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MAJOR OXIDE, MINOR OXIDE, TRACE ELEMENT, AND GEOCHEMICAL DATA FROM ROCKS COLLECTED IN THE IRON CREEK AREA, TALKEETNA MOUNTAINS B-5 QUADRANGLE, ALASKA IN 1999

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Note: This report (including all analytical data, tables, and map sheets) is available in digital format from the DGGS web site (http://wwwdggs.dnr.state.ak.us) at no charge. The digital data are available as PDF files and Excel spreadsheets.

MAJOR OXIDE, MINOR OXIDE, TRACE ELEMENT, AND GEOCHEMICAL DATA FROM ROCKS COLLECTED IN THE IRON CREEK AREA, TALKEETNA MOUNTAINS B-5 QUADRANGLE, ALASKA IN 1999

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INTRODUCTION

Mineral resource personnel from the Alaska Division of Geological & Geophysical Surveys and the U.S. Geological Survey carried out a joint geological field survey, including mapping and sampling of the Iron Creek area in the southeast Talkeetna Mountains B-5 quadrangle, Alaska from July 11-25, 1999. The fieldwork provides basic information critical to building an understanding of Alaska's geology and is part of an integrated program of airborne geophysical surveys followed by geological mapping programs. During 1999, 87 rock samples were collected for geochemical trace-element analysis, and 88 samples were collected for whole rock (major and minor oxides, and petrogenetically important trace element data) analysis. 26 geochemical trace-element samples collected in 1983 are also reported in this study. The locations of these samples are shown on Sheets 1 (whole rock) and 2 (trace-element geochemistry). Location data (in UTM coordinates with a Clark 1866, NAD27, UTM zone 6 projection), descriptions, and analytical results for each sample are tabulated in Tables 1, 2, 3, and 4.

ANALYTICAL METHODS

All 1999 trace-element geochemical analyses were performed by Chemex Labs, Inc. Rock samples were crushed so that at least 70 percent of the material passed through a –10 (2 mm) mesh screen. A 200-gram, representative split of the sample was then taken using a riffle splitter. The 200-gram sample was then pulverized in a chrome steel ring mill so that 95 percent of the sample passed through a –150 (106 micron) mesh screen.

For the samples collected in 1999, gold was analyzed on a 30 gram representative sample split using Fire Assay (FA) and Atomic Absorption Spectroscopy (AAS) methods. Most of the trace elements were analyzed by Inductively Coupled Plasma - Atomic Emission Spectroscopy (ICP-AES) methods after nitric aqua regia digestion. All Sn analyses were determined by the AAS method. Samples containing greater than 1 percent Cu were further analyzed using AAS. Two samples containing greater than 100 ppm Ag (99RJN511A and 99MBW559) were further analyzed using FA-AAS (Fire Assay - Atomic Absorption Spectroscopy). Samples containing greater than or equal to 1 ppm Hg (by the ICP-AES method) were further analyzed using AAS. Since samples containing greater than 10,000 ppm copper have interference between the spectral lines of copper and bismuth in ICP-AES analyses, where possible, the pulps for these samples were re-run for bismuth using AAS. Analytical detection limits are tabulated in Table 5. One sample (99Arj044B) was analyzed by Inductively Coupled Plasma – Mass Spectrometry (ICP-MS) and in Table 5 the elements analyzed by this method are noted by a single asterisk (*).

For the 1983 samples (prefixed by 83Hn), Au, Ba, W, and Hg were analyzed by Chemex Labs, Inc. Au and Hg were analyzed by the AAS method, W was analyzed by a colorimetric technique, and Ba was analyzed by X-Ray Fluorescence (XRF). Ag, As, Co, Cu, Mn, Mo, Ni, Pb, Sb, and Zn were analyzed by the Alaska Division of Geological & Geophysical Surveys analytical lab by the AAS method after an aqua-regia leach. Analytical detection limits are tabulated in Table 6. The pulps from the 1983 samples were also analyzed for Sn and Bi in 1999 by Chemex Labs, Inc. by the methods described above.

All whole rock analyses were performed by Chemex Labs, Inc. Major and minor element oxides were determined by XRF methods following a metaborate fusion. Trace elements (Ba, Nb, Rb, Sr, Y, and Zr) were also analyzed using XRF methods on a pressed pellet. A subset of the samples was also analyzed for Cu and Ni using AAS following an aqua-regia leach, and Cr using AAS following $HClO_4/HNO_3/HF$ total digestion. Analytical detection limits are tabulated in Table 7.

Table 1. Location and description of rock samples collected in the Iron Creek area for trace element geochemical analyses.

Sample	UTM E	UTM N	Description
99ARJ029	387241	6911484	Weak gossan on hillside with abundant disseminated pyrrhotite in a hornfelsed and fractured, medium gray, very fine grained metavolcanic(?) rock.
99ARJ038A	393843	6920011	Medium gray, finely porphyritic (feldspar phenocrysts), shallow intrusive intermediate(?) rock cut by 2- to 3-mm-wide vein of quartz and pyrite (partially altered to limonite).
99ARJ069	391822	6913512	Medium greenish gray, aphanitic to faintly crystalline(?), amygdaloidal, intermediate to mafic rock with trace disseminated chalcopyrite and one 1-mm-wide vein of quartz + chalcopyrite + malachite + epidote + maroon hematite.
99PE010A	392736	6913564	Small shear zone (~2 feet wide) with quartz + magnetite veins in copper-stained greenstone with disseminated sulfides.
99PE63	393161	6914064	1 foot wide, rusty weathering quartz vein with pyrite in epidote altered and veined greenstone.
99RN525	394590	6916163	Float of nearly massive hematite + quartz material (up to 25 cm in diameter) mixed with amygdaloidal greenstone.
99JS29C	395648	6914721	Brick-red weathering, very dark gray siliceous rock with very fine grained disseminated pyrite.
99JS33C	393603	6922036	Very dark red-brown-orange stained area in metabasalt.
99JS40B	395639	6920792	Red-brown weathering material on fracture surfaces in fine grained diorite or microgabbro.
99JS46A	393641	6913728	Dark brown to black-red weathering, epidote altered, amygdaloidal, hematite(?)-bearing lava with abundant malachite staining.
99JS58A	384522	6910814	Very bright red-orange stained zone (100 feet by 100 feet), with red stained rocks containing epidote, quartz, specular hematite, and trace copper carbonate.
99MBW537	395694	6915760	25 foot by 10 foot trench in intensely iron stained, quartz veined, greenstone with abundant disseminated pyrite and possibly chalcopyrite. Veins contain chlorite, earthy and specular hematite, quartz, and chalcopyrite. Chalcopyrite is spatially associated with quartz-rich areas in the veins.
99MBW515B	395115	6912440	Very iron-stained, orange weathering, gray siliceous rock with up to 40% disseminated pyrite, +/- cut by quartz veins. Possible mafic host rock in a hornfelsed zone above a quartz diorite pluton.
99MBW430B	395194	6914763	Small iron stained gossan zone ~3 feet wide with quartz, calcite, pyrite, chalcopyrite, malachite, and limonite. The zone trends at an azimuth of ~45 +/- 10 degrees across the ridge.
99MBW515	395115	6912440	Very iron-stained, orange weathering, gray siliceous rock with up to 40% disseminated pyrite, +/- cut by quartz veins. Possible mafic host rock in a hornfelsed zone above the quartz diorite pluton.
99ARJ030B	393189	6913124	Massive milky quartz vein intergrown with white calcite.
99ARJ038B	393843	6920011	Large iron-stained quartz vein. The quartz is irregularly intergrown with dark greenish-black, very fine grained chlorite(?) and (or) hematite(?), and also contains trace disseminated pyrite.
99ARJ068	394804	6917719	Grayish green, amygdaloidal, epidote altered microgabbro cut by quartz veins.

Table 1. Location and description of rock samples collected in the Iron Creek area for trace element geochemical analyses.

Sample	UTM E	UTM N	Description
99PE010B	392736	6913564	Recessive zone of greenstone with common linear veins that contain quartz and sulfides; non-magnetic. Fractures and veins are about 0.1-2 cm wide with abundant copper staining.
99RN502	395453	6911241	Iron stained, light gray, pyritic, hornfelsed, metafelsic (quartz-feldspar-bearing), laminated volcanic(?) rock.
99RN526C	394507	6916120	Chalcopyrite + quartz + malachite vein in amygdaloidal metabasalt/metagabbro(?).
99JS29J	395241	6915063	Float of brick red to orange weathering limestone.
99JS41A	390062	6918720	White weathering quartz blocks (40 to 60 cm across) with limonite staining on fractures.
99JS46C	393641	6913728	Azurite-rich fracture coatings (up to 4 mm thick) in amygdaloidal lava.
99JS66D	390485	6908246	1-mm-wide quartz veins with limonite staining.
99MBW549A	390968	6919881	Milky quartz vein (1 foot wide) in amygdaloidal basalt with epidote + chlorite +/- trace earthy hematite(?) + malachite.
99MBW523	392087	6908650	Pyrite altered, white and black, medium grained hornblende diorite veined by quartz and pyrite.
99MBW436	394865	6914901	Iron-stained pyritic zone approximately 50 foot wide crossing ridgeline. A green foliated metavolcanic rock is mixed in with rusty rubble.
99ARJ033	393657	6915147	Massive basalt with trace disseminated chalcopyrite(?) or pyrite(?).
99ARJ041	393814	6922343	Gossan zone near contact between metabasalt and metasedimentary rocks.
99ARJ056	392643	6924159	Limonite stained gossanous zone in metasedimentary rock with dark maroonish-gray fine grained layers (dominate component) and thin pale gray coarser grained layers.
99PE011A	392826	6913543	Dark grayish-green, very fine grained greenstone with disseminated pyrite.
99RN511A	390274	6919764	Iron stained, dark green, chlorite schist(?) cut by thin (up to 1.5 cm wide) quartz + pyrite + chalcopyrite(?) veins.
99JS28B	393528	6912149	Very fractured, pyrite-bearing cherty rock with gray and cream-colored streaks and laminations.
99JS29K	395195	6915073	Quartz veined metamafic schist with pyrite and iron oxides.
99JS35C	393316	6921529	Dark red-weathering zone in metamorphosed microgabbro.
99JS41D	389625	6918689	Epidote altered, +/- magnetite-rich amygdaloidal basalt with minor malachite staining.
99JS46D	393641	6913728	Orange weathering, green colored, chlorite-rich, schistose amygdaloidal lava with malachite staining.
99MBW525	392147	6908791	Black and white, medium grained, equigranular to porphyritic (huge quartz phenocrysts), biotite quartz diorite with disseminated pyrite alteration, that is cut by numerous quartz + pyrite veins.
99MBW559	396793	6919281	Two old prospecting trenches; one is ~50 feet by 20 feet, and one is ~10 feet by 10 feet. Amygdaloidal basalt with fractures coated with azurite, chalcocite, bornite, hematite, and (or) minor epidote.
99MBW547A	390915	6919791	Massive milky quartz + pyrite vein.
99MBW441B	392555	6919849	Quartz + limonite veins cutting porphyritic dacite dike.
99ARJ034A	393096	6915371	White quartz + hematite +/- epidote veins in greenstone.

Table 1. Location and description of rock samples collected in the Iron Creek area for trace element geochemical analyses.

Sample	UTM E	UTM N	Description
99ARJ042B	393563	6922591	Thin vein in altered granitic pluton.
99ARJ052B	392105	6925027	Slightly altered and pyritized, fine grained mafic intrusive or flow.
99PE11B	392826	6913543	Quartz + specular hematite + limonite patches + crystalline and massive malachite veins in greenstone.
99RN511B	390274	6919764	Iron stained, dark green chlorite schist(?) cut by chalcopyrite and quartz veins (up to 1 cm wide) with malachite coatings.
99JS28F	393528	6912149	Orange weathering area in mudstone with quartz pebbles.
99JS31D	392972	6919502	Red weathering goethite material from a 1- to 2-cm-thick calcite vein.
99JS35D	393261	6921533	Gossanous outcrop of medium gray to greenish gray, fine grained, granular silica rock with 2-25% fine to medium grained pyrite.
99JS44A	396595	6913527	Pyrrhotite-rich (10-15%), dark green, fine grained gabbro with local iron oxide coatings.
99JS46E	393641	6913728	Maroon to green colored amygdaloidal lava with epidote alteration and rare malachite coatings.
99MBW529B	396149	6915574	Very iron-stained, pyritic, felsic metavolcanic rock with minor quartz veining.
99MBW565	393954	6907704	Small, 10 foot wide, iron-stained, +/- quartz veined zone trending ~190 degrees.
99MBW405B	381335	6920333	Disseminated magnetite, pyrite, and chalcopyrite in a medium green aphanitic rock cut by thin quartz + limonite veins.
99MBW442	392541	6919909	Dark green finely crystalline gabbro cut by dacite dikes and quartz + pyrite veins.
99ARJ034C	393096	6915371	Hematite veinlet in very epidote and chlorite altered microgabbro.
99ARJ046	395544	6919678	Gossan(?) in mottled pale pink and pale green, quartz-rich, slightly porphyritic (quartz phenos up to 4 mm) granite.
99ARJ073B	385084	6911230	Dark green, equigranular, very fine grained greenstone with numerous quartz + epidote +/- pyrite veins and disseminated epidote.
99PE20A	393265	6919290	Green metamafic rock that is +/- highly silicified, with areas of quartz + pyrite +/- epidote in veins(?).
99RN517	389255	6910810	Medium gray, pyritic meta-argillite.
99JS28K	393404	6912406	White colored siliceous rock with orange weathering limonite which may be alteration or a different original lithology(?).
99JS32B	392417	6919883	Orange weathering material (with patches of dark red, dark orange, and brown) with manganese(?) staining, which contains very fine grained pyrite, that occurs near a dark green, hornfelsed metagabbro(?).
99JS35E	393261	6921533	1-3 mm thick, dark brown to black, manganese oxide crust on a gossanous outcrop of medium gray to greenish gray, fine grained, granular silica rock with 2-25% fine to medium grained pyrite.
99JS44B	396595	6913527	Orange and yellow weathering, platey muscovite-quartz schist.
99JS50	395661	6912428	Orange-stained, light greenish-gray, cream, and gray layers in a porphyritic aphanite (flow or tuff) with ~2-4% blue-gray quartz phenocrysts and 1-2% fine grained disseminated pyrite.

Table 1. Location and description of rock samples collected in the Iron Creek area for trace element geochemical analyses.

Sample	UTM E	UTM N	Description
99MBW530	396123	6915607	White, siliceous, quartz veined, quartz-sericite schist.
99MBW567	393850	6907893	Bright orange, iron stained zone approximately 50 feet wide with abundant fine grained disseminated pyrite in gray siliceous rock.
99MBW417	385096	6910383	Medium green, very fine grained, granular metagabbro/metavolcanic(?) rock cut by 1" crystalline quartz veins with areas of iron staining where pyrite is altering to limonite
99MBW449B	392719	6919758	30-foot-wide porphyritic dike that is iron stained and cut by quartz + pyrite + chalcopyrite(?) + limonite veins up to 1 foot thick, which occur in a sub-parallel set.
99ARJ037A	393534	6920040	Iron-stained gossan zone (3 meters wide) with abundant red hematite.
99ARJ071B	393084	6908569	Gossanous iron-stained zone in schistose, vaguely bedded(?), metatuffs/lavas(?) that are intensely fractured and faulted. Soft gouge occurs in faulted areas.
99PE009A	392634	6913648	Massive magnetite, hematite, limonite and quartz occur in a linear, reddish-stained zone within dark greenish-gray, aphanitic, amygdaloidal greenstone. Much of the iron mineral-bearing material is weathered out to boxworks.
99PE53	390282	6919745	Small, ~1-foot-thick, rusty stained zones with sulfides in greenstone.
99RN524A	394673	6916185	Very epidote altered metamafic rock cut by chalcedony(?) + pyrite + chalcopyrite(?) veins and masses.
99JS29A	395648	6914721	Gray to light yellow-orange weathering, white mica-quartz schist with ~2% very fine grained disseminated pyrite.
99JS33B	393629	6921975	Bright orange weathering calcite veins in metabasalt.
99JS39D	394350	6921333	Orange weathering, calcareous + quartz material with orange to red-brown boxworks, but with no obvious sulfides.
99JS45A	395642	6913155	Pale green, fine grained, equigranular, altered, quartz-feldspar dacite(?) with up to 15% disseminated pyrite (grains < 1 mm in diameter).
99JS57A	383559	6909858	Small, 2-meter-wide, orange-stained zone of bright, light and medium green, hornfelsed, metamafic(?) rocks cut by veins of quartz + red hematite, and calcite (or iron carbonate).
99MBW535	395919	6915744	2-foot-wide fault with intense pyrite alteration adjacent to very foliated dark green chlorite phyllite.
99MBW513	395263	6913394	Fault zone with intensely calcite- and iron carbonate-altered/veined, tan weathering, foliated rock.
99MBW420A	395835	6914617	Epidote altered and veined greenstone cut by sparse veins of quartz + epidote + limonite (after sulfides(?)) + carbonate(?) + possible tremolite(?) (or well-developed slicks? in quartz).
99MBW449C	392719	6919758	Malachite and azurite in sheared metagabbro float derived from rocks coming down from eastern hillside.
99MBW408A	380674	6920509	Hornfelsed volcaniclastic conglomerate/breccia with finely disseminated pyrite.
99MBW544	390683	6919566	Trachyte dike with color-zoned, pink-gray-white, square-shaped feldspar phenocrysts, that is cut by 1- to 2-mm-wide, pale gray quartz veins with 1 mm by 1 mm limonite patches (pseudomorphs after sulfide).

