Performance Review of In Situ Oil Sands Schemes Approval 9403F & 9404G

Calgary • March 31, 2010

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Pelican Lake Development Team, Jeff West - Group Lead

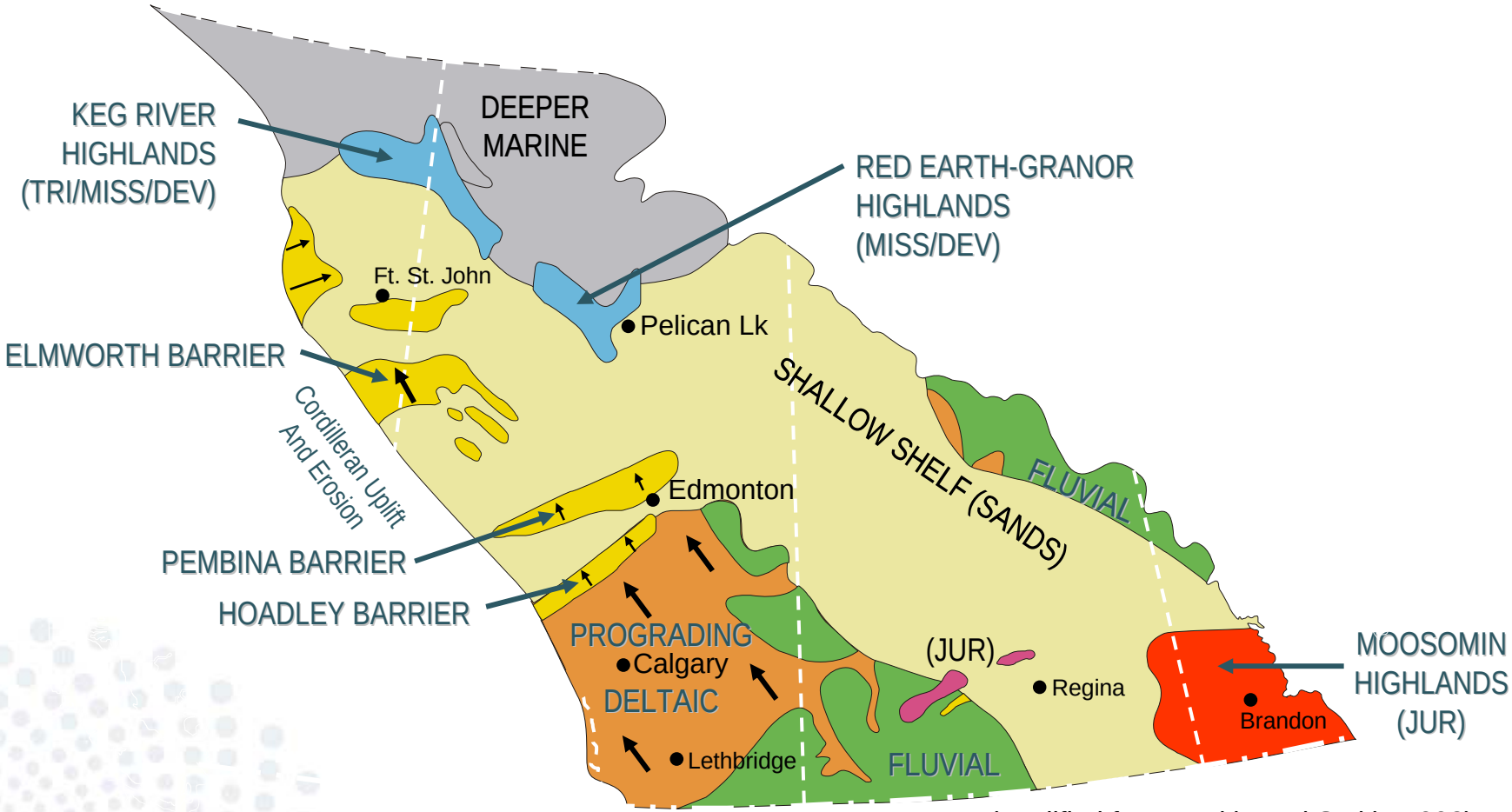
Agenda

Geological Overview

For Each Approval

- Current Approval Status
- Field Performance
- Incidents
- Near Term Activities
- Key Learnings
- ERCB Issues
- Compliance

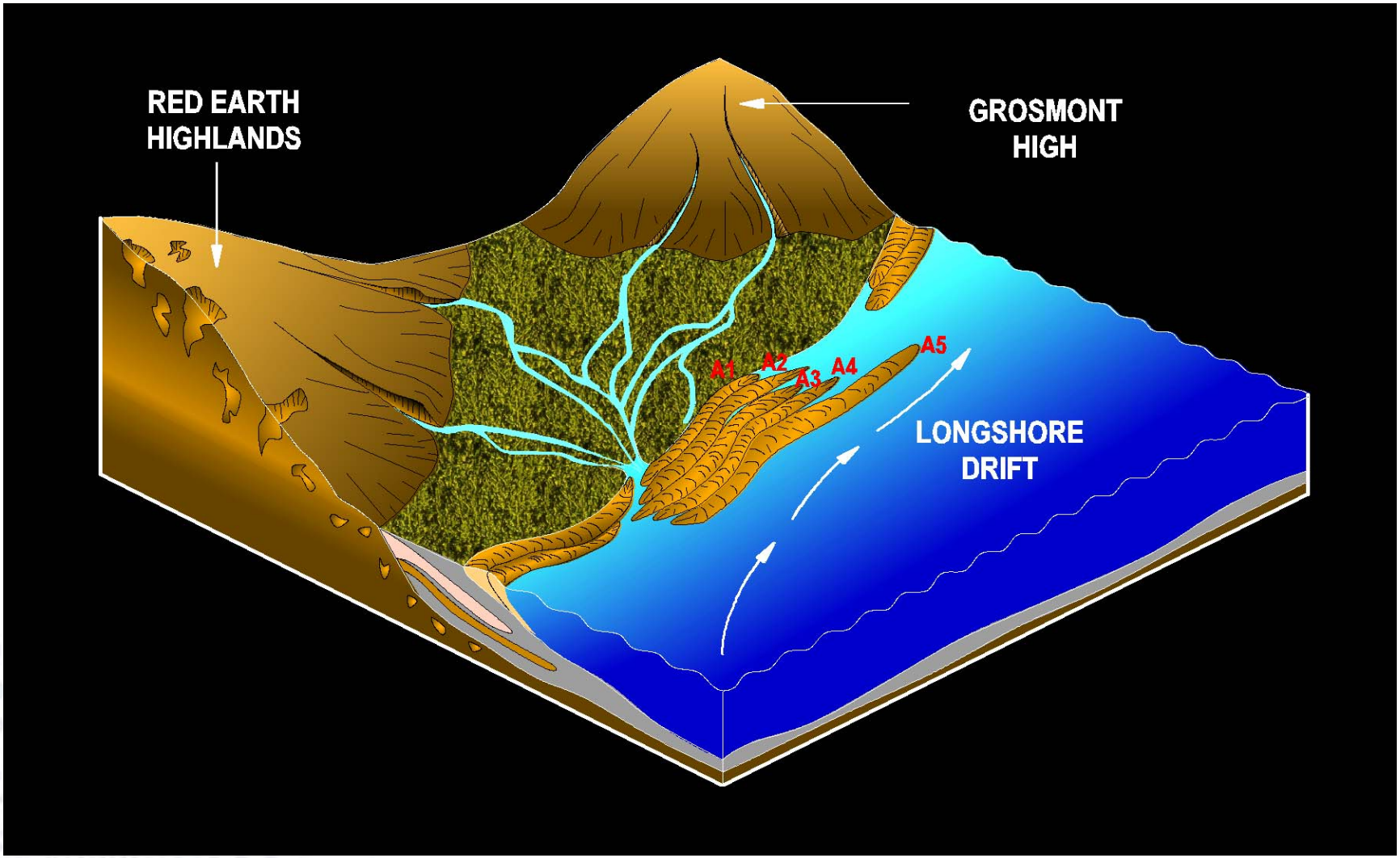
Paleogeography of the Wabiskaw and Stratigraphic Equivalents



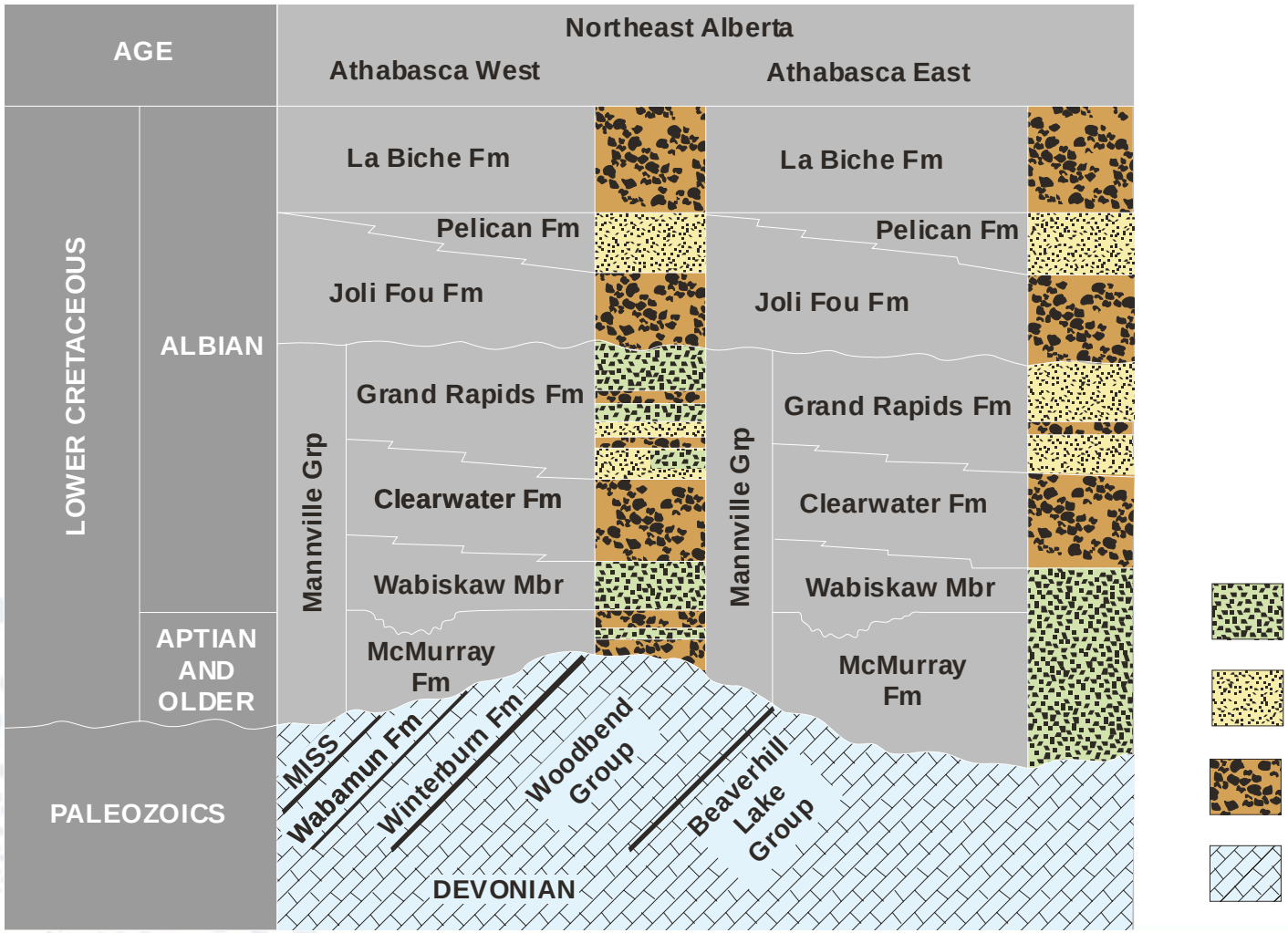
(Modified from Leckie and Smith, 1992)

