

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY^{1/}

Core samples from U.S. Bureau of Mines Wyoming Corehole No. 8 drilled in 1972 in NW1/4NE1/4 (1,047 ft S of N line and 2,095 ft W of E line) of sec 1, T 23 N, R 110 W, Sweetwater County, Wyoming

Surface elevation: 6,398 feet
 Cored interval: 355 to 775 feet

From	To	Description
355.0	355.8	Oil shale: Dark brownish gray (2.5Y to 10YR 3/1-2/1), calcareous. Finely laminated with abundant distinct buff earthy laminae and streaks in some parts. Regular shaly to papery parting. Rare fine gray tuff laminae. Sample of dark brownish-gray oil shale from 355.6 feet: X-ray - quartz, aragonite, feldspar, analcime, illite, pyrite, calcite.
355.8	357.8	Oil shale: Dark to medium brownish gray and olive gray (2.5 to 5Y 3/1-4/2), calcareous. Faintly laminated; abundant very fine distinct buff laminae and streaks in upper 0.6 foot. Regular thin to thick parting. Very thin light to medium gray tuff layers at 356.0, 356.4, and 357.1. Sample of oil shale with abundant buff earthy streaks and laminae from 356.2 feet: X-ray - aragonite, quartz, calcite, dolomite, analcime.
357.8	358.7	Oil shale: Dark and some medium brownish gray and olive gray (2.5 to 5Y 3/1-2/1, some 4/1), dolomitic. Faintly laminated. Slightly irregular thick to rare thin parting. Some very fine disseminated pyrite.
358.7	359.7	Oil shale: Dark to medium brownish gray and olive gray (2.5 to 5Y 2/1-4/2, some 5/2 lower part), dolomitic. Faint to some moderately distinct laminae. Abundant very fine disseminated pyrite. A 1-1/2-inch gray silty tuff band at top; some thin biotitic tuff streaks from 359.0 to 359.3. Indistinct conformable contact with mudstone below.
359.7	360.9	Mudstone: Medium to light brownish gray (2.5Y 5/1-6/1), very silty, slightly calcareous. Very faintly streaked to massive. Irregular thick parting; slightly irregular fracture. Abundant mica. Some fine carbonaceous plant debris. Indistinct slightly irregular contact with oil shale below. Sample of mudstone from 360.8 feet: X-ray - quartz, feldspar, dolomite, calcite, montmorillonite, illite, pyrite.
360.9	362.0	Oil shale: Olive gray to grayish brown (5Y 4/1 to 2.5Y 4/2 and some 5/2), slightly calcareous to dolomitic. Very faintly

^{1/} By L. G. Trudell, completed June 25, 1973.

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		laminated. Irregular thick parting; irregular to slightly conchoidal fracture. Some very fine disseminated pyrite in upper part.
		Sample of grayish-brown oil shale from 361.7 feet: X-ray - dolomite, calcite, quartz, feldspar, aragonite, montmorillonite.
362.0	363.2	Oil shale: Medium to dark brownish gray (2.5Y 4/2 and 4/1-2/1), dolomitic to slightly calcareous. Very faint to moderately distinct laminae. Regular thick to thin and some papery parting; hackly fracture in lower part.
363.2	363.6	Limestone: Tan to grayish brown and rare buff (10YR 6/3-5/3 and 5/2, rare 7/2), dolomitic in upper part. Fine blebby crystalline texture; some fine to thin dense layers in upper part. Rare biotite. Sample of dense to blebby limestone from 363.3-363.4 feet: X-ray - dolomite, quartz, feldspar, calcite, analcime.
363.6	364.7	Mudstone: Light gray to buff (10YR 7/1 and 6/1 to 2/5Y 7/1 and 7/2), silty to marly, slightly calcareous. Faintly streaked to very faintly laminated and banded. A 3/4-inch blebby limestone stringer at 363.9.
364.7	365.2	Oil shale: Tan and rare medium to dark grayish brown (2.5Y 6/3, rare 5/3-3/2). Faint streaked bedding and rare distinct slightly irregular laminae; slight unconformity near top. Some fine layers and streaks of abundant buff-white calcite blebs.
365.2	366.1	Siltstone: Gray to buff white (N5 to 2.5Y 8/1). Indistinctly interbedded with light brownish-gray to buff marlstone and mudstone stringers in upper 0.2 foot; contorted dark and light siltstone stringers in other parts. Some biotite. Sharp slightly irregular contact with oil shale below.
366.1	366.9	Oil shale: Buff and tan to medium and some dark olive gray and brownish gray (2.5Y and 5Y 7/2 and 6/3-4/2 and 4/1, some 3/1-2/1 lower part), slightly calcareous to dolomitic. Fairly distinct to faint, irregular to regular laminae and streaks. Irregular to regular thick parting. Abundant fine irregular buff limestone layers and blebs in upper 0.2 foot. Some fine to 1/2-inch brownish-gray to light gray and white silty biotitic tuff streaks and irregular layers in middle part. Very abundant fine brownish-gray to buff dolomite (?) blebs in lower inch.

Illustration No. SBR-4542P (Sheet 2 of 40)

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from U.S. Bureau of Mines Wyoming Corehole No. 8

From	To	Description
		Sample of olive-gray oil shale with rare silty biotitic streaks from 366.4 feet: X-ray - quartz, dolomite, calcite, analcime, feldspar, biotite, pyrite, montmorillonite.
366.9	367.1	Siltstone: Buff in upper part to light gray in lower part (5Y 7/2-6/1), calcareous. Faintly layered.
367.1	367.7	Limestone: Tan to brown in upper 2 inches (2.5Y 6/3-5/3), dark to medium slightly brownish and olive gray in lower part (2.5 to 5Y 3/1-5/1), dolomitic near top. Massive with some faint streaks. Coarse sandy texture; abundant white earthy grains; rare green grains. Sample of sandy-textured limestone from 367.3 feet: X-ray - quartz, calcite, dolomite, feldspar, analcime, illite.
367.7	370.0	Siltstone and mudstone: Gray buff to light gray (2.5Y 8/1 to N6), calcareous. Faint streaked bedding and irregular laminae. Irregular thick to thin parting. Some gray sandstone bands in lower part.
370.0	372.0	Missing.
372.0	375.0	Siltstone and sandstone: Light to medium gray (N7-5, rare 8), calcareous. Faint irregular bands, laminae, and streaks. Irregular parting and fracture; some rubble. Some crumbly earthy siltstone in lower part. Sample of gray sandstone from 374.4 feet: X-ray - quartz, feldspar, dolomite, calcite, pyrite, illite.
375.0	376.0	Mudstone and siltstone: Medium to light brownish gray and gray buff to light gray (2.5Y 5/1-6/1 and 6/2, some 7/1 to N7), calcareous. Faint to moderately distinct thin to fine laminae and some bands. Slightly irregular thick to thin parting. Some fine sandy biotitic layers and streaks.
376.0	377.1	Siltstone, mudstone, and some very fine sandstone: Light to rare dark gray (N7-5, rare 4-2) and some slightly brownish gray (2.5Y 6/1-5/1), calcareous. Faint to some fairly distinct irregular streaks and layers.
377.1	379.0	Sandstone and siltstone: Light to some medium gray (N6-7, some 5 lower part), calcareous. Faint regular bedding. Fairly regular to irregular thick to some thin parting.
379.0	380.5	Siltstone, mudstone, and sandstone: Light gray and light to some medium brownish gray (N6 and 2.5Y 6/1, some 5/1, rare 4/1), calcareous. Faint regular to distorted layers and streaks.

Illustration No. SBR-4542P (Sheet 3 of 40)

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from U.S. Bureau of Mines Wyoming Corehole No. 8

From	To	Description
		Fairly regular to irregular thick to thin parting. Some carbonaceous plant debris.
380.5	381.3	Mudstone and some siltstone: Medium to light slightly brownish gray and some gray buff (2.5Y and 10YR 5/1-6/1, some 7/1), calcareous. Faintly streaked and laminated. Fairly regular thick to some thin parting; regular fracture. Some very fine carbonaceous plant debris. Sample of slightly brownish-gray mudstone from 380.9 feet: X-ray - quartz, analcime, dolomite, calcite, feldspar, pyrite.
381.3	382.1	Sandstone: Light to medium slightly brownish gray (2.5Y 6/1-5/1), calcareous, medium to fine grained. Faintly streaked; some very calcitic buff streaks. Slightly rounded worn parting surfaces. Abundant very dark grains and white earthy to chalky grains.
382.1	382.7	Limestone: Buff to light and rare medium brownish gray (2.5Y 7/1 and 7/2-6/1 and 6/2, rare 5/2). Faintly streaked and mottled; some irregular fine platy limestone inclusions. Very sandy near top and bottom; very silty in middle.
382.7	385.1	Sandstone: Light to medium slightly brownish gray (2.5Y 6/1-5/1), medium to fine grained. Thinly layered with abundant very calcitic buff zones in upper part; becoming faintly streaked in lower part. Rare fine brown oil-shale (?) streaks.
385.1	388.2	Sandstone: Light to medium slightly brownish gray and some buff to brown (2.5Y 6/1-5/1, some 7/2-5/2 and 5/3), very calcitic, medium to fine grained. Faintly streaked and layered; some laminated marly zones. Rare small marlstone inclusions. Sample of sandstone from 386.5 feet: X-ray - dolomite, quartz, calcite, feldspar.
388.2	388.6	Mudstone: Light gray (N6, very slight brown tint), calcareous, massive, firm.
388.6	395.0	Sandstone and some siltstone: Light slightly olive to neutral gray (5Y 6/1 to N6 and 7), calcareous. Massive to faintly streaked; some faint laminae in lower part. Rare fine dark brownish gray oil-shale streaks.
395.0	397.0	Siltstone: Light gray (N6-7), calcareous. Faintly streaked and variegated. Sandy in parts.
397.0	397.5	Siltstone and mudstone: Light gray to medium slightly brownish gray (N6 to 2.5Y 5/1), calcareous. Faint to moderately distinct streaks and irregular laminae.

Illustration No. SBR-4542P (Sheet 4 of 40)

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from U.S. Bureau of Mines Wyoming Corehole No. 8

From	To	Description
397.5	400.0	Sandstone and some siltstone: Light gray (N6, some 7), calcareous. Faint streaked bedding. Some rubble.
400.0	403.5	Siltstone and some sandstone: Light gray (N6-7; very slight olive and brown tint in some parts), calcareous. Faint streaked bedding; contorted bedding at 402.4-402.6. Some rubble.
403.5	404.6	Siltstone and some sandstone: Light gray (N6-7), calcareous. Bedding marked by carbonaceous material and mica concentrated in very fine streaks; rare slight crossbedding. Fairly regular to irregular thick to very thin parting.
404.6	408.0	Siltstone and sandstone: Light gray (N6-7; some very slight brown tint), calcareous. Faintly streaked and rarely variegated. Irregular thick to some thin parting. Rare carbonaceous streaks.
408.0	412.0	Sandstone: Light gray (N6-7), calcareous, fine to medium grained. Faintly streaked to massive; some brownish-gray shaly streaks in lower part. Abundant white grains in some zones.
412.0	413.5	Siltstone, mudstone, and some fine sandstone: Light gray to slightly brownish gray (N6 to 2.5Y 6/1), calcareous. Faintly streaked to laminated. Irregular to fairly regular thick to thin parting. Some sparsely scattered carbonaceous plant debris.
413.5	415.0	Missing.
415.0	420.0	Siltstone and fine sandstone: Light gray and gray buff to some light and rare medium brownish gray (N7-6 and 2.5Y 7/1, some 6/1-6/2, rare 5/2), calcareous. Faint to some moderately distinct fairly regular to irregular layers and streaks. Irregular thick to rare thin parting.
420.0	421.0	Sandstone and mudstone: Light gray to medium brownish gray (N6 to 2.5Y 5/2 and 4/1), calcareous. Faint thin bands and laminae in upper part to faint fine displaced laminae and streaked bedding in lower part. Slightly irregular thick parting.
421.0	423.0	Mudstone: Medium and some light brownish to almost neutral gray (2.5Y 5/1 and 5/2-4/1 and 4/2, some 6/1), calcareous. Faint and some moderately distinct slightly irregular fine laminae and streaks in upper part to massive in lower part. Irregular to fairly regular thick parting. Abundant very fine disseminated pyrite in lower part.
423.0	424.0	Mudstone: Brownish gray (2.5Y 5/1 and 5/2-4/1 and 4/2, some N5 near base), calcareous. Massive to faintly laminated and streaked. Irregular to fairly regular thick parting. Some very fine pyrite. Rare carbonaceous plant debris.