Table 1. Location and description of rock samples collected in the Iron Creek area for trace element geochemical analyses.

Sample	UTM E	UTM N	Description
99ARj044B	393146	6923847	Light tan and gray, angular limestone fragments (up to 1 inch) cemented by a calcareous/clay(?) matrix. A 1- to 2-foot-wide hand dug trench is found within a hematite-stained area.
83Hn83a	392870	6913760	30-foot-wide zone of chlorite-altered greenstone cut by quartz + hematite +/- pyrite +/- chalcopyrite (+/- pyrrhotite(?) or perhaps magnetite(?)) veins.
83Hn83b	392870	6913760	30-foot-wide zone of chlorite-altered greenstone cut by quartz + hematite +/- pyrite +/- chalcopyrite (+/- pyrrhotite(?) or perhaps magnetite(?)) veins.
83Hn83c	392870	6913760	30-foot-wide zone of chlorite-altered greenstone cut by quartz + hematite +/- pyrite +/- chalcopyrite (+/- pyrrhotite(?) or perhaps magnetite(?)) veins.
83Hn84	393060	6913510	Possible sphalerite(?) occurs as very finely disseminated pink/brown colored patches in quartzose rock with abundant pyrite.
83Hn107	394110	6913770	Medium green, aphanitic, amygdaloidal greenstone that is faulted and chlorite altered. Rock is cut by vein of quartz + hematite, and it is copper stained.
83Hn108	394130	6913790	Greenstone with pods and small, randomly-oriented veinlets of quartz + hematite + pyrite + chalcopyrite + copper oxide.
83Hn128	392840	6914100	Greenstone with pods of pyrite + arsenopyrite(?) + hematite + quartz.
83Hn134	393460	6912100	Mixed andesite(?) and a pinkish-green, fine grained, massive zone that is siliceous(?) and plag-rich.
83Hn136	393275	6912030	Greenstone with numerous iron-stained gossans with pyrite + chalcopyrite(?) patches and within small shears (minor).
83Hn139	394940	6913530	Light green to purplish zone in altered intermediate volcanic(?) rock with quartz crystals, which contains 3-5% pyrite (disseminated and in small veinlets).
83Hn146	393410	6912500	Rusty-weathering mineralization at the contact between limestone and tuff.
83Hn166	395900	6911090	Fine grained to aphanitic, chlorite altered, slightly foliated, intermediate(?) volcanic rock with minor pale blue quartz phenocrysts, that is cut by epidote-filled fractures..
83Hn168	395650	6911190	Orange-stained, bedded(?) horizon of siliceous rock composed of blue-gray, massive quartz with disseminations and veinlets of pyrite and sphalerite(?) (~5% combined sulfides).
83Hn170	395530	6911230	Slightly foliated/bedded(?) siliceous rock with chlorite(?), blue quartz eyes, and disseminated pyrite.
83Hn175	394730	6911200	Altered granodiorite with quartz + pyrite + chlorite alteration.
83Hn177	394920	6911300	Veinlets in metamorphosed crystal tuff(?).
83Hn178	394990	6911450	Folded quartz veins in greenschist(?).
83Hn184	393040	6912510	Tuff - andesite contact.
83Hn192.2	392800	6913600	Quartz + hematite + pyrite + chalcopyrite(?)-bearing rock.

Table 1. Location and description of rock samples collected in the Iron Creek area for trace element geochemical analyses.

Sample	UTM E	UTM N	Description
83Hn192.3	392800	6913600	Quartz and hematite in crude layers (mm to cm scale), with relative quartz:hematite percentages varying from 50:50 to almost 100% hematite.
83Hn192.4	392800	6913600	Dark green, chlorite-altered andesite(?) cut by quartz +/- hematite stringers from 3 mm to 2.5 cm that both cross-cut and are parallel to bedding. Up to 1% pyrite and (or) chalcopyrite in some veins.
83Hn192.5	392800	6913600	Dark green, chlorite altered, magnetic andesite(?) with quartz (up to 15%) + hematite (5-10%) + pyrite occurring in pods and veins.
83Hn192.6	392800	6913600	Chlorite altered andesite(?) with quartz, hematite, and sulfides (up to 3%) that are locally abundant and randomly distributed.
83Hn192.7	392800	6913600	Iron stained, altered andesite(?) with quartz + sulfides (locally up to 5%) + minor hematite throughout rock.
83Hn192.8	392800	6913600	Slightly iron stained, altered andesite with quartz + hematite + sulfide (2-3%) veins.
83Hn192.9	392800	6913600	Massive hematite, quartz, and pyrite (1-2%) that appears to grade laterally into andesite(?).

Table 2. Concentration of trace elements in rock samples collected in the Iron Creek area.

Note: na = not analyzed; Intf = interference between the spectral lines of Cu with those of Bi and P in high Cu samples.

SAMPLE	Au	Ag	Ag	Al	As	B	Ba	Be	Bi	Bi"	Ca	Cd	Co	Cr	Cu	Cu	Fe	Ga	Ge	Hg	Hg"
	ppb	ppm	opt	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	%	ppm	ppm	ppm	ppb
99ARJ029	50	0.6	na	3.33	14	<10	10	<0.5	<2	na	0.52	<0.5	45	198	772	na	8.88	<10	na	3	<10
99ARJ038A	10	0.4	na	2.04	8	<10	100	<0.5	<2	na	0.12	<0.5	18	86	229	na	4.86	<10	na	3	10
99ARJ069	25	<0.2	na	3.59	10	<10	10	<0.5	<2	na	3.66	<0.5	44	122	175	na	6.75	10	na	<1	na
99PE010A	205	4.6	na	0.78	146	<10	410	<0.5	Intf	1.6	0.7	<0.5	24	165	>10000	2.16	>15.00	<10	na	<1	na
99PE63	65	13.6	na	0.55	284	<10	10	<0.5	10	na	0.01	1.5	148	214	3780	na	8.91	<10	na	4	4780
99RN525	5	<0.2	na	1.64	<2	<10	20	<0.5	48	na	0.59	<0.5	22	85	35	na	>15.00	<10	na	3	80
99JS29C	10	0.4	na	5.15	2	<10	100	<0.5	<2	na	2.57	<0.5	33	49	146	na	4.92	10	na	<1	na
99JS33C	<5	0.8	na	3.48	8	<10	70	<0.5	<2	na	2.69	<0.5	12	27	246	na	11.95	<10	na	2	na
99JS40B	<5	<0.2	na	1.55	90	<10	120	<0.5	<2	na	1.06	<0.5	14	64	57	na	2.19	<10	na	<1	na
99JS46A	65	11	na	3.43	<2	<10	70	<0.5	Intf	na	0.98	<0.5	25	86	>10000	5.84	6.58	10	na	<1	na
99JS58A	<5	<0.2	na	4.1	<2	<10	90	<0.5	<2	na	0.64	<0.5	28	106	292	na	12.45	<10	na	1	20
99MBW537	15	1.4	na	0.96	20	<10	40	<0.5	<2	na	0.02	<0.5	69	131	1025	na	>15.00	<10	na	2	520
99MBW515B	<5	0.8	na	0.33	<2	<10	40	<0.5	<2	na	0.1	<0.5	2	207	17	na	0.73	<10	na	<1	na
99MBW430B	25	9.6	na	0.52	178	<10	30	<0.5	8	na	0.36	<0.5	490	147	8650	na	9.59	<10	na	1	290
99MBW515	45	1.2	na	2.8	2	<10	140	<0.5	<2	na	0.55	<0.5	12	105	81	na	6.18	<10	na	1	<10
99ARJ030B	<5	<0.2	na	0.43	12	<10	10	<0.5	<2	na	7.19	<0.5	4	150	21	na	0.86	<10	na	<1	na
99ARJ038B	30	0.8	na	1.4	20	<10	10	<0.5	2	na	0.03	<0.5	12	196	596	na	3.53	<10	na	<1	na
99ARJ068	<5	<0.2	na	2.5	<2	<10	40	<0.5	<2	na	1.25	<0.5	30	119	20	na	3.95	<10	na	<1	na
99PE010B	140	3.6	na	2.48	<2	<10	390	<0.5	16	na	0.07	<0.5	28	88	8110	na	9.44	<10	na	<1	na
99RN502	40	1.6	na	3.28	18	<10	70	<0.5	<2	na	0.09	6.5	13	39	121	na	4.93	<10	na	1	340
99RN526C	<5	0.2	na	1.71	<2	<10	200	<0.5	8	na	1.12	<0.5	18	109	6780	na	3.91	<10	na	<1	na
99JS29J	<5	0.2	na	1.57	30	<10	40	<0.5	<2	na	11.9	<0.5	16	51	31	na	2.99	<10	na	<1	na
99JS41A	<5	<0.2	na	0.21	<2	<10	<10	<0.5	<2	na	0.05	<0.5	3	393	17	na	0.8	<10	na	<1	na
99JS46C	100	10.6	na	3.19	<2	<10	10	<0.5	Intf	na	0.84	<0.5	28	82	>10000	4.06	6.89	10	na	<1	na
99JS66D	10	0.2	na	0.51	6	<10	10	<0.5	<2	na	0.07	<0.5	1	92	99	na	1.77	<10	na	<1	na
99MBW549A	270	6.2	na	0.42	2	<10	<10	<0.5	6	na	0.18	<0.5	16	197	5260	na	2.91	<10	na	<1	na
99MBW523	<5	<0.2	na	1.78	6	<10	160	<0.5	<2	na	0.67	<0.5	3	111	136	na	1.65	<10	na	<1	na
99MBW436	<5	2.6	na	1	184	<10	10	<0.5	2	na	0.07	<0.5	206	119	964	na	>15.00	<10	na	1	310
99ARJ033	<5	<0.2	na	4.59	<2	<10	110	<0.5	<2	na	0.47	<0.5	51	194	1140	na	7.69	10	na	<1	na
99ARJ041	<5	0.2	na	2.39	100	<10	20	<0.5	<2	na	0.81	<0.5	92	476	581	na	4.83	<10	na	1	na
99ARJ056	<5	<0.2	na	2.91	2	<10	60	<0.5	<2	na	0.52	<0.5	19	87	142	na	4.46	<10	na	<1	na
99PE011A	10	<0.2	na	5.11	<2	<10	10	<0.5	<2	na	0.14	<0.5	26	84	419	na	9.52	10	na	<1	na
99RN511A	210	>100.0	3.5	5.65	18	<10	<10	<0.5	Intf	na	0.01	1	335	178	>10000	5.87	>15.00	20	na	<1	na
99JS28B	<5	0.2	na	0.29	14	<10	40	<0.5	<2	na	0.16	<0.5	4	79	97	na	0.6	<10	na	<1	na

Table 2. Concentration of trace elements in rock samples collected in the Iron Creek area.

Note: na = not analyzed; Intf = interference between the spectral lines of Cu with those of Bi and P in high Cu samples.

SAMPLE	Au	Ag	Ag	Al	As	B	Ba	Be	Bi	Bi"	Ca	Cd	Co	Cr	Cu	Cu	Fe	Ga	Ge	Hg	Hg"
	ppb	ppm	opt	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	%	ppm	ppm	ppm	ppb
99JS29K	35	6.2	na	1.02	46	<10	20	<0.5	8	na	0.01	<0.5	91	177	9070	na	6.18	<10	na	1	330
99JS35C	<5	<0.2	na	2.14	<2	<10	10	<0.5	<2	na	1.48	<0.5	23	25	153	na	4.34	<10	na	<1	na
99JS41D	5	1.8	na	1.2	8	<10	<10	<0.5	6	na	0.05	<0.5	62	308	2980	na	4.27	<10	na	1	80
99JS46D	150	15.2	na	2.39	<2	<10	10	<0.5	Intf	na	0.85	<0.5	13	70	>10000	5.49	4.29	<10	na	<1	na
99MBW525	<5	0.2	na	1.21	12	<10	110	<0.5	<2	na	0.29	<0.5	6	112	274	na	2.56	<10	na	<1	na
99MBW559	270	>100.0	3.8	1.76	<2	<10	10	<0.5	Intf	na	0.06	<0.5	<1	6	>10000	31.5	7.81	<10	na	<1	na
99MBW547A	<5	1.8	na	0.04	<2	<10	<10	<0.5	<2	na	0.02	<0.5	2	297	3480	na	1.09	<10	na	<1	na
99MBW441B	<5	<0.2	na	0.47	<2	<10	90	<0.5	<2	na	0.16	<0.5	2	227	358	na	0.81	<10	na	<1	na
99ARJ034A	<5	<0.2	na	0.49	<2	<10	<10	<0.5	<2	na	<.01	<0.5	9	121	102	na	14.75	<10	na	1	20
99ARJ042B	<5	<0.2	na	0.44	<2	<10	<10	<0.5	<2	na	0.07	<0.5	<1	163	136	na	0.64	<10	na	<1	na
99ARJ052B	<5	<0.2	na	2.29	<2	<10	190	<0.5	<2	na	2.83	<0.5	13	34	58	na	4.13	<10	na	<1	na
99PE11B	15	12.6	na	0.18	<2	<10	<10	<0.5	Intf	na	<.01	<0.5	<1	117	>10000	4.12	13.15	<10	na	<1	na
99RN511B	205	22.6	na	5.08	124	<10	<10	<0.5	Intf	1.7	0.05	2	376	109	>10000	3.71	>15.00	10	na	<1	na
99JS28F	<5	0.2	na	0.49	14	<10	40	<0.5	<2	na	5.03	<0.5	11	49	380	na	3.59	<10	na	1	10
99JS31D	15	<0.2	na	0.33	<2	<10	10	<0.5	<2	na	12.35	<0.5	29	27	207	na	4.71	<10	na	<1	na
99JS35D	10	<0.2	na	2.12	44	<10	40	<0.5	<2	na	0.65	<0.5	5	52	147	na	3.91	<10	na	<1	na
99JS44A	<5	0.2	na	2.68	<2	<10	130	<0.5	<2	na	1.02	<0.5	17	32	75	na	5.61	<10	na	<1	na
99JS46E	<5	<0.2	na	3.52	<2	<10	50	<0.5	6	na	1.52	<0.5	32	93	9530	na	6.42	10	na	<1	na
99MBW529B	70	2.4	na	0.42	312	<10	150	<0.5	<2	na	0.02	<0.5	<1	70	47	na	2.36	<10	na	2	1500
99MBW565	<5	<0.2	na	0.71	<2	<10	20	<0.5	<2	na	0.05	<0.5	1	184	93	na	1.97	<10	na	<1	na
99MBW405B	95	0.8	na	5.35	<2	<10	30	<0.5	<2	na	3.77	<0.5	10	139	903	na	2.96	10	na	<1	na
99MBW442	<5	0.2	na	0.71	4	<10	10	<0.5	<2	na	0.37	<0.5	34	237	401	na	5.27	<10	na	1	10
99ARJ034C	<5	<0.2	na	3.88	<2	<10	10	<0.5	<2	na	1.33	<0.5	40	100	128	na	6.27	<10	na	<1	na
99ARJ046	<5	<0.2	na	0.54	<2	<10	90	<0.5	<2	na	0.07	<0.5	1	158	31	na	0.88	<10	na	<1	na
99ARJ073B	<5	<0.2	na	2.32	<2	<10	60	<0.5	<2	na	1.13	<0.5	27	124	46	na	4.04	<10	na	<1	na
99PE20A	<5	<0.2	na	1.18	<2	<10	<10	<0.5	<2	na	1.56	<0.5	36	120	61	na	2.68	<10	na	1	<10
99RN517	<5	0.2	na	1.95	6	<10	30	<0.5	<2	na	1.23	1	5	97	42	na	2.47	<10	na	<1	na
99JS28K	5	<0.2	na	2.08	2	<10	20	<0.5	<2	na	2.16	<0.5	3	217	35	na	1.45	<10	na	1	<10
99JS32B	<5	<0.2	na	1.49	8	<10	10	<0.5	<2	na	1.61	<0.5	17	64	96	na	4.25	<10	na	<1	na
99JS35E	10	<0.2	na	2.42	108	<10	40	<0.5	<2	na	1.63	<0.5	4	127	145	na	4.52	<10	na	<1	na
99JS44B	<5	0.2	na	1.41	<2	<10	50	<0.5	<2	na	0.23	<0.5	9	111	39	na	3.4	<10	na	<1	na
99JS50	<5	<0.2	na	0.85	12	<10	80	<0.5	<2	na	0.1	<0.5	2	88	7	na	1.84	<10	na	<1	na
99MBW530	15	1.2	na	0.29	66	<10	640	<0.5	<2	na	<.01	<0.5	<1	191	38	na	0.73	<10	na	6	6560
99MBW567	10	<0.2	na	2.63	<2	<10	30	<0.5	<2	na	0.24	<0.5	13	85	24	na	5.52	<10	na	1	20

Table 2. Concentration of trace elements in rock samples collected in the Iron Creek area.

