

U.S. DEPARTMENT OF THE INTERIOR

U.S. GEOLOGICAL SURVEY

GEOCHEMICAL DATA FOR JURASSIC DIABASE ASSOCIATED WITH EARLY
MESOZOIC BASINS IN THE EASTERN UNITED STATES:
WESTERN NEWARK BASIN, PENNSYLVANIA AND NEW JERSEY

By

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WESTERN NEWARK BASIN, PENNSYLVANIA AND NEW JERSEY

One hundred twenty-three (123) samples of diabase from fifteen (15) sheets and three (3) dikes were collected by four (4) workers in New Jersey and Pennsylvania and analyzed by the U.S. Geological Survey. Johnathan Husch and others provided thirty (30) samples from seven (7) sheets and one (1) dike for which partial chemistry is here provided, the balance of the chemistry being available in Husch and others (1984), Husch and Schwimmer (1985), and Husch (1988). Two (2) dike samples in New Jersey were provided by Ronald A. Parker of the U.S.G.S. for which major element chemistry only is available. R.C. Smith, II, of the Pennsylvania Geological Survey, provided nineteen (19) samples from the Warwick core hole through the Morgantown diabase sheet; the balance of the chemistry is documented in Smith (1973). Seventy-two (72) whole rock samples from eight (8) diabase sheets in Pennsylvania were collected by Froelich and Gottfried, and complete chemistry is documented here.

The palladium (Pd) and platinum (Pt) abundances and ratios in the chilled margins of the many sheets and dikes are typical of those in the high Ti, quartz normative magmas throughout the province. Platinum contents are consistently greater than palladium in the orthopyroxene cumulate zones, and Pd is greater than Pt in the late-stage differentiates. No significant zones or areas of enrichment were discovered in sampling the diabase sheets of the Western Newark basin; however, many areas of thick evolved ferrogabbro, ferrodiorite, and granophyric differentiates are present that were not sampled.

References

- Husch, J.M., Sturgis, D.S., and Bambrick, T.C., 1984, Mesozoic diabases from west-central New Jersey: Major and trace element geochemistry of whole-rock samples: *Northeastern Geology*, v. 6, p. 51-63.
- Husch, J.M., and Schwimmer, R., 1985, Major and trace element concentrations across a Mesozoic basaltic dike, New Hope, Pennsylvania: *Northeastern Geology*, v. 7, p. 144-160.
- Husch, J.M., 1988, Significance of major- and trace-element variation trends in Mesozoic diabase, west-central New Jersey and eastern Pennsylvania, in Froelich, A.J., and Robinson, G.R., Jr., eds., *Studies of the early Mesozoic basins of the Eastern United States*: U.S. Geological Survey Bulletin 1776, p. 141-150.
- Smith, R.C., II, 1973, *Geochemistry of Triassic diabase from southeastern Pennsylvania*: unpublished Ph.D. thesis, Pennsylvania State University, University Park, 262 p.

EXPLANATION FOR PLATE 1

Geochemical sample locality

- H- ● Husch and others, 1984; 1985
Husch, 1988
- S-D- ● Smith, 1973
- RP- ● R.A. Parker, USGS, 1990
- Froelich and Gottfried, USGS, 1988; 19889

WESTERN NEWARK BASIN, PENNSYLVANIA AND NEW JERSEY

SAMPLE NO.	MAGMA TYPE	DESCRIPTION OF SAMPLE
		<u>Rocky Hill sheet</u> - Table 1 (J. Husch samples)
H-KQ-6	High Ti, quartz normative	Diabase
		<u>Pennington Mountain sheet</u> - Table 1 (J. Husch samples)
H-PQ-3	"	Ferrogabbro
H-PQ-4	"	Granophyre
H-PQ-6	"	Ferrogabbro
		<u>Unnamed dikes</u>
RP-315	"	Diabase
RP-89	"	"
		<u>Baldpate Mountain sheet</u> - Table 2 (J. Husch samples)
H-MS-1	"	Granophyre
H-MS-2	"	"
H-MS-3	"	"
H-T-1	"	Ferrogabbro
H-T-5	"	Chill
H-T-7	"	Diabase
H-T-8	"	Granophyre
H-T-9	"	Diabase
		<u>Lambertville sill</u> - Table 3a, 3b (J. Husch samples)
H-LS-3	"	Chill
H-LS-8	"	Diabase
H-LS-11	"	Diabase
H-LS-2	"	Cumulate
H-ELS-5	"	Upper chill
H-ELS-10	"	Cumulate
H-ELS-11	"	Cumulate
H-ELS-15	"	Cumulate
H-ELS-21	"	Ferrogabbro
H-ELS-23	"	Ferrogabbro
H-ELS-24	"	Diabase
		<u>Belle Mountain sheet</u> - Table 4 (J. Husch sample)
H-WH-1	"	Ferrogabbro
		<u>Stockton sheet</u> - Table 4 (J. Husch sample)
H-LQ-1	"	Diabase
		<u>Point Pleasant sheet</u> - Table 4 (J. Husch samples)
H-PP-2	"	Chilled margin
H-PP-5	"	Cumulate

WESTERN NEWARK BASIN, PENNSYLVANIA AND NEW JERSEY

SAMPLE NO.	MAGMA TYPE	DESCRIPTION OF SAMPLE
		<u>Quarry dike</u> - Table 4 (J. Husch samples)
H-Q-2	High Ti, quartz normative	Chill
H-Q-7	"	Diabase
H-Q-10	"	Diabase
		<u>Coffman Hill sheet,</u> Riegelsville area, Table 5
FG-88-PRI-1	"	Cumulate
FG-88-PRI-2	"	Cumulate
FG-88-PRI-3	"	Chill (Lower)
		<u>Quakertown sheet</u> - Table 6
FG-88-PQu-1	"	Diabase
FG-88-PQu-2	"	Diabase
FG-88-PQu-3	"	Diabase
FG-88-PQu-4	"	Cumulate
		<u>Quakertown sheet,</u> Milford Square area
FG-88-PMS-7	"	Diabase
FG-88-PMS-8	"	"
		<u>East Greenville sheet</u> - Table 7a
FG-88-PEG-1	"	Diabase
FG-88-PEG-2	"	Diabase
FG-88-PEG-3	"	Diabase
		<u>East Greenville sheet,</u> Milford Square area - Table 7b
FG-88-PMS-1	"	Chill
FG-88-PMS-2	"	Diabase
FG-88-PMS-2A	"	Granophyre
FG-88-PMS-3	"	Diabase
FG-88-PMS-3A	"	Granophyre
FG-88-PMS-4	"	Diabase
FG-88-PMS-5	"	Diabase
FG-88-PMS-6	"	Diabase
		<u>East Greenville sheet,</u> Perkiomenville area - Table 7c
FG-88-PPe-1	"	Chill
FG-88-PPe-2	"	Cumulate
FG-88-PPe-3	"	"
FG-88-PPe-4	"	"
FG-88-PPe-5	"	"
FG-88-PPe-6	"	"
FG-88-PPe-7	"	Diabase
FG-88-PPe-8	"	"
FG-88-PPe-9	"	Chill

WESTERN NEWARK BASIN, PENNSYLVANIA AND NEW JERSEY

SAMPLE NO.	MAGMA TYPE	DESCRIPTION OF SAMPLE
		<u>Pottstown sheet,</u> Sassamansville area - Table 8a, 8b
FG-88-PS-1	High Ti, quartz normative	Fine-grained diabase
FG-88-PS-2A	"	Ferrogabbro
FG-88-PS-2B	"	Granophyre
FG-88-PS-3	"	Diabase
FG-88-PS-4	"	Cumulate
FG-88-PS-5A	"	Ferrogabbro
FG-88-PS-5B	"	Ferrogabbro
FG-88-PS-6	"	Chill
FG-88-PS-7	"	Cumulate
FG-88-PS-8	"	Diabase
FG-88-PS-9	"	Granophyre
FG-88-PS-10	"	Granophyre
FG-88-PS-11	"	Granophyre
FG-88-PS-11A	"	Diabase
FG-88-PS-12	"	Diabase
		<u>Pottstown sheet,</u> Boyertown area - Table 8b
FG-88-PBO-5	"	Lower Chill
		<u>Rattlesnake Hill sheet,</u> Boyertown area - Table 9
FG-88-PBO-1	"	Near chill
FG-88-PBO-2	"	Cumulate
FG-88-PBO-3	"	Cumulate
FG-88-PBO-4	"	Cumulate
		<u>Monocacy Hill sheet</u> Jacksonwald area - Table 10
FG-89-PJ-1	"	Nr. Lower Chill
FG-89-PJ-2	"	Cumulate
FG-89-PJ-3	"	Nr. Upper Chill
		<u>Pine Ridge sheet</u> Jacksonwald area - Table 10
FG-89-PJ-4	"	Diabase
FG-89-PJ-5	"	"
FG-89-PJ-6	"	"
FG-89-PJ-9	"	"
FG-89-PJ-10	"	"
FG-89-PJ-11	"	"

WESTERN NEWARK BASIN, PENNSYLVANIA AND NEW JERSEY

SAMPLE NO.	MAGMA TYPE	DESCRIPTION OF SAMPLE
		<u>Morgantown sheet</u> - Table 11a, 11b (Smith samples) Vertical distance from upper contact (feet) Warwick core hole
S-D-150	High Ti, quartz normative	1
S-D-152	"	11
S-D-153	"	69
S-D-154	"	131
S-D-155	"	204
S-D-156	"	259
S-D-157	"	319
S-D-158	"	376
S-D-159	"	444
S-D-160	"	521
S-D-161	"	557
S-D-162	"	603
S-D-163	"	652
S-D-164	"	708
S-D-165	"	768
S-D-166	"	828
S-D-167	"	874
S-D-168	"	929
S-D-169	"	383
		<u>Morgantown sheet</u> - Table 11c
P-28	"	Granophyre
P-63	"	Diabase
P-138	"	Granophyre
P-293.7	"	Cumulate
PM-84-1A	"	Granophyre
PM-84-1B	"	Diabase
		<u>Morgantown sheet,</u> Elverson area - Table 12
FG-88-PEL-1	"	Diabase
FG-88-PEL-2	"	"
FG-88-PEL-3	"	"
		<u>Morgantown Sheet,</u> Birdsboro area - Table 12
FG-88-PBi-1	"	Diabase
FG-88-PBi-2A	"	Ferrogabbro
FG-88-PBi-2B	"	Granophyre
FG-88-PBi-3	"	Diabase
FG-88-PBi-4	"	Altered diabase

