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WESTERN CANADA SEDIMENTARY BASIN BOREHOLE IMAGERY ANALYSIS PROJECT: A SUMMARY OF TOTAL CONWEST CYPRESS C-50-B/94-B-15

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Western Canada Sedimentary Basin Borehole Imagery Analysis
Project: A Summary of TOTAL CONWEST Cypress c-50-B/94-B-15

Well Name: TOTAL CONWEST Cypress c-50-B/94-B-15

Operator: Total Petroleum Canada Ltd.

Location: latitude 56° 47' 5" N
longitude 121° 44' 7" W
(see figure 1)

Rig Release Date: January 12, 1993

Imagery Log/Interval Logged: FMI 1390.0 - 1537.9 m

Well Trajectory: Semi-vertical, deviated

Drill Bit Size: 8.0 inches over the interval logged

Formations Logged:

Jurassic Nordegg	1350.5 m
Triassic Pardonet	1403.0 m
Triassic Baldonel	1447.0 m
Triassic Charlie Lk	1502.0 m

Lithologies: The section logged consists of Jurassic - Triassic carbonates.

Core Intervals: 1453.0 m - 1466.8 m (13.8 m length)

Structural Setting: Foothills thrust belt

Regional Stress trajectories: The nearest well with stress orientation data is Shenandoah et al INGA d-53-B/94-A-13 located 6 kms SE with a S_{Hmin} direction of 125.8° N (Bell et al, in press).

Description of Images:

Drilling Induced Fractures:

Vertical Fractures: Four vertical induced fractures were observed in the interval logged and examples are given in figures 6 to 8. The fractures are characterized by thin, continuous, dark (conductive) traces appearing 180° apart on the FMI microresistivity images. Unless noted otherwise, vertical scales are 1:10 and horizontal scales are 1:5. The interpretive software program FLIP converts digital microresistivity contrasts into brown-yellow tones (dark colors indicate high conductivity whereas light colors indicate low conductivity, Bourke et al 1989) and applies a sinusoidal curve to arrive at a true dip angle and dip azimuth.

Chatter Fractures: Short, discontinuous, dark (conductive) traces on the FMI log that trend obliquely to borehole trajectory and occur in groups in an en echelon, steplike fashion are interpreted as drilling induced chatter fractures. These appear on opposite sides of the borehole wall 180° to each other. Figures 9 and 10 are examples of chatter fractures observed in Cypress c-50-B/94-B-15.

Natural Fractures: Figure 11 illustrates an example of a naturally occuring fracture in Cypress c-50-B/94-B-15. Natural fractures are characterized by dark, continuous traces which unlike induced fractures need not orient parallel to the direction of the maximum horizontal stress, S_{Hmax}.

Borehole Breakouts:

Borehole breakouts are measured by the four oriented arms of the FMI calipers to determine the profile of the wellbore (Plumb and Hickman, 1985). In the presence of anisotropic horizontal stresses borehole collapse may occur on opposite sides of the wellbore at the azimuths of the minimum horizontal stress directions (S_{Hmin}). The calipers will indicate a corresponding long axis where spalling has occurred and a perpendicular short axis near bit size. When the FMI tool is raised through a breakout zone, tool rotation will cease if the pads become entrenched within the zone. Frequently the pads themselves will be unable to make firm contact with the borehole wall in the spalled zone and a diffuse, unfocussed image will result.

Three stages in the development of borehole breakouts have been observed in Cypress c-50-B/94-B-15. *Incipient breakout* is illustrated in figures 12 and 13. The dark, arcuate fracture traces observed on the microresistivity images are interpreted as shear fractures that intersect the borehole wall in response to the anisotropic stresses acting upon it. Generally there is only minimal lateral borehole elongation.

Intermediate breakout is depicted in figures 14 and 15. The fractures are more extensive and exhibit lobate traces on the borehole wall. Some spalling may have occurred resulting in partially blurred and unfocussed FMI images at the azimuths of borehole collapse. The calipers may be parted due to differential elongation of the borehole.

A stage of *mature breakout* development, depicted in figures 16 and 17, is always marked by differential extension of the calipers in response to significant lateral elongation of the borehole. The microresistivity images are characterized by blurred, unfocussed regions at the azimuths of maximum elongation.

Bedding Planes: Nearly thirty measurements of bedding planes were made at regular intervals to supplement the data set. Figures 9 and 10 illustrate 2 such examples.

Results:

Drilling Induced Fractures:

Vertical Fractures: Vertical induced fractures are not common throughout the interval logged by the FMI tool. On the FMI microresistivity images for Cypress c-50-B/94-B-15

they are characterized by thin, continuous, dark (conductive), linear traces that parallel borehole trajectory, cross-cut bedding, and are open and mud-filled. They occur 180° apart on the images and range in length from 1.0 m to 3.0 m. Strike azimuths are summarized in figure 18a. The mean strike azimuth from 4 samples is 024.5° N with a standard deviation +/- 2.2° (Mardia, 1972).

It is believed that these fractures form as hydraulic fractures in response to pressure exerted on the undrilled rock by the weight of the drillstem during drilling. Alternatively, fracture generation may be the result of the drillpipe acting as a loose fitting piston when it is run into the hole too quickly. This action will cause bottomhole pressures to exceed the parting pressure of the rocks (Dickey, 1986).

Hydraulic fractures propagate within the plane formed by the largest and intermediate principal stresses (S_v and S_{Hmax}) and are extensional. S_v is vertical and thus induced fractures can be used to detect the direction of the maximum horizontal principal stress (S_{Hmax}). As figure 18a illustrates, this would give an S_{Hmax} azimuth of 024.5° N at Cypress c-50-B/94-B-15.

Chatter Fractures: Figure 18b summarizes the orientations of over forty chatter fractures observed in Cypress c-50-B/94-B-15. Mean strike azimuth for the fracture set is computed as 019.8° N, standard deviation +/- 14.7° (Mardia, 1972). Chatter fractures often appear on opposite sides of the borehole wall and may be stratabound. They are believed to be "drilling enhanced" natural fractures (Heliot et al, 1990) formed when a preexisting natural fracture is opened preferentially in the plane of S_{Hmax} and S_v in response to pressure exerted on the rock formation during drilling. This gives rise to the characteristic en echelon, steplike fashion of chatter fractures.

Natural Fractures: Figure 19a summarizes the orientations of the 2 naturally occuring fractures observed in Cypress c-50-B/94-B-15. A mean strike azimuth for the fracture set is computed as 175.2° N, standard deviation +/- 29.1° (Mardia, 1972). Natural fractures may be distinguished from drilling induced ones primarily upon their geometric relationship with respect to the stress regime. Induced fractures will align themselves parallel to S_{Hmax}, whereas natural ones need not.

Borehole Breakouts: A stress regime characterized by anisotropic horizontal stresses acting on the borehole will often result in borehole collapse on opposite sides of the well. Borehole breakouts form when shear fractures develope subparallel to the borehole wall and extend the well in a direction parallel to S_{Hmin}. As these fractures propagate, portions of the borehole wall spall off creating an "ovalized" borehole. These features are excellent indicators of the direction of the minimum horizontal stress orientation S_{Hmin}, although cable torque on the tool may bias results slightly (Parker and Hefferman, 1992). Figures 19b, 20a, and 20b summarize the orientations of observed borehole breakouts and are calculated as follows (Mardia, 1972):

incipient breakouts	mean strike azimuth 122.0° N (+/- 8.8°)
intermediate breakouts	mean strike azimuth 119.4° N (+/- 7.4°)
mature breakouts	mean strike azimuth 113.9° N (+/- 8.3°)

This indicates a mean S_{Hmin} direction of 118.4° N for Cypress c-50-B/94-B-15.

Conclusions

In Cypress c-50-B/94-B-15 FMI microresistivity images indicate a mean S_{Hmax} direction of 024.5° N. This orientation is in agreement with regional trends of S_{Hmax} as summarized in figure 1. The mean S_{Hmin} direction of 118.4° N differs only marginally from the S_{Hmin} direction derived from oriented caliper logs from the nearby well Shenandoah et al Inga d-53-B/94-A-13, with a values of 125.8° N.

Fig. 1 Location of Cypress c-50-B/94-B-15 with respect to the stress regime of the Western Canada Sedimentary Basin.

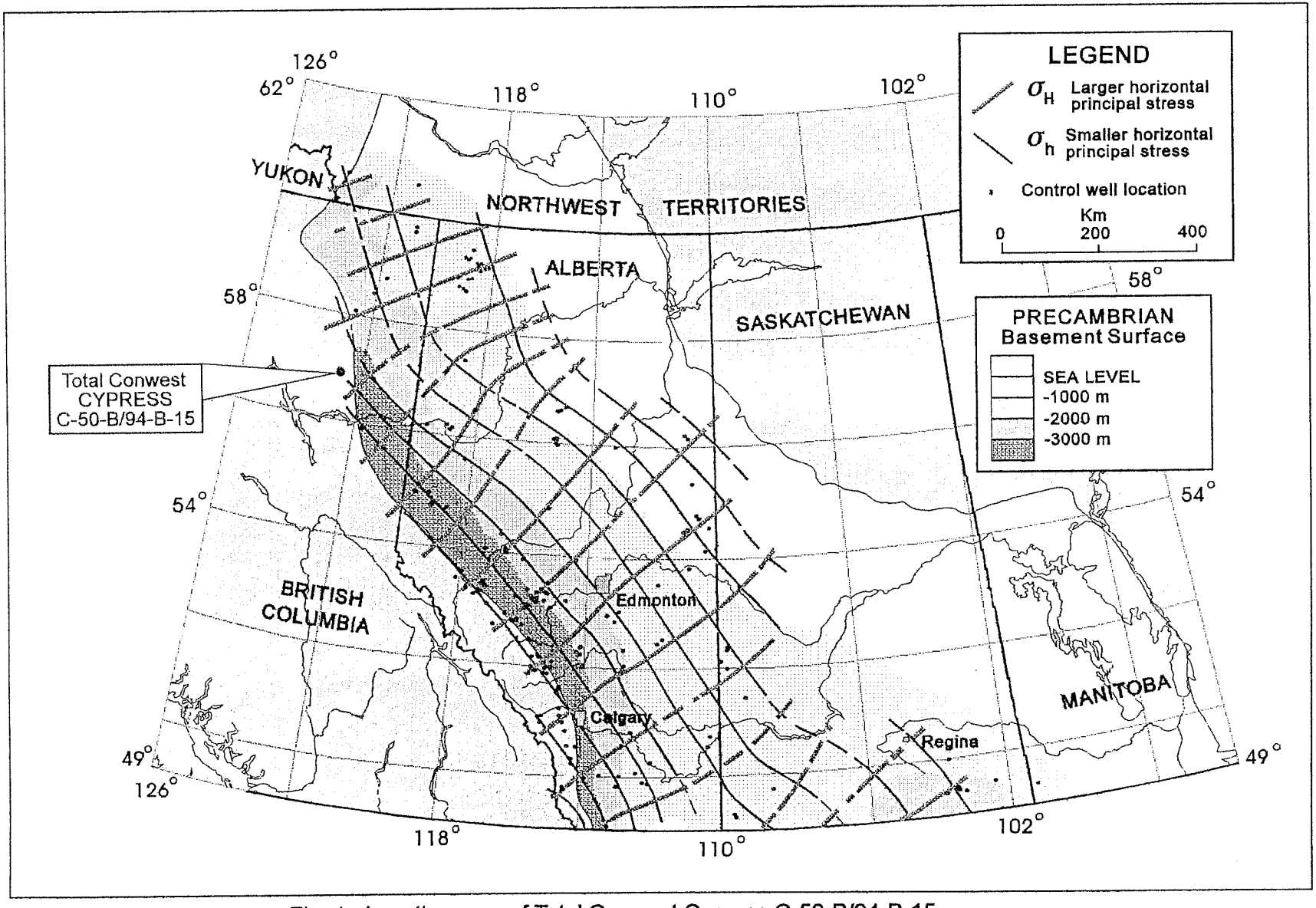


Fig. 1. Location map of Total Conwest Cypress C-50-B/94-B-15..

Figure 2. A well overview diagram of the entire Cypress c-50-B/94-B-15 well summarizing strike and dip orientations of the various features observed.

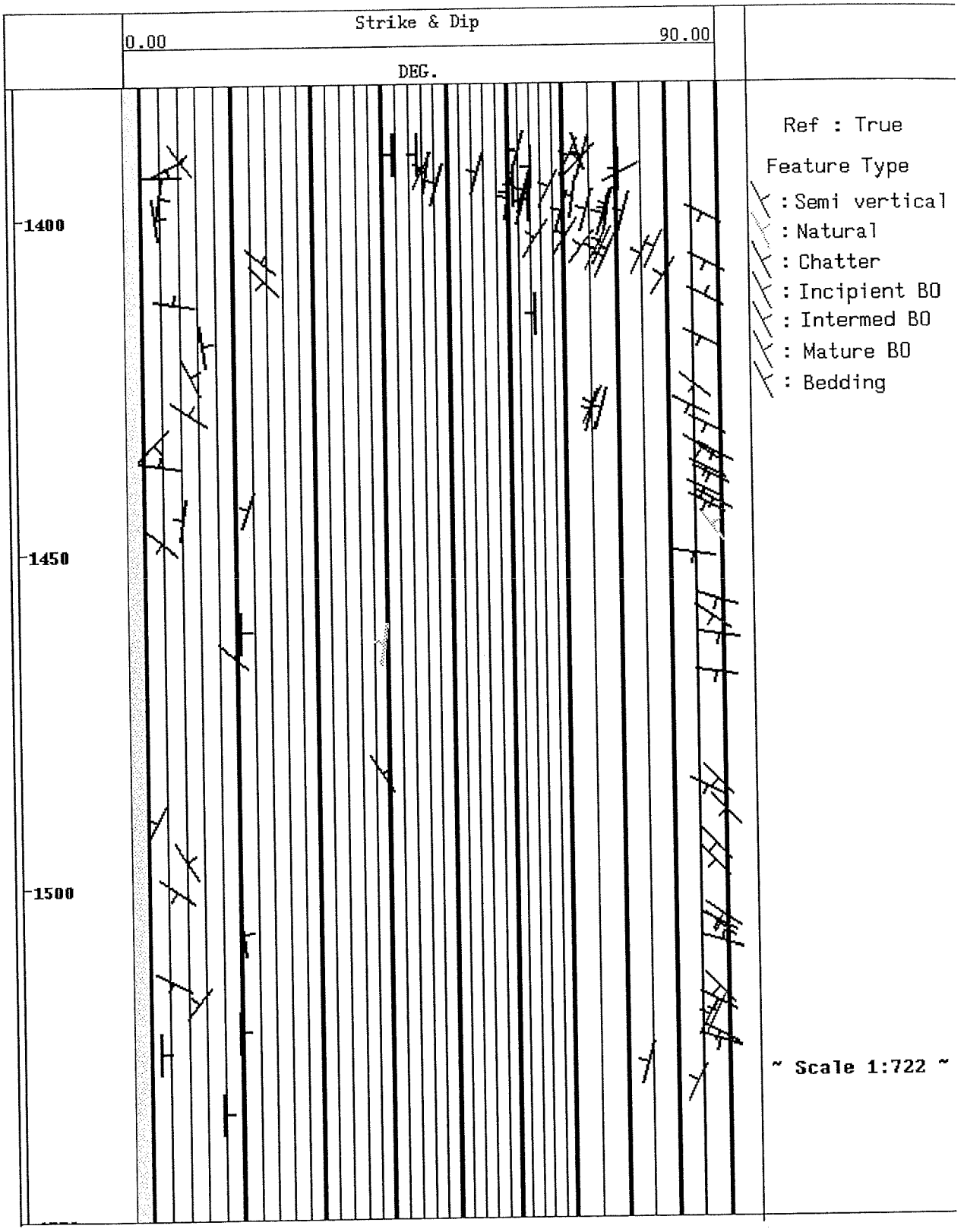

Strike & Dip
0.00
90.00
DEG.
1400
1450
1500
Ref : True
Feature Type
: Semi vertical
: Natural
: Chatter
: Incipient BO
: Intermed BO
: Mature BO
: Bedding
~ Scale 1:722 ~

Figure 3. A well overview diagram at a reduced scale summarizing strike and dip orientations over the 1390 m to 1450 m interval.

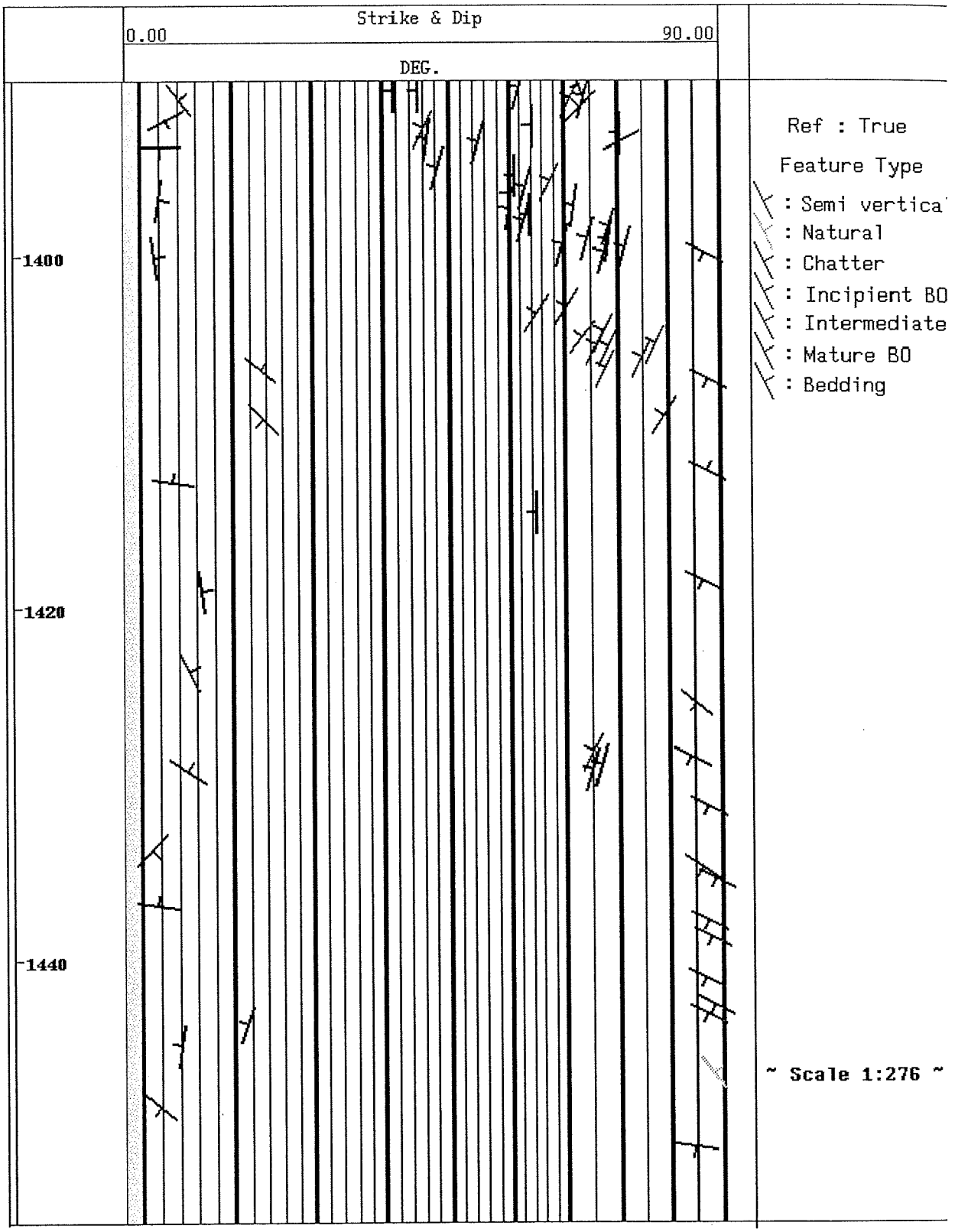

Strike & Dip
0.00
90.00
DEG.
1400
1420
1440
Ref : True
Feature Type
: Semi vertica
: Natural
: Chatter
: Incipient BO
: Intermediate
: Mature BO
: Bedding
~ Scale 1:276 ~

Figure 4. A strike and dip summary over the 1450 m to 1500 m interval.