Note: na = not analyzed; Intf = interference between the spectral lines of Cu with those of Bi and P in high Cu samples.

SAMPLE	Au	Ag	Ag	Al	As	B	Ba	Be	Bi	Bi"	Ca	Cd	Co	Cr	Cu	Cu	Fe	Ga	Ge	Hg	Hg"
	ppb	ppm	opt	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	%	ppm	ppm	ppm	ppb
99MBW417	10	0.2	na	1.56	8	<10	80	<0.5	<2	na	0.76	<0.5	35	96	911	na	10.65	<10	na	12	16240
99MBW449B	<5	<0.2	na	1.26	<2	<10	390	<0.5	<2	na	0.45	<0.5	5	97	169	na	2.14	<10	na	<1	na
99ARJ037A	<5	<0.2	na	1.58	8	<10	50	<0.5	<2	na	0.02	<0.5	5	61	13	na	5.42	<10	na	<1	na
99ARJ071B	<5	<0.2	na	1.77	<2	<10	50	<0.5	<2	na	0.94	<0.5	8	81	40	na	3.31	<10	na	<1	na
99PE009A	130	2	na	0.81	68	<10	30	<0.5	12	na	0.04	<0.5	35	46	2160	na	>15.00	<10	na	<1	na
99PE53	525	34.2	na	4.26	200	<10	<10	<0.5	Intf	na	0.07	3.5	639	118	>10000	4.66	>15.00	10	na	<1	na
99RN524A	10	0.2	na	1.41	2	<10	60	<0.5	4	na	1.98	<0.5	62	161	2990	na	6.04	<10	na	<1	na
99JS29A	<5	<0.2	na	4.05	2	<10	90	0.5	<2	na	2.88	2.5	7	50	44	na	2.26	10	na	2	na
99JS33B	<5	<0.2	na	0.2	<2	<10	<10	<0.5	<2	na	13.1	<0.5	6	5	3	na	8.11	<10	na	<1	na
99JS39D	<5	<0.2	na	1.16	8	<10	10	<0.5	<2	na	6.57	<0.5	37	156	235	na	6.94	<10	na	<1	na
99JS45A	<5	<0.2	na	1.66	<2	<10	<10	<0.5	<2	na	0.19	<0.5	7	77	7	na	3.68	<10	na	<1	na
99JS57A	<5	<0.2	na	0.8	<2	<10	130	<0.5	<2	na	6.78	<0.5	18	96	10	na	3.61	<10	na	<1	na
99MBW535	105	1	na	1.15	386	<10	<10	<0.5	2	na	0.02	<0.5	128	123	288	na	>15.00	<10	na	1	190
99MBW513	80	0.2	na	0.23	<2	<10	30	<0.5	<2	na	7.94	<0.5	8	123	9	na	2.72	<10	na	<1	na
99MBW420A	<5	<0.2	na	0.33	<2	<10	<10	<0.5	<2	na	0.47	<0.5	3	322	12	na	1.17	<10	na	<1	na
99MBW449C	<5	<0.2	na	5.31	4	<10	10	<0.5	2	na	3.41	0.5	303	85	6800	na	6.02	10	na	<1	na
99MBW408A	15	<0.2	na	2.75	6	<10	70	<0.5	<2	na	1.43	<0.5	11	38	92	na	3.97	<10	na	<1	na
99MBW544	<5	<0.2	na	1.5	<2	<10	50	<0.5	<2	na	0.81	<0.5	7	14	41	na	2.15	<10	na	<1	na
99ARj044B*	<5	<0.02	na	0.03	<2.0	<10	<10	0.2	0.03	na	>15.00	0.44	2.2	4	3.4	na	0.12	0.3	<0.1	0.06	na
83Hn83a	60	0.6	na	na	<5	na	80	na	na	<0.1	na	na	5	na	2272	na	na	na	na	0.31	na
83Hn83b	620	5.3	na	na	11	na	<20	na	na	0.1	na	na	14	na	15980	na	na	na	na	3.10	na
83Hn83c	10	1.6	na	na	<5	na	<20	na	na	1.4	na	na	22	na	1039	na	na	na	na	2.50	na
83Hn84	20	1.9	na	na	<5	na	30	na	na	1.8	na	na	<2	na	2135	na	na	na	na	0.20	na
83Hn107	20	2.7	na	na	10	na	400	na	na	3.7	na	na	14	na	18310	na	na	na	na	0.11	na
83Hn108	10	9.8	na	na	<5	na	<20	na	na	0.6	na	na	9	na	306	na	na	na	na	0.38	na
83Hn128	5	0.2	na	na	<5	na	1120	na	na	na	na	na	47	na	70	na	na	na	na	0.07	na
83Hn134	5	0.3	na	na	20	na	140	na	na	na	na	na	38	na	76	na	na	na	na	0.04	na
83Hn136	10	0.6	na	na	389	na	1140	na	na	0.3	na	na	6	na	592	na	na	na	na	0.09	na
83Hn139	5	0.5	na	na	10	na	100	na	na	na	na	na	28	na	70	na	na	na	na	0.04	na
83Hn146	10	2.5	na	na	28	na	180	na	na	<0.1	na	na	6	na	2864	na	na	na	na	0.15	na
83Hn166	40	0.2	na	na	<5	na	360	na	na	na	na	na	15	na	83	na	na	na	na	0.09	na
83Hn168	5	0.3	na	na	<5	na	600	na	na	1	na	na	15	na	55	na	na	na	na	0.05	na
83Hn170	5	0.6	na	na	29	na	2300	na	na	na	na	na	5	na	43	na	na	na	na	0.06	na
83Hn175	5	0.4	na	na	<5	na	140	na	na	na	na	na	14	na	110	na	na	na	na	0.04	na

Table 2. Concentration of trace elements in rock samples collected in the Iron Creek area.

Note: na = not analyzed; Intf = interference between the spectral lines of Cu with those of Bi and P in high Cu samples.

SAMPLE	Au	Ag	Ag	Al	As	B	Ba	Be	Bi	Bi"	Ca	Cd	Co	Cr	Cu	Cu	Fe	Ga	Ge	Hg	Hg"
	ppb	ppm	opt	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	%	ppm	ppm	ppm	ppb
83Hn177	5	0.2	na	na	<5	na	100	na	na	na	na	na	22	na	63	na	na	na	na	0.06	na
83Hn178	5	0.2	na	na	<5	na	200	na	na	na	na	na	<2	na	9	na	na	na	na	0.04	na
83Hn184	5	0.2	na	na	<5	na	140	na	na	na	na	na	61	na	<5	na	na	na	na	0.69	na
83Hn192.2	5	1.5	na	na	<5	na	60	na	na	0.3	na	na	14	na	5950	na	na	na	na	0.16	na
83Hn192.3	100	0.6	na	na	<5	na	<20	na	na	0.5	na	na	9	na	2376	na	na	na	na	0.11	na
83Hn192.4	10	0.5	na	na	<5	na	140	na	na	na	na	na	11	na	856	na	na	na	na	0.08	na
83Hn192.5	10	0.7	na	na	<5	na	110	na	na	0.3	na	na	47	na	2179	na	na	na	na	0.55	na
83Hn192.6	5	0.3	na	na	<5	na	220	na	na	na	na	na	38	na	243	na	na	na	na	0.12	na
83Hn192.7	5	0.6	na	na	<5	na	<20	na	na	0.5	na	na	6	na	955	na	na	na	na	1.50	na
83Hn192.8	5	0.5	na	na	<5	na	<20	na	na	na	na	na	28	na	305	na	na	na	na	0.78	na
83Hn192.9	10	1.2	na	na	15	na	<20	na	na	na	na	na	6	na	260	na	na	na	na	6.50	na

Table 2. Concentration of trace elements in rock samples collected in the Iron Creek area.

Note: na = not analyzed; Intf = interference between the spectral lines of Cu with those of Bi and P in high Cu samples.

SAMPLE	K	La	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb	Sc	Se	Sn	Sr	Ti	Tl	U	V	W	Zn	Te
	%	ppm	%	ppm	ppm	%	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm
99ARJ029	0.03	<10	2.95	345	<1	0.14	44	420	2	1.8	8	14	na	na	25	0.07	<10	<10	199	<10	62	na
99ARJ038A	0.29	<10	0.37	260	<1	0.03	3	10	<2	0.46	6	<1	na	na	5	<0.01	<10	<10	2	<10	34	na
99ARJ069	<0.01	<10	4.1	1140	<1	0.06	52	470	2	0.01	<2	20	na	na	54	0.52	<10	<10	247	<10	52	na
99PE010A	<0.01	<10	0.76	785	10	0.01	22	Intf	<2	0.43	<2	8	na	na	32	0.06	<10	<10	129	<10	216	na
99PE63	0.01	<10	0.26	190	9	<0.01	14	10	18	>5.00	10	2	na	na	1	<0.01	<10	<10	38	<10	438	na
99RN525	<0.01	<10	1.43	295	79	<0.01	27	110	<2	0.02	4	5	na	na	4	0.06	<10	10	66	<10	42	na
99JS29C	0.17	<10	0.69	205	<1	0.29	38	710	8	2.69	4	11	na	na	42	0.21	<10	<10	115	<10	38	na
99JS33C	0.22	10	0.71	370	<1	0.51	4	730	2	0.4	4	8	na	na	22	0.13	<10	<10	58	<10	40	na
99JS40B	0.03	<10	0.45	110	<1	0.06	34	140	<2	0.04	2	4	na	na	24	0.06	<10	<10	29	<10	6	na
99JS46A	<0.01	<10	3.58	1015	<1	0.05	55	Intf	<2	1.45	<2	11	na	na	35	0.57	<10	<10	188	<10	48	na
99JS58A	<0.01	<10	2.62	615	<1	<0.01	45	270	<2	0.01	2	29	na	na	36	0.3	<10	<10	159	<10	30	na
99MBW537	<0.01	<10	0.39	910	28	<0.01	16	60	2	4.21	6	6	na	na	2	0.03	<10	10	65	<10	14	na
99MBW515B	0.03	<10	0.19	85	<1	0.01	3	110	12	0.23	<2	1	na	na	1	<0.01	<10	<10	16	<10	10	na
99MBW430B	0.03	<10	0.21	395	<1	<0.01	28	10	6	4.95	<2	3	na	na	2	<0.01	<10	<10	27	<10	140	na
99MBW515	0.12	<10	1.61	605	<1	0.12	6	110	16	2.17	2	8	na	na	19	0.01	<10	<10	120	<10	112	na
99ARJ030B	0.05	<10	0.33	305	<1	<0.01	9	<10	<2	0.05	<2	3	na	na	49	<0.01	<10	<10	16	<10	6	na
99ARJ038B	0.06	<10	0.65	115	5	<0.01	14	80	<2	0.17	<2	4	na	na	3	0.02	<10	<10	40	<10	26	na
99ARJ068	0.12	<10	2.96	485	<1	0.08	108	260	<2	<0.01	2	3	na	na	20	0.15	<10	<10	94	<10	56	na
99PE010B	0.11	<10	1.86	450	<1	<0.01	20	210	<2	0.08	<2	13	na	na	23	0.02	<10	<10	161	<10	158	na
99RN502	0.23	<10	3.26	405	<1	0.06	7	260	122	2.75	6	14	na	na	8	0.04	<10	<10	113	<10	1445	na
99RN526C	<0.01	<10	1.62	470	<1	0.03	34	370	<2	0.35	<2	6	na	na	57	0.43	<10	<10	126	<10	24	na
99JS29J	0.3	<10	0.32	770	<1	<0.01	17	370	4	0.01	8	16	na	na	44	0.01	<10	<10	88	<10	226	na
99JS41A	<0.01	<10	0.16	55	1	<0.01	6	10	<2	<0.01	<2	<1	na	na	<1	0.01	<10	<10	13	<10	8	na
99JS46C	<0.01	<10	3.61	930	<1	0.05	63	Intf	<2	0.75	<2	11	na	na	21	0.59	<10	<10	194	<10	140	na
99JS66D	0.08	<10	0.07	30	1	0.1	1	100	2	0.03	<2	1	na	na	4	0.01	<10	<10	11	<10	4	na
99MBW549A	0.02	<10	0.13	70	<1	<0.01	15	70	<2	0.02	<2	1	na	na	14	0.01	<10	<10	154	<10	26	na
99MBW523	0.36	<10	0.42	205	<1	0.16	3	180	<2	0.46	<2	3	na	<2	59	0.05	<10	<10	19	<10	42	na
99MBW436	0.03	<10	0.17	185	<1	<0.01	49	120	8	>5.00	10	9	na	na	3	<0.01	<10	10	55	<10	38	na
99ARJ033	<0.01	<10	4.29	1010	<1	<0.01	93	390	<2	0.09	<2	14	na	na	23	0.15	<10	<10	158	<10	54	na
99ARJ041	0.26	<10	2.42	215	<1	0.03	375	60	<2	1.4	2	3	na	na	10	0.05	<10	<10	37	<10	70	na
99ARJ056	0.16	<10	1.99	710	<1	0.1	76	430	2	0.22	2	10	na	na	34	0.15	<10	<10	113	<10	72	na
99PE011A	0.06	<10	4.32	830	10	<0.01	38	170	<2	0.4	2	24	na	<2	4	0.21	<10	<10	218	<10	120	na
99RN511A	0.04	<10	2.92	400	<1	<0.01	97	Intf	<2	4.46	<2	24	na	na	3	0.04	<10	10	275	<10	476	na
99JS28B	0.16	<10	0.03	55	<1	0.07	2	10	2	0.16	<2	<1	na	na	4	<0.01	<10	<10	2	<10	6	na

Table 2. Concentration of trace elements in rock samples collected in the Iron Creek area.

Note: na = not analyzed; Intf = interference between the spectral lines of Cu with those of Bi and P in high Cu samples.

