Canadian Natural

Canadian Natural
Annual ERCB Performance Presentation

In Situ Oil Sands Schemes

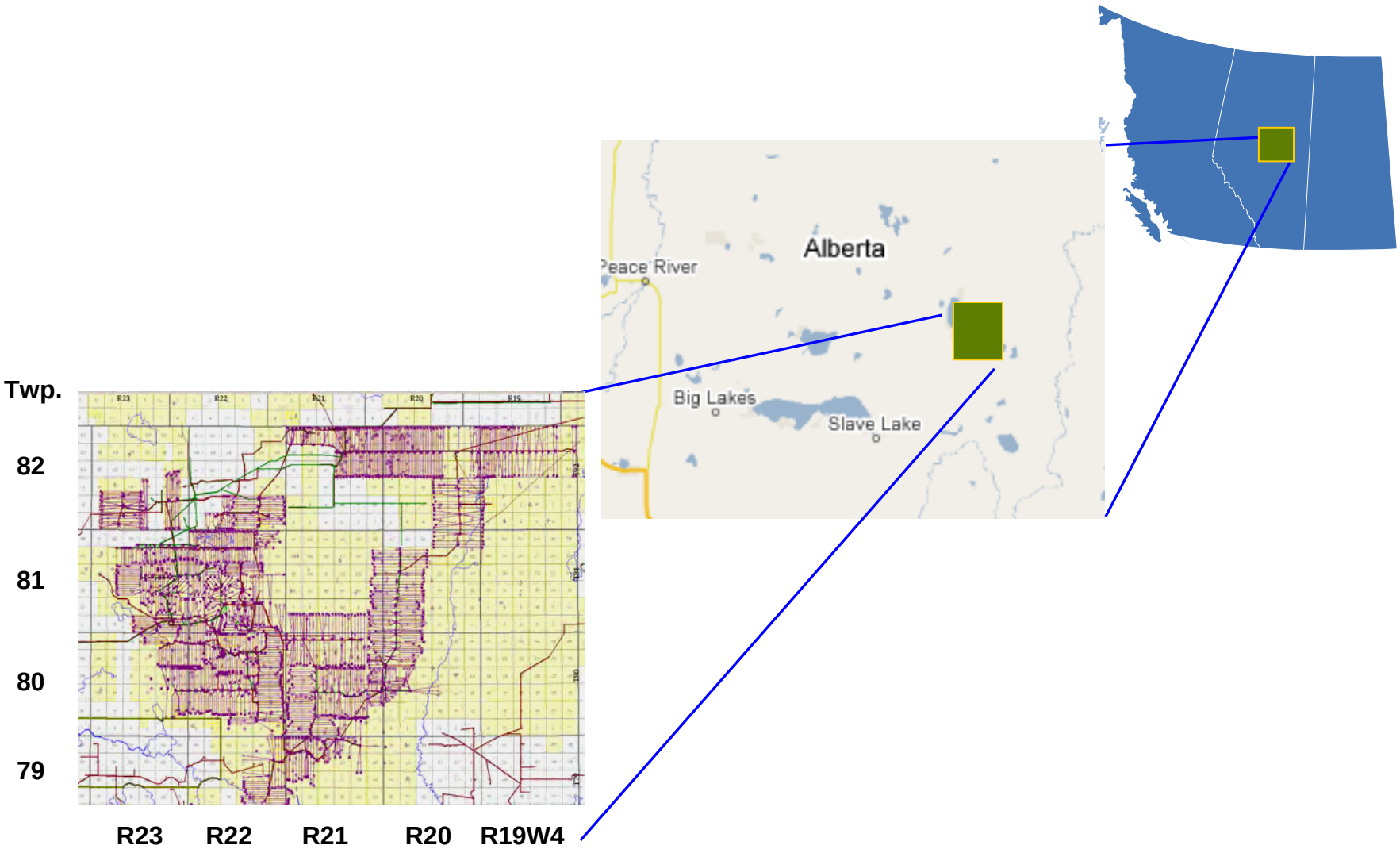
9673 / 10147 / 10423 / 10787

March 3, 2011

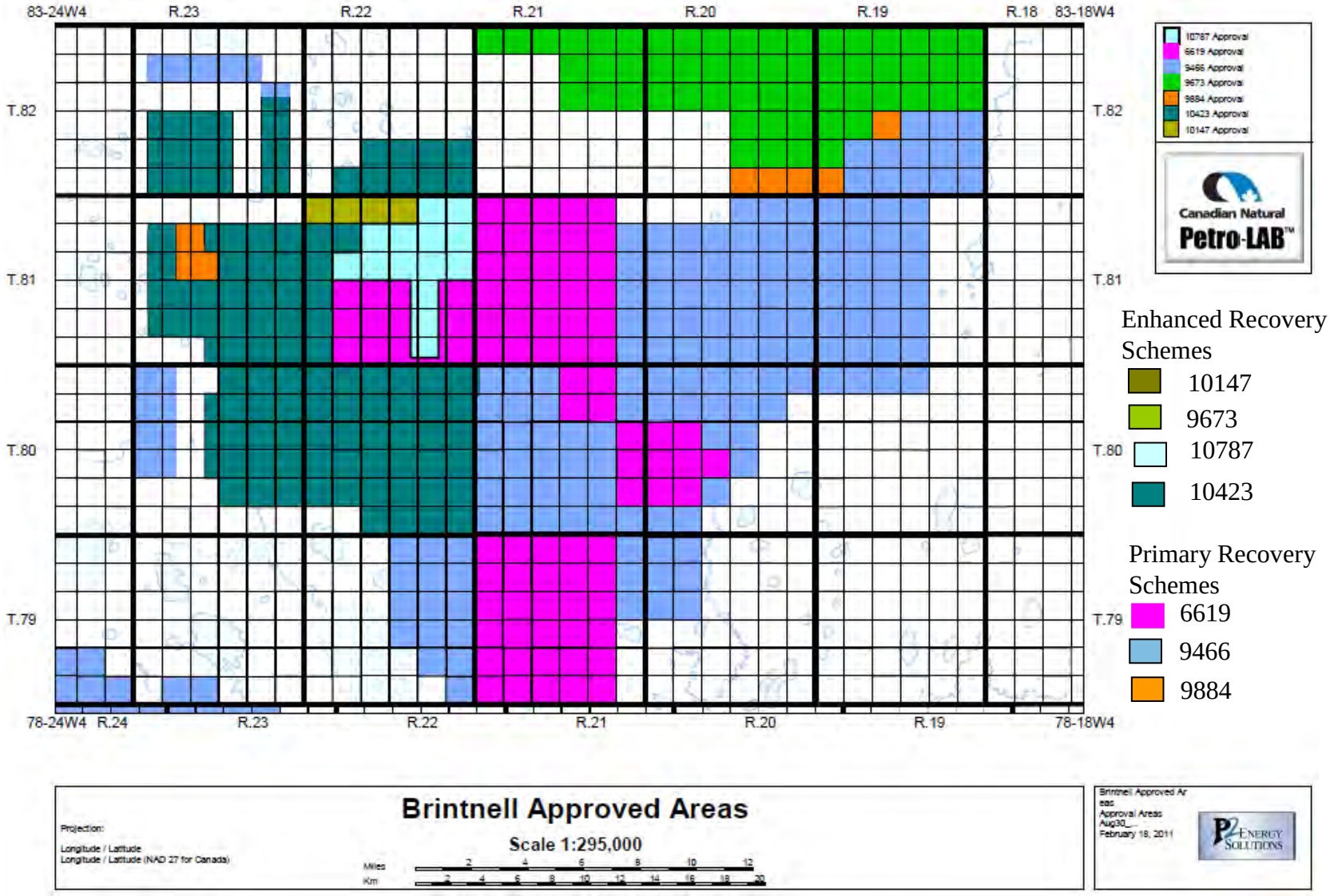
Agenda

- Current Approvals
- Geological Overview
- Drilling & Completions
- Flood Performance
- Injection Pressures
- Cap Rock Integrity
- Future Development Plans
- Facilities
- Measuring & Reporting
- Facility Future Plans
- Water Use, Conservation & Disposal
- ERCB Compliance
- Outstanding Applications
- Conclusions

