

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

Core samples from DOE/LETC Southern Uinta Basin Corehole 12. Drilled in 1977 in SESW, Sec 19, T 12 S, R 24 E, Uintah County, Utah.

Surface elevation: 6,261 feet (ungraded ground)
 Cored interval: 91.0 - 621.1
 Mahogany marker:)?) 490.9 - 491.4

From	To	Description
91.0	94.4	Oil shale: Dark olive gray (5Y 3/1-3/2) with rare gray (5Y 4/1), slightly calcareous. Faint to very faint streaked bedding. Irregular medium to thick parting; irregular to slightly hackly fracture. Rare very fine disseminated pyrite. Very rare flakes of biotite. Tuffaceous or mineralized zone 94.30-94.34, dolomitic with common pyrite or marcasite. Sample of dark olive gray oil shale from 92.0: X-ray - dolomite, calcite, quartz, analcime, feldspar, illite. Sample of mineralized zone from 94.3: X-ray - calcite, analcime, dolomite, quartz, feldspar, smectite.
94.4	99.4	Oil shale: Dark olive gray to medium olive gray (5Y 4/2-3/2) grading lighter downward to medium olive gray (5Y 5/2), calcareous. Moderately distinct streaks and fine laminae. Irregular medium to thick parting. Rare flakes of biotite but becoming increasingly more abundant downward. Rare, very fine disseminated pyrite. Natural tight near vertical fracture - calcite filled from 97.4-99.4. Rare oil staining. Sample of medium olive gray oil shale from 99.0: X-ray - dolomite, calcite, quartz, analcime, feldspar, illite, smectite.
99.4	100.0	Mudstone: Light brownish gray (2.5Y 6/2) to medium grayish brown (2.5Y 5/2) with some brownish black (2.5Y 3/2) stained crystalline masses. Fairly massive appearing with general swirled appearance, some fairly distinct laminae. Irregular thick parting, irregular fracture. Very common calcite crystalline growths with very distinct crystal form and cleavages. Crystal forms 1mm or less. Common pyrite interspersed with calcite crystals, also displaying some distinct crystalline form and cleavages. Some disseminated flakes of biotite. High porosity and permeability. Sample of light brownish gray mineralized mudstone from 99.7: X-ray - calcite, some quartz, feldspar, dolomite, analcime.

^{1/} By Glenn M. Mason, completed June 13, 1980

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From	To	Description
100.0	101.7	Siltstone: Medium to light brownish gray (2.5Y 5/2-6/2), slightly calcareous. Thin moderately distinct streaked and laminated bedding. Fairly regular thick parting, irregular to fairly faintly hackly fracture.
101.7	107.0	Oil shale (mudstone): Medium to light brownish gray (2.5 5/2-6/2) with darker streaks (2.5 4/2), slightly calcareous. Thin moderately to quite distinct streaked and laminated bedding. Regular thick parting; slightly irregular to faintly hackly fracture. Very regular spacing of laminae. Flakes of biotite common throughout section, often concentrated in laminae. Very fine disseminated blebs of pyrite common. Some dark staining of rock noted, probably tar blebs. Sample of medium to light brownish gray oil shale from 104.0: X-ray - calcite, dolomite, quartz, feldspar, analcime, illite.
107.0	110.0	Oil shale (siltstone): Light brownish gray (2.5Y 6/2), with some medium brownish gray (2.5 5/2-4/2), calcareous. Thin moderately distinct to distinct streaked and laminated bedding. Fairly regular thick parting; slightly irregular to faintly hackly fracture. Loop structure 109.75-109.9, with associated smokey to black to clear calcite and pyrite. Sample of mineralized light brownish gray oil shale from 109.8: X-ray - calcite, dolomite, quartz, feldspar, analcime, pyrite, marcasite, illite.
110.0	115.0	Oil shale (siltstone and mudstone): Medium brownish gray (2.5Y 6/2-5/2) with some dark brownish gray (2.5Y 4/2), calcareous. Thin moderately distinct to distinct streaked and laminated bedding. Fairly regular thick parting; slightly irregular to faintly hackly fracture. Some disseminated fine blebs of pyrite. Rare streaks of solid hydrocarbons. Rare very fine crystals of calcite.
115.0	120.0	Oil shale (mudstone): Dark brownish gray (2.5 3/2), grading lighter downward through medium brownish gray (2.5 4/2-5/2), with lightest at lowest point of section: moderately calcareous. Faintly streaked oil shale, with streaks becoming more distinct lower in the section. Irregular thick with some medium parting; irregular to very faintly hackly fracture. Some disseminated very fine blebs of pyrite. Rare flakes of biotite. Rare oil staining noted, particularly in upper section, occasionally associated with solid hydrocarbon.

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		Sample of dark brownish gray oil shale from 116.0: X-ray - dolomite, calcite, quartz, analcime, feldspar, illite.
120.0	122.0	Oil shale (mudstone - siltstone): Light brownish gray (2.5Y 6/2), with some medium brownish gray (2.5Y 5/2-4/2) laminae, moderately calcareous. Moderately to fairly distinct streaked and laminated bedding. Fairly regular thick parting; regular to very faintly hackly fracture, with very rare conchoidal type fracture. Some to fairly common disseminated very fine pyrite blebs, rare streaks and biotite flakes. Rare streaks of black hydrocarbon material. Some indication of open type joint or fracture 120.9-121.1, or at least possibility of groundwater circulation.
		Sample of medium brownish gray oil shale from 120.7: X-ray - dolomite, quartz, calcite, feldspar, analcime, smectite, illite.
122.0	129.7	Oil shale (mudstone): Medium grayish brown (2.5 5/2), grading darker down in section to (2.5Y 4/2), with some dark brownish gray (2.5Y 3/2), dolomitic with some calcareous patches. Faint streaked and laminated with some distinct streaked bedding and rare very distinct bands. Irregular medium to thick parting; irregular to faintly hackly fracture. Calcareous band 124.92-124.95. Limestone band 126.90-126.97. Clastic zone 127.37-127.52, fine sand predominantly with accessory biotite, quartz growth, and dark mineral thought to be hornblende. Some to common disseminated pyrite blebs and some biotite flakes disseminated throughout rock mass. Fossil leaf 126.85.
		Sample of medium brownish gray oil shale from 126.8: X-ray - dolomite, quartz, feldspar, calcite, analcime, smectite, illite.
		Sample of clastic zone with minerals from 127.4: X-ray - calcite, quartz, analcime, feldspar, smectite, dolomite.
129.7	130.0	Missing
130.0	131.7	Same as 122.0-129.7 interval limestone laminae at 130.6 and 131.3.
131.7	133.6	Oil Shale (mudstone): Medium to dark brownish gray (2.5Y 4/2-3/2), dolomitic to calcareous. Moderately distinct streaked and laminated bedding, with distinct calcite crystals in streaks. Irregular to faintly hackly fracture, irregular medium to thick parting. Abundant calcite in streaks and stringers. Common biotite flakes disseminated through rock mass, decreasing to rare downward.

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		Sample of dark brownish gray calcite oil shale from 132.0: X-ray - dolomite, calcite, quartz, feldspar, analcime, illite.
133.6	136.0	Oil Shale (siltstone): Medium brownish gray (2.5 4/2), with rare light brownish gray (2.5 6/2), calcareous. Fairly distinct to faint streaked and laminated beds. Irregular medium to thick parting; faintly irregular to very faintly hackly fracture. Clastic stringer 133.55-133.7 contains numerous biotite flakes, oil stained. Sample of clastic zone 133.6: X-ray - calcite, quartz, dolomite, analcime, feldspar, biotite, fluorite. Sample of medium brownish gray oil shale from 135.9: X-ray - dolomite, calcite, quartz, analcime, feldspar, illite.
136.0	142.0	Oil Shale (mudstone): Medium to dark brownish gray (2.5 4/2-3/2), with rare medium gray (2.5Y 5/0-4/0) limestone stringers, dolomitic to slightly calcareous. Faint to moderately distinct streaked and laminated bedding. Irregular medium to thick parting; irregular and slightly hackly fracture. Tight, vertical natural fracture with black and gold colored tar and waxey material coating the fracture sides, 138.1-141.3. Some biotite flakes disseminated throughout rock mass. Calcite stringers increasing downward in section. Shale parting with plant fossils (unidentified) 141.5.
142.0	143.6	Oil Shale (mudstone and siltstone): Medium to dark brownish gray (2.5Y 4/2-3/2) and rare brownish black (2.5 2/2), calcareous. Distinct streaked and laminated beds. Irregular thin to thick parting; irregular to hackly fracture. Very numerous calcite stringers, up to .1 feet thick, with distinct crystal and rhombohedral cleavage displayed. Tuff, with copious biotite 142.48-142.55. Fine disseminated pyrite. Sample of calcite medium to dark brownish gray oil shale from 143.1: X-ray - dolomite, calcite, quartz, feldspar, analcime, illite, smectite.
143.6	145.0	Oil Shale (mudstone): Dark brownish gray (2.5 3/2), dolomitic. Faint streaked bedding. Irregular thick parting; slightly hackly fracture. Rare disseminated flakes of biotite. Disseminated very fine blebs of pyrite. Sample of dark brownish gray oil shale from 144.5: X-ray - dolomite, calcite, quartz, analcime, feldspar, illite, smectite, apatite.