SAMPLE	K	La	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb	Sc	Se	Sn	Sr	Ti	Tl	U	V	W	Zn	Te
	%	ppm	%	ppm	ppm	%	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm
99JS29K	0.06	<10	0.33	170	10	<0.01	25	90	<2	1.53	<2	3	na	na	1	<0.01	<10	<10	36	<10	22	na
99JS35C	0.05	<10	0.76	330	<1	0.08	6	720	2	0.37	<2	8	na	na	14	0.23	<10	<10	136	<10	40	na
99JS41D	<0.01	<10	0.73	300	<1	<0.01	20	40	2	<0.01	<2	3	na	<2	2	0.02	<10	<10	64	<10	104	na
99JS46D	<0.01	<10	2.71	620	<1	0.04	32	Intf	<2	1.14	<2	5	na	na	23	0.53	<10	<10	141	<10	100	na
99MBW525	0.42	<10	0.39	275	44	0.12	4	40	<2	1.1	<2	1	na	<2	68	0.05	<10	<10	25	<10	48	na
99MBW559	<0.01	<10	1.54	365	<1	<0.01	30	Intf	<2	>5.00	<2	8	na	na	6	0.01	10	<10	199	<10	44	na
99MBW547A	<0.01	<10	0.01	25	3	<0.01	4	10	<2	0.66	<2	<1	na	<2	<1	<0.01	<10	<10	3	<10	<2	na
99MBW441B	0.07	<10	0.14	120	15	0.05	3	120	<2	0.04	<2	<1	na	<2	29	0.01	<10	<10	11	<10	16	na
99ARJ034A	<0.01	<10	0.27	85	8	<0.01	9	10	<2	<0.01	<2	1	na	<2	1	0.01	<10	<10	61	130	6	na
99ARJ042B	0.33	<10	<.01	150	1	0.12	1	<10	4	<0.01	2	<1	na	<2	<1	<0.01	<10	<10	<1	<10	66	na
99ARJ052B	0.22	<10	1.17	775	3	0.07	4	630	6	1.26	<2	9	na	<2	29	0.19	<10	<10	64	<10	66	na
99PE11B	<0.01	<10	0.1	55	4	<0.01	5	Intf	10	0.26	<2	1	na	na	1	<0.01	<10	<10	76	140	30	na
99RN511B	<0.01	<10	2.65	400	<1	<0.01	79	Intf	<2	>5.00	<2	20	na	<2	1	0.06	<10	<10	220	<10	472	na
99JS28F	0.15	<10	0.73	930	<1	0.01	29	270	8	0.12	2	3	na	<2	152	<0.01	<10	<10	15	<10	52	na
99JS31D	0.1	<10	5.26	1095	<1	<0.01	73	<10	<2	0.05	<2	5	na	na	162	<0.01	<10	<10	45	<10	38	na
99JS35D	0.59	<10	0.72	150	<1	0.01	10	1240	<2	0.32	<2	7	na	<2	9	0.16	<10	<10	67	<10	6	na
99JS44A	0.19	<10	2.17	455	<1	0.11	20	920	2	0.41	2	9	na	na	24	0.31	<10	<10	177	<10	74	na
99JS46E	<0.01	<10	4.48	1275	<1	0.04	63	490	<2	0.02	<2	11	na	na	6	0.61	<10	<10	208	<10	140	na
99MBW529B	0.26	<10	0.06	15	1	<0.01	1	30	70	1.18	14	<1	na	<2	4	<0.01	<10	<10	3	<10	8	na
99MBW565	0.09	<10	0.3	120	1	0.08	3	30	<2	0.82	2	1	na	<2	2	<0.01	<10	<10	7	<10	8	na
99MBW405B	0.05	<10	0.71	225	<1	0.5	26	680	2	0.1	2	9	na	na	181	0.26	<10	<10	144	<10	24	na
99MBW442	0.02	<10	0.5	195	7	0.01	29	100	<2	1.27	<2	4	na	<2	23	0.12	<10	<10	106	<10	42	na
99ARJ034C	<0.01	<10	3.58	835	<1	<0.01	60	460	2	<0.01	<2	8	na	na	92	0.48	<10	<10	139	<10	66	na
99ARJ046	0.34	30	0.05	80	1	0.14	3	10	2	<0.01	<2	1	na	na	6	0.01	<10	<10	4	<10	6	na
99ARJ073B	0.32	<10	2.08	515	<1	0.1	53	450	<2	0.03	<2	5	na	na	22	0.42	<10	<10	126	<10	26	na
99PE20A	0.01	<10	0.33	95	<1	0.02	35	200	2	1.12	<2	4	na	<2	87	0.25	<10	<10	71	<10	2	na
99RN517	0.13	<10	0.22	175	9	0.26	21	1540	4	0.12	2	4	na	<2	70	0.13	<10	<10	66	<10	90	na
99JS28K	0.01	<10	0.11	115	<1	<0.01	14	300	8	0.3	<2	4	na	<2	12	0.09	<10	<10	37	<10	32	na
99JS32B	0.08	<10	0.95	230	121	0.09	33	690	8	0.88	<2	7	na	<2	53	0.51	<10	<10	108	<10	58	na
99JS35E	0.53	<10	0.36	150	<1	0.02	7	350	<2	0.34	<2	8	na	na	17	0.19	<10	<10	82	<10	2	na
99JS44B	0.07	<10	1.31	75	4	0.09	21	860	6	0.64	<2	12	na	<2	8	<0.01	<10	<10	150	<10	50	na
99JS50	0.06	<10	0.49	100	9	0.12	2	230	<2	0.44	<2	7	na	<2	6	0.01	<10	<10	22	<10	40	na
99MBW530	0.27	10	<.01	5	3	<0.01	2	10	132	0.06	26	<1	na	<2	5	<0.01	<10	<10	1	<10	148	na
99MBW567	0.06	<10	1.8	425	<1	0.09	6	80	4	2.52	2	7	na	<2	21	<0.01	<10	<10	102	<10	54	na

Table 2. Concentration of trace elements in rock samples collected in the Iron Creek area.

Note: na = not analyzed; Intf = interference between the spectral lines of Cu with those of Bi and P in high Cu samples.

SAMPLE	K	La	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb	Sc	Se	Sn	Sr	Ti	Tl	U	V	W	Zn	Te
	%	ppm	%	ppm	ppm	%	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm
99MBW417	0.07	<10	0.88	1330	<1	0.01	44	230	<2	<0.01	36	12	na	<2	24	0.24	<10	<10	158	<10	140	na
99MBW449B	0.58	<10	0.57	375	<1	0.06	4	550	<2	0.14	<2	4	na	<2	16	0.1	<10	<10	49	<10	70	na
99ARJ037A	0.17	<10	0.37	200	2	0.01	3	<10	<2	0.11	<2	<1	na	<2	1	<0.01	<10	<10	1	<10	10	na
99ARJ071B	0.15	<10	1.48	670	<1	0.1	4	220	2	0.69	4	9	na	na	25	0.06	<10	<10	87	<10	166	na
99PE009A	0.03	<10	0.45	115	47	<0.01	12	100	12	0.05	8	4	na	na	5	0.01	<10	10	130	<10	60	na
99PE53	<0.01	<10	2.08	375	<1	<0.01	84	Intf	<2	>5.00	<2	21	na	na	3	0.13	10	10	196	<10	682	na
99RN524A	0.04	<10	0.36	155	<1	<0.01	18	300	<2	2.1	<2	8	na	na	113	0.23	<10	<10	82	<10	2	na
99JS29A	0.16	<10	0.94	195	6	0.45	17	580	8	0.62	4	2	na	na	119	0.09	<10	<10	29	<10	166	na
99JS33B	0.08	<10	5.04	2750	<1	0.01	18	40	6	0.03	2	14	na	na	431	<0.01	<10	<10	29	<10	50	na
99JS39D	0.02	<10	0.47	1100	<1	<0.01	62	180	<2	0.01	10	27	na	na	26	0.01	<10	<10	229	<10	38	na
99JS45A	0.01	<10	1.35	555	<1	0.08	4	210	<2	1.55	2	9	na	na	8	0.01	<10	<10	40	<10	44	na
99JS57A	<0.01	<10	2.96	895	<1	<0.01	32	120	<2	0.01	6	13	na	na	68	0.01	<10	<10	122	<10	84	na
99MBW535	<0.01	<10	0.46	135	4	<0.01	27	70	28	>5.00	16	5	na	na	1	<0.01	<10	<10	57	<10	90	na
99MBW513	0.09	<10	3.48	695	<1	<0.01	17	<10	2	0.08	<2	5	na	na	94	<0.01	<10	<10	10	<10	24	na
99MBW420A	0.01	<10	0.08	180	<1	<0.01	7	40	<2	<0.01	2	1	na	na	29	<0.01	<10	<10	21	<10	6	na
99MBW449C	0.01	<10	5.43	1950	18	<0.01	188	180	2	0.21	<2	27	na	na	55	0.01	<10	<10	207	<10	594	na
99MBW408A	0.41	<10	0.65	390	9	0.36	8	570	<2	0.78	<2	5	na	<2	91	0.19	<10	<10	86	<10	42	na
99MBW544	0.27	<10	0.59	390	2	0.11	2	1210	4	<0.01	<2	5	na	<2	159	0.09	<10	<10	75	<10	46	na
99ARj044B*	0.01	<10	0.85	275	<0.2	<0.01	<1	80	12	<0.01	0.1	<1	<0.5	<2	172	<0.01	<0.02	0.25	<1	0.15	10	0.1
83Hn83a	na	na	na	1234	2	na	50	na	11	na	<2	na	na	<2	na	na	na	na	na	2	151	na
83Hn83b	na	na	na	540	19	na	13	na	8	na	10	na	na	<2	na	na	na	na	na	28	163	na
83Hn83c	na	na	na	7	58	na	15	na	10	na	<2	na	na	<2	na	na	na	na	na	24	14	na
83Hn84	na	na	na	374	32	na	25	na	13	na	<2	na	na	<2	na	na	na	na	na	14	150	na
83Hn107	na	na	na	641	21	na	26	na	13	na	<2	na	na	<2	na	na	na	na	na	16	74	na
83Hn108	na	na	na	566	54	na	36	na	13	na	<2	na	na	<2	na	na	na	na	na	11	102	na
83Hn128	na	na	na	558	<1	na	27	na	6	na	<2	na	na	na	na	na	na	na	na	<1	39	na
83Hn134	na	na	na	391	<1	na	58	na	8	na	<2	na	na	na	na	na	na	na	na	<1	33	na
83Hn136	na	na	na	388	<1	na	99	na	7	na	<2	na	na	<2	na	na	na	na	na	<1	53	na
83Hn139	na	na	na	712	<1	na	105	na	13	na	<2	na	na	na	na	na	na	na	na	<1	81	na
83Hn146	na	na	na	736	<1	na	28	na	9	na	<2	na	na	<2	na	na	na	na	na	<1	65	na
83Hn166	na	na	na	839	4	na	13	na	9	na	<2	na	na	na	na	na	na	na	na	<1	26	na
83Hn168	na	na	na	898	<1	na	11	na	14	na	<2	na	na	<2	na	na	na	na	na	<1	175	na
83Hn170	na	na	na	471	2	na	8	na	17	na	<2	na	na	na	na	na	na	na	na	<1	116	na
83Hn175	na	na	na	327	<1	na	23	na	8	na	<2	na	na	na	na	na	na	na	na	<1	50	na

Table 2. Concentration of trace elements in rock samples collected in the Iron Creek area.

Note: na = not analyzed; Intf = interference between the spectral lines of Cu with those of Bi and P in high Cu samples.

SAMPLE	K	La	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb	Sc	Se	Sn	Sr	Ti	Tl	U	V	W	Zn	Te
	%	ppm	%	ppm	ppm	%	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm
83Hn177	na	na	na	491	2	na	2	na	7	na	<2	na	na	na	na	na	na	na	na	<1	<2	na
83Hn178	na	na	na	474	<1	na	9	na	8	na	<2	na	na	na	na	na	na	na	na	<1	<2	na
83Hn184	na	na	na	2063	<1	na	32	na	12	na	7	na	na	na	na	na	na	na	na	<1	<2	na
83Hn192.2	na	na	na	745	36	na	16	na	9	na	<2	na	na	<2	na	na	na	na	na	30	62	na
83Hn192.3	na	na	na	559	31	na	14	na	9	na	<2	na	na	<2	na	na	na	na	na	40	13	na
83Hn192.4	na	na	na	1447	27	na	42	na	11	na	<2	na	na	na	na	na	na	na	na	7	116	na
83Hn192.5	na	na	na	1840	7	na	46	na	10	na	<2	na	na	<2	na	na	na	na	na	4	137	na
83Hn192.6	na	na	na	737	15	na	32	na	10	na	<2	na	na	na	na	na	na	na	na	10	93	na
83Hn192.7	na	na	na	<1	47	na	11	na	8	na	<2	na	na	<2	na	na	na	na	na	13	8	na
83Hn192.8	na	na	na	791	27	na	32	na	9	na	<2	na	na	na	na	na	na	na	na	35	84	na
83Hn192.9	na	na	na	37	68	na	10	na	8	na	51	na	na	na	na	na	na	na	na	27	<2	na

Table 3. Location and description of rock samples collected in the Iron Creek area for major-oxide, minor oxide, and trace element analyses.

Sample #	UTM E	UTM N	Sample description
99ARj027	382633	6908334	**Metabasalt or microgabbro:** dark green, massive, very fine grained, possible relict subophitic(?) texture, slightly porphyritic to glomeroporphyritic with plagioclase phenocrysts (~5-10%). In the matrix, plagioclase laths are intergrown with felted actinolite (after clinopyroxene(?)), primary and secondary opaques (~3-4%), and epidote, which has extensively replaced plagioclase and probably clinopyroxene. The rock is cut by microveinlets of epidote and actinolite.
99ARJ028	388127	6909105	**Biotite hornblende diorite:** white, relatively fresh, medium grained, equigranular, ~15% mafics, not foliated. Primary minerals include plagioclase, quartz, K-feldspar, hornblende, and biotite. Plagioclase occurs as euhedral to subhedral, albite-twinned, +/- compositionally zoned crystals. Quartz predominantly occurs as large, anhedral crystals, some of which crystallized in late open space. K-feldspar is relatively minor (~5%) and occurs as an unzoned, late crystallizing phase. Hornblende occurs as large, anhedral, +/- twinned crystals. Biotite occurs as large, anhedral crystals with trace chlorite and epidote alteration. Both hornblende and biotite are poikilitic, with inclusions of plagioclase, apatite, zircon, sphene, and primary opaques. Accessory minerals include zircon, apatite (euhedral), sphene (anhedral grains), and primary opaques (~2%, small, rounded), all of which are spatially associated with biotite and hornblende
99ARj032	394024	6912513	**Granodiorite/tonalite:** white, fine grained, equigranular, foliated, sparse disseminated pyrite. Primary minerals include quartz, plagioclase, K-feldspar, hornblende, and biotite. Quartz occurs as large anhedral grains that have been recrystallized. Plagioclase occurs as euhedral to subhedral, albite twinned crystals that are variably altered to epidote, sericite, calcite, and (or) clinozoisite. K-feldspar is minor (</=10%) and occurs as a late crystallizing phase. Hornblende is relatively minor and occurs as anhedral crystals that have been partially altered to chlorite and epidote. Biotite occurs as deformed, euhedral to subhedral crystals that have been extensively altered to chlorite, secondary opaques, epidote, rutile, and calcite. Primary opaques are rounded, relatively minor, and partially removed during alteration. Sphene occurs as large, anhedral crystals.
99ARj035B2	392615	6918663	**Amygdaloidal basalt:** green, porphyritic, subophitic and glomeroporphyritic texture, very epidote altered, cut by tiny quartz and epidote veinlets. Plagioclase occurs as large, euhedral, albite twinned phenocrysts, and in the groundmass as euhedral laths that are partially altered to epidote. Clinopyroxene has been partially altered to clinozoisite, epidote, and secondary opaques. Primary opaques are disseminated throughout the matrix and appear to be a late crystallizing phase; they are partially replaced by hematite. Foliation bands within the rock contain crushed rock fragments and epidote.
99ARj042A	393557	6922594	**Alkali granite:** pale pinkish-tan, fine grained, seriate textured, altered. Primary minerals include plagioclase, K-feldspar, quartz, and biotite. Plagioclase occurs as small to large, euhedral, subhedral, and anhedral crystals that exhibit albite, Carlsbad, and or cross-hatch twinning. Quartz occurs as large, +/- recrystallized, anhedral crystals that commonly fill late open space between other minerals. Quartz also occurs in large crystals of myrmekitic intergrowths with plagioclase. K-feldspar occurs as large unzoned subhedral crystals, and in large anhedral perthitic intergrowths with plagioclase. Biotite is extensively altered to sericite and secondary opaques. Accessory minerals include primary opaques (large, round, partially removed during alteration) and fluorite (anhedral patches between grains and in microfractures with limonite). Trace epidote is present, and sericite replaces biotite but doesn't replace feldspars.
99ARj068	394799	6917729	**Amygdaloidal microgabbro:** grayish green, amygdaloidal, epidote altered. Composed of ~40% clinopyroxene intergrown with ~50% plagioclase (euhedral, partially altered to sericite), ~5% chlorite and epidote, and 1% primary, late-crystallizing opaques.
99ARj072	392743	6907126	**Hornblende metagabbro:** fine grained, recrystallized, not foliated. Hornblende occurs as medium grained, subhedral to euhedral grains or as large interlocking aggregates. Plagioclase occurs as fine grained, anhedral to subhedral, rounded, matrix material between hornblende crystals. The rock contains ~1% opaques.
99JS23	387069	6913182	**Amygdaloidal microgabbro:** fine grained, equigranular, diabasic/subophitic texture. Abundant amygdules up to 1 cm in diameter composed of epidote, chlorite, quartz, and calcite. The groundmass consists of relatively fresh plagioclase laths intergrown with slightly chlorite and epidote altered clinopyroxene, and ~5-8%, anhedral, late-crystallizing opaques.