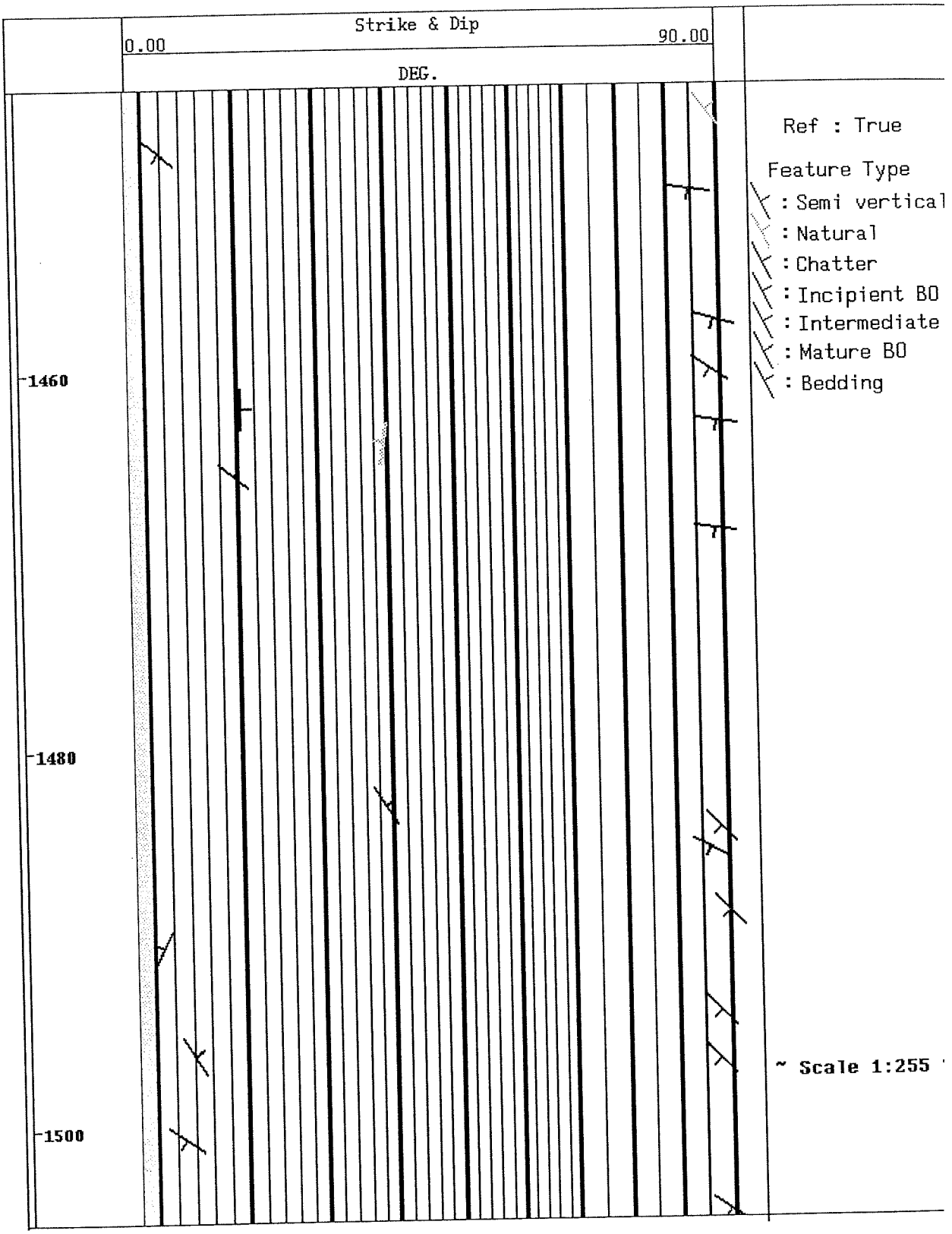

Strike & Dip
0.00
90.00
DEG.
Ref : True
Feature Type
: Semi vertical
: Natural
: Chatter
: Incipient BO
: Intermediate
: Mature BO
: Bedding
1460
1480
1500
~ Scale 1:255

Figure 5. A strike and dip summary over the 1500 m to 1550 m interval.

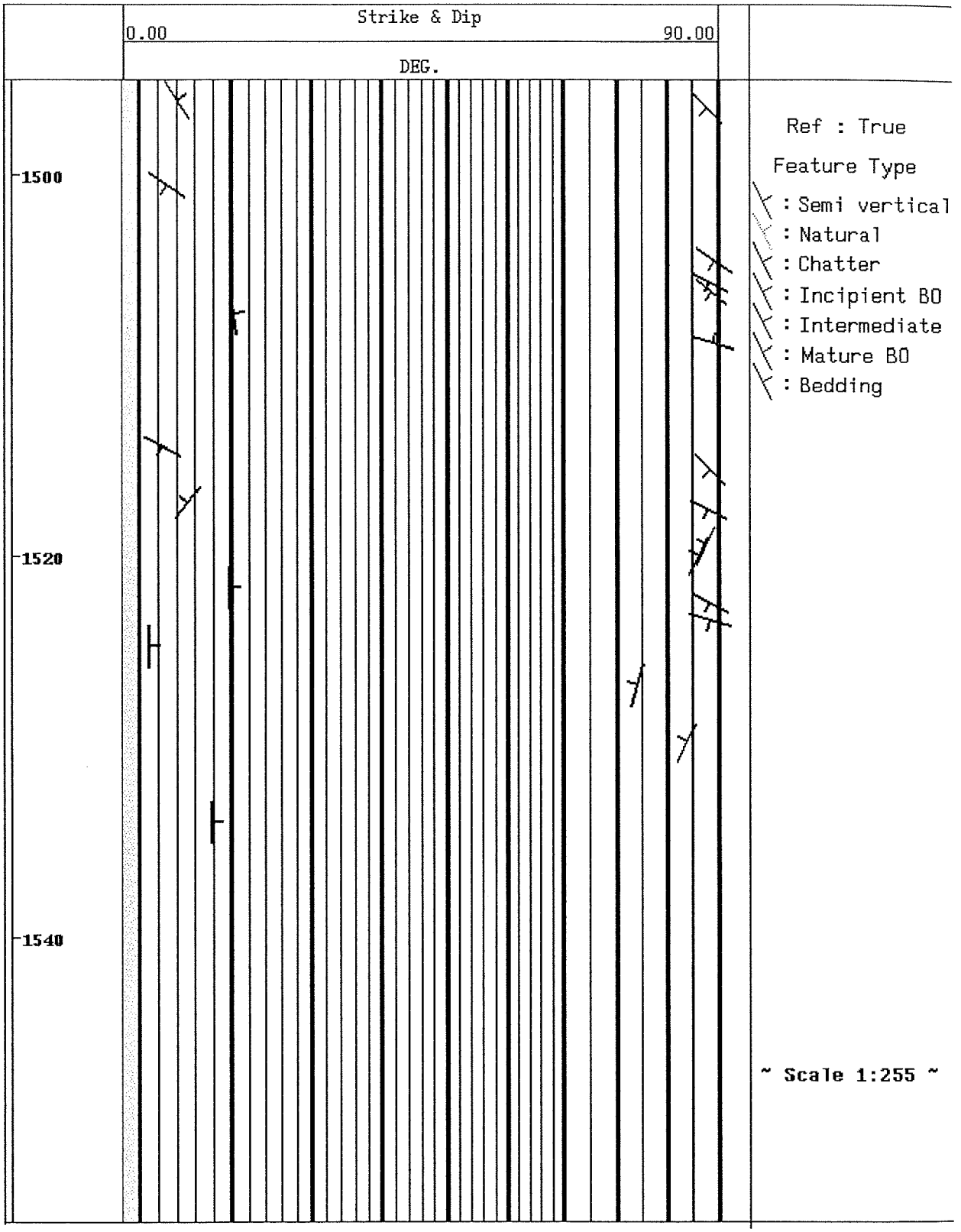

Strike & Dip
0.00
90.00
DEG.
1500
1520
1540
Ref : True
Feature Type
: Semi vertical
: Natural
: Chatter
: Incipient BO
: Intermediate
: Mature BO
: Bedding
~ Scale 1:255 ~

Figure 6. An induced fracture at the 1526.0 m to 1528.0 m mark within Triassic Charlie Lake carbonates. The fracture dips at 74° with a dip azimuth of 291° (strike 021° N).

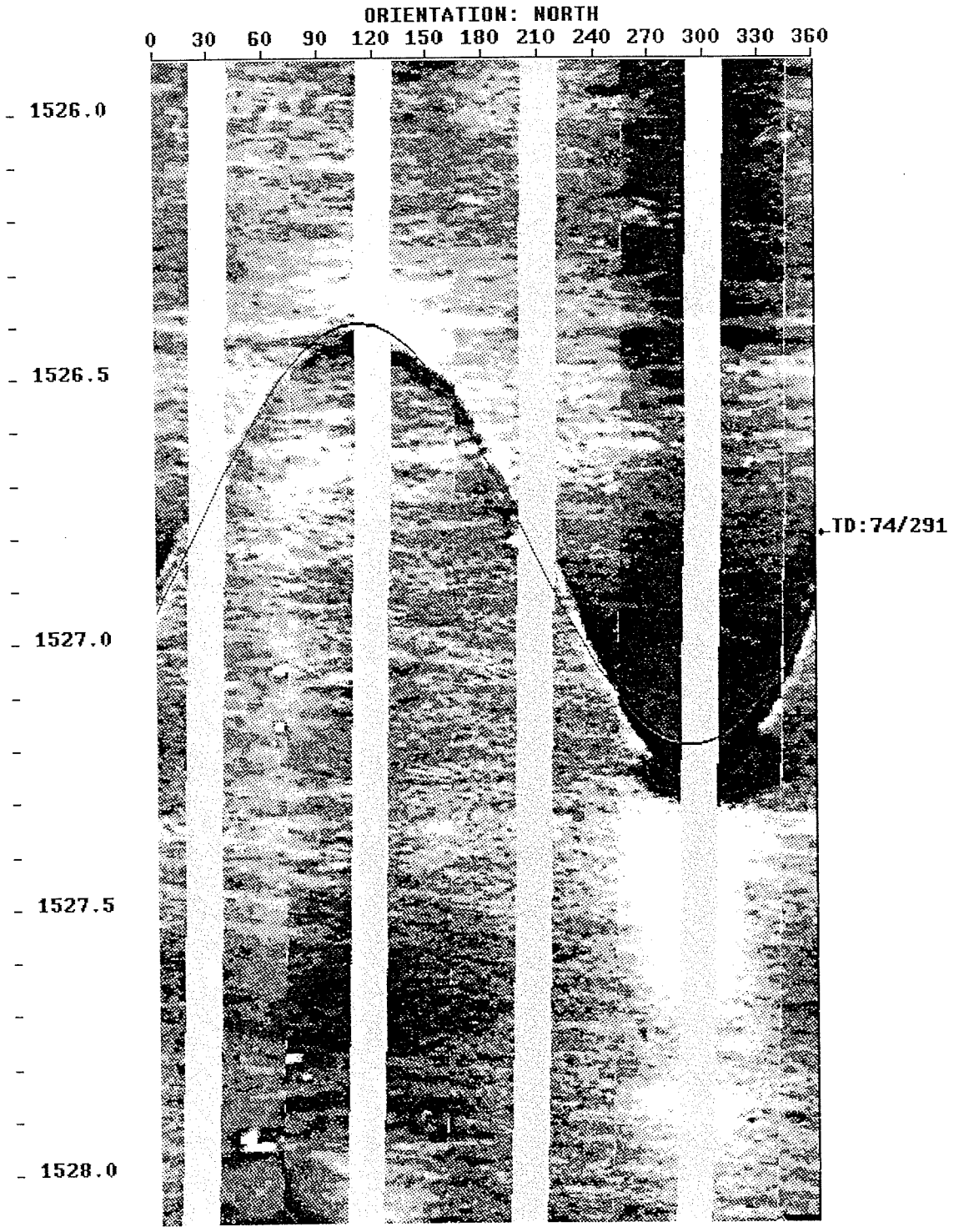

ORIENTATION: NORTH
0 30 60 90 120 150 180 210 240 270 300 330 360
1526.0
1526.5
1527.0
1527.5
1528.0
TD:74/291

Figure 7. A drilling induced fracture dipping 84° and striking 027° within Triassic Charlie Lake carbonates. Vertical scale is 1:20, horizontal scale is 1:5.

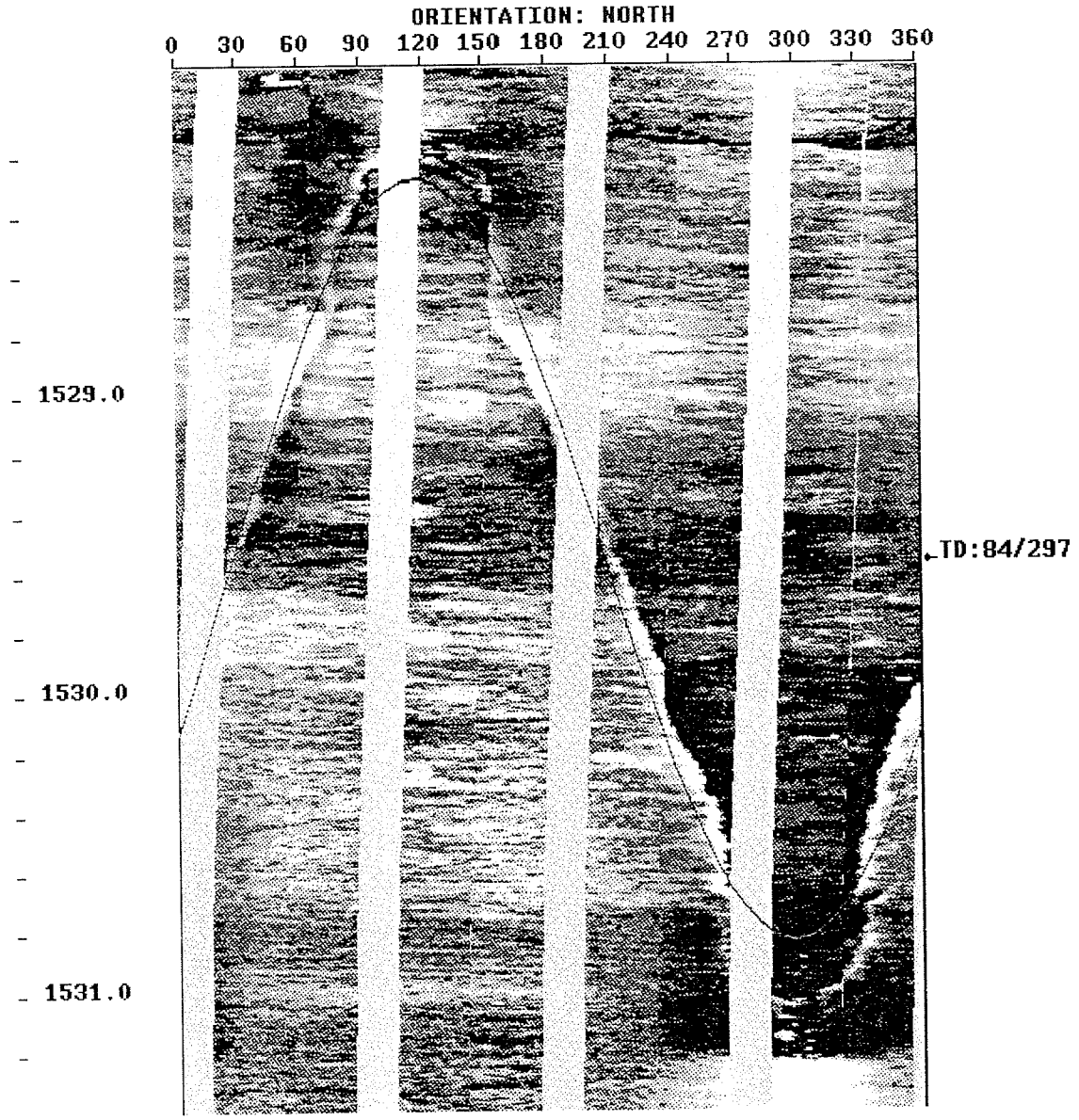

ORIENTATION: NORTH
0 30 60 90 120 150 180 210 240 270 300 330 360
1529.0
1530.0
1531.0
TD:84/297

Figure 8. Vertical fractures at the 1518.0 m to 1521.0 m mark within Triassic Charlie Lake carbonates. The fractures are characterized by linear, dark (conductive) traces appearing at opposites sides of the borehole at azimuths of 30° and 210°. They dip at 88° and 86° with a dip azimuth of 295° (strike direction of 025° N).

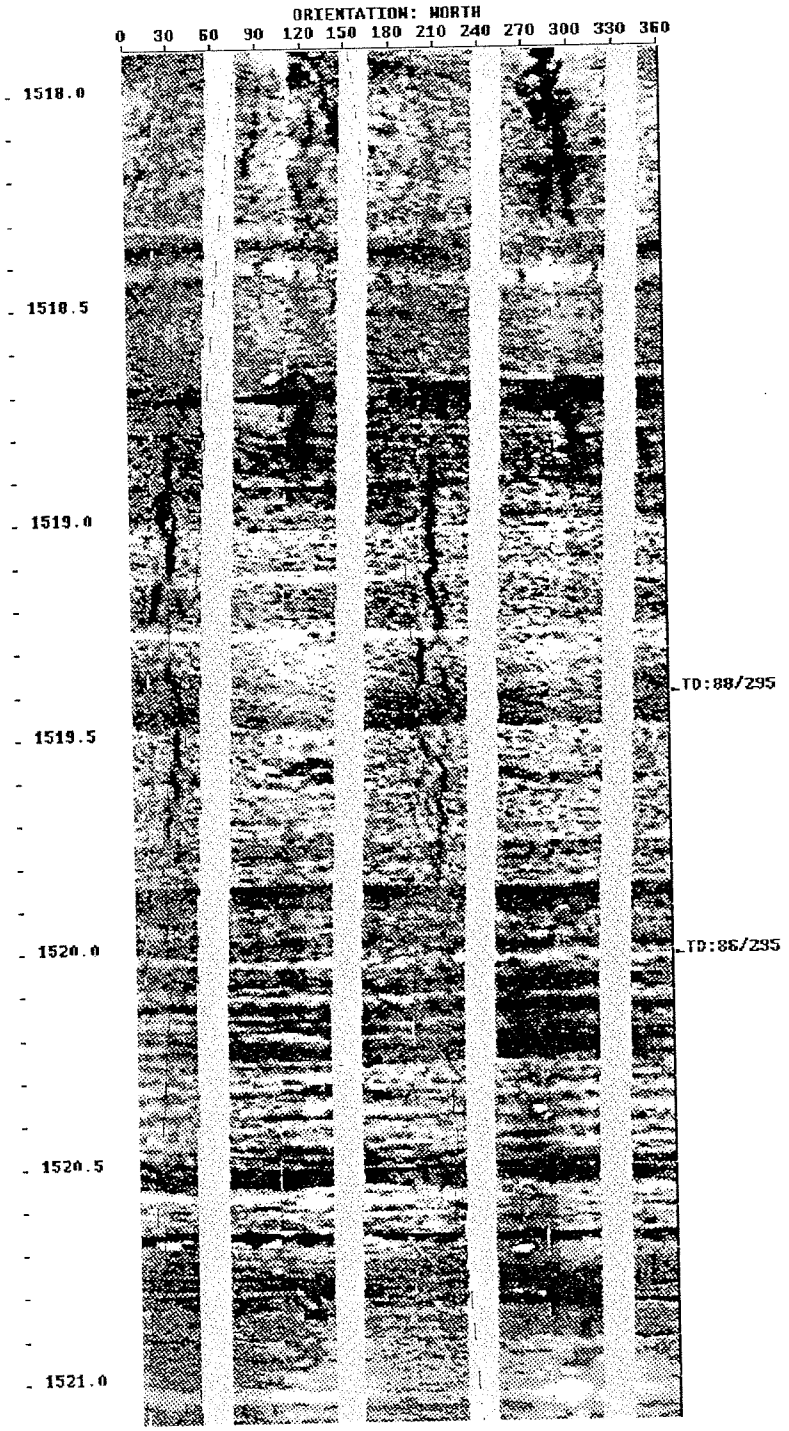

ORIENTATION: NORTH
0 30 60 90 120 150 180 210 240 270 300 330 360
1518.0
1518.5
1519.0
1519.5
1520.0
1520.5
1521.0
TD:88/295
TD:86/295

Figure 9. Chatter fractures with their orientation traces plotted in blue within the carbonates of the Jurassic Nordegg Formation. Dip magnitude and azimuth of each fracture appear to the right of the image. The fractures overlap each other in a slanted, en echelon, steplike fashion and appear on opposite sides of the borehole 180° apart. A bedding plane orientation is seen at 1396.8 m.