Illustration No. SBR-4542P (Sheet 5 of 40)

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from U.S. Bureau of Mines Wyoming Corehole No. 8

From	To	Description
		Sample of brownish-gray mudstone from 423.7 feet: X-ray - quartz, feldspar, calcite, dolomite, montmorillonite, analcime, illite, pyrite.
424.0	426.0	Mudstone and siltstone: Medium to light brownish gray and neutral gray (2.5Y 5/1-6/1 and N5-6), calcareous. Faintly laminated and banded to massive. Slightly irregular thick to medium parting. Abundant very fine pyrite (and pyrrhotite?) in some brownish-gray zones. Rare carbonaceous flecks.
426.0	430.0	Mudstone and siltstone: Light to medium gray (N6-5; very slight brown tint), calcareous. Very faint commonly contorted streaked bedding. Thick shredded and broken brownish-gray mudstone stringer at 428.8. Some thin irregular interfingered grayish-brown oil-shale stringers in lower 0.3 foot.
430.0	430.1	Oil shale: Grayish brown (2.5Y 5/2-4/2), slightly calcareous. Very faintly streaked to finely laminated. Slightly irregular contact with sandstone below.
430.1	440.8	Sandstone: Light to some medium slightly brownish gray (2.5Y 6/1, some 5/1, rare 6/2 near top), fine to medium grained, very calcareous to slightly calcareous. Massive to faintly streaked; abundant small tan limestone inclusions near top. Irregular thick to some thin parting. (434.4-435.0 missing) Sample of sandstone from 439.4 feet: X-ray - dolomite, quartz, feldspar, calcite.
440.8	443.1	Sandstone and siltstone: Light and rare medium neutral to slightly brownish gray (N7-6, rare 5 and 2.5Y 7/1-6/1, rare 6/2-5/2 lower part), calcareous. Faint slightly irregular streaked bedding and some discontinuous laminae. Irregular to rare regular thick to rare medium and thin parting.
443.1	444.2	Mudstone (lean oil shale): Buff to light and some medium olive gray (5Y 7/2 and 7/1-6/2 and 6/1, some 5/2), calcareous. Very faint to fairly distinct streaked bedding. Irregular thick parting. Abundant fine to thin buff-white silty calcite streaks and blebs in upper part.
444.2	446.2	Oil shale: Light to medium olive gray (5Y 6/2-5/2, 4/2-4/1 in lower 0.3 foot), slightly calcareous to dolomitic. Faint streaked bedding and some very fine laminae. Some fine silty streaks. Sample of light to medium olive-gray oil shale from 444.6 feet: X-ray - dolomite, calcite, quartz, feldspar, analcime, montmorillonite, illite.

Illustration No. SBR-4542P (Sheet 6 of 40)

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from U.S. Bureau of Mines Wyoming Corehole No. 8

From	To	Description
446.2	448.7	Mudstone and marlstone (oil shale in part): Medium to light olive gray and neutral gray (5Y 4/2 and 4/1-6/1 and N5-6), calcareous. Faint to moderately distinct regular to some irregular fine to thin laminae and some streaked bedding. Irregular to regular thick parting. Abundant fine irregular gray silty streaks and patches with very fine pyrite in some zones.
448.7	450.1	Oil shale: Olive gray and some medium to light brownish gray (5Y 5/1, rare 4/2, and some 2.5Y 5/1-6/1), slightly calcareous. Faintly streaked to laminated. Irregular to regular thick to rare thin parting. Some fine to thin gray silty layers near base.
450.1	453.5	Siltstone: Light to medium slightly brownish and olive gray (2.5 to 5Y 6/1-5/1), calcareous. Very faint streaked bedding and some irregular to regular laminae and bands; very distorted bedding at 451.6-452.0. Regular to irregular thick to some very thin parting. Few thin gray sandy layers in upper part. Some carbonaceous plant debris in middle part.
453.5	457.0	Siltstone: Light gray (N6-7, very slight brown tint), calcareous. Very faintly bedded to massive; massive to thinly banded and laminated brownish-gray (10YR 5/1-4/1) silty mudstone at 454.7-455.0 and 455.5-455.9. Irregular to fairly regular thick to medium parting. Sparsely scattered fine carbonaceous debris. Sample of gray siltstone from 454.1 feet: X-ray - quartz, feldspar, calcite, dolomite, illite, analcime, pyrite.
457.0	458.9	Siltstone: Light to medium brownish gray and some light gray (10YR 6/1-5/1, some N7), calcareous. Very faintly bedded to massive. Regular to irregular thick parting. Fine carbonaceous plant debris becoming abundant in lower part.
458.9	459.2	Siltstone: Medium brownish gray (10YR and 2.5Y 5/1-4/1), calcareous. Very faintly bedded. Abundant very fine carbonaceous streaks.
459.2	460.3	Mudstone: Light to medium brownish gray (2.5Y 6/1-4/1), calcareous. Faintly bedded to massive. Fairly regular thick parting. A 1-inch band of thinly laminated brown to buff oil shale at 460.1-460.2. Light to medium gray silty pyritic tuff in lower 0.1 foot.
460.3	461.5	Oil shale: Light to medium and rare dark olive gray and brownish gray (5 and 2.5Y 6/1-5/1 and 5/2, some 4/1-4/2, rare 3/1), calcareous to dolomitic. Faint to some distinct laminae; some

Illustration No. SBR-4542P (Sheet 7 of 40)

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from U.S. Bureau of Mines Wyoming Corehole No. 8

From	To	Description
		very fine neutral gray laminae in upper part; some distinct thin to fine silty to earthy yellow-buff laminae in lower part. Regular to some irregular thick to thin parting. A 1/2-inch nodular dark gray silty layer at 461.4.
461.5	462.7	Marlstone: Light to medium olive gray and rare buff (5Y 6/1 and 6/2-5/1, rare 7/1-7/2), calcareous to dolomitic. Faintly laminated and banded. Regular to irregular thick parting.
462.7	464.1	Oil shale (?): Light to rare medium brownish gray and olive gray (2.5 to 5Y 6/1 and 6/2, rare 5/1), dolomitic. Faintly laminated and banded. Irregular to regular thick parting; slightly conchoidal to regular fracture. Sample of light brownish-gray oil shale from 462.9 feet: X-ray - dolomite, quartz, analcime, calcite, feldspar.
464.1	465.0	Oil shale: Light to rare dark brownish gray and olive gray (2.5 to 5Y 6/1-5/1 and 5/2, rare 4/1-3/1), dolomitic to slightly calcareous. Faint and rare distinct laminae and streaks. Regular to irregular thick parting. Very thin dark gray silty pyritic layers near top and bottom; rare very small pyritic blebs and lenses in other parts.
465.0	466.5	Siltstone and mudstone: Medium to light gray (N5-6, slight brown tint), slightly calcareous. Massive to very faintly bedded. Slightly irregular thick parting; regular fracture. A thin tan to dark brownish-gray laminated oil-shale layer at 466.05, overlying a 2-inch tan to buff oolitic dolomite band. Sample of oolitic band from 466.1 feet: X-ray - calcite, dolomite, quartz, analcime.
466.5	468.5	Oil shale: Light to medium brownish gray and olive gray (2.5 to 5Y 6/1 and 6/2-5/2, some 4/2 lower part, rare 3/1-2/1 near base). Faint to moderately distinct laminae and streaked bedding. Irregular to regular thick to medium parting.
468.5	470.0	Oil shale: Dark and rare medium brownish gray to black (2.5Y 3/1-2/1, rare 4/2-5/2 near top). Faint streaked bedding. Slightly irregular thick parting; some hackly fracture. Rare fine to thin brown to buff dolomite streaks and lenses. One-inch gray biotitic tuff nodules at 469.7-469.8. Sample of dark brownish-gray oil shale from 469.5 feet: X-ray - quartz, calcite, dolomite, analcime, feldspar, illite, pyrite.
470.0	471.6	Marlstone and lean oil shale: Olive gray to buff (5Y 5/2-7/2 and 7/1), dolomitic. Distinctly laminated and banded to faintly

Illustration No. SBR-4542P (Sheet 8 of 40)

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from U.S. Bureau of Mines Wyoming Corehole No. 8

From	To	Description
		streaked. Irregular to regular thick to rare thin parting; some rubble. Rare thin to fine dark oil-shale laminae. A 1-inch gray fine-grained crystalline calcite band at 470.5. Some buff earthy nodules in wavy bedding near base.
471.6	473.6	Oil shale: Light to medium olive gray and rare buff (5 to 7.5Y 6/2-5/2 and 5/1, rare 7/2, some 4/1 lower part), dolomitic. Moderately distinct to faint streaked bedding and rare laminae. A 1-inch irregular fractured dense light brownish-gray to buff cherty lens at 471.7; thin buff-white lens at 473.0. A 1/2-inch gray silty tuff band at 473.5.
473.6	475.2	Marlstone: Light and rare medium slightly olive gray to gray buff (5Y 6/1-7/1, rare 5/1 upper part), dolomitic to slightly calcareous. Faintly laminated and banded. Regular to irregular thick to medium parting. Abundant dark pyrrhotite (?) flecks commonly concentrated in fine layers. Thin dense buff cherty stringer at base. Sample of marlstone with very fine dark flecks from 474.7-474.9 feet: X-ray - calcite, dolomite, quartz, feldspar.
475.2	475.7	Marlstone: Light olive gray to some buff (5Y 6/2, some 7/2-7/1 lower part), dolomitic. Nearly massive to faintly laminated.
475.7	476.7	Oil shale: Light to medium brownish gray (2.5Y 6/2-5/2, rare 4/2), dolomitic. Faintly streaked to laminated. Irregular parting and fracture. Sample of medium brownish-gray laminated oil shale from 476.5 feet: X-ray - dolomite, calcite, quartz, feldspar, illite.
476.7	478.0	Oil shale: Medium to dark brownish gray (2.5Y 4/2-2/1, rare 5/2), dolomitic. Faint to some distinct streaked bedding. Fairly regular to irregular thick parting; some irregular hackly fracture. Abundant very fine horizontal to diagonal crystalline streaks in lower half. Occasional very thin dense brown lenses and blebs in lower part.
478.0	480.7	Marlstone and lean oil shale: Gray buff to light and some medium olive gray (5Y 7/1-6/1 and 6/2, some 5/1-5/2 near top and bottom), dolomitic. Moderately distinct to faint laminae and bands; faint streaked bedding in some zones. Irregular to regular thick parting; regular to irregular and conchoidal fracture. Some fine gray silty pyritic streaks at 478.4-478.5. Rare fine to thin buff to yellowish-tan marlstone streaks and layers.

Illustration No. SBR-4542P (Sheet 9 of 40)

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from U.S. Bureau of Mines Wyoming Corehole No. 8

From	To	Description
480.7	481.7	Oil shale: Medium and some light to rare dark olive gray (5Y 5/2-4/2, some 6/2, rare 3/1), dolomitic. Faint to fairly distinct streaked bedding. Irregular to regular thick parting.
481.7	482.2	Oil shale: Medium to dark olive gray (5Y 5/2-3/1, some 2/1), dolomitic. Moderately distinct to faint streaked bedding. Irregular thick to medium parting.
482.2	482.5	Oil shale: Black to dark olive gray (5Y 1/2-3/2), dolomitic. Very faintly bedded. Regular very thin to thick parting.
482.5	483.4	Oil shale: Medium to light olive gray and rare buff to gray buff (5Y 5/2-6/2 and 6/1, rare 7/2-7/1), dolomitic. Faint streaked bedding with few distinct marlstone stringers in upper part; becoming thinly laminated near base. Irregular to regular thick parting. Abundant very fine lacy calcite-filled fractures (mostly low angle). A thin lenticular buff marlstone layer with some fine massive pyrite streaks and blebs near top. A fine buff-white very biotitic tuff layer at 483.3.
483.4	484.8	Mudstone: Light gray (N6-7, slight olive tint), dolomitic to calcareous. Faint laminae and streaked bedding. Irregular thick parting; irregular to conchoidal fracture. Occasional thin to fine white earthy to slightly silty streaks and lenses. Abundant very fine gray calcite specks concentrated in fine streaks to thin zones; commonly with very fine disseminated pyrite. Sample of mudstone with abundant very fine calcite specks from 484.0 feet: X-ray - calcite, dolomite, quartz, feldspar, analcime.
484.8	486.2	Mudstone and marlstone: Light gray to some buff (N7 to 5Y 7/1 and 6/1, some 7/2 near base), dolomitic to slightly calcareous. Faintly banded with some very faint laminae. Regular thick parting; regular to slightly irregular and conchoidal fracture. Some fine massive pyrite streaks and blebs. A thin white to gray silty tuff layer with abundant very fine dark grains at 485.6. Sharp conformable contact with oil shale below. Sample of gray-buff slightly silty marlstone from 485.7 feet: X-ray - dolomite, quartz, calcite, feldspar, analcime, illite.
486.2	488.1	Oil shale: Medium to very dark brownish gray and olive gray (2.5 and 5Y 4/2-2/1); rare fine satiny to resinous black streaks; dolomitic. Fairly distinct to faint streaked bedding; laminated near top and bottom. Fairly regular to irregular thick parting;

