**Table DR-1: Chemical contents determined by X-ray fluorescence**

| Rhyolite Paleosol | Depth Cm | $SiO_2$ wt. % | $TiO_2$ wt. % | $Al_2O_3$ wt. % | $Fe_2O_3$ wt. % | MnO wt. % | MgO wt. % | CaO wt. % | $Na_2O$ wt. % | $P_2O_5$ wt. % | $K_2O$ wt. % | Nb ppm | Zr ppm | LOI wt. % | Total wt. % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **05-27** | -5 | 44.89 | 0.54 | 34.08 | 4.75 | 0.01 | 0.16 | 0.04 | 0.15 | 0.07 | 9.82 | 168 | 1398 | 5.37 | 99.92 |
| **05-28** | -90 | 43.14 | 0.67 | 35.05 | 5.81 | 0.009 | 0.09 | 0.02 | 0.15 | 0.062 | 9.38 | 201 | 1651 | 5.4 | 99.97 |
| **05-29** | -230 | 44.22 | 0.59 | 35.3 | 6.95 | 0.02 | 0.08 | 0.02 | 0.13 | 0.03 | 8.13 | 183 | 1532 | 4.27 | 99.77 |
| **05-30** | -410 | 42.15 | 0.508 | 34.5 | 8.31 | 0.049 | 0.06 | 0.01 | 0.13 | 0.021 | 6.67 | 150 | 1310 | 7.26 | 99.81 |
| **05-31** | -480 | 43.75 | 0.488 | 33.88 | 8 | 0.014 | 0.09 | 0.03 | 0.14 | 0.04 | 6.86 | 142 | 1252 | 6.54 | 99.97 |
| **05-32** | -520 | 51.53 | 0.42 | 28.32 | 7.51 | 0.02 | 0.12 | 0.04 | 0.15 | 0.09 | 7.39 | 123 | 1049 | 4.17 | 99.81 |
| **05-33** | -590 | 56.29 | 0.392 | 26.4 | 4.39 | 0.004 | 0.1 | 0.03 | 0.14 | 0.111 | 7.54 | 114 | 955 | 4.22 | 99.72 |
| **05-34** | -615 | 52.57 | 0.398 | 27.8 | 5.71 | 0.006 | 0.15 | 0.04 | 0.16 | 0.101 | 7.89 | 116 | 999 | 4.76 | 99.7 |
| **05-35** | -695 | 80.83 | 0.167 | 11.35 | 1.49 | 0.01 | 0.19 | 0.02 | 0.1 | 0.034 | 3.49 | 49 | 403 | 2.13 | 99.86 |
| **05-36** | -745 | 81.53 | 0.165 | 11.27 | 1.07 | 0.015 | 0.16 | 0.02 | 0.09 | 0.028 | 3.55 | 48 | 395 | 1.94 | 99.88 |
| **05-39** | -1125 | 73.67 | 0.201 | 15.32 | 1.01 | 0.008 | 0.11 | 0.07 | 5.62 | 0.026 | 2.9 | 60 | 495 | 1.05 | 100.04 |
| **Basalt Paleosol 3** | **Depth Cm** | **$SiO_2$ wt. %** | **$TiO_2$ wt. %** | **$Al_2O_3$ wt. %** | **$Fe_2O_3$ wt. %** | **MnO wt. %** | **MgO wt. %** | **CaO wt. %** | **$Na_2O$ wt. %** | **$P_2O_5$ wt. %** | **$K_2O$ wt. %** | **Nb ppm** | **Zr ppm** | **LOI wt. %** | **Total wt. %** |
| **05-103** | -1 | 70.46 | 1.071 | 12.6 | 8.81 | 0.024 | 1.11 | 0.06 | 0.39 | 0.022 | 3.11 | 15 | 181 | 2.71 | 100.38 |
| **05-104** | -20 | 64.36 | 1.16 | 14.39 | 9.95 | 0.059 | 2.61 | 0.33 | 0.42 | 0.091 | 2.87 | 14 | 155 | 3.89 | 100.15 |