Brintnell Location



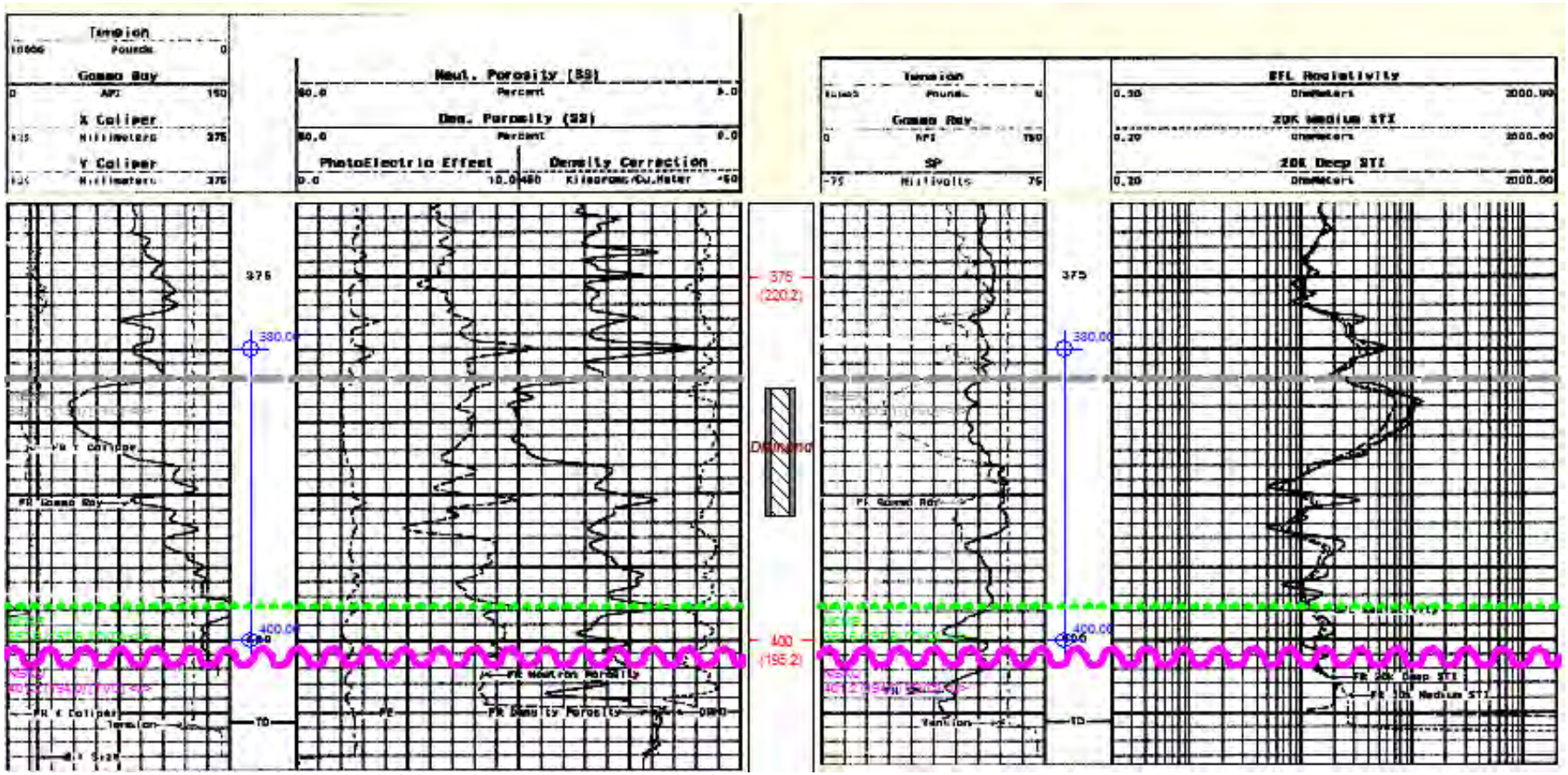
Primary and Enhanced Approvals



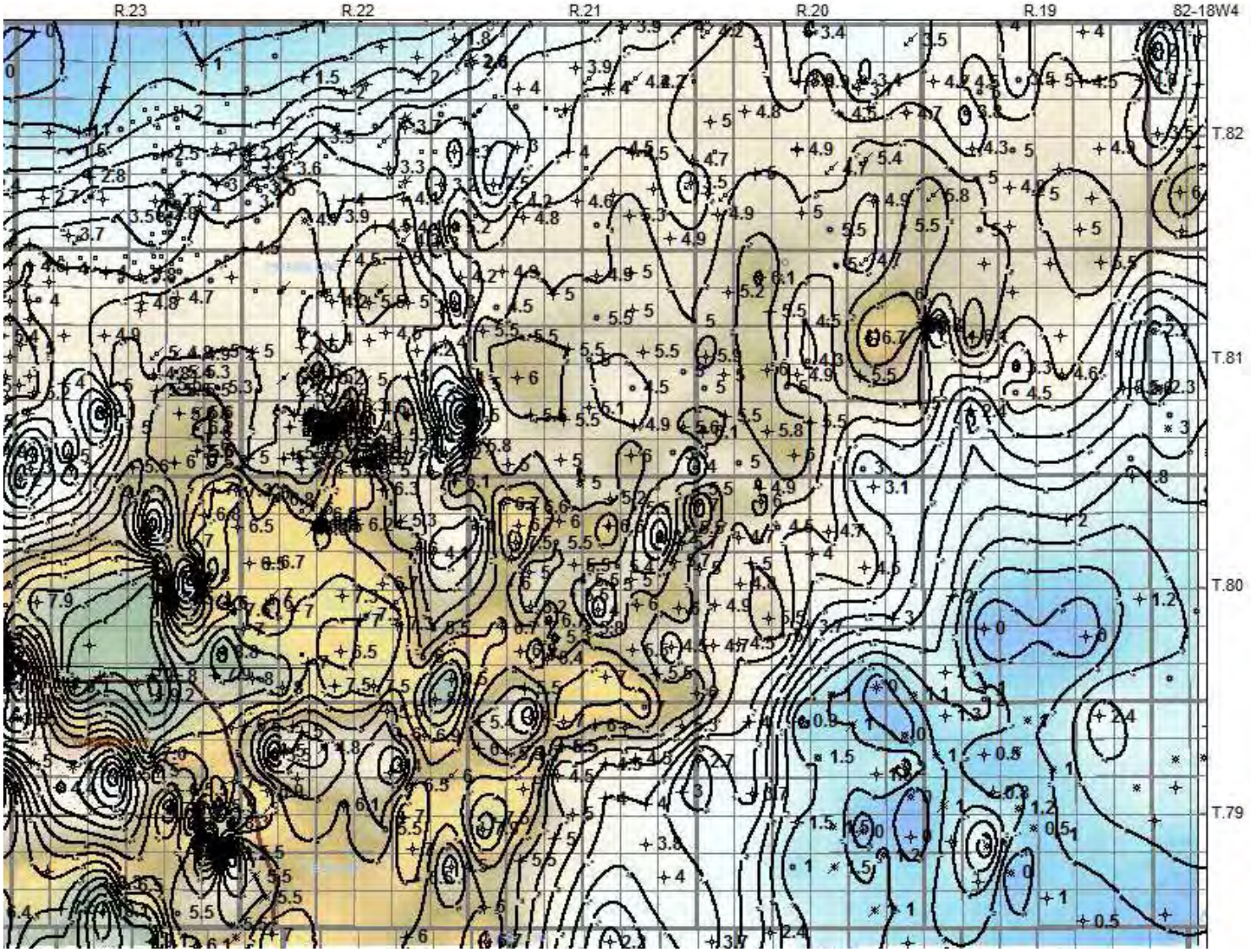
Brintnell Regional Reservoir Properties

- **Upper Wabiskaw Sand**
  - **Depth of 300-425m TVD**
  - **Net Pay Range 1 – 9m**
  - **Porosity 28 – 32%**
  - **Permeability 300 – 3000md**
  - **Temperature 13-17 deg. C**
  - **Water Saturation 30 – 40%**
  - **Oil Viscosity (dead oil) 800 – 80,000cp @ 15 deg. C**
  - **Initial Reservoir Pressure 1900 – 2600kpa**

