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GSA Special Paper 374, Chapter 7

Shaw, S.E., Todd, V.R., and Grove, M., 2003, Jurassic peraluminous gneissic granites in the axial zone of the Peninsular Ranges, southern California, *in* Johnson, S.E., Paterson, S.R., Fletcher, J.M., Girty, G.H., Kimbrough, D.L., and Martin-Barajas, A., eds., Tectonic evolution of northwestern México and the southwestern USA: Boulder, Colorado, Geological Society of America Special Paper 374, p. 157–183.

Orthoamphibolites:
Julian Schist-Harper Creek Gneiss-Stephenson Peak

Sample no	84SC3	MP942	J915	CP942	MP941	CP177	WSP99	MP948
Host unit	Stephenson Peak	Harper Creek	Harper Creek	Julian Schist	Harper Creek	Julian Schist	Julian Schist	Harper Creek
Latitude	33 06 40	32 56 10	33 07 02	32 58 53	32 56 14	32 52 58	32 50 29	32 55 47
Longitude	116 26 40	116 29 08	116 35 03	116 31 49	116 29 14	116 31 20	116 13 32	116 29 00
Lithology	Amphibolite	Mafic schist	Amphibolite	Amphibolite	Amphibolite	Amphibolite	Amphibolite	Amphibolite
<u>Orthoamphibolites in Julian Schist/Harper Creek Gneiss/Stephenson Peak facies</u>								
SiO ₂	55.80	51.60	50.39	49.49	49.05	48.90	47.60	47.57
TiO ₂	1.07	2.55	1.00	1.28	1.51	1.70	2.00	2.06
Al ₂ O ₃	14.46	12.25	15.59	15.14	18.11	15.50	15.80	17.05
Fe ₂ O ₃	1.06	1.34	1.56	1.56	1.94	1.10	3.50	2.45
FeO	9.37	10.08	10.26	8.13	9.24	8.70	8.60	10.30
MnO	0.17	0.27	0.19	0.20	0.21	0.13	0.26	0.23
MgO	7.20	9.34	6.81	8.61	5.76	6.60	5.20	5.53
CaO	7.94	7.05	9.49	12.58	11.48	12.30	10.60	11.36
Na ₂ O	0.40	0.27	0.54	1.93	0.47	2.30	3.40	0.52
K ₂ O	0.70	2.56	1.91	0.06	0.16	0.26	0.61	1.24
P ₂ O ₅	0.10	0.53	0.10	0.14	0.21	0.33	0.24	0.17
H ₂ O+	1.41	1.99	2.30	0.63	1.26	1.49	0.59	1.54
H ₂ O-	0.13	0.11	0.28	0.08	0.07	0.14	0.16	0.05
CO ₂	0.22	0.17	0.74	0.13	0.88	0.31	0.01	1.40
Total	100.03	100.11	101.16	99.96	100.35	99.76	98.57	101.47
Ba	397	1225	107	114	65	1261	76	248
Cr	132	666	251	396	250	63	218	258
Cu	13	7	3	24	27	41	122	41
Ga	18	18	15	17	17	17	18	20
Nb	6	40	5	2	9	N.D.	N.D.	3
Ni	64	143	77	62	150	25	108	122
Pb	6	8	11	<3	11	25	8	8
Rb	41	130	81	1	10	98	10	67
Sr	94	236	404	150	293	223	235	581
Th	3	2	<2	<2	<2	12	8	2
U	<3	<3	<3	<3	<3	4	<3	<3
V	291	267	322	290	249	108	306	383
Y	32	32	28	31	35	22	41	45
Zn	81	162	123	77	108	108	103	118
Zr	77	162	46	80	99	179	120	126

