PayZone Steering End of Well Report

3329 West Pinhook Road | Lafayette, Louisiana 70508 | 337.233.3982 | 800.377.3982

Schlumberger

northeast
NATURAL ENERGY

JOB DETAILS:

Client:	Northeast Natural Energy
Well Name:	MIP 3H ST01
Rig:	Patterson 254
County:	Monongalia
State:	WV
API#:	47-061-01707
Schlumberger Job #:	15NEB1139
Ground Elevation:	1,058'
RKB Elevation:	24' KB (1,082' RKB to MSL)
Surface LAT / LONG:	39° 36' 6.42" N / 79° 58' 34.04" W
Grid X / Y:	X: 1,834,344.90' / Y: 401,656.6'
Grid Datum:	NAD83
Zone:	WV North
Well Placement Specialists:	Aaron Olson / Anthony Hamrick

Postwell Follow-up with PZSOperations@SLB.com

Comments 09/22/2015

Target Entry Point: 7,964' MD / 7,483'TVD / 727'VS
Final BHL: 13,874'MD / 7,412'TVD / 6,620'VS

Total Lateral From Target Entrance: 5,910'MD / 5,893'VS
Total Lateral In-Zone: 5,439'MD / 5,423'VS
Total Lateral Out of Zone: 471'MD / 470'VS
In-Zone Percentage: 92.03%

Target Top at Entrance: 7,483'SSTVD
Target Top at Final BHL: estimated 7,406'SSTVD

Overall Dip: 0.75° up-dip

Target Description: A 6'TVD thick interval within the Marcellus centered on the high gamma interval above the Cherry Valley. Target top starting 8.6'TVD above the Cherry Valley Top and extending downwards to the Target Base located 2.6'TVD above the Cherry Valley Top.

PayZone Steering Well Placement Services provided:
Curve 18SEP15 (6,230' MD) – 19SEP15 (8,000' MD)
Lateral 19SEP15 (7,964' MD) – 22SEP15 (13,874' MD)

Customer Contact Info:

Emily Jordon – Geologist
Email: ejordon@nne-llc.com Office: (304) 414-7085 Cell: (304) 389-8564

NOTE: All interpretations are opinions based on inferences from electrical or other measurements and Schlumberger does not guarantee the accuracy or correctness of any interpretations. Schlumberger shall not, except in the case of gross or willful negligence on our part, be liable or responsible for loss, costs, damages or expenses incurred or sustained by anyone as a result of any interpretations made by one of Schlumberger officers, agents or employees. These interpretations are also subject to our General Terms and Conditions as set out in our current Price Book Schedule.

Operations Summary

Date	Time	MD/TVD	Inclination	Azimuth	Observation / Recommendation	Action Performed / Explanation
		From bottom of hole	From latest survey	From latest survey		
18SEP15	03:30	6,230' / 6,229'	00.52°	357.71°	PZS Services Started at KOP	PZS Services Started at KOP
19SEP15	03:45	7,340' / 7,237'	40.89°	291.21°	Logged and surveyed Geneso and Tully tops. Landing point target currently projected to be ~ 4.00' TVD above target top.	After discussion with NNE Geology, it was decided not to make any changes to the Landing target while continuing to monitor the correlation and reassess once the Hamilton top is logged.
	06:00	7,399' / 7,277'	48.36°	296.42°	Logged and surveyed Hamilton top. Landing point current projected to be ~2.5' TVD above target bottom.	After discussion with NNE Geology, it was decided not to make any changes to the Landing target while continuing to monitor the correlation.
	09:00	7,648' / 7,414'	60.67°	315.50°	Current correlation places landing point 1.0' TVD below target bottom with correlated bed dips at 1.6° up-dip (91.6°) over the past 500'. Recommend moving landing point up 5.0' TVD to 7,496' TVD and land at an inclination of 91.0° in order to match bed dips.	After consultation with NNE Geology, it was determined to raise landing point to 7,496' TVD.
	10:15	7,705' / 7,438'	65.42°	320.01°	Logged and surveyed Upper Marcellus top. Landing point target currently projected to be ~1.0' TVD above target bottom.	After discussion with NNE Geology, it was decided not to make any changes to the Landing target while continuing to monitor the correlation.
	10:30	7,735' / 7,448'	65.42°	320.01°	Current correlation places landing point 2.0' TVD below target bottom with correlated bed dips at 1.5° up-dip (91.5°) over the past 500'. Recommend moving landing point up 10.0' TVD to 7,486' TVD and land at an inclination of 91.0 in order to land near target top and move down in structure.	After discussion with NNE Geology, it was decided to raise landing point to 7,486' TVD.
	13:30	7,909' / 7,481'	84.42°	325.25°	Current correlation places landing point 2.5' TVD below target top with correlated bed dips at 1.8° up-dip (91.8°) over the past 400'. Recommend landing at a 91.5° in order to hold close to bed dips.	After discussion with NNE Geology, it was determined to land at an inclination of 91.5°.
	16:00	7,964' / 7,483'	89.16°	327.68°	Logged and surveyed Target Zone Top. Landing point currently projected to be 2.0' TVD below target top.	After discussion with NNE Geology, it was determined to land at an inclination of 91.8° to match apparent bed dip.
	16:00	8,000' / 7,483'	89.16°	327.68°	Landing Point Reached	Landing Point Reached
	17:15	8,003' / 7,483'	89.16°	327.68°	After landing 1.3' TVD below target top, image showed inclination of 91.8° moving up in structure. Move inclination setting to 91.3° to move down in structure towards gamma peak.	After discussion with NNE Geology, it was determined to decrease inclination to 91.3°.
	19:45	8,260' / 7,478'	91.01°	324.72°	Current correlation places BHL 1.5' TVD below target top. Apparent Up-dip 1.4° (91.4°) over last 100'.	After discussion with NNE Geology, it was determined to decrease desired inclination to 90.8° in order to place wellbore near gamma peak located in the middle of the target interval.
	20:40	8,384' / 7,476'	90.66°	323.35°	Current correlation places BHL 3.0' TVD below target top. Apparent Up-dip 1.5° (91.5°) over last 150'.	After discussion with NNE Geology, it was determined to increase desired inclination to 91.3° in order to maintain position near gamma peak located in the middle of the target interval.
	23:30	8,763' / 7,469'	90.92°	323.60°	Current correlation places BHL 4.0' TVD below target top. Apparent Up-dip 1.2° (91.2°) over last 120'.	After discussion with NNE Geology, it was determined to increase desired inclination to 91.8° in order to maintain position near gamma peak located in the middle of the target interval.

Operations Summary

Date	Time	MD/TVD	Inclination	Azimuth	Observation / Recommendation	Action Performed / Explanation
		From bottom of hole	From latest survey	From latest survey		
20SEP15	00:00	8,857' / 7,467'	91.01°	324..20°	Current correlation places BHL 1.0' TVD below target bottom. Apparent Up-dip 2.5° (92.5°) over last 100'.	After discussion with NNE Geology, it was determined to increase desired inclination to 92.3° in order to maintain position near gamma peak located in the middle of the target interval.
	01:00	8,951' / 7,464'	92.15°	324.34°	Current correlation places BHL 1.0' TVD below target top. Apparent Up-dip 0.3° (90.3°) over last 150'.	After discussion with NNE Geology, it was determined to decrease desired inclination to 91.3° in order to maintain position near gamma peak located in the middle of the target interval.
	01:42	9,046' / 7,461'	91.28°	324.06°	Current correlation places BHL 1.0' TVD below target top. Apparent Up-dip 1.0° (91.0°) over last 500'.	After discussion with NNE Geology, it was determined to decrease desired inclination to 90.8° in order to maintain position near gamma peak located in the middle of the target interval.
	03:15	9,234' / 7,459'	90.92°	324.34°	Current correlation places BHL 4.0' TVD below target top. Apparent Up-dip 1.5° (91.5°) over last 200'.	After discussion with NNE Geology, it was determined to increase desired inclination to 91.8° in order to maintain position near gamma peak located in the middle of the target interval.
	05:30	9,518' / 7,451'	91.63°	324.29°	Current correlation places BHL 0.7' TVD below target top. Apparent Up-dip 0.9° (90.9°) over last 200'.	After discussion with NNE Geology, it was determined to decrease desired inclination to 91.3° in order to maintain position near gamma peak located in the middle of the target interval.
	09:00	9,991' / 7,444'	90.13°	322.97°	Current correlation places BHL at target top. Apparent up-dip 0.8° (90.8°) over last 500'. Due to potential flattening bed dips and being at target top recommend dropping inclination to move down in structure.	After discussion with NNE Geology, it was determined to decrease desired inclination to 89.8° and watch gamma trends closely.
	10:00	10,179' / 7,445'	89.52°	325.14°	Current correlation places BHL 2.0' TVD below target top. Bed dips over past 500' have been 0.5° up-dip (90.5°). Recommend moving up desired inclination to 90.3° to slowly drop in structure.	After discussion with NNE Geology, it was determined to decrease desired inclination to 90.3°.
	10:50	10,274' / 7,512'	90.13°	324.89°	Current correlation places BHL 2.5' TVD below target top near log gamma / hard stringers. Recommend dropping inclination to 89.8° in order to drop below hard stringers.	After discussion with NNE Geology, it was determined to decrease desired inclination to 89.8° to move down in structure.
	11:30	10,369' / 7,513'	89.08°	324.25°	Current correlation places BHL 3.0' TVD below target top moving down in structure towards high gamma peak. Bed dips over the past 500' have been 0.3° up-dip (90.3°). Recommend building back up to a 90.3° to hold bed dips near center of zone.	After discussion with NNE Geology, it was determined to increase desired inclination to 90.3° to hold bed dips.
	16:20	11,126' / 7,444'	90.31°	321.45°	Current correlation places BHL 1.0' TVD below target top moving up in structure. Recommend moving inclination down to 89.3° to get below local bed dips of 89.7°.	After discussion with NNE Geology, it was determined to decrease desired inclination to 89.3° to move down in structure.
	18:45	11,410' / 7,448'	88.99°	322.59°	Current correlation places BHL 2.5' TVD below target top. Apparent Down-dip 0.6° (89.4°) over last 150'.	After discussion with NNE Geology, it was determined to increase desired inclination to 89.8° in order to maintain position near gamma peak located in the middle of the target interval.