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		<u>Rocky Hill sheet - Table 1</u> (J. Husch samples)
H-KQ-6	High Ti, quartz normative	Diabase
		<u>Pennington Mountain sheet - Table 1</u> (J. Husch samples)
H-PQ-3	"	Ferrogabbro
H-PQ-4	"	Granophyre
H-PQ-6	"	Ferrogabbro
		<u>Unnamed dikes</u>
RP-315	"	Diabase
RP-89	"	"
		<u>Baldpate Mountain sheet - Table 2</u> (J. Husch samples)
H-MS-1	"	Granophyre
H-MS-2	"	"
H-MS-3	"	"
H-T-1	"	Ferrogabbro
H-T-5	"	Chill
H-T-7	"	Diabase
H-T-8	"	Granophyre
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		<u>Lambertville sill - Table 3a, 3b</u> (J. Husch samples)
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H-LS-11	"	Diabase
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H-ELS-11	"	Cumulate
H-ELS-15	"	Cumulate
H-ELS-21	"	Ferrogabbro
H-ELS-23	"	Ferrogabbro
H-ELS-24	"	Diabase
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H-WH-1	"	Ferrogabbro
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H-LQ-1	"	Diabase
		<u>Point Pleasant sheet - Table 4</u> (J. Husch samples)
H-PP-2	"	Chilled margin
H-PP-5	"	Cumulate

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		<u>Quarry dike</u> - Table 4 (J. Husch samples)
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H-Q-10	"	Diabase
		<u>Coffman Hill sheet,</u> Riegelsville area, Table 5
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FG-88-PRI-3	"	Chill (Lower)
		<u>Quakertown sheet</u> - Table 6
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FG-88-PQu-2	"	Diabase
FG-88-PQu-3	"	Diabase
FG-88-PQu-4	"	Cumulate
		<u>Quakertown sheet,</u> Milford Square area
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FG-88-PMS-8	"	"
		<u>East Greenville sheet</u> - Table 7a
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FG-88-PEG-3	"	Diabase
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FG-88-PMS-3	"	Diabase
FG-88-PMS-3A	"	Granophyre
FG-88-PMS-4	"	Diabase
FG-88-PMS-5	"	Diabase
FG-88-PMS-6	"	Diabase
		<u>East Greenville sheet,</u> Perkiomenville area - Table 7c
FG-88-PPe-1	"	Chill
FG-88-PPe-2	"	Cumulate
FG-88-PPe-3	"	"
FG-88-PPe-4	"	"
FG-88-PPe-5	"	"
FG-88-PPe-6	"	"
FG-88-PPe-7	"	Diabase
FG-88-PPe-8	"	"
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FG-88-PEL-2	"	"
FG-88-PEL-3	"	"
		<u>Morgantown Sheet,</u> Birdsboro area - Table 12
FG-88-PBi-1	"	Diabase
FG-88-PBi-2A	"	Ferrogabbro
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FG-88-PBi-3	"	Diabase
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FG-88-PS-4	"	Cumulate
FG-88-PS-5A	"	Ferrogabbro
FG-88-PS-5B	"	Ferrogabbro
FG-88-PS-6	"	Chill
FG-88-PS-7	"	Cumulate
FG-88-PS-8	"	Diabase
FG-88-PS-9	"	Granophyre
FG-88-PS-10	"	Granophyre
FG-88-PS-11	"	Granophyre
FG-88-PS-11A	"	Diabase
FG-88-PS-12	"	Diabase
		<u>Pottstown sheet,</u> Boyertown area - Table 8b
FG-88-PBO-5	"	Lower Chill
		<u>Rattlesnake Hill sheet,</u> Boyertown area - Table 9
FG-88-PBO-1	"	Near chill
FG-88-PBO-2	"	Cumulate
FG-88-PBO-3	"	Cumulate
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		<u>Monocacy Hill sheet</u> Jacksonwald area - Table 10
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		<u>Pine Ridge sheet</u> Jacksonwald area - Table 10
FG-89-PJ-4	"	Diabase
FG-89-PJ-5	"	"
FG-89-PJ-6	"	"
FG-89-PJ-9	"	"
FG-89-PJ-10	"	"
FG-89-PJ-11	"	"

Table 1. Western Newark basin, Pennsylvania and New Jersey. Rocky Hill and Pennington Mountain sheets and unnamed dikes.

	W-243101 H-KQ-6	W-243095 H-PQ-3	W-243096 H-PQ-4	W-243097 H-PQ-6	W-251161 RP-315	W-251162 RP-89
Lat.	40°22'N	40°21'N	40°21'N	40°27'N	40°28'N	40°27'N
Long.	74°31'W	74°48'W	74°48'W	74°48'W	74°34'W	74°31'W
SiO ₂ (%)	—	—	—	—	51.00	50.70
TiO ₂	—	—	—	—	1.10	1.10
Al ₂ O ₃	—	—	—	—	14.20	14.00
Fe ₂ O ₃ [*]	11.18	12.90	14.59	18.31	—	—
Fe ₂ O ₃	—	—	—	—	1.30	1.80
FeO	—	—	—	—	8.70	8.20
MnO	—	—	—	—	0.17	0.18
MgO	—	—	—	—	7.40	7.30
CaO	10.91	9.23	5.32	5.04	10.10	10.50
Na ₂ O	2.59	2.88	3.34	3.85	2.20	1.80
K ₂ O	—	—	—	—	0.53	0.42
P ₂ O ₅	—	—	—	—	0.16	0.16
H ₂ O ⁺	—	—	—	—	1.50	0.85
H ₂ O ⁻	—	—	—	—	0.45	0.35
CO ₂	—	—	—	—	0.09	1.30
S	0.04	0.04	0.08	0.06	—	—
F	0.02	0.03	0.02	0.09	—	—
Cl	0.03	0.10	0.30	0.35	—	—
Σ	—	—	—	—	99.00	99.00
Sc (ppm)	33	32	22.4	31	—	—
Cr	33	7.6	2.80	2.50	—	—
Co	44	45	35	40	—	—
Ni	54	30	<5.0	6.0	—	—
Cu	117	194	310	470	—	—
Zn	80	108	187	180	—	—
As	<1.70	1.90	5.5	10.0	—	—
Rb	24.0	37	79	58	—	—
Sr	221	257	175	200	—	—
Sb	0.200	0.40	0.75	0.67	—	—
Cs	1.40	1.10	5.0	1.60	—	—
Ba	184	235	580	440	—	—
Y	25.0	40	87	62	—	—
La	12.0	16.7	43	29.3	—	—
Ce	25.0	33	88	60	—	—
Nd	13.0	17.0	41	31	—	—
Sm	3.7	5.0	11.8	8.9	—	—
Eu	1.18	1.40	2.88	2.68	—	—
Tb	0.72	0.92	2.03	1.50	—	—
Yb	2.30	3.0	6.7	5.0	—	—
Lu	0.36	0.44	0.92	0.70	—	—
Zr	100	159	310	224	—	—
Hf	2.60	3.7	9.2	5.7	—	—
Nb	10.0	14.0	35	20.0	—	—
Ta	4.1	2.10	12.2	2.20	—	—
Th	2.50	3.6	9.0	5.0	—	—
U	<0.70	0.82	1.90	1.20	—	—
Pd (ppb)	5.4	5.2	0.50	2.90	—	—
Pt	7.8	3.0	<1.00	<1.00	—	—
Au	<1.50	<11.0	<6.0	15.0	—	—

Table 2. Baldpate Mountain sheet.

	W-243086	W-243087	W-243088	W-243089	W-243090	W-243091	W-243092	W-243093
	H-MS-1	H-MS-2	H-MS-3	H-T-1	H-T-5	H-T-7	H-T-8	H-T-9
Lat.	40°19'N	40°19'N	40°19'N	40°20'N	40°19'N	40°19'N	40°19'N	40°19'N
Long.	74°54'W	74°54'W	74°54'W	74°52'W	74°54'W	74°54'W	74°52'W	74°53'W
Fe ₂ O ₃ (%)	14.73	13.99	14.20	15.59	11.44	11.24	11.45	11.45
CaO	4.20	5.32	4.62	4.90	8.95	10.91	9.09	10.49
Na ₂ O	3.64	3.33	3.46	3.06	2.30	2.16	2.04	2.36
S	0.07	0.06	0.06	0.04	0.03	0.04	0.03	0.05
F	0.11	0.09	0.09	0.07	0.03	0.03	0.02	0.02
Cl	0.20	0.32	0.33	0.14	0.10	0.01	0.01	0.05
Sc (ppm)	23.0	21.4	21.3	30	32	35	36	39
Cr	2.30	2.30	<4.0	2.80	61	71	330	340
Co	32	34	36	40	47	48	52	53
Ni	9.0	5.0	7.0	6.0	54	70	100	82
Cu	243	278	310	270	152	113	114	130
Zn	126	350	140	121	92	71	76	88
As	4.8	3.2	5.4	4.5	<1.10	<1.10	<1.10	<1.40
Rb	69	88	82	89	38	31	37	34
Sr	167	193	203	184	232	215	190	195
Sb	0.31	0.80	0.53	0.44	<0.110	<0.130	<0.130	<0.290
Cs	2.96	3.6	3.2	2.70	1.70	0.84	0.88	0.92
Ba	490	580	580	460	228	168	190	148
Y	76	80	126	74	42	32	35	30
La	43	43	43	34	13.0	10.0	10.0	11.0
Ce	89	88	86	66	26.4	21.1	22.1	23.2
Nd	46	48	43	35	15.0	9.8	12.0	13.0
Sm	12.2	11.7	11.5	9.5	3.9	3.3	3.2	3.3
Eu	2.86	2.73	2.82	2.21	1.23	1.04	1.00	1.00
Tb	2.15	2.06	2.02	1.65	0.74	0.61	0.60	0.64
Yb	6.9	6.7	6.6	5.4	2.30	2.10	2.00	2.10
Lu	0.94	0.92	0.89	0.75	0.35	0.30	0.290	0.33
Zr	320	330	360	280	120	107	107	106
Hf	9.4	9.8	9.6	7.6	2.69	2.40	2.40	2.60
Nb	31	45	35	25.0	12.0	8.8	9.5	11.0
Th	9.7	10.0	9.4	6.9	2.60	2.20	2.00	2.40
U	1.90	1.90	1.90	1.60	0.64	0.52	<0.60	0.60
Pd (ppb)	0.80	1.10	0.60	12.0	1.30	1.00	0.50	1.00
Pt	<1.00	<1.00	<1.00	1.10	<1.00	1.30	1.00	2.80
Au	<8.0	<1.70	<8.0	9.6	<3.0	<6.0	<2.60	<2.70

Table 3a. Lambertville sill.

