GEOLOGICAL SURVEY CIRCULAR 301

STRATIGRAPHIC SECTIONS OF THE PHOSPHORIA FORMATION IN IDAHO, 1947–48, PART 2

UNITED STATES DEPARTMENT OF THE INTERIOR
Douglas McKay, Secretary

GEOLOGICAL SURVEY
W. E. Wrather, Director

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By V. E. McKelvey, F. C. Armstrong, R. A. Gulbrandsen, and R. M. Campbell

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INTRODUCTION

The U. S. Geological Survey has measured and sampled the Phosphoria formation at many localities in Idaho and other western states. These data will not be fully synthesized and analyzed for several years, but segments of the data, accompanied by little or no interpretation, are published as preliminary reports as they are assembled. This report, which contains abstracts of many of the sections in southeastern Idaho (fig. 1), is one of this series and is the second report of data gathered in Idaho during 1947 and 1948. The field and laboratory procedures adopted in these investigations are described rather fully in a companion report (McKelvey and others, 1953).

Many people have taken part in this investigation. In addition to the authors, D. F. Davidson, J. A. Noel, F. W. O'Malley, R. L. Parker, O. A. Payne, R. S. Sears, R. P. Sheldon, R. A. Smart, R. G. Waring, C. E. Weaver, H. Wedow, and R. A. Weeks participated in the description of the strata and the collection of the samples referred to in this report. D. B. Dimick, Jack George, W. S. Hunziker, J. E. Jones, H. A. Larsen, and T. K. Rigby assisted in the preparation of trenches and the collection, crushing, and splitting of samples in the field. The laboratory preparation of samples for chemical analysis was done in Denver, Colo., under the direction of W. P. Huleatt.

All the P_2O_5, F, and acid-insoluble analyses were made for the Survey by the U. S. Bureau of Mines at the Northwest Electrodevelopment Laboratory, Albany, Oreg., under the direction of S. M. Shelton and M. L. Wright, and some of the spectrographic analyses were made there by D. M. Mortimer. The Al_2O_3, Fe_2O_3, and loss-on-ignition analyses were made in the Trace Elements Section laboratory of the Survey in Washington, D. C., under the direction of J. C. Rabbitt, by chemists I. Barlow, J. L. Greene, H. Levine, H. Mela, Jr., and A. L. White, and most of the spectrographic reports were prepared in this laboratory by C. Annell, C. L. Waring, and H. Worthington.

Compilation of the data has been largely by R. P. Sheldon and F. D. Frieske under the supervision of R. W. Swanson. Organization of the tabular data has been largely by Anita Cozzetto.

ACKNOWLEDGMENTS

Special thanks are due W. W. Rubey, J. Steele Williams, and A. E. Weissenborn who have given much advice in planning and organizing the field program.

The cost of both the field and laboratory investigations has been partly borne by the Division of Raw Materials of the Atomic Energy Commission.

It is a pleasure to acknowledge the fine cooperation extended to the field party by the local residents, property owners, and operating phosphate companies, who furnished information and services and gave access to property. A. J. Winter, Superintendent of the Montpelier schools; E. M. Norris, C. T. Russell, and L. E. Traeger of the Anaconda Copper Mining Co.; D. L. King of the San Francisco Chemical Co.; and G. A. McHugh and H. B. Fowler of the Simplot Fertilizer Co. have been especially helpful in this connection.

STRATIGRAPHY OF THE PHOSPHORIA FORMATION IN SOUTHEASTERN IDAHO

At its type locality in southeastern Idaho (Richards and Mansfield, 1912), the Phosphoria formation consists

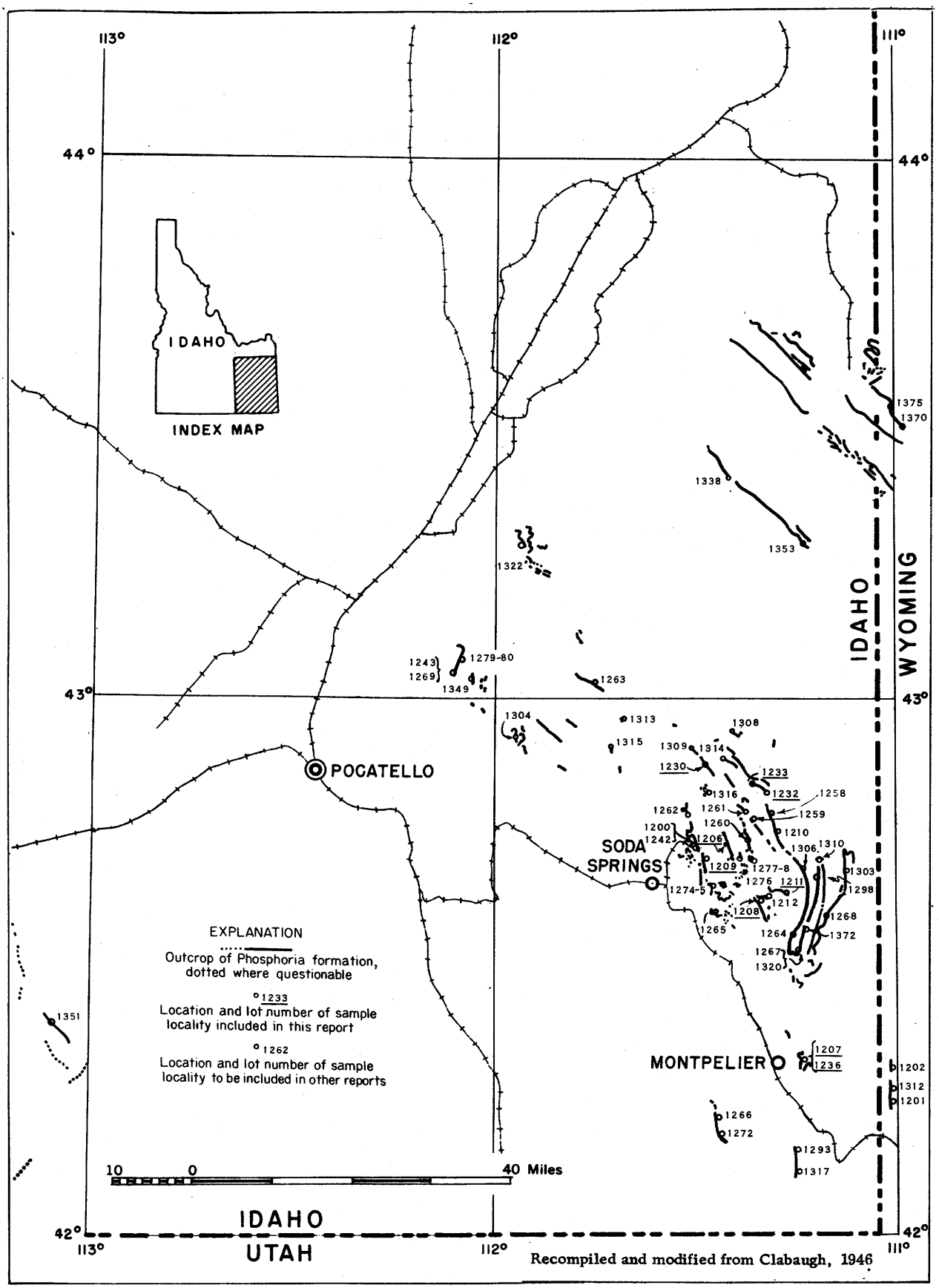

Figure 1. —Outcrops of the Phosphoria formation in Idaho and localities sampled.

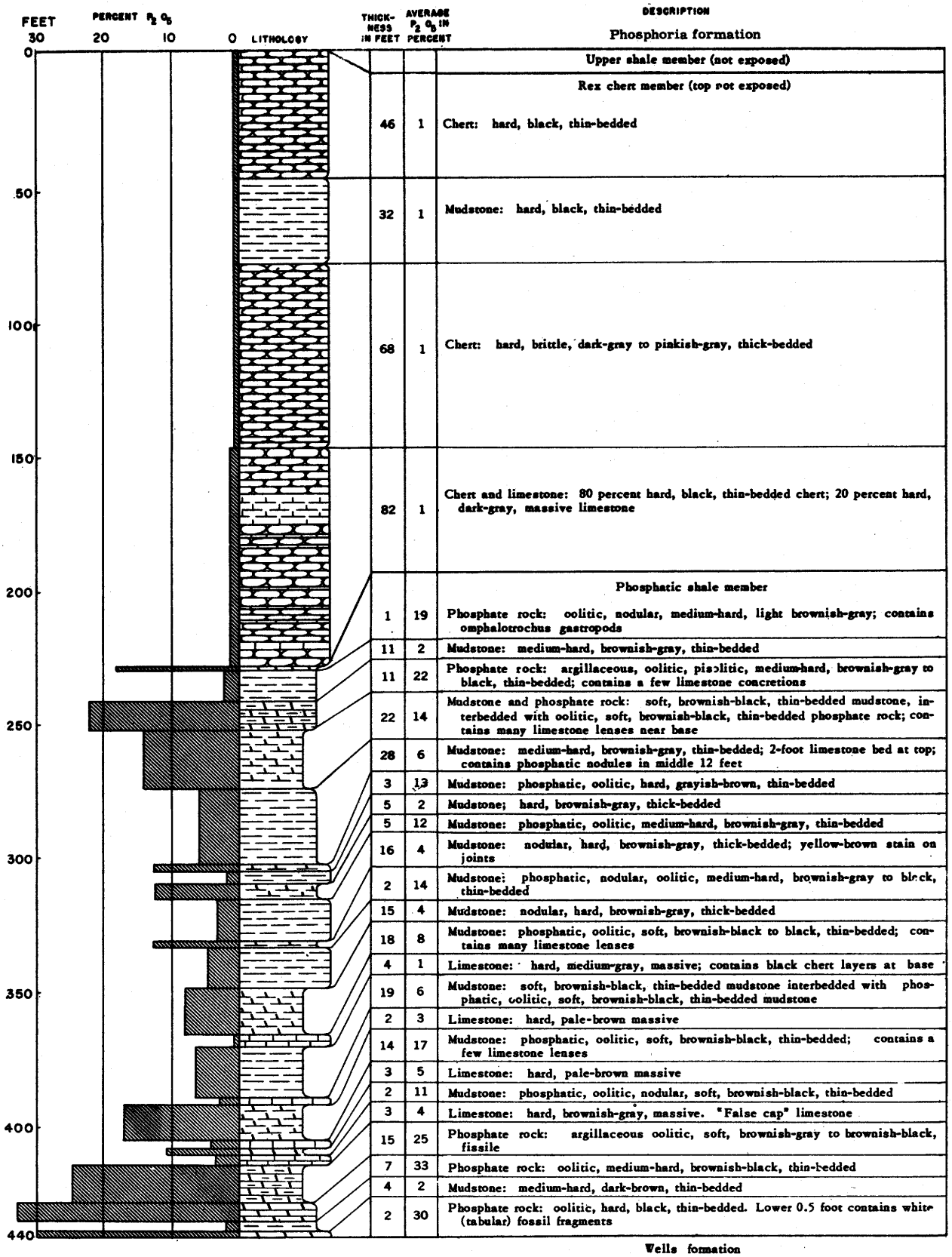

Figure 2.—Generalized section of the Phosphoria formation at Trail Canyon (lot no. 1206).

of a lower member, the phosphatic shale, about 180 feet thick, and an upper member, the Rex chert, about 240 feet thick; in most of southeastern Idaho and western Wyoming, however, another member, a thin-bedded cherty mudstone 15 to 75 feet thick, overlies the Rex chert member, though it is not well defined at the type locality.

The Phosphoria formation overlies the Wells formation of Pennsylvanian age, and underlies the Dinwoody formation of Triassic age. The upper 50 to 75 feet of the Wells formation consists of gray fossiliferous cherty limestone that contains some thin phosphatic layers. It may be the correlative of the lowermost member (A member) of the Phosphoria formation in Montana and the lower limestone member of the Park City formation in Utah (McKelvey, 1949).

In southeastern Idaho most of the phosphatic beds are in the phosphatic shale member, and it is on this member that most of our studies have been focused. It consists of many thin layers, some of which persist over the whole area. They may be grouped into several broad units, as yet unnamed, as shown on figure 2.

STRATIGRAPHIC SECTIONS

Abstracts of stratigraphic sections measured at 8 localities, and the available analytical data, are presented in the following pages. Their locations, as well as the locations of the sections reported previously (McKelvey and others, 1953) and of others to be reported later, are shown on figure 1.

The semiquantitative analyses are based upon comparisons with a standard plate representing known quantities of the elements tested for and made at the same exposure. Greater sensitivities for many elements can be obtained by additional exposures. The standard sensitivities for the elements noted in this report are as follows:

Element	Sensitivity (percent) for indicated lot				Element	Sensitivity (percent) for indicated lot			
	1230	1232 and 1233	1206 and 1209	1207 and 1236		1230	1232 and 1233	1206 and 1209	1207 and 1236
Al	0.0001	0.0001	0.001	0.005	Hg	0.1	0.1	0.1	---
Sb	.001	.001	.001	.05	Mo	.001	.001	.001	0.004
As	.1	.1	.1	.1	Nd	.01	.01	.01	---
Ba	.001	.0001	.001	.08	Ni	.001	.001	.001	.01
Be	.001	.0001	.001	.001	Nb	.01	.01	.01	.01
Bi	.001	.001	.001	.002	P	.1	.1	.1	.8
B	.001	.001	.001	.001	Pt	.01	.01	.01	.01
Cd	.01	.01	.01	.1	K	*.1	*1.0	.0001	---
Ca	.0001	.001	.0001	.01	Pr	.01	.01	---	---
Ce	.1	.1	.1	---	Re	.1	.1	.1	---
Cs	1.0	1.0	1.0	---	Rb	10.0	10.0	10.0	---
Cr	.001	.001	.001	.02	Sm	.1	.1	---	---
Co	.001	.01	.001	.01	Sc	.1	.1	.1	---
Cu	.0001	.0001	.0001	.001	Si	.0001	.0001	.0001	.002
Dy	.01	.01	---	---	Ag	.001	.001	.001	.001
Er	.01	.01	---	---	Na	*.1	*.1	.0001	.05
Eu	.01	.01	---	---	Sr	.01	.01	.01	.1
Gd	.01	.01	---	---	Ta	.1	.1	.01	1.0
Ga	.01	.01	---	.05-	Te	.1	.1	---	---
Ge	.001	.001	.01	.01	Tb	.1	.1	---	---
Au	.01	.01	---	.01	Ti	.1	.1	1.0	---
Hf	.1	.1	---	---	Th	.1	.1	.1	---
Ho	.01	.01	---	---	Tm	.01	.01	---	---
In	.001	.001	.001	---	Sn	.01	.01	.01	.01
Fe	.001	.001	.001	.005	Ti	.001	.001	.001	.002
La	.01	.01	.01	---	W	.1	.1	.1	.1
Pb	.01	.01	.01	.1	V	.01	.01	.01	.01
Li	*.1	*.1	---	.2	Yb	.0001	.0001	---	---
Lu	.01	.01	---	---	Y	.001	.001	.001	---
Mg	.0001	.0001	.0001	.001	Zn	.001	.01	.001	.05
Mn	.001	.001	.001	.004	Zr	.001	.001	.001	.003

* A greater sensitivity may be obtained by additional exposures.

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NORTH WOOLEY RANGE, IDAHO. LOT NO. 1230.

Phosphatic shale member of Phosphoria formation sampled in bulldozer trench on northeast limb of Wooley Valley anticline, sec. 24, T. 6 S., R. 42 E., Caribou County, Idaho. Beds strike N. 40° W. and dip 57° NE. Section measured by R. A. Hoppin, C. E. Weaver, R. L. Parker, R. P. Sheldon, F. W. O'Malley, and V. E. McKelvey and sampled by J. A. Noel and R. A. Smart in July 1948. Samples analyzed for P_2O_5 and acid insoluble by U. S. Bureau of Mines Laboratory, Albany, Oregon, and for other constituents by Trace Elements Section Laboratory, U. S. Geological Survey, Washington, D. C.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	Loss on ignition	Acid insoluble		
	Rex member of Phosphoria formation—basal bed only									
R- 1	Chert	1289- RAH	7.4	1.1	--	--	--	85.3	2.3	2.53
	Phosphatic shale member of Phosphoria formation									
P-92	Mudstone	1288- RAH	2.3	2.8	--	--	--	68.7	2.3	6.44
P-91	Mudstone	1287- RAH	1.7	6.0	--	--	--	77.0	4.0	16.64
P-90	Mudstone, calcareous and mudstone	1286- RAH	3.7	0.2	--	--	--	67.6	7.7	17.38
P-89	Mudstone	1285- RAH	3.3	1.5	--	--	--	79.6	11.0	22.33
P-88	Mudstone; fos. col. no. 48-JES-81[1]	1284- RAH	4.1	3.5	--	--	--	71.9	15.1	36.68
P-87	Phosphate rock, argillaceous; fos. col. no. 48-JES-80	1283- RAH	0.8	25.5	--	--	--	24.8	15.9	57.08
P-86	Mudstone; fos. col. no. 48-JES-79	1282- RAH	2.0	5.6	--	--	--	78.5	17.9	68.28
P-85	Mudstone, calcareous; fos. col. no. 48-JES-78	1281- RAH	0.8	0.5	--	--	--	63.8	18.7	68.68
P-84	Mudstone; fos. col. no. 48-JES-77	1280- RAH	1.7	6.1	--	--	--	80.7	20.4	79.05
P-83	Phosphate rock	1205- RLP	1.7	35.0	1.4	0.46	5.90	4.7	22.1	138.55
P-82	Mudstone and limestone	1204- RLP	1.6	5.0	8.5	2.59	12.32	57.9	23.7	146.55
P-81	Phosphate rock	1203- RLP	1.5	33.1	1.6	0.74	4.74	9.4	25.2	196.20
P-80	Phosphate rock	1202- RLP	0.8	32.2	2.2	0.85	4.64	11.6	26.0	221.96
P-79	Mudstone, calcareous; fos. col. no. 48-JES-76	1201- RLP	1.0	7.5	6.6	2.46	10.64	55.3	27.0	229.46
P-78	Phosphate rock	1200- RLP	1.2	29.4	3.3	0.96	5.22	16.8	28.2	264.74
P-77	Phosphate rock	1305-WOM	0.6	36.3	0.76	0.37	4.80	4.4	28.8	286.52
P-76	Phosphate rock; fos. col. no. 48-JES-75	1304-WOM	4.7	31.5	2.7	0.60	7.86	9.7	33.5	434.57
P-75	Phosphate rock, argillaceous; fos. col. no. 48-JES-74	1212-CEW	3.55	25.2	3.9	1.2	9.60	21.0	37.05	524.03
P-74	Phosphate rock and phosphatic mudstone	1211-CEW	1.5	26.5	4.1	1.3	9.02	24.0	38.55	563.78
P-73	Mudstone, phosphatic, and argillaceous phosphate rock; fos. col. no. 48-JES-73	1210-CEW	1.6	15.8	7.5	2.2	9.80	46.4	40.15	589.06
P-72	Mudstone, phosphatic; fos. col. no. 48-JES-72	1229- RPS	1.2	8.3	--	--	--	62.4	11.35	599.02
P-71	Limestone and mudstone	1228- RPS	2.8	0.7	--	--	--	33.1	44.15	600.98

[1] Fossil collection made by J. E. Smedley, Paleontology and Stratigraphy Branch, U. S. Geological Survey.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	Loss on ignition	Acid insoluble		
P-70	Mudstone, phosphatic, calcareous; fos. col. no. 48-JES-71	1227- RPS	2.3	12.8	--	--	--	45.0	46.45	630.42
P-69	Mudstone; fos. col. no. 48-JES-70	1226- RPS	1.2	5.4	--	--	--	64.4	47.65	636.90
P-68	Mudstone, phosphatic	1225- RPS	1.3	11.8	--	--	--	53.3	48.95	652.24
P-67	Mudstone, phosphatic	1224- RPS	2.4	11.6	--	--	--	48.5	51.35	680.08
P-66	Mudstone	1223- RPS	1.1	5.5	--	--	--	71.1	52.45	686.13
P-65	Mudstone, phosphatic; fos. col. no. 48-JES-69	1222- RPS	3.1	12.3	--	--	--	54.6	55.55	724.26
P-64	Phosphate rock, argillaceous	1218-CEW	1.5	25.5	--	--	--	25.8	57.05	762.51
P-63	Mudstone; fos. col. no. 48-JES-68	1303-WOM	1.0	6.1	--	--	--	75.9	58.05	768.61
P-62	Mudstone	1302-WOM	1.6	2.8	--	--	--	81.4	59.65	773.09
P-61	Mudstone; fos. col. no. 48-JES-67	1301-WOM	1.2	5.8	--	--	--	80.2	60.85	780.05
P-60	Mudstone, phosphatic	1300-WOM	0.8	11.4	--	--	--	61.0	61.65	789.17
P-59	Mudstone, phosphatic; fos. col. no. 48-JES-66	1232-WOM	4.8	12.1	--	--	--	58.3	66.45	847.25
P-58	Mudstone	1231-WOM	0.6	6.9	--	--	--	68.9	67.05	851.39
P-57	Mudstone, phosphatic; fos. col. no. 48-JES-65	1230-WOM	0.8	9.4	--	--	--	65.7	67.85	858.91
P-56	Mudstone and phosphate rock	1215-CEW	1.9	12.6	--	--	--	49.6	69.75	882.85
P-55	Mudstone	1214-CEW	2.8	3.3	--	--	--	81.0	72.55	892.09
P-54	Mudstone and phosphatic mudstone	1221- RPS	2.7	4.5	--	--	--	71.7	75.25	904.24
P-53	Mudstone	1220- RPS	0.9	1.8	--	--	--	79.9	76.15	905.86
P-52	Mudstone and phosphatic mudstone	1239- RPS	1.2	5.6	--	--	--	73.6	77.35	912.58
P-51	Mudstone and phosphate rock	1238- RPS	1.1	24.0	--	--	--	26.1	78.45	938.98
P-50	Mudstone and argillaceous phosphate rock; fos. col. no. 48-JES-64	1237- RPS	0.8	12.5	--	--	--	56.7	79.25	948.98
P-49	Mudstone and phosphate rock	1236- RPS	1.2	16.9	--	--	--	38.6	80.45	969.26
P-48	Mudstone and phosphate rock	1235- RPS	1.0	17.4	--	--	--	37.2	81.45	986.66
P-47	Mudstone; fos. col. no. 48-JES-63	1234- RPS	3.0	5.9	--	--	--	72.7	84.45	1,004.36
P-46	Mudstone	1269-VEM	2.9	4.9	--	--	--	65.9	87.35	1,018.57
P-45	Phosphate rock	1268-VEM	2.9	31.8	--	--	--	10.5	90.25	1,110.79
P-44	Mudstone, phosphatic	1267-VEM	3.0	10.0	--	--	--	60.5	93.25	1,140.79
P-43	Mudstone, calcareous, phosphatic	1266-VEM	1.4	10.7	--	--	--	43.4	94.65	1,155.77
P-42	Mudstone, phosphatic	1265-VEM	0.6	14.7	--	--	--	37.4	95.25	1,164.59
P-41	Mudstone	1264-VEM	0.6	5.8	--	--	--	68.8	95.85	1,168.07
P-40	Mudstone, phosphatic	1263-VEM	0.8	12.0	--	--	--	48.9	96.65	1,177.67
P-39	Mudstone, phosphatic	1262-VEM	0.5	8.0	--	--	--	59.9	97.15	1,181.67
P-38	Mudstone, phosphatic	1261-VEM	1.1	12.1	--	--	--	41.3	98.25	1,194.98
P-37	Mudstone, phosphatic	1260-VEM	2.1	16.5	--	--	--	43.5	100.35	1,229.63
P-36	Limestone; fos. col. no. 48-JES-62	1279-WOM	1.0	2.2	--	--	--	13.7	101.35	1,231.83
P-35	Limestone; fos. col. no. 48-JES-61	1278-WOM	2.7	0.4	--	--	--	9.7	104.05	1,232.91

P-34	Mudstone; fos. col. no. 48-JES-60	1277-WOM	1.0	2.7	--	--	--	80.7	105.05	1,235.61
P-33	Mudstone, phosphatic	1276-WOM	0.5	8.9	--	--	--	56.5	105.55	1,240.06
P-32	Mudstone; fos. col. no. 48-JES-59	1275-WOM	1.8	5.7	--	--	--	74.9	107.35	1,250.32
P-31	Mudstone, phosphatic; fos. col. no. 48-JES-58	1274-WOM	2.6	13.7	--	--	--	52.7	109.95	1,285.94
P-30	Mudstone, phosphatic	1273-WOM	3.5	14.5	--	--	--	46.1	113.45	1,336.69
P-29	Mudstone, phosphatic	1272-WOM	1.0	11.8	--	--	--	65.7	114.45	1,348.49
P-28	Mudstone, phosphatic	1247-CEW	0.7	7.9	--	--	--	65.7	115.15	1,354.02
P-27	Mudstone and phosphate rock	1246-CEW	3.2	14.6	--	--	--	48.6	118.35	1,400.74
P-26	Mudstone and phosphate rock	1245-CEW	1.1	16.3	5.8	2.44	6.06	36.7	119.45	1,418.67
P-25	Phosphate rock	1244-CEW	3.3	32.3	2.1	1.31	5.40	9.0	122.75	1,525.26
P-24	Phosphate rock	1243-CEW	2.2	28.5	3.6	1.97	5.12	15.5	124.95	1,587.96
P-23	Phosphate rock, argillaceous	1242-CEW	1.5	26.3	3.7	1.47	7.32	20.4	126.45	1,627.41
P-22	Phosphate rock, argillaceous; fos. col. no. 48-JES-57	1241-CEW	1.9	25.6	3.4	1.29	7.40	21.9	128.35	1,676.05
P-21	Mudstone, phosphatic	1240-CEW	2.3	13.0	6.5	2.48	11.54	46.4	130.65	1,705.95
P-20	Mudstone and phosphate rock	1309-CEW	2.0	16.8	6.4	2.02	7.90	41.6	132.65	1,739.55
P-19	Phosphate rock, argillaceous	1308-CEW	1.2	25.2	4.8	1.54	4.64	23.8	133.85	1,769.79
P-18	Phosphate rock	1307-CEW	3.4	33.8	1.4	0.71	3.76	6.1	137.25	1,884.71
P-17	Phosphate rock, argillaceous	1306-CEW	4.0	29.9	2.1	0.86	6.32	11.8	141.25	2,004.31
P-16	Mudstone, phosphatic	1219-CEW	1.9	16.3	6.8	2.45	5.52	48.3	143.15	2,035.28
P-15	Phosphate rock	1314-RAH	2.5	31.6	1.9	0.91	4.56	9.0	145.65	2,114.28
P-14	Mudstone, phosphatic	1313-RAH	1.6	9.7	9.4	3.10	3.80	62.2	147.25	2,129.80
P-13	Phosphate rock	1312-RAH	1.8	33.7	1.8	0.68	3.84	5.7	149.05	2,190.46
P-12	Mudstone, phosphatic and phosphate rock; fos. col. no. 48-JES-56	1311-RAH	1.5	24.6	5.5	1.57	5.32	23.5	150.55	2,227.36
P-11	Phosphate rock	1310-RAH	2.3	28.2	2.5	0.87	6.10	14.0	152.85	2,292.22
P-10	Phosphate rock, argillaceous; fos. col. no. 48-JES-55	1294-WOM	0.6	22.9	0.76	0.55	4.16	28.7	153.45	2,305.96
P- 9	Phosphate rock, argillaceous	1299-WOM	0.3	27.0	4.5	1.66	5.36	21.3	153.75	2,314.06
P- 8	Phosphate rock	1298-WOM	2.9	34.4	0.94	0.47	5.94	3.4	156.65	2,413.82
P- 7	Phosphate rock	1297-WOM	2.0	29.9	2.3	1.00	7.56	12.3	158.65	2,473.62
P- 6	Mudstone	1292-WOM	1.2	1.8	--	--	--	72.6	159.85	2,475.79
P- 5	Limestone, argillaceous	1291-WOM	1.2	0.3	--	--	--	35.4	161.05	3,476.14
P- 4	Mudstone; fos. col. no. 48-JES-54	1290-WOM	0.4	0.9	--	--	--	76.4	161.45	2,476.50
P- 3	Mudstone	1271-WOM	0.6	0.1	--	--	--	79.4	162.05	2,476.56
P- 2	Limestone, argillaceous; fos. col. no. 48-JES-53	1270-WOM	0.8	1.8	--	--	--	43.8	162.85	2.478.00
P- 1	Phosphate rock	1296-WOM	0.4	32.7	--	--	--	5.9	163.25	2,491.08
				Wells formation						
Cw-1	Limestone; fos. col. no. 48-JES-52	1295-WOM	0.7	0.5	--	--	--	4.2	--	--

SPECTROGRAPHIC ANALYSES—NORTH WOOLEY RANGE, IDAHO. LOT NO. 1230.

Semi-quantitative analyses of selected samples of the phosphatic shale member of the Phosphoria formation, North Wooley Range, Idaho (see immediately preceding pages for location of section, thickness and description of strata, and chemical analyses of samples), made by the U. S. Geological Survey, Geochemistry and Petrology Branch, Washington, D. C. In addition to the elements listed in the table below, Sb, As, Be, Bi, Cs, Co, Cb, Dy, Er, Eu, Gd, Au, Hf, Ho, Li, Lu, Nd, Pt, K, Pr, Rb, Sm, Sc, Ta, Te, Tb, Tl, Th, Tm, Sn, Ti, and W were looked for in all samples but were not detected.

