



A BUSINESS UNIT OF TURBO DRILL INDUSTRIES, INC.

The University of Utah

16B(78)-32

Presented by:
Canamera Coring Team



Goals and Objectives



All Coring operations were conducted in accordance with the safety programs as prescribed by University of Utah, Canamera, and the Drilling Contractor.

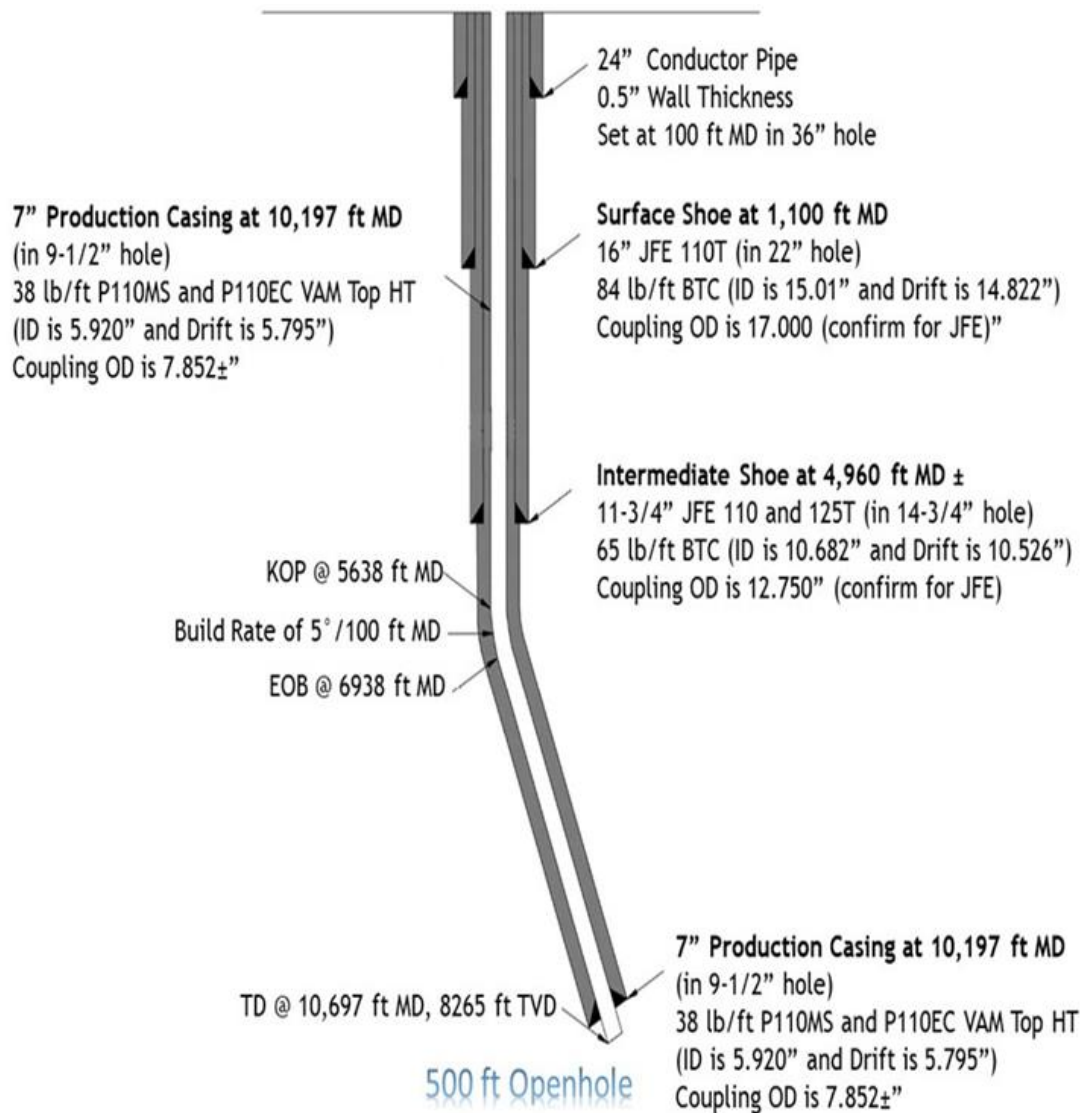
The main objective was achieved by utilizing Canamera's 700 (7.00" OD) Conventional JMS system to core and recover ~240' of Granite formation as planned with the University.

Well Program

- WELL NAME: 16B(78)-32
- LOCATION: Beaver County, UT
- RIG: Frontier 16
- FORMATION: Granite
- DEPTH: Start 4,855'
End 10,493'
- AMOUNT OF CORE: ~210' FT
- CORE SIZE: 4"
- INCLINATION: 0 & 60 Degrees
- MUD SYSTEM: WBM
- BARREL LENGTH: 60' JMS BHA to cut 30' of core



Casing Discussion



Zone 1 Core Run #1

- CCI 700 60' JMS BHA – 913 Bit
 - Sensored
- Cored from 4,855' – 4,871'
- ROP 8 ft./hr.
- Core jammed
 - @ 4,870 call was made to increase RPM from 35 to 45
 - Pump pressure went up 250 psi
 - Lost torque and ROP
- 16' cored 14.6' Recovered
- Core jam found in the shoe
 - Pictured to the right
- 2 JMS Deployments
 - Primary
 - ~4,860'
 - Secondary
 - ~4,864'