Illustration No. SBR-4542P (Sheet 10 of 40)

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from U.S. Bureau of Mines Wyoming Corehole No. 8

From	To	Description
		some slight to coarse hackly fracture. Some fine to 3/4-inch brownish-gray to brown dolomite streaks and lenses. Few small to 1-inch slightly olive gray biotitic tuff nodules in lower part. Few fine bone (?) fragments at 487.2. Sample of brown dolomite lens from 487.4 feet: X-ray - dolomite, trace quartz.
488.1	490.1	Marlstone and mudstone: Light gray and gray buff (N7-6 and 5Y 7/1), some light olive gray to tan in lower part (5Y 6/1-6/2 and 2.5Y 6/2), dolomitic. Faintly streaked to laminated and banded. Regular to irregular thick parting; slightly conchoidal fracture. Abundant fine to thick gray to gray-buff silty-textured calcite streaks and layers down to 489.4; few moderately coarse crystalline brown-stained calcite patches in upper half foot. Some fine massive pyrite streaks and blebs in upper part. Abundant small irregular buff marlstone inclusions at 489.6-489.7 and at 489.9. Abundant white powder on outside surface of core. Sharp slightly irregular contact with oil shale below.
490.1	491.1	Oil shale: Black to dark brownish gray (2.5Y 1/1-3/1), rare satiny to waxy streaks, dolomitic. Faint streaked bedding. Irregular to slightly "curly" thick parting; slight to coarse hackly fracture. Abundant fine brown to dark brownish-gray fine crystalline calcite blebs and streaks in some zones. Some fine to thin dense brown dolomite lenses. Sample of very dark brownish-gray oil shale from 490.8 feet: X-ray - dolomite, quartz, feldspar, illite.
491.1	492.1	Oil shale: Very dark to medium brownish gray (2.5Y 2/1-4/2, some 5/2 lower part), dolomitic. Fairly distinct to faint very distorted to regular streaked bedding and some laminae. Irregular thick parting. Abundant brown fine crystalline calcite streaks in upper part. Abundant small to large irregular dense brown dolomite inclusions from 491.3 to 491.6; some irregular tight tar-stained fractures and fine black tarry blebs. Abundant fine to moderately coarse disseminated calcite crystals in lower part. Sharp slightly irregular contact with marlstone below. Sample of dark brownish-gray oil shale with calcite crystals from 491.7 feet: X-ray - calcite, dolomite, illite, quartz.
492.1	494.2	Marlstone: Buff to light and rare medium brownish gray and olive gray (2.5 and 5Y 7/2-6/2, rare 2.5Y 5/2-4/2 lower part), dolomitic. Faint to some distinct laminae and bands. Irregular to

Illustration No. SBR-4542P (Sheet 11 of 40)

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from U.S. Bureau of Mines Wyoming Corehole No. 8

From	To	Description
		regular thick to medium parting. Abundant fine to thick fine-grained calcite streaks and layers. Few dense brown dolomite bands with disseminated calcite crystals in lower part.
494.2	497.3	Mudstone: Gray buff in upper part to light and medium slightly brownish gray in lower part (5Y 7/1 to 2.5Y 6/1 and 5/1), calcareous. Faint distorted to contorted streaks and stringers. Irregular thick parting. Abundant silty-textured calcite streaks and stringers. Few thin to thick contorted dark brownish-gray to tan oil-shale stringers in lower foot. Irregular displaced contact with oil shale below. Some chalky powder on outside of core.
497.3	498.1	Oil shale: Dark brownish gray (2.5Y 3/2-2/1); rare fine resinous to waxy black streaks; dolomitic. Faint to moderately distinct streaked bedding. Slightly irregular thick parting; slightly hackly fracture. Abundant fine disseminated calcite crystals. Some fine grayish-brown dolomite streaks. Sharp slightly wavy contact with leaner oil shale below.
498.1	499.3	Oil shale: Medium olive gray (5 to 7.5Y 4/2 and 4/1-5/2), dolomitic. Faint to moderately distinct streaked bedding. Irregular to regular thick parting. Abundant fine to fairly coarse disseminated calcite (?) crystals. A 1-inch finely laminated medium and light gray marlstone band at 499.2. Sample of olive-gray oil shale with abundant calcite crystals from 498.7 feet: X-ray - calcite, dolomite, quartz, feldspar, pyrite, illite.
499.3	500.2	Marlstone: Light and rare medium slightly olive gray (5 to 10Y 6/1, rare 5/1), dolomitic. Faintly banded and laminated. Fairly regular thick parting. Abundant fine crystalline calcite streaks with some pyrite. Gray-buff marly mudstone in lower 2 inches.
500.2	500.5	Tuff: Gray buff to white (5Y 8/1-9/1), silty to earthy. Faint laminae and bands. Abundant very fine black specks. Sample of white tuff from 500.4 feet: X-ray - K feldspar, biotite, pyrite, hornblende?
500.5	501.3	Marlstone and oil shale: Buff to light and some medium olive gray (5 to 10Y 7/1 and 7/2-6/1 and 6/2, some 5/1-4/2), dolomitic. Distinct to faint laminae and bands. Regular to irregular thick to thin parting. Rare calcite crystals. Rare fine flat cavities with pyrite.
501.3	502.3	Oil shale: Olive gray and olive green (5 to 10Y 5/2 and 5/1-4/2 and 4/1), dolomitic. Faint streaked bedding. Irregular thick parting. Abundant coarse to fine crystals with pyrite.

Illustration No. SBR-4542P (Sheet 12 of 40)

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from U.S. Bureau of Mines Wyoming Corehole No. 8

From	To	Description
502.3	503.5	Oil shale: Medium to some dark olive gray (5 to 7.5Y 4/2, some 3/2-2/1). Faint to some moderately distinct streaked bedding and slightly irregular laminae. Irregular thick parting. Abundant fine to fairly coarse disseminated crystals and crystalline patches. A thin lenticular buff marlstone layer at 503.3.
503.5	505.2	Oil shale: Medium and some dark olive green (10 to 7.5Y 4/2-5/2, some 3/2, some 5Y 5/2-6/2 near base), dolomitic. Faint streaked bedding. Irregular thick parting. Abundant fine to fairly coarse crystals and crystalline patches. Sample of dark olive-green oil shale with crystals from 504.5 feet: X-ray - calcite, dolomite, quartz, feldspar, illite.
505.2	505.9	Marlstone: Tan to buff white and rare brownish gray (2.5 to 5Y 6/3-8/1, rare 6/2-5/2), dolomitic. Faint streaked bedding and some faint to distinct irregular laminae. Irregular thick to thin parting. Some coarse crystalline blebs and fine layers.
505.9	506.6	Marlstone and mudstone: Light gray to some light and medium olive gray (N7-6, some 5Y 6/2-5/1 lower part), dolomitic. Faint streaked bedding to some moderately distinct thin laminae and bands. Irregular to regular thick to thin parting. Abundant calcite crystals in upper part.
506.6	507.1	Oil shale: Medium to dark olive gray and brownish gray (5 and 2.5Y 5/2-3/2), dolomitic. Faint streaked bedding and some very fine laminae. Slightly irregular thick parting. Abundant fine to fairly coarse calcite crystals and some fine tar-stained cavities.
507.1	508.4	Oil shale: Dark brownish gray to rare black and some medium brownish gray and olive gray (2.5Y 3/2-2/1, rare 1/1, some 2.5 to 5Y 4/2-5/2), dolomitic. Fairly distinct to faint streaked bedding. Irregular thick and rare thin to papery parting. Abundant coarse to fine calcite crystals and rare fine cavities. Sample of dark brownish-gray oil shale from 508.1 feet: X-ray - dolomite, quartz, feldspar, illite.
508.4	509.0	Oil shale: Medium and some dark olive green to olive brown (10 to 5Y 5/3-5/2, some 4/2-3/2), dolomitic. Faint streaked bedding. Irregular thick parting. Abundant coarse crystals.
509.0	509.8	Marlstone and oil shale: Buff and light gray in upper part (5Y 7/2 and N7-6) to light and medium olive gray in lower part

Illustration No. SBR-4542P (Sheet 13 of 40)

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from U.S. Bureau of Mines Wyoming Corehole No. 8

From	To	Description
		(5Y 6/2-5/2, some 4/2), dolomitic. Faintly streaked in upper part to slightly irregular laminae and thin bands in lower part. Irregular to regular thin to thick parting. Abundant fine to coarse calcite streaks and laminae in upper part; rare crystalline patches in lower part.
509.8	510.8	Oil shale: Medium and rare dark olive gray (5 to 7.5Y 5/2-4/2, rare 3/2 lower part), dolomitic. Faint streaked bedding. Irregular thick parting. Abundant coarse crystals. Rare small tan dolomite nodules and lenses. Sample of olive-gray oil shale with coarse crystals from 510.2 feet: X-ray - calcite, quartz, dolomite, feldspar.
510.8	511.8	Oil shale: Medium to dark brownish gray and olive gray (2.5 to 5Y 4/2-3/1), dolomitic. Faint to moderately distinct streaked bedding. Irregular thick parting. Abundant fairly coarse to fine calcite crystals and crystalline patches. A 3-inch very irregular tan to buff slightly silty tuff stringer at 511.4-511.7. Sample of thick tuff stringer from 511.6 feet: X-ray - K feldspar, biotite.
511.8	512.6	Oil shale: Medium and some dark olive gray (5 to 7.5Y 4/2 and 4/1-5/2 and 5/1, some 3/1), dolomitic to slightly calcareous. Faint streaked bedding and thin to fine laminae. Irregular thick parting. Abundant crystals and crystalline patches.
512.6	513.0	Marlstone: Medium to light slightly olive gray (5 to 7.5Y 4/1-6/1), dolomitic. Faintly laminated and streaked. Irregular thick to thin parting. Abundant coarse calcite crystals concentrated in fine to thick zones.
513.0	513.6	Oil shale (?): Brownish gray (2.5Y 5/2), dolomitic. Faint thin laminae marked by very fine dark partings. Dense and hard; some fine blebby layers. Massive coarsely crystalline calcite layer in lower inch. Sample of dense to blebby oil shale from 513.3 feet: X-ray - quartz, dolomite, feldspar, biotite.
513.6	514.8	Oil shale: Medium and some dark olive green to brownish gray and some tan (10 to 2.5Y 5/2-4/2, some 3/2 and 6/3, rare 2/1), dolomitic. Distinct streaked bedding and some regular to irregular laminae and bands. Irregular thick to medium parting. Abundant fine to coarse calcite crystals.
514.8	514.9	Missing.

Illustration No. SBR-4542P (Sheet 14 of 40)

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from U.S. Bureau of Mines Wyoming Corehole No. 8

From	To	Description
514.9	515.6	Main tuff: Buff to white (2.5Y 8/2-9/1), silty to chalky. Faintly streaked and laminated in upper part to massive in lower part. Abundant biotite in upper part becoming sparse in lower part. Thick furry white coating of thermonatrite on outside of core.
515.6	516.5	Oil shale: Olive gray and brownish gray (5 and 2.5Y 5/2-4/2), a 1-inch light greenish-gray (5GY 7/2-8/2) marlstone band at 516.0. Faint streaked bedding. Irregular thick parting. Abundant coarse calcite crystals.
516.5	518.1	Oil shale: Greenish gray (5GY and 10Y 5/2 and 5/1-4/1), dolomitic. Faint streaked bedding. Fairly regular to irregular thick parting. Abundant calcite crystals.
518.1	519.2	Oil shale: Greenish gray and olive green (5GY 5/2 and 10 to 7/5Y 5/2-4/2), dolomitic. Faint streaked bedding. Irregular thick parting. Abundant calcite crystals.
519.2	520.3	Oil shale: Medium to dark olive gray (5Y 4/2-3/2, some 2/1 lower part), dolomitic. Faint streaked bedding. Abundant crystals commonly in fine diagonal to vertical streaks. Sample of oil shale with crystalline streaks from 519.6 feet: X-ray - dolomite, calcite, quartz, feldspar, illite, pyrite.
520.3	521.4	Oil shale: Olive gray to greenish gray (10Y to 5GY 4/2 and 4/1-5/2 and 5/1), dolomitic. Faint streaked bedding. Irregular thick parting. Abundant irregular crystalline streaks. A 1-inch brown dolomite band at top.
521.4	523.0	Oil shale: Olive brown in upper half foot (5Y 5/3-4/3), greenish gray in lower part (5GY to 10Y 5/2-4/2 and 4/1), dolomitic. Faint streaked bedding and some laminae. Irregular thick parting. Some calcite crystals.
523.0	524.5	Oil shale: Greenish gray (5GY to 10Y 5/1 and 5/2-4/1). Faint streaked bedding. Irregular thick parting; some coarse hackly fracture. Abundant moderately coarse to fine crystals commonly in fine short diagonal to horizontal streaks.
524.5	525.9	Oil shale: Olive green to greenish gray (7.5Y to 5GY 5/2-4/2 and 4/1), dolomitic. Faint streaked bedding and some laminae. Fairly regular to irregular thick to medium parting. Fairly abundant crystals.
525.9	528.2	Oil shale: Greenish gray and olive gray to rare neutral gray (5GY to 7.5Y 4/1 and 4/2-5/1 and 5/2, rare N4-5), dolomitic.

