C443

GEOLOGIC AND ROCK STRUCTURE LOG

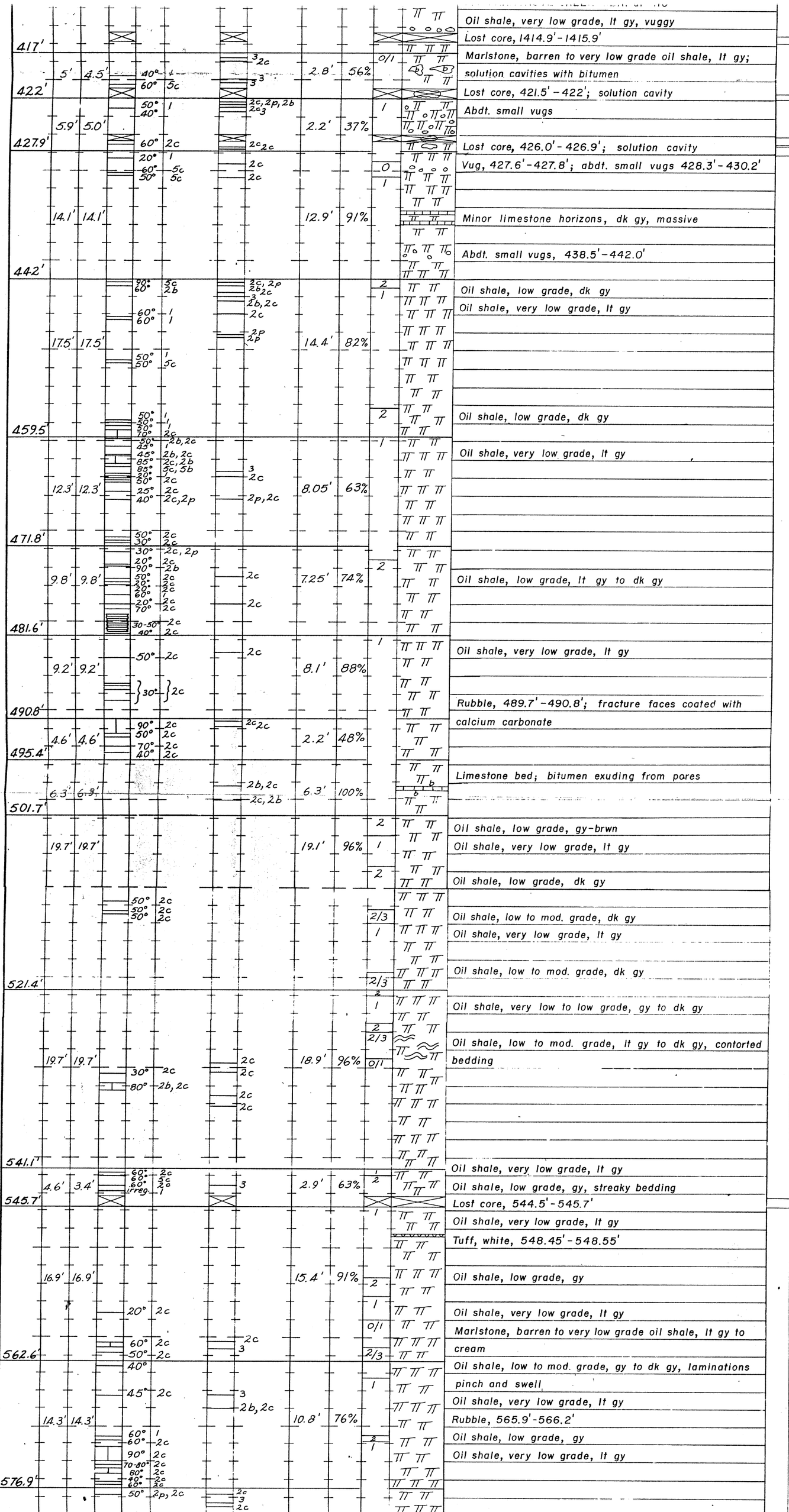
COMPANY: Union Oil Company of California
CORE HOLE: OM-2-80 A-a
LOCATION: Approx. 2440' FNL and 4420' FEL Sec. 33, T5S, R95W
Approx. N642,643' and E1,277,016' by Colorado State Coordinate System

