Appendix A

Bullfrog 5-12 Core Report

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Introduction

The Bullfrog 5-12 core was a planned core taken in the First Frontier sand member of the Cretaceous Frontier Formation at a starting measured depth of 17,815'in the Bullfrog Unit, section 12, Township 36 N, Range 87W, Natrona County, Wyoming. The cored interval was from 17,815' MD to 17,856' MD. Recovery was 100%; 41 feet cored and recovered. The core intersects a spectacular natural fracture complex that appears to control productivity in the well. The purpose of this report is to document the nature of the fractures and their geometry with respect to the wellbore.

Operations

The Bullfrog Unit 5-12 well was spud 8/29/99, projected to penetrate the Morrison Formation at total depth, with a proposed TD of 19,675'. The well penetrated the First Frontier sand at 17,689' MD (mudlogger top) and core point was called at 17,815' MD. Coring operations were supervised by Mr. Fred Barrett and Ms. Kim Vickery (pers. comm). The core was collected 11/1/99.

The core was collected using a Baker Hughes "Jambuster" 8 ½" OD bit. Internal diameter was 4". After accounting for the inner barrels the effective diameter of the core was 3.475" (measured). The 60' core barrel jammed three times before being pulled after drilling 41'. Recovery was 100%. Initial weight and mud type was 15.0 PPG oil based, invert mud.

Shows encountered during coring required raising the mud weight to 15.4 PPG. The mud was circulated through a separator for most of the coring operation yielding a sustained 10'-20' flare. The well was shut in after a major drill break at 17838'MD when the bit appeared to drop 2'. Circulation was resumed and mud weight was increased to 15.4 PPG. The flare increased to 40' during circulation period. At 17,856' MD the core barrel was successfully recovered and drilling resumed with a conventional tri-cone bit. The core was recovered to Denver for processing by Precision Core Analysis, Inc.

Normal drilling operations were resumed after the core collection. The well was drilled to a total depth of 19,550 ' MD in the Sundance Formation. The invert mud was displaced by CaCl and diesel for logging. An electric log suite consisting of Schlumberger Phasor Induction, Litho-Density-Compensated Neutron Density, Dipole Sonic and Formation Micro-imager was run. Good data was acquired over the cored interval by all tools.

Core Processing and Orientation

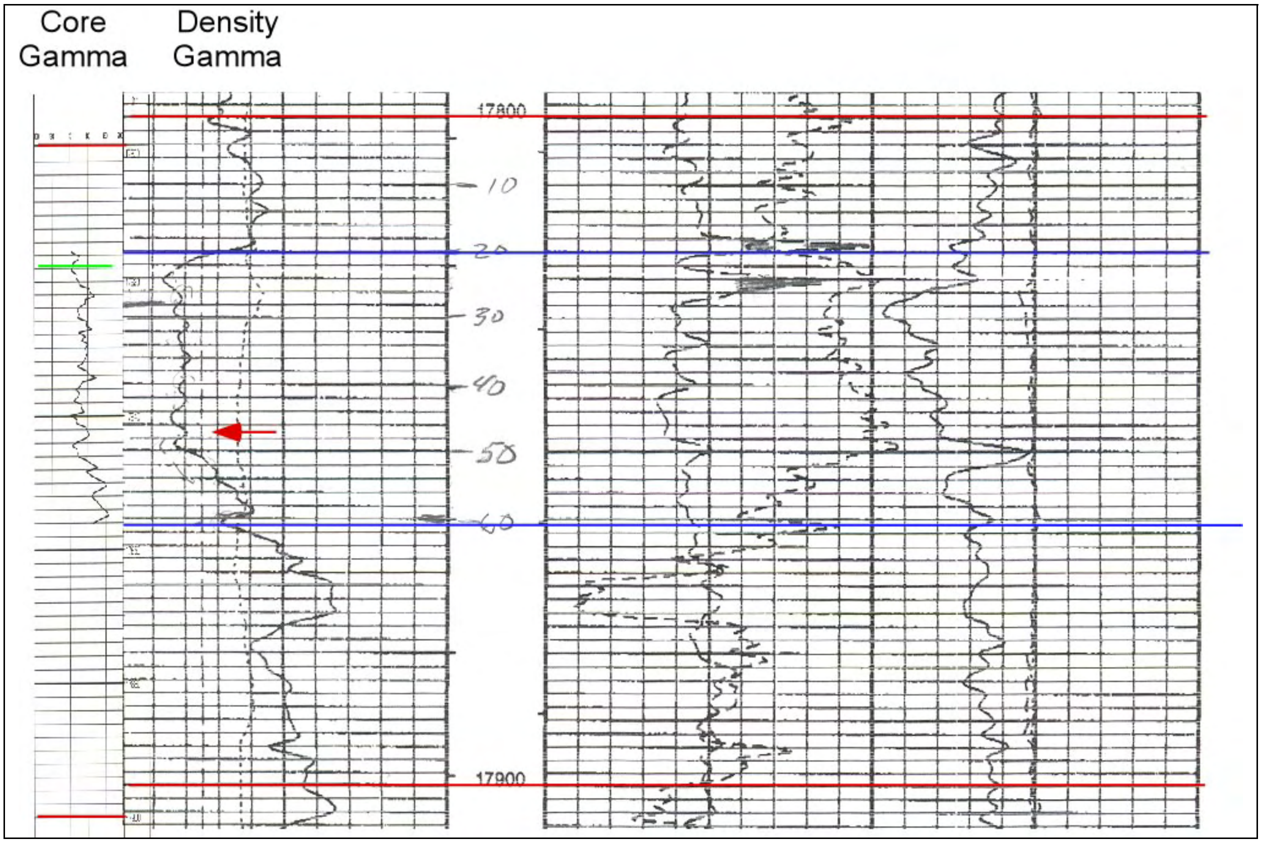
The core was transported to Denver by Precision Core Analysis, Inc. and removed from the sleeve at their facility where it was marked for reference purposes. A core gamma log was run immediately following removal from the sleeve. Scribe knives were not run in the core barrel so re-assembly to preserve the internal directional integrity of the core was a challenge.

