

WELL HISTORY REPORT

SOBC WM. SHAEFFER

CK YT 0-22

RELEASED

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SOBC WM SHAEFFER CK YT 0-22

MAY 27, 1971



R. C. RICHARDSON, P. Eng.
Project Manager

SECTION I - SUMMARY OF WELL DATA

(a) Well Name and Number

SOBC WM Shaeffer CK YT 0-22

(b) Permittee, Licencee or Lessee

Western Minerals Ltd.

(c) Name of Operator

Chevron Standard Limited
400 Fifth Avenue S.W.
Calgary 1, Alberta

(d) Location

Unit 0; Section 22; Grid: 66° 50' N; 137° 15' W

(e) Coordinates

Latitude: 66° 41' 54" N; Longitude: 137° 19' 40" W

(f) Permit or Lease Number

Permit No. 3324

(g) Drilling Contractor

General Petroleum Drilling Ltd., Rotary Rig Number Fifteen

(h) Drilling Authority

Number 464, Issued December 7, 1970

(i) Classification

Wildcat

(j) Elevations

Ground: 1,139; K.B: 1,155

(k) Spudded

0700 Hours, January 12, 1971

(l) Completed Drilling

1630 Hours, April 27, 1971

(i)

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(m) T.D. and P.B.T.D.

T.D: 10,373 P.B.T.D: Surface Logger's Depth: 10,374'

(n) Well Status

Dry and abandoned

(o) Rig Release Date

1159 Hours, May 9, 1971

(p) Hole Sizes to Total Depth

30" Hole from surface to 63' (78' K.B.)

17½" Hole from 78' K.B. to 1,205' K.B.

8-3/4" Hole from 1,205' K.B. to 10,373' K.B.

(q) Casing

23" O.D. conductor pipe set at 22'

19" O.D. conductor pipe set at 78' K.B.

13-3/8" J-55, 54.5# casing set at 1,200.66' K.B.

SECTION II - GEOLOGICAL SUMMARY

(a) Formation Tops

<u>Formation</u>	<u>Depth</u>		<u>Elevation K.B. 1155</u>
	<u>Samples</u>	<u>Logs</u>	
Upper Cretaceous Shale	Surface		
Blackie Sand	-	503	+652
Cretaceous-Devonian Unconformity	2025	-	-870
"Pure Shale" marker	-	6612	-5457
Middle Devonian Reef	8330	8326	-7171
T.D. 10373 (-9215)			

(b) Cored Intervals

<u>Core #</u>	<u>Interval</u>	<u>Formation</u>	<u>Recovery</u>
1.	8910-8970	Middle Devonian	60 ft.
2	8971-9031	Middle Devonian	56.8 ft.
3	9033-9088	Middle Devonian	53.7 ft.
4	9090-9150	Middle Devonian	58.8 ft.

(c) Core Descriptions

Core #1	8910-8970										Rec. 60.0 ft.
Coring Times:	9	8	7	6	7	9	9	8	12	10	
	12	13	13	13	11	13	11	12	12	12	
	7	12	9	10	11	10	12	10	9	8	
	12	10	12	12	10	12	10	9	10	11	
	12	11	10	10	11	10	13	9	12	9	
	12	9	9	12	10	8	10	13	10	10	

Core Description:

8910-8936.7 Limestone, light tan, crypto-crystalline, tight.
 26.7 Massive stromatoporoids, stromatoporoid fragments,
 in dark grey argillaceous crypto-crystalline limestone
 matrix. Traces of crinoids, small brachiopods,
 solitary corals. Thin (0.3ft.) finely laminated
 calcareous bituminous shale break at base.

- 8936.7-8953.0 Limestone, light tan, crypto-crystalline, tight.
16.3 Massive stromatoporoid limestone. Stylolitic.
- 8953.0-8970 Limestone, light tan, crypto-crystalline, tight.
Large calcite-infilled fracture, 8968-8970. Massive
stromatoporoids, laminae stromatoporoids, stromato-
poroid fragments, few scattered coarse crinoid
fragments, amphipora? in dense limestone matrix,
framework 80%, matrix 20%.

End of Core #1.

Core #2	8971 - 9031										Recovered 56.8 feet
Coring Times:	10	9	10	8	7	8	7	7	7	6	
	8	8	6	7	5	8	7	6	6	14	
	8	7	5	7	7	7	6	6	8	6	
	7	8	4	8	8	7	7	6	6	8	
	7	7	6	6	7	8	3	1	7	11	
	9	8	9	11	9	9	8	7	9	10	

Core Description:

- 8971-9016.1 Limestone, light grey and light tan, crypto-
45.1 crystalline to micro-crystalline, matrix to abundant
massive to fragmented stromatoporoids. Scattered
crinoid fragments, brachiopods. Stylolitic.
Orthoceratid fossils, at 9005 feet and 9007 feet.
Massive stromatoporoids 8980-8996.
- 9016.1-9017.3 Limestone, light brown, micro-crystalline. Vugs, in-
1.2 filled with light brown, very fine crystalline,
sucrosic limestone, earthy and fine intergranular
porosity, no stain, cut or fluorescence. Vugs are
leached stromatoporoid masses and fragments. Large
calcite infilled fracture at top.
- 9017.3-9019.2 Limestone, light tan and light grey, micro-
1.9 crystalline, tight. Abundant stromatoporoid fragments
and laminae. Abundant brachiopods at top and base.
Rubble in part.
- 9019.2-9024.4 Limestone, light grey, micro-crystalline dense,
5.2 shatter-fractured. Matrix to scattered stromatoporoid
fragments, brachiopods, coarse crinoids. Tight.

- 9024.4-9025.6 Limestone, light brown, micro-crystalline. Leached
1.2 stromatoporoid laminae, very fine intergranular porosity in leached laminae. No stain, cut or fluorescence.
- 9025.6-9027.8 Limestone, light grey, micro-crystalline, matrix
2.2 to stromatoporoid fragments and laminae, scattered coarse crinoid fragments. Tight.
- 9027.8-9031 Core not recovered.
3.2

Core #3 9033 - 9088 Recovered 53.7 feet

Coring Times:

18	15	7	8	8	7	9	7	8	7
7	8	9	9	8	8	7	8	8	7
8	8	6	8	11	9	9	8	10	9
8	8	7	9	9	9	8	9	8	8
9	6	8	8	9	8	7	8	8	8
8	9	7	8	7	Core jammed.				

Core Description:

- 9033-9058.8 Limestone, light grey and light tan, micro-crystalline,
25.8 tight. Massive and fragmented stromatoporoids in light grey limestone matrix. Few brachiopods. Calcite-filled veining and fractures.
- 9058.8-9085.7 Limestone, dark brown, micro-crystalline, argillaceous.
26.9 Matrix to massive and fragmented stromatoporidea, oncolites and coralline algae. Band of solitary corals at 9064 feet. Scattered brachiopods. Tight. Calcite filled veins and fractures.
- 9085.7-9086.7 Limestone, brown, micritic, tight, slightly
1.0 argillaceous.
- 9086.7-9088 Core not recovered.
1.3

Core #4 9090 - 9150 Recovered 58.8 feet

Coring Times:

9	9	10	8	12	10	12	11	6	7
8	6	7	7	9	6	7	7	7	6
8	7	7	6	6	8	7	7	8	6
7	6	7	5	7	7	6	5	6	5
7	6	6	7	5	6	5	7	6	7
5	7	7	8	5	10	5	6	9	6

Core Description:

- 9090-9110.7 Limestone, brown, micritic, dense, faintly argillaceous. Scattered calcite "eyes" - algal? Calcite veining and infilled fractures. Horizontal stress - relief fractures. Scattered stromatoporoid heads and fragments; corals and brachiopods - about 30% of rock volume. A large brachiopod, almost completely infilled with calcite, with trace of oil fluorescence, occurs at 9104.5 feet.
20.7
- 9110.7-9116.9 Limestone, dark medium brown, micro-crystalline, slightly argillaceous, dense. Scattered calcite "eyes", calcite veining.
6.2

Abundant massive stromatoporoids; scattered corals, brachiopods. Lower 3 feet interbedded with brown, micritic, dense, horizontally fractured limestone.
- 9116.9-9138.6 Limestone, brown, micritic to micro-crystalline, slightly argillaceous - matrix to stromatoporoid heads and fragments, scattered brachiopods and corals, indeterminate fossil fragments - comprising about 30% of rock volume. Horizontally fractured. Rubble 9130 - 9131.
22.7
- 9138.6-9140.2 Limestone, brown-grey, faintly argillaceous, micritic - birdseye algal texture. Calcite veining.
1.6
- 9140.2-9148.8 Limestone, dark brown, micro-crystalline, slightly argillaceous. Massive, patchy stromatoporoids, scattered corals and brachiopods, fossil fragments. Thin coral beds at 9143 and 9145. Horizontal fractures.
8.8
- 9148.8-9150 Core not recovered.
1.2

(d) Sample Description

Sample description starts at 600 feet.

