UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

STRATIGRAPHIC SECTIONS OF THE PHOSPHORIA FORMATION IN IDAHO

by

V. E. McKelvey, D. F. Davidson, F. W. O'Malley,
L. E. Smith, F. C. Armstrong, and R. P. Sheldon

U.S. GEOLOGICAL SURVEY
WASHINGTON
AUG 16 1951
LIBRARY

MINERAL DEPOSITS BRANCH

Spokane, Washington July 1951

OPEN FILE
51-18

(200)
R290
no. 100-A

This report is preliminary and has not been edited or reviewed for conformity with U. S. Geological Survey standards and nomenclature.

(200)
R290
no. 100
pt A
part

UNITED STATES
DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

[Reports - open file series]

STRATIGRAPHIC SECTIONS OF THE PHOSPHORIA FORMATION IN IDAHO

by

V. E. McKelvey, D. F. Davidson, F. W. O'Malley,
L. E. Smith, F. C. Armstrong, and R. P. Sheldon

U.S. GEOLOGICAL SURVEY
WASHINGTON
AUG 10 1951
LIBRARY

MINERAL DEPOSITS BRANCH

Spokane, Washington July 1951

OPEN FILE

This ~~map~~ report is preliminary and has not been edited or reviewed for conformity with U. S. Geological Survey standards and nomenclature.

(200)
R290
no. 100-A

(200)
229
no. 100-A

TABLE OF CONTENTS

	Page
Introduction	I
Abstract of sections	
Diamond Drill Hole 8, Fort Hall Mine. Lot no. 1279	1i
Diamond Drill Hole 9, Fort Hall Mine. Lot no. 1280	3i
Caldwell Canyon. Lot no. 1260.	5i
Mabie Canyon. Lot no. 1210.	8i
Spectrographic analyses	14i
Conda. Lot no. 1200.	19i
Spectrographic analyses	24i
Diamond Drill Hole 6, Slug Creek Valley. Lot no. 1277.	28i
Diamond Drill Hole 3, Middle Sulphur Canyon. Lot no. 1274.	30i
Diamond Drill Hole 4, Middle Sulphur Canyon. Lot no. 1275.	31i
Diamond Drill Hole 5, Southern Fork of Johnson Creek. Lot no. 1276.	32i
North Dairy. Lot no. 1212.	33i
Swan Lake Gulch. Lot no. 1265.	36i
Dry Creek. Lot no. 1268.	40i

Bound by ART GUILD BINDERY, CINCINNATI, O. Date

STRATIGRAPHIC SECTIONS OF THE PHOSPHORIA FORMATION IN IDAHO

by

V. E. McKelvey, D. F. Davidson, F. W. O'Malley,
L. E. Smith, F. C. Armstrong, and R. P. Sheldon

INTRODUCTION

The first of a series of reports giving detailed stratigraphic sections of the Phosphoria formation in the Western phosphate field as measured and described by the Geological Survey will be released as Circulars within the next few months. Because of the needs of industry for many of these data during the 1951 field season, and in view of the unavoidable delays attendant on publication, the tabular data to be included in these Circulars are hereby placed on open file in simple reproduction form (prepared by Ozalid from photographic negatives) and without explanatory text so that immediate use may be made of the data.

The tables include data on sections in four states: Montana, Idaho, Wyoming, and Utah; and the tables for each of these states are bound together as individual reports. The tables include name and location of section measured, brief description of geologic setting, acknowledgments for field and analytical work, abstract data on the sections (bed number, rock name, sample number, and thickness), and analytical data on the samples. The analytical data include reports on P_2O_5 and acid insoluble for all samples and additional analyses, such as Al_2O_3, Fe_2O_3, loss on ignition, F, and V_2O_5, for selected samples. Spectrographic analyses for a large number of elements are included for samples from selected localities, and special analyses have been made of a few samples.

These reports are placed on open file at the offices of the Geological Survey in Washington, D. C., Spokane, Washington, Salt Lake City, Utah, and Montpelier, Idaho, and at the offices of the Idaho Bureau of Mines and Geology, Moscow, Idaho, the Montana Bureau of Mines and Geology, Butte, Montana, and the Wyoming Geological Survey, Laramie, Wyoming, and the University of Utah, Salt Lake City, Utah.

DIAMOND DRILL HOLE 8, FORT HALL MINE, IDAHO. LOT NO. 127

Part of phosphatic shale member of Phosphoria formation cored in diamond drill hole 8, near diamond drill hole 237 at Fort Hall Mine of J. R. Simplot Company, sec. 14, T. 4 S., R. 37 E., Bingham County, Idaho. Hole drilled in October 1948 by U. S. Bureau of Mines; A. E. Lodge in charge, and core measured and sampled by D. F. Davidson. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness × percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
	Phosphatic shale member of Phosphoria formation—Lower beds only						
P -35	Mudstone and phosphate rock	DFD-1144	2.5	16.4	40.2	2.5	40.25
P -34	Mudstone and phosphate rock	DFD-1145	0.9	15.8	41.3	3.4	54.47
P -33	Limestone, argillaceous	DFD-1146	1.6	5.2	23.4	5.0	62.79
P -32	Phosphate rock, argillaceous, calcareous	DFD-1147	0.7	15.4	35.8	5.7	73.57
P -31	Mudstone, phosphatic, calcareous	DFD-1148	1.8	9.5	51.6	7.5	90.67
P -30	Limestone	DFD-1149	0.8	2.1	10.2	8.3	92.91
P -29	Core missing	--	1.4	--	--	9.7	--
P -28	Mudstone, phosphatic	DFD-1150	0.3	13.8	40.5	10.0	4.14
P -27	Mudstone, phosphatic	DFD-1206	3.2	15.5	49.4	13.2	46.90
P -26	Phosphate rock, calcareous, argillaceous	DFD-1207	1.5	18.4	24.4	14.7	74.50
P -25	Phosphate rock, calcareous, argillaceous	DFD-1208	1.2	14.8	25.8	15.9	92.06
P -24	Phosphate rock, calcareous	DFD-1209	1.0	22.3	19.6	16.9	114.96
P -23	Limestone, phosphatic	DFD-3336	1.2	15.6	11.6	18.1	133.68
P -22	Phosphate rock	DFD-1248	1.8	26.7	19.6	19.9	181.74
P -21	Phosphate rock, argillaceous	DFD-1249	1.6	16.2	39.1	21.5	207.66
P -20	Mudstone, phosphatic	DFD-1250	1.2	15.6	43.4	22.7	226.38
P -19	Phosphate rock, argillaceous, calcareous	DFD-1251	1.7	17.9	32.3	24.4	256.81
P -18	Phosphate rock, argillaceous	DFD-1252	0.6	25.8	21.9	25.0	272.29
P -17	Phosphate rock, argillaceous	DFD-1253	1.5	27.0	21.0	26.5	312.79
P -16	Phosphate rock, argillaceous	DFD-1254	1.8	26.3	22.8	28.3	360.13
P -15	Core missing	--	2.8	--	--	31.1	--
P -14	Mudstone, phosphatic	DFD-1255	0.5	16.6	45.6	31.6	8.30
P -13	Mudstone, phosphatic	DFD-1256	0.6	15.7	46.5	32.2	17.72
P -12	Phosphate rock	DFD-1257	1.5	30.7	13.8	33.5	57.63
P -11	Phosphate rock, argillaceous	DFD-1258	2.8	22.2	33.1	36.3	119.79
P -10	Phosphate rock and mudstone	DFD-1259	2.0	18.5	28.1	38.3	156.79
P - 9	Phosphate rock and mudstone	DFD-1827	2.0	30.8	12.6	40.3	218.39
P - 8	Phosphate rock and mudstone	DFD-1828	1.0	24.6	20.2	41.3	242.99
P - 7	Limestone	DFD-1976	1.0	4.9	17.4	42.3	247.89

* Cumulative data incomplete due to missing information. Computations start from zero after interruption.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
P - 6	Phosphate rock	DFD-1977	1.1	28.0	15.9	13.4	278.69
P - 5	Limestone, phosphatic	DFD-1978	1.8	11.8	13.1	15.2	299.93
P - 4	Phosphate rock, argillaceous	DFD-1979	2.0	24.0	23.9	47.2	347.93
P - 3	Phosphate rock	DFD-1980	2.6	34.7	3.1	49.8	438.15
P - 2	Limestone, argillaceous, phosphatic	DFD-2170	0.5	11.8	29.4	50.3	444.05
P - 1	Limestone, argillaceous	DFD-2295	0.8	5.4	33.3	51.1	448.37**
			Wells formation				
Cw- 1	Limestone, argillaceous	DFD-2296	0.2	2.5	23.0	0.2	0.30

** Note incompleteness of cumulative data.

DIAMOND DRILL HOLE 9, FORT HALL MINE, IDAHO. LOT NO. 1280.

Part of phosphatic shale member of Phosphoria formation sampled from diamond drill hole 9 near diamond drill hole 237 at Fort Hall Mine of J. R. Simplot Company, sec. 14, T. 4 S., R. 37 E., Bingham County, Idaho. Hole drilled in October 1948 by U. S. Bureau of Mines, A. E. Long in charge, and measured and sampled by D. F. Davidson. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness × percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
	Phosphatic shale member of Phosphoria formation—lower part only						
P -34	Mudstone, calcareous	DFD-2297	0.5	7.7	43.8	0.5	3.85
P -33	Mudstone, phosphatic	DFD-2298	2.0	13.5	44.0	2.5	30.85
P -32	Mudstone, phosphatic, calcareous	DFD-2299	0.6	13.7	36.5	3.1	39.07
P -31	Limestone	DFD-2300	0.7	1.9	8.0	3.8	40.40
P -30	Mudstone, phosphatic, calcareous	DFD-3035	3.4	11.5	46.2	7.2	79.50
P -29	Core missing	--	1.0	--	--	8.2	--
P -28	Limestone	DFD-2468	0.8	0.7	6.6	9.0	0.56*
P -27	Mudstone, phosphatic	DFD-2469	2.2	12.1	49.4	11.2	27.18
P -26	Phosphate rock, argillaceous	DFD-2470	1.1	16.0	39.7	12.3	44.78
P -25	Phosphate rock, calcareous, argillaceous	DFD-2471	1.0	14.6	30.6	13.3	59.38
P -24	Phosphate rock and calcareous mudstone	DFD-2472	0.9	19.3	21.7	14.2	76.75
P -23	Phosphate rock and mudstone	DFD-2473	1.0	18.2	22.9	15.2	94.95
P -22	Phosphate rock, calcareous, argillaceous	DFD-2474	1.5	17.0	23.5	16.7	120.45
P -21	Phosphate rock, calcareous	DFD-2475	1.2	24.4	16.9	17.9	149.73
P -20	Phosphate rock, argillaceous	DFD-2531	1.7	26.1	20.4	19.6	194.10
P -19	Phosphate rock, argillaceous	DFD-2532	1.6	17.2	38.6	21.2	221.62
P -18	Limestone	DFD-2533	0.9	3.2	4.5	22.1	224.50
P -17	Mudstone, phosphatic, calcareous	DFD-2534	2.9	13.4	36.5	25.0	263.36
P -16	Phosphate rock and mudstone	DFD-2535	1.6	29.1	14.1	26.6	309.92
P -15	Phosphate rock and mudstone	DFD-2536	1.9	22.7	29.6	28.5	353.05
P -14	Phosphate rock and mudstone	DFD-2537	1.3	22.6	27.3	29.8	382.43
P -13	Limestone	DFD-2538	0.5	2.6	14.5	30.3	383.73
P -12	Core missing	--	0.4	--	--	30.7	--
P -11	Mudstone, phosphatic, calcareous	DFD-2539	2.5	13.9	40.7	33.2	34.75*
P -10	Phosphate rock and mudstone	DFD-2540	2.7	27.6	19.8	35.9	109.27
P -9	Phosphate rock and mudstone	DFD-2541	2.0	22.8	31.6	37.9	154.87
P -8	Phosphate rock	DFD-2542	2.0	31.7	9.4	39.9	218.27
P -7	Phosphate rock and mudstone	DFD-2543	2.2	27.6	16.3	42.1	278.99
P -6	Limestone, argillaceous	DFD-2544	0.6	0.9	22.4	42.7	279.53
P -5	Phosphate rock, calcareous	DFD-2545	1.6	22.0	19.0	44.3	314.73

* Cumulative data incomplete due to missing information. Computations start from zero after interruption.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness × percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
P - 4	Limestone	DFD-2546	0.8	6.4	8.6	45.1	319.85
P - 3	Core missing	--	2.9	--	--	48.1	--
P - 2	Phosphate rock	DFD-2547	1.4	27.5	11.2	49.4	35.75*
P - 1	Limestone, argillaceous	DFD-2548	1.4	0.8	36.0	50.8	36.87**
			Wells formation				
CW - 3	Limestone, argillaceous	DFD-2549	0.7	2.7	21.2	0.7	1.89
CW - 2	Core missing	--	3.0	--	--	3.7	--
CW - 1	Limestone, argillaceous	DFD-2550	1.4	2.1	31.7	5.1	4.83*

* Cumulative data incomplete due to missing information. Computations start from zero after interruption.
** Note incompleteness of cumulative data.

CALDWELL CANYON, IDAHO. LOT NO. 1260.

Phosphatic shale member of Phosphoria formation sampled in bulldozer trench on north side of Caldwell Canyon, sec. 1, T. 8 S., R. 41 E., Caribou County, Idaho, on east limb of Slug Creek syncline. Beds strike N. 10° W. and dip 40° E. Section measured by R. A. Hoppin, D. F. Davidson, and F. W. O'Malley and sampled by R. A. Smart, R. P. Sheldon, R. G. Waring, and T. K. Rigby in August 1948. Samples analyzed by U. S. Bureau of Mines, Albany, Oregon.

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	WOM-1750	3.3	0.4	--	--	--	75.8		
	Phosphatic shale member of Phosphoria formation[1]									
P-84	Mudstone	WOM-1749	1.1	5.2	--	--	--	57.7	1.1	5.70
P-83	Mudstone	WOM-1748	1.2	0.7	--	--	--	70.0	2.3	6.56
P-82	Mudstone	WOM-1747	1.4	4.9	--	--	--	59.0	3.7	13.42
P-81	Mudstone; fos. col. no. 48-JES-189[2]	WOM-1746	2.7	0.5	--	--	--	64.4	6.4	14.77
P-80	Mudstone, calcareous	WOM-1745	0.6	2.4	--	--	--	63.1	7.0	16.21
P-79	Limestone, argillaceous; fos. col. no. 48-JES-188	WOM-1744	1.1	0.6	--	--	--	38.0	8.1	16.87
P-78	Mudstone, calcareous; fos. col. no. 48-JES-187	WOM-1743	3.3	2.7	--	--	--	68.3	11.4	25.78
P-77	Mudstone, phosphatic	WOM-1742	0.3	14.8	--	--	--	49.0	11.7	30.22
P-76	Mudstone	WOM-1741	1.3	2.3	--	--	--	78.5	13.0	33.21
P-75	Phosphate rock, argillaceous	WOM-1740	0.5	24.1	--	--	--	21.2	13.5	45.26
P-74	Mudstone; fos. col. no. 48-JES-186	WOM-1780	1.9	2.5	--	--	--	69.5	15.4	50.01
P-73	Mudstone, calcareous; fos. col. no. 48-JES-185	WOM-1779	1.3	0.2	--	--	--	52.0	16.7	50.27
P-72	Phosphate rock	WOM-1778	1.9	32.9	--	--	--	11.3	18.6	112.78
P-71	Phosphate rock; fos. col. no. 48-JES-184	WOM-1777	0.7	29.1	--	--	--	17.7	19.2	133.15
P-70	Mudstone	WOM-1776	0.6	7.5	--	--	--	58.2	19.9	137.63
P-69	Phosphate rock, calcareous	WOM-1775	0.9	24.9	--	--	--	9.5	20.8	160.04
P-68	Phosphate rock	WOM-1774	0.8	33.3	--	--	--	5.5	21.6	186.70
--	Limestone concretion; fos. col. no. 48-JES-183	WOM-1773	(0.9)	5.3	--	--	--	2.2	--	--
P-67	Phosphate rock, calcareous and phosphatic calcareous mudstone; fos. col. no. 48-JES-182	WOM-1772	3.0	19.7	--	--	--	25.0	24.6	245.80
P-66	Mudstone, phosphatic	WOM-1771	1.0	12.7	--	--	--	45.0	25.6	258.50
P-65	Phosphate rock, argillaceous	DFD-1790	1.3	18.8	--	--	--	37.3	26.9	283.90
P-64	Mudstone; fos. col. no. 48-JES-181	DFD-1789	1.3	7.6	--	--	--	63.3	28.2	293.78

[1] The thinness of the Phosphatic shale member is probably due to faulting.
[2] Fossil collection 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, percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	Loss on ignition	Acid insoluble		
---	Limestone lens?, argillaceous	DFD- 1788	(0.9)	0.5	--	--	--	29.8	--	--
P-63	Mudstone, phosphatic, fos. col. no. 48-JES-180	DFD- 1787	3.2	8.5	--	--	--	61.7	31.40	[illegible]
P-62	Mudstone, phosphatic	DFD- 1786	0.7	10.6	--	--	--	59.8	32.10	[illegible]
P-61	Phosphate rock, argillaceous, fos. col. no. 48-JES-179	DFD- 1785	2.7	19.4	--	--	--	44.0	34.80	[illegible]
P-60	Mudstone, phosphatic	DFD- 1784	0.5	8.9	--	--	--	67.3	35.30	[illegible]
P-59	Mudstone, phosphatic, fos. col. no. 48-JES-178	DFD- 1783	0.9	8.7	--	--	--	66.3	36.20	[illegible]
P-58	Mudstone, phosphatic	DFD- 1782	0.4	9.6	--	--	--	59.7	36.60	[illegible]
P-57	Mudstone, fos. col. no. 48-JES-177	DFD- 1781	3.6	6.4	--	--	--	70.6	40.20	[illegible]
P-56	Mudstone	DFD- 1760	0.8	1.6	--	--	--	83.0	41.00	[illegible]
P-55	Mudstone	DFD- 1759	0.5	6.4	--	--	--	74.2	41.50	[illegible]
P-54	Mudstone, phosphatic	DFD- 1758	1.2	9.1	--	--	--	64.0	42.70	[illegible]
P-53	Phosphate rock, argillaceous	DFD- 1757	0.6	17.3	--	--	--	43.2	43.30	[illegible]
P-52	Mudstone, phosphatic	DFD- 1756	0.8	15.4	--	--	--	45.8	44.10	[illegible]
P-51	Mudstone, phosphatic	DFD- 1755	0.6	9.8	--	--	--	57.8	44.70	[illegible]
P-50	Mudstone	DFD- 1754	0.7	6.4	--	--	--	62.5	45.40	[illegible]
P-49	Mudstone, phosphatic	DFD- 1753	1.0	7.9	--	--	--	64.5	46.40	[illegible]
P-48	Mudstone	DFD- 1752	1.1	5.1	--	--	--	74.8	47.50	[illegible]
P-47	Mudstone, fos. col. no. 48-JES-176	DFD- 1751	0.7	5.5	--	--	--	72.8	48.20	[illegible]
P-46	Phosphate rock and phosphatic mudstone	WOM-1810	0.7	24.6	--	--	--	26.0	48.90	[illegible]
P-45	Mudstone, phosphatic	WOM-1809	0.7	8.4	--	--	--	55.6	49.60	[illegible]
P-44	Mudstone	WOM-1808	0.7	[illegible]	--	--	--	71.1	50.30	[illegible]
	Many of the beds from P-27 to P-43 show prominent shearing that probably represents faulting and accounts for the abnormally small thickness of the phosphatic shale member at this locality.									
P-43	Phosphate rock	WOM-1807	0.4	25.8	--	--	--	19.5	50.70	[illegible]
P-42	Mudstone, phosphatic	WOM-1806	0.7	13.7	--	--	--	53.1	51.40	[illegible]
P-41	Mudstone	WOM-1805	0.8	1.2	--	--	--	84.3	52.20	[illegible]
P-40	Mudstone	WOM-1804	2.2	1.6	--	--	--	83.8	54.40	[illegible]
P-39	Mudstone	WOM-1803	0.6	0.9	--	--	--	83.3	55.00	[illegible]
P-38	Mudstone, phosphatic	WOM-1802	1.5	11.1	--	--	--	60.3	56.50	[illegible]
P-37	Mudstone	WOM-1801	2.8?	4.7	--	--	--	73.0	59.30	[illegible]
P-36	Mudstone, calcareous	WOM-1800	0.7	7.3	--	--	--	58.2	60.00	[illegible]
P-35	Phosphate rock	WOM-1799	0.5	27.4	--	--	--	19.8	60.50	[illegible]
P-34	Mudstone, phosphatic	WOM-1798	1.0	9.5	--	--	--	61.3	61.50	[illegible]
P-33	Phosphate rock, argillaceous	WOM-1797	0.6	18.1	--	--	--	37.7	62.10	[illegible]
P-32	Mudstone, calcareous	WOM-1796	1.0	2.8	--	--	--	58.5	63.10	[illegible]
P-31	Mudstone, phosphatic	WOM-1795	0.5	11.1	--	--	--	51.9	63.60	[illegible]
P-30	Mudstone, phosphatic, fos. col. no. 48-JES-175?	WOM-1794	1.3	10.4	--	--	--	49.7	64.90	[illegible]

P-29	Mudstone	WOM-1793	0.4	3.3	--	--	--	72.2	65.30	
P-28	Mudstone	WOM-1792	0.7	2.9	--	--	--	74.5	66.00	
P-27	Mudstone	WOM-1791	1.9	4.9	--	--	--	66.3	67.90	
P-26	Mudstone, phosphatic, calcareous	WOM-1820	1.2	10.4	--	--	--	50.6	69.10	
P-25	Mudstone, phosphatic	WOM-1819	1.1	9.7	--	--	--	59.0	70.20	
P-24	Mudstone, phosphatic	WOM-1818	1.2	13.2	--	--	--	17.3	71.40	
P-23	Phosphate rock, argillaceous	WOM-1817	2.2	22.7	--	--	--	21.2	74.60	
P-22	Phosphate rock, argillaceous	WOM-1816	1.2	15.7	--	--	--	34.1	73.80	
P-21	Limestone	WOM-1815	4.5	1.2	--	--	--	5.9	79.30	
P-20	Limestone; fos. col. no. 48-JES-174	WOM-1814	5.0	1.4	--	--	--	14.0	84.30	
P-19	Phosphate rock, argillaceous	WOM-1813	1.4	23.2	--	--	--	29.8	85.70	
P-18	Mudstone, phosphatic, calcareous	WOM-1812	1.2	11.7	--	--	--	48.7	86.90	
P-17	Mudstone, phosphatic; fos. col. no. 48-JES-173	WOM-1811	0.8	10.2	--	--	--	53.4	87.70	
P-16	Limestone; fos. col. no. 48-JES-172	RAH- 1826	3.7	5.6	--	--	--	12.7	91.40	
P-15	Phosphate rock, argillaceous	RAH- 1825	0.6	23.7	4.1	1.52	6.92	26.8	92.00	
P-14	Phosphate rock	RAH- 1824	1.8	31.6	1.3	0.73	6.98	10.0	93.8	
P-13	Phosphate rock, argillaceous	RAH- 1823	1.9	26.7	3.3	1.32	6.66	20.5	95.70	
P-12	Limestone, argillaceous; fos. col. no. 48-JES-171	RAH- 1822	0.8	3.4	4.5	1.50	28.58	29.7	96.50	
P-11	Phosphate rock	RAH- 1821	1.2	34.2	0.67	0.46	6.52	4.3	97.70	
P-10	Phosphate rock	RAH- 1770	1.3	29.1	2.5	1.03	8.34	12.3	99.00	
P- 9	Phosphate rock	RAH- 1769	2.0	32.8	0.67	0.42	6.76	4.8	101.00	
P- 8	Phosphate rock	RAH- 1768	1.5	32.0	1.5	0.71	6.88	7.0	102.50	
P- 7	Limestone, phosphatic, argillaceous; fos. col. no. 48-JES-170	RAH- 1767	1.3	9.7	3.4	1.06	25.18	20.2	103.80	
P- 6	Phosphate rock	RAH- 1766	1.0	26.9	2.1	0.85	10.18	10.9	104.80	
P- 5	Limestone	RAH- 1765	1.0	4.9	2.3	0.52	35.92	7.9	105.80	
P- 4	Phosphate rock; fos. col. no. 48-JES-169	RAH- 1764	3.37	25.3	3.5	1.07	8.14	18.8	109.10	
P- 3	Limestone; fos. col. no. 48-JES-168	RAH- 1763	2.5	2.3	0.46	0.50	38.42	12.4	111.60	
P- 2	Limestone and phosphate rock; fos. col. no. 48-JES-167	RAH- 1762	0.8	19.9	1.8	2.56	15.96	14.3	112.40	
P- 1	Phosphate rock	RAH- 1761	3.5	38.6	1.1	0.67	9.20	14.0	115.90	
				Wells formation						
CW-1	Limestone; fos. col. no. 48-JES-166	RAH- 1739	4.0	2.8	--	--	--	4.5	--	

MABIE CANYON, IDAHO. LOT NO. 1210.

Phosphatic shale member of Phosphoria formation sampled in bulldozer trench in Mabie Canyon, NW¼NE¼ sec. 10, T. 8 S., R. 44 E., Caribou County, Idaho, on east limb of Dry Valley anticline. Section measured by R. M. Campbell, V. E. McKelvey, and R. A. Weeks and sampled by Campbell and Weeks in September and October 1947. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)						Cumulative thickness (feet)	Thickness 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 [illegible]	Chert	VEM-470-47	3.8	0.5	1.1	3.5	--	9.6	73.3	3.8	1.90
R [illegible]	Limestone, argillaceous	VEM-469-47	1.2	0.3	0.7	1.8	--	32.0	25.9	5.0	2.26
R [illegible]	Chert	VEM-468-47	1.7	0.6	0.79	3.8	--	6.7	78.6	6.7	3.28
R [illegible]	Mudstone, calcareous, fos. col. no. 47-HW-259	VEM-467-47	0.35	0.5	1.3	1.5	--	21.2	51.1	7.05	3.46
R	Mudstone, calcareous and chert	VEM-466-47	1.0	--	--	--	--	--	--	8.05	--
Phosphatic shale member of Phosphoria formation											
P [illegible] 170	Mudstone, calcareous	VEM-465-47	0.7	5.1	4.0	1.5	0.53	13.8	60.1	[illegible]	3.57
P [illegible] 169	Phosphatic rock, argillaceous, calcareous; fos. col. no. 47-HW-258	VEM-464-47	0.6	20.1	4.0	1.3	--	12.2	26.6	[illegible]	15.63
P -168	Mudstone, calcareous; fos. col. no. 47-HW-257	VEM-463-47	1.9	2.9	9.9	3.0	--	9.9	69.4	3.2	21.14
P -167	Mudstone, calcareous	VEM-462-47	2.1	4.7	9.7	3.2	--	12.7	61.7	5.3	31.01
P -166	Mudstone	VEM-461-47	1.3	0.6	11.1	3.1	--	8.1	76.6	6.6	31.79
	Limestone (lens), argillaceous, in top of bed P-165	VEM-460-47	(0.0-0.5)	0.7	3.6	1.3	--	34.5	22.6	[illegible]	[illegible]
P -165	Mudstone	VEM-459-47	1.2	2.6	11.6	3.7	--	8.7	69.0	7.8	34.71
P -164	Mudstone, calcareous	VEM-458-47	2.4	0.4	7.4	2.4	--	19.8	52.5	10.2	35.37
P -163	Mudstone, calcareous	VEM-457-47	1.9	0.4	9.4	3.1	--	12.0	67.3	12.1	36.63
P -162	Mudstone, calcareous	VEM-456-47	2.4	1.3	11.0	3.6	--	11.0	66.0	14.5	37.75
P -161	Limestone, fos. col. no. 47-HW-255	VEM-455-47	0.7	0.6	2.2	0.6	--	37.7	24.0	15.2	40.17
P -160	Mudstone, calcareous; fos. col. no. 47-HW-254	VEM-454-47	1.8	4.0	10.6	3.0	--	10.7	62.3	17.0	47.37
P -159	Mudstone, calcareous; fos. col. no. 47-HW-254	VEM-453-47	1.8	1.5	9.2	2.7	--	12.7	64.9	18.8	50.07
P -158	Limestone, argillaceous, contains phosphatic nodules	VEM-452-47	0.9	6.3	1.3	3.3	--	27.5	24.2	19.7	65.73
P -157	Mudstone, calcareous	VEM-451-47	0.7	9.0	9.2	3.2	--	8.3	68.1	20.4	57.84
P -156	Phosphatic rock, argillaceous, calcareous?	VEM-450-47	0.5	19.9	3.1	1.8	--	9.0	28.5	20.9	67.79
P -155	Mudstone, fos. col. no. 47-HW-253	VEM-449-47	2.4	3.1	10.7	3.4	--	8.9	69.9	23.3	5[illegible]

P -154	Limestone, argillaceous (col. no. 47-HW-252	VEM-448-47	1.1	0.2	5.7	1.8	--	26.8	62.1	24.4	[illegible]
P -153	Mudstone	VEM-447-47	2.4	1.9	11.7	3.6	--	8.2	72.1	26.8	80.01
P -152	Phosphate rock	VEM-446-47	0.5	37.7	0.7	0.5	--	3.2	1.8	27.3	98.86
P -151	Phosphate rock	VEM-445-47	0.5	36.7	0.8	0.4	3.90	4.1	3.5	27.8	114.21
P -150	Phosphate rock	VEM-444-47	0.7	37.1	0.8	0.5	3.72	3.5	5.0	28.3	143.48
P -149	Mudstone, calcareous (col. no. 47-HW-251	VEM-443-47	1.3	4.1	8.6	2.8	0.47	11.8	60.7	29.8	148.51
P -148	Phosphate rock, argillaceous	VEM-442-47	1.1	25.5	4.4	1.9	2.35	5.4	25.1	30.9	176.56
P -147	Phosphate rock	VEM-441-47	0.0	21.8	2.4	0.9	3.17	6.1	11.5	31.9	208.46
P -146	Phosphate rock	VEM-440-47	0.8	32.7	1.8	0.7	3.27	5.8	9.8	32.7	241.22
P -145	Mudstone, phosphatic (col. no. 47 HW-250	VEM-439-47	1.0	14.2	6.2	2.3	1.50	7.4	48.1	33.7	248.72
P -144	Phosphate rock	VEM-438-47	0.6	31.5	2.1	0.9	3.17	6.6	11.9	34.3	267.02
P -143	Phosphate rock and mudstone	VEM-437-47	0.8	16.8	6.4	2.4	1.45	9.4	40.5	35.1	281.00
P -142	Phosphate rock and mudstone	VEM-436-47	0.4	12.9	8.1	2.5	1.40	9.5	49.4	35.6	287.31
P -141	Mudstone, calcareous	VEM-435-47	0.3	6.8	9.8	2.4	0.66	16.5	50.6	35.9	289.50
P -140	Phosphate rock and calcareous mudstone	VEM-434-47	0.3	9.1	7.6	2.6	1.15	14.0	47.8	36.2	292.41
P -139	Phosphate rock	VEM-433-47	0.9	35.1	0.6	0.3	3.54	5.5	5.5	37.1	323.97
P -138	Phosphate rock	VEM-432-47	1.4	34.0	1.6	0.5	3.54	8.0	4.5	38.5	337.47
P -137	Phosphate rock	VEM-431-47	0.9	26.5	3.1	1.2	2.83	11.8	14.4	39.4	353.32
	Limestone lens 0.2 foot below top of bed P-136	VEM-430-47	(0.0-0.5)	2.2	1.0	0.1	--	42.5	1.6	--	--
P -136	Phosphate rock	VEM-429-47	1.8	23.8	5.8	1.1	--	15.8	17.8	41.2	438.76
P -135	Phosphate rock	VEM-428-47	1.0	25.9	2.3	0.9	--	18.7	11.2	42.2	464.86
P -134	Phosphate rock	VEM-427-47	1.3	28.4	2.4	0.8	--	14.9	9.8	43.5	500.98
P -133	Phosphate rock and mudstone	VEM-426-47	0.4	20.9	4.8	1.7	--	18.5	22.6	43.9	509.34
P -132	Phosphate rock, argillaceous	VEM-425-47	1.2	20.9	4.9	1.6	--	15.5	25.6	45.1	534.42
P -131	Phosphate rock	VEM-424-47	0.7	26.8	2.7	1.1	--	14.8	14.0	45.8	553.16
P -130	Phosphate rock	VEM-423-47	0.7	23.9	3.8	1.2	--	16.5	18.5	46.5	569.31
P -129	Phosphate rock, argillaceous	VEM-422-47	0.9	20.1	4.9	1.6	--	17.7	25.6	47.4	588.00
P -128	Phosphate rock, argillaceous	VEM-421-47	1.0	21.2	4.2	1.6	--	16.5	24.2	48.4	609.20
P -127	Phosphate rock, argillaceous	VEM-420-47	0.8	18.5	4.9	1.7	--	17.3	30.5	49.2	624.00
P -126	Mudstone, phosphatic	VEM-419-47	1.0	9.2	7.5	2.6	--	16.3	52.4	50.2	633.20
P -125	Mudstone, phosphatic	VEM-418-47	1.3	9.0	7.6	2.7	--	17.4	51.3	51.5	644.90
P -124	Mudstone, phosphatic	VEM-417-47	1.2	13.0	7.4	2.5	--	15.8	45.0	52.7	660.80
P -123	Mudstone	VEM-416-47	1.3	6.5	9.4	3.1	--	11.7	62.5	54.0	688.95
P -122	Limestone, argillaceous (col. no. 47-HW-249	VEM-415-47	2.0	0.6	4.1	1.8	--	32.7	28.4	56.0	670.15
P -121	Mudstone, phosphatic	VEM-414-47	1.7	12.4	7.6	2.5	--	16.2	44.4	57.7	691.25

[1]

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

[illegible] Sample lost

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)						Cumulative thickness (feet)	Weighted percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	F	Loss on ignition	Acid insoluble		
P -120	Mudstone, phosphatic	VEM-413-47	0.3	10.2	8.0	2.5	--	16.6	49.4	58.00	[illegible]
P -119	Phosphate rock, argillaceous	VEM-412-47	0.8	16.8	6.1	2.2	--	[illegible]	36.6	58.80	707.73
P -118	Mudstone, phosphatic	VEM-411-47	0.6	15.6	4.9	2.2	--	10.7	44.7	59.40	[illegible]
P -117	Mudstone, phosphatic	VEM-410-47	1.2	8.6	8.5	2.6	--	14.9	54.0	60.60	[illegible]
P -116	Mudstone	VEM-409-47	1.3	7.4	9.8	3.2	--	11.4	63.9	61.90	[illegible]
P -115	Mudstone, phosphatic	VEM-408-47	2.0	10.9	7.8	2.8	--	10.4	56.1	63.90	[illegible]
P -114	Mudstone, phosphatic	VEM-407-47	0.5	15.7	7.2	2.9	--	10.6	44.1	64.40	[illegible]
P -113	Mudstone, phosphatic, contains phosphatic nodules	VEM-406-47	0.8	13.6	6.1	3.0	--	4.5	56.9	65.20	[illegible]
P -112	Phosphate rock, argillaceous	VEM-405-47	0.8	24.3	4.0	2.5	--	5.1	30.1	66.00	[illegible]
P -111	Mudstone, contains phosphatic nodules	VEM-404-47	1.6	3.7	8.9	2.9	--	6.5	77.4	67.60	[illegible]
P -110	Mudstone, phosphatic	VEM-403-47	1.1	11.4	7.3	2.7	--	6.5	59.9	68.70	[illegible]
P -109	Mudstone, phosphatic	VEM-402-47	0.8	15.4	5.9	1.9	--	11.4	44.0	69.50	[illegible]
P -108	Mudstone, phosphatic	VEM-401-47	1.2	10.0	7.4	2.0	--	9.1	60.8	70.70	[illegible]
P -107	Mudstone; fos. col. no. 47-HW-248	VEM-400-47	2.6	6.9	7.9	2.7	--	7.4	69.7	73.30	[illegible]
P -106	Limestone; fos. col. no. 47-HW-243	VEM-399-47	1.6	0.7	1.9	0.9	--	38.1	16.1	74.90	[illegible]
P -105	Mudstone	VEM-398-47	0.7	5.4	8.1	2.8	--	8.4	70.8	75.60	[illegible]
P -104	Phosphate rock and mudstone	VEM-397-47	1.2	13.1	6.4	2.6	--	10.9	47.4	76.80	[illegible]
P -103	Phosphate rock, argillaceous	VEM-396-47	1.1	16.3	8.4	2.5	--	11.3	23.6	77.90	[illegible]
P -102	Mudstone	VEM-395-47	1.5	2.1	9.9	2.7	--	8.9	78.2	79.40	[illegible]
P -101	Mudstone	VEM-394-47	1.0	1.3	9.9	2.8	--	10.7	76.2	80.40	[illegible]
P -100	Mudstone, calcareous	VEM-393-47	1.2	2.7	8.2	2.5	--	16.4	60.7	81.60	[illegible]
P - 99	Mudstone, phosphatic	VEM-392-47	1.2	10.1	7.4	2.4	--	14.1	53.2	82.80	[illegible]
P - 98	Mudstone	VEM-391-47	0.8	3.0	9.9	2.8	--	13.9	71.5	83.60	[illegible]
P - 97	Mudstone	VEM-390-47	1.4	4.6	9.6	3.0	--	10.4	72.1	85.00	[illegible]
P - 96	Mudstone	VEM-389-47	0.9	4.6	10.7	3.2	--	8.6	75.0	85.90	[illegible]
P - 95	Mudstone	VEM-388-47	0.5	3.4	11.8	3.7	--	15.8	65.4	86.40	[illegible]
P - 94	Phosphate rock	VEM-387-47	0.3	27.9	2.5	1.1	--	8.2	16.9	86.70	[illegible]
P - 93	Mudstone	VEM-386-47	1.0	7.1	9.0	3.4	--	9.0	66.2	87.70	[illegible]
P - 92	Mudstone, calcareous, phosphatic	VEM-385-47	1.1	11.4	7.5	2.8	--	16.9	45.6	88.80	[illegible]
P - 91	Mudstone and phosphate rock	VEM-384-47	1.0	8.8	8.5	3.2	--	16.0	51.7	89.80	[illegible]
P - 90	Phosphate rock, argillaceous	VEM-383-47	0.8	19.1	4.5	1.6	--	18.0	27.8	90.60	[illegible]
P - 89	Mudstone	VEM-382-47	1.1	4.6	10.2	2.9	--	12.9	68.3	91.70	[illegible]
P - 88	Mudstone and phosphate rock; fos. col. no. 47-HW-242	VEM-381-47	1.3	12.8	8.4	3.4	--	7.8	54.4	93.00	1,004.56
P - 87	Mudstone	VEM-380-47	2.3	3.9	10.5	4.4	--	5.0	79.4	95.30	1,013.52
P - 86	Limestone, argillaceous	VEM-379-47	2.0	0.4	4.9	1.9	--	29.7	35.0	97.30	1,014.32
P - 85	Mudstone and phosphate rock	VEM-378-47	2.4	7.4	9.8	4.2	--	5.3	69.6	99.70	1,032.08
P - 84	Mudstone	VEM-377-47	0.4	1.0	7.2	3.2	--	8.1	82.0	100.10	1,032.48

P - 83	Mudstone and calcareous mudstone	VEM-376-47	2.8	0.4	6.2	2.5	--	24.2	47.1	102.90	[illegible]	[illegible]
P - 82	Mudstone and phosphate rock	VEM-375-47	0.5	14.7	7.9	3.3	--	5.5	50.9	103.40	[illegible]	[illegible]
P - 81	Mudstone and phosphate rock	VEM-374-47	2.9	9.8	9.9	4.7	--	5.3	63.9	106.30	[illegible]	[illegible]
P - 80	Mudstone	VEM-373-47	1.0	1.7	12.0	5.8	--	5.4	84.7	107.30	[illegible]	[illegible]
P - 79	Phosphate rock	VEM-372-47	1.0	32.2	2.4	2.4	--	3.3	12.0	108.30	[illegible]	[illegible]
P - 78	Phosphate rock and mudstone	VEM-371-47	0.7	21.4	5.4	4.9	--	5.2	53.3	109.00	[illegible]	[illegible]
P - 77	Mudstone	VEM-370-47	1.4	1.8	11.5	5.2	--	6.7	81.8	110.40	[illegible]	[illegible]
P - 76	Phosphate rock and mudstone	VEM-369-47	0.9	22.5	6.5	3.5	--	6.4	32.0	111.30	[illegible]	[illegible]
P - 75	Mudstone, phosphatic	VEM-368-47	0.4	9.6	10.5	3.6	--	10.0	59.6	111.70	[illegible]	[illegible]
P - 74	Mudstone	VEM-367-47	1.1	3.5	11.7	9.5	--	6.7	78.7	112.80	[illegible]	[illegible]
P - 73	Mudstone, phosphatic	VEM-366-47	0.9	14.0	8.0	3.0	--	11.8	45.8	113.70	[illegible]	[illegible]
P - 72	Mudstone	VEM-365-47	1.3	0.9	4.0	3.6	--	8.6	84.1	115.00	[illegible]	[illegible]
P - 71	Mudstone	VEM-364-47	0.8	4.8	11.0	9.5	--	8.2	74.6	115.80	[illegible]	[illegible]
P - 70	Phosphate rock, argillaceous	VEM-363-47	0.4	17.1	5.5	2.4	--	19.7	26.7	116.20	[illegible]	[illegible]
P - 69	Phosphate rock	VEM-362-47	0.7	24.3	3.3	1.4	--	17.9	14.9	116.90	[illegible]	[illegible]
P - 68	Mudstone, phosphatic	VEM-361-47	0.8	11.1	8.7	2.7	--	14.0	50.7	117.70	[illegible]	[illegible]
P - 67	Mudstone, phosphatic	VEM-360-47	1.0	13.3	7.9	2.7	--	17.2	40.7	118.70	[illegible]	[illegible]
P - 66	Mudstone, phosphatic	VEM-359-47	0.8	8.2	10.6	3.9	--	14.5	55.0	119.50	[illegible]	[illegible]
P - 65	Mudstone, phosphatic	VEM-344-47	0.4	9.1	9.6	3.5	--	25.2	38.8	119.90	[illegible]	[illegible]
P - 64	Mudstone, calcareous, phosphatic	VEM-343-47	1.8	10.1	7.7	2.9	--	21.5	36.7	121.70	[illegible]	[illegible]
P - 63	Phosphate rock, calcareous, argillaceous	VEM-342-47	1.2	13.7	5.9	2.2	--	19.2	27.6	122.90	[illegible]	[illegible]
P - 62	Mudstone, calcareous, phosphatic	VEM-341-47	1.6	7.9	8.0	2.7	--	18.9	40.7	124.50	[illegible]	[illegible]
P - 61	Mudstone, calcareous, fos. col. no. 47-HW-241	VEM-340-47	0.4	5.7	10.6	3.3	--	15.2	52.3	124.90	[illegible]	[illegible]
P - 60	Limestone, fos. col. no. 47-HW-240	VEM-339-47	0.5	0.3	2.0	0.8	--	40.6	11.9	125.40	[illegible]	[illegible]
P - 59	Limestone, fos. col. no. 47-HW-239	VEM-338-47	1.5	0.3	1.4	0.4	--	40.8	11.3	126.90	[illegible]	[illegible]
P - 58	Mudstone, calcareous, fos. col. no. 47-HW-238	VEM-337-47	1.1	1.8	11.9	3.4	--	13.7	65.6	128.00	[illegible]	[illegible]
P - 57	Limestone, fos. col. no. 47-HW-237	VEM-336-47	3.6	0.3	1.9	0.5	--	38.5	17.4	131.60	[illegible]	[illegible]
P - 56	Chert, fos. col. no. 47-HW-236	VEM-335-47	0.3	1.0	2.4	3.5	--	5.0	85.1	131.90	[illegible]	[illegible]
P - 55	Mudstone, fos. col. no. 47-HW-235	VEM-334-47	1.0	1.8	7.6	2.6	--	6.9	81.1	132.90	[illegible]	[illegible]
P - 54	Mudstone, calcareous	VEM-333-47	1.5	2.9	11.7	3.5	--	12.1	68.9	134.40	[illegible]	[illegible]
P - 53	Mudstone	VEM-332-47	1.7	1.7	11.7	4.5	--	10.0	76.6	136.10	[illegible]	[illegible]
P - 52	Mudstone, calcareous	VEM-331-47	1.6	4.1	9.2	2.9	--	19.0	48.6	137.70	[illegible]	[illegible]
P - 51	Mudstone, fos. col. no. 47-HW-234	VEM-330-47	1.2	3.7	10.3	3.1	--	9.1	72.6	138.90	[illegible]	[illegible]
P - 50	Mudstone	VEM-329-47	1.6	6.8	11.1	3.4	--	9.2	84.3	140.50	[illegible]	[illegible]
P - 49	Mudstone	VEM-328-47	1.7	1.6	11.4	3.6	--	8.5	81.0	142.20	[illegible]	[illegible]

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)						Cumulative thickness (feet)	Tonnage per percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	F	Loss on ignition	Acid insoluble		
P - 48	Mudstone, phosphatic	RMC-104-47	2.0	10.7	11.0	3.7	--	11.5	52.6	144.2	1,310.81
P - 47	Mudstone	RMC-103-47	0.9	4.0	11.5	3.5	--	8.9	73.7	145.1	1,324.41
P - 46	Mudstone and calcareous mudstone	RMC-102-47	1.4	5.1	11.6	3.9	--	10.8	64.0	146.5	1,341.33
P - 45	Limestone, fos. col. no. 47-HW-233	RMC-101-47	1.1	0.6	2.3	1.1	--	38.6	14.3	147.6	1,347.21
P - 44	Mudstone, calcareous and phosphatic, calcareous mudstone	RMC-100-47	1.8	14.6	9.2	3.2	--	12.1	41.9	149.4	1,381.45
P - 43	Phosphate rock, argillaceous	RMC- 99-47	0.6	21.7	5.1	1.8	--	14.	34.4	150.0	1,391.51
P - 42	Phosphate rock, argillaceous, calcareous	RMC- 98-47	0.5	14.7	7.9	2.5	--	17.0	33.4	150.5	1,398.86
P - 41	Mudstone, calcareous, phosphatic	RMC- 97-47	1.5	8.0	7.5	2.7	--	18.5	44.0	152.0	1,400.86
P - 40	Mudstone, phosphatic	VEM-327-47	0.8	12.2	8.9	3.2	--	11.8	49.8	152.8	1,410.62
P - 39	Phosphate rock, argillaceous	VEM-326-47	0.8	16.3	9.4	2.5	--	11.7	38.9	153.6	1,423.66
P - 38	Phosphate rock, argillaceous, contains limestone lens at top	VEM-325-47	1.2	15.5	7.8	2.5	--	15.2	36.4	154.8	1,442.26
	Limestone lens between bed P-38 and bed P-37	VEM-324-47	(0.0-1.1)	0.7	0.6	0.2	--	42.7	3.1		1,442.26
P - 37	Mudstone, phosphatic, calcareous	VEM-323-47	1.5	11.1	10.1	3.2	--	13.5	49.4	156.3	1,458.31
P - 36	Mudstone, phosphatic, calcareous	VEM-322-47	1.5	10.6	10.5	3.2	--	15.1	47.4	157.80	1,474.81
P - 35	Phosphate rock, argillaceous, calcareous	VEM-321-47	0.7	15.2	6.3	2.1	--	16.4	36.2	158.5	1,485.13
P - 34	Phosphate rock; fos. col. no. 47-HW-232	VEM-320-47	1.6	21.1	2.8	1.2	--	14.3	11.3	160.1	1,524.11
P - 33	Phosphate rock, argillaceous	VEM-319-47	0.8	16.5	4.3	2.5	--	25.6.4	23.1	160.9	1,542.01
P - 32	Phosphate rock	VEM-318-47	0.8	30.8	1.4	1.6	--	10.7	6.8	161.7	1,566.63
P - 31	Phosphate rock	VEM-317-47	1.2	26.1	2.8	1.5	--	13.1	17.8	162.9	1,597.97
P - 30	Limestone	VEM-316-47	1.6	2.7	1.8	0.7	--	38.6	11.9	164.5	1,602.37
	Limestone lens, argillaceous, phosphatic, in bed P-29	VEM-315-47	(0.0-0.8)	10.2	4.6	1.3	--	22.4	31.0		
P - 29	Limestone, argillaceous, phosphatic	VEM-314-47	0.8	10.1	4.9	1.3	--	22.1	31.3	165.3	1,610.51
P - 28	Mudstone, calcareous, phosphatic	VEM-313-47	2.7	9.6	7.6	2.3	--	16.3	42.4	168.0	1,638.51
P - 27	Limestone	VEM-312-47	1.6	1.1	3.1	1.3	--	36.9	19.8	169.6	1,641.71
P - 26	Phosphate rock, calcareous, argillaceous	VEM-311-47	0.9	16.8	3.2	1.1	1.49	18.6	21.0	170.7	1,653.51
P - 25	Phosphate rock	RAW- 60-47	0.8	28.6	2.2	1.0	2.86	10.3	14.7	171.5	1,676.87
P - 24	Phosphate rock,	RAW- 59-47	0.8	29.2	1.8	0.6	2.82	11.5	10.7	172.3	1,689.53
P - 23	Phosphate rock	RAW- 58-47	1.4	27.7	2.4	1.1	2.48	10.8	15.2	173.7	1,710.93
P - 22	Phosphate rock, argillaceous	RAW- 49-47	1.3	16.0	5.4	2.0	1.94	9.4	37.6	175.0	1,762.73
P - 21	Limestone, argillaceous, fos. col. no. 47-HW-224	RAW- 48-47	1.2	5.0	2.9	1.6	0.31	29.9	25.6	176.2	1,780.13

P - 20	Phosphate rock	RAW- 47-47	0.9	32.5	1.3	0.8	3.30	8.8	6.8	177.1	[illegible]
P - 19	Phosphate rock	RAW- 46-47	2.1	28.7	2.5	0.9	2.47	9.4	14.1	179.2	[illegible]
	Limestone lens in bed P-18	RAW- 45-47	(0.5)	1.3	0.4	0.2	--	41.0	3.8	--	
P - 18	Phosphate rock	RAW- 44-47	2.0	26.2	2.5	1.3	2.50	10.0	19.8	181.2	[illegible]
P - 17	Phosphate rock, argillaceous	RAW- 43-47	1.7	23.1	4.1	1.3	2.16	11.0	23.4	182.9	[illegible]
P - 16	Limestone, phosphatic	RAW- 42-47	0.9	8.9	1.3	0.7	0.86	32.6	7.8	183.8	[illegible]
P - 15	Limestone	RAW- 41-47	0.8	2.0	2.5	0.7	--	40.6	8.2	184.6	[illegible]
P - 14	Phosphate rock	RAW- 40-47	1.5	26.9	3.2	0.7	2.55	9.9	16.7	186.1	[illegible]
P - 13	Phosphate rock, calcareous, fos. col. no. 47-HW-223	RAW- 39-47	1.4	20.2	2.8	1.0	2.04	15.5	18.2	187.5	2,025.62
P - 12	Limestone, phosphatic, fos. col. no. 47-HW-222	RAW- 38-47	1.5	10.5	0.8	1.2	1.06	31.1	8.4	189.0	[illegible]
P - 11	Phosphate rock	RAW- 37-47	1.0	32.6	1.24	0.4	2.67	8.5	4.0	190.0	[illegible]
P - 10	Phosphate rock	RAW- 36-37	1.1	32.4	0.94	0.5	3.21	9.8	3.8	191.1	[illegible]
P - 9	Phosphate rock	RAW- 35-47	1.2	32.0	1.1	0.8	3.17	13.7	3.7	192.3	[illegible]
P - 8	Phosphate rock	RAW- 34-47	1.1	32.4	0.98	0.6	3.24	9.9	3.3	193.4	[illegible]
P - 7	Phosphate rock	RAW- 33-47	0.6	30.1	1.4	0.9	3.07	13.0	5.2	194.0	[illegible]
P - 6	Phosphate rock	RAW- 32-47	1.4	31.0	1.4	0.8	3.17	8.3	8.9	195.4	[illegible]
P - 5	Mudstone, calcareous	RAW- 31-47	1.2	3.8	9.8	3.5	--	13.2	64.0	196.6	2,249.67
P - 4	Limestone, argillaceous	RAW- 30-47	2.6	0.4	4.2	2.0	--	29.4	34.5	199.2	[illegible]
P - 3	Mudstone, calcareous	RAW- 29-47	2.3	0.7	8.0	2.3	--	15.5	61.4	201.5	[illegible]
P - 2	Phosphate rock, argillaceous	RAW- 28-47	0.2	20.8	5.6	1.8	--	6.1	30.9	201.7	[illegible]
P - 1	Phosphate rock, fos. col. no. 47-HW-221	RAW- 61-47	0.4	29.6	1.1	0.6	2.90	8.0	7.8	202.1	[illegible]
					Wells formation						
CW- 1	Limestone, fos. col. no. 47-HW-220		4.6	--	--	--	--	--	--	--	--
CW- 2	Phosphate rock		0.2	--	--	--	--	--	--	--	--

SPECTROGRAPHIC ANALYSES—MABIE CANYON, IDAHO. LOT NO. 1240

Semi-quantitative analyses of samples of the Phosphoria formation, Mabie Canyon, Idaho (see immediately preceding pages for location, 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, Ba, Be, Bi, Cd, Co, Ge, Au, In, Pb, Li, Hg, Pb, Ta, Sn, and W were looked for in all samples 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	B	Ca	Cr	Co	Cu	Fe	Mg	Mn	Mo	Ni	Si	Ag	Na	Sr	Ti	V	Zn	Y
R - 5	VEM-470-47	C	F	C	E	ND	G	C	C	E	F	E	A	G	E	F	E	E	ND	E
R - 4	VEM-469-47	C	F	A	E	ND	G	C	C	E	F	E	A	G	E	F	E	E	ND	E
R - 3	VEM-468-47	C	F	C	E	ND	G	C	C	E	F	E	A	G	E	F	E	E	ND	E
R - 2	VEM-467-47	C	F	A	E	ND	G	C	C	E	F	E	A	G	E	F	E	E	ND	E
R - 1	VEM-466-47	C	F	A	E	ND	G	C	C	E	F	E	A	G	E	F	E	E	ND	E
P -170	VEM-465-47	C	F	A	E	ND	G	C	D	E	F	E	A	G	E	F	E	E	ND	E
P -169	VEM-464-47	C	F	A	E	ND	G	C	D	E	F	E	A	G	E	F	E	E	ND	E
P -168	VEM-463-47	C	F	A	E	ND	G	C	D	E	F	E	A	G	E	F	E	E	ND	E
P -167	VEM-462-47	C	F	A	E	ND	G	C	D	E	F	E	A	G	E	F	E	E	ND	E
P -166	VEM-461-47	C	F	C	E	ND	G	C	D	E	F	E	A	G	D	F	E	E	ND	E
	VEM-460-47	C	F	A	E	ND	G	C	D	E	F	E	A	G	E	F	E	E	ND	E
P -165	VEM-459-47	C	F	A	E	ND	G	C	D	E	F	E	A	G	E	F	E	E	ND	E
P -164	VEM-458-47	C	F	C	E	ND	G	C	D	E	F	E	A	G	E	F	E	E	ND	E
P -163	VEM-457-47	C	F	C	E	ND	G	C	D	E	F	E	A	G	E	F	E	E	ND	E
P -162	VEM-456-47	C	F	C	E	ND	G	C	D	E	F	E	A	G	D	F	E	E	ND	E
P -161	VEM-455-47	C	F	A	E	ND	G	C	D	E	F	E	A	G	E	F	E	E	ND	E
P -160	VEM-454-47	C	F	A	E	ND	G	C	D	E	F	E	A	G	E	F	E	E	ND	E
P -159	VEM-453-47	C	F	C	E	ND	G	C	D	E	F	E	A	G	E	F	E	E	ND	E
P -158	VEM-452-47	C	F	C	E	ND	G	C	D	E	F	E	A	G	E	F	E	E	ND	E
P -157	VEM-451-47	C	F	A	E	ND	G	C	D	E	F	E	A	G	E	F	E	E	ND	E
P -156	VEM-450-47	C	F	A	E	ND	G	C	D	E	F	E	A	G	E	F	E	E	ND	E
P -155	VEM-449-47	C	F	A	E	ND	G	C	D	E	F	E	A	G	ND	F	E	E	ND	E
P -154	VEM-448-47	C	F	A	E	ND	G	C	D	E	F	E	A	G	ND	F	E	E	ND	E
P -153	VEM-447-47	C	F	A	E	ND	G	C	D	E	F	E	A	G	D	F	E	E	ND	E
P -152	VEM-446-47	C	F	C	E	ND	G	C	D	E	F	E	A	G	D	F	E	E	ND	E
P -151	VEM-445-47	C	F	A	E	ND	G	C	D	E	F	E	C	G	E	F	E	E	ND	E
P -150	VEM-444-47	C	F	A	E	ND	G	C	D	E	F	E	C	G	E	F	E	E	ND	E
P -149	VEM-443-47	C	F	A	E	ND	G	C	D	E	F	E	C	G	E	F	E	E	ND	E
P -148	VEM-442-47	C	F	A	E	ND	G	C	D	E	F	E	B	G	E	F	E	D	ND	E

| | | |

Bed no.	Sample no.	Al	B	Ca	Cr	Co	Cu	Fe	Mg	Mn	Mo	Ni	Si	Ag	Na	Sr	Ti	V	Zn	Zr
P - 103	VEM-396-47	C	F	B	D	ND	G	C	D	E	F	E	A	G	D	E	E	D	ND	E
P - 102	VEM-395-47	C	F	C	E	ND	G	C	D	E	F	E	A	G	D	E	E	D	ND	E
P - 101	VEM-394-47	C	F	C	E	E	G	C	D	E	F	E	A	G	D	E	E	D	ND	E
P - 100	VEM-393-47	C	F	B	E	ND	G	C	D	E	F	E	A	G	D	E	E	D	ND	E
P - 99	VEM-392-47	C	F	A	E	ND	G	C	D	E	F	E	A	G	D	E	E	D	ND	E
P - 98	VEM-391-47	C	F	C	E	ND	G	C	D	E	F	E	A	G	D	E	E	D	ND	E
P - 97	VEM-390-47	C	F	C	E	ND	G	C	D	E	F	E	A	G	D	E	E	D	ND	E
P - 96	VEM-389-47	C	F	C	E	ND	G	C	D	E	F	E	A	G	D	E	E	D	ND	E
P - 95	VEM-388-47	C	F	C	E	ND	G	C	D	E	F	E	A	G	D	E	E	D	ND	E
P - 94	VEM-387-47	C	F	A	E	ND	G	C	D	E	F	E	A	G	D	E	E	D	ND	E
P - 93	VEM-386-47	C	F	B	E	ND	G	C	D	E	F	E	A	G	D	E	E	D	ND	E
P - 92	VEM-385-47	C	F	A	E	ND	G	C	D	E	F	E	A	G	D	E	E	D	ND	E
P - 91	VEM-384-47	C	F	A	E	ND	G	C	D	E	F	E	A	G	D	E	E	D	ND	E
P - 90	VEM-383-47	C	F	A	E	ND	G	C	D	E	F	E	A	G	D	E	E	D	ND	E
P - 89	VEM-382-47	C	F	A	E	ND	G	C	D	E	F	E	A	G	D	E	E	D	ND	E
P - 88	VEM-381-47	C	F	B	E	ND	G	C	D	E	F	E	A	G	D	E	E	D	ND	E
P - 87	VEM-380-47	C	F	C	E	ND	G	C	D	E	F	E	A	G	D	E	E	D	ND	E
P - 86	VEM-379-47	C	F	A	E	ND	G	C	D	E	F	E	A	G	D	E	E	D	ND	E
P - 85	VEM-378-47	C	F	A	E	ND	G	C	D	E	F	E	A	G	D	E	E	D	ND	E
P - 84	VEM-377-47	C	F	C	E	ND	G	C	D	E	F	E	A	G	D	E	E	D	ND	E
P - 83	VEM-376-47	C	F	A	E	ND	G	C	D	E	F	E	A	G	D	E	E	D	ND	E
P - 82	VEM-375-47	C	F	A	E	ND	G	C	D	E	F	E	A	G	D	E	E	D	ND	E
P - 81	VEM-374-47	C	F	A	E	ND	G	C	D	E	F	E	A	G	D	E	E	D	ND	E
P - 80	VEM-373-47	C	F	A	E	ND	G	C	D	E	F	E	A	G	D	E	E	D	ND	E
P - 79	VEM-372-47	C	F	A	E	ND	G	C	D	E	F	E	B	G	D	E	E	D	ND	E
P - 78	VEM-371-47	C	F	A	E	ND	G	C	D	E	F	E	A	G	D	E	E	D	ND	E
P - 77	VEM-370-47	C	F	A	E	ND	G	C	D	E	F	E	A	G	D	E	E	D	ND	E
P - 76	VEM-369-47	C	F	A	E	ND	G	C	D	E	F	E	A	G	D	E	E	D	ND	E
P - 75	VEM-368-47	C	F	A	E	ND	G	C	D	E	F	E	A	G	D	E	E	D	ND	E
P - 74	VEM-367-47	C	F	A	E	ND	G	C	D	E	F	E	A	G	D	E	E	D	ND	E
P - 73	VEM-366-47	C	F	A	E	ND	G	C	D	E	F	E	A	G	D	E	E	D	ND	E
P - 72	VEM-365-47	C	F	A	E	ND	G	C	D	E	F	E	A	G	D	E	E	D	ND	E
P - 71	VEM-364-47	C	F	A	E	ND	G	C	D	E	F	E	A	G	D	E	E	D	ND	E
P - 70	VEM-363-47	C	F	A	E	ND	G	C	D	E	F	E	A	G	D	E	E	D	ND	E
P - 69	VEM-362-47	C	F	A	E	ND	G	C	D	E	F	E	A	G	D	E	E	D	ND	E
P - 68	VEM-361-47	C	F	A	E	ND	G	C	D	E	F	E	A	G	D	E	E	D	ND	E
P - 67	VEM-360-47	C	F	A	E	ND	G	C	D	E	F	E	A	G	D	E	E	D	ND	E
P - 66	VEM-359-47	C	F	A	E	ND	G	C	D	E	F	E	A	G	D	E	E	D	ND	E
P - 65	VEM-344-47	C	F	A	E	ND	G	C	D	E	F	E	A	G	D	E	E	D	ND	E
P - 64	VEM-343-47	C	F	A	E	ND	G	C	D	E	F	E	A	G	D	E	E	D	ND	E
P - 63	VEM-342-47	C	F	A	D	ND	G	C	C	E	F	E	A	G	D	E	E	D	ND	E

| | | |

Bed no.	Sample no.	Al	B	Ca	Cr	Co	Cu	Fe	Mg	Mn	Mo	Ni	Si	Ag	Sr	Ti	V	Zr	
P - 19	RAW- 46-47	C	F	A	E	ND	G	C	D	F	F	E	A	F	N	E	D	E	E
—	RAW- 45-47	C	F	A	E	ND	G	C	D	F	F	E	A	F	N	E	D	E	E
P - 18	RAW- 44-47	C	F	A	E	ND	G	C	D	F	F	E	A	F	N	E	D	E	E
P - 17	RAW- 43-47	C	F	A	E	ND	G	C	D	F	F	E	A	F	N	E	D	E	E
P - 16	RAW- 42-47	C	F	A	E	ND	G	C	D	F	F	E	A	F	N	E	D	E	E
P - 15	RAW- 41-47	C	F	A	E	ND	G	C	D	F	F	E	A	F	N	E	D	E	E
P - 14	RAW- 40-47	C	F	A	E	ND	G	C	D	F	F	E	A	F	N	E	D	E	E
P - 13	RAW- 39-47	C	F	A	E	ND	G	C	D	F	F	E	A	F	N	E	D	E	E
P - 12	RAW- 38-47	C	F	A	E	ND	G	C	D	F	F	E	A	F	N	E	D	E	E
P - 11	RAW- 37-47	C	F	A	E	ND	G	C	D	F	F	E	A	F	N	E	D	E	E
P - 10	RAW- 36-47	C	F	A	E	ND	G	C	D	F	F	E	A	F	N	E	D	E	E
P - 9	RAW- 35-47	C	F	A	E	ND	G	C	D	F	F	E	A	F	N	E	D	E	E
P - 8	RAW- 34-47	C	F	A	E	ND	G	C	D	F	F	E	A	F	N	E	D	E	E
P - 7	RAW- 33-47	C	F	A	E	ND	G	C	D	F	F	E	A	F	N	E	D	E	E
P - 6	RAW- 32-47	C	F	A	E	ND	G	C	D	F	F	E	A	F	N	E	D	E	E
P - 5	RAW- 31-47	C	F	A	E	ND	G	C	D	F	F	E	A	F	N	E	D	E	E
P - 4	RAW- 30-47	C	F	A	E	ND	G	C	D	F	F	E	A	F	N	E	D	E	E
P - 3	RAW- 29-47	C	F	A	E	ND	G	C	D	F	F	E	A	F	N	E	D	E	E
P - 2	RAW- 28-47	C	F	A	E	ND	G	C	D	F	F	E	A	F	N	E	D	E	E
P - 1	RAW- 61-47	C	F	A	E	ND	G	C	D	F	F	E	A	F	N	E	D	E	E

CONDA, IDAHO, LOT NO. 1200.

Phosphatic shale member of Phosphoria formation sampled in 300 level east crosscut of Conda mine, sec. 11, T. 8 S., R. 42 E., Caribou County, Idaho, on west limb of Trail syncline. Beds strike N. 10° W., and dip 55° E. Section measured by F. C. Armstrong, R. A. Hoppin, and L. E. Smith and sampled by R. A. Gulbrandsen, O. A. Payne, R. S. Sears, and R. P. Sheldon in July 1947. Samples analyzed by Tennessee Valley Authority.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)						Cumulative thickness (feet)	Thickness, percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	V_2O_5	Loss on ignition	Acid insoluble		
Rex member of Phosphoria formation											
R - 4	Chert and mudstone	--	2.7	--	--	--	--	--	--	2.70	--
R - 3	Limestone, cherty	--	1.75	--	--	--	--	--	--	4.45	--
R - 2	Chert, calcareous	--	3.0	--	--	--	--	--	--	7.45	--
R - 1	Mudstone, calcareous	FCA-141-47	0.3	1.3	5.5	2.4	.045	8.6	56.3	7.75	0.51
Phosphatic shale member of Phosphoria formation											
P -142	Phosphate rock, calcareous; fos. col. no. 47-HW-12	FCA-140-47	0.8	24.0	1.8	1.3	.025	16.2	15.1	0.80	19.20
P -141	Mudstone, calcareous	FCA-139-47	0.35	4.2	9.4	3.2	.095	13.2	54.4	1.15	20.57
P -140	Mudstone, calcareous; fos. col. no. 47-HW-11	FCA-138-47	1.7	1.7	8.9	3.9	.095	13.2	60.3	2.85	23.04
P -139	Mudstone, calcareous	FCA-137-47	0.75	5.6	9.6	3.1	.03	15.8	51.5	3.60	27.76
P -138	Mudstone, calcareous; fos. col. no. 47-HW-10	FCA-144-47	4.9	1.2	8.6	4.0	.025	24.8	58.6	8.50	33.14
P -137	Limestone, argillaceous; fos. col. 47-HW-9	FCA-143-47	2.8	4.1	4.1	1.9	.015	19.5	31.6	11.30	45.20
P -136	Phosphate rock, argillaceous	FCA-142-47	0.25	24.6	5.1	2.5	.035	24.8	20.3	11.55	47.77
P -135	Phosphate rock	FCA-136-47	1.35	28.8	2.1	1.3	.08	8.4	12.3	12.90	90.15
P -134	Mudstone, calcareous	FCA-135-47	0.35	4.6	8.6	5.2	.17	15.8	54.0	13.25	91.15
P -133	Phosphate rock, calcareous; fos. col. no. 47-HW-8	FCA-134-47	0.65	25.0	0.7	0.8	.035	16.3	5.1	13.90	101.31
P -132	Phosphate rock	FCA-133-47	0.35	34.2	0.4	0.6	.06	6.5	2.3	14.25	119.40
P -131	Phosphate rock	FCA-132-47	0.55	26.9	2.2	1.1	.14	13.5	9.9	14.80	134.70
P -130	Phosphate rock	FCA-131-47	0.85	33.4	0.5	0.6	.065	9.8	2.6	15.65	163.10
P -129	Phosphate rock	FCA-130-47	0.3	30.1	1.9	1.4	.06	7.7	11.3	15.95	172.20
P -128	Phosphate rock, calcareous	FCA-129-47	0.8	22.3	1.8	1.2	.04	13.8	14.3	16.75	190.00
P -127	Phosphate rock	FCA-128-47	0.75	32.4	1.0	1.0	.09	7.5	5.2	17.50	214.20
P -126	Phosphate rock, calcareous near base	FCA-127-47	0.75	26.9	2.4	1.5	.09	8.7	15.0	18.25	234.30
P -125	Phosphate rock	FCA-126-47	0.35	26.5	2.5	1.6	.13	9.6	15.3	18.60	243.30
P -124	Limestone, phosphatic	FCA-125-47	0.65	7.8	1.5	0.7	.03	31.0	11.7	19.25	248.00
P -123	Phosphate rock, calcareous	FCA-124-47	0.8	24.2	1.4	0.8	.08	15.8	6.9	20.05	268.00

Fossil collection 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)	Tonnage per acre-foot (P_2O_5) (thousands)
				P_2O_5	Al_2O_3	Fe_2O_3	V_2O_5	Loss on ignition	Acid insoluble		
P -122	Mudstone and phosphate rock	FCA-123-47	0.6	17.5	4.8	2.0	.24	14.0	28.1	20.65	270.9
P -121	Phosphate rock, calcareous	FCA-122-47	0.7	20.0	2.6	1.5	.19	16.2	16.0	21.35	292.5
P -120	Limestone, phosphatic	FCA-121-47	1.1	15.6	0.9	0.8	.08	25.0	6.7	22.45	309.1
P -119	Limestone, argillaceous	FCA-120-47	0.9	6.7	4.8	2.0	.25	23.0	31.0	23.35	319.7
P -118	Mudstone, calcareous	FCA-119-47	0.7	3.0	7.3	2.9	.36	22.0	44.6	24.05	331.0
P -117	Mudstone, calcareous	FCA-118-47	0.25	1.0	7.4	3.7	.49	23.2	44.9	24.30	334.4
P -116	Mudstone	FCA-117-47	0.4	1.1	7.9	4.1	.42	21.0	50.4	24.70	340.0
P -115	Limestone, argillaceous	FCA-116-47	0.4	1.9	7.0	3.0	.36	22.8	46.0	25.10	345.4
P -114	Mudstone	FCA-115-47	0.65	4.7	7.5	3.4	.33	18.7	49.4	25.75	354.3
P -113	Mudstone	FCA-114-47	0.3	1.8	8.9	3.2	.41	21.7	51.3	26.05	358.4
P -112	Limestone, phosphatic, argillaceous	FCA-111-47	0.75	14.1	3.9	1.7	.38	24.1	21.6	26.80	368.8
P -111	Mudstone, phosphatic, calcareous	FCA-110-47	0.6	12.5	6.2	2.4	.30	14.8	41.4	27.40	377.1
P -110	Limestone, phosphatic	RAH-146-47	0.6	18.4	0.4	0.4	0.95	9.6	4.3	28.00	385.1
P -109	Limestone, phosphatic	RAH-145-47	2.2	8.9	1.6	1.0	.12	24.4	11.1	30.20	415.7
P -108	Limestone, phosphatic	RAH-144-47	3.5	12.8	2.9	1.4	.22	36.6	15.7	33.70	463.7
P -107	Limestone, phosphatic	RAH-143-47	2.1	13.8	3.5	1.5	.31	28.7	19.1	35.80	492.5
P -106	Phosphate rock, argillaceous, calcareous	RAH-142-47	1.6	14.5	5.4	2.2	.09	24.6	33.1	37.40	514.7
P -105	Limestone, argillaceous	RAH-141-47	2.1	2.6	4.6	2.2	.04	18.6	35.0	39.50	543.5
P -104	Mudstone, calcareous, phosphatic	RAH-140-47	1.3	10.8	6.7	2.4	.015	26.7	37.6	40.80	561.4
P -103	Mudstone, phosphatic, calcareous	LES-243-47	1.8	11.6	6.4	2.5	.055	18.9	40.6	42.60	586.1
P -102	Mudstone, calcareous	LES-242-47	1.2	4.5	7.3	3.3	.02	21.5	39.1	43.80	602.8
P -101	Mudstone	LES-241-47	1.9	2.4	7.3	3.3	.015	14.1	75.1	45.70	628.9
P -100	Phosphate rock, argillaceous, calcareous	LES-240-47	0.6	16.2	5.2	2.2	.024	12.5	55.6	49.30	678.4
P - 99	Mudstone, calcareous	LES-239-47	2.4	1.4	7.6	3.0	.018	15.3	64.0	51.70	711.4
P - 98	Mudstone, calcareous	FCA-109-47	0.9	2.7	8.5	2.8	.02	12.6	70.8	52.60	723.8
P - 97	Mudstone, calcareous, phosphatic	FCA-108-47	1.4	8.0	7.1	3.0	.025	12.8	55.9	54.00	743.0
P - 96	Mudstone, calcareous	FCA-107-47	2.0	6.5	9.9	2.4	.03	16.2	55.9	56.00	770.5
P - 95	Mudstone, calcareous	FCA-106-47	3.0	4.3	8.1	3.2	.03	13.0	65.8	59.00	811.8
P - 94	Limestone	FCA-105-47	1.8	0.5	2.2	1.2	.015	35.9	19.1	60.80	836.4
P - 93	Mudstone, calcareous	FCA-104-47	1.1	5.5	7.6	2.8	.025	18.2	60.8	61.90	851.5
P - 92	Mudstone, calcareous, phosphatic	FCA-103-47	0.8	7.8	5.1	2.4	.025	14.6	53.4	62.70	863.3
P - 91	Mudstone, phosphatic, calcareous	FCA-102-47	0.7	11.3	5.9	2.4	.03	15.8	43.2	63.40	872.9
P - 90	Mudstone, calcareous	FCA-101-47	2.7	3.6	8.2	3.1	.025	14.6	61.1	66.10	909.6
P - 89	Mudstone, calcareous	FCA-100-47	2.5	5.8	7.3	2.7	.03	18.8	51.9	68.60	944.0
P - 88	Phosphate rock, argillaceous, calcareous	FCA- 99-47	1.15	14.0	5.3	3.5	.03	14.3	39.2	69.75	959.8
P - 87	Mudstone	FCA- 98-47	1.3	5.7	9.5	2.7	.04	18.1	50.9	71.05	978.0
P - 86	Phosphate rock, argillaceous, calcareous	FCA- 97-47	1.1	14.1	4.0	1.9	.04	17.0	36.6	72.15	993.1

P - 85	Mudstone, calcareous	FCA- 96-47	0.8	4.1	8.6	3.2	.04	15.8	40.4	72.95	8[illegible]
P - 84	Phosphate rock, argillaceous, calcareous	LES -238-47	0.35	20.9	4.5	3.0	.036	13.3	22.9	73.30	673.[illegible]
P - 83	Mudstone, calcareous	LES -237-47	0.9	3.2	8.2	3.9	.03	13.2	61.4	74.20	678.[illegible]
P - 82	Mudstone	LES -236-47	0.75	2.2	8.3	4.2	.03	12.6	65.9	74.95	640.[illegible]
P - 81	Limestone, argillaceous	LES -235-47	3.4	1.1	4.8	2.1	.018	26.0	34.5	78.35	624.[illegible]
P - 80	Mudstone, calcareous and phosphate rock, fos. col. no. 47-HW-7	LES -234-47	0.45	19.4	4.1	2.8	.018	11.3	26.6	78.80	697.[illegible]
P - 79	Mudstone, calcareous	LES -233-47	0.9	7.4	7.8	4.2	.018	9.9	59.9	79.70	[illegible]
P - 78	Mudstone	LES -232-47	2.5	1.2	9.7	4.4	.018	7.5	76.4	82.20	702.[illegible]
P - 77	Phosphate rock, argillaceous, fos. col. no. 47-HW-6	LES -231-47	0.35	18.5	4.4	4.0	.018	10.8	29.2	82.55	707.05
P - 76	Mudstone	LES -230-47	1.0	7.3	8.3	5.5	.018	9.7	60.7	83.55	716.36
P - 75	Mudstone	LES -229-47	1.5	2.3	9.0	5.1	.03	8.4	75.0	84.85	719.39
P - 74	Mudstone	LES -228-47	2.3	5.6	8.2	4.5	.018	8.9	65.9	87.15	732.23
P - 73	Limestone, argillaceous	LES -227-47	1.9	3.2	7.1	3.3	.018	21.7	43.6	89.05	738.31
P - 72	Phosphate rock, argillaceous, calcareous	LES -226-47	0.65	16.2	3.5	4.1	.024	12.3	35.6	89.70	748.84
P - 71	Phosphate rock and mudstone	LES -225-47	0.5	18.6	5.2	2.8	.03	16.0	27.3	90.20	750.14
P - 70	Mudstone, calcareous	LES -224-47	1.0	1.3	6.7	3.8	.018	12.1	54.3	91.20	759.44
P - 69	Mudstone, phosphatic, calcareous	LES -223-47	0.35	14.5	5.9	3.9	.03	12.0	41.4	91.55	764.32
P - 68	Mudstone, calcareous	LES -222-47	1.8	1.2	9.1	4.2	.043	10.3	74.9	93.35	766.68
P - 67	Limestone, phosphatic, argillaceous	LES -221-47	1.0	13.4	3.2	2.3	.018	20.0	22.0	94.35	780.98
P - 66	Mudstone, contains calcareous concretions near top	LES -220-47	3.9	0.6	10.1	4.0	.015	8.8	77.6	98.25	782.[illegible]
P - 65	Mudstone	LES -219-47	3.9	0.4	10.6	4.1	.015	8.9	78.4	102.15	785.[illegible]
P - 64	Mudstone, phosphatic, calcareous	LES -218-47	0.9	9.3	9.0	4.9	.018	11.9	53.2	103.05	792.[illegible]
P - 63	Mudstone, calcareous	LES -217-47	5.4	5.0	8.4	3.6	.015	8.7	60.3	108.45	823.67
P - 62	Limestone, phosphatic, argillaceous	LES -216-47	1.05	11.8	3.8	2.2	.03	21.3	20.6	109.50	836.98
P - 61	Mudstone, dolomitic	FCA- 95-47	2.15	5.4	7.0	2.7	.03	19.8	46.2	111.65	847.[illegible]
P - 60	Limestone, argillaceous, phosphatic	FCA- 94-47	1.2	7.7	5.8	2.4	.03	21.3	35.3	112.85	856.91
P - 59	Limestone, argillaceous	FCA- 93-47	2.8	2.8	4.4	1.6	.015	28.7	29.2	115.65	864.75
P - 58	Limestone, argillaceous	FCA- 92-47	1.6	5.3	3.0	2.0	.035	28.3	27.8	117.25	873.[illegible]
P - 57	Limestone, argillaceous	FCA- 91-47	2.2	6.4	3.5	1.7	.045	30.0	28.8	119.45	887.[illegible]
P - 56	Limestone, argillaceous	FCA- 90-47	2.6	4.5	4.9	2.1	.03	26.8	33.7	122.05	899.[illegible]
P - 55	Limestone, argillaceous	FCA- 89-47	3.5	5.5	4.8	2.4	.025	28.2	27.2	125.55	918.26
P - 54	Limestone, argillaceous	FCA- 88-47	2.9	5.2	3.2	2.9	.03	21.4	40.9	128.45	933.[illegible]
P - 53	Dolomite, calcareous; fos. col. no. 47-HW-5	FCA- 87-47	3.2	0.9	2.6	1.3	.03	37.5	17.6	131.65	936.[illegible]
P - 52	Mudstone, calcareous	FCA- 86-47	0.9	2.2	7.8	4.2	.04	12.0	69.8	132.55	938.20
P - 51	Mudstone, calcareous	FCA- 85-47	2.3	2.3	9.9	3.9	.055	15.5	63.7	134.85	943.[illegible]

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)						Cumulative thickness (feet)	Thickness, percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	V_2O_5	Loss on ignition	Acid insoluble		
P - 50	Mudstone, calcareous	FCA- 84-47	4.2	3.1	9.5	4.0	.01	14.0	64.1	139.05	936.10
P - 49	Mudstone, calcareous, phosphatic	LES -215-47	3.2	8.9	8.0	2.9	.02	13.8	45.8	142.25	984.97
P - 48	Limestone, argillaceous; fos. col. no. 47-HW-4	LES -214-47	1.6	2.7	5.2	2.1	.015	27.2	33.0	143.85	989.31
P - 47	Mudstone, phosphatic, calcareous	LES -213-47	1.1	11.8	8.2	3.0	.03	17.4	39.3	144.95	1,002.47
P - 46	Mudstone, phosphatic	LES -212-47	2.0	12.3	7.2	2.4	.03	18.8	33.4	146.95	1,028.89
P - 45	Limestone	LES -211-47	1.6	0.3	2.9	1.2	.015	36.5	16.7	148.55	1,032.93
P - 44	Limestone, argillaceous	LES -210-47	0.8	4.5	5.6	2.1	.015	24.5	34.0	149.35	1,030.92
P - 43	Mudstone, phosphatic, calcareous	LES -209-47	0.7	11.6	8.4	3.0	.03	15.1	44.2	150.05	1,039.09
P - 42	Mudstone, phosphatic, contains gypsum	LES -208-47	0.45	13.7	8.5	2.6	.03	17.0	37.0	150.50	1,043.15
P - 41	Phosphate rock	LES -207-47	0.35	31.8	7.1	2.5	.03	17.9	3.5	150.85	1,050.33
P - 40	Phosphate rock	LES -206-47	1.1	31.0	7.3	2.9	.03	18.4	3.8	151.95	1,090.19
P - 39	Mudstone, phosphatic	LES -189-47	0.7	12.8	8.5	2.9	.015	17.7	43.8	152.65	1,099.45
	Possible shear zone, beds P-38 to P-31; rock structure largely destroyed; stratigraphic relations and thicknesses uncertain.										
P - 38	Mudstone, phosphatic	LES -188-47	0.8	13.5	8.1	3.1	.015	19.0	39.3	153.45	1,110.25
P - 37	Limestone, dolomitic, argillaceous	LES -187-47	0.5	1.5	4.9	1.7	.01	35.0	24.0	153.95	1,111.00
P - 36	Limestone, argillaceous, phosphatic	LES -186-47	1.4	8.1	6.6	2.8	.01	21.7	31.8	155.35	1,122.94
P - 35	Mudstone, phosphatic	LES -185-47	0.8	12.1	7.8	2.9	.015	17.8	40.6	156.15	1,132.92
P - 34	Mudstone, calcareous	LES -184-47	0.6	6.9	7.0	2.8	.015	16.4	47.6	156.75	1,136.87
P - 33	Limestone, argillaceous, phosphatic	LES -183-47	1.6	10.1	7.5	2.4	.010	20.5	36.0	158.35	1,152.32
P - 32	Mudstone, phosphatic, calcareous	LES -182-47	1.3	11.9	7.2	2.5	.015	18.3	36.7	159.65	1,167.79
P - 31	Phosphate rock, calcareous	LES -181-47	1.2	18.2	4.2	1.6	.040	20.2	18.0	160.85	1,189.43
P - 30	Phosphate rock, calcareous	LES -180-47	0.4	15.7	4.4	1.7	.050	17.0	27.0	161.25	1,193.71
P - 29	Phosphate rock, argillaceous	FCA- 83-47	0.4	17.4	5.8	2.8	.065	11.7	33.9	161.65	1,202.11
P - 28	Phosphate rock, calcareous	FCA- 82-47	1.9	26.0	1.5	1.5	.03	14.1	8.8	163.55	1,252.47
P - 27	Limestone	FCA- 81-47	2.1	3.5	1.5	0.7	.025	28.0	10.0	165.65	1,259.82
P - 26	Mudstone, phosphatic	FCA- 80-47	0.9	12.2	8.2	2.9	.03	12.6	43.0	166.55	1,270.30
P - 25	Limestone, dolomitic	FCA- 79-47	2.4	6.4	3.6	1.5	.03	29.4	21.0	168.95	1,285.76
P - 24	Phosphate rock	FCA- 78-47	2.5	26.9	2.7	1.4	.12	10.0	17.3	171.45	1,353.71
P - 23	Phosphate rock	FCA- 77-47	1.8	29.3	2.0	1.2	.26	10.4	12.2	173.25	1,404.15
P - 22	Phosphate rock, argillaceous, calcareous	FCA- 76-47	2.9	17.1	3.8	1.7	.18	15.5	25.4	176.15	1,447.20
P - 21	Phosphate rock	FCA- 75-47	1.4	29.6	1.8	1.0	.19	10.7	11.1	177.55	1,488.58
P - 20	Phosphate rock	FCA- 74-47	1.45	26.5	2.4	1.9	.25	11.8	14.7	179.00	1,527.86
P - 19	Phosphate rock, fos. col. no. 47-HW-3	FCA- 73-47	1.6	27.7	2.4	1.2	.25	12.6	14.2	180.20	1,571.60
P - 18	Limestone, phosphatic	FCA- 72-47	2.3	9.3	3.2	1.4	.1	27.2	20.6	182.50	1,592.47
P - 17	Phosphate rock, calcareous	FCA- 71-47	2.65	18.5	2.2	1.4	.04	17.4	19.2	185.15	1,641.89
P - 16	Dolomite, phosphatic	FCA- 70-47	1.6	8.7	1.2	0.7	.03	33.3	8.0	186.75	1,655.72

P - 15	Phosphate rock	LES -205-47	1.35	31.6	1.1	0.9	.42	10.5	4.6	188.10	[illegible]
P - 14	Phosphate rock	LES -204-47	0.9	30.4	0.9	0.6	.18	10.6	4.6	189.00	1,775.74
P - 13	Phosphate rock	LES -203-47	0.65	30.9	0.9	0.5	.28	10.2	4.3	189.65	1,749.82
P - 12	Phosphate rock, argillaceous	LES -202-47	1.4	16.0	0.9	0.6	.51	9.3	32.0	191.05	1,760.[illegible]
P - 11	Phosphate rock, argillaceous	LES -201-47	0.55	14.4	0.9	0.6	.54	10.2	36.8	191.60	1,776.[illegible]
P - 10	Phosphate rock	LES -200-47	0.5	31.6	0.8	0.9	.54	9.8	2.7	192.10	1,791.[illegible]
P - 9	Phosphate rock	LES -199-47	1.25	31.2	1.2	0.6	.26	8.7	3.3	193.35	1,830.94
P - 8	Limestone	LES -198-47	0.5	0.1	1.3	0.7	.16	26.3	7.7	193.85	1,830.99
P - 7	Phosphate rock	LES -197-47	0.55	27.5	2.1	1.1	.21	9.3	12.4	194.40	1,846.12
P - 6	Mudstone, calcareous	LES -196-47	1.0	5.7	8.2	5.9	.45	17.9	57.3	195.40	1,833.[illegible]
P - 5	Limestone, argillaceous	LES -195-47	1.65	0.6	5.3	2.4	.07	23.0	44.6	197.05	1,838.[illegible]
P - 4	Mudstone, calcareous	LES -194-47	0.65	1.0	10.8	5.8	.22	9.2	77.5	197.70	1,851.46
P - 3	Mudstone, calcareous	LES -193-47	0.85	0.3	7.0	2.4	.08	16.4	91.5	198.55	1,893.74
P - 2	Mudstone, calcareous	LES -192-47	0.35	7.5	10.1	5.5	.25	9.0	55.6	198.90	1,850.34
P - 1	Phosphate rocky fos. col. no. 47-HW-2	LES -191-47	0.25	34.0	0.9	0.6	.025	4.8	4.5	199.15	1,864.[illegible]
				Wells formation							
C - 1	Limestone; fos. col. no. 47-HW-1	LES -190-47	1.2	0.7	0.8	0.4	.02	44.4	2.7	1.2	

SPECTROGRAPHIC ANALYSES - CONDA, IDAHO. LOT NO. 1200.