The major fracture zones and the drill break zone at 17,838'(presumably where the barrel jammed) required considerable effort to reconstruct and remain sources of uncertainty in the description and analysis. A master orientation line (MOL) was drawn the length of the core following consensus re-assembly by Campagna and Billingsley. The fractures were described on whole core, referenced to the MOL, before slabbing.

Vertical and directional orientation of the core was accomplished through correlation of the core gamma log with the electric logs and core fracture features with the formation micro-imaging (FMI) log. The core penetration log and the mudlog were also incorporated in the effort to tie the core as closely as possible to the log information and thus establish a calibration point for evaluating all aspects of the logging suite with the core.

Vertical Core Tie

Initial comparison of the raw core gamma ray log to the wireline gamma ray log was poor. The raw core gamma ray log has significantly higher amplitude and frequency of response. This is interpreted to be the result of the different logging environments in which the logs were measured. The wellbore was filled with 15.5-lb/gal mud during logging while the core was logged in air. The core gamma log was scanned and the horizontal scale compressed in order to achieve a more correlatable log. The comparison of the resulting core gamma log to the porosity log is shown in fig. A-1



Correlation of the adjusted core gamma ray log to the density porosity log indicates the core depth is approximately 4 ½ feet shallow to the log depth. The red lines are drawn at 17,800' and 17,900' respectively to demonstrate the shift after correlation. The core begins and ends in sand. The base of the clean sand provides a good tie point. Note the 12" shaly layer at 17,847' (red arrow). This conspicuous sand-shaly sand-sand-shale transition sequence marks the base of the clean sand and provides a unique core-lot tie point.

Fig. A-1 Core gamma log and porosity log comparison

The 1st Frontier Sand appears as a compound coarsening upward sequence on the electric log suite, Panel A-1. On the gamma ray log the sand exhibits an abrupt upward transition from funnel shape to barrel shape in the main sand body (red arrow, fig. A-1). This transition is also recorded in the core gamma ray log as well as a distinctive alternating sequence of higher and lower values immediately above the transition.

The combination of these features together with the fact that the core begins in sand provides a strong tie. This indicates the core depth should be shifted 4.5'-5' deeper to match the electric log depth. Any remaining irregularities or uncertainties in the correlation are attributed to expansion of the core during retrieval to surface conditions and/or a few inches added by handling during the gamma ray logging process.

Azimuthal Core Tie

Orienting the core directionally proved to be more of a challenge than originally anticipated. It was believed, initially, that orienting the core in the presence of high quality FMI data would be a direct process. That did not prove to be the case. The coring operation at 17,000' MD is a very destructive process; approximately 75% of the hole volume is removed as cuttings leaving only 25% preserved as core.

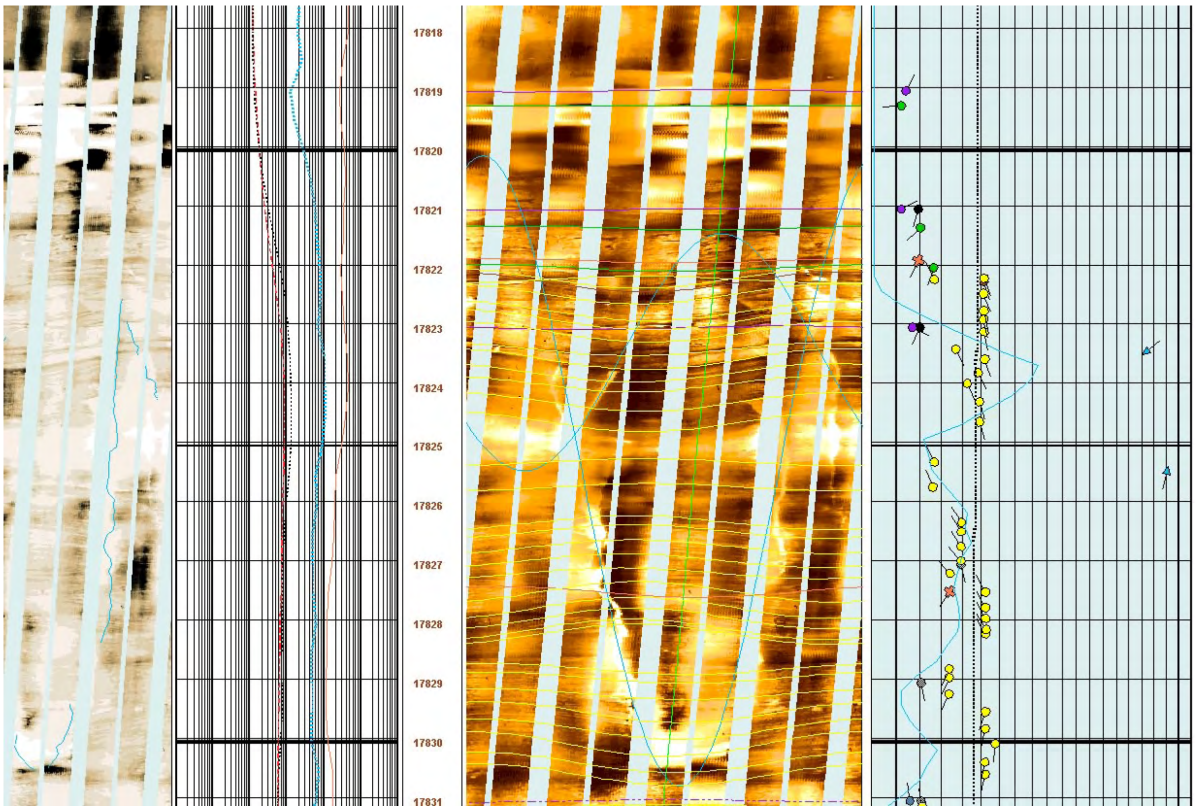
This is shown in Panel A-2, step 1 where the preserved core is shown in relation to the true diameter of the final wellbore. Thus, the FMI logs a wellbore approximately 4 ½" greater in diameter than the preserved core. Adding to the complexity is the near parallel relationship between the wellbore and the fractures where small horizontal shifts and dip changes can radically affect the appearance of the structural features in the core or FMI and complicate the correlation process. Thus, unless a particular feature is vertical, planar and passes through the axis of the core there will be considerable shift in appearance and/or depth between core and FMI.

