Open File 1091

SUDBURY TIMMINS ALGOMA MINERAL PROGRAM

PROJECT 4B

THE METAMORPHIC MINERALOGY AND CHEMICAL ALTERATION OF THE TEMAGAMI GREENSTONE BELT

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SUDBURY, TIMMINS, ALGOMA MINERALS PROGRAM (STAMP)

The Sudbury, Timmins, Algoma Minerals Program was announced in Sudbury September 17, 1983, with the objective of stimulating mineral exploration and economic development in the region. It was initiated by the Department of Energy, Mines and Resources and supported by Employment and Immigration Canada. The program was designed and implemented by the Geological Survey of Canada in collaboration with Mineral Policy Sector. The individual projects were managed by the Department of Geology, Laurentian University, Sudbury, under the Chairman, Dr. A.E. Beswick. Field operations began in early October and continued into December. Following an eight-week extension, the Program terminated on May 25, 1984.

The Program comprised four projects with the following objectives:

Project 1 - Mineral Data Base (CANMINDEX)

- to collect, code and enter basic information on mineral occurrences in north-central Ontario into the Geological Survey of Canada data bank (CANMINDEX file); to provide information on these occurrences to the Ontario Geological Survey in their file format, and update information for the EMR (Mineral Policy Sector) National Mineral Inventory System; and to compile available rock geochemical data.

Project 2 - Swayze Belt Overburden Geochemistry

- to identify target areas for mineral exploration by geochemical sampling and analyses of overburden materials (eskers) in the Chapleau-Foyleyet-Gogama area.

Project 3 - Huronian Supergroup Geochemistry

- to define target areas with anomalous metal concentrations in Huronian sedimentary rocks in the Sault Ste. Marie-Sudbury region.

Project 4 - Rock Chemical Mineral Exploration Criteria

4A: to identify lithogeochemical criteria useful for mineral exploration in the Onaping Formation of the Sudbury Basin.

4B: to determine variations in rock geochemistry of major units of the Temagami Greenstone Belt and their relationships with mineralization.

The numbers and titles of the Geological Survey of Canda Open Files reporting results of these projects are listed on the back cover of this report. A description of the STAMP program, which includes overall co-ordination and administrative support, will be published in Current Research, Part A, GSC Paper 85-1A in January 1985.

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Acknowledgments

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Introduction.

The Temagami Greenstone Belt consists of one or perhaps two cycles of volcanic igneous rock which vary in composition from basalt and Mg-basalt through to dacite and rhyolite. Mafic rock types are proportionately the most abundant. Although clastic sediments, iron formation and both mafic and felsic plutons also form part of this region, the highest proportion of "mineral showings" for metals such as Au, Cu, Ni, Pb, Zn, and Pt group metals occur within the metavolcanic rocks and for this reason they are the focus of this study.

The major objective of this project is to attempt to delineate areas within the metavolcanic terrain which exhibit a high probability of containing base metal sulphide and/or precious metal mineralization. Such mineralization is normally accompanied by alteration zones consisting of rocks which, in terms of their mineralogy and geochemistry, are "anomalous" relative to the regional and background trends. For example, McGeehan et al (1982) have stressed that *feldspar-destructive* alteration is " mainly, but not entirely, confined to rocks within and near the deformed zone hosting the Campbell-Dickenson (gold) orebodies " in the Red Lake area of north- west Ontario. Similarly, Whitehead et al (1980) have emphasized the intense dolomite-ankerite carbonatization in the vicinity of the gold deposits of the Timmins region of northeast Ontario.

In order to achieve the main objectives of this study the mineralogy and geochemistry of approximately 825 samples collected over this metavolcanic terrain have been determined. The sample distribution, sampling technique, and characteristcs of the mineralogical and geochemical studies are presented in the following pages of this report. Also included are our initial interpretations of the significance of these data.

Geology of the Temagami Region

The Temagami Greenstone belt is located near the Ontario-Quebec border 97 km. north of North Bay and 480 km. north of Toronto (see fig. 1). Bennett(1978) has summarized the regional geology of the four townships which centre on the townsite of Temagami (see figure 2) and the reader is referred to that report and accompanying Ontario Geological Survey Maps 2323 and 2324 (1" = 1/2mile) which form the bases for the maps accompanying this report. Similar regional studies by Moorhouse(1942) and Simony(1964) supplement and add to the data in Bennett's report.

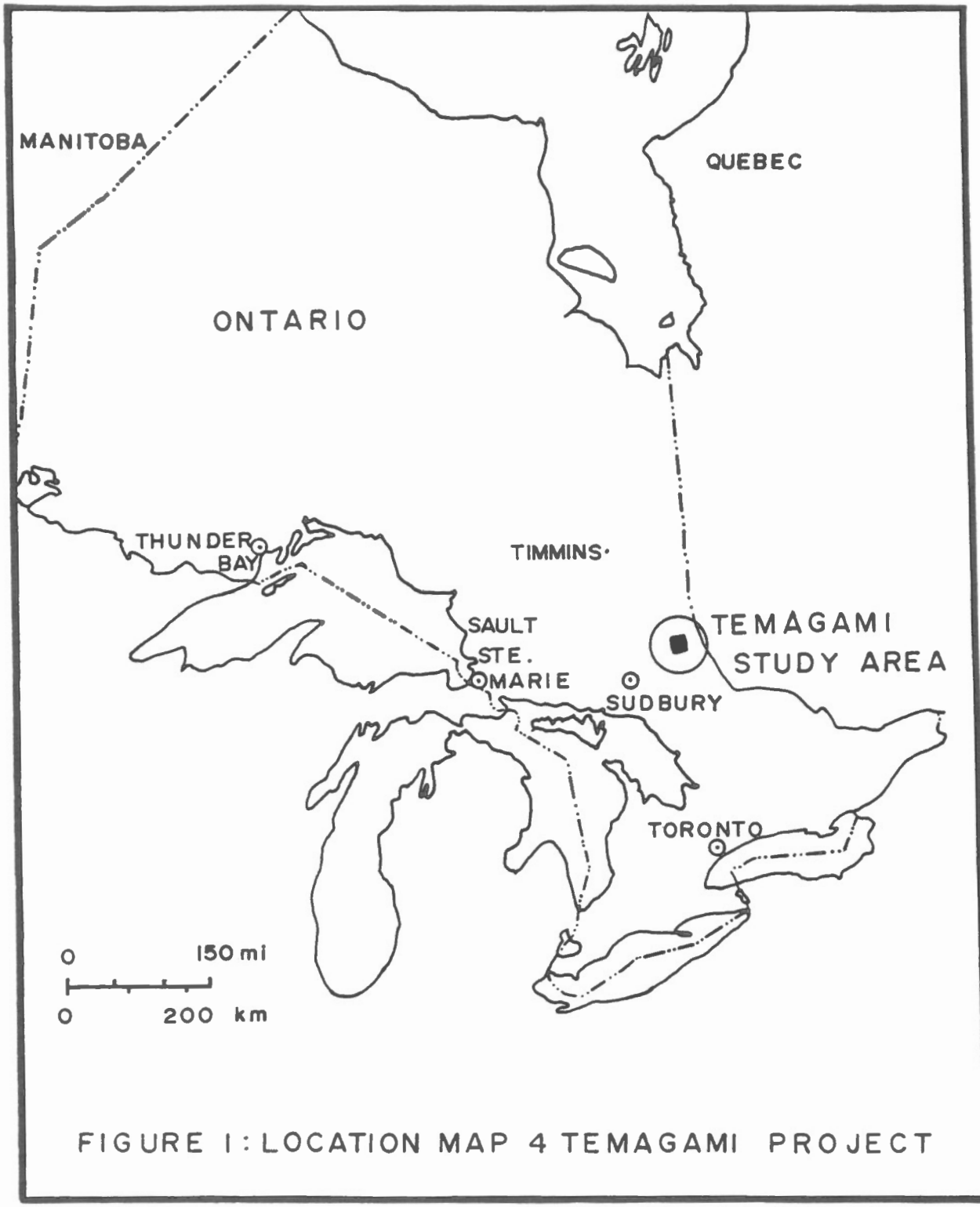
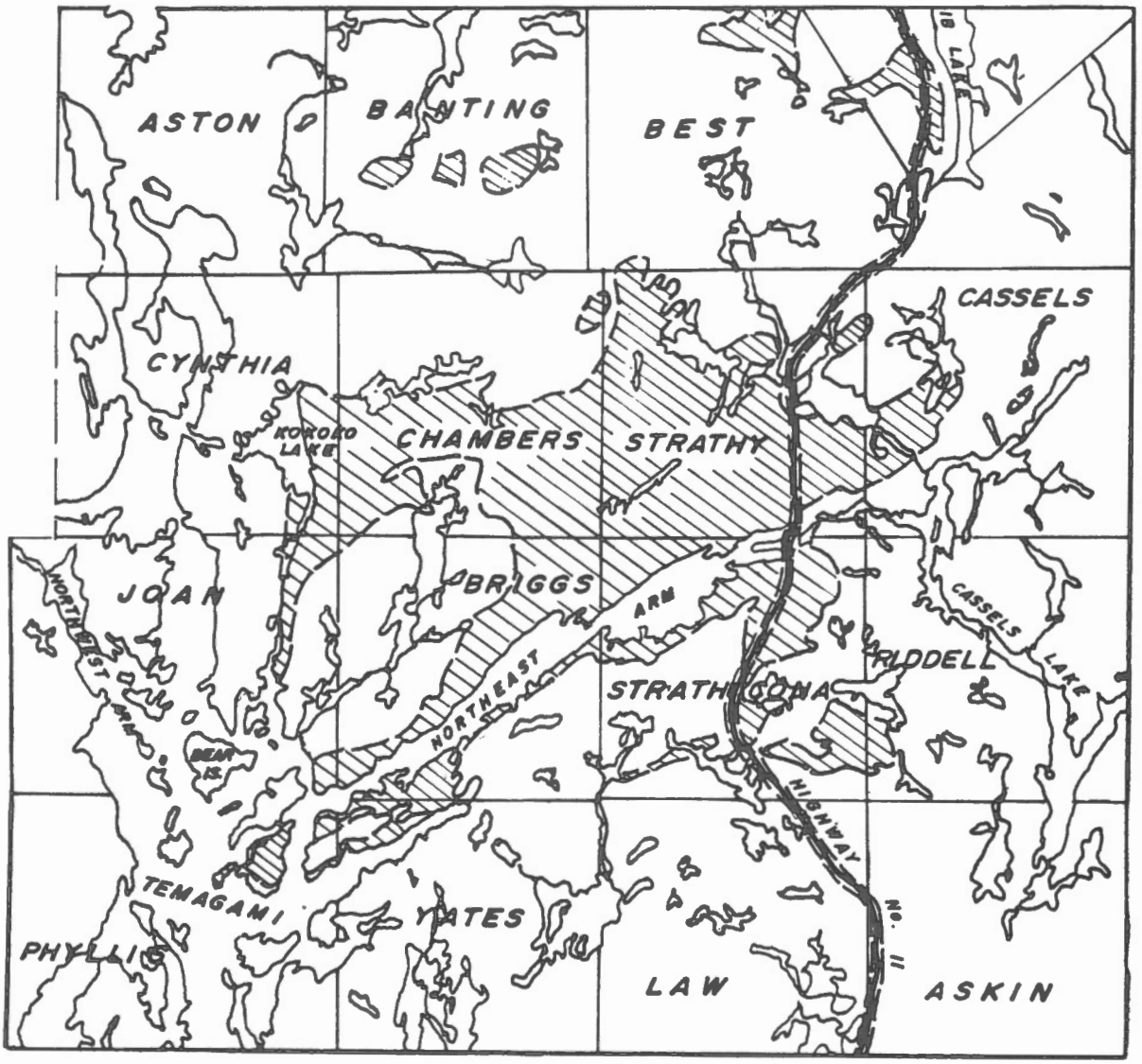


FIGURE 1: LOCATION MAP 4 TEMAGAMI PROJECT

STAMP TEMAGAMI PROJECT 4



SCALE: 1 inch = 4 miles

4 0 4

GREENSTONE BELT

Figure 2: Outcrop distribution of the Temagami Greenstone Belt.

In figure 2 the distribution of the greenstone belt is illustrated. These rocks consist of late Archean basalts, intermediate to felsic pyroclastic rocks and flows, and small amounts of volcanoclastic sediments and Algoman iron formations. Sills, dykes, and plugs of felsic porphyry and ultramafic to intermediate rock types intrude this volcanic pile but clearly predate the large granite plutons in Strathcona, Briggs and Chambers townships. The volcanic complex has been complexly folded and faulted. The simplest interpretation of the structure is that it represents a shallowly-plunging, northeast trending syncline. Regional dynamothermal metamorphism has recrystallized the volcanic-plutonic complex to the greenschist facies level. Adjacent to the granite plutons blue-green hornblendes in the mafic rocks attest to the presence of a somewhat higher grade contact facies. Within the volcanic rocks secondary carbonate minerals are widespread; particularly within a north-east trending zone 1-4 km. wide centred on the northeast arm of Lake Temagami. Here hydrothermal alteration of both felsic and mafic igneous rocks is particularly pronounced and carbonate (calcite and/or dolomite-ankerite), chlorite, white mica assemblages are common.

Early Proterozoic sediments of the Gowganda Formation and thick sheets of gently, eastward-dipping Nipissing diabase overlie unconformably this Archean basement terrain. The latter occurs as windows through the middle Precambrian supracrustal rocks.

Sample Collection

Three, two-man teams ran regularly spaced traverses approximately 1 km. apart over all reasonably accessible areas of the metavolcanic belt between early October and early December 1983 . Only samples from the volcanic/plutonic complex were collected. Access to all areas was either by four-wheel drive vehicle or boat. Samples were collected every 300 metres or less depending on lithological changes and availability of outcrop; traverse orientations were perpendicular to the stratigraphy. Samples were divided into three parts, one for thin and/or polished sections, one for geochemistry and X-ray powder diffraction analysis, and one portion was retained for reference purposes.

In map 1 the locations for some 825 samples (four digit sample numbers) collected is shown. Also indicated on this map are the locations of samples (three digit sample numbers) reported in studies by Beswick & Soucie(1978) and Soucie(1979). The results of the research in those two studies form the basis for the present project.

One portion of each specimen was crushed in a Chipmunk jaw crusher and ground to -325 mesh in tungsten carbide barrel on a Spex Shatterbox. Portions of this powdered sample were analysed by X-ray diffraction to determine the major minerals present in each. The same powdered material was also analysed for major oxides by X-ray fluorescence (XRF) techniques as outlined in appendix 1.

X-Ray Powder Diffraction Data

All X-ray data were collected using a Phillips PW 1010/90 X-ray generator equipped with a vertical circle powder diffractometer fitted with a fixed powder sample holder. Powder mounts, approximately 2 cms. in diameter and 0.2 cms. thick were prepared for each sample; care was taken to minimize parallel alignment of platy or fibrous phases in the powdered aggregate. Samples were irradiated using a Cu fine-focus X-ray generating tube at 40 kv/20 mA. Goniometer scan speed was 2^{o} 2 theta/min.

Identification of the diffraction lines was carried out by comparison of the sample diffraction lines with those for common greenschist minerals reported in the ASTM index files. Those lines used to identify a phase and to gain a qualitative estimate of its relative abundance, are presented in table 1.

On two of the mineral data maps reported upon in this section (maps 4 and 5), samples are classified as having either a mafic(basaltic) or felsic(dacite-rhyolite) parentage based upon the intensity of the quartz line reported in table 1 (peak minus background value). Samples with intensities less than 50 are classified as mafic; those with values greater than 50 as felsic. This classification technique had to be employed in the absence of analytical data early in the project. While this technique worked well for the majority of specimens which fall towards either end of the relative intensity range, it no doubt has misclassified specimens near the middle of the range, particularly if secondary alteration processes have caused a significant change in the proportion of quartz in a sample.

Table 1: XRD lines used for idenification and qualitative estimates of greenschist facies minerals.

Mineral	d-(A)	2 theta ( )
Quartz	4.26	20.84
Plagioclase	3.21	27.8
White Mica	9.97	8.86
Actinolite	8.42	10.5
Chlorite	7.08	12.5
Calcite	2.97	30.10
Dolomite-Ankerite~	2.90	30.81
Epidote	2.69	33.3

* Samples were X-rayed using Cu K alpha radiation.
~Dolomite and ankerite are essentially indistinguishable by this method.

Actinolite-Chlorite Mineral Distributions.

On map 2 the distribution of chlorite and actinolite in all rock types is illustrated and three categories are distinguished. Also shown on this and subsequent maps are the major geological subdivisions into mafic and felsic volcanic rocks etc. after Bennett(1978). The following observations can be made from these mineral data:-

a) Actinolite and/or chlorite are present in almost all samples collected.

b) Optical data for a small proportion of these samples indicate that the amphibole present may be actinolite or blue-green hornblende; the latter type is particularly common in samples adjacent to the large granitic plutons in the map area. Chlorite normally has a pale brown or near isotropic interference colour suggesting it has a Fe/ (Fe+Mg) ratio near or somewhat less than unity.

c) Mafic rocks at the northern and southern margins of the volcanic belt and also in a 2-5 km. wide zone extending along the north side of the northeast arm of Lake Temagami typically contain appreciable amounts of both chlorite and actinolite. Soucie(1979) referred to these as Net Lake, Central Strathcona, and Iron Formation Actinolitic basalts respectively.

d) Rocks which contain chlorite and little or no actinolite may be mafic or felsic in composition. In the former case, mafic rocks in the vicinity of Arsenic Lake, Strathy Twp., form a wedge-shaped unit which contain chlorite as well as appreciable amounts of calcite (see map 3).

The felsic rocks along the northeast arm of Lake Temagami and in a stratigraphic horizon parallel to Link Lake and Vermilion Lake in Strathy Twp. contain very little or no actinolite. In all of these localities, the felsic rocks contain significant quantities of calcite and/or dolomite-ankerite.

Carbonate Mineral Distributions.

On map 3 the distribution of calcite and dolomite-ankerite (sometimes simply referred to as dolomite) is shown for the volcanic rocks of this region. Carbonate minerals are clearly widespread and occur in all major rock types. The following observations can be made from map 3 :-

a) Rocks which contain only dolomitic-ankeritic carbonate occur within the immediate vicinity of the northeast arm of Lake Temagami and in much less abundance in an east-west zone along the northern margin of the volcanic belt in Chambers and Strathy Twps. Such rocks are also associated with the highest concentration of samples containing both calcite and dolomite-ankerite. While the initial primary rock type in these areas is dominantly felsic(pyroclastic) volcanics, mafic volcanics also occurs in these zones. In such rocks the carbonate often occurs in both a disseminated and vein mode.

b) North and west of Link Lake in Strathy and Chambers Twps., carbonate mineralization is less significant in amount and calcite-only veins dominate. Mafic rocks in the vicinity of Lowell Lake in Strathcona Twp. contain no appreciable carbonate mineralization and this is also true for a significant proportion of mafic rocks north and west of Arsenic Lake in Strathy and Chambers Twps.

Recrystallization in mafic and felsic volcanic/plutonic igneous mineral assemblages to metamorphic grades in the greenschist facies form the following types of mineral assemblages, provided major changes in bulk chemistry (aside from hydration) do not occur (Winkler 1974):-

Mafic Rocks (Basalts, Andesites)

Albite/oligioclase + actinolite/blue-green hornblende + epidote/clinozoisite + chlorite + sphene + minor quartz, biotite, white mica, calcite.

Felsic rocks (Rhyolites, Dacites)
Quartz + albite + white mica(muscovite and/or paragonite)
+ chlorite + biotite + minor epidote/clinozoisite, actinolite.

In comparison with the above expected mineral assemblages, the mineral distribution maps presented in maps 2 and 3 suggest that certain regions of the Temagami belt have anomalous mineralogies due to secondary chemical alteration.

These areas are:-

(a) In the mafic volcanic rocks in and about Arsenic Lake where actinolite is absent and calcite is ubiquitous. Soucie (1978) recognized these mineralogical characteristics in the volcanic rocks in Strathy Twp. and stated that the decrease in actinolite could be correlated with increasing epidote content. In this same area there exists an abundance of mineral showings centred on Arsenic Lake.

b) Along the Northeast arm of Lake Temagami where Soucie(1979) correctly observed that the most intense zones of carbonatization are associated with northeast trending shear zones. While these zones occur on all scales, the most intensely developed lies within the pyroclastic felsic volcanic rocks of his Northern and Southern Complexes, centred on the northeast arm of Lake Temagami. In map 3 the distribution of dolomite, and dolomite+calcite rocks clearly outlines this region of alteration which Soucie(ibid) identified in his traverse through the belt along Hwy. 11.

Mineral Assemblages.

On maps 4 and 5 the distributions of mineral assemblages typically exhibited by the mafic and felsic metavolcanic rocks are illustrated. These two groups were distinguished based upon the relative intensity of the (100) X-ray diffraction peak for quartz at 4.26 angstroms, as indicated in the discussion of the X-ray powder diffraction data. The mineral assemblages which characterize these two rock types are described below.

(a) Mafic mineral assemblages.

On map 4, four mineral assemblages are indicated. The two assemblages containing plagioclase, amphibole, carbonate and quartz are believed to represent the least altered mafic rocks in the region. The assemblages dominated by chlorite, carbonate, epidote and white mica are considered to be anomalous and indicative of post-magmatic hydrothermal processes. On map 4 the "least altered" to "unaltered" metabasalts occupy the same general area as the actinolite-bearing rocks identified on map 2. The chloritic metavolcanic rocks identified on map 2 in the vicinity of Arsenic and Vermillion Lakes are also clearly recognized on map 4 as a group containing significant carbonate (identified as calcitic on map 3) and white mica. These rocks are clearly anomalous in terms of their mineralogies and in view of their general association with abundant small mineral showings in the region they deserve further, more detailed examination.

A second zone of anomalous mafic mineral assemblages occurs along the northeast arm of Lake Temagami. This is a zone of intense deformation and faulting and hence an expected zone of hydrothermal alteration within the volcanic belt. Whereas late fracture vein calcite is the main carbonate mineral in the anomalous rocks of the Arsenic-Vermilion Lake area, dolomite-ankerite is the most abundant carbonate phase in the rocks along the northeast arm and often occurs disseminated through the rocks as well as in veins. The concentration of these highly carbonatized rocks adjacent to the Temagami Island copper deposit should be noted.

(b) Felsic mineral assemblages.

On map 5 the distribution of four assemblages representing recrystallized, initially felsic rocks is indicated. Those assemblages containing quartz, plagioclase, white mica and lesser amounts of chlorite and epidote appear to most closely represent those primary volcanic compositions which have largely undergone simple hydration under conditions of greenschist facies metamorphism. Their distribution is

scattered throughout areas of felsic rocks in the region. The fact that they are "intercalated" with more altered assemblages is indicative of the frequent small scale of the zones of alteration through which the hydrothermal fluids have been channelled.

The absence of plagioclase and epidote, and the dominance of white mica, carbonate and chlorite in these quartz-rich rocks is characteristic of anomalous assemblages in this area and distinguishes them from those described above. Such anomalous assemblages are also reminiscent of the feldspar- destructive alteration zones associated with gold mineralization in the Red Lake area as described by MacGeehan et al (1982). A noticeable horizon of this type is a felsic unit which runs from the south end of Net Lake in Strathy township southwest through Vermilion Lake and then westward between Sutton and Tasse Lakes in Chambers township. Numerous mineral showings of Au, Ag, and base metals occur along this horizon and we suggest it deserves further attention for these reasons. Similarly, in the felsic volcanics and porphyries immediately north of Link Lake in Strathy township mineral assemblages are anomalous and Au and Ag mineralization has been recognized.

Taken together with the anomalous mafic rocks identified on map 4 along the northeast arm of Lake Temagami, the data on map 5 indicate that zones with anomalous mineral assemblages occur in the vicinity of Temagami Island and in the relatively thick sequence of felsic volcanics immediately south of the townsite of Temagami around Jessie Lake. Our ability to distinguish the initial mafic or felsic parentage of the most highly carbonatized samples from these areas, based solely on mineralogy, is often poor hence these zone are probably best identified by examining maps 4 and 5 together. As far as we can ascertain at this stage, the end product of the alteration where strong carbonatization has been involved almost completely masks the initial rock parentage. Both of the areas mentioned above have either precious or base metal mineral showings or in the case of Temagami Island was the site of a major copper deposit.

To summarize the mineralogical data, it can be said that areas having anomalous assemblages can often be correlated with areas having a high frequency of mineral showings or with past producing mines. It is clear from all of the mineral maps (2, 3, 4 and 5), however, that within any portion of this area a large variation exists in the types of mineral assemblages occurring.

Geochemistry

Major Oxide Data.

Analytical data for 10 major and minor oxides were obtained for some 820 volcanic rock samples by X-ray fluorescence analysis of fusion pellets; the results are listed in appendix 1. The pellets were prepared by adding 4.2 grams of lithium tetraborate and 1 gram of ammonium nitrate to 1.4 grams of dried sample powder (-325 mesh). This mixture was then fused in a non-wetting Pt crucible on a Claisse Automatic Fluxer and cast in a Pt mould to form the pellet. Details of analytical methods used during this and other STAMP projects are given in the Analytical Methods report included here as appendix 2.

An indication of the relative proportions of the different rock types in the Temagami greenstone belt, as sampled and analysed during this project, is given in figure 3 which shows a moderate bimodality in the weight percentage SiO_2 frequency distribution for 747 samples in the range 45% to 80%. Approximately 65 samples with obvious signs of chemical alteration were excluded from figure 3. A few strongly carbonated basaltic rocks have silica values appreciably below the indicated gange

carbonated basaltic rocks have silica values appreciably belowindicated range (e.g. nos. 0194, 2028, 4126 and 2010) and a few highly silicified samples have silica values lying above it (e.g. nos. 0224, 2088, 4208 and 4026). In addition several samples falling within the range of silica values indicated in figure 3 but having abnormally low Al_2O_3 values (<10%) were also excluded (e.g. nos. 0220, 2088, 2067 and a number of others) . Summary statistics for the major and minor oxide weight percent values of the Temagami metavolcanic rocks are listed in table 2.

One of the major objectives of the geochemical part of this project has been to identify and characterize chemical alteration in these samples using the techniques of Beswick and Soucie (1978) and following this, to attempt to establish which samples have alteration characteristics suggestive of their proximity to zones of hydrothermal alteration associated with base metal sulphide and or precious metal mineralization using the techniques described by Beswick and Nichol (1980) and Beswick (1981).

Figure 3. Relative frequency distribution of wt. % silica values for 747 metavolcanic rocks from the Temagami Area.

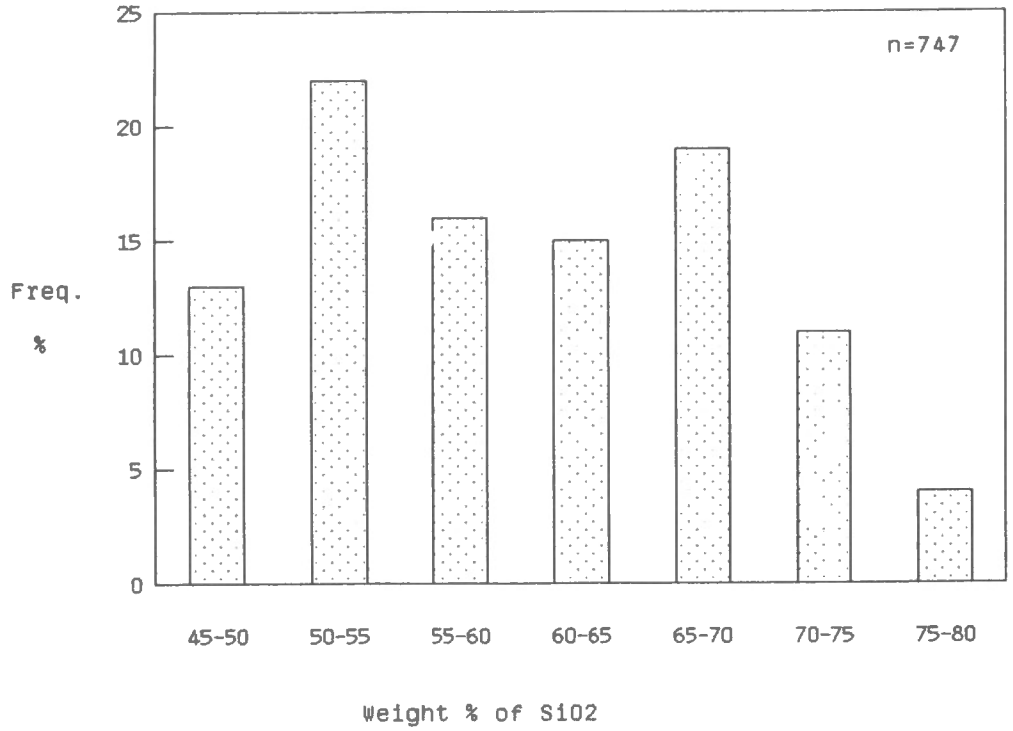


Table 2. Summary statistics for the major and minor oxide weight percent values of some 780 metavolcanic rocks from the Temagami greenstone belt.

Oxide	Mean	Std. Dev.	Minimum	Maximum
SiO_2	60.342	8.748	44.020	83.730
TiO_2	0.854	0.441	0.020	2.480
Al_2O_3	15.221	2.094	6.010	27.910
Fe_2O_3	8.962	4.760	0.260	21.830
MnO	0.139	0.086	0.000	0.720
MgO	4.517	2.771	0.030	23.820
CaO	5.312	3.554	0.020	16.690
Na_2O	2.960	1.701	0.000	11.280
K_2O	1.545	1.548	0.010	16.690
P_2O_5	0.148	0.143	0.000	2.920

Chemical alteration.

Beswick and Soucie (1978) demonstrated that unaltered volcanic rocks from a wide variety of tectonic settings exhibit well defined trends when their compositions are plotted on logarithmic molecular proportion ratio diagrams (LMPR plots) such as log SiO_2 /K_2O vs. log Al_2O_3/K_2O. They also demonstrated that the compositions of some 250 Archean volcanic rocks from the Temagami greenstone belt scattered about these trends when plotted on the same diagrams. Similar diffuse trends are indicated in figure 4 for the approximately 820 Temagami volcanic rocks analysed during the course of this project.

Beswick and Soucie (ibid.) suggested that the diffuseness of the trends displayed by Archean suites might be used as a basis for gauging the nature and intensity of the chemical alteration which had affected their compositions and outlined a graphical technique to determine these effects quantitatively.

Following on this work, Beswick and Nichol (1980) outlined two versions of a computer program to estimate oxide additions and depletion in altered volcanic rocks. Both versions assume that Al_2O_3 was immobile during the alteration and differ mainly in the algorithms used for estimating SiO_2, CaO and K_2O alterations in the initial stages of the procedure.

In appendices 3 and 4 respectively, the alteration additions and depletions as calculated by version 1 and 2 of the program are given and summary statistics of these results are listed in tables 3 and 4. In addition the results of the two versions can be compared graphically in figures 5a to 5i for each oxide.

Table 3. Summary of Descriptive Statistics for the Version 1 Alteration Parameters for Temagami

Variable Name	Mean	Std.Dev.	Skewness	Minimum	Maximum
aSiO2	-0.001	1.885	0.665	-20.600	25.900
aTiO2	-8.915	45.302	1.508	-85.200	203.900
aFe2O3	193.797	152.750	0.895	-68.300	878.000
aMnO	3.793	63.965	1.719	-94.700	504.300
aMgO	653.695	2724.046	14.164	-92.200	53566.300
aCaO	38.648	166.237	5.583	-99.400	1917.200
aNa2O	-20.501	44.565	0.617	-99.800	218.700
aK2O	-20.280	91.758	6.771	-99.500	1022.000
aP2O5	-54.059	49.967	11.356	-97.300	879.900

Table 4. Summary of Descriptive Statistics for the Version 2 Alteration Parameters for Temagami

Variable Name	Mean	Std.Dev.	Skewness	Minimum	Maximum
aSiO2	13.408	20.165	0.187	-40.800	97.900
aTiO2	-11.791	39.606	1.320	-86.300	154.900
aFe2O3	176.719	120.373	0.577	-64.000	736.800
aMnO	0.780	59.378	1.690	-93.600	464.900
aMgO	374.764	668.972	4.808	-87.400	6727.700
aCaO	2.655	57.766	2.153	-99.300	540.700
aNa2O	-18.258	43.358	0.177	-99.800	137.300
aK2O	-11.510	111.497	7.397	-97.800	1519.800
aP2O5	-49.977	62.132	11.407	-96.900	1104.300

The alteration values presented in these figures, tables and appendices (referred to as alteration parameters in the following pages) are expressed as percentage changes relative to the oxide amounts originally estimated to be present by the programs. For example, a +50% addition of MgO in a rock containing 6.0 wt. % MgO implies an original MgO content of 4.0 wt. % whereas a -25% depletion in MgO for the same rock would imply an original MgO content of 8.0 wt. %.

Figures 4a-4h. Logarithmic molecular proportion ratio (LMPR) plots of the Temagami metavolcanic rocks for each oxide (SiO_2, TiO_2, etc.) ratioed against K_2O on the y axis versus the log of Al_2O_3/K_2O on the x axis.

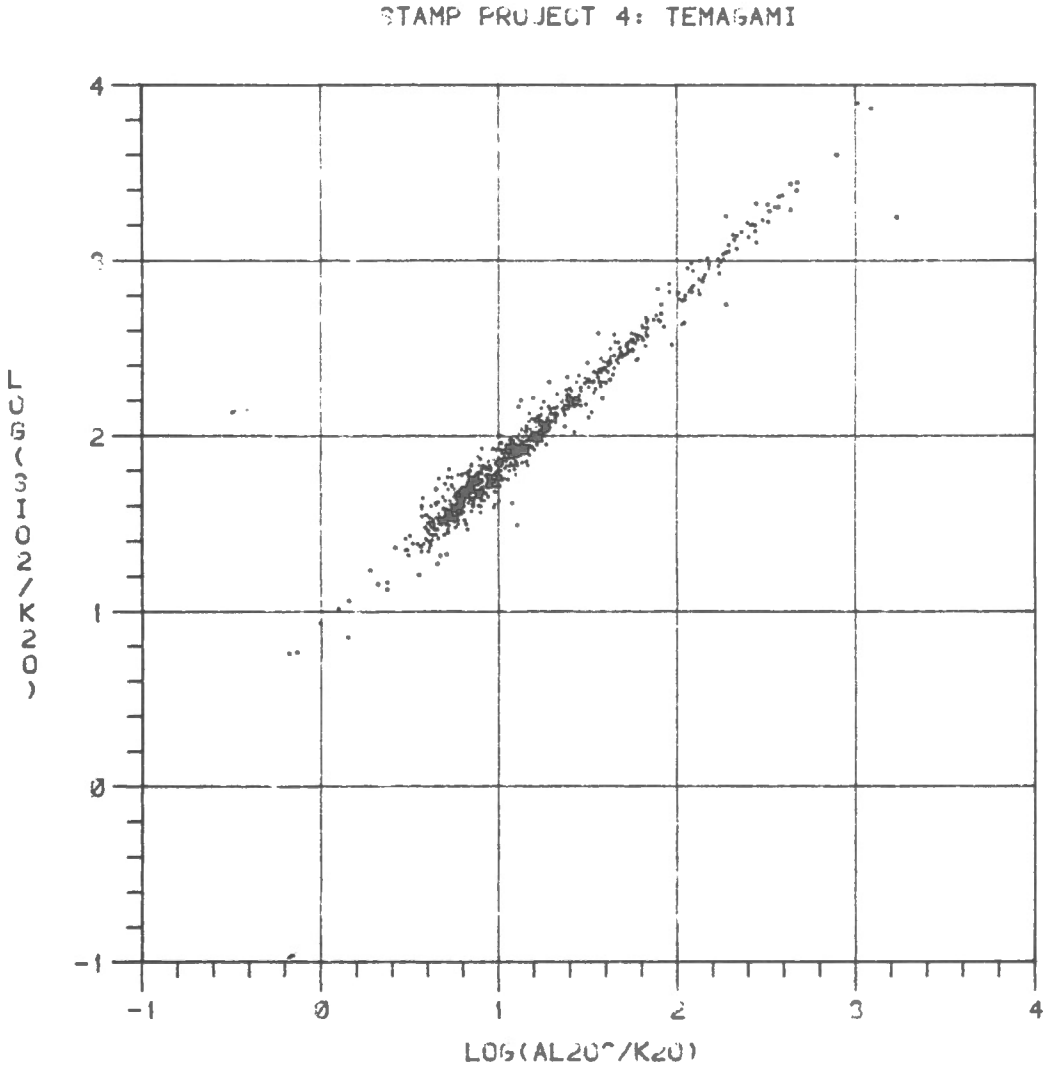


Fig. 4a. SiO_2/K_2O vs. Al_2O_3/K_2O LMPR plot.

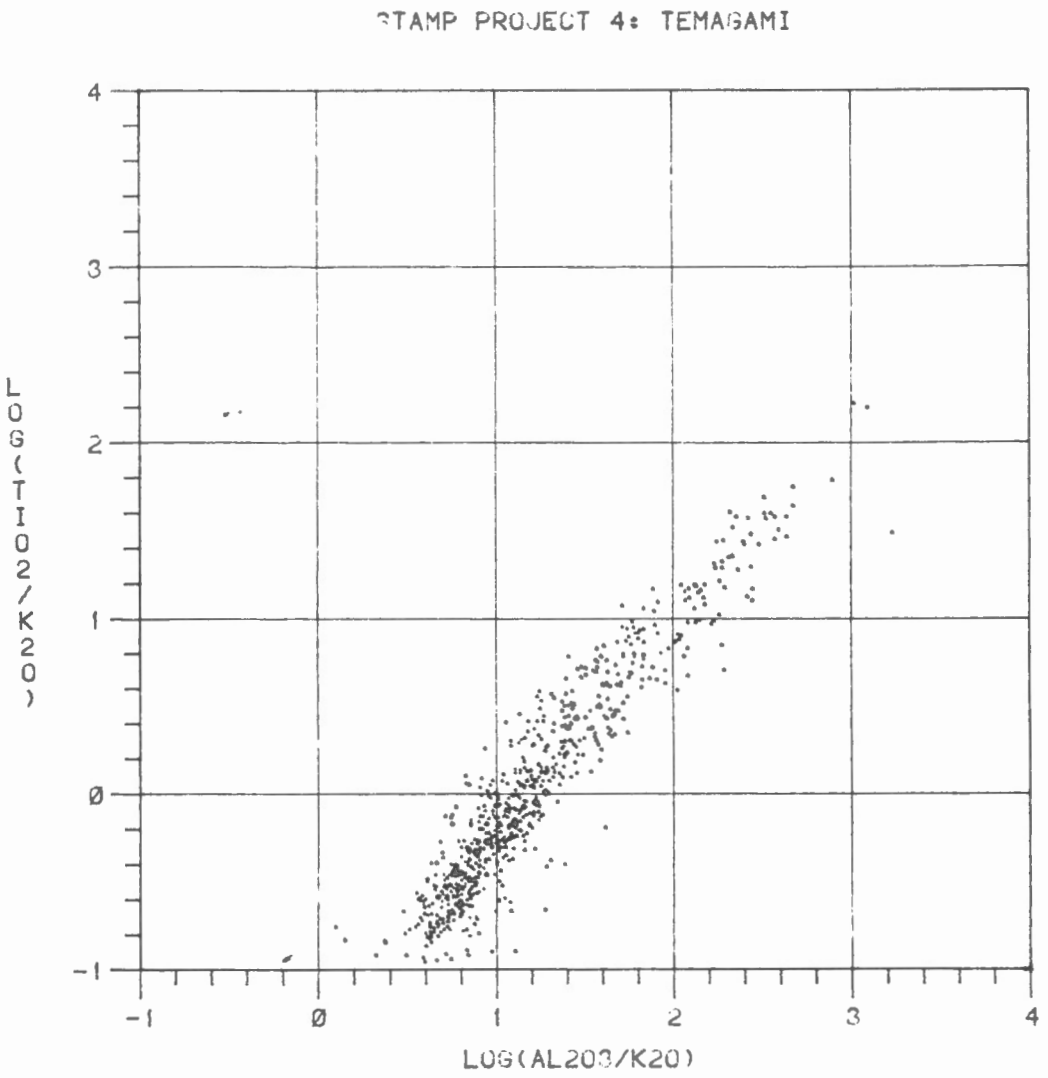


Fig. 4b. TiO_2/K_2O vs. Al_2O_3/K_2O LMPR plot.