Semi-quantitative analyses of samples of the Phosphoria formation, Conda, 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, Ga, Au, Li, Mg, Pt, Ta, Sn, and W were looked for in all samples but were not detected.

Explanation of symbols

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

Bed no.	Sample no.	Al	Ba	B	Ca	Cr	Cb	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Si	Ag	Na	Sr	Ti	V	Zn	Zr
R -1	PCA-141-47	C	ND	E	C	E	ND	G	C	ND	D	E	F	E	A	ND	E	ND	E	D	ND	F
P -142	PCA-140-47	C	ND	E	A	E	ND	G	D	ND	D	E	F	E	C	ND	E	E	E	D	ND	F
P -141	PCA-139-47	C	ND	E	C	E	ND	G	C	ND	D	E	F	E	A	C	D	E	E	D	ND	F
P -140	PCA-138-47	C	ND	E	C	E	ND	G	C	ND	D	E	F	E	A	ND	D	ND	E	D	ND	F
P -139	PCA-137-47	C	ND	E	C	E	ND	G	C	ND	D	E	F	E	A	ND	E	ND	E	D	ND	F
	Beds P-138 through P-136 not analyzed.																					
P -135	PCA-136-47	C	ND	F	A	E	ND	G	D	ND	D	E	F	E	C	G	D	E	E	D	ND	F
P -134	PCA-135-47	C	ND	E	C	E	ND	G	C	ND	D	E	F	E	A	G	D	E	E	D	ND	F
P -133	PCA-134-47	C	ND	E	A	E	ND	G	C	ND	D	E	F	E	A	G	D	E	E	D	ND	F
P -132	PCA-133-47	D	ND	E	A	E	ND	G	C	ND	D	E	F	E	A	G	D	E	E	D	ND	F
P -131	PCA-132-47	D	E	E	A	E	ND	G	C	ND	D	E	F	E	B	G	E	E	E	D	ND	F
P -130	PCA-131-47	D	E	E	A	E	ND	G	C	ND	D	E	F	E	B	G	E	E	E	D	ND	F
P -127	PCA-130-47	C	E	E	A	E	ND	G	C	ND	D	E	F	E	B	C	E	E	E	D	ND	F
P -128	PCA-129-47	C	E	E	A	E	ND	G	C	ND	D	E	F	E	B	C	E	E	E	D	ND	F
P -127	PCA-128-47	C	E	E	A	E	ND	G	C	ND	D	E	F	E	B	C	E	E	E	D	ND	F
P -126	PCA-127-47	C	E	E	A	E	ND	G	C	ND	D	E	F	E	B	C	E	E	E	D	ND	F
P -125	PCA-126-47	C	E	E	A	E	ND	G	C	ND	D	E	F	E	B	C	E	E	E	D	ND	F
P -124	PCA-125-47	C	E	E	A	E	ND	G	C	ND	D	E	F	E	C	C	E	E	E	D	ND	F
P -123	PCA-124-47	C	E	E	A	E	ND	G	C	ND	D	E	F	E	C	C	E	E	E	D	ND	F
P -122	PCA-123-47	C	E	E	A	E	ND	G	C	ND	D	E	F	E	C	C	E	E	E	D	ND	F
P -121	PCA-122-47	C	E	E	A	E	ND	G	C	ND	D	E	F	E	C	C	E	E	E	D	ND	F
P -120	PCA-121-47	D	E	E	A	E	ND	G	C	ND	D	E	F	E	C	C	E	E	E	D	ND	F
P -119	PCA-120-47	C	E	E	A	E	E	G	C	ND	D	E	F	E	A	G	D	E	E	D	ND	F
P -118	PCA-119-47	C	E	E	B	E	E	G	C	ND	D	E	F	E	A	G	D	E	E	D	ND	F
P -117	PCA-118-47	C	E	E	C	E	E	G	C	ND	D	E	F	E	A	G	D	E	E	D	ND	F
P -116	PCA-117-47	C	E	E	C	E	E	G	C	ND	D	E	F	E	A	G	D	E	E	D	ND	F
P -115	PCA-116-47	C	E	E	C	E	E	G	C	ND	D	E	F	E	A	G	D	E	E	D	ND	F

| | | |

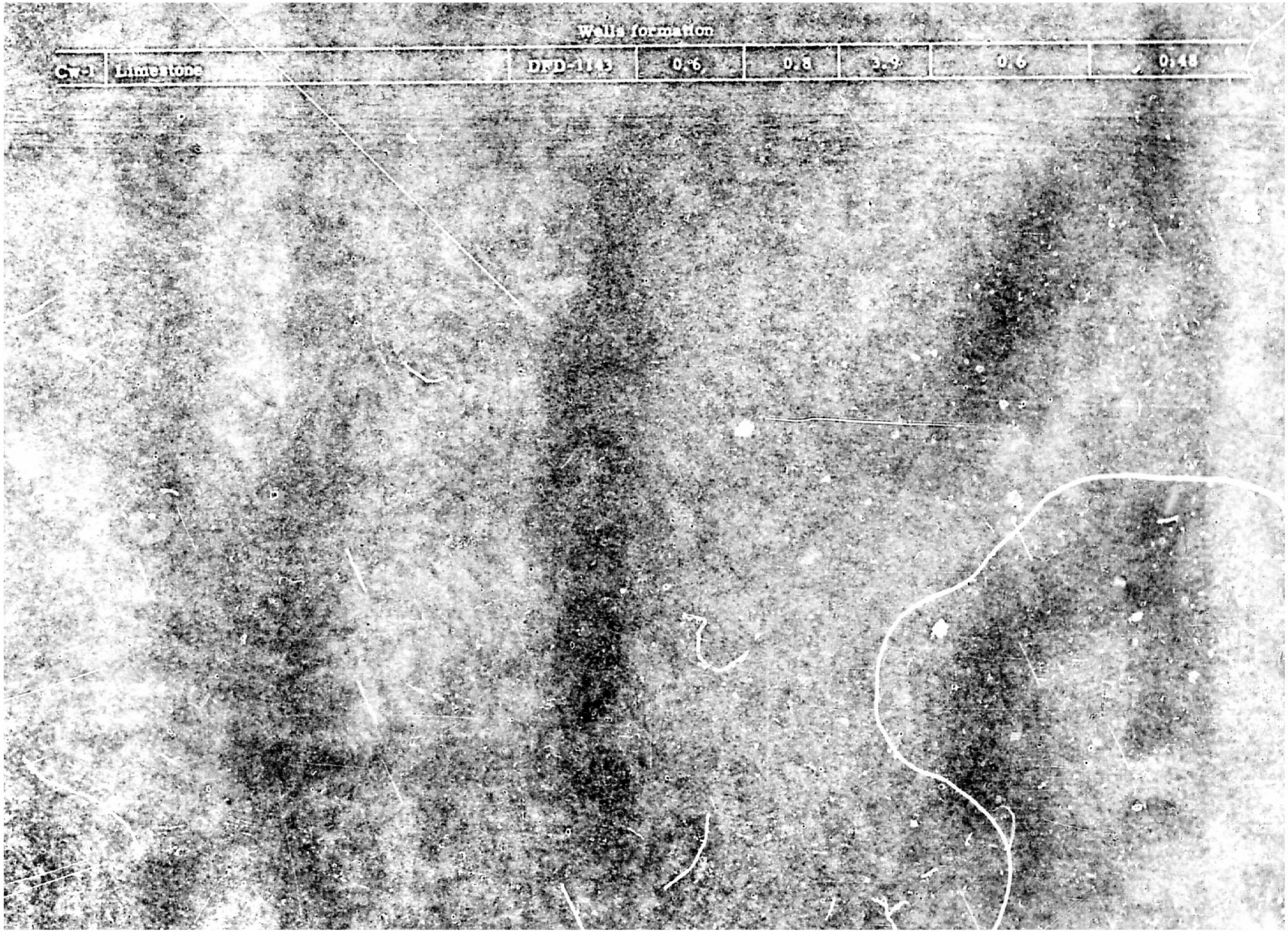
Bed no.	Sample no.	Ag	Be	B	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Si	As	Na	Sr	Ti	V	Zn	Zr
P - 68	LES -222-47	C	E	F	C	E	ND	C	C	ND	D	E	F	E	A	G	D	F	E	E	ND	ND
P - 67	LES -221-47	C	E	F	C	E	ND	C	C	ND	D	E	F	E	A	ND	D	ND	E	E	ND	ND
P - 66	LES -220-47	C	E	F	C	E	ND	C	C	ND	D	E	F	E	A	ND	D	ND	E	E	ND	ND
P - 65	LES -219-47	C	E	F	C	E	ND	C	C	ND	D	E	F	E	A	ND	D	ND	E	E	ND	ND
P - 64	LES -218-47	C	E	F	C	E	ND	C	C	ND	D	E	F	E	A	ND	D	ND	E	E	ND	ND
P - 63	LES -217-47	C	E	F	C	E	ND	C	C	ND	D	E	F	E	A	G	D	F	E	E	ND	ND
P - 62	LES -216-47	C	E	F	C	E	ND	C	C	ND	D	E	F	E	A	ND	D	ND	E	E	ND	ND
P - 61	FCA- 95-47	C	E	F	B	E	ND	C	C	ND	D	E	F	E	A	G	D	F	E	E	ND	ND
P - 60	FCA- 94-47	C	E	F	B	E	ND	C	C	ND	D	E	F	E	A	G	D	F	E	E	ND	ND
P - 59	FCA- 93-47	C	E	F	B	E	ND	C	C	ND	D	E	F	E	A	G	D	F	E	E	ND	ND
P - 58	FCA- 92-47	C	E	F	C	E	ND	C	C	ND	D	E	F	E	A	G	D	F	E	E	ND	ND
P - 57	FCA- 91-47	C	E	F	C	E	ND	C	C	ND	D	E	F	E	A	G	D	F	E	E	ND	ND
P - 56	FCA- 90-47	C	E	F	C	E	ND	C	C	ND	D	E	F	E	A	G	D	F	E	E	ND	ND
P - 55	FCA- 89-47	C	E	F	C	E	ND	C	C	ND	D	E	F	E	A	G	D	F	E	E	ND	ND
P - 54	FCA- 88-47	C	E	F	C	E	ND	C	C	ND	D	E	F	E	A	G	D	F	E	E	ND	ND
P - 53	FCA- 87-47	C	E	F	C	E	ND	C	C	ND	D	E	F	E	A	G	D	F	E	E	ND	ND
P - 52	FCA- 86-47	C	E	F	C	E	ND	C	C	ND	D	E	F	E	A	G	D	F	E	E	ND	ND
P - 51	FCA- 85-47	C	E	F	C	E	ND	C	C	ND	D	E	F	E	A	G	D	F	E	E	ND	ND
P - 50	FCA- 84-47	C	E	F	C	E	ND	C	C	ND	D	E	F	E	A	G	D	F	E	E	ND	ND
P - 49	LES -215-47	C	E	F	C	E	ND	C	C	ND	D	E	F	E	A	G	D	F	E	E	ND	ND
P - 48	LES -214-47	C	E	F	C	E	ND	C	C	ND	D	E	F	E	A	G	D	F	E	E	ND	ND
P - 47	LES -213-47	C	E	F	C	E	ND	C	C	ND	D	E	F	E	A	G	D	F	E	E	ND	ND
P - 46	LES -212-47	C	E	F	C	E	ND	C	C	ND	D	E	F	E	A	G	D	F	E	E	ND	ND
P - 45	LES -211-47	C	E	F	C	E	ND	C	C	ND	D	E	F	E	A	G	D	F	E	E	ND	ND
P - 44	LES -210-47	C	E	F	C	E	ND	C	C	ND	D	E	F	E	A	G	D	F	E	E	ND	ND
P - 43	LES -209-47	C	E	F	C	E	ND	C	C	ND	D	E	F	E	A	G	D	F	E	E	ND	ND
P - 42	LES -208-47	C	E	F	C	E	ND	C	C	ND	D	E	F	E	A	G	D	F	E	E	ND	ND
P - 41	LES -207-47	C	E	F	C	E	ND	C	C	ND	D	E	F	E	A	G	D	F	E	E	ND	ND
P - 40	LES -206-47	C	E	F	C	E	ND	C	C	ND	D	E	F	E	A	G	D	F	E	E	ND	ND
P - 39	LES -189-47	C	E	F	C	E	ND	C	C	ND	D	E	F	E	A	G	D	F	E	E	ND	ND
P - 38	LES -188-47	C	E	F	C	E	ND	C	C	ND	D	E	F	E	A	G	D	F	E	E	ND	ND
P - 37	LES -187-47	C	E	F	C	E	ND	C	C	ND	D	E	F	E	A	G	D	F	E	E	ND	ND
P - 36	LES -186-47	C	E	F	C	E	ND	C	C	ND	D	E	F	E	A	G	D	F	E	E	ND	ND
P - 35	LES -185-47	C	E	F	C	E	ND	C	C	ND	D	E	F	E	A	G	D	F	E	E	ND	ND
P - 34	LES -184-47	C	E	F	C	E	ND	C	C	ND	D	E	F	E	A	G	D	F	E	E	ND	ND
P - 33	LES -183-47	C	E	F	C	E	ND	C	C	ND	D	E	F	E	A	G	D	F	E	E	ND	ND
P - 32	LES -182-47	C	E	F	C	E	ND	C	C	ND	D	E	F	E	A	G	D	F	E	E	ND	ND
P - 31	LES -181-47	C	E	F	C	E	ND	C	C	ND	D	E	F	E	A	G	D	F	E	E	ND	ND
P - 30	LES -180-47	C	E	F	C	E	ND	C	C	ND	D	E	F	E	A	G	D	F	E	E	ND	ND
P - 29	FCA- 83-47	C	E	F	B	E	ND	C	C	ND	D	E	F	E	A	G	D	F	E	E	ND	ND
P - 28	FCA- 82-47	D	E	F	A	E	ND	G	C	ND	D	E	F	E	C	G	D	F	E	D	ND	ND

| | | |

DIAMOND DRILL HOLE 6, SLUG CREEK VALLEY, IDAHO. LOT NO. 1247.

Part of phosphatic shale member of Phosphoria formation cored in diamond drill hole 6 on west slope of hill above Slug Creek Valley, sec. 30, T. 8 S., R. 44 E., Caribou County, Idaho, on west limb of Schmid syncline. Beds strike north and dip 8° E. Hole drilled in September 1948 by U. S. Bureau of Mines, A. E. Long in charge, and core measured and sampled by D. F. Davidson. Samples analyzed by U. S. Bureau of Mines, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
	Phosphatic shale member of Phosphoria formation—lower beds only						
P-32	Phosphate rock, argillaceous	DFD-1111	2.5	16.8	41.9	2.5	42.00
P-31	Phosphate rock, argillaceous	DFD-1112	2.0	16.3	39.0	4.5	74.60
P-30	Phosphate rock, argillaceous	DFD-1113	0.5	21.2	25.4	5.0	85.20
P-29	Phosphate rock	DFD-1114	2.2	28.0	14.5	7.2	146.80
P-28	Mudstone, phosphatic, calcareous	DFD-1115	0.7	13.0	29.8	7.9	155.90
P-27	Limestone	DFD-1116	2.1	2.4	9.9	10.0	160.94
P-26	Limestone	DFD-1117	1.4	7.6	17.9	11.4	171.58
P-25	Phosphate rock, argillaceous	DFD-1118	0.5	22.3	26.0	11.9	182.73
P-24	Limestone	DFD-1119	0.8	8.7	15.8	12.7	189.69
P-23	Limestone, argillaceous, phosphatic	DFD-1120	1.3	9.1	27.5	14.0	197.52
P-22	Mudstone, phosphatic	DFD-1121	1.5	11.3	53.9	15.5	214.47
P-21	Limestone, argillaceous	DFD-1122	1.6	4.1	28.4	17.1	221.03
P-20	Limestone, argillaceous	DFD-1123	0.7	0.4	30.8	17.8	221.31
P-19	Limestone	DFD-1124	0.7	6.7	16.2	18.5	226.00
P-18	Phosphate rock	DFD-1125	1.3	28.9	14.7	19.8	263.57
P-17	Phosphate rock	DFD-1126	1.1	30.9	10.9	20.9	297.56
P-16	Phosphate rock	DFD-1127	0.8	28.8	14.5	21.7	320.60
P-15	Phosphate rock, argillaceous	DFD-1128	1.5	22.4	30.2	23.2	354.20
P-14	Limestone, argillaceous	DFD-1129	1.4	9.6	27.7	24.6	399.24
P-13	Phosphate rock, calcareous	DFD-1130	4.2	24.2	11.0	28.8	460.88
P-12	Phosphate rock	DFD-1131	1.5	22.8	16.5	30.3	495.08
P-11	Phosphate rock, argillaceous	DFD-1132	1.1	22.7	23.7	31.4	520.03
P-10	Limestone, phosphatic	DFD-1133	1.1	13.9	13.4	32.5	535.34
P- 9	Limestone, phosphatic	DFD-1134	0.9	9.8	8.6	33.4	544.16
P- 8	Phosphate rock	DFD-1135	1.0	31.4	7.3	34.4	575.56
P- 7	Phosphate rock	DFD-7136	1.3	33.7	2.8	35.7	619.37
P- 6	Phosphate rock	DFD-1137	2.5	33.6	2.3	38.2	703.37
P- 5	Phosphate rock	DFD-1138	2.3	31.8	6.1	40.5	776.51
P- 4	Mudstone	DFD-1139	1.0	6.1	64.6	41.5	782.61
P- 3	Limestone, argillaceous	DFD-1140	1.1	2.0	42.6	42.6	784.81
P- 2	Mudstone, calcareous	DFD-1141	2.1	1.1	56.2	44.7	787.12
P- 1	Phosphate rock	DFD-1142	0.4	30.7	7.4	45.1	799.40


Wells formation
Cw-1
Limestone
DFD-1143
0.6
0.8
3.9
0.6
0.48

DIAMOND DRILL HOLE 3, MIDDLE SULPHUR CANYON, IDAHO. LOT NO. 1274.

Part of phosphatic shale member of Phosphoria formation cored in diamond drill hole 3 on south slope of Middle Sulphur Canyon, sec. 8, T. 9 S., R. 43 E., Caribou County, Idaho, on west limb of Trail Creek syncline. Beds strike north-northwest and dip 15° E. Hole drilled in September 1948 by U. S. Bureau of Mines, A. E. Long in charge, and core measured and sampled by D. F. Davidson. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
	Phosphatic shale member of Phosphoria formation--partial section						
P-25	Mudstone	DFD-961	1.2	4.4	73.4	1.2	5.28
P-24	Mudstone	DFD-962	0.8	2.2	84.9	2.0	7.04
P-23	Mudstone	DFD-963	3.8	3.4	78.9	5.8	19.96
P-22	Mudstone	DFD-964	2.0	6.4	66.6	7.8	32.76
P-21	Mudstone	DFD-965	2.3	7.8	65.9	10.1	50.70
P-20	Mudstone, phosphatic	DFD-966	4.7	12.8	50.6	14.8	110.86
P-19	Mudstone, phosphatic	DFD-967	2.2	13.5	50.3	17.0	140.56
P-18	Phosphate rock, argillaceous	DFD-968	3.5	19.1	37.7	20.5	207.41
P-17	Phosphate rock, argillaceous	DFD-969	1.1	24.4	20.6	21.6	234.25
P-16	Phosphate rock, calcareous	DFD-970	2.1	25.0	13.1	23.7	286.75
P-15	Phosphate rock	DFD-971	0.7	25.3	17.3	24.4	304.46
P-14	Phosphate rock and mudstone	DFD-972	0.4	21.4	28.0	24.8	313.02
P-13	Phosphate rock and mudstone	DFD-973	3.0	24.5	16.6	27.8	386.52
P-12	Phosphate rock, argillaceous	DFD-974	0.7	18.8	35.1	28.5	399.67
P-11	Mudstone, phosphatic	DFD-975	1.9	12.8	52.4	30.4	424.00
P-10	Phosphate rock, argillaceous	DFD-976	2.6	19.8	39.3	33.0	475.48
P- 9	Phosphate rock	DFD-977	1.3	27.9	17.2	34.3	511.75
P- 8	Phosphate rock, argillaceous	DFD-978	1.9	20.8	36.0	36.2	551.27
P- 7	Mudstone, phosphatic	DFD-979	0.9	14.5	51.0	37.1	564.32
---	Core missing	---	0.3	---	---	37.4	---
P- 6	Phosphate rock, argillaceous	DFD-980	2.4	27.5	21.2	39.8	66.00*
P- 5	Phosphate rock	DFD-981	2.7	28.8	19.7	42.5	143.76
P- 4	Phosphate rock, argillaceous	DFD-982	1.3	19.9	36.7	43.8	169.63
P- 3	Phosphate rock, argillaceous	DFD-983	1.3	23.8	27.5	45.1	200.57
P- 2	Phosphate rock, argillaceous	DFD-984	0.7	28.8	24.1	45.8	220.73**
---	Core missing	---	22.4	---	---	68.2	---
P- 1	Phosphate rock	DFD-985	1.2	32.4	9.1	69.4	38.88*

* Cumulative data incomplete due to missing information. Computations start from zero after interruption.
** Note incompleteness of cumulative data.

DIAMOND DRILL HOLE 4, MIDDLE SULPHUR CANYON, IDAHO. LOT NO. 1275.

Phosphatic shale member of Phosphoria formation cored in diamond drill hole 4 on north slope of Middle Sulphur Canyon, Sec. 4, T. 9 S., R. 43 E., Caribou County, Idaho, on west limb of Trail Creek syncline. Beds strike north-northwest and dip 22° E. Hole drilled in September 1948 by U. S. Bureau of Mines, A. E. Long in charge. Partial section measured and sampled by D. F. Davidson. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
	Phosphatic shale member of Phosphoria formation—basal beds only						
P- 8	Phosphate rock	DFD-986	1.2	29.1	15.6	1.2	34.92
P- 7	Phosphate rock	DFD-987	0.9	27.6	19.4	2.1	59.76
P- 6	Phosphate rock, argillaceous	DFD-988	2.5	27.2	21.8	4.6	127.76
P- 5	Phosphate rock, argillaceous	DFD-989	4.4	26.6	21.5	9.0	244.80
P- 4	Phosphate rock	DFD-990	4.1	32.8	5.9	13.1	379.28
P- 3	Mudstone	DFD-991	3.0	2.4	78.5	16.1	386.48
P- 2	Mudstone	DFD-992	0.4	1.2	80.9	16.5	386.96
P- 1	Mudstone, phosphatic	DFD-993	0.6	9.9	59.7	17.1	392.90
	Wells formation						
Cw-1	Limestone	DFD-994	1.0	0.2	2.8	1.0	0.20

DIAMOND DRILL HOLE 5, SOUTH FORK OF JOHNSON CREEK, IDAHO. LOT NO. 1276.

Part of phosphatic shale member of Phosphoria formation cored in diamond drill hole 5 in valley bottom of south fork of Johnson Creek, sec. 9, T. 9 S., R. 43 E., Caribou County, Idaho, on east limb of Trail Creek syncline. Beds strike northwest and dip 30° SW. Hole drilled in September 1948 by U. S. Bureau of Mines, A. E. Long in charge, and core measured and sampled by D. F. Davidson. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
	Phosphatic shale member of Phosphoria formation—partial section						
P-7	Mudstone	DFD- 995	0.5	1.8	33.0	0.5	0.90
P-6	Mudstone, phosphatic	DFD- 996	1.0	12.8	31.4	1.5	13.70
P-5	Mudstone	DFD- 997	1.2	2.7	76.1	2.7	16.94
P-4	Mudstone	DFD- 998	2.3	6.6	64.0	5.0	32.12
P-3	Mudstone	DFD-1098	0.9	3.9	71.8	5.9	35.63
P-2	Mudstone	DFD-1099	2.8	6.2	67.1	8.7	52.99
	Core missing		1.1			9.8	
P-1	Mudstone and phosphatic mudstone	DFD-1110	2.1	11.5	44.6	11.9	24.15**

** Note incompleteness of cumulative data.

NORTH DAIRY, IDAHO. LOT NO. 1212.

Upper part of phosphatic shale member of Phosphoria formation sampled in bulldozer trench near north end of Dairy syncline, NE¼NE¼ sec. 20, T. 9 S., R. 44 E., Caribou County, Idaho. The stratigraphic sequence of the units is questionable for, because of a large number of faults, some beds may be omitted or repeated. No cumulative totals are given for this reason. Section measured by R. M. Campbell and L. E. Smith and sampled by R. S. Sears, R. P. Sheldon, and R. A. Smart in August and September 1947. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)				
				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	LES-400-47	0.8	6.2	--	--	--	79.6
	Phosphatic shale member of Phosphoria formation—upper part only							
P-61	Phosphate rock	LES-399-47	0.6	30.6	--	--	--	12.9
P-60	Mudstone	LES-398-47	0.8	--	--	--	--	--
P-59	Mudstone	LES-397-47	0.5	6.9	--	--	--	60.1
P-58	Mudstone	LES-396-47	2.0	1.5	--	--	--	79.3
P-57	Mudstone	LES-395-47	1.2	1.2	--	--	--	78.6
P-56	Mudstone	LES-394-47	0.5	3.9	--	--	--	67.7
P-55	Mudstone	LES-393-47	0.1	4.7	--	--	--	73.9
P-54	Mudstone	LES-392-47	1.5	6.2	--	--	--	67.3
P-53	Mudstone	LES-391-47	3.4	2.2	--	--	--	78.0
P-52	Phosphate rock, argillaceous	LES-390-47	1.0	26.6	--	--	--	25.3
P-51	Mudstone	LES-389-47	1.3	3.9	--	--	--	69.0
P-50	Mudstone	LES-388-47	1.8	1.0	--	--	--	83.3
	Several beds may be missing in fault zone between LES-388-47 and RMC-50-47							
P-49	Phosphate rock	RMC-50-47	1.3	34.2	1.60	0.94	4.26	7.1
P-48	Mudstone and phosphatic mudstone	RMC-49-47	1.1	11.7	7.60	3.0	5.10	59.2
P-47	Phosphate rock and mudstone	RMC-48-47	0.9	27.2	3.4	1.61	5.98	22.8
P-46	Mudstone	RMC-47-47	0.3	5.8	11.0	4.3	5.48	69.2
P-45	Phosphate rock	RMC-46-47	0.6	31.3	1.6	0.89	4.24	12.8
P-44	Phosphate rock, argillaceous	RMC-45-47	1.4	18.8	5.0	1.86	5.92	40.1
P-43	Phosphate rock	RMC-44-47	1.0	28.7	2.1	0.92	6.40	16.1
P-42	Mudstone, phosphatic	RMC-43-47	1.2	12.5	8.6	2.56	6.20	54.9
P-41	Phosphate rock	RMC-42-47	1.4	32.7	1.1	1.45	6.36	7.3
P-40	Phosphate rock, argillaceous	RMC-41-47	0.7	24.4	3.3	1.29	7.30	25.6
P-39	Phosphate rock	RMC-40-47	0.7	26.2	2.0	1.32	9.92	18.2

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)				
				P_2O_5	Al_2O_3	Fe_2O_3	Loss on Ignition	Acid Insoluble
P-38	Phosphate rock and phosphatic mudstone	RMC-39-47	0.7	20.8	4.1	1.42	7.02	35.9
P-37	Mudstone	RMC-38-47	0.6	5.6	9.20	3.10	5.84	73.2
P-36	Mudstone, phosphatic	RMC-37-47	0.5	13.4	7.40	2.50	5.82	55.2
P-35	Phosphate rock, argillaceous	RMC-36-47	0.9	21.7	4.90	1.70	8.64	30.0
P-34	Mudstone, phosphatic	RMC-35-47	1.0	10.4	8.40	2.90	9.72	55.3
P-33	Mudstone, calcareous and phosphate rock	RMC-34-47	0.3	17.3	7.10	2.4	9.60	38.8
P-32	Mudstone	RMC-33-47	0.2	3.5	12.00	4.10	14.84	65.3
P-31	Mudstone, phosphatic, calcareous	RMC-32-47	0.4	9.2	8.90	2.10	1.10	56.3
P-30	Phosphate rock and phosphatic mudstone	RMC-31-47	0.4	29.1	1.9	0.77	8.62	13.4
P-29	Phosphate rock and phosphatic mudstone	RMC-30-47	0.4	21.5	5.1	1.70	7.62	32.6
P-28	Phosphate rock	RMC-29-47	0.4	32.3	0.93	0.46	6.02	10.3
P-27	Phosphate rock, contains chert lens	RMC-28-47	0.37	30.1	0.55	0.70	4.29	16.6
P-26	Phosphate rock and argillaceous phosphate rock	RMC-27-47	0.43	31.3	1.6	0.70	8.04	10.2
P-25	Phosphate rock and argillaceous phosphate rock	RMC-26-47	0.5	29.6	1.3	0.63	9.52	12.1
P-24	Phosphate rock and argillaceous phosphate rock	RMC-25-47	0.8	31.4	1.4	0.68	9.34	13.6
P-23	Phosphate rock	RMC-24-47	0.57	26.8	2.4	0.97	12.54	14.3
P-22	Phosphate rock	RMC-23-47	0.5	27.6	2.3	0.86	11.78	8.0
	Fault zone, correlation not positive.							
P-21	Mudstone	LES-387-47	0.85	1.1	--	--	--	83.9
P-20	Phosphate rock and mudstone	Sample lost	0.35	--	--	--	--	--
P-19	Mudstone, phosphatic	LES-385-47	0.55	12.4	--	--	--	45.2
P-18	Mudstone, phosphatic	LES-384-47	0.7	10.4	--	--	--	53.1
P-17	Mudstone, phosphatic	LES-383-47	0.5	13.4	--	--	--	46.6
P-16	Mudstone, phosphatic	LES-382-47	0.55	15.8	--	--	--	40.9
P-15	Phosphate rock, argillaceous	LES-381-47	0.45	20.1	--	--	--	35.3
P-14	Mudstone, phosphatic	LES-380-47	0.3	8.8	--	--	--	58.0
P-13	Mudstone and phosphate rock	LES-379-47	0.55	6.9	--	--	--	60.2
P-12	Mudstone, phosphatic	LES-378-47	0.5	8.1	--	--	--	62.1
P-11	Mudstone	LES-377-47	0.6	3.9	--	--	--	73.2
P-10	Mudstone, phosphatic	LES-376-47	0.7	7.8	--	--	--	63.9
P- 9	Mudstone, phosphatic	LES-375-47	0.5	8.5	--	--	--	63.4
P- 8	Mudstone	LES-374-47	0.5	6.5	--	--	--	70.7
P- 7	Mudstone	LES-373-47	0.5	6.1	--	--	--	69.6
P- 6	Mudstone	LES-372-47	0.6	1.9	--	--	--	76.2
P- 5	Mudstone	LES-371-47	0.4	6.9	--	--	--	67.1
P- 4	Mudstone, phosphatic	LES-370-47	0.6	11.3	--	--	--	55.8

P- 3	Mudstone, chert, and phosphate rock	Sample lost	0.3	--	--	--	--	--
P- 2	Mudstone, contains chert nodules	DEB-368-47	0.35	3.0	--	--	--	80.3
P- 1	Mudstone, contains chert nodules	DEB-367-47	2.4	2.4	--	--	--	85.1

SWAN LAKE GULCH, IDAHO. LOT NO. 1265.

Phosphatic shale member and part of Rex member of Phosphoria formation sampled in bulldozer trench in Swan Lake gulch, NE¼SW¼ sec. 29, T. 9 S., R. 43 E., Caribou County, Idaho, on west limb of faulted and contorted syncline. Beds of Rex member strike N. 46° W. and dip 54° E. Section measured by F. W. O'Malley, R. P. Sheldon, and R. G. Waring and sampled by Waring and H. A. Larsen in September 1948. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness × 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-8	Chert	WOM-3011	2.7	0.2	--	--	--	79.4	2.7	0.5
R-7	Limestone, argillaceous	WOM-3020	3.5	0.3	--	--	--	35.4	6.2	1.5
R-6	Chert, calcareous	WOM-3019	3.5	0.4	--	--	--	77.4	9.7	2.3
R-5	Chert, calcareous and limestone	WOM-3018	2.5	0.6	--	--	--	65.9	12.2	3.8
R-4	Limestone, argillaceous	WOM-3017	1.5	0.4	--	--	--	24.6	13.7	4.4
R-3	Chert	WOM-3016	0.9	0.5	--	--	--	77.8	14.6	4.9
R-2	Chert, calcareous	WOM-3015	5.9	0.5	--	--	--	70.3	20.5	7.9
R-1	Chert, calcareous	WOM-3014	2.9	0.7	--	--	--	60.7	23.4	10.0
Phosphatic shale member of Phosphoria formation										
P-97	Phosphate rock, argillaceous, calcareous; fos. col. no. 48-JES-243	WOM-3013	0.9	19.5	--	--	--	28.9	0.9	17.6
P-96	Mudstone, calcareous	WOM-3012	1.2	1.5	--	--	--	74.8	2.1	19.4
P-95	Mudstone, calcareous	RGW-3010	1.1	6.4	--	--	--	54.5	3.2	26.5
P-94	Mudstone, fos. col. no. 48-JES-242	RGW-3009	2.0	1.8	--	--	--	76.4	5.2	29.7
P-93	Mudstone, calcareous; fos. col. no. 48-JES-241	RGW-3008	3.5	0.6	--	--	--	69.4	8.7	32.0
P-92	Mudstone, calcareous; fos. col. no. 48-JES-240	RGW-3007	1.5	0.9	--	--	--	73.9	10.2	33.4
P-91	Limestone	RGW-3006	0.6	0.7	--	--	--	19.7	10.8	33.8
P-90	Mudstone, calcareous; fos. col. no. 48-JES-239	RGW-3005	1.0	3.5	--	--	--	59.3	11.8	37.3
P-89	Mudstone, calcareous; fos. col. no. 48-JES-238	RGW-3004	3.2	3.2	--	--	--	66.1	14.0	44.0
P-88	Mudstone	RGW-3003	1.7	3.5	--	--	--	72.1	15.7	50.5
P-87	Mudstone, phosphatic	RGW-3002	0.3	12.3	--	--	--	43.3	16.0	54.0
P-86	Limestone, phosphatic	RGW-3001	0.5	15.8	--	--	--	18.9	16.5	61.9
P-85	Limestone, argillaceous	RPS- 2850	1.0	0.8	--	--	--	47.1	17.5	62.7
P-84	Phosphate rock	RPS- 2849	1.4	32.8	--	--	--	6.9	18.9	108.6
P-83	Phosphate rock, argillaceous, calcareous	RPS- 2848	0.4	20.9	--	--	--	23.0	19.3	117.0
P-82	Mudstone, phosphatic; fos. col. no. 48-JES-237	WOM-3000	2.7	15.8	--	--	--	39.4	22.0	159.6

P-81	Mudstone, calcareous, phosphatic, fos. col. no. 48-JES-236	WOM-2999	2.4	10.3	--	--	--	38.9	24.4	184.40
P-80	Phosphate rock, calcareous	WOM-2998	0.8	25.2	--	--	--	13.2	25.2	204.56
--	Limestone concretion	WOM-2978	(0.4)	0.9	--	--	--	D.	--	--
P-79	Phosphate rock, calcareous	WOM-2997	4.0	18.2	--	--	--	19.2	29.2	277.36
P-78	Limestone, phosphatic, fos. col. no. 48-JES-235	WOM-2996	1.5	12.6	--	--	--	18.6	30.7	296.26
P-77	Limestone, phosphatic; fos. col. no. 48-JES-234	WOM-2995	1.7	15.2	--	--	--	18.9	32.4	322.10
P-76	Phosphate rock, calcareous, argillaceous, fos. col. no. 48-JES-233	RPS- 2847	4.2	15.8	--	--	--	23.7	36.6	388.46
--	Limestone concretion	RPS- 2846	(0.5)	1.3	--	--	--	1.5	--	--
P-75	Mudstone, phosphatic, fos. col. no. 48-JES-232	RPS- 2845	2.5	11.1	--	--	--	48.-	39.1	416.21
P-74	Mudstone	RPS- 2844	0.9	0.9	--	--	--	85.5	40.0	417.02
P-73	Mudstone and argillaceous phosphate rock	RPS- 2843	3.3	10.7	--	--	--	52.2	43.3	452.33
P-72	Mudstone, fos. col. no. 48-JES-231	RPS- 2842	3.4	5.2	--	--	--	71.6	46.7	470.01
P-71	Mudstone, phosphatic	RPS- 2841	0.5	14.4	--	--	--	51.7	47.2	477.21
P-70	Mudstone	RPS- 2840	1.3	2.2	--	--	--	85.2	48.5	480.07
P-69	Phosphate rock, argillaceous	RPS- 2839	1.0	18.4	--	--	--	45.2	49.5	498.47
P-68	Mudstone	RPS- 2838	1.7	1.4	--	--	--	87.2	51.2	500.85
P-67	Mudstone, phosphatic	WOM-2994	4.0	10.2	--	--	--	61.7	55.2	541.65
P-66	Mudstone	WOM-2993	4.8	4.9	--	--	--	75.9	60.0	565.17
P-65	Mudstone	WOM-2992	2.5	5.5	--	--	--	66.6	62.5	578.92
P-64	Phosphate rock	WOM-2991	0.3	28.3	--	--	--	18.1	62.8	587.41
P-63	Mudstone, fos. col. no. 48-JES-230	WOM-2990	0.8	5.2	--	--	--	71.7	63.6	591.87
P-62	Phosphate rock, argillaceous	WOM-2989	0.4	17.4	--	--	--	40.9	64.0	598.53
P-61	Mudstone	WOM-2988	1.0	6.2	--	--	--	62.6	65.0	604.73
P-60	Phosphate rock, argillaceous and mudstone	WOM-2987	1.4	15.6	--	--	--	39.4	66.4	626.97
P-59	Mudstone	WOM-2986	1.4	5.9	--	--	--	69.2	67.8	634.85
P-58	Mudstone, phosphatic	WOM-2985	1.1	13.6	--	--	--	47.2	68.9	649.79
P-57	Mudstone	WOM-2984	1.8	1.6	--	--	--	85.7	70.7	652.67
P-56	Mudstone, phosphatic	WOM-2983	0.8	14.8	--	--	--	48.4	71.5	664.11
P-55	Mudstone	WOM-2982	2.9	1.1	--	--	--	85.6	74.0	666.86
P-54	Mudstone, fos. col. no. 48-JES-229	WOM-2981	4.0	1.3	--	--	--	89.3	78.0	672.06
P-53	Phosphate rock, argillaceous	WOM-2980	0.6	21.6	--	--	--	33.0	78.6	685.02
P-52	Mudstone	WOM-2979	0.6	3.5	--	--	--	71.7	79.2	688.32
P-51	Mudstone	WOM-2978	1.4	3.7	--	--	--	80.8	80.6	693.50
P-50	Mudstone	WOM-2977	0.8	0.3	--	--	--	88.3	81.4	693.74
P-49	Mudstone, fos. col. no. 48-JES-228	WOM-2976	1.6	1.4	--	--	--	85.1	83.0	695.98
P-48	Mudstone	WOM-2975	1.0	0.4	--	--	--	84.6	84.0	696.38

[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 in percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	Loss on ignition	Acid insoluble		
P-47	Mudstone	WOM-2974	1.4	0.4	--	--	--	85.7	85.4	696.34
P-46	Phosphate rock, argillaceous	WOM-2972	1.7	20.3	--	--	--	34.9	87.1	731.43
P-45	Mudstone, fos. col. no. 48-JES-227	WOM-2971	5.0	1.4	--	--	--	85.5	92.1	738.43
P-44	Mudstone, phosphatic	WOM-2970	1.1	8.1	--	--	--	71.0	93.2	747.36
P-43	Mudstone, fos. col. no. 48-JES-226	WOM-2969	2.0	3.0	--	--	--	76.2	95.2	753.36
P-42	Phosphate rock, argillaceous	WOM-2968	0.7	18.8	--	--	--	37.3	95.9	766.92
P-41	Phosphate rock	WOM-2967	0.9	27.7	--	--	--	19.1	96.8	791.43
P-40	Mudstone	WOM-2966	3.5	1.2	--	--	--	88.1	100.3	795.69
P-39	Mudstone	WOM-2965	1.3	1.0	--	--	--	87.1	101.6	796.95
P-38	Mudstone, fos. col. no. 48-JES-225	WOM-2964	3.0	4.2	--	--	--	77.0	104.6	809.85
P-37	Mudstone	WOM-2963	4.4	2.1	--	--	--	87.8	109.0	818.79
P-36	Phosphate rock, argillaceous	WOM-2962	0.5	22.1	--	--	--	37.8	109.5	829.41
P-35	Mudstone	WOM-2961	4.7	4.2	--	--	--	74.1	114.2	849.93
P-34	Phosphate rock, argillaceous	WOM-2960	0.5	25.3	--	--	--	24.9	114.7	862.29
P-33	Mudstone, fos. col. no. 48-JES-224	WOM-2959	1.7	1.2	--	--	--	86.5	116.4	864.27
P-32	Phosphate rock and mudstone	WOM-2958	0.7	21.3	--	--	--	35.5	117.1	879.15
P-31	Mudstone, fos. col. no. 48-JES-223	WOM-2957	0.8	2.6	--	--	--	82.7	117.9	881.26
P-30	Mudstone, phosphatic, calcareous	WOM-2956	2.4	14.5	--	--	--	38.7	120.3	916.06
P-29	Mudstone	WOM-2955	1.8	3.2	--	--	--	75.9	122.1	921.82
P-28	Mudstone	WOM-2954	0.7	3.3	--	--	--	75.7	122.8	924.13
P-27	Mudstone	WOM-2953	0.8	1.5	--	--	--	83.3	123.6	925.35
P-26	Mudstone	WOM-2952	1.0	4.9	--	--	--	68.9	124.6	930.88
P-25	Phosphate rock, argillaceous, calcareous	WOM-2951	0.4	16.4	--	--	--	31.7	125.0	936.79
P-24	Mudstone, calcareous	WOM-2950	1.1	6.7	--	--	--	53.7	126.1	940.46
P-23	Mudstone, phosphatic, calcareous	WOM-2949	3.0	13.4	--	--	--	42.0	129.1	984.36
P-22	Phosphate rock, calcareous, argillaceous	WOM-2948	2.5	21.4	--	--	--	21.3	131.6	1,031.86
P-21	Mudstone, phosphatic	WOM-2947	0.6	13.3	--	--	--	42.3	132.2	1,045.84
P-20	Phosphate rock	WOM-2946	2.6	26.7	--	--	--	14.8	134.8	1,115.26
P-19	Phosphate rock, argillaceous	WOM-2945	1.0	17.4	--	--	--	35.2	135.8	1,132.86
P-18	Limestone	WOM-2944	2.0	2.8	--	--	--	13.3	137.8	1,138.26
P-17	Mudstone, phosphatic, calcareous	WOM-2943	2.3	12.0	--	--	--	48.7	140.1	1,165.86
P-16	Limestone, argillaceous	WOM-2942	2.1	1.5	--	--	--	21.6	142.2	1,169.01
P-15	Limestone, phosphatic, argillaceous	WOM-2941	0.4	11.7	--	--	--	20.0	142.6	1,173.63
P-14	Phosphate rock, argillaceous	WOM-2940	2.9	25.6	2.1	0.80	8.74	21.7	145.5	1,247.93
P-13	Phosphate rock, argillaceous	WOM-2939	1.0	19.0	5.1	1.7	7.20	37.8	146.5	1,266.97
P-12	Phosphate rock, argillaceous	WOM-2938	0.7	21.35	2.6	1.3	5.92	34.6	147.2	1,281.67
P-11	Phosphate rock	WOM-2937	1.3	27.6	2.7	1.1	6.76	19.7	148.5	1,317.68
P-10	Phosphate rock, argillaceous	WOM-2936	1.0	25.6	2.5	0.79	9.02	20.8	149.5	1,343.68
P-9	Mudstone, fos. col. no. 48-JES-222	WOM-2935	0.3	3.0	8.9	2.8	7.60	77.8	149.8	1,344.14
P-8	Phosphate rock, argillaceous, fos. col. no. 48-JES-221	WOM-2934	1.3	22.3	4.0	3.9	6.54	28.5	151.1	1,373.28

P- 7	Phosphate rock, argillaceous; fos. col. no. 48-JES-220	WOM-2933	1.0	25.1	2.8	1.7	7.90	23.2	152.1	1,398.[illegible]
P- 6	Phosphate rock	WOM-2932	1.9	33.0	1.2	0.63	7.38	5.8	154.0	1,461.[illegible]
P- 5	Phosphate rock	WOM-2931	3.6	33.7	0.81	0.48	7.92	4.7	157.6	1,582.[illegible]
P- 4	Phosphate rock; fos. col. no. 48-JES-219	WOM-2890	1.4	26.5	3.1	1.2	8.10	18.1	159.0	1,619.[illegible]
P- 3	Mudstone, calcareous, phosphatic	WOM-2889	1.5	8.5	--	--	--	53.5	160.5	1,632.[illegible]
P- 2	Mudstone	WOM-2874	0.9	3.9	--	--	--	66.7	161.4	1,638.[illegible]
P- 1	Phosphate rock	WOM-2873	0.2	32.8	--	--	--	5.3	161.6	1,642.[illegible]
Wells formation										
C-3	Limestone, fos. col. no. 48-JES-218	WOM-2872	1.5	3.6	--	--	--	3.7	4.5	2.40

DEER CREEK, IDAHO. LOT NO. 1268.

Phosphatic shale member of Phosphoria formation sampled in Trench 1 (hand trench) on north side of Deer Creek, S½SW¼ sec. 34, T. 9 S., R. 45 E., Bannock County, Idaho. Section measured and partially sampled by C. R. Deiss in 1944. Unsampled part of section remeasured by R. P. Sheldon and sampled by R. G. Waring in 1948. All I series samples analyzed by Tennessee Valley Authority. All RPS series samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness × percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
	Phosphatic shale member of Phosphoria formation						
P-82	Phosphate rock, calcareous	57-I	0.3	24.1	14.9	0.3	7.23
P-81	Mudstone, calcareous	RPS-2837	0.8	2.1	64.8	1.1	8.91
P-80	Mudstone, phosphatic	RPS-2836	1.0	5.2	---	2.1	14.11
P-79	Mudstone, calcareous	RPS-2835	2.0	1.6	69.7	4.1	17.31
P-78	Mudstone, calcareous	RPS-2834	6.0	0.3	57.1	10.1	19.11
P-77	Mudstone, calcareous	RPS-2833	0.4	0.4	74.4	10.5	19.27
P-76	Mudstone, calcareous	RPS-2832	4.5	2.3	67.9	15.0	29.62
P-75	Limestone	RPS-2831	2.3	0.9	13.4	17.3	31.69
P-74	Mudstone and phosphate rock	RPS-2830	0.7	11.4	62.2	18.0	39.67
P-73	Mudstone	RPS-2829	1.8	1.9	78.9	19.8	43.09
P-72	Phosphate rock	RPS-2828	0.5	27.4	11.2	20.3	56.79
P-71	Mudstone, calcareous	RPS-2827	3.4	1.4	74.4	23.7	61.55
	RPS-2827 through RPS-2837 equivalent to Deiss' unit nos. 69 through 79						
P-70	Phosphate rock	56-I	0.8	35.5	4.1	24.5	89.95
P-69	Phosphate rock	55-I	1.3	33.8	6.8	25.8	133.89
P-68	Mudstone, phosphatic	54-I	0.8	9.0	61.8	26.6	134.61
P-67	Limestone		0.9	---	---	27.5	---
P-66	Phosphate rock and mudstone	53-I	2.3	21.8	30.9	29.8	50.149
P-65	Phosphate rock	52-I	1.7	32.0	6.4	31.5	104.34
P-64	Phosphate rock and mudstone	51-I	1.8	17.0	40.7	33.3	135.14
P-63	Phosphate rock	50-I	1.0	34.4	4.7	34.3	169.54
P-62	Phosphate rock	49-I	2.0	34.3	4.6	36.3	238.14
P-61	Phosphate rock, contains limestone nodules	48-I	2.5	20.1	41.1	38.8	288.39
P-60	Phosphate rock	47-I	5.5	25.4	12.5	42.3	377.29
P-59	Phosphate rock, contains limestone nodules	46-I	3.8	18.1	29.6	46.1	446.07
P-58	Limestone, argillaceous	45-I	2.5	2.3	55.1	48.6	451.82
P-57	Phosphate rock and mudstone	44-I	1.7	16.7	32.2	50.3	480.21
P-56	Mudstone, phosphatic	43-I	4.2	13.0	47.1	54.5	534.81
P-55	Phosphate rock	42-I	0.9	28.0	18.7	55.4	560.01
P-54	Mudstone	41-I	1.4	6.0	69.8	56.8	568.41
P-53	Phosphate rock, argillaceous	40-I	0.5	84.2	22.8	57.3	610.51

P-52	Mudstone, phosphatic	39-1	2.4	10.7	59.5	99.7	636.19
P-51	Limestone	RPS-2826	1.0	1.3	12.0	60.7	637.49
	RPS-2826 equivalent to Deiss' unit no. 49.						
P-50	Mudstone, calcareous	38-1	1.3	3.2	59.3	62.0	641.65
P-49	Mudstone, phosphatic rock, and limestone	37-1	1.8	14.6	49.9	63.8	667.93
P-48	Mudstone	36-1	2.2	2.2	78.7	66.0	672.77
P-47	Mudstone	35-1	1.5	4.7	64.5	67.5	679.82
P-46	Mudstone	34-1	2.7	2.6	76.3	70.2	686.84
P-45	Phosphatic rock and mudstone	33-1	1.5	13.4	43.8	71.7	706.94
P-44	Phosphatic rock and mudstone	32-1	1.2	22.6	25.8	72.9	734.06
P-43	Mudstone	31-1	7.3	2.4	66.5	80.2	751.58
P-42	Phosphatic rock and mudstone	30-1	1.2	17.5	42.9	81.4	772.58
P-41	Mudstone and phosphatic rock	29-1	0.7	9.6	58.2	82.1	779.30
P-40	Limestone and mudstone, phosphatic	28-1	1.4	12.6	27.4	83.5	796.94
P-39	Limestone	--	0.3	--	--	83.8	--
P-38	Mudstone, limestone, and phosphatic rock	27-1	3.3	9.6	39.7	87.1	91.68
P-37	Mudstone, phosphatic rock, and limestone	26-1	2.0	7.9	30.4	89.1	41.48
P-36	Mudstone, phosphatic and limestone	25-1	3.6	9.4	35.6	92.7	81.32
P-35	Limestone	RPS-2825	2.7	0.1	12.4	95.4	81.59
	RPS-2825 equivalent to Deiss' unit no. 33.						
P-34	Mudstone, calcareous	24-1	1.8	2.0	65.1	97.2	83.19
P-33	Mudstone, phosphatic	23-1	2.0	9.2	33.3	99.2	103.59
P-32	Limestone	RPS-2824	2.5	0.2	11.8	101.7	104.09
	RPS-2824 equivalent to Deiss' unit no. 30.						
P-31	Mudstone	22-1	1.2	2.0	76.5	102.9	106.49
P-30	Limestone	21-1	4.3	9.3	17.2	107.2	107.78
P-29	Mudstone	20-1	4.2	2.5	74.0	111.4	118.28
--	Limestone concretion	RPS-2823	(0.6)	0.6	3.2	--	--
	RPS-2823 equivalent to Deiss' unit no. 26. Concretion occurs between Deiss-25 and Deiss-27.						
--	Limestone concretion	RPS-2822	(1.1)	0.7	4.4	--	--
	RPS-2822 occurs within Deiss' unit no. 25.						

-- The full section was measured but only part of the section was sampled by Deiss. The I series sample data here listed are taken from table 9, p. 91 of Deiss' report. The beds not sampled by Deiss are included in the columnar section for Trench 1 (as shown on plates 6 and 7 of Deiss' report) and are there identified by unit numbers which do not correspond to the sample numbers of table 9. The beds sampled by Sheldon (RPS series) are correlated with the unit numbers of Deiss.

* Cumulative data incomplete due to missing information. Computations start from zero after interruption.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
P-28	Mudstone	19-1	5.2	2.4	74.0	16.6	130.76
P-27	Mudstone, phosphatic and limestone	18-1	4.5	7.3	53.7	121.1	163.61
P-26	Limestone	RPS-2821	1.1	1.7	18.8	122.2	165.48
	RPS-2821 equivalent to Deiss' unit no. 23.						
P-25	Phosphate rock, argillaceous and limestone	17-1	3.4	13.6	29.2	125.6	211.72
--	Limestone concretion?	RPS-2819	(1.2)	1.4	2.3	--	--
	RPS-2819 eqivalent to Deiss' unit no. 21 and occurs between RPS-2820 and Deiss 22.						
P-24	Phosphate rock and calcareous mudstone	RPS-2820	0.5	15.9	31.0	126.1	219.67
P-23	Mudstone, phosphatic and limestone	16-1	4.3	12.0	37.9	130.4	271.27
P-22	Limestone	RPS-2818	1.2	0.9	3.0	131.6	272.35
	RPS-2818 equivalent to Deiss' unit no. 19.						
P-21	Mudstone, phosphatic	15-1	2.4	10.2	47.0	134.0	296.83
P-20	Phosphate rock, calcareous, argillaceous	14-1	1.2	20.4	22.2	135.2	321.31
P-19	Phosphate rock, calcareous	13-1	1.5	23.3	14.5	136.7	356.26
P-18	Phosphate rock and mudstone	12-1	2.8	25.9	17.0	139.5	429.78
P-17	Phosphate rock and mudstone	11-1	1.9	23.9	17.6	141.4	480.39
P-16	Limestone, argillaceous	10-1	3.0	5.1	20.9	144.4	495.69
P-15	Mudstone, calcareous, phosphatic	9-1	2.7	9.2	45.8	147.1	520.53
P-14	Limestone, argillaceous	RPS-2812	2.5	0.6	20.9	149.6	521.23
	RPS-2812 equivalent to Deiss' unit no. 11.						
P-13	Phosphate rock and mudstone	8-1	2.7	25.2	10.4	152.3	578.27
P-12	Phosphate rock, mudstone, and limestone	7-1	3.5	18.7	34.9	155.8	643.72
P-11	Phosphate rock and mudstone	6-1	7.6	25.4	17.6	163.4	836.76
--	Limestone concretion	RPS-2811	(0.6)	9.8	12.8	--	--
	RPS-2811 concretion occurs within RPS-2810.						
P-10	Phosphate rock and calcareous mudstone	RPS-2810	1.7	24.9	15.7	165.1	879.09
P- 9	Limestone	RPS-2809	1.1	2.3	6.5	166.2	904.39
	RPS-2809 and RPS-2810 equivalent to Deiss' unit no. 7.						
P- 8	Phosphate rock, argillaceous	5-1	3.0	21.9	34.6	169.2	970.09
P- 7	Limestone	RPS-2808	1.6	6.6	6.9	170.8	980.65
	RPS-2808 equivalent to Deiss' unit no. 5.						
P- 6	Phosphate rock	4-1	0.8	28.0	8.1	171.6	1,003.05

P-5	Phosphate rock	3-1	3.2	52.1	4.4	174.8	1 105.77
P-4	Phosphate rock	2-1	1.2	35.0	5.9	176.3	1 155.27
P-3	Mudstone	1-1	0.9	2.9	14.8	177.2	1 157.88
P-2	Limestone, argillaceous	RPS-2807	3.5	0.3	18.8	180.7	1 158.93
P-1	Phosphate rock	RPS-2806	0.5	31.2	6.8	181.2	1 174.53**

Wells formation

CW-5	Limestone	RPS-2817	7.0	0.2	2.6	7.0	8.40
CW-4	Phosphate rock	RPS-2816	0.1	33.4	3.2	7.1	11.74
CW-3	Limestone	RPS-2815	3.0	1.9	3.6	10.1	17.44
CW-2	Phosphate rock	RPS-2814	0.1	34.6	5.9	10.2	26.30
CW-1	Limestone	RPS-2813	1.8	0.7	6.1	12.0	27.10

** Note incompleteness of cumulative data.

(200)
R290
no 100-A
pt. 2

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

U.S.
Reports-open file series.

STRATIGRAPHIC SECTIONS OF THE PHOSPHORIA FORMATION IN IDAHO

Second Idaho Report

by

V. E. McKelvey, R. A. Hoppin, F. C. Armstrong,
R. A. Gulbrandsen, L. E. Smith, and R. M. Campbell

Oct. 10 1951
LIBRARY

MINERAL DEPOSITS BRANCH

Spokane, Washington August 1951

OPEN FILE

U. S. GEOLOGICAL SURVEY
WASHINGTON
NOV 6 1951
LIBRARY

This report is preliminary and has not been edited or reviewed for conformity with U. S. Geological Survey standards and nomenclature.

TABLE OF CONTENTS

	Page
Introduction	I
Abstract of sections	
North Wooley Range. Lot no. 1230.	1
Spectrographic analyses	4
North Rasmussen Valley. Lot no. 1233.	6
Spectrographic analyses	10
South Rasmussen Valley. Lot no. 1232.	12
Spectrographic analyses	15
Trail Canyon. Lot no. 1206.	17
Spectrographic analyses	26
Johnson Creek. Lot no. 1209.	28
Spectrographic analyses	32
South Dry Valley. Lot no. 1211.	34
West Dairy. Lot no. 1208.	40
Montpelier Canyon. Lot nos. 1207 and 1236.	46
Spectrographic analyses	54

STRATIGRAPHIC SECTIONS OF THE PHOSPHORIA FORMATION IN IDAHO

Second Idaho Report

by

**V. E. McKelvey, R. A. Hoppin, F. C. Armstrong,
R. A. Gulbrandsen, L. E. Smith, and R. M. Campbell**

INTRODUCTION

The first of a series of reports giving detailed stratigraphic sections of the Phosphoria formation in the Western phosphate field as measured and described by the Geological Survey will be released as Circulars within the next few months. Because of the needs of industry for many of these data during the 1951 field season, and in view of the unavoidable delays attendant on publication, the tabular data to be included in these Circulars are hereby placed on open file in simple reproduction form (prepared by Ozalid from photographic negatives) and without explanatory text so that immediate use may be made of the data.

The first four sets of tables, one each for the states of Montana, Idaho, Wyoming, and Utah, were released on open file on August 15, 1951. This report includes data of the same character but of samples from different localities and is the second report on samples from Idaho. The tables include name and location of section measured, brief description of geologic setting, acknowledgments for field and analytical work, abstract data on the sections (bed number, rock name, sample number, and thickness), and analytical data on the samples. The analytical data include reports on P_2O_5 and acid insoluble for all samples and additional analyses, such as Al_2O_3, Fe_2O_3, loss on ignition, F, and V_2O_5, for selected samples. Spectrographic analyses for a large number of elements are included for samples from selected localities.

These reports are placed on open file at the offices of the Geological Survey in Washington, D. C., Spokane, Washington, Salt Lake City, Utah, and Montpelier, Idaho, and at the offices of the Idaho Bureau of Mines and Geology, Moscow, Idaho, the Montana Bureau of Mines and Geology, Butte, Montana, and the Wyoming Geological Survey, Laramie, Wyoming, and the University of Utah, Salt Lake City, Utah.

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, E. 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 by U. S. Bureau of Mines Laboratory, Albany, Oregon.

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	2.4	1.1	--	--	--	85.3	2.3	2.53
Phosphatic shale member of Phosphoria formation										
P-72	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	4.7	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	15.0	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	2.5	12.8	--	--	--	45.0	46.45	530.42
P-69	Mudstone; fos. col. no. 48-JES-70	1226- RPS	1.2	5.4	--	--	--	64.4	47.65	536.90
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	986.64
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	5.0	10.0	--	--	--	60.5	95.25	1,160.79
P-43	Mudstone, calcareous, phosphatic	1266- VEM	1.4	10.7	--	--	--	43.4	96.65	1,175.77
P-42	Mudstone, phosphatic	1265- VEM	0.6	14.7	--	--	--	37.4	97.25	1,184.59
P-41	Mudstone	1264- VEM	0.6	5.8	--	--	--	68.8	97.85	1,188.07
P-40	Mudstone, phosphatic	1263- VEM	0.8	12.0	--	--	--	48.9	98.65	1,197.67
P-39	Mudstone, phosphatic	1262- VEM	0.5	8.0	--	--	--	59.9	99.15	1,201.67
P-38	Mudstone, phosphatic	1261- VEM	1.1	12.1	--	--	--	41.3	100.25	1,214.98
P-37	Mudstone, phosphatic	1260- VEM	2.1	16.5	--	--	--	43.5	102.35	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	105.95	1,239.11
P-33	Mudstone, phosphatic	1276-WOM	0.5	8.9	--	--	--	86.5	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	1,285.66
P-30	Mudstone, phosphatic	1273-WOM	3.5	14.5	--	--	--	46.1	113.45	1,336.67
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	1,356.02
P-27	Mudstone and phosphate rock	1246-CEW	3.2	44.6	--	--	--	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	1,525.20
P-24	Phosphate rock	1243-CEW	2.2	28.5	3.6	1.97	5.12	15.3	124.95	1,597.96
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	11.84	46.4	130.65	1,705.93
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	21.6	153.75	2,314.06
P-8	Phosphate rock	1298-WOM	2.9	34.4	0.94	0.47	5.94	5.4	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
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	B'	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	E	F	D	D	F	E	B'	A	G	D	D	E	E	E	G	E	F
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	G	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	G	E	E
P-21	1240-CEW	A	E	ND	E	B'	D	E	B'	F	G	E	E	E	E	F	E	B'	A	F	D	D	E	D	E	G	E	E
P-20	1309-CEW	A	F	ND	E	B'	D	E	B'	F	ND	E	F	E	E	F	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'	F	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'	F	ND	E	A	D	E	D	ND	ND	E	F	E	E	E	F	E	A	B'	C	D	D	E	D	E	C	E	F
P-16	1219-CEW	A	E	ND	ND	B'	D	E	B'	F	G	E	E	E	E	E	F	E	B'	A	C	D	D	E	D	E	C	E	F
P-15	1314-RAH	B'	F	ND	E	A	D	F	D	F	ND	F	ND	E	E	E	F	E	A	B'	C	D	D	E	D	E	C	E	F
P-14	1313-RAH	B'	F	ND	E	A	D	F	D	F	ND	F	ND	E	E	E	F	E	A	B'	C	D	D	E	D	E	C	E	F
P-13	1312-RAH	B'	F	ND	E	A	D	F	D	F	ND	F	F	E	E	E	F	E	A	B'	C	D	D	E	D	E	C	E	F
P-12	1311-RAH	B'	E	ND	E	A	D	E	D	F	G	E	E	E	D	F	F	E	A	B'	C	D	D	E	D	E	C	E	F
P-11	1310-RAH	B'	F	ND	E	A	D	E	D	F	ND	E	E	E	D	F	F	E	A	B'	C	D	D	E	D	E	C	E	F
P-10	1294-WOM	B'	F	ND	F	A	D	F	D	F	F	E	E	E	D	F	F	E	A	B'	C	D	D	E	D	E	C	E	F
P-9	1299-WOM	B'	F	ND	F	A	D	F	D	ND	G	E	F	E	D	F	F	E	A	B'	C	D	D	E	D	E	C	E	F
P-8	1298-WOM	D	F	ND	E	A	D	F	E	ND	ND	E	F	E	E	ND	E	E	A	B'	C	D	D	E	D	E	C	E	F
P-7	1297-WOM	B'	F	ND	E	A	D	E	D	ND	ND	E	F	E	E	F	F	A	A	B'	C	D	D	E	D	E	C	E	F

Beds P-6 through P-1 not analyzed.

[1] B' 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 by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	Loss on ignition	Acid insoluble		
	Dinwoody formation									
Td-2	Siltstone	1418-RAH	4.0	0.5	--	--	--	78.2	--	--
Td-1	Phosphatic 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	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	Phosphatic 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	249.47
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	[illegible]	298.27
R-11	Mudstone	1403-RAH	10.0	1.6	--	--	--	82.2	[illegible]	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	1385- 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	41.68
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	183.39
P-71	Phosphate rock, argillaceous	1332- RLP	1.8	23.9	4.9	1.65	8.08	27.5	17.7	226.62
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	14.3	--	--	--	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	--	--	--	63.4	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	--	--	--	66.5	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	3.1	22.4	--	--	--	36.2	65.2	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	45.4	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	10.3	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	1,940.95
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; Hos. 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	1235-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					
C-1	Limestone	1315-RAH	3.1	0.6	--	--	--	1.8	--	--

SPECTROGRAPHIC ANALYSES—NORTH RASMUSSEN VALLEY, IDAHO. LOT NO. 1253.

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, In, 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
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	1333-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	E	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	E	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	1322-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	E	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	G	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	E	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	E	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	E	ND	E	E	E	G	E	F
P-18	1387-WOM	B	F	ND	E	B	D	ND	F	B	F	E	ND	D	F	F	E	A	A	G	D	E	ND	E	E	E	G	E	F
P-17	1386-WOM	B	F	ND	E	A	D	ND	E	B	ND	E	F	D	F	F	E	A	B	G	D	E	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	F
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	E	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	E	E	E	G	E	F
P-12	1355-CEW	B	F	ND	E	A	E	ND	F	B	ND	E	ND	D	E	F	E	A	A	G	D	E	ND	E	E	E	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	E	E	E	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	I
P- 8	1351-CEW	B'	F	ND	E	A	E	ND	F	B'	F	E	ND	D	E	F	E	B'	B'	G	D	E	ND	E	E	F	G	E	I
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	E	E	F	G	E	I
P- 6	1000-RAH	B'	E	F	E	A	E	ND	F	D	ND	E	F	D	E	F	E	A	B'	G	D	E	ND	E	E	F	G	E	I
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	I
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	E	E	F	G	E	I
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	F	G	E	I
P- 2	1317-RAH	B'	F	ND	E	B'	E	ND	F	B'	F	ND	ND	B'	E	F	E	A	A	ND	D	E	ND	E	E	F	G	E	I
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	I

[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 by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness × percentage 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	[illegible]
R-5	Chert	1491-DFD	1.8	0.6	--	--	--	94.4	2.6	[illegible]
R-4	Chert	1490-DFD	1.2	0.5	--	--	--	94.5	3.8	[illegible]
R-3	Chert	1474-DFD	1.4	0.4	--	--	--	92.9	5.2	[illegible]
R-2	Chert	1473-DFD	2.3	0.1	--	--	--	92.7	7.5	[illegible]
R-1	Chert	1472-DFD	1.5	4.4	--	--	--	74.6	9.0	[illegible]
Phosphatic shale member of Phosphoria formation										
P-72	Mudstone, cherty	3190-WOM	0.9	2.7	--	--	--	83.2	0.9	[illegible]
P-71	Mudstone	3189-WOM	0.7	4.5	--	--	--	72.2	1.6	[illegible]
P-70	Mudstone	3188-WOM	1.2	3.7	--	--	--	73.6	2.8	[illegible]
P-69	Phosphate rock, argillaceous	3187-WOM	0.8	25.9	--	--	--	28.5	3.6	[illegible]
P-68	Mudstone	3186-WOM	1.7	1.5	--	--	--	79.2	5.3	[illegible]
P-67	Mudstone	3185-WOM	1.7	0.6	--	--	--	83.8	7.0	[illegible]
P-66	Phosphate rock, argillaceous	3184-WOM	0.3	21.7	--	--	--	34.8	7.3	[illegible]
P-65	Mudstone	3183-WOM	0.9	1.3	--	--	--	80.9	8.2	[illegible]
P-64	Mudstone	1459-DFD	0.7	6.9	--	--	--	67.9	8.9	[illegible]
P-63	Mudstone, calcareous, phosphatic	1458-DFD	1.1	26.6	3.3	1.01	[illegible]	20.8	10.0	[illegible]
P-62	Phosphate rock	1457-DFD	1.1	36.0	1.4	0.53	3.24	3.6	11.1	[illegible]
P-61	Phosphate rock	1456-DFD	1.0	30.1	2.6	0.80	9.28	12.0	12.1	[illegible]
P-60	Phosphate rock	1455-DFD	1.4	29.8	3.2	0.80	37.00	12.0	13.5	[illegible]
P-59	Phosphate rock, argillaceous	1454-DFD	1.0	25.8	3.8	1.24	9.88	21.1	14.5	[illegible]
P-58	Phosphate rock, argillaceous	1453-DFD	2.6	27.1	3.4	1.15	8.84	20.1	17.1	[illegible]
P-57	Phosphate rock, argillaceous	1452-DFD	0.5	27.2	3.1	0.85	8.38	20.5	17.6	[illegible]
P-56	Phosphate rock, argillaceous	1451-DFD	0.6	20.0	5.7	1.31	9.72	36.0	18.2	[illegible]
P-55	Phosphate rock, argillaceous	1450-DFD	0.6	17.8	6.7	1.22	9.86	40.4	18.8	[illegible]
P-54	Mudstone, phosphatic	1439-DFD	1.3	14.6	8.3	1.95	9.74	45.3	20.1	[illegible]
P-53	Mudstone, calcareous	1438-DFD	0.6	8.4	--	--	--	62.5	20.7	[illegible]
P-52	Mudstone	1437-DFD	1.3	5.4	--	--	--	66.7	22.0	[illegible]
P-51	Mudstone, phosphatic	1479-DFD	1.1	13.2	--	--	--	44.8	23.1	[illegible]
P-50	Mudstone, phosphatic	1478-DFD	0.7	8.7	--	--	--	58.7	23.8	[illegible]
P-49	Mudstone, phosphatic	1477-DFD	1.2	15.8	--	--	--	43.2	25.0	[illegible]

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	460.50
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	618.89
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	647.23
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	675.19
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	--	--	--	59.8	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	924.92
P-22	Mudstone, phosphatic	1487-WOM	1.5	14.8	9.6	0.58	9.10	47.0	72.6	944.72
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	1,061.94
	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	1,108.32
P-17	Mudstone, phosphatic	1482-WOM	1.7?	12.3	8.9	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.

Lot no. 1232.

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	1,280.90
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	9.34	5.1	91.9	1,457.76
P-11	Phosphate rock	1467-WOM	2.3	32.0	1.9	0.48	5.24	24.6	94.2	1,531.36
P-10	Limestone, argillaceous, phosphatic	1466-WOM	0.3	12.4	8.2	0.68	6.00	32.0	94.5	1,535.08
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	1,782.77
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	1,829.73
P- 2	Mudstone, calcareous	1448-WOM	4.0?	8.7	9.2	2.78	8.60	71.8	109.0	1,836.85
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							
W-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]
C = 0.1-1 percent
D = 0.01-0.1 percent
E = 0.001-0.01 percent
F = 0.0001-0.001 percent
G = less than 0.0001 percent
ND = not detected

Bed no.	Sample no.	Al	Ba	B	Cd	Ca	Cr	Cu	Fe	Ga	La	Pb	Mg	Mn	Mo	Ni	P	Sr	Ag	Na	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
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
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
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
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
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
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
P-56	1451- DFD	B'	E	F	E	A	E	E	D	F	E	F	D	F	ND	E	A	B'	G	D	E	ND	E	D	E	G	E
P-55	1450- DFD	B'	E	F	E	A	E	E	D	F	F	F	D	F	ND	E	A	B'	G	D	E	F	E	D	E	G	E
P-54	1439- DFD	B'	E	F	E	A	E	E	D	F	F	F	D	F	ND	E	A	B'	G	D	E	ND	E	D	E	G	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
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
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	D	D	E	G	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
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
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	E	G	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	D	D	E	G	E
P-17	1482-WOM	A	E	F	F	B'	E	E	B'	F	F	ND	D	F	G	E	B'	A	F	D	E	ND	E	D	E	G	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
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
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
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	E	D	E	G	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

[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	E	B'	E	E	D	F	F	F	D	F	ND	E	B'	A	G	D	E	ND	E	D	E	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	G	E	B'	E	E	B'	F	F	F	B'	F	F	E	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	F	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	E
P- 4	1460-WOM	B'	D	G	E	A	E	E	E	F	F	F	D	F	ND	E	A	B'	G	B'	E	F	E	D	E	G	E	E
P- 3	1449-WOM	D	D	ND	E	A	E	E	E	F	F	F	D	D	ND	E	A	B'	G	B'	E	F	E	D	E	G	E	E
P- 2	1448-WOM	A	E	F	F	B'	E	E	B'	F	ND	F	B'	D	ND	D	A	B'	G	D	E	ND	E	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	E

Lot no. 1232.