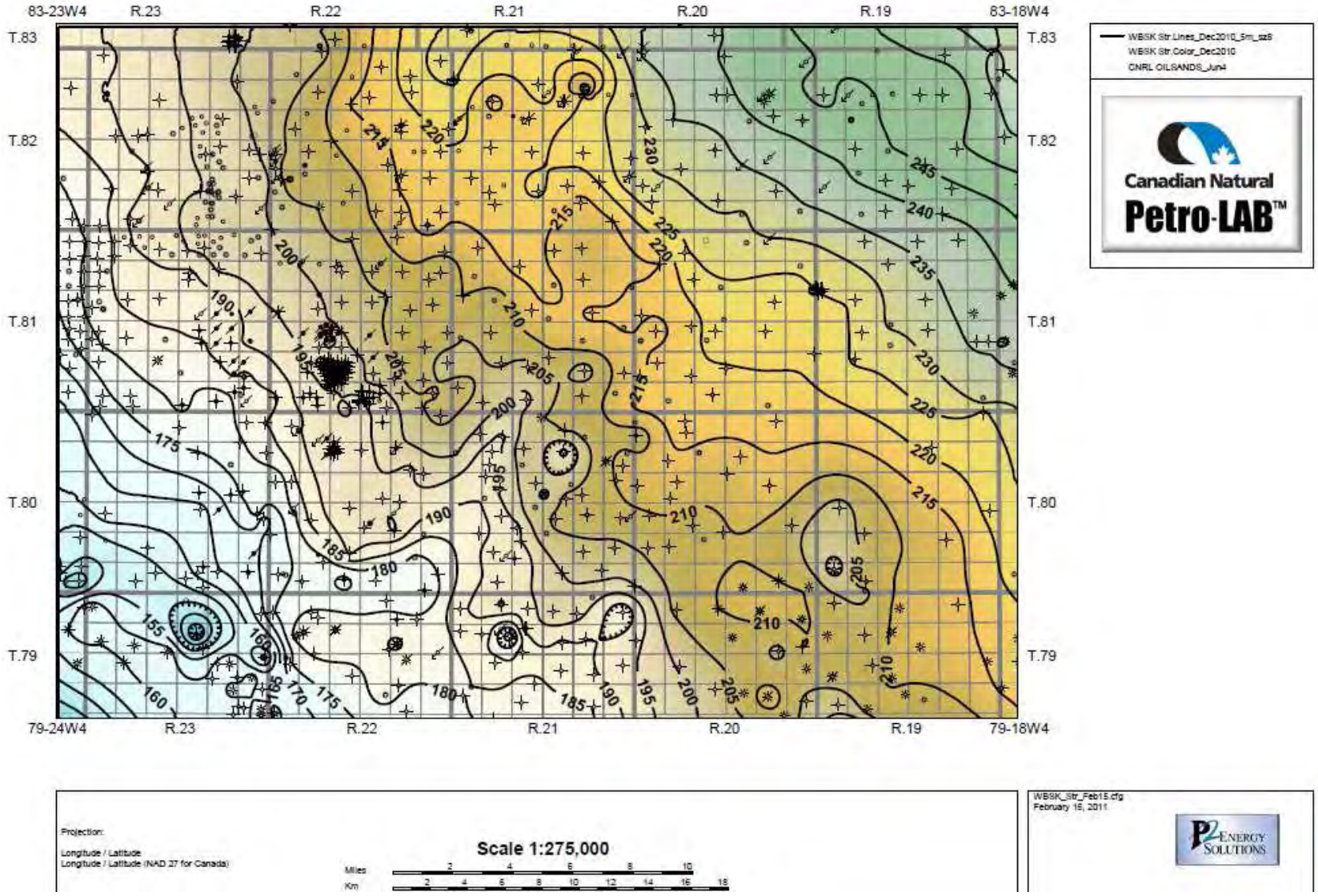
CNRL Brint 6-14-81-21 W4M Type Log



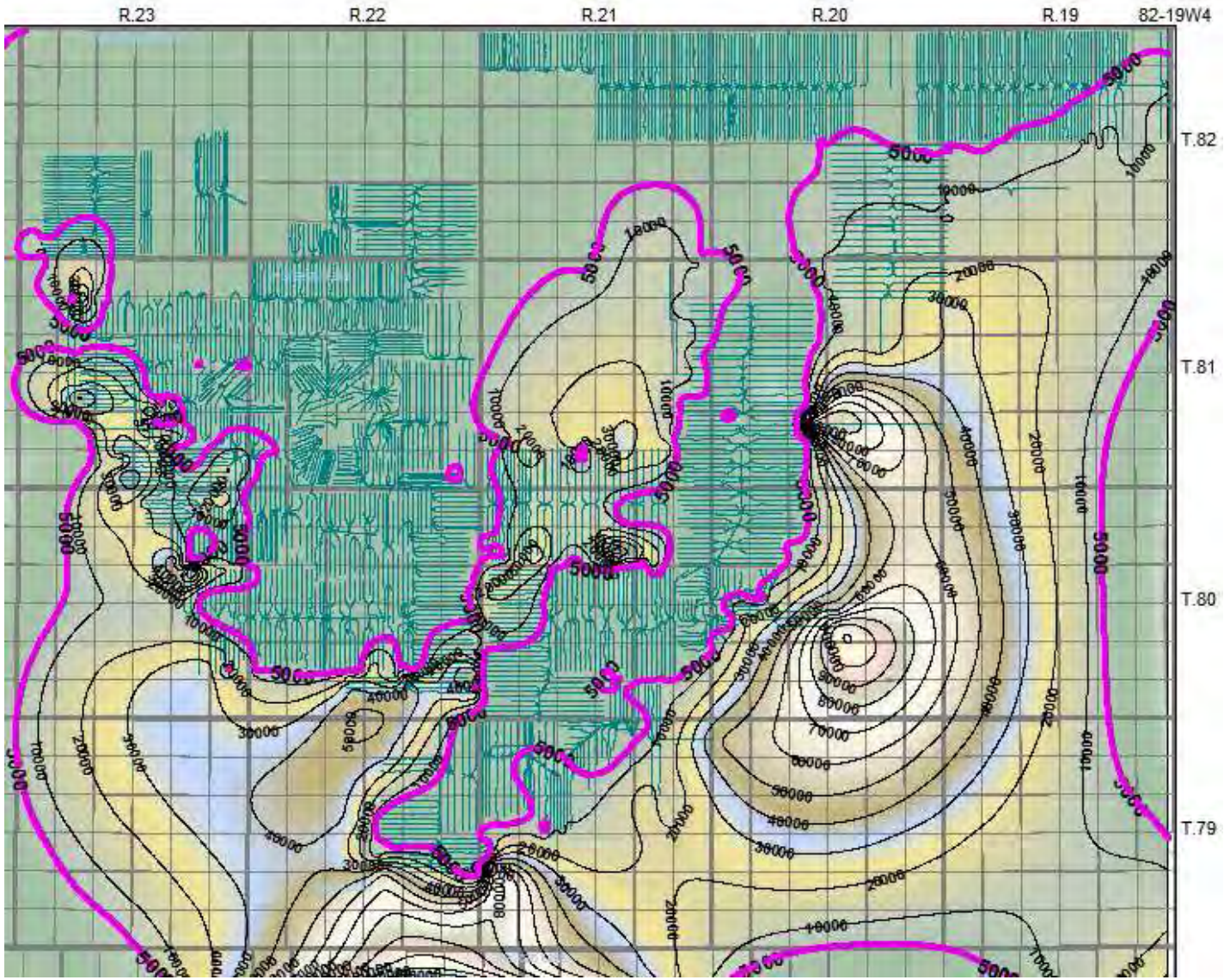
Wabiskaw ‘A’ Net Pay Map



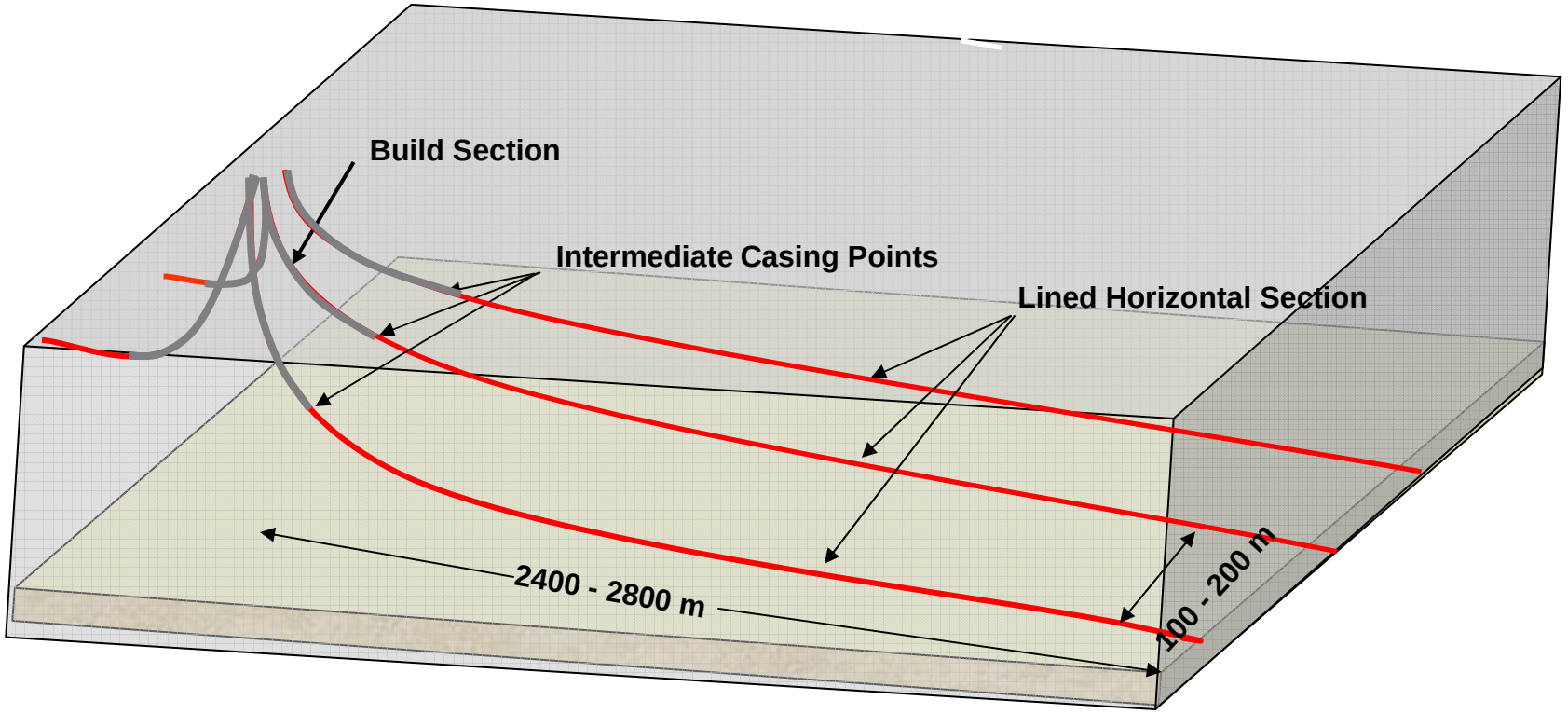
Wabiskaw Structure Map



Produced Viscosity Map

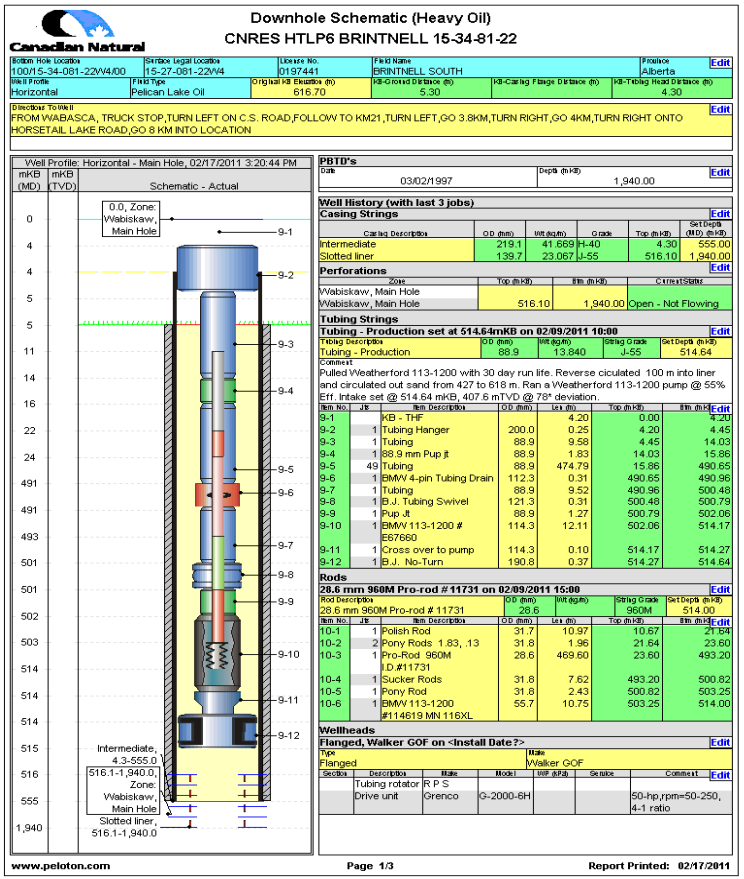


Typical Drilling Configuration



Typical Well Configurations

- **Producer**



Downhole Schematic (Heavy Oil)
CNRES HTLP6 BRINTNELL 15-34-81-22

Bottom Hole Location	Surface Legal Location	License No.	Field Name	Province
100/15-34-081-22W4/00	15-27-081-22W4	0197441	BRINTNELL SOUTH	Alberta

Well Profile	Field Type	Original KB Elevation (m)	KB-Ground Distance (m)	KB-Casing Flange Distance (m)	KB-Tbg Head Distance (m)
Horizontal	Pelican Lake Oil	616.70	5.30		4.30

Directions To Well
FROM WABASCA, TRUCK STOP,TURN LEFT ON C.S. ROAD,FOLLOW TO KM21,TURN LEFT,GO 3.8KM,TURN RIGHT,GO 4KM,TURN RIGHT ONTO HORSETAIL LAKE ROAD,GO 8 KM INTO LOCATION

Well Profile: Horizontal - Main Hole, 02/17/2011 3:20:44 PM
Schematic - Actual

0.0, Zone: Wabiskaw, Main Hole
Intermediate, 4.3-555.0
516.1-1,940.0, Zone: Wabiskaw, Main Hole
Slotted liner, 516.1-1,940.0

PBTD's

Date	Depth (mKB)
03/02/1997	1,940.00

Well History (with last 3 jobs)

Casing Strings

Casing Description	OD (mm)	Wt (kg/m)	Grade	Top (mKB)	Set Depth (MD) (mKB)
Intermediate	219.1	41.669	H-40	4.30	555.00
Slotted liner	139.7	23.067	J-55	516.10	1,940.00

Perforations

Zone	Top (mKB)	Btm (mKB)	Current Status
Wabiskaw, Main Hole	516.10	1,940.00	Open - Not Flowing

Tubing Strings

Tubing - Production set at 514.64mKB on 02/09/2011 10:00

Tubing Description	OD (mm)	Wt (kg/m)	String Grade	Set Depth (mKB)
Tubing - Production	88.9	13.840	J-55	514.64

Comment
Pulled Weatherford 113-1200 with 30 day run life. Reverse ciculated 100 m into liner and circulated out sand from 427 to 618 m. Ran a Weatherford 113-1200 pump @ 55% Eff. Intake set @ 514.64 mKB, 407.6 mTVD @ 78° deviation.

Item No.	Jts	Item Description	OD (mm)	Len (m)	Top (mKB)	Btm (mKB)
9-1		KB - THF		4.20	0.00	4.20
