

**TECHNICAL REPORT
ON CORING FIELD OPERATIONS
IN THE BARRETT RESOURCES
CORPORATION MV 8-4**

**SE/4 Sec. 4, T7S, R96W
Garfield County, Colorado**

***A Cooperative Effort Between
Barrett Resources Corporation
and CER Corporation***

***Work Performed Under
Contract No. DE-AC21-88MC24120***

***For*
U.S. Department of Energy
Office of Fossil Energy
Morgantown Energy Technology Center
Morgantown, WV 26507-0880**

***By*
CER Corporation
950 Grier Drive
Las Vegas, NV 89119**

JANUARY 1990

CONTENTS

Introduction	1
Coring Operations	1
Core Handling Techniques	2
Explanation of Coring Data and Forms	3
Coring Sampling and Packaging Summary	5
Field Core Descriptions	11
Core Fracture Descriptions and Orientation Summary	19
Eastman Christensen Core Orientation Report	26
Scribe Deviations and Core Discontinuities Report	29

FIGURES

Figure 1 Core Description Symbols	12
---	----

INTRODUCTION

This report describes coring operations in the Barrett Resources MV 8-4 well, SE/4 Sec 4 T7S R96W, Garfield County, Colorado, and presents core descriptions and orientation information. Coring in the well was a cooperative effort between Barrett Resources Company and CER Corporation between November 30 and December 7, 1989, to obtain reservoir data on tight Mesaverde Group sandstones in the Piceance Basin of northwestern Colorado for the U. S. Department of Energy.

The original plan was to take 120 ft of 4-in. diameter oriented core in the fluvial Mesaverde interval between 5,760 ft and 5,880 ft measured depth. This would be accomplished using two 60-ft core barrels and a 7-7/8-in. diameter natural diamond bit as recommended by Christensen. The original time projected for this work was two days. Actual time was eight days.

CORING OPERATIONS

Coring operations were originally projected to start late Thursday evening, November 30, 1989. Harder than expected drilling caused bit No. 4 to be pulled prematurely, and an associated rig breakdown caused core point to be reached late on Saturday, December 2, 1989. Operations for oriented core No. 1 were initiated at 3:34 a.m. December 3, 1989, following six hours reaming and circulating to get to bottom. Coring operations were terminated at 1:50 p.m. December 3, 1989, when the core barrel jammed after cutting 29.6 ft of oriented core (5,760 to 5,788.8 ft). The drive chains for the rotary broke, and the bearings in the draw works compound drive failed on the trip out of the hole with the core barrel. The draw works compound bearings were replaced, and the drive chains were repaired December 4, 1989. The trip out of the hole with core No. 1 was then resumed with 28.6 ft of oriented core being recovered. Core recovery included approximately 9 ft of siltstone and 19 ft of black shale cut in 10-1/4 hours. Prior to rerunning the core barrel, a cleanup trip was made with the bit, collars and drill pipe to circulate out any fill that occurred during the time rig repairs were being undertaken. A tight spot 40 ft off bottom was subsequently encountered and worked through with the bit and collars. On the trip out of the hole, the drive chains broke, causing additional downtime for rig repair.

Operations for oriented core No. 2 were initiated at 4:26 p.m. December 5, 1989, at 5,788.8 ft and were terminated at 5,799 ft when the core barrel jammed due to cuttings in the inner barrel above the recovered core. A Christensen SP 426 PDC core bit was used on this and subsequent coring attempts to improve coring rates. Core recovery included 10.2 ft of oriented core cut in 2-1/2 hours, including 9.8 ft of sandstone and approximately 0.4 ft of shale.

Operations for oriented core No. 3 were initiated at 5:08 a.m. December 6, 1989, at 5,799 ft and terminated at 7:02 a.m. the same day at 5,805.6 ft when the core barrel jammed while cutting dark gray lignitic shale. Core recovery was 6.6 ft of black shale, no sand. At this time, Dick Myal (CER), Ralph Reed (Executive V.P. of Production with Barrett), Merl Evers (Barrett), Scott Brady (Field Manager with Barrett) and Jeff Marmon (Christensen) discussed the problem of the core barrel jamming with drill cuttings. Because it was not

possible to circulate fluid down the inner barrel to flush cuttings ahead of the core bit while running in the hole with orientation tools attached to the core barrel, it was decided to lay down the orientation tools and to cut a 60-ft conventional core. This would allow circulation down the inner barrel and would be as the last attempt to obtain core before terminating operations.

Prior to initiation of conventional coring operations, a trip was made to total depth with the bit, collars and drill pipe to circulate out fill and to drill 3 ft to 5,808.6 ft to provide a rubble-free point to initiate coring operations. Operations for conventional core No. 4 were initiated at 4:17 a.m. December 7, 1989, and were terminated at 2:38 p.m. of that date following the cutting of 60 ft of conventional core in 10-1/4 hours. No jamming occurred, and 60 ft of conventional core were recovered, of which approximately 50 percent was sandstone and siltstone and 50 was black, lignitic shale.

All core material recovered was transported to the Multiwell Experiment site where it was cleaned, marked, wrapped, sealed with ProtecCore, and packaged for shipment to CER's Las Vegas office where a detailed lithologic description and a fracture study were performed.

CORE HANDLING TECHNIQUES

Within DOE's Tight Gas Sands Program and other large scale research projects, CER has developed comprehensive techniques for handling core in the field. These techniques were primarily developed to provide a consistent, high-quality core product to the subsequent analysts of the core. These techniques are summarized in the following sections.

Core Recovery

After the core barrels are recovered on the surface following a coring run, both 30-ft inner barrels were laid down horizontally on the pipe rack. A high-pressure, low-volume pump transmitted a fluid (water) through a hydraulic hose coupled to the top end of the core barrel. Fluid pressure exerted against a wiper plug forces core out the barrel's lower end. The resulting controlled expulsion of the core directly into sequentially numbered trays enhanced the overall core recovery process. The advantages of this recovery system are that rubblized core and core segments can be recovered and that whole trays cannot be misoriented.

Core Reassembly

After expulsion, the core was taken to a building at the MWX site to prevent the core from freezing. In the building, the core was reassembled on a layout track. In the ideal case, all core segments would be oriented on the track in the same relative position that they occurred in the subsurface. In reality, some core segments could not be accurately reassembled because of discontinuities such as rubble zones or spin-offs. When such a discontinuity occurred, notations were made of the depth and discontinuity type. The entire process of accurate core reassembly is important for 1) relating core fracture azimuths within continuous intervals and 2) orienting as long of a section of core as possible.