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 NW¼NW¼ 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 H. A. Gulbrandsen, R. A. Hoppin, V. E. McKelvey, and L. E. Smith and sampled by R. S. Sears, K. P. Sheldon, O. A. Payne, and Gulbrandsen in August 1947. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)						Cumulative thickness (feet)	Thickness × 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 of 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	80.36
R- 13	Chert	RAH-212-47	3.1	0.7	--	--	--	--	81.9	184.2	90.35
R- 12	Limestone, locally cherty	RAH-211-47	0.7	0.3	--	--	--	--	28.5	184.9	90.70
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	--	--	--	--	50.5	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	--	--	--	--	52.9	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	--	--	--	--	87.0	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	--	--	--	--	60.1	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	51.98
P-198	Mudstone	RAG- 3-47	0.71	6.9	--	--	1.09	--	56.7	13.23	56.87
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	5.2	15.66	[illegible]
P-194	Phosphate rock	VEM-264-47	0.8	31.6	1.9	1.3	3.04	5.22	11.7	16.46	[illegible]
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	[illegible]
P-192	Mudstone	VEM-262-47	0.3	2.7	9.8	3.7	0.31	10.14	70.2	17.36	[illegible]
P-191	Phosphate rock	VEM-259-47	1.0	30.6	1.5	0.97	2.97	5.02	14.6	18.36	[illegible]
P-190	Limestone	VEM-258-47	1.0	2.7	1.4	0.80	--	35.88	12.0	19.36	[illegible]
P-189	Mudstone	VEM-257-47	0.4	0.3	1.4	0.68	--	9.58	83.0	19.76	[illegible]
P-188	Phosphate rock	VEM-256-47	0.6	34.0	0.8	0.61	3.27	6.18	5.7	20.36	[illegible]
---	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	[illegible]
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	[illegible]
P-185	Phosphate rock, argillaceous	VEM-252-47	0.4	20.0	3.8	1.3	2.06	12.16	25.5	21.66	[illegible]
P-184	Phosphate rock, calcareous	VEM-251-47	0.8	23.5	0.8	0.91	2.22	15.96	7.3	22.46	[illegible]
---	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	[illegible]
P-181	Mudstone; fos. col. no. 47-HW-160	VEM-247-47	0.8	3.9	--	--	--	--	61.4	24.96	[illegible]
P-180	Mudstone; fos. col. no. 47-HW-161	VEM-246-47	1.1	3.3	--	--	--	--	63.1	26.06	[illegible]
P-179	Mudstone; fos. col. no. 47-HW-162	VEM-245-47	1.0	3.5	--	--	--	--	65.3	27.06	[illegible]
P-178	Phosphate rock, argillaceous	VEM-244-47	0.6	16.2	--	--	--	--	31.6	27.66	[illegible]
P-177	Mudstone, phosphatic	VEM-243-47	1.0	15.7	--	--	--	--	41.8	28.66	[illegible]
P-176	Phosphate rock	VEM-242-47	0.5	33.6	--	--	--	--	3.8	29.16	[illegible]
P-175	Phosphate rock, argillaceous, and calcareous mudstone	VEM-241-47	0.8	25.3	--	--	--	--	14.8	29.96	[illegible]
P-174	Phosphate rock, calcareous, argillaceous; fos. col. nos. 47-HW-163 and 47-HW-164	VEM-240-47	0.8	18.7	--	--	--	--	29.1	30.76	[illegible]
P-173	Phosphate rock, calcareous; fos. col. no. 47-HW-165	VEM-239-47	0.7	17.2	--	--	--	--	14.2	31.46	[illegible]
P-172	Limestone, phosphatic, argillaceous; fos. col. no. 47-HW-166	VEM-238-47	0.4	12.7	--	--	--	--	23.4	31.86	[illegible]
P-171	Phosphate rock, calcareous, argillaceous; fos. col. no. 47-HW-167	VEM-261-47	0.6	16.6	--	--	--	--	20.1	32.46	[illegible]
P-170	Phosphate rock, calcareous, argillaceous; fos. col. no. 47-HW-168	LES-356-47	0.4	16.3	--	--	--	--	21.4	32.86	[illegible]

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)						Cumulative thickness (feet)	Thickness 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	456.93
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	547.46
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	580.72
P-151	Mudstone, phosphatic	LES-332-47	0.6	11.1	--	--	--	--	48.4	44.11	587.30
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	--	--	--	--	47.0	46.46	592.90
P-147	Mudstone, phosphatic	VEM-236-47	1.3	12.9	--	--	--	--	45.0	47.76	640.66
P-146	Mudstone, phosphatic	VEM-235-47	1.4	18.4	--	--	--	--	47.0	49.16	689.82
P-145	Phosphate rock, argillaceous	VEM-234-47	0.4	16.9	--	--	--	--	41.3	49.36	739.18
P-144	Mudstone	VEM-233-47	1.1	7.7	--	--	--	--	61.9	50.66	789.84
P-143	Mudstone	VEM-232-47	1.6	6.5	--	--	--	--	69.2	52.26	842.10
P-142	Mudstone; fos. col. no. 47-HW-86	VEM-231-47	1.6	3.9	--	--	--	--	76.3	53.86	895.96
P-141	Mudstone	VEM-230-47	1.6	4.6	--	--	--	--	72.8	55.46	951.42
P-140	Mudstone	VEM-229-47	1.0	6.2	--	--	--	--	73.2	56.46	1007.88
P-139	Mudstone, phosphatic	VEM-228-47	0.3	13.4	--	--	--	--	54.8	57.76	1065.64
P-138	Mudstone	VEM-227-47	1.8	2.8	--	--	--	--	85.7	58.56	1124.20
P-137	Phosphate rock, argillaceous	VEM-226-47	0.6	19.9	--	--	--	--	39.7	59.16	1183.36
P-136	Mudstone	VEM-225-47	1.6	2.8	--	--	--	--	82.2	60.76	1244.12
P-135	Mudstone	VEM-224-47	1.4	3.5	--	--	--	--	79.6	62.16	1306.28
P-134	Mudstone, phosphatic	VEM-223-47	0.8	14.0	--	--	--	--	51.0	62.96	1369.24
P-133	Mudstone, phosphatic	VEM-222-47	0.5	12.1	--	--	--	--	54.6	63.46	1432.70
P-132	Mudstone	VEM-221-47	1.5	6.8	--	--	--	--	69.8	64.96	1497.66
P-131	Mudstone; fos. col. no. 47-HW-85	VEM-220-47	1.7	4.4	--	--	--	--	76.0	66.66	1564.32
P-130	Mudstone	VEM 219-47	2.8	4.3	--	--	--	--	77.0	69.46	1633.78
P-129	Mudstone	VEM-218-47	1.4	0.8	--	--	--	--	87.7	70.86	1704.64
P-128	Mudstone	VEM-217-47	1.9	4.1	--	--	--	--	77.2	72.76	1777.40
P-127	Mudstone and phosphate rock	VEM-216-47	1.3	16.8	--	--	--	--	42.9	74.06	1851.46
P-126	Mudstone	VEM-215-47	0.5	6.0	--	--	--	--	70.7	74.56	1926.02
P-125	Mudstone, phosphatic	VEM-214-47	0.8	10.7	--	--	--	--	59.4	75.36	2001.38
P-124	Mudstone; fos. col. no. 47-HW-84	VEM-213-47	2.6	2.0	--	--	--	--	79.4	77.96	2079.34
P-123	Mudstone	VEM-212-47	2.1	1.7	--	--	--	--	81.4	80.06	2159.40
P-122	Mudstone, phosphatic and phosphate rock	VEM-211-47	0.6	17.2	--	--	--	--	43.3	80.66	2240.06
P-121	Mudstone	VEM-210-47	0.8	6.9	--	--	--	--	68.2	81.46	2321.52
P-120	Mudstone, phosphatic	VEM-209-47	1.9	9.2	--	--	--	--	56.2	83.36	2404.88
P-119	Phosphate rock, argillaceous	VEM-208-47	1.8	17.0	--	--	--	--	42.4	85.16	2490.04
P-118	Mudstone	VEM-207-47	0.7	4.0	--	--	--	--	74.1	85.86	2575.90
P-117	Mudstone	VEM-206-47	2.3	5.9	--	--	--	--	72.8	88.16	2664.06
P-116	Limestone, argillaceous	VEM-205-47	2.1	0.2	--	--	--	--	30.8	90.26	2754.32
P-115	Mudstone	VEM-204-47	1.1	0.4	--	--	--	--	81.2	91.36	2845.68
P-114	Phosphate rock	VEM-203-47	0.3	22.5	--	--	--	--	7.9	91.66	2937.34
P-113	Mudstone	VEM-202-47	1.7	2.2	--	--	--	--	80.0	93.36	3030.70
P-112	Mudstone	VEM-201-47	0.4	5.8	--	--	--	--	78.7	93.76	3124.46
P-111	Limestone, argillaceous	VEM-200-47	1.5	1.1	--	--	--	--	46.6	95.26	3219.72
P-110	Mudstone	VEM-199-47	0.7	1.2	--	--	--	--	84.0	95.96	3315.68
P-109	Phosphate rock, argillaceous	VEM-198-47	0.3	29.2	--	--	--	--	20.2	96.26	3411.94
P-108	Mudstone	VEM-197-47	0.9	2.1	--	--	--	--	79.3	97.16	3508.10
P-107	Mudstone, phosphatic	VEM-196-47	0.3	14.3	--	--	--	--	48.0	97.46	3605.56
P-106	Mudstone	VEM-195-47	0.5	2.2	--	--	--	--	80.6	97.96	3703.52
P-105	Mudstone	VEM-194-47	1.1	1.2	--	--	--	--	82.3	99.06	3802.58

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)						Cumulative thickness (feet)	Thickness of 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	916.84
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	--	--	--	--	35.7	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	5.5	--	--	--	--	46.0	156.06	1,21[illegible]
P- 68	Limestone and calcareous mudstone; fos. col. no. 47-HW-80	LES- 306-47	0.35	0.4	--	--	--	--	40.0	157.41	1,21[illegible]
P- 67	Limestone and calcareous mudstone; fos. col. no. 47-HW-79	LES- 305-47	2.2	0.6	--	--	--	--	[illegible]	[illegible]	[illegible]
P- 66	Chert and mudstone	LES- 304-47	0.65	1.3	--	--	--	--	7.4	160.26	1,[illegible]
P- 65	Mudstone, calcareous	LES- 303-47	1.7	2.3	--	--	--	--	58.6	162.16	1,167.39
P- 64	Mudstone	LES- 302-47	0.5	0.4	--	--	--	--	40.5	162.76	1,[illegible]
P- 63	Mudstone	LES- 301-47	0.6	2.4	--	--	--	--	73.4	163.36	1,[illegible]
P- 62	Mudstone, phosphatic	LES- 300-47	0.6	7.8	--	--	--	--	56.8	163.96	1,[illegible]
P- 61	Limestone	LES- 299-47	0.7	2.2	--	--	--	--	18.9	164.66	[illegible]
P- 60	Mudstone	LES- 298-47	1.5	5.0	--	--	--	--	66.5	166.16	1,[illegible]
P- 59	Mudstone, calcareous	LES- 297-47	1.0	5.6	--	--	--	--	54.7	167.16	1,[illegible]
P- 58	Mudstone, calcareous	LES- 296-47	0.9	1.0	--	--	--	--	68.1	168.06	1,[illegible]
P- 57	Mudstone	LES- 295-47	0.8	1.7	--	--	--	--	80.7	168.86	1,[illegible]
P- 56	Mudstone, calcareous	LES- 294-47	0.9	7.0	--	--	--	--	54.3	169.76	1,[illegible]
P- 55	Mudstone, contains mudstone lenses; fos. col. no. 47-HW-78	LES- 293-47	0.55	7.4	--	--	--	--	59.9	170.31	1,[illegible]
P- 54	Mudstone, phosphatic, calcareous	LES- 291-47	1.6	11.2	--	--	--	--	47.8	171.91	1,[illegible]
--	Limestone concretion in bed P-54	LES- 292-47	(0.8)	0.6	--	--	--	--	3.3	--	--
P- 53	Mudstone, calcareous	LES- 290-47	0.4	4.9	--	--	--	--	66.5	172.31	1,[illegible]
P-52	Mudstone	LES- 289-47	0.4	4.9	--	--	--	--	67.5	172.71	1,[illegible]
P- 51	Mudstone, calcareous, and calcareous phosphatic rock	LES- 288-47	0.6	6.2	--	--	--	--	58.3	173.31	1,[illegible]
P- 50	Mudstone, calcareous; fos. col. no. 47-HW-77	LES- 287-47	1.0	4.3	--	--	--	--	53.6	174.31	1,[illegible]
P- 49	Mudstone, calcareous, phosphatic	LES- 286-47	2.25	9.4	--	--	--	--	41.0	176.56	1,[illegible]
P- 48	Limestone, phosphatic, argillaceous	LES- 285-47	0.45	9.0	--	--	--	--	20.9	177.01	1,[illegible]
--	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	177.81	1,[illegible]
P- 46	Mudstone, calcareous, phosphatic	LES- 282-47	0.5	11.5	--	--	--	--	32.3	178.31	1,[illegible]
P- 45	Mudstone, calcareous, phosphatic, fos. col. no. 47-HW-76	LES- 281-47	1.85	8.9	--	--	--	--	39.3	179.56	1,[illegible]
P- 44	Limestone, argillaceous; fos. col. no. 47-HW-75	LES- 280-47	1.0	0.5	--	--	--	--	21.3	180.36	1,[illegible]
P- 43	Mudstone, calcareous, phosphatic	LES- 279-47	0.8	9.9	--	--	--	--	42.8	180.76	1,[illegible]
P- 42	Mudstone, calcareous	LES- 278-47	0.4	4.0	--	--	--	--	45.0	181.16	1,[illegible]
P- 41	Mudstone, phosphatic	LES- 283-47	1.1	11.7	--	--	--	--	40.9	182.26	1,[illegible]
P- 40	Mudstone, phosphatic, calcareous	LES- 284-47	4.2	14.1	--	--	--	--	38.7	186.46	1,[illegible]
--	Limestone concretion in bed P-40	LES- 286-47	(0.5)	1.3	--	--	--	--	8.5	--	--
--	Limestone concretion in bed P-40	LES- 285-47	(0.1)	4.6	--	--	--	--	16.3	--	--

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	1,347.32
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	10.8	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	2,018.94
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	20.6	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, Ge, Gd, Au, Ho, In, Li, Lu, Nd, Pt, Pr, Rb, Sm, Sc, Ta, Te, Th, 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
C = 0.1-1 percent
D = 0.01-0.1 percent
E = 0.001-0.01 percent
F = 0.0001-0.001 percent
G = less than 0.0001 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	E	D	E	F	D	E	F	E	A	B	G	D	D	F	E	E	E	E	E
P-194	VEM-264-47	B	F	ND	ND	F	A	D	ND	E	D	E	E	D	E	F	E	A	B	G	D	D	F	E	E	E	E	E
P-193	VEM-263-47	B	F	ND	F	F	A	D	ND	E	D	E	E	D	F	F	E	A	B	G	D	D	F	E	E	E	E	E
P-192	VEM-262-47	B	E	F	E	F	B	D	ND	E	D	F	E	D	E	E	E	A	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	E	D	E	E	E	A	B	F	D	D	F	E	E	E	E	E
P-190	VEM-258-47	B	E	ND	F	F	A	D	ND	E	D	ND	F	B	E	E	E	A	B	G	D	D	F	E	E	ND	E	E
P-189	VEM-257-47	B	E	ND	F	F	A	D	ND	E	D	F	F	D	E	E	E	A	B	G	D	D	F	E	E	E	E	E
P-188	VEM-256-47	B	E	ND	F	E	A	D	ND	E	D	F	F	D	E	E	E	A	B	G	D	D	F	E	E	E	E	E
	VEM-255-47	B	E	G	F	E	A	D	ND	E	D	F	F	D	E	E	E	A	B	G	D	D	F	E	E	E	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	E	E	E	E	E
P-186	VEM-253-47	B	E	G	F	E	A	D	ND	E	D	F	F	D	E	E	E	A	B	G	D	D	F	E	E	E	E	E
P-185	VEM-252-47	B	E	ND	F	E	A	D	ND	E	D	F	F	D	E	E	E	A	B	G	D	D	F	E	E	E	E	E
P-184	VEM-251-47	B	E	ND	F	E	A	D	ND	E	D	F	F	D	E	E	E	A	B	G	D	D	F	E	E	E	E	E
P-183	VEM-249-47	B	E	G	F	ND	A	D	ND	E	D	E	F	D	E	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	E	F	E	A	B	G	D	D	F	D	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	D	E	E	E	E
P-180	VEM-246-47	B	E	G	F	E	A	D	ND	E	D	E	F	D	E	F	E	A	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	E	E	F	E	D
P- 18	VEM-179-47	B'	E	G	F	E	A	D	ND	E	D	F	F	D	F	F	F	A	B'	G	D	D	E	E	F	E	D
P- 17	VEM-178-47	B'	E	G	F	E	A	D	ND	E	D	F	F	D	F	F	F	A	B'	G	D	D	E	E	F	E	D
P- 16	VEM-177-47	B'	E	ND	F	E	A	D	ND	E	D	F	F	D	F	F	F	A	B'	G	D	D	E	E	F	E	D
P- 15	VEM-176-47	B'	E	ND	F	E	A	D	ND	E	D	F	F	D	F	F	F	A	B'	G	D	D	E	E	F	E	D
P- 14	VEM-175-47	B'	E	ND	F	E	A	D	ND	E	D	F	F	D	F	F	F	A	B'	G	D	D	E	E	F	E	D
P- 13	RAH-189-47	B'	E	ND	F	E	A	D	ND	E	D	F	F	D	F	F	F	A	B'	G	D	D	E	E	F	E	D
P- 12	WOM- 3182	B'	E	ND	F	E	A	D	ND	E	D	F	F	D	F	F	F	A	B'	G	D	D	E	E	F	E	D
P- 11	WOM- 3181	B'	E	ND	F	E	A	D	ND	E	D	F	F	D	F	F	F	A	B'	G	D	D	E	E	F	E	D
P- 10	RAH-186-47	B'	E	ND	F	E	A	D	ND	E	D	F	F	D	F	F	F	A	B'	G	D	D	E	E	F	E	D
P- 9	RAH-185-47	D	E	ND	F	E	A	D	ND	E	D	F	F	D	F	F	F	A	B'	G	D	D	E	E	F	E	D
P- 8	RAH-184-47	B'	E	ND	F	E	A	D	ND	E	D	F	F	D	F	F	F	A	B'	G	D	D	E	E	F	E	D
P- 7	RAH-183-47	B'	E	ND	F	E	A	D	ND	E	D	F	F	D	F	F	F	A	B'	G	D	D	E	E	F	E	D
P- 6	RAH-182-47	B'	E	G	F	E	B'	D	ND	E	D	F	ND	D	F	F	ND	B'	A	G	D	D	E	E	F	E	D
P- 5	RAH-181-47	B'	E	G	F	E	B'	D	ND	E	D	F	ND	D	F	F	F	B'	A	G	D	D	E	E	F	E	D
P- 4	RAH-180-47	B'	E	G	F	E	B'	E	ND	F	D	F	ND	B'	D	F	F	A	A	G	D	D	E	E	ND	E	D
P- 3	RAH-179-47	B'	E	G	F	E	B'	E	ND	E	D	F	F	D	D	F	F	A	B'	G	D	D	E	E	F	E	D
P- 2	RMC-133-47	B'	E	ND	F	E	A	D	ND	E	D	F	F	D	F	F	F	A	B'	G	D	D	E	E	F	E	D
P- 1	RMC-134-47	B'	E	ND	F	E	A	D	ND	E	D	F	F	D	F	F	F	A	B'	G	D	D	E	E	F	E	D

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 [illegible], 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 by U. S. Bureau of Mines Laboratory, Albany, Oregon.

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	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	5.48	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	359.15
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	399.41
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	407.63
P- 88	Phosphate rock	VEM-478-47	1.0	26.3	3.2	1.22	16.42	11.2	28.3	433.93
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	547.46
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	611.41
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	649.39
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	675.07
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	747.86
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	792.96
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	815.57
P- 57	Mudstone, phosphatic; fos. col. no. 47-HW-296	RAG- 12-47	0.30	15.6	--	--	--	50.7	69.12	818.82
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 × 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	846.78
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	897.91
P- 45	Mudstone	RAH-196-47	3.0	2.4	--	--	--	84.1	87.40	906.51
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	989.20
P- 35	Mudstone; fos. col. no. 47-HW-290	RAG- 21-47	3.0	1.1	--	--	--	88.1	102.43	992.30
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	1,019.30
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	1,063.16
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,[illegible]
P- 17	Mudstone, phosphatic	VEM-494-47	1.1	8.8	--	--	--	61.9	125.00	1,[illegible]
P- 16	Mudstone	RMC-111-47	1.0	6.4	--	--	--	71.8	126.00	1,[illegible]
P- 15	Mudstone, phosphatic	RMC-110-47	1.4	12.4	--	--	--	52.8	127.40	1,[illegible]
P- 14	Mudstone, phosphatic	RMC-109-47	1.4	14.8	--	--	--	46.6	128.80	1,[illegible]
P- 13	Mudstone	RMC-108-47	0.9	3.0	--	--	--	82.9	129.70	1,[illegible]
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	1,272.42
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,[illegible]
P- 8	Phosphate rock, argillaceous	VEM-516-47	2.0	21.2	--	--	--	27.5	136.90	1,[illegible]
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	1,434.91
P- 3	Mudstone	VEM-511-47	1.8	1.4	--	--	--	75.0	144.40	1,436.33
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
C = 0.1-1 percent
D = 0.01-0.1 percent
E = 0.001-0.01 percent
F = 0.0001-0.001 percent
G = less than 0.0001 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	Tl	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	F	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	E
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'	A	F	D	D	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.

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

Lot no. 206.

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 by U. S. Bureau of Mines Laboratory, Albany, Oregon.

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- 4	Chert		12.0	--	--	--	--	--	--	12.0	--
R- 3	Chert	1020-HW	4.4	0.3	--	--	--	--	87.9	16.4	[illegible]
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	22.63	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	191.17

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	600.78
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	Phosphatic 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	22.3	--	--	--	--	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

Lot no. 1211.

P- 95	Phosphate rock, argillaceous	VEM-599-47	0.5	22.3	--	--	--	--	34.9	80.57	[illegible]
P- 94	Mudstone, phosphatic	VEM-598-47	0.8	9.6	--	--	--	--	62.1	81.37	1,078.[illegible]
P- 93	Mudstone, phosphatic	VEM-597-47	0.7	8.0	--	--	--	--	64.3	82.07	1,075.[illegible]
P- 92	Mudstone	VEM-596-47	0.6	5.8	--	--	--	--	65.8	82.67	1,079.[illegible]
P- 91	Mudstone	VEM-595-47	0.4	3.3	--	--	--	--	68.0	83.07	1,080.[illegible]
P- 90	Phosphate rock, mudstone, and phosphatic mudstone	VEM-594-47	0.9	8.3	--	--	--	--	63.7	83.97	1,088.[illegible]
P- 89	Mudstone, phosphatic	VEM-593-47	0.8	8.4	--	--	--	--	66.8	84.77	1,094.[illegible]
P- 88	Mudstone	VEM-592-47	2.8	5.1	--	--	--	--	74.6	87.57	1,109.[illegible]
P- 87	Phosphate rock, mudstone, and phosphatic mudstone	VEM-591-47	0.9	15.0	--	--	--	--	47.7	88.47	1,122.[illegible]
P- 86	Mudstone; fos. col. no. 47-HW-269	VEM-590-47	1.4	3.5	--	--	--	--	79.8	89.87	1,127.[illegible]
P- 85	Mudstone, phosphatic	VEM-589-47	1.4	9.1	--	--	--	--	61.2	91.27	1,140.[illegible]
P- 84	Mudstone and argillaceous phosphate rock	VEM-588-47	1.4	7.2	--	--	--	--	67.3	92.67	1,150.[illegible]
P- 83	Phosphate rock and phosphatic mudstone	VEM-587-47	0.6	14.6	--	--	--	--	48.4	93.27	1,159.[illegible]
P- 82	Mudstone, phosphatic	VEM-586-47	0.5	8.5	--	--	--	--	48.3	93.77	1,163.[illegible]
P- 81	Mudstone, phosphatic and mudstone; fos. col. no. 47-HW-268	VEM-585-47	2.3	7.0	--	--	--	--	66.7	96.07	1,[illegible]
P- 80	Phosphate rock, argillaceous, and phosphatic mudstone	VEM-584-47	0.8	13.6	--	--	--	--	57.[illegible]	96.87	1,190.[illegible]
P- 79	Mudstone; fos. col. no. 47-HW-267	VEM-583-47	2.7	0.9	--	--	--	--	97.5	99.57	1,[illegible]
P- 78	Mudstone and phosphate rock	VEM-582-47	0.9	13.9	--	--	--	--	56.3	100.47	1,[illegible]
P- 77	Mudstone	VEM-581-47	1.3	4.9	--	--	--	--	78.8	101.77	1,[illegible]
P- 76	Mudstone	VEM-580-47	2.1	0.7	--	--	--	--	86.9	103.87	1,[illegible]
P- 75	Mudstone	VEM-579-47	1.1	1.4	--	--	--	--	87.0	104.97	1,[illegible]
P- 74	Phosphate rock, argillaceous	VEM-578-47	0.3	23.6	--	--	--	--	31.1	105.27	1,[illegible]
P- 73	Mudstone	VEM-577-47	2.3	7.2	--	--	--	--	71.7	107.57	1,[illegible]
P- 72	Mudstone and phosphate rock	VEM-576-47	1.2	8.4	--	--	--	--	67.9	108.77	1,[illegible]
P- 71	Mudstone	VEM-575-47	1.0	1.2	--	--	--	--	87.6	109.77	1,[illegible]
P- 70	Phosphate rock	VEM-574-47	1.6	31.4	--	--	--	--	12.[illegible]	111.37	1,[illegible]
P- 69	Mudstone	VEM-573-47	1.2	5.2	--	--	--	--	76.5	112.57	1,[illegible]
P- 68	Phosphate rock, argillaceous	VEM-572-47	1.4	21.3	--	--	--	--	38.3	113.97	1,[illegible]
P- 67	Mudstone	VEM-571-47	1.0	6.5	--	--	--	--	73.9	114.97	1,[illegible]
P- 66	Phosphate rock and mudstone	VEM-570-47	1.4	7.6	--	--	--	--	65.3	116.37	1,[illegible]
P- 65	Mudstone	VEM-569-47	0.9	7.5	--	--	--	--	65.[illegible]	117.27	1,[illegible]
P- 64	Mudstone, phosphatic	VEM-568-47	0.8	9.1	--	--	--	--	61.9	118.07	1,[illegible]
P- 63	Phosphate rock, argillaceous	VEM-567-47	2.0	20.0	--	--	--	--	28.6	120.07	1,[illegible]
P- 62	Mudstone, phosphatic	VEM-566-47	1.5	9.9	--	--	--	--	55.8	121.57	1,[illegible]
P- 61	Mudstone	VEM-565-47	0.8	3.7	--	--	--	--	73.8	122.37	1,[illegible]
P- 60	Phosphate rock, argillaceous	VEM-564-47	0.9	15.1	--	--	--	--	37.8	123.27	1,[illegible]
P- 59	Mudstone, phosphatic	VEM-563-47	1.2	14.4	--	--	--	--	46.3	124.47	1,[illegible]
P- 58	Phosphate rock, argillaceous	VEM-562-47	1.1	16.8	--	--	--	--	37.9	125.57	1,[illegible]

[illegible] no. 1211.

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	1,496.56
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	1,597.85
P- 41	Mudstone, phosphatic	VEM-559-47	1.8	16.0	--	--	--	--	40.9	146.37	1,625.65
P- 40	Mudstone, phosphatic	VEM 558-47	2.2	10.2	--	--	--	--	57.4	148.57	1,648.09
P- 39	Mudstone, phosphatic	VEM-557-47	2.6	11.5	--	--	--	--	53.0	151.17	1,678.04
P- 38	Phosphate rock, argillaceous	VEM-556-47	0.9	19.7	--	--	--	--	35.8	152.07	1,695.72
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	--	--	--	--	29.2	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	1,911.30
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	1,950.77
P- 27	Mudstone, phosphatic; fos. col. no. 47-HW-260	VEM-545-47	0.9	12.6	--	--	--	--	52.2	167.07	1,962.11
P- 26	Limestone, argillaceous	VEM-544-47	1.5	1.2	--	--	--	--	26.5	168.57	1,964.53
P- 25	Mudstone, calcareous	VEM-543-47	1.0	4.6	--	--	0.39	--	44.5	169.57	1,969.13
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

Lot no. 1211.7

P- 20	Mudstone, phosphatic	VEM-538-47	1.2	14.1	6.9	2.30	1.52	6.96	49.6	175.67	2,100.2
P- 19	Mudstone	VEM-537-47	0.4	6.3	9.7	3.17	0.62	5.36	70.7	176.07	2,102.7
P- 18	Phosphate rock, argillaceous; fos. col. no. 47-HW-247	VEM-536-47	1.8	27.1	--	--	--	6.48	21.7	177.87	2,191.3
P- 17	Phosphate rock	VEM-535-47	1.7	28.6	2.5	1.02	--	6.12	18.8	179.57	2,200.1
P- 16	Phosphate rock	VEM-534-47	1.9	29.1	2.9	1.07	--	6.54	19.2	181.47	2,255.4
P- 15	Mudstone, phosphatic	VEM-533-47	0.5	12.8	8.0	2.40	--	6.64	54.0	181.97	2,261.3
P- 14	Phosphate rock, argillaceous	VEM-532-47	0.7	26.9	4.1	1.25	--	5.70	22.2	182.67	2,280.7
P- 13	Mudstone, phosphatic	VEM-531-47	0.5	15.9	6.9	2.31	1.59	7.44	43.9	183.17	2,288.6
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	2,347.4
P- 11	Phosphate rock, argillaceous	VEM-529-47	0.8	21.4	5.9	2.46	--	5.34	33.9	186.37	2,364.5
P- 10	Phosphate rock	VEM-528-47	1.6	33.2	1.0	0.54	2.84	6.02	6.4	187.97	2,417.6
P- 9	Phosphate rock	VEM-527-47	1.2	32.7	1.4	0.66	--	5.98	6.0	189.17	2,436.2
P- 8	Phosphate rock	VEM-526-47	1.3	33.7	1.2	0.56	--	5.64	4.4	190.47	2,500.1
P- 7	Phosphate rock	VEM-525-47	1.5	33.4	0.53	0.44	--	7.08	4.9	191.97	2,550.1
P- 6	Phosphate rock	VEM-524-47	0.7	32.3	1.7	0.82	--	5.86	8.4	192.67	2,575.4
P- 5	Phosphate rock, argillaceous	VEM-523-47	1.0	25.4	4.3	1.27	--	6.46	22.9	193.67	2,598.3
P- 4	Mudstone	VEM-522-47	1.0	3.9	9.7	4.18	--	7.00	69.7	194.67	2,602.2
P- 3	Mudstone	VEM-521-47	2.5	1.2	10.	3.61	--	5.32	78.7	197.17	2,605.9
P- 2	Phosphate rock	VEM-520-47	0.6	33.7	1.4	0.66	3.33	4.06	7.2	197.77	2,625.9
P- 1	Phosphate rock and mudstone	VEM-519-47	0.6	26.2	5.1	2.32	--	5.02	19.0	198.37	2,641.9
					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 by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness × 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	0.8	--	--	--	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	196.90

P-168	Phosphate rock, argillaceous	RAW- 15-47	0.9	20.2	5.0	1.65	5.80	36.6	24.50	214.60
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	265.43
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	338.80
P-161	Phosphate rock, argillaceous	VEM-300-47	0.3	20.9	6.6	1.85	7.60	32.3	29.90	345.19
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	380.35
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	468.99
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	592.16
P-148	Mudstone, phosphatic	RAG-126-47	1.05	15.5	--	--	--	39.2	41.87	608.40
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	749.07
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	--	--	--	83.1	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	827.73
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	873.86
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	--	--	--	90.6	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	1,135.94
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	1,196.03
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	1,298.36
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	1,475.76
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	1,956.69
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	2,139.36
P- 14	Phosphate rock	RAG- 83-47	1.2	32.1	2.8	0.91	6.50	9.4	175.84	2,172.50
P- 13	Phosphate rock and phosphatic mudstone	RAG- 82-47	0.9	31.6	1.8	0.91	6.56	9.9	176.74	2,200.62
P- 12	Phosphate rock	RAG- 81-47	0.97	31.7	1.9	0.89	6.28	9.1	177.71	2,232.38
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	2,374.16
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	0.42
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 28° 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 by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)						Cumulative thickness (feet)	Thickness × percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	F	Loss on ignition	Acid insoluble		
Dinwoody formation—lot no. 1207											
Td- 1	Limestone, argillaceous, fos. col. no. 47-HW-187	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	12.5
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	27.77
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	76.7	40.21
R- 17	Limestone, cherty	RAH-265-47	6.0	0.5	--	--	--	--	47.4	84.7	43.41
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	54.70
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	59.46
R- 7	Chert and limestone	RAH-275-47	5.0	0.3	--	--	--	--	53.7	130.2	60.79
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	23.25
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	63.47
P-154	Mudstone	FCA-201-47	1.0	0.7	--	--	--	--	72.0	16.3	64.47
P-153	Mudstone	FCA-188-47	0.4	5.7	--	--	--	--	62.5	16.7	66.69
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 (feet) 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	[illegible]
P-150	Mudstone, calcareous	FCA-199-47	0.65	3.4	--	--	--	--	64.2	19.35	[illegible]
P-149	Phosphate rock	FCA-198-47	0.8	31.3	0.49	0.43	3.30	9.42	3.7	20.15	[illegible]
P-148	Phosphate rock	FCA-197-47	0.75	33.1	0.8	0.34	3.54	6.48	5.7	20.90	[illegible]
P-147	Phosphate rock	FCA-196-47	0.5	30.9	1.1	04.3	3.26	7.82	7.9	21.40	[illegible]
P-146	Limestone, phosphatic	FCA-195-47	0.5	12.1	0.3	0.08	--	29.16	3.8	21.90	[illegible]
P-145	Phosphate rock	FCA-194-47	1.2	33.3	0.3	0.25	--	6.38	4.8	23.10	[illegible]
P-144	Phosphate rock, argillaceous	FCA-193-47	0.18	22.9	--	--	--	--	29.3	23.28	[illegible]
P-143	Mudstone, calcareous	FCA-192-47	0.55	2.4	--	--	--	--	47.1	23.83	[illegible]
P-142	Phosphate rock, argillaceous	FCA-191-47	0.35	18.9	--	--	--	--	30.9	24.18	[illegible]
P-141	Limestone, argillaceous; fos. col. no. 47-HW-181	FCA-190-47	0.8	2.6	--	--	--	--	35.8	24.98	[illegible]
P-140	Mudstone, phosphatic	FCA-189-47	0.4	8.7	--	--	--	--	55.9	25.38	[illegible]
P-139	Limestone, argillaceous; fos. col. no. 47-HW-180	FCA-165-47	1.1	1.1	--	--	--	--	35.2	26.48	[illegible]
P-138	Phosphate rock	FCA-164-47	0.8	29.2	2.3	1.18	--	6.54	16.3	27.28	[illegible]
P-137	Mudstone, calcareous	FCA-163-47	0.65	5.7	6.1	2.28	--	17.82	42.8	27.93	[illegible]
P-136	Phosphate rock	FCA-162-47	0.55	34.2	0.57	0.39	--	5.60	4.7	28.48	[illegible]
P-135	Limestone	FCA-161-47	0.65	4.9	1.4	0.43	--	32.96	12.0	29.13	[illegible]
P-134	Phosphate rock	FCA-160-47	0.4	35.7	0.7	0.41	--	4.10	3.9	29.53	[illegible]
P-133	Phosphate rock, argillaceous	FCA-159-47	0.3	26.8	3.7	1.50	--	4.34	21.9	29.83	[illegible]
P-132	Phosphate rock	FCA-113-47	0.55	33.8	1.1	0.86	--	4.54	6.7	30.38	[illegible]
P-131	Phosphate rock	FCA-112-47	1.0	36.4	0.4	0.30	--	3.38	3.3	31.38	[illegible]
P-130	Phosphate rock	FCA-147-47	1.0	33.8	0.8	0.58	--	4.84	5.8	32.38	[illegible]
P-129	Phosphate rock, argillaceous	FCA-146-47	0.95	17.4	7.0	2.3	--	6.44	40.3	33.33	[illegible]
P-128	Phosphate rock	FCA-145-47	0.28	27.8	2.4	1.12	--	9.44	13.2	33.61	[illegible]
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	[illegible]
P-126	Phosphate rock	FCA- 50-47	0.4	33.0	1.8	1.1	--	5.40	8.3	34.61	[illegible]
P-125	Phosphate rock	FCA- 51-47	0.75	28.0	1.0	0.55	--	6.32	8.6	35.36	[illegible]
P-124	Phosphate rock	FCA- 52-47	0.5	36.2	0.9	0.56	--	4.96	1.8	35.86	[illegible]
P-123	Phosphate rock	FCA-553-47	0.5	36.2	0.8	0.48	--	4.72	1.9	36.36	[illegible]
P-122	Phosphate rock	FCA- 54-47	0.4	34.4	1.4	0.66	--	5.92	4.6	36.76	[illegible]
P-121	Phosphate rock	FCA- 64-47	0.67	35.2	0.8	0.34	--	6.06	3.4	37.43	[illegible]
P-120	Phosphate rock	FCA- 64-47	0.35	32.1	1.8	0.65	--	7.44	7.9	37.78	[illegible]
P-119	Phosphate rock	FCA- 66-47	0.4	25.9	3.3	1.2	2.67	15.64	14.9	38.18	[illegible]
P-118	Phosphate rock	FCA- 67-47	0.6	26.0	2.2	0.86	--	11.04	14.2	38.78	[illegible]
P-117	Phosphate rock	FCA- 68-47	0.4	28.6	2.1	0.84	--	12.48	10.2	39.18	[illegible]
P-116	Phosphate rock	FCA- 69-47	0.4	32.8	1.0	0.35	--	9.72	4.9	39.58	[illegible]
P-115	Phosphate rock	FCA-148-47	0.8	28.0	2.3	1.2	--	12.34	13.7	40.38	[illegible]
P-114	Phosphate rock, argillaceous	FCA-149-47	0.4	24.1	3.9	1.3	--	11.60	22.3	40.78	[illegible]

Lot nos. 1207 and 1236.

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	612.32
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	666.64
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	751.62
P-100	Phosphate rock, argillaceous	RAG- 36-47	0.42	18.5	--	--	--	--	35.3	54.15	759.42
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- 63-47	2.53	24.9	--	--	--	--	18.7	70.34	1,034.24
--	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	1,064.62
P- 82	Phosphate rock, argillaceous	RAG- 56-47	1.0	23.4	--	--	--	--	23.1	71.85	1,087.86
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	1,150.85

Lot nos. 1207 and 1236.

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	1,197.69
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	1,319.37
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-52	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

Lot nos. 1207 and 1236.

--	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	1,690.99
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	1,707.83
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	1,752.80
P- 32	Limestone, phosphatic, argillaceous	FCA-186-47	0.35	12.9	--	--	--	--	30.3	127.26	1,756.81
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

Lots 1207 and 1236.

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	2,274.37
P- 8	Phosphate rock, calcareous, argillaceous	2851-RPS	0.7	17.3	--	--	--	--	28.1	161.36	2,286.60
--	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	2,295.06
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	--	--

Lot nos. 1207 and 1236.

	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	8.08	
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

290
100
no. 3

UNITED STATES
DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

[Reports - Open file series]

STRATIGRAPHIC SECTIONS OF THE PHOSPHORIA FORMATION IN MONTANA

by

R. W. Swanson, M. R. Klepper, W. R. Lowell, F. S. Honkala,
E. R. Cressman, D. A. Bostwick, O. A. Payne, and E. T. Ruppel

MINERAL DEPOSITS BRANCH

Spokane, Washington July 1951
or Aug 15 51

U.S. GEOLOGICAL SURVEY
WASHINGTON
AUG 16 1951
LIBRARY

OPEN FILE

This ~~map~~ report is preliminary and has not been edited or reviewed for conformity with U. S. Geological Survey standards and nomenclature.

(200)
R290
no 100-B

TABLE OF CONTENTS

	Page
Introduction	I
Abstract of sections	
Anderson Mine. Lot no. 1287.	1m
Graveley Mine. Lot no. 1286.	2m
Luke Mine. Lot no. 1285.	3m
Canyon Creek no. 1. Lot no. 1237.	4m
Canyon Creek no. 2. Lot no. 1238.	5m
Melrose Adit no. 2. Lot no. 1239.	6m
Spectrographic analyses	7m
Melrose Adit no. 1. Lot no. 1240.	8m
South Greenstone Gulch. Lot no. 1250.	9m
Upper French Creek. Lot no. 1248.	11m
Kelley Gulch. Lot no. 1249.	12m
Cave Creek. Lot no. 1257.	15m
Jack Canyon. Lot no. 1218.	17m
Spectrographic analyses	19m
Aspen Valley. Lot no. 1215.	20m
Shell Canyon. Lot no. 1214.	21m
West Fork of Gallatin River. Lot no. 1216.	23m
Porcupine Creek. Lot no. 1217.	24m
Daly's Spur. Lot nos. 122 and 1223.	25m
Sheep Creek. Lot no. 1234.	28m
Spectrographic analyses	32m
Oil shale analyses	35m
Cedar Creek. Lot no. 1256.	37m
Sawtooth Peak. Lot no. 1241.	39m

TABLE OF CONTENTS (CONT' D.)

	Page
Abstract of sections (cont' d.)	
Hidden Pasture Creek, Muddy Creek, and Big Sheep Canyon. Lot nos. 1224, 1225, 1226, and 1227.	43m
Additional analyses of sample OAP-150-47	49m
Wadham Springs. Lot nos. 1246 and 1247.	50m
Centennial Range Trench no. 4. Lot no. 1251.	53m
Odell Creek. Lot no. 1252.	54m
Centennial Range Trench no. 1. Lot no. 1253.	56m
Centennial Range Trenches nos. 2 and 3, (Montana-Idaho). Lot nos. 1254 and 1255.	58m
Additional analyses of sample OAP-505-47.	60m

ANDERSON MINE, MONTANA. LOT NO. 1287.

D member of Phosphoria formation sampled at 4,800 level of Anderson mine of Montana Phosphate Products Company, secs. 2 and 3, T. 10 N., R. 10 W., Powell County, Montana, on southwest flank of Garrison anticline, samples 308-313, locality A, from 100 feet south of north heading and sample 314, locality B, from 150 feet south of crosscut. Beds strike about N. 30° W., and dip 30° SW. Section measured and sampled by M. R. Klepper in October 1948. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
	Locality A, 4,800 level, 100 feet south of north heading						
	E member of Phosphoria formation—basal beds only						
E-2	Quartzite	--	1.0	--	--	1.0	--
E-1	Conglomerate	--	0.5	--	--	1.5	--
	D member of Phosphoria formation						
D-8	Clay	--	0.02	--	--	0.02	--
D-7	Phosphate rock, argillaceous	MRK-313	0.75	27.8	25.6	0.77	20.85*
D-6	Phosphate rock	MRK-312	0.7	37.5	4.5	1.47	40.31
D-5	Phosphate rock	MRK-311	0.5	36.4	7.3	1.97	58.51
D-4	Phosphate rock	MRK-310	0.9	32.5	15.1	2.87	87.76
D-3	Phosphate rock	MRK-309	1.0	36.6	5.9	3.87	124.96
D-2	Phosphate rock	MRK-308	0.9	51.1	14.7	4.77	152.35**
D-1	Clay	--	0.15	--	--	4.92	--
	C member of Phosphoria formation—top beds only						
C-2	Conglomerate	--	1.0	--	--	1.0	--
C-1	Sandstone	--	2.0	--	--	3.0	--
	Locality B, 4,800 level, 150 feet south of crosscut						
	E member of Phosphoria formation—not measured						
E-1	Chert	--	--	--	--	--	--

* Cumulative data incomplete due to missing information.
** Note incompleteness of cumulative data.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness × percent K_2O (cumulative)
				P_2O_5	Acid insoluble		
	D member of Phosphoria formation						
D-1	Phosphate rock Composite sample representing beds D-2 to D-7 of locality A.	MRK-314	4.9	32.8	12.8	—	—
	C member of Phosphoria formation—top beds only						
C-4	Quartzite	--	0.3	--	--	0.3	
C-3	Conglomerate	--	0.9	--	--	1.2	
C-2	Clay	--	0.2	--	--	1.4	
C-1	Sandstone and chert	--	2.0	--	--	3.4	

GRAVELEY MINE, MONTANA. LOT NO. 1286.

D member of Phosphoria formation sampled in Graveley Mine of Montana Phosphate Products Company, sec. 2, T. 10 N., R. 9 W., Powell County, Montana, on northeast side of Luke-Graveley syncline; samples 297-299, locality A, from 4,906 stope and samples 300-303, locality B, from 5,101 west heading. Beds strike about N. 70° W. and dip 50° S. Section measured and sampled by M. R. Klepper in September 1948. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
	Locality A, 4,906 stope						
	E member of Phosphoria formation—not measured						
E-1	Chert	--	--	--	--	--	--
	D member of Phosphoria formation						
D-5	Clay	--	0.05	--	--	0.05	--
D-4	Phosphate rock	MRK-299	1.3	35.0	10.2	1.35	45.50*
D-3	Phosphate rock	MRK-298	1.0	37.5	8.4	2.35	83.00
D-2	Phosphate rock	MRK-297	1.25	37.4	4.6	3.60	129.75**
D-1	Clay	--	0.1	--	--	3.70	--
	C member of Phosphoria formation—not measured						
C-1	Quartzite	--	--	--	--	--	--
	Locality B, 5,101 west heading						
	E member of Phosphoria formation—not measured						
E-1	Chert	--	--	--	--	--	--
	D member of Phosphoria formation						
D-5	Clay	--	0.05	--	--	0.05	--
D-4	Phosphate rock	MRK-303	1.2	36.8	6.2	1.25	46.00*
D-3	Phosphate rock	MRK 302	1.0	37.5	3.9	2.25	81.66
D-2	Phosphate rock	MRK-301	0.8	34.4	4.1	3.05	109.18**
D-1	Clay	--	0.05	--	--	3.10	--

* Cumulative data incomplete due to missing information.
** Note incompleteness of cumulative data.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
C member of Phosphoria formation—top beds only							
C-3	Conglomerate	MRK-300	1.0	5.4	81.2	1.0	--
C-2	Sandstone	--	1.5	--	--	2.5	--
C-1	Quartzite	--	--	--	--	--	--

LUKE MINE, MONTANA. LOT NO. 1285.

D member of Phosphoria formation sampled in Luke Mine of Montana Phosphate Products Company, sec. 15, T. 10 N., R. 9 W., Powell County, Montana, on southwest side of Luke-Graveley syncline; samples 304-305, locality A, from southeast heading, 5,300 level, samples 306-307, locality B, from northwest heading, 5,300 level. Beds strike about N. 40° W. and dip 45° NE. Section measured and sampled by M. R. Klepper in September 1948. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness × percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
	Locality A, 5,300 level, southeast heading						
	E member of Phosphoria formation—basal bed only						
E-1	Quartzite, cherty	--	4.0	--	--	--	--
	D member of Phosphoria formation						
D-4	Clay	--	0.02	--	--	0.02	--
D-3	Phosphate rock	MRK-305	1.6	34.0	9.3	1.62	54.4
D-2	Phosphate rock	MRK-304	1.6	35.5	5.8	3.22	111.2**
D-1	Clay	--	0.1	--	--	3.32	--
	C member of Phosphoria formation—top beds only						
C-2	Quartzite	--	2.0	--	--	--	--
C-1	Quartzite	--	4.0	--	--	--	--
	Locality B, 5,300 level, northwest heading						
	E member of Phosphoria formation—basal bed only						
E-1	Quartzite	--	1.5	--	--	--	--
	D member of Phosphoria formation						
D-2	Phosphate rock	MRK-307	1.6	33.1	9.8	1.6	52.96
D-1	Phosphate rock	MRK-306	1.6	36.7	4.1	3.2	111.68
	C member of Phosphoria formation—top beds only						
C-3	Quartzite	--	0.3	--	--	0.3	--
C-2	Conglomerate	--	0.5	--	--	0.8	--
C-1	Chert	--	2.0	--	--	2.8	--

** Note incompleteness of cumulative data.

CANYON CREEK NO. 1, MONTANA. LOT NO. 1237.

D member of Phosphoria formation sampled in hand trench near Canyon Creek, SE¼ sec. 12, T. 2 S., R. 10 W., Beaverhead County, Montana, on west limb of an overturned anticline. Beds strike N. 60° W. and dip 50° SW. Section measured by M. R. Klepper and sampled by E. T. Ruppel in September 1948. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

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		
E member of Phosphoria formation—basal bed only										
E-1	Chert	MRK-270	1.0	7.2	--	--	--	77.0	1.0	7.2
D member of Phosphoria formation—base not exposed										
D-5	Phosphate rock	MRK-269	1.0	34.7	1.3	2.57	1.64	7.2	1.0	34.70
D-4	Mudstone, calcareous and phosphate rock	MRK-268	1.4	10.1	9.7	8.74	6.72	47.8	2.4	48.84
D-3	Phosphate rock	MRK-267	1.8	34.6	2.6	2.40	3.60	6.1	4.2	111.12
D-2	Mudstone and phosphate rock	MRK-266	1.0	16.3	8.5	5.38	7.74	39.3	5.2	127.42
D-1	Mudstone, phosphatic	MRK-265	6.0	19.6	7.9	2.34	7.06	38.7	11.2	245.02

CANYON CREEK NO. 2, MONTANA. LOT NO. 1238.

D member of Phosphoria formation sampled in hand trench near Canyon Creek, E½SE¼ sec. 6, T. 2 S., R. 9 W., Beaverhead County, Montana, on overturned east limb of an anticline. Beds strike N. 5-10° W. and dip 70° W. Section measured by M. R. Klepper and sampled by E. T. Ruppel in September 1948. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

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		
	E member of Phosphoria formation—basal bed only									
E-1	Quartzite and conglomerate	--	--	--	--	--	--	--	--	
	D member of Phosphoria formation—base not exposed									
D-4	Mudstone	--	0.2	--	--	--	--	--	0.2	
D-3	Phosphate rock and mudstone	MRK-273	3.0	19.1	--	--	--	43.2	3.2	57.30
D-2	Phosphate rock and mudstone	MRK-272	3.8	19.1	--	--	--	35.0	7.0	129.88
D-1	Phosphate rock	MRK-271	3.0	30.8	1.1	0.90	7.06	7.1	10.0	222.28**

* Cumulative data incomplete due to missing information.
** Note incompleteness of cumulative data.

MELROSE ADIT NO. 2, MONTANA. LOT NO. 1239.

D member of Phosphoria formation sampled in an adit of the Anderson Phosphate Mines, Incorporated, of Butte, Montana, known as the Melrose Property, in NW¼ sec. 5, T. 2 S., R. 9 W., Silverbow County, Montana, on the normal limb of a northwest-trending overturned syncline. Beds D-6 through D-11 sampled at heading of a south-southeast drift approximately 1,400 feet from portal; beds D-1 through D-5 sampled 36 feet from heading. Beds strike northwest and dip 45° SW. Section measured by M. R. Klepper and O. A. Payne and sampled by Payne in September 1948. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

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		
E member of Phosphoria formation—basal bed only											
E-1	Chert and conglomerate	--	--	--	--	--	--	--	--	--	--
D member of Phosphoria formation											
D-11	Mudstone		0.2	--	--	--	--	--	--	0.2	--
D-10	Phosphate rock, argillaceous	MRK-293	1.25	23.9	2.2	2.6	2.14	1.5	32.6	1.45	29.90*
D-9	Phosphate rock and calcareous mudstone	MRK-292	0.6	27.5	6.3	2.5	2.75	2.8	16.0	2.05	46.40
D-8	Phosphate rock	MRK-291	0.85	33.3	1.9	1.4	3.05	1.8	10.1	2.90	74.40
D-7	Mudstone	MRK-290	1.4	3.8	13.0	5.6	0.71	4.3	61.7	4.30	79.72
D-6	Phosphate rock	MRK-289	1.9	36.4	1.1	1.1	3.28	1.6	4.8	6.20	148.88
D-5	Mudstone, calcareous	MRK-288	0.4	4.4	10.4	10.0	2.40	6.2	39.9	6.60	150.64
D-4	Phosphate rock	MRK-287	0.6	31.2	3.2	2.0	2.78	2.2	15.3	7.20	169.36
D-3	Mudstone and phosphate rock	MRK-286	1.2	26.2	4.9	2.1	2.3	2.7	24.5	8.40	200.80
D-2	Phosphate rock	MRK-285	0.9	35.2	1.8	1.3	3.16	2.2	7.5	9.30	232.48
D-1	Phosphate rock, argillaceous	MRK-284	3.0	23.8	5.9	2.5	2.1	4.6	28.8	12.30	303.88**

* Cumulative data incomplete due to missing information.
** Note incompleteness of cumulative data.

SPECTROGRAPHIC ANALYSES – MELROSE ADIT NO. 2, MONTANA. LOT NO. 1239.

Semi-quantitative analyses of samples of the D member of Phosphoria formation, Melrose adit no. 2, Montana (see immediately preceding page 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, Ba, Be, Bi, Cd, Co, Cb, Ga, Ge, Au, In, Pb, Li, Hg, Pt, Ta, Sn, and W were looked for in all samples 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

Bed no.	Sample no.	Al	B	Ca	Cr	Cu	Fe	Mg	Mn	Mo	Ni	Si	Ag	Na	Sr	Ti	V	Zn	Zr
D-11	MRK-294	B	E	C	D	F	A	C	E	F	E	A	G	E	F	C	D	E	[illegible]
D-10	MRK-293	C	F	A	E	G	C	C	E	F	E	B	G	E	E	E	E	E	[illegible]
D- 9	MRK-292	B	F	A	E	G	C	C	E	F	E	B	G	E	E	E	E	E	[illegible]
D- 8	MRK-291	C	F	A	E	G	C	C	E	F	E	A	G	E	E	D	E	E	[illegible]
D- 7	MRK-290	B	E	B	E	G	A	C	E	F	E	A	G	E	F	D	E	E	[illegible]
D- 6	MRK-289	C	F	A	E	G	C	D	E	F	E	C	G	E	E	E	D	[illegible]	[illegible]
D- 5	MRK-288	B	F	A	D	G	C	D	E	F	E	C	G	E	E	D	D	[illegible]	[illegible]
D- 4	MRK-287	B	F	A	E	G	C	C	E	F	E	A	G	E	E	D	D	[illegible]	[illegible]
D- 3	MRK-286	B	F	A	E	G	C	C	E	F	E	A	G	E	E	D	D	[illegible]	[illegible]
D- 2	MRK-285	C	F	A	E	G	C	D	E	F	E	C	G	E	E	D	D	[illegible]	[illegible]
D- 1	MRK-284	B	F	A	D	G	C	C	F	F	E	A	G	E	E	D	D	E	E

MELROSE ADIT NO. 1, MONTANA. LOT NO. 1240.

D member of Phosphoria formation sampled in southwest crosscut 269 feet from portal of the Anderson Phosphate Mines, Incorporated, of Butte, Montana; known as the Melrose Property, NW¼ sec. 5, T. 2 S., R. 9 W., Silver Bow County, Montana, on normal limb of overturned syncline. Beds strike northwest and dip 45° SW. Section measured by M. R. Klepper and O. A. Payne and sampled by Payne in September 1948. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

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		
	E member of Phosphoria formation—basal bed only									
E- 1	Chert	--	--	--	--	--	--	--	--	--
	D member of Phosphoria formation									
D-10	Conglomerate and phosphate rock	MRK-283	0.5	27.4	1.6	2.09	2.04	25.0	0.5	13.70
D- 9	Mudstone	MRK-282	0.2	5.4	9.5	7.05	4.26	66.6	0.7	14.78
D- 8	Phosphate rock	MRK-281	1.6	29.1	2.7	2.37	2.16	18.6	2.3	61.34
D- 7	Mudstone	--	0.15	--	--	--	--	--	2.45	--
D- 6	Phosphate rock, argillaceous	MRK-280	0.8	24.1	5.4	2.96	2.56	29.4	3.25	19.28*
D- 5	Mudstone	MRK-279	1.2	1.1	13.00	6.29	4.68	76.6	4.45	20.60
D- 4	Phosphate rock	MRK-278	2.1	28.4	1.5	1.55	1.68	6.4	6.55	80.24
D- 3	Phosphate rock	MRK-277	1.0	27.6	4.9	2.51	3.50	19.5	7.55	107.84
D- 2	Phosphate rock	MRK-276	3.9	32.0	1.4	1.39	2.70	14.3	11.45	232.64**
	Base of D-2 is a gougy fault zone of several strands cutting dark mudstone and phosphate rock.									
D- 1	Phosphate rock, argillaceous	MRK-275	9.0	15.8	--	--	--	33.7	--	--
	C member of Phosphoria formation—top bed only									
C- 1	Dolomite and chert	--	--	--	--	--	--	--	--	--

* Cumulative data incomplete due to missing information. Computations start from zero after interruption.
** Note incompleteness of cumulative data.

SOUTH GREENSTONE GULCH, MONTANA. LOT NO. 1250.

D member of Phosphoria formation sampled in south bulldozer trench at Greenstone Gulch, SE¼ sec. 11, T. 5 S., R. 9 W., Beaverhead County, Montana. Beds strike N. 10° W. and dip 50° NE. The stratigraphic sequence of the units is questionable for, because of a large number of faults, some of the beds may be omitted or repeated. Section measured and sampled by R. L. Parker and E. R. Cressman in August 1948. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness × percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
	E member of Phosphoria formation—basal bed only						
E- 1	Quartzite	ERC-446	2.2?	0.4	92.2	2.2	0.88
	D member of Phosphoria formation						
D-37	Mudstone	ERC-445	3.6	3.7	51.9	3.6	13.32
D-36	Mudstone	RLP-444	3.2	1.1	72.9	6.8	16.84
D-35	Mudstone	RLP-443	2.5	0.9	76.4	9.3	19.09
D-34	Mudstone	RLP-442	5.0	1.1	77.5	14.3	24.59
D-33	Mudstone, calcareous	RLP-441	1.4	6.2	58.6	15.7	33.27
D-32	Mudstone, calcareous, phosphatic	RLP-440	2.0	9.2	50.5	17.7	51.67
D-31	Mudstone, phosphatic	ERC-439	1.4	9.8	53.4	19.1	65.39
D-30	Phosphate rock	ERC-260	0.9	24.4	17.8	20.0	87.35
D-29	Mudstone, phosphatic	ERC-259	0.9	15.4	46.0	20.9	101.21
D-28	Mudstone	ERC-258	1.3	3.6	72.2	22.2	105.89
D-27	Mudstone, phosphatic	ERC-257	2.2	9.8	54.7	24.4	127.45
D-26	Mudstone, calcareous	ERC-256	4.1	3.3	59.8	28.5	140.98
D-25	Mudstone, calcareous	ERC-255	2.1	1.9	45.1	30.6	144.97
D-24	Limestone, argillaceous	ERC-254	1.1	6.5	38.4	31.7	152.12
D-23	Mudstone, calcareous, and phosphatic mudstone	ERC-253	1.6	5.3	53.2	33.3	160.60
D-22	Mudstone and phosphate rock	RLP-252	1.0	17.2	35.8	34.3	177.80
D-21	Mudstone and phosphate rock	RLP-251	0.8?	10.2	57.8	35.1	185.96
D-20	Mudstone	RLP-250	1.4	5.9	69.0	36.5	194.22
D-19	Phosphate rock	RLP-249	0.7	29.4	14.3	37.2	214.80
D-18	Phosphate rock and mudstone	RLP-248	1.05	21.4	32.0	38.25	237.05
D-17	Phosphate rock, argillaceous	RLP-247	1.1	21.6	30.2	39.35	260.81
D-16	Phosphate rock and mudstone, cherty	RLP-246	1.6	12.3	52.7	40.95	280.47
D-15	Mudstone, calcareous and, and calcareous phosphate rock	RLP-245	0.7	15.2	25.8	41.65	291.13
D-14	Limestone	RLP-244	1.3	2.5	9.5	42.95	294.38
D-13	Phosphate rock and mudstone	RLP-243	2.0	24.6	26.2	44.95	343.58
D-12	Mudstone, phosphatic	RLP-242	1.0	14.9	44.8	45.95	358.48

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
D-11	Limestone	RLP-241	1.0	1.2	17.5	46.95	359.68
D-10	Phosphate rock and mudstone, cherty	RLP-240	0.8	18.5	39.1	47.75	374.48
D- 9	Mudstone, phosphatic, calcareous	RLP-239	1.3	11.7	46.3	49.05	389.69
D- 8	Limestone, argillaceous, phosphatic	ERC-238	0.95	11.7	31.0	50.00	400.81
D- 7	Mudstone, phosphatic	ERC-237	2.8	15.7	41.7	52.80	444.77
D- 6	Mudstone, calcareous	ERC-236	2.6	5.5	58.6	55.40	459.07
D- 5	Mudstone, phosphatic	ERC-235	3.1	11.3	52.0	58.50	494.10
D- 4	Limestone, argillaceous, phosphatic	ERC-234	1.3	9.5	36.1	59.80	506.45
D- 3	Phosphate rock, argillaceous	RLP-233	1.4	20.1	25.5	61.20	534.59
D- 2	Phosphate rock and mudstone, cherty	RLP-232	0.9	13.7	58.9	62.10	546.92
D- 1	Chert, phosphatic	RLP-231	2.0	13.4	60.3	64.10	573.72
	C member of Phosphoria formation—top bed only						
C- 1	Mudstone, calcareous	RLP-230	1.0	1.5	67.9	1.0	1.50

UPPER FRENCH CREEK, MONTANA. LOT NO. 1248.

D member of Phosphoria formation sampled in bulldozer trench near Upper French Creek, SW¼ sec. 19, T. 5 S., R. 10 W., Beaverhead County, Montana. Beds strike N. 15° E. and dip 55° W. The stratigraphic sequence and thicknesses of the units are questionable due to thrust faulting exposed in the trench and to the fragmented and weathered condition of the strata. Section measured by D. A. Bostwick and R. L. Parker and sampled by R. L. Konizeski and J. E. Joyce in August 1948. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness × percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
	D member of Phosphoria formation—top not exposed						
D-10	Phosphate rock, argillaceous	RLP-172	1.0	20.4	35.7	1.0	20.40
D- 9	Mudstone, phosphatic	RLP-171	1.3	11.3	51.0	2.3	35.09
D- 8	Phosphate rock and mudstone	RLP-170	1.0	19.1	37.2	3.3	54.19
D- 7	Phosphate rock and mudstone, cherty	RLP-169	1.7	16.0	43.1	5.0	81.39
D- 6	Mudstone	RLP-168	0.7	0.9	66.6	5.7	82.02
D- 5	Mudstone	RLP-167	1.6	2.0	79.6	7.3	85.22
D- 4	Mudstone	DAB-166	0.9	2.8	66.6	8.2	87.74
D- 3	Mudstone	DAB-165	2.9	2.7	72.5	11.1	95.57
D- 2	Mudstone, calcareous	DAB-164	1.8	3.6	71.0	12.9	102.05
D- 1	Mudstone, calcareous	DAB-163	1.6	4.3	72.6	14.5	108.93
	Probable fault; units below may be part of a fault zone.						
	C member ? of Phosphoria formation—top and base not exposed						
C- 5	Quartzite and chert	DAB-162	?	1.6	85.8	--	--
C- 4	Quartzite and chert	DAB-161	?	1.5	85.3	--	--
C- 3	Quartzite and chert	DAB-160	1.3?	2.3	84.2	--	--
C- 2	Chert	DAB-159	2.2	0.5	93.1	--	--
C- 1	Sandstone and chert	DAB-158	2.0	0.3	94.9	--	--
	Thrust fault						
	Quadrant formation—not measured						
Cq-1	Quartzite	--	--	--	--	--	--

KELLEY GULCH, MONTANA. LOT NO. 1249.

A, B, D, and part of E members of Phosphoria formation sampled in bulldozer trenches and C member measured in outcrops near Kelley Gulch, sec. 2, T. 6 S., R. 11 W., Beaverhead County, Montana. A dacitic? sill 2.7 feet thick occurs 2.1 feet above base of E member. Beds strike N. 25° E. and dip 45° NW. Section measured by R. L. Parker and D. A. Bostwick and sampled by R. L. Konizewski, J. E. Joyce, Bostwick, J. A. Kelleher, and E. T. Ruppel in August 1948. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness × percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
	Dinwoody formation—not exposed						
	E member of Phosphoria formation—top contact approximately located						
E- 9	Chert	--	23.0	--	--	23.0	--
E- 8	Chert	--	25.0	--	--	48.0	--
E- 7	Chert	--	25.0	--	--	73.0	--
E- 6	Chert	--	25.0	--	--	98.0	--
E- 5	Chert, sandy?	--	29.0	--	--	127.0	--
E- 4	Mudstone	DAB-229	4.5	0.3	85.7	131.5	1.35
E- 3	Chert	DAB-228	2.6	1.2	91.4	134.1	4.47
E- 2	Chert	DAB-227	7.4	1.4	90.7	141.5	14.83
--	Dacitic? dike	DAB-226	(2.7)	0.8	85.9	--	--
E- 1	Chert	DAB-225	2.1	1.8	89.9	143.6	18.61
	D member of Phosphoria formation						
D-38	Chert; fos. col. no. 48-KPM-51	DAB-224	3.4	5.6	69.3	3.4	19.04
D-37	Phosphate rock, cherty and mudstone	RLP-223	0.9	21.9	36.4	4.3	38.75
	Fault zone; includes gouge streaks and crushed phosphate.						
D-36	Fault gouge and breccia	RLP-222	3.0	2.1	74.2	7.3	45.05
D-35	Mudstone	RLP-221	1.3	4.4	76.5	8.6	50.77
D-34	Phosphate rock, cherty	RLP-220	1.1	22.9	34.6	9.7	75.96
D-33	Mudstone and phosphate rock	RLP-219	0.8	6.3	62.5	10.5	81.00
D-32	Mudstone	RLP-218	1.3	2.3	72.7	11.8	83.90
D-31	Mudstone	DAB-217	7.0	1.8	82.9	18.8	96.59
D-30	Mudstone	DAB-216	5.0	0.7	86.2	23.8	100.09
D-29	Mudstone	DAB-215	5.0	0.7	89.3	28.8	103.59
D-28	Mudstone	DAB-214	5.0	0.7	90.0	33.8	107.09
D-27	Mudstone	DAB-213	5.0	0.6	89.3	38.8	110.09
D-26	Mudstone	DAB-212	5.0	1.3	88.5	43.8	116.59

D-25	Mudstone	DAB-211	5.0	0.9	87.5	48.8	121.09
D-24	Mudstone	DAB-210	5.0	2.3	83.1	53.8	132.59
D-23	Mudstone and phosphate rock	DAB-209	2.2	9.8	58.0	56.0	154.15
D-22	Mudstone, calcareous	DAB-208	3.6	4.5	65.5	59.6	170.55
D-21	Dolomite, phosphatic	DAB-207	2.8	11.0	6.8	62.4	201.15
D-20	Phosphate rock	DAB-206	0.6	24.3	9.3	63.0	215.73
D-19	Limestone	DAB-205	1.1	6.7	11.6	64.1	223.10
D-18	Phosphate rock and dolomite	DAB-204	0.7	9.7	19.2	64.8	229.89
D-17	Limestone	DAB-203	1.3	2.6	6.1	66.1	233.27
D-16	Mudstone, phosphatic, calcareous	DAB-202	0.9	11.9	39.2	67.0	243.98
D-15	Phosphate rock, argillaceous; fos. col. no. 48-KPM-50	DAB-201	0.9	22.5	30.5	67.9	264.23
D-14	Mudstone, phosphatic	DAB-200	0.9	8.9	62.5	68.8	272.24
D-13	Phosphate rock, argillaceous	RLP-199	0.7	19.4	36.5	69.5	285.82
D-12	Phosphate rock, argillaceous	RLP-198	1.7	18.0	38.8	71.2	316.42
D-11	Mudstone, phosphatic	RLP-197	1.2	16.6	42.9	72.4	336.34
D-10	Mudstone, phosphatic	RLP-196	1.5	9.5	57.8	73.9	350.59
D- 9	Mudstone	RLP-195	0.6	5.2	70.6	74.5	353.78
D- 8	Mudstone, phosphatic	RLP-194	2.4	10.4	50.0	76.9	378.67
D- 7	Limestone, argillaceous	RLP-193	1.7	1.8	20.7	78.6	381.73
D- 6	Mudstone	RLP-192	0.9	7.2	58.8	79.5	388.21
D- 5	Mudstone, cherty	RLP-191	3.0	6.4	62.9	82.5	407.41
D- 4	Mudstone, phosphatic	RLP-190	1.7	13.2	49.9	84.2	429.85
D- 3	Mudstone, phosphatic	RLP-189	1.4	9.3	59.6	85.6	442.97
D- 2	Mudstone, cherty	RLP-188	2.7	7.2	61.8	88.3	[illegible]
D- 1	Mudstone, phosphatic, cherty	DAB-187	1.4	13.8	52.7	89.7	[illegible]
	C member of Phosphoria formation						
C- 2	Chert and quartzite, calcareous	--	37.2	--	--	37.2	--
C- 1	Dolomite, cherty	--	24.0	--	--	61.2	--
	B member of Phosphoria formation						
B- 4	Chert and sandstone	DAB-186	1.0	2.9	82.3	1.0	2.90
B- 3	Phosphate rock, cherty	RLP-185	1.0	27.9	21.9	2.0	30.80
B- 2	Chert, phosphatic and phosphate rock	RLP-184	0.8	22.4	31.9	2.8	48.72
B- 1	Quartzite and chert	RLP-183	3.7	2.4	85.7	6.5	57.60
	A member of Phosphoria formation						
A- 9	Mudstone	DAB-182	4.2	1.0	87.5	4.2	4.20
A- 8	Mudstone, calcareous	DAB-181	10.6	0.6	73.4	14.8	10.56
A- 7	Sandstone	DAB-180	3.1	0.3	79.5	17.9	11.49
A- 6	Sandstone, calcareous	DAB-179	3.3	0.1	76.1	21.2	11.82
A- 5	Mudstone, calcareous and sandstone	RLP-178	17.5	0.1	73.6	38.7	13.57
A- 4	Mudstone	RLP-177	17.7	0.1	72.6	56.4	[illegible]

[1] Fossil collection made by K. P. McLaughlin, Paleontology and Stratigraphy Branch, U. S. Geological Survey.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness × percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
A- 3	Mudstone, calcareous, sandy	RLP-176	23.7	0.3	75.6	80.1	22.45
A- 2	Sandstone, cherty?	DAB-175	6.3	0.5	94.9	86.4	24.34
A- 1	Mudstone and sandstone	DAB-174	19.1	0.2	85.6	105.5	28.16
	Quadrant formation						
Cq-1	Sandstone, quartzitic	DAB-173	5.0	0.3	97.2	5.0	1.5

CAVE CREEK, MONTANA. LOT NO. 1257.

D member of Phosphoria formation sampled in bulldozer trench on south side of Cave Creek, NW¼NW¼ sec. 10, T. 6 S., R. 10 W., Beaverhead County, Montana, about 2,000 feet west of axis of northeastward plunging Cave Creek syncline. Beds strike N. 25° W. and dip 40° NE. Section measured by E. T. Ruppel and sampled by J. A. Kelleher in August 1948. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

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—not exposed									
	E member of Phosphoria formation—top approximately located									
E-8	Chert and quartzite	--	11.0	--	--	--	--	--	11.0	--
E-7	Chert and quartzite	--	16.0	--	--	--	--	--	27.0	--
E-6	Chert and quartzite	--	11.0	--	--	--	--	--	38.0	--
E-5	Chert and quartzite	--	20.0	--	--	--	--	--	58.0	--
E-4	Chert and quartzite	--	22.0	--	--	--	--	--	80.0	--
E-3	Chert	--	28.0	--	--	--	--	--	108.0	--
E-2	Chert	--	32.5	--	--	--	--	--	140.5	--
E-1	Chert	ETR-620	3.5	3.1	--	--	--	88.8	144.0	--
	D member of Phosphoria formation—base not exposed									
	Rhyolite?	ETR-619	(5.25)	0.9	--	--	--	92.4	--	--
D-31	Phosphate rock	ETR-618	1.5	30.4	--	--	--	18.9	1.6	30.64
D-30	Phosphate rock, argillaceous	ETR-617	1.8	29.4	1.6	1.24	2.26	21.5	3.4	101.56
--	Flow breccia?	ETR-616	(1.2)	3.7	--	--	--	71.5	--	--
D-29	Mudstone, phosphatic	ETR-615	1.4	9.7	1.8	1.00	2.18	58.7	4.8	115.14
D-28	Mudstone	ETR-614	1.1	1.4	--	--	--	76.8	5.9	116.68
D-27	Mudstone	ETR-613	3.0	5.6	--	--	--	64.4	8.9	133.48
D-26	Mudstone, phosphatic	ETR-612	1.9	8.5	--	--	--	62.2	10.8	149.63
--	Rhyolite sill?	ETR-611	(2.3)	1.8	--	--	--	76.8	--	--
D-25	Mudstone	ETR-610	4.6	0.5	--	--	--	79.5	15.4	151.93
D-24	Phosphate rock	ETR-609	0.8	32.85	--	--	--	9.6	16.2	178.21
D-23	Mudstone, phosphatic	ETR-608	0.5	15.85	--	--	--	43.5	16.7	186.14
D-22	Phosphate rock, argillaceous	ETR-607	0.5	22.1	--	--	--	33.0	17.2	197.18
D-21	Mudstone; fos. col. no. 48-KPM-56[1]	ETR-606	0.8	6.7	--	--	--	66.3	18.0	202.54
D-20	Phosphate rock, argillaceous	ETR-605	0.8	23.6	--	--	--	29.0	18.8	221.42
D-19	Mudstone, phosphatic	ETR-604	1.1	14.4	--	--	--	49.8	19.9	237.26
D-18	Phosphate rock, argillaceous	ETR-603	0.9	24.6	--	--	--	25.6	20.8	259.40
D-17	Phosphate rock	ETR-602	0.75	30.7	--	--	--	15.0	21.55	282.43

[1] Fossil collection made by K. P. McLaughlin, Paleontology and Stratigraphy Branch, U. S. Geological Survey.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness × percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	Loss on ignition	Acid insoluble		
D-16	Phosphate rock and phosphatic mudstone*	ETR-601	0.6	21.1	--	--	--	34.3	22.15	295.09
D-15	Mudstone, phosphatic	ETR-600	0.7	11.8	--	--	--	57.0	22.85	303.35
D-14	Mudstone, phosphatic	ETR-599	0.75	9.4	--	--	--	71.0	23.60	310.40
D-13	Mudstone, calcareous, fos. col. no. 48-KPM-55	ETR-598	0.6	2.0	--	--	--	59.5	24.20	311.60
D-12	Phosphate rock, argillaceous	ETR-597	0.4	24.5	--	--	--	25.7	24.60	321.40
D-11	Mudstone, phosphatic, fos. col. no. 48-KPM-54	ETR-596	0.8	10.5	--	--	--	57.8	25.40	329.80
D-10	Phosphate rock, argillaceous	ETR-595	0.15	18.7	--	--	--	38.4	25.55	332.60
D-9	Mudstone, phosphatic, fos. col. no. 48-KPM-53	ETR-594	0.4	14.7	--	--	--	45.1	25.95	338.48
D-8	Mudstone, phosphatic	ETR-593	0.9	14.9	--	--	--	44.4	26.85	351.90
D-7	Phosphate rock, argillaceous and mudstone, fos. col. no. 48-KPM-52	ETR-592	1.7	18.4	--	--	--	39.7	28.55	383.18
D-6	Mudstone, phosphatic	ETR-591	0.55	13.8	--	--	--	51.3	29.10	390.78
D-5	Mudstone	ETR-590	1.6	4.4	--	--	--	61.4	30.70	397.80
D-4	Mudstone, phosphatic, calcareous	ETR-589	1.3	13.6	--	--	--	44.6	32.00	415.48
D-3	Mudstone	ETR-588	0.7?	6.4	--	--	--	62.3	32.70	419.96
D-2	Phosphate rock, argillaceous	ETR-587	0.3	29.4	--	--	--	21.6	33.00	428.78
D-1	Phosphate rock, sandy	ETR-586	--	20.2	--	--	--	45.4	--	--

* Stratigraphic interval of 116 feet between D-1 and approximate top of Quadrant quartzite includes few exposures of quartzite and limestone.

JACK CANYON, MONTANA. LOT NO. 1218.

Phosphoria formation sampled in hand trench and outcrop about 900 feet above Jack Creek on north side of canyon in SE¼NE¼ sec. 35, T. 8 S., R. 1 E., Madison County, Montana, on overturned and faulted west limb of Madison Range syncline. Beds strike N. 60° E. and dip 45° NW. Section measured by R. W. Swanson and sampled by J. G. Evans in September 1947. Samples analyzed by U. S. Bureau of Mines laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness × percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	Loss on ignition	Acid insol.		
Dinwoody formation										
Td1	Mudstone, calcareous	--	6.0	--	--	--	--		6.0	--
Td2	Sandstone, calcareous, argillaceous	--	1.6	--	--	--	--		7.6	--
Phosphoria formation										
25	Chert and calcareous sandstone	RWS-107-47	8.2	0.8	1.6	2.6	12.2	[illegible]	8.2	[illegible]
24	Sandstone, calcareous, and chert	RWS-106-47	18.1	1.5	0.5	1.3	9.7	[illegible].0	26.3	[illegible].71
23	Sandstone, calcareous, and chert	RWS-105-47	12.8	1.5	0.5	1.9	6.5	81.3	39.1	[illegible].91
22	Chert, sandstone, and limestone	RWS-104-47	8.4	0.8	0.9	2.8	4.7	85.0	47.5	[illegible].63
21	Chert and quartzite	RWS-103-47	8.6	1.8	0.8	2.1	2.1	88.2	56.1	75.11
20	Sandstone	RWS-102-47	10.5	1.4	0.6	1.1	9.0	75.3	66.6	89.81
19	Quartzite	RWS-101-47	9.65	2.1	0.9	1.3	1.8	89.3	76.25	110.08
18	Chert and quartzite	RWS-100-47	6.2	1.3	0.9	3.5	2.0	88.5	82.45	118.14
17	Chert and mudstone	RWS- 99-47	3.9	0.6	3.1	5.1	3.0	85.0	86.35	120.48
16	Chert and mudstone	RWS- 98-47	5.25	1.3	1.8	4.3	4.1	83.1	91.60	127.30
15	Chert and mudstone	RWS- 97-47	6.9	0.9	3.2	5.3	2.9	84.9	98.50	133.51
14	Phosphate rock, argillaceous	RWS- 96-47	0.17	18.9	1.5	2.9	2.2	44.0	98.67	136.72
13	Chert and mudstone	RWS- 95-47	2.4	1.2	6.0	5.2	4.2	81.3	101.07	139.60
12	Phosphate rock, argillaceous	RWS- 94-47	0.5	22.9	1.4	2.6	1.8	37.4	101.57	151.05
11	Chert and calcareous mudstone (may include 2.45 feet repetition by faulting)	RWS- 93-47	3.25	0.8	3.6	4.1	11.9	67.8	104.82	153.65
10	Chert and mudstone	RWS- 92-47	4.05	0.6	4.7	4.7	2.4	87.3	108.87	156.08
9	Chert and mudstone	RWS- 91-47	4.6	0.8	4.5	4.9	2.4	86.9	113.47	159.76
8	Chert and mudstone	RWS- 90-47	4.4	0.6	4.3	4.1	2.5	87.5	117.87	162.40
7	Phosphate rock	RWS- 89-47	1.15	28.8	1.9	1.4	4.5	19.0	119.02	195.52
6	Limestone, argillaceous	RWS- 88-47	0.4	0.8	4.7	2.3	32.6	24.9	119.42	195.84
--	Feldspar porphyry	RWS- 87-47	(3.0)	0.2	17.4	2.2	10.5	74.6	--	--
--	Feldspar porphyry	RWS- 86-47	(1.1)	0.5	16.9	3.1	11.1	73.3	--	--
5	Sandstone, phosphatic, and phosphate rock	RWS- 85-47	0.8	12.7	1.9	3.0	1.7	61.3	120.22	206.00
4	Quartzite	RWS- 84-47	4.6	1.3	0.5	1.8	2.4	90.7	124.82	211.93
3	Quartzite, cherty	RWS- 83-47	3.95	0.8	0.7	1.4	1.9	92.1	128.77	215.14
2	Quartzite and chert	RWS- 82-47	2.5	0.7	1.0	1.9	0.8	94.2	131.27	216.89
1	Conglomerate, mudstone, and chert	RWS- 81-47	0.6	2.4	2.8	3.1	7.3	75.8	131.87	218.33

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		
Quadrant formation										
Cq-1	Mudstone, calcareous, sandy, and argillaceous, calcareous sandstone	RWS- 80-47	1.3	0.7	6.5	3.2	9.6	70.4	1.3	---
Cq-2	Sandstone, quartzitic, cherty	---	2.2	---	---	---	---	---	3.5	---
Cq-3	Chert, sandstone, and limestone	---	11.5	---	---	---	---	---	15.0	---
Cq-4	Limestone, chert, and quartzite	---	11.0	---	---	---	---	---	26.0	---
Cq-5	Limestone, cherty	---	8.0	---	---	---	---	---	34.0	---

SPECTROGRAPHIC ANALYSES—JACK CANYON, MONTANA LOT NO. 1218.

