

DEPTH	±MM	FRX	PP	ASSAY 10 20 30 40	CAL TON	REC. 8 RD	LITH.	DESCRIPTION
31						31.00		31.0-33.3, SHALE, silty; gray-light brown;
32			80					calcareous, laminated
33			10 35					33.3-34.3 SILTSTONE, buff, massive, calcareous
34			00					34.3-34.4 MUDSTONE, tan, contorted, broken
35								34.4-37.4, SHALE, light brown, silty; very calca-
36								eous; intermixed with thick, irregular SANDSTONE
37						10.0		37.4-39.7, SHALE, silty, light brown; calcareous
38								
39								39.7-40.0, NAHCOLITE, boxwork crystals; minor nativ
40								40.0-42.3, SHALE, silty, light brown; calcareous
41			10 20 25			41.00		laminated
42								42.3-42.5, vuggy zone; some NAHCOLITE relics in vug
43			50					42.5-42.8, SILTSTONE, light brown; non-calcareous
44	1800							42.8-45.2, SHALE, gray, calcareous; broken
45								44.0 core missing between 44.5' & 45.0'
46								45.2-45.3, NAHCOLITE, gray-brown, crystalline, pitted
47								45.35-47.7, SHALE, light gray-light brown; calca-
48								areous; silty at top decreasing to very fine material at
49								47.7-50.6, SILTSTONE, light brown, grading to
50	+460		45			50.60		SANDSTONE, very fine, light gray-light brown
51								brown material contains small pits & is permea
52								50.6-51.2, SHALE, gray, hard, silty; calcareous
53								51.2-51.5, Void-NAHCOLITE remnants; torred be
54								51.5-52.6, SHALE, gray, silty; calcareous
55			20					52.6-53.5, NAHCOLITE, brown-crystalline
56								53.5-56.2, SHALE, gray, silty, calcareous
57								grained, laminated; some slightly distorted beds
58								0.2' zone of small NAHCOLITE inclusions at 56
59			50					& at 57.9
60			75			60.00		56.2-60.7, SHALE, light gray-gray; calcareous
61								silty-slightly coarser than above
62			35					60.7-61.8, SANDSTONE, thin zone; light gray; calcareous
63								61.8-62.0, SHALE, gray, dense, hard, silty; calcareous
64			35					61.8-62.0, NAHCOLITE with minor pyrite
65								62.0-64.8, SHALE, gray, hard, silty; calcareous
66								64.8-65.0, NAHCOLITE zone - partly dissolved
67			10					65.0-70.0, SHALE, gray, calcareous, dense;
68								slightly finer grained than above; strong, hard to
69								with a few thin, intermittent seams of pyrite; th
70								gilsomite seam at 69.0'
71			60 75					70.0-71.6, SHALE, gray, silty, hard; calcareous
72								71.6-71.9, SILTSTONE, tan, non-calcareous with
73								71.9, GILSONITE, very thin seam
74			30					71.9-73.2, SHALE, as above
75	+435							73.2-73.3, NAHCOLITE, thin, discontinuous zone
76								73.3-74.3, SHALE, as above; thin CLAY seam at 74
77								74.3-76.0, SHALE, ungraded brown, increased
78			10 25					76.0-76.5, NAHCOLITE crystals in brown shale
79			10 20					76.5-77.6, SHALE, brown as above, with highly
80								irregular, thin zones of NAHCOLITE
81								77.6-80.0, SHALE, gray, calcareous; with irreg
82								NAHCOLITE