Cuyamaca Reservoir Suite

Sample no.	SY12	J38	PO4	SY911	D9410	J945	ML941	J946	SY15	ML5
Latitude	33 01 31	33 05 26	33 16 40	33 04 26	32 49 08	33 02 56	32 46 22	33 03 34	33 01 34	32 51 15
Longitude	116 40 18	116 34 48	116 51 21	116 43 06	116 32 29	116 34 09	116 27 01	116 34 40	116 41 37	116 28 32
Lithology	Granodiorite	Granodiorite	Granodiorite	Granodiorite	Granodiorite	Ton/granod	Granodiorite	Tonalite	Granodiorite	Granodiorite
Cuyamaca Reservoir suite										
SiO2	73.13	69.72	69.65	69.48	69.46	69.46	68.82	68.78	68.77	68.49
TiO2	0.65	0.61	0.86	0.79	0.82	0.86	0.50	0.90	0.83	0.88
Al2O3	12.93	14.02	14.09	14.05	13.95	14.53	15.12	14.35	13.93	14.03
Fe2O3	0.57	0.53	0.85	0.71	1.04	0.98	0.64	0.92	0.94	0.43
FeO	1.94	2.43	3.12	3.37	3.24	3.06	2.44	3.14	3.48	4.25
MnO	0.04	0.06	0.06	0.05	0.07	0.08	0.06	0.06	0.07	0.06
MgO	0.78	1.57	1.47	1.27	1.45	1.72	1.94	1.42	1.69	1.47
CaO	2.14	2.83	2.63	2.94	3.00	2.37	3.54	2.36	2.98	3.07
Na2O	2.44	2.54	2.27	3.00	2.71	2.31	3.04	2.24	2.68	2.54
K2O	3.96	4.34	3.41	3.14	3.17	2.54	2.33	3.67	3.27	3.39
P2O5	0.08	0.11	0.14	0.12	0.11	0.14	0.08	0.11	0.14	0.16
H2O+	0.55	0.91	0.82	0.66	0.66	1.11	0.79	0.98	0.74	0.47
H2O-	0.05	0.06	0.10	0.13	0.06	0.11	0.05	0.05	0.04	0.09
CO2	0.18	0.16	0.96	0.21	0.26	1.53	0.26	1.55	0.24	0.03
Total	99.44	99.89	100.43	99.92	100.00	100.80	99.61	100.53	99.80	99.36
Ba	1697	1311	1048	876	927	1195	882	1233	930	942
Cr	25	58	52	37	47	65	55	54	54	31
Cu	<1	19	2	15	13	21	16	2	10	36
Ga	12	14	14	15	16	16	16	18	15	19
Nb	9	N.D.	12	10	10	13	8	12	12	N.D.
Ni	8	12	9	14	15	10	22	7	19	5
Pb	16	23	15	18	15	16	13	19	8	18
Rb	135	141	138	131	121	97	85	170	127	139
Sr	106	159	136	132	134	153	262	134	131	133
Th	14	4	14	13	18	13	14	14	12	11
U	5	6	4	4	5	<3	3	<3	5	4
V	39	51	80	58	67	108	62	95	69	59
Y	40	65	36	40	40	33	21	46	45	48
Zn	41	57	90	75	58	98	68	98	56	106
Zr	214	176	238	200	205	240	145	251	220	228