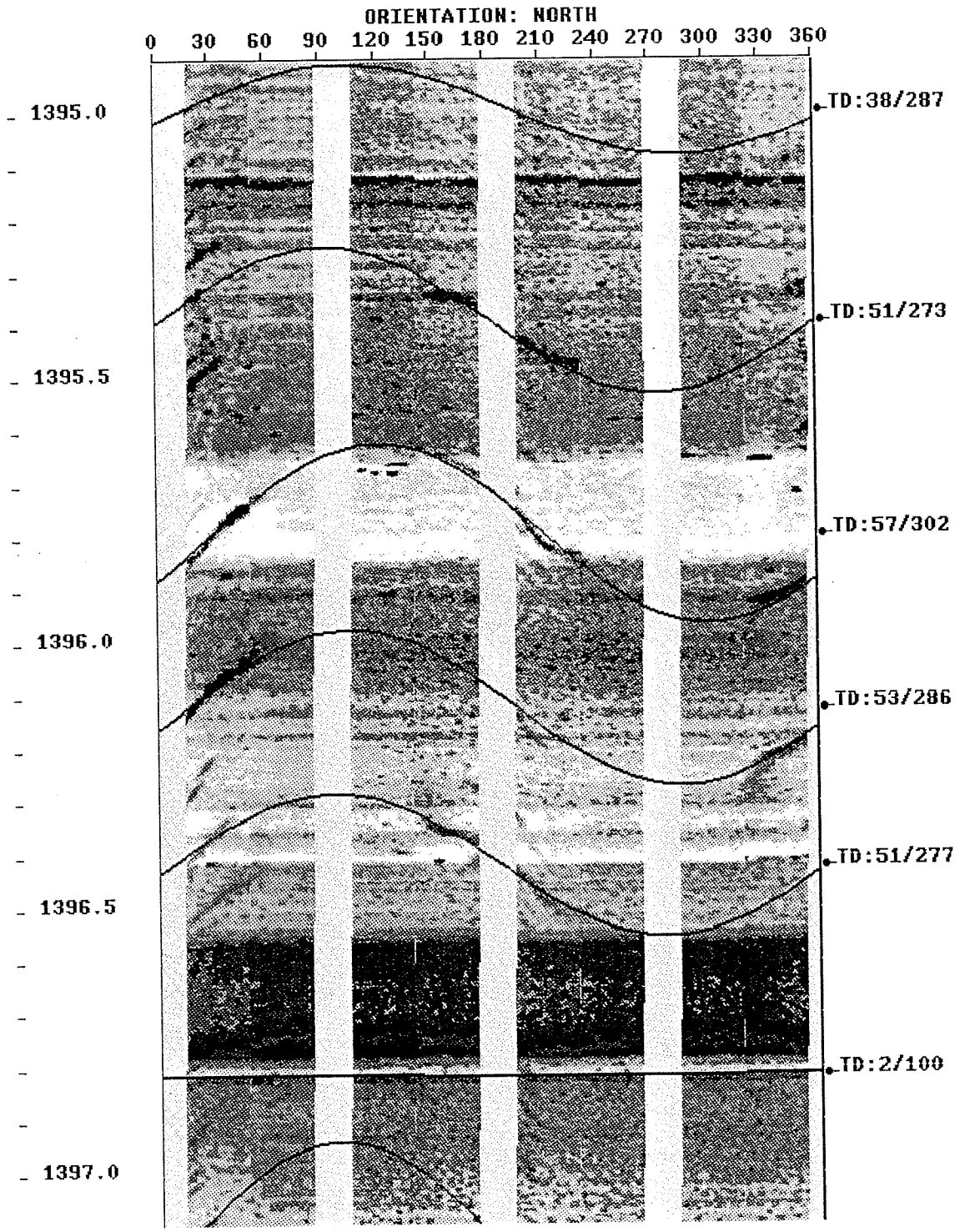

ORIENTATION: NORTH
0 30 60 90 120 150 180 210 240 270 300 330 360
1395.0
1395.5
1396.0
1396.5
1397.0
TD:38/287
TD:51/273
TD:57/302
TD:53/286
TD:51/277
TD:2/100

Figure 10. Chatter fractures and their plotted orientations in blue within the upper Jurassic Nordegg Formation. A bedding plane orientation is highlighted in black at the bottom of the image.

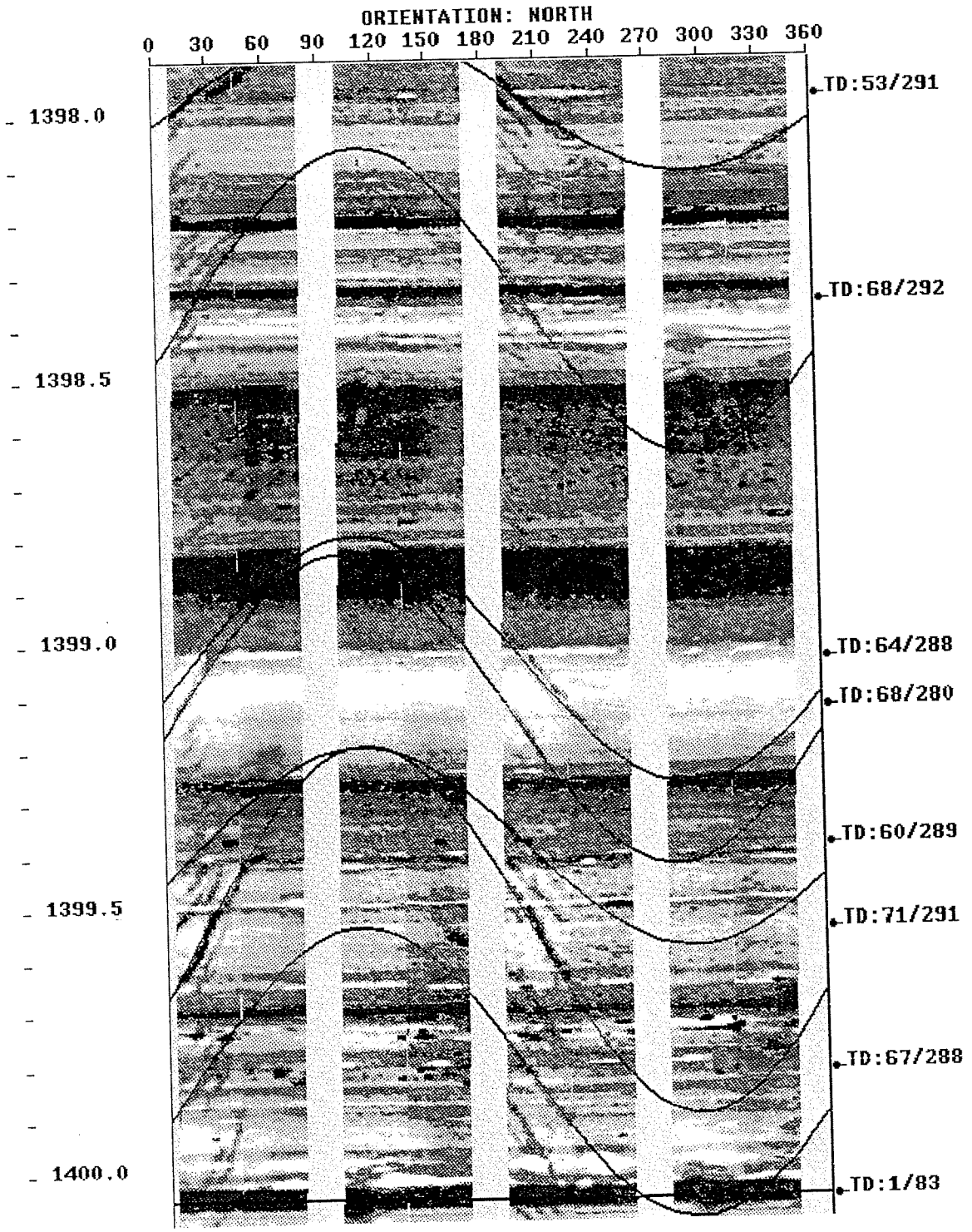

ORIENTATION: NORTH
0 30 60 90 120 150 180 210 240 270 300 330 360
1398.0
1398.5
1399.0
1399.5
1400.0
TD:53/291
TD:68/292
TD:64/288
TD:68/280
TD:60/289
TD:71/291
TD:67/288
TD:1/83

Figure 11. A natural fracture dipping at 88° with a dip azimuth of 049° (strike 139° N) within Triassic Pardonet carbonates. Top of the Triassic Baldonel Formation is at 1447.0 m. Note how this fracture is stratabound at 1447.0 m but cuts across the bedding layer at 1446.3 m.

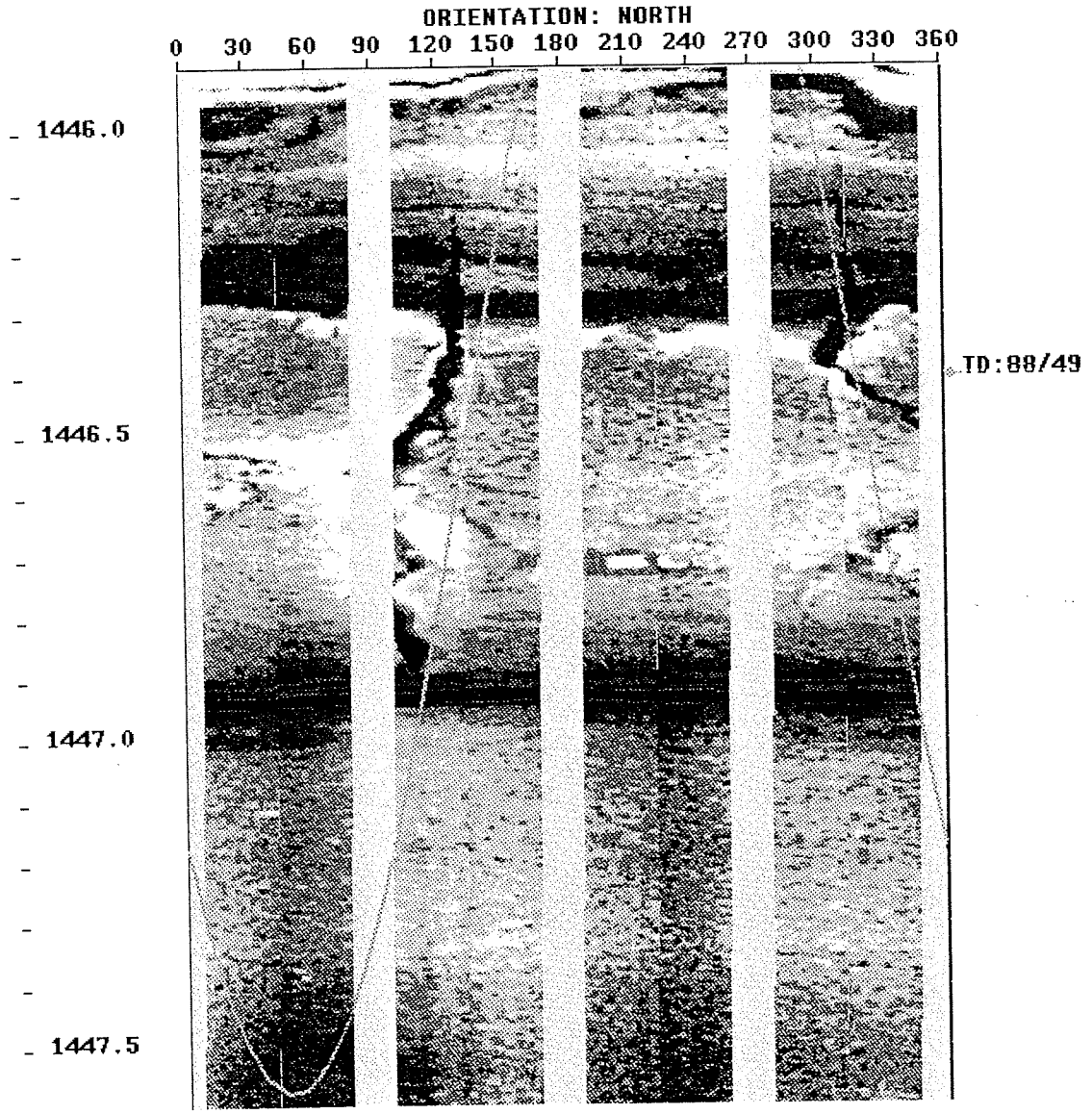

ORIENTATION: NORTH
0 30 60 90 120 150 180 210 240 270 300 330 360
1446.0
1446.5
1447.0
1447.5
TD:88/49

Figure 12. Incipient borehole wall collapse within Triassic Charlie Lake carbonates. T (conductive) arcuate fracture traces between azimuths 90°-150° and 270°-330° are interp shear fractures that intersect the borehole wall in response to anisotropic horizontal stresse upon it. Equal extension of the calipers indicate that minimal lateral borehole elongat occurred.

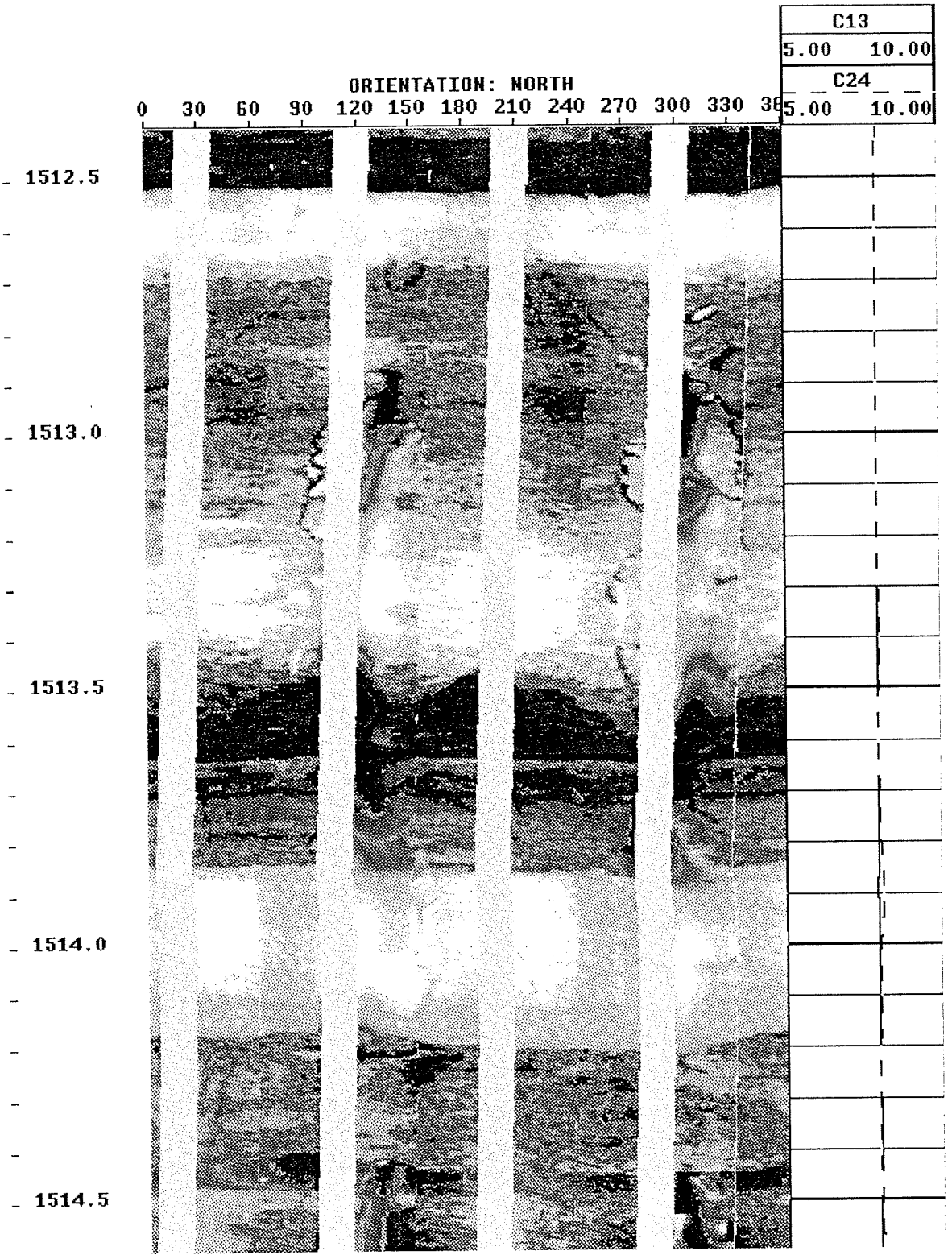

C13
5.00 10.00
C24
5.00 10.00
ORIENTATION: NORTH
0 30 60 90 120 150 180 210 240 270 300 330 360
1512.5
1513.0
1513.5
1514.0
1514.5

Figure 13. An example of incipient borehole collapse within Triassic Charlie Lake carbonates. The dark arcuate fracture traces are seen at azimuths of 110° and 290° and are shear fractures. Equal extension of the calipers indicates minimal lateral borehole elongation has occurred.

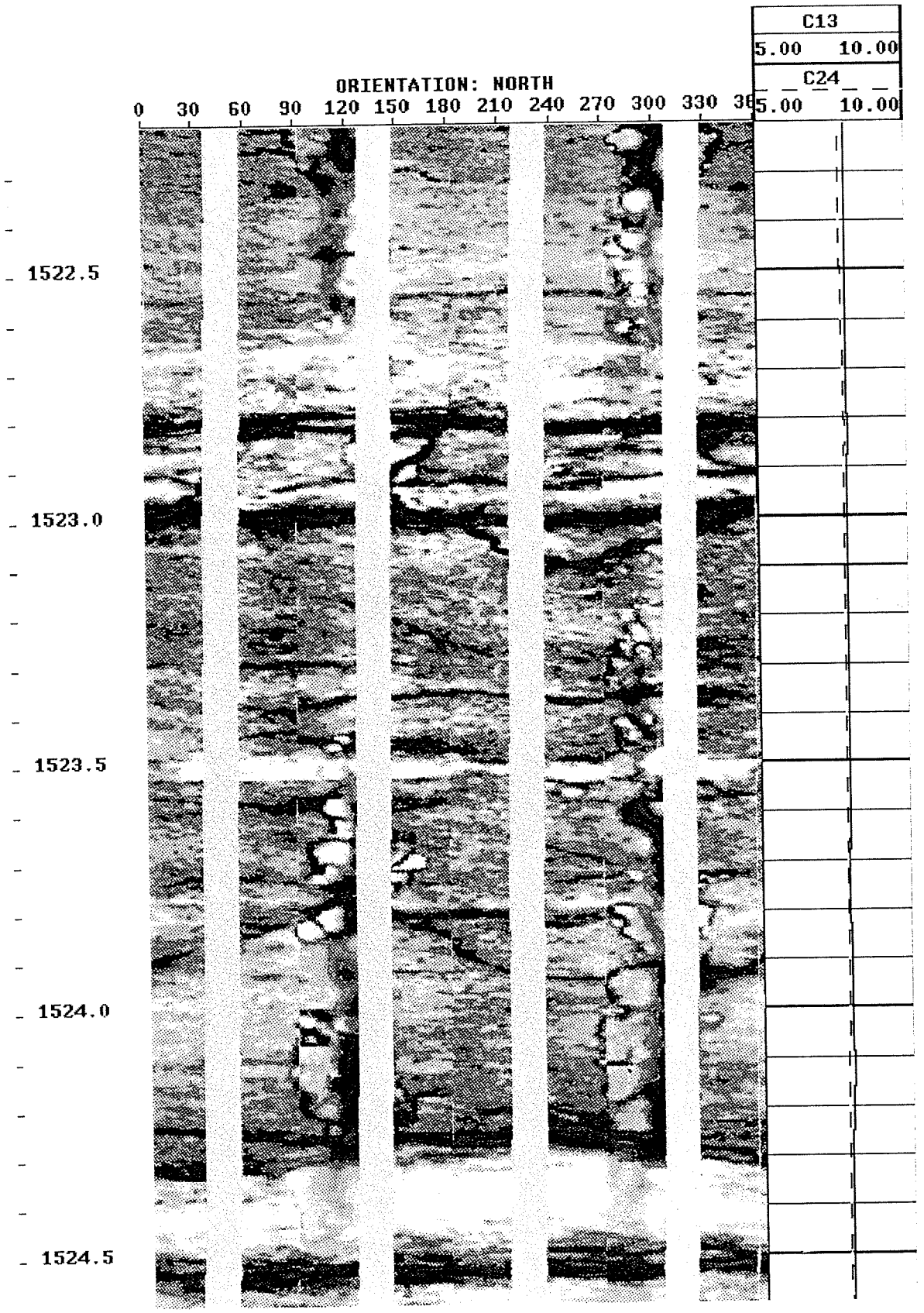

C13
5.00 10.00
C24
5.00 10.00
ORIENTATION: NORTH
0 30 60 90 120 150 180 210 240 270 300 330 360
1522.5
1523.0
1523.5
1524.0
1524.5

Figure 14. An intermediate stage of borehole breakout development within Triassic Charlie Lake carbonates. Shear fractures are more extensive and exhibit lobate traces on the borehole wall at azimuths of 110° and 290° where the character of the FMI log is at times diffuse and unfocussed. This is due to the inability of the tool pads to press firmly against the areas where spalling has already occurred. The dipmeter calipers show some separation.