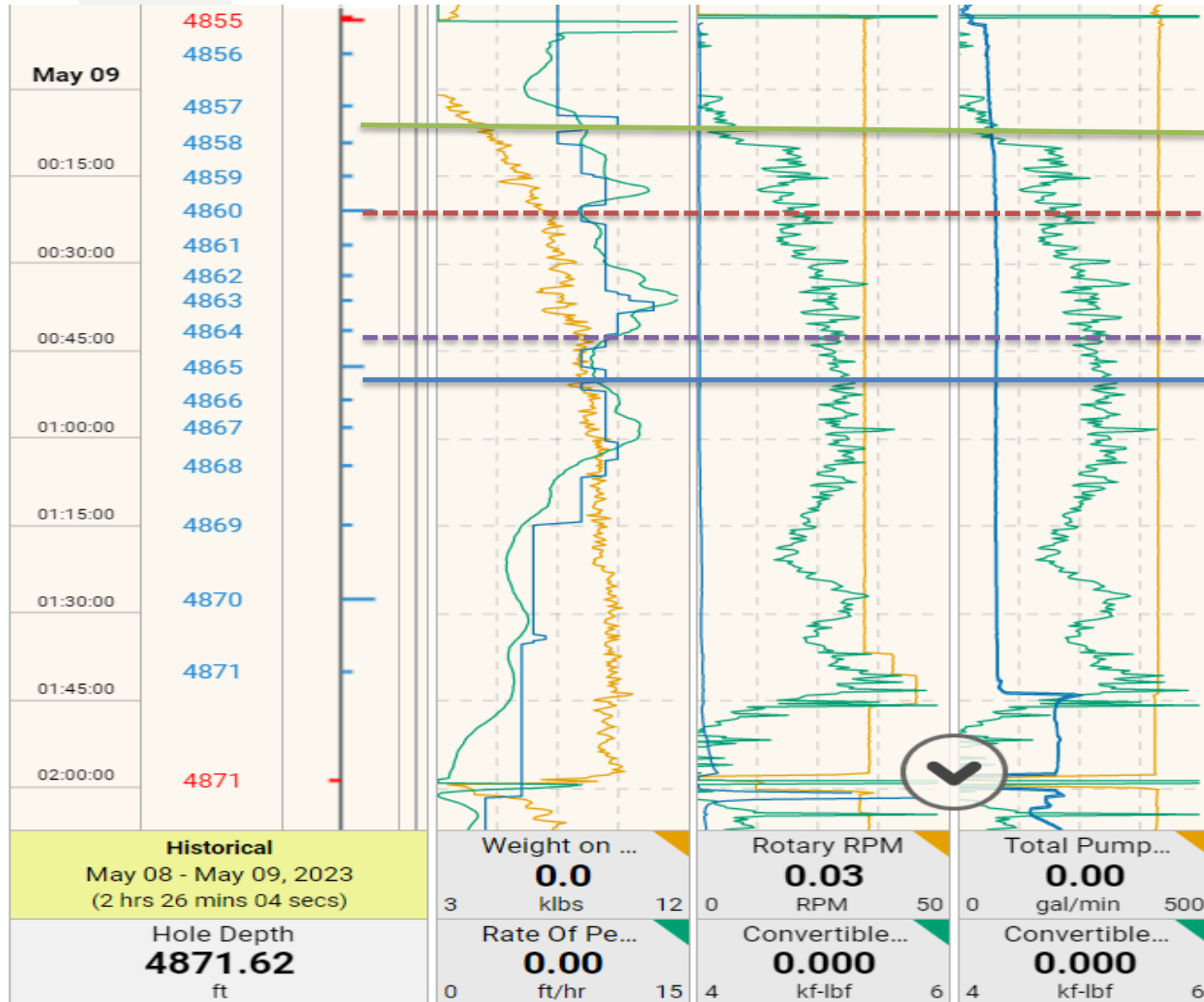
Zone 1 Core Run #1



Core from Zone 1 Core Run #1



Zone 1 Core Run #1 May 9-2023



Start of First Stabilizer

Primary Liner Deployment

Secondary Liner Deployment

Start of Second Stabilizer

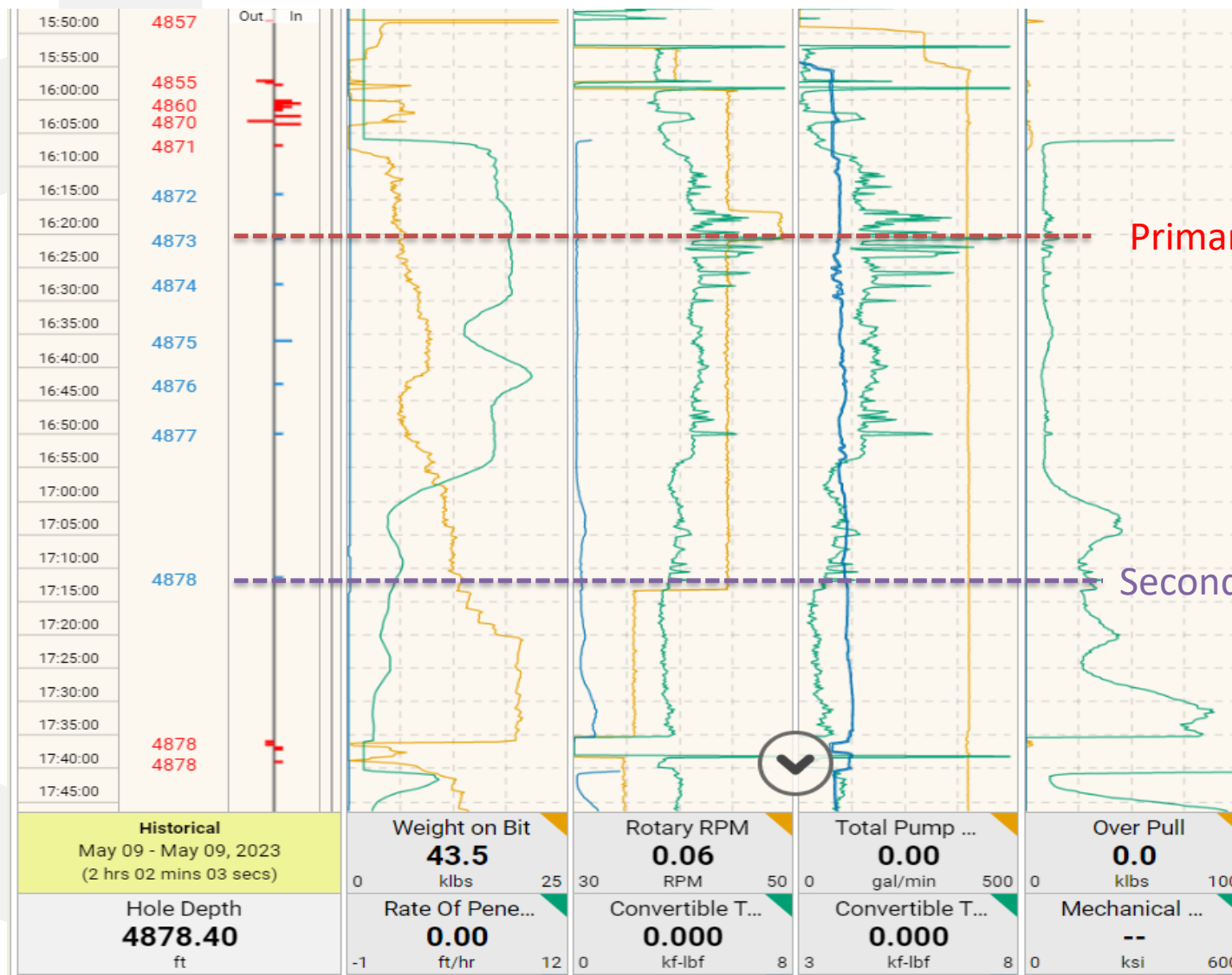


Zone 1 Core Run #2

- CCI 700 60' JMS BHA – 713 Bit
 - Sensored
- Cored from 4,871' – 4,878'
- ROP 3.5 ft./hr.
- Core jammed
 - @ 4,874 increased rotary to 50 RPM.
 - Began to see erratic torque spikes brought rotary down to 40.
 - 4,878' lost all torque
 - Pumped 3 sweep of torque ease.
 - Brought weight up in increments of 1K from 8k to 20K.
- 7' cored 6' Recovered
- 2 JMS Deployments
 - Primary
 - ~4,873"
 - Secondary
 - ~4,878'



Zone 1 Core Run #2



Primary Liner Deployment

Secondary Liner Deployment

Historical
May 09 - May 09, 2023
(2 hrs 02 mins 03 secs)

Hole Depth
4878.40
ft

Weight on Bit
43.5
klbs

Rate Of Pene...
0.00
ft/hr

Rotary RPM
0.06
RPM

Convertible T...
0.000
kf-lbf

Total Pump ...
0.00
gal/min

Convertible T...
0.000
kf-lbf

Over Pull
0.0
klbs

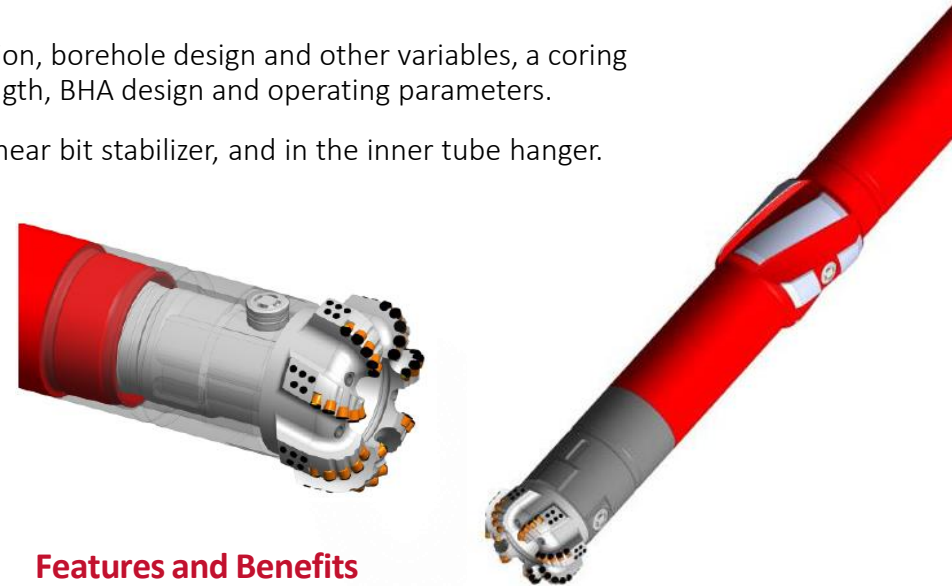
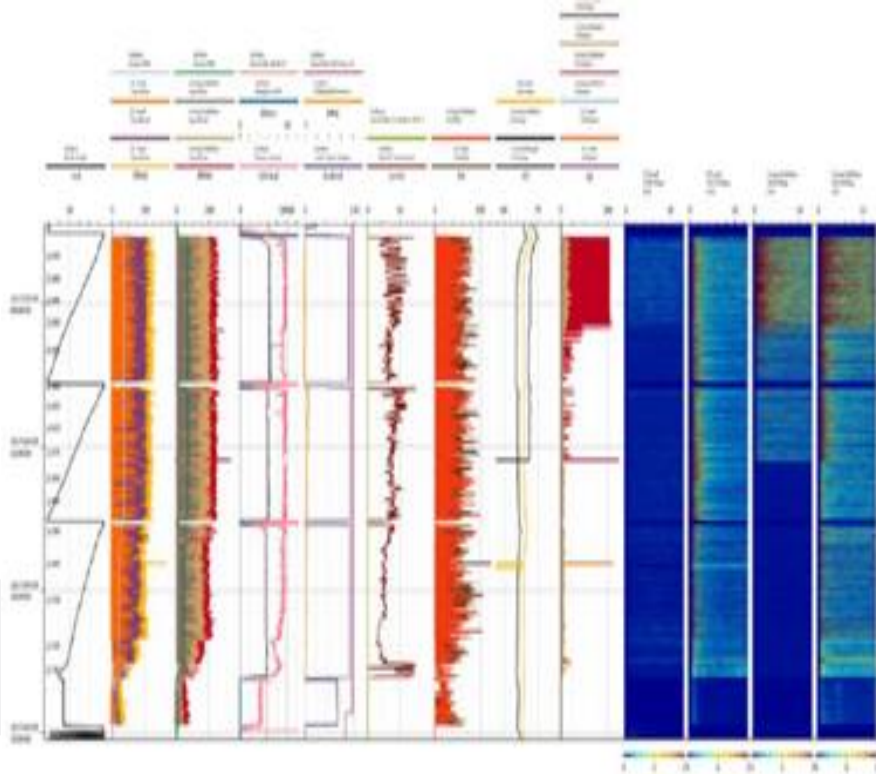
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Coring Dynamics

Measures Core Barrel Vibration to Improve Core Quality, Recovery and Efficiency

- Downhole forces experienced during the coring process adversely affect critical key performance indicators of a successful coring operation: quality, recovery and efficiency.
- By measuring the effect of operating parameters, equipment selection, borehole design and other variables, a coring program can be optimized through intelligent selection of barrel length, BHA design and operating parameters.
- Data can be collected at three points using CuBIC® 3G; the bit, the near bit stabilizer, and in the inner tube hanger.

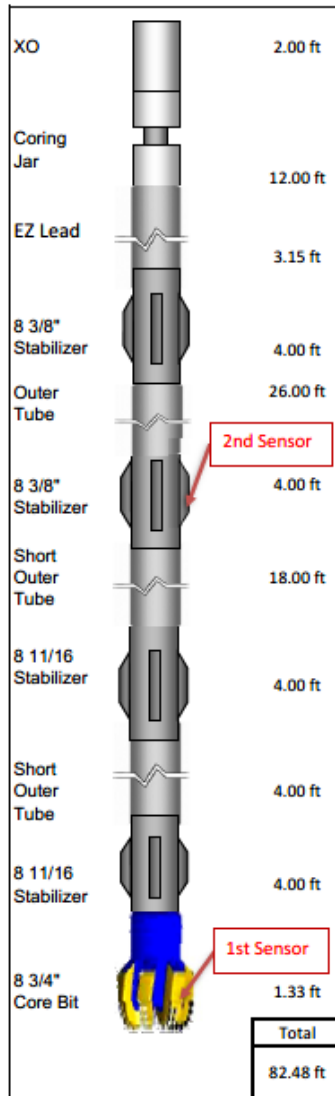


Features and Benefits

- Rotational measurements: verification of rotating inner tube
- Is inner barrel stabilization needed?
- Data measured includes
 - Rotation (RPM)
 - Axial and lateral vibration and shock
 - Inclination, time and temperature
- Memory mode
- Easily integrates within all Canamera Coring platforms