Core Marking and Measuring

Following core reassembly, an artificial "master orientation line" (MOL), highlighted in permanent blue ink, was placed in the vertical position along the entire length of the core. For Core Run Nos. 1-3, an attempt was made to scribe the core. If these core scribes were visible and straight (i.e., non-spiraling), then the MOL line would be coincident with the principal scribe line (PSL). If deviation was apparent, then there would be an angular difference between the MOL and the PSL. If no scribe shoe was run in the coring assembly, as was the case for Core Run No. 4, or if the scribe marks were of poor quality, then an observation of the MOL-PSL angular deviation was not possible and the MOL was arbitrarily placed in the vertical position on the core. Red and black permanent ink lines were placed on either side of the MOL; the red line was on the right side of the MOL when the segment was oriented so the top end of the segment points in the uphole direction. Depth marks corresponding to the drillers' depths were accurately placed on the core after the core recovery with any lost footage generally assigned to the bottom of the core run.

Core Preservation

After core marking was completed (usually a 2- to 3-hour period), the core was preserved and prepared for shipment. Preservation techniques consisted of wrapping each core segment in plastic film prior to sealing the core in a heat sealable, 4-ply (two polyethylene layers, an aluminum layer and a Borex layer), oxygen-barrier sleeve. The preserved core was placed in 3-ft long, labeled boxes prior to shipment.

Core Descriptions

A complete macroscopic description of the core was performed on each of the cores recovered. These descriptions included observations of sedimentological (e.g., lithology type, color, grain size) and structural (e.g., core fracture descriptions, measurements) features in the core.

EXPLANATION OF CORING DATA AND FORMS

A basic set of data was recorded on a standard group of forms for each of the core runs. The completed forms are briefly described below and are included after the description.

Core Packaging, Handling and Shipping Summary

Each core segment is given a unique identification number and placed in sequentially numbered core boxes prior to shipment. This information, along with a record of any samples removed for analysis, are noted on the form.

Core Description

Macroscopic core descriptions are recorded in words and symbols on this form. Core depths, corresponding to drillers' depths, are also recorded. Lithologic modifier symbols used on this form are described in Figure 1.

Core Fracture Descriptions

Core fracture data were recorded, concurrent to core lithologic descriptions, on a standardized fracture description form. This form includes the following descriptive elements.

Fracture Number and Fracture Depth. Each core fracture was assigned a depth interval (drillers' depth) and an identification number (which corresponds to the fracture identification number on the lithology description form).

Measured Strike and Dip. The apparent strikes of fractures and slickenside striations (if present) were consistently measured relative to the MOL with a simple measuring device.

True Azimuth. Where available, core orientation data were applied to the apparent fracture strikes to convert them to true strike with respect to true North. Note that only those fracture azimuths in a continuously fitted interval can be quantitatively related to each other; therefore, not all apparent strikes of fractures within a particular core run are converted.

Macroscopic Description. Distinctive fracture features, such as mineralization, fracture aperture or general fracture attitude, were also recorded for each of the identified fractures. Following the last fracture description of the core run are the intervals of continuously fitted core within the run.

Based on the above information, the fracture is classed as natural or coring-induced; this information is recorded in the "Classification" column. In general, natural fractures are present in the subsurface formation prior to the coring operation and were recognized by either the presence of mineralization. Coring-induced fractures form during and as a result of the coring operation and were identified by their unique geometry (e.g., petal structure) and their lack of mineralization or slickenside striations. Three specific subtypes of coring-induced fractures are: petal, petal-centerline and centerline.

Core Orientation Form

The electronic multi-shot data (EMS) for the cores is shown, as supplied to CER by Eastman Christensen.

Core Discontinuities and Sampling Forms

Angular difference between MOL and PSL are recorded numerically and graphically on the "Scribe Deviations and Core Discontinuities" form. When the PSL is present, the starting point is referred to as 0°, and deviations to the left or right of the MOL looking uphole are measured at each foot. Depths of continuous intervals and discontinuities such as rubble zones or spinoffs are noted.

CORE SAMPLING AND PACKAGING SUMMARY

OPERATOR Barrett Resources Corp. WELL MV-8-4
 COUNTY/STATE Garfield County, Co. LOCATION Sec 4, T7S, R96W
 CORE NUMBER/CORED INTERVAL Core No. 1; 5760.0-5788.8 ft
 CORE SAMPLE INTERVALS REMOVED/DESTINATION: Sample No. 5 removed and sent to Sandia Labs.
 CORE SEALING MATERIAL: Plastic Wrap and Protec Core

SEGMENT DEPTH	I.D. NO.	BOX NO.	SEGMENT DEPTH	I.D. NO.	BOX NO.
5760.0-5760.6	rubble	1			
5760.6-5761.2	1	1			
5761.2-5761.7	2	1			
5761.7-5763.3	3	2			
5763.3-5764.5	4	3			
5764.5-5766.2	5	3			
5766.2-5767.0	6	4			
5767.0-5769.5	7a,b,c	5			
5769.5-5770.0	8	6			
5770.0-5771.0	9	6			
5771.0-5771.5	10	6			
5771.5-5774.0	11	7			
5774.0-5775.8	12	8			
5775.8-5777.5	13	9			
5777.5-5780.2	14	10			
5780.2-5781.6	15	11			
5781.6-5782.8	16	12			
5782.8-5783.4	rubble	12			
5783.4-5784.9	17	12			
5784.9-5785.2	rubble	13			
5785.2-5786.3	18	13			
5786.3-5787.1	19	14			
5787.1-5787.4	rubble	14			
5787.4-5787.8	20	15			
5787.8-5788.8	rubble	15			

CORE BOXES 1 TO 15 SHIPPED TO _____
 VIA _____ DATE _____
 REMARKS _____

OPERATOR Barrett Resources Corp. WELL MV-8-4
 COUNTY/STATE Garfield County, Co. LOCATION Sec 4, T7S, R96W
 CORE NUMBER/CORED INTERVAL Core No. 4; 5808.6-5869.0 ft
 CORE SAMPLE INTERVALS REMOVED/DESTINATION: _____

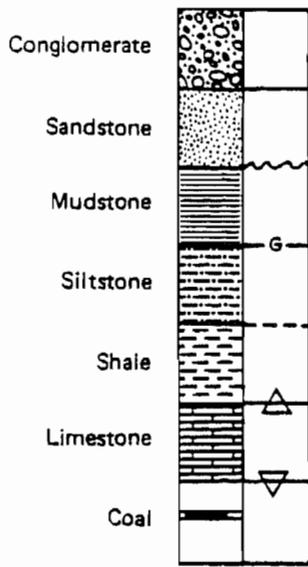
CORE SEALING MATERIAL: Plastic Wrap and Protec Core