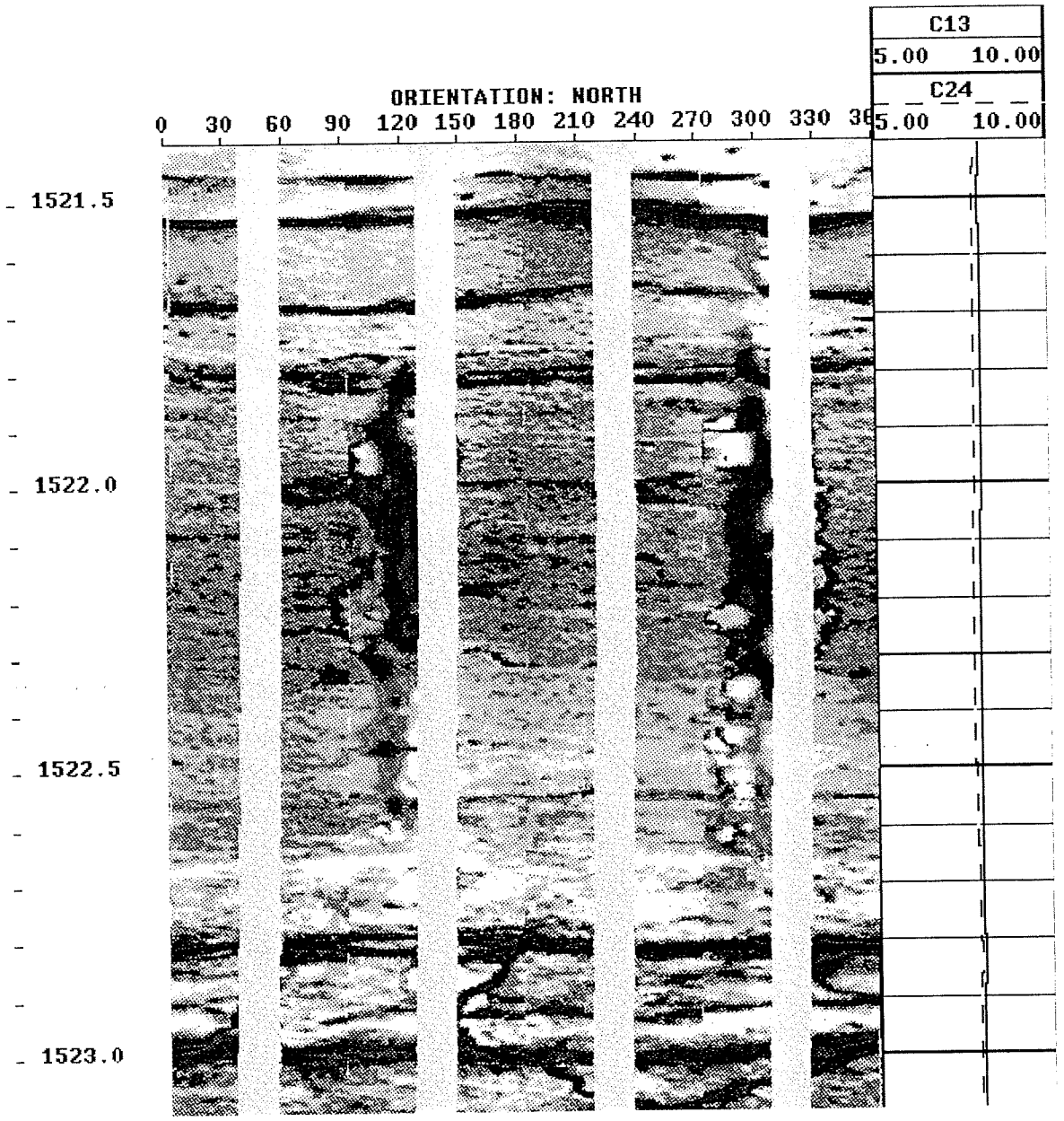

C13
5.00 10.00
C24
5.00 10.00
ORIENTATION: NORTH
0 30 60 90 120 150 180 210 240 270 300 330 360
1521.5
1522.0
1522.5
1523.0

Figure 15. An intermediate stage of borehole breakout development within Triassic carbonates. Borehole collapse has occurred and there is extension of the dipmeter calipers. The diffuse, unfocussed zones at azimuths 130° and 310° result from the inability of the tool pad to press firmly against the wall of the spalled zone.

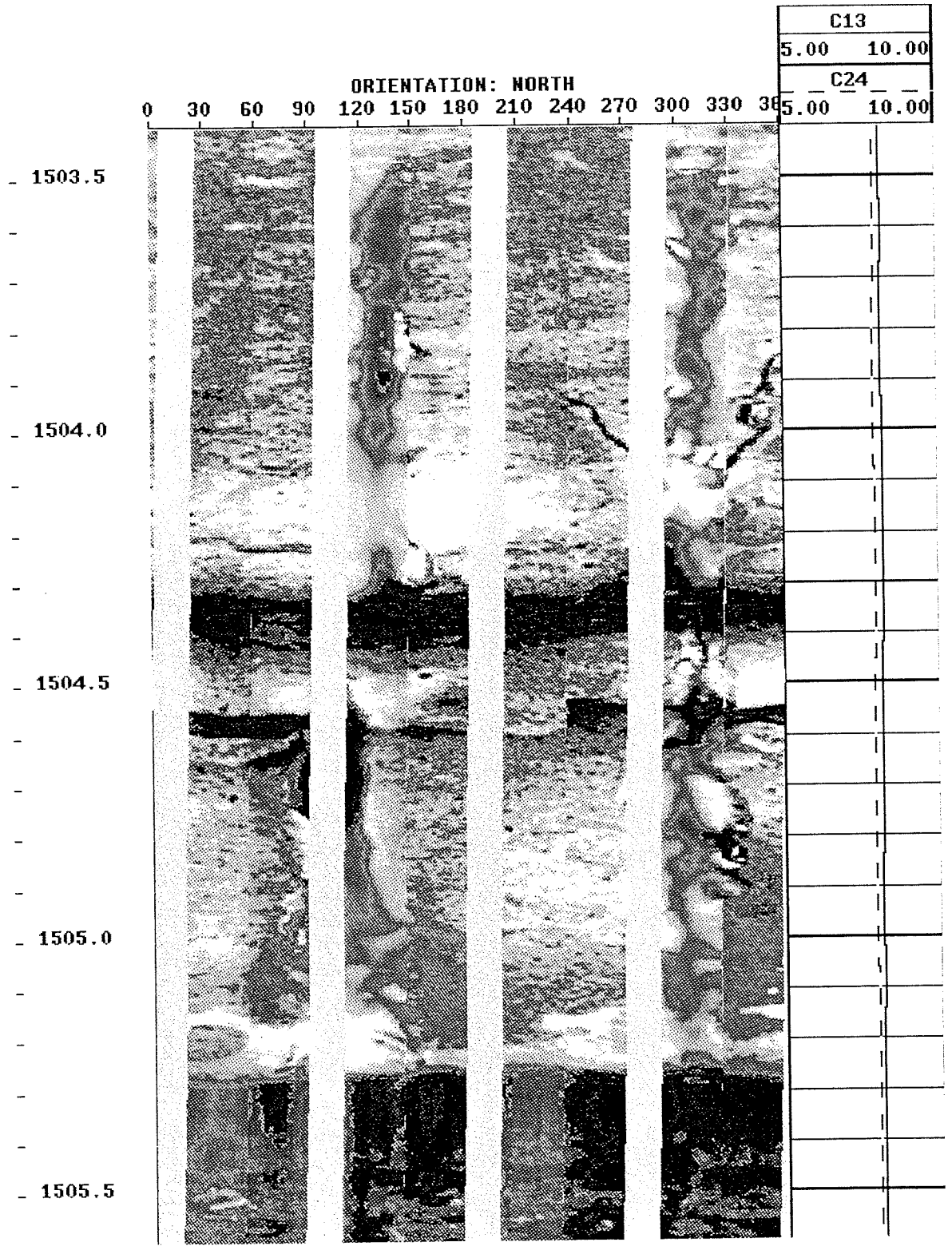

C13
5.00 10.00
C24
5.00 10.00
ORIENTATION: NORTH
0 30 60 90 120 150 180 210 240 270 300 330 360
1503.5
1504.0
1504.5
1505.0
1505.5

Figure 16. A mature stage of breakout development in the Triassic Baldonel Formation. At azimuths of 100° and 280° the microresistivity image is unfocussed as the tool pads are unable to press firmly against the spalled area. The calipers record significant separation. Lateral elongation of the borehole is parallel to the regional S_{Hmin} direction determined from adjacent wells.

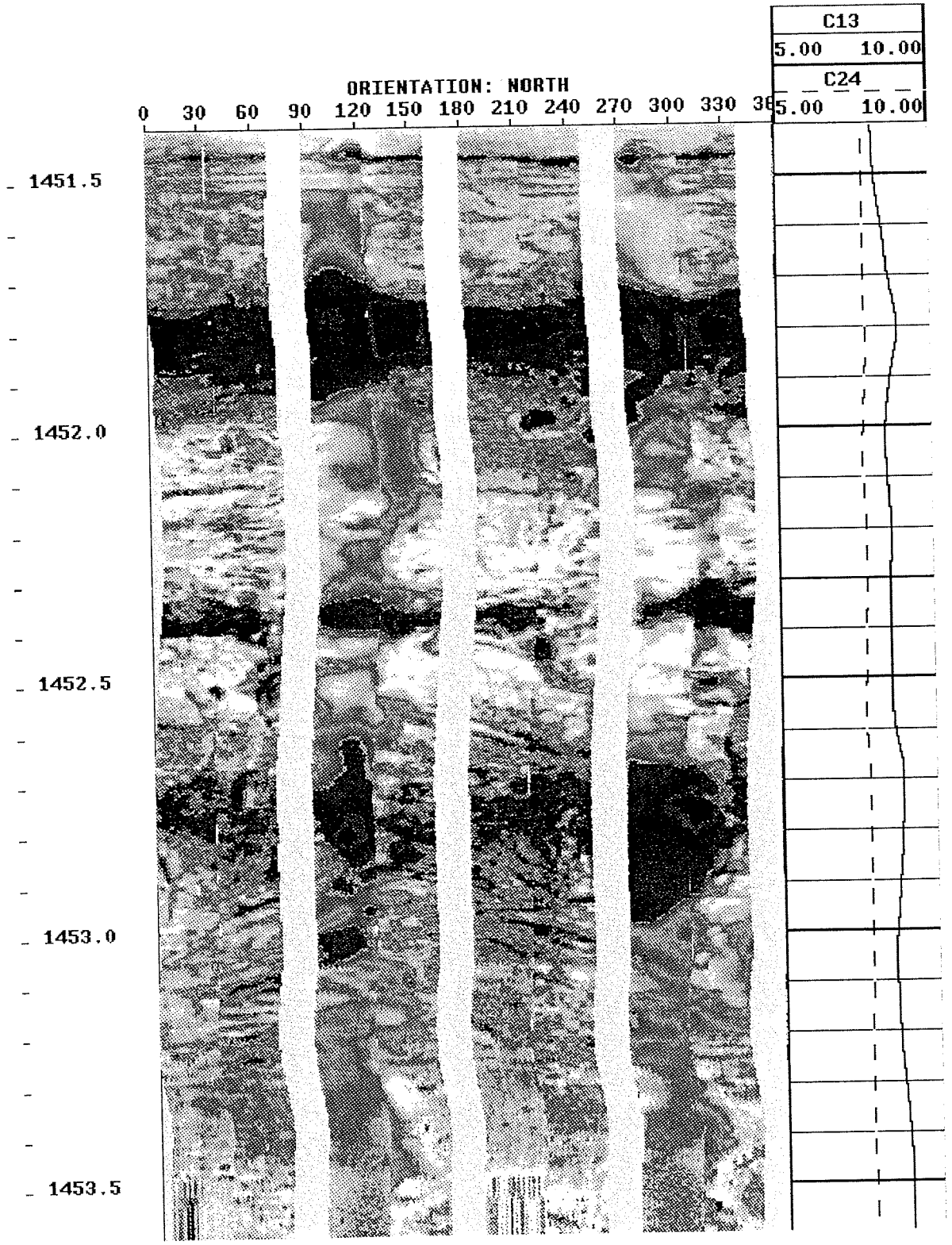

C13
5.00 10.00
C24
5.00 10.00
ORIENTATION: NORTH
0 30 60 90 120 150 180 210 240 270 300 330 360
1451.5
1452.0
1452.5
1453.0
1453.5

Figure 17. A mature stage of breakout development within the Triassic Baldonel Formation. At azimuths of 100° and 280° the microresistivity image is unfocussed as the tool pads are unable to press firmly against the spalled area. The calipers record significant separation and indicate lateral elongation of the borehole.

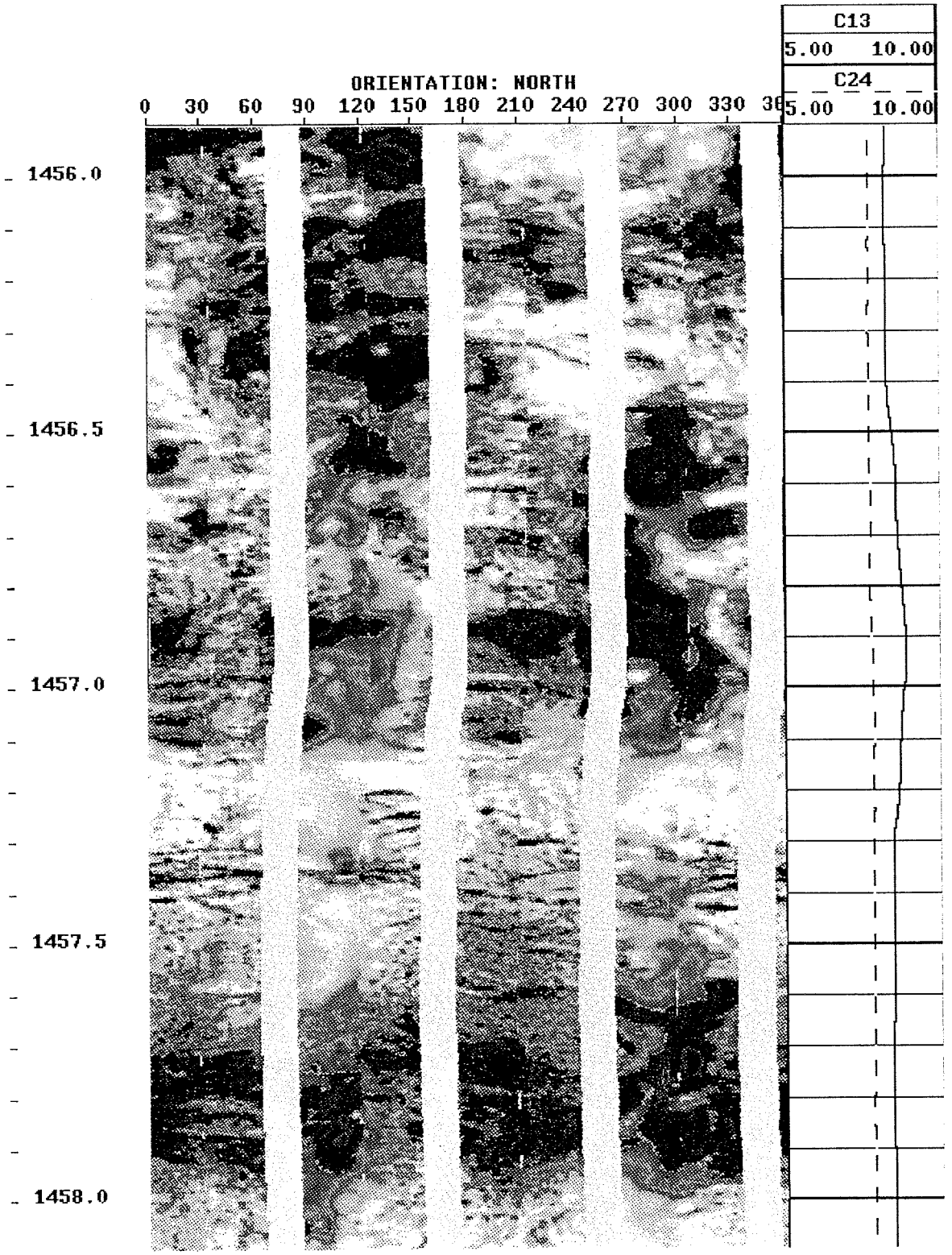
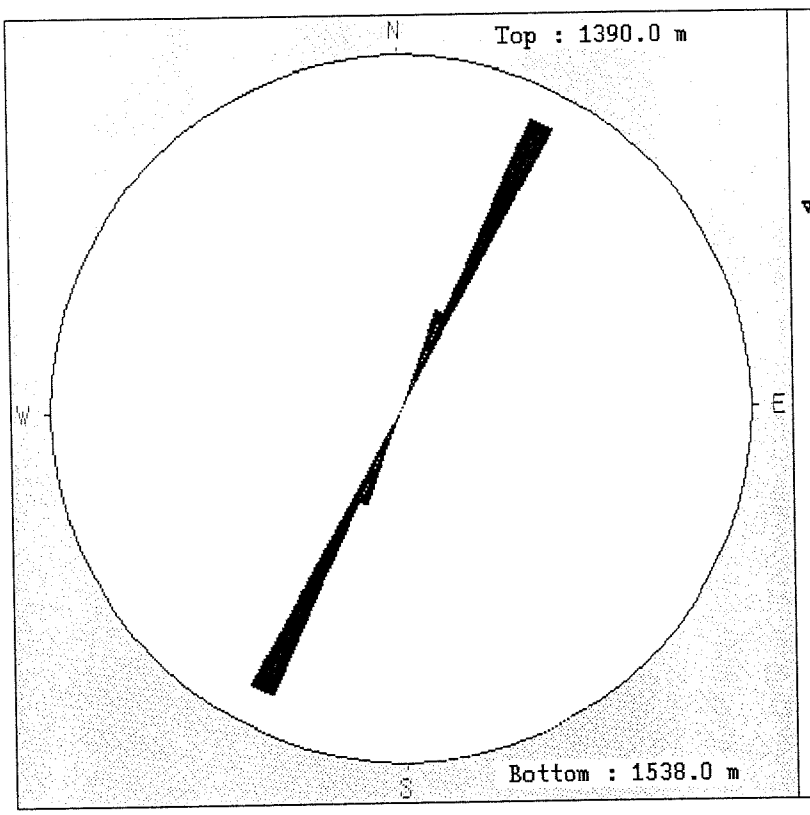

C13
5.00 10.00
C24
5.00 10.00
ORIENTATION: NORTH
0 30 60 90 120 150 180 210 240 270 300 330 360
1456.0
1456.5
1457.0
1457.5
1458.0

Figure 18a. Strike azimuth plot of semi-vertical fractures in Cypress c-50-B/94-B-15. Mean strike azimuth from 4 samples is computed as 024.5° N (standard deviation = 2.2°, Mardia 1972)

Figure 18b. Strike azimuth plot of chatter fractures in Cypress c-50-B/94-B-15. Mean strike azimuth for 42 samples is computed as 019.8° N (standard deviation = 14.7°, Mardia 1972)