- 600-610 Sandstone, grey, S & P, fine grained, (.12 mm), sub-angular to sub-rounded, fairly well sorted. Trace of glauconite, kaolinite. Minor black chert grains. Traces of black plant fragments. Fair porosity, no stain, questionable fluorescence. Much argillaceous, silty sand, minor grey, silty shale, traces of plant remains, traces of coal fragments.
- 610-640 As above. Trace of well rounded chert "grit". Faint cut and fluorescence.
- 640-660 Shale, silty, and argillaceous siltstone, light brown-grey, laminated in part, micro-micaceous. Interbedded grey, fine grained argillaceous, S & P, sandstone, glauconitic, kaolinitic in part, bitumen-flecked, traces of plant remains.
- Trace of brown and dark grey chert. Pyrite.
- Thin porosity streaks in sandstone, fair, intergranular, faint cut, fluorescence.
- 660-670 Shale, grey, laminated, silty, micro-micaceous, non-calcareous.
- Minor light grey S & P, fine grained, kaolinitic, glauconitic sandstone, sub-angular, argillaceous. Streaks of vitreous quartz sand, fair porosity. No stain, cut or fluorescence.
- 670-680 N.S.
- 680-700 Shale, brown and dark grey, as above. Minor interbedded sandstone, grey, S & P, fine grained, grading in part to grey siltstone. Trace of fair porosity, no stain, cut or fluorescence.
- 700-710 Sandstone, light grey, quartzose, fine grained, trace glauconitic, non-calcareous. Trace of fair porosity, no stain, cut or fluorescence.
- Minor grey and dark grey shale, chert pebbles, pyrite.

- 710-720 Siltstone, grey, argillaceous, grading to very fine grained sandstone. Minor brown grey and grey shale. Much light-grey cement? Contamination. Trace of light grey, coarse, quartz-chert sandstone.
- 720-760 Siltstone, brown-grey, argillaceous laminated in part, grading to silty shale and very fine grained sandstone. Much light brown silty shale. Trace of chert pebbles. Trace of light grey "fragmental" limestone, trace of grey, argillaceous, crypto-crystalline limestone. Pyrite.
- Traces to minor pale grey, fine grained quartz sand. Good inter-granular porosity, no stain, cut or fluorescence.
- 760-770 Siltstone, as above.
- Much light brown silty, micaceous shale, traces of dark grey shale. Trace of grey and brown, dense, argillaceous limestone.
- Much pale grey, fine grained, well sorted, sub-angular quartz sand, trace glauconitic. Traces chert, pyrite.
- 770-810 Siltstone, light grey-brown, argillaceous, non-calcareous grading in part to very fine grained argillaceous sandstone. Pyrite.
- 810-860 Shale, grey-brown, silty in part, micaceous, non-calcareous, blocky. Trace of silty lamination and interbedded argillaceous siltstone. Traces of chert, pyrite.
- 860-880 Shale and silty shale, as above. Trace of brittle, blocky green shale. Minor dark grey, sub-fissile shale.
- 880-910 Shale, dark grey, sub-fissile, micro-micaceous, non-calcareous.
- Much grey-brown, silty, micaceous shale and argillaceous siltstone.
- 910-990 Shale and silty shale, as above.

Trace of sandstone, fine grained, glauconitic, sub-angular, well sorted quartz. Good porosity, no stain, cut or fluorescence.

Trace of medium grained sandstone, grey, S & P, plant remains.

- 990-1000 Shale, dark grey, sub-fissile, non-calcareous. Siltstone, grey, argillaceous, micaceous, grading to very fine grained brown-grey sandstone. Trace of coaly fragments.
- 1000-1010 Shale, dark grey, sub-fissile, non-calcareous.
- 1010-1020 Shale, as above.
- Interbedded brown-grey argillaceous siltstone and very fine grained grey, quartz sandstone.
- 1020-1050 Shale, dark grey, sub-fissile, non-calcareous. Minor siltstone, as above.
- 1050-1060 Shale, as above. Trace of rusty red shale, pyrite.
- 1060-1100 Shale, dark grey, sub-fissile, non-calcareous.
- 1100-1180 Shale, as above. Minor light brown silt streaks. Trace of rusty red shale, pyrite, ironstone. Trace of grey limestone.
- 1180-1190 Shale, interbedded minor siltstone streaks, traces of grey, dense limestone.
- Traces of grey, S & P, glauconitic, fine grained quartz sandstone. Trace of pyrite.
- 1190-1200 As above.
- Minor ferruginous blocky shale, ironstone; traces of chert. Trace of grey fossiliferous limestone.
- 1200-1240 N.S.
- 1240-1250 Shale, dark grey, soft, sub-fissile, non-calcareous. Trace micaceous. Interbedded siltstone, grey, argillaceous, non-calcareous. Trace micaceous. Pyrite.

- 1250-1320 N.S.
- 1320-1330 Siltstone, grey, argillaceous, micro-micaceous.
Minor light grey calcareous siltstone.
- 1330-1350 Siltstone, as above. Minor inter-bedded grey and
dark grey micaceous shale. Trace of very fine grained
glauconitic, light grey sandstone, faintly calcareous.
- 1350-1360 Shale, dark grey, soft, sub-fissile, micro-micaceous.
Much very fine brown sandy streaks.
- 1360-1370 N.S.
- 1370-1460 Sandstone, light medium grey, very fine grained,
grading to siltstone, glauconitic, calcareous.
Minor interbedded dark grey shale. Trace of pyrite,
fossil fragments.
- 1460-1480 Sandstone, light grey, very fine grained, calcareous
in part, micaceous, glauconitic. Streaks and partings
of grey and dark grey shale, interbedded dark grey,
silty, micaceous, non-calcareous shale.
- 1480-1540 Shale, dark grey, micaceous, silty, non-calcareous.
Much interbedded light grey siltstone and very fine
grained glauconitic sandstone, calcareous in part.
Trace of fossil fragments, pyrite.
- 1540-1630 Shale, grey and dark grey, silty, micaceous, non-
calcareous. Few grey silty streaks, pyrite. Trace
of brown silty limestone.
- 1630-1660 Shale, dark grey, fissile, micro-micaceous, non-
calcareous. Trace of pyrite. Trace of fossil shell
fragments. Trace of calcareous silty streaks.
- 1660-1720 Shale, dark medium grey, hard, silty, blocky,
calcareous in part, micro-micaceous. Trace of grey,
silty streaks. Trace of pyrite.
- 1720-1820 Shale, dark grey and dark medium grey, micro-
micaceous, soft, non-calcareous, sub-fissile. Few
silty streaks. Trace of pyrite.

- 1820-1850 No returns.
Stopped drilling with foam, re-rigged to drill with mud at 1853 feet.
- 1850-1930 Shale, dark grey, non-calcareous, micro-micaceous, sub-fissile. Trace of chert. Trace of brittle, green shale. Trace of glauconite. Minor white, siliceous, slightly calcareous hard mudstone, cement and matrix to coarse chert-quartz sandstone, felspathic in part - contamination? Chert - green, brown, dark grey fragments and pebbles. Pyrite.
- 1930-1970 Shale, dark grey, sub-fissile, micaceous, non-calcareous. Much glauconitic shale. Traces dark grey and amber chert, brown chert.
- 1970-2010 Shale, dark grey, sub-fissile, non-calcareous micaceous. Trace to minor glauconite. Much chert - dark brown grey, grey, amber. Trace of light grey silt streaks.
- 2010-2090 Shale, grey and dark grey, silt streaks, chert, as above. Trace of coarse grained quartz-chert sandstone streaks, free quartz and chert grains.
- 2090-2130 Shale, medium grey, sub-fissile to blocky, non-calcareous. Trace silty streaks. Trace pyrite. Trace of brown, dense, argillaceous limestone. Scattered "floating" chert grains, glauconite streaks.
- 2130-2180 Shale, medium grey, sub-fissile, non-calcareous. Trace of silty streaks.
- 2180-2230 Shale, dark medium grey, sub-fissile, non-calcareous, trace micro-micaceous. Few light grey silty streaks. Traces of chert splinters and pebbles. Pyrite. Much interbedded light and medium grey shale.
- 2230-2240 Shale, dark medium grey and grey, as above. Trace glauconite and brown, glauconitic silty shale. Trace of very fine grained, light grey sandstone, calcareous in part.
- 2240-2270 Shale, grey, sub-fissile, non-calcareous, silty in part. Trace of chert pebbles and fragments. Streaks of light grey argillaceous siltstone. Trace pyrite.

- 2270-2310 Shale, grey, blocky, non-calcareous, much silty shale, minor micaceous shale. Siltstone, and very fine grained sandstone, grey and light grey, trace calcareous, argillaceous, trace of glauconite. Few chert pebbles and splinters.
- 2310-2380 Shale and silty shale, as above. 60%. Sandstone 40%, fine grained, siliceous, pale grey vitreous, calcareous in part, silty. Trace of pyrite, glauconite. Trace of medium to coarse quartz-chert sandstone streaks.
- 2380-2400 Shale, 80% grey and dark grey, silty in part, non-calcareous, silky texture to silty in the dark grey shale. Sandstone, grey, very fine grained, siliceous, non-calcareous, tight, streaks. Trace of pyrite, chert grains.
- 2400-2420 Shale, as above, 60%. Siltstone and very fine sandstone, light grey, siliceous, non-calcareous, trace micaceous, as streaks and thin beds. 40%. Traces of coarse "grit" chert and quartz grains.
- 2420-2450 Shale, grey, sub-fissile, micro-micaceous, silky sheen to silty in part, non-calcareous. Few silty streaks. Trace of pyrite, chert grains. Sandstone, 20%, grey, S & P, medium grained (0.50 mm) poorly sorted, rounded to sub-angular quartz and chert grains, siliceous cement, faintly calcareous, tight. Trace of glauconite.
- 2450-2470 Sandstone, 50% light grey, S & P, medium grained to fine grained, quartz and chert grains, sub-rounded to sub-angular, in siliceous matrix. Trace of glauconite, mica. Traces of coarse "grit" sandstone. Shale, grey, micro-micaceous, non-calcareous, as above.
- 2470-2510 Shale, 70% grey and dark medium grey, micro-micaceous, non-calcareous, silty in part, silty streaks. Sandstone, fine to medium grained, siliceous, non-calcareous, poorly sorted, sub-angular to rounded grains of quartz and vari-colored chert. Occurring as pockets and lenses in the coarser grades, streaks and laminae and thin beds in the finer sizes. Traces of carbonized plant remains, pyrite.