SEGMENT DEPTH	I.D. NO.	BOX NO.	SEGMENT DEPTH	I.D. NO.	BOX NO.
5808.6-5809.6	1	24	5835.3-5835.8	30	37
5809.6-5810.5	2	24	5835.8-5836.9	31	37
5810.5-5811.7	3	25	5836.9-5837.9	32	38
5811.7-5812.6	4	25	5837.9-5838.2	33	38
5812.6-5813.0	5	26	5838.2-5838.6	34	38
5813.0-5814.3	6	26	5838.6-5839.2	35	38
5814.3-5814.8	7 (rubble)	27	5839.2-5840.0	36	39
5814.8-5815.3	8	27	5840.0-5840.7	37	39
5815.3-5815.5	rubble	27	5840.7-5841.4	38	39
5815.5-5816.3	9	28	5841.4-5842.5	39	40
5816.3-5816.6	10	28	5842.5-5843.0	40	40
5816.6-5816.9	rubble	28	5843.0-5843.9	41	40
5816.9-5817.6	11 (rubble)	28	5843.9-5845.4	42	41
5817.6-5818.3	12	29	5845.4-5845.8	43	41
5818.3-5819.2	13	29	5845.8-5846.5	44	41
5819.2-5819.8	14 (rubble)	29	5846.5-5847.1	45	42
5819.8-5820.6	15	30	5847.1-5848.7	46	42
5820.6-5821.4	16	30	5848.7-5849.6	47	43
5821.4-5822.5	17	31	5849.6-5849.8	48	43
5822.5-5823.4	18	31	5849.8-5851.2	49	43
5823.4-5824.0	19	32	5851.2-5852.9	50	44
5824.0-5825.5	20	32	5852.9-5853.8	51	44
5825.5-5825.9	21	33	5853.8-5853.9	52	44
5825.9-5827.6	22	33	5853.9-5854.7	53	45
5827.6-5827.9	23	33	5854.7-5856.4	54	45
5827.9-5830.0	24	34	5856.4-5858.7	55	46
5830.3-5831.0	25	35	5858.7-5859.8	56	47
5831.0-5832.5	26	35	5859.8-5860.2	57	47
5832.5-5832.7	27	36	5860.2-5861.4	58	47
5832.7-5834.7	28	36	5861.4-5861.9	59	48
5834.7-5835.3	29	37	5861.9-5862.4	60	48

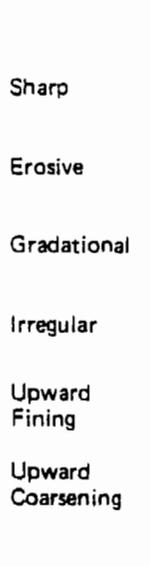
CORE BOXES 24 TO 51 SHIPPED TO _____
 VIA _____ DATE _____
 REMARKS _____

FIELD CORE DESCRIPTIONS

ROCK TYPES



CONTACTS



MODIFIERS

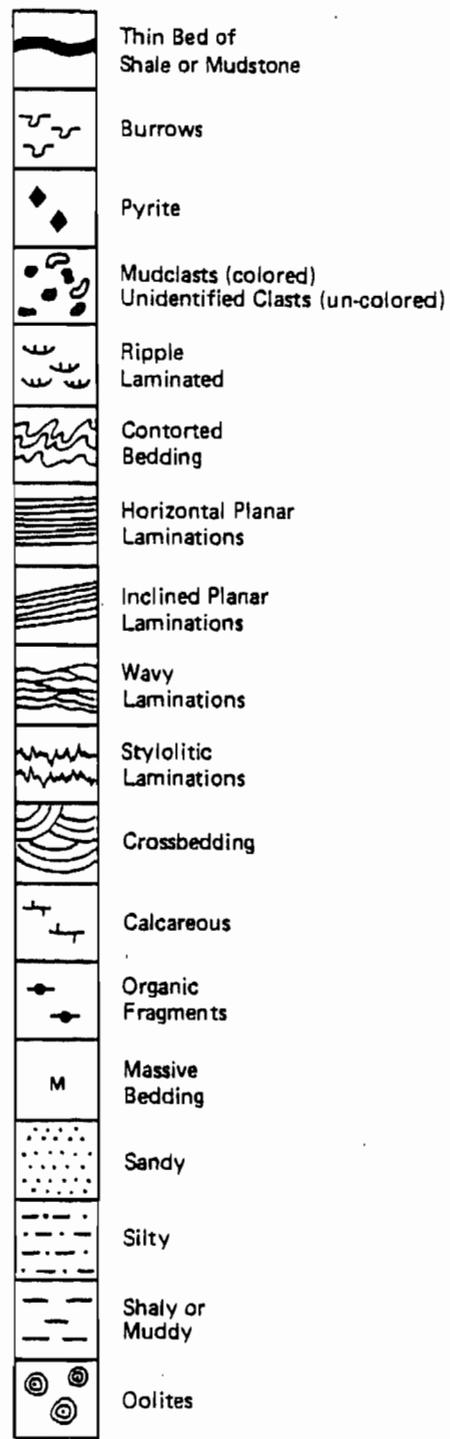


Figure 1 Core Description Symbols

OPERATOR Barrett Resources Corp. WELL MV-8-4
 COUNTY/STATE Garfield County, Co. LOCATION Sec 4, T7S, R96W
 CORE NUMBER/CORED INTERVAL Core No. 1; 5760.0-5788.8 ft
 DATUM 6063.0 FT (KB, DF, GL) Geol. C. Riecken/E. Price
 REMARKS _____

CORE DEPTH	ROCK TYPE	CON-TACT	MODI-FIERS	FRACS	SHOWS	CORE DESCRIPTION AND COMMENTS
5760						5760-63 ft Mudstone; dk gry-blk, slty; non calc.
5765		G				5763-68 ft Sandstone; vf g, gry, calc, f lams, inclined & rippled, 1-2 mm ms and coaly partings
5770		G				5768-84 ft Mudstone; drk gry to blk, calc w/ coaly films and partings on horz lams and surfaces, interbedded w/ drk gry slty-ms and slst; 5775-76 ft gry calc slst
5775		G				
5780		G				
5785						5784-88.8 ft Mudstone; blk, interbedded w/ in- clined lams of drk gry, calc slst
5790						

VERTICAL SCALE:  5 FT

OPERATOR Barrett Resources Corp. WELL MV-8-4
 COUNTY/STATE Garfield County, Co. LOCATION Sec 4, T7S, R96W
 CORE NUMBER/CORED INTERVAL Core No. 2; 5788.8-5799.0 ft
 DATUM 6063.0 FT (KB, DF, GL) Geol. C. Riecken/E. Price
 REMARKS _____