HOLE NO: X-14 SHEET 2 OF 11 DATE: 5/25/76 LOGGED BY: F.R.C. COLLAR: 5155 TD: 580

DEPTH	±MM	FRX	PP	ASSAY 10 20 30 40	GAL TON	REC. REQD	LITH.	DESCRIPTION
81							T-T	very thin clay seams that form planes of
82							T-T	weakness that break readily parallel to
83							T-T	laminations
84							T-T	84.5-87.0, SHALE, gray, as above, with
85							T-T	scattered small crystals of calcite imbedded
86							T-T	in the matrix; some zones of more intense NAHCOL
87							T-T	& CALCITE permeation are weakened to be
88							T-T	broken
89							T-T	89.0-89.7, SHALE, gray, fine-grained
90							T-T	89.7-92.3, SILTSTONE, light brown, grading
91							T-T	into SHALE, gray, lightly permeated with calcite
92							T-T	92.3-96.5, SHALE, brown, fine-grained, with
93							T-T	locally heavy concentrations of CALCITE, usual
94							T-T	in thin, very irregular seams; some pyrite &
95							T-T	possibly other sulfides associated with CALC
96							T-T	96.5-98.0, SILTSTONE, light brown, grading
97							T-T	into silty SHALE; scarce NAHCOLITE & CALCITE
98							T-T	98.0-99.8, SILTSTONE, brown to gray, locally sil
99							T-T	with abundant irregular seams of CALCITE; broken
100	+410						T-T	99.8-102.7, SILTSTONE, brown, grading into oil sh
101							T-T	brown-dark brown at 101.5 to 102.1; SHALE has th
102							T-T	seams & scattered crystals of CALCITE
103							T-T	102.7-106.5, SILTSTONE, brown, interlaced with
104							T-T	abundant, irregular seams of white CALCITE, some
105							T-T	NAHCOLITE; locally abundant pyrite closely associ
106							T-T	with CALCITE crystals; badly broken - weakened by inclu
107							T-T	106.5-108.0, SHALE, gray-brown, fine, slightly calc
108							T-T	108.0-110.4, SILTSTONE, brown with Calcite & Pyrite as
109							T-T	
110							T-T	110.4-114.0, SILTSTONE, brown, hard with dec
111							T-T	reasing amounts of calcareous material - mos
112							T-T	in small flecks & stringers; minor asphaltite
113							T-T	inclusions
114							T-T	114.0-114.5, missing core, NAHCOLITE remnants at 11
115							T-T	114.4-119.9, SILTSTONE, brown, competent;
116							T-T	calcareous; thin, sandy inclusion at 117.
117							T-T	
118							T-T	
119							T-T	
120							T-T	119.9-123.8, SILTSTONE, brown-light brown;
121							T-T	calcareous; dense & hard; thin SANDSTONE lens
122							T-T	at 120.8 - very calcareous
123							T-T	
124							T-T	124.0-124.6 CORE LOSS
125	+385						T-T	123.8-126.0, SILTSTONE as above; weakened by ver
126							T-T	irregular vugs of partly dissolved NAHCOLITE & CAL
127							T-T	126.0-128.0, SILTSTONE, brown, fine-grained,
128							T-T	competent, very calcareous; very nearly a MARLS
129							T-T	128.0-130.0, SILTSTONE as above; small NAHCOLI
							T-T	vugs at 128.1 & 128.4; thin asphaltite at 12

COMMENTS:

COMMENTS: 155.45, parting plane is in a thin layer of SANDSTONE, calcareous, poorly sorted
162.4, last reference to partially leached CALCITE & NAHCOLITE (bottom of aquifer)

