Adaptive Well Construction
Designing out Trouble Begins with the Basis-of-Design

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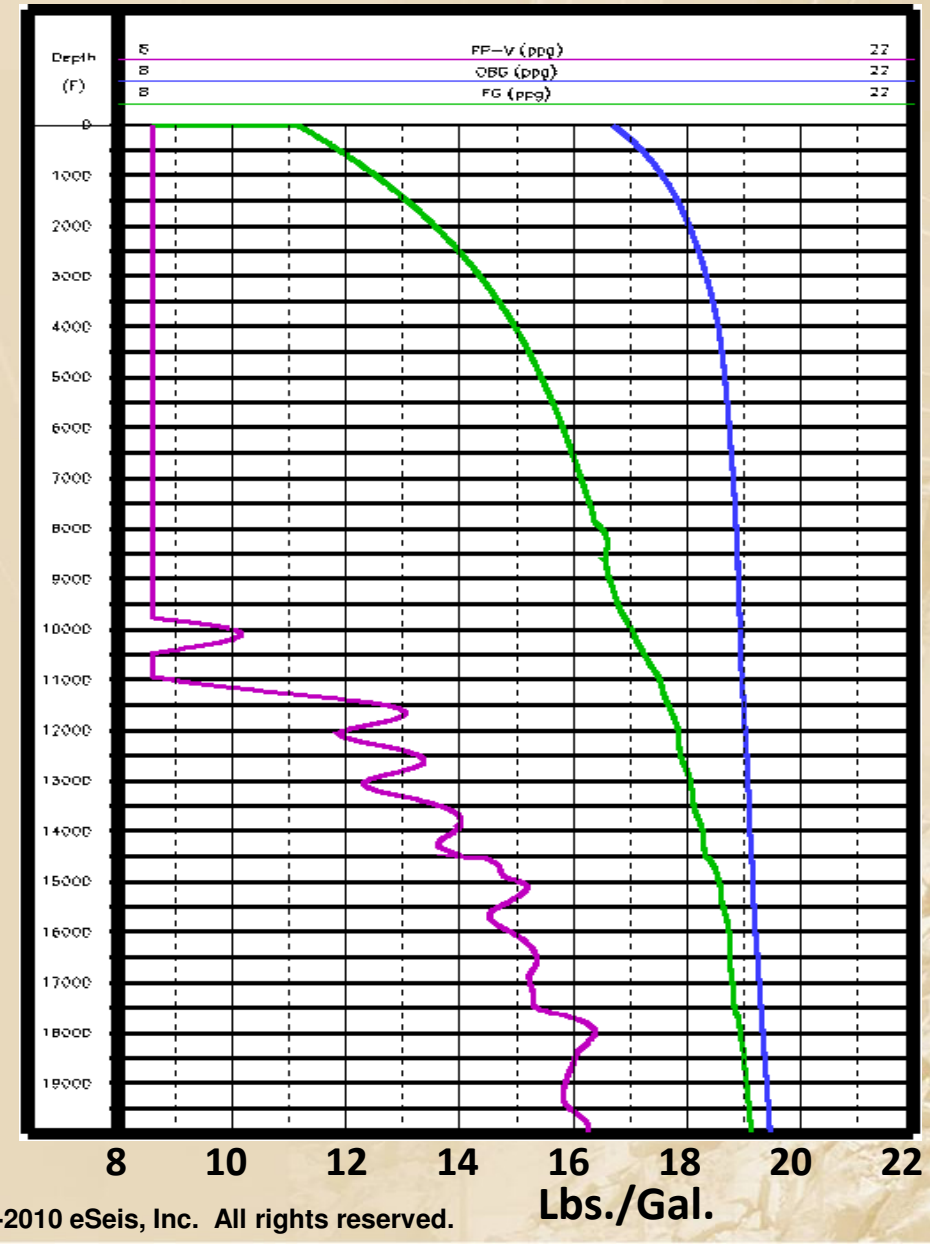
Typical Pore Pressure/Fracture Gradient (PPFG) Product

Typically pore pressure work results in a plot as shown here:
Curves shown represent:
PP-Velocity-based
Shale Fracture Gradient (FG)
Overburden Gradient (OBG)



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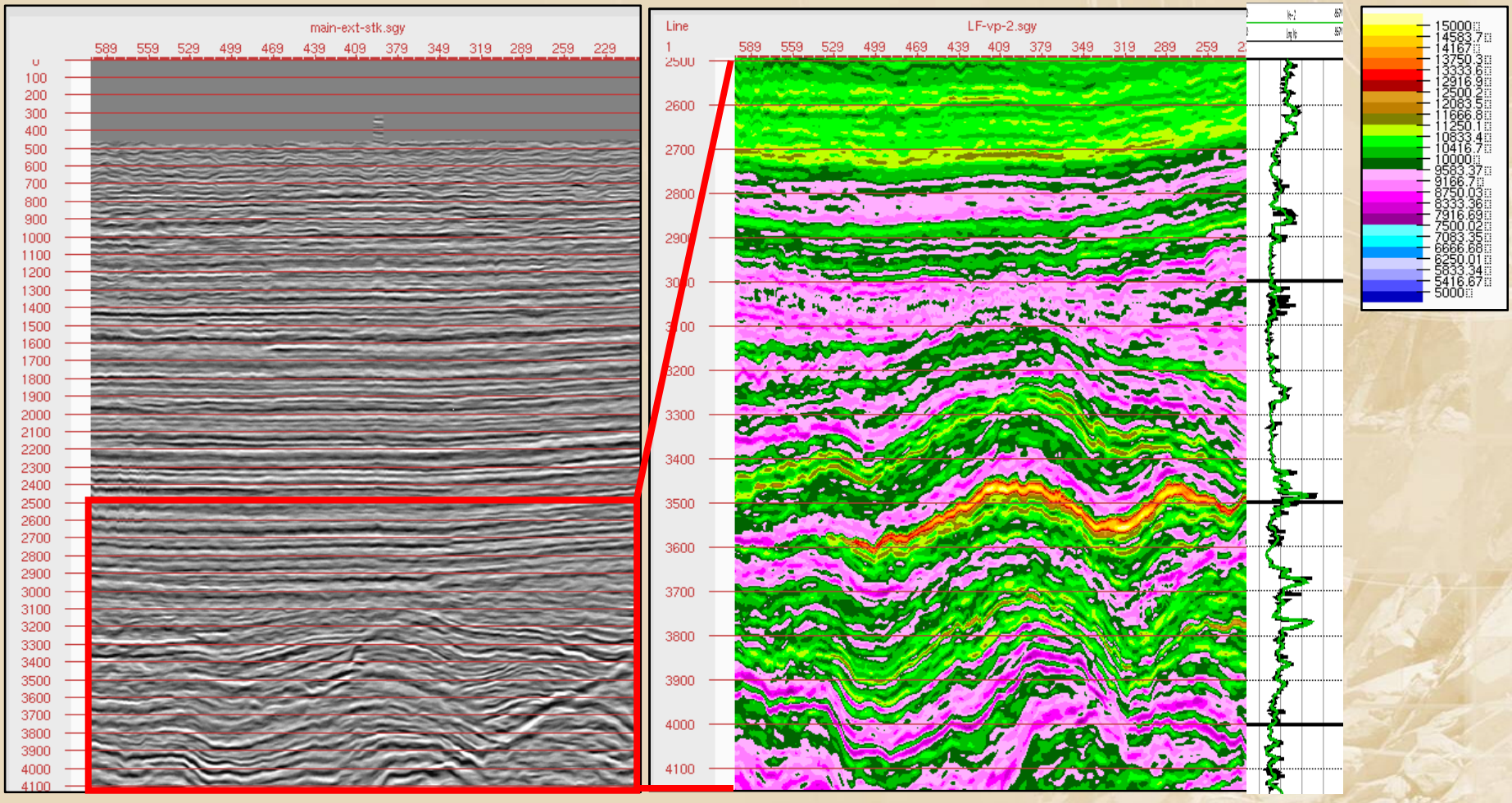
Vp Inversion



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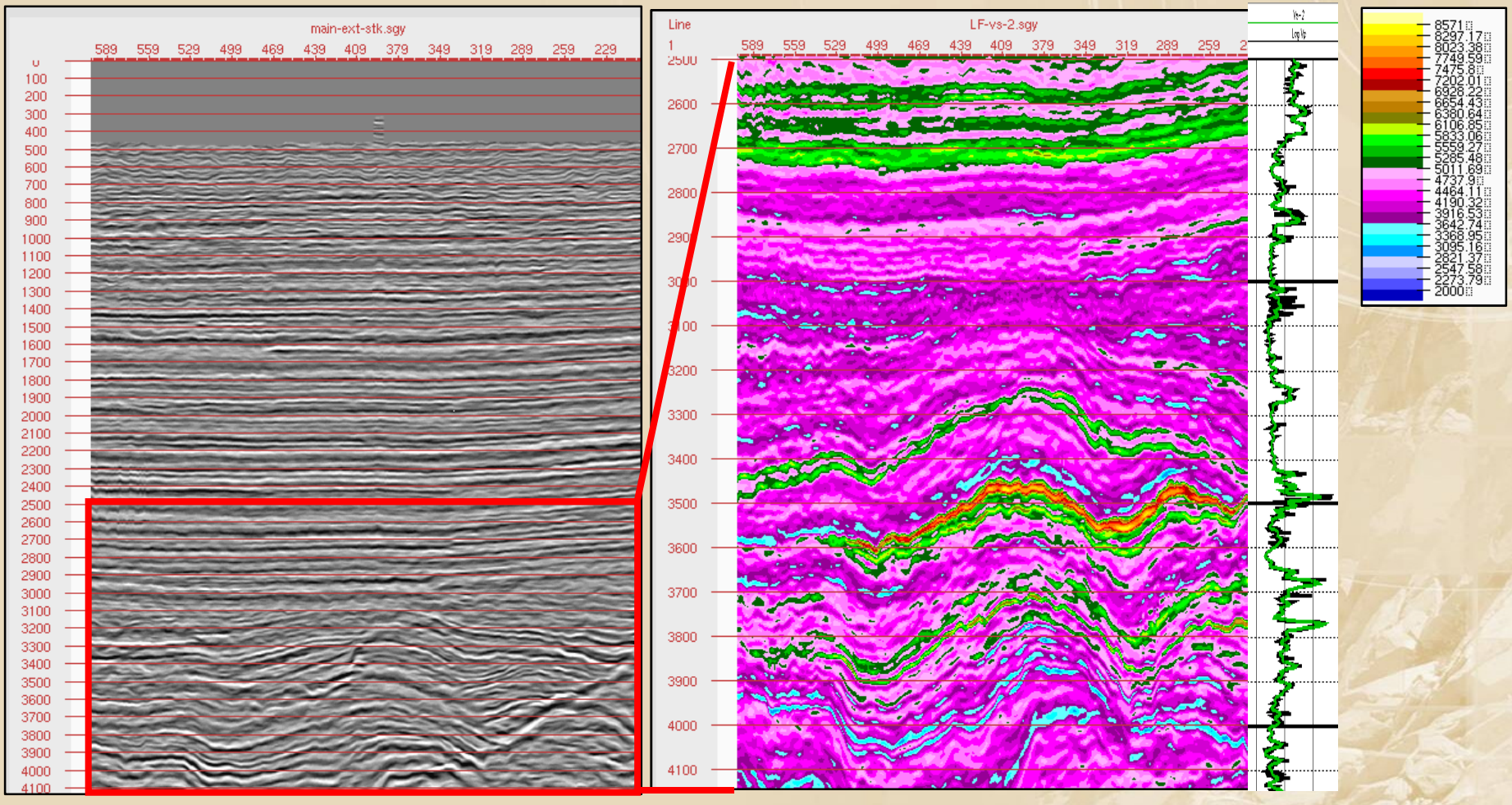
Vs Inversion



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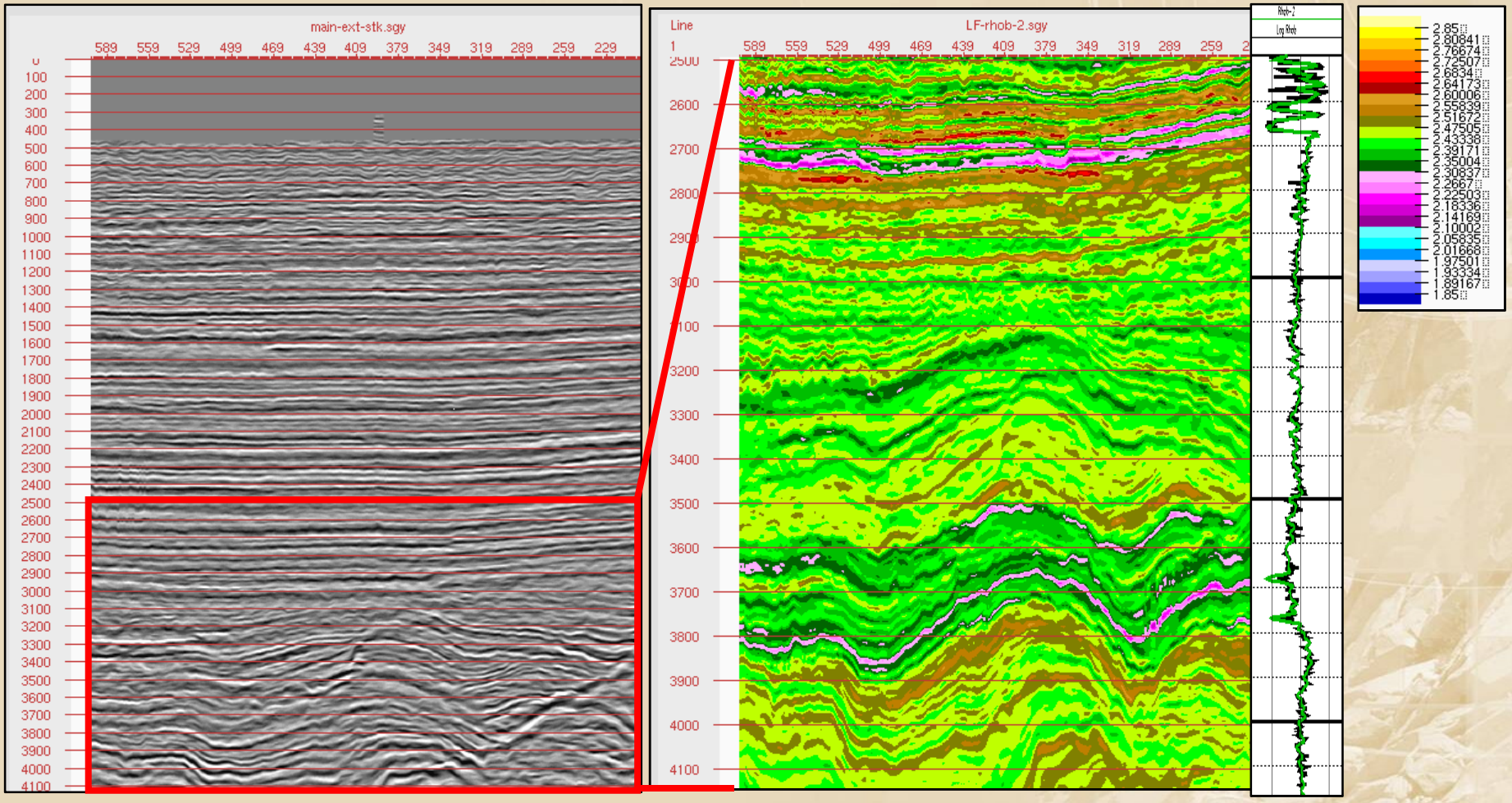
Density Inversion