- 2510-2540 Shale, as above. 40%. Siltstone 20%, pale grey and grey, non-calcareous, argillaceous partings, grading to very fine sandstone. Sandstone, 40%, pale grey, S & P, fine to medium grained, quartz-chert sandstone, siliceous matrix. Minor coarse sandstone, chert pebbles.
- 2540-2610 Siltstone as above. 20%. Sandstone, as above. 40%. Shale, as above, 30%. Trace of chert "grit", pyrite. Trace of fractures, calcite lined and infilled. Trace of dark brown, hard shale, siliceous, faintly calcareous.
- 2610-2640 Shale, 50% grey, sub-fissile, micro-micaceous, non-calcareous. Siltstone, 30%, grey, argillaceous, siliceous. Minor brown siltstone. Sandstone 20%, grey, S & P, fine to medium grained, trace of coarse quartz-chert sandstone, non-calcareous, siliceous, hard. Pyrite.
- 2640-2700 Shale 60% grey, micro-micaceous, sub-fissile, non-calcareous, interbedded dark medium grey shale. Siltstone, 30% grey, argillaceous, streaks in shale beds. Sandstone, 10% grey, fine to medium grained, hard, siliceous. Pyrite. Trace of fractures. Trace of glauconite.
- 2700-2820 Shale, 70%, grey and dark medium grey, micro-micaceous, sub-fissile to blocky, as above. Sandstone, siltstone, very fine grained to fine grained, light grey, siliceous, argillaceous, non-calcareous.
- Trace of coarse sandstone. Pyrite.
- 2820-2840 Shale, interbedded, siltstone and very fine grained grey sandstone, as above. Trace of coarse chert sandstone in brown, siliceous, faintly calcareous matrix.
- 2840-2860 Shale, 60%, grey, interbedded dark medium grey shale, sub-fissile to blocky, non-calcareous, micro-micaceous, silty in part. Sandstone, 40%, grey and light grey, very fine to fine grained, siliceous, non-calcareous, hard. Trace of hard, brown siliceous shale. Trace of chert "grit" in brown, siliceous matrix.

- 2860-2920 Shale, 80%, grey, as above. Siltstone, fine grained sandstone, as above. 20%. Trace of brown siliceous shale, trace of chert grit.
- 2920-2950 Shale, as above, 50%. Sandstone, 50% grey and light grey, S & P, fine to medium grained, siliceous, hard, silty. Poorly sorted quartz and chert grains, sub-rounded to sub-angular, traces of carbonized flecks.
- 2950-2970 Shale, 80% grey, micro-micaceous, sub-fissile to blocky, non-calcareous. Trace brown siliceous shale. Pyrite. Siltstone and fine grained sandstone 20%, siliceous, grey and light grey, S & P.
- 2970-3040 Shale, 50% grey, micro-micaceous, sub-fissile to blocky, non-calcareous. Trace of brown, slightly calcareous silty shale. Siltstone and very fine to fine grained grey S & P, sandstone, 50% - hard, siliceous, tight. Trace of coarse sandstone streaks. Pyrite.
- 3040-3050 Shale, 70% grey and darker grey, micro-micaceous, sub-fissile to blocky, non-calcareous. Silty in part. Siltstone and very fine grained sandstone, 20% light grey, siliceous, pyritic. Sandstone, 10% medium grained, grey, S & P, poorly sorted, sub-angular to rounded chert and quartz grains in hard, siliceous matrix. Trace of chert "grit".
- 3050-3080 Sandstone, 60% grey, S & P medium to coarse grained, much fine grained sandstone. Sub-angular to sub-rounded chert and quartz grains, poorly sorted, in silty, siliceous matrix. Pyrite. Shale, as above 40%.
- 3080-3110 Shale, 60%, grey, darker grey, sub-fissile to blocky, micro-micaceous, silty in part. Sandstone and siltstone, 40% grey, grading from very fine grained to coarse grained, poorly sorted chert and quartz grains. Pyrite. Trace of fractures.
- 3110-3120 Sandstone, 60% grey, S & P, fine grained, siliceous, hard, silty. Size range from silt size to coarse, chert sandstone and grit. Shale, as above. 40%.

- 3120-3240 Shale, 60% as above, silty streaks. Sandstone and siltstone, as above. 40%, faintly calcareous. Trace of brown, siliceous shale. Trace of fractures. Trace pyrite. Trace of chert grit.
- 3240-3260 Sandstone, pale grey, medium to coarse grained, minor "grit", chert and quartz grains, sub-rounded to sub-angular poorly sorted in siliceous, silty matrix, faintly to fairly calcareous. Tight. Pyrite.
- 3260-3310 Sandstone, 60% fine to medium grained, grey, S & P, faintly calcareous-minor light grey coarse, siliceous chert-quartz sandstone, calcareous in part. Shale, 40%, grey and darker grey, sub-fissile, non-calcareous, few silty streaks, micaceous. Trace pyrite. Trace of coarse sandstone in brown, siliceous matrix. Chert pebbles.
- 3310-3330 Shale and sandstone, as above. Chert pebbles, pyrite. Trace of black bituminous shale.
- 3330-3350 Shale, 60%, grey and darker grey, micro-micaceous, sub-fissile to blocky, non-calcareous. Trace pyrite, silty streaks. Sandstone, 40%, very fine to medium grained, minor coarse chert sandstone, hard, siliceous, faintly calcareous, poorly sorted. Trace of chert pebbles.
- 3350-3430 Shale, 80% grey and darker grey, sub-fissile to blocky, micro-micaceous, non-calcareous, traces silty streaks. Sandstone, 20%, grey, S & P, hard, siliceous, fine grained, tight. Trace of coarse "grit". Traces of fractures, pyrite.
- 3430-3450 Shale, as above, 60%. Sandstone, as above 40%, calcareous in part. Trace pyrite, chert.
- 3450-3470 Sandstone 60% grey, S & P, fine to medium grained, silty, siliceous, sub-angular, poor to fair sorting. Trace glauconitic, faintly calcareous. Shale, as above, 40%. Trace of pyrite. Fractured.
- 3470-3500 Shale, 70%, grey and darker grey, sub-fissile to blocky, micro-micaceous, non-calcareous, trace pyrite, silty streaks. Trace of brown grey, blocky shale. Sandstone, 30%, medium grained, grey S & P, siliceous hard, quartz-chert sandstone, silty, faintly calcareous. Trace of chert pebbles.

- 3500-3590 Shale, 70% grey and darker grey, inter-laminated, trace silty streaks, micro-micaceous, non-calcareous, sub-fissile to blocky. Trace of pyrite globules. Sandstone - 30%, very fine to coarse-grained, siliceous, faintly calcareous, hard, tight. Trace of brown hard, blocky shale, chert pebbles. Trace of glauconitic shale.
- 3590-3610 Shale, as above, 50%. Sandstone 50% grey, very fine grained, argillaceous, silty, non-calcareous. Trace of chert pebbles, pyrite.
- 3610-3810 Shale, 70%, grey and dark grey, micro-micaceous, sub-fissile to blocky, non-calcareous, trace pyrite. Few silty streaks. Trace of brown, siliceous shale. Minor grey, S & P, fine grained, siliceous sandstone, faintly calcareous.
- 3810-3870 Shale, grey and dark grey, micro-micaceous, sub-fissile to blocky, non-calcareous. Trace pyrite. Trace of grey, silty and fine sandy streaks.
- 3870-3890 Shale, as above, 60%. Sandstone, fine grained, grey, non-calcareous, silty siliceous, micro-micaceous - sub-angular, poorly sorted quartz and chert grains. Trace of plant remains.
- 3890-3950 Shale, grey and dark grey, micro-micaceous, non-calcareous, sub-fissile, as above. Trace of brown-grey shale, Trace of pyrite. Traces interbedded silty and fine sandy streaks.
- 3950-3970 Shale, as above, 60%. Sandstone, 40% fine grained, grey, silty, argillaceous, siliceous, non-calcareous to faintly calcareous. Poorly sorted sub-angular quartz and chert grains, trace of pyrite. Trace of chert pebbles. Trace of glauconite. Fractures.
- 3970-4020 Sandstone, 60% fine to medium grained, grey, S & P, siliceous, hard, faintly calcareous, subrounded to sub-angular quartz and chert grains in silty, argillaceous matrix. Trace of green chert grains. Shale, as above, 40%. Trace of chert "grit". Trace of calcite-filled fractures. Trace of brown, siliceous, faintly calcareous sandstone.