The contrasting appearance of the wellbore's major productive fracture feature in the core versus the FMI is an excellent example of the problems encountered when coring near vertical fractures in a near vertical wellbore. Fig. A-3 shows the appearance of the spectacular fracture (and its associated concave down parabola) in the core as it exits near 17,818' MD. The fracture exits the core immediately below a thin shale lamination. The intersection of the fracture and the shale bed is ambiguous in that it occurs nearly exactly as the fracture exits the core and leaves doubt as to the nature of the relationship between the fracture and the shale bed

Concave downward parabola formed as the main cored fracture exits the core near 17,818' MD. Euhedral calcite crystals visible as bright specs on fracture face.

Fig. A-2. Fracture and associated concave down parabola

Fig. A-3 at 17,830’ MD shows the most prominent, spectacular fracture present in the FMI and its associated concave upward parabola. Assuming negligible differences in orientation between core and FMI and without reconciling the differences in diameter, this observation implies significant fractures of opposing dip paradoxically occupying the same volume in space.



Concave upward signature of the most prominent fracture feature imaged in the cored interval is visible in the lower center of this portion of the FMI. Bright line is high resistivity trace of fracture on the face of the wellbore. Such high resistivity is often interpreted to be cemented fractures however in this case the FMI is imaging the thick calcite coating on the fracture face and large portions of the fracture remain open. Note also the sigmoidal trace of the fracture and the variable width of the aperture.

Fig. A-3. Prominent fracture in the FMI

Repeated attempts were made to resolve this paradox. Core handling procedures were reviewed. The re-assembly was reviewed for fit. The MOL was reviewed for consistency across breaks. None of the re-evaluations indicated any problems in handling, logging, or assembly.

Only by reconstructing the actual hole geometry and related sizes could the paradox be resolved. While the core and FMI represent *approximately* the same volume of space, they do not, however, represent *exactly* the same volume in space and in this case of complex, non-planar fracturing, the distinction is critically important.

Multiple steps were taken to facilitate integration of the core and FMI. The core gamma-electric log gamma ray tie was honored as the primary tie in the vertical dimension. The core and wireline logs primarily measure variation in gamma ray emission from horizontally stratified layers of sediment and are more likely to correlate across the borehole than near vertical fractures.

The orientation data for individual fractures, collected originally in spreadsheet format, was redisplayed as a continuous graph similar to the FMI presentation. This was plotted on depth using the vertical shift interpreted from the core gamma-wireline correlation (Panel A-2, step 2). By reducing the data to similar presentations and utilizing the core gamma shift the features observed in the core can be projected to the sidewall of the borehole and correlated to features observed in the FMI.

Panel A-2, step 1 contains a true scale representation of the borehole geometry in plan view. From this diagram it can be seen that a planar feature tangent to the core would project onto the borehole walls as a chord defining an angle of nearly 115 degrees. On the integrated core-FMI diagram (Panel A-2, step 2) it can be seen that the apex of the parabola on the core coincides with the trace of a bed-bound, sinuous fracture on the FMI at approximately 17823.3' MD.

These traces define a chord showing an angular separation of 105 degrees. This compares favorably with the theoretical 115 degrees of the diagram and well within the limits of accuracy given the non-planar nature of the fracture (discussed later). Bisecting the angle defined by this trace gives 211 degrees, interpreted as the pole to the fracture face. The MOL lies 10 degrees " east" of the apex of the fracture and thus is oriented at approximately 200 degrees true.