Illustration No. SBR-4542P (Sheet 15 of 40)

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from U.S. Bureau of Mines Wyoming Corehole No. 8

From	To	Description
		Faint laminae and streaked bedding. Irregular to some regular thick to medium parting. Fairly abundant disseminated crystals and horizontal to vertical crystalline streaks. A 1-1/2-inch dense medium to dark brownish-gray dolomite band at 527.2. Sample of greenish-gray oil shale from 526.3 feet: X-ray - dolomite, quartz, illite, feldspar.
528.2	529.2	Oil shale: Olive green to olive gray (10 to 5Y 5/2-4/2), dolomitic. Faint streaked bedding. Irregular thick to rare thin parting. Abundant disseminated crystals and crystalline streaks and patches; some chalky alteration in lower part.
529.2	530.2	Oil shale: Olive gray (5 to 7.5Y 5/2-4/2), dolomitic. Faint streaked bedding. Regular to irregular thick parting. Abundant crystals and crystalline streaks in lower half.
530.2	531.2	Oil shale: Medium to dark olive gray and brownish gray (5 to 2.5Y 4/2-3/2), dolomitic. Faint streaked bedding. Irregular thick parting; irregular hackly fracture. Abundant crystals and crystalline streaks. Some chalky white powder on outside of core. Sample of dark brownish-gray oil shale with fairly coarse disseminated crystals from 531.2 feet: X-ray - dolomite, calcite, quartz, feldspar, pyrite, illite.
531.2	533.2	Oil shale: Dark to medium brownish gray and olive gray (2.5 to 7.5Y 3/1-5/1), dolomitic. Faint streaked bedding and rare laminae. Irregular thick to thin parting; irregular hackly fracture. Abundant coarse crystals commonly with chalky white alteration. Several thin to fine brown dolomite layers in upper 0.3 foot.
533.2	534.2	Oil shale: Olive gray to greenish gray (7.5Y to 5GY 4/1-5/1, becoming almost neutral gray near base), dolomitic. Faint streaked bedding. Slightly irregular thick parting. Abundant crystals and crystalline streaks with chalky alteration.
534.2	535.3	Marlstone: Gray (N4-5, very slight green tint), dolomitic to slightly calcareous. Faintly laminated and banded. Irregular to fairly regular thick to medium parting. Some thin to fine crystalline layers; some thin to fine irregular vertical crystal-filled fractures with abundant pyrite in upper part. Abrupt change to greener oil shale at base. Sample of gray marlstone from 534.4 feet: X-ray - dolomite, quartz, feldspar, illite.

Illustration No. SBR-4542P (Sheet 16 of 40)

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from U.S. Bureau of Mines Wyoming Corehole No. 8

From	To	Description
		Sample of thin crystalline layer from 534.8 feet: X-ray - calcite, gaylussite, quartz, dolomite.
535.3	537.0	Oil shale: Olive green (7.5 to 10Y 5/2), dolomitic. Faint streaked bedding and some laminae. Irregular thick to medium parting. Fairly abundant fine to coarse crystals with some chalky alteration.
537.0	538.2	Oil shale: Medium to rare dark olive gray (7.5 to 5Y 5/2-4/2, rare 3/1), dolomitic. Faint streaked bedding. Irregular thick parting; irregular coarse hackly fracture. Abundant coarse commonly tabular crystals; some thin crystalline stringers. Some thin to fine tan dolomite lenses in middle part. Abruptly grades to dark oil shale at base. Sample of olive-gray oil shale with coarse crystals from 537.5 feet: X-ray - dolomite, shortite, quartz, feldspar, illite, calcite.
538.2	539.2	Oil shale: Dark and rare medium olive gray (5Y 3/1, rare 4/1), dolomitic. Faint streaked bedding. Slightly irregular thick parting; slightly hackly fracture. Abundant fine to coarse disseminated crystals.
539.2	540.5	Oil shale: Medium and some dark olive gray (5 to 10Y 4/1 and 4/2-5/2, some 3/1), dolomitic. Faint streaked bedding and some irregular thin laminae. Irregular thick parting; irregular coarse hackly fracture. Abundant coarse crystals and crystalline stringers.
540.5	541.7	Oil shale: Olive gray to olive green (7.5 to 10Y 4/1 and 5/1-4/2 and 5/2), dolomitic. Faint streaked bedding. Irregular thick parting. Abundant moderately coarse to very coarse disseminated crystals; some very thin to fine crystalline layers and streaks in upper part. A 0.1-foot tight brown platy dolomite conglomerate layer at 541.0; very thin black oil-shale layers above and below.
541.7	544.2	Oil shale: Medium and some light olive green (7.5 to 10Y 5/2, some 6/2 and 4/2), dolomitic. Faint streaked bedding and rare laminae and bands. Irregular thick parting. Abundant very coarse (up to 1/4 x 3/4 inch) disseminated crystals in upper part; abundant fine to coarse crystals and crystalline patches in lower part. Sample of coarse crystals from 542.2 to 542.8 feet: X-ray - calcite, gaylussite.

Illustration No. SBR-4542P (Sheet 17 of 40)

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from U.S. Bureau of Mines Wyoming Corehole No. 8

From	To	Description
544.2	545.4	Oil shale: Olive green to some medium and light olive gray (7.5 to 10Y 5/2-4/2, some 5Y 5/2-6/2 lower part), dolomitic. Faintly streaked to laminated and banded. Irregular thick parting. Abundant very coarse crystals.
545.4	546.6	Oil shale: Medium to light olive green (7.5 to 10Y 5/2 and 5/1-6/2 and 6/1, some 4/1 and 7/2), dolomitic. Faint to fairly distinct laminae and bands. Irregular thick parting. Fairly abundant coarse crystals mostly concentrated in thin zones and layers. Some medium to thin dense gray-buff stringers and lenses in lower 0.3 foot. Sample of olive-green oil shale from 545.9 feet: X-ray - dolomite, quartz, feldspar, illite.
546.6	547.6	Marlstone (oil shale?): Medium slightly greenish gray (5GY to 10G 5/1-4/1), slightly calcareous to dolomitic. Faint streaked bedding and rare thin to fine laminae. Irregular thick parting. Abundant coarse to fine disseminated crystals and few thin to thick crystalline layers. Fairly abundant fine disseminated pyrite.
547.6	549.0	Oil shale: Medium and some light olive gray (7.5Y 5/2-5/1, some 6/2, rare 4/1), slightly calcareous. Faint streaked bedding to faint and some moderately distinct laminae. Irregular to regular thick parting. Abundant coarse to fine crystals. Some very fine pyrite.
549.0	550.0	Marlstone (oil shale?): Medium gray (N4-5, very slight greenish tint), light olive gray in lower 0.2 foot (5Y 6/1-7/1 and 7/2), slightly calcareous. Faintly laminated; distorted and displaced laminae near base. Fairly regular to irregular thick to thin parting; slightly conchoidal fracture. Some thin to thick zones of abundant coarse crystals and fine pyrite. A thin finely laminated buff and brownish gray marlstone layer at 549.7. Sample of gray marlstone with abundant coarse crystals from 549.5 feet: X-ray - shortite, dolomite, quartz, pyrite, feldspar.
550.0	551.0	Oil shale: Light to medium olive gray (5Y 6/2-5/2, some 4/2-4/1), dolomitic. Faint to some moderately distinct streaked bedding and rare laminae. Irregular thick parting. Abundant small crystalline blebs commonly composed of fine radiating crystals. Some moderately coarse disseminated crystals in upper part.

Illustration No. SBR-4542P (Sheet 18 of 40)

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from U.S. Bureau of Mines Wyoming Corehole No. 8

From	To	Description
		Sample of olive-gray oil shale with small radiating crystal blebs from 550.7 feet: X-ray - dolomite, shortite, quartz, feldspar.
551.0	552.1	Oil shale: Medium to some light and dark olive gray and brownish gray (5 to 2.5Y 5/2-4/2, some 6/2 and 3/2), dolomitic. Faint to distinct streaked bedding and distorted laminae. Irregular thick parting. Abundant thin to fine vertical to horizontal crystalline streaks composed of fine radiating crystals. Some very coarse disseminated crystals.
552.1	553.8	Oil shale: Very dark to some medium olive gray and brownish gray (5 to 2.5Y 2/1-3/1, some 4/1-4/2), dolomitic. Faint streaked bedding. Irregular thick parting. Abundant coarse disseminated crystals. A very thin lenticular light olive-gray biotitic tuff stringer at 553.3.
553.8	555.0	Oil shale: Medium and some dark olive gray (5 to 7.5Y 4/2-5/2, some 3/1 upper part). Faint streaked bedding. Irregular thick parting. Very abundant streaks, blebs, and lacy patches of fine radiating crystals (like 550.7 feet).
555.0	556.0	Oil shale: Medium to light olive gray and greenish gray (7.5Y to 5GY 4/2-6/2 and 6/1), dolomitic. Faintly laminated and banded. Irregular thick parting; irregular to slightly conchoidal fracture. Fairly abundant coarse tabular crystals--some altered to chalky white material.
556.0	558.2	Marlstone and oil shale: Medium to light olive gray (5 to 10Y 4/1-6/2) and some medium to dark neutral gray (N5-3), dolomitic to slightly calcareous. Faint to distinct irregular to regular streaks, laminae, and bands. Irregular thick parting; slightly irregular to conchoidal fracture. Abundant coarse to fine crystalline streaks, stringers, and patches. Some thin dense tan to gray-buff marlstone stringers.
558.2	559.9	Oil shale: Medium to dark olive gray and brownish gray (5 to 2.5Y 4/2-2/1), dolomitic. Faint streaked bedding. Irregular thick parting; irregular slight to some coarse hackly fracture. Abundant coarse disseminated crystals and some fine-grained blebs and streaks.
559.9	560.9	Oil shale: Dark to medium olive gray (5 to 10Y 3/1-5/1 and 5/2, becoming almost neutral near base). Faint streaked bedding. Irregular thick parting. Abundant fine-grained radiating to tabular crystalline streaks (like 550.7 feet); coarse disseminated crystals in lower 0.2 foot.

Illustration No. SBR-4542P (Sheet 19 of 40)

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from U.S. Bureau of Mines Wyoming Corehole No. 8

From	To	Description
560.9	563.0	Marlstone: Medium to dark gray and slightly olive gray (N5-3 and 5 to 10Y 5/1-4/1, rare 5/2), dolomitic to slightly calcareous. Faint to moderately distinct laminae and bands. Irregular to some regular thick parting; slightly conchoidal fracture. Fairly abundant fine to moderately coarse crystalline streaks, laminae, and blebs. Three very thin dense tan dolomite layers separated by fine dark olive-gray oil-shale laminae at 562.2-562.3; some fine tan to buff dolomite lenses and laminae in lower 0.2 foot.
563.0	563.2	Marlstone: Tan to buff (2.5Y 6/2-7/2) with gray streaks (N5). Irregular wavy layers and some small nodules. Few coarse crystal blebs. Becoming interfingered with oil shale in lower inch.
563.2	564.3	Oil shale: Medium to dark olive gray and brownish gray, some tan near top (5 to 2.5Y 5/2-3/2, some 6/2), dolomitic. Moderately distinct to faint streaked bedding. Irregular thick parting; some coarse hackly fracture. Abundant fine to coarse crystalline streaks and blebs. Sample of brownish-gray oil shale from 563.7 feet: X-ray - dolomite, quartz, feldspar, illite, pyrite.
564.3	565.4	Oil shale: Dark to medium brownish gray and olive gray (2.5 to 5Y 3/2-4/2, some 2/1). Faint streaked bedding. Irregular thick parting; irregular hackly fracture. Abundant coarse crystals and crystalline patches.
565.4	566.4	Oil shale: Medium olive gray and some buff to medium and light gray green (5Y to 5GY 4/2-6/2, some 7/2-7/1), dolomitic. Faint streaked bedding and some irregular layers. Irregular thick parting. Abundant coarse crystals and crystalline streaks.
566.4	569.0	Marlstone and limestone (?): Medium to light olive-gray marlstone (7.5Y 5/2-6/2) indistinctly variegated, mottled, and streaked with olive-buff (5 to 7.5Y 7/2-8/1) silty-textured limestone. Irregular thick parting. Abundant dark to light fine to coarse crystalline blebs, patches, and streaks.
569.0	569.4	Marlstone: Gray (N5, very slight green tint), dolomitic. Faintly laminated. Abundant fine buff porous specks and streaks with pyrite. Rare coarse crystals.
569.4	572.5	Oil shale: Medium to dark olive gray and brownish gray (5 to 2.5Y 4/2-2/1, rare 5/2), dolomitic. Moderately distinct to faint distorted streaked bedding. Irregular thick parting;