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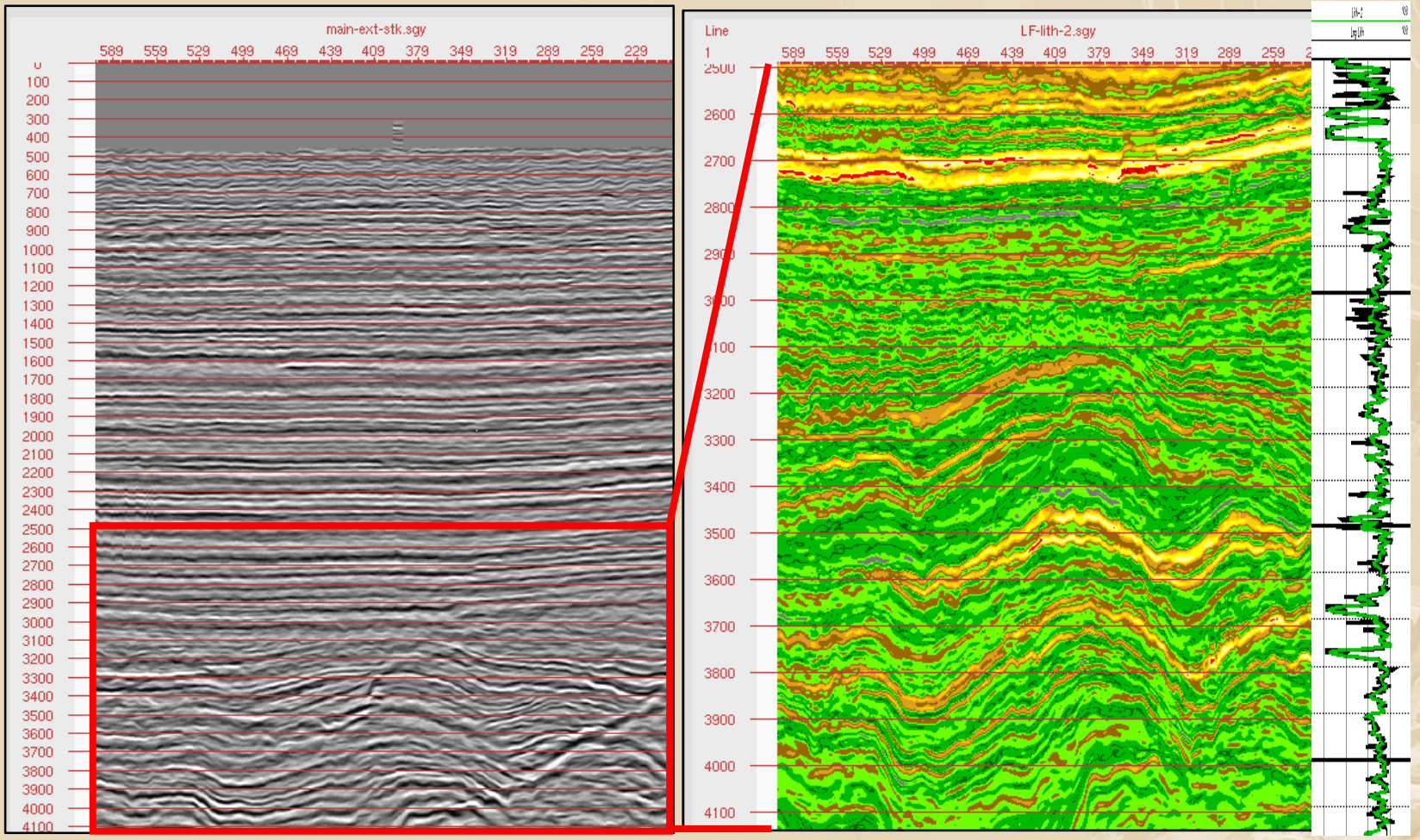
Lithology Inversion

Sand = Yellow
Shale = Green



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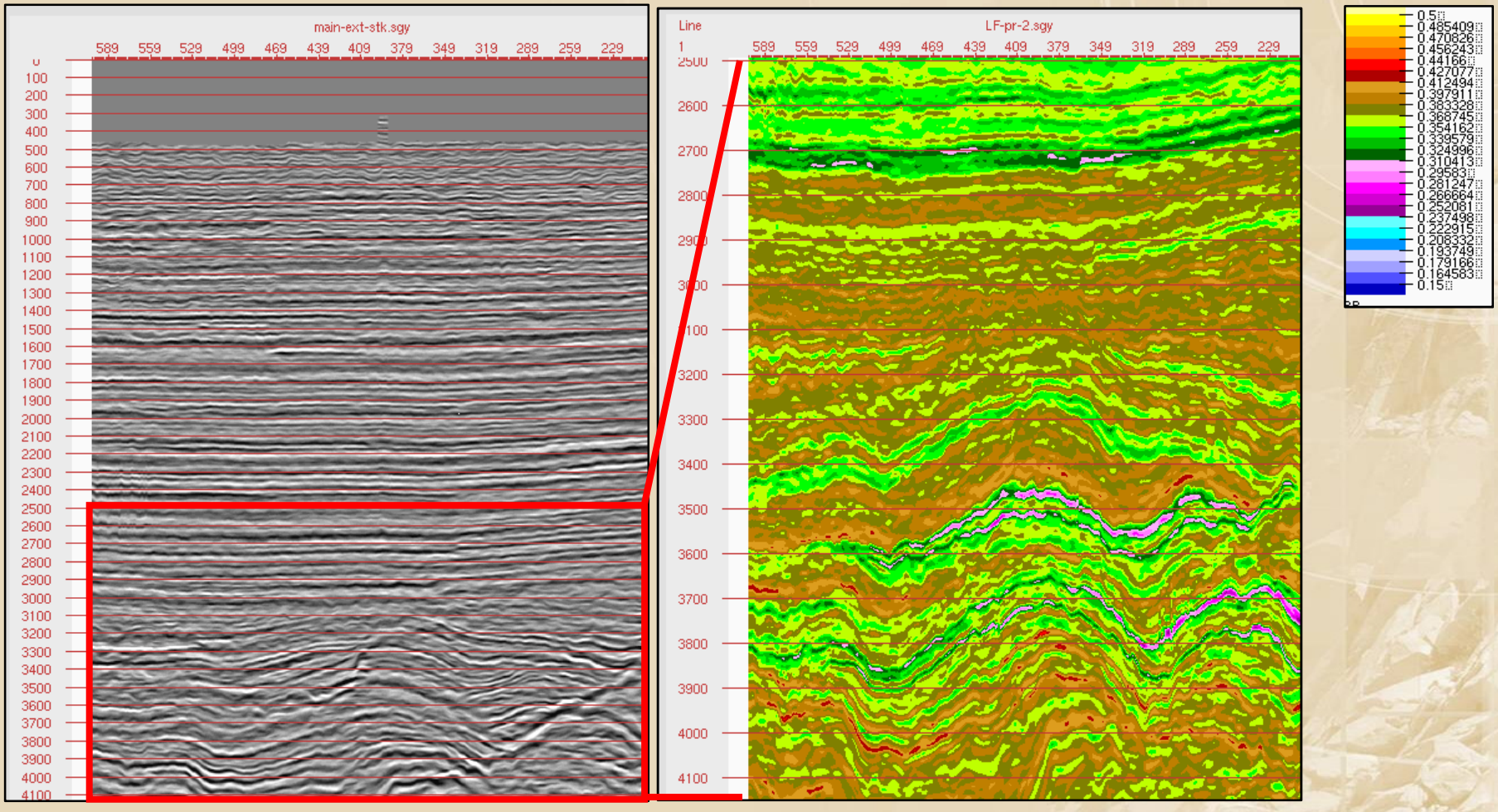
Poisson's Ratio Inversion



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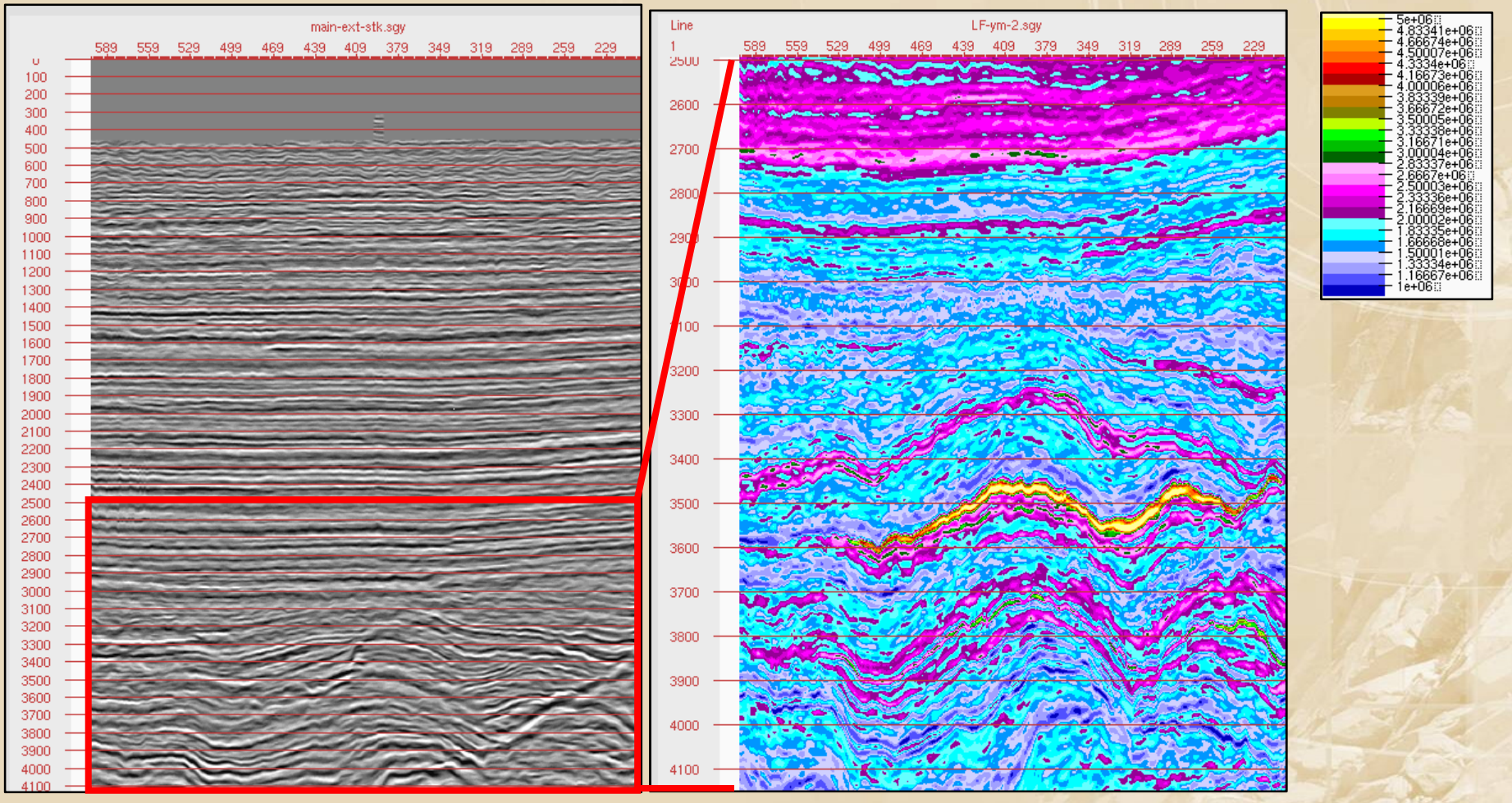
Young's Modulus Inversion



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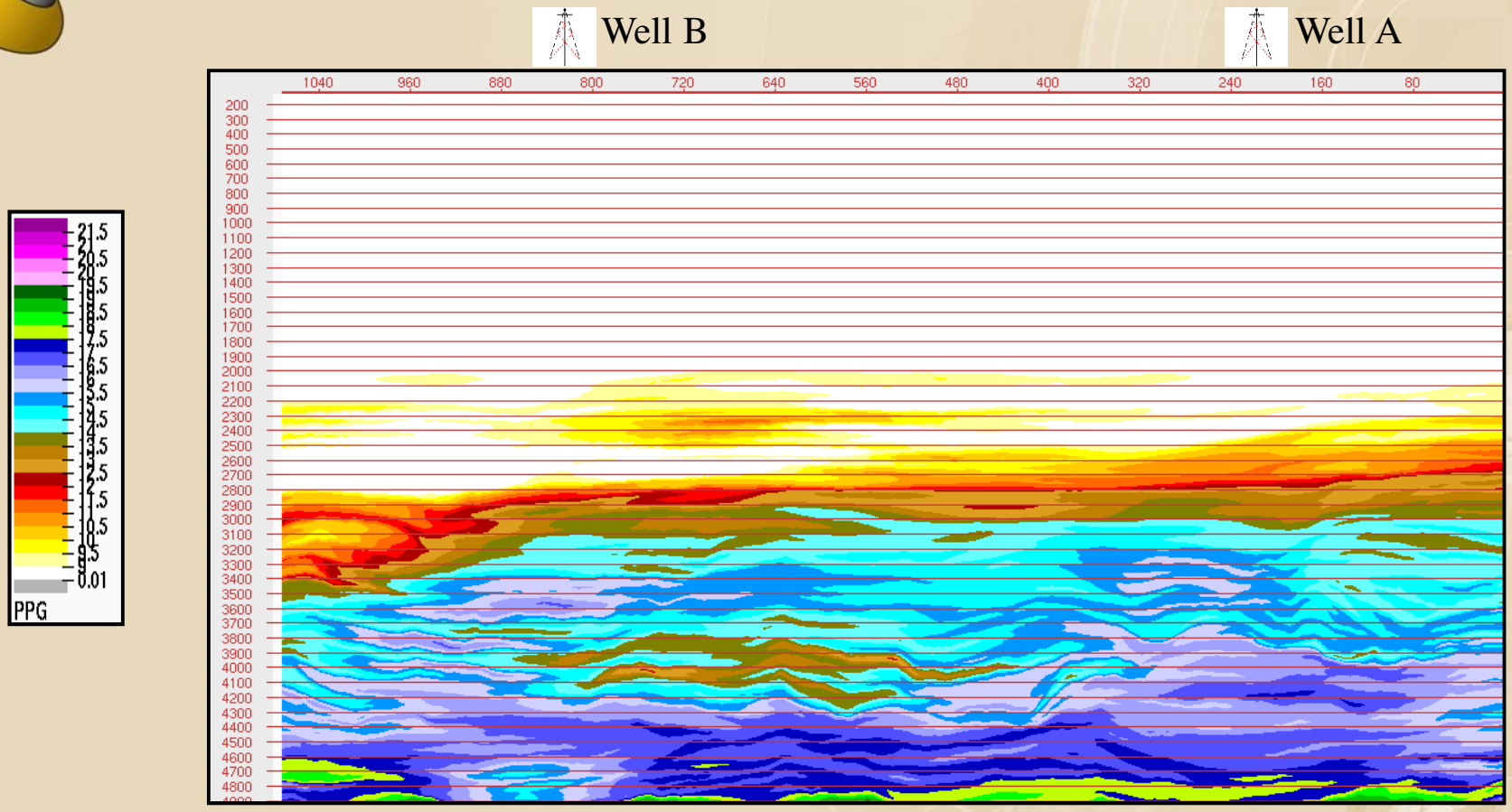
V-Based Shale PP