Operations Summary

Date	Time	MD/TVD	Inclination	Azimuth	Observation / Recommendation	Action Performed / Explanation
		From bottom of hole	From latest survey	From latest survey		
	19:20	11,504' / 7,449'	89.43°	324.04°	Current correlation places BHL 0.2' TVD above target bottom. Apparent Up-dip 2.2° (92.2°) over last 50'.	After discussion with NNE Geology, it was determined to increase desired inclination to 90.8° in order to maintain position near gamma peak located in the middle of the target interval.
	20:10	11,576' / 7,448'	90.84°	323.22°	Possible Fault at 11,576' MD	After discussion with NNE Geology, it was determined to maintain desired inclination of 90.8°, latest correlation places BHL 1.0' TVD below target top.
	22:15	11,883' / 7,444'	90.48°	323.37°	Current correlation places BHL 2.5' TVD above target bottom. Apparent Up-dip 1.1° (91.1°) over last 150'.	After discussion with NNE Geology, it was determined to increase desired inclination to 91.3° in order to maintain position near gamma peak located in the middle of the target interval.
21SEP15	04:40	12,830' / 7,424'	91.19°	325.19°	Current correlation places BHL 2.0' TVD above target bottom. Apparent Up-dip 1.3° (91.3°) over last 200'.	After discussion with NNE Geology, it was determined to increase desired inclination to 91.8° in order to maintain position near gamma peak located in the middle of the target interval.
	07:00	13,112' / 7,417'	91.98°	324.14°	Current correlation places BHL 2.0' TVD below target top. Wellbore moved through target interval relatively quickly which could indicate leveling bed dips. Recommend reducing inclination to 90.8°.	After discussion with NNE Geology, it was determined to decrease inclination to 90.8°.
	08:45	13,300' / 7,414'	90.75°	324.73°	Current correlation places BHL 0.5' TVD below target top. Possible leveling of bed dips, recommend decrease inclination setting to 90.3° to move down in structure.	After discussion with NNE Geology, it was determined to decrease inclination to 90.3°.
	09:15	13,350' / 7,414'	90.75°	324.73°	Current correlation places BHL 0.0' TVD below target top. Possible leveling of bed dips, recommend decrease inclination setting to 89.8° and watch gamma correlation	After discussion with NNE Geology, it was determined to decrease inclination to 89.8°.
	10:00	13,466' / 7,416'	89.78°	324.91°	There are two correlations. One places BHL 0.3' TVD above target top, the other places BHL 1.5' TVD below target top. Believe it is the former correlation and recommend decreasing inclination to 89.3°.	After discussion with NNE Geology, it was determined to decrease inclination to 89.3° in order to see hot gamma peak and confirm correlation.
	10:30	13,491' / 7,415'	89.69°	325.04°	Current correlation places BHL 2.0' TVD below target top. It appears as though there was a localized depression in the target interval. Recommend moving inclination up to 90.3° in order to match global bed dips of 90.3° over the past 500'.	After discussion with NNE Geology, it was determined to increase inclination to 90.3°.
	11:15	13,586' / 7,415'	89.96°	325.61°	Current correlation places BHL 2.5' TVD above target bottom. Recommend increasing desired inclination to 91.3° in order to move up structure.	After discussion with NNE Geology, it was determined to increase inclination to 91.3°.
	12:45	13,680' / 7,414'	90.92°	323.98°	Current correlation places BHL 2.5' TVD below target top. Recommend decreasing desired inclination to 90.3° in order to move up structure.	After discussion with NNE Geology, it was determined to decrease inclination to 90.3°.
	13:20	13,775' / 7,414'	90.04°	323.07°	Current correlation places BHL 3.0' TVD below target top dropping in structure. Recommend increase desired inclination to 90.8° in order to stay in zone.	After discussion with NNE Geology, it was determined to increase inclination to 90.8°.
	14:30	13,874' / 7,412'	90.75°	323.29°	Well Total Depth	Well Total Depth