Illustration No. SBR-4542P (Sheet 20 of 40)

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from U.S. Bureau of Mines Wyoming Corehole No. 8

From	To	Description
		irregular and some hackly fracture. Abundant coarse to fine crystals and some crystalline stringers; common chalky alteration.
572.5	573.5	Oil shale: Medium to dark olive gray (5Y 4/2-3/2). Faint streaked bedding. Irregular thick parting. Very abundant fairly coarse and stubby to fine and platy crystals.
573.5	574.5	Oil shale: Medium to dark almost neutral gray (5 to 2.5Y 4/1-3/1), dolomitic. Faint streaked bedding. Irregular thick parting. Abundant fairly coarse crystals; common chalky alteration. A 1-inch white silty and earthy biotitic tuff stringer at 573.9.
574.5	575.1	Marlstone: Medium to dark slightly brownish gray (2.5Y 5/1-3/1), slightly calcareous to dolomitic. Moderately distinct to faint fine to thin laminae. Slightly irregular thick parting; slightly irregular and conchoidal fracture; dense and hard. A thin zone of coarse tabular crystals at 574.8; few crystals in lower part. (574.8-575.0 missing) Sample of hard dense gray marlstone from 574.6 feet: X-ray - dolomite, quartz, feldspar, illite.
575.1	575.5	Limestone conglomerate: Buff white to gray buff (2.5Y 8/1-7/1). Small to fine lenticular to angular dense inclusions in silty-crystalline matrix. Some dark gray fine-grained calcite patches and blebs.
575.5	576.5	Oil shale: Medium to dark olive gray and brownish gray (5 to 2.5Y 4/2-3/2 and 3/1, rare 2/1), dolomitic. Faint to moderately distinct streaked bedding. Irregular thick parting; some hackly fracture. Abundant coarse disseminated crystals; a 1-inch coarse and sparry to very fine-grained crystalline stringer near top. Sample of coarse to very fine crystalline stringer from 575.6 feet: X-ray - dolomite, calcite, gaylussite, quartz.
576.5	578.4	Oil shale: Dark and rare medium brownish gray and olive gray (2.5 to 5Y 3/2-3/1, some 2/1 lower part, rare 4/2 upper part), dolomitic. Faint streaked bedding. Irregular to fairly regular thick parting; slightly hackly fracture. Abundant coarse disseminated crystals. A thin dense tan dolomite lens at 578.2. Sample of dark brownish-gray oil shale from 578.1 feet: X-ray - dolomite, quartz, feldspar, pyrite, illite.
578.4	579.1	Oil shale: Dark to medium brownish gray and olive gray (2.5 to 5Y 3/1-4/1, some 2/1). Faint streaked bedding. Irregular

Illustration No. SBR-4542P (Sheet 21 of 40)

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from U.S. Bureau of Mines Wyoming Corehole No. 8

From	To	Description
		thick parting. Abundant coarse disseminated crystals in upper half; abundant medium to fine-grained crystalline streaks in lower half. A very thin lenticular dense tan biotitic stringer at 578.7.
		Sample of dark brownish-gray oil shale with coarse disseminated crystals from 578.4 feet: X-ray - calcite, dolomite, quartz, feldspar, pyrite.
		Sample of dark brownish-gray oil shale with medium to fine-grained crystalline streaks from 578.9 feet: X-ray - calcite, dolomite, quartz, feldspar, pyrite, illite.
579.1	579.8	Oil shale: Dark almost neutral gray to medium olive green (7.5 to 10Y 3/1-5/1 and 5/2), dolomitic. Massive to faintly banded. Irregular thick parting. Abundant thin to fine coarse to medium crystalline stringers and some disseminated crystals. Abundant pyrite with crystals. Some brown organic stains in crystalline stringers.
579.8	581.5	Marlstone: Medium to light gray (N4-6, common very slight greenish tint), dolomitic to slightly calcareous. Faintly laminated. Irregular to fairly regular thick to medium parting. Abundant fine to thin moderately coarse to fine-grained crystalline layers, streaks, and blebs. Abundant pyrite with crystals. Some thin to fine gray-buff to buff silty to dense layers in lower part.
581.5	583.0	Marlstone (oil shale in part): Medium and rare dark olive gray to gray buff (5Y 4/1-7/1, rare 3/1-2/1 and 7/2-8/1), dolomitic to slightly calcareous. Distinct to faint thin to fine regular to irregular laminae. Fairly regular to irregular thick to medium parting. Abundant fine to coarse crystalline layers and stringers. Dense tan conglomeratic dolomite with abundant crystals in lower 0.1 foot.
583.0	584.6	Oil shale: Dark brownish gray to some black (2.5Y 3/1-2/1, some 1/1 in middle part), dolomitic. Faint streaked bedding with rare distinct fine to thin medium brownish-gray streaks and laminae. Irregular and rare regular thick parting. Fairly abundant fine to coarse crystalline streaks, blebs, and patches in upper part becoming very abundant in lower part. Few thin dense dark grayish-brown dolomite lenses near top.
584.6	585.3	Oil shale: Medium to rare light olive gray and olive green (5 to 10Y 4/2-5/2, rare 6/2 lower part), dolomitic. Faintly banded to laminated. Irregular thick parting. Abundant coarse to

Illustration No. SBR-4542P (Sheet 22 of 40)

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from U.S. Bureau of Mines Wyoming Corehole No. 8

From	To	Description
585.3	587.1	<p>medium crystalline blebs and stringers (some tar stained). A very thin dense buff biotitic stringer at 585.0.</p> <p>Marlstone: Light to some medium greenish gray (5GY 6/1, some 5/1-5/2), dolomitic. Faintly laminated to very faintly streaked. Irregular to fairly regular thick to rare thin parting. Abundant fine to fairly coarse crystals and crystalline stringers in upper part; abundant thin to thick crystalline layers in lower part. Common pyrite with crystals.</p> <p>Sample of light greenish-gray marlstone from 586.3 feet: X-ray - dolomite, K feldspar, illite.</p>
587.1	588.2	<p>Marlstone (oil shale?): Medium and some light slightly olive gray (10 to 5Y 5/1-4/1, some 6/1), dolomitic. Faint and rare distinct laminae to very faint streaked bedding. Irregular to fairly regular thick to medium parting. Abundant moderately coarse crystals and fine crystalline streaks. Some pyrite with crystals.</p>
588.2	590.5	<p>Marlstone (oil shale?): Light to medium greenish gray and olive gray (5GY to 7.5Y 6/1-4/1, some 7/1 upper part). Faintly laminated and banded to very faintly streaked. Regular to irregular thick to rare thin parting. Abundant moderately coarse to fine disseminated crystals and rare thin to thick crystalline layers. Abundant pyrite.</p>
590.5	590.9	<p>Dolomite: Medium to light slightly olive to brownish gray (5 to 2.5Y 4/1-6/1 and 6/2). Moderately distinct to faint thin to fine laminae. Hard and dense. A very thin layer of dark brownish-gray oil shale at top.</p> <p>Sample of hard dense laminated dolomite from 590.6 feet: X-ray - dolomite, quartz, feldspar, illite, analcime.</p>
590.9	591.1	<p>Oil shale: Olive gray (5Y 4/2), dolomitic. Very faintly bedded. Some very fine disseminated pyrite.</p>
591.1	592.0	<p>Oil shale: Very dark brownish gray to black (2.5Y 2/1-1/1), some satiny to resinous luster, dolomitic. Faint streaked bedding. Regular thick parting. Abundant fine disseminated crystals. Some small grayish-brown dolomite lenses near top.</p> <p>Sample of very dark satiny oil shale with fine disseminated crystals from 591.6 feet: X-ray - dolomite, quartz, calcite, feldspar, illite.</p>
592.0	592.4	<p>Oil shale: Medium to rare light olive gray (5Y 4/2-5/2, rare 6/2 lower part). Faintly streaked to laminated. Abundant coarse to fine disseminated crystals.</p>

Illustration No. SBR-4542P (Sheet 23 of 40)

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from U.S. Bureau of Mines Wyoming Corehole No. 8

From	To	Description
592.4	593.4	Marlstone: Greenish gray (10Y to 5GY 5/1), dolomitic. Faint streaked bedding and some very faint laminae. Fairly regular thick to medium parting. Abundant fine crystalline layers and streaks; some fine disseminated crystals. Abundant pyrite with crystals. A fine buff dolomite layer at 593.1.
593.4	594.4	Marlstone: Medium to light and rare dark olive gray (10 to 5Y 5/1-6/1, rare 4/1-3/1), dolomitic. Distinctly laminated and banded with irregular very thin to 3/4-inch coarsely crystalline layers and fine to 1/2-inch buff dolomite layers. Regular to irregular thick to medium parting. Some pyrite.
594.4	595.4	Oil shale: Medium olive gray (7.5 to 5Y 5/2 and 5/1-4/2 and 4/1), dolomitic. Faintly laminated to very faintly streaked. Irregular to fairly regular thick to thin parting. Fairly abundant moderately coarse to fine disseminated crystals and fine crystalline laminae with common pyrite. Abundant very fine dense tan to brownish-gray blebs near top. (594.8-595.0 missing)
595.4	597.0	Oil shale: Medium to dark olive gray and brownish gray (5 to 2.5Y 4/2-3/2, some 2/1), dolomitic. Faint streaked bedding. Irregular to fairly regular thick parting; some coarse hackly fracture. Abundant fine to moderately coarse crystalline patches and streaks. Abundant very fine disseminated pyrite blebs and streaks.
597.0	599.2	Oil shale and marlstone: Medium to some light olive green to greenish gray (10Y to 5GY 4/2-5/2, some 6/2 lower part, some 5GY 5/1-4/1 in middle part), dolomitic. Faint streaked bedding to faint and rare distinct laminae and bands. Irregular to regular thick to some thin parting. Abundant fine-grained crystalline patches and streaks in upper 0.2 foot. Abundant very fine disseminated pyrite and some fine crystal blebs in middle part; rare fine to thin massive pyrite streaks. Few thin dark greenish-gray oil-shale layers and rare light olive-gray to yellowish-buff dolomite laminae in lower part. Sample of slightly greenish-gray marlstone with very fine disseminated pyrite and rare fine crystals from 597.8 feet: X-ray - dolomite, quartz, feldspar, calcite, illite, montmorillonite.
599.2	601.2	Oil shale: Olive green and olive gray (10 to 5Y 5/2-4/2), dolomitic. Faint streaked bedding. Slightly irregular to irregular thick parting. Abundant fine to fairly coarse crystalline patches and

Illustration No. SBR-4542P (Sheet 24 of 40)

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from U.S. Bureau of Mines Wyoming Corehole No. 8

From	To	Description
		streaks with common pyrite. Some thin to fine buff to tan dolomite lenses and nodules in upper part.
601.2	602.1	Oil shale: Gray green to olive green (5GY to 7.5Y 5/2, rare 4/2), dolomitic. Faint streaked bedding. Irregular thick parting. Abundant moderately coarse to fine disseminated crystals. Abundant pyrite.
602.1	603.9	Marlstone: Medium to very light olive green (10Y 5/2-8/1), dolomitic to slightly calcareous. Faint to some distinct laminae and bands. Regular to irregular thick parting; some very conchoidal fracture. Rare fine crystalline layers and streaks in upper part; abundant thick to fine coarse layers and streaks in lower half (very large sparry crystals at 603.3-603.4). Sample of very large sparry crystals from 603.4 feet: X-ray - calcite; some dolomite, quartz.
603.9	604.9	Marlstone and oil shale: Very light to some medium olive gray (10 to 7.5Y 8/1-6/2, some 5/2), dolomitic. Distinct to faint thin to fine laminae. Regular to irregular thick to thin parting. Abundant coarse crystals and thin to fine crystalline layers.
604.9	606.5	Oil shale: Medium to rare light and dark olive gray (7.5 to 5Y 5/2, some 4/2, rare 6/2 and 3/2-3/1), dolomitic. Faint to fairly distinct streaked bedding. Irregular thick parting. Fairly abundant coarse to fine disseminated crystals. Some fine disseminated pyrite blebs. Abundant fine to thin yellowish-tan dolomite lenses in upper half foot.
606.5	608.2	Oil shale and marlstone: Medium and light olive green to greenish gray (7.5Y to 5GY 5/2 and 5/1-6/2 and 6/1), dolomitic to slightly calcareous. Faint streaked bedding. Irregular to regular thick to some very thin parting. Fairly abundant coarse crystals and some thin to thick crystalline layers; very large sparry crystals at 608.0-608.1.
608.2	609.1	Oil shale: Medium greenish gray and olive green (5GY to 10Y 5/2 and 5/1-4/2 and 4/1), dolomitic. Faint streaked bedding and some very faint laminae. Irregular to fairly regular thick parting. Abundant fairly coarse crystals. Some pyrite.
609.1	610.6	Marlstone: Light to medium greenish gray and some buff (5GY 6/1 and 6/2-5/1 and 5/2, some 7.5Y 7/2 upper part), dolomitic to slightly calcareous. Distinct to faint laminae and bands; becoming very faintly streaked in lower part. Regular to

