

DUVERNAY FM:
EAST SHALE BASIN

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Date: May, 2019

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PROJECT AREA:

Duvernay East Shale Basin

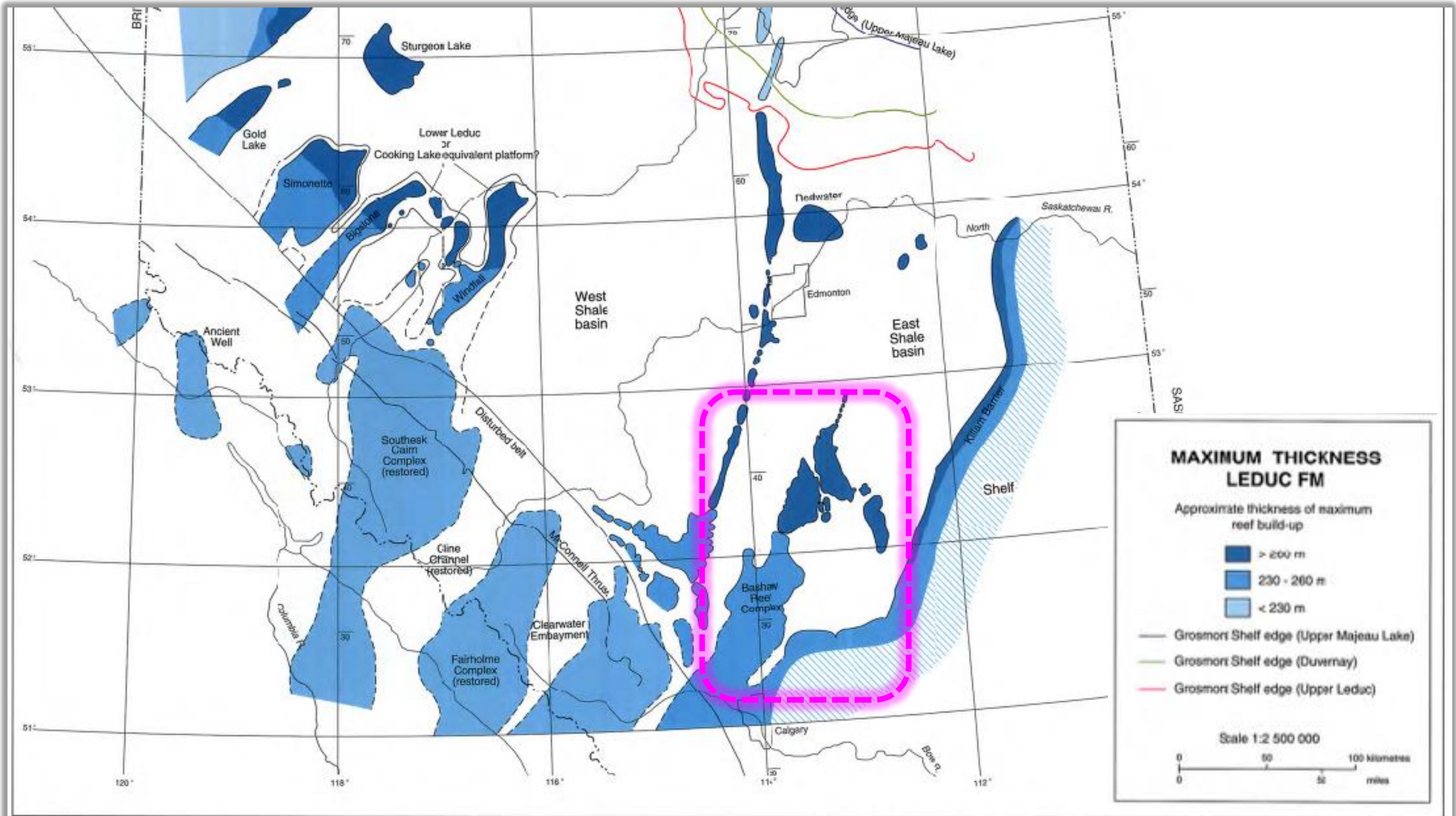
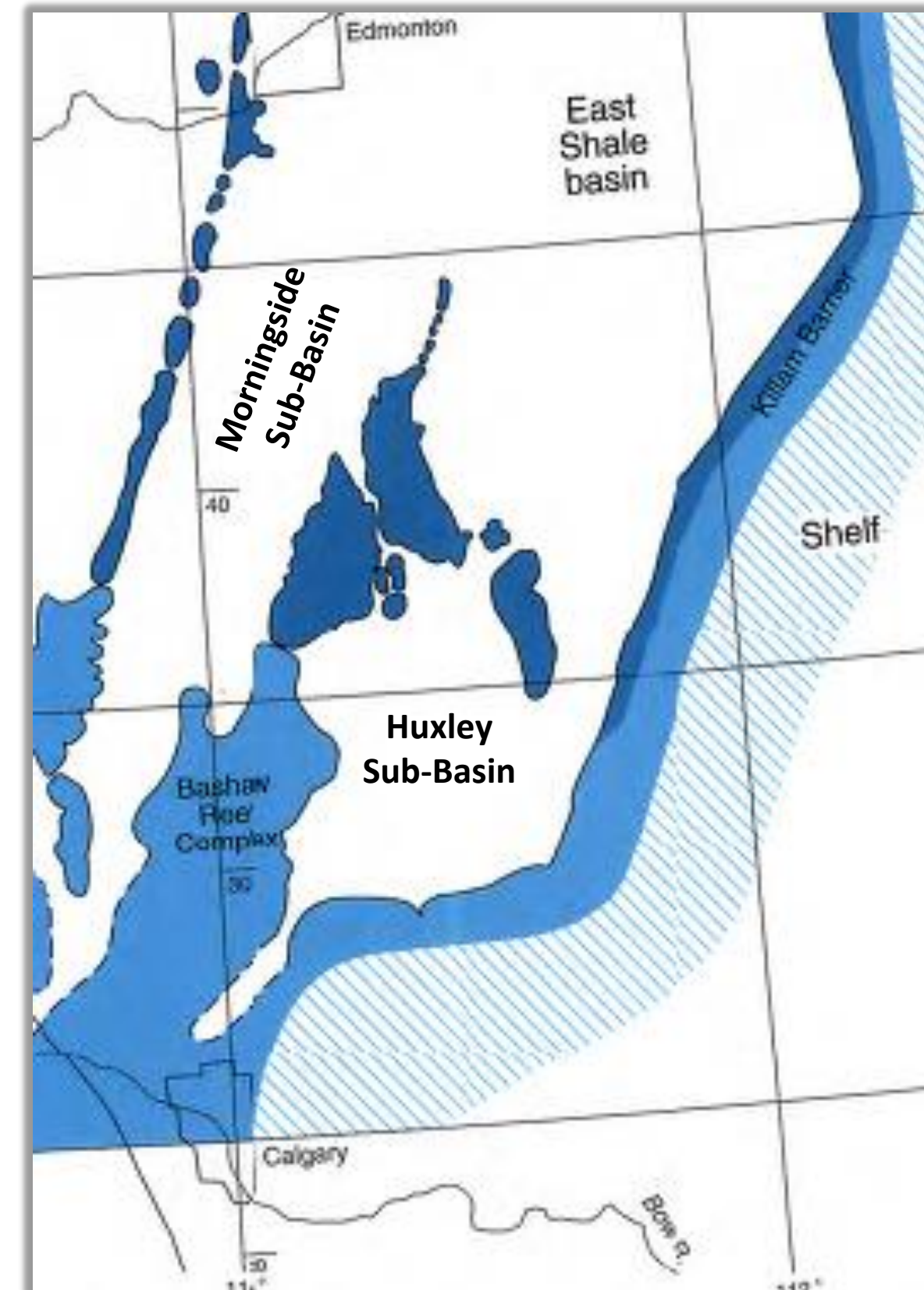


Figure 12.21 Maximum attained/preserved thickness of the Leduc Formation in Alberta. Although it is not illustrated, the combined thickness of the Grosmont stages and Lower Leduc Calling Lake reefs decreases northward. Maximum attained thickness in the northern extension of the combined Grosmont and Lower Leduc is 210 m. General thinning of the Leduc over the Peace River Arch, West Alberta Ridge axis of the Athabasca Arch and southeast of the Meadow Lake Escarpment (southern shelf edge) suggests that paleotopographic control and reduced subsidence in these areas affected Leduc deposition. Palaeogeographically restored areas are modified from Andrews (1987).

EAST SHALE BASIN DESIGNATION:

Morningside & Huxley Sub-Basins

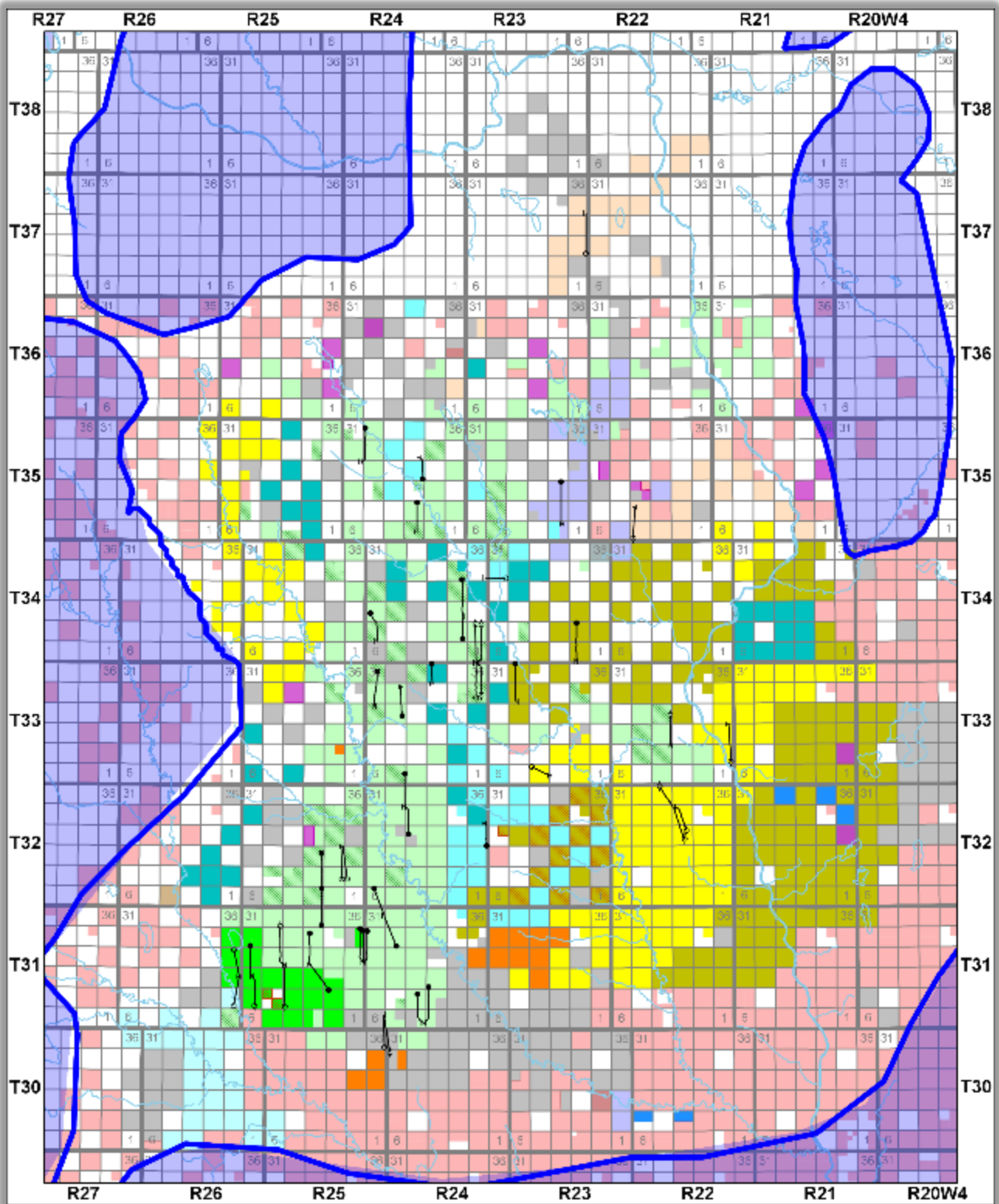
- Due to the large overall project area within the formally designated Duvernay East Shale Basin, subdivision was necessary to accommodate data collection, integration and analysis
- The Duvernay East Shale Basin was informally subdivided into the Morningside Sub-Basin & Huxley Sub-Basin
- Active exploration & development programs have/are being conducted within each sub-basin at various scales by multiple independent operators
 - **Morningside Sub-Basin** – Vesta Energy, Baytex Energy (formally Raging River Exploration) & Traverse Energy
 - **Huxley Sub-Basin** – Artis Exploration, Crescent Point Energy, Outlier Resources, Inplay Oil, Rife Resources, Mancal Energy, Chronos Resources
- Although reviewed independently, data comparison within each sub-basin was completed in order to apply learnings across the entire project area
- To-date, the Morningside Sub-Basin is further along within the play development phase with exception of the North & East flanks, while the Huxley Sub-Basin is still within the exploration phase



DUVERNAY MINERAL RIGHTS:

Operator Land Holdings & Crown Landsales

Huxley Sub-Basin (Operator Map)



Duvernay Interest Holder

Artis Exploration (All Lands)	☒	
Artis Exploration (Freehold)	☒	
Brooker Undefined (All Lands)	☒	
Brooker Undefined (East)	☒	
Brooker Undefined (West)	☒	
Chronos Resources (All Lands)	☒	
Crescent Point (Freehold)	☒	
Crescent Point Energy (All Lands)	☒	
Huron Resources (All Lands)	☒	
Inplay Oil (All Lands)	☒	
Joint Venture - Artis & CPG	☒	
Mancal Energy (All Lands)	☒	
Other Small Operators (All Lands)	☒	
Outlier Resources (All Lands)	☒	
Raging River (All Lands)	☒	
Raging River (Freehold)	☒	
Rife Resources (All Lands)	☒	
Traverse Energy	☒	
Vesta Energy (All Lands)	☒	
Vesta Energy (Freehold)	☒	
Open Crown - Duvernay Open Cr...	☒	
Sales Postings	☐	
AB 2018-10-03	☐	
AB 2018-11-14	☒	

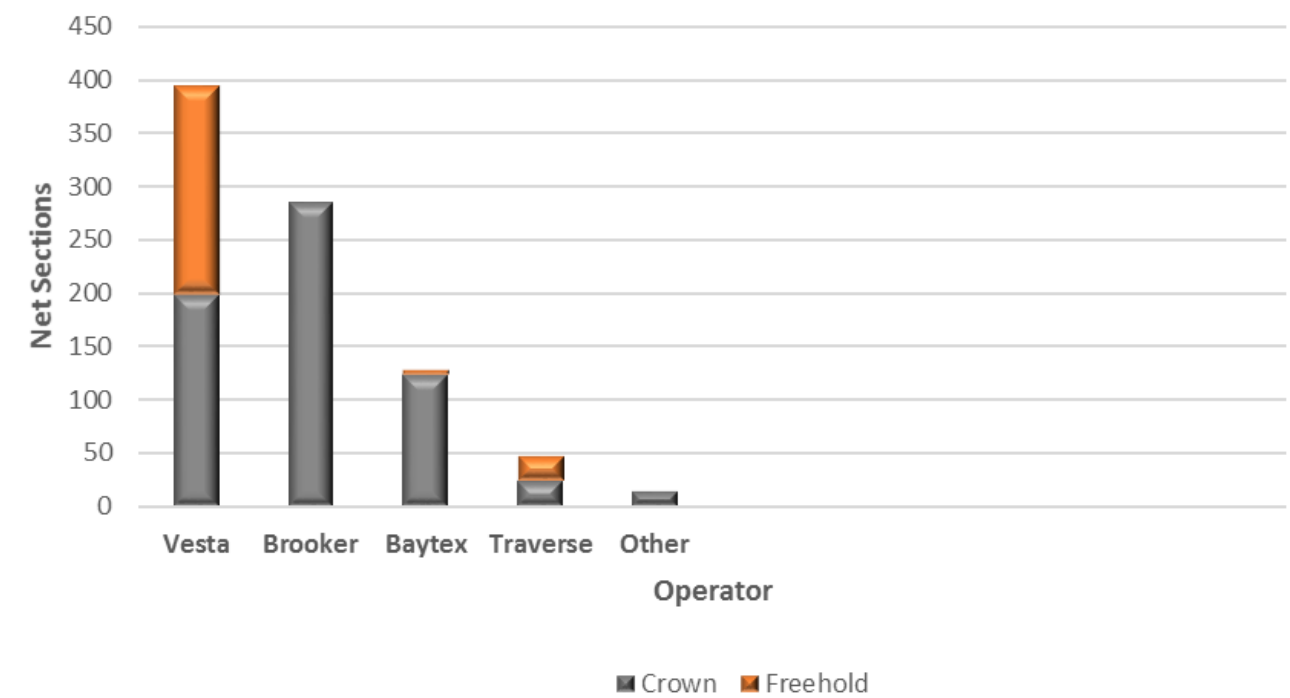
Duvernay Crown Landsale Results

Row Label	Avg Price (\$/ha)	Max Price (\$/ha)	Total Area (Ha)
2010	\$313	\$1,174	2880
Qtr2	\$926	\$1,174	640
Qtr4	\$129	\$129	2240
2011	\$111	\$206	960
Qtr3	\$141	\$206	192
Qtr4	\$91	\$102	768
2012	\$103	\$132	832
Qtr1	\$105	\$132	576
Qtr4	\$100	\$109	256
2013	\$463	\$3,887	3520
Qtr1	\$573	\$3,887	1664
Qtr3	\$510	\$625	256
Qtr4	\$226	\$846	1600
2014	\$168	\$6,134	21376
Qtr1	\$308	\$6,134	6272
Qtr2	\$79	\$79	128
Qtr3	\$127	\$1,020	7936
Qtr4	\$48	\$222	7040
2015	\$71	\$1,223	23744
Qtr1	\$12	\$38	1088
Qtr2	\$56	\$114	21376
Qtr3	\$1,023	\$1,223	512
Qtr4	\$8	\$8	768
2016	\$208	\$2,356	46784
Qtr1	\$226	\$2,356	28096
Qtr2	\$337	\$337	256
Qtr3	\$177	\$422	16640
Qtr4	\$205	\$404	1792
2017	\$1,771	\$6,834	82304
Qtr1	\$84	\$177	6144
Qtr2	\$1,925	\$4,217	14080
Qtr3	\$2,895	\$5,589	10304
Qtr4	\$1,673	\$6,834	51776
2018	\$575	\$3,388	15872
Qtr1	\$512	\$679	5824
Qtr2	\$444	\$3,131	8960
Qtr3	\$1,035	\$3,388	704
Qtr4	\$2,009	\$3,159	384
Grand Total	\$811	\$6,834	198272

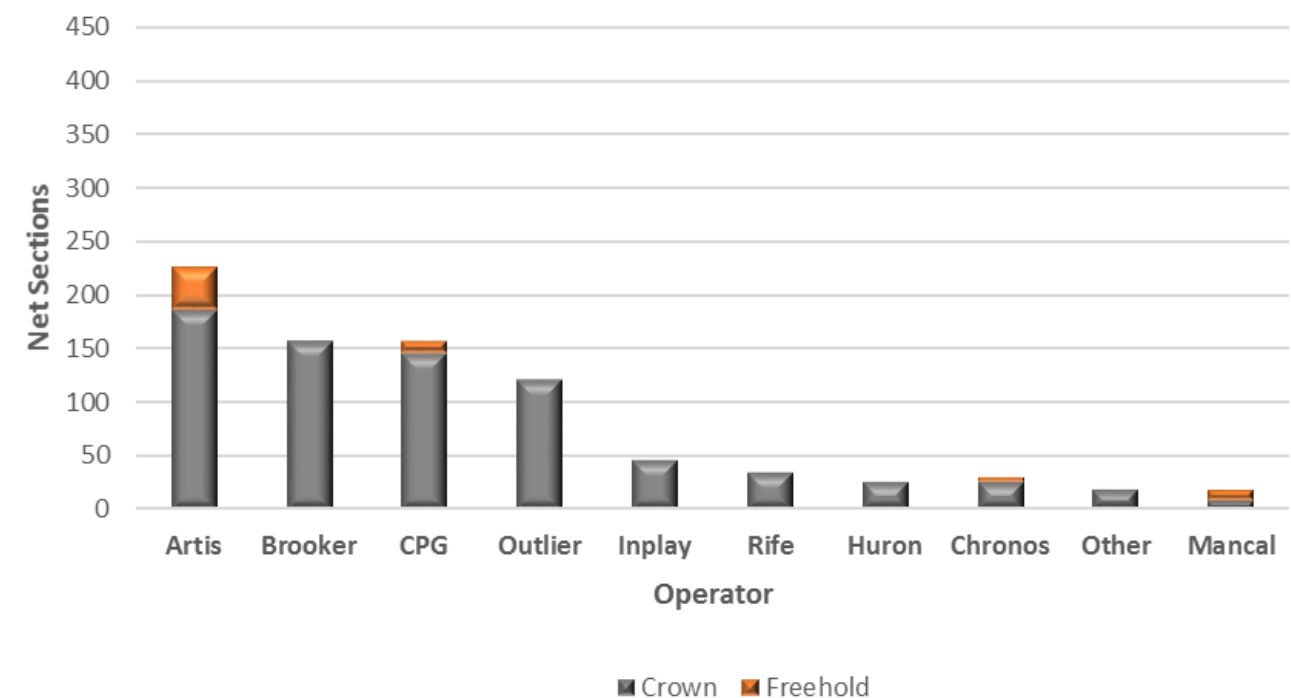
DUVERNAY MINERAL RIGHTS:

Operator Land Holdings & Acquisition Summary

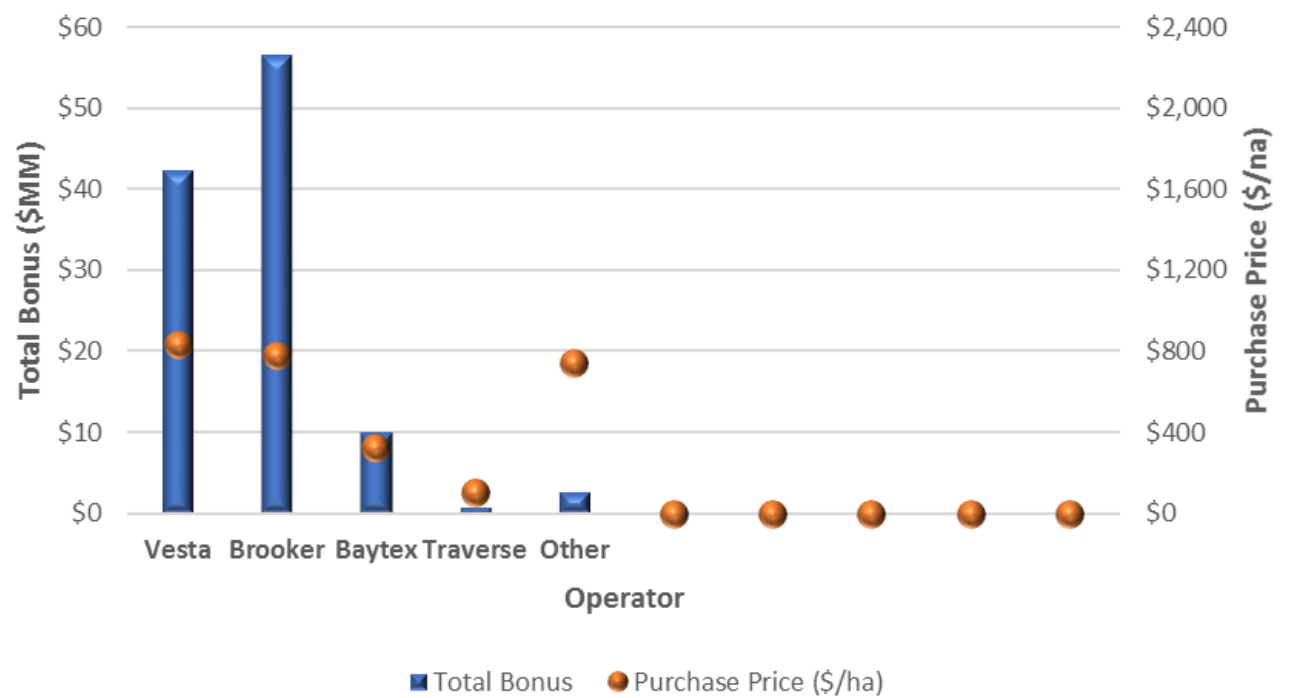
Morningside Sub-Basin Duvernay Operator Land Holdings



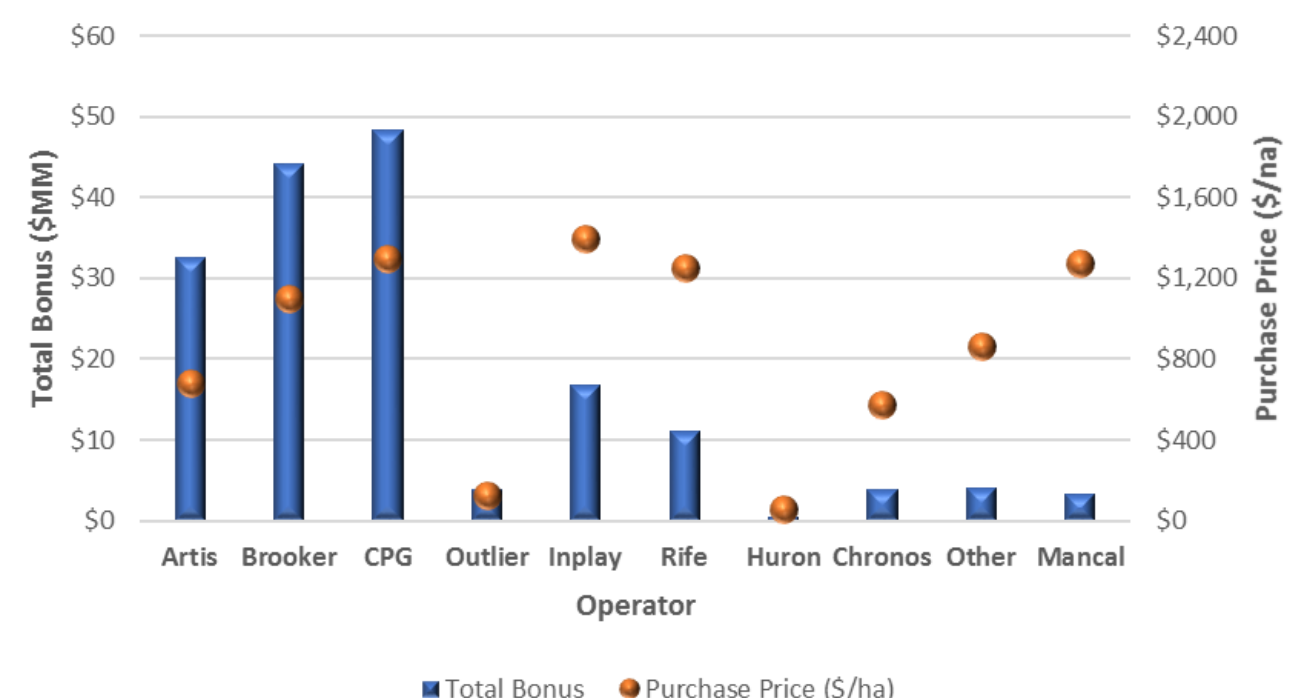
Huxley Sub-Basin Duvernay Operator Land Holdings



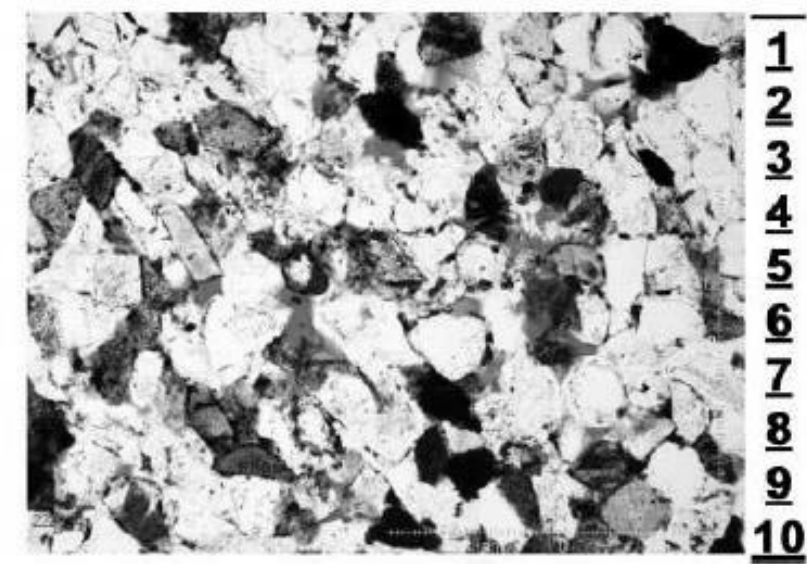
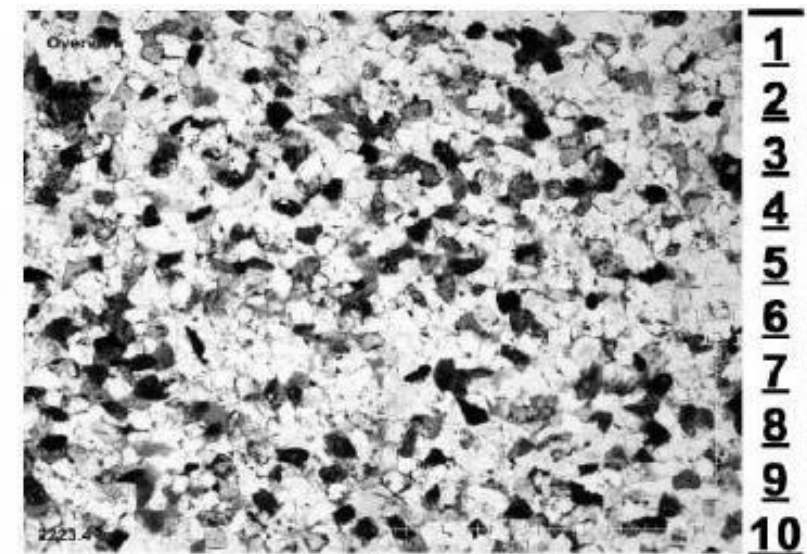
Morningside Sub-Basin Duvernay Operator Crown Acquisition Costs



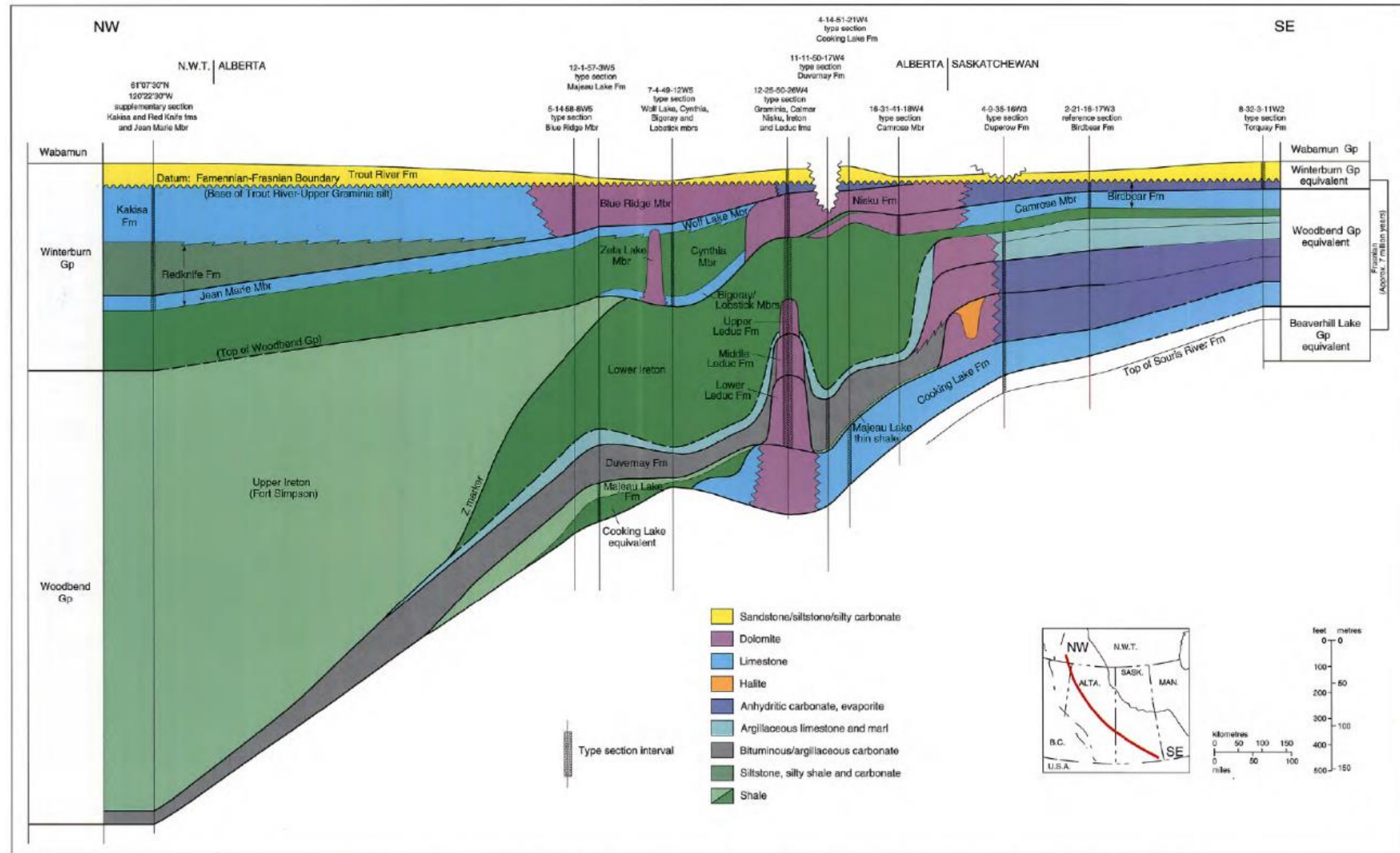
Huxley Sub-Basin Duvernay Operator Crown Acquisition Costs