BHA



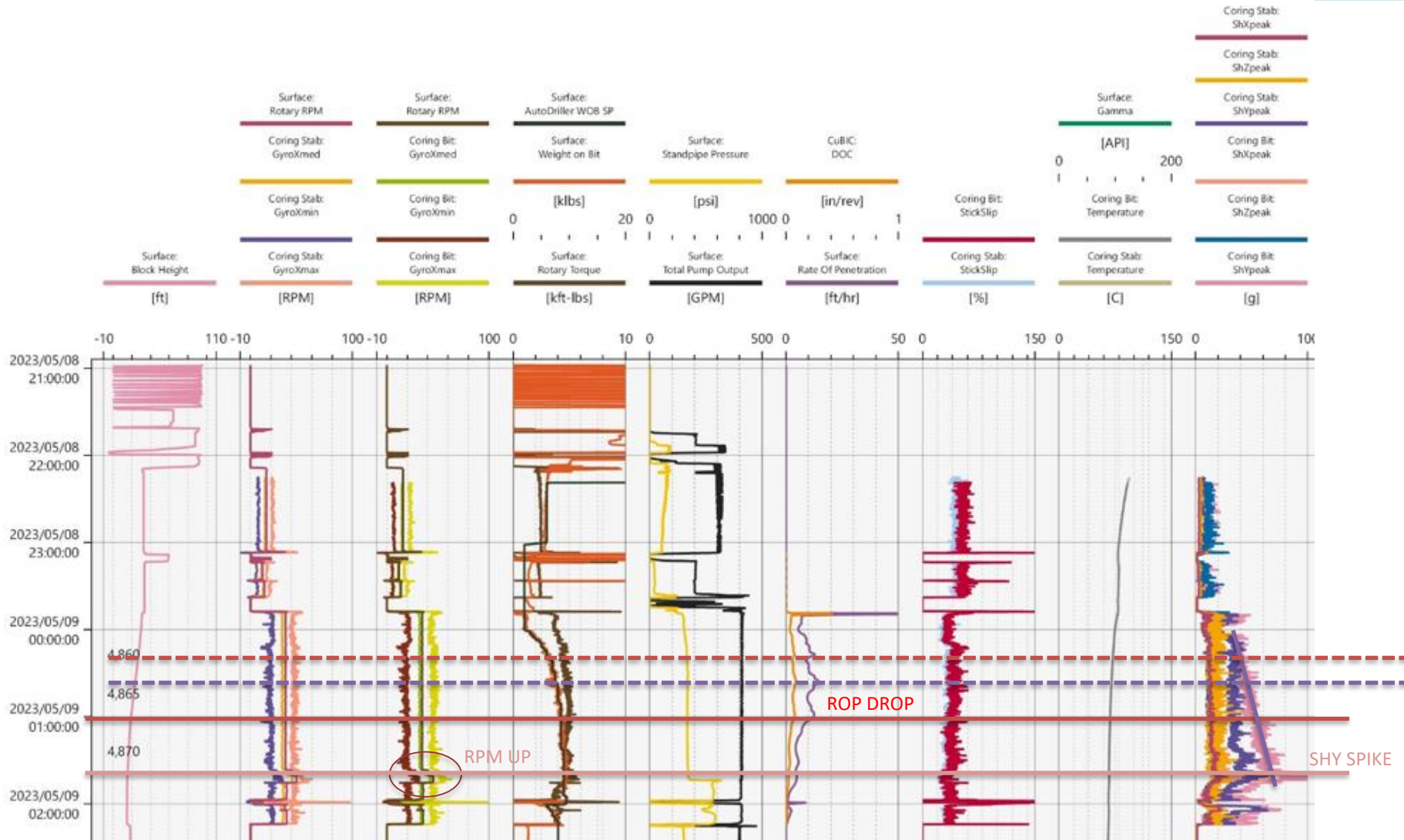
Item	Component	Vendor	OD	ID	Top Connection	Length	Cum Length	Remarks
1	Core Bit	Canamera	8.75 in	4.00 in	6.480 HT	1.33 ft	1.33 ft	
2	8 11/16 Stabilizer	Canamera	7.00 in	5.75 in	6.480 HT	4.00 ft	5.33 ft	
3	Short Outer Tube	Canamera	7.00 in	5.75 in	6.480 HT	4.00 ft	9.33 ft	
4	8 11/16 Stabilizer	Canamera	7.00 in	5.75 in	6.480 HT	4.00 ft	13.33 ft	
5	Short Outer Tube	Canamera	8.38 in	5.75 in	6.480 HT	18.00 ft	31.33 ft	
6	8 3/8 Stabilizer	Canamera	7.00 in	5.75 in	6.480 HT	4.00 ft	35.33 ft	
7	Outer Tube	Canamera	8.38 in	5.75 in	6.480 HT	26.00 ft	61.33 ft	
8	8 3/8 Stabilizer	Canamera	8.38 in	5.75 in	6.480 HT	4.00 ft	65.33 ft	
9	EZ Lead	Canamera	7.00 in	2.50 in	4 1/2 IF	3.15 ft	68.48 ft	
10	Jar	Canamera	6.88 in	2.25 in	4 1/2 IF	12.00 ft	80.48 ft	
11	XO					2.00 ft	82.48 ft	

CORING BHA: 82.48 ft

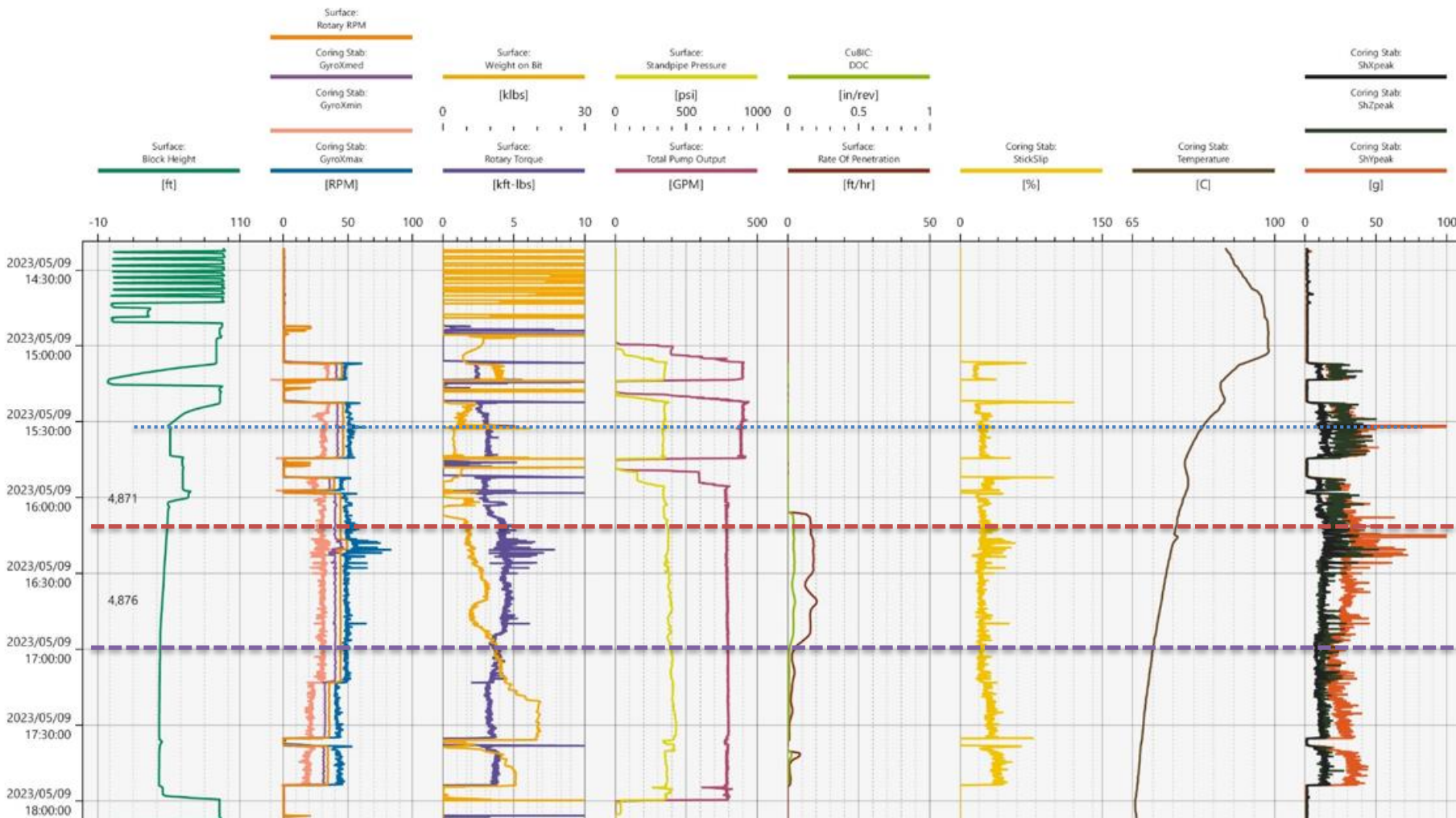
2F-3R Ported Flapper Float
75 klbs Latch Up Only



Sensor Zone 1 Core Run #1



Sensor Zone 1 Core Run #2



Conclusion

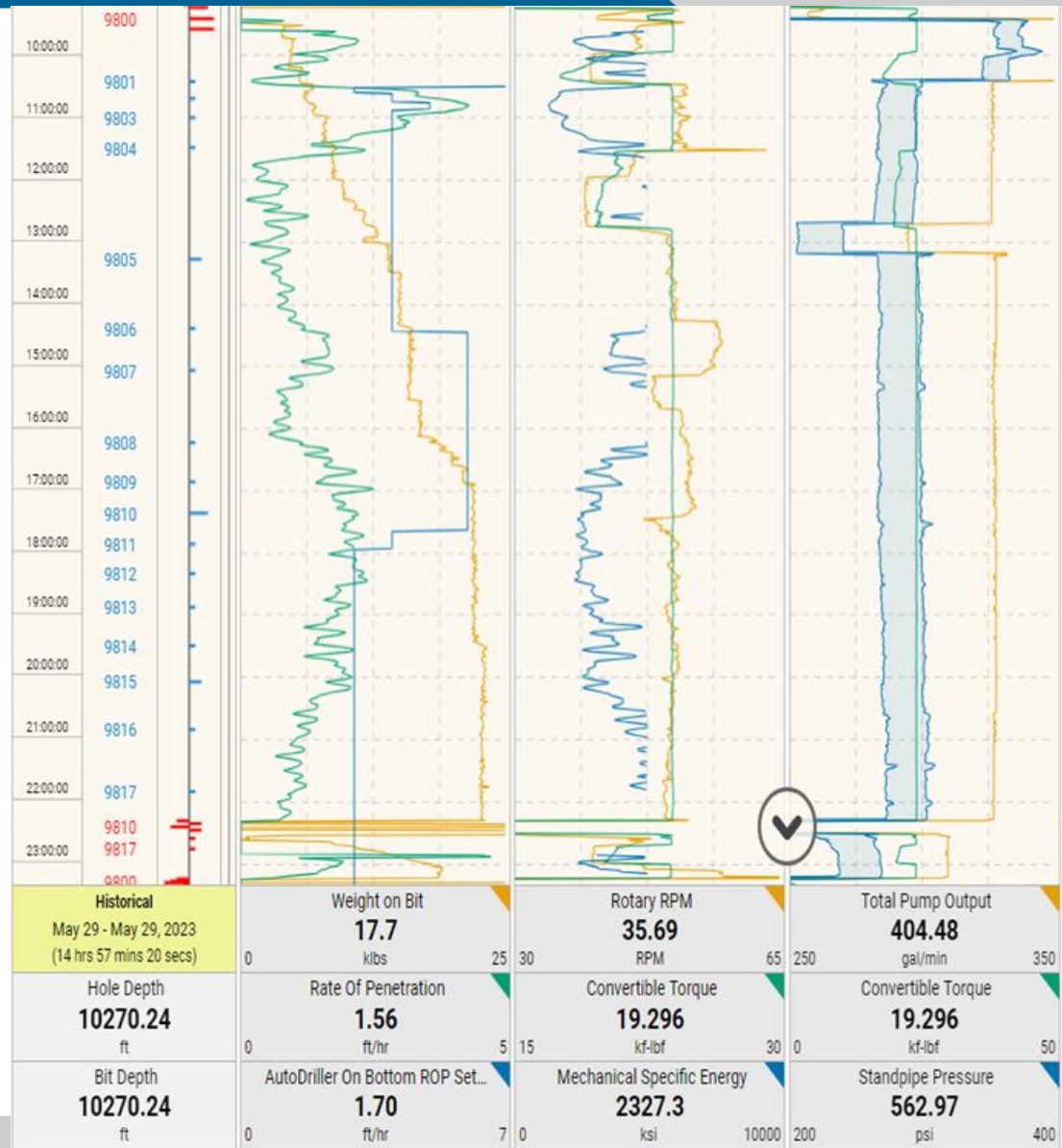
- While drilling to core point, we recommend the last 5' be drilled with reduced weight on bit
- As per Sanvean and Canamera recommendations for core #3
 - WOB 4k to 12k
 - RPM 35 to 55
 - GPM 350 to 400
 - Keep it consistent when coring is going well



