				-	_	-		28.00		100	01
2245.2	9	7	Py				34.22				0.71			65.07						-0.01									47.51											28.00	-	100	99
2245.2	9	8	TiO ₂	04.50	97.80		2.20																				00.40														1	100	41
2245.2	9	10	Zrn Zrn	31.58																							68.42															100	73
2245.2	9	11	Zrn	31.33																							68.67															100	73
2245.2	9	12	Brt	2.64		0.92	0.68				0.77			33.73	3.49					0.02							69 70		57.75												1	100	60
2245.2	9	14	Qz	100.00												_											00.72				-											100	74
2245.2	9	15	Zrn	30.86			0.50																				68.65															100	75
2245.2	9	16	Feohy "Ilm"	2.44	76.60		91.52 23.40							5.52		-			0.52										-													100	48
2245.2	9	18	Zrn	30.71																							69.29															100	75
2245.2	9	19	Zrn	30.99																							69.01															100	73
2245.2	9	20	Zm	31.16																							68.84															100	73
2245.2	9	22	Qz	99.47	0.53																																				1	100	75
2245.2	9	23	QZ Pv	0.98		0.68	32.55							62.41		_								1.33															2.05			100	114
2245.2	9	25	Zrn	31.42																							68.58															100	75
2245.2	9	26	Zrn "Ilm"	30.79	74 35		25.65																				69.21															100	74
2245.2	9	28	Py		74.33	0.33	32.79				1.41			65.47																												100	102
2245.2	9	29	Zrn	31.39			0.57																				68.04			$-\top$											$-\mp$	100	72
2245.2	9	30	∠m Tur	31.27	0.96	32,91	6.00		6.17	0.25	2.23					-											68.73															87	61
2245.2	9	32	TiO ₂		99.45		0.55				2.20																															100	65
2245.2	9	33	Py Brt				28.93							71.07						0.15									63.08													100	133
2245.2	9	35	Tur	40.11	1.26	27.28	9.76		5.32	1.86	1.40			33.07						0.15									03.30													87	58
2245.2	9	36	TiO ₂		99.44	04.00	0.56		40.05										40.00																						1	100	63
2245.2	9	37	Zrn	31.13		21.32	24.21		10.85										43.62								68.87														-	100	70
2245.2	9	39	Brt											36.37						-0.01									63.64													100	67
2245.2	9	40	Zrn	30.54		17 21	24.01		10.09										49.69								69.46														1	100	71
2245.2	9	42	TiO ₂	1.95	90.51	0.63	1.65		10.03						5.25				40.00																							100	57
2245.2	9	43	Py + Chl	14.08	0.65	8.50	34.06		1.15			0.51		32.63																									8.41		1	100	57
2245.2	9	44	Qz + Tur	96.27 38.09	0.82	33.47	5.72		6.38	0.50	2.02			2.37		-																								-		87	60
2245.2	10	1	Py				29.71							70.29																												100	117
2245.2	10	2	Zrn Brt	30.91										36.55						0.14							69.09		63.31	-												100	68 65
2245.2	10	4	Zrn	31.09																							68.91														-	100	66
2245.2	10	5	Mnz		66.28		0.02						12.96		1.26																13.00	6.50									1	100	55
2245.2	10	7	Zrn	30.83	99.07		0.93									_											69.17				-											100	71
2245.2	10	8	Zrn	30.94																							69.06														1	100	70
2245.2	10	9	Zrn Zrn	31.49							0.63				2.39												68.51 66.47														- 1	100	70 67
2245.2	10	11	Zrn	30.96							0.00																69.04															100	69
2245.2	10	12	Py		1 27	26.17	28.76		0.22					71.24					22.14																							100	133
2245.2	10	14	TiO ₂ +	3.70	86.27	3.27	3.47		9.23	0.69			1.53	1.07					33.14																						-	100	39
2245.2	10	15	Ap +	2.46		2.11	3.78		0.83	43.63			40.62		6.58												00.00														1	100	72
2245.2	10	16	Zm TiO ₂ +	31.31	84.83	0.69	11.23		2.38																		68.69			-										-		100	47
2245.2	10	18	Py				28.71							71.29																												100	137
2245.2	10	19	Py Tur	38.62	0.45	33.86	28.98		5.53		1.82			71.02																												100 87	138 61
2245.2	10	21	Py +	4.81	0.43	3.99	37.16		0.00		4.16			48.28										1.16																		100	64
2245.2	10	22	Chr	20.00	0.60	27.19	34.40		8.17									0.51	29.12								00.07														1	100	66
2245.2	10	23	Py	30.93			28.42							71.58		-											09.07															100	131
2245.2	10	25	Zrn	32.39			0.62			0.71																	66.28															100	58
2245.2	10	26	110 ₂ + Zrn	8.39 30.64	83.62	3.58	2.31		1.43			0.67															69.36															100	58
2245.2	10	28	Qz	100.00																							00.00															100	69
2245.2	10	29	Zrn	34.27	6 27	14.00	15.00		13.74			0.50			200												65.73												_			100	68
2245.2	10	30	Py	38.52	0.37	14.22	28.97		13.71			ສ.ວປ		70.72	∠.05																											100	145
2245.2	11	2	Py				28.79							71.21			1.0-																									100	144
2245.2	11	3	Zrn TiO ₂ +	29.57	0.57	0.83	4.00			0.78						-+	1.25										66.99							\vdash					1.64			100	66 46
2245.2	11	5	Zrn	30.41	52.50	5.57	0.70																				68.89															100	78
2245.2 2245.2	11	6	Ap	1.50	85.42	1 70	6.09			49.59			44.97	0.07	5.44																								4 17			100	78
2245.2	11	8	Spl	1.59	00.40	30.47	14.79		14.23					0.37					40.51																				9.17			100	71

Sample Site Position Mineral	Si02	TiO2	AI2O3	FeO	OnM MgO	CaO	Na2O	K20	P205	SO3	Ŀ	ō	Sc2O3	V205	Cr2O3	coO	CuO	NO	ZnO	As203	Y 203	SrO	ZrO2	Ag2O	BaO	La203	Ce2O3	Nd2O3	HfO2	Gd2O3	Dy203 Ta205	Yb2O3	MoO3	WO3	B203	0s02	Actual Total
2245.21 11 9 Py 2245.21 11 10 TiO ₂ + Qz	39.34	45.86	8.25	28.76	1.2	20				71.24	2.83																									1	00 150 00 42
2245.21 11 11 Py				28.81						71.19																										1	00 147
2245.21 11 12 Zrn 2245.21 11 13 Pv	30.87			28.78						71.22													69.13													1	00 150
2245.21 11 14 Zrn	29.38		0.86			0.66	6						0.54	1									66.79						1.77							1	00 74
2245.21 11 15 TiO ₂ +	7.39	86.37	1.47	28.57						71.43	3.17																									1	00 155
2245.21 11 17 Zrn	30.72			20.01						11.40													69.28													1	00 82
2245.21 11 18 Brt	0.92	2.21	17.44	0.68		_		12.02		23.55	2.95					-0.09									48.91								-		26.03	1	00 58
2245.21 11 19 Kis 2245.21 11 20 Qz	100.00	2.21	17.44	2.33				13.23		0.07	2.00																									1	00 82
2245.21 11 21 Chr			14.58	13.14	14.3	80									57.98																	-				1	30 72
2245.21 11 22 Zm 2245.21 11 23 Py	30.95			31.54			0.52			67.94													69.05													1	00 132
2245.21 11 24 Zrn	30.87																						67.36						1.77							1	30 83
2245.21 11 25 MIX 2245.21 11 26 TiO ₂	0.80	92.03	1.66	40.38	3.1	0.52	0.64	0.64	1.07																									2.69		1	00 62
2245.21 11 27 Qz	100.00																																			1	30 78
2245.21 11 28 Sd 2245.21 11 29 TiO ₂ +	0.71	97.00	0.57	0.85		-	1		<u> </u>	1.61				-	-									-								1	+	1.41		1	0 48
2245.21 11 30 Grt	41.29		22.11	23.83	0.48 11.0	1.25	5			ar -																										1	30 73
2245.21 11 31 Brt 2245.21 11 32 Pv + Chl +	14,96		12.09	32,89			2,20			36.53	<u> </u>	0.32		+	-	0.05				1.97					63.41							+	-	13.06		1	00 73 00 60
2245.21 11 33 Py	14.50			28.58			2.20			71.42				1																		1		. 5.00		1	00 146
2245.21 11 34 Tur 2245.21 11 35 Qz + TiQa	37.88	1.10	30.83	5.72	8.2	9 1.30	1.88		<u> </u>		-			1	-	-									_							-	-			1	7 65
2245.21 11 36 TiO ₂	1.34	94.81	1.24	0.94																			1.66													1	00 70
2245.21 11 37 Chr	-		17.93	24.42	9.5	58				70.50					48.07																					1	00 146
2245.21 11.1 1 TiO ₂		98.67	0.50	0.82						70.00																										1	00 127
2245.21 11.1 2 TiO ₂ +	1.26	92.14	0.83	3.65																														2.12		1	00 100
2245.21 11.1 3 IIO ₂ + 2245.21 11.2 1 "IIm" +	1.35	88.59	1.04	3.58		0.61				0.88	2.76																							2.68		1	00 71
2245.21 11.2 2 "Ilm" +	1.96	85.44	1.78	7.03																														3.80		1	30 85
2245.21 11.3 1 Qz 2245.21 11.3 2 TiO ₂	99.49	0.51 99.48																																		1	00 150 00 130
2245.21 11.3 3 Qz +	88.73	0.56	4.07	4.50	0.5	i9	0.30	0.38		0.87																										1	00 140
2245.21 11.4 1 Brt	08.56			0.60		_				35.21						-0.12									64.31							-	-			1	00 147
2245.21 11.4 3 Sd	00.00			50.37	4.91 0.7	'3																															6 73
2245.21 11.5 1 Chl +	41.67	90.52	29.57	24.50	3.5	64		0.72															2.14											2.07		1	00 123
2245.21 11.5 2 1102+ 2245.21 11.5 3 TiO2+	1.10	89.93	2.25	1.78		0.59	0.60		1.06														2.14											2.69		1	00 95
2245.21 11.5 4 Qz	99.66	00.47		0.34																																1	00 150
2245.21 11.6 1 IIO ₂ 2245.21 11.6 2 Chl +	39.51	98.17	15.89	1.83	16.7	'3	0.89				2.94															-										1	00 104
2245.21 11.6 3 TiO ₂		98.63		1.37																																1	00 132
2245.21 12 1 Zrn 2245.21 12 2 Pv	31.02	0.49		28.49						71.02													68.98													1	00 143
2245.21 12 3 Chl	28.66		21.45	31.03	3.8	37																														8	5 54
2245.21 12 4 TiO ₂ +	28.84	92.77	2.18	1.51		0.48	3		0.97	0.85			1 70										65.60						1 05							1	00 65
2245.21 12 6 Spl	20.04		34.28	13.57	16.6	52							1.70	1	35.54								55.00						1.33							1	00 70
2245.21 12 7 Ap	31.03					50.13	3		46.05		3.56	0.26			-	-						-+	68 09									+	-			1	00 76
2245.21 12 9 Zrn	30.93													1									69.07													1	00 77
2245.21 12 10 Py	20.70			34.42		_	2.24	-		61.71		-		1			\square			0.59			60.21						_			1	-	1.04		1	00 77
2245.21 12 11 Zm 2245.21 12 12 Zm	30.79		0.61	0.57									0.51	1									67.96													1	00 69
2245.21 12 13 Zrn	31.09																						68.91													1	JO 77
2245.21 12 14 "lim" + Chi 2245.21 12 15 Sd +	2.71	72.81	1.77	22.70	1.07 10.8	3 5.22	,																													1	00 48
2245.21 12 16 Tur	37.95	0.88	33.87	4.51	7.0	0.84	1.86																									1				8	7 62
2245.21 12 17 Zrn	31.20		0.55	30.01			1 70			65.46													68.80											0.95		1	00 114
2245.21 12 19 Mix	49.10	41.57	4.50	2.83	0.6	5	1.70	1.35		00.40				1																				5.35		1	00 70
2245.21 12 20 Kfs	66.25	0.77	17.80	0.02		0.44		15.96			3.04		0.45	<u> </u>	+	+							64.32									+				1	00 73
2245.21 12 22 Py + Chl	8.04	0.38	6.77	33.44	1.0	0.41				48.38	3.04	0.31	0.40	1									04.33											1.59		1	00 91
2245.21 12 23 Mix	15.10	0.75	10.06	61.33	1.00 1.5	57	+	0.92		2.45		0.77		1		0.05	$\vdash \neg$								62.05				_			1	-	6.04		1	00 53
2245.21 12 25 Zrn	30.65									36.00						0.05							69.35		03.95												00 78
2245.21 12 26 TiO ₂ +	1.22	93.66	1.80	1.62		0.40)		1.30																											1	0 63
2245.21 12 27 Zrn 2245.21 12 28 Zrn	30.48					-	-					-		-	-	-							67.77		-				1.75			+	-			1	00 82
2245.21 12 29 Mix	26.01	0.51	18.56	46.00	2.5	5	0.72	0.48		1.08		0.57		1									41.66											3.52		1	00 53
2245.21 12 30 TiO ₂ +	1.15	89.22	1.62	5.42														_																2.59		1	JO 59

Sample	Site	Mineral	SiO2	TiO2	AI2O3	FeO	MnO	OgM	CaO	Na2O	K20	P205	SO3	u.	ō	Sc2O3	V205	Cr203	CoO	cuo	NO	ZnO	As203	Y203	SrO	ZrO2	Ag2O	BaO	La203	Ce2O3	Nd2O3	HfO2	Gd2O3	Dy203	Ta205	Yb203	MoO3	W03	B2O3	0s02	Total Actual Total
2245.21	12	31 Grt 32 Brt	40.84		21.32	23.44	0.84	7.65	5.91				36.27		_	_			-0.05		-		-					63.19													00 75
2245.21	12	33 TiO ₂ +	1.29	90.64	2.59	3.65			0.51			1.31	00.21						0.00									00.10													100 53
2245.21	12 3	34 Tur	37.24	1.19	33.14	9.21		3.64	0.64	1.93											_		_																	-	87 61
2245.21	12.1	2 "llm"	2.16	68.37	1.78	24.20		0.56															-																		100 73
2245.21	12.1	3 TiO ₂		97.78		2.22																																			00 102
2245.21	12.2	1 Chl + Ms	31.84	1.91	21.92	27.01		8.99		0.49	1.73			6.10	_						_		_																		100 101
2245.21	12.2	3 Py	3.05	0.31	2.00	29.48		0.40		0.27	0.75		69.94																												100 206
2245.21	12.2	4 Qz + Chl + Ms	49.63	1.99	28.53	13.41		3.50	0.07	0.00	2.94		0.70	0.04	_						_																				00 73
2245.21	12.2	1 Qz	99.65	1.72	27.43	0.35		1.37	0.37	3.30	1.07		0.70	2.94									-																		100 118
2245.21	12.3	2 Py				28.71							71.29																												00 221
2245.21	12.3	3 Sd 4 Feoby	1.95	0.50	0.50	42.80							3.26		1.95					-	1.25																	9.76			56 74 100 76
2245.21	12.3	5 Chl + Bt	33.07	0.42	23.91	37.78		3.80		0.65	0.37																														00 83
2245.21	12.3	6 Py + 7 Py +	0.68	0.38	0.63	28.97		1 10		0.69			68.80		0.34	-				_	-		0.92															3 54			100 214
2245.21	12.3	8 Qz +	97.73	0.00	1.35	0.47		1.10		0.00	0.44		01.00		0.01																							0.04			100 115
2245.21	12.4	1 TiO ₂ +	0.92	92.93	2.25	1.83			0.52			0.91	0.64					[_		[⊢–[00 93
2245.21	12.4	3 TiO ₂ +	1.03	94.34	2.16	1.14			0.55			1.14					-	-	-	+	-		-	-																	100 81
2245.21	12.4	4 TiO ₂ +	1.68	90.96	2.40	2.17			0.55					2.25																											00 75
2245.21	13	1 Py 2 Chr.+	8.62	0.57	6.12	28.49	0.02	7.90					71.51					32.34		_	_	8 14																		1	100 147
2245.21	13	3 TiO ₂ + Chl	3.15	86.73	4.94	3.10	9.93	0.70	0.53			0.86						JZ.34				0.14																		-	100 58
2245.21	13	4 Mix	30.47	37.79	22.62	2.27				0.84	0.43			5.57																											00 58
2245.21	13	5 Zrn	31.02	1 22	12 50	1.00		0.20		0.61	2.00			2.20	_					_	_		_			68.98														1	100 72
2245.21	13	7 Chr	70.73	1.55	17.21	13.20	2.21	9.69		0.01	2.99			3.29			-	56.55			-	1.14	-																		100 66
2245.21	13	8 Qz	100.00																																						00 76
2245.21	13	9 Spl	20.96		38.87	14.83		14.39									_	31.91		_	-		_			60.14															100 67
2245.21	13	11 Py	30.00			29.14							70.86													09.14															100 139
2245.21	13	2 Ap							49.02			45.33		5.65							_		_																		00 77
2245.21	13	3 Zm 4 Mix	30.81	39.14	12 18	17.04		3.72		0.77	0.92			3.66	_	-					-		_			69.19	-												-		00 73
2245.21	13	5 TiO ₂ +	1.23	91.27	1.84	1.72			0.51		0.02		0.81	2.62																										-	100 55
2245.21	13	6 Zrn	31.19	0.61	0.79	0.00		2.07										62.75		_	_	14.00	_			68.81														1	100 72
2245.21	13	18 TiO ₂ + Qz	33.15	66.36	9.70	0.49		2.07									-	03.75			-	14.00																			100 73
2245.21	13	9 Zrn	30.37																							69.63															00 75
2245.21	13	20 Qz +	81.65	10.98	3.77	1.74					1.01		0.85		_					_	_		_			69.03														1	100 73
2245.21	13	22 Chr	51.07	0.66	10.14	27.68		3.09										58.43								00.35														-	100 64
2245.21	13	23 Py				28.69							70.98					0.33			_																				00 143
2245.21	13	24 110 ₂	100.00	98.31												-	1.69				-		-																		100 69
2245.21	13	26 Zrn	31.00																							69.00															100 77
2245.21	13	27 Zrn	29.79	0.82	0.92	40.00		44.00						3.59				45.45				0.70				64.88														1	00 64
2245.21	13	29 Zrn	30.43	0.50	25.63	12.83		14.80										45.45			-	0.79				67.81						1.75							-	-	100 71
2245.21	13.1	1 Qz + TiO ₂	40.24	48.49	4.07	1.12					0.78			5.30																											100 100
2245.21	13.1	2 Qz + 3 Cbl + Kln	98.41	0.48	0.58	9,89		1.52		0.66	0.53			2.53			_	-		-+	_		_									\vdash									100 118
2245.21	13.1	4 TiO ₂		100.00	52.30	5.55				0.00	0.00			2.00																											100 105
2245.21	13.1	5 TiO ₂ +	0.66	94.99	1.49	1.29			0.39			0.62	0.57	T	-+	T					Ţ							— T				\vdash				L T		T			00 97
2245.21 2245.21	13.1	7 Qz + Ms	1.61	94.32	27.11	3.18 6.70		0.71		0.64	0.44		1.49	3.32					-+	+	+		+	-												\vdash					100 45
2245.21	14	1 Zrn	30.69											0.02												69.31															100 75
2245.21	14	2 Py	31.12	0.60	0.85	35.73		2.51		1.48	0.76		60.42							_	_		_															1.52		1	95 52
2245.21	14	4 Ap	31.12	0.00	21.90	20.07		2.31	49.43		0.76	44.50		6.07																											100 76
2245.21	14	5 Chr		0.54	17.14	24.60		10.34										47.37																							00 69
2245.21	14	6 Zrn	30.76	03.22	0.49	6 79									_					_	_		_			68.75															100 69
2245.21	14	8 Brt		00.22		0.70							37.20						-0.22						1.62			61.40												-	100 69
2245.21	14	9 TiO ₂		99.23		0.77									_					_	_																			1	100 66
2245.21	14	10 Zm	31.14															-		-+						69.05															100 74
2245.21	14	2 Ap	50.85						47.12	0.46		42.93	0.69	8.52	0.28											00.00															100 75
2245.21	14	3 Zrn	31.10																			$-\mp$				68.90														$-\mp$	00 75
2245.21	14	14 Zm 15 Zm	30.80															-	-							69.20 69.10		-					-								100 69
2245.21	14	6 Bt	37.82	5.16	12.79	14.09		15.65		0.64	7.23			2.61												30.10															96 69
2245.21	14	7 Ap	07.0.1		22.40	26.01		0.47	49.00			44.80		6.19									_																	1	00 76
2245.21	14	9 Chr	21.34		23.19	26.01		8.47										48.05																						-	100 64