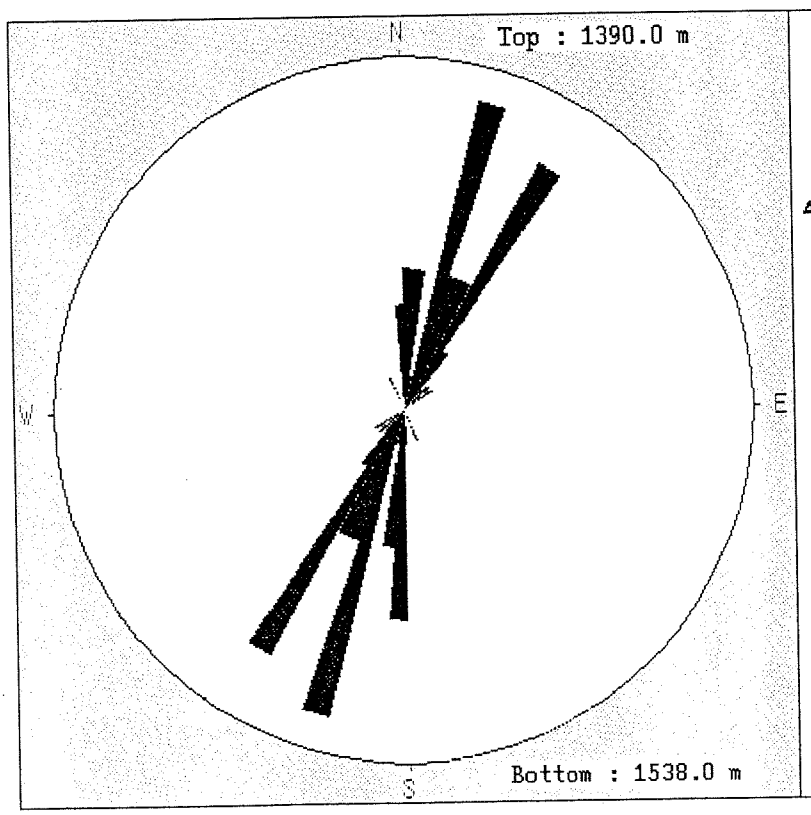
Strike Histogram

Ref : True
~ 4 samples ~

▼ : Semi vertical Fractures

Mean Strike Azimuth
= 024.5 deg N

Standard Deviation
= 2.2 deg



Strike Histogram

Ref : True
~ 42 samples ~

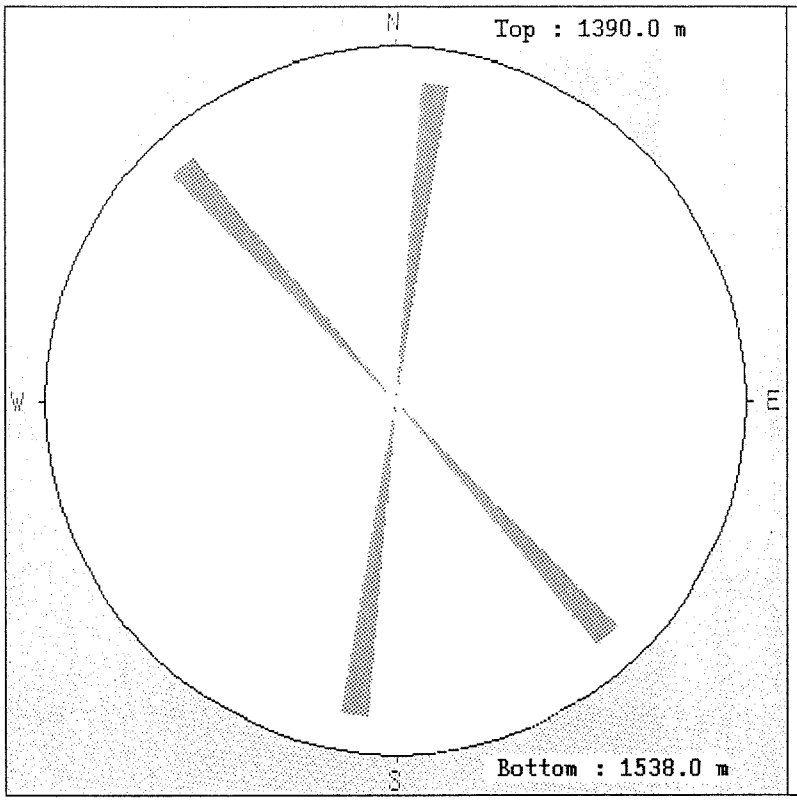
▲ : Chatter Fractures

Mean Strike Azimuth
= 019.8 deg N

Standard Deviation
= 14.7 deg

Figure 19a. Strike azimuth plot of natural fractures in Cypress c-50-B/94-B-15. Mean strike azimuth for 2 samples is computed as 164.5° N (standard deviation = 25.9°, Mardia 1972)

Figure 19b. Strike azimuth plot of incipient breakouts in Cypress c-50-B/94-B-15. Mean strike azimuth for 12 samples is computed as 122.0° N (standard deviation = 8.8°, Mardia 1972)



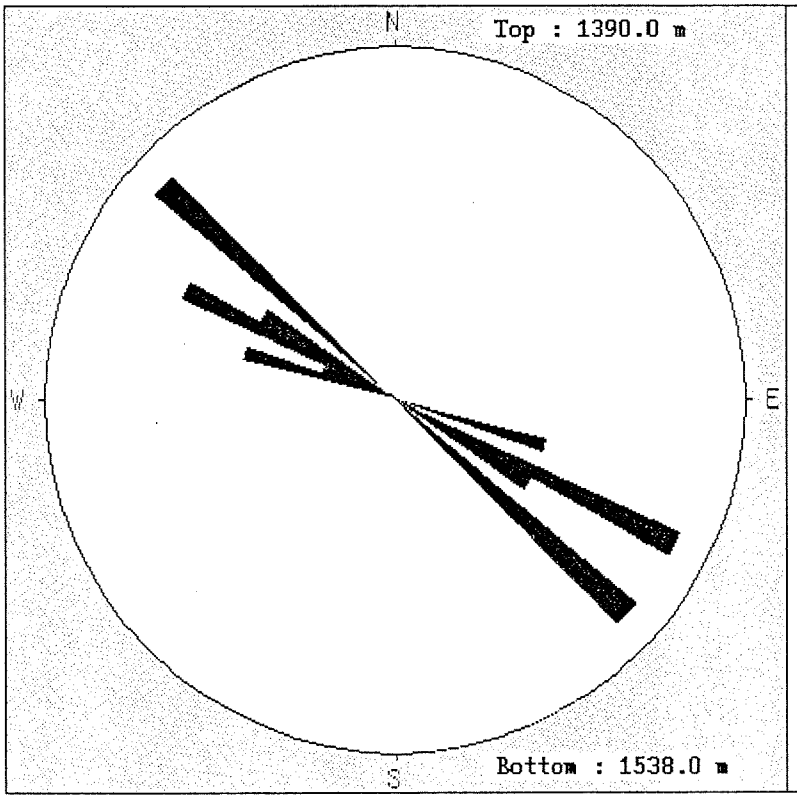
Strike Histogram

Ref : True
~ 2 samples ~

» : Natural Fractures

Mean Strike Azimuth
= 164.5 deg N

Standard Deviation
= 25.9 deg



Strike Histogram

Ref : True
~ 12 samples ~

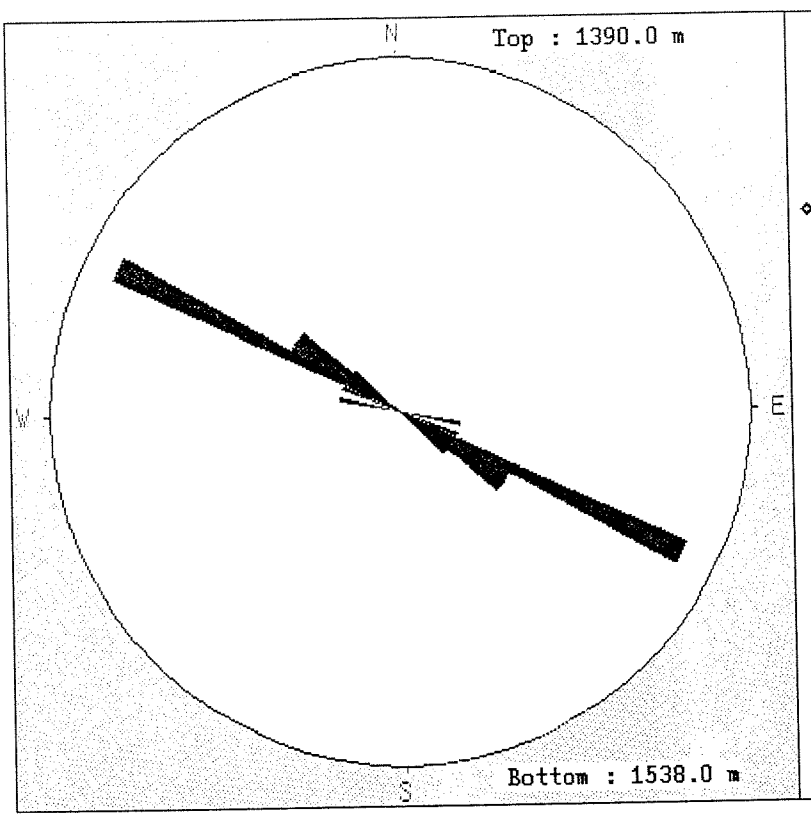
▲ : Incipient Breakouts

Mean Strike Azimuth
= 122.0 deg N

Standard Deviation
= 8.8 deg

Figure 20a. Strike azimuth plot of intermediate breakouts in Cypress c-50-B/94-B-15. Mean strike azimuth for 12 samples is computed as 119.4° N (standard deviation = 7.4°, Mardia 1972)

Figure 20b. Strike azimuth plot of mature breakouts in Cypress c-50-B/94-B-15. Mean strike azimuth for 8 samples is computed as 113.9° N (standard deviation = 8.3°, Mardia 1972)



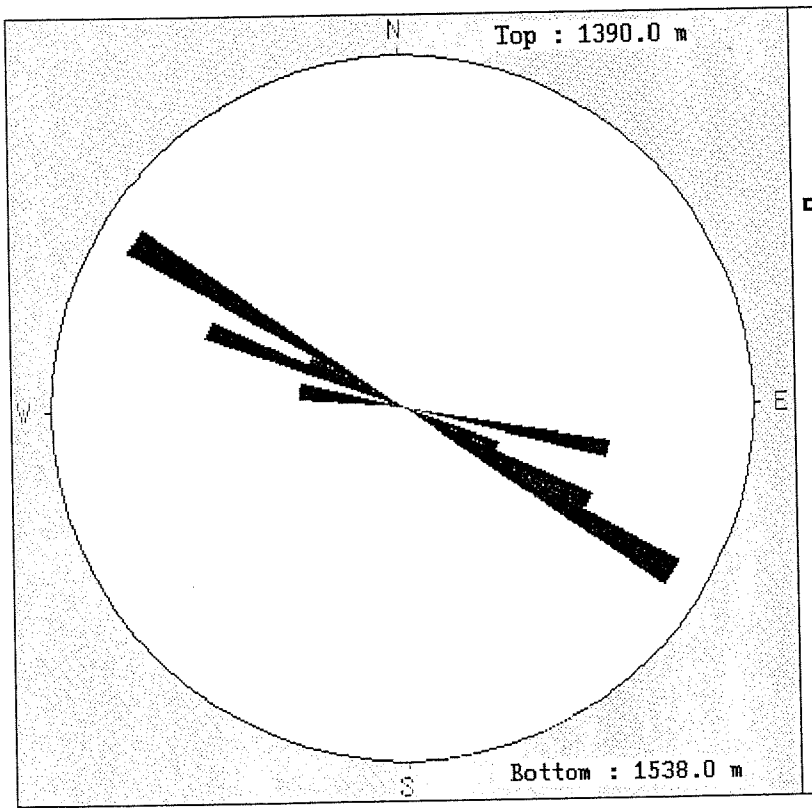
Strike Histogram

Ref : True
~ 12 samples ~

◇ : Intermediate Breakouts

Mean Strike Azimuth
= 119.4 deg N

Standard Deviation
= 7.4 deg



Strike Histogram

Ref : True
~ 8 samples ~

◘ : Mature Breakouts

Mean Strike Azimuth
= 113.9 deg N

Standard Deviation
= 8.3 deg

Figure 21. Strike azimuth plot of bedding planes in Cypress c-50-B/94-B-15. Mean strike azimuth for the 28 measured samples is computed as 159.6° N (standard deviation = 39.4°, Mardia 1972)

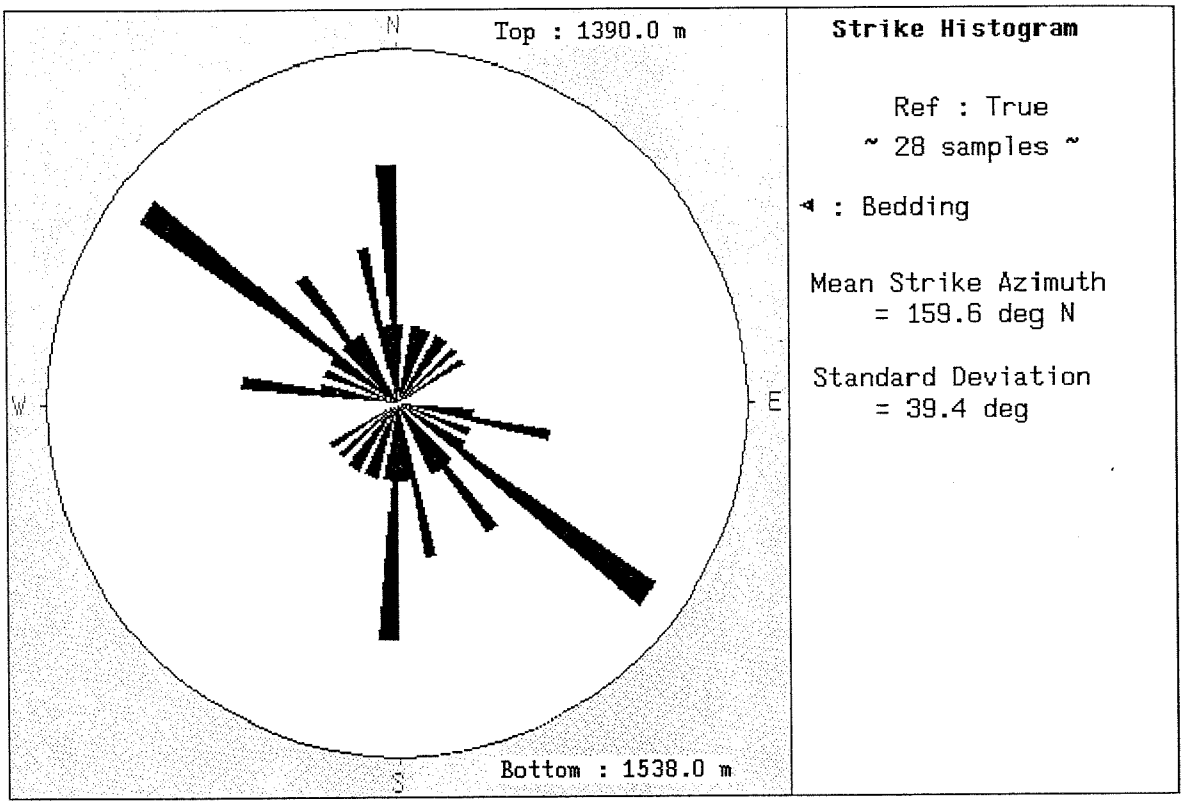
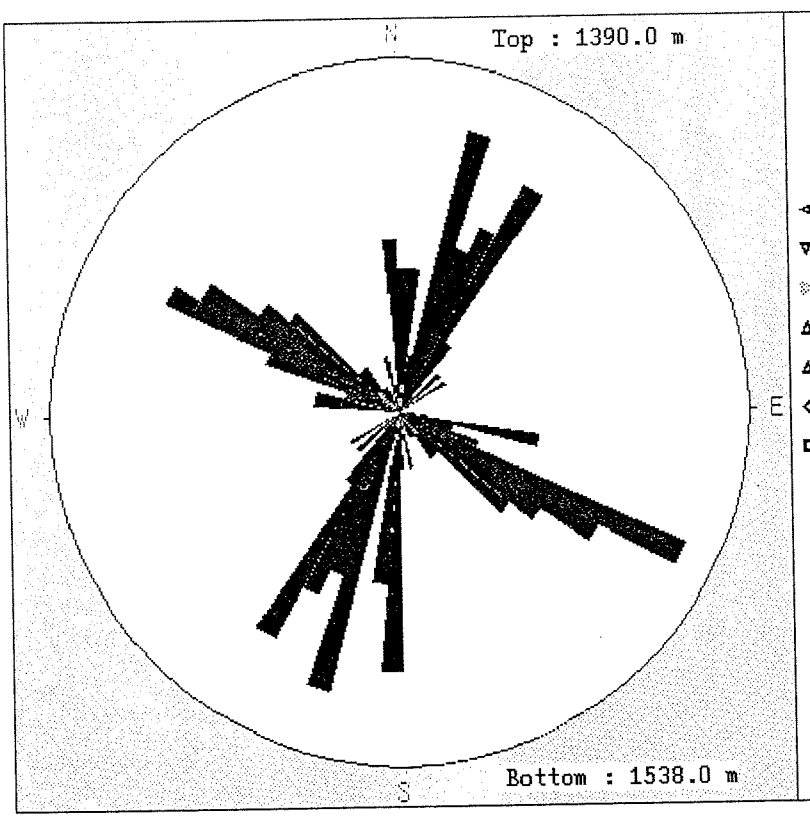

N
Top : 1390.0 m
W
E
S
Bottom : 1538.0 m
Strike Histogram
Ref : True
~ 28 samples ~
: Bedding
Mean Strike Azimuth
= 159.6 deg N
Standard Deviation
= 39.4 deg

Figure 22a. Strike azimuth summary plot of all the features measured in Cypress c-50-B/94-B-15.

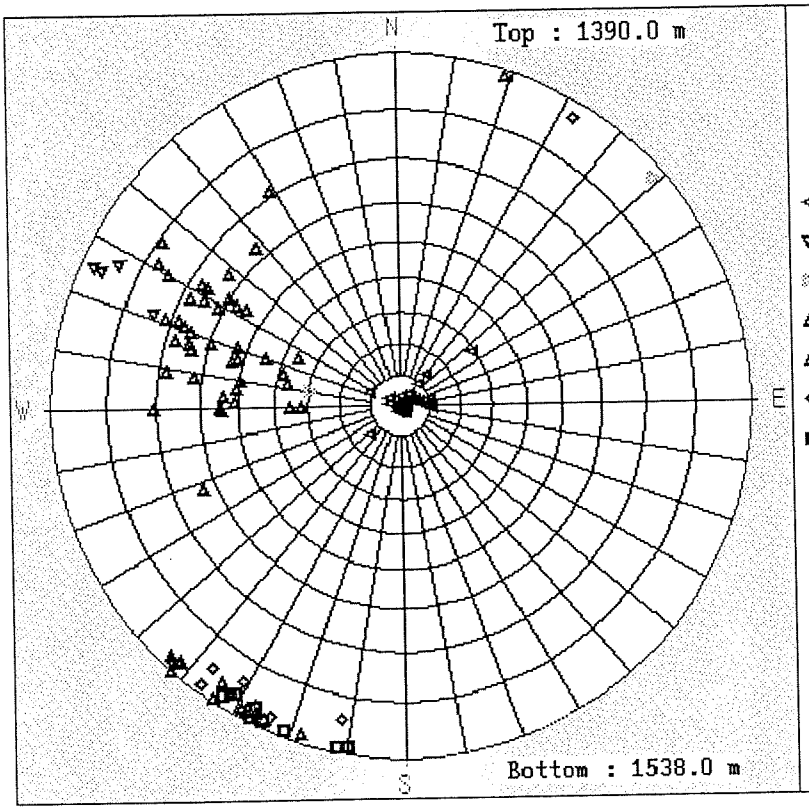
Figure 22b. Wulf stereonet summary diagram of all features measured in Cypress c-50-B/94-B-15.