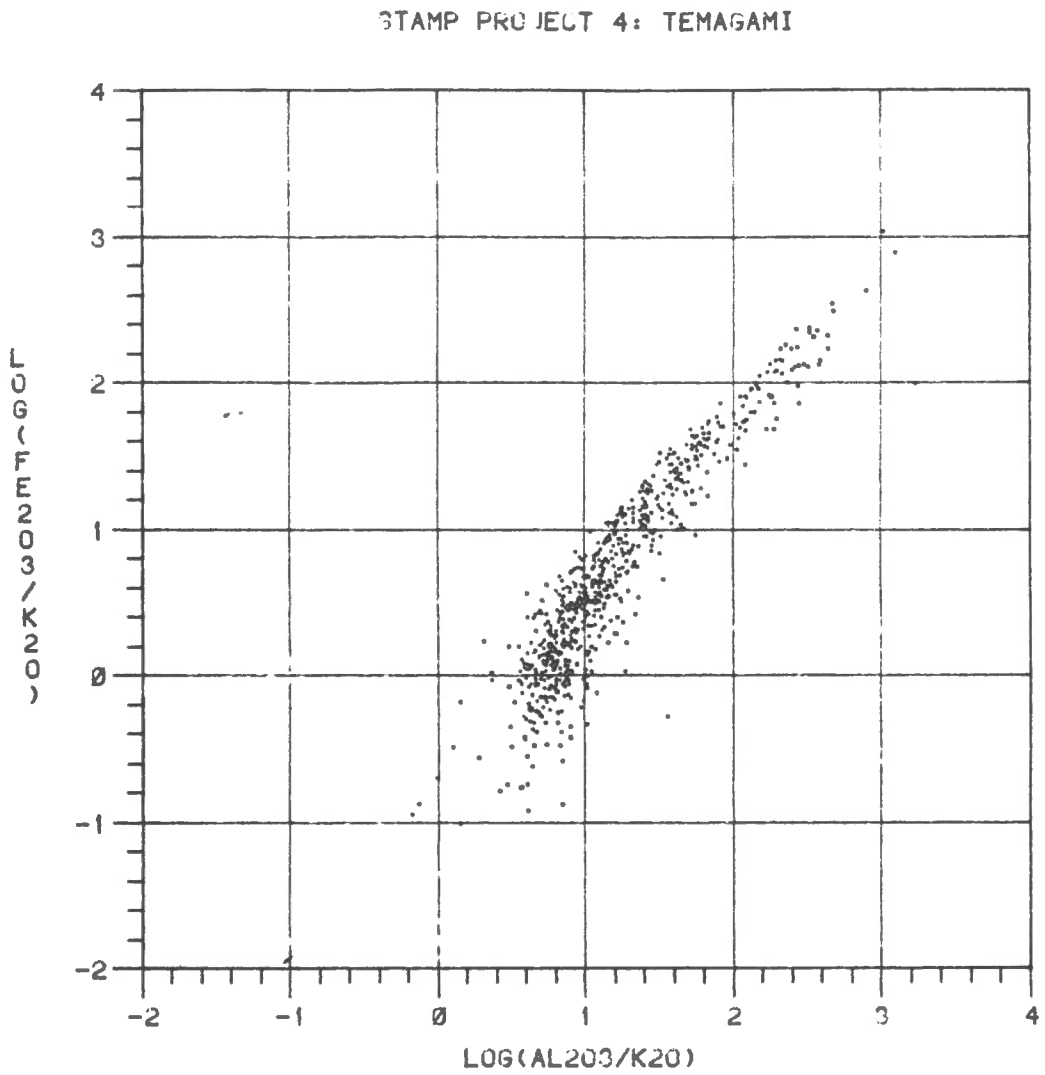


Fig. 4c. Fe_2O_3/K_2O vs. Al_2O_3/K_2O LMPR plot.

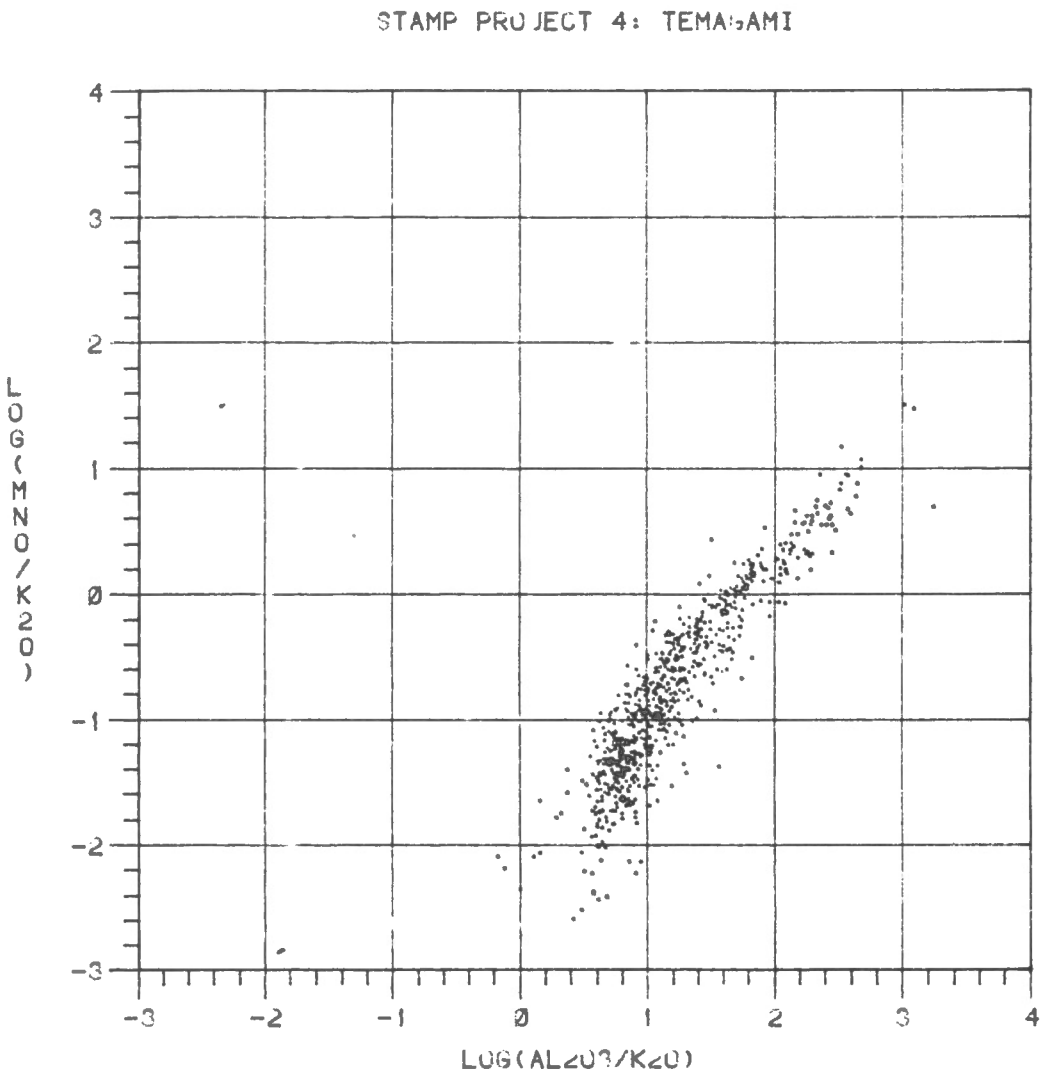


Fig. 4d. MnO/K_2O vs. Al_2O_3/K_2O LMPR plot

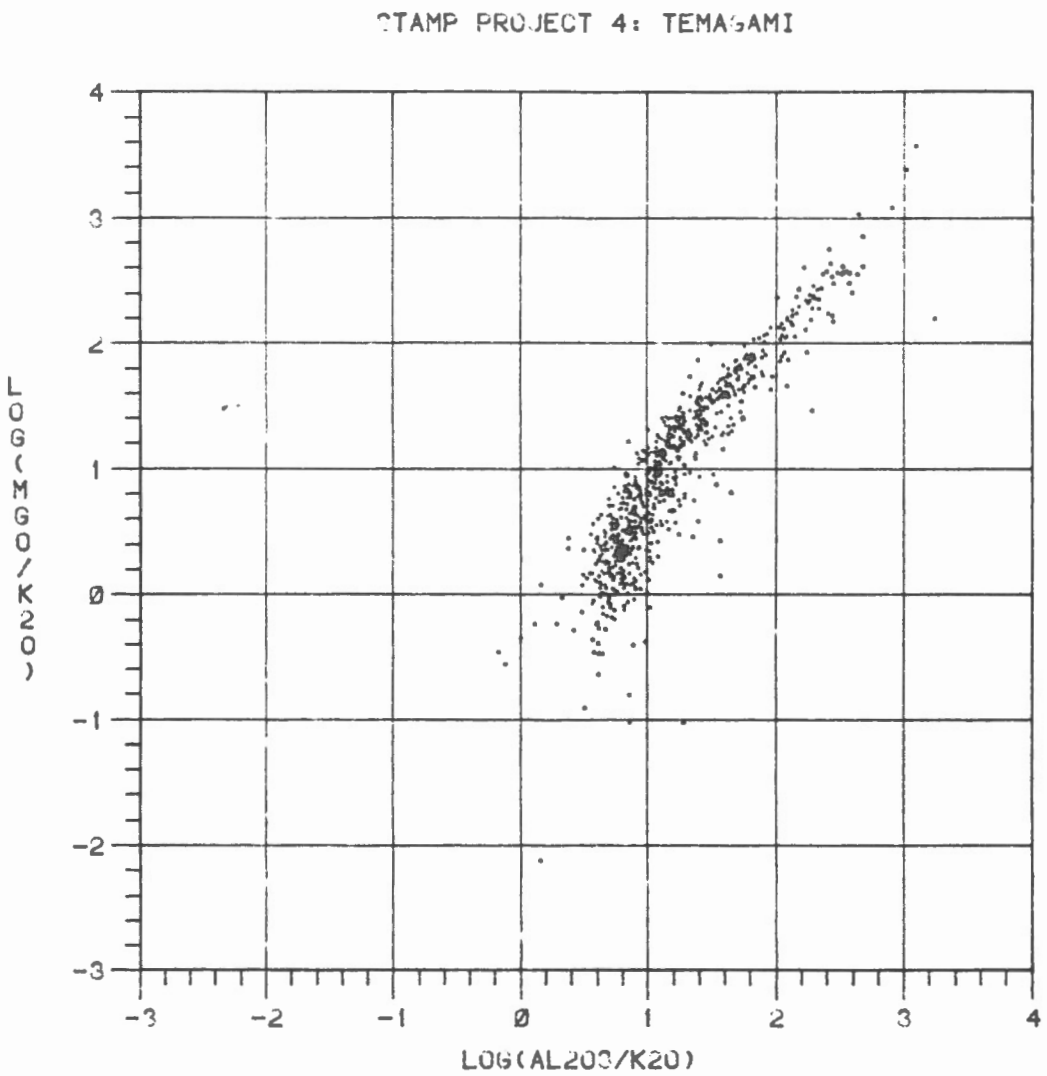


Fig. 4e. MgO/K_2O vs. Al_2O_3/K_2O LMPR plot.

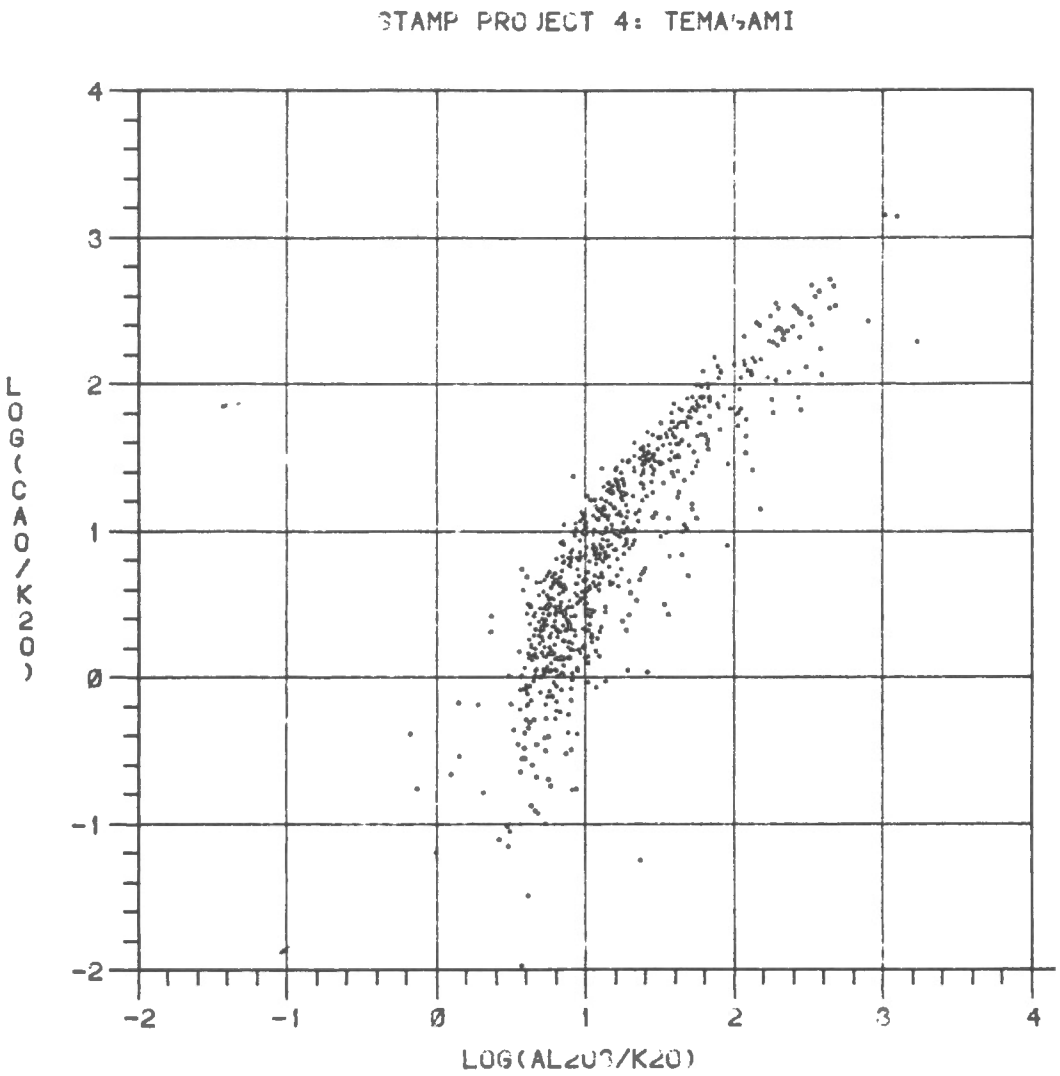


Fig. 4f. CaO/K_2O vs. Al_2O_3/K_2O LMPR plot.

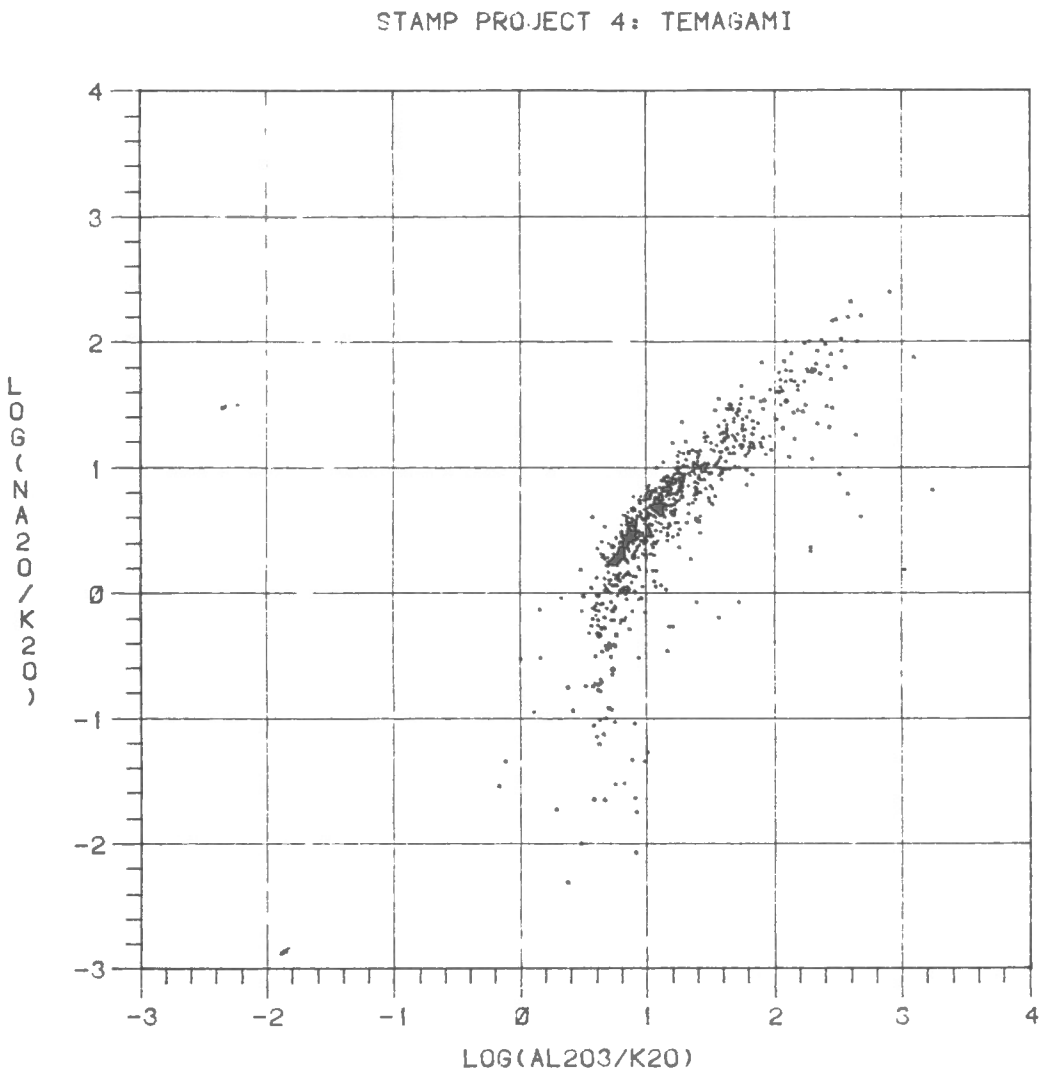


Fig. 4g. Na_2O/K_2O vs. Al_2O_3/K_2O IMPR plot.

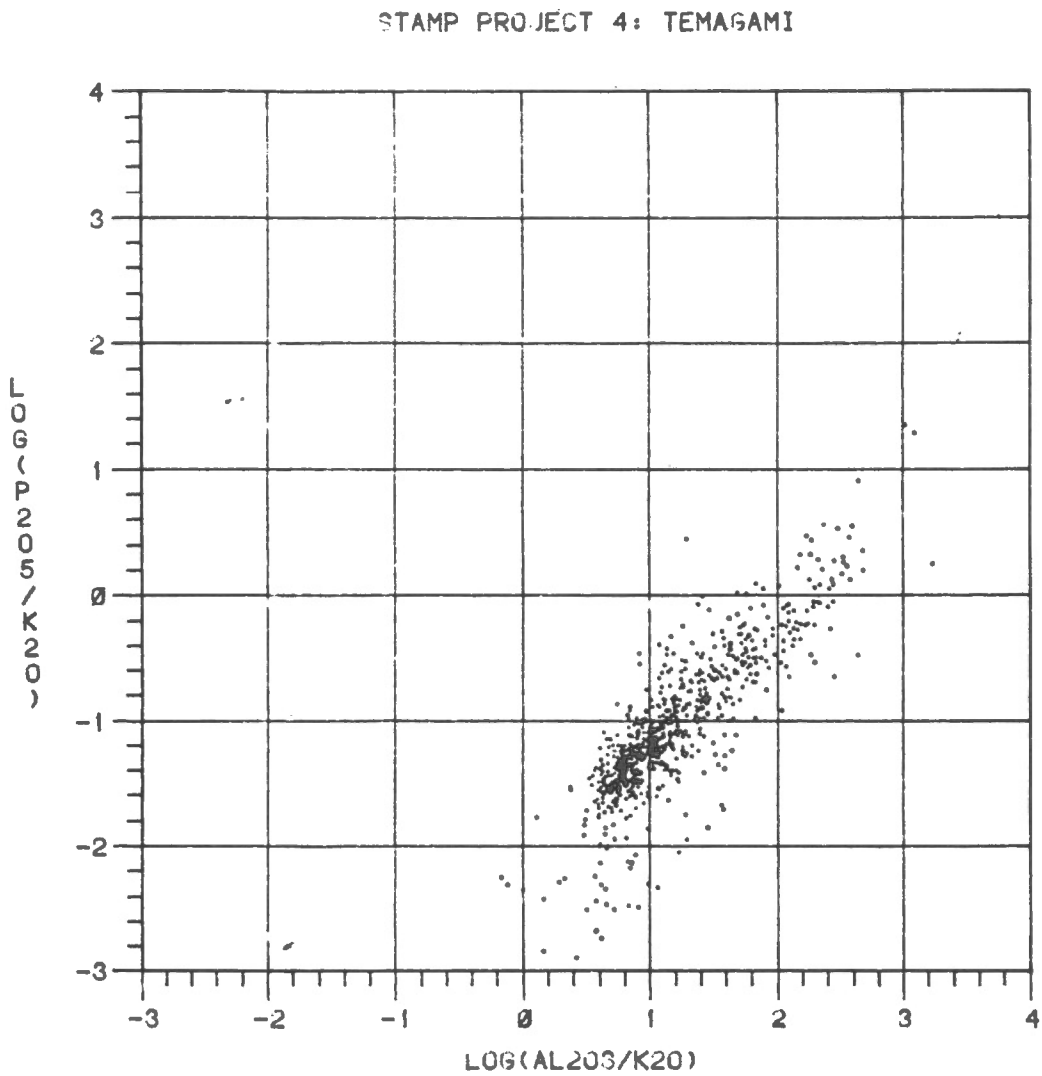


Fig. 4h. P_2O_5/K_2O vs. Al_2O_3/K_2O LMPR plot.

Figures 5a-5i. Comparative histograms of oxide alteration additions and depletions for some 820 Temagami metavolcanic rocks as obtained from the versions 1 and 2 alteration program results listed in appendices 3 and 4 respectively. Upper class bound values are listed along the x axis.

Figure 5a. SiO2 Alteration for the Temagami Area

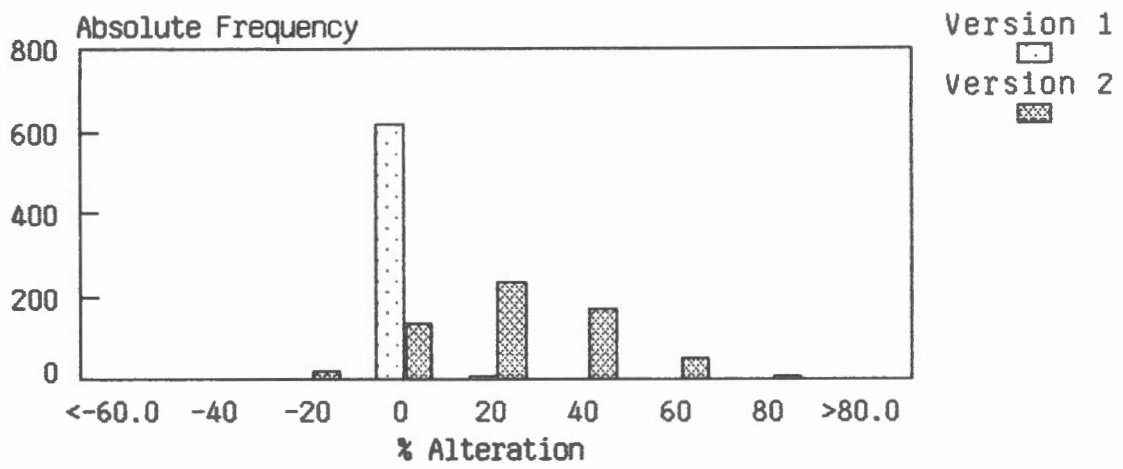


Figure 5b. TiO2 Alteration for the Temagami Area

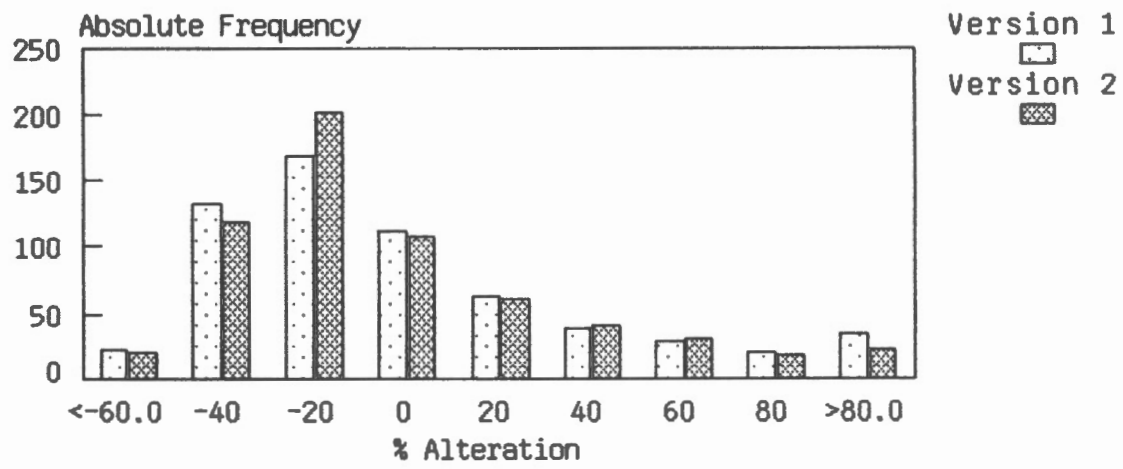


Figure 5c. Fe203 Alteration for the Temagami Area

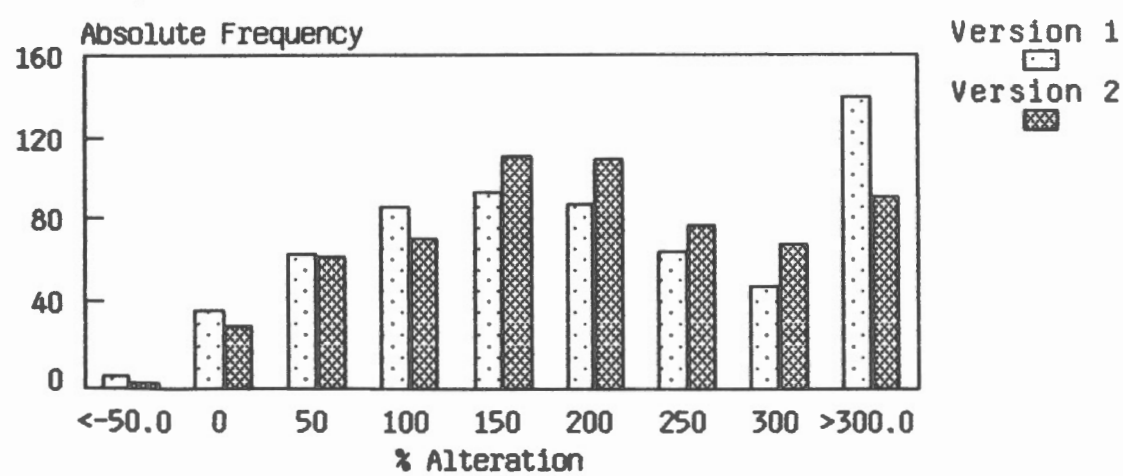


Figure 5d. MnO Alteration for the Temagami Area

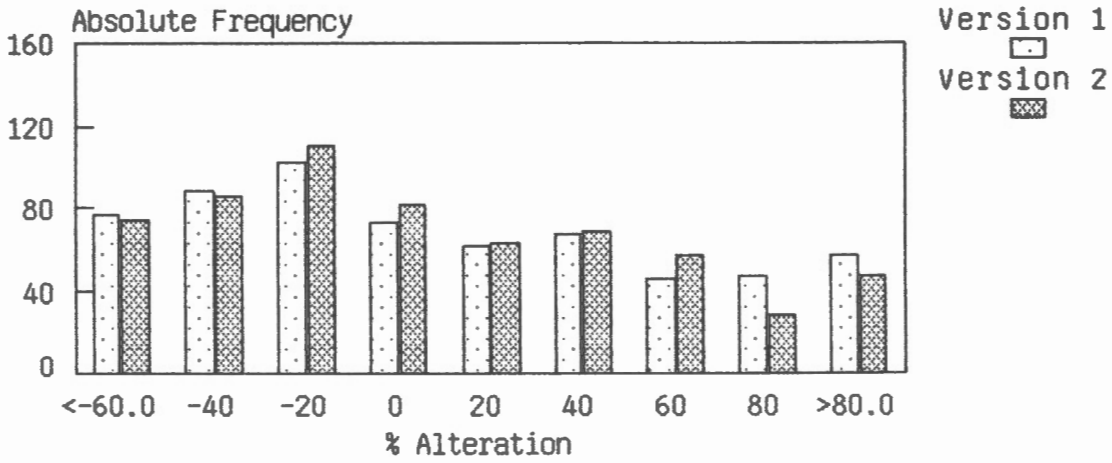


Figure 5e. MgO Alteration for the Temagami Area

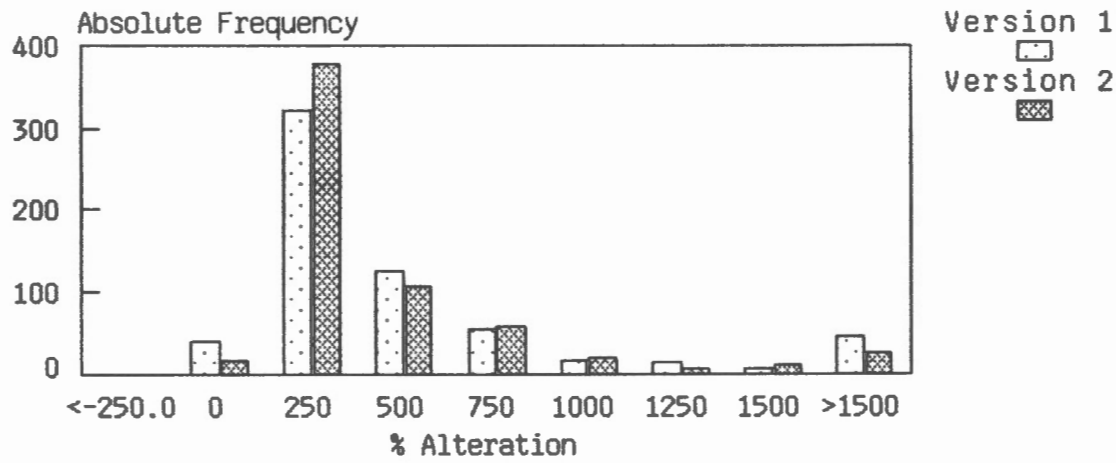


Figure 5f. CaO Alteration for the Temagami Area

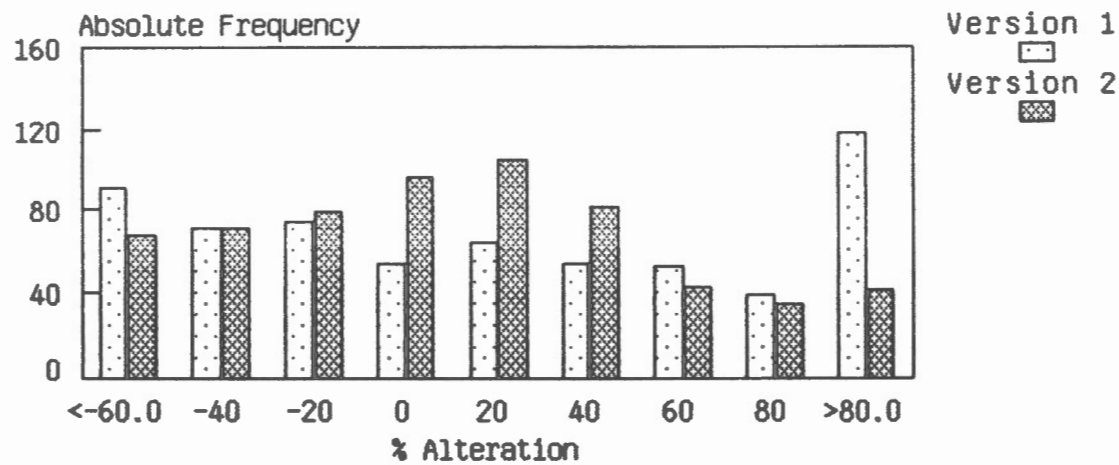


Figure 5g. Na20 Alteration for the Temagami Area

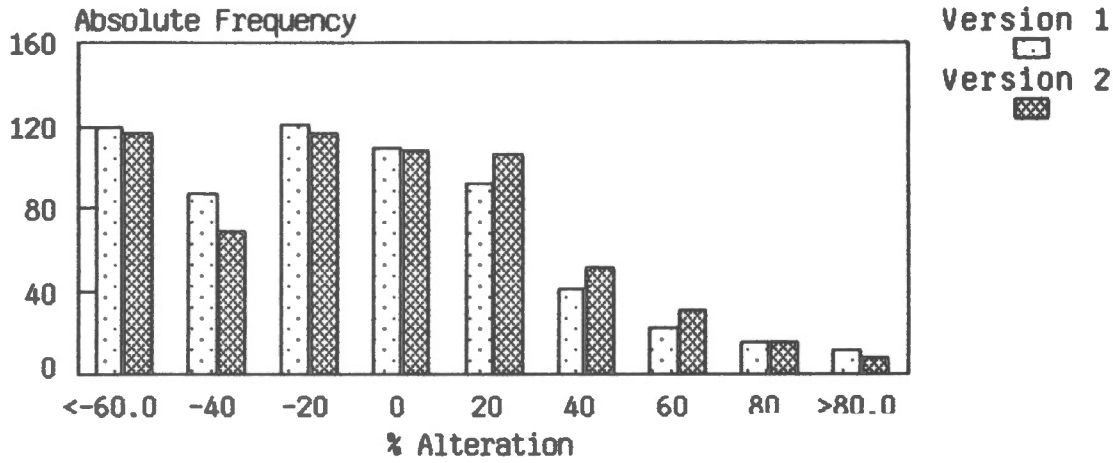


Figure 5h. K20 Alteration for the Temagami Area

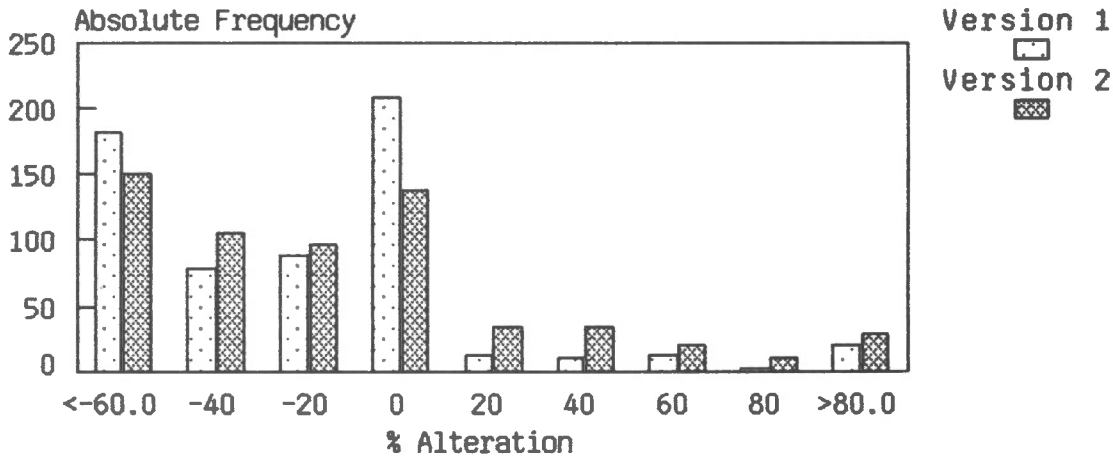
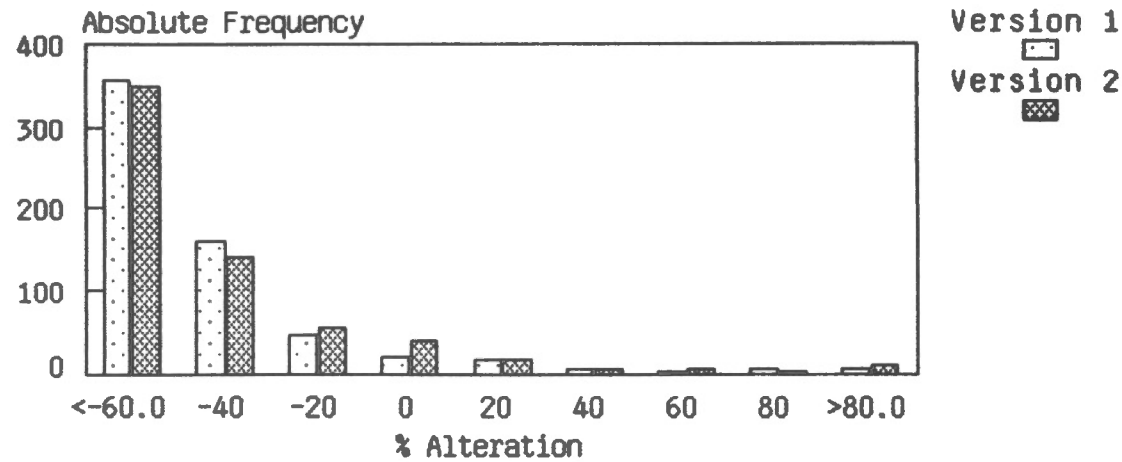


Figure 5i. P205 Alteration for the Temagami Area



It can be seen from figures 5a through 5i that in most cases the ranges and distributions of the oxide additions and depletions are very similar by the two versions of the program. Significant differences between the results of the two versions exist only for SiO_2 (figure 5a) and CaO (figure 5f) and these are expected from the differences in the algorithms used in the two versions of the program as indicated above.