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145.0	149.0	Oil Shale (mudstone): Medium to dark brownish gray (2.5 4/2-3/2), dolomitic. Faint streaked bedding. Thin to thick irregular parting; irregular to hackly fracture. Numerous calcite filled veins, both of vertical and horizontal extension in a zone 145.1-148.5. Same vein .2 feet thick. Rare disseminated blebs of pyrite.
149.0	152.0	Oil Shale (mudstone): Medium grayish brown (2.5Y 4/3), calcareous. Faint to very distinct streaked and laminated bedding. Thin to thick irregular parting; irregular to very faintly hackly fracture. Abundant calcite stringers in horizontal positions with bedding. Rare disseminated blebs of pyrite. Sample of medium grayish brown oil shale from 151.0: X-ray - calcite, dolomite, quartz, feldspar, analcime, illite, smectite, apatite.
152.0	156.0	Oil Shale (mudstone): Dark brownish gray (2.5Y 3/2-3/3), dolomitic to slightly calcareous. Very faintly streaked and laminated bedding. Irregular thin to thick parting; irregular to slightly hackly fracture. Rare stringers of calcite becoming common in lower .5 feet of section. Rare very fine disseminated blebs of pyrite. Larger blebs of pyrite (.1-.2 feet in diameter) contained in calcite stringers. Rare stringers of black crystalline hydrocarbon.
156.0	158.3	Oil Shale (mudstone): Medium to dark brownish gray to grayish brown ((2.5 4/2-3/2) - (2.5 4/3-3/3)), calcareous. Faint streaked and laminated bedding. Irregular medium to thick parting; slightly hackly fracture. Rare stringers of calcite. Rare very fine disseminated pyrite. Rare very fine flakes of biotite. Sample of medium to dark grayish brown oil shale from 161.4: X-ray - dolomite, calcite, quartz, analcime, feldspar, illite, smectite.
158.3	160.0	Missing
160.0	164.0	Same as 156.0 - 158.3
164.0	166.0	Oil Shale (mudstone): Medium to dark grayish brown (2.5Y 4/3-3/3) calcareous. Faint streaked and laminated bedding. Irregular medium to thick parting; slightly hackly fracture. Rare very fine disseminated pyrite blebs. Rare fine flakes of disseminated biotite. Abundant calcite in vertical and horizontal filled fractures and stringers. Some black crystalline hydrocarbon occurring with calcite in filled fractures.

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From	To	Description
		Sample of calcitic medium to dark grayish brown oil shale from 165.0: X-ray - dolomite, calcite, quartz, analcime, feldspar, illite, smectite.
166.0	172.0	Same as 156.0-158.3. Clastic zone (very fine sand) with biotite flakes 171.60-171.69, oil stained.
172.0	174.7	Oil Shale (siltstone) Medium to dark grayish brown (2.5Y 4/3-3/3), slightly calcareous faint streaked and laminated bedding. Irregular medium to thick parting; slightly hackly fracture. Pyrite in discontinuous streaks and blebs with some blebs (.1 X .2 feet). Rare flakes of biotite. Tight natural closed fracture, oil stained 173.73-173.97.
		Sample of medium grayish brown oil shale from 172.8: X-ray - dolomite, calcite, quartz, feldspar, analcime, illite, smectite.
174.7	177.2	Oil Shale (mudstone): Medium olive gray (5Y 4/2-5/2), dolomitic. Faint streaked bedding. Irregular medium to thick parting; irregular to faintly hackly fracture. Pyrite common to some decreasing downward, in small disseminated blebs and discontinuous streaks. Rare flakes of biotite. Oil and tar coated closed tight natural fracture 174.7-175.25. Rare calcite fracture filling.
		Sample of medium olive gray oil shale from 174.9: X-ray - quartz, calcite, dolomite, analcime, feldspar, smectite, illite.
177.2	178.3	Oil shale (mudstone) Medium grayish brown (2.5 4/2), with some brownish black (2.5 2/2), dolomitic to slightly calcareous. Moderately distinct to very distinct streaked and laminated bedding some looped structure. Irregular medium to thick parting; faintly hackly fracture. Clastic lenses composed of very fine sand with biotite flakes and rare pyrite, oil stained, 177.95-178.05, 178.15-178.21, 178.37-178.39. Rare biotite flakes and pyrite blebs disseminated through rock mass.
		Sample of medium grayish brown oil shale from 177.3: X-ray - dolomite, calcite, quartz, feldspar, illite, analcime.
		Sample of dark brown clastic zone from 178.0: X-ray - quartz, analcime, feldspar, dolomite, calcite, biotite, hornblende.
178.3	182.0	Oil shale (siltstone): Medium olive gray to medium brownish gray (5.0Y 5/2-2.5Y 5/2), dolomitic. Faint streaked bedding. Irregular medium to thick parting; irregular to faintly hackly fracture. Some disseminated very small pyrite blebs.

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182.0	183.1	Oil shale (siltstone and mudstone): Medium grayish brown (2.5 5/2) grading increasingly browner and darker downward to medium grayish brown (2.5Y 4/3), dolomitic. Faint streaked bedding. Irregular thin to thick parting; moderately hackly fracture. Rare flakes of biotite. Sample of medium grayish brown oil shale from 182.8: X-ray - dolomite, calcite, quartz, feldspar, analcime, illite, smectite.
183.1	184.8	Oil shale (mudstone): Medium to dark grayish brown (2.5 4/2-3/2) with common brownish black (2.5Y 2/2), dolomitic. Moderately to very distinct streaked and laminated bedding. Irregular medium to thick parting; faintly hackly to regular fracture. Rare disseminated very fine blebs of pyrite. Discontinuous clastic stringers with common biotite flakes at 184.35-184.38 and 184.48-184.49.
184.8	189.2	Oil shale (siltstone and mudstone): Medium olive gray (5.0Y 5/2-4/2) with light brownish gray tuff (2.5Y 6/2) and rare brownish black stringers (2.5Y 2/2) near bottom of the section, dolomitic to slightly calcareous. Faint streaked and laminated bedding with rare distinct laminae. Irregular thin to thick parting; irregular to slightly hackly fracture. Common blebs of pyrite as disseminated blebs and discontinuous streaks; relative amounts decreasing downward in section. Tuff bed 185.50-186.06 with common disseminated biotite and pyrite. Wax coated tight natural fracture extending through the tuffaceous zone 185.70-186.06. Sample of light brownish grey tuff from 185.0: X-ray - quartz, analcime, feldspar, dolomite, biotite. Sample of medium olive grey oil shale from 188.0: X-ray - calcite, quartz, dolomite, feldspar, illite, smectite, analcime.
189.2	190.2	Oil shale (mudstone): Brownish black (2.5 2/2) with some medium grayish brown (2.5Y 4/2), dolomitic. Moderately to very distinct streaked and laminated bedding. Slightly irregular to moderately hackly fracture; irregular thick parting. Very rare, very fine disseminated blebs of pyrite. Some wedges of clastic material.
190.2	192.8	Oil Shale (siltstone): Medium olive gray (5Y 5/2-4/2), dolomitic. Faint streaked and laminated bedding. Slightly irregular fracture; irregular thin to medium parting. Some pyrite in disseminated fine blebs and isolated lenses.

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From	To	Description
		Sample of medium olive gray oil shale from 192.0: X-ray - dolomite, quartz, calcite, feldspar, illite, smectite.
192.8	193.8	Marlstone and Oil Shale (mudstone): Varigated medium gray (N 3/0), light brownish gray (2.5 6/2), and dark grayish brown (2.5Y 3/2), faintly dolomitic. Distinct streaked and laminated bedding with some loop structure. Irregular fracture; irregular thin to thick parting. Some calcite crystals and limestone stringers. Oil stained.
193.8	195.3	Oil Shale (mudstone): Medium to dark olive gray (5Y 4/1-3/1), dolomitic to slightly calcareous. Faint streaked and laminated bedding. Slightly irregular fracture; medium to thick parting. Rare flakes of biotite. Very fine disseminated blebs of pyrite. Rare black stringers of organic material. Sample of medium olive gray oil shale from 194.2: X-ray - dolomite, calcite, quartz, feldspar, illite.
195.3	196.5	Oil Shale (mudstone) and marlstone: Oil shale brownish black (2.5Y 2/2) and marlstone dark brownish gray to grayish brown (2.5 3/2-3/4), dolomitic to calcareous. Faint to very distinct streaked and laminated bedding. Very faintly irregular to regular parting; slightly irregular thick fracture. Marlstone 195.5-195.67. Calcite replacement of saline mineral form 195.51-195.78, 196.15-196.30, and 196.42-196.5. Sample of brownish black oil shale with calcite mineral replacement from 195.7: X-ray - dolomite, calcite, quartz, feldspar, illite.
196.5	199.3	Oil Shale (silty mudstone very blebby; mudstone matrix with siltstone blebs: matrix light brownish gray): (2.5Y 6/2) with blebs buff (2.5Y 7/2), some medium brownish gray matrix (2.5Y 5/2), calcareous. Moderately distinct streaked and laminated bedding, very blebby. Irregular thin to thick parting; relatively even to faintly irregular fracture. Very rare, very fine blebs of disseminated pyrite. Sample of blebby, buff and light brownish gray silty mudstone from 197.9: X-ray - dolomite, quartz, calcite, feldspar, illite.

