

UNITED STATES DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY

ANALYTICAL DATA ON THE MEADE PEAK PHOSPHATIC SHALE MEMBER OF THE PHOSPHORIA  
FORMATION IN THE CENTRAL WOOLEY RANGE, SOUTHEASTERN IDAHO

BY

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

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## INTRODUCTION

The U.S. Geological Survey has published many reports on the phosphate deposits of the Phosphoria Formation in southeastern Idaho. These reports include stratigraphic descriptions, chemical analyses, and density data for the phosphate units. Gulbrandsen (1975) compiled a reference list of the main sources of these data to 1975.

This report includes a stratigraphic section, density determinations, and  $P_2O_5$  analyses for sampling units of the Meade Peak Phosphatic Shale Member of the Phosphoria Formation from sample locality CP-73. This sample locality is in Caribou County, about 25 km northeast of Soda Springs (fig. 1).

The stratigraphy and nomenclature of the Phosphoria Formation in the western phosphate field were described by McKelvey and others (1959). The methods used for sampling and describing the phosphatic units of the Meade Peak were described by Gere and others (1966) and Oberlindacher and Hovland (1979).

Phosphate section CP-73 is measured in a weathered zone. According to Gulbrandsen and Krier (1980, p. 10), the principal effect of post-depositional weathering is the loss of calcite, dolomite, and organic matter.  $P_2O_5$  analyses of weathered phosphate beds are slightly higher than unweathered phosphate beds at depth (McKelvey and Carswell, 1956, p. 485). Therefore, the  $P_2O_5$  analyses of this near surface section are not representative of the unweathered rocks at depth.

Detailed stratigraphic descriptions, density determinations, and  $P_2O_5$  analyses for each sampling unit of section CP-73 are listed in Table 1. The data is presented without interpretation in this report.