Cuyamaca Reservoir Suite

SY18	1079H	PO8	TS56	CP178	MP945	D944	J947	CP153	J943	J942	ML30	D101
33 02 13	32 46 41	33 19 05	32 57 22	33 00 02	32 50 44	32 49 22	33 04 35	33 00 22	33 03 35	33 03 38	32 44 36	32 50 05
116 38 02	116 38 31	116 51 47	116 38 50	116 33 58	116 29 33	116 33 22	116 33 46	116 33 20	116 37 02	116 36 21	116 27 08	116 32 41
Granodiorite	Tonalite	Tonalite	Tonalite	Tonalite	Ton/granod	Tonalite	Tonalite	Qz monzodiorit	Tonalite	Tonalite	Ton/granod	Tonalite
68.18	67.14	66.38	66.15	65.49	65.24	64.79	64.70	64.66	64.58	64.51	64.20	64.20
0.95	0.74	0.66	0.99	1.12	1.06	1.01	0.95	1.15	1.04	0.96	0.90	0.67
14.06	15.11	14.54	14.78	14.25	14.63	14.91	15.50	14.48	14.78	15.12	15.47	16.30
0.94	1.50	0.70	1.32	0.45	0.71	0.96	0.90	0.68	1.05	1.30	1.02	1.46
3.63	2.99	3.81	3.46	4.06	4.05	3.96	3.86	4.08	4.10	3.95	3.63	4.07
0.08	0.11	0.11	0.07	0.08	0.10	0.10	0.07	0.09	0.08	0.09	0.09	0.13
1.58	2.29	3.74	2.49	3.29	3.42	2.97	2.88	3.46	2.98	2.99	2.22	1.60
3.15	3.65	3.66	4.12	4.47	4.65	4.80	4.58	4.97	4.77	4.76	4.03	4.87
2.41	2.74	2.25	2.72	2.63	2.57	2.59	2.88	2.91	2.44	2.53	3.02	4.12
2.73	2.27	2.57	2.76	2.79	2.64	2.31	2.20	2.71	2.57	2.48	3.18	1.70
0.15	0.22	0.09	0.17	0.19	0.17	0.14	0.16	0.18	0.14	0.13	0.19	0.19
0.82	1.37	1.02	1.30	1.14	0.98	0.88	0.93	0.95	0.91	0.85	1.16	1.12
0.13	0.08	0.06	0.09	0.11	0.05	0.04	0.12	0.06	0.05	0.01	0.25	0.09
1.23	0.09	0.71	0.26	0.31	0.18	0.60	0.36	0.09	0.56	0.76	0.32	0.04
100.04	100.30	100.30	100.68	100.38	100.45	100.06	100.09	100.47	100.05	100.44	99.68	100.56
1018	672	966	804	867	769	783	718	783	919	844	768	571
48	96	171	94	150	170	124	111	159	126	132	80	7
16	14	1	21	23	10	17	15	18	17	22	26	5
16	20	15	19	17	16	13	16	24	15	16	17	25
13	N.D.	11	N.D.	13	12	12	12	12	10	9	N.D.	7
29	14	55	12	16	20	17	27	17	20	22	20	4
16	13	7	18	12	14	13	11	13	13	14	17	4
122	80	103	102	112	121	96	96	112	100	96	129	53
138	186	209	173	156	146	179	214	158	160	175	180	361
9	<2	15	13	10	10	11	5	15	11	8	12	5
<3	<3	3	4	<3	4	<3	3	<3	4	<3	4	<3
76	66	90	97	71	91	101	87	83	99	110	93	76
35	44	26	35	38	38	43	30	36	38	36	64	34
97	88	107	89	75	73	96	80	75	84	90	103	77
239	144	147	211	192	182	216	222	198	198	176	132	150

Cuyamaca Reservoir Suite

TS55	SY17	TS941	WS942	D29	D103A	BH1
33 00 10	33 03 02	32 59 26	33 22 29	32 48 03	32 49 10	33 17 11
116 42 29	116 38 01	116 39 22	116 37 16	116 33 13	116 32 34	116 52 52
Tonalite	Ton/granod	Ton/granod	Tonalite	Tonalite	Tonalite	Tonalite
64.06	63.30	63.22	61.90	61.75	60.88	57.54
1.06	0.97	0.87	0.77	1.06	0.88	0.99
14.62	15.07	14.91	16.14	15.29	17.33	17.98
0.88	1.09	1.03	0.87	0.78	1.13	1.39
4.58	4.27	4.56	4.78	4.48	5.13	6.28
0.09	0.08	0.08	0.08	0.12	0.14	0.18
3.01	3.15	3.33	3.11	3.95	1.88	2.38
4.82	5.09	4.77	5.72	5.89	5.64	6.79
2.72	2.48	2.70	2.70	2.89	4.35	3.94
2.17	2.48	2.42	2.19	2.71	1.78	1.00
0.16	0.15	0.16	0.13	0.16	0.22	0.22
1.35	0.98	0.96	1.01	1.12	1.04	1.00
0.08	0.09	0.04	0.04	0.07	0.08	0.03
0.23	0.62	0.42	0.13	0.13	0.06	0.17
99.83	99.82	99.47	99.57	100.40	100.54	99.89
675	659	803	731	959	378	188
123	130	146	69	171	10	15
26	14	16	7	19	13	17
20	17	17	18	24	20	21
N.D.	12	9	8	12	N.D.	7
25	23	26	13	16	4	4
16	13	11	7	14	9	11
77	108	101	91	101	73	30
192	164	168	274	174	351	364
8	10	10	6	16	8	2
5	<3	<3	<3	<3	<3	<3
106	105	105	115	126	95	154
33	37	36	18	50	49	27
93	88	102	76	89	72	106
180	183	185	149	136	134	218