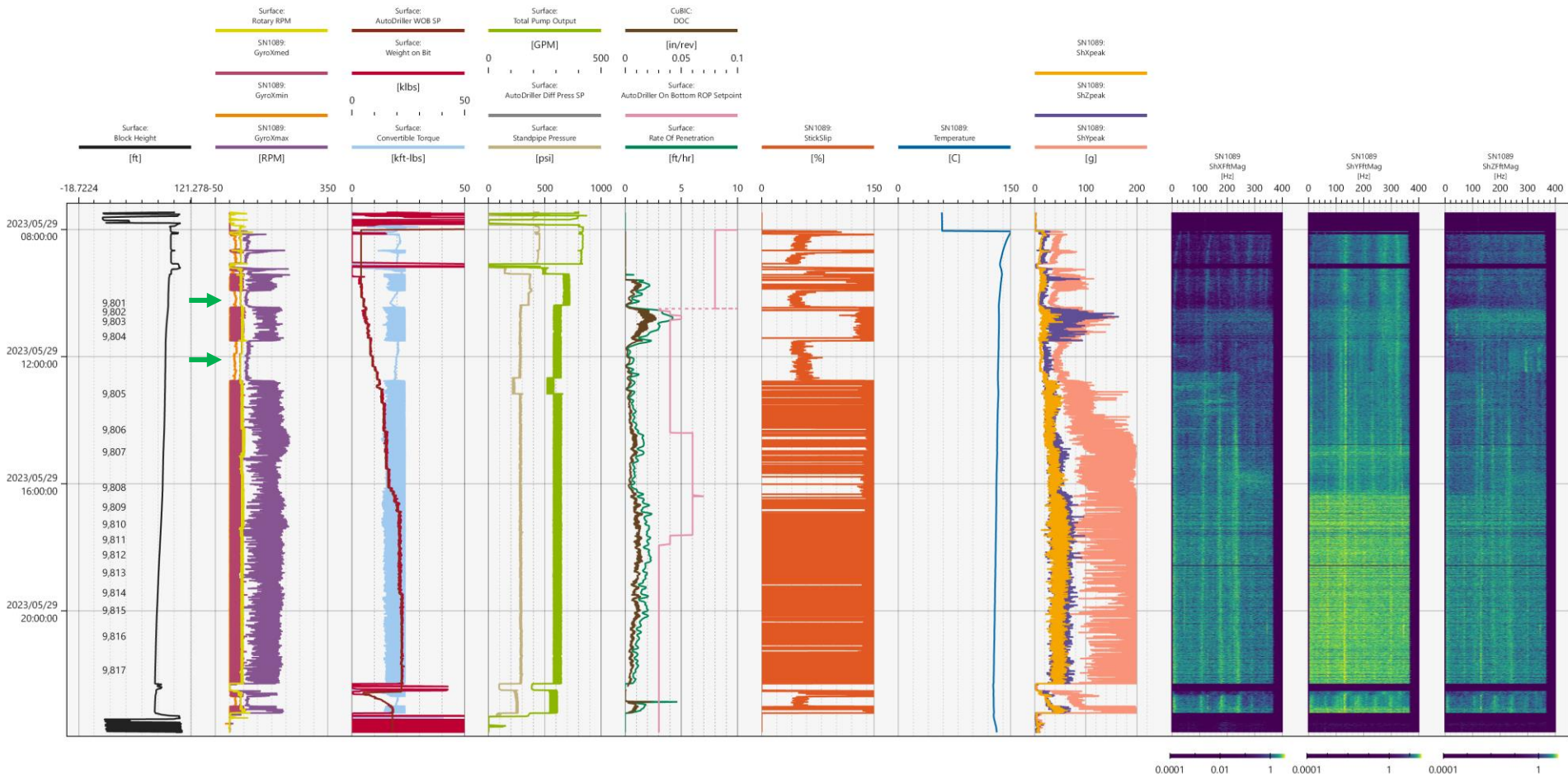
Zone 2 Core Run #1



- CCI 700 60' JMS BHA – 913 Bit
 - Sensored
- Cored from 9,800' – 9,817'
- ROP 1.9 ft./hr.
- Core jammed @ 9.817'
- 17' cored 16.6' Recovered
- No JMS deployments
- 8 ¾" Cleanout Run



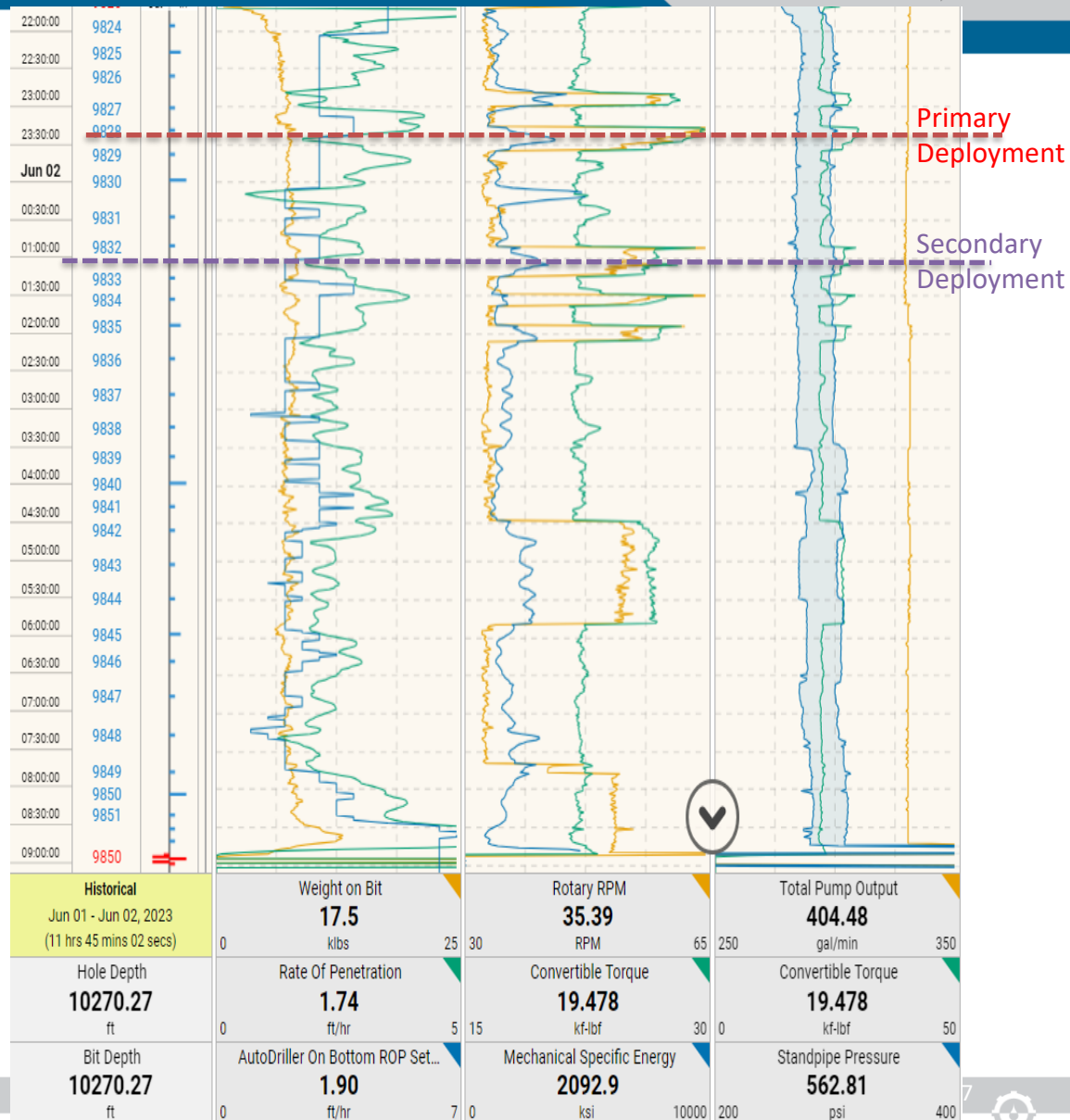
BHA 1 – Soft-torque inducing high variance in RPM. ROP seems formation dependent.