Illustration No. SBR-4542P (Sheet 25 of 40)

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from U.S. Bureau of Mines Wyoming Corehole No. 8

From	To	Description
		irregular thick parting. Abundant moderately coarse crystalline streaks, layers, and patches; very large sparry crystals at 610.0-610.3. Sample of very large crystals from 610.2 feet: X-ray - calcite; trace dolomite, quartz.
610.6	611.6	Oil shale: Medium to rare dark greenish gray and olive gray (5GY to 10Y 5/2 and 5/1-4/2, rare 3/2-3/1), dolomitic. Faint streaked bedding and rare laminae. Irregular to slightly irregular thick to rare medium and thin parting. Abundant coarse to medium crystals with some pyrite.
611.6	614.0	Marlstone: Medium to light greenish gray (5 to 10GY 5/2 and 5/1-6/2 and 6/1), some buff to olive gray near base (7.5 to 5Y 8/2-4/1). Faint streaked bedding. Abundant thin to thick moderately coarse to very coarse crystalline layers and disseminated crystals. Fairly regular to irregular thick to thin and rare papery parting.
614.0	616.1	Oil shale: Medium to rare light and dark olive gray (5 to 10Y 4/2-5/2 and 5/1, rare 6/1 and 3/2-3/1), dolomitic. Faint streaked bedding; some faint to moderately distinct bands and laminae in lower part. Irregular thick parting. Abundant fairly coarse to fine crystalline patches and streaks in upper part; abundant medium to fine disseminated crystals in lower part. Sample of olive-gray oil shale with abundant disseminated crystals from 615.6 feet: X-ray - calcite, dolomite, quartz, feldspar, illite, pyrite.
616.1	617.2	Marlstone and oil shale: Greenish gray (10GY to 10Y 5/1-5/2), medium to some dark olive-gray (7.5Y 5/2-3/2) oil shale at 616.3-616.7, dolomitic. Faint streaked bedding and rare fine laminae. Irregular to regular, medium to thick parting. Abundant fine lacy crystalline streaks and stringers in oil shale. A thin lenticular tight gray fine-grained calcite layer at 616.8.
617.2	618.7	Marlstone: Light and some medium olive green and greenish gray to greenish buff (10Y to 5GY 6/1 and 6/2-7/2, some 5/2-4/2 and 4/1, rare 8/2), dolomitic to slightly calcareous. Faint to some distinct laminae and bands. Regular to some irregular thick to thin parting. Some fine to moderately coarse crystalline streaks, mostly in darker layers.
618.7	620.0	Marlstone: Light and some medium olive green to almost neutral gray (10Y 6/2 and 6/1-7/2, some 5/2; and 5GY 6/1-7/1, rare

Illustration No. SBR-4542P (Sheet 26 of 40)

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from U.S. Bureau of Mines Wyoming Corehole No. 8

From	To	Description
		5/1), dolomitic. Faint to distinct streaked bedding and regular to irregular laminae. Irregular to regular thick to rare thin parting. Abundant medium to fine disseminated crystals below 619.0.
620.0	621.2	Oil shale: Medium to some dark and rare light olive green (10 to 7.5Y 5/2-4/2, some 3/2, rare 6/2), dolomitic. Moderately distinct to faint streaked bedding. Slightly irregular thick parting. Abundant fine to medium-grained disseminated crystals and fine lacy crystalline streaks and stringers. Sample of medium to dark olive-green oil shale with fine crystalline streaks from 620.6 feet: X-ray - dolomite, calcite, quartz, feldspar, illite, pyrite.
621.2	623.0	Marlstone (lean oil shale in part?): Medium to light olive green and greenish gray (10Y to 5GY 5/1 and 5/2-6/1 and 6/2, rare 7/1-7/2), dolomitic to slightly calcareous. Faint and rare distinct laminae and bands. Irregular to regular thick to rare thin parting. Fine gray to light brownish-gray and gray-buff crystal blebs becoming abundant in lower part. Rare fine dark olive-green oil-shale laminae.
623.0	624.0	Marlstone: Light slightly greenish gray (5GY 6/1-8/1) and rare light to medium olive green (10Y 6/2-4/2 and 4/1), slightly to moderately calcareous. Faint and rare distinct regular to irregular laminae and bands. Abundant fine to thick light gray to gray-buff fine-grained calcite streaks and layers.
624.0	625.0	Marlstone and oil shale: Light to medium olive gray (10Y 6/2 and 6/1-5/2, some 7/1-7/2, rare 4/2), calcareous. Moderately distinct to faint irregular to regular laminae. Irregular to regular thick to medium parting. Abundant thin silty-textured calcite layers in upper part. Some fine crystalline streaks and layers in lower part.
625.0	625.5	Oil shale: Medium to some light olive green at top and bottom (10Y 5/2, some 6/2 and 4/2), medium to very dark olive gray and brownish gray (10 to 2.5Y 4/2-2/1) from 625.2 to 625.4, rare satiny to resinous streaks. Faint to rare distinct laminae and streaked bedding; some thin loop structures in dark zone. Irregular to regular thick parting.
625.5	626.5	Oil shale: Medium to light olive green (10Y 5/2-6/2), calcareous to dolomitic. Faint very fine to thin regular laminae. Irregular

Illustration No. SBR-4542P (Sheet 27 of 40)

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from U.S. Bureau of Mines Wyoming Corehole No. 8

From	To	Description
		to regular thick to medium parting. Some very fine dense tan streaks in middle part.
626.5	628.5	<p>Sample of light olive-green marlstone from 626.1 feet: X-ray - dolomite, quartz, calcite, feldspar, illite.</p> <p>Oil shale and marlstone: Light and some medium olive green to greenish gray (10Y 6/2-6/1 and some 5/2 to 5 and 10GY 5/1 and 6/1), dolomitic to slightly calcareous. Faintly laminated and banded. Regular to irregular thick to some thin parting. A very fine earthy white biotitic tuff layer at 627.1. Abundant fine gray to gray-buff calcite blebs and streaks below 627.0.</p>
628.5	629.5	<p>Marlstone and limestone: Very light and rare medium slightly greenish gray (10Y 7/1-8/1, rare 6/1-5/1). Faint interbedded fine to thin marlstone and very fine-grained limestone laminae and bands. Abundant fine disseminated calcite crystals in most marlstone layers. Fairly regular thick parting.</p>
629.5	630.1	<p>Marlstone: Light to medium olive green and greenish gray (10Y to 5GY 6/2-5/2 and 5/1). Faint very fine laminae and streaked bedding. Slightly irregular thick to thin parting. Abundant fine calcite streaks and blebs; 1-inch medium-grained calcite lenses at base.</p>
630.1	631.3	<p>Shale: Medium and some light greenish gray to olive gray (10GY to 10Y 5/2 and 5/1-4/2 and 4/1, some 6/2-6/1). Faint streaked bedding and some laminae. Regular to irregular shaly to papery parting; hackly fracture. Abundant fine to thin light greenish-gray to buff fine-grained limestone laminae and streaks in upper 0.2 foot and lower 0.3 foot.</p> <p>Sample of greenish-gray papery shale from 630.9 feet: X-ray - loughlinitite, dolomite, calcite, feldspar, illite.</p>
631.3	633.3	<p>Limestone and shale: Irregular to regular thick to fine light gray to buff-white medium to very fine-grained limestone layers interbedded with papery shale as above.</p> <p>Sample of very fine-grained buff-white limestone from 632.4 feet: X-ray - calcite, dolomite, loughlinitite, montmorillonite.</p>
633.3	634.6	<p>Marlstone: Light to medium greenish gray (5 to 10GY 6/1 and 6/2-5/1 and 5/2), slightly calcareous. Very faint regular to irregular laminae. Irregular thick to some thin parting. Abundant fine to rare thick light gray fine-grained limestone layers.</p>

Illustration No. SBR-4542P (Sheet 28 of 40)

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from U.S. Bureau of Mines Wyoming Corehole No. 8

From	To	Description
634.6	635.6	Marlstone and oil shale: Light to medium greenish gray and olive gray (5GY to 7.5Y 6/1-5/1 and 5/2, some 7/1, rare 4/1), calcareous to dolomitic. Faint to distinct distorted to contorted streaks, stringers, and laminae. Irregular thick parting. Abundant irregular light gray fine-grained limestone layers and stringers in upper part. Fairly abundant dense light slightly olive-gray dolomitic stringers in lower part.
635.6	637.4	Oil shale: Medium to light olive green and rare greenish gray (10 to 7.5Y 5/2-6/2, rare 4/2, rare 5GY 5/1 upper part), slightly calcareous. Moderately distinct to faint streaked bedding and some laminae. Irregular thick to medium parting. Some fine pyritic crystalline streaks and blebs near top.
637.4	638.4	Marlstone: Light slightly olive gray to light and rare medium olive green (10Y 6/1-7/1 to 7.5Y 6/2, rare 5/2-4/2), dolomitic to slightly calcareous. Faint streaked bedding and rare distinct laminae. Irregular to regular thick to medium parting. A thin buff to orangish-tan silty tuff layer near top. Abundant moderately coarse crystalline patches and streaks in lower 0.3 foot.
638.4	639.9	Oil shale: Light to medium olive green and greenish gray (10Y to 5GY 6/2-5/2, some 6/1) and some medium olive gray to grayish brown (7.5 to 2.5Y 5/2-4/2), dolomitic to slightly calcareous. Faint and some fairly distinct streaked bedding. Fairly regular thick parting. Abundant moderately coarse to fine pale yellow to gray-buff crystals. Rare fine vitreous black organic streaks in browner zones.
639.9	643.7	Oil shale (?): Light to some medium olive green (10 to 7.5Y 6/2-6/1, some 5/2-5/1, rare 7/2), slightly to moderately calcareous. Faint to moderately distinct streaked bedding. Irregular to regular thick to medium parting. Fairly abundant fine yellowish-tan to gray-buff dense to very fine crystalline streaks.
643.7	644.7	Marlstone: Light and rare medium olive green to greenish buff (10 to 7.5Y 6/2-7/2, some 8/1, rare 5/2-5/1), slightly calcareous. Faint to some moderately distinct thin to fine laminae. Irregular to fairly regular thick parting. Some <u>very</u> fine disseminated pyrite. Rare fine light gray calcite <u>blebs</u> and streaks. A fine buff-white biotitic tuff layer at 644.6.
644.7	645.5	Marlstone and oil shale: Buff to medium olive gray (5 to 7.5Y 7/2-5/2, rare 4/2), calcareous to dolomitic. Faint to distinct laminae

Illustration No. SBR-4542P (Sheet 29 of 40)

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from U.S. Bureau of Mines Wyoming Corehole No. 8

From	To	Description
		and streaked bedding. Regular to some irregular thick to thin parting. Abundant very fine disseminated crystals in darker layers. Some fine dense to silty-textured calcite streaks.
645.5	646.0	Oil shale: Dark to medium and some light brownish gray and olive gray (2.5 to 5Y 2/1-4/2, some 5/2-6/2 at top), dolomitic. Faint streaked bedding; some distinct irregular laminae near top. Fairly regular thick parting. Some medium brownish-gray tight very fine-grained crystalline streaks. Sample of dark to medium brownish-gray oil shale from 645.7 feet: X-ray - dolomite, quartz, feldspar.
646.0	647.0	Marlstone: Light to some medium gray (10Y 6/1-7/1, some 5/1), slightly calcareous. Faintly laminated. Slightly irregular thick to medium parting. Some very fine disseminated pyrite. Abundant light gray fine-grained limestone laminae and streaks in lower part.
647.0	647.2	Marlstone: Buff to light olive gray (5Y 7/2-6/2). Very faintly banded. Abundant fine calcite blebs.
647.2	648.5	Oil shale: Light to medium olive gray and olive green in upper and lower parts (5 to 10Y 6/2-5/2, some 7/2-7/1), medium to dark olive gray and brownish gray (5 to 2.5Y 4/2-3/1) from 647.6 to 648.0, dolomitic to slightly calcareous. Faint and rare distinct laminae and streaked bedding in upper and lower parts; fairly distinct to faint streaked bedding in middle part. Regular to some irregular thick to medium parting. Abundant fine round brownish crystal blebs in middle part. Some fine light gray limestone streaks in lower part. Sample of olive-green oil shale from 648.1 feet: X-ray - dolomite, calcite, quartz, feldspar, illite.
648.5	650.0	Marlstone and mudstone: Medium and light greenish gray to almost neutral gray (5GY 5/1 and 5/2-6/1 and 6/2 upper part to 5GY 6/1 and N6 lower part), slightly calcareous. Faintly laminated to very faintly streaked. Regular to irregular thick parting; some medium to thin parting in upper part. Abundant fine silty calcareous laminae and streaks. Abundant <u>very</u> fine disseminated pyrite. Some thick to fine brownish-gray fine-grained limestone layers in upper half foot. Buff coarse sandy-textured limestone with rare fine platy limestone inclusions in lower 0.2 foot. Sample of sandy-textured limestone from 649.9 feet: X-ray - calcite, dolomite, quartz, pyrite, feldspar.