Julian Schist

Sample no	CP945	1079K	CP944	1079I	CP948	J948	584SS1	1079L1	D27	1079J	J949	58410
Latitude	32 58 30	33 03 47	32 58 30	32 53 35	32 59 29	33 00 43	32 58 47	33 00 13	32 49 14	33 03 47	33 03 16	33 03 47
Longitude	116 31 06	116 34 06	116 31 06	116 26 49	116 32 05	116 37 22	116 31 28	116 37 17	116 34 23	116 34 06	116 34 28	116 34 06
Lithology	Metaquartzite	Metaquartzite	Metaquartzite	Metaquartzite	Pelitic schist	Metaquartzite	Pelitic schist	Pelitic schist	Metaquartzite	Pelitic schist	Pelitic schist	Metasiltstone
<u>Julian Schist</u>												
SiO ₂	89.99	80.25	79.43	76.65	75.77	72.05	70.94	70.90	68.36	66.47	65.23	64.27
TiO ₂	0.24	0.32	0.47	0.28	0.54	0.44	0.68	0.68	0.60	0.78	0.77	0.70
Al ₂ O ₃	4.86	8.21	9.48	10.11	11.99	11.93	13.88	13.04	15.45	15.69	16.41	16.21
Fe ₂ O ₃	0.37	0.55	0.63	0.82	1.30	1.55	1.16	0.97	0.33	0.87	1.48	1.38
FeO	0.97	1.35	2.70	1.36	2.75	1.30	3.10	2.59	4.00	3.94	3.48	2.86
MnO	0.03	0.05	0.03	0.03	0.06	0.06	0.02	0.07	0.01	0.05	0.06	0.06
MgO	0.76	0.63	1.45	0.75	1.83	1.17	1.70	2.09	1.86	1.82	1.96	1.78
CaO	0.21	6.61	0.24	3.61	0.86	5.91	1.78	1.27	3.33	3.11	2.59	1.02
Na ₂ O	0.69	0.56	0.96	2.15	1.04	2.36	1.70	0.99	1.92	2.82	2.13	2.97
K ₂ O	1.15	0.08	2.36	3.01	1.91	1.83	2.10	3.72	2.12	2.63	2.38	5.84
P ₂ O ₅	0.02	0.13	0.04	0.11	0.09	0.14	0.09	0.14	0.15	0.13	0.17	0.09
H ₂ O+	0.70	0.83	1.26	0.74	1.32	0.30	1.33	2.10	0.74	1.38	1.33	1.33
H ₂ O-	0.13	0.11	0.05	0.18	0.25	0.12	0.17	0.20	0.10	0.08	0.28	0.29
CO ₂	0.18	0.49	0.23	0.31	2.50	2.23	2.60	1.45	3.23	0.41	3.53	1.37
Total	100.30	100.17	99.33	100.11	102.21	101.39	101.25	100.21	102.20	100.18	101.80	100.17
Ba	864	40	4121	1450	420	561	574	1428	672	408	639	861
Cr	23	30	43	23	76	38	80	79	81	77	106	73
Cu	<1	5	16	14	12	10	49	45	37	9	7	15
Ga	7	8	12	11	14	14	18	17	18	20	18	20
Nb	7	N.D.	11	N.D.	12	12	13	N.D.	12	N.D.	14	14
Ni	8	9	16	7	32	21	35	13	30	15	12	18
Pb	4	8	9	13	10	14	21	21	16	23	17	23
Rb	45	1	90	79	93	54	95	148	88	124	112	159
Sr	48	304	99	330	79	261	175	152	205	271	213	161
Th	5	4	9	3	9	12	9	9	13	10	13	12
U	<3	6	<3	3	3	4	3	5	<3	5	3	<3
V	30	35	61	39	95	68	114	155	131	121	157	116
Y	11	25	20	25	23	31	27	28	35	40	32	37
Zn	31	37	72	46	126	86	110	106	157	115	137	107
Zr	80	290	145	224	148	242	172	151	197	238	210	246