Semi-quantitative analyses of samples of the Phosphoria formation, Jack Canyon, Montana (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, Ba, Be, Bi, Cd, Co, Cb, Ga, Ge, Au, In, Pb, Li, Hg, Pt, Ta, Sn, and W were looked for in all samples 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	B	Ca	Cr	Cu	Fe	Mg	Mn	Mo	Ni	Si	Ag	Na	Sr	Ti	V	Zn	Zr
25	RWS-107-47	C	F	B	ND	G	C	C	E	F	E	A	G	ND	F	E	F	E	E
24	RWS-106-47	C	F	A	ND	G	C	C	E	F	E	A	G	ND	F	E	F	E	E
23	RWS-105-47	C	F	B	ND	G	C	C	E	F	E	A	G	ND	F	E	F	E	E
22	RWS-104-47	C	F	C	ND	G	C	C	D	F	E	A	G	ND	F	E	F	E	E
21	RWS-103-47	C	F	C	ND	G	C	D	E	F	E	A	G	ND	F	E	F	E	E
20	RWS-102-47	D	F	B	E	G	C	C	E	F	E	A	G	E	F	E	E	E	E
19	RWS-101-47	D	F	B	E	G	C	C	E	F	E	A	G	E	F	E	E	E	E
18	RWS-100-47	D	F	C	E	G	C	C	E	F	E	A	G	E	F	E	E	E	E
17	RWS- 99-47	C	F	C	E	G	C	D	E	F	E	A	G	E	F	E	E	E	E
16	RWS- 98-47	C	F	C	E	G	C	D	E	F	E	A	G	E	F	E	E	E	E
15	RWS- 97-47	C	F	C	E	G	C	D	E	F	E	A	G	E	F	E	E	E	E
14	RWS- 96-47	C	F	A	E	G	C	D	E	F	E	A	G	E	F	E	E	E	E
13	RWS- 95-47	C	F	A	E	G	C	D	E	F	E	A	G	E	F	E	E	E	E
12	RWS- 94-47	C	F	A	E	G	C	D	E	F	E	A	G	E	F	E	E	E	E
11	RWS- 93-47	C	F	B	E	G	C	C	E	F	E	A	G	E	F	E	E	E	E
10	RWS- 92-47	C	F	C	E	G	C	D	E	F	E	A	G	E	F	E	E	E	E
9	RWS- 91-47	C	F	C	E	G	C	D	E	F	E	A	G	E	F	E	E	E	E
8	RWS- 90-47	C	F	C	E	G	C	D	E	F	E	A	G	E	F	E	E	ND	E
7	RWS- 89-47	C	F	A	E	G	C	D	E	F	E	A	G	E	F	E	E	ND	E
6	RWS- 88-47	C	F	A	E	G	C	C	F	F	F	A	G	E	F	E	E	ND	E
5	RWS- 87-47	C	F	C	ND	G	C	D	E	F	F	A	G	D	F	E	E	ND	E
4	RWS- 86-47	C	F	C	ND	G	C	D	E	F	F	A	G	E	F	E	E	ND	E
3	RWS- 85-47	C	F	A	ND	G	C	D	E	F	F	A	G	E	F	E	E	ND	E
2	RWS- 84-47	D	F	C	ND	G	C	D	E	F	F	A	G	E	F	E	E	ND	E
1	RWS- 83-47	D	F	C	ND	G	C	D	E	F	F	A	G	E	F	E	E	ND	E
Cq-1	RWS- 82-47	D	F	C	ND	G	C	D	F	F	F	A	G	E	F	E	E	ND	E
	RWS- 81-47	C	F	B	ND	G	C	D	E	F	F	A	G	E	F	E	E	ND	E
	RWS- 80-47	C	F	B	ND	G	C	C	E	F	F	A	G	E	E	E	E	E	E

ASPEN VALLEY, MONTANA. LOT NO. 1215.

Phosphatic shale member of Phosphoria formation sampled in hand trench near top of ridge on west side of Aspen Valley, SE¼SE¼ sec. 11, 6 S., R. 1 E., Madison County, Montana, on overturned west limb of Madison Range syncline. Beds strike N. 45° E. and dip 55° NW. Section measured by R. W. Swanson and sampled by J. A. Mann and J. G. Evans in August 1947. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)			Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	F	Acid insoluble		
	Phosphoria formation—top and base not exposed							
20	Sandstone	--	2.1	--	--	--	2.1	--
19	Quartzite	RWS-43-47	0.75	1.3	--	90.1	2.85	0.98*
18	Chert and mudstone	RWS-42-47	4.2	0.9	--	81.8	7.05	4.76
17	Chert and mudstone	RWS-41-47	2.5	0.6	--	84.0	9.55	6.26
16	Chert and mudstone	RWS-40-47	4.45	0.7	--	78.0	14.00	9.37
15	Mudstone	RWS-39-47	0.55	1.3	--	75.4	14.55	10.08
14	Phosphate rock, cherty	RWS-38-47	0.25	23.5	2.05	31.4	14.80	15.96
13	Limestone, argillaceous	RWS-37-47	1.0	0.5	--	37.6	15.80	16.46
12	Chert and mudstone	RWS-36-47	4.55	0.5	--	50.6	20.35	18.74
11	Chert and mudstone	RWS-35-47	4.45	0.7	--	82.1	24.80	21.85
10	Chert and mudstone	RWS-34-47	4.5	0.7	--	82.4	29.30	25.00
9	Chert and mudstone	RWS-33-47	2.25	0.5	--	84.9	31.55	26.12
8	Phosphate rock	RWS-32-47	1.6	31.0	3.0	11.8	33.15	75.82
7	Phosphate rock	RWS-31-47	0.3	26.9	2.97	18.0	33.45	83.80
6	Mudstone	RWS-30-47	0.45	1.4	--	72.3	33.90	84.42
5	Limestone	RWS-29-47	0.83	0.7	--	15.4	34.73	85.01
4	Mudstone, calcareous	RWS-28-47	0.7	3.7	--	56.7	35.43	87.60
3	Phosphate rock and mudstone	RWS-27-47	0.6	14.6	1.52	37.0	36.03	96.36
2	Phosphate rock and phosphatic sandstone	RWS-26-47	0.55	21.3	--	38.9	36.58	108.07
1	Sandstone	RWS-25-47	0.8	1.6	--	92.9	37.38	199.35**

* Cumulative data incomplete due to missing information.

** Note incompleteness of cumulative data.

SHELL CANYON, MONTANA. LOT NO. 1214.

Phosphoria formation measured and phosphatic shale member sampled in hand trench and outcrop on north side of Shell Creek canyon, SW¼NE¼ sec. 33, T. 6 S., R. 1 E., Madison County, Montana, near crest of small dome at west side of Madison Range syncline. Beds strike N. 5° W. and dip 12° W. Section measured by R. W. Swanson and sampled by J. A. Mann and J. G. Evans in August 1947. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)			Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	F	Acid insoluble		
	Dinwoody formation							
Td-1	Limestone	--	25.0	--	--	--	25.0	--
	Phosphoria formation							
43	Sandstone, calcareous, cherty	--	0.75	--	--	--	0.75	--
42	Sandstone, calcareous, cherty	--	6.0	--	--	--	6.75	--
41	Chert and sandstone	--	3.4	--	--	--	10.15	--
40	Quartzite	--	2.8	--	--	--	12.95	--
39	Limestone, cherty	--	1.45	--	--	--	14.40	--
38	Chert and quartzite	--	4.3	--	--	--	18.70	--
37	Quartzite and chert	--	7.4	--	--	--	26.10	--
36	Chert and quartzite	--	5.8	--	--	--	31.90	--
35	Quartzite	--	2.9	--	--	--	34.80	--
34	Quartzite and chert	--	11.3	--	--	--	46.10	--
33	Quartzite	--	5.2	--	--	--	51.30	--
32	Sandstone and chert	--	3.3	--	--	--	54.60	--
31	Chert, contains sandstone lenses	--	3.0	--	--	--	57.60	--
30	Sandstone, quartzitic	--	5.3	--	--	--	62.90	--
29	Sandstone, quartzitic, cherty	--	1.7	--	--	--	64.60	--
28	Chert and quartzitic sandstone	--	4.6	--	--	--	69.20	--
27	Chert and quartzite	RWS-24-47	0.7	1.6	--	90.2	69.90	1.12
26	Chert	RWS-23-47	3.2	0.6	--	86.7	73.10	3.04
25	Chert, contains thin mudstone partings	RWS-22-47	4.15	0.8	--	84.7	77.25	6.36
24	Chert, contains thin mudstone partings	RWS-21-47	5.0	0.5	--	85.0	82.25	8.86
23	Chert, contains thin mudstone partings	RWS-20-47	5.2	0.6	--	82.1	87.45	11.98
22	Chert, contains thin mudstone partings	RWS-19-47	5.1	0.9	--	82.3	92.55	16.57
21	Mudstone, calcareous	RWS-18-47	1.2	1.1	--	73.7	93.75	17.89
20	Phosphate rock, cherty	RWS-17-47	0.55	19.2	--	43.9	94.30	28.45
19	Mudstone, calcareous	RWS-16-47	1.15	0.8	--	50.0	95.45	29.37
18	Mudstone, calcareous	RWS-15-47	3.7	0.9	--	74.9	99.15	33.70
17	Mudstone, cherty, calcareous	RWS-14-47	0.75	0.6	--	72.0	99.90	33.15

* Cumulative data incomplete due to missing information.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)			Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	F	Acid insoluble		
16	Mudstone	RWS-13-47	2.05	0.1	--	80.9	101.95	33.36
15	Phosphate rock, argillaceous	RWS-12-47	0.75	23.6	2.48	30.2	102.70	51.06
14	Phosphate rock	RWS-11-47	0.5	32.4	3.43	8.1	103.20	67.26
13	Phosphate rock	RWS-10-47	1.5	32.5	3.44	8.4	104.70	116.01
12	Mudstone	RWS- 9-47	0.5	3.7	--	70.6	105.20	117.86
11	Limestone, argillaceous	RWS- 8-47	1.2	0.9	--	20.0	106.40	118.46
10	Mudstone, calcareous	RWS- 7-47	0.8	5.6	--	55.2	107.20	121.34
9	Mudstone, calcareous	RWS- 6-47	0.45	6.0	0.79	47.3	107.65	124.04
8	Mudstone and phosphate rock	RWS- 5-47	0.65	14.9	1.58	40.4	108.30	133.72
7	Sandstone, quartzitic, phosphatic and chert	RWS- 4-47	1.0	9.5	--	70.5	109.30	143.22
6	Sandstone, quartzitic	RWS- 3-47	1.9	1.1	--	90.1	111.20	145.31
5	Sandstone, quartzitic	RWS- 2-47	0.85	1.0	--	93.3	112.05	146.16
4	Sandstone, quartzitic	RWS- 1-47	0.7	0.8	--	92.2	112.75	146.79**
3	Sandstone, quartzitic	--	5.55	--	--	--	118.30	--
2	Chert	--	3.75	--	--	--	122.05	--
1	Sandstone, quartzitic and chert	--	2.5	--	--	--	124.55	--
	Quadrant formation							
Cq-1	Limestone, cherty	--	3.0	--	--	--	3.0	--
Cq-2	Sandstone, quartzitic	--	10	--	--	--	13.0	--

** Note incompleteness of cumulative data.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent) P_2O_5	F	Acid insoluble	Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
16	Mudstone	RWS-13-47	2.05	0.1	--	80.5	101.95	133.36
15	Phosphate rock, argillaceous	RWS-12-47	0.75	23.6	[illegible]	30.2	102.70	151.06
14	Phosphate rock	RWS-11-47	0.5	32.4	[illegible]	8.1	103.20	167.26
13	Phosphate rock	RWS-10-47	1.5	32.5	3.44	8.4	104.70	116.01
12	Mudstone	RWS- 9-47	0.5	3.7	--	70.6	105.20	117.86
11	Limestone, argillaceous	RWS- 8-47	1.2	0.5	--	20.0	106.40	118.46
10	Mudstone, calcareous	RWS- 7-47	0.8	3.6	--	55.2	107.20	121.34
9	Mudstone, calcareous	RWS- 6-47	0.45	6.0	0.79	47.3	107.65	124.04
8	Mudstone and phosphate rock	RWS- 5-47	0.65	14.9	1.58	40.4	108.30	133.72
7	Sandstone, quartzitic, phosphatic and chert	RWS- 4-47	1.0	9.5	--	70.5	109.30	143.22
6	Sandstone, quartzitic	RWS- 3-47	1.9	1.1	--	90.[illegible]	111.20	145.3[illegible]
5	Sandstone, quartzitic	RWS- 2-47	0.85	1.0	--	93.[illegible]	112.05	146.16
4	Sandstone, quartzitic	RWS- 1-47	0.7	0.8	--	92.[illegible]	112.75	146.79**
3	Sandstone, quartzitic	--	5.55	--	--	--	118.30	--
2	Chert	--	3.75	--	--	--	122.05	--
1	Sandstone, quartzitic and chert	--	2.5	--	--	--	124.55	--
	Quadrant formation							
Cq-1	Limestone, cherty	--	3.0	--	--	--	3.0	--
Cq-2	Sandstone, quartzitic	--	10	--	--	--	13.0	--

** Note incompleteness of cumulative data.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent) P_2O_5	F	Acid insoluble	Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
16	Mudstone	RWS-13-47	2.05	0.1	--	80.3	101.95	33.36
15	Phosphate rock, argillaceous	RWS-12-47	0.75	23.6	2.48	30.2	102.70	51.06
14	Phosphate rock	RWS-11-47	0.5	32.4	3.43	8.1	103.20	67.26
13	Phosphate rock	RWS-10-47	1.5	32.5	3.44	8.4	104.70	116.01
12	Mudstone	RWS- 9-47	0.5	3.7	--	70.6	105.20	117.86
11	Limestone, argillaceous	RWS- 8-47	1.2	0.5	--	20.0	106.40	118.46
10	Mudstone, calcareous	RWS- 7-47	0.8	3.6	--	55.2	107.20	121.34
9	Mudstone, calcareous	RWS- 6-47	0.45	6.0	0.79	47.3	107.65	124.04
8	Mudstone and phosphate rock	RWS- 5-47	0.65	14.9	1.58	40.4	108.30	133.72
7	Sandstone, quartzitic, phosphatic and chert	RWS- 4-47	1.0	9.5	--	70.5	109.30	143.22
6	Sandstone, quartzitic	RWS- 3-47	1.9	1.1	--	90.1	111.20	145.31
5	Sandstone, quartzitic	RWS- 2-47	0.85	1.0	--	93.3	112.05	146.16
4	Sandstone, quartzitic	RWS- 1-47	0.7	0.8	--	92.2	112.75	146.79**
3	Sandstone, quartzitic	--	5.55	--	--	--	118.30	--
2	Chert	--	3.75	--	--	--	122.05	--
1	Sandstone, quartzitic and chert	--	2.5	--	--	--	124.55	--
	Quadrant formation							
Cq-1	Limestone, cherty	--	3.0	--	--	--	3.0	--
Cq-2	Sandstone, quartzitic	--	10	--	--	--	13.0	--

** Note incompleteness of cumulative data.

WEST FORK OF GALLATIN RIVER, MONTANA. LOT NO. 1216.

Part of Phosphoria formation sampled in hand trench and outcrops on slope north of West Fork of Gallatin River, NW¼SE¼ sec. 32, T. 6 S., R. 4 E., Gallatin County, Montana, from strata dragged up beneath Gardiner thrust fault. Beds strike N. 85° W. and dip 45-50° SW. Section measured by R. W. Swanson and sampled by J. A. Mann and J. G. Evans in September 1947. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
	Phosphoria formation—lower part only						
25	Sandstone, quartzitic and chert	--	10.5	--	--	10.5	--
24	Quartzite, contains chert concretions	--	2.0	--	--	12.5	--
23	Limestone, contains chert concretions	--	0.7	--	--	13.2	--
22	Chert and quartzite	--	5.5	--	--	18.7	--
21	Chert, quartzite, and mudstone	RWS-63-47	8.85	0.8	90.7	27.55	0.8*
20	Quartzite	RWS-62-47	0.65	2.0	89.2	28.20	0.98
19	Chert and mudstone	RWS-61-47	5.75	0.7	84.6	33.95	12.41
18	Chert and mudstone	RWS-60-47	3.4	0.6	90.7	37.35	14.45
17	Chert and mudstone	RWS-59-47	4.45	0.7	91.0	41.80	17.56
16	Mudstone, phosphatic	RWS-58-47	0.3	14.9	56.3	42.10	22.03
15	Mudstone	RWS-57-47	1.35	0.9	81.1	43.45	23.25
14	Mudstone	RWS-56-47	1.8	0.8	88.1	45.25	24.69
13	Mudstone	RWS-55-47	0.85	0.8	81.1	46.10	25.37
12	Mudstone	RWS-54-47	2.5	2.1	84.2	48.60	28.12
11	Phosphate rock, argillaceous	RWS-53-47	0.45	22.2	39.4	49.05	38.11
10	Phosphate rock, argillaceous	RWS-52-47	0.7	26.2	27.0	49.75	56.45
9	Sandstone, phosphatic	RWS-51-47	1.5	8.3	70.2	51.25	68.90
8	Sandstone	RWS-50-47	1.6	0.6	88.1	52.85	69.86
7	Mudstone, contains quartzitic sandstone concretions	RWS-49-47	1.3	1.1	81.3	54.15	71.29
6	Chert, calcareous mudstone, and quartzite	RWS-48-47	1.35	1.5	55.0	55.50	73.31
5	Quartzite, cherty	RWS-47-47	2.2	1.4	91.9	57.70	76.39
4	Mudstone, sandy, contains quartzitic concretions	RWS-46-47	1.15	2.2	87.2	58.85	78.92
3	Mudstone, calcareous and quartzitic	RWS-45-47	1.05	0.9	77.1	59.90	79.87
2	Sandstone, quartzitic	RWS-44-47	1.2	0.8	95.2	61.10	80.83**
1	Quartzite	--	4.3	--	--	65.40	--
	Quadrant formation						
Cq-1	Chert	--	1.8	--	--	1.8	--
Cq-2	Chert and sandstone	--	6.3	--	--	8.1	--

* Cumulative data incomplete due to missing information.
** Note incompleteness of cumulative data.

PORCUPINE CREEK, MONTANA. LOT NO. 1217.

Part of Phosphoria formation sampled in hand trench and outcrops on slope 1½ miles north of Porcupine Creek, NE¼SE¼ sec. 10, T. 7 S., R. 4 E., Gallatin County, Montana, from strata dragged up beneath Gardiner thrust fault. Beds strike N. 40° W. and dip 75° SW. Section measured by R. W. Swanson and sampled by J. A. Mann and J. G. Evans in September 1947. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
	Phosphoria formation—lower part only						
20	Sandstone	--	6.0	--	--	6.0	--
19	Chert, contains sandstone lenses	--	2.6	--	--	8.6	--
18	Sandstone	--	4.8	--	--	13.4	--
17	Sandstone, quartzitic	RWS-79-47	0.6	1.6	93.1	14.0	0.96*
16	Chert, contains mudstone partings	RWS-78-47	4.6	0.8	82.1	18.6	4.64
15	Chert, contains mudstone partings	RWS-77-47	3.9	0.4	86.0	22.5	6.20
14	Chert, contains mudstone partings	RWS-76-47	3.6	0.9	84.8	26.1	9.44
13	Chert, contains mudstone partings	RWS-75-47	1.55	3.3	87.0	27.65	14.56
12	Chert, contains mudstone partings	RWS-74-47	1.0	0.8	87.4	28.65	15.36
11	Chert, contains mudstone partings	RWS-73-47	0.95	0.6	86.0	29.60	15.93
10	Chert, contains mudstone partings	RWS-72-47	1.65	1.1	87.4	31.25	17.75
9	Sandstone	RWS-71-47	0.6	6.9	76.6	31.85	21.89
8	Mudstone, calcareous	RWS-70-47	0.8	1.4	80.8	32.65	23.01
7	Limestone, argillaceous	RWS-69-47	0.7	0.4	45.5	33.35	23.29
6	Mudstone	RWS-68-47	2.9	1.6	81.8	36.25	27.93
5	Phosphate rock and mudstone	RWS-67-47	1.0	22.9	35.0	37.25	50.83
4	Limestone, contains sandstone concretions	RWS-66-47	1.25	0.8	59.3	38.50	51.83
3	Mudstone, contains sandstone concretions	RWS-65-47	0.6	1.8	78.5	39.10	52.91
2	Sandstone, quartzitic	RWS-64-47	0.67	2.6	86.7	39.77	54.65**
1	Sandstone	--	9.5	--	--	49.27	--
	Quadrant formation						
Cq-1	Sandstone	--	1.5	--	--	1.5	--
Cq-2	Sandstone and chert	--	11.4	--	--	12.9	--
Cq-3	Sandstone	--	10.0	--	--	22.9	--

* Cumulative data incomplete due to missing information.
** Note incompleteness of cumulative data.

DALY'S SPUR, MONTANA. LOT NOS. 1222 AND 1223.

Phosphoria formation sampled near Daly's Spur, west side of Beaverhead River: A, B, C, and E members, lot no. 1223, sampled in hand trench and natural exposures, SW¼SW¼ sec. 36, and D member, lot no. 1222, in hand trench, NW¼SW¼ sec. 36, T. 9 S., R. 10 W., Beaverhead County, Montana. Beds strike north to N. 30° E. and dip 30-40° W. Section measured by W. R. Lowell and sampled by D. A. Bostwick, R. [illegible] and E. T. Ruppel in July 1937. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent) P_2O_5	F	Acid insoluble	Cumulative thickness (feet)	Thickness, percent P_2O_5 (cumulative)
	Dinwoody formation—base not exposed.							
	E member of Phosphoria formation, lot no. 1223—top not exposed.							
	Dinwoody-Phosphoria contact concealed by basalt flow, estimated thickness of covered E member	--	20.0	--	--	--	20.0	
E-10	Quartzite	WRL-286-47	23.7	2.2	--	89.4	43.7	[illegible]
E- 9	Chert	WRL-285-47	12.5	1.5	--	91.0	56.2	[illegible]
E- 8	Quartzite, chert, and sandstone	WRL-284-47	9.8	2.2	--	89.5	66.0	[illegible]
E- 7	Chert, sandy	WRL-283-47	20.4	1.5	--	90.1	86.4	[illegible]
E- 6	Chert, sandy	WRL-282-47	22.3	1.6	--	89.6	108.7	[illegible]
E- 5	Chert	WRL-281-47	7.4	2.5	--	87.3	116.1	[illegible]
E- 4	Chert, sandy	WRL-280-47	14.7	1.7	--	89.1	130.8	[illegible]
E- 3	Mudstone, contains gypsum	WRL-279-47	0.5	2.2	--	78.3	131.3	[illegible]
E- 2	Chert	WRL-278-47	3.6	2.6	--	86.3	134.9	[illegible]
E- 1	Quartzite, cherty, phosphatic	WRL-277-47	1.2	16.6	--	57.6	136.1	[illegible]
--	Chert	WRL- 46-47	--	5.9	--	78.2	--	
	WRL-46-47 is correlative with WRL-277-47 but occurs in same trench as D member.							
	D member of Phosphoria formation, lot no. 1222							
D-45	Mudstone	WRL- 45-47	1.0	3.5	--	80.0	1.0	[illegible]
D-44	Mudstone	WRL- 44-47	1.3	3.2	--	78.5	2.3	[illegible]
D-43	Mudstone	WRL- 43-47	1.4	1.8	--	66.7	3.7	[illegible]
D-42	Phosphate rock, argillaceous	WRL- 42-47	0.8	29.3	2.44	30.1	4.5	[illegible]
D-41	Mudstone, phosphatic	WRL- 41-47	0.7	13.7	1.62	51.1	5.2	[illegible]
D-40	Phosphate rock, argillaceous	WRL- 40-47	0.3	28.6	--	22.2	5.5	[illegible]
D-39	Mudstone, phosphatic	WRL- 39-47	1.2	17.0	1.60	45.1	6.7	[illegible]
D-38	Phosphate rock and phosphatic mudstone	WRL- 38-47	1.5	22.1	--	32.8	8.2	[illegible]
D-37	Mudstone, calcareous	WRL- 37-47	0.9	6.1	--	45.5	9.1	[illegible]
D-36	Phosphate rock, argillaceous	WRL- 36-47	0.5	22.2	--	32.0	9.7	[illegible]

* Cumulative data incomplete due to missing information.
** Note incompleteness of cumulative data.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)			Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	F	Acid insoluble		
D-35	Mudstone, phosphatic	WRL- 35-47	0.5	10.1		53.8	10.2	126.00
D-34	Mudstone	WRL- 34-47	0.4	4.8	0.41	71.5	10.6	127.92
D-33	Phosphate rock, argillaceous	WRL- 33-47	0.4	22.4		42.5	11.0	136.88
D-32	Mudstone, calcareous	WRL- 32-47	0.3	2.9		95.8	11.3	137.75
D-31	Phosphate rock, argillaceous	WRL- 31-47	0.3	19.0		33.0	11.6	143.45
D-30	Mudstone, calcareous	WRL- 30-47	4.0	4.2		42.6	15.6	160.23
D-29	Mudstone, calcareous	WRL- 29-47	5.0	2.9		49.9	20.6	174.75
D-28	Mudstone, calcareous	WRL- 28-47	0.8	2.7		61.3	21.4	176.91
D-27	Mudstone, calcareous	WRL- 27-47	2.1	0.6		65.9	23.5	178.17
D-26	Mudstone, calcareous	WRL- 26-47	1.6	1.6		67.9	25.1	180.73
D-25	Mudstone, calcareous	WRL- 25-47	2.7	2.0		63.5	27.8	186.13
D-24	Mudstone, calcareous	WRL- 24-47	1.2	1.6		65.3	29.0	188.05
D-23	Mudstone, calcareous	WRL- 23-47	1.2	0.6		69.6	30.2	188.77
D-22	Mudstone, calcareous	WRL- 22-47	1.6	1.1		35.0	31.8	190.53
D-21	Mudstone, calcareous	WRL- 21-47	0.8	1.2		69.4	32.6	191.49
D-20	Mudstone	WRL- 20-47	1.7	1.8		71.5	34.3	194.31
D-19	Mudstone, calcareous	WRL- 19-47	1.2	2.9		50.2	35.5	198.03
D-18	Phosphate rock	WRL- 18-47	0.3	27.4	3.8	19.3	35.8	206.25
D-17	Mudstone, calcareous	WRL- 17-47	0.8	4.4		60.6	36.6	209.77
D-16	Phosphate rock	WRL- 16-47	1.2	33.1	4.1	6.7	37.8	249.49
D-15	Mudstone, calcareous	WRL- 15-47	1.4	6.8		52.9	39.2	259.01
D-14	Phosphate rock, argillaceous	WRL- 14-47	1.7	22.6		24.62	40.9	297.43
D-13	Limestone	WRL- 13-47	0.9	3.9		18.6	41.8	300.94
D-12	Mudstone, phosphatic	WRL- 12-47	0.8	10.0		49.1	42.6	308.94
D-11	Phosphate rock and mudstone	WRL- 11-47	0.5	22.8		21.3	43.1	320.34
D-10	Mudstone and phosphate rock	WRL- 10-47	1.3	11.0		48.3	44.4	334.64
D- 9	Phosphate rock, argillaceous	WRL- 9-47	1.3	24.4	2.48	24.7	45.7	366.36
D- 8	Mudstone, calcareous	WRL- 8-47	0.5	0.2		68.3	46.2	366.46
D- 7	Mudstone and phosphate rock	WRL- 7-47	1.5	14.7	1.28	48.2	47.7	388.51
D- 6	Mudstone	WRL- 6-47	1.0	5.3	0.68	71.2	48.7	393.81
D- 5	Phosphate rock, argillaceous	WRL- 5-47	1.6	17.2		35.9	50.3	421.33
D- 4	Phosphate rock, argillaceous, contains gypsum	WRL- 4-47	1.4	20.3		27.5	51.7	449.13
D- 3	Mudstone, phosphatic, contains gypsum	WRL- 3-47	0.9	8.8		62.1	52.6	457.05
D- 2	Mudstone	WRL- 2-47	0.8	3.3		75.8	53.4	460.31
D- 1	Mudstone, phosphatic	WRL- 1-47	1.2	13.8	1.33	45.9	54.6	476.87
	C member of Phosphoria formation, lot no. 1223							
C-11	Sandstone	WRL-276-47	2.2	15.1	1.39	56.1	2.2	33.22
C-10	Sandstone and chert	WRL-275-47	2.7	3.9	---	77.2	4.9	43.75

C- 9	Sandstone, calcareous	WRL-274-47	8.7	0.8	--	46.9	13.6	50.71
C- 8	Sandstone	WRL-273-47	11.0	1.3	--	90.8	24.6	63.01
C- 7	Chert and sandstone	WRL-272-47	9.0	0.2	--	95.1	33.6	66.81
C- 6	Sandstone and cherty mudstone	WRL-271-47	14.5	0.5	--	92.8	48.1	74.06
C- 5	Sandstone and chert	WRL-270-47	2.8	1.3	--	91.3	50.9	77.70
C- 4	Sandstone	WRL-269-47	7.4	2.5	--	78.2	58.3	96.20
C- 3	Sandstone, cherty	WRL-268-47	9.2	5.4	0.71	80.0	67.5	[illegible]
C- 2	Sandstone and chert	WRL-267-47	11.0	1.9	--	87.6	78.5	[illegible]
C- 1	Sandstone and chert	WRL-266-47	12.1	1.1	--	92.5	90.6	180.09
	B member of Phosphoria formation, lot no. 1223							
B- 5	Mudstone	WRL-265-47	3.1	6.7	0.68	67.0	3.1	[illegible]
B- 4	Mudstone	WRL-264-47	0.8	6.0	--	69.6	3.9	[illegible]
B- 3	Phosphate rock	WRL-263-47	0.4	35.7	3.56	6.4	4.3	[illegible]
B- 2	Mudstone	WRL-262-47	0.3	4.5	--	76.5	4.6	[illegible]
B- 1	Phosphate rock	WRL-261-47	0.7	36.4	3.57	5.2	5.3	[illegible]
	A member of Phosphoria formation, lot no. 1223							
A-10	Sandstone	WRL-260-47	2.4	4.4	--	84.4	2.4	[illegible]
A- 9	Sandstone and mudstone	WRL-259-47	3.3	0.5	--	82.0	5.7	[illegible]
A- 8	Sandstone, cherty	WRL-258-47	1.4	0.8	--	90.5	7.1	[illegible]
A- 7	Mudstone	WRL-257-47	4.2	0.6	--	80.0	11.3	[illegible]
A- 6	Sandstone, calcareous	WRL-256-47	3.0	0.1	--	76.6	14.3	[illegible]
A- 5	Limestone	WRL-255-47	2.8	0.2	--	18.9	17.1	[illegible]
A- 4	Mudstone	WRL-254-47	0.7	0.5	--	79.3	17.8	[illegible]
A- 3	Limestone	WRL-253-47	3.5	0.0	--	2.6	21.3	[illegible]
A- 2	Mudstone	WRL-252-47	1.5	0.4	--	80.6	22.8	[illegible]
A- 1	Limestone	WRL-251-47	6.7	0.3	--	1.9	29.5	[illegible]
	Quadrant formation							
--	Thickness of Quadrant formation exposed in cliff	--	400	--	--	--	--	--

SHEEP CREEK, MONTANA. LOT NO. [illegible]

Phosphoria formation sampled in two bulldozer trenches near Sheep Creek Canyon, NW¼SW¼ sec. 2, T. 9 S., R. 9 W., Beaverhead County, Montana, on west side of Small Horn Canyon anticline. Beds strike N. 23-41° E. and dip 30-45° NW. Section measured by L. A. Thomas, E. R. Cressman, O. A. Payne, V. E. McKelvey, D. A. Eostwick, F. S. Honkala, and J. E. Smedley and sampled by W. H. Wilson, Payne, R. L. Konizeski, Thomas and Cressman in June 1948. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	Loss on ignition	Acid insoluble		
	Dinwoody formation									
Td-1	Mudstone, calcareous	DAB- 80	--	1.0	8.1	4.0	10.4	71.4	--	--
	E member of Phosphoria formation									
E-11	Sandstone; fos. col. no. 48-KPM-43	DAB- 78	1.9	1.7	2.5	4.6	1.5	87.9	1.9	3.23
E-10	Mudstone and chert	LAT- 78	10.2	1.6	5.1	3.0	2.3	87.3	12.1	19.45
E- 9	Chert and mudstone	LAT- 77	13.7	2.1	4.4	3.4	1.8	88.9	25.8	48.37
E- 8	Sandstone, chert, and mudstone; fos. col. no. 48-KPM-42	LAT- 76	13.5	1.7	2.3	3.4	1.5	88.6	39.3	71.27
E- 7	Sandstone and chert	ERC- 75	14.0	2.4	2.1	3.9	1.0	86.9	53.3	104.87
E- 6	Sandstone and chert	ERC- 74	17.1	2.6	2.9	2.8	1.3	88.1	70.4	149.33
E- 5	Sandstone	ERC- 73	13.6	2.7	1.0	4.0	1.0	87.0	84.0	186.05
E- 4	Mudstone and chert	DAB- 72	10.5	3.3	2.2	3.2	1.2	86.5	94.5	220.70
E- 3	Mudstone	DAB- 71	10.8	1.6	4.8	2.3	2.8	88.3	105.3	237.98
E- 2	Sandstone and chert	DAB- 70	4.1	3.0	1.0	3.2	0.8	87.9	109.4	250.28
E- 1	Sandstone, phosphatic; fos. col. no. 48-KPM-41	DAB- 69	0.75	17.2	2.2	1.5	2.8	51.1	110.15	263.10
	D member of Phosphoria formation									
D-48	Mudstone, phosphatic	VEM- 1	0.9	16.2	7.4	3.6	8.0	43.6	0.9	14.58
D-47	Mudstone; fos. col. no. 48-KPM-40	VEM- 2	1.3	7.4	9.2	2.4	9.7	64.6	2.2	24.20
D-46	Mudstone, phosphatic; fos. col. no. 48-KPM-39	VEM- 3	2.3	12.5	8.7	2.3	10.0	51.9	4.5	52.95
D-45	Mudstone; fos. col. no. 48-KPM-38	VEM- 4	1.3	1.7	11.2	1.9	9.3	79.0	5.8	55.16
D-44	Mudstone	JES - 5	2.2	3.2	9.9	4.3	13.4	70.4	8.0	62.20
D-43	Mudstone	JES - 6	0.5	1.6	8.8	2.0	11.8	76.3	8.5	63.00
D-42	Mudstone, phosphatic	JES - 7	1.6	15.6	16.7	2.8	11.1	45.9	10.1	87.96
D-41	Mudstone, phosphatic	JES - 8	1.4	9.2	9.0	3.3	14.2	54.4	11.5	100.84
D-40	Phosphate rock, argillaceous	OAP- 9	0.5	22.1	4.7	2.3	7.5	34.5	12.0	111.89
	Mudstone and phosphate rock	OAP-385	(0.3)	23.8	4.1	1.8	6.9	28.7	--	--
	OAP-385 represents the same bed as OAP-9 but was collected from a more weathered zone.									
D-39	Mudstone	OAP- 10	0.4	3.8	12.2	3.3	16.8	67.0	12.4	113.43
D-38	Phosphate rock, argillaceous	OAP- 11	0.3	18.2	7.0	2.4	14.0	34.4	12.7	118.90

D-37	Mudstone	OAP- 12	0.3	6.7	10.3	3.6	12.8	60.7	13.0	120.4
D-36	Phosphate rock, argillaceous	OAP- 13	1.9	17.6	6.5	2.1	13.2	36.3	14.9	134.5
D-35	Phosphate rock, argillaceous	LAT- 14	0.5	25.8	2.9	1.9	6.8	29.1	15.4	167.4
+-	Phosphate rock, argillaceous	LAT-386	(0.5)	25.4	2.8	1.0	9.3	27.1	—	—

LAT-386 represents the same bed as LAT 14 but was sampled where the unit appeared to contain more argillaceous material.

D-34	Phosphate rock, argillaceous	FSH- 15	0.8	20.2	4.8	1.6	9.0	37.7	16.2	183.1
D-33	Mudstone and phosphate rock	FSH- 16	0.85	20.2	5.8	2.1	10.5	35.6	17.05	200.15
D-32	Mudstone	FSH- 17	0.8	6.4	9.6	2.5	14.1	60.9	17.85	218.00
D-31	Phosphate rock, argillaceous	FSH- 18	0.8	26.0	3.9	1.5	8.9	25.5	18.65	226.80
D-30	Mudstone	FSH- 19	2.7	5.2	10.2	3.2	18.4	60.5	21.35	240.34
D-29	Mudstone	ERC- 20	1.0	1.4	10.7	2.9	20.8	72.7	22.35	241.94
D-28	Mudstone	LAT- 21	2.2	3.5	10.0	3.4	16.4	64.2	24.55	249.64
D-27	Mudstone, calcareous, fos. col. no. 48-KPM-37	LAT- 22	1.5	2.4	9.2	3.7	30.1	53.3	26.05	253.24
D-26	Mudstone	LAT- 23	0.9	4.6	9.8	4.2	30.5	64.2	26.95	254.30
D-25	Mudstone, calcareous	LAT- 24	2.8	1.4	10.9	3.7	21.1	63.2	29.75	258.60
D-24	Mudstone, calcareous	ERC- 25	0.9	4.5	11.1	4.7	20.9	64.3	30.65	262.65
--	Mudstone	ERC-387	(0.85)	2.7	1.1	3.5	22.1	63.4	—	—

ERC-387 represents the same bed as ERC 25 but was sampled where the unit appeared to contain more argillaceous material.

D-23	Mudstone, calcareous	ERC- 26	1.9	1.6	10.6	4.1	30.6	56.7	32.55	265.69
D-22	Mudstone, calcareous	ERC- 27	0.8	2.2	9.0	2.8	26.2	63.6	33.35	267.45
D-21	Mudstone, calcareous	ERC- 28	0.75	3.8	10.0	1.9	30.0	58.0	34.10	270.30
D-20	Phosphate rock, argillaceous, fos. col. no. 48-KPM-36	LAT- 29	1.05	28.2	5.6	2.9	14.3	24.0	35.15	297.31
D-19	Phosphate rock	LAT- 30	0.65	31.9	3.9	1.9	8.1	13.8	35.80	318.34
D-18	Phosphate rock, argillaceous	LAT- 31	1.55	24.0	5.6	1.5	16.8	21.2	37.35	333.74
D-17	Phosphate rock and mudstone	DAB- 32	0.85	21.3	6.8	1.7	20.0	25.7	38.20	342.85
D-16	Phosphate rock and mudstone	DAB- 33	1.33	16.4	6.7	3.7	19.6	35.0	39.53	355.66
D-15	Phosphate rock and mudstone, fos. col. no. 48-KPM-35	DAB- 34	1.16	14.6	7.9	2.6	19.0	39.0	40.69	367.60
D-14	Mudstone, phosphatic	DAB- 35	1.2	14.0	8.8	2.5	22.5	39.1	41.89	379.40
D-13	Mudstone and phosphate rock	DAB- 36	1.2	14.7	8.3	2.2	19.8	39.8	43.09	391.04
D-12	Phosphate rock and mudstone, fos. col. no. 48-KPM-34	DAB- 37	1.7	18.8	6.0	2.0	25.5	23.7	44.79	419.00
D-11	Phosphate rock	DAB- 38	0.54	32.3	2.6	1.0	7.1	11.9	45.53	496.46
D-10	Phosphate rock and mudstone, fos. col. no. 48-KPM-33	DAB- 39	2.2	15.5	7.3	2.9	17.0	40.2	47.53	530.56
D- 9	Mudstone	DAB- 40	0.5	6.5	10.2	3.6	8.0	72.8	48.05	538.79
D- 8	Phosphate rock and mudstone	DAB- 41	2.4	12.3	9.5	2.6	14.2	50.7	50.45	563.31
D- 7	Phosphate rock, argillaceous	DAB- 42	1.3	15.9	10.5	2.7	17.6	37.1	51.73	583.98
D- 6	Mudstone and phosphate rock	DAB- 43	1.75	21.7	6.3	2.5	10.5	32.6	53.48	621.46

1 Fossil collection made by K. P. McLaughlin, 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		
D- 5	Mudstone, phosphatic	ERC- 44	1.5	10.4	9.7	3.8	14.5	56.8	54.98	[illegible]
D- 4	Mudstone	ERC- 45	2.4	6.0	14.1	3.5	16.0	65.7	57.38	[illegible]
D- 3	Mudstone	ERC- 46	0.8	6.6	11.9	4.4	10.4	69.5	58.18	627.24
D- 2	Mudstone and phosphate rock	DAB- 47	1.2	15.0	8.0	7.1	5.6	46.2	59.38	675.24
D- 1	Phosphate rock and mudstone, fos. col. no. 48-KPM-32	DAB- 48	0.5	27.0	2.0	1.7	2.4	28.7	59.88	[illegible]
	C member of Phosphoria formation									
C-14	Sandstone, argillaceous	DAB- 49	2.9	3.4	3.7	2.9	2.5	85.9	2.9	9.86
C-13	Sandstone	ERC- 50	2.3	3.6	3.1	1.7	9.4	68.6	5.2	18.14
--	Sample of mudstone nodules within bed C-13	ERC-388	--	5.1	4.3	2.6	5.7	70.0	--	--
C-12	Sandstone, cherty, fos. col. no. 48-KPM-31	ERC- 51	7.2	3.2	3.0	2.5	1.6	88.4	12.4	41.18
C-11	Chert and sandstone	ERC- 52	5.5	2.7	2.2	2.4	1.1	49.2	17.9	56.03
C-10	Chert and sandstone	LAT- 53	15.0	0.6	2.1	2.4	1.4	94.1	32.9	65.03
C- 9	Chert and sandstone	LAT- 54	20.5	0.9	4.1	2.9	2.3	91.3	53.4	83.48
--	Mudstone	LAT-391	--	1.8	11.0	4.9	9.0	71.4	--	--
--	Mudstone, calcareous	LAT-390	--	2.0	14.3	4.8	11.8	66.9	--	--
--	Mudstone, calcareous	LAT-389	--	5.2	13.5	6.0	12.4	58.2	--	--
	LAT-391, LAT-390, and LAT-389 represent three thin clay layers within bed C-9.									
C- 8	Limestone, argillaceous	LAT- 55	8.4	1.2	2.0	1.9	29.7	32.2	61.8	94.56
C- 7	Sandstone and limestone, cherty	ERC- 56	9.2	0.5	1.3	3.4	16.0	58.8	71.0	98.16
C- 6	Limestone, sandy	ERC- 57	21.0	0.6	1.1	1.1	34.3	23.3	92.0	110.76
C- 5	Limestone, sandy, cherty	ERC- 58	6.8	3.1	3.0	1.8	26.0	35.6	98.8	131.84
C- 4	Sandstone, cherty	DAB- 59	4.9	5.9	1.1	3.7	1.3	78.3	103.7	160.75
--	Sandstone, cherty	DAB-392	--	3.7	0.9	2.8	1.0	90.3	--	--
	DAB-392 was a grab sample of less weathered rock in bed C-4.									
C- 3	Mudstone and chert, fos. col. no. 48-KPM-30	DAB- 60	8.7	0.6	2.5	4.2	1.3	90.7	112.4	165.97
C- 2	Chert and sandstone	DAB- 61	9.6	0.8	2.1	3.9	1.3	91.8	122.0	173.65
C- 1	Chert	LAT- 62	17.0	2.2	2.4	2.9	1.6	89.1	139.0	211.05
	B member of Phosphoria formation									
B- 6	Mudstone, sandy	RLP-393	2.0	2.2	9.5	3.3	4.1	85.0	2.00	4.40
B- 5	Mudstone and phosphate rock	RLP- 63	1.45	14.5	7.2	3.2	4.3	51.2	3.45	25.42
B- 4	Mudstone	RLP-395	5.9	0.7	8.6	2.9	3.6	90.7	9.35	29.56
B- 3	Mudstone, calcareous	RLP-394	0.7	0.8	4.2	3.9	17.2	58.9	10.05	30.12
B- 2	Mudstone	RLP- 64	7.4	0.3	2.8	2.6	1.5	93.0	17.45	32.34
B- 1	Mudstone	LAT- 65	6.5	0.4	2.1	2.5	1.3	89.0	23.95	[illegible]

-	Mudstone, calcareous	LAT-396	(0.2)	0.4	16.3	3.5	14.6	61.2		
	LAT-396 represents a 0.2 foot layer containing quartz crystals in bed B-1.									
	A member of Phosphoria formation									
A-2	Mudstone, calcareous	DAB-66	6.7	0.3	4.6	2.3	17.9	60.7	[illegible]	[illegible]
A-1	Limestone, argillaceous; fos. col. nos. 48-KPM-27 and 48-KPM-28	DAB-67	10.5	0.3	3.1	2.3	24.9	47.5	[illegible]	[illegible]
	Quadrant formation									
Cq-1	Sandstone	DAB-68	-	0.1	2.5	2.0	1.8	18.5		

SPECTROGRAPHIC ANALYSES—SHEEP CREEK, MONTANA. LOT NO. 124.

Semi-quantitative analyses of samples of the Phosphoria formation, Sheep Creek, Montana (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, Ba, Be, Bi, Cd, Ga, Ge, Au, In, Li, Hg, Pt, Te, Sn, and W were looked for in all samples 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	B	Ca	Cr	Co	Cb	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Si	Ag	Na	Sr	Ti	V	Zn	Zr
[illegible]	DAB- 80	C	F	A	ND	ND	ND	G	C	ND	C	E	F	F	A	ND	E	ND	E	E	E	E
[illegible]	DAB- 79	C	F	C	ND	ND	ND	G	C	ND	D	E	F	F	A	ND	E	ND	E	E	E	E
[illegible]	LAT- 78	C	E	C	E	ND	ND	G	B	ND	D	E	F	F	A	ND	E	F	E	E	ND	E
[illegible]	LAT- 77	C	E	C	E	ND	ND	G	B	ND	D	E	F	F	A	ND	E	F	E	E	ND	E
[illegible]	LAT- 76	D	E	C	E	ND	ND	G	B	ND	D	E	F	F	A	ND	E	F	E	E	ND	E
[illegible]	ERC- 75	C	F	C	E	ND	ND	G	C	ND	D	E	F	E	A	ND	F	ND	E	E	E	E
[illegible]	ERC- 74	C	F	C	E	ND	ND	G	C	ND	D	E	F	E	A	ND	E	ND	E	E	E	E
[illegible]	ERC- 73	C	F	C	E	ND	ND	G	C	ND	D	E	F	E	A	ND	E	ND	E	E	E	E
[illegible]	DAB- 72	C	F	C	E	ND	ND	G	C	ND	D	E	F	E	A	ND	E	ND	E	E	E	E
[illegible]	DAB- 71	C	F	C	E	ND	ND	G	C	ND	D	E	F	E	A	ND	E	ND	E	E	E	E
[illegible]	DAB- 70	C	F	C	E	ND	ND	G	C	ND	D	E	F	E	A	ND	E	ND	E	E	E	E
[illegible]	DAB- 69	C	F	A	E	ND	ND	G	C	ND	D	E	F	F	A	ND	E	ND	E	E	E	E
D-18	VEM- 1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
D-17	VEM- 2	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
D-16	VEM- 3	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
D-15	VEM- 4	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
D-14	JES - 5	C	F	D	D	ND	ND	G	C	ND	D	E	E	E	A	F	E	ND	E	D	E	E
D-13	JES - 6	C	F	D	D	ND	ND	G	C	ND	D	E	E	E	A	F	E	ND	E	D	E	E
D-12	JES - 7	C	F	A	D	ND	ND	G	C	ND	D	E	E	E	A	F	E	ND	E	D	E	E
D-11	JES - 8	C	F	A	D	ND	ND	G	C	ND	D	E	E	E	A	F	E	ND	E	D	E	E
D-10	OAP- 9	C	F	A	D	ND	ND	G	C	ND	D	E	E	E	A	G	E	ND	E	D	E	E
[illegible]	OAP-385	B	F	A	E	ND	ND	G	C	ND	D	E	E	E	A	G	E	ND	E	D	E	E
D-9	OAP- 10	B	E	C	E	ND	ND	G	B	ND	C	E	E	E	A	G	E	F	D	D	E	E
D-8	OAP- 11	B	E	C	E	ND	ND	G	B	ND	C	E	E	E	A	G	E	F	D	D	E	E
D-7	OAP- 12	C	E	C	E	ND	ND	G	C	ND	D	E	E	E	A	G	E	F	D	D	E	E
D-6	OAP- 13	B	F	A	D	ND	ND	G	C	ND	D	E	E	E	A	F	E	ND	D	D	E	E
D-5	LAT- 14	C	F	A	D	ND	ND	G	C	ND	D	E	E	E	A	F	E	ND	E	D	E	E

| | | |

Bed no.	Sample no.	Al	B	Ca	Cr	Co	Cb	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Si	Ag	Na	Sr	Ti	V	Zn	Zr
—	LAT-390	B	F	C	E	F	E	G	A	ND	C	D	F	D	A	G	E	F	D	E	D	E
—	LAT-389	B	F	C	E	E	E	G	A	ND	C	D	F	D	A	G	E	F	D	E	D	E
C 5	LAT- 55	B	F	A	E	ND	ND	G	C	ND	A	E	F	E	A	G	E	F	E	E	E	E
C 7	ERC- 56	C	F	B	E	ND	ND	G	C	ND	C	E	F	E	A	ND	E	ND	E	E	E	E
C 6	ERC- 57	C	F	A	E	ND	ND	G	C	ND	B	E	F	E	A	ND	E	ND	E	E	E	E
C 5	ERC- 58	C	F	A	E	ND	ND	G	C	ND	B	E	F	E	A	ND	E	ND	E	E	E	E
C 4	DAB- 59	C	F	B	E	ND	ND	G	C	ND	D	E	F	E	A	G	E	ND	E	E	E	E
—	DAB-392	C	F	C	ND	ND	ND	G	C	ND	D	E	F	E	A	ND	E	ND	E	E	E	E
C 3	DAB- 60	C	F	C	E	ND	ND	G	C	ND	D	E	F	E	A	G	E	ND	E	E	E	E
C 2	DAB- 61	C	F	C	E	ND	ND	G	C	ND	D	E	F	E	A	G	E	ND	E	E	E	E
C 1	LAT- 62	C	F	C	E	ND	ND	G	B	E	E	E	F	E	A	G	E	E	E	E	E	E
B 6	RLP-393	B	F	C	E	F	E	G	B	E	D	E	F	E	A	F	E	F	E	E	E	E
B 5	RLP- 63	B	F	A	E	ND	ND	G	C	D	D	E	F	E	A	F	E	F	E	E	E	E
B 4	RLP-395	B	F	A	E	F	ND	G	B	ND	D	E	F	E	A	G	E	F	E	E	E	E
B 3	RLP-394	B	F	D	E	F	ND	G	B	ND	D	E	F	E	A	G	E	F	E	E	D	E
B 2	RLP- 64	C	F	D	E	ND	ND	G	B	ND	D	E	F	E	A	G	E	F	E	E	E	E
B 1	LAT- 65	B	E	D	F	F	ND	G	B	ND	D	E	F	E	A	G	E	F	D	E	D	E
—	LAT-396	B	F	C	F	F	E	G	A	ND	C	D	F	E	A	G	E	F	E	E	D	E
A 2	DAB- 66	C	F	A	E	ND	ND	G	C	ND	C	E	F	F	A	ND	E	ND	E	E	E	E
A 1	DAB- 67	C	F	A	E	ND	ND	G	C	ND	C	E	F	F	A	ND	E	ND	E	E	E	E
C 1	DAB- 68	C	F	C	E	ND	ND	G	C	ND	D	E	F	F	A	ND	E	ND	E	E	E	E

OIL SHALE ANALYSES—SHEEP CREEK, MONTANA. LOT NO. 1234.

Oil-shale analyses of samples of the D member of the Phosphoria formation, Sheep Creek, Montana (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 Petroleum and Oil-Shale Experiment Station, Laramie, Wyoming, by the modified Fischer Retort method. None of the samples showed a tendency to coke.

Bed no.	Sample no.	Yield of products						Specific gravity of oil at 60°/60°F.	Properties of spent shale Percent of original shale	
		Weight (percent)				Gallons per ton				
		Oil	Water	Spent shale	Gas+loss	Oil	Water		Loss on ignition	Ash
D-48	VEM- 1	--	3.8	95.1	1.1	--	9.1	--	[illegible]	91.5
D-47	VEM- 2	--	4.2	94.0	1.8	--	10.1	--	[illegible]	89.7
D-46	VEM- 3	--	4.6	93.2	2.2	--	11.0	--	4.2	89.0
D-45	VEM- 4	--	4.0	94.4	1.6	--	9.6	--	4.9	89.6
D-44	JES- 5	--	6.5	91.3	2.2	--	15.6	--	5.3	86.0
D-43	JES- 6	--	4.8	93.3	1.9	--	11.5	--	5.5	87.[illegible]
D-42	JES- 7	--	5.4	92.9	1.7	--	12.9	--	5.0	87.9
D-41	JES- 8	0.5	5.8	91.6	2.1	1.3[1]	13.9	--	[illegible]	[illegible]
D-40	OAP- 9	--	3.5	95.7	0.8	--	8.4	--	[illegible]	[illegible]
--	OAP-385	--	3.2	95.7	1.1	--	7.7	--	[illegible]	[illegible]
D-39	OAP- 10	1.0	6.4	90.1	2.5	2.6[1]	15.3	--	7.5	82.[illegible]
D-38	OAP- 11	0.7	5.0	91.7	2.6	1.8[1]	12.0	--	6.4	85.[illegible]
D-37	OAP- 12	--	6.2	91.9	1.9	--	14.9	--	6.2	85.[illegible]
D-36	OAP- 13	--	5.2	92.5	2.3	--	12.5	--	6.3	86.2
D-35	LAT- 14	--	3.1	96.1	0.8	--	7.4	--	4.8	91.3
--	LAT-386	0.4	3.4	94.8	1.4	0.9[1]	8.[illegible]	--	4.7	90.1
D-34	FSH- 15	--	3.8	94.1	2.1	--	9.1	--	4.1	89.8
D-33	FSH- 16	--	4.5	93.9	1.6	--	10.8	--	4.1	89.8
D-32	FSH- 17	--	5.5	92.1	2.4	--	13.2	--	6.4	85.7
D-31	FSH- 18	--	3.4	95.1	1.5	--	8.1	--	4.2	90.9
D-30	FSH- 19	--	7.5	89.4	3.1	--	18.0	--	7.9	81.5
D-29	FSH- 20	2.9	5.6	88.9	2.6	7.0	13.4	0.986	9.9	79.0
D-28	ERC- 21	--	7.0	89.6	3.4	--	16.8	--	7.8	81.8
D-27	LAT- 22	8.2	5.2	82.7	3.9	20.0	12.5	0.989	12.5	70.2
D-26	LAT- 23	7.8	6.0	82.9	3.3	18.8	14.4	0.990	14.8	68.1
D-25	LAT- 24	5.3	4.4	87.8	2.5	12.8	10.5	0.990	10.1	77.7
D-24	ERC- 25	1.9	7.7	87.3	3.1	4.7[1]	18.6	--	10.4	76.9
--	ERC-387	2.6	6.5	85.7	5.2	6.6[1]	15.6	--	10.7	75.0
D-23	ERC- 26	9.7	4.3	82.7	3.3	23.6	10.3	0.989	14.2	68.5
D-22	ERC- 27	3.2	7.2	85.8	3.8	7.8	17.3	0.990	11.9	73.9

[1] Estimated.

Bed no.	Sample no.	Yield of products						Specific gravity of oil at 60°/60° F.	Properties of spent shale, Percent of original shale	
		Weight (percent)				Gallons per ton				
		Oil	Water	Spent shale	Gas + loss	Oil	Water		Loss on ignition	Ash
D-21	ERC- 28	7.8	5.6	81.3	5.3	18.9	13.4	0.991	13.0	68.3
D-20	LAT- 29	--	7.5	91.1	1.4	--	18.0	--	6.1	85.0
D-19	LAT- 30	--	4.2	94.4	1.4	--	10.2	--	6.0	88.4
D-18	LAT- 31	1.9	5.3	89.8	3.0	4.8[1]	12.7	--	8.0	81.8
D-17	DAB- 32	3.2	5.0	89.0	2.8	7.6	12.0	1.002	7.8	81.2
D-16	DAB- 33	3.3	5.0	88.8	2.9	8.4[1]	12.0	--	9.2	79.6
D-15	DAB- 34	3.7	4.8	88.8	2.7	8.9	11.5	0.994	9.0	79.8
D-14	ERC- 35	4.3	4.6	87.0	3.1	10.4	13.4	0.990	9.4	77.6
D-13	ERC- 36	3.7	5.2	87.7	3.4	8.9	12.5	0.986	9.8	77.9
D-12	ERC- 37	5.5	5.0	86.6	2.9	13.4	12.0	0.990	9.0	77.6
D-11	DAB- 38	--	3.0	96.7	0.3	--	7.2	--	3.4	93.3
D-10	DAB- 39	2.5	5.4	89.9	2.2	6.4[1]	12.9	--	8.0	81.9
D- 9	DAB- 40	0.8	5.7	92.6	0.9	1.9[1]	13.7	--	3.4	89.2
D- 8	DAB- 41	--	4.8	94.8	0.4	--	11.4	--	6.4	88.4
D- 7	DAB- 42	--	8.5	91.1	0.4	--	20.4	--	7.2	85.9
D- 6	DAB- 43	--	5.5	93.1	1.4	--	13.2	--	5.1	88.0
D- 5	ERC- 44	--	7.5	89.7	2.8	--	18.0	--	8.0	81.7
D- 4	ERC- 45	--	8.0	88.8	3.2	--	19.2	--	7.6	81.2
D- 3	ERC- 46	--	5.5	94.2	0.3	--	13.2	--	3.8	90.4
D- 2	DAB- 47	--	3.2	96.5	0.3	--	7.7	--	2.2	94.3
D- 1	DAB- 48	--	1.5	98.5	0.0	--	3.6	--	1.6	96.9

[1] Estimated

CEDAR CREEK, MONTANA. LOT NO. 1256.

D member of Phosphoria formation sampled in bulldozer trench near Cedar Creek, sec. 26, T. 9 S., R. 11 W., Beaverhead County, Montana, on eastern limb of a syncline. Beds strike north and dip 61° W. Section measured by E. T. Ruppel and sampled by J. A. Kelleher in August 1948. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness × percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
	E member of Phosphoria formation—basal bed only						
E-1	Chert	ETR-585	5.0	4.3	78.5	5.0	11.50
	D member of Phosphoria formation—base not exposed						
D-43	Mudstone	ETR-584	11.5	1.0	74.0	11.5	11.50
D-42	Mudstone	ETR-583	10.0	1.1	82.3	21.5	22.50
D-41	Phosphate rock, cherty, calcareous	ETR-582	0.8	15.4	41.2	22.3	34.82
D-40	Limestone, phosphatic, argillaceous	ETR-581	0.3	11.4	22.7	22.6	38.24
D-39	Mudstone	ETR-580	1.5	4.6	62.6	24.1	45.14
D-38	Mudstone, calcareous, phosphatic	ETR-579	0.9	9.2	42.2	24.4	47.50
D-37	Mudstone	ETR-578	3.0	2.0	77.6	27.4	53.90
D-36	Mudstone and calcareous phosphate rock	ETR-577	1.0	9.6	51.0	28.4	63.50
D-35	Mudstone, calcareous and phosphate rock	ETR-576	0.7	6.3	42.8	29.1	67.91
D-34	Limestone	ETR-575	1.2	3.8	48.4	30.3	72.47
D-33	Mudstone, calcareous	ETR-574	1.2	7.8	42.7	31.5	81.87
D-32	Phosphate rock, calcareous	ETR-573	1.0	17.4	19.6	32.5	96.59
D-31	Phosphate rock, calcareous	ETR-572	0.8	24.0	2.6	33.3	115.79
D-30	Mudstone	ETR-571	0.9	1.4	62.0	34.2	116.05
D-29	Phosphate rock, argillaceous	ETR-570	0.15	10.9	33.5	34.35	117.49
D-28	Phosphate rock, fos. col. no. 48-KPM-48*	ETR-569	0.77	32.6	25.0	35.05	140.31
D-27	Phosphate rock, argillaceous	ETR-568	0.3	25.4	26.8	35.35	147.36
D-26	Mudstone	ETR-567	0.7	5.7	64.7	36.05	151.35
D-25	Phosphate rock, argillaceous	ETR-566	0.8	20.9	33.0	36.15	153.44
D-24	Phosphate rock, argillaceous	ETR-565	0.3	17.5	55.8	36.45	158.69
D-23	Phosphate rock, argillaceous	ETR-564	0.4	22.4	24.1	36.85	167.53
D-22	Limestone, argillaceous	ETR-563	0.5	3.5	39.1	37.35	169.28
D-21	Mudstone, calcareous, phosphatic	ETR-562	0.3	9.8	41.4	37.65	174.18
D-20	Mudstone, phosphatic	ETR-561	0.4	8.9	58.9	38.25	177.74
D-19	Phosphate rock and calcareous mudstone, fos. col. no. 48-KPM-47	ETR-560	0.5	24.8	20.5	38.75	190.14
D-18	Phosphate rock, argillaceous	ETR-559	0.6	22.8	24.0	39.35	203.82

* Fossil collection made by K. P. McLaughlin, 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	Acid insoluble		
D-17	Phosphate rock, argillaceous, and calcareous mudstone	ETR-558	0.9	20.3	26.6	40.25	222.09
D-16	Mudstone, phosphatic	ETR-557	0.25	10.1	55.0	40.50	224.61
D-15	Mudstone, calcareous	ETR-556	0.9	2.9	58.9	41.40	227.22
D-14	Phosphate rock, calcareous; fos. col. no. 48-KPM-46	ETR-555	0.3	25.1	17.6	41.70	234.75
D-13	Mudstone, phosphatic	ETR-554	0.3	9.9	56.4	42.00	237.72
D-12	Mudstone, phosphatic	ETR-553	0.6	12.4	52.1	42.60	245.16
D-11	Phosphate rock and limestone	ETR-552	0.9	16.8	3.8	43.50	260.28
D-10	Phosphate rock, calcareous	ETR-551	0.4	20.8	17.7	43.90	268.60
D- 9	Mudstone, phosphatic	ETR-550	0.25	14.1	16.8	44.15	272.12
D- 8	Phosphate rock, argillaceous	ETR-549	0.33	19.7	30.2	44.48	278.62
D- 7	Phosphate rock, argillaceous	ETR-548	0.2	21.5	30.6	44.68	282.92
D- 6	Mudstone, calcareous	ETR-547	0.6	6.6	49.6	45.28	286.88
D- 5	Mudstone	ETR-546	0.5	1.7	79.4	45.78	287.73
D- 4	Mudstone, calcareous	ETR-545	0.6	6.7	62.0	46.38	291.75
D- 3	Phosphate rock and mudstone	ETR-544	1.1	16.5	40.3	47.48	309.90
D- 2	Mudstone, phosphatic	ETR-543	0.35	8.2	51.1	47.83	312.77
D- 1	Phosphate rock, sandy; fos. col. no. 48-KPM-44	ETR-542	3.0	26.3	28.6	50.83	291.67

Stratigraphic interval of 286 feet between D-1 and approximate base of C member, includes few exposures of chert and limestone or dolomite.

Stratigraphic interval of 123 feet between approximate base of C member and approximate top of Quadrant sandstone, strata concealed.

SAWTOOTH PEAK, MONTANA. LOT NO. 124.

C and E members and part of A member of Phosphoria formation measured in natural exposures, and B and D members sampled from hand trenches on Sawtooth Peak, NE¼SW¼ sec. 10, T. 12 S., R. 5 W., Beaverhead County, Montana, on overturned east limb of Snowcrest anticline. Beds at top of section strike N. 5° W. and dip 75° W. Beds at base of section strike N. 40° E. and dip 64° SE. Section measured by F. S. Honkala and O. A. Payne and sampled by Payne in August 1948. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
	Dinwoody formation						
Rd-2	Not described; fos. col. no. 48-KPM-77	--	--	--	--	--	--
Rd-1	Mudstone, quartzitic	--	5.0	--	--	5.0	--
	E member of Phosphoria formation						
E-15	Quartzite	--	2.4	--	--	2.4	--
E-14	Sandstone	--	4.3	--	--	6.7	--
E-13	Quartzite	--	5.0	--	--	11.7	--
E-12	Quartzite	--	5.0	--	--	16.7	--
E-11	Sandstone	--	2.8	--	--	19.5	--
E-10	Sandstone	--	5.0	--	--	24.5	--
E- 9	Sandstone	--	5.0	--	--	29.5	--
E- 8	Quartzite	--	3.4	--	--	32.9	--
E- 7	Quartzite	--	5.0	--	--	37.9	--
E- 6	Quartzite	--	5.0	--	--	42.9	--
E- 5	Sandstone, quartzitic	--	5.0	--	--	47.9	--
E- 4	Quartzite	--	3.8	--	--	51.7	--
E- 3	Sandstone, quartzitic	--	5.0	--	--	57.7	--
E- 2	Sandstone, quartzitic	--	5.0	--	--	61.7	--
E- 1	Conglomerate and quartzite	--	5.0	--	--	66.7	--
	D member of Phosphoria formation						
D-14	Phosphate rock and quartzite	FSH-438	3.5	7.4	27.7	3.5	25.90
D-13	Phosphate rock and mudstone	FSH-437	2.8	14.7	51.7	6.3	67.06
D-12	Mudstone	FSH-436	4.6	4.7	63.1	10.9	88.68
D-11	Phosphate rock and mudstone	FSH-435	2.5	20.9	27.5	13.4	140.93
D-10	Mudstone, phosphatic, calcareous	FSH-434	5.0	7.9	50.7	18.4	180.43
D- 9	Mudstone and phosphate rock, argillaceous, calcareous	FSH-433	5.0	16.3	33.8	23.4	261.93

[1] Fossil collection made by K. P. McLaughlin, Paleontology and Stratigraphy Branch, U. S. Geological Survey, from bed 16.3 feet above base of formation.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
D- 8	Phosphate rock and mudstone	FSH-432	2.3	16.9	35.4	25.7	300.80
D- 7	Limestone; fos. col. no. 48-KPM-76	FSH-431	2.9	6.9	18.7	28.6	320.81
D- 6	Mudstone	FSH-430	3.2	0.2	85.7	31.8	321.45
D- 5	Mudstone	FSH-429	5.0	0.3	84.9	36.8	322.95
D- 4	Mudstone	FSH-428	5.0	0.4	83.7	41.8	324.95
D- 3	Mudstone	FSH-427	5.0	0.3	87.3	46.8	326.45
D- 2	Mudstone	FSH-426	5.0	0.4	83.5	51.8	328.45
D- 1	Mudstone	FSH-425	5.0	0.2	86.3	56.8	329.45
	C member of Phosphoria formation						
C-60	Chert	---	2.3	---	---	2.3	---
C-59	Sandstone	---	4.3	---	---	6.6	---
C-58	Sandstone	---	5.0	---	---	11.6	---
C-57	Sandstone	---	2.0	---	---	13.6	---
C-56	Sandstone	FSH-424	1.8	3.6	86.7	15.4	---
C-55	Sandstone, quartzitic	---	3.3	---	---	18.7	---
C-54	Quartzite	---	3.2	---	---	21.9	---
C-53	Chert and mudstone	---	2.7	---	---	24.6	---
C-52	Conglomerate, cherty	---	0.6	---	---	25.2	---
C-51	Chert	---	4.0	---	---	29.2	---
---	Covered interval; float strongly suggests limestone	---	11.0	---	---	40.2	---
C-50	Limestone	---	5.0	---	---	45.2	---
C-49	Limestone	---	5.0	---	---	50.2	---
C-48	Limestone	---	5.0	---	---	55.2	---
C-47	Limestone	---	5.0	---	---	60.2	---
C-46	Limestone	---	2.5	---	---	62.7	---
C-45	Limestone	---	5.0	---	---	67.7	---
C-44	Limestone	---	2.6	---	---	70.3	---
C-43	Limestone; fos. col. no. 48-KPM-75	---	5.0	---	---	75.3	---
C-42	Limestone	---	5.0	---	---	80.3	---
C-41	Limestone	---	5.0	---	---	85.3	---
C-40	Limestone	---	5.0	---	---	90.3	---
C-39	Limestone and dolomite	---	5.0	---	---	95.3	---
C-38	Chert	---	1.1	---	---	96.4	---
C-37	Dolomite	---	3.5	---	---	99.9	---
C-36	Dolomite	---	5.0	---	---	104.9	---
C-35	Dolomite	---	5.0	---	---	109.9	---

C-34	Dolomite			1.6			111.5	
C-33	Limestone, fos, col. no. 48-KPM-74			4.2			115.7	
C-32	Limestone and chert			5.0			120.7	
C-31	Limestone and chert			5.0			125.7	
C-30	Limestone and chert			5.0			130.7	
C-29	Limestone			3.0			133.7	
C-28	Limestone			5.0			138.7	
C-27	Limestone			5.0			143.7	
C-26	Limestone			5.0			148.7	
C-25	Limestone			5.0			153.7	
C-24	Limestone			5.0			158.7	
C-23	Limestone, sandy			5.0			163.7	
C-22	Limestone, sandy			3.4			167.1	
C-21	Limestone, dolomitic, sandy?			3.7			170.8	
C-20	Chert			3.5			174.3	
C-19	Sandstone, calcareous			1.4			175.7	
C-18	Chert, sandy, calcareous			1.8			177.5	
C-17	Chert, sandy			4.4			181.9	
C-16	Chert, sandy			5.0			186.9	
C-15	Chert, sandy			5.0			191.9	
C-14	Chert, sandy			5.0			196.9	
C-13	Chert, sandy			5.0			201.9	
C-12	Chert, sandy			5.0			206.9	
C-11	Chert, sandy			5.0			211.9	
C-10	Chert, sandy			5.0			216.9	
C- 9	Chert			5.0			221.9	
C- 8	Chert			4.8			226.7	
C- 7	Sandstone and chert			4.0			230.7	
C- 6	Chert			3.8			234.5	
C- 5	Chert			5.0			239.5	
C- 4	Chert			5.0			244.5	
C- 3	Chert			5.0			249.5	
C- 2	Chert			5.0			254.5	
C- 1	Chert, argillaceous			5.0			259.5	
	B member of Phosphoria formation							
B- 6	Mudstone and phosphate rock	FSH-423	3.1	4.0	80.8	3.1	12.40	
B- 5	Mudstone and phosphate rock	FSH-422	3.6	5.2	73.6	6.7	31.12	
B- 4	Mudstone	FSH-421	2.8	7.0	60.1	9.5	50.72	
B- 3	Phosphate rock	FSH-420	2.7	27.6	12.7	12.2	125.24	
B- 2	Limestone, phosphatic, sandy; fos. col. no. 48-KPM-73	FSH-419	1.2	10.2	24.0	13.4	137.48	
B- 1	Phosphate rock, sandy; fos. col. no. 48-KPM-72	FSH-418	2.8	7.5	30.3	16.2	207.28	

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness, percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
	A member of Phosphoria formation—base not exposed						
A-16	Chert	--	1.8	--	--	1.8	--
A-15	Dolomite, argillaceous, [illegible] col. no. 48-KPM-71	--	4.2	--	--	6.0	--
A-14	Mudstone and sandstone, calcareous	--	4.6	--	--	10.6	--
A-13	Sandstone, calcareous, argillaceous	--	2.6	--	--	13.2	--
A-12	Sandstone, calcareous, argillaceous	--	5.0	--	--	18.2	--
A-11	Sandstone, calcareous	--	5.0	--	--	23.2	--
A-10	Sandstone, calcareous	--	5.0	--	--	28.2	--
A- 9	Sandstone, calcareous	--	5.0	--	--	33.2	--
A- 8	Sandstone, calcareous	--	5.0	--	--	38.2	--
A- 7	Sandstone, calcareous, argillaceous	--	3.7	--	--	41.9	--
A- 6	Dolomite, argillaceous	--	5.0	--	--	46.9	--
A- 5	Dolomite, argillaceous	--	5.0	--	--	51.9	--
A- 4	Dolomite, sandy	--	5.0	--	--	56.9	--
A- 3	Dolomite, sandy	--	5.0	--	--	61.9	--
A- 2	Dolomite, sandy	--	5.0	--	--	66.9	--
A- 1	Dolomite, sandy	--	5.0	--	--	71.9	--

HIDDEN PASTURE CREEK, MUDDY CREEK, AND BIG SHEEP CANYON, MONTANA. LOT NOS. 1224, 1225, 1226 and 1227.