DEPTH	±MM	FRX	PP	ASSAY 10 20 30 40	GAL TON	REC ERGQ	LITH.	DESCRIPTION
131							T T	broken; thinly banded, finely laminated, very
132							T T	calcareous; hard & competent
133							T T	
134							T T	SANDSTONE, c.l., very fine, gray, well cemented; with PYRITE
135							T T	135.2-136.6, SILTSTONE, brown, calcareous; badl
136							T T	broken (spiral breaks as if jammed in barrel)
137							T T	136.6-140.0, SILTSTONE, as above, finely la
138							T T	minated in part; mottled with small, tan spherules
139							T T	dark brown matrix near 140
140			.90				T T	140.0-146.0, MARLSTONE, tan to medium brack
141							T T	banded; calcareous; very hard & competent; th
142							T T	laminae of SANDSTONE & associated PYRITE
143							T T	several thin, discontinuous streaks of
144		I 90°					T T	ASPHALTITE
145		I 90°	.60				T T	
146							T T	146.0-146.3 CORE LOSS (small NAHCOLITE jug)
147		I 90°	.85				T T	146.3-150.0, SILTSTONE, brown to brownish g
148							T T	calcareous; color is not banded & laminations are
149							T T	more obscure than in MARLSTONE above
150	+360						T T	150.0-152.3, SILTSTONE, brown, calcareous
151							T T	
152							T T	152.3-153.6, SILTSTONE as above with partly le
153							T T	ached vug at 152.4; badly broken zone from 153.3-15
154			.60				T T	153.6-157.0, SILTSTONE, brown-light brown u
155			.45				T T	thin laminae & small flecks of lighter material
156			.10				T T	calcareous
157							T T	157.0-158.0, leached zone, badly broken
158							T T	158.0-159.0, SILTSTONE, gray-brown; mottled
159			.80 .90				T T	159.0-162.4, SILTSTONE, gray-brown-light brown
160							T T	calcareous; locally sandy with partly leached
161							T T	of CALCITE & NAHCOLITE
162		I 90°					T T	162.4-169.0, SILTSTONE grading to MARLSTONE
163							T T	brown-light brown; calcareous-very calcareous;
164							T T	hard & competent; thin calcareous SANDSTONE
165							T T	laminae at 165.4, 168.5, & 168.8
166							T T	
167							T T	
168							T T	
169							T T	169.0-172.0, SILTSTONE, brownish gray to
170							T T	medium brown; calcareous (170.2-170.3, H
171							T T	irregular seam of SANDSTONE, gray, non-calcareous
172							T T	probably tuffaceous); SILTSTONE is banded light
173							T T	brown to tan & finely laminated at 176.0; hard
174							T T	competent
175	+335						T T	
176							T T	176.0-179.0, SILTSTONE, brownish gray, calcareous
177							T T	homogeneous, competent; breaks with conchoidal
178							T T	fracture at times
179							T T	179.0-187.0, SILTSTONE (1-8 ft length), brownish

DEPTH	±MM	FRX	PP	ASSAY 10 20 30 40	CAL TON	REC EQD	LITH.	DESCRIPTION
181								subtly finer grained; partial horizontal
182								GILSONITE seam at 182.1 along with numerous
183								other discontinuous thin streaks of asphaltic
184								material
185								
186								
187			.50*					187.0-189.0, MARLSTONE(?), light brown
188			.50*					tan; lightly banded, finely laminated
189								189.0-191.0, MARLSTONE, light-medium brown, co-
190								careous, finely laminated; slightly distorted bedding
191								191.0-199.0, MARLSTONE, light brown-gray
192								silty, coarser texture than above; very fine
193								indistinct laminations; the only two breaks in
194								the run (from 189 to 199) are associated with
195								thin, irregular SANDSTONE stringers at 197.5
196								198.5; minor PYRITE in SANDSTONE
197								
198								
199								199.0-209.0, MARLSTONE, light gray-light
200	+310							brown to tan near lower end of run; colored
201								conchoidal to semi-hackly fracture; very
202								homogeneous & competent; slightly silty
203								upper half of run; 1 break in core at 201.7
204								near thin, irregular gray SANDSTONE lens
205								tuffaceous; from 205.5 to 207.5 there are
206								about 5' thin, gray, discontinuous, tuffaceous
207								SANDSTONE stringers - all are pyritized
208								
209								209.0-219.5, MARLSTONE, light gray to brown
210								to light brown; some thin, light tan banding
211								from 218-219; calcareous, homogeneous,
212								competent; thinly laminated; one break in core
213								at 217.2 near a very thin, gray SANDSTONE
214								lamina; a few other very thin, discontinuous
215								SANDSTONE laminae are present; from 212
216								to 213.0 rock might be labelled OIL SHALE
217								low grade, medium brown; silty, calcareous
218								
219								219.5-220.5, OIL SHALE, dark brown, finely laminated
220								220.5-229.0, MARLSTONE, gray-light brown,
221								calcareous; competent (10-ft. run came out
222								in 1 piece); SANDSTONE (tuffaceous) occurs
223								irregular stringers at 224.4, 226.6, & 228.5
224								usually calcareous
225	+285							
226								
227								228.0, GILSONITE, very thin partial stringer
228								228.9-229.0, SANDSTONE, coarse; bitumen impregnated
229								229.0-231.0, MARLSTONE, light brown, brown