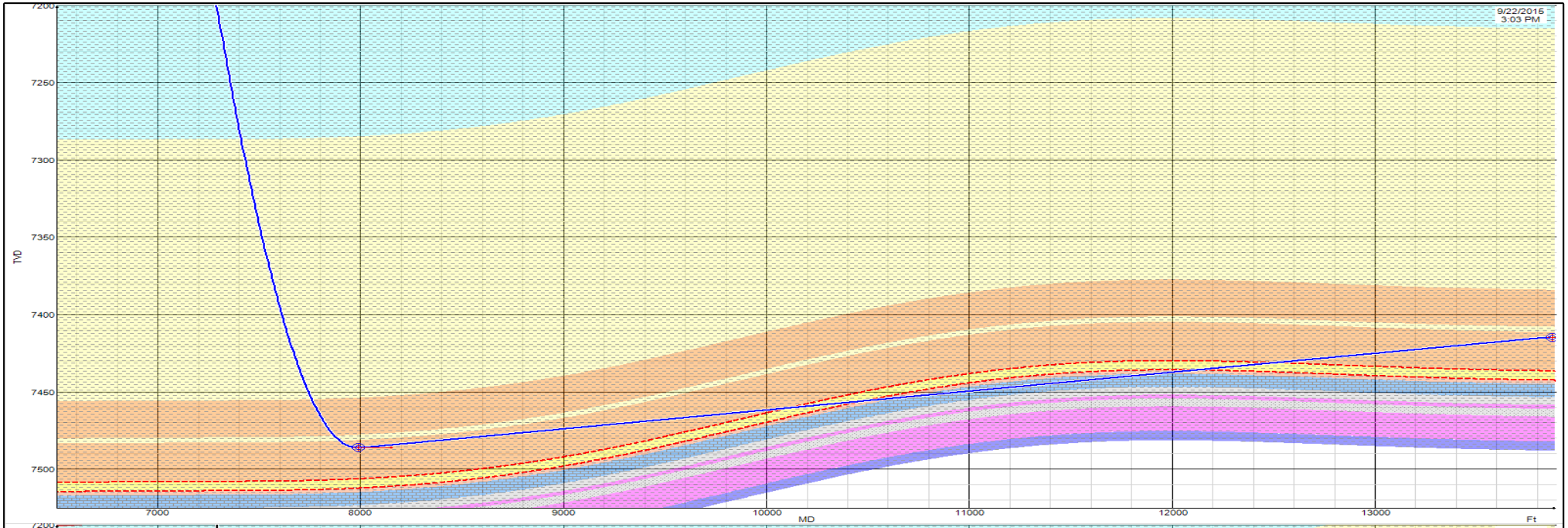
Formation Tops

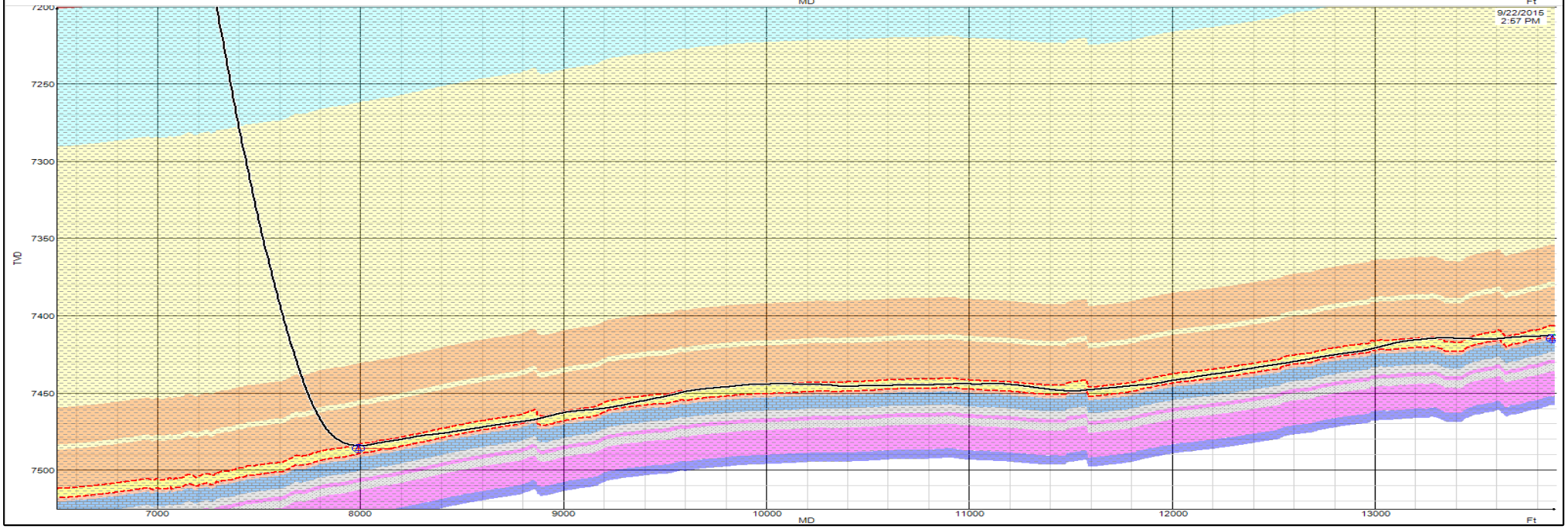
Formation	MD	TVD	VS
Geneso	7,255’	7,173’	134’
Tully	7,280’	7,191’	147’
Hamilton	7,399’	7,277’	222’
Upper Marcellus	7,705’	7,438’	475’
Target Interval Top	7,964’	7,483’	727’
Exit Target Interval Top	9,859’	7,445’	2,617’
Re-Target Interval Top	10,075’	7,444’	2,832’
Exit Target Interval Top	13,310’	7,414’	6,058’
Re-Enter Target Interval Top	13,446’	7,415’	6,194’

Dip Picks

MD	Apparent Dip	Well Inclination	Well Azimuth	Hole Size	Image DI	Source	Category
7775.82	1.65	74.91	317.07	8.75	1.50	IGR_A	Bedding
7780.93	-1.08	75.29	317.24	8.75	1.50	IGR_A	Bedding
7849.23	4.09	80.37	319.50	8.75	1.50	IGR_A	Bedding
7870.50	0.88	81.96	320.19	8.75	1.50	IGR_A	Bedding
7895.98	-0.49	83.86	321.01	8.75	1.50	IGR_A	Bedding
7918.54	1.08	85.55	321.73	8.75	1.50	IGR_A	Bedding
7949.97	-0.52	87.90	322.73	8.75	1.50	IGR_A	Bedding
8333.93	-1.39	90.70	324.00	8.75	1.50	IGR_A	Bedding
8812.49	-2.22	90.70	324.00	8.75	1.50	IGR_A	Bedding
8865.03	36.91	90.70	324.00	8.75	1.50	IGR_A	Unclassified
8884.13	4.22	90.70	324.00	8.75	1.50	IGR_A	Bedding
9156.04	-2.38	90.70	324.00	8.75	1.50	IGR_A	Bedding
9437.97	0.00	90.70	324.00	8.75	1.50	IGR_A	Bedding
9584.34	-0.11	90.70	324.00	8.75	1.50	IGR_A	Bedding
10134.75	-1.41	90.70	324.00	8.75	1.50	IGR_A	Bedding
10357.00	-1.28	90.70	324.00	8.75	1.50	IGR_A	Bedding
10990.45	-0.26	90.70	324.00	8.75	1.50	IGR_A	Bedding
11479.70	-10.05	90.70	324.00	8.75	1.50	IGR_A	Bedding
11502.12	-2.03	90.70	324.00	8.75	1.50	IGR_A	Bedding
11576.79	64.72	90.70	324.00	8.75	1.50	IGR_A	Fault
11789.76	-1.45	90.70	324.00	8.75	1.50	IGR_A	Bedding
12182.09	-0.46	90.70	324.00	8.75	1.50	IGR_A	Bedding
12501.34	-1.99	90.70	324.00	8.75	1.50	IGR_A	Bedding
12531.02	-3.84	90.70	324.00	8.75	1.50	IGR_A	Bedding
12645.78	0.14	90.70	324.00	8.75	1.50	IGR_A	Bedding
12702.05	-2.61	90.70	324.00	8.75	1.50	IGR_A	Bedding
13037.57	1.28	90.70	324.00	8.75	1.50	IGR_A	Bedding
13066.76	2.33	90.70	324.00	8.75	1.50	IGR_A	Bedding
13493.67	-3.67	90.70	324.00	8.75	1.50	IGR_A	Bedding
13816.52	-3.47	90.57	324.00	8.75	1.50	IGR_A	Bedding

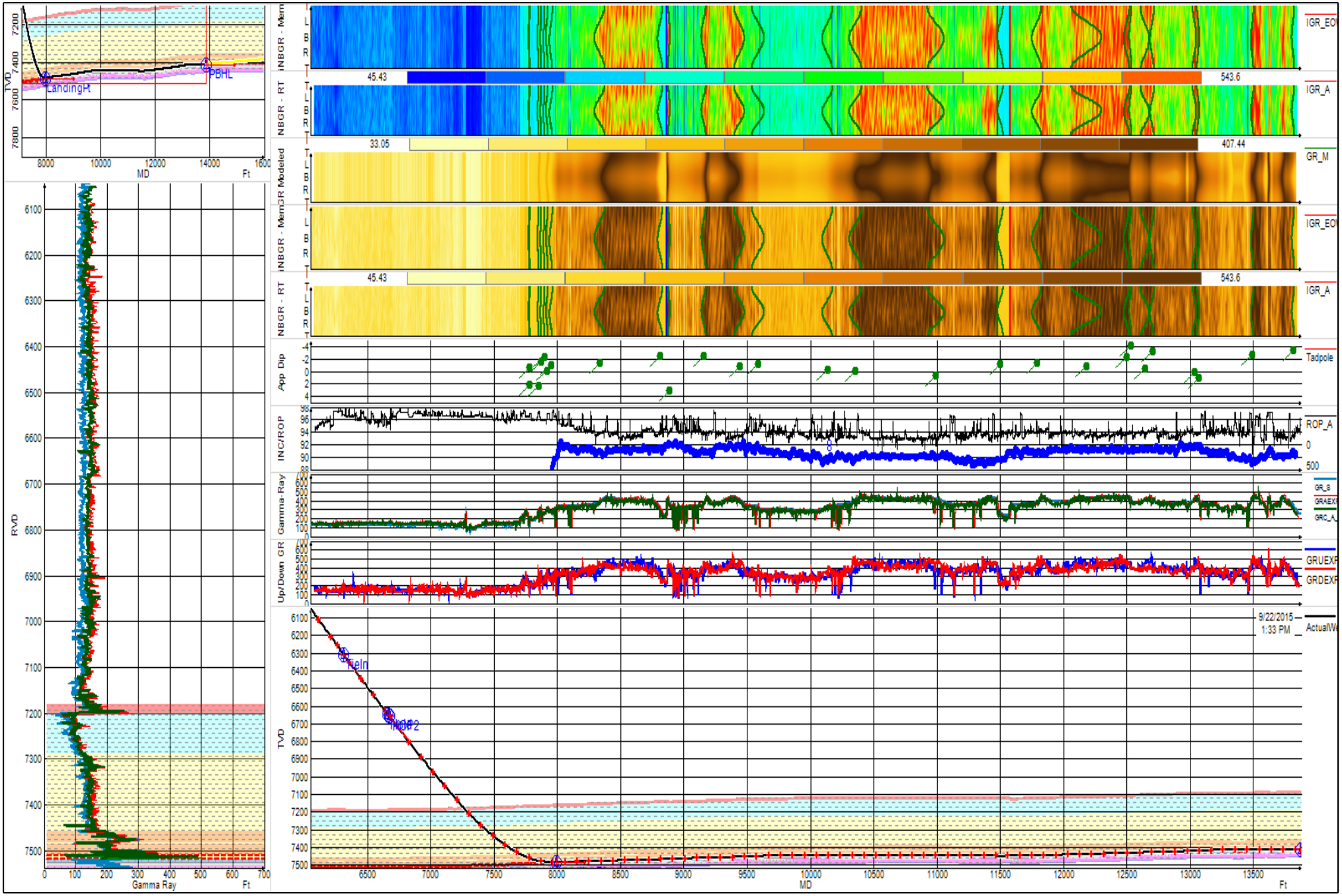
MIP 3H ST01 Model – Pre-Well versus Post-Well Comparison





