

DEPARTMENT OF THE INTERIOR

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Analytical and stratigraphic data on the Meade Peak Phosphatic Shale Member
of the Phosphoria Formation at Freeman Pass, Caribou County, 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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CONTENTS

	Page
Introduction.....	1
Methods and Terminology.....	1
Acknowledgments.....	5
References Cited.....	5

ILLUSTRATIONS

	Page
Figure 1. Index map showing location of sample locality CP-75 in southeastern Idaho.....	2
2. Perspective, plan, and cross-sectional views of trench CP-75.....	4

TABLES

	Page
Table 1. Generalized stratigraphic section and P ₂ O ₅ analyses from the Meade Peak Phosphatic Shale Member at sample locality CP-75.....	8
2. Chemical composition of selected units of the Meade Peak Phosphatic Shale Member of the Phosphoria Formation from sample locality CP-75.....	31
3. Uranium and thorium analyses of selected units of the Meade Peak Phosphatic Shale Member of the Phosphoria Formation from sample locality CP-75.....	39

SYSTEM OF MEASUREMENT UNITS

The following report uses metric units of measure throughout. These metric units can be converted to English units by multiplying by the following factors.

<u>Metric unit</u> To convert	Multiply by	<u>English unit</u> To obtain
Meters (m).....	3.281	Feet (ft)
Millimeters(mm).....	0.03937	Inches (in)
Centimeters (cm).....	0.3937	Inches (in)
Kilometers (km).....	0.6214	Miles (mi)

INTRODUCTION

The U.S. Geological Survey has published extensive information on the phosphate deposits of the Permian Phosphoria Formation in southeastern Idaho. These reports include stratigraphic descriptions, chemical composition, and rock densities for the phosphate units. Gulbrandsen (1975) published a reference list of the major sources of these data to 1975. Other recent information on the analytical and stratigraphic data for these southeastern Idaho phosphate deposits are included in reports by Powell, Cook, and McKidry (1975); Maughan (1975, 1976, 1979ab); Desborough (1977); Claypool, Love, and Maughan (1978); Gulbrandsen (1979); Gulbrandsen and Krier (1980); and Hovland (1983).

This report includes a detailed stratigraphic section, and selected chemical analyses for sampling units of the Meade Peak from sample locality CP-75. This sample locality is in Caribou County, about 33 km east of Soda Springs (fig. 1). Detailed stratigraphic descriptions and P₂O₅ analyses for each sampling unit of section CP-75 are listed in Table 1. The detailed chemical analyses of selected units of section CP-75 are listed in Table 2. Table 3 contains uranium and thorium analyses of selected units for section CP-75. This analytical data is presented without interpretation in this report.

Phosphate section CP-75 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. P₂O₅ analyses of weathered phosphate beds are slightly higher than unweathered phosphate beds at depth (McKelvey and Carswell, 1956, p. 485). Therefore, the P₂O₅ analyses of this near surface section are not representative of the unweathered rocks at depth.

This study was supported by a program of the U.S. Geological Survey, Conservation Division (now a part of the Bureau of Land Management¹), to evaluate Federal phosphate mineral resources in Idaho.

Methods and Terminology

Section CP-75 was measured and sampled along the eastern part of Freeman Ridge in a bulldozer trench located in the NW1/4NW1/4NE1/4 sec. 10, T. 9 S., R. 45 E., Boise Meridian, Idaho.

The field investigation for this study was divided into the following four phases: 1) siting the proposed sampling trench; 2) clearing the trench site of brush and timber, stockpiling the topsoil, and cutting the trench with a bulldozer; 3) measuring, describing, and sampling all units within the Meade Peak;

¹ On January 19, 1982 the Secretary of Interior formed the Minerals Management Service from the Conservation Division of the U.S. Geological Survey. On December 3, 1982 the management of the onshore minerals program was transferred from the Minerals Management Service to the Bureau of Land Management.

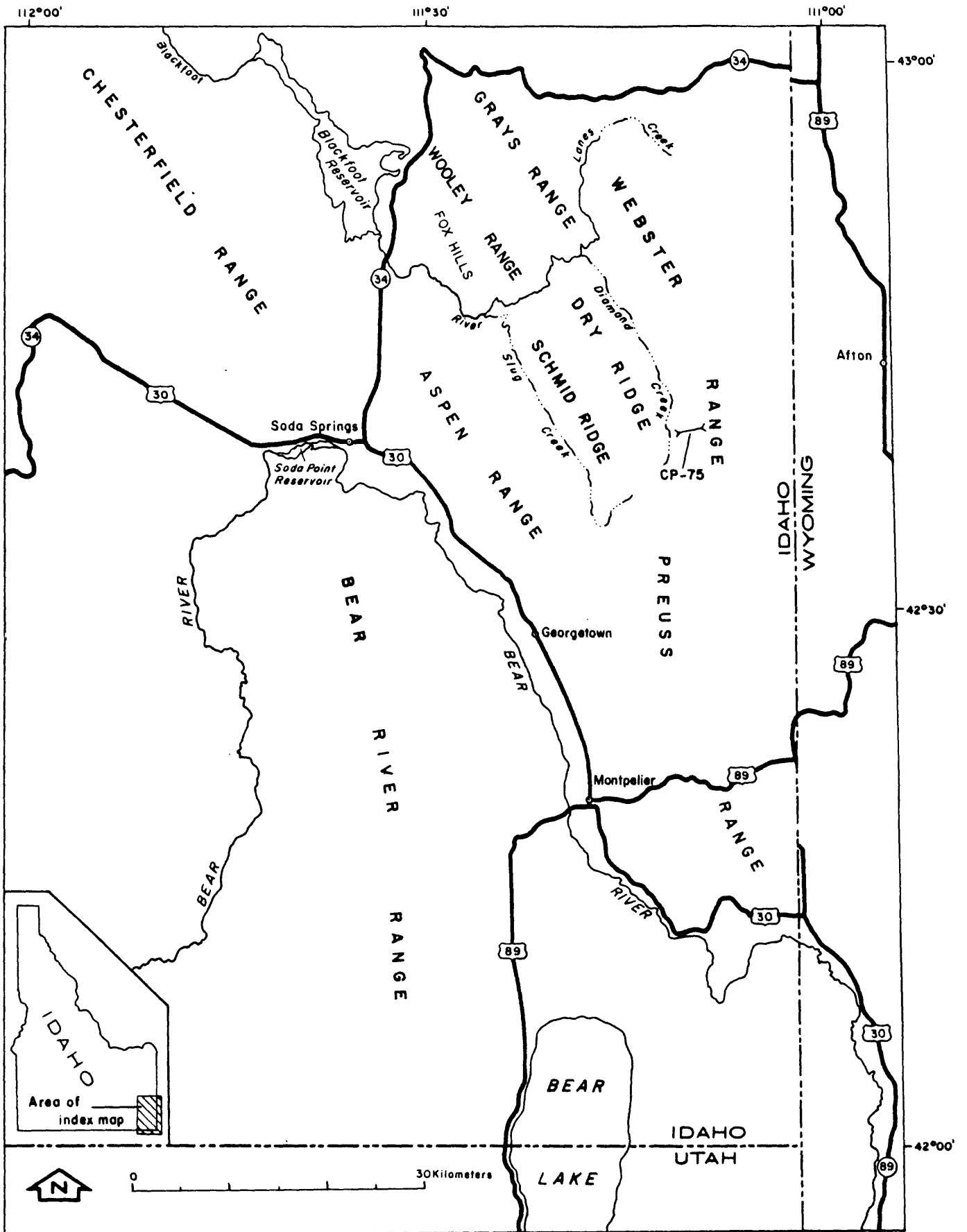


Figure 1. Index map showing location of sample locality CP-75 in southeastern Idaho.

and 4) backfilling and final reclamation of the trench site to USFS specifications. The final siting of CP-75 was completed on June 25, 1982. Site clearing and trenching commenced on August 26, 1982, and was completed on August 28, 1982. An entire section of the Meade Peak was exposed in the trench that measured about 76 m long, 15 m wide, and as deep as 4.6 m. Two benches were incorporated into the design of the trench for safety (fig. 2). All units of the Meade Peak were measured, described, and channel-sampled from August 29 to September 2. The trench was then backfilled after the sampling was completed, and the topsoil was replaced to the approximate original contour. The topsoil was then reseeded by the USFS.