	W-243102	W-243103	W-243104	W-243105	W-243106	W-243107	W-243108	W-243109
	H-LS-3	H-LS-8	H-LS-11	H-LS-2	H-ELS-5	H-ELS-10	H-ELS-11	H-ELS-15
Lat.	40°20'N	40°21'N	40°21'N	40°21'N	40°21'N	40°20'N	40°21'N	40°21'N
Long.	74°55'W	74°56'W	74°56'W	74°55'W	74°56'W	74°56'W	74°56'W	74°56'W
Fe ₂ O ₃ (%)	11.58	10.05	10.81	11.87	12.03	13.47	11.65	11.67
CaO	11.47	11.47	11.61	11.61	10.07	11.05	11.75	10.91
Na ₂ O	2.02	2.67	2.26	1.70	2.20	1.82	1.75	2.01
S	0.04	0.03	0.01	0.04	0.03	0.06	0.02	0.04
F	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Cl	0.01	0.02	0.03	0.01	0.17	0.10	0.01	0.04
Sc (ppm)	37	30	37	43	37	44	42	38
Cr	350	20.0	195	980	310	137	930	400
Co	51	43	49	62	63	60	63	55
Ni	97	51	85	170	91	88	140	97
Cu	118	129	98	85	111	129	97	105
Zn	74	65	64	63	81	88	65	85
As	<1.80	<2.70	<2.00	0.70	1.00	<0.70	<0.70	1.10
Rb	25.0	16.0	12.0	12.0	29.0	22.0	25.0	25.0
Sr	204	236	191	129	189	159	153	202
Sb	<0.31	<0.230	<0.160	0.160	0.150	0.230	<0.110	0.150
Cs	0.88	0.68	0.61	0.78	1.10	1.20	0.68	1.40
Ba	174	152	118	107	164	164	118	153
Y	31	36	22.0	19.0	27.0	28.0	25.0	22.0
La	10.0	10.0	9.6	8.5	10.9	10.9	8.7	9.8
Ce	22.4	20.0	20.4	19.0	23.0	23.3	19.0	21.3
Nd	12.0	12.0	12.0	9.9	13.0	12.0	11.0	12.0
Sm	3.4	3.1	3.0	2.76	3.4	3.5	2.80	3.2
Eu	1.04	1.10	0.96	0.88	1.09	0.96	0.93	1.10
Tb	0.58	0.58	0.59	0.58	0.70	0.67	0.54	0.64
Yb	2.20	1.90	1.90	1.80	2.20	2.40	1.90	2.10
Lu	0.30	0.290	0.290	0.260	0.290	0.31	0.250	0.280
Zr	109	103	88	76	108	93	86	98
Hf	2.50	2.10	2.10	1.80	2.60	2.41	2.10	2.24
Nb	8.9	11.0	7.1	7.5	12.0	8.8	8.9	9.5
Th	2.10	2.00	2.00	1.60	2.20	2.40	1.70	1.90
U	<0.70	<1.30	<0.70	<0.40	<0.40	0.46	0.49	0.61
Pd (ppb)	1.90	3.4	1.40	3.2	1.80	1.50	2.10	0.90
Pt	3.5	4.3	6.2	6.0	3.7	3.2	3.5	1.40
Au	<3.1	15.0	<2.70	<4.0	<5.0	<1.90	<4.0	<1.80

Table 3b. Lambertville sill.

	W-243110 H-ELS-21	W-243111 H-ELS-23	W-243112 H-ELS-24
Lat.	40°21'N	40°21'N	40°21'N
Long.	74°56'W	74°56'W	74°56'W
Fe ₂ O ₃ * (%)	13.40	11.18	10.93
CaO	7.97	7.97	7.41
Na ₂ O	3.49	2.79	3.26
S	0.02	0.05	0.04
F	0.03	0.03	0.03
Cl	0.11	0.02	0.05
Sc (ppm)	36	32	30
Cr	9.0	46	20.0
Co	53	83	45
Ni	39	51	51
Cu	20.0	130	131
Zn	86	135	69
As	<1.70	<1.70	4.2
Rb	50	33	114
Sr	232	215	340
Sb	0.32	<0.220	0.41
Cs	<0.30	1.00	1.20
Ba	188	144	272
Y	28.0	27.0	32
La	11.8	13.0	11.4
Ce	25.0	27.0	23.7
Nd	13.0	15.0	13.0
Sm	3.7	4.1	3.5
Eu	1.29	1.20	1.10
Tb	0.68	0.70	0.63
Yb	2.31	2.40	2.18
Lu	0.33	0.33	0.30
Zr	95	105	109
Hf	2.10	3.1	2.51
Nb	9.6	18.0	9.3
Ta	2.33	9.7	2.00
Th	1.80	2.80	2.30
U	<0.40	1.60	0.55
Pd (ppb)	1.90	0.60	1.70
Pt	2.10	<1.00	1.70
Au	<2.10	<9.0	7.0

Table 4. Belle Mountain, Stockton, Point Pleasant sheets and Quarry dike.

	W-243094 H-WH-1	W-243113 H-LQ-1	W-243098 H-PP-2	W-243099 H-PP-5	W-243114 H-Q-2	W-243115 H-Q-7	W-243116 H-Q-10
Lat.	40°19'N	40°23'N	40°25'N	40°25'N	40°22'N	40°22'N	40°22'N
Long.	74°55'W	74°57'W	75° 3'W	75° 3'W	74°58'W	74°58'W	74°58'W
Fe ₂ O ₃ (%)	12.66	10.90	11.68	12.13	11.35	11.23	11.13
CaO	8.11	10.07	10.77	9.79	10.49	7.97	7.83
Na ₂ O	3.63	2.43	2.04	1.28	1.93	2.05	2.70
S	0.04	0.03	0.03	0.02	0.04	0.03	0.03
F	0.03	0.02	0.02	0.01	0.02	0.02	0.02
Cl	0.21	0.02	0.01	0.01	0.01	0.00	0.01
Sc (ppm)	33	36	38	39	36	36	36
Cr	11.0	20.0	380	960	340	350	370
Co	44	47	53	70	55	52	49
Ni	36	57	91	200	88	91	91
Cu	180	89	98	71	105	108	101
Zn	114	61	67	69	89	81	81
As	2.80	<0.80	2.10	<2.30	<0.90	<1.10	1.40
Rb	55	21.0	23.0	14.0	29.0	63	73
Sr	245	221	190	115	196	208	202
Sb	0.49	<0.220	<0.150	<0.160	0.140	<0.100	0.260
Cs	1.10	0.79	0.80	0.61	0.74	0.40	0.30
Ba	300	167	147	79	149	198	197
Y	27.0	22.0	35	21.0	26.0	27.0	24.0
La	14.8	9.4	10.5	6.1	10.4	10.0	9.8
Ce	31	19.7	22.0	13.0	22.0	21.0	21.0
Nd	16.0	12.0	11.0	7.7	12.0	12.0	11.0
Sm	4.4	2.88	3.3	2.10	3.4	3.2	3.2
Eu	1.45	1.03	1.02	0.62	1.06	1.01	1.03
Tb	0.78	0.62	0.60	0.38	0.60	0.63	0.62
Yb	2.70	1.90	2.20	1.40	2.10	2.00	2.10
Lu	0.38	0.260	0.290	0.220	0.290	0.280	0.270
Zr	132	92	102	66	106	111	102
Hf	3.3	2.17	2.40	1.40	2.50	2.38	2.27
Nb	11.0	7.5	8.7	7.0	7.9	7.5	6.7
Ta	1.80	2.40	2.75	3.7	2.16	1.30	0.84
Th	3.1	2.10	2.10	1.30	2.00	2.00	2.10
U	0.62	0.45	<0.70	<0.70	0.51	0.53	0.55
Pd (ppb)	6.0	1.80	1.80	2.00	2.40	3.1	4.5
Pt	3.1	2.80	3.1	5.9	5.5	6.6	6.8
Au	<10.0	5.1	<2.60	<4.0	<4.0	<6.0	<4.0

Table 5. Coffman Hill sheet, Riegelsville area.

	W-245984 FG-88-PRI-1	W-245985 FG-88-PRI-2	W-245986 FG-88-PRI-3
Lat.	40°33'N	40°33'N	40°31'N
Long.	75° 7'W	75° 7'W	75° 9'W
SiO ₂ (%)	51.00	52.20	52.70
TiO ₂	0.77	0.64	1.13
Al ₂ O ₃	11.70	10.20	14.20
Fe ₂ O ₃	3.18	1.62	2.78
FeO	8.40	8.70	8.10
MnO	0.18	0.19	0.17
MgO	12.40	15.20	7.68
CaO	11.00	9.48	11.00
Na ₂ O	1.56	1.17	2.06
K ₂ O	0.38	0.28	0.60
P ₂ O ₅	0.09	0.07	0.14
H ₂ O ⁺	0.51	0.83	0.90
H ₂ O ⁻	0.32	0.50	0.25
CO ₂	0.04	0.02	0.03
S	0.03	0.01	0.01
F	0.02	0.01	0.03
Cl	0.00	<0.00	0.01
Σ	101.58	101.12	101.79
Sc (ppm)	37	39	37
Cr	860	1070	320
Co	70	64	48
Ni	270	240	95
Zn	60	52	64
Ga	14.0	14.0	18.0
As	<1.00	<1.00	<1.10
Rb	16.0	12.0	25.0
Sr	150	120	180
Sb	0.37	<0.130	0.220
Cs	0.58	0.48	1.20
Ba	110	83	180
Y	15.0	12.0	20.0
La	6.6	5.5	11.0
Ce	16.0	14.0	24.0
Nd	10.0	<10.0	13.0
Sm	2.37	1.87	3.6
Eu	0.71	0.61	1.10
Tb	0.43	0.38	0.63
Yb	1.60	1.30	2.10
Lu	0.240	0.190	0.32
Hf	1.60	1.30	2.80
Nb	4.4	3.3	6.8
Ta	0.35	0.31	0.51
Th	1.30	1.00	2.30
U	0.290	0.250	0.46
Pd (ppb)	9.9	4.7	7.9
Pt	23.0	22.0	15.0
Rh	1.20	0.90	0.80
Ru	0.80	0.60	<0.50
Ir	2.10	1.60	0.60
Au	8.5	<7.0	<4.0

Table 6. Quakertown sheet.

