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CONSERVATION DIVISION
WICHITA, KS

STAR Image Interpretation

Well: Blout # 4-5
County: Morton / KA

SEC: 5 TWP: 33S RGE: 42W

Sedimentbody Orientation and Paleo-Transport Direction of the Upper Morrow Sandstone

Report prepared for:
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Oklahoma City, OK

by
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Baker Atlas

July 2002

STAR Image Interpretation



**Dominion Oklahoma Texas E & P, Inc.
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Project Objectives

- 1. Determine near-wellbore structure including fault identification and attitude.**
- 2. Definition of lithofacies, description of sedimentary structures, and interpretation of depositional environments.**
- 3. Determination of paleo-transport directions and sediment body orientations.**

STAR Image Interpretation



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Study Process Flow

High-resolution, interactive
image processing including
bedding, fault, and fracture attitude
calculation



Definition of structural dip
for sequence bounded stratigraphic
sequences and distinct structural
domains



Recording sediment structures, bedding contact and
lithofacies characteristics



Characterization of
vertical facies associations



Removing structural tilt



Isolating data related to transport
direction and sediment body orientation



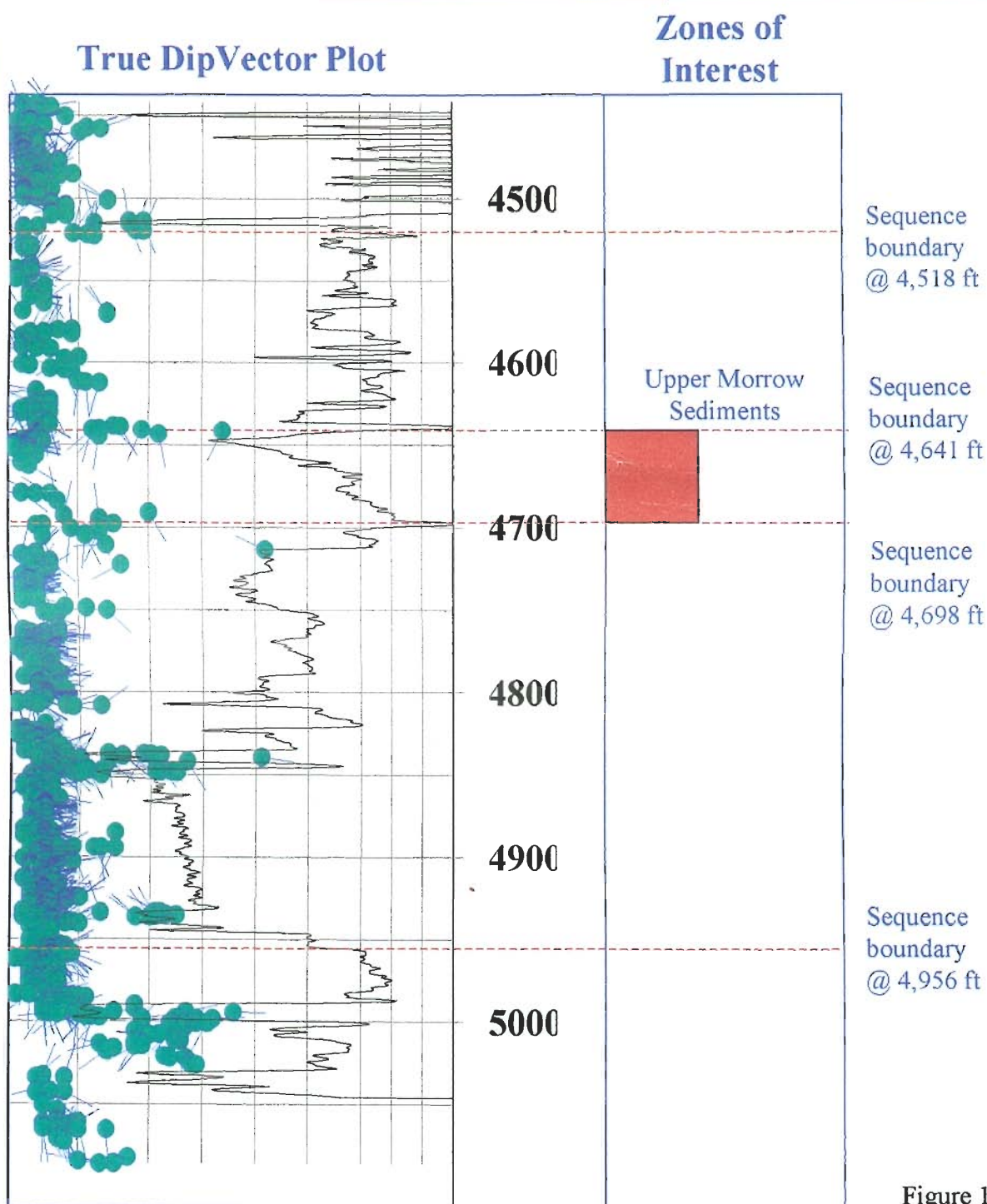
Developing depositional environment model