REMARKS: * Further pieces are being taken showing some thin sandstone (weathered zone)

DEPTH	±MM	FRX	PP	ASSAY 10 20 30 40	GAL/TON	REC. G RGD	LITH.	DESCRIPTION
231								231.0-234.0, SHALE, gray, fine-grained,
232								slightly calcareous; some irregular, discontinuous
233								SANDSTONE lenses, light gray, fine; abundant PYRITE
234								234.0-239.0, MARLSTONE, brown, silty,
235								calcareous; slightly coarser than above; thin,
236								discontinuous SANDSTONE lenses, fine
237								laminations are more evident in MARLSTONE
238								than SHALE; thin GILSONITE seam at 238.3
239								239.0-239.8, contorted zone; numerous irregular
240								239.8-241.0, MARLSTONE as above
241								241.0-250.0, MARLSTONE, gray-brown, cal-
242								careous; finely laminated with thin light & dark
243								bands in part; strong, competent (1 break in
244								run associated with SANDSTONE lense at 245.
245								scattered irregular seams & stringers of SAN-
246								STONE, fine, light gray - usually with some
247								PYRITE within SANDSTONE matrix
248			70(d61)					248.5-6 & 248.7, SANDSTONE; irregular lense
249								oil saturated
250	+260							250.0-254.5, MARLSTONE, gray, hard, comp-
251								etent (1 piece run); finely laminated with nume-
252								rous thin, irregular, discontinuous stringers of S-
253								STONE, gray, fine with minor PYRITE
254								254.5-255.5, OIL SHALE, medium brown with
255								minor irregular SANDSTONE lenses; partly oil satur-
256								255.5-260.0, MARLSTONE, brown to gray; fine
257								laminated, competent; very scarce SAND-
258								STONE lenses
259								260.0-268.0, MARLSTONE, gray-brown; con-
260								careous; increased kerogen content at 263
261								finely laminated & lightly banded to 264;
262								irregular lenses of SANDSTONE (.01 to .10"), gray
263								partly saturated with hydrocarbons; some
264								irregular breaks in the core - usually
265								influenced by a SANDSTONE lense
266								268.0-270.0, OIL SHALE, dark brown; calcareous
267								finely laminated & banded; badly broken; twisted in part
268		I 90°						270.0-280.0, MARLSTONE, gray-gray brown;
269								calcareous; hard, competent (most of run cut
270								out in 1 piece); finely laminated, lightly & thin
271								banded; 4 irregular, partly discontinuous
272								SANDSTONE lenses between 276.0 & 278.0
273								some hydrocarbons in SANDSTONE;
274								MARLSTONE is slightly silty but generally
275	+235							fine-grained
276								
277								
278								
279								

REMARKS: * FIRST OIL SATURATED SAND NOTED.
From 229 to 239 ft. - cut 100' recovered 3.6' - went back in hole - recovered 6.4' & cut 20' more to 241'