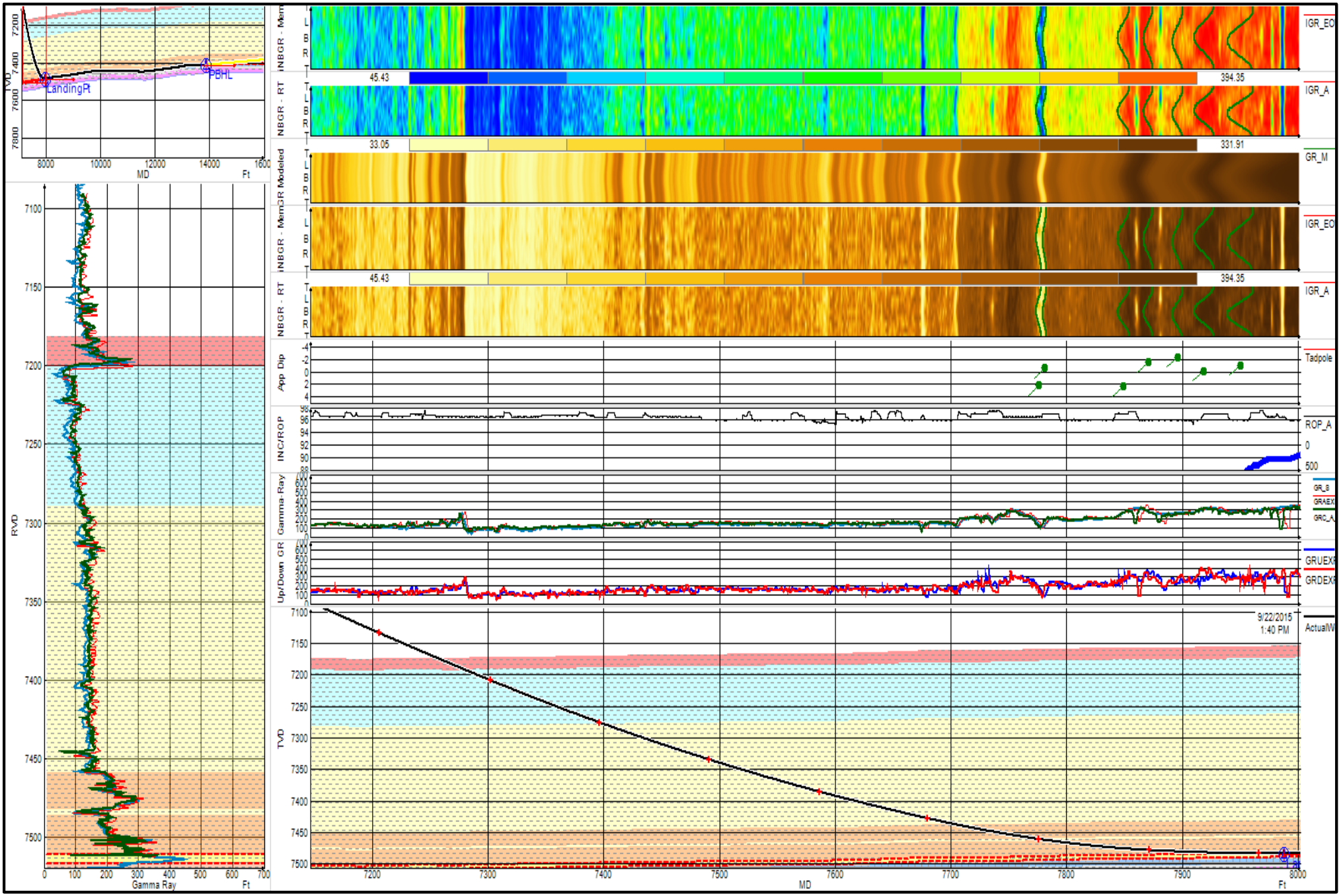
MIP 3H ST01 Model - Overview

Based on MIP 3H Pilot Offset Well Data



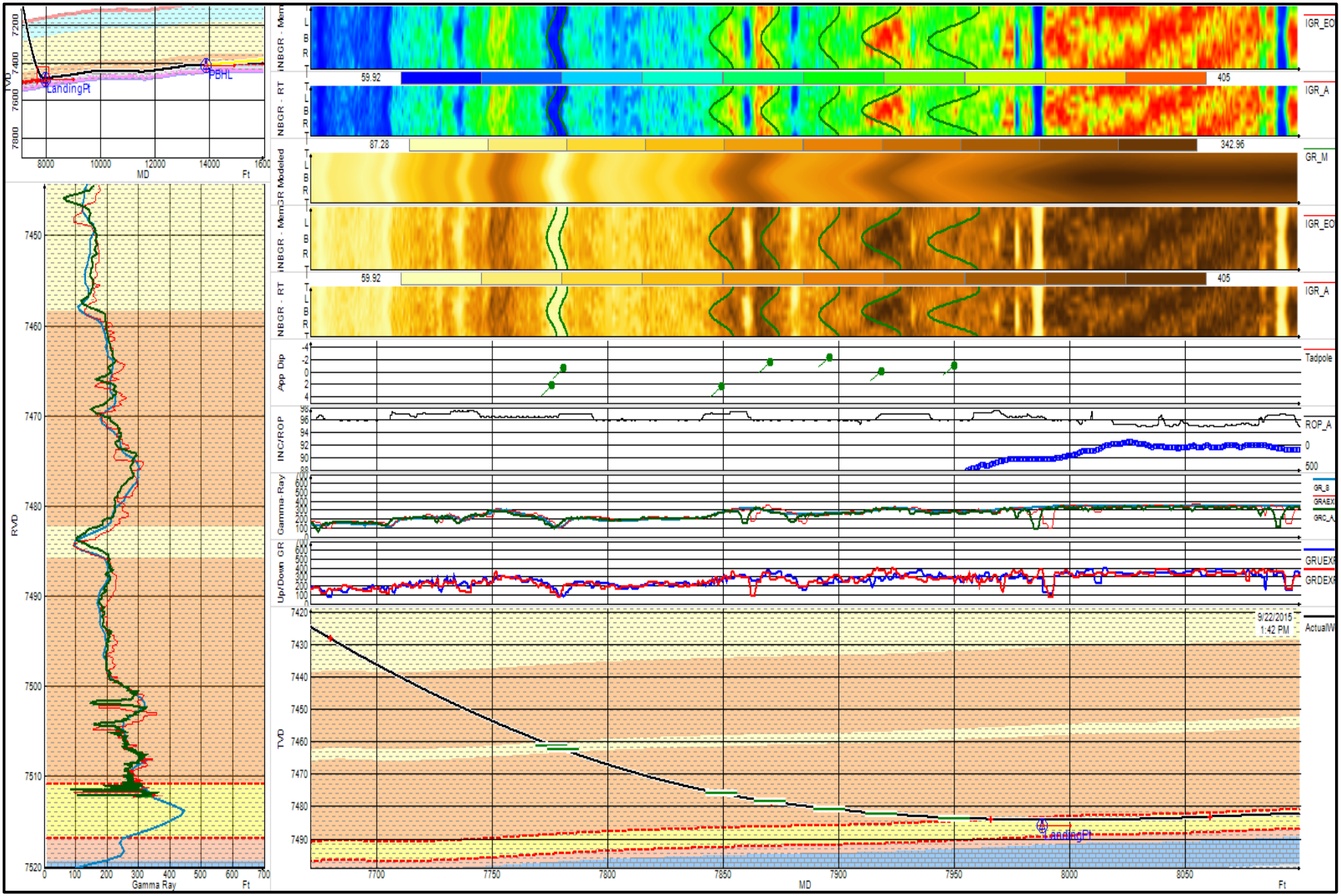
MIP 3H ST01 Model - Building the Curve

Based on MIP 3H Pilot Offset Well Data



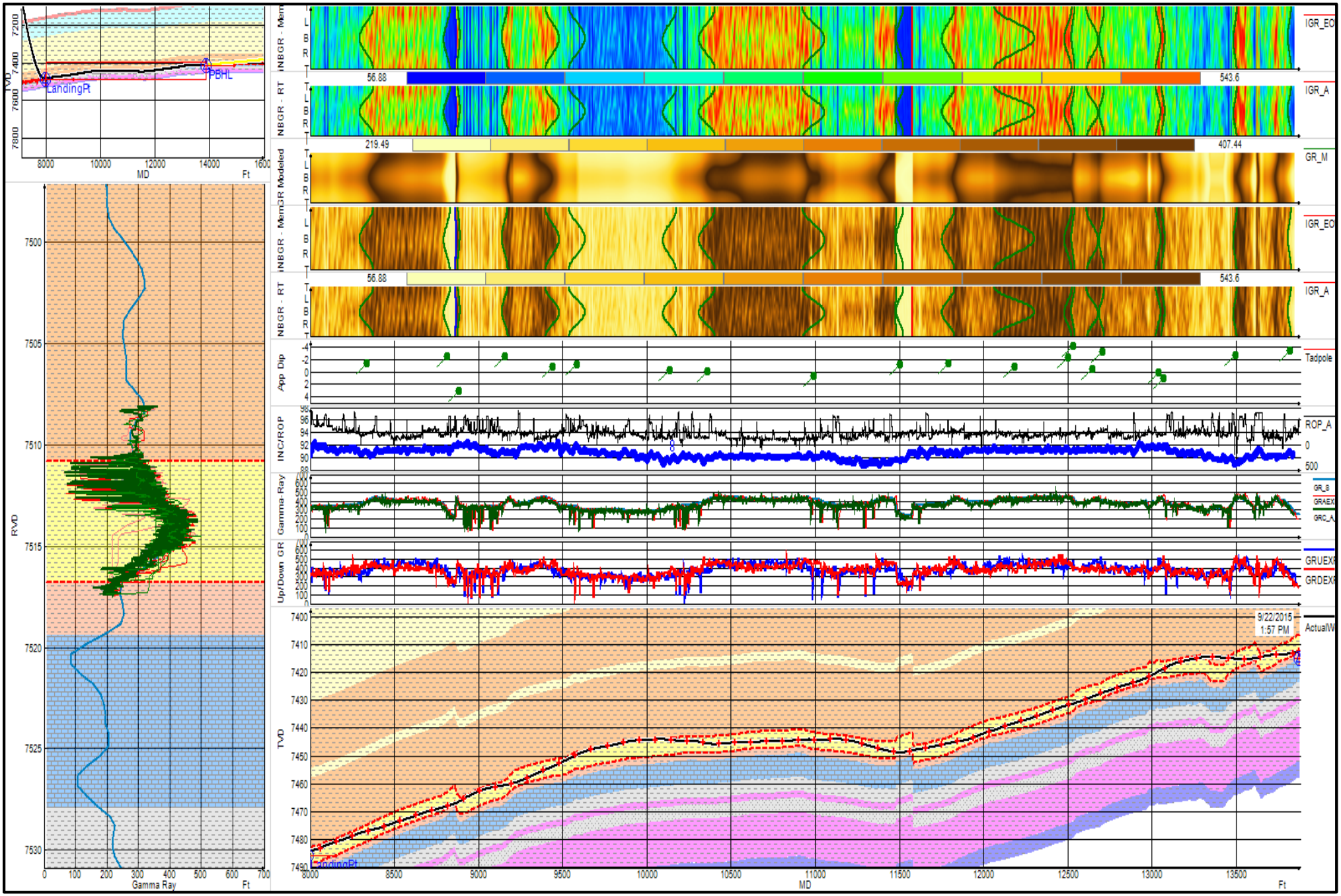