Harper Creek Suite

Sample no.	WS945*	15M613*	WS944	J914	CP946	WS912	1079G	MP947	WS911	WS941
Latitude	33 22 28	32 41 08	33 22 44	33 07 02	32 57 28	33 22 29	32 46 46	32 55 47	33 18 26	33 18 29
Longitude	116 36 46	116 11 18	116 35 58	116 35 03	116 32 22	116 37 08	116 38 29	116 29 00	116 38 49	116 41 33
Lithology	Qz-rich granitoid	Qz-rich granitoid	Granodiorite	Tonalite	Granodiorite	Qz-rich granitoid	Ton/granod	Granodiorite	Tonalite	Monzogranite
Harper Creek suite										
SiO ₂	75.32	75.08	74.47	73.82	72.47	71.25	71.20	71.12	71.10	71.07
TiO ₂	0.53	0.56	0.48	0.43	0.53	0.63	0.59	0.49	0.58	0.52
Al ₂ O ₃	11.87	11.75	12.61	12.67	13.48	12.78	13.91	13.83	13.96	13.30
Fe ₂ O ₃	0.70	1.38	0.35	0.98	0.92	2.59	0.67	0.98	0.87	0.52
FeO	1.60	1.91	1.77	2.18	1.80	0.77	2.15	2.31	2.42	2.14
MnO	0.05	0.07	0.03	0.07	0.04	0.04	0.09	0.08	0.06	0.03
MgO	1.68	1.74	1.25	1.11	1.01	1.87	1.69	1.48	1.66	1.37
CaO	1.12	0.85	2.63	2.66	2.63	0.53	2.69	2.63	1.71	2.04
Na ₂ O	2.07	1.23	2.70	2.43	2.09	1.18	2.49	2.44	1.54	2.18
K ₂ O	2.69	3.02	1.60	1.56	2.48	2.35	3.06	3.02	3.37	4.08
P ₂ O ₅	0.04	0.06	0.14	0.05	0.02	0.17	0.16	0.12	0.06	0.04
H ₂ O+	1.10	1.61	0.76	1.03	0.92	2.19	1.10	0.77	1.47	0.91
H ₂ O-	0.18	0.21	0.10	0.19	0.11	0.34	0.14	0.08	0.21	0.08
CO ₂	1.75	0.53	1.74	1.73	2.70	6.21	0.76	1.60	2.71	2.27
Total	100.70	100.00	100.63	100.91	101.20	102.90	100.70	100.95	101.72	100.55
C (graphit)	0.48	N.D.	0.47	0.47	0.74	1.69	N.D.	0.44	0.74	0.62
Total with	99.43	N.D.	99.36	99.65	99.24	98.38	N.D.	99.79	99.75	98.90
Ba	1622	1106	715	431	861	1785	2028	810	1353	1363
Cr	70	73	47	44	47	71	58	51	77	53
Cu	7	25	16	11	13	95	60	30	20	4
Ga	15	18	15	15	13	17	16	13	14	14
Nb	12	11	12	10	11	15	N.D.	10	14	15
Ni	5	14	6	5	17	44	14	24	7	6
Pb	14	14	11	11	18	12	21	17	18	19
Rb	101	115	71	72	100	61	92	124	126	160
Sr	148	102	221	225	190	107	218	178	182	185
Th	12	11	8	4	11	9	7	9	8	7
U	3	4	<3	<3	3	4	4	4	3	<3
V	105	99	68	53	102	168	121	78	122	86
Y	18	29	21	7	27	24	23	18	23	6
Zn	95	90	78	61	100	60	77	80	82	81
Zr	143	145	176	175	217	133	199	130	155	182