Illustration No. SBR-4542P (Sheet 30 of 40)

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from U.S. Bureau of Mines Wyoming Corehole No. 8

From	To	Description
650.0	651.6	Oil shale: Medium to light olive green and some greenish gray (7.5 to 5Y 5/3 and 5/2-6/2, some 5GY 5/1-6/1 lower part), slightly calcareous. Faint streaked bedding to faint and some distinct laminae. Regular to irregular thick to medium parting. Rare very fine dark brownish-gray oil-shale streaks near top. Abundant fine disseminated calcite crystals and crystalline streaks in upper 0.6 foot and at 651.0-651.2. Distinct very light buff marlstone laminae at 650.5 and 650.6. Abundant thin to fine irregular gray-buff to light gray fine-grained limestone layers and streaks in lower 0.3 foot.
651.6	655.3	Marlstone: Medium to light slightly olive and greenish gray (10Y to 5GY 5/1-6/1), slightly calcareous. Very faintly banded and laminated. Regular to irregular thick to medium parting. Abundant fine to thin gray silty-textured limestone layers and streaks. Abundant very fine disseminated pyrite.
655.3	655.5	Oil shale: Buff to grayish brown (2.5Y 8/1 and 7/2-5/2, some 4/2), calcareous. Distinct fine slightly wavy laminae. Sharp slightly wavy contact with dark oil shale below. Sample of distinctly laminated buff to grayish-brown oil shale from 655.4 feet: X-ray - dolomite, quartz, montmorillonite, calcite, feldspar.
655.5	656.4	Oil shale: Medium olive gray (5Y 4/2) in upper 0.2 foot with a thin very dark layer at top; dark brownish gray to black in other parts (2.5Y 3/2-1/2), some satiny luster, dolomitic. Faint streaked bedding; some fine distinct dense medium brownish-gray dolomite streaks and lenses in lower part. Slightly wavy thick parting; regular to slightly hackly fracture. Abundant fine crystalline streaks, patches, and blebs in dark parts. Very abrupt change to lean oil shale at base. Sample of dark brownish-gray oil shale (without crystals) from 655.8 feet: X-ray - dolomite, quartz, feldspar, pyrite, illite.
656.4	657.8	Oil shale: Olive green in upper part to light olive gray in lower part (10Y 5/2 and some 4/2 to 5Y 6/2-7/2 and some 6/3-7/3), dolomitic to slightly calcareous. Faint to some moderately distinct bands and laminae. Fairly regular to irregular thick parting. Fine to thin brownish-gray to buff and light gray fairly coarse crystalline calcite layers and streaks becoming abundant in lower part.

Illustration No. SBR-4542P (Sheet 31 of 40)

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from U.S. Bureau of Mines Wyoming Corehole No. 8

From	To	Description
657.8	660.2	Oil shale and marlstone: Light to medium olive-green and rare medium to dark brownish-gray oil shale in upper and lower parts (10 to 7.5Y 6/2-5/2, rare 5 to 2.5Y 5/2-3/2 in lower part); pale greenish-gray marlstone from 658.4 to 659.2 (10Y 7/2 and 7/1, some 8/2); dolomitic to slightly calcareous. Faint streaked bedding and some faint to distinct bands and laminae. Irregular and rare regular thick parting. Abundant fine buff-white to pale brown calcite blebs. Buff marlstone grading into a thin white biotitic tuff layer at 658.0-658.1; a very thin light gray to white biotitic tuff stringer at 659.6. A 0.1-foot gray-buff fine to moderately coarse limestone layer at base of marlstone zone (659.2) interfingering with oil shale below.
660.2	662.0	Limestone and marlstone: Light to medium slightly olive and greenish gray (10Y to 5GY 6/1-5/1, some 7/1 upper part). Fairly distinct fine to thick interbedded limestone and marlstone laminae in upper part grading to dense massive marlstone with fairly abundant fine to thin gray silty limestone layers in lower part. Regular thick to medium parting in upper part; irregular thick parting and conchoidal fracture in lower part.
662.0	665.0	Mudstone and siltstone: Light to some medium olive gray (10Y 6/1-7/1, some 5/1-5/2 lower part), calcareous. Very faintly streaked to massive. Irregular thick parting. Abundant very fine disseminated pyrite in some parts. A 2-inch fine to medium-grained light brownish-gray limestone band at 662.2.
665.0	669.0	Mudstone grading to marlstone: Light to medium olive gray (10Y 6/1-5/2), moderately to slightly calcareous. Very faintly streaked and laminated to massive. Irregular to some regular thick parting. Abundant very fine disseminated pyrite in lower part.
669.0	669.7	Mudstone and siltstone: Light olive gray (10Y 6/1) and light to medium slightly brownish gray (2.5Y 6/1-5/1), calcareous. Faint very fine to thin streaks and irregular laminae; some slight crossbedding.
669.7	673.0	Mudstone and marlstone: Olive gray (10Y 5/1-5/2), calcareous. Very faint streaked bedding. Irregular thick parting. Some indistinct siltstone stringers and streaks in lower part. Sample of olive-gray marlstone (or claystone) from 670.7 feet: X-ray - K feldspar, illite, montmorillonite, dolomite, calcite.

Illustration No. SBR-4542P (Sheet 32 of 40)

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from U.S. Bureau of Mines Wyoming Corehole No. 8

From	To	Description
673.0	674.0	Mudstone and siltstone: Like 669.0-669.7.
674.0	680.5	Mudstone, marlstone, and some siltstone: Like 665.0-674.0. Abundant very fine disseminated pyrite in most parts.
680.5	683.0	Mudstone and marlstone: Medium and some light olive gray to neutral gray (10Y 5/1, some 6/1, some N5-4), moderately calcareous. Very faintly streaked to massive; some faint laminae in gray zones. Irregular to some regular thick parting. Very rare fine pyrite streaks and blebs.
683.0	684.2	Marlstone and claystone: Medium to light gray and some light olive gray (N5-6, rare 4, some 10Y 6/1), moderately calcareous. Faintly laminated and banded. Irregular to regular thick to medium parting. Some silty calcareous laminae and streaks. Sample of gray claystone from 683.6 feet: X-ray - quartz, feldspar, calcite, analcime, dolomite, montmorillonite, illite, pyrite.
684.2	685.2	Marlstone and mudstone: Medium to some light olive gray (10 to 7.5Y 5/1, some 6/1), moderately calcareous. Faint streaked bedding and rare laminae. Fairly regular to irregular thick to medium parting. Some very fine disseminated pyrite.
685.2	686.2	Marlstone, siltstone, and sandstone: Olive gray to gray buff (10Y 5/1-7/1, rare 8/1). Olive-gray marlstone finely laminated and streaked with light calcareous siltstone and fine to moderately coarse sandstone; contorted and broken bedding at 685.8-686.0. Irregular to rare regular thick parting. Coarser sand grains are very round and many appear to be dense brown dolomite.
686.2	687.9	Marlstone and mudstone: Medium to light olive gray (10Y 5/1 and 5/2-6/2, almost neutral gray in middle part), moderately to slightly calcareous. Faint streaked bedding and some thin to fine laminae. Irregular to fairly regular thick to medium parting. Abundant very fine disseminated pyrite. Some fine to thin gray to light olive-gray silty-textured limestone streaks and layers near base.
687.9	688.6	Oil shale and limestone: Medium and dark grayish-brown to light olive-green oil shale (2.5Y 5/2-3/2 in upper part to 10Y 6/2-7/2 and rare 5/1 in lower part); tan to buff-white silty crystalline limestone (2.5Y 7/3 to 10Y 7/1 and 8/1). Fine to thin slightly wavy oil-shale laminae with abundant very distinct fine to thin irregular limestone laminae and lenses. Slightly irregular thick parting; hackly fracture. Some fine crystalline calcite blebs in dark oil shale.

Illustration No. SBR-4542P (Sheet 33 of 40)

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from U.S. Bureau of Mines Wyoming Corehole No. 8

From	To	Description
688.6	691.9	<p>Limestone (?): Buff white to light slightly greenish gray and rare light gray (10 to 7.5Y 8/1-7/1, rare 6/1-6/2 and N7-6). Coarse angular to rounded porous texture with rare very small pebbles at top, becoming very fine-grained with small greenish-buff marlstone inclusions and grading into light olive-green marlstone at 689.9-690.2; sandy to silty crystalline texture in lower part with rare fine marlstone laminae. Some medium to dark gray grains in upper part.</p> <p>Sample of coarse-grained limestone from 688.7 feet: X-ray - dolomite, calcite, quartz, feldspar.</p> <p>Sample of fine sandy to silty-textured limestone from 691.1 feet: X-ray - calcite, dolomite, quartz, feldspar.</p>
691.9	696.0	<p>Oil shale: Light to rare dark olive green and olive gray (10 to 7.5Y 7/2 and 7/1-5/2 and 5/1, rare 4/2-3/2 mostly in upper half), calcareous to some dolomitic. Faint to distinct laminae and thin bands. Irregular to regular thick to medium parting. Abundant fine disseminated calcite blebs in upper part. Some thin to fine light gray silty limestone layers and streaks in middle part. Some buff earthy marlstone laminae in lower part.</p> <p>Sample of light to medium olive-green oil shale from 694.9 feet: X-ray - dolomite, calcite, quartz, feldspar, montmorillonite.</p>
696.0	697.0	<p>Marlstone: Very light to rare medium olive gray (10Y 7/2 and 7/1-6/2, some 8/1, rare 5/2-4/2), slightly calcareous. Faint to distinct laminae and some bands. Slightly irregular thick parting. Some very fine calcite specks and fine to thin silty-textured layers.</p>
697.0	698.0	<p>Marlstone: Light and rare medium olive gray (10Y 7/1 and 7/2-6/1, rare 5/2-4/2 upper part), slightly calcareous to dolomitic. Faint laminae and streaked bedding; some very fine distinct darker laminae in upper part. Abundant fine white calcite specks and streaks; some fine silty-textured layers in upper part.</p>
698.0	698.8	<p>Marlstone grading to oil shale: Light to medium olive gray (10Y 6/1 and 6/2 upper part to 7.5Y 5/2 and 4/2 lower part), dolomitic. Nearly massive in upper part to faint streaked bedding and some laminae in lower part. Irregular parting and fracture. Abundant very fine white to pale yellowish-gray calcite blebs and streaks. A 1/2-inch white earthy tuff at 698.7.</p>
698.8	699.6	<p>Marlstone and oil shale: Light to medium olive gray and some buff (10Y 6/2 and 6/1-5/2, some 7/2-8/2), slightly calcareous. Faint</p>

Illustration No. SBR-4542P (Sheet 34 of 40)

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from U.S. Bureau of Mines Wyoming Corehole No. 8