MIP 3H ST01 Model - Landing

Based on MIP 3H Pilot Offset Well Data



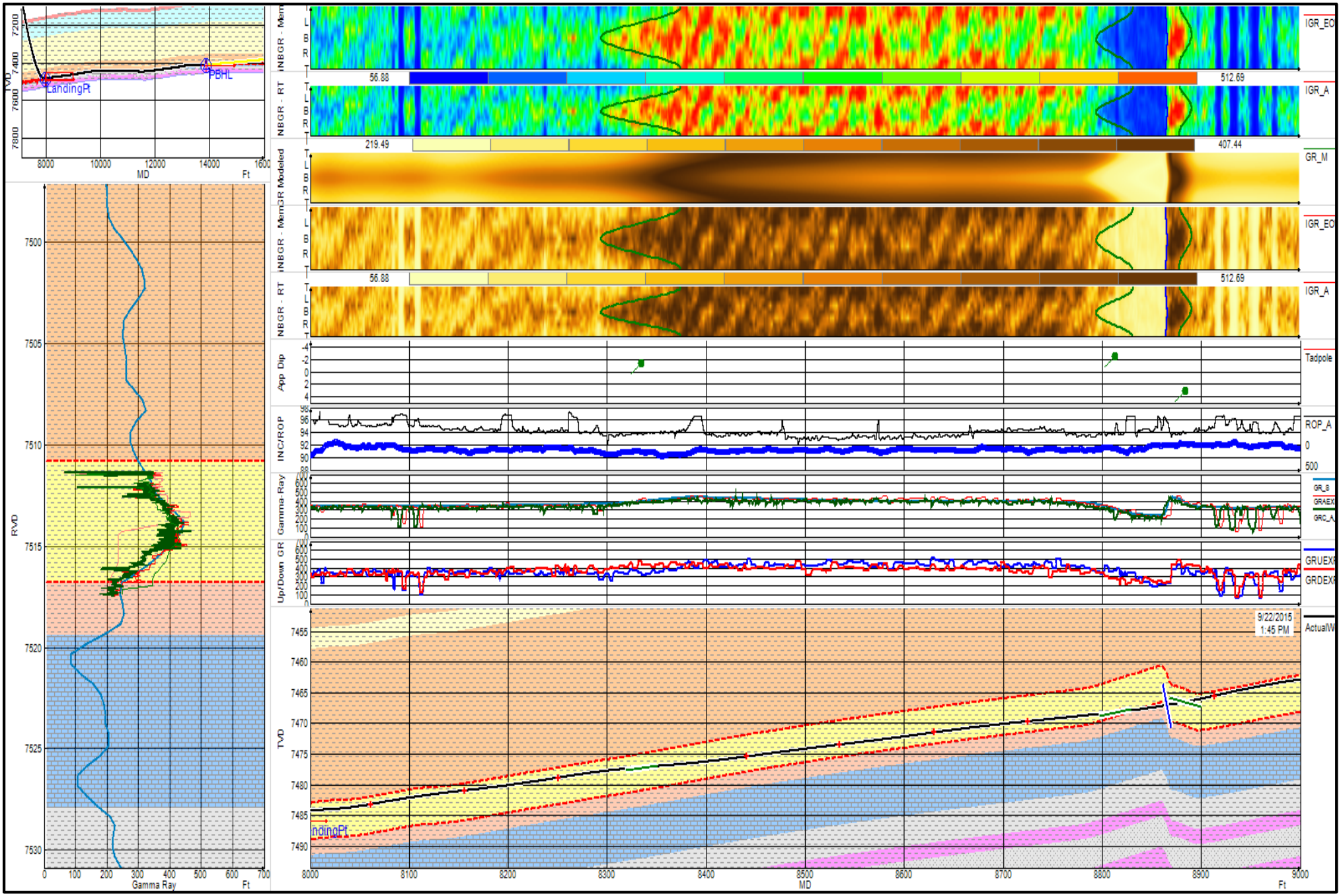
MIP 3H ST01 Model – Lateral Overview

Based on MIP 3H Pilot Offset Well Data



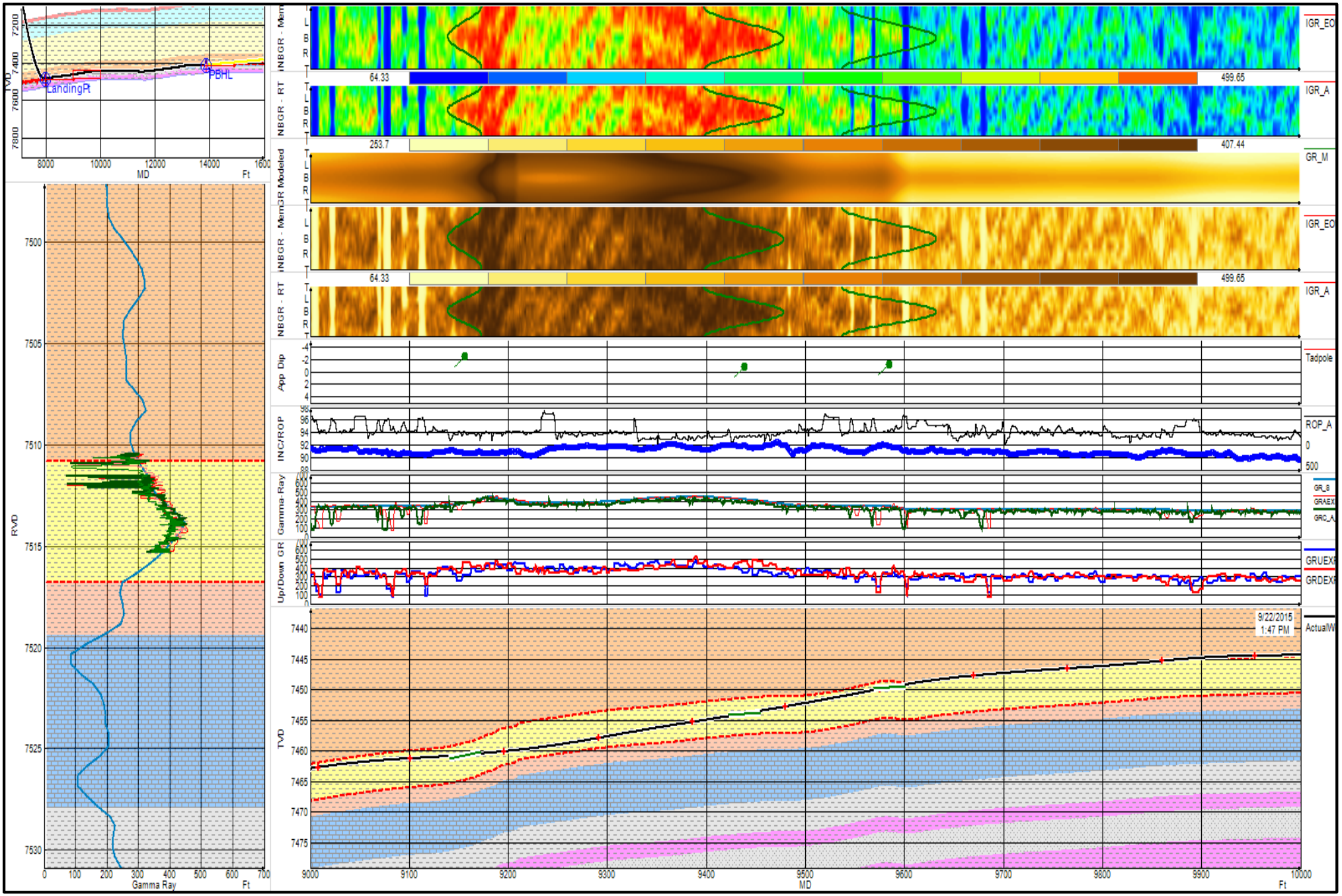
MIP 3H ST01 Model 8,000' to 9,000' MD