Wabiskaw Depositional Model

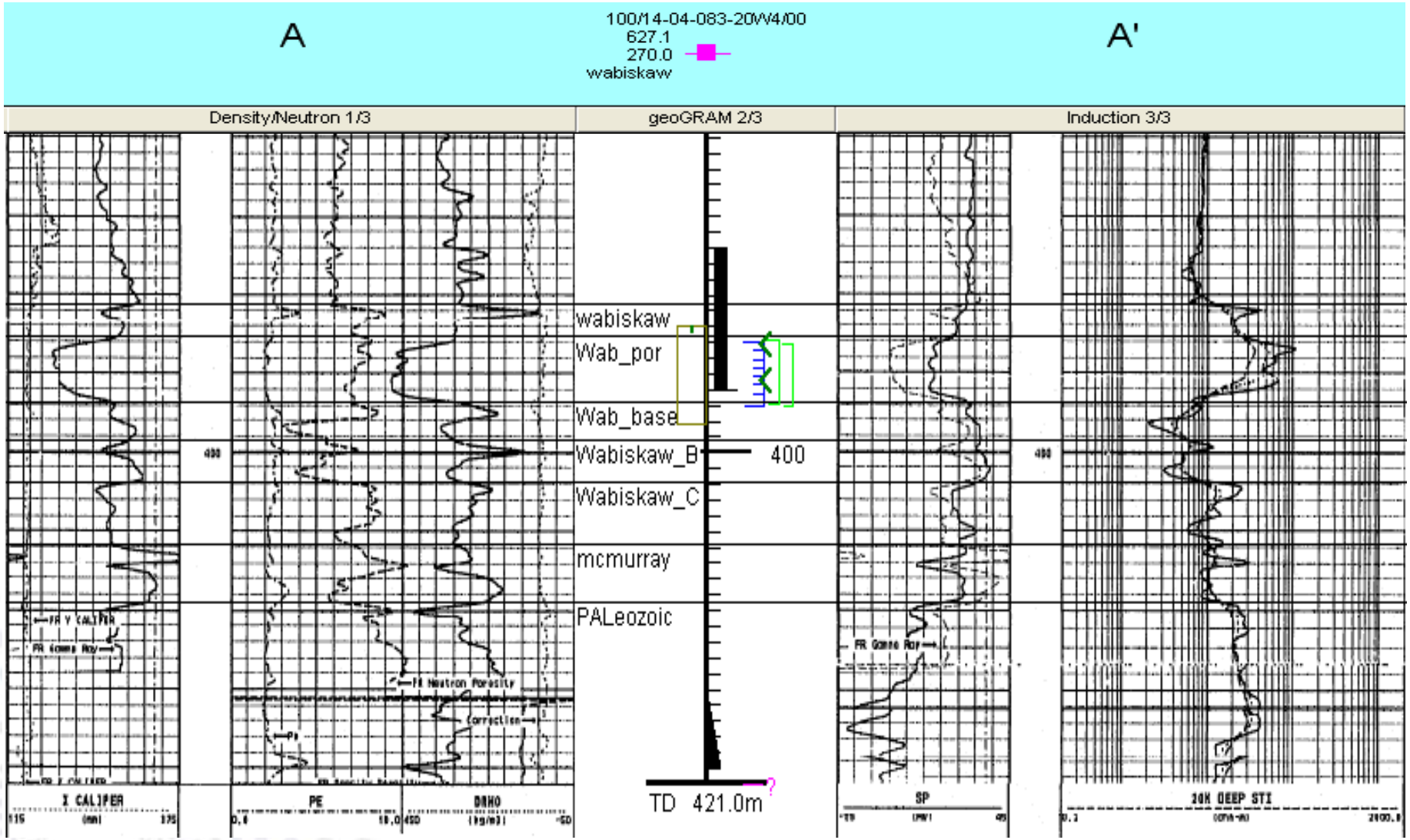
Pelican Lake Area



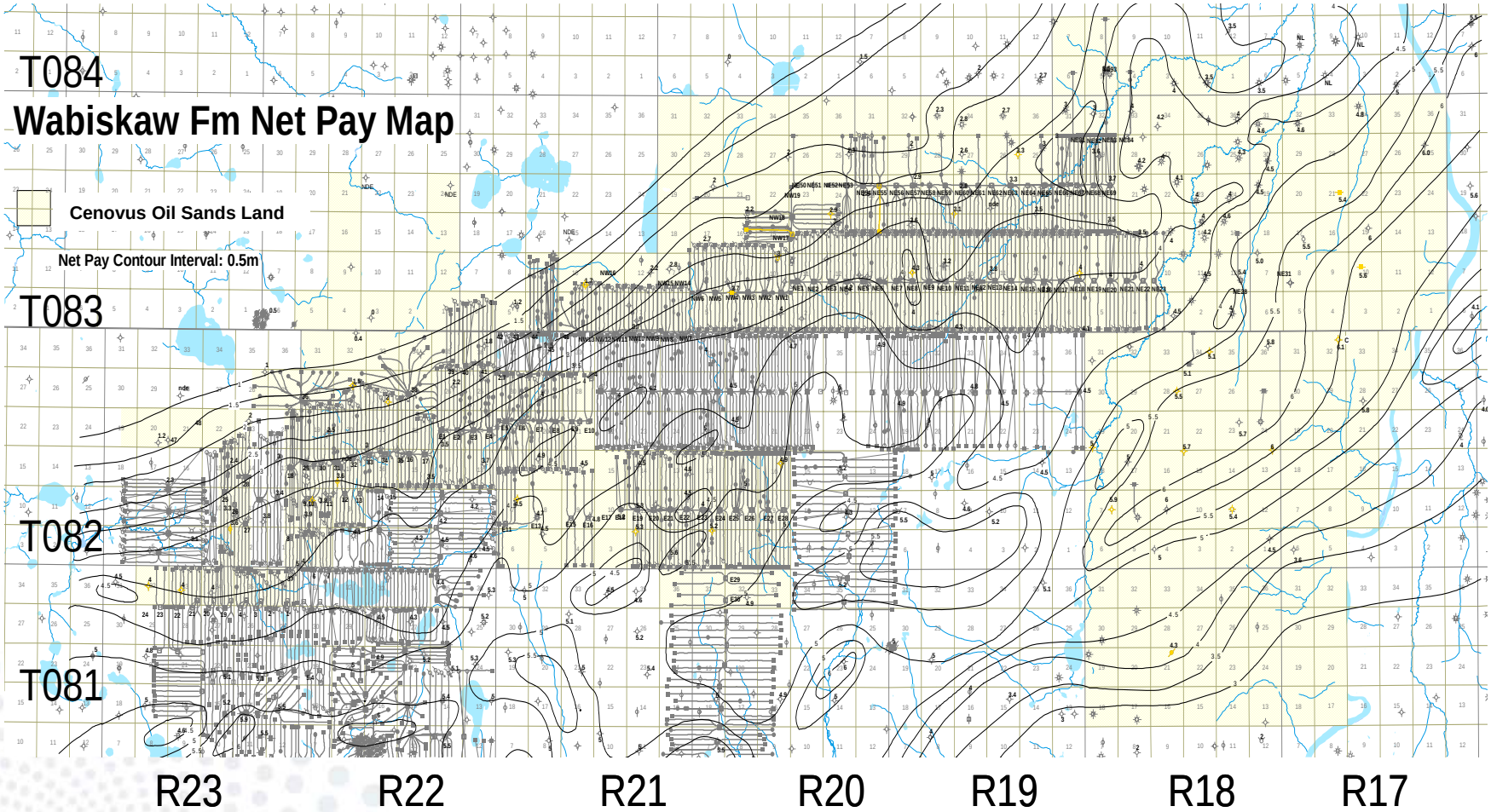
Cretaceous Stratigraphy of the Athabasca Oil Sands Area



Pelican Lake Type Log



Pelican Lake Net Pay Map



Pelican Lake Wabiskaw “A”

Typical Reservoir Parameters

Depth:	**300m - 450m**
Thickness:	**3m (avg)**
Porosity:	**30% (avg)**
Oil Saturation:	**70% (avg)**
Permeability:	**300 - 3000 md**

Current Reservoir Temp: **~14° C**

Initial Reservoir Pressure:
1800 - 2400 kPa

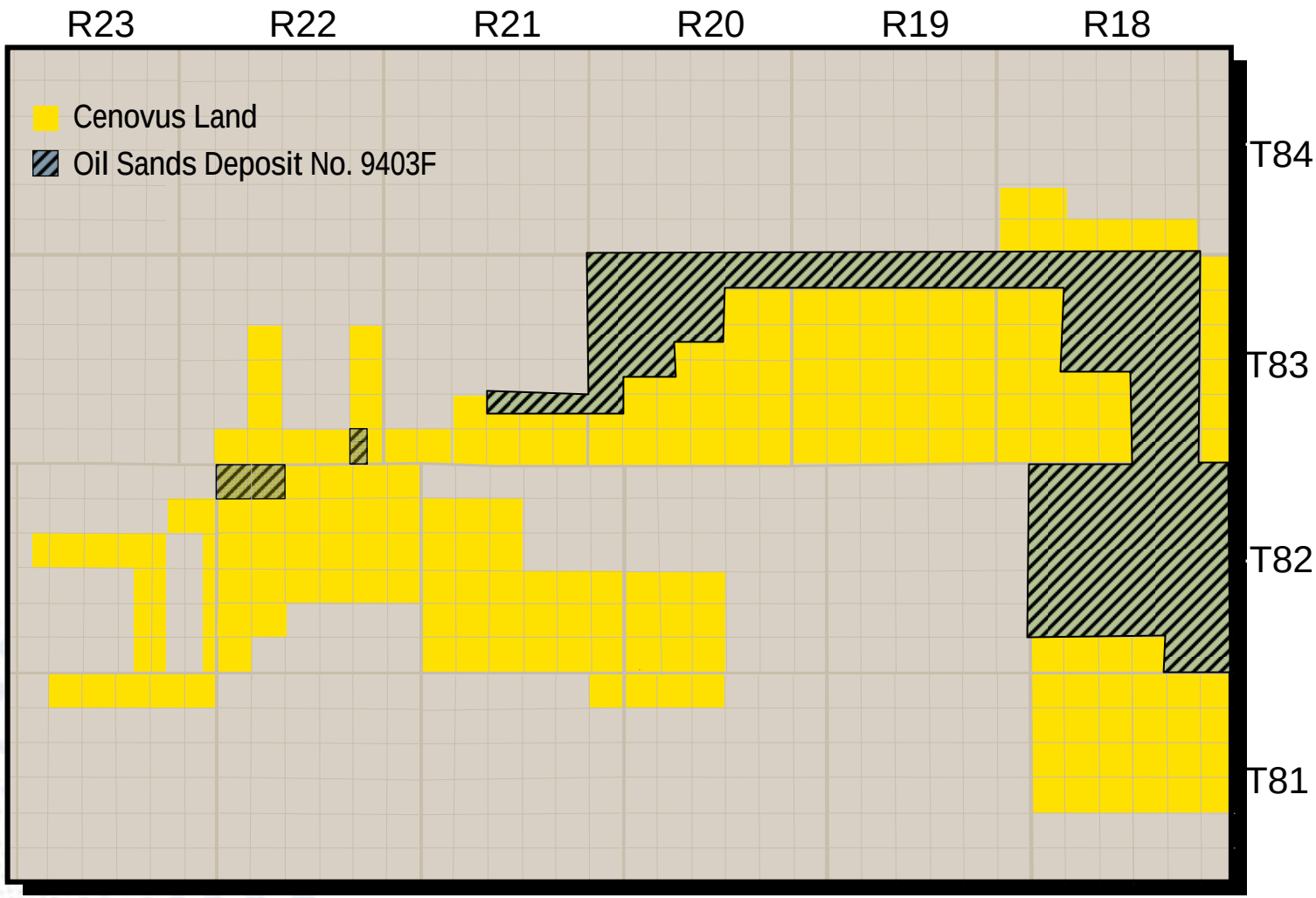
Oil Viscosity (dead)
1000 - 10000+ cp

Oil Gravity: **13.5° - 16.5° API**

Approval 9403F - Primary

Approval 9403F

Approval Area



Approval 9403F
Development Activities

No primary development in 2009

39 wells (26 producing, 13 shut-in) were moved from 9403F to 9404G, waterflood scheme

