

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

Core samples from U.S. Bureau of Mines Site 9 well No. 1 drilled
in NW1/4SW1/4NW1/4 of sec 15, T 18 N, R 106 W
Sweetwater County, Wyoming

Surface elevation: 6339.74 feet
Described interval: 115.8 to 179.2 feet

From	To	Description
115.8	119.1	Mudstone: Light slightly olive and greenish gray (7.5 to 10Y 7/1 and 7/2-6/1 and 6/2), dolomitic. Very faint streaked bedding with some faint to moderately distinct laminae and thin bands. Fairly regular to irregular thick parting; slightly conchoidal to irregular fracture. Abundant very fine dark gray pyritic specks and streaks in upper part; very fine diagonal fracture filling at 116.3-116.5. Thin irregular white earthy tuff lenses at 118.2-118.3. Sample of mudstone with very fine dark gray streaks and blebs from 116.2 feet: X-ray-dolomite, quartz, feldspar, analcite, illite.
119.1	122.0	Mudstone and marlstone (lean oil shale in part?): Medium olive green (10Y 5/1 and 5/2-4/1 and 4/2), slightly dolomitic. Very faint streaked bedding and rare laminae. Regular to irregular, thick to medium parting; irregular to some hackly fracture. Some very fine pyritic streaks and blebs. (120.6-120.8 missing).
122.0	123.0	Mudstone: Medium to light olive gray (10Y 5/1-6/1), slightly dolomitic. Very faint streaked bedding. Regular to irregular thick parting; irregular fracture.
123.0	123.7	Mudstone and marlstone: Medium olive green (10Y 5/1 and 5/2-4/1 and 4/2), dolomitic. Faint streaked bedding and some very fine laminae. Irregular to regular and slightly curved, thick to medium parting. Rare very fine pyrite blebs. Sample of olive-green marlstone from 123.6 feet: X-ray-K feldspar, dolomite, illite, analcite.
123.7	124.7	Oil shale (marlstone): Medium olive gray (7.5 to 5Y 4/2-5/2), dolomitic. Faint streaked bedding and very fine laminae. Slightly irregular thick to medium parting; irregular slightly hackly fracture. Very abundant very fine slightly stellate pyrite (?) blebs. Sample of olive-gray oil shale with fine stellate blebs from 124.4 feet: X-ray-dolomite, feldspar, quartz, analcite, illite.
124.7	125.2	Oil shale (marlstone and shale): Medium to very dark olive gray and brownish gray (5 to 2.5Y 4/2-2/1), dolomitic. Faint streaked bedding and very fine laminae. Regular to slightly irregular, thick to

^{1/} By L. G. Trudell, completed July 24, 1972

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		thin parting; irregular slightly hackly fracture. Very abundant fine stellate blebs as above.
		Sample of dark brownish-gray oil shale from 125.0 feet: X-ray-dolomite, feldspar, analcite, quartz, illite, ferroan.
125.2	126.2	Oil shale (marlstone and mudstone): Medium olive gray (5 to 7.5Y 4/2-5/2), dolomitic. Faint streaked bedding. Regular to irregular, medium to thick parting; slightly irregular and hackly fracture. Very abundant fine stellate pyrite (?) blebs.
126.2	127.2	Oil shale (marlstone): Medium to some light olive gray (5 to 7.5Y 4/2-5/2, some 6/2 lower part), dolomitic. Faint very fine laminae and streaked bedding. Slightly irregular thick to medium parting; irregular fracture. Very abundant fine pyrite (?) blebs. Some very small dark pyritic patches and fine diagonal streaks at 126.9. Sample of marlstone with fine pyritic streaks from 126.9 feet: X-ray-Na feldspar, dolomite, quartz, analcite, illite, ferroan.
127.2	128.6	Marlstone and mudstone (oil shale in part): Medium to light olive gray (5Y 5/2-6/2 and 6/1), dolomitic to very slightly calcareous. Very faint streaked bedding and rare faint banding. Fairly regular to irregular thick parting; irregular to some conchoidal fracture. Some fine dark pyritic blebs and streaks.
128.6	130.7	Siltstone, mudstone, and rare very fine sandstone: Gray buff to gray (5 to 2.5Y 7/1-5/1, some 8/1-8/2 lower part), calcareous in coarser parts. Faint streaked bedding to moderately distinct bands and laminae. Regular to some irregular thick parting; slightly irregular and conchoidal fracture. Abundant very fine dark gray specks in some zones (rarely limonite stained). Sample of siltstone with abundant very fine dark gray specks from 130.5 feet: X-ray-quartz, Na feldspar, dolomite, analcite, illite.
130.7	130.8	Missing.
130.8	132.0	Siltstone: Gray buff to light gray (5Y 7/1-6/1), very slightly calcareous. Faint streaked bedding. Irregular thick to some thin parting; slightly conchoidal to irregular fracture. Some fine dark gray specks and streaks in upper part.
132.0	133.3	Siltstone and mudstone: Light gray to medium slightly olive gray (5Y 6/1-5/1), noncalcareous to dolomitic. Faint streaked bedding with abundant thin indistinct