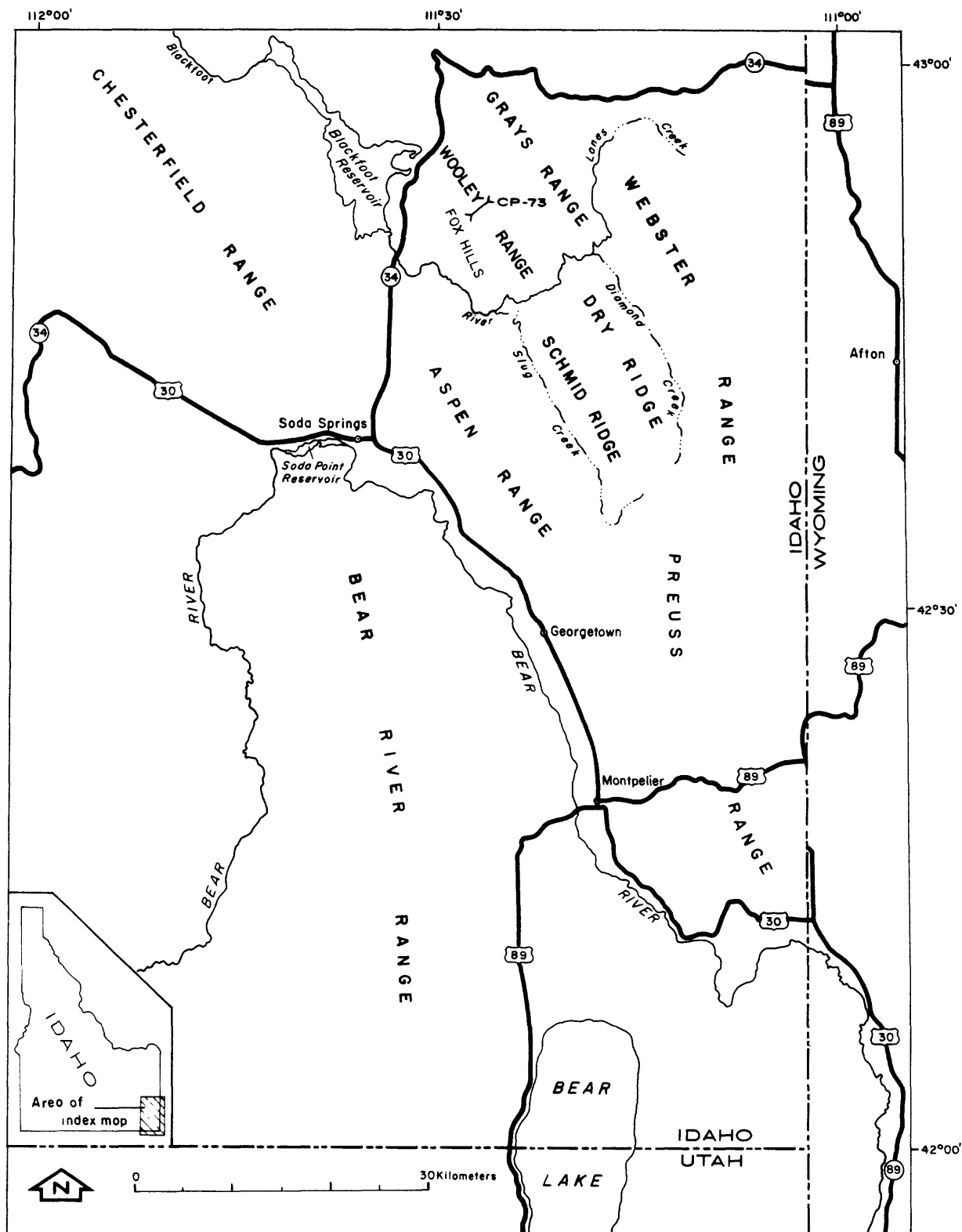


Figure 1.- Index map showing location of sample locality CP-73 in the central Wooley Range, southeastern Idaho.

## Acknowledgments

The author is grateful to the Monsanto Company, Soda Springs, Idaho for providing access to the Henry Mine area. The phosphate section (CP-73) in the Henry Mine was measured and sampled with Peter Oberlindacher, assisted by Clare E. Shemeta and Frank J. Rubio. Eve D. Roberts helped determine density values for phosphate-bearing beds within this section. I also thank Robert A. Gulbrandsen for providing helpful suggestions during all phases of this study.

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Table 1 - GENERALIZED STRATIGRAPHIC SECTION, DENSITY DETERMINATIONS AND P<sub>2</sub>O<sub>5</sub> ANALYSES OF SAMPLES FROM THE MEADE PEAK PHOSPHATIC SHALE MEMBER OF THE PHOSPHORIA FORMATION, CENTRAL WOOLEY RANGE SAMPLE LOCALITY CP-73, CARIBOU COUNTY, IDAHO

(The section was measured and sampled in 1978 by R. David Hovland and Peter Oberlindacher, assisted by Clare E. Shemeta and Frank J. Rubio. The section was located along a benched cut in the Henry Mine southern continuation, SE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 30 T. 6 S., R. 43 E., Boise Meridian, Idaho. Density determinations were made by R. David Hovland and Eve D. Roberts. Analyses for P<sub>2</sub>O<sub>5</sub> content were made by Z. Hamlin, U.S. Geological Survey, Reston, VA, using the "single solution" method as described by Shapiro (1975). Colors were determined by comparison with the "Rock-Color Chart" distributed by the National Research Council (Goddard, 1948), supplemented by the Munsell Soil Color Charts (Munsell Color, 1975). The average bedding strike is N36W, and the bedding dip varies from 62 NE at unit M-1, to 64 NE at unit M-39, to 68 NE at unit M-54, to 60 NE at unit M-58)

Sample No.	Unit No.	Rock Description	Thickness (m)	P <sub>2</sub> O <sub>5</sub> (percent)	Density (g/cm <sup>3</sup> )	Cumulative thickness (m)	Thickness X percent P <sub>2</sub> O <sub>5</sub> (cumulative)
Rex Chert Member of Phosphoria Formation (Permian) basal unit only							
CP-73 -60	R-1	Chert, dark-gray (2.5Y 4/0), hard, medium-bedded; sharp-planar contact with unit below.	Not Measured	0.72	2.53	--	--
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian)							
CP-73 -59	M-58	Siltstone, phosphatic, light brownish-gray (10YR 5/1), medium-hard to hard, shaly, laminated; blocky weathering; upper 5 cm of unit is a phosphatic mudstone; sharp-planar contact with unit below.	0.50	3.3	2.29	0.50	1.65
CP-73 -58	M-57	Siltstone, argillaceous, moderate-brown (7.5YR 4/4), soft; sharp-planar contact with unit below.....	0.83	0.36	1.68	1.33	1.95

Table 1 - GENERALIZED STRATIGRAPHIC SECTION, DENSITY DETERMINATIONS AND P<sub>2</sub>O<sub>5</sub> ANALYSES OF SAMPLES FROM THE MEADE PEAK PHOSPHATIC SHALE MEMBER OF THE PHOSPHORIA FORMATION, CENTRAL WOOLEY RANGE SAMPLE LOCALITY CP-73, CARIBOU COUNTY, IDAHO - Continued