Reviewing opportunities for step-out drilling:

- 2009: 5 Vertical Strat Wells
- 2010: 7 Vertical Strat Wells

Approval 9403F

Key Learnings – Primary Production

Any future development in the primary area will be supplemented with enhanced development methods

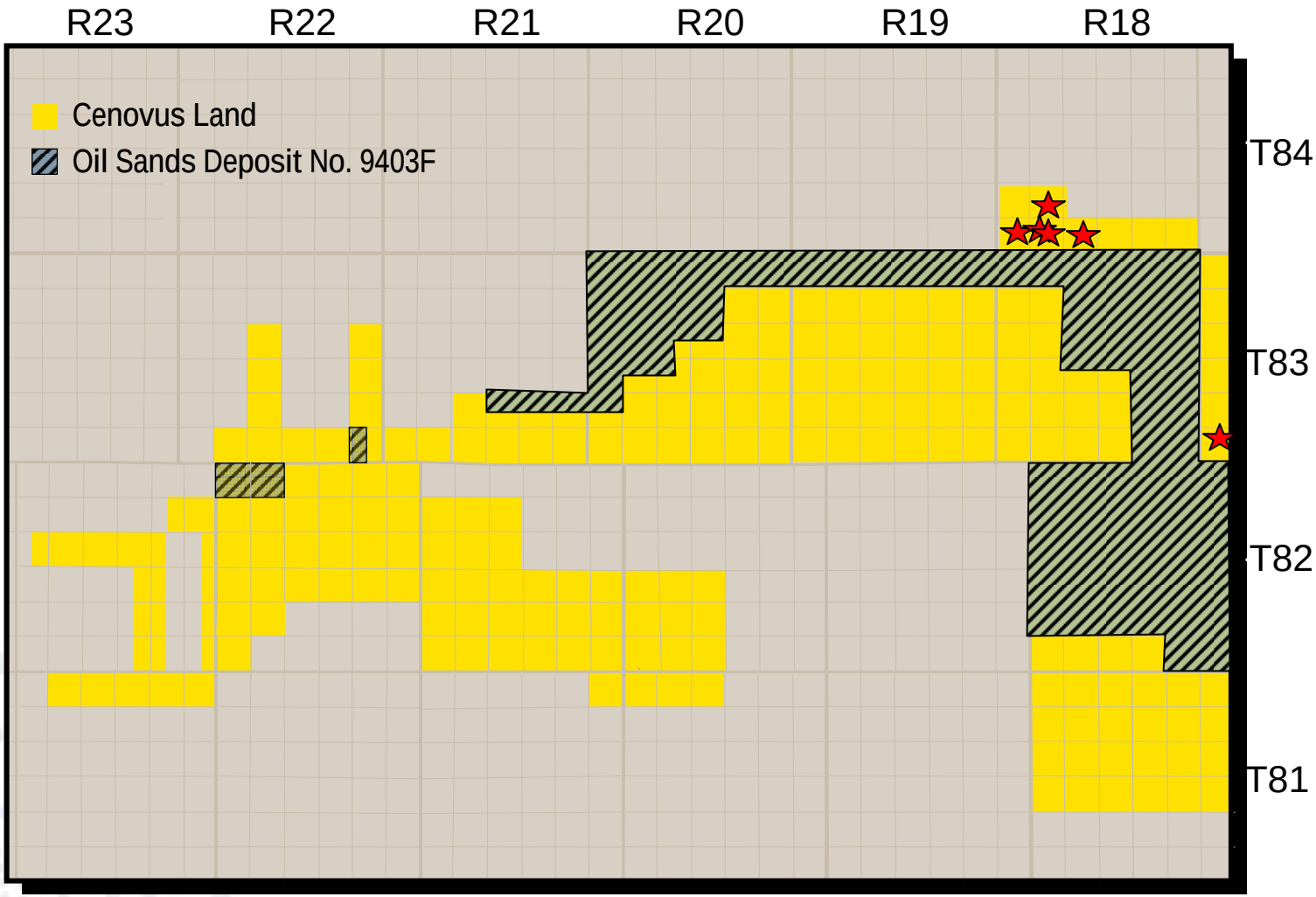
Cum rf: 1.5%; expected ultimate recovery <3%

Approval 9403F
Management and Compliance

- Should locations listed in Section 3 of Approval 9403F be within the scheme area in Appendix A ?
- This well listed in Section 3 of Approval 9403F is not in Cenovus database:
  - Surface 04-08-083-17W4M
  - BH 00/03-05-083-17W4M
- Question: With no producing wells in 9403F, any need for future annual review of this scheme ?
- Cenovus is not aware of any conditions in its Approvals or Regulations in which it is not compliant