Table 3. Location and description of rock samples collected in the Iron Creek area for major-oxide, minor oxide, and trace element analyses.

Sample #	UTM E	UTM N	Sample description
99JS25A	382110	6909272	**Trondhjemite:** light green, medium to coarse grained, equigranular. Primary minerals include quartz and plagioclase. Quartz occurs as large anhedral grains, and quite commonly as myrmekitic intergrowths with plagioclase. The rest of the plagioclase is subhedral to anhedral and +/- albite twinned. No primary mafic minerals are present; they have been altered to patches of chlorite and secondary opaques. Most of the rock is fresh but rare tiny fractures contain sericite.
99JS26	386119	6909280	**Biotite hornblende granodiorite:** medium grained, equigranular, not foliated, ~13% mafics. Primary minerals include plagioclase, K-feldspar, quartz, biotite, and hornblende. Plagioclase forms large, subhedral to euhedral, albite +/- Carlsbad twinned, concentrically compositionally zoned crystals. K-feldspar occurs as large subhedral, +/- Carlsbad twinned, concentrically compositionally zoned crystals, with or without sericite-altered cores. Quartz occurs as an anhedral, middle- to late-crystallizing phase. Biotite is anhedral, irregularly-shaped, and generally fresh but locally it is partially to completely altered to chlorite, sphene, and epidote. Hornblende is unaltered and anhedral. Both biotite and hornblende are poikilitic with inclusions of apatite, plagioclase, zircon, and primary equant-shaped opaques. Sphene occurs as large, +/- euhedral, primary(?) crystals.
99JS28A	393523	6912162	**Hornblende tonalite:** green and white, medium grained, equigranular, foliated/metamorphosed, ~25-30% mafics. Primary minerals include plagioclase, quartz, hornblende, and minor biotite and opaques. Plagioclase occurs as large, anhedral to euhedral, albite twinned, +/- deformed crystals that are extensively altered to epidote, sericite, and clay(?). Quartz occurs as large, anhedral, strained, polycrystalline grains. Hornblende occurs as large, subhedral crystals that are partially altered to chlorite, calcite, epidote, and secondary sphene. Biotite is altered to chlorite, epidote and sphene. There are small bands of more intense strain/foliation that destroy the original texture.
99JS28F	393523	6912162	**Mudstone with quartz pebbles:** pale gray, foliated. The mudstone is composed of mixed, tiny, angular to rounded grains of quartz and chert floating in a very fine grained matrix of siliceous argillite(?) with ~1% tiny, disseminated pyrite/limonite grains. One microfracture cutting foliation contains sericite and calcite.
99JS33A	393643	6921913	**Clinopyroxene gabbro:** medium grained, equigranular, very altered. Primary minerals include plagioclase and clinopyroxene. Plagioclase occurs as large, euhedral to subhedral, albite twinned, unzoned crystals. Plagioclase is intergrown with clinopyroxene, which is partially altered to felted masses of actinolite, minor chlorite, and trace tiny grains of limonite (after secondary opaques(?)). No primary opaques are present.
99JS36A	393773	6918282	**Amygdaloidal microgabbro:** dark grayish green with diabasic(?) texture, rare glomeroporphyritic plagioclase phenocrysts, late-crystallizing opaques, clinopyroxene (partially altered to chlorite/pumpellyite(?)). Amygdules are filled with epidote, chlorite, pumpellyite?, and (or) quartz. Rock is cut by microveinlet of unaltered plagioclase (albite(?)).
99JS40A	395639	6920792	**Microgabbro:** fine grained, equigranular, diabasic to subophitic(?) texture. Primary minerals include plagioclase, clinopyroxene, hornblende(?), and rare opaques. Plagioclase occurs as euhedral to subhedral crystals that are partially altered to clay and epidote(?). Clinopyroxene occurs as relatively unaltered, roundish, equant grains that are partially altered to actinolite and secondary opaques. The microgabbro is cut by thin chlorite veins
99JS42	388384	6911246	**Biotite hornblende tonalite:** black and tan, fine to medium grained, equigranular, ~15-20% mafics, not foliated. Primary minerals include plagioclase, quartz, minor K-feldspar, biotite, and hornblende. Plagioclase occurs as large, subhedral to euhedral, albite and Carlsbad twinned, very concentrically zoned, relatively fresh crystals. Quartz is relatively abundant and appears to have crystallized later than most of the plagioclase; there are some large grains but it mostly occurs in late intergranular open space. K-feldspar is relatively minor and occurs in two forms. Earlier K-feldspar is compositionally zoned, and late K-feldspar is anhedral, unzoned, and occurs as late intergranular open-space fillings. Biotite is relatively fresh (only trace chlorite alteration), forms large crystals, and often has inclusions of opaques, apatite, plagioclase, zircon, and quartz (poikilitic). Hornblende is unaltered and forms subhedral crystals. Accessory minerals include sphene (large crystals), zircon (large and small euhedral crystals), and primary opaques (large anhedral grains).

Table 3. Location and description of rock samples collected in the Iron Creek area for major-oxide, minor oxide, and trace element analyses.

Sample #	UTM E	UTM N	Sample description
99JS46F	393641	6913728	**Amygdaloidal basalt:** altered, amygdaloidal, distinct diabasic texture with some glomeroporphyritic plagioclase crystals. The amygdules are up to 1 cm in diameter and contain epidote, chlorite, calcite, and quartz. In the groundmass plagioclase occurs as relatively fresh, small, sharply euhedral, randomly oriented elongate laths. Clinopyroxene has been completely altered to chlorite, secondary opaques, and epidote. Opaques are abundant (~5-10%) and primary opaques were a late crystallizing phase. The basalt is cut by microveinlets of epidote.
99JS48B	394795	6905572	**Metarhyodacite:** gray, very porphyritic, foliated, metamorphosed/hornfelsed (partial recrystallization and alteration of primary minerals is extensive). Phenocrysts include rounded quartz (up to 2 cm in diameter), plagioclase (large, albite twinned), and K-feldspar (large, unzoned, altered). The matrix is composed of small intergrown crystals of anhedral quartz, plagioclase, K-feldspar, white mica, and secondary biotite. White mica occurs as sericite alteration in feldspars and as large, subhedral, well crystallized grains composing ~5% of the rock. Other alteration minerals include epidote, calcite, chlorite, and secondary(?) opaques.
99JS49A	394989	6911291	**Hornfels/tonalite?:** very fine grained, equigranular, no relict textures are present. The rock is a mixture of small, granular quartz grains with acicular clusters of actinolite, tiny green secondary biotite, apatite, minor epidote, secondary opaques, and trace chlorite.
99JS52	387904	6916376	**Microgabbro:** dark green, fine grained, sparsely amygdaloidal, porphyritic with an equigranular matrix with relict diabasic/subophitic texture. Primary minerals include plagioclase, clinopyroxene, and ~5% late-crystallizing opaques. Plagioclase occurs as phenocrysts and in the matrix as equant to elongate, epidote-altered crystals that are intergrown with clinopyroxene. Clinopyroxene has been partially altered to actinolite, epidote, and secondary opaques. The microgabbro is cut by microveinlets of epidote and quartz. Amygdules are filled with quartz, chlorite, and epidote.
99JS54A	384162	6917597	**Hornblende biotite diorite:** coarse grained, ~30% mafics, relict equigranular texture is preserved but it has been hornfelsed (partial recrystallization of all phases). Primary minerals include plagioclase, quartz, hornblende, and biotite(?). Plagioclase occurs as anhedral albite-twinned crystals intergrown with anhedral quartz. Hornblende is partially recrystallized and altered to secondary hornblende, epidote, and secondary opaques. Biotite occurs as small randomly-oriented secondary grains in patches (pseudomorphs after primary biotite(?)) and is partially altered to chlorite and secondary opaques.
99JS55A	384971	6918804	**Biotite hornblende granodiorite:** black and tan, fine to medium grained, seriate, poikilitic, ~12-15% mafics, altered. Primary minerals include quartz, plagioclase, K-feldspar, hornblende, biotite, and opaques. Plagioclase occurs as both small and very large crystals that are subhedral to euhedral, albite twinned, and +/- have zoned rims. Quartz occurs as anhedral poikilitic crystals that have commonly filled late inter-grain spaces. Two types of K-feldspar are present. Early K-feldspar is subhedral, Carlsbad twinned, and is compositionally zoned. The rest of the K-feldspar is anhedral and unzoned, crystallized in late open space between other crystals, and is poikilitic with inclusions of biotite, hornblende, and plagioclase. Hornblende is often anhedral and twinned, forms both small and large crystals, and is variably altered to secondary biotite, actinolite, and (or) chlorite. Biotite occurs as large crystals, with or without secondary biotite rims, and is partially altered to chlorite. Primary opaques are a minor component and are spatially associated with the mafic minerals.
99JS56	383198	6910629	**Trondhjemite:** White, fine to medium grained, equigranular. Approximately 95% of the rock consists of graphically-intergrown quartz and plagioclase crystals. The proportion of quartz and plagioclase varies widely in the individual graphic-textured grains, and about 4% of the quartz and plagioclase form anhedral, non-graphically-intergrown crystals. Mafic minerals are very minor and have been altered to epidote, secondary opaques, and minor sericite.

Table 3. Location and description of rock samples collected in the Iron Creek area for major-oxide, minor oxide, and trace element analyses.

Sample #	UTM E	UTM N	Sample description
99JS59A	389181	6909576	**Biotite hornblende quartz diorite:** black and pale tan, fine to medium grained, equigranular, ~20% mafics, foliated, altered. Primary minerals include plagioclase, quartz, K-feldspar, biotite, and hornblende. Plagioclase occurs as large, albite twinned, +/- concentrically zoned crystals. K-feldspar(?) occurs as large, subhedral to anhedral crystals with pronounced zoning, which crystallized later(?) than plagioclase. Quartz is anhedral and crystallized in late intergranular spaces. Hornblende is relatively fresh and forms large, euhedral to anhedral, +/- twinned crystals. Biotite form large crystals and has been partially altered to chlorite, epidote, and (or) secondary opaques. Accessory minerals include primary opaques (large, anhedral, irregular and roundish shapes), and apatite (large crystals). Feldspars have been partially altered to sericite and (or) calcite/dolomite(?).
99JS61A	396148	6916488	**Amygdaloidal basalt:** extensively epidote altered, poorly preserved relict equigranular texture, and relict glomeroporphyritic texture with plagioclase phenocrysts. Amygdules filled with chlorite, epidote, quartz, and minor calcite. Contains ~5% disseminate, equant, +/- irregularly-shaped primary(?) opaques.
99JS64A	391639	6914967	**Amygdaloidal basalt/microgabbro:** fine grained, relict subophitic and glomeroporphyritic texture. Primary minerals consist of intergrown plagioclase, clinopyroxene, and 3-5% late-crystallizing opaques. Plagioclase occurs as phenocrysts and as randomly-oriented laths in the matrix with minor epidote alteration. Clinopyroxene is partially to completely altered to actinolite, chlorite, and epidote. Amygdules are filled with chlorite, epidote, and minor quartz.
99MBW403	381545	6920029	**Biotite hornblende granodiorite:** white and black, fine grained (average diameter: 1.5-2 mm; range: 0.7 mm-3.2 mm), equigranular. K-feldspar occurs as large, concentrically-zoned, subhedral crystals with or without perthitic intergrowths with plagioclase. Plagioclase occurs as large, subhedral to euhedral, albite- and Carlsbad-twinned, concentrically-zoned crystals. One plagioclase crystal may have glass(?) (now crystallized) along a growth plane within the crystal. The feldspars are generally fresh but may contain trace sericite alteration. Quartz occurs as large anhedral grains that were deposited late in the open space left over between feldspar crystals. Biotite occurs as large subhedral crystals, some of which are partially altered to chlorite +/- epidote. Hornblende is not visibly altered, it forms large, occasionally twinned crystals, and it is generally euhedral to subhedral. One hornblende grain may have trace clinopyroxene(?) in its core. Primary opaques vary widely in size and usually occur within the mafic minerals, often with irregular to highly irregular (nebulous) shapes. Apatite and zircon are common accessory minerals and are generally spatially associated with the mafic minerals.
99MBW408A	380546	6920664	**Hornfelsed volcaniclastic breccia:** medium gray, breccia fragments include: 1) medium grained plutonic rock fragments, and 2) interlocking crystalline plagioclase fragments in a matrix of clastic(?) accumulations of quartz and plagioclase crystals. Metamorphic minerals include epidote, acicular actinolite(?) and disseminated iron sulfides.
99MBW410B	380242	6921146	**Alkali granite aplite dike:** white, fine grained, anhedral granular texture; dike is ~10 cm wide.
99MBW411	384675	6913498	**Basaltic andesite:** well-jointed massive outcrop; dark green, epidote altered, aphanitic to very fine grained, equigranular. Primary minerals are not present. Metamorphic minerals include actinolite, clay (after plagioclase), secondary opaques, epidote, and calcite.
99MBW415	382324	6912556	**Microgabbro:** medium green, fine grained, equigranular, relict subophitic(?) texture, highly altered. The rock is composed of plagioclase, epidote, trace iddingsite(?), quartz, calcite, and opaques. Epidote appears to have replaced clinopyroxene, and plagioclase is partially replaced by epidote and chlorite.
99MBW416	385275	6910351	**Porphyritic metamorphosed microgabbro:** medium to dark green, equigranular, very fine grained, blocky weathering, very altered. Relict subophitic(?) and glomeroporphyritic textures are variably preserved. Metamorphic minerals include abundant epidote, actinolite, chlorite, calcite, and opaques. Plagioclase occurs in glomeroporphyritic clusters.

Table 3. Location and description of rock samples collected in the Iron Creek area for major-oxide, minor oxide, and trace element analyses.