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199.3	199.7	Tuff: Dark grayish brown to buff (2.5Y 4/2-7/2), not reactive with acid. Single massive bed. Thick parting; irregular fracture. Abundant biotite. High porosity and permeability.
199.7	200.5	Same as 196.5 - 199.3. Very calcareous tuffaceous material 199.85 - 199.92.
200.5	202.0	Missing
202.0	204.2	Oil Shale (siltstone) with very abundant calcite mineralization: Dark olive gray (5Y 3/1), with milky white mineralization, calcareous. Moderately distinct streaked and laminated bedding. Irregular thin to thick parting; irregular fracture. Zone completely saturated with secondary calcite mineralization, milky white quartz generally with cubic to near cubic form. Numerous places where mineralization doesn't completely fill void space, suggestive of secondary nature of the mineralization. Some pyrite in very fine disseminated blebs. Sample of dark olive gray oil shale with abundant mineralization from 203.3: X-ray - calcite, dolomite, quartz, feldspar, apatite.
204.2	208.0	Oil Shale (silty mudstone, mudstone matrix with siltstone blebs): Matrix medium to light brownish gray (2.5Y 5/2-6/2), with blebs buff (2.5Y 7/2), calcareous. Moderately distinct streaked and laminated bedding, some distinct beds. Irregular medium to thick parting; irregular fracture. Calcite mineralization, possibly secondary replacement of shortite along partings, some iron (yellow-orange) staining present in calcite.
208.0	212.0	Oil Shale (mudstone): Medium olive gray (5Y 5/1-4/1), slightly reactive with acid. Very distinct streaked bedding with common calcite stringers. Irregular thin to medium parting; the fracture appears quite regular along bedding planes with calcite crystallization very common along parting surfaces. Rare brownish-black laminae of oil shale. Disseminated fine blebs of pyrite. Sample of medium olive gray oil shale from 209.0: X-ray - calcite, quartz, dolomite, feldspar, illite.

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212.0	212.8	<p>Oil Shale (mudstone) with abundant calcite: Medium olive gray (5Y 4/1) with white calcite, calcareous. Moderately distinct to very distinct streaked and laminated bedding. Slightly irregular thin to thick parting; moderately regular fracture generally with calcite mineralization along partings. Sample has decidedly a ringgy appearance, with mineralization often not completely filling the rings, quite suggestive that the mineralization is secondary replacement.</p> <p>Sample of medium olive gray oil shale from 212.5: X-ray - dolomite, calcite, quartz, feldspar, illite.</p>
212.8	213.4	<p>Oil Shale (mudstone) with moderately abundant calcite: Olive black (5Y 2/1) and some dark olive gray (5Y 3/1-3/2), slightly calcareous to calcareous. Moderately distinct to distinct streaked and laminated bedding. Slightly irregular thin to thick parting; moderately regular fracture - generally along bedding planes with abundant calcite mineralization. Calcite crystals display definite rhombohedral form. Moderately rare very fine disseminated pyrite.</p> <p>Sample of olive black oil shale with calcite mineralization from 213.0: X-ray - dolomite, calcite, quartz, apatite, feldspar, illite.</p>
213.4	215.0	<p>Oil Shale (mudstone) with abundant calcite mineralization: Dark gray to dark olive gray (5Y 4/0-4/1), with white calcite crystals, oil shale is only slightly reactive with HCL. Moderately streaked to distinctly laminated bedding. Irregular thin to thick parting; fracture irregular along bedding planes with calcite mineralization. Calcite crystals are generally coarse in nature, single crystals to .1 foot, and generally restricted to partings. Buff siltstone blebs becoming increasingly abundant toward lower half of the section. Fine disseminated blebs of pyrite becoming increasingly more abundant lower in the section.</p> <p>Sample of dark gray oil shale from 214.5: X-ray - dolomite, feldspar, quartz, calcite, illite.</p>

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215.0	217.3	Oil Shale (mudstone) with very abundant siltstone blebs: Light gray to light olive gray (5Y 6/0-6/1) and medium gray to medium olive gray (5Y 5/0-5/1) with buff blebs, slightly calcareous. Moderate distinctly streaked and laminated bedding. Irregular thin to thick parting, slightly irregular fracture. Calcite with pyrite mineralization along bedding planes. Pyrite in disseminated blebs and streaks. Sample of mineralized zone from 216.9: X-ray - calcite, pyrite, feldspar.
217.3	217.8	Oil Shale (siltstone) with large mineral filled rings: Medium gray to medium olived gray (5Y 5/0-5/1), with buff to white mineralized rings, the oil shale is faintly dolomitic. Faintly streaked bedding displaying some disruption of horizontal nature (wavy) suggestive that the mineralization is secondary replacement. Thick parting; slightly irregular fracture with mineralization also occurring along parting. Moderately large rings 0.5 feet across, partially filled with minerals, calcite predominately, with minor amounts of pyrite and an unidentified silver-gray, possibly calcite. Sample of mineralized ring in oil shale 217.2: X-ray - dolomite, calcite, feldspar, pyrite, quartz, illite.
217.8	220.0	Oil Shale (siltstone): Medium olive gray (5Y 5/2-4/2), slightly calcareous to calcareous. Moderately distinct to distinct streaked and laminated bedding. Irregular thick parting; slightly irregular fracture with mineralization often along parting surfaces. Relatively abundant calcite mineralization in discontinuous streaks, lenses, and blebs. Buff to white calcareous tuff 218.75-218.90 with abundant biotite flakes. Rare to some very fine disseminated flakes of pyrite. 221.6-222.0 has whitish mineral blebs, oblong with the long axis oriented horizontally, the blebs up to .2 foot along long axis, probably calcite. Sample of tuffaceous zone from 218.9: X-ray - Sodium and Potassium feldspar, calcite, quartz, biotite, dolomite, hornblende. Sample of Oil Shale with whitish mineral blebs from 219.9: X-ray - dolomite, calcite, quartz, feldspar, illite.

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220.0	221.3	Oil Shale (mudstone and siltstone) and siltstone: Medium olive gray (5Y 5/1-5/2), dolomitic to faintly calcareous. Indistinct streaked and moderately distinct streaked bedding. Irregular medium to thick parting; irregular fracture. Pyrite in specific zones (locally abundant within these zones) also displaying iron staining within these zones possibly as a result from alteration. Some laminae display distinctly siltier texture.
221.3	226.4	Oil Shale (siltstone and mudstone) with very abundant calcite mineralization: Medium to dark olive gray (5Y 4/1-3/2), with calcite milky white to clear, oil shale is very faintly reactive to HCL. Faint streaked and laminated with apparent loop structure present, the calcite mineralization is sometimes bedding related but also may cut across bedding boundaries. Irregular thick and rare medium parting; irregular to some very irregular and hackly fracture. Large amounts of calcite mineralization very coarse crystals, possibly secondary in nature, replacing rings and fractures in rock. Pyrite associated and intermingled with the calcite, often displaying reddish-orange weathered iron staining. Sample of highly mineralized oil shale from 224.5: X-ray - calcite, dolomite, feldspar, quartz, illite, smectite, pyrite.
226.4	227.0	Oil Shale (siltstone): Medium olive gray (5Y 5/1-4/1), moderately reactive with HCL. Moderately distinct streaked and laminated bedding. Slightly irregular thick parting; slightly irregular fracture with mineralization occurring along the parting surfaces. Heavy calcite mineralization fine crystals, primarily associated in discontinuous streaks and very small rings and small lenses. Numerous very small rings with only some partly filled with calcite. Some very fine blebs of discontinuous pyrite. Sample of medium olive gray oil shale with calcite mineralization from 226.8: X-ray - dolomite, calcite, quartz, feldspar, illite.
227.0	229.1	Oil Shale (siltstone and mudstone), with abundant calcite mineralization 227.0-227.7: Dark brownish gray grading downward to brownish black (2.5 3/2-2/1), oil shale slightly reactive with HCL grading downward to unreactive. 227.0-227.7 displays relatively little bedding information because the rock is very heavily mineralized, the lower part however displays quite distinct laminated bedding. Irregular thick parting grading downward out of mineralized

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From	To	Description
		zone into papery parting; irregular fracture grading downward to quite regular and smooth parting. Oil shale zone 228.7-229.0 displays shiny luster, and displays a regular pattern structure that may be fossiliferous organic matter. Sample of dark brownish gray oil shale with mineralization from 227.3: X-ray - dolomite, calcite, feldspar, quartz, illite.
229.0	230.6	Oil Shale (siltstone): Medium olive gray (5Y 4/1-4/2), faintly dolomitic. Some distinct laminated bedding and rare streaked bedding. Irregular thin to thick parting; slightly irregular fracture. Moderately large amounts of calcite replacement mineralization. Bottom of section becomes increasingly clastic in nature, highly calcareous, black angular crystalline mineral, possibly hornblende in clastic zone. Black mineral has somewhat of an elongate tubular form, shiny semi-metallic luster, and is quite soft (easily flaked with probe). Sample of clastic zone from 230.5: X-ray - dolomite, calcite, quartz, feldspar, illite, pyrite.
230.6	235.0	Oil Shale (mudstone and siltstone): Medium olive gray (5Y 5/2-4/2) with buff to olive buff siltstone blebs (5Y 7/2-6/2), slightly calcareous. Very faint streaked bedding, with some irregular lenticular black hydrocarbon lenses. Very irregular thin to thick parting; slightly irregular fracture. Some disseminated pyrite. Some calcite crystals in rings, with relative abundance of calcite increasing downward.
235.0	240.0	Oil Shale (mudstone) with abundant calcite: Medium olive gray (5Y 5/2-4/2) with clear to milky white calcite, calcareous. Faint streaked bedding, but appears quite jumbled due to mineralization. Irregular thick parting; irregular fracture. Very abundant mineralization, calcite and pyrite, probably secondary infilling fractures.
240.0	243.0	Oil Shale (siltstone): Medium to dark olive gray (5Y 4/2-3/2), slightly calcareous. Relatively faint streaked and laminated bedding. Moderately irregular medium to thick parting, irregular to very faintly hackly fracture. Rare disseminated blebs of pyrite. Rare flakes of biotite. Sample of medium olive gray oil shale from 242.5: X-ray - dolomite, calcite, quartz, feldspar, illite.