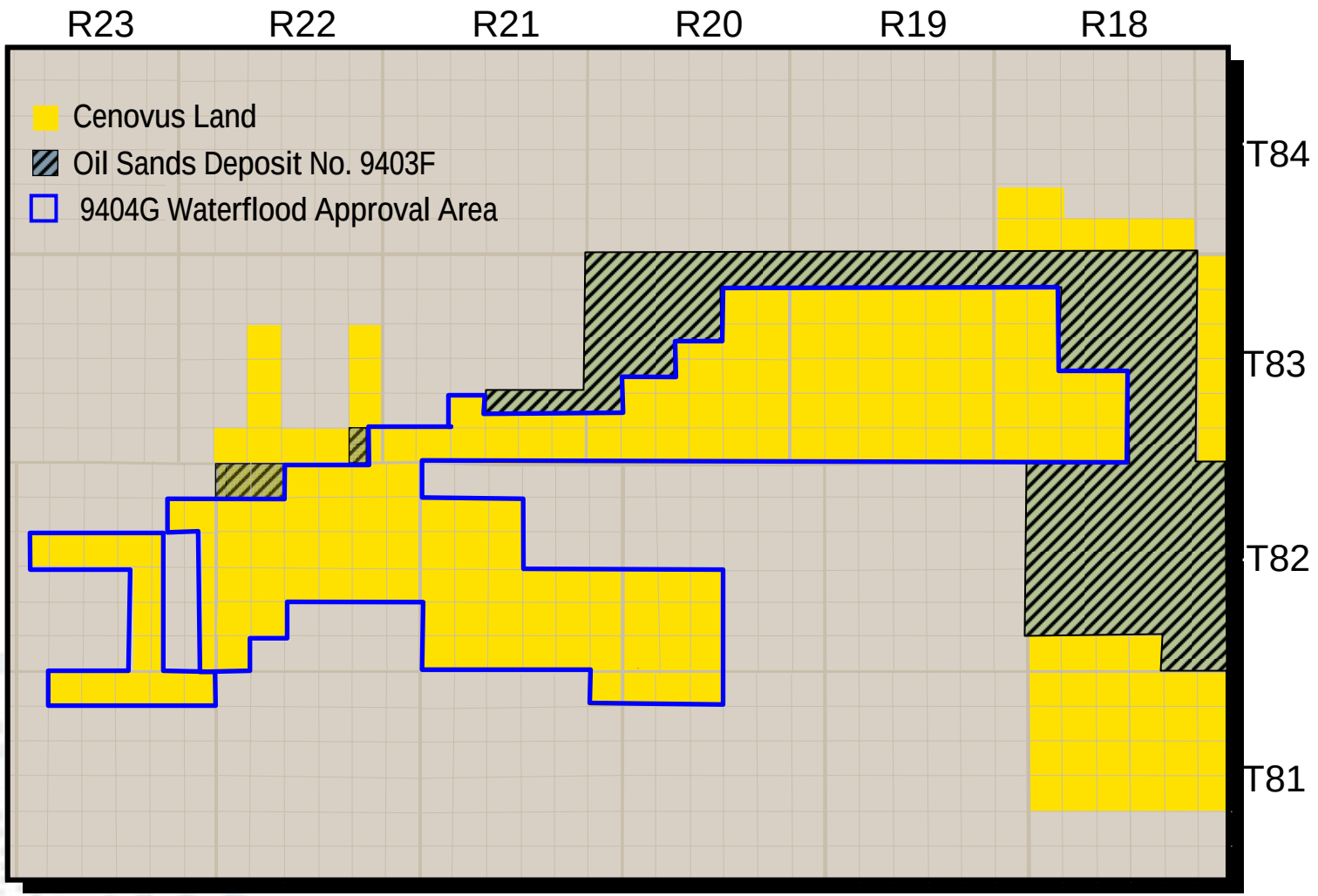
Approval 9403F

Approval Area



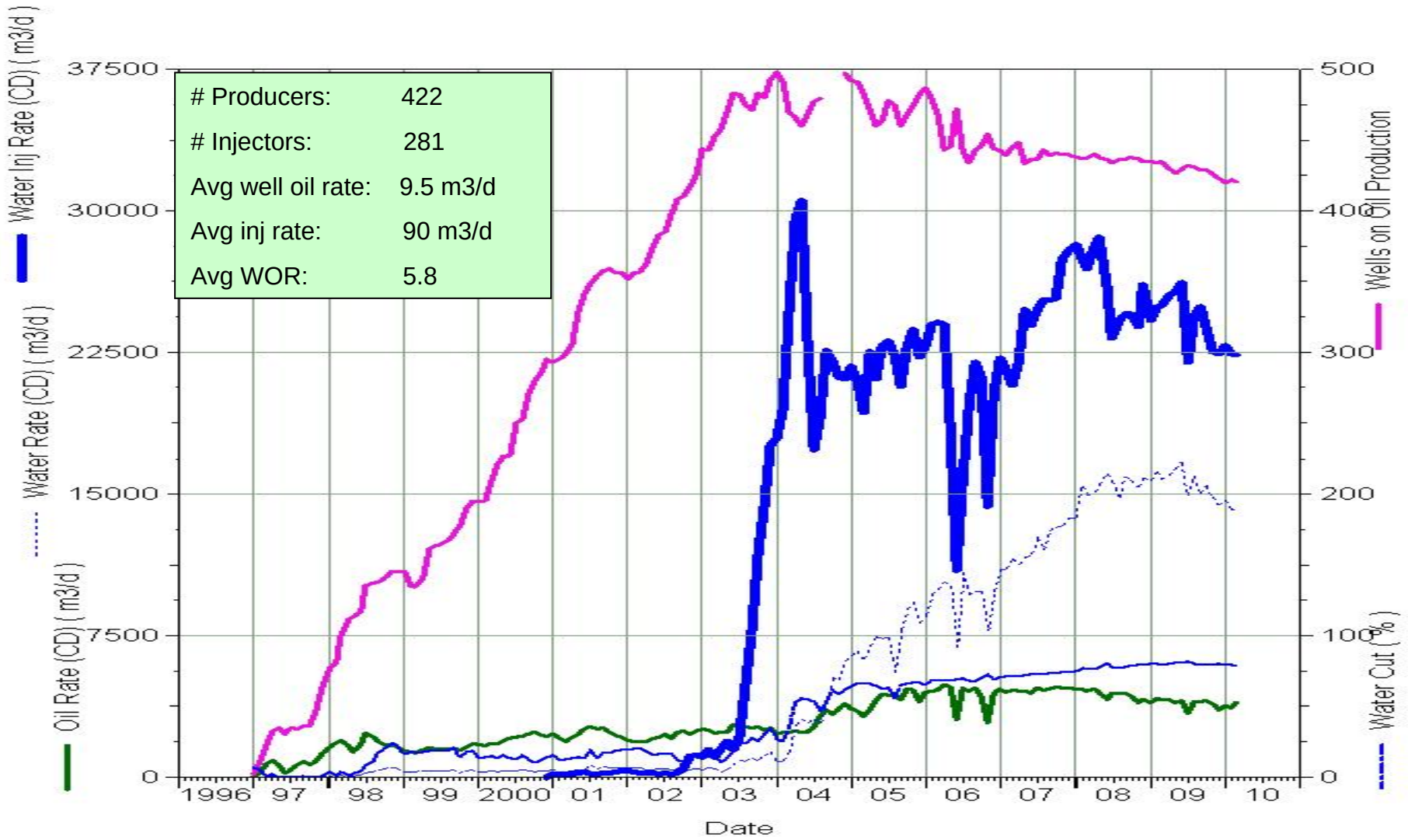
Approval 9404G – EOR Scheme

Approval 9404G
Current EOR Scheme Area



Scheme 9404G

Performance



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Waterflood Surveillance

Balance between fluid injection and production

- instantaneous VRR > 1 due to fillup period:
- Currently = 1.0
- In some cases, VRR<1 due to water breakthrough

Target cumulative VRR to approach unity

- Some pattern VRR's > 1 due to insufficient historical produced gas, but surface pressures below MAWHIP (7,650 kpag)
- Current cumulative VRR = 0.6
- Average Wellhead Injection pressure = 4,538 kpag

VRR Report to 2009-12 to be submitted by April 30th

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Waterflood Surveillance Continued

Real time pattern performance monitoring

- fluid rate, fluid level, watercut, injection rate/pressure, etc.

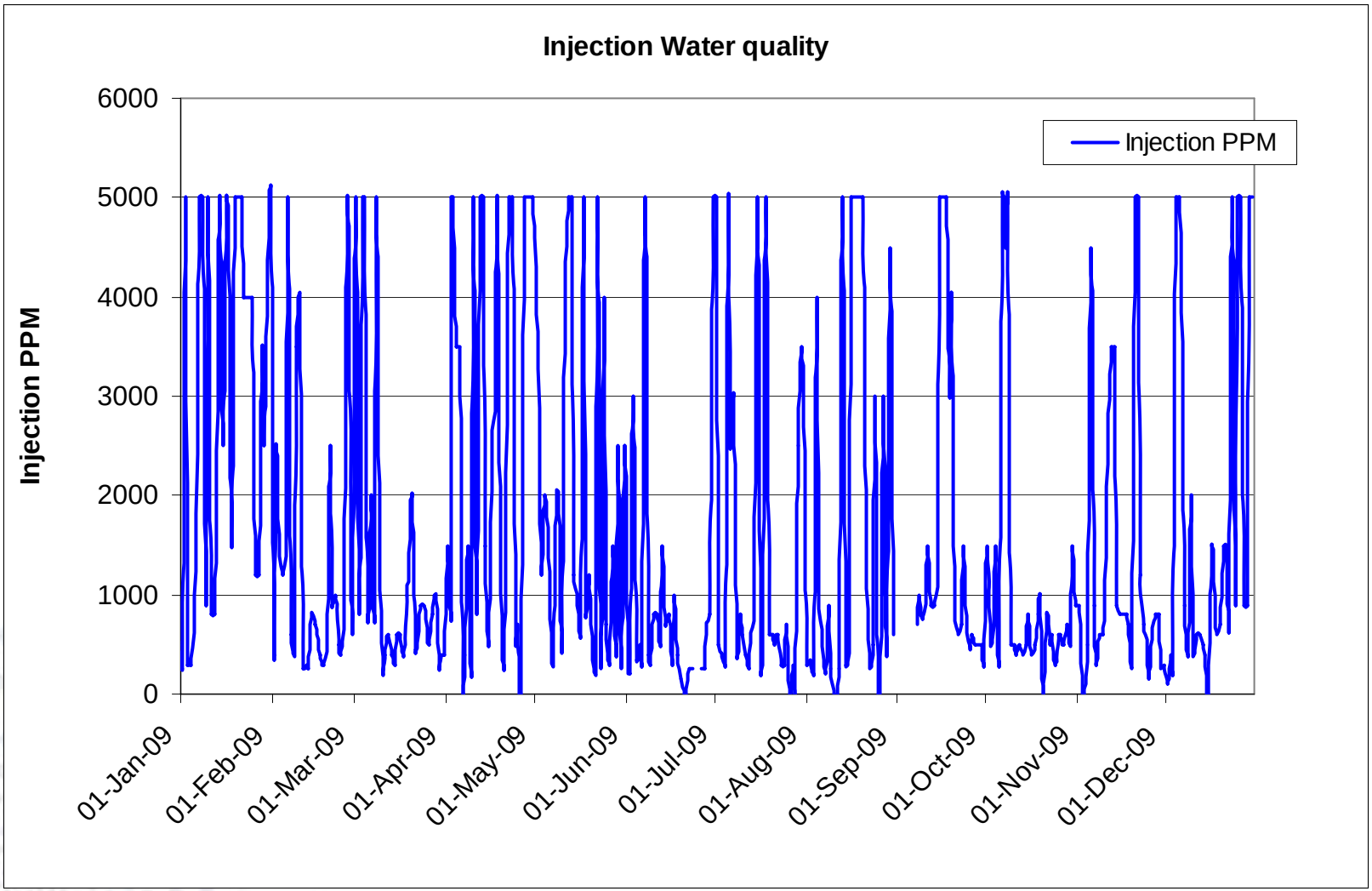
Monitor injectivity changes w/ Hall Plots

Monthly injection target adjustment

Daily injection water quality tracking (ppm oil)

Waterflood Surveillance

2009 Injection Water Quality



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Waterflood Surveillance Continued

Monthly sampling for polymer & surfactant returns

Semi-Annual Grand Rapids source water chemistry analysis

Monitoring rates and producing pressures on Grand Rapids source wells

Surveillance
Observation Wells

Currently have 11 wells (2 dual) equipped with real time pressure and temperature monitoring:

5 Wabiskaw Zones

6 Grand Rapids B Zones

1 Grand Rapids A Zone

1 Grosmont Zone

Provide better understanding of:

- Reservoir pressure profile
- Average reservoir pressure
- Near wellbore skin

2009: 4 Observation wells (3 Grand Rapids, 2 Wabiskaw zones)

2010: plan to equip 1 well with dual sensors in Quaternary-Wabiskaw

Fluid Production – Producing Wells

Artificial lift is required for all fluid production

Fluid Type	PCP	ESP
Oil	416	5
Grosmont SW		6
Grand Rapids SW	11	2
Quaternary SW *	1	
Run Life, yrs	~5	~2

*** Planned to come on-stream in 2010**

EOR Development History

Water and Polymer Injection

- 2001: Water Pilot (3 Pads)
- 2003: Commercial Waterflood (Scheme 9404)
- 2003: Polymer pilot (1)
- 2004: Polymer pilots in gassy pattern (4)
- 2005: Polymer pilot expansion (15)
- 2006: Polymer Facility Redesign (20)
- 2007: Polymer in high viscosity area (20)
- 2008: Polymer rollout (15), Surfactant pilot (2)
- 2009: Polymer rollout (50), Surfactant pilots (9)

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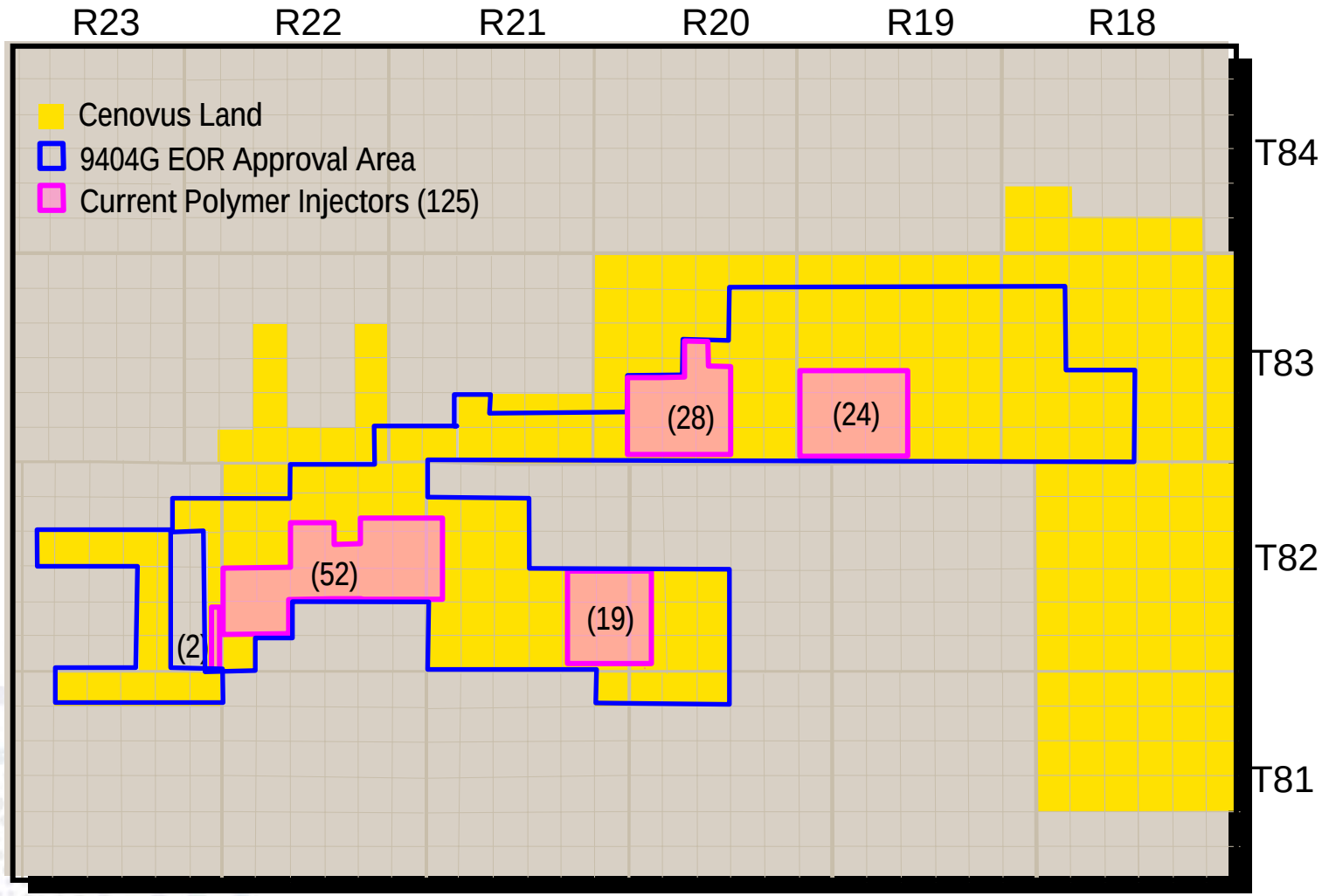
Current Polymer Injectors



2009 Development Summary

Drilling:

- 10 Step Out (4 producers, 6 injectors)
- 1 Redrill
- 3 Water Source Wells (2 Grand Rapids, 1 Quaternary)
- 4 Strat Wells

Polymer

- 2 New Polymer Facilities Constructed (30 injectors)
- 1 Facility from 2008 brought onstream (20 injectors)

Surfactant/Emulsifier

- 4 skids (9 injectors)

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2009 Polymer Injectors

Polymer injectors onstream in 2009:

- NE 6-10 (20 injectors)
- Pad 9-14 (19 injectors)
- Pad 15-35 (11 injectors)
- High Fluid Productivity area; early response looks encouraging

Continuous improvement in efficiencies in facility construction and project implementation

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2009 Gel Treatments

NE20:

- Injected 725m3 of high viscosity polymer in one injector over 13 days to stem early waterflood breakthrough

NE15:

- Injected 19,400 m3 of high viscosity polymer in 4 injectors to improve pattern conformance

NE6-10:

- Injected 16,790 m3 of high viscosity polymer in 13 injectors to assess longer term impact of initial higher viscosity slug treatments.