Sample	Site	Position	Mineral	SiO2 TiO2	Al2O3	FeO	MnO	MgO	CaO	Na2O	K2O	P205	S03	ш	G	SCZUG	0024	CI2O3	000	NiO	ZnO	As203	Y203 Sr0	ZrO2	Ag2O	BaO	La203	Ce2O3	Nd2O3	HfO2	Gd2O3	Dy203 Ta205	Vh2O3	MoO3	WO3	B2O3	OsO2 Total	Actual Total
2245.21	14	20	Zrn Tur	30.90 37.81 0	96 29.5	7 10.48	0.70	4.67		2.80									_	-				69.10									-	-			100	59
2245.21	14	22	Brt	01.01 0.	20.01	10.10	0.70	4.01		2.00			37.56					-	0.06							62.50											100	70
2245.21	14	23	Zrn TiO ₂	29.70	0.43	3 69	9							1.97		0.54	_							65.13						2.23							100	70
2245.21	14	25	?Feohy	1.91	00	95.87							2.22	4.04																							100	1 54
2245.21	14	26	Chr	31.50	20.81	20.74	l .	9.33									49	9.12						68.50									-				100	64
2245.21	14	28	Py	0.77 0.	49	42.04	ł						52.53		0.42									00.00											3.76		100	1 86
2245.21	14	29	Zrn	31.36		-											_			-				68.64									-	_			100	74
2245.21	14	31	TiO ₂ + Qz	20.09 79.	45 0.46	6																		03.00													100	1 66
2245.21	14	32	TiO ₂ +	4.41 87.	69 2.8	5 4.11	2.29	0.60	0.34						_		-	4.50		_													_	_			100	50
2245.21	14	34	Py	0.	74 2.4	28.86	2.30	2.44					71.14				44	4.30																			100	133
2245.21	14	35	Chr Kin + Me	52.51	11.43	3 20.48	3	6.73		0.61	2.06			3.55	_	_	6	1.37		_													-	_			100	64
2245.21	14.1	2	Feohy	32.31	1.22	2 69.83	0.80			0.01	2.00		1.29	3.35	0.84																				26.04		100	1 72
2245.21	14.1	3	Chl	27.23	20.05	28.44	1	3.00		0.48	0.50		69 34	2.73			_																	_	2.58		85	89
2245.21	14.1	5	Mix	3.38	2.73	3 72.86	0.79	4.05					1.54		0.66																				13.99		100	75
2245.21 2245.21	14.2	2	2rn Qz	31.01 100.00													_							68.99									-				100	119
2245.21	14.3	1	Qz	98.98 1.	02	0.10																											1				100	119
2245.21	14.3	3	TiO ₂	0.55 99.	54	0.63	8																														100	103
2245.21	14.3	4	TiO ₂ + Qz	22.54 75.	87 0.84	4 0.38	8				0.36																										100	108
2245.21 2245.21	15	2	Py TiO ₂	2.43 90.	41 89 1.4 ⁻	28.25	r						71.35		_		_			_														_			100	130 53
2245.21	15	3	Zrn	31.22																				68.78													100	70
2245.21	15	4	Zrn Sd +	30.52	-	79.94	16.04	3.02	1.00					2.40			-							66.47													100	67
2245.21	15	6	Zrn	30.69																				69.31													100	71
2245.21	15	7	Mix Sol	15.39 60.	50 5.75 77 34.89	5 6.12	2	1.68				6.63					30	0.98															-				3.94 100	63
2245.21	15	9	Zrn	30.59																				69.41													100	1 74
2245.21	15	10	Tur TiO ₂	38.27 1.	64 28.67 08	6.39	9	8.80	0.92	2.31					_		_																				87	62
2245.21	15	12	Tur	38.10 0.	96 31.64	1 5.93	3	7.23	1.03	2.11																											87	62
2245.21	15	13	Zrn Ab	31.14 68.89	18.8	2				12 23					_		_			_				68.86									-	_			100	74
2245.21	15	15	Sd +	1.76	1.49	74.90	1.08	6.35	4.33	12.20																									10.10		100	1 42
2245.21	15	16	TiO ₂ + Chl	6.37 78.	27 4.58	3 9.87	,	0.91	48 18			44 42		7.40	_	_	_			_													-	-			100	40
2245.21	15	18	Chr		14.46	3 18.26	5 1.44	9.96	-10.10			11.12		1.40			55	5.09			0.79																100	64
2245.21	15	19	TiO ₂ Chl + TiO ₂	1.16 93. 32.01 14	19 0.8 ⁻ 38 22.13	4.84)	4.67							_		_																-				100	52
2245.21	15	21	Zrn	31.11																				68.89													100	1 72
2245.21	15	22	Grt Oz	40.76	20.93	3 23.69	0.50	5.32	8.81						_	_	_																-				100	70
2245.21	15	24	Ap	100.00		0.51	1		48.61			42.61	0.67	7.60																							100	1 71
2245.21	15	25	Zrn Chr	31.32	10.7	19.02	,	10.41							_		59	9.87		_				68.68									-	_			100	74
2245.21	15	27	Py		10.1	28.67		10.41					71.33					0.07																			100	136
2245.21	15	28	Ms + Moz	65.16 1.	29 19.59	4.29	9	1.69	1.07	0.58	4.38	38 37		3.01	_	_	_			_					1.67		17 11	32 35	9.81				-	-			100	66
2245.21	15	30	TiO ₂	100.	00				1.01			00.01		0.07											1.07			02.00	0.01								100	64
2245.21	15	31	TiO ₂ +	3.75 95.	65 45	0.59	8						68.92		_	_	_																-	_			100	63
2245.21	15	33	Zrn	31.40	10	00.00	, 						00.02											68.60													100	70
2245.21	15	34	TiO ₂ + Chl	13.92 58.	89 11.32	2 13.14	1	2.12	0.61								_																				100	30
2245.21	15	36	Py		20	28.77							71.23																								100	135
2245.21	15	37	TiO ₂ +	1.34 89.	26 2.64	1.71			0.45			1.16	69.06	3.44	_		_			_													-	_			100	49
2245.21	15.1	1	Py+	0.77 0.	28	28.18	3						70.49									1.05															100	220
2245.21	15.1	2	Py + Sd	0.	24 37	29.85	9,17	1.67	0.87		-		68.57	\vdash			+			_		1.02											+	_			100	206
2245.21	15.1	4	Py		_	28.55	5			0.65		00.00	70.81						4.00				40.04								0.40	4.00 0.1	_				100	213
2245.21 2245.21	15.2	1	Qz	98.97	0.70	0.33	8					39.98							1.02				48.81								3.40	4.36 2.4	3				100	104
2245.21	15.2	3	Chl	33.79 0.	67 21.59	22.56	6	5.12		0.85	[_				(0.43								_											85	84
2245.21	15.2	4	Xtm +	4.28 6.	54							33.59							1.05			0.38	40.32								3.79	7.50	2.	.55			100	103
2245.21	15.2	6	Mix Xtm +	41.74 6.	87 18.19	7.46	6	1.18		0.53	3.57	8.77		1.76					1 26				9.54								2 77	4 64					0.39 100	97
2245.21	15.3	1	Qz +	96.22	0.50	2.87			0.41			33.47											-10.10								2.11	-1.04					100	/ 113
2245.21	15.3	2	Py Sd	0.	34	30.15	0.37	7.68	0.69	0.87	-		66.41		-		_			_													-	_	1.56		100	199
2245.21	15.3	4	Sd	0.	45 0.5	7 40.85	0.95	2.11	2.00												0.16												1		8.91		56	68

Sample	Site	Position	Mineral	Si02	ТЮ2	AI2O3	FeO	OnM	CaO	Na2O	K20	P205	so3	٤	G	Sc203	V205	Cr203	CoO	CuO		2110 As203	Y 203	SrO	ZrO2	Ag2O	DaO	La203 Ce203	Nd2O3	nton		Gd203 Dv203	Totoe	13205	Yb2O3 MoO3	WO3	B2O3	0s02	Total	Actual Total
2245.21	15.3	5 Bt -	+	56.53		19.14	14.19	1.61 1	80 17	1.07	7.46				_		-			_	_	_				_	_	_	_	-	_			-	_	23.26			100	78
2245.21	16	1 Zrn	n	30.99		2.13	00.10	1.01	.00 1.7	1.01															69.01											20.20			100	76
2245.21	16	2 Py					28.53						71.47				_				_						_		_		_								100	143
2245.21	16	3 QZ 4 Zrn	:	29.79			0.54		0.7	9							-								68.87								-						100	72
2245.21	16	5 TiC	D ₂ +	24.89	55.84	11.10	3.61	1	.35		2.26		0.95												00.07														100	53
2245.21	16	6 Qz		100.00																																			100	79
2245.21	16	7 TiC	<u>),</u>	17.06	99.16		0.84		_						_						_						_		-	-	_	_	-		_				100	71
2245.21	16	9 Pv	J ₂ +	17.90	11.25		28.62						71.38													-													100	150
2245.21	16	10 Spl	1			32.44	18.13	11	.40									38.03																					100	72
2245.21	16	11 Ap	+	4.59		3.57	3.89	(.64 41.2	6	0.28	38.13		7.64	_		_				_			_			_		_		_								100	50
2245.21	16	12 Ch	ir)- + 07	41 47	0.50	24.68	24.25	11	.45		0.52				-		-	39.12		_	-			-				_	-		-		-		-	-			100	74
2245.21	16	14 Zrn	1	30.85	00.11	1.66	0.02				0.02														69.15														100	82
2245.21	16	15 Zrn	n	30.87																					69.13														100	82
2245.21	16	16 Qz		100.00					_								-				-				60.02		-		-	-	_	_			_				100	81
2245.21	16	18 Kfs	s + TiO ₂	50.53	28.65	10.71	2.50	1	.00		3.23			3.39											00.03														100	76
2245.21	16	19 Qz		98.54	0.36	0.58	0.53																																100	78
2245.21	16	20 Qz		100.00																	_	_					_		_										100	78
2245.21	16	21 Spi	0	20.91		32.00	20.73	14	.02	8					-	0.80	-	33.25		_	_			-	66.07	_			-			_	-		_	-			100	64
2245.21	16	23 Zrn	n	30.70		0.70			0.5							0.00									69.30														100	79
2245.21	16	24 Qz		99.65		_	0.35		_																	-							T	+					100	79
2245.21	16	25 Zrn	n	31.04	0.92	2.67	2.14		0.0					2.04		1.04	_				_			-	68.96		_		_			_	_			-			100	77
2245.21	16	27 Fee	ohv	2.00	0.02	2.07	96.07		0.0	5			1.93	2.04		1.04									30.19														100	54
2245.21	16	28 Grt	t	39.84		20.23	28.60	2.12	9.2	1																													100	75
2245.21	16	29 Sd	+ Chl	10.30		7.70	67.50	1.13 1	.09 0.6	1			1.82		0.36										60.40				_	_	_	_	_	_		9.49			100	51
2245.21	16	30 Zm 31 Pv	1	30.51			29.61						70 39												69.49								-						100	140
2245.21	16	32 Zrn	n	30.81			20.01						10.00												67.60					1	.59								100	84
2245.21	16	33 Zrn	า	31.11																					68.89														100	82
2245.21	16	34 Zrn	n 	30.88	16.10	0.49			_	-	0.20				_						_				67.18		_		_	1	.94	_	-		_				100	84
2245.21	16	36 Py	+	03.04	0.27	0.40	28.89				0.29		70.84			-											-												100	140
2245.21	16	37 Py	+			1.47	41.18			5.80	0.33		50.84		0.38																								100	61
2245.21	16.1	1 Qz		100.00	2.47				_	-					_		-			_	_	_	-	-		_	_	_	_	-	_			-	_	-	-		100	119
2245.21	16.1	3 Ch	. . II +	30.33	2.79	22.33	32.97	0.51 10	.77	0.52	2																												100	97
2245.21	16.1	4 TiC	D ₂ +	2.33	96.54		1.13			_					_									-			_					_				_			100	104
2245.21	16.1	5 TIC	D ₂ + Qz	99.60	88.41	0.51	0.63		_								_				_								_	_	_		_						100	107
2245.21	16.1	7 Ch	II + Ms	48.34	0.81	24.51	5.74	15	.03	0.52	1.13		1.15	2.77																									100	82
2245.21	16.2	1 TiC	D ₂	00.50	99.53		0.47										_				_						_		_		_		_						100	103
2245.21	16.2	3 Qz	+	76.56	1.81	19.17				0.44	0.80			1.22																									100	113
2245.21	16.2	4 TiC	D ₂ + Qz	11.67	85.65	1.86	0.52				0.30																												100	104
2245.21	16.2	5 Qz	+ Kln	55.64	0.78	39.56	0.51			0.49	0.81			2.23								_	_	-	00.04				_	_	_	_	_	_		-			100	90
2245.21	17	2 Tur	r	39.05	0.44	32.65	7.21	5	.56	2.05)														09.34	-													87	64
2245.21	17	3 Zrn	n	31.06																					68.94														100	79
2245.21	17	4 Mix	x	66.76	20.35	6.98	3.83	(.90		1.18						_				_			-			_		_		_	_	_			_			100	67
2245.21	17	5 Spl 6 Zm	1 0	29.66		0.62	14.65	12	.94	2					-	1 18	-	41.29			-				67.22		-				-								100	69
2245.21	17	7 Ap		20.00		0.02	0.00		46.6	3		42.99	0.92	7.23										2.23	01.22														100	76
2245.21	17	8 Qz		100.00	100.0-																							_											100	77
2245.21	17	9 TIC 10 Pv	J ₂		100.00		28.52		_	-	-		71.49				-				_		-			-	_	-	-	-	_		_	+					100	68
2245.21	17	11 Zrn	n	31.61			20.52						/ 1.40												68.39														100	76
2245.21	17	12 Kfs	\$	66.55		17.74				1.15	14.56																												100	74
2245.21	17	13 Zrn	n	30.79			1.00														_				69.21		_		_										100	76
2245.21	17	14 11C	J ₂ 1	31.15	94.15		1./3		_	-	-			4.12	-+		-				+		+		68.85	-+	+		-	+	+	+		+	+		+		100	39
2245.21	17	16 Zrn	n	30.96						1	1														69.04														100	78
2245.21	17	17 Py					29.76			+	<u> </u>		67.74		—F	T		T			+				+		$-\Gamma$	_		+	+	-+	+	-		2.50	-	+	100	127
2245.21	17	18 Py	+ TiO-	75.64	23.69		28.39		-	-	-	<u> </u>	71.61				-				_	_	+			-		-	-	-			_	+					100	148
2245.21	17	20 Zrn	n	31.27	20.00		0.07								-	-							1	1	68.73									+		1	1		100	78
2245.21	17	21 Mn	IZ									37.28		0.61														16.47 34	88 10	.77									100	66
2245.21	17	22 Ch	<u> +</u>	35.34	1.34	25.03	32.86	3	.95	0.61	0.87	<u> </u>									_		-		+	_	_		_	_	_			+					100	60
2245.21	17	24 Oli	0 ₂	64,59	100.00	21.90	0.35		3.5	9,66	;						-	-			_	_	1	-		-	_	-		-				+		-	-		100	78
2245.21	17	25 Grt	ť	39.90		21.00	34.28	2	.90 1.9	2																													100	74
2245.21	17	26 Zrn	n	31.34			$\vdash \neg$				<u> </u>				<u> </u>		T	T			+				68.66	_							-	_			0.0.4	\vdash	100	78
2245.21	17	27 Brt 28 Al-	Phos			36.01	0.74		2.2	0.27	-	34.19	∠1.66 4.14	1.34			+		0.14		+		+	14.35		40	080	1.54 4	16 1	.34	+		+	+	+	-	37.07		100	59