Explanation of symbols

A = more than 10 percent
B' = 1-10 percent[1]
D = 0.1-1 percent
E = 0.01-0.1 percent
F = 0.001-0.01 percent
G = less than 0.001 percent
ND = not detected

Bed no.	Sample no.	Al	Ba	B	Cd	Ca	Cr	Cu	Fe	Ga	In	La	Pb	Mg	Mn	Mo	Ni	P	Si	Ag	Na	Sr	Ti	V	Y	Yb	Zn	Zr
	Beds P-92 through P-84 not analyzed.																											
P-83	1205- RLP	D	F	ND	ND	A	D	F	E	ND	ND	E	ND	E	E	F	E	A	B'	G	D	D	E	D	E	G	ND	F
P-82	1204- RLP	A	F	F	ND	B'	D	F	B'	ND	F	F	F	D	D	F	E	B'	A	G	D	E	D	E	E	G	E	E
P-81	1203- RLP	B'	F	ND	ND	A	D	F	D	F	ND	E	F	E	E	F	E	A	B'	G	D	D	E	E	E	G	ND	F
P-80	1202- RLP	B'	F	ND	ND	A	D	F	D	ND	ND	E	ND	E	E	F	E	A	B'	G	D	D	E	E	E	G	ND	F
P-79	1201- RLP	A	E	F	ND	B'	D	E	B'	F	G	F	F	D	D	F	E	B'	A	G	D	E	D	E	E	G	E	E
P-78	1200- RLP	B'	E	ND	ND	A	D	F	D	F	ND	E	ND	E	E	F	E	A	B'	G	D	D	E	D	E	G	E	F
P-77	1305-WOM	B'	F	ND	E	A	D	F	D	ND	ND	E	ND	E	E	F	E	A	B'	G	D	D	E	D	E	G	E	F
P-76	1304-WOM	D	F	ND	F	A	D	F	E	ND	ND	E	ND	E	E	F	E	A	B'	G	D	D	F	D	E	G	ND	F
P-75	1212-CEW	B'	F	ND	E	A	D	E	D	F	G	ND	E	E	E	F	E	A	B'	G	D	D	E	D	E	G	E	F
P-74	1211-CEW	B'	F	ND	E	A	D	E	D	F	G	ND	E	E	E	F	E	A	B'	G	D	D	E	D	E	G	E	F
P-73	1210-CEW	A	E	ND	E	B'	D	E	B'	F	G	E	E	E	D	E	E	B'	A	G	D	D	D	D	E	G	E	E
	Beds P-72 through P-27 not analyzed.																											
P-26	1245-CEW	B'	E	ND	ND	A	D	E	B'	F	ND	E	F	E	E	F	E	A	B'	G	D	D	E	E	E	G	E	F
P-25	1244-CEW	B'	F	ND	ND	A	D	E	D	F	ND	E	F	E	E	F	E	A	B'	G	D	D	E	E	E	G	E	F
P-24	1243-CEW	B'	ND	ND	ND	A	D	F	B'	F	G	E	F	E	D	F	E	A	B'	G	D	D	E	E	E	G	E	F
P-23	1242-CEW	B'	F	ND	E	A	D	E	D	F	G	E	E	E	D	F	E	A	B'	G	D	D	E	D	E	F	E	E
P-22	1241-CEW	B'	F	ND	ND	A	D	E	D	F	ND	E	E	E	E	F	E	A	B'	F	D	D	E	D	E	F	E	F
P-21	1240-CEW	A	E	ND	E	B'	D	E	B'	F	G	E	E	E	E	E	E	B'	A	F	D	D	D	D	E	F	E	E
P-20	1309-CEW	A	F	ND	E	B'	D	E	B'	F	ND	E	F	E	E	E	E	B'	A	F	D	D	E	D	E	G	E	E
P-19	1308-CEW	B'	F	ND	E	A	E	E	D	F	G	E	F	E	D	F	E	A	B'	G	D	D	E	D	E	G	E	F
P-18	1307-CEW	B'	F	ND	E	A	D	F	D	ND	ND	E	F	E	E	F	E	A	B'	G	D	D	E	D	E	G	E	F

P-17	1306-CEW	B[1]	F	ND	E	A	D	E	D	ND	ND	E	F	E	E	F	E	A	B[1]	G	D	D	E	D	E	G	E	F
P-16	1219-CEW	A	E	ND	ND	B[1]	D	E	B[1]	F	G	E	E	E	E	E	E	B[1]	A	G	D	D	D	D	E	G	E	E
P-15	1314-RAH	B[1]	F	ND	E	A	D	F	D	F	ND	F	ND	E	E	F	E	A	B[1]	G	D	D	E	D	E	G	E	F
P-14	1313-RAH	B[1]	F	ND	E	A	D	F	D	F	ND	F	ND	E	E	F	E	A	B[1]	G	D	D	E	D	E	G	E	F
P-13	1312-RAH	B[1]	F	ND	E	A	D	F	D	F	ND	F	F	E	E	F	E	A	B[1]	G	D	D	E	D	E	G	E	F
P-12	1311-RAH	B[1]	E	ND	E	A	D	E	D	F	G	E	E	E	D	F	E	A	B[1]	G	D	D	E	D	E	G	E	F
P-11	1310-RAH	B[1]	F	ND	E	A	D	E	D	F	ND	E	E	E	E	F	E	A	B[1]	G	D	D	E	D	E	G	E	F
P-10	1294-WOM	B[1]	F	ND	F	A	D	F	D	F	F	E	E	E	D	F	E	A	B[1]	G	D	D	E	D	E	G	E	E
P- 9	1299-WOM	B[1]	F	ND	F	A	D	F	D	ND	G	E	F	E	D	F	E	A	B[1]	G	D	D	E	D	E	G	E	F
P- 8	1298-WOM	D	F	ND	E	A	D	F	E	ND	ND	E	F	E	E	ND	E	A	B[1]	G	D	D	E	D	E	G	E	F
P- 7	1297-WOM	B[1]	F	ND	E	A	D	E	D	ND	ND	E	E	E	E	F	F	A	B[1]	G	D	D	E	D	E	G	E	F
	Beds P-6 through P-1 not analyzed.																											

[1] B[1] is equivalent to B and C of Bureau of Mines analyses as recorded in other reports.

NORTH RASMUSSEN VALLEY, IDAHO. LOT NO. 1233.

Phosphoria formation sampled in bulldozer trench on northeast slope of Rasmussen Valley, sec. 6, T. 7 S., R. 44 E., Caribou County, Idaho, on southwest limb of Snowdrift anticline. Beds strike N. 53° W. and dip 63° SW. Section measured by R. A. Hoppin, C. E. Weaver, R. L. Parker, R. P. Sheldon, D. F. Davidson, and F. W. O' Malley and sampled by R. A. Smart and R. G. Waring. Samples analyzed for P_2O_5 and acid insoluble by U. S. Bureau of Mines Laboratory, Albany, Oregon, and for other constituents by Trace Elements Section Laboratory, U. S. Geological Survey, Washington, D. C.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	Loss on ignition	Acid insoluble		
	Dinwoody formation—basal bed only									
Trd-2	Siltstone	1418- RAH	4.0	0.5	--	--	--	78.2	--	--
Trd-1	Phosphate rock, argillaceous, conglomeratic	1417- RAH	0.6	21.2	--	--	--	31.6	--	--
	Rex member of Phosphoria formation									
R-24	Mudstone; fos. col. no. 48-JES-82[1]	1416- RAH	2.3	4.0	--	--	--	77.0	2.3	9.20
R-23	Mudstone; fos. col. no. 48-JES-83	1415- RAH	10.0	4.2	--	--	--	71.6	12.3	51.20
R-22	Mudstone	1414- RAH	10.0	5.6	--	--	--	62.7	22.3	107.20
R-21	Phosphate rock, argillaceous	1413- RAH	2.0	21.2	--	--	--	31.4	24.3	149.60
R-20	Mudstone	1412- RAH	2.1	2.2	--	--	--	69.7	26.4	154.22
R-19	Mudstone	1411- RAH	10.5	3.1	--	--	--	73.6	36.9	186.77
R-18	Mudstone, cherty	1410- RAH	7.0	1.5	--	--	--	83.7	43.9	197.27
R-17	Mudstone; fos. col. no. 48-JES-84	1409- RAH	10.0	1.9	--	--	--	82.4	53.9	216.27
R-16	Chert	1408- RAH	2.0	2.1	--	--	--	88.4	55.9	220.47
R-15	Mudstone, cherty; fos. col. no. 48-JES-85	1407- RAH	12.0	2.4	--	--	--	73.3	67.9	249.27
R-14	Mudstone	1406- RAH	10.0	2.1	--	--	--	77.0	77.9	270.27
R-13	Mudstone	1405- RAH	10.0	1.3	--	--	--	80.4	87.9	283.27
R-12	Mudstone	1404- RAH	10.0	1.5	--	--	--	81.2	97.9	298.27
R-11	Mudstone	1403- RAH	10.0	1.6	--	--	--	82.2	107.9	314.27
R-10	Mudstone	1402- RAH	10.0	1.9	--	--	--	76.5	117.9	333.27
R- 9	Mudstone	1401- RAH	10.0	1.6	--	--	--	79.2	127.9	349.27
R- 8	Mudstone	1400- RAH	10.0	1.3	--	--	--	83.5	137.9	362.27
R- 7	Mudstone	1399- RAH	10.0	1.9	--	--	--	81.3	147.9	381.27
R- 6	Mudstone	1398- RAH	10.0	1.2	--	--	--	83.7	157.9	393.27
R- 5	Chert	1397- RAH	5.4	0.6	--	--	--	92.2	163.3	396.51
R- 4	Chert and mudstone	1396- RAH	5.1	0.9	--	--	--	88.5	168.4	401.10
R- 3	Chert	1395- RAH	4.0	1.2	--	--	--	90.2	172.4	405.90
R- 2	Chert	1394- RAH	10.0	2.9	--	--	--	87.1	182.4	434.90
R- 1	Chert	1384- DFD	10.0	0.2	--	--	--	88.9	192.4	436.90

		Phosphatic shale member of Phosphoria formation								
P-83	Mudstone	1383- DFD	1.6	1.3	--	--	--	82.6	1.6	2.08
P-82	Mudstone	1382- DFD	0.9	2.5	--	--	--	70.6	2.5	4.33
P-81	Mudstone	1381- DFD	2.5	3.9	--	--	--	69.3	5.0	14.08
P-80	Mudstone, phosphatic	1380- DFD	0.9	9.5	--	--	--	40.1	5.9	22.63
P-79	Mudstone, phosphatic; fos. col. no. 48-JES-103	1339- DFD	0.7	16.1	--	--	--	48.2	6.6	33.90
P-78	Mudstone	1338- DFD	1.7	3.2	--	--	--	76.6	8.3	39.34
P-77	Mudstone; fos. col. no. 48-JES-104	1337- DFD	2.1	1.1	--	--	--	80.1	10.4	41.65
P-76	Mudstone	1336- DFD	0.8	3.7	--	--	--	73.1	11.2	44.61
P-75	Phosphate rock	1335- RLP	1.3	36.2	1.1	0.36	6.50	3.7	12.5	91.67
P-74	Phosphate rock and mudstone	1334- RLP	1.0	26.4	3.1	1.64	7.90	15.2	13.5	118.07
P-73	Mudstone	1525-WOM	0.4	7.3	8.4	3.89	9.50	65.1	13.9	120.99
P-72	Phosphate rock	1524-WOM	2.0	31.3	1.9	0.94	27.28	12.3	15.9	183.59
P-71	Phosphate rock, argillaceous	1332- RLP	1.8	23.9	4.9	1.65	8.08	27.5	17.7	226.61
P-70	Phosphate rock	1331- RLP	1.2	33.8	1.6	0.58	6.96	5.7	18.9	267.17
P-69	Phosphate rock	1330- RLP	1.0	35.5	1.5	0.52	5.12	3.3	19.9	302.67
P-68	Phosphate rock	1523-WOM	1.3	29.9	2.8	1.05	11.32	11.3	21.2	341.54
P-67	Phosphate rock	1522-WOM	4.1	27.4	3.2	1.14	9.80	17.4	25.3	453.88
P-66	Mudstone, phosphatic	1379-WOM	2.4	13.1	8.3	2.37	11.04	50.9	27.7	485.32
P-65	Mudstone	1349- RPS	1.3	6.0	--	--	--	67.3	29.0	493.12
P-64	Mudstone, phosphatic	1348- RPS	0.8	11.3	--	--	--	51.7	29.8	502.16
P-63	Mudstone and argillaceous phosphate rock	1347- RPS	1.8	11.3	--	--	--	49.3	31.6	522.50
P-62	Mudstone and phosphate rock; fos. col. no. 48-JES-105	1521-WOM	1.2	9.0	--	--	--	52.7	32.8	533.30
P-61	Phosphate rock, argillaceous	1520-WOM	0.8	19.5	--	--	--	28.7	33.6	548.90
P-60	Mudstone	1345- RPS	1.4	7.6	--	--	--	63.3	35.0	559.54
P-59	Phosphate rock and mudstone	1344- RPS	2.3	16.8	--	--	--	42.5	37.3	598.18
P-58	Phosphate rock, argillaceous	1343- RPS	1.4	25.4	--	--	--	26.3	38.7	633.74
P-57	Mudstone	1342- RPS	1.1	6.6	--	--	--	73.4	39.8	641.00
P-56	Mudstone, phosphatic	1529-WOM	2.6	14.0	--	--	--	52.6	42.4	677.40
P-55	Mudstone, phosphatic; fos. col. no. 48-JES-106	1528-WOM	3.0	8.3	--	--	--	68.0	45.4	702.30
P-54	Mudstone	1340- RPS	0.6	7.7	--	--	--	66.3	46.0	706.92
P-53	Mudstone	1369- RAH	1.0	7.4	--	--	--	66.6	47.0	714.32
P-52	Phosphate rock, argillaceous	1368- RAH	0.6	26.3	--	--	--	22.0	47.6	730.10
P-51	Mudstone	1367- RAH	0.7	6.8	--	--	--	62.9	48.3	734.86
P-50	Mudstone	1366- RAH	1.1	5.9	--	--	--	69.2	49.4	741.35
P-49	Mudstone and phosphate rock	1365- RAH	3.5	7.4	--	--	--	63.1	52.9	767.25
P-48	Mudstone	1364- RAH	1.1	5.2	--	--	--	71.4	54.0	772.97
P-47	Mudstone	1363- RAH	3.6	5.6	--	--	--	69.9	57.6	793.13
P-46	Phosphate rock, argillaceous	1378-WOM	1.1	21.2	--	--	--	32.2	58.7	816.45
P-45	Mudstone, phosphatic	1377-WOM	0.6	8.6	--	--	--	62.5	59.3	821.61

[1] Fossil collection made by J. E. Smedley, Paleontology and Stratigraphy Branch, U. S. Geological Survey.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	Loss on ignition	Acid insoluble		
P-44	Phosphate rock, calcareous and phosphatic mudstone	1376-WOM	2.1	17.7	--	--	--	33.5	61.4	858.78
P-43	Mudstone	1375-WOM	0.7	4.7	--	--	--	76.3	62.1	862.07
P-42	Phosphate rock, argillaceous	1374-WOM	1.1	22.4	--	--	--	36.2	63.2	886.71
P-41	Mudstone	1373-WOM	0.8	3.5	--	--	--	36.3	64.0	889.51
P-40	Mudstone and argillaceous phosphate rock; fos. col. no. 48-JES-107	1370-CEW	1.3	11.2	--	--	--	54.4	65.3	904.07
P-39	Phosphate rock, argillaceous	1371-CEW	2.7	19.1	--	--	--	31.0	68.0	955.64
P-38	Phosphate rock, argillaceous	1372-CEW	4.3	15.5	--	--	--	34.9	72.3	1,022.29
P-37	Mudstone	1329-WOM	1.8	3.3	--	--	--	73.3	74.1	1,028.23
P-36	Mudstone, phosphatic	1328-WOM	1.5	9.2	--	--	--	62.8	75.6	1,042.03
P-35	Mudstone, phosphatic	1327-WOM	0.4	12.5	--	--	--	52.8	76.0	1,047.03
P-34	Mudstone	1326-WOM	2.0	2.1	--	--	--	84.8	78.0	1,051.23
P-33	Mudstone, phosphatic	1325-WOM	0.5	13.2	--	--	--	50.4	78.5	1,057.83
P-32	Mudstone, phosphatic	1324-WOM	0.7	14.3	--	--	--	48.4	79.2	1,067.84
P-31	Phosphate rock, argillaceous	1323-WOM	0.8	20.7	--	--	--	34.3	80.0	1,084.40
P-30	Mudstone	1322-WOM	0.7	7.2	--	--	--	67.9	80.7	1,089.44
P-29	Phosphate rock and phosphatic mudstone	1321-WOM	0.9	24.1	--	--	--	24.9	81.6	1,111.13
P-28	Mudstone, phosphatic, calcareous	1527-WOM	3.0	13.8	--	--	--	42.1	84.6	1,152.53
P-27	Mudstone, phosphatic, calcareous	1526-WOM	3.0	13.1	--	--	--	41.0	87.6	1,191.83
P-26	Mudstone, phosphatic	1362- RAH	0.35	7.9	--	--	--	61.2	87.95	1,194.60
P-25	Mudstone, phosphatic	1361- RAH	3.4	13.6	--	--	--	46.0	91.35	1,240.84
P-24	Mudstone, phosphatic	1360- RAH	0.6	8.4	--	--	--	60.5	91.95	1,245.88
P-23	Phosphate rock, argillaceous	1393-WOM	0.8	16.8	8.6	2.60	8.94	41.2	92.75	1,259.32
P-22	Phosphate rock; fos. col. no. 48-JES-124	1392-WOM	3.0	27.3	3.1	1.77	8.94	18.1	95.75	1,341.22
P-21	Phosphate rock, argillaceous and phosphatic mudstone	1391-WOM	2.7	21.2	3.9	1.41	10.38	30.9	98.45	1,398.46
P-20	Mudstone and argillaceous calcareous phosphate rock	1390-WOM	2.8	13.6	5.9	2.11	13.32	43.4	101.25	1,436.54
--	Mudstone and argillaceous phosphate rock 1389-WOM is equivalent to 1390-WOM.	1389-WOM	(3.0)	18.3	5.3	1.78	12.30	36.9	--	--
P-19	Phosphate rock and mudstone	1388-WOM	1.4	29.2	2.9	1.18	2.88	16.7	102.65	1,477.42
P-18	Phosphate rock, argillaceous	1387-WOM	4.0	20.6	5.5	1.99	8.24	36.1	106.65	1,559.82
P-17	Phosphate rock	1386-WOM	1.5	31.4	2.4	1.15	5.82	12.7	108.15	1,606.92
P-16	Phosphate rock	1359-CEW	1.05	28.5	2.3	0.85	7.76	15.3	109.20	1,636.84
P-15	Phosphate rock	1358-CEW	1.4	31.3	2.7	0.98	9.36	12.1	110.60	1,680.66
P-14	Phosphate rock and mudstone	1357-CEW	0.9	27.4	3.5	1.25	6.60	20.7	111.50	1,705.32
P-13	Mudstone, phosphatic	1356-CEW	0.8	10.3	7.3	2.65	7.70	58.3	112.30	1,713.56
P-12	Phosphate rock	1355-CEW	2.3	31.3	2.0	0.92	6.62	13.0	114.60	1,785.55

P-11	Mudstone, phosphatic	1354-CEW	1.0	11.3	7.9	2.71	7.16	53.6	115.60	1,796.85
P-10	Phosphate rock	1353-CEW	4.0	34.5	1.4	0.56	8.88	5.9	119.60	1,934.85
P- 9	Mudstone, phosphatic	1352-CEW	0.45	13.5	7.8	2.13	8.42	52.0	120.05	1,940.93
P- 8	Phosphate rock, argillaceous	1351-CEW	0.7	24.5	4.2	1.54	5.98	25.6	120.75	1,958.08
P- 7	Mudstone	1350-CEW	0.8	4.9	1.7	0.55	8.08	9.2	121.55	1,961.99
P- 6	Phosphate rock	1000- RAH	1.4	27.9	3.4	1.01	5.98	16.4	122.95	2,001.06
P- 5	Phosphate rock, calcareous, argillaceous; fos. col. no. 48-JES-125	1319- RAH	0.7	15.7	3.0	1.06	6.70	21.1	123.65	2,012.05
P- 4	Phosphate rock	1419-WOM	2.0	33.9	1.0	0.56	7.18	5.3	125.65	2,079.85
P- 3	Phosphate rock	1233-WOM	3.0	32.5	1.1	0.93	8.06	6.6	128.65	2,177.35
P- 2	Mudstone, calcareous	1317- RAH	3.0	2.2	6.8	2.65	19.66	51.9	131.65	2,183.95
P- 1	Phosphate rock	1316- RAH	0.5	32.4	0.98	0.82	19.80	5.1	132.15	2,200.15
				Wells formation						
Cw-1	Limestone	1315- RAH	3.1	0.6	--	--	--	1.8	--	--

SPECTROGRAPHIC ANALYSES—NORTH RASMUSSEN VALLEY, IDAHO. LOT NO. 1233.

Semi-quantitative analyses of selected samples of the phosphatic shale member of the Phosphoria formation, North Rasmussen Valley, Idaho (see immediately preceding pages for location of section, thickness and description of strata, and chemical analyses of samples), made by U. S. Geological Survey, Geochemistry and Petrology Branch, Washington, D. C. In addition to the elements listed in the table below, Sb, As, Be, Bi, Cs, Cb, Dy, Er, Eu, Gd, Au, Hf, Ho, Li, Lu, Nd, Pt, K, Pr, Rb, Sm, Sc, Ta, Te, Tb, Tl, Th, Tm, Sn, Ti, and W were looked for in all samples but were not detected.

Explanation of symbols

A = more than 10 percent
B' = 1-10 percent[1]
D = 0.1-1 percent
E = 0.01-0.1 percent
F = 0.001-0.01 percent
G = less than 0.001 percent
ND = not detected

Bed no.	Sample no.	Al	Ba	B	Cd	Ca	Cr	Co	Cu	Fe	Ga	La	Pb	Mg	Mn	Mo	Ni	P	Si	Ag	Na	Sr	Sn	Ti	V	Y	Yb	Zn	Zr
	Beds P-83 through P-76 not analyzed.																												
P-75	1353-CEW	D	F	ND	E	A	E	ND	F	D	ND	E	ND	E	E	F	E	A	B'	ND	D	E	ND	F	E	E	G	ND	F
P-74	1334- RLP	B'	F	ND	E	A	E	ND	F	B'	F	E	ND	D	E	ND	E	A	B'	G	D	D	ND	E	E	E	G	E	F
P-73	1525-WOM	B'	F	ND	ND	B'	E	ND	F	B'	F	ND	ND	D	F	F	E	B'	A	G	D	E	ND	D	E	ND	ND	ND	F
P-72	1224-WOM	B'	G	ND	ND	A	E	ND	F	B'	ND	E	ND	E	F	ND	E	A	B'	G	D	E	ND	E	E	E	G	ND	F
P-71	1332- RLP	B'	F	ND	E	A	D	ND	F	B'	F	E	ND	D	E	ND	E	A	A	G	D	D	ND	E	E	E	G	E	F
P-70	1331- RLP	D	F	ND	E	A	E	ND	F	D	ND	E	ND	E	E	ND	E	A	B'	G	D	D	ND	E	E	E	G	E	F
P-69	1330- RLP	D	F	ND	E	A	D	ND	F	D	ND	E	ND	D	E	ND	E	A	B'	G	D	D	ND	E	E	E	G	E	F
P-68	1523-WOM	B'	G	ND	ND	A	D	ND	F	B'	ND	E	ND	D	F	ND	E	A	B'	G	D	E	ND	E	E	E	G	ND	F
P-67	1522-WOM	B'	F	ND	ND	A	D	ND	F	B'	ND	E	ND	D	F	ND	E	A	B'	G	D	E	ND	E	E	E	G	ND	F
P-66	1379-WOM	A	F	ND	ND	B'	D	ND	F	B'	F	ND	F	D	F	F	E	B'	A	G	D	E	ND	E	E	E	G	ND	F
	Beds P-65 through P-24 not analyzed.																												
P-23	1393-WOM	B'	F	ND	E	B'	D	ND	F	B'	F	E	ND	D	E	F	E	B'	A	G	D	E	ND	E	E	E	G	E	F
P-22	1392-WOM	B'	F	ND	E	A	D	ND	F	B'	F	E	ND	D	E	F	E	B'	B'	G	D	D	ND	E	E	E	G	E	F
P-21	1391-WOM	B'	F	ND	E	B'	D	ND	E	B'	F	E	E	D	F	F	E	B'	A	F	D	E	ND	E	E	E	G	E	F
P-20	1390-WOM	B'	F	ND	E	B'	D	ND	E	B'	F	E	E	D	F	F	E	B'	A	F	D	E	ND	E	D	E	G	E	F
--	1389-WOM	B'	F	ND	E	B'	D	ND	E	B'	F	E	E	D	F	F	E	B'	A	F	D	D	ND	E	E	E	G	E	F
P-19	1388-WOM	B'	F	ND	E	A	D	ND	F	B'	ND	E	ND	D	F	F	E	A	B'	F	D	D	ND	E	E	E	G	E	F
P-18	1387-WOM	B'	F	ND	E	B'	E	ND	F	B'	F	E	ND	D	E	F	E	B'	A	G	D	E	ND	E	E	E	G	E	F
P-17	1386-WOM	B'	F	ND	E	A	D	ND	F	B'	ND	E	F	D	F	F	E	A	B'	G	D	D	ND	E	E	E	G	E	F
P-16	1359-CEW	D	E	G	E	A	E	F	E	D	ND	E	F	D	F	G	E	A	B'	G	D	E	F	E	D	E	G	E	E
P-15	1358-CEW	D	E	F	E	A	E	ND	F	D	ND	F	F	D	F	G	E	A	B'	G	D	E	F	E	D	E	G	E	F
P-14	1357-CEW	D	F	ND	E	A	E	E	F	B'	ND	E	E	D	ND	F	E	A	B'	ND	B'	D	ND	E	E	E	G	E	F
P-13	1356-CEW	B'	F	ND	E	B'	E	ND	F	B'	F	ND	E	D	E	F	E	B'	A	G	D	E	ND	D	E	F	G	E	F
P-12	1355-CEW	B'	F	ND	E	A	E	ND	F	B'	ND	E	ND	D	E	F	E	A	B'	G	D	D	ND	E	E	F	G	E	F
P-11	1354-CEW	A	F	ND	E	B'	E	ND	F	B'	F	ND	ND	D	E	F	E	B'	A	G	D	E	ND	D	E	F	G	E	F
P-10	1353-CEW	D	F	ND	E	A	E	ND	F	D	ND	E	ND	D	F	ND	E	A	B'	G	D	D	ND	E	E	F	G	E	F

P- 9	1352-CEW	A	F	ND	E	B'	E	ND	F	B'	F	ND	ND	D	E	F	E	B'	A	G	D	E	ND	E	E	F	G	E	F
P- 8	1351-CEW	B'	F	ND	E	A	E	ND	F	B'	F	E	ND	D	E	F	E	B'	B'	G	D	D	ND	E	E	F	G	E	F
P= 7	1350-CEW	D	F	ND	E	A	E	ND	F	D	ND	ND	F	A	E	F	E	D	B'	G	D	E	ND	F	E	F	G	E	F
P- 6	1000- RAH	B'	E	F	E	A	E	ND	E	D	ND	E	F	D	F	F	E	A	B'	G	D	E	ND	E	D	E	G	E	F
P- 5	1319- RAH	B'	F	ND	E	A	E	ND	F	B'	ND	E	ND	B'	E	F	E	B'	B'	G	D	E	ND	E	E	F	G	E	F
P- 4	1419-WOM	D	G	ND	E	A	E	ND	F	D	ND	E	ND	D	F	ND	E	A	D	G	D	E	ND	F	E	E	G	E	F
P- 3	1233-WOM	D	F	ND	E	A	D	ND	F	B'	ND	E	E	D	F	F	E	A	B'	G	B'	E	ND	E	E	E	G	E	F
P- 2	1317- RAH	B'	F	ND	E	B'	E	ND	F	B'	F	ND	ND	B'	E	F	D	D	A	ND	D	E	ND	E	E	F	G	E	F
P- 1	1316- RAH	B'	F	ND	E	A	E	ND	F	B'	ND	E	ND	D	E	ND	E	A	B'	G	D	D	ND	E	E	F	G	E	F

[1] B' is equivalent to B and C of the Bureau of Mines analyses as recorded in other reports.

SOUTH RASMUSSEN VALLEY, IDAHO. LOT NO. 1232.