Sample No.	Unit No.	Rock Description	Thickness (m)	P <sub>2</sub> O <sub>5</sub> (percent)	Density (g/cm <sup>3</sup> )	Cumulative thickness (m)	Thickness X percent P <sub>2</sub> O <sub>5</sub> (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued							
CP-73-57	M-56	Siltstone, phosphatic, carbonaceous, pale-brown (10YR 6/3), medium-hard, shaly, laminated; concentrically banded siltstone at base of unit; concentric bands are 7 by 15 cm; sharp-irregular contact with unit below...	1.01	2.1	2.32	2.34	4.07
CP-73-56	M-55	Sandstone, phosphatic, very-dark-gray (2.5Y 3/0), medium hard, poorly-bedded; moderately-to well-sorted, fine grained; grains are 65 percent quartz and 35 percent phosphatic peloids; gradational contact with unit below.....	1.02	14.5	2.44	3.36	18.86
CP-73-55	M-54	Siltstone, phosphatic, carbonaceous, pale-brown (7.5YR 5/2), medium-hard, shaly, poorly-bedded; some parts of unit weather to a friable argillaceous siltstone; sharp-planar contact with unit below.....	1.32	2.0	2.26	4.68	21.50

Table 1 - GENERALIZED STRATIGRAPHIC SECTION, DENSITY DETERMINATIONS AND P<sub>2</sub>O<sub>5</sub> ANALYSES OF SAMPLES FROM THE MEADE PEAK PHOSPHATIC SHALE MEMBER OF THE PHOSPHORIA FORMATION, CENTRAL WOOLEY RANGE SAMPLE LOCALITY CP-73, CARIBOU COUNTY, IDAHO - Continued

Sample No.	Unit No.	Rock Description	Thickness (m)	P <sub>2</sub> O <sub>5</sub> (percent)	Density (g/cm <sup>3</sup> )	Cumulative thickness (m)	Thickness X percent P <sub>2</sub> O <sub>5</sub> (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued							
CP-73-54	M-53	Phosphorite, carbonaceous, dark-gray (7.5YR 4/0), medium-hard, poorly-bedded; gradational contact with unit below.	0.46	33.0	2.82	5.14	36.68
CP-73-53	M-52	Siltstone, phosphatic, carbonaceous, moderate-yellowish-brown (10YR 5/4), soft to medium-hard, poorly-bedded; blocky weathering; gradational contact with unit below.....	0.52	4.8	2.26	5.66	39.18
CP-73-52	M-51	Phosphorite, with interbeds of carbonaceous siltstone as much as 1.5 cm thick, brownish-gray (10YR 3/1), medium-hard to hard, very-thin- to medium-bedded; gradational contact with unit below.....	0.82	31.5	2.73	6.48	65.01
CP-73-51	M-50	Siltstone, phosphatic, carbonaceous, pale-brown (10YR 5/3), hard, poorly-bedded; blocky-weathering; some limonite staining; gradational contact with unit below.....	0.35	11.5	2.26	6.83	69.03



Table 1 - GENERALIZED STRATIGRAPHIC SECTION, DENSITY DETERMINATIONS AND P<sub>2</sub>O<sub>5</sub> ANALYSES OF SAMPLES FROM THE MEADE PEAK  
PHOSPHATIC SHALE MEMBER OF THE PHOSPHORIA FORMATION, CENTRAL WOOLEY RANGE SAMPLE LOCALITY CP-73, CARIBOU  
COUNTY, IDAHO - Continued

Sample No.	Unit No.	Rock Description	Thickness (m)	P <sub>2</sub> O <sub>5</sub> (percent)	Density (g/cm <sup>3</sup> )	Cumulative thickness (m)	Thickness X percent P <sub>2</sub> O <sub>5</sub> (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued							
CP-73-50	M-49	Phosphorite and interbedded phosphatic, shaly, mudstone. Phosphorite beds are dark yellowish brown (10YR 4/2), soft to hard, and thin to medium bedded. Mudstone beds are moderate yellowish brown (10YR 4/4), soft to hard and laminated to thin bedded; gradational contact with unit below.....	1.18	30.4	2.38	8.01	104.90
CP-73-49	M-48	Phosphorite, silty, argillaceous, carbonaceous, grayish-brown (7.5YR 3/2), soft to medium-hard, laminated; gradational contact with unit below.....	1.48	27.2	2.30	9.49	145.16

Table 1 - GENERALIZED STRATIGRAPHIC SECTION, DENSITY DETERMINATIONS AND P<sub>2</sub>O<sub>5</sub> ANALYSES OF SAMPLES FROM THE MEADE PEAK PHOSPHATIC SHALE MEMBER OF THE PHOSPHORIA FORMATION, CENTRAL WOOLEY RANGE SAMPLE LOCALITY CP-73, CARIBOU COUNTY, IDAHO - Continued