Phosphoria formation sampled in hand trenches and natural exposures on east limb of Dixon Mountain syncline; D and E members, lot no. 1224, sampled in NE¼SW¼ sec. 26, B and C members, lot no. 1225, in SE¼SW¼ sec. 35, and upper part of A member, lot no. 1226, in NE¼NW¼ sec. 35, T. 13 S., R. 10 W., lower part of A member, lot no. 1227, sampled in NW¼NW¼ sec. 11, T. 14 S., R. 10 W., Beaverhead County, Montana. Beds strike northwest and dip 30-40° SW. Section measured by W. R. Lowell and sampled by D. A. Bostwick, E. T. Ruppel, and R. L. Parker in August 1947. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

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	V_2O_5	F	Loss on ignition	Acid insoluble		
	Dinwoody formation—not measured											
	E member of Phosphoria formation, lot no. 1224											
E-34	Mudstone	—	25.0	--	--	--	--	--	--	--	25.0	--
E-33	Mudstone, cherty	WRL-222-47	3.5	1.5	--	--	--	--	--	78.9	28.5	--
E-32	Mudstone, cherty	WRL-221-47	4.0	1.3	--	--	--	--	--	71.7	32.5	10.45
E-31	Mudstone, cherty	WRL-220-47	5.0	1.5	--	--	--	--	--	74.6	37.5	14.95
E-30	Mudstone, cherty	WRL-219-47	4.2	1.8	--	--	--	--	--	74.6	41.7	21.51
E-29	Mudstone, cherty	WRL-218-47	4.2	1.2	--	--	--	--	--	75.5	45.9	29.55
E-28	Mudstone, calcareous	WRL-217-47	0.8	0.9	--	--	--	--	--	66.6	46.7	30.27
E-27	Mudstone, calcareous	WRL-216-47	1.3	1.9	--	--	--	--	--	75.3	48.0	32.74
E-26	Quartzite	WRL-215-47	4.6	1.2	--	--	--	--	--	76.1	52.6	38.26
E-25	Chert	WRL-214-47	5.0	0.6	--	--	--	--	--	80.9	57.6	41.26
E-24	Chert	WRL-213-47	5.0	1.0	--	--	--	--	--	80.3	62.6	46.26
E-23	Chert and mudstone	WRL-212-47	4.7	1.2	--	--	--	--	--	80.3	67.3	51.90
E-22	Chert	WRL-211-47	5.0	1.2	--	--	--	--	--	78.9	72.3	57.40
E-21	Chert	WRL-210-47	1.7	1.4	--	--	--	--	--	85.0	74.0	61.78
E-20	Chert	WRL-209-47	4.4	2.2	--	--	--	--	--	77.8	78.4	71.46
E-19	Limestone	WRL-208-47	0.8	0.5	--	--	--	--	--	3.0	79.2	71.86
E-18	Chert	WRL-207-47	4.9	1.3	--	--	--	--	--	74.3	84.1	78.23
E-17	Chert	WRL-206-47	4.5	1.6	--	--	--	--	--	75.5	88.6	85.43
E-16	Chert	WRL-205-47	1.9	1.1	--	--	--	--	--	85.7	90.5	87.90
E-15	Limestone	WRL-204-47	1.0	0.5	--	--	--	--	--	1.4	91.5	88.40
E-14	Chert	WRL-203-47	2.2	1.5	--	--	--	--	--	76.4	93.7	91.70
E-13	Chert	WRL-202-47	5.0	1.4	--	--	--	--	--	78.7	98.7	98.70
E-12	Chert	WRL-201-47	2.2	1.5	--	--	--	--	--	76.7	100.9	102.00
E-11	Chert and limestone	WRL-200-47	2.5	0.9	--	--	--	--	--	75.5	103.4	104.25
E-10	Chert	WRL-199-47	2.7	1.4	--	--	--	--	--	80.4	106.1	108.03
E-9	Mudstone	WRL-107-47	5.0	1.2	--	--	--	--	--	78.4	111.1	114.03
E-8	Chert	WRL-106-47	5.0	1.6	--	--	--	--	--	8.9	116.1	122.03
E-7	Mudstone	WRL-105-47	5.0	1.6	--	--	--	--	--	80.2	121.1	130.03
E-6	Mudstone	WRL-104-47	5.0	1.3	--	--	--	--	--	77.4	126.1	136.53
E-5	Mudstone	WRL-103-47	5.0	1.3	--	--	--	--	--	80.3	131.1	143.03

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	V_2O_5	F	Loss on ignition	Acid insoluble		
E-4	Mudstone	WRL-102-47	5.0	1.3	--	--	--	--	--	79.4	136.1	149.53
E-3	Mudstone	WRL-101-47	4.2	1.4	--	--	--	--	--	82.6	140.3	155.41
E-2	Mudstone	WRL-100-47	5.0	1.3	--	--	--	--	--	81.1	145.3	161.91
E-1	Mudstone	WRL- 99-47	3.3	3.5	--	--	--	--	--	68.1	148.6	173.46
	D member of Phosphoria formation, lot no. 1224											
D-51	Mudstone	WRL- 98-47	5.0	5.8	--	--	--	0.47	--	50.3	5.0	19.00
D-50	Mudstone	WRL- 97-47	5.0	5.6	--	--	--	--	--	50.5	10.0	47.00
D-49	Mudstone	WRL- 96-47	5.0	7.8	--	--	--	--	--	46.3	15.0	86.00
D-48	Limestone, argillaceous	WRL- 95-47	1.3	6.8	--	--	--	--	--	40.8	16.3	104.84
D-47	Limestone	WRL- 94-47	4.1	1.8	--	--	--	--	--	19.2	20.4	112.22
D-46	Limestone, argillaceous	WRL- 93-47	5.0	5.7	--	--	--	--	--	36.7	25.4	140.72
D-45	Limestone, argillaceous	WRL- 92-47	1.2	6.8	--	--	--	--	--	38.1	26.6	148.88
D-44	Phosphate rock	WRL- 91-47	2.5	26.8	--	--	--	2.7%	--	12.3	29.1	215.88
D-43	Mudstone, calcareous and phosphate rock	WRL- 90-47	0.7	8.8	--	--	--	--	--	49.4	29.8	222.04
D-42	Phosphate rock, calcareous	WRL- 89-47	1.5	22.5	--	--	--	--	--	41.7	31.3	255.79
D-41	Mudstone	WRL- 88-47	3.0	6.9	--	--	--	--	--	56.9	34.3	276.49
D-40	Phosphate rock, calcareous, argillaceous	WRL- 87-47	2.3	16.7	--	--	--	--	--	23.7	36.6	314.90
D-39	Phosphate rock and argillaceous limestone	WRL- 86-47	1.1	21.7	--	--	--	--	--	13.5	37.7	338.77
D-38	Limestone, phosphatic, argillaceous	WRL- 85-47	0.6	12.9	--	--	--	--	--	32.3	38.3	346.51
D-37	Dolomite, argillaceous	WRL- 84-47	0.7	5.4	--	--	--	--	--	34.1	39.0	350.29
D-36	Phosphate rock, argillaceous, calcareous	WRL- 83-47	1.7	13.8	--	--	--	--	--	33.2	40.7	373.75
D-35	Limestone, argillaceous	WRL- 82-47	0.5	5.1	--	--	--	0.47	--	39.0	41.2	376.30
D-34	Phosphate rock, argillaceous and limestone	WRL- 81-47	2.9	14.9	--	--	--	1.35	--	33.7	44.1	419.31
D-33	Limestone, argillaceous	WRL- 80-47	2.9	4.9	--	--	--	--	--	26.3	47.0	433.72
D-32	Mudstone, calcareous, phosphatic	WRL- 79-47	1.3	8.5	--	--	--	--	--	41.9	48.3	444.77
D-31	Limestone and phosphate rock	WRL- 78-47	1.8	5.3	--	--	--	0.75	--	15.2	50.1	454.31
D-30	Mudstone, calcareous, phosphatic	WRL- 77-47	1.2	9.1	--	--	--	--	--	46.0	51.3	465.23
D-29	Limestone	WRL- 76-47	1.6	6.6	--	--	--	--	--	18.3	52.9	475.79
D-28	Mudstone, calcareous, phosphatic	WRL- 75-47	0.6	10.0	--	--	--	--	--	42.6	53.5	481.79
D-27	Limestone	WRL- 74-47	0.7	3.8	--	--	--	--	--	15.2	54.2	484.45
D-26	Mudstone, calcareous, phosphatic	WRL- 73-47	1.4	9.2	--	--	--	--	--	46.1	55.6	497.33
D-25	Limestone, argillaceous	WRL- 72-47	1.2	4.0	--	--	--	--	--	22.6	56.8	502.13

D-24	Mudstone, calcareous	WRL- 71-47	0.6	7.1	--	--	--	--	--	30.6	57.4	506.39
D-23	Phosphate rock, argillaceous, calcareous	WRL- 70-47	1.5	18.0	--	--	--	--	--	26.5	58.9	533.19
D-22	Mudstone, phosphatic, calcareous	WRL- 69-47	0.7	12.2	--	--	--	--	--	41.2	59.6	541.93
D-21	Mudstone, calcareous	WRL- 68-47	1.7	3.3	--	--	--	--	--	64.8	61.3	547.54
D-20	Mudstone, phosphatic, calcareous	WRL- 67-47	0.3	12.7	--	--	--	--	--	40.0	61.6	551.19
D-19	Mudstone	WRL- 66-47	0.8	3.4	--	--	--	--	--	69.7	62.4	554.07
D-18	Mudstone and phosphate rock	WRL- 65-47	1.3	5.2	--	--	--	--	--	61.8	63.7	560.83
D-17	Phosphate rock, argillaceous, calcareous	WRL- 64-47	0.5	15.3	--	--	--	1.29	--	36.0	64.2	568.48
D-16	Mudstone	WRL- 63-47	2.5	2.3	--	--	--	--	--	72.3	66.7	574.23
D-15	Mudstone, phosphatic	WRL- 62-47	0.5	14.5	--	--	--	--	--	41.7	67.2	581.48
D-14	Mudstone, phosphatic	WRL- 61-47	0.9	4.1	--	--	--	--	--	53.9	68.1	588.77
D-13	Phosphate rock	WRL- 60-47	0.9	24.0	--	--	--	2.74	--	18.3	69.0	610.37
D-12	Mudstone, calcareous	WRL- 59-47	0.4	0.9	--	--	--	--	--	59.7	69.4	610.73
D-11	Phosphate rock, argillaceous, calcareous	WRL- 58-47	0.4	15.0	--	--	--	1.70	--	36.4	69.8	616.73
D-10	Mudstone	WRL- 57-47	1.4	1.9	--	--	--	--	--	75.9	71.2	619.39
D- 9	Mudstone, calcareous, phosphatic	WRL- 56-47	1.7	10.5	--	--	--	--	--	44.9	72.9	637.24
D- 8	Phosphate rock, argillaceous, calcareous	WRL- 55-47	1.5	15.7	--	--	--	--	--	30.6	74.4	660.79
D- 7	Phosphate rock, calcareous, argillaceous	WRL- 54-47	1.3	16.0	--	--	--	--	--	34.3	75.7	681.59
D- 6	Limestone	WRL- 53-47	1.2	0.9	--	--	--	--	--	17.9	76.9	682.67
D- 5	Phosphate rock, argillaceous, calcareous	WRL- 52-47	1.3	14.6	--	--	--	--	--	32.7	78.2	701.65
D- 4	Phosphate rock, argillaceous, calcareous	WRL- 51-47	1.5	15.9	--	--	--	--	--	29.1	79.7	725.30
D- 3	Mudstone, phosphatic, calcareous	WRL- 50-47	0.6	11.2	--	--	--	--	--	43.9	80.3	722.22
D- 2	Limestone	WRL- 49-47	0.8	0.8	--	--	--	--	--	19.5	81.1	732.86
D- 1	Mudstone, calcareous, phosphatic	WRL- 48-47	1.8	8.8	--	--	--	--	--	42.7	82.9	748.70
	C member of Phosphoria formation, lot no. 1224--top bed only												
C- 1	Sandstone, phosphatic	WRL- 47-47	(1.7)	13.3	--	--	--	--	--	55.4	--	--
	WRL-47-47, lot no. 1224, logged as equivalent to upper 1.7 feet of WRL-198-47, lot no. 1225.												
	C member of Phosphoria formation, lot no. 1225												
C-36	Limestone, sandy	WRL-198-47	12.0	1.0	0.5	1.1	0.01	--	26.5	32.6	12.0	12.00
C-35	Sandstone, calcareous	WRL-197-47	8.3	1.0	3.5	2.2	0.01	--	8.4	73.1	20.3	20.30
C-34	Chert, calcareous	WRL-196-47	7.4	0.7	3.5	2.5	0.01	--	9.8	73.1	27.7	25.48
C-33	Chert, calcareous	WRL-195-47	9.9	0.5	4.3	3.7	0.01	--	8.0	75.1	37.6	30.43

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses, percent							Cumulative thickness (feet)	Thickness × percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	V_2O_5	F	Loss on ignition	Acid insoluble		
C-32	Chert and limestone	WRL-194-47	11.0	0.5	1.3	5.1	0.01	---	18.1	63.2	48.6	35.93
C-31	Chert and limestone	WRL-193-47	7.2	0.3	3.2	2.6	0.01	---	18.8	62.3	55.8	38.09
C-30	Mudstone, calcareous	WRL-192-47	5.0	1.1	6.2	2.4	0.01	---	14.1	59.0	60.8	43.89
C-29	Limestone, cherty	WRL-191-47	4.4	0.5	0.3	3.5	0.01	---	17.6	52.9	65.2	45.79
C-28	Limestone, sandy	WRL-190-47	4.3	0.4	4.1	1.7	0.01	---	22.8	43.2	69.5	47.51
C-27	Sandstone, calcareous	WRL-189-47	3.1	0.6	1.1	2.7	0.01	---	14.5	62.7	72.6	49.37
C-26	Limestone, sandy	WRL-188-47	3.2	0.7	0.5	1.3	0.01	---	27.4	36.0	75.8	51.61
C-25	Sandstone and limestone	WRL-187-47	7.8	0.6	0.6	1.6	0.01	---	19.9	51.3	83.6	56.29
C-24	Limestone, sandy	WRL-186-47	2.5	0.8	0.6	1.7	0.01	---	23.2	44.6	86.1	58.29
C-23	Limestone, sandy	WRL-185-47	2.7	0.6	0.8	1.2	0.01	---	35.0	20.5	88.8	59.91
C-22	Sandstone, calcareous	WRL-184-47	5.8	1.8	0.2	1.3	0.01	---	16.1	58.6	94.6	70.35
C-21	Limestone, sandy	WRL-183-47	7.3	0.8	0.7	1.6	0.01	---	26.3	37.0	101.9	76.19
C-20	Limestone, cherty	WRL-182-47	7.8	0.3	0.5	2.6	0.01	---	22.2	43.1	109.7	78.53
C-19	Chert, calcareous	WRL-181-47	3.7	0.3	1.3	3.2	0.02	---	13.5	63.8	113.4	79.64
C-18	Limestone, sandy	WRL-180-47	1.4	0.8	0.6	2.04	0.02	---	21.5	47.4	114.8	80.76
C-17	Limestone, sandy	WRL-179-47	4.5	0.7	0.6	1.6	0.02	---	25.4	40.6	119.3	83.91
C-16	Sandstone and limestone	WRL-178-47	12.3	0.7	0.2	1.9	0.02	---	18.5	55.4	131.6	92.52
C-15	Limestone, sandy	WRL-177-47	2.4	0.6	0.9	1.2	0.01	---	34.5	21.3	134.0	93.96
C-14	Sandstone, calcareous	WRL-176-47	5.4	1.5	0.4	0.9	0.02	---	14.7	62.2	139.4	102.06
C-13	Limestone	WRL-175-47	1.3	0.2	0.5	1.1	0.01	---	40.7	9.1	140.7	102.32
C-12	Limestone	WRL-174-47	6.2	1.9	0.3	0.7	0.01	---	37.5	10.4	146.9	114.10
C-11	Sandstone, calcareous	WRL-173-47	9.5	1.4	0.6	1.7	0.01	---	12.4	67.2	156.4	127.40
C-10	Chert, sandy	WRL-172-47	4.2	0.5	0.3	2.9	0.01	---	0.3	94.3	160.6	129.50
C- 9	Chert	WRL-171-47	2.0	0.3	1.0	2.9	0.01	---	1.0	92.8	162.6	130.10
C- 8	Chert	WRL-170-47	3.2	0.4	1.3	4.7	0.02	---	2.2	88.1	165.8	131.38
C- 7	Chert	WRL-169-47	5.0	0.3	1.1	2.9	0.01	---	2.6	89.4	170.8	132.88
C- 6	Chert	WRL-168-47	5.0	0.4	1.6	4.4	0.02	---	3.4	85.9	175.8	134.88
C- 5	Chert	WRL-167-47	5.0	0.5	1.9	4.9	0.01	---	5.7	79.7	180.8	137.38
C- 4	Chert	WRL-166-47	5.0	0.4	2.1	4.8	0.01	---	6.9	78.2	185.8	139.38
C- 3	Chert	WRL-165-47	5.0	0.5	1.7	4.7	0.02	---	7.2	77.1	190.8	141.88
C- 2	Chert, calcareous	WRL-164-47	5.0	0.4	1.8	4.0	0.01	---	13.9	63.4	195.8	143.88
C- 1	Chert	WRL-163-47	4.0	0.5	2.0	3.2	0.02	---	2.2	89.7	199.8	145.88
	B member of Phosphoria formation, lot no. 1225											
B-30	Mudstone and chert	WRL-162-47	1.4	1.0	4.7	3.1	0.01	---	8.2	79.9	1.4	1.40
B-29	Mudstone	WRL-161-47	1.5	1.4	6.4	2.7	0.03	---	9.7	74.3	2.9	3.50
B-28	Limestone, argillaceous	WRL-160-47	0.6	0.4	1.2	0.8	0.02	---	35.1	22.8	3.5	3.74

B-27	Limestone, argillaceous and phosphate rock	WRL-159-47	0.8	7.5	2.2	1.5	0.02	--	24.9	27.3	4.3	9.74
B-26	Mudstone	WRL-158-47	1.8	3.2	6.8	3.1	0.04	--	9.6	68.7	6.1	13.50
B-25	Mudstone, phosphatic, calcareous	WRL-157-47	2.3	11.7	1.8	1.7	0.02	--	11.4	43.0	8.4	42.41
B-24	Chert and mudstone	WRL-156-47	5.4	0.9	2.7	3.5	0.02	--	3.5	83.7	13.8	47.27
B-23	Mudstone, cherty	WRL-155-47	3.2	0.3	5.8	3.9	0.02	--	5.0	79.0	17.0	48.23
B-22	Mudstone, cherty	WRL-154-47	2.8	0.2	6.8	3.5	0.03	--	3.4	86.6	19.8	48.79
B-21	Chert	WRL-153-47	3.3	2.9	2.9	3.6	0.03	--	8.4	70.7	23.1	56.36
B-20	Chert, calcareous and mudstone	WRL-152-47	2.3	2.3	1.7	3.4	0.03	--	15.0	56.3	25.4	63.65
B-19	Phosphate rock, calcareous, argillaceous	WRL-151-47	1.0	18.1	3.4	1.9	0.06	--	11.6	25.6	26.4	81.75
B-18	Mudstone	WRL-150-47	1.3	1.5	7.9	3.6	0.47	--	15.1	66.1	27.7	83.70
B-17	Limestone, argillaceous	WRL-149-47	0.8	0.3	5.8	3.4	0.08	--	19.9	48.0	28.5	88.94
B-16	Mudstone, calcareous, phosphatic	WRL-148-47	1.5	9.5	7.2	2.9	0.12	--	10.6	50.0	30.0	98.19
B-15	Mudstone, calcareous	WRL-147-47	2.4	2.0	6.2	2.7	0.03	--	19.4	45.4	32.4	102.99
B-14	Mudstone, phosphatic	WRL-146-47	0.5	14.6	5.3	2.2	0.03	--	10.0	39.4	32.9	110.29
B-13	Mudstone, calcareous	WRL-145-47	1.7	1.4	6.9	2.8	0.03	--	16.1	54.0	34.6	112.67
B-12	Limestone, argillaceous	WRL-144-47	3.3	5.8	6.0	2.6	0.04	--	26.0	35.7	37.9	131.81
B-11	Phosphate rock, calcareous	WRL-143-47	2.6	19.8	2.3	1.4	0.14	--	20.8	12.0	40.5	183.29
B-10	Limestone, argillaceous	WRL-142-47	1.3	4.8	5.4	2.1	0.09	--	33.8	27.8	41.8	189.53
B- 9	Limestone, argillaceous	WRL-141-47	1.0	3.6	5.2	2.3	0.1	--	37.3	27.3	42.8	193.13
B- 8	Limestone, argillaceous	WRL-140-47	1.5	3.3	5.2	2.2	0.07	--	36.3	27.9	44.3	198.08
B- 7	Limestone, phosphatic, argillaceous	WRL-139-47	1.2	8.0	3.8	1.6	0.1	--	31.0	20.8	45.5	207.68
B- 6	Mudstone, calcareous and calcareous phosphate rock	WRL-138-47	1.8	16.6	3.1	1.9	0.11	--	24.7	15.2	47.3	237.36
B- 5	Phosphate rock, calcareous	WRL-137-47	1.2	22.1	2.4	1.0	0.07	--	12.5	15.2	48.5	264.08
B- 4	Phosphate rock, calcareous and calcareous mudstone	WRL-136-47	1.5	20.5	2.3	1.2	0.09	--	18.3	14.2	50.0	294.83
B- 3	Limestone, argillaceous	WRL-135-47	1.2	3.3	4.9	1.8	0.11	--	23.7	41.1	51.2	298.79
B- 2	Phosphate rock	WRL-134-47	1.2	16.8	3.6	1.9	0.2	--	22.1	19.3	52.4	318.95
B- 1	Phosphate rock	WRL-133-47	2.0	29.4	0.8	0.8	0.008	3.16	6.4	8.8	54.4	377.75
	A member of Phosphoria formation, lot nos. 1226 and 1227											
	Lot no. 1226											
A-33	Limestone	WRL-132-47	5.0	0.2	--	--	--	--	--	4.9	5.0	1.00
A-32	Mudstone, calcareous	WRL-131-47	2.3	0.2	--	--	--	--	--	60.7	7.3	1.46
A-31	Limestone	WRL-130-47	4.7	0.2	--	--	--	--	--	17.9	12.0	2.40
A-30	Limestone	WRL-129-47	4.9	1.2	--	--	--	--	--	3.3	16.9	5.28
A-29	Mudstone, calcareous	WRL-128-47	4.8	0.2	--	--	--	--	--	63.3	21.7	9.24
A-28	Mudstone, calcareous	WRL-127-47	5.0	0.3	--	--	--	--	--	62.6	26.7	10.74
A-27	Mudstone, calcareous	WRL-126-47	5.0	0.1	--	--	--	--	--	64.8	31.7	11.24
A-26	Mudstone, calcareous	WRL-125-47	5.0	1.2	--	--	--	--	--	72.9	36.7	17.24

[1] See additional analyses at end of table.

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	V_2O_5	F	Loss on Ignition	Acid insoluble		
A-45	Mudstone, calcareous	WRL-124-47	5.0	0.1	--	--	--	--	--	72.0	41.7	17.74
A-44	Mudstone, calcareous	WRL-123-47	2.3	0.1	--	--	--	--	--	71.4	44.0	17.97
A-43	Mudstone, calcareous	WRL-122-47	5.0	1.3	--	--	--	--	--	70.8	49.0	24.47
A-42	Mudstone, calcareous	WRL-121-47	5.0	1.3	--	--	--	--	--	72.1	54.0	30.97
A-41	Mudstone, calcareous	WRL-120-47	5.0	1.3	--	--	--	--	--	71.4	59.0	37.47
A-40	Mudstone, calcareous	WRL-119-47	5.0	0.1	--	--	--	--	--	70.9	64.0	37.77
A-39	Sandstone, calcareous	WRL-118-47	2.5	0.1	--	--	--	--	--	77.9	66.5	38.02
A-38	Mudstone, calcareous	WRL-117-47	3.7	0.1	--	--	--	--	--	73.2	70.2	38.39
A-37	Mudstone, calcareous	WRL-116-47	5.0	0.1	--	--	--	--	--	68.9	75.2	39.09
A-36	Mudstone, calcareous	WRL-115-47	5.0	1.3	--	--	--	--	--	65.5	80.2	45.99
A-35	Mudstone, calcareous	WRL-114-47	5.0	0.1	--	--	--	--	--	65.4	85.2	46.09
A-34	Mudstone, calcareous	WRL-113-47	5.0	0.1	--	--	--	--	--	65.6	90.2	46.59
A-33	Mudstone, calcareous	WRL-112-47	5.0	1.4	--	--	--	--	--	65.0	95.2	53.59
A-32	Mudstone, calcareous	WRL-111-47	5.0	1.2	--	--	--	--	--	58.6	100.2	59.59
A-31	Mudstone, calcareous and calcareous sandstone	WRL-110-47	4.5	1.2	--	--	--	--	--	69.3	104.7	64.99
A-30	Mudstone, calcareous	WRL-109-47	2.8	0.2	--	--	--	--	--	65.2	107.5	65.55
A-29	Sandstone, calcareous and mudstone	WRL-108-47	3.6	0.3	--	--	--	--	--	70.2	111.1	66.63
A-28	Limestone, cherty	WRL-250-47	2.3	0.5	--	--	--	--	--	48.1	113.4	67.78
A-27	Limestone and sandstone	WRL-249-47	2.4	0.3	--	--	--	--	--	48.4	115.8	68.50
A-26	Phosphate rock	WRL-248-47	1.0	31.4	--	--	--	--	--	12.0	116.8	99.90
A-25	Limestone, cherty	WRL-247-47	2.6	0.5	--	--	--	--	--	34.1	119.4	101.20
A-24	Limestone and chert	WRL-246-47	3.5	0.3	--	--	--	--	--	29.1	122.9	102.25
A-23	Limestone	WRL-245-47	1.8	0.1	--	--	--	--	--	9.9	124.7	102.43
	Lot no. 1227											
A-22	Limestone, sandy	WRL-244-47	5.6	0.0	--	--	--	--	--	48.4	130.3	102.43
A-21	Limestone and sandstone, calcareous	WRL-243-47	19.2	0.1	--	--	--	--	--	68.3	149.5	104.35
A-20	Limestone, sandy	WRL-242-47	7.7	0.1	--	--	--	--	--	28.0	157.2	105.12
A-19	Limestone	WRL-241-47	25.6	1.3	--	--	--	--	--	19.9	182.8	138.40
A-18	Chert and limestone	WRL-240-47	5.8	0.4	--	--	--	--	--	55.1	188.6	140.72
A-17	Limestone	WRL-239-47	12.4	0.2	--	--	--	--	--	11.3	201.0	143.20
A-16	Limestone, argillaceous	WRL-238-47	4.2	0.4	--	--	--	--	--	25.6	205.2	144.88
A-15	Limestone, argillaceous	WRL-237-47	4.0	0.4	--	--	--	--	--	40.6	209.2	146.48
A-14	Mudstone	WRL-236-47	2.3	0.5	--	--	--	--	--	76.3	211.5	147.63
A-13	Sandstone	WRL-235-47	17.8	0.2	--	--	--	--	--	89.2	229.3	151.19
A-12	Limestone, sandy, cherty	WRL-234-47	11.0	0.3	--	--	--	--	--	32.2	240.3	154.49
A-11	Sandstone, calcareous	WRL-233-47	7.5	0.1	--	--	--	--	--	76.8	247.8	155.24
A-10	Mudstone, calcareous	WRL-232-47	2.3	0.4	--	--	--	--	--	71.6	250.1	156.16

A- 9	Limestone, argillaceous	WRL-231-47	17.1	0.2	--	--	--	--	--	41.1	267.4	15.38
A- 8	Chert and limestone float; bedrock not exposed	--	15.6	--	--	--	--	--	--	--	283.0	--
A- 7	Chert, calcareous, sandy	WRL-229-47	5.4	0.1	--	--	--	--	--	66.1	288.4	0.54
A- 6	Chert and limestone	WRL-228-47	5.4	1.3	--	--	--	--	--	54.8	293.8	7.56
A- 5	Chert, calcareous, and limestone	WRL-227-47	10.7	1.3	--	--	--	--	--	58.7	304.5	21.47
A- 4	Sandstone, calcareous	WRL-226-47	6.8	1.3	--	--	--	--	--	75.6	311.3	30.31
A- 3	Limestone, cherty, sandy	WRL-225-47	6.5	1.4	--	--	--	--	--	25.7	317.8	39.41
A- 2	Limestone	WRL-224-47	16.1	0.1	--	--	--	--	--	7.0	333.9	41.02
A- 1	Limestone	WRL-223-47	13.3	172	--	--	--	--	--	6.1	347.2	56.98**

Quadrant formation—not measured

* Cumulative data incomplete due to missing information. Computations start from zero after interruption.
** Note incompleteness of cumulative data.

Additional analyses of sample WRL-150-47[2]

Bed no.	Sample no.	P_2O_5	V_2O_5	F	SiO_2	TiO_2	CaO	MgO	Na_2O	K_2O	MnO
B-18	WRL-150-47	2.81	0.56	0.31	60.60	0.48	4.02	2.34	0.17	3.15	0.028
		Ni	Cr_2O_3	Co	Zn	Cu	Pb	Ag	MoO_3	W	Organic matter[3]
		0.022	0.02	0.004	0.003	0.011	0.006	0.0001	0.006	<0.005	6.66

[2] Analyses made by the U. S. Geological Survey, Geochemistry and Petrology Branch.
[3] CO_2 and S reported present.

WADHAM SPRINGS, MONTANA. LOT NOS. 1246 and 1247.

Phosphoria formation sampled in bulldozer trenches near Wadham Springs on southeast limb of anticline. Upper part of formation, lot no. 1246, sampled in north trench, SE¼SW¼ sec. 22, and lower part of formation, lot no. 1247, in south trench, SW¼NE¼ sec. 28, T. 13 S., R. 7 W., Beaverhead County, Montana. Beds strike N. 30° E. and dip 70-80° SE. Section measured by D. A. Bostwick, E. R. Cressman, and L. A. Thomas and sampled by Bostwick, Cressman, Thomas, and W. H. Wilson in August 1948. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
	Dinwoody formation						
Td-1	Mudstone	ERC-157	--	1.3	83.1	--	--
	E member of Phosphoria formation, lot no. 1247						
E-12	Mudstone and chert	ERC-156	3.6	1.4	78.5	3.6	5.04
E-11	Siltstone and sandstone	ERC-155	5.8	1.3	78.2	9.4	12.58
E-10	Mudstone, chert, and sandstone	DAB-154	9.4	1.4	88.1	18.8	25.74
E- 9	Mudstone and chert	DAB-153	11.2	1.4	89.1	30.0	41.42
E- 8	Sandstone and chert	DAB-152	2.1	1.3	86.3	32.1	44.15
E- 7	Mudstone and chert	ERC-151	14.5	1.4	89.7	46.6	64.45
E- 6	Chert	ERC-150	8.1	1.7	90.5	54.7	78.22
E- 5	Mudstone and chert	ERC-149	12.3	1.4	89.9	67.0	91.75
E- 4	Mudstone and chert; fos. col. no. 48-KPM-69	DAB-148	9.3	1.1	92.0	76.3	104.77
E- 3	Mudstone and chert	DAB-147	18.0	1.0	92.5	94.3	122.77
E- 2	Mudstone and chert; fos. col. no. 48-KPM-69	DAB-146	14.8	1.1	93.1	109.1	139.05
E- 1	Chert, phosphatic	ERC-145	0.8	16.9	53.2	109.9	152.57
	D member of Phosphoria formation, lot no. 1247						
D-23	Mudstone, phosphatic	ERC-144	1.5	17.0	51.2	1.5	25.50
D-22	Phosphate rock, argillaceous	ERC-143	2.05	28.5	20.2	3.55	83.92
D-21	Phosphate rock, argillaceous	DAB-142	0.5	21.6	31.7	4.05	94.72
D-20	Mudstone, phosphatic	DAB-141	0.8	9.9	59.6	4.85	102.64
D-19	Mudstone; fos. col. no. 48-KPM-68	DAB-140	3.3	3.9	75.9	8.15	115.51
D-18	Mudstone and phosphate rock	ERC-139	3.5	14.2	48.0	11.65	165.21
D-17	Mudstone	ERC-138	1.2	3.6	72.9	12.85	169.53
D-16	Mudstone and phosphate rock	ERC-137	0.7	10.5	52.0	13.55	176.88
D-15	Mudstone	DAB-136	1.8	4.4	71.3	15.35	184.80
D-14	Mudstone, phosphatic	DAB-135	1.5	11.4	53.3	16.85	201.90
D-13	Phosphate rock, argillaceous	DAB-134	0.6	17.9	44.3	17.45	212.64
D-12	Mudstone, phosphatic	DAB-133	1.0	9.7	55.8	18.45	222.34

D-11	Mudstone and phosphate rock	DAB-132	0.8	14.3	46.1	19.25	233.78
D-10	Mudstone	DAB-131	1.0	6.2	66.0	20.25	249.98
D- 9	Mudstone	ERC-130	1.9	6.4	65.8	22.15	252.14
D- 8	Mudstone, phosphatic	ERC-129	1.1	8.5	52.5	23.25	261.49
D- 7	Mudstone	ERC-128	1.2	6.3	63.0	24.45	269.05
D- 6	Mudstone and phosphate rock	ERC-127	3.7	17.1	40.3	28.15	332.32
D- 5	Mudstone	ERC-126	0.8	5.3	75.7	28.95	336.56
D- 4	Mudstone, phosphatic	ERC-125	2.3	14.3	45.1	31.25	369.45
D- 3	Phosphate rock, argillaceous	DAB-124	0.8	16.2	41.3	32.05	382.41
D- 2	Mudstone and phosphate rock	DAB-123	3.6	9.7	59.0	35.65	417.33
D- 1	Mudstone and phosphate rock	DAB-122	2.3	7.2	61.7	37.95	433.89
	29 feet below D-1 not exposed though trenched by bulldozer and hand to depth of 24 feet. Interval probably chiefly D member.						
	C member of Phosphoria formation, lot nos. 1246 and 1247						
	Lot no. 1247						
C-18	Limestone; fos. col. no. 48-KPM-67	ERC-121	21.8	0.7	11.3	21.8	13.26
C-17	Limestone; fos. col. no. 48-KPM-66	DAB-120	22.5	1.2	16.5	44.3	42.26
C-16	Limestone; fos. col. no. 48-KPM-65	DAB-119	15.0	0.8	11.3	59.3	54.26
C-15	Limestone; fos. col. no. 48-KPM-64	DAB-118	18.4	0.6	16.0	77.7	65.30
C-14	Mudstone, calcareous	ERC-117	17.7	0.6	53.3	95.4	75.92
C-13	Mudstone, calcareous	ERC-116	20.3	0.4	75.4	115.7	84.04
C-12	Mudstone, calcareous	ERC-115	12.2	0.7	57.0	127.9	92.58
C-11	Limestone	DAB-114	2.6	0.3	18.9	130.5	93.36
C-10	Limestone; fos. col. no. 48-KPM-63	DAB-113	19.8	0.3	6.8	150.3	99.30
C- 9	Limestone; fos. col. no. 48-KPM-62	DAB-112	13.3	0.3	5.8	163.6	103.29
C- 8	Limestone	DAB-111	14.9	0.3	12.6	178.5	107.76
C- 7	Limestone	DAB-110	13.6	0.2	12.5	192.1	110.48
C- 6	Limestone	DAB-109	7.3	0.2	8.9	199.4	111.94
C- 5	Limestone, argillaceous	DAB-108	8.2	0.3	21.3	207.6	114.40
C- 4	Sandstone, calcareous	DAB-107	1.2	1.3	56.5	208.8	115.96
C- 3	Chert	DAB-106	14.8	0.2	87.7	223.6	118.92
	Lot no. 1246						
C- 2	Chert, sandstone and mudstone	LAT-105	17.7	0.7	93.9	241.3	131.31
C- 1	Mudstone and chert	DAB-104	13.6	0.65	93.3	254.9	140.15
	B member of Phosphoria formation, lot no. 1246						
B- 8	Mudstone; fos. col. nos. 48-KPM-61 and 48-KPM-60	DAB-103	13.2	2.2	87.2	13.2	29.04
--	Mudstone, phosphatic	LAT-264	(1.3)	10.7	70.0	--	--
	LAT-264 represents upper 1.3 feet of DAB-103.						

J Fossil collection by K. P. McLaughlin, 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	Acid insoluble		
B- 7	Chert and mudstone	DAB-102	4.6	0.35	95.3	17.8	30.65
B- 6	Mudstone and chert	ERC-101	5.7	0.60	93.3	23.5	34.07
B- 5	Mudstone, cherty	ERC-100	14.3	0.3	94.0	37.8	38.36
B- 4	Phosphate rock, sandy	ERC- 99	0.9	26.1	29.5	38.7	61.85
B- 3	Mudstone; fos. col. no. 48-KPM-59	LAT- 98	8.2	4.6	74.0	46.9	99.57
B- 2	Phosphate rock, argillaceous	LAT-263	0.8	26.3	22.4	47.7	120.61
B- 1	Phosphate rock, argillaceous	LAT-262	4.3	23.2	23.6	52.0	220.37
	A member of Phosphoria formation, lot no. I246						
A-15	Mudstone, calcareous	LAT- 96	6.8	0.6	76.0	6.8	4.08
A-14	Mudstone and limestone	ERC- 95	3.8	0.6	51.6	10.6	6.36
A-13	Limestone	ERC- 94	2.0	0.2	6.5	12.6	6.76
A-12	Mudstone, calcareous	ERC- 93	3.2	0.4	67.6	15.8	8.04
A-11	Limestone	DAB- 92	3.3	0.2	10.2	19.1	8.70
A-10	Mudstone, calcareous	DAB- 91	1.9	0.25	70.1	21.0	9.18
A- 9	Limestone; fos. col. no. 48-KPM-58	DAB- 90	5.4	0.3	6.7	26.4	10.80
A- 8	Mudstone, calcareous	LAT- 89	12.7	0.1	50.0	39.1	12.06
A- 7	Mudstone, calcareous	LAT- 88	12.7	0.1	57.0	51.8	13.34
A- 6	Mudstone, calcareous	LAT- 87	11.6	0.25	66.6	53.4	16.24
A- 5	Mudstone, calcareous, cherty	ERC- 86	9.4	0.4	72.8	72.8	20.00
A- 4	Mudstone and limestone	ERC- 85	8.1	0.4	32.4	80.9	23.24
A- 3	Mudstone and chert; fos. col. no. 48-KPM-57	ERC- 84	11.6	0.3	56.6	92.5	26.72
A- 2	Limestone	DAB- 83	18.2	0.2	4.6	110.7	30.36
A- 1	Mudstone, calcareous and sandstone	DAB- 82	12.4	0.3	85.5	123.1	36.56
	Quadrant formation						
Cq-1	Sandstone	DAB- 81	18.0	0.2	97.6	--	--

CENTENNIAL RANGE TRENCH NO. 4, MONTANA. LOT NO. 1251.

B member of Phosphoria formation sampled in hand trench at Centennial Range locality no. 4 along south side of east fork of Odell Creek, near [redacted] corner sec. 6, T. 15 S., R. 1 W., Beaverhead County, Montana, on southward-dipping homocline. Beds strike N. 70° W. and dip 10° S. Section measured by F. S. Honkala and sampled by O. A. Payne in August 1948. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

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		
	C member of Phosphoria formation—not measured										
	B member of Phosphoria formation										
B-1	Phosphate rock	FSH-261	6.2	31.3	0.97	0.[redacted]16		3.90	10.9	6.2	...
	A member of Phosphoria formation—not measured										

ODELL CREEK, MONTANA. LOT NO. 1252.

Upper part of Phosphoria formation sampled and lower part of Dinwoody formation measured in hand trench on west side of Odell ...ek, SE¼ sec. 1, T. 15 S., R. 2 W., Beaverhead County, Montana, on southward-dipping homocline. Beds strike N. 82° E. and dip 30° S. ...tion measured by F. S. Honkala and O. A. Payne and sampled by Payne and J. A. Kelleher in 1948. Samples analyzed by U. S. Bureau ... Mines Laboratory, Albany, Oregon.

...nd ...o.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
	Lower part of Dinwoody formation						
...30	Limestone	--	2.1	--	--	2.1	--
...29	Limestone	--	2.8	--	--	4.9	--
...28	Mudstone	--	2.6	--	--	7.5	--
...27	Limestone	--	2.9	--	--	10.4	--
...26	Limestone and dolomite	--	3.6	--	--	14.0	--
...25	Limestone	--	5.0	--	--	19.0	--
...24	Mudstone, calcareous	--	4.9	--	--	23.9	--
...23	Limestone and calcareous mudstone	--	2.7	--	--	26.6	--
...22	Dolomite	--	4.5	--	--	31.1	--
...21	Dolomite and calcareous mudstone	--	5.0	--	--	36.1	--
...20	Dolomite	--	3.3	--	--	39.4	--
...19	Dolomite	--	5.0	--	--	44.4	--
...18	Dolomite	--	2.2	--	--	46.6	--
...17	Dolomite and calcareous mudstone	--	2.3	--	--	48.9	--
...16	Dolomite	--	3.3	--	--	52.2	--
...15	Limestone	--	1.8	--	--	54.0	--
...14	Dolomite and limestone	--	3.4	--	--	57.4	--
...13	Mudstone and dolomite	--	3.2	--	--	60.6	--
...12	Dolomite and mudstone	--	0.5	--	--	61.1	--
...11	Dolomite	--	1.3	--	--	62.4	--
...10	Dolomite	--	2.0	--	--	64.4	--
...9	Dolomite	--	1.7	--	--	66.1	--
...8	Dolomite and mudstone	--	3.0	--	--	69.1	--
...7	Dolomite	--	1.4	--	--	70.5	--
...6	Dolomite	--	3.1	--	--	73.6	--
...5	Dolomite and mudstone	--	1.6	--	--	75.2	--
...4	Mudstone, calcareous	--	2.1	--	--	77.3	--
...3	Mudstone	--	0.3	--	--	78.1	--
...2	Mudstone	--	2.2	--	--	80.3	--
...1	Mudstone, calcareous and dolomite	FSH-417	2.4	0.6	17.6	82.7	--

E member of Phosphoria formation—upper part only

E-16	Mudstone, calcareous	FSH-416	2.6	0.4	57.1	2.6	1.04
E-15	Mudstone, calcareous and limestone	FSH-415	1.8	0.3	49.2	4.4	1.58
E-14	Limestone, argillaceous	FSH-414	1.5	0.4	45.0	5.9	2.18
E-13	Limestone	FSH-413	0.8	0.7	15.6	6.7	2.74
E-12	Mudstone, calcareous	FSH-412	0.2	0.5	50.6	6.9	2.84
E-11	Limestone	FSH-411	1.0	0.7	11.6	7.9	3.54
E-10	Limestone, argillaceous	FSH-410	0.3	0.75	29.6	8.2	3.76
E- 9	Limestone, argillaceous	FSH-409	1.3	0.4	38.5	9.5	4.28
E- 8	Mudstone, calcareous	FSH-408	0.6	0.2	70.0	10.1	4.40
E- 7	Mudstone	FSH-407	0.9	0.9	78.9	11.0	5.21
E- 6	Chert	FSH-406	1.4	1.8	86.7	12.4	7.73
E- 5	Mudstone	OAP-405	4.5	1.5	84.0	16.9	14.48
E- 4	Chert	OAP-404	1.5	1.05	90.6	18.4	16.06
E- 3	Mudstone and sandstone	OAP-403	0.7	1.3	89.3	19.1	16.97
E- 2	Sandstone	OAP-402	0.7	4.6	82.9	19.8	20.19
E- 1	Chert	OAP-401	2.6	0.4	94.8	22.4	21.23

CENTENNIAL RANGE TRENCH NO. 1, MONTANA. LOT NO. 1253.

D, E, and part of C members of Phosphoria formation sampled in hand trench at Centennial Range locality no. 1 near crest of range, NW corner sec. 33, T. 14 S., R. 1 W., Beaverhead County, Montana, on southward-dipping homocline. Beds strike east and dip 20° S. Section measured by F. S. Honkala and O. A. Payne and sampled by J. A. Kelleher in July 1948. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
Dinwoody formation							
Td-1	Mudstone	OAP-496	0.7	0.9	79.7	--	--
E member of Phosphoria formation							
E-21	Mudstone, calcareous	OAP-495	2.8	1.3	58.8	2.8	3.64
E-20	Mudstone, calcareous	OAP-494	2.5	1.4	75.7	5.3	7.14
E-19	Mudstone, calcareous	OAP-493	3.4	1.3	74.6	8.7	11.56
E-18	Mudstone, calcareous	OAP-492	2.0	1.3	75.0	10.7	14.16
E-17	Chert	OAP-491	1.5	1.0	77.7	12.2	15.86
E-16	Chert	OAP-490	3.5	0.3	95.3	15.7	16.91
E-15	Chert	OAP-489	4.1	0.5	83.5	19.8	18.96
E-14	Chert	OAP-488	3.2	0.7	90.6	23.0	21.00
E-13	Chert	OAP-487	2.9	0.5	93.5	25.9	22.45
E-12	Chert	FSH-486	5.0	0.6	93.3	30.9	25.45
E-11	Chert	FSH-485	5.0	0.6	88.0	35.9	28.45
E-10	Chert	FSH-484	5.0	0.5	86.7	40.9	30.95
E- 9	Chert	FSH-483	5.0	0.5	86.7	45.9	33.45
E- 8	Chert	FSH-482	5.0	0.5	85.2	50.9	35.95
E- 7	Dolomite and calcareous mudstone	FSH-481	3.2	0.3	50.7	54.1	36.91
E- 6	Chert	FSH-480	4.3	0.5	84.3	58.4	39.06
E- 5	Chert	FSH-479	5.0	0.6	82.3	63.4	42.06
E- 4	Chert, calcareous and mudstone	FSH-478	5.0	0.5	77.0	68.4	44.56
E- 3	Mudstone and limestone	FSH-477	3.5	0.5	76.2	71.9	46.31
E- 2	Mudstone and chert	FSH-476	5.0	0.6	81.7	76.9	49.31
E- 1	Mudstone, calcareous and chert	FSH-475	5.0	0.8	77.3	81.9	53.31
D member of Phosphoria formation							
D-12	Mudstone	OAP-474	3.3	1.0	76.0	3.3	3.3
D-11	Mudstone	OAP-473	2.2	0.9	77.5	5.5	5.28
D-10	Mudstone	OAP-472	1.2	1.5	74.7	6.7	7.08
D- 9	Mudstone	OAP-471	4.6	0.6	69.0	11.3	9.84

Beds D-9 through D-12 are slumped and thicknesses may not be correct.

D- 8	Mudstone	OAP-470	2.0	2.2	71.7	13.3	14.24
D- 7	Mudstone, calcareous	OAP-469	1.7	3.3	67.9	15.0	19.85
D- 6	Mudstone	OAP-468	0.4	7.6	53.5	15.4	22.89
D- 5	Phosphate rock	OAP-467	0.8	33.6	6.4	16.2	49.77
D- 4	Mudstone	OAP-466	0.9	7.5	45.7	17.1	56.52
D- 3	Mudstone, phosphatic	OAP-465	1.1	8.0	51.5	19.2	65.32
D- 2	Phosphate rock	OAP-464	1.1	29.3	15.2	19.3	97.55
D- 1	Mudstone	OAP-463	1.0	6.6	66.0	20.5	104.15

C member of Phosphoria formation

C-15	Sandstone	FSH-462	2.8	2.8	90.7	2.8	7.84
C-14	Sandstone	FSH-461	5.0	2.1	92.9	7.8	18.34
C-13	Sandstone	FSH-460	4.2	1.7	92.6	12.0	25.48
C-12	Sandstone	FSH-459	5.0	1.7	91.8	17.0	33.98
C-11	Sandstone	FSH-458	5.0	1.7	92.7	22.0	42.48
C-10	Sandstone	FSH-457	2.6	2.1	91.0	24.6	47.94
C- 9	Sandstone	FSH-456	5.0	2.2	90.7	29.6	58.94
C- 8	Sandstone	FSH-455	1.1	7.6	74.2	30.7	67.30
C- 7	Sandstone	FSH-454	3.9	2.4	83.8	34.6	76.66
C- 6	Chert	FSH-453	4.0	1.6	80.3	38.6	83.06
C- 5	Quartzite	FSH-452	1.2	2.0	89.0	39.8	85.46
C- 4	Dolomite, argillaceous	FSH-451	3.0	1.7	36.0	42.8	90.56
C- 3	Limestone, sandy	FSH-450	3.5	0.2	32.2	46.3	91.26
C- 2	Limestone	FSH-449	5.0	0.0	16.3	51.3	91.26
C- 1	Dolomite and calcareous sandstone	FSH-448	4.8	0.1	62.5	56.1	91.74

It is doubtful that the full thickness of the C member was exposed at this locality.

CENTENNIAL RANGE TRENCHES NOS. 2 AND 3, MONTANA-IDAHO. LOT NOS. 1254 AND 1255.

Phosphoria formation sampled in Centennial Range hand trenches nos. 2 and 3. Upper part of formation, lot no. 1255, sampled in trench no. 2, NW¼ sec. 12, T. 14 N., R. 40 E., Clark County, Idaho. Beds strike N. 65° W. and dip 14° SW. Lower part of formation, lot no. 1254, sampled in trench no. 3, near N¼ corner sec. 2, T. 15 S., R. 1 W., Beaverhead County, Montana, at crest of range on southward-dipping homocline. Beds strike N. 70° W. and dip 22° S. Section measured by F. S. Honkala and O. A. Payne and sampled by J. A. Kelleher and R. L. Konizeski in July 1948. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness × percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
	Dinwoody formation						
Trd-2	Mudstone, calcareous, sandy	---	0.5	---	---	0.5	---
Trd-1	Mudstone and limestone	FSH-540	0.8	0.65	77.5	1.3	0.52
	E member of Phosphoria formation, lot no. 1255						
E-12	Mudstone, sandy	FSH-539	5.0	1.0	81.1	6.3	5.00
E-11	Mudstone	FSH-538	5.0	1.1	81.5	11.3	10.50
E-10	Mudstone, sandy, calcareous	FSH-537	5.0	1.2	74.4	16.3	16.50
E- 9	Mudstone and chert	FSH-536	0.9	1.3	89.0	17.2	17.67
E- 8	Chert	FSH-535	0.6	0.4	93.0	17.8	17.91
E- 7	Chert, argillaceous	FSH-534	2.2	0.4	92.5	20.0	18.79
E- 6	Chert, argillaceous	FSH-533	1.3	0.4	87.4	21.3	19.31
E- 5	Chert, argillaceous	FSH-532	3.8	0.6	89.5	25.1	21.59
E- 4	Chert, argillaceous	FSH-531	2.7	0.6	90.2	27.8	23.21
E- 3	Chert and mudstone	FSH-530	4.0	0.6	90.1	31.8	25.61
E- 2	Mudstone	FSH-529	1.8	0.65	81.6	33.6	26.78
E- 1	Mudstone	FSH-528	1.7	0.80	82.4	35.3	28.14
	D member of Phosphoria formation, lot no. 1255						
D-12	Mudstone	OAP-527	0.9	0.8	86.5	36.2	0.72
D-11	Mudstone	OAP-526	1.6	1.0	81.5	37.8	2.37
D-10	Mudstone	OAP-525	3.0	1.05	80.7	40.8	5.47
	Possible fault at top of D-9 indicated by gouge and breccia zone. No displacement apparent.						
D- 9	Mudstone	OAP-524	3.2	1.6	80.3	44.0	10.59
D- 8	Mudstone	OAP-523	2.2	1.1	77.1	46.2	13.01
D- 7	Mudstone, calcareous	OAP-522	5.0	1.7	70.6	51.2	21.51
D- 6	Phosphate rock	OAP-521	1.5	31.4	10.0	52.7	68.61
D- 5	Mudstone	OAP-520	0.7	5.4	66.0	53.4	72.39
D- 4	Mudstone, calcareous and phosphate rock	OAP-519	1.4	9.65	52.3	54.8	85.90
D- 3	Phosphate rock	OAP-518	0.7	34.5	4.3	55.5	110.05

D- 2	Mudstone	OAP-517	1.7	2.8	74.4	21.9	114.81
D- 1	Phosphate rock, argillaceous	OAP-516	0.9	19.8	39.2	22.8	132.63
	C member of Phosphoria formation, lot nos. 1255 and 1254						
	Lot no. 1255						
C-10	Sandstone	FSH-515	1.6	3.2	87.1	8.6	5.12
C- 9	Sandstone	FSH-514	3.0	1.7	92.9	3.0	10.22
C- 8	Sandstone, calcareous	FSH-513	2.6	1.3	76.2	17.2	13.60
C- 7	Sandstone	FSH-512	5.0	1.7	85.7	12.2	22.10
C- 6	Sandstone	FSH-511	5.0	2.8	85.3	17.2	36.10
C- 5	Sandstone	FSH-510	2.1	5.0	80.2	12.5	46.60
C- 4	Sandstone	FSH-509	5.0	3.7	77.0	24.3	65.10
C- 3	Sandstone, phosphatic	FSH-508	1.1	12.8	52.6	25.4	79.18
C- 2	Sandstone, calcareous	FSH-507	4.3	7.5	45.2	29	111.43
	There is probably a gap of 10 feet or more between the lowest bed of lot no. 1255 and the highest bed of lot no. 1254.						
	Lot no. 1254						
C- 1	Chert	OAP-541	1.0	0.4	93.2	1.0	0.4e
	B member of Phosphoria formation, lot no. 1254						
B- 2	Phosphate rock, argillaceous	OAP-506	1.7	22.8	34.1	13.7	38.76
B- 1	Phosphate rock	OAP-505	4.6	32.4	8.4	6.2	187.80
	A member of Phosphoria formation, lot no. 1254						
A- 7	Limestone and conglomerate	OAP-504	2.7	2.7	35.2	2.7	7.29
A- 6	Limestone, argillaceous	OAP-503	4.8	1.5	47.2	3.5	14.49
A- 5	Limestone, sandy, and calcareous sandstone	FSH-502	5.0	0.1	60.3	12.5	14.99
A- 4	Sandstone, calcareous	FSH-501	5.0	0.1	68.6	17.5	15.49
A- 3	Limestone, sandy, and calcareous sandstone	FSH-500	4.6	0.4	68.7	22.1	17.33
A- 2	Sandstone, calcareous	FSH-499	5.0	0.0	64.5	27.1	17.33
A- 1	Conglomerate, calcareous	FSH-498	2.1	0.2	56.0	29.2	17.75
	Quadrant formation						
Cq-1	Sandstone, calcareous	FSH-497	4.4	0.3	61.0	4.4	1.32

[1] Cumulative data incomplete due to missing information.
See additional analyses at end of table.

Additional analyses of sample OAP-505[2]

Bed no.	Sample no.	P_2O_5	V_2O_5	F	SiO_2	TiO_2	CaO	MgO	Na_2O	K_2O	MnO
B-1	OAP-505	33.93	0.05	3.63	4.83	0.008	49.84	0.11	1.16	0.22	0.008
		Ni	Cr_2O_3	Co	Zn	Cu	Pb	Ag	MoO_3	Cl	Organic matter
		0.005	0.07	0.000	0.012	0.001	0.002	0.00004	0.002	0.008	0.24[3]

[2] Analyses made by the U. S. Geological Survey, Geochemistry and Petrology Branch.
[3] CO_2 and S reported present.

100

UNITED STATES
DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

[Reports - Open file series]

STRATIGRAPHIC SECTIONS OF THE PHOSPHORIA FORMATION IN UTAH

by

V. E. McKelvey, L. E. Smith, D. M. Kinney, J. W. Huddle,
G. F. Hosford, R. S. Sears, D. P. Sprouse, and M. D. Stewart

U.S. GEOLOGICAL SURVEY
WASHINGTON
AUG 10 1951
LIBRARY

MINERAL DEPOSITS BRANCH

Spokane, Washington July 1951

OPEN FILE

This ~~map~~ report is preliminary and has not been edited or reviewed for conformity with U. S. Geological Survey standards and nomenclature.

TI-100

TABLE OF CONTENTS

	Page
Introduction	1
Abstract of sections	
Brazer Canyon. Lot no. 1203.	1u
Additional analyses	7u
Spectrographic analyses	12u
Upper Brazer Canyon. Lot no. 1228.	17u
Wolf Creek. Lot no. 1231.	21u
Spectrographic analyses	23u
Dry Canyon. Lot no. 1229.	25u
Lake Fork. Lot no. 1235.	27u
Rock Canyon. Lot no. 1220.	29u
Brush Creek Gorge. Lot no. 1219.	31u
Little Brush Creek. Lot no. 1221.	32u
Right Fork of Hobble Creek. Lot no. 1271.	33u
Wanrhodes Canyon. Lot no. 1270.	38u
Alta Quadrangle. Lot no. 1284.	44u
Spectrographic analyses	44u

STRATIGRAPHIC SECTIONS OF THE PHOSPHORIA FORMATION IN UTAH

by

V. E. McKelvey, L. E. Smith, D. M. Kinney, J. W. Huddle,
G. F. Hosford, R. S. Sears, D. P. Sprouse, and M. D. Stewart

INTRODUCTION

The first of a series of reports giving detailed stratigraphic sections of the Phosphoria formation in the Western phosphate field as measured and described by the Geological Survey will be released as Circulars within the next few months. Because of the needs of industry for many of these data during the 1951 field season, and in view of the unavoidable delays attendant on publication, the tabular data to be included in these Circulars are hereby placed on open file in simple reproduction form (prepared by Ozalid from photographic negatives) and without explanatory text so that immediate use may be made of the data.

The tables include data on sections in four states: Montana, Idaho, Wyoming, and Utah; and the tables for each of these states are bound together as individual reports. The tables include name and location of section measured, biref description of geologic setting, acknowledgments for field and analytical work, abstract data on the sections (bed number, rock name, sample number, and thickness), and analytical data on the samples. The analytical data include reports on P_2O_5, and acid insoluble for all samples and additional analyses, such as Al_2O_3, Fe_2O_3, loss on ignition, F, and V_2O_5, for selected samples. Spectrographic analyses for a large number of elements are included for samples from selected localities, and special analyses have been made of a few samples.

These reports are placed on open file at the offices of the Geological Survey in Washington, D. C., Spokane, Washington, Salt Lake City, Utah, and Montpelier, Idaho, and at the offices of the Idaho Bureau of Mines and Geology, Moscow, Idaho, the Montana Bureau of Mines and Geology, Butte, Montana, and the Wyoming Geological Survey, Laramie, Wyoming, and the University of Utah, Salt Lake City, Utah.

BRAZER CANYON, UTAH. LOT NO. 1203.

Phosphoria formation sampled in Brazer Canyon, sec. 18, T. 11 N., R. 8 E., Rich County, Utah, on west limb of Crawford Mountains syncline. Section pieced together from two overlapping hand trenches and natural outcrops. Beds P-1 to P-60 sampled in lower trench, beds P-61 to P-137 sampled in upper trench, and beds R-1 to R-35 sampled in upper trench and natural outcrops. Upper trench overlaps lower trench 40 feet; it and natural outcrops lie 50 feet above lower trench. Beds strike north and dip 60° E. Section measured by V. E. McKelvey, L. E. Smith, and R. A. Hoppin and sampled by R. P. Sheldon, O. A. Payne, R. A. Gulbrandsen, and R. S. Sears in July 1947. Samples analyzed by Tennessee Valley Authority.

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	V_2O_5	F	Loss on ignition	Acid insoluble		
Dinwoody formation												
Td-1	Mudstone, calcareous; chert and limestone nodules in lower 0.5 feet	RAH- 99-47	2.0	0.80	11.7	4.1	0.07	--	14.4	62.4	2.0	1.6
Rex member of Phosphoria formation												
R- 35	Limestone, argillaceous; fos. col. no. 47-HW-317[1]	RAH- 98-47	9.2	0.6	1.8	1.2	0.02	--	28.4	30.4	9.2	5.52
R- 34	Limestone, argillaceous	RAH- 97-47	4.2	6.3	2.8	1.9	0.04	--	22.9	30.0	13.4	31.98
R- 33	Chert and limestone	RAH- 96-47	6.8	4.1	3.0	2.2	0.06	--	12.7	56.7	20.2	59.66
R- 32	Chert, calcareous	RAH- 95-47	2.5	2.95	2.4	1.8	0.04	0.41	12.5	61.7	22.7	67.04
R- 31	Chert, calcareous	RAH- 94-47	6.5	3.25	2.1	2.7	0.05	--	10.0	69.8	29.2	86.37
R- 30	Chert, phosphatic	RAH- 93-47	9.3	8.0	2.0	2.6	0.00	0.80	6.1	63.5	38.5	162.77
R- 29	Mudstone, contains chert concretions	RAH- 92-47	1.2	2.10	14.5	5.1	0.07	--	6.7	75.8	39.7	165.29
R- 28	Chert, phosphatic	RAH- 91-47	2.2	13.4	4.6	3.9	0.03	1.6	6.2	48.2	41.9	194.77
R- 27	Limestone, argillaceous, calcareous	RAH- 90-47	3.7	3.85	1.5	2.3	0.05	--	19.0	47.9	45.6	209.02
R- 26	Dolomite	RAH- 89-47	5.9	3.6	0.8	1.1	0.00	0.39	38.1	10.6	51.5	230.26
R- 25	Dolomite, argillaceous	RAH- 88-47	8.7	3.7	0.5	1.0	0.04	--	29.7	26.6	60.2	262.45
R- 24	Dolomite, calcareous, argillaceous	RAH- 87-47	6.1	2.7	0.5	1.4	0.00	0.33	31.8	23.5	66.3	278.91
R- 23	Chert and dolomite	RAH- 86-47	11.8	1.50	2.4	2.0	0.05	--	12.2	65.4	78.1	296.62
R- 22	Dolomite, cherty	RAH- 85-47	10.2	1.0	0.6	0.88	0.05	--	31.7	27.1	88.3	317.02
R- 21	Dolomite, cherty	RAH- 84-47	8.0	0.6	0.7	1.5	0.0	--	28.0	36.5	96.3	321.82
R- 20	Chert and dolomite	RAH- 83-47	5.3	0.2	0.5	1.7	0.04	--	21.6	51.5	101.6	322.88
R- 19	Dolomite	RAH- 82-47	8.8	0.6	0.7	0.63	0.00	--	39.9	12.6	110.4	328.16
R- 18	Dolomite	RAH- 81-47	8.3	0.6	0.7	0.51	0.03	--	43.4	6.0	118.7	333.14
R- 17	Dolomite, argillaceous	RAH- 80-47	4.8	0.8	1.9	1.4	0.0	--	33.2	25.7	123.5	336.98
R- 16	Dolomite, argillaceous	RAH- 79-47	5.0	0.8	1.5	1.9	0.04	0.11	33.0	24.2	128.5	340.98

[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	V_2O_5	F	Loss on ignition	Acid insoluble		
R- 15	Dolomite, argillaceous	RAH- 78-47	7.1	0.6	2.4	2.3	0.00	--	28.2	35.4	135.6	345.24
R- 14	Dolomite, argillaceous	RAH- 77-47	3.5	0.43	1.5	1.6	0.00	--	35.7	21.0	139.1	346.74
R- 13	Dolomite, argillaceous	RAH- 76-47	4.9	0.50	3.8	2.1	0.04	--	28.7	32.3	144.0	349.19
R- 12	Dolomite, argillaceous, fos. col. no. 47-HW-316	RAH- 75-47	6.9	0.4	3.6	2.0	0.03	--	29.2	32.3	150.9	351.95
R- 11	Chert, dolomitic	RAH- 74-47	10.0	0.25	7.2	2.5	0.0	--	18.8	56.3	160.9	354.45
R- 10	Limestone, argillaceous	RAH- 73-47	7.1	0.60	3.0	1.3	0.05	--	26.2	36.5	168.0	358.71
R- 9	Limestone, phosphatic, cherty	RAH- 72-47	2.4	11.4	2.6	1.9	0.09	--	21.3	20.7	170.4	386.07
R- 8	Mudstone, calcareous	RAH- 71-47	3.4	1.3	0.6	1.1	0.00	--	21.0	47.3	173.8	390.49
R- 7	Chert and limestone	RAH- 70-47	2.8	0.1	2.2	2.9	0.06	--	9.4	75.3	176.6	390.77
R- 6	Chert and dolomite, calcareous	RAH- 69-47	10.0	0.15	2.4	3.1	0.04	--	15.9	60.0	186.6	392.27
R- 5	Chert and dolomite	RAH- 68-47	9.8	0.10	2.45	3.1	0.03	--	9.32	73.3	196.4	393.25
R- 4	Chert and limestone	RAH- 67-47	4.0	1.95	2.3	2.0	0.02	--	15.1	57.4	200.4	401.05
R- 3	Limestone and chert	RAH- 66-47	7.2	0.2	1.1	1.0	0.04	--	24.6	43.3	207.6	402.49
R- 2	Chert and limestone	RAH- 65-47	6.8	1.75	0.8	2.1	0.04	--	16.9	54.0	214.4	414.39
R- 1	Limestone and chert	RAH- 64-47	4.8	0.55	1.1	1.5	0.05	--	22.2	45.2	219.2	417.03
	Phosphatic shale member of Phosphoria formation											
P-140	Limestone, argillaceous, contains chert nodules	LES- 148-47	4.0	0.6	3.5	1.5	0.05	0.09	22.7	46.0	4.0	2.40
P-139	Mudstone, calcareous	LES- 147-47	3.8	0.4	4.0	1.9	0.07	--	20.9	50.0	7.8	3.92
P-138	Mudstone, dolomitic	LES- 146-47	4.1	0.1	5.0	1.9	0.00	--	21.0	50.0	11.9	4.33
P-137	Mudstone, calcareous	LES- 145-47	0.6	0.5	15.0	5.4	0.12	--	17.6	54.8	12.5	4.63
P-136	Mudstone, dolomitic	LES- 144-47	3.7	0.3	5.9	1.9	0.09	--	20.4	52.5	16.2	5.74
P-135	Mudstone, dolomitic	LES- 140-47	4.9	0.2	6.4	2.2	0.13	--	18.0	56.8	21.1	6.72
P-134	Mudstone, dolomitic	LES- 139-47	4.3	0.1	8.5	2.7	0.05	--	16.7	60.1	25.4	7.15
P-133	Mudstone, calcareous, dolomitic	LES- 138-47	2.4	0.3	7.6	2.4	0.06	--	18.4	56.8	27.8	7.87
P-132	Mudstone, calcareous	LES- 137-47	0.7	0.2	10.3	2.6	0.05	--	10.4	73.1	28.5	8.01
P-131	Mudstone	LES- 136-47	2.0	0.2	6.9	3.2	0.11	--	14.5	65.1	30.5	8.41
P-130	Mudstone, dolomitic	LES- 135-47	4.5	0.3	9.1	2.3	0.05	0.14	16.2	61.9	35.0	9.76
P-129	Mudstone, dolomitic	LES- 134-47	3.0	0.1	9.4	2.7	0.02	0.15	16.0	60.9	38.0	10.06
P-128	Mudstone, dolomitic	LES- 133-47	0.2	1.7	10.5	2.9	0.04	0.40	17.5	52.3	38.2	10.40
P-127	Phosphate rock, argillaceous	LES- 143-47	1.2	17.7	1.8	1.4	0.05	--	8.1	33.1	39.4	31.64
P-126	Limestone, phosphatic, and phosphatic, calcareous mudstone	LES- 142-47	1.65	8.7	4.7	1.7	0.14	--	18.6	35.8	41.05	46.00
P-125	Limestone, argillaceous	LES- 141-47	1.2	14.1	5.3	1.9	0.06	--	23.2	35.8	43.25	50.92
P-124	Phosphate rock	RAH- 111-47	1.8	31.5	1.6	0.61	0.17	--	6.8	4.5	44.05	107.62
P-123	Phosphate rock	RAH- 110-47	1.7	31.4	1.8	0.40	0.11	3.5	5.8	1.9	45.75	161.00
P-122	Phosphate rock, argillaceous	RAH- 109-47	0.5	21.0	3.4	1.6	0.06	2.2	8.3	29.4	46.25	171.50
P-121	Phosphate rock	RAH- 108-47	1.3	31.5	1.1	0.63	0.22	--	8.8	4.0	47.55	212.44
P-120	Phosphate rock	RAH- 107-47	0.6	24.0	3.8	1.4	0.28	2.7	13.2	17.2	48.15	226.84

P-119	Phosphate rock	RAH-106-47	1.4	28.0	2.0	1.0	0.17	3.1	11.1	11.0	49.55	266.04
P-118	Phosphate rock	RAH-105-47	1.0	25.9	2.5	1.0	0.14	3.0	12.3	13.2	50.55	291.94
P-117	Phosphate rock, argillaceous	RAH-104-47	0.9	22.7	5.1	1.4	0.25	--	10.8	26.2	51.45	312.38
P-116	Mudstone, dolomitic	RAH-103-47	2.9	6.5	6.4	1.9	0.03	--	19.7	44.3	54.35	331.23
P-115	Phosphate rock, argillaceous	RAH-102-47	2.9	23.4	4.4	1.7	0.06	2.8	6.6	25.5	57.25	399.09
P-114	Phosphate rock, lower 0.3 foot cherty	RAH-101-47	2.0	28.1	2.3	1.5	0.02	3.0	4.0	18.4	59.25	435.29
P-113	Chert	RAH-100-47	3.8	0.8	0.1	3.4	0.06	0.10	2.2	89.9	63.05	458.33
P-112	Mudstone, dolomitic	VEM-174-47	1.1	0.5	1.5	2.1	0.05	0.07	23.4	64.1	64.15	458.88
P-111	Chert	VEM-173-47	1.2	1.3	6.4	3.7	0.05	0.23	4.3	83.4	65.35	460.44
P-110	Dolomite, cherty	LES-179-47	1.6	0.4	1.0	1.9	0.05	0.07	29.1	34.5	66.95	461.08
P-109	Phosphate rock	LES-178-47	1.25	25.3	2.3	1.8	0.09	3.0	6.6	18.9	68.20	492.70
P-108	Mudstone, dolomitic	LES-177-47	0.5	6.0	6.6	2.5	0.10	--	17.2	43.9	68.70	495.70
P-107	Mudstone, dolomitic	LES-176-47	2.3	1.6	5.5	2.1	0.02	0.21	20.6	50.1	71.00	499.38
P-106	Phosphate rock, argillaceous	LES-175-47	0.4	22.0	6.2	2.2	0.07	2.4	7.5	27.6	71.40	508.18
P-105	Mudstone, dolomitic	LES-174-47	1.7	0.1	8.8	2.9	0.06	--	13.9	66.8	73.10	508.35
P-104	Mudstone	LES-173-47	0.8	0.8	12.3	3.2	0.05	0.22	4.6	84.3	73.90	508.99
P-103	Phosphate rock and mudstone	LES-172-47	0.9	17.6	4.9	2.1	0.06	--	16.4	23.5	74.80	524.83
P-102	Mudstone, calcareous	LES-171-47	0.3	7.5	8.8	3.8	0.09	1.1	24.5	40.5	75.10	527.08
P-101	Mudstone, calcareous, dolomitic	LES-170-47	0.7	2.3	5.7	2.9	0.05	0.37	23.9	41.3	75.80	528.69
P-100	Phosphate rock and mudstone, calcareous	LES-169-47	0.9	10.1	6.2	2.1	0.13	--	21.7	28.5	76.70	537.78
P- 99	Mudstone, dolomitic	LES-168-47	0.5	0.20	8.6	2.3	0.05	0.13	18.2	60.0	77.20	537.88
P- 98	Limestone, argillaceous	LES-167-47	0.75	0.1	5.0	1.3	0.04	--	30.1	31.2	77.90	537.95
P- 97	Phosphate rock and phosphatic mudstone	LES-166-47	0.7	17.5	5.7	2.2	0.08	--	15.7	24.4	78.65	551.08
P- 96	Phosphate rock and phosphatic limestone	LES-165-47	0.6	22.2	2.7	2.0	0.02	2.4	15.6	10.7	79.25	564.40
P- 95	Mudstone, calcareous, phosphatic and limestone	LES-164-47	1.1	8.3	4.3	1.6	0.04	1.0	27.3	17.7	80.35	573.53
P- 94	Mudstone, phosphatic	LES-163-47	0.55	9.4	9.6	3.0	0.02	1.0	16.1	45.5	80.90	578.70
P- 93	Mudstone, phosphatic	LES-162-47	1.1	7.8	11.6	3.4	0.07	--	16.0	40.3	82.00	587.28
P- 92	Limestone	LES-161-47	2.8	0.3	2.1	0.63	0.04	--	41.0	8.2	84.80	588.12
P- 91	Mudstone	LES-160-47	0.6	2.3	11.5	3.6	0.25	0.34	11.8	60.5	85.40	589.50
P- 90	Mudstone	LES-159-47	0.6	0.06	13.0	3.9	0.11	0.17	15.2	70.0	86.00	589.53
P- 89	Mudstone	LES-158-47	0.3	0.15	14.3	3.7	0.33	0.14	11.2	78.4	86.30	589.58
P- 88	Mudstone	LES-157-47	0.4	0.2	13.4	3.5	0.23	0.12	10.9	76.5	86.70	589.66
P- 87	Mudstone	LES-156-47	0.4	2.0	12.6	3.7	0.10	0.40	10.8	74.5	87.10	590.46
P- 86	Mudstone, phosphatic	LES-155-47	0.4	8.60	9.5	3.4	0.05	1.0	14.4	49.8	87.50	593.90
P- 85	Mudstone, calcareous	LES-154-47	0.6	5.3	11.0	3.5	0.10	0.64	14.9	50.5	88.10	597.08
P- 84	Dolomite, argillaceous	LES-153-47	0.9	0.9	5.2	1.7	0.07	--	27.9	35.5	89.00	597.89
P- 83	Mudstone	LES-152-47	1.0	4.9	11.0	3.0	0.03	--	7.4	71.9	90.00	602.79
P- 82	Mudstone, contains limestone concretions	LES-151-47	2.2	0.8	9.7	2.7	0.06	0.13	9.5	73.2	92.20	604.55
P- 81	Mudstone	LES-150-47	1.6	0.3	10.0	2.8	0.02	--	11.6	71.6	93.80	605.03

[2] See silver analyses of selected samples at end of chemical analyses tables.

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	V_2O_5	F	Loss on ignition	Acid insoluble		
P- 80	Mudstone, phosphatic, contains gypsum	LES- 149-47	2.5	8.3	8.0	2.9	0.03	1.0	19.7	43.0	96.30	625.78
P- 79	Limestone, argillaceous	VEM-172-47	1.3	0.2	4.3	1.2	0.08	--	30.3	28.7	97.60	626.04
P- 78	Mudstone and phosphatic mudstone, contains gypsum	VEM-171-47	0.9	3.9	9.0	2.8	0.0	0.59	12.3	60.6	98.50	629.55
P- 77	Mudstone, calcareous, mudstone and phosphate rock	VEM-169-47	1.1	9.0	6.4	0.6	0.05	1.0	13.3	45.1	99.60	639.45
--	Limestone concretion near top of bed P-77	VEM 170-47	(0.9)	1.9	1.5	2.6	0.05	--	37.6	7.5	--	--
P- 76	Mudstone, phosphatic	VEM-168-47	1.3	10.6	8.2	2.3	0.09	--	19.3	34.1	100.90	654.23
P- 75	Phosphate rock, argillaceous, contains gypsum	VEM-167-47	2.2	15.6	5.4	1.8	0.09	1.6	21.2	19.5	103.10	687.54
P- 74	Limestone, argillaceous	VEM-166-47	0.5	2.2	0.3	0.3	0.07	--	40.5	3.00	103.60	688.65
P- 73	Phosphate rock and phosphatic mudstone, contains gypsum	VEM-165-47	0.6	16.4	6.9	2.0	0.22	--	16.1	29.7	104.20	698.49
P- 72	Mudstone, calcareous	VEM-164-47	0.6	1.1	7.5	2.3	0.09	--	24.2	45.9	104.80	699.15
P- 71	Mudstone, phosphatic and limestone	VEM-163-47	1.6	8.5	7.9	2.4	0.13	--	19.0	41.4	106.40	712.75
P- 70	Phosphate rock, argillaceous, contains gypsum	VEM-162-47	2.7	13.9	6.0	1.9	0.10	--	20.7	23.2	109.10	750.28
P- 69	Limestone and calcareous mudstone	VEM-161-47	1.2	1.2	3.8	0.4	0.02	--	40.9	5.1	110.30	751.72
P- 68	Limestone	VEM-160-47	1.4	1.4	2.0	0.6	0.02	0.22	38.5	10.4	111.70	753.68
P- 67	Mudstone, phosphatic, contains gypsum	VEM-159-47	0.9	8.4	8.3	2.5	0.06	--	23.6	35.0	112.60	761.24
P- 66	Mudstone, phosphatic, contains gypsum	VEM-158-47	1.2	8.8	10.5	2.5	0.13	--	21.3	37.7	113.80	771.80
P- 65	Dolomite, argillaceous	VEM-157-47	0.6	2.7	6.2	1.8	0.05	--	29.7	25.6	114.40	773.42
P- 64	Phosphate rock, argillaceous	VEM-156-47	2.0	18.3	6.0	1.9	0.05	--	17.7	23.9	116.40	810.02
P- 63	Phosphate rock	VEM-155-47	2.4	18.0	4.1	1.6	0.12	--	19.3	16.1	118.80	853.22
P- 62	Limestone, dolomitic	VEM-154-47	1.1	2.6	1.7	0.6	0.02	--	37.5	9.7	119.90	856.08
P- 61	Phosphate rock	VEM-153-47	1.0	31.2	2.0	1.5	0.11	--	6.7	7.4	120.90	887.28
P- 60	Phosphate rock, argillaceous	VEM-152-47	0.9	23.6	3.2	1.1	0.06	--	9.0	20.5	121.80	908.52
P- 59	Limestone, argillaceous	VEM-151-47	1.5	2.5	3.0	0.9	0.08	--	30.6	24.2	123.30	912.27
P- 58	Mudstone	VEM-150-47	0.9	6.7	9.4	2.6	0.00	--	13.5	52.9	124.20	918.30
P- 57	Mudstone	VEM-149-47	2.1	4.9	9.4	2.7	0.08	--	14.2	57.5	126.30	928.59
P- 56	Mudstone, dolomitic	VEM-148-47	3.9	0.9	7.4	2.2	0.06	--	21.1	50.9	130.20	932.10
P- 55	Limestone, argillaceous	VEM-147-47	1.7	0.8	5.2	1.3	0.12	--	27.7	35.3	131.90	933.46
P- 54	Mudstone, cherty	VEM-146-47	0.9	4.2	4.9	2.5	0.05	--	9.3	65.6	132.80	937.24
P- 53	Limestone	VEM-145-47	2.3	0.7	1.2	0.5	0.04	0.08	35.5	17.4	135.10	938.85
P- 52	Mudstone, calcareous, and phosphatic limestone	VEM-123-47	2.3	3.0	4.4	1.5	0.00	--	12.9	63.3	137.40	945.75

P- 51	Limestone, dolomitic, argillaceous	VEM-122-47	2.4	0.3	1.3	0.3	0.05	--	34.2	21.3	139.80	946.47
P- 50	Mudstone and chert	VEM-121-47	2.5	3.9	3.9	1.7	0.02	0.54	10.9	64.0	142.30	956.22
P- 49	Dolomite, argillaceous	VEM-120-47	3.2	1.1	1.4	0.4	0.12	--	34.6	20.1	145.50	959.74
P- 48	Mudstone, phosphatic	VEM-119-47	1.5	8.5	4.3	1.4	0.02	0.90	11.6	53.6	147.00	972.49
P- 47	Mudstone, phosphatic	VEM-118-47	2.2	10.35	4.4	1.8	0.05	0.98	9.2	51.2	149.20	995.26
P- 46	Mudstone	VEM-117-47	1.1	0.9	10.5	2.6	0.20	--	11.1	73.9	150.30	996.25
P- 45	Phosphate rock, argillaceous	VEM-116-47	1.0	18.0	3.8	1.2	0.18	--	11.5	31.0	151.30	1,014.25
P- 44	Mudstone, phosphatic	VEM-114-47	1.6	13.9	6.8	1.5	0.18	--	12.2	42.4	152.90	1,036.49
--	Limestone concretion at base of bed P-44	VEM-115-47	(0.9)	0.3	2.1	0.5	0.07	--	35.5	18.5	--	--
P- 43	Limestone, argillaceous	VEM-113-47	1.8	0.1	5.7	1.5	0.05	--	28.2	43.9	154.70	1,036.67
P- 42	Mudstone	VEM-112-47	1.5	7.2	7.1	1.8	0.26	--	14.0	55.5	156.20	1,047.47
--	Limestone concretion near base of bed P-42	VEM-111-47	(0.7)	2.5	0.5	0.4	0.08	0.31	35.2	13.8	--	--
P- 41	Mudstone, phosphatic	VEM-110-47	1.4	13.1	5.7	1.6	0.09	1.2	9.2	49.7	157.60	1,065.81
P- 40	Mudstone, phosphatic	VEM-108-47	2.1	7.8	8.0	2.1	0.14	--	9.7	58.4	159.70	1,082.19
--	Limestone concretion at top of bed P-40	VEM-109-47	(0.7)	1.2	2.0	0.6	0.05	--	34.7	16.4	--	--
P- 39	Mudstone, dolomitic	VEM-107-47	1.4	1.4	9.0	2.3	0.06	--	13.2	66.4	161.10	1,082.15
P- 38	Phosphate rock, argillaceous	VEM-106-47	2.1	22.6	3.9	1.1	0.07	--	9.0	25.1	163.20	1,131.61
P- 37	Limestone	VEM-105-47	1.2	1.0	1.4	0.4	0.07	--	37.8	11.0	164.40	1,132.81
P- 36	Phosphate rock, argillaceous and limestone	LES- 132-47	3.5	22.1	3.0	0.88	0.06	--	9.4	27.2	167.90	1,210.16
P- 35	Phosphate rock, argillaceous	LES- 131-47	2.2	23.8	2.9	0.53	0.05	--	9.3	22.8	170.10	1,262.52
P- 34	Mudstone, calcareous	LES- 130-47	0.6	4.2	3.2	0.78	0.02	--	15.8	56.5	170.70	1,265.04
P- 33	Phosphate rock, argillaceous	LES- 129-47	0.65	18.1	3.9	0.91	0.03	--	9.2	34.8	171.35	1,276.80
P- 32	Limestone	LES- 128-47	1.7	1.8	1.1	0.35	0.05	--	37.2	11.7	173.05	1,279.86
P- 31	Mudstone, calcareous, phosphatic	LES- 127-47	0.8	8.9	3.6	1.0	0.04	--	15.2	46.1	173.85	1,286.98
P- 30	Mudstone, phosphatic	LES- 126-47	1.45	11.35	6.8	1.6	0.08	1.4	10.6	45.5	175.30	1,303.44
P- 29	Limestone, argillaceous	LES- 125-47	0.95	5.9	3.3	1.2	0.09	--	20.5	37.0	176.25	1,309.04
P- 28	Phosphate rock, argillaceous	LES- 124-47	0.8	17.0	6.8	1.3	0.06	--	11.9	30.5	177.05	1,322.64
P- 27	Chert, calcareous	LES- 123-47	0.4	1.8	1.7	1.3	0.00	0.24	18.2	56.4	177.45	1,323.36
P- 26	Limestone	LES- 122-47	1.8	0.5	1.1	0.25	0.06	--	37.7	12.4	179.25	1,324.26
P- 25	Phosphate rock, calcareous, and argillaceous limestone	LES- 121-47	1.0	11.9	7.0	1.4	0.04	--	16.2	32.6	180.25	1,336.16
P- 24	Chert, dolomitic	LES- 120-47	0.6	3.8	1.9	2.2	0.07	--	11.3	62.3	180.85	1,338.44
P- 23	Limestone and chert	LES- 119-47	1.0	3.0	1.8	0.85	0.05	--	24.3	33.9	181.85	1,341.44
P- 22	Limestone	LES- 118-47	1.3	1.2	0.7	0.21	0.04	0.18	37.7	10.1	183.15	1,343.00
P- 21	Mudstone, calcareous	LES- 117-47	1.2	1.5	1.4	0.24	<0.01	0.09	10.8	65.8	184.35	1,344.80
P- 20	Limestone	VEM-144-47	1.0	1.0	0.2	0.2	0.07	0.13	37.3	10.7	185.35	1,345.80
P- 19	Limestone, phosphatic, argillaceous; fos. col. no. 47-HW-313	VEM-143-47	2.3	8.4	3.5	0.7	0.08	--	24.8	21.4	187.65	1,365.12

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	V_2O_5	F	Loss on ignition	Acid insoluble		
P- 18	Limestone, phosphatic; fos. col. nos. 47-HW-312 and 47-HW-312 A	VEM-142-47	0.6	12.4	1.9	0.7	0.04	1.3	21.5	18.8	188.25	1,371.56
P- 17	Limestone, fos. col. no. 47-HW-311	VEM-141-47	1.55	0.5	1.9	0.3	0.11	--	35.4	17.1	189.80	1,373.34
P- 16	Limestone, argillaceous; fos. col. no. 47-HW-310	VEM-140-47	2.0	1.8	2.2	0.6	0.18	--	31.6	24.7	191.80	1,376.94
	Limestone concretion at top of bed P-16; thickness of beds P-16 and P-17 irregular.											
P- 15	Dolomite, argillaceous	VEM-139-47	2.3	1.9	4.0	1.2	0.05	--	24.5	42.6	194.10	1,381.31
P- 14	Mudstone, dolomitic	VEM-138-47	0.8	4.1	3.8	1.6	0.03	0.58	24.9	33.7	194.90	1,384.59
P- 13	Limestone, cherty; fos. col. no. 47-HW-309	VEM-137-47	1.5	1.9	1.9	0.5	0.0	0.15	33.0	20.9	196.40	1,387.44
P- 12	Dolomite, argillaceous	VEM-136-47	1.5	3.1	3.9	1.2	0.0	0.41	26.3	33.0	197.90	1,392.09
P- 11	Dolomite, argillaceous,	VEM-135-47	2.6	2.2	3.5	1.1	0.0	0.34	27.9	32.0	200.50	1,397.81
P- 10	Dolomite, calcareous, argillaceous	VEM-134-47	2.2	1.8	2.2	0.8	0.00	0.16	33.2	25.2	202.70	1,401.77
P- 9	Dolomite, calcareous, argillaceous	VEM-133-47	1.7	1.7	3.2	1.0	0.05	--	31.8	25.5	204.40	1,404.66
P- 8	Phosphate rock and phosphatic mudstone	VEM-132-47	1.3	22.9	1.1	1.4	0.18	--	11.0	18.5	205.70	1,434.43
P- 7	Dolomite, argillaceous	VEM-131-47	0.6	7.5	5.2	2.0	0.21	0.82	25.5	31.3	206.30	1,438.93
P- 6	Phosphate rock	VEM-130-47	0.7	26.3	2.8	1.0	0.16	2.9	8.7	13.0	207.00	1,457.34
P- 5	Mudstone, dolomitic	VEM-129-47	0.7	0.3	8.4	2.1	0.08	0.16	15.6	63.6	207.70	1,457.55
P- 4	Mudstone, calcareous	VEM-128-47	1.9	0.1	6.8	1.4	0.12	--	16.8	61.8	209.60	1,457.74
P- 3	Mudstone	VEM-127-47	1.0	0.4	10.2	2.5	0.10	0.35	12.2	66.0	210.60	1,458.14
P- 2	Mudstone, calcareous	VEM-126-47	1.2	0.4	6.7	1.4	0.07	0.13	17.5	57.4	211.80	1,458.62
P- 1	Phosphate rock; fos. col. no. 47-HW-308	VEM-125-47	0.4	28.6	1.8	0.5	0.12		5.5	12.8	212.20	1,470.06
	Wells formation											
CW- 1	Dolomite, calcareous	VEM-124-47	3.6	2.2	0.8	0.5	0.16	--	36.8	14.8	3.6	--

Additional analyses of Brazer Canyon samples

Bed no.	Sample no.	SiO_2	CaO	MgO	Na_2O	K_2O	TiO_2	H_2O-	CO_2	S as SO_3
Td-1	RAH- 99-47	48.36	12.40	1.90	--	--	0.62	0.98	9.80	--
R- 35	RAH- 98-47	29.72	35.70	1.20	--	--	0.09	0.24	27.7	--
R- 34	RAH- 97-47	28.42	--	--	--	--	0.07	0.33	21.5	--
R- 33	RAH- 96-47	54.72	19.0	1.90	--	--	0.14	0.34	11.4	--
R- 32	RAH- 95-47	56.76	17.60	1.40	0.55	0.70	0.09	0.16	11.5	0.27
R- 31	RAH- 94-47	62.22	14.00	2.0	--	--	0.08	0.26	9.7	0.33
R- 30	RAH- 93-47	60.80	15.6	1.3	0.52	0.67	0.08	0.26	5.1	0.54
R- 29	RAH- 92-47	57.02	4.40	1.2	--	--	0.61	2.65	0.70	0.16
R- 28	RAH- 91-47	43.18	21.00	1.6	0.64	1.20	0.24	0.48	3.5	0.77
R- 27	RAH- 90-47	42.60	18.80	8.0	--	--	0.09	0.06	18.8	--
R- 26	RAH- 89-47	10.02	29.0	16.4	0.54	0.37	0.05	0.17	37.9	0.13
R- 25	RAH- 88-47	25.82	25.60	12.9	--	--	0.04	0.10	30.2	--
R- 24	RAH- 87-47	22.82	25.00	6.8	0.52	0.35	0.05	0.09	31.4	0.08
R- 23	RAH- 86-47	62.34	11.20	5.1	--	--	0.05	0.07	12.8	--
R- 22	RAH- 85-47	26.30	24.80	13.3	--	--	0.03	0.06	31.3	--
R- 21	RAH- 84-47	36.14	20.2	12.2	--	--	0.03	0.10	28.0	--
R- 20	RAH- 83-47	50.58	15.4	9.6	--	--	0.03	0.11	21.9	--
R- 19	RAH- 82-47	12.18	27.16	17.7	--	--	0.05	0.13	40.0	--
R- 18	RAH- 81-47	5.78	31.60	19.1	--	--	0.04	0.04	43.1	--
R- 17	RAH- 80-47	23.78	25.4	13.1	--	--	0.10	0.08	33.0	--
R- 16	RAH- 79-47	23.52	26.00	12.8	0.49	0.49	0.14	0.15	32.4	0.08
R- 15	RAH- 78-47	31.30	21.00	11.4	--	--	0.20	0.32	27.1	--
R- 14	RAH- 77-47	19.70	28.60	14.0	--	--	0.07	0.05	34.7	--
R- 13	RAH- 76-47	28.94	22.30	10.2	--	--	0.22	0.16	27.5	--
R- 12	RAH- 75-47	29.86	21.8	11.4	--	--	0.23	0.22	28.4	--
R- 11	RAH- 74-47	47.32	13.20	6.5	--	--	0.39	0.40	16.8	--
R- 10	RAH- 73-47	33.00	30.00	2.9	--	--	0.18	0.31	24.9	0.17
R- 9	RAH- 72-47	19.46	--	--	0.80	1.05	0.14	0.38	20.2	--
R- 8	RAH- 71-47	47.50	25.60	2.5	0.35	0.40	0.06	0.16	20.6	0.14
R- 7	RAH- 70-47	71.26	--	--	--	--	0.04	0.15	9.1	--
R- 6	RAH- 69-47	55.94	13.60	5.0	--	--	0.16	0.12	15.6	--
R- 5	RAH- 68-47	68.16	7.80	3.0	--	--	0.12	0.19	9.1	0.14
R- 4	RAH- 67-47	53.08	18.30	1.8	--	--	0.16	0.15	14.4	--
R- 3	RAH- 66-47	41.80	--	--	--	--	0.05	0.15	24.2	--
R- 2	RAH- 65-57	52.10	21.00	2.2	0.77	0.40	0.07	0.11	16.7	0.24
R- 1	RAH- 64-47	43.86	24.20	2.6	--	--	0.08	0.28	21.7	--
P-140	LES- 148-47	41.86	26.40	1.8	0.84	0.89	0.19	0.29	20.9	0.30
P-138	LES- 147-47	44.98	--	--	--	--	0.14	0.33	19.8	--
P-137	LES- 146-47	45.48	--	--	0.92	1.30	0.30	0.43	19.5	--
P-136	LES- 145-47	42.26	--	--	0.82	3.00	0.15	1.43	12.1	--

Bed no.	Sample no.	SiO_2	CaO	MgO	Na_2O	K_2O	TiO_2	H_2O	CO_2	S as SO_3
P-136	LES- 144-47	47.90	--	--	--	--	0.28	0.41	16.2	--
P-135	LES- 140-47	50.64	--	--	0.87	1.20	0.32	0.40	15.9	--
P-134	LES- 139-47	52.08	--	--	--	--	0.15	0.68	13.8	--
P-133	LES- 138-47	51.28	--	--	--	--	0.38	0.55	15.6	--
P-132	LES- 137-47	62.26	--	--	1.07	2.30	0.92	0.80	6.6	--
P-131	LES- 136-47	51.16	--	--	1.05	2.10	0.30	0.65	10.8	--
P-130	LES- 135-47	47.80	10.20	6.2	1.00	2.14	0.43	0.59	13.0	0.21
P-129	LES- 134-47	53.00	11.00	5.6	0.70	2.00	0.40	0.62	13.1	0.22
P-128	LES- 133-47	44.50	12.40	6.1	0.62	2.05	0.44	0.92	12.9	0.41
P-127	LES- 143-47	33.74	--	--	0.95	0.80	0.08	0.30	6.8	--
P-126	LES- 142-47	32.34	--	--	0.84	1.10	0.27	0.38	16.8	--
P-125	LES- 141-47	30.58	--	--	--	--	0.21	0.38	21.7	--
P-124	RAH- 111-47	4.56	--	--	1.30	0.80	0.08	0.45	4.8	--
P-123	RAH- 110-47	3.50	52.40	0.19	1.30	0.59	0.03	0.33	4.3	2.8
P-122	RAH- 109-47	27.00	32.60	1.5	1.30	1.1	0.28	0.54	3.6	2.1
P-121	RAH- 108-47	4.86	--	--	1.35	0.70	0.06	0.65	3.9	--
P-120	RAH- 107-47	17.00	36.4	0.96	1.20	1.40	0.18	1.71	2.0	3.1
P-119	RAH- 106-47	11.08	40.90	0.80	1.30	0.70	0.12	1.30	2.0	3.3
P-118	RAH- 105-47	13.30	39.50	0.78	1.24	0.80	0.13	1.66	2.0	3.6
P-117	RAH- 104-47	22.58	--	--	1.40	1.50	0.22	1.40	1.5	--
P-116	RAH- 103-47	34.30	--	--	1.40	1.70	0.31	0.65	16.3	--
P-115	RAH- 102-47	23.90	35.20	0.50	1.40	1.20	0.23	0.69	1.4	2.3
P-114	RAH- 101-47	18.00	41.40	0.21	1.50	0.80	0.18	0.30	1.5	2.1
P-113	RAH- 100-47	82.94	1.60	0.19	0.65	1.40	0.27	0.35	0.40	0.35
P-112	VEM-174-47	43.06	17.60	9.2	0.62	0.59	0.07	0.18	23.3	0.21
P-111	VEM-173-47	77.02	2.40	0.78	0.52	2.00	0.27	0.42	1.4	0.53
P-110	LES- 179-47	32.88	21.40	12.0	0.69	0.40	0.04	0.08	28.6	0.4
P-109	LES- 178-47	19.00	39.80	1.0	1.10	0.89	0.10	0.44	4.3	1.7
P-108	LES- 177-47	37.00	--	--	1.50	1.40	0.39	0.45	15.0	--
P-107	LES- 176-47	41.76	15.80	8.3	1.49	1.90	0.38	0.18	19.7	0.23
P-106	LES- 175-47	25.00	32.40	0.59	1.40	1.60	0.32	1.09	1.4	2.2
P-105	LES- 174-47	55.56	--	--	--	--	0.51	0.28	12.2	--
P-104	LES- 173-47	68.82	2.40	0.61	2.00	3.50	0.53	0.53	0.55	0.40
P-103	LES- 172-47	21.24	--	--	0.90	1.30	0.23	2.13	4.6	--
P-102	LES- 171-47	25.14	12.80	2.1	0.64	2.10	0.33	4.47	0.55	4.2
P-101	LES- 170-47	35.18	21.76	4.1	0.94	1.50	0.36	1.10	19.0	1.0
P-100	LES- 169-47	24.52	--	--	0.99	1.70	0.27	1.90	13.4	--
P- 99	LES- 168-47	48.46	11.80	4.3	1.40	2.50	0.50	0.87	12.4	1.2
P- 98	LES- 167-47	26.00	--	--	--	--	0.26	0.43	28.0	--
P- 97	LES- 166-47	22.42	--	--	1.14	1.30	0.26	1.60	5.6	--

Bed no.	Sample no.	SiO_2	CaO	MgO	Na_2O	K_2O	TiO_2	H_2O-	CO_2	S & SO_3
P- 56	VEM-148-47	[illegible]	---	---	1.00	2.00	0.37	0.85	17.1	---
P- 55	VEM-147-47	30.24	---	---	0.60	1.20	0.20	0.48	25.1	---
P- 54	VEM-146-47	60.94	---	---	0.62	1.40	0.16	0.48	6.0	---
P- 53	VEM-145-47	16.48	42.40	2.2	0.42	0.80	0.06	0.15	34.6	0.37
P- 52	VEM-123-47	39.36	---	---	0.70	1.90	0.22	0.45	9.9	---
P- 51	VEM-122-47	20.20	---	---	0.30	0.50	0.07	0.18	32.9	---
P- 50	VEM-121-47	56.64	22.0	1.7	0.59	1.30	0.22	0.49	7.5	0.63
P- 49	VEM-120-47	19.42	---	---	0.67	0.47	0.06	0.08	33.4	---
P- 48	VEM-119-47	49.82	17.90	2.7	0.60	1.40	0.20	0.67	7.7	1.01
P- 47	VEM-118-47	45.60	20.00	1.7	0.74	1.70	0.22	0.53	6.1	1.1
P- 46	VEM-117-47	61.72	---	---	0.84	3.20	0.55	0.95	5.2	---
P- 45	VEM-116-47	30.30	---	---	0.90	1.10	0.24	1.28	4.3	---
P- 44	VEM-114-47	38.00	---	---	1.09	2.00	0.35	1.70	3.0	---
---	VEM-115-47	16.28	---	---	0.84	0.60	0.11	0.28	33.9	---
P- 43	VEM-113-47	37.68	---	---	---	---	0.35	0.50	21.9	---
P- 42	VEM-112-47	58.92	---	---	1.19	2.30	0.36	1.70	4.1	---
---	VEM-111-47	2.48	46.20	0.94	0.95	0.30	0.09	0.22	33.8	0.71
P- 41	VEM-110-47	3.30	20.40	0.66	1.30	1.90	0.41	1.28	2.0	1.9
P- 40	VEM-108-47	60.42	---	---	1.25	2.80	0.51	1.28	2.9	---
---	VEM-109-47	14.42	---	---	---	---	0.12	0.18	33.3	---
P- 39	VEM-107-47	36.56	---	---	---	---	0.17	0.45	11.1	---
P- 38	VEM-106-47	22.96	---	---	---	---	0.21	1.08	2.6	---
P- 37	VEM-105-47	10.16	---	---	---	---	0.07	0.15	37.2	---
P- 36	LES- 132-47	26.16	---	---	---	---	0.18	0.93	3.7	---
P- 35	LES- 131-47	21.44	37.60	0.60	1.00	1.00	0.14	0.82	3.1	2.4
P- 34	LES- 130-47	56.10	19.20	1.2	0.45	1.05	0.14	0.54	12.6	1.0
P- 33	LES- 129-47	35.48	30.60	0.60	0.77	1.30	0.18	0.87	4.0	1.8
P- 32	LES- 128-47	11.16	---	---	0.60	0.70	0.04	0.15	36.2	---
P- 31	LES- 127-47	43.80	---	---	0.69	1.20	0.20	0.68	10.6	---
P- 30	LES- 126-47	39.80	22.40	1.2	0.85	2.40	0.35	0.95	5.2	1.5
P- 29	LES- 125-47	34.52	---	---	0.64	1.30	0.14	0.45	18.1	---
P- 28	LES- 124-47	27.66	---	---	0.95	1.90	0.25	0.75	5.7	---
P- 27	LES- 123-47	35.38	21.60	0.89	0.40	0.60	0.06	0.24	14.9	0.35
P- 26	LES- 122-47	11.56	---	---	0.57	0.70	0.05	0.08	36.9	---
P- 25	LES- 121-47	28.98	---	---	0.80	1.90	0.29	0.58	12.4	---
P- 24	LES- 120-47	60.72	---	---	0.62	0.80	0.07	0.33	10.5	---
P- 23	LES- 119-47	33.80	---	---	---	---	0.05	0.33	23.0	---
P- 22	LES- 118-47	10.10	50.80	0.66	0.50	0.30	0.05	0.16	37.3	0.27
P- 21	LES- 117-47	64.1	15.2	0.64	0.2	1.0	0.2	0.2	36.7	0.32
P- 20	VEM-144-47	10.86	49.20	0.59	0.68	0.40	0.05	0.15	36.8	0.31

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness × percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
P - 4	Limestone	DFD-2546	0.8	6.4	8.6	45.1	319.85
P - 3	Core missing	---	2.9	---	---	48.1	---
P - 2	Phosphate rock	DFD-2547	1.4	27.5	11.2	49.4	35.75*
P - 1	Limestone, argillaceous	DFD-2548	1.4	0.8	36.0	50.8	36.87**
	Wells formation						
Cw- 3	Limestone, argillaceous	DFD-2549	0.7	2.7	21.2	0.7	1.89
Cw- 2	Core missing	---	3.0	---	---	3.7	---
Cw- 1	Limestone, argillaceous	DFD-2550	1.4	2.1	31.7	5.1	4.83*

* Cumulative data incomplete due to missing information. Computations start from zero after interruption.
** Note incompleteness of cumulative data.