Phosphatic shale member of Phosphoria formation sampled in bulldozer trench on northeast slope of Rasmussen Valley, sec. 9, T. 7 S., R. 44 E., Caribou County, Idaho, on southwest limb of Snowdrift anticline. Beds strike N. 45° W. and dip about 60° SW. Many beds within the phosphatic shale member are locally tightly folded, faulted, and overturned. Section measured by F. W. O' Malley and D. F. Davidson and sampled by R. A. Smart and R. G. Waring in July 1948. Samples analyzed for P_2O_5 and acid insoluble by U. S. Bureau of Mines Laboratory, Albany, Oregon, and for other constituents by Trace Elements Section Laboratory, U. S. Geological Survey, Washington, D. C.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	Loss on ignition	Acid insoluble		
Rex member of Phosphoria formation—basal beds only										
R- 6	Chert	1492- DFD	0.8	0.6	--	--	--	94.4	0.8	0.48
R- 5	Chert	1491- DFD	1.8	0.6	--	--	--	94.4	2.6	1.56
R- 4	Chert	1490- DFD	1.2	0.5	--	--	--	94.5	3.8	2.16
R- 3	Chert	1474- DFD	1.4	0.4	--	--	--	92.9	5.2	2.72
R- 2	Chert	1473- DFD	2.3	0.1	--	--	--	92.7	7.5	2.95
R- 1	Chert	1472- DFD	1.5	4.4	--	--	--	74.6	9.0	9.55
Phosphatic shale member of Phosphoria formation										
P-72	Mudstone, cherty	3190-WOM	0.9	2.7	--	--	--	83.2	0.9	2.43
P-71	Mudstone	3189-WOM	0.7	4.5	--	--	--	72.2	1.6	5.58
P-70	Mudstone	3188-WOM	1.2	3.7	--	--	--	73.6	2.8	10.02
P-69	Phosphate rock, argillaceous	3187-WOM	0.8	25.9	--	--	--	28.5	3.6	30.74
P-68	Mudstone	3186-WOM	1.7	1.5	--	--	--	79.2	5.3	33.29
P-67	Mudstone	3185-WOM	1.7	0.6	--	--	--	83.8	7.0	34.31
P-66	Phosphate rock, argillaceous	3184-WOM	0.3	21.7	--	--	--	34.8	7.3	40.82
P-65	Mudstone	3183-WOM	0.9	1.3	--	--	--	80.9	8.2	41.99
P-64	Mudstone	1459- DFD	0.7	6.9	--	--	--	67.9	8.9	46.82
P-63	Mudstone, calcareous, phosphatic	1458- DFD	1.1	26.6	3.3	1.01	5.74	20.8	10.0	78.06
P-62	Phosphate rock	1457- DFD	1.1	36.0	1.4	0.53	3.24	3.6	11.1	115.68
P-61	Phosphate rock	1456- DFD	1.0	30.1	2.6	0.80	9.28	12.0	12.1	145.78
P-60	Phosphate rock	1455- DFD	1.4	29.8	3.2	0.80	37.00	12.0	13.5	187.50
P-59	Phosphate rock, argillaceous	1454- DFD	1.0	25.8	3.8	1.24	9.88	21.1	14.5	213.30
P-58	Phosphate rock, argillaceous	1453- DFD	2.6	27.1	3.4	1.15	8.84	20.1	17.1	283.76
P-57	Phosphate rock, argillaceous	1452- DFD	0.5	27.2	3.1	0.85	8.38	20.5	17.6	297.36
P-56	Phosphate rock, argillaceous	1451- DFD	0.6	20.0	5.7	1.31	9.72	36.0	18.2	309.36
P-55	Phosphate rock, argillaceous	1450- DFD	0.6	17.8	6.7	1.22	9.86	40.4	18.8	320.04
P-54	Mudstone, phosphatic	1439- DFD	1.3	14.6	8.3	1.95	9.74	45.3	20.1	339.02
P-53	Mudstone, calcareous	1438- DFD	0.6	8.4	--	--	--	62.5	20.7	344.06
P-52	Mudstone	1437- DFD	1.3	5.4	--	--	--	66.7	22.0	351.08
P-51	Mudstone, phosphatic	1479- DFD	1.1	13.2	--	--	--	44.8	23.1	365.60
P-50	Mudstone, phosphatic	1478- DFD	0.7	8.7	--	--	--	58.7	23.8	371.69
P-49	Mudstone, phosphatic	1477- DFD	1.2	15.8	--	--	--	43.2	25.0	390.65

P-48	Mudstone, phosphatic	1476- DFD	0.9	12.3	--	--	--	55.9	25.9	401.72
P-47	Mudstone, phosphatic	1475- DFD	4.6	12.8	--	--	--	49.3	30.5	460.60
P-46	Mudstone, phosphatic	1436- DFD	4.0	10.2	--	--	--	59.0	34.5	501.40
P-45	Mudstone, calcareous and phosphate rock	1435- DFD	3.2	15.2	--	--	--	47.2	37.7	550.04
P-44	Phosphate rock, argillaceous	1434- DFD	0.8	20.6	--	--	--	39.8	38.5	566.52
P-43	Mudstone	1433- DFD	0.9	7.6	--	--	--	69.1	39.4	573.36
P-42	Mudstone, phosphatic; fos. col. no. 48-JES-128[1]	1432- DFD	1.8	10.6	--	--	--	64.6	41.2	592.44
P-41	Mudstone, phosphatic	1431- DFD	2.5	10.5	--	--	--	64.6	43.7	618.69
P-40	Mudstone	1430- DFD	1.5	7.6	--	--	--	70.9	45.2	630.09
P-39	Mudstone and argillaceous phosphate rock	1445-WOM	2.2	7.8	--	--	--	65.6	47.4	647.25
P-38	Mudstone	1444-WOM	2.9	7.4	--	--	--	67.6	50.3	668.71
P-37	Mudstone	1443-WOM	1.2	3.7	--	--	--	61.5	51.5	673.15
P-36	Phosphate rock, argillaceous	1442-WOM	2.0	21.1	--	--	--	36.5	53.5	715.35
P-35	Mudstone, phosphatic	1441-WOM	2.4	17.1	--	--	--	44.6	55.9	756.39
P-34	Mudstone and calcareous argillaceous phosphate rock	1440-WOM	1.0	10.3	--	--	--	46.0	56.9	766.69
P-33	Mudstone	1429-WOM	1.1	4.2	--	--	--	73.8	58.0	771.31
P-32	Mudstone, phosphatic	1428-WOM	0.5	15.1	--	--	--	48.1	58.5	778.86
P-31	Mudstone, phosphatic and argillaceous phosphate rock	1427-WOM	2.1	14.0	--	--	--	48.0	60.6	808.26
P-30	Mudstone, phosphatic, calcareous	1426-WOM	1.3	13.9	--	--	--	39.6	61.9	826.33
P-29	Mudstone	1425-WOM	1.6	3.7	--	--	--	59.3	63.5	832.25
P-28	Mudstone	1424-WOM	0.9	2.1	--	--	--	82.0	64.4	834.14
P-27	Mudstone, phosphatic	1423-WOM	2.3	12.2	--	--	--	53.4	66.7	862.20
P-26	Mudstone, phosphatic	1422-WOM	0.6	10.0	--	--	--	61.0	67.3	868.20
P-25	Mudstone, phosphatic	1421-WOM	2.8	15.4	--	--	--	42.9	70.1	911.32
P-24	Mudstone, phosphatic	1420-WOM	0.5	12.6	8.8	2.15	9.08	52.8	70.6	917.62
P-23	Mudstone, phosphatic	1488-WOM	0.5	13.8	9.8	0.76	12.14	46.1	71.1	924.52
P-22	Mudstone, phosphatic	1487-WOM	1.5	14.8	9.6	0.58	9.10	47.0	72.6	946.72
P-21	Phosphate rock, argillaceous, calcareous	1486-WOM	1.3	18.4	8.2	2.03	9.52	38.2	73.9	970.64
P-20	Phosphate rock; fos. col. no. 48-JES-126	1485-WOM	3.2	28.5	3.6	1.94	8.10	15.4	77.1	1,061.84
	The thicknesses of beds P-20 through P-1 are approximation due to complications by folding and are possibly accurate to within only ten percent.									
P-19	Mudstone, phosphatic, and argillaceous phosphate rock	1484-WOM	2.5?	16.6	5.0	1.30	11.10	41.3	79.6	1,103.34
P-18	Phosphate rock, argillaceous	1483-WOM	0.3	18.6	4.8	5.08	6.80	38.1	79.9	1,108.92
P-17	Mudstone, phosphatic	1482-WOM	1.7?	12.3	8.5	4.12	8.20	50.2	81.6	1,129.83
P-16	Mudstone, phosphatic	1481-WOM	0.6	16.7	7.7	1.80	4.96	47.7	82.2	1,139.85
P-15	Phosphate rock, argillaceous	1480-WOM	0.5	23.7	4.6	0.86	3.94	32.8	82.7	1,151.70

[1] Fossil collection made by J. E. Smedley, Paleontology and Stratigraphy Branch, U. S. Geological Survey.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	Loss on ignition	Acid insoluble		
P-14	Phosphate rock	1469-WOM	4.0?	32.2	2.2	0.63	10.02	13.0	86.7	1,280.50
P-13	Mudstone, phosphatic	1468-WOM	0.5	13.7	7.9	1.00	6.04	45.8	87.2	1,287.35
P-12	Phosphate rock	1489-WOM	4.7	36.3	1.1	0.38	3.34	5.1	91.9	1,457.96
P-11	Phosphate rock	1467-WOM	2.3	32.0	1.9	0.48	5.24	24.6	94.2	1,531.56
P-10	Limestone, argillaceous, phosphatic	1466-WOM	0.3	12.4	8.2	0.68	6.00	32.0	94.5	1,535.28
P- 9	Phosphate rock, argillaceous, calcareous, and phosphatic mudstone	1465-WOM	1.6?	28.2	2.9	0.58	4.96	19.7	96.1	1,580.40
P- 8	Mudstone, calcareous, phosphatic	1464-WOM	0.7	12.1	12.0	4.29	9.92	37.5	96.8	1,588.87
P- 7	Phosphate rock	1463-WOM	4.5	28.0	2.4	0.70	6.38	14.0	101.3	1,714.87
P- 6	Phosphate rock, argillaceous	1462-WOM	0.4	24.3	4.3	0.72	6.20	37.1	101.7	1,724.59
P- 5	Phosphate rock; fos. col. no. 48-JES-127	1461-WOM	1.8?	32.1	1.3	0.46	5.04	6.7	103.5	1,782.37
P- 4	Phosphate rock, calcareous	1460-WOM	0.4?	29.9	1.6	0.57	7.26	8.7	103.9	1,794.33
P- 3	Phosphate rock	1449-WOM	1.1	32.2	2.6	0.48	5.74	14.7	105.0	1,829.75
P- 2	Mudstone, calcareous	1448-WOM	4.0?	1.7	9.2	2.78	8.60	71.8	109.0	1,836.55
P- 1	Phosphate rock, calcareous	1447-WOM	0.5	1.7	1.2	7.54	5.20	54.9	109.5	1,837.40
				Wells formation						
Cw-1	Mudstone, calcareous	1446-WOM	3.5	1.3	--	--	--	67.0	3.5	4.55

SPECTROGRAPHIC ANALYSES—SOUTH RASMUSSEN VALLEY, IDAHO. LOT NO. 1232.

Semi-quantitative analyses of selected samples of phosphatic shale member of Phosphoria formation, South Rasmussen Valley, Idaho (see immediately preceding pages for location of section, thickness and description of strata, and chemical analyses of samples), made by U. S. Geological Survey Laboratory, Geochemistry and Petrology Branch, Washington, D. C. In addition to the elements listed in the table below, Sb, As, Be, Bi, Ce, Cs, Co, Cb, Dy, Er, Eu, Gd, Ge, Au, Ho, Li, Lu, Nd, Pt, Pr, Rb, Sm, Sc, Ta, Te, Tb, Tl, Tm, and W were looked for in all samples but were not detected.

Explanation of symbols

A = more than 10 percent
B' = 1-10 percent[1]
D = 0.1-1 percent
E = 0.01-0.1 percent
F = 0.001-0.01 percent
G = less than 0.001 percent
ND = not detected

Bed no.	Sample no.	Al	Ba	B	Cd	Ca	Cr	Cu	Fe	Ga	La	Pb	Mg	Mn	Mo	Ni	P	Si	Ag	Na	Sr	Sn	Ti	V	Y	Yb	Zn	Zr
	Beds P-72 through P-64 not analyzed.																											
P-63	1458- DFD	B'	E	G	E	A	E	E	D	F	E	E	D	F	ND	F	A	B'	G	D	E	F	E	D	E	G	E	F
P-62	1457- DFD	D	E	F	E	A	E	E	D	ND	E	ND	D	F	ND	F	A	B'	G	D	E	F	E	D	E	G	E	F
P-61	1456- DFD	B'	E	G	E	A	E	E	D	F	E	F	D	F	ND	E	A	B'	G	D	E	ND	E	D	E	G	E	F
P-60	1455- DFD	B'	E	G	E	A	E	E	D	F	F	F	D	F	ND	E	A	B'	G	D	E	ND	E	D	E	G	E	F
P-59	1454- DFD	B'	E	G	E	A	E	E	D	F	E	F	D	F	ND	E	A	B'	G	D	E	ND	E	D	E	G	E	F
P-58	1453- DFD	B'	E	G	E	A	E	E	D	F	E	F	D	F	ND	E	A	B'	G	D	E	F	E	D	E	G	E	F
P-57	1452- DFD	B'	E	G	E	A	E	E	D	F	E	F	D	F	ND	E	A	B'	G	D	E	F	E	D	E	G	E	F
P-56	1451- DFD	B'	E	F	E	A	E	E	D	F	E	F	D	F	ND	E	B'	A	G	D	E	ND	E	D	E	G	E	E
P-55	1450- DFD	B'	E	F	E	A	E	E	D	F	F	F	D	F	ND	E	B'	A	G	D	E	F	E	D	E	G	E	E
P-54	1439- DFD	B'	E	F	E	A	E	E	D	F	F	F	D	F	ND	E	B'	A	G	D	E	ND	E	D	E	G	E	E
	Beds P-53 through P-25 not analyzed.																											
P-24	1420-WOM	A	E	F	ND	B'	E	E	D	F	F	F	D	F	ND	E	B'	A	G	D	E	ND	D	D	E	G	E	E
P-23	1488-WOM	A	E	F	ND	B'	D	E	D	F	F	ND	D	F	ND	E	B'	A	G	D	E	ND	D	D	E	G	E	E
P-22	1487-WOM	A	E	F	ND	B'	D	E	D	F	F	F	D	F	ND	E	B'	A	G	D	E	ND	E	E	E	G	E	E
P-21	1486-WOM	A	E	F	ND	B'	E	E	B'	F	E	F	D	F	ND	E	B'	A	G	D	E	ND	E	D	E	G	E	E
P-20	1485-WOM	B'	E	G	F	A	E	E	D	F	E	F	D	E	ND	E	A	B'	G	D	E	ND	E	D	E	G	E	E
P-19	1484-WOM	B'	E	F	E	B'	D	E	D	F	E	F	D	F	ND	E	B'	A	F	D	E	ND	D	D	D	G	E	E
P-18	1483-WOM	B'	E	F	F	B'	E	E	B'	F	F	F	D	F	G	E	B'	A	F	D	E	ND	E	D	E	G	E	E
P-17	1482-WOM	A	E	F	F	B'	E	E	B'	F	F	ND	D	F	G	E	B'	A	G	D	E	ND	E	D	E	G	E	E
P-16	1481-WOM	B'	E	F	F	B'	E	E	D	F	E	F	D	F	ND	E	B'	A	F	D	E	ND	E	D	E	G	E	E
P-15	1480-WOM	B'	E	G	F	B'	E	E	D	F	E	ND	D	F	ND	E	B'	A	G	D	E	ND	E	E	E	G	E	E
P-14	1469-WOM	D	E	G	E	A	E	E	E	F	E	F	D	F	ND	E	A	B'	G	D	E	F	E	D	E	G	E	E
P-13	1468-WOM	A	E	G	F	B'	E	E	D	F	F	F	D	F	ND	E	B'	A	G	D	E	ND	D	D	F	G	E	E
P-12	1489-WOM	D	E	ND	E	A	E	E	E	ND	F	F	D	F	ND	E	A	B'	G	D	E	F	E	D	E	G	E	E
P-11	1467-WOM	D	E	G	E	A	E	E	E	ND	F	F	D	F	ND	E	A	B'	G	D	E	F	E	D	E	G	E	E

[1] B' is equivalent to B and C of Bureau of Mines analyses as recorded in other reports.

Bed no.	Sample no.	Al	Ba	B	Cd	Ca	Cr	Cu	Fe	Ga	La	Pb	Mg	Mn	Mo	Ni	P	Si	Ag	Na	Sr	Sn	Ti	V	Y	Yb	Zn	Zr
P-11	1467-WOM	D	E	G	E	A	E	E	E	ND	F	F	D	F	ND	E	A	B'	G	D	E	F	E	D	E	G	E	E
P-10	1466-WOM	A	E	G	F	B'	E	E	D	F	F	F	D	F	ND	E	B'	A	G	D	E	ND	D	D	F	G	E	E
P- 9	1464-WOM	B'	E	G	E	A	E	E	D	F	F	F	D	F	ND	E	A	B'	G	D	E	F	E	D	E	G	E	E
P- 8	1464-WOM	A	E	F	F	B'	E	E	B'	F	F	F	B'	F	F	D	B'	A	G	D	E	ND	E	D	E	G	E	E
P- 7	1463-WOM	B'	E	G	E	A	E	E	D	F	E	F	D	F	ND	E	A	B'	G	B'	E	F	E	D	E	G	E	E
P- 6	1462-WOM	B'	E	G	E	A	E	E	D	F	E	ND	D	E	ND	E	A	B'	G	B'	E	F	E	D	E	G	E	E
P- 5	1461-WOM	B'	E	ND	E	A	E	E	E	ND	E	F	D	F	ND	E	A	B'	G	B'	E	F	E	D	E	G	E	F
P- 4	1460-WOM	D	E	G	E	A	E	E	E	F	E	F	D	F	ND	E	A	B'	G	B'	E	F	E	D	E	G	E	F
P- 3	1449-WOM	D	E	ND	E	A	E	E	E	F	F	F	D	F	ND	E	A	B'	G	B'	E	F	E	D	E	G	E	F
P- 2	1448-WOM	A	E	F	F	B'	E	E	B'	F	ND	F	B'	D	ND	D	D	A	G	D	E	ND	D	D	F	G	D	E
P- 1	1447-WOM	D	E	G	E	A	F	F	B'	ND	E	ND	D	D	ND	D	ND	B'	G	B'	E	ND	E	D	E	G	E	F

TRAIL CANYON, IDAHO. LOT NO. 1206.

Phosphatic shale member and part of Rex chert member of Phosphoria formation sampled in bulldozer trenches and from natural outcrop on north side of Trail Canyon, SW corner of $NW\frac{1}{4}NW\frac{1}{4}$ sec. 30, T. 8 S., R. 43 E., Caribou County, Idaho, on west limb of Trail Creek syncline. Beds strike N. 12° W. and dip 55° E. Section measured by R. A. Gulbrandsen, R. A. Hoppin, V. E. McKelvey, and L. E. Smith and sampled by R. S. Sears, R. P. Sheldon, O. A. Payne, and Gulbrandsen in August 1947. Samples analyzed for P_2O_5 and acid insoluble by U.S. Bureau of Mines Laboratory, Albany, Oregon, and for other constituents by Trace Elements Section Laboratory, U.S. Geological Survey, Washington, D. C.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)						Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	F	Loss on ignition	Acid insoluble		
			Rex member of Phosphoria formation								
R- 39	Chert	RAH-241-47	8.4	0.4	--	--	--	--	88.4	8.4	4.20
R- 38	Chert	RAH-240-47	10.8	0.6	--	--	--	--	87.5	19.2	10.68
R- 37	Chert, silty	RAH-239-47	8.9	0.5	--	--	--	--	88.4	28.1	15.13
R- 36	Chert	RAH-238-47	9.7	0.6	--	--	--	--	87.9	37.8	20.95
R- 35	Chert, silty	RAH-237-47	7.9	0.6	--	--	--	--	88.8	45.7	25.69
R- 34	Mudstone	RAH-236-47	6.8	0.4	--	--	--	--	88.2	52.5	28.41
R- 33	Mudstone	RAH-235-47	8.2	0.5	--	--	--	--	87.0	60.7	32.51
R- 32	Mudstone	RAH-234-47	10.0	0.5	--	--	--	--	87.8	70.7	37.51
R- 31	Mudstone	RAH-233-47	6.7	0.5	--	--	--	--	85.5	77.4	40.86
R- 30	Chert	RAH-232-47	2.9	1.2	--	--	--	--	86.4	80.3	44.34
R- 29	Chert	RAH-231-47	3.1	1.1	--	--		--	86.1	83.4	47.75
R- 28	Chert	RAH-230-47	7.4	0.1	--	--	--	--	90.8	90.8	48.49
R- 27	Chert	RAH-229-47	7.3	0.4	--	--	--	--	94.4	98.1	51.41
R- 26	Chert	RAH-228-47	12.4	0.7	--	--	--	--	94.5	110.5	60.09
R- 25	Chert	RAH-227-47	6.0	0.5	--	--	--	--	94.9	116.5	63.09
R- 24	Chert	RAH-226-47	5.6	0.2	--	--	--	--	94.1	122.1	64.21
R- 23	Chert	RAH-225-47	4.7	0.3	--	--	--	--	93.7	126.8	65.62
R- 22	Chert	RAH-224-47	6.7	0.4	--	--	--	--	94.8	133.5	68.30
R- 21	Chert	RAH-223-47	1.6	0.7	--	--	--	--	94.7	135.1	69.42
R- 20	Chert	RAH-222-47	10.5	0.6	--	--	--	--	92.9	145.6	75.72
R- 19	Chert	RAH-221-47	8.3	0.2	--	--	--	--	86.6	153.9	77.38
R- 18	Chert	RAH-220-47	10.2	0.2	--	--	--	--	89.4	164.1	79.42
R- 17	Chert and limestone	RAH-219-47	3.6	0.3	--	--	--	--	82.6	167.7	80.50
R- 16	Chert and limestone	RAH-218-47	8.7	0.6	--	--	--	--	81.5	176.4	85.72
R- 15	Chert and limestone; fos. col. no. 47-HW-152[1]	RAH-218-47	3.8	0.6	--	--	--	--	82.6	180.2	88.00

Preceding section measured along road (beds R-26 to R-39) and in cut 50 feet above road (beds R-15 to R-25); following section (beds R-1 to R-14) measured in trench 200 feet above road. Contact between beds R-25 and R-26 (black chert and pinkish white chert) is exposed at road and lower cut; beds below R-15 are concealed along road and beds R-15 to R-25 are largely concealed at upper trench level. Thickness of beds R-15 to R-25 is 69.7 feet, but computed thickness of same sequence at upper trench is 59 feet. The larger (measured) figure is used in computing total thickness of Rex member.

[1] Fossil collection made by H. Wedow, Paleontology and Stratigraphy Branch, U. S. Geological Survey.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)						Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	F	Loss on ignition	Acid insoluble		
R- 14	Limestone, cherty	RAH-213-47	0.9	0.4	--	--	--	--	42.9	181.1	88.36
R- 13	Chert	RAH-212-47	3.1	0.7	--	--	--	--	81.9	184.2	90.53
R- 12	Limestone, locally cherty	RAH-211-47	0.7	0.3	--	--	--	--	28.5	184.9	90.74
R- 11	Chert, contains scattered limestone concretions	RAH-210-47	8.1	0.6	--	--	--	--	73.3	193.0	95.60
R- 10	Chert, contains limestone concretions and lenses	RAH-209-47	6.4	0.6	--	--	--	--	86.2	199.4	99.44
R- 9	Limestone, locally cherty	RAH-208-47	0.8	0.2	--	--	--	--	31.0	200.2	99.60
R- 8	Chert, contains thin limestone lenses	RAH-207-47	5.7	0.4	--	--	--	--	77.7	205.9	101.88
R- 7	Limestone, argillaceous	RAH-206-47	1.3	0.6	--	--	--	--	30.5	207.2	102.66
R- 6	Chert, contains thin limestone lenses	RAH-205-47	3.3	0.7	--	--	--	--	88.7	210.5	104.97
R- 5	Limestone, contains cherty limestone beds	RAH-204-47	2.0	0.7	--	--	--	--	45.5	212.5	106.37
R- 4	Chert	RAH-203-47	5.6	0.8	--	--	--	--	85.8	218.1	110.85
R- 3	Limestone, argillaceous	RAH-202-47	3.3	0.6	--	--	--	--	32.9	221.4	112.83
R- 2	Chert	RAH-201-47	4.0	0.8	--	--	--	--	90.5	225.4	116.03
R- 1	Chert, contains mudstone layers	RAH-200-47	2.7	0.7	--	--	--	--	87.8	228.1	117.92
	Phosphatic shale member of Phosphoria formation										
P-210	Mudstone, phosphatic; fos. col. no. 47-HW-122	VEM-274-47	0.3	8.0	--	--	--	--	68.1	0.3	2.40
P-209	Phosphate rock, argillaceous; fos. col. no. 47-HW-172	VEM-273-47	0.4	26.6	--	--	--	--	21.5	0.7	13.04
P-208	Mudstone	VEM-272-47	0.9	1.4	--	--	--	--	77.5	1.6	14.30
P-207	Mudstone, phosphatic	VEM-271-47	0.7	8.8	--	--	--	--	57.9	2.3	20.46
P-206	Mudstone	VEM-270-47	0.9	1.8	--	--	--	--	75.1	3.2	22.08
P-205	Mudstone; fos. col. no. 47-HW-123	VEM-269-47	0.7	2.2	--	--	--	--	70.6	3.9	23.62
P-204	Mudstone, argillaceous; fos. col. no. 47-HW-124	VEM-268-47	2.9	0.2	--	--	--	--	53.9	6.8	24.20
P-203	Mudstone, calcareous, possibly concretionary	VEM-267-47	0.7	1.1	--	--	--	--	67.0	7.5	24.97
P-202	Mudstone, possibly concretionary; fos. col. no. 47-HW-153	VEM-266-47	1.4	1.3	--	--	--	--	78.4	8.9	26.79
P-201	Limestone, argillaceous; fos. col. no. 47-HW-154	RAG- 6-47	1.24	2.4	--	--	--	--	39.8	10.14	29.67
P-200	Mudstone; fos. col. no. 47-HW-154	RAG- 5-47	1.65	3.2	--	--	--	--	72.6	11.79	35.11
P-199	Phosphate rock, argillaceous; fos. col. no. 47-HW-173	RAG- 4-47	0.73	23.1	--	--	2.14	--	25.5	12.52	51.28
P-198	Mudstone	RAG- 3-47	0.71	6.9	--	--	1.09	--	56.7	13.23	56.19
P-197	Phosphate rock	RAG- 2-47	1.15	28.6	1.6	0.80	2.75	9.64	9.4	14.38	89.08
P-196	Phosphate rock	RAG- 1-47	0.68	28.0	2.3	0.98	2.90	8.86	12.9	15.06	108.13

P-195	Phosphate rock	VEM-265-47	0.6	36.7	0.7	0.58	3.65	4.18	3.2	15.66	130.15
P-194	Phosphate rock	VEM-264-47	0.8	31.6	1.9	1.3	3.04	5.22	11.7	16.46	155.43
P-193	Phosphate rock, contains phosphatic limestone concretion 0.2 foot thick	VEM-263-47	0.6	33.9	1.1	0.80	3.23	5.22	6.7	17.06	175.86
P-192	Mudstone	VEM-262-47	0.3	2.7	9.8	3.7	0.31	10.14	70.2	17.36	176.67
P-191	Phosphate rock	VEM-259-47	1.0	30.6	1.5	0.97	2.97	5.02	14.6	18.36	207.27
P-190	Limestone	VEM-258-47	1.0	2.7	1.4	0.80	--	35.88	12.0	19.36	209.97
P-189	Mudstone	VEM-257-47	0.4	0.3	1.4	0.68	--	9.58	83.0	19.76	210.09
P-188	Phosphate rock	VEM-256-47	0.6	34.0	0.8	0.61	3.27	6.18	5.7	20.36	230.49
--	Phosphate rock, calcareous, concretion in bed P-188	VEM-255-47	(0.0-0.4)	23.5	0.8	0.45	2.26	16.14	7.3	--	--
P-187	Phosphate rock and phosphatic mudstone; fos. col. no. 47-HW-155	VEM-254-47	0.3	16.4	6.0	2.0	1.61	10.12	36.3	20.66	235.41
P-186	Phosphate rock, calcareous, contains phosphatic mudstone concretions; fos. col. no. 47-HW-156	VEM-253-47	0.6	20.9	1.8	0.66	2.06	19.68	9.3	21.26	247.95
P-185	Phosphate rock, argillaceous	VEM-252-47	0.4	20.0	3.8	1.3	2.06	12.16	25.5	21.66	255.95
P-184	Phosphate rock, calcareous	VEM-251-47	0.8	23.5	0.8	0.91	2.22	15.96	7.3	22.46	274.75
--	Limestone concretion; fos. col. no. 47-HW-157	VEM-250-47	(0.0-0.7)	1.6	--	--	--	--	11.4	--	--
P-183	Mudstone, calcareous, phosphatic; fos. col. no. 47-HW-158	VEM-249-47	1.2	9.1	--	--	--	--	42.8	23.66	285.67
P-182	Mudstone; fos. col. no. 47-HW-159	VEM-248-47	0.5	3.1	--	--	--	--	50.9	24.16	287.22
P-181	Mudstone; fos. col. no. 47-HW-160	VEM-247-47	0.8	3.9	--	--	--	--	61.4	24.96	290.34
P-180	Mudstone; fos. col. no. 47-HW-161	VEM-246-47	1.1	3.3	--	--	--	--	63.1	26.06	293.97
P-179	Mudstone; fos. col. no. 47-HW-162	VEM-245-47	1.0	3.5	--	--	--	--	65.3	27.06	297.47
P-178	Phosphate rock, argillaceous	VEM-244-47	0.6	16.2	--	--	--	--	31.6	27.66	307.19
P-177	Mudstone, phosphatic	VEM-243-47	1.0	15.7	--	--	--	--	41.8	28.66	322.89
P-176	Phosphate rock	VEM-242-47	0.5	33.6	--	--	--	--	3.8	29.16	339.69
P-175	Phosphate rock, argillaceous, and calcareous mudstone	VEM-241-47	0.8	25.5	--	--	--	--	14.8	29.96	360.09
P-174	Phosphate rock, calcareous, argillaceous; fos. col. nos. 47-HW-163 and 47-HW-164	VEM-240-47	0.8	18.7	--	--	--	--	23.1	30.76	375.05
P-173	Phosphate rock, calcareous; fos. col. no. 47-HW-165	VEM-239-47	0.7	17.2	--	--	--	--	14.2	31.46	387.09
P-172	Limestone, phosphatic, argillaceous; fos. col. no. 47-HW-166	VEM-238-47	0.4	12.7	--	--	--	--	23.4	31.86	392.17
P-171	Phosphate rock, calcareous, argillaceous; fos. col. no. 47-HW-167	VEM-261-47	0.6	16.6	--	--	--	--	20.1	32.46	402.13
P-170	Phosphate rock, calcareous, argillaceous; fos. col. no. 47-HW-168	LES- 356-47	0.4	16.3	--	--	--	--	21.4	32.86	408.65