CORE DEPTH	ROCK TYPE	CON-TACT	MODI-FIERS	FRACS	SHOWS	CORE DESCRIPTION AND COMMENTS
5790	[Patterned Rock Type]	△		2		5788.8-90 ft Siltstone; drk gry, calc
5795						5790-96 ft Sandstone; gry, f-m g, calc, chiefly horz lams, w/ thin 1-2 mm coal partings, occ pyr, and brn sid mud lumps
5800						5796-99.0 ft Sandstone; drk gry, m g, calc, cross bedded lams grading to horz, 1-2 mm coaly partings, 5mm sid mud lumps

VERTICAL SCALE: 5 FT

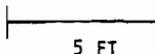
OPERATOR Barrett Resources Corp. WELL MV-8-4
 COUNTY/STATE Garfield County, Co. LOCATION Sec 4, T7S, R96W
 CORE NUMBER/CORED INTERVAL Core No. 3; 5799.0-5805.6 ft
 DATUM 6063.0 FT (KB, DF, GL) Geol. C. Riecken/E. Price
 REMARKS _____

CORE DEPTH	ROCK TYPE	CON-TACT	MODI-FIERS	FRACS	SHOWS	CORE DESCRIPTION AND COMMENTS
5800						5799.0-5800.7 ft Sandstone; gry, m g, calc, thin 1-2 mm carb partings
						5800.7-02.4 ft Shale; blk, carb, non calc
5805						5802.5-03.5 ft Mudstone; gry
						5803.5-05.6 ft Shale; blk, carb, non calc

VERTICAL SCALE: 5 FT.

OPERATOR Barrett Resources Corp. WELL MV-8-4
 COUNTY/STATE Garfield County, Co. LOCATION Sec 4, T7S, R96W
 CORE NUMBER/CORED INTERVAL Core No. 4; 5808.6-5869.0 ft
 DATUM 6063.0 FT (KB, DF, GL) Geol. C. Riecken/E. Price
 REMARKS _____

CORE DEPTH	ROCK TYPE	CON-TACT	MODI-FIERS	FRACS	SHOWS	CORE DESCRIPTION AND COMMENTS
5810			C			5808.6-10 ft Shale; blk, carb, non calc w/ thin coaly partings
5815		G	C			5810-14 ft Shale; drk gry-blk, slty, chiefly horz 5-10 mm slst lams
5820		G	C			5814-14.5 ft Shale blk, carb, w/ thin 5-10 mm coaly streaks
5825		G	C			5814.5-17.8 ft Mudstone; gry, slty, fos
5830		▽	C			5817.8-20 ft Siltstone; gry, w/ coaly partings
5835		▽	C			5820-26 ft Shale; blk, carb w/ thin shiny blk coal partings
		△	C			5826-28 ft Sandstone; gry, slty-vf g, w/ thin horz lams
		▽	C			5828-30 ft Sandstone; gry, f-m g, thin 2-10 mm lams, w/ v thin < 1 mm coaly partings
			C			5830-33 ft Mudstone-SLST; gry-blk, inclined lams
			M			5833-37 ft Sandstone; gry, f-m g, calc, cross bedded lams, w/ blk 1-2 mm inclined (13 degree) part- ings, drk gry mdst inter- clasts
		G				

VERTICAL SCALE:  5 FT

OPERATOR Barrett Resources Corp. WELL MV-8-4
 COUNTY/STATE Garfield County, Co. LOCATION Sec 4, T7S, R96W
 CORE NUMBER/CORED INTERVAL Core No. 4; 5808.6-5869.0 ft
 DATUM 6063.0 FT (KB, DF, GL) Geol. C. Riecken/E. Price
 REMARKS _____

CORE DEPTH	ROCK TYPE	CON-TACT	MODI-FIERS	FRACS	SHOWS	CORE DESCRIPTION AND COMMENTS
5845						5837-39 ft Sandstone; gry, m g, w/ blk sh parting, 7.5 cm thick at 5835.5 ft
				5		5839-40 ft Siltstone/Shale; gry-blk
				6		5840-42 ft Shale; blk
		G		7		5842-48 ft Shale; blk, interbedded w/ siltst, gry, calc, highly contorted & inclined lams, ripup clasts & mdst partings, vertical and inclined ccf
5850						5848-50 ft Sandstone; gry, f-m g, calc, w/ blk mdst interclasts, contorted bedding. 5849.75 ft 5 cm blk mdst parting
5855						5850-59 ft Sandstone; gry, m g, w/ blk irr shaped (up to 15 cm) mdst interclasts, 5851 ft cross-bedding, 5853 ft thin (1-2 mm) coal partings, 5855 ft small (up to 1 cm) mdst interclasts & mud balls
5860						5858.8 ft gry-blk mdst interclasts
5865		G				5859-61.4 ft Siltstone; gry, interlam w/ 1-5mm blk carb mdst partings
5870						5861.4-63 ft Shale; blk w/ thin 1-2mm coaly lam

VERTICAL SCALE:  5 FT

**CORE FRACTURE DESCRIPTION
AND ORIENTATION SUMMARY**

OPERATOR Barrett Resources Corp. WELL MV-8-4
 COUNTY/STATE Garfield County, Co. LOCATION Sec 4, T7S, R96W
 CORE NUMBER/CORED INTERVAL Core No. 1; 5760.0-5788.8 ft
 DATUM 6063.0 FT (KB, DF, GL) ANALYST E. Monson
 REMARKS Core scribed and downhole survey tool run.