Harper Creek Suite

1079F	D9411	J902	PO2	D949	J40	WS943	D947	MP944	MP949	PO1
32 52 12	32 47 08	33 01 43	33 17 11	32 48 04	33 05 33	33 22 49	32 49 00	32 50 12	32 56 27	33 21 49
116 30 40	116 30 25	116 32 57	116 47 45	116 31 10	116 35 41	116 35 45	116 31 56	116 29 44	116 29 20	116 50 08
Qz-rich granitoid	Monzogranite	Ton/granod	Granodiorite	Monzogranite	Granodiorite	Granodiorite	Monzogranite	Tonalite	Monzogranite	Granodiorite
70.93	70.80	70.72	70.52	70.33	70.32	69.88	69.59	69.52	69.39	69.19
0.74	0.51	0.47	0.73	0.63	0.68	0.55	0.60	0.56	0.70	0.88
13.42	13.85	14.44	12.90	13.85	13.26	14.05	14.21	14.32	14.24	14.35
1.29	0.97	0.77	0.98	0.73	0.66	0.69	0.58	0.91	0.67	0.85
2.81	1.90	2.32	2.77	2.41	2.97	2.35	2.58	2.38	2.81	3.01
0.10	0.02	0.04	0.06	0.09	0.09	0.03	0.07	0.04	0.08	0.04
2.00	1.30	1.39	1.94	1.60	2.14	1.72	1.71	1.42	1.81	1.50
1.28	2.65	1.74	2.45	1.72	1.82	2.63	2.87	2.66	2.99	1.83
1.34	2.05	1.72	1.97	1.84	2.02	2.03	2.06	1.88	2.81	2.01
3.85	4.00	3.39	2.75	3.48	4.10	3.24	2.70	2.66	2.79	4.32
0.05	0.15	0.04	0.09	0.06	0.04	0.11	0.08	0.14	0.15	0.07
1.63	0.87	1.48	1.21	1.38	1.48	0.98	1.17	1.42	0.80	1.18
0.11	0.23	0.25	0.19	0.15	0.25	0.20	0.09	0.25	0.07	0.22
0.26	1.92	2.94	2.47	2.84	3.04	1.62	3.38	3.78	0.43	0.98
99.81	101.22	101.71	101.03	101.11	102.87	100.08	101.69	101.94	99.74	100.43
N.D.	0.52	0.80	0.67	0.77	0.83	0.44	0.92	1.03	N.D.	N.D.
N.D.	99.82	99.57	99.23	99.04	100.66	98.90	99.23	99.19	N.D.	N.D.
1164	945	1024	935	1349	1215	842	1267	905	564	1854
68	57	66	75	65	75	57	83	64	66	52
20	7	12	37	22	63	15	10	22	10	8
17	13	15	15	14	17	14	16	15	17	13
N.D.	13	10	15	14	14	14	11	10	13	15
13	14	6	36	5	18	22	4	31	16	6
20	17	21	14	21	24	18	18	23	15	22
142	133	136	121	128	136	118	87	100	155	160
141	174	163	167	153	186	176	194	199	145	158
17	13	18	15	9	19	14	13	10	2	12
3	<3	4	3	4	<3	3	3	3	3	<3
117	99	104	115	119	125	79	141	116	62	82
27	27	29	27	22	27	23	21	29	23	38
105	63	100	90	101	97	83	97	106	82	95
192	162	147	181	144	224	138	197	184	198	246