Dominion E & P, Inc.
Well: Blout # 4-5
Field: Greenwood
Morton County / KA

Summary
Dip Vector Plot
- Upper Morrow -



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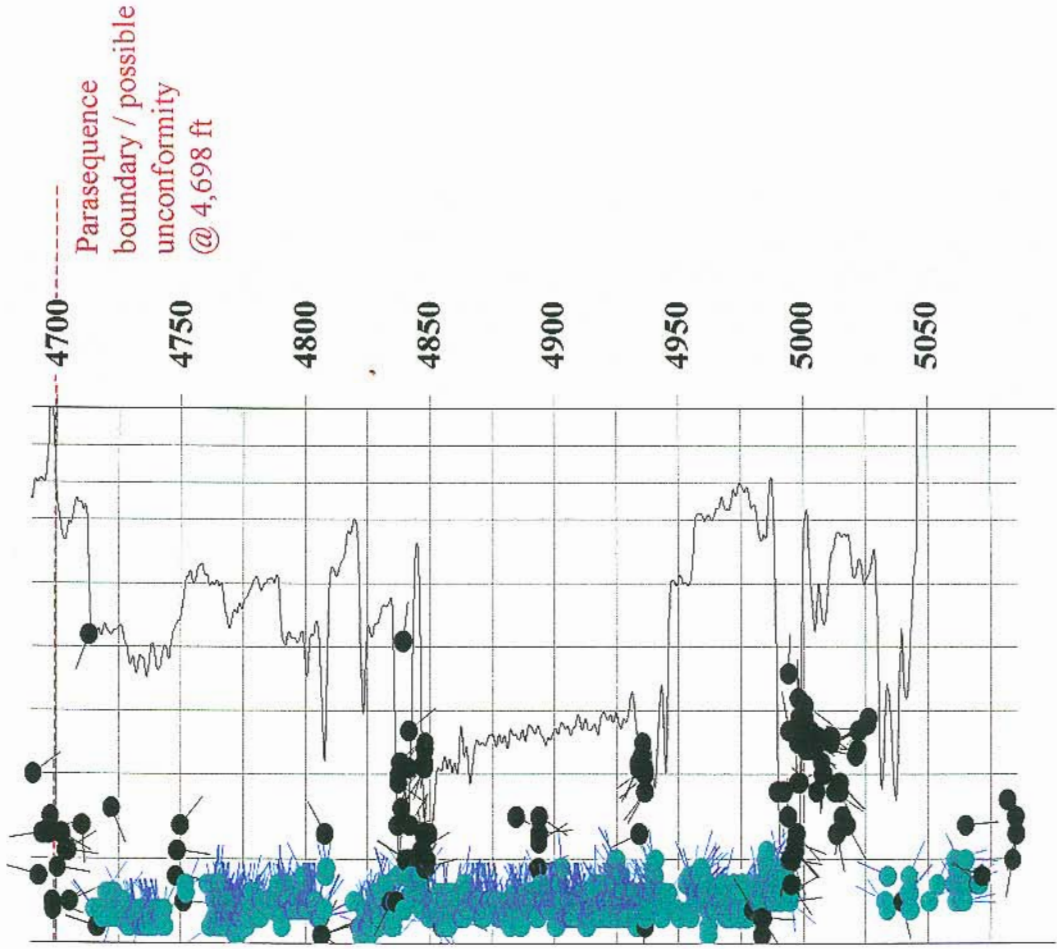
Dominion Oklahoma Texas E & P
Well: Blout # 4-5
Field: Greenwood Gas Field
County: Morton / KA