FRAC. NO.	FRAC. DEPTH	MEASURED		TRUE AZIM.	CLASS	DESCRIPTIVE FEATURES
		STRIKE	DIP			
1	5760.6-5762.3	46	89	57	CI	Subvertical; unbroken, width 0.2 mm to <0.05 mm; begins at break in core; enclosed; centerline
2	5763.0-5765.0	58	83	69	CI	Subvertical; unbroken (5763.0-63.2 ft) width <0.05 mm; broken (5763.2-65.0 ft) no mineralization or slickensides; hooks out at bottom; penetrating; petal-centerline
3	5765.5-5767.5	53	87	64	CI	Subvertical; broken (5765.5-67.0 ft), no mineralization or slickensides; unbroken (5767.0-67.5 ft), width 0.05 mm; hooks out at top; penetrating; petal-centerline
4	5767.9-5770.8	71	89	82	CI	Subvertical; unbroken, width 0.1 mm; broken (5770.0-70.1 ft), no mineralization or slickensides; begins & ends in core; enclosed; centerline
5	5770.5-5780.2	59	89	70	CI	Subvertical; unbroken (5770.5-70.9 ft), width <0.05 mm; broken (5770.9-71.2 ft), no mineralization or slickensides; unbroken (5771.2-80.2 ft), width <0.05 mm; enechelon; hooks out at top; ends at break in core; penetrating; petal-centerline

NOTE: TRUE AZIMUTH NOT CORRECTED FOR HOLE DEVIATION, IF ANY

CER85-6

OPERATOR Barrett Resources Corp. WELL MV-8-4
 COUNTY/STATE Garfield County, Co. LOCATION Sec 4, T7S, R96W
 CORE NUMBER/CORED INTERVAL Core No. 1; 5760.0-5788.8 ft
 DATUM 6063.0 FT (KB, DF, GL) ANALYST E. Monson
 REMARKS Core scribed and downhole survey tool run.

FRAC. NO.	FRAC. DEPTH	MEASURED STRIKE	DIP	TRUE AZIM.	CLASS	DESCRIPTIVE FEATURES
6	5770.9-5771.0	62	32	73	CI	Inclined; broken, no mineralization or slickensides; intersects fracture No. 5 at 5771.0 ft; hooks out at top penetrating; petal
7	5780.2-5782.8	280	90	111	CI	Vertical; unbroken, width 0.05 mm; trace right of MOL ends at 5781.1 ft; begins and ends at break in core; enclosed; centerline
8	5785.1-5787.1	45	89		CI	Subvertical; broken, no mineralization or slickensides; begins and ends at break in core; enclosed; centerline 5788.8 ft bottom of core Continuous Interval, ft 5760.6-5782.8

NOTE: TRUE AZIMUTH NOT CORRECTED FOR HOLE DEVIATION, IF ANY

CER85-6

OPERATOR Barrett Resources Corp. WELL MV-8-4
 COUNTY/STATE Garfield County, Co. LOCATION Sec 4, T7S, R96W
 CORE NUMBER/CORED INTERVAL Core No. 2; 5788.8-5799.0 ft
 DATUM 6063.0 FT (KB, DF, GL) ANALYST E. Monson
 REMARKS Core scribed and downhole survey tool run.

FRAC. NO.	FRAC. DEPTH	MEASURED STRIKE	DIP	TRUE AZIM.	CLASS	DESCRIPTIVE FEATURES
1	5790.1-5790.4	294	71	25	CI	Inclined; unbroken, width <0.05 mm; hooks out at top; penetrating; petal
2	5791.5-5792.0	301	88	112	Nat	Subvertical; unbroken, width 0.2 mm; mineralized, completely infilled; reacts with HCl; enechelon; enclosed 5799.0 bottom of core Continuous Interval, ft 5789.2-5798.0

NOTE: TRUE AZIMUTH NOT CORRECTED FOR HOLE DEVIATION, IF ANY

OPERATOR Barrett Resources Corp. WELL MV-8-4
 COUNTY/STATE Garfield County, Co. LOCATION Sec 4, T7S, R96W
 CORE NUMBER/CORED INTERVAL Core No. 3; 5799.0-5805.6 ft
 DATUM 6063.0 FT (KB, DF, GL) ANALYST E. Monson
 REMARKS Core scribed and downhole survey tool run. Fracture strike and dip measured with respect to Principal Scribe Line.

FRAC. NO.	FRAC. DEPTH	MEASURED		TRUE AZIM.	CLASS	DESCRIPTIVE FEATURES
		STRIKE	DIP			
1	5803.7- 5803.8	295	53	70	CI	Inclined; unbroken, width 0.05 mm; hooks out at top; penetrating; petal
2	5804.5- 5804.6	306	64	81	CI	Inclined; broken, no mineralization or slickensides; hooks out at top; penetrating; petal
3	5804.7- 5805.0	303	78	78	CI	Inclined; broken, no mineralization or slickensides; hooks out at top; penetrating; petal 5805.6 ft bottom of core Continuous Interval, ft 5799.0-5805.5

NOTE: TRUE AZIMUTH NOT CORRECTED FOR HOLE DEVIATION, IF ANY

CER85-6

OPERATOR Barrett Resources Corp. WELL MV-8-4
 COUNTY/STATE Garfield County, Co. LOCATION Sec 4, T7S, R96W
 CORE NUMBER/CORED INTERVAL Core No. 4; 5808.6-5869.0 ft
 DATUM 6063.0 FT (KB, DF, GL) ANALYST E. Monson
 REMARKS Core not scribed and no downhole survey tool run.

FRAC. NO.	FRAC. DEPTH	MEASURED		TRUE AZIM.	CLASS	DESCRIPTIVE FEATURES
		STRIKE	DIP			
1	5826.3- 5826.5	61	61		CI	Inclined; unbroken, width <0.05 mm; hooks out at top; penetrating; petal
2	5826.6- 5826.8				CI	Inclined; unbroken, width <0.05 mm; hooks out at top; not developed enough to measure strike and dip; penetrating; petal
3	5826.9- 5827.0	67	57		CI	Inclined; unbroken, width <0.05 mm; hooks out at top; ends at break in core; penetrating; petal
	5830.0	174	7			Bedding plane; blk mdst; crossing
4	5830.1- 5830.5	291	68		CI	Inclined; unbroken, width <0.05 mm; hooks out at top; ends at break in core; penetrating; petal
	5835.15 5835.25	169	13			Bedding plane; crossing
	5838.4	129	2			Bedding plane; drk blk mdst; dip and strike measured at top of contact; crossing
	5844.2- 5844.5	15	40			Bedding plane; crossing

NOTE: TRUE AZIMUTH NOT CORRECTED FOR HOLE DEVIATION, IF ANY

CER85-6

OPERATOR Barrett Resources Corp. WELL MV-8-4
 COUNTY/STATE Garfield County, Co. LOCATION Sec 4, T7S, R96W
 CORE NUMBER/CORED INTERVAL Core No. 4; 5808.6-5869.0 ft
 DATUM 6063.0 FT (KB, DF, GL) ANALYST E. Monson
 REMARKS Core not scribed and no downhole survey tool run.