9-2	1	Tubing Hanger	200.0	0.25	4.20	4.45
9-3	1	Tubing	88.9	9.58	4.45	14.03
9-4	1	88.9 mm Pup jt	88.9	1.83	14.03	15.86
9-5	49	Tubing	88.9	474.79	15.86	490.65
9-6	1	BMV 4-pin Tubing Drain	112.3	0.31	490.65	490.96
9-7	1	Tubing	88.9	9.52	490.96	500.48
9-8	1	B.J. Tubing Swivel	121.3	0.31	500.48	500.79
9-9	1	Pup Jt	88.9	1.27	500.79	502.06
9-10	1	BMV 113-1200 # E67660	114.3	12.11	502.06	514.17
9-11	1	Cross over to pump	114.3	0.10	514.17	514.27
9-12	1	B.J. No-Turn	190.8	0.37	514.27	514.64

Rods

28.6 mm 960M Pro-rod # 11731 on 02/09/2011 15:00

Rod Description	OD (mm)	Wt (kg/m)	String Grade	Set Depth (mKB)
28.6 mm 960M Pro-rod # 11731	28.6		960M	514.00

Item No.	Jts	Item Description	OD (mm)	Len (m)	Top (mKB)	Btm (mKB)
10-1	1	Polish Rod	31.7	10.97	10.67	21.64
10-2	2	Pony Rods 1.83, .13	31.8	1.96	21.64	23.60
10-3	1	Pro-Rod 960M I.D.#11731	28.6	469.60	23.60	493.20
10-4	1	Sucker Rods	31.8	7.62	493.20	500.82
10-5	1	Pony Rod	31.8	2.43	500.82	503.25
10-6	1	BMV 113-1200 #114619 MN 116XL	55.7	10.75	503.25	514.00

Wellheads

Flanged, Walker GOF on <Install Date?>

Type	Make
Flanged	Walker GOF

Section	Description	Make	Model	WP (kPa)	Service	Comment
	Tubing rotator	R P S				
	Drive unit	Grenco	G-2000-6H			50-hp,rpm=50-250, 4-1 ratio

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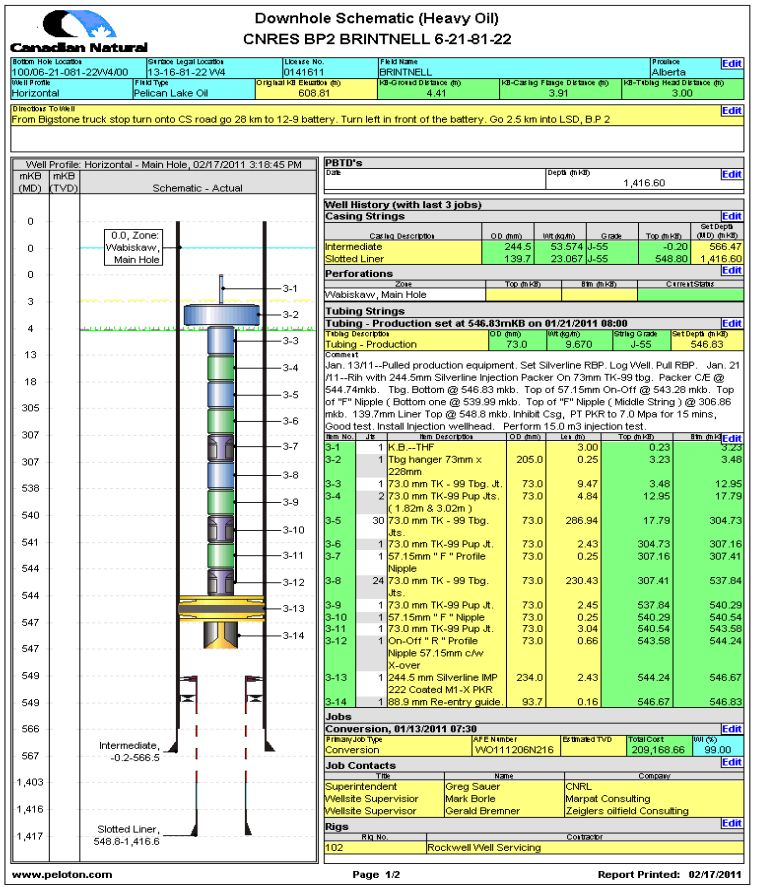
- **Injector**



Downhole Schematic (Heavy Oil)
CNRES BP2 BRINTNELL 6-21-81-22

Bottom Hole Location	Surface Legal Location	License No.	Field Name	Province
100/06-21-081-22W4/00	13-16-81-22 W4	0141611	BRINTNELL	Alberta

Well Profile	Field Type	Original KB Elevation (m)	KB-Ground Distance (m)	KB-Casing Flange Distance (m)	KB-Tbg Head Distance (m)
Horizontal	Pelican Lake Oil	608.81	4.41	3.91	3.00

Directions To Well
From Bigstone truck stop turn onto CS road go 28 km to 12-9 battery. Turn left in front of the battery. Go 2.5 km into LSD, B.P 2

Well Profile: Horizontal - Main Hole, 02/17/2011 3:18:45 PM
Schematic - Actual

0.0, Zone: Wabiskaw, Main Hole
Intermediate, -0.2-566.5
Slotted Liner, 548.8-1,416.6