Based on MIP 3H Pilot Offset Well Data



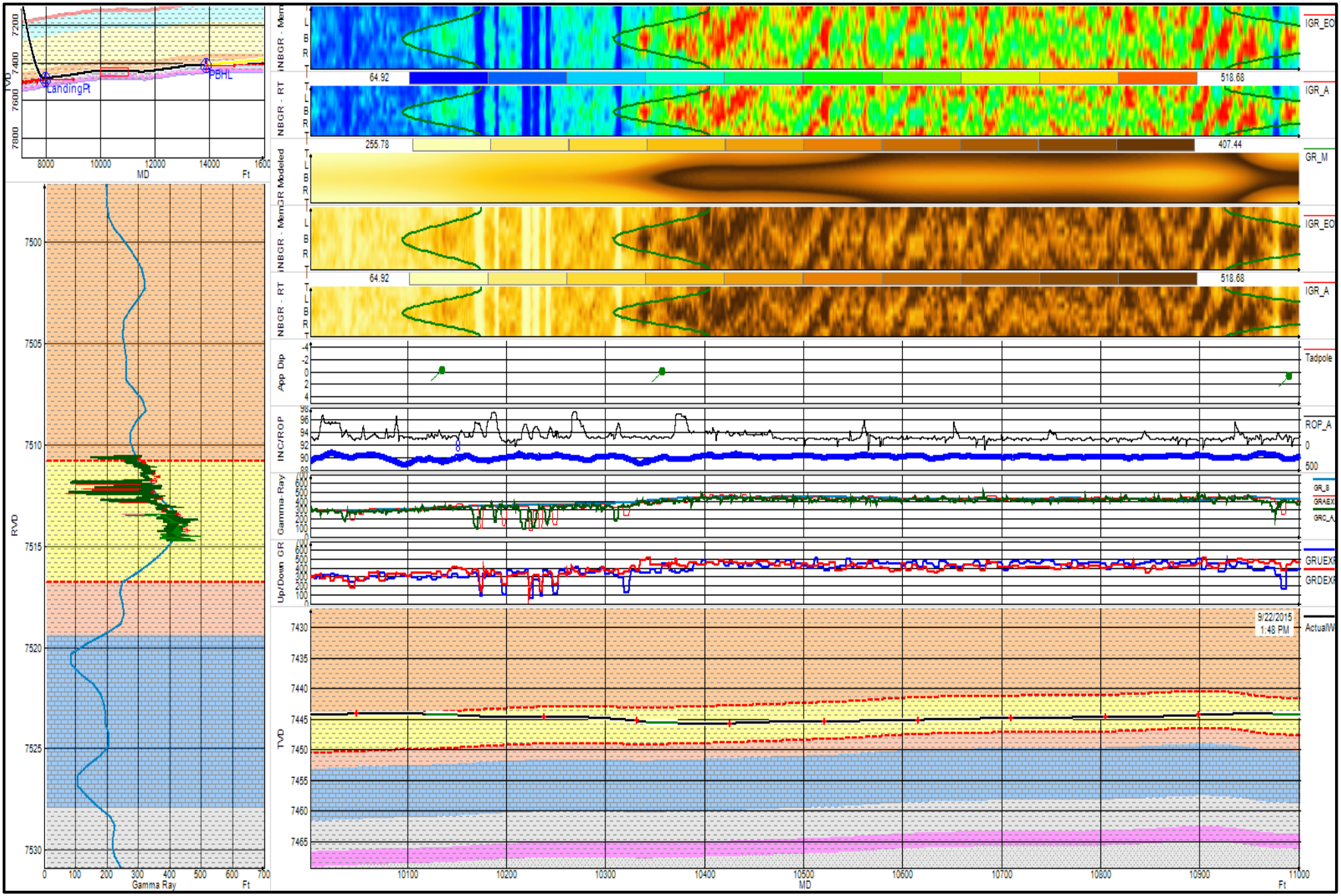
MIP 3H ST01 Model 9,000' to 10,000' MD

Based on MIP 3H Pilot Offset Well Data



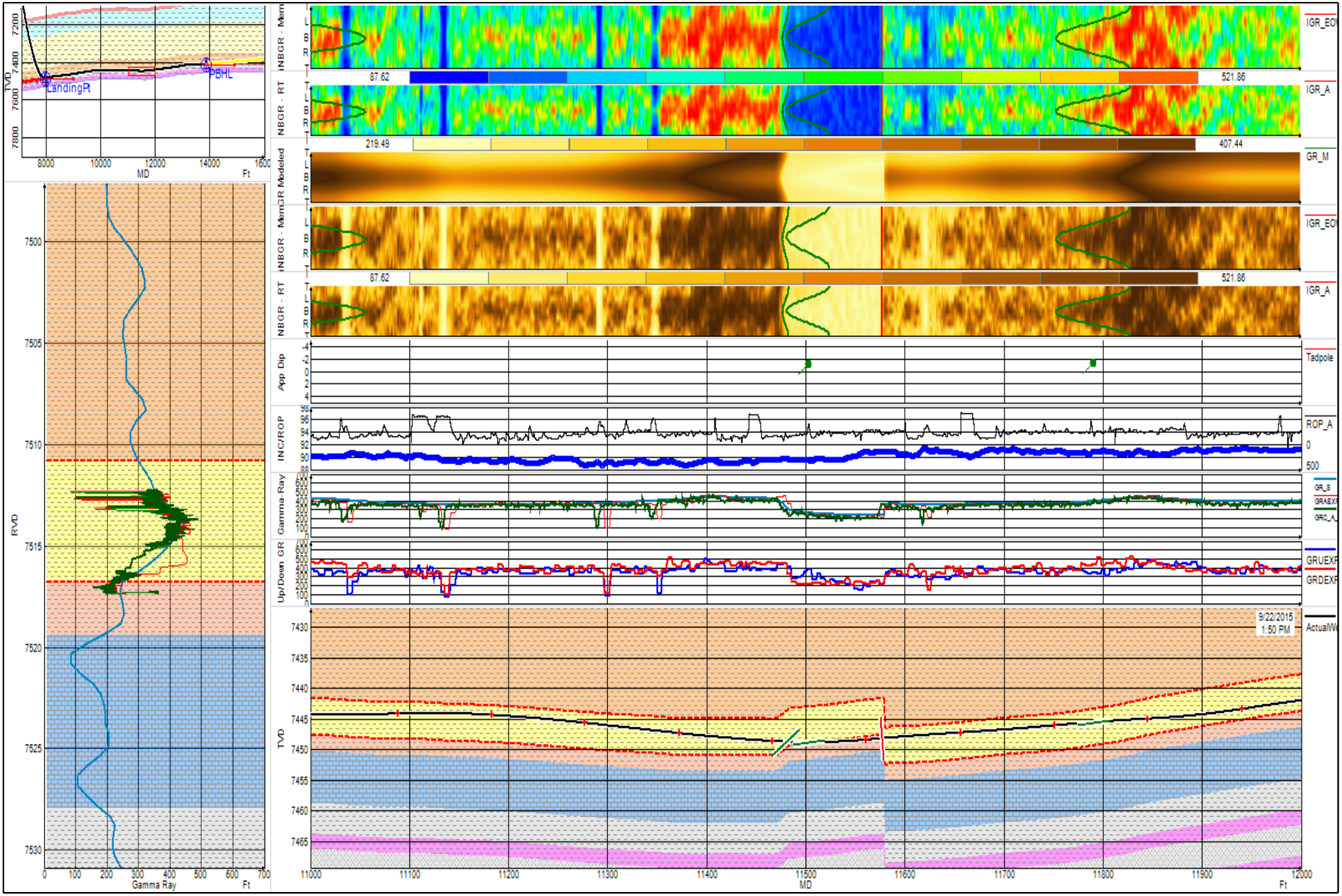
MIP 3H ST01 Model 10,000' to 11,000' MD