STAR Image Analysis Structural Dip Definition

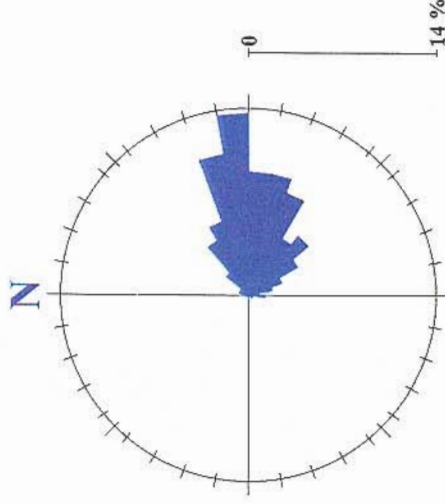


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Bedding Dip Vector Plot



Interval from 4,690 - 5,086 ft



Dip Statistics:

Number of vectors: 1281

Structural Dip: 098 / 4

95% Confidence Interval: 0

Spherical Dispersion: 3

Dip vector constraints applied:
Dip angle range: visually filtered
Dip azimuth range: visually filtered

Only blue dip vectors were considered in statistical analysis

Figure 2

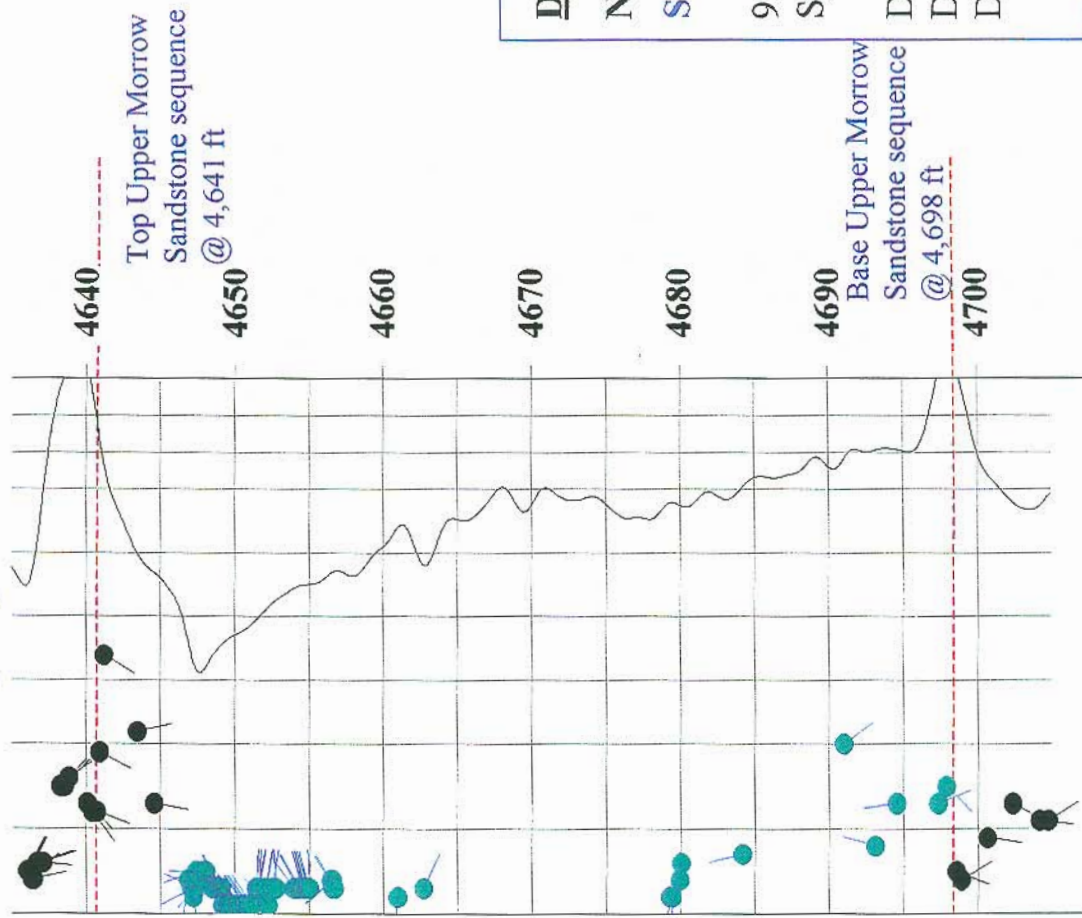
Dominion Oklahoma Texas E & P
Well: Blout # 4-5
Field: Greenwood Gas Field
County: Morton / KA