PBTD's

Date	Depth (mKB)
	1,416.60

Well History (with last 3 jobs)

Casing Strings

Casing Description	OD (mm)	Wt (kg/m)	Grade	Top (mKB)	Set Depth (MD) (mKB)
Intermediate	244.5	53.574	J-55	0.20	566.47
Slotted Liner	139.7	23.067	J-55	548.80	1,416.60

Perforations

Zone	Top (mKB)	Btm (mKB)	Current Status
Wabiskaw, Main Hole			

Tubing Strings

Tubing - Production set at 546.83mKB on 01/21/2011 08:00

Tubing Description	OD (mm)	Wt (kg/m)	String Grade	Set Depth (mKB)
Tubing - Production	73.0	9.670	J-55	546.83

Comment
Jan. 13/11--Pulled production equipment. Set Silverline RBP. Log Well. Pull RBP. Jan. 21 /11--Rih with 244.5mm Silverline Injection Packer On 73mm TK-99 tbg. Packer C/E @ 544.74mkb. Tbg. Bottom @ 546.83 mkb. Top of 57.15mm On-Off @ 543.28 mkb. Top of "F" Nipple (Bottom one @ 539.99 mkb. Top of "F" Nipple (Middle String) @ 306.86 mkb. 139.7mm Liner Top @ 548.8 mkb. Inhibit Csg., PT PKR to 7.0 Mpa for 15 mins, Good test. Install Injection wellhead. Perform 15.0 m3 injection test.

Item No.	Jts	Item Description	OD (mm)	Len (m)	Top (mKB)	Btm (mKB)
3-1	1	K.B.--THF		3.00	0.23	3.23
3-2	1	Tbg hanger 73mm x 228mm	205.0	0.25	3.23	3.48
3-3	1	73.0 mm TK - 99 Tbg. Jt.	73.0	9.47	3.48	12.95
3-4	2	73.0 mm TK-99 Pup Jts. (1.82m & 3.02m)	73.0	4.84	12.95	17.79
3-5	30	73.0 mm TK - 99 Tbg. Jts.	73.0	286.94	17.79	304.73
3-6	1	73.0 mm TK-99 Pup Jt.	73.0	2.43	304.73	307.16
3-7	1	57.15mm " F " Profile Nipple	73.0	0.25	307.16	307.41
3-8	24	73.0 mm TK - 99 Tbg. Jts.	73.0	230.43	307.41	537.84
3-9	1	73.0 mm TK-99 Pup Jt.	73.0	2.45	537.84	540.29
3-10	1	57.15mm " F " Nipple	73.0	0.25	540.29	540.54
3-11	1	73.0 mm TK-99 Pup Jt.	73.0	3.04	540.54	543.58
3-12	1	On-Off " R " Profile Nipple 57.15mm c/w X-over	73.0	0.66	543.58	544.24
3-13	1	244.5 mm Silverline IMP 222 Coated M1 -X PKR	234.0	2.43	544.24	546.67
3-14	1	88.9 mm Re-entry guide.	93.7	0.16	546.67	546.83

Jobs

Conversion, 01/13/2011 07:30

Primary Job Type	AFE Number	Estimated TVD	Total Cost	Wt (%)
Conversion	WO111206N216		209,168.66	99.00

Job Contacts

Title	Name	Company
Superintendent	Greg Sauer	CNRL
Wellsite Supervisor	Mark Borle	Marpat Consulting
Wellsite Supervisor	Gerald Bremner	Zeiglers oilfield Consulting

Rigs

Rig No.	Contractor
102	Rockwell Well Servicing

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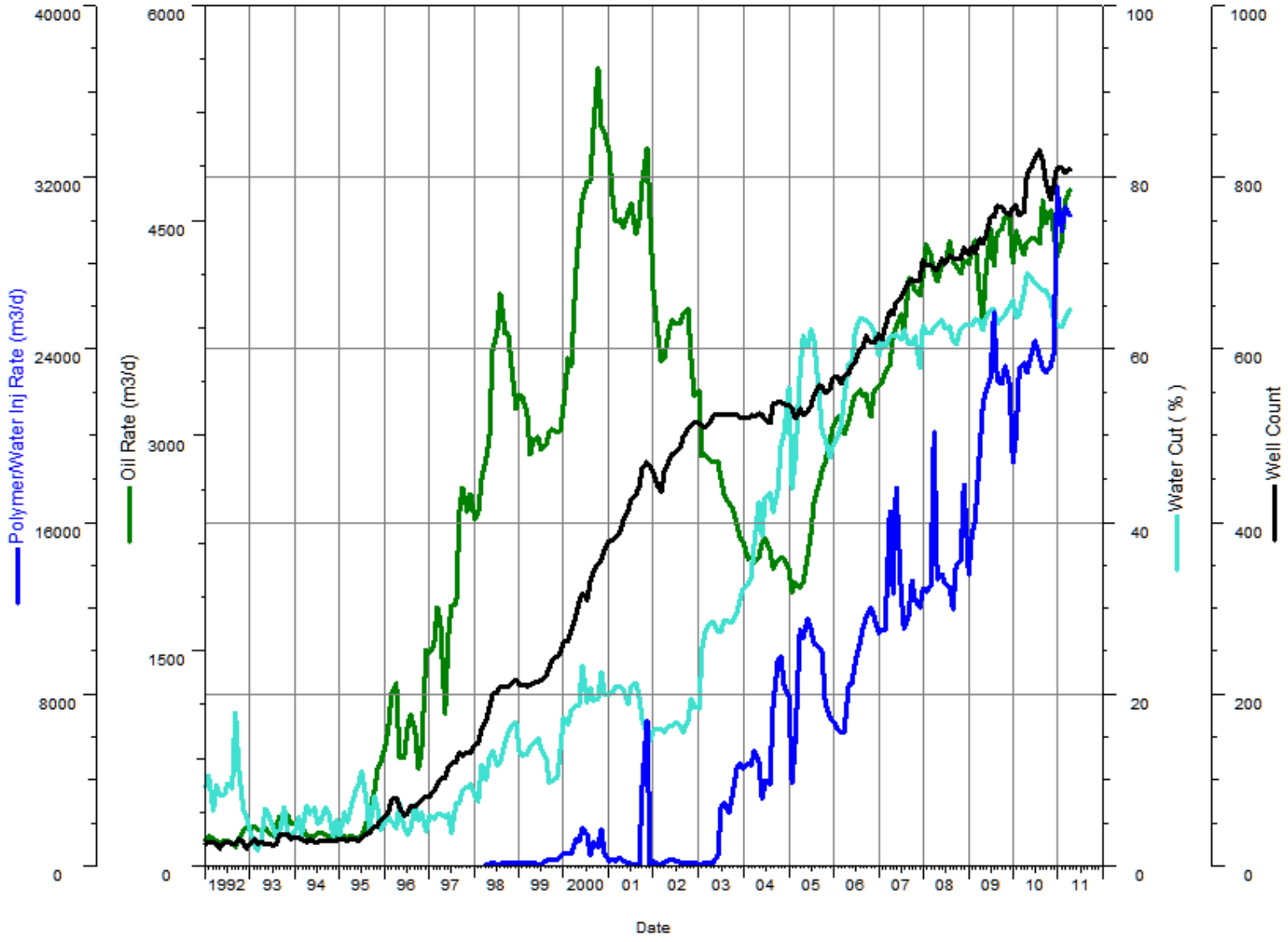
- **Intermediate Casing landed in Wabiskaw sand (producers and injectors).**

Flood Performance

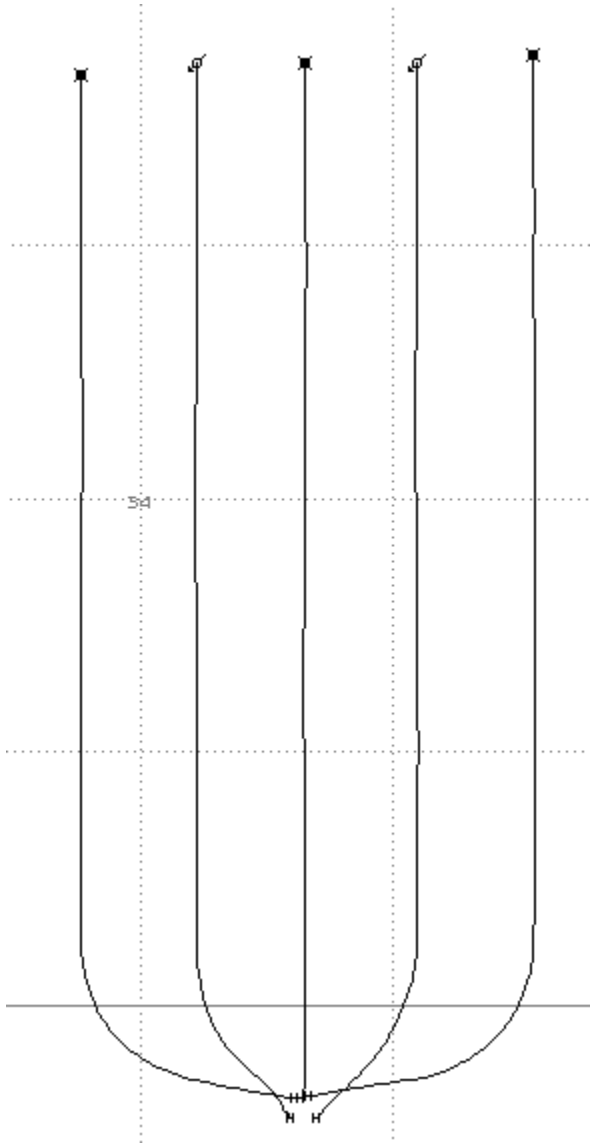
- Flood performance prediction is based on cumulative past performance of previous flood areas.
- HTLP 6 was the initial pilot area and became the primary template for future prediction.
- Allowances for spacing, oil viscosity and well performance are incorporated.