Calibrated PP from seismic velocities

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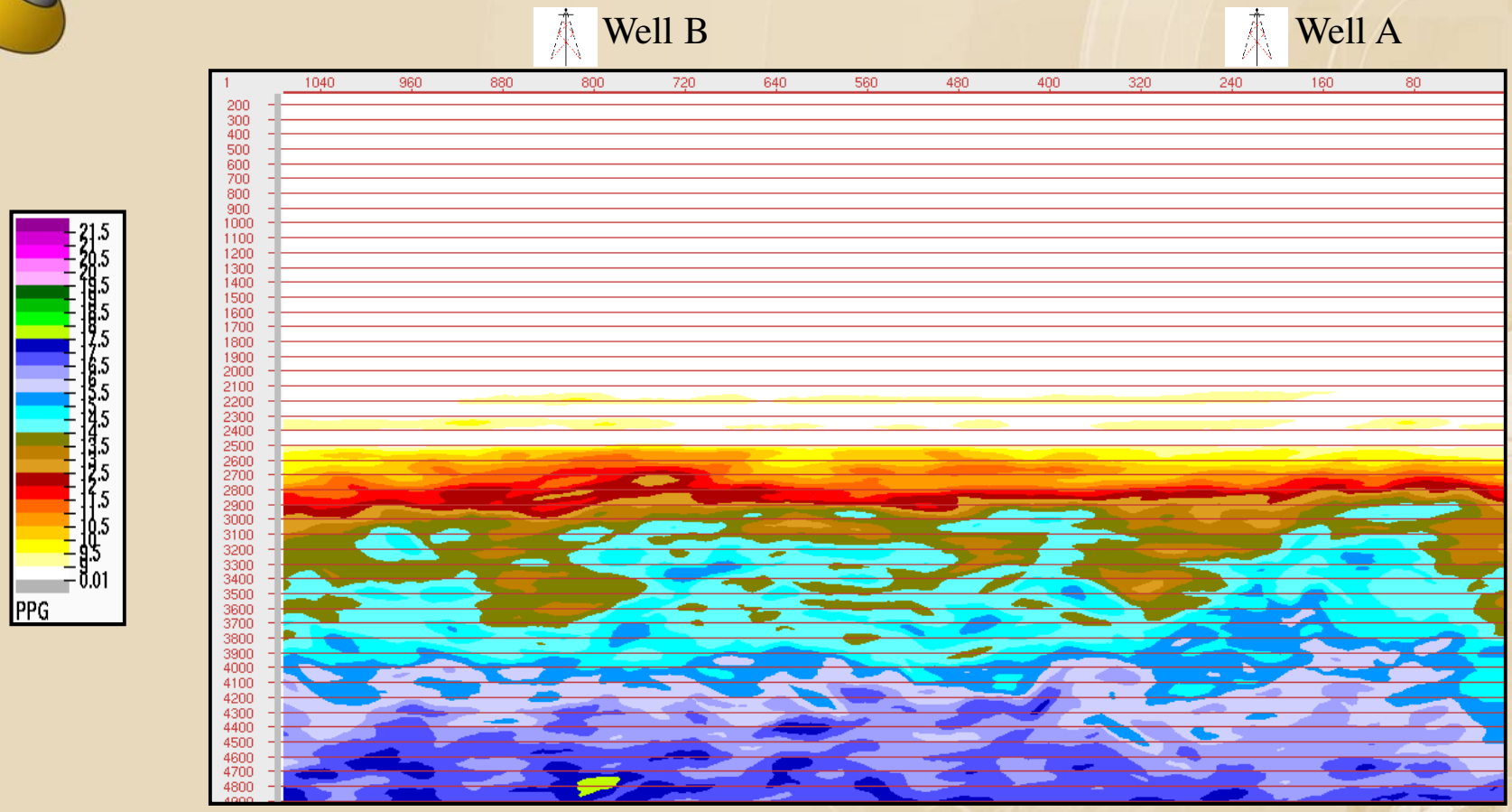
Q-Based Shale PP



Calibrated PP from seismic frequencies

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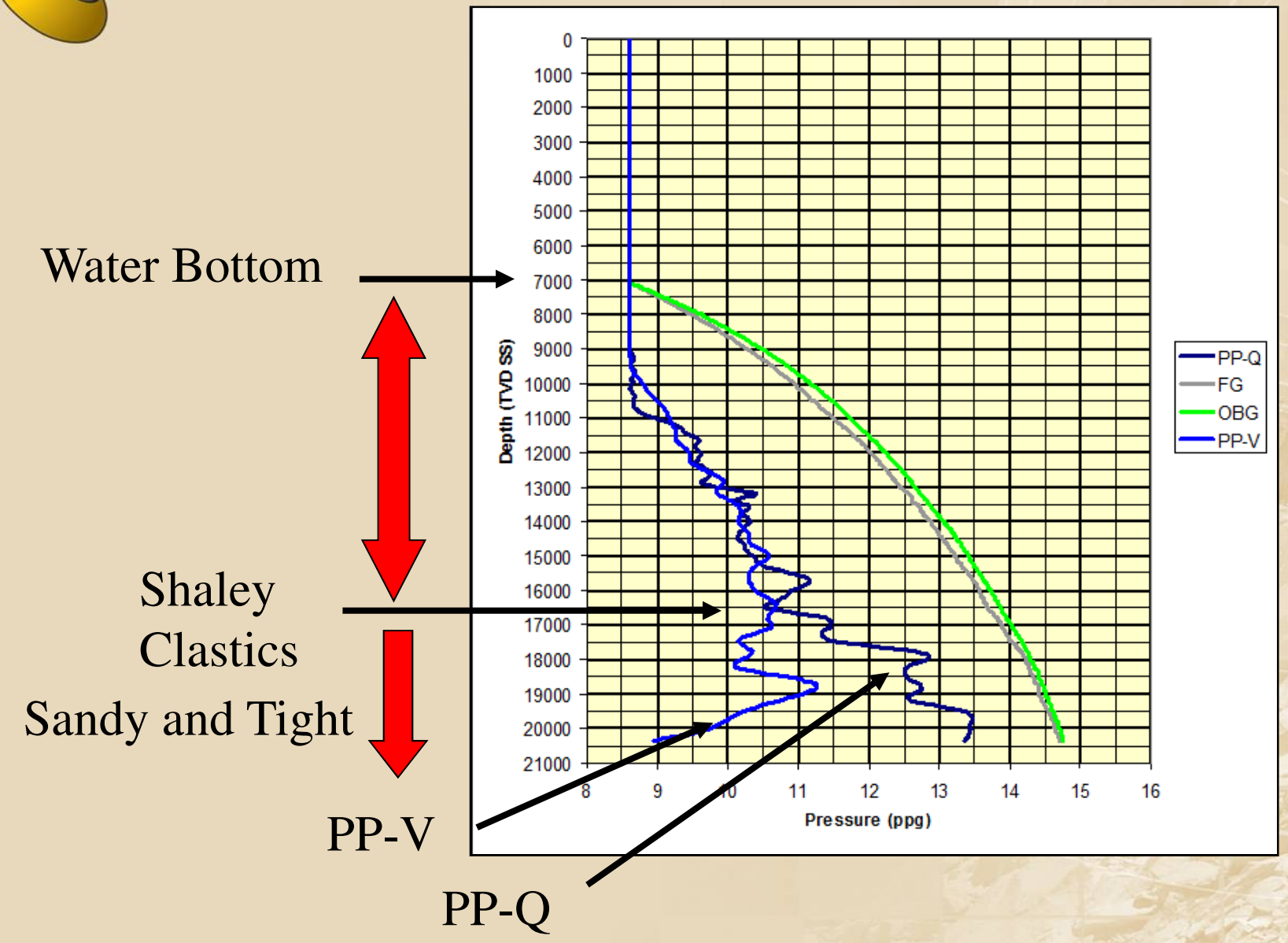

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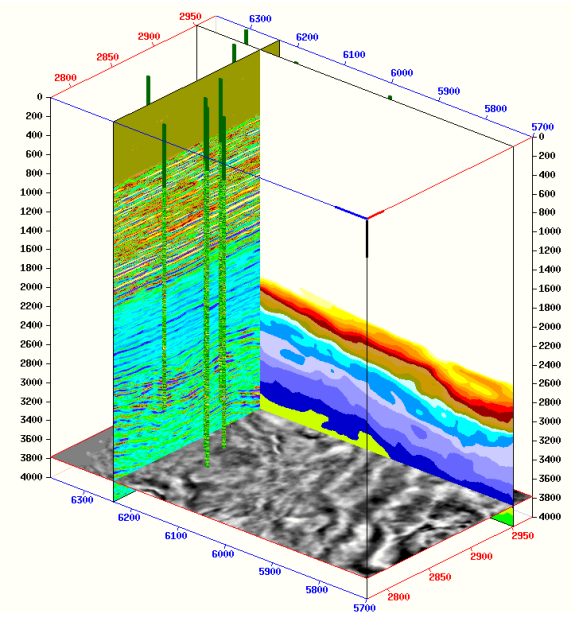
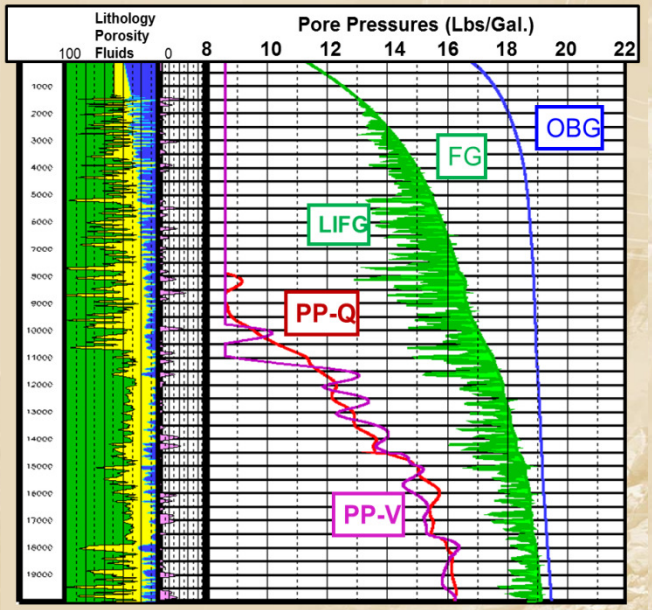
The “Pre-Drill Mud Log” (PDML)

3D Volumes Include:

1) **Pore pressure**
   a) PP-Q (freq-based)
   b) PP-V (vel-based)
   c) centroids
2) **Fracture Gradient**
   a) shale
   b) sand (LIFG)
3) **Lithology**
   a) shale/“not-shale”
   b) porosity



PDML



The PDML is an extraction of over 10 different inversions/calculations along a proposed well path.

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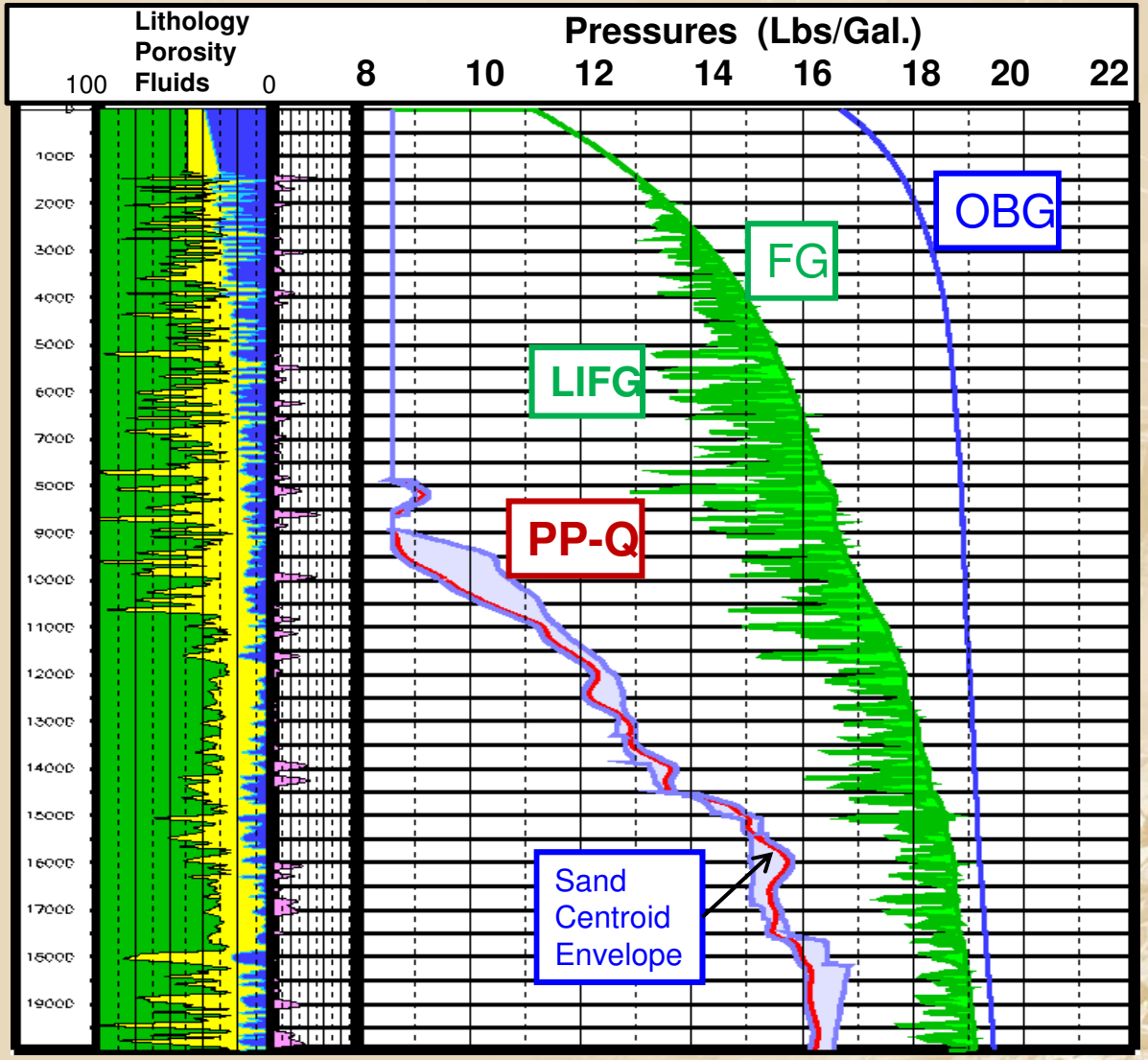
The Elements of the PDML

Depth Track
Track 1contains:
  lithologies
  porosity
  fluids
Track 2 contains:
  gas indication
Track 3 contains:
PP-Q
Centroids (min,max)
LIFG
FG
OBG



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Near Time Updating

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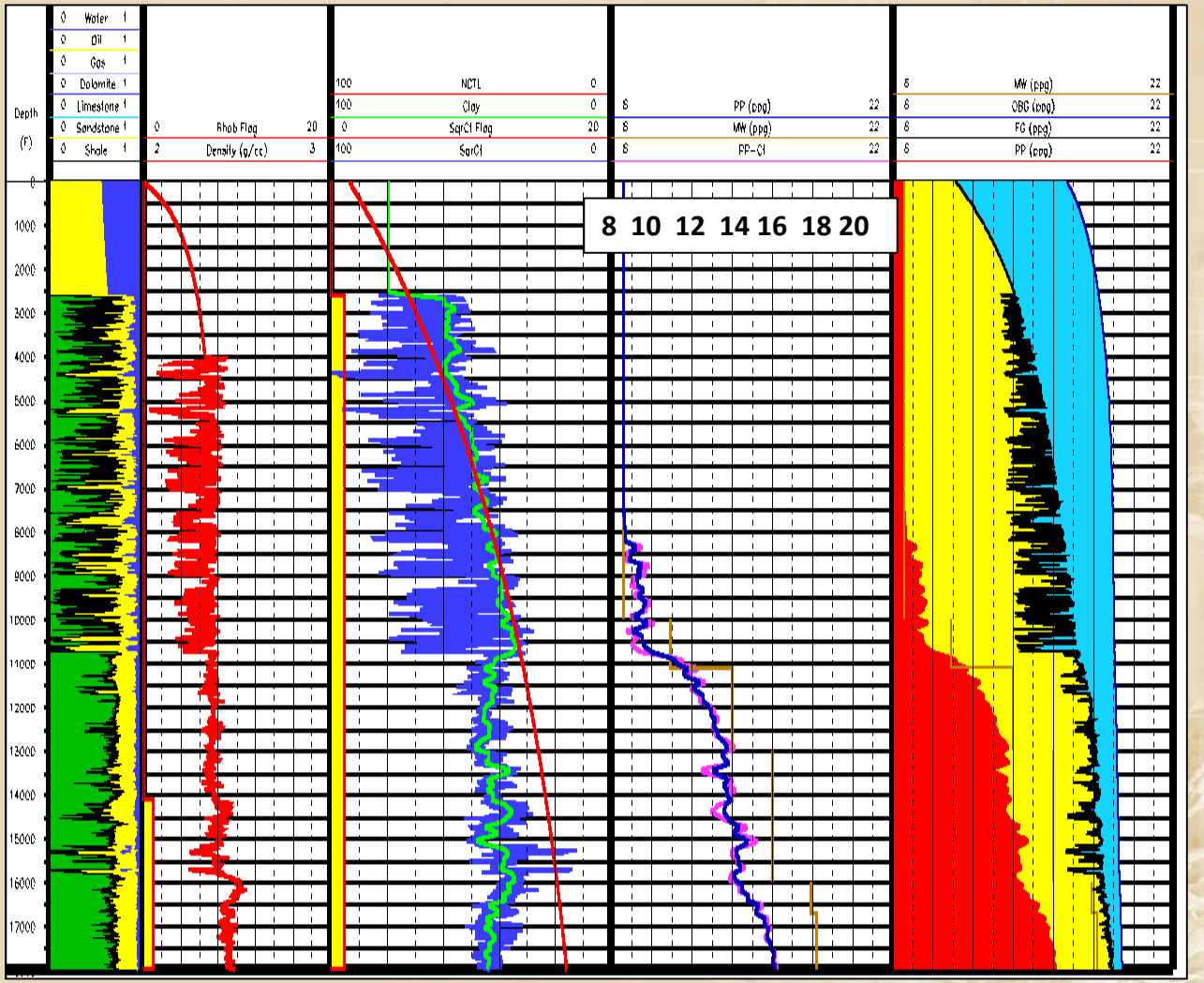
The Daily Assessment of PP and FG

When the drilling starts. The shale pore pressure is assessed using info from LWD logs, wireline logs and other drilling parameters (such as mud weight, LOT's, MDT's, RFT's).