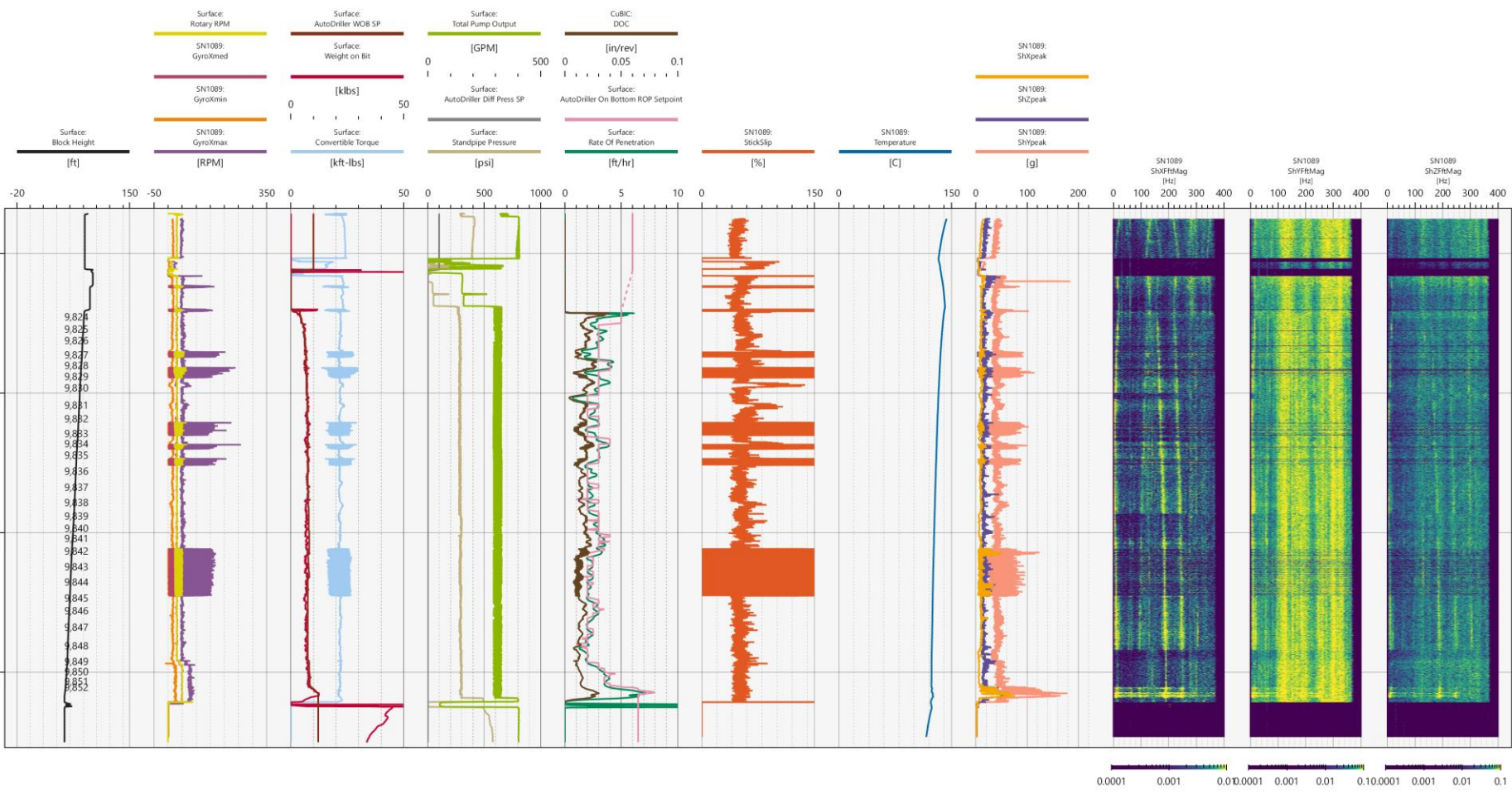
Zone 2 Core Run #2



- CCI 700 60' JMS BHA – 713 Bit
 - Sensored
- Cored from 9,823' – 9,853'
- ROP 2.7 ft./hr.
- 30' cored 28,4' Recovered
- 2 JMS Deployments
 - Primary
 - ~9,828"
 - Secondary
 - ~9,832'
- 9 1/2" Drill Ahead



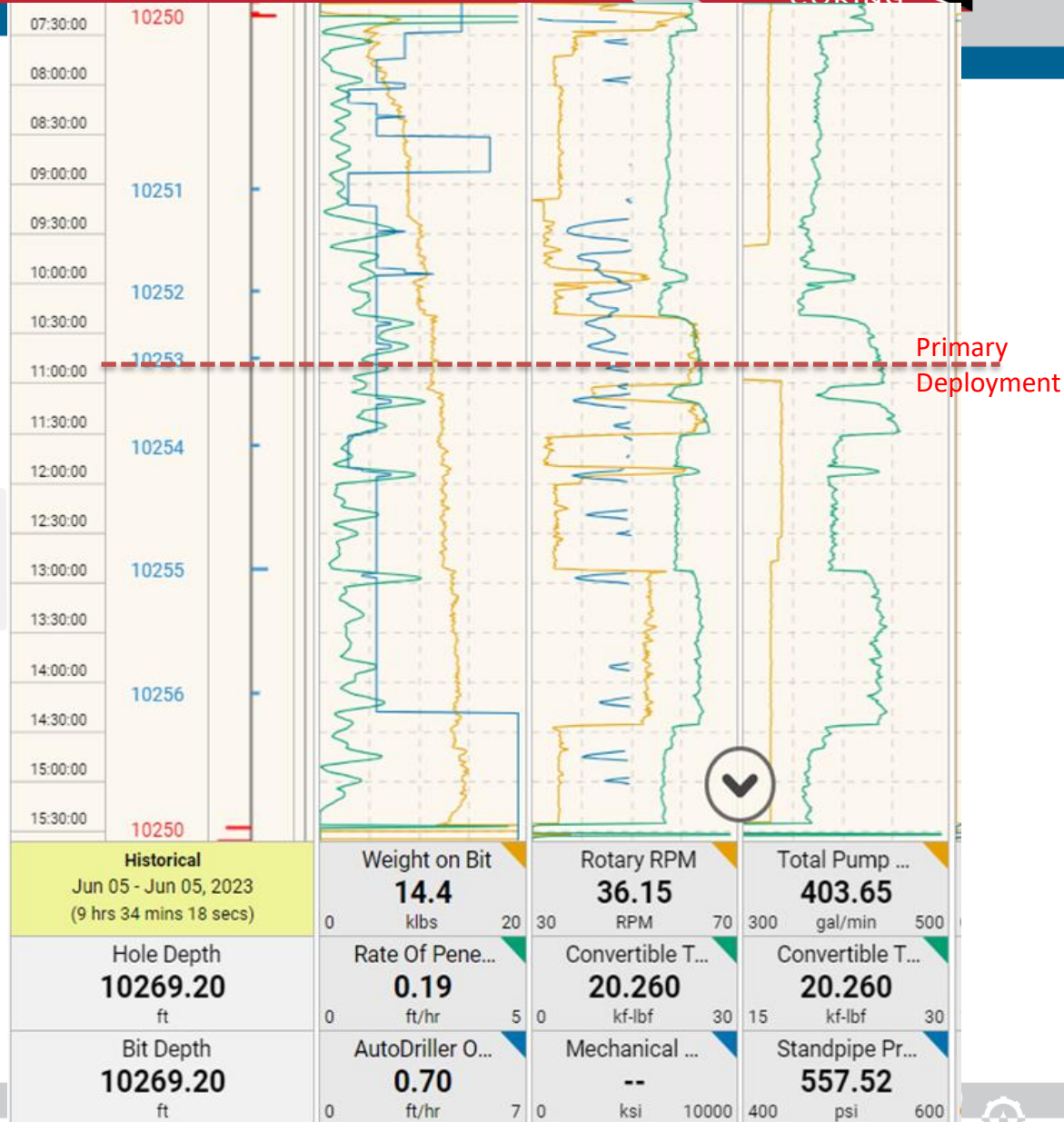
BHA 2 – RPM variation rises during soft-torque ON. ROP priority on autodriller settings?