	W-247401 FG88 PQU-1	W-247402 FG88 PQU-2	W-247403 FG88 PQU-3	W-247404 FG88 PQU-4	W-245979 FG88 PMS-7	W-245980 FG88 PMS-8
Lat.	40°28'N	40°28'N	40°27'N	40°24'N	40°28'N	40°29'N
Long.	75°22'W	75°22'W	75°22'W	75°15'W	75°22'W	75°22'W
SiO ₂ (%)	52.70	52.90	52.60	52.60	52.60	52.10
TiO ₂	1.08	1.02	0.96	0.81	1.10	1.12
Al ₂ O ₃	13.60	15.60	15.70	12.50	15.30	14.80
Fe ₂ O ₃	2.02	2.06	1.82	1.68	3.46	2.24
FeO	9.20	8.00	8.00	7.60	7.30	8.50
MnO	0.19	0.17	0.17	0.17	0.17	0.17
MgO	7.64	6.10	6.70	10.30	6.19	7.10
CaO	11.20	11.10	11.30	11.90	11.10	11.50
Na ₂ O	2.13	2.51	2.32	1.74	2.32	2.17
K ₂ O	0.55	0.58	0.58	0.36	0.62	0.50
P ₂ O ₅	0.15	0.11	0.11	0.09	0.13	0.09
H ₂ O ⁺	0.41	0.45	0.48	0.38	0.50	0.28
H ₂ O ⁻	0.17	0.12	0.09	0.23	0.47	0.44
CO ₂	0.01	0.01	0.02	0.01	0.03	0.03
S	<0.01	<0.01	<0.01	<0.01	0.03	0.01
F	0.02	0.02	0.03	0.02	0.03	0.02
Cl	0.03	0.02	0.05	0.02	0.02	0.02
Σ	101.09	100.77	100.93	100.41	101.36	101.09
Sc (ppm)	41	36	35	40	36	38
Cr	76	26.0	89	670	49	239
Co	51	44	44	48	45	47
Ni	82	58	68	138	67	78
Cu	116	68	68	58	—	—
Zn	76	63	66	68	66	65
Ga	19.0	21.0	20.0	17.0	19.0	19.0
As	<1.30	<0.90	2.00	1.30	1.40	<0.90
Rb	18.0	30	16.0	11.0	26.0	<19.0
Sr	184	219	210	147	200	190
Sb	0.140	0.220	0.170	0.170	0.210	0.230
Cs	1.10	0.79	1.20	1.20	0.95	0.83
Ba	143	168	143	115	160	130
Y	21.0	19.0	17.0	16.0	20.0	17.0
La	10.0	9.8	8.9	7.7	11.2	8.2
Ce	22.0	21.0	19.0	17.0	23.3	18.0
Nd	11.0	11.0	8.3	9.4	12.0	<18.0
Sm	3.3	3.1	2.79	2.44	3.5	2.85
Eu	1.01	1.10	1.00	0.81	1.10	0.97
Tb	0.61	0.59	0.54	0.46	0.60	0.51
Yb	2.10	1.80	1.90	1.70	2.30	1.90
Lu	0.32	0.280	0.260	0.240	0.31	0.250
Zr	83	88	75	66	—	—
Hf	2.33	2.40	2.10	1.80	2.60	2.00
Nb	6.8	6.9	6.5	5.1	7.5	5.3
Ta	0.49	0.50	0.41	0.39	0.48	0.44
Th	2.00	2.20	2.00	1.70	2.20	1.70
U	0.45	0.44	0.40	0.37	0.50	0.44
Pd (ppb)	9.5	8.4	7.4	7.3	13.0	4.3
Pt	7.5	6.8	8.1	25.0	8.9	6.7
Rh	<0.50	<0.50	<0.50	0.90	0.50	<0.70
Ru	<0.50	<0.50	<0.50	<0.50	<0.50	<0.70
Ir	<0.50	<0.50	<0.50	1.00	<0.50	<0.70
Au	<4.0	<4.0	<3.0	<6.0	<5.0	<7.0

Table 7a. East Greenville sheet.

	W-245981	W-245982	W-245983
	FG-88	FG-88	FG-88
	PEG-1	PEG-2	PEG-3
Lat.	40°25'N	40°25'N	40°25'N
Long.	75°31'W	75°31'W	75°31'W
SiO ₂ (%)	52.40	52.40	52.70
TiO ₂	1.16	0.97	1.15
Al ₂ O ₃	13.90	14.80	14.70
Fe ₂ O ₃	1.21	1.65	1.33
FeO	8.10	8.40	9.20
MnO	0.18	0.16	0.17
MgO	7.45	7.59	6.62
CaO	10.30	11.30	11.00
Na ₂ O	2.87	2.10	2.10
K ₂ O	0.63	0.55	0.70
P ₂ O ₅	0.13	0.12	0.14
H ₂ O ⁺	1.00	0.68	0.63
H ₂ O ⁻	0.73	0.47	0.51
CO ₂	0.03	0.04	0.04
S	0.03	0.01	0.04
F	0.09	0.02	0.03
Cl	0.06	0.06	0.07
Σ	100.27	101.32	101.13
Sc (ppm)	36	35	36
Cr	263	310	165
Co	40	45	45
Ni	87	91	78
Zn	76	69	83
Ga	19.0	18.0	20.0
As	2.00	<1.00	<1.00
Rb	32	23.0	25.0
Sr	290	190	200
Sb	0.51	<0.270	<0.40
Cs	2.10	1.60	1.40
Ba	140	150	190
Y	20.0	18.0	20.0
La	14.6	10.0	11.3
Ce	28.0	22.0	24.3
Nd	<14.0	12.0	12.0
Sm	3.3	3.1	3.5
Eu	1.10	0.99	1.10
Tb	0.61	0.58	0.65
Yb	2.10	2.00	2.10
Lu	0.290	0.290	0.290
Hf	2.70	2.30	2.70
Nb	6.7	5.9	7.4
Ta	0.53	0.52	0.56
Th	2.20	1.90	2.40
U	1.10	0.40	0.43
Pd (ppb)	11.0	9.9	11.0
Pt	13.0	14.0	10.0
Rh	<1.00	0.60	0.50
Ru	<1.00	<0.50	<0.50
Ir	<1.00	0.60	<0.50
Au	<5.0	<7.0	<5.0

Table 7b. East Greenville sheet, Milford Square area.

	W-245971	W-245972	W-245973	W-245974	W-245975	W-245976	W-245977	W-245978
	FG-88	FG-88	FG-88	FG-88	FG-88	FG-88	FG-88	FG-88
	PMS-1	PMS-2	PMS-2A	PMS-3	PMS-3A	PMS-4	PMS-5	PMS-6
Lat.	40°25'N	40°25'N	40°25'N	40°25'N	40°25'N	40°25'N	40°25'N	40°25'N
Long.	75°26'W	75°26'W	75°26'W	75°26'W	75°26'W	75°26'W	75°26'W	75°26'W
SiO ₂ (%)	52.20	52.10	52.80	52.40	50.30	52.90	52.80	52.40
TiO ₂	1.16	1.08	1.80	0.91	1.90	1.32	1.13	0.86
Al ₂ O ₃	14.10	15.00	13.20	15.10	11.60	14.60	13.90	15.10
Fe ₂ O ₃	2.36	2.15	2.53	1.78	5.48	2.76	-0.17	1.81
FeO	8.40	7.90	8.30	8.20	9.10	8.60	11.00	7.70
MnO	0.17	0.16	0.15	0.17	0.22	0.18	0.18	0.16
MgO	7.51	7.18	3.74	7.19	5.77	5.85	7.32	7.64
CaO	11.00	11.50	9.34	11.70	9.93	10.40	11.00	11.80
Na ₂ O	2.26	2.13	3.17	2.10	2.20	2.44	2.12	2.04
K ₂ O	0.61	0.57	0.87	0.49	0.73	0.77	0.67	0.47
P ₂ O ₅	0.14	0.13	0.29	0.10	0.29	0.17	0.13	0.09
H ₂ O ⁺	0.39	0.45	2.40	0.54	2.70	0.86	0.61	0.11
H ₂ O ⁻	0.46	0.37	0.43	0.38	0.34	0.25	0.14	0.61
CO ₂	0.06	0.07	0.56	0.06	0.37	0.07	0.05	0.05
S	0.05	0.03	0.02	0.01	0.01	0.01	0.03	0.02
F	0.02	0.02	0.05	0.02	0.05	0.03	0.03	0.02
Cl	0.05	0.03	0.08	0.03	0.16	0.05	0.03	0.03
Σ	100.95	100.87	99.73	101.18	101.15	101.26	100.96	100.91
Sc (ppm)	36	35	24.0	36	35	36	38	36
Cr	283	261	33	195	42	64	230	230
Co	47	44	32	45	53	45	48	45
Ni	90	89	35	87	62	66	91	95
Zn	70	69	67	69	180	86	77	61
Ga	19.0	19.0	26.0	18.0	23.0	20.0	18.0	18.0
As	1.50	1.80	1.70	<0.80	1.10	<0.90	<0.90	<0.90
Rb	25.0	23.0	24.0	17.0	21.0	31	25.0	18.0
Sr	190	190	72	190	56	200	180	190
Sb	<0.100	0.260	0.50	<0.110	0.180	<0.100	<0.110	<0.230
Cs	2.60	1.30	0.66	1.10	1.20	1.50	1.20	0.99
Ba	160	160	99	140	99	200	170	130
Y	20.0	19.0	31	17.0	33	23.0	20.0	15.0
La	10.7	10.1	24.5	8.7	21.1	13.4	11.1	8.0
Ce	24.0	21.8	51	19.0	44	29.0	24.3	18.0
Nd	12.0	13.0	23.0	11.0	21.0	14.0	13.0	<17.0
Sm	3.6	3.3	6.0	2.84	6.1	4.1	3.5	2.60
Eu	1.10	1.00	1.68	0.95	1.41	1.19	1.10	0.88
Tb	0.64	0.66	1.04	0.56	1.00	0.70	0.64	0.52
Yb	2.20	2.00	3.1	2.10	3.5	2.40	2.20	1.70
Lu	0.280	0.30	0.44	0.270	0.47	0.36	0.31	0.280
Hf	2.60	2.40	5.1	2.00	4.1	2.90	2.50	2.00
Nb	7.3	7.3	14.0	6.5	13.0	9.0	7.6	5.3
Ta	0.52	0.52	1.00	0.41	0.96	0.64	0.56	0.40
Th	2.30	2.10	6.6	1.80	3.7	2.70	2.40	1.60
U	0.47	0.44	2.00	0.33	0.86	0.57	0.50	0.36
Pd (ppb)	12.0	9.2	5.6	9.2	11.0	13.0	11.0	7.4
Pt	13.0	17.0	3.7	12.0	3.4	6.4	13.0	11.0
Rh	0.60	0.70	<0.50	0.60	<0.50	<0.50	<1.00	0.60
Ru	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.00	<0.50
Ir	0.60	0.70	<0.50	<0.50	<0.50	<0.50	<1.00	<0.50
Au	<7.0	<9.0	<4.0	<7.0	<4.0	<5.0	<11.0	<7.0