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from DOE/LETC Southern Uinta Basin Corehole 12 (Con.)

From	To	Description
243.0	249.0	Oil Shale (mudstone): Medium olive gray (5Y 4/2) with rare dark olive gray (5Y 3/2), slightly calcareous. Faint streaked bedding, rarely laminated. Irregular medium to thick parting, irregular to slightly hackly fracture. Some marcasite lenses. Rare flakes of biotite.
249.0	251.5	Oil Shale (mudstone): Dark grayish brown to brownish black (2.5 3/2-2/2), moderately calcareous. Faint streaked and laminated bedding. Slightly irregular thick parting; irregular to slightly hackly fracture. Rare flakes of biotite. Sample of dark grayish brown oil shale from 250.3: X-ray - dolomite, calcite, quartz, feldspar, illite, pyrite.
251.5	252.6	Oil Shale (mudstone): Medium olive gray (5Y 5/2 and 5Y 4/2), dolomitic to slightly calcareous. Moderately distinct streaked and laminated bedding. Fairly regular thick parting; slightly irregular to very faintly hackly fracture. Rare disseminated blebs of pyrite. Rare flakes of biotite.
252.6	261.9	Oil Shale (siltstone and mudstone): Dark olive gray (5Y 3/2) and dark brownish gray (2.5Y 3/2), with some brownish black (2.5Y 2/2) and black streaks, dolomitic to slightly calcareous. Faint streaked and laminated bedding. Irregular medium to thick parting; irregular to slightly hackly fracture. Relatively rare very fine blebs of disseminated pyrite with rare streaks and thin lenses. Sample of dark olive gray oil shale from 257.9: X-ray - calcite, dolomite, quartz, feldspar, illite.
261.9	263.4	Oil Shale (mudstone and siltstone) and siltstone: Medium grayish brown (2.5 5/2-4/2) and buff (2.5Y 7/2), calcareous to faintly dolomitic (variable with bed). Irregular thick parting. Faintly streaked to moderately distinct streaked and laminated bedding, slightly irregular fracture. Relatively abundant calcite occurring both in fracture filling and as streaks interbedded. Rare flakes of biotite. Sample of white to clear mineral laminae from 263.0: X-ray - quartz, dolomite, gaylussite, feldspar, illite, trace to doubtful searlesite.
263.4	266.3	Oil Shale (siltstone to mudstone) with abundant calcite mineralization: Medium to dark olive gray (5Y 4/2-3/2), the oil shale appears faintly dolomitic. Irregular medium to thick parting. Faintly streaked and laminated bedding; irregular to moderately hackly fracture.

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from DOE/LETC Southern Uinta Basin Corehole 12 (Con.)

From	To	Description
266.3	272.4	<p>Very abundant calcite mineralization, probably infilling of fractures, secondary in nature. Rare flakes of biotite.</p> <p>Oil Shale (silty mudstone): Medium to dark olive gray (5Y 4/2-3/2), with rare streaks of olive black (5Y 2/2), dolomitic to slightly calcareous. Faint streaked and laminated bedding. Irregular thin to thick parting; irregular to slightly hackly fracture. Rare very fine blebs of disseminated pyrite. Rare flakes of biotite. Calcite mineralization of fracture 269.9-270.2.</p> <p>Sample of medium to dark olive gray oil shale from 269.9: X-ray - dolomite, calcite, quartz, feldspar, illite.</p>
272.4	273.3	<p>Oil Shale (mudstone): Dark olive gray (5Y 3/2) and olive black (5Y 2/2) and rare black (N 2/0), dolomitic. Faint streaked and rare distinct laminated bedding. Irregular thick parting; irregular to faintly conchoidal fracture. Black crystalline hydrocarbon substance 273.09-273.12, possibly coal. Rare flakes of biotite lense of pyrite 273.23-273.26.</p>
273.3	285.6	<p>Oil Shale (mudstone and siltstone): Variable medium olive gray (5Y 5/2-4/2) to medium brownish gray (2.5 5/2-4/2), with rare to some brownish black to olive black (2.5Y 2/2-5.0Y 2/2) streaks, dolomitic to slightly calcareous. Faintly streaked and laminated bedding. Irregular medium to thick parting; irregular to faintly hackly fracture. Rare to some very fine blebs of disseminated pyrite, with rare streaks and small lenses of pyrite. Rare flakes of biotite.</p> <p>Sample of medium olive gray oil shale from 280.3: X-ray - dolomite, calcite, quartz, feldspar, illite.</p>
285.6	286.6	<p>Oil Shale (mudstone): Dark olive gray to olive black (5.0Y 3/2-2/2), dolomitic to faintly calcareous. Faint to moderately distinct streaked and laminated bedding. Irregular thick parting; irregular to faintly hackly fracture. Some very fine disseminated blebs of pyrite.</p>
286.6	289.3	<p>Same as 273.3-285.6, except: increased pyrite lenses.</p> <p>Sample of medium olive gray oil shale from 287.0: X-ray - dolomite, calcite, quartz, feldspar, illite, smectite.</p>

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from DOE/LETC Southern Uinta Basin Corehole 12 (Con.)

From	To	Description
289.3	303.9	Oil Shale (siltstone): Medium to dark olive gray (5.OY 4/1-3/1), dolomitic to slightly calcareous. Faintly streaked and laminated bedding. Irregular medium to thick parting; slightly irregular fracture. Disseminated flakes of biotite. Fine disseminated blebs of pyrite, with rare streaks and lenses. Sample of medium olive gray oil shale from 300.4: X-ray - dolomite, calcite, quartz, feldspar, illite, smectite.
303.9	304.8	Oil Shale (mudstone): Olive black (5.OY 2/2), dolomitic. Faintly streaked and laminated bedding. Irregular thick parting; irregular to slightly conchoidal fracture. Rare very fine flakes of disseminated biotite.
304.8	310.0	Oil Shale (mudstone and siltstone): Medium olive gray (5.OY 4/1-4/2), dolomitic to faintly calcareous. Faint streaked and laminated bedding, with rare moderately distinct laminae. Irregular medium to thick parting; irregular to very faintly conchoidal fracture. Moderately common disseminated blebs of pyrite, rare streaks. Some to common flakes of biotite.
310.0	310.7	Oil Shale (mudstone): Black to olive black (5.OY 2/1-2/2), faintly dolomitic. Some laminae display resinous luster. Moderately distinct streaked and laminated bedding. Irregular thick parting; slightly irregular to conchoidal fracture. Very fine disseminated blebs of pyrite. Sample of black oil shale from 310.6: X-ray - dolomite, quartz, calcite, feldspar, illite.
310.7	322.0	Oil Shale (siltstone and mustone): Medium olive gray (5.OY 4/1-4/2), rare streaks of black dolomitic to faintly calcareous. Faintly to moderately distinct streaked and laminated bedding. Irregular thin to thick parting; irregular to faintly conchoidal fracture. Some disseminated biotite flakes, locally quite concentrated. Several thin limestone stringers (.2 feet thick). Sample of medium olive gray oil shale from 316.0: X-ray - dolomite, calcite, quartz, feldspar, illite, smectite.
322.0	323.0	Oil Shale (siltstone) and oil impregnated tuff: Black (5.OY 2/1), olive black (5.OY 2/2), and brownish black (2.5Y 2/2), dolomitic to faintly calcareous. Moderately to very distinct streaked and laminated bedding. Irregular thick parting; irregular to faintly hackly fracture.

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from DOE/LETC Southern Uinta Basin Corehole 12 (Con.)

From	To	Description
		Bleeding tuff 322.58-322.68. Rare stringers of limestone. Some disseminated pyrite, and rare clumps of disseminated pyrite. Moderately common flakes of biotite. Sample of oil impregnated tuff from 322.6: X-ray - sodium feldspar, quartz, calcite, dolomite, potash feldspar.
323.0	332.4	Oil Shale (siltstone and mudstone) and tuff: Medium brownish gray to medium olive gray (2.5Y 4/2-5.0Y 4/2) and some dark olive gray (5.0Y 3/1) grading darker downward in section, dolomitic to faintly calcareous. Faintly to moderately distinct streaked and laminated bedding. Irregular medium to thick parting; irregular to rare faintly hackly fracture. Tuff 328.86-329.05. Some disseminated pyrite blebs, rare streaks. Some disseminated flakes of biotite. Sample of medium olive gray oil shale from 331.0: X-ray - dolomite, calcite, quartz, feldspar, illite, smectite.
332.4	333.4	Oil Shale (mudstone): Black (5.0Y 2/0) and rare olive black (5.0Y 2/2), slightly dolomitic. Satiny to moderately resinous sheen. Faint to moderately distinct streaked and laminated bedding. Irregular thick parting; irregular to faintly conchoidal fracture. Rare disseminated pyrite, very rare streaks. Rare flakes of biotite.
333.4	362.0	Oil Shale (mudstone and siltstone): Medium and dark olive gray (5.0Y 4/2 and 5.0Y 3/2) grading gradually downward to medium and dark brownish gray (2.5Y 4/2 and 2.5Y 3/2), with some olive black to brownish black (5.0Y 2/2-2.5Y 2/2) laminae and streaks, dolomitic to faintly calcareous. Faintly to moderately distinct streaked and laminated bedding. Irregular medium to thick parting, irregular to very faintly conchoidal fracture. Disseminated pyrite rare becoming increasing more prevalent downward in section, very abundant 353.2-362.0. Hydrocarbon (waxy) coated, tight natural fracture 333.4-337.78. Some stringers of limestone, on very irregular intervals. Tuffs: 346.13-346.15 oil stained, 346.20-346.29 oil stained, and 355.95-356.01 oil stained. Sample of medium olive gray oil shale from 352.5: X-ray - Calcite, dolomite, quartz, feldspar, illite.