| **05-105** | -40 | 57.56 | 1.437 | 17.2 | 12.49 | 0.061 | 2.86 | 0.13 | 0.54 | 0.06 | 3.47 | 17 | 186 | 4.46 | 100.28 |
| **05-107** | -65 | 43.38 | 2.681 | 16.12 | 18.87 | 0.168 | 4.56 | 3.4 | 0.43 | 0.244 | 2.53 | 17 | 186 | 7.82 | 100.29 |
| **05-109** | -115 | 44.7 | 2.747 | 16.8 | 18.44 | 0.158 | 6.06 | 1.46 | 2.91 | 0.454 | 0.89 | 15 | 152 | 5.77 | 100.41 |
| **05-110** | -200 | 43.49 | 2.782 | 16.02 | 13.53 | 0.259 | 5.89 | 6.26 | 3.75 | 0.471 | 0.21 | 15 | 154 | 7.55 | 100.23 |
| **Basalt Paleosol 2** | **Depth Cm** | **$SiO_2$ wt. %** | **$TiO_2$ wt. %** | **$Al_2O_3$ wt. %** | **$Fe_2O_3$ wt. %** | **MnO wt. %** | **MgO wt. %** | **CaO wt. %** | **$Na_2O$ wt. %** | **$P_2O_5$ wt. %** | **$K_2O$ wt. %** | **Nb ppm** | **Zr ppm** | **LOI wt. %** | **Total wt. %** |
| **05-111** | -3 | 71.92 | 1.034 | 10.46 | 9.06 | 0.061 | 2.04 | 0.19 | 0.25 | 0.02 | 2.29 | 13 | 183 | 2.88 | 100.22 |
| **05-112** | -85 | 61.64 | 1.263 | 15.95 | 8.65 | 0.078 | 4.2 | 0.08 | 0.34 | 0.03 | 2.97 | 15 | 163 | 4.93 | 100.15 |
| **05-113** | -130 | 32.36 | 3.603 | 20.5 | 19.31 | 0.214 | 8.72 | 2.21 | 0.34 | 0.672 | 2.55 | 20 | 138 | 9.65 | 100.14 |
| **05-114** | -200 | 39.34 | 2.647 | 17.05 | 13.02 | 0.324 | 8.08 | 6.55 | 2.86 | 0.434 | 0.36 | 14 | 382 | 9.57 | 100.27 |
| **Basalt Paleosol 1** | **Depth Cm** | **SiO2 wt. %** | **TiO2 wt. %** | **$Al_2O3$ wt. %** | **$Fe_2O_3$ wt. %** | **MnO wt. %** | **MgO wt. %** | **CaO wt. %** | **Na2O wt. %** | **P2O5 wt. %** | **K2O wt. %** | **Nb ppm** | **Zr ppm** | **LOI wt. %** | **Total wt. %** |
| **P2d** | -5 | 59.29 | 1.32 | 16.34 | 10.7 | 0.06 | 2.25 | 0.16 | 0.19 | 0.06 | 5.26 | 19 | 170 | 4.44 | 95.63 |
| **P2c** | -40 | 58.82 | 1.59 | 17.93 | 8.01 | 0.07 | 2.34 | 0.13 | 0.27 | 0.01 | 6.03 | 17 | 182 | 4.57 | 95.2 |
| **P2b** | -60 | 43.59 | 2.62 | 20.1 | 18.31 | 0.09 | 2.79 | 0.38 | 0.26 | 0.23 | 6.96 | 21 | 177 | 6.32 | 95.33 |
| **P2a** | -80 | 44.25 | 2.66 | 19.09 | 18.32 | 0.12 | 2.48 | 0.34 | 0.24 | 0.2 | 6.64 | 24 | 181 | 5.96 | 94.34 |
| **B2** | -120 | 47.83 | 2.14 | 17.37 | 12.66 | 0.39 | 7.05 | 0.99 | 5.59 | 0.34 | 0.3 | 17 | 158 | 5.25 | 94.66 |