Table 7c. East Greenville sheet, Perkiomenville area.

	W-247405	W-247406	W-247407	W-247408	W-247409	W-247410	W-247411	W-247412	W-247413
	FG88	FG88	FG88	FG88	FG88	FG88	FG88	FG88	FG88
	PPE-1	PPE-2	PPE-3	PPE-4	PPE-5	PPE-6	PPE-7	PPE-8	PPE-9
Lat.	40°19'N	40°19'N	40°19'N	40°19'N	40°19'N	40°21'N	40°21'N	40°22'N	40°22'N
Long.	75°28'W	75°28'W	75°26'W	75°26'W	75°26'W	75°25'W	75°25'W	75°25'W	75°25'W
SiO ₂ (%)	52.70	52.90	51.90	52.50	52.20	51.70	52.40	52.70	52.00
TiO ₂	1.18	0.75	0.51	0.50	0.47	0.50	0.95	1.09	1.15
Al ₂ O ₃	14.10	9.88	14.60	9.88	11.70	16.80	16.30	14.20	14.00
Fe ₂ O ₃	2.09	2.11	0.90	2.04	1.13	1.04	2.10	2.06	1.86
FeO	8.80	8.50	6.60	7.60	7.30	5.60	7.00	8.70	8.90
MnO	0.18	0.20	0.14	0.19	0.17	0.13	0.15	0.18	0.17
MgO	7.59	14.60	11.00	15.60	13.50	8.80	6.53	7.45	7.44
CaO	11.20	9.68	12.80	10.40	12.00	13.70	11.80	11.20	11.00
Na ₂ O	2.05	1.36	1.58	1.01	1.27	1.83	2.28	2.10	2.13
K ₂ O	0.59	0.36	0.26	0.19	0.20	0.26	0.53	0.57	0.56
P ₂ O ₅	0.14	0.08	0.06	<0.05	<0.05	0.05	0.11	0.13	0.14
H ₂ O ⁺	0.21	0.40	0.36	0.54	0.24	0.17	0.47	0.48	0.61
H ₂ O ⁻	0.10	0.08	0.14	0.34	0.13	0.15	0.20	0.11	0.07
CO ₂	0.01	0.01	<0.01	0.01	0.01	0.01	<0.01	0.01	0.05
S	0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
F	0.03	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02
Cl	0.01	0.00	<0.00	<0.00	<0.00	<0.00	0.01	0.01	0.01
Σ	100.99	100.95	100.86	100.81	100.32	100.75	100.85	101.01	100.11
Sc (ppm)	37	38	37	41	40	33	33	37	37
Cr	293	1000	930	1190	1010	400	106	285	277
Co	47	62	45	62	53	37	41	47	47
Ni	87	219	160	219	175	101	68	81	89
Cu	114	51	42	37	30	39	109	117	111
Zn	72	70	58	55	43	38	55	66	81
Ga	19.0	16.0	17.0	13.0	14.0	17.0	20.0	20.0	20.0
As	1.30	<0.90	<0.90	<1.30	<1.00	<0.90	<1.10	<1.10	<1.20
Rb	32	14.0	11.0	7.0	7.0	21.0	19.0	20.0	19.0
Sr	187	119	165	106	135	205	211	185	177
Sb	<0.120	<0.120	<0.100	<0.130	<0.120	<0.120	0.180	<0.130	0.35
Cs	0.99	0.68	0.77	0.60	0.38	0.250	0.88	0.76	1.30
Ba	146	95	78	62	58	81	149	153	155
Y	22.0	14.0	11.0	10.0	10.0	10.0	17.0	21.0	21.0
La	11.0	6.7	4.4	4.1	3.9	4.5	8.8	10.0	11.0
Ce	24.0	16.0	11.0	9.6	9.0	10.0	20.0	22.0	23.0
Nd	12.0	7.2	5.8	6.1	4.6	4.6	9.9	10.0	11.0
Sm	3.5	2.15	1.61	1.41	1.37	1.47	2.84	3.3	3.5
Eu	1.10	0.68	0.56	0.50	0.51	0.60	0.93	1.10	1.10
Tb	0.64	0.44	0.34	0.270	0.31	0.240	0.52	0.59	0.65
Yb	2.20	1.40	1.10	1.10	0.98	0.97	1.80	2.20	2.20
Lu	0.33	0.220	0.190	0.190	0.150	0.140	0.270	0.32	0.33
Zr	105	58	48	38	41	51	81	91	95
Hf	2.60	1.70	0.95	0.96	0.78	1.10	1.90	2.30	2.70
Nb	8.4	4.7	2.60	2.60	2.30	2.80	5.6	7.1	8.1
Ta	0.49	0.36	0.200	0.200	0.170	0.200	0.39	0.49	0.56
Th	2.30	1.40	0.85	0.72	0.71	0.83	1.90	2.00	2.20
U	0.37	0.37	<0.40	<0.40	<0.40	<0.40	0.190	0.33	0.55
Pd (ppb)	11.0	7.1	3.8	2.90	2.90	2.30	5.0	9.2	11.0
Pt	13.0	16.0	33	29.0	33	30.0	7.5	14.0	13.0
Rh	0.60	0.80	1.20	1.10	1.20	0.90	<0.50	0.70	0.60
Ru	<0.50	<0.50	0.70	0.60	0.60	<0.50	<0.50	<0.50	<0.50
Ir	<0.50	0.90	1.60	1.60	1.40	0.70	<0.50	<0.50	1.20
Au	<12.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0

Table 8a. Pottstown sheet, Sassamansville area.

	W-247386	W-247387	W-247388	W-247389	W-247390	W-247391	W-247392	W-247393
	FG88	FG88	FG88	FG88	FG88	FG88	FG88	FG88
	PS-1	PS-2A	PS-2B	PS-3	PS-4	PS-5A	PS-5B	PS-6
Lat.	40°16'N	40°16'N	40°16'N	40°16'N	40°16'N	40°16'N	40°16'N	40°15'N
Long.	75°36'W	75°36'W	75°36'W	75°36'W	75°35'W	75°35'W	75°35'W	75°33'W
SiO ₂ (%)	52.50	47.80	52.10	52.70	52.30	53.10	52.70	52.40
TiO ₂	1.19	4.01	1.72	0.89	0.82	1.55	1.39	1.15
Al ₂ O ₃	14.20	12.10	13.60	19.70	13.70	13.70	15.20	13.50
Fe ₂ O ₃	1.90	6.18	4.36	1.70	2.03	2.96	2.75	2.27
FeO	8.80	13.10	8.30	5.20	7.30	10.00	9.00	8.50
MnO	0.17	0.22	0.32	0.11	0.16	0.20	0.19	0.18
MgO	7.35	3.91	4.77	4.48	9.84	4.86	4.78	8.52
CaO	10.80	9.14	7.43	11.90	11.70	9.08	9.56	11.20
Na ₂ O	2.12	2.48	3.88	2.75	1.79	2.72	2.86	2.01
K ₂ O	0.70	0.77	1.21	0.62	0.43	0.91	0.95	0.55
P ₂ O ₅	0.14	0.18	0.22	0.12	0.10	0.18	0.17	0.13
H ₂ O ⁺	0.69	0.62	1.70	0.39	0.39	0.76	0.89	0.61
H ₂ O ⁻	0.14	0.24	0.40	0.22	0.33	0.34	0.21	0.17
CO ₂	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	0.01	<0.01
S	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
F	0.03	0.04	0.05	0.02	0.02	0.04	0.03	0.03
Cl	0.07	0.04	0.06	0.02	0.01	0.13	0.18	0.01
Σ	100.80	100.84	100.13	100.82	100.91	100.53	100.88	101.22
Sc (ppm)	36	45	38	23.0	37	39	34	38
Cr	273	6.3	10.0	67	730	11.0	9.9	450
Co	46	68	43	28.4	49	49	45	49
Ni	76	46	45	41	134	38	41	96
Cu	115	174	53	64	65	146	156	124
Zn	75	104	206	51	46	83	92	66
Ga	19.0	27.0	23.0	20.0	17.0	23.0	22.0	20.0
As	1.80	<0.70	4.5	1.10	1.20	1.70	<0.80	1.00
Rb	28.0	26.0	45	20.0	12.0	40	44	21.0
Sr	186	203	283	257	162	212	232	167
Sb	0.240	0.280	0.34	0.210	0.200	0.260	0.240	<0.30
Cs	1.10	1.30	0.48	0.98	0.71	1.40	0.78	0.99
Ba	183	213	292	177	132	242	243	145
Y	21.0	28.0	34	16.0	16.0	29.0	25.0	20.0
La	11.0	14.1	17.5	11.0	8.2	15.9	14.0	10.0
Ce	23.2	31	35	21.0	17.0	31	28.0	23.0
Nd	12.0	17.0	19.0	11.0	9.1	18.0	11.0	12.0
Sm	3.5	4.4	5.3	2.81	2.46	4.7	4.1	3.3
Eu	1.07	1.50	1.67	1.10	0.81	1.40	1.40	1.00
Tb	0.67	0.89	1.00	0.44	0.50	0.84	0.77	0.62
Yb	2.40	3.0	3.2	1.60	1.70	3.1	2.60	2.20
Lu	0.30	0.40	0.46	0.240	0.210	0.38	0.37	0.31
Zr	93	141	145	78	64	122	113	94
Hf	2.48	3.6	4.1	2.20	1.80	3.5	3.0	2.40
Nb	8.8	15.0	14.0	7.6	5.3	11.0	10.0	6.7
Ta	0.55	0.85	0.89	0.51	0.35	0.74	0.71	0.51
Th	2.30	3.0	3.4	2.10	1.70	3.2	2.80	2.10
U	0.52	0.60	0.96	0.33	0.34	0.66	0.53	0.46
Pd (ppb)	10.0	18.0	13.0	4.4	6.0	15.0	13.0	9.2
Pt	12.0	5.4	4.3	14.0	28.0	2.10	4.2	16.0
Rh	0.60	1.00	<0.50	0.60	1.00	<0.50	<0.50	0.70
Ru	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Ir	<0.50	<0.50	<0.50	<0.50	1.30	<0.50	<0.50	0.60
Au	<6.0	<7.0	<7.0	<6.0	<6.0	<6.0	7.9	<2.80