It should be stressed at this point that the alteration parameter values calculated by these programs are not meant to be used as *absolute* measures of the amounts of the various oxide additions and depletions. Rather they should be used in a relative sense to estimate, for example, which rocks or areas within a region have lost the most CaO or which have gained the most MgO etc.

From an overall examination of the alteration data plotted in figures 5a-i and of the related statistics listed in tables 3 and 4 the following general observations can be made:-

The vast majority of samples SiO_2 alterations in the range from -20% to +20% of the original amounts with the overall distribution being skewed toward moderate additions according to the results of version 2.

In the case of TiO_2 an overall minor loss is suggested from the

mean values, however the range of values is large and their distribution appears positively skewed.

Fe_2O_3 alterations are strongly biased toward overall additions and once again the range of values is large.

MnO values overall show very weak addition but the range of values is again large and generally balanced between additions and depletions.

MgO values in almost every sample suggest strong additions with some values being extreme, particularly as calculated by version 1.

In the case of CaO the overall range of values and the pattern of additions and depletions is very similar to that for MnO.

For Na_2O the majority of samples show significant depletions although an appreciable number show moderate to strong additions.

Again in the case of K_2O most samples show strong depletions with a small but significant number of samples showing moderate to strong additions.

The vast majority of samples show strong P_2O_5 depletions.

Alteration and mineralization

Using version 2 of the programs referred to above it was demonstrated by Beswick (1981) that the nature and intensity of oxide alteration characteristics on a regional scale, are significantly different in mineralized (massive Cu-Zn sulphide bearing) and unmineralized segments of selected greenstone belts in the Superior Province of the Canadian Shield. Based on such differences between some 760 samples from the mineralized, 400 sq. km. Uchi-Confederation Lakes area (which hosts Selco's South Bay Mine) and the unmineralized Kakagi Lake (840 samples in 300 sq. km.) and Halliday Dome (600 samples in 500 sq. km.) areas a version 2 based discriminant function was established which had the capability of correctly identifying samples from these two types of population with up to 90% success. Furthermore, when "probabilities of correctness", based on individual sample discriminant scores, were assigned to samples identified as being from a "mineralized" population it was noted for a test sample suite from the Sturgeon Lake area (800 samples in 600 sq. km.) that the majority of the 123 high probability (>80%) samples closely coincided with known prospects and mines such as the Mattabi and Lyon Lake deposits. In addition, two previously unknown, high probability, potential mineral targets were also identified (Beswick, 1981, fig. 3b).

Blind testing of this massive sulphide disciminant function has successfully targetted known occurrences in three other areas for which data for several hundred samples are available at a density of 1 to 2 samples per sq. km.

Temagami discriminant scores.

The alteration parameters calculated by versions 1 and 2 of the program have been used in conjunction with the corresponding massive sulphide discriminant functions to obtain discriminant scores and hence classify each of the samples as "mineralized" (class 0.0) or unmineralized (class 1.0). The discriminant scores and the class are listed in the two right hand columns of appendices 3 and 4 together with the version 1 and version 2 alteration parameters respectively.

In general samples with negative scores are classed as "mineralized" (class 0.0) and the more negative the score the higher the probability that this classification is correct. The percentage of total samples (724) identified as having greater than 50% probability (scores<0.0) of being from a "mineralized" population, based on version 1 and version 2 results, are 50.4% and 36.9% respectively.

The relationships between discriminant score and "probability of mineralization" (between 0.0 and 1.0) using version 1 and version 2 results are shown in figures 6 and 7 respectively. These plots indicate that for any given probability greater than 0.5 (50%) the corresponding discriminant score is somewhat more negative for version 1 than for version 2 results. For example, "probabilities of mineralization" of 0.6, 0.7, 0.8 and 0.9 correspond to version 1 discriminant score values of -0.56, -1.15, -1.87 and -2.94 whereas the same probabilities require version 2 discriminant scores of -0.45, -0.95, -1.57 and -2.35.

Figure 8 shows the relative frequency distribution of samples (vertical axis) in each probability interval and it can be seen that the distribution patterns of the various probability levels are very similar based on version 1 and 2 results. It should be noted, however, that although version 1 is more liberal than version 2 in its overall classification of "mineralized" samples this becomes less and less so at progressively higher probability levels so that at the >90% level there are approximately three times as many so classified by the version 2 function than that by version 1. These factors should be borne in mind when the individual sample scores in appendices 3 and 4 are compared in terms of consistency in targetting high probability alteration anomalies.

The most useful way to undertake a comparison of the discriminant score results for the two versions is to examine the regional distribution of those samples classified by both version as having a high probability of being associated with massive sulphide mineralization.

On maps 6 and 7 respectively, those samples classified by version 1 and version 2 as falling within the probability intervals whose lower bounds are 60%, 70%, 80%,and 90% are indicated by different symbols.

A comparison of these two maps indicates that the 118 samples identified by version 1 and the 72 samples identified by version 2 at the 60-70% probality level are somewhat widely and similarly distributed in the south east corner of the map area in the felsic volcanics immediately west of Temagami Island. They also occur in the mafic volcanics along the northern shore of the northeast arm of Lake Temagami and extending to the southern edges of Lake Tetapaga and Link Lake. In the north west of the region they occur in the southern half of Chambers township particularly in the southeast corner as well as in the vicinity of Charley and Tasse Lakes. They are most widely distributed in the northeast of the region around the southern and western reaches of Kanichee and Net Lakes.

Figure 6. Discriminant Score - Probability Relationships based on Version 1 results

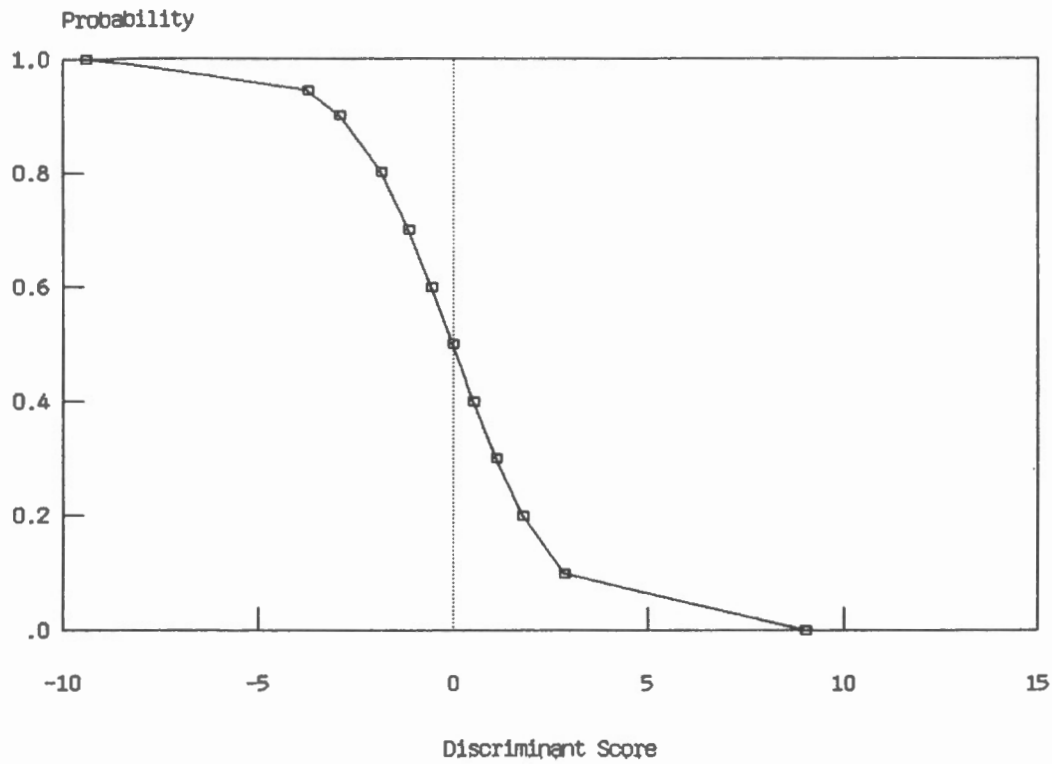


Figure 7. Discriminant Score - Probability Relationships based on Version 2 results

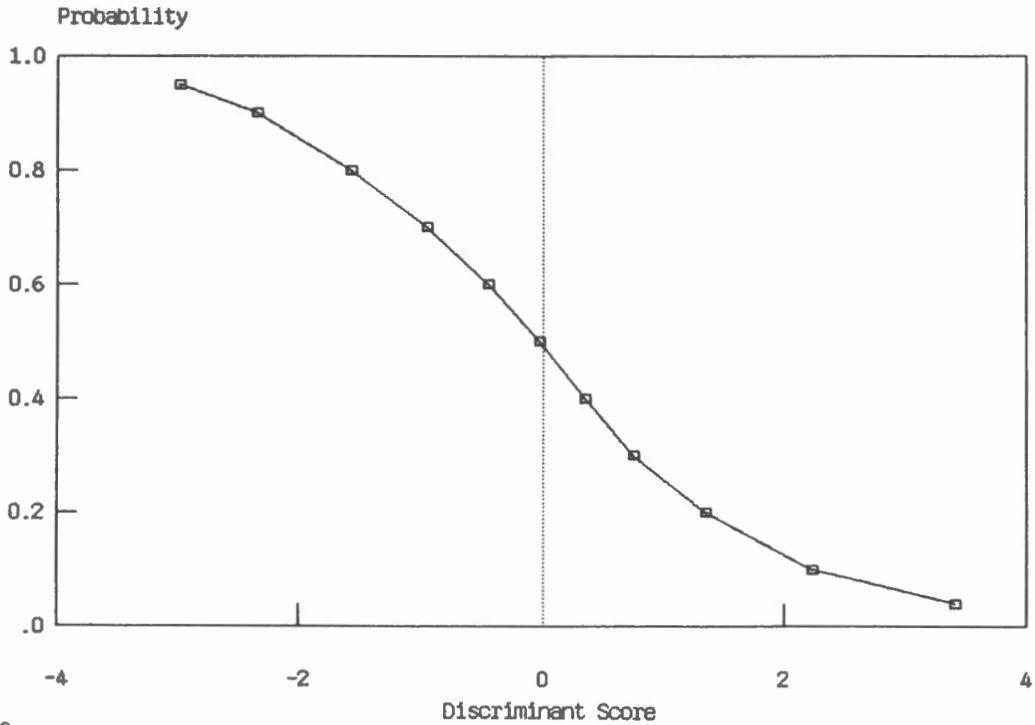
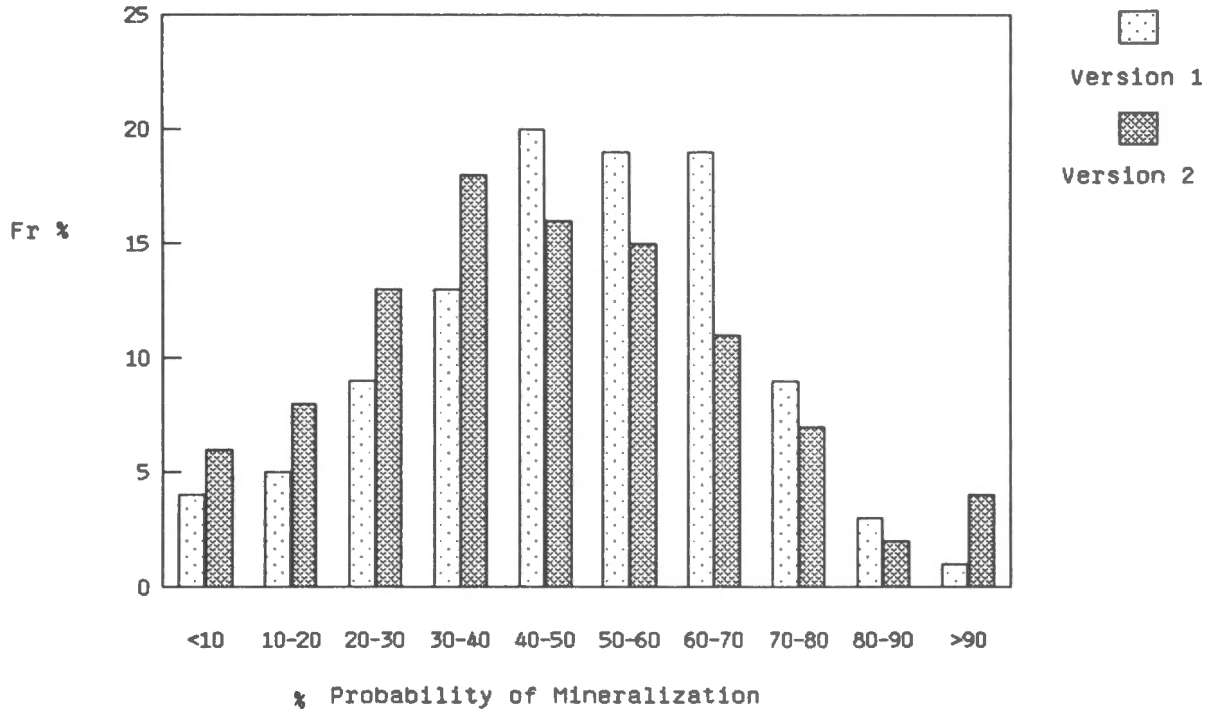


Figure 8. Relative frequency distributions of massive sulfide mineralization probabilities as determined by discriminant scopes based on Version 1 & 2 results



At the 70-80% probability level only 48 samples are identified by version 1 and 54 by version 2. At the 80-90% level 19 samples are identified by both methods while at the >90% level version 1 identifies only 8 samples compared with 23 identified at this level by version2.

Based on experience with other data sets most samples identified by both version 1 and 2 at >80% probability have been found to be located within 1 km. approximately of volcanic-hosted sulphide occurrences particularly when several samples of this type occur in a spatial cluster and are consistently identified at high probability levels by both versions.

Target Anomalies

An examination of maps 6 and 7 for spatially clustered high probability samples would suggest that hydrothermal alteration associated with sulphide mineralization would most likely be found in the following locations:-

(a) On Temagami Island or on the facing shore at the mouth of the northeast arm of Lake Temagami, in the felsic volcanics.

(b) Approximately 0.5 to 1.0 miles inland from the south shore of the northeast arm immediately to the east of Ferguson island, in felsic volcanics.

(c) Due west of Pingue Lake, half way to Hwy. 11 and approximately 1 mile south of Temagami townsite, in felsic volcanics.

(d) Within the quadrilateral bounded approximately by the south side of Point Provincial Park, the west end of Bell Island, the east end of Turtle Lake and the northwest corner of Temagami townsite, in felsic volcanics.

(e) The area within 0.5 miles north of the west end of Tetapaga Lake in felsic volcanics and in the same felsic horizon some 2 miles to the west where it is in faulted contact with the Spawning Lake Granite.

(f) The area of felsic volcanics and quartz porphyry to the west and southwest of Tasse Lake in the southwest of Chambers township.

(g) The vicinity of the felsic-mafic volcanic horizon between O'Connor Lake and Vermilion Lake and the same horizon along strike to the notheast of Vermilion Lake between the southern arms of Kanichee and Net Lakes.

(h) An area within a half mile width along the western side of the south arm of Kanichee Lake.

(i) Along the south shore of Arsenic Lake in mafic volcanics.

(j) In the felsic and mafic volcanics along the south shore of Net Lake, immediately to the west of Hwy. 11 and halfway between here and the north shore of Arsenic Lake.

Of the above listed locations area (a) has the past producing Temagami Island, Copperfields Mine as well as several sulphide showings indicated on Ontario Geological Survey Map 2324 including the Niemitz property.

The area indicated under (b) above is within 1 km of both the Nickel Rim Mines and Milestone Explorations properties while location (c) precisely targets the Pingue Lake occurrence.

In the area outlined under (d) the only known mineralization is the Portage Bay occurrence while locations (e) and (f) have no currently known sulphide or precious metal mineralization.

The horizon referred to under (g) has several known Ag, Au and sulphide occurrences to the northeast of Vermilion Lake but none is recorded to the southwest in the vicinity of O'Connor Lake.

Within the areas referred to under locations (h), (i) and (j) there are numerous occurrences of Au, Ag, Cu and Ni. These areas have the strongest chemical alteration anomalies as well as being typified by anomalous mineral assemblages and because of this we would recommend that together with areas outlined in (e) and (f) they should be worthy of further investigation.

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APPENDIX 1

MAJOR OXIDE ANALYSES

PROJECT 4:TEMAGAMI MAJOR OXIDE ANALYSES (WT. %)

SAMPLE	SIO2	TIO2	AL203	FE203	FEO	MNO	MGO	CAO	NA2O	K2O	P2O5
S 1	57.40	0.88	17.03	10.07	0.00	0.15	4.76	6.82	1.03	1.74	0.12
S 2	57.06	1.04	15.43	9.00	0.00	0.23	3.87	9.37	2.47	1.44	0.09
S 3	58.51	1.06	14.65	9.21	0.00	0.22	3.82	9.62	2.64	0.20	0.07
S 4	58.60	1.55	16.37	10.63	0.00	0.24	3.94	4.26	1.59	2.70	0.12
S 5	53.98	1.70	14.21	11.75	0.00	0.45	6.59	9.14	1.61	0.43	0.14
S 6	46.94	1.22	13.12	18.35	0.00	0.43	5.34	10.84	2.53	1.12	0.12
S 7	46.38	1.42	12.13	19.73	0.00	0.72	6.34	11.17	1.62	0.35	0.13
S 8	49.99	0.89	13.90	19.54	0.00	0.11	2.54	9.22	0.38	3.19	0.23
S 9	53.85	1.36	15.00	10.58	0.00	0.28	5.36	9.51	3.43	0.52	0.11
S 10	60.23	1.50	16.30	9.71	0.00	0.00	3.88	6.42	0.00	1.70	0.26
S 11	58.74	1.04	17.31	9.79	0.00	0.13	4.79	3.47	2.85	1.82	0.06
S 12	55.08	0.82	14.91	11.34	0.00	0.17	4.24	9.69	1.99	1.61	0.15
S 13	62.40	0.88	17.82	9.66	0.00	0.08	2.52	2.76	0.87	2.90	0.11
S 14	57.16	0.90	16.98	8.21	0.00	0.16	4.91	7.02	2.53	2.01	0.12
S 15	57.26	1.98	15.38	8.01	0.00	0.25	5.85	7.79	3.07	0.24	0.17
S 16	51.97	1.46	14.90	11.24	0.00	0.25	8.36	9.87	1.31	0.54	0.10
S 17	48.86	0.74	14.08	15.03	0.00	0.15	7.22	10.17	2.90	0.80	0.04
S 18	60.21	0.66	15.06	14.08	0.00	0.06	2.01	3.72	1.90	2.20	0.10
S 19	65.99	0.57	16.38	5.87	0.00	0.10	4.87	1.89	1.33	2.86	0.14
S 20	67.77	0.58	14.43	3.41	0.00	0.06	5.30	1.39	4.78	2.12	0.16
S 21	66.70	0.65	14.95	6.10	0.00	0.08	3.03	5.63	1.35	1.39	0.12
S 22	54.20	1.28	15.66	7.68	0.00	0.24	7.71	11.75	1.14	0.24	0.10
S 23	53.26	0.83	14.52	5.96	0.00	0.13	5.76	12.20	3.72	0.70	2.92
S 24	69.05	0.10	12.04	11.61	0.00	0.02	0.39	2.36	1.69	2.72	0.02
S 25	62.60	1.08	14.43	9.49	0.00	0.11	1.95	5.40	4.16	0.53	0.25
S 26	67.67	0.58	15.67	8.26	0.00	0.08	2.92	2.71	1.82	0.16	0.13
S 27	64.72	0.83	20.41	1.42	0.00	0.12	4.74	2.25	3.55	1.82	0.14
S 28	59.80	0.61	14.04	4.99	0.00	0.14	3.70	7.48	6.24	2.81	0.19
S 29	64.41	0.44	15.27	4.77	0.00	0.10	4.02	7.00	1.58	2.30	0.11
S 30	71.52	0.35	12.60	5.94	0.00	0.04	1.66	5.18	0.73	1.86	0.12
S 31	61.97	0.53	17.65	7.07	0.00	0.13	2.79	5.26	1.45	2.97	0.18
S 32	64.86	0.71	15.78	8.28	0.00	0.10	4.73	2.68	1.00	1.72	0.14
S 33	54.51	0.83	13.52	13.60	0.00	0.19	4.67	9.09	1.38	1.55	0.66
S 35	65.91	0.59	10.54	11.78	0.00	0.10	1.63	5.37	3.33	0.63	0.12
S 36	56.90	0.56	21.27	4.08	0.00	0.03	4.10	3.47	5.20	4.26	0.13
S 41	60.47	0.86	17.68	6.59	0.00	0.06	3.41	2.50	5.32	2.90	0.21
S 42	65.51	0.55	14.26	6.08	0.00	0.10	3.27	4.60	4.70	0.82	0.11
S 43	67.76	0.64	15.18	7.93	0.00	0.10	3.38	0.02	4.26	0.60	0.13
S 44	69.70	0.60	15.17	4.56	0.00	0.06	2.17	1.70	3.06	2.86	0.12
S 45	58.92	0.73	17.17	7.43	0.00	0.10	3.75	4.22	6.98	0.57	0.13
S 46	72.74	0.57	13.77	5.26	0.00	0.07	2.43	3.66	0.04	1.35	0.11
S 47	54.90	0.74	16.96	10.80	0.00	0.17	7.98	7.77	0.18	0.43	0.07
S 49	49.37	1.01	14.33	16.59	0.00	0.22	7.69	9.51	0.31	0.89	0.08
S 50	68.88	0.53	15.13	4.82	0.00	0.05	2.46	1.90	4.44	1.66	0.13
S 51	78.99	0.04	13.86	0.41	0.00	0.01	0.12	1.15	3.56	1.84	0.02
S 52	43.23	1.19	15.95	16.39	0.00	0.21	8.52	12.14	2.01	0.25	0.12
S 53	63.68	0.55	16.04	6.14	0.00	0.10	2.23	6.56	2.09	2.47	0.14
S 55	55.70	0.98	15.05	10.21	0.00	0.16	9.12	4.33	4.06	0.06	0.33
S 56	56.74	1.32	16.19	9.68	0.00	0.12	5.30	5.04	5.20	0.08	0.33
S 57	49.60	1.31	15.27	15.92	0.00	0.27	6.64	7.46	3.24	0.21	0.09
S 59	64.86	0.77	16.82	7.71	0.00	0.06	2.95	0.66	2.06	3.99	0.12
S 60	71.24	0.22	15.53	1.54	0.00	0.02	1.01	1.32	7.84	1.20	0.08
S 61	66.67	0.53	14.04	5.35	0.00	0.06	4.63	3.93	3.08	1.52	0.20
S 62	58.57	0.88	16.62	9.29	0.00	0.11	4.13	5.73	4.06	0.46	0.15
S 63	67.63	0.43	16.74	3.75	0.00	0.07	1.43	3.04	4.42	2.44	0.06

SAMPLE	SIO2	TIO2	AL203	FE203	FEO	MNO	MGO	CAO	NA20	K20	P205
S 64	71.38	0.45	16.65	3.28	0.00	0.04	0.66	1.18	2.42	3.88	0.06
S 65	65.24	0.79	16.05	6.56	0.00	0.09	2.72	3.58	4.15	0.70	0.12
S 66	62.37	0.88	18.19	8.62	0.00	0.10	3.02	2.92	2.64	1.15	0.11
S 67	68.69	0.83	16.65	4.61	0.00	0.06	2.11	3.51	1.98	1.47	0.09
S 69	57.96	0.41	18.50	11.36	0.00	0.09	3.61	1.74	3.62	2.44	0.27
S 70	63.04	0.59	16.03	7.00	0.00	0.22	6.63	3.07	0.24	3.04	0.14
S 71	65.86	0.47	15.27	6.44	0.00	0.24	3.42	4.61	0.21	3.35	0.12
S 72	62.49	0.81	16.20	8.28	0.00	0.11	3.53	3.13	1.78	3.32	0.35
S 73	65.39	0.50	15.69	8.72	0.00	0.06	4.21	1.40	0.17	3.64	0.22
S 74	53.13	0.83	20.99	9.43	0.00	0.09	3.04	7.51	4.43	0.51	0.04
S 75	59.80	0.91	18.39	6.96	0.00	0.19	4.67	2.12	2.29	4.29	0.38
S 76	65.32	0.62	15.40	5.05	0.00	0.10	2.98	4.72	3.29	2.16	0.36
S 77	56.81	1.17	16.13	10.72	0.00	0.19	5.48	4.73	3.63	0.79	0.35
S 78	72.95	0.18	13.95	9.43	0.00	0.04	0.86	1.64	0.29	0.53	0.13
S 80	66.92	0.64	16.23	6.68	0.00	0.08	2.68	0.89	1.36	4.32	0.20
S 81	68.88	0.50	16.78	3.51	0.00	0.04	1.60	1.12	4.48	2.91	0.18
S 82	58.72	0.78	16.63	9.07	0.00	0.08	5.34	3.54	4.87	0.74	0.23
S 83	71.34	0.48	15.38	4.49	0.00	0.04	1.38	1.16	3.31	2.27	0.15
S 84	70.37	0.50	16.35	3.64	0.00	0.04	1.57	0.67	3.48	3.24	0.14
S 85	69.49	0.51	16.18	5.26	0.00	0.12	1.66	2.17	1.12	3.30	0.19
S 88	57.19	0.56	16.42	13.44	0.00	0.11	3.85	3.54	2.60	1.98	0.31
S 89	57.77	0.13	16.60	9.83	0.00	0.12	3.20	6.24	4.67	1.20	0.24
S 90	48.16	0.76	17.94	13.24	0.00	0.16	7.69	10.81	1.16	0.06	0.02
S 91	49.75	0.99	18.74	11.49	0.00	0.18	6.02	12.30	0.47	0.04	0.02
S 92	60.22	0.84	18.36	10.34	0.00	0.10	4.05	2.24	0.25	3.32	0.28
S 93	45.52	2.48	15.11	14.22	0.00	0.17	5.80	7.71	7.37	1.03	0.58
S 94	67.64	0.52	16.94	3.56	0.00	0.04	1.45	0.86	8.50	0.46	0.03
S 95	68.04	0.54	15.18	6.05	0.00	0.08	3.20	1.96	4.76	0.05	0.14
S 96	49.85	0.65	16.54	12.80	0.00	0.12	6.94	8.68	4.03	0.35	0.03
S 97	70.72	0.49	15.55	3.20	0.00	0.04	1.33	2.32	3.89	2.33	0.13
S 98	67.49	0.47	12.77	6.63	0.00	0.08	2.22	5.53	3.32	1.30	0.19
S 99	67.44	0.44	14.35	5.15	0.00	0.07	2.14	2.88	7.28	0.11	0.14
S 100	73.28	0.46	11.03	4.71	0.00	0.07	2.58	2.89	4.02	0.79	0.17
S 101	68.22	0.62	16.97	3.14	0.00	0.09	1.64	2.26	4.28	2.63	0.15
S 102	70.53	0.45	15.46	2.46	0.00	0.04	1.48	2.12	5.32	2.02	0.12
S 103	53.51	1.31	16.57	11.67	0.00	0.20	5.34	9.24	1.95	0.11	0.10
S 104	73.71	0.28	14.19	1.09	0.00	0.03	1.01	2.39	5.26	1.95	0.08
S 105	72.06	0.43	10.31	3.76	0.00	0.07	2.46	1.57	6.62	2.56	0.16
S 107	66.25	0.59	16.50	4.12	0.00	0.07	3.13	4.39	3.62	1.13	0.20
S 109	70.35	0.40	15.34	3.00	0.00	0.06	1.25	3.38	4.06	2.03	0.13
S 110	65.91	0.51	16.64	3.74	0.00	0.05	4.76	0.26	3.01	4.98	0.14
S 111	66.37	0.56	16.05	4.90	0.00	0.06	5.16	1.40	3.10	2.29	0.11
S 112	54.11	0.89	18.76	10.85	0.00	0.06	5.99	6.42	2.61	0.26	0.04
S 113	61.27	0.90	16.92	8.45	0.00	0.10	2.20	1.97	4.62	3.52	0.05
S 114	67.73	0.43	15.47	3.35	0.00	0.06	1.10	2.78	7.02	1.85	0.20
S 115	66.05	0.80	16.77	6.70	0.00	0.08	2.98	0.77	1.75	4.00	0.10
S 116	47.98	1.09	20.06	11.95	0.00	0.18	5.74	9.28	3.45	0.17	0.09
S 118	49.55	1.77	13.05	16.78	0.00	0.20	5.86	7.76	4.58	0.30	0.15
S 119	48.12	1.60	14.42	16.26	0.00	0.22	7.29	7.89	3.94	0.12	0.14
S 120	49.28	1.62	13.47	16.45	0.00	0.21	6.73	7.94	3.92	0.26	0.12
S 121	70.49	0.69	15.64	3.39	0.00	0.04	1.85	0.93	4.53	2.29	0.15
S 122	55.42	0.62	13.58	17.59	0.00	0.08	2.42	0.58	3.59	6.07	0.05
S 123	64.92	0.84	19.05	6.06	0.00	0.05	2.24	1.14	1.26	4.27	0.17
S 124	56.90	0.97	17.96	8.79	0.00	0.09	7.34	2.75	4.63	0.48	0.09
S 125	46.93	2.29	19.19	15.20	0.00	0.24	6.23	4.68	4.17	1.04	0.03

SAMPLE	SIO2	TIO2	AL2O3	FE2O3	FEO	MNO	MGO	CAO	NA2O	K2O	P2O5
S 126	56.35	0.97	16.79	8.94	0.00	0.12	4.22	5.99	6.08	0.29	0.25
S 127	51.13	1.04	16.69	10.17	0.00	0.17	5.98	10.13	2.99	1.25	0.45
S 128	62.40	0.74	17.15	9.42	0.00	0.10	3.83	1.09	3.84	1.31	0.12
S 129	54.32	1.13	16.35	11.24	0.00	0.12	7.75	3.89	4.90	0.05	0.25
S 130	49.31	1.28	15.61	14.17	0.00	0.18	6.20	9.36	2.65	1.14	0.10
S 131	61.35	1.26	18.08	6.27	0.00	0.21	1.55	4.66	2.75	3.67	0.20
S 132	63.63	0.82	17.58	4.69	0.00	0.07	2.52	1.67	7.05	1.83	0.14
S 133	52.32	1.17	13.35	14.44	0.00	0.19	7.94	7.37	3.11	0.05	0.06
S 134	66.65	0.73	16.39	4.11	0.00	0.07	2.81	2.69	4.46	1.94	0.15
S 135	70.51	0.46	14.72	4.79	0.00	0.06	1.99	0.97	4.49	1.99	0.02
S 136	69.78	0.66	13.52	2.77	0.00	0.05	1.51	4.72	6.10	0.70	0.19
S 137	52.74	0.92	18.19	11.35	0.00	0.16	6.34	4.37	5.31	0.40	0.22
S 138	63.41	1.23	14.79	9.41	0.00	0.13	3.15	2.99	2.98	1.51	0.40
S 139	52.80	1.65	14.09	15.88	0.00	0.23	6.91	6.05	2.24	0.04	0.11
S 140	59.25	1.05	17.50	9.32	0.00	0.06	6.11	0.40	5.51	0.62	0.19
S 141	70.94	0.66	17.13	5.29	0.00	0.04	1.86	0.19	1.96	1.84	0.09
S 142	65.06	0.95	17.94	6.98	0.00	0.07	2.71	1.18	2.88	2.07	0.16
S 143	67.68	0.79	15.73	5.56	0.00	0.10	1.93	2.22	3.39	2.46	0.15
S 144	73.95	0.25	14.55	2.36	0.00	0.02	0.22	1.65	2.70	4.28	0.02
S 145	66.36	1.08	15.72	7.23	0.00	0.11	1.64	3.40	1.91	2.37	0.18
S 146	70.71	0.78	14.95	1.82	0.00	0.11	0.45	4.16	5.52	1.33	0.17
S 147	42.27	2.35	16.78	18.46	0.00	0.14	17.15	2.51	0.07	0.00	0.26
S 148	77.17	0.23	13.96	1.19	0.00	0.03	0.42	0.43	3.62	2.93	0.02
S 150	50.21	1.85	15.22	18.17	0.00	0.25	7.17	3.73	3.16	0.08	0.16
S 151	55.18	1.52	14.72	14.36	0.00	0.25	6.55	4.88	2.16	0.21	0.17
S 152	53.15	1.69	13.89	14.55	0.00	0.25	5.77	7.22	3.31	0.06	0.11
S 153	57.66	1.31	15.36	8.98	0.00	0.12	5.42	4.12	5.93	0.68	0.42
S 154	50.27	0.94	13.93	13.06	0.00	0.25	7.45	10.91	2.31	0.82	0.06
S 155	47.79	1.02	16.83	12.72	0.00	0.17	9.39	8.22	2.99	0.66	0.20
S 156	66.02	0.67	16.10	5.45	0.00	0.07	1.97	2.77	4.93	1.95	0.07
S 157	66.21	1.01	17.45	3.45	0.00	0.08	1.11	3.19	5.04	2.16	0.30
S 158	68.59	0.47	14.89	3.84	0.00	0.04	2.70	1.82	7.26	0.25	0.14
S 159	50.41	0.80	15.00	12.58	0.00	0.21	7.88	10.26	2.47	0.34	0.05
S 160	68.54	0.48	16.48	2.74	0.00	0.03	2.12	1.42	4.97	3.08	0.14
S 161	65.87	0.60	15.78	5.80	0.00	0.07	4.63	1.65	3.36	2.10	0.14
S 162	65.41	0.81	15.73	6.27	0.00	0.13	2.26	4.75	1.95	2.56	0.13
S 164	58.54	1.02	16.66	10.14	0.00	0.10	3.40	4.22	3.87	1.89	0.16
S 165	55.83	1.18	17.07	9.76	0.00	0.15	2.39	7.78	3.61	1.99	0.24
S 167	52.14	0.96	14.12	10.68	0.00	0.17	13.74	5.82	1.98	0.03	0.36
S 168	60.72	0.64	16.79	6.96	0.00	0.08	6.54	2.49	4.09	1.51	0.18
S 169	58.54	0.25	23.45	2.36	0.00	0.05	0.41	5.36	6.97	2.33	0.28
S 172	60.35	0.94	17.06	9.51	0.00	0.10	4.25	1.63	3.95	2.02	0.19
S 173	61.84	0.81	16.40	7.35	0.00	0.10	3.46	4.29	5.34	0.29	0.12
S 175	59.67	1.31	15.16	10.50	0.00	0.12	3.12	5.04	3.79	1.11	0.18
S 176	61.65	0.78	15.95	9.07	0.00	0.10	5.10	1.92	5.01	0.31	0.11
S 177	65.09	0.80	15.45	4.66	0.00	0.11	1.22	6.88	3.21	2.39	0.19
S 178	63.17	1.03	16.22	9.12	0.00	0.09	1.90	3.49	3.85	0.96	0.17
S 180	58.55	0.53	16.84	6.77	0.00	0.13	5.49	6.63	2.40	2.57	0.09
S 181	79.32	0.17	12.52	3.98	0.00	0.01	0.46	0.02	0.37	3.14	0.01
S 182	53.17	0.18	14.83	14.48	0.00	0.26	6.40	6.33	3.70	0.33	0.32
S 183	61.24	0.81	16.10	5.97	0.00	0.16	3.52	7.92	1.34	2.85	0.09
S 184	47.52	2.45	14.35	18.00	0.00	0.44	4.78	10.07	1.12	0.75	0.52
S 185	65.18	0.63	15.17	6.53	0.00	0.11	2.77	2.77	2.13	4.60	0.11
S 186	58.12	0.89	18.63	8.02	0.00	0.14	5.01	4.87	1.18	3.01	0.13
S 188	79.85	0.09	12.77	0.93	0.00	0.02	0.70	0.73	3.43	1.48	0.00