Sample #	UTM E	UTM N	Sample description
99MBW418B	387061	6910235	**Hornblende-biotite tonalite:** gray, fine grained, equigranular, slightly altered. Plagioclase occurs as large, Carlsbad- and albite-twinned, concentrically-zoned crystals, some of which have thin rims of unzoned, untwinned feldspar. K-feldspar is relatively minor and forms untwinned, concentrically zoned crystals. Feldspars are variably altered by minor sericite and (or) calcite. Quartz occurs as large anhedral crystals, and as myrmekitic intergrowths with feldspar. Hornblende is relatively unaltered but biotite is partially to completely altered to chlorite. Apatite and primary opaques form relatively large grains, and most commonly are spatially associated with mafic minerals. Large, rhomb-shaped crystals of sphene(?) (or perhaps dolomite(?)) are common throughout the tonalite.
99MBW419C	395784	6914903	**Biotite granodiorite/tonalite:** Tan weathering, light colored, fine grained, equigranular, quartz-rich (>20%), ~7% biotite.
99MBW421	395707	6914685	**Gabbro:** medium to dark green, fine grained, highly magnetic, epidote altered along joints. Primary minerals include plagioclase, clinopyroxene, and late-crystallizing opaques. The plagioclase and clinopyroxene are intergrown with an equigranular subophitic texture. Metamorphic minerals include chlorite, epidote, actinolite(?), pumpellyite(?), opaques, and trace calcite and quartz; tiny roundish patches (amygdules?) are predominantly filled with chlorite, and lessor epidote and pumpellyite(?).
99MBW422	395497	6914783	**Amygdaloidal metagabbro:** dark to medium green, amygdules filled with epidote, chlorite, and milky, feathery-textured quartz The matrix has a relict subophitic texture. Plagioclase crystals are fairly fresh, clinopyroxene has been replaced by actinolite, and primary opaques crystallized late in intergranular spaces. Epidote alteration of the groundmass is extensive. The metagabbro is cut by anastomosing foliation bands that contain broken metagabbro fragments.
99MBW435	394739	6914976	**Metagabbro:** green, equigranular to slightly porphyritic(?). Primary minerals include plagioclase, opaques, and probably clinopyroxene. Primary opaques crystallized in late open intergranular space. Metamorphism has resulted in extensive replacement of primary minerals by actinolite, calcite, epidote, chlorite, and secondary opaques.
99MBW440	392358	6919922	**Olivine microgabbro/picrite basalt:** Dark brownish-black, very fine grained, rare amygdules filled with calcite and (or) quartz. The matrix predominantly has an equigranular, diabasic, subophitic texture, with sparse local ophitic texture. Primary minerals include unaltered plagioclase laths, olivine (~35%; completely pseudomorphed by iddingsite +/- calcite), clinopyroxene, questionable orthopyroxene(?), and late-crystallizing opaques. Calcite occurs in thin cross-cutting veins.
99MBW441A	392469	6920076	**Dacite dike:** gray and white, seriate-textured, large phenocrysts of plagioclase, K-feldspar, quartz, and biotite. The matrix is almost completely crystalline and consists of feldspars, quartz, chloritized biotite, apatite, and tiny opaque minerals. Alteration includes recrystallization of quartz phenocrysts, clay (after feldspars), sericite (after feldspars and biotite), and epidote and chlorite (after biotite).
99MBW450	392816	6919823	**Biotite tonalite:** white, medium grained, porphyritic. Phenocrysts include large plagioclase and quartz phenocrysts (up to 1 cm on average) in a medium gray matrix. The quartz phenocrysts have been strained and partially recrystallized. Plagioclase occurs as subhedral, albite twinned, +/- concentrically zoned crystals. K-feldspar occurs as perthite and as concentrically zoned crystals that are clay altered in their cores. Biotite occurs throughout the groundmass as large primary crystals surrounded by margins of smaller secondary biotite. The biotite has also been partially altered to chlorite, sericite, epidote, secondary opaques and (or) calcite. Accessory minerals include apatite and large primary opaques.
99MBW453	393240	6922624	**Granite pegmatite:** quartz-rich, medium grained, roughly equigranular. Primary minerals include quartz, K-feldspar, plagioclase, and fluorite. Quartz occurs as large and small anhedral crystals, with some of the larger grains exhibiting undulatory extinction and partial recrystallization. K-feldspar is present as large, anhedral perthite crystals. Plagioclase occurs as smaller, albite twinned, subhedral to anhedral crystals. Fluorite occurs as anhedral grains deposited in late inter-crystalline spaces. The pegmatite is altered, and sericite occurs as tiny crystals replacing feldspars and along microfractures and grain boundaries. Trace epidote and secondary(?) opaques are also present.
99MBW456	393090	6922864	**Altered granite:** orange-weathering, iron-stained with leisegang banding, massive, jointed outcrop. Pluton is pink, medium grained, equigranular, and very altered. Primary minerals include quartz, plagioclase, K-feldspar, biotite(?). Quartz is abundant (up to 40%), structurally deformed, and occurs as recrystallized anhedral grains. K-feldspar occurs as perthitic intergrowths with plagioclase. Plagioclase also occurs as separate, albite twinned crystals. Mafic minerals (probably former biotite) have been replaced by sericite, epidote, and secondary opaques. Most feldspars are relatively unaltered but some contain trace sericite alteration.

Table 3. Location and description of rock samples collected in the Iron Creek area for major-oxide, minor oxide, and trace element analyses.

Sample #	UTM E	UTM N	Sample description
99MBW459	393913	6922603	**Diorite:** medium green, fine to medium grained, equigranular, ~40% dark green clinopyroxene(?) and ~60% plagioclase with minor epidote and chlorite(?) alteration.
99MBW468	394418	6922294	**Diorite:** dark green and white, medium grained, approximately equigranular, contains ~40% randomly oriented, elongate, euhedral laths of hornblende floating in a matrix of white plagioclase (~60%) that are partially altered to epidote.
99MBW477	394632	6921815	**Metabasalt/greenstone:** medium green, aphanitic, unfoliated rock with no relict primary textures. Composed of fresh-looking, small elongate laths of plagioclase randomly oriented in a slightly finer grained matrix of randomly oriented pumpellyite(?) and opaques. Rock is cut by veins of albite, clinozoisite, pumpellyite(?), quartz, chlorite, and (or) limonite.
99MBW480	394688	6921746	**Porphyritic amygdaloidal basalt:** green, fine grained, highly altered, relict diabasic/subophitic texture. Primary minerals include elongate-shaped, +/- twinned clinopyroxene intergrown with untwinned, clay-altered plagioclase, and tiny disseminated opaques. Amygdules are filled with chlorite, actinolite, calcite, and (or) epidote. Metamorphic minerals in the groundmass include epidote, clay, chlorite, and calcite, and the groundmass exhibits patchy areas of relatively unaltered and extensively altered material.
99MBW481	394726	6921742	**Granite? dike or plug?:** white to pale pink weathering, +/- iron-stained, quartz-rich, equigranular, fine to medium grained.
99MBW485	394915	6921673	**Metamorphosed microgabbro:** dark green, very fine grained, porphyritic. Plagioclase phenocrysts are glomeroporphyritic, and occur throughout a subophitic matrix of intergrown plagioclase, clinopyroxene, and late-crystallizing opaques. Metamorphic alteration minerals include epidote, calcite, and albite(?). There is extensive epidote alteration of the matrix and plagioclase phenocrysts. Albite(?) occurs as small, relatively fresh crystals in the matrix. Calcite occurs in thin veins.
99MBW487	394966	6921661	**Metagabbro:** hornfelsed, pale green, fine grained, equigranular. Primary minerals include plagioclase, clinopyroxene, and euhedral apatite. The rock is largely composed of plagioclase, which occurs as large relict interlocking bladed crystals that have been extensively replaced by epidote and calcite. Relict clinopyroxene crystals are commonly twinned and are much smaller than the plagioclase crystals. Metamorphic minerals include clinozoisite, epidote, calcite, tremolite, and trace quartz. Opaque minerals are not present.
99MBW492	395621	6921528	**Trondhjemite:** pale gray, equigranular, fine grained. Primary minerals include quartz (>20%), and plagioclase. Quartz occurs as anhedral grains, most of which crystallized later than plagioclase. Plagioclase occurs as euhedral to subhedral, albite and Carlsbad twinned crystals. Alteration minerals include epidote (abundant, replaces plagioclase), chlorite (after biotite?), and calcite (in microfractures). Large opaques (possibly primary?) have been partially removed or redistributed within the rock during alteration.
99MBW493	395780	6920916	**Basalt/basaltic andesite:** brown weathering, massive, minor epidote and red hematite on fractures in outcrop. Most of the rock is composed of a randomly oriented mixture of euhedral to subhedral plagioclase laths and actinolite (probably replaced clinopyroxene). The textures appears equigranular and may have been subophitic(?). Metamorphic minerals include actinolite, epidote (replacing plagioclase and pyroxene), trace quartz, and leached, limonite altered opaques.
99MBW494	390358	6918894	**Amygdaloidal basalt:** medium green, amygdules filled with quartz and acicular sprays of epidote. Outcrop cut by epidote veins. In thin section the basalt is extremely altered and primary matrix textures are not preserved. Relict primary plagioclase phenocrysts occur in glomeroporphyritic clusters, and are partially altered to calcite and epidote. Metamorphic minerals include epidote, chlorite, calcite, actinolite, and pumpellyite(?).
99MBW500	390615	6918385	**Metabasalt:** medium to dark green, very fine grained, massive, amygdaloidal. Amygdules contain chlorite and epidote and are up to 2 cm in diameter.
99MBW506	379284	6913910	**Hornblende diorite/gabbro:** medium gray, fine to medium grained, appears equigranular but contains large poikilitic hornblende crystals (~25-30%) up to 2.5 cm in diameter. Plagioclase may be slightly epidote altered and composes ~70-75% of the rock.

Table 3. Location and description of rock samples collected in the Iron Creek area for major-oxide, minor oxide, and trace element analyses.

Sample #	UTM E	UTM N	Sample description
99MBW514	394975	6912796	**Hornblende tonalite:** white and black, medium grained, generally equigranular with local patches of finer grained material. Primary minerals include quartz, plagioclase, hornblende, biotite, apatite, and opaques. Quartz occurs as large anhedral crystals that have been partially recrystallized, and it is mostly a middle to late crystallizing phase. Plagioclase occurs as large subhedral to euhedral, albite twinned, +/- concentrically zoned crystals that are often, but not always, altered by sericite, clay, calcite, and (or) epidote. Hornblende and biotite occur as large, anhedral, late(?) open-space filling crystals that are poikilitic and contain inclusions of apatite, quartz, plagioclase and primary opaques. Hornblende is partially replaced by epidote, clinozoisite, calcite, chlorite, and sphene(?). Biotite is partially altered to chlorite, rutile, epidote, and secondary opaques. Apatite (small, euhedral) and primary opaques (large, roundish to irregularly shaped) tend to be spatially associated with hornblende and biotite.
99MBW514A	394975	6912796	**Hornblende tonalite:** duplicate of sample 99MBW514 above.
99MBW516	395073	6912548	**Dacite:** greenish-gray aphanitic matrix, porphyritic, feldspar phenocrysts are glomeroporphyritic. Phenocrysts include large, equant, strained, blue quartz crystals, large plagioclase and K-feldspar crystals, and biotite. The matrix is composed of microcrystalline, intergrown crystals of quartz, feldspar, secondary biotite(?), chlorite, and large, equant, primary(?) opaques. Alteration is extensive; feldspars are altered to calcite and sericite, and biotite is altered to chlorite and secondary opaques.
99MBW519	390983	6914578	**Trondhjemite?:** white to pale green, fine grained, equigranular, quartz-rich (~30%), white/gray colored feldspar, low mafic content (~5%) that may be biotite(?) altered to chlorite(?).
99MBW520	390671	6910287	**Biotite hornblende monzogranite:** white, quartz-rich, foliated, hornfelsed. Primary minerals include quartz, plagioclase, K-feldspar, biotite and hornblende. Quartz occurs as anhedral, recrystallized interlocking grains of varying sizes. Plagioclase occurs as large, albite twinned crystals that exhibit brittle deformation and have been altered to sericite and calcite. K-feldspar occurs individually as large crystals, as well as within large anhedral crystals of perthite, both of which are partially to completely altered to sericite and (or) clay. Biotite is extensively altered to secondary biotite, chlorite, epidote, and secondary opaques. Hornblende is minor and partially altered to chlorite. Accessory minerals include apatite (small crystals) and primary opaques (equant, spatially associated with mafic minerals).
99MBW524	392148	6908826	**Biotite tonalite:** white and gray, foliated, hornfelsed, ~8% mafics, porphyritic with large quartz phenocrysts. Primary minerals include plagioclase and quartz. Plagioclase occurs as large, anhedral to subhedral, +/- albite and Carlsbad twinned, compositionally zoned crystals that have been recrystallized along their edges and partially replaced by sericite and epidote. Quartz occurs as recrystallized, equant, interlocking crystal aggregates. Primary mafic minerals have been altered to secondary biotite, epidote, clinozoisite, secondary opaques, and chlorite, and have been redistributed within the rock. Accessory minerals include apatite (euhedral) and primary opaques (large, equant to irregular shapes), both of which are spatially associated with secondary biotite.
99MBW527D	396216	6915366	**Greenstone/metabasalt:** outcrop is cut by chlorite + quartz + epidote + calcite veins subparallel to foliation. Some veins are folded.
99MBW528	396182	6915425	**Metabasalt:** medium green, aphanitic.
99MBW529A	396127	6915477	**Quartz-sericite schist:** iron-stained, white, highly foliated, microcrystalline. The schist is composed of intergrown and banded quartz, sericite, and pyrite in varying proportions. The quartz occurs as fine and very fine grained, anhedral, interlocking crystals. The sericite occurs as tiny, elongate but irregular-shaped crystals that are partially oriented with foliation. Minor limonite occurs along foliation. The schist is cut by a microveinlet with symmetrically-deposited quartz along the margins, and possibly zoisite(?) in the center. The rock is likely a product of hydrothermal alteration.
99MBW539B	388401	6916248	**Granite:** white and green, fine to medium grained, equigranular, ~40% mafic minerals that are altered to chlorite.
99MBW540	386697	6917164	**Metabasalt:** medium green, aphanitic
99MBW541B	385301	6917121	**Hornblendite/quartz diorite?:** dark green, medium grained, equigranular, ~90% hornblende and ~10% plagioclase; 1-cm-long hornblende crystals are randomly oriented. Possibly a marginal plutonic phase(?).

Table 3. Location and description of rock samples collected in the Iron Creek area for major-oxide, minor oxide, and trace element analyses.

Sample #	UTM E	UTM N	Sample description
99MBW542	385648	6917836	**Biotite hornblende quartz diorite:** tan and black, fine to medium grained, equigranular, ~15% mafics. Primary minerals include plagioclase, quartz, K-feldspar, hornblende, and biotite. Plagioclase occurs as large, subhedral to euhedral, +/- albite and (or) Carlsbad twinned, distinctly concentrically zoned, +/- epidote altered crystals, with or without interior rings of sieve-texture or perhaps crystallized glass inclusions. K-feldspar occurs as anhedral unzoned crystals that crystallized late along with late anhedral quartz crystals. Hornblende occurs as anhedral to euhedral, +/- twinned crystals that have been partially altered to epidote, chlorite, and (or) secondary opaques. Biotite is anhedral to euhedral, often intergrown with hornblende, and altered to chlorite and epidote. Accessory minerals include primary opaques (equant, round) and apatite (euhedral, varying sizes), both of which are spatially associated with biotite and hornblende.
99MBW544	390628	6919541	**Trachyte/trachydacite dike:** light gray, porphyritic. The dike contains abundant phenocrysts of square, color-zoned (pink-gray-white) K-feldspar and white, elongate plagioclase. Hornblende, or perhaps pyroxene(?), occurs as dark green, 1- to 3-mm-long slightly elongate, faintly aligned phenocrysts. Locally the dike is cut by 1 to 2 mm wide, pale gray quartz + limonite (after cubic iron sulfide) veins. Dike occasionally contains xenoliths of greenstone country rocks.
99MBW552	383202	6910351	**Gabbro:** medium to light green, fine grained, slightly porphyritic with euhedral, albite +/- Carlsbad twinned plagioclase phenocrysts. Plagioclase also occurs in the matrix where it occurs as randomly oriented laths intergrown with hornblende(?), actinolite, epidote, chlorite, and primary and secondary opaques. Primary opaques are large, and their subangular shapes suggest they crystallized as late open-space filling crystals. The matrix +/- exhibits a diabasic texture, and epidote alteration is extensive.
99MBW556	396743	6919909	**Rhyodacite:** bright maroon weathering, red hematite altered, possibly subaerially(?) deposited volcanic rock.
99MBW558	396632	6919220	**Amygdaloidal basalt:** medium brownish gray, porphyritic with ~15% phenocrysts of altered plagioclase(?) feldspar and possibly altered biotite(?). The rock also contains amygdules (~2%) composed of chlorite, quartz, and epidote. The matrix is very fine grained.
99MBW563	391090	6913944	**Quartz diorite?/gabbro/greenstone:** black to forest green, very fine grained, composed of acicular, oriented, dark green needles of actinolite(?) and some plagioclase(?).
99MBW575	383755	6910415	**Amygdaloidal basalt:** epidote and quartz in amygdules.
99M8W576	570171	6996108	**Amygdaloidal metabasalt:** dark brown, very fine grained, equigranular, contains minor disseminated pyrite altering to limonite. Amygdules are up to 1 cm in diameter and composed of milky quartz, clinozoisite, epidote, and (or) chlorite. Primary minerals include plagioclase, clinopyroxene, and opaques. Metamorphic minerals include clinozoisite, epidote, quartz, and chlorite.
99MBW577	570171	6996108	**Metabasalt:** dark brown, massive; a few small amygdules composed of quartz, epidote, minor chlorite, an unidentified zeolite(?), and trace limonite; metamorphic alteration is extensive, with all plagioclase and some clinopyroxene crystals altered to actinolite + calcite + quartz.
99Pe14	393998	6915674	**Amygdaloidal microgabbro:** medium to dark forest green, fine to medium grained, sparse disseminated pyrite. Amygdules filled with chlorite and epidote.
99Pe021	393352	6919117	**Felsite/Rhyodacite? flow:** very light gray to white, porphyritic, phenocrysts include biotite, quartz, plagioclase, and K-feldspar, planar partings. Quartz phenocrysts are rounded +/- embayed; K-feldspar phenocrysts are sharply euhedral, partially replaced by calcite, and concentrically zoned; plagioclase phenocrysts are large and sharply euhedral; and biotite phenocrysts are fresh, small, and euhedral. The matrix is very fine grained but has a bimodal size distribution. The larger portion is composed of strongly aligned (trachytic), generally euhedral, elongate plagioclase, and square crystals of quartz(?) or K-feldspar(?). This material is mixed with an even finer matrix of granular crystals of the same composition. Probably Tertiary?