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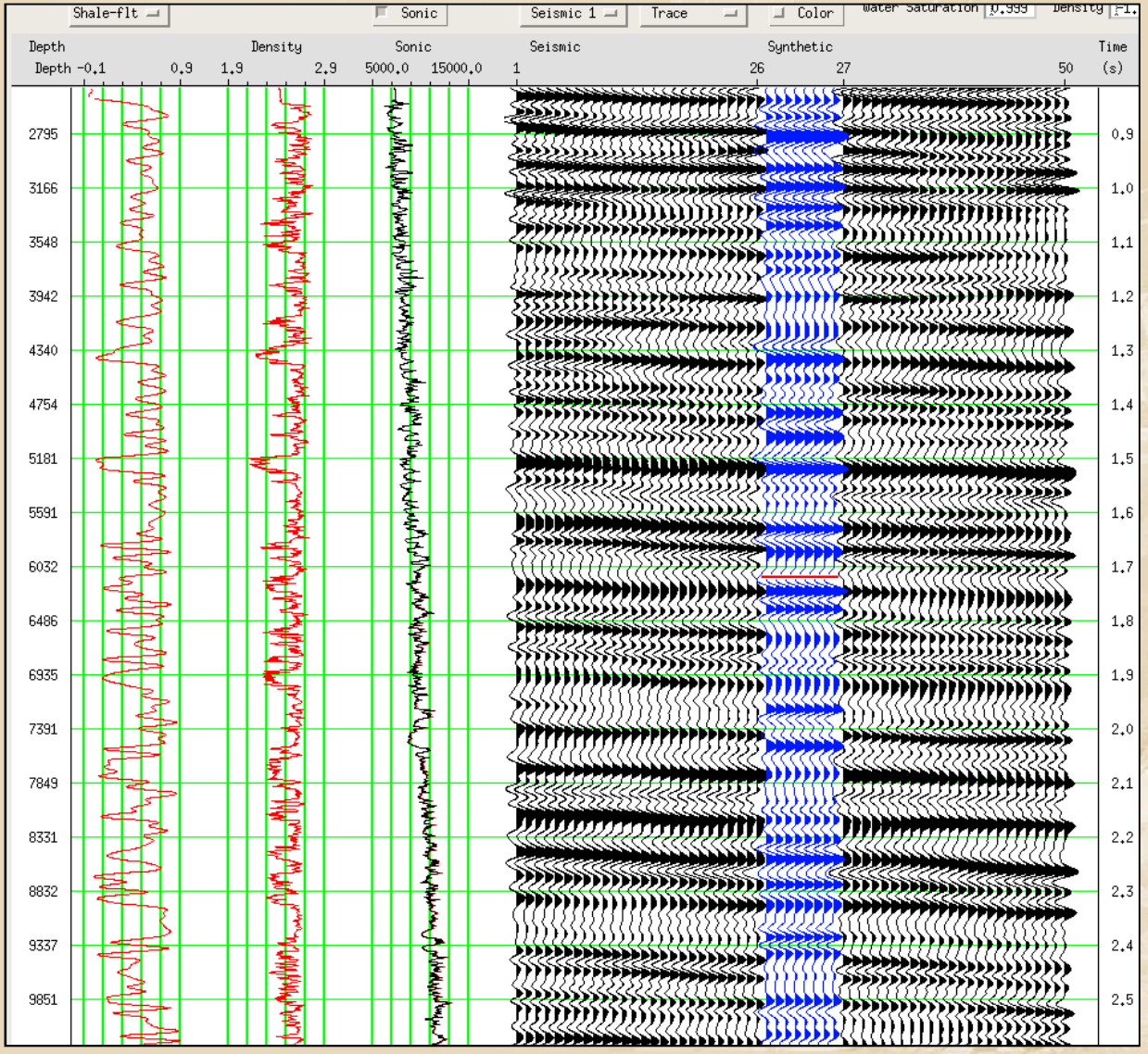
The Daily Update Of Time/Depth

The PDML is a prediction of rock properties for designing the well. These predictions are provided in depth, however the data source is seismic which is in time. The time/depth relationship for the well is assessed by re-tying the well synthetic (shown in blue)to the seismic, as drilling proceeds, This is done using a synthetic from LWD info. The new time/depth relationship is used to convert the PDML to depth.



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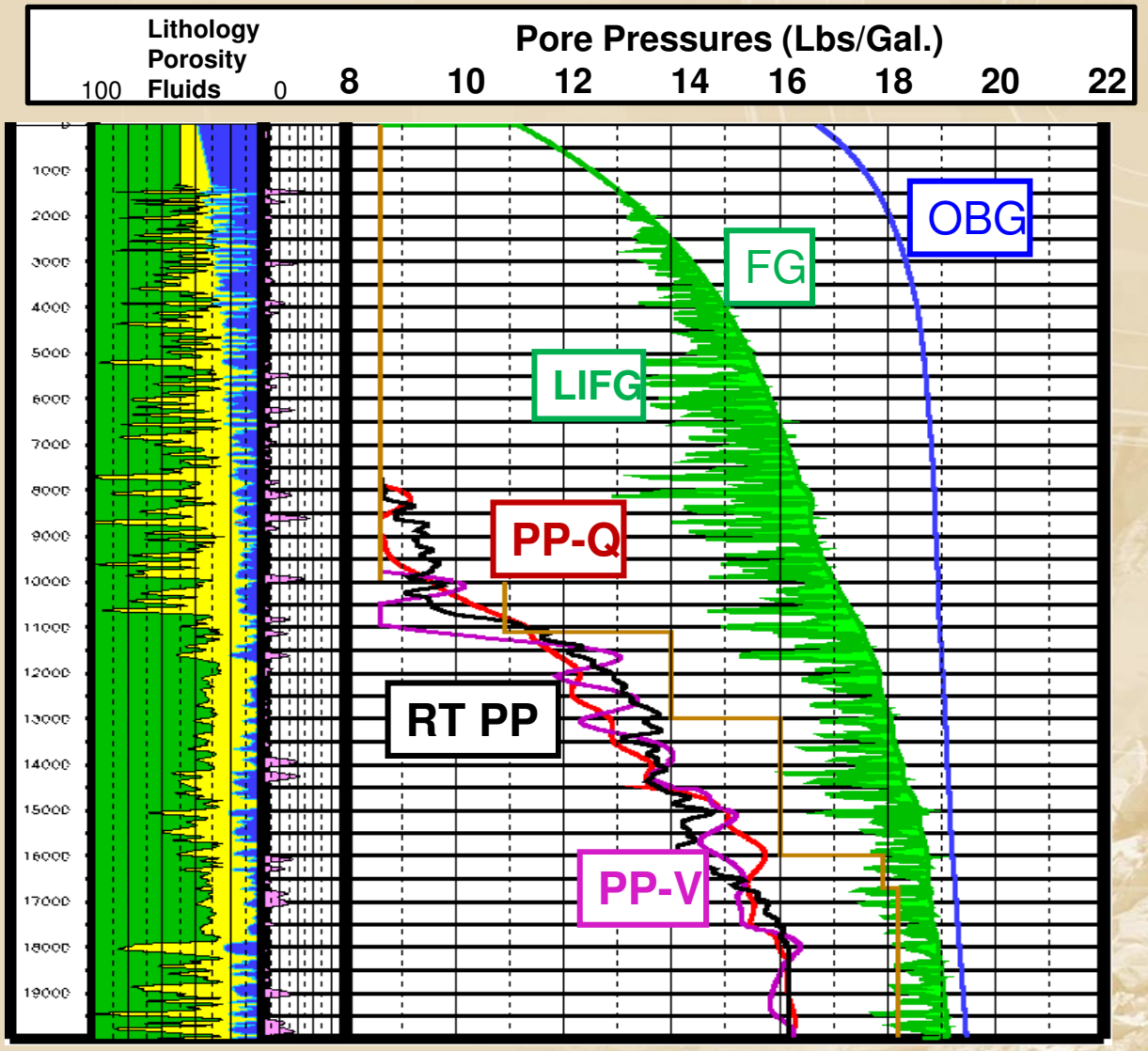
The Daily Update of the Pre-Drill Mud Log

The latest drilling information is posted on the PDML. Predicted and actual pore pressures and mud weights are displayed, along with the well's GR curve. If required, the PDML can be recalibrated, therefore providing the best prediction of what lies ahead of the bit.



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Near Time Compressive Strength

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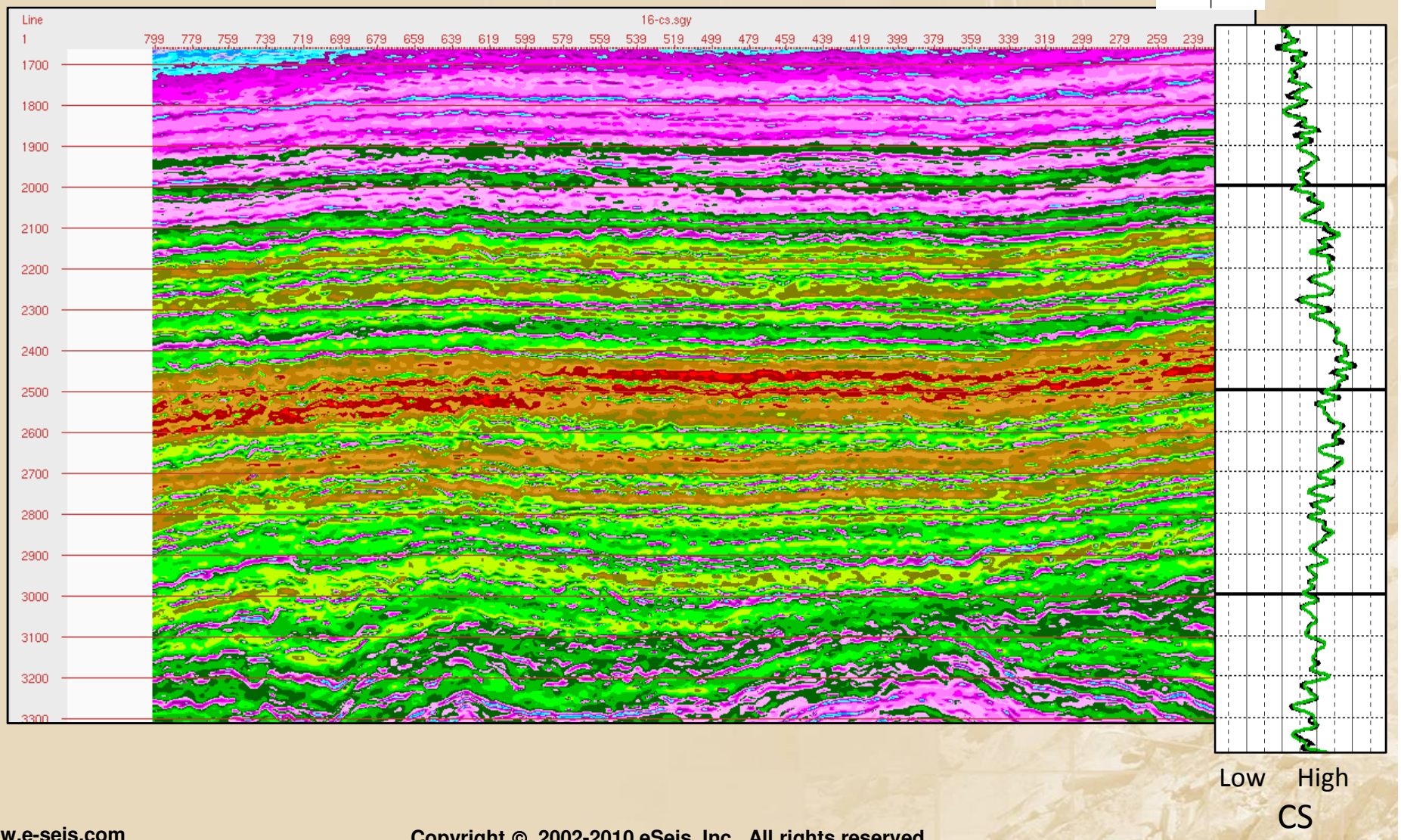
Compressive Strength



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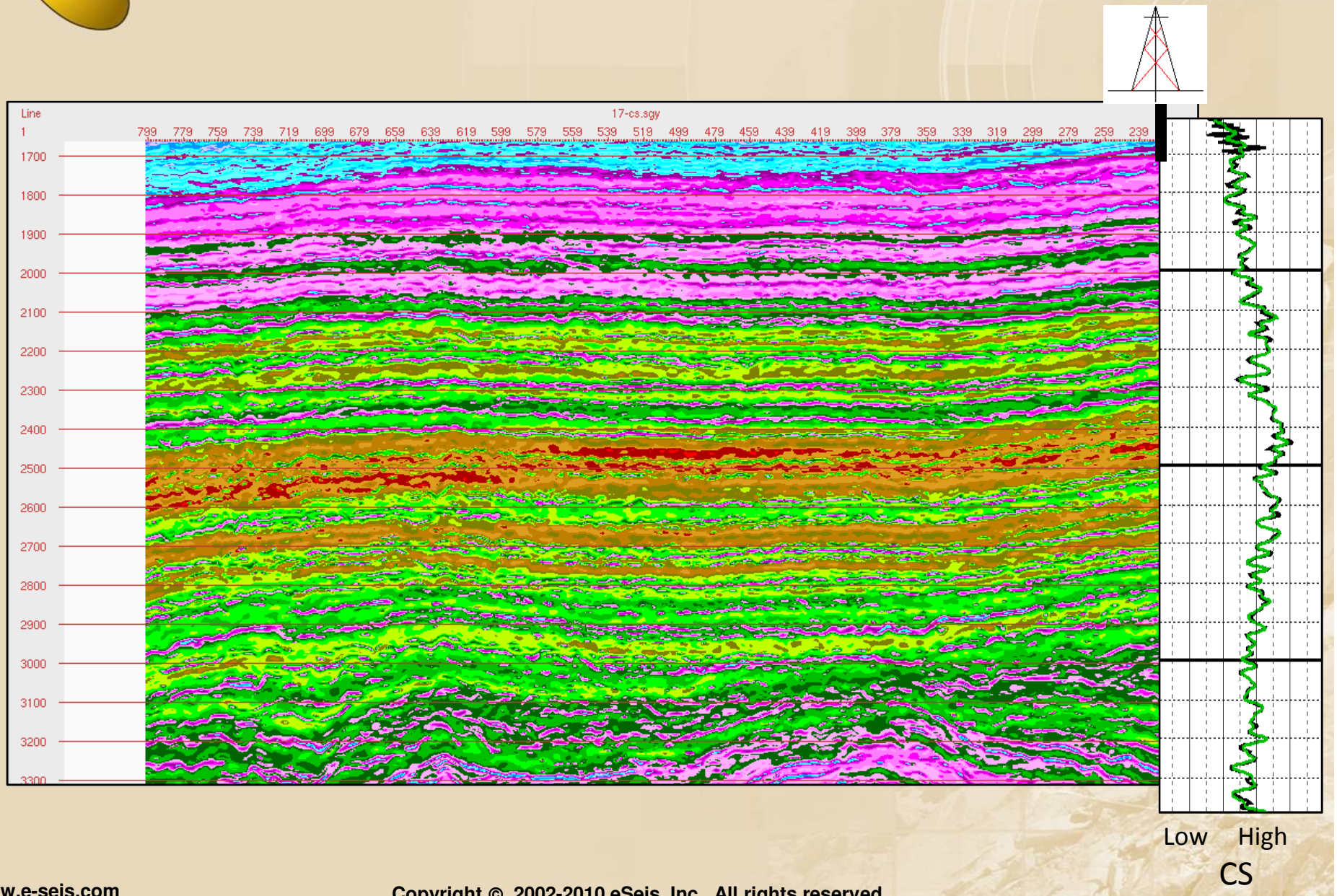
Compressive Strength