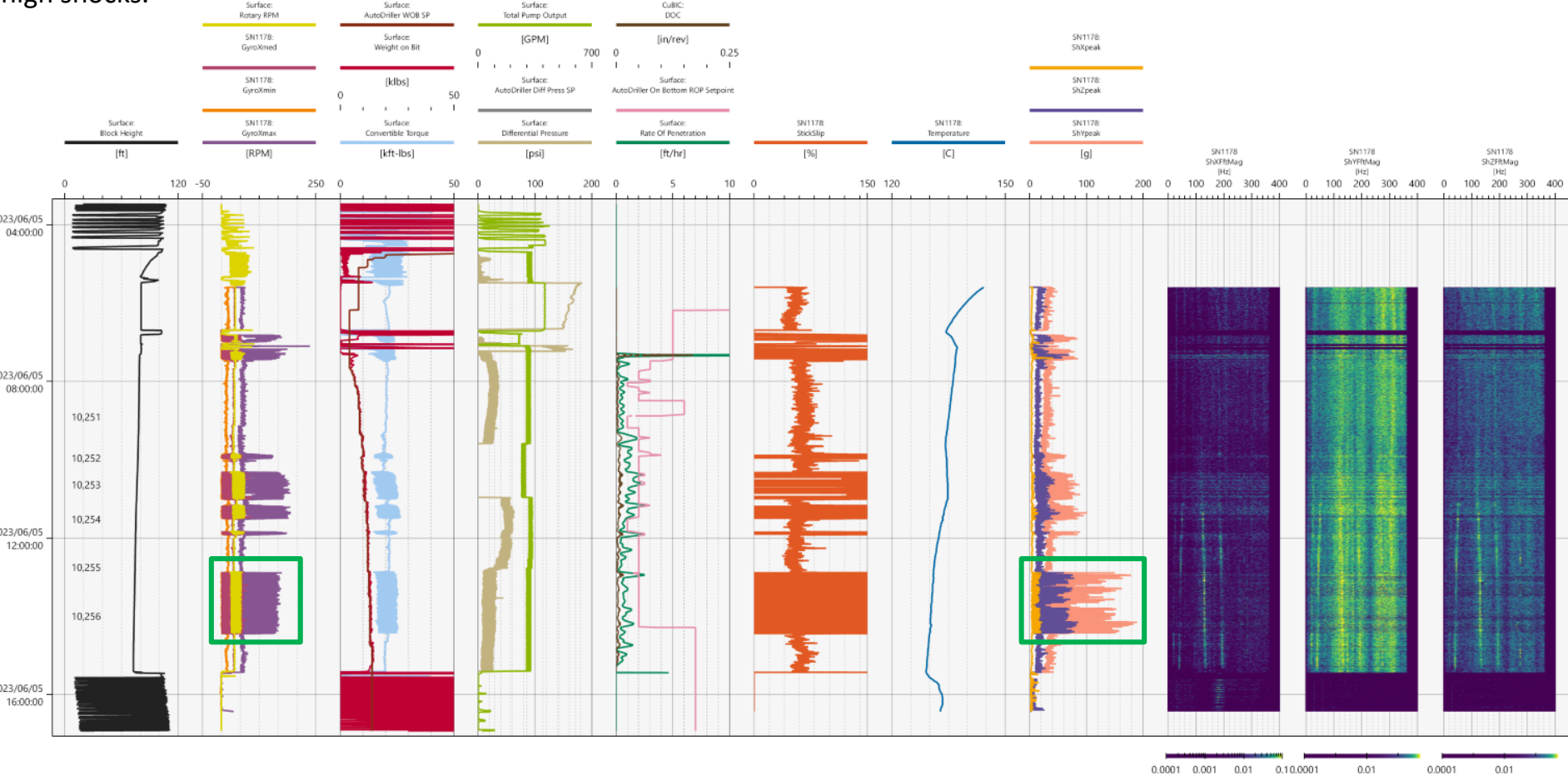
Zone 2 Core Run #3



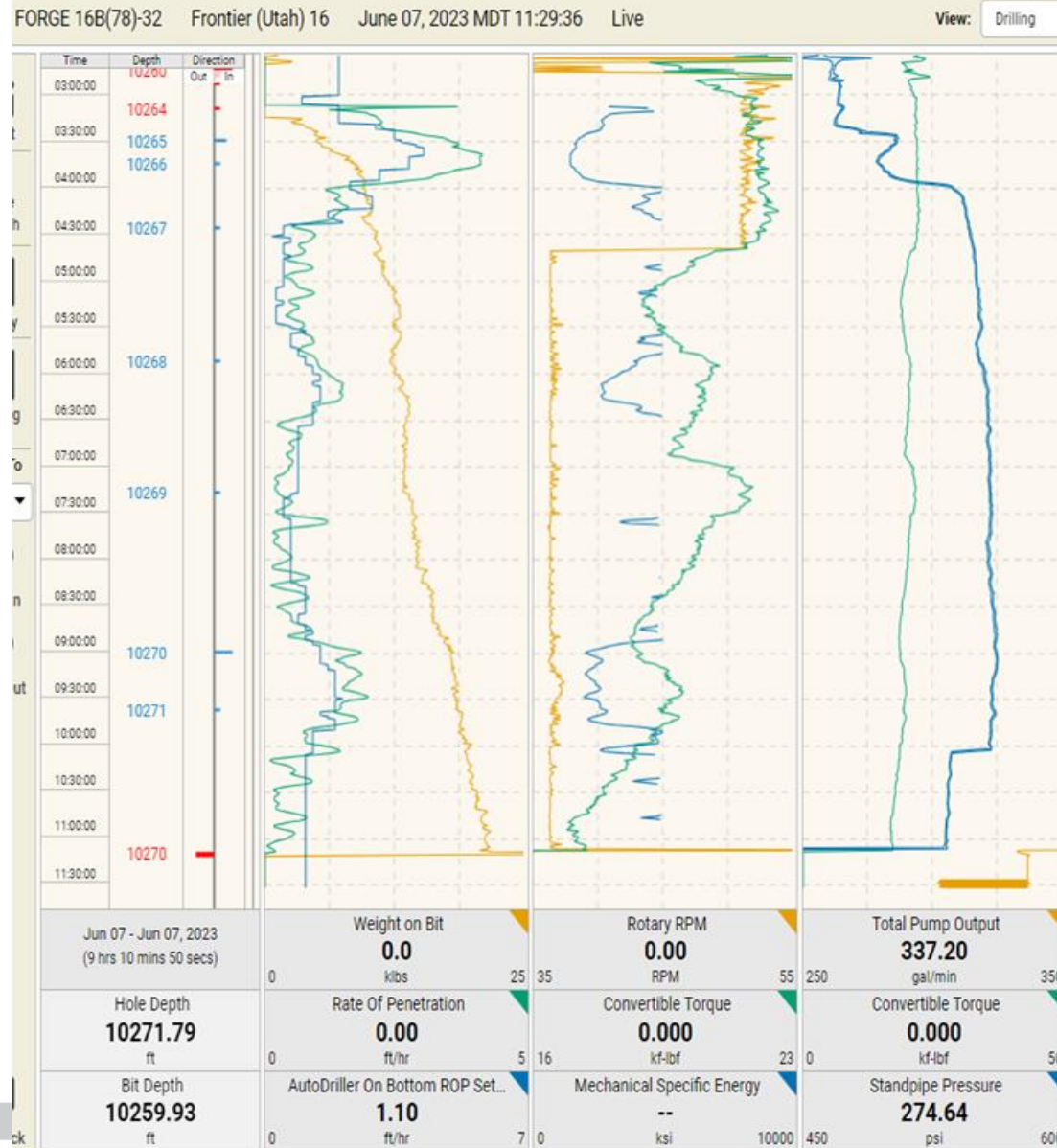
- CCI 700 60' JMS BHA – 713 Bit
 - Sensored
- Cored from 10,250' – 10,256'
- ROP 1.3.ft./hr.
- Core jammed @10,256'
- 6' cored 5,5' Recovered
- 1 JMS Deployment
 - Primary
 - ~10,253"
- 8 3/4" Drill Ahead



BHA 3 – Soft-torque ON during parts of run. ROP does not appear to be primary setpoint. As bit plays out, S-T may be inducing high shocks.

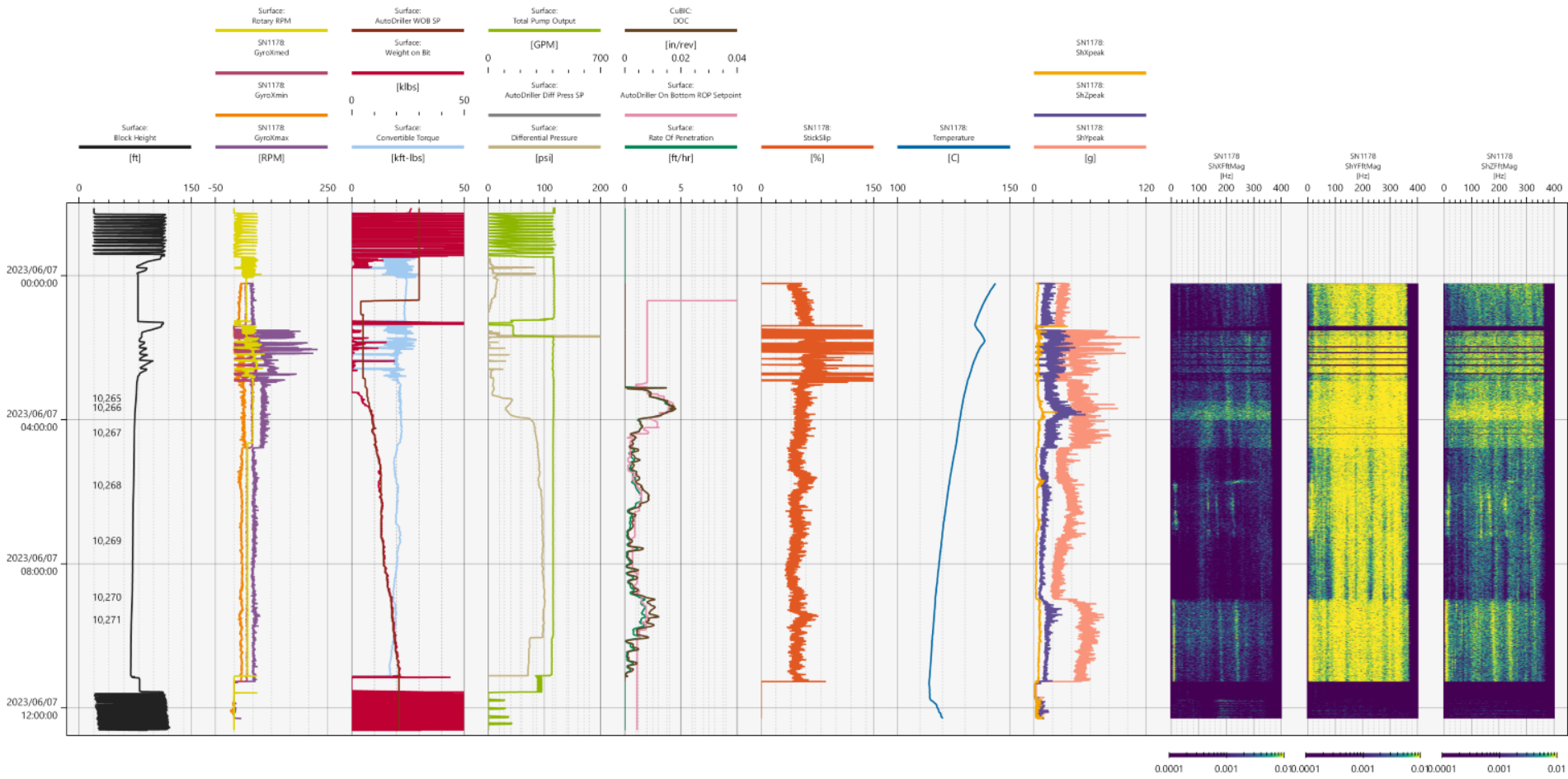


Zone 2 Core Run #4



- CCI 700 60' JMS BHA – 713 Bit
 - Sensored
- Cored from 10,264' – 10,272'
- ROP 1 ft./hr.
- Core jammed @ 10,272'
- 8' cored 4,6' Recovered
- No JMS Deployments
- 8 3/4" Drill Ahead

BHA 4 – Soft-torque OFF. ROP responds closely to autodriller.



BHA Run #5



Project BHA Details



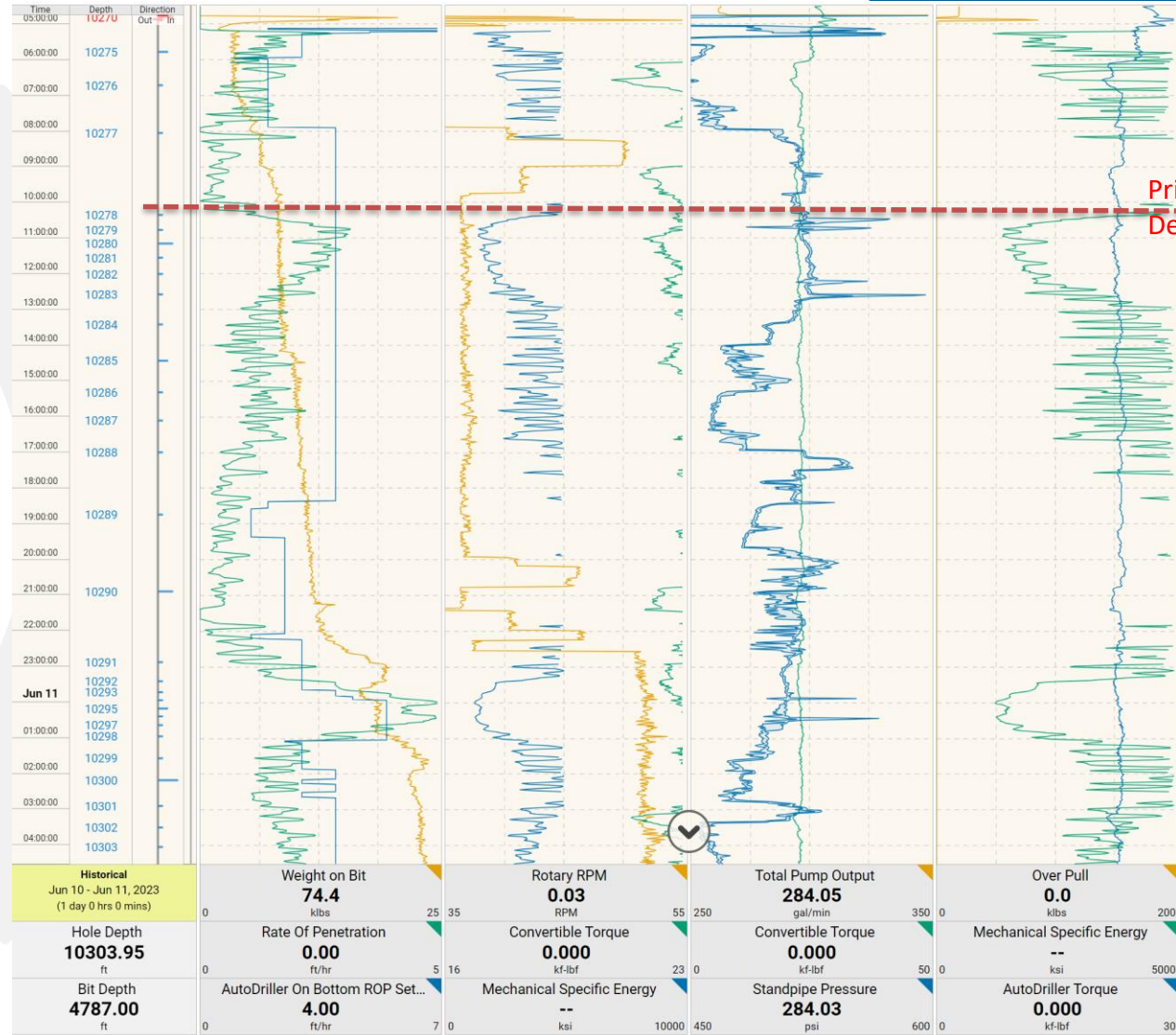
Name	Utah Forge #5	Core Bit	713	IADC	S232
Components	75.11	Serial #	CCI-3409-01	TFA	1.05
BHA Total	76.42	Size	8.75 x 4.00	Length	15.7480
Description	60' Standard JMS System with 8.44 stabs	Nozzles	14.000		