ple	e	aral	22 02	03	0	õ	0	Q	20	0	05	33			03	35	g g	0	0	0	ß	03	0	22	50	0	03 03	03	02	03	8	05	8 8	03	ő	22	al
Sam	ŝ	Min	Sic	Al2	£	Ā	Mg	õ	Na	2 2	P2(S		0	Sc2	V2(C C C	ŭ	Z	ភ	As2	73	Sr	Z	Agi	Ba	Ce2	ZPN	Ŧ	Gd2	Dy2	Ta2	Yb2	Ň	B2(8	P
2245.2	17	29 Mix	27.48 48.12	15.97	0.85		0.48	40.00		4.13	44.10		2.98			_		_										_	_					_	_	+	100
2245.2	17	31 TiO ₂ +	1.39 87.61	2.34	1.68			0.38			1.46		5.14																								100
2245.2	17.1	1 Chl + 2 Qz + TiQ ₂ +	40.14 2.01 54.97 38.98	20.97	20.64		10.89		0.69	0.46			4.20			-		-																_	-	+	100
2245.2	17.1	3 Chl +	37.63 5.39	22.84	23.09		3.24		1.27	0.99		5.55																								—	100
2245.2	17.2	1 TiO ₂ + Qz 2 TiO ₂ + Qz	35.93 61.36 11.73 86.79	1.00	0.57								1.71																						_	+	100
2245.2	17.2	3 Qz + TiO ₂	75.94 23.00	0.49	0.57																															\square	100
2245.2	17.2	4 TIO ₂ + QZ 1 TIO ₂ +	40.25 55.18 0.90 89.59	2.40	1.83			0.48			1.35		3.44			1.17																				++	100
2245.2	17.3	2 TiO ₂ +	1.13 92.20	2.57	1.59			0.59			1.35	0.58																								\square	100
2245.2	17.3	4 TiO ₂ +	0.77 88.58	2.37	1.63			1.63	0.79		1.39	3.42																								+ +	100
2245.2	17.3	5 TiO ₂ +	1.01 88.30	2.12	1.67		0.06	0.52	0.45		1.21	0.81	4.37			_		_											_					_	_		100
2245.2	17.3	1 Zrn	30.86	6.17	9.14		0.96	0.46	0.45		1.20		5.50											69.14												+ +	100
2245.2	18	2 "Bt"	44.53 1.35	24.10	18.56		2.84		1.40	2.90		4.32					40.00	_																	_	\rightarrow	100
2245.2	18	4 Ap		10.43	24.70		10.55	48.54			44.51		6.95				40.20																				100
2245.2	18	5 Brt	+ $ -$		20.50							36.63					0.0	4								63.32										$+ \neg$	100
2245.2	18	7 Zrn	30.95		28.53							(1.4/												69.05													100
2245.2	18	8 Zrn	30.64													1								69.36												$+ \neg$	100
2245.2	18	9 Zm 10 Py	30.95		28.94							71.06												oy.05													100
2245.2	18	11 Grt	40.02	21.29	30.94		6.12	1.64																[=	100
2245.2	18	12 Q2 + 110 ₂ 13 Chr	0.91	21.80	26.21		7.65										43.43																			+ +	100
2245.2	18	14 Mnz	400.00								35.58		0.34					_	0.19						1.97		9.15 33.	91 8.8	5						_	\square	100
2245.2	18	16 Brt	100.00									36.59				-	0.2	6					1.31			61.84										+	100
2245.2	18	17 Brt		1.50								37.50					0.0	5								62.45										\square	100
2245.2	18	18 TiO ₂ + 19 TiO ₂	1.01 89.96	1.53	0.71																													2.	30	++	100
2245.2	18	20 Qz +	91.30 1.08	4.83	0.83		0.49			1.47																										\square	100
2245.2	18	21 Zm 22 Qz	31.63																					68.37		-										++	100
2245.2	18	23 Py			28.76							71.24																								\square	100
2245.2	18	24 Zrn 25 Zrn	31.17 31.15													-		-						68.83 68.85										-	+	+	100
2245.2	18	26 Brt										37.37					0.0	7					1.31			61.25										\square	100
2245.2	18	27 Tur 28 Sd +	38.46 0.83	33.79	7.18	13.90	4.64		2.09									-																	-	+	87
2245.2	18	29 Brt	0.50									24.13					-0.2	3						00.74		45.36									30.2	3	100
2245.2	18	30 Zm 31 Zm	28.56 0.58	1.19				0.71							1.23									67.74												-	100
2245.2	18	32 Zrn	30.83	47.05	40.00	0.50	44.40			0.00			1.89			_								67.28												\rightarrow	100
2245.2	18	33 Bt 34 Py	38.24 4.02	17.35	45.54	0.56	11.18		4.52	0.37		47.91		0.38																						-	100
2245.2	18	35 Brt	110					0.00			00.00	36.85	0.47			_	-0.1	5					2.47		0.40	60.82	0.40 00								_		100
2245.2	18	37 TiO ₂	0.55 97.41		2.04			0.00			32.09	1.10	0.17												2.13		19.10 33.	0 9.3								-	100
2245.2	18	38 Qz	100.00	0.54	0.54											_		-						65.04					_					_	_	+	100
2245.2	18	40 TiO ₂	100.00	0.34	0.34																			05.04												-	100
2245.2	18	41 Ap	0.63					48.49	6.49		44.82		6.69			_		-																02	97	+	100
2245.2	19	2 Zrn	30.79	0.92	0.67			0.49	0.43															67.13										32.	07	-	100
2245.2	19	3 Zrn	31.27															-	<u> </u>					68.73	\vdash	<u> </u>		+	_		\square				_	$+ \overline{-}$	100
2245.2	19	5 Grt	41.15	21.84	24.62	0.53	10.48	1.38																													100
2245.2	19	6 Zrn	30.48	20.07	26.60	5.00	0.77	4.85								1								69.52												$+ \neg$	100
2245.2	19	8 Chr	39.51	15.72	20.60	5.30	12.27	4.85									51.14																				100
2245.2	19	9 Mnz +	3.49	2.89	2.15			30.26	1.05		37.25	71.00	10.66			-			-								2.81 7.	07 2.3	6							+	100
2245.2	19	11 Zrn	30.69		28.72							(1.28												69.31													100
2245.2	19	12 Chr	0.46	7.50	25.62	3.10	2.38	0.5.1	-			_				-	59.41	-		1.52	-		-	-				_		<u> </u>				_		+	100
2245.2	19	14 Tur	<u>1.45</u> <u>92.72</u> 37.94 <u>0.82</u>	2.04	2.65		7.05	0.54	2.22																												87
2245.2	19	15 TiO ₂	98.74	0.56	0.71							74.44																_								+ - 1	100
2245.2	19	17 Grt	39.52	20.69	28.89	1.35	1.38	7.94				71.11																									100
2245.2	19	18 Chr	04.00	24.49	18.96		9.71										46.84							00.07												\blacksquare	100
2245.2	19	20 "llm" +	31.33	7.94	12.26		3.16									+		-	1					68.67				+	-						-	+	100
2245.2	19	21 TiO ₂	100.00																																		100

Sample	Site	Mineral	SiO2	Ti02	AI2O3	FeO	MnO	OgM	CaO	Na2O	K20	P205	SO3	ш	ū	Sc203	V205	Cr203	000	NIO	OuZ	As203	Y 203	SrO	ZrO2	Ag2O	BaO	La203	Ce2O3	Nd2O3	HfO2	Gd2O3	Dy203	Ta205	Yb203	MoO3	WO3	B2O3	0s02	Total Actual Total
2245.21	19	22 Qz	100.00																																					100 71
2245.21	19	23 Qz	100.00																																					100 72
2245.21	19	24 Grt	39.20		20.40	13.49	24.51		2.40																															100 67
2245.21	19	25 Sd	2.13			52.85	i						0.65					0.37																						56 47
2245.21	19.1	1 TiO ₂ + Chl	8.11	74.94	5.38	9.53		2.05																																100 87
2245.21	19.1	2 TiO ₂ + ChI	31.22	16.52	22.15	22.66	1	3.80		0.54	1.38		1.72																						-+					100 67
2245.21	19.1	3 Chl +	43.75	3.42	28.09	15.92		2.79		0.49	1.06		1.66	2.81						-															-+					100 63
2245.21	19.1	4 TiO ₂ +	1.98	92.64	1.20	4.18														-					07.00						1.00				-+					100 71
2245.21	20	1 Zm	31.05			10 70		1.05											_	-					67.03						1.92				-+					100 74
2245.21	20	2 Tur	36.75	0.42	33.44	12.70	-	1.35	0.47	2.34									_	-															-+	_				87 59
2245.21	20	3 lur	38.32	0.56	32.72	6.11		6.84	0.47	1.99			74.00						_	_															-+					87 59
2245.21	20	4 Py	04.04	0.00	47.00	28.94		4.04		4.05	40.00		/1.06	4.05					_	-												_			-+	-				100 130
2245.21	20	5 KIS	61.01	0.98	17.30	3.35		1.21	0.50	1.05	12.30		0.78	1.95	-				-						07.40										-	-				100 58
2245.21	20	6 Zm	30.63		0.71	0.67			40.05			45.42		5.52					-						67.48										-+					100 56
2243.21	20	7 Ap	-		12.06	17.27		10.07	49.05			40.40		0.02			-	EG 41	_																_					100 71
2245.21	20	9 Chr		3.10	5.89	59.92	1 36	12.27									-	29.73																-						100 61
2245.21	20	10 Qz	100.00	3.10	5.03	03.32	1.50										-	20.75			1	1																- 1	-	100 72
2245.21	20	11 TiO ₂	0.60	96.07		3.33	1	1									-				1	1																		100 54
2245.21	20	12 Sd	0.00	0.45		47,10	6.71	1.32	0.42												1																			56 37
2245,21	20	13 Zrn	30,83	2.10			1														1	1			69.17															100 73
2245.21	20	14 Qz	100.00																																					100 75
2245.21	20	15 TiO ₂ +	1.77	95.29	1.02	1.93																													_					100 63
2245.21	20	16 Feohy	2.65			81.27							3.10					5.38																	_		7.60			100 48
2245.21	20	17 Zrn	31.24																						65.94						2.82				_					100 72
2245.21	20	18 Py +	0.90	0.59	0.65	36.27							58.16	3.43																										100 102
2245.21	20	19 Qz	100.00																																					100 72
2245.21	20	20 Tur	37.90	0.50	32.59	1.75		9.34	1.31	1.78				1.83																										87 61
2245.21	20	21 Chr		1.89	3.23	38.66	i	1.99										54.23																						100 61
2245.21	20	22 Zrn	30.38																						69.62															100 71
2245.21	20	23 Zrn	30.81																						69.19															100 72
2245.21	20	24 Py			0.69	39.09	1			3.16	0.29		55.40																								1.37			100 80
2245.21	20	25 Zrn	30.85			0.54																			68.61															100 68
2245.21	20	26 Zrn	31.12																	_					68.88										-+					100 75
2245.21	20	27 TiO ₂ +	5.31	94.69																															-+					100 68
2245.21	20	28 Brt	_										36.48					-0	.01								63.53									_				100 70
2245.21	20	29 Py				28.57							71.43						_																_					100 144
2245.21	20	30 1102	0.69	97.19		2.12												10.00	_	_															-+	_		-		100 60
2245.21	20	31 Chr			24.83	20.72		11.76										42.69	_	-															-+	-				100 68
2245.21	20	32 Zm	31.01		04.50	40.00		44.04									-	44.00							68.99										-					100 76
2245.21	20	33 Chr	04.07		24.50	16.63		14.21										44.00							60.00										-					100 68
2245.21	20	35 Chr	31.07		11.06	20.73		8.72									-	58 58		-					08.93									-				-	-	100 75
2245.21	20	36 Qz	100.00		11.30	20.73	1	0.73										55.50		-	1																			100 75
2245.21	20	37 "llm" +	1.26	63.87		34.14	0.72	1									-				1	1		1	1															100 60
2245.21	20	38 Qz	98,35	20.07		1.65	0.12														1																			100 73
2245,21	20	39 Pv				32.55		1		0.53			66.92								1	1																		100 114
2245.21	20.1	1 TiO ₂ +	1	95.24		2.67	1	1						2.09							1																			100 89
2245.21	20.1	2 TiO ₂		99.17	1	0.83		1												1	1	1																1		100 101
2245.21	20.1	3 TiO ₂		96.75		3.25																																		100 87
2245.21	20.2	1 Py+		0.24		24.00	0.79			2.08			65.81						5.	14		1.95													_					100 203
2245.21	20.2	2 Sd		0.71		42.57	9.32	2.90	0.50																															56 59
2245.21	20.2	3 Brt	0.65			2.24	4						35.61				_	-0	.04		L						61.54								-+					100 112
2245.21	20.2	4 Py		0.29		26.23	0.78			0.44			70.24				_		1.	09		0.92																		100 210
2245.21	20.3	1 Feohy	3.08	0.71		86.24	0.67						3.04				-	6.26	_		0.41	 		-											\rightarrow		00.04			100 81
2245.21	20.3	2 Feohy 3 Feohy	+	0.64		58.13 72.52	1				-		1.60					0.25			0.11													-	\rightarrow		23.91		-+	100 79
2245.21	20.3	4 Feoby	1.80	0.54		84 77							1.50		-		-	4.73		-														-			10.29	-	-	100 74
2245.21	20.4	1 TiO ₂	1.00	100.00		04.77	1						1.70				-	3.47			1	1																- 1	-	100 104
2245.21	20.4	2 Chl	28.34	0.31	20.06	27.45		8.83													1																			85 94
2245.21	20.4	3 Qz	100.00			1	1														1	1																		100 116
2245.21	20.4	4 Qz	100.00																																-					100 116
2245.21	20.4	5 Ms	52.83	0.44	26.75	2.14		1.07		0.91	7.54			3.32															_										-	95 115

Appendix A10: BSE images and EDS mineral analyses for sample Sable Island O-47 1886.47 m



Figure A10.1: Sable Island O-47 (1886.47 m)



1:Zircon 22:Quartz 2:Zircon 23: 3:Pyrite 24:Pyrite 4:Pyrite 25: 5:Ilmenite 26:TiO₂ + 6:Ilmenite 27:Chlorite 7:"Ilmenite" 28:Pyrite 8:Ilmenite 29:Quartz + 9:TiO₂ + 30:TiO₂ 10:"Ilmenite" 31: 11:TiO₂ 32: 12:TiO₂ + 13:TiO₂ + 14:"Ilmenite" + 15:TiO₂ 16:TiO₂ + 17:Biotite 18:Chlorite 19:Tourmaline 20:Tourmaline 21:Tourmaline

Figure A10.2: Sable Island O-47 (1886.47 m) (SEM) site 1 (Table A10.1)



Figure A10.3: Sable Island O-47 (1886.47 m) (SEM) site 2 (Table A10.1)



1:"Ilmenite" 2:"Ilmenite" 3:"Ilmenite" 4:"Ilmenite" 5:"Ilmenite" $6:TiO_2 + 7:TiO_2 + Kaolinite$

Figure A10.4: Sable Island O-47 (1886.47 m) (SEM) site 2.1 (Table A10.1). Two altered ilmenite grains.



1:Biotite + TiO₂ 24:TiO₂ + 25:Ilmenite + 2:TiO₂ + 26:Chlorite 3:TiO₂ + 27:Ilmenite 4:"Ilmenite" 28:"Ilmenite" 5:TiO₂ + 29:Quartz + 6:Pyrite 30:Pyrite + 7:Chloritized 31:Chlorite Biotite 32:Pyrite 8:Siderite 33:Quartz + 9:Quartz 34:Xenotime + Quartz 11:TiO₂ + 35:Biotite + 12:Pyrite 36:Ilmenite 13:Chlorite 37:Pyrite 14:TiO₂ 38:Ilmenite 15:Quartz + 39:TiO₂ 16:TiO₂ + 40:"Ilmenite" 17:TiO₂ + 41:Ilmenite 18:Quartz + 42:Mix 19:"Ilmenite" + 43:Pyrite 20:Monazite 44:Chloritized 21:Apatite Biotite 22:"Ilmenite" +

Figure A10.5: Sable Island O-47 (1886.47 m) (SEM) 23:Mix site 3 (Table A10.1)



1:Chlorite + TiO_2 2:Ti O_2 + 3:Ti O_2 + 4:Chlorite + TiO_2 5:Ti O_2 + 6:Chlorite + Muscovite 7:"Ilmenite"

Figure A10.6: Sable Island O-47 (1886.47 m) (SEM) site 3.1 (Table A10.1). a) a lithic clast made up of ilmenite (7) and muscovite (6) (Igneous felsic); b) a lithic clast with foliation? made up of chlorite (1,4) and probably diagenetic TiO₂ minerals (Metasedimentary).



1:TiO₂ + 2:TiO₂ + Chlorite + 3:TiO₂ + 4:TiO₂ + 5:Quartz 6:Chlorite + Muscovite 7:TiO₂ + 8:Quartz 9:Chlorite + Biotite

Figure A10.7: Sable Island O-47 (1886.47 m) (SEM) site 3.2 (Table A10.1). Precipitation of TiO_2 mineral zones (1,3) with probably relics of ilmenite (7) that surrounds a lot of quartz (5) and muscovite (6) grains.



1:Ilmenite 2:Chlorite + 3:Ilmenite 4:Ilmenite + Chlorite 5:"Ilmenite" + 6:Pyrite + 7:Chlorite + 8:Quartz

Figure A10.8: Sable Island O-47 (1886.47 m) (SEM) site 3.3 (Table A10.1). A lithic clast that is made up of quartz (8), chlorite (2,7) and an altered ilmenite grain (1,3,4).



1:Pyrite 2:Chlorite + Biotite 3:K-Feldspar 4:Chlorite + Biotite 5:Chlorite + Biotite 6:Chlorite + Biotite 7:Pyrite 8:Pyrite + 9:Pyrite + 10:Fe-oxide/hydroxide +

Figure A10.9: Sable Island O-47 (1886.47 m) (SEM) site 3.4 (Table A10.1). Pyrite (1,7) precipitates along the cleavage planes of an expanded, partly chloritized, biotite grain (2,5,6). It appears that the biotite contains a K-feldspar (3) inclusion.



1:TiO₂ 2:Quartz 3:Quartz + 4:Chlorite + Muscovite ? $5:TiO_2$ + 6:Muscovite + Chlorite

Figure A10.10: Sable Island O-47 (1886.47 m) (SEM) site 3.5 (Table A10.1). Two lithic clasts in this site: a) it consists of quartz (2,3), probably detrital TiO_2 (1) and small grains of chloritized muscovite (4); b) it consists of partly chloritized muscovite (6) and TiO_2 (5).



1:K-Feldspar 2:Muscovite + Chlorite 3:"Ilmenite" $4:TiO_2$ + 5:Quartz + Muscovite

Figure A10.11: Sable Island O-47 (1886.47 m) (SEM) site 3.6 (Table A10.1). The lithic clast in this site consists of: K-feldspar (1), partly chloritized muscovite (2), quartz (5) and partly altered ilmenite (3). Metasedimentary.



1:Quartz + Chlorite + 2:Quartz 3:"Ilmenite" 4:"Ilmenite" + 5:Ilmenite 6:"Ilmenite" 7:Mix 8:Ilmenite + Chlorite

Figure A10.12: Sable Island O-47 (1886.47 m) (SEM) site 3.7 (Table A10.1). A lithic clast that consists of quartz (2), ilmenite (3,5,6) and chlorite (1,8). Metasedimentary.



1:Pyrite 2:Chlorite + $3:TiO_2$ + 4:Chlorite + Muscovite $5:TiO_2$ +

Figure A10.13: Sable Island O-47 (1886.47 m) (SEM) site 3.8 (Table A10.1). Lithic clast that consists of chlorite (2,4), altered muscovite (4) and probably diagenetic TiO_2 (3,5).