Table 8b. Pottstown sheet, Sassamansville area and Boyertown area.

	W-247394	W-247395	W-247396	W-247397	W-247398	W-247399	W-247400	W-245970
	FG88	FG88	FG88	FG88	FG88	FG88	FG88	FG88
	PS-7	PS-8	PS-9	PS-10	PS-11	PS-11A	PS-12	PB-5
Lat.	40°15'N	40°15'N	40°20'N	40°20'N	40°20'N	40°21'N	40°31'N	40°18'N
Long.	75°33'W	75°32'W	75°33'W	75°33'W	75°33'W	75°33'W	75°33'W	75°39'W
SiO ₂ (%)	51.00	52.50	53.20	51.40	55.60	52.70	52.40	52.20
TiO ₂	0.89	0.93	1.28	1.41	1.45	0.91	0.99	1.13
Al ₂ O ₃	12.30	15.50	15.00	16.20	15.80	13.80	14.10	14.00
Fe ₂ O ₃	2.03	1.58	3.11	3.67	3.23	2.34	2.03	2.55
FeO	8.80	7.50	8.80	7.20	6.80	8.00	7.90	8.40
MnO	0.18	0.17	0.19	0.19	0.16	0.18	0.18	0.17
MgO	11.60	7.23	3.85	4.06	2.21	8.11	7.73	7.85
CaO	10.90	11.90	8.50	8.09	6.43	11.60	11.50	10.50
Na ₂ O	1.73	2.17	3.11	3.63	4.69	2.01	2.04	2.13
K ₂ O	0.44	0.55	1.44	1.94	1.23	0.50	0.60	0.96
P ₂ O ₅	0.11	0.11	0.21	0.16	0.33	0.10	0.11	0.14
H ₂ O ⁺	0.47	0.48	1.40	1.80	1.50	0.32	0.45	0.44
H ₂ O ⁻	0.22	0.12	0.40	0.32	0.32	0.19	0.19	0.63
CO ₂	<0.01	<0.01	0.02	0.02	0.01	<0.01	0.01	0.03
S	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01
F	0.02	0.02	0.04	0.02	0.05	0.02	0.02	0.03
Cl	0.00	0.13	0.13	0.06	0.17	0.03	0.05	0.02
Σ	100.70	100.88	100.68	100.17	99.97	100.80	100.30	101.18
Sc (ppm)	36	34	34	33	22.1	40	37	38
Cr	700	219	9.2	9.0	6.0	111	208	360
Co	62	41	43	43	28.1	49	45	49
Ni	203	72	39	28.0	10.0	89	79	99
Cu	82	81	139	120	184	110	120	—
Zn	68	67	92	64	69	77	81	66
Ga	17.0	19.0	23.0	22.0	24.0	18.0	19.0	20.0
As	2.10	<0.70	2.10	4.0	6.5	<1.50	<0.80	1.40
Rb	19.0	21.0	48	77	49	20.0	26.0	43
Sr	152	197	253	330	247	178	195	220
Sb	0.230	<0.30	0.220	0.41	0.290	<0.110	0.180	0.170
Cs	0.78	0.93	1.10	0.85	0.38	1.00	1.50	1.10
Ba	139	162	340	350	233	145	182	180
Y	17.0	17.0	37	26.0	40	18.0	20.0	20.0
La	8.1	9.4	18.4	12.0	22.4	8.7	9.9	10.6
Ce	17.0	19.0	37	23.0	46	18.0	21.0	22.0
Nd	9.8	11.0	19.0	13.0	23.0	9.3	11.0	<3.0
Sm	2.64	2.85	5.4	3.9	6.5	2.79	3.0	3.5
Eu	0.85	0.96	1.70	1.40	1.82	0.94	1.00	1.10
Tb	0.52	0.56	0.99	0.78	1.10	0.51	0.60	0.68
Yb	1.70	1.70	3.4	2.70	3.6	2.00	2.00	2.10
Lu	0.260	0.270	0.49	0.37	0.50	0.280	0.290	0.30
Zr	71	81	137	89	197	77	87	—
Hf	1.90	2.10	3.8	2.50	5.5	2.00	2.40	2.60
Nb	5.4	6.3	11.0	8.9	19.0	6.4	8.0	7.5
Ta	0.43	0.47	0.82	0.53	1.20	0.44	0.45	0.48
Th	1.60	1.70	3.6	2.20	5.1	1.90	2.10	2.10
U	0.290	0.34	0.55	0.45	0.91	0.38	<0.30	0.49
Pd (ppb)	6.0	7.7	11.0	7.0	6.2	7.1	5.2	12.0
Pt	26.0	20.0	5.0	5.5	3.7	8.4	13.0	13.0
Rh	1.30	0.70	<0.50	<0.50	<1.00	<1.00	0.60	<0.70
Ru	0.60	<0.50	<0.50	<0.50	<1.00	<1.00	<0.50	<0.70
Ir	1.80	<0.50	<0.50	<0.50	<1.00	<1.00	<0.50	<0.70
Au	<7.0	<6.0	<10.0	<14.0	<2.60	<6.0	<4.0	<11.0

Table 9. Rattlesnake Hill sheet, Boyertown area.

	W-245966	W-245967	W-245968	W-245969
	FG-88	FG-88	FG-88	FG-88
	PBo-1	PBo-2	PBo-3	PBo-4
Lat.	40°15'N	40°15'N	40°16'N	40°16'N
Long.	75°42'W	75°42'W	75°41'W	75°41'W
SiO ₂ (%)	52.40	51.70	51.70	51.90
TiO ₂	1.18	0.64	0.49	0.63
Al ₂ O ₃	14.00	12.00	9.16	9.20
Fe ₂ O ₃	4.14	1.98	2.41	1.95
FeO	6.90	8.00	8.00	9.20
MnO	0.17	0.17	0.19	0.20
MgO	7.74	13.30	17.40	16.40
CaO	11.00	11.10	10.10	9.38
Na ₂ O	2.09	1.47	0.96	1.07
K ₂ O	0.57	0.32	0.19	0.30
P ₂ O ₅	0.14	0.07	<0.05	0.07
H ₂ O ⁺	0.91	0.56	0.21	0.08
H ₂ O ⁻	0.28	0.13	0.41	0.58
CO ₂	0.02	0.04	0.03	0.03
S	0.01	0.03	0.03	0.02
F	0.02	0.02	0.01	0.01
Cl	0.01	0.00	0.01	0.01
Σ	101.59	101.53	101.30	101.03
Sc (ppm)	37	37	40	39
Cr	320	990	1320	1140
Co	48	62	72	74
Ni	96	240	320	300
Zn	67	49	47	56
Ga	19.0	15.0	12.0	13.0
As	0.91	<0.70	<0.70	<0.70
Rb	27.0	15.0	11.0	9.2
Sr	180	140	100	110
Sb	0.230	<0.110	<0.110	<0.120
Cs	0.74	0.55	0.70	0.67
Ba	160	100	61	87
Y	20.0	12.0	9.0	12.0
La	11.1	5.8	3.8	5.5
Ce	23.3	14.0	10.0	13.0
Nd	12.0	<3.0	<3.0	8.8
Sm	3.5	1.95	1.38	1.85
Eu	1.10	0.68	0.50	0.57
Tb	0.60	0.37	0.30	0.37
Yb	2.20	1.30	1.10	1.40
Lu	0.31	0.200	0.140	0.190
Hf	2.60	1.30	0.93	1.30
Nb	7.7	3.8	2.40	4.1
Ta	0.53	0.270	0.250	0.31
Th	2.20	1.00	0.67	1.00
U	0.39	0.200	<0.230	0.240
Pd (ppb)	13.0	6.6	4.1	7.2
Pt	13.0	32	34	27.0
Rh	0.70	1.40	1.40	1.30
Ru	<0.50	0.80	0.80	0.80
Ir	0.50	2.50	2.60	2.10
Au	<3.0	<4.0	<6.0	<6.0

Table 10. Monocacy Hill and Pine Ridge sheets, Jacksonwald area.