Table 3. Location and description of rock samples collected in the Iron Creek area for major-oxide, minor oxide, and trace element analyses.

Sample #	UTM E	UTM N	Sample description
99Pe36	391857	6920770	**Biotite granite:** rusty weathering, tan to light gray, medium grained, equigranular, altered, forms non-resistant outcrop. Primary minerals include quartz, plagioclase, K-feldspar, biotite, apatite, and zircon. Plagioclase occurs as subhedral to rarely euhedral, albite-twinned crystals, some of which are compositionally zoned and have altered cores and fresh rims. Quartz occurs as very large anhedral grains exhibiting undulatory extinction. K-feldspar occurs as late (generally post-quartz and plagioclase) anhedral crystals. K-feldspar often forms perthitic intergrowths with plagioclase. Biotite forms large crystals that are partially altered to chlorite, white mica, and (or) limonite (former secondary opaques). White mica commonly replaces feldspars.
99Pe40	395146	6922778	**Metagabbro/greenstone:** dark greenish-gray, fine to medium grained, equigranular; blocky, massive weathering. Varies laterally into finer grained varieties. In thin section, no relict textures are preserved due to extensive alteration. Metamorphic minerals include actinolite (~70%), epidote, clinozoisite, iddingsite(questionable; 15%, brown patches and round shapes, distributed throughout), quartz, calcite, and secondary opaques.
99Pe48	396084	6920924	**Porphyritic dacite:** maroon, porphyritic (plagioclase phenocrysts up to 0.5 cm in length). Phenocrysts include clinopyroxene, plagioclase, alkali feldspar, and primary opaques, in a very fine grained matrix mostly composed of plagioclase laths. Clinopyroxene phenocrysts are rimmed by disseminated limonite/opaques(?) and occur as euhedral, commonly twinned, crystals, some of which are partially altered to calcite. Primary opaques occur as large, anhedral-equant to irregular-shaped grains. Plagioclase phenocrysts are generally sharply euhedral, albite twinned, +/- compositionally zoned, and some phenocrysts have a sievey texture with tiny glass? or matrix? inclusions within them. Alkali feldspar(?) occurs as euhedral, Carlsbad twinned, concentrically zoned phenocrysts. The matrix is wholly crystalline but extremely fine grained, and is composed of a slightly-aligned mass of plagioclase laths intergrown with opaques/limonite. Probably Tertiary?
99Pe55	390444	6920055	**Syenite:** light gray, medium grained, porphyritic- to seriate-textured, with bright pink, equant, color-zoned K-feldspar, white and tan, slightly elongate, color-zoned plagioclase, and dark green, slightly elongate hornblende, or perhaps pyroxene(?), phenocrysts.
99Pe66	393356	6908617	**Hornblende diorite:** medium to coarse grained, massive, equigranular to very faintly porphyritic. Primary minerals include hornblende, clinopyroxene, plagioclase, K-feldspar, quartz, and biotite. Hornblende occurs as large, poikilitic crystals with many inclusions of euhedral plagioclase. Hornblende crystals are often twinned, and some have cores of clinopyroxene. Plagioclase is albite-twinned, commonly compositionally zoned, and mostly occurs as euhedral crystals, although some are anhedral. K-feldspar occurs as very large, anhedral, unzoned, late-crystallizing, poikilitic crystals that enclose numerous hornblende and plagioclase crystals. K-feldspar also occurs as perthitic phenocrysts, irregularly intergrown with plagioclase and minor anhedral quartz. Quartz is relatively minor and it crystallized in late inter-grain space. Biotite is relatively minor, spatially associated with hornblende, and partially to completely altered to chlorite, epidote, and secondary opaques. Accessory minerals include opaques, apatite, and sphene. Primary opaques occur as large anhedral grains spatially associated with mafic minerals. Sphene occurs as small roundish-shaped grains.
99RN513	383648	6913019	**Microgabbro/basalt:** dark green, porphyritic with plagioclase phenocrysts, epidote altered.
99RN523A	394765	6916158	**Amygdaloidal greenstone/microgabbro(?):** dark green, with epidote and chlorite in amygdules.
99RN526A	394512	6916132	**Amygdaloidal microgabbro:** dark green, with or without finely disseminated, rare patches/amygdules of chalcopyrite + epidote +/- quartz?, as well as patches of chlorite.
99RN529A	393857	6907328	**Amphibolite (former hornblende gabbro?):** dark green, fine grained, equigranular, foliated; patchy areas composed of sprays of acicular dark green hornblende. Recrystallized hornfelsed texture. Groundmass composed of actinolite, opaques, clinozoisite, and plagioclase (anhedral, albite-twinned, intergrown with actinolite and quartz), and quartz. Relict large plagioclase, and possibly other crystals suggest the former texture was fine to medium grained, and that is was a plutonic rock.

Table 3. Location and description of rock samples collected in the Iron Creek area for major-oxide, minor oxide, and trace element analyses.

Sample #	UTM E	UTM N	Sample description
99RN530A'	393339	6906715	**Tonalite:** very altered, white, fine grained, equigranular. Primary minerals include quartz, plagioclase, K-feldspar, and biotite. Quartz is abundant, and generally occurs as anhedral, large, roundish grains that have been strained and partially recrystallized. Plagioclase is anhedral to subhedral, albite twinned, and compositionally zoned. K-feldspar is anhedral and compositionally zoned, and also occurs as myrmekitic intergrowths with quartz. Accessory minerals include apatite, sphene? and opaques. Biotite is partially altered to chlorite, sericite, and secondary opaques. Both feldspars are partially altered to sericite, and plagioclase is also altered to calcite and epidote.
99RN530B	393339	6906715	**Diorite? dike:** dark green, diabasic-textured(?), contains disseminated pyrite. Primary minerals include quartz, plagioclase, apatite, opaques, and probably mafic minerals. In thin section, the primary texture is not preserved due to extensive alteration. Plagioclase occurs as anhedral (rarely subhedral), +/- concentrically zoned, +/- albite twinned crystals that are partially replaced by calcite. Quartz may have been present as larger grains, but most quartz is intergrown with plagioclase in the groundmass. Secondary green biotite is very abundant (~40-50%) and it occurs as small, randomly oriented crystals distributed throughout the rock. Alteration minerals include calcite (as veins and replacements), secondary opaques, quartz, and limonite.

Table 4. Concentration of major-oxides, minor oxides, and trace elements in rock samples from the Iron Creek area.

Note: na = not analyzed.

SAMPLE	Al2O3	CaO	Cr2O3	Fe2O3*	K2O	MgO	MnO	Na2O	P2O5	SiO2	TiO2	LOI	TOTAL	Ba	Rb	Sr	Nb	Zr	Y	Cu	Ni	Cr
	%	%	%	%	%	%	%	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
99JS28F	13.23	0.73	<0.01	7.92	1.02	3.27	0.06	2.8	0.14	65.42	0.8	3.48	98.87	405	28	82	14	150	24	na	na	na
99MBW524	16.13	5.3	<0.01	3.15	0.87	0.99	0.05	2.93	0.14	68.28	0.23	1.08	99.15	600	30	438	6	48	14	na	na	na
99MBW542	17.06	6.06	<0.01	7.12	1.78	2.8	0.13	3.33	0.22	57.91	0.84	1.32	98.57	675	46	448	10	135	26	na	na	na
99RN529A	18.32	13.2	<0.01	11.25	0.17	6.69	0.18	0.75	0.03	46.11	0.29	1.39	98.38	30	10	270	6	21	10	167	14	186
99PE40	15.47	10.03	0.02	10.57	0.21	10.1	0.16	1.91	0.04	47.93	0.38	2.62	99.44	270	10	112	6	27	14	9	94	384
99JS33A	18.91	11.15	0.03	7.43	0.35	10.47	0.1	1.32	0.03	46.71	0.21	2.93	99.64	80	14	84	4	21	12	23	98	334
99MBW419C	14.55	3.47	<0.01	4.52	1.75	1.01	0.1	3.44	0.12	69.14	0.56	1.18	99.84	540	38	180	14	117	30	na	na	na
99MBW506	21.01	12.04	<0.01	10.57	0.46	5.8	0.14	1.39	0.08	44.87	0.8	1.98	99.14	170	12	612	6	36	12	na	na	na
99MBW514	14.77	5.76	<0.01	8.6	1.14	2.19	0.16	3.17	0.28	60.48	1.29	1.75	99.59	390	32	270	14	99	32	na	na	na
99PE66	16.56	11.21	<0.01	10.38	0.36	6.13	0.17	1.76	0.15	50	0.66	1.08	98.46	115	10	276	4	48	12	72	32	48
99MBW403	15.16	3.91	<0.01	4.9	3.02	1.93	0.09	3.14	0.15	64.95	0.61	0.51	98.37	900	82	360	12	144	24	na	na	na
99JS56	11.69	1.07	<0.01	1.38	0.21	0.88	0.02	5.44	0.02	76.52	0.18	0.85	98.26	70	6	64	24	267	105	na	na	na
99MBW418B	15.78	3.54	<0.01	4.85	1.31	1.83	0.1	3.86	0.13	63.78	0.58	3.03	98.79	535	36	376	12	108	26	na	na	na
99JS55A	15.64	4.06	<0.01	4.79	2.76	1.98	0.08	3.36	0.15	65.76	0.55	0.65	99.78	775	74	370	10	123	22	na	na	na
99MBW520	13.11	1.59	<0.01	1.71	3.35	0.3	0.05	3.22	0.05	74.54	0.19	1.37	99.48	665	64	66	8	108	46	na	na	na
99MBW514A	22.92	5.44	<0.01	7.76	1.06	2.3	0.14	3.03	0.32	53.16	1.18	1.62	98.93	365	32	268	14	87	38	na	na	na
99MBW456	12.33	0.23	<0.01	0.53	4.91	0.01	0.01	3.36	0.03	77.3	0.09	0.49	99.29	170	158	2	18	126	90	na	na	na
99JS54A	16.46	11.09	<0.01	9.43	0.69	7.25	0.17	2.41	0.06	50.36	0.47	1.22	99.61	210	26	174	4	33	18	na	na	na
99JS59A	16.94	6.11	<0.01	6.89	1.41	2.96	0.13	3.55	0.25	58.62	0.86	0.76	98.48	565	34	562	10	108	24	na	na	na
99MBW459	16.6	12.09	0.08	7.17	0.33	13.24	0.12	0.85	0.04	44.96	0.18	3.59	99.25	45	20	86	6	21	12	24	161	770
99MBW450	17.48	3.98	<0.01	2.87	1.38	0.98	0.08	4.57	0.17	66.37	0.3	1.14	99.32	785	30	808	14	120	14	na	na	na
99JS52	14.33	8.37	<0.01	12.43	0.31	7.22	0.22	3.72	0.13	49.17	1.58	2.11	99.59	175	12	140	10	90	20	32	36	134
99MBW487	14.6	10.81	<0.01	4.08	0.09	4.51	0.05	5.77	0.41	55.3	1.79	2.04	99.45	50	6	106	8	96	38	na	na	na
99JS28A	13.61	5.87	<0.01	12.3	1.21	1.79	0.23	2.9	0.47	57.01	1.74	1.83	98.96	450	26	178	16	120	34	na	na	na
99MBW539B	11.89	1.4	<0.01	2	1.23	0.33	0.03	3.39	0.04	77.11	0.2	2.07	99.69	530	24	90	12	129	62	na	na	na
99MBW492	13.94	2.25	<0.01	2.32	0.45	1.04	0.01	5.07	0.06	72.13	0.31	1.8	99.38	140	8	372	14	204	48	1	10	90
99JS49A	16.88	6.75	<0.01	7.17	0.65	3.93	0.17	2.09	0.1	58.62	0.51	2.18	99.05	105	20	252	6	45	22	47	9	58
99MBW435	15.02	6.94	<0.01	11.71	0.15	6.82	0.16	4.15	0.17	48.78	1.67	4.31	99.88	120	8	308	12	105	22	101	73	240
99JS40A	15.37	11.77	0.04	8.98	0.43	9.12	0.12	1.84	0.08	49.88	0.46	1.44	99.53	190	14	216	6	36	14	26	56	480
99JS25A	12.17	0.27	<0.01	0.9	0.11	0.95	0.01	6.57	0.04	77.84	0.23	0.77	99.86	35	4	20	28	234	120	na	na	na
99JS42	16.44	4.83	<0.01	5.25	1.84	1.96	0.11	3.61	0.17	64.3	0.6	0.62	99.73	705	46	410	12	102	26	na	na	na
99ARJ028	16.78	6.09	<0.01	6.74	1.49	2.92	0.13	3.56	0.22	59.53	0.82	0.6	98.88	650	32	536	10	90	22	na	na	na

Table 4. Concentration of major-oxides and tracc elements in rocks from the Iron Creek area, Talkeetna Mountains (B-5) quadrangle.
Note: na = not analyzed.