1:Garnet 2:Pyrite 3:Albite 4:Chlorite 5:Siderite + 6:Quartz 7:"Ilmenite" + 8:Ilmenite 9:Siderite 10:"Ilmenite" 11:TiO₂ 12:"Ilmenite" + 13:Siderite + 14:"Ilmenite" 15:TiO₂ 16:Ilmenite 17:TiO₂ 18:TiO₂ 19:K-Feldspar 20:Ilmenite + Quartz 21:"Ilmenite" 22:Chloritized Biotite

23:Ilmenite 24:Pyrite 25:TiO₂ 26:Ilmenite 27:TiO₂ + Chlorite 28:TiO₂ + 29:TiO₂ 30:TiO₂ 31:"Ilmenite" 32:"Ilmenite" 33:Quartz 34:TiO₂ + Chlorite 35:Ilmenite 36:TiO₂ + 37:Ilmenite 38:Ilmenite 39:TiO₂ + Chlorite 40:TiO₂ 41:TiO₂ + 42:Ilmenite + 43:Pyrite 44:TiO₂ + 45:Pyrite 46:Ilmenite

Figure A10.14: Sable Island O-47 (1886.47 m) (SEM) site 4 (Table A10.1)



1:Ilmenite + 2:"Ilmenite" + 3:TiO₂ + 4:Ilmenite 5:Quartz 6:"Ilmenite" 7:Quartz + 8:TiO₂ 9:Ilmenite 10:Ilmenite+ 11:Pyrite 12:"Ilmenite" + 13:Chromite 14:Feoxide/hydroxide + Contaminant 15:Zircon 16:Quartz 17:TiO₂ + Quartz 40:Pyrite 18:Pyrite 19:Siderite + 20:Chloritized Biotite 21:Ilmenite 22:TiO₂ +

24:Siderite 25:Chlorite 26:"Ilmenite" + 27:"Ilmenite" 28:Quartz + Ilmenite 29:Ilmenite 30:Garnet 31:"Ilmenite" + 32:Ilmenite 33:Pyrite 34:Biotite 35:Chromite 36:TiO₂ + 37:K-Feldspar 38:TiO₂ + 39:Chloritized Biotite 41:Quartz + 42:Monazite + Quartz 43:Monazite 44:Zircon

Figure A10.15: Sable Island O-47 (1886.47 m) (SEM) 23:Ilmenite + site 5 (Table A10.1)



1:Chloritized Biotite 2:Chlorite 3:Ilmenite $4:TiO_2$ 5:"Ilmenite" 6:Biotite 7:TiO₂ 8:Monazite 9:Chlorite 10:TiO₂ + 11:TiO₂ + 12:Quartz 13:Pyrite 14:Pyrite 15:Zircon 16:Pyrite 17:Pyrite 18:Pyrite 19:TiO₂ 20:TiO₂ + Chlorite

21:"Ilmenite" 22:Ilmenite 23:Ilmenite 24: TiO_2 + 25:Zircon 26: TiO_2 27:"Ilmenite" + 28:"Ilmenite" + 30:Chromite 31:Quartz 32:Siderite + 33:"Ilmenite" +

Figure A10.16: Sable Island O-47 (1886.47 m) (SEM) site 6 (Table A10.1)



Figure A10.17: Sable Island O-47 (1886.47 m) (SEM) ^{20:Ilmenite} site 7 (Table A10.1)



1:Ilmenite 22:Ilmenite 2:Monazite + 23:Chlorite 3:Ilmenite + 24:Quartz 4:Ilmenite 25:Pyrite 5:TiO₂ + 26:Pyrite 6:Quartz + 27:Apatite 7:Ilmenite 28:Chloritized Biotite 8:Ilmenite 29:Apatite 9:Quartz + 30:"Ilmenite" 10:TiO₂ 31:Spinel 11:Ilmenite 32:Tourmaline 12:Quartz 13:Zircon + 14:Chloritized Biotite 15:K-Feldspar 16:Ilmenite 17:Ilmenite 18:"Ilmenite" + 19:"Ilmenite" 20:Zircon 21:"Ilmenite"

Figure A10.18: Sable Island O-47 (1886.47 m) (SEM) site 8 (Table A10.1)



1:Zircon 2:"Ilmenite" 3:TiO₂ + 4:Quartz 5:Ilmenite 6:"Ilmenite" + 7:Pyrite 8:Chlorite 9:Ilmenite 10:Chloritized Biotite 11:Chloritized Biotite + Pyrite 12:Pyrite 13:Pyrite 14:Ilmenite + 15:Pyrite 16:Chlorite 17:Zircon 18:"Ilmenite" + 19:Monazite +

20:Pyrite 21:Pyrite + ? 22:Quartz 23:TiO₂ 24:Zircon 25:Quartz 26:TiO₂ + Quartz 27:Chlorite 28:"Ilmenite" 29:Zircon 30:Quartz 31:Chlorite 32:TiO₂ 33:Ilmenite 34:Mix 35:Zircon 36:Pyrite + Quartz + 37:Tourmaline 38:Pyrite 39:K-Feldspar

Figure A10.19: Sable Island O-47 (1886.47 m) (SEM) site 9 (Table A10.1)



1:Pyrite 22:TiO₂ + 2:Chlorite 23:Ilmenite 3:Pyrite 24:Siderite + 4:"Ilmenite" 25:"Ilmenite" $5:TiO_2 + Quartz$ 26:TiO₂ + ? 6:TiO₂ + 27:Ilmenite 7:Pyrite 28:TiO₂+ 8:"Ilmenite" + 29:Apatite 9:TiO₂ + Chlorite 10:TiO₂ 11:Garnet 12:Ilmenite 13:"Ilmenite" 14:TiO₂ + 15:Ilmenite 16:Ilmenite + 17:TiO₂ 18:TiO₂ 19:Pyrite 20:TiO₂ + 21:TiO₂

Figure A10.20: Sable Island O-47 (1886.47 m) (SEM) site 10 (Table A10.1)



22:Mix 23:Ilmenite + 24:Ilmenite 25:Apatite 26:TiO₂ 27:Chlorite 28:Zircon 29:Chloritized **Biotite** 10:Monazite + 30:Ilmenite 31:Ilmenite + 12:Chloritized 32:TiO₂ + 33:Chloritized Biotite 34:Pyrite

16:Quartz 17:Chloritized Biotite 18:Ilmenite + 19:Zircon 20:Ti O_2 21:Chlorite

Figure A10.21: Sable Island O-47 (1886.47 m) (SEM) ^{21:Chlori} site 11 (Table A10.1)


1:Ilmenite 2:Tourmaline 3:Kaolinite + 4:Ilmenite 5:Monazite + 6:Apatite 7:Chlorite 8:"Ilmenite" 9:Pyrite 10:Quartz 11:Ilmenite 12:TiO₂ 13:Tourmaline 14:Ilmenite 15:Apatite 16:Ilmenite 17:TiO₂ + 18:Ilmenite 19:Ilmenite 20:Quartz 21:Ilmenite

22:Chlorite + 23:Biotite 24:TiO₂ + 25:Apatite 26:Tourmaline 27:TiO₂ + 28:Quartz 29:Chlorite 30:Quartz 31:Quartz 32:TiO₂ +

Figure A10.22: Sable Island O-47 (1886.47 m) (SEM) site 12 (Table A10.1)



1:Ilmenite 2:TiO₂ 3:Chromite 4:TiO₂ + Chlorite 5:Ilmenite + 6:Biotite 7:"Ilmenite" 8:TiO₂ + Quartz 9:Chloritized Biotite 10:Pyrite 11:Ilmenite 12:TiO₂ + 13:"Ilmenite" + 14:TiO₂ + 15:Quartz 16:TiO₂ 17:Ilmenite 18:Quartz 19:Zircon 20:Ilmenite +

21:Ilmenite 22:Pyrite + Chlorite 23:Chlorite 24:Ilmenite 25:Quartz 26:Pyrite 27:Chloritized Biotite 28:"Ilmenite" 29:Tourmaline 30:Biotite 31:Ilmenite 32:Ilmenite 33:"Ilmenite" 34:Chlorite 35:TiO₂ + 36:Pyrite

Figure A10.23: Sable Island O-47 (1886.47 m) (SEM) site 13 (Table A10.1)



1:Siderite + 21:Chloritized Pyrite Biotite 2:TiO₂ + 22:TiO₂ + 3:"Ilmenite" 23:Ilmenite 4:TiO₂+ 24:Garnet 5:"Ilmenite" 25:Muscovite 6:Ilmenite 26:Zircon 27:Quartz 7:Zircon 8:Ilmenite 28:Biotite 29:TiO₂ + 9:TiO₂ 30:Siderite + 10:Zircon 31:TiO₂ + 11:"Ilmenite" 12:TiO₂ + 32:Ilmenite + 13:TiO₂ + Quartz 33:Ilmenite + 34:Pyrite 14:Biotite 35:"Ilmenite" + 15:"Ilmenite" 16:TiO₂ + 36:Mix 37:TiO₂ 17:TiO₂ 38:Ilmenite 18:Tourmaline 39:Pyrite 19:Monazite 40:Quartz 20:K-Feldspar +

Figure A10.24: Sable Island O-47 (1886.47 m) (SEM) site 14 (Table A10.1)



2:Pyrite 3:Quartz 4:TiO₂ 5:Tourmaline 6:Pyrite 7:Chloritized Biotite 8:Chromite 9:Ilmenite + 10:Siderite + 11:Quartz 12:Siderite + 13:TiO₂ + 14:Ilmenite 15:Ilmenite 16:TiO₂ 17:TiO₂ + ? 18:Muscovite + Chlorite 19:TiO₂

20:Quartz 21:Apatite 22:Zircon 23:Ilmenite 24:Zircon 25:Chlorite + 26:Zircon 27:Ilmenite 28:Siderite 29:TiO₂

Figure A10.25: Sable Island O-47 (1886.47 m) (SEM) site 15 (Table A10.1)



1:Chlorite + Biotite 2:Apatite 3:"Ilmenite" 4:Ilmenite 5:Tourmaline 6:"Ilmenite" 7:Ilmenite 8:Ilmenite 9:Zircon 10:Quartz + 11:Biotite 12:Biotite 13:Ilmenite 14:Siderite + 15:Contaminant 36:Biotite 16:TiO₂ + 17:Siderite 18:Ilmenite + 19:Quartz + 20:Chlorite 21:Quartz

23:"Ilmenite" + 24:TiO₂ 25:Tourmaline 26:Quartz 27:TiO₂ + ? 28:Ilmenite 29:Ilmenite 30:Ilmenite 31:Tourmaline 32:TiO₂ + 33:Chloritized Biotite 34:Pyrite 35:Chloritized Biotite

22:TiO₂ + Figure A10.26: Sable Island O-47 (1886.47 m) (SEM) site 16 (Table A10.1)



1:Siderite 22:TiO₂ 2:TiO₂ + 3:Pyrite 4:TiO₂ + Quartz Chlorite 5:Ilmenite 6:"Ilmenite" 7:"Ilmenite" + 8:TiO₂ + 9:Ilmenite 10:TiO₂ + 11:Pyrite 12:"Ilmenite" 13:Chlorite 14:"Ilmenite" 15:Quartz 16:TiO₂ 17:Ilmenite + 18:Monazite 19:Quartz 20:Zircon 21:Monazite

23:Ilmenite 24:TiO₂ + 25:Pyrite 26:Quartz + 27:TiO₂ + Chlorite 28:Biotite 29:Quartz 30:TiO₂ + 31:TiO₂ + 32:"Ilmenite" 33:TiO₂ + 34:Quartz 35:"Ilmenite"

Figure A10.27: Sable Island O-47 (1886.47 m) (SEM) site 17 (Table A10.1)



1:Biotite 23:K-Feldspar + 2:Zircon 24:Apatite 3:TiO₂ 25:Feoxide/hydroxide + 4:TiO₂ + Contaminant 5:Zircon 26:TiO₂ + 6:"Ilmenite" 27:"Ilmenite" 7:Tourmaline 28:"Ilmenite" + 8:Pyrite 9:K-Feldspar + 29:"Ilmenite" 10:Tourmaline 30:Quartz 11:TiO₂ + 31:TiO₂ + 12:"Ilmenite" + 13:Ilmenite 14:Ilmenite 15:TiO₂ + 16:"Ilmenite" 17:Monazite 18:Ilmenite 19:Quartz 20:Ilmenite 21:Tourmaline 22:TiO, +

Figure A10.28: Sable Island O-47 (1886.47 m) (SEM) site 18 (Table A10.1)



22:Ilmenite 1:Ilmenite 23:TiO₂ + 2:"Ilmenite" 3:Tourmaline 24:Quartz + 4:Ilmenite 25:TiO₂ + 5:"Ilmenite" 26:Quartz + 6:"Ilmenite" + 27:TiO₂ + ? 7:Al-phosphate 28:TiO₂ + 8:"Ilmenite" + 29:"Ilmenite" 9:Ilmenite 30:"Ilmenite" 10:TiO₂ + 31:Pyrite 11:TiO₂ + 32:Pyrite 12:Ilmenite + 33:Chlorite 13:Pyrite 34:Tourmaline 14:Quartz + 15:TiO₂ + Chlorite 16:Quartz 17:TiO₂ + 18:Ilmenite 19:Quartz + Chlorite 20:Zircon 21:Quartz

Figure A10.29: Sable Island O-47 (1886.47 m) (SEM) site 19 (Table A10.1)



1:Zircon 2:TiO₂ + 3:Tourmaline 4:K-Feldspar + 5:"Ilmenite" + 6:TiO₂ + Quartz 27:Apatite 7:TiO₂ 8:Apatite 9:TiO₂ + Chlorite 30:"Ilmenite" 10:Pyrite 11:Tourmaline 12:Ilmenite 13:TiO₂ + 14:Ilmenite 15:Pyrite 16:Biotite 17:TiO₂ 18:TiO₂ + 19:Quartz 20:Quartz

22:"Ilmenite" 23:Ilmenite 24:Tourmaline 25:Pyrite 26:"Ilmenite" + 28:Spinel 29:Quartz 31:TiO₂ + 32:Quartz 33:Pyrite 34:Quartz 35:Zircon

Figure A10.30: Sable Island O-47 (1886.47 m) (SEM) site 20 (Table A10.1)

Sample	Site	Mineral	SiO2	TiO2	AI203	MnO	MgO	CaO	Na2O	K20	P205	SO3	ш	CI	Sc203	V205	Cr203	NiO	CuO ZnO	As203	SrO	Y203	ZrO2	Nb2O5 Aq2O	La203	Ce2O3	Pr203	Nd2O3	Sm203	Gd2O3	Dy203	Er203	Hf02	WO3	ThO2	Total Actual Total
1886.47	1	1 Zrn	30.84					_															69.16													100 118
1886.47	1	2 Zrn 3 Pv	30.98		28	.88						71.12											69.02							-	_					100 120
1886.47	1	4 Py		0.24	28	.30						71.46																								100 218
1886.47	1	5 llm		46.44	50	0.42 1.	57 1.5	6												_					-											100 101
1886.47	1	7 "llm"		52.45	0.62 3	.58 1.	01 2.8	5									-														-					100 105
1886.47	1	8 llm		52.31	45	i.45 0.	45 1.8	0																												100 101
1886.47	1	9 TiO ₂ +	0.07	92.70	2.24	.96	05	0.35	0.48		1.27														_						_					100 88
1886.47	1 1		0.67	97 72	3	.68 1.	.05	-									-										_				-	_				100 98
1886.47	1 1	2 TiO ₂ +	0.89	92.52	2.18	.34		0.52	2		1.56																									100 87
1886.47	1 1	3 TiO ₂ +	0.68	92.13	2.44	.35		0.58			1.25						0.58																			100 97
1886.47	1 1	4 "llm" +	1.09	69.28	1.01 23	.54 0.	47 3.9	2 0.39											0.3	0																100 88
1886.47	1 1	5 TiO ₂ +	0.56	96.93	1.22	.29	0.5	6		1.25																					-					100 101
1886.47	1 1	7 Bt	38.42	1.53	14.29 19		10 11.2	9		6.56			3.13				-										_				-					96 108
1886.47	1 1	8 Chl	24.11	0.77	21.85 30	0.06 0.	50 7.7	1																												85 97
1886.47	1 1	9 Tur	38.75	0.52	31.50 6	i.81	6.9	2 0.18	2.32							_									-						-		_			87 100
1886.47	1 2	1 Tur	38.28	1.05	32.88	.69	6.5	2 0.44	2.15																											87 97
1886.47	1 2	2 Qz	100.00	0.24	27.95 41	20		7	0.00	0.22		0.70	2.40							_	-	+			-						_			0.76		100 117
1886.47	1 2	24 Py	0.21	0.24	21.05 13	.23	0.9	1	0.98	0.23		71.32	3.49																					0.70		100 212
1886.47	1 2	25 "Ilm" +	1.67	79.79	1.69 14	.56 0.	50	0.46	0.44		0.89																									100 86
1886.47	1 2	26 TiO ₂ +	2.82	88.25	4.98	.95	05 0.7		0.07		1.00																									100 92
1886.47	1 2	27 Chi 28 Pv	24.75		21.84 30	0.04	65 6.7	0	0.67			70.96																								100 220
1886.47	1 2	29 Qz +	80.17	1.37	11.23	.98	0.9	4	1.25	1.06																										100 104
1886.47	1 3	10 TiO ₂	00.00	98.79	44.00 47	.21	22 6.2	4	4.50				6.24							_						_										100 92
1886.47	1 3	32 llm + Qz	48.71	29.51	14.96 1.	0.41 1.	.32 0.3	4	1.55				0.31																							100 109
1886.47	2	1 Zrn	31.37																				68.63													100 120
1886.47	2	2 Zrn 3 Pv+	30.63	0.45	1.51 4	11		-	1 37			11 72	1.57	0.63						_			67.79											2.01		100 116
1886.47	2	4 Bt +	44.90	1.05	25.82 19	.99	3.6	6	0.62	2.53		1.43	7.12	0.05																				2.01		100 89
1886.47	2	5 Qz	99.59	50.74	(0.41		-																							_					100 119
1886.47	2	6 IIM 7 IIm		50.74	40	i.29 i.12 0.	56 1.5	0									-				-						_				-					100 104
1886.47	2	8 Sd + ?	2.71	0.79	2.06 93	.01 1.	43																													100 61
1886.47	2	9 TiO ₂ +	1.16	93.28	1.57 2	2.67	0.6	0.46	i	4.40	0.86									_	_															100 93
1886.47	2 1	1 "llm"	0.30	88.58	0.04 10	.42	0.0	0		1.12																				-						100 105
1886.47	2 1	2 TiO ₂ +	0.90	90.83	2.07 4	.50		0.64			1.07																									100 83
1886.47	2 1	3 Mix	9.34	77.84	7.47	.36	60 1 1	•		0.81	1.04		2.15							_					-											100 93
1886.47	2 1	5 Chl +	52.17	0.79	20.95 20	0.26	2.0	2	0.74	1.87		0.91		0.29																						100 66
1886.47	2 1	6 Spl		0.69	31.25 20	1.72	12.4	2									34.91																			100 105
1886.47	2 1	/ IIU ₂ +	1.14	92.07	2.30 2	:.52		0.69			1.27					-+				_	_				-					\vdash	-					100 90
1886.47	2 1	9 Tur	37.35	0.90	31.99	.69	6.2	7 1.14	1.67																											87 97
1886.47	2 2	20 Chr		0.41	29.80 13	.30	14.1	8							\vdash	[·	42.32	— T		_		+			-					— I						100 105
1886.47	2 2	22 "Ilm"		61.37	0.45 35	0.04 0.	52 2.6	1	1												+				+					\vdash						100 99
1886.47	2 2	23 "Ilm"	0.63	72.31	25	.82 1.	24																													100 99
1886.47	2 2	24 Bt	36.50	2.76	14.78 18	0.37 0.	64 9.9	6	0.46	7.03			5.49				-			_		+			-						-					96 112
1886.47	2 2	26 Kfs	66.14	54.57	17.75	.54		0.42	0.51	15.61																										100 83
1886.47	2 2	27 Py		0.27	28	.57						71.16								_					_											100 222
1886.47	2 2	28 Chloritized Bt	37.33	2.48	19.47 29	1.84	8.1	5 0.40	0.82	1.50	1.09													2.50							-					100 87
1886.47	2 3	30 Chl +	44.11	0.63	25.41 2	.24	3.9	4	2.67	1.96	1.90									_				3.39							-					100 92
1886.47	2 3	31 TiO ₂		100.00																																100 102
1886.47	23	32 Qz +	90.13	7.35	0.52	14	_	+	+											_					+						-					100 118
1886.47	2 3	34 llm	0.04	52.71	0.02	.14	51 3.0	1	<u> </u>						\vdash	_				-	+				-					\vdash	-					100 103
1886.47	2 3	35 Qz	99.62		0	.38																														100 120
1886.47	2 3	86 Sd		0.48	52	2.63 0.	64 0.7	6	+			0.95		0.54						_	-				+						_					56 62
1886.47	2.1	1 "llm"		<u>65.8</u> 2	34	.18																														100 90
1886.47	2.1	2 "llm"	0.05	93.44	6	56																								ļ	_					100 82
1886.47	2.1 2.1	4 "llm"	0.65	91.98 73.71	0.55 25	.30 0.	44																													100 81

