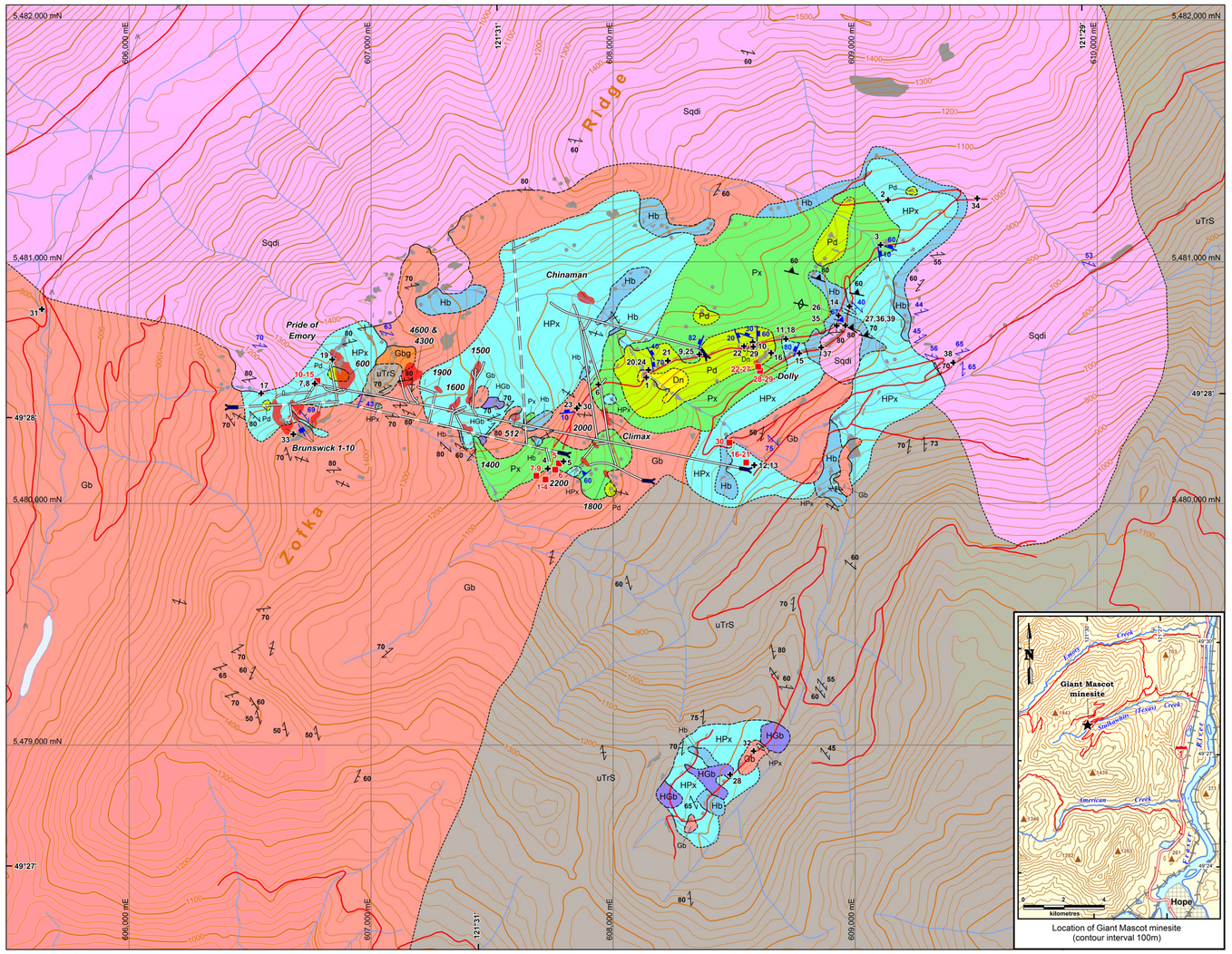

Location of Giant Mascot minesite (contour interval 100m)