Name	Description	Serial	Length	ID	OD
Bit Stab		4223-02-01	4.0000	5.750	8.440
Core BBL		4481-01	26.0000	5.750	7.000
Stab		3695-01-07	4.0000	5.750	8.440
Core BBL		1460-7	26.0000	5.750	7.000
Stab		1948-01-05	4.0000	5.750	8.440
EZ-Lead		2674-01-3	2.9800	1.250	7.000
Core Jar		662-003	8.1300	2.250	6.500



Zone 2 Core Run #5

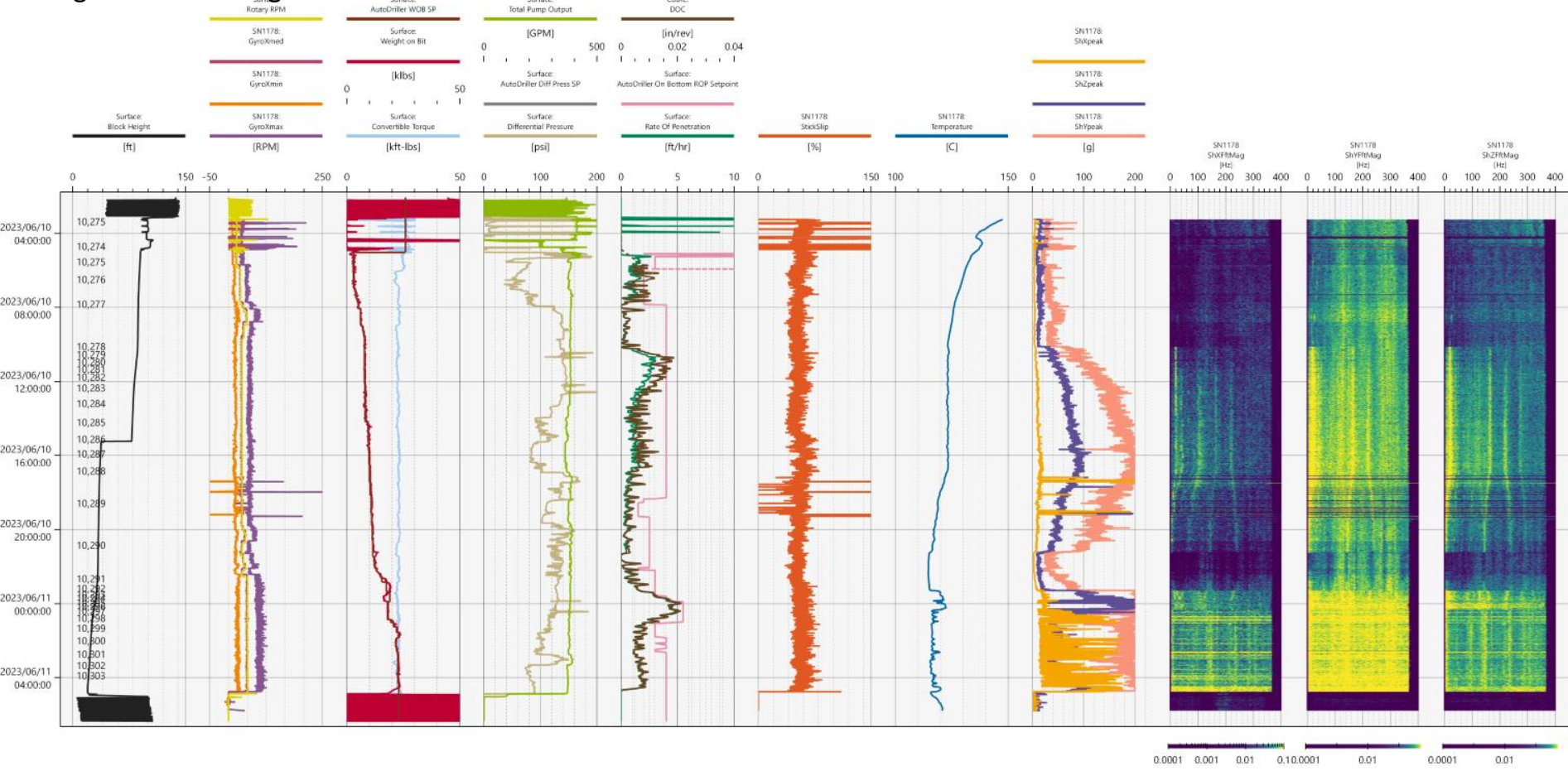
- CCI 700 60' JMS BHA – 8.44 Stabs – 713 Bit
 - Sensored
- Cored from 10,274' – 10,304'
- ROP 1 ft./hr.
- Full Run
- 30' cored 28' Recovered
- 1 JMS Deployments
 - Primary Deployed 10,278'
- 8 3/4" Drill Ahead



Primary Deployment

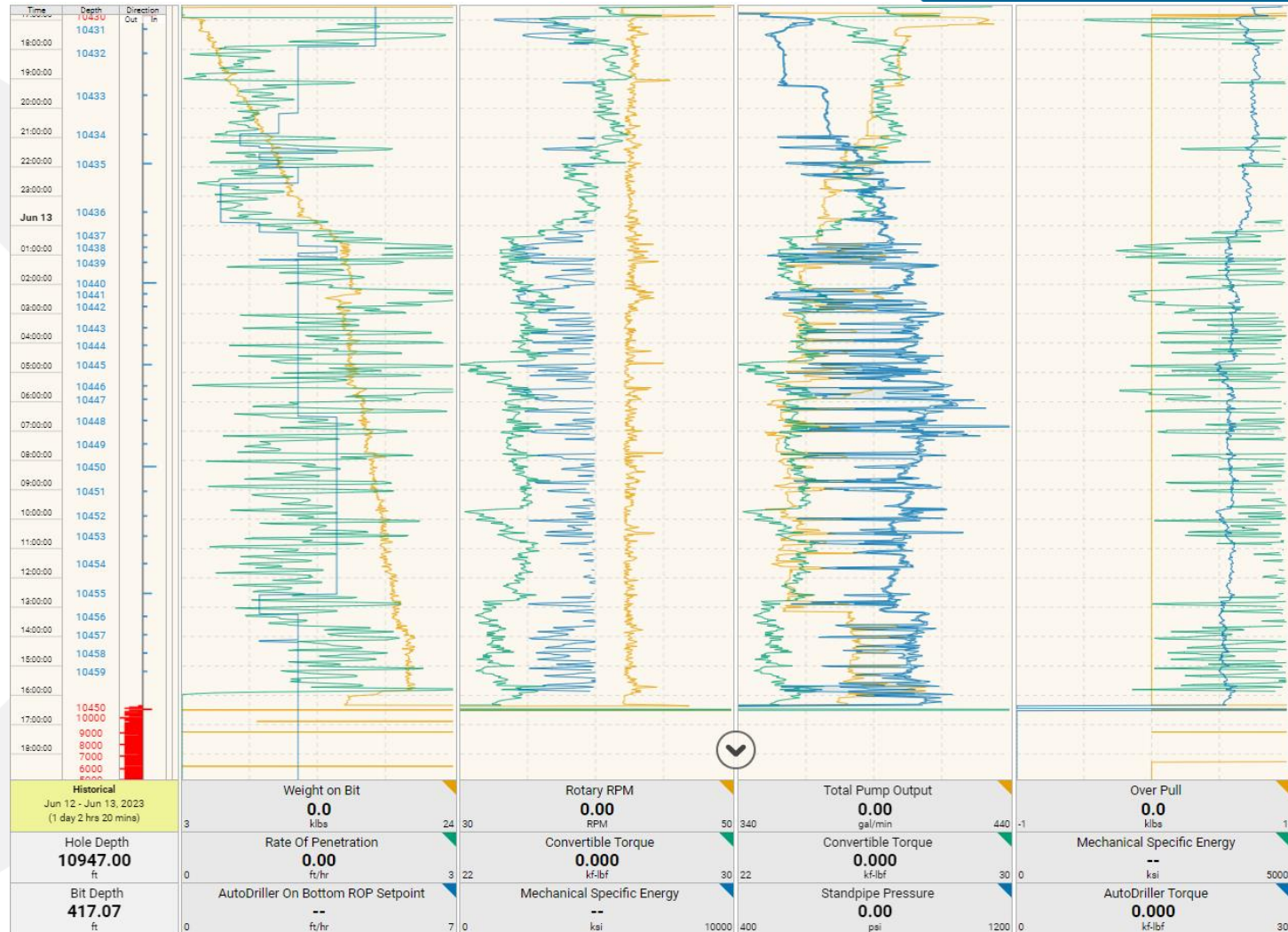


BHA 5 – Soft-torque OFF. Very high shocks, likely formation driven, RPM/WOB do not appear to drive shock. Frequencies shift during instances of higher shock.