- 4020-4070 Sandstone, 70% fine to medium grained, trace coarse grained, light grey, minor brown sandstone, tight, siliceous, silty and argillaceous matrix, faintly calcareous. Poorly sorted sub-angular quartz and chert grains. Trace of fracturing. Shale, as above, 30%, trace glauconite.
- 4070-4090 Shale, grey and dark grey, fissile, micro-micaceous, non-calcareous. Trace of pyrite. Much (30%) interbedded grey, argillaceous siltstone and very fine grained sandstone.
- 4090-4110 Sandstone, 50%, light grey, S & P, fine to medium grained, sub-angular to sub-round quartz and chert grains, siliceous, silty matrix, faintly calcareous. Trace of drusy fracture - lining. Shale, as above 50%. Pyrite. Trace of chert "grit".
- 4110-4150 Sandstone, pale grey, minor brown sandstone, medium to coarse grained, siliceous, hard, very faintly calcareous. Poorly sorted very fine to coarse chert and quartz grains, minor "grit", sub-angular to rounded. Minor interbedded grey and dark grey shale, as above.
- 4150-4170 Shale, 60% grey and dark grey, micro-micaceous, fissile to sub-fissile, non-calcareous, trace pyritic. Much sandstone, 40%, as above.
- 4170-4200 Sandstone, 80% light grey, hard, siliceous, as above. Shale, 20% grey and dark grey, as above. Trace of fractures.
- 4200-4240 Sandstone, medium to coarse grained, light grey, siliceous hard. Poorly sorted - "grit" chert grains in medium grained quartz-chert sand matrix, rounded to sub-angular. Tight. Trace of pyrite, glauconite.
- 4240-4310 Shale, grey and dark grey, micro-micaceous, sub-fissile to fissile, non-calcareous. Silty streaks. Minor sandstone as above - cavings.
- 4310-4330 Siltstone, grey, argillaceous, non-calcareous, grading in part to very fine grained sandstone. Shale, as above, trace pyrite. Traces medium and coarse grained quartz-chert sandstone - cavings.

- 4330-4360 Sandstone, 70% light grey, fine to medium grained, quartz, chert grains, sub-angular, siliceous, matrix to scattered chert "grit" grains. Shale, 30%, as above, - caving. Trace of fractures.
- 4360-4400 Shale, 50% grey and dark grey, micro-micaceous, sub-fissile, non-calcareous, silty streaks. Sandstone, 50% very fine grained to medium grained, grey, argillaceous, siliceous, silty, hard, tight.
- 4400-4450 Sandstone, 60% grey, very fine to fine grained, silty, argillaceous, siliceous. Trace of coarse chert "grit". Shale, as above, 40%.
- 4450-4470 Shale, 70% grey and dark grey, micro-micaceous, sub-fissile, non-calcareous, trace pyrite, few silty streaks.
- Sandstone, 30%, grey S & P, fine grained to medium grained, quartz-chert grains, trace of glauconite, in a silty, argillaceous, siliceous matrix. Trace of fractures.
- 4470-4500 Sandstone, 70% light grey, fine to medium grained, trace of chert "grit" in sandstone matrix, siliceous, silty, hard, tight.
- Trace of fractures - staining, cut fluorescence reported from fracture - no primary porosity noted.
- 4500-4530 Shale, 40% grey and dark grey, micro-micaceous, sub-fissile, non-calcareous, silty streaks. Sandstone, 60%, light grey, siliceous, as above. Trace of plant remains, trace of brown sandstone. Trace of pyrite.
- 4530-4580 Shale, 60%, as above. Sandstone, 40%, as above - grey and light grey, fine to medium grained, siliceous, hard, tight.
- 4580-4600 Shale, 70% grey and dark grey, micro-micaceous, silty streaks, fissile to sub-fissile, trace of plant remains, pyrite. Sandstone, as above, 30%, trace pyritic.
- 4600-4660 Shale, as above, 80% silty streaks, pyrite. Sandstone, as above, 20%. Trace of fractures.

- 4660-4700 Sandstone, 60% light grey and grey, S & P, fine to medium grained, trace chert pebbles. Sub-angular to sub-round quartz and chert grains, poor to fair sorting, in siliceous matrix. Minor interbedded grey siltstone. Shale, as above. 40%.
- 4700-4710 N.S. Depth Correction.
- 4710-4730 Shale, 50% dark grey and grey, micro-micaceous, non-calcareous, sub-fissile, few silty streaks. Sandstone, 50%, very fine to medium grained, light grey, siliceous, hard. Scattered chert grit in sandstone matrix. Trace pyrite, fractures.
- 4730-4740 Shale, 60%, dark grey and grey, as above. Sandstone, 40%, grey S & P, fine to medium grained, argillaceous, silty, siliceous. Scattered coarse chert grains in sandstone matrix. Trace of fractures, pyrite.
- 4740-4770 Shale, 80%, dark grey and grey, micro-micaceous, sub-fissile, non-calcareous, grey silty streaks. Sandstone 20% grey, S & P, very fine to fine grained, argillaceous, micro-micaceous, silty, and light grey, fine to medium grained quartz-chert sandstone, siliceous, hard, tight, pyrite.
- 4770-4830 Shale, as above, 50%. Sandstone, fine to medium grained, grey and brown, S & P slightly calcareous, siliceous, hard, tight. Sub-round to sub-angular quartz and chert grains, poorly sorted, siliceous, silty matrix. Micaceous in part. Trace of coarse sandstone, chert grit. Pyrite. Trace of fractures.
- 4830-4890 Sandstone, 60% grey, S & P, fine to medium grained, minor interbedded grey siltstone. Coarser sands are slightly calcareous. Sub-angular quartz and chert grains, silty, siliceous matrix. Trace of coarse chert "grit" in sandstone matrix. Shale, 40%, grey and dark grey, micro-micaceous, sub-fissile, non-calcareous. Trace of pyrite. Fractures.
- 4890-4910 Sandstone, grey, S & P, medium grained, size range from fine to coarse grained, non-calcareous, siliceous, silty, hard, tight. Sub-angular to sub-rounded chert and quartz grains, poor to fair sorting. Trace of bituminous ? flecks.

- 4910-4930 Sandstone, as above, 80%. Much sandstone, pale grey, S & P, medium grained, slightly to fairly calcareous. Shale 20% dark grey and grey, blocky, silty streaks, micro-micaceous, non-calcareous. Pyrite, trace of carbonized flecks, plant remains. Fractures.
- 4930-4960 Sandstone, 70% grey, S & P, argillaceous, silty, siliceous, trace micaceous, fine to medium grained, trace of coarse streaks. Sub-angular quartz and chert grains in a silty, siliceous matrix, poor to fair sorting. Pyrite, fractures. Shale 30%, grey and dark grey, micro-micaceous, sub-fissile to blocky. Trace of glauconite.
- 4960-4990 Shale, as above, traces brown, blocky siliceous shale. 60%. Sandstone, minor interbedded grey siltstone, as above 40%. Sandstone, cherty, interbedded siltstone. Some coarser sandstone with angular crystals up to 0.5 mm. Fractures with pyrite. Some glauconite and green unidentified glassy crystals.
- 4990-5020 Sandstone and shale interbedded as above with trace of glauconite and black chert. Sorting of sub-angular grains is fair to poor.
- 5020-5050 Sandstone and shale as above. Ratio is now 40% - 60% (sandstone/shale). Trace of pyrite and mica, slightly calcareous.
- 5050-5080 Sandstone, siltstone and shale. Ratio (sandstone/siltstone, shale = 60%-40%). Trace of glauconite, and green quartz ? crystals. Sorting is fair to poor and grains are sub-angular to angular.
- 5080-5110 Sandstone and shale as above, slightly calcareous (sandstone/shale = 50% - 50%). Shale dark grey pyritic (80% of rock). Some plant remains. Some interbedded micaceous. Sandstones with chert.
- 5110-5140 Shale pyritic as above. Some plant remains and chert associated with interbedded sandstones (sandstone/shale = 30% - 70%). Trace of pyrite in the sandstone.

- 5140-5170 Shale and sandstone as above (sandstone/shale = 30% - 70%). Some coarser sandstones, associated with chert, with sub-angular poor to fair sorted grains, shales are dark grey, sandstones are fine to medium grained and brown to grey. No porosity.
- 5170-5200 Shale dark grey and siltstone and sandstone (siltstone/ sandstone, shale - 30% - 70%). Sandstone fine to medium grained, grey with trace of pyrite, mica, glauconite, and chert. Sorting is fair to poor. Sub-rounded. No porosity. Increase in percentage of sandstone (50% - 50% with shales).
- 5200-5230 Sandstones interbedded with shales and siltstones (sandstone/ siltstone, shale = 60% - 40%). Sandstones as above, cherty, grey, sub-rounded and poor to fair sorting. Shales, dark grey.
- 5230-5260 Sandstone, grey to brown, fine to medium grained, angular, medium sorted, cherty and micaceous. Interbedded with shale, dark grey, sub-fissile, and siltstone (sandstone/ siltstone, shale = 50% - 50%).
- 5260-5290 Sandstone as above interbedded with shales.
- 5290-5320 Sandstone and shale interbedded as above. Some isolated quartz crystals. Sandstone is fine grained to silty. Shale is dark grey and sub-fissile.
- 5320-5360 Sandstone, fine to medium grained, interbedded with shales, dark grey (sandstone/shale = 60% - 40%).
- 5360-5390 Sandstone as above, sub-angular and medium sorted interbedded with dark grey shales. Trace of glauconite.
- 5390-5470 Sandstone and siltstone, fine grained micaceous, interbedded with shales, sub-fissile, dark grey silty.
- 5470-5530 Sandstone fine to medium grained, slightly micaceous, cherty, sub-rounded, poor to medium sorted, grey, interbedded with siltstone and shales (sandstone/ siltstone, shale = 60% - 40%). Shales, dark grey, sub-fissile interbedded with siltstones (siltstones/ shale = 40% - 60%).