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From	To	Description
		dense dolomitic stringers, streaks and blebs. Irregular thick to thin parting; slightly irregular to irregular and some coarse hackly fracture. Sample of mudstone with dolomitic stringers and blebs from 132.8 feet: X-ray-dolomite, feldspar, illite, ferroan.
133.3	134.4	Mudstone and marlstone (oil shale in part): Olive gray (5Y 5/1-4/1), dolomitic. Faint streaked bedding. Irregular to fairly regular, thick to some thin parting; irregular and some coarse hackly fracture. A 3/4-inch oolitic dolomite layer near top. Abundant very fine pyrite (?) blebs in middle. Sample of olive-gray oil shale from 133.9 feet: X-ray-dolomite, K feldspar, illite, ferroan.
134.4	135.5	Oil shale (marlstone and shale): Medium to dark olive gray and brownish gray (5 to 2.5Y 4/1 and 4/2-3/1 and 3/2, rare 2/2-2/1), dolomitic. Faint streaked bedding and very fine laminae. Irregular to regular, thick to some thin parting; slightly irregular to hackly fracture. Very abundant very fine disseminated pyrite crystals. Sample of dark brownish-gray pyritic oil shale from 134.6 feet: X-ray-dolomite, K feldspar, illite, ferroan.
135.5	136.5	Oil shale (marlstone): Medium and rare dark olive gray (5Y 4/2 and 4/1-5/2 and 5/1, rare 3/2), dolomitic. Faint streaked bedding and some very fine laminae. Irregular to fairly regular, thick and rare thin parting; irregular slightly hackly fracture. Abundant very fine disseminated pyrite crystals.
136.5	137.4	Oil shale (shale): Brownish black to dark brownish gray (2.5Y and 10YR 1/1-2/1, some 3/1-3/2), some satiny to resinous luster, dolomitic. Very faint streaked bedding. Irregular shaly to papery parting; very hackly fracture. Rare fine brittle vitreous black organic streaks. Rare very thin lenticular dark brown dolomite layers. Sample of very dark fissile oil shale from 136.8 feet: dolomite, analcite, feldspar, quartz, illite, ferroan.
137.4	139.3	Oil shale: Very dark fissile oil shale as above and below with some 1- to 3-inch tight marly medium brownish-gray zones.