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from DOE/LETC Southern Uinta Basin Corehole 12 (Con.)

From	To	Description
362.0	368.7	Oil Shale (siltstone): Dark olive gray (5.0Y 3/2), and some medium olive gray (5.0Y 5/2), slightly calcareous to moderately calcareous. Faint to moderately distinct streaked bedding. Irregular thick parting; irregular to faintly conchoidal fracture. Abundant disseminated fine pyrite. Tuffs: 361.91-361.93 oil stained, 362.49-362.52 oil stained, 367.61-367.67 oil stained, and 367.83-367.86 oil stained. Tight vertical natural fracture 366.7-367.57. Sample of dark olive gray oil shale from 365.7: X-ray - dolomite, calcite, quartz, feldspar, illite, smectite.
368.7	371.0	Oil Shale (siltstone): Medium and dark olive gray (5.0Y 5/2 and 5.0Y 3/2), calcareous. Faint streaked bedding. Irregular thick parting; irregular to faintly hackly fracture. Moderately abundant disseminated fine pyrite, rare streaks. Rare flakes of mica.
371.0	372.0	Oil Shale (mudstone and siltstone): Black and olive black (5.0Y 2.0 and 5.0Y 2/2), dolomitic. Rare resinous luster. Faint to moderately distinct streaked and laminated bedding. Slightly irregular thick parting; along bedding planes to faintly irregular fracture. Some very fine disseminated pyrite. Bleeding tuff at 371.46-371.50. Rare flakes of biotite.
372.0	382.1	Oil Shale (siltstone and mudstone) and siltstone: Medium olive gray (5.0Y 5/2) and some medium brownish gray (2.5Y 5/2) and rare dark olive gray (5.0Y 3/2), dolomitic to slightly calcareous. Faint to moderately distinct and rare very distinct streaked and laminated bedding. Irregular thick parting; irregular to faintly hackly fracture. Some fine disseminated pyrite. Carbonized fossil insects on parting at 373.50. Rare clastic stringers. Sample of medium brownish gray oil shale from 375.5: X-ray - dolomite, calcite, quartz, feldspar, illite, smectite.
382.1	382.2	Oil Shale (siltstone and mudstone): Medium olive gray interbedded with and grading downward fully to olive black (5.0Y 4/2-2/2), dolomitic. Faint to moderately distinct streaked and laminated bedding. Irregular thick parting; irregular to faintly hackly fracture. Rare very fine disseminated pyrite.
382.2	385.50	Oil Shale (siltstone): Medium olive gray (5.0Y 5/2-4/2), dolomitic to faintly calcareous. Faint streaked bedding;

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from DOE/LETC Southern Uinta Basin Corehole 12 (Con.)

From	To	Description
		irregular to very faintly hackly fracture. Moderately abundant disseminated pyrite. Abundant mica flakes in some bedding planes.
		Sample of medium olive gray oil shale from 385.0: X-ray - dolomite, calcite, quartz, feldspar, smectite, illite.
385.5	387.0	Oil Shale (mudstone and siltstone): Medium olive gray (5.0Y 4/2 - 5/2) with rare dark olive gray streaks (5.0Y 3/2), dolomitic to slightly calcareous. Faint streaked and laminated bedding. Irregular thick parting; irregular to slightly hackly fracture. Disseminated pyrite common 385.5-385.8.
387.0	387.7	Oil Shale (siltstone): Dark olive gray to olive black (5.0Y 3/2-2/2), dolomitic. Streaked and laminated bedding. Irregular thick parting; irregular fracture. Some disseminated pyrite.
387.7	391.6	Oil Shale (siltstone and mudstone): Medium olive gray (5.0Y 4/2) grading downward to medium brownish gray (2.5Y 4/2), dolomitic to slightly calcareous. Faint streaked and laminated bedding. Irregular thick to medium parting; slightly irregular grading downward to hackly fracture. Closed vertical fracture 387.7-389.4. Sample of medium brownish gray oil shale from 390.4: X-ray - dolomite, calcite, quartz, feldspar, smectite, illite.
391.6	392.6	Oil Shale (siltstone): Dark olive gray (5.0Y 3/2) and some olive black (5.0Y 2/2), dolomitic. Satiny luster, faintly streaked and laminated bedding. Thick parting; slightly irregular fracture. Some disseminated blebs of pyrite.
392.6	396.4	Oil Shale (siltstone): Medium olive gray (5.0Y 5/2-4/2) grading downward to medium brownish gray (2.5Y 5/2-4/2), dolomitic. Faint streaked and rare laminated bedding. Slightly irregular parting; irregular to very faintly hackly fracture. Common very fine disseminated pyrite. Moderately common flakes of biotite. Closed tight natural vertical fracture 395.8-396.4.
396.4	397.5	Oil Shale (mudstone and siltstone): Dark olive gray (5.0Y 4/2) and olive black (5.0Y 2/2), dolomitic to calcareous. Common satiny luster. Faint to moderately distinct streaked and laminated bedding. Irregular thick parting; irregular fracture. Oil bleeding tuff 397.38-397.46. Rare very fine pyrite.

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from DOE/LETC Southern Uinta Basin Corehole 12 (Con.)

From	To	Description
397.5	401.0	<p>Oil Shale (siltstone and mudstone): Medium olive gray (5.0Y 4/2) grading downward to medium brownish gray (2.5Y 4/2), dolomitic to slightly calcareous. Faintly streaked bedding. Irregular thick parting; irregular to slightly conchoidal fracture. Common blebs of very fine disseminated pyrite. Moderately common flakes of biotite. Tight vertical fracture 399.2-400.0.</p> <p>Sample of medium olive gray oil shale from 398.7: X-ray - calcite, dolomite, quartz, feldspar, smectite, illite.</p> <p>Sample of medium brownish gray oil shale from 400.1: X-ray - calcite, dolomite, quartz, feldspar, illite, smectite.</p>
401.0	404.4	<p>Oil Shale (siltstone): Striped appearing medium olive gray (5.0Y 5/2) and dark olive gray (5.0Y 3/2), dolomitic. Faint and moderately distinct streaked and laminated bedding. Irregular medium and thick parting; irregular to faintly conchoidal fracture. Some very fine flakes of pyrite. Rare biotite flakes.</p>
404.4	405.4	<p>Oil Shale (mudstone and siltstone): Dark olive gray (5.0Y 3/2) and olive black (5.0Y 2/2), dolomitic. Some satiny luster. Moderately distinct streaked and laminated wavy bedding. Irregular thin to thick parting; irregular to conchoidal fracture. Some very fine disseminated pyrite. Rare very fine flakes of biotite. Bleeding tuff 405.20-405.4.</p> <p>Sample of olive black oil shale from 405.0: X-ray - dolomite, calcite, quartz, feldspar, illite, smectite.</p>
405.4	410.0	<p>Oil Shale (siltstone): Medium olive gray (5.0Y 5/2) grading to medium brownish gray (2.5Y 5/2) with rare brownish black at bottom of section, calcareous. Faint to moderately distinct streaked and laminated bedding. Irregular medium to thick parting, irregular to faintly conchoidal fracture. Rock display moderately high permeability. Disseminated pyrite common 405.4-406-7. Carbon pressing of unidentified plant fossil 406.79.</p> <p>Sample of medium olive gray oil shale from 408.2: X-ray - dolomite, quartz, calcite, feldspar, smectite, illite.</p>

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from DOE/LETC Southern Uinta Basin Corehole 12 (Con.)