The methods used for sampling and describing units of the Meade Peak were discussed by Gere and others (1966), and Oberlindacher and Hovland (1979). The stratigraphy and nomenclature of the Phosphoria Formation used in this report follows that described by McKelvey and others (1959). Bedding thickness was assigned in accordance with Ingram (1954). Rock 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).

Phosphate allochems such as peloids, oolites, and nodules were identified in the field with a hand lens. Grain size distributions and rounding of these allochems were also determined in the field. A "peloid" is a general term for a subrounded to rounded micritic grain 0.062 to 2 mm in diameter and is without internal structure. The term "peloid" is used where the origin of such a grain is in question. An oolite is a rounded accretionary grain 0.062 to 2 mm in diameter having an internal concentric structure that formed around a nucleus. A nodule is an irregular shaped, mostly subrounded, grain with no internal structure that is larger than 2 mm in diameter. Most nodules in CP-75 are 1 cm to 4 cm in diameter.

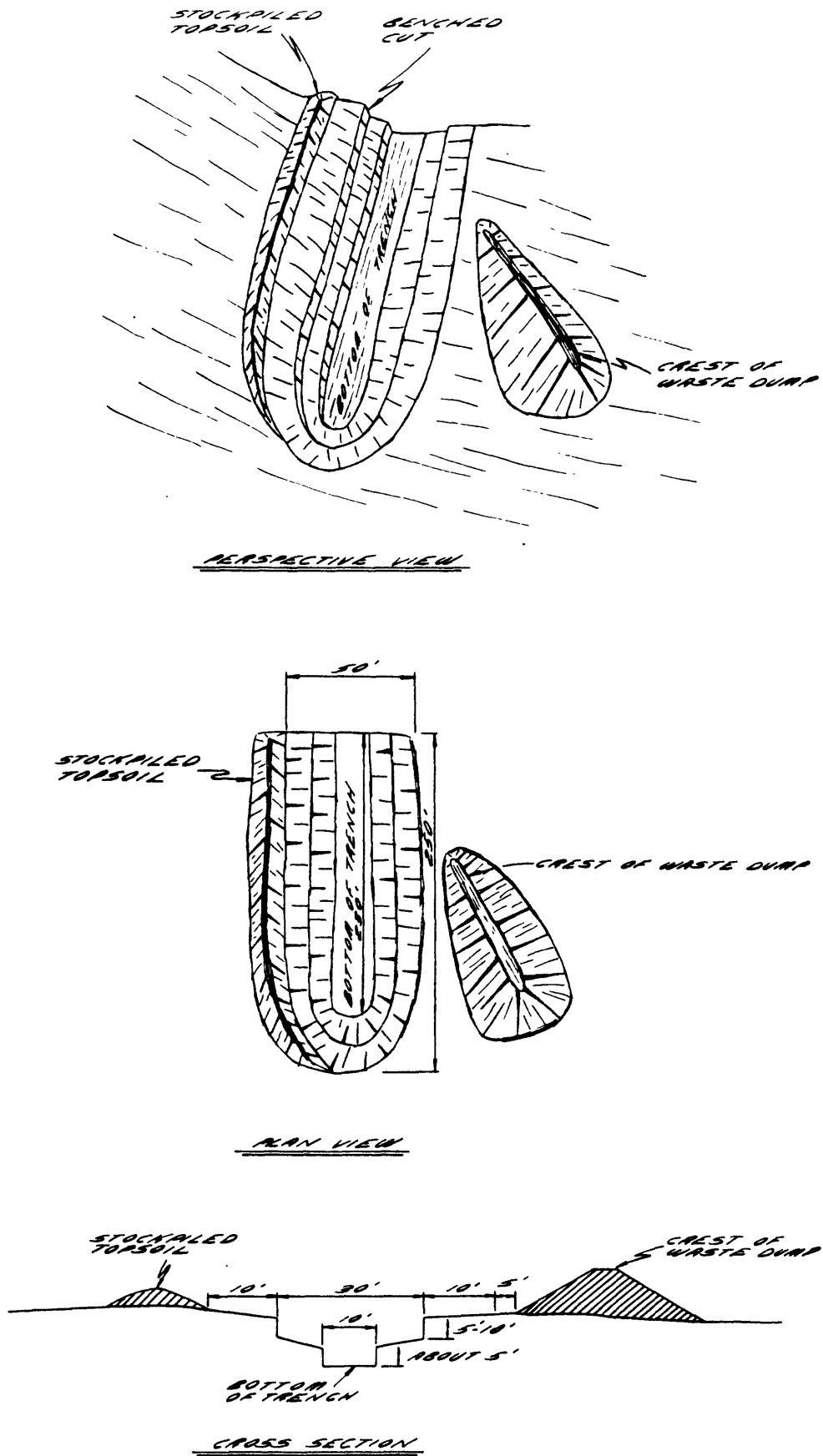


Figure 2. Perspective, plan, and cross-sectional views of trench CP-75. Diagrams not to scale.

Acknowledgments

The authors are grateful to Boyd Cook of the U.S. Forest Service in Soda Springs, Idaho for providing his expertise in locating an environmentally acceptable trench site, and providing guidance during all phases of trenching including the final reclamation of the site. Joseph Rasmussen, mining engineer with the Bureau of Land Management, also provided invaluable assistance during the siting of the trench.

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Table 1 - GENERALIZED STRATIGRAPHIC SECTION AND P₂O₅ ANALYSES OF SAMPLES FROM THE MEADE PEAK PHOSPHATIC SHALE MEMBER OF THE PHOSPHORIA FORMATION, FREEMAN PASS SAMPLE LOCALITY CP-75, CARIBOU COUNTY, IDAHO

(This section was measured and sampled from August 29 to September 2, 1982 by R. David Hovland and Eve D. Roberts-Tobey. The section was located in a bulldozer trench in the NW1/4NW1/4NE1/4 sec. 10, T. 9 S., R. 45 E., Boise Meridian, Idaho. Analyses for P₂O₅ content were made by J. Marinenko and Z. Brown, U.S. Geological Survey, Reston, VA, using the "single solution" method as described by Shapero (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 strike and dip of bedding measured at the following units is: N 5 W, vertical at unit M-5; N 7 W, 76 E at unit M-23; N 8 W, 60 E at unit M-38; N 5 W, 70 E at unit M-53; and N 2 E, 72 E at unit M-74.)