P- 19	VEM-143-47	19.76	--	--	0.60	1.20	0.16	0.40	22.5	--
P- 18	VEM-142-47	18.80	42.60	1.1	0.84	0.69	0.09	0.19	20.4	1.0
P- 17	VEM-141-47	16.16	--	--	0.40	0.50	0.08	0.18	34.4	--
P- 16	VEM-140-47	23.10	--	--	0.54	0.60	0.09	0.20	30.3	--
P- 15	VEM-139-47	30.92	--	--	0.55	1.00	0.07	0.33	22.8	--
P- 14	VEM-138-47	29.64	22.80	9.1	0.60	1.20	0.21	0.31	23.4	0.65
P- 13	VEM-137-47	20.28	39.80	2.6	0.50	0.57	0.07	0.14	31.9	0.22
P- 12	VEM-136-47	30.66	23.60	9.4	0.65	1.20	0.16	0.32	25.0	0.47
P- 11	VEM-135-47	28.92	24.80	9.0	0.55	1.00	0.14	0.31	26.2	0.45
P- 10	VEM-134-47	20.82	28.8	9.6	0.54	0.70	0.11	0.28	31.5	0.43
P- 9	VEM-133-47	22.44	--	--	--	--	0.15	0.45	29.9	--
P- 8	VEM-132-47	19.36	--	--	1.10	1.10	0.16	1.28	3.7	--
P- 7	VEM-131-47	26.46	22.40	6.4	0.75	2.0	0.25	1.95	16.5	2.4
P- 6	VEM-130-47	15.32	60.84	1.4	1.30	1.20	0.12	0.76	3.4	3.0
P- 5	VEM-129-47	51.74	10.00	5.6	0.47	2.40	0.50	0.63	12.0	0.45
P- 4	VEM-128-47	54.38	--	--	0.34	1.80	0.45	0.43	14.7	--
P- 3	VEM-127-47	60.10	6.40	3.0	0.43	2.80	0.46	0.85	7.2	0.65
P- 2	VEM-126-47	51.48	11.20	6.5	0.50	2.00	0.44	0.39	15.1	0.22
P- 1	VEM-125-47	43.66	--	--	1.00	0.60	0.09	0.38	4.2	--
Cwr. 1	VEM-124-47	15.48	--	--	0.54	0.60	0.03	0.03	36.6	--

[1] The CO_2 analysis for this sample is probably in error.

Silver analyses of selected samples[1]

Bed no.	Sample no.	Percent Ag
P-102	LES-171-47	0.0010
P- 87	LES-157-47	0.0004
P- 86	LES-156-47	0.0003

[1] Analyses made by U. S. Geological Survey, Geochemistry and Petrology Branch.

SPECTROGRAPHIC ANALYSES—BRAZER CANYON, UTAH. LOT NO. 1203.

Semi-quantitative analyses of samples of the phosphatic shale member of Phosphoria formation, Brazer Canyon, Utah (see immediately preceding paper for location of section, thickness and description of strata, and chemical analyses of samples), made by the 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, Ge, Au, In, Pb, Li, Hg, P, Ta, Sn, and W were looked for in all samples but were not detected.

Explanation of symbols

A = more than 10 percent	E = 0.01-0.1 percent
B = 5-10 percent	F = 0.001-0.01 percent
C = 1-5 percent	G = Less than 0.001 percent
D = 0.1-1 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	Zn
Td-1	RAH- 99-47	B	E	E	B	F	G	C	ND	D	E	F	E	A	ND	E	E	D	E	ND	E
R-35	RAH- 98-47	C	ND	F	A	E	G	C	E	D	E	F	F	A	ND	E	E	E	E	E	E
	Bed R-34 not analyzed.																				
R-33	RAH- 96-47	C	ND	F	A	E	G	C	E	C	E	F	F	A	ND	E	E	E	E	E	E
R-32	RAH- 95-47	C	ND	F	A	E	G	C	ND	C	E	F	E	A	G	E	E	E	E	E	E
R-31	RAH- 94-47	C	E	E	A	E	G	B	E	C	E	F	E	A	ND	E	E	E	E	E	E
R-30	RAH- 93-47	C	ND	F	A	E	G	C	ND	D	E	F	E	A	G	E	E	E	E	E	E
R-29	RAH- 92-47	B	E	E	A	E	G	B	E	C	E	F	E	A	ND	E	E	E	E	E	E
R-28	RAH- 91-47	B	ND	E	A	E	G	C	E	C	E	F	E	A	G	E	E	E	E	E	E
R-27	RAH- 90-47	D	E	E	A	F	G	C	ND	B	E	F	E	A	ND	E	E	E	E	ND	E
R-26	RAH- 89-47	D	ND	ND	A	E	G	C	ND	B	E	F	F	A	ND	E	E	E	E	ND	E
R-25	RAH- 88-47	D	ND	F	A	E	G	C	ND	B	E	F	F	A	ND	E	E	E	E	E	E
R-24	RAH- 87-47	D	ND	F	A	E	G	C	ND	B	E	F	F	A	G	E	E	E	E	E	E
R-23	RAH- 86-47	C	E	F	A	E	G	C	ND	B	E	F	F	A	ND	E	ND	E	E	ND	E
R-22	RAH- 85-47	C	ND	F	A	E	G	C	ND	B	E	F	F	A	ND	E	E	E	E	ND	E
R-21	RAH- 84-47	D	ND	F	A	E	G	C	ND	B	E	F	F	A	ND	E	E	E	E	ND	E
R-20	RAH- 83-47	D	ND	F	A	E	G	C	ND	B	E	F	F	A	ND	E	E	E	E	E	E
R-19	RAH- 82-47	D	ND	F	A	E	G	C	ND	A	E	F	F	A	ND	E	E	E	E	E	E
R-18	RAH- 81-47	D	ND	F	A	E	G	C	ND	A	E	F	F	A	ND	E	E	E	E	E	E
R-17	RAH- 80-47	C	ND	F	A	E	G	C	ND	A	E	F	F	A	ND	E	E	E	E	E	E
R-16	RAH- 79-47	C	ND	F	A	E	G	C	ND	B	E	F	F	A	ND	E	E	E	E	E	E
R-15	RAH- 78-47	C	ND	F	A	E	G	B	ND	B	E	F	F	A	ND	E	E	E	E	ND	E
R-14	RAH- 77-47	C	ND	F	A	E	G	B	ND	B	E	F	F	A	ND	E	E	E	E	ND	E
R-13	RAH- 76-47	C	E	F	A	F	G	C	ND	B	E	F	E	A	G	E	E	E	E	ND	E
R-12	RAH- 75-47	C	ND	F	A	E	G	C	ND	B	E	F	E	A	ND	E	E	E	E	ND	E
R-11	RAH- 74-47	C	E	E	B	F	G	C	ND	C	E	F	E	A	ND	E	E	D	E	ND	E

| | | |

Bed no.	Sample no.	Al	Ba	B	Ca	Cr	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Si	Ag	Na	Sr	Ti	V	Zn	Zr
P-106	LES-173-47	C	D	E	A	D	C	C	E	D	E	F	E	A	D	D	D	D	E	ND	E
P-105	LES-174-47	C	ND	E	C	E	C	C	ND	D	E	ND	E	A	ND	D	ND	D	E	ND	E
P-104	LES-173-47	C	E	E	C	E	C	C	ND	D	E	E	E	A	C	D	E	D	E	ND	E
P-101	LES-172-47	C	ND	E	A	E	C	C	ND	C	E	E	E	A	C	D	E	D	E	D	E
P-102	LES-171-47	C	E	E	B	C	C	C	ND	C	E	E	D	A	F	D	E	D	E	D	E
P-107	LES-170-47	C	ND	E	A	E	C	C	ND	C	E	E	E	A	G	D	E	D	E	ND	E
P-100	LES-169-47	C	ND	E	A	E	C	C	ND	C	E	E	E	A	G	D	E	D	E	ND	E
P-99	LES-168-47	C	E	E	B	E	C	C	ND	C	E	E	E	A	G	D	E	D	E	ND	E
P-98	LES-167-47	C	ND	E	B	E	C	C	ND	D	E	ND	E	A	ND	D	ND	D	E	ND	E
P-97	LES-166-47	C	ND	E	A	E	C	C	ND	D	E	E	E	A	G	D	E	D	E	E	E
P-96	LES-165-47	C	ND	E	A	E	C	C	ND	D	E	E	E	B	G	D	E	D	E	E	E
P-95	LES-164-47	C	ND	E	A	E	C	C	ND	D	E	E	E	B	G	D	E	D	E	E	E
P-94	LES-163-47	C	ND	E	A	E	C	C	ND	D	E	E	E	B	G	D	E	D	E	E	E
P-93	LES-162-47	C	ND	E	A	E	C	C	ND	D	E	E	E	A	G	D	E	D	E	E	E
P-92	LES-161-47	C	ND	E	A	E	C	C	ND	D	E	E	E	A	G	D	E	D	E	E	E
P-91	LES-160-47	B	E	E	C	E	C	C	ND	D	E	E	E	A	F	D	E	D	E	E	E
P-90	LES-159-47	B	E	E	C	E	C	C	ND	D	E	E	E	A	G	D	E	D	E	E	E
P-89	LES-158-47	B	E	E	C	E	C	C	ND	D	E	E	E	A	G	D	E	D	E	E	E
P-88	LES-157-47	B	ND	E	C	E	C	C	ND	D	E	E	E	A	G	D	E	D	E	E	E
P-87	LES-156-47	B	ND	E	C	E	C	C	ND	D	E	E	E	A	G	D	E	D	E	E	E
P-86	LES-155-47	B	E	E	A	E	C	C	ND	D	E	E	E	A	G	D	E	D	E	E	E
P-85	LES-154-47	B	E	E	A	E	C	C	ND	D	E	E	E	A	G	D	E	D	E	E	E
P-84	LES-153-47	B	ND	E	A	E	C	C	ND	D	E	E	E	A	G	D	E	D	E	E	E
P-83	LES-152-47	B	ND	E	A	E	C	C	ND	D	E	E	E	A	G	D	E	D	E	E	E
P-82	LES-151-47	B	ND	E	B	E	C	C	ND	D	E	E	E	A	G	D	E	D	E	E	E
P-81	LES-150-47	C	ND	E	B	E	C	C	ND	D	E	E	E	A	G	D	E	D	E	E	E
P-80	LES-149-47	C	ND	E	A	E	C	C	ND	D	E	E	E	A	G	D	E	D	E	E	E
P-79	VEM-172-47	C	ND	E	A	E	C	C	ND	D	E	E	E	A	G	D	E	D	E	E	E
P-78	VEM-171-47	C	E	E	A	E	C	C	ND	D	E	E	E	A	G	D	E	D	E	E	E
P-77	VEM-169-47	C	E	E	A	E	C	C	ND	D	E	E	E	A	G	D	E	D	E	E	E
P-76	VEM-170-47	D	ND	E	A	E	C	C	ND	D	E	E	E	A	G	D	E	D	E	E	E
P-75	VEM-168-47	C	ND	E	A	E	C	C	ND	D	E	E	E	A	G	D	E	D	E	E	E
P-74	VEM-167-47	C	E	E	A	E	C	C	ND	D	E	E	E	A	G	D	E	D	E	E	E
P-73	VEM-166-47	C	ND	E	A	E	C	C	ND	D	E	E	E	A	G	D	E	D	E	E	E
P-72	VEM-165-47	C	ND	E	A	E	C	C	ND	D	E	E	E	A	G	D	E	D	E	E	E
P-71	VEM-164-47	C	ND	E	A	E	C	C	ND	D	E	E	E	A	G	D	E	D	E	E	E
P-70	VEM-163-47	C	ND	E	A	E	C	C	ND	D	E	E	E	A	G	D	E	D	E	E	E
P-69	VEM-162-47	C	ND	E	A	E	C	C	ND	D	E	E	E	A	G	D	E	D	E	E	E
P-68	VEM-161-47	C	ND	E	A	E	C	C	ND	D	E	E	E	A	G	D	E	D	E	E	E
P-67	VEM-160-47	C	E	E	A	E	C	C	ND	D	E	E	E	A	G	D	E	D	E	E	E
P-66	VEM-159-47	C	ND	E	A	E	C	C	ND	D	E	E	E	A	G	D	E	D	E	E	E
	VEM-158-47	C	ND	E	A	E	C	C	ND	D	E	E	E	A	G	D	E	D	E	E	E

| | | |

Bed no.	Sample no.	Al	Ba	B	Ca	Cr	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Si	Ag	Na	Sr	Ti	V	Zn	Zr
P- 23	LES- 119-47	D	ND	F	A	ND	G	D	ND	D	F	ND	F	A	G	E	F	E	E	ND	E
P- 22	LES- 118-47	D	E	F	A	E	G	D	ND	D	F	E	F	C	G	E	F	E	E	ND	E
P- 21	LES- 117-47	D	ND	F	A	ND	G	D	ND	D	F	ND	F	C	G	E	ND	E	E	ND	E
P- 20	VEM-144-47	D	E	F	A	F	G	D	ND	D	F	E	F	C	G	E	F	E	E	ND	E
P- 19	VEM-143-47	C	ND	F	A	E	G	D	ND	C	F	ND	F	A	ND	E	E	E	E	ND	E
P- 18	VEM-142-47	D	E	F	A	E	G	D	ND	C	F	E	F	B	C	E	E	E	E	ND	E
P- 17	VEM-141-47	D	ND	F	A	ND	G	D	ND	C	F	ND	F	B	ND	E	ND	E	E	ND	E
P- 16	VEM-140-47	C	ND	F	A	E	G	D	ND	C	F	ND	F	B	ND	E	ND	E	E	ND	E
P- 15	VEM-139-47	C	ND	F	A	E	G	D	ND	B	F	F	F	A	G	D	E	E	E	ND	E
P- 14	VEM-138-47	C	ND	F	A	E	G	C	ND	B	F	F	F	A	G	D	E	E	E	ND	E
P- 13	VEM-137-47	D	ND	F	A	E	G	C	ND	C	F	F	F	B	G	E	E	E	E	E	E
P- 12	VEM-136-47	C	E	F	A	E	G	C	ND	C	F	F	F	A	G	E	E	E	E	ND	E
P- 11	VEM-135-47	C	E	F	A	E	G	C	ND	C	F	F	F	A	ND	E	E	E	E	ND	E
P- 10	VEM-134-47	C	ND	F	A	E	G	C	ND	C	F	F	F	A	ND	E	E	E	E	ND	E
P- 9	VEM-133-47	C	ND	F	A	E	G	C	ND	C	F	ND	F	A	ND	E	ND	E	E	ND	E
P- 8	VEM-132-47	C	ND	F	A	E	G	C	ND	C	F	E	F	B	G	D	E	E	D	E	E
P- 7	VEM-131-47	C	E	F	A	E	G	C	ND	C	F	E	F	B	G	D	E	E	D	E	E
P- 6	VEM-130-47	C	ND	F	A	E	G	C	ND	C	F	E	F	B	G	D	E	E	D	E	E
P- 5	VEM-129-47	C	E	F	A	E	G	C	ND	C	F	E	F	A	G	D	E	E	D	E	E
P- 4	VEM-128-47	C	ND	F	A	E	G	C	ND	C	F	E	F	A	ND	E	F	E	E	ND	E
P- 3	VEM-127-47	C	ND	F	A	E	G	C	ND	C	F	E	F	A	G	E	E	E	D	E	E
P- 2	VEM-126-47	C	ND	F	A	E	G	C	ND	C	F	E	F	A	G	E	E	E	D	E	E
P- 1	VEM-125-47	D	ND	F	A	E	G	C	ND	C	F	E	F	A	G	E	E	E	E	ND	E
CW- 1	VEM-124-47	D	ND	F	A	E	F	C	ND	B	E	F	E	B	G	E	F	E	E	E	F

UPPER BRAZER CANYON, UTAH. LOT NO. 1228.

Phosphatic shale member of Phosphoria formation sampled in bulldozer trench on north side of Upper Brazer Canyon, Sec. 30, T. 11 N., R. 8 E., Box Elder County, Utah, on east limb of syncline. Beds strike N. 36° E. and dip 39° W. Section measured by V. E. McKelvey, J. E. Smedley, R. A. Hoppin, and F. W. O'Malley and sampled by R. G. Waring, J. A. Moody, and R. P. Sheldon in June and July 1948. Samples analyzed by U. S. Bureau of Mines laboratory, Albany, Oregon.

No.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness × percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	Loss on ignition	Acid insoluble		
	Phosphatic shale member of Phosphoria formation—lower part only									
[illegible]	Limestone, argillaceous	JES-1089	5.0	0.8	---	---	---	45.5	5.0	[illegible]
[illegible]	Mudstone, calcareous	JES-1088	1.1	0.8	---	---	---	62.1	6.1	[illegible]
[illegible]	Phosphatic rock, argillaceous	JES-1087	1.2	24.0	4.2	2.04	2.82	38.1	7.3	30.06
[illegible]	Limestone, argillaceous; fos. col. no. 48-JES-48[1]	JES-1086	2.4	6.2	2.1	2.29	23.90	30.5	10.1	47.44
[illegible]	Phosphatic rock	JES-1085	0.8	30.8	1.6	0.63	6.48	6.1	10.9	72.18
[illegible]	Phosphatic rock	JES-1084	2.0	32.4	0.73	0.30	6.54	2.8	12.9	136.88
[illegible]	Phosphatic rock	RAH-1094	1.9	32.1	0.89	0.59	5.44	2.5	14.8	197.87
[illegible]	Phosphatic rock, argillaceous	RAH-1093	0.5	20.7	2.7	1.07	8.10	26.4	15.3	208.22
[illegible]	Phosphatic rock	RAH-1092	1.1	33.6	1.0	0.34	4.10	2.0	16.4	245.18
[illegible]	Phosphatic rock	RAH-1091	0.5	33.2	1.2	0.39	4.86	4.3	16.9	261.78
[illegible]	Phosphatic rock, calcareous	RAH-1080	3.0	23.9	2.7	1.14	7.26	18.2	19.9	333.48
[illegible]	Limestone, argillaceous	RAH-1079	2.3	0.9	5.4	1.64	27.92	38.3	22.2	338.55
[illegible]	Phosphatic rock, argillaceous	RAH-1078	0.7	25.3	4.8	1.45	5.08	21.3	22.9	353.26
[illegible]	Phosphatic rock, argillaceous	RAH-1077	1.4	20.6	2.8	1.69	5.72	34.1	24.3	382.10
[illegible]	Phosphatic rock, argillaceous; fos. col. no. 48-JES-47	RAH-1076	2.8	25.6	2.6	1.68	3.58	25.5	27.1	453.78
[illegible]	Limestone, argillaceous	WOM-1083	2.2	3.1	---	---	---	34.4	29.3	460.60
[illegible]	Chert	WOM-1082	2.9	1.8	---	---	---	92.6	32.0	465.46
[illegible]	Mudstone, calcareous	WOM-1081	3.7	2.1	---	---	---	52.7	35.7	473.23
[illegible]	Phosphatic rock, argillaceous; fos. col. no. 48-JES-46	WOM-1070	1.4	24.9	---	---	---	24.2	37.1	508.09
[illegible]	Mudstone and calcareous phosphatic rock; fos. col. no. 48-JES-45	WOM-1069	3.0	9.3	---	---	---	53.3	40.1	517.99
[illegible]	Mudstone; fos. col. no. 48-JES-44	WOM-1068	1.6	1.9	---	---	---	62.8	41.7	522.03
[illegible]	Limestone, argillaceous	WOM-1067	2.2	9.2	---	---	---	42.2	43.9	533.83
[illegible]	Phosphatic rock, argillaceous, calcareous	WOM-1066	1.6	17.1	---	---	---	28.7	45.5	560.49
[illegible]	Limestone and mudstone; fos. col. no. 48-JES-43	RAH-1075	2.25	1.0	---	---	---	16.0	47.75	562.99
[illegible]	Mudstone	RAH-1074	0.5	0.5	---	---	---	69.5	48.25	563.14

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

Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness × percent P_2O_5 (cumulative)
			P_2O_5	Al_2O_3	Fe_2O_3	Loss on ignition	Acid insoluble		
Mudstone	RAH-1073	0.9	1.9	--	--	--	74.5	49.15	564.8
Mudstone, (os. col no. 48-JES-40	RAH-1072	0.6	7.7	--	--	--	58.3	49.75	569.41
Limestone, argillaceous, fos. col. nos. 48-JES-42 and 48-JES-43	RAH-1071	1.8	1.1	--	--	--	35.3	51.55	571.45
Limestone, argillaceous, fos. col. no. 48-JES-49	RAH-1050	(1.8)	0.8	--	--	--	32.8	--	--
RAH-1050 represents the same bed as RAH-1071 but was collected 20 feet farther west.									
Mudstone and phosphate rock	RAH-1049	1.6	7.8	--	--	--	62.3	53.15	583.97
Mudstone and calcareous mudstone	VEM-1010	3.4	1.5	--	--	--	74.0	56.55	589.03
Mudstone, phosphatic	VEM-1009	2.5	10.1	--	--	--	44.9	59.05	614.28
Limestone, argillaceous, fos. col. no. 48-JES-38	VEM-1008	0.7	1.6	--	--	--	30.1	59.75	615.40
Limestone, phosphatic mudstone, and calcareous mudstone	VEM-1007	1.4	6.3	--	--	--	50.3	61.15	624.22
Mudstone, calcareous, phosphatic	VEM-1006	0.6	11.5	--	--	--	35.1	61.75	631.12
Limestone, (os. col. no. 48-JES-37	VEM-1005	0.7	6.4	--	--	--	9.9	62.45	635.60
Limestone, argillaceous	VEM-1060	0.9	1.3	--	--	--	26.1	63.35	636.77
Mudstone, phosphatic	VEM-1059	1.5	13.1	--	--	--	34.6	64.85	656.42
Limestone	VEM-1058	1.3	6.4	--	--	--	19.7	66.15	664.74
Mudstone and calcareous phosphate rock, fos. col. no. 48-JES-36	WOM-1065	2.5	21.1	--	--	--	15.7	68.65	717.49
Limestone	WOM-1064	0.9	3.7	--	--	--	16.0	69.55	720.82
Phosphate rock, calcareous	WOM-1063	2.6	27.0	--	--	--	8.9	72.15	791.02
Limestone, phosphatic	WOM-1062	1.9	13.8	--	--	--	10.0	74.05	817.24
Phosphate rock, calcareous	RPS-1004	(1.9)	16.8	--	--	--	14.9	--	--
RPS-1004 represents the same bed as WOM-1062.									
Phosphate rock, argillaceous	WOM-1061	1.2	19.5	--	--	--	17.7	75.25	835.84
Mudstone, phosphatic	RPS-1003	(1.0)	13.1	--	--	--	43.1	--	--
RPS-1003 represents the same bed as WOM-1061.									
Mudstone	WOM-1030	1.0	7.0	--	--	--	56.7	76.25	842.84
Mudstone	RAH-1015	(1.0)	5.6	--	--	--	59.4	--	--
RAH-1015 represents the same bed as WOM-1030.									
Mudstone, calcareous	RAH-1014	6.5	2.9	--	--	--	57.9	82.75	861.69
Mudstone, calcareous, (os. col. no. 48-JES-35	WOM-1029	(1.3)	6.4	--	--	--	55.7	--	--
WOM-1029 represents the top 1.3 feet of RAH-1014.									

P-29	Mudstone, calcareous; fos. col. no. 48-JES-34	RAH-1013	1.8	3.9	--	--	--	53.7	84.55	868.71
P-30	Limestone, argillaceous	RAH-1012	0.9	0.9	--	--	--	21.4	85.45	869.52
P-31	Mudstone and limestone	RAH-1011	1.5	2.8	--	--	--	46.8	86.95	873.72
P-32	Mudstone	RPS-1002	2.2	5.3	--	--	--	64.9	89.15	885.38
P-33	Limestone and mudstone	RPS-1001	2.7	1.5	--	--	--	21.4	91.85	889.43
P-34	Mudstone, calcareous	RPS-1829	1.7	2.9	--	--	--	60.5	93.55	894.36
P-35	Chert and limestone	RAH-1048	0.7	3.9	--	--	--	72.3	94.25	897.09
P-36	Mudstone and limestone	RAH-1074	2.9	1.3	--	--	--	34.5	97.15	900.86
P-37	Mudstone, cherty, calcareous	RAH-1046	2.8	4.4	--	--	--	68.4	99.95	913.18
P-38	Limestone, cherty	RAH-1045	3.9	1.4	--	--	--	26.4	103.85	918.64
P-39	Mudstone	RAH-1044	3.1	7.0	--	--	--	59.2	106.95	940.34
P-40	Chert and phosphatic mudstone	RAH-1043	1.1	12.9	--	--	--	49.5	108.05	954.53
P-41	Limestone and cherty limestone	RAH-1041	1.6	2.7	--	--	--	70.0	109.65	958.85
	Limestone concretion in RAH-1041	RAH-1042	(0.0-3.0)	0.6	--	--	--	18.2	--	--
P-42	Phosphate rock, argillaceous; fos. col. no. 48-JES-33	RAH-1020	0.8	17.5	--	--	--	40.9	110.45	972.33
P-43	Mudstone and argillaceous phosphate rock	RAH-1019	1.2	16.2	--	--	--	44.6	111.65	992.39
P-44	Limestone, argillaceous; fos. col. no. 48-JES-32	RAH-1018	1.9	0.9	--	--	--	37.8	113.55	994.00
P-45	Mudstone	RAH-1017	0.5	7.2	--	--	--	67.3	114.05	997.60
P-46	Phosphate rock and mudstone	RAH-1016	0.9	18.6	--	--	--	39.2	114.95	1,014.14
P-47	Mudstone, phosphatic	WOM-1028	1.6	10.9	--	--	--	61.7	116.55	1,031.78
P-48	Mudstone, calcareous	WOM-1027	1.5	2.7	--	--	--	56.5	118.05	1,035.91
P-49	Phosphate rock, argillaceous	WOM-1026	1.3	27.6	--	--	--	21.3	119.35	1,071.71
P-50	Phosphate rock and limestone, argillaceous; fos. col. no. 48-JES-31	WOM-1025	3.7	20.2	--	--	--	22.4	123.05	1,146.43
P-51	Phosphate rock and limestone, argillaceous	WOM-1024	2.2	18.4	--	--	--	39.4	125.25	1,186.73
P-52	Mudstone, calcareous and limestone	WOM-1023	1.8	3.3	--	--	--	25.3	127.05	1,192.07
P-53	Mudstone, phosphatic; fos. col. no. 48-JES-30	WOM-1022	2.1	12.0	--	--	--	50.5	129.15	1,218.03
P-54	Chert	VEM-1053	0.4	5.0	--	--	--	68.6	129.55	1,220.01
P-55	Limestone, argillaceous	VEM-1052	0.8	1.8	--	--	--	33.8	130.35	1,221.51
	Phosphate rock and chert; fos. col. no. 48-JES-29	WOM-1021	(1.0)	15.6	--	--	--	45.4	--	--
	WOM-1021 represents a composite of VEM-1052 and VEM-1053.									
P-56	Mudstone, calcareous	VEM-1051	0.5	2.0	--	--	--	50.5	130.85	1,225.01
P-57	Limestone, argillaceous	VEM-1040	0.8	2.2	--	--	--	21.1	131.65	1,226.77
P-58	Limestone, argillaceous; fos. col. no. 48-JES-28	VEM-1039	1.2	4.5	--	--	--	35.8	132.85	1,232.17
P-59	Phosphate rock, calcareous and limestone; fos. col. no. 48-JES-27	VEM-1038	0.5	4.5	--	--	--	16.3	133.35	1,234.42
P-60	Phosphate rock, calcareous	VEM-1037	0.9	14.6	--	--	--	27.1	134.25	1,247.56
P-61	Limestone, fos. col. no. 48-JES-26	VEM-1036	1.0	1.7	--	--	--	18.8	135.25	1,249.76

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		
Pr-6	Mudstone, calcareous; (os. col. no. 48-JES-25	VEM-1035	0.8	4.6	--	--	--	45.5	136.05	1,232.94
Pr-5	Limestone, argillaceous; (os. col. no. 48-JES-24	VEM-1034	1.4	2.5	--	--	--	23.6	137.45	1,236.44
Pr-4	Mudstone, calcareous; (os. col. no. 48-JES-23	VEM-1033	0.8	3.7	--	--	--	48.8	138.25	1,239.40
Pr-3	Limestone, argillaceous	VEM-1032	0.5	4.4	--	--	--	42.2	138.75	1,241.60
Pr-2	Limestone, argillaceous	VEM-1031	1.5	2.0	--	--	--	41.1	140.25	1,244.60
Pr-1	Limestone, argillaceous	VEM-1057	1.4	3.0	--	--	--	30.5	141.65	1,248.80

The contact between the Wells and Phosphoria formations is indistinct. VEM-1057 is believed to be below VEM-1031, though brecciation makes this uncertain. Since VEM-1057 is the lowest dark-colored bed exposed in the trench, it is taken as the base of the Phosphoria. However, about 75 feet east and probably 50 feet or more lower stratigraphically is an outcrop of black limestone typical in appearance of Phosphoria.

Wells formation

Cw-4	Mudstone, calcareous	VEM-1056	0.9	3.7	--	--	--	50.9	0.9	3.33
Cw-3	Limestone, argillaceous	VEM-1055	2.9	3.4	--	--	--	42.0	3.8	10.13
Cw-2	Mudstone, calcareous	VEM-1054	1.9	3.8	--	--	--	39.4	4.8	17.31
Cw-1	Mudstone	--	--	--	--	--	--	--	--	--

WOLF CREEK, UTAH. LOT NO. 1251.

Park City formation sampled from a continuous exposure on south side of Wolf Creek, sec. 27, T. 1 N., R. 9 W., Wasatch County, Utah, on south flank of Uinta Range. Beds U-17, U-18, and W-1 sampled in small trench at base of Woodside formation on top of nose; beds U-12 to U-16 in hand trench on side of nose above cliff-making part of formation; beds U-6 to U-11 on cliff exposure; all other beds in hand trench on lower part of nose. Beds strike N. 82° W. and dip 12° S. Section measured by J. W. Huddle and J. B. Collins and sampled by R. S. Sears, G. F. Hosford, M. D. Stewart, and D. P. Krouse in June and July 1948. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

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		
Woodside formation										
W-1	Mudstone, calcareous	JWH-2050	1.5	0.3	10.9	3.2	8.9	75.4	1.5	4.5
Upper member of Park City formation										
U-18	Mudstone, calcareous	JWH-2049	1.8	<0.1	8.9	2.2	13.0	70.5	1.8	0.18
U-17	Sandstone, calcareous	JWH-2048	2.3	1.6	2.9	1.2	18.2	56.2	4.1	3.86
U-16	Chert and limestone	JWH-2047	5.6	0.6	1.3	2.3	9.2	76.2	9.7	7.22
U-15	Limestone, sandy	JWH-2046	5.1	0.2	1.4	2.0	25.4	42.7	14.8	8.24
U-14	Sandstone, calcareous, argillaceous	JWH-2045	4.4	0.4	6.4	2.1	10.2	75.2	19.2	10.00
U-13	Sandstone, calcareous	JWH-2044	0.8	1.2	5.1	3.5	3.7	74.9	20.0	10.96
U-12	Sandstone, calcareous	JWH-2043	7.0	0.5	4.6	2.2	11.8	71.6	27.0	14.46
U-11	Limestone, [illegible]	JWH-2040	1.0	0.7	0.41	1.6	27.2	39.2	28.0	15.16
U-10	Limestone, [illegible]gillaceous	JWH-2039	12.3	0.4	0.6	2.4	23.4	45.8	40.3	23.77
U-9	Limestone	JWH-2038	13.0	0.8	0.5	1.5	41.2	9.9	53.3	34.17
U-8	Limestone	JWH-2037	17.7	0.4	0.7	0.7	44.6	4.6	71.0	41.25
U-7	Limestone, argillaceous	JWH-2036	7.8	0.7	1.5	3.0	31.4	29.1	78.8	46.71
U-6	Limestone	JWH-2035	18.0	5.7	0.8	1.1	44.1	4.5	96.8	149.31
U-5	Limestone	JWH-2034	11.1	1.8	1.2	0.84	39.6	10.2	107.9	169.29
U-4	Limestone, argillaceous	JWH-2033	8.4	2.2	1.4	1.6	32.9	23.2	116.3	187.77
U-3	Limestone	JWH-2032	1.65	2.3	2.0	2.2	37.6	13.5	117.95	191.56
U-2	Limestone, argillaceous and phosphatic rock	JWH-2031	6.4	5.2	1.8	2.2	19.7	43.1	124.35	224.84
U-1	Mudstone, calcareous	JWH-2030	1.5	7.3	2.1	2.5	9.5	57.8	125.85	235.80
Phosphatic shale member of upper Park City formation										
P-37	Mudstone and phosphatic rock, calcareous	JBC-2169	1.15	4.8	4.3	2.7	16.7	48.6	1.15	5.52
P-36	Phosphatic rock, argillaceous	JBC-2168	0.6	22.0	3.2	0.9	8.4	22.3	1.75	18.72
P-35	Phosphatic rock and calcareous mudstone	JBC-2167	1.1	12.3	5.2	2.0	12.6	37.0	2.85	32.25
P-34	Mudstone, calcareous	JBC-2166	2.2	3.6	7.5	1.8	14.3	57.8	5.05	40.17
P-33	Mudstone, calcareous	JBC-2165	4.2	2.3	8.0	2.5	14.9	58.5	9.25	49.82
P-32	Mudstone, calcareous	JBC-2164	1.35	1.6	7.8	2.9	11.0	69.2	10.60	51.97
P-31	Mudstone, calcareous	JBC-2163	2.7	3.2	3.4	2.8	8.2	71.5	13.30	60.61
P-30	Mudstone, calcareous, phosphatic	JBC-2162	1.15	8.5	8.8	2.9	12.0	46.6	14.45	70.40

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-29	Mudstone, calcareous	JBC- 2161	1.2	2.7	10.5	2.6	16.7	55.6	15.65	73.64
P-28	Mudstone, calcareous	JWH-2029	2.7	4.1	6.8	2.5	12.6	57.5	18.35	84.72
P-27	Mudstone, calcareous	JWH-2028	4.6	2.1	6.7	2.4	18.5	49.5	22.95	94.38
P-26	Mudstone, calcareous	JWH-2027	1.1	3.6	5.1	2.0	12.4	60.4	24.05	98.34
P-25	Limestone, argillaceous	JWH-2026	0.7	0.7	2.8	2.3	24.9	42.2	24.75	98.82
P-24	Limestone, argillaceous	JWH-2025	2.8	1.7	6.5	2.2	22.3	45.8	27.55	103.58
P-23	Mudstone, calcareous	JWH-2024	2.75	2.3	9.2	3.6	18.6	51.6	30.30	109.91
P-22	Mudstone, calcareous	JWH-2023	1.8	9.8	7.6	3.4	16.3	54.3	32.10	116.75
P-21	Mudstone, calcareous	JWH-2022	2.1	9.6	10.6	3.5	16.5	55.6	34.20	124.91
P-20	Mudstone, calcareous	JWH-2021	2.2	2.9	11.0	3.5	17.5	52.9	36.40	130.69
P-19	Mudstone, calcareous	JWH-2020	0.95	6.9	11.7	4.1	10.7	52.1	37.35	137.24
P-18	Limestone, argillaceous	JWH-2019	1.1	1.7	4.0	2.1	32.9	25.6	38.45	139.12
P-17	Phosphate rock, argillaceous	JWH-2018	0.6	22.1	3.7	1.7	7.1	27.4	39.05	152.38
P-16	Mudstone, calcareous	JWH-2017	1.4	5.5	9.2	3.8	11.0	61.3	40.45	160.08
P-15	Mudstone, calcareous	JWH-2016	1.1	5.4	7.6	2.8	10.9	61.0	41.55	166.02
P-14	Mudstone	JWH-2015	2.55	5.1	4.6	2.6	12.6	65.0	44.10	179.07
P-13	Mudstone, calcareous	JWH-2014	1.4	1.6	4.2	2.1	17.4	67.9	45.50	181.26
P-12	Mudstone, calcareous	JWH-2013	2.1	2.3	6.2	2.3	15.8	58.6	47.60	186.09
P-11	Mudstone, calcareous	JWH-2012	3.1	3.8	8.4	2.7	16.1	53.9	50.70	197.87
P-10	Mudstone, calcareous, phosphatic	JWH-2011	2.25	8.3	11.8	3.8	12.8	51.3	52.95	216.54
P-9	Mudstone, phosphatic, calcareous	JWH-2010	1.7	9.6	12.1	4.1	11.6	52.3	54.15	228.00
P-8	Limestone and phosphatic mudstone	JWH-2009	2.2	6.3	3.8	1.5	31.8	18.0	56.35	241.92
P-7	Limestone	JWH-2008	0.55	1.9	1.5	1.0	37.9	14.6	56.90	242.97
P-6	Phosphate rock	JWH-2007	1.8	27.8	1.7	1.5	8.8	8.8	58.70	293.01
P-5	Limestone, argillaceous, phosphatic	JWH-2006	0.95	9.5	1.7	1.4	23.7	24.8	59.65	302.04
P-4	Limestone	JWH-2005	1.5	0.4	0.4	0.2	41.7	9.9	61.15	302.64
P-3	Phosphate rock	JWH-2004	2.35	25.3	2.0	1.5	8.4	16.2	63.50	362.09
P-2	Mudstone, calcareous, phosphatic	JWH-2003	0.5	10.1	1.6	2.7	13.8	40.3	64.00	367.14
P-1	Limestone, argillaceous	JWH-2002	0.4	6.7	1.2	2.4	22.0	34.3	64.40	369.82
Lower member of Park City formation										
	Limestone	JWH-2001	0.8	1.4	1.1	0.7	38.6	14.3	0.8	1.12
	Sandstone, calcareous, phosphatic	JWH-2041	5.2	7.8	0.8	1.4	20.9	57.8	6.0	37.00
	Sandstone	JWH-2042	6.2	0.6	0.9	1.3	7.9	79.8	12.2	40.72
Weber formation—not measured										

SPECTROGRAPHIC ANALYSES - WOLF CREEK, UTAH LOT NO. 1231.

Semi-quantitative analyses of samples of the Park City formation, Wolf Creek, Utah (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, Ba, Be, Cd, Co, Cb, Ga, Ge, Au, In, La, Hg, Pt, Ta, Sn, and W were looked for in all samples 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

Batch no.	Sample no.	Al	B	Ca	Cu	Cr	Fe	Pb	Mg	Mn	Mo	Ni	Si	Ag	Na	Sr	Ti	V	Zn	Zr
W-1	JWH-2050	C	F	C	G	E	C	ND	C	E	F	F	A	ND	E	ND	E	E	ND	E
U-18	JWH-2049	C	F	B	G	E	C	ND	C	E	F	F	A	ND	F	ND	E	E	ND	E
U-17	JWH-2048	C	F	A	G	E	C	ND	C	E	F	F	A	ND	F	ND	E	E	ND	E
U-16	JWH-2047	C	F	A	G	E	C	ND	C	E	F	F	A	ND	F	ND	E	E	ND	E
U-15	JWH-2046	C	F	A	G	E	C	ND	B	E	F	F	A	ND	F	ND	E	E	ND	E
U-14	JWH-2045	C	F	B	G	E	C	ND	C	E	F	F	A	ND	E	ND	E	E	ND	E
U-13	JWH-2044	C	F	C	G	F	C	ND	C	E	F	F	A	ND	E	ND	E	E	ND	E
U-12	JWH-2043	C	F	B	G	F	C	ND	C	E	F	F	A	ND	E	ND	E	E	ND	E
U-11	JWH-2040	C	F	A	G	F	C	ND	B	E	F	F	A	ND	E	ND	E	E	ND	E
U-10	JWH-2039	C	F	A	G	F	C	ND	B	E	F	F	A	ND	E	ND	E	E	ND	E
U-9	JWH-2038	C	F	A	G	F	C	ND	B	E	F	F	A	ND	E	ND	E	E	ND	E
U-8	JWH-2037	C	F	A	G	F	C	ND	B	E	F	F	C	ND	E	ND	E	E	ND	E
U-7	JWH-2036	C	F	A	G	E	C	ND	B	E	F	F	C	ND	E	ND	E	E	ND	E
U-6	JWH-2035	C	F	A	G	E	C	ND	B	E	F	F	C	ND	E	ND	E	E	ND	E
U-5	JWH-2034	C	F	A	G	E	C	ND	B	E	F	F	B	ND	E	ND	E	E	ND	E
U-4	JWH-2033	C	F	A	G	E	C	ND	B	E	F	F	A	ND	E	ND	E	E	ND	E
U-3	JWH-2032	C	F	A	G	E	C	ND	B	E	F	F	B	ND	E	ND	E	E	ND	E
U-2	JWH-2031	C	F	A	G	E	C	ND	C	E	F	F	A	ND	E	ND	E	E	ND	E
U-1	JWH-2030	C	F	A	G	E	C	ND	C	E	F	F	A	ND	E	ND	E	E	ND	E
P-37	JBC-2169	C	F	A	G	E	C	E	C	E	F	F	A	G	E	ND	E	E	ND	F
P-36	JBC-2168	C	F	A	G	E	C	E	C	E	F	F	A	G	E	ND	E	E	ND	F
P-35	JBC-2167	C	F	A	G	E	C	ND	C	E	F	F	A	ND	E	ND	E	E	ND	F
P-34	JBC-2166	C	F	A	G	E	C	ND	C	E	F	F	A	ND	E	ND	E	E	ND	F
P-33	JBC-2165	C	F	A	G	E	C	ND	C	E	F	F	A	ND	E	ND	E	E	ND	F
P-32	JBC-2164	C	F	A	G	E	C	ND	C	E	F	F	A	ND	E	ND	E	E	ND	F
P-31	JBC-2163	C	F	A	G	E	C	ND	C	E	F	F	A	ND	E	ND	E	E	ND	F
P-30	JBC-2162	C	F	A	G	E	C	ND	C	E	F	F	A	ND	E	ND	E	E	ND	F
P-29	JBC-2161	C	F	B	G	E	C	ND	C	E	F	F	A	ND	E	ND	E	E	ND	F
P-28	JWH-2029	C	F	A	G	E	C	ND	C	E	F	F	A	ND	E	ND	E	E	ND	F

Bed no.	Sample no.	Al	B	Ca	Cu	Cr	Fe	Pb	Mg	Mn	Mo	Ni	Si	Ag	Na	Sr	Ti	V	Zn	Zr
P-27	JWH-2028	C	F	B	C	E	C	ND	C	E	F	F	A	ND	E	ND	E	E	ND	E
P-26	JWH-2027	C	F	A	C	E	C	ND	C	E	F	F	A	ND	E	ND	E	E	ND	E
P-25	JWH-2026	C	F	A	C	E	C	ND	C	E	F	F	A	ND	E	ND	E	E	ND	E
P-24	JWH-2025	C	F	A	C	E	C	ND	C	E	F	F	A	ND	E	ND	E	E	ND	E
P-23	JWH-2024	C	F	A	C	E	C	ND	C	E	F	F	A	ND	E	ND	E	E	ND	E
P-22	JWH-2023	B	F	A	C	D	C	ND	C	E	F	F	A	G	E	ND	E	E	ND	E
P-21	JWH-2022	B	F	A	C	D	C	ND	C	E	F	F	A	G	E	ND	E	E	ND	E
P-20	JWH-2021	B	F	A	C	D	C	ND	C	E	F	F	A	G	E	F	E	E	ND	E
P-19	JWH-2020	B	F	A	C	D	C	ND	C	E	F	F	A	G	E	F	E	E	ND	E
P-18	JWH-2019	B	F	A	C	D	C	ND	C	E	F	F	A	G	E	F	E	E	ND	E
P-17	JWH-2018	C	F	A	C	E	C	-	C	E	F	F	A	G	E	F	E	E	ND	E
P-16	JWH-2017	C	F	A	C	E	C	-	C	E	F	F	A	G	E	F	E	E	ND	E
P-15	JWH-2016	C	F	A	C	E	C	ND	C	E	F	F	A	G	E	F	E	E	ND	E
P-14	JWH-2015	C	F	A	C	E	C	ND	C	E	F	F	A	G	E	F	E	E	ND	E
P-13	JWH-2014	C	F	A	C	E	C	ND	C	E	F	F	A	G	E	F	E	E	ND	E
P-12	JWH-2013	C	F	B	C	E	C	ND	C	E	F	F	A	G	E	F	E	E	ND	E
P-11	JWH-2012	C	F	B	C	E	C	ND	C	E	F	F	A	G	E	F	E	E	ND	E
P-10	JWH-2011	C	F	B	C	E	C	ND	C	E	F	F	A	G	E	F	E	E	ND	E
P-9	JWH-2010	C	F	A	C	E	C	E	C	E	F	F	A	G	E	F	E	E	ND	E
P-8	JWH-2009	C	F	A	C	E	C	E	C	E	F	F	A	G	E	F	E	E	ND	E
P-7	JWH-2008	C	F	A	C	E	C	ND	C	E	F	F	A	G	E	F	E	E	ND	E
P-6	JWH-2007	C	F	A	C	E	C	E	C	E	F	F	A	G	E	F	E	E	ND	E
P-5	JWH-2006	C	F	A	C	E	C	ND	C	E	F	F	A	G	E	F	E	E	ND	E
P-4	JWH-2005	C	F	A	C	E	C	ND	C	E	F	F	A	G	E	F	E	E	ND	E
P-3	JWH-2004	C	F	A	C	E	C	ND	C	E	F	F	A	G	E	F	E	E	ND	E
P-2	JWH-2003	C	F	A	C	E	C	E	C	E	F	F	A	G	E	F	E	E	ND	E
P-1	JWH-2002	C	F	A	C	E	C	E	C	E	F	F	A	G	E	F	E	E	ND	E
L-3	JWH-2001	C	F	A	C	ND	C	ND	B	E	F	F	A	G	E	F	E	E	ND	E
L-2	JWH-2041	C	F	A	C	F	C	ND	B	E	F	F	A	ND	E	ND	E	E	ND	E
L-1	JWH-2042	C	F	C	C	F	C	ND	C	E	F	F	A	ND	E	ND	E	E	ND	E

DRY CANYON, UTAH. LOT NO. 1229.

Phosphatic shale member of Park City formation sampled approximately 250 feet above streambed on north side of Dry Canyon, S½SW¼ sec. 3, T. 1 N., R. 6 W., Duchesne County, Utah, on south flank of Uinta Range. Section measured by J. S. Huddle and sampled by G. F. Hosford, D. P. Sprouse, and M. D. Stewart in 1948. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness × percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
Upper member of Park City formation—lower part only							
U- 9	Limestone and cherty dolomite	---	12.0	---	---	12.0	---
U- 8	Dolomite and cherty limestone	---	7.2	---	---	19.2	---
U- 7	Dolomite and limestone	---	39.0	---	---	58.2	---
U- 6	Limestone and phosphatic, calcareous mudstone; fos. col. no. 48-KPM-8	JWH-2086	4.7	7.8	22.0	62.9	36.66
U- 5	Mudstone, calcareous	JWH-2085	0.8	4.8	53.7	63.7	40.50
U- 4	Limestone, phosphatic, argillaceous	JWH-2084	1.1	11.8	30.3	64.8	53.48
U- 3	Mudstone, cherty, calcareous	JWH-2083	2.2	3.1	61.1	67.0	60.30
U- 2	Limestone, argillaceous	JWH-2092	0.8	3.4	41.9	67.8	63.02
U- 1	Mudstone, cherty, calcareous	JWH-2081	3.4	2.8	65.7	71.2	72.54
Phosphatic shale member of Park City formation							
P-29	Mudstone, phosphatic, calcareous	JWH-2080	1.7	10.7	46.0	1.7	18.19
P-28	Limestone, argillaceous; fos. col. no. 48-KPM-7	JWH-2079	1.0	2.4	25.5	12.7	20.29
P-27	Mudstone, calcareous, phosphatic	JWH-2078	2.7	8.1	46.8	5.4	42.16
P-26	Mudstone, phosphatic and cherty limestone	JWH-2077	0.5	11.8	42.2	5.9	48.06
P-25	Mudstone, phosphatic, calcareous; fos. col. 48-KPM-6	JWH-2076	1.8	13.8	39.0	7.7	72.90
P-24	Chert, calcareous, argillaceous	JWH-2075	1.3	1.2	68.8	9.0	74.46
P-23	Mudstone, calcareous, phosphatic	JWH-2074	0.5	10.1	47.6	9.5	79.51
P-22	Chert, calcareous, argillaceous	JWH-2073	2.3	1.4	80.5	11.8	82.73
P-21	Chert, calcareous	JWH-2072	0.9	1.1	55.2	12.7	83.72
P-20	Mudstone, calcareous	JWH-2071	1.7	5.1	52.1	14.4	92.39
P-19	Mudstone, calcareous	JWH-2070	2.2	3.3	47.6	16.6	99.65
P-18	Mudstone, calcareous, and argillaceous limestone	JWH-2069	1.2	2.4	45.6	17.8	102.53
P-17	Limestone	JWH-2068	0.9	2.6	9.3	18.7	104.87
P-16	Mudstone, calcareous	JWH-2067	1.3	1.8	67.0	20.0	107.21
P-15	Limestone, dolomitic, cherty	JWH-2066	0.5	0.5	32.8	20.5	107.36
P-14	Mudstone, calcareous	JWH-2065	3.2	5.7	54.8	23.7	125.60
P-13	Chert, calcareous	JWH-2064	0.6	6.1	57.4	24.3	129.26

Fossil collection made by K. P. McLaughlin, 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	Acid insoluble		
P-12	Limestone, dolomitic	JWH-2063	2.8	2.2	17.0	26.6	134.32
P-11	Limestone, argillaceous	JWH-2062	1.6	3.1	22.8	28.2	139.28
P-10	Limestone, dolomitic	JWH-2061	1.5	2.1	16.8	29.7	142.43
P-9	Limestone, argillaceous; fos. col. no. 48-KPM-5	JWH-2060	1.8	5.0	35.6	31.5	151.43
P-8	Limestone, argillaceous	JWH-2059	1.8	7.6	29.4	33.3	165.11
P-7	Limestone, dolomitic; fos. col. no. 48-KPM-4	JWH-2058	3.5	1.5	16.1	36.8	170.36
P-6	Limestone	JWH-2057	1.8	4.3	12.1	38.6	178.10
P-5	Limestone	JWH-2056	1.4	6.5	62.2	40.0	187.20
P-4	Mudstone, phosphatic and phosphate rock	JWH-2055	1.1	13.6	37.2	41.1	202.16
P-3	Phosphate rock and phosphatic mudstone	JWH-2054	1.7	21.5	22.4	42.8	238.71
P-2	Limestone, dolomitic	JWH-2053	0.8	6.2	5.2	43.6	243.67
P-1	Phosphate rock, argillaceous	JWH-2052	1.25	24.5	20.2	44.85	274.30
° Lower member of Park City formation—base not exposed							
L-3	Sandstone, calcareous; fos. col. no. 48-KPM-3	JWH-2051	1.9	1.7	54.9	1.9	3.23
L-2	Limestone and phosphatic sandstone	---	6.5	---	---	8.4	---
L-1	Sandstone, calcareous	---	11.4	---	---	19.8	---

LAKE FORK, UTAH. LOT NO. 1235.

Phosphatic shale member of Park City formation sampled in two hand trenches cut obliquely down canyon from points approximately 125 feet above canyon bottom and approximately 150 yards above mouth of Mackentire Draw, NE¼NW¼ sec. 34, T. 2 N., R. 5 W., Duchesne County, Utah, the lower part on the west bank of the canyon and the upper part on the east bank. Beds strike N. 85° E. and dip 35° S. Section measured by J. W. Huddle and sampled by G. F. Hosford, D. P. Sprouse, and M. D. Stewart in 1948. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness × percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
	Upper member of Park City formation—basal beds only						
U- 3	Limestone and phosphatic mudstone	JWH-2135	3.9	7.8	26.6	3.9	30.42
U- 2	Mudstone, calcareous, cherty	JWH-2134	1.0	3.3	67.5	4.9	33.72
U- 1	Mudstone, cherty, calcareous	JWH-2133	2.1	2.2	62.6	7.0	38.34
	Phosphatic shale member of Park City formation						
P-44	Mudstone, calcareous	JWH-2132	1.1	2.4	49.2	1[illegible]	2.64
P-43	Mudstone and limestone	JWH-2131	1.2	3.7	58.2	2.3	7.08
P-42	Mudstone, phosphatic, and argillaceous limestone; fos. col. no. 48-KPM-13[1]	JWH-2130	2.1	11.8	35.5	4.4	31.86
P-41	Limestone, argillaceous, phosphatic	JWH-2129	1.6	11.3	33.7	6.0	49.94
P-40	Chert, calcareous; fos. col. no. 48-KPM-12	JWH-2128	1.0	1.4	61.3	7.0	51.34
P-39	Mudstone, calcareous, phosphatic; fos. col. no. 48-KPM-11	JWH-2127	3.5	9.9	41.3	10.5	85.99
P-38	Chert, limestone and calcareous, phosphatic mudstone; fos. col. no. 48-KPM-10	JWH-2126	2.4	2.7	69.4	12.90	92.47
P-37	Mudstone, calcareous, cherty	JWH-2125	1.5	1.6	71.6	14.4	94.87
P-36	Limestone and mudstone, cherty, and calcareous mudstone	JWH-2124	2.3	1.4	64.1	16.7	98.09
P-35	Mudstone and phosphatic rock, calcareous and limestone	JWH-2123	0.75	10.2	47.7	17.45	105.74
P-34	Mudstone, calcareous	JWH-2122	1.6	2.1	53.1	19.05	109.10
P-33	Mudstone, calcareous	JWH-2121	1.7	3.7	59.6	20.75	115.39
	Limestone lens, dolomitic		(0.8)	--	--	--	--
P-32	Mudstone, phosphatic, calcareous, cherty	JWH-2120	1.1	8.7	57.5	21.85	124.96
P-31	Mudstone, calcareous	JWH-2119	1.7	2.6	61.3	23.55	129.38
P-30	Limestone, argillaceous	JWH-2118	2.1	2.6	45.5	25.65	134.84
P-29	Limestone, argillaceous	JWH-2117	1.7	3.3	40.9	27.35	140.45
P-28	Mudstone, calcareous	JWH-2116	1.7	4.4	59.0	29.05	147.93
P-27	Mudstone, calcareous; fos. col. no. 48-KPM-9	JWH-2115	2.8	3.5	49.3	31.85	156.34

[1] Fossil collection made by K. P. McLaughlin, 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	Acid insoluble		
P-26	Phosphate rock, calcareous and mudstone	JWH-2114	0.5	16.0	28.5	82.35	163.51
---	Mudstone, calcareous	JWH-2113	(2.7)	2.6	80.9	---	---
---	Mudstone and calcareous phosphate rock	JWH-2112	(0.5)	12.7	51.3	---	---
	JWH-2113 is equivalent to JWH-2115 and JWH-2112 is equivalent to JWH-2114. Duplicate samples were collected from two trenches.						
P-24	Limestone, argillaceous	JWH-2111	1.9	3.2	20.2	34.25	169.59
P-23	Mudstone, calcareous, and dolomitic limestone	JWH-2110	2.5	3.1	39.5	36.75	177.34
P-22	Limestone, dolomitic	JWH-2109	2.4	1.3	18.7	39.15	180.46
P-22	Limestone, dolomitic, argillaceous	JWH-2108	1.1	3.4	40.7	40.25	184.20
P-21	Limestone, dolomitic and mudstone	JWH-2107	2.8	1.8	28.8	43.05	189.24
P-20	Mudstone and limestone	JWH-2106	3.6	4.9	56.6	46.65	206.88
P-19	Limestone, dolomitic	JWH-2105	3.2	1.2	19.6	49.85	210.72
P-18	Dolomite, calcareous	JWH-2104	2.0	1.5	19.6	51.85	213.72
P-17	Limestone, dolomitic and mudstone	JWH-2103	1.2	3.9	53.8	53.05	218.40
P-16	Mudstone, calcareous	JWH-2102	3.6	4.9	65.0	56.65	236.04
P-15	Limestone, argillaceous, dolomitic	JWH-2101	1.7	1.8	43.8	58.35	239.10
P-14	Mudstone	JWH-2100	1.2	4.8	72.0	59.55	244.86
P-13	Limestone, argillaceous	JWH-2099	2.3	5.5	30.0	61.85	257.51
P-12	Mudstone, phosphatic, calcareous	JWH-2098	0.7	14.1	36.0	62.55	267.38
P-11	Limestone, argillaceous; fos. col. no. 48-KPM-15	JWH-2097	1.5	1.1	20.3	64.05	269.03
P-10	Mudstone, calcareous	JWH-2096	1.2	4.1	56.1	65.25	273.95
P-9	Phosphate rock, calcareous, and phosphatic mudstone	JWH-2095	1.0	15.6	32.1	66.25	289.45
P-8	Phosphate rock and mudstone	JWH-2094	1.0	17.3	28.5	67.25	306.75
P-7	Limestone, argillaceous	JWH-2093	1.9	1.5	26.9	69.15	309.60
P-6	Phosphate rock and calcareous mudstone; fos. col. no. 48-KPM-14	JWH-2092	1.7	16.6	36.0	70.85	337.82
P-5	Mudstone, phosphatic	JWH-2091	0.9	15.3	43.2	71.75	351.59
P-4	Limestone, phosphatic, argillaceous	JWH-2090	2.9	11.9	34.1	74.65	386.10
P-3	Phosphate rock, quartzitic	JWH-2089	0.8	21.4	22.6	76.45	403.22
P-2	Sandstone, phosphatic	JWH-2088	1.9	14.1	58.9	77.35	430.01
P-1	Sandstone and calcareous phosphate rock	JWH-2087	3.5	12.7	57.7	80.85	474.46
	Lower member of Park City formation--top bed only						
L-1	Limestone	--	1.7	--	--	1.7	--

ROCK CANYON, UTAH. LOT NO. 1220.

Phosphatic shale member of Park City formation sampled in Rock Canyon in bulldozer exposure previously stripped to supply earth dam fill. SE¼ sec. 6, T. 3 S., R. 21 E., Uintah County, Utah, on south-dipping monocline. Beds strike N. 71° E. and dip 8° S. Section measured by D. M. Kinney and J. F. Rominger in August and sampled by R. P. Sheldon in September 1947. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent) P_2O_5	Al_2O_3	Fe_2O_3	V_2O_5	Loss on ignition	Acid insoluble	Cumulative thickness (feet)	Thickness × percent P_2O_5 (cumulative)
Upper member of Park City formation--basal bed only											
U-1	Mudstone, calcareous, contains chert nodules	--	4.8	--	--	--	--	--	--	4.8	--
Phosphatic shale member of Park City formation											
P-26	Limestone, argillaceous	DMK-51-47	1.8	7.1	7.0	2.0	--	21.6	34.2	1.8	12.78
P-25	Mudstone, calcareous, phosphatic	DMK-50-47	2.4	10.4	5.1	2.12	0.011	16.1	37.0	4.2	37.74
P-24	Phosphate rock, calcareous	DMK-49-47	1.1	25.0	2.1	1.97	0.011	9.1	13.5	5.3	65.24
P-23	Dolomite, argillaceous and phosphatic rock	DMK-48-47	1.9	6.3	3.9	1.57	0.010	23.2	34.1	7.2	77.21
P-22	Phosphate rock and phosphatic mudstone	DMK-47-47	0.5	23.7	3.4	2.27	0.008	5.4	25.2	7.7	89.06
P-21	Phosphatic rock, argillaceous and mudstone	DMK-46-47	1.6	15.7	5.4	2.01	0.014	6.3	43.2	9.3	114.18
P-20	Phosphate rock, argillaceous, calcareous	DMK-45-47	0.9	20.8	1.8	1.57	0.008	8.8	25.2	10.2	132.90
P-19	Phosphate rock, argillaceous	DMK-44-47	1.9	21.6	3.9	1.86	0.015	7.3	25.9	12.1	173.94
P-18	Phosphate rock, argillaceous	DMK-43-47	0.9	19.4	3.4	1.90	0.015	7.3	31.1	13.0	191.40
P-17	Mudstone, phosphatic, calcareous	DMK-42-47	0.7	12.4	7.5	2.70	0.019	12.4	36.7	13.7	200.08
P-16	Shale, calcareous, phosphatic	DMK-41-47	1.0	8.1	2.1	2.78	0.008	9.9	54.7	14.7	208.18
P-15	Phosphate rock, calcareous	DMK-40-47	0.8	25.5	2.2	1.46	0.017	8.8	24.6	15.5	228.88
P-14	Mudstone, calcareous, phosphatic	DMK-39-47	0.2	11.8	7.3	1.83	0.026	4.1	31.8	15.7	230.94
P-13	Mudstone	DMK-38-47	1.3	4.6	3.6	3.36	0.01	3.4	78.2	17.0	236.92
P-12	Mudstone, phosphatic	DMK-37-47	0.6	10.0	8.7	2.67	0.026	5.1	60.2	17.6	242.92
P-11	Phosphatic rock, cherty	DMK-36-47	0.1	19.6	1.3	1.83	0.007	2.9	42.9	17.7	244.88
P-10	Mudstone, phosphatic, contains iron oxide	DMK-35-47	0.05	12.0	11.9	3.18	0.032	7.3	49.6	17.75	245.48
P-9	Mudstone, phosphatic	DMK-34-47	0.4	18.2	3.3	1.43	<0.005	2.4	48.5	18.15	252.76
P-8	Mudstone, phosphatic	DMK-33-47	0.4	12.7	11.7	3.18	0.029	6.5	51.2	18.55	257.84
P-7	Mudstone, phosphatic	DMK-32-47	0.2	16.8	3.0	1.75	0.015	3.7	48.1	18.75	261.20
P-6	Phosphate rock, argillaceous	DMK-31-47	1.0	12.7	1.3	1.10	0.01	5.5	35.7	19.75	280.90
P-5	Phosphate rock, argillaceous	DMK-30-47	1.3	25.4	2.2	1.32	<0.005	4.8	23.0	21.05	313.92
P-4	Limestone, argillaceous	DMK-29-47	0.7	1.5	1.4	1.5	--	34.8	21.8	21.75	314.97
P-3	Mudstone, calcareous, phosphatic	DMK-28-47	0.5	8.0	12.4	3.8	--	12.7	47.4	22.25	318.97
P-2	Phosphate rock, sandy	DMK-27-47	0.4	18.2	1.3	1.5	--	3.6	44.4	22.65	326.25

BRUSH CREEK GORGE, UTAH. LOT NO. 1219.

Phosphatic shale member of Park City formation sampled in Brush Creek Gorge, SW¼NW¼ sec. 32, T. 2 S., R. 22 E., Uintah County, Utah, on south flank of Uinta Range. Section exposed in trench previously dug by Humphreys Phosphate Company, at end of automobile road at mouth of Brush Creek Gorge. Beds strike N. 80° E., dip 7° S. Section measured by D. M. Kinney and J. F. Rominger in August 1947 and sampled by R. P. Sheldon in September 1947. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

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		
	Upper member of Park City formation—not measured										
	Phosphatic shale member of Park City formation										
P-25	Mudstone, calcareous	DMK-25-47	1.0	5.5	7.9	2.89	0.69	17.1	43.6	1.0	5.50
P-24	Limestone, argillaceous	DMK-24-47	1.3	1.5	2.1	2.67	---	25.3	38.7	2.3	7.45
P-23	Mudstone, calcareous and chert	DMK-23-47	2.2	2.5	4.4	3.40	---	17.3	49.8	4.5	12.95
P-22	Mudstone, calcareous	DMK-22-47	1.4	4.1	6.8	2.42	0.39	12.7	56.6	5.9	18.69
P-21	Dolomite, argillaceous	DMK-21-47	0.7	5.4	1.8	1.94	0.59	27.0	24.2	6.6	22.47
P-20	Phosphate rock, calcareous	DMK-20-47	1.3	19.1	2.5	1.28	---	15.5	14.6	7.9	47.3
P-19	Phosphate rock	DMK-19-47	1.5	28.3	1.8	1.14	2.79	9.4	14.1	9.4	89.75
P-18	Dolomite, phosphatic, argillaceous	DMK-18-47	0.5	10.6	3.8	1.47	---	23.0	20.8	9.9	95.05
P-17	Limestone, phosphatic	DMK-17-47	0.6	8.6	2.9	2.16	---	26.6	16.9	10.5	100.21
P-16	Phosphate rock, calcareous, and phosphatic mudstone	DMK-16-47	3.4	16.9	4.5	2.05	1.68	8.0	34.4	13.9	157.67
P-15	Phosphate rock	DMK-15-47	3.1	27.2	2.3	1.17	---	7.7	12.5	17.0	241.99
P-14	Chert, phosphatic, dolomitic	DMK-14-47	1.3	9.4	3.5	3.33	---	7.1	54.5	18.3	254.41
P-13	Phosphate rock	DMK-13-47	0.5	27.7	3.2	1.46	---	6.1	13.5	18.8	268.06
P-12	Phosphate rock, argillaceous	DMK-12-47	0.5	15.1	7.0	3.14	1.45	7.8	30.6	19.3	275.61
P-11	Dolomite, cherty	DMK-11-47	0.4	3.1	2.2	2.96	---	24.7	35.4	19.7	276.89
P-10	Phosphate rock, argillaceous	DMK-10-47	2.7	22.0	2.1	2.05	---	7.0	23.5	22.4	336.23
P-9	Mudstone, phosphatic	DMK- 9-47	0.8	10.3	8.6	3.11	---	6.6	54.2	23.2	344.49
P-8	Phosphate rock, contains iron oxide	DMK- 8-47	0.025	25.9	2.4	6.93	2.74	7.2	15.2	23.22	345.14
P-7	Phosphate rock	DMK- 7-47	0.3	28.5	2.2	2.09	2.9	5.6	13.8	23.52	353.69
P-6	Mudstone, phosphatic	DMK- 6-47	0.05	12.0	10.9	3.51	1.47	6.4	51.1	23.57	354.29
P-5	Phosphate rock	DMK- 5-47	2.65	27.3	2.0	1.33	2.59	5.9	18.0	26.22	426.64
P-4	Dolomite	DMK- 4-47	0.5	2.8	2.8	1.74	---	37.4	11.1	26.72	428.04
P-3	Mudstone, phosphatic, contains gypsum	DMK- 3-47	0.4	10.6	14.1	4.94	---	10.2	41.7	27.12	432.28
P-2	Mudstone, phosphatic, contains gypsum	DMK- 2-47	0.22	10.2	14.8	5.41	---	12.7	38.8	27.32	434.32
P-1	Phosphate rock, sandy	DMK- 1-47	0.5	20.0	1.9	2.38	---	2.4	41.9	27.82	444.32
	Weber formation—not measured										

LITTLE BRUSH CREEK, UTAH. LOT NO. 1221.