Sample No.	Unit No.	Rock Description	Thickness (m)	P <sub>2</sub> O <sub>5</sub> (percent)	Density (g/cm <sup>3</sup> )	Cumulative thickness (m)	Thickness X percent P <sub>2</sub> O <sub>5</sub> (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued							
CP-73-48	M-47	Siltstone, phosphatic, argillaceous, and interbedded phosphorite. Siltstone beds are pale brown (10YR 5/3) and laminated. Phosphorite beds are dark gray (7.5YR 4/0) and as much as 4 cm thick. Unit as a whole is shaly, soft to medium hard; limonite stains along joint surfaces; gradational contact with unit below.....	2.00	16.0	2.59	11.49	177.16
CP-73-47	M-46	Siltstone, phosphatic, and interbedded silty phosphorite and siltstone. The upper 32 cm of unit is a siltstone, light yellowish brown (10YR 6/4), soft; rest of unit is pale brown (10YR 5/3), medium hard, and laminated; gradational contact with unit below.....	2.66	8.1	2.46	14.15	198.70

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Sample No.	Unit No.	Rock Description	Thickness (m)	P <sub>2</sub> O <sub>5</sub> (percent)	Density (g/cm <sup>3</sup> )	Cumulative thickness (m)	Thickness X percent P <sub>2</sub> O <sub>5</sub> (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued							
CP-73-46	M-45	Siltstone, carbonaceous, and interbedded phosphatic siltstone and phosphorite. The units are dark gray (7.5YR 3/0), medium hard to hard, shaly, blocky weathering; some gastropod casts; phosphorite interbeds are as much as 9 cm thick; zone of hard siltstone pebbles near base of unit; gradational contact with unit below.....	2.00	12.9	2.27	16.15	224.50
CP-73-45	M-44	Siltstone, phosphatic, moderate-brown (7.5YR 4/4), soft, poorly bedded; unit is deeply weathered; friable; sharp-irregular contact with unit below.....	0.67	2.1	1.58	16.82	225.91

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Sample No.	Unit No.	Rock Description	Thickness (m)	P <sub>2</sub> O <sub>5</sub> (percent)	Density (g/cm <sup>3</sup> )	Cumulative thickness (m)	Thickness X percent P <sub>2</sub> O <sub>5</sub> (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued							
CP-73-44	M-43	Siltstone, phosphatic, dark-gray (7.5YR 3/0) to grayish-brown (7.5YR 4/2), medium-hard to hard, laminated - to thin-bedded, shaly in part; blocky-weathering of unit; lower part of unit carbonaceous; gradational contact with unit below.....	2.33	9.9	2.24	19.15	248.98
CP-73-43	M-42	Siltstone, phosphatic, argillaceous, mottled, color varies from grayish-brown (7.5YR 3/2) to moderate-brown (7.5YR 4/4), soft, poorly bedded; sharp-planar contact with unit below.....	0.33	5.4	1.70	19.48	250.76

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Sample No.	Unit No.	Rock Description	Thickness (m)	P <sub>2</sub> O <sub>5</sub> (percent)	Density (g/cm <sup>3</sup> )	Cumulative thickness (m)	Thickness X percent P <sub>2</sub> O <sub>5</sub> (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued							
CP-73-42	M-41	Phosphorite and interbedded carbonaceous siltstone. Phosphorite beds are as much as 4 cm thick, brownish black (10YR 2/1). Siltstone beds are very dark grayish brown (10YR 3/2). Unit as a whole is medium hard, very thin to thin bedded; minor limonite staining along fractures; sharp-planar contact with unit below.....	0.50	14.8	2.14	19.98	258.16
CP-73-41	M-40	Siltstone, phosphatic, carbonaceous, black (7.5YR 2/0), medium-hard to hard, laminated to very thin-bedded; some laminated thin phosphorite beds are as much as 1 cm thick in the upper part of unit; lower 9 cm of unit is a phosphorite; gradational contact with unit below....	0.85	8.5	2.24	20.83	265.39

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Sample No.	Unit No.	Rock Description	Thickness (m)	P <sub>2</sub> O <sub>5</sub> (percent)	Density (g/cm <sup>3</sup> )	Cumulative thickness (m)	Thickness X percent P <sub>2</sub> O <sub>5</sub> (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued							
CP-73-40	M-39	Siltstone, phosphatic, argillaceous, carbonaceous, grayish-brown (7.5YR 4/2) to brownish-gray (10YR 3/1), medium-hard, poorly bedded, weathers blocky; gradational contact with unit below.....	0.70	5.3	2.18	21.53	269.10
CP-73-39	M-38	Siltstone, phosphatic, argillaceous, grades to siltstone at top of unit. Lower phosphatic siltstone unit is 40 cm thick, dark gray (7.5YR 3/0), medium hard and poorly bedded. Upper siltstone unit is grayish brown (10YR 4/3), soft, and friable. Unit as a whole has limonite stains along fractures; gradational contact with unit below.....	0.63	5.4	2.10	22.16	272.50