Chemical compositions were determined with X-ray fluorescence (XRF) for both major and trace elements using a Philips PW2400 X-ray spectrometer housed at the Regional Geochemical Centre of Saint Mary's University, Halifax, Nova Scotia, Canada. Major elements were determined using the fusion method, whereas trace elements were analyzed separately using pressed pellets from the same powdered mix.

| Table DR-2: Bulk densities of the parent rocks versus the upper part of the soil profiles. | | | | | | |
|---|---|---|---|---|---|---|
| **Rhyolite Paleosol** | **Depth** | **Field description** | **Volume** | **Weight** | **Density** | **Zr** |
| | **cm** | | **$cm^3$** | **g** | **$g/cm^3$** | **ppm** |
| **05 -28** | -90 | red soil horizon | 3.43 | 10.36 | 3.02 | 1651.3 |
| **05 -39** | -1125 | rhyolite | 0.98 | 2.93 | 2.99 | 495.4 |
| **Basalt Paleosol 3** | | **Field description** | **Volume** | **Weight** | **Density** | **Zr** |
| | | | **$cm^3$** | **g** | **g/cm3** | **ppm** |
| **05-103** | 0- | red soil horizon | 8.51 | 24.74 | 2.91 | 180.5 |
| **05-110** | -300 | basalt | 1.30 | 3.53 | 2.71 | 153.6 |
| **Basalt Paleosol 2** | | **Field description** | **Volume** | **Weight** | **Density** | **Zr** |
| | | | **$cm^3$** | **g** | **g/cm3** | **ppm** |
| **05-111** | -3 | red soil horizon | 3.40 | 10.09 | 2.97 | 135.4 |
| **05-114** | -245 | basalt | 4.22 | 12.21 | 2.89 | 137.6 |
| **Basalt Paleosol 1** | | **Field description** | **Volume** | **Weight** | **Density** | **Zr** |
| | | | **$cm^3$** | **g** | **g/cm3** | **ppm** |
| **P2d** | **-5** | red soil horizon | 3.26 | 9.40 | 2.88 | 158.0 |
| **B2** | **-120** | basalt | 7.31 | 19.50 | 2.67 | 170.0 |

| Table DR-3: XRD data | Depth | Calcite | Quartz | Chlorite | Kaolinite | Muscovite+phengite | Albite | Microcl+orth | Hematite |
|---|---|---|---|---|---|---|---|---|---|
| **Rhyolite Paleosol 1** | **cm** | **vol %** | **vol %** | **vol %** | **vol %** | **vol %** | **vol %** | **vol %** | **vol %** |
| **05-27** | -5 | | 5 | | 1 | 71 | 1 | 1 | 13 |
| **05-28** | -90 | | 10 | | 22 | 51 | | | 13 |
| **05-30** | -410 | | 13 | | 29 | 40 | | | 17 |
| **05-31** | -480 | | 8 | | 31 | 45 | | | 14 |
| **05-33** | -590 | | 51 | | 1 | 36 | | | 7 |
| **05-34** | -615 | | 56 | | 2 | 35 | | | 7 |
| **05-35** | -695 | | 90 | | | 9 | | | |
| **05-36** | -745 | | 87 | | | 12 | | | |
| **05-39** | -1125 | | 19 | | | 6 | 65 | 8 | |
| **Basalt Paleosol 3** | | | | | | | | | |
| **05-103** | -1 | | 83 | 2 | | 5 | 1 | | 6 |
| **05-104** | -20 | | 79 | 6 | | 4 | | | 6 |
| **05-105** | -40 | | 75 | 3 | | 5 | | | 5 |
| **05-107** | -65 | 13 | 42 | 15 | | 7 | | 3 | 17 |
| **05-109** | -115 | 3 | 28 | 19 | 2 | 1 | 27 | 2 | 12 |
| **05-110** | -200 | 3 | 32 | 11 | | 2 | 36 | | |
| **Basalt Paleosol 2** | | | | | | | | | |
| **05-111** | -3 | | 78 | | 1 | 9 | | | 6 |
| **05-112** | -85 | | 72 | | 1 | 11 | | | 7 |
| **05-113** | -130 | | 26 | 9 | 1 | 19 | 4 | 3 | 33 |
| **05-114** | -200 | 4 | 9 | 9 | 3 | 3 | 53 | | 9 |
| **Basalt Paleosol 1** | | | | | | | | | |
| **P2d** | -5 | | 60 | 2 | 2 | 17 | 2 | | 10 |
| **P2c** | -40 | | 49 | 3 | 2 | 17 | 8 | | 16 |
| **P2b** | -60 | 5 | 18 | 5 | 2 | 26 | 2 | | 29 |
| **P2a** | -80 | 4 | 19 | 3 | 6 | 24 | 2 | | 32 |
| **B2** | -120 | | 4 | 11 | | 3 | 72 | | 8 |

X-ray diffraction (XRD) analysis of all samples was performed at the Département des Sciences de la Terre et de l'Atmosphère de l'Université du Québec à Montréal, Canada