SAMPLE	Al2O3	CaO	Cr2O3	Fe2O3*	K2O	MgO	MnO	Na2O	P2O5	SiO2	TiO2	LOI	TOTAL	Ba	Rb	Sr	Nb	Zr	Y	Cu	Ni	Cr
	%	%	%	%	%	%	%	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
99MBW453	11.85	0.2	<0.01	0.33	5.97	<0.01	0.01	3.22	<0.01	76.02	0.05	0.43	98.08	240	236	10	38	177	130	na	na	na
99PE36	12.68	0.52	<0.01	2.24	4.43	0.14	0.06	3.64	0.02	73.9	0.17	0.71	98.51	735	134	36	28	192	94	na	na	na
99MBW421	13.23	9.64	0.01	11.85	0.26	7.28	0.17	3.54	0.17	49.43	1.56	1.52	98.66	120	10	216	12	99	26	87	34	230
99JS26	16.62	5.72	<0.01	6.26	1.57	2.37	0.13	3.5	0.23	61.56	0.71	0.65	99.32	555	34	436	10	105	28	na	na	na
99ARJ042A	12.37	0.43	<0.01	1	4.39	<0.01	0.01	4.06	0.01	76.79	0.06	0.48	99.6	20	314	<2	82	144	110	na	na	na
99MBW563	11.16	10.38	0.09	11.01	0.09	11.99	0.24	1.19	0.05	51.72	0.26	1.35	99.53	100	8	134	6	27	12	2	21	640
99PE55	16.61	2.26	<0.01	2.92	4.62	0.88	0.11	5.18	0.22	64.69	0.24	1.16	98.89	1415	88	1450	6	87	16	na	na	na
99ARJ072	15.46	11.35	<0.01	11.67	0.21	8.57	0.18	1.76	0.06	48.58	0.59	0.87	99.3	50	10	64	4	39	18	207	74	282
99MBW481	11.55	1.55	<0.01	1.89	0.66	0.27	0.02	4.46	0.02	78	0.16	1	99.58	190	16	144	14	132	40	na	na	na
99MBW410B	12.41	0.39	<0.01	0.8	4.69	0.01	0.01	3.98	0.03	77.09	0.06	0.16	99.63	130	92	6	8	99	26	na	na	na
99MBW552	14.75	10.22	<0.01	11.34	0.15	6.97	0.14	3.38	0.15	48.39	1.43	2.36	99.28	60	12	404	10	87	20	15	50	252
99MBW541B	10.14	10.92	<0.01	16.78	0.3	5.69	0.25	1.35	0.24	48.26	3.56	0.82	98.31	185	14	212	16	138	28	na	na	na
99RN530A'	12.58	2.2	<0.01	1.89	1.07	0.56	0.04	3.82	0.06	75.24	0.28	1.2	98.94	410	24	158	10	102	16	na	na	na
99MBW468	11.47	9.27	<0.01	15.81	0.41	5.58	0.17	2.29	0.27	49.07	3.04	1.46	98.84	95	16	224	16	153	30	31	14	22
99ARJ032	14.12	2.95	<0.01	4.39	1.94	0.88	0.09	3.63	0.14	68.7	0.52	1.52	98.88	580	44	166	16	168	38	na	na	na
99MBW519	11.52	0.89	<0.01	1.67	0.34	0.07	0.02	5.56	0.01	77.73	0.13	0.9	98.84	115	12	60	26	279	140	na	na	na
99MBW493	13.95	6.95	<0.01	10.54	0.13	5.29	0.16	2.75	0.11	55.32	1.05	2.96	99.21	85	10	334	10	126	32	41	24	90
99JS64A	13.57	6.15	<0.01	12.54	0.1	8.42	0.11	3.9	0.15	48.73	1.97	3.34	98.98	40	10	118	16	114	24	na	na	na
99MBW411	14.98	7.38	<0.01	9.52	0.27	7.51	0.1	4.43	0.1	52.02	0.76	2.42	99.49	85	14	156	8	54	22	2	24	174
99RN526A	12.77	5.09	<0.01	13.59	0.79	7.31	0.21	2.65	0.19	49.86	2.29	4.29	99.04	605	16	138	14	129	24	172	52	122
99MBW416	13.45	8.11	<0.01	14.48	0.16	6.45	0.24	3.2	0.18	47.38	2.03	2.81	98.49	100	8	232	14	111	28	53	41	62
99ARJ035B2	13.29	14.13	<0.01	11.76	0.33	5.89	0.17	2.02	0.15	46.71	1.67	3.34	99.46	285	10	298	12	96	24	85	47	134
99RN513	15.01	8.2	<0.01	11.55	0.42	6.6	0.13	4	0.13	48.22	1.52	2.53	98.31	135	14	366	12	90	20	5	59	286
99MBW415	14.13	13.93	<0.01	14.1	0.04	3.91	0.09	0.03	0.2	44.35	1.91	6.29	98.98	10	6	414	12	114	22	5	37	50
99JS23	12.9	7.21	<0.01	13.42	0.07	7.44	0.16	3.76	0.16	49.63	1.94	2.97	99.66	40	10	116	12	114	22	21	47	90
99MBW527D	14.7	7.31	<0.01	11.89	1.3	7.64	0.19	3.23	0.16	48.6	1.91	2.94	99.87	430	22	156	14	111	24	74	62	136
99MBW422	15.48	9.94	0.02	11.92	0.09	9.04	0.17	2.61	0.07	45.65	0.81	3.14	98.94	55	8	126	2	45	20	45	114	372
99MBW529A	8.16	0.05	<0.01	0.56	1.89	0.47	<0.01	<0.01	0.03	84.92	0.09	2.06	98.23	2790	48	<2	10	126	54	na	na	na
99JS36A	13.98	9.44	<0.01	12.51	0.18	5.42	0.17	3.92	0.16	48.78	1.69	2.45	98.7	90	12	164	12	99	22	135	39	100
99RN530B	14.46	7.27	<0.01	7.82	3.21	4.91	0.15	1.48	0.18	52.97	0.62	5.21	98.28	455	92	198	10	69	22	31	38	160
99MBW575	14.36	11.75	<0.01	11.3	0.1	7.69	0.18	2.67	0.06	47.89	0.53	2.82	99.35	40	4	248	6	39	22	3	34	158
99PE14	13.71	9.44	<0.01	12.93	0.13	5.88	0.23	3.93	0.16	48.2	1.92	3.16	99.69	80	12	314	12	111	24	128	50	86

Table 4. Concentration of major-oxides, minor oxides, and trace elements in rock samples from the Iron Creek area.

Note: na = not analyzed.

SAMPLE	Al2O3	CaO	Cr2O3	Fe2O3*	K2O	MgO	MnO	Na2O	P2O5	SiO2	TiO2	LOI	TOTAL	Ba	Rb	Sr	Nb	Zr	Y	Cu	Ni	Cr
	%	%	%	%	%	%	%	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
99MBW485	14.36	10.49	<0.01	12.35	0.31	6.27	0.19	2.74	0.15	48.18	1.66	1.81	98.51	120	10	246	12	96	20	43	21	136
99MBW440	15.53	11.21	<0.01	10.26	0.15	6.78	0.17	2.12	0.1	44.78	1.12	7.46	99.68	85	14	216	2	78	24	72	65	76
99RN523A	13.62	6.45	<0.01	13.35	1.49	7.89	0.22	3.1	0.13	48.31	1.49	3.43	99.48	990	20	188	10	87	20	49	60	162
99MBW408A	15.51	6.54	<0.01	7.84	1.49	2.41	0.15	2.71	0.17	60.16	0.68	1.53	99.19	415	34	354	6	81	24	na	na	na
99ARJ068	11.87	9.58	0.07	11.04	1.13	11.29	0.18	2.15	0.09	47.58	1.06	3.04	99.08	415	24	178	8	60	16	40	124	668
99MBW540	13.28	9.04	<0.01	13.76	0.54	6.69	0.2	3.11	0.19	48.59	2.15	1.99	99.54	125	16	190	14	111	22	123	38	188
99JS61A	12.43	9.09	<0.01	13.29	0.87	7.04	0.25	1.8	0.11	48.39	1.54	4.34	99.15	360	20	128	8	72	20	na	na	na
99MBW558	14.55	9.23	<0.01	11.71	0.45	6.13	0.17	3.75	0.17	47.89	1.81	3.1	98.96	160	12	194	14	108	22	77	52	196
99ARJ027	13.12	8.42	<0.01	14.11	0.27	7.01	0.2	2.98	0.16	48.46	1.86	2.28	98.87	155	16	158	12	108	24	70	40	86
99MBW477	14.57	12.01	0.01	10.33	0.14	8.63	0.15	1.94	0.06	47.49	0.53	3.34	99.2	70	8	100	6	39	18	69	75	336
99PE48	15.61	5.89	<0.01	6.24	1.67	2.62	0.12	3.33	0.21	60.42	0.82	2.21	99.14	550	50	202	10	144	28	na	na	na
99MBW494	14.1	8.53	<0.01	12.46	0.14	7.31	0.2	3.53	0.16	48.41	1.88	2.43	99.15	50	8	204	14	108	22	16	32	78
99MBW480	14.27	9.57	<0.01	10.09	0.7	7.21	0.11	2.93	0.06	51.66	0.62	1.53	98.75	155	20	240	4	39	18	22	8	236
99MBW528	14.31	5.39	<0.01	12.7	1.51	6.76	0.16	4	0.19	48.33	1.96	3.02	98.33	320	24	156	14	114	24	117	64	190
99MBW556	15.82	3.63	<0.01	4.87	2.61	0.05	0.08	4.05	0.45	64.82	1.08	1.38	98.84	1150	82	200	28	387	58	na	na	na
99MBW577	14.35	12.06	0.01	12.77	0.13	6.22	0.14	2.44	0.18	46.41	1.76	3.09	99.56	25	8	40	14	93	20	18	44	276
99MBW500	12.28	14.81	<0.01	12.28	0.07	6.34	0.12	0.92	0.15	47.69	1.7	2.66	99.02	45	8	530	12	102	24	1	22	90
99MBW441A	16.19	4.09	<0.01	2.95	0.88	1	0.07	4.19	0.18	68.17	0.27	0.85	98.84	625	26	632	10	90	12	na	na	na
99MBW516	13.47	2.76	<0.01	3.49	1.05	0.97	0.03	3.52	0.05	72.08	0.24	1.3	98.96	360	30	82	6	60	26	na	na	na
99JS46F	13.27	6.17	<0.01	13.61	0.14	6.81	0.24	4.17	0.16	48.9	1.77	3.32	98.56	110	10	188	12	102	22	945	49	70
99PE021	14.56	1.57	<0.01	1.33	2.42	0.39	0.01	3.23	0.1	72.81	0.07	3.1	99.59	1255	68	198	12	54	14	na	na	na
99MBW576	12.7	13.27	0.01	12.52	0.07	5.95	0.12	0.7	0.17	49.05	1.75	3.25	99.56	25	10	96	12	93	22	701	44	294
99MBW544	17.11	2.55	<0.01	4.25	3.98	1.33	0.1	5.2	0.29	61.62	0.34	2.01	98.78	1285	58	982	10	102	20	na	na	na
99JS48B	13.89	2.57	<0.01	3.36	2.01	0.61	0.08	3.95	0.06	70.71	0.23	0.87	98.34	175	32	116	6	60	28	na	na	na

Table 5. Detection limits for geochemical analyses. Analytical methods include: FA-AAS = Fire Assay - Atomic Absorption Spectroscopy, ICP-AES = Inductively Coupled Plasma - Atomic Emission Spectroscopy, ICP-MS = Inductively Coupled Plasma - Mass Spectroscopy, AAS = Atomic Absorption Spectroscopy.

Element	Units	Lower Detection Limit	Upper Detection Limit	Analytical Method
Au	ppb	5	10,000	FA-AAS
Ag	ppm	0.2	100	ICP-AES
Ag*	ppm	0.02	100	ICP-MS
Ag"	opt	0.1	1,000	FA-AAS
Al	percent	0.01	15	ICP-AES
Al*	percent	0.01	15	ICP-MS
As	ppm	2	10,000	ICP-AES
As*	ppm	0.2	10,000	ICP-MS
B	ppm	10	10,000	ICP-AES
B*	ppm	10	10,000	ICP-MS
Ba	ppm	10	10,000	ICP-AES
Ba*	ppm	10	10,000	ICP-MS
Be	ppm	0.5	100	ICP-AES
Be*	ppm	0.5	100	ICP-MS
Bi	ppm	2	10,000	ICP-AES
Bi*	ppm	0.02	10,000	ICP-MS
Bi"	ppm	0.1	1,000	AAS
Ca	percent	0.01	15	ICP-AES
Ca	percent	0.01	15	ICP-MS
Cd	ppm	0.5	500	ICP-AES
Cd*	ppm	0.1	500	ICP-MS
Co	ppm	1	10,000	ICP-AES
Co*	ppm	1	10,000	ICP-MS
Cr	ppm	1	10,000	ICP-AES
Cr*	ppm	1	10,000	ICP-MS
Cu	ppm	1	10,000	ICP-AES
Cu*	ppm	0.2	10,000	ICP-MS
Cu"	percent	0.01	100	AAS
Fe	percent	0.01	15	ICP-AES
Fe*	percent	0.01	15	ICP-MS
Ga	ppm	10	10,000	ICP-AES
Ga*	ppm	0.1	10,000	ICP-MS
Ge*	ppm	0.1	500	ICP-MS
Hg	ppm	1	10,000	ICP-AES
Hg*	ppm	0.01	10,000	ICP-MS
Hg"	ppm	0.01	100	AAS
K	percent	0.01	10	ICP-AES
K*	percent	0.01	10	ICP-MS

Element	Units	Lower Detection Limit	Upper Detection Limit	Analytical Method
La	ppm	10	10,000	ICP-AES
La*	ppm	10	10,000	ICP-MS
Mg	percent	0.01	15	ICP-AES
Mg	percent	0.01	15	ICP-MS
Mn	ppm	5	10,000	ICP-AES
Mn*	ppm	5	10,000	ICP-MS
Mo	ppm	1	10,000	ICP-AES
Mo*	ppm	0.2	10,000	ICP-MS
Na	percent	0.01	10	ICP-AES
Na*	percent	0.01	10	ICP-MS
Ni	ppm	1	10,000	ICP-AES
Ni*	ppm	1	10,000	ICP-MS
P	ppm	10	10,000	ICP-AES
P*	ppm	10	10,000	ICP-MS
Pb	ppm	2	10,000	ICP-AES
Pb*	ppm	2	10,000	ICP-MS
S	percent	0.01	5	ICP-AES
S*	percent	0.01	5	ICP-MS
Sb	ppm	2	1	ICP-AES
Sb*	ppm	0.1	10,000	ICP-MS
Sc	ppm	1	10,000	ICP-AES
Sc*	ppm	1	10,000	ICP-MS
Sn	ppm	2	1000	AAS
Sr	ppm	1	10,000	ICP-AES
Sr*	ppm	1	10,000	ICP-MS
Te*	ppm	0.1	500	ICP-MS
Ti	percent	0.01	10	ICP-AES
Ti*	percent	0.01	10	ICP-MS
Tl	ppm	10	10,000	ICP-AES
Tl*	ppm	0.1	10,000	ICP-MS
U	ppm	10	10,000	ICP-AES
U*	ppm	0.05	10,000	ICP-MS
V	ppm	1	10,000	ICP-AES
V*	ppm	0.05	10,000	ICP-MS
W	ppm	10	10,000	ICP-AES
W*	ppm	0.05	10,000	ICP-MS
Zn	ppm	2	10,000	ICP-AES
Zn*	ppm	2	10,000	ICP-MS

ICP-

Table 6. Detection limits for "83Hn" geochemical analyses. Analytical methods include: AAS = Atomic Absorption Spectroscopy; XRF = X-ray Fluorescence.

Element	Units	Lower Detection Limit	Upper Detection Limit	Analytical Method
Au	ppb	5	?	AAS
Ag	ppm	0.2	100	AAS
As	ppm	5	?	AAS
Ba	ppm	20	?	XRF
Bi"	ppm	0.1	1,000	AAS
Co	ppm	2	?	AAS
Cu	ppm	5	?	AAS
Hg"	ppm	0.01	100	AAS
Mn	ppm	1	?	AAS
Mo	ppm	1	?	AAS
Ni	ppm	1	?	AAS
Pb	ppm	2	?	AAS
Sb	ppm	2	?	AAS
Sn	ppm	2	1000	AAS
W	ppm	1	?	Colorimetric technique
Zn	ppm	2	?	AAS

Table 7. Detection limits for major-oxide, minor oxide, and trace element analyses. Analytical methods include: XRF = X-Ray Fluorescence Spectroscopy, and AAS = Atomic Absorption Spectroscopy. Note: LOI* = Loss On Ignition.

Element	Units	Lower Detection Limit	Upper Detection Limit	Analytical Method
Al_2O_3	percent	0.01	100.00	XRF
CaO	percent	0.01	100.00	XRF
Cr_2O_3	percent	0.01	100.00	XRF
Fe_2O_3*	percent	0.01	100.00	XRF
K_2O	percent	0.01	100.00	XRF
MgO	percent	0.01	100.00	XRF
MnO	percent	0.01	100.00	XRF
Na_2O	percent	0.01	100.00	XRF
P_2O_5	percent	0.01	100.00	XRF
SiO_2	percent	0.01	100.00	XRF
TiO_2	percent	0.01	100.00	XRF
LOI*	percent	0.01	100.00	XRF
Total	percent	0.01	105.00	Calculation
Ba	ppm	5	50,000	XRF
Rb	ppm	2	50,000	XRF
Sr	ppm	2	50,000	XRF
Nb	ppm	2	50,000	XRF
Zr	ppm	3	50,000	XRF
Y	ppm	2	50,000	XRF
Cu	ppm	1	10,000	AAS
Ni	ppm	1	10,000	AAS
Cr	ppm	2	10,000	AAS