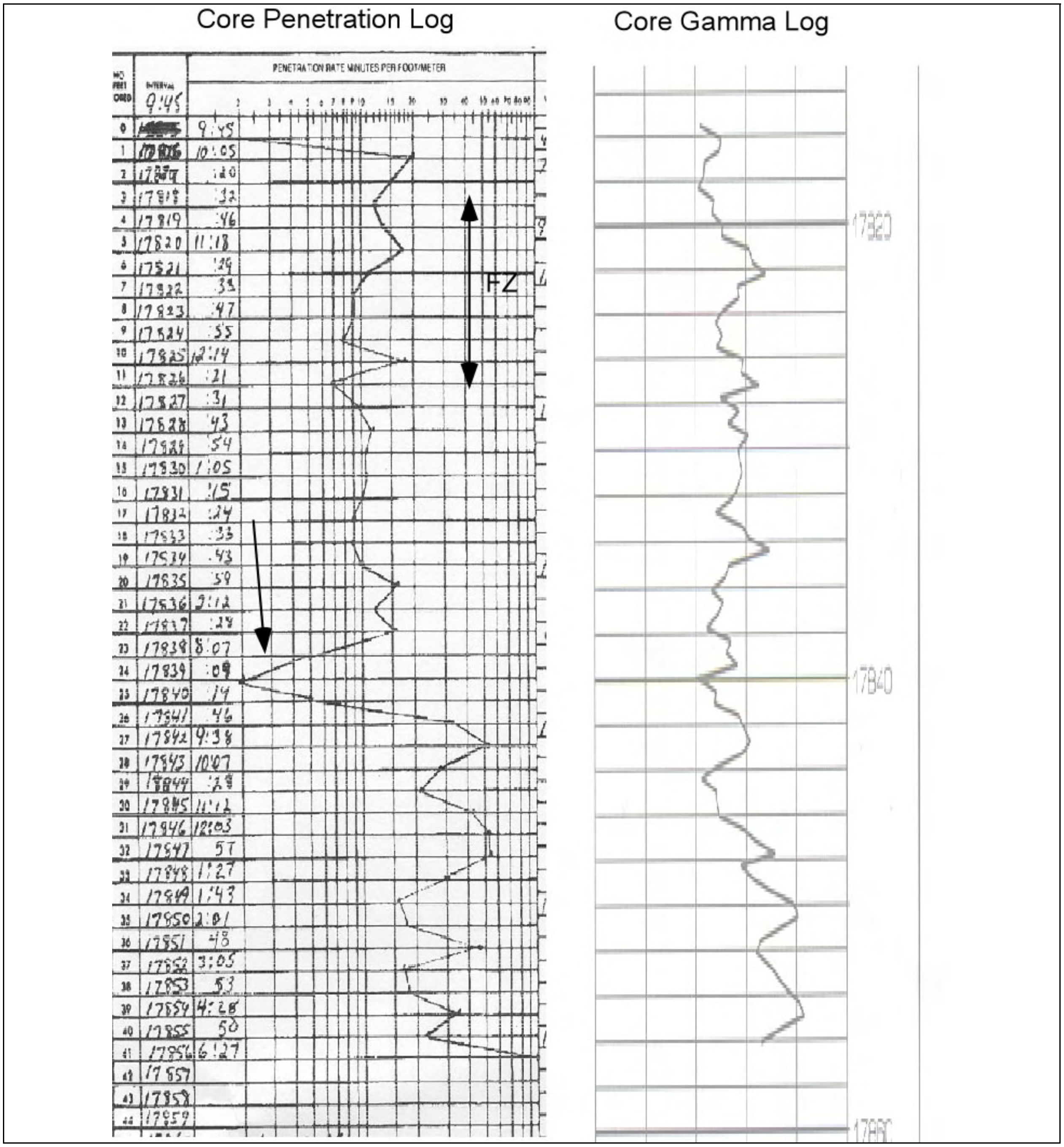
Finally, close examination of the FMI shows the prominent imaged fracture is compound, composed of two different fractures at a slightly divergent angle. The fracture forming the upward concave parabola has a jagged appearance on the image and presents an increasingly broad, high resistivity trace.

There are 3 small patches of crystals (fig. A-4) on the external face of the core between 17,822.5' and 17,824' MD. These were initially interpreted as vugs; however, on closer examination they appear to be remnants of an undulatory fracture face. Their location and orientation on the core suggests they are remnants of the "core side" of the large imaged fracture.

Two of the three “vug-like” patches interpreted to be preserved portions of the fracture imaged in the FMI but predominately consumed in the coring process and poorly represented in the recovered core.

Fig. A-4. Vug-like patches of crystal on external face of core

This is further supported by the steadily increasing penetration rate (fig. A-5), and an increasing amount of gas influx that finally forced the well to be shut-in and mud weight raised. Interpreting the patches as fracture faces, and if they are approximately the same orientation as the prominent fracture imaged on the FMI, again places the MOL on an orientation of 205 degrees +/-.



Coring penetration log on left documents 2-foot drop of bit (arrow) during coring operation. There is no indication from the core, core gamma log on right or other logs to explain the event.

Fig. A-5. Core penetration and core gamma logs

There are few significant features in the core below 17,824' MD (core) and none visible directly or indirectly on the FMI. The reconstruction of the core and MOL below the major drill break at 17,838' MD (core) is weaker than the upper part of the core.

Reconstruction and orientation of the Bullfrog 5-12 core focused on the upper portion of the core where we encountered major natural fractures in the core and on the FMI. Orientation was accomplished by vertically locating the core with the core gamma ray log and interpreting and orienting features through indirect observation and inference. The MOL is interpreted to be oriented on an azimuth of 205-210 degrees true. The near vertical and non-planar nature of the structural features makes closer estimation questionable.

Core Fracture Description

The Bullfrog core samples five types of structural features in its forty-one foot length. These consist of natural fractures, petal fractures, bedding plane slip striae, horizontal natural fractures and a stylolite. The vertical distribution of the features is shown on the Core to FMI correlation (<u>Panel A-2, step 1</u>).

The major natural fracturing occurs near the top of the core and the petal fractures more towards the base of the core although there is some overlap. Bedding plane slip is observed on most exposed bedding surfaces. The horizontal fractures and the stylolite are minor features noted but not believed of major significance.