STAR Image Analysis Structural Dip Definition

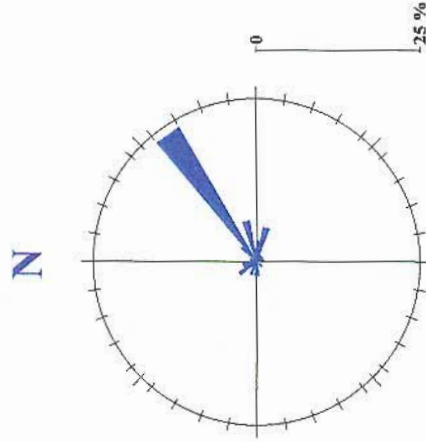


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Bedding Dip Vector Plot



Interval from 4,641 - 4,698 ft



Dip Statistics:

Number of vectors: 65

Structural Dip: ENE / 1 degree

95% Confidence Interval: 0

Spherical Dispersion: 3

Dip vector constraints applied:

Dip angel range: visually filtered

Dip azimuth range: visually filtered

A statistical analysis of the bed vectors to calculate the structural dip in the vicinity of the well has not been performed due to lack of favorable facies and stratigraphic scatter of the data.

Based on visual inspection of the dip vector plot it is assumed that the structural dip in the subject well is between 1 and 2 degrees to the ENE.

Only blue dip vectors were considered in statistical analysis

Figure 3

Diagnostic Sedimentary Structures and Syn-/Post-Depositional Features

Current related sediment structures:

 Horizontal bedding

 Parallel lamination

 Wavy and flaser bedding

 Lenticular bedding

 Cross-bedding (>15 deg.)

 Bi-modal cross-bedding

 Low-angle cross-bed (<15 deg.)

 Over-Steepened cross-bedding

 Differential Compaction

 Abandonment / Differential Compaction

 Scour surface / cut-and-fill

 Erosive basal contact

Biogenic structures:

 Bioturbation

 Rootlets

Soft-sediment deformation structures

 Water escape structure

 Slump structure

 Carbonate concretion

 Conglomerate / debris flow

 Structureless / Contorted

Figure 4

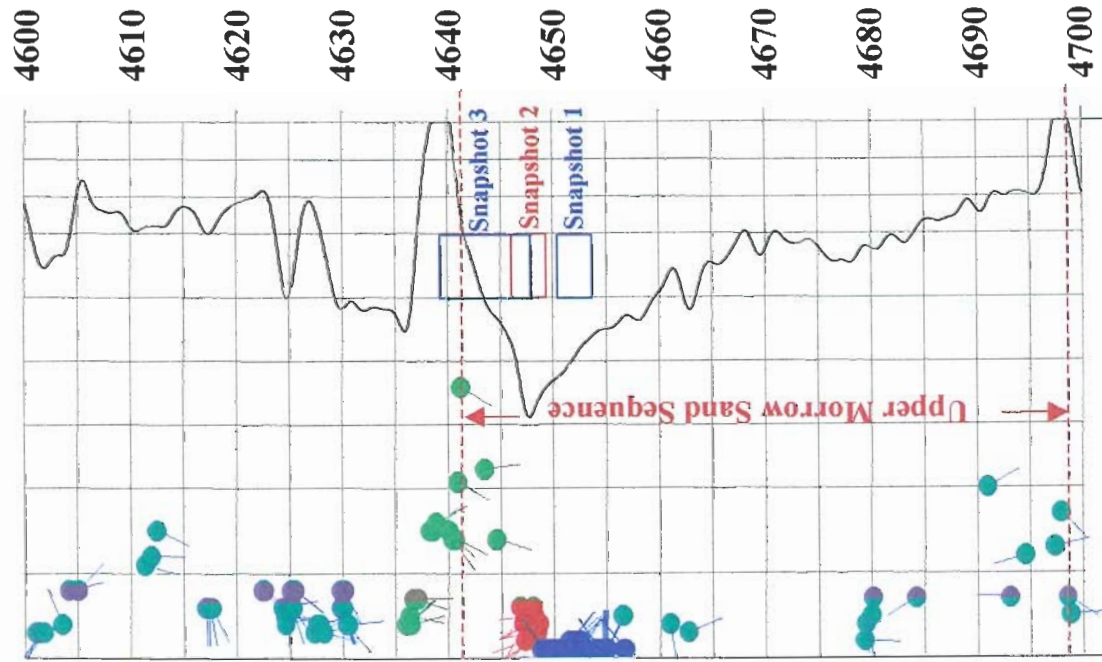
Dominion Oklahoma Texas E & P
 Well: Blout # 4-5
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Stratigraphic Dip Analysis Upper Morrow Sandstone Sequence (4,641 - 4,698 ft)