Sample No.	Unit No.	Rock Description	Thickness (m)	P ₂ O ₅ (percent)	Cumulative Thickness (m)	Thickness X percent P ₂ O ₅ (cumulative)
Rex Chert Member of Phosphoria Formation (Permian) basal unit only						
CP-75-80	R-1	Chert, argillaceous, very dark-gray (2.5Y 3/0) to dark-gray (2.5Y 4/0), hard, thin-bedded; sharp-planar contact with unit below	2.85	Not Determined	----	----
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian)						
CP-75-79	M-78	Phosphorite, silty, peloidal, nodular, brownish-black (10YR 2/1), soft; fine- to medium-grained phosphatic peloids; nodules are silty phosphorite and as much as 2 cm across; gradational contact with unit below	0.08	21.7	0.08	1.74

Table 1 - Continued

Sample No.	Unit No.	Rock Description	Thickness (m)	P ₂ O ₅ (percent)	Cumulative Thickness (m)	Thickness X percent P ₂ O ₅ (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued						
CP-75-78	M-77	Mudstone, silty, grayish-brown (10YR 4/3), soft; sharp-planar contact with unit below	0.6	2.7	0.68	3.36
CP-75-77	M-76	Mudstone, silty, moderate-yellowish-brown (10YR 4/4), medium-hard, very thin-bedded; some 1-mm-thick brownish-gray (10YR 3/1) laminations; sharp-planar contact with unit below	0.75	1.8	1.43	4.71
CP-75-76	M-75	Mudstone, similar to M-76, except unit is calcareous and shaly; sharp-planar contact with unit below	1.0	0.42	2.43	5.13
CP-75-75	M-74	Mudstone, silty, calcareous, grayish-brown (10YR 4/3), medium-hard to hard, very thin- to medium-bedded; some dark-gray (2.5Y 3/0) carbonaceous laminations as much as 6-mm-thick; sharp-planar contact with unit below	1.0	0.74	3.43	5.87
CP-75-74	M-73	Mudstone, similar to M-74 except unit is shaly and thin- to medium-bedded; sharp-planar contact with unit below	1.03	2.8	4.46	8.75

Table 1 - Continued

Sample No.	Unit No.	Rock Description	Thickness (m)	P ₂ O ₅ (percent)	Cumulative Thickness (m)	Thickness X percent P ₂ O ₅ (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued						
CP-75-73	M-72	Siltstone, calcareous, phosphatic, peloidal, laminated, brownish-gray (10YR 3/1), hard, medium-bedded; 1-mm-thick pale-brown (10YR 5/3) laminations; fine- to medium-grained phosphatic peloids; sharp-planar contact with unit below	0.58	1.9	5.04	9.85
CP-75-72	M-71	Phosphorite, peloidal, nodular, silty, laminated, dark-gray (7.5YR 3/0), hard, very thin- to thin-bedded; fine- to medium-grained phosphatic peloids; subrounded, phosphatic nodules, as much as 2 to 3 cm in diameter; sharp-planar contact with unit below	0.35	23.4	5.39	18.04
CP-75-71	M-70	Siltstone, shaly, laminated, dark-brown (10YR 3/3), medium-hard, very thin- to thin-bedded; 1- to 2-mm-thick, dark-gray (7.5YR 3/0), carbonaceous laminations that comprise 10 percent of unit; Liesegang banding; 1 percent phosphatic peloids throughout unit; sharp-planar contact with unit below	0.42	1.6	5.81	18.71

Table 1 - Continued

Sample No.	Unit No.	Rock Description	Thickness (m)	P ₂ O ₅ (percent)	Cumulative Thickness (m)	Thickness X percent P ₂ O ₅ (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued						
CP-75-70	M-69	Siltstone, carbonaceous, calcareous, bioclastic, laminated, grayish-brown (10YR 4/3) to moderate-yellowish-brown (10YR 5/6), medium-hard to hard, very thin- to medium-bedded; Liesegang banding; 1-mm-thick, brownish-gray (10YR 3/1), carbonaceous laminations throughout unit; bioclasts are bivalves; sharp-planar contact with unit below	0.7	0.58	6.51	19.12
CP-75-69	M-68	Phosphorite, peloidal, oolitic, silty, laminated, brownish-gray (10YR 3/1), medium-hard to hard, very thin- to thin-bedded; fine- to very coarse-grained, subrounded phosphatic peloids; fine- to medium-grained phosphatic ooliths; phosphatic nodules as much as 1 cm across; gradational contact with unit below	1.0	35.4	7.51	54.52
CP-75-68	M-67	Siltstone, phosphatic, moderate-yellowish-brown (10YR 4/4) to dark-yellowish-orange (10YR 6/8), soft to hard, thin-bedded; Liesegang banding; sharp-planar contact with unit below	0.4	3.0	7.91	55.72

Table 1 - Continued

Sample No.	Unit No.	Rock Description	Thickness (m)	P ₂ O ₅ (percent)	Cumulative Thickness (m)	Thickness X percent P ₂ O ₅ (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued						
CP-75-67	M-66	Mudstone (50 percent) and interbedded phosphorite (50 percent). Mudstone, carbonaceous, laminated, brownish-gray (10YR 3/1), hard, thin-bedded; Liesegang banding. Phosphorite, peloidal, silty, shaly, brownish-gray (10YR 3/1), medium-hard, very thin-bedded; medium- to coarse-grained phosphatic peloids; gradational contact with unit below	0.5	27.5	8.41	69.47
CP-75-66	M-65	Phosphorite, silty, peloidal, laminated, brownish-black (10YR 2/1), soft to medium-hard, very thin- to thin-bedded; medium- to coarse-grained phosphatic peloids; sharp-planar contact with unit below.....	0.56	34.0	8.97	88.51
CP-75-65	M-64	Siltstone, same as M-67	0.3	11.8	9.27	92.05
CP-75-64	M-63	Phosphorite, silty, peloidal, brownish-gray (10YR 3/1), soft to medium-hard, very thin-bedded; medium- to very coarse-grained phosphatic peloids; gradational contact with unit below	0.62	33.4	9.89	112.76

Table 1 - Continued

Sample No.	Unit No.	Rock Description	Thickness (m)	P ₂ O ₅ (percent)	Cumulative Thickness (m)	Thickness X percent P ₂ O ₅ (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued						
CP-75-63	M-62	Phosphorite, similar to M-63, except unit is laminated to very thin-bedded; gradational contact with unit below.....	0.59	35.4	10.48	133.64
CP-75-62	M-61	Phosphorite, silty, peloidal, black (2.5Y 2/0), soft, very thin-bedded; very fine-grained phosphatic peloids; gradational contact with unit below	0.33	26.8	10.81	142.49
CP-75-61	M-60	Phosphorite (50 percent) and interbedded siltstone (50 percent). Phosphorite, peloidal, silty, brownish-black (10YR 2/1), soft to medium-hard, laminated to very thin-bedded; fine- to medium-grained phosphatic peloids. Siltstone, phosphatic, carbonaceous, brownish-black (10YR 2/1), soft to medium-hard, laminated to very thin-bedded; sharp-planar contact with unit below	0.8	29.0	11.61	165.69
CP-75-60	M-59	Phosphorite and interbedded siltstone, same as M-60	0.6	26.0	12.21	181.29
CP-75-59	M-58	Phosphorite and interbedded siltstone, lithology same as M-60, gradational contact with unit below	0.65	23.7	12.86	196.69

Table 1 - Continued

Sample No.	Unit No.	Rock Description	Thickness (m)	P ₂ O ₅ (percent)	Cumulative Thickness (m)	Thickness X percent P ₂ O ₅ (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued						
CP-75-58	M-57	Phosphorite and interbedded siltstone, similar to M-60, except siltstone comprises 60 percent of unit; gradational contact with unit below	1.0	19.3	13.86	215.99
CP-75-57	M-56	Siltstone, peloidal, grayish-brown (10YR 4/3), soft to medium-hard, laminated to very thin-bedded; fine-grained phosphatic peloids; contains a 3-cm-thick phosphorite bed, 0.65 m below contact with M-57; sharp-planar contact with unit below	0.85	9.0	14.71	223.64
CP-75-56	M-55	Siltstone (80 percent) and interbedded phosphorite (20 percent). Siltstone, phosphatic, carbonaceous, grayish-brown (10YR 4/3) to brownish-gray (10YR 3/1), soft to medium-hard, laminated to very thin-bedded. Phosphorite, silty, peloidal, brownish-gray (10YR 3/1), medium-hard, laminated to very thin-bedded; gradational contact with unit below	1.0	16.2	15.71	239.84
CP-75-55	M-54	Siltstone and interbedded phosphorite, similar to M-55 except very thin-bedded and has Liesegang banding; sharp-planar contact with unit below	1.0	10.9	16.71	250.74