Based on MIP 3H Pilot Offset Well Data



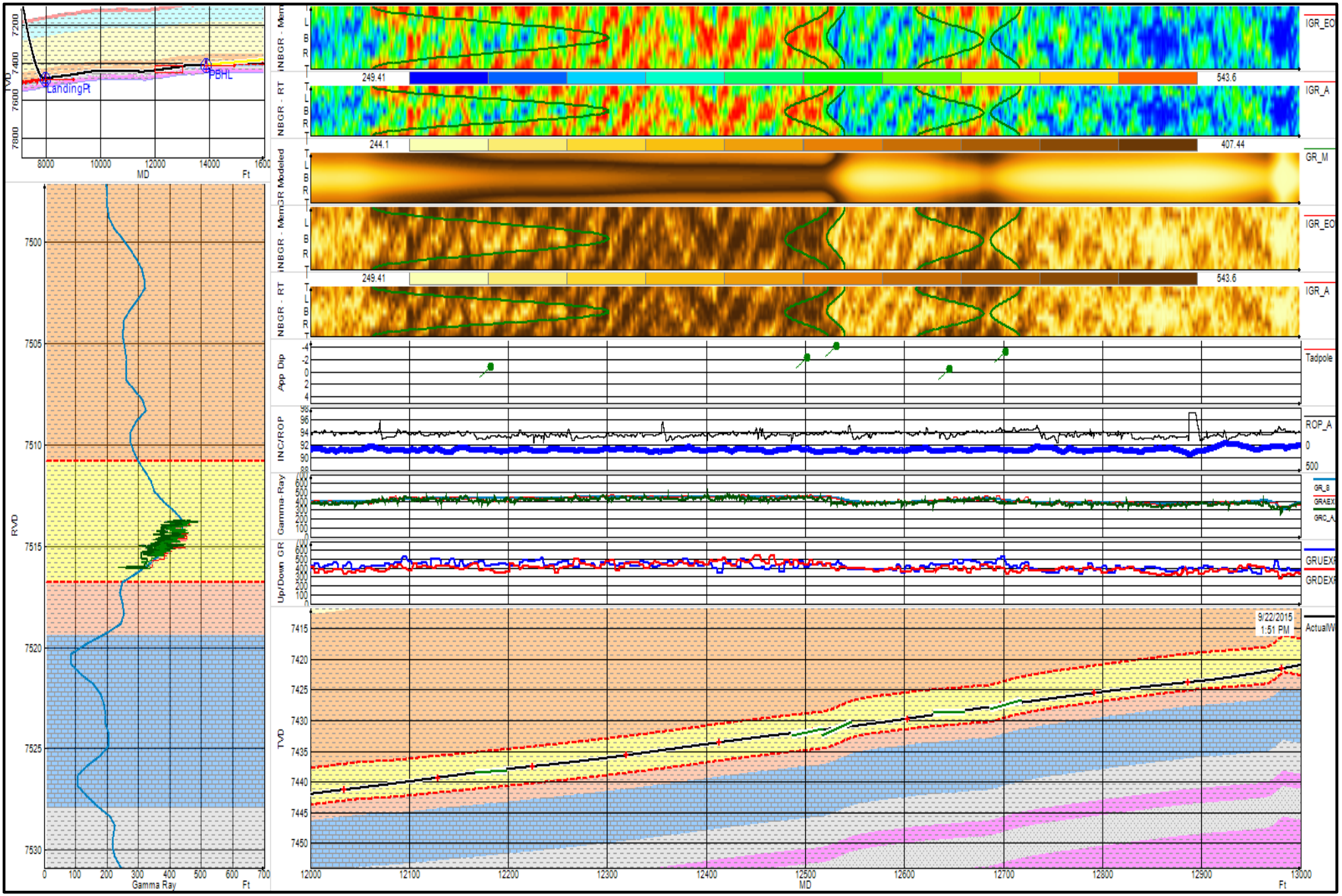
MIP 3H ST01 Model 11,000' to 12,000' MD

Based on MIP 3H Pilot Offset Well Data



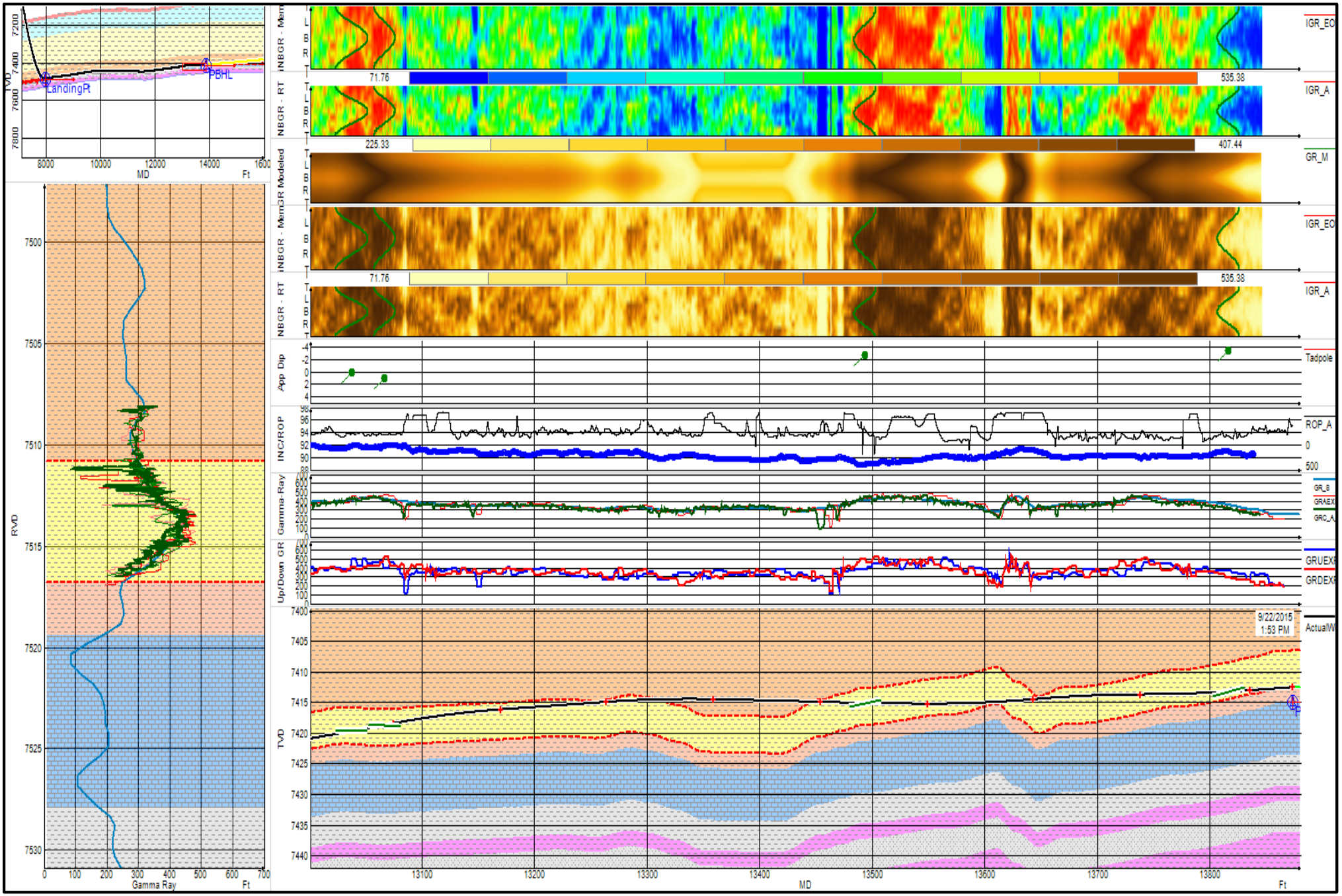
MIP 3H ST01 Model 12,000' to 13,000' MD