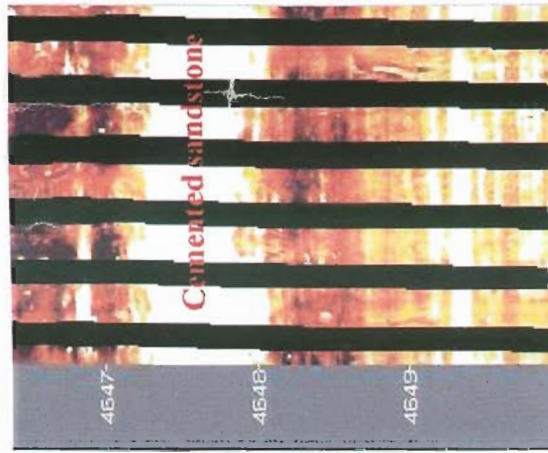


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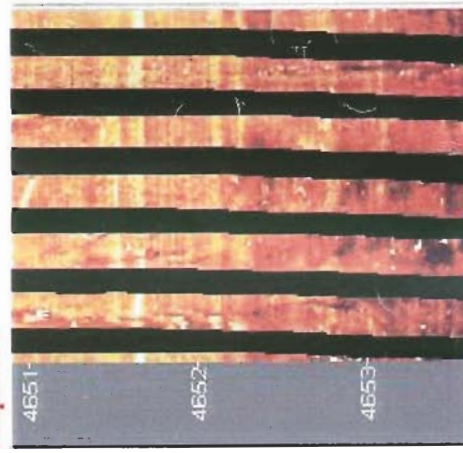
Stratigraphic Dip Vector Plot



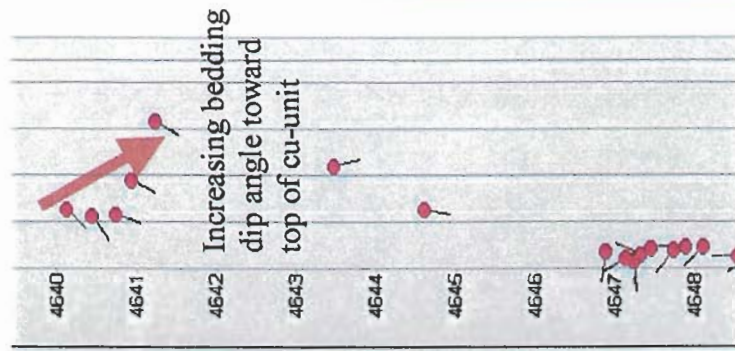
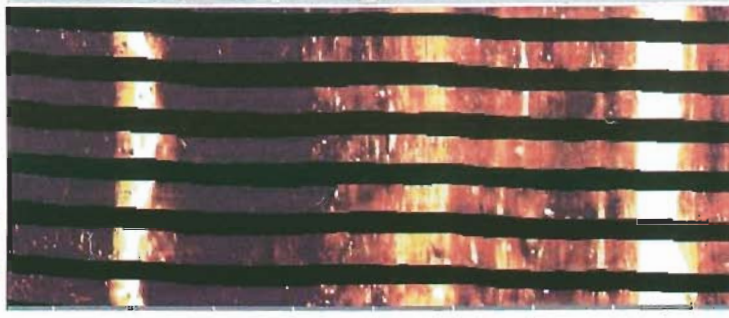
Snapshot 1



Snapshot 2



Snapshot 3



Snapshot 1: Gradual transition from bioturbated and structureless shale to horizontally laminated sandstone.

Snapshot 2: Top of coarsening-upward sequence with sub-horizontal to low-angle bedding lamination in siltstone capped by cemented and structureless sandstone.

Snapshot 3: Poorly laminated to structureless and bioturbated siltstone with some increasing bedding dips downward to the top of the cu-unit.

Structural dip has been removed for sedimentologic analysis: 060 / 2.