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Polymer Injection Response

Polymer Pilots

- improved conformance and incremental RF demonstrated (~6%)

Pad E19-23 – EOR in high viscosity oil

– Positive response in oil production

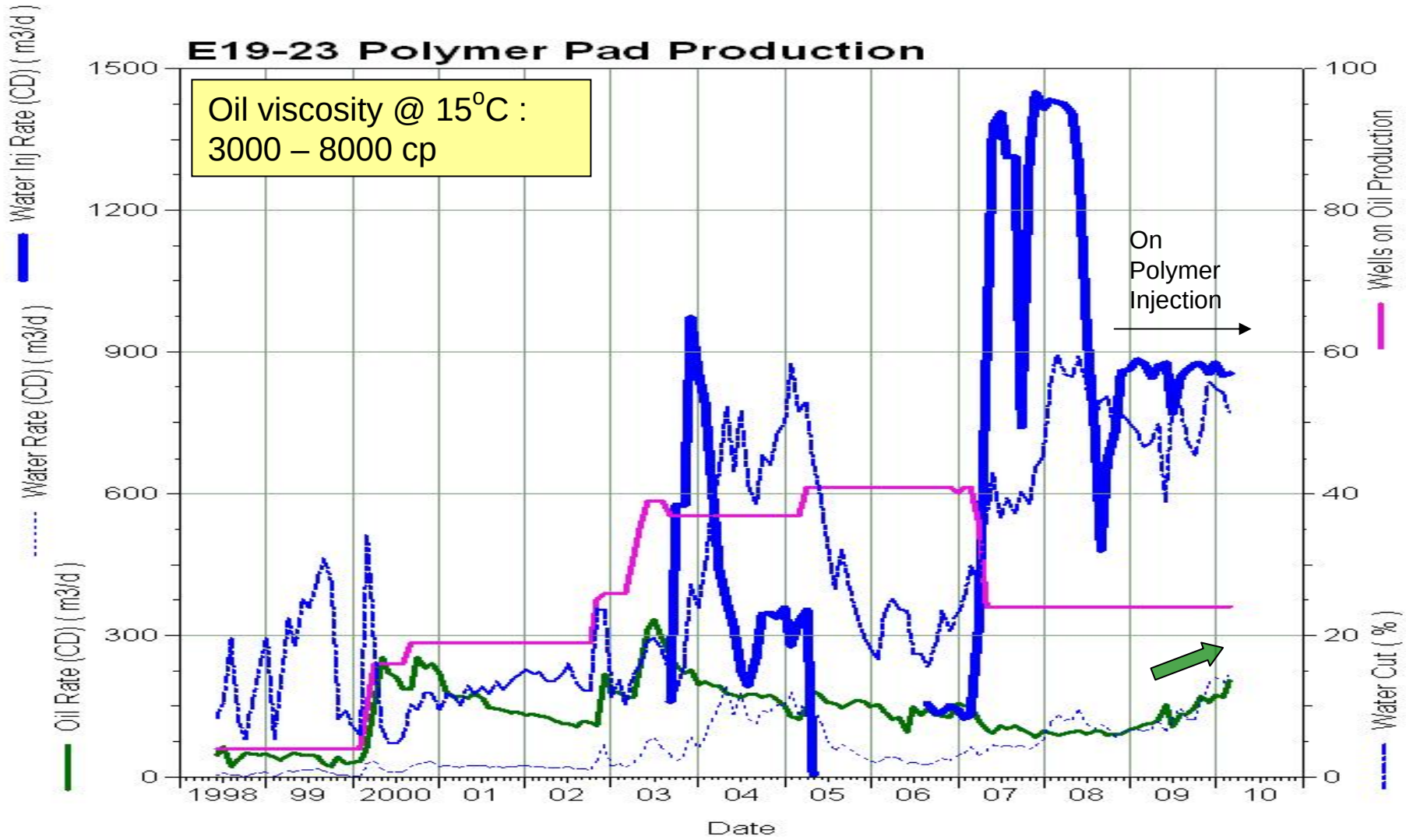
– Lower watercuts

Other 2009 Polymer Pads – EOR in

too early to determine effectiveness

Polymer Pad Performance

High Viscosity Oil



Polymer Performance

Water Oil Ratio

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Estimate of Current & Ultimate Recovery Factors

Estimates for Project Area

Category	Recovery Factor (%)
Current	5
Primary	6
Incr. Waterflood	12
Incr. Polymer	6
Ultimate	24

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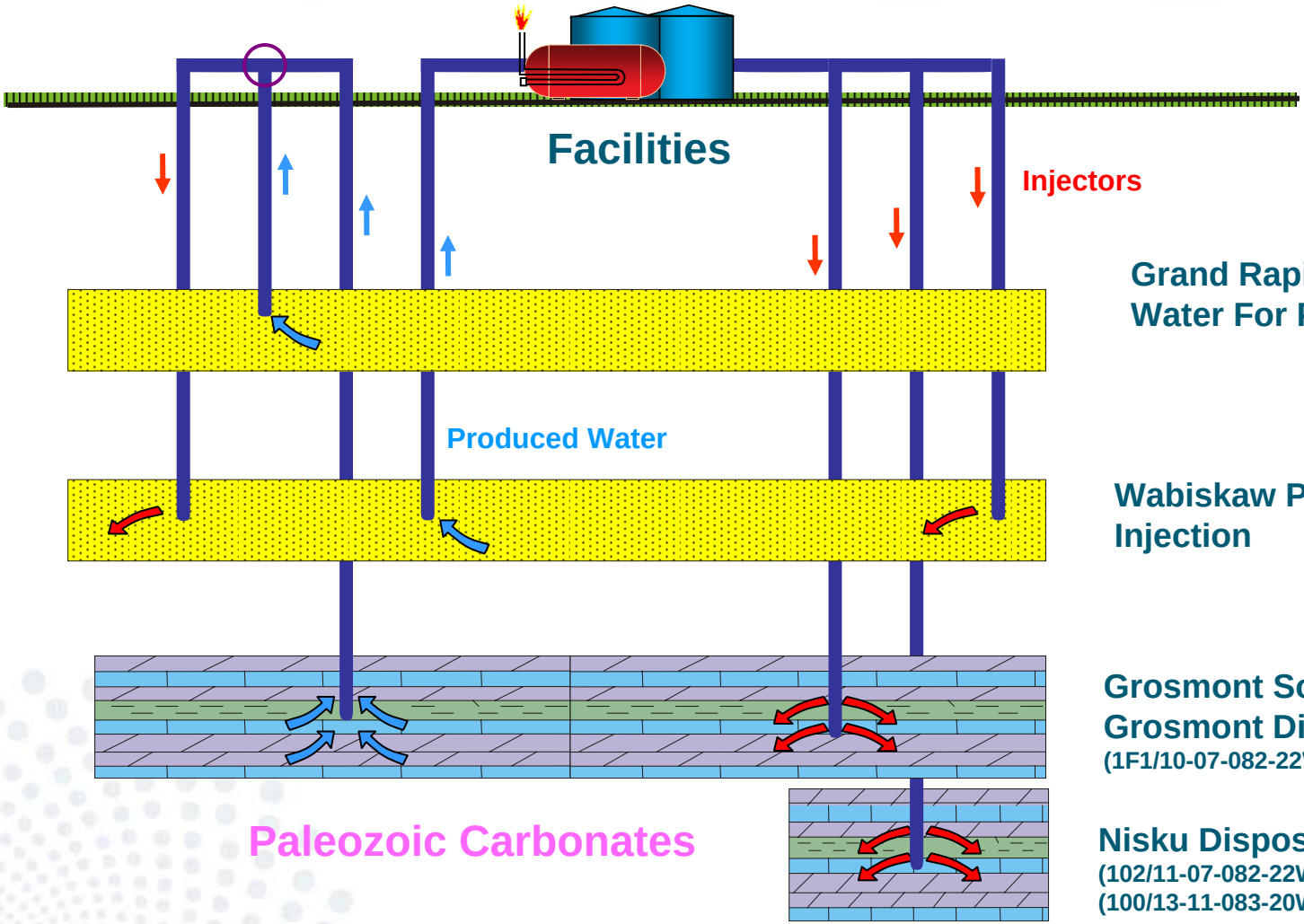
Water Usage