Geological Survey of Canada
OPEN FILE 7570

Preliminary Geology and Geochemistry of the Giant Mascot Ultramafic-mafic Intrusion, Hope, Southwestern British Columbia

parts of NTS 92H/05 and 06

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0 0.5 1
kilometres
Scale 1:10 000

LEGEND

LATE CRETACEOUS

GIANT MASCOT ULTRAMAFIC-MAFIC SUITE (ca. 93 Ma)

- **HGb** — Black and white mottled, medium to coarse grained hornblende gabbro with minor pyroxene (<15 vol %) and phlogopite (<5%); melanocratic varieties contain up to 75% stubby prismatic hornblende crystals.
- **Gb** — Pale grey to pinkish grey, medium-grained, hornblende and biotite gabbro and diorite: subhedral calcic plagioclase(An50-70; 45-75 vol %), pyroxene (15-35%), hornblende (<15%), biotite (<5%), quartz (0-15%),Fe-Ti oxides (ilmenite and magnetite<2%) and sulphides (pyrrhotite, pentlandite, chalcopyrite<5%); rare subround xenoliths of pyroxenite and hornblende pyroxenite; weak to moderate foliation; rare centimetre-scale modal layering.
- **Gbg** — Garnetiferous gabbro adjacent to small raft of Settler Schist in the western part of Zofka Ridge.
- **Hb** — Black to grey-brown, medium grained to pegmatitic hornblendite and feldspathic hornblendite: subhedral hornblende (90-98 vol %), minor pyroxene (<5%), rare phlogopite (<5%) and disseminated sulphide (trace); forms a discontinuous pegmatitic zone up to 40m wide at the periphery of the ultramafic intrusion and also occurs in the pyroxenite.
- **HPx** — Black to dark green, medium to coarse grained hornblende pyroxenite (websterite and orthopyroxenite), locally oikocrystic and feldspathic: anhedral-subhedral pyroxene (20-60 vol %) and hornblende (20-80%) with minor olivine (<5%) and trace sulphide; rare centimetre- to decimetre-scale modal layering.
- **Px** — Dark brownish green, medium grained pyroxenite (websterite, olivine websterite and orthopyroxenite), locally oikocrystic and feldspathic: subhedral pyroxene (55-90 vol %), olivine (5-35%), minor hornblende (<5%) and disseminated trace magnetite and sulphide.
- **Pd** — Dark brownish green, fine to medium grained, locally oikocrystic peridotite (lherzolite and harzburgite): subhedral olivine (40-80%), pyroxene (30-60%), minor hornblende (<10%), net-textured sulphide (pyrrhotite, pentlandite and chalcopyrite, 2-25%) and trace chromian spinel.
- **Dn** — Dark green to yellow-brown, fine- to medium-grained, equigranular dunite: subhedral olivine (90-95%) and minor intercummulus pyroxene (5-10%) with accessory chromian spinel and disseminated trace sulphide.

SPUZZUM PLUTON (ca. 95 Ma)

- **Sqdi** — Pale grey, medium grained hornblende-biotite diorite and quartz diorite: subhedral plagioclase (An30-55; 40-60%), pyroxene (10-35%), biotite (5-20%), hornblende (5-15%) and accessory magnetite and ilmenite, and trace disseminated sulphide; entrains sparse ultramafic xenoliths and locally exhibits a moderate to strong foliation.

UPPER TRIASSIC

SETTLER SCHIST

- **uTrS** — Dark grey, finely to coarsely crystalline, metasedimentary schist containing garnet, staurolite, kyanite, biotite, plagioclase, quartz and trace pyrite.