Total ER Scheme Production

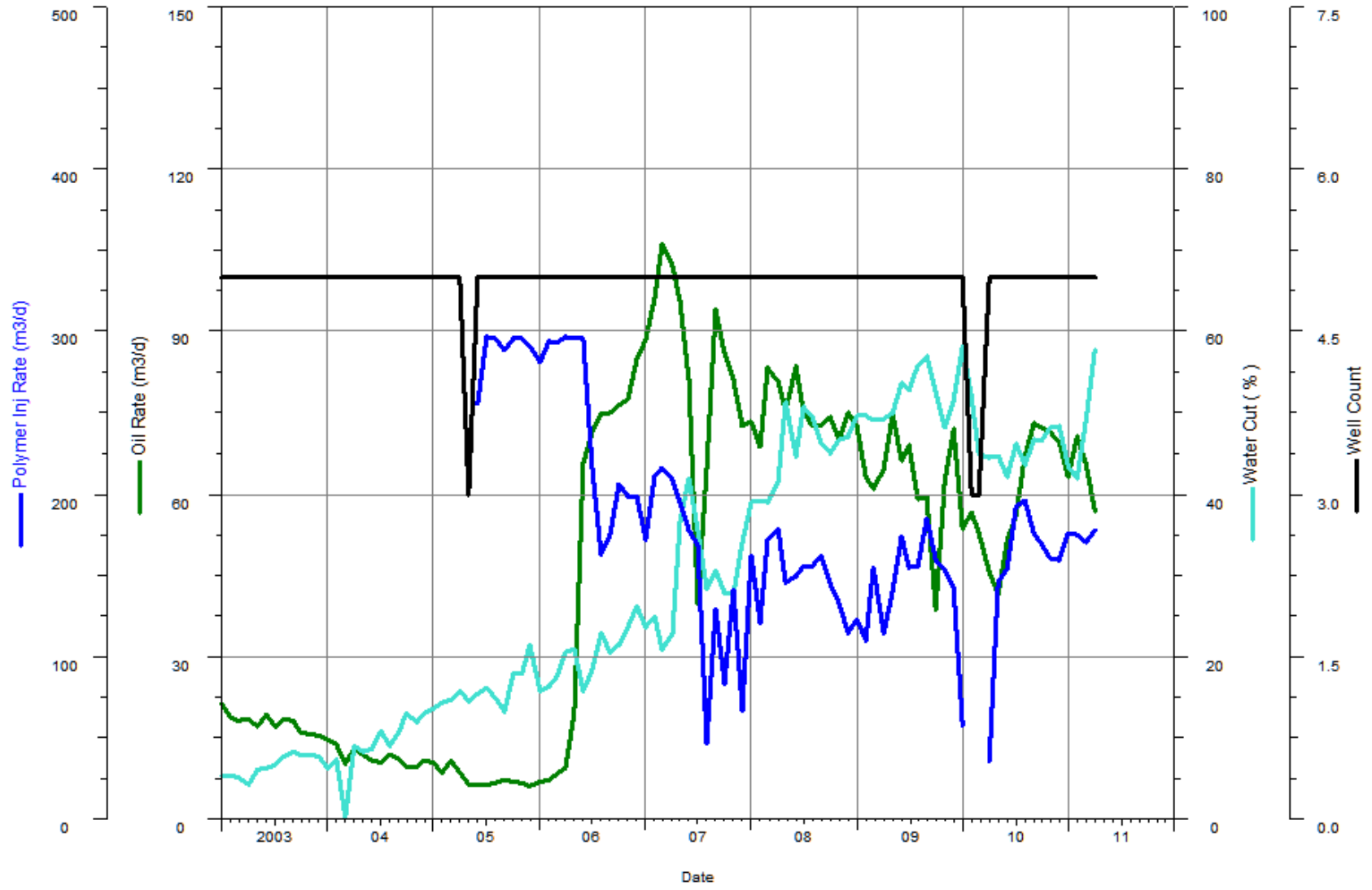


HTLP6 Polymer Pilot

- 2 injectors 3 producers
- 1400m long lined horizontals
- 175m inter-well spacing
- Injection commenced May 2005