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Sample No.	Unit No.	Rock Description	Thickness (m)	P <sub>2</sub> O <sub>5</sub> (percent)	Density (g/cm <sup>3</sup> )	Cumulative thickness (m)	Thickness X percent P <sub>2</sub> O <sub>5</sub> (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued							
CP-73 -38	M-37	Phosphorite, argillaceous and interbedded mudstone. Phosphorite beds are brownish gray (10YR 3/1); mudstone beds are dusky yellowish brown (10YR 2/2). Unit as a whole is medium hard, very thin to thin bedded; gradational contact with unit below..	0.26	16.8	2.47	22.42	276.87
CP-73 -37	M-36	Mudstone, phosphatic, carbonaceous, silty, grayish-brown (10YR 4/3), medium-hard, generally poorly bedded with some minor laminations; gradational contact with unit below.....	0.33	3.4	2.10	22.75	277.99

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Sample No.	Unit No.	Rock Description	Thickness (m)	P <sub>2</sub> O <sub>5</sub> (percent)	Density (g/cm <sup>3</sup> )	Cumulative thickness (m)	Thickness X percent P <sub>2</sub> O <sub>5</sub> (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued							
CP-73-36	M-35	Phosphorite, carbonaceous, and phosphatic mudstone and siltstone. Basal siltstone bed is 8 cm thick, grayish brown (7.5YR 4/2), and medium hard. Overlying the basal siltstone bed is a 65-cm-thick phosphatic mudstone unit, very dark-grayish-brown (10YR 3/2), soft to medium-hard, and laminated. Upper phosphorite unit is brownish black (10YR 2/1), soft, and deeply weathered. Unit has a sharp planar contact with the unit below.....	1.37	13.1	1.98	24.12	295.93
CP-73-35	M-34	Siltstone, phosphatic, moderate-yellowish-brown (10YR 5/6), soft, friable, poorly-bedded; unit contains very dark-grayish-brown (10YR 3/2), unweathered, hard, subangular to subrounded siltstone pebbles throughout; gradational contact with unit below.....	0.91	1.5	1.58	25.03	297.30



Table 1 - GENERALIZED STRATIGRAPHIC SECTION, DENSITY DETERMINATIONS AND P<sub>2</sub>O<sub>5</sub> ANALYSES OF SAMPLES FROM THE MEADE PEAK PHOSPHATIC SHALE MEMBER OF THE PHOSPHORIA FORMATION, CENTRAL WOOLEY RANGE SAMPLE LOCALITY CP-73, CARIBOU COUNTY, IDAHO - Continued

Sample No.	Unit No.	Rock Description	Thickness (m)	P <sub>2</sub> O <sub>5</sub> (percent)	Density (g/cm <sup>3</sup> )	Cumulative thickness (m)	Thickness X percent P <sub>2</sub> O <sub>5</sub> (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued							
CP-73-34	M-33	Siltstone, phosphatic, reddish-brown (5YR 5/3), soft, deeply weathered, blocky-weathering in places, very-thin- to thin-bedded; extensive limonite staining; gradational contact with unit below.....	1.23	6.5	2.42	26.26	305.29
CP-73-33	M-32	Siltstone, phosphatic, clayey, moderate-brown (7.5YR 4/6), deeply weathered, soft, poorly-bedded; gradational contact with unit below.....	0.33	5.3	2.10	26.59	307.04
CP-73-32	M-31	Mudstone, phosphatic, silty, carbonaceous, brownish-gray (5YR 4/1), soft, friable, deeply weathered, laminated; gradational contact with unit below.....	1.15	9.2	1.93	27.74	317.62

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Sample No.	Unit No.	Rock Description	Thickness (m)	P <sub>2</sub> O <sub>5</sub> (percent)	Density (g/cm <sup>3</sup> )	Cumulative thickness (m)	Thickness X percent P <sub>2</sub> O <sub>5</sub> (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued							
CP-73-31	M-30	Mudstone, phosphatic, silty, carbonaceous, moderate-yellowish-brown (10YR 5/4), soft, thinly laminated, fissile; sharp-planar contact with unit below.....	0.86	12.2	2.14	28.60	328.12
CP-73-30	M-29	Siltstone, phosphatic, light-brownish-gray (10YR 5/1), hard, thin-bedded, blocky weathering, joints are stained with limonite; gradational contact with unit below.....	0.42	4.8	2.20	29.02	330.13
CP-73-29	M-28	Mudstone, phosphatic, silty, brownish-gray (5YR 4/1), soft, laminated, shaly, limonite stains on bedding planes; some carbonaceous interbeds; gradational contact with unit below.....	0.71	12.5	2.40	29.73	339.01

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Sample No.	Unit No.	Rock Description	Thickness (m)	P <sub>2</sub> O <sub>5</sub> (percent)	Density (g/cm <sup>3</sup> )	Cumulative thickness (m)	Thickness X percent P <sub>2</sub> O <sub>5</sub> (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued							
CP-73-28	M-27	Siltstone, phosphatic, brownish-gray (5YR 4/1), medium hard, very-thin to thin-bedded, shaly; gradational contact with unit below.....	1.15	13.1	2.32	30.88	354.07
CP-73-27	M-26	Siltstone, phosphatic, clayey, with carbonaceous laminations. Siltstone beds are light yellowish brown (10YR 6/4), and carbonaceous laminations are brownish gray (10YR 3/1). The unit as a whole is medium hard to soft; gradational contact with unit below....	1.00	14.0	2.30	31.88	368.07