Sample	Site	Mineral	SiO2	TiO2	AI203	FeO	Oum	MgO	CaO	Na2O	K20	P205	SO3	L	C	Sc203	V205	Cr203	NO	CuO	ZnO	As203	D's	Y203	ZrO2	Nb2O5	Ag2O	La203	200	PIZO3		Sm203	90702	Dy203	Er203	Hf02	W03	ThO2	Pt02 Total	Actual Total
1886.47	2.1	5 "llm"		72.79		26.44	0.77																										_						100	85
1886.47	2.1	5 110 ₂ +	0.69	91.96	2.12	2.93			0.42	0.57		1.31											_				_						_	_					100	70
1886.47	2.1	$1 \text{ Cbl} + \text{TiO}_2$	4.02	38 30	4.30	20.82		4 31	0.32	0.03		1.12				-		_				-	-			-	-		_		-	-	-	-	-		-		100	73
1886.47	3	2 TiQ ₂ +	0.65	94.43	1.75	1.54		4.51	0.41	0.71		1.22					_														-	-			_				100	92
1886.47	3	3 TiO ₂ + ?	3.69	83.87	3.22	6.04			0.58	0.65		1.31					(0.65																					100	77
1886.47	3	4 "lim"	1.02	78.17	2.33	17.74		0.74																															100	94
1886.47	3	5 "llm" +	3.80	80.02	3.32	12.49			0.37				70.20					_				_	_			_	_		_	_	_	_	_	_					100	57
1886.47	3	7 Chloritized Bt	36.93	1.71	20.07	30.24		7.06	0.44	0.52	3.03		10.30																										100	94
1886.47	3	8 Sd	0.78	0.82		51.52	0.80		1.41			0.67																											56	61
1886.47	3 1	9 Qz	99.35	50.66	0.43	6 35		0.43			0.21			2 38				-				_					-		_		-	_	-	-	_				100	122
1886.47	3 1	1 TiO ₂ +	1.27	92.93	2.55	1.66		0.10	0.30		0.10	1.29		2.00																									100	96
1886.47	3 1	2 Py		0.26		28.29							71.46																										100	223
1886.47	3 1	3 Chi	31.95	1.15	17.78	27.40		6.02		0.71																	_						_	_					85	61
1886.47	3 1	4 110 ₂ 5 "Kfs" ?	72.02	97.29	18.01	1.60		0.97		0.52	4.84			1.71				_				-	_			-	_		_		-	-	-	-			-		100	104
1886.47	3 1	6 TiO ₂ +	4.12	91.10	2.58	2.21																																	100	89
1886.47	3 1	7 TiO ₂ +	1.83	92.15	2.30	3.72																																	100	78
1886.47	3 1	8 Qz +	95.63	0.32	2.23	0.77		2.01	0.20		1.05	0.07						_			0.40	_	_			_	_		_	_	_	_	_	_					100	117
1886.47	3 2	9 Mnz +	9.84	/1.00	1.94	0.80		2.01	0.34			29.49		1.40				-0	0.17		0.12						1	7.52 31	.06	7	76								100	102
1886.47	3 2	1 Ap				0.64			47.45			43.61		6.60	0.51																						1.20		100	118
1886.47	3 2	2 "IIm" + 3 Mix	12.12	71.10	6.19	8.53		8.08	0.44	0.76	0.33	1.29				_							_			-	_					_	-	_					100	80
1886.47	3 2	4 TiO ₂ +	0.65	94.76	0.84	2.33		0.00	0.32	0.59							(0.51																					100	86
1886.47	3 2	5 llm +	13.10	58.54	9.98	16.96		1.42																															100	76
1886.47	3 2	6 Chl	25.32	0.54	20.58	28.41	0.59	9.56										_				_	_			_	_		_	_	_	_	_	_	_				85	89
1886.47	3 2	8 "llm"		62.19		36.59	0.85	0.74																															100	96
1886.47	3 2	9 Qz +	92.73	6.95		0.31																																	100	118
1886.47	3 3	0 Py +	7.54	0.57	5.03	40.40	0.35	0.60	0.29				45.56			_		_				_	-			_	_		_	-	_	_	_	-					100	125
1886.47	3 3	2 Py	20.00	0.40	0.31	36.83	0.55	2.10					60.92																								1.52		100	156
1886.47	3 3	3 Qz +	93.91		4 77	1.02			0.56		4.00	07.00		4.51		_		_					_	24.07		_					_	-	05 0						100	105
1886.47	3 3	4 Xtm + Qz 5 Bt +	20.21	3.53	4.77	20.10	0.52	9.33	0.69	0.66	6.98	27.20		6.40				_				-	3	31.27		-	_		_			2.	35 3	5.39 2	2.89				100	81
1886.47	3 3	6 llm		52.12		41.86	6.02																																100	100
1886.47	3 3	7 Py		0.44		28.37	0.67	2.00					71.19			_	_	_				_				_	_		_	_	_	_	_	-	_				100	221
1886.47	3 3			95.14		4.86	0.07	2.00									_														-	-			_				100	93
1886.47	3 4	0 "Ilm"	1.47	73.20	0.67	24.66																																	100	92
1886.47	3 4	1 llm	52.05	50.46	25.20	47.73	0.84	0.97		0.00	2.62		4.24	2.40									_																100	99
1886.47	3 4	2 IVIX 3 Pv	53.05	0.30	25.30	28.12		0.91		0.60	3.03		71.58	2.10																									100	217
1886.47	3 4	4 Chloritized Bt	40.19	1.98	21.96	25.17		6.42		0.53	3.75																												100	88
1886.47	3.1	1 Chl + TiO ₂	32.00	10.64	21.82	31.65		3.11		0.78													_				_			_	_		_						100	46
1886.47	3.1	2 1102 +	0.80	93.00	3.14	1.28			0.35			1.42			\vdash								_							_		_	_	-					100	86
1886.47	3.1	4 Chl + TiO ₂	28.09	93.03	2.20	32.12		2.65	0.40	0.88		1.12			\vdash					-				-									-			_			100	43
1886.47	3.1	5 TiO ₂ +	1.26	93.32	1.70	2.99		2.00		0.00		0.73									-			-								+							100	78
1886.47	3.1	6 Chl + Ms	39.35	1.49	26.09	27.33		3.27			2.46																												100	72
1886.47	3.1	7 "llm"	0.54	75.47	1.60	23.98			0.50			1 42						0.06				_	_							_		_	_						100	83
1886.47	3.2	7 TiO ₂ + Chl +	17 90	91.95 38.41	1.69	23.54		1.60	0.50	1.51	0.27	1.43	1 16	4.69				0.96			-+									_	_								100	/0
1886.47	3.2	3 TiO ₂ +	0,98	91.10	2.14	2.40		1.00	0.66	1.91	0.21	1.57	1.10	09			1	1.14			-												-		-				100	84
1886.47	3.2	4 TiO ₂ +	1.84	89.42	2.52	4.05			0.68			1.50																											100	77
1886.47	3.2	5 Qz	99.63	0.37																																			100	107
1886.47	3.2	6 Chl + Ms	37.87	1.16	20.17	28.97		1.66	0.07	1.32	1.50	4.40		3.72		_		0.74				_				-	-	_	_		_	_	-	-	_		3.61		100	62
1886.47	3.2	B Qz	99.09	0.09	3.03	4./4			0.07	0.53		1.40			\vdash			0.71			+																		100	184
1886.47	3.2	9 Chl + Bt	37.82	3.05	25.10	30.71		2.74			0.58																												100	39
1886.47	3.3	1 llm 2 Chi +	38.00	55.91	26.20	40.13	3.96	3 1 1			0.00							_											-+	_		_	-			_			100	89
1886.47	3.3	3 llm	0.59	56.15	20.20	39.13	4.13	3.11			0.90																												100	83
1886.47	3.3	4 llm + Chl	10.35	50.87	8.26	27.09	2.59	0.84									_																T		_				100	81
1886.47	3.3	5 "lim" + 6 Pv +	2.41	86.14	2.70	7.17			0.51			1.07	70 73		\vdash			_				_	_	-					_		_		-						100	81
1886.47	3.3	7 Chl +	39.00	1.55	25.54	30.26		2.91			0.75		.0.73																										100	38
1886.47	3.3	B Qz	99.70			0.30	T			4.05			70.0.		— F	_				T	[T					-			-+		_					100	106
1886.47	3.4	UPV	1			28.28				1.08			/0.64																										100	191

Sample	Site	Position	Mineral	SiO2	TiO2	AI203	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	F	CI	Sc203	V205	Cr203	NiO	CuO	ZnO	As203	Y203	ZrO2	Nb2O5	Ag2O	La203	Ce2O3	Pr203	Nd2O3	Sm203	Gd2O3	Dy203	Er203	HfO2	WO3	ThO2	Pt02 Total	Actual Total
1886.47	3.4	2	Chl + Bt	37.76	1.64	19.61	30.41		7.58			3.00																											100	82
1886.47	3.4	3	Kfs Chi i Dt	66.13	0.50	17.92	0.84		2.50		4.05	15.11		5.00										_															100	102
1886.47	3.4	4	Chi + Bt	37.76	0.52	23.97	28.37		2.59		1.25	0.59		0.67										-													5.05		100	70
1886.47	3.4	6	Chl + Bt	37.81	1.98	19.25	30.03		7.41		0.46	3.05		0.07																							5.05		100	84
1886.47	3.4	7	Py				28.77							71.23																									100	195
1886.47	3.4	8	Py +	0.59	0.24	0.50	27.86							70.81																									100	193
1886.47	3.4	9	Py +	0.32	0.26	0.76	29.96							69.46										_															100	182
1886.47	3.4	10	Feony +	1.83	0.60	0.76	89.55							7.26			_	-						-	-														100	07
1886.47	3.5	2	07	98.64	100.00	0.86	0.31					0.19						-						_															100	106
1886.47	3.5	3	Qz +	96.42		1.86	1.43					0.29																											100	97
1886.47	3.5	4	Chl + Ms ?	45.72	1.44	26.98	14.53		7.41		0.97	0.28			2.67																								100	67
1886.47	3.5	5	TiO ₂ +	4.55	88.46	2.80	3.27		0.92																														100	90
1886.47	3.5	6	Ms + Chl	51.40	1.32	27.76	7.11		2.87		0.60	6.57			2.37									_	_														100	89
1886.47	3.6	1	KIS Me + Chi	47.56	0.82	23.62	1.05		1.80		1 17	3.58	1.02		3.53																								100	69
1886.47	3.6	3	"llm"	0.58	61.63	23.02	35.28	2.51	1.09		1.17	3.50	1.02		3.55																								100	88
1886.47	3.6	4	TiO ₂ +	0.74	94.47	1.49	2.49						0.82																										100	76
1886.47	3.6	5	Qz + Ms + Chl	80.59	1.17	10.69	2.72		1.84			3.00																											100	101
1886.47	3.7	1	Qz + Chl +	83.69	0.49	7.89	4.16		0.57		2.76	0.44																											100	97
1886.47	3.7	2	Qz "llm"	99.62	0.38		24.11	1 92																-															100	87
1886.47	3.7	4	"llm" +	11.20	66.29	7.41	11.35	1.02	2.20	0.64			0.91											-															100	76
1886.47	3.7	5	llm		55.23		42.64	2.13					0.0.																										100	90
1886.47	3.7	6	"llm"		62.95		35.52	1.52																															100	87
1886.47	3.7	7	Mix	55.08	13.90	13.97	14.04	0.40	1.78	0.00	0.45	0.78												_															100	80
1886.47	3.7	8	IIM + Chi Pv	12.68	50.91	8.30	24.31	0.49	2.28	0.39	0.64			70.91			-	-						-															100	183
1886.47	3.8	2	Chl +	34.63	3.23	24.44	34.61		3.08					70.51	_																								100	48
1886.47	3.8	3	TiO ₂ +	1.30	92.29	2.03	2.53			0.49			1.36																										100	79
1886.47	3.8	4	Chl + Ms	35.98	2.65	24.44	32.72		3.08			1.14																											100	62
1886.47	3.8	5	TiO ₂ +		94.15	1.94	2.16			0.57			1.18																										100	81
1886.47	4	1	Grt	38.63	0.64	20.45	11.35	26.90		2.03				74.40										_															100	105
1886.47	4	2	Ab	68.92	0.21	18.80	28.69				11.80			71.10										-															100	112
1886.47	4	4	Chl	25.26		20.25	32.45		7.04		11.00																												85	93
1886.47	4	5	Sd +	1.89	0.93		83.52	0.98	1.13	0.65				2.66		1.66						0.62															5.96		100	65
1886.47	4	6	Qz	100.00																				_															100	114
1886.47	4	/	"IIM" +	6.12	75.35	3.31	13.91	1.20	0.87	0.44							_	-						-															100	80
1886.47	4	9	Sd		0.46		51.58	2.55		0.52			0.90																										56	58
1886.47	4	10	"llm"		63.71	0.67	32.26	0.55	2.81																														100	99
1886.47	4	11	TiO ₂		100.00																																		100	103
1886.47	4	12	"llm" +	6.70	70.15	4.17	17.15	0.98	0.84															_	_														100	75
1886.47	4	14	50 + "llm"	12.30	1.64	1.38	10.52	_	2.86	0.80	0.76	0.73	1.19	1.57		0.46	-																						100	- /1
1886.47	4	15	TiO ₂	1.00	99.58	1.50	0.42						0.00																										100	104
1886.47	4	16	llm		53.24		42.00	0.49	4.27																														100	102
1886.47	4	17	TiO ₂		100.00																																		100	102
1886.47	4	18	TiO ₂		99.30		0.70																																100	101
1886.47	4	19	Kfs	65.61	1.29	17.29	04.40	0.50				15.82												_															100	110
1886.47	4	20	llm + Qz	20.27	54.95	0.61	24.19	0.59																-			_												100	106
1886.47	4	22	Chloritized Bt	35.92	1.07	24.37	34.98		2.68			0.99																											100	64
1886.47	4	23	llm		52.04		44.79	0.64	2.53																														100	97
1886.47	4	24	Py		1.30		28.08							70.63																									100	207
1886.47	4	25	TiO ₂	0.65	98.19		1.16																																100	99
1886.47	4	26		20.20	56.03	10.00	41.44	2.53	2.02			0.47					-	-						-			-												100	97
1000.47	4	20		20.29	34.14	1.67	20.00	0.69	3.02	0.20		2.17																											100	92
1000.47	4	20	TiO 102 F	1.00	100.00	1.07	9.15	_		0.29							-							-															100	92
1886.47	4	29	TiO ₂		00.00		0.61										-										_												100	99
1886.47	4	31	"llm"		63.17		34.35	2.48									-																						100	91
1886.47	4	32	"llm"	1.27	78.99	1.80	17.16	0.77																															100	91
1886.47	4	33	Qz	100.00																																			100	113
1886.47	4	34	IIO ₂ + Chl	34.58	26.54	19.19	13.87	0.01	2.41		0.65	2.76												_	1														100	83
1886.47	4	35	IIM TiO	1.02	58.14	2.15	35.52	6.34		0.40			1.40												-		_								\vdash				100	99
1886.47	4	30	1102 +	1.03	92.47	2.15	2.55	1.02	1.01	0.40			1.40			\vdash									1		_												100	90
1886.47	4	38	llm		60.57		37.47	1.96	1.01								-		-						1														100	96
1886.47	4	39	TiO ₂ + Chl	37.85	17.71	20.46	20.65		1.84			1.49																											100	52