DEPTH	±MM	FRX	PP	ASSAY 10 20 30 40	GAL TON	REC. GRQD	LITH.	DESCRIPTION
281								gray-brown; thinly banded, finely laminated
282								(could also be described as low to medium
283								grade(?) OIL SHALE); bedding is regular
284								buffaceous SANDSTONE. stringers are very thin
285								& uncommon to 286; several thin irregular
286								SANDSTONE inclusions between 286 & 288
287								
288								2880-2900, same as above but mixed with SILTST
289								289.15, .05' layer of SANDSTONE, saturated with to
290								2900-2990, MARLSTONE, mottled brown to mottle
291								gray-brown, moderately calcareous, finely laminated
292								thinly banded; strong, hard (1 parting plane); has a
293								grainy look & hackly fracture; SANDSTONE occurs
294			.70*					with PYRITE only in widely spaced, very thin,
295								irregular stringers; two thicker lenses (.05') with
296								hydrocarbons at 293.8 (with MARLSTONE breccia
297								at 296.3
298								
299								
300	210							300.0-3, MARLSTONE as above; hackly fra
301								ture, grainy look, etc.; some mildly distorted
302								bedding & lap structures; a few, widely-spaced
303								thin, irregular SANDSTONE lenses usually with
304								some bedding distortion at the bottom contact
305								
306								306.9-307.0, SANDSTONE, fine, gray; especially on bott
307								307.0-310.0, MARLSTONE as above, slightly
308								siltier near bottom; rock is hard & strong (1 piece
309								1 thin, partly saturated SANDSTONE lense at 30
310								310.0-319.5, MARLSTONE, gray-dark gray,
311								mottled; rough, hackly fracture; silty, strong
312								true parting planes); finely laminated with no
313								edges thin (.03' or less) SANDSTONE lamellae
314								most are fairly even; SANDSTONE is light gr
315								fine, with minor hydrocarbon saturation & minor
316								PYRITE; much of the surface of the core con
317								tains innumerable very fine, hair-like black for
318								more surrounded by broader tan-colored zone
319								319.5-320.5 OIL SHALE, dark brown
320								319.9, thin SANDSTONE lense, oil saturated
321								320.0-329.0, MARLSTONE (low grade OIL SHALE
322								gray, dark gray, mottled gray; grades locally to
323								SILTSTONE & CLAYSTONE; several very thin, l
324								ular lenses of SANDSTONE, fine, gray - coar
325	185							lar at 326.1; stair-step-like break in core at
326								328.8 is in fine-grained non-calcareous materi
327								(CLAYSTONE?) with PYRITE crystals at 326
328								
329								

REMARKS: A parting plane is always seen at SANDSTONE lense

DEPTH	IMM	FRX	PP	ASSAY 10 20 30 40	GAL TON	REC EQD	LITH.	DESCRIPTION
331								uneven to hackly fracture; scattered PYRITE
332								crystals; finely laminated; scarce SANDSTONE
333								in very thin stringers
334								
335								335.0-337.0 OIL SHALE, dark to medium brown
336								calcareous, but less than above; finely laminated
337								337.9-338.0, SANDSTONE, lense, fine, gray; appearance
338								338.0-340.0, MARLSTONE, gray; grainy texture
339								appearance; uneven fracture; SANDSTONE thin
340								340.0-344.0 MARLSTONE, light gray, fine
341								brown with PYRITE crystals in upper part; thin
342								laminated with grainy appearance on fractures; sand
343								thin, irregular SANDSTONE lenses; fine, gray with PYR
344								344.0-347.0, OIL SHALE, dark to medium brown; calcareous
345								except in higher grade portion (344-345); SANDSTONE
346								fine, light gray; mostly in very thin, discontinuous lens
347								347.0-348.2, MARLSTONE, gray, finely laminated
348								348.2-348.3, SANDSTONE, lense, fine, gray, irregular, partly
349								348.3-350.0, MARLSTONE, in alternating thin bands
350	+160							350.0-351.5, MARLSTONE, light brown with "wo
351								grain" appearance on broken surface; fine laminated
352								351.5-352.5, OIL SHALE, dark brown; non-calcareous
353								352.5-356.0, SILTSTONE, gray with grainy ap
354			.30*					pearance; fine, relatively non-calcareous; very thin SA
355								STONE lenses; small GILSENITE seam at 35
356								356.0-358.6, MARLSTONE, light brown, grainy,
357								mottled; hard with very thin SANDSTONE lense
358								358.6-358.7, SANDSTONE, oil saturated; irregular
359								358.7-360.5, OIL SHALE, nearly black, badly broke
360								360.5-370.0, MARLSTONE, gray to light brown,
361			.70*					finely laminated with grainy appearance; slight
362								coarser grained & more brown in color below 3
363								a few thin, gray SANDSTONE lenses above 36
364								unsaturated - mostly saturated below 366.7 (
365								zones)
366			.60					
367			.55*					
368								368.9-369.1, SANDSTONE, fine - oil saturated
369								369.1-371.0, MARLSTONE, as above
370								371.0-371.0, SANDSTONE, fine, gray
371								371.0-373.0, MARLSTONE, light gray - light brown,
372								grainy, finely laminated; strong, hard
373								373.0-375.0, OIL SHALE, brown - dark brown, r
374								calcareous
375	+135							374.8-375.1, thin SANDSTONE lenses, oil saturat
376								emitting gas bubbles; uneven layer contacts
377			.50					375.0-380.0, MARLSTONE, gray - light gray - but
378								buff-colored material is very calcareous; parti
379								along thin, mudstone seams