From	To	Description
		to some distinct thin to fine laminae. Irregular to regular thick to rare thin parting. Abundant fine white calcite blebs and buff to gray fine-grained crystalline layers in some zones.
699.6	700.2	Oil shale: Medium to light olive green (10Y 4/2-6/2), calcareous to dolomitic. Moderately distinct to faint slightly irregular laminae and rare bands. Regular to irregular thin to thick parting. Abundant very fine calcite blebs. Some thin to fine buff silty-textured limestone layers.
700.2	701.2	Oil shale and marlstone: Light to medium olive green (10 to 7.5Y 6/2 and 6/1-5/2 and 5/1, some 7/1). Moderately distinct to faint regular to irregular laminae and some streaked bedding. Slightly irregular thick to medium parting. Abundant fine buff to white calcite blebs and thin to fine silty-textured layers and streaks.
701.2	702.2	Marlstone: Light and medium greenish gray in upper part (5GY 6/2 and 6/1-5/2 and 5/1) to very pale slightly greenish gray in lower part (10GY 7/1-8/1), slightly calcareous. Faint fine to thin laminae in upper part to faint streaked bedding in lower part. Fairly regular to irregular thick to medium parting. Some very fine calcite specks and streaks in upper part. Abundant thin to fine sandy-textured calcareous layers with abundant brownish-gray and dark gray round grains in middle part, becoming streaked and patchy in lower part.
702.2	702.4	Tuff: White to buff white (N9 to 2.5Y 9/1), slightly calcareous, silty to earthy. Massive with some very fine faint streaks. Some fine light rusty orange-tan streaks and blebs. Very abundant biotite throughout. Sample of white biotitic tuff from 702.3 feet: X-ray - K feldspar, biotite.
702.4	703.3	Marlstone: Pale slightly greenish gray (10 to 5GY 8/1-7/1). Massive to faintly streaked and laminated. Irregular thick to medium parting. Fine to coarse round-sandy-textured zone in upper inch; abundant scattered round grains and rare fine streaks in other parts. Some fine silty-textured calcite streaks and layers in lower part. Sample of marlstone with fairly abundant very fine round dark grains from 702.7 feet: X-ray - dolomite, apatite, feldspar, illite, montmorillonite.
703.3	704.4	Marlstone (lean oil shale?): Buff to light and rare medium olive gray (10 to 7.5Y 7/1 and 7/2-6/1 and 6/2, some 8/1, rare 5/1-

Illustration No. SBR-4542P (Sheet 35 of 40)

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from U.S. Bureau of Mines Wyoming Corehole No. 8

From	To	Description
		5/2), slightly to moderately calcareous. Faint and rare distinct laminae and streaked bedding. Regular thick to medium parting. Abundant fine buff-white calcite blebs and some silty-textured streaks and laminae.
704.4	705.9	Oil shale: Light to medium olive gray (7.5 to 10Y 6/1 and 6/2-5/2, some 7/1), calcareous. Faint streaked bedding and some faint to distinct laminae. Regular to irregular thick to medium parting. Some fine silty calcite streaks. A thin buff-white earthy marlstone band at 705.0.
705.9	706.9	Marlstone (lean oil shale?): Light slightly olive and greenish gray (10Y to 5GY 6/1-7/1). Faint streaked bedding. Irregular to fairly regular thick to thin parting. Abundant very fine white calcite specks and streaks. Some fine dark oil-shale streaks near base.
706.9	707.9	Oil shale: Dark and some medium olive gray and brownish gray (5 to 2.5Y 3/2-2/2, some 4/2). Distinct to faint streaked bedding. Slightly irregular and wavy thick parting. Very abundant very fine pale brownish calcite crystals and very fine streaks. Some fine to small buff to light brownish-gray marlstone and tuff (?) streaks and nodules in lower part. A very fine buff-white biotitic tuff lamina at base. Sample of oil shale with abundant very fine calcite crystals from 707.4 feet: X-ray - dolomite, calcite, feldspar, quartz, montmorillonite.
707.9	709.4	Marlstone (lean oil shale in part?): Light to rare medium olive gray (10Y 6/1-7/1, rare 5/1-5/2). Distinct streaked bedding; some laminae near top. Irregular to some regular thick to thin parting; some rubble. Very abundant fine buff silty-textured calcite streaks and rare thin to 1-inch layers. A fine buff earthy tuff streak at 708.0. Sample of thin silty-textured calcite layer from 708.4 feet: X-ray - calcite, dolomite, quartz, montmorillonite, feldspar.
709.4	710.0	Oil shale: Dark brownish gray and medium to some light olive gray (2.5Y 3/2-2/1 and 5Y 4/2-5/2, some 6/2), dolomitic to slightly calcareous. Very distinct streaked bedding; faint very fine laminae near top. Fairly regular medium to thick parting. Some very fine dense tan to brown blebs and streaks. Very sharp regular contact with marlstone below.

Illustration No. SBR-4542P (Sheet 36 of 40)

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from U.S. Bureau of Mines Wyoming Corehole No. 8

From	To	Description
710.0	710.45	Marlstone: Light to rare medium olive gray (7.5 to 10Y 7/1-6/1 and 6/2, rare 5/2), calcareous. Faint streaked bedding and some laminae. Some fine silty calcareous streaks in upper part. A 1-inch tan silty limestone band at 710.3; two thin brown sandy-textured layers in lower inch.
710.45	710.65	Oil shale: Black (2.5Y 1/1-2/1), some slight satiny luster. Very finely laminated with tan blebby layers near top; very faintly bedded with few very fine light laminae in lower part. Rare very fine pyrite streaks. Sample of black oil shale from 710.6 feet: X-ray - quartz, calcite, feldspar, dolomite, illite, pyrite.
710.65	710.8	Oil shale: Olive gray to buff (10 to 7.5Y 5/1-7/1 and 7/2). Distinct thin laminae. Some fine gray-buff calcite blebs and streaks in lower half. Very sharp slightly wavy contact with black oil shale above.
710.8	711.4	Marlstone: Light slightly greenish gray (10Y to 5GY 6/1-7/1, some 8/1), calcareous. Distinct to faint fine to thin laminae. Irregular to regular thick to thin parting. Abundant fine silty layers and streaks.
711.4	712.0	Limestone (?): Buff (5Y 8/2), fine sandy to earthy texture. Faint streaked bedding. Irregular core pieces and rubble with irregular thin parting.
712.0	712.6	Marlstone: Light olive gray (7.5Y 7/1-6/1 and 6/2, some 7/2), silty, calcareous. Faintly laminated. Fairly regular thick parting.
712.6	713.6	Oil shale: Medium to light olive green (7.5Y 5/2-6/2, rare 4/2 upper part), calcareous. Distinct laminae in upper 0.1 foot; faint streaked bedding with rare distinct dark oil-shale streaks in other parts. Regular to irregular thick parting. Greenish-buff silty limestone (?) at 713.2-713.4.
713.6	714.6	Oil shale: Medium to dark olive gray (5Y 5/2-3/2, some 5/3, rare 2/1), dolomitic. Faint to moderately distinct streaks and discontinuous laminae with some slight unconformities; very fine regular laminae in lower 0.3 foot. Irregular to regular thick to medium parting; some hackly fracture. Few fine slightly brownish gray dense to blebby and rarely slightly prismatic calcite stringers and streaks. A 1-inch light olive-gray marlstone band with very fine dense buff to slightly reddish streaks near base.

Illustration No. SBR-4542P (Sheet 37 of 40)

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from U.S. Bureau of Mines Wyoming Corehole No. 8

From	To	Description
		Sample of very finely laminated medium to dark olive-gray oil shale from 714.4 feet: X-ray - dolomite, quartz, feldspar, montmorillonite, calcite, illite, pyrite.
714.6	715.7	Oil shale and marlstone: Olive gray to buff (5Y 5/2-7/2, rare 4/2), calcareous. Faint to distinct laminae and bands. Regular to irregular thick parting. Some silty to fine sandy-textured streaks in buff zones. Thin dense gray calcite layers at 715.3 and 715.4; a 3/4-inch dense medium to dark brownish-gray layer at base.
		Sample of dense brownish-gray band from 715.7 feet: X-ray - calcite, trace dolomite.
715.7	716.7	Oil shale: Medium and light brownish gray in upper part (2.5Y 5/2-6/2) to light olive gray in lower part (7.5Y 6/2), calcareous. Faintly laminated to very faintly streaked. Irregular thick to medium parting. Some fine dense to silty light gray to gray-buff streaks.
716.7	717.7	Oil shale: Light olive gray to slightly greenish gray (7.5Y 6/2 to 10Y and 5GY 6/1), calcareous. Faint streaked bedding and some faint bands. Irregular thick parting; conchoidal fracture. Rare fine buff to gray calcite streaks.
717.7	720.3	Marlstone and mudstone: Gray-buff and light gray to medium olive-gray marlstone (7.5Y 7/1 and N6 to 10Y 6/2 and 5/2) and buff mudstone (7.5Y 7/2). Faint streaked bedding in marlstone in upper and lower parts; mudstone in coarse jagged to irregular broken lateral contact with marlstone from 718.6 to 720.0. Large jagged protrusion of tan to dark grayish-brown oil shale at top of mudstone.
720.3	721.6	Marlstone: Light greenish gray (10Y to 5G 6/1-7/1, becoming almost neutral gray in lower part), calcareous. Faint streaked bedding; some very fine distinct medium gray streaks. Irregular thick to some thin parting; slightly unctuous in lower part. Some very irregular indistinct thin to fine vertical stringers. Rare fine oolitic streaks in lower part.
		Sample of slightly greenish gray marlstone or claystone from 721.5 feet: X-ray - montmorillonite, quartz, analcime, dolomite, calcite, illite, feldspar.
721.6	724.0	Sandstone, siltstone, and mudstone: Gray buff (7.5Y 8/1-7/1), calcareous. Faintly mottled to very finely streaked and laminated. Irregular to fairly regular thick parting. Fairly abundant fine

Illustration No. SBR-4542P (Sheet 38 of 40)

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from U.S. Bureau of Mines Wyoming Corehole No. 8

From	To	Description
		round grains to very small irregular pebbles in coarser zones. A 0.1-foot white to light gray earthy to silty band with indistinct distorted conglomeratic (?) mottling at 721.7-721.8. A thin light olive-gray marlstone layer at 721.9.
724.0	729.0	Siltstone: Light gray (10Y 7/1-6/1), moderately to slightly calcareous. Faintly mottled to massive. Irregular thick to some medium parting; some rubble in middle part. Abundant fine irregular to round white grains in upper part becoming sparse in lower part. Few 1/2- to 3/4-inch white ostracodal limestone inclusions at 724.9.
729.0	733.6	Siltstone and very fine sandstone: Light slightly olive gray (10Y 7/1-6/1), slightly calcareous to noncalcareous. Very faintly mottled and variegated. Irregular thick parting. Rare very fine white specks.
733.6	735.0	Sandstone: Light slightly olive gray (10Y 6/1-7/1), very fine grained. Very faintly variegated to massive. Very irregular parting and fracture; very crumbly and friable from 733.8 to 734.8; some rubble at base. Some very fine muscovite and biotite.
735.0	740.0	Missing. (Half of core loss from Run 20 arbitrarily assigned here.)
740.0	741.2	Sandstone: Light slightly olive gray (10Y 6/1-7/1), fine to some medium grained, slightly calcareous, massive. Mostly rubble and rounded core pieces. Some biotite and muscovite.
741.2	745.2	Siltstone: Light slightly olive gray (10Y 7/1), moderately to very slightly calcareous. Very faintly variegated to massive. Irregular thick to some medium and thin parting. Some fine-grained sandy patches in upper and lower parts.
745.2	750.2	Missing. (Half of core loss from Run 20 arbitrarily assigned here.)
750.2	751.6	Sandstone: Light slightly olive gray (10Y 6/1-7/1), fine grained, slightly calcareous, massive. Irregular thick to thin parting; some rounded core pieces and rubble. Abundant biotite and muscovite.
751.6	753.8	Siltstone: Light slightly olive gray (10 to 7.5Y 7/1-6/1, some 8/1), very to slightly calcareous. Massive to faintly variegated. Irregular thick parting. Abundant biotite in some parts.
753.8	757.0	Siltstone and some mudstone: Light olive gray (7.5Y 7/1 and 7/2-6/2), very slightly calcareous. Massive to faintly variegated. Irregular thick parting. Some sandy zones in upper part. Some small indistinctly bounded light gray to gray-buff tight calcitic patches in middle part.

Illustration No. SBR-4542P (Sheet 39 of 40)

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from U.S. Bureau of Mines Wyoming Corehole No. 8

From	To	Description
757.0	760.5	Sandstone and sandy siltstone: Light olive gray (7.5Y 7/1-6/1), very fine grained, slightly to moderately calcareous. Massive with some very faint mottling. Irregular to slightly irregular thick parting. Abundant biotite.
760.5	764.0	Siltstone and some mudstone: Light slightly olive gray (10 to 7.5Y 7/1-6/1), calcareous in upper part. Massive to very faintly mottled with rare faint streaks. Irregular to slightly irregular thick parting. Some mudstone in upper half has a slight gray haze from drying of split core surfaces.
764.0	775.0	Sandy siltstone and some very fine sandstone: Light slightly olive gray (10Y 6/1-7/1), slightly to moderately calcareous. Massive to very faintly mottled. Irregular to slightly irregular thick parting. Fairly abundant muscovite and biotite.

Bottom of core.

Illustration No. SBR-4542P (Sheet 40 of 40)