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Sample No.	Unit No.	Rock Description	Thickness (m)	P <sub>2</sub> O <sub>5</sub> (percent)	Density (g/cm <sup>3</sup> )	Cumulative thickness (m)	Thickness X percent P <sub>2</sub> O <sub>5</sub> (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued							
CP-73 -26	M-25	Siltstone, phosphatic, with phosphorite interbeds as much as 6.5 cm thick. Siltstone units are very dark grayish brown (10YR 3/2), thinly laminated to very thin bedded, shaly, weathers blocky. The unit as a whole is medium hard; gradational contact with unit below.....	1.00	11.9	2.37	32.88	379.97
CP-73 -25	M-24	Siltstone, phosphatic, carbonaceous, with minor phosphorite beds as much as 1 cm thick. Siltstone beds are laminated and shaly. The unit as a whole is grayish brown (7.5YR 3/2), and medium hard; sharp-irregular contact with unit below.....	1.00	16.0	2.32	33.88	395.97

Table 1 - GENERALIZED STRATIGRAPHIC SECTION, DENSITY DETERMINATIONS AND P<sub>2</sub>O<sub>5</sub> ANALYSES OF SAMPLES FROM THE MEADE PEAK PHOSPHATIC SHALE MEMBER OF THE PHOSPHORIA FORMATION, CENTRAL WOOLEY RANGE SAMPLE LOCALITY CP-73, CARIBOU COUNTY, IDAHO - Continued

Sample No.	Unit No.	Rock Description	Thickness (m)	P <sub>2</sub> O <sub>5</sub> (percent)	Density (g/cm <sup>3</sup> )	Cumulative thickness (m)	Thickness X percent P <sub>2</sub> O <sub>5</sub> (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued							
CP-73 -24	M-23	Siltstone, phosphatic, calcareous, brownish-gray (10YR 4/1), medium-hard to hard, poorly-bedded, blocky-weathering; contains a thin carbonaceous lens; sharp-irregular contact with unit below.....	0.53	1.4	2.67	34.41	396.71
CP-73 -23	M-22	Phosphorite, with some minor mudstone interbeds as much as 1 cm thick near base. Phosphorite is silty, very dark grayish brown (5YR 3/1), medium hard to soft, laminated, shaly. Mudstone is phosphatic, carbonaceous, nodular, laminated; gradational contact with unit below.....	1.04	29.7	2.75	35.45	427.60

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Sample No.	Unit No.	Rock Description	Thickness (m)	P <sub>2</sub> O <sub>5</sub> (percent)	Density (g/cm <sup>3</sup> )	Cumulative thickness (m)	Thickness X percent P <sub>2</sub> O <sub>5</sub> (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued							
CP-73-22	M-21	Phosphorite, silty, with a 20-cm-thick phosphatic siltstone bed near middle of unit. Phosphorite beds are brownish gray (10YR 3/1), soft to medium hard, laminated to thin bedded; gradational contact with unit below.....	0.77	23.5	2.57	36.22	445.70
CP-73-21	M-20	Siltstone, phosphatic, clayey, carbonaceous, with phosphorite interbeds as much as 1 cm thick in the upper half of unit. Siltstone beds are grayish brown (7.5YR 3/2), medium hard, laminated to thin bedded, shaly; gradational contact with unit below.....	1.48	18.0	2.36	37.70	472.34

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Sample No.	Unit No.	Rock Description	Thickness (m)	P <sub>2</sub> O <sub>5</sub> (percent)	Density (g/cm <sup>3</sup> )	Cumulative thickness (m)	Thickness X percent P <sub>2</sub> O <sub>5</sub> (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued							
CP-73-20	M-19	Mudstone, phosphatic, and interbedded mudstone. The unit as a whole is dark yellowish brown (10YR 4/2), medium hard, very thin bedded, shaly; sharp-planar contact with unit below.....	0.69	13.0	2.17	38.39	481.31
CP-73-19	M-18	Phosphorite, with mudstone interbed in the middle of unit. Basal phosphorite bed is 7 cm thick, laminated and brownish gray (10YR 3/1). Overlying this phosphorite unit is a laminated, grayish brown (7.5YR 4/2), 12-cm-thick mudstone bed. The upper phosphorite bed is 18 cm thick, laminated and brownish gray (10YR 3/1); sharp-planar contact with unit below.....	0.37	25.4	2.80	38.76	490.70

