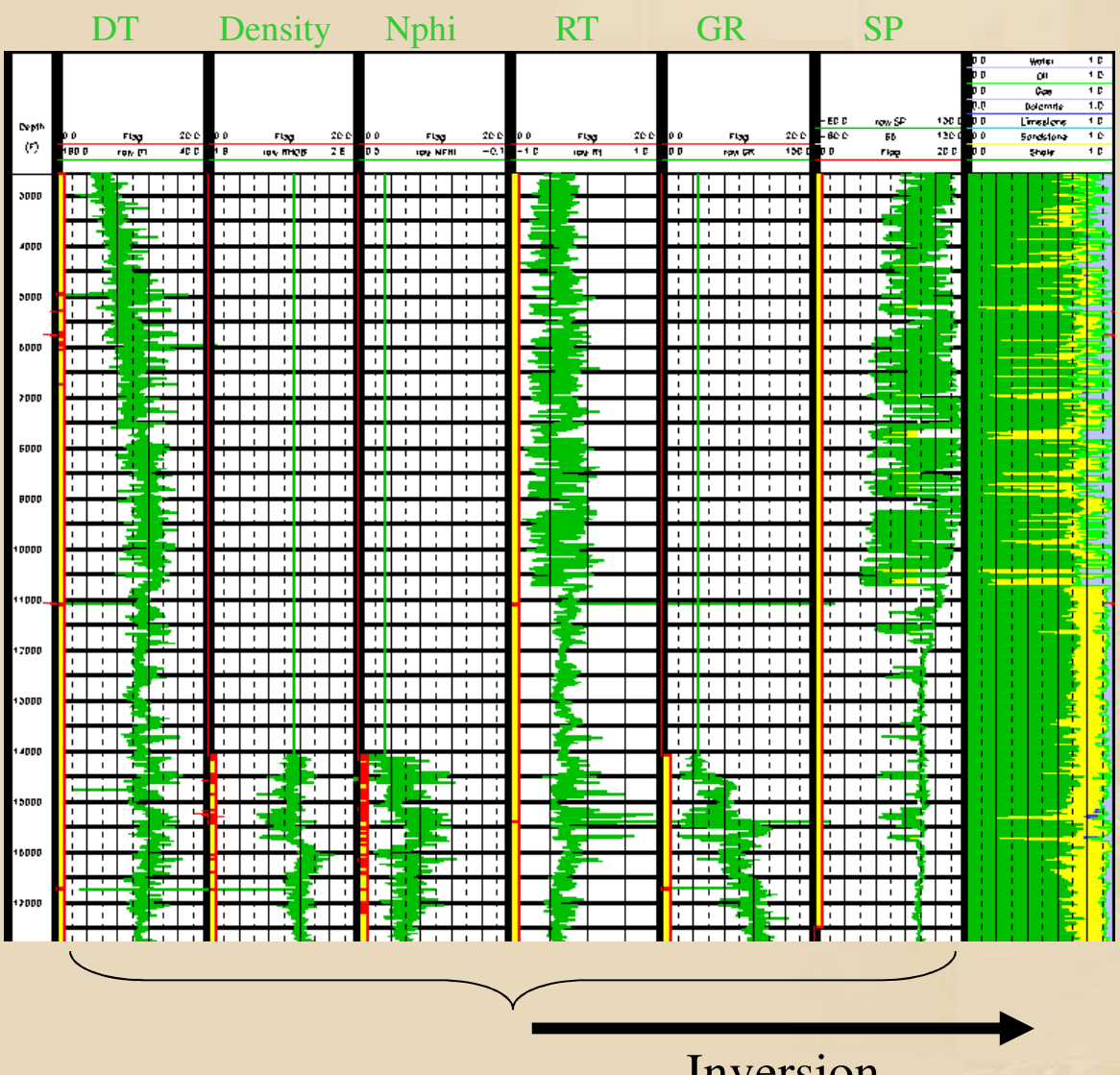
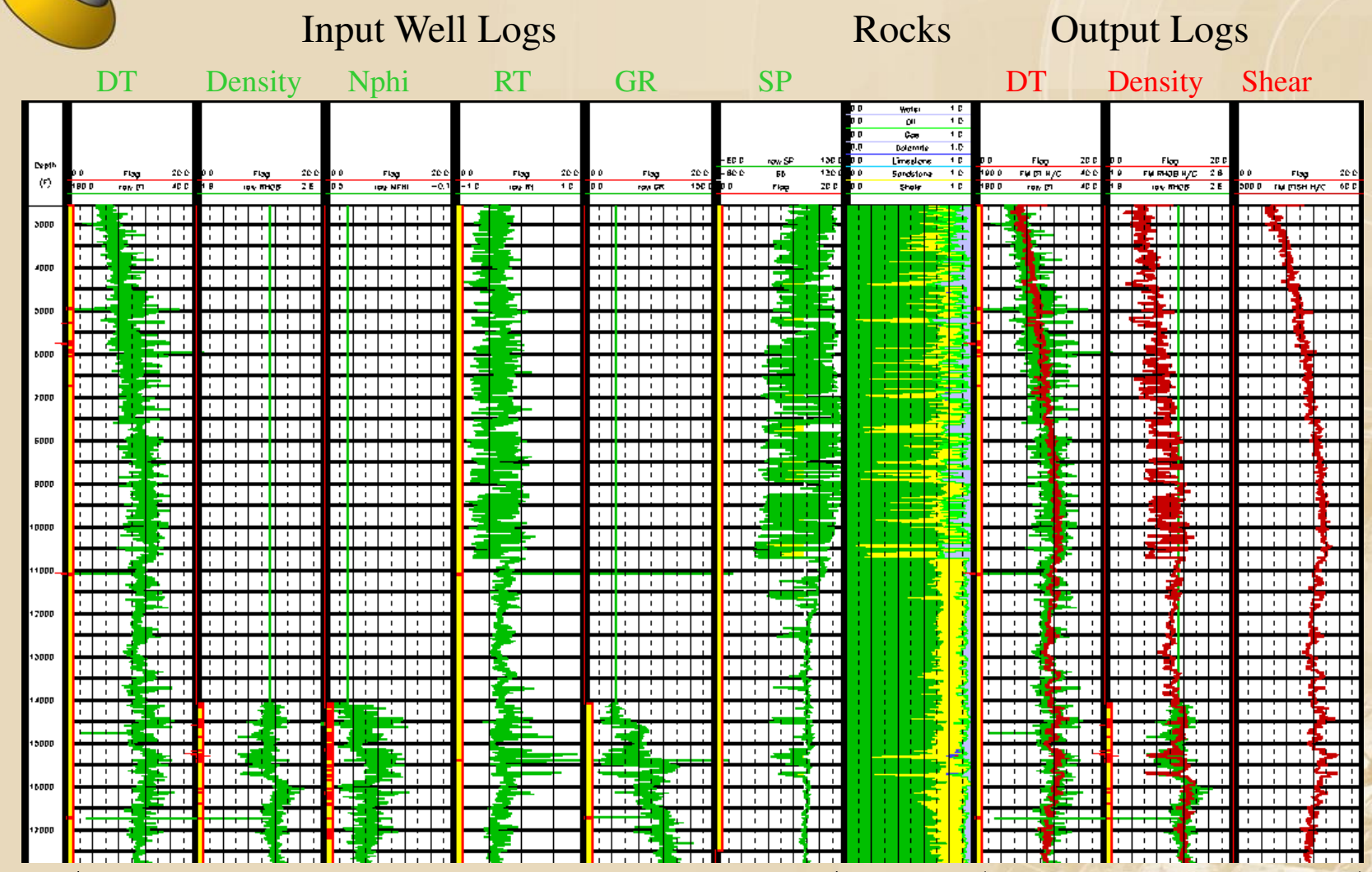
Logs are Not “Ground Truth”, Correcting Logs for a Better Earth Model