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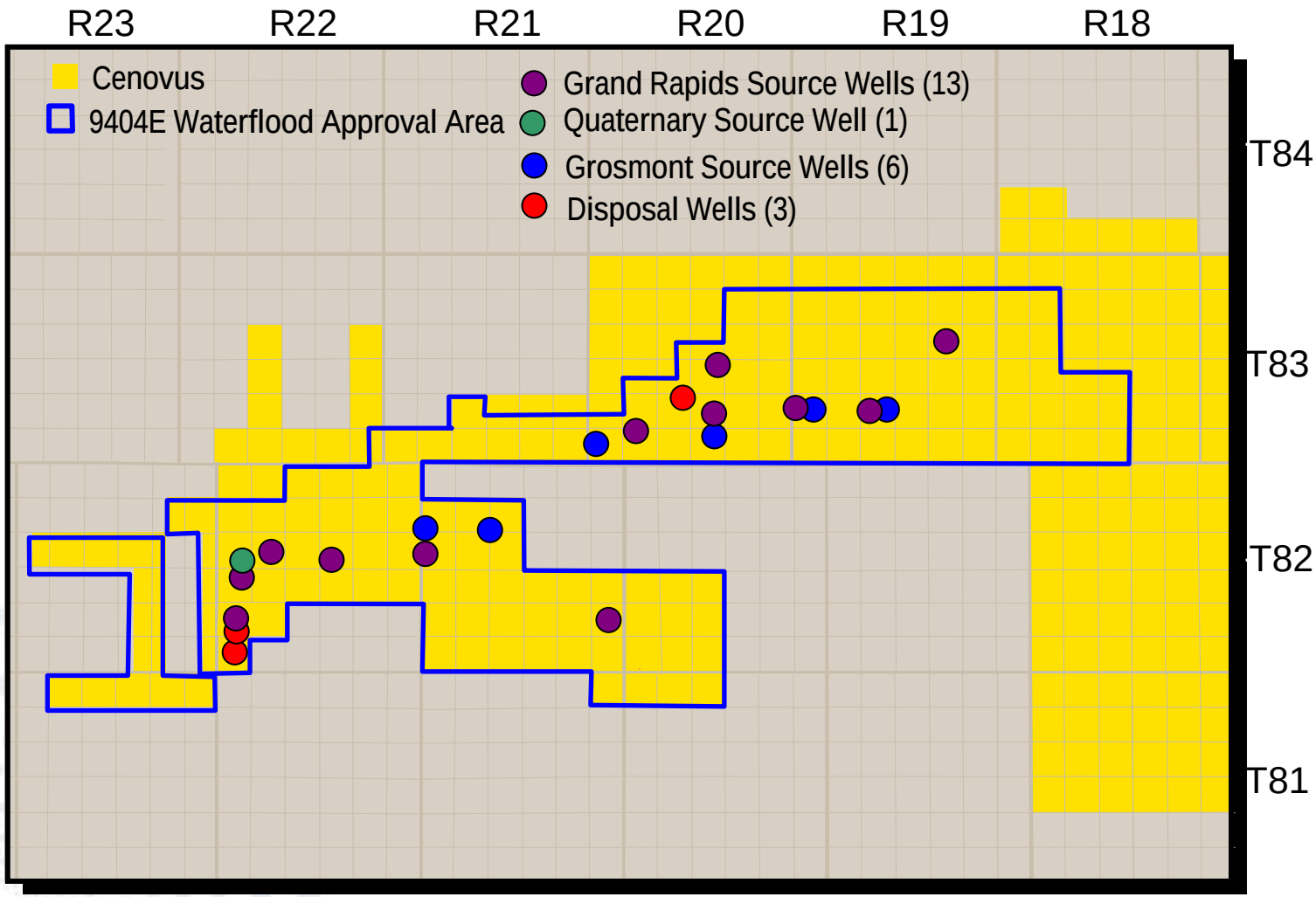
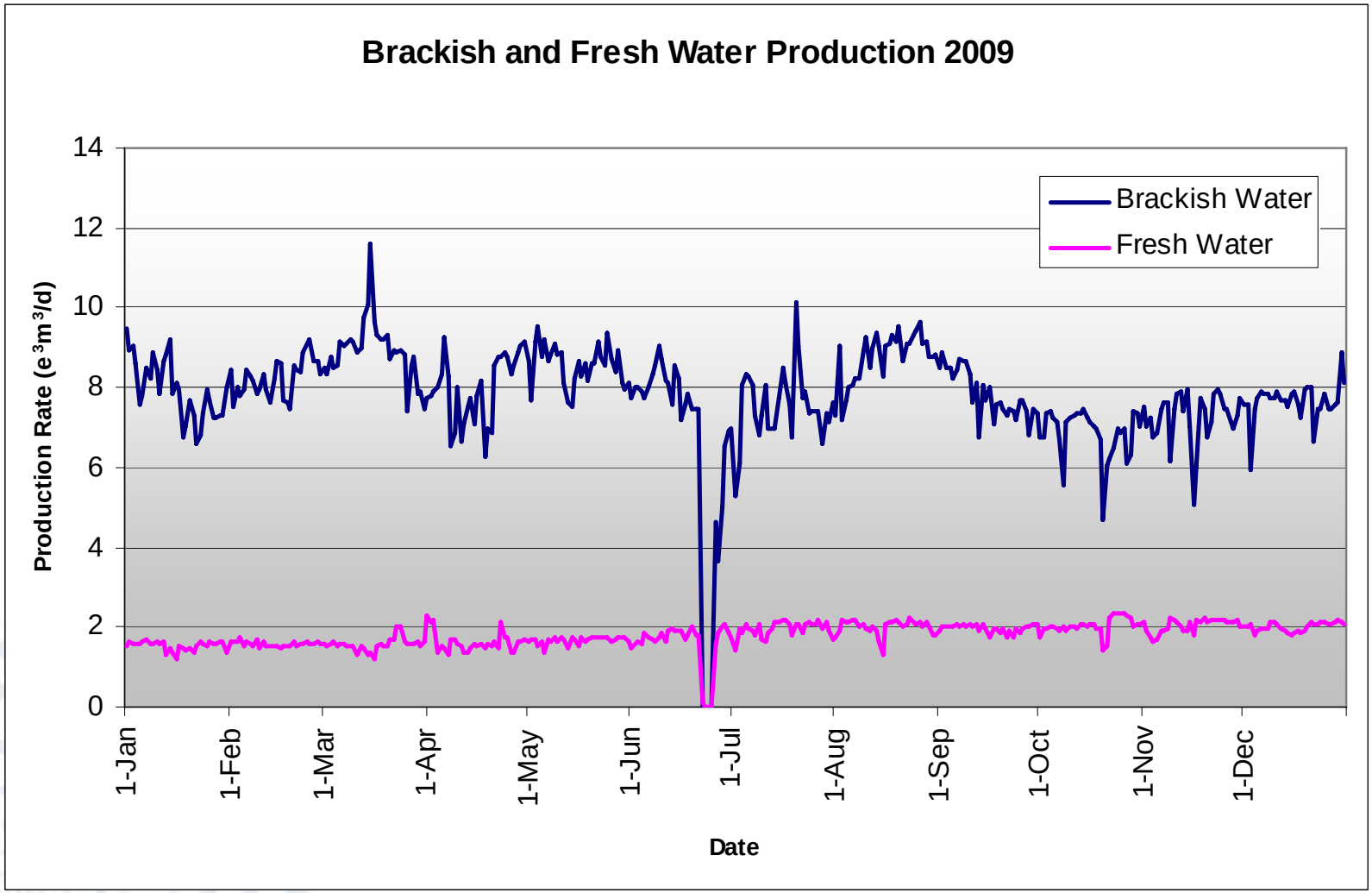
Current Water Source Wells



Brackish and Fresh Water Production



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Brackish Water Source Well Summary

		Annual Produced Volume (e^3m^3)		
Source Well Location	**Formation**	**2007**	**2008**	**2009**
1F1/07-07-083-19W4/00	Grosmont	692	1010	1038
1F1/06-10-083-19W4/00	Grosmont	1129	1048	1178
1F1/15-36-082-21W4/00	Grosmont	1216	608	467
1F1/12-19-082-21W4/00	Grosmont	847	249	0
1F1/04-11-083-20W4/00	Grosmont	1188	503	177
1F1/08-07-082-20W4/00	Grosmont	0	0	0
1F1/10-21-082-21W4/00	Grosmont	478	367	0
	Total	**5072**	**3418**	**2860**

Note: Increased use of produced water (less disposal) due to new field water handling facilities and increased polymer rollout has reduced brackish source water requirements

Approval 9404G
Fresh Water Source Well Summary (Polymer Mixing)

		Annual Produced Volume (e^3m^3)		
Source Well Location	**Formation**	**2007**	**2008**	**2009**
1F1/10-01-082-23W4/00	Grand Rapids B	48.9	67.4	84.2
1F1/16-15-082-22W4/00	Grand Rapids B	40.7	24.3	14.0
1F1/08-23-082-22W4/02	Grand Rapids B	-	37.0	106.5
1F1/11-19-082-21W4/00*	Grand Rapids B	39.0	37.3	24.1
1F1/09-11-082-21W4/03	Grand Rapids B	32.9	82.2	107.7
1F1/05-11-083-20W4/00	Grand Rapids B	50.9	49.9	47.5
1F1/05-07-083-19W4/00	Grand Rapids B	46.4	48.7	42.5
1F1/03-09-083-20W4/02	Grand Rapids B	53.7	62.8	77.7
1F1/02-09-083-20W4/00**	Grand Rapids A	-	-	-
1F1/05-14-083-20W4/00	Grand Rapids A	21.2	22.5	17.6
1F2/05-14-083-20W4/00	Grand Rapids B	22.9	25.1	24.7
1F1/05-08-083-19W4/02	Grand Rapids B	-	-	52.0
1F1/13-07-082-22W4/00	Grand Rapids B	-	-	40.3
1F1/09-24-083-19W4/00***	Grand Rapids A	-	-	-
1F1/15-16-082-22W4/00	Grand Rapids B	-	-	16.6
1F2/13-07-082-22W4/00	Quaternary	-	-	0.2
	Total	**356.6**	**457.2**	**655.6**

*Observation well as of Sept 18, 2009

** Not currently in production

***TDL application submitted Q1 2010

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Water Disposal Summary

			Annual Injected Volume (e^3m^3)			
Disposal Well Location	**Well Classification**	**Formation**	**2006**	**2007**	**2008**	**2009**
F1/10-07-082-22W4/0	Class II	Grosmont	352	1011	569	80.9
102/11-07-082-22W4/0	Class IB	Nisku	344	314	274	234
*100/13-11-083-20W4/0	Class IB	Nisku	0	0	0	0
*primarily used for drilling mud		**Total**	**696**	**1325**	**843**	**314.9**