Table 1 - GENERALIZED STRATIGRAPHIC SECTION, DENSITY DETERMINATIONS AND P<sub>2</sub>O<sub>5</sub> ANALYSES OF SAMPLES FROM THE MEADE PEAK PHOSPHATIC SHALE MEMBER OF THE PHOSPHORIA FORMATION, CENTRAL WOOLEY RANGE SAMPLE LOCALITY CP-73, CARIBOU COUNTY, IDAHO - Continued

Sample No.	Unit No.	Rock Description	Thickness (m)	P <sub>2</sub> O <sub>5</sub> (percent)	Density (g/cm <sup>3</sup> )	Cumulative thickness (m)	Thickness X percent P <sub>2</sub> O <sub>5</sub> (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued							
CP-73-18	M-17	Limestone, phosphatic, with two 1-cm- thick calcareous phosphorite beds at top of unit. Limestone beds are brownish gray (10YR 4/1), hard, poorly bedded, with minor limonite stains along fractures; sharp irregular contact with unit below.....	0.90	12.2	2.64	39.66	501.68
CP-73-17	M-16	Phosphorite, silty, brownish-gray (10YR 4/1), soft to medium-hard; lower 39 cm is laminated and upper 16 cm is thin-bedded; a few thin carbonaceous interbeds; limonite stains along fractures; gradational contact with unit below..	0.55	29.2	2.70	40.21	517.74



Table 1 - GENERALIZED STRATIGRAPHIC SECTION, DENSITY DETERMINATIONS AND P<sub>2</sub>O<sub>5</sub> ANALYSES OF SAMPLES FROM THE MEADE PEAK  
 PHOSPHATIC SHALE MEMBER OF THE PHOSPHORIA FORMATION, CENTRAL WOOLEY RANGE SAMPLE LOCALITY CP-73, CARIBOU  
 COUNTY, IDAHO - Continued

Sample No.	Unit No.	Rock Description	Thickness (m)	P <sub>2</sub> O <sub>5</sub> (percent)	Density (g/cm <sup>3</sup> )	Cumulative thickness (m)	Thickness X percent P <sub>2</sub> O <sub>5</sub> (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued							
CP-73-16	M-15	Phosphorite, silty, with a few thin clayey siltstone beds. Phosphorite beds are brownish gray (10YR 3/1), medium hard, laminated to very thin bedded; sharp-planar contact with unit below.....	1.16	30.7	2.80	41.37	553.36
CP-73-15	M-14	Phosphorite, silty, brownish- gray (5YR 4/1), medium-hard, blocky-weathering, some shaly zones throughout unit; sharp- planar contact with unit below.	0.70	35.5	2.90	42.07	578.21

Table 1 - GENERALIZED STRATIGRAPHIC SECTION, DENSITY DETERMINATIONS AND P<sub>2</sub>O<sub>5</sub> ANALYSES OF SAMPLES FROM THE MEADE PEAK PHOSPHATIC SHALE MEMBER OF THE PHOSPHORIA FORMATION, CENTRAL WOOLEY RANGE SAMPLE LOCALITY CP-73, CARIBOU COUNTY, IDAHO - Continued

Sample No.	Unit No.	Rock Description	Thickness (m)	P <sub>2</sub> O <sub>5</sub> (percent)	Density (g/cm <sup>3</sup> )	Cumulative thickness (m)	Thickness X percent P <sub>2</sub> O <sub>5</sub> (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued							
CP-73-14	M-13	Siltstone, phosphatic, clayey, grayish-brown (7.5YR 4/2), soft, poorly-bedded; sharp-planar contact with unit below.....	0.57	9.8	1.76	42.64	583.79
CP-73-13	M-12	Phosphorite, silty, with some 4-mm- to 5-cm-thick, carbonaceous, shaly, mudstone interbeds. Phosphorite beds are brownish gray (10YR 3/1), medium hard, laminated to thin bedded; sharp-planar contact with unit below.....	0.53	34.1	2.89	43.17	601.87
CP-73-12	M-11	Phosphorite, silty, with some 3-mm- to 3-cm-thick shaly claystone interbeds. Phosphorite beds are pale brown (10 YR 5/2), soft to medium hard, poorly bedded, with limonite staining along weathered fractured surfaces. Claystone beds are grayish brown (7.5YR 4/2); gradational contact with unit below.....	1.67	33.2	1.81	44.84	657.31

Table 1 - GENERALIZED STRATIGRAPHIC SECTION, DENSITY DETERMINATIONS AND P<sub>2</sub>O<sub>5</sub> ANALYSES OF SAMPLES FROM THE MEADE PEAK PHOSPHATIC SHALE MEMBER OF THE PHOSPHORIA FORMATION, CENTRAL WOOLEY RANGE SAMPLE LOCALITY CP-73, CARIBOU COUNTY, IDAHO - Continued