All fabric geometries were measured circumferentially on the core and corrected to compass true using an MOL orientation of 210 True. The margin for error is considered 5 degrees +/-. Possible sources of error include core reconstruction along its length, measurement errors, and the orientation of the FMI (from which the tie was built). In general, there is good agreement between orientations of fabric features calculated from the FMI and the Core.

The single most spectacular feature of the core is a complex of compound natural fractures that extends from 17,817' MD (core depth) to 17,821 MD (<u>Panel A-2, step 2</u>). Much of the complex was destroyed in the coring process however remnants of a fracture face and FMI data indicate the stranded fracture complex was at least seven feet in height within the reservoir interval. Strike and dip is variable along the fracture length giving the surface an undulatory appearance (photo, <u>Panel A-2, step 2</u>).

Reconstruction of the core indicates the aperture varied between 3/16"-5/16' in width along its length. The variability occurs in the form of rhombic voids generated along the fracture (<u>Panel A-2, step 3</u>). One fracture strand can be restored to a closed position with a few degrees of counter-clockwise rotation applied along an axis nearly perpendicular to the MOL. The rhombic features thus represent voids generated during failure induced by clockwise shear motion at depth.

Examination of the rhombic fracture trace visible on the FMI yields a similar sense of displacement. The fracture is partially filled with large euhedral crystals of calcite. This interval is the main productive interval in the wellbore (at the time of writing).

Petal fractures (interpreted to be coring induced) occur throughout the core. Fig. A-6 is an example of the most prominent dis-articulated petal fracture. Others were noted and their strike orientations captured. Considerable variability was noted in their strikes. A rose diagram of this data is shown on Panel A-2, step 3. The predominant strike direction is approximately 50 degrees although there is considerable scatter.

Most of the induced petal fractures remained intact in the core. The petal fractures are interpreted to be indicators of present day stress direction and in aggregate lie in a northeast-southwest axis (see Panel A-2).

Fig. A-6. Coring induced petal fracture at 17,818' MD

Bedding plane slip was noted along several bedding surfaces where carbonaceous layers had parted. Azimuthal data was collected for these features and is shown in Panel A-2, step 3.

Fabric Data Compilation

Structural fabric data is compiled in a series of rose diagrams on Panel A-2, step 3. The MOL was interpreted to face 210 degrees true based on the correlation with the FMI. Orientations based on core measurements were adjusted by adding or subtracting 210 as appropriate.

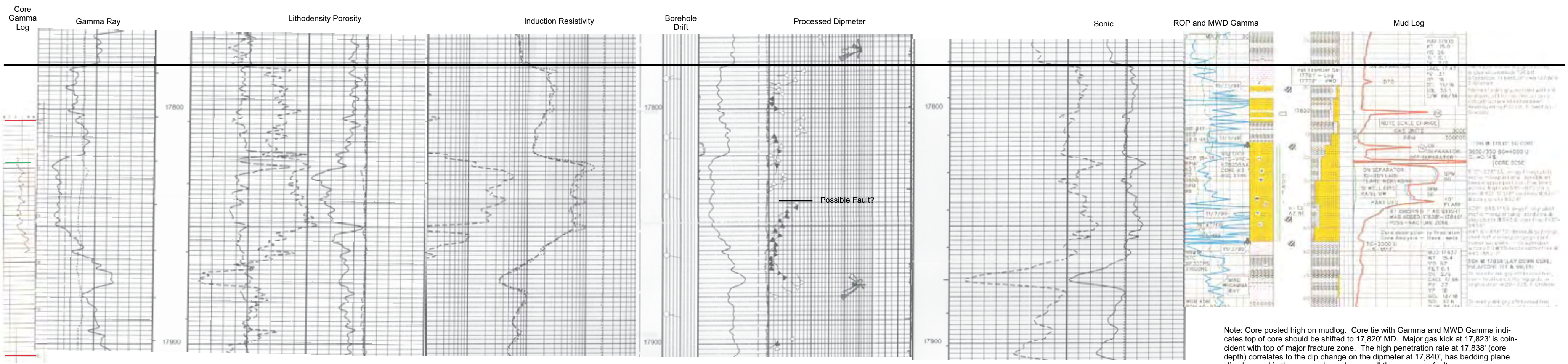
Histograms were calculated on the adjusted data using 20 degree buckets. This was perceived adequate given the uncertainties associated with re-assembly and orientation. Sample size for the histograms is very small; thus, interpretations from this data need to be used with caution.

The following inferences are drawn from this data:

1. The numerical cluster of natural fractures is also in the northeast quadrant, approximately N30E.
2. The major shear fracture that provides the production permeability strikes northwest, approximately N30W.
3. Measured bedding plane slip azimuthal data is sub-parallel to the strikes of petal fractures, natural fractures and the single large shear fracture.
4. The clustering of petal fractures in the northeast quadrant indicates the local principal horizontal stress is acting in a northeast-southwest direction, approximately N50E.

In general, the fabric data seems internally consistent which indicates the core was reassembled correctly and future interpretations based on the core fracture data should be reliable.

Bullfrog Unit 5-12
Log Data Montage



Note: Best correlation indicates core depth is 4.5-5' shallow to log depths

The wellbore is near vertical as shown by the drift column of the dipmeter. Structural dip is low above and below the Frontier sand. There is a possible fault of small displacement 17,838' (log depth). The downward decreasing dip suggests drag beneath a small reverse fault. This is coincident with a bit drop during coring, a small resistivity anomaly, and a small PEF departure. It is interpreted as an erosional surface on the FMI but the other data support an interpretation of a small fault or structural weak zone.