Table 1 - Continued

Sample No.	Unit No.	Rock Description	Thickness (m)	P ₂₀₅ (percent)	Cumulative Thickness (m)	Thickness X percent P ₂₀₅ (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued						
CP-75-54	M-53	Siltstone (60 percent) and interbedded phosphorite (40 percent). Siltstone, laminated, very dark-grayish-brown (10YR 3/2), medium-hard, thin-bedded. Phosphorite, peloidal, silty, laminated, brownish-gray (10YR 3/1), medium-hard, very thin- to thin-bedded; nodular at base; subrounded, phosphatic nodules as much as 5 cm across; sharp-irregular contact with unit below	1.0	19.0	17.71	269.74
CP-75-53	M-52	Siltstone, laminated, nodular, moderate-yellowish-brown (10YR 5/6) to dark-brown (10YR 3/3), soft to medium-hard, thin- to medium-bedded; subrounded, slightly phosphatic nodules as much as 3 cm across; Liesegang banding; sharp-planar contact with unit below	0.34	3.1	18.05	270.80

Table 1 - Continued

Sample No.	Unit No.	Rock Description	Thickness (m)	P ₂ O ₅ (percent)	Cumulative Thickness (m)	Thickness X percent P ₂ O ₅ (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued						
CP-75-52	M-51	Phosphorite (50 percent) and interbedded siltstone (50 percent). Phosphorite, nodular, peloidal, silty, brownish-gray (10YR 3/1), medium-hard, laminated to thin-bedded; phosphatic nodules as much as 2 cm across; sub-rounded, fine- to medium-grained phosphatic peloids. Siltstone, laminated, very dark-grayish-brown (10YR 3/2), medium-hard, thin-bedded; Liesegang banding; sharp-planar contact with unit below	0.75	16.5	18.80	283.17
CP-75-51	M-50	Siltstone, phosphatic, laminated, bioclastic, very dark-grayish-brown (10YR 3/2), medium-hard, very thin- to thin-bedded; laminated near base of unit; fossils are bivalves; sharp-planar contact with unit below	1.07	8.0	19.87	291.73
CP-75-50	M-49	Phosphorite, silty, peloidal, brownish-gray (10YR 3/1), medium-hard, laminated to thin-bedded; medium- to coarse-grained phosphatic peloids; gradational contact with unit below	0.67	19.9	20.54	305.07

Table 1 - Continued

Sample No.	Unit No.	Rock Description	Thickness (m)	P ₂₀₅ (percent)	Cumulative Thickness (m)	Thickness X percent P ₂₀₅ (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued						
CP-75-49	M-48	Siltstone, carbonaceous, brownish-black (10YR 2/1) to very dark-grayish-brown (10YR 3/2), soft to medium-hard, laminated to thin-bedded; gradational contact with unit below	1.0	4.5	21.54	309.57
CP-75-48	M-47	Siltstone, same as M-48	1.0	2.0	22.54	311.57
CP-75-47	M-46	Siltstone, same as M-48	1.0	3.0	23.54	314.57
CP-75-46	M-45	Siltstone (95 percent) with minor phosphorite (5 percent) in middle of unit. Siltstone, same as M-48. Phosphorite, peloidal, brownish-black (10YR 2/1), medium-hard, very thin- to thin-bedded; medium- to coarse-grained phosphatic peloids; gradational contact with unit below	1.0	10.8	24.54	325.37
CP-75-45	M-44	Siltstone, similar to M-45 except phosphorite comprises 10 percent of unit, gradational contact with unit below	0.9	12.6	25.44	336.71

Table 1 - Continued

Sample No.	Unit No.	Rock Description	Thickness (m)	P ₂ O ₅ (percent)	Cumulative Thickness (m)	Thickness X percent P ₂ O ₅ (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued						
CP-75-44	M-43	Phosphorite, peloidal, nodular, brownish-gray (10YR 3/1), medium-hard, very thin-bedded; medium- to coarse-grained, subrounded, phosphatic peloids; subrounded phosphatic nodules as much as 2 cm across; sharp-planar contact with unit below	0.15	30.0	25.59	341.21
CP-75-43	M-42	Siltstone, laminated, grayish-brown (10YR 4/3), medium-hard, very thin- to thin-bedded; gradational contact with unit below	0.64	2.9	26.23	343.06
CP-75-42	M-41	Siltstone, sandy, calcareous, dark-yellowish-orange (10YR 6/8), soft, friable; very fine-grained sand; gradational contact with unit below	1.13	0.74	27.36	343.90
CP-75-41	M-40	Siltstone, laminated, sandy, pale-brown (7.5YR 5/2) to moderate-yellowish-brown (10YR 4/4), hard, very thin- to thick-bedded; Liesegang banding; very fine-grained sand; sharp-irregular contact with unit below	2.2	0.76	29.56	345.57

Table 1 - Continued

Sample No.	Unit No.	Rock Description	Thickness (m)	P ₂ O ₅ (percent)	Cumulative Thickness (m)	Thickness X percent P ₂ O ₅ (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued						
CP-75-40	M-39	Siltstone (80 percent) and interbedded phosphorite (20 percent) in upper part of unit. Siltstone, same as M-40. Phosphorite, cherty, nodular, peloidal, dark-gray (2.5Y 4/0), hard, thin-bedded; subrounded to rounded phosphatic nodules from 5 mm to 4 cm in diameter; fine- to medium-grained phosphatic peloids; sharp-planar contact with unit below	0.7	5.2	30.26	349.21
CP-75-39	M-38	Phosphorite, peloidal, nodular, silty, laminated, very dark-gray (2.5Y 3/0), hard, thin-bedded; medium-grained phosphatic peloids; subrounded, phosphatic nodules from 1 to 3 cm in length; sharp-planar contact with unit below	0.73	29.8	30.99	370.96
CP-75-38	M-37	Siltstone, laminated, dark-brown (10YR 3/3), medium-hard to hard, thin- to medium-bedded; Liesegang banding; gradational contact with unit below	1.9	0.42	32.89	371.76

Table 1 - Continued

Sample No.	Unit No.	Rock Description	Thickness (m)	P ₂ O ₅ (percent)	Cumulative Thickness (m)	Thickness X percent P ₂ O ₅ (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued						
CP-75-37	M-36	Phosphorite (60 percent) and interbedded Siltstone (40 percent). Phosphorite, peloidal, nodular, laminated, silty, brownish-gray (10YR 3/1), medium-hard, very thin to thin-bedded; medium- to coarse-grained, subrounded phosphatic peloids; subrounded phosphatic nodules as much as 2 cm in diameter. Siltstone, similar to M-37 except very thin-bedded; sharp-planar contact with unit below	0.65	27.0	33.54	389.31
CP-75-36	M-35	Siltstone, similar to M-37 except thin-bedded and carbonaceous; sharp-planar contact with unit below	0.5	6.9	34.04	392.76
CP-75-35	M-34	Phosphorite, peloidal, brownish-black (10YR 2/1), medium-hard, laminated to very thin-bedded; medium- to coarse-grained, subrounded phosphatic peloids; gradational contact with unit below	0.2	18.3	34.24	396.42

Table 1 - Continued

Sample No.	Unit No.	Rock Description	Thickness (m)	P ₂ O ₅ (percent)	Cumulative Thickness (m)	Thickness X percent P ₂ O ₅ (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued						
CP-75-34	M-33	Siltstone, similar to M-37 except the unit is nodular, carbonaceous, and very thin to thin-bedded. The nodules are carbonaceous and as much as 4 cm in length; gradational contact with unit below	0.65	4.7	34.89	399.48
CP-75-33	M-32	Siltstone, phosphatic, slightly carbonaceous, peloidal, nodular, brownish-black (10YR 2/1), soft, laminated; medium- to coarse-grained, subrounded phosphatic peloids; subrounded phosphatic nodules from 1 to 2 cm in length; gradational contact with unit below	0.6	15.3	35.49	408.66
CP-75-32	M-31	Siltstone with a minor phosphorite bed near base. Siltstone, similar to M-37 except unit is carbonaceous, and very thin- to thin-bedded. Phosphorite, peloidal; 2 cm thick. Gradational contact with unit below	0.7	7.4	36.19	413.84