Phosphatic shale member of Park City formation sampled in natural exposures and bulldozer excavations prepared by Humphreys Phosphate Company, 2 miles west of Little Brush Creek, SE¼NE¼ sec. 22, T. 2 S., R. 22 E., Uintah County, Utah, on south-dipping monocline. Beds strike N. 50° E. and dip 70° S. Section measured by D. M. Kinney and J. F. Rominger in August and sampled by R. P. Sheldon in September 1947. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

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		
Upper member of Park City formation—basal bed only										
U-1	Limestone	---	6.0	--	--	--	--	--	--	--
Phosphatic shale member of Park City formation										
P-23	Chert and calcareous mudstone	DMK-74-47	5.0	2.9	5.6	2.9	14.9	58.2	5.0	14.50
P-22	Mudstone, phosphatic, calcareous	DMK-73-47	0.3	12.5	3.8	1.83	2.7	38.7	5.3	18.22
P-21	Mudstone, phosphatic, calcareous	DMK-72-47	0.2	11.9	2.2	1.61	11.5	42.2	5.5	20.60
P-20	Phosphate rock, calcareous	DMK-71-47	1.0	16.7	2.5	1.54	7.6	17.5	6.5	37.30
P-19	Phosphate rock, calcareous	DMK-70-47	0.9	24.7	1.9	1.05	9.2	15.2	7.4	59.53
P-18	Mudstone, calcareous, phosphatic	DMK-69-47	0.4	8.5	0.7	1.32	1.2	51.3	7.8	62.93
P-17	Limestone, argillaceous	DMK-68-47	0.4	4.6	2.5	1.39	17.7	27.6	8.2	64.77
P-16	Phosphate rock, calcareous	DMK-67-47	0.3	22.1	2.8	1.68	1.1	17.7	8.5	71.40
P-15	Limestone	DMK-66-47	0.4	6.5	3.0	1.24	30.2	18.2	8.9	74.00
P-14	Phosphate rock	DMK-65-47	0.9	24.6	3.6	1.46	8.8	14.8	9.8	96.14
P-13	Phosphate rock, argillaceous, calcareous	DMK-64-47	0.4	14.6	5.6	2.52	12.8	32.3	10.2	101.98
P-12	Phosphate rock, calcareous	DMK-63-47	0.5	20.7	5.5	2.32	4.9	32.4	10.7	112.33
P-11	Mudstone, cherty	DMK-62-47	0.3	6.5	4.0	2.19	4.7	70.1	11.0	114.28
P-10	Phosphate rock	DMK-61-47	3.6	27.5	2.7	1.39	6.4	15.7	14.6	213.28
P- 9	Mudstone	DMK-60-47	0.5	6.8	3.1	3.40	4.7	67.7	15.1	216.68
P- 8	Phosphate rock, calcareous and mudstone	DMK-59-47	1.6	19.4	5.1	2.19	8.6	23.8	16.7	247.72
P- 7	Mudstone, calcareous	DMK-58-47	0.6	5.6	2.1	0.03	12.9	54.0	17.3	251.08
P- 6	Limestone, argillaceous, phosphatic	DMK-57-47	1.9	27.9	2.4	1.61	7.3	10.7	19.2	304.09
P- 5	Mudstone, phosphatic	DMK-56-47	0.5	12.4	9.5	3.00	5.6	53.0	19.7	310.29
P- 4	Phosphate rock	DMK-55-47	2.2	28.2	2.1	1.46	4.5	15.9	21.9	372.33
P- 3	Limestone	DMK-54-47	0.8	5.6	3.6	1.57	32.4	14.8	22.7	376.81
P- 2	Mudstone, phosphatic, calcareous	DMK-53-47	0.4	12.3	13.5	4.57	7.7	43.1	23.1	381.73
P- 1	Phosphate rock, sandy	DMK-52-47	0.4	17.0	2.3	3.47	2.9	47.5	23.5	388.53
Weber formation—not measured										

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
P-128	Mudstone, calcareous	GFH-2311	0.95	1.5	46.7	33.95	103.87
P-127	Mudstone, calcareous	GFH-2310	0.8	2.5	57.6	34.75	105.87
	Sample GFH-2310 represents a thickness of 2.3 feet, the lower 1.5 feet of which is equivalent to the upper 1.5 feet of sample RSS-2268.						
P-126	Mudstone, calcareous	RSS-2268	2.0	2.3	61.4	36.75	110.47
P-125	Mudstone, calcareous	RSS-2267	3.0	2.4	63.3	39.75	117.67
P-124	Mudstone, calcareous	RSS-2266	2.5	2.6	65.6	42.25	124.17
P-123	Mudstone, calcareous	RSS-2265	1.8	3.2	65.6	44.05	129.93
--	Mudstone, calcareous	GFH-2309	(1.3)	2.2	63.3	--	--
--	Mudstone, calcareous	GFH-2308	(3.2)	2.6	63.2	--	--
--	Mudstone and chert, calcareous	GFH-2307	(2.1)	2.8	61.0	--	--
P-122	Mudstone, phosphatic, contains pyrite	RSS-2264	0.2	13.4	42.1	44.25	132.61
P-121	Mudstone, calcareous	RSS-2263	0.9	4.2	59.4	45.15	136.39
P-120	Phosphate rock, argillaceous	MDS-2185	0.6	23.2	20.1	45.75	150.31
P-119	Mudstone, cherty, phosphatic	MDS-2184	1.1	8.2	59.8	46.85	159.33
P-118	Limestone, argillaceous	MDS-2183	0.8	2.7	39.3	47.65	161.49
P-117	Mudstone, cherty	MDS-2182	3.6	3.5	72.2	51.25	174.09
P-116	Mudstone, cherty	MDS-2181	0.7	4.3	76.5	51.95	177.10
P-115	Mudstone	GFH-2330	0.3	5.8	64.8	52.25	178.84
P-114	Mudstone, phosphatic	GFH-2329	0.5	15.7	43.5	52.75	186.69
P-113	Limestone, argillaceous	GFH-2328	0.5	4.7	35.0	53.25	189.04
P-112	Phosphate rock, argillaceous	GFH-2327	0.4	17.3	36.0	53.65	195.96
P-111	Mudstone	GFH-2326	0.55	7.0	62.2	54.20	199.81
P-110	Phosphate rock and mudstone	GFH-2325	0.8	17.8	43.3	55.00	214.05
P-109	Mudstone	GFH-2324	1.45	6.1	72.9	56.45	222.90
P-108	Mudstone, phosphatic	GFH-2323	0.3	11.2	56.8	56.75	226.26
--	Limestone lens	GFH-2331	(1.65)	1.4	17.7	--	--
P-107	Mudstone, calcareous	GFH-2322	0.85	4.2	62.3	57.60	229.82
P-106	Mudstone, calcareous	GFH-2321	2.3	4.0	65.4	59.90	239.02
P-105	Mudstone, calcareous	GFH-2320	1.5	4.2	65.0	61.40	245.32
P-104	Mudstone, calcareous	MDS-2180	0.4	7.7	46.9	61.80	248.40
P-103	Mudstone, calcareous	MDS-2179	3.6	4.5	60.1	65.40	264.60
P-102	Mudstone	MDS-2178	1.25	5.8	63.6	66.65	271.86
P-101	Mudstone, calcareous	MDS-2177	3.0	5.0	58.4	69.65	286.86
P-100	Mudstone, phosphatic	MDS-2176	0.3	12.3	49.2	69.95	290.54
P- 99	Mudstone	MDS-2175	3.5	5.2	63.1	73.45	308.74
P- 98	Phosphate rock, argillaceous	MDS-2174	0.55	19.2	30.9	74.00	319.30
P- 97	Mudstone, cherty	MDS-2173	1.8	1.5	78.8	75.80	322.00
P- 96	Mudstone	MDS-2172	0.9	1.4	79.7	76.70	323.26

P- 95	Mudstone, phosphatic and calcareous mudstone	MDS-2171	0.7	5.8	48.5	77.40	327.32
P- 94	Limestone and calcareous mudstone	GFH-2319	2.55	1.8	40.5	79.95	331.92
P- 93	Mudstone, cherty, calcareous	GFH-2318	3.05	1.3	55.3	83.00	335.88
P- 92	Limestone, cherty	GFH-2317	2.2	2.2	44.6	85.20	340.72
P- 91	Limestone and chert	GFH-2316	3.4	1.6	53.4	88.60	346.16
P- 90	Phosphate rock, calcareous, cherty	GFH-2315	0.6	14.3	30.0	89.20	354.74
P- 89	Phosphate rock, calcareous, argillaceous	GFH-2314	0.65	13.9	29.7	89.85	363.78
P- 88	Mudstone, phosphatic	DPS-2376	1.4	10.5	56.3	91.25	378.48
P- 87	Mudstone, phosphatic	DPS-2375	1.9	10.3	37.8	93.15	398.04
P- 86	Phosphate rock, argillaceous	DPS-2374	0.45	18.2	38.5	93.60	406.24
P- 85	Mudstone, cherty, phosphatic	DPS-2373	0.85	14.1	46.5	94.45	418.22
P- 84	Mudstone, phosphatic	DPS-2372	0.35	15.6	51.1	94.80	423.60
P- 83	Mudstone, phosphatic	DPS-2371	2.0	14.9	45.9	96.80	453.48
P- 82	Phosphate rock, argillaceous	DPS-2370	0.35	19.7	38.6	97.15	460.36
P- 81	Mudstone, phosphatic	DPS-2369	2.35	8.5	60.6	99.50	480.35
P- 80	Phosphate rock, argillaceous	DPS-2368	0.45	16.3	41.2	99.95	487.68
P- 79	Phosphate rock, argillaceous	DPS-2367	0.6	21.4	30.3	100.55	500.52
P- 78	Mudstone, calcareous, cherty	DPS-2387	0.95	2.1	68.9	101.50	502.52
P- 77	Mudstone, cherty, calcareous	DPS-2386	1.3	1.7	70.7	102.80	504.73
P- 76	Mudstone, calcareous, cherty	DPS-2385	1.45	2.2	68.9	104.25	507.93
P- 75	Mudstone, calcareous, cherty	DPS-2384	2.1	2.6	69.7	106.35	513.38
P- 74	Mudstone, cherty, calcareous	DPS-2383	1.25	2.4	69.9	107.60	516.38
P- 73	Mudstone and cherty limestone	DPS-2382	1.6	2.5	68.4	109.20	520.38
P- 72	Mudstone, cherty, calcareous	DPS-2381	1.25	2.4	72.6	110.45	523.38
P- 71	Mudstone, cherty, calcareous	DPS-2380	1.7	2.8	67.4	112.15	528.14
P- 70	Mudstone, calcareous, cherty	DPS-2379	1.4	2.5	70.4	113.55	531.64
P- 69	Mudstone, calcareous, cherty	DPS-2378	2.6	3.4	65.7	116.15	540.48
P- 68	Limestone and mudstone	DPS-2377	1.15	1.6	44.0	117.30	547.32
P- 67	Mudstone, calcareous	MDS-2191	4.0	4.7	57.0	121.30	561.12
P- 66	Mudstone, calcareous	MDS-2190	3.8	4.5	63.6	125.10	578.22
P- 65	Mudstone, calcareous	MDS-2189	3.1	4.1	64.7	128.20	590.93
P- 64	Phosphate rock, argillaceous	MDS-2188	1.2	17.0	39.3	129.40	611.33
P- 63	Phosphate rock, argillaceous	MDS-2187	0.8	20.5	31.0	130.20	627.73
P- 62	Phosphate rock, argillaceous	MDS-2186	0.8	19.6	16.0	131.00	643.41
P- 61	Mudstone, calcareous	RSS- 2262	1.65	5.9	60.7	132.65	652.16
P- 60	Mudstone	RSS- 2261	2.3	6.6	66.2	134.95	667.34
P- 59	Mudstone, phosphatic	RSS- 2260	0.4	10.8	55.5	135.35	671.66
P- 58	Mudstone, phosphatic	RSS- 2259	0.3	15.2	47.8	135.65	676.22
P- 57	Mudstone, calcareous	RSS- 2258	3.1	7.6	54.8	138.75	699.78
P- 56	Mudstone, phosphatic, calcareous	RSS- 2257	1.8	8.9	55.1	140.55	719.80
P- 55	Mudstone, phosphatic	RSS- 2256	2.9	9.2	55.3	143.45	742.48
P- 54	Limestone, argillaceous	RSS- 2255	0.5	3.2	21.0	143.95	744.08
P- 53	Mudstone, calcareous	RSS- 2254	2.8	7.6	53.3	146.75	765.36
P- 52	Mudstone, phosphatic, calcareous	RSS- 2253	1.8	8.8	51.3	148.55	780.20

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness, percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
P- 51	Mudstone, phosphatic, calcareous	RSS- 2252	1.7	9.2	51.7	150.25	796.44
P- 50	Mudstone, phosphatic, calcareous	RSS- 2251	2.7	9.3	50.5	152.95	821.93
P- 49	Phosphate rock, argillaceous	RSS- 2250	0.4	19.7	37.0	153.35	828.22
P- 48	Limestone	RSS- 2249	1.2	4.7	17.8	154.55	833.86
P- 47	Mudstone, calcareous	RSS- 2248	1.7	7.4	50.9	156.25	846.44
P- 46	Mudstone, calcareous	RSS- 2247	0.8	6.7	50.5	157.05	851.40
P- 45	Mudstone, calcareous	RSS- 2246	2.7	6.8	56.2	159.75	870.10
P- 44	Mudstone, calcareous	RSS- 2245	3.3	6.5	55.8	163.05	890.36
P- 43	Phosphate rock, argillaceous	RSS- 2244	0.8	20.1	26.8	163.85	907.04
P- 42	Mudstone, calcareous	RSS- 2243	0.55	2.2	60.3	164.40	908.74
P- 41	Phosphate rock, calcareous -contains pyrite	RSS- 2242	0.4	17.1	18.1	164.80	913.03
P- 40	Limestone, argillaceous	RSS- 2241	0.55	2.7	22.7	165.35	916.37
P- 39	Mudstone, calcareous	RSS- 2240	0.7	3.5	49.6	166.05	919.02
P- 38	Mudstone, calcareous	RSS- 2239	1.6	3.6	59.4	167.65	924.78
P- 37	Mudstone, calcareous	RSS- 2238	0.5	3.5	59.8	168.15	926.93
P- 36	Phosphate rock, argillaceous	RSS- 2237	0.4	15.0	34.2	168.55	932.53
P- 35	Mudstone, calcareous	RSS- 2236	1.0	1.5	49.6	169.55	934.03
P- 34	Limestone, argillaceous	RSS- 2235	2.0	1.3	47.7	171.55	936.63
P- 33	Phosphate rock, argillaceous	RSS- 2234	0.3	16.2	39.5	171.85	941.49
P- 32	Limestone, argillaceous	RSS- 2233	1.6	0.7	40.1	173.45	942.61
P- 31	Mudstone, calcareous	RSS- 2232	1.3	1.8	56.1	174.75	944.95
P- 30	Mudstone, calcareous	RSS- 2231	1.45	1.8	53.3	176.20	947.56
P- 29	Mudstone, calcareous, cherty	RSS- 2230	0.4	2.0	48.7	176.60	948.36
P- 28	Mudstone, calcareous	RSS- 2229	0.77	2.8	50.8	177.37	950.50
P- 27	Mudstone, calcareous	RSS- 2228	1.1	1.9	51.7	178.47	952.45
P- 26	Mudstone, calcareous	RSS- 2227	0.6	2.8	35.8	179.07	954.13
P- 25	Mudstone, calcareous	RSS- 2226	0.8	5.2	56.1	179.87	958.29
P- 24	Mudstone, cherty, calcareous	RSS- 2225	1.75	2.7	56.2	181.62	963.02
P- 23	Mudstone, calcareous, cherty	RSS- 2224	1.45	2.6	63.1	183.07	966.79
P- 22	Mudstone, calcareous, cherty	RSS- 2223	1.8	1.9	65.7	184.87	969.13
P- 21	Mudstone, calcareous	RSS- 2222	1.4	1.8	68.4	186.27	971.65
P- 20	Mudstone, calcareous	RSS- 2221	0.35	3.6	59.9	186.62	972.91
P- 19	Mudstone, cherty, calcareous	RSS- 2220	1.6	4.5	70.5	188.22	979.31
P- 18	Mudstone, calcareous	RSS- 2219	0.35	2.2	65.3	188.57	976.78
P- 17	Mudstone, calcareous, cherty	RSS- 2218	1.5	0.3	64.5	190.07	978.73
P- 16	Mudstone, calcareous	RSS- 2217	3.2	1.1	67.2	193.27	984.17
P- 15	Mudstone, calcareous	RSS- 2216	2.5	1.1	64.3	195.77	988.42
P- 14	Mudstone, calcareous	RSS- 2215	0.8	3.8	50.1	196.57	991.46
P- 13	Limestone, argillaceous	RSS- 2214	1.6	1.6	47.0	198.17	994.02
P- 12	Mudstone, calcareous	RSS- 2213	0.8	3.6	49.3	198.97	996.90

P- 11	Mudstone, calcareous	RSS-2212	2.1	2.1	51.0	201.07	1,001.31
P- 10	Limestone, argillaceous	RSS-2211	2.0	1.7	47.9	203.07	1,004.77
P- 9	Limestone, argillaceous	RSS-2210	1.0	1.5	40.5	204.07	1,006.21
P- 8	Limestone, argillaceous	RSS-2209	1.8	1.6	43.9	205.87	1,009.09
P- 7	Limestone, argillaceous	RSS-2208	1.3	1.8	43.4	207.17	1,011.43
P- 6	Mudstone, calcareous	RSS-2207	0.4	4.7	48.1	207.57	1,013.31
P- 5	Phosphate rock, argillaceous, calcareous	RSS-2206	0.6	18.8	27.6	208.17	1,024.59
P- 4	Limestone, argillaceous	RSS-2205	0.9	3.2	32.7	209.07	1,027.47
P- 3	Mudstone, calcareous	RSS-2204	1.0	6.2	47.5	210.07	1,033.67
P- 2	Mudstone, calcareous	RSS-2203	0.6	7.4	46.8	210.67	1,038.11
P- 1	Phosphate rock and mudstone	RSS-2202	0.7	23.2	17.1	211.37	1,054.35
Lower member of Park City formation—top bed only							
L- 1	Limestone	RSS-2201	4.9	0.6	7.8	4.9	2.94

WANRHODES CANYON, UTAH. LOT NO. 1270.

Phosphatic shale member of Park City formation sampled in hand trench at bottom of Wanrhodes Canyon, secs. 14 and 15, T. [illegible] S., R. [illegible] E., Utah County, Utah. Beds strike N. 56° E. and dip 52° SE. Section measured and sampled by G. F. Hosford, D. P. Sprouse, and M. D. Stewart in August and September 1948. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
Upper member of Park City formation—basal beds only							
U- 7	Limestone	--	1.0	--	--	1.0	--
U- 6	Limestone	--	0.5	--	--	1.5	--
U- 5	Limestone	--	0.85	--	--	2.35	--
U- 4	Limestone, cherty	--	1.7	--	--	4.05	--
U- 3	Limestone, cherty	--	0.9	--	--	4.95	--
U- 2	Limestone, cherty	--	0.6	--	--	5.55	--
U- 1	Mudstone, calcareous	GFH-2596	2.6	2.0	58.5	8.15	5.20
Phosphatic shale member of Park City formation							
P-219	Mudstone, calcareous	GFH-2595	0.4	2.6	67.3	0.4	1.04
P-218	Mudstone, calcareous	GFH-2594	0.9	4.2	66.0	1.3	4.82
P-217	Mudstone, calcareous	GFH-2593	1.35	3.9	67.3	2.65	10.08
P-216	Mudstone	GFH-2592	0.45	4.1	70.8	3.10	11.93
P-215	Mudstone	GFH-2591	0.9	4.6	70.0	4.00	16.07
P-214	Mudstone, calcareous	GFH-2590	1.0	4.4	64.0	5.00	20.47
P-213	Mudstone	GFH-2589	0.55	6.9	61.0	5.55	24.26
P-212	Phosphate rock, argillaceous	GFH-2588	0.45	21.3	27.7	6.00	33.85
P-211	Mudstone, calcareous	GFH-2587	2.2	4.3	67.8	8.20	43.31
P-210	Mudstone and phosphate rock	GFH-2586	0.8	4.5	71.8	9.00	46.91
P-209	Mudstone, phosphatic	GFH-2585	0.55	8.3	63.5	9.55	51.48
P-208	Mudstone	GFH-2584	1.2	5.3	72.5	10.75	57.84
P-207	Mudstone	GFH-2583	0.45	4.5	73.8	11.20	59.86
P-206	Mudstone, phosphatic	GFH-2582	0.75	16.9	43.2	11.95	72.54
P-205	Mudstone	GFH-2581	0.65	6.5	63.7	12.60	76.76
P-204	Mudstone	GFH-2580	2.85	4.8	71.2	15.45	90.44
P-203	Mudstone	GFH-2579	1.7	5.2	69.8	17.15	99.28
P-202	Mudstone	GFH-2578	1.0	5.9	70.5	18.15	105.18
P-201	Mudstone	GFH-2577	0.9	5.5	67.0	19.05	110.13
P-200	Mudstone	GFH-2576	0.8	7.4	66.3	19.85	116.05
P-199	Mudstone	GFH-2575	0.4	3.5	72.5	20.25	117.45
P-198	Mudstone and chert	GFH-2574	1.9	5.0	68.3	22.15	126.95
P-197	Mudstone	GFH-2573	2.2	5.4	68.7	24.35	138.83
P-196	Mudstone	GFH-2572	0.8	6.1	68.2	25.15	143.71
P-195	Mudstone	GFH-2571	1.05	6.4	69.0	26.20	150.43

P-194	Mudstone	GFH-2570	1.5	6.8	67.0	27.70	160.63
P-193	Chert and mudstone	GFH-2569	1.35	5.7	70.3	29.05	168.33
P-192	Mudstone	GFH-2568	1.1	5.9	68.2	30.15	174.82
P-191	Mudstone	GFH-2567	0.45	4.7	72.0	30.60	176.93
P-190	Mudstone	GFH-2566	0.6	5.3	69.7	31.20	180.11
P-189	Mudstone	GFH-2565	0.6	5.2	70.8	31.80	183.23
P-188	Mudstone	GFH-2564	0.75	5.7	68.0	32.55	187.50
P-187	Mudstone and phosphate rock	GFH-2563	0.45	16.6	43.2	33.00	194.98
P-186	Chert	GFH-2562	0.6	3.1	78.7	33.60	196.84
P-185	Mudstone, cherty	GFH-2561	1.5	1.9	70.3	35.10	199.68
P-184	Mudstone	GFH-2560	1.35	2.5	72.3	36.45	203.06
P-183	Mudstone, phosphatic	GFH-2559	0.6	11.7	56.3	37.05	210.08
P-182	Mudstone	GFH-2558	1.8	2.6	78.7	38.85	214.76
P-181	Mudstone, calcareous, phosphatic	GFH-2557	0.8	9.0	52.0	39.65	221.96
P-180	Limestone, argillaceous	GFH-2556	0.55	2.2	36.0	40.20	223.17
P-179	Mudstone, phosphatic	GFH-2555	0.3	8.4	56.7	40.50	225.69
P-178	Mudstone, calcareous	GFH-2554	1.2	1.6	60.2	41.70	227.61
P-177	Mudstone, calcareous	GFH-2553	0.6	2.1	54.7	42.30	228.87
P-176	Mudstone, calcareous	GFH-2552	1.1	0.9	53.0	43.40	229.86
P-175	Limestone, argillaceous	GFH-2551	0.75	1.2	31.7	44.15	230.76
P-174	Limestone, argillaceous	GFH-2360	0.4	5.5	41.9	44.55	232.96
P-173	Mudstone, calcareous	GFH-2359	2.85	1.9	53.7	47.40	238.38
P-172	Mudstone, calcareous	GFH-2358	1.1	0.8	54.8	48.50	239.26
P-171	Limestone, argillaceous	GFH-2357	1.2	0.5	38.7	49.70	239.86
P-170	Mudstone, calcareous	GFH-2356	1.25	0.8	60.8	50.95	240.86
P-169	Mudstone, calcareous, phosphatic	GFH-2355	0.5	9.5	37.0	51.45	245.60
P-168	Mudstone, phosphatic and chert	GFH-2354	2.0	8.3	56.8	53.45	262.20
P-167	Chert	GFH-2353	0.3	4.5	72.3	53.75	263.56
P-166	Chert	GFH-2352	0.5	6.1	66.2	54.25	266.60
P-165	Chert	GFH-2351	0.45	5.5	66.2	54.70	269.08
P-164	Phosphate rock, argillaceous	GFH-2350	1.0	17.7	33.5	55.70	286.78
P-163	Chert, calcareous	GFH-2349	1.8	1.7	62.3	57.50	289.84
P-162	Chert	GFH-2348	1.0	2.2	81.0	58.50	292.04
P-161	Chert	GFH-2347	1.4	4.5	78.0	59.90	298.06
P-160	Mudstone, cherty	GFH-2346	1.2	3.1	79.5	61.10	301.78
P-159	Chert	GFH-2345	0.55	6.3	70.3	61.65	305.24
P-158	Mudstone, phosphatic	GFH-2344	0.65	14.1	55.0	62.30	314.41
P-157	Phosphate rock, argillaceous	GFH-2343	0.3	21.3	33.7	62.60	320.80
P-156	Phosphate rock, argillaceous	GFH-2342	0.9	21.1	34.8	63.50	339.79
P-155	Mudstone	GFH-2341	0.35	7.5	70.0	63.85	342.42
P-154	Mudstone	GFH-2340	2.0	5.3	74.7	64.85	347.72
P-153	Mudstone	GFH-2339	0.55	6.1	76.5	65.40	351.07
P-152	Phosphate rock, argillaceous	GFH-2338	0.3	25.6	26.2	65.70	358.75
P-151	Phosphate rock, argillaceous	GFH-2337	1.9	24.7	30.5	67.60	405.65
P-150	Chert and mudstone	GFH-2336	0.4	7.1	73.8	68.00	408.52

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
P-149	Chert	GFH-2335	0.8	5.0	80.2	68.80	412.52
P-148	Mudstone	GFH-2334	1.2	7.7	71.7	70.00	421.76
P-147	Phosphate rock and mudstone	GFH-2333	0.45	20.5	41.0	70.45	430.98
P-146	Limestone	GFH-2332	1.9	1.8	18.3	72.35	434.40
P-145	Mudstone, cherty	DPS-2451	0.55	4.0	72.3	72.90	436.60
P-144	Mudstone, cherty	DPS-2450	1.2	5.4	80.9	74.10	443.08
P-143	Mudstone, phosphatic, cherty	DPS-2449	0.5	10.8	65.8	74.60	448.48
P-142	Mudstone, cherty	DPS-2448	0.75	5.8	79.8	75.35	452.84
P-141	Mudstone	DPS-2447	1.05	7.5	69.3	76.40	460.71
P-140	Mudstone, phosphatic	DPS-2446	0.3	17.7	46.7	76.70	466.02
P-139	Mudstone, phosphatic	DPS-2445	0.4	8.3	63.5	77.10	469.34
P-138	Mudstone, cherty	DPS-2444	0.6	4.9	66.5	77.70	472.28
P-137	Mudstone, calcareous	DPS-2443	1.45	4.3	40.5	79.15	478.52
P-136	Mudstone, cherty	DPS-2442	0.55	7.0	72.1	79.70	482.36
P-135	Mudstone	DPS-2441	0.75	7.5	68.7	80.45	487.99
P-134	Mudstone	DPS-2440	1.1	7.7	70.5	81.55	496.46
P-133	Mudstone, phosphatic	DPS-2439	0.75	10.7	59.7	82.30	504.48
P-132	Phosphate rock, argillaceous	DPS-2438	0.3	16.0	44.1	82.60	509.88
P-131	Mudstone, phosphatic	DPS-2437	0.75	8.2	59.2	83.35	516.04
P-130	Mudstone, phosphatic	DPS-2436	0.6	10.2	59.2	83.95	522.16
P-129	Mudstone, phosphatic	DPS-2435	0.9	8.1	64.3	84.85	529.44
P-128	Mudstone	DPS-2434	2.3	7.5	68.8	87.15	546.70
P-127	Mudstone, phosphatic	DPS-2433	2.1	7.9	66.0	89.25	563.28
P-126	Mudstone, phosphatic	DPS-2432	0.6	9.0	61.2	89.85	568.68
P-125	Mudstone	DPS-2431	0.6	5.7	60.0	90.45	572.10
P-124	Mudstone	DPS-2430	1.35	7.7	64.8	91.80	582.50
P-123	Mudstone	DPS-2429	0.75	7.6	64.3	92.55	588.20
P-122	Mudstone, phosphatic	DPS-2428	0.7	8.6	64.5	93.25	594.22
P-121	Mudstone, phosphatic	DPS-2427	0.9	8.2	63.8	94.15	601.60
P-120	Mudstone	DPS-2426	1.6	7.7	67.0	95.75	613.92
P-119	Mudstone, phosphatic	DPS-2425	0.95	10.5	57.0	96.70	623.90
P-118	Mudstone	DPS-2424	1.4	7.2	63.0	98.10	633.98
P-117	Mudstone, phosphatic	DPS-2423	0.55	8.0	63.7	98.65	638.38
P-116	Mudstone, phosphatic	DPS-2422	0.75	8.4	66.7	99.40	644.68
P-115	Mudstone and phosphate rock	DPS-2421	0.6	11.4	55.7	100.00	651.52
P-114	Mudstone, phosphatic	DPS-2420	0.6	10.5	59.2	100.60	657.82
P-113	Mudstone, phosphatic	DPS-2419	0.3	14.3	50.0	100.90	662.10
P-112	Phosphate rock, argillaceous	DPS-2418	0.3	17.8	43.0	101.20	667.44
P-111	Mudstone, phosphatic	DPS-2417	0.75	9.3	66.2	101.95	674.42
P-110	Mudstone, phosphatic	DPS-2416	0.8	9.2	64.8	102.75	681.78
P-109	Mudstone, phosphatic	DPS-2415	0.7	9.5	61.1	103.45	688.43

P-108	Mudstone, phosphatic	DPS-2414	0.7	10.4	56.2	104.15	695.[illegible]
P-107	Limestone, argillaceous	DPS-2413	0.65	4.9	38.7	104.80	698.90
P-106	Mudstone, phosphatic	DPS-2412	1.1	9.1	63.3	105.90	708.90
P-105	Mudstone, phosphatic	DPS-2411	1.55	10.2	62.9	107.45	724.72
P-104	Mudstone, phosphatic	DPS-2410	0.5	8.2	62.9	107.95	728.82
P-103	Mudstone, phosphatic	DPS-2409	2.0	8.5	69.0	109.95	745.82
P-102	Phosphate rock, argillaceous	DPS-2408	0.6	19.5	39.0	110.55	757.32
P-101	Mudstone	DPS-2407	0.95	6.5	65.5	111.50	763.69
P-100	Mudstone	DPS-2406	0.55	6.5	87.5	112.05	767.26
P- 99	Mudstone	DPS-2405	0.75	2.6	52.6	112.80	769.22
P- 98	Mudstone, phosphatic	DPS-2467	0.5	7.8	62.0	113.30	773.12
P- 97	Mudstone, calcareous	DPS-2466	0.5	6.3	55.5	113.80	776.27
P- 96	Mudstone	DPS-2465	0.85	7.2	59.8	114.65	782.38
P- 95	Mudstone	DPS-2404	1.1	6.8	62.9	115.75	789.86
P- 94	Mudstone	DPS-2403	0.65	5.5	66.7	116.40	793.44
P- 93	Mudstone	DPS-2402	0.6	5.4	67.1	117.00	796.68
P- 92	Mudstone, phosphatic	DPS-2401	0.35	10.4	54.6	117.35	800.32
P- 91	Mudstone, phosphatic	DPS-2400	0.8	8.2	57.9	118.15	806.88
P- 90	Mudstone, calcareous	DPS-2399	0.95	5.8	56.0	119.10	812.39
P- 89	Mudstone	DPS-2398	1.4	6.6	60.1	120.50	821.63
P- 88	Mudstone, calcareous	DPS-2397	3.0	5.2	62.0	123.50	837.23
P- 87	Mudstone, calcareous	DPS-2396	0.6	6.5	58.4	124.10	841.13
P- 86	Mudstone, phosphatic, calcareous	DPS-2395	0.55	11.7	46.4	124.65	847.56
P- 85	Mudstone, calcareous	DPS-2394	2.5	5.1	58.1	127.15	860.32
P- 84	Mudstone, calcareous	DPS-2393	0.5	5.7	53.6	127.65	863.16
P- 83	Mudstone, phosphatic, calcareous	DPS-2392	0.65	9.2	48.8	128.30	869.14
P- 82	Phosphate rock, argillaceous, calcareous	DPS-2391	0.3	14.9	35.8	128.60	873.62
P- 81	Limestone, argillaceous	DPS-2390	0.95	4.9	30.8	129.55	878.27
P- 80	Mudstone, calcareous	DPS-2389	1.55	7.7	48.5	131.10	890.20
P- 79	Mudstone, phosphatic	DPS-2388	0.35	14.7	41.7	131.45	895.35
P- 78	Mudstone, calcareous	MDS-2523	0.5	6.4	57.1	131.95	898.55
P- 77	Mudstone, calcareous	MDS-2522	0.7	5.3	60.1	132.65	902.26
P- 76	Mudstone, calcareous	MDS-2521	0.75	6.8	53.3	133.40	907.36
P- 75	Mudstone, calcareous, phosphatic	MDS-2520	0.9	8.0	56.5	134.30	914.56
P- 74	Mudstone, calcareous, phosphatic	MDS-2519	0.4	9.4	47.0	134.70	918.32
P- 73	Phosphate rock, argillaceous	GFH-2530	0.7	20.5	38.5	135.40	932.67
P- 72	Mudstone	GFH-2529	0.3	2.2	82.3	135.70	933.33
P- 71	Mudstone, calcareous	GFH-2528	2.0	1.2	73.2	137.70	935.73
P- 70	Mudstone, cherty, calcareous	GFH-2527	0.65	1.8	69.3	138.35	936.90
P- 69	Mudstone, calcareous	GFH-2526	0.85	2.4	64.3	139.20	938.94
P- 68	Mudstone, calcareous, contains pyrite	GFH-2600	0.5	4.6	60.0	139.70	941.24
P- 67	Mudstone, calcareous	GFH-2599	2.6	1.7	65.8	142.30	945.66
P- 66	Phosphate rock and mudstone	GFH-2598	0.5	23.2	30.0	142.80	957.26
P- 65	Phosphate rock, argillaceous	GFH-2597	1.0	18.5	33.7	143.80	975.76

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
P- 64	Limestone, argillaceous	MDS-2518	2.3	0.4	34.2	146.10	976.68
P- 63	Mudstone, calcareous	MDS-2514	2.5	1.7	52.3	148.60	980.93
P- 62	Mudstone, calcareous	MDS-2516	1.2	3.0	54.5	149.80	984.53
P- 61	Limestone, argillaceous	MDS-2515	1.1	1.7	43.8	150.90	986.40
P- 60	Mudstone, calcareous	MDS-2514	0.6	1.8	52.0	151.50	987.48
P- 59	Mudstone, calcareous	DPS-2464	0.65	3.0	60.3	152.15	989.43
P- 58	Mudstone, calcareous	DPS-2463	1.2	4.3	60.8	153.35	994.59
P- 57	Limestone, argillaceous, cherty	DPS-2462	0.7	1.5	46.2	154.05	995.64
P- 56	Mudstone, calcareous	DPS-2461	0.95	3.5	63.8	155.00	998.96
P- 55	Mudstone, cherty	DPS-2460	0.55	2.2	75.2	155.55	1,000.18
P- 54	Mudstone, cherty, calcareous	DPS-2459	0.75	1.4	64.0	156.30	1,001.22
P- 53	Mudstone, calcareous	DPS-2458	0.5	4.0	65.2	156.80	1,003.22
P- 52	Mudstone, cherty, calcareous	DPS-2457	0.75	1.4	70.3	157.55	1,004.28
P- 51	Mudstone, calcareous, cherty	DPS-2456	0.55	1.6	62.9	158.10	1,005.16
P- 50	Mudstone, calcareous	DPS-2455	0.85	2.2	67.1	158.95	1,007.03
P- 49	Mudstone, calcareous	DPS-2454	0.8	2.4	67.1	159.75	1,008.94
P- 48	Mudstone, cherty, calcareous	DPS-2453	0.5	1.5	70.0	160.25	1,009.70
P- 47	Mudstone, cherty, calcareous	DPS-2452	0.7	1.5	60.6	160.95	1,010.74
P- 46	Mudstone, calcareous	MDS-2513	0.4	2.6	58.7	161.35	1,011.78
P- 45	Mudstone, cherty, calcareous	MDS-2512	0.5	1.2	65.2	161.85	1,012.38
P- 44	Mudstone, calcareous	MDS-2511	0.3	2.3	56.8	162.15	1,013.08
P- 43	Mudstone, calcareous	MDS-2510	0.95	1.6	68.2	163.10	1,014.60
P- 42	Mudstone, cherty, calcareous	MDS-2509	0.5	1.3	72.9	163.60	1,015.24
P- 41	Mudstone, calcareous	MDS-2508	0.6	2.4	70.7	164.20	1,016.68
P- 40	Mudstone, cherty, calcareous	MDS-2507	1.3	2.0	67.3	165.50	1,019.28
P- 39	Mudstone, calcareous	MDS-2506	0.6	2.9	67.3	166.10	1,021.02
P- 38	Mudstone, calcareous	MDS-2505	0.5	5.3	63.5	166.60	1,023.68
P- 37	Mudstone, calcareous	MDS-2504	0.7	1.5	66.0	167.30	1,024.72
P- 36	Mudstone, cherty, calcareous	MDS-2503	0.9	1.1	64.0	168.20	1,025.72
P- 35	Mudstone, calcareous	MDS-2502	0.8	1.4	69.7	169.00	1,026.84
P- 34	Mudstone, calcareous	MDS-2501	0.9	1.1	71.5	169.90	1,027.82
P- 33	Mudstone, calcareous	MDS-2500	0.4	2.0	71.8	170.30	1,028.62
P- 32	Mudstone, calcareous	MDS-2499	1.1	1.4	66.3	171.40	1,030.16
P- 31	Mudstone, calcareous	MDS-2498	0.55	1.5	75.7	171.95	1,030.99
P- 30	Mudstone, calcareous	MDS-2497	0.7	1.2	73.3	172.65	1,031.83
P- 29	Mudstone	MDS-2496	0.7	3.0	76.0	173.35	1,033.93
P- 28	Mudstone, cherty, calcareous	MDS-2495	0.95	1.5	68.8	174.30	1,035.36
P- 27	Mudstone, calcareous	MDS-2494	1.6	1.2	74.2	175.90	1,037.28
P- 26	Mudstone, calcareous	MDS-2493	1.2	1.2	70.5	177.10	1,038.72
P- 25	Mudstone, calcareous	MDS-2492	1.0	1.3	72.8	178.10	1,040.22

P- 24	Mudstone, calcareous	MDS-2491	0.8	1.8	72.5	178.90	1,041.66
P- 23	Mudstone, calcareous	MDS-2490	0.9	1.0	64.5	179.80	1,042.56
P- 22	Mudstone, calcareous	MDS-2489	1.75	1.6	68.6	181.55	1,045.36
P- 21	Mudstone	MDS-2488	1.1	1.7	76.2	182.65	1,047.23
P- 20	Mudstone, calcareous	MDS-2487	0.5	2.1	56.9	183.15	1,048.28
P- 19	Mudstone, calcareous	MDS-2486	0.35	1.7	63.3	183.50	1,048.87
P- 18	Mudstone, calcareous	MDS-2485	0.6	7.3	57.5	184.10	1,053.25
P- 17	Mudstone, calcareous	MDS-2484	1.1	1.7	57.3	185.20	1,055.12
P- 16	Mudstone, calcareous	MDS-2483	4.0	2.5	63.0	189.20	1,065.12
P- 15	Limestone, argillaceous	MDS-2482	2.6	1.4	43.8	191.80	1,068.76
P- 14	Mudstone, calcareous	MDS-2481	3.85	3.1	67.8	195.65	1,080.70
P- 13	Mudstone, calcareous	MDS-2480	3.45	2.0	59.3	199.10	1,087.60
P- 12	Mudstone, calcareous	MDS-2479	0.55	2.4	65.5	199.65	1,088.92
P- 11	Mudstone, calcareous	MDS-2478	0.75	2.8	72.7	200.40	1,091.02
P- 10	Mudstone, calcareous	MDS-2477	1.4	1.6	62.5	201.80	1,093.26
P- 9	Limestone, argillaceous	MDS-2476	0.4	4.1	34.8	202.20	1,094.90
P- 8	Mudstone, calcareous	MDS-2200	1.5	2.6	61.7	203.70	1,098.80
P- 7	Limestone, argillaceous	MDS-2199	1.0	1.9	42.8	204.70	1,100.70
P- 6	Mudstone, calcareous	MDS-2198	0.75	5.5	55.2	205.45	1,104.82
P- 5	Phosphate rock, argillaceous	MDS-2197	0.7	16.5	39.7	206.15	1,116.37
P- 4	Phosphate rock, calcareous, argillaceous	MDS-2196	0.65	12.7	28.5	206.80	1,124.62
P- 3	Phosphate rock, calcareous, argillaceous	MDS-2195	0.65	21.8	21.0	207.45	1,138.80
P- 2	Phosphate rock, argillaceous	MDS-2194	1.0	18.85	32.0	208.45	1,157.60
P- 1	Phosphate rock	MDS-2193	0.7	31.0	3.3	209.15	1,179.30
	Lower member of Park City formation--top beds only						
L- 5	Limestone	MDS-2192	1.9	1.0	9.3	1.9	--
L- 4	Limestone	--	2.4	--	--	4.3	--
L- 3	Limestone, dolomitic	--	1.2	--	--	5.5	--
L- 2	Limestone, cherty	--	10.0	--	--	15.5	--
L- 1	Limestone, cherty	--	0.5	--	--	16.0	--

ALTA QUADRANGLE, UTAH. LOT NO. 1284.

Samples collected by F. C. Calkins from base of Deseret limestone in the Alta quadrangle, Utah, in September 1948, samples FCC(A)1107 and FCC(B)1108 from ridge between Solitude and Honeycomb Forks and sample FCC(B)1109 from crest of Kessler Peak Ridge. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

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	V_2O_5	Loss on ignition	Acid insoluble		
[illegible]	Limestone	FCC(A)1107	[illegible]	0.8	3.5	1.6	0.05	31.6	10.2	---	---
[illegible]	Limestone	FCC(B)1108	[illegible]	2.2	1.3	0.4	0.05	39.1	7.1	---	---
[illegible]	Phosphate rock, calcareous	FCC(C)1109	---	25.7	0.6	0.5	0.05	14.0	6.6	---	---

SPECTROGRAPHIC ANALYSES—ALTA QUADRANGLE, UTAH. LOT NO. 1284.

Semi-quantitative analyses of samples from the base of the Deseret limestone, Alta quadrangle, Utah (see above 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, Ba, Be, Bi, B, Cd, Co, Cb, Ga, Ge, Au, In, Pb, Li, Hg, Pt, Ag, Ta, Sn, W, and Zn were looked for in all samples but were not detected.

Explanation of symbols

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

Bed no.	Sample no.	Al	Ca	Cr	Cu	Fe	Mg	Mn	Mo	Ni	Si	Na	Sr	Ti	V	Zr
[illegible]	FCC(A)1107	C	B	E	C	C	C	F	ND	E	B	ND	F	E	E	F
[illegible]	FCC(B)1108	C	A	E	C	D	C	F	F	E	C	ND	E	E	D	F
[illegible]	FCC(C)1109	C	A	E	C	C	C	F	F	E	C	E	E	E	E	F

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

U.S. [Reports - Principles series]

STRATIGRAPHIC SECTIONS OF THE PHOSPHORIA FORMATION IN WYOMING

by

V. E. McKelvey, L. E. Smith,
R. A. Hoppin, and F. C. Armstrong

U.S. GEOLOGICAL SURVEY
WASHINGTON
AUG 16 1951
LIBRARY

MINERAL DEPOSITS BRANCH

Spokane, Washington July 1951

OPEN FILE

This ~~map~~ report is preliminary and has not been edited or reviewed for conformity with U. S. Geological Survey standards and nomenclature.

TABLE OF CONTENTS

	Page
Introduction	1
Abstract of sections	
Layland Canyon. Lot no. 1202.	1w
Spectrographic analyses	5w
Coal Canyon. Lot no. 1201.	7w
Additional analyses	12w
Additional analyses of selected samples	16w
Spectrographic analyses	17w
North Fork of Pine Creek. Lot no. 1204.	20w
Spectrographic analyses	23w
Middle Fork of Pine Creek. Lot no. 1205.	24w
Spectrographic analyses	28w
Leefe. Lot no. 1213.	29w
Spectrographic analyses	31w

LAYLAND CANYON, WYOMING. LOT NO. 1202.

Phosphatic shale member of Phosphoria formation sampled and upper shale member measured in hand trenches in Layland Canyon, sec. 15, T. 27 N., R. 119 W., Lincoln County, Wyoming, on east limb of anticline. Beds P-1 through P-82 sampled in trench in next canyon to south, sec. 30, T. 27 N., R. 119 W., Lincoln County, Wyoming, on east limb of anticline. Beds P-1 through P-82 sampled in trench in lower shale member 300 feet above canyon bottom on north side of Layland Canyon; beds P-83 through R-1 sampled and upper shale member measured in trench 25 feet above canyon bottom on north side of canyon ¼ mile to south. Beds in north trench strike N. 20° W. and dip 34° E. at Wells contact and strike N. 15° W. and dip 76° E. in upper part of section; beds in south trench strike N. 13° W. and dip 80° E. Phosphatic shale member measured by D. M. LaFrabee, R. A. Hoppin, and L. E. Smith and sampled by R. P. Sheldon, R. A. Gulbrandsen, R. S. Sears, and O. A. Payne in June and July 1947; upper shale member measured by F. C. Armstrong in September 1947. Samples analyzed for P_2O_5 and acid insoluble by U. S. Bureau of Mines Laboratory, Albany, Oregon, and for Al_2O_3, Fe_2O_3, and loss on ignition by U. S. Geological Survey.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness in percent of P2O5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	Loss on ignition	Acid insoluble		
	Dinwoody formation									
Trd- 1	Limestone, sandy	--	2.0	--	--	--	--	--	210	--
	Upper shale member of Phosphoria formation									
U- 12	Mudstone	--	0.7	--	--	--	--	2 --	0.7	--
U- 11	Mudstone, contains phosphatic limestone concretion at base	--	0.8	--	--	--	--	--	1.5	--
U- 10	Mudstone, calcareous, cherty	--	1.0	--	--	--	--	--	2.5	--
U- 9	Mudstone	--	3.2	--	--	--	--	--	5.7	--
U- 8	Mudstone	--	2.2	--	--	--	--	--	7.9	--
U- 7	Mudstone	--	1.1	--	--	--	--	--	9.0	--
U- 6	Mudstone, calcareous	--	0.75	--	--	--	--	--	9.75	--
U- 5	Mudstone	--	1.4	--	--	--	--	--	11.15	--
U- 4	Mudstone	--	0.35	--	--	--	--	--	11.50	--
U- 3	Limestone, sandy	--	0.4	--	--	--	--	--	11.90	--
U- 2	Phosphatic rock, cherty	--	1.1	--	--	--	--	--	13.00	--
U- 1	Phosphatic rock, cherty	--	1.5	--	--	--	--	--	14.50	--
	Rex member of Phosphoria formation—basal bed only									
R- 1	Chert, contains calcite veinlets	RAH-147-47	10.0	0.7	--	--	--	73.3	10.0	7.00
	Phosphatic shale member of Phosphoria formation									
P-105	Limestone, argillaceous	RAH-148-47	6.0	1.7	--	--	--	33.5	6.0	10.20
P-104	Phosphatic rock	RAH-149-47	0.3	24.0	--	--	--	19.4	6.3	17.40
P-103	Mudstone, contains phosphatic mudstone lens 0.2 foot thick	RAH-150-47	1.0	4.9	--	--	--	67.9	7.3	17.89
P-102	Mudstone	RAH-151-47	0.6	1.2	--	--	--	75.3	7.9	18.07
P-101	Mudstone, calcareous	RAH-152-47	2.6	0.5	--	--	--	49.5	10.5	18.32
P-100	Mudstone	RAH-153-47	1.8	4.2	--	--	--	70.2	12.3	18.88

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness of percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	Loss on ignition	Acid insoluble		
P- 95	Phosphate rock	RAH-154-47	1.5	24.8	2.4	4.47	6.8	18.6	13.8	69.08
P- 96	Phosphate rock and mudstone	RAH-155-47	1.15	21.0	2.8	4.02	6.4	31.1	14.95	91.43
P- 97	Phosphate rock	RAH-156-47	1.4	29.8	1.5	4.48	6.6	9.5	16.35	133.98
P- 94	Phosphate rock	RAH-157-47	3.1	31.5	1.1	3.15	7.5	4.6	19.45	232.60
P- 93	Phosphate rock	RAH-158-47	2.3	29.6	1.9	0.79	8.30	9.9	21.75	300.68
P- 98	Mudstone, phosphatic	RAH-159-47	0.7	12.2	6.7	5.74	7.8	50.1	22.45	309.22
P- 99	Limestone, argillaceous	RAH-160-47	2.2	0.3	4.5	4.45	46.8	40.2	24.65	309.88
P- 92	Phosphate rock	RAH-161-47	1.1	29.6	2.1	3.82	8.0	9.0	25.75	342.43
P- 91	Phosphate rock, mudstone, and limestone	RAH-162-47	1.2	20.6	3.9	1.04	9.50	26.1	26.95	367.16
P- 90	Phosphate rock	RAH-163-47	2.5	28.4	2.6	3.76	7.0	11.7	29.25	432.48
P- 89	Phosphate rock, argillaceous	RAH-164-47	1.2	20.6	5.3	4.24	6.5	31.5	30.45	457.20
P- 88	Phosphate rock	RAH-165-47	2.1	30.1	2.4	4.86	5.1	11.5	32.55	520.41
P- 87	Mudstone, calcareous and phosphatic	RAH-166-47	1.0	9.3	5.4	5.58	15.4	40.3	33.55	529.71
P- 86	Mudstone, calcareous	RAH-167-47	2.2	2.3	6.9	4.83	18.2	51.0	35.75	534.77
P- 85	Phosphate rock, calcareous and limestone	RAH-168-47	0.8	20.8	2.5	4.89	17.6	6.1	36.25	541.11
P- 84	Mudstone, phosphatic	RAH-169-47	1.5	13.7	9.0	6.22	13.8	36.3	37.75	565.72
P- 83	Limestone, "hanging-wall limestone"	RAH-170-47	3.2	0.7	--	--	--	10.4	40.95	567.96
P- 82	Mudstone, phosphatic	LES-258-47	0.3	8.9	--	--	--	52.5	41.25	570.63
P- 81	Mudstone	LES-257-47	0.4	0.5	--	--	--	79.4	41.65	570.83
P- 80	Mudstone	LES-256-47	0.65	0.1	--	--	--	64.1	42.30	571.09
P- 79	Mudstone	LES-255-47	0.5	0.4	--	--	--	82.3	42.80	571.29
P- 78	Mudstone	LES-254-47	0.5	0.6	--	--	--	74.1	43.30	571.59
P- 77	Mudstone	LES-253-47	0.45	4.8	--	--	--	60.4	43.75	573.75
P- 76	Mudstone, phosphatic	LES-252-47	0.4	8.4	--	--	--	55.7	44.15	577.11
P- 75	Limestone, argillaceous, "footwall limestone"	LES-251-47	1.3	1.6	--	--	--	33.0	45.45	579.19
P- 74	Mudstone	LES-250-47	0.5	3.3	--	--	--	75.0	45.85	580.84
P- 73	Mudstone, phosphatic	LES-249-47	0.6	11.1	--	--	--	50.4	46.45	587.47
P- 72	Limestone, calcareous	RAH-139-47	1.6	0.7	--	--	--	66.6	48.05	588.59
P- 71	Limestone, calcareous	RAH-138-47	1.0	0.5	--	--	--	66.6	49.05	588.79
P- 70	Limestone, argillaceous	RAH-137-47	2.2	0.6	--	--	--	41.5	51.25	590.11
P- 69	Mudstone, calcareous, phosphatic	RAH-136-47	2.9	12.0	--	--	--	35.6	54.15	624.91
P- 68	Limestone, argillaceous	RAH-135-47	0.5	2.5	--	--	--	36.3	54.65	626.16
P- 67	Mudstone, phosphatic	RAH-134-47	0.7	14.9	--	--	--	42.1	55.35	636.59
P- 66	Limestone, argillaceous	RAH-133-47	0.8	3.9	--	--	--	38.6	56.15	639.71
P- 65	Phosphate rock, argillaceous	RAH-132-47	2.1	15.6	--	--	--	21.9	58.25	672.47
P- 64	Limestone, argillaceous, phosphatic	RAH-131-47	0.8	9.7	--	--	--	31.4	59.05	680.22
P- 63	Phosphate rock, argillaceous	RAH-129-47	3.5	17.1	--	--	--	24.7	62.55	740.08
--	Three limestone concretions in bed P-63	RAH-130-47	(0.0-1.4)	2.0	--	--	--	1.8	--	--

P- 47	Phosphate rock, argillaceous	RAH-128-47	0.7	17.6	--	--	--	23.1	69.25	752.40
P- 48	Phosphate rock, argillaceous	RAH-127-47	1.7	17.5	--	--	--	24.9	64.95	782.15
P- 49	Limestone, argillaceous	RAH-126-47	1.0	1.7	--	--	--	32.5	87.95	787.23
P- 50	Phosphate rock, argillaceous	RAH-125-47	0.7	19.5	--	--	--	26.0	68.65	800.90
P- 51	Mudstone, calcareous, phosphatic	RAH-124-47	0.4	10.2	--	--	--	45.7	69.05	804.98
P- 52	Phosphate rock, argillaceous, calcareous	RAH-123-47	0.8	19.4	--	--	--	25.0	69.85	820.30
P- 53	Phosphate rock, argillaceous	RAH-122-47	0.7	13.4	--	--	--	33.0	70.55	829.88
P- 54	Limestone, phosphatic, argillaceous	RAH-121-47	2.5	10.5	--	--	--	21.7	73.05	856.13
P- 55	Phosphate rock and mudstone, calcareous	RAH-120-47	1.6	14.9	--	--	--	17.0	74.65	879.97
P- 56	Limestone, phosphatic	RAH-119-47	0.4	15.5	--	--	--	15.2	75.05	886.17
P- 57	Mudstone	RAH-118-47	0.7	6.6	--	--	--	66.7	75.75	890.79
P- 58	Limestone	RAH-117-47	0.7	7.4	--	--	--	7.4	76.45	895.97
P- 59	Phosphate rock	RAH-116-47	0.6	28.7	--	--	--	9.4	77.05	913.19
P- 60	Limestone, argillaceous	RAH-115-47	1.7	3.4	--	--	--	26.0	78.75	918.97
P- 61	Phosphate rock	RAH-114-47	5.8	30.1	2.2	3.30	8.9	9.0	82.55	1,033.35
P- 62	Limestone, argillaceous, phosphatic	RAH-113-47	2.0	10.4	--	--	--	26.2	84.55	1,051.47
P- 63	Mudstone, phosphatic, calcareous	RAH-112-47	1.3	14.3	--	--	--	41.7	85.85	1,072.04
P- 64	Mudstone	RAH-30-47	3.9	7.2	--	--	--	31.8	89.75	1,100.82
P- 65	Mudstone, calcareous	RAH-29-47	2.1	2.5	--	--	--	16.3	91.85	1,106.07
P- 66	Mudstone, phosphatic, calcareous	RAH-28-47	0.6	12.0	--	--	--	46.5	92.45	1,113.27
P- 67	Limestone, argillaceous	RAH-27-47	3.1	6.5	--	--	--	24.0	95.55	1,133.43
P- 68	Phosphate rock, argillaceous	RAH-26-47	0.5	23.0	--	--	--	26.5	96.05	1,144.92
P- 69	Phosphate rock	RAH-25-47	0.6	27.7	--	--	--	33.7	96.65	1,161.54
P- 70	Mudstone, phosphatic	RAH-24-47	1.0	9.7	--	--	--	46.2	97.65	1,171.24
P- 71	Mudstone, calcareous	RAH-23-47	1.0	3.3	--	--	--	53.2	98.65	1,174.54
P- 72	Phosphate rock, argillaceous	RAH-22-47	0.4	17.7	--	--	--	34.4	99.05	1,181.62
P- 73	Mudstone, phosphatic	RAH-21-47	2.0	12.3	--	--	--	50.0	101.05	1,206.22
P- 74	Mudstone	RAH-20-47	0.3	7.1	--	--	--	61.5	101.35	1,208.35
P- 75	Limestone	RAH-19-47	1.6	2.0	--	--	--	18.6	102.95	1,211.55
P- 76	Phosphate rock, argillaceous	RAH-18-47	0.5	25.6	3.7	4.32	8.6	20.0	103.45	1,224.35
P- 77	Phosphate rock	RAH-17-47	0.7	25.6	3.6	3.76	9.7	19.0	104.15	1,242.47
P- 78	Phosphate rock, argillaceous	RAH-16-47	0.2	18.1	4.5	4.28	11.3	34.0	104.35	1,245.89
P- 79	Phosphate rock, argillaceous	RAH-15-47	1.1	19.1	3.3	3.54	11.6	26.6	105.45	1,266.90
P- 80	Phosphate rock	RAH-14-47	1.2	31.4	1.8	4.56	6.4	9.8	106.65	1,304.38
P- 81	Phosphate rock	RAH-13-47	2.1	30.8	1.7	3.78	6.6	10.5	108.75	1,369.20
P- 82	Phosphate rock	RAH-12-47	0.4	29.8	2.1	4.62	7.1	10.0	109.15	1,381.12
P- 83	Phosphate rock	RAH-11-47	0.6	30.4	2.2	3.92	6.8	10.5	109.75	1,399.42
P- 84	Phosphate rock	RAH-10-47	0.8	26.0	3.6	3.94	8.4	18.7	110.55	1,420.22
P- 85	Phosphate rock	RAH- 9-47	0.3	27.9	2.6	3.92	8.2	13.4	110.85	1,428.59
P- 86	Phosphate rock	RAH- 8-47	0.3	26.4	2.6	3.12	7.8	18.8	111.15	1,436.91
P- 87	Phosphate rock, argillaceous	RAH- 7-47	0.2	22.1	2.2	2.88	7.6	28.4	111.35	1,440.93
P- 88	Phosphate rock, argillaceous	RAH- 6-47	0.4	19.3	3.2	5.26	7.9	19.7	111.75	1,448.65
P- 89	Limestone, argillaceous	RAH- 5-47	1.0	6.4	4.4	4.54	23.0	33.3	112.75	1,455.05
P- 90	Mudstone, phosphatic, calcareous	RAH- 4-47	0.4	14.9	6.2	4.80	12.4	42.3	113.15	1,459.81

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness × percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	Loss on ignition	Acid insoluble		
P- 18	Phosphate rock, argillaceous	RAH- 3-47	0.7	22.6	4.2	3.90	7.0	22.0	113.85	1,475.63
P- 17	Limestone, argillaceous, phosphatic	RAH- 2-47	1.1	10.3	5.5	5.26	18.0	32.7	114.95	1,486.96
P- 16	Phosphate rock, argillaceous	RAH- 1-47	0.4	20.8	6.5	5.80	9.4	24.5	115.35	1,495.28
P- 15	Dolomite, calcareous	DML- 24-47	1.1	8.9	--	--	--	13.7	116.45	1,499.57
P- 14	Mudstone, cherty	DML- 23-47	0.1	2.7	--	--	--	80.9	116.55	1,499.84
P- 13	Limestone, argillaceous	DML- 22-47	0.7	1.7	--	--	--	26.6	117.25	1,501.03
P- 12	Phosphate rock	DML- 21-47	1.3	23.9	--	--	--	19.4	118.55	1,532.10
P- 11	Phosphate rock, calcareous, contains fluorite	DML- 20-47	2.3	20.4	--	--	--	15.2	120.85	1,579.02
P- 10	Mudstone, phosphatic	DML- 19-47	0.2	13.8	--	--	--	42.1	121.05	1,581.78
P- 9	Limestone, argillaceous	DML- 18-47	1.4	3.2	--	--	--	23.6	122.45	1,586.26
P- 8	Phosphate rock, argillaceous	DML- 17-47	0.1	21.8	--	--	--	24.6	122.55	1,588.44
P- 7	Phosphate rock, argillaceous	DML- 16-47	0.3	25.4	--	--	--	20.1	122.85	1,596.06
P- 6	Mudstone	DML- 15-47	0.3	2.9	--	--	--	67.0	123.15	1,596.93
P- 5	Mudstone, calcareous	DML- 14-47	3.2	0.4	--	--	--	68.6	126.35	1,598.21
P- 4	Mudstone	DML- 13-47	0.5	0.2	--	--	--	76.2	126.85	1,598.31
P- 3	Mudstone	DML- 12-47	2.5	0.4	--	--	--	81.0	129.35	1,599.31
P- 2	Phosphate rock	DML- 11-47	0.3	33.4	--	--	--	5.2	129.65	1,609.33
P- 1	Phosphate rock	DML- 10-47	0.4	34.8	--	--	--	3.3	130.05	1,623.25
	Wells formation - not measured									
C.F- 1	Mudstone, calcareous and limestone	--	--	--	--	--	--	--	--	--

SPECTROGRAPHIC ANALYSES—LAYLAND CANYON, WYOMING, LOT NO. 1202.

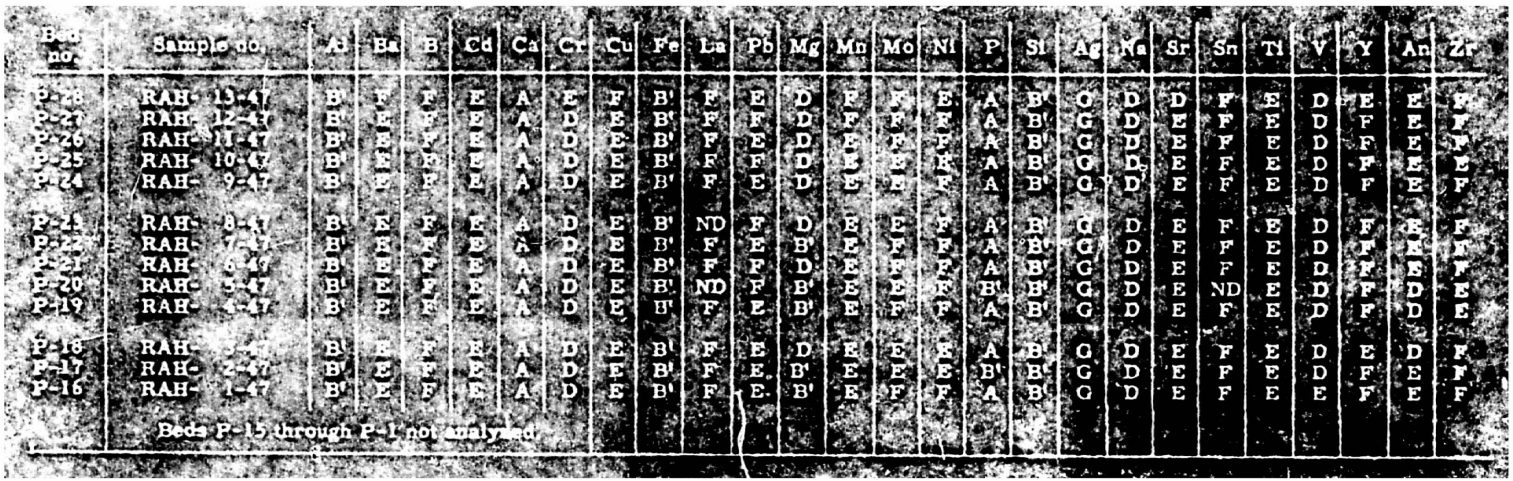
Semi-quantitative analyses of samples of the Phosphoria formation, Layland Canyon, Wyoming (see immediately preceding pages for location of section, thickness and description of strata, and chemical analyses of samples), made by U. S. Geological Survey Laboratory, Geochemistry and Petrology Branch, Washington, D. C. In addition to the elements listed in the table below, Sb, As, Be, B., Ce, Cs, Co, Cb, Ge, In, Hg, Nd, Pt, Re, Rb, Sc, Ta, Tl, Th, and W were looked for in all samples but were not detected.

Explanation of symbols

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

Bed no.	Sample no.	Al	Ba	B	Cd	Cu	Cr	Cu	Fe	La	Pb	Mg	Mn	Mo	Ni	P	Si	Ag	Na	Sr	Sn	Ti	V	Y	Zn	Zr
	Beds P-105 through P-100 not analyzed.																									
P-99	RAH-154-47	B'	F	F	F	A	E	F	B'	E	E	D	E	F	E	A	B'	G	D	D	F	E	D	E	E	F
P-98	RAH-155-47	B'	E	F	F	A	E	E	B'	E	E	D	E	F	E	A	B'	G	D	D	F	E	D	E	E	F
P-97	RAH-156-47	B'	D	F	F	A	E	F	B'	E	E	D	E	F	E	A	B'	G	D	D	F	E	D	E	E	F
P-96	RAH-157-47	B'	F	F	F	A	E	F	B'	E	E	D	E	F	E	A	B'	G	D	D	F	E	D	E	E	F
P-95	RAH-158-47	B'	F	F	E	A	E	E	B'	F	E	D	E	F	E	A	B'	G	D	D	F	E	D	E	E	F
P-94	RAH-159-47	B'	E	F	F	B'	D	E	B'	E	E	D	E	F	E	B'	A	G	D	D	F	D	D	E	E	E
P-93	RAH-160-47	B'	F	F	F	B'	E	F	B'	ND	F	B'	E	F	E	D	A	G	E	D	F	D	D	F	E	E
P-92	RAH-161-47	B'	E	F	F	A	D	F	B'	E	F	D	E	F	F	A	B'	G	D	D	F	E	E	E	E	F
P-91	RAH-162-47	B'	F	F	F	A	D	F	B'	E	F	D	E	F	F	A	B'	G	D	D	F	E	E	E	E	F
P-90	RAH-163-47	B'	F	F	F	A	D	F	B'	E	E	D	E	F	E	A	B'	G	D	D	ND	E	E	E	E	E
P-89	RAH-164-47	B'	F	F	F	A	D	E	B'	E	E	D	E	F	E	A	B'	G	D	D	F	D	E	E	E	E
P-88	RAH-165-47	B'	F	F	ND	A	D	F	B'	E	E	D	E	F	E	A	B'	G	D	D	F	D	E	E	E	E
P-87	RAH-166-47	B'	F	F	F	B'	D	F	B'	E	E	-	E	F	E	B'	A	G	D	D	F	D	E	E	E	ND
P-86	RAH-167-47	B'	F	F	F	B'	D	F	B'	F	F	B'	E	F	E	B'	A	G	D	D	F	D	E	E	E	E
P-85	RAH-168-47	B'	F	F	F	A	D	F	B'	E	F	D	E	F	E	A	B'	G	ND	D	F	E	E	E	E	F
P-84	RAH-169-47	B'	E	F	F	B'	D	E	B'	E	E	D	E	F	E	B'	A	G	D	D	F	D	D	E	E	E
	Beds P-83 through P-49 not analyzed.																									
P-48	RAH-114-47	B'	E	F	F	A	E	E	B'	E	E	D	F	F	E	A	B'	G	D	D	F	E	D	E	E	F
	Beds P-47 through P-34 not analyzed.																									
P-33	RAH- 18-47	B'	F	F	E	A	E	E	B'	F	E	D	F	F	E	A	B'	G	D	D	F	E	D	E	E	F
P-32	RAH- 17-47	B'	F	F	E	A	E	E	B'	F	E	D	F	ND	E	A	B'	G	D	D	F	E	D	E	E	F
P-31	RAH- 16-47	B'	F	F	E	A	E	E	B'	F	E	D	E	F	E	A	B'	G	D	D	F	E	D	E	E	E
P-30	RAH- 15-47	B'	E	F	E	A	E	F	B'	F	E	B'	E	F	E	A	B'	G	D	D	F	E	D	E	E	F
P-29	RAH- 14-47	B'	E	F	E	A	E	F	B'	F	E	D	F	F	E	A	B'	G	D	D	F	E	D	E	E	F

[1] B' is equivalent to B and C of Bureau of Mines analyses.



Bed no.	Sample no.	Al	Ba	B	Cd	Ca	Cr	Cu	Fe	La	Pb	Mg	Mn	Mo	Ni	P	Si	Ag	Na	Sr	Sn	Ti	V	Y	An	Zr
P-28	RAH- 13-47	B	E	F	E	A	E	F	B'	F	E	D	F	E	E	A	B'	G	D	D	F	E	D	E	E	E
P-27	RAH- 12-47	B'	E	F	E	A	D	E	B'	F	E	D	E	E	E	A	B'	G	D	E	F	E	D	F	E	F
P-26	RAH- 11-47	B'	E	F	E	A	D	E	B'	F	E	D	E	E	E	A	B'	G	D	E	F	E	D	F	E	F
P-25	RAH- 10-47	B'	E	F	E	A	D	E	B'	F	E	D	E	E	E	A	B'	G	D	E	F	E	D	F	E	F
P-24	RAH- 9-47	B	E	F	E	A	D	E	B'	F	E	D	E	E	E	A	B'	G	D	E	F	E	D	F	E	F
P-23	RAH- 8-47	B	E	F	E	A	D	E	B'	ND	E	D	E	E	F	A	B'	G	D	E	F	E	D	F	E	F
P-22	RAH- 7-47	B'	E	F	E	A	D	E	B'	F	E	D	E	E	F	A	B'	G	D	E	F	E	D	F	E	F
P-21	RAH- 6-47	B'	E	F	E	A	D	E	B'	F	E	D	E	E	F	A	B'	G	D	E	F	E	D	F	E	F
P-20	RAH- 5-47	B'	E	F	E	A	D	E	B'	ND	E	B'	E	E	F	B'	B'	G	D	E	ND	E	D	F	E	E
P-19	RAH- 4-47	B	E	F	E	A	D	E	B'	F	E	B'	E	F	F	A	B'	G	D	E	F	E	D	F	D	E
P-18	RAH- 3-47	B'	E	F	E	A	D	E	B'	F	E	D	E	E	E	A	B'	G	D	E	F	E	D	E	E	F
P-17	RAH- 2-47	B'	E	F	E	A	D	E	B'	F	E	B'	E	E	E	B'	B'	G	D	E	F	E	D	F	E	F
P-16	RAH- 1-47	B'	E	F	E	A	D	E	B'	F	E	B'	E	F	E	A	B'	G	D	E	F	E	D	F	E	F

Beds P-15 through P-1 not analyzed

COAL CANYON, WYOMING. LOT NO. 1201.

Phosphoria formation sampled in hand trenches, mine adit, and natural exposures in Coal Canyon, sec. 7, T. 26 N., R. 119 W., Lincoln County, Wyoming, on east limb of Subletts anticline. Upper shale member sampled in trench 200 feet above canyon bottom on south side; Rex member in natural exposures 50 feet above canyon bottom on south side; beds P-69 to P-74 from vanadiferous zone in face of adit 50 feet above canyon bottom on north side; all other beds from trench in phosphatic shale member at bottom of canyon on south side. Beds strike north and dip 75° E. Section measured by V. E. McKelvey, D. M. Larrabee, and L. E. Smith and sampled by R. A. Gulbrandsen; samples 2058-2087 collected in June 1946, all others in June 1947. Samples analyzed by Tennessee Valley Authority.

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	V_2O_5	F	Loss on ignition	Acid insoluble		
Dinwoody formation												
Td- 1	Mudstone	VEM-97-47	1.7	0.13	11.7	3.0	0.07	0.09	9.7	74.9	1.7	1.70
Upper shale member of Phosphoria formation												
U- 27	Phosphate rock, argillaceous	VEM-96-47	1.7	24.8	4.3	3.4	0.07	2.5	4.9	23.8	1.7	42.16
U- 26	Phosphate rock and chert	VEM-95-47	0.6	15.14	9.1	4.2	--	1.3	6.7	42.10	2.3	51.24
U- 25	Chert, dolomitic	VEM-94-47	0.8	6.25	3.8	2.2	0.05	0.68	15.3	46.8	3.1	56.24
U- 24	Mudstone and chert	VEM-93-47	4.0	0.70	5.3	3.2	0.04	0.13	4.3	81.3	7.1	59.04
U- 23	Mudstone, cherty	VEM-92-47	1.6	1.65	5.4	3.8	0.04	0.18	2.5	85.9	8.7	61.68
U- 22	Mudstone	VEM-91-47	1.6	2.93	11.2	4.9	0.09	0.34	6.1	77.1	10.3	66.37
U- 21	Mudstone	VEM-90-47	3.2	4.60	10.7	4.5	0.06	0.58	7.5	70.3	13.50	81.09
U- 20	Mudstone	VEM-89-47	3.0	4.00	11.7	4.3	0.10	0.47	7.2	73.0	16.5	93.09
U- 19	Mudstone	VEM-88-47	2.6	2.00	7.3	2.5	0.10	0.31	9.5	72.1	19.1	98.29
U- 18	Mudstone, calcareous	VEM-87-47	2.6	0.30	7.8	2.6	0.06	0.21	11.7	69.2	21.7	99.07
U- 17	Limestone, argillaceous	VEM-86-47	1.6	0.5	3.6	1.5	0.04	0.11	26.7	43.5	23.3	99.87
U- 16	Mudstone	VEM-85-47	3.5	1.39	7.3	2.5	0.05	0.18	10.6	68.5	26.8	104.74
U- 15	Dolomite	VEM-84-47	3.9	1.01	4.5	2.3	0.04	0.16	11.8	68.0	30.7	108.69
U- 14	Mudstone	VEM-83-47	3.7	0.25	8.7	2.8	0.06	0.19	7.5	80.3	34.4	109.60
U- 13	Mudstone	VEM-82-47	3.6	1.21	8.1	3.2	0.05	0.24	7.1	76.8	38.0	133.96
U- 12	Mudstone	VEM-81-47	4.3	0.85	10.4	3.5	0.08	0.26	8.6	75.00	42.3	117.60
U- 11	Mudstone	VEM-80-47	1.4	0.60	10.3	4.0	0.04	0.26	8.6	73.4	43.7	118.43
U- 10	Mudstone, dolomitic	VEM-79-47	1.0	1.60	6.4	2.9	0.08	0.17	14.1	64.4	44.7	120.05
U- 9	Mudstone	VEM-78-47	0.7	0.91	9.8	4.7	0.09	0.17	5.8	79.5	45.4	120.69
U- 8	Mudstone	VEM-77-47	2.7	1.00	10.4	3.9	0.05	0.22	4.9	85.2	48.1	123.39
U- 7	Mudstone	VEM-76-47	3.1	0.75	7.5	3.2	0.05	0.22	5.2	82.5	51.2	125.71
U- 6	Phosphate rock, cherty	VEM-75-47	2.3	22.5	3.7	3.3	0.06	2.1	6.7	25.8	53.50	177.46
U- 5	Mudstone	VEM-74-47	1.4	4.1	5.1	3.5	0.04	0.51	4.4	73.2	54.9	183.20
U- 4	Chert	VEM-73-47	0.6	0.49	2.4	2.6	0.04	0.10	7.6	77.6	55.5	183.50
U- 3	Chert	VEM-72-47	1.1	4.71	1.5	3.2	0.03	0.54	6.0	69.6	56.6	188.68
U- 2	Phosphate rock, cherty	VEM-71-47	0.6	25.5	1.4	2.0	0.04	2.4	3.4	25.1	57.2	203.98
U- 1	Phosphate rock, argillaceous	VEM-70-47	0.4	16.7	4.4	2.8	0.11	2.1	4.9	30.6	57.6	210.66

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	V_2O_5	F	Loss on ignition	Acid insoluble		
Rex member of Phosphoria formation												
	Chert and limestone, represents top of VEM-68-47 resampled in upper shale trench	VEM-69-47	(1.4)	0.65	0.7	1.8	--	0.08	15.3	61.5	--	--
R- 7	Chert and limestone	VEM-68-47	8.5	0.11	0.2	2.5	--	0.05	9.6	73.0	8.5	0.94
R- 6	Chert and limestone	VEM-67-47	9.0	0.22	0.4	1.9	--	0.03	10.2	73.8	17.5	2.92
R- 5	Chert and limestone	VEM-66-47	10.5	0.20	0.5	2.1	--	0.04	13.1	66.7	28.0	5.02
R- 4	Chert and limestone	VEM-65-47	9.0	0.23	0.3	2.2	--	0.04	9.6	72.3	37.0	7.09
R- 3	Chert and limestone; fos. col. no. 47-HW-48	VEM-64-47	10.4	0.20	0.7	2.3	--	0.04	11.6	68.5	47.4	9.17
R- 2	Chert and limestone	VEM-63-47	9.8	0.40	0.8	2.3	--	0.05	11.2	69.2	57.2	13.09
R- 1	Chert and limestone; fos. col. no. 47-HW-49	VEM-62-47	9.6	0.25	0.4	1.9	--	0.05	14.4	63.8	66.8	15.49
Phosphatic shale member of Phosphoria formation												
--	Covered	--	13	--	--	--	--	--	--	--	13.0	--
P-107	Dolomite, calcareous, argillaceous	DML-8-47	5.7	0.76	2.5	0.9	0.04	0.13	35.7	20.0	18.7	4.33
P-106	Phosphate rock	DML-8-47	0.3	25.45	4.1	1.5	0.09	2.5	6.2	17.8	19.0	11.97
P-105	Mudstone	DML-7-47	0.4	3.25	13.3	4.0	0.07	0.37	5.9	75.6	19.4	13.27
P-104	Mudstone	DML-6-47	0.5	6.15	10.9	3.1	0.06	0.59	6.3	68.8	19.9	16.35
P-103	Mudstone	DML-5-47	0.5	4.35	12.1	3.4	0.04	0.48	6.3	73.3	20.4	18.53
P-102	Mudstone, dolomitic	DML-4-47	3.2	0.65	9.3	3.0	0.02	0.15	13.7	66.9	23.6	20.61
P-101	Mudstone	DML-3-47	1.2	4.51	10.2	3.3	0.04	0.52	7.7	69.3	24.8	26.02
P-100	Phosphate rock	DML-2-47	0.4	25.9	3.6	1.1	0.04	2.4	6.5	19.0	25.2	36.38
P- 99	Dolomite, argillaceous	DML-1-47	1.4	0.81	4.3	1.5	0.06	0.15	28.3	35.6	26.6	37.51
P- 98	Phosphate rock	2063	1.1	29.8	1.4	0.8	0.07	3.1	4.2	8.2	27.7	70.39
P- 97	Phosphate rock	2062	1.9	32.9	0.9	0.6	0.10	3.8	5.4	3.2	29.6	132.80
P- 96	Phosphate rock	2061	0.7	27.2	2.3	1.1	0.23	2.9	8.6	12.4	30.3	151.84
P- 95	Phosphate rock	2060	0.6	29.8	1.5	0.7	0.26	3.1	8.0	7.2	30.9	169.72
P- 94	Phosphate rock	2059	0.5	26.9	2.1	1.0	0.24	2.7	9.6	11.4	31.4	183.17
P- 93	Phosphate rock	2058	0.8	32.7	1.2	0.5	0.15	3.4	6.9	5.2	32.2	209.33
P- 92	Phosphate rock, argillaceous	VEM-61-47	1.1	21.6	4.2	1.7	0.16	2.2	9.0	22.2	33.3	233.09
P- 91	Mudstone, dolomitic	VEM-60-47	0.4	3.80	7.8	2.6	0.09	0.51	13.5	58.5	33.7	234.61
P- 90	Limestone, argillaceous, dolomitic	VEM-59-47	1.9	0.20	3.4	2.0	0.08	0.12	26.6	38.6	35.6	234.99
P- 89	Phosphate rock	VEM-58-47	0.7	29.3	2.0	2.3	0.10	3.0	9.5	10.6	36.3	255.50
P- 88	Phosphate rock, calcareous, contains limestone lens 0.0-0.3 foot thick	VEM-57-47	0.9	24.09	0.8	0.8	0.06	2.6	15.0	4.7	37.2	277.18
P- 87	Phosphate rock, argillaceous	VEM-56-47	0.6	21.03	4.4	1.6	0.11	1.9	8.3	29.2	37.8	289.80
P- 86	Phosphate rock	VEM-55-47	0.5	27.45	2.1	1.2	0.06	2.9	8.1	13.9	38.3	303.52

P- 85	Phosphate rock	VEM-34-47	0.9	27.44	1.4	1.1	0.06	3.0	8.1	11.3	39.2	328.22
P- 84	Phosphate rock and phosphatic mudstone	VEM-33-47	0.8	16.52	5.3	1.9	0.05	1.6	9.5	40.4	41.0	357.96
P- 83	Phosphate rock, limestone, and mudstone	VEM-32-47	1.0	29.41	2.3	1.7	0.05	3.2	5.4	11.80	42.0	387.37
P- 82	Limestone, argillaceous	VEM-31-47	4.7	2.11	5.8	2.1	0.06	0.24	22.1	41.2	43.7	390.96
P- 81	Mudstone, calcareous and phosphate rock	VEM-30-47	2.0	4.04	8.8	2.5	0.05	0.45	14.2	56.8	45.7	399.04
P- 80	Limestone, argillaceous, mudstone, and phosphate rock	VEM-29-47	1.0	9.90	6.7	2.3	0.09	1.1	16.6	37.0	46.7	408.94
P- 79	Mudstone, calcareous	VEM-28-47	0.8	2.16	9.7	3.0	0.05	0.31	16.5	54.7	47.5	410.67
P- 78	Phosphate rock	VEM-27-47[2]	0.4	28.67	1.9	2.1	0.11	2.8	13.1	5.62	47.9	422.14
P- 77	Limestone, argillaceous, calcareous mudstone, and phosphate rock	VEM-26-47	2.1	9.92	6.2	2.6	0.07	1.1	22.0	25.2	50.0	442.97
P- 76	Limestone, "hanging-wall limestone"	VEM-25-47	1.6	0.36	1.1	0.5	0.06	0.06	41.1	5.90	51.6	443.35
P- 75	Mudstone	VEM-24-47	0.55	2.73	8.6	3.4	0.52	0.44	16.7	59.32	52.35	445.60
P- 74	Mudstone	VEM-23-47	0.4	0.34	9.8	3.9	1.75	0.15	24.9	51.2	52.75	445.74
P- 73	Mudstone	VEM-22-47	0.65	0.20	9.6	4.0	1.45	0.23	22.6	56.38	53.40	445.87
P- 72	Mudstone	VEM-21-47	0.9	0.05	9.7	4.4	0.37	0.08	16.6	65.75	54.30	445.91
P- 71	Mudstone	VEM-20-47	1.05	6.30	7.1	3.3	0.14	0.67	17.4	46.66	55.35	452.53
P- 70	Limestone, argillaceous, "footwall limestone"	VEM-19-47	1.1	0.80	12.6	1.2	0.06	0.10	30.7	27.6	56.45	453.41
P- 69	Mudstone, phosphatic	VEM-18-47	1.5	8.31	9.2	3.6	0.08	0.80	10.3	57.9	57.95	465.87
P- 68	Mudstone	VEM-17-47	1.4	0.76	9.3	2.8	0.08	0.09	11.4	73.0	59.35	466.93
P- 67	Mudstone	VEM-16-47	0.5	6.02	10.3	3.4	0.06	0.57	10.2	65.1	59.85	469.94
P- 66	Mudstone, calcareous, dolomitic	VEM-15-47	2.3	0.66	5.7	1.9	0.05	0.08	25.9	41.4	62.15	471.46
P- 65	Mudstone, phosphatic, and calcareous phosphatic mudstone	VEM-14-47	3.0	9.97	8.0	2.6	0.03	1.1	14.3	42.4	65.15	501.37
P- 64	Dolomite, argillaceous	VEM-13-47	0.7	1.51	5.9	1.9	0.05	0.18	25.7	39.9	65.85	502.43
P- 63	Mudstone, phosphatic	VEM-12-47	2.0	12.38	8.5	2.4	0.08	1.3	15.9	35.23	67.85	527.19
P- 62	Phosphate rock, argillaceous	VEM-11-47	2.0	13.73	5.1	2.1	0.17	1.4	18.7	25.1	69.85	554.65
P- 61	Limestone, dolomitic, argillaceous	VEM-10-47	3.5	0.69	4.3	1.4	0.05	0.09	33.1	15.00	73.35	557.07
P- 60	Dolomite, argillaceous	VEM-09-47	1.1	2.22	3.6	1.3	0.05	0.22	33.7	23.4	74.45	559.51
P- 59	Phosphate rock, dolomitic, argillaceous, dolomite lens included in sample	VEM-08-47	3.0	14.29	7.1	2.3	0.08	1.3	18.2	26.53	77.45	602.38
P- 58	Dolomite	VEM-07-47	1.6	2.10	2.2	0.7	0.07	0.22	40.7	10.47	79.05	605.74
P- 57	Mudstone, phosphatic	VEM-06-47	1.6	13.63	10.5	3.1	0.05	1.5	15.2	38.27	80.65	627.55
P- 56	Dolomite	VEM-05-47	1.2	2.24	2.2	0.7	0.05	0.27	40.0	25.48	81.85	630.24

[1] Fossil collection made by H. Wedow, Paleontology and Stratigraphy Branch, U. S. Geological Survey.
[2] See additional analyses of selected samples at end of chemical analyses tables.