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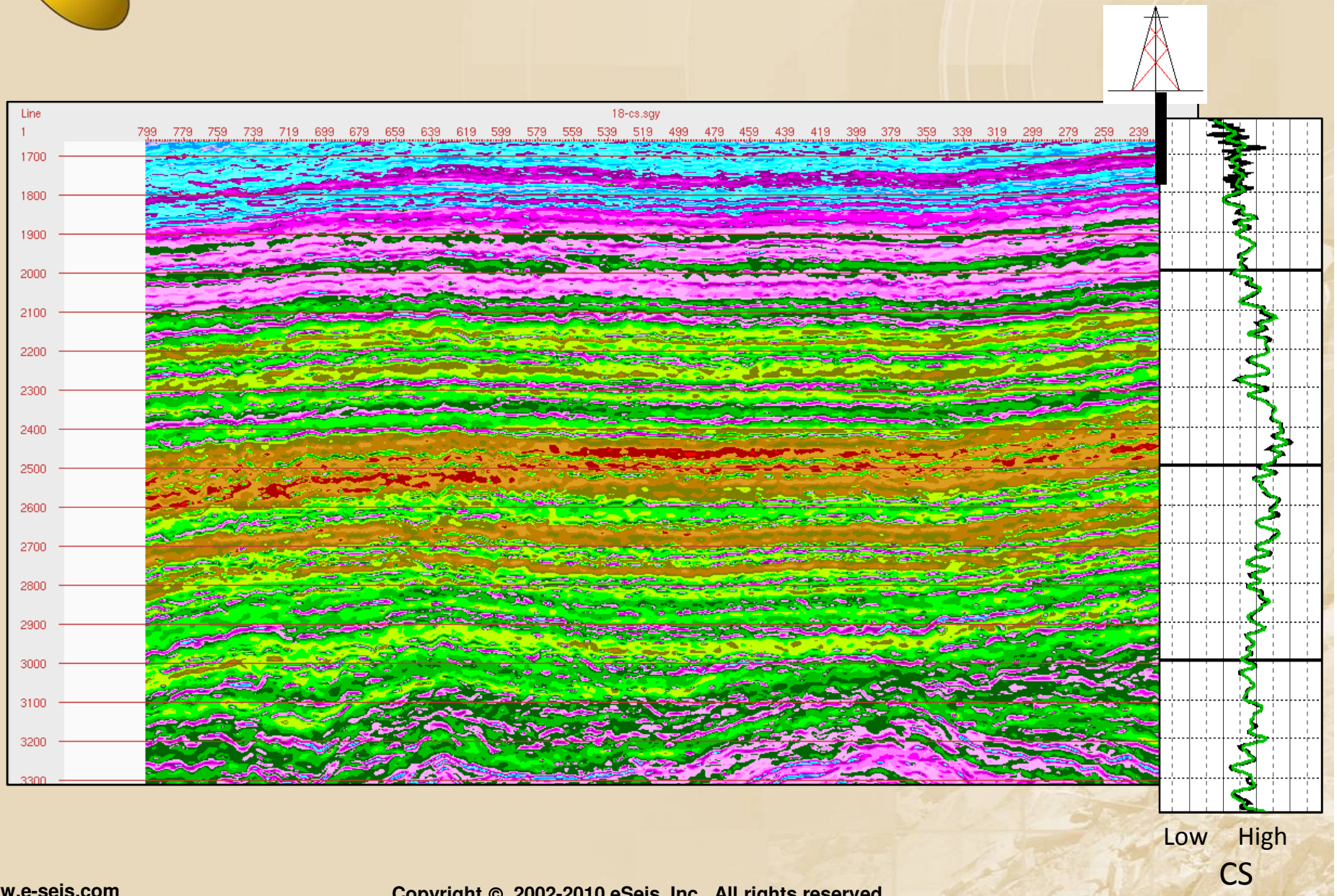

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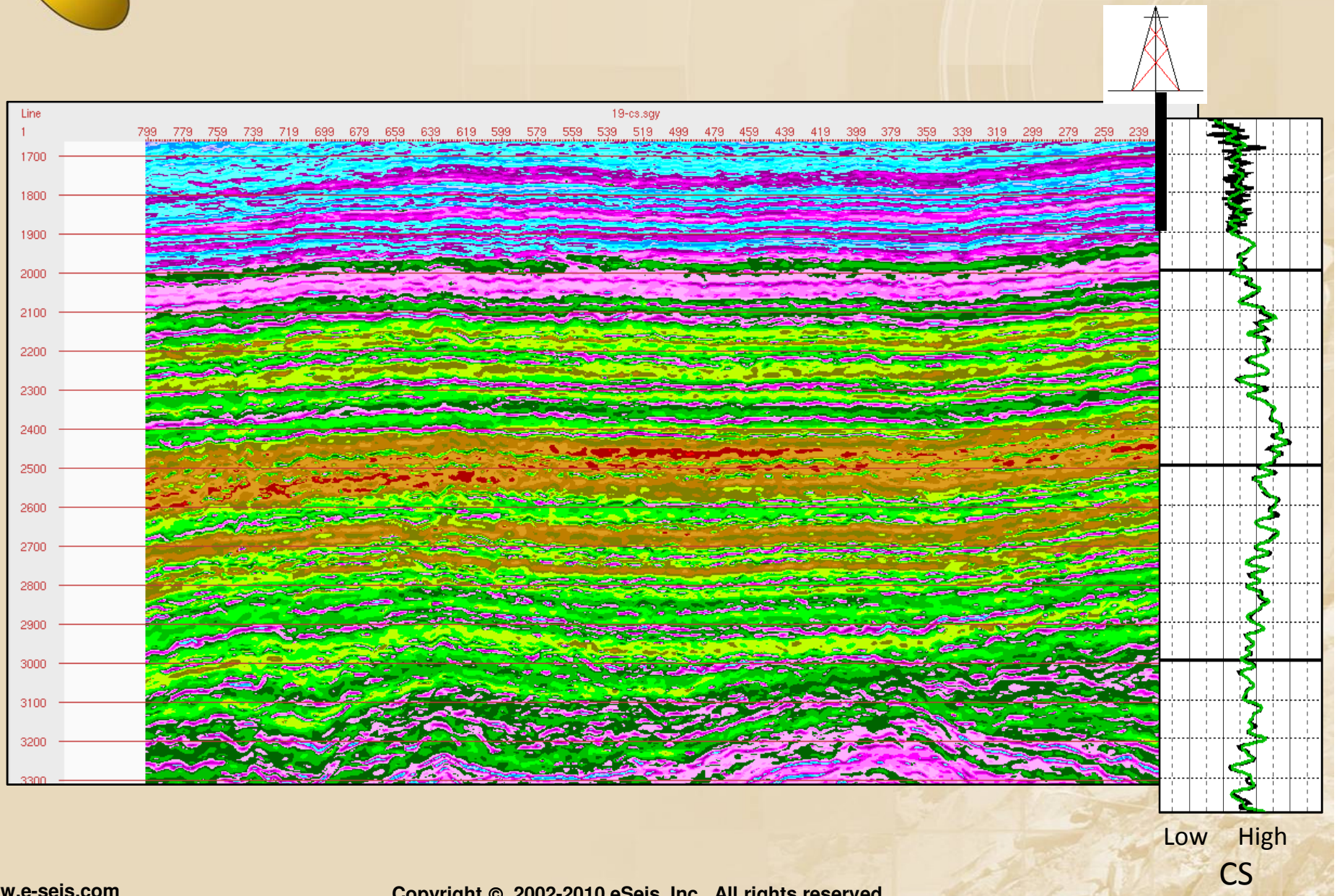
Compressive Strength



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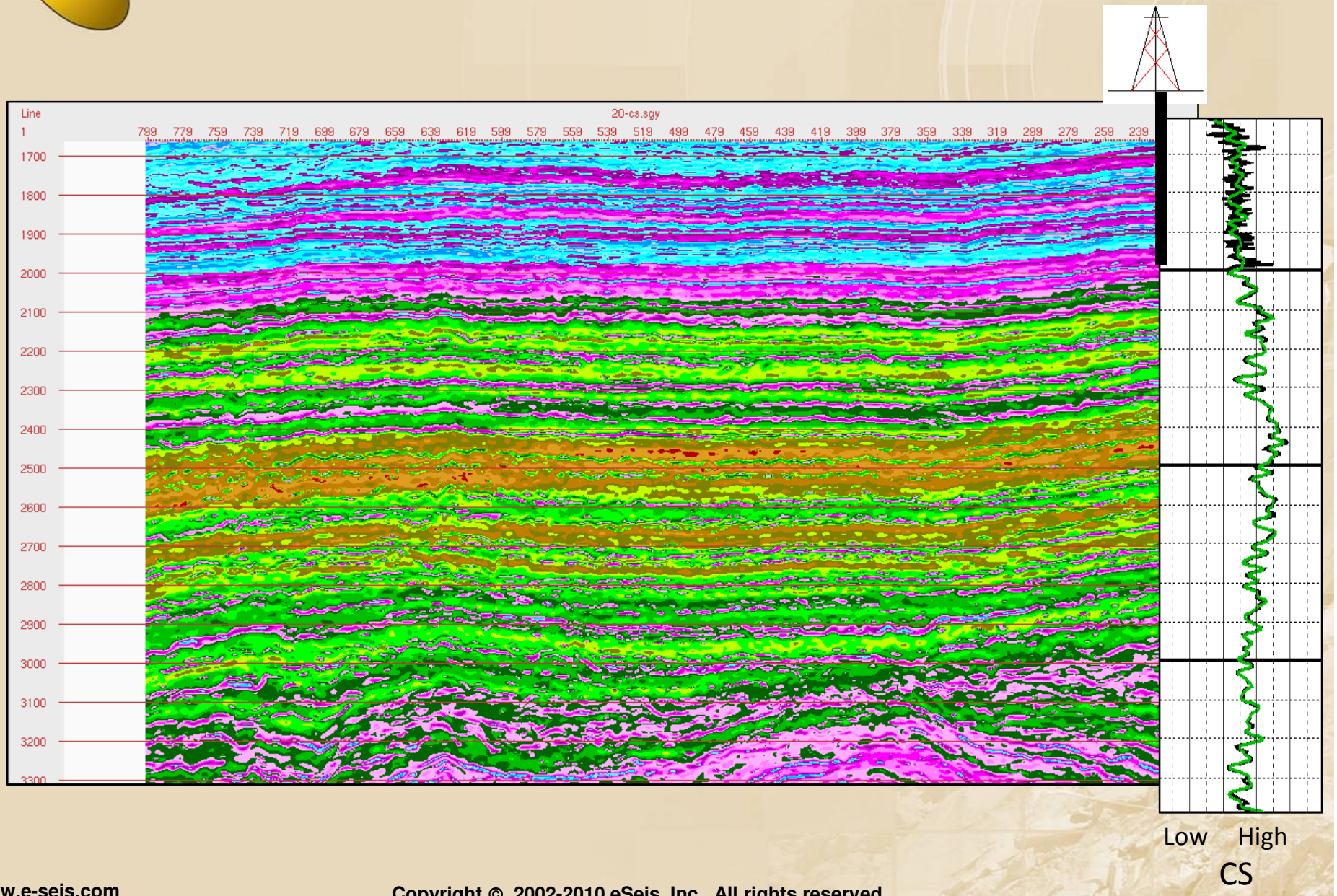

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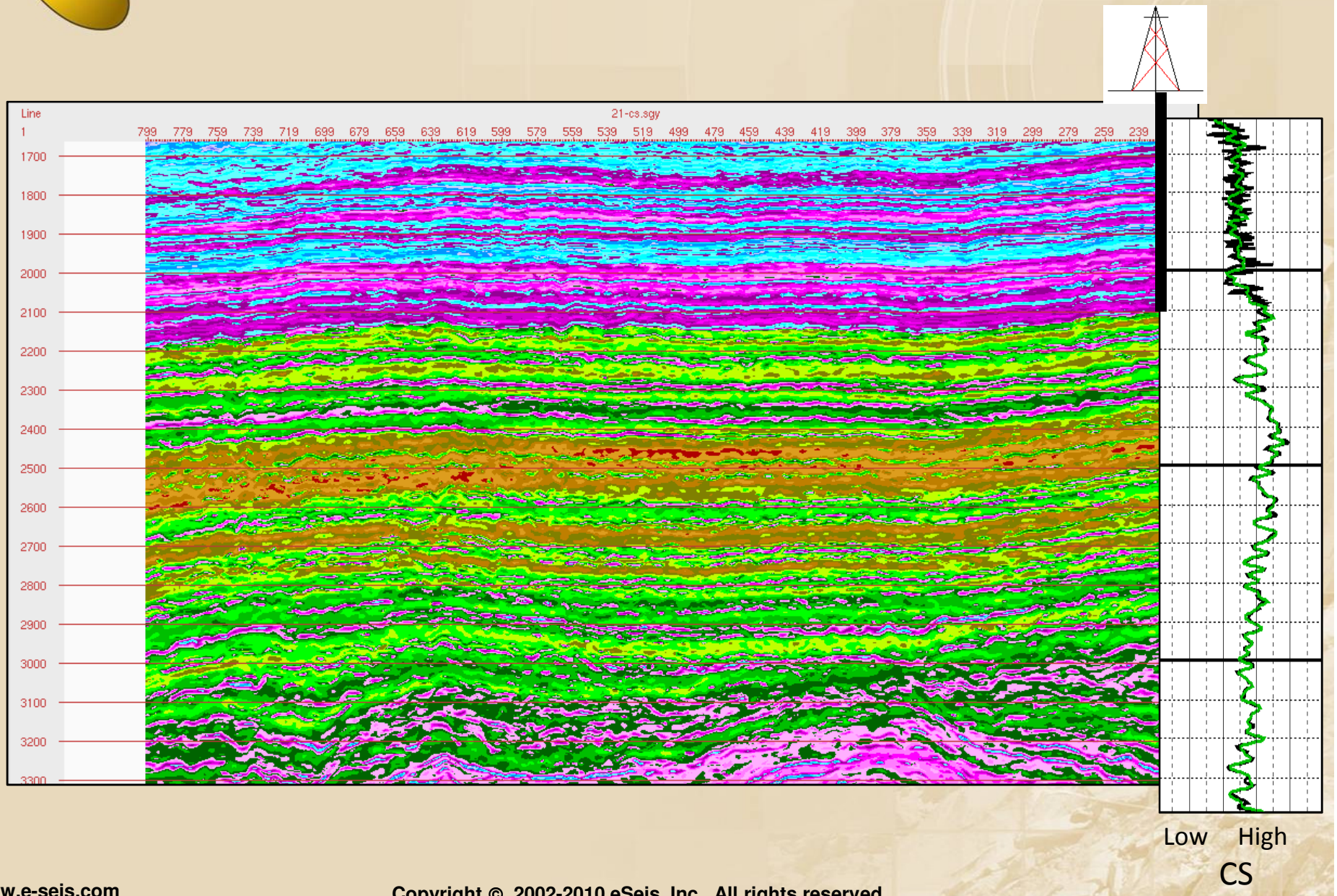