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From	To	Description
		Sample of tight brownish-gray dolomitic oil shale from 138.4 feet: X-ray-dolomite, analcite, feldspar, quartz, illite, ferroan.
139.3	141.1	Oil shale (shale): Dark brownish gray to black (10YR 3/1-1/1), dolomitic. Very faint streaked bedding. Irregular shaly to papery parting; very hackly fracture. Some <u>very</u> fine disseminated pyrite and rare small blebs.
141.1	142.0	Oil shale (marlstone): Dark to medium brownish gray in upper 0.3 foot (10YR and 2.5Y 3/1-4/1), medium olive gray in lower part (5Y 4/2-5/2 and 5/1), dolomitic. Faint streaked bedding. Irregular to fairly regular thick parting; irregular coarse hackly fracture. A diagonal limonite-stained fracture surface at top. Fairly abundant fine dark pyritic (?) blebs and streaks.
142.0	142.5	Mudstone and marlstone (lean oil shale): Medium to light olive gray (5 to 7.5Y 5/2-6/2), dolomitic. Two-inch massive band at top; faintly streaked in lower part. Irregular thick parting; slightly irregular and conchoidal fracture. Some fine dark pyritic (?) blebs and patches. Sample of light olive-gray mudstone from 142.1 feet: X-ray-dolomite, feldspar, quartz, illite, analcite.
142.5	143.5	Oil shale (marlstone): Medium to some light olive gray (7.5 to 5Y 5/2-4/2, some 6/2), dolomitic to slightly calcareous. Faint streaked bedding. Slightly irregular thick parting; slightly irregular fracture. Abundant very fine dark pyritic (?) blebs.
143.5	144.7	Shaly marlstone (lean oil shale): Slightly brownish gray (2.5Y 5/1-4/1), dolomitic. Massive to faint very fine streaked bedding. Irregular to regular, thick to thin shaly parting; hackly fracture. Sample of shaly marlstone from 144.4 feet: X-ray-dolomite, analcite, quartz, feldspar, ferroan, illite.
144.7	146.0	Oil shale (marlstone): Medium to dark brownish gray (2.5Y 4/1-3/1, rare 2/1), dolomitic. Faint streaked bedding and very fine laminae. Regular to slightly irregular, thick to medium parting; slightly hackly to irregular fracture. Rare fine pyritic streaks.

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From	To	Description
		Sample of dark brownish-gray oil shale from 145.1 feet: X-ray-analcite, dolomite, quartz, illite, feldspar, ferroan.
146.0	148.1	Oil shale (shaly marlstone): Medium to some dark brownish to slightly olive gray (2.5 to 5Y 4/1, some 3/1), dolomitic. Faint streaked bedding and some very fine laminae. Regular to irregular, thick to thin shaly and rare papery parting; hackly to slightly irregular and conchoidal fracture. Rare very fine pyrite blebs in upper part.
148.1	149.2	Oil shale (marlstone): Medium to some dark olive gray (5Y 4/1-4/2, some 3/1), dolomitic. Faint streaked bedding. Fairly regular to irregular thick parting; slightly hackly fracture. Abundant fine pyrite (?) blebs.
149.2	150.5	Oil shale (marlstone): Medium olive gray (5Y 4/1-4/2), dolomitic. Faint streaked bedding and some very fine laminae. Slightly irregular to irregular thick parting; irregular fracture. Very abundant fine pyrite (?) blebs.
		Sample of oil shale with abundant fine pyrite (?) blebs from 149.5 feet: X-ray-dolomite, analcite, quartz, feldspar, ferroan, illite.
150.5	151.5	Oil shale (marlstone): Medium to dark olive gray and brownish-gray (5 to 2.5Y 4/1 and 4/2-3/1, some 2/1), slightly dolomitic. Faint streaked bedding. Irregular thick to rare medium and thin parting; irregular and rare hackly fracture. Some very fine pyrite (?) blebs as above. A thin brownish-gray finely laminated dolomite layer at 151.1 with fine vermiform stringers extending a short distance into oil shale below.
		Sample of dark brownish-gray oil shale from 151.2 feet: X-ray-dolomite, analcite, quartz, feldspar, ferroan, illite.
151.5	152.8	Oil shale (marlstone and shale): Dark to rare medium brownish gray and olive gray (2.5 to 5Y 3/2-2/2, rare 4/2-4/1), dolomitic. Faint streaked bedding and some very fine laminae. Slightly irregular thick parting and slightly irregular fracture in most parts; irregular shaly to papery parting and hackly fracture at 152.2-152.5. Rare fine pyrite streaks.
		Sample of dark brownish-gray papery oil shale from 152.3 feet: X-ray-analcite, quartz, dolomite, ferroan, feldspar, illite.