GEOLOGY



WOODBEND-WINTERBURN STRATA: NW – SE Regional Cross-Section Schematic



WOODBEND-WINTERBURN STRATA: W-E Southern Alberta Cross-Section

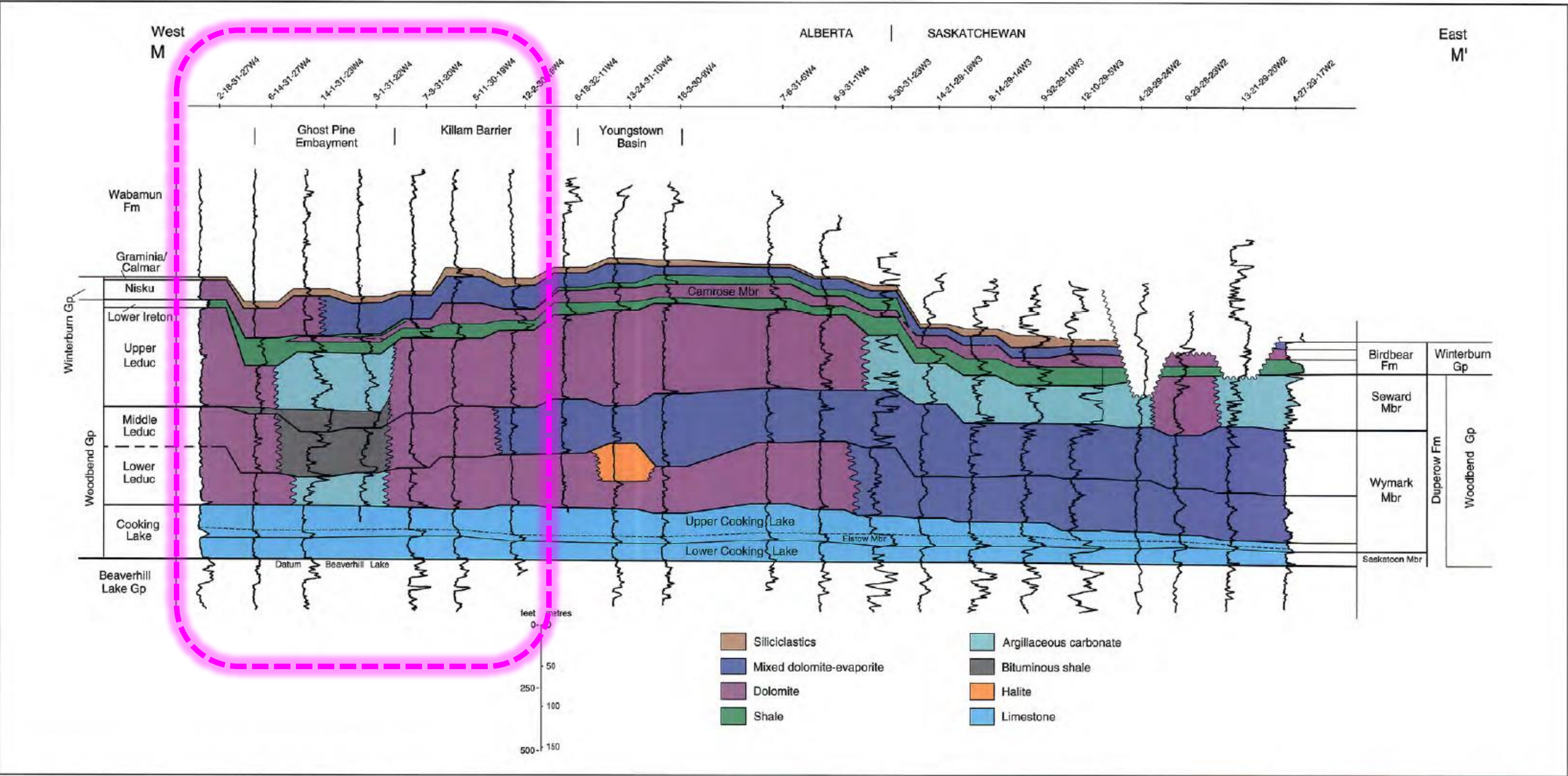
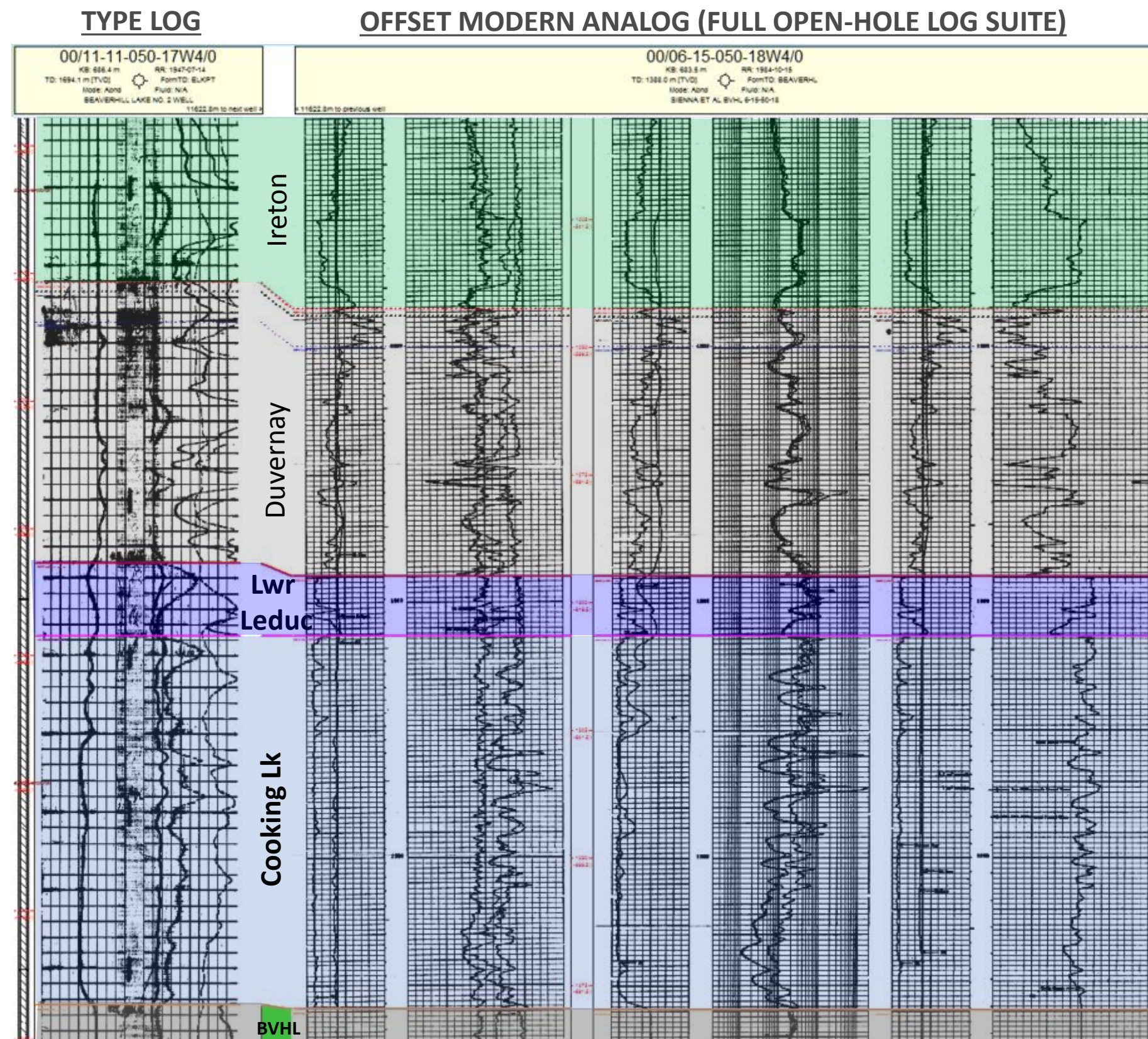


Figure 12.15 West-east cross section M-M', showing Woodbend-Winterburn strata from southern Alberta to Saskatchewan. Note that the Southern Leduc Shelf is divided into three major stages. Log traces are gamma ray. Line of section is shown on Figure 12.11.

DUVERNAY FORMATION INTRODUCTION:

Historic Review (Author: Imperial Oil, 1950)

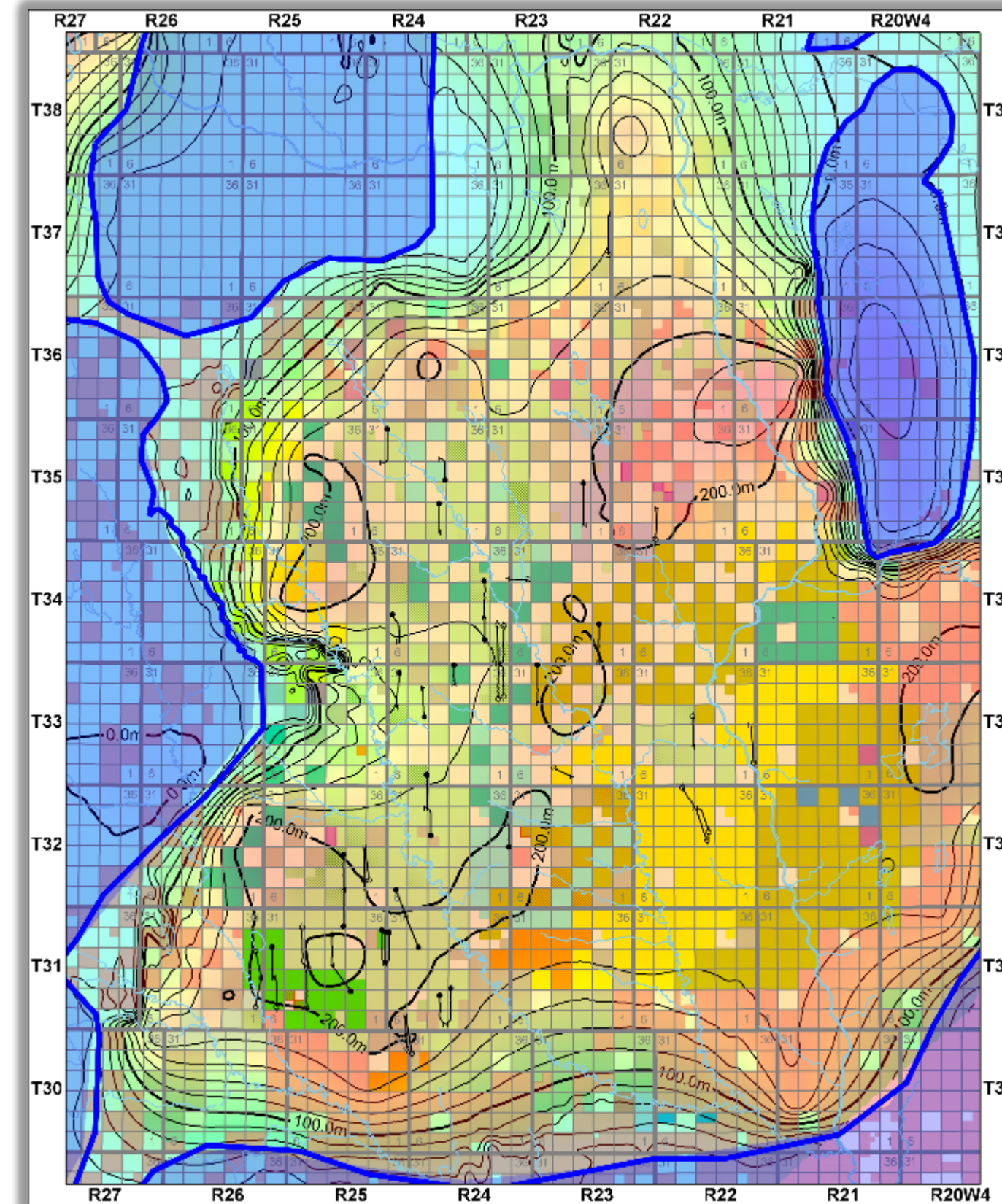
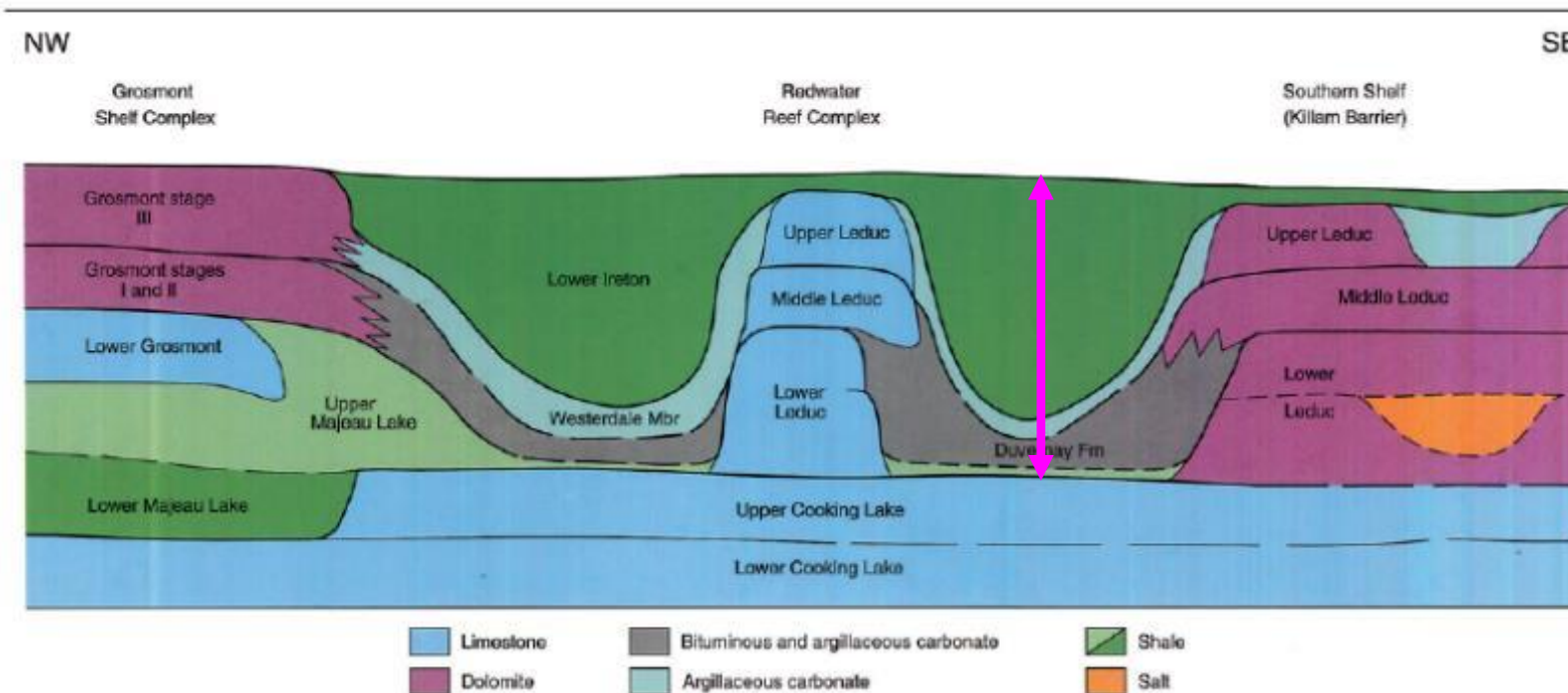
- The Duvernay name was first applied by well-site geologists to describe the brown bituminous shales found in wells drilled in the east-central area of Ab
- The Anglo Canadian Beaverhill Lake No. 2 in 11-11-050-17W4 represents the defined type log for the Duvernay formation, occurring within the interval defined from 1,178 – 1,231 m 03,863 – 4,038 ft); continuous wireline core
- Conformably overlies platform carbonates of the Cooking Lake formation and is the basinal equivalent of surrounding Leduc reef growth peripheral to the East Shale Basin
- Lithology:** Interbedded dark brown bituminous shales, dark brown, black and occasionally grey-green calcareous shales and dense argillaceous limestones. Sediments are characteristically petroliferous and exhibit plane parallel millimeter laminations. Rarely is composed of thin calcarenitic beds and coral rich lime mud accumulations. Disseminated pyrite common with some thin stringers
- Paleontology:** sparse pelagic fauna or tentaculitids, ostracods, conodonts and embryonic brachiopods. Also contains specialized forms such as *Leiorhynchus walcotti*. Bioturbation generally absent.



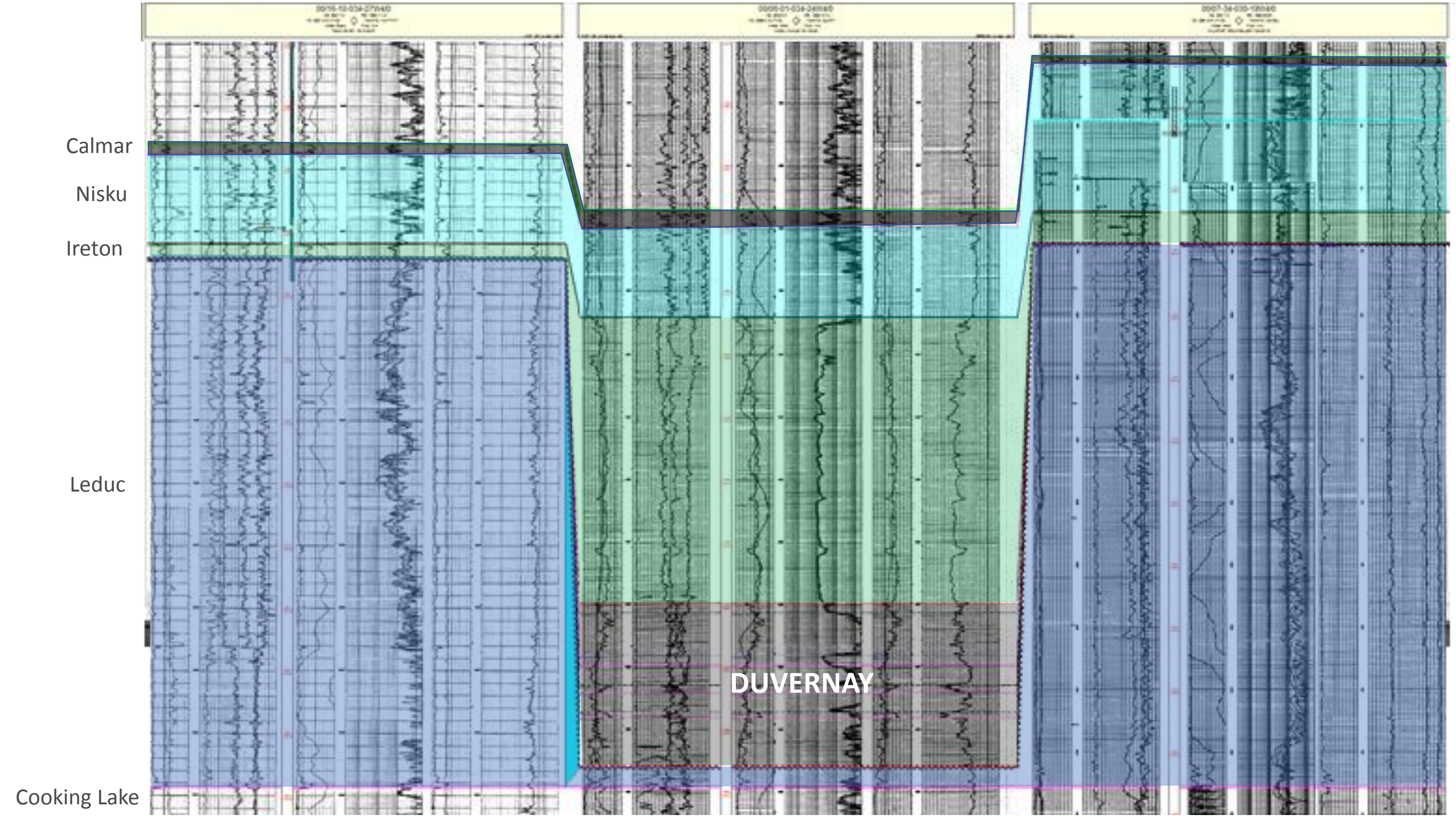
DEPOSITION:

Ireton – Lower Leduc Isopach (CI – 20 m)

- The Duvernay shale is part of the first five chronostratigraphic intervals in the Devonian Woodbend Group, consisting of the Cooking Lake, Majeau Lake/Lower Leduc, Duvernay/Middle Leduc, Lower Ireton/Upper Leduc, and Leduc intervals
- The deposition of the Woodbend group is thought to be consisted of a rapid upbuilding phase of shelf and reefal sediments followed by infilling of basinal areas by shale and marlstones
- The Duvernay sequence is generally represented by the 'basinal infilling' phase, followed by significant growth in the Leduc reefs
- The Duvernay shales are typically non-existent where the Leduc Reefs are known to be present



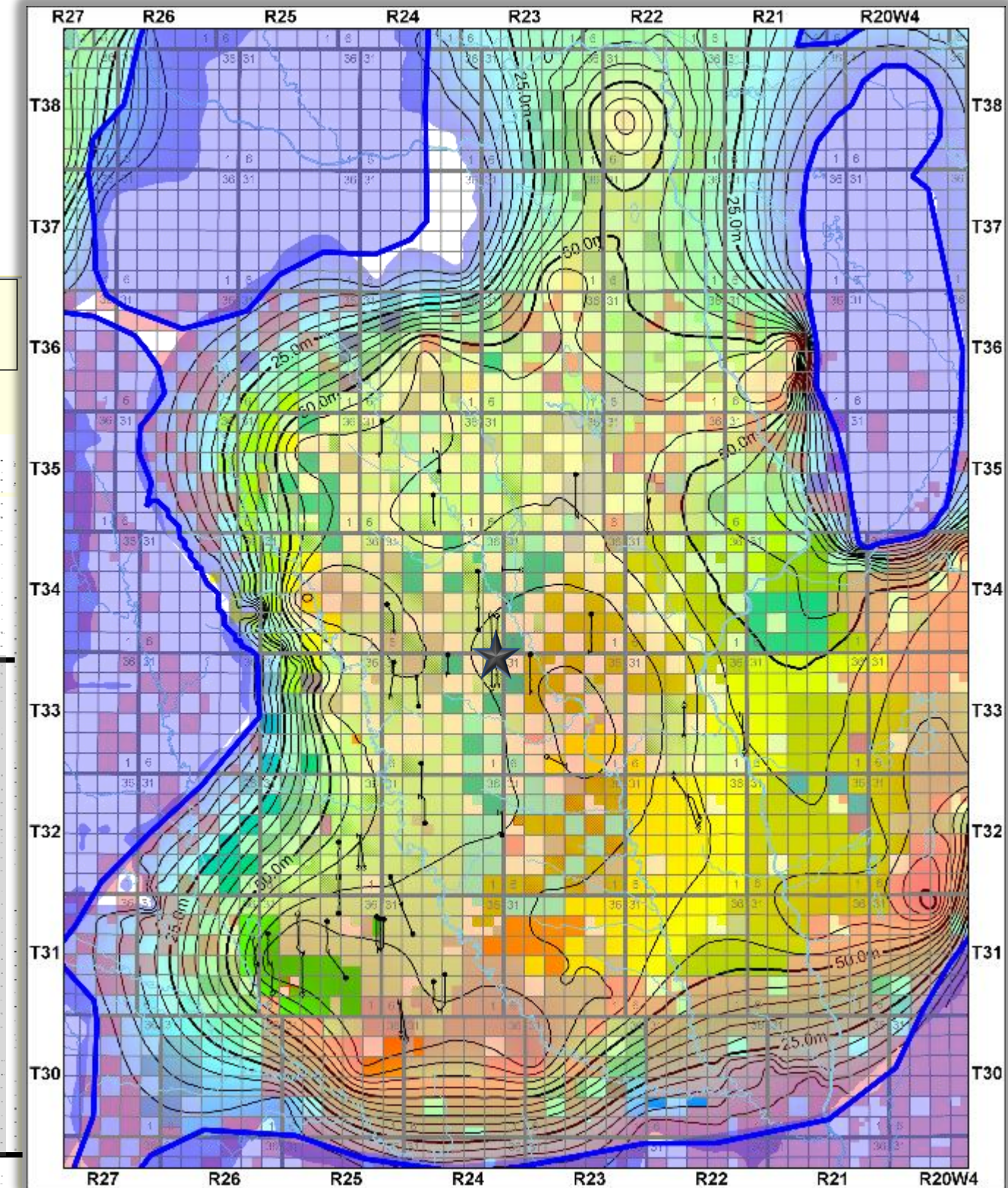
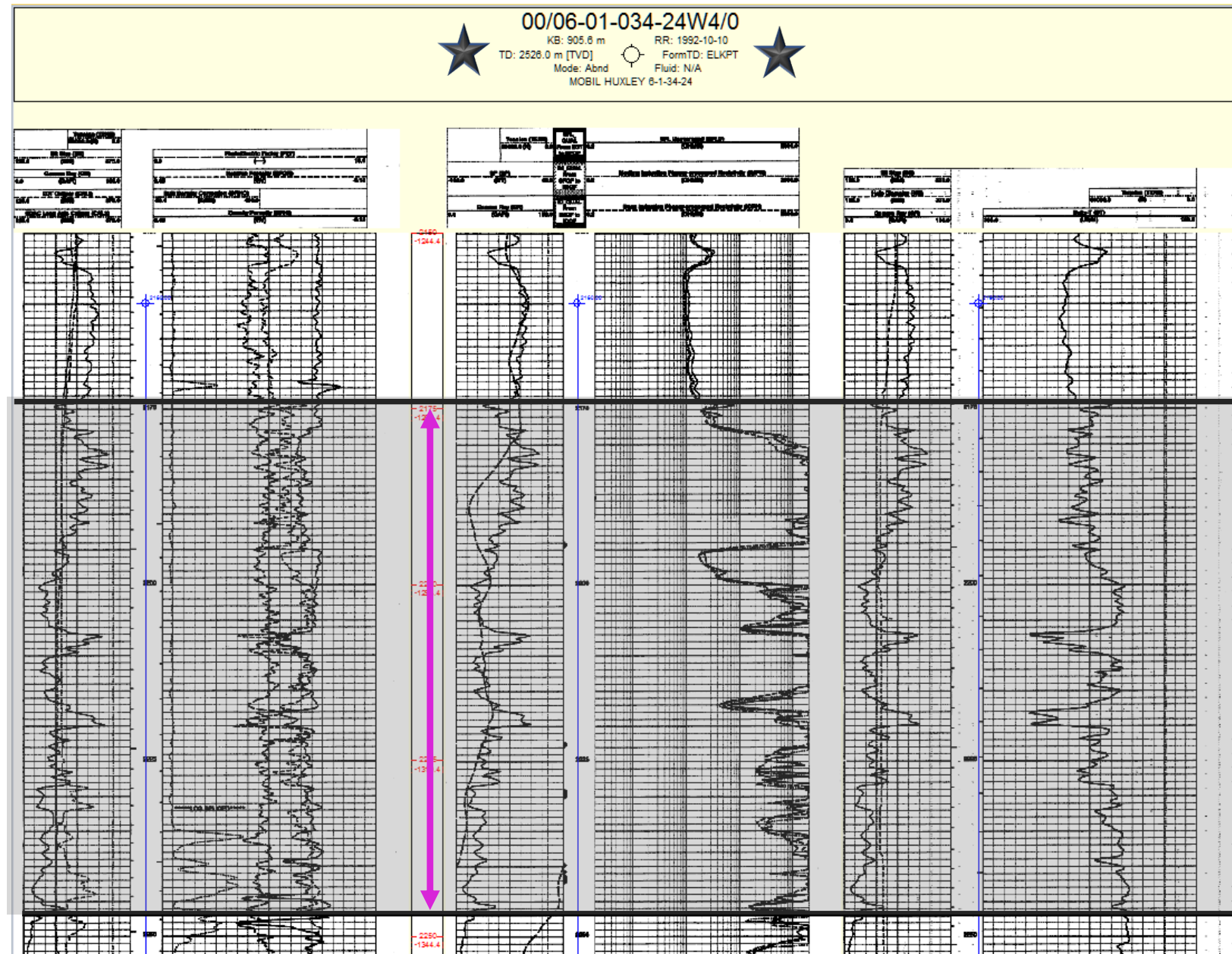
DEPOSITION: GENERAL STRATIGRAPHY



DEPOSITION:

Duvernay-Cooking Lake Isopach (CI = 5 m)

- The gross Duvernay stratigraphic interval ranges from zero (Leduc buildups) to in excess of 75 m (basinal center)
- Variations in observed open-hole log attributes (e.g. clean vs. dirty gamma, high vs. low resistivity) indicate variations in depositional attributes within the gross Duvernay stratigraphic interval



Operator - Artis Exploration (2016-08)

- [illegible]



SPEERS **EDGE**
Consulting Ltd.

- 02/14-19-033-24W4/0**

KB: 892.6 m RR: 2017-10-28
 TD: 2384.8 m [TVD] FormTD:
 Mode: Abd Whip Fluid: N/A
 ARTIS HZ 102 TWINING 14-19-33-24

DUVERNAY CAP
 2236.20m MD / 2235.97m TVD - 1343.37m subsea

2235-2240 LS(100%): tenal sl gy brn, lt-m gy ipt, rr crm-wh frags, predly micl mdst, nr vltin ls lams & strgs, variably arg, sp mrlly lams & strgs, rr vltin Pyt, p rthy pot; SH(1%): m-dk gy, blk ipt, blkly-stfns, mic lam, calc, mod stf, blns.

DUVERNAY 1 (ORGANIC)
 2239.80m MD / 2239.57m TVD - 1346.97m subsea

2240-2250 LS(85%): predly ten to sl gy brn, lt-m gy ipt, rr wh frags, predly micl mdst, tr vltin ls lams & strgs, variably arg, tr mrlly-shy lams & strgs, rr chky bdt, rr vltin & v r nod Pyt, p rthy pot; SH(15%): m-dk gy, blk, blkly-stfns, mic lam, calc, mod stf, sl blns ipt.

DUVERNAY 2 (CLAY RICH ZONE)
 2255.60m MD / 2255.36m TVD - 1362.76m subsea

2250-2255 LS(90%): predly ten to sl gy brn, lt-m gy ipt, rr wh frags, predly micl mdst, tr vltin ls lams & strgs, variably arg, mrlly to shy lams & strgs, rr chky bdt, rr vltin & v r nod Pyt, p rthy pot; SH(10%): m-dk gy, blk, blkly-stfns, mic lam, calc, mod stf, sl blns ipt.

DUVERNAY 3 (MIDDLE CARBONATE)
 2257.40m MD / 2257.16m TVD - 1364.56m subsea

2250-2270 LS(90%): predly ten to sl gy brn, lt-m gy ipt, rr wh frags, predly micl mdst, tr vltin ls lams & strgs, variably arg, mrlly to shy lams & strgs, rr chky bdt, mrlly nod & v r nod Pyt, p rthy pot; SH(10%): m-dk gy, blk, blkly-stfns, mic lam, calc, mod stf, sl blns ipt.

2270-2280 LS(90%): predly ten to sl gy brn, lt-m gy ipt, rr wh frags, predly micl mdst, tr vltin ls lams & strgs, variably arg, mrlly to shy lams & strgs, rr chky bdt, mrlly nod & v r nod Pyt, p rthy pot; SH(10%): m-dk gy, blk, blkly-stfns, mic lam, calc, mod stf, sl blns ipt.

Core #1 2235-2280m 45m Cut & Recovered.

2280-2290 LS(90%): predly ten to sl gy brn, lt-m gy ipt, rr wh frags, predly micl mdst, tr vltin ls lams & strgs, variably arg, mrlly to shy lams & strgs, rr chky bdt, mrlly nod & v r nod Pyt, p rthy pot; SH(10%): m-dk gy, blk, blkly-stfns, mic lam, calc, mod stf, sl blns ipt.

2290-2300 LS(95%): predly ten to sl gy brn, lt-m gy ipt, rr wh frags, predly micl mdst, tr vltin ls lams & strgs, variably arg, mrlly to shy lams & strgs, rr chky bdt, mrlly nod & v r nod Pyt, p rthy pot; SH(5%): m-dk gy, blk, blkly-stfns, mic lam, calc, mod stf, sl blns ipt.

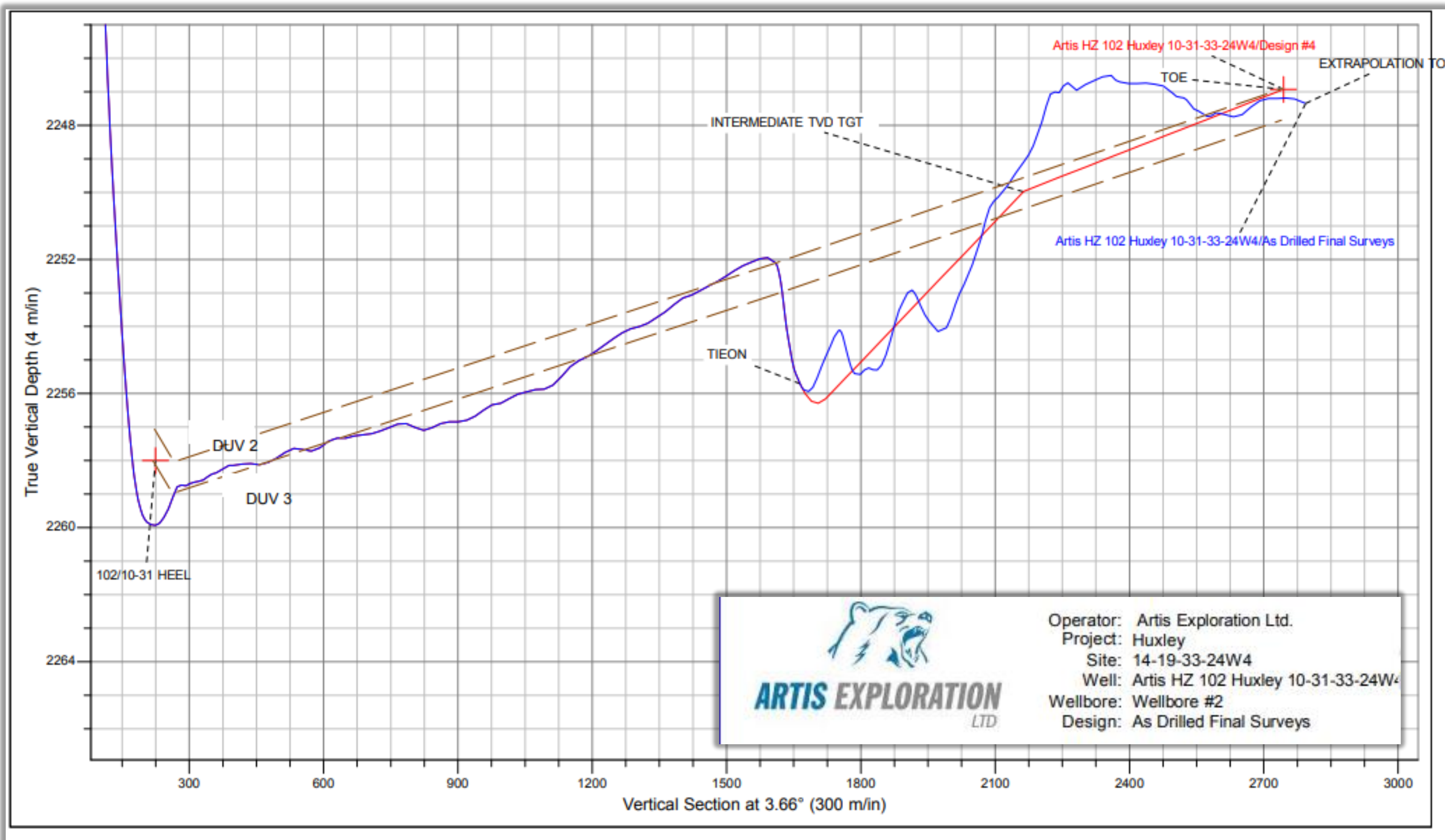
2300-2305 LS(95%): predly ten to sl gy brn, lt-m gy ipt, rr wh frags, predly micl mdst, tr vltin ls lams & strgs, variably arg, mrlly to shy lams & strgs, rr chky bdt, mrlly nod & v r nod Pyt, p rthy pot; SH(5%): m-dk gy, blk, blkly-stfns, mic lam, calc, mod stf, sl blns ipt.