FRAC. NO.	FRAC. DEPTH	MEASURED		TRUE AZIM.	CLASS	DESCRIPTIVE FEATURES
		STRIKE	DIP			
5	5845.2- 5845.7	162	89		Nat	Subvertical; unbroken, width 0.5 mm; mineralized, completely infilled, reacts with HCl; trace left of MOL enechelon; ends at blk mdst bed; enclosed
6	5846.1- 5846.4				Nat	Subvertical; unbroken, width 0.5 mm; mineralized, completely infilled, reacts with HCL; 6 traces left of MOL; enclosed
7	5847.8- 5848.1				Nat	Subvertical; unbroken, width 0.1 mm; mineralized, completely infilled, reacts with HCL; single trace 168 right of MOL; enclosed
8	5853.1- 5854.2	294	89		CI	Subvertical; broken, no mineralization or slickensides; begins and ends in core; enclosed; centerline
	5863.0	266	23			Bedding plane; crossing 5869.0 bottom of core Continuous Intervals, ft 5809.5-5814.3 5819.2-5822.5 5822.5-5827.5 5827.9-5835.8 5835.8-5839.2 5840.0-5867.2

NOTE: TRUE AZIMUTH NOT CORRECTED FOR HOLE DEVIATION, IF ANY

CER85-6

**EASTMAN CHRISTENSEN
CORE ORIENTATION REPORT**

TOOLFACE REVIEW REPORT
PROBE #: 2014 FILENAME: MV3

Company:	BARRETT ENERGY	Core #:	2 JAMMED AT 5816 MD
Location:	GARFIELD COUNTY COLORADO	Declination:	12.48
Field:	GRAND VALLEY	Time Interval:	60 Second(s)
Operator:	JOHN HALSTED	Holdoff Time:	181 Minute(s)
Well no:	MICHAEL VICTOR #8-4	Depth Units:	FEET
Time:	TUE DEC 05 22:44:00		
Comments:	CORE FROM 5789 TO 5816		

Azimuth values below are corrected for declination.
 Toolface type: Magnetic Only Toolface. (corrected for declination)

Shot	Measured Depth	Inc	True Azimuth	Toolface	Additional Offset	Final Toolface
186	5789.4	1.5	212.47	107.6	-11.0	96.6
194	5790.0			277.8	-11.0	266.8
206	5791.0			352.2	-11.0	341.2
207	5792.0			185.1	-11.0	174.1
215	5794.0			323.1	-11.0	312.1
218	5795.0			154.5	-11.0	143.5
224	5798.0			321.7	-11.0	310.7
230	5799.0			189.0	-11.0	178.0
241	5800.0			184.7	-11.0	173.7
244	5801.0			183.3	-11.0	172.3
247	5802.0			182.2	-11.0	171.2
253	5803.0			180.3	-11.0	169.3
258	5804.0			176.9	-11.0	165.9
260	5804.1	1.5	209.82	177.1	-11.0	166.1
273	5804.2	1.6	210.79	176.9	-11.0	165.9
275	5805.0			176.8	-11.0	165.8
279	5806.0			177.8	-11.0	166.8
286	5807.0			247.3	-11.0	236.3
294	5808.0			220.9	-11.0	209.9
299	5809.0			246.6	-11.0	235.6
307	5810.0			235.7	-11.0	224.7
310	5811.0			231.1	-11.0	220.1
318	5812.0			162.9	-11.0	151.9
325	5813.0			185.3	-11.0	174.3
334	5814.0			200.0	-11.0	189.0
340	5815.0			205.3	-11.0	194.3
343	5816.0			204.9	-11.0	193.9
365	5816.7	1.5	217.19	205.2	-11.0	194.2

TOOLFACE REVIEW REPORT
PROBE #: 2014 FILENAME: MV4

Company: BARRETT ENERGY Core #: 3 JAMMED AT 5814 MD
 Location: GARFIELD COUNTY COLORADO Declination: 12.48
 Field: GRAND VALLEY Time Interval: 60 Second(s)
 Operator: JOHN HALSTED Holdoff Time: 181 Minute(s)
 Well no: MICHAEL VICTOR #8-4
 Time: WED DEC 06 11:43:00 1989 Depth Units: FEET
 Comments: CORE FROM 5807 TO 5814

Azimuth values below are corrected for declination.
 Toolface type: Magnetic Only Toolface. (corrected for declination)

Shot	Measured Depth	Inc	True Azimuth	Toolface	Additional Offset	Final Toolface
107	5806.0	1.4	201.62	60.8	-12.0	48.8
116	5808.0			104.4	-12.0	92.4
125	5809.0			322.8	-12.0	310.8
152	5810.0			327.9	-12.0	315.9
165	5811.0			329.7	-12.0	317.7
183	5812.0			327.9	-12.0	315.9
190	5813.0			328.8	-12.0	316.8
212	5814.0			1.7	-12.0	349.7
253	5814.4	1.1	204.64	0.2	-12.0	348.2