Log Analysis Workflow

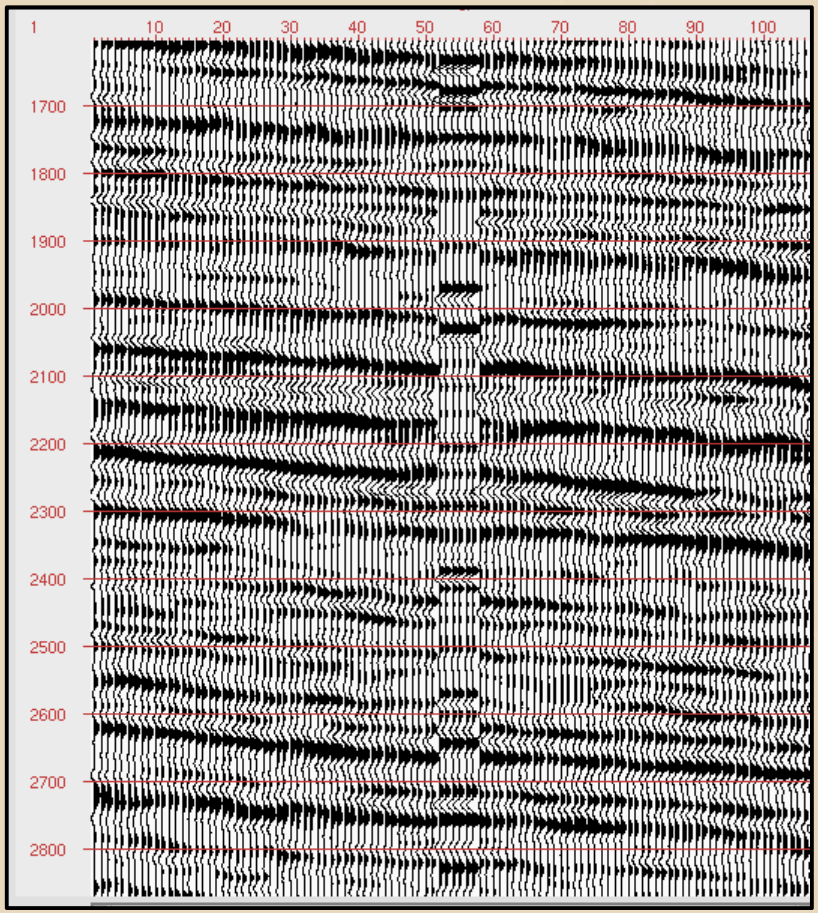


Log Analysis Workflow



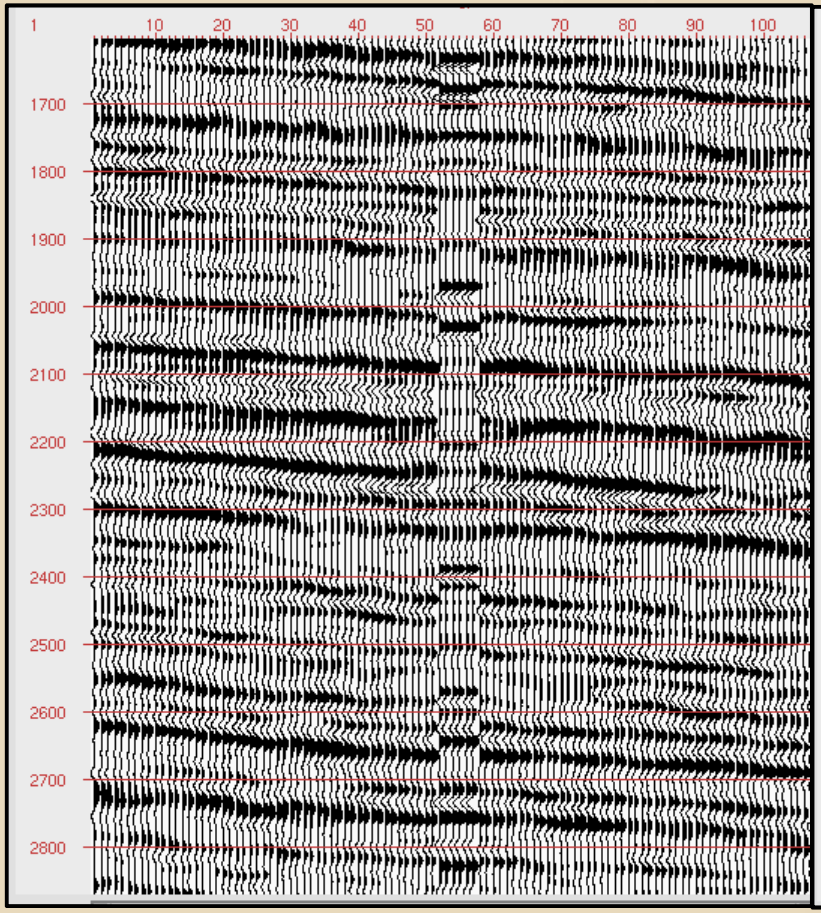
Synthetic Tie

Synthetic Tie Before

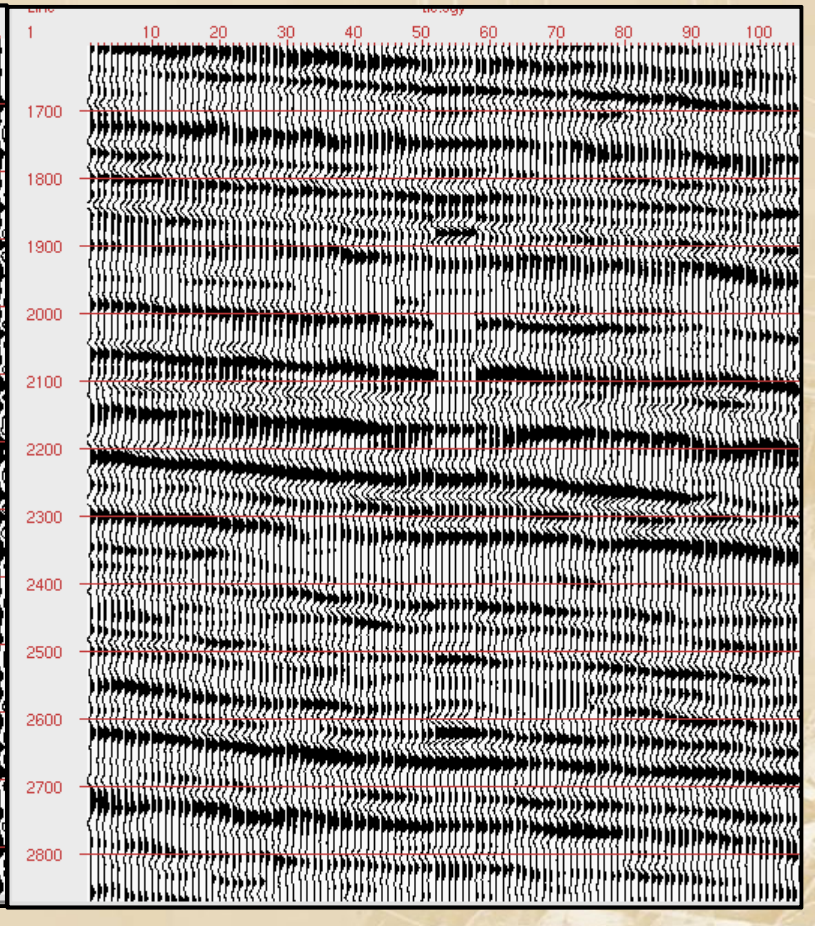


Synthetic Tie

Synthetic Tie Before



Synthetic Tie After



Alpine Field

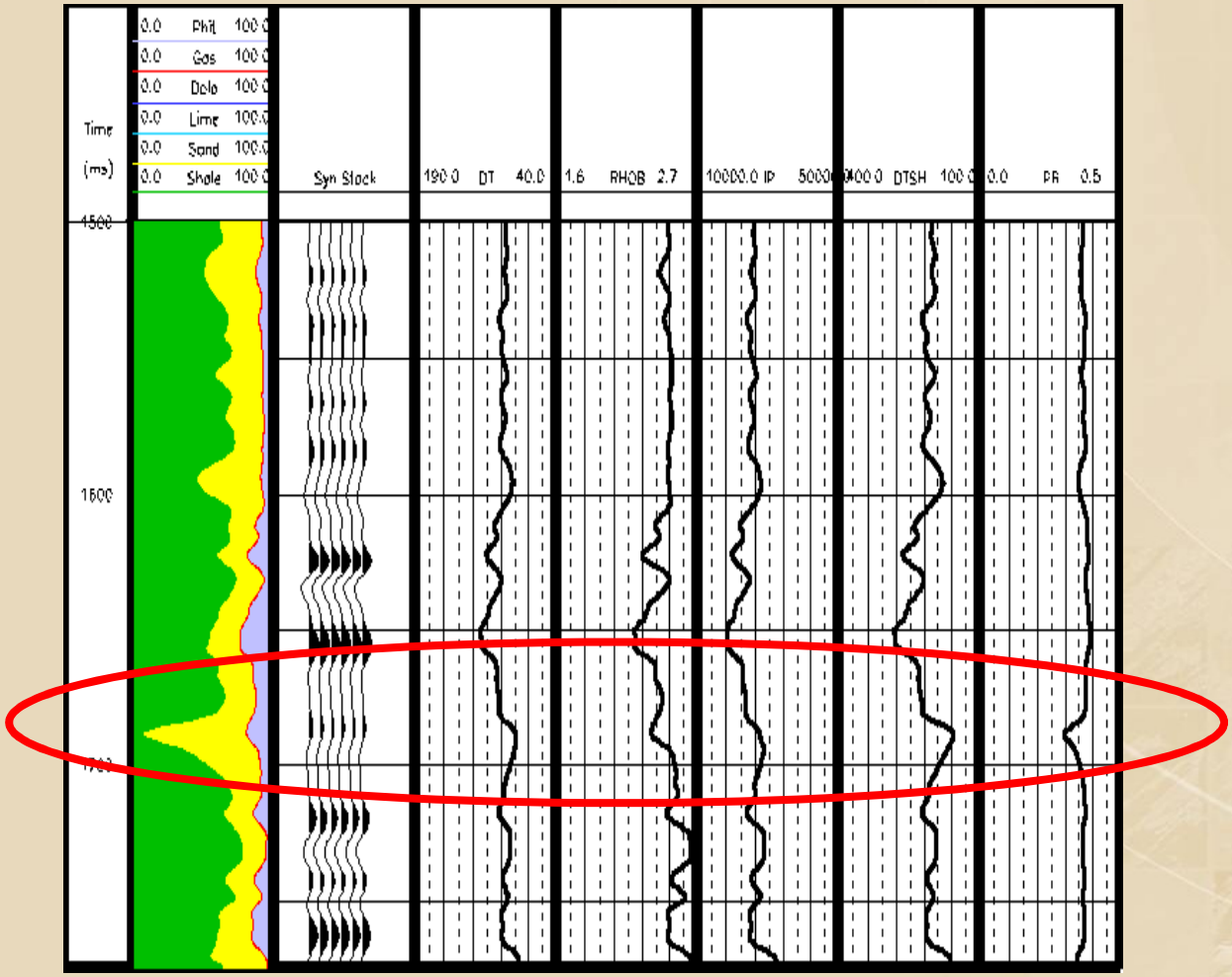
North Slope, Alaska

A tale of ½ Billion Barrels

Creating a Valid Model

Bergschrund #1 Well

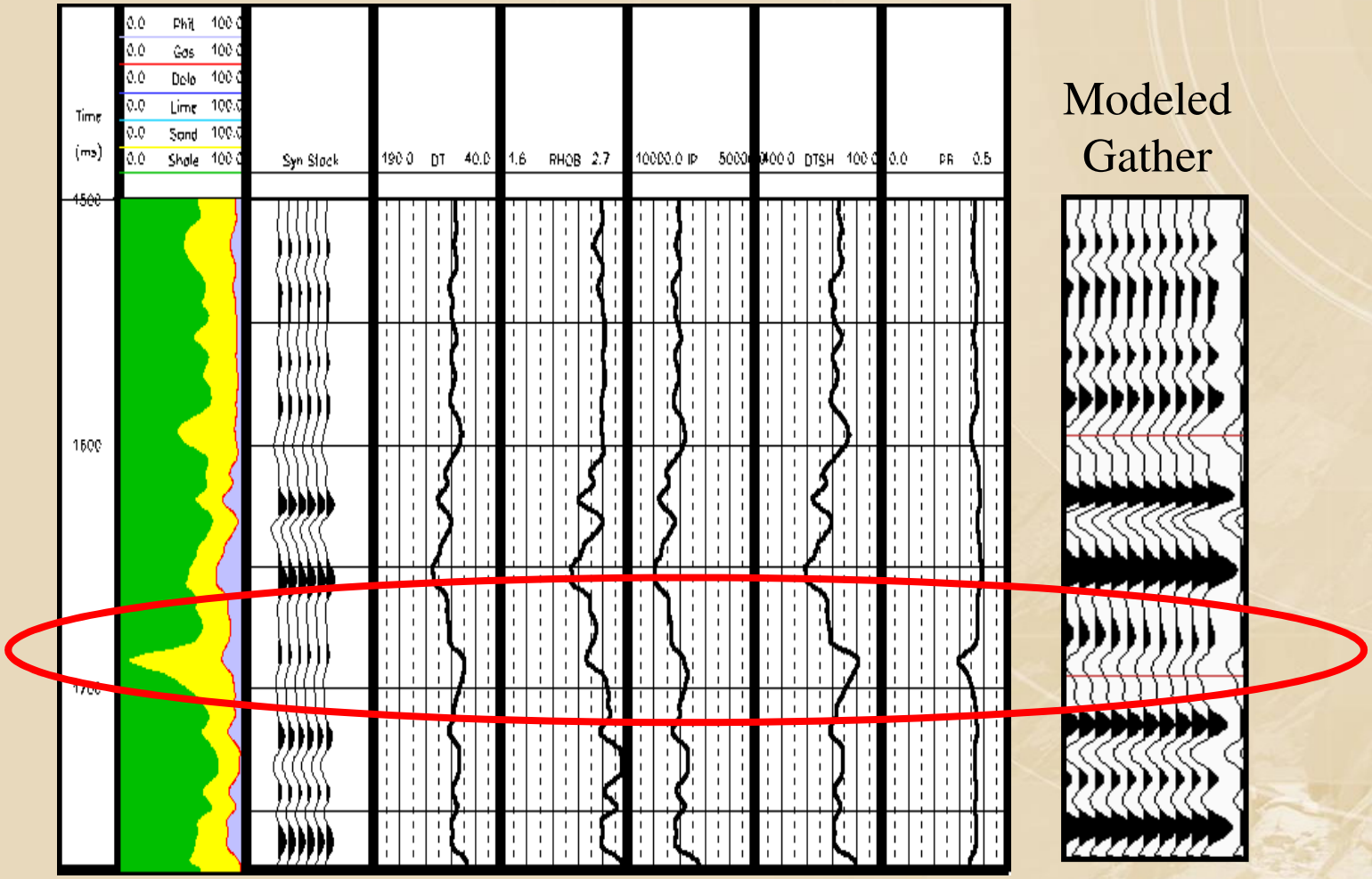
Well Log Information as Logged



Creating a Valid Model

Bergschrund #1 Well

Well Log Information as Logged

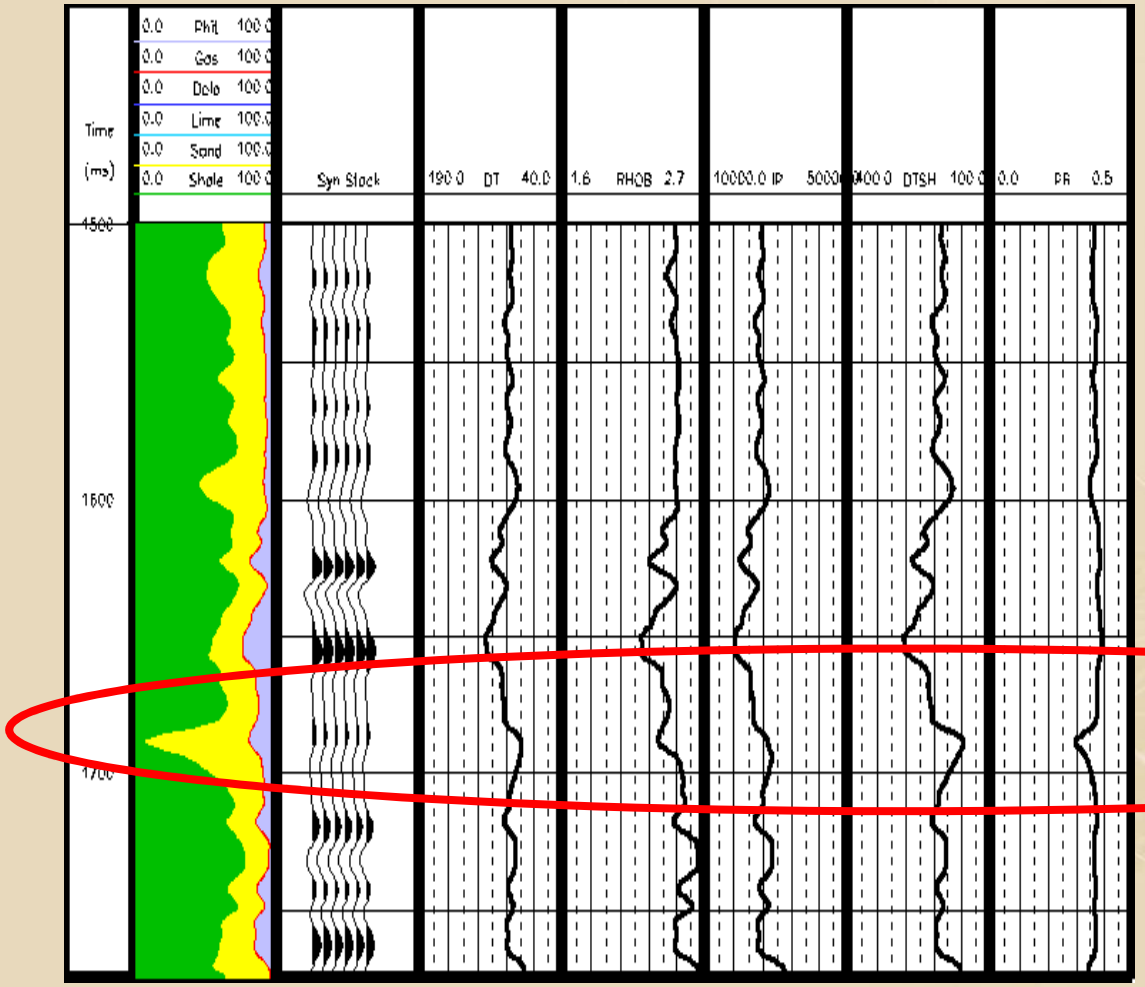


Modeled Gather

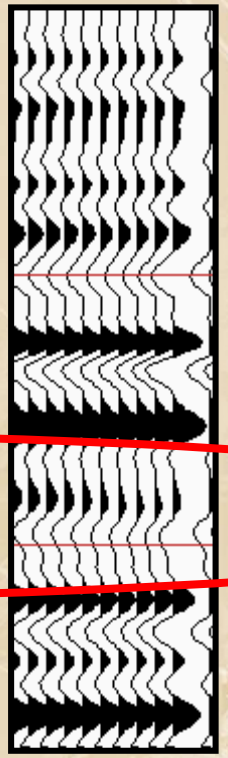
Offset

Creating a Valid Model

Bergschrund #1 Well
Well Log Information as Logged

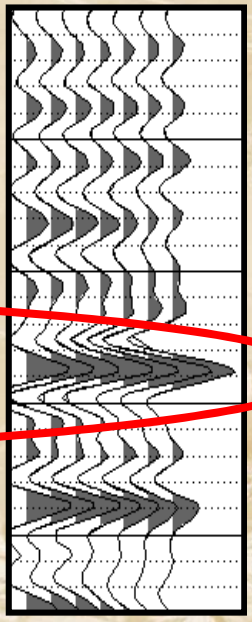


Modeled Gather



Offset

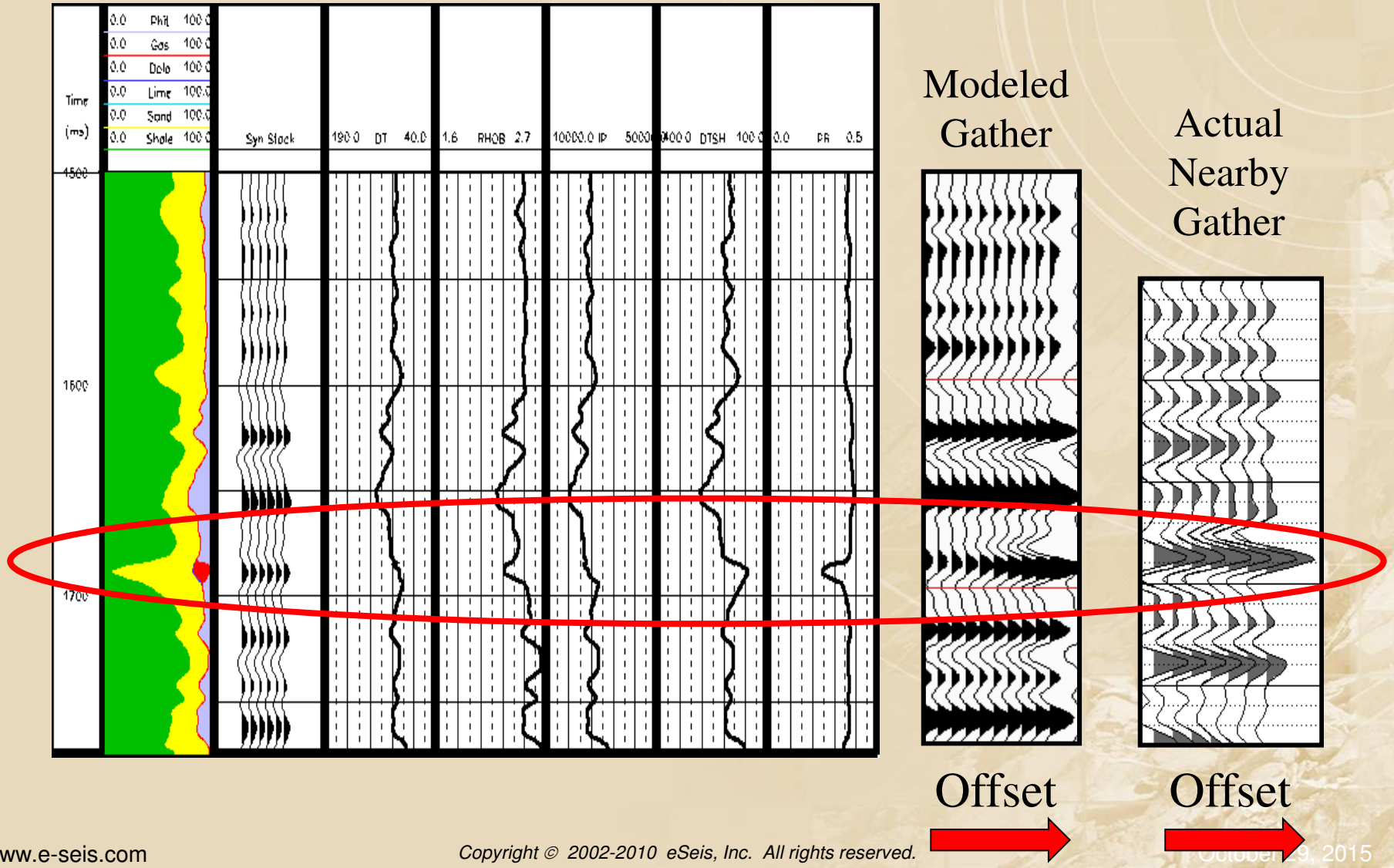
Actual Nearby Gather



Offset

Creating a Valid Model

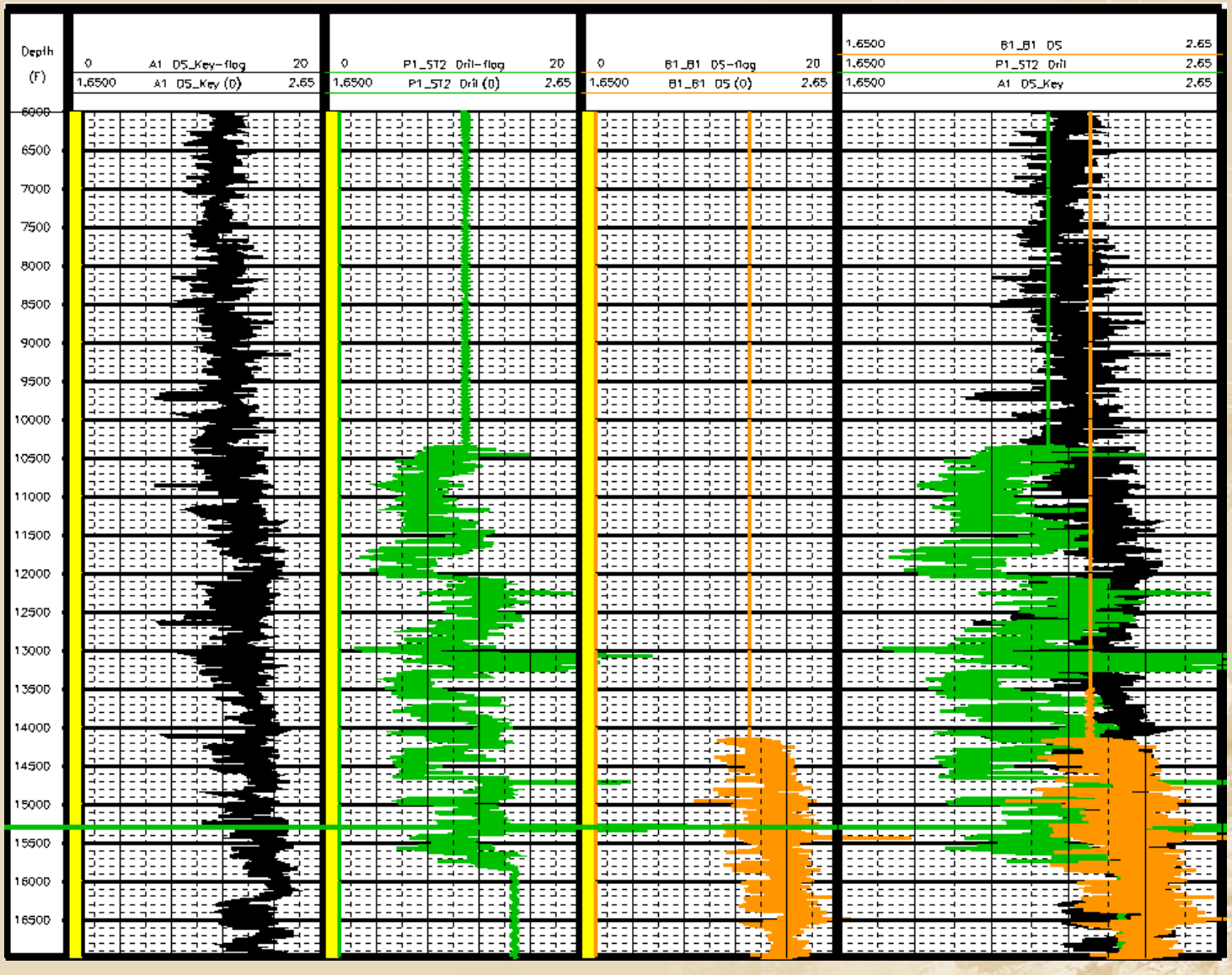
Bergschrund #1 Well
Well Log Information Corrected