COOKING LAKE
 2307.20m MD / 2306.96m TVD - 1414.36m subsea

2305-2310 LS(100%): lt-m brn, gy brn, mrlly to mgy, micl to vltin mdst & wkst, tr dol strgs, pos biocl frags, ipt fl, sp p mtl & pp por, ipt blns.

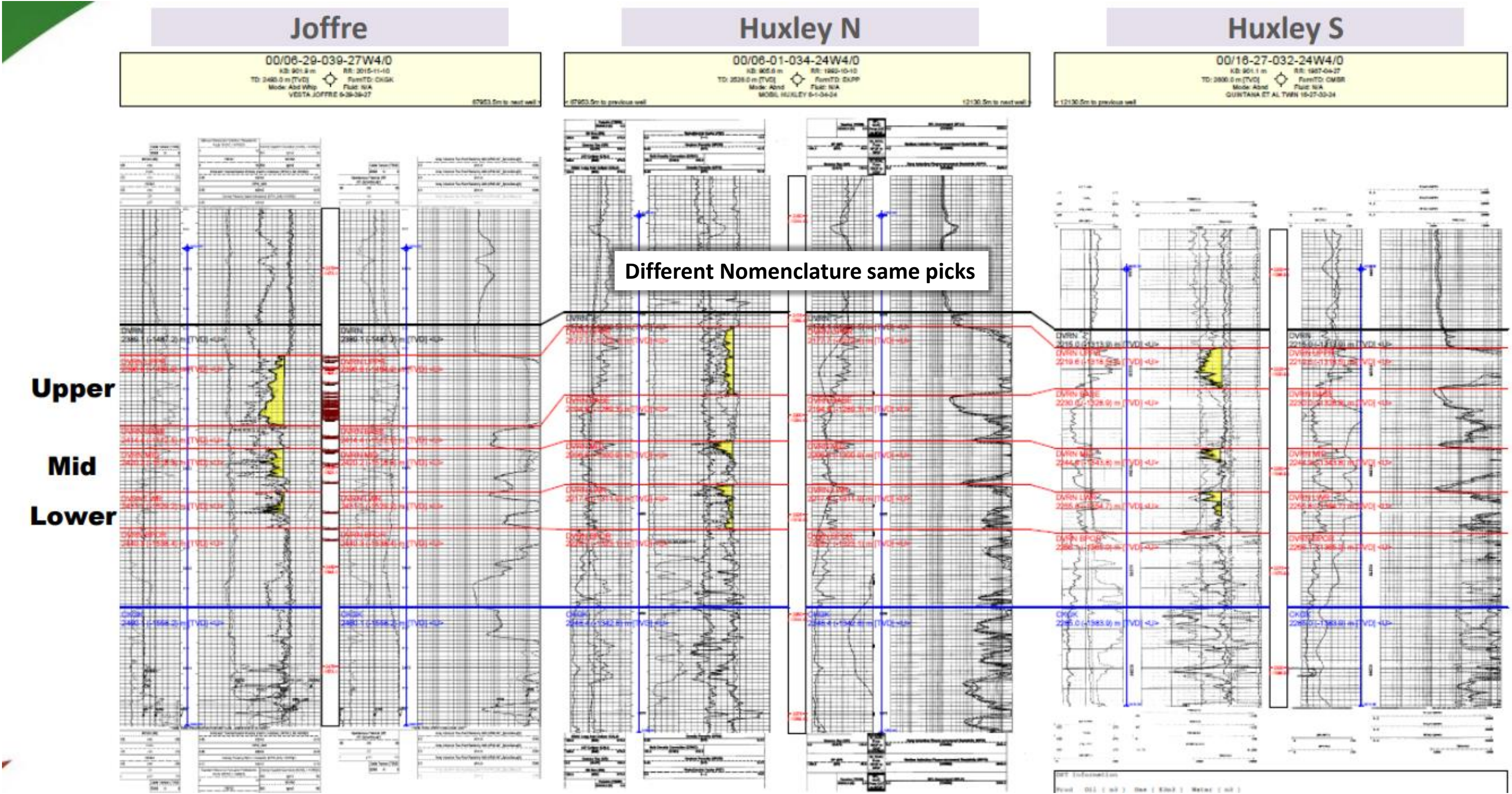
PLANNED VS. ACTUAL WELL PATH:

Artis Exploration 102/10-31-033-24W4/2



DUVERNAY STRATIGRAPHY & NOMENCLATURE:

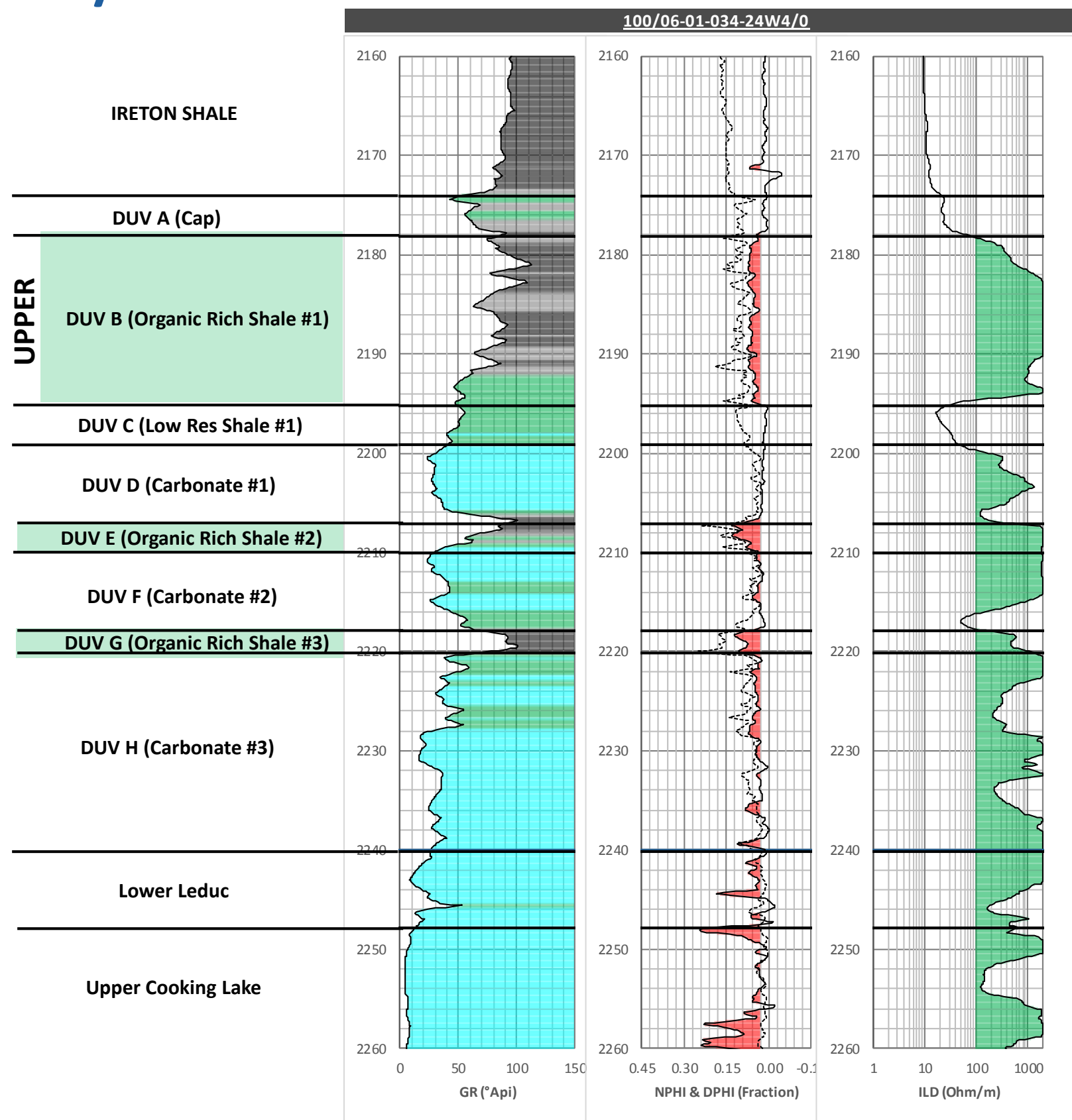
Operator - InPlay Oil



DUVERNAY STRATIGRAPHY & NOMENCLATURE:

Project Type Log – 00/06-01-34-24W4/0

- Stratigraphic subdivision of the Duvernay formation integrated both log and core attributes to subdivide the gross stratigraphic interval into 9 identifiable intervals for mapping purposes
- Nomenclature defined based on major offset operator's (e.g. Artis Exploration) was implemented to eliminate confusion



UPPER DUVERNAY DEPOSITION:

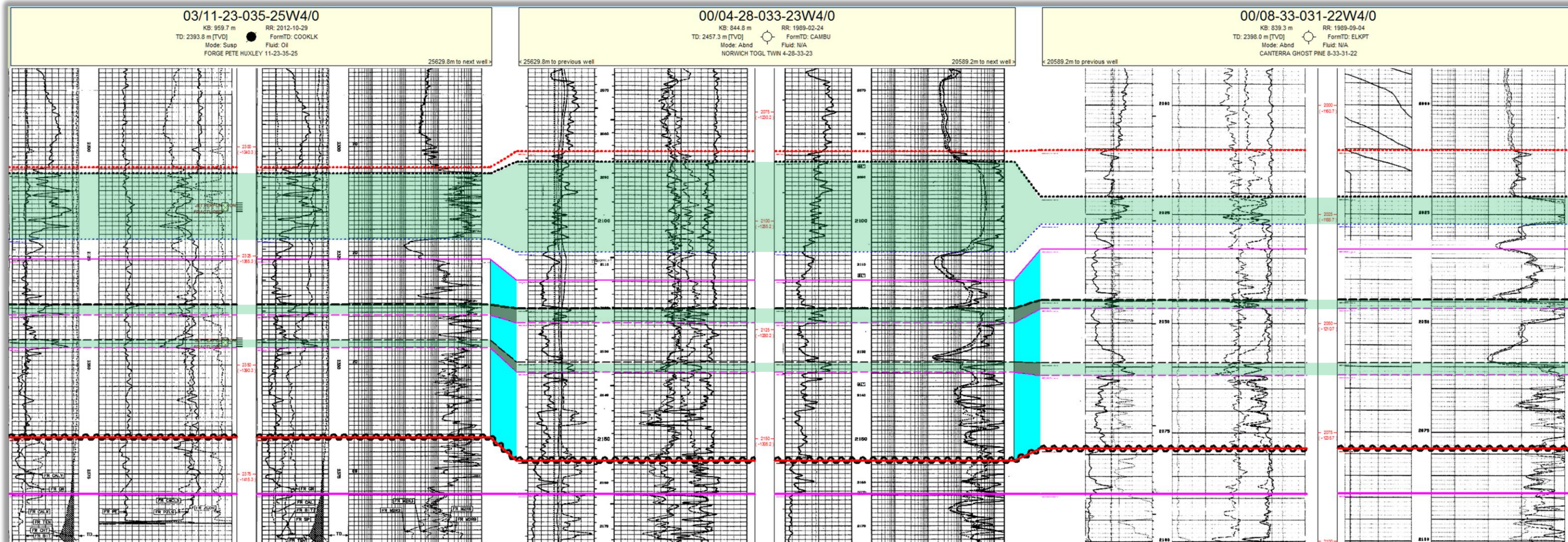
Project Reference Cross-Section

- Across the project area, the Duvernay is represented by at least two major lithologic variations comprising the gross 75 m thick package
- Alternating layers of highly radioactive, porous, organic-rich shales present significantly different open-hole log signatures than dense, argillaceous limestone
- Thickest accumulation of organic-rich shale appears near the very top of the Duvernay gross stratigraphic interval with an addition two, significantly thinner, organic-rich shales found within the middle and lower portions of the stratigraphic package

Organic-Rich Shale



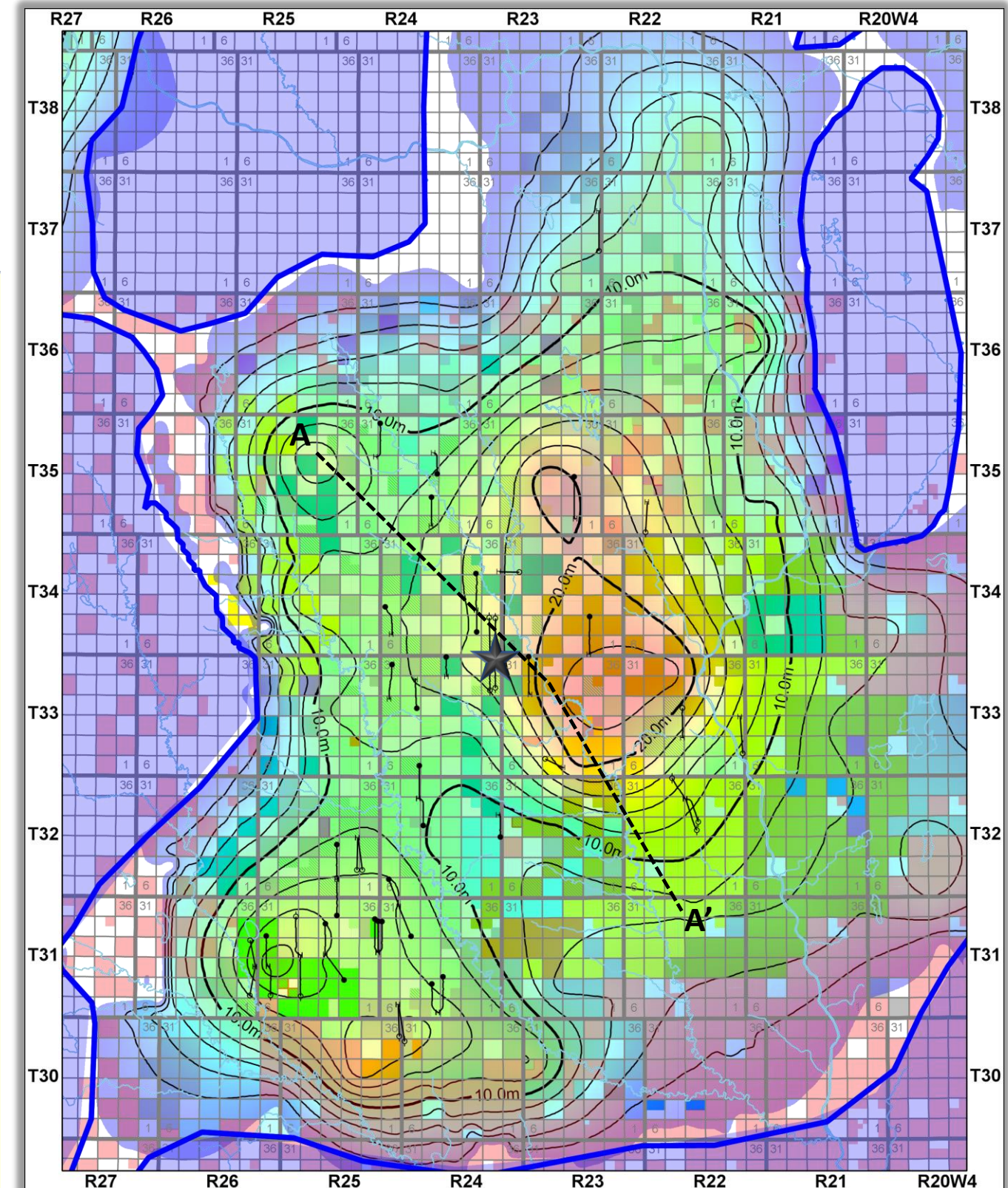
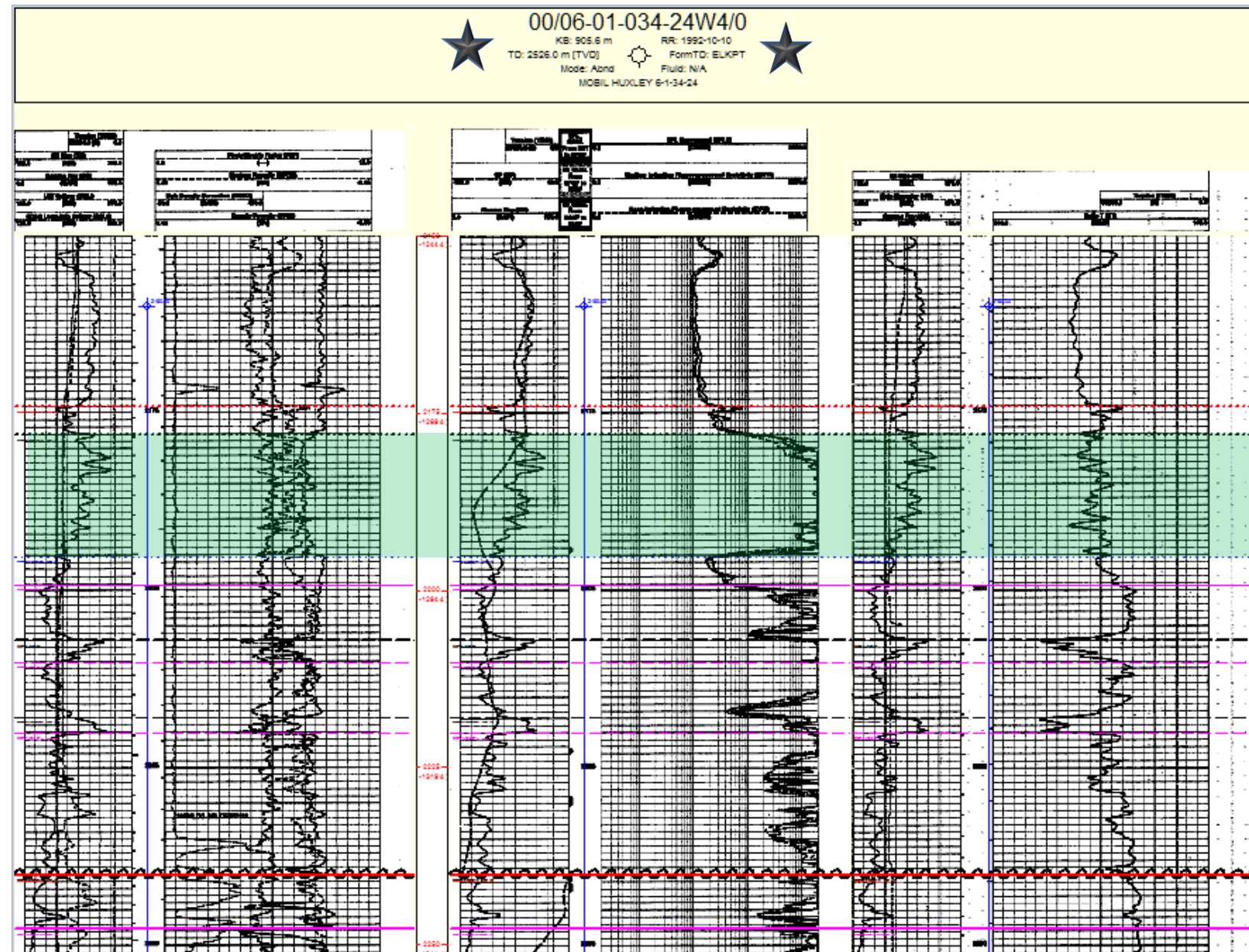
Limestone



PRIMARY ZONE OF INTEREST:

Upper Duvernay Gross Isopach (CI = 2.0 m)

- The Upper Duvernay (“Duvernay B Organic Rich Shale #1”) represents the primary geologic target to date, with all horizontal wellbores targeting this defined interval
- The Upper Duvernay zone ranges from zero (Leduc buildups) to in excess of 22 m within Township 033 Range 23 W4M

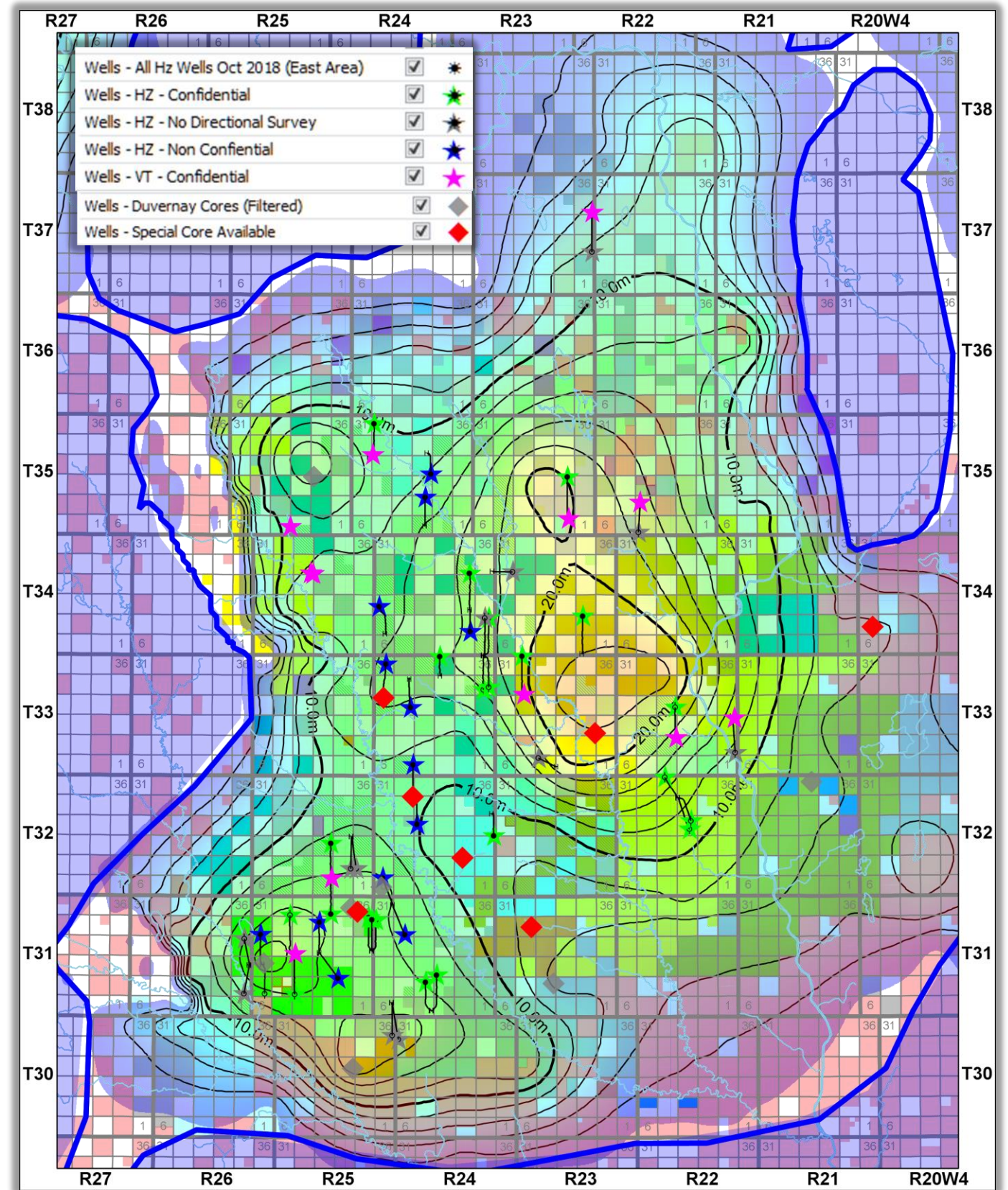


RESERVOIR ATTRIBUTES:

Core Availability & Special Testing

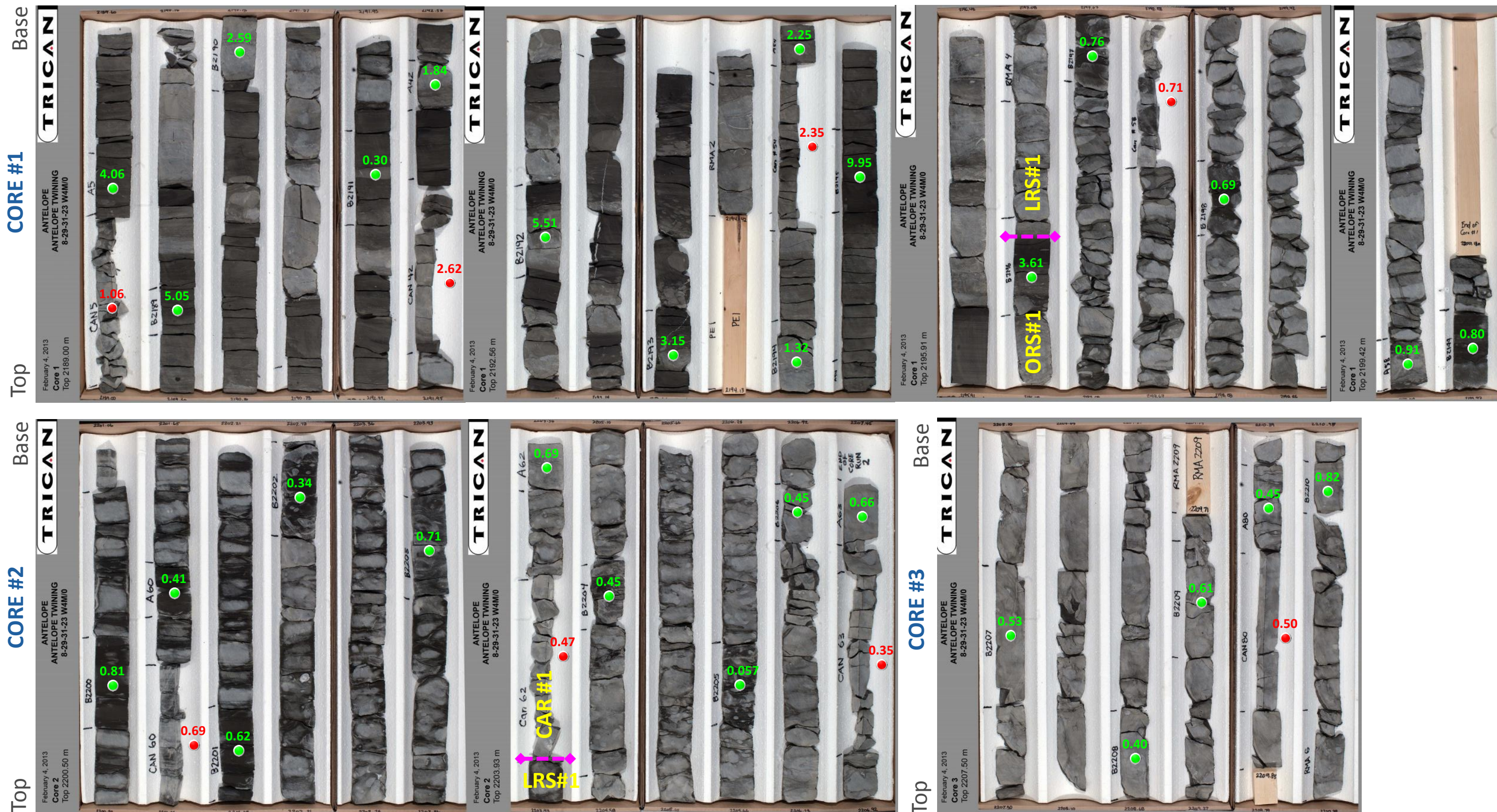
- Duvernay core analysis can be segregated into two major categories: historic (routine analysis) & modern (special analysis)
- Special core analysis collected and analyzed included any information relating to porosity/permeability, pyrolysis, mineralogy, gas/oil composition, etc.
- Data must be collected in a digital format which can be integrated into multiple independent software systems

UWI	Vintage	ZONE	LENGTH (m)	TESTING/ANALYSIS
00/08-22-030-25W4/0	Old	Silt/ORS #1	15.2	none
00/13-05-030-26W4/0	Old	Lwr Leduc	7.0	routine
00/09-09-031-23W4/0	Old	ORS #3	1.5	none
00/08-29-031-23W4/0	New	ORS#1-Lwr Leduc	57.3	Full Pics, Special Analysis
02/10-18-031-25W4/0	New	Ireton - Carb #2	54.0	Routine
00/08-35-031-25W4/0	Old	Ireton-Carb #3	171.4	Routine
00/04-36-031-25W4/0	Old	Carb #1 - Carb #2	18.3	Routine, Special Analysis
00/10-34-032-21W4/0	Old	Ireton - Cooking	308.0	none
02/06-06-032-24W4/0	Old	Carb #1 - Carb #2	18.0	none
00/14-11-032-24W4/0	Old	Carb #1 - Carb #3	24.0	Special Core
00/06-30-033-21W4/0	Old	Lwr Leduc	24.0	none
02/01-14-033-23W4/0	New	Silt - Lwr Led	72.0	Special Core
00/07-07-034-20W4/0	Old	Carb #1	9.1	Special Core
00/04-29-034-20W4/0	Old	Lwr Leduc	9.0	none
00/01-11-034-21W4/0	Old	Lwr Leduc	9.0	none
00/12-06-035-20W4/0	Old	ORS/Upr Led ???	8.0	none
02/15-08-035-23W4/0	Old	Cook	10.0	none
00/13-14-035-25W4/0	Old	Ireton-Cook	100.0	none
00/16-29-032-24W4/0	New	????	53.0	Special Core
02/14-19-033-24W4/0	New	Silt/Carb #3	44.0	Special (No Data Yet)



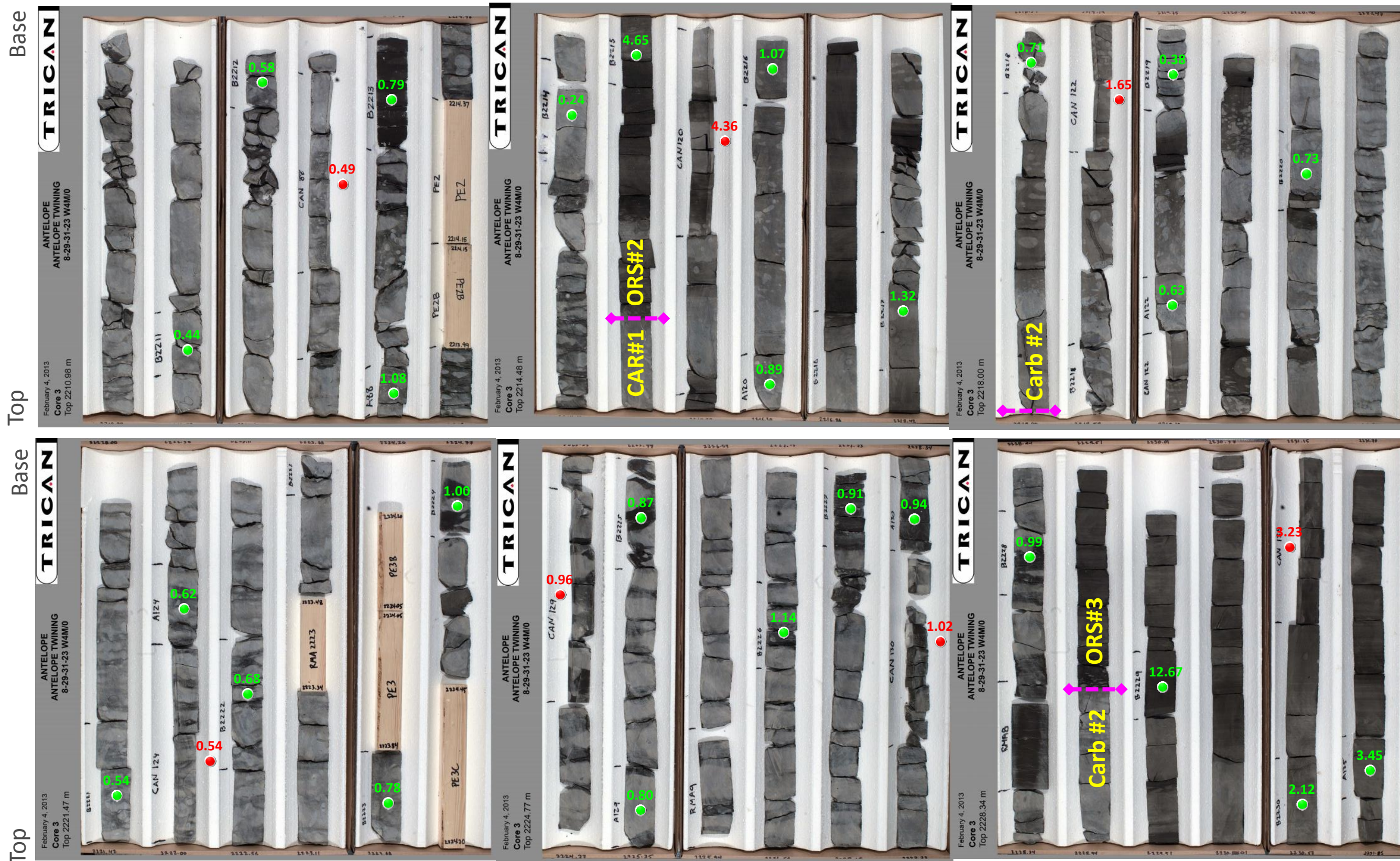
RESERVOIR ATTRIBUTES:

Core Inspection – 00/08-29-031-23W4/0 (1 of 3)



RESERVOIR ATTRIBUTES:

Core Inspection – 00/08-29-031-23W4/0 cont... (2 of 3)



RESERVOIR ATTRIBUTES:

Core Inspection – 00/08-29-031-23W4/0 cont... (3 of 3)

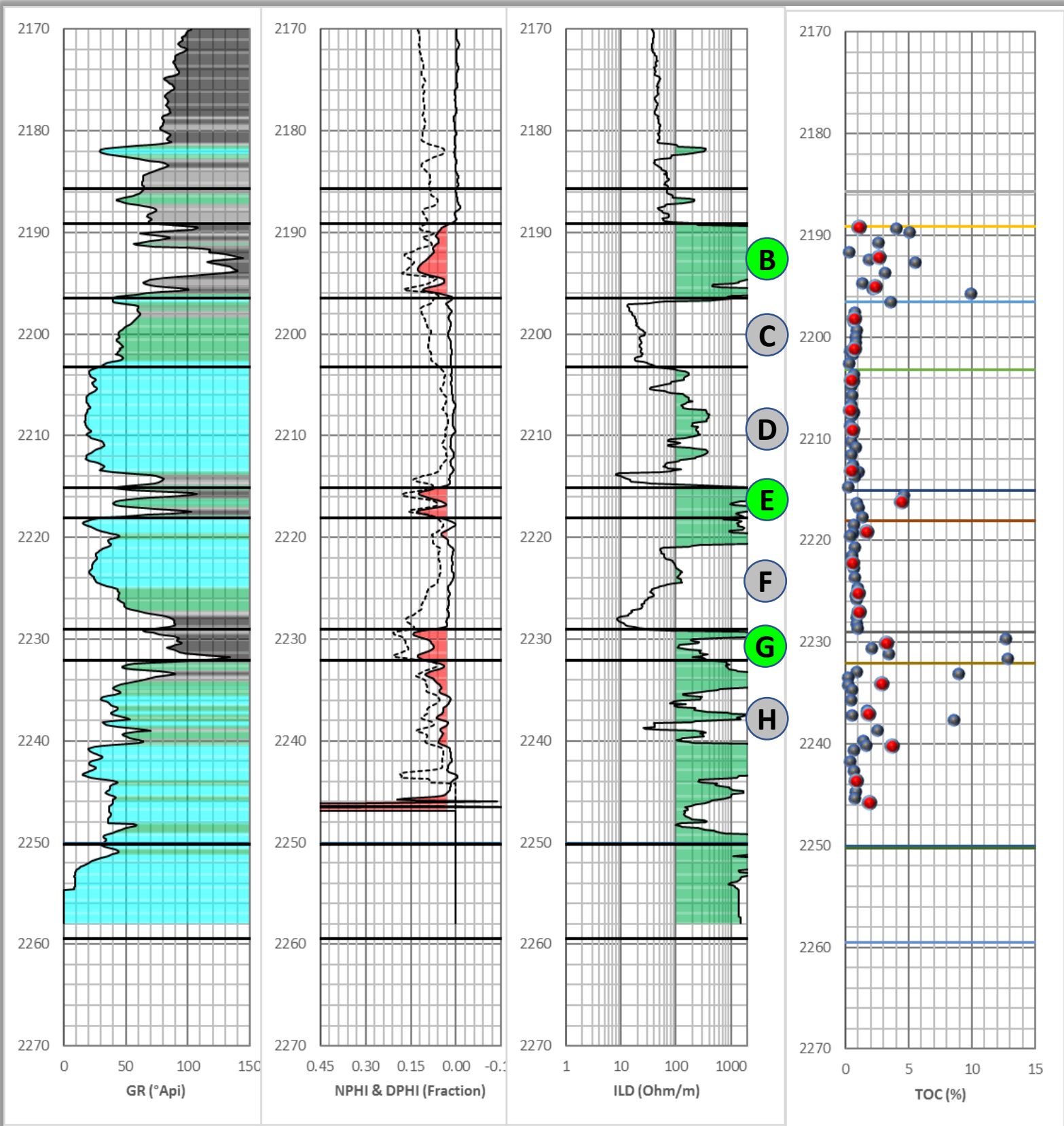
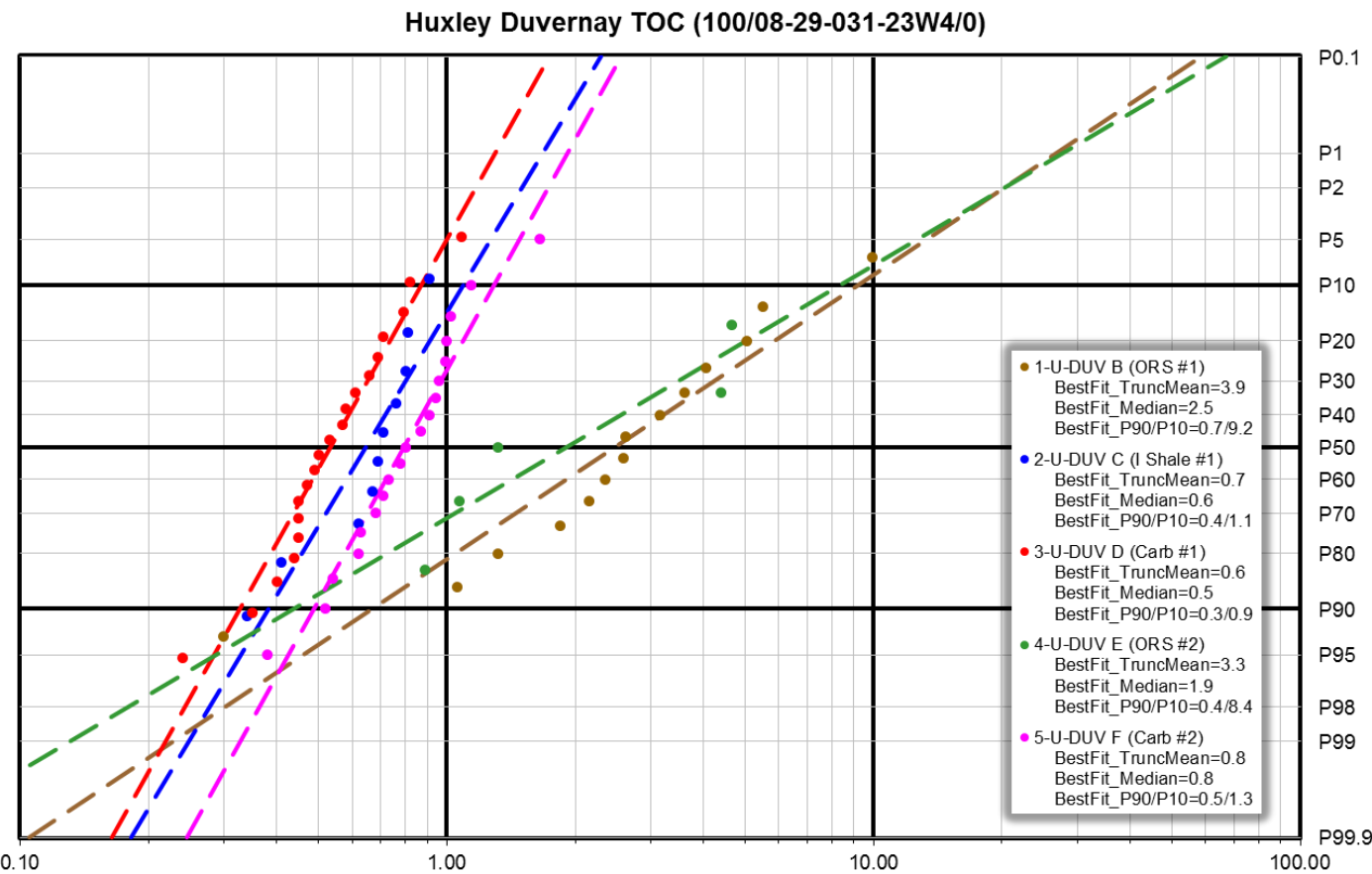


RESERVOIR ATTRIBUTES:

Total Organic Carbon (TOC%) - 00/08-29-031-23W4/0

- TOC analysis on the 100/08-29-031-23W4/0 confirms original stratigraphy and nomenclature based on organic vs. inorganic rich intervals which are clearly identifiable on geophysical logs (e.g. high-gamma, density porosity & resistivity = high TOC)

ZONE	FORMATION	Avg	Min	Max	# Samples	Smp Density (#/m)
B	U-DUV B (ORS #1)	3.25	0.30	9.95	14	0.53
C	U-DUV C (I Shale #1)	0.67	0.34	0.91	10	0.67
D	U-DUV D (Carb #1)	0.56	0.24	1.08	20	0.60
E	U-DUV E (ORS #2)	2.46	0.89	4.65	5	0.60
F	U-DUV F (Carb #2)	0.84	0.38	1.65	19	0.57
G	U-DUV G (ORS #3)	6.86	2.12	12.85	5	0.62
H	U-DUV H (Carb #3)	1.87	0.25	8.98	23	0.78

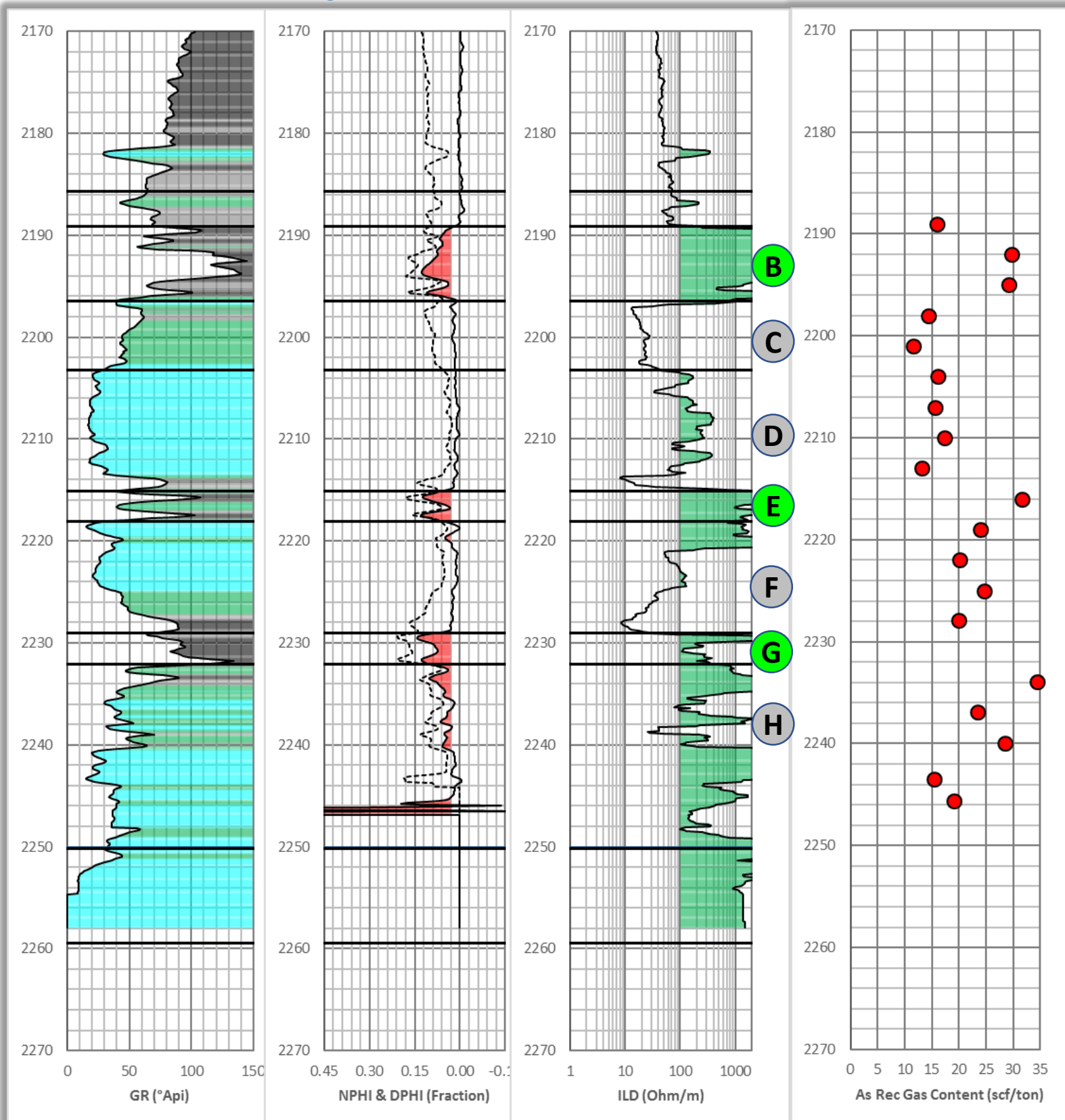
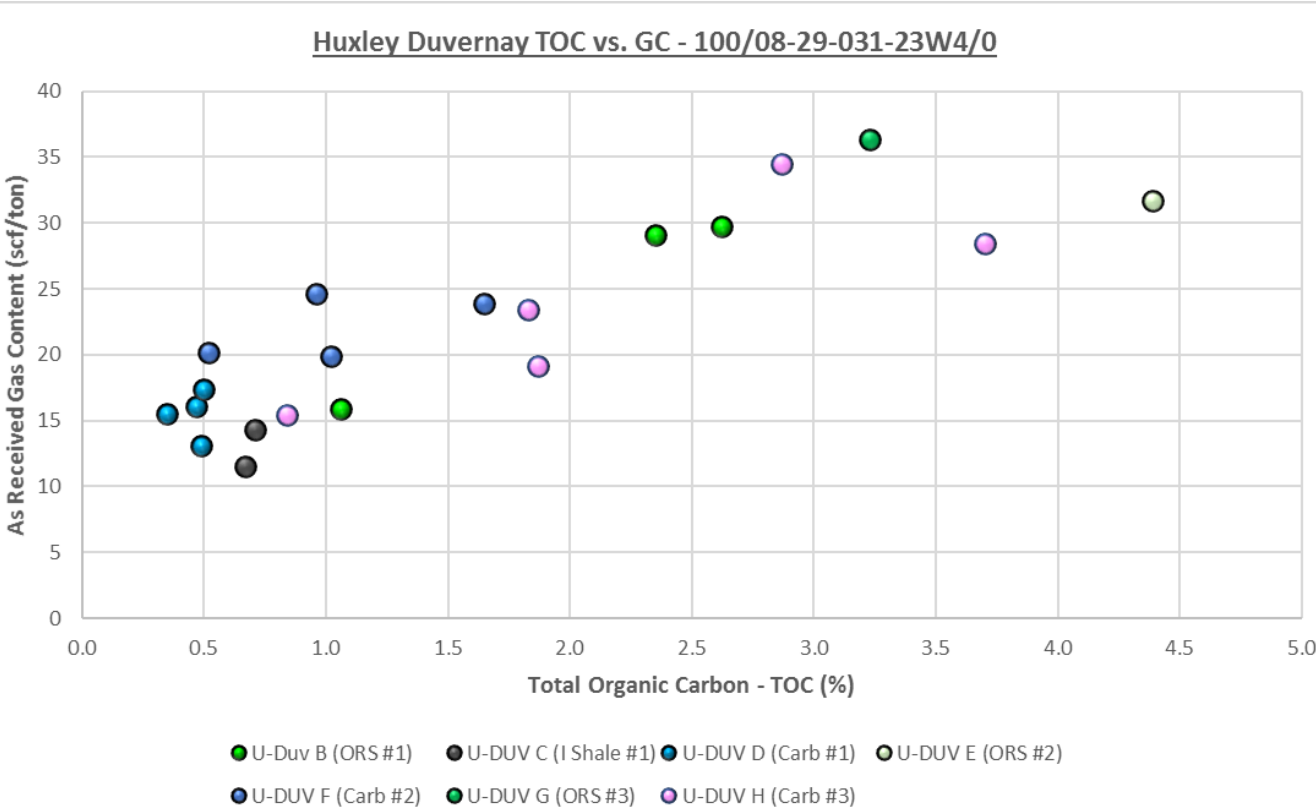


RESERVOIR ATTRIBUTES:

As Received Gas Content - 00/08-29-031-23W4/0

- Twenty canister core data points were analyzed throughout the entire Duvernay formation....as expected, the stratigraphic intervals with the highest TOC displayed the overall highest as received gas content

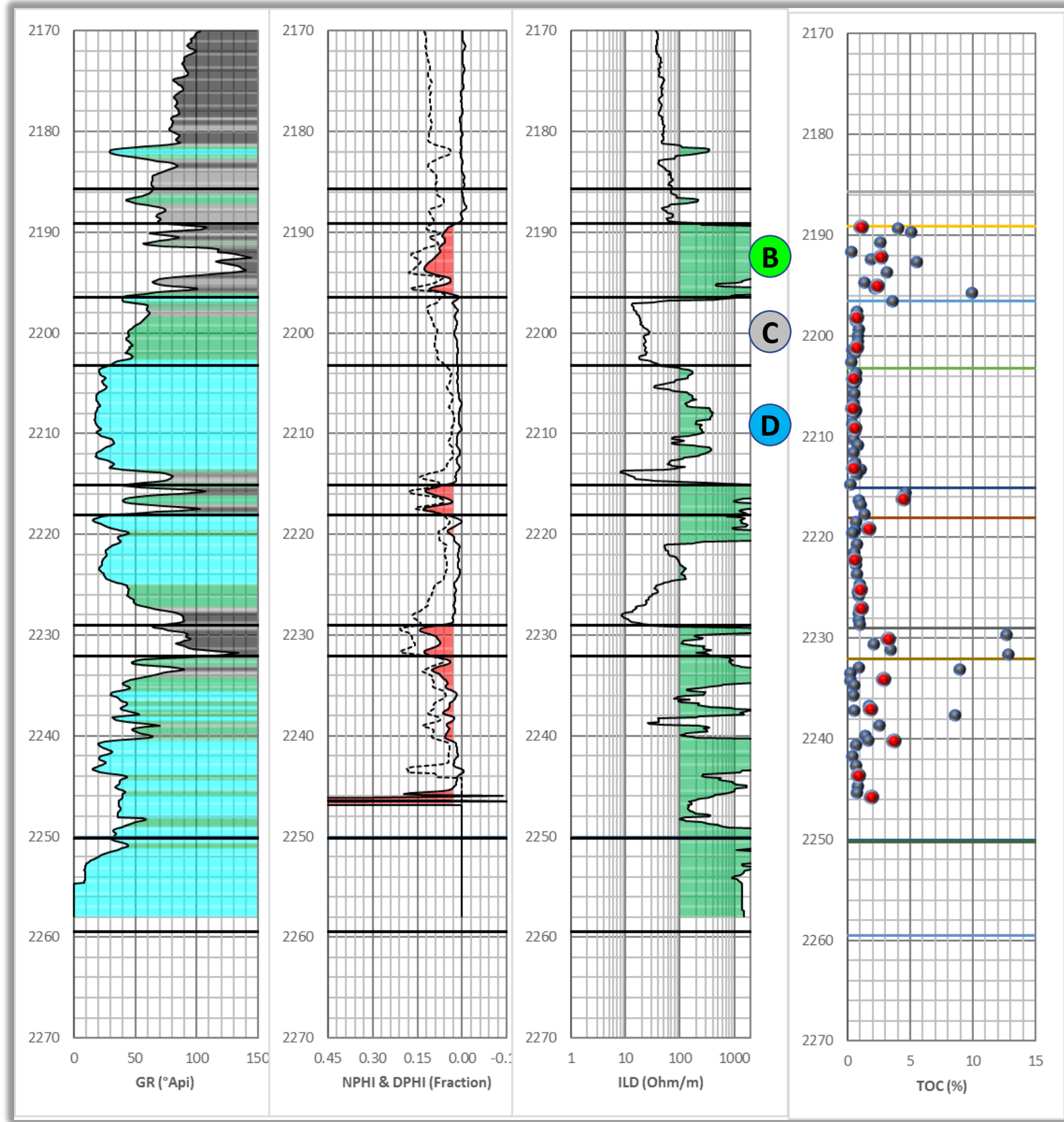
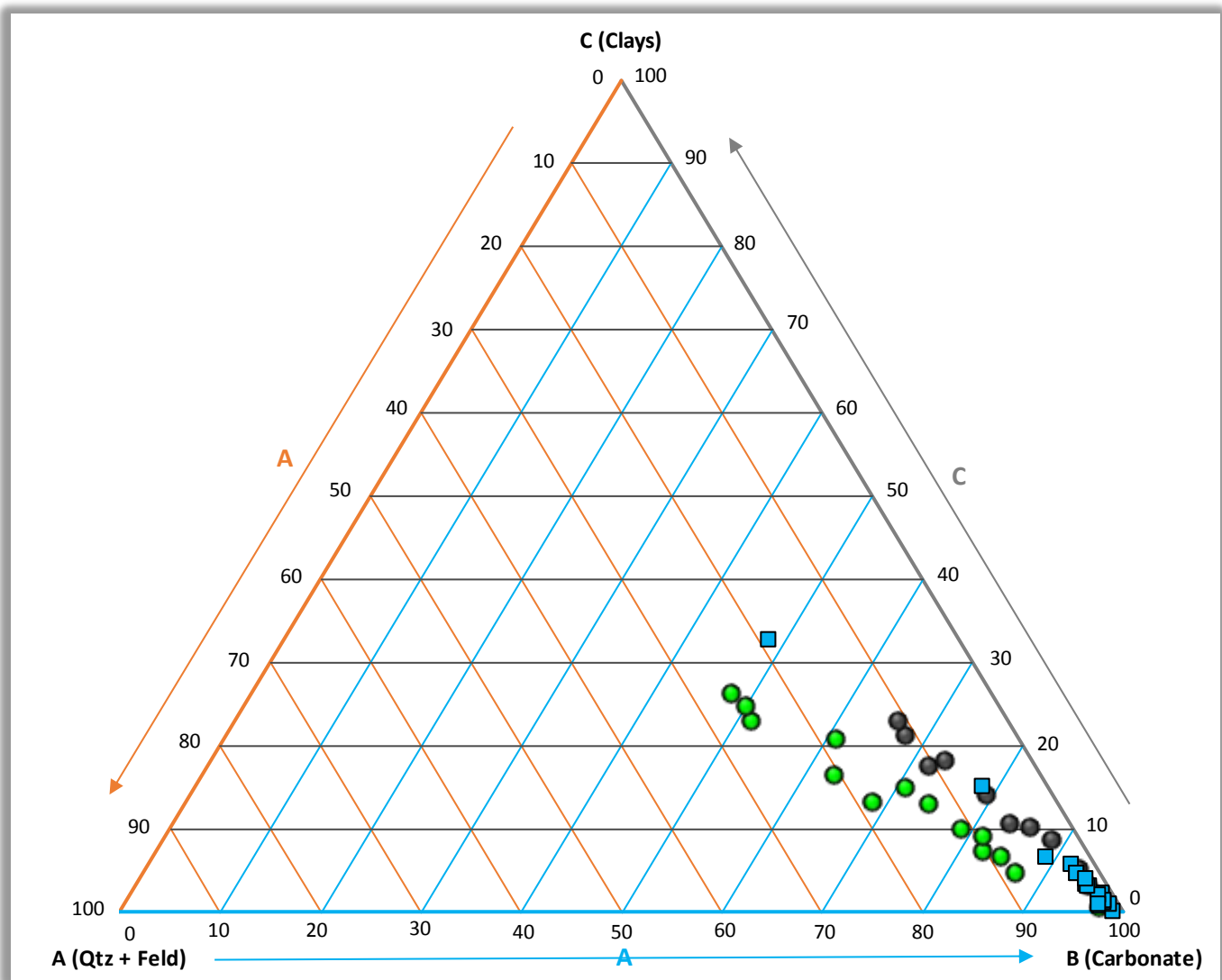
ZONE	FORMATION	Avg	Min	Max	# Samples	Smp Density (#/m)
B	U-Duv B (ORS #1)	24.9	15.9	29.7	3	0.41
C	U-DUV C (I Shale #1)	12.9	11.5	14.3	2	0.30
D	U-DUV D (Carb #1)	15.5	13.1	17.4	4	0.34
E	U-DUV E (ORS #2)	31.7	31.7	31.7	1	0.33
F	U-DUV F (Carb #2)	22.2	19.9	24.6	4	0.36
G	U-DUV G (ORS #3)	36.3	36.3	36.3	1	0.33
H	U-DUV H (Carb #3)	24.2	15.4	34.5	5	0.54



RESERVOIR ATTRIBUTES:

Mineralogy (XRD Analysis) - 00/08-29-031-23W4/0

- XRD analysis across the three main stratigraphic intervals defined as the DUV B (Organic Rich Shale #1), DUC C (Low Res Shale #1) and the DUV D (Carbonate #1) plotted on a ternary diagram further confirms contrasting mineralogic composition
- In addition, quartz within the system



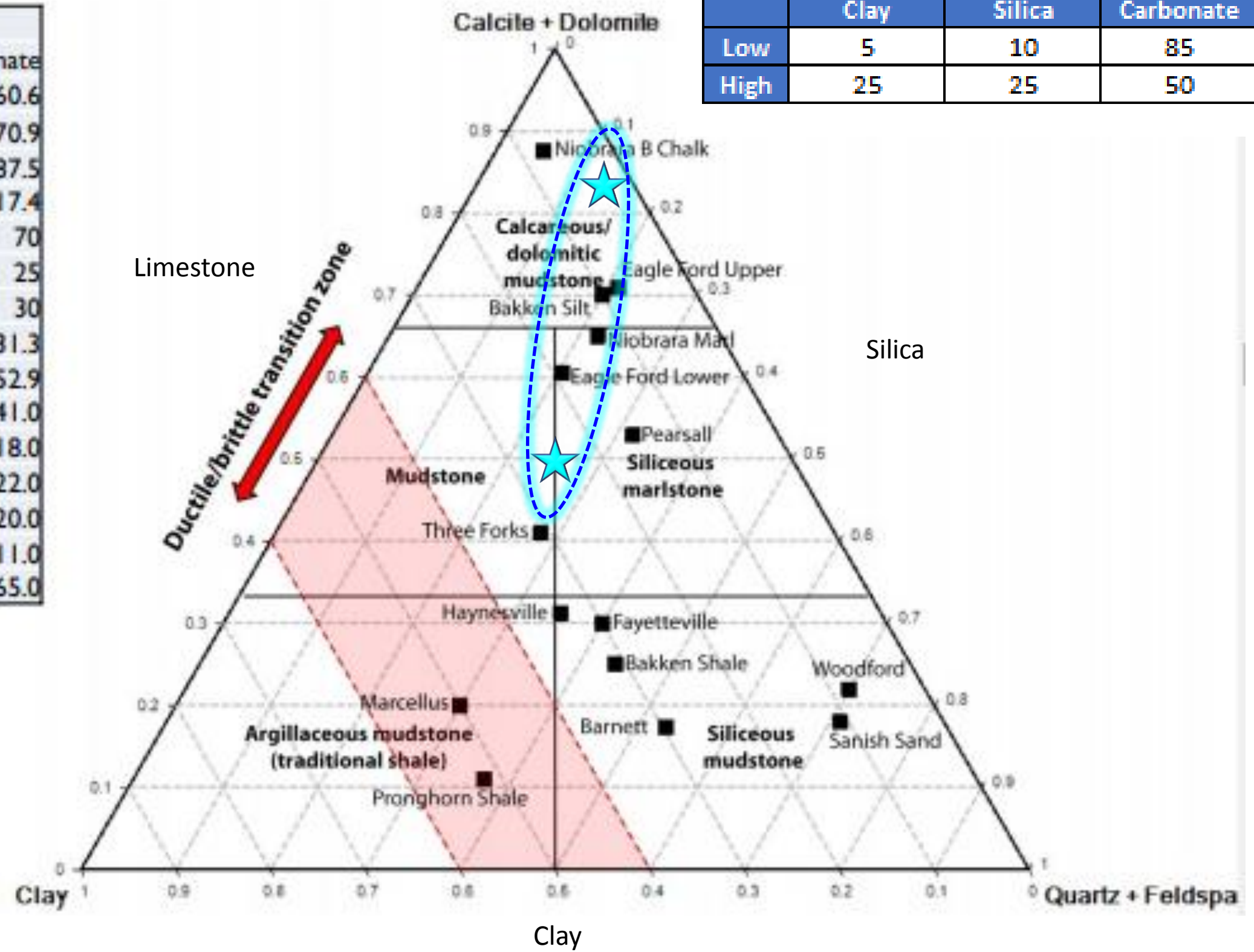
RESERVOIR ATTRIBUTES:

Huxley Duvernay vs. Other Shale Plays

Shale Formation	Proportion in class (%)		
	Clay	Silica	Carbonate
Eagle Ford L.	18.9	20.5	60.6
Eagle Ford U.	7.9	21.2	70.9
Niobrara Chalk	7.5	5	87.5
Barnett	29.6	53	17.4
Bakken Silt	10	20	70
Bakken Sh	31.2	43.8	25
Fayetteville	30	40	30
Haynesville	33.7	35	31.3
Pearsall	15.3	31.8	52.9
Three Forks	31.0	28.0	41.0
Sanish	11.0	71.0	18.0
Woodford	8.0	70.0	22.0
Marcellus	50.0	30.0	20.0
Pronghorn	52.0	37.0	11.0
Niobrara Marl	13.0	22.0	65.0

Huxley Duvernay (Organic Rich Shale #1)

	Clay	Silica	Carbonate
Low	5	10	85
High	25	25	50



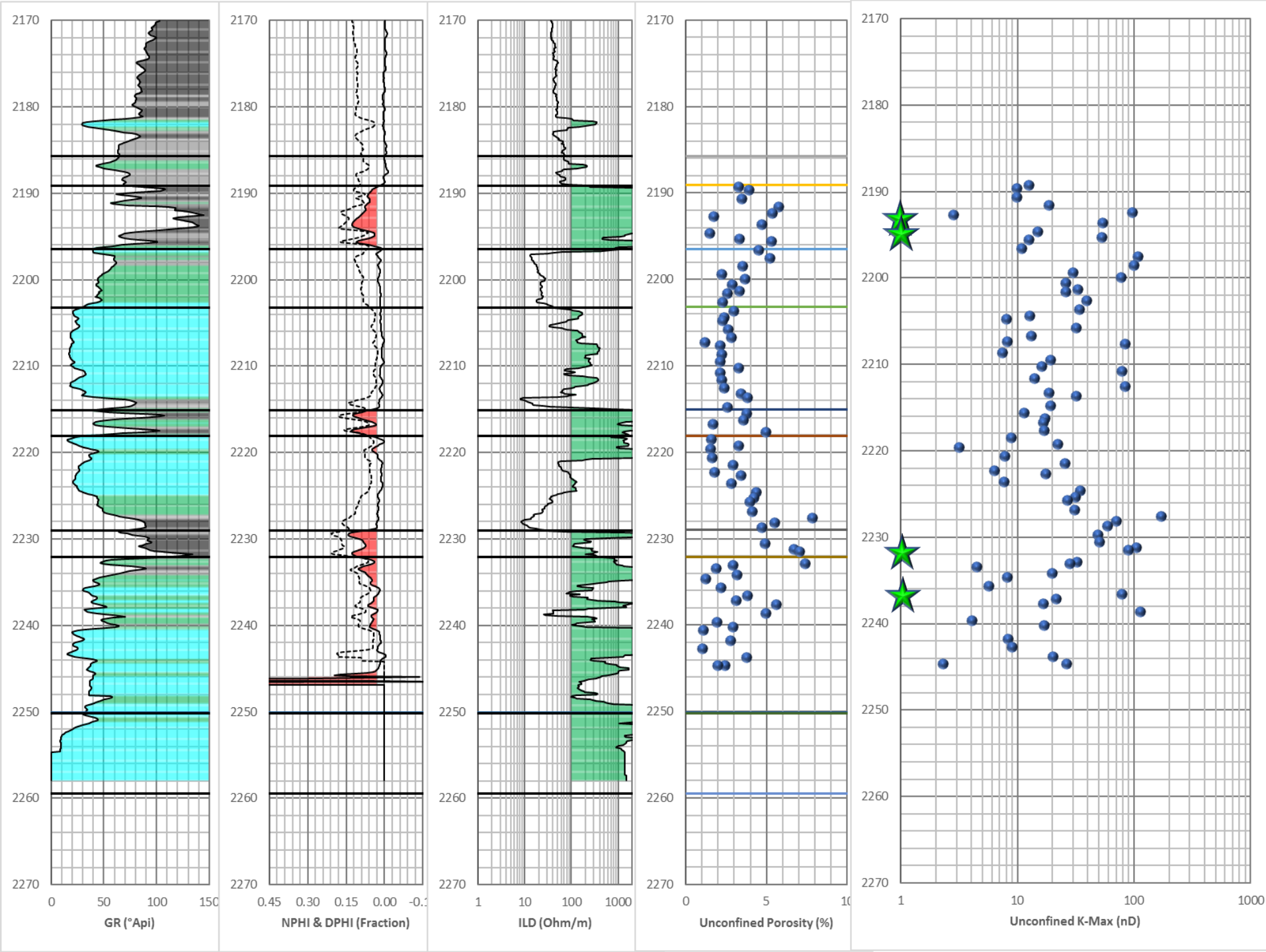
RESERVOIR ATTRIBUTES:

Unconfined Porosity & Permeability

Unconfined Porosity						
ZONE	FORMATION	Avg (%)	Avg (%)	Avg (%)	# Samples	Smp Density (#/m)
B	U-DUV B (ORS #1)	3.9	1.5	5.8	11	1.49
C	U-DUV C (I Shale #1)	3.2	2.2	5.2	8	1.19
D	U-DUV D (Carb #1)	2.5	1.2	3.8	16	1.34
E	U-DUV E (ORS #2)	3.5	1.5	5.0	4	1.33
F	U-DUV F (Carb #2)	3.6	1.5	7.9	15	1.38
G	U-DUV G (ORS #3)	7.4	4.9	10.8	4	1.29
H	U-DUV H (Carb #3)	3.0	1.1	7.4	18	1.00

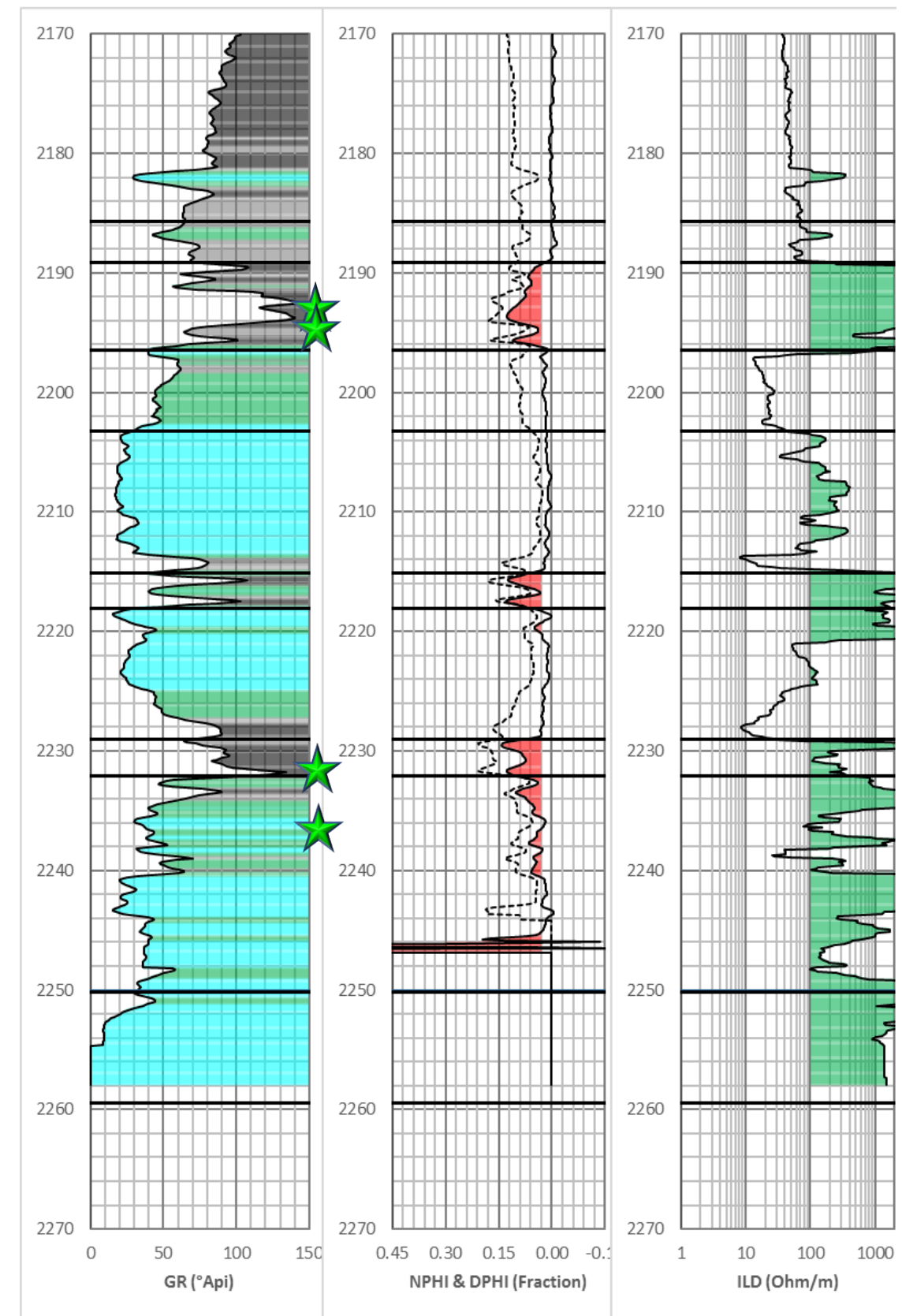
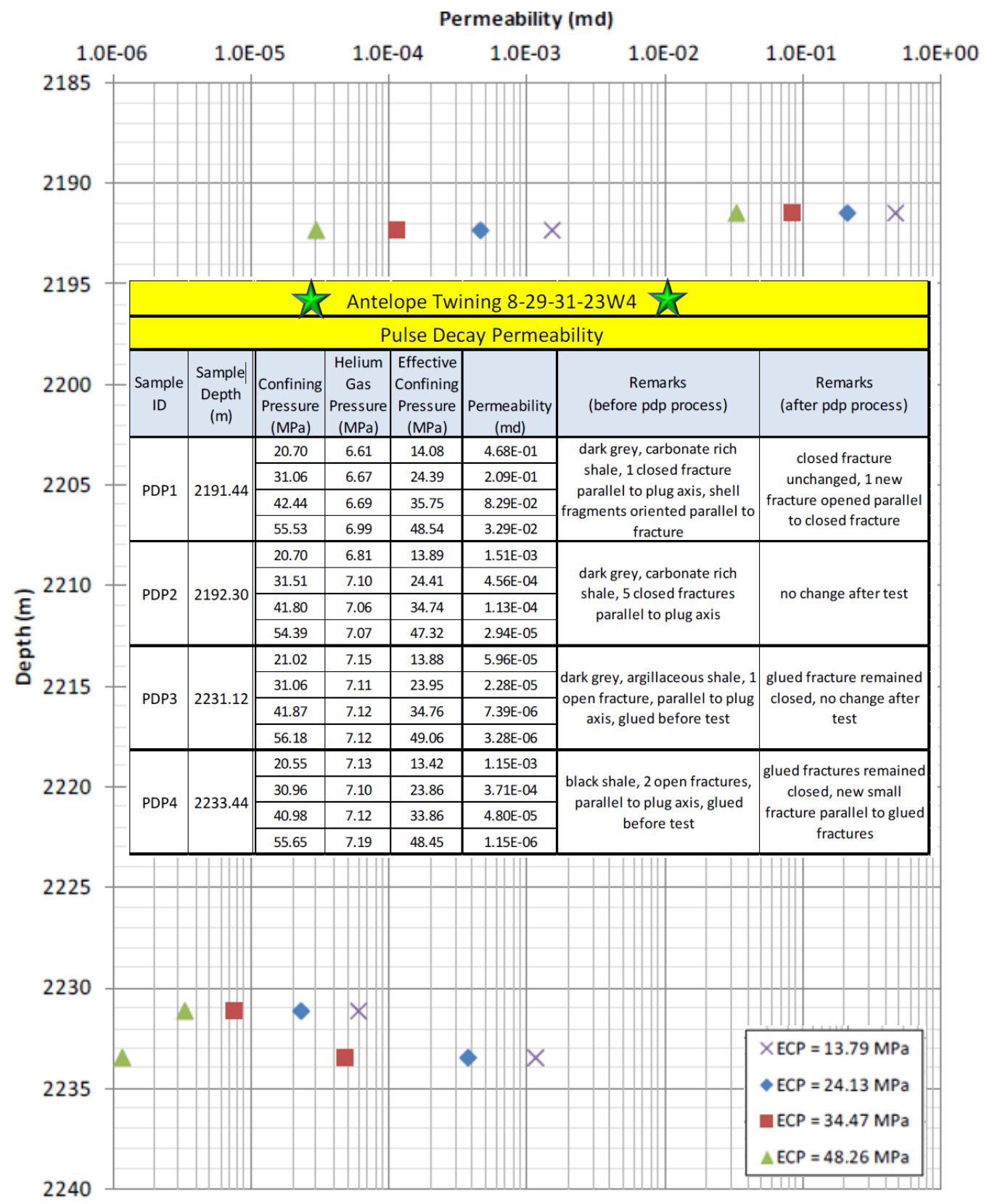
Unconfined K-Max						
ZONE	FORMATION	Avg (nD)	Avg (nD)	Avg (nD)	# Samples	Smp Density (#/m)
B	U-DUV B (ORS #1)	27	3	97	11	1.49
C	U-DUV C (I Shale #1)	55	26	108	8	1.19
D	U-DUV D (Carb #1)	30	7	85	16	1.34
E	U-DUV E (ORS #2)	16	11	17	4	1.33
F	U-DUV F (Carb #2)	35	3	172	15	1.38
G	U-DUV G (ORS #3)	73	49	104	4	1.29
H	U-DUV H (Carb #3)	23	1	114	18	1.00

Antelope Twining 8-29-31-23W4							
★ Pulse Decay Permeability ★							
Sample ID	Sample Depth (m)	Confining Pressure (MPa)	Helium Gas Pressure (MPa)	Effective Confining Pressure (MPa)	Permeability (md)	Remarks (before pdp process)	Remarks (after pdp process)
PDP1	2191.44	20.70	6.61	14.08	4.68E-01	dark grey, carbonate rich shale, 1 closed fracture parallel to plug axis, shell fragments oriented parallel to fracture	closed fracture unchanged, 1 new fracture opened parallel to closed fracture
		31.06	6.67	24.39	2.09E-01		
		42.44	6.69	35.75	8.29E-02		
		55.53	6.99	48.54	3.29E-02		
PDP2	2192.30	20.70	6.81	13.89	1.51E-03	dark grey, carbonate rich shale, 5 closed fractures parallel to plug axis	no change after test
		31.51	7.10	24.41	4.56E-04		
		41.80	7.06	34.74	1.13E-04		
		54.39	7.07	47.32	2.94E-05		
PDP3	2231.12	21.02	7.15	13.88	5.96E-05	dark grey, argillaceous shale, 1 open fracture, parallel to plug axis, glued before test	glued fracture remained closed, no change after test
		31.06	7.11	23.95	2.28E-05		
		41.87	7.12	34.76	7.39E-06		
		56.18	7.12	49.06	3.28E-06		
PDP4	2233.44	20.55	7.13	13.42	1.15E-03	black shale, 2 open fractures, parallel to plug axis, glued before test	glued fractures remained closed, new small fracture parallel to glued fractures
		30.96	7.10	23.86	3.71E-04		
		40.98	7.12	33.86	4.80E-05		
		55.65	7.19	48.45	1.15E-06		



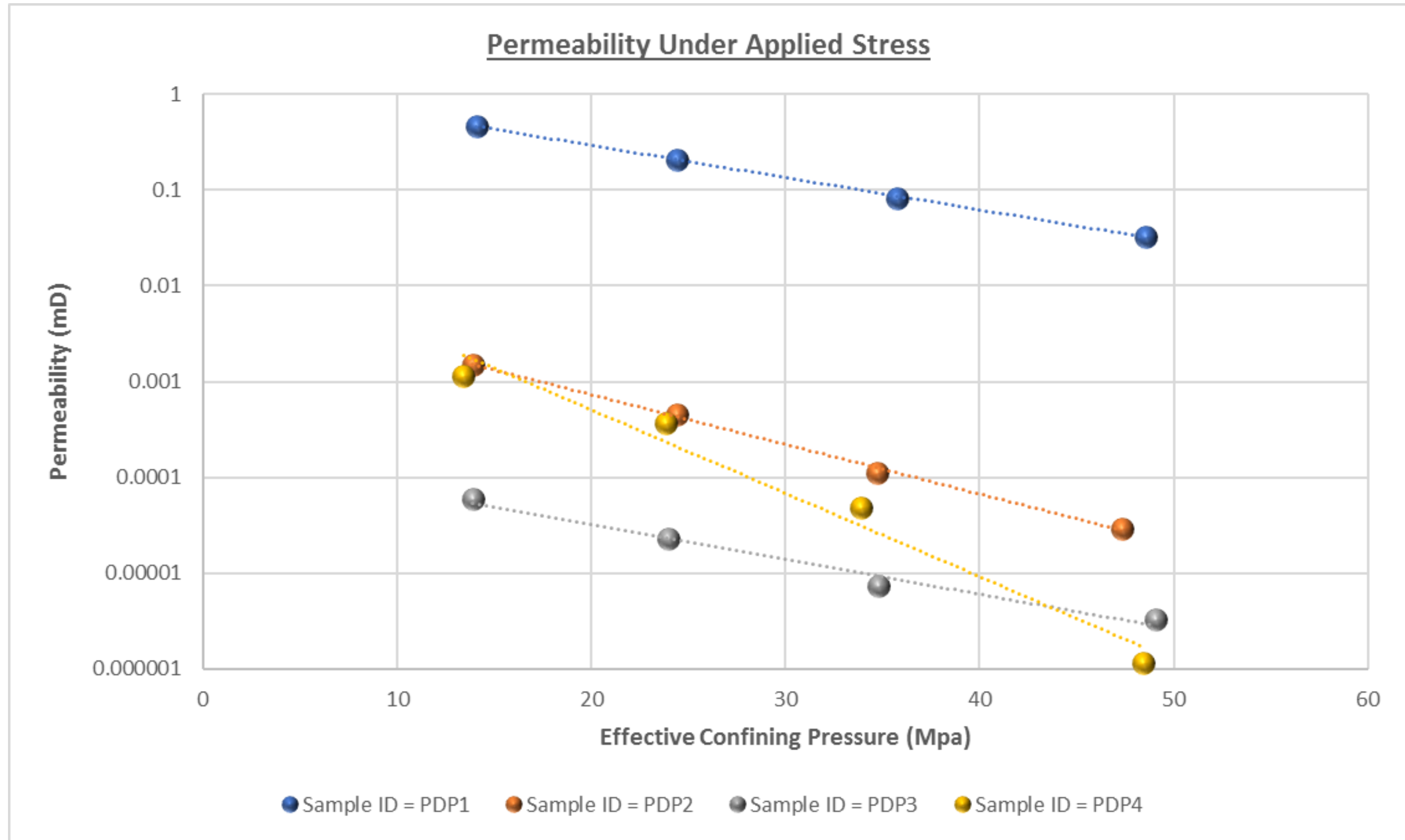
RESERVOIR ATTRIBUTES:

Confined Permeability - 00/08-29-031-23W4/0



RESERVOIR ATTRIBUTES:

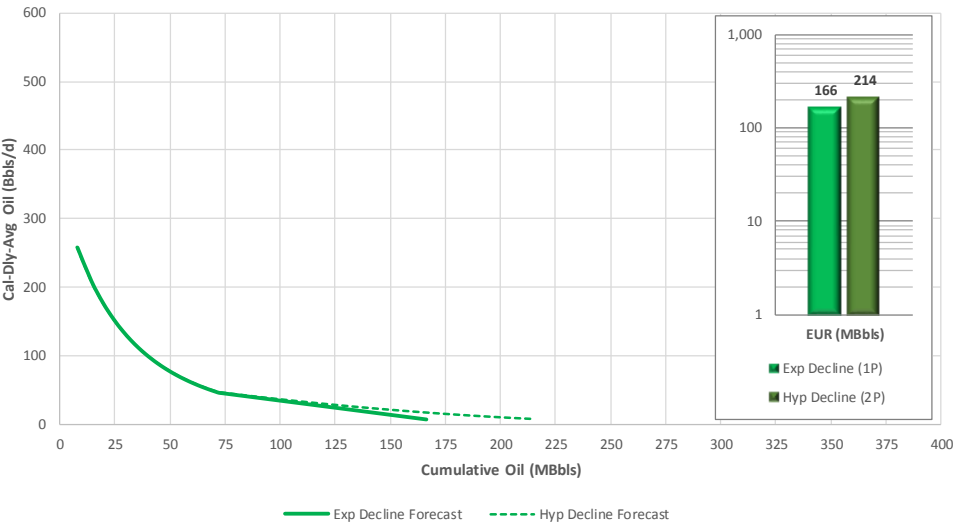
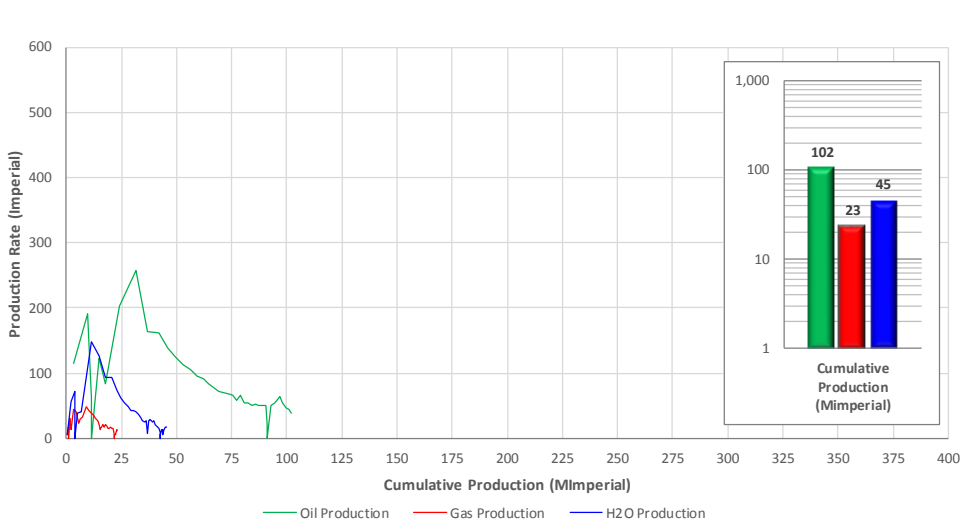
Confined Permeability - 00/08-29-031-23W4/0



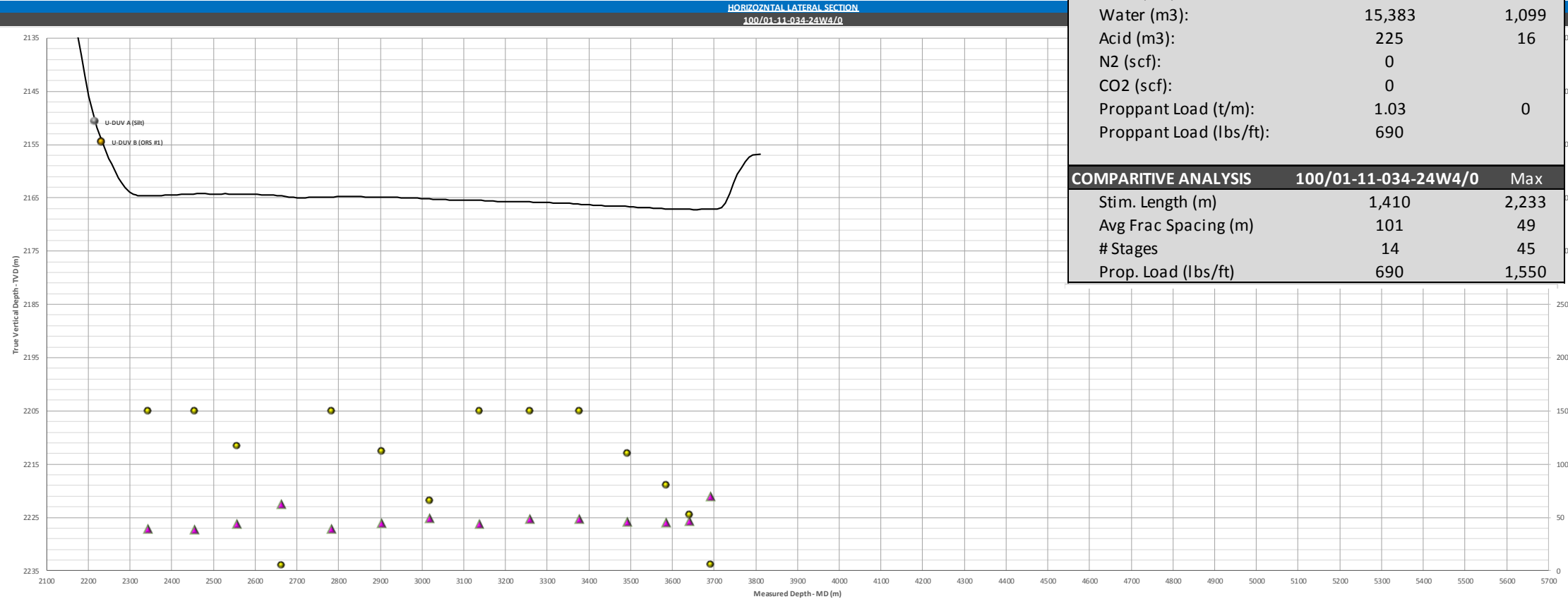
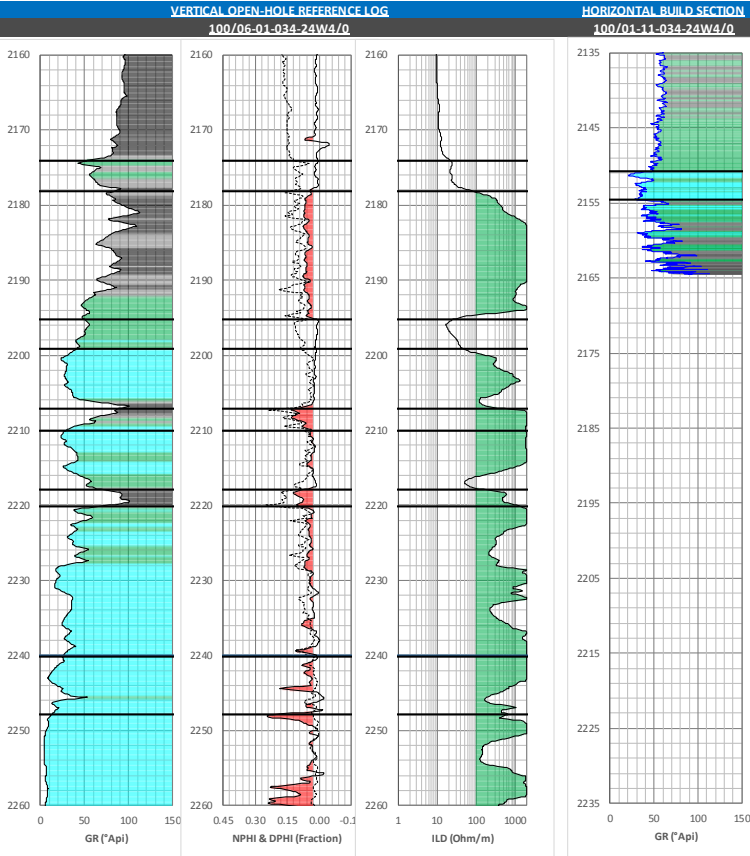
OPERATIONS:
DRILLING

WELLBORE SUMMARY – ARTIS EXPLORATION:

100/01-11-034-24W4/0 (1ST Horizontal)

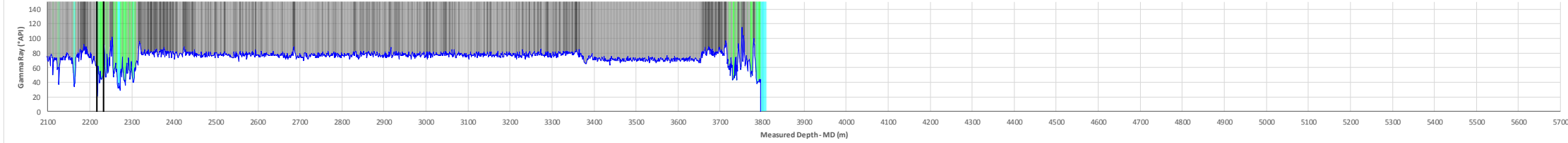


HEADER:		
UWI:	100/01-11-034-24W4/0	
Start Date:	11/12/2014	
End Date:	11/22/2014	
Completion Duration:	10	
Top Depth:	2,305	
End Depth:	3,715	
COMPLETION METHOD:		Per Stage
Type:	PLUG & PERF	
Stimulated Length (m):	1,410	
Avg Frac Spacing (m):	101	
# Stages:	14	
Total Perf Cluster Count:	48	3
QUANTITIES:		Per Stage
Proppant Pumped (t):	1,448	103
Proppant Placed (t):	1,448	103
Fluid (m3):	11,031	788
Water (m3):	15,383	1,099
Acid (m3):	225	16
N2 (scf):	0	
CO2 (scf):	0	
Proppant Load (t/m):	1.03	0
Proppant Load (lbs/ft):	690	
COMPARITIVE ANALYSIS		100/01-11-034-24W4/0
Stim. Length (m)	1,410	2,233
Avg Frac Spacing (m)	101	49
# Stages	14	45
Prop. Load (lbs/ft)	690	1,550



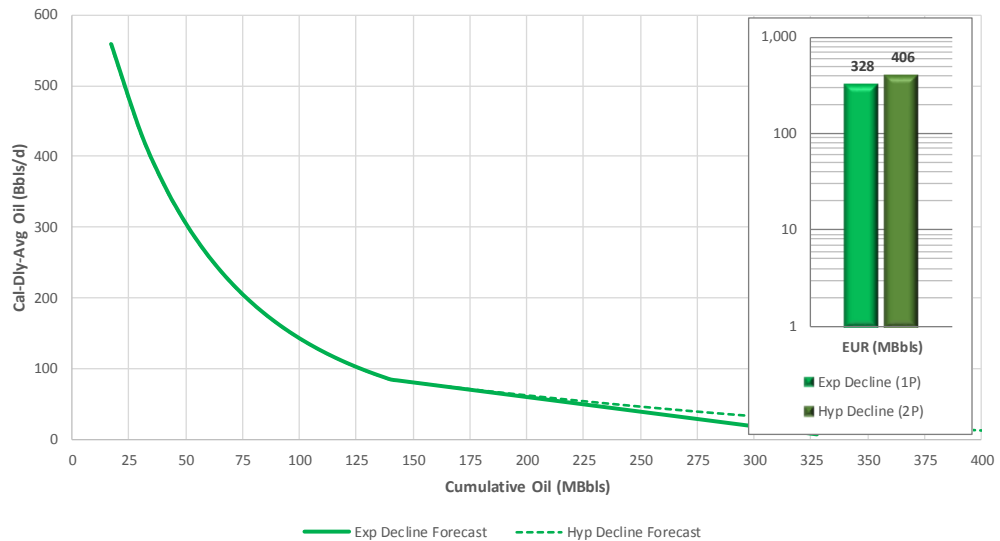
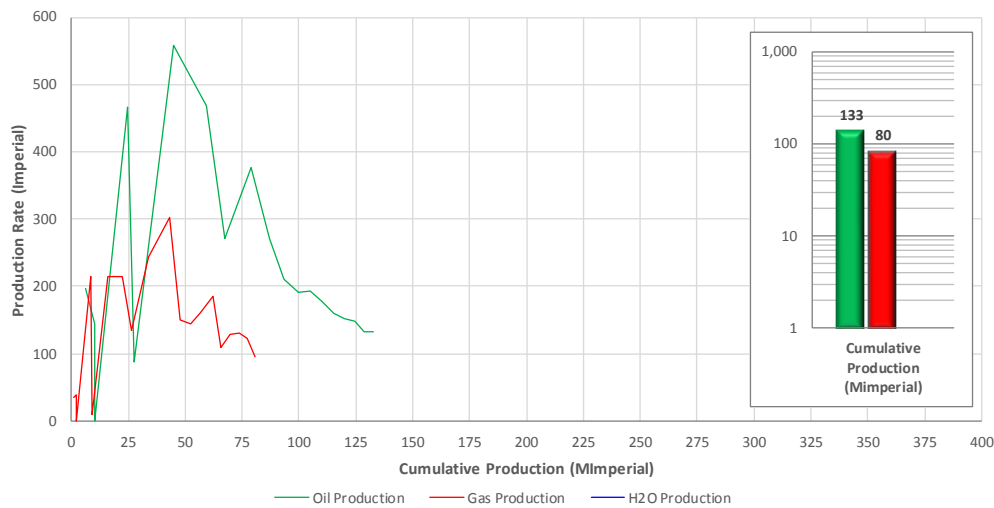
IMPORTANT NOTE(S):

- 1st Huxley Duvernay Hz
- Toe Roof Hit



WELLBORE SUMMARY – ARTIS EXPLORATION:

102/14-06-032-24W4/0 (4TH Horizontal)



HEADER:

UWI:	102/14-06-032-24W4/0
Start Date:	12/16/2016
End Date:	12/31/2016
Completion Duration:	15
Top Depth:	2,475
End Depth:	4,488

COMPLETION METHOD:

Per Stage

Type:	PLUG & PERF
Stimulated Length (m):	2,013
Avg Frac Spacing (m):	49
# Stages:	41
Total Perf Cluster Count:	112

QUANTITIES:

Per Stage

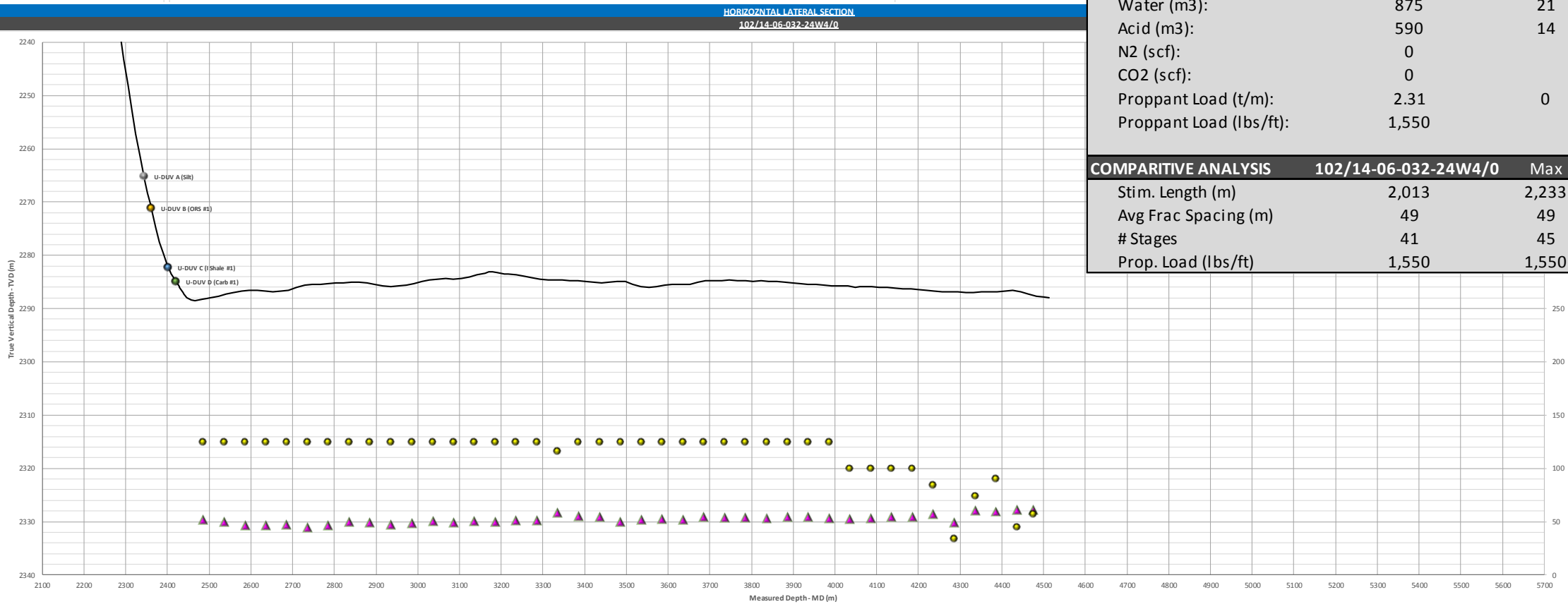
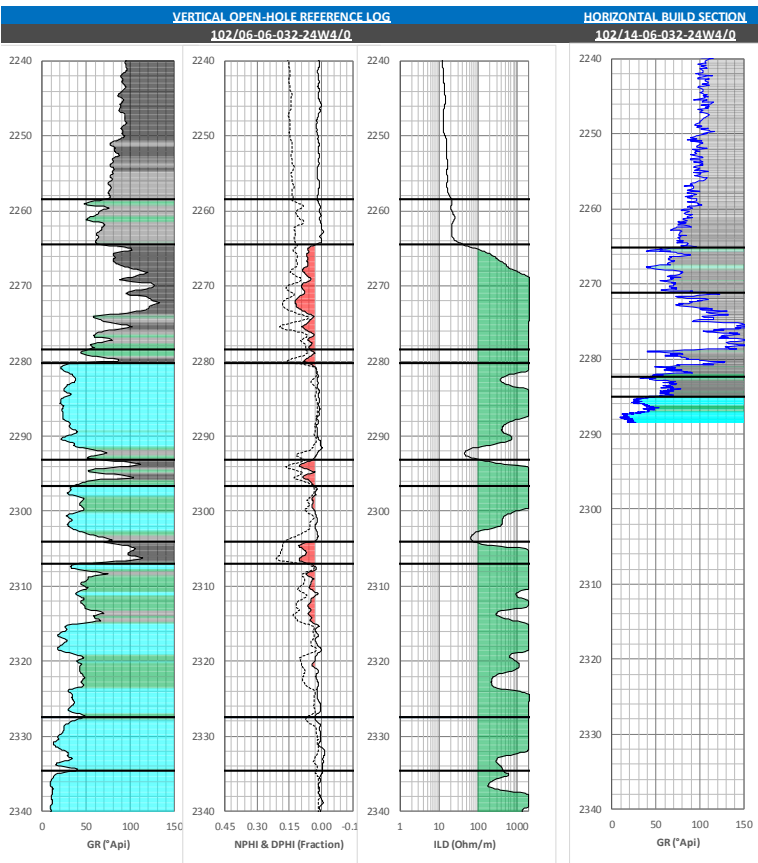
Proppant Pumped (t):	4,651	113
Proppant Placed (t):	4,645	113
Fluid (m3):	41,717	1,017
Water (m3):	875	21
Acid (m3):	590	14
N ₂ (scf):	0	
CO ₂ (scf):	0	
Proppant Load (t/m):	2.31	0
Proppant Load (lbs/ft):	1,550	