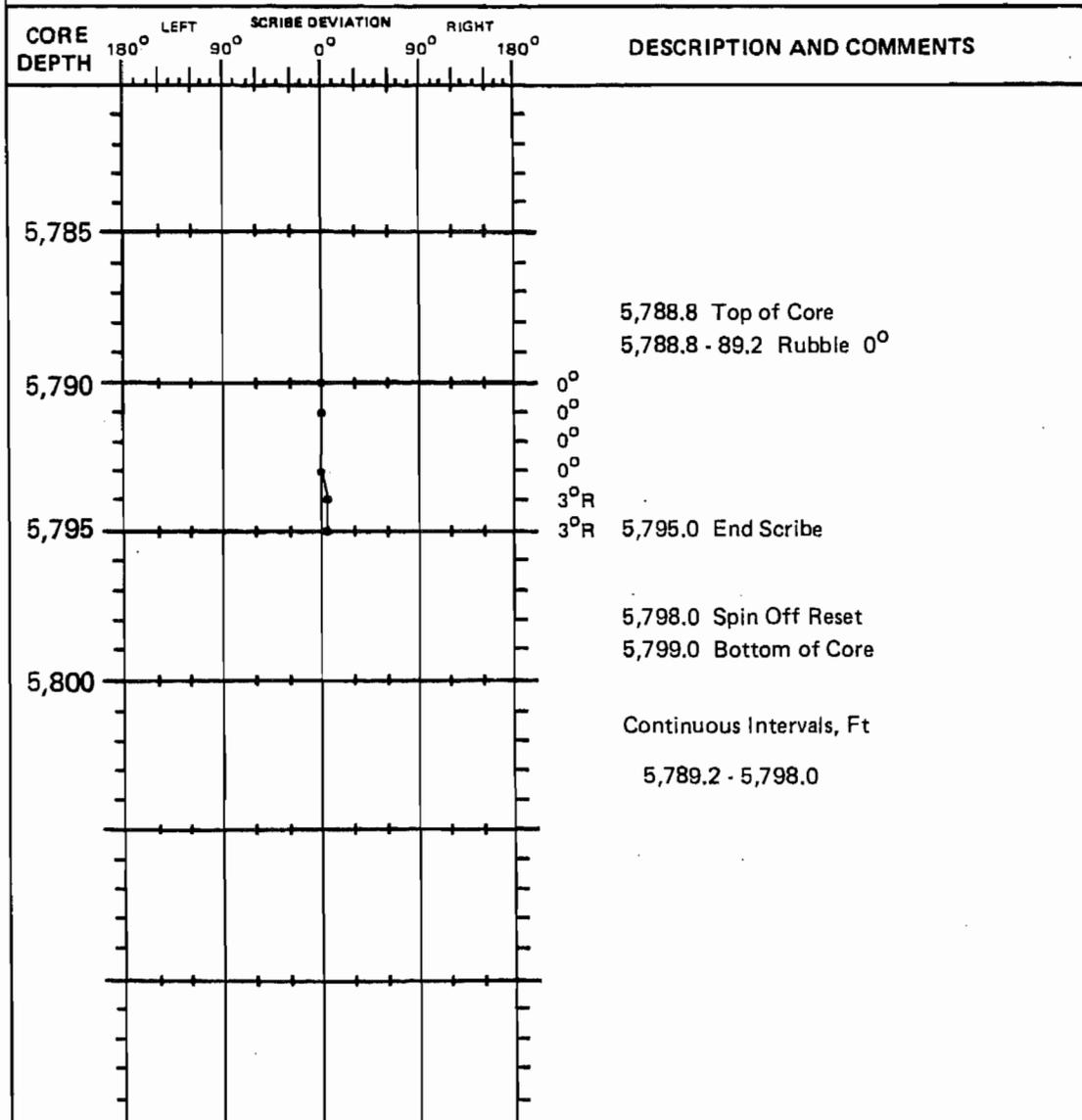
**SCRIBE DEVIATIONS AND
CORE DISCONTINUITIES REPORT**

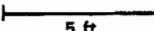
DOE TECHNOLOGY EXTRAPOLATION SCRIBE DEVIATIONS AND CORE DISCONTINUITIES

DATE 18 December 1989

PAGE 1 of 1

OPERATOR Barrett Resources Corporation WELL MV-8-4
 COUNTY/STATE Garfield County, CO LOCATION Sec. 4, T7S, R96W
 CORE NUMBER/CORED INTERVAL Core No. 2; 5,788.8 - 5,799.0 ft
 DATUM 6,063.0 FT (KB, DF, GL) ANALYST R. Zeis/E. Monson
 REMARKS Core scribed and downhole survey tool run.



VERTICAL SCALE:  5 ft

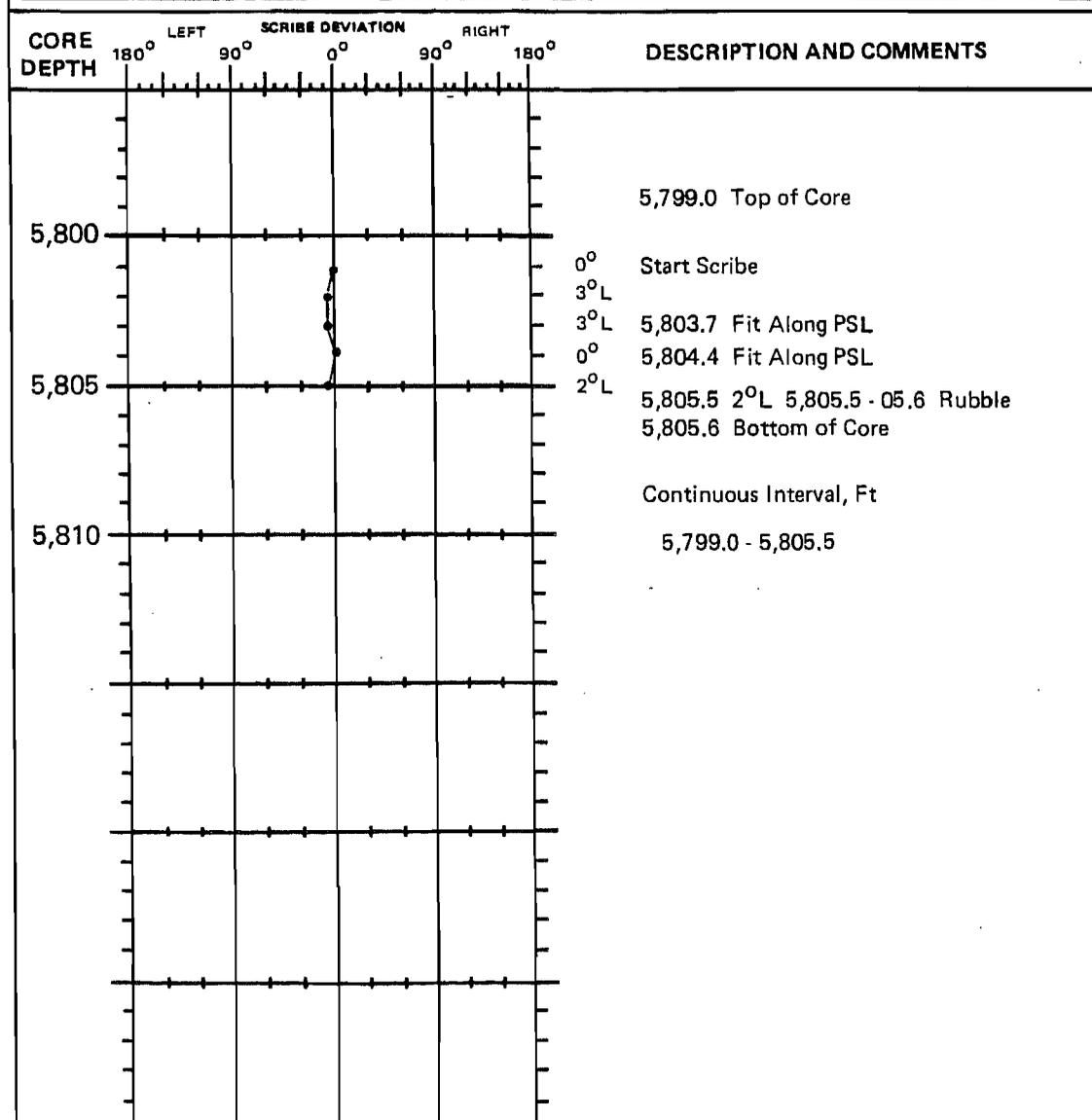
CER90-1

DOE TECHNOLOGY EXTRAPOLATION SCRIBE DEVIATIONS AND CORE DISCONTINUITIES

DATE 18 December 1989

PAGE 1 of 1

OPERATOR Barrett Resources Corporation WELL MV-8-4
 COUNTY/STATE Garfield County, CO LOCATION Sec. 4, T7S, R96W
 CORE NUMBER/CORED INTERVAL Core No. 3; 5,799.0 - 5,805.6 ft
 DATUM 6,063.0 FT (KB, DF, GL) ANALYST R. Zeis/E. Monson
 REMARKS Core scribed and downhole survey tool run.