SAMPLE	SIO2	TIO2	AL203	FE203	FEO	MNO	MGO	CAO	NA20	K20	P205
S 190	64.66	0.67	17.13	5.98	0.00	0.08	3.05	3.05	3.98	1.31	0.09
S 191	70.89	0.48	16.99	2.57	0.00	0.07	1.55	1.59	4.08	1.62	0.15
S 192	69.97	0.60	18.03	3.91	0.00	0.11	1.92	1.17	0.16	4.00	0.13
S 193	60.43	0.86	16.19	6.98	0.00	0.19	4.83	5.42	3.91	0.69	0.50
S 194	30.42	1.07	21.24	11.78	0.00	0.35	16.54	15.24	1.17	1.55	0.64
S 195	72.46	0.68	19.49	1.69	0.00	0.01	1.22	0.43	1.50	2.26	0.26
S 196	70.56	0.64	15.59	3.73	0.00	0.05	2.72	1.10	4.57	0.87	0.17
S 197	71.80	0.53	17.82	1.25	0.00	0.03	0.94	1.88	1.48	4.09	0.18
S 198	69.89	0.46	15.87	2.97	0.00	0.04	1.50	2.59	4.25	2.29	0.14
S 199	68.53	0.44	16.31	3.79	0.00	0.05	3.15	1.48	4.87	1.22	0.16
S 200	56.59	1.01	17.82	9.52	0.00	0.19	4.21	7.44	3.08	0.06	0.08
S 201	56.03	1.55	17.68	12.27	0.00	0.22	5.08	2.60	2.90	1.54	0.13
S 202	59.09	1.44	17.67	10.18	0.00	0.15	3.59	2.08	4.74	0.70	0.36
S 203	53.51	1.84	17.07	16.97	0.00	0.23	6.37	1.81	0.03	1.98	0.19
S 205	56.46	1.99	13.25	14.89	0.00	0.26	3.65	5.28	2.22	1.84	0.16
S 206	54.99	0.92	12.01	11.33	0.00	0.29	8.25	9.58	1.32	0.77	0.54
S 207	57.67	1.69	13.32	13.29	0.00	0.25	4.40	6.42	1.02	1.77	0.17
S 208	72.21	1.18	10.40	9.90	0.00	0.12	1.29	0.40	3.65	0.72	0.13
S 209	53.31	2.44	12.95	16.64	0.00	0.43	4.35	6.68	2.49	0.47	0.24
S 210	52.09	2.19	13.20	16.83	0.00	0.24	4.13	8.83	0.86	1.43	0.20
S 212	60.14	2.14	19.05	8.37	0.00	0.08	2.44	1.98	2.60	3.01	0.19
S 216	57.52	1.62	15.50	18.31	0.00	0.15	2.95	1.14	0.05	2.60	0.16
S 218	50.14	1.42	11.13	18.28	0.00	0.24	10.10	8.34	0.01	0.01	0.33
S 219	51.11	0.97	15.67	16.23	0.00	0.14	7.87	4.07	3.78	0.12	0.04
S 221	59.68	1.14	14.13	10.77	0.00	0.22	4.00	8.08	0.62	1.35	0.01
S 222	55.71	1.13	22.40	7.30	0.00	0.17	2.44	5.44	0.98	4.11	0.32
S 225	65.58	1.73	16.22	9.21	0.00	0.12	3.84	0.32	0.16	2.69	0.13
S 227	62.04	1.19	12.85	10.42	0.00	0.15	3.82	6.49	2.61	0.28	0.14
S 228	53.85	1.50	16.42	17.27	0.00	0.12	7.68	2.63	0.16	0.29	0.08
S 229	78.69	0.08	16.01	0.74	0.00	0.01	0.35	0.07	0.40	3.64	0.01
S 230	59.09	0.96	16.23	8.96	0.00	0.14	6.19	4.11	4.11	0.04	0.17
S 231	66.14	0.65	16.57	5.96	0.00	0.10	4.32	2.77	0.46	2.90	0.13
S 232	67.93	0.62	16.74	5.78	0.00	0.08	3.42	0.17	2.21	2.91	0.14
S 233	64.79	0.70	15.80	6.42	0.00	0.08	4.53	3.07	3.27	1.17	0.17
S 234	50.91	1.28	14.70	14.82	0.00	0.20	7.15	9.16	1.64	0.05	0.09
S 235	59.22	0.50	16.08	7.16	0.00	0.11	7.30	5.01	3.34	1.20	0.08
S 236	54.47	1.18	16.08	11.71	0.00	0.15	6.27	7.95	0.11	1.86	0.21
S 237	62.58	0.79	15.42	8.10	0.00	0.12	4.78	3.94	2.68	1.42	0.17
S 238	53.71	0.96	16.64	11.71	0.00	0.17	6.90	5.66	4.01	0.14	0.09
S 239	53.21	0.73	13.22	11.67	0.00	0.15	8.03	8.59	3.11	1.03	0.26
S 240	57.27	0.75	16.16	8.71	0.00	0.11	6.11	4.43	5.56	0.75	0.15
S 241	51.15	0.78	14.44	14.14	0.00	0.23	6.75	10.56	1.50	0.39	0.06
S 242	53.92	0.81	17.87	8.18	0.00	0.16	4.69	11.16	2.51	0.57	0.13
S 243	45.58	1.06	18.82	12.02	0.00	0.32	7.69	12.00	1.77	0.53	0.20
S 244	60.31	0.50	15.46	6.86	0.00	0.12	4.28	6.30	5.24	0.83	0.10
S 245	66.10	0.52	14.32	5.72	0.00	0.08	4.51	5.09	3.11	0.47	0.08
S 246	75.05	0.44	16.03	3.27	0.00	0.13	1.31	0.51	0.40	2.77	0.09
S 247	51.23	2.28	13.87	16.29	0.00	0.25	4.44	8.08	2.61	0.75	0.20
S 248	50.87	0.89	13.00	12.49	0.00	0.33	7.56	11.86	2.35	0.25	0.39
S 249	54.23	0.94	14.54	12.08	0.00	0.31	4.62	10.34	2.33	0.24	0.37
S 250	49.93	1.40	13.12	18.20	0.00	0.23	7.20	7.62	1.85	0.33	0.11
S 251	52.41	0.52	15.69	10.13	0.00	0.15	10.59	7.91	1.71	0.82	0.07
S 252	57.21	0.73	12.96	9.58	0.00	0.20	6.28	8.07	4.77	0.09	0.10
S 253	54.66	0.86	19.24	8.94	0.00	0.16	5.99	4.33	4.27	1.42	0.13
S 255	54.98	1.78	12.43	18.60	0.00	0.25	2.43	6.34	2.67	0.31	0.21

SAMPLE	SIO2	TIO2	AL203	FE203	FEO	MNO	MGO	CAO	NA20	K20	P205
S 256	48.44	1.69	13.16	18.59	0.00	0.22	5.45	9.72	2.24	0.38	0.12
S 257	50,76	1.15	14.87	13.92	0.00	0.20	6.96	10.00	1.86	0.28	0.00
S 258	57.44	0.76	19.14	9.28	0.00	0.15	3.27	8.04	0.06	1.74	0.12
S 259	51.48	1.25	10.63	8.81	0.00	0.35	6.65	16.69	2.33	1.20	0.61
S 260	67.10	0.68	13.56	6.91	0.00	0.10	4.32	3.58	2.31	1.30	0.14
S 261	66.25	0.51	14.75	6.47	0.00	0.10	3.87	3.54	3.20	1.20	0.11
S 262	68.85	0.36	12.30	4.86	0.00	0.07	0.74	12.59	0.09	0.06	0.08
S 263	52.27	0.82	12.93	14.40	0.00	0.21	6.97	10.16	1.86	0.31	0.07
S 264	58.94	0.72	16.77	7.68	0.00	0.10	6.03	5.53	3.16	0.96	0.11
S 265	50.07	0.78	15.41	13.73	0.00	0.24	5.62	11.87	0.91	1.24	0.13
S 266	60.46	0.68	15.76	7.88	0.00	0.12	5.12	6.20	2.92	0.77	0.09
S 267	66.05	0.60	13.71	7.04	0.00	0.09	7.86	0.66	3.75	0.14	0.10
S 268	53.74	0.76	13.52	8.21	0.00	0.20	9.35	11.17	2.05	0.94	0.06
S 269	72.90	0.53	16.27	3.64	0.00	0.05	2.87	0.66	0.93	1.99	0.16
S 270	69.14	0.46	14.44	3.62	0.00	0.06	1.76	4.94	4.48	0.90	0.20
S 271	73.47	0.48	16.42	3.57	0.00	0.02	1.55	0.28	0.47	3.56	0.18
S 272	52.21	1.34	16.26	13.82	0.00	0.23	5.72	9.25	1.01	0.07	0.09
S 273	73.03	0.49	15.92	2.42	0.00	0.06	1.44	2.81	0.42	3.34	0.07
S 274	70.15	0.42	15.90	2.54	0.00	0.04	1.02	3.29	3.59	2.91	0.14
S 275	69.27	0.47	15.46	4.27	0.00	0.12	2.13	3.01	2.84	2.29	0.14
S 276	75.90	0.40	13.30	5.31	0.00	0.12	1.31	0.71	0.58	2.28	0.09
S 277	63.20	0.69	15.69	9.28	0.00	0.15	3.14	3.14	3.28	1.25	0.18
S 278	64.47	0.87	16.75	5.71	0.00	0.08	3.73	2.67	4.95	0.49	0.28
S 279	74.70	0.22	16.05	1.77	0.00	0.04	0.92	1.40	1.16	3.70	0.04
S 280	69.22	0.45	17.87	3.20	0.00	0.05	2.03	1.56	3.23	2.28	0.11
S 281	70.77	0.47	18.12	2.51	0.00	0.07	2.23	2.03	0.51	3.18	0.11
S 282	68.39	0.56	17.45	3.99	0.00	0.09	2.42	2.42	1.74	2.79	0.15
S 283	51.05	0.80	21.92	9.55	0.00	0.09	2.42	10.73	2.76	0.63	0.05
S 284	61.10	0.69	16.96	7.66	0.00	0.14	3.26	5.18	3.59	1.11	0.31
S 285	67.77	0.59	16.58	5.45	0.00	0.08	2.36	2.43	3.06	1.47	0.21
S 286	52.96	0.56	12.40	11.61	0.00	0.19	11.84	9.04	1.27	0.07	0.06
S 287	75.04	0.27	14.48	1.92	0.00	0.02	1.08	0.96	4.84	1.30	0.09
S 288	50.46	0.89	14.83	14.41	0.00	0.20	8.57	9.97	0.54	0.07	0.06
S 289	78.74	0.20	12.61	1.71	0.00	0.02	1.62	0.40	4.04	0.61	0.05
S 291	69.70	0.53	14.94	3.96	0.00	0.14	1.80	3.26	3.64	1.88	0.15
S 292	69.59	0.48	14.95	6.82	0.00	0.07	1.83	2.70	1.42	1.99	0.15
S 293	72.46	0.44	15.26	2.96	0.00	0.08	1.54	2.77	1.89	2.49	0.11
S 294	66.92	0.57	16.03	5.89	0.00	0.07	3.45	1.71	3.07	2.11	0.18
S 295	56.60	1.14	14.73	11.13	0.00	0.21	7.28	5.11	1.90	1.18	0.72
S 296	50.64	0.80	14.58	12.42	0.00	0.21	6.77	11.41	1.94	1.18	0.05
S 297	52.51	0.76	13.45	11.29	0.00	0.21	8.86	10.56	1.38	0.72	0.26
S 298	53.07	1.10	14.59	10.56	0.00	0.32	4.52	12.79	2.49	0.48	0.08
S 299	49.68	0.63	15.16	12.32	0.00	0.19	9.21	9.95	1.98	0.84	0.04
S 301	53.28	1.07	15.34	10.91	0.00	0.27	5.46	9.46	3.06	1.08	0.07
S 302	49.49	1.15	13.46	12.74	0.00	0.05	9.54	9.62	2.74	0.49	0.72
S 303	70.68	0.38	16.07	2.98	0.00	0.25	1.43	2.66	4.53	0.91	0.11
S 304	52.66	1.06	16.46	11.31	0.00	0.27	5.47	9.29	2.77	0.63	0.08
S 305	53.06	0.92	14.91	10.67	0.00	0.24	6.50	9.73	3.34	0.58	0.05
S 306	52.16	1.04	15.85	14.21	0.00	0.23	7.86	6.17	2.18	0.23	0.07
S 308	56.55	1.03	17.39	8.78	0.00	0.14	4.60	5.74	5.49	0.15	0.13
S 309	54.64	0.72	16.34	9.28	0.00	0.18	9.43	5.56	3.61	0.19	0.05
S 310	58.03	0.84	16.22	9.76	0.00	0.16	6.17	4.76	2.99	0.83	0.24
S 311	51.03	1.18	18.01	12.15	0.00	0.26	7.81	6.75	0.05	2.56	0.20
S 312	78.29	0.09	13.83	1.03	0.00	0.03	0.65	1.25	1.28	3.52	0.03
S 313	47.71	0.98	16.42	15.07	0.00	0.21	8.98	8.91	1.48	0.18	0.07

SAMPLE	SIO2	TIO2	AL2O3	FE2O3	FEO	MNO	MGO	CAO	NA2O	K2O	P2O5
S 314	69.20	0.42	14.88	6.38	0.00	0.07	2.61	0.64	3.76	1.93	0.11
S 315	46.24	1.93	16.51	17.68	0.00	0.23	8.97	4.01	3.49	0.82	0.12
S 316	50.31	1.84	13.89	17.28	0.00	0.20	5.30	9.06	1.78	0.19	0.15
S 317	67.50	0.80	16.44	7.19	0.00	0.10	3.90	1.90	0.06	1.99	0.12
S 318	58.12	0.90	17.45	8.82	0.00	0.18	4.30	5.00	3.77	1.29	0.17
S 319	79.80	0.04	12.92	0.94	0.00	0.01	1.21	0.53	1.30	3.24	0.01
S 320	59.76	0.70	16.00	8.49	0.00	0.12	5.16	4.89	3.93	0.80	0.15
S 322	76.79	0.18	11.51	1.36	0.00	0.04	0.80	2.77	4.03	2.41	0.11
S2001	49.34	0.90	13.34	17.03	0.00	0.28	6.75	8.31	2.70	1.23	0.12
S2002	49.34	1.47	12.90	17.67	0.00	0.21	6.83	8.79	2.34	0.34	0.12
S2003	51.52	0.96	12.58	14.03	0.00	0.17	6.15	10.60	3.38	0.60	0.01
S2004	51.06	0.82	12.88	16.21	0.00	0.30	9.45	5.48	2.90	0.87	0.03
S2005	50.47	0.80	13.14	16.14	0.00	0.19	5.86	10.66	1.84	0.85	0.05
S2006	49.39	0.61	13.48	15.73	0.00	0.17	7.73	9.15	2.98	0.75	0.01
S2007	51.28	1.03	15.24	12.66	0.00	0.24	7.81	6.31	4.92	0.28	0.23
S2008	64.95	1.49	13.45	5.45	0.00	0.06	2.45	1.26	0.72	9.91	0.25
S2009	57.66	0.93	17.25	8.87	0.00	0.16	3.95	4.25	6.13	0.54	0.25
S2010	35.51	1.79	20.48	19.80	0.00	0.27	8.13	13.67	0.14	0.10	0.12
S2011	61.51	0.21	20.33	2.31	0.00	0.05	1.01	3.60	8.00	2.93	0.05
S2013	68.82	0.66	14.92	5.73	0.00	0.09	1.90	4.02	1.46	2.25	0.15
S2015	50.23	0.44	13.79	9.63	0.00	0.18	9.33	14.34	1.71	0.33	0.02
S2017	60.65	0.75	17.07	11.50	0.00	0.12	3.71	2.27	0.22	3.39	0.31
S2018	47.60	1.16	19.03	16.27	0.00	0.25	5.45	6.09	0.19	3.94	0.02
S2019	63.08	0.68	13.95	8.55	0.00	0.13	3.45	5.50	2.81	1.62	0.23
S2024	43.41	1.92	13.76	16.76	0.00	0.23	6.61	13.09	3.05	0.73	0.33
S2025	50.10	0.66	13.43	9.37	0.00	0.26	7.95	15.48	2.50	0.17	0.08
S2026	55.13	0.93	16.88	9.25	0.00	0.13	4.07	9.25	3.65	0.57	0.14
S2027	52.45	1.16	15.62	11.91	0.00	0.23	4.99	9.69	1.85	2.02	0.08
S2028	69.51	0.65	15.85	4.92	0.00	0.10	2.57	1.16	0.52	4.49	0.23
S2029	63.05	1.07	14.45	6.17	0.00	0.11	5.75	5.57	0.33	3.13	0.37
S2030	50.62	1.80	15.94	17.59	0.00	0.14	8.21	2.24	2.44	0.90	0.12
S2031	55.12	0.75	13.07	9.79	0.00	0.15	9.58	6.47	2.61	2.21	0.25
S2032	57.68	0.65	14.78	9.60	0.00	0.14	7.64	4.59	2.30	2.53	0.09
S2033	67.20	0.56	15.24	5.32	0.00	0.16	1.74	3.91	4.85	0.88	0.14
S2034	78.15	0.58	12.54	0.28	0.00	0.01	0.19	0.51	7.41	0.32	0.01
S2035	62.25	0.61	15.05	7.16	0.00	0.06	7.52	3.27	2.65	1.31	0.12
S2036	51.02	1.47	15.23	11.02	0.00	0.16	5.57	9.80	3.46	0.12	0.15
S2037	51.56	0.84	13.34	12.19	0.00	0.30	7.74	9.47	3.67	0.84	0.05
S2038	61.59	1.34	17.13	7.67	0.00	0.08	2.07	2.12	6.25	1.17	0.58
S2039	66.52	0.64	15.51	4.78	0.00	0.09	3.36	1.99	6.22	0.74	0.15
S2041	48.55	1.17	14.54	14.66	0.00	0.21	7.44	8.86	2.87	1.60	0.09
S2042	51.81	0.91	14.26	12.08	0.00	0.24	7.49	10.04	2.79	0.31	0.07
S2044	52.17	0.94	14.74	11.86	0.00	0.29	6.22	10.17	2.39	1.17	0.05
S2045	52.23	0.93	14.91	11.69	0.00	0.22	6.24	9.06	3.56	1.11	0.05
S2046	52.08	0.93	14.06	12.48	0.00	0.12	6.65	10.47	1.79	1.36	0.06
S2047	68.42	0.57	15.98	4.03	0.00	0.07	1.75	3.32	4.54	1.15	0.17
S2048	49.28	0.89	14.72	14.27	0.00	0.22	7.97	9.79	2.16	0.65	0.05
S2049	49.69	0.82	15.17	13.03	0.00	0.20	7.59	10.47	2.67	0.32	0.05
S2050	50.86	0.87	15.48	11.34	0.00	0.21	7.79	9.92	2.61	0.87	0.05
S2051	51.35	0.98	15.22	11.97	0.00	0.22	6.18	10.75	2.99	0.28	0.06
S2052	69.69	0.37	14.62	3.07	0.00	0.09	2.23	3.56	4.08	2.18	0.11
S2053	67.89	0.64	16.53	4.93	0.00	0.05	3.08	1.22	3.48	1.91	0.27
S2054	70.09	0.65	16.44	3.73	0.00	0.05	1.98	0.63	3.43	2.74	0.26
S2055	67.48	0.59	14.84	8.40	0.00	0.09	1.75	1.44	4.08	1.09	0.24
S2056	68.65	0.45	15.50	4.24	0.00	0.08	2.26	3.20	3.53	1.96	0.13

SAMPLE	SIO2	TIO2	AL2O3	FE2O3	FEO	MNO	MGO	CAO	NA2O	K2O	P2O5
S2057	61.61	0.64	15.25	8.86	0.00	0.25	6.21	3.89	0.89	2.12	0.28
S2058	65.97	0.61	16.05	5.20	0.00	0.11	2.83	4.24	2.56	2.18	0.25
S2059	70.52	0.40	15.28	3.21	0.00	0.09	2.18	3.15	1.73	3.31	0.13
S2060	71.49	0.43	16.21	3.01	0.00	0.06	1.11	1.84	3.34	2.34	0.17
S2061	72.00	0.41	15.60	2.70	0.00	0.04	2.23	0.72	3.86	2.33	0.11
S2062	70.59	0.58	16.70	3.01	0.00	0.05	1.50	1.91	1.74	3.68	0.24
S2063	72.68	0.42	15.26	3.28	0.00	0.05	1.83	0.71	3.52	2.09	0.16
S2064	52.66	2.00	14.03	16.91	0.00	0.23	5.48	6.42	1.48	0.63	0.16
S2065	71.25	0.44	16.74	3.20	0.00	0.03	1.33	0.86	3.56	2.47	0.12
S2066	55.42	0.81	15.16	10.30	0.00	0.41	2.61	8.02	4.86	2.02	0.39
S2068	55.83	0.93	15.82	9.71	0.00	0.12	7.79	3.89	4.86	0.82	0.23
S2069	55.41	1.11	15.83	10.92	0.00	0.13	7.57	3.04	5.66	0.08	0.25
S2070	68.35	0.74	16.70	3.75	0.00	0.06	1.26	1.90	3.91	3.16	0.17
S2071	61.63	0.75	16.51	9.57	0.00	0.13	3.99	2.04	3.24	1.98	0.16
S2072	57.22	0.84	16.83	10.13	0.00	0.16	4.02	2.95	4.11	1.53	0.21
S2073	50.89	1.14	14.05	13.08	0.00	0.20	7.13	9.96	1.88	1.42	0.25
S2074	56.55	0.77	16.06	13.46	0.00	0.12	6.57	2.97	2.99	0.41	0.10
S2075	64.15	0.82	16.36	5.00	0.00	0.07	3.11	4.09	3.39	2.80	0.21
S2076	60.83	1.13	18.30	7.77	0.00	0.10	2.44	3.36	1.66	4.15	0.26
S2077	47.21	1.34	13.71	13.09	0.00	0.22	15.74	8.25	0.49	0.01	0.29
S2078	50.63	1.29	14.24	14.23	0.00	0.18	7.39	9.11	2.36	0.28	0.29
S2080	53.50	0.77	15.71	9.68	0.00	0.12	6.06	7.65	0.02	6.23	0.26
S2083	58.36	1.22	15.37	10.67	0.00	0.09	5.44	3.44	4.86	0.34	0.21
S2084	64.45	0.95	17.70	5.42	0.00	0.26	1.09	2.86	3.74	3.23	0.30
S2086	63.46	0.79	15.43	6.58	0.00	0.12	2.80	4.30	6.03	0.26	0.23
S2087	74.64	0.72	15.71	5.44	0.00	0.02	1.32	0.18	0.01	1.80	0.16
S2089	63.63	1.13	18.21	9.37	0.00	0.14	2.34	1.63	1.37	1.85	0.33
S2090	71.84	0.29	15.39	2.34	0.00	0.03	0.98	2.76	4.41	1.89	0.07
S2091	67.34	0.67	16.21	4.29	0.00	0.06	2.30	3.04	3.28	2.56	0.25
S2092	49.85	0.75	13.10	12.45	0.00	0.17	11.85	9.63	1.86	0.12	0.21
S2093	54.14	0.81	14.87	11.96	0.00	0.12	5.85	7.88	3.97	0.18	0.22
S2094	63.08	0.95	15.17	5.96	0.00	0.13	4.65	4.52	4.94	0.21	0.39
S2095	48.09	1.13	15.23	17.80	0.00	0.26	9.01	8.29	0.08	0.03	0.07
S2096	69.78	0.41	15.36	2.84	0.00	0.06	1.63	3.39	5.41	1.00	0.12
S2097	70.17	0.43	15.71	3.43	0.00	0.06	2.29	1.93	4.46	1.39	0.13
S2098	69.76	0.45	14.51	3.06	0.00	0.09	2.42	3.95	4.08	1.53	0.15
S2099	52.55	0.93	14.31	10.30	0.00	0.19	8.78	9.12	2.52	0.96	0.35
S2100	65.65	0.68	17.04	7.92	0.00	0.06	1.57	2.11	0.33	4.38	0.26
S2101	66.39	0.72	16.69	7.04	0.00	0.05	2.75	1.48	1.21	3.57	0.10
S2102	68.63	0.61	15.82	4.87	0.00	0.09	2.35	1.87	3.23	2.38	0.15
S2104	72.76	0.51	15.10	2.82	0.00	0.02	2.63	2.40	2.64	0.91	0.21
S2105	67.42	0.49	13.93	4.83	0.00	0.14	3.40	4.46	3.32	1.81	0.20
S2106	71.25	0.42	14.38	3.38	0.00	0.06	2.04	3.25	3.12	1.97	0.13
S2107	75.52	0.36	10.25	9.25	0.00	0.04	2.23	0.15	0.03	2.08	0.09
S2108	50.82	1.13	16.33	13.33	0.00	0.16	5.34	9.00	3.05	0.45	0.09
S2109	49.58	1.28	13.56	15.13	0.00	0.19	6.80	11.54	1.55	0.24	0.12
S2110	59.61	0.81	17.25	7.53	0.00	0.11	4.25	4.13	5.04	1.14	0.13
S2111	63.37	0.85	17.60	8.50	0.00	0.06	0.87	1.28	5.43	1.87	0.17
S2112	59.87	0.98	15.96	7.89	0.00	0.17	2.08	8.90	1.61	2.34	0.20
S2114	58.44	0.93	16.62	10.30	0.00	0.14	5.64	5.01	0.70	2.11	0.11
S2115	79.09	0.16	11.93	2.19	0.00	0.07	1.29	2.28	0.84	2.14	0.01
S2116	51.48	1.73	14.85	14.59	0.00	0.19	6.70	6.18	3.78	0.23	0.27
S2117	48.82	1.54	13.78	16.36	0.00	0.22	5.10	11.49	1.95	0.54	0.19
S2118	48.03	1.40	14.26	17.86	0.00	0.25	7.99	7.56	1.80	0.76	0.09
S2121	49.94	1.68	13.53	15.99	0.00	0.21	6.14	9.82	2.22	0.34	0.14

SAMPLE	SIO2	TIO2	AL203	FE203	FEO	MNO	MGO	CAO	NA20	K20	P205
S2122	47.52	1.42	13.22	16.50	0.00	0.28	4.33	14.73	1.67	0.20	0.13
S2123	49.30	1.85	13.43	17.67	0.00	0.25	4.33	9.87	2.90	0.24	0.15
S2124	50.55	2.23	12.22	17.95	0.00	0.23	5.05	7.68	3.71	0.22	0.16
S2127	48.15	1.49	16.84	12.44	0.00	0.14	3.24	15.68	1.84	0.09	0.08
S2130	52.03	1.33	13.80	11.57	0.00	0.13	4.38	13.39	3.04	0.23	0.10
S2131	49.21	1.49	14.29	15.91	0.00	0.23	6.44	10.26	1.86	0.21	0.10
S2133	73.83	0.25	14.52	1.53	0.00	0.03	0.59	2.55	5.28	1.37	0.05
S2134	51.71	1.34	16.44	12.50	0.00	0.16	4.38	12.13	1.18	0.06	0.10
S2135	49.92	1.06	15.25	14.92	0.00	0.22	6.74	9.53	2.04	0.21	0.10
S2136	70.87	0.35	15.56	2.85	0.00	0.03	1.44	2.12	5.32	1.35	0.11
S2137	45.79	0.75	13.73	14.98	0.00	0.31	8.98	14.17	0.99	0.09	0.22
S2138	72.46	0.37	15.79	2.37	0.00	0.05	2.04	2.57	0.46	3.77	0.12
S2139	63.11	0.66	19.37	6.47	0.00	0.06	3.24	1.32	2.49	3.01	0.26
S2140	68.39	0.84	15.43	6.41	0.00	0.04	1.84	1.17	5.01	0.74	0.12
S2142	52.60	1.46	15.37	15.15	0.00	0.33	5.51	7.71	0.02	1.75	0.10
S2143	48.69	1.24	14.69	16.98	0.00	0.34	6.24	10.57	0.21	0.95	0.09
S2144	52.72	1.90	14.48	11.88	0.00	0.26	4.91	10.11	2.92	0.63	0.19
S2146	54.68	0.93	14.68	16.89	0.00	0.09	10.18	0.75	1.65	0.09	0.06
S2150	55.51	2.39	13.60	12.24	0.00	0.50	4.17	6.73	3.53	1.11	0.22
S2151	49.56	1.52	15.24	14.60	0.00	0.21	10.15	4.41	3.93	0.25	0.13
S2152	48.67	1.27	14.25	14.95	0.00	0.44	6.20	11.32	2.74	0.04	0.12
S2153	53.86	1.32	13.55	13.97	0.00	0.26	4.74	8.39	3.60	0.20	0.11
S2155	54.46	1.14	15.61	11.34	0.00	0.16	8.57	6.58	0.33	1.68	0.12
S2156	68.57	0.55	15.33	4.64	0.00	0.06	1.93	2.66	5.33	0.82	0.12
S2157	63.15	0.62	15.66	6.49	0.00	0.10	4.53	4.22	4.17	0.95	0.11
S2158	60.44	0.58	15.06	7.88	0.00	0.12	6.57	4.94	3.69	0.61	0.10
S2159	63.61	0.54	14.31	6.13	0.00	0.09	4.64	4.65	4.80	1.14	0.09
S2160	62.84	0.63	14.60	7.36	0.00	0.11	5.27	4.49	3.44	1.16	0.10
S2161	59.60	0.56	16.97	8.07	0.00	0.11	6.17	3.59	3.98	0.87	0.08
S2162	65.23	0.45	14.61	5.21	0.00	0.09	3.53	5.52	4.06	1.19	0.10
S2163	57.68	0.78	14.58	8.04	0.00	0.12	6.24	5.72	4.30	2.32	0.22
S2164	62.19	0.76	13.60	10.02	0.00	0.09	2.76	5.95	3.77	0.75	0.11
S2165	62.06	0.81	14.82	8.42	0.00	0.11	5.74	3.15	4.01	0.70	0.18
S2166	61.40	0.58	14.32	7.30	0.00	0.13	5.32	5.65	4.26	0.98	0.06
S2167	60.11	0.58	15.49	9.44	0.00	0.19	1.73	7.11	3.93	1.29	0.13
S2168	58.52	0.58	15.98	8.17	0.00	0.11	6.18	5.33	4.66	0.38	0.08
S2169	62.97	0.55	13.60	7.04	0.00	0.04	5.69	5.54	3.51	0.97	0.09
S2170	56.21	0.73	17.04	9.03	0.00	0.11	6.27	3.62	4.66	2.22	0.11
S2171	59.26	0.61	14.75	8.55	0.00	0.14	6.34	5.34	4.19	0.73	0.09
S2172	59.31	0.69	16.11	7.45	0.00	0.12	6.32	3.89	3.15	2.84	0.12
S2173	56.04	0.64	16.22	8.45	0.00	0.14	6.15	5.03	4.40	2.84	0.10
S2174	63.62	0.58	15.77	6.75	0.00	0.10	4.52	3.50	3.85	1.21	0.10
S2175	57.03	0.68	15.20	9.08	0.00	0.15	5.85	6.56	3.31	2.04	0.10
S2176	59.08	0.70	15.74	7.69	0.00	0.10	5.91	5.34	4.42	0.91	0.11
S2177	52.64	0.99	14.47	11.37	0.00	0.17	9.15	7.39	2.80	0.86	0.16
S2178	63.36	0.78	10.81	7.77	0.00	0.13	6.04	6.19	3.84	0.99	0.09
S2179	60.95	0.65	14.20	9.35	0.00	0.17	6.32	3.67	3.67	0.91	0.10
S2180	60.33	0.63	13.50	8.93	0.00	0.19	7.66	5.02	2.56	0.52	0.66
S2181	71.56	0.61	11.98	4.84	0.00	0.07	2.08	4.68	2.14	1.87	0.15
S2182	67.55	0.61	13.97	4.97	0.00	0.08	2.03	5.11	3.16	2.36	0.16
S2183	52.85	0.74	13.76	11.02	0.00	0.17	7.17	11.64	2.06	0.52	0.06
S2184	57.96	1.09	15.04	7.64	0.00	0.15	4.62	7.41	5.06	0.48	0.55
S2185	53.92	0.89	15.81	12.28	0.00	0.20	7.87	5.23	3.60	0.14	0.06
S2186	51.78	0.72	15.84	10.80	0.00	0.19	8.31	9.22	3.02	0.08	0.04
S2187	50.43	0.57	14.10	10.92	0.00	0.18	11.81	9.84	2.06	0.05	0.04

SAMPLE	SIO2	TIO2	AL2O3	FE2O3	FEO	MNO	MGO	CAO	NA2O	K2O	P2O5
S2188	69.41	0.50	15.42	4.94	0.00	0.05	3.67	0.26	3.21	2.46	0.07
S2189	54.42	1.08	17.86	9.12	0.00	0.17	4.64	4.10	6.51	1.90	0.20
S2190	69.53	0.57	13.77	5.33	0.00	0.08	3.09	1.18	6.02	0.29	0.14
S2191	65.61	0.49	12.73	4.06	0.00	0.04	2.27	0.45	2.29	11.98	0.08
S2192	53.23	0.85	15.55	14.34	0.00	0.21	7.21	4.03	3.75	0.77	0.06
S2193	48.11	1.34	16.28	11.78	0.00	0.18	5.32	4.18	2.10	10.64	0.06
S2195	48.87	1.10	18.33	12.65	0.00	0.18	6.09	4.25	3.51	4.77	0.26
S2196	60.59	0.61	11.90	3.20	0.00	0.10	2.41	4.05	0.31	16.69	0.14
S2197	61.62	0.60	13.23	3.67	0.00	0.08	1.93	1.71	0.49	16.55	0.12
S2198	68.41	0.11	14.40	1.55	0.00	0.06	0.03	1.61	4.45	9.36	0.02
S2199	70.31	0.14	15.14	1.35	0.00	0.05	0.03	0.93	11.28	0.75	0.02
S2201	55.62	0.95	14.47	10.52	0.00	0.16	7.77	7.47	2.65	0.23	0.16
S2202	57.12	0.45	27.91	5.60	0.00	0.07	2.41	1.98	2.17	2.19	0.10
S2203	65.55	0.61	16.37	6.62	0.00	0.07	2.71	2.16	3.26	2.51	0.14
S2204	64.55	0.62	16.77	6.96	0.00	0.09	2.82	2.01	3.57	2.47	0.14
S2205	64.72	0.63	16.32	7.08	0.00	0.30	2.83	1.92	3.49	2.58	0.13
S2206	56.01	1.21	13.09	14.77	0.00	0.30	5.73	5.65	2.71	0.44	0.09
S2207	53.48	1.62	13.27	13.84	0.00	0.23	7.57	7.12	1.72	1.01	0.14
S2208	49.78	1.66	12.18	17.41	0.00	0.23	6.13	9.50	2.59	0.37	0.15
S2209	66.39	0.55	14.44	8.47	0.00	0.09	5.79	2.03	0.96	1.19	0.09
S2210	69.01	0.77	17.66	5.10	0.00	0.04	2.70	0.24	0.86	3.47	0.15
S2211	56.56	0.72	19.28	9.02	0.00	0.17	7.11	1.81	3.31	1.86	0.16
S2212	54.27	0.83	17.41	11.81	0.00	0.19	10.21	0.97	3.74	0.33	0.24
S2213	51.55	1.20	15.20	13.31	0.00	0.17	5.49	7.30	3.62	1.99	0.17
S4003	60.27	0.55	14.30	8.72	0.00	0.26	2.93	5.69	4.08	3.09	0.12
S4004	49.15	1.08	14.49	15.05	0.00	0.20	6.52	10.26	2.67	0.51	0.08
S4005	51.90	1.11	13.97	17.62	0.00	0.19	5.76	6.57	2.25	0.53	0.10
S4006	56.89	0.84	15.78	9.92	0.00	0.16	5.68	5.34	3.98	1.31	0.10
S4007	56.23	0.81	15.96	8.52	0.00	0.16	4.32	7.58	5.79	0.52	0.11
S4008	54.16	1.05	15.41	10.66	0.00	0.14	6.38	7.52	4.09	0.45	0.14
S4009	60.22	0.77	13.44	10.03	0.00	0.14	4.10	8.40	1.68	1.11	0.11
S4010	54.16	0.77	14.38	7.81	0.00	0.22	5.51	11.74	1.78	3.61	0.02
S4011	53.58	0.89	15.07	9.80	0.00	0.14	7.41	7.23	4.77	0.97	0.14
S4012	51.11	0.87	15.31	10.02	0.00	0.11	7.23	11.22	3.01	0.93	0.19
S4013	67.73	0.73	15.06	5.29	0.00	0.06	2.68	1.04	5.59	1.58	0.24
S4014	63.15	0.94	16.82	9.46	0.00	0.15	2.84	3.70	1.37	1.39	0.18
S4015	49.34	1.57	17.32	18.44	0.00	0.20	7.22	1.85	3.86	0.12	0.08
S4016	79.45	0.09	10.95	2.67	0.00	0.04	0.54	2.72	1.60	1.94	0.00
S4017	50.13	0.76	14.35	12.09	0.00	0.19	9.13	11.96	1.14	0.20	0.06
S4018	53.96	1.27	17.30	9.53	0.00	0.11	3.45	11.24	2.47	0.42	0.25
S4019	69.81	0.55	14.28	4.12	0.00	0.08	3.78	1.09	5.43	0.76	0.10
S4020	60.66	0.54	14.74	6.94	0.00	0.12	6.19	6.36	3.23	1.11	0.12
S4021	59.62	0.69	14.45	8.28	0.00	0.12	7.17	5.55	2.52	1.49	0.11
S4022	49.12	1.26	13.90	15.67	0.00	0.34	6.76	7.52	4.63	0.72	0.08
S4024	63.44	1.23	17.29	9.31	0.00	0.17	1.90	1.75	2.89	1.93	0.09
S4027	50.48	1.04	17.17	14.63	0.00	0.15	10.11	3.18	3.22	0.02	0.00
S4028	65.21	0.62	14.81	6.55	0.00	0.07	4.24	1.84	3.04	3.48	0.14
S4030	75.38	0.54	16.85	3.18	0.00	0.08	0.87	1.42	0.86	0.71	0.11
S4031	50.20	1.49	12.34	17.23	0.00	0.35	4.82	10.17	3.12	0.14	0.14
S4032	58.05	1.47	14.27	11.31	0.00	0.15	4.23	6.23	3.62	0.54	0.13
S4033	61.54	1.31	11.77	9.57	0.00	0.24	3.26	5.78	6.30	0.14	0.09
S4034	67.97	0.44	15.29	3.68	0.00	0.09	1.38	6.49	1.03	3.43	0.20
S4035	72.80	0.22	14.34	2.42	0.00	0.09	0.97	3.29	3.12	2.67	0.08
S4036	63.62	0.65	14.71	5.35	0.00	0.06	2.93	6.05	6.12	0.32	0.19
S4037	67.43	0.46	14.40	6.16	0.00	0.12	2.67	3.97	1.91	2.77	0.11