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	V_2O_5		Loss on ignition	Acid insoluble		
P- 55	Phosphate rock, dolomitic	VEM-24-47	1.0	14.85	4.3	1.4	0.21	1.5	22.4	15.28	83.45	654.00
P- 54	Dolomite	VEM-23-47	1.9	5.38	1.3	0.9	0.04	0.56	35.9	10.8	84.75	660.99
P- 53	Phosphate rock and phosphatic mudstone	VEM-22-47	2.5	21.00	4.5	1.7	0.09	2.1	18.9	11.68	87.25	713.49
P- 52	Dolomite, phosphatic	VEM-21-47	0.7	8.11	0.1	0.5	0.07	0.78	35.8	4.93	87.95	719.17
P- 51	Phosphate rock	VEM-20-47	0.3	24.35	2.8	1.7	0.08	2.6	11.9	16.55	88.25	726.47
P- 50	Dolomite, calcareous	VEM-19-47	1.3	4.42	3.0	1.1	0.06	0.47	34.8	18.02	89.55	732.22
	Fault (strikes N. 10° W. dips 60° E.) truncates beds P-50 and P-51.											
P- 49	Phosphate rock	VEM-18-47	0.6	26.01	3.1	1.4	0.06	2.9	11.2	10.08	90.15	747.83
P- 48	Dolomite	VEM-17-47	1.1	4.04	1.7	1.0	0.07	0.44	37.0	13.63	91.25	752.27
P- 47	Dolomite	VEM-16-47	1.1	3.05	1.7	0.9	0.09	0.35	38.7	12.92	92.35	755.63
P- 46	Dolomite, argillaceous	VEM-15-47	1.1	4.85	3.7	1.7	0.08	0.56	30.5	23.8	93.45	760.97
P- 45	Phosphate rock	VEM-14-47	0.8	28.85	1.3	0.9	0.08	3.3	11.0	3.46	94.25	784.05
P- 44	Phosphate rock	LES-10-47	1.3	26.24	2.3	1.2	0.25	2.9	13.6	10.0	95.55	818.11
P- 43	Phosphate rock	LES- 9-47	0.7	29.26	1.2	1.0	0.13	3.2	8.7	8.9	96.25	838.59
P- 42	Dolomite	LES- 8-47	2.0	1.41	2.0	0.8	0.05	0.44	33.7	17.8	98.25	847.41
P- 41	Mudstone, phosphatic	LES- 7-47	3.8	10.75	7.9	2.5	0.05	1.1	11.7	48.2	102.05	888.26
P- 40	Mudstone, dolomitic	LES- 6-47	3.0	1.55	4.6	2.1	0.05	0.19	22.5	47.4	105.05	892.91
P- 39	Mudstone, phosphatic	LES- 5-47	0.6	12.33	8.5	2.5	0.07	1.1	10.2	47.2	105.65	900.31
P- 38	Dolomite, argillaceous	LES- 4-47	1.8	1.90	2.2	0.9	0.04	0.21	31.5	28.7	107.45	903.73
P- 37	Dolomite, argillaceous	LES- 3-47	0.6	4.75	2.3	0.8	0.05	0.50	27.6	29.2	108.05	906.58
P- 36	Dolomite, argillaceous	LES- 2-47	0.9	7.08	2.4	0.8	0.05	0.75	24.7	28.8	108.95	912.95
P- 35	Phosphate rock, argillaceous	LES- 1-47	0.4	23.34	3.7	1.3	0.06	2.3	8.2	25.2	109.35	922.29
P- 34	Phosphate rock	VEM-13-47	0.6	30.00	1.8	0.7	0.09	3.2	7.6	9.4	109.95	940.29
P- 33	Mudstone and phosphate rock, contains gypsum	2086	0.8	8.1	3.0	2.6	0.35	0.83	19.6	48.9	110.75	946.77
P- 32	Mudstone, dolomitic	2085	1.8	7.2	2.2	2.0	--	0.71	19.1	41.1	112.55	959.73
P- 31	Phosphate rock, argillaceous	2084	1.0	18.1	2.0	1.8	0.42	1.8	11.6	33.3	113.55	977.83
P- 30	Mudstone, phosphatic	2083	0.9	8.0	2.5	2.2	--	0.84	13.4	49.5	114.45	985.03
P- 29	Mudstone, dolomitic	2082	0.8	6.0	2.4	1.9	0.23	0.88	16.6	40.2	115.25	989.83
P- 28	Dolomite, argillaceous	2081	1.7	6.4	1.3	1.2	0.18	0.71	25.7	25.5	116.95	1,000.71
P- 27	Phosphate rock	2080	1.2	26.3	2.1	1.1	0.30	2.4	9.4	14.6	118.15	1,032.27
P- 26	Phosphate rock	2079	2.1	26.1	1.6	0.9	0.17	2.4	9.3	13.6	120.25	1,087.08
P- 25	Phosphate rock	2078	0.3	29.5	1.1	0.7	0.08	3.0	7.1	10.9	120.55	1,095.93
P- 24	Phosphate rock	2077	1.7	28.6	1.4	0.7	0.09	2.6	7.8	10.5	122.25	1,144.55
P- 23	Phosphate rock	2076	1.7	26.7	1.9	0.8	0.14	2.7	9.1	12.3	123.95	1,189.94
P- 22	Phosphate rock	2075	0.8	21.1	2.0	1.0	0.10	2.1	12.2	18.5	124.75	1,206.82
P- 21	Phosphate rock, argillaceous, dolomitic	2074	0.9	16.4	2.2	1.3	0.09	1.8	14.7	24.4	125.65	1,221.58

P- 20	Phosphate rock, argillaceous, dolomitic	2073	1.2	12.8	2.8	1.4	0.08	1.4	17.1	28.0	126.85	1,236.94
P- 19	Phosphate rock, argillaceous, dolomitic	2072	1.1	15.5	2.7	1.3	0.06	1.7	14.0	27.3	127.95	1,253.99
P- 18	Dolomite, argillaceous	2071	0.7	6.9	2.0	1.2	0.06	0.82	26.5	23.8	128.65	1,258.82
P- 17	Dolomite, phosphatic, argillaceous	2070	0.4	13.3	1.7	1.1	0.05	1.6	19.0	22.7	129.05	1,264.14
P- 16	Dolomite	2069	2.3	5.2	1.2	0.5	0.05	0.55	32.6	16.1	131.35	1,276.10
P- 15	Phosphate rock	VEM-12-47	1.1	21.55	3.1	1.3	0.05	2.2	11.9	18.5	132.65	1,304.11
P- 14	Dolomite	VEM-11-47	0.5	6.4	0.5	0.8	0.05	0.74	31.7	16.5	133.15	1,307.31
P- 13	Phosphate rock, dolomitic	VEM-10-47	0.9	15.69	1.2	1.5	0.05	1.6	20.2	16.2	134.05	1,321.43
P- 12	Dolomite, phosphatic	VEM- 9-47	0.5	11.5	0.9	0.7	0.05	1.3	27.3	12.2	134.55	1,327.18
P- 11	Phosphate rock	VEM- 8-47	0.7	28.9	1.1	0.7	0.11	3.4	9.1	7.9	135.25	1,347.41
P- 10	Mudstone	VEM- 7-47	0.4	7.5	5.6	2.7	0.09	0.91	18.3	44.0	135.65	1,350.41
P- 9	Dolomite, phosphatic, argillaceous	2066	1.4	9.7	2.4	1.4	0.09	0.93	25.6	20.0	137.05	1,363.99
P- 8	Phosphate rock, argillaceous	2065	0.4	20.6	3.2	1.6	0.17	2.2	9.0	26.4	137.45	1,372.21
P- 7	Mudstone	2064	0.5	5.0	4.2	3.4	0.36	0.77	11.5	62.7	137.95	1,374.73
P- 6	Mudstone, dolomitic	VEM- 6-47	2.6	0.26	7.5	2.5	0.09	0.12	14.9	64.7	140.55	1,375.41
P- 5	Mudstone	VEM- 5-47	0.5	0.3	9.7	3.1	0.04	0.19	10.7	73.5	141.05	1,375.56
P- 4	Mudstone	VEM- 4-47	0.6	0.44	9.8	4.6	0.19	0.29	12.8	74.7	141.65	1,375.82
P- 3	Mudstone	VEM- 3-47	0.5	0.16	8.8	3.7	0.11	0.23	6.6	81.5	142.15	1,375.90
P- 2	Mudstone	VEM- 2-47	1.4	0.67	10.1	3.1	0.08	0.25	6.5	80.3	143.55	1,376.84
P- 1	Phosphate rock	VEM- 1-47	0.2	29.05	2.5	0.7	0.10	2.9	7.4	8.3	143.75	1,382.65

Wells formation

Cw- 5	Limestone, sandy	--	4.3	--	--	--	--	--	--	--	4.3	--
Cw- 4	Limestone	--	2.8	--	--	--	--	--	--	--	7.1	--
Cw- 3	Siltstone, calcareous	--	3.0	--	--	--	--	--	--	--	10.0	--
Cw- 2	Limestone, sandy	--	3.8	--	--	--	--	--	--	--	13.9	--
Cw- 1	Limestone	--	9.0	--	--	--	--	--	--	--	22.9	--

See additional analyses of selected samples at end of chemical analyses tables.

Additional analyses of Coal Canyon samples

Bed no.	Sample no.	SiO_2	CaO	MgO	Na_2O	K_2O	TiO_2	H_2O-	CO_2	S as SO_3
D- 1	VEM-97-47	61.04	8.16	2.1	0.95	3.40	0.65	0.75	6.9	nil
U- 27	VEM-96-47	23.48	37.18	0.45	1.00	1.05	0.25	0.54	1.6	1.2
U- 26	VEM-95-47	37.80	22.60	1.4	--	--	--	0.88	2.3	0.75
U- 25	VEM-94-47	43.60	19.80	5.4	0.72	1.22	0.27	0.30	13.5	0.43
U- 24	VEM-93-47	74.62	4.70	0.84	0.97	1.20	0.34	0.30	2.9	<0.1
U- 23	VEM-92-47	78.46	3.60	0.51	0.62	1.50	0.34	0.30	0.7	0.22
U- 22	VEM-91-47	65.22	4.00	0.88	--	--	0.52	1.23	0.2	0.32
U- 21	VEM-90-47	59.54	7.32	1.1	3.10	0.69	0.49	1.89	0.5	0.39
U- 20	VEM-89-47	63.04	4.80	1.2	0.50	3.50	0.53	1.31	0.4	0.26
U- 19	VEM-88-47	65.32	8.36	2.6	2.20	0.57	0.35	0.57	5.9	0.11
U- 18	VEM-87-47	61.52	8.20	3.7	0.40	2.40	0.52	0.50	8.4	nil
U- 17	VEM-86-47	23.50	18.20	8.8	0.30	1.50	0.24	0.36	22.7	<0.1
U- 16	VEM-85-47	62.30	8.20	3.1	0.50	2.13	0.43	0.46	7.1	0.17
U- 15	VEM-84-47	62.36	10.20	3.0	0.44	1.85	0.37	0.41	8.8	0.21
U- 14	VEM-83-47	70.84	4.90	1.3	2.40	0.49	0.46	0.77	3.1	0.20
U- 13	VEM-82-47	66.84	4.20	1.9	0.60	2.77	0.44	0.64	3.1	0.20
U- 12	VEM-81-47	65.02	5.30	2.2	3.10	0.30	0.44	0.82	4.2	0.13
U- 11	VEM-80-47	61.70	5.40	2.0	0.25	3.20	0.44	0.86	3.9	0.20
U- 10	VEM-79-47	57.51	10.80	4.4	0.28	1.79	0.37	0.55	10.8	0.28
U- 9	VEM-78-47	70.14	2.00	0.86	0.40	3.10	0.55	0.92	0.3	0.31
U- 8	VEM-77-47	72.94	1.42	0.79	3.20	0.50	0.52	0.78	0.2	0.17
U- 7	VEM-76-47	71.02	4.40	0.73	0.52	2.60	0.34	0.54	2.0	0.21
U- 6	VEM-75-47	24.86	35.60	0.62	0.85	1.30	0.14	0.48	4.5	1.0
U- 5	VEM-74-47	67.68	8.40	0.55	0.40	1.83	0.33	0.38	1.8	0.24
U- 4	VEM-74-47	74.34	9.00	0.40	0.60	0.60	0.09	0.16	6.6	0.10
U- 3	VEM-72-47	69.00	13.20	0.39	0.32	0.42	0.10	0.13	5.3	0.21
U- 2	VEM-71-47	27.60	37.10	0.27	0.53	0.75	0.13	0.27	1.7	1.0
U- 1	VEM-70-47	34.00	30.40	0.59	0.57	1.70	0.20	0.68	1.6	0.95
--	VEM-69-47	61.05	19.00	1.00	--	--	--	0.09	14.7	<0.1
R- 7	VEM-68-47	73.49	11.80	0.78	--	--	--	0.12	9.6	nil
R- 6	VEM-67-47	72.48	12.00	0.64	--	--	--	0.05	9.3	<0.1
R- 5	VEM-66-47	66.49	16.40	0.41	--	--	--	0.06	12.7	nil
R- 4	VEM-65-47	73.72	11.50	0.41	0.89	2.72	--	0.15	9.5	<0.1
R- 3	VEM-64-47	66.91	14.00	0.48	--	--	--	0.08	11.2	<0.1
R- 2	VEM-63-47	68.45	14.00	0.63	--	--	--	0.14	10.9	<0.1
R- 1	VEM-62-47	73.28	18.00	0.62	--	--	--	0.07	14.1	nil
P-107	DML- 9-47	17.58	39.80	11.1	0.54	0.63	0.14	0.26	33.8	0.51
P-106	DML- 8-47	17.00	39.40	0.47	1.50	1.20	0.20	0.67	2.6	2.3

P-105	DML- 7-47	61.52	5.60	0.82	0.35	3.90	0.01	0.79	0.9	0.60
P-104	DML- 6-47	57.58	9.00	0.67	0.39	3.30	0.47	1.02	0.8	0.91
P-103	DML- 5-47	61.14	6.60	0.63	0.40	3.37	0.45	1.04	0.6	0.76
P-102	DML- 4-47	55.26	9.00	4.2	0.84	2.53	0.54	0.43	10.4	0.31
P-101	DML- 3-47	57.11	10.40	0.90	1.02	1.67	0.43	0.93	3.2	0.77
P-100	DML- 2-47	37.70	40.80	0.39	1.09	0.80	0.17	0.62	3.8	2.0
P- 99	DML- 1-47	30.02	22.20	10.0	1.00	1.22	0.31	0.31	26.6	0.48
P- 98	2063	9.91	46.2	0.24	0.83	0.60	0.09	0.50	4.4	2.3
P- 97	2062	4.73	49.1	0.20	1.01	0.39	0.07	0.46	2.0	2.9
P- 96	2061	13.87	39.8	0.37	0.76	1.10	0.16	0.47	1.7	2.9
P- 95	2060	8.85	44.1	0.34	1.03	0.67	0.07	1.26	2.3	3.2
P- 94	2059	13.28	39.7	0.36	0.91	0.92	0.12	1.41	1.9	4.0
P- 93	2058	6.49	43.7	0.24	1.16	0.54	0.05	1.02	2.2	3.5
P- 92	VEM-61-47	27.10	32.40	0.39	1.20	1.80	0.26	1.12	1.3	2.8
P- 91	VEM-60-47	47.36	12.80	3.8	0.96	2.30	0.42	0.83	8.8	1.0
P- 90	VEM-59-47	32.52	25.60	4.7	0.90	1.47	0.08	0.32	24.8	0.85
P- 89	VEM-58-47	12.90	42.24	0.33	1.00	0.77	0.14	0.89	1.6	3.2
P- 88	VEM-57-47	6.70	48.42	0.41	1.14	0.45	0.08	0.56	11.8	2.3
P- 87	VEM-56-47	27.70	31.46	0.42	1.09	1.24	0.32	0.87	1.8	2.5
P- 86	VEM-55-47	15.50	41.60	0.31	1.25	0.70	0.16	0.89	2.1	2.9
P- 85	VEM-54-47	14.10	44.18	0.29	1.20	0.49	0.16	0.58	4.7	2.3
P- 84	VEM-53-47	34.22	25.41	0.43	1.09	1.60	0.40	1.08	2.0	2.4
P- 83	VEM-52-47	13.20	44.00	0.26	0.94	0.62	0.15	0.47	2.3	1.6
P- 82	VEM-51-47	35.27	26.80	2.1	0.74	1.45	0.19	0.34	20.8	0.90
P- 81	VEM-50-47	47.21	13.40	4.2	0.84	2.43	0.42	0.62	10.0	0.90
P- 80	VEM-49-47	31.21	26.4	0.90	0.45	1.89	0.32	1.35	9.6	2.1
P- 79	VEM-48-47	47.41	15.40	2.21	0.62	2.45	0.10	0.86	10.5	1.0
P- 78	VEM-47-47	7.70	42.10	0.43	0.90	0.67	0.14	1.55	1.9	3.5
P- 77	VEM-46-47	21.10	30.80	1.70	1.00	1.49	0.26	1.37	14.0	2.2
P- 76	VEM-45-47	4.82	50.22	1.8	0.60	0.72	0.03	0.13	40.2	0.44
P- 75	VEM-44-47	47.18	8.40	1.9	1.25	2.12	0.52	0.51	5.0	8.6
P- 74	VEM-43-47	41.60	6.05	2.3	0.78	2.35	0.18	0.83	5.9	12.5
P- 73	VEM-42-47	45.01	4.20	2.7	0.99	2.78	0.23	0.52	5.1	10.6
P- 72	VEM-41-47	42.78	4.20	2.9	1.30	2.85	0.36	0.32	5.6	8.4
P- 71	VEM-40-47	37.46	15.60	1.4	1.27	2.11	0.28	0.37	6.4	9.4
P- 70	VEM-39-47	22.98	36.40	1.8	1.10	0.70	0.06	0.29	29.3	0.60
P- 69	VEM-38-47	46.07	13.20	0.53	1.30	2.38	0.48	1.33	0.52	1.6
P- 68	VEM-37-47	39.80	5.40	2.4	1.30	2.30	0.42	0.99	5.3	0.90
P- 67	VEM-36-47	53.23	9.48	0.48	1.20	2.62	0.61	1.41	0.59	1.6
P- 66	VEM-35-47	33.46	23.20	5.4	1.20	1.30	0.24	0.46	23.0	0.62
P- 65	VEM-34-47	35.28	22.2	1.2	1.20	2.14	0.38	1.32	6.1	2.0
P- 64	VEM-33-47	32.75	20.20	8.6	1.41	1.25	0.27	0.39	23.3	0.55
P- 63	VEM-32-47	29.90	24.40	0.80	1.02	1.95	0.38	1.62	5.1	2.2

* See additional analyses of selected samples at end of chemical analyses tables.

Band no.	Sample no.	SiO_2	CaO	MgO	Na_2O	K_2O	TiO_2	H_2O-	CO_2	P_2O_5
P- 62	VEM-31-47	20.82	28.40	1.0	0.94	1.32	0.26	1.85	7.3	3.0
P- 61	VEM-30-47	19.60	32.40	5.3	0.95	0.95	0.13	0.45	30.1	0.56
P- 60	VEM-29-47	15.63	25.8	12.3	1.26	0.97	0.10	0.54	30.3	0.80
P- 59	VEM-28-47	22.60	26.40	3.4	0.89	1.70	0.29	1.76	7.9	2.5
P- 58	VEM-27-47	8.27	29.60	15.1	0.80	0.50	0.06	0.77	36.2	1.0
P- 57	VEM-26-47	32.60	20.07	0.63	0.76	2.60	0.38	1.86	0.86	2.5
P- 56	VEM-25-47	7.85	29.72	15.0	0.60	0.71	0.10	0.43	36.7	0.60
P- 55	VEM-24-47	13.10	32.05	6.1	0.79	1.22	0.18	1.23	14.4	2.5
P- 54	VEM-23-47	8.69	31.80	10.9	0.50	0.66	0.11	0.58	32.3	1.1
P- 53	VEM-22-47	10.60	32.82	1.0	0.72	1.20	0.15	1.00	2.4	3.9
P- 52	VEM-21-47	5.20	36.00	13.0	0.60	0.40	0.13	0.41	33.00	1.0
P- 51	VEM-20-47	15.23	36.45	0.77	1.15	1.12	0.25	1.24	2.2	3.1
P- 50	VEM-19-47	14.50	27.20	8.0	0.78	1.12	0.04	1.07	28.6	1.7
P- 49	VEM-18-47	11.50	40.37	0.98	1.56	0.95	0.16	0.53	3.4	3.0
P- 48	VEM-17-47	12.19	26.60	13.2	0.58	0.82	0.07	1.00	31.2	1.7
P- 47	VEM-16-47	10.47	27.36	13.9	0.84	0.69	0.06	1.10	32.8	1.6
P- 46	VEM-15-47	19.38	24.96	9.9	0.89	1.59	0.22	1.15	24.4	1.6
P- 45	VEM-14-47	0.17	45.45	0.39	1.00	0.49	0.07	1.01	4.3	2.7
P- 44	LES- 10-47	12.80	38.80	0.58	1.35	0.79	0.15	1.46	2.0	3.8
P- 43	LES- 9-47	9.50	43.73	0.57	0.97	0.54	0.11	0.79	2.8	3.0
P- 42	LES- 8-47	14.42	28.40	12.8	0.70	0.85	0.11	0.44	30.6	0.76
P- 41	LES- 7-47	36.80	18.40	1.9	1.44	2.62	0.28	1.06	4.3	5.4
P- 40	LES- 6-47	30.32	16.2	8.4	1.19	2.17	0.06	0.59	19.5	0.63
P- 39	LES- 5-47	36.80	20.00	1.5	0.87	3.27	0.34	0.20	3.5	1.8
P- 38	LES- 4-47	25.56	23.2	12.4	0.41	0.85	0.06	0.41	28.6	0.71
P- 37	LES- 3-47	26.12	24.20	10.3	0.80	1.05	0.26	0.54	24.4	1.0
P- 36	LES- 2-47	25.76	24.53	9.1	1.00	0.97	0.13	0.60	22.6	1.2
P- 35	LES- 1-47	43.70	34.40	0.41	1.00	1.40	0.22	0.77	1.6	2.9
P- 34	VEM- 13-47	10.75	43.65	0.19	1.08	0.51	0.08	0.72	1.6	3.4
P- 33	2086	44.45	12.7	0.64	0.30	2.73	0.40	3.88	1.1	4.5
P- 32	2085	---	---	5.4	---	---	---	---	13.1	2.0
P- 31	2084	30.01	27.2	0.39	0.66	1.81	0.33	2.10	1.3	3.7
P- 30	2083	---	---	3.0	---	---	---	---	7.2	2.1
P- 29	2082	36.28	21.5	4.8	1.10	2.03	0.36	1.19	11.6	3.1
P- 28	2081	22.93	26.7	9.5	1.02	1.30	0.23	0.75	22.9	1.3
P- 27	2080	15.75	37.5	0.46	0.95	1.35	0.16	1.52	2.0	3.5
P- 26	2079	14.06	39.7	1.5	0.77	1.36	0.13	1.09	4.9	2.8
P- 25	2078	12.04	42.9	0.59	0.72	0.99	0.10	0.99	2.5	2.4
P- 24	2077	11.63	42.3	0.60	0.90	0.88	0.10	0.87	3.3	2.8
P- 23	2076	13.36	41.2	0.80	0.95	1.07	0.12	1.22	3.6	3.1
P- 22	2075	18.16	35.4	2.2	0.83	1.51	0.16	1.48	6.4	3.1
P- 21	2074	22.77	30.4	3.7	0.70	1.88	0.21	1.39	9.8	2.7

P- 20	2076	25.87	27.8	5.0	0.60	1.53	0.21	1.30	12.5	2.1
P- 19	2074	25.91	29.4	3.9	0.63	2.26	0.21	1.38	8.6	2.3
P- 18	2073	21.20	26.7	9.0	0.30	4.49	0.13	0.70	23.5	1.1
P- 17	2070	21.25	30.9	5.9	0.42	1.65	0.32	0.71	16.0	1.5
P- 16	2069	16.21	28.2	12.2	0.33	0.79	0.09	0.59	33.2	1.0
P- 15	VEM- 12-47	16.64	26.10	2.4	0.83	1.52	0.45	0.71	7.1	2.6
P- 14	VEM- 11-47	15.20	30.60	12.3	0.40	0.78	0.08	0.37	29.8	1.1
P- 13	VEM- 10-47	16.02	35.00	6.7	0.77	0.83	0.17	0.55	17.7	1.2
P- 12	VEM- 9-47	13.00	32.15	10.1	0.62	0.69	0.12	1.46	25.3	2.3
P- 11	VEM- 8-47	10.09	43.82	0.6	1.09	0.45	0.16	0.70	3.7	3.5
P- 10	VEM- 7-47	39.08	16.32	3.7	0.45	2.25	0.24	1.53	8.0	2.8
P- 9	2068	17.98	26.8	9.5	0.42	1.31	0.14	1.35	21.9	2.1
P- 8	2067	26.27	31.1	0.57	0.79	1.58	0.19	1.82	1.9	3.7
P- 7	2066	55.29	9.1	0.80	0.59	5.96	0.45	2.36	0.8	3.1
P- 6	VEM- 6-47	53.36	10.00	5.8	0.40	4.10	0.18	0.33	13.3	0.59
P- 5	VEM- 5-47	61.56	4.96	3.0	0.17	4.63	0.16	0.78	6.1	1.5
P- 4	VEM- 4-47	61.56	0.64	0.87	0.24	5.03	0.11	1.58	0.3	3.7
P- 3	VEM- 3-47	71.04	2.28	0.72	0.30	5.07	0.10	0.95	0.9	1.6
P- 2	VEM- 2-47	69.28	2.50	1.4	0.35	4.50	0.18	0.75	2.3	1.1
P- 1	VEM- 1-47	10.20	41.24	1.9	0.95	0.40	0.07	0.42	5.1	2.2

[1] See additional analyses of selected samples on next page.
[2] The SiO_2 analysis for this sample is probably in error.

Additional analyses of selected samples[1]

Bed no.	Sample no.	P_2O_5	V_2O_5	F	SiO_2	TiO_2	CaO	MgO	Na_2O	K_2O	MnO	Ni
P-9?	2063	--	--	--	--	--	--	--	--	--	--	--
P-9	2061	28.77	0.31	3.03	10.06	0.06	41.73	0.20	0.73	0.96	0.003	0.002
P-17	VEM-47-47	29.89	0.05	3.18	2.43	0.04	42.10	2.36	0.80	0.55	0.009	0.023
P-25	2080	26.32	0.21	2.61	12.63	0.06	38.96	0.22	0.91	1.16	0.009	0.002
P-26	2079	--	--	--	--	--	--	--	--	--	--	--
P-12 to 15	2068[2]	--	--	--	--	--	--	--	--	--	--	--
P-10 to 11	2067[3]	18.48	0.10	2.01	16.13	0.08	31.48	4.21	0.65	1.16	0.035	0.039

Bed no.	Sample no.	Cr_2O_3	Co	Zn	Cu	Pb	Ag	MoO_3	W	Cl	Organic matter
P-9?	2063	--	--	--	--	--	0.0001	--	--	--	--
P-9	2061	0.14	0.004	0.008	0.003	0.001	0.0001	0.002	--	0.004	5.28
P-17	VEM-47-47	0.28	0.006	0.001	0.013	0.005	0.0002	0.002	<0.005	--	7.18
P-25	2080	0.08	0.004	0.010	0.0006	0.001	0.0002	0.012	--	0.004	5.82
P-26	2079	--	--	--	--	--	0.0003	--	--	--	--
P-12 to 15	2068[2]	--	--	--	--	--	0.0003	--	--	--	--
P-10 to 11	2067[3]	0.12	0.004	0.002	0.020	0.005	0.0004	0.002	<0.005	--	4.44

[1] Analyses made by U. S. Geological Survey, Geochemistry and Petrology Branch.
[2] Sample no. 2068 is a composite of samples VEM-9-47 through VEM-12-47.
[3] Sample no. 2067 is a composite of samples VEM-7-47 and VEM-8-47.
[4] CO_2 and S reported present.
[5] CO_2 reported present, strong, and S reported present.

SPECTROGRAPHIC ANALYSES - COAL CANYON, WYOMING. LOT NO. 1201

Semi-quantitative analyses of samples of the phosphatic shale member of Phosphoria formation, Coal Canyon, Wyoming (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, Bi, Cd, Co, Ga, Au, Li, Hg, Pt, Ta, Sn, and W were looked for in all samples but were not detected.

Explanation of symbols

A = over 10 percent
B = 1-10 percent
C = 0.1-1 percent
D = 0.01-0.1 percent
E = 0.001-0.01 percent
F = 0.0001-0.001 percent
G = less than 0.001 percent
ND = not detected

Bed no.	Sample no.	Al	Ba	Be	B	Ca	Cr	Cb	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Si	Ag	Na	Sr	Ti	V	Zn	Zr
P-107	DML-[illegible]-47	C	ND	ND	F	A	E	ND	G	D	E	C	E	F	E	B	ND	E	ND	E	F	ND	E
P-106	DML-[illegible]-47	C	ND	ND	F	A	E	ND	G	D	ND	D	E	F	E	B	ND	E	ND	E	E	ND	E
P-104	DML-[illegible]-47	C	ND	ND	E	C	E	ND	G	D	ND	D	E	F	E	A	ND	E	ND	E	E	ND	E
P-103	DML-[illegible]-47	C	ND	ND	E	C	E	ND	G	D	ND	D	E	F	E	A	ND	E	ND	E	E	ND	E
P-102	DML-[illegible]-47	C	ND	ND	E	C	E	ND	G	D	ND	D	E	F	E	A	ND	E	ND	E	E	ND	E
P-101	DML-[illegible]-47	C	ND	ND	E	C	E	ND	G	D	ND	D	E	F	E	A	ND	E	ND	E	E	ND	E
P-100	DML-[illegible]-47	C	ND	ND	E	B	E	ND	G	D	ND	D	E	F	E	A	ND	E	ND	E	E	ND	E
P- 99	DML-[illegible]-47	C	ND	ND	E	B	E	ND	G	D	ND	D	E	F	E	A	ND	E	ND	E	E	ND	E
P- 98	2063	C	ND	ND	F	A	E	ND	G	D	ND	D	E	F	E	A	E	E	ND	E	E	ND	E
P- 97	2062	C	E	G	E	A	D	ND	F	D	E	D	E	F	E	B	G	E	E	E	E	E	E
P- 96	2061	C	E	G	E	A	D	ND	F	D	E	D	E	F	E	B	G	E	E	E	E	E	E
P- 95	2060	C	ND	ND	E	A	E	E	G	D	ND	D	E	F	E	B	G	E	ND	E	D	ND	E
P- 94	2059	C	ND	ND	E	A	E	E	G	D	ND	D	ND	F	E	C	G	E	ND	E	D	ND	E
P- 93	2058	C	ND	ND	F	A	E	ND	G	E	ND	D	ND	F	E	C	G	E	ND	E	D	ND	E
P- 92	VEM-[illegible]-47	C	E	G	E	A	D	ND	F	C	E	D	E	F	E	A	G	E	E	E	E	E	E
P- 91	VEM-60-47	C	E	ND	E	A	E	E	F	C	ND	D	E	F	E	A	G	E	ND	E	E	ND	E
P- 90	VEM-[illegible]-47	C	ND	ND	E	A	E	ND	G	D	ND	D	E	F	E	B	G	E	ND	E	E	ND	E
P- 89	VEM-58-47	D	ND	ND	E	A	E	ND	G	D	ND	D	E	F	E	C	G	E	E	E	E	ND	E
P- 88	VEM-57-47	D	ND	ND	E	A	E	ND	G	D	ND	D	E	ND	ND	C	ND	E	E	E	E	ND	E
P- 87	VEM-56-47	C	E	ND	E	A	E	E	G	C	ND	D	E	F	E	B	G	E	E	E	E	E	E
P- 86	VEM-55-47	C	ND	ND	E	A	E	ND	G	C	ND	D	E	ND	E	C	G	E	E	E	E	ND	E
P- 85	VEM-54-47	C	ND	ND	E	A	E	ND	G	D	ND	D	E	ND	E	C	G	E	E	E	E	ND	E
P- 84	VEM-53-47	C	D	ND	E	A	E	E	G	D	ND	D	E	F	E	C	G	E	E	E	E	ND	E
P- 83	VEM-52-47	D	ND	ND	E	A	E	ND	G	D	ND	D	E	F	E	C	G	E	E	E	E	ND	E
P- 82	VEM-51-47	C	E	ND	E	A	E	E	G	D	ND	D	E	F	E	A	ND	E	ND	E	E	ND	E
P- 81	VEM-50-47	C	E	ND	E	A	E	E	G	D	ND	D	E	F	E	A	ND	E	ND	E	E	ND	E
P- 80	VEM-49-47	C	E	ND	E	A	E	E	G	D	ND	D	E	F	E	A	G	E	E	E	E	ND	E
P- 79	VEM-48-47	C	E	ND	E	A	E	E	G	D	ND	D	E	F	E	A	G	E	ND	E	E	ND	E
P- 78	VEM-47-47	C	E	ND	F	A	E	E	G	D	ND	D	E	F	E	A	G	E	E	E	E	ND	E

Bed no.	Sample no	Al	Ba	Be	B	Ca	Cr	Cb	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Si	Ag	Na	Sr	Ti	V	Zn	Zr
P- 79	VEM-46-47	C	E	ND	F	A	E	E	G	D	ND	D	E	ND	E	B	G	D	E	E	E	ND	F
P- 78	VEM-45-47	D	ND	ND	F	B	E	E	G	C	ND	D	E	ND	E	C	ND	D	ND	E	E	ND	F
P- 77	VEM-44-47	C	E	G	F	B	E	ND	G	C	E	C	E	E	D	A	ND	D	F	D	D	E	E
P- 76	VEM-43-47	C	E	G	F	C	E	ND	G	C	E	C	E	D	D	A	G	D	F	D	D	E	E
P- 75	VEM-42-47	C	E	G	F	C	D	ND	G	B	E	C	E	D	D	A	G	D	F	D	D	E	E
P- 74	VEM-41-47	C	E	ND	F	C	E	E	G	C	ND	D	E	E	E	A	G	D	ND	D	E	E	E
P- 73	VEM-40-47	C	E	G	F	A	E	ND	G	C	E	D	E	E	E	A	G	D	F	D	E	E	E
P- 72	VEM-39-47	C	E	ND	F	A	E	ND	G	C	ND	D	E	ND	E	A	G	D	ND	D	E	ND	E
P- 71	VEM-38-47	C	E	G	F	A	E	ND	G	C	E	D	E	ND	E	A	G	D	ND	D	E	ND	E
P- 68	VEM-37-47	C	E	ND	F	A	E	E	G	C	ND	D	E	ND	E	A	ND	D	ND	D	E	ND	E
P- 67	VEM-36-47	C	E	ND	F	C	E	E	G	C	ND	D	E	F	E	A	ND	D	ND	D	E	ND	E
P- 66	VEM-35-47	C	E	ND	F	A	E	E	G	C	ND	D	E	ND	E	A	ND	D	ND	D	E	ND	E
P- 65	VEM-34-47	C	E	ND	F	B	E	E	G	C	ND	D	E	ND	E	A	ND	D	ND	D	E	ND	E
P- 64	VEM-33-47	C	E	ND	F	A	E	E	G	C	ND	D	E	ND	E	A	ND	D	ND	D	E	ND	E
P- 63	VEM-32-47	C	E	ND	F	A	E	D	G	C	ND	D	E	F	E	A	G	D	E	E	E	E	E
P- 62	VEM-31-47	C	E	G	F	A	E	D	G	C	E	C	E	F	E	B	G	D	E	E	E	E	E
P- 61	VEM-30-47	C	E	ND	F	A	E	D	G	C	ND	C	E	F	E	B	ND	D	ND	E	E	ND	E
P- 60	VEM-29-47	C	E	ND	F	A	E	ND	G	C	ND	C	E	F	E	B	G	D	ND	E	E	ND	E
P- 59	VEM-28-47	C	E	G	F	A	E	ND	G	C	E	C	E	F	E	B	G	D	ND	E	E	F	E
P- 58	VEM-27-47	C	E	ND	F	A	E	ND	G	C	ND	C	E	F	E	B	ND	D	ND	E	E	ND	F
P- 57	VEM-26-47	C	E	ND	F	B	E	ND	G	D	ND	C	F	F	E	C	G	E	E	E	E	ND	F
P- 56	VEM-25-47	C	E	ND	F	A	E	ND	G	D	ND	C	F	F	E	C	ND	E	E	E	E	ND	F
P- 55	VEM-24-47	C	E	ND	F	A	E	ND	G	C	ND	C	F	F	E	C	G	E	E	E	E	ND	F
P- 54	VEM-23-47	C	E	ND	F	A	E	ND	G	C	ND	C	F	F	E	C	G	E	E	E	E	ND	F
P- 53	VEM-22-47	C	E	ND	F	A	E	E	G	D	ND	C	F	F	E	C	ND	E	E	E	E	E	F
P- 52	VEM-21-47	D	E	ND	F	A	E	ND	G	E	ND	C	F	ND	E	C	G	E	E	E	E	ND	F
P- 51	VEM-20-47	C	E	ND	F	A	E	E	G	D	ND	C	F	F	E	C	G	E	E	E	E	ND	F
P- 50	VEM-19-47	C	E	ND	F	A	E	ND	G	C	ND	C	F	F	E	C	G	E	E	E	E	ND	F
P- 49	VEM-18-47	C	E	G	F	A	E	ND	G	C	E	C	F	F	E	C	G	E	E	E	E	ND	F
P- 48	VEM-17-47	C	E	ND	F	A	E	ND	G	C	ND	C	F	F	E	C	G	E	E	E	E	ND	F
P- 47	VEM-16-47	D	E	ND	F	B	E	ND	G	C	ND	B	F	F	E	C	G	E	E	E	E	ND	F
P- 46	VEM-15-47	C	E	G	F	A	E	ND	G	C	E	B	F	F	E	C	G	E	E	E	E	ND	F
P- 45	VEM-14-47	C	E	ND	F	A	E	ND	G	C	ND	B	F	F	E	C	G	E	E	E	E	ND	F
P- 44	LES- 10-47	C	ND	ND	F	A	E	E	G	C	ND	D	ND	F	E	C	G	D	ND	E	E	E	F
P- 43	LES- 9-47	C	ND	ND	F	A	E	ND	G	C	ND	D	ND	F	E	C	G	D	ND	E	D	E	F
P- 42	LES- 8-47	C	ND	ND	F	A	E	ND	G	D	ND	C	F	F	E	A	G	D	ND	E	E	E	F
P- 41	LES- 7-47	C	ND	ND	F	B	E	ND	G	C	ND	C	F	F	E	A	G	D	ND	E	E	E	F
P- 40	LES- 6-47	C	ND	ND	F	B	E	ND	G	C	ND	C	F	F	E	A	G	D	ND	E	E	E	F
P- 39	LES- 5-47	C	ND	ND	F	B	E	ND	G	C	ND	C	F	F	E	A	G	D	ND	E	E	E	F
P- 38	LES- 4-47	C	ND	ND	F	B	E	ND	G	C	ND	C	F	F	E	A	G	E	ND	E	E	E	F
P- 37	LES- 3-47	C	ND	ND	F	A	E	ND	G	D	ND	C	F	F	F	A	G	E	ND	E	E	ND	F
P- 36	LES- 2-47	C	ND	ND	F	A	E	ND	G	D	ND	C	F	F	F	A	G	E	ND	E	E	ND	F

| | | |

NORTH FORK OF PINE CREEK, WYOMING. LOT NO. 1204.

Phosphatic shale member of Phosphoria formation sampled in bulldozer trench on North Fork of Pine Creek, sec. 13, T. 25 N., R. 118 W., Lincoln County, Wyoming, 10 miles northeast of Cokeville on east limb of syncline. Beds strike N. 10-25° E. and dip 37-45° W. Section measured by R. A. Hoppin, V. E. McKelvey, and L. E. Smith and sampled by R. P. Sheldon, O. A. Payne, and R. S. Sears in June and July 1947. Samples analyzed by U.S. Bureau of Mines Laboratory, Albany, Oregon.

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		
	Phosphatic shale member of Phosphoria formation.									
P-83	Mudstone, calcareous	RAH-63-47	2.2	0.3	---	--	--	67.8	2.2	0.66
P-82	Mudstone, calcareous	RAH-62-47	2.4	7.4	---	--	--	50.7	4.6	18.42
P-81	Limestone, argillaceous; fos. col. no. 47-HW-54	RAH-61-47	2.5	6.3	--	--	--	27.3	7.1	34.17
P-80	Limestone, argillaceous; fos. col. no. 47-HW-53	RAH-60-47	1.5	0.6	--	--	--	44.0	8.6	35.07
P-79	Limestone, argillaceous; fos. col. no. 47-HW-52	RAH-59-47	1.9	0.7	--	--	--	41.9	10.5	36.40
P-78	Mudstone, calcareous; fos. col. no. 47-HW-51	RAH-58-47	2.7	1.2	--	--	--	60.9	13.2	39.64
P-77	Mudstone, calcareous; fos. col. no. 47-HW-50	RAH-57-47	1.6	0.7	--	--	--	59.0	14.8	40.76
P-76	Mudstone, calcareous	RAH-56-47	1.0	0.7	--	--	--	60.0	15.8	41.46
P-75	Limestone, argillaceous	RAH-55-47	3.2	0.6	--	--	--	49.7	19.0	43.38
P-74	Mudstone	RAH-54-47	3.8	1.0	--	--	--	82.7	22.8	47.18
P-73	Mudstone, phosphatic; fos. col. no. 47-HW-21	RAH-53-47	0.9	13.3	--	--	--	61.1	23.7	59.15
P-72	Mudstone; fos. col. no. 47-HW-20	RAH-52-47	4.4	4.7	--	--	--	83.6	28.1	79.83
P-71	Mudstone	RAH-51-47	2.8	4.3	--	--	--	74.6	30.7	91.01
P-70	Mudstone, calcareous	RAH-50-47	1.4	2.3	--	--	--	65.7	32.1	94.23
P-69	Mudstone	RAH-49-47	1.3	3.3	--	--	--	79.6	33.4	98.52
P-68	Phosphate rock	RAH-48-47	3.6	34.7	1.2	0.45	3.40	5.3	36.9	219.97
P-67	Mudstone, calcareous	RAH-47-47	1.4	2.8	9.72	1.7	6.44	72.2	38.3	223.89
P-66	Phosphate rock, argillaceous	RAH-46-47	4.4	25.9	3.5	0.89	3.92	23.4	42.7	337.85
P-65	Phosphate rock; fos. col. no. 47-HW-19	RAH-45-47	1.0	30.1	2.9	1.3	2.78	17.7	43.7	367.95
P-64	Mudstone	RAH-44-47	1.3	1.4	--	--	--	84.8	45.0	369.77
P-63	Mudstone	LES-116-47	1.8	3.3	--	--	--	77.0	46.8	375.71
P-62	Mudstone	LES-115-47	0.9	1.0	--	--	--	84.3	47.7	376.61
P-61	Phosphate rock, argillaceous	LES-114-47	0.4	24.1	--	--	--	24.9	48.1	386.25
P-60	Mudstone, phosphatic	LES-113-47	0.6	13.6	--	--	--	47.2	48.7	394.41
P-59	Mudstone	LES-112-47	1.0	1.1	--	--	--	78.6	49.7	395.51
P-58	Phosphate rock, calcareous, argillaceous	LES-111-47	0.4	20.8	--	--	--	22.7	50.1	403.83
P-57	Mudstone, phosphatic	LES-110-47	0.55	14.4	--	--	--	39.4	50.65	411.74
P-56	Limestone, argillaceous, phosphatic	LES-109-47	0.5	9.2	--	--	--	35.0	51.15	416.34

P-55	Limestone, argillaceous; fos. col. no. 47-HW-18	LES-108-47	1.4	3.8	--	--	--	22.6	52.55	421.66
P-54	Mudstone	LES-107-47	0.5	0.5	--	--	--	67.3	53.05	421.91
P-53	Mudstone	LES-106-47	0.45	0.2	--	--	--	71.6	53.50	422.00
P-52	Mudstone	LES-105-47	0.95	0.2	--	--	--	80.1	54.45	422.19
--	Mudstone	LES-354-47	(0.5)	0.3	--	--	--	78.0	--	--
	LES-354-47 represents the upper half of LES-105- bed P-52.									
P-51	Mudstone	LES-104-47	1.0	6.3	--	--	--	55.9	55.45	428.49
P-50	Mudstone, calcareous; fos. col. no. 47-HW-17	LES-103-47	0.7	2.1	--	--	--	51.7	56.15	429.96
P-49	Mudstone	LES-102-47	0.7	1.5	--	--	--	84.6	56.85	430.87
P-48	Mudstone, phosphatic	LES-101-47	0.7	12.5	--	--	--	51.1	57.55	439.62
P-47	Mudstone, calcareous and limestone	LES-100-47	3.0	0.4	--	--	--	46.7	60.55	440.82
P-46	Mudstone, calcareous	LES- 99-47	2.0	0.9	--	--	--	63.0	62.55	442.62
P-45	Mudstone, phosphatic	LES- 98-47	2.0	10.0	--	--	--	49.8	64.55	462.62
P-44	Mudstone, calcareous	LES- 97-47	3.6	6.7	--	--	--	56.0	68.15	486.74
P-43	Phosphate rock, argillaceous, contains calcareous concretions; fos. col. no. 47-HW-41	LES- 96-47	3.9	15.2	--	--	--	30.1	72.05	546.02
P-42	Limestone, argillaceous; fos. col. no. 47-HW-16	LES- 95-47	2.8	1.0	--	--	--	28.3	74.89	548.82
P-41	Phosphate rock, argillaceous, calcareous	LES- 94-47	1.9	16.4	--	--	--	35.9	76.75	579.98
P-40	Limestone, argillaceous, phosphatic	LES- 93-47	1.0	8.4	--	--	--	34.7	77.75	588.38
P-39	Phosphate rock, argillaceous, calcareous	LES- 92-47	2.1	17.6	--	--	--	33.8	79.85	625.94
P-38	Phosphate rock, argillaceous, calcareous	LES- 91-47	0.5	16.3	--	--	--	35.7	80.35	633.49
P-37	Phosphate rock, argillaceous, calcareous, contains chert lenses	LES- 90-47	0.75	19.0	--	--	--	26.7	81.10	647.74
P-36	Limestone, argillaceous	LES- 89-47	3.0	4.7	--	--	--	22.2	84.10	661.84
P-35	Chert, contains quartz vugs; fos. col. no. 47-HW-15	LES- 88-47	0.7	5.5	--	--	--	77.8	84.80	665.69
P-34	Mudstone, phosphatic	LES- 87-47	0.8	13.7	--	--	--	51.4	85.60	676.65
P-33	Phosphate rock, silty and mudstone	LES- 86-47	0.5	26.1	--	--	--	20.4	86.10	689.70
P-32	Phosphate rock	LES- 85-47	2.15	33.0	--	--	--	8.6	88.25	760.65
P-31	Phosphate rock, argillaceous	LES- 84-47	0.5	18.0	--	--	--	39.1	88.75	769.65
P-30	Mudstone, phosphatic, calcareous	LES- 83-47	2.3	13.1	--	--	--	41.8	91.05	799.78
P-29	Limestone, argillaceous	LES- 82-47	2.2	0.6	--	--	--	35.1	93.25	801.10
P-28	Mudstone, calcareous, phosphatic	LES- 81-47	0.8	7.8	--	--	--	51.0	94.05	807.35
P-27	Limestone, argillaceous, contains chert lenses	LES- 80-47	0.8	5.7	--	--	--	30.0	94.85	811.90
P-26	Phosphate rock	LES- 79-47	0.85	30.2	--	--	--	12.9	95.70	837.97
P-25	Mudstone, calcareous	LES- 78-47	0.3	4.8	--	--	--	62.1	96.00	839.01
P-24	Mudstone, calcareous	LES- 77-47	1.2	0.4	--	--	--	70.5	97.20	839.49
P-23	Mudstone	LES- 76-47	0.35	3.8	--	--	--	71.2	97.55	840.82
P-22	Mudstone	LES- 75-47	1.6	5.4	--	--	--	73.7	99.15	849.46

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 percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	Loss on ignition	Acid insoluble		
P-21	Mudstone	LES- 74-47	0.75	1.7	--	--	--	83.9	99.90	850.74
P-20	Phosphate rock	LES- 73-47	0.9	31.7	--	--	--	15.6	100.80	879.26
P-19	Mudstone, contains chert leaves	LES- 72-47	4.0	1.0	--	--	--	92.7	104.80	883.26
P-18	Mudstone and chert	LES- 71-47	1.8	1.0	--	--	--	85.8	106.60	885.06
P-17	Mudstone, calcareous and chert	LES- 58-47	2.0	0.6	--	--	--	43.9	108.60	886.26
P-16	Mudstone, calcareous and chert	LES- 57-47	1.9	1.1	--	--	--	60.6	110.50	888.36
P-15	Mudstone, calcareous and chert	LES- 56-47	1.5	1.1	--	--	--	66.6	112.00	890.00
P-14	Mudstone, calcareous and chert	LES- 55-47	1.2	1.2	--	--	--	48.7	113.20	891.44
P-13	Limestone, argillaceous and phosphatic rock	LES- 54-47	0.7	6.5	--	--	--	26.0	113.90	895.16
P-12	Limestone, argillaceous	LES- 53-47	0.85	1.9	--	--	--	25.4	114.75	897.47
P-11	Mudstone, calcareous	LES- 52-47	1.8	6.8	--	--	--	52.7	116.55	909.71
P-10	Limestone, argillaceous	LES- 51-47	0.65	2.6	--	--	--	19.0	117.20	911.14
P- 9	Mudstone, phosphatic	LES- 50-47	0.85	13.2	--	--	--	46.3	118.05	922.36
P- 8	Mudstone, calcareous	LES- 49-47	0.45	3.9	--	--	--	37.4	118.50	924.12
P- 7	Limestone, argillaceous	LES- 48-47	1.9	0.6	--	--	--	34.9	120.40	925.26
P- 6	Mudstone, calcareous	LES- 47-47	0.5	1.3	--	--	--	4.0	120.90	925.90
P- 5	Limestone, argillaceous	VEM-104-47	1.9	0.4	--	--	--	33.0	122.80	926.66
P- 4	Mudstone	VEM-103-47	0.5	1.1	--	--	--	75.6	123.30	927.22
P- 3	Mudstone, calcareous	VEM-102-47	1.9	0.4	--	--	--	57.9	125.20	927.98
P- 2	Limestone, argillaceous	VEM-101-47	1.1	0.4	--	--	--	45.4	126.30	928.42
P- 1	Phosphate rock, mudstone, and chert	VEM-100-47	0.4	26.4	--	--	--	17.4	126.70	938.96
	Wells formation									
C-2	Mudstone, phosphatic	VEM- 99-47	1.4	12.0	--	--	--	56.1	1.4	--
C-1	Mudstone, calcareous	VEM- 98-47	1.9	1.0	--	--	--	53.6	3.3	--

SPECTROGRAPHIC ANALYSES—NORTH FORK OF PINE CREEK, WYOMING. LOT NO. 1204.

Semi-quantitative analyses of a few samples of the Phosphoria formation, North Fork of Pine Creek, Wyoming (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. In addition to the elements listed in the table below, Sb, As, Be, Bi, Cd, Ce, Cs, Co, Cb, Ge, In, Hg, Mo, Nd, Pt, Re, Rb, Sc, Ta, Tl, Th, and W were looked for in all samples but were not detected.

Explanation of symbols

A = more than 10 percent
B = 1-10 percent
C = 0.07-0.1 percent
D = 0.01-0.1 percent
E = 0.001-0.01 percent
F = 0.0001-0.001 percent
G = less than 0.001 percent
ND = not detected

Bed no.	Sample no.	Al	Ba	B	Cr	Cr	Cu	Fe	La	Pb	Mg	Mn	Ni	P	Si	Ag	Na	Sr	Sn	Ti	V	Y	Zn	Zr
P-68	RAH-48-47	D	F	F	A	D	F	D	E	E	D	F	F	--	B	G	D	D	F	E	E	E	F	E
P-67	RAH-47-47	D	F	F	B	D	F	D	ND	E	D	E	F	B	A	G	D	D	F	D	E	ND	F	E
P-66	RAH-46-47	D	F	F	A	D	F	D	E	E	D	F	F	A	B	G	D	D	F	E	E	E	F	E
P-65	RAH-45-47	D	F	F	A	E	F	E	F	E	D	E	F	A	B	G	D	D	F	E	E	E	F	E

B = 1 equivalent to B and C of Bureau of Mines analyses.

Trench work of Pine Creek, Wyoming. Lot No. 1202.

Phosphate (Permian) from [illegible] on west side of Pine Creek, SE¼ sec. 35, T. 25 N., R. 118 W., Lincoln County, Wyoming, as follows: Bed 1-1 to 1-5, inclusive, [illegible] Bed 2-1 to 2-5, inclusive, sampled in trench 150 feet above creek. All other beds in trench 50-200 feet above creek. Beds 3-1 to 3-5, inclusive, [illegible] Beds 4-1 to 4-22, inclusive, sampled in trench 100-200 feet above creek. Beds strike N. 10° E. and dip 16° W. Section measured by R. A. Hoppin, [illegible] Armstrong, and L. B. Smith and sampled by R. S. Sears and O. A. Payne in June, July, and August 1947. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed No.	Rock description	Sample no.	Thickness (feet)	Chemical analysis (percent)					Cumulative thickness (feet)	Thickness per ton P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	Loss on ignition	Acid insoluble		
	Dinwoody formation									
[illegible]	[illegible] chert, [illegible] (4-HW-2), and (4-HW-1).		[illegible]	--	--	--	--	--	[illegible]	--
	Upper shale member of Phosphoria formation									
4-20	Phosphatic rock, argillaceous, chert and [illegible] (4-HW-30 and 4-HW-30A	RAH-43-47	2.2	18.0	--	--	--	29.1	2.2	59.60
4-19	Chert, calcareous, phosphatic	RAH-42-47	1.9	8.2	--	--	--	47.0	4.1	55.18
4-18	Chert, calcareous	RAH-41-47	1.1	11.6	--	--	--	31.3	5.2	56.94
4-17	Chert, siliceous	RAH-40-47	2.8	0.9	--	--	--	64.6	8.0	59.46
4-16	Chert, calcareous	RAH-39-47	1.0	11.1	--	--	--	62.4	9.0	60.55
4-15	[illegible] chalcedonic	RAH-38-47	1.1	1.7	--	--	--	80.7	10.1	[illegible]
4-14	[illegible] calcareous	RAH-37-47	1.4	4.4	--	--	--	56.1	11.5	[illegible]
4-13	[illegible] phosphatic, calcareous	RAH-36-47	0.6	13.1	--	--	--	41.0	12.1	[illegible]
4-12	Chert, calcareous	RAH-35-47	1.6	1.7	--	--	--	80.6	13.7	[illegible]
4-11	Chert, calcareous	RAH-34-47	0.7	2.3	--	--	--	62.3	14.4	[illegible]
4-10	[illegible] calcareous	RAH-33-47	0.7	2.0	--	--	--	65.2	15.1	[illegible]
4-9	[illegible] calcareous	RAH-32-47	1.0	1.6	--	--	--	65.2	16.1	[illegible]
4-8	[illegible] calcareous	RAH-31-47	2.5	1.6	--	--	--	66.6	18.6	[illegible]
4-7	[illegible] calcareous	DES-46-47	2.6	2.8	--	--	--	67.7	21.2	[illegible]
4-6	[illegible] calcareous	DES-34-47	1.0	3.4	--	--	--	62.4	22.2	[illegible]
4-5	[illegible] calcareous	DES-33-47	2.4	4.2	--	--	--	61.7	24.6	[illegible]
4-4	[illegible] calcareous	DES-32-47	1.0	3.3	--	--	--	65.2	25.6	[illegible]
4-3	[illegible] calcareous	DES-31-47	1.5	2.9	--	--	--	65.8	27.1	[illegible]
4-2	Phosphatic rock, [illegible] calcareous [illegible]	DES-30-47	1.5	6.2	--	--	--	61.1	28.6	[illegible]
4-1	[illegible] [illegible] shale	DES-29-47	1.05	3.3	--	--	--	72.1	29.65	[illegible]
3-10	[illegible] [illegible]	DES-28-47	1.4	3.2	--	--	--	70.2	31.05	[illegible]
3-9	[illegible] calcareous	DES-27-47	2.4	3.8	--	--	--	66.6	33.45	[illegible]
3-8	[illegible]	DES-26-47	2.5	3.4	--	--	--	73.9	35.95	[illegible]
3-7	[illegible] [illegible], phosphatic	DES-25-47	0.65	8.7	--	--	--	34.7	36.60	[illegible]
3-6	[illegible] calcareous	DES-24-47	3.4	5.7	--	--	--	62.6	40.00	[illegible]

U- 5	Phosphate rock, argillaceous	LES-23-47	0.55	23.1	--	--	--	24.8	40.55	184.98
U- 4	Limestone, argillaceous	LES-22-47	1.45	5.9	--	--	--	41.8	42.00	193.54
U- 3	Mudstone, calcareous	LES-21-47	5.0	1.8	--	--	--	56.8	47.00	202.54
U- 2	Mudstone, calcareous	LES-20-47	1.9	2.2	--	--	--	65.0	48.90	206.72
U- 1	Phosphate rock, argillaceous; fos. col. no. 47-HW-29	LES-19-47	0.6	25.1	--	--	--	22.3	49.50	221.78
	Rex member of Phosphoria formation									
R-26	Limestone, phosphatic; fos. col. no. 47-HW-28	LES-18-47	0.3	11.4	--	--	--	10.0	0.3	3.42
R-25	Limestone; fos. col. no. 47-HW-33	--	3.5	--	--	--	--	--	3.8	--
R-24	Limestone, phosphatic	--	0.3	--	--	--	--	--	4.1	--
R-23	Limestone, contains chert; fos. col. no. 47-HW-36	--	5.0	--	--	--	--	--	9.1	--
R-22	Limestone, phosphatic	--	2.3	--	--	--	--	--	11.4	--
R-21	Limestone, cherty; fos. col. no. 47-HW-37	--	5.1	--	--	--	--	--	16.5	--
R-20	Limestone and chert; fos. col. no. 47-HW-38	--	9.0	--	--	--	--	--	25.5	--
R-19	Limestone	--	2.0	--	--	--	--	--	27.5	--
R-18	Limestone and chert; fos. col. nos. 47-HW-39 and 47-HW-40	--	8.0	--	--	--	--	--	35.5	--
R-17	Limestone; fos. col. no. 47-HW-27	--	5.4	--	--	--	--	--	40.9	--
R-16	Limestone; fos. col. no. 47-HW-26	--	5.4	--	--	--	--	--	46.3	--
R-15	Limestone; fos. col. no. 47-HW-25	--	2.5	--	--	--	--	--	48.8	--
R-14	Covered; may be probably fossiliferous limestone and chert	--	23.0	--	--	--	--	--	71.8	--
R-13	Limestone; fos. col. nos. 47-HW-23 and 47-HW-24	--	11.0	--	--	--	--	--	82.8	--
R-12	Limestone and chert	--	15.0	--	--	--	--	--	97.8	--
R-11	Limestone	--	4.5	--	--	--	--	--	102.3	--
R-10	Limestone and chert	--	7.5	--	--	--	--	--	109.8	--
R- 9	Limestone and chert	--	6.2	--	--	--	--	--	116.0	--
R- 8	Mudstone, calcareous	--	2.5	--	--	--	--	--	118.5	--
R- 7	Mudstone, calcareous	--	5.0	--	--	--	--	--	123.5	--
R- 6	Mudstone, calcareous	--	5.0	--	--	--	--	--	128.5	--
R- 5	Mudstone, calcareous	--	5.0	--	--	--	--	--	133.5	--
R- 4	Mudstone, calcareous	--	4.0	--	--	--	--	--	137.5	--
R- 3	Chert and mudstone	--	2.6	--	--	--	--	--	140.1	--
R- 2	Quartzite, phosphatic	--	1.2	--	--	--	--	--	141.3	--
R- 1	Mudstone, dolomitic	--	5.0	--	--	--	--	--	146.3	--

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 of percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	Loss on ignition	Acid insoluble		
	Phosphatic shale member of Phosphoria formation									
P-70	Mudstone, calcareous	LES- 12-47	5.0	9.98	--	--	--	63.19	41.0	3.92
P-69	Mudstone, phosphatic, calcareous	LES- 13-47	2.0	10.65	--	--	--	48.2	43.0	25.18
P-68	Mudstone, calcareous	LES- 14-47	3.2	1.0	--	--	--	49.6	46.2	29.38
P-67	Phosphate rock, cherty	LES- 15-47	0.7	25.8	--	--	--	26.0	46.9	46.04
P-66	Limestone, argillaceous	LES- 15-47	2.8	1.8	--	--	--	42.5	49.7	51.08
P-65	Mudstone, calcareous	LES- 16-47	3.2	1.2	--	--	--	73.6	52.9	53.12
P-64	Mudstone and argillaceous limestone	LES- 17-47	1.5	5.3	--	--	--	29.3	54.4	61.07
P-63	Phosphate rock	LES- 35-47	2.2	33.5	0.7	0.58	5.00	9.1	58.2	104.62
P-62	Phosphate rock	LES- 36-47	0.7	34.9	0.8	0.65	2.98	11.1	58.9	129.05
P-61	Phosphate rock	LES- 37-47	1.0	32.6	1.2	0.85	3.88	6.4	59.9	161.65
P-60	Mudstone and phosphate rock	LES- 38-47	0.3	8.2	--	--	--	60.0	60.3	164.93
P-59	Limestone, argillaceous	LES- 39-47	1.2	0.6	--	--	--	47.5	61.5	165.65
P-58	Phosphate rock	LES- 40-47	0.9	32.0	--	--	--	6.6	62.4	194.45
P-57	Phosphate rock, cherty	LES- 41-47	2.0	26.2	--	--	--	24.2	64.4	246.85
P-56	Phosphate rock, top of col. no. 47-RW-22	LES- 42-47	1.5	25.8	--	--	--	13.5	65.9	285.55
P-55	Mudstone, calcareous	LES- 43-47	2.3	1.4	--	--	--	57.6	68.2	288.77
P-54	Phosphate rock, cherty	LES- 44-47	0.1	25.8	--	--	--	21.7	68.6	299.09
P-53	Mudstone, calcareous	LES- 45-47	2.0	0.6	--	--	--	74.9	71.4	300.77
P-52	Phosphate rock	LES- 59-47	0.4	28.8	--	--	--	10.2	71.8	312.29
P-51	Limestone, argillaceous	LES- 60-47	0.5	1.3	--	--	--	42.4	72.3	312.94
P-50	Phosphate rock, argillaceous	LES- 61-47	0.35	22.6	--	--	--	27.6	72.65	320.85
P-49	Limestone, argillaceous	LES- 62-47	1.4	0.6	--	--	--	47.1	74.05	321.69
P-48	Phosphate rock	LES- 63-47	0.6	23.5	--	--	--	19.1	74.65	335.79
P-47	Phosphate rock, argillaceous	LES- 64-47	0.6	16.8	--	--	--	34.6	75.25	345.87
P-46	Phosphate rock, argillaceous	LES- 65-47	0.6	14.6	--	--	--	36.3	75.85	354.63
P-45	Limestone, argillaceous	LES- 66-47	1.5	0.8	--	--	--	42.7	77.35	357.43
P-44	Mudstone	FCA-15-47	0.45	4.4	--	--	--	55.3	77.80	359.41
P-43	Phosphate rock, argillaceous	FCA-16-47	0.4	21.7	--	--	--	22.8	78.20	368.09
P-42	Mudstone	LES- 68-47	0.45	0.2	--	--	--	61.5	78.65	368.18
P-41	Mudstone	FCA-17-47	0.5	0.1	--	--	--	66.7	79.15	368.23
P-40	Mudstone	FCA-18-47	0.65	0.4	--	--	--	73.6	79.80	368.49
P-39	Mudstone	FCA-19-47	0.5	3.2	--	--	--	67.8	80.30	370.09
P-38	Mudstone	FCA-20-47	0.35	6.4	--	--	--	55.3	80.65	372.33
P-37	Dolomite	FCA- 1-47	0.8	0.5	--	--	--	7.6	81.45	372.73
P-36	Mudstone, calcareous	FCA- 2-47	1.05	2.7	--	--	--	49.5	82.50	375.56
P-35	Mudstone	FCA- 3-47	0.6	2.2	--	--	--	80.8	83.10	376.88
P-34	Mudstone, phosphatic	FCA- 4-47	0.6	13.0	--	--	--	43.4	83.70	384.68
P-33	Limestone, argillaceous	FCA- 5-47	2.3	0.4	--	--	--	42.4	86.00	385.60
P-32	Mudstone, calcareous	FCA- 6-47	1.8	0.9	--	--	--	53.6	87.80	387.22
P-31	Mudstone, phosphatic	FCA- 7-47	2.05	10.4	--	--	--	49.5	89.85	408.54

P-33	Limestone, argillaceous	FCA- 9-47	1.2	1.6	--	--	--	33.3	53.15	410.62
P-32	Limestone, argillaceous	FCA- 9-47	1.15	0.4	--	--	--	33.3	54.30	411.08
P-31	Mudstone, phosphatic	FCA-10-47	0.6	13.4	--	--	--	41.3	54.90	419.12
P-30	Limestone, argillaceous	FCA-11-47	0.9	1.3	--	--	--	22.3	55.80	420.30
P-29	Phosphate rock, argillaceous, calcareous	FCA-12-47	1.2	12.4	--	--	--	32.3	57.00	435.18
P-28	Limestone, phosphatic	FCA-13-47	0.65	9.4	--	--	--	19.2	57.65	441.28
P-27	Mudstone	FCA-14-47	0.6	7.2	--	--	--	36.3	58.25	445.60
P-26	Phosphate rock, argillaceous, calcareous, contains concretions	FCA-21-47	1.6	19.5	--	--	--	17.4	59.85	476.80
P-25	Phosphate rock, argillaceous, calcareous	FCA-22-47	0.7	14.8	--	--	--	30.4	60.55	487.16
P-24	Limestone, argillaceous	FCA-23-47	1.9	1.0	--	--	--	30.8	62.45	489.06
P-23	Limestone, argillaceous	FCA-24-47	1.1	0.6	--	--	--	24.3	63.55	489.72
P-22	Phosphate rock, argillaceous	FCA-25-47	0.9	14.1	--	--	--	31.2	64.45	502.41
P-21	Phosphate rock, argillaceous	FCA-26-47	1.1	17.5	--	--	--	29.9	65.55	521.66
P-20	Phosphate rock, argillaceous	FCA-27-47	2.7	14.2	--	--	--	32.4	68.25	560.00
P-19	Limestone	FCA-28-47	1.4	3.7	--	--	--	14.6	69.65	565.18
P-18	Limestone, argillaceous	FCA-30-47	1.0	7.6	--	--	--	27.2	70.65	572.78
P-17	Phosphate rock, calcareous, argillaceous	FCA-31-47	1.5	15.3	--	--	--	26.4	72.15	595.73
P-16	Phosphate rock, calcareous, argillaceous	FCA-32-47	1.6	17.0	--	--	--	23.7	73.75	622.94
P-15	Limestone, fos. col. no. 47-HW-14	FCA-33-47	3.6	3.4	--	--	--	11.6	77.35	635.18
P-14	Mudstone, phosphatic	FCA-34-47	0.75	9.2	--	--	--	51.8	78.10	642.08
P-13	Phosphate rock	FCA-35-47	1.35	31.1	--	--	--	5.0	79.45	684.46
P-12	Mudstone, calcareous, phosphatic	FCA-36-47	2.0	11.7	--	--	--	36.8	81.45	707.46
P-11	Mudstone, calcareous, phosphatic	FCA-37-47	0.9	10.6	--	--	--	45.3	82.35	717.00
P-10	Limestone, argillaceous	FCA-38-47	3.4	1.7	--	--	--	36.1	85.75	722.78
P- 9	Limestone, argillaceous	FCA-39-47	1.3	0.3	--	--	--	35.0	87.05	723.17
P- 8	Limestone, argillaceous, phosphatic	FCA-40-47	2.1	11.0	--	--	--	30.6	89.15	746.27
P- 7	Mudstone, phosphatic	FCA-41-47	0.8	12.8	--	--	--	45.3	89.95	756.51
P- 6	Limestone, argillaceous	FCA-42-47	0.75	1.5	--	--	--	47.2	90.70	757.64
P- 5	Mudstone	FCA-43-47	1.1	4.0	--	--	--	66.6	91.80	762.04
P- 4	Phosphate rock, calcareous	FCA-44-47	1.4	30.7	--	--	--	7.1	93.20	805.02
P- 3	Limestone, argillaceous	FCA-45-47	2.35	0.4	--	--	--	38.4	95.55	805.96
P- 2	Mudstone, phosphatic, calcareous	FCA-46-47	0.55	12.3	--	--	--	45.0	96.10	812.72
P- 1	Limestone, argillaceous, phosphatic; fos. col. no. 47-HW-13	FCA-47-47	0.35	11.5	--	--	--	30.2	96.45	816.74

Wells formation

Cw-6	Limestone, cherty	FCA-48-47	0.8	0.4	--	--	--	11.0	0.8	--
Cw-5	Chert, calcareous, argillaceous	FCA-232-47	0.7	0.6	--	--	--	72.1	1.5	--
Cw-4	Chert, calcareous	FCA-231-47	1.6	0.7	--	--	--	54.4	3.1	--
Cw-3	Chert, calcareous	FCA-230-47	3.6	0.7	--	--	--	51.0	6.7	--
Cw-2	Limestone, cherty	FCA-229-47	1.5	0.8	--	--	--	43.0	8.2	--
Cw-1	Chert, calcareous	FCA-	0.2	--	--	--	--	--	8.4	--

SPECTROGRAPHIC ANALYSES--MIDDLE FORK OF PINE CREEK, WYOMING. LOT NO. 1205.

Semi-quantitative analyses of 3 samples of the Phosphoria formation, Middle Fork of Pine Creek, Wyoming (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, Cd, Ce, Cs, Co, Cb, Ge, In, Hg, Mo, Nd, Pt, Re, Rb, Sc, Ta, Tl, Th, 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

B.M. No.	Sample no.	Al	Ba	B	Be	Ca	Cr	Cu	Fe	La	Pb	Mg	Mn	Ni	Ps	Si	Ag	Na	Sr	Sn	Ti	V	Y	Zn	Zr
P-60	LES-35-47	D	F	F	F	A	D	F	D	E	E	D	F	F	A	B'	G	D	D	F	E	E	E	F	E
P-65	LES-36-47	D	F	E	ND	A	D	F	D	E	E	D	F	F	A	B'	G	D	D	F	E	E	E	F	E
P-64	LES-37-47	D	F	ND	ND	A	D	F	D	E	E	D	F	F	A	B'	G	D	D	F	E	ND	E	F	E

[1] B' is equivalent to B and C of Bureau of Mines analyses.

LEEFE, WYOMING. LOT NO. 1213.

Part of phosphatic shale member of Phosphoria formation sampled at two places in Leefe open pit mine of San Francisco Chemical Company 4 miles west of Sage, secs. 10 and 15, T. 21 N., R. 120 W., Uinta County, Wyoming. Beds are flat lying. Section of beds P-1 to P-11 from locality A measured and sampled by R. M. Campbell in December 1947; section of beds P-1 to P-23 from locality B measured by F. W. O'Malley and R. A. Harris and sampled by Harris and R. A. Smart in October 1948. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent) P_2O_5	Al_2O_3	Fe_2O_3	Loss on ignition	Acid insoluble	Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
	Locality A[1]									
	Phosphatic shale member of Phosphoria formation—partial section									
P-11	Phosphate rock, argillaceous	RMC-145-47	2.5	17.4	2.1	1.67	9.14	31.6	2.5	43.50
P-10	Limestone, argillaceous	RMC-144-47	0.7	1.7	3.6	1.65	28.26	29.2	3.2	44.69
P-9	Phosphate rock	RMC-143-47	2.7	35.5	0.66	0.53	3.50	3.1	5.9	140.54
P-8	Phosphate rock, argillaceous	RMC-142-47	0.4	26.9	3.4	0.80	3.94	20.7	6.3	151.30
P-7	Phosphate rock	RMC-141-47	1.0	34.6	0.99	0.61	3.12	4.2	7.3	185.90
P-6	Phosphate rock	RMC-140-47	0.9	32.6	1.2	2.10	4.00	5.4	8.2	215.24
P-5	Phosphate rock, argillaceous	RMC-139-47	0.6	20.8	5.5	1.00	4.22	33.5	8.8	227.72
P-4	Phosphate rock, argillaceous	RMC-138-47	1.4	28.8	2.6	0.82	3.74	14.5	10.2	268.04
P-3	Phosphate rock, argillaceous	RMC-137-47	1.2	28.8	2.9	0.69	3.82	18.3	11.4	302.60
P-2	Phosphate rock, argillaceous	RMC-136-47	0.8	24.8	3.6	1.46	3.80	26.3	12.2	322.44
P-1	Phosphate rock, argillaceous	RMC-135-47	0.5	23.0	4.8	0.79	2.84	32.7	12.5	329.34
	Locality B									
	Phosphatic shale member of Phosphoria formation—upper part only									
P-24	Chert	--	0.03	--	--	--	--	--	--	--
	Bed P-24 may represent base of Rex member.									
P-23	Mudstone, cherty	RH-3326	2.0	3.5	--	--	--	83.9	2.0	7.00
P-22	Phosphate rock, argillaceous	RH-3325	0.8	23.9	--	--	--	30.9	2.8	26.12
P-21	Mudstone	RH-3324	1.3	2.9	--	--	--	79.9	4.1	29.89
P-20	Phosphate rock, argillaceous	RH-3323	0.4	28.5	--	--	--	20.8	4.5	41.29
P-19	Mudstone	WOM - 3322	1.7	3.6	--	--	--	72.4	6.2	47.41
P-18	Mudstone, phosphatic and cherty phosphate rock	WOM - 3321	1.0	18.3	--	--	--	44.2	7.2	65.71
P-17	Mudstone, phosphatic	WOM - 3320	0.4	9.5	--	--	--	63.6	7.6	69.51
P-16	Phosphate rock and mudstone	WOM - 3319	0.8	21.4	--	--	--	34.0	8.4	86.63
P-15	Phosphate rock	WOM - 3318	4.5	35.0	--	--	--	4.7	12.9	244.13
P-14	Phosphate rock, calcareous	RH-3317	1.4	26.7	--	--	--	2.0	14.3	281.51

[1] Beds P-1 to P-11 of locality A are probably equivalent to beds P-9 through P-18 of locality B.

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-13	Phosphate rock	RH-3346	0.8	34.1	--	--	--	6.2	15.1	308.79
P-12	Phosphate rock	RH-3345	0.3	35.3	--	--	--	4.6	15.4	319.44
P-11	Phosphate rock	WOM - 3334	0.8	27.0	--	--	--	19.3	16.2	341.04
P-10	Phosphate rock	WOM - 3313	1.4	28.3	--	--	--	17.6	17.6	380.94
P- 9	Phosphate rock, argillaceous	WOM - 3312	0.6	17.7	--	--	--	43.2	18.2	391.56
P- 8	Mudstone	WOM - 3311	2.0	3.9	--	--	--	76.7	20.2	399.36
P- 7	Phosphate rock	WOM - 3310	0.7	29.9	--	--	--	13.9	20.9	420.29
P- 6	Phosphate rock	WOM - 3309	0.7	34.5	--	--	--	7.3	21.6	444.44
P- 5	Phosphate rock, argillaceous	WOM - 3308	1.5	19.5	--	--	--	37.3	23.1	473.69
P- 4	Phosphate rock, argillaceous	WOM - 3307	1.0	23.7	--	--	--	28.0	24.1	497.39
P- 3	Phosphate rock	WOM - 3306	1.2	28.8	--	--	--	17.6	25.3	531.93
P- 2	Mudstone and argillaceous phosphate rock	WOM - 3305	1.1	15.6	--	--	--	47.7	26.4	549.11
P- 1	Phosphate rock, argillaceous	WOM - 3335	1.1	23.9	--	--	--	28.1	27.5	575.40

SPECTROGRAPHIC ANALYSES--LEEFE, WYOMING LOT NO. 1213.

Locality A

Semi-quantitative analyses of samples of the Phosphoria formation, Leefe, Wyoming (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. In addition to the elements listed in the table below, Sb, As, Be, Bi, B, Ce, Cs, Cb, Ge, Hg, Mo, Nd, Pt, Re, Rb, Sc, Ta, Tl, Th, Sn, 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	Cd	Ca	Cr	Co	Cu	Ga	In	Fe	La	Pb	Mg	Mn	Ni	P	Si	Ag	Na	Sr	Ti	V	Yb	Y	Zn	Zr
P- 11	RMC-145-47	B'	E	ND	B'	F	ND	F	F	G	D	E	ND	E	D	E	B'	A	G	D	D	E	E	G	E	F	F
P- 10	RMC-144-47	B'	E	F	A	F	ND	F	F	G	D	ND	ND	E	D	E	D	A	G	D	E	E	E	G	E	F	F
P- 9	RMC-143-47	D	E	ND	A	E	ND	F	F	ND	E	E	F	E	E	E	A	B'	G	D	D	E	E	G	E	F	F
P- 8	RMC-142-47	B'	E	ND	A	E	ND	F	F	G	D	E	F	E	E	E	A	B'	G	D	D	E	D	G	E	E	F
P- 7	RMC-141-47	D	F	ND	A	E	ND	F	F	G	D	E	E	E	D	E	A	B'	G	D	D	E	D	G	E	E	F
P- 6	RMC-140-47	D	E	F	A	E	F	F	F	G	D	E	E	E	D	E	A	B'	G	D	D	E	D	G	E	E	F
P- 5	RMC-139-47	B'	E	ND	B'	E	F	F	F	G	D	F	E	E	D	E	B'	A	G	D	D	E	D	G	E	E	F
P- 4	RMC-138-47	B'	E	F	A	E	F	F	F	G	D	E	E	E	D	E	A	B'	G	D	D	E	D	G	E	E	F
P- 3	RMC-137-47	B'	E	F	A	E	F	F	F	G	D	E	E	E	D	E	A	B'	G	D	D	E	D	G	E	E	F
P- 2	RMC-136-47	B'	E	F	A	E	F	F	F	ND	D	E	E	E	D	E	A	A	G	D	D	E	D	G	E	E	F
P- 1	RMC-135-47	B'	E	ND	A	E	ND	F	F	ND	D	F	E	E	D	E	A	A	G	D	D	E	D	G	E	E	F

[1] B' is equivalent to B and C of Bureau of Mines analyses.