COMPARITIVE ANALYSIS

102/14-06-032-24W4/0

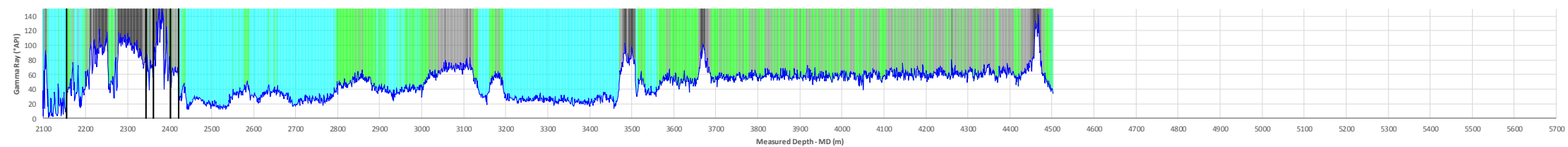
Max

Stim. Length (m)	2,013	2,233
Avg Frac Spacing (m)	49	49
# Stages	41	45
Prop. Load (lbs/ft)	1,550	1,550



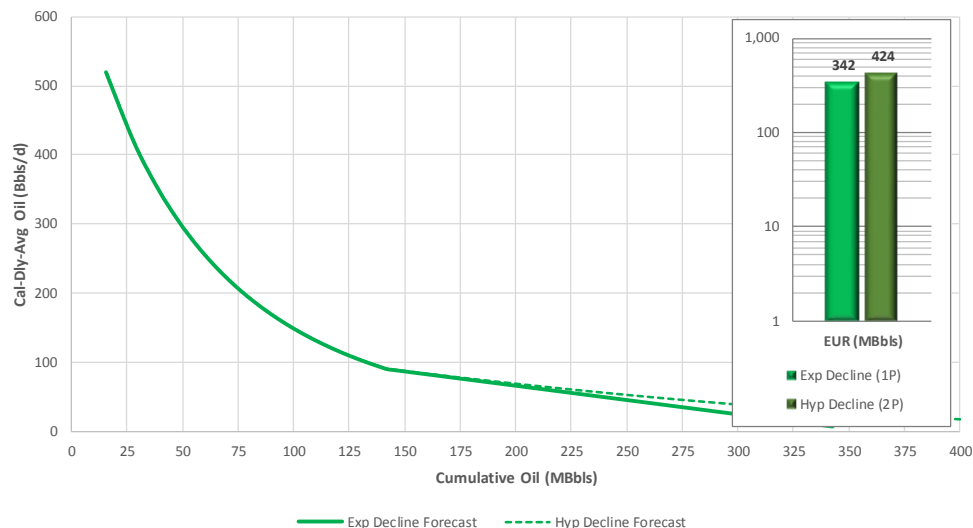
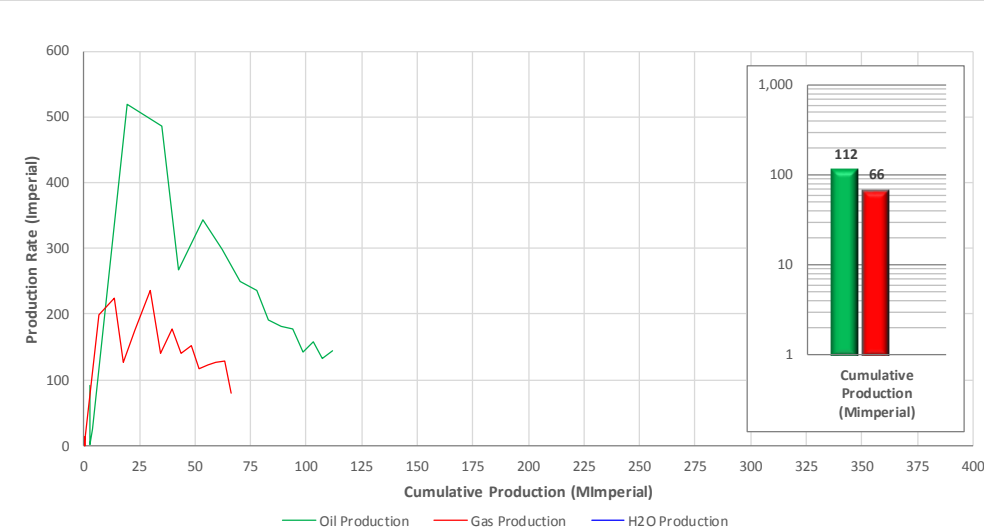
IMPORTANT NOTE(S):

- Highest Intensity Frac Spacing & proppant load



WELLBORE SUMMARY – ARTIS EXPLORATION:

103/02-29-031-24W4/0 (5th Horizontal)

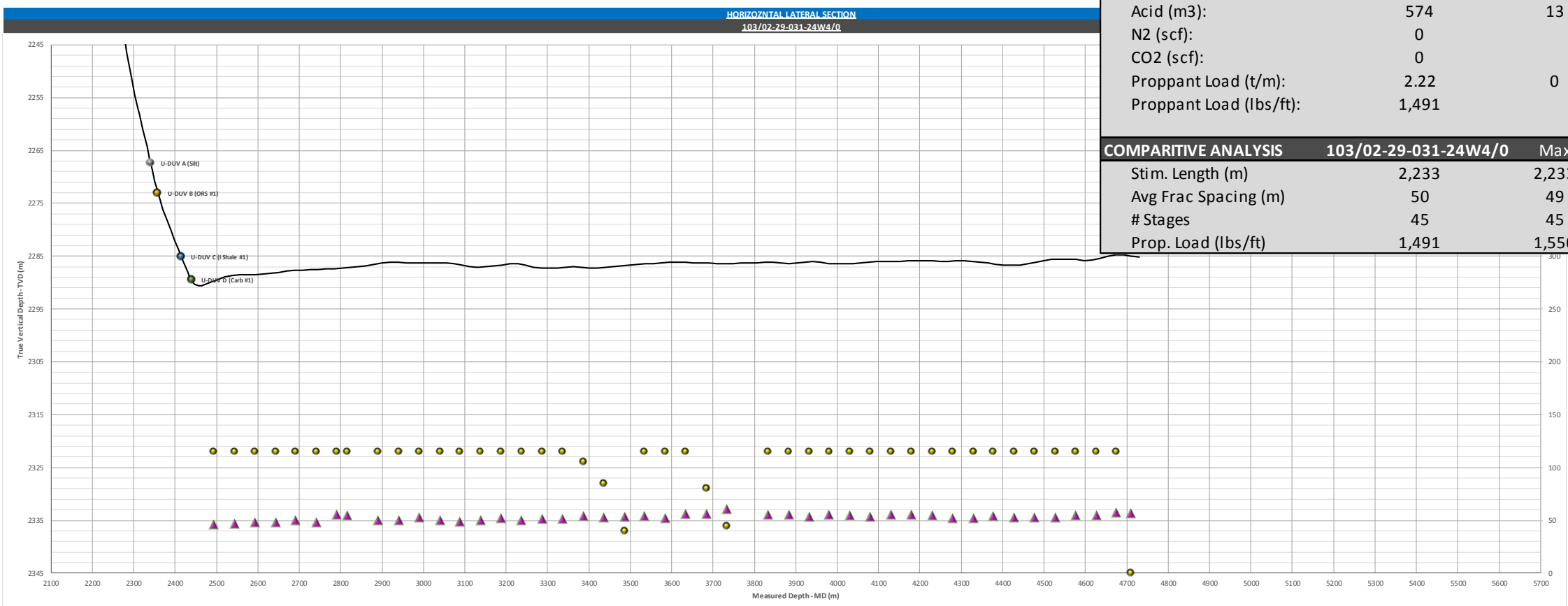
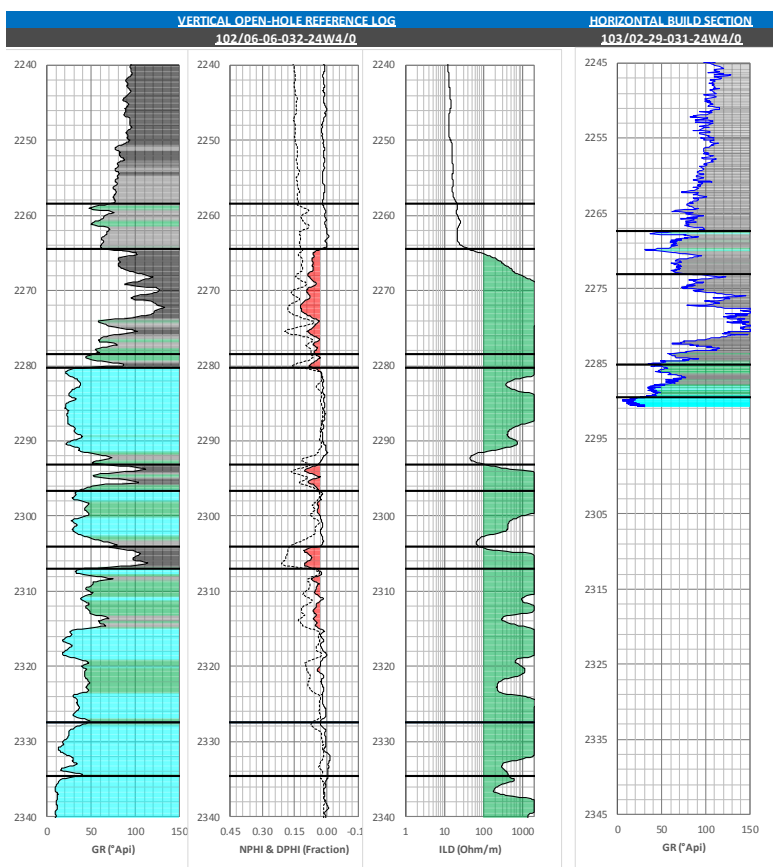


HEADER:	
UWI:	103/02-29-031-24W4/0
Start Date:	4/5/2017
End Date:	4/18/2017
Completion Duration:	13
Top Depth:	2,478
End Depth:	4,711

COMPLETION METHOD:		Per Stage
Type:	PLUG & PERF	
Stimulated Length (m):	2,233	
Avg Frac Spacing (m):	50	
# Stages:	45	
Total Perf Cluster Count:	123	3

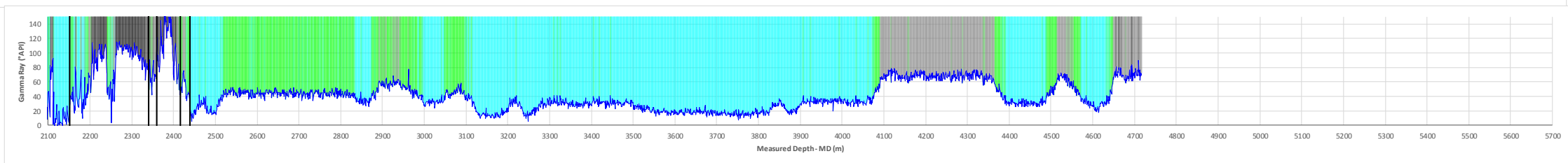
QUANTITIES:		Per Stage
Proppant Pumped (t):	4,955	110
Proppant Placed (t):	4,955	110
Fluid (m3):	38,892	864
Water (m3):	0	
Acid (m3):	574	13
N2 (scf):	0	
CO2 (scf):	0	
Proppant Load (t/m):	2.22	0
Proppant Load (lbs/ft):	1,491	

COMPARITIVE ANALYSIS	103/02-29-031-24W4/0	Max
Stim. Length (m)	2,233	2,233
Avg Frac Spacing (m)	50	49
# Stages	45	45
Prop. Load (lbs/ft)	1,491	1,550



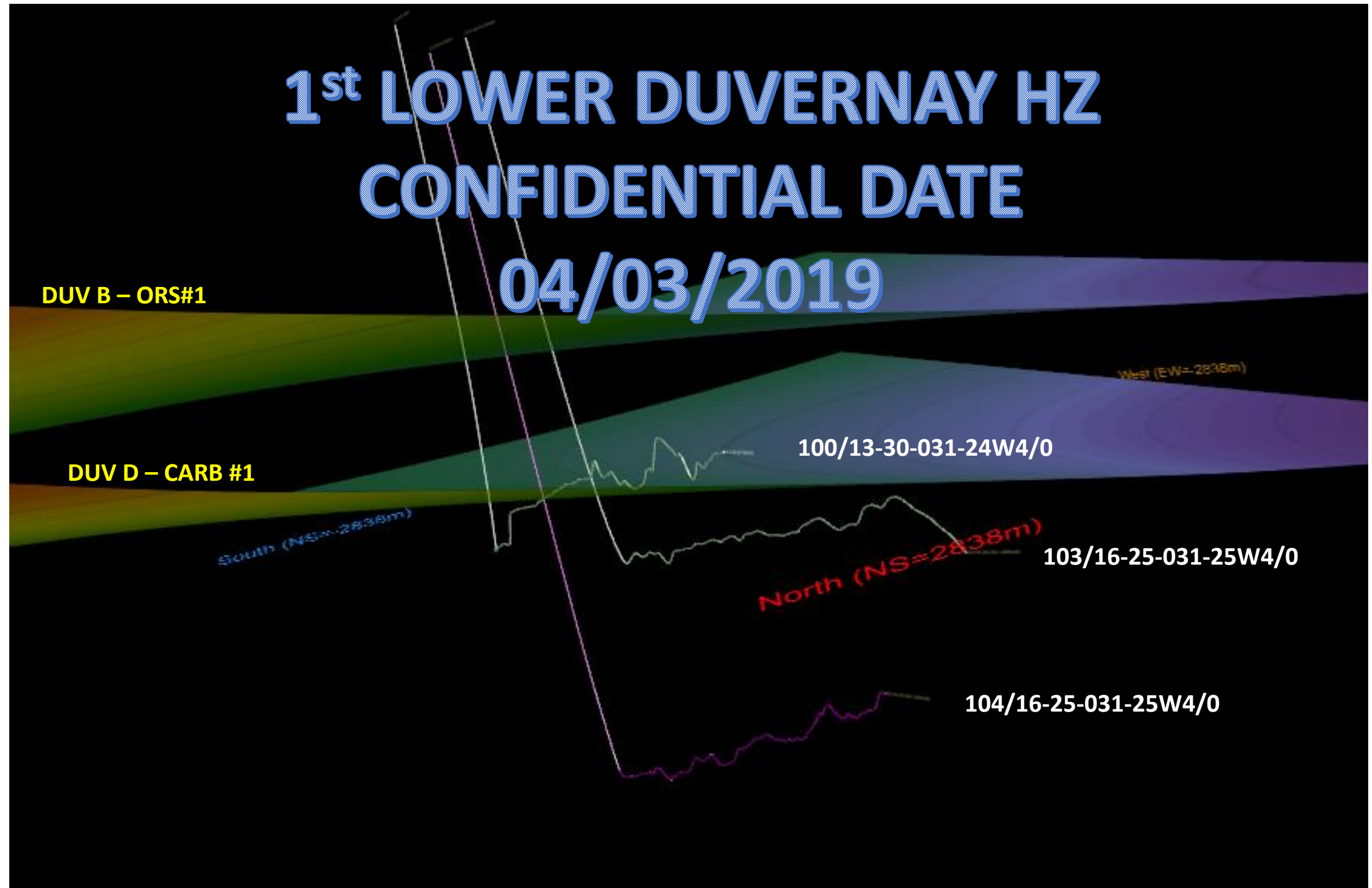
IMPORTANT NOTE(S):

- Update frac data with true proppant pumped per stage



WELLBORE SUMMARY – ARTIS EXPLORATION:

104/16-25-031-25W4/0 (16th Horizontal)



OPERATIONS: COMPLETIONS



STIMULATION EVOLUTION:

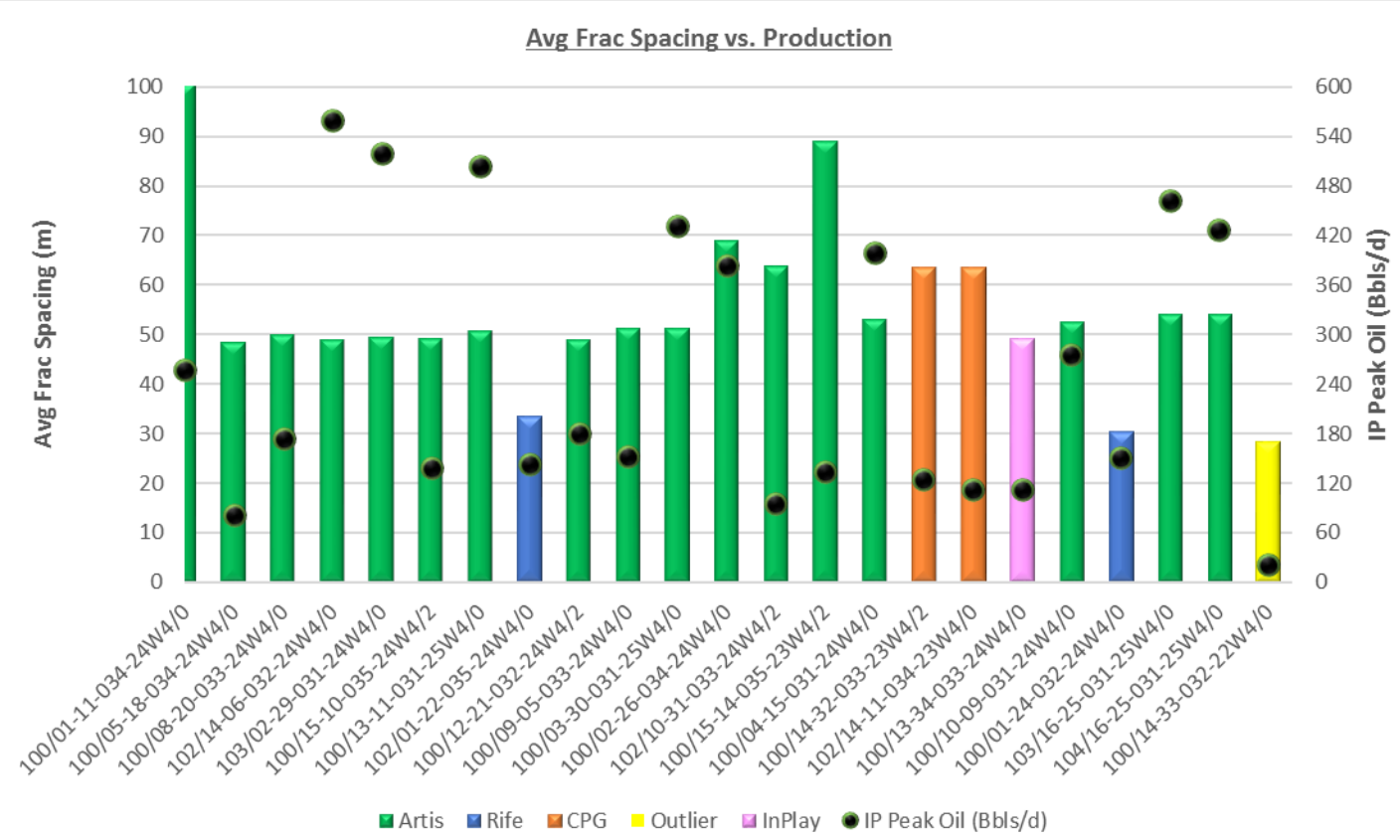
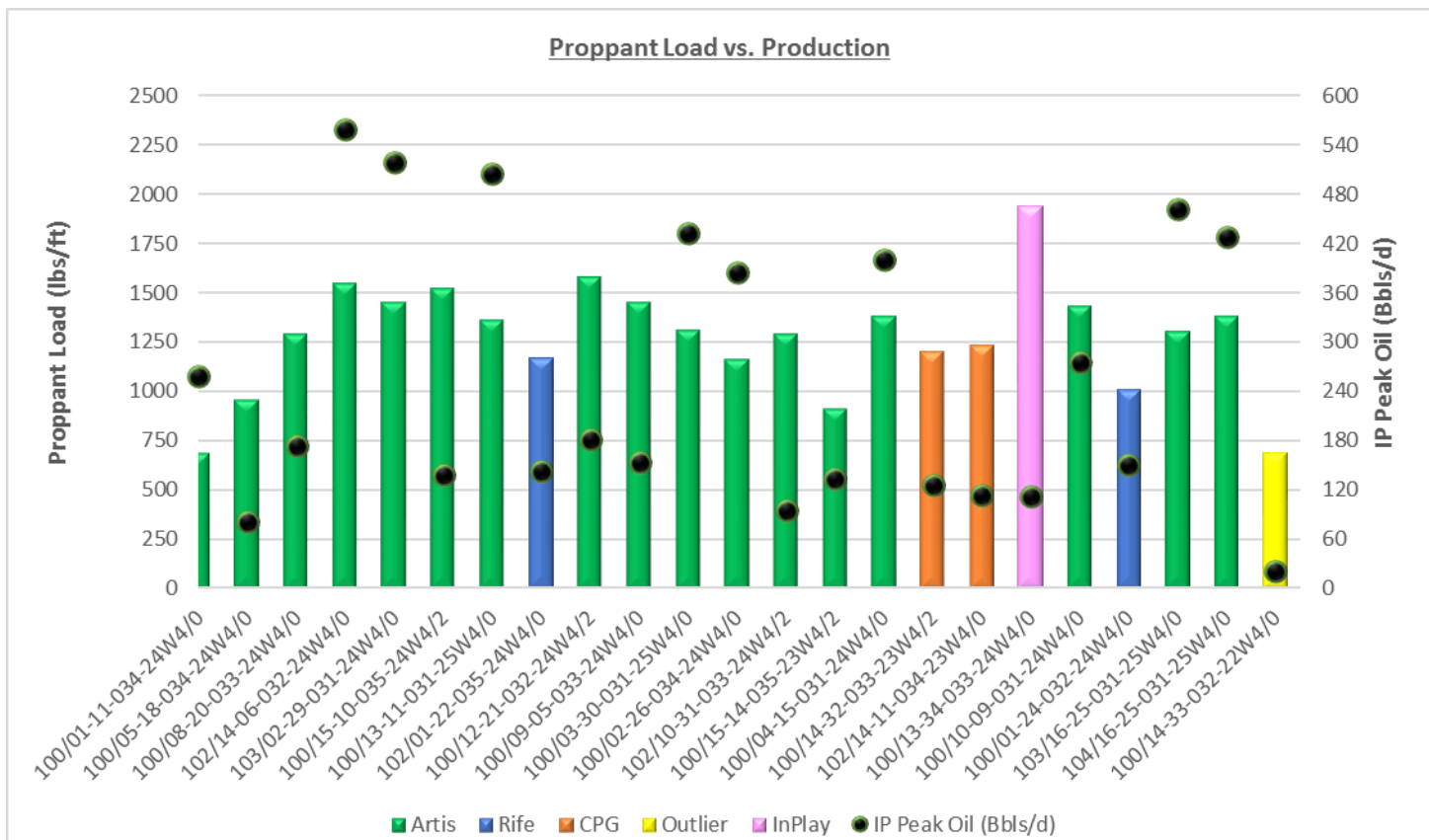
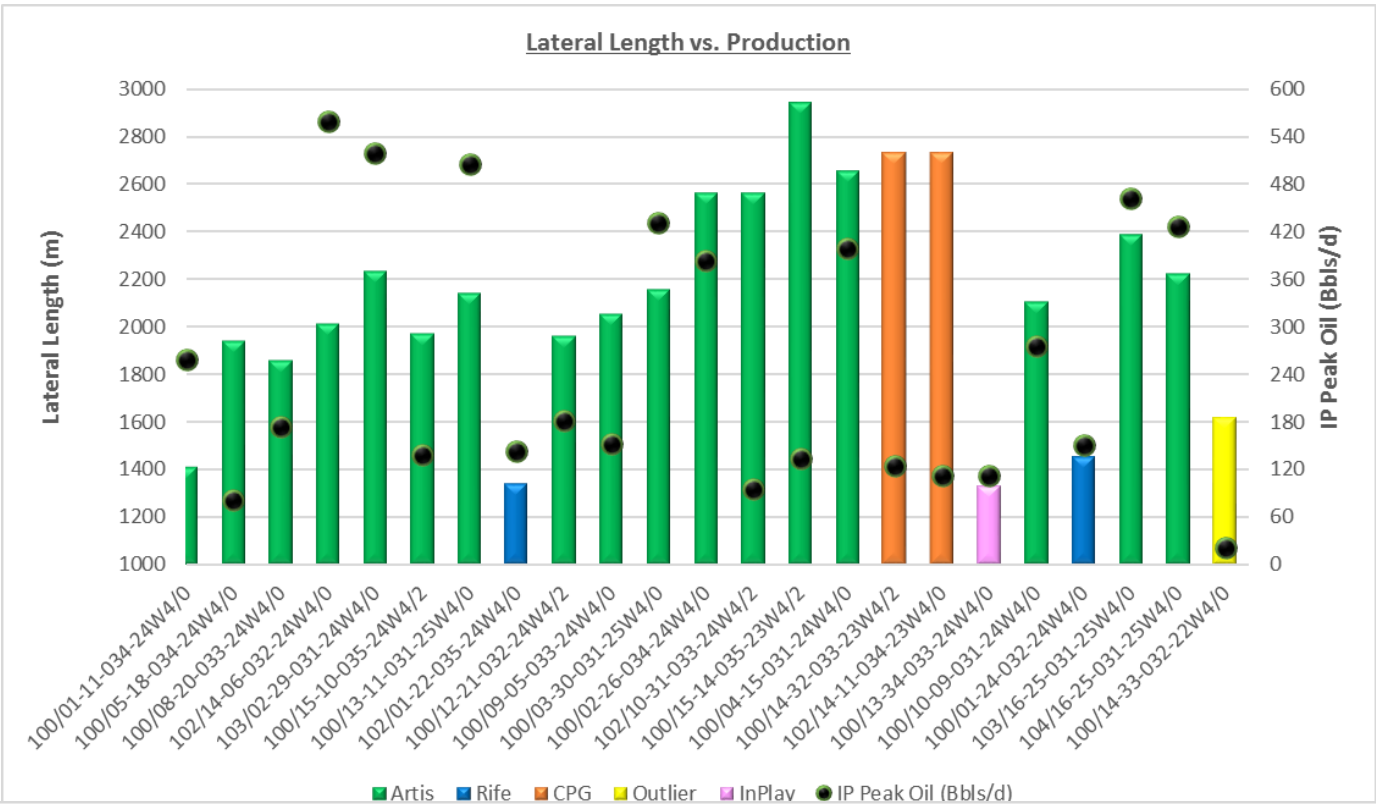
General Design Attributes

Well #	UWI	Operator	Casing Type	Length (m)	Avg Frac Spacing (m)	# Stages	Total Proppant (t)	Total Fluid (m3)	Proppant Load (lbs/ft)	IP Peak Oil (Bbls/d)
1	100/01-11-034-24W4/0	Artis	CASED	1410	101	14	1448	11031	690	258
2	100/05-18-034-24W4/0	Artis	LINER-UNCCEM	1941	49	40	2775	33173	961	81
3	100/08-20-033-24W4/0	Artis	LINER-UNCCEM	1855	50	37	3573	25771	1294	174
4	102/14-06-032-24W4/0	Artis	CASED	2013	49	41	4645	41717	1550	559
5	103/02-29-031-24W4/0	Artis	CASED	2233	50	45	4840	38704	1456	519
6	100/15-10-035-24W4/2	Artis	CASED	1970	49	40	4481	33347	1529	138
7	100/13-11-031-25W4/0	Artis	CASED	2139	51	42	4353	35842	1368	505
8	102/01-22-035-24W4/0	Rife	LINER-UNCCEM	1339	33	40	2333	21468	1171	143
9	100/12-21-032-24W4/2	Artis	CASED	1958	49	40	4608	32110	1581	181
10	100/09-05-033-24W4/0	Artis	CASED	2052	51	40	4448	30689	1457	153
11	100/03-30-031-25W4/0	Artis	CASED	2154	51	42	4207	40969	1312	432
12	100/02-26-034-24W4/0	Artis	CASED	2559	69	37	4434	1146	1164	384
13	102/10-31-033-24W4/2	Artis	CASED	2560	64	40	4923	40632	1292	95
14	100/15-14-035-23W4/2	Artis	CASED	2942	89	33	4015	58646	917	134
15	100/04-15-031-24W4/0	Artis	CASED	2654	53	50	5457	46118	1382	399
16	100/14-32-033-23W4/2	CPG	CASED	2732	64	43	4908	428	1207	125
17	102/14-11-034-23W4/0	CPG	CASED	2733	64	43	5025		1236	113
18	100/13-34-033-24W4/0	InPlay	CASED	1325	49	27	3828	21557	1941	112
19	100/10-09-031-24W4/0	Artis	CASED	2103	53	40	4492	37311	1436	276
20	100/01-24-032-24W4/0	Rife	LINER-UNCCEM	1453	30	48	2181	29817	1009	150
21	103/16-25-031-25W4/0	Artis	CASED	2387	54	44	4635		1305	462
22	104/16-25-031-25W4/0	Artis	CASED	2220	54	41	4569		1383	427
23	100/14-33-032-22W4/0	Outlier	CASED	1614	28	57	1656	18570	690	21

STIMULATION EVOLUTION:

General Design Attributes

- As with the majority of resource plays completion and stimulation design continue to evolve throughout time, which is no different that that being observed across the Duvernay East Shale Basin at Huxley
- Completion and stimulation design for all wells with information available were plotted based on completion data and coded based on operator
- Key variables relating to lateral length, proppant load and average frac spacing currently do not exhibit any correlation with production as defined by IP Peak Oil (e.g. linear flow conditions).



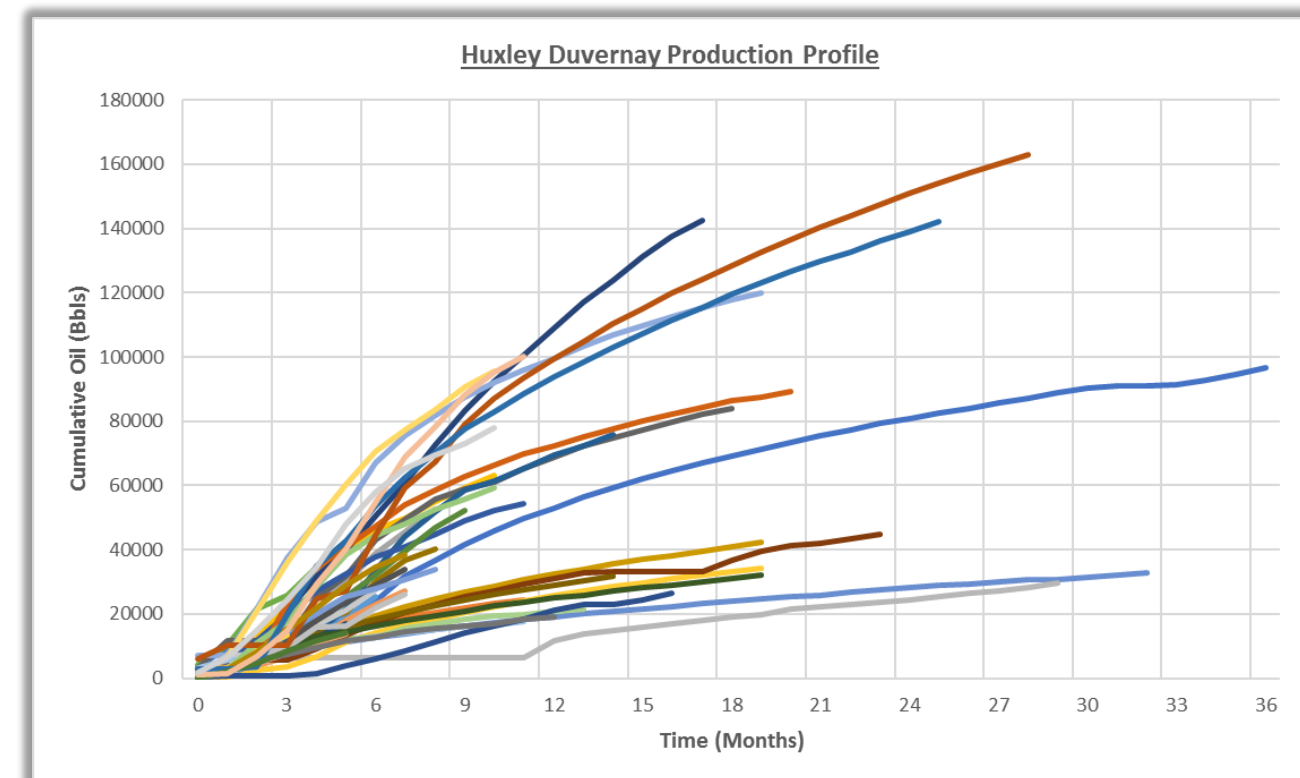
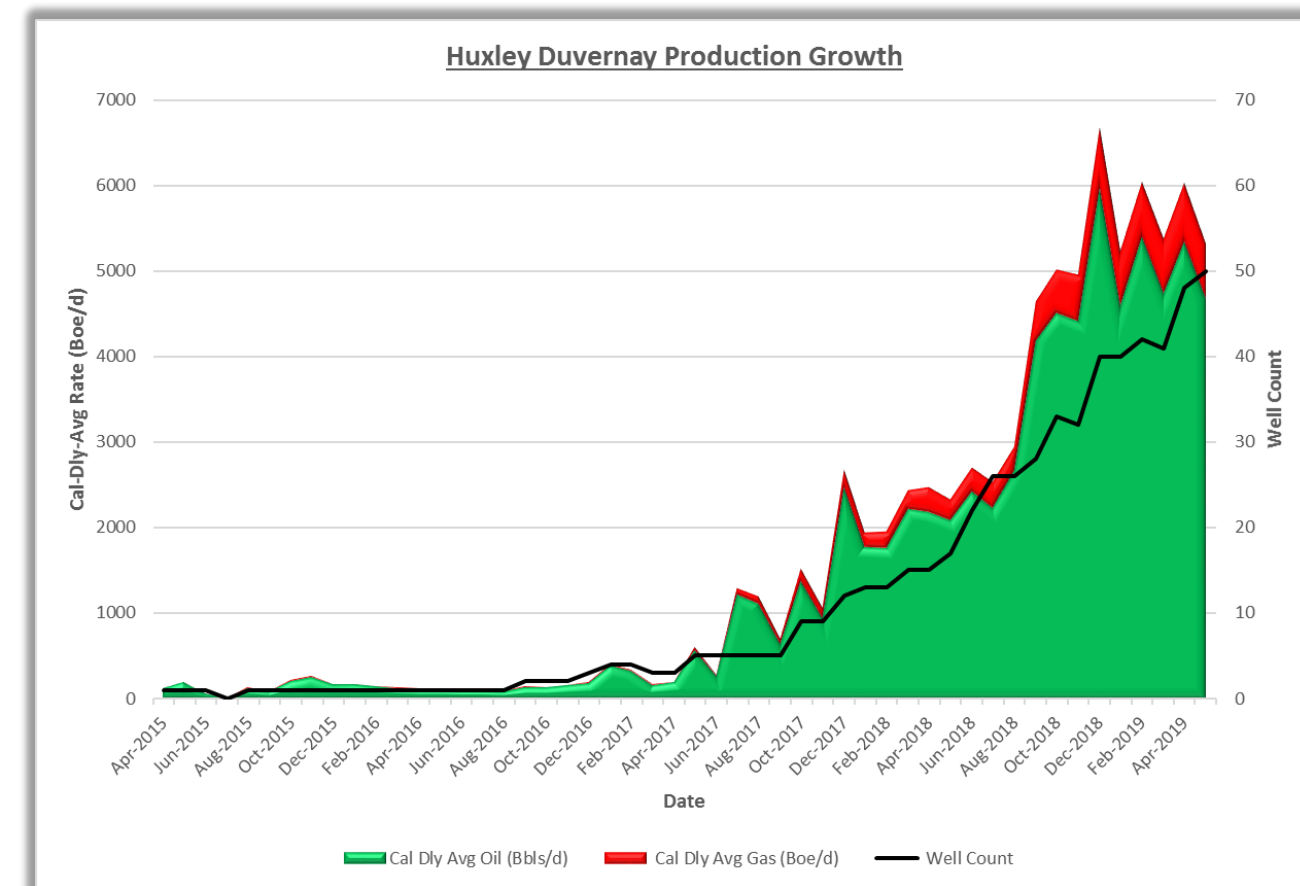
OPERATIONS:
PRODUCTION