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From	To	Description
152.8	154.0	Oil shale (marlstone and shale): Dark to medium brownish gray and olive gray (2.5 to 5Y 3/2-4/2 and 4/1), slightly dolomitic. Faint streaked bedding. Irregular thick parting and slightly irregular fracture in upper and lower parts; irregular shaly to papery parting and hackly fracture at 153.2-153.6. A 0.1-foot dark brown tar-stained silty to very fine sandy-textured tuff stringer at top. Some very fine pyrite (?) blebs in lower part. Finely interfingered with wavy tuff streaks and stringers in lower inch. Sample of dark brown tar-stained tuff from 152.8-152.9 feet: X-ray-analcite, Na and K feldspars, quartz, biotite?
154.0	154.15	Tuff: Tan to buff (2.5Y 6/3-7/2, some 8/2), silty, porous and permeable. Faint mosaic pattern. Sample of buff silty tuff from 154.1 feet: X-ray-analcite, ferroan, feldspar, quartz, dolomite.
154.15	154.25	Tuff and oil shale: Medium to light brownish-gray tight silty tuff stringers with fine wavy streaks of dark brownish-gray oil shale. Oil shale is commonly bleached to light brownish gray adjacent to tuff stringers.
154.25	154.6	Oil shale (shale and marlstone): Dark brownish gray and olive gray (2.5 to 5Y 3/1-2/1), slightly dolomitic. Faint streaked bedding. Irregular thin to thick parting; hackly to irregular fracture.
154.6	156.2	Oil shale (marlstone): Medium to dark olive gray (5Y 4/2 and 4/1-3/1), some dark brownish gray in lower part (2.5Y 3/1-2/1), dolomitic. Faint streaked bedding and rare very fine laminae; distinct fine tan marlstone laminae at 155.2 and 155.3. Irregular to slightly irregular, thick to some medium parting; irregular and some coarse hackly fracture. Very abundant fine pyrite blebs in upper half. Thin to fine pinch-and-swell dense grayish-brown dolomite layers at 155.4, 155.6, and 156.05. Sample of dark olive-gray oil shale from 155.8 feet: X-ray-analcite, quartz, illite, feldspar, dolomite, ferroan.
156.2	157.3	Oil shale (shale and marlstone): Dark brownish gray in upper part to dark and medium olive gray in lower part (2.5Y 2/1 to 5Y 3/1 and 4/2), slightly to moderately dolomitic. Very faint very fine laminae to faint streaked bedding. Irregular to fairly regular, thin to thick parting; hackly to irregular