REMARKS: * Irregular partings associated with thin, calcareous stringers

DEPTH	±MM	FRX	PP	ASSAY 10 20 30 40	GAL TON	REC GAL QD	LITH.	DESCRIPTION
381								381.0-387.5, MARLSTONE, brownish-gray;
382								could also be labelled "OIL SHALE"-low grade
383								finely laminated; mottled to grainy appearance
384								on fracture surfaces; scattered thin, irregu
385								SANDSTONE lenses
386								
387								387.5-387.6, SANDSTONE, fine, gray; ^{tar} saturated
388								387.6-388.0, MARLSTONE, brownish-gray
389								388.0-388.6, SANDSTONE, gray; ^{tar} saturated
390								388.6-390.0, MARLSTONE, brown; finely laminated
391								390.0-397.6, MARLSTONE, brown-brownish gray;
392								grainy appearance on broken surfaces; rock is
393								strong, hard; partings only along thin clay or
394								SANDSTONE seams
395			60 75					395.6-395.7, SANDSTONE, fine, gray
396			90					
397								397.6-398.3, SANDSTONE, dark gray, partly sat
398								urated with hydrocarbons; ^{highly contorted lat} irregular contact below
399								398.3-400.0, MARLSTONE, as above
400	+110							400.0-408.5, MARLSTONE, as above, brown
401								grayish brown; some with grainy appearance
402								on freshly broken surfaces; rock is very strong
403								hard; very few, uneven partings influenced
404								by sand or clay lenses; numerous SANDSTONE
405								lenses, fine, gray; some highly irregular in shape
406								many are very thin (0.1' or less); some bedding distorted
407								around SANDSTONE - otherwise bedding is very consistent
408								408.5-409.0, SANDSTONE, gray to tan; partly saturated
409								409.0-410.0, MARLSTONE, as above
410								410.0-412.8, MARLSTONE, brown, finely laminated
411								416.0, SANDSTONE, brown; partly saturated; bleeding 90
412			90					412.0-412.9, SANDSTONE, brown-dark gray; partly sat
413			10					413.1-413.2, SANDSTONE
414								413.2-418.2, MARLSTONE, brown; grainy to massive
415								finely laminated, regularly bedded; competent - partings
416								usually result from CLAY seams or thin SAN
417								STONE lenses
418			30					418.2, SANDSTONE (0.5'), black; saturated with tar
419			60 90					418.2-420.0, MARLSTONE, tan-gray; many very thin
420								SANDSTONE lenses
421								420.0-429.5, MARLSTONE, light gray with strong
422								grainy or thinly banded appearance at top; changes
423								to light brown, more massive, finer-grained material
424								at 421; very few partings along clay seams
425	+85		40					rock is very hard, calcareous, finely laminated
426								evenly bedded
427								
428								428.4, SANDSTONE (0.5'), light brown; partly saturated
429								429.2, SANDSTONE (2.10'), gray, fine; irregular lower con
								429.5-431.6, UPPER WAVY RED SANDSTONE

* first significant SANDSTONE intercept in Green River fm. (16.5' thick); upper & lower contacts fairly even - slight undulations; 0.3' seam of MARLSTONE at 388.3.5

REMARKS: LITTLE WAVY BEDDING; IRREGULAR MARLSTONE STRINGERS ARE MOSTLY CONTAINED IN UPPER 1/3 OF INTERVAL; SOME GAS BUBBLES NOTED IN MIDDLE PORTION; SCATTERED PYRITE IN SANDSTONE; MUD HYDROCARBONS; IRREGULAR LAYER CONTACT - SLIGHTLY IRREGULAR UPPER CONTACT; POROUS