- 5530-5610 Sandstone as above, trace of glauconite, and some isolated quartz crystals. Interbedded with dark grey shales (sandstone/shale = 60% - 40%).
- 5610-5670 Shale, grey and dark grey, micro-micaceous, sub-fissile, non-calcareous. Much brown-grey silty streaks, trace pyrite, glauconite. Trace of coal, 5660-5670.
- 5670-5740 Siltstone, very fine grained sandstone, grey and brown-grey, siliceous, argillaceous. 60%. Much shale, as above 40%. Trace of glauconitic sandstone.
- 5740-5760 Shale, as above, 40%. Siltstone, and fine grained sandstone, brown and grey, siliceous, hard, trace glauconitic, as above. Much brown ironstone. Trace pyrite. Trace of coarse siliceous quartz-chert sandstone.
- 5760-5780 Sandstone, 50% as above. Much coarse chert "grit". Shale and interbedded siltstone, as above. 50%.
- 5780-5830 Chert-quartz "grit" pale grey, siliceous, hard. 60%. Siltstone and very fine sandstone, grey and brown-grey, minor interbedded shale, 40%. Siltstone and sandstone matrix to chert grit.
- 5830-5880 Shale, grey and dark grey, sub-fissile, micro-micaceous, non-calcareous. Interbedded brown-grey siltstone and very fine grained siliceous sandstone, minor chert grit.
- 5880-5950 Shale, as above. Siltstone, and very fine grained sandstone, as above. Trace only, of chert grit. Trace of pyrite.
- 5950-5990 Shale, grey and dark grey, micro-micaceous, sub-fissile, non-calcareous.
- 5990-6000 Shale, as above. Increase in content of very fine grained, grey-brown argillaceous sandstone, scattered chert "grit". Trace of pyrite.
- 6000-6010 Shale, grey and dark grey, micro-micaceous, blocky, hard. Siltstone, very fine sandstone, grey, argillaceous, siliceous, hard, slightly calcareous. Trace of pyrite.

- 6010-6050 Sandstone, grey, fine grained to medium grained, poorly sorted, silty, argillaceous, quartz and chert grains, sub-angular to sub-rounded, siliceous matrix. Trace coarse chert grains. Minor shale, as above. Trace of pyrite.
- 6050-6080 Sandstone, minor coarse sandstone, as above 50%. Interbedded shale, grey and dark grey, micro-micaceous, as above. 50%.
- 6080-6090 Shale, grey and dark grey, micro-micaceous, sub-fissile 70%. Sandstone, as above, 30%. Trace of glauconite. Pyrite.
- 6090-6130 Sandstone, grey S & P, medium grained, poorly sorted sub-angular to sub-rounded quartz and chert grains, silty, argillaceous matrix, micaceous in part. Trace of chert grit. 70%. Shale as above. 30%.
- 6130-6170 Sandstone, as above. 60%. Shale, as above, 40%.
- 6170-6180 Sandstone, fine-grained, grey, S & P, silty, siliceous, very faintly calcareous, matrix to scattered grey and green-grey chert "grit". Shale, grey and dark grey, silty streaks, sub-fissile to blocky, micro-micaceous, fissile shale. Trace of anhydrite.
- 6180-6210 Sandstone, as above, 80%. Much "grit". Shale, as above, 20%. Traces of fractures. Pyrite.
- 6210-6340 Sandstone, grey, S & P, minor brown-grey sandstone, fine to medium grained, siliceous, hard; matrix to chert "grit" grains. 60%. Shale, grey and dark grey, silty streaks, blocky, micro-micaceous, fissile in part. Trace of fractures.
- 6340-6390 Shale, grey and dark grey, micro-micaceous, sub-fissile to fissile. 60%. Silty streaks. Sandstone, grey, S & P, fine to medium grained, quartz and chert grains, sub-angular, siliceous, silty, matrix to scattered coarse chert grit. Trace of pyrite. Trace of fractures.
- 6390-6420 Sandstone, as above, 50%. Shale, as above, 50%. Much grey argillaceous siltstone. Trace of pyrite.

- 6420-6490 Shale, grey and dark grey, micro-micaceous, few silty streaks, as above. 70%. Sandstone as above, traces to minor grit 30%. Trace of pyrite. Fractures.
- 6490-6520 Sandstone, grey, S & P, fine to medium grained, poorly sorted, sub-angular quartz and chert in a silty, siliceous, argillaceous matrix. Scattered streaks of grit and coarse chert grains. 70%. Shale, as above, 30%. Trace of fractures.
- 6520-6580 Shale, grey and dark grey, sub-fissile, micro-micaceous, few silty streaks. Minor sandstone, as above - interbedded grey siltstone. Trace of fractures.
- 6580-6620 Shale, as above, 60%. Sandstone 40% grey, medium grained, argillaceous, silty, siliceous, poorly sorted, sub-round to sub-angular, matrix to abundant (30%) coarse grey and green-grey chert grit. Much grey very fine grained sandstone. Trace of fractures - quartz infilled. Trace of pyrite.
- 6620-6680 Shale, as above, silty streaks, 80%. Sandstone, as above, 20%. Trace of anhydrite - fracture infilling - 6630-6640. Trace of glauconitic, sandy shale, 6640-6650. Pyrite.
- 6680-6730 Shale, 70% grey and dark grey, sub-fissile to blocky, non-calcareous, micro-micaceous, few silty streaks. Siltstone 30%, grading to very fine sandstone, grey and light grey, argillaceous, siliceous, hard, faintly laminated. Trace of pyrite, trace of chert grit - cavings? Trace of fractures.
- 6730-6830 Shale, 80% dark grey, fissile to sub-fissile, non-calcareous. Siltstone and fine grained grey sandstone, faintly calcareous, interbedded with shale. Minor brown blocky shale or ironstone 6730-6740.
- 6830-6990 Shale, as above, 60%. Trace of plant remains. Siltstone, fine grained, grey sandstone, argillaceous, faintly calcareous, siliceous, scattered coarse chert grains, 40%. Trace of ironstone, 6870-6890. Trace fractures, anhydrite infilled. Pyrite.

- 6990-7050 Shale, grey and dark grey, micro-micaceous, sub-fissile, non-calcareous. 80%. Siltstone, fine grained sandstone, grey, argillaceous, silty, siliceous matrix, faintly calcareous. Scattered coarse chert grains, 20%. Trace of fractures, pyrite, plant remains. Trace of ironstone.
- 7050-7080 Shale, as above. 50%. Siltstone, sandstone, as above, 40%.
- 7080-7100 Shale, as above. 70%. Sandstone, grey, medium grained, sub-angular to sub-round quartz and chert grains in argillaceous, siliceous matrix. Scattered coarse chert grains. Much dark grey - grey argillaceous, very fine grained sandstone 30%. Trace of fractures. Trace of pyrite, ironstone.
- 7100-7130 Shale, grey and dark grey, micro-micaceous, sub-fissile. Much interbedded grey and dark grey argillaceous siltstone and very fine grained sandstone, trace of glauconite. Trace of pyrite.
- 7130-7180 Shale, as above, 60%. Siltstone, grey, argillaceous siliceous, grading in part to very fine grained sandstone, minor medium grained sandstone. 40%. Trace of fractures, pyrite.
- 7180-7220 Shale, 80%, grey and dark grey, micro-micaceous, fissile to sub-fissile, minor grey silty shale. Sandstone and siltstone, grey, very fine to fine grained, argillaceous, siliceous. Trace of medium to coarse chert grains. Trace of pyrite, fractures.
- 7220-7280 Sandstone, 50%, grey, very fine to fine grained, argillaceous, silty, siliceous, poorly sorted, tight, - gradation from siltstone to fine grained sandstone, traces scattered coarse chert. Shale, 50%, as above. Trace of pyrite, fractures.
- 7280-7290 Shale, grey and dark grey, micro-micaceous, fissile; much grey, blocky, silty shale. Minor sandstone - silt size to fine grained, as above. Traces of "grit".
- 7290-7400 Shale, as above. Trace pyrite. Sandstone, grey, vitreous, medium grained, siliceous, faintly calcareous, sub-round to sub-angular, poorly sorted quartz and chert grains, silty, argillaceous matrix. Much medium to coarse chert grains.