Harper Creek Suite

1079M*	EV911*	1079E	CP947	PO9	84SC2*	PO3	J9410	MP943	MP35	MP946
33 04 14	33 07 02	32 48 52	32 56 42	33 19 24	33 06 40	33 15 54	33 04 20	32 49 47	32 56 19	32 52 22
116 32 36	116 26 25	116 31 26	116 32 11	116 51 51	116 26 46	116 48 46	116 32 19	116 29 41	116 29 03	116 24 47
Granodiorite	Ton/granod	Tonalite	Qz-rich granitoid	Ton/granod	Tonalite	Granodiorite	Tonalite	Tonalite	Granodiorite	Qz-rich granitoid
68.91	68.34	68.27	67.96	67.39	67.33	67.10	67.02	66.81	66.07	65.36
0.74	0.55	0.59	0.67	0.67	0.72	0.50	0.58	0.73	0.54	0.86
14.02	14.98	14.65	15.34	13.79	14.74	16.23	14.49	15.20	15.70	14.60
1.22	1.07	1.04	1.39	1.27	0.80	1.36	1.22	1.25	0.71	1.59
2.55	2.36	2.97	2.80	2.72	3.48	3.21	2.84	3.30	2.74	3.45
0.08	0.05	0.05	0.04	0.06	0.06	0.29	0.06	0.07	0.10	0.09
1.97	1.88	1.72	1.62	3.21	2.37	1.48	2.04	2.05	1.85	2.18
2.49	3.02	3.26	1.96	3.10	3.08	3.71	2.12	2.41	3.22	2.17
2.04	2.44	2.34	1.92	2.32	2.34	2.85	2.22	1.72	2.75	1.62
3.48	2.65	2.96	2.36	3.06	2.29	2.39	3.58	3.07	4.03	3.29
0.04	0.08	0.12	0.14	0.12	0.06	0.26	0.05	0.10	0.30	0.09
1.55	1.00	1.10	2.10	1.17	1.21	0.79	1.17	1.57	1.26	1.69
0.09	0.09	0.09	0.31	0.19	0.05	0.14	0.14	0.19	0.10	0.19
1.02	1.31	0.74	3.70	0.85	2.42	0.86	4.31	4.05	0.20	5.25
100.20	99.82	99.90	102.31	99.92	100.95	101.17	101.84	102.52	99.57	102.43
N.D.	N.D.	N.D.	1.01	N.D.	0.66	N.D.	1.18	1.10	N.D.	1.43
N.D.	N.D.	N.D.	99.62	N.D.	99.19	N.D.	98.71	99.57	N.D.	98.61
1243	1593	1261	819	1242	753	829	1145	1058	1360	1174
81	61	63	89	131	86	29	86	92	39	96
33	17	41	26	8	19	<1	38	45	18	43
18	15	17	18	16	18	17	19	18	19	18
N.D.	13	N.D.	12	12	15	10	14	14	N.D.	15
14	10	25	39	24	12	7	40	44	18	46
17	19	25	17	16	14	17	17	14	22	21
123	86	98	94	109	97	87	151	126	143	124
192	266	223	172	184	252	241	158	189	224	185
16	9	12	11	11	11	9	16	12	<2	14
3	<3	4	<3	<3	<3	<3	<3	3	4	<3
136	80	108	131	90	126	66	125	151	52	163
27	22	22	24	22	16	74	25	30	35	39
101	79	108	92	94	98	85	90	123	100	96
202	148	179	183	160	188	227	187	206	81	210

Western-zone

Sample no	ECM32	A44	1079B	A942	E7	330851	1079A1	TS45	A23	1079C1
Latitude	32 57 08	32 49 30	32 51 17	32 50 10	33 01 22	32 47 38	32 52 10	32 55 02	32 50 40	32 49 35
Longitude	116 47 44	116 48 55	116 51 04	116 50 35	117 05 46	117 03 45	116 53 05	116 39 02	116 52 37	116 51 44
Lithology	Rhyolite tuff	Rhyolite	Meta-dacite tuff	Meta-dacite tuff	Monzogranite	Andesite breccia	Pelitic schist	Amphibolite	Metabasalt	Amphibolite
<u>Western-zone metavolcanic and metasedimentary rocks/coeval plutons</u>										
SiO ₂	78.11	77.80	74.85	74.00	73.56	70.74	60.79	55.32	52.10	49.13
TiO ₂	0.11	0.08	0.19	0.27	0.27	0.57	0.96	1.26	1.20	1.23
Al ₂ O ₃	12.58	12.33	12.75	13.62	13.69	13.42	17.15	14.33	16.70	14.70
Fe ₂ O ₃	0.84	0.50	0.84	0.90	0.83	2.29	1.22	5.76	2.60	1.76
FeO	0.16	0.08	0.59	1.82	1.38	2.37	6.28	7.58	7.30	9.00
MnO	0.01	0.01	0.03	0.10	0.04	0.05	0.20	0.28	0.26	0.53
MgO	0.09	0.20	0.30	0.34	0.66	1.40	2.61	2.79	6.10	1.89
CaO	0.48	0.56	1.38	2.04	2.69	4.16	3.35	9.61	10.60	19.62
Na ₂ O	4.69	3.24	3.09	3.64	3.75	3.42	2.71	0.95	2.60	0.75
K ₂ O	2.95	4.89	5.27	2.64	1.85	1.21	3.50	0.28	0.33	0.06
P ₂ O ₅	0.01	0.02	0.04	0.04	0.04	0.09	0.19	0.21	0.16	0.26
H ₂ O+	0.27	0.73	0.53	0.52	0.62	0.52	1.39	1.14	0.36	0.72
H ₂ O-	0.08	0.10	0.08	0.06	0.20	0.12	0.11	0.06	0.12	0.08
CO ₂	0.05	0.06	0.04	0.23	0.11	0.07	0.05	0.05	0.02	0.05
Total	100.43	100.60	99.98	100.22	99.69	100.43	100.51	99.62	100.45	99.78
Ba	694	726	1603	838	557	301	383	147	41	67
Cr	3	5	6	6	4	15	36	15	65	7
Cu	<1	6	4	<1	10	4	5	10	133	9
Ga	18	13	16	16	11	17	22	22	19	22
Nb	3	N.D.	N.D.	9	5	5	N.D.	6	N.D.	N.D.
Ni	<2	2	2	3	4	8	10	7	20	9
Pb	11	4	10	39	7	14	10	8	5	13
Rb	47	136	134	85	58	39	326	4	46	4
Sr	41	43	144	158	191	180	144	148	193	139
Th	10	15	11	17	6	8	5	4	7	5
U	<3	4	4	6	<3	<3	<3	4	4	4
V	<4	7	12	13	29	61	165	153	312	70
Y	41	24	39	38	17	41	30	62	19	60
Zn	65	8	27	286	30	64	73	78	107	298
Zr	181	87	215	193	117	223	190	142	50	192