Next Example, With Multiple Wells

Density from 3 wells

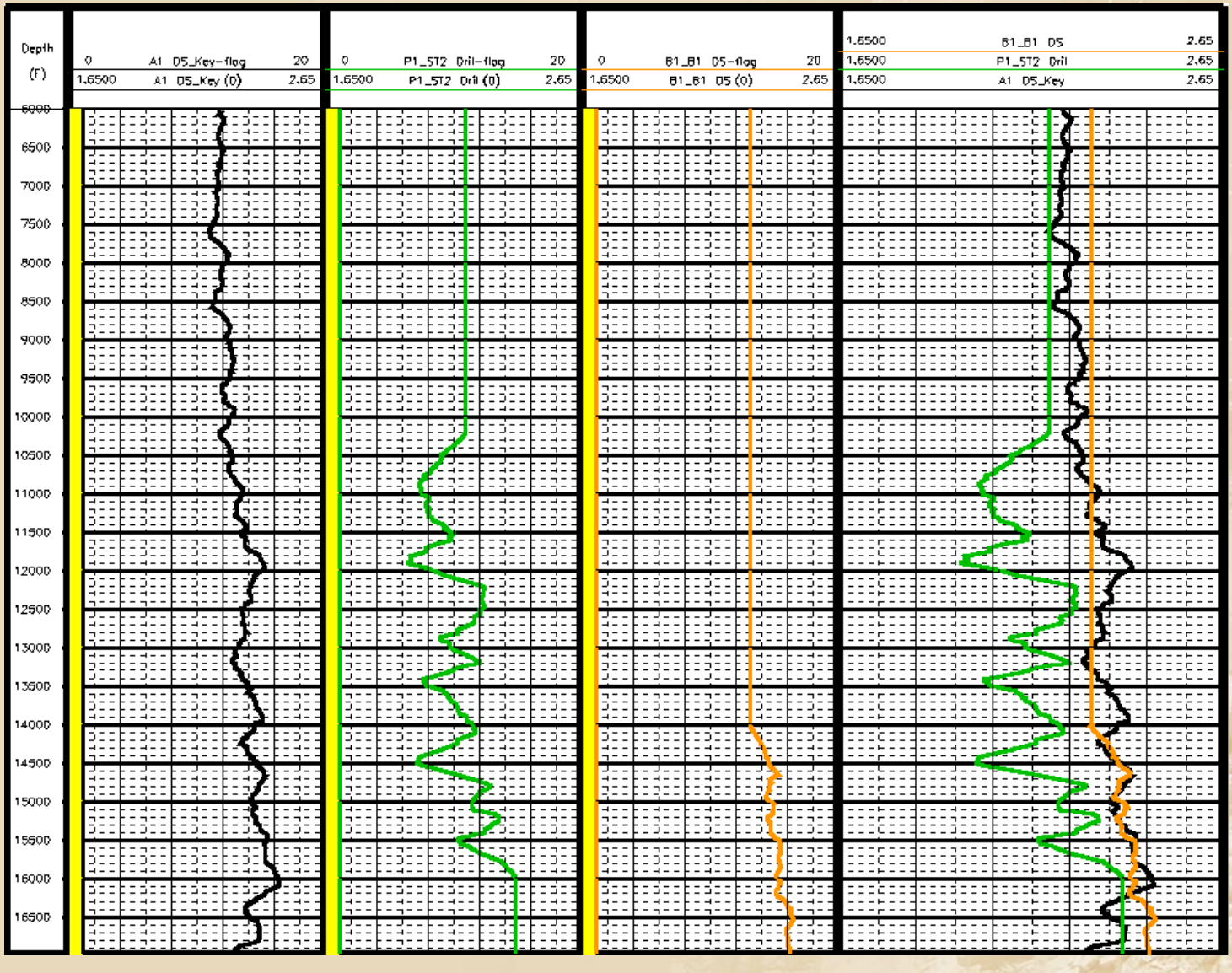
Well 1 Well 2 Well 3 ALL



Density from 3 wells

Well 1 | Well 2 | Well 3 | ALL

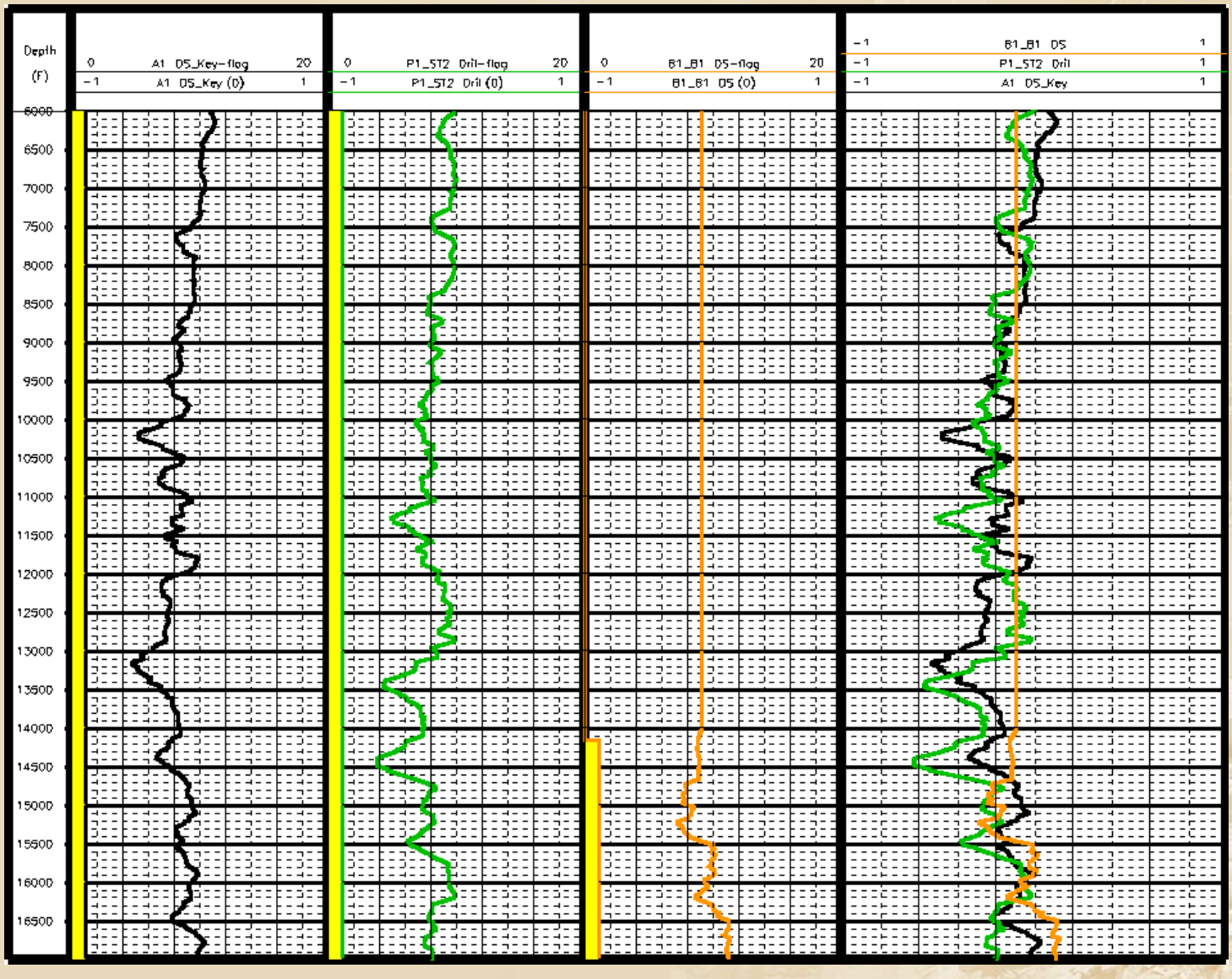
301 ft Boxcar Filter

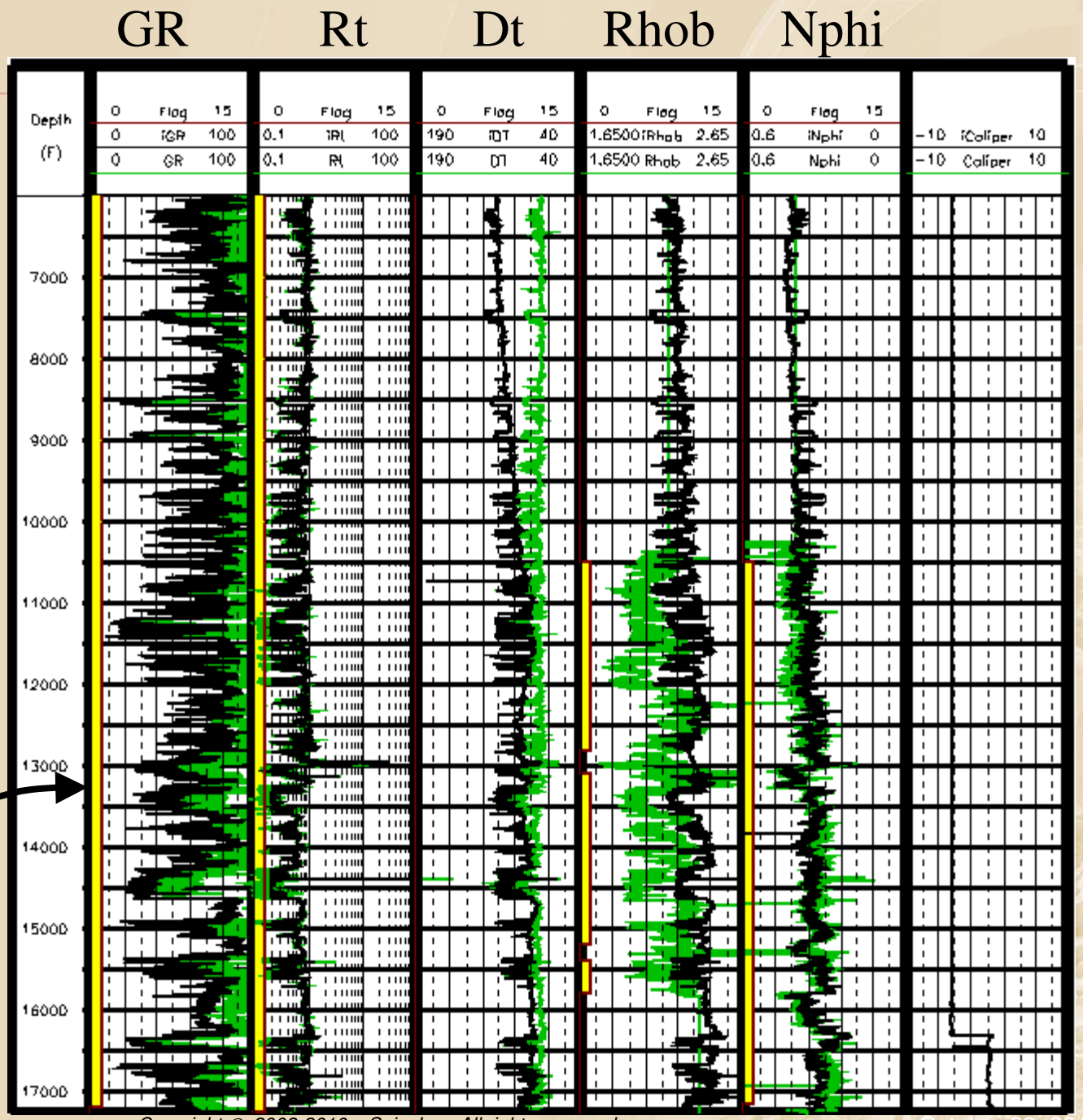


Resistivity from 3 wells

Well 1 Well 2 Well 3 ALL

301 ft Boxcar Filter





Input Green
Edited Black

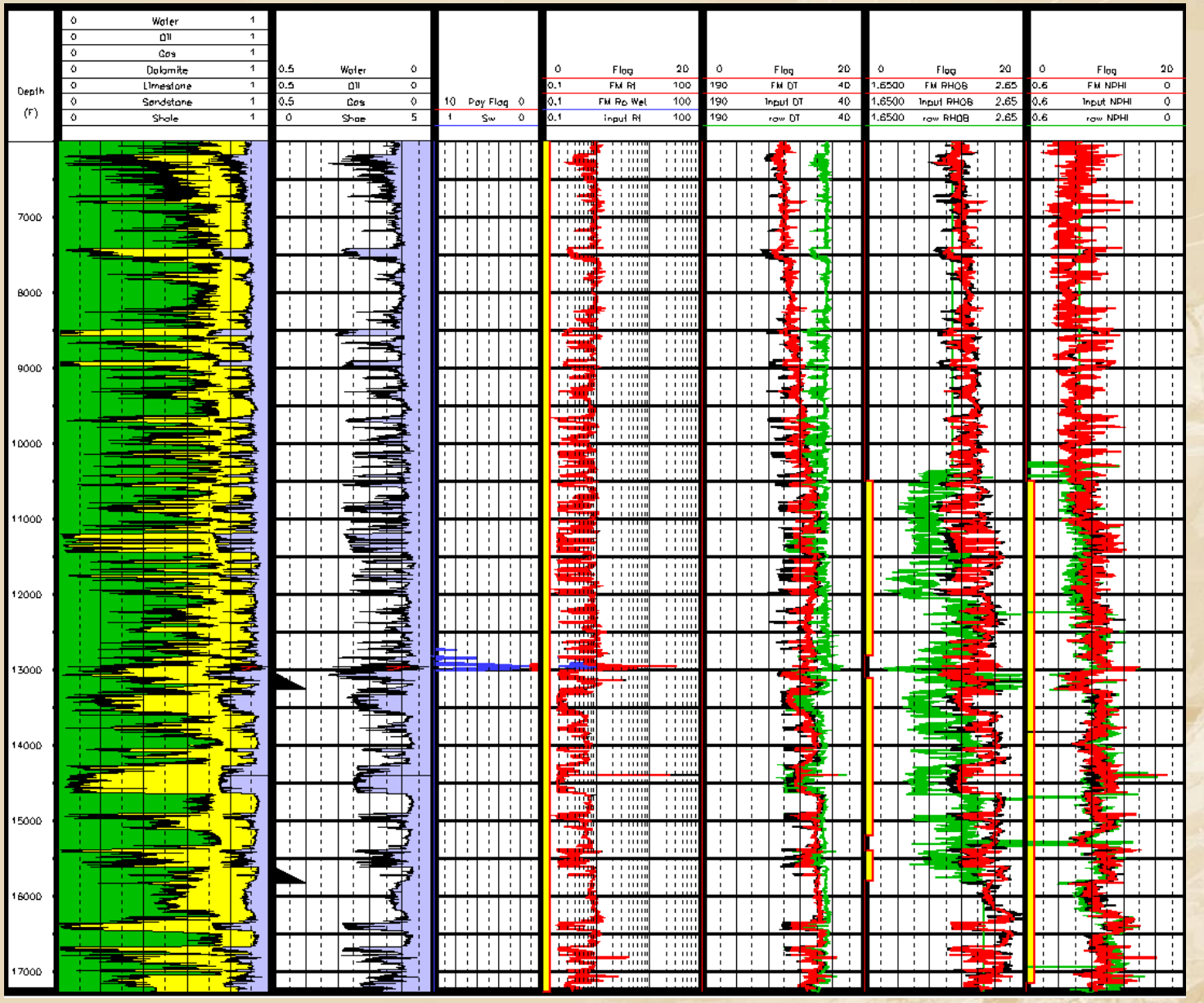
No input DT
Rhob is bad

Real log flag

eSeis

Lith Phi Sw Rt Dt Rhob Nphi

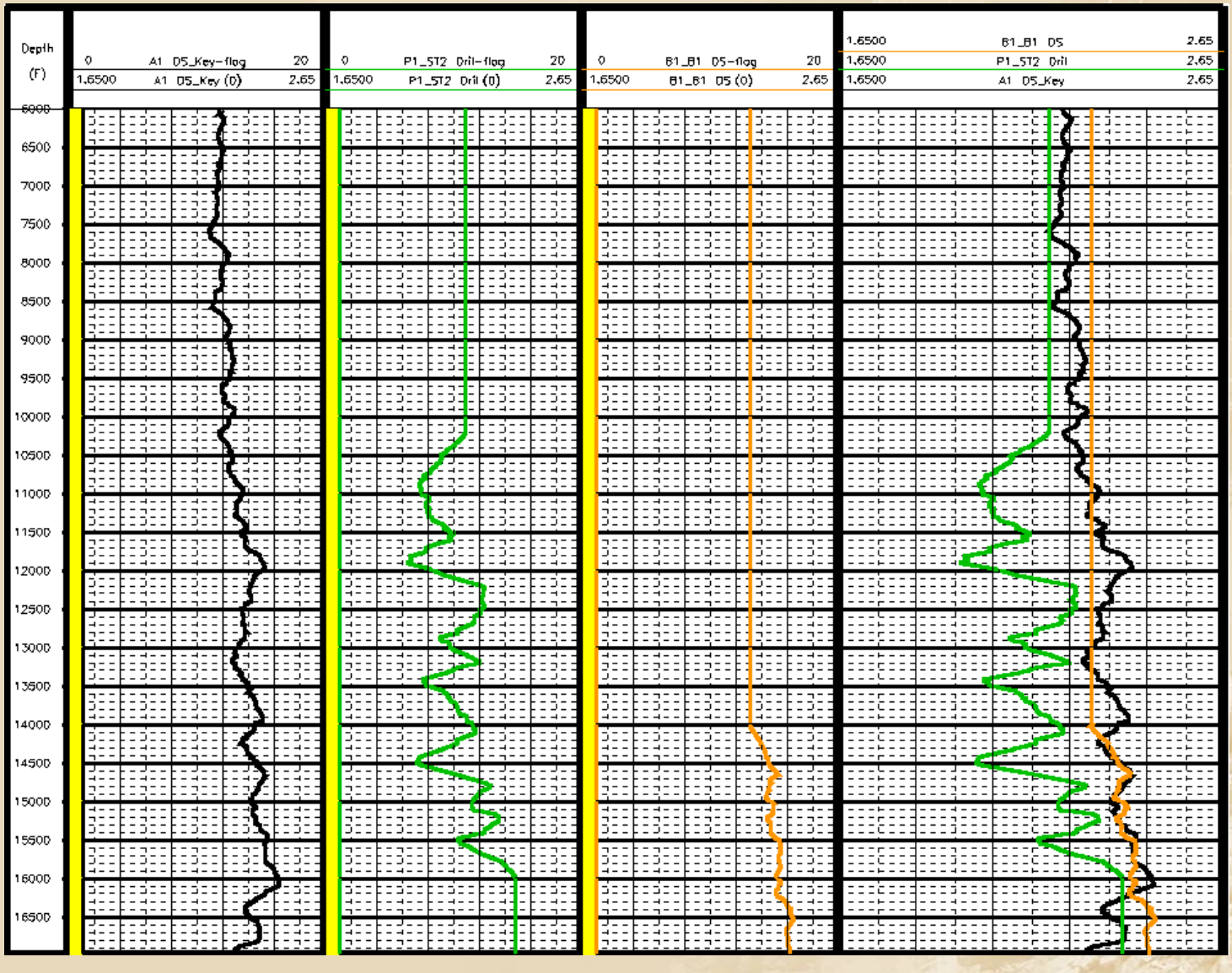
Input Green
Edited Black
FM Red



Density from 3 wells

Well 1 | Well 2 | Well 3 | ALL

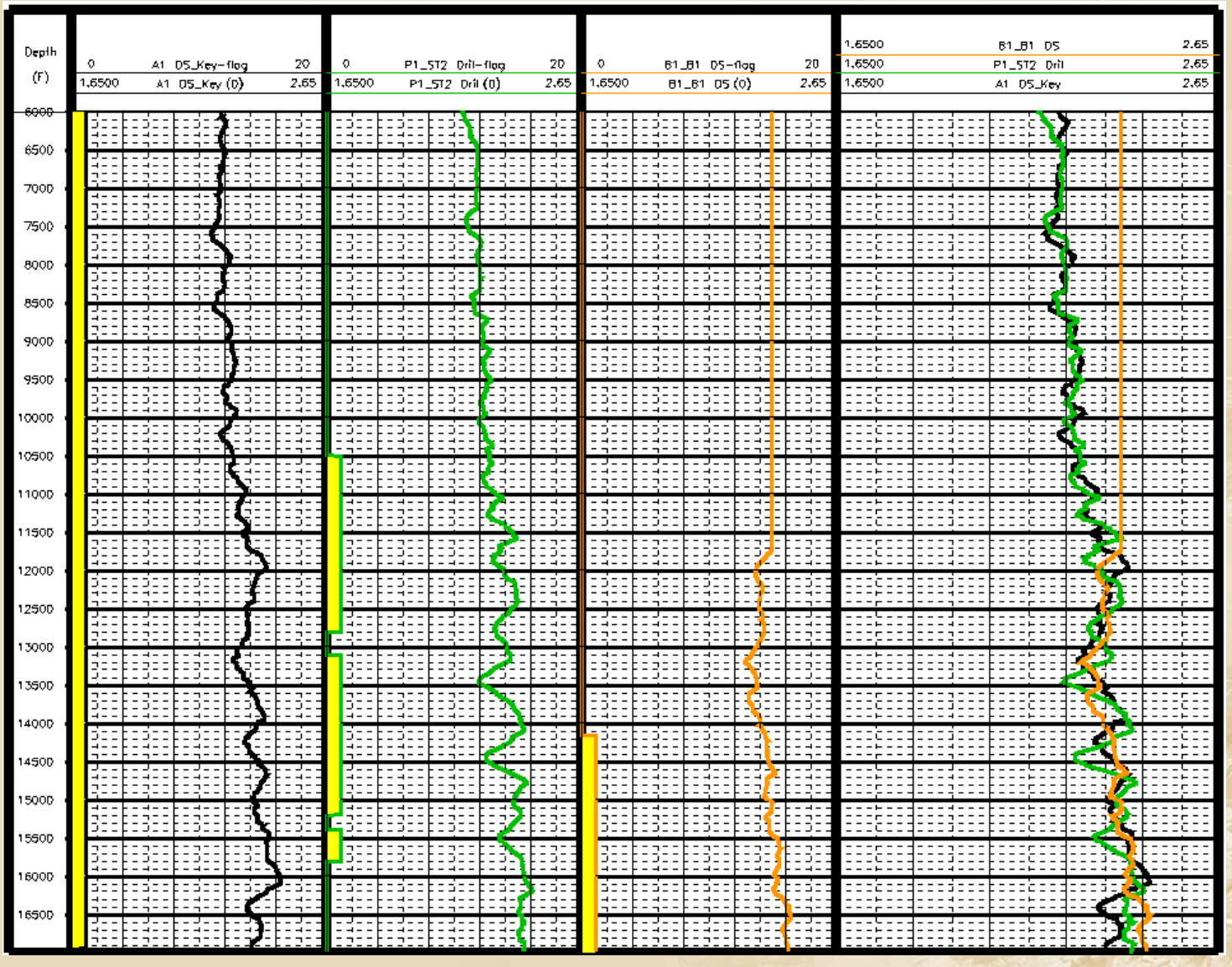
301 ft Boxcar Filter



Density from 3 wells

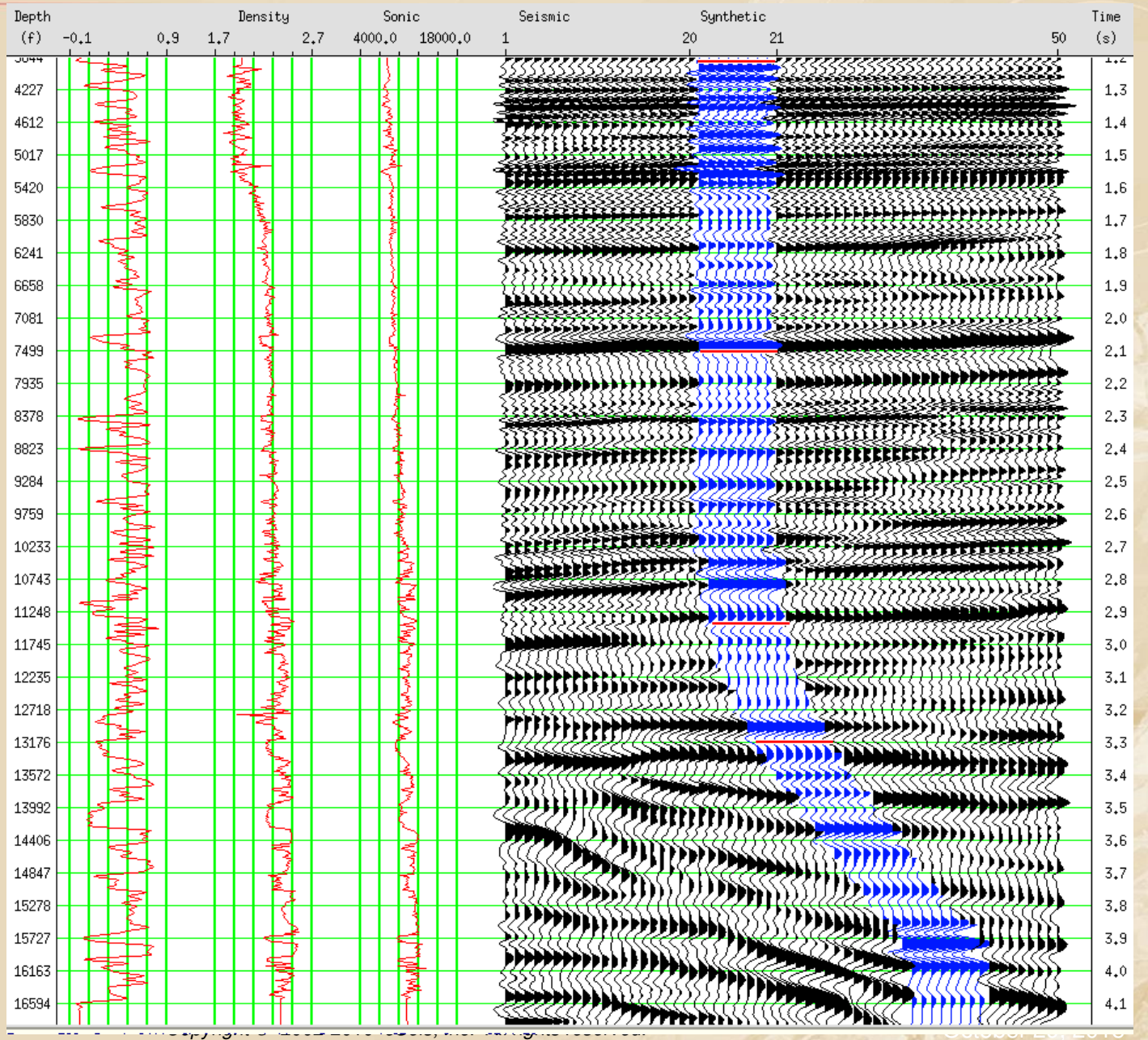
Well 1 Well 2 Well 3 ALL

301 ft Boxcar Filter



Synthetic Tie

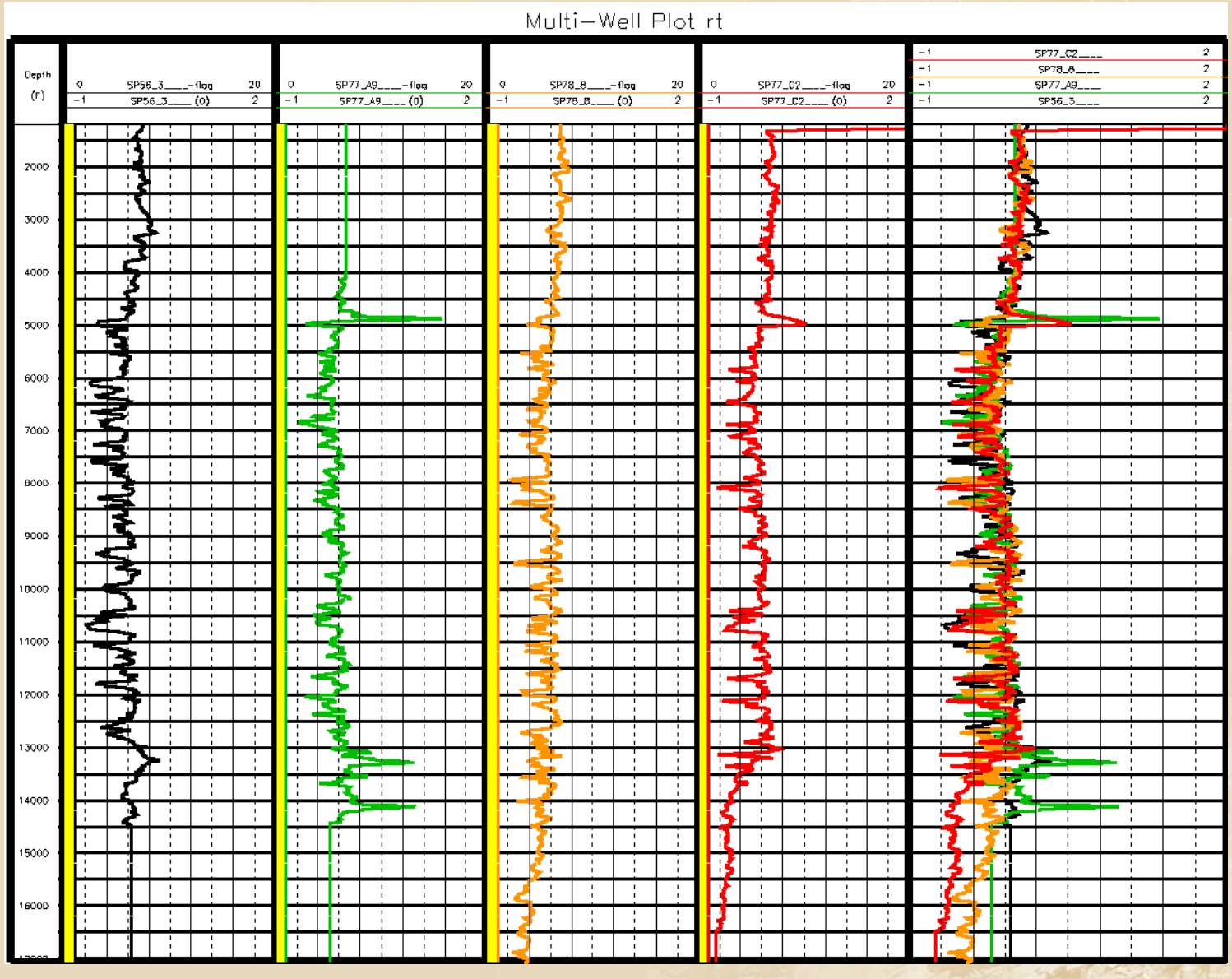
Better Synthetic Remember:
No Sonic and Bad Density