- 7400-7420 Shale, 60%, grey and dark grey, micaceous, sub-fissile to blocky, silty. Sandstone, grey, fine to medium grained, argillaceous, silty, siliceous, poorly sorted, sub-round to sub-angular quartz and chert grains. Much grey and darker grey argillaceous siltstone, trace brown shale.
- 7420-7450 Sandstone, 40%, grey, S & P, fine grained, very argillaceous, non-calcareous. Poorly sorted sub-round to sub-angular chert and quartz grains in a silty, siliceous matrix. Trace of chert grit. Trace of fractures, calcite, and quartz infilled. Shale, as above, 60%. Trace of pyrite.
- 7450-7520 Sandstone, 40% as above. Trace of medium grained, S & P, slightly calcareous quartz-chert sandstone. Shale, as above, 60%. Trace of fractures, quartz, calcite infilled.
- 7520-7570 Shale, grey and dark grey, micro-micaceous, sub-fissile to blocky, non-calcareous, silty streaks. Minor (less than 20%) sandstone, as above. Trace of pyrite.
- 7570-7580 N.S.
- 7580-7680 Shale, grey and dark grey, micro-micaceous, fissile to sub-fissile, non-calcareous. Minor grey, argillaceous siltstone, very fine grained sandstone, trace of coarse sandstone. Trace of pyrite, ironstone. Trace of fractures. Trace of chert pebbles, 7630-7640.
- 7680-7700 Shale, as above, 60%. Siltstone, minor very fine grained sandstone, 40%, grey, argillaceous. Trace of medium to coarse sandstone.
- 7700-7760 Shale, as above. Minor (less than 30%) siltstone, as above. Trace of fine to medium grained argillaceous, quartz-chert sandstone. Much ironstone 7710-7730.
- 7760-7850 Shale, as above, grey and dark grey, sub-fissile to fissile, micro-micaceous. 60%. Siltstone and fine grained grey sandstone, 40%, argillaceous, siliceous, tight. Traces of ironstone, pyrite, fractures. Trace of black bituminous shale, 7790-7800.

- 7850-7890 Shale, as above, 80%. Siltstone, very fine grained sandstone, as above. 20%. Trace of pyrite, ironstone.
- 7890-7930 Shale, as above. 60%. Siltstone, fine grained sandstone, 40% - grey, vitreous, siliceous, tight.
- 7930-8160 Shale, as above, grey and dark grey, micro-micaceous, sub-fissile to fissile, silty streaks. 80%. Siltstone, very fine grained sandstone, grey, vitreous, siliceous. 20%. Trace of pyrite, ironstone. Fractures.
- 8160-8170 N.S.
- 8170-8230 Shale, grey and dark grey, sub-fissile, non-calcareous, micro-micaceous. Few light grey silty streaks. Traces of dark grey, argillaceous sandstone. Traces of fractures, pyrite.
- 8230-8290 Shale, as above. Trace of brown shale. Minor sandstone, grey, very fine to fine grained, siliceous, hard. Trace of coarse chert "grit". Trace of fractures.
- 8290-8330 Shale, grey and dark grey, sub-fissile, micro-micaceous, non-calcareous. Minor brown siliceous shale, few silty streaks. Trace of pyrite, fractures.
- 8330-8400 Limestone, sub-chalky, pale grey, argillaceous, veining and matrix. Traces to minor pale grey medium to coarsely crystalline limestone. Trace of stromatoporoids, corals. Interbedded dark brown argillaceous, dense limestone. Trace of black, slightly bituminous shale.
- 8400-8490 Limestone, micritic, brown and dark brown, argillaceous, splintery. Minor brown sub-chalky limestone, interbedded very argillaceous dark brown-grey limestone, grading to calcereous shale. Fossiliferous. Traces of ostracods, 8400-8410, 8430-8440. Traces of corals, stromatoporoids.
- 8490-8500 Limestone, dark brown grey and brown, as above. Minor pale grey sub-chalky limestone - coarse fossil fragments. Traces of pale brown, coarsely crystalline compact, limestone.

- 8500-8520 Limestone, dark brown, micritic to micro-crystalline, argillaceous. Scattered fossil remains. Traces of coarse, crystalline to chalky limestone. Trace of fractures.
- 8520-8550 Limestone, dark brown micritic, argillaceous, as above. Much light brown and pale grey chalky to coarsely crystalline limestone, indistinct fossil fragments. Trace of stromatoporoids. Trace crinoids - 8540-8550. Trace oolites, bryozoa, brachiopods? Tight.
- 8550-8590 Limestone, brown and dark brown, micritic to micro-crystalline, argillaceous. Matrix to scattered fossil fragments - bryozoa, oolites, pellets. Much pale brown, compact, coarse, crystalline limestone, tight. Minor grey and pale grey chalky limestone. Trace of stylolites. Calcite - fracture infilling. Trace of stromatoporoids.
- 8590-8660 Limestone, brown and dark brown, micritic - dense, matrix to scattered fossil fragments. Stromatoporoids, bryozoa, indistinct fossils, crinoids? Minor light brown coarsely crystalline limestone, calcite, infilling. Trace of oolites, pellets.
- 8660-8680 Limestone, brown and dark brown, as above. Much pale brown and pale grey coarsely crystalline, compact limestone - fossil fragments. Traces of pelletoid limestone, stromatoporoids, crinoids.
- 8680-8800 Limestone, coarsely crystalline, fossil fragments, light brown and pale grey, minor chalky limestone. Trace of corals, crinoids, pellets, stromatoporoids? Minor grey, argillaceous partly chalky limestone. Much grey and dark brown-grey argillaceous micrite.
- 8800-8830 Limestone, pale grey, sub-chalky, to light tan, pelletoid, intraclastic, compact. Trace of bryozoa. Traces to minor coarse fossil fragments. Much cavings.
- 8830-8850 Limestone, as above - earthy, fine intraclastic, pelletoid. Minor light tan dense, pelletoid limestone, bryozoa.

- 8850-8910 Limestone, pale grey, sub-chalky, trace of light tan pelletoid limestone. Traces of stromatoporoids. Tight.
- 8910-8970 Core #1. Recovered 60 feet.
- 8970-8971 Drilled.
- 8971-9031 Core #2. Recovered 56.8 feet.
- 9031-9033 Drilled.
- 9033-9088 Core #3. Recovered 53.7 feet.
- 9088-9090 Drilled.
- 9090-9150 Core #4. Recovered 58.8 feet.
- 9150-9170 Limestone, brown, dense, micritic, faintly argillaceous. Traces of fracturing and calcite veining. Scattered medium to coarse fossil fragments. Tight. Minor pale grey chalky limestone.
- 9170-9210 Limestone, brown and dark medium brown, faintly argillaceous, micritic. Algal. Scattered fossil remains - usually more coarsely crystalline. Traces of fractures and calcite veining. Minor light grey-brown earthy limestone - bit fractured.
- 9210-9270 Limestone, light brown, earthy and chalky-crystalline, in part due to bit damage. Much brown, slightly argillaceous, micritic algal limestone, scattered medium crystalline calcite eyes. Traces of fossil fragments - stromatoporoids? corals? brachiopods, as patches of crystalline, brown and pale grey limestone. Trace ostracods.
- 9270-9310 Limestone, brown and dark brown, micritic, algal, faintly argillaceous. Matrix to fine to medium crystalline limestone, light brown and light grey, fossil fragments. Stromatoporoids, brachiopods, corals. Trace of ostracods.
- 9310-9350 Limestone, pale brown and light grey, fine to medium crystalline, compact - trace of stromatoporoid and coral, brachiopod remains. Minor light brown and white chalky limestone, coarse calcite crystals - fracture filling. Minor brown and dark brown slightly argillaceous micritic to micro-crystalline limestone.

- 9350-9430 Limestone; brown and dark brown, micritic, faintly argillaceous, to micro-crystalline, argillaceous - matrix to abundant stromatoporoids, corals? traces of brachiopods, as light brown, fine to medium crystalline limestone, compact, tight. Minor light brown earthy limestone.
- 9430-9710 Limestone, brown, micritic, faintly argillaceous, and dark brown, micritic to micro-crystalline, argillaceous. Minor (30%) light brown and brown, compact fine to medium crystalline limestone, fossil remains - stromatoporoids, brachiopods, corals? Traces of ostracods. Tight.
- 9710-9720 Limestone, brown and dark brown, micritic, earthy in part, slightly argillaceous. Much pale grey fossil fragments. Trace crinoids? Trace of spicules.
- 9720-9730 Limestone, as above. Scattered two-holed crinoid ossicles. Trace of shell fragments.
- 9730-9790 Limestone, grey and light brownish grey, argillaceous, earthy, matrix to abundant crinoid plates and ossicles. Scattered two-holed crinoid ossicles. Much compact, fine fragmental limestone.
- 9790-9840 Limestone, dark brown, micritic, argillaceous. Scattered recrystallized fossil fragments. Trace of ostracods. Trace of pellets. Much earthy, fragmental limestone - cavings in part.
- 9840-9860 Limestone, brown, micro-crystalline, scattered fossil fragments, slightly argillaceous. Much pale brown finely pelletoid and fine fragmental limestone, sub-chalky in part. Trace of crinoid and coarse fossil fragments. Minor interbeds of grey-brown micritic limestone.
- 9860-9890 Limestone, brown and dark brown, micritic, slightly argillaceous. Trace of mollusc shells. Minor interbedded? light grey earthy "fragmental" limestone, as above.
- 9890-9920 Limestone, as above, brown, micritic, argillaceous. Much white, earthy to coarsely crystalline calcite - fracture filling?