CORE SIZE: 2.4" (NC)
ELEVATION: 7923'
DESCRIBED BY: Nieuwenhuis
DATE DESCRIBED: August 24-28, 1980

MARKER BED:	DEPTH	ELEVATION
Top "A" Groove	710'	7213.1'
Base "A" Groove	722'	7201'
Mahogany Marker	748'	7176'
Top 60' Mine Zone	752	7171'
Top "B" Groove	840'	7083'
Base "B" Groove	Did not penetrate	

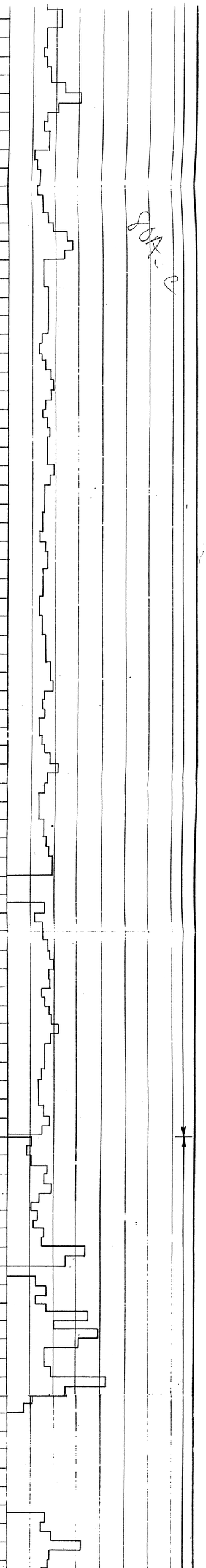
Depth	Core: Footage	Core: Recovery	Joints and Fractures: Location	Joints and Fractures: Dip	Joints and Fractures: Nature	Partings: Location	Partings: Nature	RQD: Sum of Piece Lengths > 0.35'	RQD: RQD Percentage	Oil Shale Grade	Lithology	Description and Remarks
												Note: Hole began to produce water at approx. 125 ft. at a rate of approx. 50 gpm
320'												
322'	2'	1.1'				2c, 3		0	0%	0/1		Marlstone, barren to very low grade oil shale, gy-brwn
				30°, 40°	2c, 2c	2c, 2c, 2c						Sandstone, lt gy, calc., very fine-grained, massive with interbedded barren marlstone
				80°-90°	2c	2c, 2c				0		Siltstone, marly, lt gy, massive
				80°, 2c, 2p, 40°	1, 2c	2p				1		
	20'	20'				2c		15.2'	79%			Sandstone, lt gy, calc., very fine-grained, massive with interbedded marlstone, vuggy at 330.9'
				20°, 40°, 30°, 80°, 80°	2c, 2b, 2c, 2c, 5c, 5c	2c				0		
										0		Marlstone, barren, gy, carb debris, abdt. small healed fractures 341'-342'
342'						2c, 2c, 2c, 2p						
	7'	6.4'		40°, 40°, 30°, 60°, 70°, 60°, 90°	5c, 5c, 5c, 5c, 2c, 1	2c, 1		1.75'	27%			Lost core, 342.7'-342.9' and 344'-344.4', vuggy; limestone, white, 345.9'-346.0'
												Sandstone, lt reddish-brwn, fine-grained, vuggy
349'				40°, 30°								Marlstone, barren, gray
	6.7'	6.2'		30°, 70°, 70°	2c, 5c, 2c	3, 3		3.5'	57%			Lost core, 349.7'-350.2'; solution cavity
355.7'						3, 3						
	5.4'	5.4'		50°, 60°, 40°, 60°, 80°, 60°	1, 1, 1, 1, 1, 1			4.05'	75%	1, 3, 1		Oil shale, very low grade with minor moderate grade, gy to bl, vuggy
361.1'				90°	2b							
										1/2		Oil shale, very low to low grade, lt gy to dk gy, with interbedded sandstone, dk gy, calc., fine-grained with marly stringers
	19.5'	19.5'						16.45'	85%			
				30°	1							Lost core, 372.6'-373.0'
381.0'												Rubble, 379.5'-880.8'
										1		Sandstone with minor interbedded oil shale, very low grade; sandstone, lt reddish-brwn, calc., very fine-grained with abdt. marly rip-clasts, chaotic appearance
	20'	19.5'						18.3'	93%			
				70°	2b, 2c							Burrows, 388.0'-388.5'; bedding inclined 40°, 388.0'-388.7'
						limonite, limonite, limonite						Lost core, 397.5'-398'; vuggy
401'												
	16'	15'		0-60°, 30°, 30°, 60°	1, 1, 1			14.2'	88%			Siltstone, marly, lt gy to gy
												TOP PARACHUTE CREEK MBR. at 410'
												Oil shale, very low grade, lt gy, vuggy
417'												Lost core, 1414.9'-1415.9'
	5'	4.5'		40°, 60°	1, 5c	3, 2c, 3		2.8'	56%	0/1		Marlstone, barren to very low grade oil shale, lt gy; solution cavities with bitumen
422'												Lost core, 421.5'-422'; solution cavity
	5.9'	5.0'		50°, 40°	1	2c, 2p, 2b, 2c, 3		2.2'	37%	1		Abdt. small vugs
427.9'				60°	2c	2c, 2c						Lost core, 426.0'-426.9'; solution cavity