DEPTH	±MM	FRX	PP	ASSAY 10 20 30 40	GAL TON	REC. ERQD	LITH.	DESCRIPTION
431								layers of MARLSTONE, light brown *
432								431.6-440.0, MARLSTONE, light brown-medium
433								brown-gray; thin GILSONITE inclusion at 433;
434								MARLSTONE is very hard & strong; tends to part
435								only along SANDSTONE stringers; finely laminated
436								evenly bedded except for minor distortions around
437								SANDSTONE inclusions, particularly between 432
438								& 440
439								
440								440.0-447.0, MARLSTONE, light to medium
441								brown; uneven fracture, grainy appearance; hard
442			40					competent; partings only on clayey seams; finely
443			30					laminated, evenly bedded; scarce SANDSTONE lens
444								usually in very thin seams or discontinuous blebs or
445								pods
446								
447								447.0-450.0, SHALE, light brown-light gray, non
448			40					calcareous; finely laminated but mostly massive on
449								broken surface; rough conchoidal fracture
450	+60							450.0-456.0, MARLSTONE, light brown-tan-
451			45					brown, fine-grained; mottled to grainy appearance
452								on fresh break; uneven fracture - conchoidal
453			20					hackly - somewhat brittle; alternating hair-like
454								laminae (blk) separated by lighter-colored
455			15					material
456			10					456.0-458.4, MARLSTONE, tan-light brown
457			60					uneven fracture; grainy to massive
458								458.4-459.4, OIL SHALE, dark brown, grainy
459								appearance; slightly calcareous; finely laminated
460			30					459.4-466.4, MARLSTONE, buff to light brown
461								obviously very lean; slight to very distinctive
462								grain; partings mostly along CLAY seams; even
463			70					bedded; very scarce thin SANDSTONE lenses
464								
465								
466								466.4 SANDSTONE, brown; saturated - bleeding gas
467								466.4-467.0, OIL SHALE, brown
468								467.0-470.2, MARLSTONE, light grayish brown
469								uniformly bedded, thinly laminated; hard, competent;
470			70					hackly fracture with grainy appearance
471								470.2-471.3 OIL SHALE, darker zone; predominant
472								black, hairlike laminations; thin SANDSTONE lenses below
473								471.3-474.0, MARLSTONE, light brown to tan;
474			90					massive to grainy; uniform bedding
475	+35		65 40 95 20 45 60 70 85					474.0-476.0, MARLSTONE, light brown to buff
476			50					dry lean; partings along CLAY seams; dry color
477			20					476.0-478.4, MARLSTONE, as above; buff to con-
478			60					amel-colored in alternating bands; rough textured; th
479								478.4 zone at 476.8; small pits at 479; very calcareous
								479.4-483.5, SHALE, brown to tan; massive

HOLE NO: X-14 SHEET 10 OF 11 DATE: 6/6/76 LOGGED BY: ERC COLLAR: 5155 TD: 580.7

DEPTH	±MM	FRX	PP	ASSAY 10 20 30 40	GAL TON	REC COR	LITH.	DESCRIPTION
481								fracture; uniform bedding; thin layer (1/16") of
482								CALCITE at 482.2
483								483.0-488.0, SHALE, gray to brown; fine-grained
484								& uniformly bedded; grainy appearance
485								
486								
487								
488								4890-4892 SHALE, banded buff to dark brown;
489								disturbed bedding & lap structures; irregular SAND lens
490								489.2-490.5, MARLSTONE, light brown; uniform bedding
491								490.5-490.9, SANDSTONE, fine, white-gray-tan; confor-
492								extremely irregular upper contact; intervening MARLSTONE
493								490.9-493.8, MARLSTONE, buff-tan-light brown
494								numerous irregular SANDSTONE inclusions with
495								distorted beds surrounding them
496								493.8-494.6, same as above, but darker (more kerogen)
497								494.6-495.1, SANDSTONE, gray-black, tarry; bleeding gray
498								495.1-500.5, OIL SHALE, brown-dark brown; fine-
499								laminated, thinly bedded with numerous irregular
500	+10							often discontinuous SANDSTONE inclusions (to 1'
501								aceous, fine gray - see comments); bedding is displaced
502								around lenses - especially at lower contacts
503								500.5-501.4, MARLSTONE, brown (lower grade than above)
504								501.4-510.2, SHALE, brown-grayish brown-gray
505								rock tends to become finer-grained (related to the
506								color change) & becomes very hard & siliceous; no
507								calcareous, evenly bedded; semi-conchoidal fracture
508								a few, very thin, fine gray SANDSTONE inclusions
509								near base (510')
510								
511								510.2-510.8, MAHOGANY MARKER, tan-brown-dark
512								gray; fairly bedded, confor. partly sandy
513								510.8-515.0, SHALE, light gray-brown, dense; un-
514								hard; infrequent parting - mostly along clay seams
515								minor bedding irregularities; relatively non-calcareous
516								minor SANDSTONE lenses; very thin, gray
517								515.0-516.0, MARLSTONE, tan-light brown; minor SAND
518								516.0-522.0, OIL SHALE, brown-dark brown, gray
519								into MARLSTONE locally (buff-light brown, calcareous);
520								thin CALCITE on healed fracture at 518
521								uniformly bedded to 520 - some disturbed lap
522								below; scarce discontinuous SANDSTONE lenses
523								
524								522.0-531.0, OIL SHALE, MAHOGANY ZONE
525	-15							brown-dark brown-black; some light bands
526								within darker colored zones; tends to part
527								along bedding at points of high kerogen con-
528								tent (black waxy surfaces); much moderately dis-
529								urbed bedding & lap structures; very scarce, thin
								SANDSTONE lenses; relatively light specific
								gravity; tough-resistant