SAMPLE	SIO2	TIO2	AL203	FE203	FEO	MNO	MGO	CAO	NA20	K20	P205
S4038	60.78	0.71	14.74	9.04	0.00	0.16	3.33	6.99	2.26	1.78	0.21
S4041	49.72	0.85	14.26	14.82	0.00	0.15	6.27	12.76	0.29	0.83	0.05
S4042	58.58	1.09	14.85	12.57	0.00	0.21	5.04	4.13	0.71	2.75	0.06
S4044	49.90	2.05	13.43	17.41	0.00	0.22	6.77	7.36	2.63	0.06	0.17
S4045	52.70	0.91	18.00	13.60	0.00	0.36	3.88	4.69	4.52	1.17	0.17
S4048	69.82	0.56	15.20	6.88	0.00	0.04	2.50	1.59	0.76	2.48	0.18
S4049	70.97	0.55	17.58	3.78	0.00	0.01	1.12	0.45	3.47	1.85	0.22
S4050	52.19	1.05	16.21	11.17	0.00	0.18	6.55	9.06	2.35	1.17	0.07
S4051	55.21	1.05	14.30	14.26	0.00	0.25	0.83	11.84	1.90	0.30	0.06
S4052	66.88	0.26	15.80	1.34	0.00	0.02	5.63	1.64	7.62	0.73	0.08
S4053	64.83	0.88	16.00	7.50	0.00	0.08	2.99	1.70	3.70	2.15	0.17
S4054	69.56	0.71	14.83	3.93	0.00	0.07	0.95	3.08	5.24	1.48	0.15
S4055	59.38	1.26	16.65	10.32	0.00	0.12	3.12	4.80	3.10	1.14	0.11
S4056	66.57	0.66	15.74	5.95	0.00	0.10	2.31	3.16	3.40	2.02	0.09
S4057	65.48	0.77	12.43	9.35	0.00	0.28	2.10	5.04	3.61	0.77	0.17
S4058	55.38	1.06	15.64	8.27	0.00	0.19	4.69	11.59	2.46	0.63	0.09
S4059	51.56	0.84	14.74	10.31	0.00	0.20	8.25	9.45	3.83	0.76	0.06
S4061	47.80	1.46	14.87	15.22	0.00	0.22	7.13	8.16	3.58	1.45	0.12
S4062	65.80	0.47	14.75	2.78	0.00	0.04	1.42	4.93	8.76	0.86	0.19
S4063	53.89	1.09	14.63	10.91	0.00	0.20	5.59	9.15	3.90	0.54	0.10
S4064	48.92	1.23	13.37	14.52	0.00	0.25	6.35	12.31	2.18	0.76	0.11
S4067	49.94	1.57	13.84	16.38	0.00	0.24	5.95	8.56	2.91	0.48	0.13
S4068	62.99	0.75	16.39	5.82	0.00	0.09	2.41	4.97	4.71	1.69	0.18
S4069	71.05	0.53	18.30	3.05	0.00	0.03	1.13	1.16	0.85	3.83	0.07
S4070	49.03	1.06	15.03	13.20	0.00	0.21	8.09	9.87	3.19	0.25	0.08
S4071	52.84	1.42	14.16	12.66	0.00	0.18	6.66	8.00	3.42	0.56	0.10
S4072	49.62	1.62	13.69	16.31	0.00	0.22	6.47	9.19	1.89	0.84	0.14
S4074	52.15	1.85	12.76	16.13	0.00	0.23	4.45	8.52	3.25	0.48	0.18
S4075	48.68	1.37	14.23	15.61	0.00	0.23	8.39	7.27	2.67	1.43	0.13
S4076	49.74	1.34	13.65	15.31	0.00	0.23	7.23	9.93	1.98	0.48	0.11
S4077	53.83	0.95	14.48	11.31	0.00	0.18	5.47	9.71	3.68	0.35	0.04
S4078	51.91	1.17	16.98	12.79	0.00	0.19	7.57	8.25	0.95	0.12	0.07
S4079	52.80	0.90	12.82	12.23	0.00	0.18	6.69	11.90	2.33	0.08	0.07
S4080	65.23	0.56	13.95	6.26	0.00	0.09	2.54	5.19	4.94	1.16	0.08
S4081	51.48	1.30	15.02	13.96	0.00	0.20	4.35	10.30	3.17	0.12	0.10
S4082	48.73	1.68	14.29	16.30	0.00	0.21	6.50	9.03	2.55	0.53	0.17
S4083	48.02	1.44	15.54	14.64	0.00	0.32	5.50	11.89	1.64	0.90	0.11
S4084	52.29	1.27	11.88	13.32	0.00	0.19	6.86	10.41	3.36	0.26	0.16
S4085	68.05	0.52	14.69	5.46	0.00	0.07	3.13	2.20	4.03	1.72	0.13
S4086	61.97	0.78	16.77	5.99	0.00	0.06	5.47	1.87	5.79	1.14	0.16
S4087	67.13	0.56	15.63	4.83	0.00	0.06	4.01	2.18	4.14	1.32	0.14
S4088	59.75	0.61	14.41	7.17	0.00	0.11	7.99	4.31	4.70	0.79	0.17
S4089	48.43	0.73	17.63	10.55	0.00	0.16	9.00	10.24	2.08	1.12	0.06
S4090	65.72	0.57	17.77	3.04	0.00	0.04	0.90	2.83	7.36	1.64	0.13
S4091	64.14	0.57	14.88	5.60	0.00	0.06	4.73	4.21	4.39	1.19	0.23
S4092	62.91	0.60	13.38	6.14	0.00	0.10	7.39	4.80	3.45	1.06	0.17
S4093	69.20	0.49	15.91	3.52	0.00	0.10	1.89	3.30	2.48	2.97	0.14
S4094	47.29	1.31	16.04	15.97	0.00	0.21	7.65	6.96	4.09	0.37	0.10
S4095	50.20	1.60	20.18	11.67	0.00	0.23	5.66	2.95	5.26	1.85	0.40
S4096	62.28	0.55	15.20	5.30	0.00	0.09	4.75	5.43	5.14	1.13	0.13
S4097	53.42	1.69	17.46	10.77	0.00	0.25	7.57	8.39	0.29	0.05	0.11
S4098	58.90	0.79	16.55	9.66	0.00	0.24	3.28	5.40	2.35	2.61	0.22
S4099	73.03	0.49	11.65	5.91	0.00	0.07	1.36	3.78	1.46	2.16	0.09
S4100	51.77	1.19	14.58	11.14	0.00	0.13	10.42	7.94	2.46	0.09	0.28
S4101	64.70	0.88	18.86	6.33	0.00	0.08	2.90	1.73	2.60	1.80	0.12

SAMPLE	SIO2	TIO2	AL203	FE203	FEO	MNO	MGO	CAO	NA20	K20	P205
S4102	65.17	0.39	14.95	12.20	0.00	0.03	2.33	0.19	0.03	4.61	0.10
S4103	52.87	1.43	15.27	15.59	0.00	0.23	5.27	6.06	3.15	0.03	0.10
S4104	50.26	1.33	14.22	15.10	0.00	0.19	7.69	7.28	3.75	0.10	0.08
S4105	58.71	0.65	13.37	6.97	0.00	0.13	4.00	9.55	4.98	1.43	0.21
S4106	49.51	1.64	14.58	16.68	0.00	0.22	6.87	7.74	2.56	0.07	0.12
S4108	66.10	0.76	16.16	7.75	0.00	0.10	3.17	1.34	2.41	2.12	0.09
S4109	48.08	1.40	14.61	16.12	0.00	0.22	7.53	9.34	2.53	0.08	0.09
S4110	47.20	1.12	14.01	14.01	0.00	0.25	6.64	13.77	2.84	0.09	0.07
S4111	51.58	1.28	15.99	15.27	0.00	0.26	5.08	10.26	0.16	0.04	0.08
S4112	58.32	0.74	16.40	7.26	0.00	0.15	4.91	5.95	5.79	0.09	0.39
S4113	49.28	1.38	14.38	14.94	0.00	0.21	7.28	9.76	2.45	0.23	0.09
S4114	62.89	0.97	17.83	6.93	0.00	0.02	2.82	0.61	3.26	4.52	0.15
S4115	50.68	1.79	14.34	15.03	0.00	0.24	4.34	10.96	2.22	0.24	0.16
S4116	52.02	1.61	14.53	17.45	0.00	0.23	4.09	6.30	3.40	0.24	0.13
S4118	49.26	1.32	14.44	15.28	0.00	0.21	6.31	11.31	1.60	0.17	0.10
S4119	50.46	1.91	13.77	16.98	0.00	0.15	5.74	7.76	2.64	0.44	0.15
S4120	55.44	1.26	13.19	13.23	0.00	0.19	6.92	7.36	2.20	0.10	0.11
S4121	45.34	1.35	16.98	13.89	0.00	0.23	5.28	14.97	1.61	0.26	0.09
S4122	47.94	1.55	14.12	16.88	0.00	0.25	8.28	7.47	2.67	0.70	0.13
S4123	49.47	1.28	15.85	14.75	0.00	0.21	5.80	8.28	3.88	0.36	0.12
S4125	62.29	0.53	13.31	6.11	0.00	0.10	5.13	4.89	4.43	3.04	0.17
S4126	33.45	0.79	54.94	4.98	0.00	0.11	2.03	3.46	0.13	0.03	0.08
S4127	70.72	0.49	15.71	2.76	0.00	0.05	1.08	1.54	5.63	1.89	0.13
S4128	61.41	0.95	20.25	6.53	0.00	0.08	2.90	3.22	2.14	2.40	0.12
S4129	60.06	0.63	15.65	6.90	0.00	0.13	3.95	7.85	2.14	2.52	0.17
S4130	58.83	0.61	12.78	7.87	0.00	0.15	6.45	8.43	2.84	1.73	0.31
S4131	48.03	1.22	20.60	14.67	0.00	0.15	6.21	6.91	1.41	0.72	0.08
S4132	73.13	0.81	14.18	1.34	0.00	0.01	1.35	0.25	4.42	4.43	0.08
S4133	65.82	0.50	17.74	5.60	0.00	0.08	1.95	3.80	0.47	3.85	0.19
S4134	68.49	0.52	14.19	4.86	0.00	0.08	2.35	4.01	4.37	0.98	0.15
S4135	59.51	1.08	16.81	9.59	0.00	0.13	4.31	2.76	5.56	0.04	0.21
S4137	68.98	0.28	17.04	3.15	0.00	0.04	2.21	2.03	3.22	2.87	0.18
S4138	77.19	0.32	14.42	2.15	0.00	0.03	0.84	0.84	0.69	3.43	0.09
S4139	75.21	0.21	14.04	1.31	0.00	0.04	0.84	1.56	4.81	1.91	0.07
S4141	49.96	0.71	13.82	10.10	0.00	0.18	12.48	9.05	1.73	1.81	0.16
S4142	71.31	0.46	15.38	3.09	0.00	0.03	1.17	1.55	4.61	2.29	0.12
S4143	68.94	0.43	16.31	2.61	0.00	0.04	1.19	2.99	4.71	2.67	0.11
S4144	57.40	0.87	15.18	9.05	0.00	0.16	4.21	8.61	2.93	1.20	0.39
S4145	68.12	0.71	17.85	3.85	0.00	0.06	2.43	2.18	0.25	4.37	0.18
S4146	64.42	0.60	17.96	3.98	0.00	0.09	3.34	4.28	1.19	3.95	0.19
S4147	68.95	0.40	14.86	6.75	0.00	0.04	2.89	2.01	2.35	1.63	0.12
S4148	67.16	0.57	15.94	4.28	0.00	0.09	2.89	4.89	1.32	2.64	0.22
S4150	66.41	0.53	15.82	4.59	0.00	0.07	3.21	3.69	3.14	2.32	0.22
S4151	74.97	0.22	13.75	1.90	0.00	0.02	0.78	0.66	6.02	1.61	0.07
S4152	63.98	0.61	18.94	4.71	0.00	0.04	3.27	0.43	5.44	2.42	0.16
S4153	56.34	1.15	17.41	12.59	0.00	0.05	6.15	0.85	3.61	1.55	0.30
S4154	68.89	0.48	15.10	2.96	0.00	0.07	0.99	4.92	4.46	1.95	0.18
S4155	70.55	0.51	16.41	2.50	0.00	0.04	1.05	1.56	5.82	1.39	0.17
S4156	72.72	0.43	14.74	3.25	0.00	0.06	2.28	1.15	2.83	2.41	0.13
S4157	49.17	0.72	17.13	12.57	0.00	0.20	7.67	8.97	3.02	0.51	0.05
S4158	70.90	0.50	15.59	4.24	0.00	0.03	1.15	0.62	4.08	2.72	0.17
S4159	72.22	0.41	15.18	3.17	0.00	0.03	1.44	1.76	3.91	1.75	0.13
S4160	69.32	0.49	14.97	4.38	0.00	0.07	2.26	2.62	2.60	3.05	0.24
S4161	55.00	0.45	11.15	9.49	0.00	0.15	13.60	8.44	1.15	0.33	0.24
S4162	73.58	0.38	13.16	2.61	0.00	0.06	1.02	3.29	3.50	2.26	0.14

SAMPLE	SIO2	TIO2	AL203	FE203	FEO	MNO	MGO	CAO	NA2O	K2O	P2O5
S4166	72.33	0.39	15.91	2.19	0.00	0.03	0.74	2.24	3.26	2.73	0.17
S4167	72.99	0.28	14.27	2.63	0.00	0.04	0.65	2.31	5.06	1.69	0.08
S4168	73.71	0.42	13.60	3.55	0.00	0.04	2.53	2.20	0.95	2.85	0.15
S4169	74.04	0.27	14.13	2.09	0.00	0.04	1.18	1.56	5.35	1.26	0.08
S4170	70.96	0.42	15.10	4.47	0.00	0.03	1.78	0.60	5.30	1.19	0.15
S4171	46.88	0.56	19.47	15.30	0.00	0.11	7.81	5.26	4.41	0.17	0.03
S4172	70.64	0.48	14.30	3.07	0.00	0.07	2.23	3.36	4.01	1.69	0.15
S4173	71.05	0.48	15.22	3.44	0.00	0.03	2.47	1.82	3.40	1.93	0.16
S4175	77.27	0.28	13.92	1.87	0.00	0.06	0.64	2.51	1.39	1.99	0.07
S4176	64.83	0.87	14.95	8.47	0.00	0.06	3.55	3.59	1.31	2.05	0.32
S4177	64.12	0.71	16.21	5.02	0.00	0.09	3.24	5.44	3.75	1.17	0.25
S4178	70.52	0.44	16.42	2.94	0.00	0.07	1.15	3.63	1.54	3.16	0.13
S4179	72.06	0.52	17.50	2.38	0.00	0.01	0.98	0.43	2.50	3.47	0.15
S4181	67.47	0.88	16.28	7.49	0.00	0.09	2.49	1.60	2.20	1.38	0.12
S4182	60.12	1.15	19.48	9.92	0.00	0.08	3.47	1.49	2.25	1.83	0.21
S4183	64.15	0.73	15.87	6.22	0.00	0.11	2.30	5.15	3.93	1.40	0.14
S4184	62.09	0.82	17.39	8.85	0.00	0.10	3.53	1.23	3.04	2.79	0.16
S4185	61.49	0.85	15.34	6.99	0.00	0.15	2.70	7.83	4.12	0.34	0.19
S4186	76.96	0.23	13.34	0.76	0.00	0.03	0.07	1.83	5.00	1.75	0.03
S4187	65.90	1.06	16.00	2.89	0.00	0.07	1.09	5.08	6.79	0.85	0.27
S4188	71.18	1.00	16.94	3.97	0.00	0.05	1.65	1.92	2.36	0.69	0.24
S4189	61.28	0.98	18.04	6.41	0.00	0.11	2.16	4.77	3.49	2.64	0.12
S4190	55.80	1.61	12.19	15.44	0.00	0.34	5.78	6.87	1.80	0.05	0.12
S4191	56.06	1.23	16.39	13.22	0.00	0.34	3.01	4.95	4.01	0.79	0.00
S4192	48.68	1.11	14.75	14.85	0.00	0.21	7.58	9.00	3.34	0.48	0.01
S4193	51.64	1.09	17.59	13.13	0.00	0.18	6.01	7.00	1.90	1.45	0.01
S4194	47.60	1.44	17.41	13.72	0.00	0.20	7.36	7.55	2.68	2.04	0.01
S4195	65.03	1.02	17.21	10.27	0.00	0.08	4.02	4.84	0.52	2.26	0.24
S4198	49.82	1.67	14.74	14.51	0.00	0.29	5.89	10.14	1.85	0.94	0.15
S4200	52.19	1.78	15.58	15.81	0.00	0.24	4.37	6.48	0.57	2.82	0.16
S4201	56.19	1.43	14.91	14.71	0.00	0.21	4.03	5.16	1.60	1.59	0.17
S4202	52.36	1.66	12.14	16.57	0.00	0.23	4.60	8.35	2.96	0.75	0.38
S4203	50.07	2.02	13.18	15.84	0.00	0.21	4.07	12.55	1.63	0.16	0.27
S4204	53.37	2.03	13.50	14.36	0.00	0.24	3.66	8.50	3.05	0.70	0.59
S4206	52.80	1.97	14.78	12.21	0.00	0.18	7.80	5.04	3.19	2.02	0.01
S4207	53.54	1.04	11.26	9.85	0.00	0.24	7.92	11.52	4.14	0.49	0.00
S4209	61.17	0.67	16.94	8.18	0.00	0.18	3.47	2.67	4.50	2.14	0.08
S4210	60.03	0.69	16.99	9.11	0.00	0.15	4.41	2.48	5.71	0.30	0.13
S4211	54.47	0.67	11.83	12.01	0.00	0.26	9.27	6.15	4.15	1.08	0.11
S4212	55.27	0.76	15.78	11.19	0.00	0.19	6.11	4.20	6.06	0.32	0.12
S4213	56.41	0.74	18.29	8.16	0.00	0.15	5.27	5.53	4.20	1.14	0.11
S4214	53.89	1.04	13.98	7.27	0.00	0.12	3.45	12.90	6.01	1.26	0.08
S4215	58.00	0.53	15.21	8.69	0.00	0.17	6.84	5.50	4.05	0.92	0.08
S4216	49.30	0.64	12.26	12.73	0.00	0.20	12.47	10.32	1.50	0.54	0.05
S4218	57.61	0.75	16.99	10.37	0.00	0.15	6.26	2.60	5.02	0.13	0.12
S4219	59.44	0.69	17.03	7.68	0.00	0.10	5.01	3.48	4.51	1.95	0.11
S4220	59.61	0.66	15.69	8.65	0.00	0.12	5.36	4.47	4.15	1.16	0.13
S4221	61.61	0.75	16.44	8.38	0.00	0.10	3.52	3.82	2.30	2.98	0.10
S4222	54.03	1.13	13.29	14.74	0.00	0.22	5.74	8.38	2.33	0.06	0.08
S4223	51.10	1.45	13.41	16.21	0.00	0.18	6.08	9.02	2.22	0.23	0.10
S4225	59.09	0.75	19.63	6.54	0.00	0.09	3.31	3.57	4.58	2.31	0.13
S4226	65.79	0.84	16.33	6.06	0.00	0.09	4.05	2.02	1.37	3.31	0.14
S4227	52.45	0.69	14.38	10.10	0.00	0.17	6.73	8.89	0.65	5.69	0.25
S4228	65.28	0.72	13.49	5.71	0.00	0.09	4.85	4.78	3.87	1.07	0.14
S4229	50.68	1.33	13.06	15.86	0.00	0.22	6.25	10.16	2.16	0.18	0.10

SAMPLE	SIO2	TIO2	AL2O3	FE2O3	FEO	MNO	MGO	CAO	NA2O	K2O	P2O5
S4230	50.97	1.06	14.34	11.04	0.00	0.19	11.95	6.29	3.18	0.71	0.27
S4231	56.45	0.95	15.09	8.75	0.00	0.12	5.00	8.54	4.18	0.78	0.14
S4232	67.11	0.75	15.43	5.35	0.00	0.08	2.94	2.02	5.87	0.31	0.14
S4233	50.91	1.61	13.17	17.17	0.00	0.12	5.22	9.39	1.98	0.31	0.12
S4234	58.83	0.88	16.23	9.05	0.00	0.12	8.19	1.99	3.98	0.60	0.13
S4235	65.04	0.71	15.71	6.15	0.00	0.10	3.46	3.43	3.77	1.45	0.18
S4236	50.46	0.97	13.35	11.70	0.00	0.14	5.49	13.29	3.95	0.48	0.17
S4237	49.65	0.82	13.62	8.93	0.00	0.25	7.11	15.54	2.96	0.98	0.14
S4238	68.08	0.42	17.46	3.68	0.00	0.06	1.23	1.29	6.05	1.56	0.17
S4239	53.20	0.66	14.57	10.41	0.00	0.21	7.08	8.41	4.31	1.00	0.15
S4240	50.44	1.13	14.06	13.62	0.00	0.19	7.06	11.46	1.81	0.16	0.07
S4241	67.91	0.56	15.13	5.27	0.00	0.07	2.59	1.81	6.24	0.31	0.11
S4243	57.96	0.52	12.38	9.26	0.00	0.14	5.56	12.73	1.31	0.10	0.04
S4244	49.29	0.56	15.11	10.20	0.00	0.18	10.68	11.98	1.43	0.53	0.03
S4245	66.49	0.53	15.23	3.99	0.00	0.08	2.08	5.50	3.75	2.11	0.24
S4246	50.66	0.95	19.35	10.64	0.00	0.14	7.58	6.87	1.08	2.70	0.03
S4247	70.40	0.41	13.38	5.04	0.00	0.13	3.26	4.52	0.54	2.21	0.11
S4250	67.63	0.53	14.68	4.97	0.00	0.10	2.73	5.36	1.86	2.04	0.10
S4251	61.11	0.60	16.47	7.91	0.00	0.13	5.11	5.08	0.93	2.49	0.18
S4252	51.72	1.57	14.40	19.67	0.00	0.15	9.23	2.43	0.68	0.05	0.10
S4253	68.79	0.43	14.64	4.14	0.00	0.07	5.09	1.21	3.25	2.23	0.15
S4254	58.90	1.27	19.22	10.46	0.00	0.13	0.54	1.93	6.70	0.48	0.37
S4255	75.82	0.27	12.91	3.10	0.00	0.04	0.26	1.28	4.73	1.57	0.02
S4256	65.76	0.60	15.86	5.47	0.00	0.07	3.16	3.51	4.50	0.91	0.16
S4257	63.84	0.81	14.71	7.03	0.00	0.13	5.47	4.52	1.36	1.96	0.17
S4258	55.38	1.00	13.62	9.54	0.00	0.21	5.57	11.55	1.23	1.77	0.13
S4259	50.22	0.77	14.22	12.69	0.00	0.21	9.50	10.42	1.32	0.53	0.11
S4260	59.55	0.71	17.11	8.20	0.00	0.19	5.74	3.36	3.40	1.60	0.14
S4261	65.72	0.48	14.91	5.67	0.00	0.10	2.80	5.04	4.20	0.98	0.10
S4262	62.18	0.76	16.35	6.24	0.00	0.07	5.12	3.37	3.14	2.54	0.22
S4263	49.11	1.63	14.58	15.01	0.00	0.20	4.38	11.89	2.83	0.36	0.00
S4264	49.72	1.63	13.76	11.79	0.00	0.18	5.53	12.95	4.09	0.34	0.01
S4265	54.95	0.74	14.27	9.91	0.00	0.14	6.61	8.24	4.60	0.54	0.00
S4266	49.79	1.05	15.34	13.46	0.00	0.17	6.95	7.57	2.74	2.86	0.08
S4267	51.11	0.64	15.12	10.14	0.00	0.17	8.31	10.63	2.37	1.48	0.03
S4269	70.69	0.48	14.53	5.07	0.00	0.09	1.35	2.29	3.61	1.79	0.10
S4270	51.28	0.59	13.59	9.57	0.00	0.17	10.29	10.82	2.30	1.34	0.05
S4271	48.93	1.66	14.43	13.73	0.00	0.22	6.33	10.64	2.92	0.96	0.17
S4272	46.10	1.26	22.23	13.99	0.00	0.22	5.07	8.82	1.99	0.22	0.11
S4274	54.39	0.30	14.79	6.73	0.00	0.11	7.02	13.78	2.78	0.07	0.03
S4275	50.50	2.00	15.32	13.58	0.00	0.21	4.53	8.44	3.93	1.17	0.32
S4277	58.91	0.87	15.78	10.39	0.00	0.26	3.27	6.99	2.54	0.91	0.08
S4280	48.42	0.79	12.06	12.55	0.00	0.21	14.51	8.94	1.94	0.46	0.12
S4282	70.07	0.66	12.98	6.20	0.00	0.08	3.67	1.56	1.50	3.13	0.15
S4284	63.75	0.75	13.81	6.98	0.00	0.17	3.09	7.91	0.05	3.37	0.12
S4286	78.23	0.20	14.39	1.84	0.00	0.03	0.71	1.24	1.37	1.94	0.05
S4288	76.83	0.10	14.64	1.44	0.00	0.01	1.14	0.24	0.39	5.20	0.01
S7000	52.56	1.18	13.37	12.27	0.00	0.22	7.91	10.61	1.29	0.51	0.08
S7001	69.37	0.50	16.82	2.36	0.00	0.05	1.50	3.63	4.51	1.08	0.18
S7002	63.74	0.76	16.35	6.21	0.00	0.08	2.79	2.87	5.73	1.06	0.41
S7003	52.43	1.39	15.54	14.79	0.00	0.22	6.56	7.24	0.71	1.02	0.10
S7004	50.28	1.36	17.10	15.95	0.00	0.20	6.45	5.76	2.40	0.38	0.12
S7005	55.70	1.34	16.01	11.19	0.00	0.13	3.77	9.01	2.64	0.12	0.09
S7006	51.73	1.35	15.22	13.84	0.00	0.27	6.38	9.43	1.64	0.04	0.10
S7007	68.14	0.50	16.09	3.65	0.00	0.06	1.95	3.39	4.52	1.48	0.22

SAMPLE	SIO2	TIO2	AL2O3	FE2O3	FEO	MNO	MGO	CAO	NA2O	K2O	P2O5
S7008	72.39	0.27	13.35	3.07	0.00	0.08	1.61	2.55	0.08	6.55	0.05
S7009	72.47	0.26	13.38	4.03	0.00	0.11	0.61	4.53	1.86	2.71	0.04
S7010	52.11	1.30	20.79	11.34	0.00	0.17	4.93	2.56	4.69	2.03	0.08
S7011	76.19	0.25	13.36	2.79	0.00	0.05	2.39	1.98	0.55	2.40	0.04
S7012	71.98	0.29	15.97	3.56	0.00	0.03	2.90	1.39	2.49	1.34	0.05
S7013	56.22	1.10	18.58	10.45	0.00	0.15	1.42	4.67	5.27	2.06	0.08
S7014	58.18	0.65	17.61	10.54	0.00	0.14	6.13	2.25	4.10	0.35	0.04
S7015	62.34	0.80	16.67	9.61	0.00	0.14	6.24	0.50	1.61	2.03	0.06
S7016	79.07	0.05	12.61	1.22	0.00	0.05	0.68	2.89	0.85	2.15	0.43
S7023	61.25	0.75	16.40	6.35	0.00	0.17	3.54	4.65	6.09	0.67	0.13
S7024	63.97	0.70	15.42	6.46	0.00	0.10	4.28	4.48	1.82	2.77	0.00
S7025	66.48	0.60	15.38	5.80	0.00	0.08	3.87	3.52	1.52	2.75	0.00
S 68	80.49	0.06	9.79	0.26	0.00	0.05	0.05	2.52	4.31	2.47	0.00
S 106	54.40	0.55	9.51	18.17	0.00	0.25	7.85	8.15	0.69	0.30	0.13
S 108	55.21	0.71	11.27	20.86	0.00	0.21	5.67	4.61	1.11	0.17	0.19
S 117	49.01	2.05	11.51	20.78	0.00	0.18	3.85	6.81	5.30	0.26	0.24
S 163	61.96	0.56	11.39	21.75	0.00	0.05	2.41	0.28	0.32	1.14	0.14
S 174	81.50	0.18	10.32	1.13	0.00	0.03	0.37	1.90	1.54	3.01	0.02
S 211	81.03	0.15	12.71	1.66	0.00	0.01	0.46	0.05	0.06	3.87	0.00
S 214	55.62	1.37	15.35	21.27	0.00	0.13	3.47	0.43	0.04	2.04	0.28
S 223	81.25	0.06	10.93	0.65	0.00	0.02	0.43	4.99	0.58	1.08	0.01
S 224	83.73	0.06	12.31	0.34	0.00	0.02	0.14	0.02	0.22	3.15	0.01
S 290	43.06	1.08	17.44	23.42	0.00	0.15	10.39	3.91	0.41	0.10	0.04
S 300	54.72	0.66	11.96	21.83	0.00	0.11	5.61	2.13	1.73	1.19	0.06
S 321	81.83	0.02	11.51	1.06	0.00	0.03	1.61	0.27	0.85	2.82	0.00
S2022	43.65	1.61	7.90	19.68	0.00	0.26	13.07	13.40	0.19	0.13	0.11
S2081	81.40	0.32	8.42	4.83	0.00	0.02	1.10	0.33	0.01	3.55	0.02
S2120	44.02	1.33	13.30	21.42	0.00	0.35	6.57	10.10	2.19	0.63	0.09
S2141	82.50	0.07	11.55	1.13	0.00	0.03	0.72	0.77	0.15	3.07	0.01
S2145	43.06	2.40	16.60	26.28	0.00	0.16	9.11	1.01	1.18	0.02	0.19
S2194	47.52	0.83	14.69	20.21	0.00	0.31	5.44	6.51	0.01	4.14	0.34
S4023	56.40	0.36	8.81	12.51	0.00	0.19	6.39	10.31	4.15	0.86	0.02
S4026	83.45	0.08	10.84	1.67	0.00	0.01	0.94	0.06	0.24	2.69	0.02
S4047	82.35	0.29	7.57	3.83	0.00	0.04	0.54	3.19	0.86	1.21	0.12
S4149	80.11	0.19	12.43	1.37	0.00	0.03	0.96	1.49	1.04	2.33	0.05
S4174	68.71	0.23	8.94	4.63	0.00	0.12	5.11	9.84	0.62	1.70	0.10
S4180	81.82	0.18	11.57	0.82	0.00	0.02	0.79	1.35	1.02	2.40	0.03
S4196	49.81	1.10	6.01	17.49	0.00	0.27	14.31	9.23	0.10	1.60	0.08
S4199	54.86	1.45	14.85	21.83	0.00	0.24	4.47	0.57	0.19	1.30	0.24
S4248	55.16	1.32	9.59	13.61	0.00	0.47	3.88	11.09	3.69	0.74	0.44
S4268	49.67	0.93	7.76	14.78	0.00	0.26	17.92	8.40	0.08	0.13	0.07
S4273	47.22	0.30	8.01	13.83	0.00	0.19	23.82	6.25	0.35	0.02	0.01

APPENDIX 2

STAMP ANALYTICAL METHODS REPORT

Sample Preparation:

A total of 3,910 samples were analyzed for various elements. All of these were catalogued and stored once a subsample was taken for analysis. Project 3 and Project 4 subsamples were crushed using a Bico Jaw crusher then ground to ~ 200 mesh in a tungsten carbide dish on a shatterbox grinder. The resulting powders were stored in polystyrene vials. Project 2 esker samples were dried and sieved to < 2 um and stored in plastic sample bags. The coarser fraction of these was also stored for future reference. The following analyses were done at Laurentian University.

Gold Analysis:

Project 2 esker powders were analyzed for gold following a partial acid digestion. A 2 gm weight was transferred to a 50 ml capacity test tube and digested with 15 ml of aqua regia for 1 hr. at low heat. Rock powders from the other projects were totally digested prior to gold analysis. A 2 gm weight was digested in a teflon beaker with a 30 ml HF/15 ml $HClO_4$ mixture to dryness. The residue was then dissolved in 25 ml aqua regia. Gold was then extracted from the aqua regia solutions into a 3 ml aliquot of methyl iso-butyl ketone (MIBK). Project 2 samples required centrifugation at this stage. Once the layers had separated a 0.5 ml aliquot of the gold bearing MIBK was removed for analysis. Gold determinations were done using a Model 703 Perkin-Elmer Atomic Absorption spectrophotometer with graphite furnace and HGA 500 programmer. The analysis program for gold is outlined in Table 1. The instrument was calibrated using standards prepared from the appropriate dilution of a stock solution of 'Fisher purified' gold metal, which was then extracted into MIBK as for the samples.

All analyses were done with a deuterium lamp background corrector to minimize any matrix enhancement effects. Highly anomalous samples were reanalyzed as often as four times. Due to the inherent nature of gold it is very difficult to obtain a homogeneous sample distribution. Ideally a larger sample size would have been preferable however not economical in view of the large number of samples. The large majority of samples analyzed were near the detection limits (ie. 2 ppb).

Table 1
Gold Analysis Program

Step 1 (drying)	150°c Temperature 70 sec. Ramp 15 sec. Hold Baseline
Step 2 (charring)	800°c Temperature 55 sec. Ramp 15 sec. Hold 40 sec. Recorder
Step 3 (atomization)	2700°c Temperature 3 sec. Ramp 7 sec. Hold 5 sec. Read Recorder 40 Internal Flow
Step 4	2750°c Temperature 1 sec. Ramp 3 sec. Hold Recorder
Step 5	30°c Temperature 10 sec. Ramp 5 sec. Hold 10 sec. Read

Note: 20 ul sample volume

Traces by Atomic Absorption Spectrophotometry:

All project 3 and project 4 samples were analyzed for Cu, Ni, Zn and Pb following a total digestion (ie.$HF/HClO_4$). The digestion residue from a 0.5 gm sample was then dissolved in 5% HCl and analyzed by flame atomic absorption spectrophotometry using a Perkin-Elmer Model 5000 with an AS50 autosampler in conjunction with a Model 3600 Data Station. Project 3 samples were also analyzed for Fe and Mn by this method. All flame atomic absorption spectrophotometry standard solutions were prepared by the appropriate dilution of Fisher 'Certified A.A. Standard' 1000 ppm stock solution with 5% HCl. Single element electrodeless discharge lamps were used for Pb and Zn while all other analyses were done with single element hollow cathode lamps. All anlyses were done with flow spoiler option.

Detection limits for each element are shown in Table 2. Precision was determined by repeated analysis of random samples as shown in Table 3.

Project 2 esker samples were analyzed for a number of traces by atomic absorption spectrophotometry at Queen's University following

an aqua regia digestion.

Table 2
A.A. Detection Limits

Element	D.L. (ppm)
Cu	.16
Ni	.06
Zn	.03
Pb	.68
Fe	.03
Mn	.09

Table 3
Results of Repeated Analyses

Sample	Content (ppm ± S.D.[A])					
	Cu	Ni	Zn	Pb	Mn	Fe
6067	4 ± 1	16 ± 12	2.5 ± .6	ND	-	9431 ± 952
6099	172 ± 12	117 ± 38	117 ± 13	ND	1945 ± 147	119,525 ± 3,521
6176	58 ± 6	36 ± 11	13 ± 1	ND	92 ± 32	12,786 ± 2,949
6181	7 ± 3	60 ± 15	57 ± 7	ND	306 ± 46	231,425 ± 21,885

A) standard deviation based on 4 separate analyses.

Traces by X-ray Fluorescence Spectrometry:

A Philips Model 1220 Semi-Automatic Spectrometer was used to determine Y, Rb, Sr, Zr and As levels. Samples were analyzed as 4 gm loose powders in spectro cups on mylar film. The instrument conditions are shown in Table 4.

The XRF data were processed on a PDP11/03 (Digital Equip. Co.). Matrix correction for these elements was based on the total mass absorption coefficient as determined by comparing their Mo - K compton peak intensity to that of several standards of known absorption coefficients. Duplicate sample powders were also prepared and analyzed, one in every 20 samples. Accuracy and precision were determined by analyzing international rock standards with each sample batch. Table 5 shows these results along with the published values for these standards.

Table 4
Operating Conditions for X-ray Fluroescence

Element	Tube	Excitation		Crystal	Counter
Si	Cr	50kv	40 mA	PE	Flow
Ti	Cr	50kv	35 mA	LiF200	Flow
Al	Cr	50kv	40 mA	PE	Flow
Fe	W	35kv	10 mA	LiF200	Flow
Mn	W	50kv	40 mA	LiF200	Flow
Mg	Cr	50kv	40 mA	TLAP	Flow
Ca	Cr	40kv	30 mA	LiF200	Flow
K	Cr	50kv	40 mA	PE	Flow
P	Cr	50kv	40 mA	PE	Flow
Na	Cr	50kv	40 mA	TLAP	Flow
Y[A]	Mo	95kv	20 mA	LiF200	Scintillation
Rb	Mo	95kv	20 mA	LiF200	Scintillation
Zr[B]	Mo	95kv	20 mA	LiF200	Scintillation
Sr	Mo	95kv	20 mA	LiF200	Scintillation
As	Mo	60kv	40 mA	LiF200	Scintillation

A) Y and Rb were determined simultaneously in order to correct for the enhancement of Y by Rb directly.

B) Zr and Sr were determined simultaneously in order to correct for Sr enhancement of Zr.

Table 5
Comparison of Published Values to Experimental Values for International Standards.[A]

Element	W-1		GSP-1		BCR1	
	Published Value(Abbey)	L.U. Value	Published Value	L.U. Value	Pub. Value	L.U. Value
Sr	190	190 $\pm$ 4			330	328 $\pm$ 6
Zr	105	90 $\pm$ 11			185	177 $\pm$ 7
Y	25	28 $\pm$ 2	29	34 $\pm$ 2		
Rb	21	21 $\pm$ 1	250	260 $\pm$ 8		

A) based on at least 6 analyses.

Whole Rock Analysis by X-ray Fluorescence Spectrometry

The ten major oxides were determined on sample beads by a Philips PW 1220 semi-automatic X-ray spectrometer. The sample beads were prepared by adding 4.2 gm of lithium tetraborate and 1 gm of ammonium nitrate to 1.4 gm of roasted sample powder. Loss on ignition was determined from the roasting data. This dry mixture was then mechanically mixed and transferred to a non-wetting platinum crucible of the Claisse Automatic Fluxer. The sample was fused and cast in a platinum mould to form the bead.

Matrix correction for the major elements was based on mass absorption comparisons between samples and international standards. Approximately one in every twenty samples was a duplicate bead. The accuracy of these results is shown in Table 6. Table 7 shows the results of our analyses of the international standards and their published values. Also shown are the results of a basalt rock powder (BAS) run as an internal check with each sample batch, a total of 17 separate analyses. The instrument conditions for these analyses are listed in Table 4.

