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STRATIGRAPHIC SECTIONS OF THE PHOSPHORIA FORMATION IN MONTANA

by

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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.

The work in Montana has been done with the aid of Missouri River Basin funds as part of a program of appraisal of the Missouri Basin mineral resources. These reports are placed on open file at the offices of the Geological Survey in Washington, D. C

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 ₂ O ₅ (cumulative)
				P ₂ O ₅	Acid insoluble		
Locality A, 4,800 level, 100 feet south of north heading							
E member of Phosphoria formation—basal beds only							

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 member of Phosphoria formation							
D-1	Phosphate rock	MRK-314	4.3	32.8	12.8	--	--
	Composite sample representing beds D-2 to D-7 of locality A.						
C member of Phosphoria formation—top beds only							
C-4	Quartzite	--	0.3	--	--	0.3	--
C-3	Conglomerate	--	0.9	--			

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 ₂ O ₅ (cumulative)
				P ₂ O ₅	Acid insoluble		

Locality A, 4,906 stope

E member of Phosphoria 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		
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 x percent P ₂ O ₅ (cumulative)
				P ₂ O ₅			

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

D member of Phosphoria formation sampled in hand trench near Canyon Creek, SE $\frac{1}{4}$ 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 ₂ O ₅ (cumulative)
				P ₂ O ₅	Al ₂ O ₃	Fe ₂ O ₃				

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

D member of Phosphoria formation sampled in hand trench near Canyon Creek, E $\frac{1}{2}$ SE $\frac{1}{4}$ 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 ₂ O ₅ (cumulative)
				P ₂ O ₅	Al ₂ O ₃	Fe ₂				

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 NW $\frac{1}{4}$ 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 ₂ O ₅ (
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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 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

Bed no.	Sample no.	Al	B	Ca	Cr	Cu	Fe	Mg	Mn
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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, NW $\frac{1}{4}$ 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 ₂ O ₅ (cumulative)
				P ₂ O ₅						

SOUTH GREENSTONE GULCH, MONTANA. LOT NO. 1250.

D member of Phosphoria formation sampled in south bulldozer trench at Greenstone Gulch, SE $\frac{1}{4}$ 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 x percent P ₂ O ₅ (cumulative)
				P ₂ O ₅	Acid insoluble		

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,						

UPPER FRENCH CREEK, MONTANA. LOT NO. 1248.

D member of Phosphoria formation sampled in bulldozer trench near Upper French Creek, SW $\frac{1}{4}$ 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 x percent P ₂ O ₅ (cumulative)
				P ₂ O ₅			

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. Konizeski, 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 x percent P ₂ O ₅ (cumulative)

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		
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	0.3	94.9	86.4	24.34
A- 1	Mudstone and sandstone	DAB-174	19.1	0.2	85.6	105.5	28.16