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)						Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	F	Loss on ignition	Acid insoluble		
--	Limestone	VEM-260-47	(0.0-0.3)	6.0	--	--	--	--	7.6	--	--
	VEM-260 represents two concretions of 0.0-0.3 and 0.0-0.2 foot thickness in beds P-171 and P-170 respectively.										
P-169	Phosphate rock, calcareous, argillaceous, contains calcareous concretions; fos. col. no. 47-HW-169	LES- 355-47	0.75	21.0	--	--	--	--	21.0	33.61	425.45
P-168	Phosphate rock, calcareous; fos. col. no. 47-HW-170	LES- 349-47	0.6	16.6	--	--	--	--	19.5	34.21	435.41
--	Limestone concretion in bed P-168	LES- 350-47	(0.45)	1.3	--	--	--	--	1.9	--	--
P-167	Limestone, phosphatic, argillaceous; fos. col. no. 47-HW-171	LES- 348-47	0.4	10.8	--	--	--	--	26.0	34.61	439.73
P-166	Limestone, argillaceous, phosphatic	LES- 347-47	0.55	8.9	--	--	--	--	29.1	35.16	444.63
P-165	Limestone, phosphatic, argillaceous; fos. col. no. 47-HW-88	LES- 346-47	0.75	15.2	--	--	--	--	19.9	35.91	456.03
P-164	Phosphate rock, calcareous	LES- 345-47	0.55	18.2	--	--	--	--	13.2	36.46	466.03
P-163	Phosphate rock, calcareous	LES- 344-47	0.6	18.0	--	--	--	--	19.1	37.06	476.83
P-162	Phosphate rock, calcareous, argillaceous	LES- 343-47	0.6	15.5	--	--	--	--	29.8	37.66	486.13
P-161	Phosphate rock, calcareous, argillaceous	LES- 342-47	0.65	15.3	--	--	--	--	22.6	38.31	496.08
P-160	Phosphate rock, calcareous, argillaceous	LES- 341-47	0.7	17.8	--	--	--	--	20.3	39.01	508.54
P-159	Phosphate rock, calcareous, argillaceous	LES- 340-47	0.6	18.7	--	--	--	--	22.7	39.61	519.76
P-158	Phosphate rock, calcareous, argillaceous	LES- 339-47	0.5	18.8	--	--	--	--	25.9	40.11	529.16
P-157	Phosphate rock, calcareous, argillaceous, contains limestone concretions	LES- 338-47	0.55	14.8	--	--	--	--	21.5	40.66	537.30
P-156	Phosphate rock, calcareous, argillaceous	LES- 337-47	0.6	16.9	--	--	--	--	27.9	41.26	547.44
P-155	Phosphate rock, argillaceous	LES- 336-47	0.55	16.4	--	--	--	--	31.0	41.81	556.46
P-154	Mudstone, phosphatic	LES- 335-47	0.6	14.7	--	--	--	--	39.6	42.41	565.28
P-153	Mudstone, phosphatic	LES- 334-47	0.6	15.4	--	--	--	--	40.1	43.01	574.52
P-152	Mudstone, phosphatic	LES- 333-47	0.5	12.8	--	--	--	--	44.1	43.51	580.92
P-151	Mudstone, phosphatic	LES- 332-47	0.6	11.1	--	--	--	--	48.4	44.11	587.58
P-150	Limestone, argillaceous	LES- 331-47	0.65	4.9	--	--	--	--	39.2	44.76	590.77
P-149	Limestone; fos. col. no. 47-HW-87	LES- 330-47	1.3	0.9	--	--	--	--	29.6	46.06	591.94

P-148	Mudstone, calcareous	VEM-237-47	0.4	3.9	--	--	--	--	49.6	46.46	593.90
P-147	Mudstone, phosphatic	VEM-236-47	1.3	12.9	--	--	--	--	45.0	47.76	610.27
P-146	Mudstone, phosphatic	VEM-235-47	1.4	12.4	--	--	--	--	47.0	49.16	627.63
P-145	Phosphate rock, argillaceous	VEM-234-47	0.4	16.9	--	--	--	--	41.3	49.56	634.39
P-144	Mudstone	VEM-233-47	1.1	7.7	--	--	--	--	61.9	50.66	642.86
P-143	Mudstone	VEM-232-47	1.6	6.5	--	--	--	--	65.2	52.26	653.26
P-142	Mudstone; fos. col. no. 47-HW-86	VEM-231-47	1.6	3.9	--	--	--	--	74.1	53.86	659.50
P-141	Mudstone	VEM-230-47	1.6	4.6	--	--	--	--	72.1	55.46	666.86
P-140	Mudstone	VEM-229-47	1.0	6.2	--	--	--	--	73.2	56.46	673.06
P-139	Mudstone, phosphatic	VEM-228-47	0.3	13.4	--	--	--	--	54.8	57.76	677.08
P-138	Mudstone	VEM-227-47	1.8	2.8	--	--	--	--	85.7	58.56	682.12
P-137	Phosphate rock, argillaceous	VEM-226-47	0.6	19.9	--	--	--	--	39.7	59.16	694.06
P-136	Mudstone	VEM-225-47	1.6	2.8	--	--	--	--	82.2	60.76	698.54
P-135	Mudstone	VEM-224-47	1.4	3.5	--	--	--	--	79.6	62.16	703.44
P-134	Mudstone, phosphatic	VEM-223-47	0.8	14.0	--	--	--	--	51.0	62.96	714.64
P-133	Mudstone, phosphatic	VEM-222-47	0.5	12.1	--	--	--	--	54.6	63.46	720.69
P-132	Mudstone	VEM-221-47	1.5	6.8	--	--	--	--	69.8	64.96	730.89
P-131	Mudstone; fos. col. no. 47-HW-85	VEM-220-47	1.7	4.4	--	--	--	--	76.0	66.66	738.37
P-130	Mudstone	VEM 219-47	2.8	4.3	--	--	--	--	77.0	69.46	750.41
P-129	Mudstone	VEM-218-47	1.4	0.8	--	--	--	--	87.7	70.86	751.53
P-128	Mudstone	VEM-217-47	1.9	4.1	--	--	--	--	77.2	72.76	759.32
P-127	Mudstone and phosphate rock	VEM-216-47	1.3	16.8	--	--	--	--	42.9	74.06	781.16
P-126	Mudstone	VEM-215-47	0.5	6.0	--	--	--	--	70.7	74.56	784.16
P-125	Mudstone, phosphatic	VEM-214-47	0.8	10.7	--	--	--	--	59.4	75.36	792.72
P-124	Mudstone; fos. col. no. 47-HW-84	VEM-213-47	2.6	2.0	--	--	--	--	79.4	77.96	797.92
P-123	Mudstone	VEM-212-47	2.1	1.7	--	--	--	--	81.4	80.06	801.49
P-122	Mudstone, phosphatic and phosphate rock	VEM-211-47	0.6	17.2	--	--	--	--	43.3	80.66	811.81
P-121	Mudstone	VEM-210-47	0.8	6.9	--	--	--	--	68.2	81.46	817.33
P-120	Mudstone, phosphatic	VEM-209-47	1.9	9.2	--	--	--	--	56.2	83.36	834.81
P-119	Phosphate rock, argillaceous	VEM-208-47	1.8	17.0	--	--	--	--	42.4	85.16	865.41
P-118	Mudstone	VEM-207-47	0.7	4.0	--	--	--	--	74.1	85.86	868.21
P-117	Mudstone	VEM-206-47	2.3	5.9	--	--	--	--	72.8	88.16	881.78
P-116	Limestone, argillaceous	VEM-205-47	2.1	0.2	--	--	--	--	30.8	90.26	882.20
P-115	Mudstone	VEM-204-47	1.1	0.4	--	--	--	--	81.2	91.36	882.64
P-114	Phosphate rock	VEM-203-47	0.3	22.5	--	--	--	--	7.9	91.66	889.39
P-113	Mudstone	VEM-202-47	1.7	2.2	--	--	--	--	80.0	93.36	893.13
P-112	Mudstone	VEM-201-47	0.4	5.8	--	--	--	--	78.7	93.76	895.45
P 111	Limestone, argillaceous	VEM-200-47	1.5	1.1	--	--	--	--	46.6	95.26	897.10
P-110	Mudstone	VEM-199-47	0.7	1.2	--	--	--	--	84.0	95.96	897.94
P-109	Phosphate rock, argillaceous	VEM-198-47	0.3	29.2	--	--	--	--	20.2	96.26	906.70
P-108	Mudstone	VEM-197-47	0.9	2.1	--	--	--	--	79.3	97.16	908.59
P-107	Mudstone, phosphatic	VEM-196-47	0.3	14.3	--	--	--	--	48.0	97.46	912.88
P-106	Mudstone	VEM-195-47	0.5	2.2	--	--	--	--	80.6	97.96	913.98
P-105	Mudstone	VEM-194-47	1.1	1.2	--	--	--	--	82.3	99.06	915.30

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)						Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	F	Loss on ignition	Acid insoluble		
P-104	Mudstone	VEM-193-47	0.7	1.2	--	--	--	--	81.2	99.76	916.14
P-103	Mudstone	VEM-192-47	0.6	4.4	--	--	--	--	71.6	100.36	918.78
P-102	Mudstone; fos. col. no. 47-HW-83	VEM-191-47	0.9	0.7	--	--	--	--	83.7	101.26	919.41
P-101	Phosphate rock, argillaceous	VEM-190-47	0.5	20.4	--	--	--	--	35.3	101.76	929.61
P-100	Mudstone	VEM-189-47	0.6	1.6	--	--	--	--	70.1	102.36	930.57
P- 99	Phosphate rock, argillaceous	VEM-188-47	0.3	26.5	--	--	--	--	23.8	102.66	938.52
P- 98	Mudstone, phosphatic	VEM-187-47	0.5	11.0	--	--	--	--	56.1	103.16	944.02
P- 97	Phosphate rock, argillaceous, and phosphatic mudstone	VEM-186-47	0.5	19.2	--	--	--	--	33.7	103.66	953.62
P- 96	Mudstone	VEM-185-47	2.3	5.5	--	--	--	--	75.5	105.96	966.27
P- 95	Phosphate rock, argillaceous	VEM-184-47	0.5	24.0	--	--	--	--	28.1	106.46	978.27
P- 94	Mudstone	VEM-183-47	1.6	0.7	--	--	--	--	88.1	108.06	979.39
P- 93	Mudstone	VEM-182-47	0.9	6.7	--	--	--	--	68.5	108.96	985.42
P- 92	Mudstone; fos. col. no. 47-HW-82	VEM-181-47	3.4	1.6	--	--	--	--	84.6	112.36	990.86
P- 91	Mudstone, phosphatic and chert	LES- 329-47	0.3	14.2	--	--	--	--	50.5	112.66	995.12
P- 90	Mudstone	LES- 328-47	2.0	1.7	--	--	--	--	82.6	114.66	998.52
P- 89	Mudstone, phosphatic, contains chert nodules	LES- 327-47	0.4	14.7	--	--	--	--	46.9	115.06	1,004.40
P- 88	Mudstone	LES- 326-47	0.75	1.2	--	--	--	--	86.5	115.81	1,005.30
P- 87	Mudstone, contains chert nodules	LES- 325-47	0.4	7.0	--	--	--	--	70.7	116.21	1,008.10
P- 86	Mudstone; fos. col. no. 47-HW-81	LES- 324-47	2.0	0.6	--	--	--	--	88.5	118.21	1,009.30
P- 85	Phosphate rock, argillaceous	LES- 323-47	0.75	17.7	--	--	--	--	34.1	118.96	1,022.58
P- 84	Mudstone, phosphatic	LES- 322-47	1.45	14.9	--	--	--	--	43.9	120.41	1,044.18
P- 83	Mudstone	LES- 321-47	0.55	6.2	--	--	--	--	68.9	120.96	1,047.59
P- 82	Mudstone, phosphatic	LES- 320-47	1.0	8.1	--	--	--	--	59.6	121.96	1,055.69
P- 81	Mudstone	LES- 319-47	1.0	1.6	--	--	--	--	84.0	122.96	1,057.29
P- 80	Mudstone and phosphate rock	LES- 318-47	0.75	6.0	--	--	--	--	60.4	123.71	1,061.79
P- 79	Mudstone, phosphatic	LES- 317-47	1.6	10.8	--	--	--	--	52.0	125.31	1,079.07
P- 78	Mudstone, phosphatic	LES- 316-47	1.0	12.4	--	--	--	--	37.3	126.31	1,091.47
P- 77	Mudstone, phosphatic	LES- 315-47	0.65	11.2	--	--	--	--	45.7	126.96	1,098.75
P- 76	Mudstone, calcareous	LES- 314-47	1.2	6.6	--	--	--	--	43.5	128.16	1,106.67
P- 75	Mudstone, calcareous, phosphatic	LES- 313-47	0.7	8.3	--	--	--	--	38.7	128.86	1,112.48
P- 74	Limestone, argillaceous, phosphatic	LES- 312-47	1.0	9.0	--	--	--	--	26.3	129.86	1,121.48
P- 73	Limestone, argillaceous, phosphatic	LES- 311-47	0.75	8.5	--	--	--	--	24.7	130.61	1,127.86
P- 72	Mudstone, contains limy concretions	LES- 310-47	0.9	7.3	--	--	--	--	31.4	131.51	1,134.42
P- 71	Limestone, argillaceous	LES- 309-47	2.2	6.3	--	--	--	--	27.8	133.71	1,148.28
P- 70	Phosphate rock and calcareous mudstone	LES- 308-47	0.35	10.4	--	--	--	--	40.4	134.06	1,151.92

P- 69	Mudstone, calcareous	LES- 307-47	2.0	5.1	--	--	--	--	46.0	136.06	1,162.12
P- 68	Limestone and calcareous mudstone; fos. col. no. 47-HW-80	LES- 306-47	1.35	0.4	--	--	--	--	10.0	137.41	1,162.66
P- 67	Limestone and calcareous mudstone; fos. col. no. 47-HW-79	LES- 305-47	2.2	0.6	--	--	--	--	10.3	139.61	1,163.98
P- 66	Chert and mudstone	LES- 304-47	0.65	1.3	--	--	--	--	78.4	140.26	1,164.83
P- 65	Mudstone, calcareous	LES- 303-47	1.9	2.3	--	--	--	--	58.6	142.16	1,169.20
P- 64	Mudstone	LES- 302-47	0.6	0.4	--	--	--	--	80.5	142.76	1,169.44
P- 63	Mudstone	LES- 301-47	0.6	2.4	--	--	--	--	73.4	143.36	1,170.88
P- 62	Mudstone, phosphatic	LES- 300-47	0.6	7.8	--	--	--	--	54.8	143.96	1,175.56
P- 61	Limestone	LES- 299-47	0.7	2.2	--	--	--	--	16.9	144.66	1,177.10
P- 60	Mudstone	LES- 298-47	1.5	5.0	--	--	--	--	66.5	146.16	1,184.60
P- 59	Mudstone, calcareous	LES- 297-47	1.0	5.6	--	--	--	--	54.7	147.16	1,190.20
P- 58	Mudstone, calcareous	LES- 296-47	0.9	1.0	--	--	--	--	68.1	148.06	1,191.10
P- 57	Mudstone	LES- 295-47	0.8	1.7	--	--	--	--	80.7	148.86	1,192.46
P- 56	Mudstone, calcareous	LES- 294-47	0.9	7.0	--	--	--	--	54.3	149.76	1,198.76
P- 55	Mudstone, contains mudstone lenses; fos. col. no. 47-HW-78	LES- 293-47	0.55	7.4	--	--	--	--	59.9	150.31	1,202.83
P- 54	Mudstone, phosphatic, calcareous	LES- 291-47	1.6	11.2	--	--	--	--	47.8	151.91	1,220.75
--	Limestone concretion in bed P-54	LES- 292-47	(0.8)	0.6	--	--	--	--	3.3	--	--
P- 53	Mudstone, calcareous	LES- 290-47	0.4	4.5	--	--	--	--	66.5	152.31	1,222.55
P-52	Mudstone	LES- 289-47	0.4	4.9	--	--	--	--	67.5	152.71	1,224.51
P- 51	Mudstone, calcareous, and calcareous phosphate rock	LES- 288-47	0.6	6.2	--	--	--	--	58.3	153.31	1,228.23
P- 50	Mudstone, calcareous; fos. col. no. 47-HW-77	LES- 287-47	1.0	4.5	--	--	--	--	65.6	154.31	1,232.73
P- 49	Mudstone, calcareous, phosphatic	LES- 286-47	2.25	9.4	--	--	--	--	41.0	156.56	1,253.88
P- 48	Limestone, phosphatic, argillaceous	LES- 285-47	0.45	9.0	--	--	--	--	20.9	157.01	1,257.93
--	Limestone concretion in bed P-47	LES- 284-47	(0.8)	1.1	--	--	--	--	1.7	--	--
P- 47	Limestone, phosphatic, argillaceous	LES- 283-47	0.8	11.7	--	--	--	--	26.4	157.81	1,267.29
P- 46	Mudstone, calcareous, phosphatic	LES- 282-47	0.5	11.5	--	--	--	--	38.3	158.31	1,273.04
P- 45	Mudstone, calcareous, phosphatic; fos. col. no. 47-HW-76	LES- 281-47	1.05	8.9	--	--	--	--	39.3	159.36	1,282.38
P- 44	Limestone, argillaceous; fos. col. no. 47-HW-75	LES- 280-47	1.0	0.5	--	--	--	--	21.3	160.36	1,282.88
P- 43	Mudstone, calcareous, phosphatic	LES- 279-47	0.4	9.9	--	--	--	--	42.8	160.76	1,286.84
P- 42	Mudstone, calcareous	LES- 268-47	0.4	4.0	--	--	--	--	45.0	161.16	1,288.44
P- 41	Mudstone, phosphatic	LES- 267-47	1.1	11.7	--	--	--	--	48.9	162.26	1,301.32
P- 40	Mudstone, phosphatic, calcareous	LES- 264-47	4.2	14.1	--	--	--	--	38.7	166.46	1,360.54
--	Limestone concretion in bed P-40	LES- 266-47	(0.5)	1.3	--	--	--	--	8.5	--	--
--	Limestone concretion in bed P-40	LES- 265-47	(0.1)	4.6	--	--	--	--	14.3	--	--

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)						Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	F	Loss on ignition	Acid insoluble		
P- 39	Mudstone, calcareous, phosphatic	LES- 263-47	0.6	11.3	--	--	--	--	41.3	167.06	1,367.32
P- 38	Mudstone, calcareous, phosphatic	LES- 262-47	0.65	12.1	--	--	--	--	36.1	167.71	1,375.18
P- 37	Phosphate rock and calcareous mudstone	LES- 261-47	2.5	15.8	--	--	--	--	23.7	170.21	1,414.68
P- 36	Phosphate rock, contains laminations of calcareous mudstone	LES- 260-47	1.0	23.1	--	--	--	--	17.4	171.21	1,437.78
P- 35	Mudstone and phosphate rock	LES- 259-47	0.55	24.5	--	--	--	--	22.3	171.76	1,451.26
P- 34	Phosphate rock, calcareous	LES- 278-47	0.5	28.8	--	--	--	--	4.6	172.26	1,465.66
P- 33	Limestone, contains phosphate rock lenses	LES- 277-47	0.8	8.2	--	--	--	--	10.4	173.06	1,472.22
P- 32	Phosphate rock, calcareous	LES- 276-47	0.55	24.2	--	--	--	--	13.4	173.61	1,485.52
P- 31	Phosphate rock and mudstone; fos. col. no. 47-HW-174	LES- 275-47	1.15	28.4	--	--	--	--	12.9	174.76	1,518.18
P- 30	Phosphate rock and phosphatic mudstone	LES- 274-47	0.6	18.4	--	--	--	--	34.5	175.36	1,529.22
P- 29	Limestone	LES- 273-47	3.2	4.6	--	--	--	--	13.7	178.56	1,543.94
P- 28	Mudstone, phosphatic	LES- 272-47	1.75	11.0	--	--	--	--	46.1	180.31	1,563.20
P- 27	Limestone	LES- 271-47	0.9	3.0	--	--	--	--	15.0	181.21	1,565.90
P- 26	Limestone	LES- 270-47	2.85	3.8	--	--	--	--	18.7	184.06	1,576.72
P- 25	Phosphate rock, argillaceous	LES- 269-47	0.6	21.8	4.5	1.6	1.99	7.36	29.9	184.66	1,589.80
P- 24	Phosphate rock, calcareous, and calcareous phosphatic mudstone	LES- 248-47	1.45	29.6	2.3	1.2	2.82	7.38	14.4	186.11	1,632.72
P- 23	Phosphate rock and phosphatic calcareous mudstone	LES- 247-47	0.5	29.4	2.2	1.1	2.67	6.18	16.5	186.61	1,647.42
P- 22	Phosphate rock, argillaceous	LES- 246-47	0.55	25.1	3.3	1.5	2.25	6.74	26.1	187.16	1,661.23
P- 21	Mudstone and phosphate rock	LES- 245-47	1.1	18.8	6.4	2.2	1.62	6.84	40.2	188.26	1,681.91
P- 20	Mudstone	LES- 244-47	0.4	6.7	9.40	2.97	0.57	5.92	70.2	188.66	1,684.59
P- 19	Phosphate rock	VEM-180-47	1.0	33.1	1.3	0.58	2.49	6.16	8.6	189.66	1,717.69
P- 18	Phosphate rock	VEM-179-47	1.4	27.8	2.8	1.1	2.56	6.76	18.9	191.06	1,756.61
P- 17	Phosphate rock	VEM-178-47	0.9	31.8	1.7	0.91	2.84	5.96	10.4	191.96	1,785.23
P- 16	Phosphate rock, argillaceous	VEM-177-47	1.3	26.2	2.7	1.2	2.64	6.90	20.6	193.26	1,819.29
P- 15	Phosphate rock, argillaceous	VEM-176-47	1.2	21.9	5.4	1.9	1.92	7.48	31.4	194.46	1,845.57
P- 14	Phosphate rock and phosphatic mudstone	VEM-175-47	0.6	16.3	7.3	1.9	1.43	9.44	39.9	195.06	1,855.35
P- 13	Phosphate rock, argillaceous; fos. col. no. 47-HW-74	RAH- 189-47	2.5	24.0	3.9	1.5	2.08	5.76	26.3	197.56	1,915.35
P- 12	Phosphate rock, argillaceous	WOM - 3182	1.35	25.4	1.3	0.55	3.25	6.24	25.5	198.91	1,949.64
P- 11	Phosphate rock	WOM - 3181	2.1	33.0	3.5	1.7	2.55	5.24	6.9	201.01	1,018.94
P- 10	Phosphate rock	RAH- 186-47	1.9	33.3	0.7	0.52	3.40	6.24	4.3	202.91	2,082.21
P- 9	Phosphate rock	RAH- 185-47	1.7	35.0	--	--	3.60	--	3.0	204.61	2,141.71
P- 8	Phosphate rock	RAH- 184-47	0.4	26.8	2.3	1.0	2.72	6.18	18.0	205.01	2,152.43

P- 7	Phosphate rock	RAH-183-47	0.55	28.3	2.2	0.95	2.39	6.46	16.6	205.56	2,168.00
P- 6	Mudstone	RAH-182-47	2.1	2.5	11.6	3.0	--	10.24	68.4	207.66	2,173.24
P- 5	Mudstone	RAH-181-47	1.0	0.8	11.6	3.4	--	6.56	77.8	208.66	2,174.04
P- 4	Limestone, argillaceous	RAH-180-47	0.4	0.6	4.5	1.7	--	31.28	30.3	209.06	2,174.28
P- 3	Mudstone, calcareous	RAH-179-47	0.5	3.9	8.8	6.3	--	9.36	56.3	209.56	2,176.24
P- 2	Phosphate rock	RMC-133-47	1.1	30.2	2.2	1.4	--	5.66	12.8	210.66	2,209.46
P- 1	Phosphate rock	RMC-134-47	0.5	31.4	1.3	0.75	--	4.48	9.9	211.16	2,225.16
					Wells formation						
Cw- 1	Limestone	RAH-177-47	2.0	1.2	--	--	--	--	4.7	--	--

SPECTROGRAPHIC ANALYSES—TRAIL CANYON, IDAHO. LOT NO. 1206.

Semi-quantitative analyses of selected samples of the phosphatic shale member of the Phosphoria formation, Trail Canyon, Idaho (see immediately preceding pages for location of section, thickness and description of strata, and chemical analyses of samples), made by U. S. Geological Survey Laboratory, Geochemistry and Petrology Branch, Washington, D. C. In addition to the elements listed in the table below, Sb, As, Bi, Cs, Cb, Dy, Er, Eu, Ga, Gd, Au, Ho, In, Li, Lu, Nd, Pt, Pr, Rb, Sm, Sc, Ta, Te, Tb, Tl, Tm, W, and Yb were looked for in all samples but were not detected.

Explanation of symbols

A = more than 10 percent
B' = 1-10 percent[1]
D = 0.1-1 percent
E = 0.01-0.1 percent
F = 0.001-0.01 percent
G = less than 0.001 percent
ND = not detected

Bed no.	Sample no.	Al	Ba	Be	B	Cd	Ca	Cr	Co	Cu	Fe	La	Pb	Mg	Mn	Mo	Ni	P	Si	Ag	Na	Sr	Sn	Ti	V	Y	Zn	Zr
	Beds P-210 through P-198 not analyzed.																											
P-197	RAG- 2-47	B'	E	G	F	E	A	D	ND	E	D	E	F	D	D	F	E	A	B'	G	D	D	F	E	E	E	E	E
P-196	RAG- 1-47	B'	E	G	F	E	A	D	ND	E	D	E	F	D	D	F	E	A	B'	G	D	D	F	E	E	E	E	E
P-195	VEM-265-47	B'	F	ND	F	F	A	D	ND	F	D	E	F	D	F	F	E	A	B'	G	D	D	F	E	E	E	F	E
P-194	VEM-264-47	B'	F	ND	ND	F	A	D	ND	F	D	E	E	D	E	F	E	A	B'	G	D	D	F	E	E	E	F	E
P-193	VEM-263-47	B'	F	ND	F	F	A	D	ND	F	D	E	E	D	F	F	E	A	B'	G	D	D	F	E	E	E	F	E
P-192	VEM-262-47	B'	E	F	E	F	B'	D	ND	E	D	F	E	D	E	E	E	D	A	F	D	D	F	D	D	E	E	E
P-191	VEM-259-47	B'	E	G	F	F	A	D	ND	E	D	F	F	D	E	F	F	A	B'	G	D	D	F	E	E	F	F	E
P-190	VEM-258-47	B'	E	ND	F	F	A	D	ND	E	D	ND	F	B'	E	F	F	D	B'	G	D	D	F	E	E	ND	F	E
P-189	VEM-257-47	B'	E	ND	F	F	A	D	ND	E	D	F	F	D	E	F	F	A	B'	G	D	D	F	E	E	F	F	E
P-188	VEM-256-47	B'	E	ND	F	E	A	D	ND	E	D	F	F	D	E	F	F	A	B'	G	D	D	F	E	E	F	F	E
--	VEM-255-47	B'	E	G	F	E	A	D	ND	E	D	F	F	D	E	F	F	A	B'	G	D	D	F	E	E	F	E	E
P-187	VEM-254-47	B'	E	G	F	E	A	D	ND	E	D	F	F	D	E	E	E	A	B'	G	D	D	ND	D	D	F	E	D
P-186	VEM-253-47	B'	E	G	F	E	A	D	ND	E	D	F	F	D	E	F	E	A	B'	G	D	D	F	E	E	F	F	E
P-185	VEM-252-47	B'	E	ND	F	E	A	D	ND	E	D	F	F	D	E	F	E	A	B'	G	D	D	F	E	E	F	E	E
P-184	VEM-251-47	B'	E	ND	F	E	A	D	ND	E	D	F	F	D	E	F	F	A	B'	G	D	D	F	E	E	F	F	E
P-183	VEM-249-47	B'	E	G	F	ND	A	D	ND	E	D	E	F	D	F	F	E	A	B'	G	D	D	F	D	E	E	E	E
P-182	VEM 248-47	B'	E	G	F	F	A	D	ND	E	D	E	F	D	F	F	E	A	B'	G	D	D	F	E	E	E	E	E
P-181	VEM-247-47	B'	E	G	F	E	A	D	ND	E	D	E	F	D	E	F	E	A	B'	G	D	D	F	E	E	E	E	E
P-180	VEM-246-47	B'	E	G	F	E	A	D	ND	E	D	E	F	D	F	F	E	B'	B'	G	D	D	F	D	E	E	E	E
P-179	VEM-245-47	B'	E	G	F	E	A	D	ND	E	D	F	F	D	E	F	E	A	A	G	D	D	F	D	E	E	E	E
P-178	VEM-244-47	B'	E	G	F	ND	B'	D	ND	E	D	ND	F	D	D	F	E	B'	A	G	B'	D	F	D	E	F	E	D
	Beds P-177 through P-20 not analyzed.																											