MAP SYMBOLS

- Geological contact, defined
- Geological contact, approximate
- Geological contact, inferred
- Modal layering, inclined
- Dyke (hornblendite or hornblende gabbro), inclined, vertical
- Foliation or schistosity, inclined
- Foliation or schistosity, inclined, vertical (Aho, 1954)
- Foliation induced by shearing, inclined
- Foliation induced by shearing, inclined, vertical (Aho, 1954)
- Sample location for ore/sulphide-rich rock (Table 1)
- Sample location for silicate rock (Table 2)
- Tunnel and adit
- Orebody (projected to surface)
- Outcrop examined
- Outcrop too small to show at map scale
- Flooded land (swamp)
- Stream or river
- Contour (100m)
- Contour (20m)
- Road (dirt)

References Cited

Aho, A. E. (1954): Geology and genesis of ultrabasic Ni-Cu-pyrrhotite deposits at the Pacific Nickel property, southwestern British Columbia; unpublished Ph.D. thesis, The University of California, Berkeley, California.

Pinsent, R. H. (2002): Ni-Cu-PGE potential of the Giant Mascot and Cogburn ultramafic-mafic bodies, Harrison-Hope area, southwestern British Columbia (092H); BC Ministry of Energy and Mines, Geological Fieldwork 2001, Paper 2002-1, 211-236.

Acknowledgments

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TABLE 1. LITHOGEOCHEMICAL ANALYSES OF GIANT MASCOT ORES AND SULPHIDE-RICH ROCKS