Table 1 - Continued

Sample No.	Unit No.	Rock Description	Thickness (m)	P ₂ O ₅ (percent)	Cumulative Thickness (m)	Thickness X percent P ₂ O ₅ (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued						
CP-75-31	M-30	Siltstone (60 percent) and interbedded phosphorite (40 percent). Siltstone, argillaceous, carbonaceous, grayish-brown (10YR 3/3), soft to medium-hard, thinly-laminated to very thin-bedded; carbonaceous laminations. Phosphorite, peloidal, silty, brownish-black (10YR 2/1), soft to medium-hard, thinly-laminated to very thin-bedded; medium- to coarse-grained, subrounded phosphatic peloids; gradational contact with unit below	1.0	11.4	37.19	425.24
CP-75-30	M-29	Siltstone (70 percent) and interbedded phosphorite (30 percent). Siltstone, same as M-30. Phosphorite, same as M-30	1.28	14.4	38.47	443.67
CP-75-29	M-28	Siltstone, mottled, grayish-brown (10YR 4/3) to moderate-yellowish-brown (10YR 5/4), soft, very thin-bedded, gradational contact with unit below	0.6	2.8	39.07	445.35

Table 1 -- Continued

Sample No.	Unit No.	Rock Description	Thickness (m)	P ₂ O ₅ (percent)	Cumulative Thickness (m)	Thickness X percent P ₂ O ₅ (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) -- Continued						
CP-75-28	M-27	Siltstone, calcareous, bioclastic, dark-brown (10YR 3/3), medium-hard to hard, very thin- to thin-bedded; Liesegang banding; bioclasts are brachiopods; gradational contact with unit below	1.0	1.5	40.07	446.85
CP-75-27	M-26	Siltstone, similar to M-27, except fossils include gastropods; sharp-planar contact with unit below	1.33	0.27	41.40	447.21
CP-75-26	M-25	Siltstone (70 percent) and interbedded phosphorite (30 percent). Siltstone, laminated, nodular, carbonaceous, moderate-yellowish-brown (10YR 4/4), medium-hard to hard, very thin- to thin-bedded; Liesegang banding; subrounded, phosphatic nodules as much as 1-cm-across. Phosphorite, peloidal, laminated, silty, brownish-gray (10YR 3/1); medium-hard, very thin- to thin-bedded; subrounded coarse-grained phosphatic peloids; gradational contact with unit below	1.0	2.0	42.40	449.21

Table 1 - Continued

Sample No.	Unit No.	Rock Description	Thickness (m)	P ₂ O ₅ (percent)	Cumulative Thickness (m)	Thickness X percent P ₂ O ₅ (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued						
CP-75-25	M-24	Siltstone, phosphatic, laminated, dark-brown (10YR 3/3) to moderate-yellowish-brown (10YR 4/4), soft to medium-hard, very thin- to thin-bedded; Liesegang banding; gradational contact with unit below	1.0	3.7	43.40	452.91
CP-75-24	M-23	Siltstone, similar to M-24, except unit is carbonaceous, and laminated to thin-bedded; sharp-planar contact with unit below	1.0	2.5	44.40	455.41
CP-75-23	M-22	Siltstone (95 percent) and interbedded phosphorite (5 percent). Siltstone, similar to M-24, except beds are carbonaceous, and laminated to very thin-bedded. Phosphorite, peloidal, 1- to 2-cm-thick beds; gradational contact with unit below	1.0	6.9	45.40	462.31
CP-75-22	M-21	Siltstone (95 percent) and interbedded phosphorite (5 percent). Siltstone, similar to M-24 except beds are carbonaceous, and laminated to very thin-bedded. Phosphorite, peloidal, 1- to 2-cm-thick beds; gradational contact with unit below	1.45	10.2	46.85	477.10

Table 1 - Continued

Sample No.	Unit No.	Rock Description	Thickness (m)	P ₂ O ₅ (percent)	Cumulative Thickness (m)	Thickness X percent P ₂ O ₅ (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued						
CP-75-21	M-20	Siltstone (80 percent) and interbedded phosphorite (20 percent). Siltstone, argillaceous, carbonaceous, laminated, dusky yellowish-brown (10YR 2/2), soft, laminated. Phosphorite, peloidal, silty, brownish-gray (10YR 3/1), medium-hard, laminated; fine to medium-grained phosphatic peloids; gradational contact with unit below	0.84	17.9	47.69	492.13
CP-75-20	M-19	Siltstone (90 percent) and interbedded phosphorite (10 percent). Siltstone, same as M-20. Phosphorite, same as M-20	1.0	13.9	48.69	506.03
CP-75-19	M-18	Siltstone (80 percent) and interbedded phosphorite (20 percent). Siltstone, same as M-20. Phosphorite, same as M-20	0.27	18.1	48.96	510.92

Table 1 - Continued

Sample No.	Unit No.	Rock Description	Thickness (m)	P ₂ O ₅ (percent)	Cumulative Thickness (m)	Thickness X percent P ₂ O ₅ (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued						
CP-75-18	M-17	Phosphorite (70 percent) and interbedded siltstone (30 percent). Phosphorite, silty, peloidal, laminated, brownish-black (10YR 2/1), soft to medium-hard, very thin-bedded; medium- to coarse-grained phosphatic peloids. Siltstone, phosphatic, peloidal, carbonaceous, very-dark-grayish-brown (10YR 3/2), medium-hard, laminated to very thin-bedded; medium- to coarse-grained phosphatic peloids; gradational contact with unit below	0.9	27.0	49.86	535.22
CP-75-17	M-16	Phosphorite (70 percent) and interbedded siltstone (30 percent). Phosphorite, same as M-17. Siltstone, same as M-17	1.15	26.2	51.01	565.35
CP-75-16	M-15	Siltstone, peloidal, phosphatic, dusky yellowish-brown (10YR 2/2), soft, unstratified; fine-grained phosphatic peloids; gradational contact with unit below	0.48	10.2	51.49	570.25

Table 1 - Continued

Sample No.	Unit No.	Rock Description	Thickness (m)	P ₂ O ₅ (percent)	Cumulative Thickness (m)	Thickness X percent P ₂ O ₅ (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued						
CP-75-15	M-14	Siltstone, carbonaceous, peloidal, shaly, phosphatic, nodular, laminated, grayish-brown (10YR 4/3), soft to medium-hard, very thin-bedded; Liesegang banding; fine-grained phosphatic peloids; subrounded, carbonaceous nodules as much as 3 cm across; gradational contact with unit below	0.8	11.1	52.29	579.13
CP-75-14	M-13	Siltstone, phosphatic, moderate-yellowish-brown (10YR 3/4), soft, unstratified; gradational contact with unit below	0.55	5.5	52.84	582.15
CP-75-13	M-12	Phosphorite, peloidal, argillaceous, carbonaceous, shaly, brownish-gray (10YR 3/1), medium-hard, thinly laminated to very thin-bedded; subrounded, medium-grained phosphatic, peloids; gradational contact with unit below	0.8	27.0	53.64	603.75
CP-75-12	M-11	Phosphorite, same as M-12	0.65	25.1	54.29	620.07