P- 19	VEM-180-47	B'	E	ND	ND	E	A	D	ND	E	D	F	F	D	F	F	F	A	B'	G	D	D	F	E	E	F	F	E
P- 18	VEM-179-47	B'	E	G	F	E	A	D	ND	E	D	F	E	D	F	F	E	A	B'	G	D	D	F	E	E	F	F	E
P- 17	VEM-178-47	B'	E	G	F	E	A	D	ND	E	D	F	E	D	F	F	E	A	B'	G	D	D	F	E	E	F	F	E
P- 16	VEM-177-47	B'	E	ND	F	E	A	D	ND	E	D	E	E	D	F	F	E	A	B'	F	D	D	F	E	E	E	E	E
P- 15	VEM-176-47	B'	E	ND	F	E	A	D	ND	E	D	E	E	D	E	F	E	A	B'	F	D	D	F	D	E	E	E	D
P- 14	VEM-175-47	B'	E	ND	E	E	A	D	ND	E	D	E	E	D	E	F	E	A	B'	F	D	D	F	D	E	E	E	D
P- 13	RAH- 189-47	B'	E	ND	F	E	A	D	ND	E	D	E	E	D	E	F	E	A	B'	F	D	D	F	D	E	E	E	D
P- 12	WOM- 3182	B'	E	ND	F	E	A	D	ND	E	D	E	E	D	F	F	E	A	B'	G	D	D	F	E	E	E	E	E
P- 11	WOM- 3181	B'	E	ND	F	F	A	E	ND	E	D	E	F	D	E	F	E	A	B'	G	D	D	F	D	E	E	E	E
P- 10	RAH- 186-47	B'	E	ND	F	E	A	D	ND	E	D	E	E	D	F	F	E	A	B'	G	D	D	F	E	E	E	E	E
P- 9	RAH- 185-47	D	E	ND	F	E	A	D	ND	E	D	F	E	D	F	F	E	A	B'	G	D	D	F	E	E	E	E	E
P- 8	RAH- 184-47	B'	E	ND	F	E	A	D	ND	E	D	F	E	D	F	F	E	A	B'	G	D	D	F	E	E	E	E	E
P- 7	RAH- 183-47	B'	E	ND	F	E	A	D	ND	E	D	F	E	D	F	F	E	A	B'	G	D	D	ND	E	E	E	E	E
P- 6	RAH- 182-47	B'	D	G	E	E	B'	D	ND	E	D	ND	F	D	E	F	E	B'	A	G	D	D	F	D	D	F	E	E
P- 5	RAH- 181-47	B'	E	G	E	E	B'	D	ND	E	D	ND	F	D	E	F	E	D	A	G	D	D	F	D	E	F	E	E
P- 4	RAH- 180-47	B'	E	G	F	E	B'	E	ND	F	D	ND	F	B'	D	F	E	D	A	G	D	D	F	E	E	ND	E	E
P- 3	RAH- 179-47	B'	D	G	F	E	B'	D	E	E	D	F	F	D	B'	E	B'	B'	A	F	D	D	E	D	D	E	E	D
P- 2	RMC-133-47	B'	E	ND	F	E	A	D	ND	F	D	E	E	D	E	F	E	A	B'	G	D	D	F	E	E	E	E	E
P- 1	RMC-134-47	B'	E	ND	F	E	A	D	ND	F	D	E	E	D	F	F	E	A	B'	G	D	D	F	E	E	E	E	E

JOHNSON CREEK, IDAHO. LOT NO. 1209.

Phosphatic shale member of Phosphoria formation sampled in two bulldozer trenches on north side of Johnson Creek, SE¼ sec. 23, T. 8 S., R. 43 E., Caribou County, Idaho, near north end of east limb of Aspen Range anticline. Beds strike N. 10-40° W. and dip 25-45° NE. Section measured by R. M. Campbell, R. A. Gulbrandsen, R. A. Hoppin, V. E. McKelvey, and R. A. Weeks and sampled by Campbell and Weeks in September and October 1947. Samples analyzed for P_2O_5 and acid insoluble by U. S. Bureau of Mines Laboratory, Albany, Oregon, and for other constituents by Trace Elements Laboratory, U. S. Geological Survey, Washington, D. C.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	Loss on ignition	Acid insoluble		
	Rex member of Phosphoria formation—basal beds only									
R- 2	Chert	RAW- 73-47	8.1	0.7	--	--	--	93.0	8.1	5.67
R- 1	Chert and mudstone	RAW- 72-47	3.5	1.2	--	--	--	81.2	11.6	9.87
	Phosphatic shale member of Phosphoria formation									
P-119	Mudstone	RAW- 71-47	0.6	2.9	--	--	--	91.7	0.6	1.74
P-118	Phosphate rock, calcareous; fos. col. no. 47-HW-230[1]	RAW- 70-47	0.5	27.6	--	--	--	7.6	1.1	15.54
P-117	Mudstone	RAW- 69-47	1.5	2.4	--	--	--	84.0	2.6	19.14
P-116	Mudstone	RAW- 68-47	1.4	1.5	--	--	--	75.6	4.0	21.24
P-115	Limestone, argillaceous	RAW- 67-47	1.0	5.7	--	--	--	23.2	5.0	26.94
P-114	Mudstone; fos. col. no. 47-HW-229	RAW- 66-47	0.8	2.1	--	--	--	75.0	5.8	28.62
P-113	Mudstone, calcareous; fos. col. no. 47-HW-228	RAW- 65-47	2.6	0.9	--	--	--	65.2	8.4	30.96
P-112	Mudstone; fos. col. no. 47-HW-227	RAW- 64-47	2.4	3.2	--	--	--	71.7	10.8	38.64
P-111	Phosphate rock	RAW- 63-47	0.8	30.7	--	--	--	13.3	11.6	63.20
P-110	Mudstone; fos. col. no. 47-HW-226	RAW- 62-47	2.1	6.4	--	--	--	64.6	13.7	76.64
P-109	Mudstone; fos. col. no. 47-HW-225	RAW- 57-47	0.5	1.9	--	--	--	79.4	14.2	77.59
P-108	Phosphate rock	RAW- 56-47	0.6	36.9	0.63	0.46	1.84	5.6	14.8	99.73
P-107	Phosphate rock	RAW- 55-47	0.4	37.4	0.53	0.41	1.32	3.6	15.2	114.69
P-106	Phosphate rock	RAW- 54-47	0.4	35.3	2.0	0.87	3.88	4.0	15.6	128.81
P-105	Phosphate rock	RAW- 53-47	0.8	36.5	0.82	0.50	1.96	4.5	16.4	158.01
P-104	Phosphate rock	RAW- 52-47	0.9	35.3	1.4	0.70	1.68	7.3	17.3	189.78
P-103	Phosphate rock and mudstone	VEM-493-47	0.5	26.5	3.2	1.28	2.98	23.6	17.8	203.03
P-102	Phosphate rock	VEM-492-47	0.6	34.6	1.0	0.60	0.80	9.9	18.4	223.79
P-101	Phosphate rock	VEM-491-47	0.5	30.3	2.1	0.90	4.46	14.8	18.9	238.94
P-100	Phosphate rock	VEM-490-47	0.5	33.0	1.7	1.22	3.24	11.5	19.4	255.44
P- 99	Phosphate rock, argillaceous	VEM-489-47	0.6	19.7	7.5	2.26	7.22	35.1	20.0	267.26
P- 98	Mudstone	VEM-488-47	1.0	5.5	11.	3.20	11.12	61.4	21.0	272.76
P- 97	Mudstone, phosphatic	VEM-487-47	1.3	9.5	9.4	1.88	10.78	55.3	22.3	285.11
P- 96	Phosphate rock	VEM-486-47	0.6	28.9	4.1	1.59	7.00	15.5	22.9	302.45
P- 95	Phosphate rock	VEM-485-47	0.6	31.8	1.3	0.30	5.40	11.7	23.5	321.53
P- 94	Phosphate rock	VEM-484-47	0.6	34.5	1.1	0.43	4.86	6.0	24.1	342.23

P- 93	Phosphate rock	VEM-483-47	0.4	32.3	2.2	0.70	6.48	8.7	24.5	355.15
P- 92	Phosphate rock	VEM-482-47	0.8	32.4	1.6	1.49	5.84	9.2	25.3	381.07
P- 91	Mudstone; fos. col. no. 47-HW-303	VEM-481-47	0.8	3.0	4.2	1.23	10.54	77.1	26.1	383.47
P- 90	Phosphate rock, argillaceous; fos. col. no. 47-HW-302	VEM-480-47	0.6	19.9	5.2	1.60	13.54	29.1	26.7	395.41
P- 89	Phosphate rock, argillaceous; fos. col. no. 47-HW-301	VEM-479-47	0.6	20.4	5.5	1.53	15.76	24.8	27.3	407.65
P- 88	Phosphate rock	VEM-478-47	1.0	26.3	3.2	1.22	16.42	11.2	28.3	433.95
P- 87	Phosphate rock, argillaceous	VEM-477-47	0.7	23.9	4.1	1.48	16.74	20.1	29.0	450.68
P- 86	Phosphate rock, argillaceous	VEM-476-47	0.7	19.4	5.5	1.91	11.18	30.0	29.7	464.26
P- 85	Phosphate rock, argillaceous	VEM-475-47	0.6	19.2	6.6	2.15	15.14	28.5	30.3	475.78
P- 84	Phosphate rock, argillaceous	VEM-474-47	0.8	22.6	4.7	1.65	14.42	20.9	31.1	493.86
P- 83	Phosphate rock, argillaceous	VEM-473-47	1.2	20.4	4.5	1.59	14.64	27.2	32.3	518.34
P- 82	Mudstone and phosphate rock	VEM-472-47	1.0	16.6	--	--	--	33.0	33.3	534.94
P- 81	Mudstone, phosphatic	VEM-471-47	1.0	12.9	--	--	--	45.9	34.3	547.84
P- 80	Mudstone, phosphatic	VEM-358-47	1.2	15.6	--	--	--	42.0	35.5	566.56
P- 79	Mudstone, calcareous; fos. col. no. 47-HW-300	VEM-357-47	1.5	2.7	--	--	--	47.0	37.0	570.61
P- 78	Mudstone, phosphatic	VEM-356-47	2.0	14.1	--	--	--	46.6	39.0	598.81
P- 77	Mudstone, phosphatic; fos. col. no. 47-HW-299	VEM-355-47	0.8	15.5	--	--	--	46.4	39.8	611.21
P- 76	Mudstone	VEM-354-47	2.9	7.1	--	--	--	67.2	42.7	631.80
P- 75	Mudstone, phosphatic	VEM-353-47	1.7	10.7	--	--	--	60.5	44.4	649.99
P- 74	Mudstone	VEM-352-47	0.8	3.3	--	--	--	78.1	45.2	652.63
P- 73	Mudstone; fos. col. no. 47-HW-298	VEM-351-47	1.6	2.4	--	--	--	88.3	46.8	656.47
P- 72	Phosphate rock, argillaceous	VEM-350-47	0.8	18.5	--	--	--	45.9	47.6	671.27
P- 71	Mudstone	VEM-349-47	1.2	1.5	--	--	--	85.7	48.8	673.07
P- 70	Mudstone, phosphatic	VEM-348-47	1.3	8.2	--	--	--	69.5	50.1	683.73
P- 69	Mudstone, phosphatic and chert	VEM-347-47	0.8	15.3	--	--	--	47.2	50.9	695.97
P- 68	Mudstone, phosphatic	VEM-346-47	1.7	8.0	--	--	--	67.2	52.6	709.57
P- 67	Mudstone	VEM-345-47	2.4	4.7	--	--	--	77.2	55.0	720.85
P- 66	Mudstone, cherty	RMC- 90-47	1.2	3.2	--	--	--	83.1	56.2	724.69
P- 65	Mudstone	RAW- 51-47	1.1	1.1	--	--	--	86.8	57.3	725.90
P- 64	Mudstone and phosphate rock	RAW- 50-47	2.1	7.6	--	--	--	71.1	59.4	741.86
P- 63	Mudstone and phosphate rock	RAW- 27-47	1.5	12.6	--	--	--	54.1	60.9	760.76
P- 62	Mudstone	RAW- 26-47	0.9	7.3	--	--	--	71.1	61.8	767.33
P- 61	Mudstone	RAW- 25-47	0.6	7.5	--	--	--	63.3	62.4	771.83
P- 60	Mudstone	RAG- 15-47	4.82	4.3	--	--	--	74.3	67.22	792.56
P- 59	Mudstone, phosphatic	RAG- 14-47	0.75	16.6	--	--	--	44.5	67.97	805.01
P- 58	Mudstone, phosphatic; fos. col. no. 47-HW-297	RAG- 13-47	0.85	10.5	--	--	--	60.7	68.82	813.93
P- 57	Mudstone, phosphatic; fos. col. no. 47-HW-296	RAG- 12-47	0.30	15.6	--	--	--	50.7	69.12	818.61
P- 56	Mudstone; fos. col. no. 47-HW-295	RAG- 11-47	1.92	6.8	--	--	--	69.7	71.04	831.67

[1] Fossil collection made by H. Wedow, Paleontology and Stratigraphy Branch, U. S. Geological Survey.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	Loss on ignition	Acid insoluble		
P- 55	Mudstone, phosphatic; fos. col. no. 47-HW-294	RAG- 10-47	1.02	14.8	--	--	--	46.5	72.06	846.76
P- 54	Mudstone	RAG- 9-47	2.62	5.5	--	--	--	70.8	74.68	861.17
P- 53	Mudstone, phosphatic, contains chert nodules	RAG- 8-47	0.62	11.8	--	--	--	58.9	75.30	868.49
P- 52	Mudstone	RAG- 7-47	3.3	1.3	--	--	--	86.8	78.60	872.78
P- 51	Phosphate rock, argillaceous	RAH-216-47	0.4	23.0	--	--	--	32.0	79.00	881.98
P- 50	Mudstone	RAH-215-47	1.9	1.8	--	--	--	84.2	80.90	885.40
P- 49	Mudstone	RAH-214-47	1.3	0.6	--	--	--	87.3	82.20	886.18
P- 48	Mudstone	RAH-199-47	0.9	0.7	--	--	--	88.5	83.10	886.81
P- 47	Phosphate rock	RAH-198-47	0.3	30.0	--	--	--	18.9	83.40	895.81
P- 46	Mudstone	RAH-197-47	1.0	3.3	--	--	--	77.9	84.40	899.11
P- 45	Mudstone	RAH-196-47	3.0	2.4	--	--	--	84.1	87.40	906.31
P- 44	Mudstone; fos. col. no. 47-HW-293	RAH-195-47	0.5	3.2	--	--	--	80.8	87.90	907.91
P- 43	Mudstone; fos. col. no. 47-HW-292	RAH-194-47	1.9	0.8	--	--	--	85.6	89.80	909.43
P- 42	Mudstone, phosphatic	RAH-193-47	0.9	9.8	--	--	--	62.0	90.70	918.25
P- 41	Mudstone	RAH-192-47	1.4	1.6	--	--	--	84.6	92.10	920.49
P- 40	Mudstone, phosphatic; fos. col. no. 47-HW-291	RAH-191-47	0.7	14.7	--	--	--	46.5	92.80	930.78
P- 39	Phosphate rock, argillaceous; fos. col. no. 47-HW-291	RAH-190-47	0.6	19.7	--	--	--	39.0	93.40	942.60
P- 38	Mudstone	RAG- 24-47	2.64	4.4	--	--	--	79.9	96.04	954.22
P- 37	Mudstone, phosphatic	RAG- 23-47	1.48	11.9	--	--	--	61.9	97.52	971.83
P- 36	Mudstone	RAG- 22-47	1.91	7.0	--	--	--	73.2	99.43	985.20
P- 35	Mudstone; fos. col. no. 47-HW-290	RAG- 21-47	3.0	1.1	--	--	--	88.1	102.43	988.50
P- 34	Phosphate rock and phosphatic mudstone	RAG- 20-47	0.95	22.7	--	--	--	31.0	103.38	1,010.06
P- 33	Mudstone, phosphatic; fos. col. no. 47-HW-289	RAG- 19-47	1.16	8.0	--	--	--	70.8	104.54	1,019.34
P- 32	Phosphate rock	RAG- 18-47	0.45	32.0	--	--	--	8.2	104.99	1,033.74
P- 31	Mudstone	RAG- 17-47	1.71	4.3	--	--	--	78.2	106.70	1,041.10
P- 30	Mudstone, phosphatic	VEM-507-47	1.9	11.6	--	--	--	52.3	108.60	1,063.14
P- 29	Mudstone	VEM-506-47	0.6	3.0	--	--	--	78.6	109.20	1,064.94
P- 28	Mudstone, phosphatic	VEM-505-47	1.4	13.6	--	--	--	43.9	110.60	1,083.98
P- 27	Mudstone, phosphatic	VEM-504-47	1.6	12.4	--	--	--	48.8	112.20	1,103.82
P- 26	Mudstone, phosphatic	VEM-503-47	0.6	9.4	--	--	--	57.4	112.80	1,109.46
P- 25	Mudstone, phosphatic	VEM-502-47	0.8	9.0	--	--	--	58.2	113.60	1,116.66
P- 24	Mudstone	VEM-501-47	1.6	5.0	--	--	--	72.0	115.20	1,124.66
P- 23	Mudstone; fos. col. no. 47-HW-306	VEM-500-47	2.8	2.5	--	--	--	79.4	118.00	1,131.66
P- 22	Mudstone	VEM-499-47	0.8	4.7	--	--	--	72.6	118.80	1,135.42
P- 21	Mudstone; fos. col. no. 47-HW-305	VEM-498-47	1.1	3.9	--	--	--	77.1	119.90	1,139.71
P- 20	Mudstone	VEM-497-47	0.9	7.4	--	--	--	65.0	120.80	1,146.37
P- 19	Mudstone	VEM-496-47	1.5	1.2	--	--	--	86.0	122.30	1,148.17

P- 18	Mudstone, phosphatic	VEM-495-47	1.6	11.3	--	--	--	55.7	123.90	1,166.25
P- 17	Mudstone, phosphatic	VEM-494-47	1.1	8.8	--	--	--	61.9	125.00	1,175.93
P- 16	Mudstone	RMC-111-47	1.0	6.4	--	--	--	71.8	126.00	1,182.33
P- 15	Mudstone, phosphatic	RMC-110-47	1.4	12.4	--	--	--	52.8	127.40	1,199.69
P- 14	Mudstone, phosphatic	RMC-109-47	1.4	14.8	--	--	--	46.6	128.80	1,220.41
P- 13	Mudstone	RMC-108-47	0.9	3.0	--	--	--	82.9	129.70	1,223.11
P- 12	Mudstone, phosphatic	RMC-107-47	1.7	14.3	--	--	--	48.3	131.40	1,247.42
P- 11	Phosphate rock, argillaceous	RMC-106-47	1.5	16.8	--	--	--	40.0	132.90	1,272.62
P- 10	Mudstone and phosphate rock	RMC-105-47	1.3	14.8	--	--	--	47.6	134.20	1,291.86
P- 9	Mudstone, phosphatic	VEM-517-47	0.7	15.5	--	--	--	45.3	134.90	1,302.71
P- 8	Phosphate rock, argillaceous	VEM-516-47	2.0	21.2	--	--	--	27.5	136.90	1,345.11
P- 7	Phosphate rock	VEM-515-47	1.6	28.5	--	--	--	15.8	138.50	1,390.71
P- 6	Mudstone, phosphatic	VEM-514-47	1.9	13.2	--	--	--	50.2	140.40	1,415.79
P- 5	Mudstone, phosphatic	VEM-513-47	1.0	11.5	--	--	--	55.0	141.40	1,427.29
P- 4	Mudstone	VEM-512-47	1.2	5.6	--	--	--	68.8	142.60	1,434.01
P- 3	Mudstone	VEM-511-47	1.8	1.4	--	--	--	75.0	144.40	1,436.53
P- 2	Mudstone, phosphatic	VEM-510-47	0.4	9.5	--	--	--	56.5	144.80	1,440.33
P- 1	Phosphate rock	VEM-509-47	0.25	35.7	--	--	--	4.8	145.05	1,449.26
	The lower phosphate bed appears to be absent due to faulting.									
	Wells formation									
Cw- 1	Dolomite; fos. col. no. 47-HW-304	VEM-508-47	3.2	1.1	--	--	--	7.3	3.2	3.52
Cw- 2	Clay and phosphate rock	--	0.1	--	--	--	--	--	3.3	--
Cw- 3	Dolomite	--	0.2	--	--	--	--	--	3.5	--

SPECTROGRAPHIC ANALYSES—JOHNSON CREEK, IDAHO. LOT NO. 1209.

Semi-quantitative analyses of selected samples of the phosphatic shale member of the Phosphoria formation, Johnson Creek, Idaho (see immediately preceding pages for location of section, thickness and description of strata, and chemical analyses of samples), made by the U. S. Geological Survey Laboratory, Geochemistry and Petrology Branch, Washington, D. C. In addition to the elements listed in the table below, Sb, As, Be, Bi, Cs, Co, Cb, Dy, Sm, Sc, Ta, Te, Tb, Tl, Tm, W, and Yb were looked for in all samples but were not detected.

Explanation of symbols

A = more than 10 percent
B' = 1-10 percent[1]
D = 0.1-1 percent
E = 0.01-0.1 percent
F = 0.001-0.01 percent
G = less than 0.001 percent
ND = not detected

Bed no.	Sample no.	Al	Ba	B	Cd	Ca	Cr	Cu	Fe	Ga	La	Pb	Mg	Mn	Mo	Ni	P	Si	Ag	Na	Sr	Sn	Ti	V	Y	Zn	Zr
	Beds P-119 through P-109 not analyzed.																										
P-108	RAW- 56-47	D	F	ND	F	A	D	F	D	ND	E	ND	E	F	ND	E	B'	B'	G	D	E	ND	E	D	E	E	F
P-107	RAW- 55-47	D	F	ND	F	A	D	F	D	ND	E	ND	E	F	ND	E	B'	B'	G	D	E	ND	F	D	E	E	F
P-106	RAW- 54-47	D	F	ND	F	A	D	ND	D	ND	E	E	D	F	ND	E	B'	B'	G	D	E	F	E	D	E	E	F
P-105	RAW- 53-47	D	F	ND	F	A	D	E	D	ND	E	ND	E	F	ND	E	B'	B'	G	D	E	F	E	D	E	E	F
P-104	RAW- 52-47	D	F	ND	ND	A	D	F	D	ND	E	E	E	F	ND	E	B'	B'	G	D	E	ND	E	D	E	E	F
P-103	VEM-493-47	B'	F	F	F	B'	D	F	D	ND	F	ND	E	E	ND	F	B'	A	G	D	D	ND	E	E	F	E	F
P-102	VEM-492-47	D	G	F	F	B'	D	F	D	ND	F	ND	E	E	ND	ND	B'	A	G	D	D	ND	E	E	F	F	F
P-101	VEM-491-47	D	G	F	F	B'	D	F	D	ND	F	ND	E	E	ND	ND	B'	A	G	D	D	ND	E	D	F	F	F
P-100	VEM-490-47	D	G	F	F	B'	D	F	D	ND	E	ND	E	F	ND	F	B'	A	G	D	D	ND	E	D	E	F	F
P- 99	VEM-489-47	B'	E	F	F	B'	D	F	D	F	F	F	E	E	ND	F	B'	A	G	D	D	ND	E	D	F	E	E
P- 98	VEM-488-47	B'	E	F	F	B'	D	F	B'	F	F	F	E	E	ND	E	D	A	G	D	E	ND	E	D	F	E	E
P- 97	VEM-487-47	B'	E	F	F	B'	D	F	D	F	F	F	E	E	ND	F	D	A	G	D	E	ND	E	D	F	E	F
P- 96	VEM-486-47	B'	F	F	E	B'	D	F	D	ND	F	ND	E	E	ND	F	B'	A	G	D	D	ND	E	E	F	E	F
P- 95	VEM-485-47	D	F	F	E	B'	D	F	D	ND	F	ND	E	F	ND	F	B'	A	G	D	D	ND	E	D	F	E	F
P- 94	VEM-484-47	D	G	F	E	B'	D	F	D	ND	F	ND	E	F	ND	F	B'	A	G	D	D	ND	E	D	F	E	F
P- 93	VEM-483-47	D	F	F	E	B'	D	F	D	ND	F	ND	E	F	ND	E	B'	A	G	D	D	ND	E	D	F	E	F
P- 92	VEM-482-47	D	G	F	E	B'	D	F	D	ND	F	ND	E	F	ND	F	B'	A	G	D	D	ND	E	D	F	E	F
P- 91	VEM-481-47	B'	F	F	E	A	D	E	D	ND	E	E	D	F	ND	E	B'	B'	F	D	E	ND	E	D	E	E	F
P- 90	VEM-480-47	B'	F	F	E	A	D	E	D	ND	E	E	D	F	F	E	B'	B'	F	D	E	ND	E	D	E	E	F
P- 89	VEM-479-47	B'	F	F	E	A	D	E	D	ND	E	E	D	F	F	E	B'	B'	F	D	E	ND	E	D	E	E	F
P- 88	VEM-478-47	B'	F	F	E	A	D	E	D	ND	F	E	D	F	ND	E	B'	B'	F	D	E	F	E	D	E	E	F
P- 87	VEM-477-47	B'	F	F	E	A	D	E	D	ND	F	E	D	F	ND	E	B'	B'	F	D	E	ND	E	D	E	E	F
P- 86	VEM-476-47	B'	E	F	E	A	D	E	D	ND	E	E	D	F	F	E	B'	B'	F	D	E	ND	E	D	E	E	F
P- 85	VEM-475-47	B'	E	F	E	A	D	E	D	ND	E	E	D	F	F	ND	B'	B'	F	D	E	ND	E	D	E	E	F

P- 84	VEM-474-47	B'	F	F	E	A	D	E	D	ND	E	ND	D	F	F	E	B'	B'	F	D	E	ND	E	D	E	E	F
P- 83	VEM-473-47	B'	F	F	E	A	D	E	D	ND	E	E	D	F	F	E	B'	B'	F	D	E	ND	E	D	E	E	F
	Beds P-82 through P-1 not analyzed.																										

[1] B' is equivalent to B and C of Bureau of Mines analyses as recorded in other reports.

SOUTH DRY VALLEY, IDAHO. LOT NO. 1211.