Next Example Making a Model for Seismic Inversion

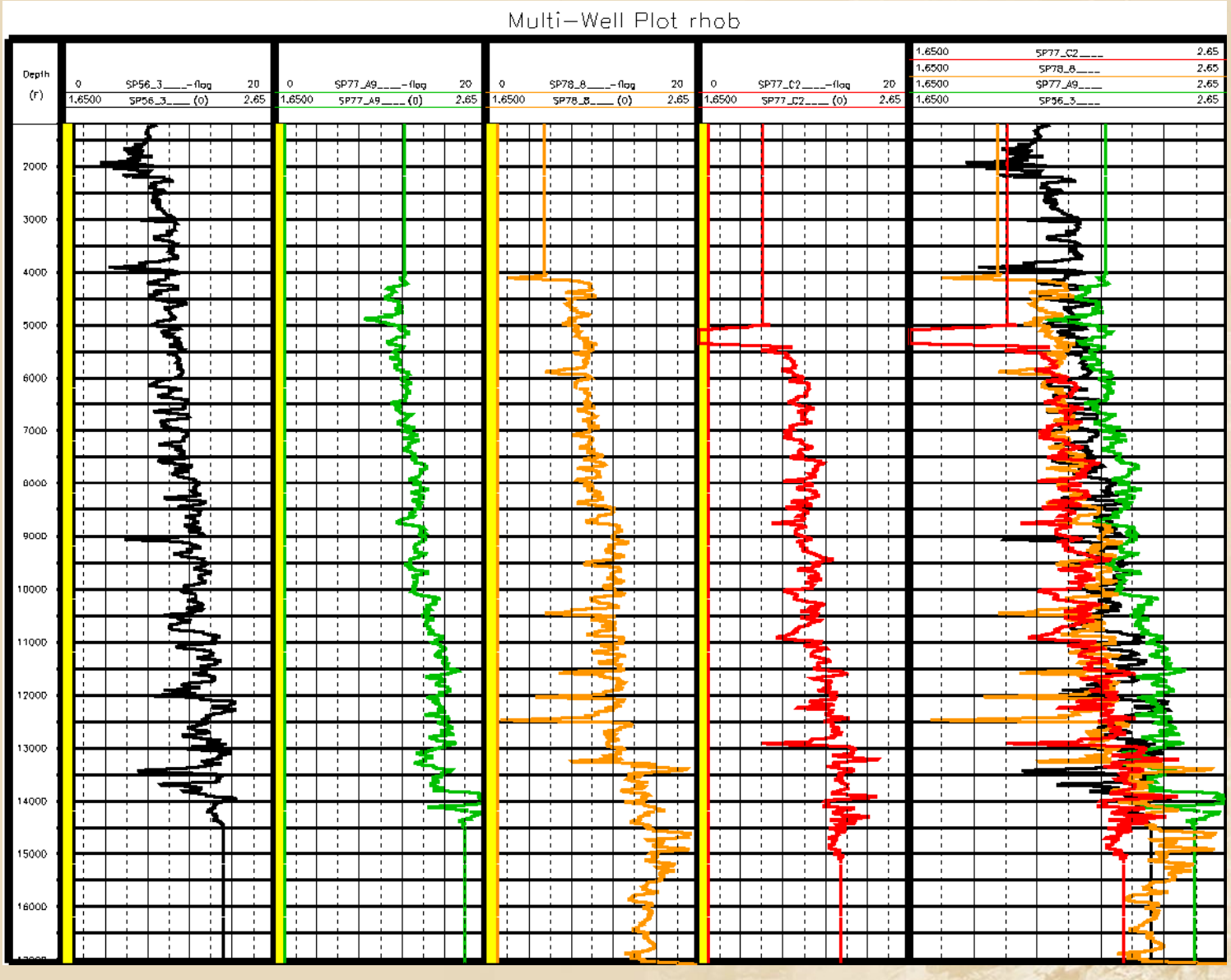
Deep Resistivity

All RT curves are in alignment



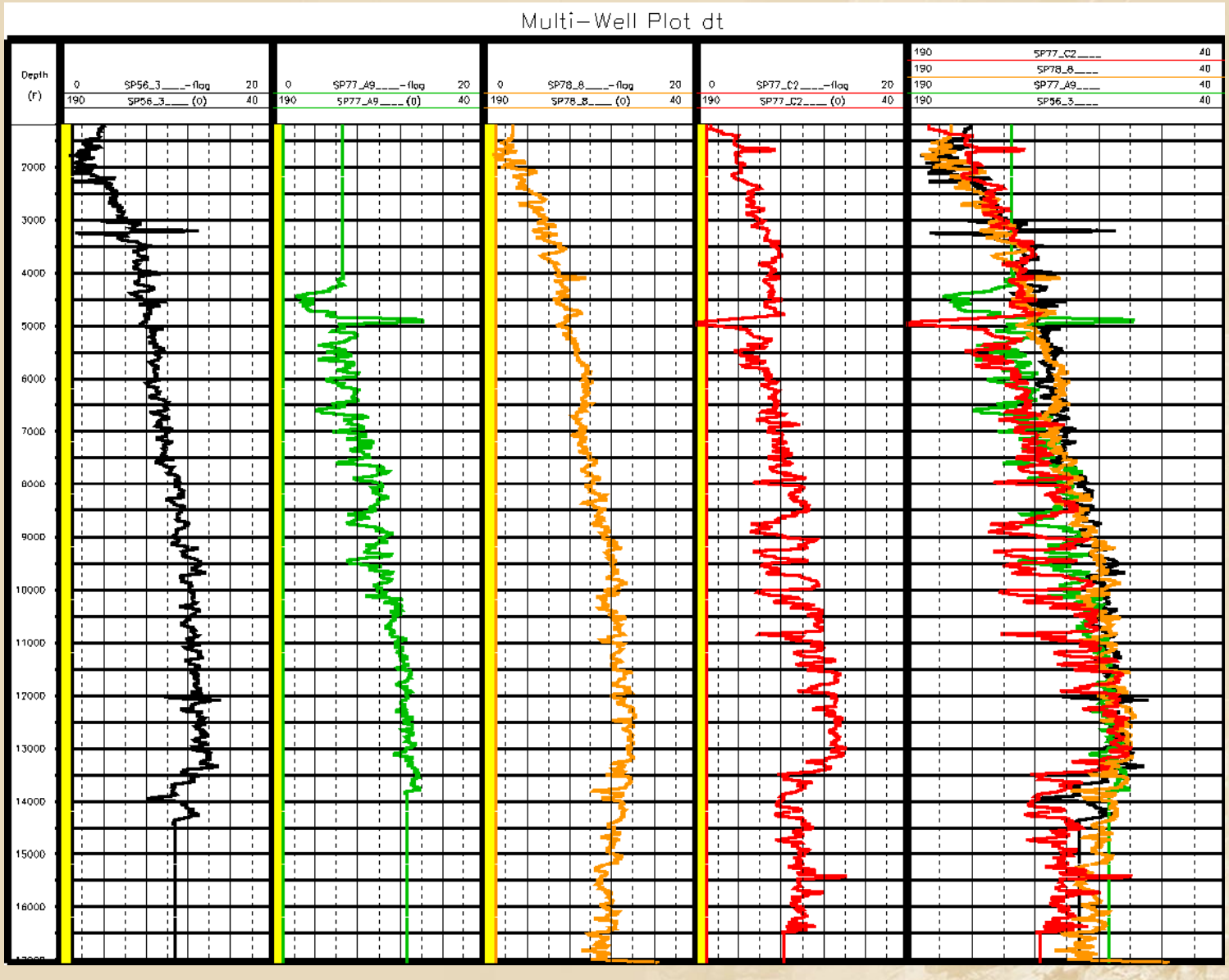
Density

Not the case with Rhob



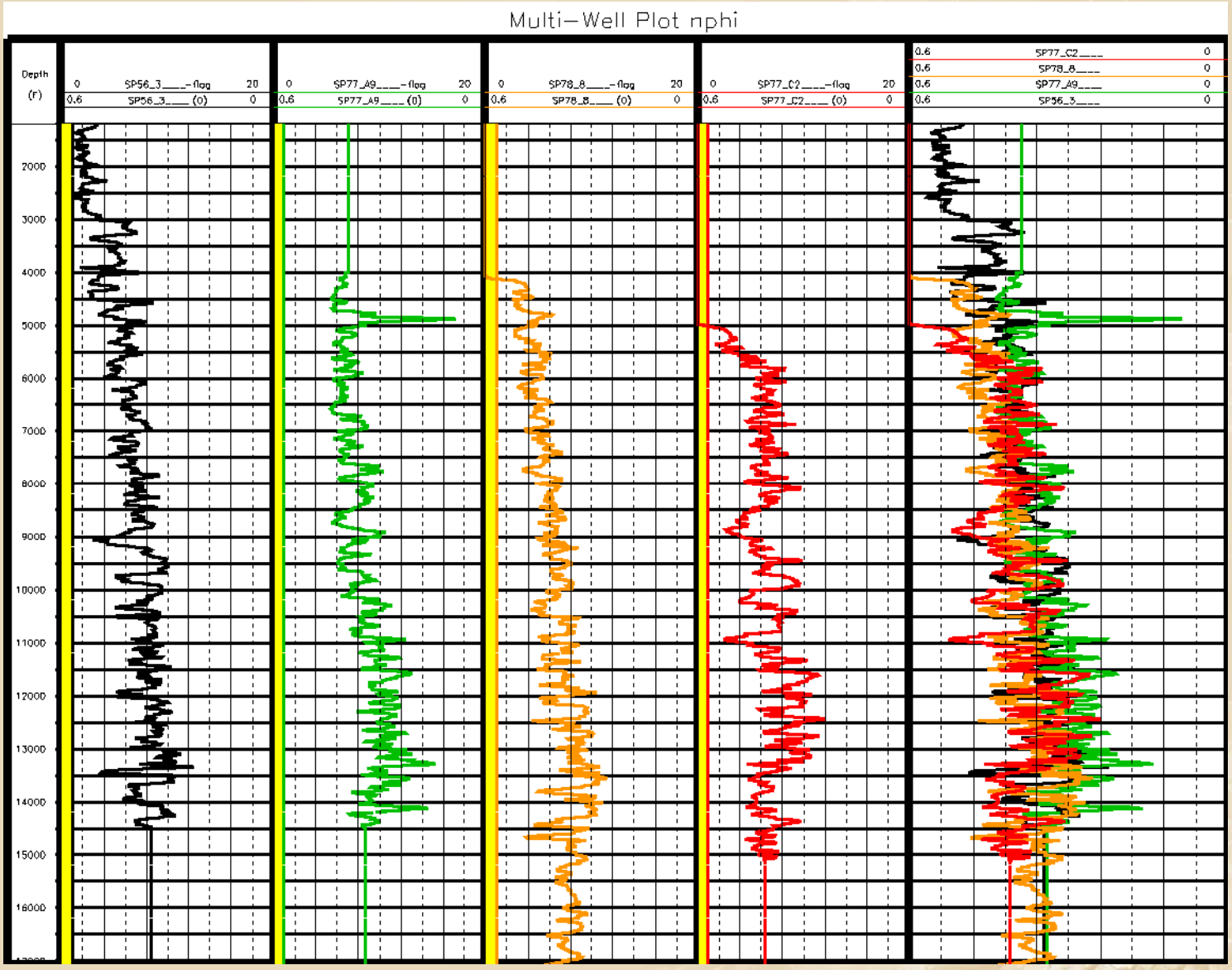
Sonic

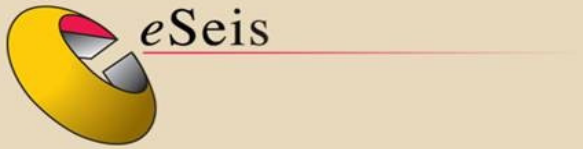
Not the case with DT



Neutron

Not the case with Nphi

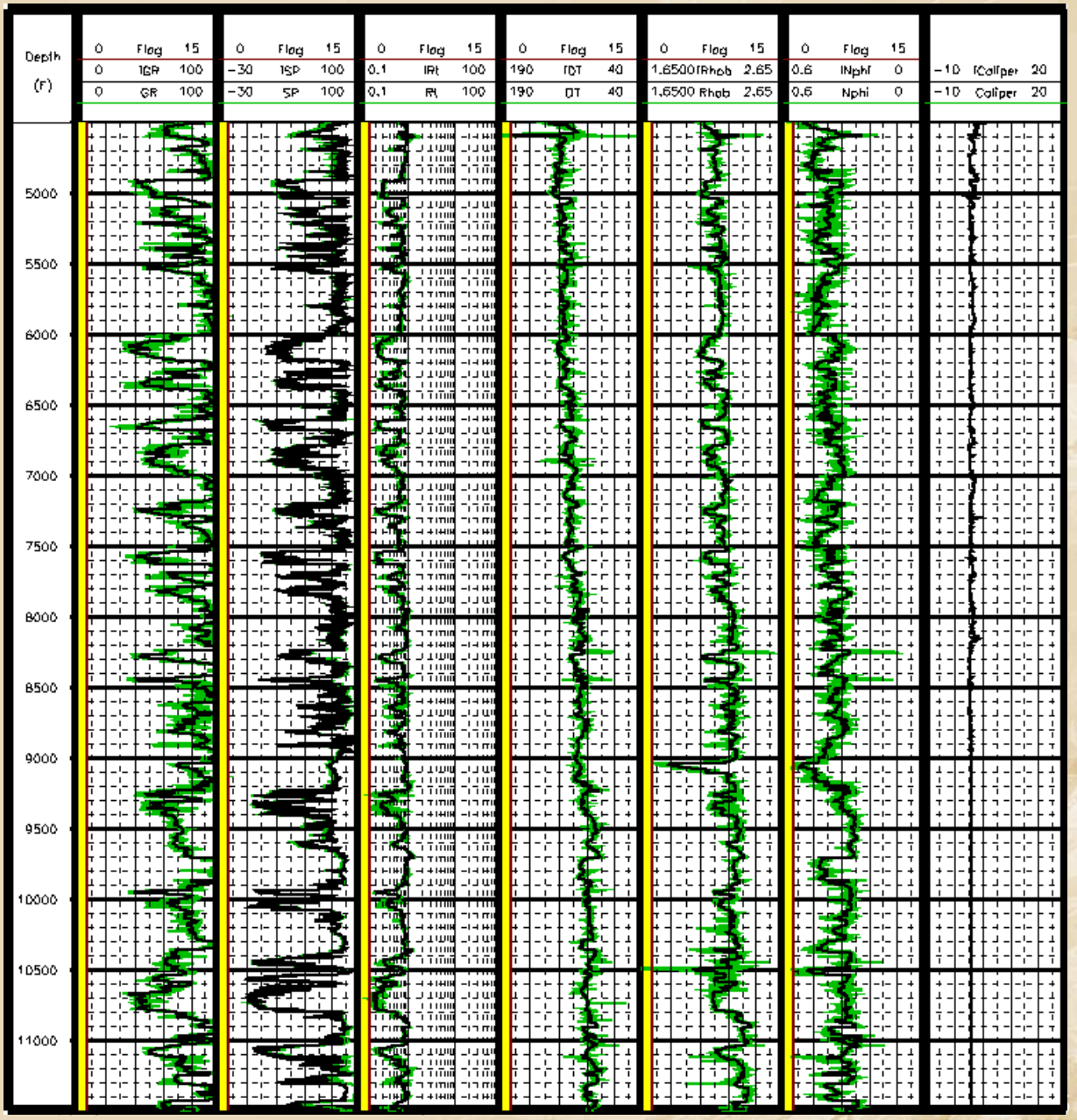




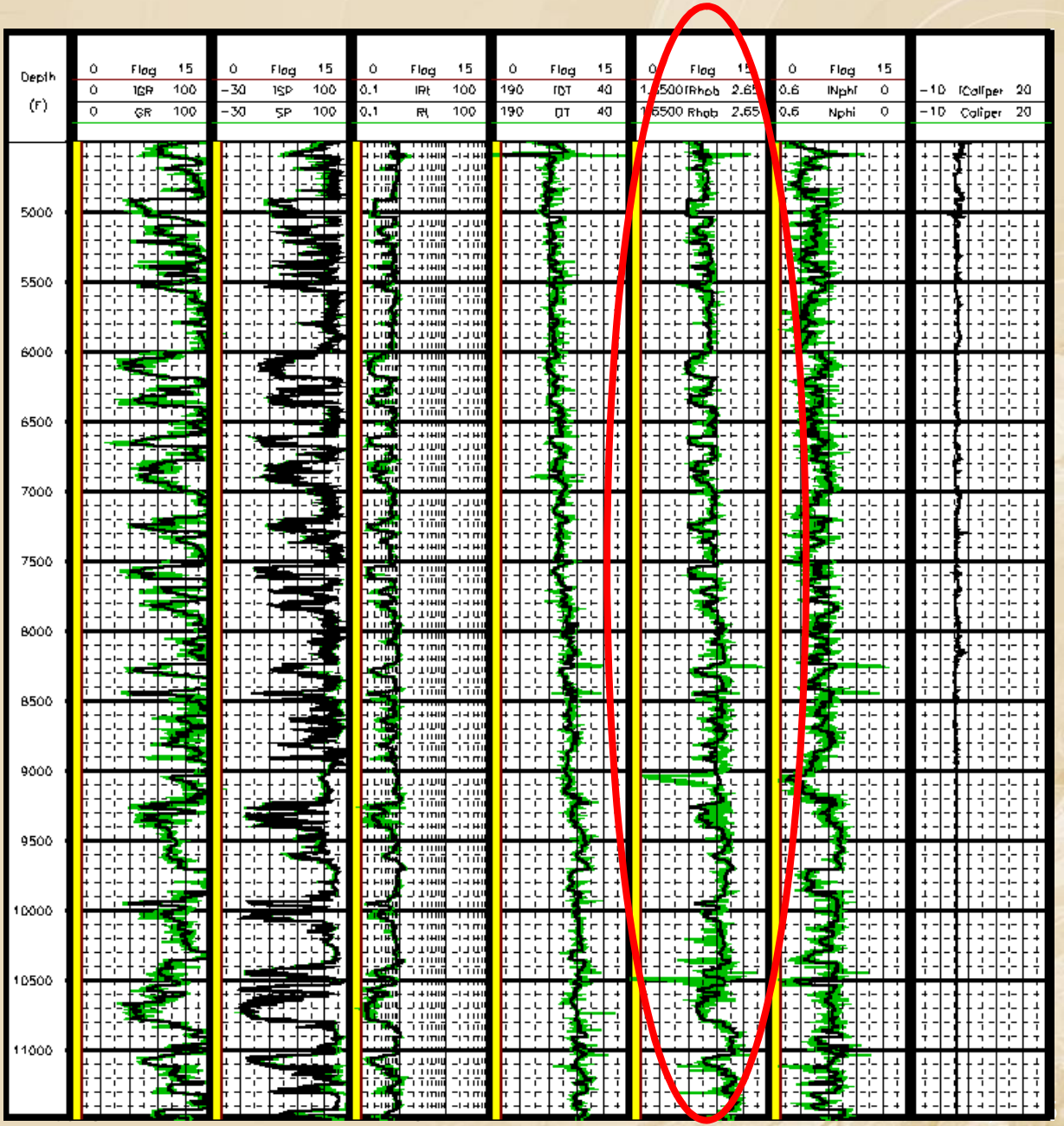
Some Thoughts on Correcting the Logs

eSeis

Raw Log Curves
Median Smoother



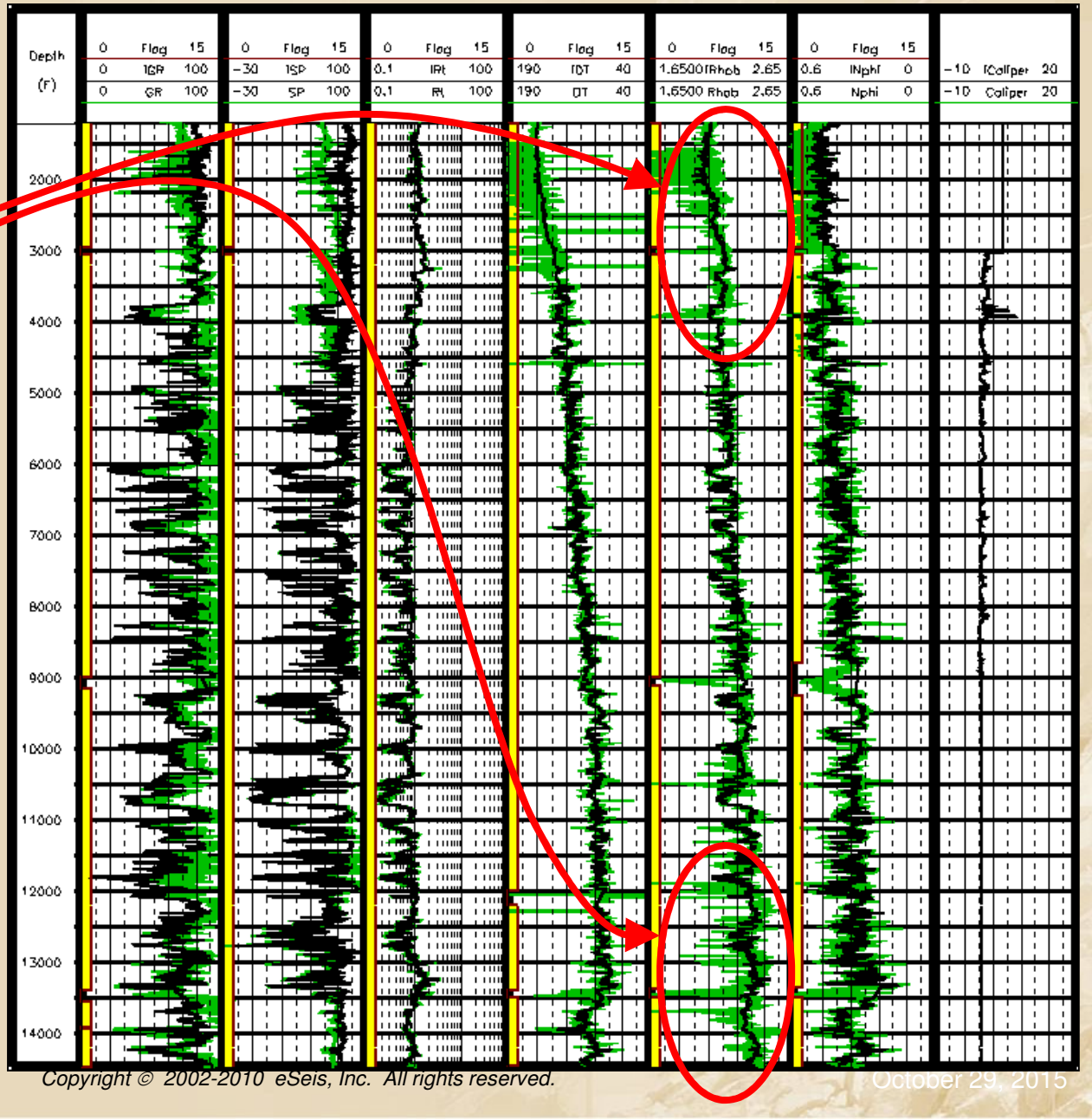
RT replaces the HF part of rhob. Result is no real change.



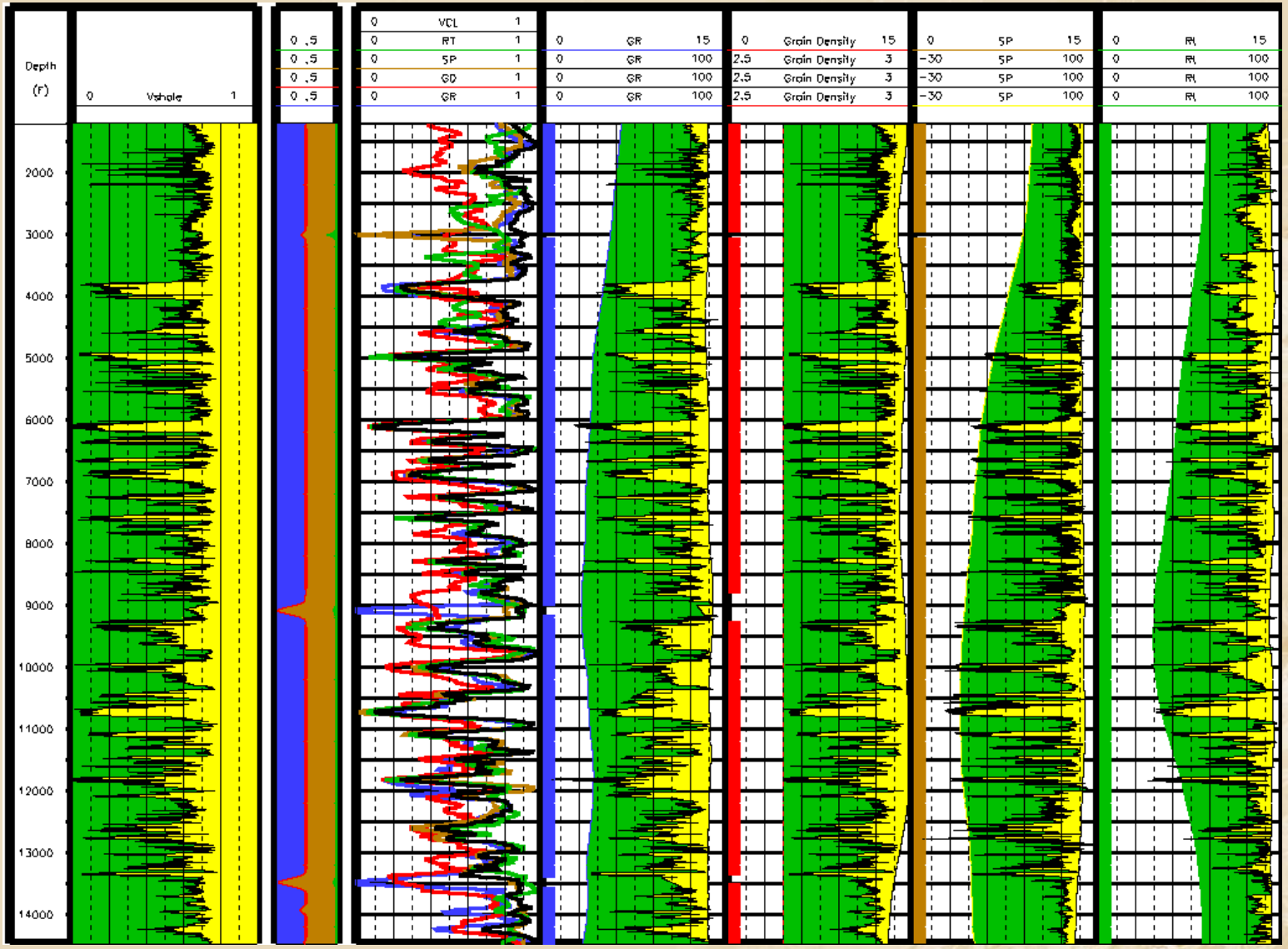
eSeis

Log editing using Rt as a constraint where logs go bad.