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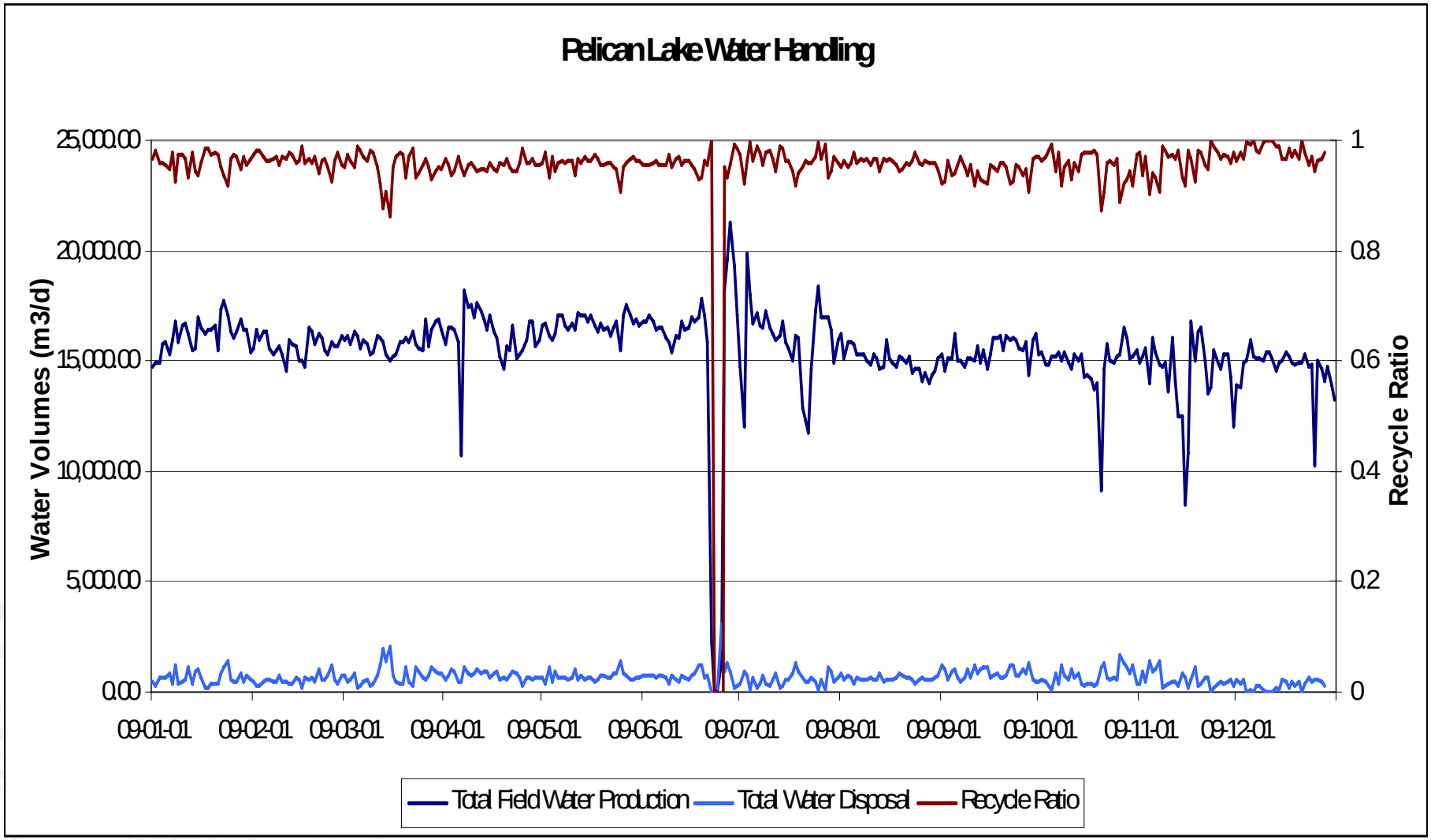
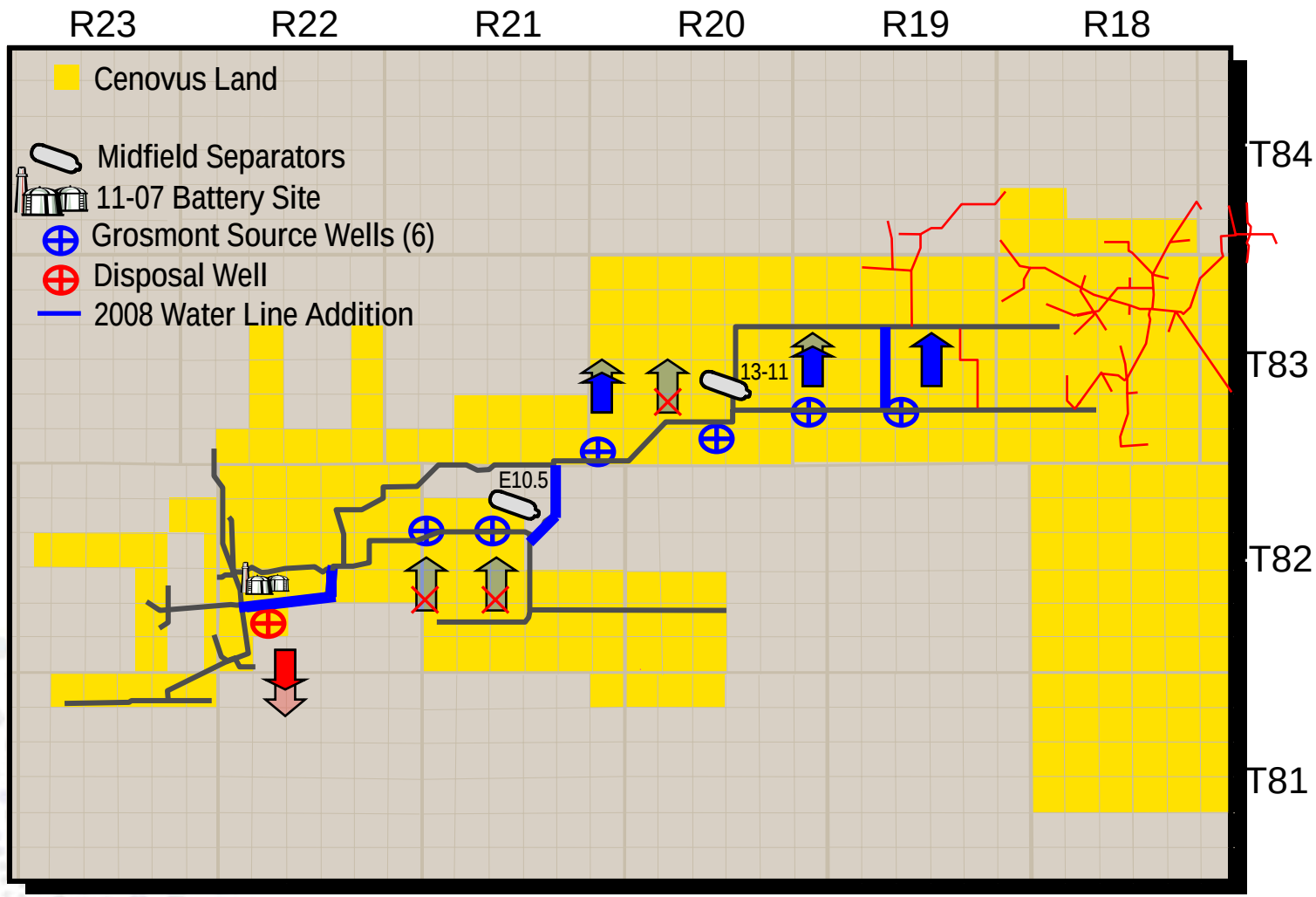
Field Recycle Ratio



2009 Facilities Expansion
Operational Impact

Added new 10” emulsion line between 13-11 and 10.5 batteries due to corrosion

Facilities


R23
R22
R21
R20
R19
R18
Cenovus Land
Midfield Separators
11-07 Battery Site
Grosmont Source Wells (6)
Disposal Well
2008 Water Line Addition
13-11
E10.5
T84
T83
T82
T81

Significant Events

Approval 9404G – consolidated approval for all chemical injection projects has improved project execution and reduce timeline to test new ideas

Drilling Incident

Drilling Incident

Blowout occurred on 11th well in 2009 drilling program (FIS Incident 20090744)

- Redrill of a producing well (unique situation with high pressures due to offsetting injection with no producer to act as a pressure sink)
- Encountered pressure ~2.8m TVD above Wabiskaw porosity prior to running intermediate casing
- Not able to shutin at surface (diverter system, conductor at 20m TVD)
- Spilled ~6200 m3 mostly onlease (no direct measurement available)
- Weighted up mud to ~20 kPa/m within ~36 hours, successfully killing the well
- Ran and cemented intermediate casing
- Have not yet drilled out the horizontal section

Drilling Incident
Observations and Learnings to Date

Drilling

- Drilled too close to pressure without significant well control

Cap Rock Integrity

- Cap Rock consists of ~80m of interbedded shale, siltstone and minor fine grained sandstone sediments with abundant calcareous and sideritic cementation
  - Thickness, depositional environment and cementation make fluid migration between the Wabiskaw and Grand Rapids highly unlikely
- Upper cap rock was intact in the incident well (failure occurred only after drilling into bottom 2.8m TVD of cap rock; top of the calcareous Wabiskaw siltstone)
- Grand Rapids surveillance (pressures, productivities, compositions) shows no indication of cap rock breach
- Injector surveillance (injection pressures, tracer surveys) shows no indication of cap rock breach
- Current voidage replacement ratios reflect containment of injection in the Wabiskaw
- Preliminary rock modeling indicated that failure should not occur above the Wabiskaw siltstone (consistent with observation in incident well)

Drilling Incident

Action Plan

- New drilling design for “Waterflood Area”
  - Deepen conductor to 30m
  - Excess storage tanks at surface for the unlikely event of a flow
  - Have mud pre-mixed while in Clearwater for a minimum of 2 circulations (intermediate hole volume)
  - Perform Formation Integrity Test in Clearwater
  - Land intermediate casing 10m TVD above top of Wabiskaw
  - Drill out intermediate with Class III BOPs, manage pressure drill
- Cap Rock Study
  - Increased surveillance
  - Testing Program
  - Geomechanical simulation (Clearwater core)

Cap Rock Study

Increased Surveillance

- Additional 2 observation wells and 3 producers in Grand Rapids
  - pressures and compositions within expected ranges for Grand Rapids)
- Chemical composition analysis performed on all producing Grand Rapids water source well (Q1 2010)
  - No significant changes from Q2 2009 analyses, all within expected range for Grand Rapids

Cap Rock Study

Grand Rapids Water Analysis

Total Dissolved Solids (PPM) - CoreLabs

Pad	UWI	2009 Q2	2010 Q1
8 (GR B)	1F1/10-01-082-23	2500	2435
NE 5 (GR B)	1F1/05-07-083-19	2018	1977
NW 17 (GR A)	1F1/05-14-083-20	1512	1470
NW 17 (GR B)	1F2/05-14-083-20	1862	1823
17 (GR B)	1F1/16-15-082-22	2425	2420
E 5 (GR B)	1F1/11-19-082-21	2252	SI (2)
NE 1 (GR B)	1F1/05-11-083-20	2018	2015
NW 3 (GR A)	1F1/02-09-083-20	SI	SI
NW 3 (GR B)	1F1/03-09-083-20	1967	1925
E 3 (GR B)	1F1/08-23-082-22	2202	2174
E 21 (GR B)	1F1/09-11-082-21	2372	2348
NE 8 (GR B)	1F1/05-08-083-19	2195	2139
9 (GR B)	1F1/13-07-082-22	2487	2495
9 (Quat)	1F2/13-07-082-22	1000	SI (3)
35 (GR B)	1F1/15-16-082-22	1900 (1)	2446
NE65 (GR A)	1F1/09-24-083-19	SI	1400 (1)
NE15 (GR A)	100/05-12-083-19	SI	1100 (1)

(1) Testing completed by Maxaam Analytics

Change of TDS results is due to different procedures between labs in calculating TDS values.

(2) Converted to observation well

(3) Waiting on tie-in

Note: TDS of produced water from Wabiskaw is approximately 13,000 ppm

Cap Rock Study

Testing and Modeling

- Additional step rate tests
  - Nov 2009: 100/09-35-081-23w4 test performed
  - Mar 2010: 100/05-15-083-19w4 test performed
- Mini-frac Test
  - Feb 2010: 100/01-04-083-22w4 test performed
- Cap rock core capture and testing
  - Feb 2010: 100/01-04-083-22w4 core captured
- Geomechanical simulation
- Possible micro-seismic testing contingent on results of simulation

Environmental Issues

Pelican Lake 2009 Summary

Total spills/releases : 42

Total reportable spills/releases: 7

(produced water spills > 2 m3 off-lease)

Approval 9404G
Key Learnings

Polymer flooding is effective in high viscosity areas

- reduced WOR, improved recovery

Produced Water Polymer Skid field trial

- Successfully mixed polymer with brackish injection system water & reduced fresh water usage
- High chemical costs due to saline water

Early indications that surfactant can be effective at improving injectivity on high pressure injectors

New drilling design for high pressure “Waterflood Areas”

2010 Development Activities

Drilling and Conversions:

- 18 Infill Wells (12 producers, 6 injectors)
  - 6 wells at reduced spacing (200m between producers)
- 1 Redrill in high pressure “Waterflood Area”
- 10 Injector Conversions
- 5 Water Source Wells (Grand Rapids)
- 3 Vertical Strat Wells