	W-251480	W-251481	W-251482	W-251483	W-251484	W-251485	W-251486	W-251487	W-251488
	FG-89	FG-89	FG-89	FG-89	FG-89	FG-89	FG-89	FG-89	FG-89
	PJ-1	PJ-2	PJ-3	PJ-4	PJ-5	PJ-6	PJ-9	PJ-10	PJ-11
Lat.	40°17'N	40°17'N	40°17'N	40°19'N	40°19'N	40°19'N	40°19'N	40°19'N	40°19'N
Long.	75°45'W	75°45'W	75°45'W	75°49'W	75°49'W	75°49'W	75°51'W	75°51'W	75°51'W
SiO ₂ (%)	51.70	51.10	52.20	51.70	51.80	51.90	51.50	51.80	50.40
TiO ₂	1.12	0.56	1.01	1.17	0.99	0.98	1.33	0.99	1.39
Al ₂ O ₃	14.10	10.60	14.40	15.30	15.40	15.00	13.80	15.00	16.40
Fe ₂ O ₃	2.41	1.39	1.93	3.08	2.20	1.97	3.04	1.95	2.81
FeO	8.00	8.20	7.80	7.40	7.20	7.50	7.70	7.60	8.00
MnO	0.17	0.19	0.16	0.17	0.15	0.16	0.19	0.17	0.15
MgO	7.69	14.70	7.31	5.91	6.80	7.10	7.42	6.96	4.09
CaO	10.70	10.30	11.10	10.60	10.90	11.20	9.75	9.71	6.94
Na ₂ O	2.08	1.17	1.93	2.41	2.29	2.21	1.93	2.66	4.15
K ₂ O	0.59	0.26	0.60	0.57	0.59	0.52	1.41	1.43	1.85
P ₂ O ₅	0.14	0.06	0.13	0.14	0.12	0.13	0.14	0.15	0.18
H ₂ O ⁺	0.70	0.47	0.83	1.00	1.00	0.91	1.00	1.30	2.40
H ₂ O ⁻	0.36	0.23	0.27	0.45	0.50	0.49	0.60	0.44	0.64
CO ₂	0.01	0.02	0.02	0.01	0.02	0.03	0.03	0.03	0.10
Σ	99.76	99.25	99.69	99.91	99.97	100.09	99.84	100.18	99.50
Sc (ppm)	37	37	36	34	34	35	36	34	30
V	272	212	252	267	247	247	275	247	268
Cr	320	960	271	59	216	240	264	254	11.0
Co	48	62	44	44	42	43	47	42	40
Ni	95	220	88	65	77	82	95	77	48
Cu	120	53	100	120	100	100	130	110	150
Zn	70	56	69	75	62	67	106	71	93
Ga	19.0	14.0	18.0	20.0	19.0	17.0	19.0	19.0	21.0
As	1.30	<0.40	1.20	1.10	1.40	1.20	2.30	1.40	2.90
Rb	25.0	11.0	25.0	22.0	22.0	19.0	59	50	58
Sr	196	133	206	221	198	195	226	268	320
Sb	0.170	0.160	0.160	0.190	0.220	0.120	0.150	<0.290	0.180
Cs	1.00	0.55	0.96	0.96	0.47	0.53	1.60	0.50	<0.210
Ba	169	91	167	164	153	145	310	227	276
Y	22.0	12.0	20.0	22.0	19.0	20.0	22.0	20.0	27.0
La	10.8	5.1	11.0	12.0	10.1	10.0	11.8	10.5	14.5
Ce	23.5	12.0	22.4	24.1	21.0	21.7	24.0	22.0	29.4
Nd	12.0	6.6	12.0	14.0	9.8	12.0	11.0	12.0	17.0
Sm	3.5	1.76	3.3	3.6	3.1	3.2	3.7	3.3	4.4
Eu	1.06	0.55	1.02	1.12	0.97	0.99	1.07	1.02	1.29
Tb	0.67	0.38	0.62	0.67	0.54	0.57	0.65	0.62	0.73
Yb	2.20	1.20	2.10	2.30	1.90	2.10	2.30	2.00	2.70
Lu	0.31	0.170	0.280	0.31	0.280	0.30	0.33	0.280	0.37
Zr	120	<100	200	260	190	130	280	150	160
Hf	2.78	1.20	2.50	2.66	2.30	2.40	2.65	2.20	3.3
Nb	7.6	1.80	7.3	9.2	6.1	7.4	8.3	6.4	12.0
Ta	0.56	0.250	0.51	0.54	0.51	0.50	0.55	0.47	0.68
Th	2.21	0.97	2.20	2.50	2.10	2.20	2.40	2.10	3.0
U	0.49	<0.40	0.55	0.36	0.49	0.38	0.68	0.32	0.66
Pd (ppb)	11	5.0	9.1	6.9	9.2	9.0	11	9.6	14
Pt	13	22	13	7.9	14	12	9.6	14	5.7
Rh	0.9	0.9	0.9	0.6	0.8	0.7	0.9	1.1	0.8
Ru	<0.5	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ir	0.7	1.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Au	6.5	<3.0	<5.0	<6.0	5.5	<9.0	<6.0	<5.0	<3.0

Table 11a. Morgantown sheet, Warwick core hole.

	W-243063	W-243064	W-243065	W-243066	W-243067	W-243068	W-243069	W-243070	W-243071	W-243072
	S-D-150	S-D-152	S-D-153	S-D-154	S-D-155	S-D-156	S-D-157	S-D-158	S-D-159	S-D-160
Lat.	40°10'N	40°10'N	40°10'N	40°10'N	40°10'N	40°10'N	40°10'N	40°10'N	40°10'N	40°10'N
Long.	75°46'W	75°46'W	75°46'W	75°46'W	75°46'W	75°46'W	75°46'W	75°46'W	75°46'W	75°46'W
Fe ₂ O ₃ (%)	12.00	11.98	11.51	11.63	11.10	11.51	13.60	12.51	11.90	11.18
CaO	10.77	10.35	10.63	11.05	10.63	10.77	9.93	10.35	10.07	7.97
Na ₂ O	2.32	2.24	2.30	2.29	2.06	2.17	2.79	2.56	2.71	4.03
Sc (ppm)	37	37	38	40	40	41	42	39	39	38
Cr	280	260	300	298	310	340	51	59	51	60
Co	48	47	48	50	50	51	51	49	48	47
Ni	86	83	89	97	100	110	65	71	71	78
Cu	101	107	95	78	63	83	115	120	90	76
Zn	75	72	73	70	58	78	95	75	74	79
As	1.00	1.40	<0.80	<0.80	<0.80	<0.90	1.20	1.50	<1.00	1.40
Rb	7.0	27.0	19.0	21.0	6.0	19.0	24.0	16.0	24.0	42
Sr	163	197	189	193	174	188	215	196	192	254
Ag	0.046	0.064	0.035	0.033	0.0290	0.033	0.100	0.073	0.046	0.110
Sb	<0.060	0.140	0.140	0.110	0.110	0.130	0.160	0.180	0.140	0.32
Cs	0.71	0.97	0.62	0.41	<0.40	0.51	0.72	0.87	0.44	0.70
Ba	145	154	135	122	101	178	176	189	170	350
Y	16.0	19.0	26.0	29.0	21.0	23.0	30	26.0	22.0	24.0
La	11.1	11.0	10.3	9.1	6.9	8.9	12.9	12.0	10.2	8.9
Ce	23.2	24.3	22.6	20.0	15.0	19.0	27.4	26.0	20.7	18.6
Nd	13.0	13.0	12.0	9.8	7.6	9.6	15.0	14.0	11.0	9.4
Sm	3.6	3.6	3.3	2.91	2.35	2.88	4.1	3.9	3.3	2.93
Eu	1.10	1.10	1.04	0.93	0.83	0.94	1.30	1.23	1.01	0.82
Tb	0.68	0.69	0.57	0.52	0.49	0.65	0.77	0.64	0.58	0.53
Yb	2.20	2.20	2.00	1.90	1.50	1.90	2.58	2.50	2.10	1.80
Lu	0.32	0.31	0.290	0.270	0.220	0.260	0.36	0.34	0.31	0.270
Zr	87	90	91	90	64	78	108	105	87	84
Hf	2.57	2.80	2.30	2.10	1.60	2.00	3.0	2.80	2.28	2.01
Nb	6.4	7.0	6.0	5.5	4.0	5.4	8.4	8.1	6.3	5.3
Ta	0.58	0.56	0.54	0.47	0.33	0.43	0.66	0.61	0.44	0.49
Th	2.10	2.30	2.20	1.80	1.50	1.90	2.50	2.70	2.00	1.80
U	0.43	0.52	0.41	0.52	0.44	0.39	0.56	0.57	0.50	0.44
Au (ppb)	11.0	7.9	4.1	5.1	4.2	7.1	6.5	6.8	4.5	4.9

Table 11b. Morgantown sheet, Warwick core hole.

	W-243073 S-D-161	W-243074 S-D-162	W-243075 S-D-163	W-243076 S-D-164	W-243077 S-D-165	W-243078 S-D-166	W-243079 S-D-167	W-243080 S-D-168	W-243081 S-D-169
Lat.	40°10'N	40°10'N	40°10'N	40°10'N	40°10'N	40°10'N	40°10'N	40°10'N	40°10'N
Long.	75°46'W	75°46'W	75°46'W	75°46'W	75°46'W	75°46'W	75°46'W	75°46'W	75°46'W
Fe ₂ O ₃ (%)	10.83	10.74	10.51	10.31	10.34	10.63	10.28	10.48	14.87
CaO	9.79	11.33	11.89	11.75	11.33	11.89	12.31	11.47	7.97
Na ₂ O	2.48	2.22	1.97	1.73	1.67	1.70	1.73-	1.81	2.79
Sc (ppm)	39	40	40	40	40	42	40	41	36
Cr	360	94	208	390	460	480	410	510	14.0
Co	48	49	48	49	49	51	49	49	43
Ni	110	92	110	120	130	130	120	130	34
Cu	66	74	67	62	54	47	59	67	200
Zn	83	65	58	66	58	55	54	64	93
As	<1.10	<1.10	<1.40	<1.40	<1.80	<1.60	<1.60	<1.70	2.40
Rb	38	15.0	13.0	11.0	10.0	6.0	12.0	7.0	37
Sr	200	189	169	153	151	144	154	150	243
Ag	0.073	0.031	0.031	0.031	0.0290	0.0270	0.0270	0.031	0.088
Sb	0.280	<0.080	<0.160	0.150	<0.100	<0.110	<0.150	<0.180	0.280
Cs	0.59	0.50	0.49	0.52	0.45	0.49	0.91	0.38	1.50
Ba	320	107	94	110	90	82	92	85	273
Y	20.0	21.0	17.0	13.0	16.0	12.0	17.0	11.0	44
La	7.7	7.2	7.3	6.4	6.5	6.2	6.4	7.0	23.9
Ce	17.0	15.0	15.0	14.0	15.0	14.0	14.0	16.0	50
Nd	9.4	8.6	7.3	6.9	7.5	7.4	7.8	9.3	26.0
Sm	2.50	2.40	2.42	2.14	2.17	2.16	2.18	2.40	7.0
Eu	0.80	0.81	0.82	0.74	0.76	0.75	0.75	0.80	1.75
Tb	0.49	0.50	0.46	0.44	0.47	0.43	0.48	0.45	1.20
Yb	1.70	1.60	1.60	1.50	1.50	1.50	1.50	1.70	3.9
Lu	0.250	0.220	0.220	0.210	0.210	0.210	0.210	0.230	0.55
Zr	73	70	64	63	61	59	67	65	191
Hf	1.70	1.70	1.70	1.40	1.50	1.50	1.50	1.70	5.5
Nb	5.0	4.4	4.3	4.0	4.0	3.8	3.8	4.4	17.0
Ta	0.35	0.37	0.37	0.34	0.34	0.290	0.30	0.33	1.20
Th	1.50	1.60	1.50	1.30	1.40	1.30	1.20	1.40	4.9
U	<0.40	0.42	0.44	<0.80	<0.40	0.50	<0.40	0.40	0.72
Au (ppb)	<5.0	4.5	<7.0	<4.0	4.7	<0.80	4.3	<1.20	12.0