From	To	Description
410.0	420.5	Oil Shale (siltstone and mudstone) and tuff: Medium olive gray (5.OY 5/2-4/2) and medium brownish gray (2.5Y 5/2-4/2) and some medium brown (5YR 4/4), moderately calcareous. Faint streaked bedding, with numerous very distinct tuffaceous laminae and bands. Irregular thin to thick parting; irregular to moderately hackly fracture. Some very fine disseminated pyrite. Some very fine flakes of biotite. Oil bleeding tuff 411.82-411.98, bleeding tuff 413.59-414.0, tuff 415.50-415.70, tuff 418.15-418.20, oil bleeding tuff 418.81-419.22, tuff 423.90-423.98, tuff 424.52-424.80, tuff 426.19-426.31, oil bleeding tuff 429.0-429.19, and tuff 436.36-436.41. Sample of medium olive gray oil shale from 414.3: X-ray - calcite dolomite, quartz, feldspar, smectite, illite. Sample of oil bleeding tuff from 415.6: X-ray - sodium feldspar, quartz, calcite, dolomite. Sample of medium brownish gray oil shale from 435.0: X-ray - calcite, dolomite, quartz, feldspar, smectite, illite.
420.5	421.0	Missing
421.0	436.7	See 410.0 - 420.5, same.
436.7	438.5	Tuff (Wavy Bedded Tuff): Medium grayish brown (2.5Y 5/2), non-reactive with acid, probably due to organic material. Massive bedding. Thick parting, slightly irregular fracture. Very abundant mica (muscovite and biotite). Some bleeding of oil evident. Sample of wavy bedded tuff from 437.0: X-ray - quartz, analcime, feldspar, biotite.
438.5	439.7	Oil Shale (siltstone): Medium brownish gray to medium grayish brown (2.5Y 5/2-2.5YR 5/2), moderately calcareous. Moderately distinct streaked and laminated bedding. Irregular thin to thick parting; moderately hackly fracture. Rare very fine disseminated pyrite. Rare biotite flakes.
439.7	451.0	Oil Shale (siltstone and some mudstone): Medium olive gray (5.OY 4/2) with some medium brownish gray (2.5Y 4/2) and rare olive black (5.OY 2/2), dolomitic to faintly calcareous. Faint streaked and laminated bedding.

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from DOE/LETC Southern Uinta Basin Corehole 12 (Con.)

From	To	Description
		Irregular medium to thick parting; irregular to faintly hackly fracture, and rare conchoidal fracture. Some disseminated very fine blebs of pyrite, and rare streaks of pyrite. Moderately rare flakes of biotite. Sample of medium olive gray oil shale from 446.3: X-ray - dolomite, calcite, quartz, feldspar, illite, smectite.
451.0	452.2	Oil Shale (mudstone and siltstone): Dark olive gray (5.0Y 4/2) and olive black (5.0Y 2/2), dolomitic. Very faint satiny sheen. Faint to moderately distinct streaked and laminated bedding. Irregular medium to thick parting; irregular fracture.
452.2	455.8	Same as 439.7-451.0.
455.8	457.0	Oil Shale (siltstone and mudstone): Dark olive gray (5.0Y 4/2) and olive black (5.0Y 2/2) in alternating bands, dolomitic to faintly calcareous. Faint to moderately distinct streaked and laminated bedding, with some looped structure present. Irregular thick parting; slightly irregular to faintly conchoidal fracture. Rare to some, very fine disseminated pyrite. Abundant biotite flakes in rare bedding planes. Several thin clastic wedges noted 456.0-456.5. Sample of olive black oil shale from 456.2: X-ray - dolomite, quartz, feldspar, calcite, illite.
457.0	458.6	Oil Shale (siltstone): Medium brownish gray (2.5Y 5/2) and rare buff (2.5Y 7/2), dolomitic. Faint to moderately distinct streaked and laminated bedding, rare looped structure. Irregular medium to thick parting; faintly irregular fracture. Rare to some fine disseminated pyrite, rare streaks.
458.6	459.8	Oil Shale (mudstone): Brownish black (2.5Y 2/2) and medium to dark brownish gray (2.5Y 5/2-4/2) in alternating bands, faintly dolomitic. Darker laminae have moderately distinct satiny sheen. Bedding has distinct crinkly laminae, alternating dark and light. Irregular thin to thick parting; faintly irregular fracture. Moderately indistinct blebs present. Rare very fine disseminated pyrite. Sample of crinkly bedded brownish black oil shale from 458.8: X-ray - dolomite, quartz, feldspar, illite.
		TOP OF A-GROOVE

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from DOE/LETC Southern Uinta Basin Corehole 12 (Con.)

From	To	Description
459.8	461.7	Oil Shale (siltstone): light olive gray (5.0Y 6/2) and olive buff (5.0Y 7/2), dolomitic to faintly calcareous. Faint to moderately distinct streaked and laminated bedding, rare loop structure. Irregular thick parting; irregular to faintly conchoidal fracture, with very rare hackly fracture present also. Some very fine disseminated pyrite. Very abundant very fine flakes of biotite and another dark mineral possibly hornblende (?). Moderate permeability. Sample of light olive gray oil shale from 461.2: X-ray - dolomite, quartz, calcite, feldspar, illite.
461.7	465.5	Siltstone and oil shale (siltstone): Light brownish gray (2.5Y 6/2) and buff (2.5Y 7/2), moderately calcareous. Faint streaked to moderately distinct streaked and laminated bedding. Irregular thick parting; irregular to faintly conchoidal with rare hackly fracture. Rare flakes of very fine biotite. Some calcite mineralization, possibly replacement, in laminae 463.7-464.4. Sand grains appear in some laminae. Carbonized plant remains from 462.7. Moderate to highly permeable. Sample of light brownish gray oil shale from 461.8: X-ray - dolomite, calcite, quartz, feldspar, illite. Sample of buff siltstone from 462.7: X-ray - dolomite, quartz, feldspar, illite.
465.5	469.8	Siltstone and oil shale (siltstone): Light olive gray (5.0Y 6/2), olive buff (5.0Y 7/2), and gray buff (5.0Y 7/1), dolomitic to faintly calcareous. Faint to moderately distinct streaked and laminated bedding, moderately rare loop structure. Irregular thick parting; irregular to conchoidally fractured. Very abundant black mineral, possibly pyrrhotite 466.3-469.8. Calcite filling tight natural fracture 467.0-467.5. Siltstone has very high permeability. Rare streaks of pyrite. Sample of gray buff siltstone from 467.4: X-ray - dolomite, quartz, feldspar, illite.
469.8	471.9	Oil Shale (siltstone): Medium brownish gray (2.5Y 4/2) to medium olive gray (5.0Y 5/2), dolomitic. Faint streaked and laminated bedding. Irregular thick parting;

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from DOE/LETG Southern Uinta Basin Corehole 12 (Con.)

From	To	Description
		Irregular to faintly conchoidal fracture. Some streaks and disseminated blebs of pyrite in section 469.8-470.9. Moderately rare flakes of biotite. Sample of medium olive gray oil shale from 470.2: X-ray - dolomite, quartz, feldspar, illite, calcite. Sample of medium brownish gray oil shale from 471.2: X-ray - dolomite, quartz, feldspar, illite.
471.9	472.1	BOTTOM OF A-GROVE Oil Shale (siltstone): Dark olive gray (5.0Y 3/2) and medium olive gray (5.0Y 5/2-4/2), rare black (N 2/1), faintly dolomitic. Moderately to quite distinct streaked and laminated bedding. Irregular medium and some thick parting; irregular to faintly conchoidal fracture. Some small amounts of mineralization in discontinuous lenses, probably calcite (or calcite replacement). Pyrite as disseminated specks and discontinuous streaks. Sample of mineralized zone in medium to dark olive gray oil shale from 472.0: X-ray - dolomite, calcite, aragonite, MG-siderite, quartz, feldspar.
472.1	475.1	Oil Shale (siltstone and mudstone): Medium olive gray (5.0Y 5/2) with streaks of dark olive gray (5.0Y 3/2) throughout, calcareous. Faint streaked bedding with some looped structures. Irregular thick parting, moderately conchoidally fracture. Abundant disseminated pyrite present as both specks and discontinuous streaks, and rare lenses. Abundant flakes of biotite. Limestone stringer at 473.86-473.91. Sample of medium olive gray oil shale from 473.8: X-ray - dolomite, quartz, feldspar, illite.
475.1	476.6	Oil Shale (siltstone) and siltstone: Buff to gray buff (5.0Y 7/2-7/1), light to medium brownish gray (2.5Y 5/2), and some dark grayish brown (2.5 3/2) in an alternating stripped pattern, dolomitic. Moderately distinct to very distinct streaked and laminated bedding. Irregular thick parting; irregular to faintly hackly fracture. Tight natural fracture 475.1-475.66 with orange rust colored coating and abundant abelsonite. Rare flakes of biotite. Tuffs: 475.89-475.94, 476.09-476.13, 476.51-476.52, 476.58-476.65. Sample of buff and light brownish gray oil shale from 475.6: X-ray - dolomite, quartz, feldspar, illite.

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from DOE/LETC Southern Uinta Basin Corehole 12 (Con.)