Table 6
Results for Duplicate Beads

Major Oxides (%)

CODE	NA	MG	AL	SI	P	K	CA	TI	MN	FE
0063A)	4.42	1.43	16.74	67.64	0.06	2.44	3.04	0.43	0.07	3.75
B)	4.38	1.37	16.67	67.87	0.06	2.45	3.02	0.43	0.06	3.69
2003A)	3.38	6.15	12.58	51.52	0.01	0.60	10.60	0.96	0.17	14.03
B)	3.62	6.15	12.76	51.23	0.01	0.60	10.59	0.95	0.16	13.9
4015A)	3.86	7.22	17.32	49.34	0.08	0.12	1.85	1.57	0.20	18.44
B)	3.92	7.25	17.45	49.34	0.07	0.12	1.89	1.60	0.21	18.14
4101A)	2.87	2.96	20.19	63.17	0.12	1.57	1.70	0.86	0.07	6.49
B)	3.01	2.97	20.17	62.97	0.12	1.57	1.70	0.85	0.07	6.56
4165A)	2.84	1.22	15.41	73.12	0.12	2.54	2.37	0.39	0.03	1.97
B)	2.31	1.16	15.49	73.56	0.11	2.53	2.43	0.40	0.03	1.99
C)	2.69	1.21	14.91	73.47	0.12	2.92	2.41	0.39	0.03	1.85
4284A)	0.05	3.09	13.81	63.75	0.12	3.37	7.91	0.75	0.17	6.98
B)	0.07	3.04	13.84	63.77	0.14	3.39	7.94	0.73	0.18	6.90
4070A)	3.19	8.09	15.03	49.03	0.08	0.25	9.87	1.06	0.21	13.20
B)	3.14	8.09	15.09	49.20	0.08	0.26	9.78	1.04	0.21	13.10
4096A)	5.14	4.75	15.20	62.28	0.13	1.13	5.43	0.55	0.09	5.30
B)	4.88	4.91	15.51	62.24	0.14	1.11	5.38	0.53	0.08	5.22
0205A)	2.22	3.65	13.25	56.46	0.16	1.84	5.28	1.99	0.26	14.89
B)	2.88	3.62	13.18	56.02	0.16	1.86	5.26	1.98	0.27	14.76
0236A)	0.11	6.27	16.08	54.46	0.21	1.86	7.95	1.18	0.15	11.71
B)	0.09	6.34	16.13	54.41	0.22	1.86	7.83	1.17	0.15	11.79
0144A)	2.86	0.34	14.63	73.88	0.02	4.18	1.56	0.24	0.02	2.27
B)	2.70	0.22	14.55	73.94	0.02	4.28	1.65	0.25	0.02	2.36
0194A)	1.17	16.54	21.24	30.42	0.64	1.55	15.24	1.07	0.35	11.78
B)	1.85	16.51	21.16	30.19	0.65	1.56	15.08	1.07	0.35	11.58
0244A)	5.24	4.28	15.46	60.31	0.10	0.83	6.30	0.50	0.12	6.86
B)	5.40	4.19	15.47	60.20	0.09	0.84	6.28	0.49	0.13	6.89
2100A)	0.33	1.57	17.04	65.65	0.26	4.38	2.11	0.68	0.06	7.92
B)	0.36	1.51	17.04	65.78	0.26	4.36	2.08	0.68	0.06	7.87
4101A)	2.87	2.96	20.19	63.17	0.12	1.57	1.70	0.86	0.07	6.49
B)	3.01	2.97	20.17	62.97	0.12	1.57	1.70	0.85	0.07	6.56
4165A)	2.84	1.22	15.41	73.12	0.12	2.54	2.37	0.39	0.03	1.97
B)	2.31	1.16	15.49	73.56	0.11	2.53	2.43	0.40	0.03	1.99
4284A)	0.05	3.09	13.81	63.75	0.12	3.37	7.91	0.75	0.17	6.98
B)	0.07	3.04	13.84	63.77	0.14	3.39	7.94	0.73	0.18	6.90
4070A)	3.19	8.09	15.03	49.03	0.08	0.25	9.87	1.06	0.21	13.20
B)	3.14	8.09	15.09	49.20	0.08	0.26	9.78	1.04	0.21	13.10

Table 7

Results for International Standards Compared to Their Published Values

Oxide Content (%)

Standard	Na_2O	MgO
GSP1[A]	2.76 ± .25	0.96 ± .03
published	2.82	0.97
BCR1[A]	3.48 ± .28	3.49 ± .09
published	3.28	3.48
BAS	4.71 ± .32	4.93 ± .13

Standard	AL_2O_3	SiO_2
GSP1[A]	15.10 ± .53	68.12 ± 1.5
published	15.32	67.91
BCR1[A]	13.40 ± .19	54.58 ± .38
published	13.65	54.72
BAS	15.92 ± .46	49.8 ± .8

Standard	P_2O_5	K_2O
GSP1[A]	0.21 ± .01	5.06 ± .34
published	0.28	5.58
BCR1[A]	0.34 ± .005	1.56 ± .08
published	0.33	1.68
BAS	0.5 ± .03	1.11 ± .06

Standard	CaO	TiO_2
GSP1[A]	1.98 ± .09	0.66 ± .02
published	2.04	0.66
BCR1[A]	6.97 ± .04	2.30 ± .33
published	6.96	2.21
BAS	5.80 ± .09	3.09 ± .25

Standard	MnO	Fe_2O_3
GSP1[A]	0.04 ± .003	4.34 ± .05
published	0.04	4.37
BCR1[A]	0.18 ± .006	13.70 ± .27
published	0.19	13.70
BAS	.20 ± .008	14.01 ± .38

A) based on 10 analyses

APPENDIX 3

ALTERATION PARAMETERS: VERSION 1

VERSION 1 ALTERATION PARAMETERS AS LOG MOLE PERCENT

SAMPLE	ASIO2	ATIO2	AFE203	AFEO	AMNO	AMGO	ACAO	AK20	ANA20	AP205
4S0001	0	-25	178	0	-10	130	2	-75	0	-68
4S0002	0	-3	169	0	50	83	45	-32	0	-73
4S0003	0	10	208	0	57	183	94	-30	-89	-80
4S0004	0	55	242	0	63	424	13	-66	0	-73
4S0005	0	72	283	0	219	249	56	-52	-68	-54
4S0006	0	31	531	0	226	167	87	-16	0	-55
4S0007	0	71	665	0	504	331	135	-45	-72	-52
4S0008	0	4	638	0	-12	281	180	-90	41	-39
4S0009	0	26	212	0	84	112	36	3	-55	-63
4S0010	0	35	181	0	75	101	2	-14	0	-29
4S0011	0	-12	168	0	-23	137	-48	-33	0	-85
4S0012	0	-19	262	0	17	153	73	-46	0	-56
4S0013	0	-22	177	0	-52	121	-44	-82	12	-76
4S0014	0	-20	135	0	-2	199	19	-42	0	-70
4S0015	0	83	136	0	62	157	16	-14	-82	-47
4S0016	0	34	220	0	62	183	31	-58	-44	-63
4S0017	0	-29	340	0	2	136	36	3	0	-83
4S0018	0	-31	378	0	-57	112	-10	-54	0	-74
4S0019	0	-42	91	0	-31	668	-45	-72	0	-69
4S0020	0	-29	32	0	-51	1675	-35	8	-29	-63
4S0021	0	-29	115	0	-41	344	64	-68	-44	-71
4S0022	0	11	105	0	48	138	45	-65	-75	-64
4S0023	0	-19	85	0	-11	161	90	12	-44	880
4S0024	0	-83	500	0	-78	2490	524	-60	-29	-95
4S0025	0	22	246	0	-15	190	61	2	-78	-36
4S0026	0	-40	176	0	-44	285	-27	-59	-94	-69
4S0027	0	-42	-68	0	-41	60	-74	-25	0	-67
4S0028	0	-24	96	0	16	999	230	47	0	-54
4S0029	0	-54	61	0	-29	350	74	-63	0	-73
4S0030	0	-44	187	0	-59	4997	775	-83	-50	-72
4S0031	0	-52	106	0	-20	167	12	-70	12	-61
4S0032	0	-30	164	0	-32	313	-43	-76	-21	-65
4S0033	0	-6	399	0	49	317	111	-61	-11	99
4S0035	12	13	584	0	23	6803	1074	-9	-80	-67
4S0036	0	-65	-27	0	-87	-27	-72	37	401	-58
4S0041	0	-23	91	0	-63	207	-49	10	12	-54
4S0042	0	-35	130	0	-20	575	65	12	-68	-73
4S0043	0	-30	180	0	-26	495	-99	-3	-78	-70
4S0044	0	-33	64	0	-55	377	-39	-32	0	-73
4S0045	0	-43	76	0	-44	-4	-55	108	-37	-54
4S0046	0	-23	122	0	-38	1880	185	-99	-60	-75
4S0047	0	-41	133	0	-5	64	-24	-94	-21	-68
4S0049	0	-4	387	0	48	163	29	-90	0	-69
4S0050	0	-40	75	0	-62	515	-26	-2	-44	-71
4S0051	0	-94	-82	0	-91	261	84	-26	-55	-96
4S0052	0	10	229	0	32	60	19	-5	0	-16
4S0053	0	-45	98	0	-32	151	60	-53	0	-67
4S0055	0	-7	209	0	6	318	-33	16	-96	5
4S0056	0	11	152	0	-29	61	-39	56	-92	15
4S0057	0	16	279	0	68	50	-20	29	-55	-53
4S0059	0	-22	150	0	-59	484	-79	-59	26	-75
4S0060	0	-76	-46	0	-85	141	-51	69	-60	-82
4S0061	0	-33	115	0	-49	1797	107	-29	-50	-53
4S0062	0	-27	141	0	-36	33	-30	14	-60	-52
4S0063	0	-59	15	0	-55	35	-34	-3	0	-86

VERSION 1 ALTERATION PARAMETERS AS LOG MOLE PERCENT

SAMPLE	ASIO2	ATIO2	AFE203	AFEO	AMNO	AMGO	ACAO	AK20	ANA20	AP205
4S0064	0	-50	13	0	-71	229	-36	-54	0	-89
4S0065	0	-25	101	0	-41	88	-33	0	-65	-69
4S0066	0	-34	100	0	-47	-18	-69	-30	0	-66
4S0067	0	-22	40	0	-61	82	-27	-56	-37	-79
4S0069	0	-68	190	0	-50	66	-76	-20	26	-35
4S0070	0	-37	138	0	57	1309	6	-95	0	-70
4S0071	0	-45	138	0	87	1283	132	-96	0	-74
4S0072	0	-16	176	0	-23	551	0	-63	12	-24
4S0073	0	-42	219	0	-54	2076	-20	-97	0	-55
4S0074	0	-45	53	0	-59	-54	-43	44	12	-82
4S0075	0	-26	84	0	7	157	-67	-51	100	-12
4S0076	0	-35	71	0	-29	270	24	-24	-11	-13
4S0077	0	0	186	0	15	81	-40	5	-29	17
4S0078	0	-75	303	0	-64	1103	71	-94	-86	-72
4S0080	0	-30	131	0	-42	764	-62	-73	26	-59
4S0081	0	-51	12	0	-73	141	-69	-8	0	-62
4S0082	0	-35	136	0	-53	74	-56	36	-37	-26
4S0083	0	-47	58	0	-70	184	-60	-27	-21	-66
4S0084	0	-47	23	0	-72	285	-75	-29	0	-71
4S0085	0	-45	80	0	-13	362	-13	-77	0	-61
4S0088	0	-49	300	0	-30	151	-37	-38	0	-21
4S0089	0	-89	157	0	-30	7	-22	30	0	-24
4S0090	0	9	85	0	31	20	-3	-21	0	-70
4S0091	0	76	45	0	68	-9	8	-65	0	-63
4S0092	0	-30	179	0	-43	164	-62	-95	41	-38
4S0093	0	125	304	0	9	102	3	129	0	108
4S0094	0	-54	3	0	-75	-8	-85	96	-78	-93
4S0095	0	-40	116	0	-40	561	-32	6	-98	-68
4S0096	0	-45	162	0	-30	32	-17	67	0	-83
4S0097	0	-46	12	0	-71	186	-18	-16	-21	-71
4S0098	0	-30	205	0	-22	2341	426	-21	-60	-54
4S0099	0	-47	96	0	-44	437	15	70	-96	-66
4S0100	26	-21	151	0	-22	3061	211	11	-72	-53
4S0101	0	-41	-4	0	-42	78	-48	-9	0	-67
4S0102	0	-51	-14	0	-71	196	-28	17	-29	-73
4S0103	0	7	154	0	15	10	-9	-28	-78	-51
4S0104	0	-63	-55	0	-74	664	76	15	-44	-82
4S0105	26	-18	119	0	-14	5877	155	90	-11	-54
4S0107	0	-46	22	0	-56	107	-21	-15	-44	-49
4S0109	0	-56	6	0	-55	164	19	-11	-29	-71
4S0110	0	-46	26	0	-65	1411	-89	-41	41	-72
4S0111	0	-45	55	0	-60	383	-69	-29	0	-73
4S0112	0	-28	81	0	-67	-6	-47	9	0	-75
4S0113	0	-13	163	0	-34	185	-50	-4	26	-89
4S0114	0	-54	15	0	-57	66	-19	59	-29	-53
4S0115	0	-15	124	0	-44	852	-67	-66	12	-80
4S0116	-11	-6	72	0	0	-19	-28	58	0	-30
4S0118	0	98	505	0	56	271	52	44	-78	-48
4S0119	0	48	336	0	45	96	-5	51	-80	-34
4S0120	0	70	452	0	55	231	34	27	-78	-57
4S0121	0	-25	17	0	-71	265	-69	-2	-21	-66
4S0122	0	-17	636	0	-30	1115	-65	-16	100	-88
4S0123	0	-31	61	0	-72	73	-79	-76	59	-65
4S0124	0	-27	73	0	-52	35	-75	64	0	-58
4S0125	0	92	138	0	33	-7	-62	84	401	-79

VERSION 1 ALTERATION PARAMETERS AS LOG MOLE PERCENT

SAMPLE	ASIO2	ATIO2	AFE203	AFEO	AMNO	AMGO	ACAO	AK2O	ANA2O	AP205
4S0126	0	-23	108	0	-32	0	-38	97	-60	0
4S0127	0	-14	167	0	0	105	28	-18	0	40
4S0128	0	-40	142	0	-43	30	-87	1	0	-64
4S0129	0	-8	168	0	-31	87	-58	63	-93	2
4S0130	0	13	296	0	13	122	25	-22	0	-66
4S0131	0	10	77	0	25	31	-8	-44	41	-57
4S0132	0	-32	26	0	-59	21	-76	64	0	-64
4S0133	0	32	426	0	48	516	59	-9	-97	-81
4S0134	0	-31	25	0	-55	121	-47	3	-11	-63
4S0135	0	-44	83	0	-52	650	-52	-1	-37	-96
4S0136	0	-7	21	0	-54	1620	346	37	-80	-57
4S0137	0	-30	113	0	-15	10	-62	98	0	13
4S0138	0	35	234	0	-3	339	-15	-29	-37	0
4S0139	0	67	414	0	63	240	0	-32	-97	-63
4S0140	0	-20	114	0	-67	49	-96	64	-29	-32
4S0141	0	-40	55	0	-75	45	-96	-57	-21	-79
4S0142	0	-21	88	0	-60	50	-82	-36	0	-62
4S0143	0	-19	84	0	-30	131	-44	-23	0	-64
4S0144	0	-66	-1	0	-82	479	140	-46	0	-96
4S0145	0	10	137	0	-24	79	-18	-56	0	-56
4S0146	0	-9	-33	0	-15	23	71	22	-55	-61
4S0147	0	97	268	0	-19	217	-76	-97	298	53
4S0148	0	-67	-48	0	-72	1129	-32	-25	-29	-96
4S0150	0	62	351	0	56	74	-58	19	-86	-24
4S0151	0	47	346	0	70	210	-23	-37	-84	-45
4S0152	0	76	386	0	82	217	27	0	-96	-63
4S0153	0	24	173	0	-21	178	-33	61	-55	25
4S0154	0	-7	310	0	76	203	64	-24	-21	-78
4S0155	0	-19	189	0	-4	110	-16	0	0	-17
4S0156	0	-35	70	0	-54	65	-43	15	-11	-83
4S0157	0	-12	-3	0	-52	-29	-45	12	0	-29
4S0158	0	-46	40	0	-69	503	-33	64	-91	-67
4S0159	0	-29	230	0	33	112	21	-12	-50	-78
4S0160	0	-50	-10	0	-79	316	-54	2	0	-70
4S0161	0	-40	89	0	-52	391	-61	-23	-11	-66
4S0162	0	-16	109	0	-9	201	28	-56	0	-70
4S0164	0	-9	193	0	-38	97	-30	-8	0	-59
4S0165	0	4	177	0	-9	41	30	-17	0	-40
4S0167	0	-4	241	0	20	531	-7	-39	-98	25
4S0168	0	-46	89	0	-52	171	-65	5	0	-49
4S0169	0	-85	-67	0	-79	-95	-64	116	462	25
4S0172	0	-17	171	0	-39	158	-72	-9	0	-53
4S0173	0	-28	109	0	-38	67	-35	35	-82	-67
4S0175	0	29	235	0	-18	106	-6	-1	-37	-49
4S0176	0	-28	172	0	-36	190	-68	27	-82	-70
4S0177	0	-17	56	0	-22	44	75	-25	0	-54
4S0178	0	-7	166	0	-43	0	-44	-3	-44	-53
4S0180	0	-50	108	0	-16	476	52	-49	0	-80
4S0181	12	-73	92	0	-90	892	-97	-91	-11	-98
4S0182	0	-83	322	0	71	134	-13	16	-68	15
4S0183	0	-16	99	0	12	490	139	-71	0	-80
4S0184	0	129	408	0	192	45	29	-60	0	122
4S0185	0	-23	149	0	-12	1708	83	-56	26	-77
4S0186	0	-30	102	0	-24	120	-34	-74	59	-69
4S0188	12	-86	-56	0	-80	1828	15	-22	-60	-70

VERSION 1 ALTERATION PARAMETERS AS LOG MOLE PERCENT

SAMPLE	ASIO2	ATIO2	AFE203	AFEO	AMNO	AMGO	ACAO	AK2O	ANA2O	AP205
4S0190	0	-44	62	0	-53	35	-57	-2	-21	-76
4S0191	0	-56	-24	0	-56	21	-69	-10	-29	-65
4S0192	0	-42	19	0	-29	324	-61	-97	12	-76
4S0193	0	-24	100	0	18	123	-19	2	-55	44
4S0194	-44	-30	91	0	59	149	15	-63	216	175
4S0195	0	-48	-58	0	-95	-38	-94	-70	0	-43
4S0196	0	-31	28	0	-64	366	-66	1	-68	-61
4S0197	0	-48	-61	0	-80	140	-31	-73	12	-66
4S0198	0	-53	-2	0	-72	95	-31	-5	-11	-67
4S0199	0	-57	20	0	-67	223	-66	9	-50	-63
4S0200	0	-22	85	0	3	-24	-33	14	-86	-60
4S0201	0	24	215	0	24	93	-66	-29	0	-64
4S0202	0	9	126	0	-20	-19	-79	45	-11	35
4S0203	0	58	369	0	37	212	-73	-99	12	-50
4S0205	0	142	484	0	115	413	58	-40	-11	-55
4S0206	0	29	408	0	174	1880	303	-62	-65	59
4S0207	0	109	427	0	109	649	113	-73	-21	-53
4S0208	26	122	470	0	46	2773	-38	4	-75	-63
4S0209	0	189	538	0	251	306	62	-27	-72	-25
4S0210	0	151	524	0	90	239	98	-75	-11	-37
4S0212	0	67	111	0	-57	21	-72	-45	41	-57
4S0216	0	72	525	0	8	335	-67	-99	0	-62
4S0218	0	114	783	0	144	2449	273	-100	-100	5
4S0219	0	-17	285	0	-15	80	-57	42	-78	-81
4S0221	0	29	293	0	70	390	118	-84	-37	-97
4S0222	0	-27	5	0	-24	-67	-62	-68	1022	56
4S0225	0	75	200	0	-18	424	-91	-97	0	-71
4S0227	0	66	358	0	39	1679	282	-35	-90	-64
4S0228	0	22	293	0	-31	69	-73	-94	-50	-64
4S0229	0	-91	-74	0	-93	60	-96	-92	0	-98
4S0230	0	-18	144	0	-15	127	-46	14	-97	-47
4S0231	0	-35	92	0	-32	578	-20	-90	0	-72
4S0232	0	-38	84	0	-46	420	-95	-54	0	-70
4S0233	0	-32	103	0	-46	263	-38	-22	-44	-57
4S0234	0	18	322	0	31	134	20	-46	-94	-65
4S0235	0	-56	100	0	-32	191	-30	-9	-11	-76
4S0236	0	10	252	0	-3	288	40	-97	0	-44
4S0237	0	-21	161	0	-18	282	-19	-34	-29	-55
4S0238	0	-22	154	0	-3	42	-44	48	-72	-57
4S0239	0	-16	334	0	19	578	95	-9	-37	-18
4S0240	0	-37	129	0	-34	93	-46	64	-29	-49
4S0241	0	-26	320	0	55	145	47	-51	-60	-78
4S0242	0	-39	68	0	-15	-8	3	-16	0	-44
4S0243	0	0	82	0	93	15	0	-12	255	72
4S0244	0	-52	111	0	-20	144	8	38	-50	-71
4S0245	0	-39	116	0	-36	875	87	-26	-82	-80
4S0246	0	-53	12	0	-7	202	-82	-92	-11	-81
4S0247	0	133	430	0	79	111	32	-18	-37	-30
4S0248	0	1	358	0	161	419	143	-27	-82	32
4S0249	0	-7	282	0	114	130	69	-32	-82	20
4S0250	0	55	549	0	78	338	46	-42	-75	-62
4S0251	0	-56	162	0	-9	194	-7	-44	0	-73
4S0252	0	-6	295	0	74	1147	195	27	-96	-72
4S0253	0	-39	98	0	-20	59	-55	6	12	-63
4S0255	0	139	701	0	127	423	147	-26	-86	-40

VERSION 1 ALTERATION PARAMETERS AS LOG MOLE PERCENT

SAMPLE	ASIO2	ATIO2	AFE203	AFEO	AMNO	AMGO	ACAO	AK20	ANA20	AP205
4S0256	0	80	531	0	65	158	62	-25	-65	-55
4S0257	0	4	281	0	28	106	24	-36	-65	-51
4S0258	0	-43	122	0	-22	20	-1	-99	0	-70
4S0259	0	113	372	0	294	4278	1195	-30	-50	85
4S0260	0	-11	187	0	-13	1681	92	-45	-55	-66
4S0261	0	-42	137	0	-23	677	23	-26	-55	-74
4S0262	0	-43	137	0	-28	1247	1509	-98	-98	-81
4S0263	0	-2	459	0	73	615	159	-46	-82	-78
4S0264	0	-41	94	0	-42	81	-35	-10	-11	-64
4S0265	0	-29	297	0	54	124	68	-74	0	-58
4S0266	0	-36	139	0	-22	195	6	-25	-55	-75
4S0267	0	-23	185	0	-23	2468	-69	-10	-95	-76
4S0268	0	-15	198	0	55	674	149	-41	-44	-82
4S0269	0	-46	19	0	-66	341	-81	-80	-29	-65
4S0270	0	-43	42	0	-51	681	169	0	-72	-55
4S0271	0	-48	23	0	-86	452	-87	-91	0	-64
4S0272	0	12	202	0	35	17	-8	-61	-84	-53
4S0273	0	-46	-15	0	-56	358	22	-91	0	-85
4S0274	0	-55	-14	0	-71	93	7	-23	0	-69
4S0275	0	-48	50	0	-11	342	4	-38	-21	-68
4S0276	0	-39	146	0	18	5023	34	-88	-44	-81
4S0277	0	-33	192	0	1	133	-39	-20	-37	-53
4S0278	0	-24	61	0	-51	87	-59	21	-72	-25
4S0279	0	-75	-37	0	-70	350	-23	-77	0	-92
4S0280	0	-62	-11	0	-71	35	-73	-31	0	-75
4S0281	0	-57	-26	0	-57	223	-46	-90	0	-78
4S0282	0	-48	20	0	-43	177	-43	-65	0	-68
4S0283	-11	-51	56	0	-61	-63	-20	-22	0	-81
4S0284	0	-44	97	0	-19	8	-36	-3	-11	-5
4S0285	0	-44	67	0	-48	107	-49	-32	-37	-50
4S0286	0	-27	389	0	69	1781	199	-64	-97	-82
4S0287	0	-65	-22	0	-83	882	-22	2	-65	-81
4S0288	0	-19	295	0	29	154	24	-81	-91	-75
4S0289	12	-69	-19	0	-80	2611	-52	-4	-82	-88
4S0291	0	-38	46	0	9	396	34	-19	-37	-66
4S0292	0	-45	148	0	-46	304	-2	-68	-29	-65
4S0293	0	-49	8	0	-39	368	19	-59	-21	-76
4S0294	0	-44	88	0	-53	251	-61	-30	-11	-57
4S0295	0	13	254	0	45	299	-13	-47	-21	122
4S0296	0	-23	280	0	42	187	72	-41	0	-83
4S0297	0	-17	299	0	60	477	107	-58	-50	-15
4S0298	0	6	224	0	117	96	94	-25	-60	-73
4S0299	0	-44	233	0	20	175	23	-34	0	-84
4S0301	0	-4	207	0	71	93	26	-7	0	-76
4S0302	0	20	323	0	-63	342	57	-10	-55	167
4S0303	0	-62	-3	0	72	77	-32	0	-65	-75
4S0304	0	-14	161	0	55	24	-4	-5	0	-66
4S0305	0	-15	208	0	57	133	33	5	-44	-82
4S0306	0	-12	237	0	37	82	-34	-21	-60	-68
4S0308	0	-21	88	0	-24	-5	-45	85	-75	-44
4S0309	0	-41	124	0	5	135	-40	18	-75	-80
4S0310	0	-28	162	0	-4	111	-39	-15	-29	-22
4S0311	0	-11	185	0	39	116	-27	-99	124	-38
4S0312	0	-87	-55	0	-72	1319	68	-73	-11	-94
4S0313	0	-5	176	0	36	57	-16	-24	0	-42

VERSION 1 ALTERATION PARAMETERS AS LOG MOLE PERCENT

SAMPLE	ASIO2	ATIO2	AFE203	AFEO	AMNO	AMGO	ACAO	AK20	ANA20	AP205
4S0314	0	-51	139	0	-45	715	-72	-17	-37	-75
4S0315	0	57	329	0	33	130	-56	10	0	-54
4S0316	0	85	448	0	41	124	39	-42	-82	-45
4S0317	0	-24	120	0	-35	220	-62	-99	-11	-71
4S0318	0	-29	121	0	1	39	-40	-1	0	-49
4S0319	12	-94	-56	0	-90	2426	-29	-70	-11	-98
4S0320	0	-38	142	0	-25	121	-29	6	-44	-55
4S0322	26	-70	-30	0	-57	1085	225	6	-21	-71
4S2001	0	-3	486	0	111	263	48	-14	0	-58
4S2002	0	67	548	0	66	352	77	-26	-75	-59
4S2003	0	18	459	0	44	545	177	1	-65	-97
4S2004	0	-4	514	0	143	679	24	-12	-44	-90
4S2005	0	-11	478	0	47	268	107	-42	-37	-83
4S2006	0	-37	417	0	24	244	47	0	-29	-96
4S2007	0	-10	228	0	50	109	-27	72	-60	-2
4S2008	0	122	147	0	-42	6712	96	-84	151	-46
4S2009	0	-28	101	0	-12	-9	-57	92	-29	-4
4S2010	-29	87	156	0	71	11	6	-93	0	25
4S2011	0	-85	-48	0	-75	-65	-58	68	59	-88
4S2013	0	-24	109	0	-31	336	50	-67	-21	-65
4S2015	0	-56	207	0	28	291	120	-44	-68	-93
4S2017	0	-29	251	0	-23	318	-46	-95	26	-32
4S2018	0	-13	182	0	29	-12	-50	-93	1022	-89
4S2019	0	-18	232	0	6	659	106	-32	-37	-42
4S2024	0	86	390	0	58	109	74	12	0	45
4S2025	0	-30	218	0	94	310	168	-20	-86	-72
4S2026	0	-26	103	0	-27	-14	-9	28	0	-37
4S2027	0	14	279	0	56	290	96	-55	0	-79
4S2028	0	-23	82	0	-22	2006	-15	-90	12	-55
4S2029	0	32	141	0	-10	2218	187	-93	0	-16
4S2030	0	52	355	0	-16	136	-74	-24	0	-56
4S2031	0	-5	297	0	28	1616	123	-30	0	-31
4S2032	0	-27	245	0	6	1155	43	-46	0	-78
4S2033	0	-40	83	0	16	139	9	13	-65	-66
4S2034	12	-8	-87	0	-90	367	-24	74	-91	-98
4S2035	0	-37	140	0	-37	597	-26	-34	-37	-68
4S2036	0	29	183	0	0	46	13	94	-82	-35
4S2037	0	-7	339	0	132	447	95	10	-44	-84
4S2038	0	9	97	0	-54	-29	-74	65	-11	74
4S2039	0	-34	59	0	-37	272	-51	45	-68	-63
4S2041	0	19	382	0	49	369	65	-21	0	-73
4S2042	0	-11	274	0	65	210	51	-12	-72	-75
4S2044	0	-11	257	0	94	156	50	-28	0	-83
4S2045	0	-14	243	0	44	138	28	9	0	-83
4S2046	0	-5	312	0	-14	260	82	-47	0	-80
4S2047	0	-42	32	0	-52	123	-13	1	-55	-61
4S2048	0	-19	279	0	42	116	17	-21	0	-78
4S2049	0	-28	225	0	25	85	17	0	-44	-76
4S2050	0	-24	202	0	30	130	20	-16	0	-81
4S2051	0	-14	211	0	37	65	26	5	-60	-74
4S2052	0	-55	18	0	-28	685	69	-9	-29	-75
4S2053	0	-41	48	0	-68	128	-77	-20	-11	-34
4S2054	0	-35	20	0	-66	170	-83	-27	0	-42
4S2055	0	-33	206	0	-31	265	-49	-7	-60	-43
4S2056	0	-51	47	0	-42	305	2	-22	-29	-70

VERSION 1 ALTERATION PARAMETERS AS LOG MOLE PERCENT

SAMPLE	ASIO2	ATIO2	AFE203	AFEO	AMNO	AMGO	ACAO	AK2O	ANA2O	AP205
4S2057	0	-34	194	0	76	477	-13	-78	0	-28
4S2058	0	-41	63	0	-27	138	-12	-40	0	-38
4S2059	0	-53	18	0	-30	731	54	-64	0	-72
4S2060	0	-57	-3	0	-59	42	-52	-27	-11	-61
4S2061	0	-55	-6	0	-71	372	-75	-17	-21	-76
4S2062	0	-38	2	0	-64	466	-11	-67	0	-53
4S2063	0	-51	21	0	-61	605	-65	-26	-37	-66
4S2064	0	103	450	0	64	171	6	-55	-50	-46
4S2065	0	-58	-2	0	-81	29	-81	-22	0	-72
4S2066	0	-17	240	0	188	123	72	21	0	3
4S2068	0	-20	161	0	-27	150	-51	47	-21	-20
4S2069	0	-4	192	0	-21	138	-62	72	-92	-12
4S2070	0	-24	22	0	-59	155	-37	-21	0	-65
4S2071	0	-32	183	0	-18	156	-64	-23	0	-59
4S2072	0	-29	176	0	-5	152	-59	5	0	-41
4S2073	0	18	337	0	45	310	79	-45	0	-19
4S2074	0	-35	255	0	-28	105	-64	-11	-60	-65
4S2075	0	-17	62	0	-52	361	15	-28	0	-54
4S2076	0	-6	110	0	-42	58	-43	-65	78	-42
4S2077	0	37	318	0	59	509	23	-83	-99	19
4S2078	0	25	331	0	23	179	30	-23	-72	9
4S2080	0	-23	212	0	-18	462	69	-100	182	-35
4S2083	0	15	224	0	-41	178	-44	32	-78	-38
4S2084	0	-13	61	0	63	29	-32	-25	12	-37
4S2086	0	-21	114	0	-17	137	-9	47	-87	-40
4S2087	0	-20	92	0	-85	276	-93	-100	-44	-66
4S2089	0	-10	142	0	-22	5	-77	-69	0	-18
4S2090	0	-68	-17	0	-78	139	5	-4	-37	-84
4S2091	0	-33	38	0	-59	174	-24	-28	0	-42
4S2092	0	-16	347	0	32	649	88	-42	-91	-28
4S2093	0	-24	254	0	-21	130	13	21	-84	-24
4S2094	0	-2	98	0	-8	331	1	22	-90	2
4S2095	0	3	299	0	65	87	-13	-97	-91	-57
4S2096	0	-55	0	0	-56	222	15	20	-65	-73
4S2097	0	-54	17	0	-57	290	-41	-2	-50	-71
4S2098	0	-45	18	0	-27	754	89	-9	-50	-66
4S2099	0	-8	224	0	32	297	43	-23	-21	20
4S2100	0	-33	151	0	-60	172	-37	-93	41	-46
4S2101	0	-23	137	0	-65	807	-36	-77	0	-80
4S2102	0	-36	63	0	-37	246	-47	-29	-11	-66
4S2104	0	-40	5	0	-84	858	15	-44	-72	-54
4S2105	0	-38	93	0	18	1042	111	-22	-37	-52
4S2106	0	-48	33	0	-51	735	69	-30	-37	-70
4S2107	26	-27	463	0	-48	18713	-51	-99	-37	-75
4S2108	0	-8	184	0	-8	7	-12	16	0	-54
4S2109	0	32	395	0	38	203	84	-49	-78	-55
4S2110	0	-36	86	0	-38	27	-52	39	0	-59
4S2111	0	-29	129	0	-65	-57	-81	26	0	-57
4S2112	0	-3	153	0	15	109	104	-63	0	-52
4S2114	0	-15	207	0	-11	299	-7	-84	0	-73
4S2115	26	-75	8	0	-27	1336	125	-79	-29	-97
4S2116	0	58	313	0	23	120	-19	24	-75	3
4S2117	0	54	412	0	55	99	70	-34	-44	-26
4S2118	0	32	410	0	67	147	-2	-36	0	-62
4S2121	0	77	439	0	55	212	68	-29	-72	-51

VERSION 1 ALTERATION PARAMETERS AS LOG MOLE PERCENT

SAMPLE	ASIO2	ATIO2	AFE203	AFEO	AMNO	AMGO	ACAO	AK20	ANA20	AP205
4S2122	0	49	448	0	108	90	136	-43	-80	-49
4S2123	0	93	485	0	84	97	60	-4	-78	-44
4S2124	0	187	647	0	103	524	123	12	-87	-49
4S2127	0	82	98	0	5	-46	47	16	0	-4
4S2130	0	38	286	0	-5	132	132	-7	-82	-66
4S2131	0	41	362	0	54	111	37	-36	-75	-59
4S2133	0	-68	-39	0	-75	269	67	14	-60	-89
4S2134	0	14	156	0	-5	-17	17	-50	-82	-41
4S2135	0	-7	264	0	37	59	5	-22	-60	-51
4S2136	0	-61	0	0	-78	244	-21	14	-55	-76
4S2137	0	-27	321	0	114	152	79	-60	-84	10
4S2138	0	-57	-13	0	-62	1119	59	-91	0	-76
4S2139	0	-48	64	0	-68	87	-80	-50	26	-44
4S2140	0	-10	121	0	-71	184	-66	13	-72	-72
4S2142	0	42	375	0	122	247	40	-100	0	-72
4S2143	0	15	390	0	124	115	42	-93	0	-66
4S2144	0	83	262	0	76	100	50	-9	-44	-33
4S2146	0	-10	421	0	-39	362	-88	-51	-93	-80
4S2150	0	170	347	0	289	274	56	0	-37	-34
4S2151	0	34	253	0	31	134	-52	54	-50	-35
4S2152	0	20	321	0	194	85	44	0	-94	-47
4S2153	0	46	400	0	100	256	77	5	-87	-66
4S2155	0	8	246	0	5	387	12	-91	0	-66
4S2156	0	-41	60	0	-56	195	-22	21	-68	-72
4S2157	0	-40	103	0	-33	211	-21	4	-50	-71
4S2158	0	-41	159	0	-16	422	2	-6	-68	-73
4S2159	0	-37	130	0	-29	796	60	15	-55	-78
4S2160	0	-30	163	0	-17	604	25	-16	-50	-74
4S2161	0	-55	102	0	-37	83	-58	12	-21	-74
4S2162	0	-48	93	0	-30	618	94	-5	-55	-76
4S2163	0	-13	188	0	-9	743	61	5	0	-44
4S2164	0	-4	305	0	-24	676	158	-8	-72	-72
4S2165	0	-13	192	0	-19	549	-20	-2	-68	-54
4S2166	0	-35	164	0	0	563	53	7	-55	-84
4S2167	0	-45	188	0	25	-5	19	4	-21	-63
4S2168	0	-49	130	0	-32	150	-25	28	-72	-75
4S2169	0	-30	186	0	-66	1676	155	-15	-65	-78
4S2170	0	-34	164	0	-32	355	-33	4	0	-74
4S2171	0	-37	185	0	0	386	10	10	-60	-75
4S2172	0	-29	148	0	-16	944	17	-33	0	-73
4S2173	0	-38	163	0	-7	438	6	1	26	-76
4S2174	0	-44	110	0	-34	211	-34	-5	-37	-74
4S2175	0	-31	199	0	5	406	42	-18	0	-74
4S2176	0	-36	124	0	-36	167	-20	20	-37	-67
4S2177	0	-4	253	0	17	307	14	-15	-29	-46
4S2178	0	51	350	0	60	53566	1917	0	-72	-77
4S2179	0	-26	245	0	32	805	8	-8	-60	-74
4S2180	0	-23	252	0	58	1300	72	-34	-78	76
4S2181	12	0	143	0	-26	4134	544	-47	-44	-63
4S2182	0	-23	100	0	-32	680	161	-27	-21	-62
4S2183	0	-21	280	0	27	355	123	-39	-65	-81
4S2184	0	5	138	0	1	148	24	39	-68	66
4S2185	0	-25	212	0	20	111	-40	19	-82	-76
4S2186	0	-39	155	0	14	91	-2	10	-86	-82
4S2187	0	-44	235	0	24	356	43	-32	-95	-85

VERSION 1 ALTERATION PARAMETERS AS LOG MOLE PERCENT

SAMPLE	ASIO2	ATIO2	AFE203	AFEO	AMNO	AMGO	ACAO	AK20	ANA20	AP205
4S2188	0	-46	72	0	-63	565	-92	-29	-11	-84
4S2189	0	-13	136	0	-4	93	-45	54	12	-48
4S2190	0	-24	123	0	-30	1903	-19	37	-91	-68
4S2191	0	-18	101	0	-58	22794	46	-50	182	-83
4S2192	0	-26	279	0	29	110	-52	21	-11	-77
4S2193	0	16	224	0	9	106	-43	-43	694	-82
4S2195	0	-20	166	0	-7	28	-60	6	531	-3
4S2196	0	6	67	0	11	13736	893	-93	347	-67
4S2197	0	-11	67	0	-23	3698	121	-89	347	-73
4S2198	0	-85	-35	0	-46	-28	123	-10	124	-96
4S2199	0	-84	-51	0	-62	-92	-63	147	-75	-96
4S2201	0	-5	240	0	12	330	30	-24	-84	-50
4S2202	-21	-78	-29	0	-76	-71	-89	-51	182	-70
4S2203	0	-40	109	0	-53	196	-49	-28	0	-68
4S2204	0	-41	113	0	-42	172	-56	-22	0	-68
4S2205	0	-38	126	0	102	236	-52	-24	0	-70
4S2206	0	47	481	0	150	642	63	-25	-78	-74
4S2207	0	84	410	0	81	510	58	-49	-37	-56
4S2208	0	112	618	0	102	577	159	-20	-78	-51
4S2209	0	-36	218	0	-29	1140	-26	-77	-55	-78
4S2210	0	-25	59	0	-74	494	-92	-84	0	-71
4S2211	0	-48	106	0	-13	116	-80	-22	26	-58
4S2212	0	-32	125	0	7	80	-91	53	0	39
4S2213	0	22	336	0	19	351	53	-10	0	-55
4S4003	0	-31	243	0	115	1081	195	-8	0	-72
4S4004	0	0	316	0	31	91	28	-4	-29	-65
4S4005	0	12	468	0	35	169	6	-30	-55	-65
4S4006	0	-25	182	0	0	129	-25	11	0	-69
4S4007	0	-31	127	0	-3	37	-6	73	-50	-62
4S4008	0	-7	194	0	-12	111	-3	27	-55	-50
4S4009	0	-3	304	0	19	850	229	-58	-55	-71
4S4010	0	-10	191	0	73	946	300	-58	41	-95
4S4011	0	-18	183	0	-9	172	0	46	-11	-51
4S4012	0	-23	174	0	-31	128	41	-4	0	-29
4S4013	0	-18	91	0	-55	472	-63	26	-44	-44
4S4014	0	-20	159	0	-11	22	-48	-65	-11	-50
4S4015	0	68	197	0	36	17	-83	118	0	-20
4S4016	26	-83	51	0	-52	3381	638	-58	-44	-79
4S4017	0	-28	255	0	28	212	62	-62	-78	-76
4S4018	0	1	91	0	-39	-36	4	-6	0	29
4S4019	0	-32	62	0	-34	1298	-46	23	-75	-77
4S4020	0	-43	136	0	-13	450	41	-17	-44	-67
4S4021	0	-27	185	0	-12	510	22	-34	-21	-69
4S4022	0	24	379	0	137	147	7	59	-21	-68
4S4024	0	6	158	0	1	3	-72	-33	0	-77
4S4027	0	204	88	0	104	70	-69	219	0	169
4S4028	0	-23	154	0	-43	2381	15	-36	0	-70
4S4030	0	-47	0	0	-47	18	-63	-82	-75	-76
4S4031	0	85	591	0	199	362	155	-3	-91	-54
4S4032	0	60	297	0	12	290	43	-4	-72	-64
4S4033	0	115	383	0	156	4950	589	61	-96	-77
4S4034	0	-48	37	0	-30	519	246	-79	0	-58
4S4035	0	-72	-3	0	-24	479	112	-32	-21	-82
4S4036	0	-29	88	0	-55	260	61	50	-86	-51
4S4037	0	-45	134	0	-4	565	57	-56	0	-74