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From	To	Description
		fracture. Abundant very fine pyrite (?) blebs in lower part.
157.3	159.6	Oil shale (marlstone and claystone): Dark and some medium olive gray and brownish-gray to black (5 to 2.5Y 3/1-2/1, some 4/1 upper part), slightly dolomitic. Faint streaked bedding and very fine laminae. Regular to irregular thick parting; irregular to some coarse hackly fracture. Sample of black oil shale from 159.2 feet: X-ray-analcite, dolomite, quartz, feldspar, illite, ferroan.
159.6	161.2	Oil shale (shale): Black to dark brownish gray (2.5Y 1/1-2/1, some 3/1). Faint streaked bedding. Irregular papery to shaly parting; hackly fracture. Badly broken and mixed up from splitting; mostly grab sampled. Sample of very dark papery shale from 160.0 feet: X-ray-dolomite, analcite, quartz, ferroan, feldspar, illite.
161.2	162.2	Oil shale (marlstone): Black to medium olive gray (2.5 and 5Y 1/1-4/1 and 4/2), dolomitic. Very faintly streaked to faintly laminated and banded. Irregular to rare regular, thick to rare thin parting; coarse hackly to slightly irregular fracture. A very thin brittle vitreous black organic streak at 161.5. A thin light gray to yellowish-buff silty tuff stringer at 161.7. Abundant fine pyrite (?) blebs in lower part. Sample of silty tuff stringer from 161.7 feet: X-ray-analcite; some quartz, feldspar.
162.2	164.7	Oil shale (marlstone): Medium olive gray to some black (5Y 5/2-3/1, some 2/1), dolomitic. Faint to rare moderately distinct laminae and streaked bedding in thick gradational slightly lighter and darker zones. Irregular to fairly regular, thick to medium parting; irregular slight to coarse hackly fracture. Abundant fine flakey pyrite (?) blebs. A 2-inch irregular dense grayish-brown dolomite nodule at 162.5 (few drops of viscous tar bleeding from very small fractures in nodule); irregular thin dense dark grayish-brown layers at 163.1, 163.7, and 164.3; thin light grayish-brown lenses at 163.2 and 163.8. Sample of large dense grayish-brown nodule from 162.5 feet: X-ray-dolomite, trace analcite.

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From	To	Description
		Sample of oil shale with abundant fine pyrite (?) blebs from 163.4 feet: X-ray-dolomite, quartz, feldspar, illite.
		Sample of thin dense dark grayish-brown layer from 163.7 feet: X-ray-dolomite.
164.7	165.9	Oil shale (marlstone): Dark brownish gray (2.5Y 3/1-2/1), dolomitic. Faint streaked bedding. Irregular to slightly irregular thick parting; irregular coarse to slight hackly fracture. Abundant fine pyrite (?) blebs in upper part becoming sparse in lower part. Rare fine dolomite lenses in upper part; thin irregular layers at 165.3 and 165.7.
		Sample of dark brownish-gray oil shale from 165.8 feet: X-ray-dolomite, quartz, analcite, feldspar, illite, ferroan.
165.9	166.9	Oil shale (marlstone and shale): Dark brownish gray to black (2.5Y 3/1-1/1), slightly dolomitic. Very faintly streaked; some fine distinct grayish-brown dolomite laminae near base. Irregular to fairly regular, thick to thin parting; slightly irregular to hackly fracture. A 1-1/2-inch reddish-grayish-brown tuff (?) band at 166.5; mottled with dense patches and oil-stained sandy-textured patches. A fine sandy-textured tuff lamina at 166.7 at top of finely laminated dolomitic zone.
		Sample of tuff from 166.5 feet: X-ray-analcite, ferroan, K and Na feldspars, quartz, biotite?
166.9	167.9	Oil shale (shale): Very dark brownish gray to black (2.5Y and 10YR 2/1-1/1, some 3/1). Faint streaked bedding. Irregular to fairly regular, thin to thick parting; hackly fracture.
167.9	169.0	Oil shale (marlstone): Dark to medium brownish gray (2.5Y 3/1-4/1, some 10YR 3/2 and 2/1 near top), dolomitic. Very faintly bedded; some moderately distinct laminae near top. Slightly irregular thick to some thin parting; slightly irregular to rare coarse hackly fracture. A large irregular nodular dense to sandy-textured, grayish-tan to brown tuff mass in lower three inches.
169.0	170.1	Oil shale (marlstone and shale): Dark brownish gray (2.5Y 3/1, some 2/1), slightly dolomitic. Faint very fine laminae and streaked bedding. Irregular to regular, thick to papery parting; slightly irregular to hackly fracture; broken and mixed up core from 169.5 to 170.0. Some fine pyrite (?) blebs in upper