PRODUCTION GROWTH:

Huxley Sub-Basin Summary

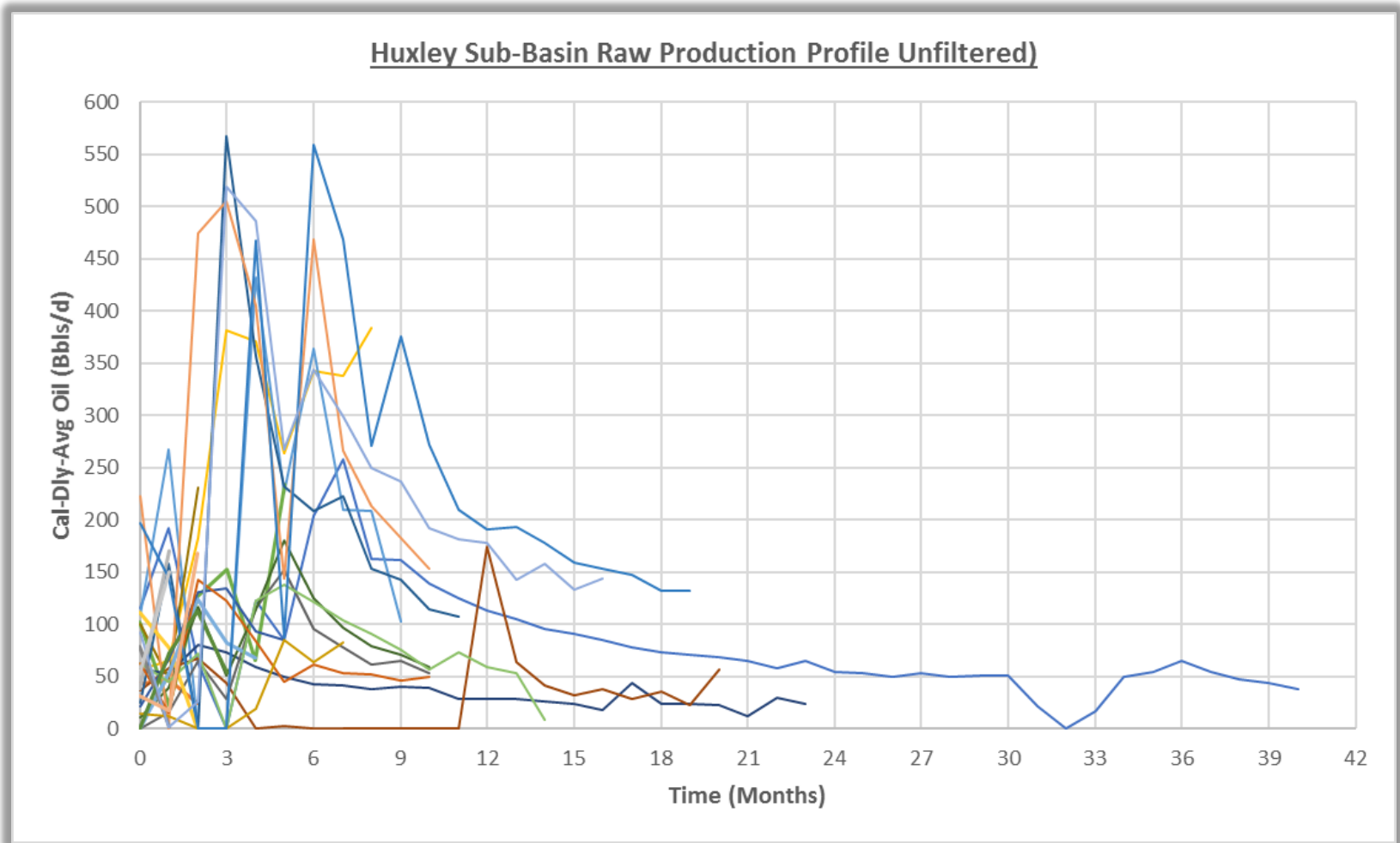
- Duvernay production growth has continued to climb since the first well (e.g. 100/01-11-034-24W4/0) came online back in April 2015
- Production across the play reached its peak to date in December 2018, with 40 producing wellbores cumulatively producing 6,676 Boe/d comprised of 5,964 Bbls/d of oil and 712 Boe/d (4,277 Mcf/d) of associated solution gas
- An additional 10 wellbores have been placed on production since the start of 2019 and are currently in their cleanup phases and as such, a further increase in cumulative play production should be expected in Q2/Q3 2019
- Production growth across the play has been accomplished essentially from one operator, Artis Exploration to date, with other minor operators maintaining minimal production
- Individual wellbore performances continues to be relatively inconsistent within the current 50 well sample set partially due to continued evolution of stimulation design
- The best performing wellbore to date, the 100/02-26-034-24W4/0, has cumulatively produced 142,584 Bbls of oil within the first 17 months of production life and continues to produce at high volume in excess of 163 Bbls/d



PRODUCTION ANALYSIS:

IP Methodology & Analysis

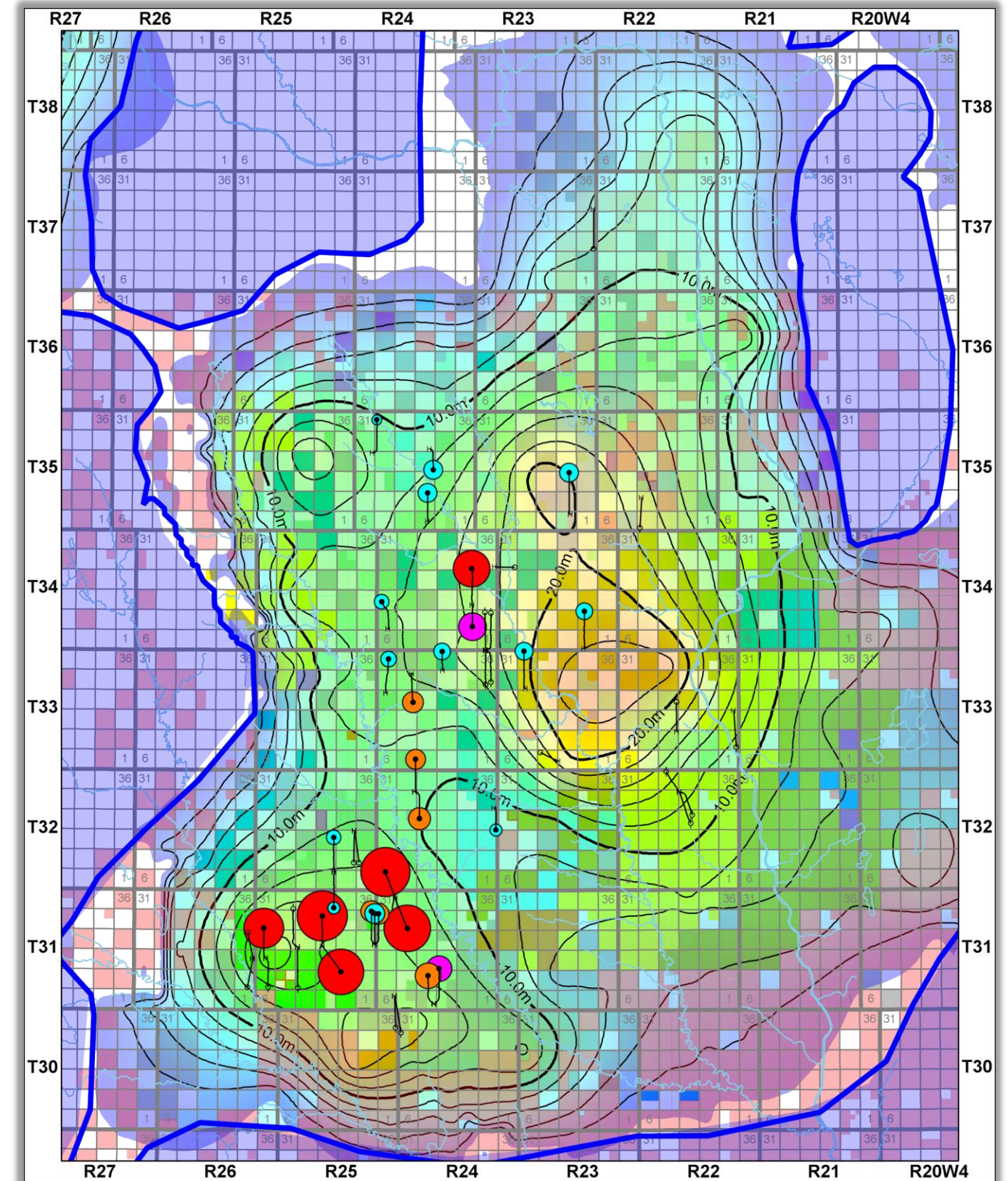
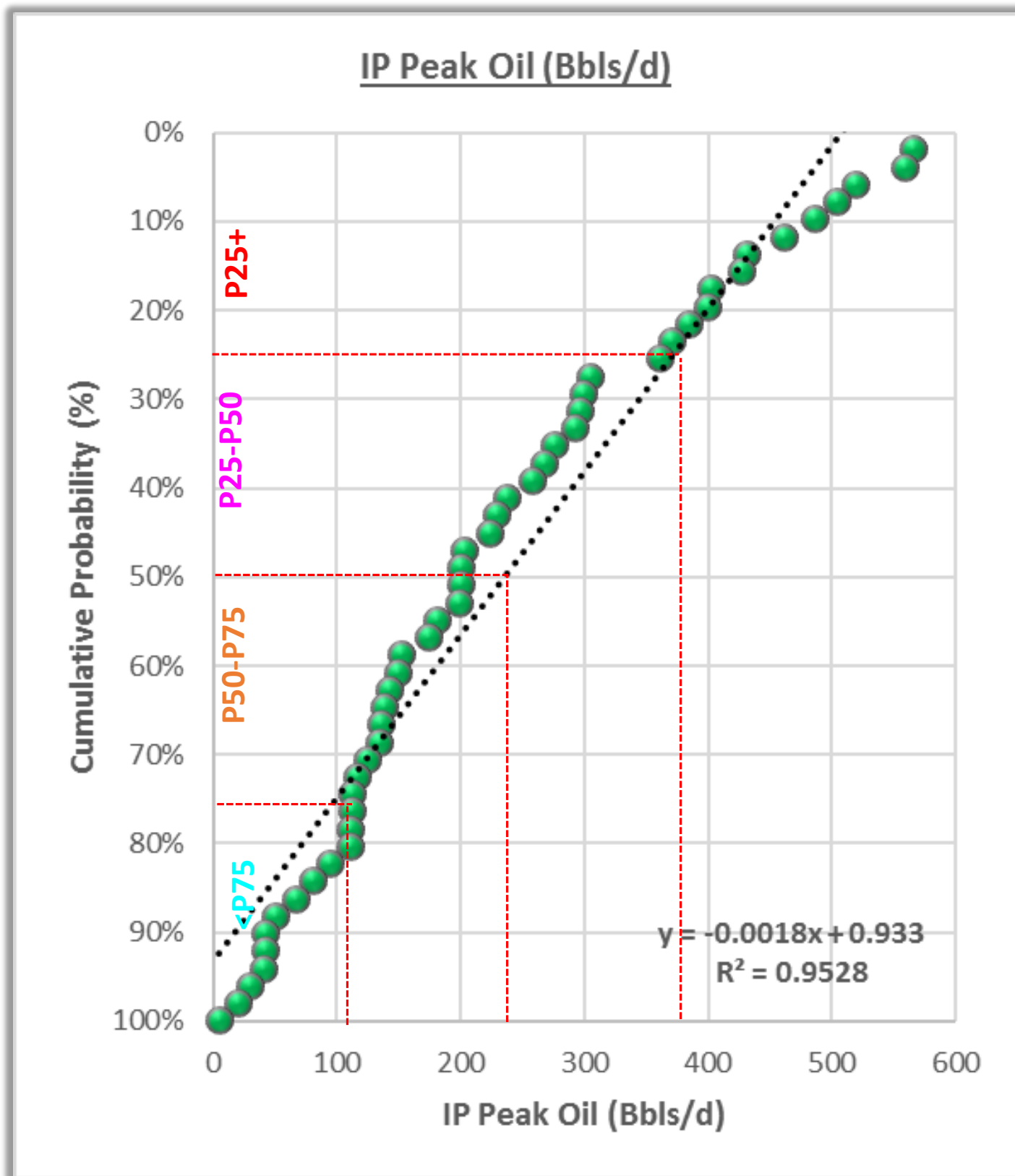
- As with many unconventional play types, defining IP for productivity analysis can be somewhat difficult due to multiple factors
- Review of all Duvernay Hz's raw production profile illustrates a somewhat long production startup phase (3 to 8 months) followed by a more typical decline profile there after
- In order to complete meaningful statistical analysis, a strict means of defining IP was implemented in order to capture true IP Peak production
- IP Peak production is defined as the highest overall observed production value, regardless of the month that it occurs in, followed by at least two subsequent months of legitimate production decline



MONTH	100/01-11-034-24W4/0	100/01-24-032-24W4/0	100/01-34-031-25W4/0	100/02-26-034-24W4/0	100/03-30-031-25W4/0	100/04-15-031-24W4/0	100/05-18-034-24W4/0	100/08-20-033-24W4/0	100/09-05-033-24W4/0
0	115	43	2	57	110	103	56	37	0
1	192	47	53	65	268	23	53	58	16
2	63	25		182	0	126	81	67	65
3	0			382	0	153	73	45	29
4	123			371	432	66	59	0	116
5	85			264	227	234	49	3	153
6	204			343	364		42	0	96
7	258			338	210		41	0	78
8	163			384	209		39	0	61
9	162				103		40	0	65
10	139						39	0	54
11	125						29	0	
12	114						29	174	
13	105						28	64	
14	96						26	41	
15	91						24	33	

DUVERNAY HZ PRODUCTION PERFORMANCE:

Cumulative Probability - IP Peak Oil (Bbls/d)

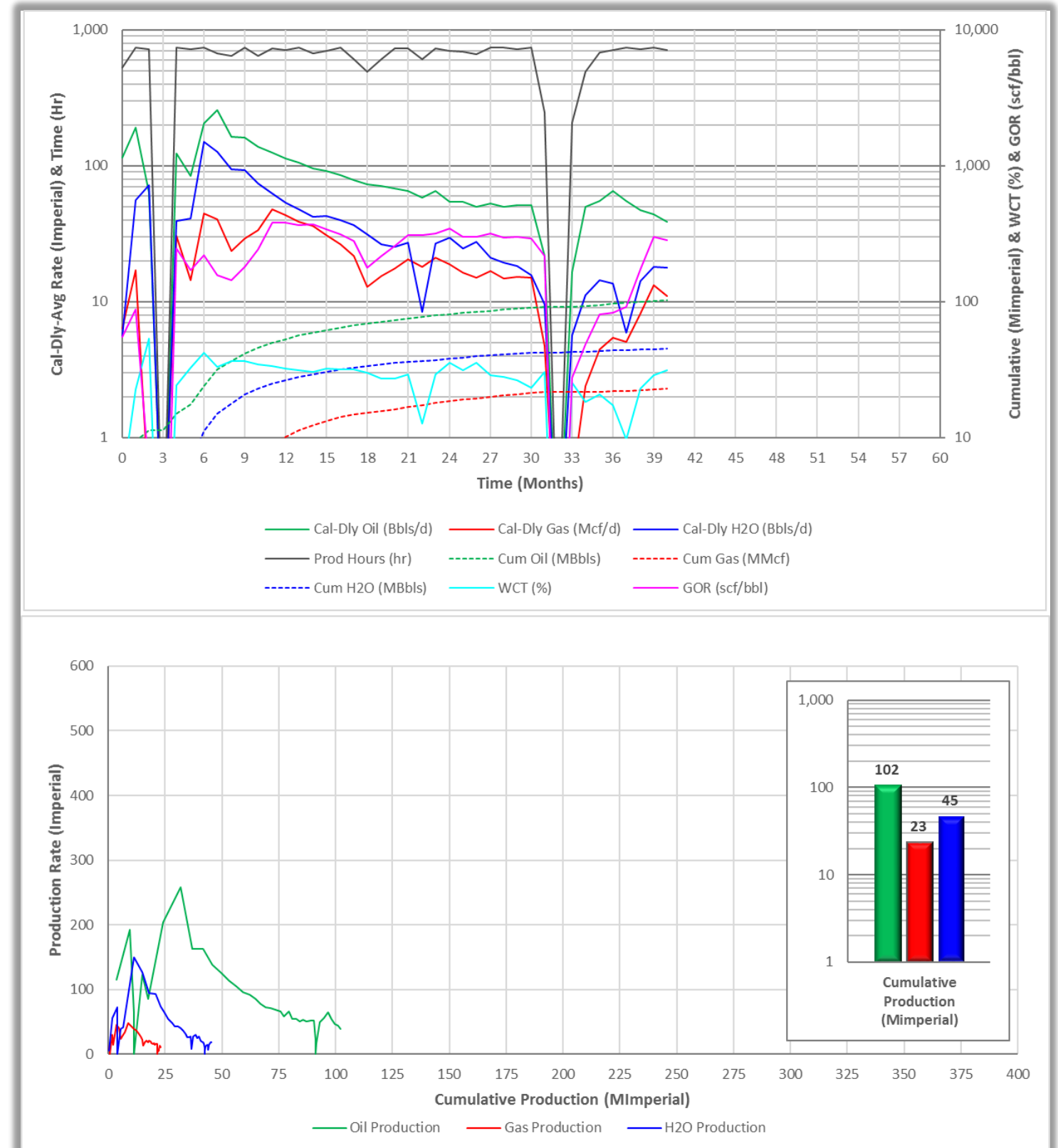


PRODUCTION ANALYSIS:

EUR Methodology & Analysis

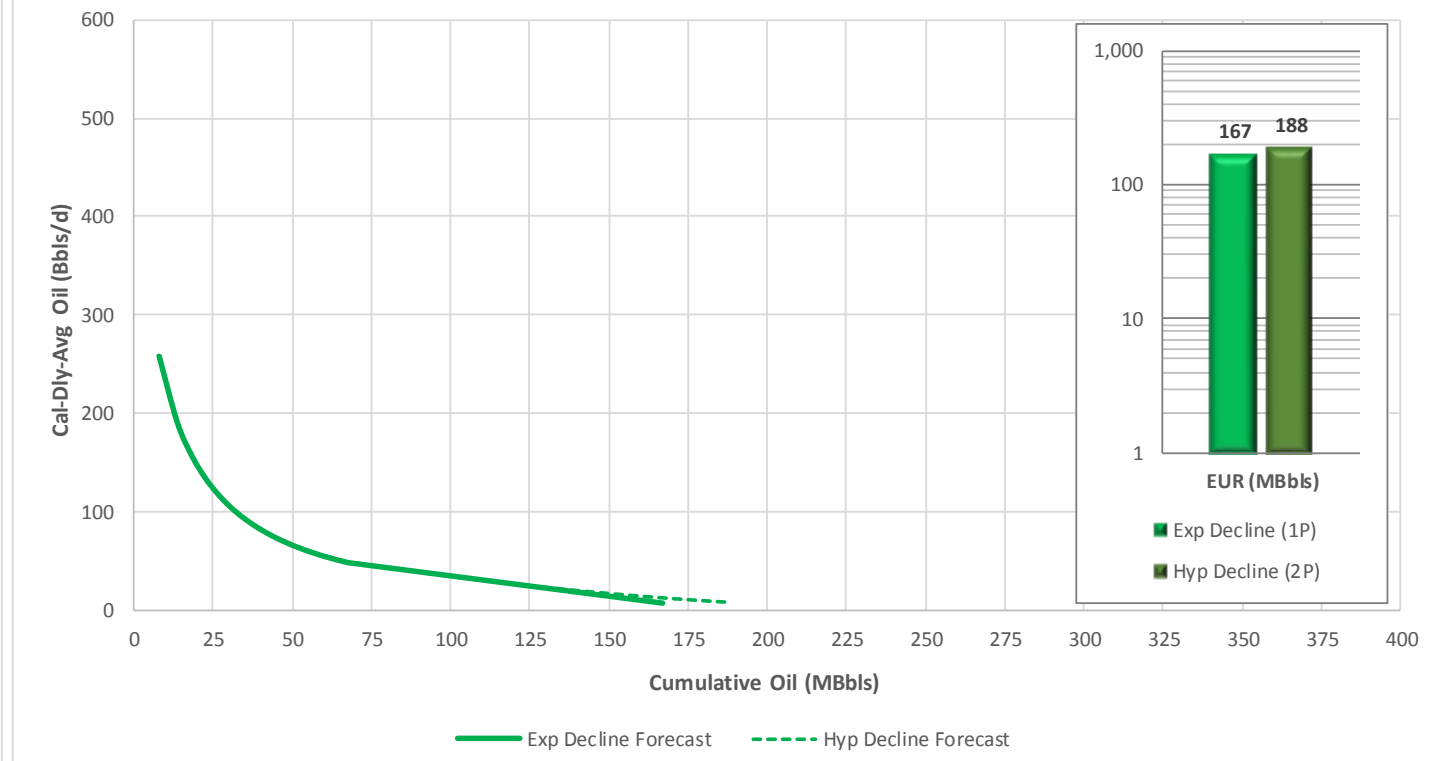
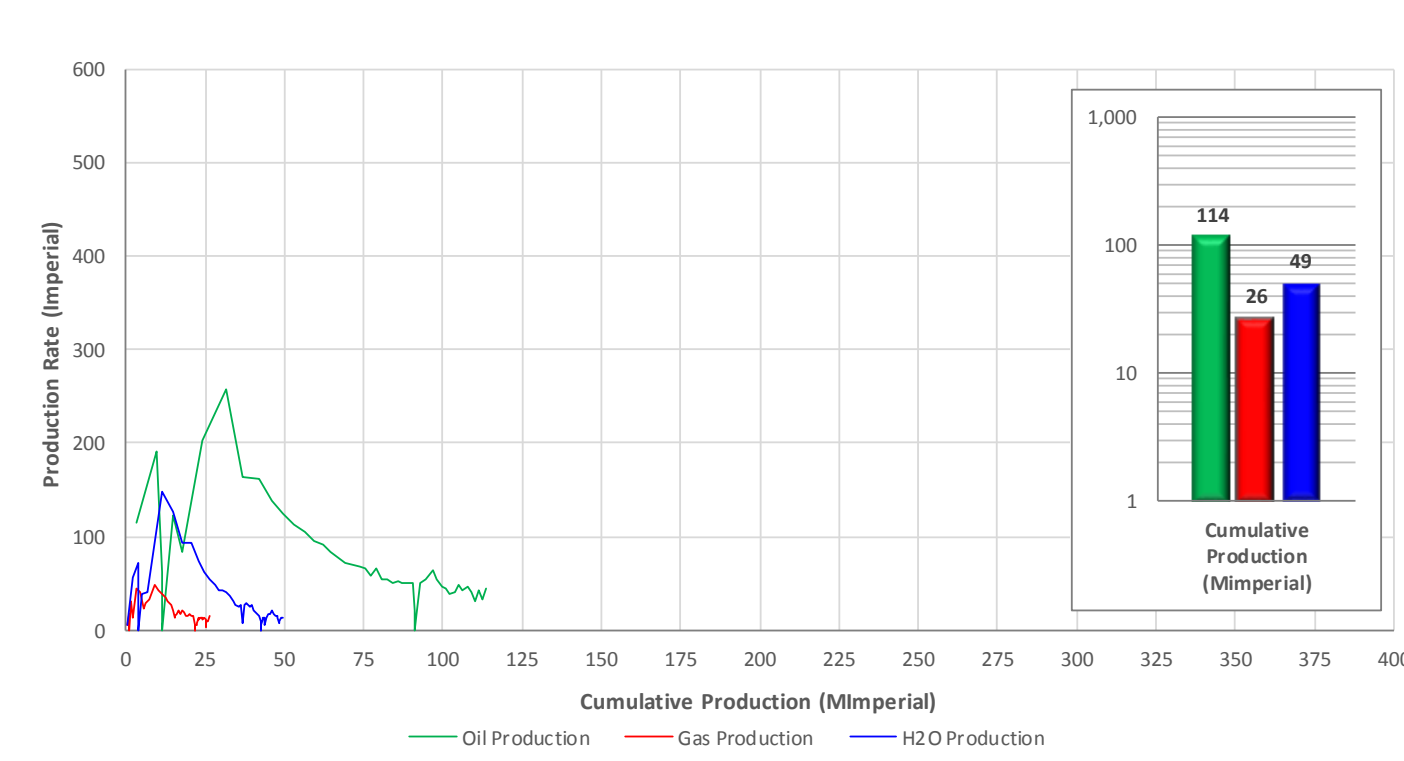
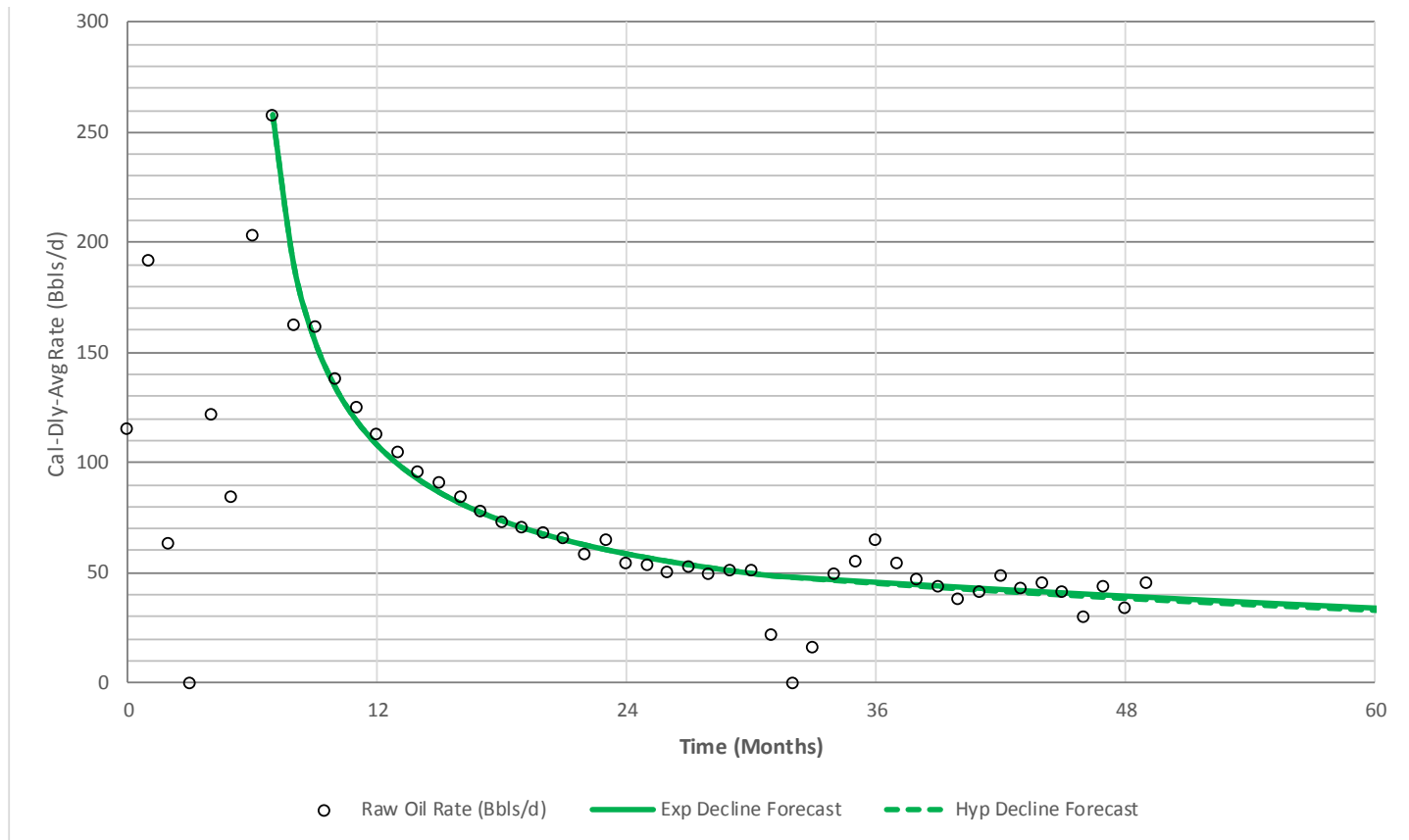
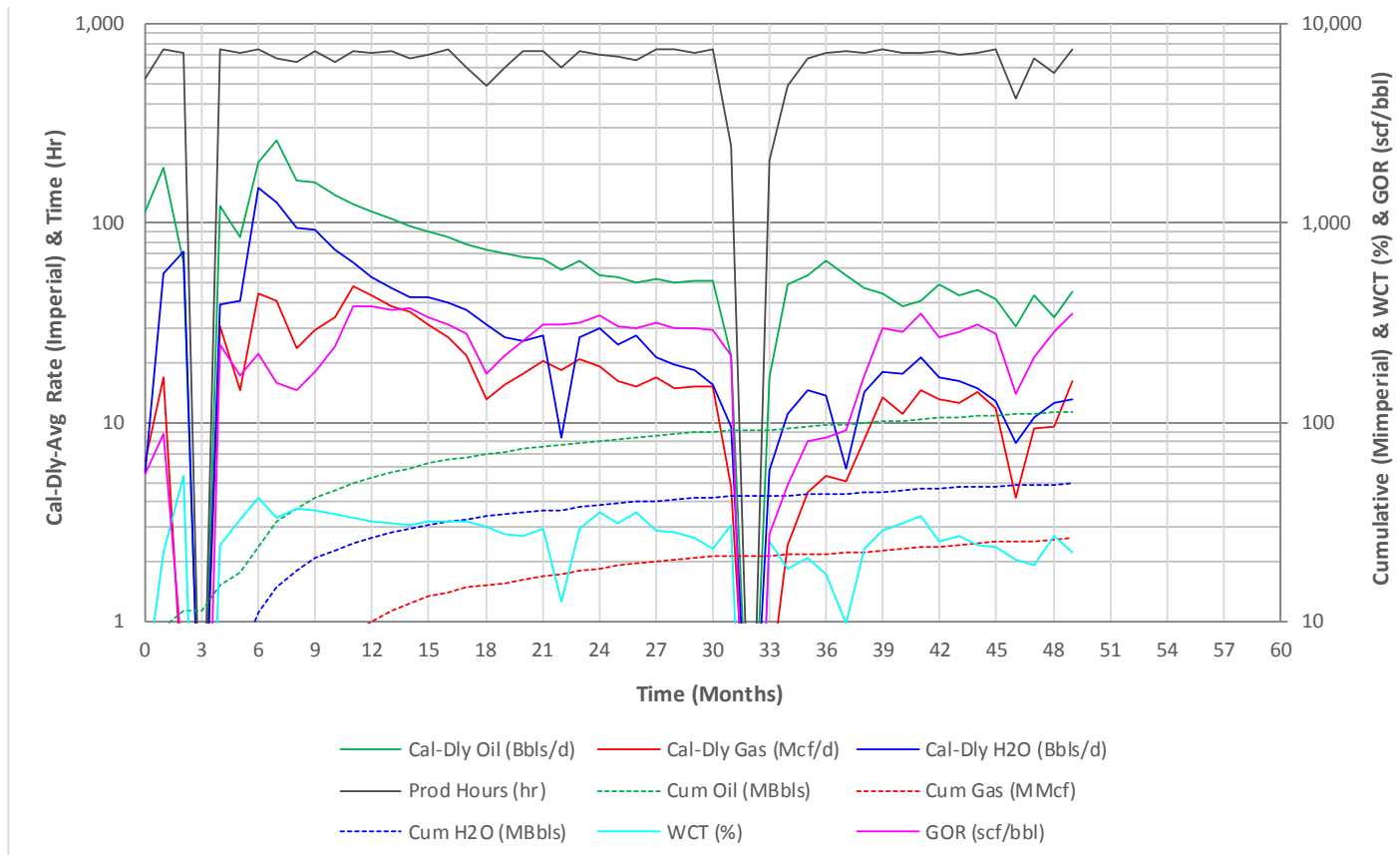
- As a result of the East Duvernay Play being early on in the production phase (Huxley Sub-Basin, has only 4 wellbores with 12 months or more of valid production) integration of analogous offset data (e.g. Morningside Sub-Basin) was required in order to effectively decline each wellbore in order to derive an overall EUR estimate
- Wellbores with longest overall production life (100/01-11-034-24W4/0) were initially declined from peak observed production, in order to derived the variables for the first segment of the curve
- Segment 2 of the curve was subdivided into pessimistic case (1P) and optimistic case (2P)
 - 1P Curve – implemented a straight 15% annual exponential decline starting at month 24 to an abandonment rate of 7 Bbls/d
 - 2P Curve – implemented a hyperbolic decline with a b factor of 0.5, starting at month 24 to abandonment rate of 7 Bbls/d
- Decline attributes including EUR & Reserve life were captured for mapping purposes in addition to the decline curve for future type curve creation and production growth estimates