Sample	NAD 83 UTM Zone 10 Easting	Northing	Location	Type	Host Lithology	Sulphide Texture[§]	wt % S****	ICP* (ppm) Mo	Cu	Pb	Zn	Ni	Co	Mn	As	Cd	Sn	Sc	V	Cr	Ba	Sr	Zr	Y	Nb	Ag	FA-ICP** (ppb) Au	Pt	Pd	INAA*** (ppb) Os	Ir	Ru	Rh	Pt	Pd	Au	Re
1 RHP01-075	607721	5480101	3550 East Portal	Dump	Peridotite	Net	16.92	<2	9000	<5	74	14838	883	678	<5	<0.4	3	8	114	3342	11	25	<2	<2	3	1.3	3	8	31								
2 RHP01-076	607721	5480101	3550 East Portal	Dump	Pyroxenite	Bx-Semi-massive	22.65	<2	37786	<5	117	25523	1076	568	<5	<0.4	4	20	127	543	4	15	<2	2	3	12.1	4	6	142	8	11	10	14.7	66	166	11	130
3 RHP01-077	607721	5480101	3550 East Portal	Dump	Pyroxenite	Disseminated	7.44	<2	2426	<5	80	13069	527	1238	<5	1.1	<2	12	91	1116	12	30	3	2	<2	1	4	5	89	5	5.1	11	7.4	<5	98	6	23
4 RHP01-078	607721	5480101	3550 East Portal	Dump	Peridotite	Net	10.72	<2	36019	<5	135	18308	419	950	<5	1.3	2	10	63	921	16	61	6	3	<2	13.1	287	1142	889	137	120	180	100	1140	894	280	34
5 RHP01-080	607777	5480168	3550 East Portal	Dump	Pyroxenite	Disseminated	2.40	<2	2448	<5	84	5944	253	1277	<5	<0.4	<2	8	63	1841	44	96	7	3	<2	1	42	93	161	3	4.2	<5	5.2	156	182	46	9
6 RHP01-081	607761	5480141	3550 East Portal	Dump	Pyroxenite	Net	6.63	<2	1852	<5	75	6761	509	1252	<5	0.7	<2	14	85	2723	7	20	<2	<2	<2	<0.5	5	2	19	<2	0.5	<5	1.2	<5	26	12	24
7 RHP01-151	607683	5480116	3550 East Portal	Dump	Pyroxenite	Net	10.26	<2	3451	<5	72	13280	592	964	<5	<0.4	<2	14	131	1861	28	65	6	5	<2	<0.5	4	4	57								
8 RHP01-152	607683	5480116	3550 East Portal	Dump	Peridotite	Net	15.77	<2	36109	10	82	38628	824	713	<5	1	<2	2	35	1006	15	50	6	2	<2	7.2	1553	1046	946								
9 RHP01-153	607683	5480116	3550 East Portal	Dump	Pyroxenite	Disseminated	0.41	<2	185	<5	87	659	112	1357	<5	<0.4	<2	17	223	2421	71	105	16	7	<2	<0.5	2	2	4								
10 RHP01-088	606777	5480508	Pride of Emory	Dump	Pyroxenite	Bx-Semi-massive	11.84	<2	6729	<5	106	14733	729	1477	<5	0.8	4	21	122	910	15	22	<2	<2	1.5	35	126	186	5	8.4	10	39.4	110	189	38	21
11 RHP01-089	606777	5480508	Pride of Emory	Dump	Pyroxenite	Disseminated	2.25	<2	2412	<5	99	2429	159	1411	<5	<0.4	2	15	163	879	27	53	6	2	<2	<0.5	8	25	34								
12 RHP01-090	606777	5480508	Pride of Emory	Dump	Pyroxenite	Semi-massive	14.38	<2	8547	<5	78	21986	918	937	7	<0.4	4	30	162	812	7	23	<2	2	3	1.9	74	1	237								
13 RHP01-091	606777	5480508	Pride of Emory	Dump	Peridotite	Net	6.98	<2	9469	<5	99	8261	412	1316	<5	0.9	4	13	89	1322	41	64	6	2	<2	1.4	45	15	44								
14 RHP01-161	606777	5480508	Pride of Emory	Dump	Pyroxenite	Bx-Semi-massive	14.44	<2	3568	<5	56	18120	868	980	<5	<0.4	<2	17	149	1057	29	31	4	2	<2	0.5	4	2630	114								