494.6-495.1 has fairly even upper contact, but irregular contacts surrounding SHALE inclusions at base
 493.4-493.8, 494.6-495.1, 495.1-495.5 (confor. bed zones); Gas bleeding zones from highly irregular
 SANDSTONE lenses at 493.2 (top), 493.5, 494.6-495.1, 495.5, 496.6, 497.1, 500.1, 500.3, & MAHOGANY MARKER (502-510.8)

DEPTH	±MM	FRX	PP	ASSAY 10 20 30 40	GAL/TON	REC GRD	LITH.	DESCRIPTION
531			30					531.0-537.5, OIL SHALE, MAHOGANY ZONE, above
532								
533								
534								
535								
536								
537								537.5-541.0, MARLSTONE, tan-light brown calcareous; mostly uniformly bedded, lightly banded, hard, competent
538			95					
539								
540								
541								541.0-542.6, OIL SHALE, brown-dark brown
542								542.6, SANDSTONE (p.i.), tan-gray; irregular
543								542.7-547.5, OIL SHALE, as above, relatively moderate distortion; high grade zones near 544 & 546.5; several thin, irregular SANDSTONE lenses at 545-547.5-551.5, MARLSTONE, tan-light brown; calcareous, uniformly bedded, partings along clay seams; OIL SHALE zone at 550'
544								
545								
546								
547								
548								
549			60					
550	-40		45					
551								551.5-553.3, OIL SHALE, brown-dark brown, moderately disturbed bed
552								calcareous, light & dark banding; several SANDSTONE lenses
553								553.3-559.3, MARLSTONE, buff to light brown banded; finely laminated; mostly uniformly bedded, strong, competent rock - very low kerogen content; uneven fracture with a grainy or finely laminated appearance
554			40					
555								
556								
557								
558								
559								559.3-566.0, OIL SHALE, brown; slightly disturbed bedding; rock is very tough (resilient) - moderate kerogen content; rock has a grainy appearance - irregular fracture - hard to break
560								
561								
562								
563		I-90°						
564								
565								
566								566.0-572.5, MARLSTONE, buff-light brown-brown, mostly uniformly bedded with very minor disturbances around thin, irregular, gray SANDSTONE lenses
567								
568								
569								
570								
571			20 (dbl)					572.5-573.5, OIL SHALE, brown; irregular break
572			30					SANDSTONE lenses
573								573.5-579.8, MARLSTONE, buff-light brown, very lean; finely laminated - mostly uniform bedding except where displaced by minor SANDSTONE inclusions; some cream to brown banded zones; partings along fine-grained, very light colored seams
574								
575	-65		60 75 .85 30 70 .85 20 .25 60 .70					
576								
577								
578								
579			00 .80					

REMARKS: Thin SANDSTONE lenses bearing gas at 552.4' & at 552.6' * Drilling stopped at 580.7'