From	To	Description
476.6	481.0	<p>Oil Shale (siltstone): Dark grayish brown (2.5Y 4/2-3/2), some medium grayish brown (2.5Y 5/2) and some brownish black (2.5Y 2/2), dolomitic to moderately calcareous in spots. Faint streaked to some moderately distinct streaked and laminated bedding. Regular thick parting; moderately smooth to slightly irregular fracture, faint conchoidal fracture in places. Moderately abundant pyrite in disseminated blebs, streaks, and discontinuous lenses. Biotite flakes abundant in some laminae. Clastic zone 477.31-477.54, abundant sub-rounded to rounded sand grains present, plus oolites and pyrite. Light gray (N 6.5/0) tuff with numerous black specks, possibly biotite.</p> <p>Sample of clastic zone from 477.4: X-ray - analcime, potassium and sodium feldspar. Sample of light gray tuff from 477.6: X-ray - sodium feldspar, dolomite, hornblende, analcime, illite, quartz.</p>
481.0	494.3	<p>Oil Shale (siltstone) and Tuff (Mahogany Marker Bed): Medium gray (N 5/2-2.5Y 5/2), dolomitic to faintly calcareous. Faint streaked and laminated bedding. Irregular thick and very rare shaley thin partings; irregular to mildly conchoidal fracture. Abundant disseminated pyrite. Tuffaceous clastic zone 490.9-491.4, Mahogany Marker Tuff, moderately abundant pyrite flakes and blebs; closed natural fracture extending completely through tuff oil staining along fracture with rare abelsonite crystals. Abelsonite crystals appear to extend into tuffaceous zone. Abundant black specks in tuff.</p> <p>Sample of medium grayish brown oil shale from 489.5: X-ray - dolomite, quartz, calcite, feldspar, illite. Sample of tuffaceous zone from 491.0: X-ray - quartz, feldspar, analcime.</p>
494.3	495.4	<p>Oil Shale (siltstone): Alternating medium grayish brown (2.5Y 5/3) and dark grayish brown to brownish black (2.5Y 3/3-2/2), dolomitic to faintly calcareous. Moderate to very distinct streaked and laminated bedding. Slightly irregular thick parting; irregular to faintly conchoidal fracture. Rare flakes of mica. Fine disseminated pyrite abundant in upper portion of section decreasing in abundance downward.</p> <p>TOP OF MAHOGANY BED</p>
495.4	496.6	<p>Oil Shale (mudstone): Brownish black to black (2.5Y 2/2-1/1), not reactive with acid. Satiny to resinous luster.</p>

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from DOE/LETC Southern Uinta Basin Corehole 12 (Con.)

From	To	Description
		Moderate to fairly distinct streaked and laminated bedding with fairly apparent crinkly structure present. Papery to faintly irregular parting; faintly irregular fracture. Rare flakes of biotite.
		BOTTOM OF MAHOGANY BED
496.6	499.3	Oil Shale (siltstone) and marlstone: Alternating buff (2.5Y 7/2) and light brownish gray (2.5Y 6/2) with some medium grayish brown (2.5Y 4/3), dolomitic to faintly calcareous. Moderately distinct streaked and laminated bedding, some loop structure evident. Irregular thick parting; irregular to faintly conchoidal fracture. Rare flakes of biotite.
		Sample of buff marlstone from 498.4: X-ray - quartz, dolomite, calcite, feldspar, illite.
499.3	500.7	Oil Shale (siltstone and mudstone): Dark olive gray to olive black and black (5.0Y 3/2 to 2/2 and 1/1), dolomitic. Moderately distinct streaked and laminated bedding, rare loop structure. Irregular thick parting; irregular to faintly conchoidal fracture. Moderately abundant flakes of biotite.
		Sample of olive black oil shale from 499.7: X-ray - dolomite, quartz, feldspar, illite, pyrite.
500.7	501.0	Marlstone and oil shale (siltstone): Buff (2.5Y 7/2) and some medium brownish gray (2.5Y 5/2), dolomitic to moderately calcareous. Laminated bedding with common loop structure. Irregular thick parting; faintly irregular fracture. Rare disseminated flakes of biotite. Some tight fractures filled with black hydrocarbon material noted.
501.0	511.0	Oil Shale (mudstone and siltstone): Brownish black to black (2.5Y 2/2-1/1), with some medium grayish brown (2.5Y 5/2), dolomitic to faintly calcareous on the light areas with darker areas unreactive with acid. Some resinous and rare waxey luster noted. Moderately distinct streaked and laminated bedding, some loop structure and rare displacement structures noted. Irregular papery to thick parting; faintly irregular to conchoidal fracture. Disseminated pyrite moderately abundant in some sections. Tuffs 503.38-503.41, 507.75-507.89, 508.70-508.90.
		Sample of brownish black oil shale from 506.8: X-ray - dolomite, quartz, feldspar, illite, pyrite.

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from DOE/LETC Southern Uinta Basin Corehole 12 (Con.)

From	To	Description
		Sample of buff clastic zone from 508.8: X-ray - sodium feldspar, quartz, pyrite, calcite, dolomite.
511.0	512.4	Oil Shale (siltstone) and marlstone: Medium brownish gray (2.5Y 5/2) and some buff (2.5Y 7/2), calcareous. Moderate to distinct streaked and laminated bedding. Irregular thin to thick parting; irregular to faintly conchoidal fracture. Some very fine flakes of mica. Sample of buff marlstone from 511.2: X-ray - dolomite, quartz, calcite, feldspar, illite.
512.4	514.9	Oil Shale (siltstone and claystone): Brownish black (2.5Y 2/2) and some dark grayish brown (2.5Y 3/3) faintly dolomitic. Brownish black oil shale displays faint satiny luster in places. Faint streaked and rare laminated bedding, rare loop structure. Moderately irregular thick parting; faintly irregular to faintly conchoidal fracture. Rare to some disseminated flakes, rare stringers, of pyrite. Clastic tuffaceous zone 513.40-513.53. Sample of brownish black oil shale from 512.7: X-ray - dolomite, quartz, feldspar, calcite, illite, pyrite. Sample of clastic tuffaceous zone from 513.4: X-ray - sodium feldspar, quartz, biotite, pyrite.
514.9	516.3	Oil Shale (siltstone): Medium brownish gray to medium grayish brown (2.5Y 5/3-5/2), dolomitic. Faint to moderately distinct streaked and laminated bedding. Slightly irregular thick parting; faintly irregular to moderately conchoidal fracture. Rare flakes of biotite. Sample of medium brownish gray oil shale from 516.2: X-ray - dolomite, sodium feldspar, quartz, calcite, illite.
516.3	517.3	Same as 512.4-514.9 Sample of brownish black oil shale from 517.1: X-ray - calcite, aragonite, dolomite, quartz, feldspar, illite.
517.3	519.4	Same as 514.9-516.3 Tuff: 518.65-518.66, 519.0-519.05, and 519.10-519.11. Sample of Medium brownish gray oil shale from 518.4: X-ray - dolomite, calcite, quartz, feldspar, illite. Sample of medium grayish brown oil shale with tuff from 519.1: X-ray - dolomite, sodium feldspar, quartz, calcite, illite.

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from DOE/LETC Southern Uinta Basin Corehole 12 (Con.)

From	To	Description
519.4	521.4	Oil Shale (siltstone and mudstone): Brownish black to black (2.5Y 2/2-1/1) and some medium grayish brown, faintly dolomitic to unreactive with acid. Rare waxey, some satiny, but generally earthy luster. Faint streaked and rare laminated, with some loop and displacement bedding. Irregular thick parting; irregular to faintly conchoidal fracture. Tuffs: 520.59-520.65, 521.19-521.25. Rare flakes of pyrite.
521.4	524.3	Oil Shale (siltstone) and marlstone: Medium brownish gray to medium grayish brown (2.5Y 5/2-5/3), some medium gray (N 5/0), and rare dark grayish brown (2.5Y 3/3), calcareous. Moderately distinct streaked and laminated bedding, rare loop and pinch out structures. Irregular thick parting; slightly irregular to conchoidal fracture. Abundant flakes of biotite, sometimes unconcentrated in bedding to very abundant. Tight natural fracture 521.85-522.2. Sample of medium brownish gray oil shale from 522.0: X-ray - dolomite, calcite, quartz, feldspar, illite.
524.3	529.3	Oil Shale (siltstone to mudstone): Dark grayish brown (2.5Y 4/3) and brownish black (2.5Y 2/2) alternating, dolomitic to faintly calcareous. Moderately distinct streaked and laminated bedding, rare loop structure. Slightly irregular thick parting; irregular to faintly hackly fracture. Some flakes of biotite. Tuff: 526.85-526.90.
529.3	533.4	Marlstone and oil shale (siltstone): Buff (2.5Y 7/2) and light to medium grayish brown (2.5Y 5/3-4/3), calcareous. Moderately distinct to distinct streaked and laminated bedding, some loop structure. Irregular thick parting; faintly irregular to moderately conchoidal fracture. Some disseminated flakes of biotite.
533.4	535.1	Oil Shale (mudstone and siltstone): Brownish black (2.5Y 2/2) and dark grayish brown (2.5Y 3/3), dolomitic to faintly calcareous. Rare satiny luster. Faint to moderately distinct streaked and laminated bedding. Irregular medium to thick parting; mildly conchoidal fracture. Oil impregnated tuff 534.0-534.06. Some very fine flakes of pyrite. Rare flakes of biotite. Sample of brownish black oil shale from 533.7: X-ray - dolomite, quartz, calcite, feldspar, illite.

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from DOE/LETC Southern Uinta Basin Corehole 12 (Con.)