Figure 5

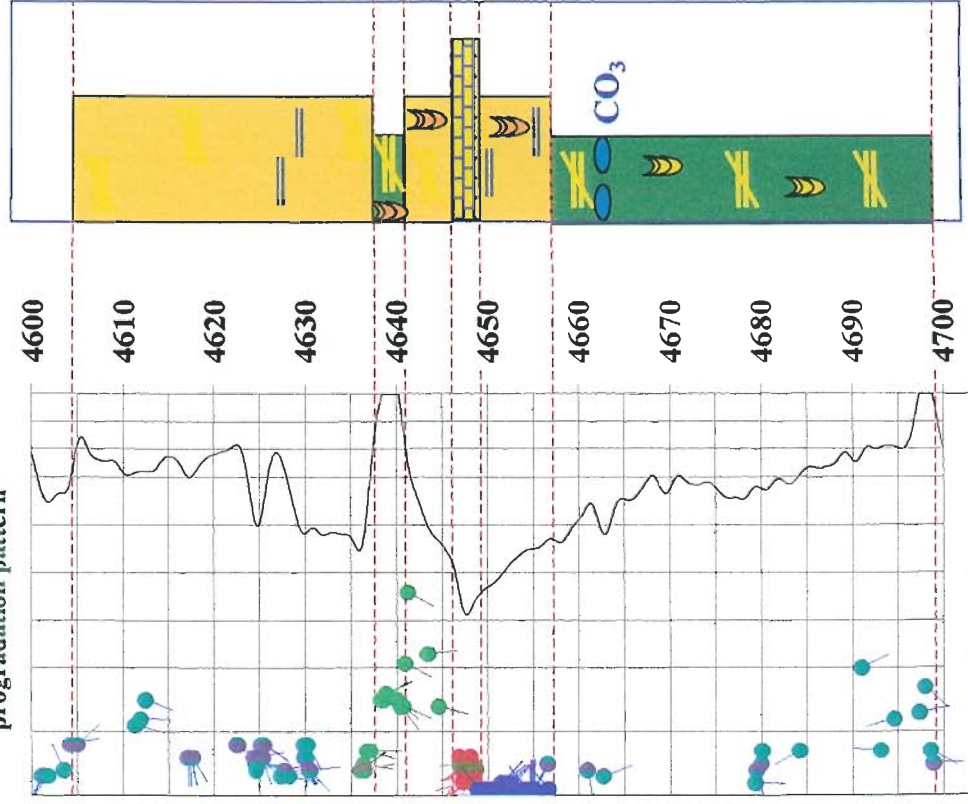
Stratigraphic Dip Analysis Upper Morrow Sandstone Sequence (4,641 - 4,698 ft)



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Stratigraphic Dip Vector Plot

- Low-angle bedding lamination
- Horizontal lamination
- Compaction / progradation pattern
- Unclassified bedding

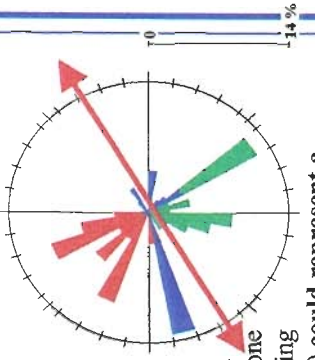


Siltstone, mostly structureless, occasionally horizontal lamination, bioturbated,

Tight, calcareous sand, low-angle bedding to lamination, Siltstone, parallel lamination, moderately bioturbated,

Shale, poorly bedded, mostly without sedimentary structures, possibly bioturbated,

Paleo-Transport and Sediment-body Geometry



Summary:
Without sand development there is also no evidence for sedimentary structures related to paleo-transport direction such as cross-bedding. The closest hint is probably given by the low-angle bedding lamination directly underneath the condensed zone at 4,649 ft (red bedding vectors dipping to the NW). This facies (snapshot 2) could represent a distributary mouthbar or lower shoreface striking approximately NE-SW.

Below the condensed zone, only parallel lamination (blue dip vectors) exists which does not provide any clues about sediment-body geometry or transport direction. The entire coarsening-upward unit (4,655 ft to 4,698 ft) has been interpreted as prograding delta to prograding delta front.

The uppermost five feet of the cu Upper Morrow sandstone sequence shows some increasing bedding dips (green vectors) in poorly laminated silt and shale toward the top of the tightly cemented sand at 4,645 ft. This dip pattern has been interpreted as differential compaction pattern on top of the prograding delta front and indicates deepening of the depositional environment to the SE.

In making interpretations of logs our employees will give customer the benefit of their best judgement. But since all interpretations are opinions based on inferences from electrical or other measurements, we cannot, and we will not guarantee the accuracy or correctness of any interpretation. We shall not be liable or responsible for any loss, cost, damages, or expenses whatsoever incurred or sustained by the customer resulting from any interpretation made by any of our employees.