Strike Histogram

Ref : True
~ 108 samples ~

◁ : Bedding
▽ : Semi Vertical Frac
▷ : Natural Fractures
△ : Chatter Fractures
▲ : Incipient Breakouts
◇ : Intermediate Breakou
□ : Mature Breakouts



Wulff Stereonet
(Upper Hemisphere)

Ref : True
~ 108 samples ~

◁ : Bedding
▽ : Semi Vertical Frac
▷ : Natural Fractures
△ : Chatter Fractures
▲ : Incipient Breakouts
◇ : Intermediate Breakou
□ : Mature Breakouts

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Well Name: CYPRESS c-50-B/94-B-15 Semi-vertical Fracture Orientations							
Depth KB m	Azimuth of feature	Sin Azi	Cumulative Total Sin Azi	Cos Azi	Cos Azi corrected for zero values	Cumulative Total Cos Azi	Measurement made or not 1 or 0 entered
1390.3	0	0.000	0.000	1.000	0.000	0.000	0
1390.4	0	0.000	0.000	1.000	0.000	0.000	0
1390.6	0	0.000	0.000	1.000	0.000	0.000	0
1390.7	0	0.000	0.000	1.000	0.000	0.000	0
1391.0	0	0.000	0.000	1.000	0.000	0.000	0
1391.1	0	0.000	0.000	1.000	0.000	0.000	0
1391.2	0	0.000	0.000	1.000	0.000	0.000	0
1391.5	0	0.000	0.000	1.000	0.000	0.000	0
1392.2	0	0.000	0.000	1.000	0.000	0.000	0
1392.6	0	0.000	0.000	1.000	0.000	0.000	0
1392.8	0	0.000	0.000	1.000	0.000	0.000	0
1393.1	0	0.000	0.000	1.000	0.000	0.000	0
1393.4	0	0.000	0.000	1.000	0.000	0.000	0
1393.5	0	0.000	0.000	1.000	0.000	0.000	0
1393.6	0	0.000	0.000	1.000	0.000	0.000	0
1393.9	0	0.000	0.000	1.000	0.000	0.000	0
1395.0	0	0.000	0.000	1.000	0.000	0.000	0
1395.4	0	0.000	0.000	1.000	0.000	0.000	0
1395.8	0	0.000	0.000	1.000	0.000	0.000	0
1396.1	0	0.000	0.000	1.000	0.000	0.000	0
1396.4	0	0.000	0.000	1.000	0.000	0.000	0
1396.8	0	0.000	0.000	1.000	0.000	0.000	0
1397.1	0	0.000	0.000	1.000	0.000	0.000	0
1397.3	0	0.000	0.000	1.000	0.000	0.000	0
1397.6	0	0.000	0.000	1.000	0.000	0.000	0
1398.0	0	0.000	0.000	1.000	0.000	0.000	0
1398.4	0	0.000	0.000	1.000	0.000	0.000	0
1399.0	0	0.000	0.000	1.000	0.000	0.000	0
1399.1	0	0.000	0.000	1.000	0.000	0.000	0
1399.4	0	0.000	0.000	1.000	0.000	0.000	0
1399.6	0	0.000	0.000	1.000	0.000	0.000	0
1399.8	0	0.000	0.000	1.000	0.000	0.000	0
1399.9	0	0.000	0.000	1.000	0.000	0.000	0
1400.1	0	0.000	0.000	1.000	0.000	0.000	0
1402.9	0	0.000	0.000	1.000	0.000	0.000	0
1403.3	0	0.000	0.000	1.000	0.000	0.000	0
1404.3	0	0.000	0.000	1.000	0.000	0.000	0
1404.5	0	0.000	0.000	1.000	0.000	0.000	0
1405.0	0	0.000	0.000	1.000	0.000	0.000	0
1405.1	0	0.000	0.000	1.000	0.000	0.000	0
1405.3	0	0.000	0.000	1.000	0.000	0.000	0
1405.8	0	0.000	0.000	1.000	0.000	0.000	0
1406.4	0	0.000	0.000	1.000	0.000	0.000	0
1406.5	0	0.000	0.000	1.000	0.000	0.000	0
1407.0	0	0.000	0.000	1.000	0.000	0.000	0
1409.1	0	0.000	0.000	1.000	0.000	0.000	0
1409.2	0	0.000	0.000	1.000	0.000	0.000	0
1412.4	0	0.000	0.000	1.000	0.000	0.000	0
1412.9	0	0.000	0.000	1.000	0.000	0.000	0
1414.5	0	0.000	0.000	1.000	0.000	0.000	0
1418.5	0	0.000	0.000	1.000	0.000	0.000	0
1419.1	0	0.000	0.000	1.000	0.000	0.000	0
1423.6	0	0.000	0.000	1.000	0.000	0.000	0

1425.6	0	0.000	0.000	1.000	0.000	0.000	0
1428.1	0	0.000	0.000	1.000	0.000	0.000	0
1428.4	0	0.000	0.000	1.000	0.000	0.000	0
1429.0	0	0.000	0.000	1.000	0.000	0.000	0
1429.2	0	0.000	0.000	1.000	0.000	0.000	0
1429.3	0	0.000	0.000	1.000	0.000	0.000	0
1431.3	0	0.000	0.000	1.000	0.000	0.000	0
1433.6	0	0.000	0.000	1.000	0.000	0.000	0
1434.7	0	0.000	0.000	1.000	0.000	0.000	0
1435.4	0	0.000	0.000	1.000	0.000	0.000	0
1436.9	0	0.000	0.000	1.000	0.000	0.000	0
1437.7	0	0.000	0.000	1.000	0.000	0.000	0
1438.7	0	0.000	0.000	1.000	0.000	0.000	0
1441.0	0	0.000	0.000	1.000	0.000	0.000	0
1442.5	0	0.000	0.000	1.000	0.000	0.000	0
1443.1	0	0.000	0.000	1.000	0.000	0.000	0
1443.7	0	0.000	0.000	1.000	0.000	0.000	0
1444.9	0	0.000	0.000	1.000	0.000	0.000	0
1446.4	0	0.000	0.000	1.000	0.000	0.000	0
1448.3	0	0.000	0.000	1.000	0.000	0.000	0
1450.6	0	0.000	0.000	1.000	0.000	0.000	0
1457.5	0	0.000	0.000	1.000	0.000	0.000	0
1460.0	0	0.000	0.000	1.000	0.000	0.000	0
1462.0	0	0.000	0.000	1.000	0.000	0.000	0
1462.9	0	0.000	0.000	1.000	0.000	0.000	0
1463.7	0	0.000	0.000	1.000	0.000	0.000	0
1465.4	0	0.000	0.000	1.000	0.000	0.000	0
1468.5	0	0.000	0.000	1.000	0.000	0.000	0
1483.0	0	0.000	0.000	1.000	0.000	0.000	0
1484.3	0	0.000	0.000	1.000	0.000	0.000	0
1485.4	0	0.000	0.000	1.000	0.000	0.000	0
1488.7	0	0.000	0.000	1.000	0.000	0.000	0
1490.4	0	0.000	0.000	1.000	0.000	0.000	0
1494.0	0	0.000	0.000	1.000	0.000	0.000	0
1496.0	0	0.000	0.000	1.000	0.000	0.000	0
1496.5	0	0.000	0.000	1.000	0.000	0.000	0
1500.4	0	0.000	0.000	1.000	0.000	0.000	0
1504.5	0	0.000	0.000	1.000	0.000	0.000	0
1505.6	0	0.000	0.000	1.000	0.000	0.000	0
1506.1	0	0.000	0.000	1.000	0.000	0.000	0
1507.2	0	0.000	0.000	1.000	0.000	0.000	0
1508.8	0	0.000	0.000	1.000	0.000	0.000	0
1514.2	0	0.000	0.000	1.000	0.000	0.000	0
1515.4	0	0.000	0.000	1.000	0.000	0.000	0
1517.1	0	0.000	0.000	1.000	0.000	0.000	0
1517.5	0	0.000	0.000	1.000	0.000	0.000	0
1519.4	205	-0.423	-0.423	-0.906	-0.906	-0.906	1
1520.0	205	-0.423	-0.845	-0.906	-0.906	-1.813	1
1521.7	0	0.000	-0.845	1.000	0.000	-1.813	0
1522.4	0	0.000	-0.845	1.000	0.000	-1.813	0
1523.4	0	0.000	-0.845	1.000	0.000	-1.813	0
1524.7	0	0.000	-0.845	1.000	0.000	-1.813	0
1526.7	201	-0.358	-1.204	-0.934	-0.934	-2.746	1
1529.8	207	-0.454	-1.658	-0.891	-0.891	-3.637	1
1534.0	0	0.000	-1.658	1.000	0.000	-3.637	0

Arithmetic mean of strike values (col 2) = 204.5 # of measurements = 4

Feature Orientation measurements **Well: CYPRESS c-50-B/94-B-15 Semi-Vertical Fractures**

Reference Mardia 1972 for statistics of directional data

Total Sin x thick	Total Cos x thick	Total Thickness	S Col A/ColC	C ColB/ColC	R x R	R	S/R	C/R	Azimuth from S/R	Azimuth from C/R	Standard Deviation
-1.658	-3.637	4	-0.4145	-0.9093	0.9985	0.9993	-0.4148	-0.9099	204.5	204.5	2.2

Well Name: CYPRESS c-50-B/94-B-15 Chatter Fracture Orientation Measurements							
Depth KB m	Azimuth of feature	Sin Azi	Cumulative Total Sin Azi	Cos Azi	Cos Azi corrected for zero values	Cumulative Total Cos Azi	Measurement made or not 1 or 0 entered
1390.3	158	0.375	0.375	-0.927	-0.927	-0.927	1
1390.4	197	-0.292	0.082	-0.956	-0.956	-1.883	1
1390.6	181	-0.017	0.065	-1.000	-1.000	-2.883	1
1390.7	181	-0.017	0.047	-1.000	-1.000	-3.883	1
1391.0	196	-0.276	-0.228	-0.961	-0.961	-4.844	1
1391.1	0	0.000	-0.228	1.000	0.000	-4.844	0
1391.2	209	-0.485	-0.713	-0.875	-0.875	-5.719	1
1391.5	228	-0.743	-1.456	-0.669	-0.669	-6.388	1
1392.2	0	0.000	-1.456	1.000	0.000	-6.388	0
1392.6	179	0.017	-1.439	-1.000	-1.000	-7.388	1
1392.8	206	-0.438	-1.877	-0.899	-0.899	-8.287	1
1393.1	180	0.000	-1.877	-1.000	-1.000	-9.287	1
1393.4	192	-0.208	-2.085	-0.978	-0.978	-10.265	1
1393.5	239	-0.857	-2.942	-0.515	-0.515	-10.780	1
1393.6	200	-0.342	-3.284	-0.940	-0.940	-11.720	1
1393.9	0	0.000	-3.284	1.000	0.000	-11.720	0
1395.0	197	-0.292	-3.577	-0.956	-0.956	-12.676	1
1395.4	183	-0.052	-3.629	-0.999	-0.999	-13.675	1
1395.8	212	-0.530	-4.159	-0.848	-0.848	-14.523	1
1396.1	196	-0.276	-4.435	-0.961	-0.961	-15.484	1
1396.4	187	-0.122	-4.556	-0.993	-0.993	-16.477	1
1396.8	0	0.000	-4.556	1.000	0.000	-16.477	0
1397.1	189	-0.156	-4.713	-0.988	-0.988	-17.464	1
1397.3	191	-0.191	-4.904	-0.982	-0.982	-18.446	1
1397.6	184	-0.070	-4.973	-0.998	-0.998	-19.443	1
1398.0	201	-0.358	-5.332	-0.934	-0.934	-20.377	1
1398.4	202	-0.375	-5.706	-0.927	-0.927	-21.304	1
1399.0	198	-0.309	-6.015	-0.951	-0.951	-22.255	1
1399.1	190	-0.174	-6.189	-0.985	-0.985	-23.240	1
1399.4	199	-0.326	-6.515	-0.946	-0.946	-24.186	1
1399.6	201	-0.358	-6.873	-0.934	-0.934	-25.119	1
1399.8	198	-0.309	-7.182	-0.951	-0.951	-26.070	1
1399.9	0	0.000	-7.182	1.000	0.000	-26.070	0
1400.1	0	0.000	-7.182	1.000	0.000	-26.070	0
1402.9	213	-0.545	-7.727	-0.839	-0.839	-26.909	1
1403.3	213	-0.545	-8.271	-0.839	-0.839	-27.748	1
1404.3	212	-0.530	-8.801	-0.848	-0.848	-28.596	1
1404.5	218	-0.616	-9.417	-0.788	-0.788	-29.384	1
1405.0	211	-0.515	-9.932	-0.857	-0.857	-30.241	1
1405.1	212	-0.530	-10.462	-0.848	-0.848	-31.089	1
1405.3	208	-0.469	-10.931	-0.883	-0.883	-31.972	1
1405.8	210	-0.500	-11.431	-0.866	-0.866	-32.838	1
1406.4	212	-0.530	-11.961	-0.848	-0.848	-33.686	1
1406.5	0	0.000	-11.961	1.000	0.000	-33.686	0
1407.0	0	0.000	-11.961	1.000	0.000	-33.686	0
1409.1	215	-0.574	-12.535	-0.819	-0.819	-34.505	1
1409.2	0	0.000	-12.535	1.000	0.000	-34.505	0
1412.4	0	0.000	-12.535	1.000	0.000	-34.505	0
1412.9	0	0.000	-12.535	1.000	0.000	-34.505	0
1414.5	180	0.000	-12.535	-1.000	-1.000	-35.505	1
1418.5	0	0.000	-12.535	1.000	0.000	-35.505	0
1419.1	0	0.000	-12.535	1.000	0.000	-35.505	0
1423.6	0	0.000	-12.535	1.000	0.000	-35.505	0

1425.6	0	0.000	-12.535	1.000	0.000	-35.505	0
1428.1	209	-0.485	-13.020	-0.875	-0.875	-36.380	1
1428.4	0	0.000	-13.020	1.000	0.000	-36.380	0
1429.0	201	-0.358	-13.378	-0.934	-0.934	-37.313	1
1429.2	201	-0.358	-13.736	-0.934	-0.934	-38.247	1
1429.3	0	0.000	-13.736	1.000	0.000	-38.247	0
1431.3	0	0.000	-13.736	1.000	0.000	-38.247	0
1433.6	0	0.000	-13.736	1.000	0.000	-38.247	0
1434.7	0	0.000	-13.736	1.000	0.000	-38.247	0
1435.4	0	0.000	-13.736	1.000	0.000	-38.247	0
1436.9	0	0.000	-13.736	1.000	0.000	-38.247	0
1437.7	0	0.000	-13.736	1.000	0.000	-38.247	0
1438.7	0	0.000	-13.736	1.000	0.000	-38.247	0
1441.0	0	0.000	-13.736	1.000	0.000	-38.247	0
1442.5	0	0.000	-13.736	1.000	0.000	-38.247	0
1443.1	0	0.000	-13.736	1.000	0.000	-38.247	0
1443.7	0	0.000	-13.736	1.000	0.000	-38.247	0
1444.9	0	0.000	-13.736	1.000	0.000	-38.247	0
1446.4	0	0.000	-13.736	1.000	0.000	-38.247	0
1448.3	0	0.000	-13.736	1.000	0.000	-38.247	0
1450.6	0	0.000	-13.736	1.000	0.000	-38.247	0
1457.5	0	0.000	-13.736	1.000	0.000	-38.247	0
1460.0	0	0.000	-13.736	1.000	0.000	-38.247	0
1462.0	0	0.000	-13.736	1.000	0.000	-38.247	0
1462.9	0	0.000	-13.736	1.000	0.000	-38.247	0
1463.7	0	0.000	-13.736	1.000	0.000	-38.247	0
1465.4	0	0.000	-13.736	1.000	0.000	-38.247	0
1468.5	0	0.000	-13.736	1.000	0.000	-38.247	0
1483.0	0	0.000	-13.736	1.000	0.000	-38.247	0
1484.3	0	0.000	-13.736	1.000	0.000	-38.247	0
1485.4	0	0.000	-13.736	1.000	0.000	-38.247	0
1488.7	0	0.000	-13.736	1.000	0.000	-38.247	0
1490.4	0	0.000	-13.736	1.000	0.000	-38.247	0
1494.0	0	0.000	-13.736	1.000	0.000	-38.247	0
1496.0	0	0.000	-13.736	1.000	0.000	-38.247	0
1496.5	0	0.000	-13.736	1.000	0.000	-38.247	0
1500.4	0	0.000	-13.736	1.000	0.000	-38.247	0
1504.5	0	0.000	-13.736	1.000	0.000	-38.247	0
1505.6	0	0.000	-13.736	1.000	0.000	-38.247	0
1506.1	0	0.000	-13.736	1.000	0.000	-38.247	0
1507.2	0	0.000	-13.736	1.000	0.000	-38.247	0
1508.8	0	0.000	-13.736	1.000	0.000	-38.247	0
1514.2	0	0.000	-13.736	1.000	0.000	-38.247	0
1515.4	0	0.000	-13.736	1.000	0.000	-38.247	0
1517.1	0	0.000	-13.736	1.000	0.000	-38.247	0
1517.5	0	0.000	-13.736	1.000	0.000	-38.247	0
1519.4	0	0.000	-13.736	1.000	0.000	-38.247	0
1520.0	0	0.000	-13.736	1.000	0.000	-38.247	0
1521.7	0	0.000	-13.736	1.000	0.000	-38.247	0
1522.4	0	0.000	-13.736	1.000	0.000	-38.247	0
1523.4	0	0.000	-13.736	1.000	0.000	-38.247	0
1524.7	0	0.000	-13.736	1.000	0.000	-38.247	0
1526.7	0	0.000	-13.736	1.000	0.000	-38.247	0
1529.8	0	0.000	-13.736	1.000	0.000	-38.247	0
1534.0	0	0.000	-13.736	1.000	0.000	-38.247	0

Arithmetic mean of strike values (col 2)= 199.7 Total measurements taken = 42

Feature Orientation measurements **Well: CYPRESS c-50-B/94-B-15 Chatter Fractures**

Reference Mardia 1972 for statistics of directional data

Total Sin x thick	Total Cos x thick	Total Thickness	S Col A/ColC	C ColB/ColC	R x R	R	S/R	C/R	Azimuth from S/R	Azimuth from C/R	Standard Deviation
-13.736	-38.247	42	-0.3270	-0.9106	0.9362	0.9676	-0.3380	-0.9411	199.8	199.8	14.7

Well Name: CYPRESS c-50-B/94-B-15 Natural Fracture Orientation Measurements							
Depth KB m	Azimuth of feature	Sin Azi	Cumulative Total Sin Azi	Cos Azi	Cos Azi corrected for zero values	Cumulative Total Cos Azi	Measurement made or not 1 or 0 entered
1390.3	0	0.000	0.000	1.000	0.000	0.000	0
1390.4	0	0.000	0.000	1.000	0.000	0.000	0
1390.6	0	0.000	0.000	1.000	0.000	0.000	0
1390.7	0	0.000	0.000	1.000	0.000	0.000	0
1391.0	0	0.000	0.000	1.000	0.000	0.000	0
1391.1	0	0.000	0.000	1.000	0.000	0.000	0
1391.2	0	0.000	0.000	1.000	0.000	0.000	0
1391.5	0	0.000	0.000	1.000	0.000	0.000	0
1392.2	0	0.000	0.000	1.000	0.000	0.000	0
1392.6	0	0.000	0.000	1.000	0.000	0.000	0
1392.8	0	0.000	0.000	1.000	0.000	0.000	0
1393.1	0	0.000	0.000	1.000	0.000	0.000	0
1393.4	0	0.000	0.000	1.000	0.000	0.000	0
1393.5	0	0.000	0.000	1.000	0.000	0.000	0
1393.6	0	0.000	0.000	1.000	0.000	0.000	0
1393.9	0	0.000	0.000	1.000	0.000	0.000	0
1395.0	0	0.000	0.000	1.000	0.000	0.000	0
1395.4	0	0.000	0.000	1.000	0.000	0.000	0
1395.8	0	0.000	0.000	1.000	0.000	0.000	0
1396.1	0	0.000	0.000	1.000	0.000	0.000	0
1396.4	0	0.000	0.000	1.000	0.000	0.000	0
1396.8	0	0.000	0.000	1.000	0.000	0.000	0
1397.1	0	0.000	0.000	1.000	0.000	0.000	0
1397.3	0	0.000	0.000	1.000	0.000	0.000	0
1397.6	0	0.000	0.000	1.000	0.000	0.000	0
1398.0	0	0.000	0.000	1.000	0.000	0.000	0
1398.4	0	0.000	0.000	1.000	0.000	0.000	0
1399.0	0	0.000	0.000	1.000	0.000	0.000	0
1399.1	0	0.000	0.000	1.000	0.000	0.000	0
1399.4	0	0.000	0.000	1.000	0.000	0.000	0
1399.6	0	0.000	0.000	1.000	0.000	0.000	0
1399.8	0	0.000	0.000	1.000	0.000	0.000	0
1399.9	0	0.000	0.000	1.000	0.000	0.000	0
1400.1	0	0.000	0.000	1.000	0.000	0.000	0
1402.9	0	0.000	0.000	1.000	0.000	0.000	0
1403.3	0	0.000	0.000	1.000	0.000	0.000	0
1404.3	0	0.000	0.000	1.000	0.000	0.000	0
1404.5	0	0.000	0.000	1.000	0.000	0.000	0
1405.0	0	0.000	0.000	1.000	0.000	0.000	0
1405.1	0	0.000	0.000	1.000	0.000	0.000	0
1405.3	0	0.000	0.000	1.000	0.000	0.000	0
1405.8	0	0.000	0.000	1.000	0.000	0.000	0
1406.4	0	0.000	0.000	1.000	0.000	0.000	0
1406.5	0	0.000	0.000	1.000	0.000	0.000	0
1407.0	0	0.000	0.000	1.000	0.000	0.000	0
1409.1	0	0.000	0.000	1.000	0.000	0.000	0
1409.2	0	0.000	0.000	1.000	0.000	0.000	0
1412.4	0	0.000	0.000	1.000	0.000	0.000	0
1412.9	0	0.000	0.000	1.000	0.000	0.000	0
1414.5	0	0.000	0.000	1.000	0.000	0.000	0
1418.5	0	0.000	0.000	1.000	0.000	0.000	0
1419.1	0	0.000	0.000	1.000	0.000	0.000	0
1423.6	0	0.000	0.000	1.000	0.000	0.000	0