From	To	Description
535.1	538.3	Marlstone and rare oil shale (siltstone): Buff (2.5Y 7/2) and rare light brownish gray (2.5Y 6/2), calcareous. Distinct streaked and laminated bedding. Irregular thick parting; moderate conchoidal fracture. Abundant flakes of biotite. Abundant flakes radiating mass, has a dendritic appearance, associated in bedding planes. Rare nodules of pyrite. Rock has high permeability. Sample of buff marlstone from 537.8: X-ray - dolomite, quartz, feldspar, calcite, illite.
538.3	541.1	Oil Shale (siltstone), siltstone, and tuff: Medium grayish brown to medium olive gray (2.5Y 5/3-5.0Y 5/3), some brownish black (2.5Y 2/2), moderately calcareous to unreactive with acid. Some faint but most moderately distinct streaked and laminated bedding. Irregular thick parting; faintly conchoidal fracture. Some pyrite stringers. Clastic tuffaceous zone 539.18-539.60, very porous and permeable. Other tuffs: 538.95-538.97, 539.86-539.88. Sample of medium brownish gray oil shale from 539.6: X-ray - calcite, dolomite, quartz, feldspar, illite. Sample of clastic tuffaceous zone from 540.5: X-ray - analcime, quartz, smectite.
541.1	542.4	Oil Shale (claystone): Brownish black to black (2.5Y 2/2-1/1), not reactive with acid. Some satiny luster. Moderately distinct laminated bedding, with crinkly appearing bedding predominate. Irregular thick parting; faint conchoidal fracture. Biotite flakes moderately common. Unit has abundant clastic grains locally. Tuff: 541.06-541.12, 541.50-541.59. Sample of brownish black oil shale from 541.8. X-ray - dolomite, quartz, feldspar, illite, calcite, pyrite.
542.4	545.5	Oil Shale (siltstone): Medium olive gray (5.0Y 5/2) and some brownish black (2.5Y 2.2), dolomitic to faintly calcareous. Moderately distinct streaked and laminated bedding, crinkly bedding 545.17-545.45. Irregular medium to thick parting; irregular to faintly conchoidal fracture. Moderately abundant pyrite or pyrrhotite occurring as disseminated blebs. Tuffs: 542.55-542.58, 544.18-544.20, 545.45-545.46. Sample of medium olive gray oil shale 543.3: X-ray - dolomite, feldspar, quartz, calcite, illite, pyrite.

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from DOE/LETC Southern Uinta Basin Corehole 12 (Con.)

From	To	Description
		Sample of crinkly bedded brownish black oil shale from 545.4: X-ray - dolomite, quartz, feldspar.
545.5	546.9	Marlstone: Buff to buff-white (2.5Y 7/2-8/2) and rare medium brownish gray (2.5Y 5/2), calcareous. Faint and very distinct streaked and laminated bedding. Irregular medium to thick parting; irregular to faintly conchoidal fracture. Some flakes of biotite. Closed tight natural fracture 545.9-546.25. Sample of buff marlstone from 546.7: X-ray - dolomite, quartz, feldspar, illite.
546.9	548.0	Same as 545.5-546.9
548.0	549.3	Tuff: (Curly bedded tuff): Buff (2.5Y 7/2) and gray buff (2.5Y 7/1), faintly calcareous. Massive bedded with wavy streaks. Thick parting; slightly irregular fracture. Abundant biotite. Very porous and permeable. Sample of Tuff (wavy bedded buff from 549.0: X-ray - quartz, analcime, feldspar, biotite, pyrite.
549.3	554.8	Marlstone, oil shale, (siltstone, mudstone), siltstone: Irregularly alternating of buff (2.5Y 7/2), medium gray (N 5/0), light to medium brownish gray (2.5Y 5/2-4/2), and rare medium to dark brown gray (2.5Y 4/2-3/2), moderately calcareous to calcareous. Faint to moderately distinct streaked and laminated, some massive, some very distinct bedding. Irregular thin to thick parting; subconchoidal fracture. Tuffs: 549.77-549.82, 553.85-554.03. Biotite flakes moderately abundant throughout section generally concentrated in specific laminae. Common silver to blackish colored blebs present (pyrrhotite) Oil stained clastic 554.55-555.88. Hydrocarbon coated tight natural fracture 549.93-550.2. Sample of light grayish brown oil shale from 551.4: X-ray - dolomite, quartz, feldspar, illite. Sample of siltstone with metallic minerals from 554.3: X-ray - dolomite, quartz, feldspar, calcite, illite, MG-siderite. Sample of brown clastic zone from 554.6: X-ray - dolomite, calcite, feldspar, quartz, pyrrhotite.
554.8	556.9	Siltstone and clastics: Buff-white (2.5Y 8/2) with some medium brown (2.5Y 5/4) resulting from oil staining. Rare streaked and laminated bedding, generally massive appearing with algae (organic) disruption of bedding noted. Irregular thick parting; irregular to blocky fracture. Oil staining and oil blebs common. Clastic laminae present consisting of poorly sorted angular sand grains and oolites. Very porous and permeable.

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from DOE/LETC Southern Uinta Basin Corehole 12 (Con.)

From	To	Description
		Sample of oil stained algae siltstone from 556.8: X-ray - dolomite, calcite, quartz, feldspar.
556.9	559.1	Siltstone and oil shale (siltstone): Medium gray to medium brownish gray (2.5Y 5/0-5/3) rare dark brownish gray (2.5Y 3/2), calcarious. Faint to distinct streaked and laminated bedding, some wavy bedded structure. Irregular thin to thick parting; irregular to subconchoidal fracture. Abundant pyrrhotite.
559.1	560.1	Oil Shale (mudstone and siltstone): Dark grayish brown (2.5Y 4/2) and medium grayish brown (2.5Y 5/2), dolomitic. Moderately distinct streaked and laminated bedding, rare loop structure. Irregular thick parting; sub-conchoidal to conchoidal fracture.
		Sample of dark grayish brown oil shale from 559.6: X-ray - dolomite, quartz, feldspar, illite.
560.1	562.0	Oil Shale (siltstone), Medium brownish gray (2.5Y 5/2), faintly calcarious. Faint to moderately distinct streaked and laminated bedding. Irregular thick parting; conchoidal fracture. Abundant metallic mineral - assumed to be pyrite.
		Sample of medium brownish gray oil shale from 560.6: X-ray - dolomite, calcite, quartz, feldspar, illite.
562.0	563.0	Oil Shale (mudstone and siltstone): Dark grayish brown (2.5Y 4/3) and rare brownish black (2.5Y 2/2), dolomitic with increasing degree of calcareous nature downward. Faint to moderately distinct streaked and laminated bedding, rare loop structure. Irregular thick parting; irregular to conchoidal fracture. Tuff: 562.17-562.22. Moderately abundant flakes of pyrite. Some flakes of biotite.
		Sample of light gray tuff from 562.1: X-ray - dolomite, feldspar, quartz, pyrite, illite.
563.0	569.0	Oil Shale (siltstone and mudstone), marlstone, and tuff: Tan (2.5Y 6/3), buff (2.5Y 7/2), medium brownish gray to medium grayish brown (2.5Y 4/2-5/3), rare medium gray (N 5/0), calcareous. Some faint to mostly moderately to very distinct streaked and laminated bedding. Irregular thin to thick parting; irregular to subconchoidal fracture. Tuffs: 563.43-563.54, 563.85-563.86, 564.27-564.29, 564.85-564.95, 565.05-565.25, 567.02-567.10, 567.60-567.65. Moderately abundant biotite flakes found throughout section. Abundant abelsonite in tight vertical natural fracture: 565.52-565.95, 566.70-566.85.

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from DOE/LETC Southern Uinta Basin Corehole 12 (Con.)

From	To	Description
		<p>Sample of tan oil shale from 565.6: X-ray - dolomite, quartz, feldspar, pyrite, illite. Sample of Tuff from 566.0: X-ray - potassium feldspar, pyrite, quartz, dolomite. Sample of Tan oil shale from 568.2: X-ray - dolomite, quartz, calcite, feldspar, pyrite, illite.</p>
569.0	571.9	<p>Oil shale (mudstone and siltstone): Medium olive gray (5.0Y 4/2-5/2), medium grayish brown (2.5Y 4/3-5/3), and rare buff (2.5Y 7/2), dolomitic. Faint to moderately distinct streaked and laminated bedding, some very distinct laminae. Irregular thin to thick parting; irregular to faintly conchoidal fracture, some faintly hackly. Tuff: 569.40-569.41, 570.60-570.72, 571.20-571.21, 571.34-571.35. Abundant biotite flakes throughout section. Sample of medium grayish brown oil shale from 569.5: X-ray - dolomite, feldspar, illite, smectite, pyrite. Sample of Tuff from 569.7: X-ray - potassium feldspar, dolomite, quartz, sodium feldspar, pyrite.</p>
571.9	577.0	<p>Oil Shale (siltstone), marlstone and tuff: Buff to tan (2.5Y 7/2-7/3), medium grayish brown (2.5Y 4/3), some dark grayish brown (2.5Y 3/3), some medium gray (N 5/0), rare brownish black (2.5Y 2/2), dolomitic to calcareous. Some faint, mostly distinct streaked and laminated bedding, some crinkly bedding. Irregular thin to thick parting; blocky to subconchoidal fracture. Tuff: 573.18-573.21, 573.35-573.95, 575.50-575.73, 576.15-576.16. Sample of medium grayish brown oil shale from 575.0: X-ray - dolomite, quartz, calcite, feldspar, pyrite, illite.</p>
577.0	583.2	<p>Marl, conglomerate, siltstone and rare oil shale (siltstone): Tan (2.5Y 7/3) and some medium to dark grayish brown (2.5Y 5/3-4/3), calcareous. Algae disturbed massive bedding, some distinct laminae, rare crinkly bedding. Very irregular thin to thick parting (papery to massive); irregular to rare subconchoidal fracture. Oil staining below 580.1. Section becoming increasingly more sandy downward in section, with some places fine pebbles. Oolite siltone 578.50-578.90. Most of unit predominately very poorly sorted. High porosity and permeability. Sample of conglomeratic oil stained siltstone from 582.7: X-ray - dolomite, rare quartz.</p>