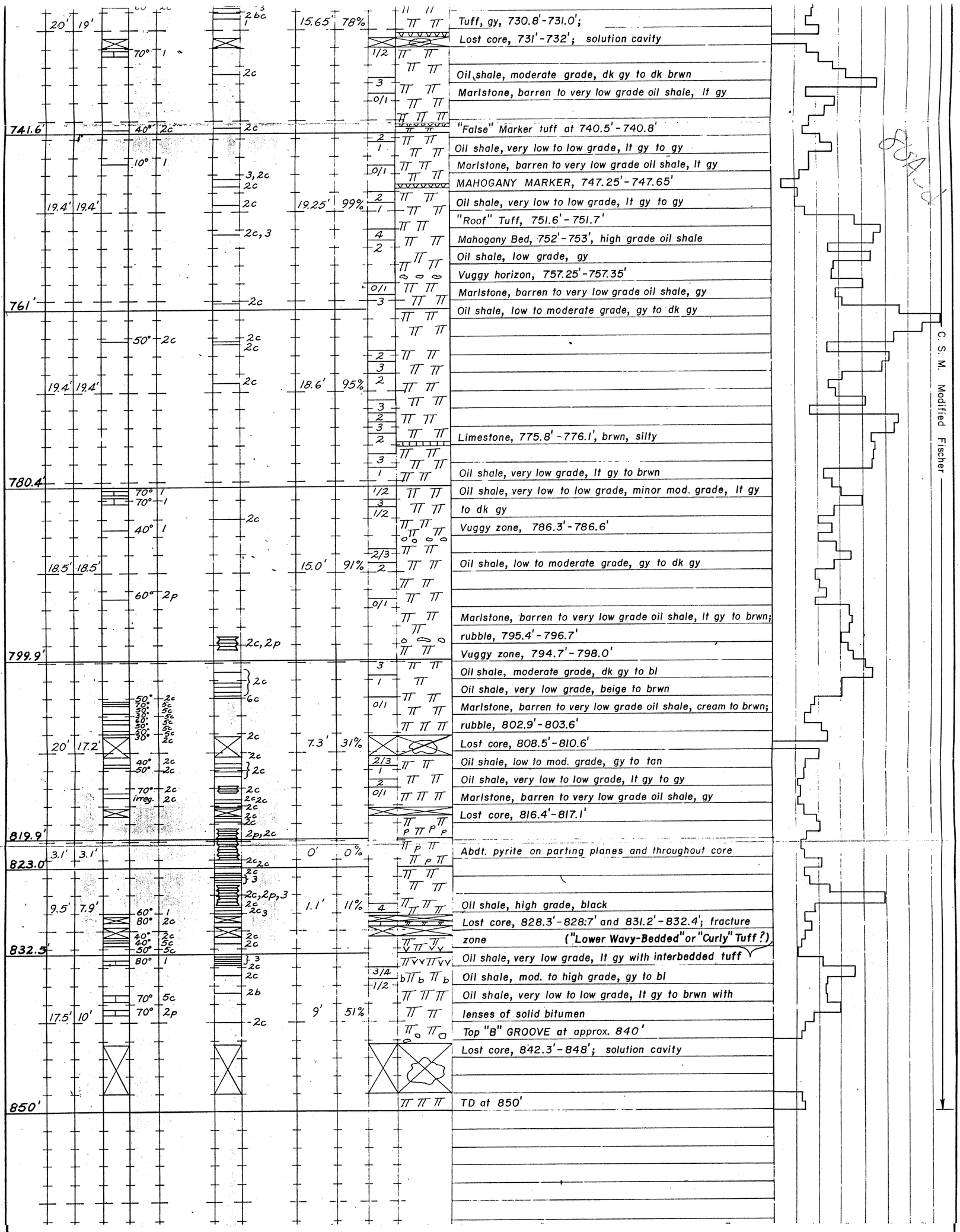
Assay: Gallons Per Ton (0, 20, 40, 60, 80)