1425.6	0	0.000	0.000	1.000	0.000	0.000	0
1428.1	0	0.000	0.000	1.000	0.000	0.000	0
1428.4	0	0.000	0.000	1.000	0.000	0.000	0
1429.0	0	0.000	0.000	1.000	0.000	0.000	0
1429.2	0	0.000	0.000	1.000	0.000	0.000	0
1429.3	0	0.000	0.000	1.000	0.000	0.000	0
1431.3	0	0.000	0.000	1.000	0.000	0.000	0
1433.6	0	0.000	0.000	1.000	0.000	0.000	0
1434.7	0	0.000	0.000	1.000	0.000	0.000	0
1435.4	0	0.000	0.000	1.000	0.000	0.000	0
1436.9	0	0.000	0.000	1.000	0.000	0.000	0
1437.7	0	0.000	0.000	1.000	0.000	0.000	0
1438.7	0	0.000	0.000	1.000	0.000	0.000	0
1441.0	0	0.000	0.000	1.000	0.000	0.000	0
1442.5	0	0.000	0.000	1.000	0.000	0.000	0
1443.1	0	0.000	0.000	1.000	0.000	0.000	0
1443.7	0	0.000	0.000	1.000	0.000	0.000	0
1444.9	0	0.000	0.000	1.000	0.000	0.000	0
1446.4	139	0.656	0.656	-0.755	-0.755	-0.755	1
1448.3	0	0.000	0.656	1.000	0.000	-0.755	0
1450.6	0	0.000	0.656	1.000	0.000	-0.755	0
1457.5	0	0.000	0.656	1.000	0.000	-0.755	0
1460.0	0	0.000	0.656	1.000	0.000	-0.755	0
1462.0	0	0.000	0.656	1.000	0.000	-0.755	0
1462.9	0	0.000	0.656	1.000	0.000	-0.755	0
1463.7	190	-0.174	0.482	-0.985	-0.985	-1.740	1
1465.4	0	0.000	0.482	1.000	0.000	-1.740	0
1468.5	0	0.000	0.482	1.000	0.000	-1.740	0
1483.0	0	0.000	0.482	1.000	0.000	-1.740	0
1484.3	0	0.000	0.482	1.000	0.000	-1.740	0
1485.4	0	0.000	0.482	1.000	0.000	-1.740	0
1488.7	0	0.000	0.482	1.000	0.000	-1.740	0
1490.4	0	0.000	0.482	1.000	0.000	-1.740	0
1494.0	0	0.000	0.482	1.000	0.000	-1.740	0
1496.0	0	0.000	0.482	1.000	0.000	-1.740	0
1496.5	0	0.000	0.482	1.000	0.000	-1.740	0
1500.4	0	0.000	0.482	1.000	0.000	-1.740	0
1504.5	0	0.000	0.482	1.000	0.000	-1.740	0
1505.6	0	0.000	0.482	1.000	0.000	-1.740	0
1506.1	0	0.000	0.482	1.000	0.000	-1.740	0
1507.2	0	0.000	0.482	1.000	0.000	-1.740	0
1508.8	0	0.000	0.482	1.000	0.000	-1.740	0
1514.2	0	0.000	0.482	1.000	0.000	-1.740	0
1515.4	0	0.000	0.482	1.000	0.000	-1.740	0
1517.1	0	0.000	0.482	1.000	0.000	-1.740	0
1517.5	0	0.000	0.482	1.000	0.000	-1.740	0
1519.4	0	0.000	0.482	1.000	0.000	-1.740	0
1520.0	0	0.000	0.482	1.000	0.000	-1.740	0
1521.7	0	0.000	0.482	1.000	0.000	-1.740	0
1522.4	0	0.000	0.482	1.000	0.000	-1.740	0
1523.4	0	0.000	0.482	1.000	0.000	-1.740	0
1524.7	0	0.000	0.482	1.000	0.000	-1.740	0
1526.7	0	0.000	0.482	1.000	0.000	-1.740	0
1529.8	0	0.000	0.482	1.000	0.000	-1.740	0
1534.0	0	0.000	0.482	1.000	0.000	-1.740	0

Arithmetic mean of strike values (col 2) = 164.5 # of measurements taken = 2

Feature Orientation measurements **Well: CYPRESS c-50-B/94-B-15 Natural Fractures**

Reference Mardia 1972 for statistics of directional data

Total Sin x thick	Total Cos x thick	Total Thickness	S Col A/ColC	C ColB/ColC	R x R	R	S/R	C/R	Azimuth from S/R	Azimuth from C/R	Standard Deviation
0.482	-1.74	2	0.2410	-0.8700	0.8150	0.9028	0.2670	-0.9637	164.5	195.5	25.9

Well Name: CYPRESS c-50-B/94-B-15 Incipient Breakout Orientation Measurements							
Depth KB m	Azimuth of feature	Sin Azi	Cumulative Total Sin Azi	Cos Azi	Cos Azi corrected for zero values	Cumulative Total Cos Azi	Measurement made or not 1 or 0 entered
1390.3	0	0.000	0.000	1.000	0.000	0.000	0
1390.4	0	0.000	0.000	1.000	0.000	0.000	0
1390.6	0	0.000	0.000	1.000	0.000	0.000	0
1390.7	0	0.000	0.000	1.000	0.000	0.000	0
1391.0	0	0.000	0.000	1.000	0.000	0.000	0
1391.1	0	0.000	0.000	1.000	0.000	0.000	0
1391.2	0	0.000	0.000	1.000	0.000	0.000	0
1391.5	0	0.000	0.000	1.000	0.000	0.000	0
1392.2	0	0.000	0.000	1.000	0.000	0.000	0
1392.6	0	0.000	0.000	1.000	0.000	0.000	0
1392.8	0	0.000	0.000	1.000	0.000	0.000	0
1393.1	0	0.000	0.000	1.000	0.000	0.000	0
1393.4	0	0.000	0.000	1.000	0.000	0.000	0
1393.5	0	0.000	0.000	1.000	0.000	0.000	0
1393.6	0	0.000	0.000	1.000	0.000	0.000	0
1393.9	0	0.000	0.000	1.000	0.000	0.000	0
1395.0	0	0.000	0.000	1.000	0.000	0.000	0
1395.4	0	0.000	0.000	1.000	0.000	0.000	0
1395.8	0	0.000	0.000	1.000	0.000	0.000	0
1396.1	0	0.000	0.000	1.000	0.000	0.000	0
1396.4	0	0.000	0.000	1.000	0.000	0.000	0
1396.8	0	0.000	0.000	1.000	0.000	0.000	0
1397.1	0	0.000	0.000	1.000	0.000	0.000	0
1397.3	0	0.000	0.000	1.000	0.000	0.000	0
1397.6	0	0.000	0.000	1.000	0.000	0.000	0
1398.0	0	0.000	0.000	1.000	0.000	0.000	0
1398.4	0	0.000	0.000	1.000	0.000	0.000	0
1399.0	0	0.000	0.000	1.000	0.000	0.000	0
1399.1	0	0.000	0.000	1.000	0.000	0.000	0
1399.4	0	0.000	0.000	1.000	0.000	0.000	0
1399.6	0	0.000	0.000	1.000	0.000	0.000	0
1399.8	0	0.000	0.000	1.000	0.000	0.000	0
1399.9	0	0.000	0.000	1.000	0.000	0.000	0
1400.1	0	0.000	0.000	1.000	0.000	0.000	0
1402.9	0	0.000	0.000	1.000	0.000	0.000	0
1403.3	0	0.000	0.000	1.000	0.000	0.000	0
1404.3	0	0.000	0.000	1.000	0.000	0.000	0
1404.5	0	0.000	0.000	1.000	0.000	0.000	0
1405.0	0	0.000	0.000	1.000	0.000	0.000	0
1405.1	0	0.000	0.000	1.000	0.000	0.000	0
1405.3	0	0.000	0.000	1.000	0.000	0.000	0
1405.8	0	0.000	0.000	1.000	0.000	0.000	0
1406.4	0	0.000	0.000	1.000	0.000	0.000	0
1406.5	0	0.000	0.000	1.000	0.000	0.000	0
1407.0	0	0.000	0.000	1.000	0.000	0.000	0
1409.1	0	0.000	0.000	1.000	0.000	0.000	0
1409.2	0	0.000	0.000	1.000	0.000	0.000	0
1412.4	0	0.000	0.000	1.000	0.000	0.000	0
1412.9	0	0.000	0.000	1.000	0.000	0.000	0
1414.5	0	0.000	0.000	1.000	0.000	0.000	0
1418.5	0	0.000	0.000	1.000	0.000	0.000	0
1419.1	0	0.000	0.000	1.000	0.000	0.000	0
1423.6	0	0.000	0.000	1.000	0.000	0.000	0

1425.6	0	0.000	0.000	1.000	0.000	0.000	0
1428.1	0	0.000	0.000	1.000	0.000	0.000	0
1428.4	0	0.000	0.000	1.000	0.000	0.000	0
1429.0	0	0.000	0.000	1.000	0.000	0.000	0
1429.2	0	0.000	0.000	1.000	0.000	0.000	0
1429.3	0	0.000	0.000	1.000	0.000	0.000	0
1431.3	0	0.000	0.000	1.000	0.000	0.000	0
1433.6	0	0.000	0.000	1.000	0.000	0.000	0
1434.7	124	0.829	0.829	-0.559	-0.559	-0.559	1
1435.4	117	0.891	1.720	-0.454	-0.454	-1.013	1
1436.9	0	0.000	1.720	1.000	0.000	-1.013	0
1437.7	0	0.000	1.720	1.000	0.000	-1.013	0
1438.7	0	0.000	1.720	1.000	0.000	-1.013	0
1441.0	0	0.000	1.720	1.000	0.000	-1.013	0
1442.5	0	0.000	1.720	1.000	0.000	-1.013	0
1443.1	0	0.000	1.720	1.000	0.000	-1.013	0
1443.7	0	0.000	1.720	1.000	0.000	-1.013	0
1444.9	0	0.000	1.720	1.000	0.000	-1.013	0
1446.4	0	0.000	1.720	1.000	0.000	-1.013	0
1448.3	0	0.000	1.720	1.000	0.000	-1.013	0
1450.6	0	0.000	1.720	1.000	0.000	-1.013	0
1457.5	0	0.000	1.720	1.000	0.000	-1.013	0
1460.0	0	0.000	1.720	1.000	0.000	-1.013	0
1462.0	0	0.000	1.720	1.000	0.000	-1.013	0
1462.9	0	0.000	1.720	1.000	0.000	-1.013	0
1463.7	0	0.000	1.720	1.000	0.000	-1.013	0
1465.4	0	0.000	1.720	1.000	0.000	-1.013	0
1468.5	0	0.000	1.720	1.000	0.000	-1.013	0
1483.0	0	0.000	1.720	1.000	0.000	-1.013	0
1484.3	0	0.000	1.720	1.000	0.000	-1.013	0
1485.4	0	0.000	1.720	1.000	0.000	-1.013	0
1488.7	132	0.743	2.463	-0.669	-0.669	-1.682	1
1490.4	0	0.000	2.463	1.000	0.000	-1.682	0
1494.0	134	0.719	3.183	-0.695	-0.695	-2.377	1
1496.0	0	0.000	3.183	1.000	0.000	-2.377	0
1496.5	132	0.743	3.926	-0.669	-0.669	-3.046	1
1500.4	0	0.000	3.926	1.000	0.000	-3.046	0
1504.5	124	0.829	4.755	-0.559	-0.559	-3.605	1
1505.6	118	0.883	5.638	-0.469	-0.469	-4.075	1
1506.1	0	0.000	5.638	1.000	0.000	-4.075	0
1507.2	0	0.000	5.638	1.000	0.000	-4.075	0
1508.8	109	0.946	6.583	-0.326	-0.326	-4.400	1
1514.2	0	0.000	6.583	1.000	0.000	-4.400	0
1515.4	132	0.743	7.326	-0.669	-0.669	-5.069	1
1517.1	0	0.000	7.326	1.000	0.000	-5.069	0
1517.5	119	0.875	8.201	-0.485	-0.485	-5.554	1
1519.4	0	0.000	8.201	1.000	0.000	-5.554	0
1520.0	0	0.000	8.201	1.000	0.000	-5.554	0
1521.7	0	0.000	8.201	1.000	0.000	-5.554	0
1522.4	115	0.906	9.107	-0.423	-0.423	-5.977	1
1523.4	108	0.951	10.058	-0.309	-0.309	-6.286	1
1524.7	0	0.000	10.058	1.000	0.000	-6.286	0
1526.7	0	0.000	10.058	1.000	0.000	-6.286	0
1529.8	0	0.000	10.058	1.000	0.000	-6.286	0
1534.0	0	0.000	10.058	1.000	0.000	-6.286	0

Arihmetic mean of strike values (col 2)= 122.0 Total measurements taken = 12

Feature Orientation measurements **Well: CYPRESS c-50-B/94-B-15 Incipient Breakouts**

Reference Mardia 1972 for statistics of directional data

Total Sin x thick	Total Cos x thick	Total Thickness	S Col A/ColC	C ColB/ColC	R x R	R	S/R	C/R	Azimuth from S/R	Azimuth from C/R	Standard Deviation
10.058	-6.286	12	0.8382	-0.5238	0.9769	0.9884	0.8480	-0.5300	122.0	238.0	8.8

Well Name: CYPRESS c-50-B/94-B-15 Intermediate Breakout Measurements							
Depth KB m	Azimuth of feature	Sin Azi	Cumulative Total Sin Azi	Cos Azi	Cos Azi corrected for zero values	Cumulative Total Cos Azi	Measurement made or not 1 or 0 entered
1390.3	0	0.000	0.000	1.000	0.000	0.000	0
1390.4	0	0.000	0.000	1.000	0.000	0.000	0
1390.6	0	0.000	0.000	1.000	0.000	0.000	0
1390.7	0	0.000	0.000	1.000	0.000	0.000	0
1391.0	0	0.000	0.000	1.000	0.000	0.000	0
1391.1	0	0.000	0.000	1.000	0.000	0.000	0
1391.2	0	0.000	0.000	1.000	0.000	0.000	0
1391.5	0	0.000	0.000	1.000	0.000	0.000	0
1392.2	0	0.000	0.000	1.000	0.000	0.000	0
1392.6	0	0.000	0.000	1.000	0.000	0.000	0
1392.8	0	0.000	0.000	1.000	0.000	0.000	0
1393.1	0	0.000	0.000	1.000	0.000	0.000	0
1393.4	0	0.000	0.000	1.000	0.000	0.000	0
1393.5	0	0.000	0.000	1.000	0.000	0.000	0
1393.6	0	0.000	0.000	1.000	0.000	0.000	0
1393.9	0	0.000	0.000	1.000	0.000	0.000	0
1395.0	0	0.000	0.000	1.000	0.000	0.000	0
1395.4	0	0.000	0.000	1.000	0.000	0.000	0
1395.8	0	0.000	0.000	1.000	0.000	0.000	0
1396.1	0	0.000	0.000	1.000	0.000	0.000	0
1396.4	0	0.000	0.000	1.000	0.000	0.000	0
1396.8	0	0.000	0.000	1.000	0.000	0.000	0
1397.1	0	0.000	0.000	1.000	0.000	0.000	0
1397.3	0	0.000	0.000	1.000	0.000	0.000	0
1397.6	0	0.000	0.000	1.000	0.000	0.000	0
1398.0	0	0.000	0.000	1.000	0.000	0.000	0
1398.4	0	0.000	0.000	1.000	0.000	0.000	0
1399.0	0	0.000	0.000	1.000	0.000	0.000	0
1399.1	0	0.000	0.000	1.000	0.000	0.000	0
1399.4	0	0.000	0.000	1.000	0.000	0.000	0
1399.6	0	0.000	0.000	1.000	0.000	0.000	0
1399.8	0	0.000	0.000	1.000	0.000	0.000	0
1399.9	0	0.000	0.000	1.000	0.000	0.000	0
1400.1	0	0.000	0.000	1.000	0.000	0.000	0
1402.9	0	0.000	0.000	1.000	0.000	0.000	0
1403.3	0	0.000	0.000	1.000	0.000	0.000	0
1404.3	0	0.000	0.000	1.000	0.000	0.000	0
1404.5	0	0.000	0.000	1.000	0.000	0.000	0
1405.0	0	0.000	0.000	1.000	0.000	0.000	0
1405.1	0	0.000	0.000	1.000	0.000	0.000	0
1405.3	0	0.000	0.000	1.000	0.000	0.000	0
1405.8	0	0.000	0.000	1.000	0.000	0.000	0
1406.4	0	0.000	0.000	1.000	0.000	0.000	0
1406.5	0	0.000	0.000	1.000	0.000	0.000	0
1407.0	118	0.883	0.883	-0.469	-0.469	-0.469	1
1409.1	0	0.000	0.883	1.000	0.000	-0.469	0
1409.2	0	0.000	0.883	1.000	0.000	-0.469	0
1412.4	122	0.848	1.731	-0.530	-0.530	-0.999	1
1412.9	0	0.000	1.731	1.000	0.000	-0.999	0
1414.5	0	0.000	1.731	1.000	0.000	-0.999	0
1418.5	117	0.891	2.622	-0.454	-0.454	-1.453	1
1419.1	0	0.000	2.622	1.000	0.000	-1.453	0
1423.6	0	0.000	2.622	1.000	0.000	-1.453	0