Sample	Site	Mineral	SiO2	TiO2	AI203	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	Ŀ	ō	Sc203	V205	Cr203	NiO	CuO	ZnO	As203	so	Y203	ZrO2	Nb2O5	Ag2O	La203	Ce2O3	Pr203	Nd2O3	Sm203	Gd2O3	Dy203	Er203	H02	W03	ThO2	PtO2 Total	Achial	Total
1886.47	4 4	D TiO ₂	1.49	96.50	0.44	0.71			0.86													_																	10	0 1	102
1886.47	4 4	1 110 ₂ + 2 llm +	0.80	88.29 55.15	2.43	2.57		2.87	0.72		0.61	1.14		4.05																					\rightarrow		-	_	10	10 7	70 43
1886.47	4 4	3 Py		0.92		28.17							70.91																										10	0 2	208
1886.47	4 4	4 TiO ₂ +	0.75	94.04	1.61	2.26			0.36			0.98	70.02																										10	10	78
1886.47	4 4	6 llm		59.07		37.69	0.45	2.79					70.93																										10	0 2	90
1886.47	5	1 llm + 2 "llm" +	0.50	53.80	3.56	44.46	0.53	0.71															_																10	<u>)0 (</u>	93
1886.47	5	3 TiO ₂ +	2.76	89.08	1.42	5.11		0.55	0.35			1.28																											10	00	88
1886.47	5	4 "llm"	0.67	60.49		35.79	3.04																_																10	20 1	95
1886.47	5	6 "Ilm"	0.62	64.32		34.37	0.70																																10	0 1	96
1886.47	5	7 Qz +	72.30	2.81	12.57	7.89		4.00		0.43													_																10	0 1	83
1886.47	5	9 llm		99.12 52.77		45.23	0.53	1.47																															10	1 00	101
1886.47	5 1	0 llm+	0.49	54.60	0.51	40.65	0.71	3.03																															10)0 1	100
1886.47	5 1	1 Py 2 "llm" +	1.16	0.23	1.51	28.89		0.48	0.55	0.52		1.05	70.88					0.45			-	_											_		\rightarrow		-	-	10	<u>02</u> 00	219 94
1886.47	5 1	3 Chr		0.00	15.46	28.08		9.72				4.00	0.00				0.58	46.15																					10	0 1	104
1886.47	5 1	5 Zrn	31.21	0.93		73.89						1.93	0.89												68.79											2	22.36		10	000 1 1000	81 113
1886.47	5 1	6 Qz	100.00																																\square				10	0 1	115
1886.47	5 1	7 1iO ₂ + Qz 8 Pv	0.43	79.80 0.33	0.71	28.59							70.64																						-+				10	20 2	93 204
1886.47	5 1	9 Sd +	4.91	0.88	3.24	88.97							1.36		0.63																								10	00	60
1886.47	5 2	1 llm	40.53	57.42	19.68	24.35 39.63	2.95	11.15	0.54	0.87	1.86					-											_								$ \rightarrow$		-	-	10	00	<u>76</u> 96
1886.47	5 2	2 TiO ₂ +	0.71	93.40	2.01	2.35			0.53			0.99																											10	00	90
1886.47	5 2	3 llm + 4 Sd	3.65	58.72	2.19	34.35	0.56				0.53																								\rightarrow				10	<u>10 9</u>	92 54
1886.47	5 2	5 Chl	27.53	0.55	19.23	26.02	0.00	2.28		1.18	1.27		6.72																										8	5	62
1886.47	52	6 "llm" + 7 "llm"	5.48	73.17	4.76	15.30		0.58	0.71														-												-		_	_	10	10 0	<u>69</u> 92
1886.47	5 2	B Qz + IIm	73.36	17.55	1.48	6.88	0.40				0.34																												10	0 1	109
1886.47	52	9 lm 0 Grt	41.45	55.81	21.87	37.59 23.83	6.60	11.53	0.99												-														-		-		10	<u>10 9</u> 10 1	<u>94</u> 106
1886.47	5 3	1 "lim" +	1.58	77.82	2.29	17.88	0.44																																10	0 0	92
1886.47	53	2 llm 3 Pv	0.20	50.96 0.29		48.33 28.33		0.71					71.17																						-+				10	<u>10 9</u> 10 5	<u>99</u> 211
1886.47	5 3	4 Bt	34.30	1.41	17.12	25.61		7.99		0.72	4.17			4.69																									96	6 (97
1886.47	5 3	6 TiO ₂ +	10.08	1.14 78.28	7.60	30.27	1.01	1.05		0.56								48.28			1.65																_		10	<u>10 9</u>	<u>98</u> 89
1886.47	5 3	7 Kfs	66.60		17.79					0.76	14.84																												10	0 1	112
1886.47	5 3	B TiO ₂ +	0.94	92.21	2.47	2.67		6 1 6	0.48	0.51	5.07	1.23	-																										10	10 1	88
1886.47	5 4	D Py	38.80	0.46	19.57	31.19		0.10		0.51	5.07		67.21																								1.14		10	0 1	127
1886.47	5 4	1 Qz + 2 Mnz + Oz	85.30	0.36	7.56	1.37		0.67		0.37	2.37	26.12		2.00									_				1.62	11 99	24.88		8 68				-				10	10 1	103
1886.47	5 4	3 Mnz	1.43		1.17				0.68		0.41	34.51		-0.11					0.04								1.02	14.73	33.37		10.08							3.67	10	0	94
1886.47	5 4	4 Zrn 5 Mnz +	31.16		9 74	3.87		0.78			0.52	27.23	1.56	0.34											68.84			8 75	22.99		10 17		_		\rightarrow		-	_	10	10 1	117
1886.47	5 4	6 Py			0.1 1	28.58		0.10			0.02		71.42	0.04									ļ					0.10	00		.0.17								10	0 2	211
1886.47	5 4	7 TiO ₂ +	0.68	91.15	2.32	2.14			0.45			1.35	68 51	1.92		-+						_	+										_						10	10	78
1886.47	5 4	9 "llm"		74.19	0.20	24.25	1.56						00.01																										10	0	88
1886.47	6	1 Chloritized Bt 2 Chl	38.94	1.02	22.78	33.85		2.17		1.23					$\left \right $	-					-									-				_	$ \rightarrow$				<u>10</u>	<u>10 f</u>	66 97
1886.47	6	3 llm	30.72	58.09	0.82	38.87	0.47	1.75		2.12																													10	0	98
1886.47	6	4 TiO ₂	0.50	98.69		0.82										_							_												\rightarrow		_	_	10	10 1	103
1886.47	6	6 Bt	34.11	7.78	14.15	<u>∠1.53</u> 16.50		10.65			7.09			5.73																									10 9/	<u>6</u>	94 22
1886.47	6	7 TiO ₂		96.45	1.01	2.24			0.29					0.07		_			0.05				Ţ								44.05				\dashv			$-\top$	10	00	86
1886.47	6	9 Chl	38.28	0.80	28.32	11.50		0.96	4.91	0.43		30.02		2.07					-0.03				+					23.91	20.01		11.28						1.82		10	<u>10 9</u> 5 1	<u>97</u> 101
1886.47	6 1	D TiO ₂ +	1.07	91.40	2.48	2.96			0.79			1.29																											10)0	96
1886.47	6 1	1 TiO ₂ +	3.47	92.68	1.42	2.43										_							_												\rightarrow				10	10 !	98
1886.47	6 1	2 942 3 Py	0.29	0.35	0.24	33.24				0.58			64.47																								0.83		10	1 00	195
1886.47	6 1	4 Py	30.81	0.37		22.57							53.33		\vdash					23.73			-		66 55								_		-	1.47		_	10	10 1	193
1886.47	6 1	6 Py	1.77	0.62	1.35	32.46				0.41			63.39												00.00											1.47			10	1 00	182
1886.47	6 1	7 Pv		0.34		28.49							71.18																										10	0 2	214

Sample	Site	Position	Si02	Ti02	AI2O3	FeO	MnO	OĝM	CaO	Na2O	K20	P205	SO3	Ŀ	ū	Sc203	V205	Cr203	NiO	CuO	ZnO	As203	sro	Y203	ZrO2	Nb2O5	Ag2O	La203	Ce2O3	Pr203	Nd2O3	Sm203	Gd2O3	Dy203	Er203	HfO2	W03	ThO2	Pt02	Actual	Total
1886.47	6	18 Py				28.47							71.53																										10	<u>)0 2</u>	212
1886.47	6		27.02	99.16	10.70	0.84		7.00			0.50												_																10	30 8	83
1886.47	6	20 110 ₂ + Chi 21 "llm"	27.02	20.00	0.54	28.25	0.58	1.20			0.56												-				-												10	00 .	94 91
1886.47	6	22 llm		53.46	1	41.81	0.75	3.97																															10	00 1	101
1886.47	6	23 "Ilm"		60.71		31.82	6.13	1.34																															10	<u>JO 1</u>	104
1886.47	6	24 TiO ₂ +	0.77	88.68	0.77	9.78																			00.00											4.00			10	30 00	89
1886.47	6	25 ZIII 26 TiO.	0.88	0.04	0.45	0.75											_				_				00.99		-		_	-			_			1.03			10	00 1	104
1886.47	6	27 "llm" +	0.00	70.09	0.57	21.07	3.35		3.76												1.16								-										1(00 1	101
1886.47	6	28 "Ilm"	0.66	69.19)	28.66	1.48																																10	00 !	94
1886.47	6	29 TiO ₂ +	1.12	91.56	2.70	1.92			0.78			1.35						0.57																					10)0 9	94
1886.47	6	30 Chr 31 Oz	00.32	0.63	0.68	23.75		7.24										62.83									_						-							00 1	104
1886.47	6	32 Sd +	7.50	1.25	5.20	59.11		1.75													1.73																23.45		1(00	52
1886.47	6	33 "llm" +	0.87	79.35	1.18	15.64		1.76	0.29			0.91																											10	<u>)0</u>	93
1886.47	7	1 Py	0.37	0.71	14.46	28.53	0.40	7 41			7.02		70.39	2.00																									10	<u>)0 2</u>	210 106
1886.47	7	3 Chloritized Bt	36.56	2.28	20.43	31.01	0.45	6.10			3.62			5.00																									1(00	98
1886.47	7	4 llm		52.52	2	43.42	0.88	3.18																															10	JO 1	101
1886.47	7	5 Py 6 Chloritized Pt	20.60	1.67	20.22	28.54		7.04		1 1 1	2.01		71.46																										10	<u>)0 2</u>	214
1886.47	7	7 Bt	36.33	2.75	17.66	27.53	0.42	5.25		0.48	5.58																												- 9	16 1	102
1886.47	7	8 llm +	4.31	58.35	2.28	32.84	2.23																																10	30 9	90
1886.47	7	9 Qz	97.84	0.31	1.52	1.85					\vdash			2.52	-						0.05		-				_						_				_	-	10	<u>)0 1</u>	118
1886.47	7	10 110 ₂ + 11 Pv	2.40	92.20	0.30	35.28							63.42	2.53							0.05																		10	00 1	183
1886.47	7	12 TiO ₂ +	3.01	86.93	3.52	5.14			0.55			0.85	00.12																										1(00 1	92
1886.47	7	13 TiO ₂ +	0.85	88.74	1.04	8.93	0.44																																10	00 9	93
1886.47	7	14 TiO ₂ +	0.80	92.34	3.28	1.92			0.53			1.12																											10	00 !	98
1886.47	7	15 "llm"		60.38	1	37.93	1.69																_																10	<u>)0</u>	99
1886.47	7	16 TiO ₂	0.87	96.47	0.57	2.09		6.60	0.07	2.04				4.00									_																10)0 1	103
1886.47	7	18 Chloritized Bt	31.25	0.63	19.43	37.25		6.51	0.32	2.01				3.77													_						_						- 0	00	99
1886.47	7	19 "llm"		65.17		33.47	1.36		0.02	0.00																													10	00	99
1886.47	7	20 llm		58.41		39.69	0.64	1.26															_																10	20 9	98
1886.47	7	21 IIO ₂	0.65	99.35		35.20	1 30															_	-																10	00 1	95
1886.47	7	23 Bt	38.53	2.42	20.53	23.43	1.55	5.55		0.71	4.84																												9	6	89
1886.47	7	24 TiO ₂ + Qz	24.90	74.30	0.43	0.37																																	10	JO 1	105
1886.47	7	25 "llm"		74.64	0.83	23.72	0.81																																10	<u>)0 (</u>	96
1886.47	7	26 1iO ₂ +	5.32	85.79	4.40	3.98			0.50																														10	00 1	76
1886.47	7	27 110 ₂ 28 07 +	81.89	90.14	14 10	2.60				0.48	2.65												-																10	00 1	104
1886.47	7	29 "Ilm" +	2.39	67.79	3.48	25.58				0.10	2.00		0.77																										10	00	91
1886.47	7	30 "Ilm"		66.75		32.71	0.54																																10	30 1	86
1886.47	7	31 Sd 32 Kin +	/0.30	0.72	36.95	50.54	4.74	0.50		0.80				4 10									-															-	10	6	57 02
1886.47	7	33 Mix	34.06	26.14	23.23	13.11	1.45	0.64		0.48	0.89			4.10																									1(00	64
1886.47	7	34 Qz	100.00	4 - 4	\vdash	62.47				4.50	\vdash		2.20		0.70	\vdash							_						_								20.64		10	<u>J0 1</u>	116
1886.47	7	36 Pv + Bt	19.33	0.65	15.04	33.50		1.22		2.21	\vdash		2.26	5.30	0.28							-	-										_				2.80	-	10	00 0	<u>90</u>
1886.47	7	37 Py	. 3.33	0.59	10.04	29.69							69.71	0.00	0.20																						2.00		1(00 1	173
1886.47	7	38 Py	0.60		0.42	29.24							69.74			\vdash							Ţ																10	200	209
1886.47	8	1 llm		50.77	0.29	29.60	0.59	0.87					70.11																										10	00 2	<u>209</u> 99
1886.47	8	2 Mnz +	6.12	7.21	4.27	4.26	0.00	0.01				26.72		0.38					0.06									13.72 2	8.56		8.70								10	00 0	85
1886.47	8	3 llm +		52.78		40.37	0.67	6.18																															10	20 90	99
1886.47	8	4 lim	4 70	52.68	4 74	43.56	0.57	3.19	0.44			1.02																										-	10	00 1	101
1886.47	8	6 Qz +	75.07	0.44	14.12	6.12		1.43	0.44	0.58	2.23	1.02											-										_						10	00 1	102
1886.47	8	7 llm	0.58	52.08		44.14	3.20			2.20																													10	00 1	101
1886.47	8	8 llm	80.25	52.14	-	45.95	0.52	1.39								\vdash							_																10	00 1	103
1886.47	8	3 42 + 10 TiO	05.25	95.81	0.57	0.34					\vdash				-								-			\vdash						-						-	10	00 1	96
1886.47	8	11 llm	5.55	54.96	5.57	41.73	0.63	2.67																				<u> </u>											1(00 1	103
1886.47	8	12 Qz	100.00																																				10	00 1	119
1886.47	8	13 Zrn + 14 Chloritized Bt	35.93	2 16	8.99	1.26		0.64	0.70	0.50	2.62					0.42							+		49.45		_												10	00	99 80
1886.47	8	15 Kfs	59.99	0.61	17.50	2.40		0.47		0.34	14.96		1.81	1.93									+																1(20 00	95
1886.47	8	16 llm		53.05	i i	39.08	7.87																																10	20 .	96
1886.47	8	17 llm	0.07	57.48	0.00	41.87	0.65								-																								10	20 90	94
1886.47	ö	101 11111 +	8.07	02.42	0.69	21.68		1.14							1																								110	JU	10

Sample	Site Position	Mineral	SiO2	TiO2	AI2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	S03	ш	CI	Sc203	V205	Cr203	NiO	CuO ZnO	As203	SrO	Y203	ZrO2	Nb2O5	NJ4 U	La203 Ce203	0000	Nd2O3		Sm203	602/03	Dy203	Er203	W03	ThO2	PtO2	Total	Actual Total
1886.47	8 19) "llm"	1.16	63.49	1.55	33.81																															1	00	59
1886.47	8 20) Zrn	28.90	CC 00	4.44	0.41	0.57			0.61				5.02			_							65.06		-		_	-	_	_	_	_			-	1	.00	121
1886.47	8 22	2 llm	1.20	48.27	1.44	47.10	4.64																													+ +	1	100	96
1886.47	8 23	3 Chl	24.94	1.49	15.04	35.67		4.49		0.70	1.67		0.81		0.21																							85	87
1886.47	8 24	1 Qz	100.00																							_				_							1	00	116
1886.47	8 25	5 Py	0.24	0.66	0.27	30.53				0.43			68.14		0.54											-				_					2.2	2	1	100	199
1886.47	8 27	7 Ap		0.41	0.57	0.38			46.75	0.82		41.75	1.15	7.92	0.54																				1.2	4	1	100	110
1886.47	8 28	3 Chloritized Bt	38.46	1.76	21.83	27.60		6.23		0.63	3.48																										1	.00	90
1886.47	8 29	Ap	0.75	70.00	0.70	00.00			48.96			44.43		6.61												_				_					_		1	00	120
1886.47	8 31	Sol	0.75	0.48	38.01	15.90		16.03									2	29.58																		+ +	1	100	104
1886.47	8 32	2 Tur	37.01	1.03	29.21	7.00		7.66	0.77	2.18				2.14																							5	87	96
1886.47	9 1	Zrn	29.42	04.40		0.85	0.00		1.61															68.12		_				_					_		1	00	87
1886.47	9 4	3 TiO. +	2.06	88 38	3.24	3 58	0.00		0.71			1 4 2						0.62																		+ +	1	100	87
1886.47	9 4	1 Qz	100.00	00.00	0.21	0.00			0.71									0.02																			1	100	110
1886.47	9 5	5 llm		51.24		45.02	3.74																														1	.00	95
1886.47	9 6	3 "llm" +	2.03	85.08	1.71	10.72			0.46				74.05													_			_	_	_						1	00	47
1886.47	9 8	3 Chl	35.70		25.45	21.14	-	2.71					11.35						+		1					+				+		+					1	85	<u>200</u> 77
1886.47	9 9) IIm		53.92		42.25	0.69	3.14																													1	00	98
1886.47	9 10	Chloritized Bt	37.46	1.65	20.07	24.44		6.37		0.70	3.89		7.00	5.42				_			-							_	_	_				_	_	+	1	.00	95
1886.47	9 12	Pv	32.88	1.53	10.20	28.45	-	4.94		0.64	3.53		71.55						+			1 1				+			+	+	+	+			+		1	100	207
1886.47	9 13	3 Py		0.27		28.52							71.21																								1	.00	213
1886.47	9 14	1 llm +	13.73	51.92	11.84	18.92		1.68				0.95	0.97													_					_						1	00	67
1886.47	9 16	S Chl	29.56		20.35	26.29		2.24		1.29	0.94		4.32						-																		- 1	85	63
1886.47	9 17	Zrn	31.68		1.12	0.86																		66.34													1	00	101
1886.47	9 18	3 "llm" +	1.93	69.78	1.19	25.63	1.47		0.70			00.44	0.00	0.04															-								1	00	93
1886.47	9 19	Pv	11.58		7.83	2.11			2.72			29.44	2.63	-0.91					-						2	84 1	0.22 23.	39		57							1	00	216
1886.47	9 21	Py + ?	15.72	0.86	10.28	43.83		0.84		2.40	0.99		19.47		0.53																				5.0	8	1	00	75
1886.47	9 22	2 Qz	97.45	0.53	1.56						0.45															_											1	00	113
1886.47	9 23	3 110 ₂	31.03	97.20		2.03											_	_						68 97						-			_				1	100	92
1886.47	9 25	5 Qz	100.00																					00.37													1	100	114
1886.47	9 26	6 TiO ₂ + Qz	23.75	73.10	2.65						0.50																										1	00	110
1886.47	9 27	Chl	27.53	0.91	20.35	32.32	2.09	3.89									_	_	_										_	_			_	_	-			35	49
1886.47	9 29	9 Zrn	31.24	0.48	0.47	51.05	5.00																	68.28													1	100	112
1886.47	9 30) Qz	100.00															_												_					_	_	1	00	112
1886.47	9 31	Chl	28.25	0.48	17.44	25.83	0.39	12.18		0.43																-				_	_	_	_					35	90
1886.47	9 32	2 110 ₂		55.78		41.62	0.61	1.99									_	-								-			-	_	-		-	_	-		1	100	88
1886.47	9 34	1 Mix	50.50	0.67	21.66	18.39		2.85		0.90	3.30																								1.7	3	1	00	74
1886.47	9 35	Zrn	30.50	0.50	0.55	0.47		0.00			0.07		05.74							0.04				69.02		_			_	_	_		_	_			1	00	116
1886.47	9 30	Tur	42.02	0.58	0.55	23.53		0.98	1.50	2.29	0.27		25.74	1.88				0.41		0.34	-					+		+		+		+			+	+		87	90
1886.47	9 38	3 Py		0.31		28.99				0			70.71																								1	00	218
1886.47	9 39	Kfs	65.94	· ·	17.59	0.47				0.47	15.52		74.00				_					+				+			_	+		+		_	_	+	1	00	112
1886.47	10 1	2 Chl	31.48	0.31	16.24	28.32		3.78		0.82	0.99		/1.08			\vdash			+		1	+				+		-	+	+	+	+				+	-	85	<u>∠∪5</u> 81
1886.47	10 3	3 Py	00		10.24	29.54		0.70		0.02	0.00		70.46																								1	00	203
1886.47	10 4	1 "Ilm"	0.75	72.04	0.95	25.61		0.66							\square							+ - 1								_	-+					+	1	00	85
1886.47	10 5	110 ₂ + Qz	21.88	70.65	5.01	0.38			0.64		\vdash	0.90					-	U.//			-	+				-				_	_	-	-			+	1	100	107
1886.47	10 0	7 Pv	5.21	79.65	5.01	34.37			0.04			0.69	64.09					-								-									11	4	1	100	169
1886.47	10 8	3 "llm" +	6.85	61.58	4.97	26.09		0.52																													1	00	83
1886.47	10 9	TiO ₂ + Chl	25.89	24.75	20.62	27.16		1.58																													1	00	82
1886.47	10 10	TiO ₂	00.75	98.89	00.05	1.11	0.07	1.55	0.45												-	$ \downarrow \downarrow$								_						+	1	.00	101
1886.47	10 11		39.76	53.36	20.88	23.51	8.65	4.58	2.12									-+			-					+				+		+			-	+ +	1	00	106 99
1886.47	10 13	3 "Ilm"		79.39		20.02	0.59	0.37																													1	100	88
1886.47	10 14	TiO ₂ +	0.70	93.62	1.02	4.65																															1	00	85
1886.47	10 15	5 llm	0.27	59.10	2 22	33.86	6.42	0.62										_			-					_			_	_	_	_			_	+	1	00	90
1886.47	10 10	TiO ₂	0.27	96.58	0.79	1.66	0.72											-+	-		1					+				+		+	-			+ +	1	100	30
1886.47	10 18	3 TiO ₂	0.07	95.21	0.10	1.18													-		1				3.61	+				+		-				+ +	1	100	96
1886.47	10 19	Py		0.34		28.71							70.96																								1	.00	206
1886.47	10 20) TiO ₂ +	1.51	91.90	2.17	2.87			0.39		I T	1.15										1														1 T	1	00	86