Table 1 - Continued

Sample No.	Unit No.	Rock Description	Thickness (m)	P ₂ O ₅ (percent)	Cumulative Thickness (m)	Thickness X percent P ₂ O ₅ (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued						
CP-75-11	M-10	Phosphorite, same as M-12	0.64	19.5	54.93	632.55
CP-75-10	M-9	Siltstone, phosphatic, dark-yellowish-brown (10YR 4/2), soft, unstratified; gradational contact with unit below	0.25	8.1	55.18	634.57
CP-75-9	M-8	Phosphorite, argillaceous, carbonaceous in part, peloidal, very dark-gray (2.5Y 3/0), medium-hard, laminated to very thin-bedded; fine-grained phosphatic peloids; gradational contact with unit below	0.7	28.6	55.88	654.59
CP-75-8	M-7	Phosphorite, same as M-8	0.85	29.6	56.73	679.75
CP-75-7	M-6	Phosphorite, lithology same as M-8; sharp-planar contact with unit below	0.53	28.1	57.26	694.65

Table 1 - Continued

Sample No.	Unit No.	Rock Description	Thickness (m)	P ₂ O ₅ (percent)	Cumulative Thickness (m)	Thickness X percent P ₂ O ₅ (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued						
CP-75-6	M-5	Phosphorite, silty, peloidal, laminated, carbonaceous, brownish-black (10YR 2/1) to dusky yellowish-brown (10YR 2/2), medium-hard, very thin-bedded; very fine- to fine-grained phosphatic peloids	0.8	20.8	58.06	711.28
CP-75-5	M-4	Phosphorite, peloidal, carbonaceous, shaly, very dark-grayish-brown (10YR 3/2), medium-hard, laminated to very thin-bedded; fine-grained phosphatic peloids; gradational contact with unit below	0.6	26.6	58.66	727.24
CP-75-4	M-3	Phosphorite, peloidal, laminated, brownish-black (10YR 2/1), soft to medium-hard, very thin-bedded, medium- to coarse-grained subrounded, phosphatic peloids; gradational contact with unit below	0.68	33.0	59.34	749.68

Table 1 - Continued

Sample No.	Unit No.	Rock Description	Thickness (m)	P ₂ O ₅ (percent)	Cumulative Thickness (m)	Thickness X percent P ₂ O ₅ (cumulative)
Meade Peak Phosphatic Shale Member of Phosphoria Formation (Permian) - Continued						
CP-75-3	M-2	Siltstone, dolomitic, calcareous, laminated, moderate-yellowish-brown (10YR 4/4), medium-hard, very thin- to thin-bedded; Liesegang banding; gradational contact with unit below	0.4	0.16	59.74	749.75
CP-75-2	M-1	Phosphorite, peloidal, bioclastic, dark-gray (2.5Y 4/0), hard; medium- to coarse-grained, sub-rounded phosphatic peloids; bioclasts are brachiopod fragments; sharp-irregular contact with unit below	0.08	33.6	59.82	752.44
Grandeur Tongue of Park City Formation (Permian), upper unit only						
CP-75-1	G-1	Dolomite, gray, (2.5Y 5/0), hard, thin-bedded	0.2	0.40	---	---

Table 2 - Chemical composition of selected units of the Meade Peak Phosphatic Shale Member of the Phosphoria Formation from sample locality CP-75, Caribou County, Idaho

	M-78	M-77	M-76	M-75	M-74	M-73	M-72	M-71	M-70	M-69
S ₁ O ₂	---	---	---	---	---	---	---	27.4	67.9	53.4
Al ₂ O ₃	---	---	---	---	---	---	---	2.8	10.4	8.3
Fe ₂ O ₃	---	---	---	---	---	---	---	0.87	3.2	2.8
FeO	---	---	---	---	---	---	---	---	---	---
MgO	---	---	---	---	---	---	---	0.24	1.1	4.6
CaO	---	---	---	---	---	---	---	34.9	3.5	10.4
Na ₂ O	---	---	---	---	---	---	---	0.52	1.3	1.1
K ₂ O	---	---	---	---	---	---	---	0.58	2.2	1.7
H ₂ O ⁺	---	---	---	---	---	---	---	1.8	3.0	2.5
H ₂ O ⁻	---	---	---	---	---	---	---	0.86	1.1	0.97
TiO ₂	---	---	---	---	---	---	---	0.16	0.69	0.57
P ₂ O ₅	21.7	2.7	1.8	0.42	0.74	2.8	1.9	23.4	1.6	0.58
MnO	---	---	---	---	---	---	---	0.02	0.03	0.07
CO ₂	---	---	---	---	---	---	---	2.2	1.2	12.3
	---	---	---	---	---	---	---	97	98	100
Corg	---	---	---	---	---	---	---	1.3	0.78	0.83
Cr ₂ O ₃	---	---	---	---	---	---	---	0.056	0.075	0.062
V ₂ O ₅	---	---	---	---	---	---	---	0.040	0.045	0.049
LOI	---	---	---	---	---	---	---	5.6	5.6	16.0
AI	33.7	81.0	84.7	89.3	80.4	72.8	13.0	30.5	84.6	64.8

Note: All values in weight percent. Due to organic matter in samples, FeO was not determined. LOI = loss on ignition, AI = acid insoluble, Corg = organic carbon. Analyses were made by J. Marinenko and Z. Brown, U. S. Geological Survey, Reston, VA.

Table 2 - Continued

	M-68	M-67	M-66	M-65	M-64	M-63	M-62	M-61	M-60	M-59
SiO ₂	6.9	69.2	22.7	8.7	49.7	10.9	5.3	14.1	10.4	19.0
Al ₂ O ₃	0.78	9.9	3.4	1.4	7.9	2.0	1.2	3.6	2.4	4.2
Fe ₂ O ₃	0.25	3.3	1.1	0.36	2.5	0.48	0.46	1.3	0.96	1.7
FeO	---	---	---	---	---	---	---	---	---	---
MgO	0.12	0.43	0.26	0.16	0.45	0.19	0.17	0.38	0.32	0.41
CaO	49.3	4.3	37.9	47.8	16.8	46.6	48.7	38.0	41.8	36.4
Na ₂ O	0.24	1.7	0.38	0.22	0.72	0.22	0.20	0.16	0.20	0.26
K ₂ O	0.20	1.7	0.66	0.25	1.5	0.43	0.28	0.64	0.54	0.87
H ₂ O ⁺	1.1	2.8	1.7	1.3	3.2	1.4	1.5	4.4	3.4	3.2
H ₂ O ⁻	0.77	1.1	0.93	0.88	1.4	0.94	1.0	2.8	2.6	2.0
TiO ₂	0.04	0.74	0.23	0.1	0.54	0.11	0.07	0.15	0.14	0.25
P ₂ O ₅	35.4	3.0	27.5	34.0	11.8	33.4	35.4	26.8	29.0	26.0
MnO	0.01	0.02	0.01	0.01	0.02	< 0.01	0.01	0.01	0.01	0.01
CO ₂	1.3	0.12	1.0	1.3	0.47	1.2	1.3	0.93	1.3	1.1
	97	99	98	97	98	99	97	98	97	98
Corg	0.76	0.53	0.57	0.86	0.98	0.81	1.3	4.5	3.9	2.2
Cr ₂ O ₃	0.092	0.081	0.11	0.12	0.16	0.12	0.19	0.26	0.24	0.32
V ₂ O ₅	0.14	0.20	0.098	0.18	0.20	0.27	0.35	0.47	0.84	0.75
LOI	3.4	4.1	3.7	3.8	5.5	3.9	4.8	12.3	10.9	8.0
AI	6.8	84.3	25.2	9.5	60.0	11.9	6.4	16.8	12.0	22.2

Note: All values in weight percent. Due to organic matter in samples, FeO was not determined. LOI = loss on ignition, AI = acid insoluble, Corg = organic carbon. Analyses were made by J. Marinenko and Z. Brown, U. S. Geological Survey, Reston, VA.