Table 11c. Morgantown sheet.

	W-243817 P-28	W-243818 P-63	W-243819 P-138	W-243866 P-293.7	W-236282 PM-84-1A	W-236281 PM-84-1B
Lat.	40°16'N	40°17'N	40°16'N	40°10'N	40° 9'N	40° 9'N
Long.	75°58'W	75°55'W	75°52'W	75°57'W	75°54'W	75°54'W
SiO ₂ (%)	58.20	52.40	58.40	52.40	54.70	52.60
TiO ₂	1.88	1.28	1.91	0.81	2.00	0.89
Al ₂ O ₃	11.80	14.50	11.70	9.93	13.40	14.50
Fe ₂ O ₃	4.30	3.43	4.66	2.59	3.60	1.30
FeO	9.00	7.40	8.80	8.40	8.60	8.00
MnO	0.20	0.17	0.19	0.20	0.21	0.17
MgO	1.31	5.21	1.30	14.40	4.00	8.10
CaO	4.95	8.14	4.95	9.46	8.00	11.30
Na ₂ O	3.13	3.73	3.09	1.42	2.51	2.05
K ₂ O	2.33	1.25	2.35	0.35	1.30	0.51
P ₂ O ₅	0.57	0.17	0.55	0.09	0.33	0.11
H ₂ O ⁺	1.10	2.00	1.10	0.25	0.96	0.29
H ₂ O ⁻	0.42	0.40	0.41	0.12	0.12	0.09
CO ₂	0.01	0.29	0.01	<0.01	0.07	0.02
S	0.08	0.04	0.07	0.05	0.03	<0.01
F	0.08	0.03	0.08	0.01	0.05	0.02
Cl	0.29	0.02	0.31	0.00	0.09	0.01
Σ	99.65	100.46	99.89	100.48	99.97	99.96
B (ppm)	27.1	14.8	21.6	5.8	—	—
Sc	24.7	32	25.2	39	34	39
Cr	5.5	38	5.3	880	19.0	239
Co	27.7	40	28.1	64	41	49
Ni	8.0	42	5.0	201	65	110
Cu	239	110	240	67	78	56
Zn	209	74	205	65	97	63
Ga	25.0	20.0	24.0	15.0	—	—
As	6.8	5.4	6.6	<1.30	2.10	<3.0
Rb	78	47	73	12.0	46	23.0
Sr	181	194	177	135	208	194
Ag	—	—	—	0.0220	—	—
Sb	0.68	0.33	0.75	<0.100	<0.50	<0.60
Cs	2.10	0.91	2.10	0.51	0.61	0.49
Ba	530	227	530	98	310	137
Y	65	24.0	65	15.0	49	21.0
La	40	13.8	39	6.9	23.1	8.9
Ce	82	28.0	80	16.0	50	20.0
Nd	41	16.0	38	8.1	28.0	9.1
Sm	11.5	4.1	11.2	2.33	7.1	2.77
Eu	2.85	1.10	2.84	0.71	1.76	0.93
Tb	2.00	0.75	2.02	0.44	1.20	0.55
Yb	6.4	2.70	6.4	1.60	3.8	1.90
Lu	0.94	0.37	0.90	0.250	0.60	0.270
Zr	300	118	330	70	213	85
Hf	8.9	3.1	8.8	1.60	5.2	2.10
Nb	26.0	11.0	30	4.3	17.0	5.7
Ta	1.87	0.68	2.00	0.35	1.18	0.45
Th	7.8	2.80	8.2	1.40	5.2	1.90
U	1.80	0.50	1.60	<0.40	0.59	<0.80
Pd (ppb)	1.30	10.0	1.00	7.2	6.5	4.6
Pt	1.60	8.3	<1.00	12.0	2.80	2.60
Rh	—	—	—	—	<0.50	<0.50
Au	<9.0	8.1	<1.30	<3.0	<23.0	<22.0

Table 12. Morgantown sheet, Elverson and Birdsboro areas.

	W-245958	W-245959	W-245960	W-245961	W-245962	W-245963	W-245964	W-245965
	FG-88	FG-88	FG-88	FG-88	FG-88	FG-88	FG-88	FG-88
	PEL-1	PEL-2	PEL-3	PBi-1	PBi-2A	PBi-2B	PBi-3	PBi-4
Lat.	40°14'N	40°14'N	40°13'N	40°16'N	40°16'N	40°16'N	40°15'N	40°16'N
Long.	75°47'W	75°47'W	75°47'W	75°51'W	75°51'W	75°51'W	75°50'W	75°51'W
SiO ₂ (%)	52.70	46.00	52.50	52.70	54.10	54.60	52.30	51.40
TiO ₂	0.87	1.02	0.98	1.27	1.78	2.06	0.99	1.17
Al ₂ O ₃	14.60	10.80	14.10	15.50	16.00	13.60	16.50	16.40
Fe ₂ O ₃	0.55	2.49	2.31	2.18	2.93	5.89	1.27	1.64
FeO	9.00	8.00	8.20	9.00	8.80	7.70	8.60	8.60
MnO	0.17	0.12	0.17	0.16	0.16	0.20	0.16	0.17
MgO	7.90	6.40	8.11	5.27	2.70	2.51	5.98	4.85
CaO	11.60	11.50	11.80	10.50	8.63	6.75	11.50	9.94
Na ₂ O	2.10	1.03	1.94	2.43	3.10	3.60	2.32	3.18
K ₂ O	0.50	0.54	0.49	0.73	1.24	1.59	0.58	1.13
P ₂ O ₅	0.08	0.13	0.10	0.16	0.24	0.43	0.12	0.15
H ₂ O ⁺	0.63	4.20	0.40	0.89	0.86	1.70	0.91	1.50
H ₂ O ⁻	0.37	0.77	0.39	0.36	0.32	0.31	0.18	0.37
CO ₂	0.03	7.40	0.04	0.06	0.04	0.10	0.02	0.04
S	0.02	0.03	0.05	0.04	0.05	0.03	0.02	0.01
F	0.02	0.03	0.02	0.03	0.04	0.05	0.02	0.03
Cl	0.03	0.05	0.01	0.03	0.13	0.22	0.01	0.07
Σ	101.18	100.51	101.61	101.31	101.13	101.34	101.48	100.64
Sc (ppm)	35	35	39	36	27.0	28.0	34	31
Cr	279	203	258	48	8.3	6.4	89	30
Co	45	50	49	45	36	37	43	41
Ni	100	100	100	58	23.0	20.0	67	49
Zn	63	150	60	78	100	120	61	51
Ga	18.0	16.0	18.0	21.0	24.0	24.0	20.0	20.0
As	1.20	3.5	0.80	1.30	3.1	<0.80	<0.70	1.70
Rb	22.0	32	17.0	27.0	51	57	24.0	39
Sr	190	52	180	210	230	210	210	210
Sb	<0.140	<0.50	0.140	0.230	0.250	0.250	0.210	0.220
Cs	0.96	3.0	0.66	1.20	1.90	1.20	0.86	0.52
Ba	150	49	140	200	320	340	160	230
Y	16.0	17.0	17.0	22.0	32	44	18.0	20.0
La	8.6	11.3	8.7	12.2	19.9	26.8	10.3	11.5
Ce	18.1	22.0	19.0	26.5	41	56	20.9	24.0
Nd	11.0	12.0	9.5	14.0	19.0	30	11.0	15.0
Sm	2.62	3.0	2.86	3.7	5.6	8.0	3.2	3.5
Eu	0.96	0.90	0.97	1.20	1.88	1.92	1.00	1.20
Tb	0.49	0.51	0.56	0.70	0.97	1.40	0.57	0.63
Yb	1.70	2.00	2.20	2.30	3.3	4.3	2.00	2.10
Lu	0.230	0.290	0.280	0.33	0.45	0.61	0.290	0.30
Hf	1.99	2.20	2.10	2.60	4.5	6.2	2.20	2.50
Nb	6.5	6.5	6.6	6.6	13.0	20.0	6.7	7.8
Ta	0.43	0.47	0.47	0.61	0.96	1.51	0.51	0.55
Th	1.70	2.00	1.80	2.40	4.3	5.7	2.10	2.30
U	0.37	0.44	0.43	0.55	0.82	1.20	0.52	0.37
Pd (ppb)	8.8	10.0	9.7	11.0	15.0	10.0	9.6	11.0
Pt	14.0	14.0	14.0	6.9	5.8	3.0	12.0	9.4
Rh	0.70	<1.00	0.60	<0.50	<0.50	<0.50	0.50	0.50
Ru	<0.50	<1.00	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Ir	0.50	<1.00	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Au	<8.0	<6.0	<7.0	10.0	10.0	<10.0	<7.0	<5.0