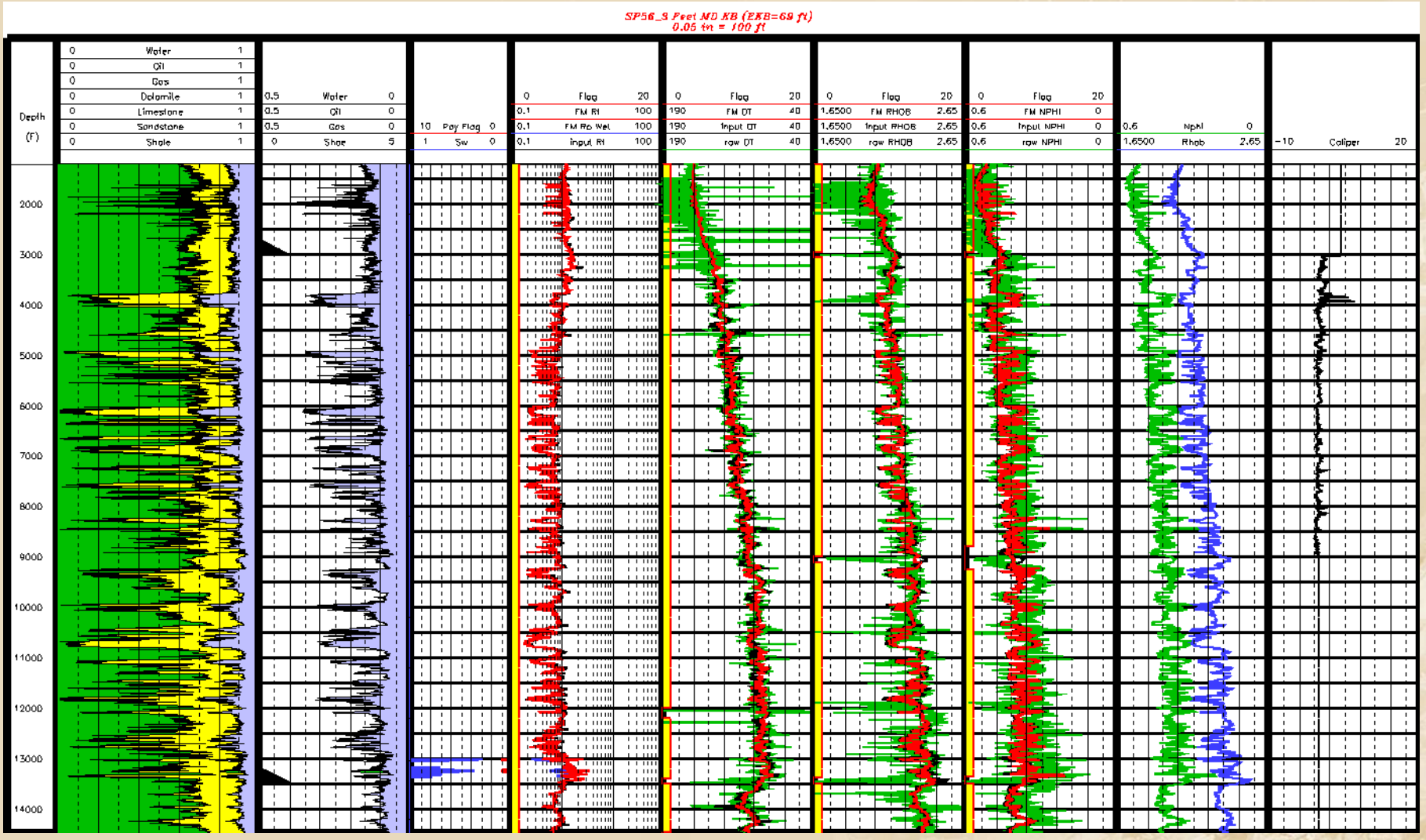
Previous Slide Focus



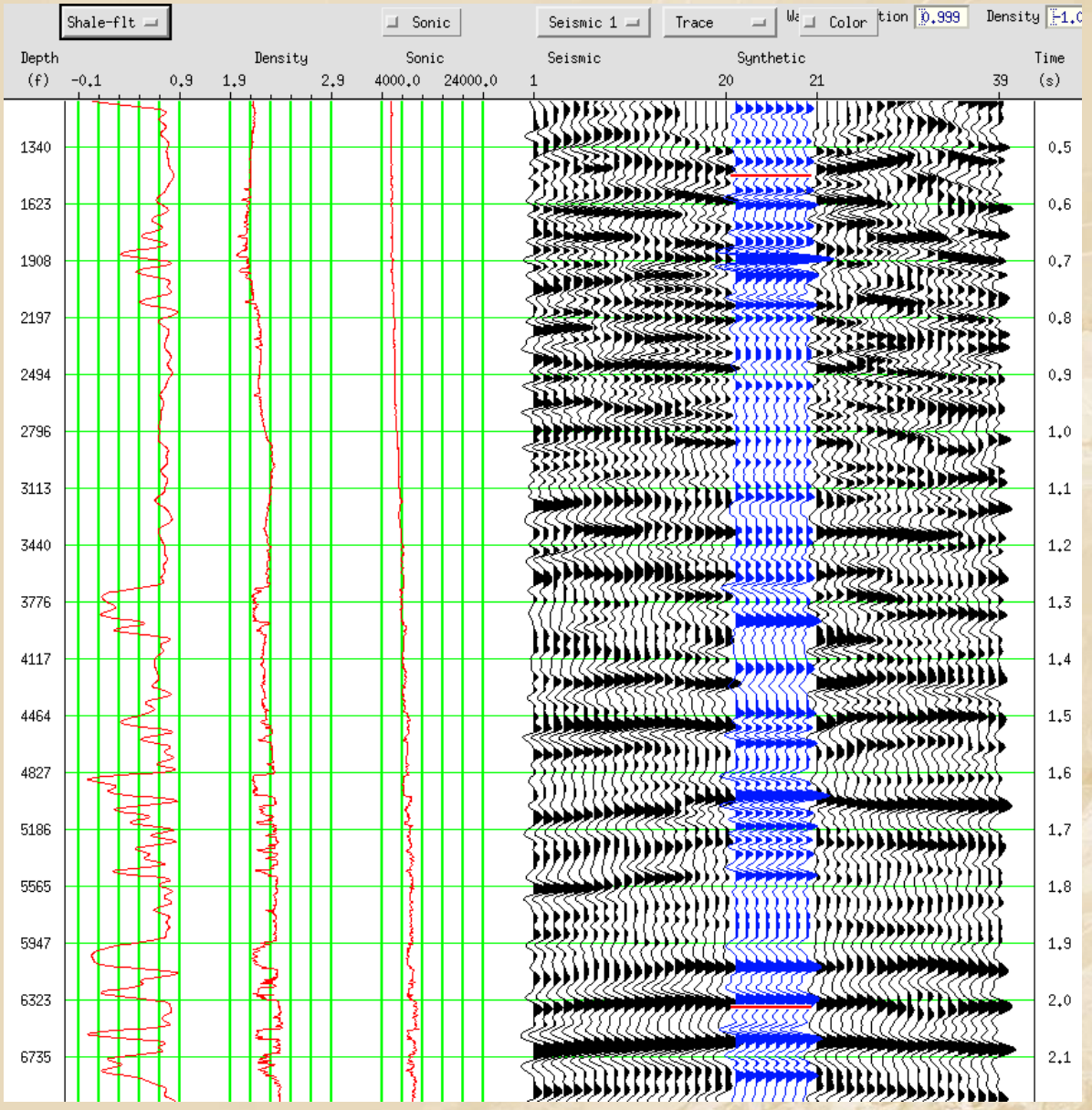
Vclay Analysis



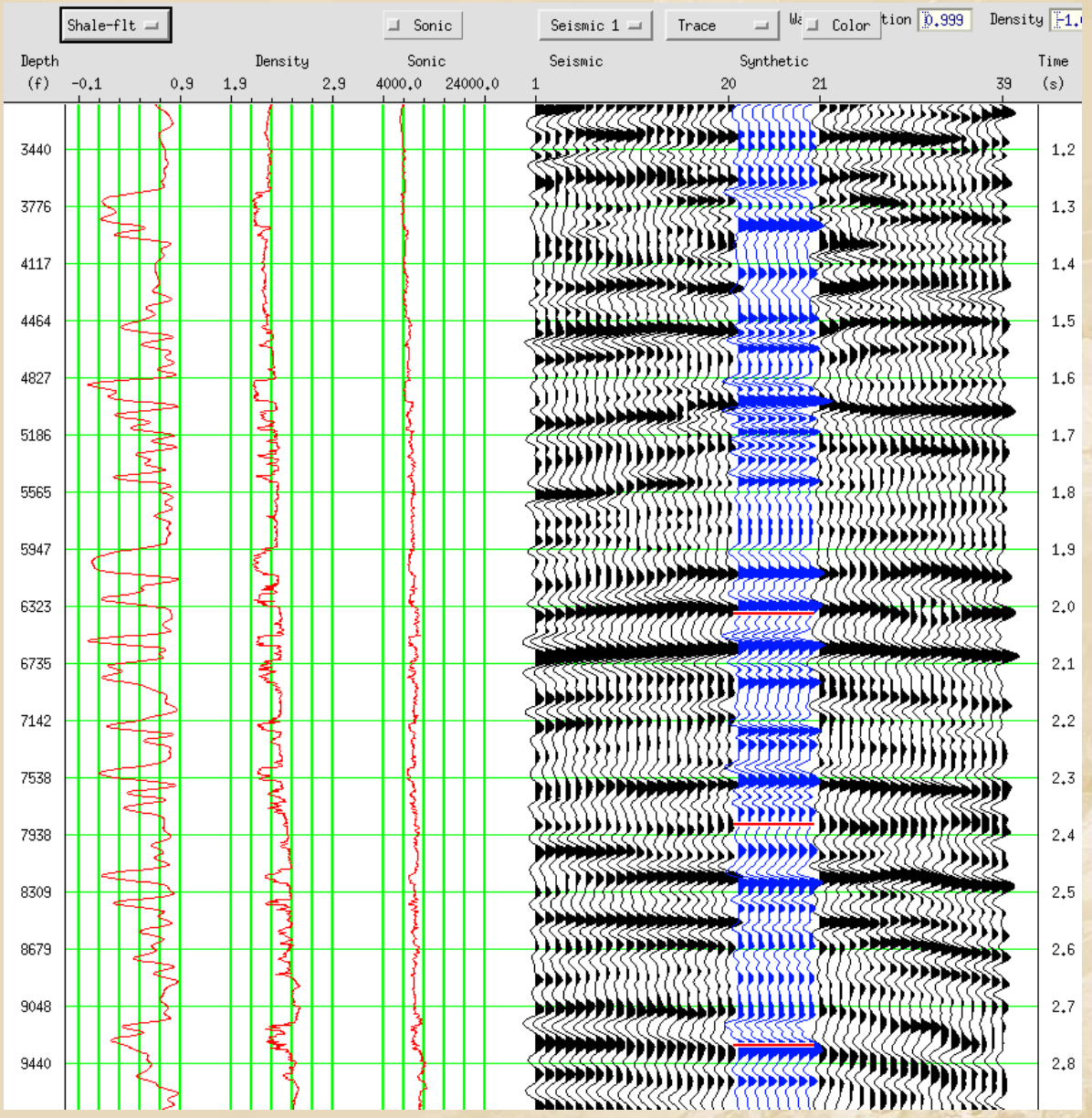
Log Analysis



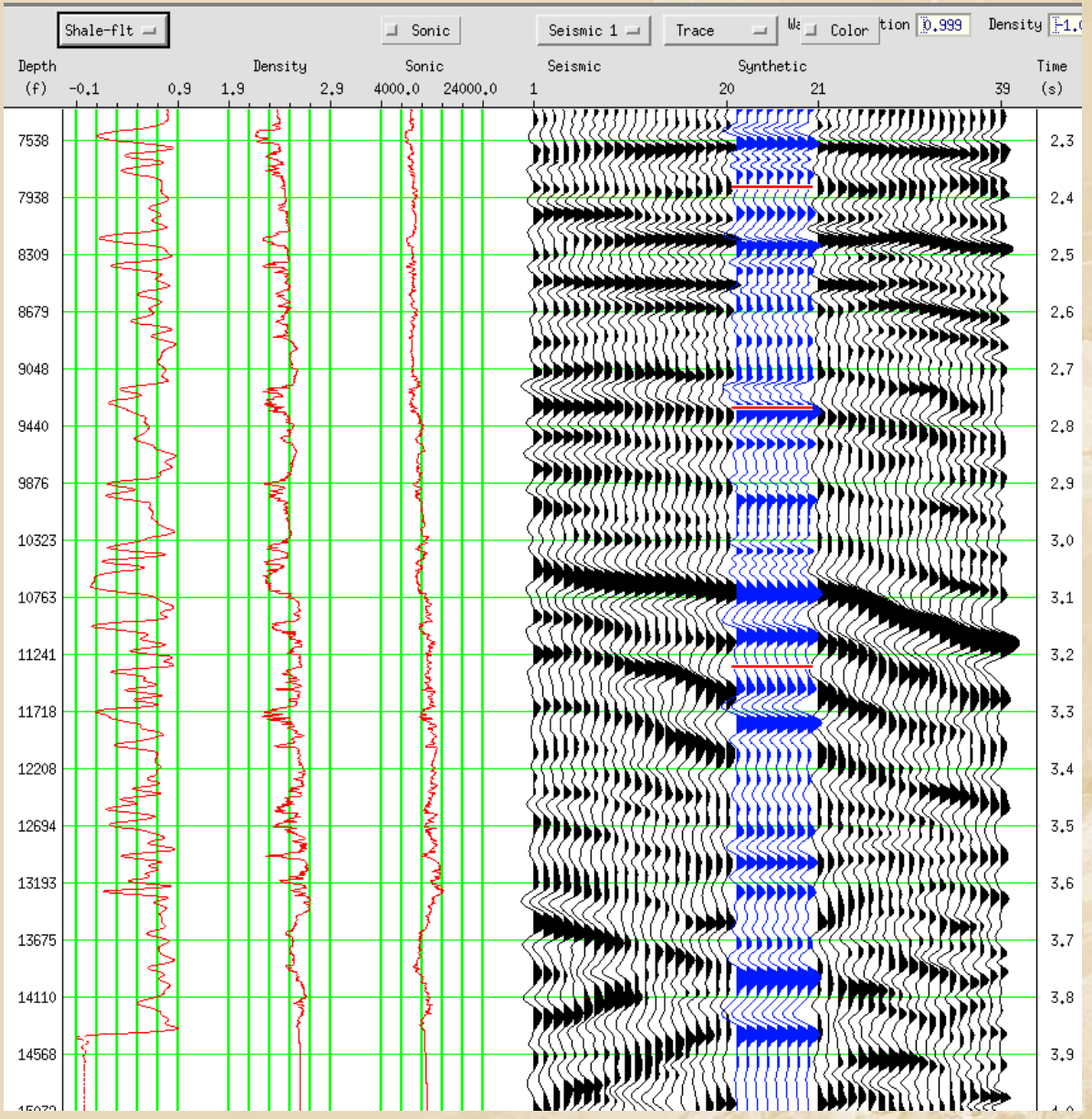
Synthetic Tie, Upper Section



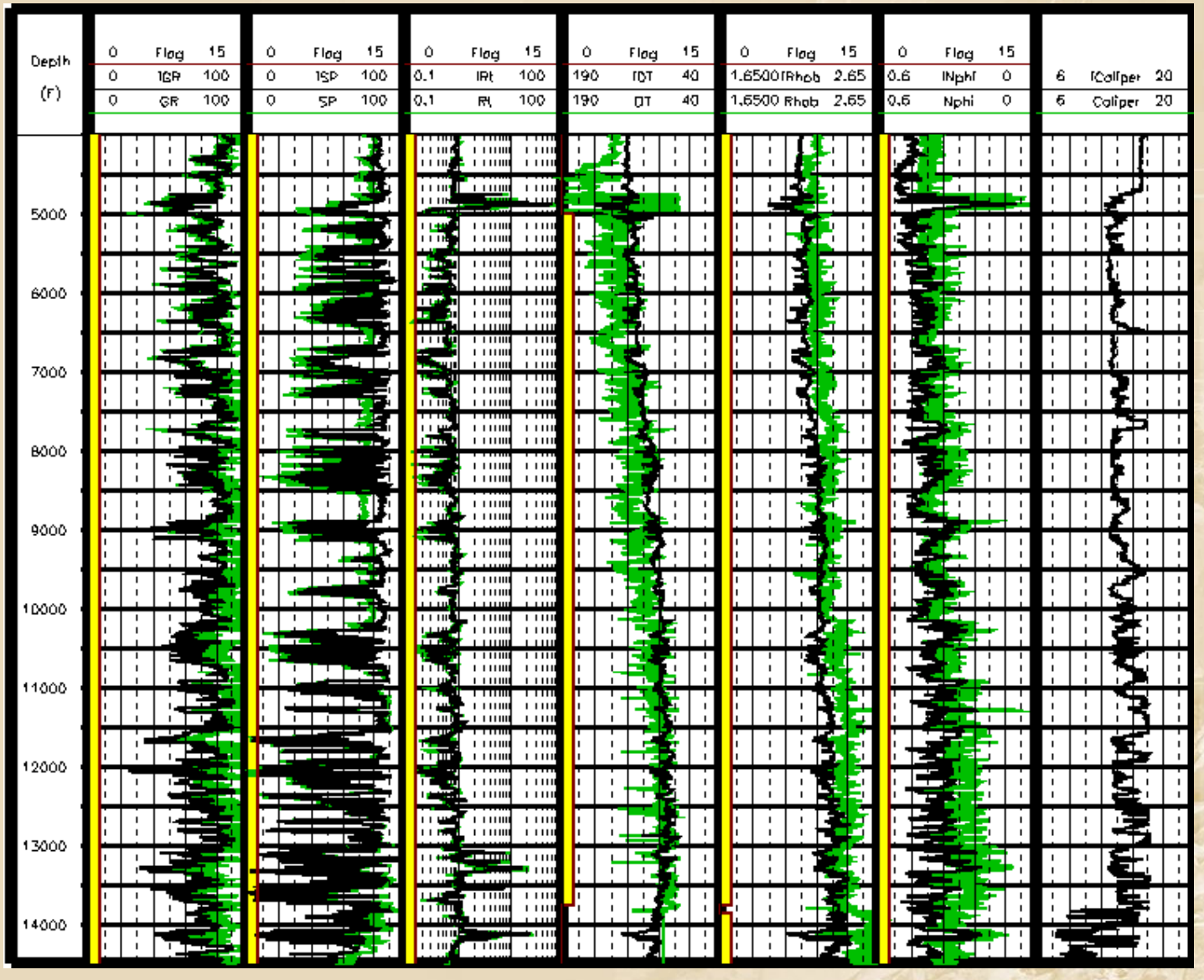
Synthetic Tie, Middle Section



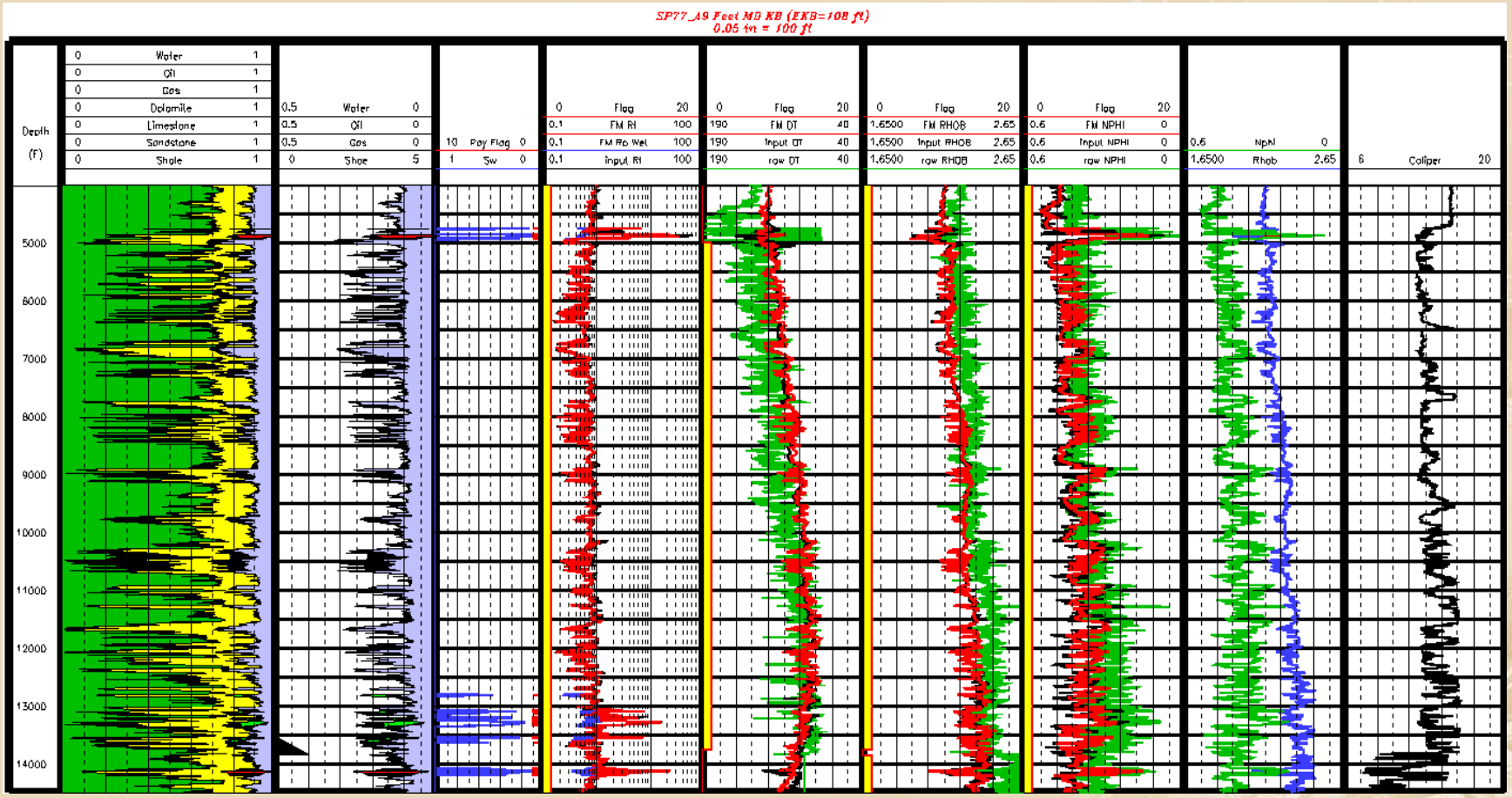
Synthetic Tie, lower Section



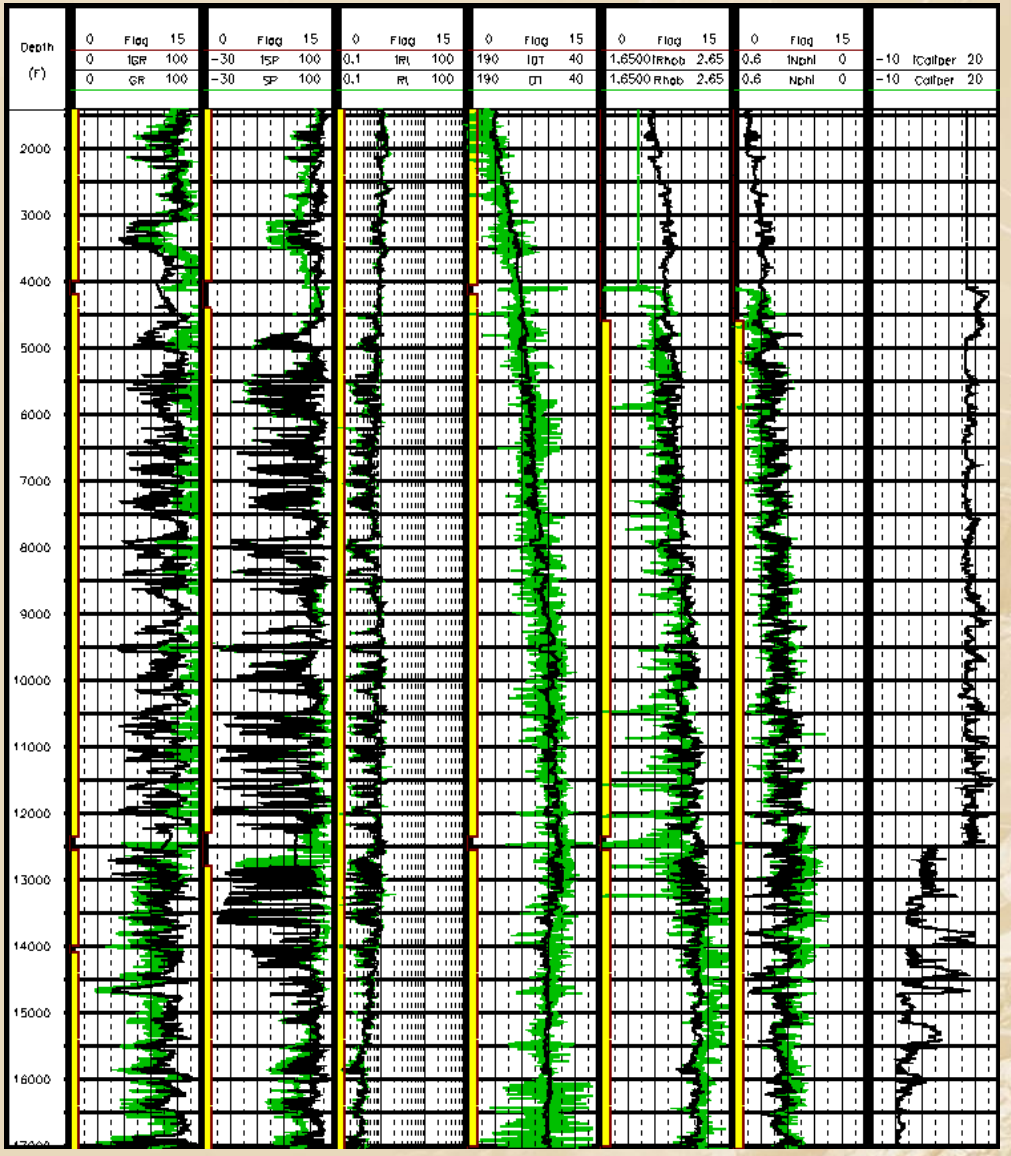
Log Editing



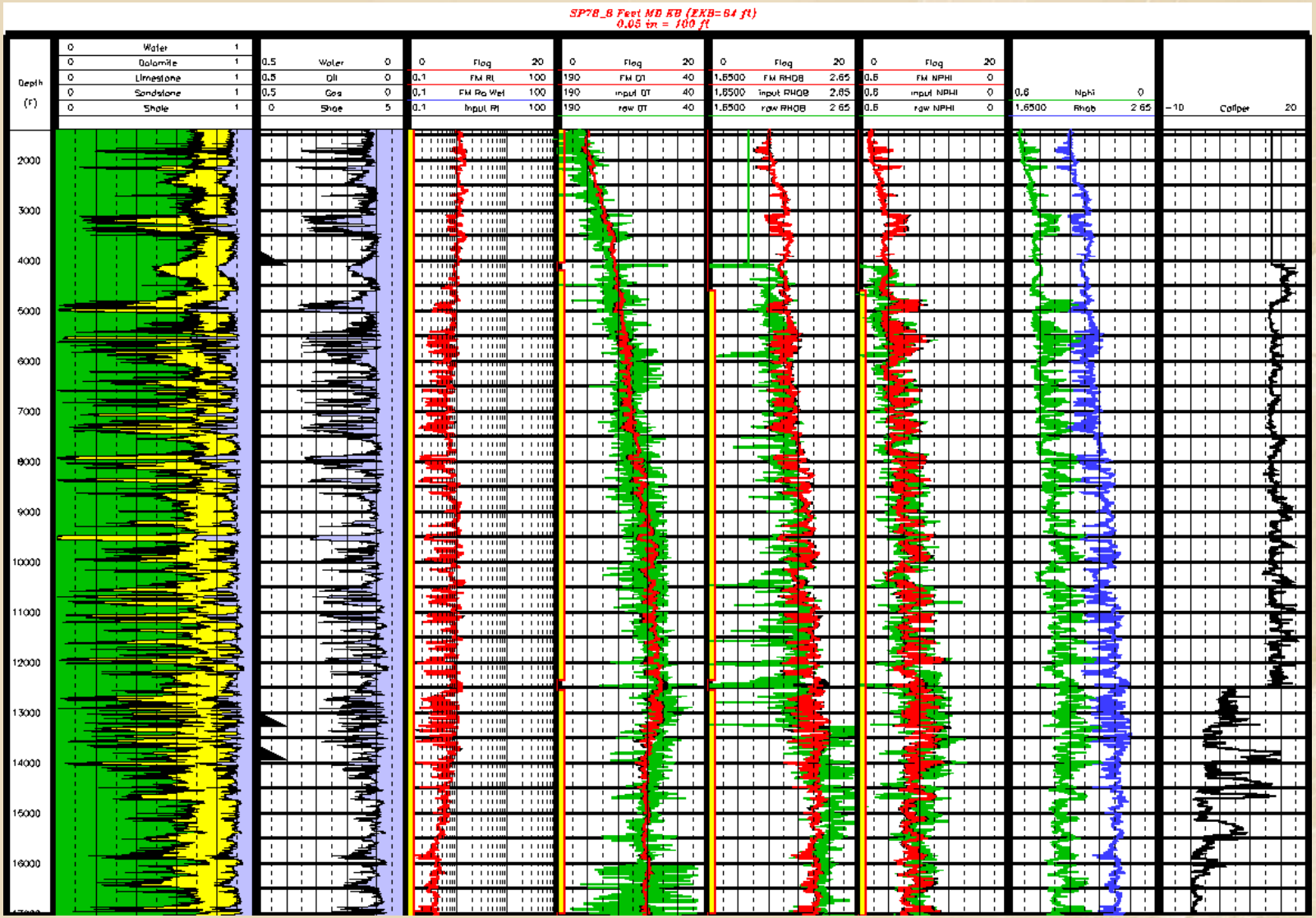
Log Analysis



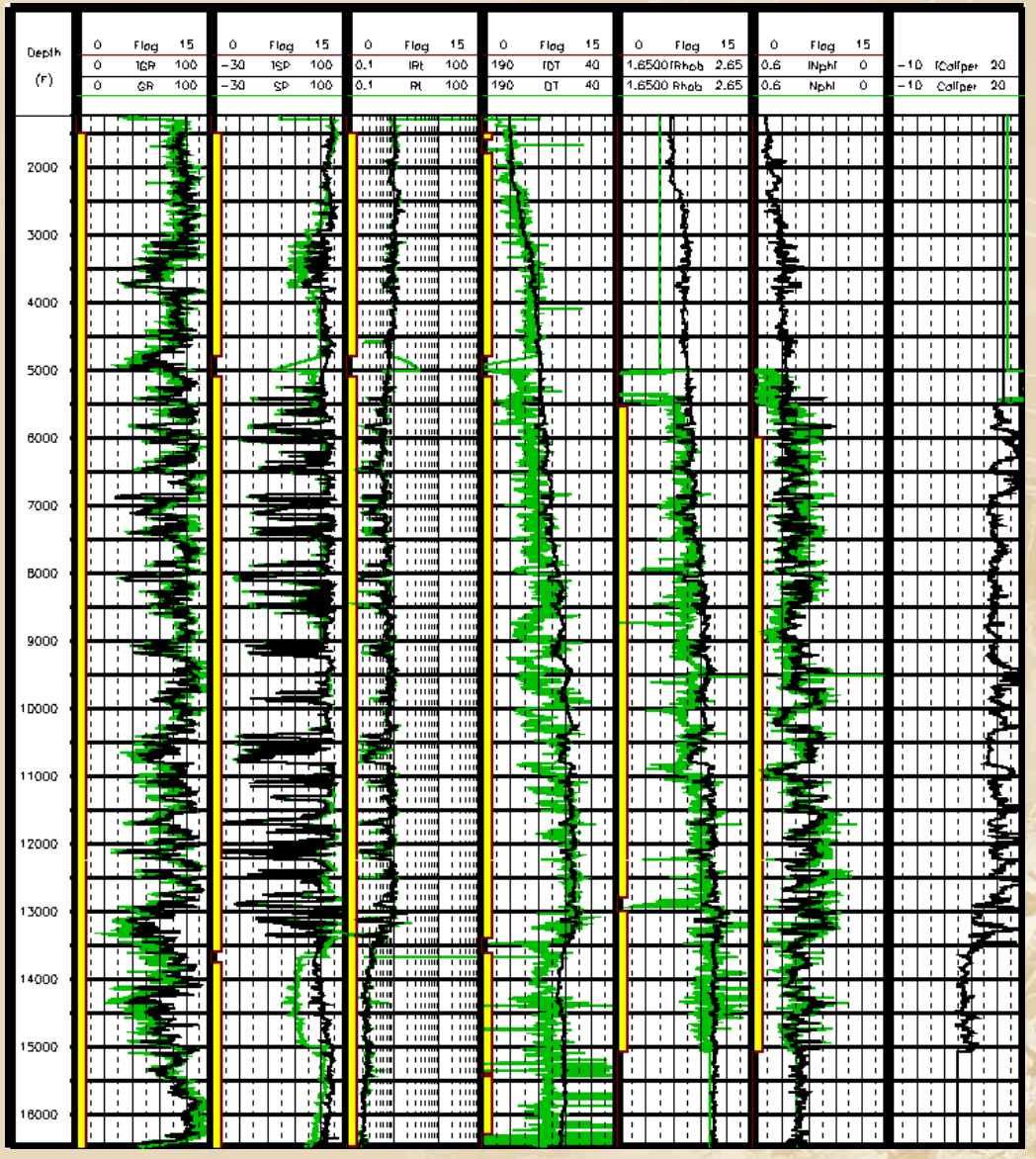