VERTICAL SCALE: 5 ft

CER90-1

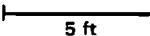
**DOE TECHNOLOGY EXTRAPOLATION
SCRIBE DEVIATIONS AND
CORE DISCONTINUITIES**

DATE 19 December 1989

PAGE 1 of 2

OPERATOR Barrett Resources Corporation WELL MV-8-4
 COUNTY/STATE Garfield County, CO LOCATION Sec. 4, T7S, R96W
 CORE NUMBER/CORED INTERVAL Core No. 4; 5,808.6 - 5,869.0 ft
 DATUM 6,063.0 FT (KB, DF, GL) ANALYST R. Zeis/E. Monson
 REMARKS Core not scribed and no downhole survey tool run.

CORE DEPTH	SCRIBE DEVIATION					DESCRIPTION AND COMMENTS
	180°	90°	0°	90°	180°	
						5,808.6 Top of Core
						5,809.5 No Fit Reset
5,810						
						5,814.3 - 14.5 Rubble
						5,814.9 - 17.7 Multiple No Fit Resets
5,815						
						5,819.2 No Fit Reset
5,820						
						5,822.5 No Fit Reset
5,825						
						5,827.5 No Fit Reset
						5,827.9 No Fit Reset
5,830						
						5,835.8 No Fit Reset
5,835						
						5,839.2 No Fit Reset
						5,840.0 No Fit Reset

VERTICAL SCALE:  5 ft

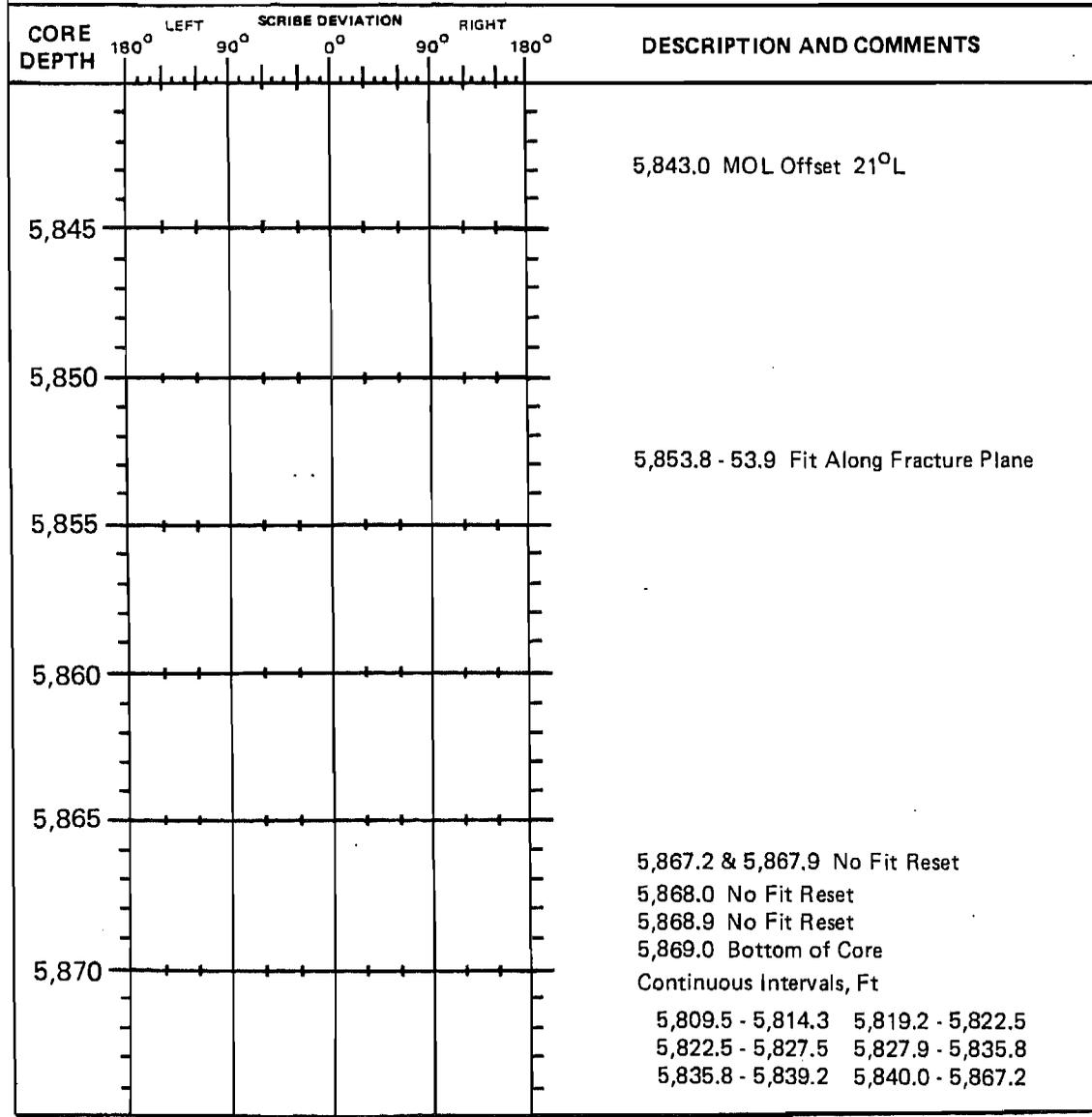
CER90-1

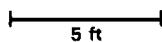
DOE TECHNOLOGY EXTRAPOLATION SCRIBE DEVIATIONS AND CORE DISCONTINUITIES

DATE 19 December 1989

PAGE 2 of 2

OPERATOR Barrett Resources Corporation WELL MV-8-4
 COUNTY/STATE Garfield County, CO LOCATION Sec. 4, T7S, R96W
 CORE NUMBER/CORED INTERVAL Core No. 4; 5,808.6 - 5,869.0 ft
 DATUM 6,063.0 FT (KB, DF, GL) ANALYST R. Zeis/E. Monson
 REMARKS Core not scribed and no downhole survey tool run.



VERTICAL SCALE:  5 ft

CER90-1