- 9920-9930 Shale, dark grey, non-calcareous, sub-fissile. Much brown, micritic limestone and white, chalky to crystalline calcite, as above - cavings.
- 9930-10,000 Limestone, brown, micritic, argillaceous, matrix to scattered fossil fragments, pelletoid. Trace of stromatoporoids - cavings? Trace of ostracods.
- 10,000-10,080 Limestone, brown and dark brown, micritic, argillaceous to very argillaceous. Scattered beds of lumps (oolites?) pellets, micro-breccia? Scattered fossil fragments, ostracods.
- 10,080-10,190 Limestone, brown and dark brown, micritic, argillaceous, dense. Minor brown, fine fragmental limestone, traces brown, algal limestone, pelletoid limestone.
- 10,190-10,200 Limestone, brown, micritic, argillaceous, as above. Trace of pyrite. Trace of grey-green silty dolomitic limestone.
- 10,200-10,220 Dolomite, brown, micro-crystalline, dense, slightly argillaceous. Trace of grey-green argillaceous, silty dolomite. Pyrite. Much brown, micritic limestone, as above - cavings?
- 10,220-10,240 Limestone, brown and dark brown, argillaceous, micritic, trace algal limestone, pelletoid beds. Minor dolomite, as above - cavings?
- 10,240-10,250 Dolomite, calcareous, brown, micro-crystalline, dense, argillaceous. Trace of grey-green hard, argillaceous dolomite. Much micritic and pelletoid limestone, as above.
- 10,250-10,300 Limestone, brown, argillaceous, micritic, beds of pelletoid limestone, trace algal limestone. Interbedded brown, micro-crystalline dolomitic limestone and dolomite.
- 10,300-10,330 Dolomite, brown, calcareous, argillaceous, micro-crystalline, dense. Minor interbedded brown micritic argillaceous limestone, pelletoid in part.
- 10,330-10,373 Dolomite, calcareous, brown and light brown, micro-crystalline, slightly argillaceous. Interbedded dolomitic limestone and micritic limestone, brown and light brown. Traces of pelletoid limestone. Tight.
- Total Depth - 10,373.

SECTION III - ENGINEERING SUMMARY

(a) Report of Drill Stem Tests (Field Pressures are reported)

DST #1: 9004 - 9068

Zone: Middle Devonian Reef

Times: Preflow 10 mins.
ISI 60 mins.
VO 120 mins.
FSI 120 mins.

Pressures: IHP 5266 psi FHP 5004 psi
ISIP 2107 psi FSIP 987 psi
IFP 564 psi FFP 604 psi
Preflow 564 psi

Recovery: Strong air blow on preflow
Gas to surface immediately on VO at 10 Mcf/Day
1030 feet of gassy water cushion
150 feet of gassy drilling mud

Remarks: Test satisfactory

DST #2: 8314 - 8417

Zone: Middle Devonian Reef

Times: Preflow 5 mins.
ISI 60 mins.
VO 120 mins.
FSI 120 mins.

Pressures: IHP 4900 psi
ISIP 738 psi
IFP 517 psi FFP 665 psi
Preflow 197 psi

Reset tool

IHP #2 4900 psi FSIP 788 psi
IFP #2 566 psi FHP 4775 psi
FFP #2 665 psi

Recovery: Very weak blow on preflow
No blow on VO
65 feet drilling mud recovered

Remarks: Test a misrun

DST #3: 8314 - ~~8420~~

Zone: Middle Devonian Reef

Times: Preflow 10 mins.
ISI 60 mins.
VO 180 mins.
FSI 180 mins.

Pressures: IHP 4914 psi FHP 4813 psi
ISIP 1067 psi FSIP 2190 psi
IFP 49 psi FFP 74 psi
Preflow 74 psi

Recovery: Gas to surface in 4 mins. on VO too small to measure
120 feet of drilling mud recovered

Remarks: Test satisfactory

DST #4: 504 - 512 (Perforated Interval)

Zone: Blackie Sand

Remarks: Test a misrun. Bridge plug slipped.

DST #5: 504 - 512 (Perforated Interval)

Zone: Blackie Sand

Times: Preflow 5 mins.
ISI 30 mins.
VO 120 mins.
FSI 120 mins.

Pressures: IHP 256 psi FHP 256 psi
ISIP 218 psi FSIP 152 psi
IFP 180 psi FFP 161 psi
Preflow 133 psi

Recovery: Good air blow on preflow
Good air blow on VO. Dead in 2 minutes.
325 feet of drilling mud recovered

Remarks: Test a misrun as packer unseated upon taking ISI
and FSI.

DST #6: 504 - 512 (Perforated Interval)

Zone: Blackie Sand

Times: Preflow Not taken
ISI Not taken
VO 360 mins.
FSI 180 mins.

Pressures: IHP 237 psi FFP 161 psi
FHP 228 psi FSIP 161 psi
IFP 28 psi

Recovery: Good air blow to weak in 6 minutes
Dead in 180 minutes
281 feet of drilling mud recovered on test

Remarks: Test satisfactory

(b) Casing Record

22 feet of 23" O.D. 3/16" insulated conductor pipe complete with 3/4" O.D. cooling coils.
41 feet of 19" O.D. 3/16" conductor pipe set 63 feet below ground or 78 feet K.B.
Conductor pipe cemented with 182 sax of permafrost cement.
Ran 38 joints (1184.70) of 13-3/8" 54.5#, J-55, 8-round, new seamless casing landed at 1200.66 feet K.B. Cemented casing with 1200 sax construction cement plus 3% CaCl₂. Recemented through a 1" pipe to 350 feet K.B. with 108 sax permafrost cement and 90 sax construction cement and 3% CaCl₂. Cement in place on first job at 0800 hours January 21, 1971. Cement in place on recement job at 2330 hours January 22, 1971.

(c) Bit Record

See attached sheets for bit record.

(d) Mud Report

Surface Hole - The 17-1/2" surface hole was drilled from 78 feet K.B. to 699 feet using stable foam as the drilling fluid. From 699 feet to 1205 feet a gel water drilling mud was used. The following materials were used on surface:

Sulfotex Sal	3 drums
Gel	207 Sax
Sawdust	71 Sax
Caustic	7 Sax
Aluminum Stearate	1 Box
Fiber Seal	3 Sax

Main Hole - The main hole was drilled with foam to a depth of 1853 feet, at which time the hole was displaced to a gel water system. From 1853 to 2424 the hole was drilled with the gel water system, and at 2424 feet the hole was displaced to an XC polymer system and was continued throughout the remainder of the hole. The following materials were used on the main hole:

Gel	1086 Sax
Weight Material	2218 Sax
Plaster	23 Sax
Bicarbonate of Soda	6 Sax
CMC	28 Sax
Caustic	115 Sax
Spersene	71 Sax
Kelzan "AL"	191 Sax
Dowicide "B"	7 Drums
Sawdust	1280 Sax
Aluminum Stearate	3 Boxes
Chrome Alum	7 Sax

(e) Deviation Record

60	-	1-1/8°	1390	-	1-1/4°	2970	-	2°
110	-	3/4	1450	-	1	3100	-	1-1/2
230	-	1/4	1578	-	1	3190	-	2-1/8
320	-	7/8	1580	-	1-1/8	3225	-	2
390	-	1/2	1670	-	3/4	3280	-	2
480	-	1/4	1770	-	1/2	3380	-	2
570	-	1/4	1852	-	7/8	3475	-	2-3/4
620	-	1/2	1917	-	7/8	3505	-	2-1/4
695	-	7/8	2043	-	1/2	3543	-	2-3/4
729	-	3/4	2170	-	1	3575	-	2
790	-	1	2233	-	1-1/4	3695	-	2-1/8
856	-	7/8	2295	-	1	3795	-	2-1/8
915	-	1-1/4	2360	-	1	3891	-	2
950	-	1	2443	-	1-3/4	4049	-	2-1/4
1040	-	1	2530	-	1-1/4	4112	-	2
1105	-	1-1/4	2625	-	2-1/8	4207	-	1-3/4
1165	-	1-1/8	2655	-	2-1/8	4239	-	1-1/2
1200	-	1-1/4	2685	-	2	4295	-	2-1/2
1280	-	1-3/4	2786	-	2	4365	-	1-7/8
1350	-	2	2880	-	1-7/8	4428	-	2

4523	-	2-1/4 ^o	5917	-	2 ^o	7640	-	1-3/4 ^o
4587	-	2-1/2	5942	-	1-3/4	7713	-	1
4614	-	2-1/4	6032	-	1-1/2	7800	-	1/2
4681	-	2-1/4	6078	-	1-1/4	7920	-	3/4
4705	-	2-1/2	6155	-	1-1/4	8015	-	3/4
4765	-	2	6255	-	1-1/8	8110	-	1-1/2
4840	-	2	6345	-	1-1/2	8170	-	1
4904	-	1-7/8	6440	-	1-3/4	8238	-	1-1/4
4985	-	2	6528	-	3/4	8399	-	2
5060	-	2	6605	-	1	8545	-	1-1/2
5150	-	1-7/8	6730	-	1	8800	-	1-1/4
5250	-	2-1/8	6880	-	1-1/2	8965	-	1-1/4
5270	-	1-1/2	6898	-	1-1/4	9025	-	2
5365	-	1-1/2	6980	-	1-1/8	9090	-	1-1/2
5470	-	1-7/8	7070	-	7/8	9275	-	2-1/2
5512	-	2-1/8	7170	-	1-1/2	9550	-	2
5598	-	2-1/8	7280	-	3/4	9680	-	2
5629	-	2-1/8	7398	-	1-7/8	9890	-	1-7/8
5673	-	2	7460	-	1-1/8	10,118	-	1-7/8
5790	-	1-7/8	7540	-	1-1/4	10,373	-	1

(f) Abandonment Plugs

			<u>Felt</u>
Plug #1	(10,300 - 10,150)	90 Sax Construction Cement + 0.4% R5	
Plug #2	(8450 - 8300)	90 Sax Construction Cement + 0.2% R5	8285'
Plug #3	(4250 - 4150)	50 Sax Construction Cement + 2% CaCl ₂	4155'
Plug #4	(3300 - 3200)	50 Sax Construction Cement + 2% CaCl ₂	3170'
Plug #5	(1250 - 1150)	140 Sax Construction Cement + 2-1/2% CaCl ₂	1155'
Plug #6	(580 - 470)	100 Sax Construction Cement + 3% CaCl ₂	448'
Surface Plug - 5 Sax Construction Cement			

(g) Lost Circulation Zones

After mudding up at 699 feet on the 17-1/2" surface hole, circulation was lost. Approximately 160 barrels of mud was lost in the Blackie Sand. Circulation was regained by mixing a pill of saw-dust, mud and fiber seal. No other zones of lost circulation were encountered throughout the remainder of the hole.