15 RHP01-162	606777	5480508	Pride of Emory	Dump	Pyroxenite	Disseminated	0.95	<2	392	<5	82	1257	121	1328	<5	<0.4	<2	16	124	1483	54	75	8	3	<2	<0.5	2	6	5								
16 RHP01-104	608550	5480171	Millsite	Dump	Pyroxenite	Disseminated	8.19	13	3210	<5	91	10835	489	1352	<5	1.1	4	31	434	2123	5	16	4	6	2	0.5	20	36	466	10	9	11	9.7	42	413	47	65
17 RHP01-105	608550	5480171	Millsite	Dump	Pyroxenite	Disseminated	1.54	<2	1339	<5	96	1905	186	1249	<5	<0.4	<2	8	93	1438	24	52	4	2	<2	<0.5	3	10	10	<2	0.3	<5	0.4	8	9	4	<5
18 RHP01-106	608550	5480171	Millsite	Dump	Peridotite	Disseminated	3.12	<2	1172	<5	54	3809	338	1217	<5	0.5	3	10	51	1386	23	58	5	2	<2	<0.5	5	16	27								
19 RHP01-107	608550	5480171	Millsite	Dump	Pyroxenite	Net	13.44	<2	3789	<5	73	22488	1006	1060	14	1.3	<2	3	22	737	5	9	<2	<2	3	1.2	3	110	244								
20 RHP01-108	608550	5480171	Millsite	Dump	Hornblendite	Disseminated	5.61	<2	16872	<5	107	8470	300	1160	<5	1.1	2	20	114	1233	16	82	7	4	<2	3.7	24	196	150	8	12	11	12.7	88	150	24	7
21 RHP01-109	608550	5480171	Millsite	Dump	Pyroxenite	Disseminated	2.52	<2	5501	12	100	3859	181	1396	<5	2.8	2	19	407	1442	107	61	7	4	<2	6	332	359	140	3	0.3	<5	0.4	213	141	300	<5
22 RHP01-117	608600	5480567	Dolly Adit	Dump	Olivine pyroxenite	Net	15.51	<2	7233	<5	70	25705	1099	822	7	<0.4	4	13	58	835	5	15	<2	<2	3	1.6	4	10	255								
23 RHP01-118	608600	5480567	Dolly Adit	Dump	Olivine pyroxenite	Net	12.41	<2	7332	<5	66	16983	804	840	<5	1.8	4	24	103	1140	4	20	<2	2	<2	1.9	11	89	317	18	25	40	31.9	100	285	13	48
24 RHP01-119	608600	5480567	Dolly Adit	Dump	Pyroxenite	Disseminated	2.68	<2	1990	<5	85	5832	256	1456	<5	0.5	2	21	107	1631	5	15	<2	<2	2	<0.5	7	35	74	<2	0.8	<5	2.6	38	81	7	7
25 RHP01-120	608600	5480567	Dolly Adit	Dump	Peridotite	Bx-Net	5.55	<2	7690	<5	90	9901	412	1272	<5	1.4	2	14	74	1741	8	19	2	<2	<2	1.6	3	5	116								
26 RHP01-121	608600	5480567	Dolly Adit	Dump	Olivine pyroxenite	Disseminated	3.09	<2	3676	<5	62	6398	276	1209	<5	0.6	<2	37	205	2012	6	39	4	4	3	0.7	9	79	50	2	3.3	<5	4.5	82	60	11	15
27 RHP01-122	608600	5480567	Dolly Adit	Dump	Olivine pyroxenite	Net	8.21	<2	40106	<5	163	7945	374	1085	<5	1.8	<2	6	21	874	4	10	<2	<2	<2	7.8	154	6	131	6	9.1	5	11.7	37	135	44	19
28 RHP01-147	608608	5480551	Dolly Adit	Dump	Olivine pyroxenite	Disseminated	5.02	<2	3161	<5	64	10691	462	1248	<5	<0.4	<2	6	27	884	2	5	<2	<2	<2	0.6	12	88	74								
29 RHP01-149	608608	5480551	Dolly Adit	Dump	Pyroxenite	Bx-Net	3.62	<2	7671	<5	76	4878	276	1377	<5	<0.4	<2	34	187	1731	7	29	4	4	<2	1	18	99	113								
30 RHP01-154	608480	5480253	Upper Road	Outcrop	Pyroxenite	Disseminated	1.63	<2	104	<5	135	318	77	1728	<5	<0.4	<2	33	295	1137	79	278	23	16	<2	<0.5	4	2	1								