1425.6	127	0.799	3.421	-0.602	-0.602	-2.055	1
1428.1	0	0.000	3.421	1.000	0.000	-2.055	0
1428.4	121	0.857	4.278	-0.515	-0.515	-2.570	1
1429.0	0	0.000	4.278	1.000	0.000	-2.570	0
1429.2	0	0.000	4.278	1.000	0.000	-2.570	0
1429.3	0	0.000	4.278	1.000	0.000	-2.570	0
1431.3	118	0.883	5.161	-0.469	-0.469	-3.040	1
1433.6	0	0.000	5.161	1.000	0.000	-3.040	0
1434.7	0	0.000	5.161	1.000	0.000	-3.040	0
1435.4	0	0.000	5.161	1.000	0.000	-3.040	0
1436.9	0	0.000	5.161	1.000	0.000	-3.040	0
1437.7	114	0.914	6.074	-0.407	-0.407	-3.446	1
1438.7	117	0.891	6.965	-0.454	-0.454	-3.900	1
1441.0	0	0.000	6.965	1.000	0.000	-3.900	0
1442.5	0	0.000	6.965	1.000	0.000	-3.900	0
1443.1	0	0.000	6.965	1.000	0.000	-3.900	0
1443.7	0	0.000	6.965	1.000	0.000	-3.900	0
1444.9	0	0.000	6.965	1.000	0.000	-3.900	0
1446.4	0	0.000	6.965	1.000	0.000	-3.900	0
1448.3	0	0.000	6.965	1.000	0.000	-3.900	0
1450.6	102	0.978	7.943	-0.208	-0.208	-4.108	1
1457.5	0	0.000	7.943	1.000	0.000	-4.108	0
1460.0	0	0.000	7.943	1.000	0.000	-4.108	0
1462.0	0	0.000	7.943	1.000	0.000	-4.108	0
1462.9	0	0.000	7.943	1.000	0.000	-4.108	0
1463.7	0	0.000	7.943	1.000	0.000	-4.108	0
1465.4	0	0.000	7.943	1.000	0.000	-4.108	0
1468.5	0	0.000	7.943	1.000	0.000	-4.108	0
1483.0	0	0.000	7.943	1.000	0.000	-4.108	0
1484.3	133	0.731	8.675	-0.682	-0.682	-4.790	1
1485.4	117	0.891	9.566	-0.454	-0.454	-5.244	1
1488.7	0	0.000	9.566	1.000	0.000	-5.244	0
1490.4	0	0.000	9.566	1.000	0.000	-5.244	0
1494.0	0	0.000	9.566	1.000	0.000	-5.244	0
1496.0	0	0.000	9.566	1.000	0.000	-5.244	0
1496.5	0	0.000	9.566	1.000	0.000	-5.244	0
1500.4	0	0.000	9.566	1.000	0.000	-5.244	0
1504.5	0	0.000	9.566	1.000	0.000	-5.244	0
1505.6	0	0.000	9.566	1.000	0.000	-5.244	0
1506.1	127	0.799	10.364	-0.602	-0.602	-5.846	1
1507.2	0	0.000	10.364	1.000	0.000	-5.846	0
1508.8	0	0.000	10.364	1.000	0.000	-5.846	0
1514.2	0	0.000	10.364	1.000	0.000	-5.846	0
1515.4	0	0.000	10.364	1.000	0.000	-5.846	0
1517.1	0	0.000	10.364	1.000	0.000	-5.846	0
1517.5	0	0.000	10.364	1.000	0.000	-5.846	0
1519.4	0	0.000	10.364	1.000	0.000	-5.846	0
1520.0	0	0.000	10.364	1.000	0.000	-5.846	0
1521.7	0	0.000	10.364	1.000	0.000	-5.846	0
1522.4	0	0.000	10.364	1.000	0.000	-5.846	0
1523.4	0	0.000	10.364	1.000	0.000	-5.846	0
1524.7	0	0.000	10.364	1.000	0.000	-5.846	0
1526.7	0	0.000	10.364	1.000	0.000	-5.846	0
1529.8	0	0.000	10.364	1.000	0.000	-5.846	0
1534.0	0	0.000	10.364	1.000	0.000	-5.846	0

Arihmetic mean of strike values (col 2)= 119.4 Total measurements taken = 12

Feature Orientation measurements **Well: CYPRESS c-50-B/94-B-15 Intermediate Breakouts**

Reference Mardia 1972 for statistics of directional data

Total Sin x thick	Total Cos x thick	Total Thickness	S Col A/ColC	C ColB/ColC	R x R	R	S/R	C/R	Azimuth from S/R	Azimuth from C/R	Standard Deviation
10.364	-5.846	12	0.8637	-0.4872	0.9833	0.9916	0.8710	-0.4913	119.4	240.6	7.4

Well Name: CYPRESS c-50-B/94-B-15 Mature Breakout Orientations							
Depth KB m	Azimuth of feature	Sin Azi	Cumulative Total Sin Azi	Cos Azi	Cos Azi corrected for zero values	Cumulative Total Cos Azi	Measurement made or not 1 or 0 entered
1390.3	0	0.000	0.000	1.000	0.000	0.000	0
1390.4	0	0.000	0.000	1.000	0.000	0.000	0
1390.6	0	0.000	0.000	1.000	0.000	0.000	0
1390.7	0	0.000	0.000	1.000	0.000	0.000	0
1391.0	0	0.000	0.000	1.000	0.000	0.000	0
1391.1	0	0.000	0.000	1.000	0.000	0.000	0
1391.2	0	0.000	0.000	1.000	0.000	0.000	0
1391.5	0	0.000	0.000	1.000	0.000	0.000	0
1392.2	0	0.000	0.000	1.000	0.000	0.000	0
1392.6	0	0.000	0.000	1.000	0.000	0.000	0
1392.8	0	0.000	0.000	1.000	0.000	0.000	0
1393.1	0	0.000	0.000	1.000	0.000	0.000	0
1393.4	0	0.000	0.000	1.000	0.000	0.000	0
1393.5	0	0.000	0.000	1.000	0.000	0.000	0
1393.6	0	0.000	0.000	1.000	0.000	0.000	0
1393.9	0	0.000	0.000	1.000	0.000	0.000	0
1395.0	0	0.000	0.000	1.000	0.000	0.000	0
1395.4	0	0.000	0.000	1.000	0.000	0.000	0
1395.8	0	0.000	0.000	1.000	0.000	0.000	0
1396.1	0	0.000	0.000	1.000	0.000	0.000	0
1396.4	0	0.000	0.000	1.000	0.000	0.000	0
1396.8	0	0.000	0.000	1.000	0.000	0.000	0
1397.1	0	0.000	0.000	1.000	0.000	0.000	0
1397.3	0	0.000	0.000	1.000	0.000	0.000	0
1397.6	0	0.000	0.000	1.000	0.000	0.000	0
1398.0	0	0.000	0.000	1.000	0.000	0.000	0
1398.4	0	0.000	0.000	1.000	0.000	0.000	0
1399.0	0	0.000	0.000	1.000	0.000	0.000	0
1399.1	0	0.000	0.000	1.000	0.000	0.000	0
1399.4	0	0.000	0.000	1.000	0.000	0.000	0
1399.6	0	0.000	0.000	1.000	0.000	0.000	0
1399.8	0	0.000	0.000	1.000	0.000	0.000	0
1399.9	122	0.848	0.848	-0.530	-0.530	-0.530	1
1400.1	0	0.000	0.848	1.000	0.000	-0.530	0
1402.9	0	0.000	0.848	1.000	0.000	-0.530	0
1403.3	0	0.000	0.848	1.000	0.000	-0.530	0
1404.3	0	0.000	0.848	1.000	0.000	-0.530	0
1404.5	0	0.000	0.848	1.000	0.000	-0.530	0
1405.0	0	0.000	0.848	1.000	0.000	-0.530	0
1405.1	0	0.000	0.848	1.000	0.000	-0.530	0
1405.3	0	0.000	0.848	1.000	0.000	-0.530	0
1405.8	0	0.000	0.848	1.000	0.000	-0.530	0
1406.4	0	0.000	0.848	1.000	0.000	-0.530	0
1406.5	0	0.000	0.848	1.000	0.000	-0.530	0
1407.0	0	0.000	0.848	1.000	0.000	-0.530	0
1409.1	0	0.000	0.848	1.000	0.000	-0.530	0
1409.2	0	0.000	0.848	1.000	0.000	-0.530	0
1412.4	0	0.000	0.848	1.000	0.000	-0.530	0
1412.9	0	0.000	0.848	1.000	0.000	-0.530	0
1414.5	0	0.000	0.848	1.000	0.000	-0.530	0
1418.5	0	0.000	0.848	1.000	0.000	-0.530	0
1419.1	0	0.000	0.848	1.000	0.000	-0.530	0
1423.6	0	0.000	0.848	1.000	0.000	-0.530	0

1425.6	0	0.000	0.848	1.000	0.000	-0.530	0
1428.1	0	0.000	0.848	1.000	0.000	-0.530	0
1428.4	0	0.000	0.848	1.000	0.000	-0.530	0
1429.0	0	0.000	0.848	1.000	0.000	-0.530	0
1429.2	0	0.000	0.848	1.000	0.000	-0.530	0
1429.3	0	0.000	0.848	1.000	0.000	-0.530	0
1431.3	0	0.000	0.848	1.000	0.000	-0.530	0
1433.6	0	0.000	0.848	1.000	0.000	-0.530	0
1434.7	0	0.000	0.848	1.000	0.000	-0.530	0
1435.4	0	0.000	0.848	1.000	0.000	-0.530	0
1436.9	0	0.000	0.848	1.000	0.000	-0.530	0
1437.7	0	0.000	0.848	1.000	0.000	-0.530	0
1438.7	0	0.000	0.848	1.000	0.000	-0.530	0
1441.0	121	0.857	1.705	-0.515	-0.515	-1.045	1
1442.5	115	0.906	2.612	-0.423	-0.423	-1.468	1
1443.1	117	0.891	3.503	-0.454	-0.454	-1.922	1
1443.7	0	0.000	3.503	1.000	0.000	-1.922	0
1444.9	0	0.000	3.503	1.000	0.000	-1.922	0
1446.4	0	0.000	3.503	1.000	0.000	-1.922	0
1448.3	0	0.000	3.503	1.000	0.000	-1.922	0
1450.6	0	0.000	3.503	1.000	0.000	-1.922	0
1457.5	111	0.934	4.436	-0.358	-0.358	-2.280	1
1460.0	123	0.839	5.275	-0.545	-0.545	-2.825	1
1462.0	0	0.000	5.275	1.000	0.000	-2.825	0
1462.9	102	0.978	6.253	-0.208	-0.208	-3.032	1
1463.7	0	0.000	6.253	1.000	0.000	-3.032	0
1465.4	0	0.000	6.253	1.000	0.000	-3.032	0
1468.5	100	0.985	7.238	-0.174	-0.174	-3.206	1
1483.0	0	0.000	7.238	1.000	0.000	-3.206	0
1484.3	0	0.000	7.238	1.000	0.000	-3.206	0
1485.4	0	0.000	7.238	1.000	0.000	-3.206	0
1488.7	0	0.000	7.238	1.000	0.000	-3.206	0
1490.4	0	0.000	7.238	1.000	0.000	-3.206	0
1494.0	0	0.000	7.238	1.000	0.000	-3.206	0
1496.0	0	0.000	7.238	1.000	0.000	-3.206	0
1496.5	0	0.000	7.238	1.000	0.000	-3.206	0
1500.4	0	0.000	7.238	1.000	0.000	-3.206	0
1504.5	0	0.000	7.238	1.000	0.000	-3.206	0
1505.6	0	0.000	7.238	1.000	0.000	-3.206	0
1506.1	0	0.000	7.238	1.000	0.000	-3.206	0
1507.2	0	0.000	7.238	1.000	0.000	-3.206	0
1508.8	0	0.000	7.238	1.000	0.000	-3.206	0
1514.2	0	0.000	7.238	1.000	0.000	-3.206	0
1515.4	0	0.000	7.238	1.000	0.000	-3.206	0
1517.1	0	0.000	7.238	1.000	0.000	-3.206	0
1517.5	0	0.000	7.238	1.000	0.000	-3.206	0
1519.4	0	0.000	7.238	1.000	0.000	-3.206	0
1520.0	0	0.000	7.238	1.000	0.000	-3.206	0
1521.7	0	0.000	7.238	1.000	0.000	-3.206	0
1522.4	0	0.000	7.238	1.000	0.000	-3.206	0
1523.4	0	0.000	7.238	1.000	0.000	-3.206	0
1524.7	0	0.000	7.238	1.000	0.000	-3.206	0
1526.7	0	0.000	7.238	1.000	0.000	-3.206	0
1529.8	0	0.000	7.238	1.000	0.000	-3.206	0
1534.0	0	0.000	7.238	1.000	0.000	-3.206	0

Arithmetic mean of strike values (col 2) = 113.9 # of measurements taken = 8

Feature Orientation measurements **Well: CYPRESS c-50-B/94-B-15 Mature Breakouts**

Reference Mardia 1972 for statistics of directional data

Total Sin x thick	Total Cos x thick	Total Thickness	S Col A/ColC	C ColB/ColC	R x R	R	S/R	C/R	Azimuth from S/R	Azimuth from C/R	Standard Deviation
7.238	-3.206	8	0.9048	-0.4008	0.9792	0.9895	0.9143	-0.4050	113.9	246.1	8.3

Well Name: CYPRESS c-50-B/94-B-15 Bedding Orientation Measurements							
Depth KB m	Azimuth of feature	Sin Azi	Cumulative Total Sin Azi	Cos Azi	Cos Azi corrected for zero values	Cumulative Total Cos Azi	Measurement made or not 1 or 0 entered
1390.3	0	0.000	0.000	1.000	0.000	0.000	0
1390.4	0	0.000	0.000	1.000	0.000	0.000	0
1390.6	0	0.000	0.000	1.000	0.000	0.000	0
1390.7	0	0.000	0.000	1.000	0.000	0.000	0
1391.0	0	0.000	0.000	1.000	0.000	0.000	0
1391.1	141	0.629	0.629	-0.777	-0.777	-0.777	1
1391.2	0	0.000	0.629	1.000	0.000	-0.777	0
1391.5	0	0.000	0.629	1.000	0.000	-0.777	0
1392.2	239	-0.857	-0.228	-0.515	-0.515	-1.292	1
1392.6	0	0.000	-0.228	1.000	0.000	-1.292	0
1392.8	0	0.000	-0.228	1.000	0.000	-1.292	0
1393.1	0	0.000	-0.228	1.000	0.000	-1.292	0
1393.4	0	0.000	-0.228	1.000	0.000	-1.292	0
1393.5	0	0.000	-0.228	1.000	0.000	-1.292	0
1393.6	0	0.000	-0.228	1.000	0.000	-1.292	0
1393.9	97	0.993	0.765	-0.122	-0.122	-1.414	1
1395.0	0	0.000	0.765	1.000	0.000	-1.414	0
1395.4	0	0.000	0.765	1.000	0.000	-1.414	0
1395.8	0	0.000	0.765	1.000	0.000	-1.414	0
1396.1	0	0.000	0.765	1.000	0.000	-1.414	0
1396.4	0	0.000	0.765	1.000	0.000	-1.414	0
1396.8	190	-0.174	0.591	-0.985	-0.985	-2.399	1
1397.1	0	0.000	0.591	1.000	0.000	-2.399	0
1397.3	0	0.000	0.591	1.000	0.000	-2.399	0
1397.6	0	0.000	0.591	1.000	0.000	-2.399	0
1398.0	0	0.000	0.591	1.000	0.000	-2.399	0
1398.4	0	0.000	0.591	1.000	0.000	-2.399	0
1399.0	0	0.000	0.591	1.000	0.000	-2.399	0
1399.1	0	0.000	0.591	1.000	0.000	-2.399	0
1399.4	0	0.000	0.591	1.000	0.000	-2.399	0
1399.6	0	0.000	0.591	1.000	0.000	-2.399	0
1399.8	0	0.000	0.591	1.000	0.000	-2.399	0
1399.9	0	0.000	0.591	1.000	0.000	-2.399	0
1400.1	173	0.122	0.713	-0.993	-0.993	-3.391	1
1402.9	0	0.000	0.713	1.000	0.000	-3.391	0
1403.3	0	0.000	0.713	1.000	0.000	-3.391	0
1404.3	0	0.000	0.713	1.000	0.000	-3.391	0
1404.5	0	0.000	0.713	1.000	0.000	-3.391	0
1405.0	0	0.000	0.713	1.000	0.000	-3.391	0
1405.1	0	0.000	0.713	1.000	0.000	-3.391	0
1405.3	0	0.000	0.713	1.000	0.000	-3.391	0
1405.8	0	0.000	0.713	1.000	0.000	-3.391	0
1406.4	0	0.000	0.713	1.000	0.000	-3.391	0
1406.5	130	0.766	1.479	-0.643	-0.643	-4.034	1
1407.0	0	0.000	1.479	1.000	0.000	-4.034	0
1409.1	0	0.000	1.479	1.000	0.000	-4.034	0
1409.2	139	0.656	2.135	-0.755	-0.755	-4.789	1
1412.4	0	0.000	2.135	1.000	0.000	-4.789	0
1412.9	101	0.982	3.117	-0.191	-0.191	-4.980	1
1414.5	0	0.000	3.117	1.000	0.000	-4.980	0
1418.5	0	0.000	3.117	1.000	0.000	-4.980	0
1419.1	166	0.242	3.359	-0.970	-0.970	-5.950	1
1423.6	155	0.423	3.781	-0.906	-0.906	-6.856	1

1425.6	0	0.000	3.781	1.000	0.000	-6.856	0
1428.1	0	0.000	3.781	1.000	0.000	-6.856	0
1428.4	0	0.000	3.781	1.000	0.000	-6.856	0
1429.0	0	0.000	3.781	1.000	0.000	-6.856	0
1429.2	0	0.000	3.781	1.000	0.000	-6.856	0
1429.3	126	0.809	4.590	-0.588	-0.588	-7.444	1
1431.3	0	0.000	4.590	1.000	0.000	-7.444	0
1433.6	226	-0.719	3.871	-0.695	-0.695	-8.139	1
1434.7	0	0.000	3.871	1.000	0.000	-8.139	0
1435.4	0	0.000	3.871	1.000	0.000	-8.139	0
1436.9	104	0.970	4.841	-0.242	-0.242	-8.381	1
1437.7	0	0.000	4.841	1.000	0.000	-8.381	0
1438.7	0	0.000	4.841	1.000	0.000	-8.381	0
1441.0	0	0.000	4.841	1.000	0.000	-8.381	0
1442.5	0	0.000	4.841	1.000	0.000	-8.381	0
1443.1	0	0.000	4.841	1.000	0.000	-8.381	0
1443.7	204	-0.407	4.434	-0.914	-0.914	-9.294	1
1444.9	195	-0.259	4.176	-0.966	-0.966	-10.260	1
1446.4	0	0.000	4.176	1.000	0.000	-10.260	0
1448.3	128	0.788	4.964	-0.616	-0.616	-10.876	1
1450.6	0	0.000	4.964	1.000	0.000	-10.876	0
1457.5	0	0.000	4.964	1.000	0.000	-10.876	0
1460.0	0	0.000	4.964	1.000	0.000	-10.876	0
1462.0	184	-0.070	4.894	-0.998	-0.998	-11.873	1
1462.9	0	0.000	4.894	1.000	0.000	-11.873	0
1463.7	0	0.000	4.894	1.000	0.000	-11.873	0
1465.4	128	0.788	5.682	-0.616	-0.616	-12.489	1
1468.5	0	0.000	5.682	1.000	0.000	-12.489	0
1483.0	145	0.574	6.255	-0.819	-0.819	-13.308	1
1484.3	0	0.000	6.255	1.000	0.000	-13.308	0
1485.4	0	0.000	6.255	1.000	0.000	-13.308	0
1488.7	0	0.000	6.255	1.000	0.000	-13.308	0
1490.4	211	-0.515	5.740	-0.857	-0.857	-14.165	1
1494.0	0	0.000	5.740	1.000	0.000	-14.165	0
1496.0	146	0.559	6.300	-0.829	-0.829	-14.994	1
1496.5	0	0.000	6.300	1.000	0.000	-14.994	0
1500.4	124	0.829	7.129	-0.559	-0.559	-15.554	1
1504.5	0	0.000	7.129	1.000	0.000	-15.554	0
1505.6	0	0.000	7.129	1.000	0.000	-15.554	0
1506.1	0	0.000	7.129	1.000	0.000	-15.554	0
1507.2	165	0.259	7.387	-0.966	-0.966	-16.520	1
1508.8	0	0.000	7.387	1.000	0.000	-16.520	0
1514.2	114	0.914	8.301	-0.407	-0.407	-16.926	1
1515.4	0	0.000	8.301	1.000	0.000	-16.926	0
1517.1	218	-0.616	7.685	-0.788	-0.788	-17.714	1
1517.5	0	0.000	7.685	1.000	0.000	-17.714	0
1519.4	0	0.000	7.685	1.000	0.000	-17.714	0
1520.0	0	0.000	7.685	1.000	0.000	-17.714	0
1521.7	177	0.052	7.738	-0.999	-0.999	-18.713	1
1522.4	0	0.000	7.738	1.000	0.000	-18.713	0
1523.4	0	0.000	7.738	1.000	0.000	-18.713	0
1524.7	180	0.000	7.738	-1.000	-1.000	-19.713	1
1526.7	0	0.000	7.738	1.000	0.000	-19.713	0
1529.8	0	0.000	7.738	1.000	0.000	-19.713	0
1534.0	181	-0.017	7.720	-1.000	-1.000	-20.713	1

Arithmetic mean of strike values (col 2) = 160.3

Total measurements taken = 28

Feature Orientation measurements **Well: MURRAY RIVER c-40-H/93-I-14 Bedding**

Reference Mardia 1972 for statistics of directional data

Total Sin x thick	Total Cos x thick	Total Thickness	S Col A/ColC	C ColB/ColC	R x R	R	S/R	C/R	Azimuth from S/R	Azimuth from C/R	Standard Deviation
7.72	-20.713	28	0.2757	-0.7398	0.6232	0.7895	0.3492	-0.9370	159.6	200.4	39.4