Based on MIP 3H Pilot Offset Well Data

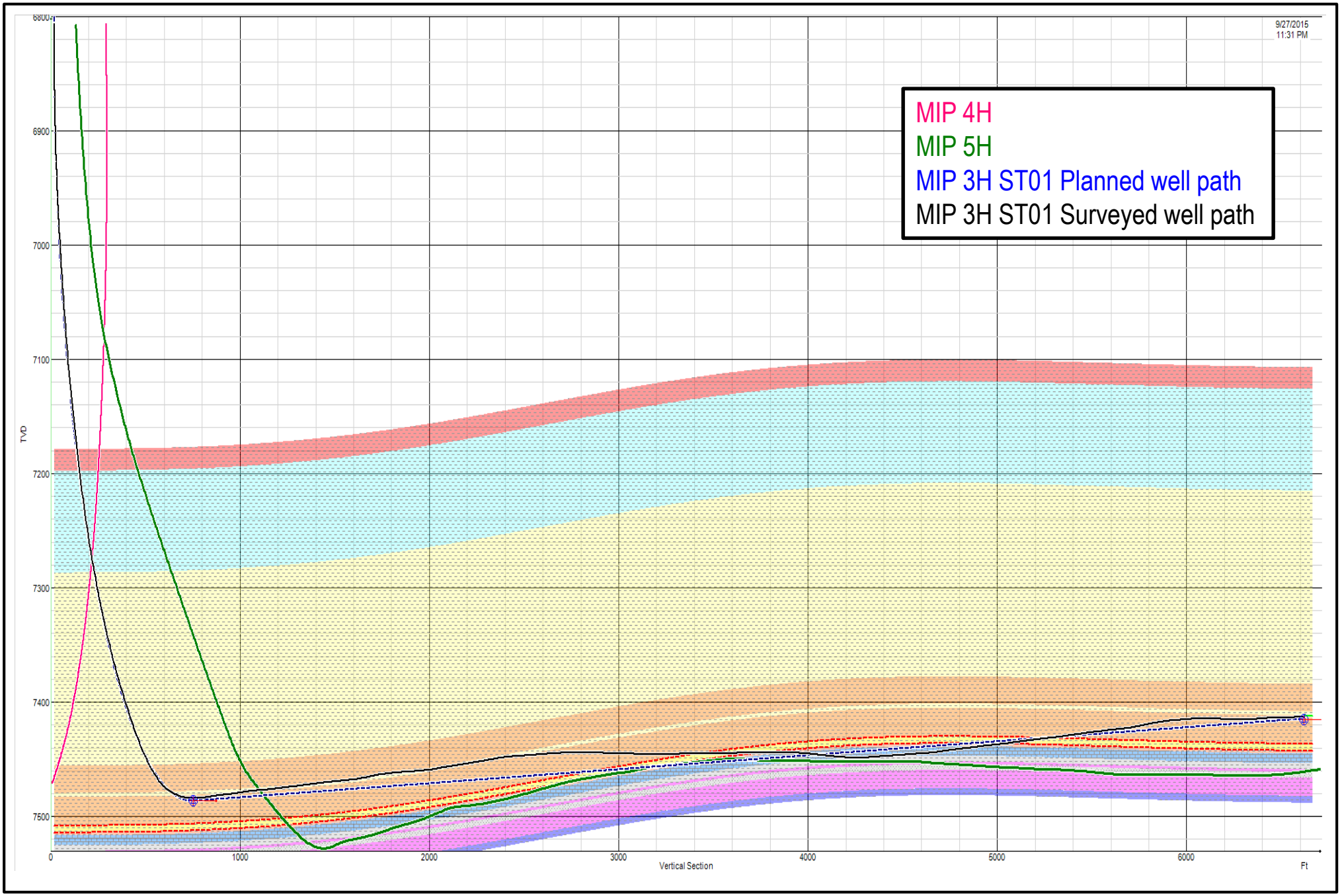
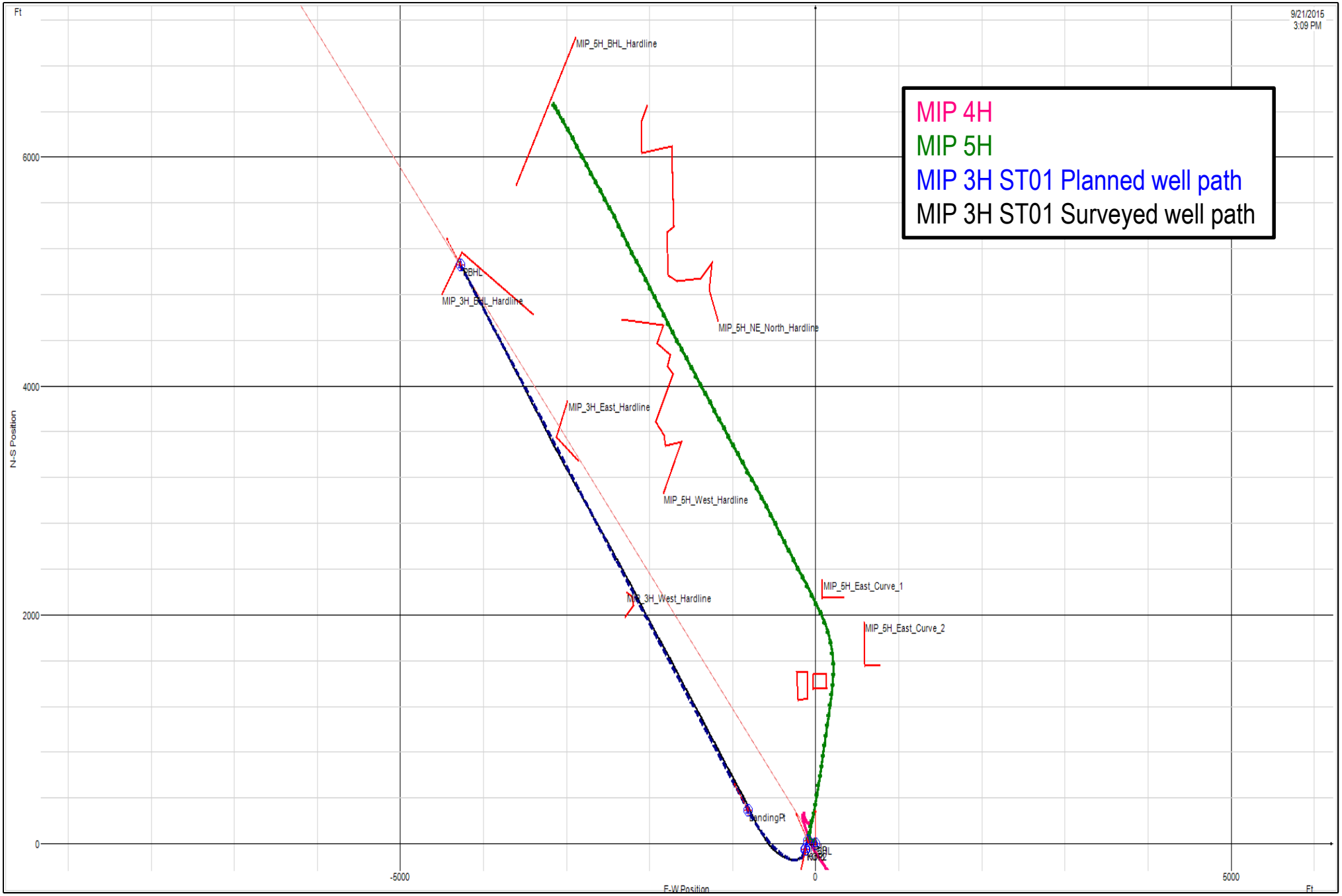


MIP 3H ST01 Model 13,000' to 13,874' MD

Based on MIP 3H Pilot Offset Well Data



MIP 3H ST01 Model - Vertical Section View



MIP 3H ST01 Model - Map View