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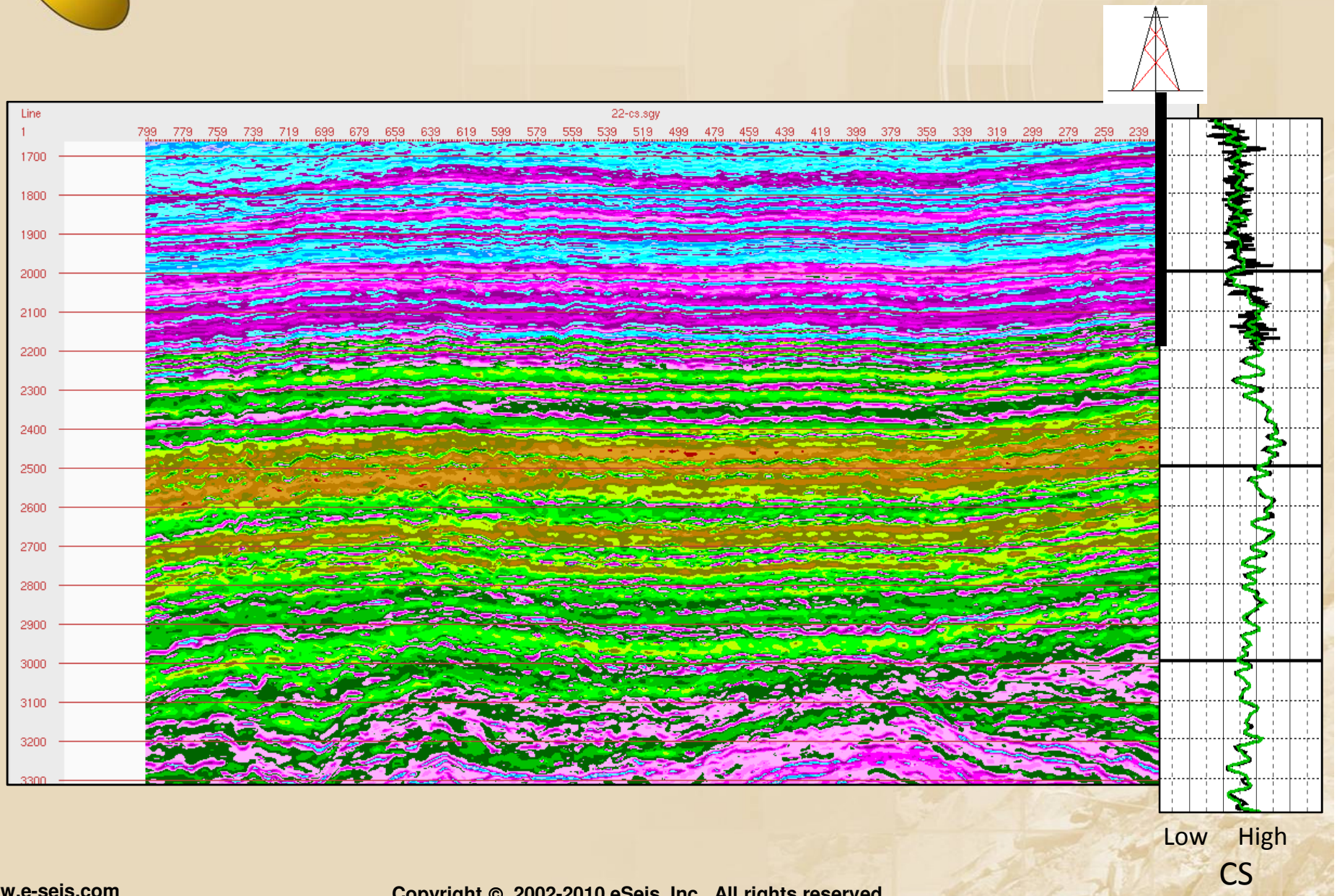

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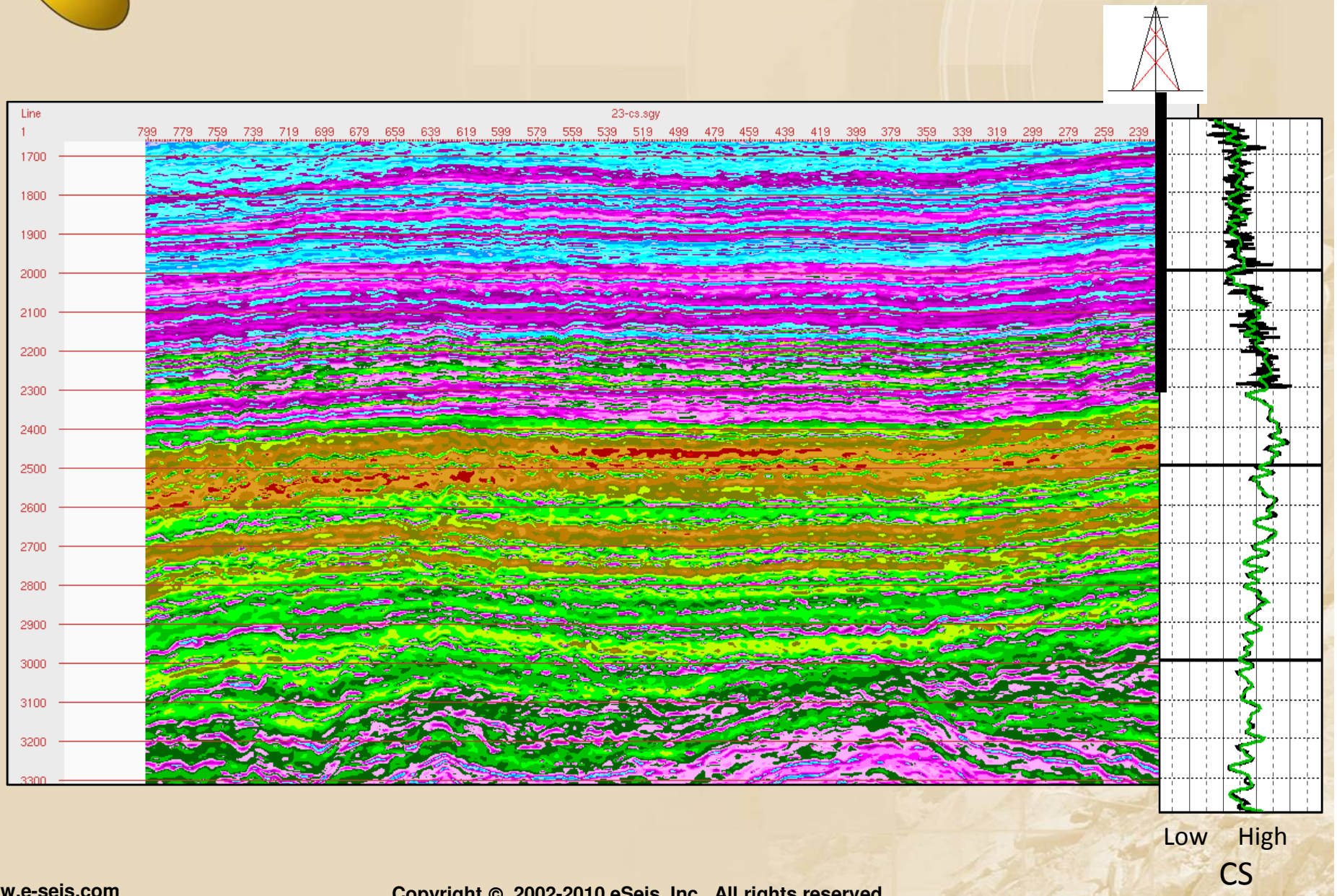
Compressive Strength



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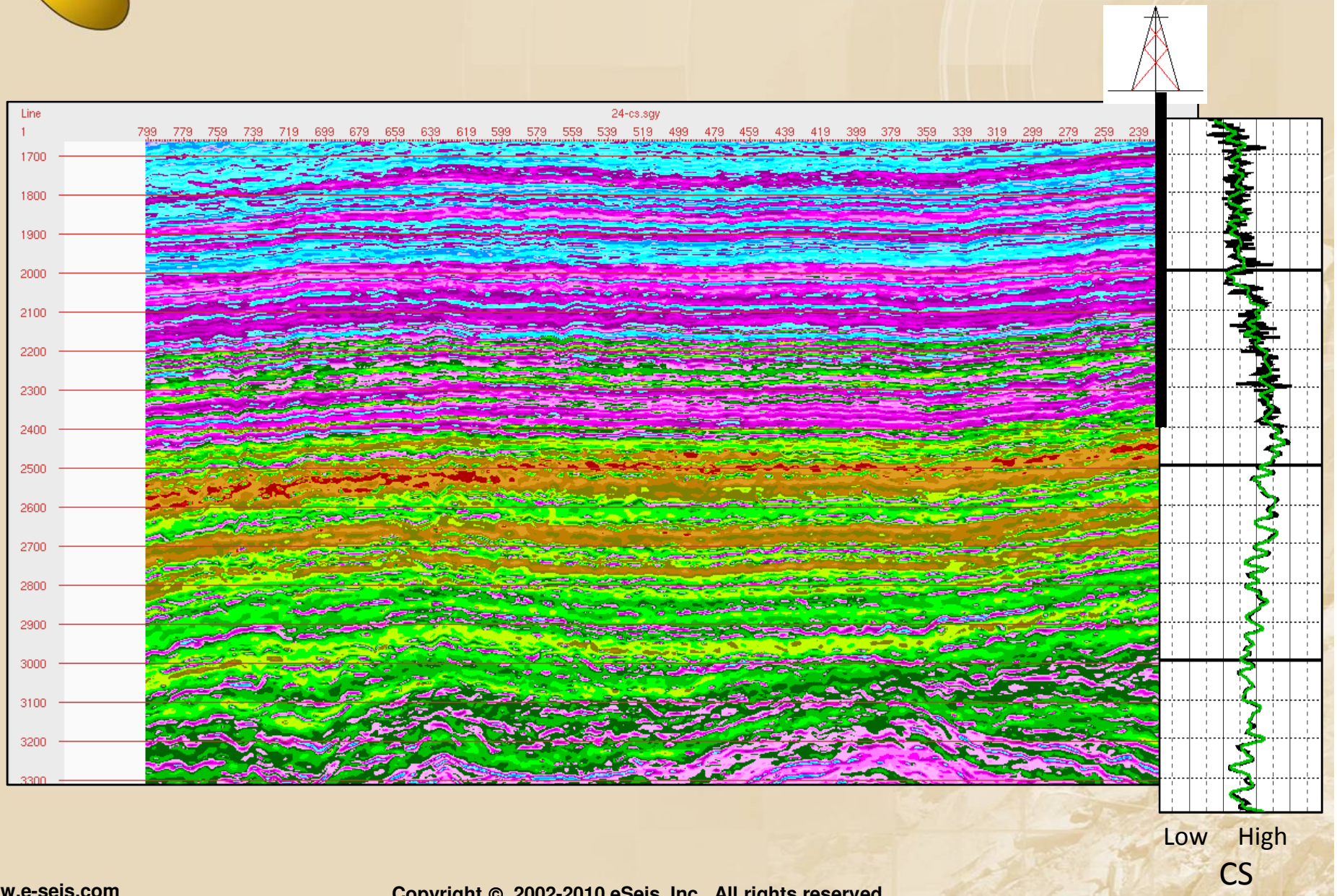

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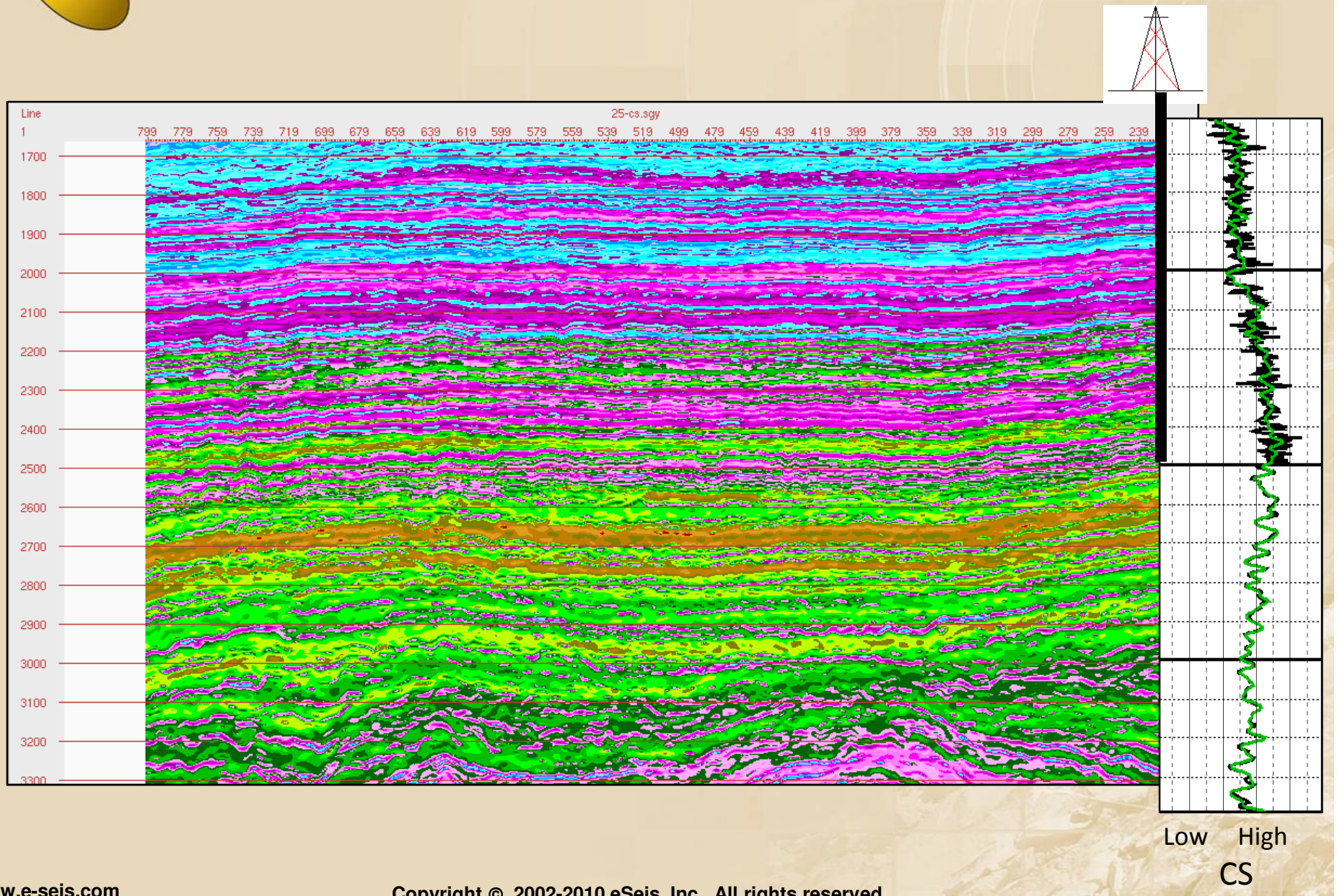