Samples were jaw crushed and steel milled with quartz wash between each sample; * 4-acid (HF-HClO4-HNO3-HCl) digestion (1g) with ICP-ES finish, Acme Analytical Laboratories (Vancouver) Ltd; ** Fire assay (15g) with ICP finish, Acme Analytical Laboratories (Vancouver) Ltd; *** Instrumental Neutron Activation Analysis, Actlabs, Ancaster, Ontario; [§] Bx: Breccia cement; **** Sulphur (weight %) by Leco combustion. Additional trace elements analyzed but not detected: Sb<5 ppm; Bi<5 ppm; W<4 ppm; Be<1 ppm; La<2 ppm; Th<2 ppm; and U<10 ppm. NAD83 location, lithology and sulphide textures modified from Pinsent (2002 and unpublished data).

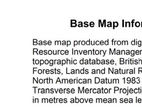
TABLE 2. LITHOGEOCHEMICAL ANALYSES OF SILICATE ROCKS

Sample	NAD 83 Zone 10 Easting	Northing	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	FeO[1]	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	LOI[2]	Total	Rb	Sr	Y	Zr	Nb[3]
Giant Mascot Ultramafic-Mafic Suite																				
Dunite																				
1 RHP01-085	608137	5480523	39.00	0.05	0.87	3.43	9.73	0.15	41.79	1.02	0.10	0.01	0.01	1.52	97.68	<3	23	<3	16	6
Pyroxenite																				
2 RHP01-072	609136	5481256	52.31	0.27	2.76	1.61	6.52	0.17	21.17	12.46	0.31	0.01	0.01	1.02	98.62	6	29	7	19	9
3 RHP01-074	609105	5481071	52.29	0.33	3.43	1.24	6.95	0.17	20.52	12.81	0.37	0.03	0.01	0.47	98.62	4	36	12	20	8
4 RHP01-079	607730	5480146	52.95	0.81	16.45	1.01	6.35	0.10	8.32	9.06	3.33	0.23	0.15	0.82	99.58	6	826	13	44	6
5 RHP01-080*	607796	5480176	38.11	0.23	3.18	2.80	12.82	0.12	32.20	1.94	0.50	0.07	0.02	4.15	96.14	<3	62	<3	22	8
6 RHP01-084	607939	5480494	52.45	0.37	4.07	1.22	5.61	0.15	20.84	14.02	0.33	0.01	0.01	1.05	98.68	<3	45	3	16	10
7 RHP01-088*	606766	5480497	37.20	0.17	1.92	5.50	21.20	0.18	18.62	3.21	0.20	0.01	0.01	5.57	93.79	<3	12	<3	15	7
8 RHP01-089*	606766	5480497	44.29	0.18	2.63	1.96	13.01	0.15	29.62	2.93	0.31	0.02	0.01	1.79	96.90	3	43	8	17	10
9 RHP01-096	608356	5480618	53.09	0.16	2.30	1.81	9.62	0.18	27.88	2.60	0.12	0.01	0.01	0.37	98.37	3	12	6	17	8
10 RHP01-100	608577	5480669	48.93	0.23	2.31	2.05	9.00	0.17	28.10	6.88	0.21	0.01	0.01	0.30	98.20	5	25	8	14	9
11 RHP01-101	608714	5480682	52.84	0.23	3.04	2.31	8.85	0.15	24.40	4.42	0.33	0.02	0.01	3.61	98.21	3	39	8	18	9
12 RHP01-105*	608584	5480160	38.47	0.23	2.72	3.67	12.60	0.15	32.38	1.58	0.34	0.03	0.02	5.42	97.61	<3	41	4	21	8
13 RHP01-109*	608584	5480160	48.77	0.33	3.90	2.52	12.98	0.15	23.59	2.29	0.46	0.15	0.01	1.69	96.84	<3	47	<3	18	8
14 RHP01-110	608977	5480817	45.29	0.70	5.67	1.22	7.01	0.15	17.30	14.92	0.98	0.09	0.01	1.19	98.53	6	77	13	21	8
15 RHP01-116	607939	5480494	52.00	0.37	4.07	1.16	8.41	0.16	21.59	9.78	0.46	0.05	0.01	0.67	98.75	4	56	6	19	7
16 RHP01-119*	608653	5480624	46.79	0.18	2.14	3.05	11.89	0.17	26.39	4.86	0.12	0.01	0.01	1.39	97.00	<3	17	<3	17	7
17 RHP01-142	606545	5480457	44.08	0.25	3.36	2.71	9.73	0.15	28.95	6.11	0.43	0.07	0.01	2.63	98.48	5	65	5	18	4
18 RHP01-150	608714	5480682	52.29	0.28	2.77	1.19	5.91	0.15	21.27	13.68	0.28	0.01	0.01	1.31	99.15	<3	37	10	17	6
19 RHP01-160	608840	5480597	52.13	0.34	4.65	1.25	5.83	0.14	17.42	14.48	0.72	0.07	0.03	2.14	99.20	6	83	11	27	5
Peridotite																				
20 RHP01-087	608146	5480554	43.29	0.14	1.62	3.02	7.16	0.14	31.90	7.38	0.25	0.03	0.01	3.28	98.22	3	37	5	16	8
21 RHP01-094	608226	5480592	40.33	0.07	1.16	2.45	9.71	0.15	42.29	1.48	0.15	0.01	0.01	0.23	98.04	3	26	3	17	9