NOTE: the purpose of this exercise is not to determine the exact expected EUR to three decimal places, but rather view each well in relatively the same way in order to accurately map, and compare production results relative to reservoir/wellbore attributes



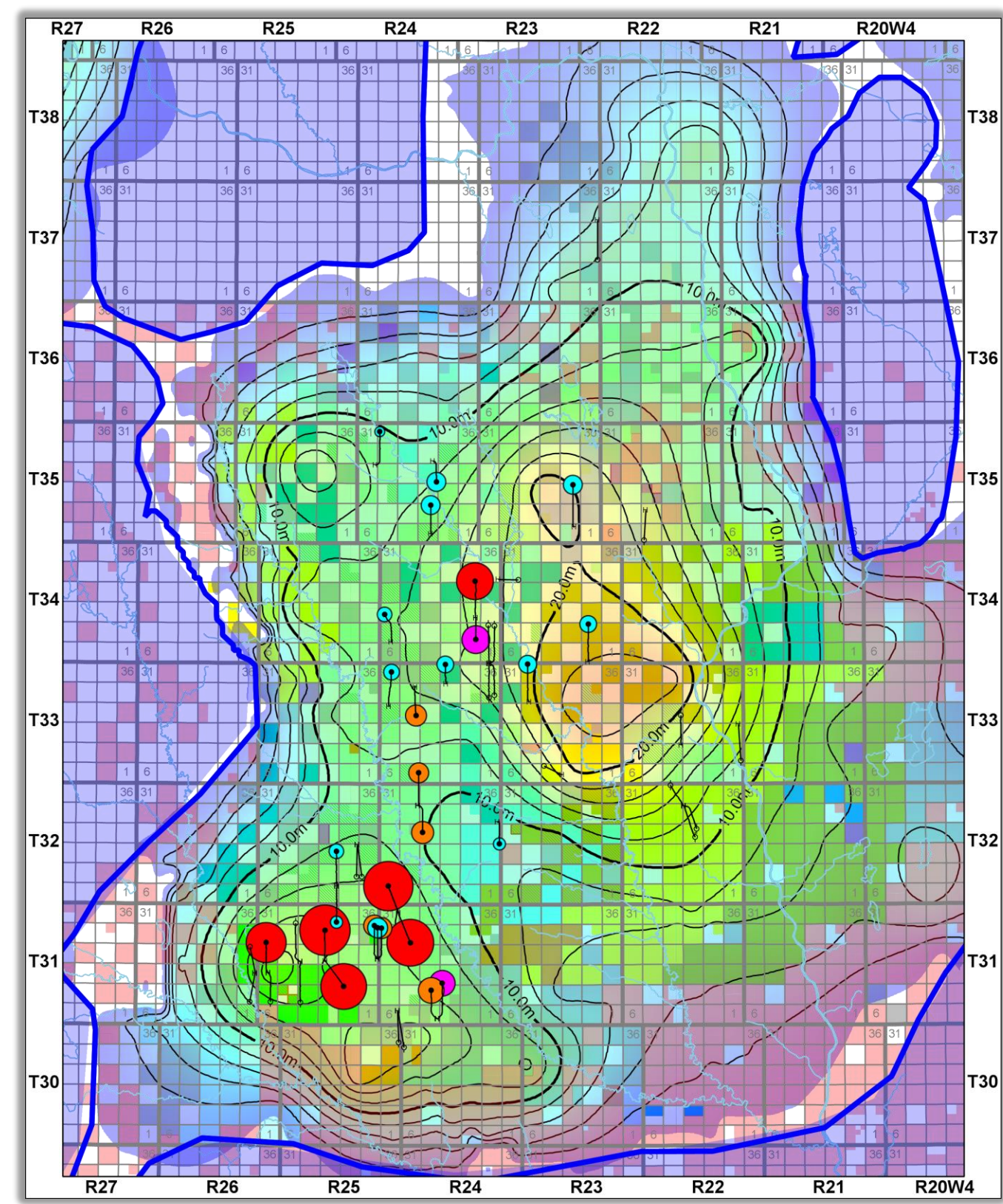
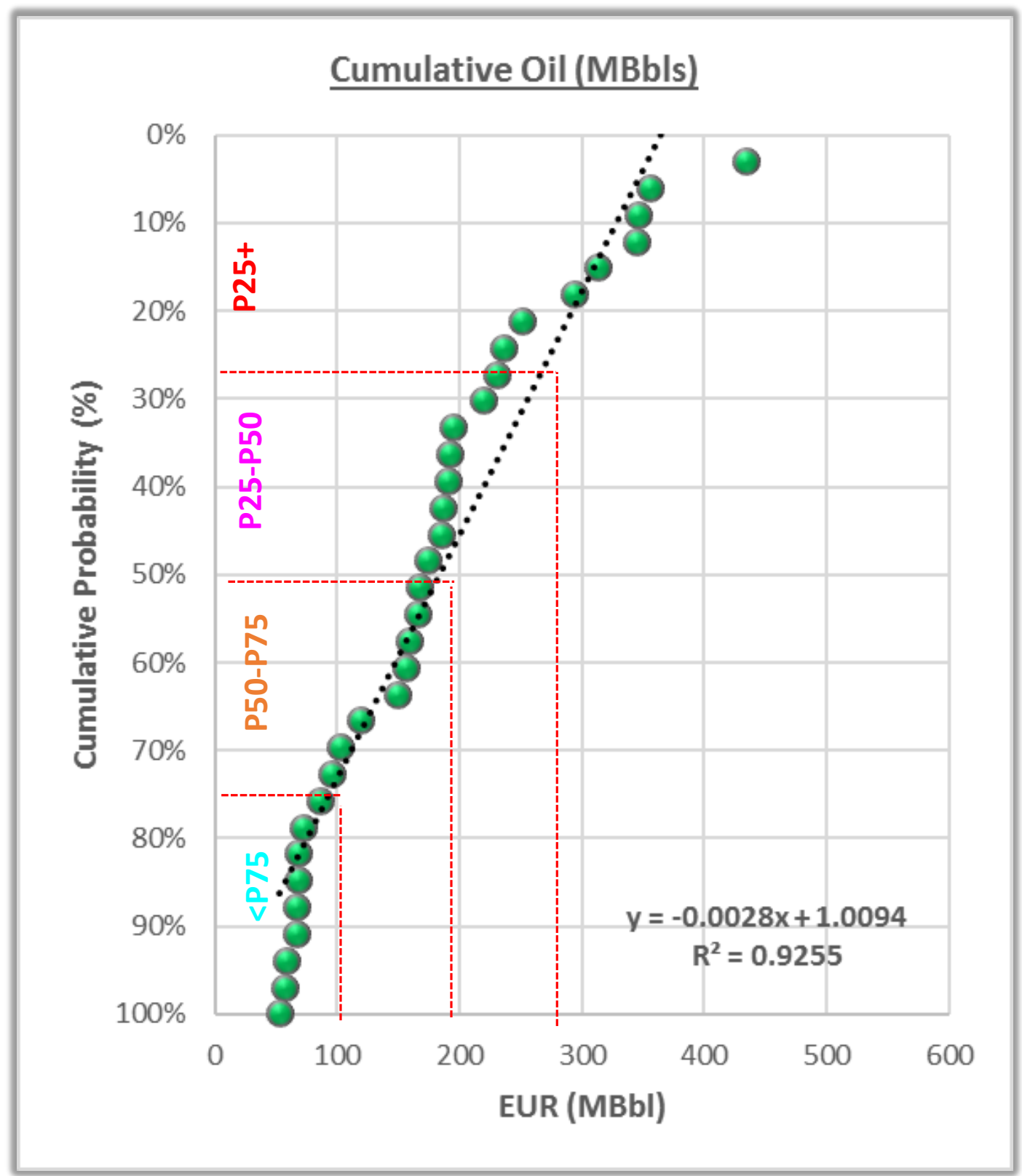
EUR FORECASTING:

Decline Analysis Example (100/01-11-034-24W4/0)



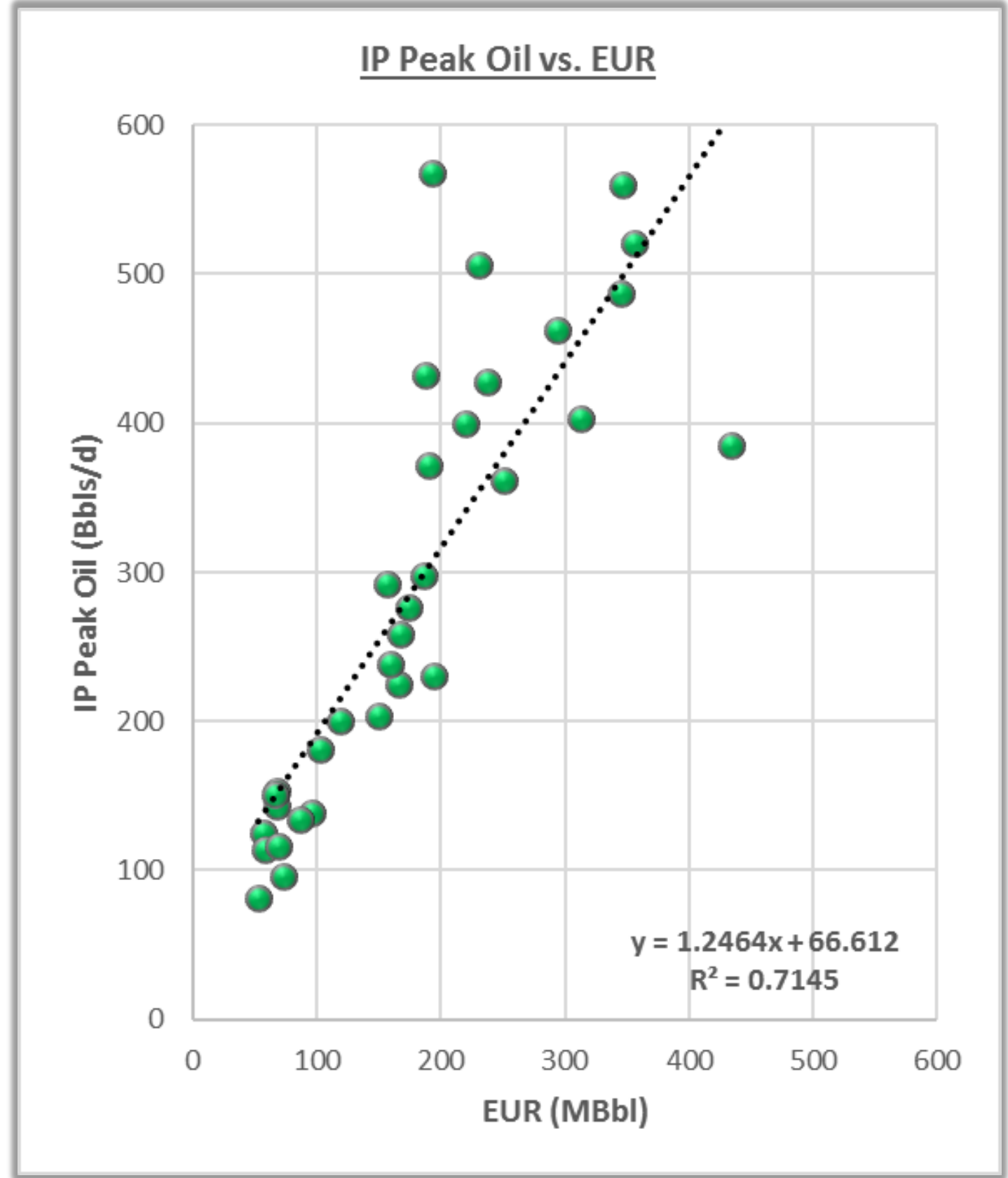
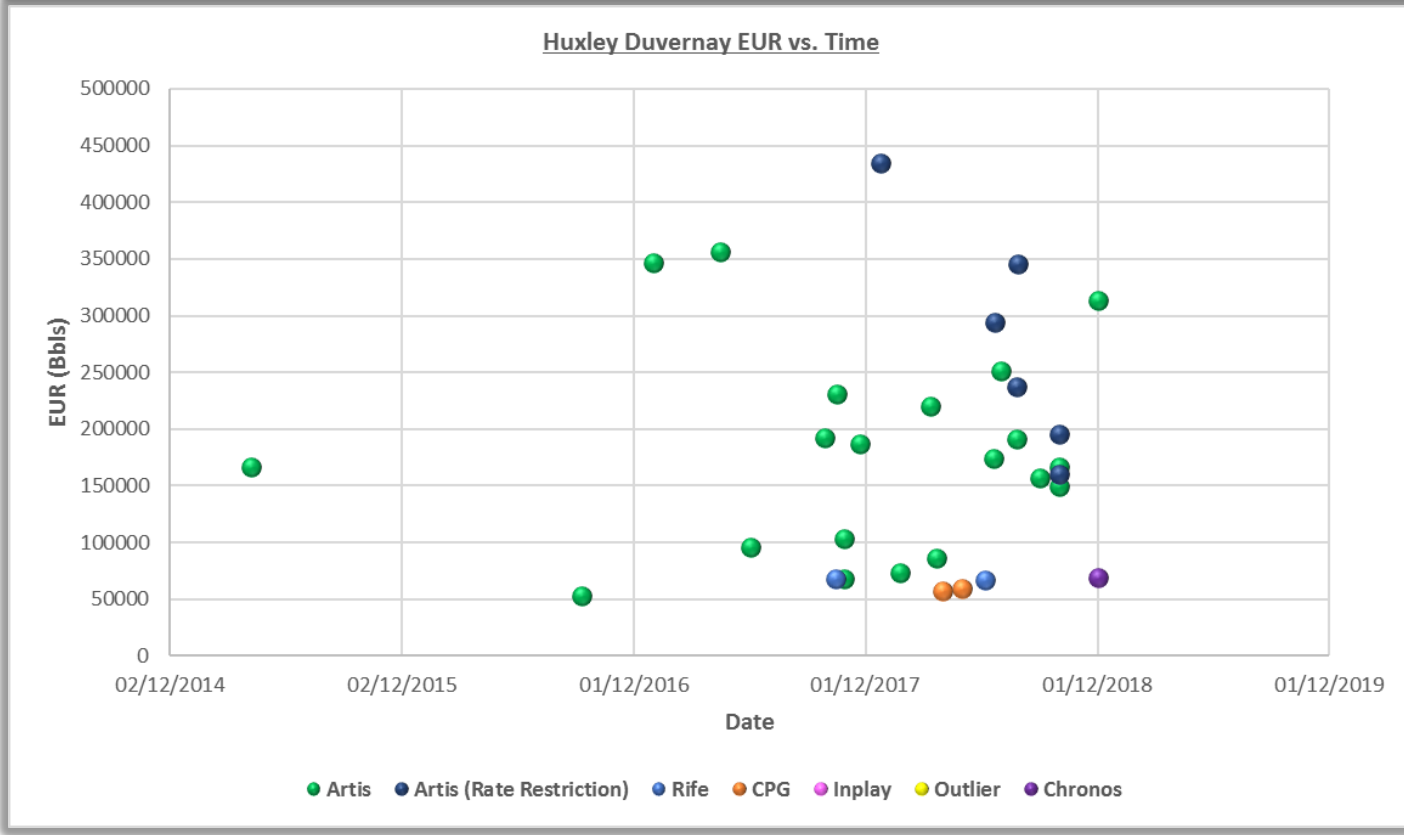
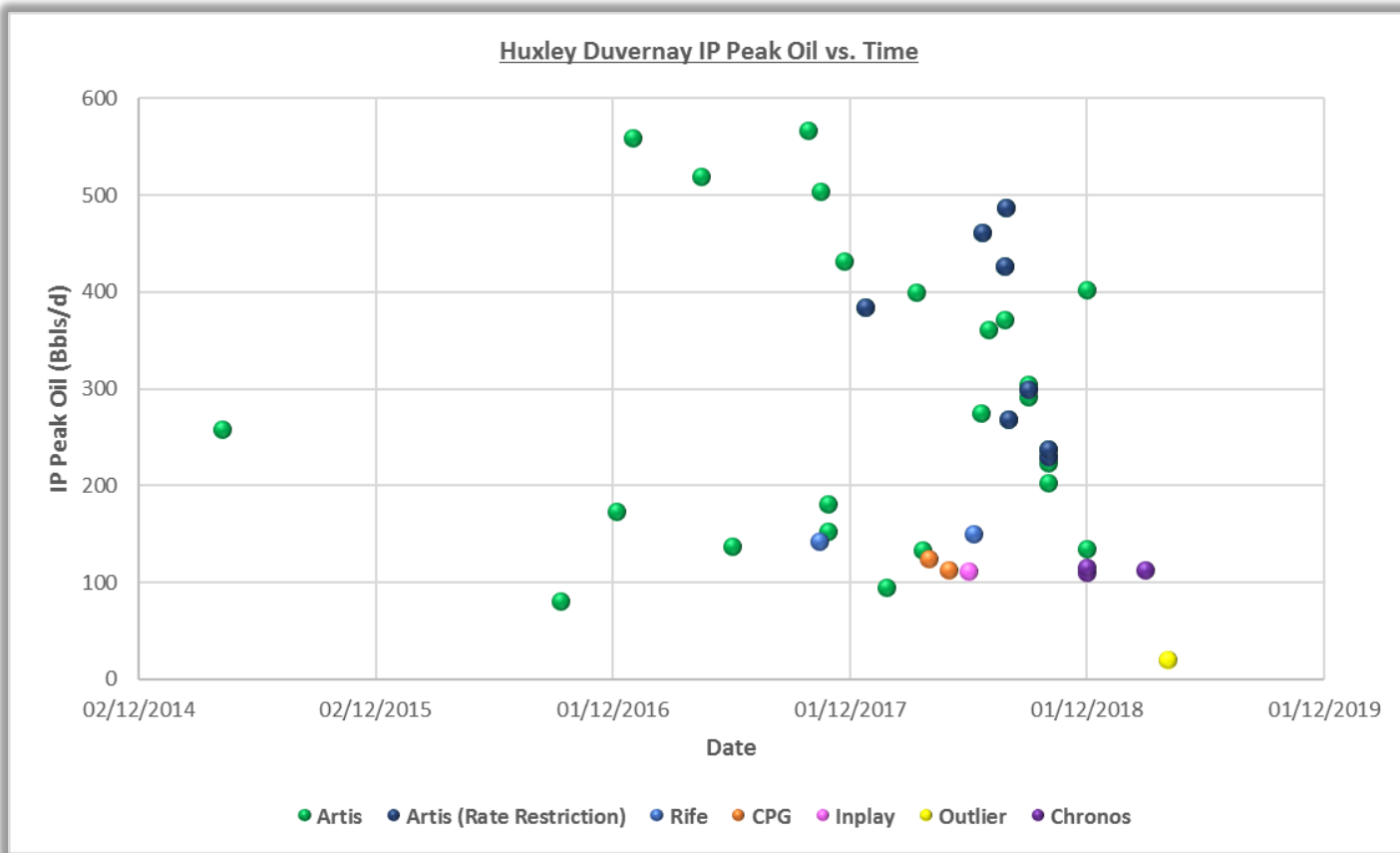
DUVERNAY HZ PRODUCTION PERFORMANCE:

Cumulative Probability – Forecasted EUR (1P Decline)



DUVERNAY HZ PRODUCTION PERFORMANCE:

IP Peak vs. Time & IP Peak vs. EUR (1P)

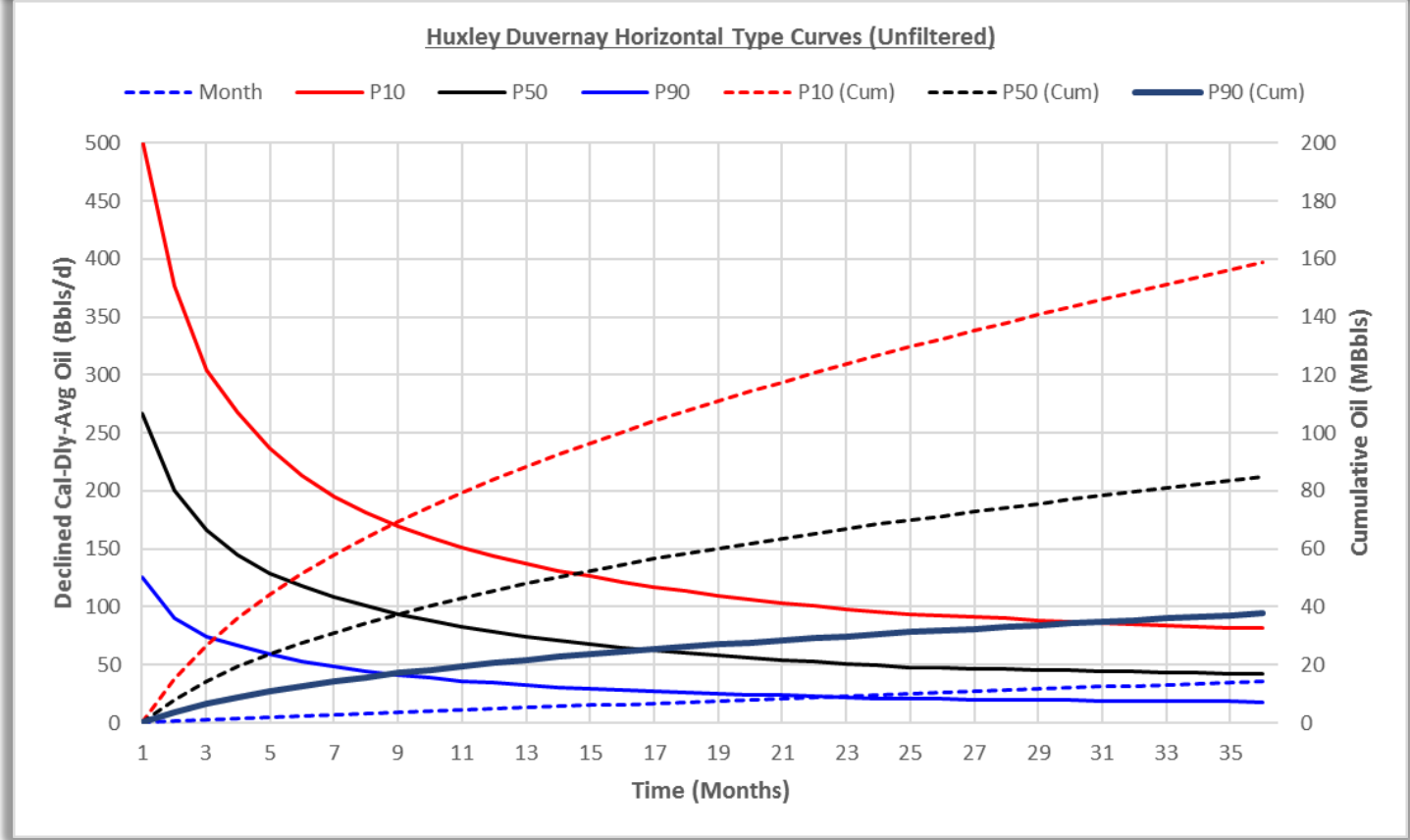
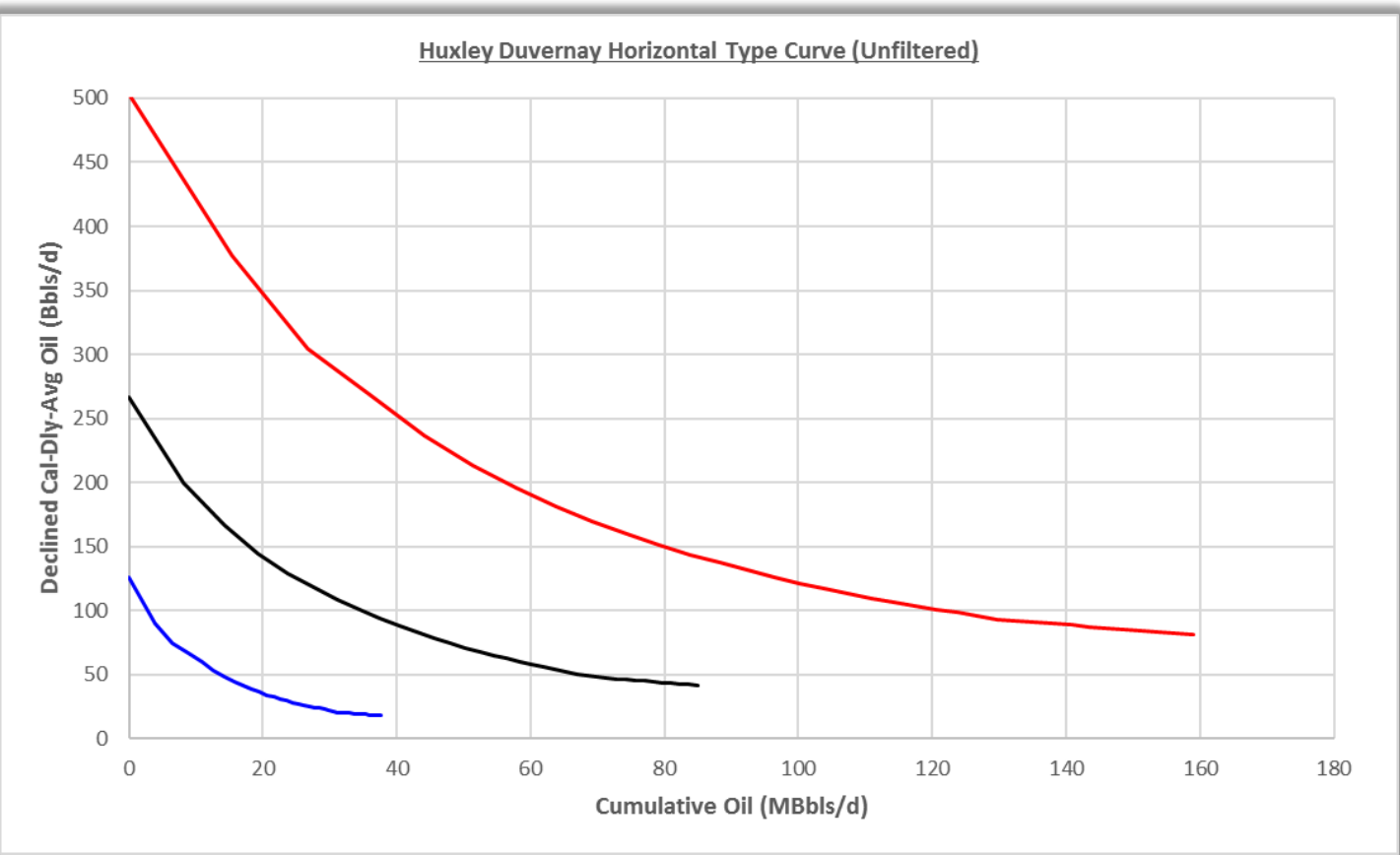
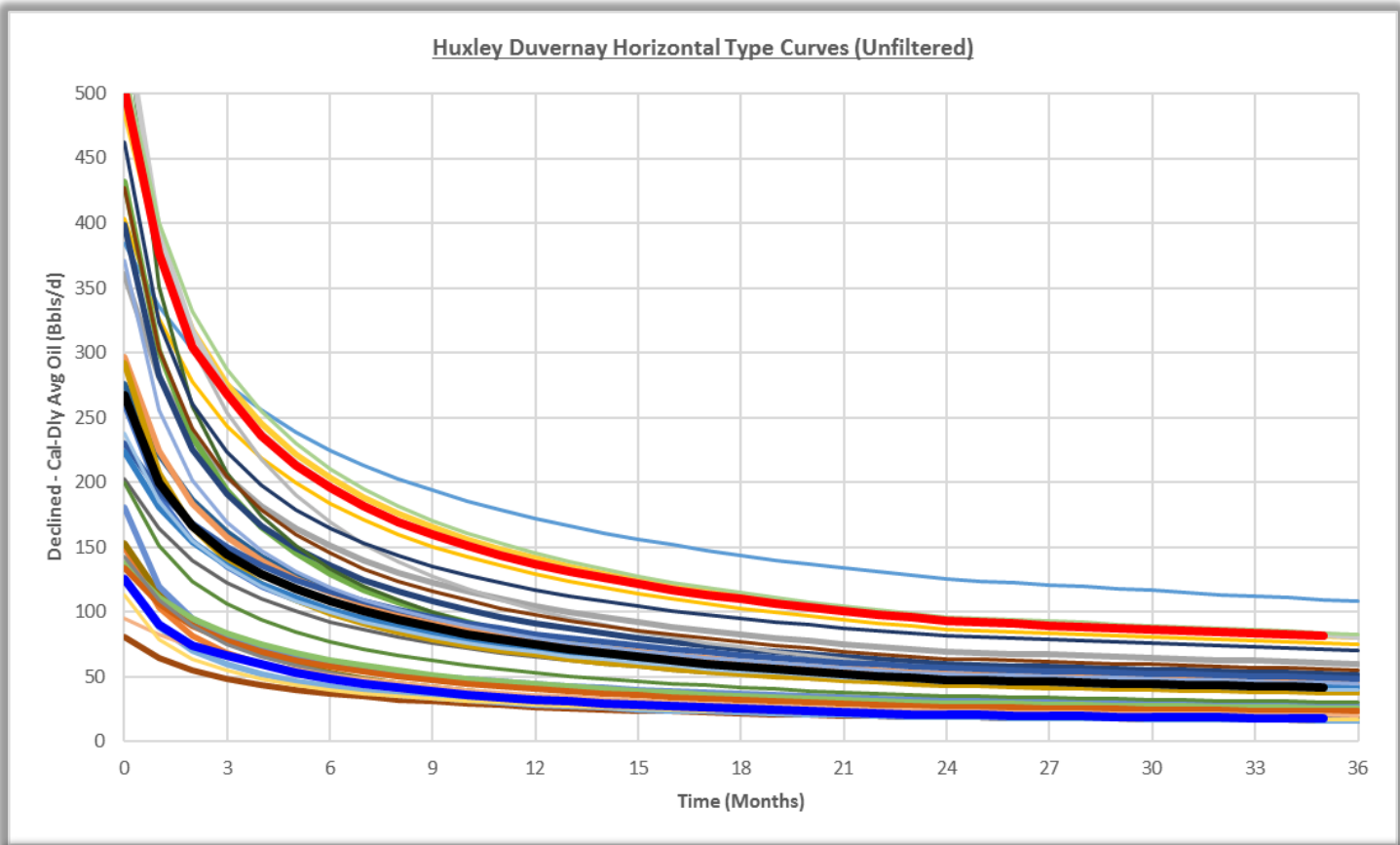


DUVERNAY HZ PRODUCTION FORECASTING:

Type Curve Generation

- Raw type curves (e.g. includes all wells) were generated through the process of normalizing production back to peak observed production rate, before declining subsequent production months
- All production declines were populated on a Cal-Dly-Avg Oil (Bbl/d) vs. Time (Months) group production plot before generating P10, P50, and P90 statistical type curves across the entire same set for the first 36 months (3 years) of production life yielding the following:

	P10	P50	P90	Ratio (P10/P90)
IP Peak (Bbls/d)	503	267	126	3.99
1 Year Cum (Bbls)	83860	45592	20642	4.06
Rate @ Yr 3 (Bbls/d)	81	41	18	4.50
3 Year Cum (Bbls)	158942	84991	37711	4.21



FINANCIAL:
CAPITAL
INVESTMENT



CORPORATE FINIANCING:

Artis Exploration & Vesta Energy

Co-Lead Agent



\$10,487,500

**8,390,000
Common Shares
at \$1.25**

July 2016

Advisor to



*in the \$180 million
growth equity
investment at
\$5.00 per share by*

WARBURG PINCUS

May 2018

Riverstone Holdings and JOG Capital Lead C\$305 Million Financing Round for Vesta Energy

CALGARY, Alberta and NEW YORK, May 17, 2017 /CNW/ – Vesta Energy Corp. ("Vesta" or the "Company") today announced it has entered into definitive agreements with respect to a C\$295 million equity financing round (the "Transaction") priced at C\$4.50/share, co-led by energy private equity firms Riverstone Holdings LLC ("Riverstone") and JOG Capital ("JOG"). Other investors in the round include certain funds managed by JOG and the Vesta management team. In conjunction with the investments by Riverstone and JOG, Vesta has announced a private placement offering of up to C\$10 million to existing shareholders at C\$4.50/share.

Headquartered in Calgary, Alberta, Vesta is a privately held exploration and production ("E&P") company led by Founder and CEO Curtis Cook focused on the development of light oil properties in the shallow Joffre Duvernay Shale oil play. Mr. Cook is joined on the management team by Paul Smith (CFO), Grant Rabe (COO), Jenny Ngo (CAO) and Dermot O'Connor (VP Exploration). Vesta's management team brings strong industry experience from companies such as EOG Resources, Renaissance Energy, and Talisman Energy, and has an impressive track record of value creation across a variety of US and Canadian shale plays.

Vesta has assembled a contiguous land position of over 200,000 net acres within the Joffre Duvernay Shale oil play. The Company currently has 23 wells on stream and is producing approximately 3,500 boe/d, of which 80% is light oil. The Transaction is anticipated to close on May 26, 2017, and will provide Vesta with sufficient capital to execute on an accelerated development program across its extensive land base.

Curtis Cook, Founder and CEO, said: "We are excited to partner with Riverstone and to welcome Olivia Wassenaar and Denzil West to the Vesta Board of Directors. Riverstone will assist the Company in accelerating its development of the Joffre Duvernay Shale oil play and ultimately showcasing the play to the broader North American investment community. Riverstone brings a strong financial acumen as well as a deep understanding of the development of shale resource plays through the likes of Mark Papa, Riverstone partner, CEO of Centennial Resource Development, and former CEO of EOG Resources."

Olivia Wassenaar, Managing Director at Riverstone, added: "Our investment in Vesta reflects the confidence we have in Curtis and the entire Vesta management team. By applying learnings from US shale plays, Vesta is developing the Joffre Duvernay Shale oil play into a world class resource and one of the most economic plays in North America. We look forward to partnering with the management team and JOG to continue to grow the business."

Our Mandate

To deliver high-performance professional
services focused on value creation level of
budget constraints

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