NOTES AND APPENDIX FOR GEOCHEMICAL ANALYSES

Notes: Abbreviations for lithologies are: quartz-rich granitoid, qz-rich granitoid; leucomonzogranite, leucomonzo; borderline monzogranite-granodiorite, monzo/granod; borderline tonalite-granodiorite, ton/granod; quartz monzodiorite, qz monzodiorite; borderline tonalite-quartz diorite, ton/qz diorite; quartz diorite, qz diorite; hornblende gabbro, hbl gabbro.
*Forty-three samples analyzed for major oxides by Rapid Rock method at the U.S Geological Survey, Reston, Virginia.

#N.D. = not determined. Symbol < indicates actual value less than or equal to number shown.

**Stephenson Peak facies of the Harper Creek suite.

##Mother Grundy Peak Monzogranite.

Appendix

Two hundred-forty-six plutonic rocks and twenty-nine prebatholithic rocks were analyzed by a combination of x-ray fluorescence (XRF) and rapid rock method for major and selected trace elements. Major and trace elements of 201 samples were determined by XRF method at Macquarie University. Forty-three plutonic samples were analyzed for major oxides at the U.S. Geological Survey by rapid rock method; trace elements for these samples were determined by XRF method at Macquarie University. In addition, major and trace elements of two plutonic rock samples were analyzed at the U.S. Geological Survey by quantitative x-ray spectroscopy, partial chemical analysis, and XRF methods.

At Macquarie University, major elements (Si, Al, Fe, Mg, Ca, Na) were determined by XRF using lithium tetraborate/lithium carbonate/la oxide glass disks, in a Siemens instrument. Calibration was by means of international rock standards, and well-calibrated internal standards were included as unknowns in each run. All samples were run in duplicate. FeO was determined by titration; H₂O and CO₂ were analyzed using a LECO furnace, with magnesium perchlorate (H₂O) and ascarite (CO₂) collectors. Minor elements (Ti, Cr, Mn, Ni, K, P) and some trace elements (Rb, Ba, Nb, Sr, Zr, Pb, Th, U, Y, V, Zn, Cu, Ga) were analyzed by XRF using pressed-powder pellets. Mass-absorption corrections (Norrish and Chappell, 1977) were applied, and all samples were analyzed in duplicate, using an appropriate range of carefully selected rock standards. Comparisons of duplicate analyses have given the following estimates of precision (1s) at the median values for each element:

Major elements: <± 1%

Minor elements: Ti, Mn, Cr, Ni, ± 2% or better; K, P, ± 10%

Trace elements, XRF: Rb, Ba, Nb, Y, Ga, ± 15%; Zr, Cu, ± 10%; Sr, V, Zn, ± 2%