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From	To	Description
		half. Some buff earthy to silty streaks in broken zone. A 1-inch irregular brown dolomite layer at base. Sample of dense brown dolomite layer from 170.1 feet: X-ray-dolomite; trace quartz, analcite, feldspar.
170.1	171.1	Oil shale (shale): Very dark brownish gray to black (2.5Y and 10YR 2/1-1/1). Very faintly streaked. Shaly to some papery parting; hackly fracture. Badly broken and mixed from splitting; uneven sample split. Sample of dark brownish-gray to black oil shale from 170.6 feet: X-ray-dolomite, analcite, quartz, feldspar, ferroan, illite.
171.1	171.5	M-BED Tuff: Slightly reddish brown (7.5 to 10YR 4/2-5/2). Faintly mottled; riddled with very fine tight light mudstone-filled fractures. Silty to very fine sandy textured. Some very fine oil-shale streaks near base. Sample of tuff from 171.1 to 171.3 feet: X-ray-analcite, ferroan, quartz, feldspar.
171.5	172.1	Oil shale (shale): Black to very dark brownish gray (10YR 1/1-2/1). Faint streaked bedding. Shaly to some papery parting; hackly fracture; uneven sample split. A fine slightly prismatic calcite seam at about 171.8.
172.1	173.4	Oil shale (shale): Dark to medium brownish gray (10YR to 2.5Y 3/1-4/1). Very faintly bedded. Shaly to papery parting; sharp hackly fracture; slightly unctuous. Thin brown dolomite layer at about 173.1. Uneven sample split. Sample of unctuous papery shale from 172.8 feet: X-ray-dolomite, quartz, analcite, illite, feldspar, ferroan.
173.4	174.7	Oil shale (marlstone): Medium to dark and rare light olive gray (5Y 4/2-3/1, some 5/2-6/2 near top), dolomitic. Faint streaked bedding with some faint to distinct light laminae and bands. Irregular to regular, thick to medium parting; irregular fracture. Some fine gray silty pyritic streaks in upper part. Abundant fine pyrite (?) blebs in lower part. A 1-inch tan dolomite stringer with some fine oil-shale streaks at base. Sample of olive-gray oil shale with fine pyrite (?) blebs from 174.2 feet: X-ray-quartz, feldspar, illite, analcite, pyrite.

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From	To	Description
174.7	175.9	Oil shale (shale): Dark brownish gray (2.5Y and 10 YR 2/1-3/1). Faint streaked bedding. Irregular to fairly regular, thin to medium parting; hackly fracture. Rare very fine dense grayish-brown layers and stringers. A thin irregular light brownish-gray to dirty buff silty to muddy tuff stringer at 175.3 (broken core). Sample of thin tuff stringer from 175.3 feet: X-ray-analcite, quartz, feldspar, illite, pyrite.
175.9	177.1	Oil shale (shale): Dark to medium brownish-gray (2.5Y 3/1-5/1, rare 2/1). Faint streaked bedding and some very fine laminae. Irregular shaly to papery parting; hackly fracture; slightly unctuous. Some fine pyritic stringers and very irregular fracture fillings at 176.3-176.5. Sample of medium brownish-gray shale from 176.6 feet: X-ray-quartz, analcite, dolomite, feldspar, illite, pyrite.
177.1	179.2	Oil shale (marlstone): Medium slightly brownish and olive gray to buff (2.5 to 5Y 4/1-7/1 and 7/2), dolomitic. Faint streaked bedding and laminae with distinct irregular to regular light banding; some fine displacements. Irregular thick to medium parting; irregular to conchoidal fracture; slightly unctuous in parts. A 1-inch white to gray silty tuff band with abundant dark pyritic streaks and patches near top. Sample of white to gray silty tuff with dark pyritic streaks and patches from 177.2 feet: X-ray-pyrite, feldspar, quartz, analcite, dolomite. Sample of slightly brownish-gray oil shale from 177.8 feet: X-ray-quartz, K feldspar, dolomite, illite. Sample of light brownish-gray to buff marlstone from 178.8 feet: X-ray-dolomite, quartz, feldspar, illite.

Bottom of core.

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