Polymer

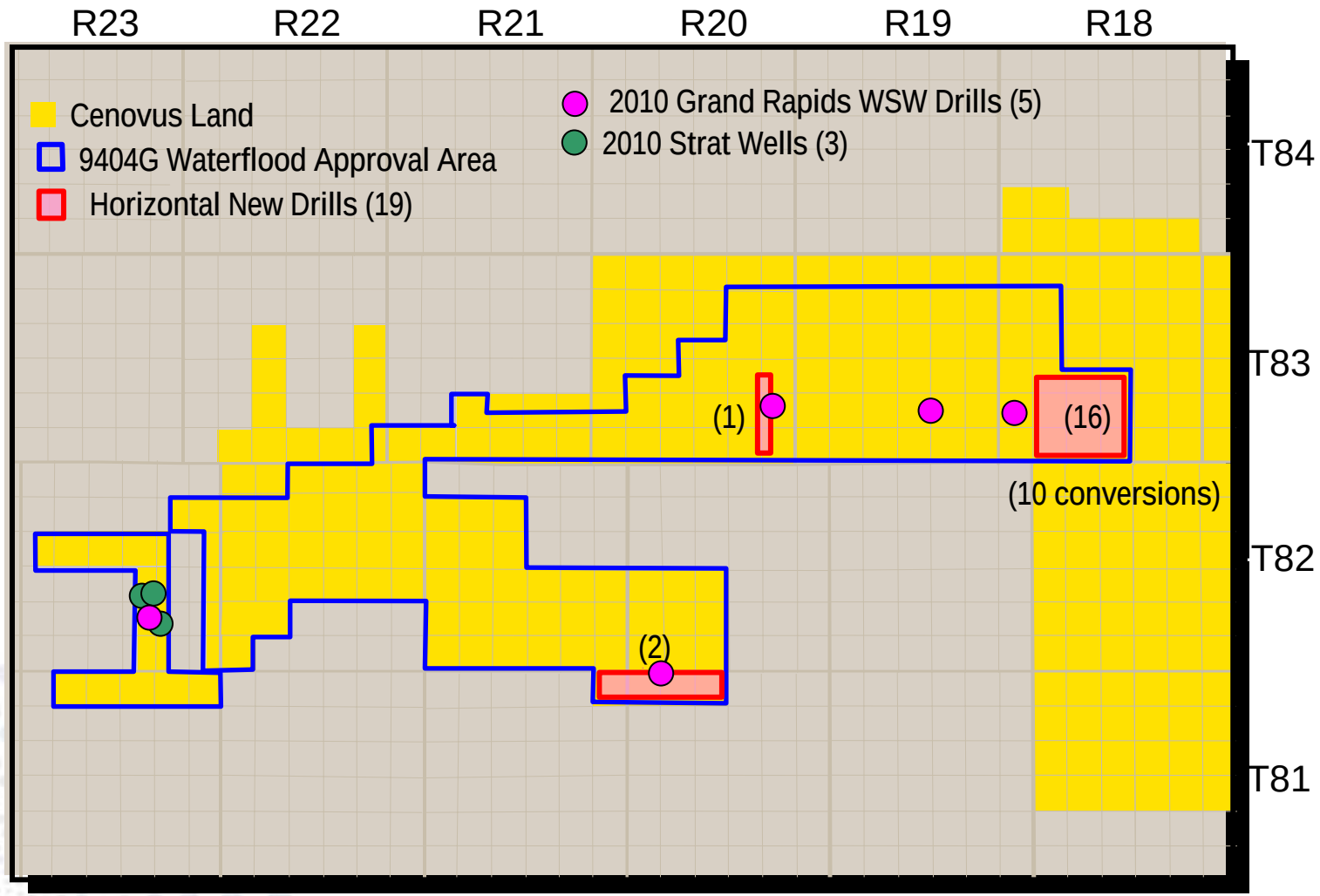
- 3 New Polymer Facilities (50 injectors)

Surfactant/Emulsifier

- 5 skids (20 injectors)

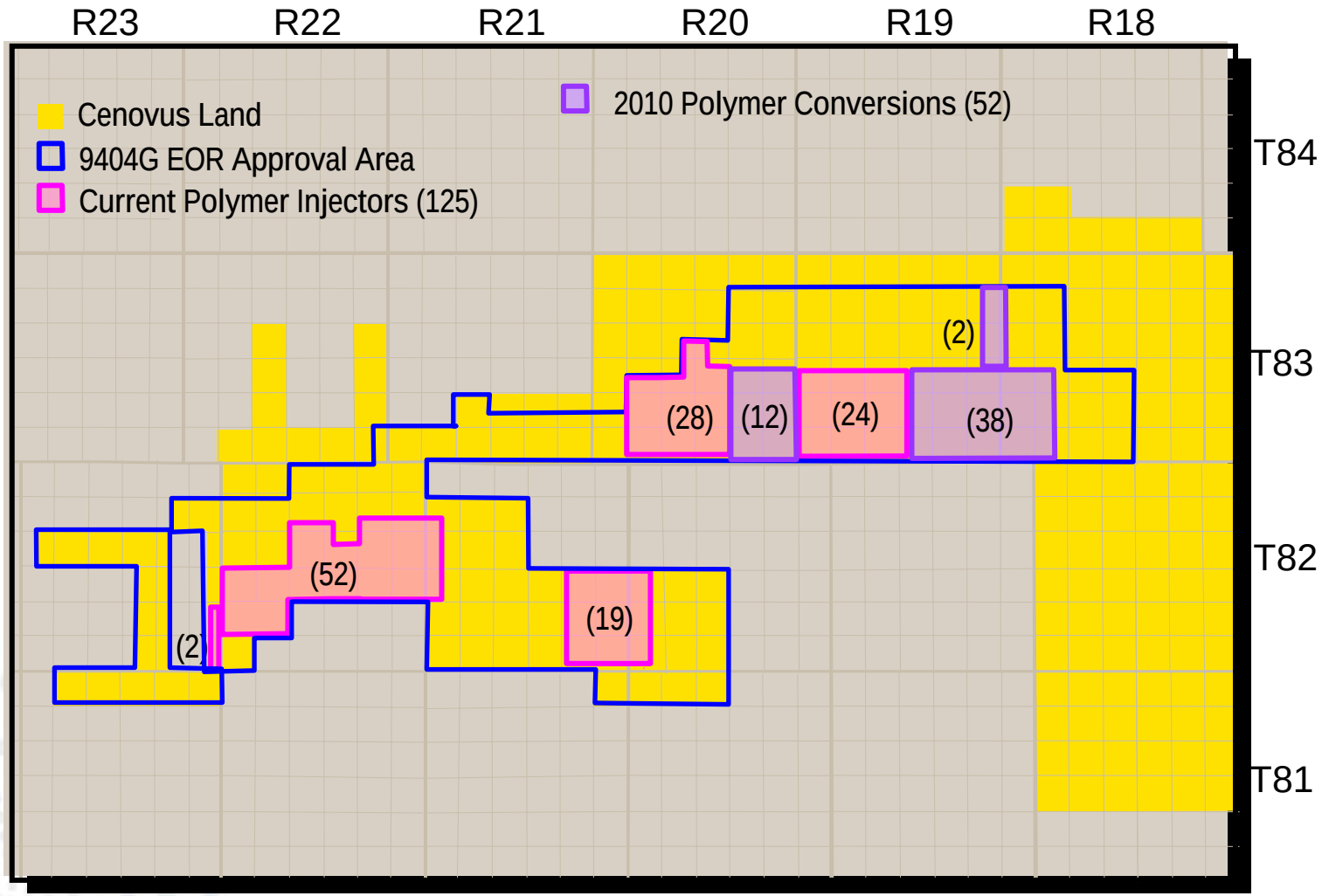
2010 Plans

New- Drills and Injector Conversions



Current & Future EOR Scheme

Polymer Injection



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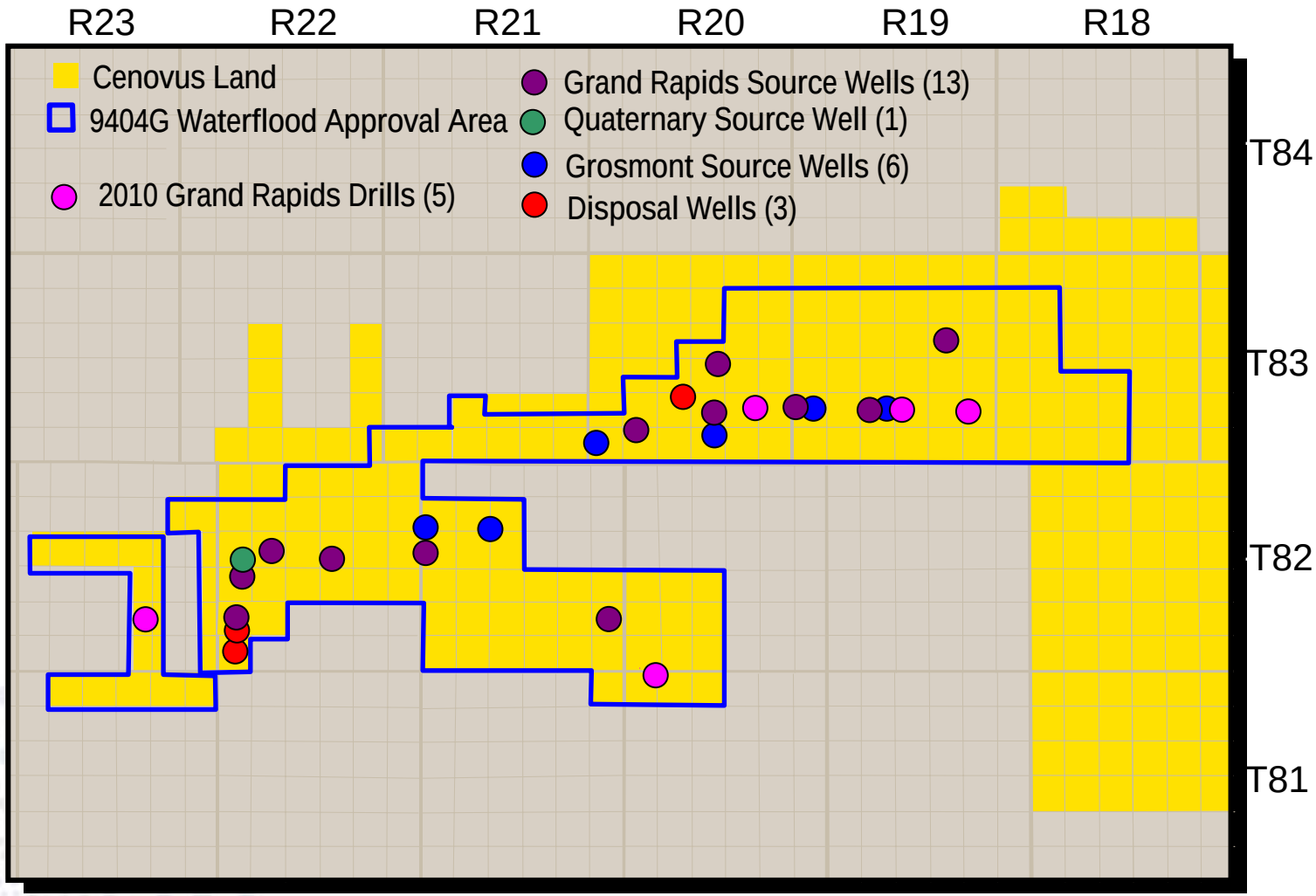
Water Source Wells – End of 2010



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Future Plans

Expand water/polymer injection to other viable parts of Cenovus-operated portion of pool:

- Optimize existing polymer injectors
- Stage future polymer injectors
- Evaluate down spacing and step out drilling

Evaluate Brackish vs Fresh Source Water Feasibility:

- Assess Quaternary well deliverability and compatibility
- Mobile Polymer skid for injector treatment using brackish water
- Examining alternative TDS resistant chemicals to reduce fresh water usage and minimize infrastructure requirements

Evaluate potential for Chemical EOR (Surfactant, Emulsifier) and Thermal

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Compliance

Two High Risk Non-compliant events in 2009

- 07-12-083-20w4 (Pad NE4) Blowout
- 14-03-083-20w4 contaminated soil on well site
- In accordance with the ERCB, both high enforcement incidents were successfully addressed

Approval 9404G
Issues

With the new approval 9404G, Cenovus has been more efficient implementing EOR projects

D51 Approvals on New Injectors

- 2009 New Drills approved at lower MAWHIP (5,785 kPa) compared to the rest of the field (7,650 kPa)
- 2010 Conversions and New Drills – uncertainty around MAWHIP approval

Questions ?

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