Table 2 - Continued

	M-58	M-57	M-56	M-55	M-54	M-53	M-52	M-51	M-50	M-49
SiO ₂	23.0	27.5	---	---	---	34.3	---	39.7	---	31.2
Al ₂ O ₃	4.7	5.4	---	---	---	5.6	---	6.2	---	5.0
Fe ₂ O ₃	1.7	1.8	---	---	---	2.3	---	2.2	---	1.8
FeO	---	---	---	---	---	---	---	---	---	---
MgO	0.40	0.40	---	---	---	0.28	---	0.22	---	0.27
CaO	33.5	28.0	---	---	---	26.0	---	22.7	---	28.3
Na ₂ O	0.35	0.49	---	---	---	0.74	---	0.95	---	0.76
K ₂ O	1.0	1.2	---	---	---	1.3	---	1.4	---	1.1
H ₂ O ⁺	3.6	4.5	---	---	---	3.0	---	3.1	---	3.1
H ₂ O ⁻	2.3	2.8	---	---	---	1.9	---	1.8	---	1.8
TiO ₂	0.28	0.31	---	---	---	0.38	---	0.41	---	0.32
P ₂ O ₅	23.7	19.3	9.0	16.2	10.9	19.0	3.1	16.5	8.0	19.9
MnO	< 0.01	0.01	---	---	---	< 0.01	---	< 0.01	---	0.01
CO ₂	0.99	0.83	---	---	---	0.51	---	0.49	---	0.60
	98	97	---	---	---	97	---	98	---	97
Corg	2.9	4.7	---	---	---	1.9	---	1.9	---	2.7
Cr ₂ O ₃	0.42	0.34	---	---	---	0.23	---	0.19	---	0.26
V ₂ O ₅	0.34	0.26	---	---	---	0.058	---	0.049	---	0.049
LOI	9.1	12.6	---	---	---	6.9	---	7.0	---	8.1
AI	27.0	33.4	62.2	44.2	60.5	41.5	83.1	47.9	70.6	36.8

Note: All values in weight percent. Due to organic matter in samples, FeO was not determined. LOI = loss on ignition, AI = acid insoluble, Corg = organic carbon. Analyses were made by J. Marinenko and Z. Brown, U. S. Geological Survey, Reston, VA.

Table 2 - Continued

	M-48	M-47	M-46	M-45	M-44	M-43	M-42	M-41	M-40	M-39
SiO ₂	---	---	---	---	---	---	---	---	---	---
Al ₂ O ₃	---	---	---	---	---	---	---	---	---	---
Fe ₂ O ₃	---	---	---	---	---	---	---	---	---	---
FeO	---	---	---	---	---	---	---	---	---	---
MgO	---	---	---	---	---	---	---	---	---	---
CaO	---	---	---	---	---	---	---	---	---	---
Na ₂ O	---	---	---	---	---	---	---	---	---	---
K ₂ O	---	---	---	---	---	---	---	---	---	---
H ₂ O ⁺	---	---	---	---	---	---	---	---	---	---
H ₂ O ⁻	---	---	---	---	---	---	---	---	---	---
TiO ₂	---	---	---	---	---	---	---	---	---	---
P ₂ O ₅	4.5	2.0	3.0	10.8	12.6	30.0	2.9	0.74	0.76	5.2
MnO	---	---	---	---	---	---	---	---	---	---
CO ₂	---	---	---	---	---	---	---	---	---	---
	---	---	---	---	---	---	---	---	---	---
Corg	---	---	---	---	---	---	---	---	---	---
Cr ₂ O ₃	---	---	---	---	---	---	---	---	---	---
V ₂ O ₅	---	---	---	---	---	---	---	---	---	---
LOI	---	---	---	---	---	---	---	---	---	---
AI	74.1	83.1	79.5	59.6	54.4	17.0	84.5	89.3	90.1	75.5

Note: All values in weight percent. Due to organic matter in samples, FeO was not determined. LOI = loss on ignition, AI = acid insoluble, Corg = organic carbon. Analyses were made by J. Marinenko and Z. Brown, U. S. Geological Survey, Reston, VA.

Table 2 - Continued

	M-38	M-37	M-36	M-35	M-34	M-33	M-32	M-31	M-30	M-29
SiO ₂	---	---	---	---	---	---	---	---	---	---
Al ₂ O ₃	---	---	---	---	---	---	---	---	---	---
Fe ₂ O ₃	---	---	---	---	---	---	---	---	---	---
FeO	---	---	---	---	---	---	---	---	---	---
MgO	---	---	---	---	---	---	---	---	---	---
CaO	---	---	---	---	---	---	---	---	---	---
Na ₂ O	---	---	---	---	---	---	---	---	---	---
K ₂ O	---	---	---	---	---	---	---	---	---	---
H ₂ O ⁺	---	---	---	---	---	---	---	---	---	---
H ₂ O ⁻	---	---	---	---	---	---	---	---	---	---
TiO ₂	---	---	---	---	---	---	---	---	---	---
P ₂ O ₅	29.8	0.42	27.0	6.9	18.3	4.7	15.3	7.4	11.4	14.4
MnO	---	---	---	---	---	---	---	---	---	---
CO ₂	---	---	---	---	---	---	---	---	---	---
	---	---	---	---	---	---	---	---	---	---
Corg	---	---	---	---	---	---	---	---	---	---
Cr ₂ O ₃	---	---	---	---	---	---	---	---	---	---
V ₂ O ₅	---	---	---	---	---	---	---	---	---	---
LOI	---	---	---	---	---	---	---	---	---	---
AI	14.8	91.9	20.6	71.3	38.0	74.7	33.0	64.3	49.0	44.5

Note: All values in weight percent. Due to organic matter in samples, FeO was not determined. LOI = loss on ignition, AI = acid insoluble, Corg = organic carbon. Analyses were made by J. Marinenko and Z. Brown, U. S. Geological Survey, Reston, VA.

Table 2 - Continued

	M-28	M-27	M-26	M-25	M-24	M-23	M-22	M-21	M-20	M-19
SiO ₂	---	---	---	75.8	59.8	66.4	54.0	47.7	28.0	38.7
Al ₂ O ₃	---	---	---	7.3	12.2	11.9	11.1	10.0	7.2	8.7
Fe ₂ O ₃	---	---	---	2.2	4.1	3.7	3.9	3.7	2.3	2.7
FeO	---	---	---	---	---	---	---	---	---	---
MgO	---	---	---	0.25	0.51	0.39	0.53	0.46	0.54	0.37
CaO	---	---	---	3.2	5.6	3.6	10.1	14.8	26.5	20.1
Na ₂ O	---	---	---	0.56	1.2	1.7	1.0	1.0	0.53	0.77
K ₂ O	---	---	---	1.6	2.9	2.7	2.7	2.4	1.8	2.1
H ₂ O ⁺	---	---	---	3.3	5.0	4.0	4.8	4.2	5.1	4.6
H ₂ O ⁻	---	---	---	1.2	2.0	1.4	1.9	1.7	2.8	2.2
TiO ₂	---	---	---	0.40	0.72	0.76	0.62	0.56	0.36	0.47
P ₂ O ₅	2.8	1.5	0.27	2.0	3.7	2.5	6.9	10.2	17.9	13.9
MnO	---	---	---	0.01	0.02	0.01	0.02	0.02	0.01	0.01
CO ₂	---	---	---	0.09	0.14	0.09	0.25	0.40	0.69	0.51
	---	---	---	99	100	100	100	99	98	98
Corg	---	---	---	1.3	1.7	1.2	1.8	1.6	4.2	3.0
Cr ₂ O ₃	---	---	---	.14	0.30	0.23	0.36	0.29	0.37	0.24
V ₂ O ₅	---	---	---	0.054	0.087	0.052	0.049	0.056	0.056	0.049
LOI	---	---	---	5.7	8.3	6.3	8.3	7.5	12.7	9.9
AI	78.0	72.3	26.5	86.2	77.4	83.4	69.8	61.7	36.2	50.6

Note: All values in weight percent. Due to organic matter in samples, FeO was not determined. LOI = loss on ignition, AI = acid insoluble, Corg = organic carbon. Analyses were made by J. Marinenko and Z. Brown, U. S. Geological Survey, Reston, VA.