Log Editing



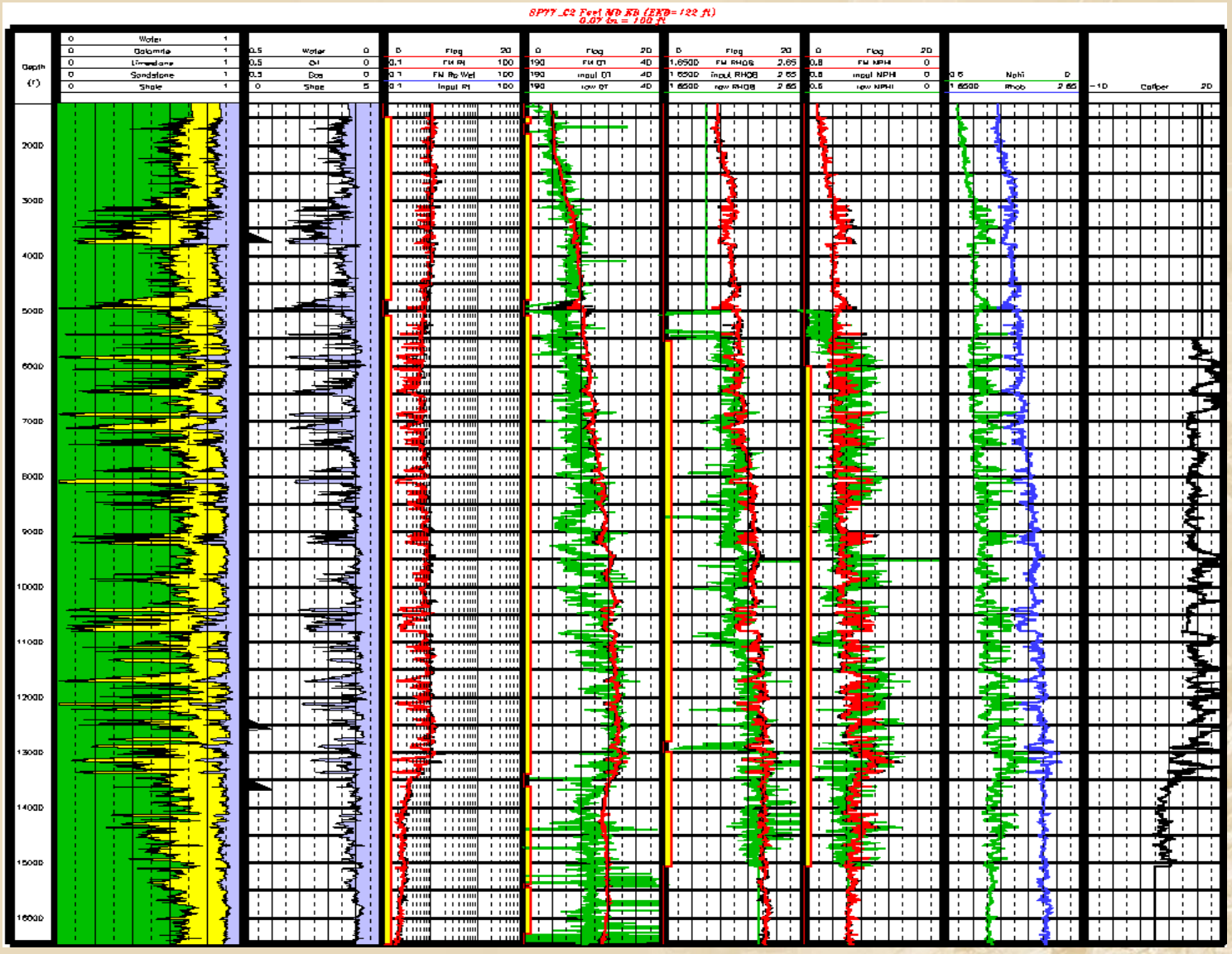
Log Analysis



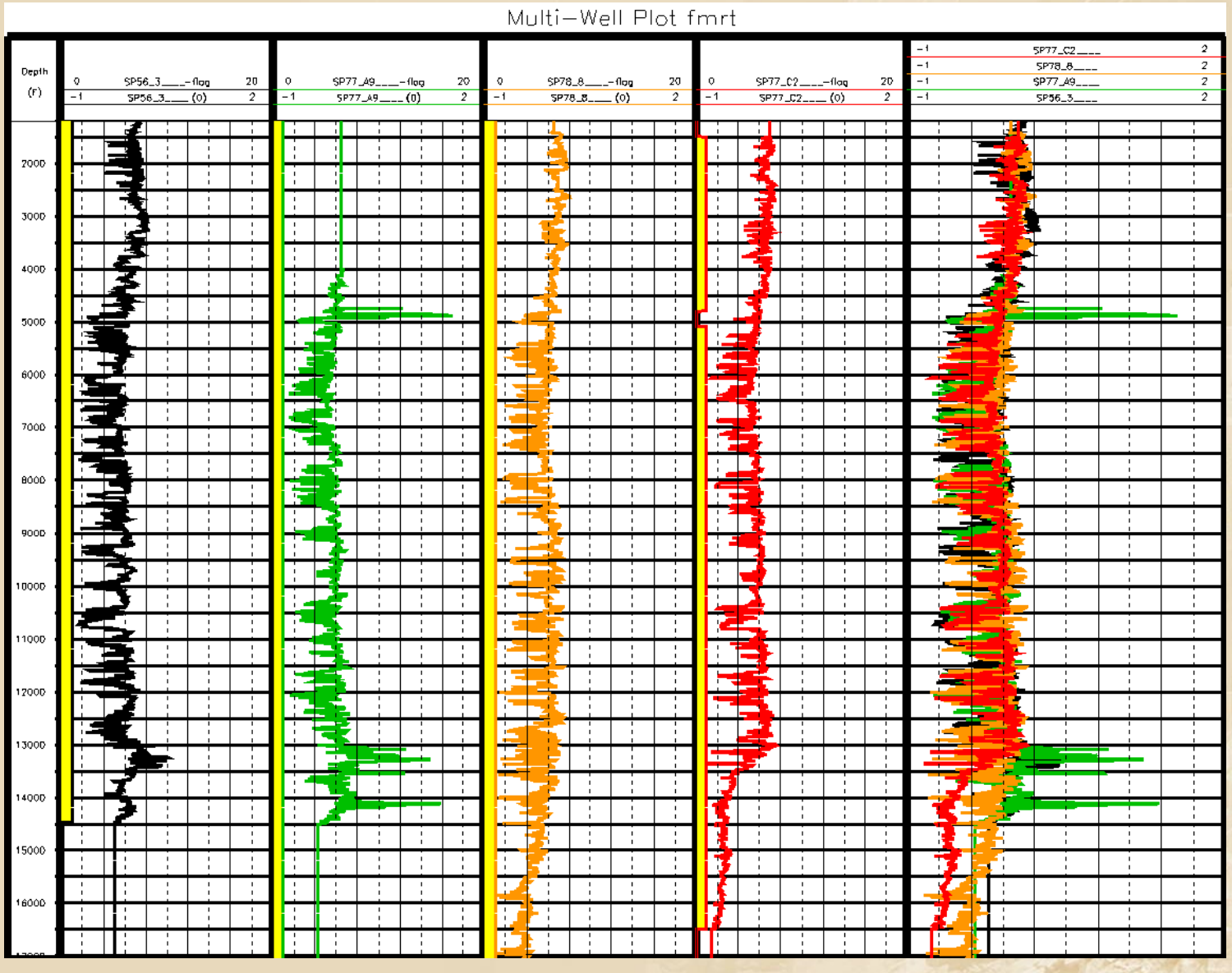
Log Editing



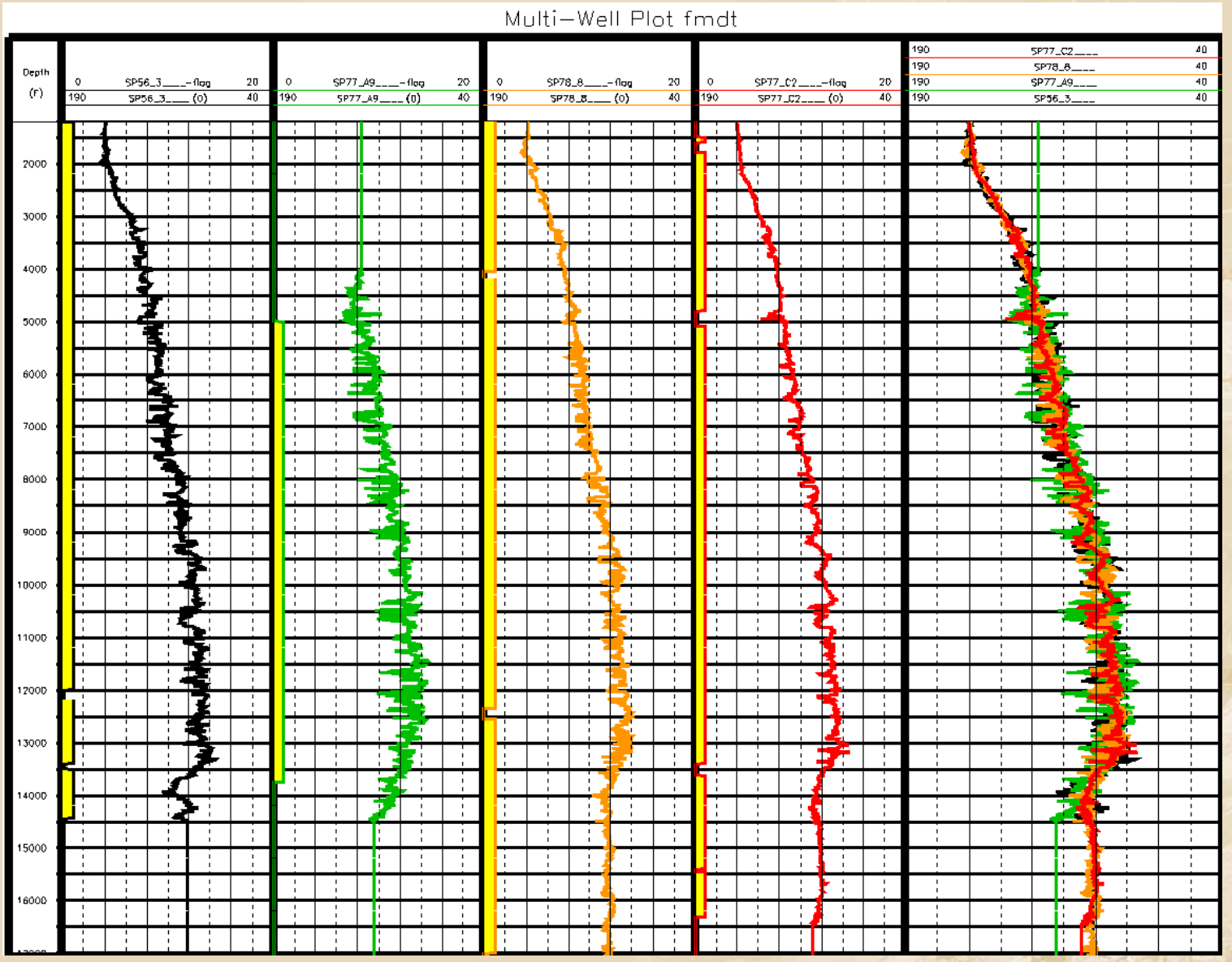
Log Analysis



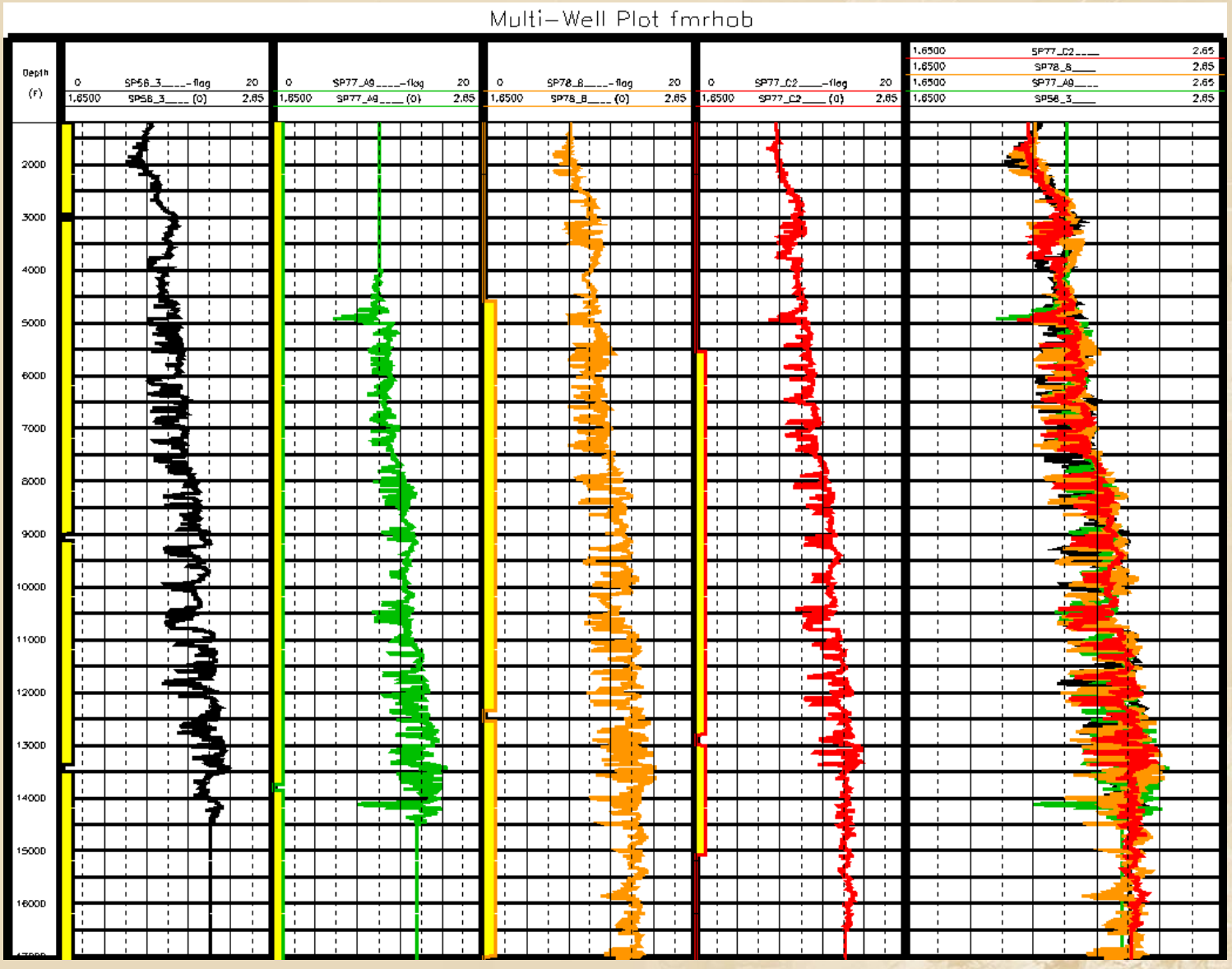
Deep Resistivity



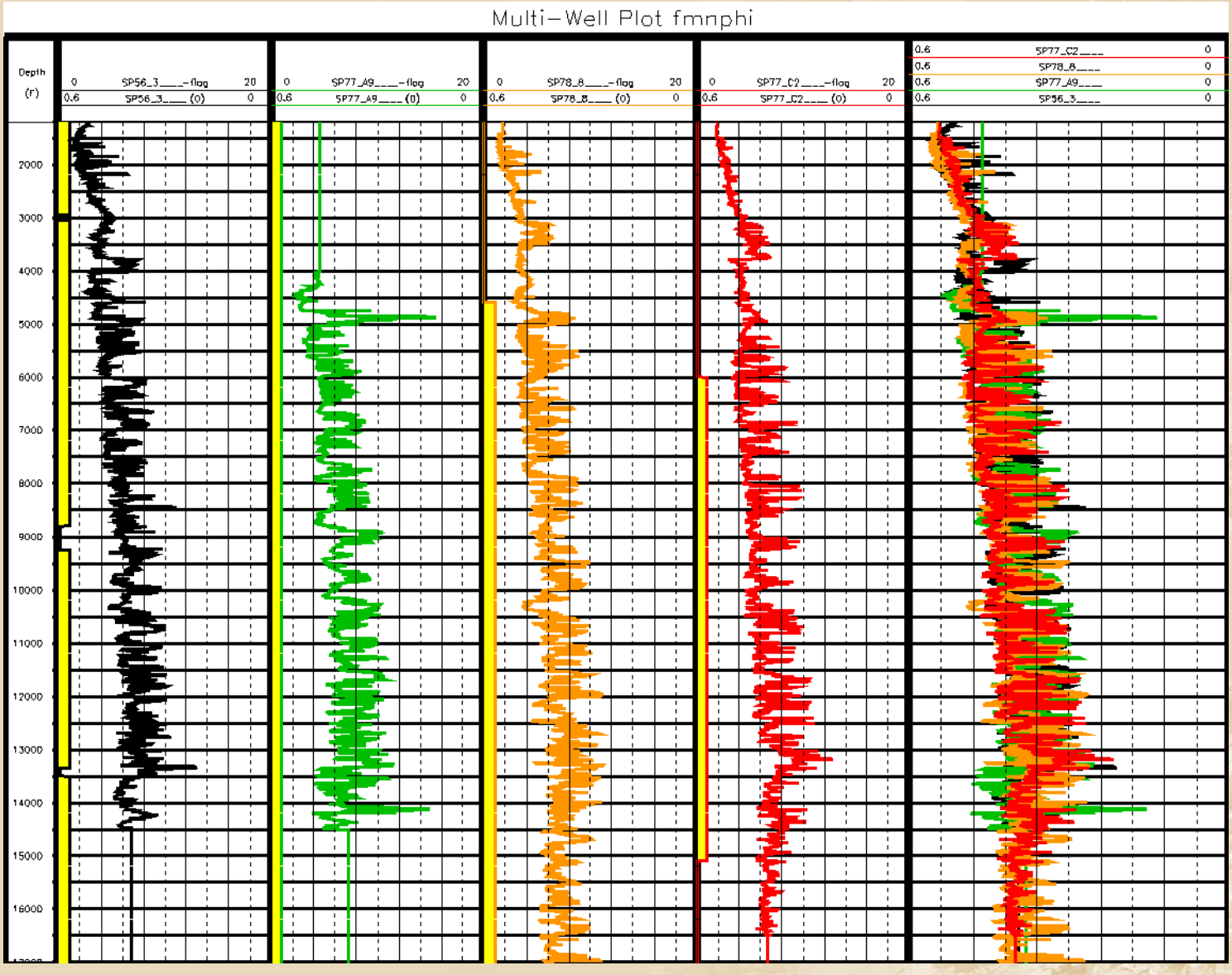
Sonic



Density

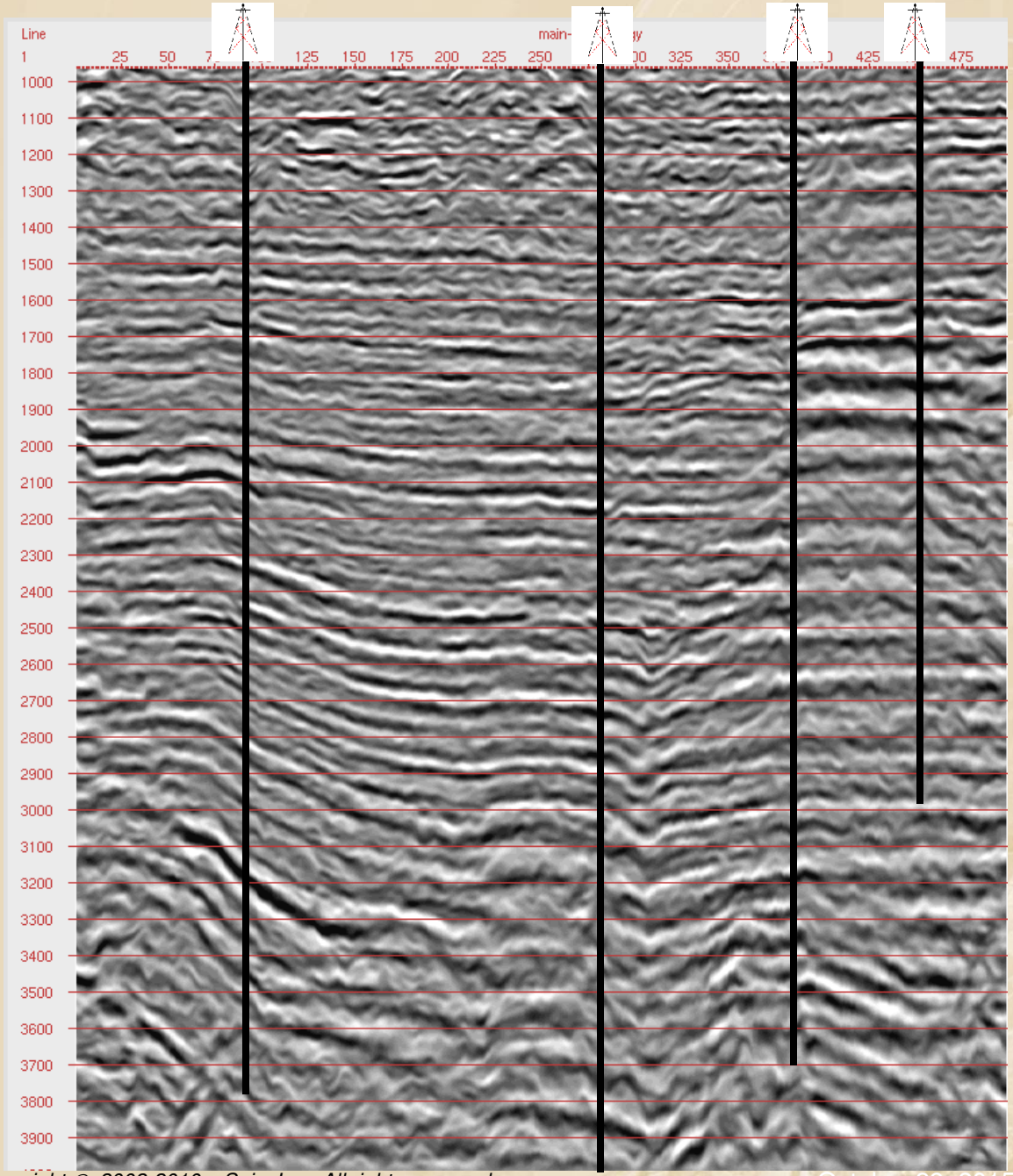


Neutron

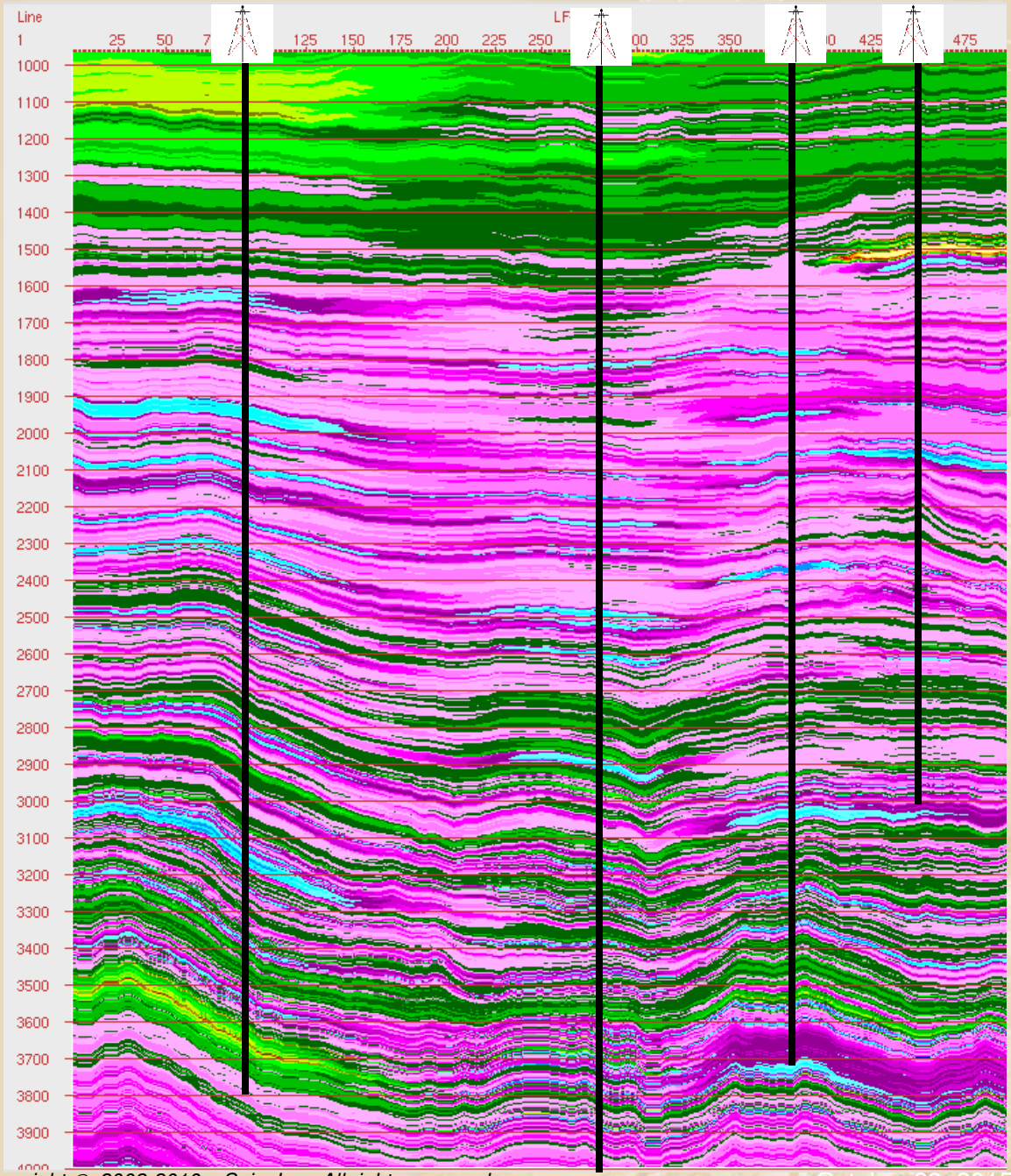


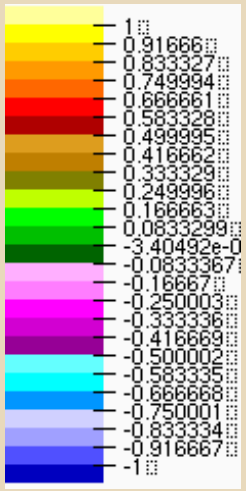
Making the Seismic Inversion Model

Seismic
Full Offset Stack

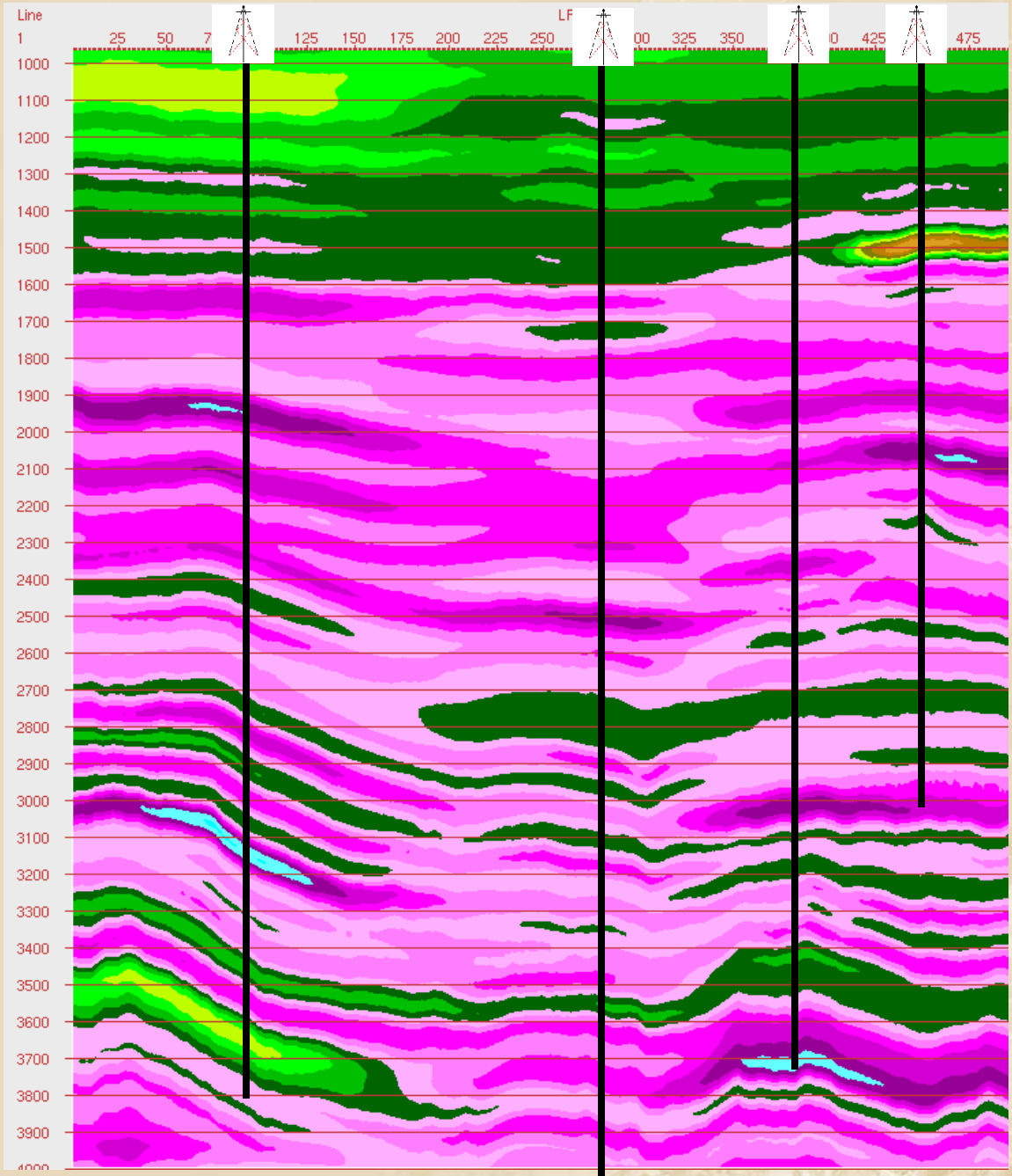