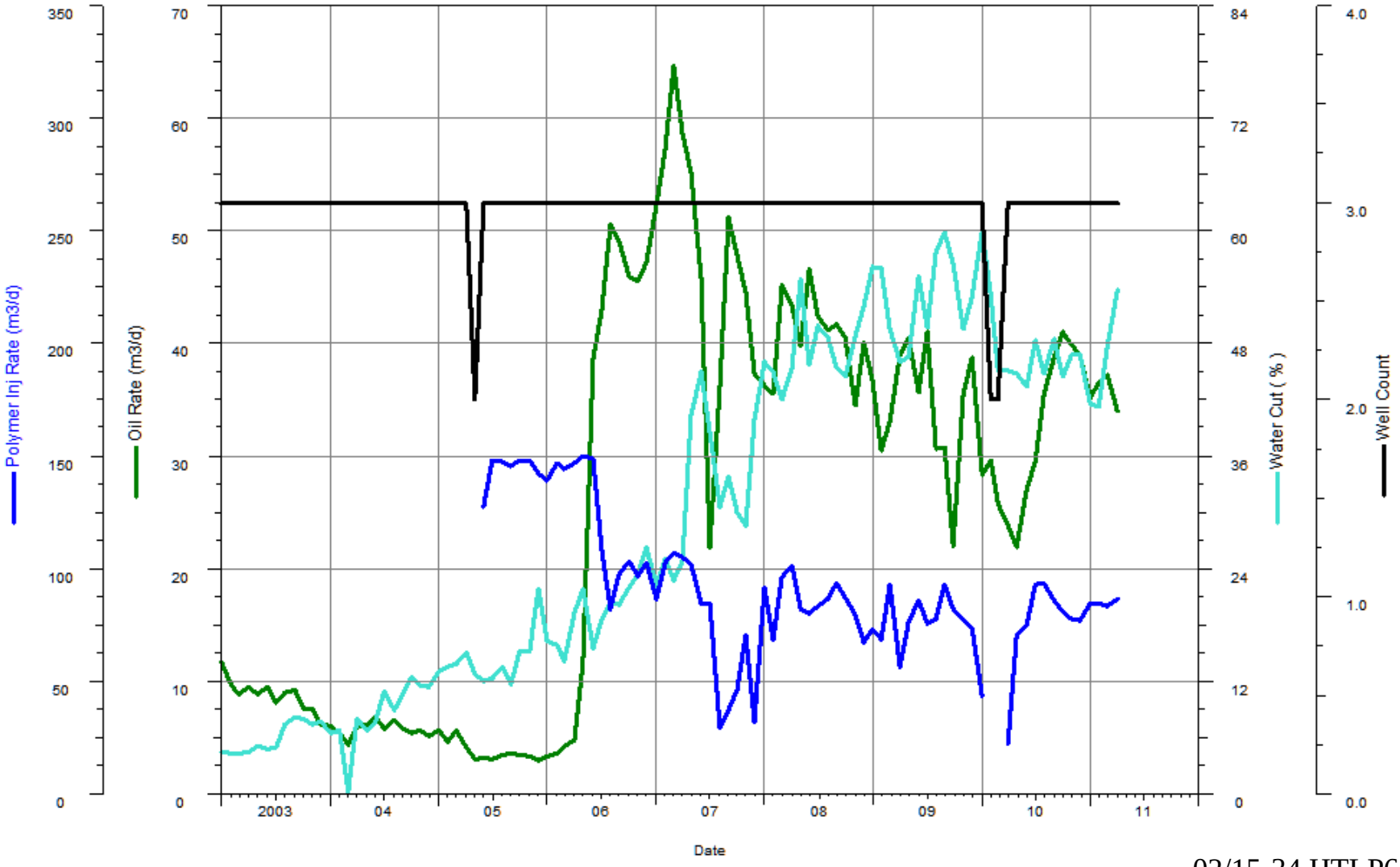
HTLP 6 Pilot – Part of Approval 10147



HTLP 6 Pilot Discussion

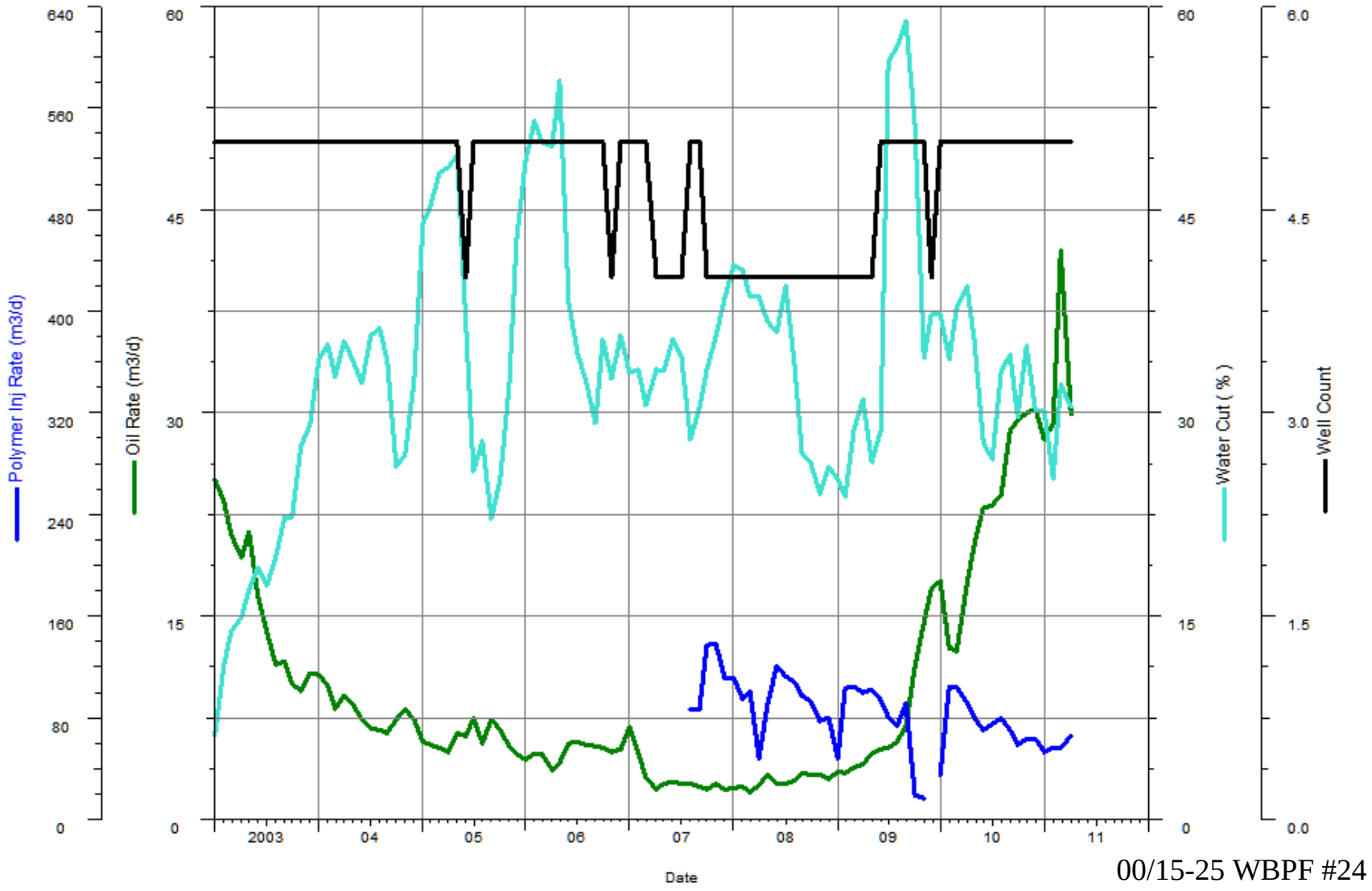
- First Polymer injection in May 2005
- Polymer Response March 2006
- Average Watercuts have increased, but remain less than 60%
- Latest incremental polymer flood recovery factor estimate is 15% - 21%
- Early 2010 Injection shut in to depressurize area and drill offsets