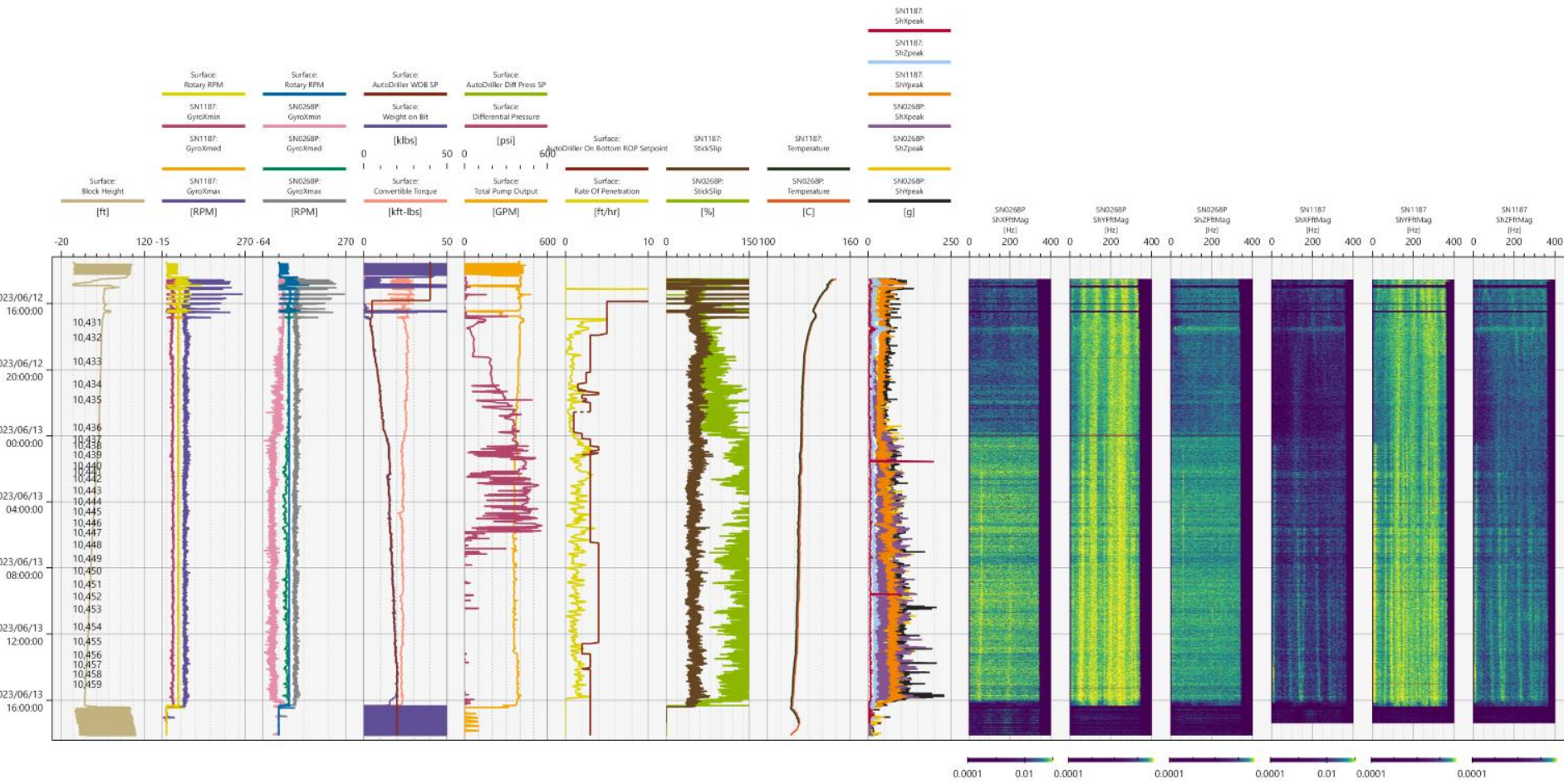


Zone 2 Core Run #6

- CCI 700 60' JMS BHA – 8.44
- Stabs – 713 Bit
 - Sensored
- Cored from 10,430' – 10,460'
- ROP 1.3 ft./hr.
- Full Run
- 30' cored 25,7' Recovered
- 1 JMS Deployments
 - 8 3/4" Drill Ahead



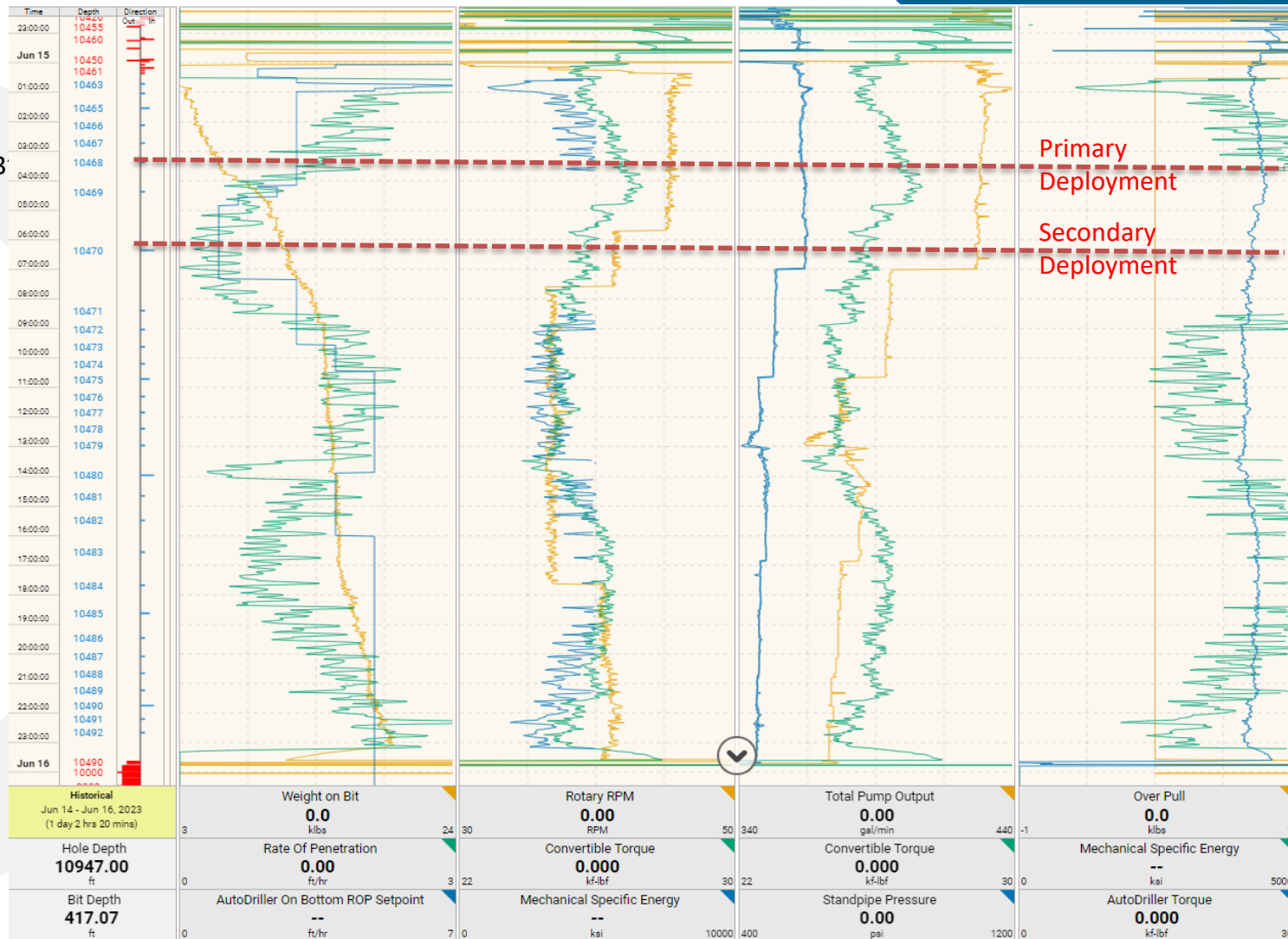
BHA 6 – Soft-torque OFF. Relatively low WOB and good cutter engagement resulted in longer run.



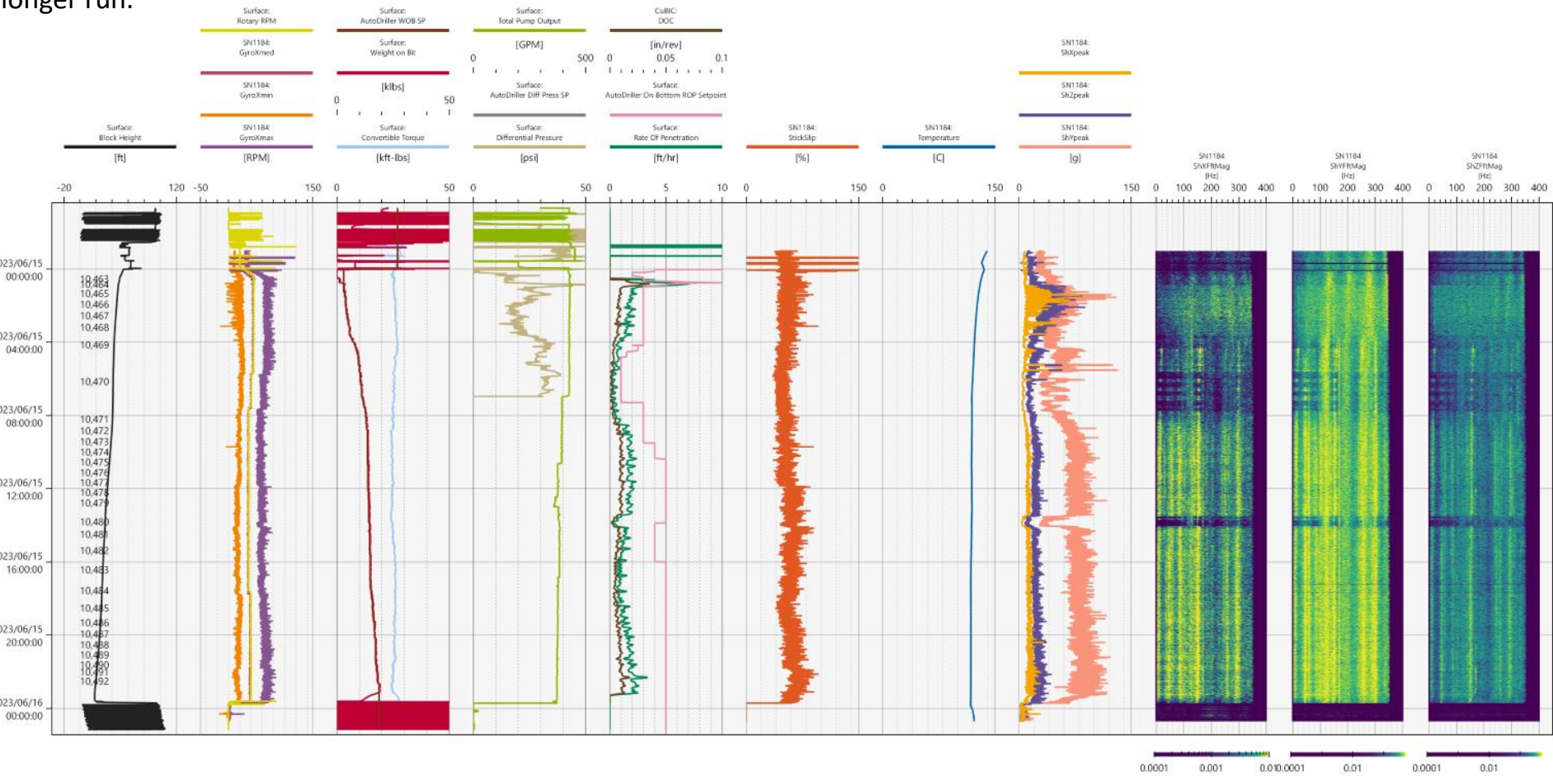
Zone 2 Core Run #7



- CCI 700 60' JMS BHA – 8.44 Stabs – 713 Bit
 - Sensored
- Cored from 10,462' – 10,493'
- ROP 2.6 ft./hr.
- Full Run
- 31' cored 27' Recovered
- 2 JMS Deployments
 - Primary Deployed 10,468'
 - Secondary Deployed 10,470'
- 8 3/4" Drill Ahead
- Bit has damage



BHA 7 – Soft-torque OFF. Interesting FFT response during RPM step test. Shocks rise with WOB, but higher ROP setpoint yields longer run.



Conclusion

- Lower WOB, gradual upward staging yields longer runs
- Full hole 8 ¾" hole size proved to provide the best runs
- 8.44 Stabs & standard BHA provided the best runs and recoveries
- Friction reduction shoe seemed to provide better runs and recoveries
- JMS mitigated 11 potential jams



Canamera Contacts - Questions



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