Note: Core posted high on mudlog. Core tie with Gamma and MWD Gamma indicates top of core should be shifted to 17,820' MD. Major gas kick at 17,823' is coincident with top of major fracture zone. The high penetration rate at 17,838' (core depth) correlates to the dip change on the dipmeter at 17,840', has bedding plane slip observed in the core and may be a small throw reverse fault.

Multi-Site Application of the Geomechanical Approach for Natural Fracture Exploration
DE-RA26-99FT40720
Cored Interval Log Panel

Barrett Resources, Inc.
Bullfrog 5-12
Core #1
First Frontier
17,815'-17,856' MD

Appendix A, Panel A-1 R.L. Billingsley 5/00

Appendix B

Natural Fracture Supporting Documentation

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FIGURES

WALTER STEFFIS 1-5 (5-9N-19W)

Core 1—13625’-13662’

A. Condition of Core

Unslabbed, significant portions rubbled. Rubble portions likely shale, some of which have been plugged vertically, presumably for seal capacity.

B. Lithology

- Basal portion (~12’) fine to medium grained greenish sandstone, very well indurated.
- No visible P&P. Appears to have undergone significant soft sediment deformation.
- Overlain by 28’ (or at least boxes representing) black shale, badly rubbled during coring. Forms poker chip like pieces. Some surfaces shiny, probably from core deformation.
- Overlain by ~4.5’ cobble conglomerate and sandstone. Cobbles are inches in diameter.
- Sediments are reactive to HCl suggesting calcite cement and or carbonate clasts in the core. Also clasts of gneiss and greenish, fine-grained porphorytic volcanics and possible tan sandstone or chert.
- Cobbles sub-rounded to rounded. In some cases the cobbles seem to interpenetrate suggesting significant burial diagenesis.
- Matrix is dark brown or green fine-grained sandstone.
- Overall, conglomerate is a mauve color with green cobbles.
- Last lithology represented appears to be brownish siltstone in graded beds, distal.

C. Natural Fractures

No natural fractures observed.

Core 2—13,692’-13727’

A. Condition of Core

Moderate. 40-50% of recovery is rubble. Extensive drilling induced fracturing of finer grained intervals has occurred. Core has been sawn in several places making accurate reconstruction difficult in the absence of large cobbles or other fabric elements upon which to base assembly.

B. Lithology

In general, similar to conglomerates in core 1 above.

- Core has mauve cast deriving from matrix and green cobbles.
- Very well indurated.
- Breaks both through and around clasts.

C. Natural Fractures

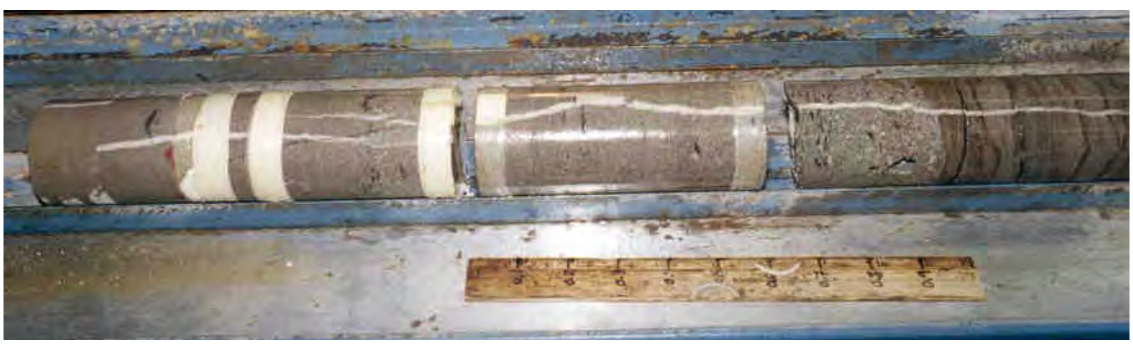
Two intervals of fracturing were observed. At 13,704-13,705’ a calcite filled natural fracture of about 1mm aperture is observed breaking both through and around clasts (figs. 1 and 2). At 13710’-13712’ a two-fracture swarm is observed (fig. B-1). The fractures were 2-3mm in aperture and are calcite filled. A drilling induced petal fracture forms 60-degree angle with the natural fracture (fig. B-2). The ends of the swarm are not observed. The swarm cross cuts the bed boundary at the base of the conglomerate (fig. B-3). Maximum height of the swarm was greater than presently visible (fig. B-4, fig. B-6)). A drilling induced fracture intersects a calcite filled fracture at an angle of nearly 60 degrees (fig. B-5) indicating a rotation of the principal horizontal stress since the formation of the calcite filled fracture.

Aperture of the healed fracture approximately 2 mm. Inter-penetration of the clasts can be observed on the left central part of the photo.