Phosphatic shale member of Phosphoria formation sampled in two bulldozer trenches near south end of Dry Valley, NW¼SE¼ sec. 14, T. 9 S., R. 44 E., Caribou County, Idaho, on west limb of Schmid syncline. Beds strike N. 55° W. and dip 45° NE. Section measured by R. M. Campbell, R. A. Gulbrandsen, V. E. McKelvey, H. Wedow, and R. A. Weeks and sampled by Campbell and Weeks in September and October 1947. Samples analyzed for P_2O_5, F, and acid insoluble by U. S. Bureau of Mines Laboratory, Albany, Oregon, and for other constituents by Trace Elements Section Laboratory, U. S. Geological Survey, Washington, D. C.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)						Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	F	Loss on ignition	Acid insoluble		
	Rex member of Phosphoria formation—basal beds only										
R- 4	Chert		12.0	--	--	--	--	--	--	12.0	--
R- 3	Chert	1020-HW	4.4	0.3	--	--	--	--	87.9	16.4	1.32
R- 2	Mudstone	1019-HW	0.3	0.5	--	--	--	--	71.4	16.7	1.47
R- 1	Chert	1018-HW	4.4	0.5	--	--	--	--	86.3	21.1	3.67
	Phosphatic shale member of Phosphoria formation										
P-182	Phosphate rock, argillaceous; fos. col. no. 47-HW-288[1]	1017-HW	0.5	23.8	--	--	--	--	32.3	0.5	11.90
P-181	Phosphate rock, argillaceous; fos. col. no. 47-HW-287	1016-HW	0.4	25.2	--	--	2.2	--	29.3	0.9	21.98
P-180	Mudstone, phosphatic	1015-HW	0.4	8.6	--	--	--	--	57.3	1.3	25.42
P-179	Mudstone	1014-HW	0.9	2.5	--	--	--	--	76.9	2.2	27.67
P-178	Mudstone; fos. col. no. 47-HW-286	1013-HW	1.4	5.2	--	--	--	--	65.3	3.6	34.95
P-177	Mudstone	1012-HW	1.5	1.9	--	--	--	--	75.4	5.1	37.80
P-176	Mudstone	1011-HW	0.4	2.9	--	--	--	--	72.0	5.5	38.96
P-175	Mudstone	1010-HW	1.1	0.9	--	--	--	--	79.9	6.6	39.95
P-174	Mudstone	1009-HW	2.7	0.7	--	--	--	--	79.9	9.3	41.84
P-173	Mudstone; fos. col. no. 47-HW-285	1008-HW	1.2	1.3	--	--	--	--	78.8	10.5	43.40
P-172	Mudstone; fos. col. no. 47-HW-284	1007-HW	0.8	4.5	--	--	--	--	67.8	11.3	47.00
P-171	Mudstone; fos. col. no. 47-HW-283	1006-HW	1.4	4.8	--	--	--	--	73.5	12.7	53.72
P-170	Mudstone; fos. col. no. 47-HW-282	1005-HW	0.5	5.6	--	--	--	--	74.1	13.2	56.52
P-169	Mudstone	1004-HW	1.7	0.9	--	--	--	--	84.7	14.9	58.05
P-168	Mudstone	1003-HW	1.3	6.8	--	--	--	--	66.2	16.2	66.89
P-167	Phosphate rock	1002-HW	0.8	30.9	--	--	--	--	16.0	17.0	91.61
P-166	Mudstone	1001-HW	1.8	3.5	--	--	--	--	72.4	18.8	97.91
P-165	Mudstone; fos. col. no. 47-HW-281	RAG-123-47	1.45	0.6	--	--	--	--	80.8	20.25	98.78
P-164	Mudstone	RAG-122-47	0.69	1.4	--	--	--	--	76.7	20.94	99.75
P-163	Phosphate rock	RAG-121-47	0.52	34.9	0.87	0.39	3.37	2.04	7.9	21.46	117.89
P-162	Phosphate rock	RAG-120-47	0.25	34.0	2.2	0.93	--	4.34	5.9	21.71	126.39
P-161	Phosphate rock	RAG-119-47	0.42	35.9	1.4	0.51	--	3.14	5.0	22.13	141.47
P-160	Phosphate rock	RAG-118-47	0.5	33.8	2.2	0.85	--	4.90	6.1	222.63	158.37
P-159	Phosphate rock and phosphatic mudstone	RAG-117-47	1.0	33.2	1.4	0.70	--	2.58	11.0	23.63	191.57

P-158	Mudstone, phosphatic	RAG-116-47	0.98	9.0	11.	3.29	--	3.34	61.8	24.61	200.39
P-157	Mudstone and argillaceous phosphate rock	RAG-115-47	0.74	24.8	5.7	2.15	2.53	3.46	27.4	25.35	218.74
P-156	Phosphate rock	RAG-114-47	0.6	32.5	2.2	1.10	--	2.84	12.9	25.95	238.24
P-155	Mudstone, phosphatic and phosphate rock	RAG-113-47	1.13	20.3	6.7	2.16	--	4.44	36.1	27.08	261.18
P-154	Phosphate rock	RAG-112-47	0.8	32.0	2.3	1.05	--	2.90	13.1	27.88	286.78
P-153	Mudstone, phosphatic and phosphate rock	RAG-111-47	0.79	12.6	9.2	2.76	--	4.82	54.0	28.67	296.74
P-152	Phosphate rock	RAW-104-47	0.8	34.4	1.8	0.74	--	3.20	7.2	29.47	324.26
--	Phosphate rock	RAG-110-47	(0.82)	35.3	--	--	--	--	6.0	--	--
P-151	Phosphate rock and phosphatic mudstone	RMC- 96-47	0.5	26.4	4.5	1.48	--	5.56	22.6	29.97	337.46
--	Phosphate rock	RAG-109-47	(0.45)	32.0	--	--	--	--	14.4	--	--
	RAG-109-47 and RAG-110-47 are logged as equivalent to RMC-96-47 and RAW-104-47.										
P-150	Phosphate rock and argillaceous phosphate rock	RMC- 95-47	0.7	30.9	2.7	0.98	--	4.16	14.6	30.67	359.09
P-149	Phosphate rock	RMC- 94-47	0.5	30.4	2.6	1.02	--	4.06	15.7	31.17	374.29
P-148	Mudstone, phosphatic; fos. col. no. 47-HW-280	RMC- 93-47	0.5	11.8	8.3	2.71	--	6.32	57.1	31.67	380.19
P-147	Mudstone	RMC- 92-47	0.5	5.2	11.	3.33	--	4.64	73.5	32.17	382.79
P-146	Mudstone, phosphatic	RMC- 91-47	0.7	10.5	9.2	2.60	--	5.02	47.1	32.87	390.14
P-145	Phosphate rock and phosphatic mudstone	VEM-608-47	0.7	27.6	3.7	1.27	--	5.52	20.0	33.57	409.46
P-144	Phosphate rock and phosphatic mudstone	VEM-607-47	1.7	18.8	6.6	2.31	--	5.80	38.9	35.27	441.42
P-143	Mudstone	VEM-606-47	0.8	6.8	11.	3.90	--	8.74	63.3	36.07	446.86
P-142	Phosphate rock and phosphatic mudstone	VEM-605-47	0.6	27.1	3.8	1.32	--	5.92	20.5	36.67	463.12
P-141	Phosphate rock	VEM-604-47	0.6	33.9	1.4	0.58	--	5.14	8.0	37.27	483.46
P-140	Phosphate rock	VEM-603-47	0.8	31.1	2.2	0.88	--	12.48	11.2	38.07	508.34
P-139	Phosphate rock	VEM-602-47	1.1	30.8	2.6	1.06	--	6.06	12.0	39.77	560.70
P-138	Phosphate rock	RMC-132-47	0.5	31.6	2.3	0.84	--	5.72	11.5	40.27	576.50
P-137	Phosphate rock, argillaceous	RMC-131-47	0.7	23.4	5.3	2.28	--	9.34	24.7	40.97	592.88
P-136	Phosphate rock, argillaceous, calcareous	RMC-130-47	0.5	15.6	7.8	2.61	--	15.90	35.4	41.47	600.68
P-135	Phosphate rock, argillaceous, calcareous	RMC-129-47	1.0	18.4	6.1	2.14	--	14.28	30.9	42.47	619.08
P-134	Phosphate rock and argillaceous phosphate rock	RMC-128-47	0.8	22.2	5.0	1.89	--	12.86	24.5	43.27	636.84
P-133	Phosphate rock	RMC-127-47	0.8	25.8	3.4	1.48	--	13.88	16.1	44.07	657.48
P-132	Phosphate rock	RMC-126-47	1.1	27.6	2.7	1.3	--	9.48	14.6	45.17	687.84
P-131	Mudstone, phosphatic; fos. col. no. 47-HW-279	RMC-125-47	0.7	23.5	5.2	2.57	--	9.78	25.2	45.87	704.29

[1] Fossil collection made by H. Wedow, Paleontology and Stratigraphy Branch, U. S. Geological Survey.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)						Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	F	Loss on ignition	Acid insoluble		
P-130	Phosphate rock, argillaceous	RMC-124-47	1.0	18.6	7.1	2.48	--	8.86	36.0	46.87	722.89
P-129	Phosphate rock, argillaceous	RMC-123-47	0.4	20.0	6.6	2.53	--	9.28	32.9	47.27	730.89
P-128	Phosphate rock, argillaceous	RMC-122-47	1.2	22.5	5.0	1.99	--	11.56	27.0	48.47	757.89
P-127	Phosphate rock, argillaceous; fos. col. no. 47-HW-278	RMC-121-47	1.4	20.7	5.4	1.98	--	10.70	29.6	49.87	786.86
P-126	Phosphate rock and phosphatic calcareous mudstone	RMC-120-47	1.5	16.8	--	--	--	--	35.8	51.37	812.06
P-125	Mudstone, phosphatic; fos. col. no. 47-HW-277	RMC-119-47	0.6	14.6	--	--	--	--	43.7	51.97	820.82
P-124	Mudstone, phosphatic; fos. col. no. 47-HW-277	RMC-118-47	1.2	10.8	--	--	--	--	51.6	53.17	833.78
P-123	Mudstone, phosphatic	RMC-117-47	1.1	12.5	--	--	--	--	50.9	54.27	847.53
P-122	Mudstone; fos. col. no. 47-HW-276	RMC-116-47	0.9	7.3	--	--	--	--	67.8	55.17	854.10
P-121	Mudstone	RMC-115-47	1.5	3.9	--	--	--	--	76.1	56.67	859.95
P-120	Mudstone, phosphatic	RMC-114-47	0.9	12.6	--	--	--	--	50.7	57.57	871.29
P-119	Mudstone, phosphatic	RMC-113-47	1.1	10.6	--	--	--	--	54.7	58.67	882.95
P-118	Mudstone, phosphatic; fos. col. no. 47-HW-275	RMC-112-47	1.0	12.3	--	--	--	--	52.2	59.67	895.25
P-117	Phosphate rock, argillaceous	VEM-292-47	0.4	22.7	--	--	--	--	34.1	60.07	904.33
P-116	Mudstone; fos. col. no. 47-HW-274	VEM-291-47	0.7	6.8	--	--	--	--	68.1	60.77	909.09
P-115	Mudstone	VEM-290-47	1.4	7.0	--	--	--	--	68.5	62.17	918.89
P-114	Mudstone	VEM-289-47	1.1	7.8	--	--	--	--	67.6	63.27	927.47
P-113	Mudstone; fos. col. no. 47-HW-273	RAW-103-47	1.3	7.8	--	--	--	--	66.9	64.57	937.61
P-112	Phosphate rock and mudstone	RAW-102-47	0.5	9.0	--	--	--	--	63.0	65.07	942.11
P-111	Mudstone, phosphatic	RAW-101-47	0.6	16.8	--	--	--	--	46.3	65.67	952.19
P-110	Mudstone; fos. col. no. 47-HW-272	RAW-100-47	1.2	6.3	--	--	--	--	74.7	66.87	959.75
P-109	Mudstone, phosphatic	RAW- 99-47	0.6	13.9	--	--	--	--	56.0	67.47	968.09
P-108	Mudstone, phosphatic; fos. col. no. 47-HW-271	RAW- 98-47	0.9	12.4	--	--	--	--	60.2	68.37	979.25
P-107	Mudstone; fos. col. no. 47-HW-270	RAW- 97-47	1.1	2.1	--	--	--	--	85.1	67.47	981.56
P-106	Mudstone	RAW- 96-47	0.9	4.4	--	--	--	--	79.3	70.37	985.52
P-105	Mudstone, phosphatic	RAW- 95-47	0.6	11.7	--	--	--	--	60.0	70.97	992.54
P-104	Mudstone, phosphatic	RAW- 94-47	0.9	12.1	--	--	--	--	51.6	71.87	1,003.43
P-103	Mudstone, phosphatic and chert	RAW- 93-47	0.8	8.3	--	--	--	--	68.9	72.67	1,010.07
P-102	Mudstone, phosphatic	RAW- 92-47	0.9	8.0	--	--	--	--	68.4	73.57	1,017.27
P-101	Mudstone	RAW- 91-47	1.5	6.1	--	--	--	--	74.6	75.07	1,026.42
P-100	Mudstone	RAW- 90-47	0.8	5.5	--	--	--	--	76.0	75.87	1,030.82
P- 99	Mudstone	RAW- 89-47	0.7	3.9	--	--	--	--	81.0	76.57	1,033.55
P- 98	Mudstone	RAW- 88-47	1.2	2.2	--	--	--	--	78.1	77.77	1,036.19
P- 97	Mudstone	VEM-601-47	1.4	4.7	--	--	--	--	76.3	79.17	1,042.77
P- 96	Mudstone and argillaceous phosphate rock	VEM-600-47	0.9	9.5	--	--	--	--	63.0	80.07	1,051.32

P- 95	Phosphate rock, argillaceous	VEM-599-47	0.5	22.3	--	--	--	--	34.9	80.57	1,062.47
P- 94	Mudstone, phosphatic	VEM-598-47	0.8	9.6	--	--	--	--	62.1	81.37	1,070.15
P- 93	Mudstone, phosphatic	VEM-597-47	0.7	8.0	--	--	--	--	64.3	82.07	1,075.75
P- 92	Mudstone	VEM-596-47	0.6	5.8	--	--	--	--	65.8	82.67	1,079.23
P- 91	Mudstone	VEM-595-47	0.4	3.3	--	--	--	--	68.0	83.07	1,080.55
P- 90	Phosphate rock, mudstone, and phosphatic mudstone	VEM-594-47	0.9	8.3	--	--	--	--	63.7	83.97	1,088.02
P- 89	Mudstone, phosphatic	VEM-593-47	0.8	8.4	--	--	--	--	66.8	84.77	1,094.74
P- 88	Mudstone	VEM-592-47	2.8	5.1	--	--	--	--	74.6	87.57	1,109.02
P- 87	Phosphate rock, mudstone, and phosphatic mudstone	VEM-591-47	0.9	15.0	--	--	--	--	47.7	88.47	1,122.52
P- 86	Mudstone; fos. col. no. 47-HW-269	VEM-590-47	1.4	3.5	--	--	--	--	79.8	89.87	1,127.42
P- 85	Mudstone, phosphatic	VEM-589-47	1.4	9.1	--	--	--	--	61.2	91.27	1,140.16
P- 84	Mudstone and argillaceous phosphate rock	VEM-588-47	1.4	7.2	--	--	--	--	67.3	92.67	1,150.24
P- 83	Phosphate rock and phosphatic mudstone	VEM-587-47	0.6	14.6	--	--	--	--	48.4	93.27	1,159.00
P- 82	Mudstone, phosphatic	VEM-586-47	0.5	8.5	--	--	--	--	48.3	93.77	1,163.25
P- 81	Mudstone, phosphatic and mudstone; fos. col. no. 47-HW-268	VEM-585-47	2.3	7.0	--	--	--	--	66.7	96.07	1,179.35
P- 80	Phosphate rock, argillaceous, and phosphatic mudstone	VEM-584-47	0.8	13.6	--	--	--	--	57.2	96.87	1,190.23
P- 79	Mudstone; fos. col. no. 47-HW-267	VEM-583-47	2.7	0.9	--	--	--	--	87.5	99.57	1,192.66
P- 78	Mudstone and phosphate rock	VEM-582-47	0.9	13.9	--	--	--	--	56.3	100.47	1,205.17
P- 77	Mudstone	VEM-581-47	1.3	4.9	--	--	--	--	78.8	101.77	1,211.54
P- 76	Mudstone	VEM-580-47	2.1	0.7	--	--	--	--	86.9	103.87	1,213.01
P- 75	Mudstone	VEM-579-47	1.1	1.4	--	--	--	--	87.0	104.97	1,214.55
P- 74	Phosphate rock, argillaceous	VEM-578-47	0.3	23.6	--	--	--	--	31.1	105.27	1,221.63
P- 73	Mudstone	VEM-577-47	2.3	7.2	--	--	--	--	71.7	107.57	1,238.19
P- 72	Mudstone and phosphate rock	VEM-576-47	1.2	8.4	--	--	--	--	67.9	108.77	1,248.27
P- 71	Mudstone	VEM-575-47	1.0	1.2	--	--	--	--	87.6	109.77	1,249.47
P- 70	Phosphate rock	VEM-574-47	1.6	31.4	--	--	--	--	12.7	111.37	1,299.71
P- 69	Mudstone	VEM-573-47	1.2	5.2	--	--	--	--	76.5	112.57	1,305.95
P- 68	Phosphate rock, argillaceous	VEM-572-47	1.4	21.3	--	--	--	--	38.3	113.97	1,335.77
P- 67	Mudstone	VEM-571-47	1.0	6.5	--	--	--	--	73.9	114.97	1,342.27
P- 66	Phosphate rock and mudstone	VEM-570-47	1.4	7.6	--	--	--	--	65.3	116.37	1,352.91
P- 65	Mudstone	VEM-569-57	0.9	7.5	--	--	--	--	65.3	117.27	1,359.66
P- 64	Mudstone, phosphatic	VEM-568-47	0.8	9.1	--	--	--	--	61.9	118.07	1,366.94
P- 63	Phosphate rock, argillaceous	VEM-567-47	2.0	20.0	--	--	--	--	28.6	120.07	1,406.94
P- 62	Mudstone, phosphatic	VEM-566-47	1.5	9.9	--	--	--	--	55.8	121.57	1,421.79
P- 61	Mudstone	VEM-565-47	0.8	3.7	--	--	--	--	73.8	122.37	1,424.75
P- 60	Phosphate rock, argillaceous	VEM-564-47	0.9	15.1	--	--	--	--	37.8	123.27	1,438.34
P- 59	Mudstone, phosphatic	VEM-563-47	1.2	14.4	--	--	--	--	46.3	124.47	1,455.62
P- 58	Phosphate rock, argillaceous	VEM-562-47	1.1	16.8	--	--	--	--	37.9	125.57	1,474.10

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)						Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	F	Loss on ignition	Acid insoluble		
P- 57	Mudstone	VEM-561-47	1.5	2.8	--	--	--	--	70.5	127.07	1,478.30
P- 56	Mudstone, phosphatic	VEM-560-47	1.2	8.5	--	--	--	--	60.3	128.27	1,488.50
P- 55	Mudstone	RAW- 87-47	0.6	1.5	--	--	--	--	81.7	128.87	1,489.40
P- 54	Mudstone and chert; fos. col. no. 47-HW-266	RAW- 86-47	0.8	0.9	--	--	--	--	91.7	129.67	1,490.12
P- 53	Mudstone; fos. col. no. 47-HW-265	RAW- 85-47	1.7	3.2	--	--	--	--	80.7	131.37	1,495.56
P- 52	Mudstone	RAW- 84-47	0.9	1.5	--	--	--	--	84.2	132.27	1,496.91
P- 51	Mudstone, phosphatic	RAW- 83-47	0.9	8.8	--	--	--	--	64.2	133.17	1,504.83
P- 50	Mudstone; fos. col. no. 47-HW-264	RAW- 82-47	2.1	5.2	--	--	--	--	75.2	135.27	1,515.75
P- 49	Mudstone	RAW- 81-47	1.6	0.7	--	--	--	--	89.6	136.87	1,516.87
P- 48	Mudstone, phosphatic	RAW- 80-47	1.9	11.6	--	--	--	--	57.1	138.77	1,538.91
P- 47	Mudstone; fos. col. no. 47-HW-263	RAW- 79-47	1.2	7.8	--	--	--	--	68.8	139.97	1,548.27
P- 46	Mudstone	RAW- 78-47	0.7	3.4	--	--	--	--	82.0	140.67	1,550.65
P- 45	Mudstone, phosphatic; fos. col. no. 47-HW-262	RAW- 77-47	1.1	9.4	--	--	--	--	64.2	141.77	1,560.99
P- 44	Mudstone, phosphatic	RAW- 76-47	1.7	16.4	--	--	--	--	42.7	143.47	1,588.87
P- 43	Mudstone, phosphatic	RAW- 75-47	0.5	13.0	--	--	--	--	50.8	143.97	1,595.37
P- 42	Mudstone	RAW- 74-47	0.6	2.8	--	--	--	--	80.0	144.57	1,597.05
P- 41	Mudstone, phosphatic	VEM-559-47	1.8	16.0	--	--	--	--	40.9	146.37	1,625.85
P- 40	Mudstone, phosphatic	VEM 558-47	2.2	10.2	--	--	--	--	57.4	148.57	1,648.29
P- 39	Mudstone, phosphatic	VEM-557-47	2.6	11.5	--	--	--	--	53.0	151.17	1,678.19
P- 38	Phosphate rock, argillaceous	VEM-556-47	0.9	19.7	--	--	--	--	35.8	152.07	1,695.92
P- 37	Phosphate rock, argillaceous	VEM-555-47	0.8	18.2	--	--	--	--	38.9	152.87	1,710.48
P- 36	Phosphate rock and mudstone	VEM 554-47	1.0	22.9	--	--	--	--	24.9	153.87	1,733.38
P- 35	Phosphate rock	VEM-553-47	1.8	26.3	--	--	--	--	18.2	155.67	1,780.72
P- 34	Phosphate rock and mudstone	VEM-552-47	1.3	31.5	--	--	--	--	11.0	156.97	1,821.67
P- 33	Phosphate rock and mudstone	VEM-551-47	1.7	21.7	--	--	--	--	29.3	158.67	1,858.56
P- 32	Mudstone, phosphatic	VEM-550-47	1.3	11.0	--	--	--	--	52.0	159.97	1,872.86
P- 31	Mudstone, phosphatic; fos. col. no. 47-HW-261	VEM-549-47	1.6	12.0	--	--	--	--	53.3	161.57	1,892.06
P- 30	Mudstone, phosphatic	VEM-548-47	1.4	13.8	--	--	--	--	50.4	162.97	1,911.38
P- 29	Mudstone, phosphatic	VEM-547-47	1.7	12.8	--	--	--	--	52.8	164.67	1,933.14
P- 28	Mudstone, phosphatic	VEM-546-47	1.5	11.9	--	--	--	--	52.5	166.17	1,950.99
P- 27	Mudstone, phosphatic; fos. col. no. 47-HW-260	VEM-545-47	0.9	12.6	--	--	--	--	52.2	167.07	1,962.33
P- 26	Limestone, argillaceous	VEM-544-47	1.5	1.2	--	--	--	--	26.5	168.57	1,964.13
P- 25	Mudstone, calcareous	VEM-543-47	1.0	4.6	--	--	0.39	--	44.5	169.57	1,968.73
P- 24	Phosphate rock, argillaceous	VEM-542-47	2.2	24.1	3.1	1.25	--	8.12	24.8	171.77	2,021.75
P- 23	Phosphate rock, argillaceous	VEM-541-47	1.7	25.5	2.4	1.08	2.35	9.14	20.8	173.47	2,065.10
P- 22	Phosphate rock, argillaceous	VEM-540-47	0.6	20.4	5.5	1.81	--	7.22	34.9	174.07	2,077.34
P- 21	Mudstone, phosphatic	VEM-539-47	0.4	15.0	6.2	2.09	1.52	7.28	48.7	174.47	2,083.34

P- 20	Mudstone, phosphatic	VEM-538-47	1.2	14.1	6.9	2.30	1.52	6.96	49.6	175.67	2,100.26
P- 19	Mudstone	VEM-537-47	0.4	6.3	9.7	3.17	0.62	5.36	70.7	176.07	2,102.78
P- 18	Phosphate rock, argillaceous; fos. col. no. 47-HW-247	VEM-536-47	1.8	27.1	--	--	--	6.48	21.7	177.87	2,151.56
P- 17	Phosphate rock	VEM-535-47	1.7	28.6	2.5	1.02	--	6.12	18.8	179.57	2,200.18
P- 16	Phosphate rock	VEM-534-47	1.9	29.1	2.9	1.07	--	6.54	19.2	181.47	2,255.47
P- 15	Mudstone, phosphatic	VEM-533-47	0.5	12.8	8.0	2.40	--	6.64	54.0	181.97	2,261.87
P- 14	Phosphate rock, argillaceous	VEM-532-47	0.7	26.9	4.1	1.25	--	5.70	22.2	182.67	2,280.70
P- 13	Mudstone, phosphatic	VEM-531-47	0.5	15.9	6.9	2.31	1.59	7.44	43.9	183.17	2,288.65
P- 12	Phosphate rock, argillaceous; fos. col. no. 47-HW-246	VEM-530-47	2.4	24.5	3.9	1.21	--	6.50	26.2	185.57	2,347.45
P- 11	Phosphate rock, argillaceous	VEM-529-47	0.8	21.4	5.9	2.46	--	5.34	33.9	186.37	2,364.57
P- 10	Phosphate rock	VEM-528-47	1.6	33.2	1.0	0.54	2.84	6.02	6.4	187.97	2,417.69
P- 9	Phosphate rock	VEM-527-47	1.2	32.7	1.4	0.66	--	5.98	6.0	189.17	2,456.93
P- 8	Phosphate rock	VEM-526-47	1.3	33.7	1.2	0.56	--	5.64	4.4	190.47	2,500.74
P- 7	Phosphate rock	VEM-525-47	1.5	33.4	0.53	0.44	--	7.08	4.9	191.97	2,550.84
P- 6	Phosphate rock	VEM-524-47	0.7	32.3	1.7	0.82	--	5.86	8.4	192.67	2,573.45
P- 5	Phosphate rock, argillaceous	VEM-523-47	1.0	25.4	4.5	1.27	--	6.46	22.9	193.67	2,598.85
P- 4	Mudstone	VEM-522-47	1.0	3.9	9.7	4.18	--	7.00	69.7	194.67	2,602.75
P- 3	Mudstone	VEM-521-47	2.5	1.2	10.	3.61	--	5.32	78.7	197.17	2,605.75
P- 2	Phosphate rock	VEM-520-47	0.6	33.7	1.4	0.66	3.33	4.06	7.2	197.77	2,625.97
P- 1	Phosphate rock and mudstone	VEM-519-47	0.6	26.2	5.1	2.32	--	5.02	19.0	198.37	2,641.69
	Wells formation										
Cw- 1	Dolomite; fos. col. no. 47-HW-244	VEM-518-47	3.2	1.0	--	--	--	--	4.8	3.2	3.20
Cw- 2	Phosphate rock	--	0.1	--	--	--	--	--	--	3.3	--
Cw- 3	Dolomite; fos. col. no. 47-HW-245	--	4.0	--	--	--	--	--	--	7.3	--

WEST DAIRY, IDAHO. LOT NO. 1208.

Phosphatic shale member and part of Rex member of Phosphoria formation sampled in bulldozer trench near SE corner of NE¼SE¼ sec. 19, T. 9 S., R. 44 E., Caribou County, Idaho, on west limb of Dairy syncline. Beds strike N. 64° W. and dip 85° NE. Section measured by F. C. Armstrong, V. E. McKelvey, L. E. Smith, and R. A. Weeks and sampled by O. A. Payne and R. A. Smart in September 1947. Samples analyzed for P_2O_5 and acid insoluble by U. S. Bureau of Mines Laboratory, Albany, Oregon, and for other constituents by Trace Elements Section Laboratory, U. S. Geological Survey, Washington, D. C.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	Loss on ignition	Acid insoluble		
Rex member of Phosphoria formation—basal beds only										
R- 4	Mudstone and chert; fos. col. no. 47-HW-139[1]	FCA-267-47	1.7	1.6	--	--	--	89.4	1.7	2.72
R- 3	Chert	FCA-268-47	1.0	0.5	--	--	--	93.9	2.7	3.22
R- 2	Mudstone and chert	FCA-269-47	0.25	1.7	--	--	--	90.1	2.95	3.65
R- 1	Chert, phosphatic	FCA-270-47	0.25	15.6	--	--	--	53.1	3.20	7.55
Phosphatic shale member of Phosphoria formation										
P-193	Mudstone, phosphatic	FCA-271-47	0.2	8.7	--	--	--	58.1	0.2	1.74
P-192	Mudstone	FCA-272-47	0.8	0.8	--	--	--	78.7	1.0	2.38
P-191	Mudstone, phosphatic	FCA-273-47	0.4	7.8	--	--	--	60.1	1.4	5.50
P-190	Mudstone	FCA-281-47	1.4	3.6	--	--	--	70.8	2.8	10.54
P-189	Mudstone; fos. col. no. 47-HW-140	FCA-280-47	2.9	1.3	--	--	--	75.0	5.7	14.31
P-188	Mudstone; fos. col. no. 47-HW-141	FCA-279-47	1.7	1.8	--	--	--	73.5	7.4	17.37
P-187	Mudstone; fos. col. no. 47-HW-142	FCA-278-47	0.5	3.7	--	--	--	70.2	7.9	19.22
P-186	Mudstone	FCA-277-47	0.9	3.2	--	--	--	75.5	8.8	22.10
P-185	Mudstone, phosphatic	FCA-276-47	0.35	15.7	--	--	--	46.9	9.15	27.60
P-184	Mudstone	FCA-275-47	1.4	1.7	--	--	--	77.0	10.55	29.98
P-183	Phosphate rock, argillaceous	FCA-274-47	0.35	19.0	--	--	--	37.1	10.90	36.63
P-182	Phosphate rock	RAW- 1-47	0.2	32.5	--	--	--	12.7	11.10	43.13
P-181	Mudstone	RAW- 2-47	1.1	2.8	--	--	--	73.0	12.20	46.21
P-180	Mudstone; fos. col. no. 47-HW-143	RAW- 3-47	0.9	0.6	--	--	--	79.3	13.10	46.75
P-179	Mudstone	RAW- 4-47	1.5	4.7	--	--	--	67.5	14.60	53.80
P-178	Mudstone; fos. col. no. 47-HW-144	RAW- 5-47	1.3	2.9	--	--	--	73.7	15.90	57.57
P-177	Phosphate rock	RAW- 6-47	0.5	30.5	--	--	--	15.3	16.40	72.82
P-176	Mudstone	RAW- 7-47	1.3	3.7	--	--	--	70.14	17.70	77.63
P-175	Mudstone; fos. col. no. 47-HW-145	RAW- 8-47	1.6	1.0	--	--	--	80.9	19.30	79.23
P-174	Phosphate rock	RAW- 9-47	0.5	32.3	1.8	0.40	4.98	11.4	19.80	95.38
P-173	Phosphate rock	RAW- 10-47	0.9	32.8	1.7	0.45	5.18	9.4	20.70	124.90
P-172	Phosphate rock	RAW- 11-47	0.5	33.3	2.2	0.33	5.30	8.7	21.20	141.55
P-171	Phosphate rock	RAW- 12-47	0.9	33.6	2.0	0.35	4.24	8.7	22.10	171.79
P-170	Mudstone, phosphatic	RAW- 13-47	0.7	14.5	7.8	2.50	6.62	48.6	22.80	181.94
P-169	Phosphate rock, argillaceous	RAW- 14-47	0.8	18.2	5.5	1.83	6.40	40.9	23.60	196.50