Table 2 - Continued

	M-18	M-17	M-16	M-15	M-14	M-13	M-12	M-11	M-10	M-9
SiO ₂	28.6	13.5	16.6	46.0	45.7	56.7	17.0	18.3	32.0	56.6
Al ₂ O ₃	6.8	3.3	3.0	9.2	9.2	12.0	2.5	3.0	5.0	9.4
Fe ₂ O ₃	2.4	1.4	1.2	2.8	2.9	3.7	0.84	1.0	1.6	2.8
FeO	---	---	---	---	---	---	---	---	---	---
MgO	0.45	0.33	0.27	0.45	0.50	0.53	0.28	0.33	0.34	0.35
CaO	26.5	38.8	37.6	15.2	16.4	8.2	38.2	35.7	27.2	11.6
Na ₂ O	0.55	0.42	0.41	0.96	0.66	1.3	0.31	0.40	0.67	1.2
K ₂ O	1.8	0.96	0.81	2.3	2.8	2.7	0.83	0.85	1.4	2.3
H ₂ O ⁺	4.7	3.4	3.2	4.8	3.9	4.4	2.7	3.4	3.2	3.1
H ₂ O ⁻	2.8	2.3	2.2	2.4	1.8	2.1	2.1	2.5	2.1	1.4
TiO ₂	0.36	0.17	0.16	0.44	0.48	0.64	0.16	0.20	0.37	0.66
P ₂ O ₅	18.1	27.0	26.2	10.2	11.1	5.5	27.0	25.1	19.5	8.1
MnO	< 0.01	< 0.01	0.01	0.08	0.02	0.08	< 0.01	< 0.01	< 0.01	0.04
CO ₂	0.66	0.94	1.0	0.46	0.60	0.24	1.1	1.0	0.74	0.31
	98	96	96	98	98	99	96	96	97	99
Corg	4.1	3.7	3.5	2.4	1.9	1.4	3.0	4.1	2.9	1.3
Cr ₂ O ₃	0.34	0.31	0.21	0.21	0.19	0.14	0.14	0.13	0.12	0.093
V ₂ O ₅	0.056	0.085	0.15	0.21	0.12	0.10	0.10	0.13	0.54	0.30
LOI	12.0	10.5	10.0	9.6	8.0	7.6	9.0	11.1	9.0	6.0
AI	37.0	15.8	18.4	58.5	59.0	72.5	18.3	20.0	37.8	68.7

Note: All values in weight percent. Due to organic matter in samples, FeO was not determined. LOI = loss on ignition, AI = acid insoluble, Corg = organic carbon. Analyses were made by J. Marinenko and Z. Brown, U. S. Geological Survey, Reston, VA.

Table 2 - Continued

	M-8	M-7	M-6	M-5	M-4	M-3	M-2	M-1
SiO ₂	13.6	12.9	14.9	27.1	20.7	5.0	38.5	5.1
Al ₂ O ₃	2.2	2.1	2.4	5.5	3.3	0.88	4.9	0.30
Fe ₂ O ₃	0.83	0.71	0.90	1.6	1.0	0.38	1.4	0.19
FeO	---	---	---	---	---	---	---	---
MgO	0.25	0.25	0.28	0.38	0.36	0.25	9.9	0.27
CaO	40.0	42.0	39.9	30.1	37.4	47.5	16.7	49.3
Na ₂ O	0.42	0.40	0.41	0.57	0.69	0.96	0.59	0.90
K ₂ O	0.70	0.60	0.68	1.3	0.91	0.26	1.4	0.15
H ₂ O ⁺	2.7	2.6	2.8	3.4	2.4	2.5	1.4	1.5
H ₂ O ⁻	1.9	1.5	1.6	1.9	1.3	1.3	0.59	0.94
TiO ₂	0.15	0.13	0.13	0.26	0.16	0.06	0.38	0.01
P ₂ O ₅	28.6	29.6	28.1	20.8	26.6	33.0	0.16	33.6
MnO	< 0.01	< 0.01	< 0.01	0.03	0.01	< 0.01	0.01	< 0.01
CO ₂	1.2	1.1	1.2	0.87	1.3	2.0	24.2	2.8
	96	97	96	97	98	97	101	95
Corg	3.3	2.9	3.1	3.1	1.9	2.7	0.47	0.30
Cr ₂ O ₃	0.13	0.13	0.15	0.15	0.18	0.11	0.027	0.041
V ₂ O ₅	0.26	0.25	0.29	0.15	0.094	0.38	0.073	0.029
LOI	9.1	8.3	8.8	9.6	7.0	8.5	25.9	5.1
AI	15.4	13.3	16.4	32.5	22.3	5.0	44.7	5.2

Note: All values in weight percent. Due to organic matter in samples, FeO was not determined. LOI = loss on ignition, AI = acid insoluble, Corg = organic carbon. Analyses were made by J. Marinenko and Z. Brown, U. S. Geological Survey, Reston, VA.

Table 3 - Uranium and Thorium analyses of selected units of the Meade Peak Phosphatic Shale Member of the Phosphoria Formation from sample locality CP-75, Caribou County, Idaho.
 (Element determinations are based on delayed-neutron activation analysis by J. Storey, S. Danahey, B. Vaughn, and M. Coughlin; U.S. Geological Survey, Lakewood, Colorado. CV is coefficient of variation, expressed as a statistical approximation of precision (shown in percent) based on the measurement parameters).

Sample No.	Unit No.	Thorium		Uranium	
		ppm	CV	ppm	CV
CP-75-72	M-71	<19	-	93.9	1
CP-75-71	M-70	< 5.8	-	14.5	2
CP-75-70	M-69	< 4.8	-	9.02	2
CP-75-69	M-68	<25	-	136	1
CP-75-68	M-67	< 5.6	-	13.9	2
CP-75-67	M-66	<22	-	108	1
CP-75-66	M-65	<36	-	212	1
CP-75-65	M-64	<10	-	38.2	1
CP-75-64	M-63	<34	-	195	1
CP-75-63	M-62	<38	-	194	1
CP-75-62	M-61	<31	-	145	1
CP-75-61	M-60	<36	-	189	1
CP-75-60	M-59	<32	-	154	1
CP-75-59	M-58	<26	-	116	1
CP-75-58	M-57	<20	-	86.0	1
CP-75-54	M-53	<14	-	53.7	1
CP-75-52	M-51	<15	-	57.9	1
CP-75-50	M-49	<16	-	60.6	1
CP-75-26	M-25	< 9.2	-	15.5	3
CP-75-25	M-24	< 9.8	-	19.9	2
CP-75-24	M-23	17.6	12	10.1	2
CP-75-23	M-22	23.0	14	21.7	2
CP-75-22	M-21	23.3	14	21.7	2
CP-75-21	M-20	<16	-	45.4	2
CP-75-20	M-19	<12	-	30.9	2
CP-75-19	M-18	<11	-	33.9	2
CP-75-18	M-17	<20	-	69.2	2
CP-75-17	M-16	<31	-	125	1
CP-75-16	M-15	<12	-	29.7	2
CP-75-15	M-14	43.8	10	42.2	1
CP-75-14	M-13	24.9	13	21.0	2
CP-75-13	M-12	<25	-	107	1
CP-75-12	M-11	<25	-	107	1
CP-75-11	M-10	<25	-	114	1
CP-75-10	M-9	<13	-	45.7	1
CP-75-9	M-8	<28	-	130	1
CP-75-8	M-7	<28	-	125	1
CP-75-7	M-6	<34	-	159	1
CP-75-6	M-5	<23	-	92.5	1
CP-75-5	M-4	<18	-	69.9	1
CP-75-4	M-3	<32	-	158	1
CP-75-3	M-2	9.92	11	3.24	3
CP-75-2	M-1	<19	-	87.5	0.9