22 RHP01-099	608541	5480652	39.22	0.10	1.09	2.93	12.10	0.16	39.25	2.32	0.11	0.01	0.01	0.30	97.62	<3	14	<3	14	8
Hornblendite/Hornblende gabbro																				
23 RHP01-083**	607851	5480394	45.22	1.33	10.92	3.33	6.80	0.14	15.93	11.76	1.90	0.18	0.01	1.44	98.96	7	168	14	23	11
24 RHP01-086**	608146	5480554	42.75	1.37	15.82	3.37	7.32	0.12	12.01	11.71	2.35	0.23	0.15	2.11	99.31	8	458	19	42	4
25 RHP01-097**	608356	5480618	45.74	1.49	10.30	3.38	7.39	0.15	17.54	9.71	1.77	0.28	0.01	1.00	98.76	5	183	22	31	10
26 RHP01-103	608932	5480779	41.68	2.15	14.28	2.49	9.12	0.12	12.97	11.22	2.38	0.30	0.01	1.71	98.63	5	245	21	31	9
27 RHP01-113	608960	5480738	42.54	1.77	16.26	1.75	8.03	0.10	11.89	11.84	2.49	0.25	0.01	1.61	98.54	5	414	19	29	9
28 RHP01-139	608483	5478881	48.65	1.27	15.35	1.09	8.09	0.11	10.60	9.39	2.43	0.46	0.05	2.00	99.49	12	356	20	48	6
29 RHP01-145**	608579	5480650	42.15	1.49	16.88	3.48	7.82	0.15	9.72	11.00	3.06	0.43	0.25	2.77	99.20	11	853	20	51	5
Gabbro/Diorite																				
30 RHP01-082	607859	5480406	57.68	0.66	17.90	1.07	5.86	0.14	4.17	7.78	3.50	0.14	0.11	-0.09	98.92	5	439	13	31	11
31 RHP01-125	605639	5480805	50.83	1.15	17.62	1.46	6.80	0.12	7.17	9.43	3.26	0.15	0.25	1.27	99.51	<3	708	14	42	5
32 RHP01-138	608581	5478978	53.08	1.14	17.62	0.84	6.24	0.11	6.44	8.76	3.16	0.38	0.23	1.64	99.64	8	1124	14	62	4
33 RHP01-159	606678	5480288	50.70	0.68	21.14	0.98	6.85	0.10	4.05	9.13	3.70	0.11	0.23	1.76	99.43	5	655	11	31	6
Spuzzum pluton																				
Dacite/Quartz diorite																				
34 RHP01-073	609505	5481263	55.75	0.23	21.60	1.05	2.71	0.07	3.94	7.90	4.63	0.40	0.02	0.72	99.02	12	697	9	29	10
35 RHP01-102	608924	5480737	55.34	0.76	18.17	0.57	5.95	0.12	4.76	8.18	3.90	0.20	0.15	0.64	98.74	5	541	15	58	10
36 RHP01-112	608960	5480738	55.34	0.80	16.76	1.70	4.55	0.12	4.38	7.09	3.74	0.30	0.10	0.58	99.26	7	443	17	62	9
37 RHP01-114	608860	5480647	52.58	0.68	19.50	1.10	6.22	0.14	4.98	8.10	4.15	0.12	0.14	0.93	98.64	7	556	11	23	9
38 RHP01-130	609405	5480584	62.68	0.52	16.22	1.57	3.61	0.09	3.21	5.86	3.76	1.00	0.10	0.92	99.54	19	386	18	90	6
39 RHP01-134	608960	5480738	53.27	0.72	17.72	1.22	6.60	0.12	5.94	9.03	3.38	0.18	0.15	1.29	99.62	7	471	19	46	7

Samples jaw-crushed and ground in tungsten carbide mill; major elements (weight %) determined by X-ray fluorescence (XRF) on lithium tetraborate fused bead; trace elements (ppm) determined by XRF on powder pellet (Teck-Cominco Laboratories). [1] FeO by titration. [2] Loss on ignition at 1100 deg C. [3] Maximum value due to contamination in tungsten carbide mill.
* Sulphide-rich (cf. Table 1). ** Dyke NAD83 location and lithology modified after Pinsent (2002 and unpublished data).

Base Map Information

Base map produced from digital TRIM (Terrain Resource Inventory Management) 1:20 000-scale topographic database, British Columbia Ministry of Forests, Lands and Natural Resource Operations. North American Datum 1983 (NAD83). Universal Transverse Mercator Projection (Zone 10). Elevation in metres above mean sea level. Contour interval 20m.



Approximate mean magnetic declination December 2013 for centre of map area: 16 degrees 36 minutes east, decreasing annually 11.5 minutes per year

Digital Cartography

G. T. Nixon

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