P-168	Phosphate rock, argillaceous	RAW- 15-47	0.9	20.2	5.0	1.65	5.80	36.6	24.50	214.68
P-167	Phosphate rock	RAW- 16-47	0.7	33.9	1.2	0.63	4.58	5.8	25.20	238.41
P-166	Phosphate rock and phosphatic mudstone	RAW- 17-47	1.0	16.9	7.3	2.00	5.88	44.5	26.20	255.31
P-165	Phosphate rock	VEM-304-47	0.3	33.8	1.5	0.70	4.24	9.0	26.50	265.45
P-164	Phosphate rock and argillaceous phosphate rock	VEM-303-47	1.0	25.9	3.2	1.15	5.20	25.6	27.50	291.35
P-163	Phosphate rock, argillaceous	VEM-302-47	0.8	26.1	3.9	1.26	6.86	21.0	28.30	312.23
P-162	Phosphate rock, argillaceous	VEM-301-47	1.3	20.5	5.2	1.75	6.20	37.0	29.60	338.88
P-161	Phosphate rock, argillaceous	VEM-300-47	0.3	20.9	6.6	1.85	7.60	32.3	29.90	345.15
P-160	Mudstone, phosphatic	VEM-299-47	0.9	11.4	9.5	2.91	8.24	53.3	30.80	355.41
P-159	Phosphate rock and phosphatic mudstone	VEM-298-47	0.7	12.6	8.07	2.73	8.32	50.3	31.50	364.23
P-158	Phosphate rock, argillaceous and phosphate rock	VEM-297-47	0.7	23.0	5.3	1.63	5.88	29.5	32.20	380.33
P-157	Phosphate rock	VEM-296-47	0.4	32.8	1.3	0.59	4.98	10.6	32.60	393.45
P-156	Phosphate rock	VEM-295-47	0.6	33.1	1.5	0.52	4.70	10.0	33.20	413.31
P-155	Phosphate rock	VEM-294-47	1.0	32.3	1.9	0.68	5.88	10.4	34.20	445.61
P-154	Phosphate rock	VEM-293-47	0.8	28.1	2.4	0.43	7.22	17.6	35.00	468.09
P-153	Phosphate rock, argillaceous	RAG-131-47	1.0	20.1	5.7	1.68	13.7	27.4	36.00	488.19
P-152	Phosphate rock, argillaceous	RAG-130-47	1.1	21.4	5.2	1.68	13.8	25.0	37.10	511.73
P-151	Phosphate rock, argillaceous	RAG-129-47	1.5	23.1	4.4	1.58	13.1	21.5	38.60	546.38
P-150	Phosphate rock, argillaceous; fos. col. no. 47-HW-146	RAG-128-47	1.0	21.9	5.1	1.70	13.0	26.3	39.60	568.28
P-149	Phosphate rock, argillaceous	RAG-127-47	1.22	19.6	5.7	2.08	11.9	31.4	40.82	592.18
P-148	Mudstone, phosphatic	RAG-126-47	1.05	15.5	--	--	--	39.2	41.87	608.48
P-147	Mudstone, phosphatic	RAG-125-47	1.5	12.4	--	--	--	49.3	43.37	627.08
P-146	Mudstone	RAG-108-47	0.95	7.0	--	--	--	68.6	44.32	633.73
P-145	Mudstone	RAG-107-47	0.7	1.7	--	--	--	78.7	45.02	634.92
P-144	Mudstone, phosphatic; fos. col. no. 47-HW-175	RAG-124-47	2.6	13.2	--	--	--	49.4	47.62	669.24
P-143	Mudstone, phosphatic	RMC- 89-47	1.2	13.0	--	--	--	53.1	48.82	684.84
P-142	Mudstone	RMC- 88-47	0.8	5.6	--	--	--	72.0	49.62	689.32
P-141	Mudstone, phosphatic	RMC- 87-47	1.1	7.9	--	--	--	66.6	50.72	698.01
P-140	Mudstone, phosphatic; fos. col. no. 47-HW-147	RMC- 86-47	0.7	12.3	--	--	--	55.7	51.42	706.62
P-139	Mudstone	RMC- 85-47	1.0	1.6	--	--	--	78.2	52.42	708.22
P-138	Mudstone, phosphatic	RMC- 84-47	2.4	8.5	--	--	--	70.6	54.82	728.62
P-137	Mudstone	RMC- 83-47	1.6	3.3	--	--	--	82.6	56.42	733.90
P-136	Mudstone, phosphatic	RMC- 82-47	0.9	10.9	--	--	--	63.2	57.32	743.71
P-135	Mudstone, phosphatic	VEM-310-47	0.7	12.6	--	--	--	56.0	58.02	752.53
P-134	Mudstone	VEM-309-47	2.3	7.7	--	--	--	71.0	60.32	770.24
P-133	Mudstone	VEM-308-47	1.8	5.5	--	--	--	75.5	62.12	780.14

[1] Fossil collection made by H. Wedow, Paleontology and Stratigraphy Branch, U. S. Geological Survey.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative Thick (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	Loss on ignition	Acid insoluble		
P-132	Mudstone	VEM-307-47	1.7	2.9	--	--	--	83.6	63.82	785.07
P-131	Mudstone	VEM-306-47	1.9	2.2	--	--	--	77.8	65.72	789.25
P-130	Mudstone	VEM-305-47	2.0	3.8	--	--	--	81.1	67.72	796.85
P-129	Mudstone, phosphatic	RAG-138-47	0.51	8.7	--	--	--	63.8	68.23	801.29
P-128	Phosphate rock, argillaceous	RAG-137-47	0.65	27.1	--	--	--	26.9	68.88	818.89
P-127	Mudstone, phosphatic	RAG-136-47	1.02	8.7	--	--	--	64.3	69.90	827.75
P-126	Mudstone	RAG-135-47	1.25	6.6	--	--	--	71.9	71.15	836.00
P-125	Mudstone and phosphatic mudstone	RAG-134-47	0.4	15.6	--	--	--	49.2	71.55	842.24
P-124	Mudstone; fos. col. no. 47-HW-148	RAG-133-47	2.15	6.5	--	--	--	71.2	73.70	856.23
P-123	Mudstone	RAG-132-47	0.6	3.5	--	--	--	71.4	74.30	858.33
P-122	Mudstone, phosphatic; fos. col. no. 47-HW-149	RAW- 24-47	1.1	12.3	--	--	--	58.6	75.40	871.86
P-121	Mudstone	RAW- 23-47	1.0	7.1	--	--	--	66.3	76.40	878.96
P-120	Mudstone, phosphatic; fos. col. no. 47-HW-150	RAW- 22-47	0.8	9.1	--	--	--	65.2	77.20	886.24
P-119	Mudstone, phosphatic; fos. col. no. 47-HW-150	RAW- 21-47	0.3	17.9	--	--	--	46.6	77.50	891.61
P-118	Mudstone, phosphatic	RAW- 20-47	1.3	11.0	--	--	--	54.6	78.80	905.91
P-117	Mudstone; fos. col. no. 47-HW-151	RAW- 19-47	1.2	4.7	--	--	--	73.2	80.00	911.55
P-116	Mudstone, phosphatic	RAW- 18-47	1.3	14.9	--	--	--	52.0	81.30	930.92
P-115	Mudstone	FCA-288-47	1.2	1.0	--	--	--	28.0	82.50	932.12
P-114	Mudstone	FCA-287-47	1.3	3.4	--	--	--	80.3	83.80	936.54
P-113	Mudstone	FCA-286-47	0.9	0.6	--	--	--	90.5	84.70	937.08
P-112	Mudstone, phosphatic	FCA-285-47	0.4	17.3	--	--	--	45.1	85.10	944.00
P-111	Mudstone	FCA-284-47	1.7	3.0	--	--	--	82.5	86.80	949.10
P-110	Mudstone	FCA-283-47	0.8	4.7	--	--	--	76.7	87.60	952.86
P-109	Mudstone	FCA-282-47	1.0	0.8	--	--	--	89.8	88.60	953.66
P-108	Phosphate rock, argillaceous	RMC- 81-47	0.3	29.1	--	--	--	20.0	88.90	962.39
P-107	Mudstone	RMC- 80-47	0.75	3.7	--	--	--	78.3	89.65	965.17
P-106	Phosphate rock, argillaceous	RAG-106-47	0.3	23.6	--	--	--	32.8	89.95	972.25
P-105	Phosphate rock, argillaceous	RAG-105-47	0.8	0.2	--	--	--	91.4	90.75	972.41
P-104	Mudstone, phosphatic	RAG-104-47	0.4	8.0	--	--	--	69.4	91.15	975.61
P-103	Mudstone; fos. col. no. 47-HW-136	RAG-103-47	0.75	0.4	--	--	--	90.0	91.90	975.91
P-102	Mudstone, phosphatic	RAG-102-47	0.75	11.0	--	--	--	62.6	92.65	984.16
P-101	Mudstone	RAG-101-47	1.05	2.8	--	--	--	82.0	93.70	987.10
P-100	Phosphate rock	RAG-100-47	0.9	32.3	--	--	--	12.2	94.60	1,016.17
P- 99	Mudstone and phosphatic mudstone	RAG- 99-47	0.85	9.1	--	--	--	69.4	95.45	1,023.91
P- 98	Phosphate rock	VEM-288-47	0.9	33.5	--	--	--	9.9	96.35	1,054.06
P- 97	Mudstone	VEM-287-47	3.8	0.9	--	--	--	89.4	100.15	1,057.48
P- 96	Mudstone and phosphate rock	VEM-286-47	0.8	10.6	--	--	--	62.3	100.95	1,065.96
P- 95	Phosphate rock, cherty	VEM-285-47	1.3	27.0	--	--	--	25.8	102.25	1,069.47

P- 94	Phosphate rock, sandy; fos. col. no. 47-HW-135	RMC- 75-47	0.4	28.0	--	--	--	23.0	102.65	1,080.67
P- 93	Mudstone, phosphatic	RMC- 74-47	0.4	15.4	--	--	--	47.6	103.05	1,086.83
P- 92	Mudstone, phosphatic; fos. col. no. 47-HW-137	RMC- 73-47	0.9	9.2	--	--	--	65.9	103.95	1,095.11
P- 91	Mudstone, phosphatic and phosphate rock; fos. col. no. 47-HW-134	RMC- 72-47	0.3	9.7	--	--	--	61.1	104.25	1,098.02
P- 90	Mudstone and phosphatic mudstone	RMC- 71-47	0.7	6.0	--	--	--	70.5	104.95	1,102.22
P- 89	Mudstone, phosphatic	RMC- 79-47	0.25	8.6	--	--	--	53.9	105.20	1,104.37
P- 88	Mudstone	RMC- 78-47	0.5	3.9	--	--	--	74.7	105.70	1,106.32
P- 87	Mudstone	RMC- 77-47	0.4	1.6	--	--	--	81.9	106.10	1,106.96
P- 86	Mudstone and phosphatic mudstone	RMC- 76-47	1.0	7.7	--	--	--	64.3	107.10	1,114.66
P- 85	Phosphate rock, argillaceous	FCA-266-47	0.9	23.2	--	--	--	25.0	108.00	1,135.54
P- 84	Mudstone, phosphatic	FCA-265-47	0.5	12.1	--	--	--	54.0	108.50	1,141.59
P- 83	Mudstone, phosphatic	FCA-264-47	0.9	15.1	--	--	--	41.2	109.40	1,155.18
P- 82	Mudstone	FCA-263-47	0.9	4.7	--	--	--	69.6	110.30	1,159.41
P- 81	Phosphate rock, argillaceous	FCA-262-47	0.4	15.2	--	--	--	38.1	110.70	1,165.49
P- 80	Phosphate rock, argillaceous	FCA-261-47	0.4	19.7	--	--	--	30.3	111.10	1,173.37
P- 79	Mudstone, phosphatic	FCA-260-47	1.8	13.7	--	--	--	44.0	112.90	1,198.03
P- 78	Mudstone, phosphatic; fos. col. no. 47-HW-133	FCA-259-47	1.6	10.3	--	--	--	55.0	114.50	1,214.51
P- 77	Mudstone	RAG- 98-47	1.45	3.8	--	--	--	75.0	115.95	1,220.01
P- 76	Mudstone	RAG- 97-47	0.28	0.5	--	--	--	93.8	116.23	1,220.15
P- 75	Chert	RAG- 96-47	0.35	0.7	--	--	--	93.3	116.58	1,220.40
P- 74	Mudstone	RAG- 95-47	0.63	2.1	--	--	--	85.1	117.21	1,221.72
P- 73	Mudstone	RAG- 94-47	0.75	4.1	--	--	--	74.3	117.96	1,224.80
P- 72	Mudstone	RAG- 93-47	1.8	3.5	--	--	--	73.8	119.76	1,231.10
P- 71	Mudstone	RAG- 92-47	0.69	4.1	--	--	--	71.8	120.45	1,233.92
P- 70	Mudstone	RAG- 91-47	1.6	1.1	--	--	--	84.8	122.05	1,235.68
P- 69	Mudstone and phosphate rock	RMC- 70-47	0.63	3.5	--	--	--	76.9	122.68	1,237.89
P- 68	Mudstone and phosphate rock	RMC- 69-47	0.8	8.0	--	--	--	59.2	123.48	1,244.29
P- 67	Mudstone; fos. col. no. 47-HW-132	RMC- 68-47	1.4	3.2	--	--	--	79.0	124.88	1,248.77
P- 66	Mudstone	RMC- 67-47	0.5	4.4	--	--	--	77.2	125.38	1,250.97
P- 65	Mudstone, phosphatic	RMC- 66-47	0.5	8.7	--	--	--	61.8	125.88	1,255.32
P- 64	Mudstone	RMC- 65-47	1.0	1.2	--	--	--	85.5	126.88	1,256.52
P- 63	Mudstone	RMC- 64-47	0.7	0.6	--	--	--	86.3	127.58	1,256.94
P- 62	Mudstone, phosphatic	FCA-258-47	1.7	8.7	--	--	--	59.5	129.28	1,271.73
P- 61	Mudstone, phosphatic	FCA-257-47	1.4	12.0	--	--	--	52.7	130.68	1,288.53
P- 60	Mudstone	FCA-256-47	0.85	4.6	--	--	--	74.8	131.53	1,292.44
P- 59	Mudstone	FCA-255-47	0.7	5.6	--	--	--	68.5	132.23	1,296.36
P- 58	Mudstone, phosphatic	FCA-254-47	0.5	8.7	--	--	--	63.4	132.73	1,300.71
P- 57	Mudstone, phosphatic	FCA-253-47	1.0	11.0	--	--	--	56.5	133.73	1,311.71
P- 56	Mudstone, phosphatic	FCA-252-47	2.0	15.1	--	--	--	45.6	135.73	1,341.91
P- 55	Mudstone, phosphatic	FCA-251-47	1.1	11.5	--	--	--	53.7	136.83	1,354.56

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	Loss on ignition	Acid insoluble		
P- 54	Mudstone, phosphatic	VEM-284-47	1.4	11.9	--	--	--	55.0	138.23	1,371.22
P- 53	Mudstone, phosphatic	VEM-283-47	1.1	12.4	--	--	--	53.0	139.33	1,384.86
P- 52	Mudstone, phosphatic	VEM-282-47	1.5	14.7	--	--	--	46.9	140.83	1,406.91
P- 51	Mudstone, phosphatic	VEM-281-47	2.0	11.2	--	--	--	56.1	142.83	1,429.31
P- 50	Mudstone, phosphatic	VEM-280-47	2.0	13.5	--	--	--	50.3	144.83	1,456.31
P- 49	Phosphate rock, argillaceous	VEM-279-47	0.9	21.6	7.5	2.83	5.06	34.7	145.73	1,475.75
P- 48	Phosphate rock	VEM-278-47	0.8	28.1	5.2	1.75	3.94	19.4	146.53	1,498.23
P- 47	Phosphate rock	VEM-277-47	0.7	31.4	1.1	0.15	3.22	14.2	147.23	1,520.21
P- 46	Phosphate rock	VEM-276-47	0.5	35.3	2.0	1.13	2.20	6.7	147.73	1,537.86
P- 45	Phosphate rock, argillaceous	VEM-275-47	0.3	27.6	4.4	2.60	4.18	20.9	148.03	1,546.14
P- 44	Phosphate rock and mudstone	LES- 425-47	0.75	18.6	7.8	3.31	6.38	38.3	148.78	1,560.09
P- 43	Phosphate rock	LES- 424-47	0.5	31.6	2.4	1.66	5.02	12.1	149.28	1,575.89
P- 42	Phosphate rock	LES- 423-47	0.8	33.5	2.7	1.2	3.02	10.6	150.08	1,602.69
P- 41	Phosphate rock and mudstone	LES- 422-47	1.0	24.0	7.3	1.99	6.34	27.9	151.08	1,626.69
P- 40	Phosphate rock	LES- 421-47	1.15	30.8	1.6	1.28	3.94	16.2	152.23	1,662.11
P- 39	Mudstone, phosphatic, and argillaceous phosphate rock	LES- 420-47	0.85	17.6	7.1	2.55	7.06	41.8	153.08	1,677.06
P- 38	Phosphate rock and phosphatic mudstone	LES- 419-47	0.5	21.3	4.7	2.34	6.68	33.4	153.58	1,687.71
P- 37	Mudstone, phosphatic	LES- 418-47	0.45	16.4	6.7	2.52	6.28	48.1	154.03	1,695.09
P- 36	Mudstone, phosphatic	LES- 417-47	0.9	11.4	--	--	--	57.5	154.93	1,705.35
P- 35	Mudstone, phosphatic	LES- 416-47	2.2	13.8	--	--	--	50.8	157.13	1,735.71
P- 34	Mudstone, phosphatic; fos. col. no. 47-HW-131	LES- 415-47	0.45	10.4	--	--	--	56.9	157.58	1,740.39
P- 33	Mudstone, phosphatic	LES- 414-47	0.65	14.4	--	--	--	49.3	158.23	1,749.75
P- 32	Mudstone, phosphatic	LES- 413-47	0.65	7.8	--	--	--	64.4	158.88	1,754.82
P- 31	Mudstone	LES- 412-47	0.5	2.7	--	--	--	77.2	159.38	1,756.17
P- 30	Mudstone, phosphatic	LES- 411-47	0.3	15.2	--	--	--	46.8	159.68	1,760.73
P- 29	Phosphate rock and mudstone; fos. col. no. 47-HW-138	RMC- 63-47	0.9	22.2	4.3	1.50	5.86	32.5	160.58	1,780.71
P- 28	Phosphate rock and mudstone	RMC- 62-47	1.3	28.9	0.66	0.28	5.04	17.3	161.88	1,818.28
P- 27	Phosphate rock	RMC- 61-47	0.75	29.5	2.8	0.83	4.64	17.6	162.63	1,840.43
P- 26	Phosphate rock, argillaceous	FCA-250-47	0.4	25.6	4.2	1.29	4.78	26.5	163.03	1,850.67
P- 25	Phosphate rock, argillaceous	FCA-249-47	0.9	27.2	3.6	1.42	4.78	23.7	163.93	1,875.15
P- 24	Mudstone, phosphatic	FCA-248-47	1.3	14.2	7.8	1.99	6.90	51.4	165.23	1,893.61
P- 23	Phosphate rock	FCA-247-47	1.25	29.2	2.7	1.12	6.34	17.0	166.48	1,928.65
P- 22	Phosphate rock, argillaceous	FCA-246-47	1.05	26.7	3.6	1.26	6.34	24.4	167.53	1,956.65
P- 21	Phosphate rock	RAG- 90-47	1.75	28.5	6.7	0.70	7.26	17.6	169.28	2,006.65
P- 20	Mudstone, phosphatic	RAG- 89-47	0.88	15.1	2.4	1.75	6.70	50.6	170.16	2,019.94
P- 19	Phosphate rock and mudstone	RAG- 88-47	1.2	25.0	4.7	1.24	6.08	26.4	171.36	2,049.94
P- 18	Phosphate rock, argillaceous	RAG- 87-47	1.5	25.1	5.5	1.28	7.14	24.8	172.86	2,087.59
P- 17	Phosphate rock, argillaceous	RAG- 86-47	0.6	22.7	4.1	1.37	4.46	34.5	173.46	2,101.21
P- 16	Phosphate rock, argillaceous	RAG- 85-47	0.52	24.5	3.9	1.52	4.40	31.0	173.98	2,113.96

P- 15	Phosphate rock	RAG- 84-47	0.66	30.1	2.5	1.13	5.84	14.5	174.64	2,133.86
P- 14	Phosphate rock	RAG- 83-47	1.2	32.1	2.8	0.91	6.50	9.4	175.84	2,172.38
P- 13	Phosphate rock and phosphatic mudstone	RAG- 82-47	0.9	31.6	1.8	0.91	6.56	9.9	176.74	2,200.82
P- 12	Phosphate rock	RAG- 81-47	0.97	31.7	1.9	0.89	6.28	9.1	177.71	2,232.52
P- 11	Phosphate rock	RAG- 80-47	0.92	32.1	2.4	0.93	6.12	8.1	178.63	2,262.05
P- 10	Phosphate rock	RAG- 79-47	1.05	34.3	1.3	0.71	5.76	4.3	179.68	2,298.05
P- 9	Phosphate rock	RAG- 78-47	1.2	33.6	1.0	0.67	5.78	6.0	180.88	2,338.37
P- 8	Phosphate rock, argillaceous	LES- 410-47	0.35	25.8	3.3	1.24	5.50	22.2	181.23	2,347.41
P- 7	Phosphate rock	LES- 409-47	0.6	27.6	2.0	0.84	5.82	18.9	181.83	2,363.97
P- 6	Mudstone	LES- 408-47	0.6	4.3	--	--	--	65.2	182.43	2,366.55
P- 5	Mudstone, phosphatic	LES- 407-47	0.6	8.9	--	--	--	58.7	183.03	2,371.89
P- 4	Mudstone	LES- 406-47	1.5	1.5	--	--	--	79.2	184.53	2,374.14
P- 3	Mudstone	LES- 405-47	1.1	1.2	--	--	--	79.8	185.63	2,375.46
P- 2	Mudstone	LES- 404-47	1.2	2.3	--	--	--	76.1	186.83	2,378.22
P- 1	Phosphate rock and phosphatic mudstone; fos. col. no. 47-HW-130	LES- 403-47	0.4	34.7	--	--	--	6.5	187.23	2,392.10
				Wells formation						
Cw-12	Mudstone, contains limestone nodules	LES- 402-47	0.3	5.4	--	--	--	46.8	0.3	1.62
Cw-11	Limestone; fos. col. no. 47-HW-126	LES- 401-47	2.8	0.7	--	--	--	5.0	3.1	3.58
Cw-10	Limestone; fos. col. no. 47-HW-127	--	0.8	--	--	--	--	--	3.9	--
Cw- 9	Limestone and mudstone; fos. col. no. 47-HW-128	--	2.0	--	--	--	--	--	5.9	--
Cw- 8	Limestone; fos. col. no. 47-HW-129	--	3.3	--	--	--	--	--	9.2	--
Cw- 7	Chert	--	0.9	--	--	--	--	--	10.1	--
Cw- 6	Limestone	--	4.5	--	--	--	--	--	14.6	--
Cw- 5	Limestone	--	3.0	--	--	--	--	--	17.6	--
Cw- 4	Limestone	--	1.8	--	--	--	--	--	19.4	--
Cw- 3	Limestone	--	0.5	--	--	--	--	--	19.9	--
Cw- 2	Chert	--	0.7	--	--	--	--	--	20.6	--
Cw- 1	Limestone	--	--	--	--	--	--	--	--	--

MONTPELIER CANYON, IDAHO. LOT NOS. 1207 AND 1236.

Phosphoria formation measured and sampled in hand trenches on westward-dipping fault block, northwest side of Montpelier Canyon three miles east of Montpelier, sec. 31, T. 12 S., R. 45 E., Bear Lake County, Idaho. Most of section (lot no. 1207) measured in long trench, exposing strata that strike N. 18° E. and dip 29° W., by F. C. Armstrong, R. M. Campbell, R. A. Gulbrandsen, and R. A. Hoppin and sampled by Campbell, O. A. Payne, R. A. Smart, and R. S. Sears during August 1947. Lower part of phosphatic shale (lot no. 1236) measured in two trenches 425 feet to the southwest exposing strata that strike N. 32° E. and dip 30° NW., by R. A. Gulbrandsen and R. P. Sheldon and sampled by R. A. Smart in September 1948. Samples analyzed for P_2O_5, F, and acid insoluble by U. S. Bureau of Mines Laboratory, Albany, Oregon, and for other constituents by Trace Elements Laboratory, U. S. Geological Survey, Washington, D. C.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)						Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	F	Loss on ignition	Acid insoluble		
Dinwoody formation—basal bed only—lot no. 1207											
Trd- 1	Limestone, argillaceous; fos. col. no. 47-HW-187[1]	RAH-242-47	4.0	0.8	--	--	--	--	46.8	4.0	3.20
Upper shale member of Phosphoria formation—lot no. 1207											
U- 12	Chert, phosphatic; fos. col. no. 47-HW-186	RAH-243-47	0.5	16.3	--	--	--	--	44.6	0.5	8.15
U- 11	Limestone, argillaceous	RAH-244-47	2.1	1.6	--	--	--	--	29.3	2.6	11.51
U- 10	Mudstone, calcareous	RAH-245-47	2.9	0.7	--	--	--	--	52.4	5.5	13.54
U- 9	Mudstone	RAH-246-47	3.4	1.4	--	--	--	--	69.8	8.9	18.30
U- 8	Mudstone	RAH-247-47	1.2	1.5	--	--	--	--	68.0	10.1	20.10
U- 7	Mudstone	RAH-248-47	1.6	2.4	--	--	--	--	70.6	11.7	23.94
U- 6	Limestone, argillaceous	RAH-249-47	1.3	1.2	--	--	--	--	40.8	13.0	25.50
U- 5	Mudstone	RAH-250-47	2.6	1.3	--	--	--	--	75.9	15.6	28.88
U- 4	Limestone, argillaceous	RAH-251-47	2.6	0.9	--	--	--	--	37.9	18.2	31.22
U- 3	Chert	RAH-252-47	2.1	1.4	--	--	--	--	82.0	20.3	34.16
U- 2	Chert, calcareous	RAH-253-47	4.7	1.5	--	--	--	--	61.1	25.0	41.21
U- 1	Mudstone	RAH-254-47	5.0	2.9	--	--	--	--	64.9	30.0	55.71
Rex member of Phosphoria formation—lot no. 1207											
R- 27	Limestone, cherty; fos. col. no. 47-HW-185	RAH-255-47	2.5	0.6	--	--	--	--	35.4	2.5	1.5
R- 26	Limestone, cherty; fos. col. no. 47-HW-184	RAH-256-47	2.2	0.6	--	--	--	--	45.9	4.7	2.82
R- 25	Chert, calcareous; fos. col. no. 47-HW-183	RAH-257-47	9.8	0.4	--	--	--	--	64.4	14.5	6.74
R- 24	Chert, calcareous	RAH-258-47	9.6	0.6	--	--	--	--	75.2	24.1	12.50
R- 23	Chert, calcareous	RAH-259-47	9.0	0.5	--	--	--	--	71.1	33.1	17.00
R- 22	Chert, calcareous	RAH-260-47	9.3	0.4	--	--	--	--	76.6	42.4	20.72
R- 21	Chert, calcareous	RAH-261-47	12.5	0.3	--	--	--	--	68.6	54.9	24.47

R- 20	Chert, calcareous	RAH-262-47	7.0	0.5	--	--	--	--	74.7	61.9	27.97
R- 19	Chert, calcareous	RAH-263-47	12.8	0.8	--	--	--	--	76.8	74.7	38.21
R- 18	Limestone, cherty	RAH-264-47	4.0	0.5	--	--	--	--	42.1	78.7	40.21
R- 17	Limestone, cherty	RAH-265-47	6.0	0.5	--	--	--	--	47.4	84.7	43.21
R- 16	Chert, calcareous	RAH-266-47	8.9	0.4	--	--	--	--	70.0	93.6	45.77
R- 15	Limestone, argillaceous	RAH-267-47	5.2	0.5	--	--	--	--	33.5	98.8	48.37
R- 14	Chert and limestone	RAH-268-47	4.4	0.6	--	--	--	--	67.0	103.2	51.01
R- 13	Chert, calcareous	RAH-269-47	4.5	0.3	--	--	--	--	53.5	107.7	52.36
R- 12	Chert and limestone	RAH-270-47	3.5	0.4	--	--	--	--	48.6	111.2	53.76
R- 11	Limestone and chert	RAH-271-47	3.8	0.3	--	--	--	--	46.8	115.0	54.90
R- 10	Limestone and chert; fos. col. no. 47-HW-182	RAH-272-47	4.3	0.4	--	--	--	--	33.4	119.3	56.62
R- 9	Chert, calcareous	RAH-273-47	3.0	0.5	--	--	--	--	73.4	122.3	58.12
R- 8	Limestone and chert	RAH-274-47	2.9	0.4	--	--	--	--	50.6	125.2	59.28
R- 7	Chert and limestone	RAH-275-47	5.0	0.3	--	--	--	--	53.7	130.2	60.78
R- 6	Limestone and chert	RAG- 51-47	3.65	0.4	--	--	--	--	36.8	133.85	62.24
R- 5	Chert, calcareous	RAG- 64-47	0.6	0.4	--	--	--	--	69.2	134.45	62.48
R- 4	Chert	RAG- 63-47	0.35	0.8	--	--	--	--	70.5	134.80	62.76
R- 3	Limestone, cherty	RAG- 62-47	0.4	0.5	--	--	--	--	38.6	135.20	62.96
R- 2	Limestone, argillaceous	FCA-209-47	1.0	0.8	--	--	--	--	21.2	136.20	63.76
R- 1	Chert, calcareous	FCA-210-47	0.3	0.9	—	--	--	--	76.1	136.50	64.03
	Phosphatic shale member of Phosphoria formation—lot nos. 1207 and 1236										
	Lot no. 1207										
P-168	Phosphate rock, argillaceous	FCA-211-47	0.9	21.2	--	--	--	--	32.4	0.9	19.08
P-167	Mudstone, calcareous; fos. col. no. 47-HW-65	FCA-212-47	1.6	1.2	--	--	--	--	68.7	2.5	21.00
P-166	Mudstone; fos. col. no. 47-HW-68	FCA-213-47	1.1	2.5	--	--	--	--	64.6	3.6	23.75
P-165	Mudstone, calcareous	FCA-214-47	0.7	6.3	--	--	--	--	57.5	4.3	28.16
P-164	Mudstone	FCA-215-47	0.8	3.7	--	--	--	--	65.9	5.1	31.12
P-163	Mudstone	FCA-216-47	2.8	0.7	--	--	--	--	79.5	7.9	33.08
P-162	Mudstone	FCA-217-47	0.8	1.3	--	--	--	--	75.8	8.7	34.12
P-161	Mudstone, calcareous	FCA-208-47	0.6	0.5	--	--	--	--	67.7	9.3	34.42
P-160	Mudstone, calcareous; fos. col. no. 47-HW-67	FCA-207-47	0.6	4.8	--	--	--	--	58.8	9.9	37.30
P-159	Mudstone, calcareous; fos. col. no. 47-HW-66	FCA-206-47	1.2	2.4	--	--	--	--	66.7	11.1	40.18
P-158	Limestone; fos. col. no. 47-HW-69	FCA-205-47	1.8	3.7	--	--	--	--	14.9	12.9	46.84
P-157	Phosphate rock, argillaceous	FCA-204-47	0.3	16.6	--	--	--	--	37.7	13.2	51.82
P-156	Mudstone, calcareous	FCA-203-47	1.5	5.1	--	--	--	--	62.4	14.7	59.47
P-155	Mudstone, calcareous	FCA-202-47	0.6	7.0	--	--	--	--	59.1	15.3	63.67
P-154	Mudstone	FCA-201-47	1.0	0.7	--	--	--	--	72.0	16.3	64.37
P-153	Mudstone	FCA-188-47	0.4	5.7	--	--	--	--	62.5	16.7	66.65
P-152	Mudstone	FCA-187-47	0.6	0.6	--	--	--	--	70.0	17.3	67.01