Sample	Site	Position	Mineral	SiO2	TIO2	AI2O3	FeO	MnO	MgO	CaO	Na2O	K2O	P205	SO3	ш	ū	Sc203	V205	Cr203	OIN	CuO	ZnO	As203	Y203	ZrO2	Nb2O5	Ag2O	La2O3	Ce203	Pr203	Nd2O3	Sm203	Gd2O3	Dy203	Er203	Hf02	W03	ThO2	PtO2 Total	Actual Total
1886.47	10	21	TiO ₂	0.63	98.68		0.70																													_			100) 96
1886.47	10	22	TiO ₂ +	1.36	88.44	1.58	8.62	0.95	1 22															_	-			_		_			_	_		_			100) 88
1886.47	10	24	Sd +	2.40	0.57	0.82	43.30 91.45	0.85	1.22					3.19		0.60									+														100) 95
1886.47	10	25	"llm"		65.11		33.79	1.10																															100) 91
1886.47	10	26	TiO ₂ + ?	22.07	56.99	14.48	6.46	4.00	2.00															_	+														100) 69
1886.47	10	28	TiO ₂ +	6.32	82.51	3.84	6.33	1.33	0.47			0.54													1														100) <u>99</u>) 91
1886.47	10	29	Ap				0.36			48.39			44.25		7.00																								100	111
1886.47	11	1	llm Du		52.22		42.69	0.62	4.48					67.44										_	-									_					100) 101
1886.47	11	3	Qz	98.65	0.97	0.38	32.03							07.41																									100) 112
1886.47	11	4	Py	00.00	0.33		28.64							71.03											00.00		_						_			_			100) 221
1886.47	11	5	2m lim	30.62	52.42		45.69	1.90									-	-							69.38		_		-	-			-	-					100	1115
1886.47	11	7	Bt	39.56	2.70	20.55	20.14	1.64	2.07			9.34																											96	101
1886.47	11	8	Py Oz	99.65			28.98							71.02			-	_						-	-		_			_		-	_	-		_			100) 221
1886.47	11	10	Mnz +	15.35		7.18	3.54		0.98	2.23			28.22		1.38													9.10	23.26		3.76								100	3 88
1886.47	11	11	Py Chloritized Dt	40.00	0.14	25.20	28.59		5.45		0.54	2.20		71.41											+														100) 221
1886.47	11	13	TiO ₂ + Kfs	42.00	38.82	25.30	1.12		5.15		0.51	10.31											_		+														100) 102
1886.47	11	14	llm	10.00	55.03	0.01	42.56	2.41				10.01																											100) 101
1886.47	11	15	Zrn	30.84																					67.28								_		1	.87			100	J 119
1886.47	11	17	Chloritized Bt	35.75	3.08	18.85	28.97		9.50			3.87																											100) 116) 89
1886.47	11	18	llm +	4.22	50.03	1.26	40.11	0.75	2.61			1.02												_									_						100) 99
1886.47	11	19	Zrn TiO	30.61	95.22	1.65	0.54						1.07												67.17									-	1	.68			100) 115
1886.47	11	21	Chl	24.53	0.47	21.94	29.50		8.57				1.07																		-								85	91
1886.47	11	22	Mix	18.58	46.03	11.86	20.45	0.52	1.40	0.39		0.30										0.47														_			100) 74
1886.47	11	23	lim +	1.60	53.83 48.62	1.59	40.81	2.90	1.69																									-		-			100) 89
1886.47	11	25	Ap				0.59		0.46	48.48			45.08		5.03	0.36																							100) 112
1886.47	11	26	TiO ₂	0.53	98.41	0.68	0.37		10.00		0.07	0.04																											100	J 99
1886.47	11	27	Zrn	35.07	0.50	16.87	21.32		10.66		0.37	0.21					-								68.77		_	-					-						100	99) 114
1886.47	11	29	Chloritized Bt	37.49	1.53	23.97	27.33		5.81		0.58	1.64		1.65																									100) 85
1886.47	11	30	"llm"	4 76	61.65	3 60	37.83	0.52							2 / 7																		-	_		_			100) 100
1886.47	11	32	TiO ₂ +	6.67	77.56	5.49	4.87			0.54	0.48	0.40	1.04	0.55	2.39																								100) 90
1886.47	11	33	Chloritized Bt	42.82	1.76	28.87	16.93		3.68	0.43		2.19		00.77	3.33									_			_						_	_		_	0.45		100) 101
1886.47	11	34	"llm"		60.18		34.22	4.87						62.77			-										_	-	-		_			-			2.45		100) <u>1//</u>) 93
1886.47	12	2	Tur	36.77	1.02	33.15	11.78		2.02	0.30	1.97																												87	92
1886.47	12	3	Kin + Ilm	51.29	2.44	32.98	8.22 44.39	0.71	2.70		1.12	2.97															-						-	-		-			100) 86
1886.47	12	5	Mnz +	33.96		17.19	1.87		1.48			5.59	12.12		1.19													4.86	12.00		3.81							ę	5.94 100) 107
1886.47	12	6	Ap	24 59	0.77	20.00	24.10		2 90	48.42	0.94		44.30		7.29												_						_			-			100) 116
1886.47	12	8	"llm"	34.30	68.48	20.30	29.72	1.81	5.00		0.04																												100	3 89
1886.47	12	9	Py	00.00	0.23		28.73							71.05	4.00										_														100) 219
1886.47	12	10	lm	98.92	56.31		40.82	2.30							1.08										+														100) 118
1886.47	12	12	TiO ₂		100.00																																		100) 105
1886.47	12	13	Tur	37.04	1.05	32.14	7.80	0.52	4.74		2.24				1.98									_	-		_			_			_	-		_			87	99
1886.47	12	15	Ap		55.45		43.14	0.55	0.91	48.66			44.50		6.84																								100) 120
1886.47	12	16	lim		53.72		43.40	0.56	2.31																			_					_						100) 103
1886.47	12	17	TiO ₂ +	0.72	93.79	0.74	0.96	0.01							3.80									-				_					_	_					100) 74
1886.47	12	19	llm		55.51	0.43	42.96	1.10																															100) 65
1886.47	12	20	Qz	100.00	54 77		45.04	0.04	4.04																											_			100) 115
1886.47	12	22	Chl +	29.66	51.77	23.28	39.46	0.61	0.87		1.00			1.51	3.20	0.58																							100	3 84
1886.47	12	23	Bt	34.10	4.16	14.63	26.98		5.91		0.60	6.41			3.00	0.21																							96	98
1886.47	12	24	TiO ₂ +	5.22	79.61	5.01	8.58			0.51			1.08		6.09									_		$\left \right $					_		-+			-+			100) 76
1886.47	12	20 26	Tur	36.94	1.02	32.40	6.16		5.57	0.72	1.96	0.17	44.41		2.06																								87	97
1886.47	12	27	TiO ₂ +	0.79	94.73	2.01	1.13			0.42			0.92																										100) 93
1886.47	12	28	Qz Chi	100.00	0.20	10 50	10.24	0.90	10.20	1.55															+	\vdash					_					_			100	115
1886.47	12	30	Qz	100.00	0.30	10.52	10.31	0.00	10.30	1.00																													100	103

Sample	Site	Mineral	SiO2	TiO2	AI203	FeO	MnO	MgO	CaO	Na2O	K20	P205	S03	н	C	Sc203	V205	Cr203	NiO	CuO ZnO	As203	sro	Y203	ZrO2	Nb2O5	O zĥu	C ₂₀ O3	Pr203	Nd2O3	Sm203	Gd2O3	Dy203	Er203	Hf02	WO3	ThO2	Total Actual Total
1886.47	12 3	31 Qz	99.04	0.66		0.30																															100 116
1886.47	12 3	32 TiO ₂ +	4.79	93.48	0.47	1.26	0.55	2.06																		_											100 104
1886.47	13	2 TiO ₂	0.54	98.21		0.97	0.00	2.00			0.28																										100 99
1886.47	13	3 Chr		0.64	7.79	17.07	2.10	10.22			0.20							62.19																			100 102
1886.47	13	4 TiO ₂ + Chl	29.65	13.72	19.40	31.50		4.21		1.52																											100 40
1886.47	13	5 "llm" +	10.59	61.87	7.43	17.48		1.35		0.67	0.60											-				_			-	-							100 69
1886.47	13	7 "llm"	0.81	70.35	23.11	24.17	4.67	3.41		0.59	3.93							-																			100 93
1886.47	13	8 TiO ₂ + Qz	40.61	53.96	0.49	4.94																															100 88
1886.47	13	9 Chloritized Bt	35.98	1.01	22.97	32.56		4.88		0.87	0.75		0.98									_								_							100 79
1886.47	13 1 13 1	0 Py		0.31 54.60		28.30		0.58					/1.39									-			-	-				-	-	-					100 207
1886.47	13 1	2 TiO ₂ +	6.94	76.93	6.45	7.34		0.74	0.53			1.06																									100 71
1886.47	13 1	3 "llm" +	1.16	85.85	0.87	12.12																															100 96
1886.47	13 1	4 TiO ₂ +	0.89	92.56	2.43	2.34			0.41			1.37														_				_							100 93
1886.47	13 1	6 TiO	0.60	96 79		2.61												-								-											100 117
1886.47	13 1	7 llm		52.52		42.71	4.77																														100 99
1886.47	13 1	8 Qz	99.70	0.30																		1		67.70					-				$+ \overline{1}$	4.75			100 116
1886.47	13 1	19 ∠m 20 lm +	30.47	57.50	1.53	37.61	1.22														+	+		01.18					1	+	+	-	\vdash	1.75			100 113
1886.47	13 2	21 llm		53.70		34.47	10.94													0.89	9																100 99
1886.47	13 2	2 Py + Chl	29.06	0.53	17.48	20.91		2.21		0.85	1.50		27.47								+	-						_	+	+			+				100 91
1886.47	13 2	24 llm	20.27	51.13	19.01	46.72	0.84	1.31		0.79								-											-								100 101
1886.47	13 2	25 Qz	100.00																																		100 112
1886.47	13 2	26 Py Chloritized Pt	20.02	1 20	24.22	29.10		4 66		0.71	2.00		70.91									-				-			-	_	-						100 205
1886.47	13 2	28 "Ilm"	39.03	72.41	24.23	26.52	1.07	4.55		0.71	2.90							-																			100 90
1886.47	13 2	9 Tur	38.17	1.56	29.33	7.57		7.28	0.49	2.60																											87 95
1886.47	13 3	30 Bt	34.99	53.45	12.30	13.81	0.89	14.02		0.59	6.69			7.43								-				-			-								96 104
1886.47	13 3	32 Ilm	0.77	59.45		37.87	1.91	5.04																													100 93
1886.47	13 3	33 "Ilm"		84.54		15.46															_																100 93
1886.47	13 3	14 Chi 15 TiO. +	25.92	87.77	21.81	9.55		5.96		0.43												-				-				-		-					85 87
1886.47	13 3	36 Py	1.20	0.94	1.45	28.70							70.36																								100 210
1886.47	14	1 Sd + Py			1.16	67.55				0.80			21.24		0.91																				8.34		100 86
1886.47	14	2 TiO ₂ +	7.38	84.52	3.74	3.83					0.52															_											100 89
1886.47	14	3 IIII 4 TiO₀ +	0.92	92.38	2.80	21.94			0.38			1 12						-								-											100 88
1886.47	14	5 "llm"	0.02	77.37	0.60	21.56	0.47		0.00																												100 85
1886.47	14	6 llm		54.57		43.02	0.70	1.71														_				_				_							100 98
1886.47	14 14	7 <u>Zrn</u> 8 llm	31.11	51.47		46.19	0.60	1.74																68.89													100 112
1886.47	14	9 TiO ₂		97.99	0.69	1.32																															100 86
1886.47	14 1	0 Zrn	31.16																					68.84													100 113
1886.47	14 1	1 "IIM"	2.07	73.48	2.20	23.13	3.39								\vdash						+	+							+	+	+	-	+				100 99
1886.47	14 1	3 TiO ₂ + Qz	48.24	47.78	1.00	1.43		0.78	0.77												1	1							-	1	1						100 110
1886.47	14 1	4 Bt	35.09	2.83	19.43	27.30		5.48			5.87																										96 96
1886.47	14 1	5 "Ilm"		70.18		24.89	4.93	0 =						0.55	ΗŢ		_				+	+	+			+				+	\vdash		$\vdash \downarrow$				100 93
1886.47	14 1	b 110 ₂ +	5.10	/5.09	5.33	6.10		0.70	0.72			U.89		6.08							+	1				+		_	-	+	-	-	\vdash				100 97
1886.47	14 1	8 Tur	38.88	1.12	31.10	6.95		6.62		2.32							+		-		+	+				+			-	+	+						87 93
1886.47	14 1	9 Mnz										35.01		-0.22					-0.06							1	.17 35	15 4.02	2 14.9	3							100 98
1886.47	14 2	20 Kfs +	71.27	1.42	17.40	3.19		1.18	0.00	0.07	5.54											-				_			-	-							100 104
1886.47	14 2	22 TiO ₂ +	39.24	92.06	2.21	20.03		3.91	0.66	0.07	2.10	1.53						-			+	+							-	1	1						100 93
1886.47	14 2	23 llm	1.00	51.24	2.21	47.46	0.51	0.78	0.00			1.00																									100 96
1886.47	14 2	4 Grt	41.05	0.38	21.73	19.83	0.39	9.67	6.96		5.05	0.5		7.65	μ-Τ			— T			+-		\vdash			+					<u> </u>	<u> </u>	$+$ $\overline{+}$				100 106
1886.47	14 2	26 Zrn	43.51 30.70	0.62	29.38	4.75		1.44		1.43	5.83	0.54		7.50							1	-		69.30					-	+	+		\vdash				95 101
1886.47	14 2	27 Qz	99.60			0.40																		50.00													100 109
1886.47	14 2	28 Bt	35.36	3.33	14.32	21.99	0.80	6.39	0.07		8.33	0.05		5.47				0.00			-					_		_		-			+				96 96
1886.47	14 2	29 110 ₂ + 80 Sd +	0.59	94.24	1.07	2.11	1 97		2.24			0.98	1 18		1.03		_	0.62			-	-				_			-	-	-						100 87
1886.47	14 3	31 TiO ₂ +	2.19	91.84	1.46	2.32	1.37		2.24			1.00	1.10	2.18	1.03						1	1				+			1	1	1						100 89
1886.47	14 3	32 llm +	0.77	55.82	0.44	41.09	1.88																														100 97
1886.47	14 3	33 "Ilm" +	5.86	61.06	5.19	25.43	1.04	0.72				0.71	65.07		\vdash						1	1	+							+	<u> </u>		+		4.00		100 78
1886.47	14 3	941PV		0.43		32.21							05.97								1	_	1							1		1			1.39		100 153