Union Oil Simulated Fischer

562.6'		50° 2c 40°	3			2/3	cream Oil shale, low to mod. grade, gy to dk gy, laminations
		45° 2c	3 2b, 2c			1	pinch and swell Oil shale, very low grade, lt gy
	14.3' 14.3'			10.8'	76%		Rubble, 565.9'-566.2'
		60° 1 60° 2c 90° 2c 70-80° 2c 80° 2c 80° 2c 60° 2c				2 1	Oil shale, low grade, gy Oil shale, very low grade, lt gy
576.9'		50° 2p, 2c	2c 3 2c				
	15.7' 15.7'		2c	14.95'	95%		
		50° 1				2/3 1	Oil shale, low to mod. grade, lt gy Oil shale, very low grade, lt gy
592.6'							
	10.1' 10.1'		2c 2c	9.15'	91%	0 2	Marlstone, barren, cream to lt gy-brwn Oil shale, low grade, lt gy to gy-brwn
602.7'		50° 2c				0	Marlstone, barren, lt gy to lt brwn
	18.4' 18.4'	45° 1 50° 2c	2c 2c 3	14.4'	78%	2	Calcium carbonate horizons with bitumen, 601.7'-601.75' and 602.2'-602.5' Oil shale, low grade, lt gy to gy
621.1'		60° 5c 60° 2c 60° 5c 50° 2c 50° 2c 50° 2c 30° 2c 90° 1	3, 2c 2c			1	Oil shale, very low grade, lt gy to brwn with interbedded limestone, lt gy
	10.2' 10.2'	50° 2c	2c 2c	9.7'	96%	0/1	Marlstone, barren to very low grade oil shale, lt gy-brwn, minor interbedded limestone, white, silty
631.3'							Marlstone, barren, lt gy
	19.6' 19.6'	50° 2c 60° 2c 60° 2c 50° 2c	2c 2c 2c 2c	16.55'	84%	2 0/1	Oil shale, low grade, lt gy-brwn to gy, burrowed and bioturbated 640.5'-642.5' Marlstone, barren to very low grade oil shale, beige to lt gy
650.9'		45° 2c	2c 2c				
	10.9' 10.9'	60° 2c 30° 2c	3 2b, 2c 2c	10.4'	95%	0 1	Marlstone, barren, lt brwn to tan "Upper Wavy-Bedded Tuff", 654'-657', white, with marly stringers and bitumen Oil shale, very low grade, gy-brwn
661.8'							
	19.7' 19.7'	50° 1 50° 2c		17.8'	90%	0/1	Marlstone, barren to very low grade oil shale, lt gy to tan
		70° 2c 40° 2c 60° 2c 50° 2c 60° 2c 85° 2c	3 3				
681.5'							
	19.5' 19.5'	50° 1	2b	17.3'	89%	1	Oil shale, very low grade, lt gy-brwn
		70° 1 60° 2c 70° 2c 70° 2c 70° 1 70° 1				3 1	Oil shale, moderate grade, dk gy Oil shale, very low grade, lt gy-brwn
701.0'							
	20.6' 19.5'	70° 2c 50° 1 50° 1 60° 2c 60° 2c 30° 6 60° 5c	2c 2b, 2c 2c 2c 3 3, 2c 2c 2c 2p 6 2p	13.5'	66%	3 1 2	Oil shale, moderate grade, dk gy to bl Oil shale, very low grade, lt gy-brwn Oil shale, moderate grade, dk gy to bl TOP "A" GROOVE at approx. 710' Oil shale, very low to low grade, lt gy to gy Rubble, 715.0'-715.5' Lost core, 715.0'-716.6'; solution cavity
721.6'		40° 2c	2c			0	Marlstone, barren, white, silty BASE "A" GROOVE at approx. 722'
		60° 2c	2c 2c 2c 3 2bc			1 2 1 2	Oil shale, very low to low grade, gy-brwn to beige Abdt. solution cavities, 723.6'-724.1'