Fig. B-1. Aperture of the healed fracture

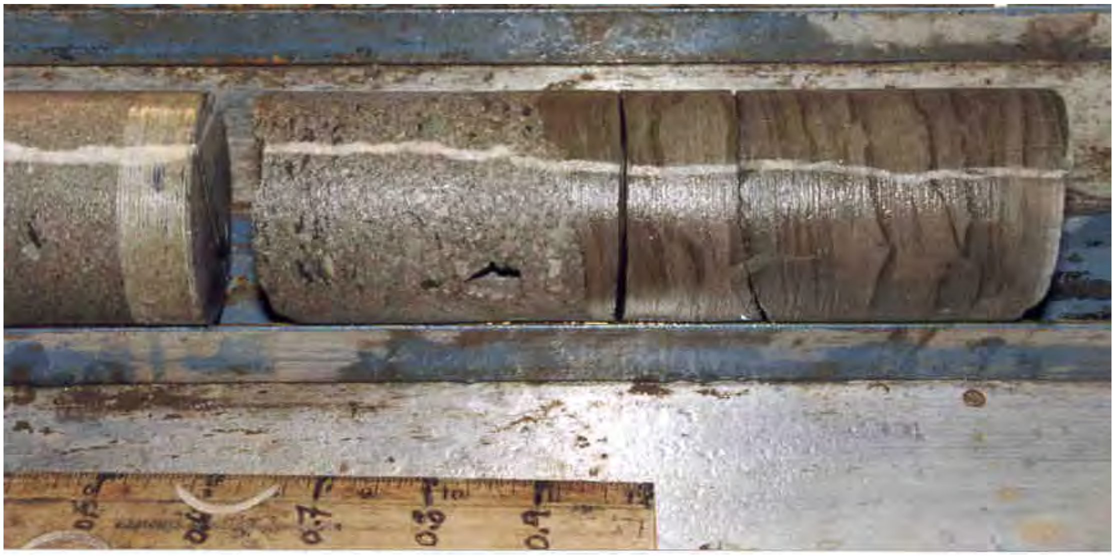
Aperture of the healed fracture was approximately 2 mm. Inter-penetration of the clasts can be observed on the left central part of the photo.

Fig. B-2. Butt photo of core



A large 2-fracture swarm was encountered in the core at 13710'-13712'. The jagged white line along the upper third of the core marks the trace of the fracture. The overlap between the fractures is seen just above and to the left of the 1-foot scale. Pieces were sawn out of the core and missing. The missing gaps are interpreted based on a reasonable alignment of features in the core. Up is to the left.

Fig. B-3. Large - fracture swarm encountered in the core at 13710'-13712'



The fracture at 13, 712' cuts across lithologic boundary between pebble conglomerate and sandstone. The lower end of the fracture was not observed. Up is to the left.

Fig. B-4. Fracture at 13, 712'

The healed, calcite-filled natural fracture is the white line to the left center of the photo parallel to the scale edge of the grain size comparator. The jagged black line running left to right is the trace of a drilling induced petal fracture. The angle between the fractures was measured to be 60 degrees. The data supports a rotation of the stress field between the time of the natural fracture and the collection of the core. View is looking up the core.

Fig. B-5. View looking up the core of healed, calcite filled natural fracture

Oblique axial view of the core at 13710'-13712' showing the position of the fractures along the outer edge of the core, the jagged trace of the fracture and the overlapping nature of the fractures in the swarm. Neither the top nor the bottom terminations of the fracture swarm were preserved in the core so total height remains unknown. View is up the core from bottom to top.

Fig. B-6. Oblique axial view of the core at 13710'-13712'

Conclusions

The Atokan sands and conglomerates in the Walter Steffis 1-5 core have undergone significant burial diagenesis and fracturing in the past. The strength of the rock at the time of fracturing supported 2-3 mm aperture fractures, contributing significant enhancement to the permeability of the tight sediments. The fractures were subsequently filled with calcite. Present day principal horizontal stress, as judged from relationships between filled natural fractures and a drilling induced petal fracture, is oriented at an angle of 60 degrees to the paleo principal horizontal stress.

MARIE WALTERS 1–14

Introduction

The Kaiser Francis Oil Co. Marie Walters 1-14 is a significant, naturally fractured, Atoka Group producer in the Elk City field area. Located in Elk City field (Beckham County, Oklahoma), the well was drilled, evaluated and completed as a fractured reservoir prospect and is one of the few wells in the Elk City area that has sufficient data available to characterize its anomalous production behavior. It has become a key well in the Elk City field demonstration area.

Wellbore Summary

State**: OKLAHOMA**
County**: BECKHAM**
Operator**: KAISER-FRANCIS OIL**
API**: 35009208500000**
Final Well Class: **DG**
Status**: GAS**
Field**: ELK CITY**

Location

The Marie Francis 1-14 (MW 1-14) was drilled near the structural crest of the Elk City anticline in section 14, Town 10N, Range 21W, Beckham County, Oklahoma (fig. 1) The seismic section illustrates the location in a vertical sense.(See Attachment B.)

Drilling Narrative

The well was spud April 3, 1988 and drilled into the Atoka "D" at a total depth of 13,988 feet. Total drilling time was approximately 85 days. Wellbore casing consisted of a 16" surface conductor set at 608', 10.75" casing set at 4561' and 7.625" casing set at 12,040'. The well was completed with a 4.5"liner from 11,794-13,985'. Completion and testing operations extended from late June 1989 until late August 1989. The actual completion date is recorded as 8/24/1989 with first production indicated to have occurred in September 1989.

A lost circulation zone was encountered at 13,200' when 350 Bbls of mud was lost in the wellbore. After restoration of circulation a 2000 unit gas show was circulated from the wellbore. This fracture zone, later identified on image logs, is presently believed to be the major producing interval in the well.

Atoka (Pennsylvanian) Stratigraphy

The Atoka Group top was reported in the Marie Walters at 12,730, scout top, Atoka E. The well remained in the Atoka Group at TD. The Atoka in the Marie Walters 1-14 consists of a series coarse grained sequences of conglomeratic-rich sediment separated by low conductivity shale sections tens to several tens of feet thick. The conglomeratic sand units are composite in nature and consist of both fining upward and coarsening upward units representing a variety of facies within the fan-delta systems (Operator and literature references).