VERSION 1 ALTERATION PARAMETERS AS LOG MOLE PERCENT

SAMPLE	ASI02	ATI02	AFE203	AFEO	AMNO	AMGO	ACAO	AK20	ANA20	AP205
4S4038	0	-25	208	0	16	203	57	-42	-11	-43
4S4041	0	-19	331	0	1	106	70	-90	0	-80
4S4042	0	25	359	0	61	963	47	-84	0	-86
4S4044	0	117	491	0	64	247	27	-16	-95	-39
4S4045	0	-31	221	0	93	9	-48	20	0	-48
4S4048	0	-38	145	0	-70	395	-46	-83	-11	-58
4S4049	0	-52	7	0	-94	-19	-92	-25	-21	-50
4S4050	0	-11	200	0	8	124	16	-33	0	-77
4S4051	0	8	372	0	79	-50	116	-46	-80	-81
4S4052	0	-74	-57	0	-86	466	-62	77	-68	-80
4S4053	0	-15	135	0	-47	146	-65	-13	0	-58
4S4054	0	-17	46	0	-45	162	27	17	-50	-66
4S4055	0	4	166	0	-30	0	-42	-13	0	-64
4S4056	0	-34	93	0	-31	125	-28	-21	-11	-78
4S4057	0	16	338	0	176	1811	336	-10	-75	-57
4S4058	0	-7	129	0	19	65	53	-27	-44	-70
4S4059	0	-22	197	0	31	183	27	24	-21	-78
4S4061	0	42	376	0	50	269	35	1	0	-63
4S4062	0	-46	2	0	-69	197	75	102	-68	-55
4S4063	0	5	234	0	35	142	39	18	-55	-66
4S4064	0	29	383	0	85	191	101	-27	-29	-59
4S4067	0	58	423	0	71	155	33	-5	-55	-52
4S4068	0	-33	67	0	-44	22	-22	18	0	-51
4S4069	0	-51	-10	0	-81	98	-66	-84	12	-87
4S4070	0	-5	224	0	32	90	9	26	-50	-60
4S4071	0	43	307	0	27	221	30	4	-55	-66
4S4072	0	65	426	0	58	179	44	-38	-21	-48
4S4074	0	124	533	0	92	353	118	-4	-72	-43
4S4075	0	40	414	0	64	373	29	-22	0	-59
4S4076	0	37	397	0	66	218	57	-35	-55	-59
4S4077	0	-7	253	0	24	149	52	11	-72	-87
4S4078	0	13	123	0	21	27	-24	-51	-29	-41
4S4079	0	10	383	0	51	648	219	-32	-96	-79
4S4080	0	-29	151	0	-24	804	154	15	-60	-81
4S4081	0	17	283	0	28	33	29	5	-86	-61
4S4082	0	58	362	0	40	99	16	-9	-29	-27
4S4083	0	25	290	0	98	65	45	-48	0	-59
4S4084	0	78	498	0	80	1370	313	-2	-87	-52
4S4085	0	-40	102	0	-46	572	-21	-7	-37	-69
4S4086	0	-34	61	0	-64	114	-75	51	-21	-54
4S4087	0	-43	59	0	-58	335	-47	-4	-44	-66
4S4088	0	-34	151	0	-18	670	1	22	-60	-53
4S4089	0	-45	141	0	-14	118	6	-39	26	-79
4S4090	0	-54	-21	0	-77	-64	-62	76	0	-66
4S4091	0	-38	97	0	-56	531	16	5	-50	-43
4S4092	0	-22	153	0	-13	2153	119	-15	-60	-57
4S4093	0	-48	20	0	-28	283	11	-47	0	-69
4S4094	0	13	242	0	26	52	-31	70	0	-43
4S4095	0	16	87	0	14	-16	-77	94	462	117
4S4096	0	-44	74	0	-37	298	15	28	-44	-66
4S4097	0	58	83	0	54	24	-25	-86	-72	-11
4S4098	0	-23	204	0	60	281	32	-49	0	-50
4S4099	12	-16	209	0	-22	4330	583	-64	-37	-78
4S4100	0	12	229	0	-13	282	11	-21	-91	3
4S4101	0	-33	55	0	-57	15	-78	-42	0	-70

VERSION 1 ALTERATION PARAMETERS AS LOG MOLE PERCENT

SAMPLE	ASIO2	ATIO2	AFE203	AFEO	AMNO	AMGO	ACAO	AK2O	ANA2O	AP2O5
4S4102	0	-51	374	0	-75	1595	-87	-99	26	-79
4S4103	0	26	319	0	44	56	-26	4	-97	-61
4S4104	0	29	359	0	30	193	5	23	-90	-70
4S4105	0	-20	176	0	9	606	223	30	-37	-43
4S4106	0	51	355	0	43	96	-5	-8	-90	-48
4S4108	0	-28	139	0	-34	146	-74	-43	0	-78
4S4109	0	28	320	0	43	93	9	-2	-86	-57
4S4110	0	7	294	0	69	91	74	9	-86	-67
4S4111	0	9	241	0	55	7	5	-94	-91	-59
4S4112	0	-38	91	0	-11	60	-26	65	-92	28
4S4113	0	30	329	0	40	133	28	-15	-72	-63
4S4114	0	-12	103	0	-88	216	-86	-35	59	-69
4S4115	0	71	348	0	62	57	53	-27	-75	-39
4S4116	0	54	424	0	55	59	-9	7	-78	-53
4S4118	0	23	329	0	39	91	44	-43	-78	-58
4S4119	0	94	449	0	8	156	23	-15	-60	-45
4S4120	0	53	417	0	57	806	113	-40	-95	-68
4S4121	0	17	161	0	36	-7	38	-28	0	-40
4S4122	0	47	379	0	68	148	-4	-2	0	-42
4S4123	0	12	219	0	28	17	-17	64	0	-30
4S4125	0	-28	162	0	-10	2788	215	5	0	-59
4S4126	-75	35	-81	0	-28	-89	-89	-95	0	23
4S4127	0	-49	-7	0	-64	63	-56	25	-29	-70
4S4128	0	-33	49	0	-60	5	-62	-55	26	-72
4S4129	0	-35	131	0	-8	414	109	-52	0	-60
4S4130	0	-18	236	0	35	1671	271	-25	-29	-16
4S4131	-11	-21	166	0	-31	9	-44	-60	0	-71
4S4132	0	18	-42	0	-91	6102	-50	-11	0	-84
4S4133	0	-53	68	0	-49	173	0	-91	26	-61
4S4134	0	-34	93	0	-33	902	115	-1	-68	-65
4S4135	0	-12	144	0	-25	33	-67	56	-97	-32
4S4137	0	-73	-2	0	-74	200	-47	-34	0	-62
4S4138	0	-57	-11	0	-74	978	-18	-86	-11	-81
4S4139	0	-71	-44	0	-64	1144	68	2	-50	-85
4S4141	0	-21	264	0	38	1029	109	-52	0	-53
4S4142	0	-49	9	0	-78	149	-46	1	-21	-73
4S4143	0	-57	-16	0	-73	56	-22	2	0	-75
4S4144	0	-17	179	0	7	120	42	-20	-21	17
4S4145	0	-32	18	0	-61	408	-29	-95	26	-65
4S4146	0	-46	15	0	-45	246	-5	-76	41	-60
4S4147	0	-54	149	0	-69	635	-21	-47	-44	-72
4S4148	0	-41	42	0	-37	299	34	-71	0	-49
4S4150	0	-47	49	0	-52	225	-15	-27	0	-46
4S4151	0	-69	-18	0	-82	832	-36	32	-55	-85
4S4152	0	-51	23	0	-78	106	-93	10	0	-66
4S4153	0	-6	229	0	-71	143	-89	-11	0	-17
4S4154	0	-46	6	0	-47	95	67	1	-29	-58
4S4155	0	-50	-22	0	-73	9	-64	29	-44	-61
4S4156	0	-47	26	0	-51	1126	-31	-40	-29	-72
4S4157	0	-43	165	0	11	53	-14	8	0	-77
4S4158	0	-47	45	0	-78	90	-81	-10	0	-61
4S4159	0	-53	16	0	-77	336	-24	-16	-44	-71
4S4160	0	-43	62	0	-45	576	13	-43	0	-46
4S4161	0	-26	390	0	63	10499	604	-68	-87	-32
4S4162	0	-41	22	0	-40	3996	533	-24	-44	-70

VERSION 1 ALTERATION PARAMETERS AS LOG MOLE PERCENT

SAMPLE	ASIO2	ATIO2	AFE203	AFEO	AMNO	AMGO	ACAO	AK2O	ANA2O	AP2O5
4S4166	0	-58	-25	0	-78	67	-20	-31	-11	-63
4S4167	0	-64	6	0	-66	307	53	11	-50	-82
4S4168	0	-41	55	0	-63	3088	119	-79	-21	-67
4S4169	0	-64	-13	0	-65	955	26	16	-65	-83
4S4170	0	-52	63	0	-77	371	-76	16	-60	-66
4S4171	0	-44	116	0	-32	12	-58	129	41	-71
4S4172	0	-38	24	0	-41	1277	120	-12	-50	-67
4S4173	0	-45	25	0	-77	588	-25	-26	-37	-65
4S4175	0	-60	-19	0	-45	1276	233	-71	-50	-85
4S4176	0	-7	193	0	-56	328	-6	-68	-11	-19
4S4177	0	-35	49	0	-43	95	-6	-8	-37	-34
4S4178	0	-54	-2	0	-51	152	26	-69	0	-73
4S4179	0	-49	-25	0	-93	125	-85	-53	0	-71
4S4181	0	-16	131	0	-41	102	-68	-49	-37	-71
4S4182	0	-15	135	0	-59	31	-82	-51	0	-50
4S4183	0	-30	93	0	-27	65	-2	-4	-29	-64
4S4184	0	-23	166	0	-37	309	-71	-38	0	-66
4S4185	0	-16	124	0	3	100	55	4	-82	-49
4S4186	0	-65	-65	0	-71	98	188	9	-55	-94
4S4187	0	3	-10	0	-53	-12	4	60	-60	-32
4S4188	0	-7	20	0	-68	51	-59	-49	-72	-45
4S4189	0	-17	77	0	-35	49	-16	-26	12	-73
4S4190	0	123	585	0	217	1332	192	-50	-98	-65
4S4191	0	1	229	0	98	-18	-44	24	-11	-56
4S4192	0	1	279	0	35	88	3	30	-11	-95
4S4193	0	-14	226	0	0	92	-17	-50	12	-97
4S4194	0	11	219	0	10	85	-20	-21	124	-97
4S4195	0	69	424	0	-14	7205	532	-87	-29	-39
4S4198	0	55	316	0	90	100	35	-40	0	-43
4S4200	0	75	403	0	63	236	30	-86	41	-58
4S4201	0	41	368	0	44	136	-9	-56	0	-50
4S4202	0	120	608	0	108	599	172	-12	-60	18
4S4203	0	121	458	0	61	134	133	-48	-87	-5
4S4204	0	125	415	0	85	171	78	-11	-55	86
4S4206	0	107	316	0	30	621	14	-19	0	-97
4S4207	0	66	394	0	153	4128	676	18	-80	-97
4S4209	0	-40	139	0	12	139	-52	2	0	-81
4S4210	0	-44	132	0	-14	40	-70	56	-75	-59
4S4211	0	-4	448	0	150	2220	166	20	-50	-67
4S4212	0	-34	200	0	16	94	-48	84	-68	-58
4S4213	0	-45	88	0	-21	42	-41	11	0	-66
4S4214	0	8	144	0	-13	100	133	78	-11	-74
4S4215	0	-50	165	0	13	239	-12	12	-37	-76
4S4216	0	-21	411	0	71	1047	154	-53	-65	-83
4S4218	0	-41	143	0	-16	54	-73	55	-84	-55
4S4219	0	-40	118	0	-39	188	-43	5	0	-72
4S4220	0	-38	161	0	-22	190	-26	8	-29	-63
4S4221	0	-23	175	0	-31	524	18	-52	0	-79
4S4222	0	30	449	0	75	410	95	-33	-97	-75
4S4223	0	56	461	0	36	244	64	-31	-82	-66
4S4225	0	-46	50	0	-55	8	-60	3	41	-67
4S4226	0	-10	106	0	-36	988	-21	-72	0	-71
4S4227	0	-20	276	0	33	1156	200	-84	124	-38
4S4228	0	-4	140	0	-20	2326	186	-9	-65	-66
4S4229	0	51	480	0	73	336	109	-33	-87	-67

VERSION 1 ALTERATION PARAMETERS AS LOG MOLE PERCENT

SAMPLE	ASIO2	ATIO2	AFE203	AFEO	AMNO	AMGO	ACAO	AK2O	ANA2O	AP2O5
4S4230	0	2	232	0	29	349	-11	3	-29	1
4S4231	0	-10	166	0	-20	137	34	18	-44	-56
4S4232	0	-21	81	0	-43	278	-46	35	-87	-66
4S4233	0	79	517	0	-7	239	86	-39	-78	-59
4S4234	0	-25	144	0	-28	185	-74	12	-50	-58
4S4235	0	-28	100	0	-31	251	-20	-12	-37	-56
4S4236	0	6	311	0	7	234	152	22	-65	-42
4S4237	0	-16	192	0	81	222	150	-3	-11	-49
4S4238	0	-64	1	0	-65	-33	-80	38	-21	-58
4S4239	0	-37	215	0	42	186	23	34	-11	-47
4S4240	0	11	321	0	32	177	68	-41	-84	-74
4S4241	0	-38	88	0	-47	411	-38	41	-89	-74
4S4243	0	-27	315	0	32	1878	556	-65	-96	-89
4S4244	0	-50	152	0	13	155	33	-45	0	-85
4S4245	0	-44	36	0	-42	153	43	-12	-11	-41
4S4246	0	-34	105	0	-32	41	-40	-68	298	-89
4S4247	0	-41	123	0	21	3869	345	-88	-37	-75
4S4250	0	-38	86	0	-21	620	117	-58	-29	-77
4S4251	0	-42	148	0	-14	435	17	-80	0	-58
4S4252	0	52	504	0	2	281	-64	-79	-96	-65
4S4253	0	-50	55	0	-45	1133	-53	-26	-21	-65
4S4254	0	-10	90	0	-35	-91	-84	127	0	69
4S4255	0	-57	48	0	-60	967	151	5	-60	-96
4S4256	0	-40	76	0	-52	206	-21	5	-60	-61
4S4257	0	-9	153	0	-2	750	37	-68	-21	-58
4S4258	0	13	248	0	63	404	169	-66	0	-61
4S4259	0	-26	281	0	43	244	46	-56	-44	-58
4S4260	0	-41	121	0	12	145	-53	-16	0	-62
4S4261	0	-47	100	0	-26	310	47	0	-60	-75
4S4262	0	-25	98	0	-53	479	-19	-31	0	-49
4S4263	0	50	312	0	31	27	47	1	-50	-5
4S4264	0	65	279	0	29	140	103	34	-68	-96
4S4265	0	-24	230	0	1	305	52	31	-65	-97
4S4266	0	3	326	0	15	364	41	-30	59	-78
4S4267	0	-39	212	0	14	326	74	-35	0	-91
4S4269	0	-41	97	0	-26	470	21	-20	-44	-78
4S4270	0	-37	228	0	27	492	98	-30	0	-83
4S4271	0	58	306	0	48	127	47	-4	0	-36
4S4272	-21	-7	86	0	7	-35	-38	-22	0	-29
4S4274	0	-71	105	0	-26	206	109	-18	-94	-90
4S4275	0	82	290	0	35	73	17	16	0	7
4S4277	0	-21	202	0	65	47	4	-31	-37	-76
4S4280	0	-1	409	0	82	1187	118	-37	-68	-58
4S4282	0	-1	185	0	-22	5647	79	-65	-11	-65
4S4284	0	1	194	0	51	2283	496	-99	0	-73
4S4286	0	-73	-24	0	-74	863	26	-72	-50	-90
4S4288	0	-85	-37	0	-91	20721	2	-93	0	-98
4S7000	0	33	348	0	72	533	133	-62	-68	-75
4S7001	0	-53	-29	0	-68	36	-23	-1	-55	-58
4S7002	0	-31	84	0	-49	69	-51	39	-44	7
4S7003	0	22	305	0	37	116	-7	-78	0	-65
4S7004	0	10	219	0	13	20	-46	-5	0	-35
4S7005	0	13	191	0	-22	12	8	-19	-87	-68
4S7006	0	19	269	0	69	83	14	-45	-95	-60
4S7007	0	-51	16	0	-60	91	-24	3	-37	-47

VERSION 1 ALTERATION PARAMETERS AS LOG MOLE PERCENT

SAMPLE	ASIO2	ATIO2	AFE203	AFEO	AMNO	AMGO	ACAO	AK2O	ANA2O	AP205
4S7008	0	-56	46	0	-18	24317	916	-98	41	-90
4S7009	0	-61	82	0	5	1296	533	-59	-29	-91
4S7010	0	-12	82	0	-20	-27	-81	59	401	-62
4S7011	0	-63	26	0	-52	5177	172	-88	-37	-91
4S7012	0	-69	21	0	-79	498	-53	-47	-55	-89
4S7013	0	-16	156	0	-20	-48	-42	23	26	-79
4S7014	0	-51	129	0	-25	32	-78	30	-50	-84
4S7015	0	-27	182	0	-12	307	-91	-62	0	-85
4S7016	12	-92	-41	0	-48	2573	460	-81	-44	-2
4S7023	0	-35	77	0	4	53	-33	59	-55	-63
4S7024	0	-24	125	0	-27	685	45	-60	0	-70
4S7025	0	-35	103	0	-41	601	13	-66	0	-70
4S0068	41	-87	-84	0	-32	290	699	25	-21	0
4S0106	0	20	1086	0	247	58884	2463	-79	-90	-61
4S0108	0	12	939	0	120	2623	193	-68	-93	-44
4S0117	0	189	844	0	73	568	144	64	-86	-23
4S0163	0	-3	1051	0	-44	5716	-57	-92	-65	-64
4S0174	41	-65	-33	0	-63	1180	275	-56	0	-94
4S0211	12	-76	-20	0	-90	1763	-90	-99	0	-96
4S0214	0	38	593	0	-10	191	-91	-99	0	-27
4S0223	41	-90	-65	0	-78	362	402	-84	-60	-97
4S0224	26	-91	-84	0	-80	60	-98	-95	0	-98
4S0290	0	24	264	0	6	67	-65	-76	0	-56
4S0300	0	-8	878	0	4	1163	-13	-50	-44	-82
4S0321	26	-96	-43	0	-66	7990	-38	-79	-21	-85
4S2022	0	308	1416	0	325	60569	3406	-93	-94	-60
4S2081	78	-19	262	0	-68	17231	65	-100	26	-93
4S2120	0	34	539	0	150	104	36	-13	0	-57
4S2141	26	-88	-40	0	-66	2578	50	-96	-11	-98
4S2145	0	608	251	0	121	59	-90	20	0	474
4S2194	0	-16	561	0	118	250	22	-100	151	0
4S4023	12	-16	776	0	183	42158	3026	35	-68	-94
4S4026	41	-86	-7	0	-88	2063	-91	-93	-11	-95
4S4047	100	-24	206	0	-32	1978	667	-67	-44	-53
4S4149	12	-69	-33	0	-69	3111	166	-76	-37	-88
4S4174	41	-50	208	0	69	10951	1495	-79	-29	-66
4S4180	26	-69	-57	0	-78	2431	143	-74	-29	-93
4S4196	41	270	1681	0	483	999999	3391	-95	-11	-62
4S4199	0	39	567	0	61	103	-91	-95	0	-22
4S4248	0	182	775	0	542	22449	2914	10	-75	31
4S4268	12	142	1065	0	335	98183	2330	-97	-94	-74
4S4273	12	-30	909	0	192	36054	774	-87	-99	-96

APPENDIX 4

ALTERATION PARAMETERS: VERSION 2

VERSION 2 ALTERATION PARAMETERS AS LOG MOLE PERCENT

SAMPLE	ASIO2	ATIO2	AFE203	AFEO	AMNO	AMGO	ACAO	AK2O	ANA2O	AP2O5
4S0001	-1	-25	178	0	-10	130	0	-75	0	-68
4S0002	10	-3	169	0	50	83	48	-32	0	-73
4S0003	24	5	192	0	52	100	75	-25	-86	-78
4S0004	1	44	220	0	54	173	-30	-63	32	-70
4S0005	13	63	249	0	206	131	30	-46	-52	-45
4S0006	-7	26	399	0	212	36	11	21	206	-24
4S0007	-4	58	484	0	465	77	20	-17	0	-13
4S0008	-6	-14	472	0	-25	-19	6	-86	330	0
4S0009	8	23	194	0	79	70	27	12	-42	-58
4S0010	17	36	185	0	77	119	18	-15	-5	-30
4S0011	3	-12	168	0	-23	137	-46	-33	0	-85
4S0012	1	-21	252	0	15	113	40	-44	13	-53
4S0013	1	-20	182	0	-51	171	-46	-83	3	-77
4S0014	-6	-21	133	0	-3	176	1	-41	5	-70
4S0015	14	83	137	0	62	162	25	-14	-83	-47
4S0016	2	31	201	0	60	136	19	-54	-26	-58
4S0017	-10	-30	316	0	1	103	8	12	31	-81
4S0018	16	-32	368	0	-58	74	-26	-52	9	-73
4S0019	24	-42	91	0	-31	668	-46	-72	0	-69
4S0020	44	-31	29	0	-52	1224	-46	11	-24	-62
4S0021	41	-28	118	0	-40	426	88	-69	-47	-71
4S0022	4	11	107	0	48	145	54	-65	-76	-64
4S0023	10	-23	68	0	-14	78	63	29	-12	1104
4S0024	61	-85	449	0	-80	130	26	-55	0	-95
4S0025	37	16	230	0	-19	79	33	9	-73	-31
4S0026	33	-37	188	0	-41	545	-5	-61	-95	-71
4S0027	1	-35	-64	0	-36	318	-54	-37	-42	-74
4S0028	22	-33	78	0	6	240	55	68	50	-46
4S0029	34	-54	61	0	-29	350	87	-63	0	-73
4S0030	54	-48	174	0	-61	1329	267	-82	-40	-70
4S0031	2	-52	107	0	-20	178	1	-70	11	-61
4S0032	30	-27	173	0	-30	467	-28	-77	-31	-67
4S0033	11	-13	356	0	40	131	40	-56	32	137
4S0035	98	-8	490	0	6	249	136	11	-64	-58
4S0036	-26	-61	-8	0	-85	81	-61	-2	79	-74
4S0041	0	-24	88	0	-64	167	-57	13	19	-53
4S0042	46	-37	124	0	-22	384	45	17	-65	-72
4S0043	39	-28	184	0	-25	641	-99	-5	-79	-70
4S0044	34	-29	70	0	-53	787	-22	-35	-14	-74
4S0045	8	-38	102	0	-41	72	-33	69	-67	-65
4S0046	30	-20	128	0	-36	3352	189	-99	-64	-76
4S0047	-3	-40	175	0	-3	153	-2	-95	-64	-78
4S0049	-11	-6	363	0	46	125	3	-89	27	-65
4S0050	39	-39	77	0	-62	619	-21	-4	-46	-71
4S0051	-90	-93	-80	0	-89	999999	415	-36	-72	-97
4S0053	22	-45	98	0	-32	151	57	-53	0	-67
4S0055	14	-10	195	0	4	238	-36	24	-95	15
4S0056	6	16	171	0	-26	117	-26	40	-94	-1
4S0057	-4	17	267	0	69	43	-24	36	-47	-49
4S0059	12	-23	147	0	-60	411	-83	-58	31	-75
4S0060	26	-74	-43	0	-84	546	-27	57	-68	-84
4S0061	50	-37	104	0	-52	763	39	-24	-38	-49
4S0062	8	-23	162	0	-33	102	-8	1	-73	-59
4S0063	27	-56	21	0	-52	167	0	-11	-21	-88
4S0064	17	-50	14	0	-71	325	-38	-55	-5	-89

VERSION 2 ALTERATION PARAMETERS AS LOG MOLE PERCENT

SAMPLE	ASIO2	ATIO2	AFE2O3	AFEO	AMNO	AMGO	ACAO	AK2O	ANA2O	AP2O5
4S0065	29	-20	114	0	-38	245	-2	-8	-73	-72
4S0066	9	-26	136	0	-42	106	-44	-45	-52	-76
4S0067	26	-13	53	0	-58	442	30	-61	-56	-82
4S0069	-11	-67	198	0	-50	97	-76	-23	13	-38
4S0070	15	-40	128	0	52	731	-30	-95	18	-68
4S0071	26	-48	130	0	80	647	40	-95	16	-73
4S0072	12	-19	167	0	-25	324	-32	-61	29	-19
4S0073	22	-46	201	0	-57	722	-61	-96	26	-51
4S0074	-25	-47	85	0	-59	-34	-31	6	-56	-89
4S0075	-6	-24	89	0	10	217	-67	-53	78	-16
4S0076	36	-35	71	0	-29	278	35	-24	-12	-13
4S0077	8	2	199	0	17	119	-30	-1	-42	7
4S0078	25	-75	305	0	-64	1279	33	-94	-86	-72
4S0080	19	-31	128	0	-43	619	-72	-72	32	-58
4S0081	23	-48	17	0	-72	357	-58	-13	-16	-64
4S0082	9	-32	156	0	-51	160	-42	21	-56	-37
4S0083	26	-42	70	0	-68	890	-35	-34	-40	-70
4S0084	24	-44	27	0	-71	598	-69	-33	-13	-72
4S0085	27	-44	83	0	-12	485	-9	-78	-5	-61
4S0088	-2	-50	291	0	-31	112	-47	-36	11	-17
4S0089	6	-89	174	0	-27	44	-4	19	-24	-33
4S0090	-18	-36	131	0	-9	26	-13	-49	-76	-87
4S0091	-21	-28	118	0	-8	7	4	-84	-92	-91
4S0092	-5	-29	183	0	-42	192	-64	-95	34	-39
4S0093	-22	134	210	0	11	17	-37	250	272	295
4S0094	24	-48	14	0	-73	185	-72	69	-86	-94
4S0095	37	-39	119	0	-39	705	-26	4	-98	-69
4S0096	-10	-47	174	0	-31	39	-17	55	-21	-85
4S0097	28	-42	18	0	-69	636	18	-22	-36	-74
4S0098	62	-37	183	0	-28	500	134	-13	-47	-49
4S0099	47	-48	94	0	-44	365	8	72	-96	-66
4S0100	50	-17	158	0	-19	6879	215	7	-75	-55
4S0101	24	-37	1	0	-39	257	-22	-16	-20	-70
4S0102	31	-47	-9	0	-69	613	6	9	-43	-75
4S0103	-4	7	192	0	16	50	10	-42	-89	-65
4S0104	13	-61	-53	0	-73	2330	120	8	-53	-84
4S0105	81	-21	115	0	-16	3394	48	95	-4	-53
4S0107	27	-41	33	0	-53	361	27	-24	-60	-56
4S0109	33	-53	11	0	-53	460	66	-16	-41	-73
4S0110	15	-47	23	0	-66	914	-93	-39	56	-71
4S0111	31	-42	63	0	-58	692	-58	-33	-17	-75
4S0112	-14	-35	145	0	-69	60	-30	-33	-78	-88
4S0113	5	-16	156	0	-36	109	-63	0	42	-89
4S0114	37	-53	18	0	-56	129	0	54	-36	-55
4S0115	14	-18	119	0	-45	553	-78	-65	23	-80
4S0116	-27	-17	85	0	-8	-16	-34	37	-36	-45
4S0118	10	83	366	0	46	54	-7	115	-24	-8
4S0119	0	65	258	0	54	50	-21	110	-44	11
4S0120	7	64	331	0	49	65	-9	86	-27	-24
4S0121	28	-19	24	0	-69	833	-54	-9	-37	-69
4S0122	11	-34	506	0	-40	42	-91	10	346	-83
4S0123	0	-26	71	0	-70	233	-75	-77	25	-68
4S0124	-3	-24	120	0	-50	164	-63	13	-68	-75
4S0125	-39	60	195	0	18	17	-67	27	57	-88
4S0126	3	-19	136	0	-30	52	-17	62	-78	-25

VERSION 2 ALTERATION PARAMETERS AS LOG MOLE PERCENT

SAMPLE	ASIO2	ATIO2	AFE203	AFEO	AMNO	AMGO	ACAO	AK2O	ANA2O	AP2O5
4S0127	-19	-15	158	0	-2	79	4	-14	18	51
4S0128	16	-34	174	0	-38	181	-78	-15	-42	-72
4S0129	-1	-5	193	0	-29	145	-51	42	-95	-16
4S0130	-18	10	263	0	10	67	-8	-11	49	-60
4S0131	-1	10	77	0	26	35	-17	-44	39	-57
4S0132	16	-27	35	0	-57	112	-64	49	-27	-69
4S0133	18	17	327	0	35	142	1	24	-92	-71
4S0134	28	-26	34	0	-52	353	-18	-6	-33	-67
4S0135	36	-43	86	0	-51	976	-49	-4	-42	-96
4S0136	51	-12	16	0	-56	584	145	45	-76	-54
4S0137	-14	-32	154	0	-16	53	-55	49	-59	-27
4S0138	37	30	222	0	-6	208	-24	-25	-27	6
4S0139	13	57	352	0	55	108	-19	-17	-94	-51
4S0140	5	-12	152	0	-65	200	-94	28	-66	-52
4S0141	17	-29	77	0	-72	819	-91	-64	-54	-83
4S0142	15	-14	103	0	-57	189	-72	-43	-27	-67
4S0143	35	-15	92	0	-27	293	-22	-27	-16	-67
4S0144	8	-66	-1	0	-82	479	55	-46	0	-96
4S0145	32	15	146	0	-21	170	5	-58	-14	-59
4S0146	33	-4	-30	0	-11	154	120	16	-62	-64
4S0148	-56	-62	-44	0	-70	33865	-3	-31	-47	-96
4S0150	-2	64	332	0	56	61	-60	27	-83	-16
4S0151	13	43	324	0	66	145	-28	-32	-80	-39
4S0152	12	65	335	0	73	95	0	18	-93	-54
4S0153	15	22	169	0	-22	157	-32	64	-53	28
4S0154	-7	-9	290	0	72	152	27	-18	0	-75
4S0155	-28	-19	189	0	-4	110	-31	0	0	-17
4S0156	30	-32	79	0	-52	181	-19	7	-28	-84
4S0157	19	-4	5	0	-49	58	-13	0	-28	-38
4S0158	41	-45	43	0	-69	658	-26	61	-92	-68
4S0159	-2	-29	213	0	33	90	12	-4	-36	-75
4S0160	28	-50	-8	0	-79	418	-48	0	-6	-71
4S0161	31	-37	95	0	-51	584	-52	-26	-21	-68
4S0162	31	-16	109	0	-9	201	34	-56	0	-70
4S0164	3	-9	193	0	-38	97	-32	-8	0	-59
4S0165	-9	0	168	0	-11	12	3	-12	17	-36
4S0167	9	-9	202	0	15	308	-25	-27	-96	61
4S0168	13	-43	102	0	-50	301	-54	-4	-24	-55
4S0169	-23	-85	-53	0	-78	-86	-39	24	0	-46
4S0172	9	-17	171	0	-39	158	-71	-9	0	-53
4S0173	19	-25	122	0	-36	148	-12	25	-86	-70
4S0175	22	28	232	0	-19	90	-4	0	-34	-48
4S0176	22	-26	181	0	-34	269	-60	21	-85	-72
4S0177	33	-16	58	0	-21	60	92	-26	-4	-54
4S0178	23	0	185	0	-40	70	-21	-12	-58	-59
4S0180	-2	-52	98	0	-19	270	5	-45	22	-78
4S0181	-92	-66	121	0	-88	999999	-89	-93	-48	-98
4S0182	8	-84	298	0	68	92	-18	27	-59	30
4S0183	12	-21	88	0	7	225	58	-69	25	-78
4S0184	-17	128	379	0	190	26	-2	-56	34	155
4S0185	27	-30	131	0	-18	411	-21	-52	69	-74
4S0186	-12	-28	111	0	-21	190	-32	-75	33	-71
4S0188	-97	-82	-49	0	-76	999999	426	-35	-78	-76
4S0190	20	-37	81	0	-49	219	-26	-16	-50	-80
4S0191	18	-48	-13	0	-50	672	-24	-25	-59	-72

VERSION 2 ALTERATION PARAMETERS AS LOG MOLE PERCENT

SAMPLE	ASIO2	ATIO2	AFE203	AFEO	AMNO	AMGO	ACAO	AK20	ANA20	AP205
4S0192	13	-40	23	0	-27	593	-53	-97	0	-77
4S0193	18	-21	107	0	21	183	2	-4	-62	34
4S0195	-7	-33	-49	0	-94	1027	-77	-77	-56	-60
4S0196	29	-25	37	0	-61	1285	-45	-8	-76	-65
4S0197	7	-44	-59	0	-79	556	-2	-75	-8	-69
4S0198	28	-48	6	0	-70	510	16	-14	-35	-71
4S0199	27	-53	29	0	-64	733	-45	-2	-63	-67
4S0200	-3	-20	139	0	6	49	-1	-24	-96	-78
4S0201	-7	24	215	0	24	93	-66	-29	0	-64
4S0202	4	19	172	0	-13	70	-67	10	-62	-9
4S0203	-16	52	346	0	33	137	-79	-99	40	-45
4S0205	20	120	430	0	100	130	-7	-31	34	-46
4S0206	37	6	310	0	136	279	71	-49	-11	137
4S0207	24	88	379	0	94	210	22	-69	19	-45
4S0208	78	117	462	0	44	1807	-62	7	-73	-62
4S0209	22	155	433	0	219	57	0	-5	-38	8
4S0210	4	129	455	0	78	74	21	-70	49	-20
4S0212	-8	74	120	0	-55	66	-69	-49	19	-60
4S0216	5	56	469	0	0	82	-82	-99	48	-56
4S0218	30	71	512	0	104	226	21	-100	-97	121
4S0219	-3	-17	292	0	-15	86	-56	37	-80	-82
4S0221	32	19	264	0	60	155	65	-82	-12	-97
4S0222	-31	-27	52	0	-23	-14	-46	-82	85	-35
4S0225	27	75	200	0	-18	424	-91	-97	0	-71
4S0227	51	43	305	0	24	276	72	-23	-84	-56
4S0228	0	24	336	0	-30	118	-68	-95	-70	-72
4S0229	-88	-88	-68	0	-91	999999	-76	-94	-50	-99
4S0230	14	-14	159	0	-12	209	-30	5	-98	-53
4S0231	24	-35	92	0	-32	578	-21	-90	0	-72
4S0232	26	-37	89	0	-45	610	-94	-56	-9	-71
4S0233	29	-28	112	0	-44	450	-18	-26	-53	-60
4S0234	3	17	277	0	29	76	5	-35	-90	-55
4S0235	15	-55	110	0	-30	282	-13	-15	-28	-78
4S0236	-8	5	234	0	-6	180	3	-97	25	-38
4S0237	28	-21	164	0	-17	312	-10	-35	-32	-56
4S0238	-3	-22	193	0	-2	97	-32	19	-86	-69
4S0239	9	-23	290	0	12	261	25	6	0	0
4S0240	9	-34	144	0	-32	154	-32	49	-47	-55
4S0241	4	-28	275	0	51	78	25	-42	-33	-71
4S0242	-11	-38	93	0	-14	31	26	-33	-50	-59
4S0243	-39	-22	120	0	64	31	-21	-37	22	-3
4S0244	22	-52	114	0	-20	171	23	35	-53	-72
4S0245	45	-40	112	0	-38	662	68	-24	-81	-80
4S0246	-21	-42	28	0	8	7908	-44	-93	-47	-84
4S0247	2	121	379	0	72	43	0	-5	0	-13
4S0248	13	-9	270	0	140	124	54	0	-53	106
4S0249	13	-12	249	0	105	55	46	-22	-73	44
4S0250	11	43	409	0	66	92	-7	-16	-22	-35
4S0251	-2	-56	162	0	-9	194	-7	-44	0	-73
4S0252	36	-20	235	0	54	224	53	60	-92	-63
4S0253	-17	-38	103	0	-19	76	-53	2	0	-65
4S0255	33	97	547	0	96	6	9	0	-65	-10
4S0256	2	74	407	0	59	40	8	6	0	-26
4S0257	0	3	255	0	27	74	13	-29	-50	-42
4S0258	-8	-43	122	0	-22	20	5	-99	0	-70