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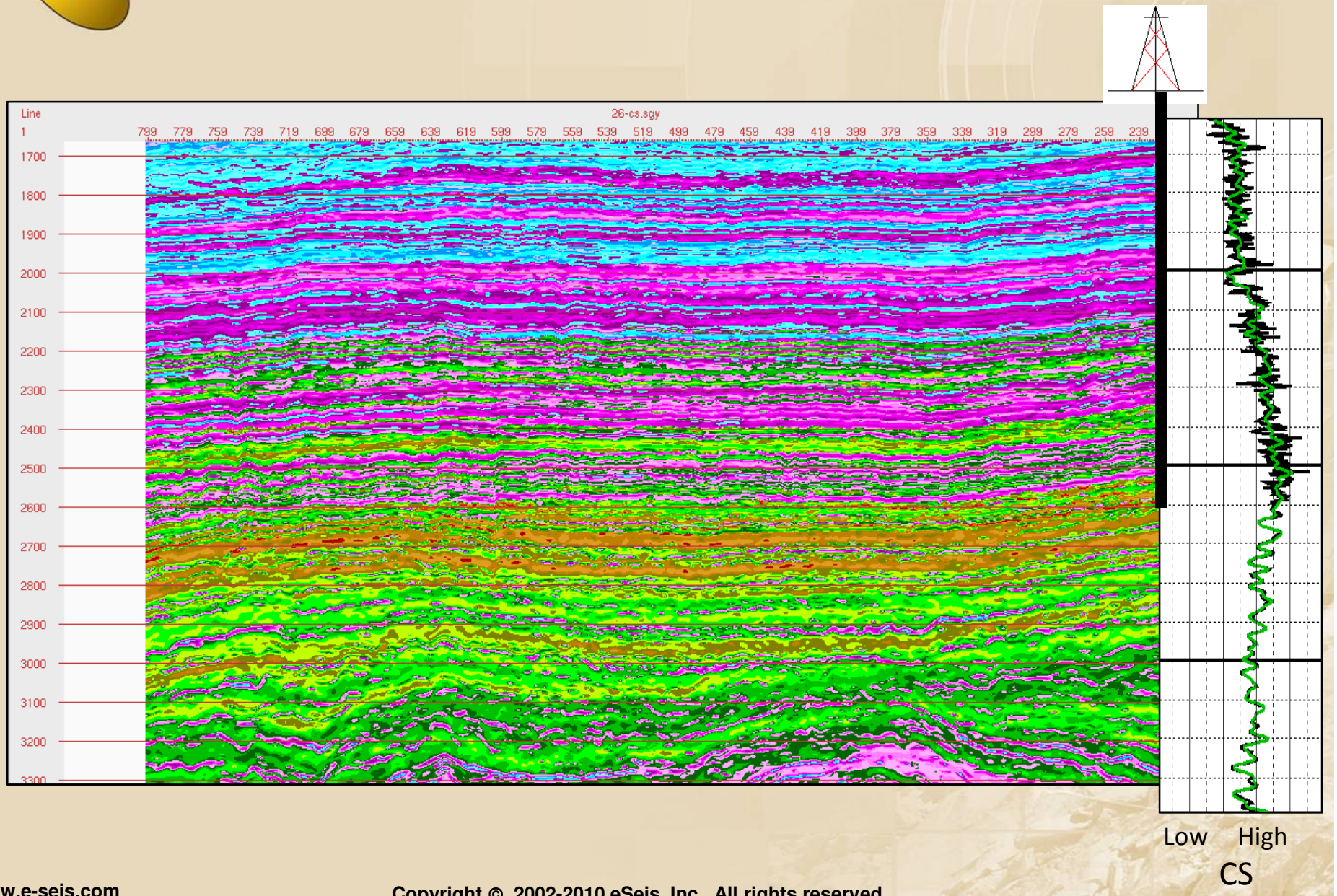

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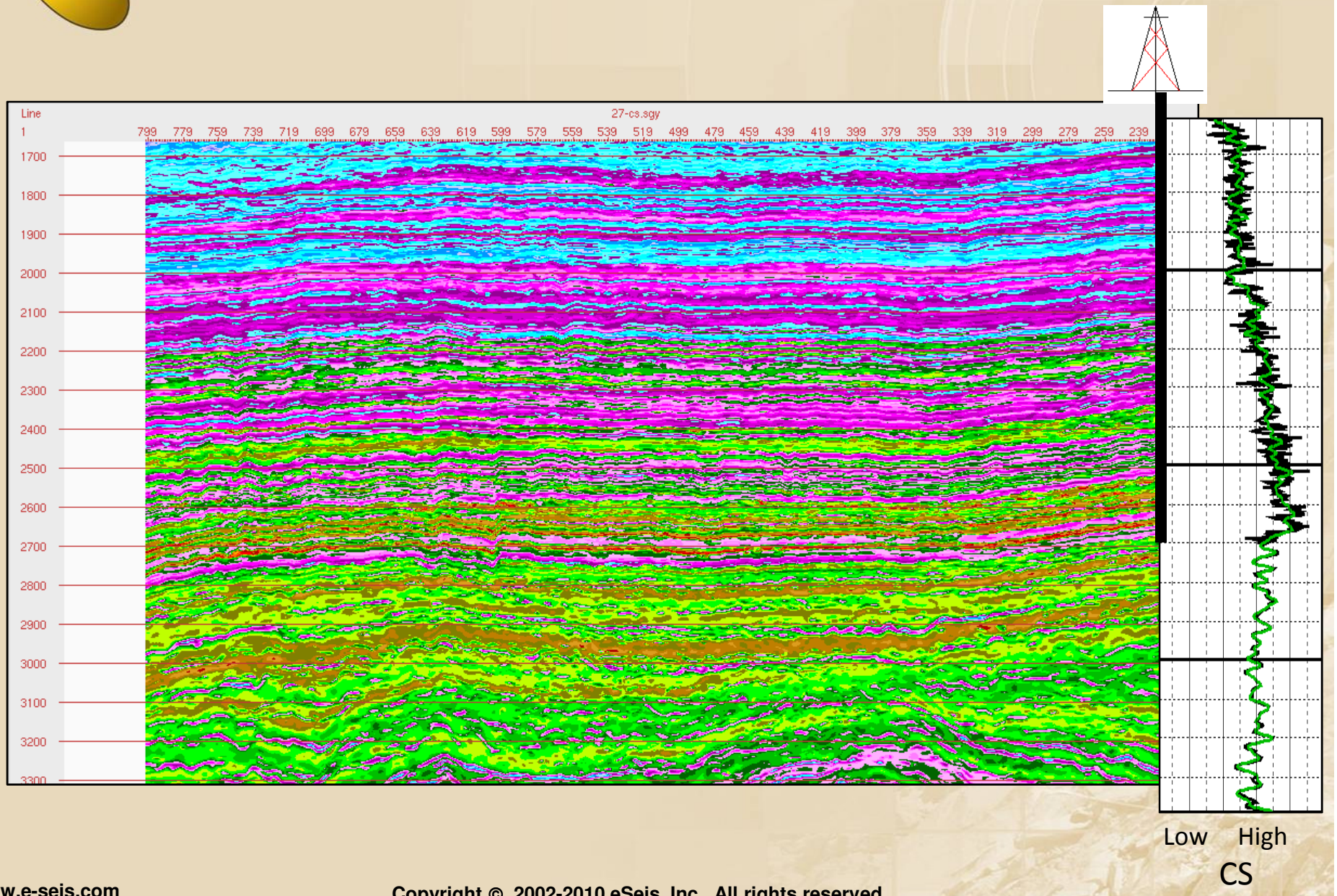

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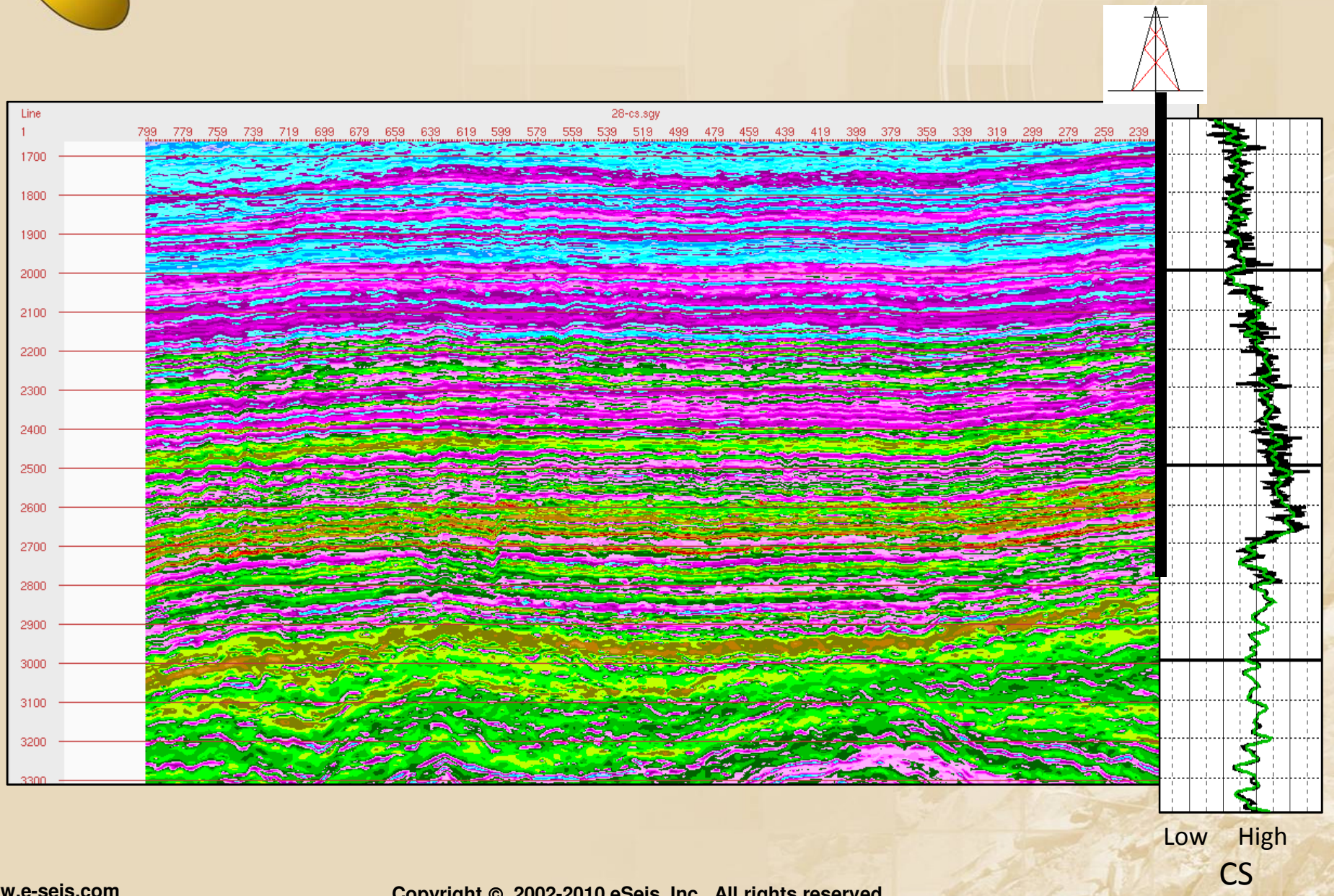

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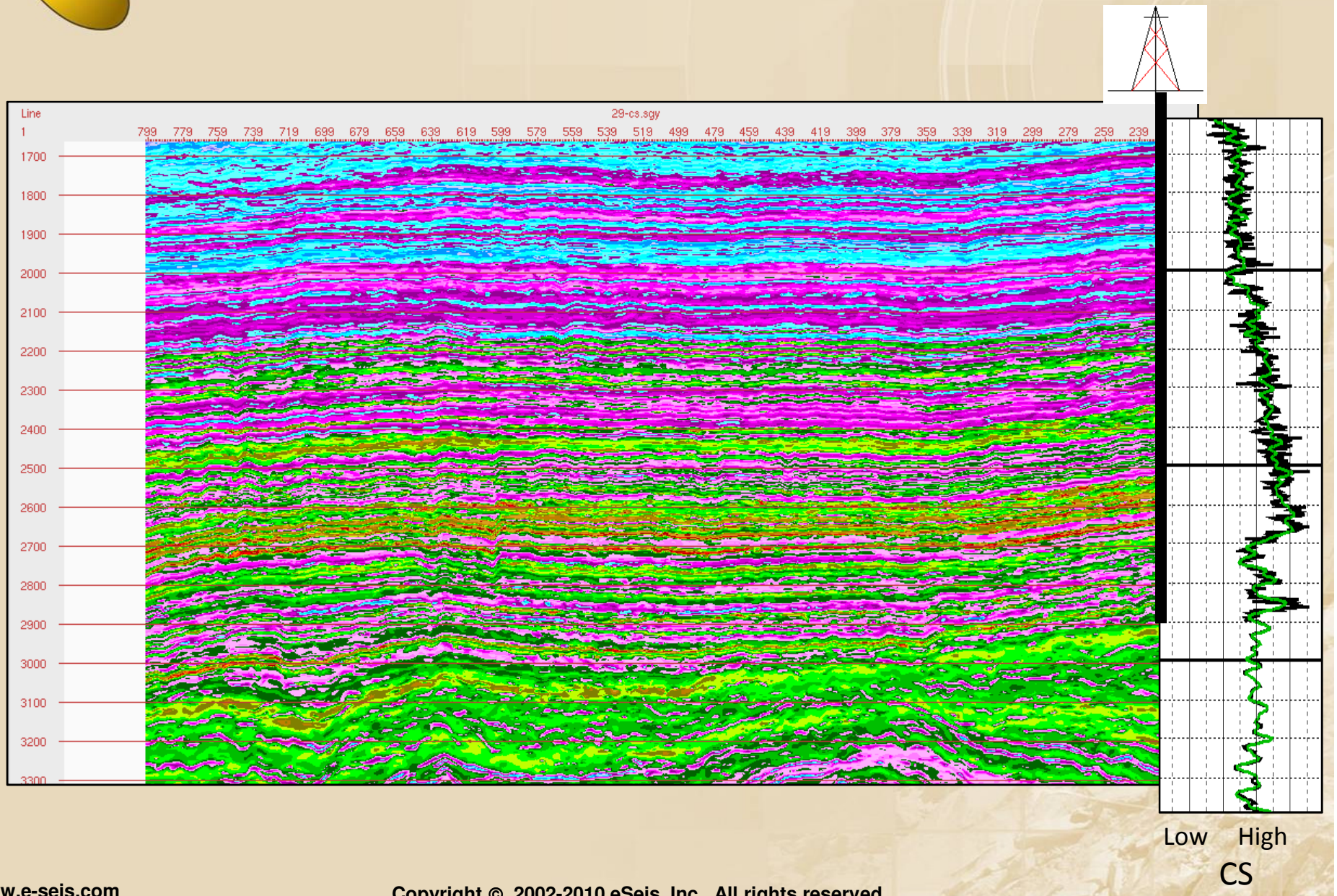

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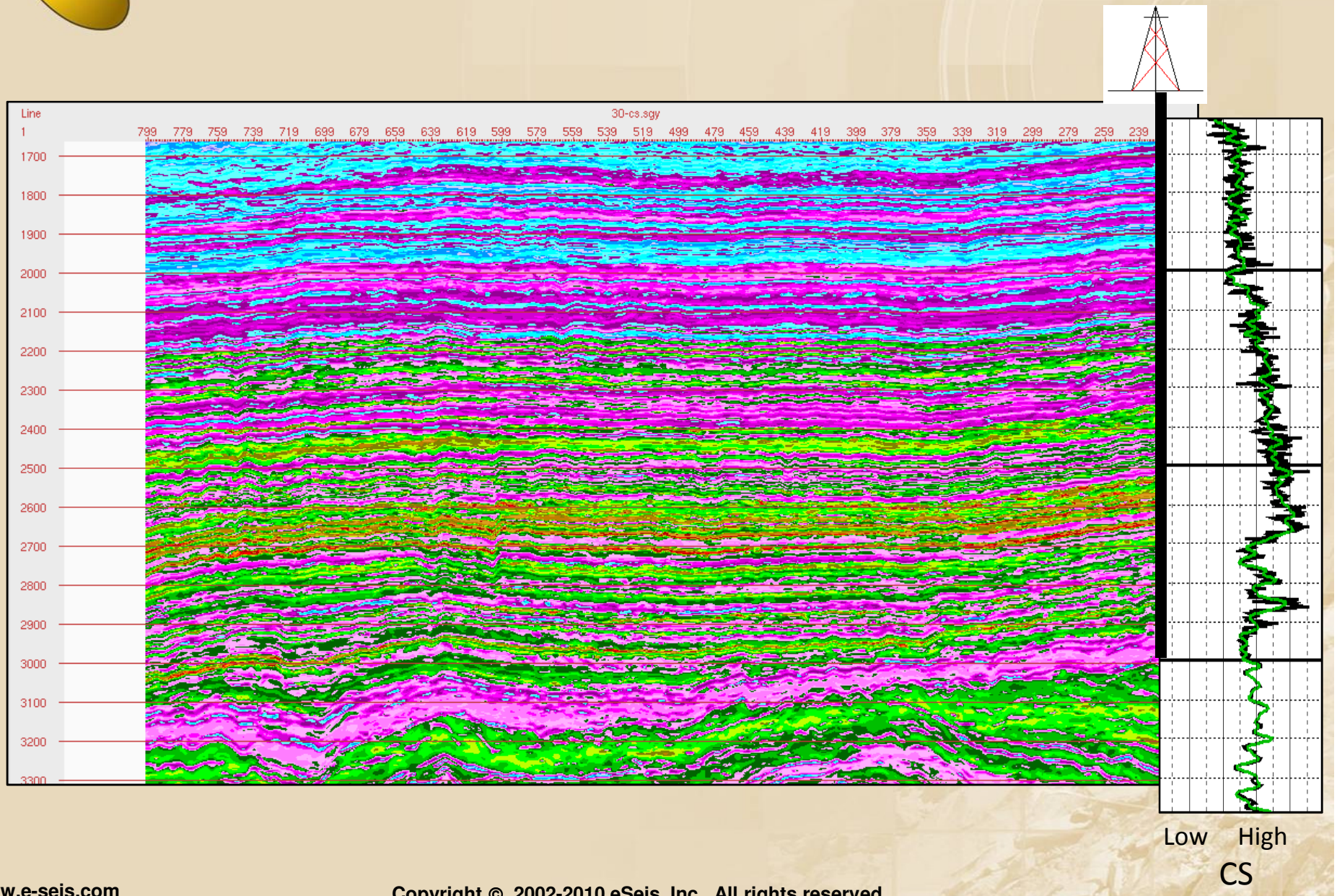