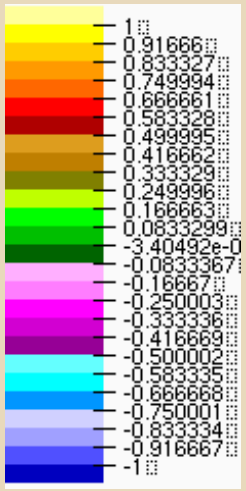
RT, Raw Logs
Full Bandwidth
4 Wells



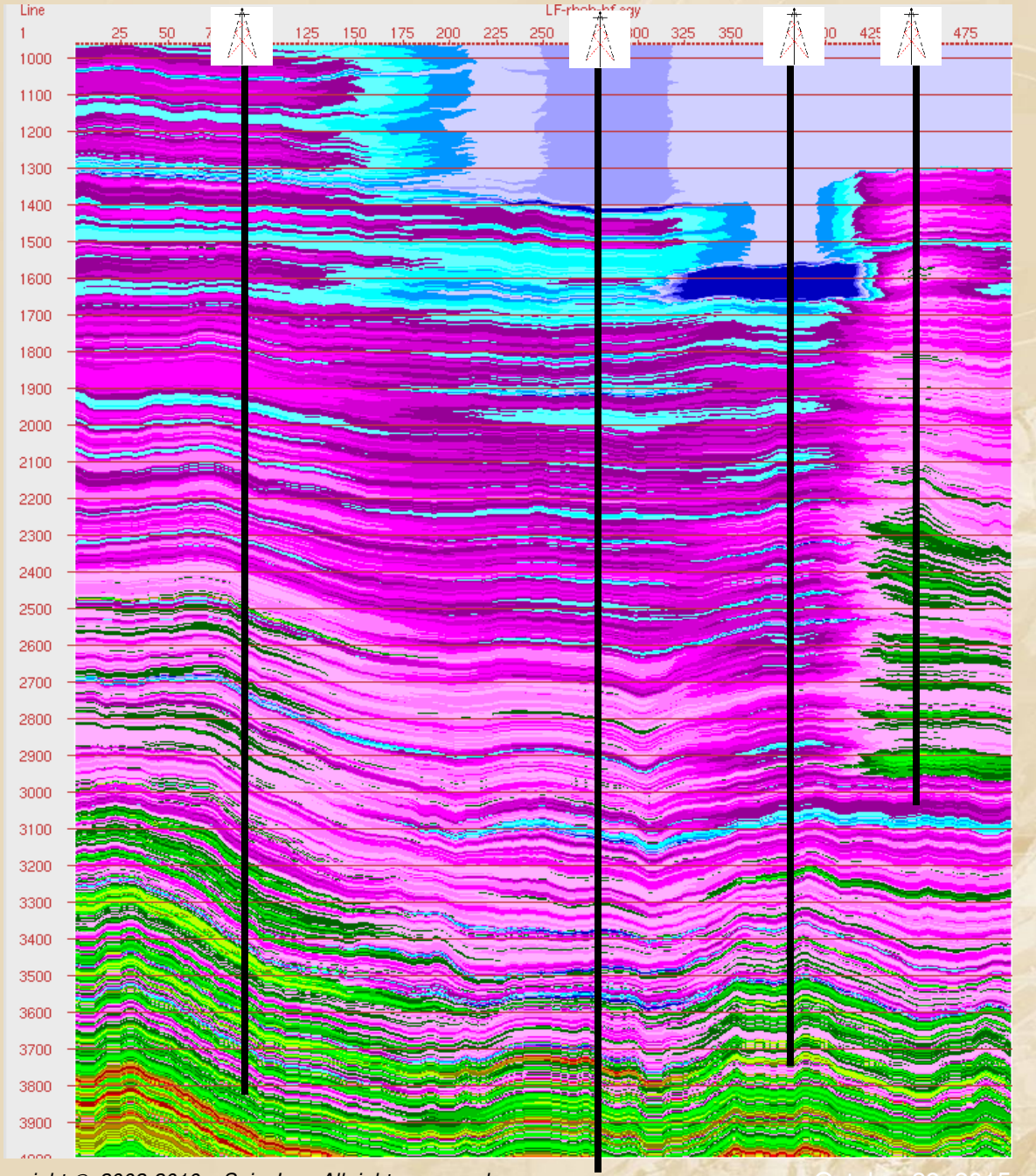


RT, Raw Logs
0 – 10 Hz
4 Wells

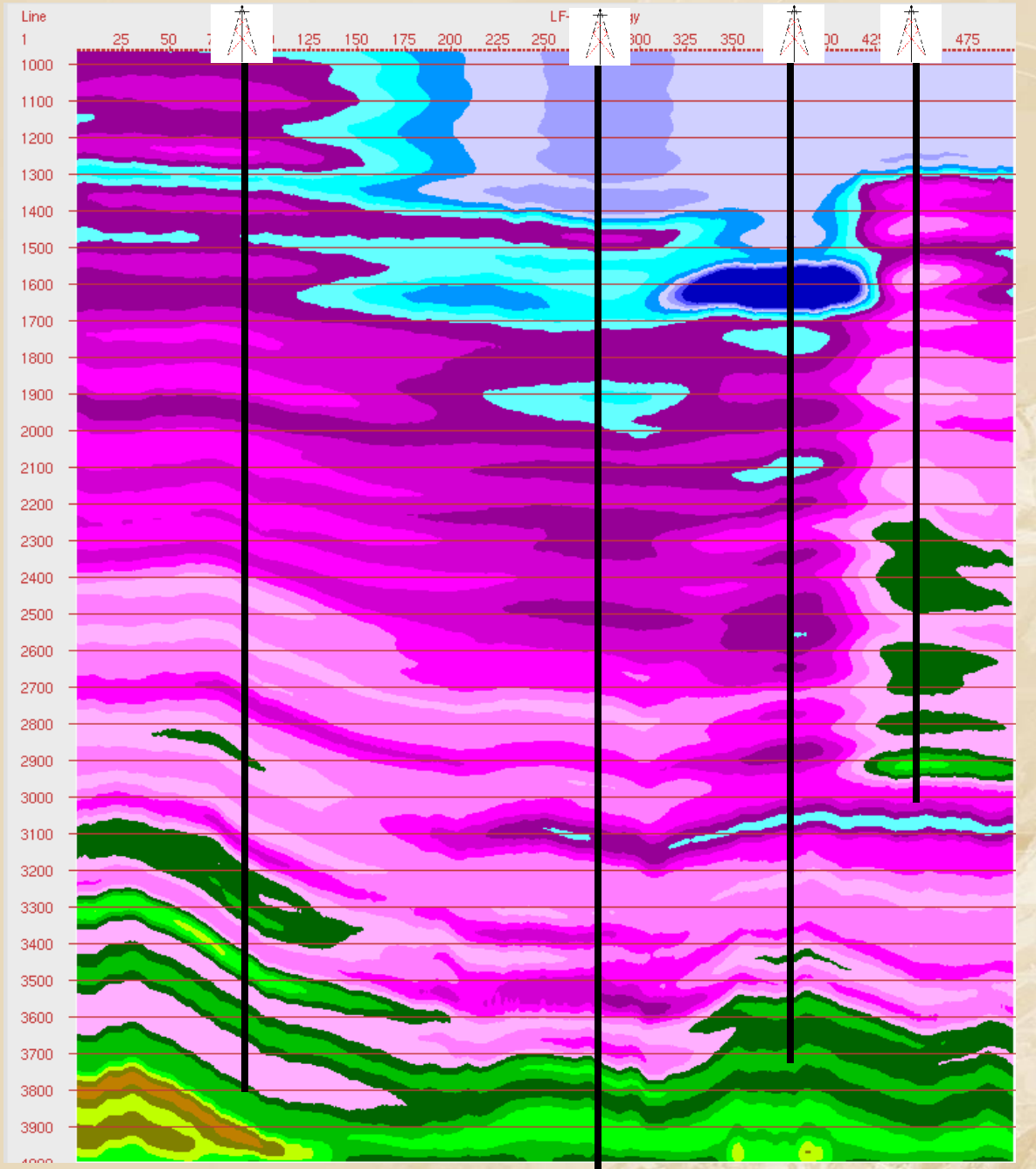


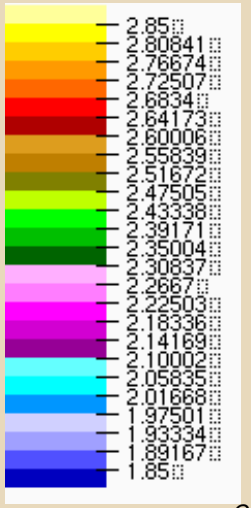


Rhob, Raw Logs
Full Bandwidth
4 Wells

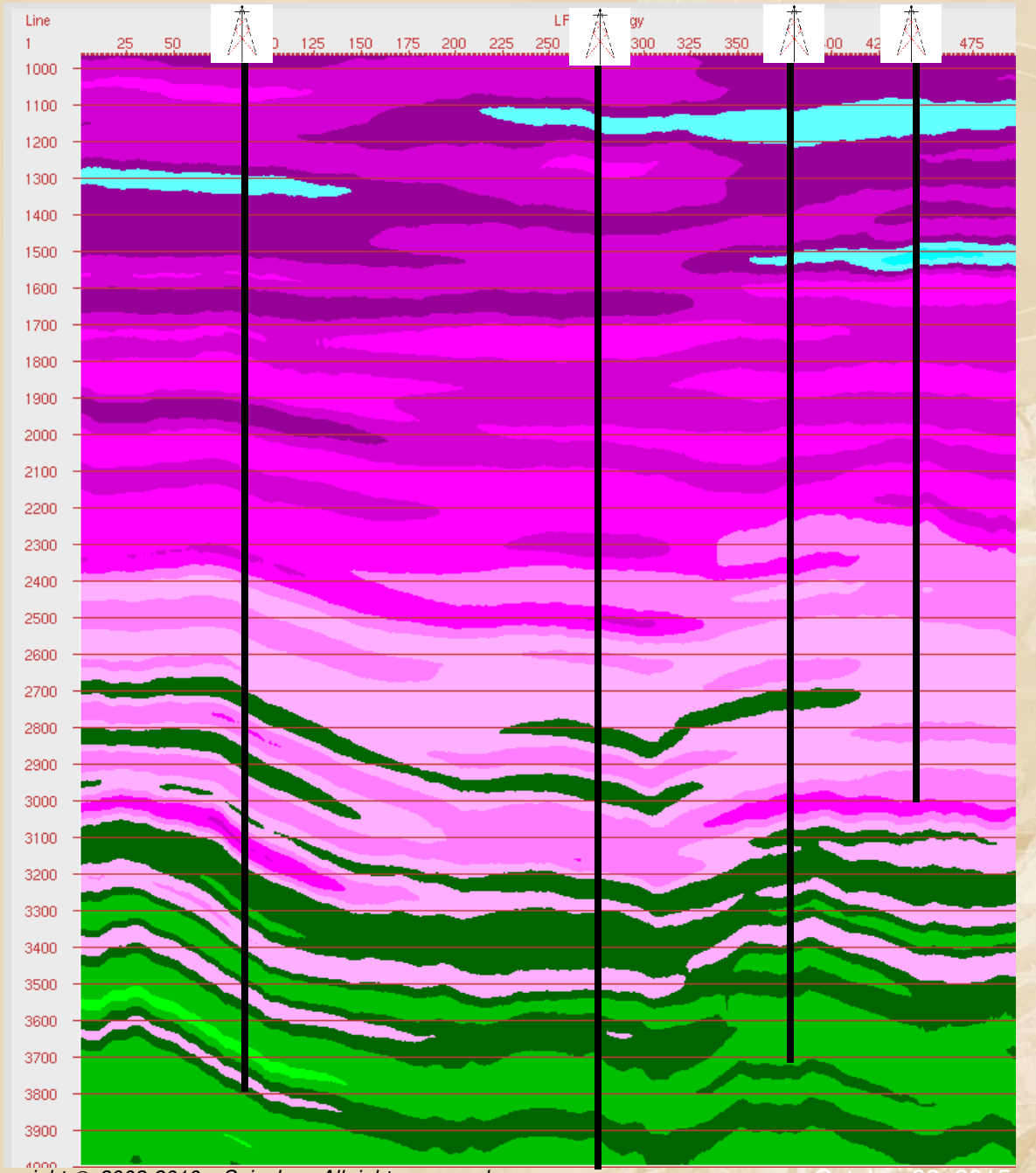


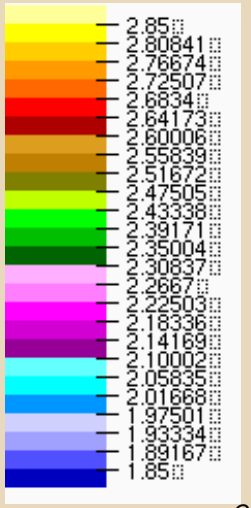
Rhob, Raw Logs
0 – 10 Hz
4 Wells



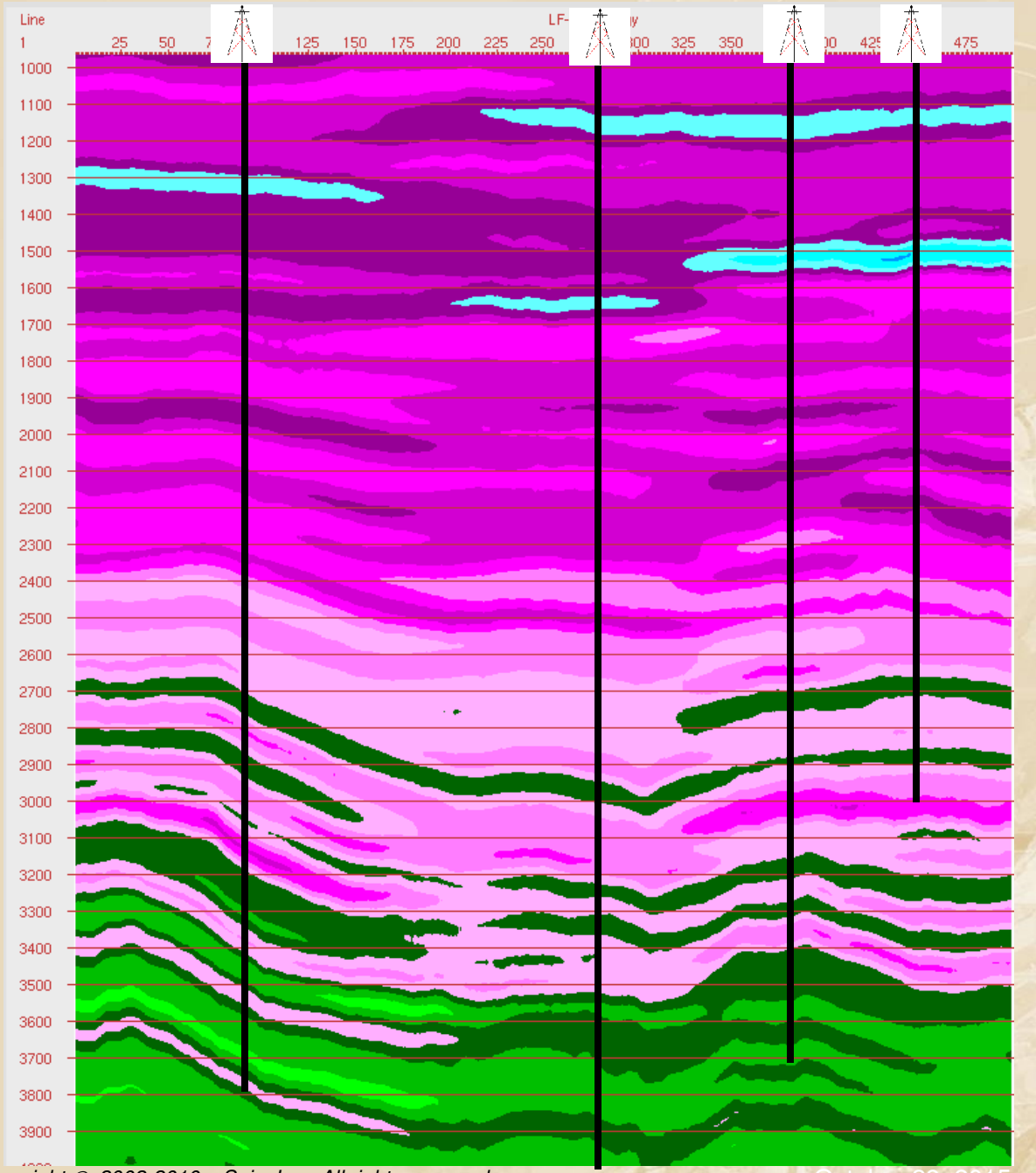


Rhob, FM Logs
0 – 10 Hz
4 Wells





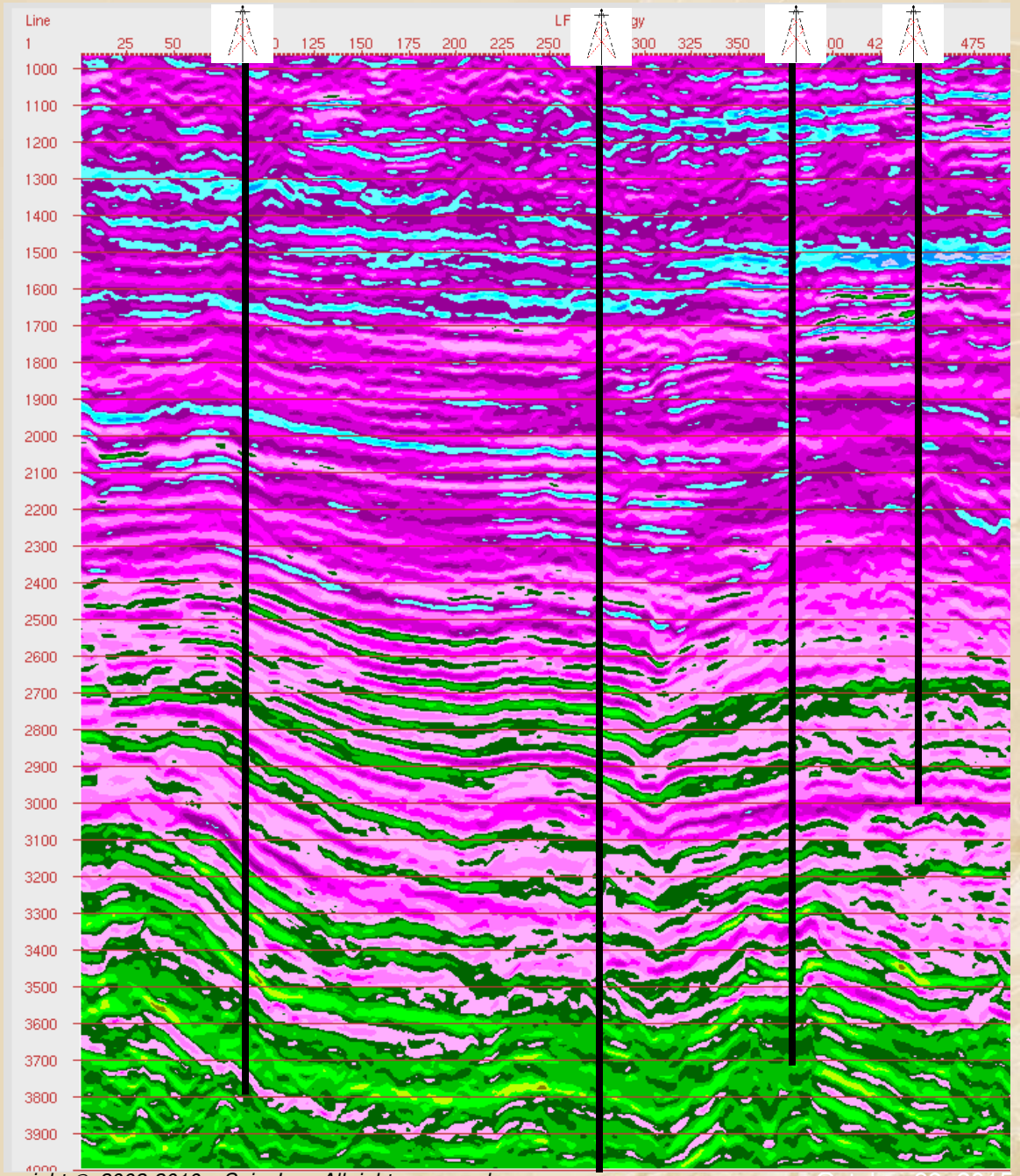
Rhob, FM Logs
0 – 10 Hz
4 Wells
Model Normalization