Sample Site Position Mineral	SiO2	TiO2	AI203	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	ш	CI	Sc203	V205	Cr203	NiO	CuO	ZnO	As203	SrO	Y203	ZrO2	Nb2O5	Ag2O	La203 Ce203	Pr203	Nd2O3	Sm203	Gd2O3	Dy2O3	Er203	HfO2	WO3	ThO2	PtO2 Total	Actual Total
1886.47 14 35 "llm" +	2.77	64.79	2.23 2	7.10	0.90	2.21		0.00																	_		_		_	_						100	53
1886.47 14 36 MIX 1886.47 14 37 TiO	26.53	21.65	18.99 2	9.84		2.39		0.60							-	-																				100	100
1886.47 14 38 llm		51.16	4	6.95	0.60	1.29																														100) 98
1886.47 14 39 Py		0.37	2	8.42							71.21																									100	208
1886.47 14 40 Qz	99.64	0.36		0.50							74.04																		_	_						100	116
1886.47 15 1 Py 1886.47 15 2 Py		0.26	2	8.53							71.21																									100	205
1886.47 15 3 Qz	99.70	0.30		0.21							11.75																									100	111
1886.47 15 4 TiO ₂		97.58	1.17	1.24																																100	82
1886.47 15 5 Tur	36.88	0.84	32.00	6.89		5.74	0.52	2.17				1.97																_	_							87	92
1886.47 15 6 Py 1886.47 15 7 Chloritized Pt	41.29	0.47	24 10 2	8.21		2.20		1 20	1 74		/1.32																_	-	-	_						100	207
1886.47 15 8 Chr	2.91	0.99	6.69 3	9.20		7.15		1.30	1.74		4.15					43.06																				100) 96
1886.47 15 9 llm +	7.18	53.80	3	4.51	4.51																															100	97
1886.47 15 10 Sd +	16.51	0.71	12.20 6	3.26	0.73	1.68		0.89	1.20		2.25		0.58												_			-	_							100	1 78
1886.47 15 11 UZ 1886.47 15 12 Sd +	3.81	1 28	2.61.8	2 34		-				1 46	3 22		1.51		-					-														3.77		100	110
1886.47 15 13 TiO ₂ +	1.01	93.13	1.67	2.23			0.55			0.98	U.LL		1.01			0.44																		0.11		100	87
1886.47 15 14 llm		52.94	4	6.26	0.81																															100	98
1886.47 15 15 llm		52.82	4	6.29	0.90																						-	-	-	-	-	-				100	98
1886.47 15 16 TiO ₂	07.6-	99.49	10.01	0.51		0.70			5.54			0.07															_	-	_	-	-	-		\vdash		100	103
1886.47 15 17 1702 + ?	27.38	43.13	19.01	1.95		0.79		0.65	5.51			2.22		\vdash													+		-	-		+		\vdash		100	115
1886.47 15 19 TiO	40.43	100.00	20.34 1	0.33		2.00		0.05	1.21																											100	102
1886.47 15 20 Qz	100.00	100.00																											1							100) 114
1886.47 15 21 Ap							48.65			44.68		6.67																								100	115
1886.47 15 22 Zrn	30.70	54.00		4 70	0.50	2.04																	69.30		_		_	-	_							100	112
1886.47 15 24 Zrn	30.82	0.43	4	4.70	0.52	2.94									-					-			68 76	-												100	1112
1886.47 15 25 Chl +	34.74	5.25	23.67 1	7.39		1.53		1.23	0.42														3.96											11.82		100	J 59
1886.47 15 26 Zrn	28.09		0.85				0.75					2.08		1.06									67.17				_		_							100	85
1886.47 15 27 llm		52.27	4	3.54	0.58	3.62	0.20						0.00												_											100	1 99
1886.47 15 29 TiO		100.00	5.	3.43	1.25		0.39						0.23																							100	100
1886.47 16 1 Chl + Bt	45.69	0.50	20.55 2	8.43		3.00	0.64	0.69	0.50																											100	71
1886.47 16 2 Ap			(0.34			48.64			45.17		5.39	0.45																							100) 117
1886.47 16 3 "llm"	0.59	70.51	2	7.57	1.32	0.00																			_		_		_	_						100	98
1886.47 16 4 llm 1886.47 16 5 Tur	38.12	<u>58.78</u> 1.12	32.63	7.86	0.46	2.90	0.68	1 79												-					-											100	96
1886.47 16 6 "llm"	00.12	75.93	2	1.57	1.12	1.38	0.00																													100	52
1886.47 16 7 llm		55.81	3	9.76	4.43																															100	101
1886.47 16 8 llm	20.49	53.47	4	4.08	2.45																		60.04		-					_						100	101
1886.47 16 10 Qz +	88.41	0.36	4.71	5.74		0.50			0.27														05.04													100) 96
1886.47 16 11 Bt	36.71	3.34	17.90 2	1.01		9.25			7.48				0.30																							96	98
1886.47 16 12 Bt	36.12	1.67	19.02 24	4.66		5.75		1.06	3.94			3.78													_			-	_							96	99
1886.47 16 13 IIM 1886.47 16 14 Sd +	1 78	0.58	1 69 9	2.34	1.38	1.09	0.66				1.84		0.81		-					-																100	98
1886.47 16 15 Contaminant	1110	0.00	1.00 0	0.86	1.00	1.00	0.00	4.77			1.01		0.01																					94.37		100	J 73
1886.47 16 16 TiO ₂ +	0.84	93.39	1.51	2.57			0.71			0.98																										100) 89
1886.47 16 17 Sd	0.15	50.01	4	9.74	2.35		2.64		$ \downarrow \downarrow$	1.27															_		_				-	<u> </u>				56	56
1886.47 16 19 Qz +	9.48	0.39	6.76	9.03	1.54	0.81			2.75						-											_	-	-		-	-	1				100	92
1886.47 16 20 Chl	23.94	0.65	23.04 2	9.55	0.75	7.08			25																											85	92
1886.47 16 21 Qz	100.00																																			100) 113
1886.47 16 22 TiO ₂ +	1.45	90.08	3.16	4.71			0.55	0 - 1								0.60											_			1	-	-				100	96
1886.47 16 23 "IIM" +	7.52	70.85	5.87 1	4.06		0.86	0.26	0.59												-																100	93
1886.47 16 25 Tur	37.85	55.40 1.02	32.87	8.53		4.45	0.37	1.90						-		-											-	-	-	-	<u> </u>	1			-	87	96
1886.47 16 26 Qz +	96.52	0.38	1.99	0.39		7.45	0.07	1.30	0.71																											100	J <u>118</u>
1886.47 16 27 TiO ₂ + ?	18.02	63.26	14.77	0.44				0.52				3.00																								100	103
1886.47 16 28 llm	+	53.77	4	4.15	2.07	1.00																								+		<u> </u>			_	100	104
1886.47 16 29 "IIM" 1886.47 16 30 IIm	+ +	<u>60.77</u>	3	7.50 5.08	0.65	1.06														-							-	-		-		-				100	97
1886.47 16 31 Tur	37.85	1.24	31.82	7.90	0.00	5.37	0.87	1.94																-				1			1	1				87	98
1886.47 16 32 TiO ₂ +	8.46	79.89	5.70	4.64		1.05			0.25																											100	103
1886.47 16 33 Chloritized Bt	38.88	2.36	22.34 2	1.14		6.90		0.78	4.36			3.23																								100	91
1886.47 16 34 Py	2.07	0.43	1.48 2	9.53		0.35		0.33	0.17		65.65																			1	-	 				100	203
1886.47 16 36 Bt	34.22	4.33	15.48 2	0.39 3.83	1	4.28			0.41		1.41		0.34		-											_	-	-		-	-	1				96	101
1886.47 17 1 Sd	00.10	0.52	5	2.25			1.76		0.00	1.47			3.51																							56	57
1886.47 17 2 TiO ₂ +	0.88	90.06	1.59	6.08			0.42			0.97							_							_												100) 81

Sample	Site	Mineral	SiO2	TiO2	AI2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	SO3	ц	CI	Sc203	V205	Cr203	NiO	CuO	ZnO	As203	SrO	Y203	ZrO2	Nb205	Ag2O	La2O3	Ce2O3	Pr203	Nd2O3	Sm203	Gd2O3	Dy203	Er203	HfO2	WO3	ThO2	PtO2 Total	Actual	Total
1886.47	17	3 Py		0.41		28.74							70.86																										10	0 21	.14
1886.47	17	4 110 ₂ + Qz	41./1	58.87		0.69																																	10	0 11	13
1886.47	17	6 "llm"	1.82	63.06	0.59	34.52																																	10	0 9	93
1886.47	17	7 "llm" +	6.04	77.29	4.34	11.41		0.92																															10	0 6	36
1886.47	17	8 TiO ₂ +	3.31	91.87	1.92	2.90																																	10	0 9	}2
1886.47	17	9 llm		53.84		42.59	0.82	2.74																															10	0 10	04
1886.47	17	10 mm		92.53		28.53							71.47									-	-																10	0 25	25
1886.47	17	12 "llm"		66.56		32.51	0.94																																10	0 9	94
1886.47	17	13 Chl	29.42	1.48	17.03	32.82		3.17		0.48	0.60																												85	5 9) 0
1886.47	17	14 "lim"	0.80	/6.45	0.49	21.43	0.82																_																10	0 9	16
1886.47	17	16 TiO ₂	35.10	99.49	0.51	0.51																																	10	0 10	04
1886.47	17	17 llm +	5.70	49.35	1.74	38.45	0.69	2.88		0.67	0.53																												10	0 10	04
1886.47	17	18 Mnz										34.82		-0.09					-0.04									11.18	35.60	4.28	14.25								10	0 10	06
1886.47	17	19 Qz	99.57	0.43																					60.00														10	0 11	17
1886.47	17	21 Mnz	1,16									37.04		-0.47											JO.02			10.73	28.63		17.09	3.36	2.46						10	0 9	<u>13</u> 94
1886.47	17	22 TiO ₂	0.65	99.35																									0.00										10	0 9	98
1886.47	17	23 llm		58.81	0.46	39.52	0.47	0.74																															10	0 9	34
1886.47	17	24 TiO ₂ + Chl	29.91	15.54	22.24	19.89		12.07	0.35		$ \vdash $																												10	0 9	12
1886.47	17 1	25 Py 26 Oz +	95.05	0.54	0.68	35.02					0.68		63.00		0.31																								10	0 16	1/
1886.47	17 1	27 TiO ₂ + Chl	33.53	14.84	20.65	17.22		10.23		0.49	3.04						-																						10	0 8	88
1886.47	17 3	28 Bt	42.81	1.98	23.14	14.37		8.40		0.52	4.78																												96	3 9	94
1886.47	17	29 Qz	100.00																																				10	0 11	15
1886.47	17 :	30 TiO ₂ +	13.12	68.26	5.35	7.26		0.57	0.39	0.66	1.62	2.78																											10	0 9) 0
1886.47	17 3	31 TiO ₂ +		92.99	1.17	4.85			0.29				0.69																										10	0 8	32
1886.47	17 3	32 "lim"	1.10	76.20	0.40	20.77	1.93		0.50			4.20											_																10	0 7	<u>- 8</u>
1886.47	17 :	33 110 ₂ +	100.00	93.19	2.12	1.09			0.59			1.30																											10	0 11	13
1886.47	17 3	35 "Ilm"	0.77	85.92		13.32																																	10	0 8	33
1886.47	18	1 Bt	37.25	5.30	13.81	17.90		10.27		0.49	7.74			3.24																									96	3 10	04
1886.47	18	2 Zrn	31.30	00.07		4 70																			68.70														10	0 11	10
1886.47	18	3 TIO ₂	1 17	98.27	1.52	9.44						0.77					_					-	-																10	0 9	18
1886.47	18	5 Zm	30.47	00.09	1.55	0.44						0.77					-								69.08														10	0 11	11
1886.47	18	6 "llm"		68.60		29.18	0.51	1.71																															10	0 9	96
1886.47	18	7 Tur	37.58	0.81	33.32	6.93		5.70	0.55	2.11																													87	7 9	<u>}</u> 4
1886.47	18	8 Py	61.04	0.27	20.17	28.50		0.85		0.57	8 16		/1.23	2.56			_					-	_								-		-						10	0 21	<u>19</u> 86
1886.47	18	10 Tur	38.43	0.71	32.49	5.38		7.32	0.54	2.13	0.10			2.00																									87	7 9	95
1886.47	18	11 TiO ₂ +	1.18	88.13	1.71	6.82			0.41	0.59		1.16																											10	0 8	33
1886.47	18	12 "Ilm" +	1.05	83.33	1.28	13.61	0.72																																10	0 9	<u>)</u> 1
1886.47	18	13 llm	0.72	51.33		46.44	0.82	0.70																															10	0 10	02
1886.47	18	15 TiO ₂ +	2.23	91 77	1 72	4 29	0.34	2.71									_					-																	10	0 8	87
1886.47	18	16 "llm"	1.23	60.60		36.91	1.26																																10	0 9	97
1886.47	18	17 Mnz	15.66		6.37						1.35	26.98		0.51														13.53	25.90		9.70								10	0 10	00
1886.47	18	18 lim	00.70	54.44		36.64	8.92				+												_			_							_				_		10	0 9	<u>19</u>
1886.47	18	20 IIm	33.10	53.14		44.61	0.53	1.72																															10	0 9	98
1886.47	18	21 Tur	37.67	1.49	28.80	8.89		6.73	1.57	1.59	0.26																												87	7 9	э4
1886.47	18	22 TiO ₂ +	0.63	93.39	1.42	2.49			0.58	0.49		1.00																											10	0 8	39
1886.47	18 2	23 Kfs +	50.28	1.15	28.96	5.47		1.95	47.02	0.55	8.84	44.04		2.81																							4.40		10	0 9	16
1886.47	18 3	24 Ap 25 Feoby + Contaminant				65.47			47.93	0.66		44.04	1.63	6.90			-																				32.24		10	0 8	81
1886.47	18	26 TiO ₂ +	9.03	80.72	4.07	4.42		0.55	0.31	0.00	0.90		1.00																								02.21		10	0 9	93
1886.47	18	27 "llm"		67.70		30.35	1.95																																10	0 9	J1
1886.47	18	28 "llm" +	0.62	69.27	2.12	25.42	0.48	2.08			⊢ – Ţ					— T	T					T	T			T		T							\square		T	— T	10	0 9	<u>33</u>
1886.47	18 1	29 'IIM' 30 Oz	1.18	66.20	0.63	30.99	1.00					-																					_					-	10	0 7	17
1886.47	18	31 TiO ₂ +	1.37	89.73	2.54	2.19			0.57			1.29		2.31																								-	10	0 9	91
1886.47	19	1 llm		51.92		45.75	0.70	1.63																															10	0 9	96
1886.47	19	2 "llm"		81.94	0.63	17.43								_																				_				T	10	0 8	31
1886.47	19	3 lur 4 llm	38.46	<u>1.01</u>	30.68	5.52	0.60	8.22	0.66	2.44												-	_																87	<u>/ 9</u>	<u>33</u>
1886.47	19	5 "llm"		84.24		15.76	0.09	1.04									-																						10	0 9	30
1886.47	19	6 "llm" +	24.95	64.01	4.70	5.93		0.41																															10	0 9	3 7
1886.47	19	7 Al-phos	0.07	74.5.	34.21	04.45	4.05		1.97			28.88	1.92	-0.14								4.48	4.71					10.10	13.88										10	0 8	37
1886.47	19	8 '''''''' + 9 llm	0.98	<u>/1.54</u> 56.16	1.11	24.49	1.89																-										_						10	<u>u 9</u>	93
	1.971			00.10		14.61	0.01		_					_					_																	_		1			

Sample	Site	Mineral	SiO2	Ti02	AI2O3	FeO	MnO	MgO	CaO	Na2O	K20	P205	L	ō	Sc203	V205	Cr203	0N	CuO	ZnO	As203	Y203	Zr02	Nb2O5	Ag2O	La203	Ce203	Pr203	Nd2O3	Sm203	Gd2O3	Dy203	Er203	Hf02	MO3	Pt02	Total	Actual Total
1886.47	19	10 TiO ₂ +	11.22	66.94	6.24	7.30		1.05		1.21	0.90		5.	13																							100	103
1886.47	19	11 TiO ₂ +	1.10	93.67	1.74	1.79			0.42			1.28																									100	80
1886.47	19	12 llm +	2.33	54.68		38.67	4.32																														100	95
1886.47	19	13 Py		0.35		30.28						69	37																								100	193
1886.47	19	14 Qz +	92.45	0.30	3.66	0.33					3.26																										100	110
1886.47	19	15 TiO ₂ + Chl	25.69	28.59	18.73	25.49		0.95		0.54																											100	66
1886.47	19	16 Qz	99.63	0.37																																	100	115
1886.47	19	17 TiO ₂ +	1.50	90.06	0.71	0.86			0.27			0	60 5.:	22						0.79																	100	104
1886.47	19	18 llm		53.77		42.73	0.64	2.86																													100	101
1886.47	19	19 Qz + Chl	68.48	1.00	15.41	9.67		1.39		0.59	0.53		2.)4																				(0.89		100	80
1886.47	19	20 Zrn	31.20																				68.	30													100	114
1886.47	19	21 Qz	100.00											_																							100	115
1886.47	19	22 llm		58.65		39.08	0.56	1.72						_	-										-								+				100	95
1886.47	19	23 TiO ₂ +	0.82	93.67	1.53	2.17			0.99			0.82		_																			\rightarrow				100	89
1886.47	19	24 Qz +	94.44	5.56										_	1							_	_	_	-								+				100	112
1886.47	19	25 TiO ₂ +	4.27	86.80	2.40	6.07					0.45				1																		<u> </u>				100	73
1886.47	19	26 Qz +	91.86	0.67	3.66	2.64				0.43	0.25	0	50	_	-								_	_	-								+				100	100
1886.47	19	27 TiO ₂ + ?	24.29	52.05	12.16	4.05		1.20			3.99		2.	26	1																		<u> </u>		_		100	103
1886.47	19	28 TiO ₂ +	1.32	89.26	2.15	7.27									1																						100	90
1886.47	19	29 "llm"	_	70.09		29.91																	_										$ \rightarrow $				100	88
1886.47	19	30 "llm"	_	60.37		37.47	0.43	1.73							-							_			-								<u> </u>	_			100	93
1886.47	19	31 Py		1.46	0.34	43.27						51	99	0.65	5																			1	2.29		100	143
1886.47	19	32 Py	0.27	0.61		28.30						70	81		-								-		-								<u> </u>				100	207
1886.47	19	33 Chi	38.57	0.73	22.59	13./1		1.37	0.00	2.12	2.39	1	04 2.	19								-	-		-								-				85	88
1886.47	19	<u>34 Tur</u>	37.99	1.25	31.76	5.92		7.12	0.92	2.04				-	+							-	60.	12	-								-+	_	-		100	92
1996 47	20	2 TiO +	1 20	02.62	1.61	2.05									-		0.61					-	09.	13									-+	-	-		100	97
1000.47	20	2 Tio2 T	20.17	92.62	29.10	3.00		E 90		2.77			_	-	-		0.61					_	-		-								\rightarrow				97	00
1886.47	20	A Kfe ±	53.48	0.45	32.36	2.08		0.51		2.11	4 77		4	76								-											-+		_		100	104
1886.47	20	5 "llm" +	13.90	70.95	7.68	5.98		0.51		2.04	0.74	0.75	7.																								100	70
1886.47	20	6 TiO ₂ + Oz	57.51	41.29	0.49	0.71					0.71	0.10																									100	103
1886.47	20	7 TiO:		00.35		0.65																															100	00
1886.47	20	8 Ap		33.33		0.00			48.85			44 77	6	38																			-+				100	114
1996 47	20	0 TiO + Chi	15.61	47.91	12 72	21.09		1 72	0.42	0.61		44.77	0.																								100	
1886.47	20	10 Pv	0.66	47.01	0.51	35.02		1.73	0.43	0.01		60	50																				-+		2 40		100	150
1886.47	20	11 Tur	39.20	0.44	32.22	6.45		6.69		2.00		00	50																				-		2.40		87	94
1886.47	20	12 llm		50.74		47.22	0.65	1.39																													100	100
1886.47	20	13 TiO ₂ +	2.18	89.59	2.33	3.15	0.00		0.60			1.39					0.76																				100	83
1886.47	20	14 llm		57.41		40.10	2.49		0.00								0.1.0																				100	94
1886.47	20	15 Py	0.76	0.26	0.61	32.60				0.39		65	38																								100	146
1886.47	20	16 Bt	35.15	2.44	15.34	23.85	0.88	5.56		0.72	6.21		5.	35																							96	97
1886.47	20	17 TiO ₂	0.85	95.77	2.46	0.93																															100	86
1886.47	20	18 TiO ₂ +	1.34	91.94	1.87	2.98			0.68			1.08								0.11																	100	83
1886.47	20	19 Qz	99.70	0.30																																	100	108
1886.47	20	20 Qz	99.70	0.30																																	100	107
1886.47	20	21 TiO ₂ +	0.81	92.81	2.05	1.99			0.74			1.59																									100	84
1886.47	20	22 "llm"		69.14		29.18	1.68																														100	87
1886.47	20	23 llm		54.98		44.26	0.76																														100	94
1886.47	20	24 Tur	37.34	1.13	32.96	5.09		7.16	1.20	2.12																											87	91
1886.47	20	25 Py		0.23		28.95						70	82		1								_		-								⊢				100	209
1886.47	20	26 "llm" +	0.85	68.64	0.96	26.72	2.34	0.50	17.0				-		-							_	_	_	-												100	93
1886.47	20	27 Ap			24.42	0.37		44.00	47.80			44.50	7.3	34	+		27.04					_		_	-							_	<u> </u>		-+		100	114
1886.47	20	28 50	400.00		31.40	16.17		14.62						_	-		37.81					_	_	_	-								+				100	102
1886.47	20	29 UZ 30 "llm"	100.00	68.45	0.65	20.24	0.48							-	+								-	_	+								-+				100	80
1886.47	20	31 TiO. +	5.02	80.45	5.15	7 22	0.48	0.74		0.56			_		1								-	_	+								\rightarrow		-+		100	75
1000.47	20	22 07	100.00	00.49	0.15	1.23		0.74		0.00	-		-		+								+		+							-	<u> </u>		-+		100	100
1886.47	20	33 Pv	0.31	0.71	0.53	42.62						55	52	0.31	1							-	-		+								\rightarrow		-+	-	100	143
1886.47	20	34 07	99.34	0.71	0.00	12.02						55	52	0.3	1								+	-	+								\rightarrow		-		100	109
1886.47	20	35 Zm	30.73			0.54				1					1								68.	73	1										-		100	112