Sample No.	Unit No.	Rock Description	Thickness (m)	P <sub>2</sub> O <sub>5</sub> (percent)	Density (g/cm <sup>3</sup> )	Cumulative thickness (m)	Thickness X percent P <sub>2</sub> O <sub>5</sub> (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued							
CP-73-11	M-10	Phosphorite, clayey, brownish-black (10YR 2/1), soft, friable, contorted bedding, shaly; gradational contact with unit below..	2.73	27.1	2.72	47.57	731.29
CP-73-10	M-9	Phosphorite, clayey, with a few 3-cm-thick carbonaceous mudstone interbeds. Phosphorite beds are brownish black (10YR 2/1), soft to medium hard, poorly bedded, shaly, weathers blocky; sharp-planar contact with unit below.....	0.94	28.5	2.57	48.51	758.08
CP-73-9	M-8	Phosphorite, silty, carbonaceous, very-dark-gray (2.5Y 3/0), medium-hard, laminated, shaly; sharp-planar contact with unit below.....	0.63	27.5	2.58	49.14	775.41
CP-73-8	M-7	Phosphorite, silty, clayey, dark-brown (7.5YR 3/2), soft, friable; gradational contact with unit below.....	0.71	24.5	1.78	49.85	792.80

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Sample No.	Unit No.	Rock Description	Thickness (m)	P <sub>2</sub> O <sub>5</sub> (percent)	Density (g/cm <sup>3</sup> )	Cumulative thickness (m)	Thickness X percent P <sub>2</sub> O <sub>5</sub> (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued							
CP-73-7	M-6	Phosphorite, silty, color varies from brownish-gray (10YR 3/1) in lower part of unit to light-brownish-gray (10YR 5/1) in upper part of unit, soft to medium-hard, laminated with some contorted bedding, weathered, limonite staining along fractures and joints; gradational contact with unit below.....	1.35	33.2	2.87	51.20	837.62
CP-73-6	M-5	Phosphorite, clayey, color varies from brownish-gray (10YR 3/1), to light-brownish gray (10YR 5/1), soft to medium hard, laminated, some limonite staining; gradational contact with unit below.....	1.60	32.1	2.75	52.80	888.98

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Sample No.	Unit No.	Rock Description	Thickness (m)	P <sub>2</sub> O <sub>5</sub> (percent)	Density (g/cm <sup>3</sup> )	Cumulative thickness (m)	Thickness X percent P <sub>2</sub> O <sub>5</sub> (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued							
CP-73-5	M-4	Siltstone, dolomitic, pale-brown (10YR 6/3), weathers to weak-yellowish-orange (10YR 8/4), hard, poorly bedded, weathers blocky, manganese oxide staining on fracture surfaces; gradational contact with unit below.....	1.12	0.17	2.54	53.92	889.17
CP-73-4	M-3	Siltstone, brownish-gray (10YR 3/1), soft to medium-hard, laminated, with weak-orange (7.5YR 7/6) lamina; limonite staining along bedding planes; sharp-planar contact with unit below.....	0.19	0.47	2.37	54.11	889.26

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Sample No.	Unit No.	Rock Description	Thickness (m)	P <sub>2</sub> O <sub>5</sub> (percent)	Density (g/cm <sup>3</sup> )	Cumulative thickness (m)	Thickness X percent P <sub>2</sub> O <sub>5</sub> (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued							
CP-73-3	M-2	Siltstone, light-yellowish-brown (10YR 6/4), medium-hard with a 6-cm-thick clayey, phosphatic siltstone bed at base. Phosphatic siltstone unit is yellowish gray (10YR 3/1), soft, with some limonite staining; phosphate peloids as much as 5-mm-across near lower contact. Sharp-irregular contact with unit below.....	0.42	0.19	2.45	54.53	889.34
CP-73-2	M-1	Phosphorite, bioclastic, peloidal, dark-gray (7.5YR 4/0), medium-hard, thick-bedded; bioclasts are brachiopod shell fragments and minor fish scales; peloids are as much as 2-cm-across; sharp-irregular contact with unit below.....	0.10	34.2	2.88	54.63	892.76

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 PHOSPHATIC SHALE MEMBER OF THE PHOSPHORIA FORMATION, CENTRAL WOOLEY RANGE SAMPLE LOCALITY CP-73, CARIBOU  
 COUNTY, IDAHO - Continued

Sample No.	Unit No.	Rock Description	Thickness (m)	P <sub>2</sub> O <sub>5</sub> (percent)	Density (g/cm <sup>3</sup> )	Cumulative thickness (m)	Thickness X percent P <sub>2</sub> O <sub>5</sub> (cumulative)
Grandeur Tongue of Park City Formation (Permian), upper unit only							
CP-73-1	G-1	Dolomite, sandy, light- brownish-gray (10YR 6/1), hard, thick-bedded, fine to very-fine grained quartz sand.....	0.89	0.17	Not determined	--	--