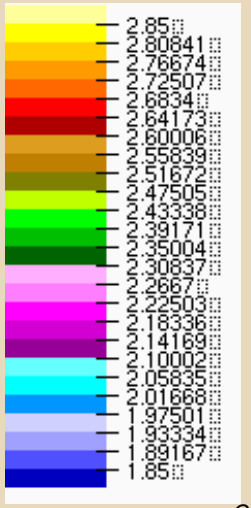


eSeis

Rhob, FM Logs
0 – 10 Hz
4 Wells
Model Normalization

Spectral Recursive Inversion

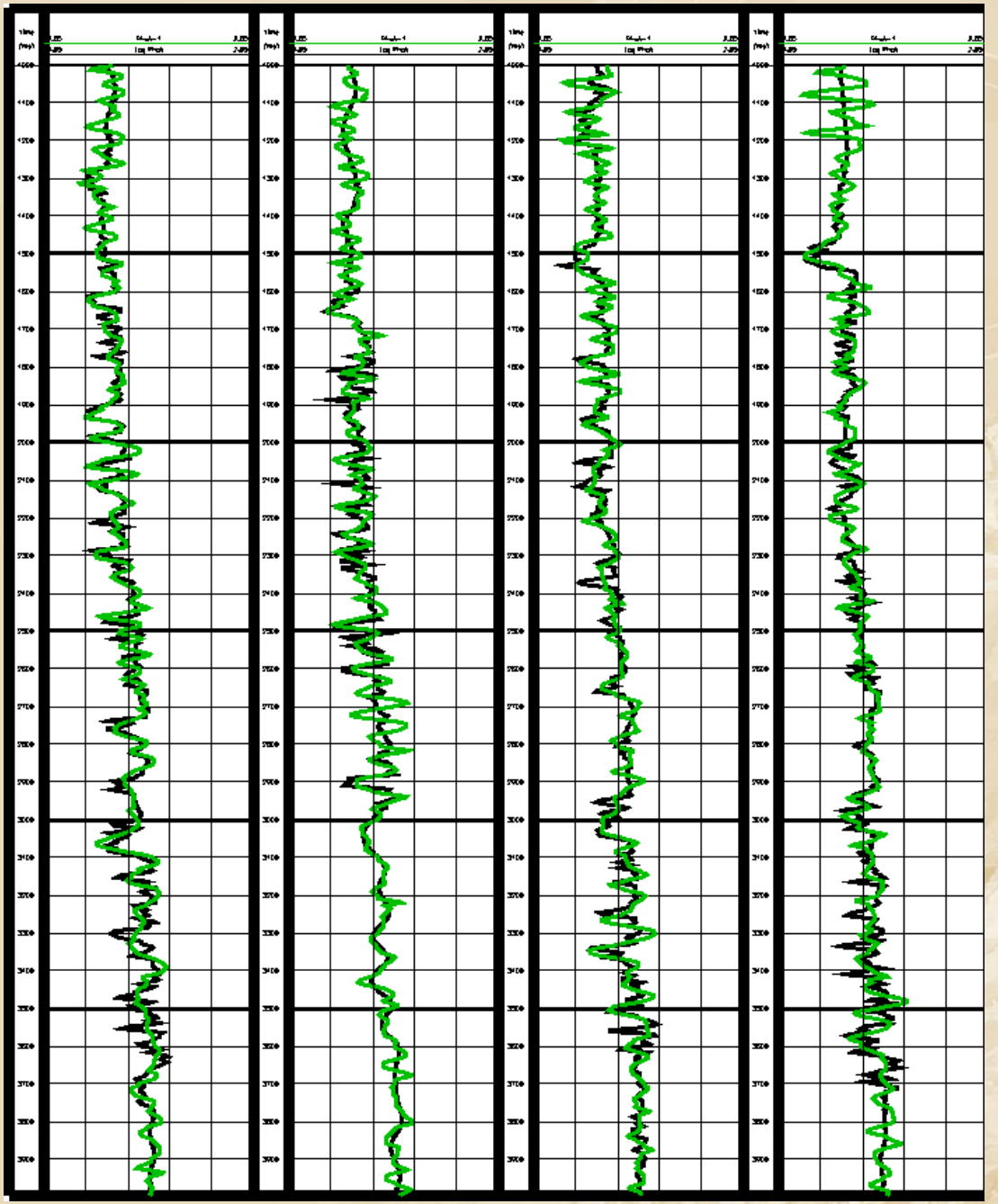




Rhob, FM Logs
0 – 10 Hz
4 Wells
Model Normalization

Spectral Recursive Inversion

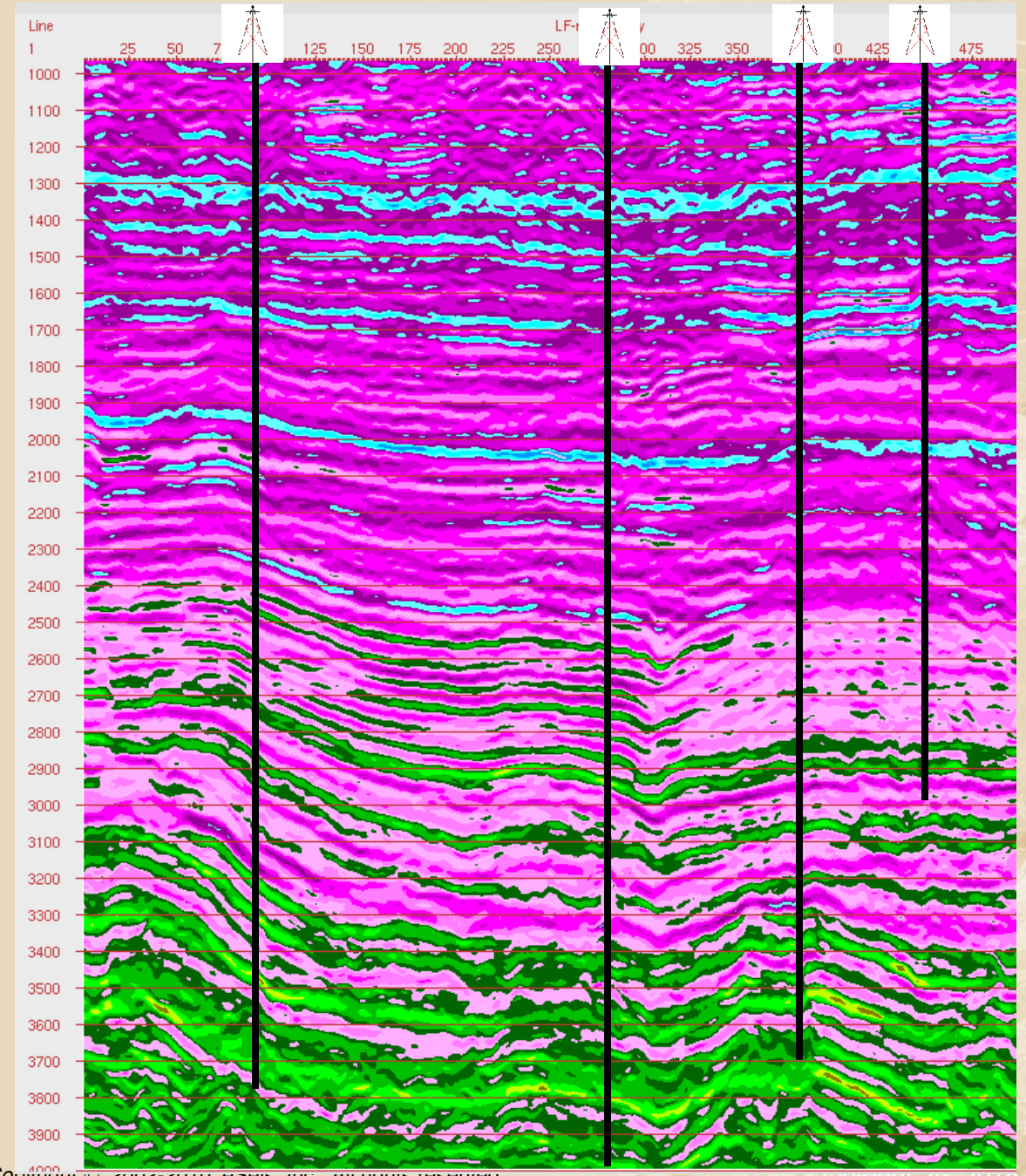
Black Logs FM
Green Inversion

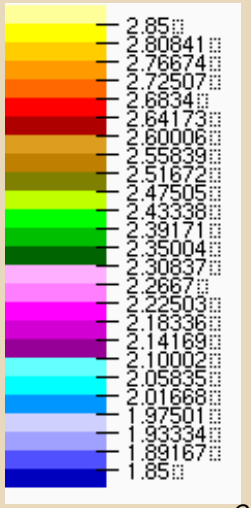


Making the Seismic Inversion Model Using Only 1 Well

Rhob, FM Logs
0 – 10 Hz
1 Well
Model Normalization

Spectral
Recursive Inversion

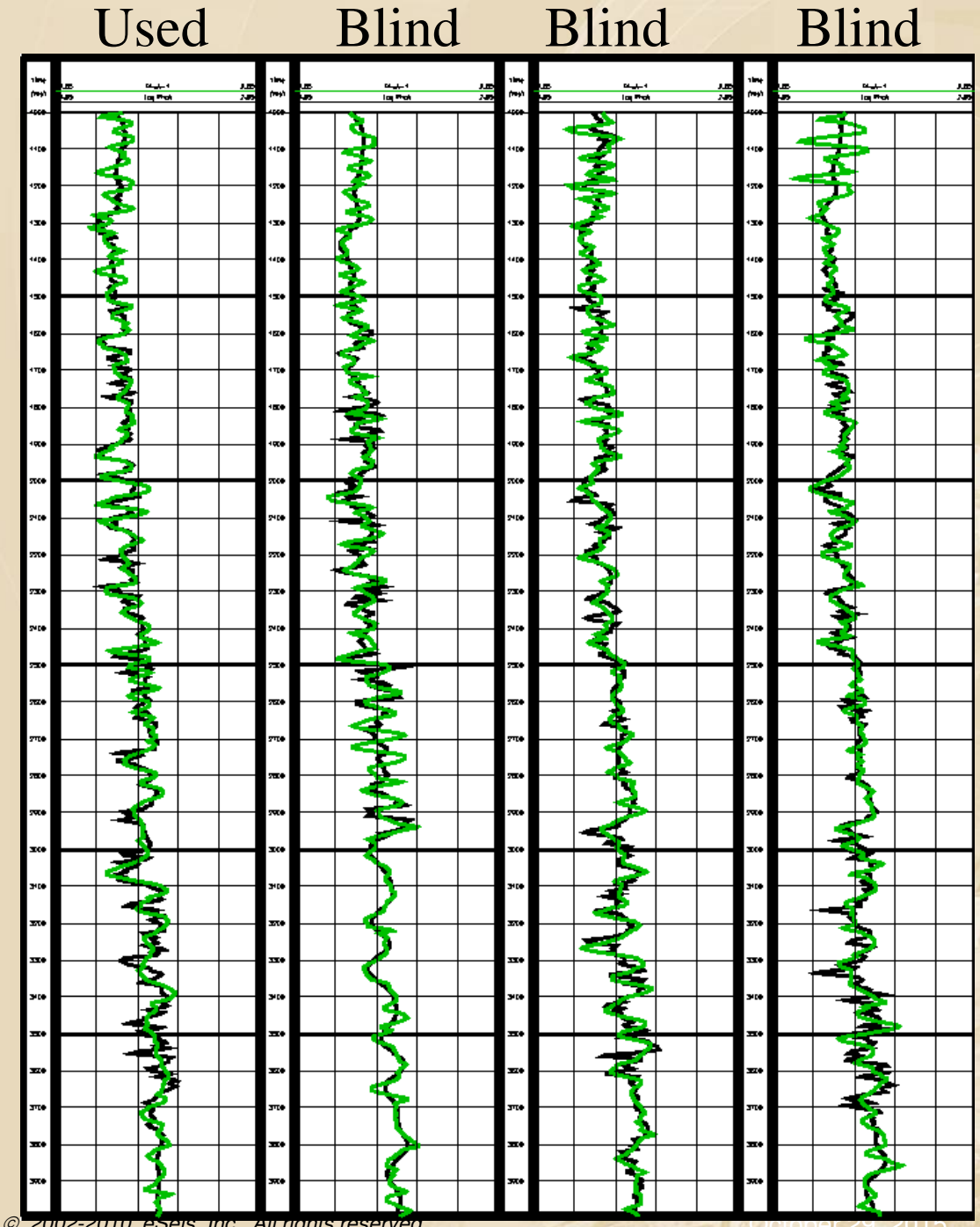




Rhob, FM Logs
0 – 10 Hz
1 Well
Model Normalization

Spectral
Recursive Inversion

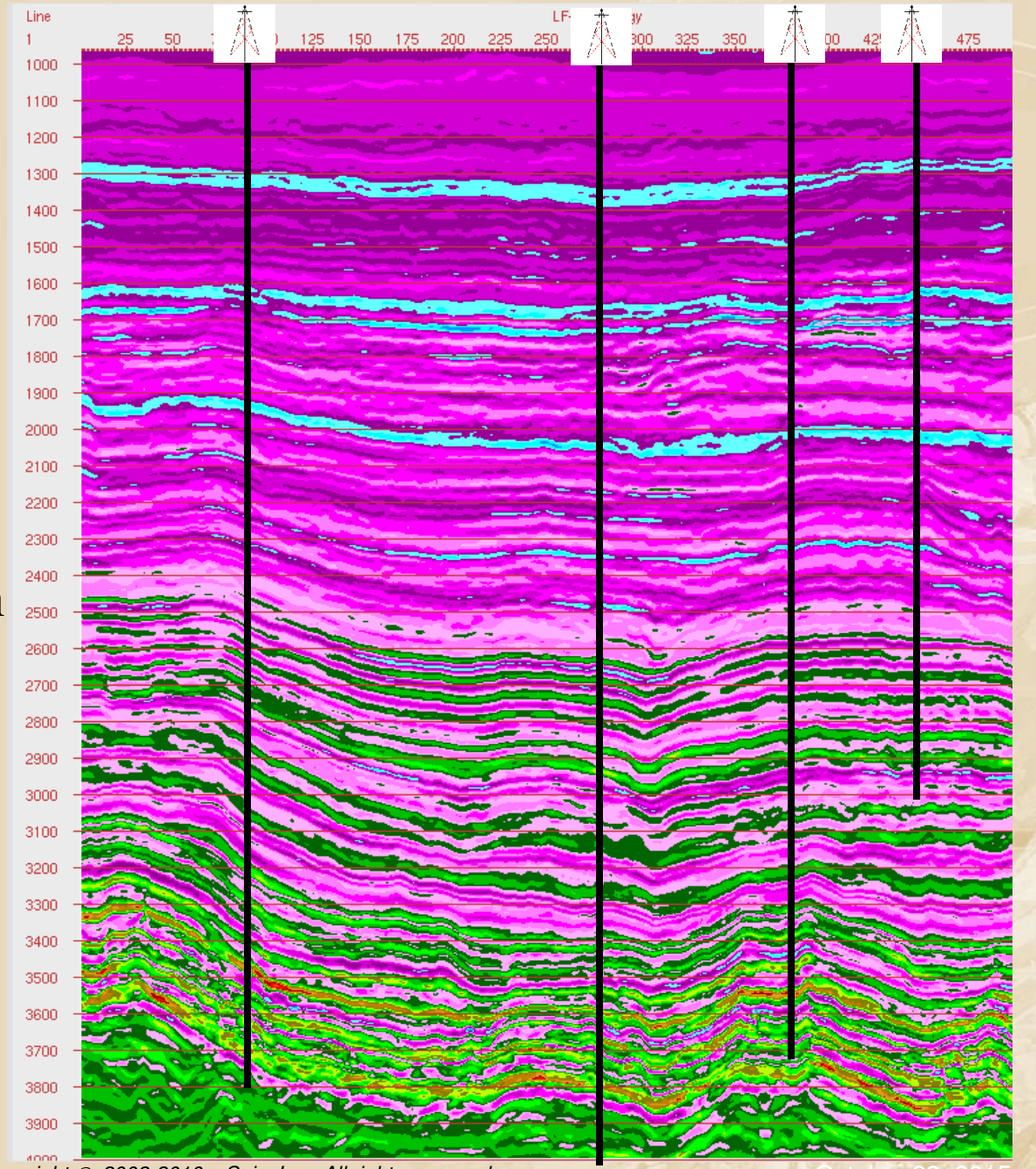
Black Logs FM
Green Inversion

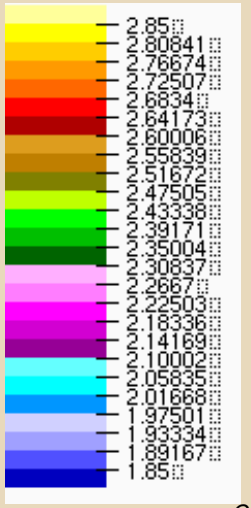


eSeis

Rhob, FM Logs
1 Well
Model Normalization

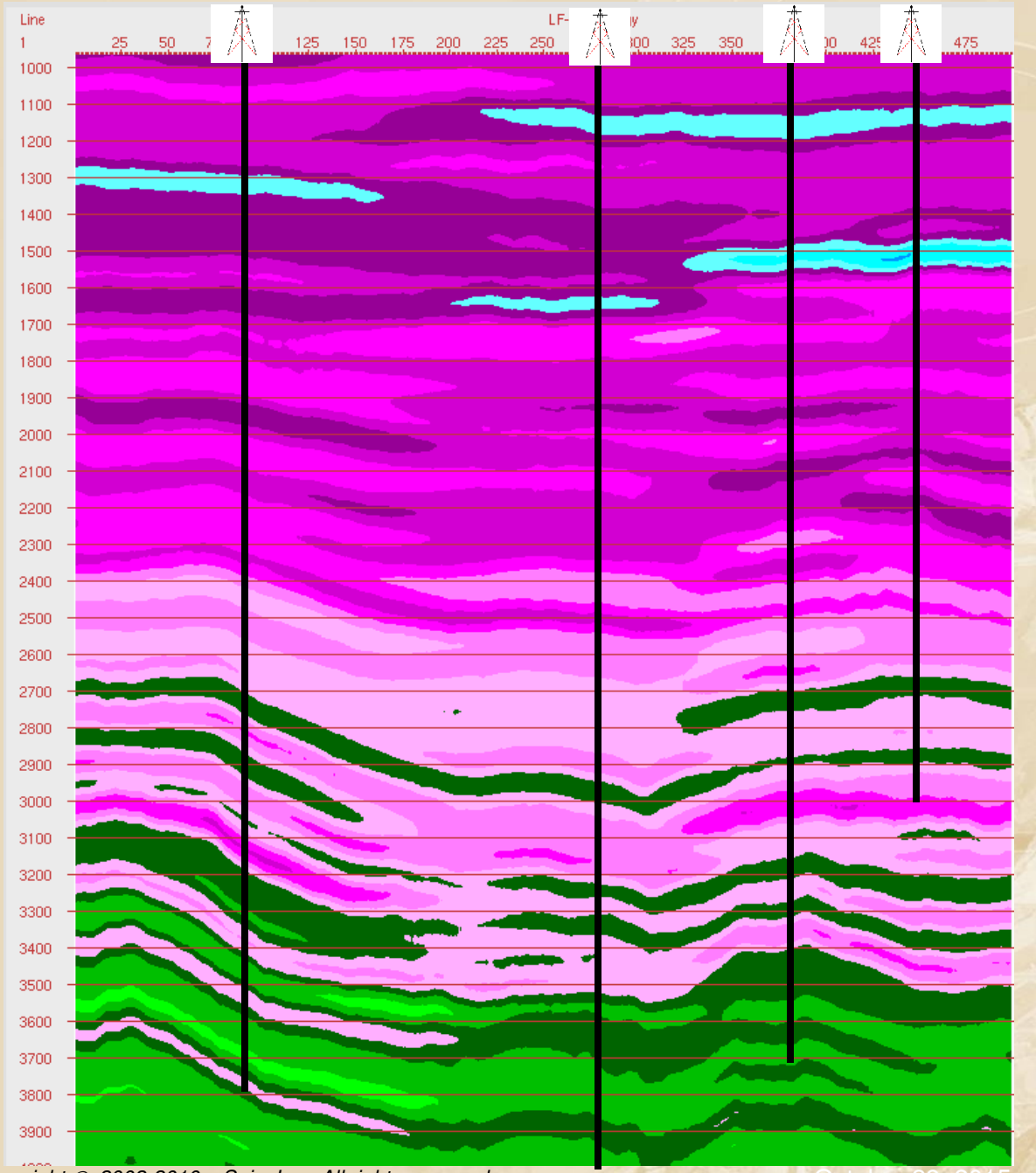
Spectral
Model-Based Inversion



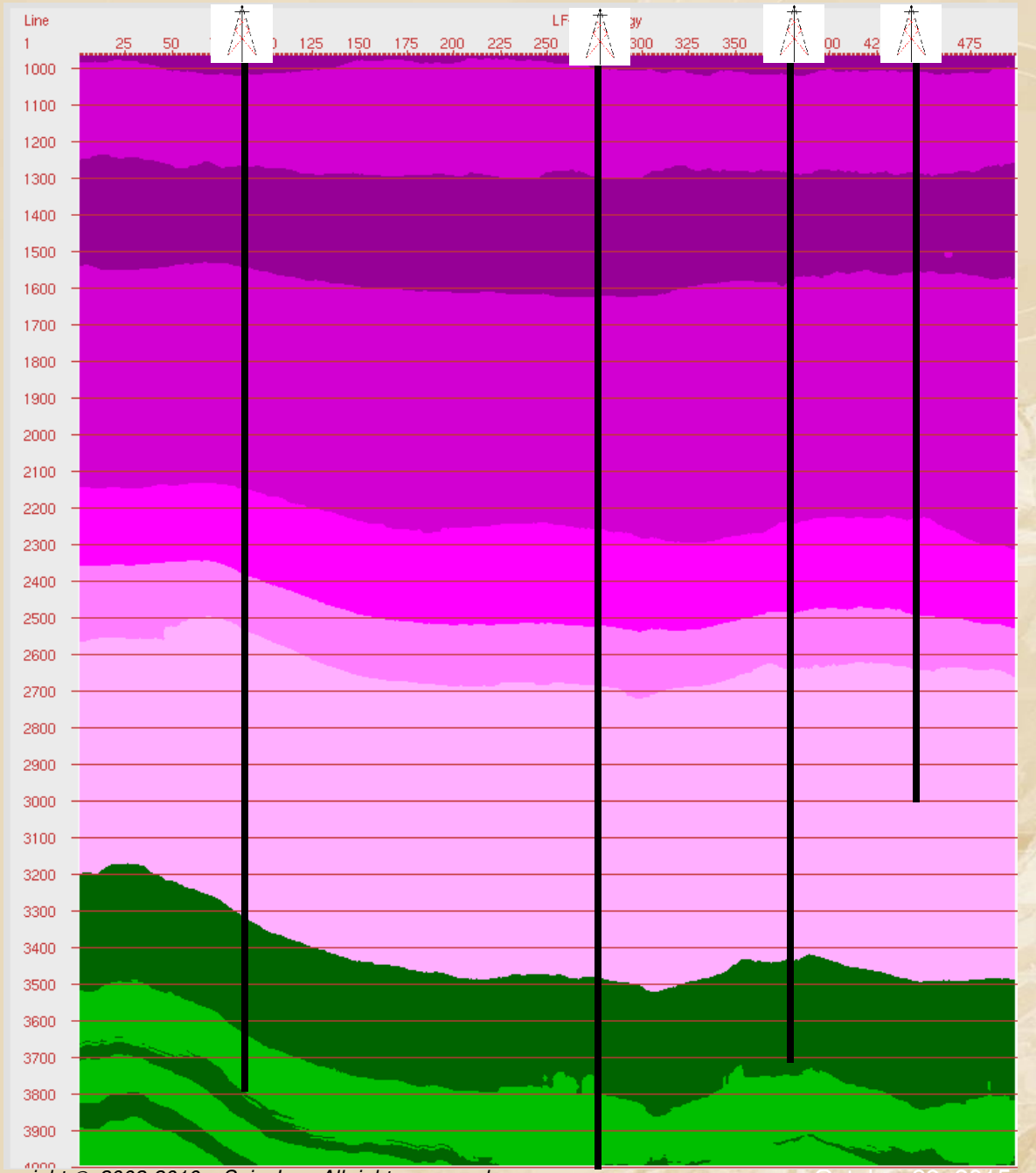


Making the Seismic Inversion Model Using Only 1 Well And Only 1 Hz

Rhob, FM Logs
0 – 10 Hz
4 Wells
Model Normalization

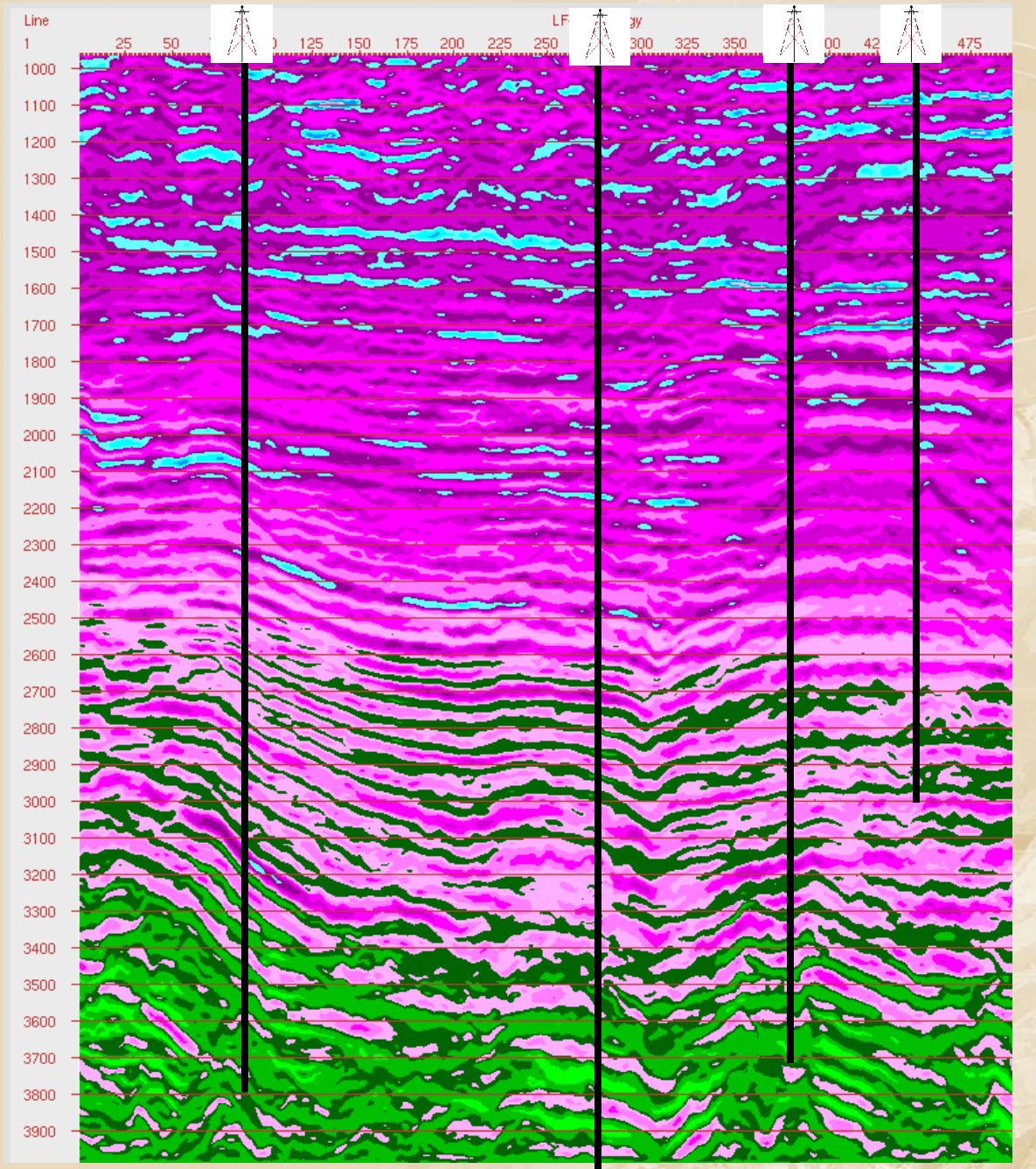


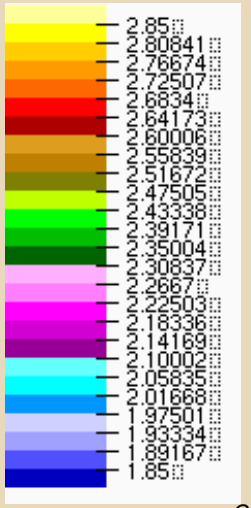
Rhob, FM Logs
0 – 1 Hz
1 Well



Rhob, FM Logs
0 – 1 Hz
1 Well

Spectral
Recursive Inversion

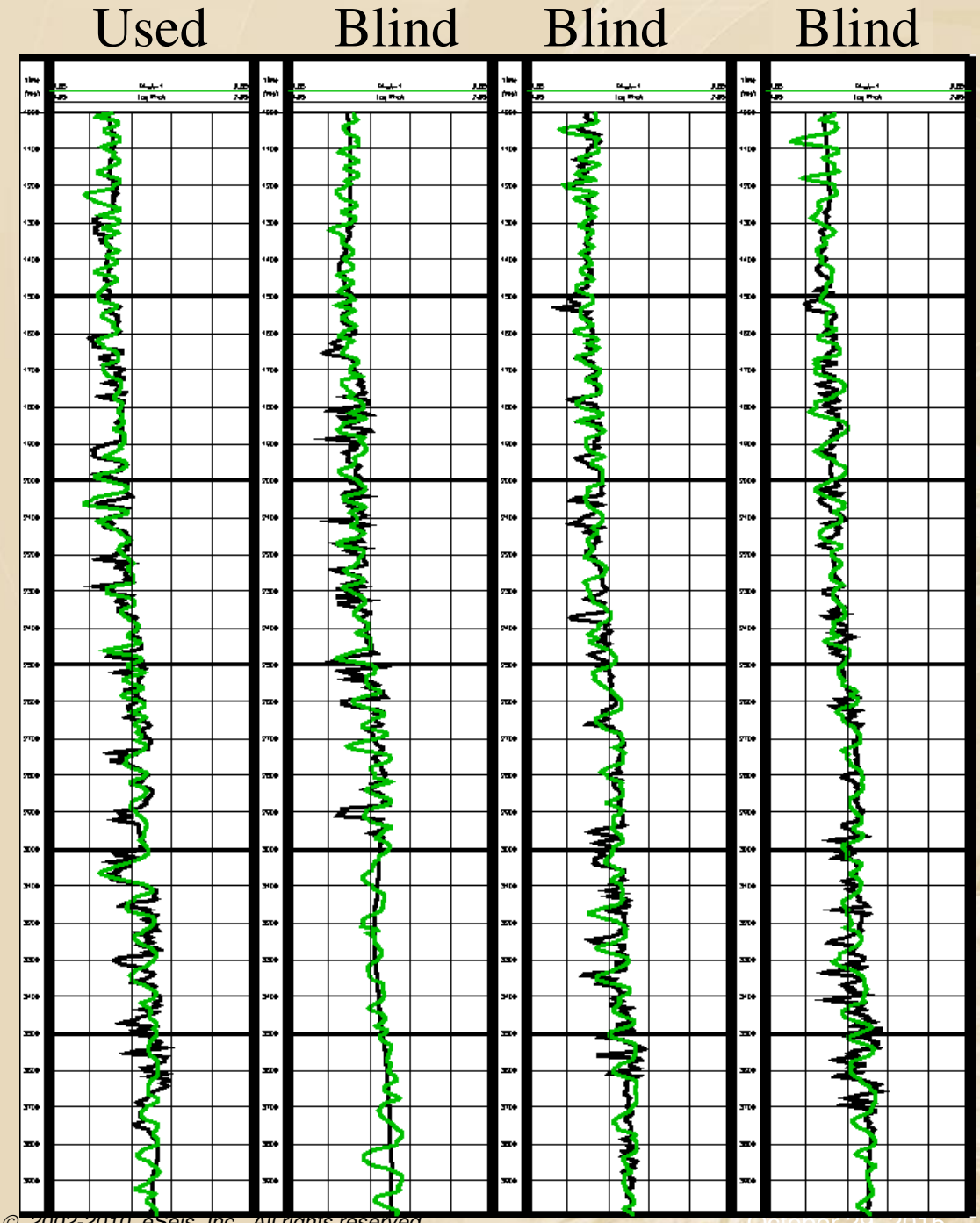




Rhob, FM Logs
0 – 1 Hz
1 Well

Spectral
Recursive Inversion

Black Logs FM
Green Inversion



Conclusions

All of our data set have errors

Bad models = Bad Inversions