The abrupt changes between the shales and sands, presence of isolated (within low conductivity shales) channel-like features, for example, a bell-shaped sand body at 13,384'MD, boulder conglomerates, and abundant soft sediment deformation depict rapid deposition in a high gradient setting. The sediments likely represent near shore fan-deltas but might also be that due to gravitational pull turbidite flows in very deep water adjacent to a narrow, tectonically active shelf. Some combination of these depositional environments is also both plausible and likely. Both environments are common in active tectonic settings as discussed in the literature for the Wichita Front area.

Impact of Stratigraphy on Petrophysics

Rapid facies changes as discussed above plus rapid provenance changes from sediment supply shifts and structural unroofing of the Wichita Uplift Complex in this tectonically active area make reliable log analysis a daunting challenge. Sediment provenance is known to vary inversely with the uplift of the Wichita Front. Older units such as the Atoka frequently have an abundance of limestone or dolomite clasts and grains reflecting the initial erosion of the pre-orogenic Paleozoic shelf carbonates (1989 Lyday).

The nature of the clasts varies upward through the section from carbonate through volcanics representing the southern Oklahoma aulacogen and finally into the basement granites from which the younger Pennsylvanian sediments take the name "Granite Wash." Operators in the area vary their log analysis parameters (both vertically and aerially) based on sparse core data to achieve some measure of analytic reliability. Lyday (1989) attributes the late discovery of Berlin field to early use of incorrect grain densities (limestone vs. dolomite), which caused operators to believe the sediments were of very low porosity and thus uneconomic.

These challenges reinforce the use of mud log data in the evaluation and completion process for reasonable estimation of appropriate matrix densities. Thus, while it is theoretically possible to evaluate the wells in this area from log data, it is impractical and uneconomic to collect sufficient data on every well to reliably evaluate each zone. Natural fractures bring additional uncertainty to the process.

Available Data

The wellbore was logged with a standard evaluation suite, induction, gamma ray, spontaneous potential (sp), and density logs. A Formation Micro-imager (FMI) log was run from the base of intermediate casing to total depth. Only selected workstation screen prints are presently available for this log. A mudlog is presently available for lithology, and drilling event control. No cores were taken and no DST's recorded. The operator shared some drilling and completion data to support this study. Two production tests were performed with incomplete treatment and results reported. The final reported IP test includes both the Atoka "C" and Atoka "D". Scout and production data were taken from IHS Energy Group reports. Log digits were supplied by Burlington Resources, Inc.

Log Analysis

See Attachment B.

Natural Fracture Section

Examination of the FMI and drilling data indicates several zones of natural fractures in the wellbore. Black and white screen prints of the FMI work session were available for examination. Eighteen zones of natural fracturing between the depths of 13,085' MD and 13,779' MD were observed in the set of screen prints. The dominant trend of open, near vertical natural fractures is ESE. Minor low angle fractures are observed trending NNE. A zone of possible wellbore breakout was observed trending approximately 335 degrees. Bedding dips gently to the southwest at 5 degrees +/-. Overall, quality of the log seems good however; the screen prints are difficult to interpret.

A drill break, shows and lost circulation were observed in conjunction with natural fractures at 13,150' MD (5' drill break, 500 BBLS.) and 13204' MD (350 BBLS, 2000 unit show following circulation recovery). The zone at 13,204' MD also shows an anomalously high porosity measurement suggesting that the fracture aperture is large enough to register on a fortuitously oriented porosity log. The zone at 13,204' MD is believed to be the main pay interval in the well.

Completion Treatments and Production Tests

The wellbore received a complex evaluation and completion designed for a naturally fractured well (scout and operator, verb comm.). All zones were perforated one shot per foot, 180-degree phasing. The lower Atoka was opened and received two treatments, at least one of which involved acid, and flow tested at 675 MMcfd with 300-psi FTP.

The younger Atoka "B" and Atoka "C" were opened and tested under tight hole status. The operator now reports the naturally fractured zone at 13,188-13,276 flowed approximately 4.25 MMCFD naturally. The gross interval was hydraulically fractured with 142,000 gals. fluid, 12,500 lbs 100 mesh sand and 150,000 lbs. 20/40 sand. The well cleaned up from the fracture treatment rapidly and was making 8.8MMCFD on test after two days.

Final potential of the commingled production intervals was recorded to be 1900 MCFD on a 32/64" choke with a flowing tubing pressure of 400 psi. On a later well test, about two weeks after first production, the well recorded an CAOF of 27 MMCFD suggesting there was some formation damage clean up from the original fracture treatment.

Reservoir Pressure Conditions

Bottom-hole pressure at the time of first production was reported to be 6843 psi with a BHP/Z of 0.5950. The original pressure gradient of the reservoir is estimated to be between 0.595 psi/ft. (wellhead pressure projection) and 0.76 psi/ft (from mud weight), clearly over-pressured. The mud weight at TD was 14.6-14.8 ppg, consistent with the pressure projections used for the BHP.

Flow potential of the wellbore was recorded on 9/29/89 to be in excess of 19.0 MMCFD at 3774 wellhead flowing pressure.

Production Modeling

See. Attachment B.

Summary

Available data and operator input indicate the Marie Walters 1-14 was conceived, drilled and evaluated as a fractured reservoir prospect. The well encountered large open natural fractures in the target section, was appropriately logged to identify the fractures and tested naturally before hydraulic fracture treatment. Pre-treatment testing indicated significant flow capacity in identified, naturally fractured zones and post treatment production modeling (quarter slope behavior) is consistent with an overpressured, tight, naturally fractured reservoir.

ATTACHMENT