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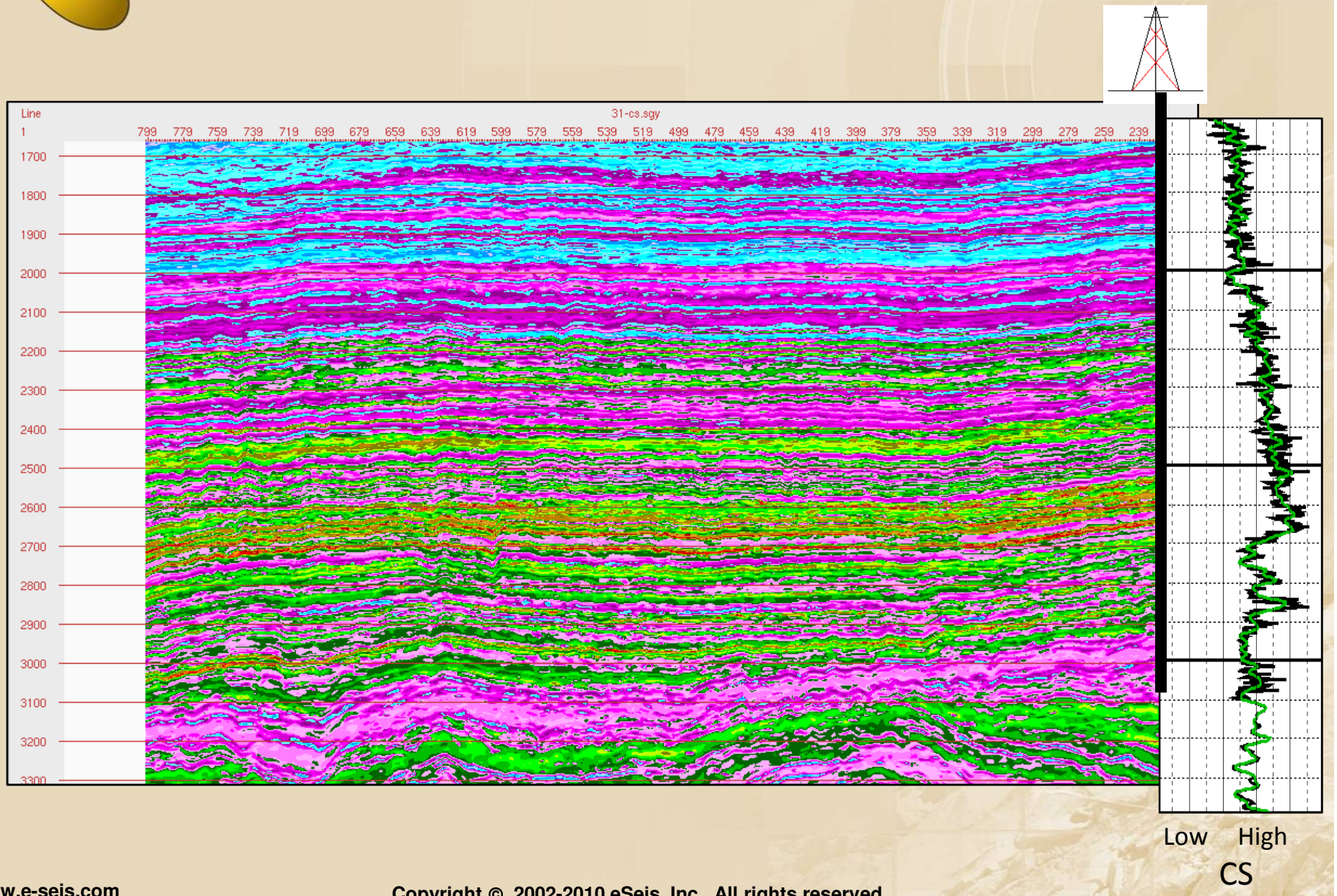

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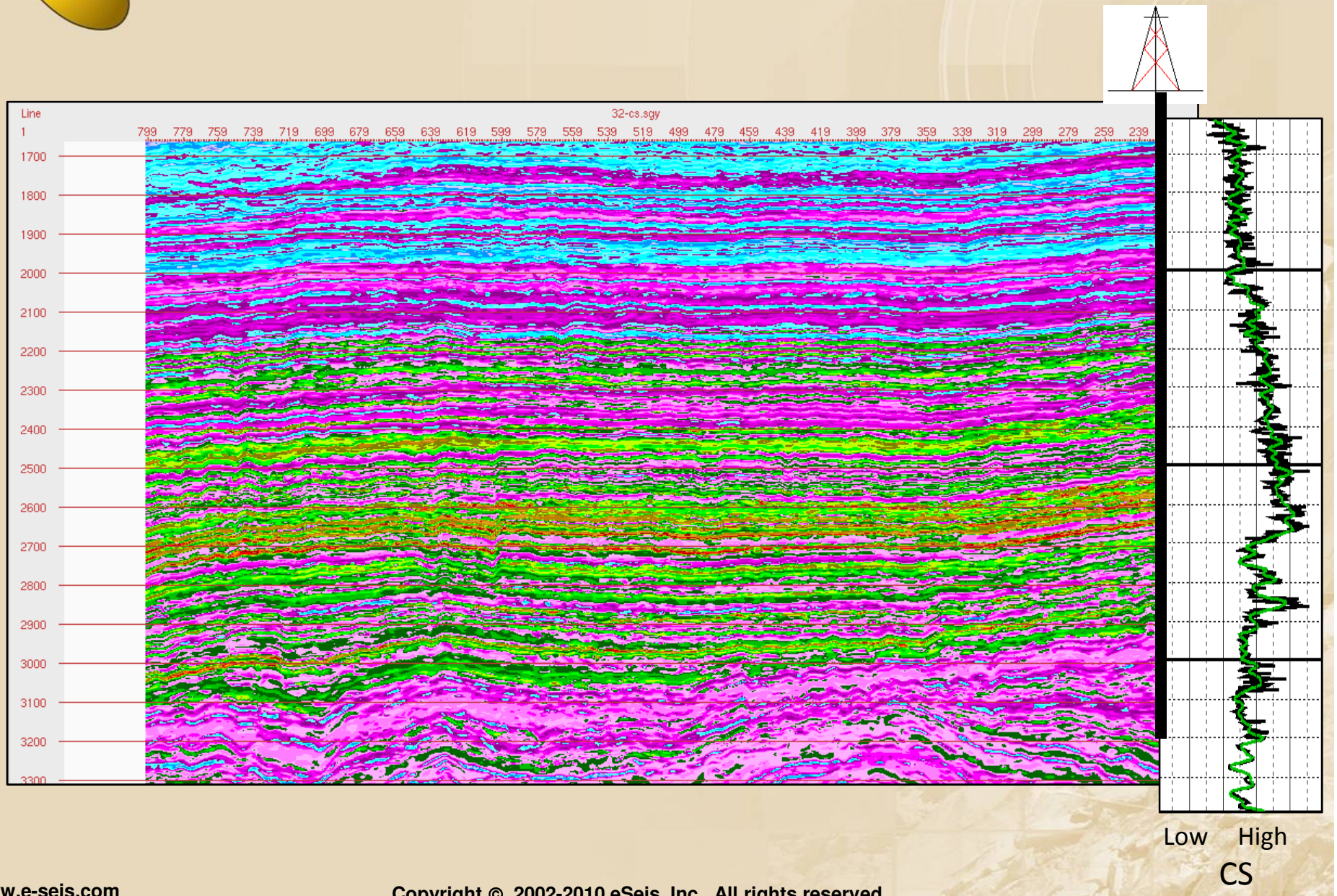

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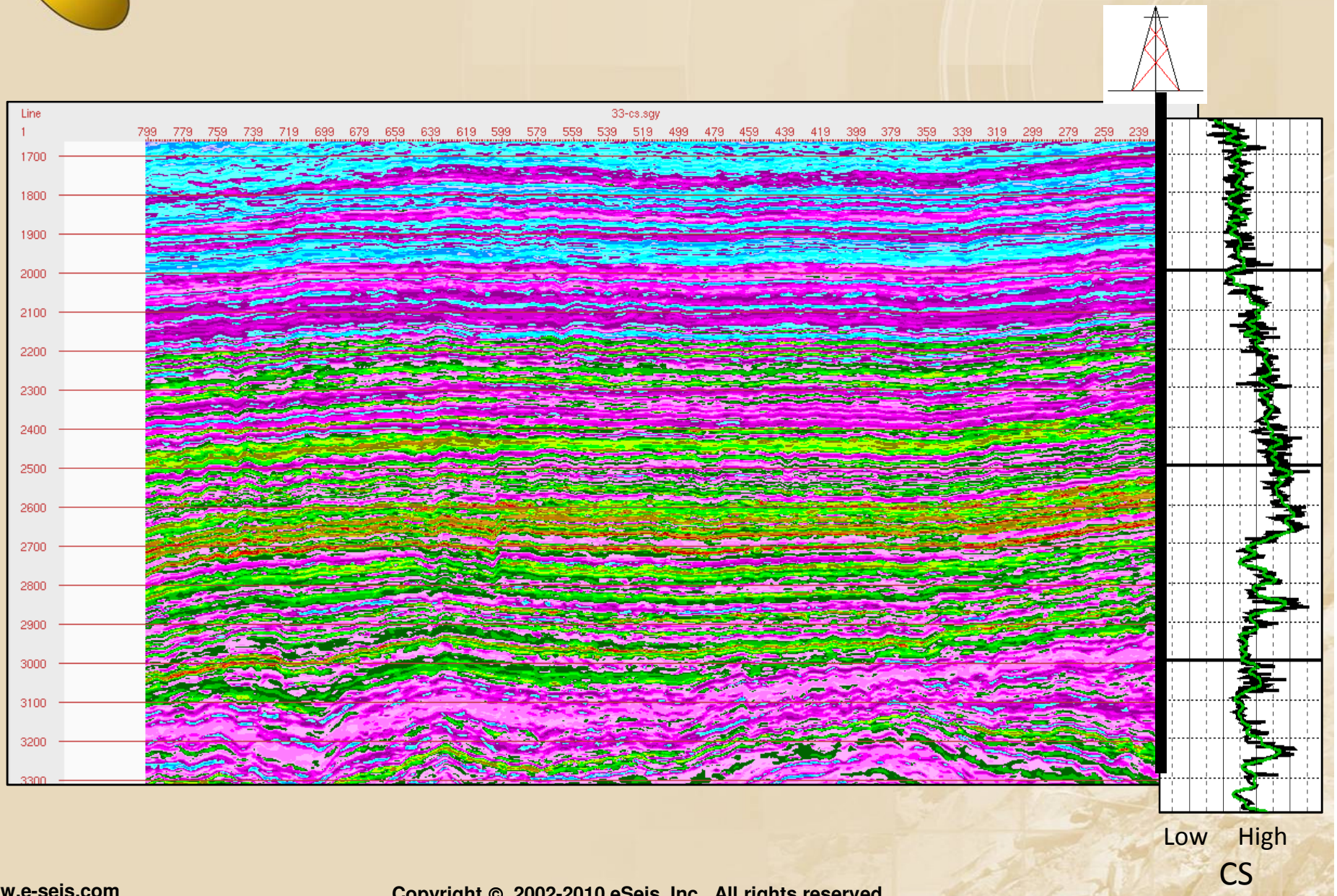

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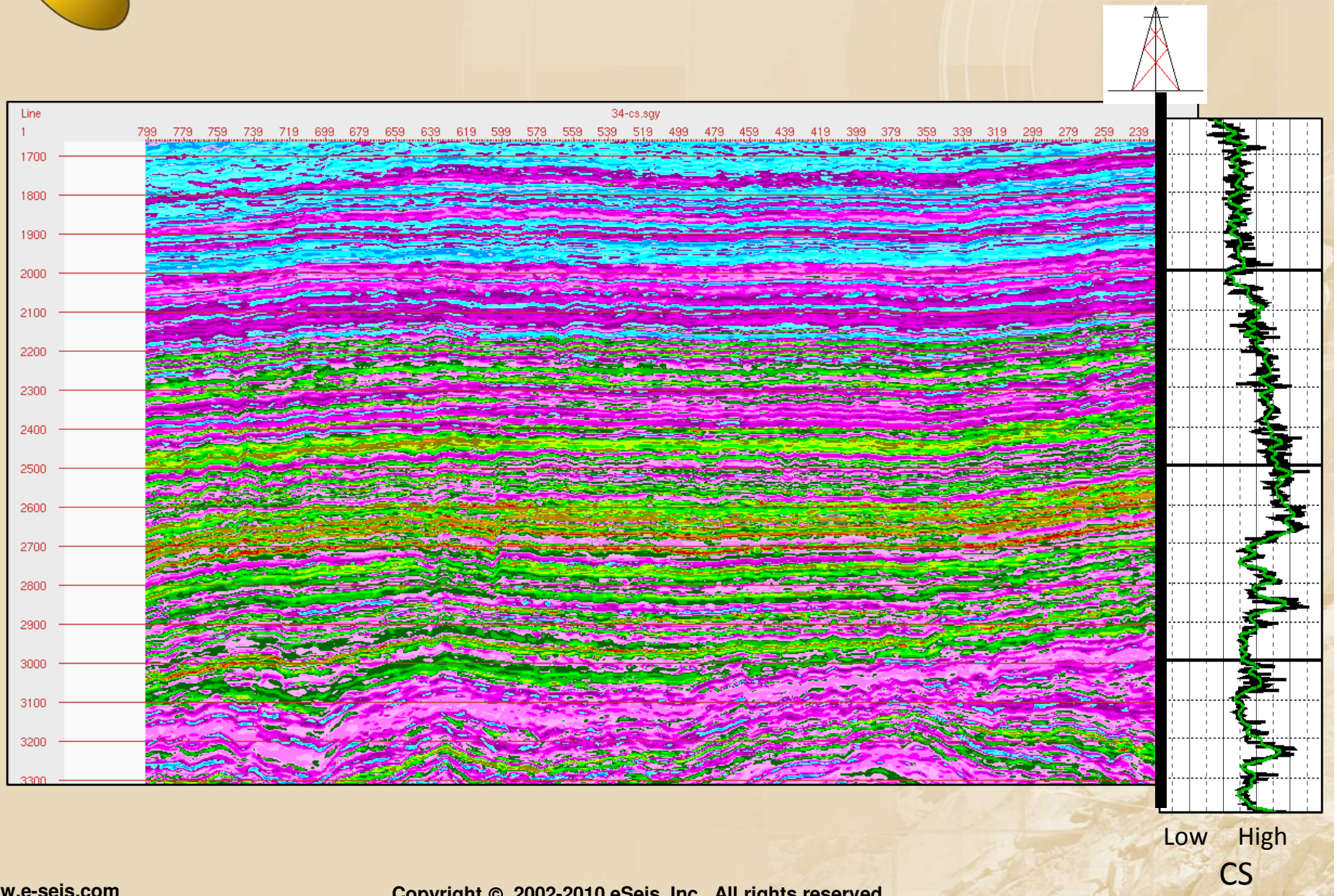

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