VERSION 2 ALTERATION PARAMETERS AS LOG MOLE PERCENT

SAMPLE	ASIO2	ATIO2	AFE203	AFEO	AMNO	AMGO	ACAO	AK20	ANA20	AP205
4S0259	27	62	256	0	220	231	174	3	65	209
4S0260	56	-16	174	0	-17	794	37	-42	-47	-63
4S0261	42	-43	133	0	-24	532	15	-25	-52	-73
4S0262	70	-49	119	0	-34	171	541	-98	-98	-78
4S0263	21	-15	339	0	54	119	43	-23	-48	-65
4S0264	9	-37	115	0	-39	195	-10	-22	-44	-70
4S0265	-16	-32	266	0	49	66	24	-70	44	-50
4S0266	21	-36	141	0	-21	218	20	-27	-57	-76
4S0267	53	-28	172	0	-27	1222	-77	-4	-94	-74
4S0268	14	-23	162	0	44	271	64	-29	0	-76
4S0269	8	-37	34	0	-61	3702	-55	-83	-55	-71
4S0270	45	-44	40	0	-51	469	122	2	-70	-54
4S0271	0	-42	32	0	-84	2756	-79	-92	-24	-68
4S0272	-4	10	234	0	34	41	4	-67	-90	-64
4S0273	9	-40	-9	0	-52	1955	102	-92	-24	-87
4S0274	28	-52	-9	0	-70	342	52	-28	-19	-72
4S0275	35	-46	54	0	-9	587	28	-40	-29	-70
4S0276	-23	-35	154	0	23	20647	16	-88	-51	-82
4S0277	28	-31	199	0	3	187	-26	-22	-43	-55
4S0278	22	-17	76	0	-48	296	-35	7	-81	-37
4S0279	-16	-72	-31	0	-67	4406	41	-80	-28	-93
4S0280	17	-56	0	0	-67	440	-43	-41	-38	-79
4S0281	11	-52	-21	0	-53	913	-11	-91	-25	-81
4S0282	20	-44	26	0	-40	451	-18	-67	-19	-71
4S0283	-31	-51	65	0	-61	-59	-17	-28	-23	-84
4S0284	13	-39	121	0	-14	107	-3	-18	-46	-24
4S0285	26	-39	80	0	-45	397	-19	-38	-54	-56
4S0286	29	-39	278	0	46	312	39	-47	-89	-70
4S0287	-12	-61	-17	0	-82	6842	16	-6	-72	-83
4S0288	-1	-20	266	0	28	112	11	-79	-87	-71
4S0289	-85	-61	-7	0	-76	999999	77	-20	-90	-90
4S0291	39	-37	49	0	11	566	51	-21	-41	-67
4S0292	38	-43	157	0	-45	590	24	-69	-38	-67
4S0293	20	-45	15	0	-35	1550	88	-63	-38	-78
4S0294	31	-40	97	0	-51	498	-46	-34	-26	-60
4S0295	19	8	236	0	41	202	-18	-43	0	146
4S0296	-10	-25	258	0	39	126	30	-35	32	-81
4S0297	14	-24	242	0	49	192	45	-48	0	17
4S0298	10	1	193	0	109	35	68	-13	-37	-67
4S0299	-16	-44	233	0	20	175	3	-34	0	-84
4S0301	-3	-4	207	0	71	93	19	-7	0	-76
4S0302	2	14	256	0	-65	159	11	17	0	289
4S0303	24	-57	6	0	88	630	31	-11	-76	-78
4S0304	-4	-14	176	0	56	41	5	-12	-23	-70
4S0305	8	-17	189	0	53	89	25	15	-25	-79
4S0306	-4	-12	260	0	38	111	-29	-29	-71	-73
4S0308	-2	-16	127	0	-20	71	-22	38	-90	-63
4S0309	0	-39	145	0	7	208	-29	3	-83	-84
4S0310	12	-26	176	0	-1	171	-24	-21	-44	-30
4S0311	-26	-11	185	0	39	116	-36	-99	123	-38
4S0312	-79	-84	-50	0	-68	999999	322	-76	-42	-95
4S0313	-11	-5	176	0	36	57	-24	-24	0	-42
4S0314	38	-50	140	0	-45	829	-72	-18	-39	-76
4S0315	-29	59	279	0	33	80	-69	34	85	-39
4S0316	6	78	361	0	36	36	6	-25	-60	-19

VERSION 2 ALTERATION PARAMETERS AS LOG MOLE PERCENT

SAMPLE	ASIO2	ATIO2	AFE203	AFEO	AMNO	AMGO	ACAO	AK20	ANA20	AP205
4S0317	29	-18	137	0	-31	628	-38	-99	-34	-74
4S0318	3	-26	134	0	4	85	-25	-9	-23	-55
4S0319	-96	-92	-49	0	-88	999999	269	-76	-51	-98
4S0320	17	-35	153	0	-23	191	-11	0	-54	-59
4S0322	-37	-65	-23	0	-51	50015	573	-7	-45	-75
4S2001	-4	-10	412	0	100	115	-4	5	85	-44
4S2002	12	55	383	0	56	75	5	16	0	-21
4S2003	18	2	343	0	28	102	47	42	0	-95
4S2004	5	-14	426	0	124	251	-28	10	12	-87
4S2005	1	-18	408	0	39	107	34	-31	13	-78
4S2006	-5	-39	366	0	20	140	5	16	14	-95
4S2007	-2	-10	223	0	49	102	-29	76	-57	1
4S2008	43	85	117	0	-50	388	-60	-82	317	-34
4S2009	3	-23	136	0	-7	62	-38	52	-66	-31
4S2011	-11	-84	-42	0	-73	-24	-42	45	0	-90
4S2013	41	-23	113	0	-30	444	68	-68	-25	-66
4S2015	8	-57	154	0	24	133	69	-25	-22	-89
4S2017	3	-32	240	0	-25	203	-59	-95	44	-28
4S2018	-37	-19	226	0	24	8	-55	-94	434	-93
4S2019	45	-24	208	0	0	236	45	-25	-15	-34
4S2025	8	-34	158	0	83	111	86	10	-62	-55
4S2026	-2	-24	139	0	-25	35	19	0	-54	-57
4S2027	-11	3	234	0	44	83	14	-46	72	-74
4S2028	20	-25	79	0	-24	1330	-50	-90	20	-54
4S2029	29	20	123	0	-16	669	41	-92	37	-4
4S2030	-16	52	355	0	-16	136	-77	-24	0	-56
4S2031	15	-17	248	0	16	461	7	-16	74	-12
4S2032	11	-34	213	0	-2	401	-21	-38	50	-74
4S2033	38	-38	88	0	19	233	35	9	-68	-68
4S2034	-74	11	-85	0	-88	999999	81	52	-94	-98
4S2035	31	-38	137	0	-58	524	-25	-33	-34	-68
4S2036	-2	29	176	0	0	37	9	102	-80	-31
4S2037	4	-14	285	0	117	187	24	33	0	-79
4S2038	14	19	120	0	-51	35	-59	41	-45	41
4S2039	35	-31	65	0	-35	466	-37	39	-73	-65
4S2041	-15	8	296	0	37	106	-10	6	143	-60
4S2042	9	-15	227	0	59	103	25	8	-48	-67
4S2044	-6	-12	251	0	92	136	25	-26	9	-82
4S2045	-8	-14	243	0	44	138	11	9	0	-83
4S2046	-1	-9	283	0	-17	155	35	-41	38	-77
4S2047	32	-38	39	0	-49	319	24	-5	-63	-64
4S2048	-11	-19	279	0	42	116	2	-21	0	-78
4S2049	-3	-27	205	0	26	67	9	11	-23	-72
4S2050	-12	-24	202	0	30	130	8	-16	0	-81
4S2051	-2	-14	206	0	37	60	22	7	-57	-74
4S2052	42	-55	18	0	-27	734	69	-10	-30	-75
4S2053	28	-34	63	0	-65	534	-58	-29	-39	-43
4S2054	23	-29	29	0	-64	720	-72	-34	-26	-49
4S2055	41	-32	208	0	-31	287	-48	-7	-61	-44
4S2056	36	-50	51	0	-40	499	26	-25	-37	-72
4S2057	21	-34	194	0	76	477	-16	-78	0	-28
4S2058	29	-37	72	0	-23	327	23	-45	-21	-44
4S2059	32	-52	20	0	-29	982	59	-64	-5	-73
4S2060	21	-51	8	0	-55	614	1	-36	-41	-67
4S2061	19	-50	2	0	-68	2024	-56	-25	-42	-78

VERSION 2 ALTERATION PARAMETERS AS LOG MOLE PERCENT

SAMPLE	ASIO2	ATIO2	AFE203	AFEO	AMNO	AMGO	ACAO	AK20	ANA20	AP205
4S2062	20	-36	3	0	-64	623	-11	-67	-5	-54
4S2063	18	-47	28	0	-59	2103	-50	-31	-49	-68
4S2064	11	91	387	0	56	69	-15	-46	-13	-30
4S2065	16	-51	11	0	-78	730	-56	-34	-39	-78
4S2066	1	-23	215	0	173	30	16	35	39	19
4S2068	8	-18	170	0	-26	185	-45	40	-32	-25
4S2069	7	-3	198	0	-20	159	-58	66	-93	-16
4S2070	27	-24	23	0	-59	184	-33	-22	-3	-65
4S2071	18	-31	186	0	-17	179	-59	-24	-5	-60
4S2072	3	-29	176	0	-5	152	-57	5	0	-41
4S2073	-5	10	290	0	37	145	20	-35	66	1
4S2074	7	-32	277	0	-26	164	-56	-18	-70	-69
4S2075	15	-17	62	0	-52	361	0	-28	0	-54
4S2076	-3	-4	115	0	-41	90	-43	-66	63	-44
4S2077	9	78	179	0	88	232	-16	-66	-90	254
4S2078	6	22	268	0	20	83	6	-1	-40	56
4S2080	-9	-31	178	0	-24	151	-4	-99	368	-19
4S2083	18	14	221	0	-41	166	-41	33	-77	-37
4S2084	6	-10	64	0	66	67	-34	-27	3	-40
4S2086	29	-19	118	0	-16	183	5	44	-88	-42
4S2087	-11	-6	114	0	-83	5376	-82	-100	-63	-71
4S2089	11	-2	162	0	-17	94	-66	-72	-29	-29
4S2090	24	-64	-11	0	-76	705	68	-12	-51	-86
4S2091	28	-30	44	0	-58	360	0	-32	-16	-46
4S2092	11	-23	245	0	23	212	17	-14	-70	27
4S2093	9	-26	239	0	-22	94	8	29	-81	-17
4S2094	32	-2	98	0	-8	328	9	22	-90	2
4S2095	-5	11	268	0	73	75	-22	-96	-86	-46
4S2096	33	-52	4	0	-54	542	55	13	-70	-75
4S2097	28	-50	24	0	-54	945	-10	-10	-61	-73
4S2098	42	-45	19	0	-27	855	90	-9	-51	-66
4S2099	1	-11	208	0	29	219	18	-17	0	33
4S2100	13	-32	152	0	-60	189	-44	-93	39	-47
4S2101	15	-25	132	0	-65	546	-57	-76	9	-80
4S2102	31	-33	71	0	-34	569	-28	-33	-26	-68
4S2104	17	-34	12	0	-83	3608	74	-48	-78	-58
4S2105	51	-40	88	0	14	648	72	-19	-29	-50
4S2106	36	-46	36	0	-49	1335	94	-33	-43	-72
4S2107	10	-25	472	0	-47	35046	-71	-99	-41	-76
4S2108	-11	-9	205	0	-9	20	-9	4	-30	-62
4S2109	10	29	289	0	35	63	33	-25	-28	-22
4S2110	7	-31	109	0	-34	125	-31	18	-40	-67
4S2111	13	-24	146	0	-63	-25	-73	14	-26	-62
4S2112	7	-5	148	0	14	73	63	-62	9	-50
4S2114	0	-15	203	0	-12	267	-20	-84	5	-72
4S2115	-90	-66	27	0	-11	999999	1137	-83	-63	-98
4S2116	3	56	278	0	21	73	-27	41	-62	25
4S2117	-6	49	353	0	51	40	25	-20	0	-3
4S2118	-14	31	380	0	66	113	-24	-30	33	-56
4S2121	7	67	333	0	47	59	16	-2	-22	-20
4S2122	5	59	297	0	114	-3	55	-4	0	12
4S2123	8	89	359	0	79	5	13	41	-28	-2
4S2124	23	145	443	0	78	47	4	80	-46	0
4S2127	-15	29	139	0	-17	-42	34	-19	-68	-49
4S2130	13	29	228	0	-11	26	75	19	-62	-52

VERSION 2 ALTERATION PARAMETERS AS LOG MOLE PERCENT

SAMPLE	ASIO2	ATIO2	AFE203	AFEO	AMNO	AMGO	ACAO	AK2O	ANA2O	AP2O5
4S2131	4	46	277	0	56	42	10	-11	-31	-33
4S2133	8	-65	-36	0	-73	1513	135	6	-68	-90
4S2134	-7	9	197	0	-8	6	30	-61	-92	-60
4S2135	-5	-7	259	0	37	55	0	-20	-57	-49
4S2136	26	-58	6	0	-77	760	10	7	-64	-78
4S2137	-3	4	202	0	169	83	30	-28	0	188
4S2138	16	-55	-11	0	-60	2049	69	-91	-9	-77
4S2139	-3	-45	73	0	-66	210	-75	-54	0	-50
4S2140	34	-5	130	0	-70	401	-55	7	-76	-74
4S2142	-9	32	335	0	111	111	-7	-99	48	-67
4S2143	-15	13	355	0	120	72	7	-92	42	-60
4S2144	9	76	229	0	71	44	31	5	-13	-18
4S2146	11	-13	397	0	-40	275	-89	-48	-91	-78
4S2150	20	147	302	0	263	91	10	15	0	-19
4S2151	-5	35	244	0	31	125	-55	60	-43	-30
4S2152	5	30	237	0	209	30	18	44	-83	-7
4S2153	18	33	336	0	85	74	24	28	-77	-55
4S2155	-5	4	231	0	2	280	-12	-91	20	-63
4S2156	36	-38	67	0	-55	434	5	15	-73	-74
4S2157	28	-38	109	0	-32	309	0	0	-56	-72
4S2158	26	-42	153	0	-17	333	0	-3	-65	-72
4S2159	40	-40	119	0	-32	410	24	23	-45	-76
4S2160	36	-33	154	0	-19	400	11	-12	-42	-73
4S2161	10	-52	126	0	-34	218	-39	-5	-52	-79
4S2162	42	-50	86	0	-32	373	65	0	-49	-75
4S2163	12	-20	166	0	-15	315	0	17	40	-35
4S2164	44	-14	267	0	-30	155	50	5	-58	-67
4S2165	32	-16	183	0	-21	376	-28	3	-64	-51
4S2166	36	-39	149	0	-5	300	28	16	-44	-83
4S2167	21	-44	194	0	27	8	36	1	-27	-64
4S2168	13	-47	139	0	-30	210	-11	21	-76	-77
4S2169	45	-37	162	0	-68	508	48	-4	-49	-74
4S2170	-8	-38	149	0	-34	204	-51	13	27	-71
4S2171	24	-39	175	0	-3	277	1	15	-54	-73
4S2172	5	-34	130	0	-21	380	-32	-26	36	-70
4S2173	-3	-43	143	0	-13	201	-29	13	76	-72
4S2174	29	-42	118	0	-32	329	-15	-10	-46	-75
4S2175	5	-34	185	0	2	250	5	-12	23	-71
4S2176	16	-35	132	0	-35	224	-6	14	-45	-69
4S2177	4	-7	227	0	13	200	-5	-5	0	-36
4S2178	84	14	266	0	30	756	115	31	-36	-68
4S2179	36	-31	220	0	25	352	-19	2	-45	-70
4S2180	39	-30	220	0	46	461	12	-25	-67	109
4S2181	59	-4	136	0	-28	2049	250	-45	-38	-61
4S2182	49	-25	94	0	-34	390	99	-24	-11	-60
4S2183	15	-28	224	0	18	125	60	-23	-27	-73
4S2184	19	4	135	0	0	127	27	42	-66	71
4S2185	2	-23	227	0	22	145	-33	10	-86	-79
4S2186	-5	-39	170	0	14	115	3	1	-89	-84
4S2187	4	-46	192	0	21	208	15	-16	-90	-80
4S2188	33	-42	80	0	-62	1227	-89	-33	-26	-85
4S2189	-17	-14	134	0	-5	82	-52	56	18	-47
4S2190	51	-27	117	0	-32	1103	-42	42	-90	-66
4S2191	51	-35	73	0	-64	471	-84	-39	405	-78
4S2192	2	-26	279	0	29	110	-50	21	-11	-77

VERSION 2 ALTERATION PARAMETERS AS LOG MOLE PERCENT

SAMPLE	ASIO2	ATIO2	AFE203	AFEO	AMNO	AMGO	ACAO	AK20	ANA20	AP205
4S2193	-24	10	178	0	5	25	-63	-28	1520	-75
4S2195	-32	-20	177	0	-7	41	-65	0	425	-11
4S2196	49	-20	35	0	-10	174	4	-90	931	-53
4S2197	36	-28	42	0	-34	137	-57	-87	748	-65
4S2198	35	-86	-39	0	-51	-87	-33	0	198	-96
4S2199	35	-83	-49	0	-61	-87	-54	137	-78	-96
4S2201	17	-9	218	0	8	206	15	-16	-79	-43
4S2202	-37	-77	-10	0	-75	-44	-83	-66	-8	-83
4S2203	26	-39	113	0	-53	260	-41	-30	-7	-69
4S2204	22	-41	115	0	-41	199	-51	-23	-4	-68
4S2205	24	-38	126	0	102	236	-51	-24	0	-70
4S2206	31	29	397	0	125	157	-2	-6	-56	-65
4S2207	11	70	359	0	70	232	5	-41	0	-46
4S2208	19	84	418	0	79	73	23	30	0	-2
4S2209	44	-37	213	0	-30	919	-32	-77	-53	-78
4S2210	18	-23	61	0	-74	633	-91	-84	-5	-72
4S2211	-15	-46	117	0	-11	180	-78	-28	0	-62
4S2212	-6	-35	185	0	5	188	-89	4	-70	-22
4S2213	-11	9	277	0	9	92	-16	12	90	-40
4S4003	21	-40	207	0	94	182	19	7	58	-67
4S4004	-7	0	288	0	31	63	8	7	0	-59
4S4005	10	6	395	0	29	65	-16	-13	-15	-53
4S4006	11	-25	182	0	0	129	-19	11	0	-69
4S4007	7	-29	137	0	-1	65	10	62	-59	-65
4S4008	4	-7	195	0	-12	112	0	26	-56	-50
4S4009	42	-15	257	0	7	182	87	-50	-25	-64
4S4010	3	-24	146	0	52	157	67	-46	188	-93
4S4011	4	-19	176	0	-10	147	-5	52	0	-48
4S4012	-11	-23	174	0	-31	128	25	-4	0	-29
4S4013	38	-17	92	0	-54	540	-62	24	-46	-45
4S4014	20	-13	184	0	-4	138	-19	-70	-40	-58
4S4015	-15	25	267	0	11	33	-84	48	-70	-58
4S4016	-93	-79	71	0	-44	999999	1789	-64	-64	-83
4S4017	2	-29	212	0	25	126	35	-53	-59	-68
4S4018	-7	0	132	0	-39	-2	31	-31	-61	-19
4S4019	44	-31	63	0	-34	1492	-46	22	-76	-77
4S4020	28	-45	130	0	-15	345	33	-14	-37	-66
4S4021	28	-29	174	0	-15	353	10	-30	-6	-67
4S4022	-10	22	356	0	133	111	-18	71	0	-65
4S4024	16	12	175	0	6	70	-62	-39	-23	-80
4S4027	-13	-19	216	0	-17	110	-70	10	-97	-61
4S4028	28	-29	139	0	-46	779	-46	-30	28	-67
4S4030	-30	-32	19	0	-36	6306	60	-86	-87	-82
4S4031	18	62	419	0	169	40	34	49	-67	-15
4S4032	24	49	268	0	6	128	13	6	-61	-58
4S4033	65	69	300	0	114	211	61	107	-90	-68
4S4034	28	-49	35	0	-31	378	141	-78	6	-57
4S4035	23	-70	1	0	-21	1311	152	-35	-31	-83
4S4036	38	-30	85	0	-56	203	57	53	-85	-50
4S4037	42	-45	134	0	-4	565	48	-56	0	-74
4S4038	28	-27	200	0	14	142	47	-40	0	-40
4S4041	-9	-20	320	0	0	90	41	-90	13	-78
4S4042	13	11	315	0	48	269	-25	-81	52	-83
4S4044	8	105	377	0	55	77	-13	17	-86	-3
4S4045	-18	-31	221	0	93	9	-51	20	0	-48

VERSION 2 ALTERATION PARAMETERS AS LOG MOLE PERCENT

SAMPLE	ASIO2	ATIO2	AFE203	AFEO	AMNO	AMGO	ACAO	AK20	ANA20	AP205
4S4048	35	-34	156	0	-69	906	-26	-84	-26	-61
4S4049	14	-43	24	0	-93	438	-79	-38	-55	-60
4S4050	-15	-11	200	0	8	124	2	-33	0	-77
4S4051	16	2	335	0	71	-67	80	-39	-72	-78
4S4052	33	-73	-55	0	-86	867	-47	66	-74	-82
4S4053	28	-11	144	0	-45	261	-55	-17	-15	-60
4S4054	39	-15	49	0	-44	254	42	14	-53	-67
4S4055	10	12	195	0	-26	67	-19	-25	-37	-71
4S4056	32	-30	102	0	-28	290	0	-26	-27	-80
4S4057	68	1	294	0	149	241	81	3	-61	-49
4S4058	8	-7	129	0	18	62	63	-27	-43	-69
4S4059	-1	-24	183	0	29	142	12	34	0	-75
4S4061	-19	31	293	0	40	83	-23	34	141	-44
4S4062	41	-48	0	0	-70	117	54	108	-65	-53
4S4063	10	1	214	0	32	88	26	29	-41	-62
4S4064	-7	23	336	0	78	101	39	-15	14	-49
4S4067	3	52	341	0	64	54	-1	23	0	-30
4S4068	22	-29	79	0	-41	104	11	7	-25	-57
4S4069	7	-46	-4	0	-80	502	-47	-86	-13	-88
4S4070	-4	-3	202	0	35	72	0	42	-27	-51
4S4071	11	35	263	0	21	107	7	23	-25	-57
4S4072	-7	59	387	0	54	112	5	-30	13	-39
4S4074	23	94	396	0	71	40	21	37	-16	-7
4S4075	-13	29	336	0	54	144	-24	0	111	-42
4S4076	3	31	319	0	60	91	15	-16	0	-40
4S4077	10	-11	230	0	20	87	34	22	-62	-85
4S4078	-10	-8	197	0	6	81	-13	-70	-85	-73
4S4079	24	-6	284	0	34	123	75	-6	-88	-66
4S4080	50	-35	134	0	-29	249	63	27	-47	-79
4S4081	3	16	255	0	26	9	20	19	-80	-53
4S4082	-9	57	331	0	39	68	-6	2	0	-14
4S4083	-21	24	261	0	95	34	10	-41	46	-51
4S4084	32	43	342	0	52	134	60	51	-52	-12
4S4085	42	-39	104	0	-45	689	-14	-8	-40	-70
4S4086	16	-29	78	0	-62	300	-62	32	-48	-61
4S4087	35	-40	67	0	-57	642	-27	-10	-53	-68
4S4088	31	-38	137	0	-22	388	-13	32	-49	-48
4S4089	-29	-45	132	0	-14	99	-15	-35	51	-77
4S4090	17	-47	-10	0	-75	13	-27	45	-45	-73
4S4091	37	-39	94	0	-56	434	13	7	-47	-41
4S4092	50	-30	131	0	-20	641	30	-3	-42	-49
4S4093	30	-46	24	0	-26	508	35	-49	-11	-71
4S4094	-20	13	242	0	26	52	-40	70	0	-43
4S4095	-36	7	141	0	9	32	-76	28	55	15
4S4096	30	-44	74	0	-37	286	24	29	-43	-65
4S4097	-9	31	154	0	37	99	-6	-92	-95	-63
4S4098	2	-28	187	0	52	122	-11	-45	28	-45
4S4099	49	-18	204	0	-24	2515	272	-63	-32	-77
4S4100	5	9	200	0	-15	187	-3	-9	-86	26
4S4101	9	-25	74	0	-54	184	-62	-51	-39	-76
4S4102	27	-56	341	0	-77	363	-95	-99	69	-77
4S4103	4	26	312	0	44	49	-25	6	-96	-60
4S4104	3	25	293	0	27	92	-17	56	-79	-57
4S4105	33	-29	148	0	0	163	93	51	0	-31
4S4106	2	55	297	0	45	52	-17	15	-80	-27

VERSION 2 ALTERATION PARAMETERS AS LOG MOLE PERCENT

SAMPLE	ASIO2	ATIO2	AFE203	AFEO	AMNO	AMGO	ACAO	AK2O	ANA2O	AP205
4S4108	28	-22	155	0	-31	383	-61	-48	-24	-80
4S4109	2	50	237	0	58	49	-8	42	-54	-21
4S4110	6	53	176	0	114	33	34	103	0	-9
4S4111	-5	7	273	0	54	26	13	-95	-94	-67
4S4112	10	-35	106	0	-8	130	-4	48	-94	10
4S4113	3	33	256	0	41	61	4	14	-29	-42
4S4114	4	-12	103	0	-88	208	-88	-35	60	-69
4S4115	4	67	294	0	58	11	27	-11	-54	-19
4S4116	5	49	380	0	51	18	-22	23	-66	-44
4S4118	1	25	269	0	40	42	20	-28	-53	-39
4S4119	9	86	352	0	3	46	-7	15	0	-16
4S4120	28	32	336	0	41	189	23	-23	-89	-56
4S4121	-30	17	161	0	36	-7	8	-28	0	-40
4S4122	-12	47	349	0	68	114	-25	9	37	-33
4S4123	-6	12	219	0	28	17	-19	64	0	-30
4S4125	38	-37	137	0	-18	558	27	21	52	-51
4S4127	27	-43	1	0	-62	486	-22	13	-49	-74
4S4128	-4	-29	58	0	-59	59	-48	-59	-4	-75
4S4129	10	-37	122	0	-11	246	48	-49	18	-57
4S4130	33	-28	201	0	23	440	80	-13	12	2
4S4131	-39	-21	166	0	-31	9	-52	-60	0	-71
4S4132	11	16	-42	0	-91	4096	-79	-10	4	-84
4S4133	8	-52	72	0	-48	280	-1	-91	14	-63
4S4134	46	-36	90	0	-34	614	70	2	-66	-64
4S4135	10	-5	172	0	-21	131	-53	34	-98	-45
4S4137	22	-71	3	0	-73	522	-24	-38	-19	-65
4S4138	-59	-49	-2	0	-70	73205	85	-87	-40	-84
4S4139	-13	-68	-41	0	-62	6799	102	-4	-59	-86
4S4141	-7	-31	201	0	25	311	5	-37	134	-31
4S4142	28	-45	16	0	-76	652	-13	-7	-38	-76
4S4143	28	-54	-11	0	-71	229	16	-5	-20	-77
4S4144	15	-18	173	0	6	97	41	-18	-14	22
4S4145	8	-29	22	0	-60	724	-30	-96	12	-67
4S4146	6	-45	18	0	-44	364	-3	-77	27	-62
4S4147	41	-53	152	0	-69	789	-14	-48	-46	-73
4S4148	31	-40	45	0	-36	449	60	-72	-10	-52
4S4150	34	-45	54	0	-51	387	13	-31	-14	-50
4S4151	-6	-67	-14	0	-81	4962	-18	24	-64	-86
4S4152	7	-49	28	0	-77	181	-91	5	-14	-68
4S4153	-5	-6	229	0	-71	143	-89	-11	0	-17
4S4154	38	-44	9	0	-46	195	105	-3	-37	-60
4S4155	23	-43	-13	0	-71	378	-26	12	-63	-67
4S4156	20	-43	32	0	-49	3173	-15	-43	-40	-74
4S4157	-18	-43	165	0	11	53	-20	8	0	-77
4S4158	28	-41	56	0	-77	538	-68	-18	-26	-65
4S4159	23	-49	23	0	-75	1308	16	-22	-55	-74
4S4160	39	-42	64	0	-45	668	16	-44	-3	-47
4S4161	48	-44	270	0	31	572	62	-52	-59	14
4S4162	25	-43	20	0	-42	2284	218	-22	-40	-69
4S4166	16	-53	-19	0	-77	632	43	-38	-34	-68
4S4167	21	-62	11	0	-64	990	84	5	-57	-83
4S4168	17	-38	59	0	-62	6728	111	-80	-28	-68
4S4169	7	-61	-9	0	-63	3952	54	9	-71	-84
4S4170	32	-49	70	0	-76	917	-67	10	-66	-69
4S4171	-28	-51	128	0	-37	14	-64	106	0	-76

VERSION 2 ALTERATION PARAMETERS AS LOG MOLE PERCENT

SAMPLE	ASIO2	ATIO2	AFE203	AFEO	AMNO	AMGO	ACAO	AK20	ANA20	AP205
4S4172	41	-39	23	0	-41	1115	84	-12	-49	-66
4S4173	30	-42	31	0	-76	1412	0	-30	-47	-67
4S4175	-59	-54	-11	0	-38	73096	487	-74	-64	-87
4S4176	38	-6	194	0	-56	344	1	-69	-12	-20
4S4177	26	-31	59	0	-40	226	34	-16	-51	-41
4S4178	24	-51	2	0	-49	408	71	-70	-15	-75
4S4179	7	-43	-20	0	-93	721	-76	-57	-23	-74
4S4181	30	-9	149	0	-37	361	-47	-54	-54	-74
4S4182	-4	-12	145	0	-58	71	-77	-54	-17	-54
4S4183	29	-27	101	0	-25	136	30	-10	-40	-66
4S4184	3	-24	164	0	-37	273	-76	-37	4	-65
4S4185	25	-15	125	0	3	106	67	3	-83	-49
4S4186	-50	-61	-63	0	-68	4385	305	0	-66	-94
4S4187	31	9	-5	0	-51	48	47	50	-68	-38
4S4188	16	10	36	0	-64	866	-4	-57	-83	-56
4S4189	-2	-14	82	0	-34	91	-15	-29	0	-74
4S4190	41	83	453	0	173	167	27	-32	-94	-49
4S4191	5	5	256	0	104	8	-31	11	-37	-63
4S4192	-10	1	270	0	35	81	-9	35	0	-95
4S4193	-22	-15	218	0	0	76	-30	-49	24	-97
4S4194	-30	11	196	0	9	54	-39	-11	225	-96
4S4195	65	46	369	0	-23	821	77	-85	9	-27
4S4198	-11	52	297	0	87	72	9	-35	25	-37
4S4200	-11	58	341	0	50	55	-24	-83	151	-46
4S4201	6	39	362	0	43	116	-20	-56	6	-48
4S4202	21	86	473	0	83	85	26	18	0	77
4S4203	10	106	345	0	51	10	53	-27	-64	55
4S4204	17	104	342	0	71	28	23	11	-12	153
4S4206	-5	86	267	0	20	220	-36	-3	72	-97
4S4207	41	25	265	0	105	237	101	80	-28	-95
4S4209	12	-40	139	0	12	139	-50	2	0	-81
4S4210	10	-40	157	0	-9	145	-57	34	-84	-67
4S4211	25	-19	365	0	120	455	8	50	0	-56
4S4212	5	-33	210	0	18	119	-42	76	-73	-60
4S4213	-7	-43	100	0	-19	83	-29	1	-25	-70
4S4214	5	5	133	0	-15	58	85	89	8	-72
4S4215	19	-50	162	0	12	219	-7	14	-34	-75
4S4216	7	-30	306	0	55	304	30	-34	0	-73
4S4218	5	-37	179	0	-12	159	-61	27	-92	-67
4S4219	6	-40	118	0	-39	188	-42	5	0	-72
4S4220	18	-38	164	0	-21	213	-18	6	-33	-64
4S4221	10	-28	161	0	-34	244	-24	-49	23	-77
4S4222	22	16	365	0	59	109	28	-15	-93	-66
4S4223	13	44	359	0	27	69	15	-6	-55	-47
4S4225	-11	-43	62	0	-52	73	-50	-8	0	-72
4S4226	17	-12	103	0	-37	769	-43	-72	6	-70
4S4227	-3	-33	208	0	16	168	14	-79	429	-10
4S4228	52	-13	122	0	-26	658	56	1	-51	-62
4S4229	15	36	354	0	60	73	30	-4	-61	-44
4S4230	-1	0	208	0	26	252	-26	16	0	18
4S4231	14	-11	160	0	-21	110	33	22	-38	-54
4S4232	37	-18	86	0	-41	431	-32	31	-89	-68
4S4233	14	63	394	0	-14	47	20	-15	-38	-35
4S4234	13	-21	161	0	-25	307	-67	2	-63	-64
4S4235	31	-27	104	0	-30	328	-6	-14	-42	-57

VERSION 2 ALTERATION PARAMETERS AS LOG MOLE PERCENT

SAMPLE	ASIO2	ATIO2	AFE203	AFEO	AMNO	AMGO	ACAO	AK2O	ANA2O	AP2O5
4S4236	10	-3	229	0	0	50	64	71	0	-7
4S4237	-5	-19	165	0	75	125	79	12	41	-37
4S4238	21	-59	15	0	-61	150	-58	16	-53	-66
4S4239	3	-38	207	0	40	158	11	39	0	-45
4S4240	7	8	254	0	28	75	34	-22	-64	-61
4S4241	37	-36	91	0	-47	544	-33	38	-90	-75
4S4243	46	-40	243	0	13	220	165	-55	-91	-85
4S4244	-10	-50	152	0	13	155	22	-45	0	-85
4S4245	37	-42	40	0	-41	259	77	-15	-21	-44
4S4246	-32	-33	131	0	-30	91	-41	-73	126	-91
4S4247	50	-44	115	0	17	1731	156	-87	-28	-74
4S4250	42	-38	85	0	-22	541	100	-57	-27	-76
4S4251	7	-42	145	0	-15	388	-2	-79	4	-58
4S4252	7	46	431	0	-1	151	-70	-74	-92	-53
4S4253	42	-49	57	0	-44	1459	-49	-27	-25	-66
4S4254	-5	-3	157	0	-31	-77	-73	43	-76	-14
4S4255	-20	-55	53	0	-58	4044	110	1	-65	-96
4S4256	32	-38	82	0	-51	329	1	0	-65	-63
4S4257	38	-13	144	0	-4	490	20	-66	-9	-55
4S4258	13	6	224	0	55	206	86	-62	36	-56
4S4259	1	-28	237	0	40	147	19	-47	0	-44
4S4260	10	-39	127	0	13	185	-44	-19	-11	-64
4S4261	39	-47	101	0	-25	322	54	-1	-61	-76
4S4262	10	-25	98	0	-53	479	-29	-31	0	-49
4S4263	-1	53	259	0	32	-3	24	27	0	33
4S4264	9	62	199	0	26	30	48	94	0	-94
4S4265	15	-29	201	0	-4	152	24	50	-47	-96
4S4266	-15	-8	254	0	6	96	-22	-8	263	-68
4S4267	-12	-42	187	0	9	185	20	-26	47	-89
4S4269	37	-39	100	0	-25	677	25	-22	-47	-78
4S4270	0	-41	198	0	21	279	37	-19	54	-80
4S4271	-13	54	277	0	45	80	11	7	42	-24
4S4272	-41	-7	86	0	7	-35	-49	-22	0	-29
4S4274	9	-72	95	0	-28	151	93	-12	-93	-89
4S4275	-14	77	267	0	32	38	-9	27	32	22
4S4277	17	-20	208	0	67	64	21	-33	-42	-77
4S4280	5	-13	295	0	65	349	9	-9	0	-29
4S4282	46	-6	177	0	-25	2717	-13	-64	0	-64
4S4284	35	-10	168	0	38	423	122	-99	44	-68
4S4286	-79	-67	-14	0	-69	999999	294	-76	-69	-91
4S4288	-51	-85	-36	0	-90	55400	-54	-93	-7	-98
4S7000	16	19	272	0	57	158	47	-51	-27	-63
4S7001	24	-48	-22	0	-65	351	44	-13	-69	-64
4S7002	24	-27	94	0	-47	168	-32	29	-55	-3
4S7003	-7	22	305	0	37	116	-14	-78	0	-65
4S7004	-14	7	244	0	11	34	-45	-17	-33	-47
4S7005	4	17	209	0	-20	40	26	-26	-90	-71
4S7006	0	19	259	0	68	70	10	-43	-94	-57
4S7007	29	-46	25	0	-57	379	22	-7	-53	-53
4S7008	25	-60	39	0	-23	3587	96	-98	72	-89
4S7009	35	-63	79	0	3	723	252	-58	-24	-91
4S7010	-33	-14	136	0	-20	29	-78	5	39	-80
4S7011	-32	-59	35	0	-48	63445	248	-89	-51	-92
4S7012	18	-66	31	0	-77	2403	-17	-52	-67	-90
4S7013	-17	-13	167	0	-17	-34	-42	16	5	-81

VERSION 2 ALTERATION PARAMETERS AS LOG MOLE PERCENT

SAMPLE	ASIO2	ATIO2	AFE203	AFEO	AMNO	AMGO	ACAO	AK2O	ANA2O	AP2O5
4S7014	3	-47	177	0	-20	158	-67	-2	-79	-89
4S7015	18	-26	188	0	-11	384	-90	-64	-9	-86
4S7016	-90	-90	-33	0	-40	999999	1375	-83	-64	-18
4S7023	18	-31	89	0	8	133	-9	45	-66	-67
4S7024	23	-25	122	0	-28	531	14	-59	7	-69
4S7025	34	-35	103	0	-41	601	12	-66	0	-70
4S0068	-99	-83	-81	0	-18	999999	3194	4	-54	0
4S0106	67	-20	728	0	156	351	77	-66	-56	-28
4S0108	47	-13	708	0	82	184	-11	-55	-80	-12
4S0117	26	147	518	0	51	6	-10	209	0	93
4S0163	69	-24	855	0	-53	174	-92	-89	-25	-51
4S0174	-100	-50	-18	0	-51	999999	4169	-66	-53	-96
4S0211	-100	-67	-4	0	-87	999999	-32	-99	-48	-97
4S0214	1	29	542	0	-15	71	-94	-99	38	-16
4S0223	-100	-84	-56	0	-70	999999	8961	-88	-84	-98
4S0224	-100	-84	-78	0	-69	999999	112	-96	-68	-98
4S0300	25	-21	737	0	-8	234	-62	-38	9	-76
4S0321	-100	-95	-31	0	-56	999999	577	-83	-62	-89
4S2081	-100	9	326	0	-60	999999	755	-100	-31	-95
4S2120	-10	114	327	0	241	38	-13	80	871	44
4S2141	-100	-81	-25	0	-54	999999	3003	-97	-62	-98
4S2194	-19	-25	422	0	100	38	-38	-100	638	65
4S4023	83	-41	561	0	118	460	174	97	0	-90
4S4026	-100	-76	23	0	-83	999999	461	-95	-68	-96
4S4047	-100	17	288	0	-7	999999	17414	-75	-77	-66
4S4149	-98	-60	-21	0	-62	999999	1156	-80	-65	-91
4S4174	135	-55	186	0	56	2310	578	-77	-5	-62
4S4180	-100	-54	-47	0	-70	999999	3242	-80	-68	-94
4S4196	122	145	1052	0	327	876	143	-91	469	-14
4S4199	3	39	567	0	61	103	-92	-95	0	-22
4S4248	69	92	526	0	381	139	151	74	0	134
4S4268	87	62	584	0	219	681	70	-94	-42	-26
4S4273	71	-44	444	0	141	777	7	-66	-83	-85

SUDBURY, TIMMINS, ALGOMA MINERALS PROGRAM (STAMP)

Geological Survey of Canada Open File Reports

O.F. 1087*	Mineral inventory of the Sudbury-Timmins-Sault Ste. Marie region, Ontario; D.G. Rose (Project 1)
O.F. 1088*	Geochemistry of Swayze Belt esker, northern Ontario; J.A. Richard (Project 2)
O.F. 1089	Lithogeochemistry of Huronian Supergroup, Bruce Mines and Whitefish Falls areas, northern Ontario; D. Tortosa (Project 3)
O.F. 1090	Mineralization in the Onaping Formation, Sudbury Basin, Ontario; N. Bussolaro, D.H. Rousell, A.E. Beswick (Project 4A)
O.F. 1091	The metamorphic mineralogy and chemical alteration of the Temagami Greenstone Belt, northern Ontario; A.E. Beswick, R.S. James (Project 4B)

* To be released later.

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