[1] Fossil collection made by H. Wedow, Paleontology and Stratigraphy Branch, U. S. Geological Survey.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)						Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	F	Loss on ignition	Acid insoluble		
P-151	Limestone, argillaceous; fos. col. no. 47-HW-70	FCA-200-47	1.4	0.7	--	--	—	--	45.6	18.7	67.99
P-150	Mudstone, calcareous	FCA-199-47	0.65	3.4	--	--	--	--	64.2	19.35	70.20
P-149	Phosphate rock	FCA-198-47	0.8	31.3	0.49	0.43	3.30	9.42	3.7	20.15	95.24
P-148	Phosphate rock	FCA-197-47	0.75	33.1	0.8	0.34	3.54	6.48	5.7	20.90	120.04
P-147	Phosphate rock	FCA-196-47	0.5	30.9	1.1	04.3	3.26	7.82	7.9	21.40	135.49
P-146	Limestone, phosphatic	FCA-195-47	0.5	12.1	0.3	0.08	--	29.16	3.8	21.90	141.54
P-145	Phosphate rock	FCA-194-47	1.2	33.3	0.3	0.25	--	6.38	4.8	23.10	181.50
P-144	Phosphate rock, argillaceous	FCA-193-47	0.18	22.9	--	--	--	--	29.3	23.28	185.62
P-143	Mudstone, calcareous	FCA-192-47	0.55	2.4	--	--	--	--	47.1	23.83	186.94
P-142	Phosphate rock, argillaceous	FCA-191-47	0.35	18.9	--	--	--	--	30.9	24.18	193.55
P-141	Limestone, argillaceous; fos. col. no. 47-HW-181	FCA-190-47	0.8	2.6	--	--	--	--	35.8	24.98	195.63
P-140	Mudstone, phosphatic	FCA-189-47	0.4	8.7	--	--	--	--	55.9	25.38	199.61
P-139	Limestone, argillaceous; fos. col. no. 47-HW-180	FCA-165-47	1.1	1.1	--	--	--	--	35.2	26.48	200.82
P-138	Phosphate rock	FCA-164-47	0.8	27.2	2.3	1.18	--	6.54	16.3	27.28	222.58
P-137	Mudstone, calcareous	FCA-163-47	0.65	5.7	6.1	2.28	--	17.82	42.8	27.93	226.28
P-136	Phosphate rock	FCA-162-47	0.55	34.2	0.57	0.39	--	5.60	4.7	28.48	245.08
P-135	Limestone	FCA-161-47	0.65	4.9	1.4	0.43	--	32.96	12.0	29.13	248.26
P-134	Phosphate rock	FCA-160-47	0.4	35.7	0.7	0.41	--	4.10	3.9	29.53	262.54
P-133	Phosphate rock, argillaceous	FCA-159-47	0.3	26.8	3.7	1.50	--	4.34	21.9	29.83	270.58
P-132	Phosphate rock	FCA-113-47	0.55	33.8	1.1	0.86	--	4.54	6.7	30.38	291.96
P-131	Phosphate rock	FCA-112-47	1.0	36.4	0.4	0.30	--	3.38	3.3	31.38	328.36
P-130	Phosphate rock	FCA-147-47	1.0	33.8	0.8	0.58	--	4.84	5.8	32.38	362.16
P-129	Phosphate rock, argillaceous	FCA-146-47	0.95	17.4	7.0	2.3	--	6.44	40.3	33.33	378.81
P-128	Phosphate rock	FCA-145-47	0.28	27.8	2.4	1.12	--	9.44	13.2	33.61	386.61
P-127	Phosphate rock, calcareous, argillaceous	FCA- 49-47	0.6	15.0	6.0	1.7	1.41	15.22	29.0	34.21	395.61
P-126	Phosphate rock	FCA- 50-47	0.4	33.0	1.8	1.1	--	5.40	8.3	34.61	396.93
P-125	Phosphate rock	FCA- 51-47	0.75	28.0	1.0	0.55	--	6.32	8.6	35.36	417.93
P-124	Phosphate rock	FCA- 52-47	0.5	36.2	0.9	0.56	--	4.96	1.8	35.86	436.03
P-123	Phosphate rock	FCA- 53-47	0.5	36.2	0.8	0.48	--	4.72	1.9	36.36	454.13
P-122	Phosphate rock	FCA- 54-47	0.4	34.4	1.4	0.66	--	5.92	4.6	36.76	467.89
P-121	Phosphate rock	FCA- 64-47	0.67	35.2	0.8	0.34	--	6.06	3.4	37.43	489.39
P-120	Phosphate rock	FCA- 65-47	0.35	32.1	1.8	0.65	--	7.44	7.9	37.78	500.64
P-119	Phosphate rock	FCA- 66-47	0.4	25.9	3.3	1.2	2.67	15.64	14.9	38.18	511.00
P-118	Phosphate rock	FCA- 67-47	0.6	26.0	2.2	0.86	--	11.04	14.2	38.78	526.60
P-117	Phosphate rock	FCA- 68-47	0.4	28.6	2.1	0.84	--	12.48	10.2	39.18	538.04
P-116	Phosphate rock	FCA- 69-47	0.4	32.8	1.0	0.55	--	9.72	4.9	39.58	551.16
P-115	Phosphate rock	FCA-148-47	0.8	28.0	2.3	1.2	--	12.34	13.7	40.38	573.56
P-114	Phosphate rock, argillaceous	FCA-149-47	0.4	24.1	3.9	1.3	--	11.60	22.3	40.78	583.20

P-113	Phosphate rock, calcareous, argillaceous	FCA-150-47	0.35	21.1	5.4	1.9	--	15.00	22.7	41.13	590.60
P-112	Phosphate rock	FCA-151-47	0.8	27.4	2.3	0.78	--	13.62	14.7	41.93	612.52
P-111	Phosphate rock, argillaceous	RAG- 25-47	2.6	20.1	5.1	1.8	--	15.16	27.3	44.53	664.78
P-110	Mudstone	RAG- 26-47	1.0	1.9	--	--	--	--	78.6	45.53	666.68
P-109	Mudstone, phosphatic	RAG- 27-47	0.56	13.6	--	--	--	--	39.6	46.09	674.28
P-108	Mudstone, phosphatic	RAG- 28-47	1.55	13.7	--	--	--	--	47.1	47.64	695.48
P-107	Mudstone	RAG- 29-47	0.87	2.8	--	--	--	--	77.9	48.51	697.92
P-106	Mudstone	RAG- 30-47	0.92	3.0	--	--	--	--	78.8	49.43	700.68
P-105	Mudstone	RAG- 31-47	0.88	2.2	--	--	--	--	81.1	50.31	702.62
P-104	Phosphate rock; fos. col. no. 47-HW-179	RAG- 32-47	0.55	29.4	--	--	--	--	15.9	50.86	718.82
P-103	Mudstone, phosphatic, calcareous	RAG- 33-47	0.87	14.2	--	--	1.49	--	36.2	51.73	731.20
P-102	Mudstone, phosphatic, calcareous	RAG- 34-47	0.55	11.4	--	--	--	--	44.3	52.28	737.58
P-101	Mudstone, phosphatic	RAG- 35-47	1.45	9.7	--	--	--	--	54.6	53.73	751.68
P-100	Phosphate rock, argillaceous	RAG- 36-47	0.42	18.5	--	--	--	--	35.3	54.15	759.43
P- 99	Mudstone	RAG- 37-47	1.1	7.6	--	--	--	--	63.4	55.25	767.79
P- 98	Mudstone, phosphatic	RAG- 38-47	0.37	11.6	--	--	--	--	52.4	55.62	772.08
P- 97	Mudstone; fos. col. no. 47-HW-178	RAG- 39-47	0.66	7.5	--	--	--	--	64.7	56.28	777.03
P- 96	Phosphate rock, argillaceous; fos. col. no. 47-HW-177	RAG- 40-47	1.9	17.4	--	--	--	--	35.9	58.18	810.09
P- 95	Mudstone, phosphatic, calcareous	RAG- 41-47	1.75	15.5	--	--	1.55	--	39.6	59.93	837.19
P- 94	Mudstone, phosphatic, calcareous	RAG- 42-47	0.91	12.1	--	--	--	--	46.7	60.84	848.19
P- 93	Phosphate rock, calcareous	RAG- 43-47	0.97	18.1	--	--	--	--	14.7	61.81	865.74
P- 92	Phosphate rock, argillaceous	RAG- 44-47	0.58	16.4	8.2	2.6	--	10.14	39.2	62.39	875.25
P- 91	Phosphate rock and phosphatic mudstone	RAG- 45-47	0.96	31.6	1.7	0.68	--	8.80	9.7	63.35	895.65
P- 90	Mudstone, phosphatic	RAG- 46-47	0.48	8.4	11.6	3.6	--	9.12	62.0	63.83	899.69
P- 89	Phosphate rock, argillaceous	RAG- 47-47	0.55	23.7	5.4	1.8	--	10.56	22.6	64.38	912.74
P- 88	Phosphate rock	RAG- 48-47	1.75	31.6	1.8	0.74	--	9.20	8.2	66.13	967.99
P- 87	Mudstone	RAG- 49-47	0.82	7.0	11.3	3.6	--	9.20	64.7	66.95	973.73
P- 86	Phosphate rock	RAG- 50-47	0.55	28.0	3.0	1.1	--	10.38	13.8	67.50	989.13
P- 85	Limestone, argillaceous	RAG- 52-47	0.31	6.8	--	--	--	--	39.7	67.81	991.24
P- 84	Phosphate rock	RAG- 53-47	2.53	24.9	--	--	--	--	18.7	70.34	1,054.24
--	Limestone concretion in bed P-84	RAG- 54-47	(0.0-1.2)	2.4	--	--	--	--	11.9	--	--
P- 83	Phosphate rock, argillaceous	RAG- 55-47	0.51	20.5	--	--	--	--	29.4	70.85	1,064.69
P- 82	Phosphate rock, argillaceous	RAG- 56-47	1.0	23.4	--	--	--	--	23.1	71.85	1,089.09
P- 81	Mudstone, calcareous	RAG- 57-47	0.64	3.5	--	--	--	--	39.3	72.49	1,090.49
P- 80	Phosphate rock	RAG- 58-47	2.2	27.3	--	--	--	--	14.2	74.69	1,150.55

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)						Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	F	Loss on ignition	Acid insoluble		
P- 79	Limestone, argillaceous	RAG- 59-47	1.55	4.8	--	--	0.51	--	20.5	76.24	1,158.49
P- 78	Phosphate rock, argillaceous, calcareous	RAG- 60-47	2.23	17.5	--	--	--	--	33.0	78.47	1,197.49
P- 77	Mudstone, phosphatic	RAG- 61-47	1.4	10.6	--	--	--	-	56.6	79.87	1,212.33
P- 76	Mudstone, phosphatic, calcareous	RAG- 65-47	1.6	14.0	--	--	--	--	39.3	81.47	1,234.73
P- 75	Mudstone, calcareous, phosphatic	RAG- 66-47	3.55	11.5	--	--	--	--	37.8	85.02	1,275.63
P- 74	Limestone	RAG- 67-47	1.17	1.5	--	--	--	--	4.8	86.19	1,277.38
P- 73	Limestone, phosphatic, argillaceous	RMC- 22-47	0.7	13.4	--	--	--	--	30.1	86.89	1,286.76
P- 72	Phosphate rock, calcareous	RMC- 21-47	1.7	19.3	4.1	1.3	--	18.92	15.2	88.59	1,319.57
P- 71	Phosphate rock, calcareous	RMC- 20-47	0.5	22.4	2.8	1.25	--	17.42	13.0	89.09	1,330.77
P- 70	Phosphate rock, calcareous	RMC- 19-47	1.1	22.7	4.1	1.5	--	14.86	16.7	90.19	1,355.74
P- 69	Phosphate rock, argillaceous, calcareous	RMC- 18-47	0.3	22.2	4.3	1.83	--	13.44	22.0	90.49	1,362.40
P- 68	Phosphate rock	RAG- 76-47	1.25	25.5	3.5	1.2	--	14.40	13.8	91.74	1,394.30
P- 67	Phosphate rock	RAG- 75-47	1.95	32.2	0.9	0.36	--	9.18	3.5	93.69	1,457.10
P- 66	Phosphate rock	RAG- 74-47	1.45	31.9	1.0	0.37	--	10.44	3.8	95.14	1,503.35
P- 65	Phosphate rock, calcareous	RAG- 73-47	0.33	19.1	2.4	1.07	--	20.90	12.5	95.47	1,509.71
P- 64	Limestone	RAG- 72-47	0.85	2.9	0.3	0.06	--	42.38	1.4	96.32	1,512.18
--	Limestone concretion in bed P-63 and lower part of bed P-64	RAG- 71-47	(0.0-3.0)	0.3	1.3	0.41	--	41.98	8.6	--	--
P- 63	Phosphate rock, calcareous; fos. col. no. 47-HW-176	RAG- 70-47	2.66	22.0	4.4	1.4	--	16.40	16.7	98.98	1,570.68
P- 62	Mudstone, calcareous, phosphatic	RAG- 69-47	0.33	8.6	--	--	--	--	45.8	99.31	1,573.52
P- 61	Limestone	RAG- 68-47	1.35	0.9	--	--	--	--	15.7	100.66	1,574.74
P- 60	Limestone	RMC- 16-47	0.6	0.5	--	--	--	--	14.2	101.26	1,575.04
P- 59	Limestone	RMC- 15-47	0.9	0.7	--	--	--	--	8.6	102.16	1,575.67
P- 58	Limestone	RMC- 14-47	1.6	0.6	--	--	--	--	9.3	103.76	1,576.63
P- 57	Limestone, argillaceous	RMC- 13-47	0.4	0.5	--	--	--	--	44.2	104.16	1,576.83
P- 56	Limestone	RMC- 12-47	0.6	0.4	--	--	--	--	13.9	104.76	1,577.07
P- 55	Limestone	RMC- 11-47	1.8	0.4	--	--	--	--	14.0	106.56	1,577.79
P- 54	Limestone, argillaceous	FCA-228-47	1.1	0.9	--	--	--	--	27.4	107.66	1,578.78
P- 53	Mudstone, calcareous	FCA-227-47	0.75	2.0	--	--	--	--	62.6	108.41	1,580.28
--	Limestone concretion in bed P-53	FCA-226-47	(0.0-1.2)	0.2	--	--	--	--	14.9	--	--
P- 52	Mudstone	FCA-225-47	0.9	2.7	--	--	—	--	66.0	109.31	1,582.71
P- 51	Mudstone	FCA-224-47	1.0	4.0	--	--	--	--	62.2	110.31	1,586.71
P- 50	Mudstone	FCA-223-47	0.9	8.6	--	--	--	--	50.0	111.21	1,594.45

--	Limestone concretion in bed P-49	FCA-222-47	(0.0-0.35)	0.9	--	--	--	--	4.0	--	--
P- 49	Mudstone, calcareous, phosphatic	FCA-221-47	1.2	7.8	--	--	--	--	38.7	112.41	1,603.81
--	Limestone concretion in bed P-48	FCA-220-47	(0.0-0.45)	0.8	--	--	--	--	2.6	--	--
P- 48	Mudstone, phosphatic, calcareous	FCA-219-47	1.4	8.8	--	--	--	--	51.3	113.81	1,616.13
P- 47	Limestone; fos. col. no. 47-HW-71	FCA-218-47	1.4	2.4	--	--	--	--	11.4	115.21	1,619.09
P- 46	Phosphate rock, calcareous, argillaceous	FCA-158-47	1.3	15.6	--	--	--	--	25.7	116.51	1,639.37
--	Limestone concretion in bed P-46	FCA-157-47	(0.0-1.0)	2.3	--	--	--	--	8.7	--	--
P- 45	Limestone, argillaceous, phosphatic	FCA-156-47	0.9	9.6	--	--	--	--	32.5	117.41	1,648.06
P- 44	Mudstone, calcareous, phosphatic	FCA-155-47	1.4	9.7	--	--	--	--	38.9	118.81	1,661.64
P- 43	Phosphate rock, calcareous, argillaceous	FCA-154-47	0.8	15.1	--	--	--	--	29.1	119.61	1,673.72
P- 42	Limestone, phosphatic, argillaceous	FCA-153-47	0.5	12.6	--	--	--	--	23.2	120.11	1,680.02
P- 41	Phosphate rock and calcareous mudstone	FCA-152-47	0.7	15.1	--	--	--	--	29.7	120.81	1,690.59
P- 40	Limestone	FCA- 63-47	0.95	1.3	--	--	--	--	3.2	121.76	1,691.83
P- 39	Mudstone, phosphatic	FCA- 62-47	0.85	10.1	--	--	--	--	45.5	122.61	1,700.43
P- 38	Mudstone, phosphatic	FCA- 61-47	0.6	11.0	--	--	--	--	39.5	123.21	1,707.03
P- 37	Mudstone, phosphatic	FCA- 60-47	0.45	10.5	--	--	--	--	44.6	123.66	1,711.73
P- 36	Mudstone, phosphatic	FCA- 59-47	0.75	12.2	--	--	--	--	32.0	124.41	1,720.88
P- 35	Limestone, phosphatic, argillaceous	FCA- 58-47	0.6	13.2	--	--	--	--	27.3	125.01	1,728.80
--	Limestone concretion in bed P-34	FCA- 57-47	(0.0-0.8)	1.4	--	--	--	--	2.7	--	--
P- 34	Limestone, phosphatic, argillaceous	FCA- 56-47	0.9	11.0	--	--	--	--	25.2	125.91	1,738.70
P- 33	Limestone, phosphatic, argillaceous	FCA- 55-47	1.0	13.3	--	--	--	--	28.1	126.91	1,752.00
P- 32	Limestone, phosphatic, argillaceous	FCA-186-47	0.35	12.9	--	--	--	--	30.3	127.26	1,756.51
P- 31	Mudstone, phosphatic, calcareous	FCA-185-47	0.65	11.9	--	--	--	--	27.9	127.91	1,764.25
P- 30	Phosphate rock, calcareous	FCA-184-47	1.0	17.4	--	--	--	--	16.1	128.91	1,781.65
P- 29	Phosphate rock, calcareous	FCA-183-47	0.8	17.3	--	--	--	--	11.7	129.71	1,795.49
P- 28	Limestone, phosphatic	FCA-182-47	0.95	16.3	--	--	--	--	13.3	130.66	1,810.99
P- 27	Mudstone, calcareous, phosphatic	FCA-181-47	0.65	11.0	--	--	--	--	32.7	131.31	1,818.14
P- 26	Phosphate rock	FCA-180-47	0.6	24.2	--	--	--	--	17.4	131.91	1,832.66

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)						Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	F	Loss on ignition	Acid insoluble		
P- 25	Limestone	FCA-179-47	0.35	3.4	--	--	--	--	10.2	132.26	1,833.85
P- 24	Phosphate rock, argillaceous	FCA-178-47	0.45	14.7	--	--	--	--	30.9	132.71	1,840.46
P- 23	Limestone, argillaceous	FCA-177-47	1.7	3.8	--	--	--	--	17.5	134.41	1,846.92
P- 22	Mudstone, phosphatic	FCA-172-47	2.6	9.6	--	--	--	--	49.1	137.01	1,871.88
P- 21	Mudstone, calcareous	FCA-171-47	0.8	6.8	--	--	0.63	--	58.5	137.81	1,877.32
P- 20	Mudstone, phosphatic	FCA-170-47	1.0	8.7	--	--	--	--	46.5	138.81	1,886.02
	At the north trench (lot no. 1207) the strata at the base of the phosphatic shale are in fault contact with the underlying Wells formation. The strata at the south trenches (lot no. 1236) were measured and sampled to complete the information on this interval. Correlation between the trenches was based on a nodular zone below samples 3053-RPS and FCA-169-47.										
	Lot no. 1236										
P- 19	Limestone, argillaceous	3053-RPS	2.7	2.8	--	--	--	--	24.7	141.51	1,893.58
P- 18	Phosphate rock and mudstone	3052-RPS	3.2	23.6	3.1	1.20	--	10.18	26.0	144.71	1,969.10
P- 17	Phosphate rock and mudstone	3051-RPS	1.1	24.3	3.7	1.35	--	8.30	25.7	145.81	1,995.83
P- 16	Limestone, argillaceous	2859-RPS	0.75	7.6	2.9	1.04	--	25.42	26.7	146.56	2,001.53
--	Limestone lens in bed P-15	--	(0.0-1.2)	--	--	--	--	--	--	--	--
P- 15	Phosphate rock and mudstone	2858-RPS	3.6	20.8	4.1	1.46	--	9.08	32.4	150.16	2,076.41
P- 14	Phosphate rock	2857-RPS	2.2	27.7	2.3	0.95	--	9.12	16.6	152.36	2,137.35
P- 13	Phosphate rock, argillaceous, calcareous	2856-RPS	2.4	17.2	3.4	1.26	--	14.20	29.5	154.76	2,178.63
P- 12	Phosphate rock, argillaceous	2855-RPS	2.1	24.2	3.5	1.20	--	8.68	24.9	156.86	2,249.45
P- 11	Limestone	2854-RPS	1.7	2.4	1.8	0.41	--	37.22	11.4	158.65	2,233.53
P- 10	Phosphate rock, argillaceous, calcareous	2853-RPS	1.3	20.0	3.2	1.03	--	10.94	27.4	159.86	2,259.53
P- 9	Phosphate rock, argillaceous, calcareous	2852-RPS	0.8	18.8	--	--	--	--	27.4	160.66	2,274.57
P- 8	Phosphate rock, calcareous, argillaceous	2851-RPS	0.7	17.3	--	--	--	--	28.1	161.36	2,286.68
--	Limestone lens, argillaceous in bed P-7	2850-RPS	(0.0-1.5)	--	--	--	--	--	--	--	--
P- 7	Limestone	1106-RAG	1.8	5.1	--	--	--	--	8.4	163.16	2,295.86
P- 6	Phosphate rock	1105-RAG	3.4	31.4	1.1	0.51	3.41	8.54	5.6	166.56	2,402.62
P- 5	Phosphate rock	1104-RAG	2.4	32.6	0.58	0.48	3.57	7.70	2.6	168.96	2,480.86
P- 4	Mudstone, calcareous	1103-RAG	0.6	2.7	--	--	--	--	52.8	169.56	2,482.48
P- 3	Limestone, argillaceous	1102-RAG	2.6	4.2	--	--	--	--	33.5	172.16	2,493.40
P- 2	Mudstone, calcareous	1101-RAG	1.2	3.6	--	--	--	--	40.9	173.36	2,497.72
P- 1	Phosphate rock	1100-RAG	0.4	33.6	--	--	3.57	--	6.1	173.76	2,511.16
	Lot no. 1207										
P- 12	Limestone, argillaceous; fos. col. no. 47-HW-64	FCA-169-47	(2.2)	1.2	--	--	--	--	22.0	--	--

	FCA-169-47 is equivalent to 3053-RPS of lot no. 1236.										
P- 11	Phosphate rock	FCA-168-47	(1.4)	27.0	--	--	--	--	19.2	--	--
--	Mudstone concretion in bed P-10	FCA-167-47	(0.0-0.4)	5.7	--	--	0.49	--	65.9	--	--
P- 10	Phosphate rock, argillaceous	FCA-166-47	(1.05)	24.1	--	--	--	--	21.7	--	--
P- 9	Phosphate rock	RAH-176-47	(0.9)	27.1	--	--	2.70	--	14.4	--	--
P- 8	Limestone, phosphatic; fos. col. no. 47-HW-63	RAH-175-47	(0.7)	8.7	--	--	3.58	--	8.3	--	--
P- 7	Phosphate rock, argillaceous	RAH-174-47	(1.0)	25.3	--	--	--	--	21.0	--	--
--	Limestone concretion in bed P-7	RAH-173-47	(0.0-0.7)	3.3	--	--	--	--	4.1	--	--
P- 6	Phosphate rock, argillaceous	RAH-172-47	(0.6)	22.7	--	--	--	--	23.7	--	--
P- 5	Mudstone, calcareous	RAH-171-47	(0.35)	0.7	--	--	--	--	50.4	--	--
P- 4	Limestone, argillaceous	FCA-173-47	(1.0)	0.2	--	--	--	--	35.7	--	--
P- 3	Limestone	FCA-174-47	(0.15)	3.7	--	--	2.48	--	19.4	--	--
P- 2	Phosphate rock	FCA-175-47	(0.25)	32.3	--	--	--	--	5.5	--	--
P- 1	Limestone, phosphatic	RAG- 77-47	(0.5)	9.0	--	--	--	--	13.4	--	--
	RAG-77-47 lies in fault contact with FCA-176-47 at the top of the Wells formation.										
	Wells formation—top beds only										
Cw- 1	Limestone; fos. col. no. 47-HW-62	FCA-176-47	3.1	2.6	--	--	--	--	5.0	3.1	8.06
Cw- 2	Limestone	--	3.0	--	--	--	--	--	--	6.1	--
Cw- 3	Chert	--	1.0	--	--	--	--	--	--	7.1	--
Cw- 4	Quartzite	--	2.4	--	--	--	--	--	--	9.5	--
Cw- 5	Quartzite, chert, and limestone	--	3.1	--	--	--	--	--	--	12.6	--
Cw- 6	Quartzite	--	3.0	--	--	--	--	--	--	15.6	--
Cw- 7	Quartzite	--	9.0	--	--	--	--	--	--	24.6	--
Cw- 8	Quartzite	--	11.55	--	--	--	--	--	--	36.15	--
Cw- 9	Quartzite, limestone, and chert	--	3.65	--	--	--	--	--	--	39.80	--
Cw-10	Quartzite and limestone	--	10.0	--	--	--	--	--	--	49.80	--
Cw-11	Quartzite and limestone	--	9.3	--	--	--	--	--	--	59.10	--
Cw-12	Quartzite and chert	--	6.48	--	--	--	--	--	--	65.58	--
Cw-13	Quartzite, calcareous	--	11.5	--	--	--	--	--	--	77.08	--
Cw-14	Sandstone and mudstone	--	0.82	--	--	--	--	--	--	77.90	--

SPECTROGRAPHIC ANALYSES—MONTPELIER CANYON, IDAHO. LOT NO. 1207.

Semi-quantitative analyses of two samples of phosphatic shale member of Phosphoria formation, Montpelier Canyon, Idaho (see immediately preceding pages for location of section, thickness and description of strata, and chemical analyses of samples), made by U. S. Bureau of Mines Laboratory, Albany, Oregon. In addition to the elements listed in the table below, Sb, As, Be, Bi, Cd, Co, Cb, Ga, Au, Li, Hg, Pt, Ta, Sn, W, and Zn were looked for but were not detected.

Explanation of symbols

A = more than 10 percent
B = 5-10 percent
C = 1-5 percent
D = 0.1-1 percent
E = 0.01-0.1 percent
F = 0.001-0.01 percent
G = less than 0.001 percent
ND = not detected

Bed no.	Sample no.	Al	Ba	B	Ca	Cr	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Si	Ag	Na	Sr	Ti	V	Zr
P-132	FCA-113-47	D	E	F	A	E	G	D	E	D	F	F	F	C	G	E	E	E	D	F
P-131	FCA-112-47	D	E	F	A	E	G	D	ND	D	F	ND	F	C	G	E	E	E	D	F

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