KEY TO GEOLOGIC AND ROCK STRUCTURE LOG

ROCK TYPES

- SANDSTONE
- SILTSTONE
- CLAY
- MARLSTONE OR OIL SHALE, LIMY
- MARLSTONE OR OIL SHALE, DOLOMITIC

ACCESSORIES

- ARGILLACEOUS
- SILTY
- CALCAREOUS
- DOLOMITIC
- SANDY
- SOLID BITUMEN
- CARBONACEOUS DEBRIS
- FOSSILS
- CONTORTED BEDDING
- NO CORE RECOVERY

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KEY TO GEOLOGIC AND ROCK STRUCTURE LOG

ROCK TYPES

- SANDSTONE
- SILTSTONE
- CLAY
- MARLSTONE OR OIL SHALE, LIMY
- MARLSTONE OR OIL SHALE, DOLOMITIC
- LIMESTONE
- DOLOMITE
- TUFF
- BRECCIA

ACCESSORIES

- ARGILLACEOUS
- SILTY
- CALCAREOUS
- DOLOMITIC
- SANDY
- TUFFACEOUS
- NODULE, DOLOMITIC
- CHERT NODULE
- P M — PYRITE OR MARCASITE
- b — SOLID BITUMEN
- CARBONACEOUS DEBRIS
- F — FOSSILS
- CONTORTED BEDDING
- NO CORE RECOVERY
- SOLUTION CAVITIES OR VUGS
- NO CORE RECOVERY DUE TO SOLUTION CAVITY
- L — LIMONITE STAIN

JOINT AND FRACTURE NATURE

1.....SURFACES SHOW NO MINERALIZATION OR SLICKENSIDES
2.....SURFACES SHOW MINERALIZATION
- 2c.....CALCITE MINERALIZATION
- 2p.....PYRITE MINERALIZATION
- 2bc.....BICARBONATE MINERALIZATION
- 2b.....SOLID BITUMEN

3.....SURFACES SHOW SLICKENSIDES
4.....BEDDING SHOWS OFFSET
5.....SEALED JOINT OR FRACTURE
- 5c.....SEALED WITH CALCITE
- 5p.....SEALED WITH PYRITE
- 5bc.....SEALED WITH BICARBONATE
- 5b.....SEALED WITH BITUMEN

6.....BREAK APPEARS TO BE MECHANICALLY INDUCED

PARTING NATURE

1.....SURFACES SHOW CHANGE IN LITHOLOGY
2.....SURFACES SHOW MINERALIZATION
- 2c.....CALCITE MINERALIZATION
- 2p.....PYRITE MINERALIZATION
- 2bc.....BICARBONATE MINERALIZATION
- 2b.....SOLID BITUMEN

3.....SURFACES SHOW GRINDING IN CORE BARREL
4.....BREAK APPEARS TO BE MECHANICALLY INDUCED
5.....SURFACES SHOW SLICKENSIDES
6.....SEALED PARTING PLANES
- 6c.....SEALED WITH CALCITE
- 6p.....SEALED WITH PYRITE
- 6bc.....SEALED WITH BICARBONATE
- 6b.....SEALED WITH BITUMEN

OIL SHALE GRADE

1.....VERY LOW
2.....LOW
3.....MEDIUM
4.....HIGH

ROCK QUALITY DESIGNATION (RQD)

SUM OF PIECE LENGTHS 0.35' (4") OR LONGER DIVIDED BY RUN LENGTH