(h) Report of Blowouts

At a depth of 699 feet (Blackie Sand) and while drilling 17-1/2" hole with foam, gas was observed at the end of the Blooie Line. The gas was flared until sufficient mud was mixed to pump down the hole and kill the well. No measurement of the gas blow was made. The gas was flared for approximately 2-1/2 hours before being killed.

SECTION IV - LOGS

The following Schlumberger logs were run on surface hole on January 19, 1971:

I - ES	(1197' - 50')
Caliper	(1198' - Surface)
Microlog Caliper	(1195' - 50')
FDC/GR	(1195' - 50')

The following logs were run on April 28, 1971:

Dual Induction Laterolog	(10,368' - 1200')
BHC/Gamma Ray/Caliper	(10,372' - 1200')
S.N.P.	(10,373' - 8300')
FDC	(10,373' - 8300')
Completion Record	(480' - 76')

Total depth loggers at 10,374 feet

Ran a velocity survey on April 29, 1971

Ran Schlumberger Gamma Ray/Neutron Correlation Log (697' - 250') on May 7, 1971.

The following sidewall cores were recovered:

1441	4370
1684	4549
1758	5076
1808	5165
1847	5651
1948	5744
2253	6427
2326	6647
2432	6724
2545	6802
2733	7223
2828	7318
2952	7389
3106	7564
3156	7637
3289	7822
3366	7901
3590	7973
3705	8202
3906	8284
4091	8313
4246	

SECTION V - ANALYSIS

(a) Core Analysis

Core analysis enclosed in back folder.

(b) Water Analysis

Water analysis enclosed in back folder.

(c) Gas Analysis

Gas analysis enclosed in back folder.

(d) Oil Analysis

No oil analysis.

SECTION VI - COMPLETION SUMMARY

(a) Tubing Record

No tubing run.

(b) Perforation Record

Perforated through 13-3/8" J-55 casing at interval 504'-512' with 17 3-5/8" Schlumberger Uni-gun 20.5 gram charges. Perforations were shot on May 7, 1971 with a spacing of 2 shots per foot.

(c) Cementation Record

Abandonment Plug #1: (10,300' - 10,150')

Cemented with 90 sax construction cement plus 0.4% R-5 retarder. Cement in place at 2205 hours May 4, 1971. No feel on Plug #1.

Abandonment Plug #2: (8450' - 8300')

Cemented with 90 sax construction cement plus 0.2% R-5 retarder. Cement in place at 0050 hours May 5, 1971. Felt Plug #2 after 8 hours W.O.C. at 8285 feet.

Abandonment Plug #3: (4250' - 4150')

Cemented with 50 sax construction cement plus 2% CaCl₂. Cement in place at 1100 hours May 5, 1971. Felt Plug #3 after 8 hours W.O.C. at 4155 feet.

Abandonment Plug #4: (3300' - 3200')

Cemented with 50 sax construction cement plus 2% CaCl₂. Cement in place at 1955 hours May 5, 1971. Felt Plug #4 after 8 hours W.O.C. at 3170 feet.

Abandonment Plug #5: (1250' - 1150') Cretaceous and Surface Casing

Cemented with 140 sax construction cement plus 2-1/2% CaCl₂. Cement in place at 0625 hours May 6, 1971. Felt Plug #5 after 8 hours W.O.C. at 1155 feet.

Abandonment Plug #6: (580' - 470') Across perforations in the surface casing, Blackie Formation.

Cemented with 100 sax construction cement plus 3% CaCl₂. Cement in place at 2030 hours May 8, 1971. Felt Plug #6 after 8 hours W.O.C. at 448 feet.

Surface Plug: Cut off casing bowl below ground level and cemented top of casing with 5 sax of cement. Welded on casing plate and installed well name and location sign.

(d) Acidization and Fracturing Record

No acidizing or fracturing operations.

(e) Back Pressure and Production Tests

No back pressure or production tests.

CHEVRON STANDARD LIMITED
BIT RECORD

WELL NAME SHAFFER CK.

CONTRACTOR GENERAL PETROLEUMS

RIG No. 15

PUMP No. 1 _____

SPUD DATE _____

RIG RELEASED _____

DRILLING DAYS _____

PUMP No. 2 _____

BIT No.	MAKE	SIZE	TYPE	DEPTH		FOOTAGE	TIME	DRLG. RATE	NOZZLE SIZES	JET VEL	WEIGHT M #	RPM	No. 1 PUMP		No. 2 PUMP		PUMP PSI	HHP AT BIT	DP ANN.	DC ANN.	MUD		DULL COND.			DEV.					
				FROM	TO								LINER	SPM	LINER	SPM					WT.	VIS.	T	B	G						
22	SEC	8 3/4	H-100	6605	6898	293	78 1/4	3.1	2-10 1-9		45	36	5 1/2	62			1750				9.3	45	3	5	1						
23	HW	"	RG7X	6898	7295	397	76 1/4	5.5	"		45	36	"	62			1800				9.4	44	2	3	1						
24	HW	"	XSSR	7295	7713	418	78	5.3	"		35	36	"	64			2000				9.5	54	3	3	1						
25	SMITH	"	AJS	7713	8170	457	69 1/4	6.3	2-10 1-11		45	36	"	64			1600				9.5	47	4	8	1						
26	SEC	"	S-88	8170	8170	-	-	-	"	WASHED NOZZLE SOCKET																					
27	REED	"	SSIG	8170	8238	68	13 3/4	5.1	2-10 1-11 1-9		40	36	"	63			1400				9.8	108	2	7	1						
28	HW	"	ODV	8238	8299	161	24 1/2	6.7	1-10		40	60	"	62			1950				10.1	106	4	4	1						
29	SEC	"	S-88	8309	8809	410	50 3/4	8.0	"		35	62	"	63			2080				10.3	114	8	8	1						
30	HW	"	XV	8809	-	-	21	-	2-11 1-10	REAM FROM 5183 TO 6320														10.5	220	3	1	1			
31	HW	"	XV	8809	-	-	-	-	3-13	REAMING FROM 5481														-	-						
32	HW	"	XDV	8809	8910	101	18	6.0	3-13		35	80	5 1/2	63			1300				11.0	240	3	1	1						
33	WEST DRILL	6 3/16	◇	8910	8970	60	11 1/2	5.1	-		10	85	5 1/2	65			1100				10.9	215	GOOD								
34	SEC	8 3/4	M44N	8970	8971	1	1/4	4	2-12 1-15		10	80	"	63			1600				11.1	280	3	1	1						
35	WEST DRILL	6 3/16	◇	8971	9031	60	7 3/4	7 3/4	-		12	85	"	48/50			1500				11.2	235	GOOD								
36	SMITH	8 3/4	SVH	8971	9033	2	16 3/4			REAMED RAT HOLE FROM 8971 TO 9031																					
11RR	HW	8 3/4	XWR							RUN IN WITH JUMP SUB. NO FOOTAGE																					
37	WEST DRILL	6 3/16	◇	9033	9088	55	8 1/2	7	-		12	85	5 1/2	50			1600				10.7	195	FAIR								
38	REED	8 3/4	SSIG	9088	9090	2	7		2-14 1-16		15	60	"	64			1550				11.2	195	4	4	1						
39	WEST DRILL	6 3/16	◇	9090	9150	60	7 1/4	8.2			10	80	"	52			1700				11.2	195	FAIR								
40	SEC	8 3/4	M44N	9150	9280	130	18 1/2	7.3	2-14 1-15		20	60	"	64			1800				11.2	245	5	4	1						
41	SEC	8 3/4	S-88	9280	9684	404	52 1/2	7.7	3-14		35	60	"	63			1700				11.2	240	5	1	1						
42	SEC	8 3/4	S-88	9684	10118	434	57	7.6	3-14		35	60	"	62			1650				11.1	260	3	4	1						
43	HW	8 3/4	XSSR	10118	10373	255	45 3/4	5.5	3-14		40	60	"	62			1800				11.2	245	2	3	1	(T.D.)					