Example Pattern - Better Performance



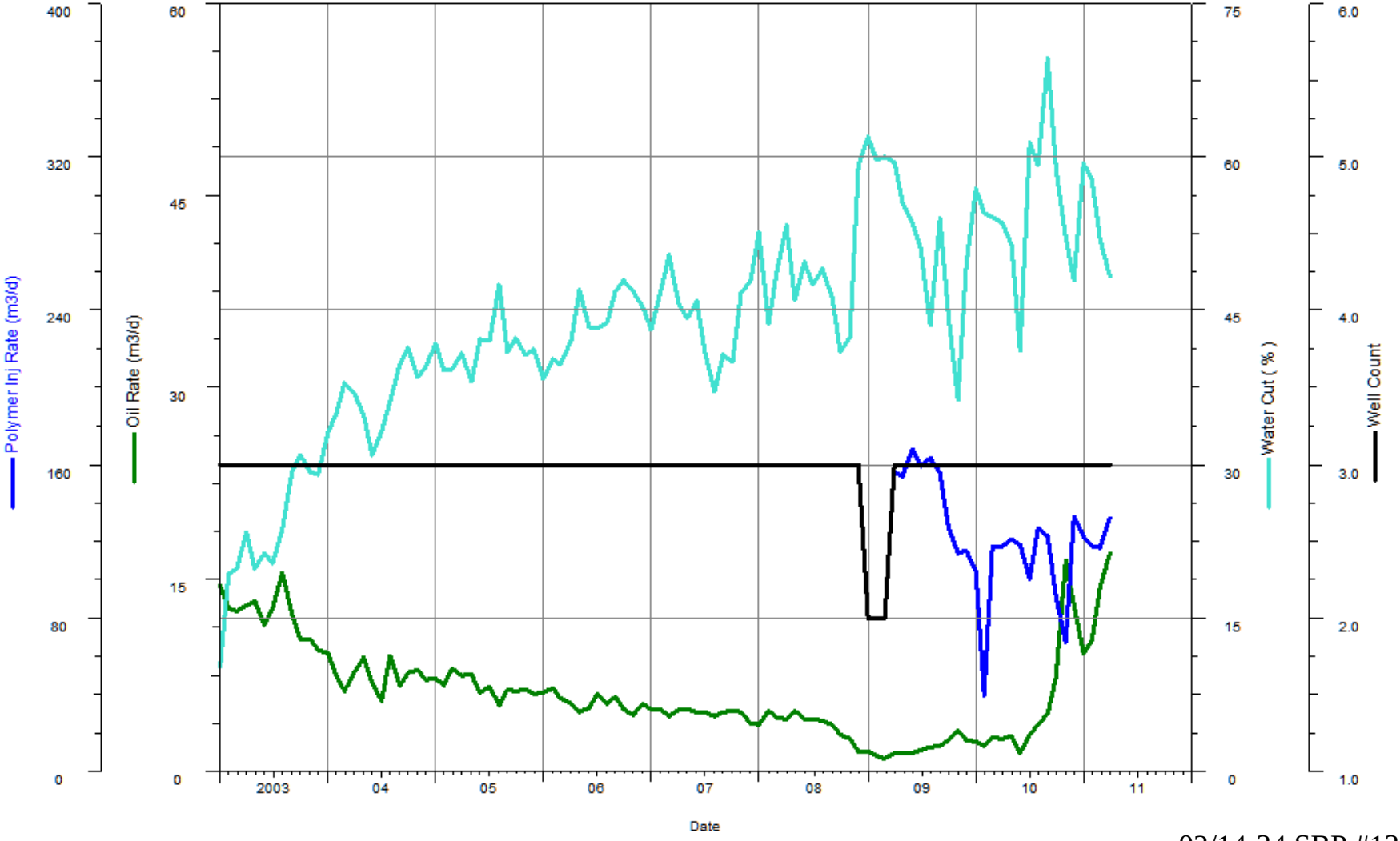
02/15-34 HTLP6

Example Pattern – Average Performance



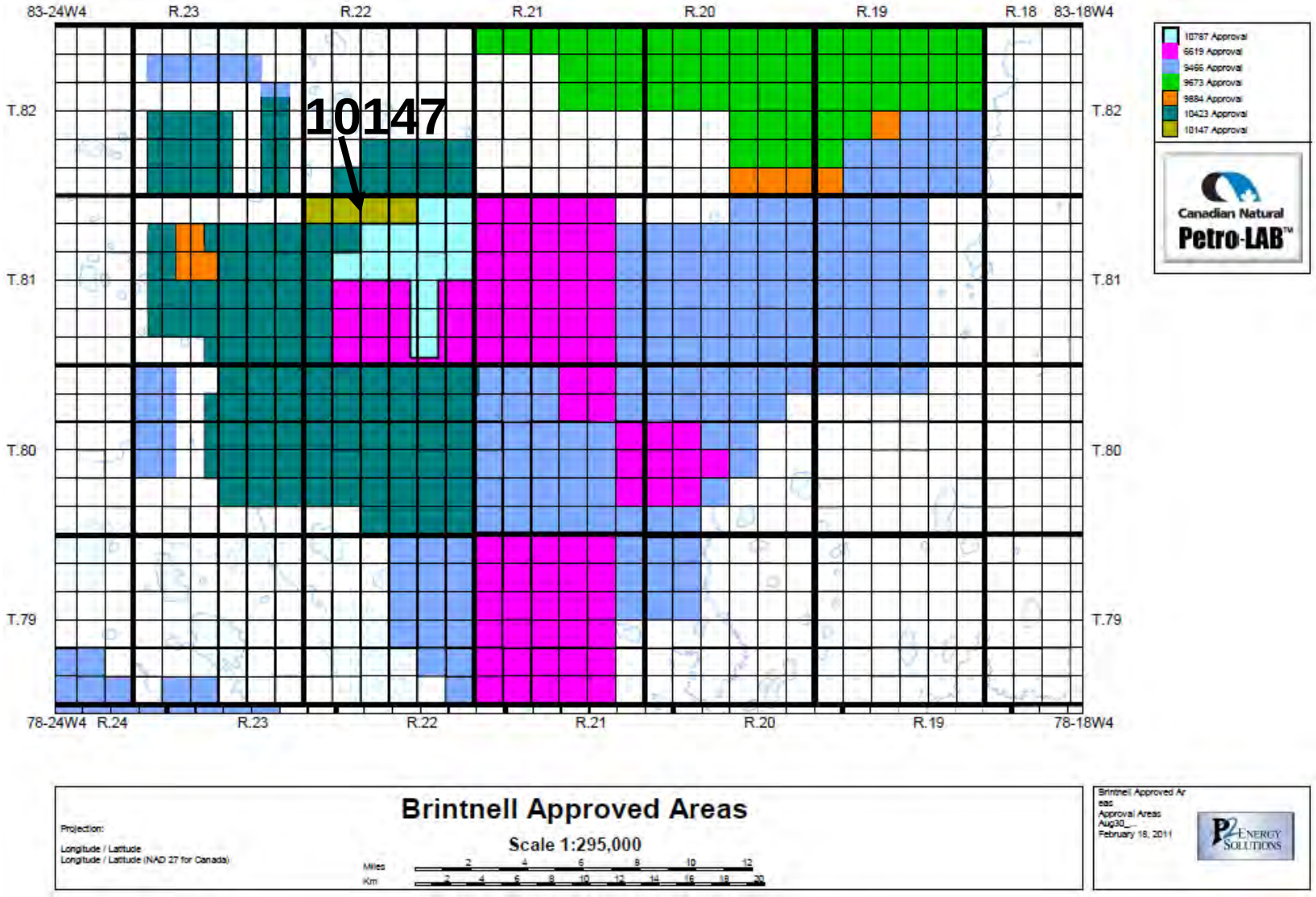
00/15-25 WBPF #24

Example Pattern - Poorer Performance

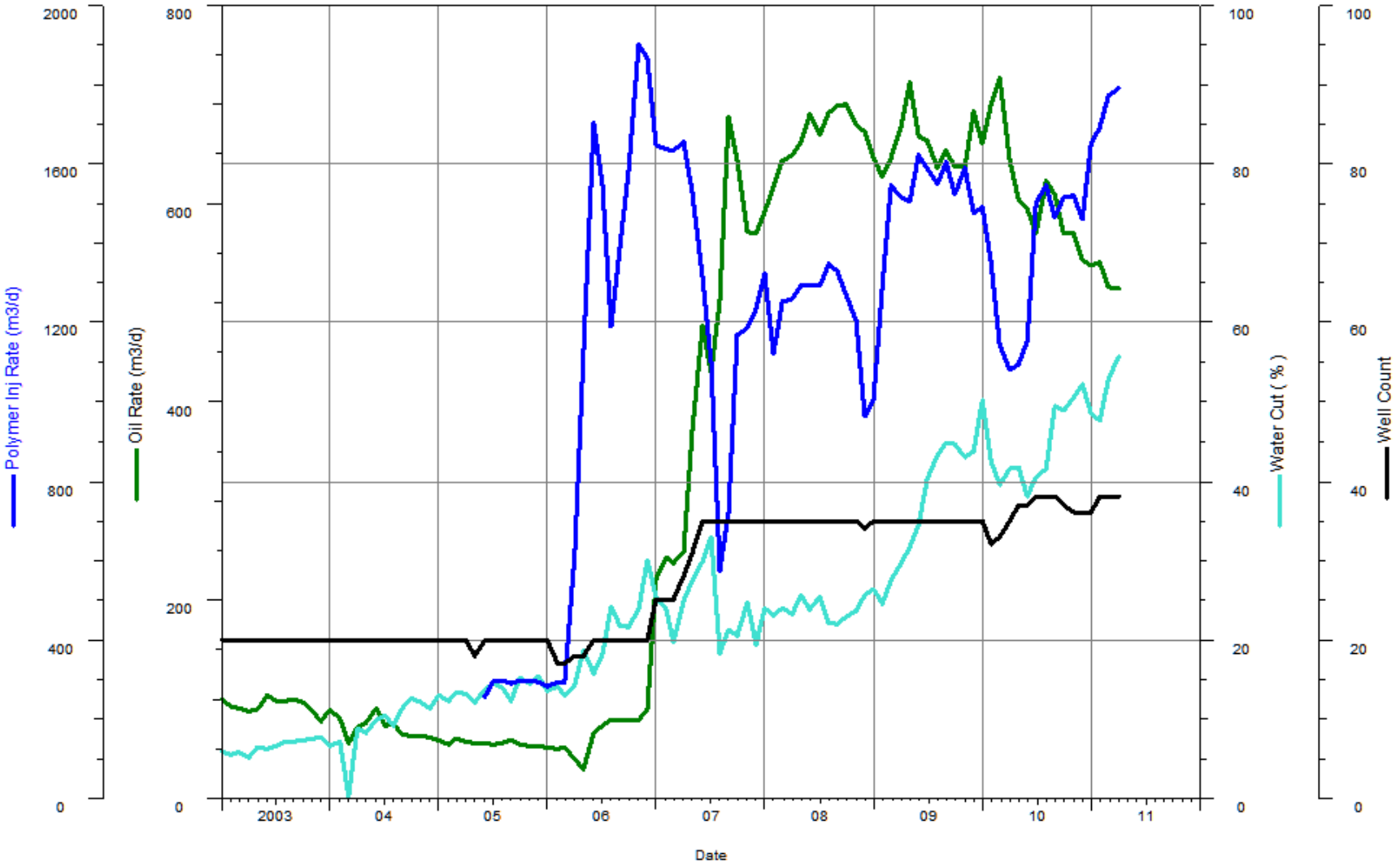


02/14-34 SBP #13

Approval 10147



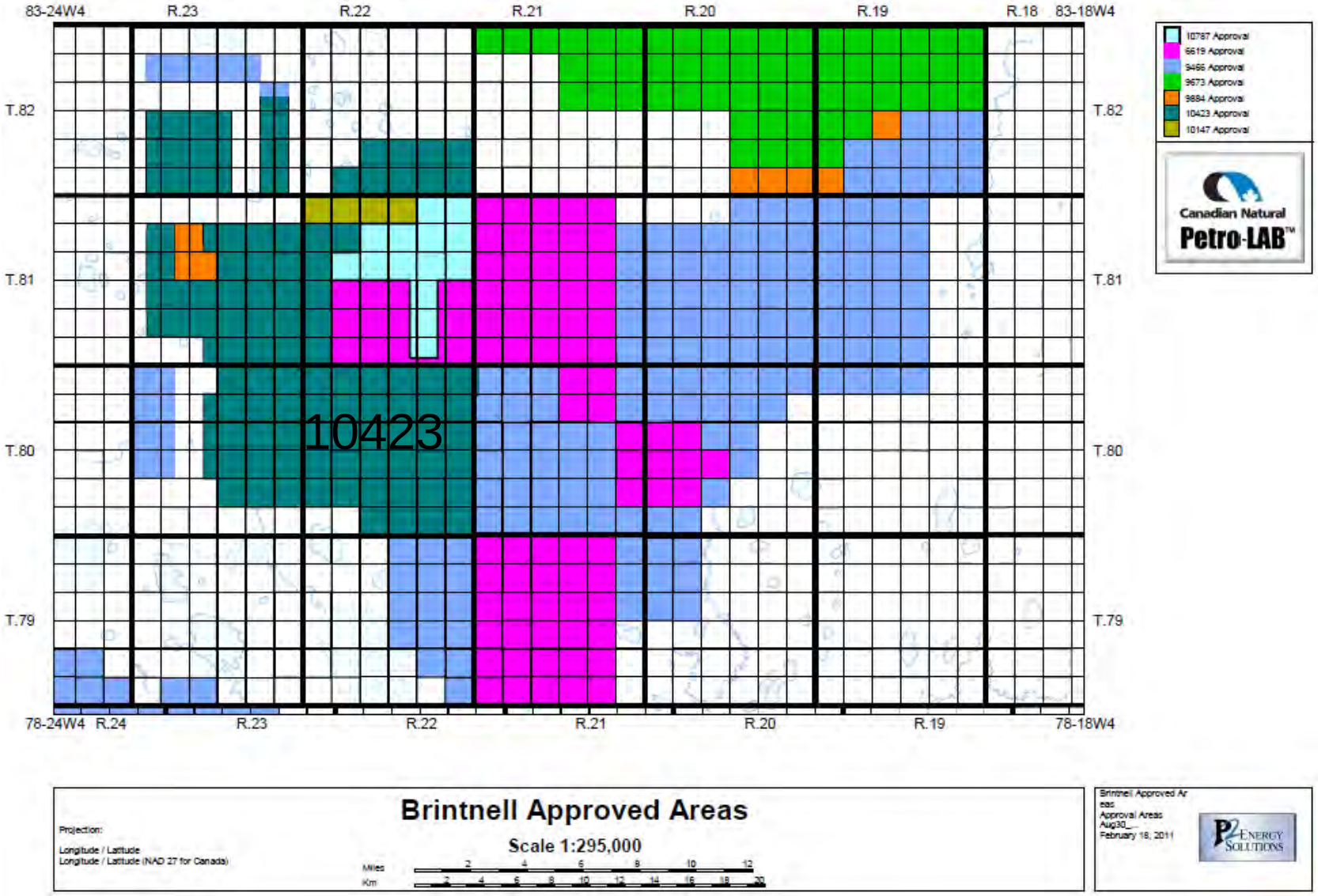
Approval 10147 Flood Area



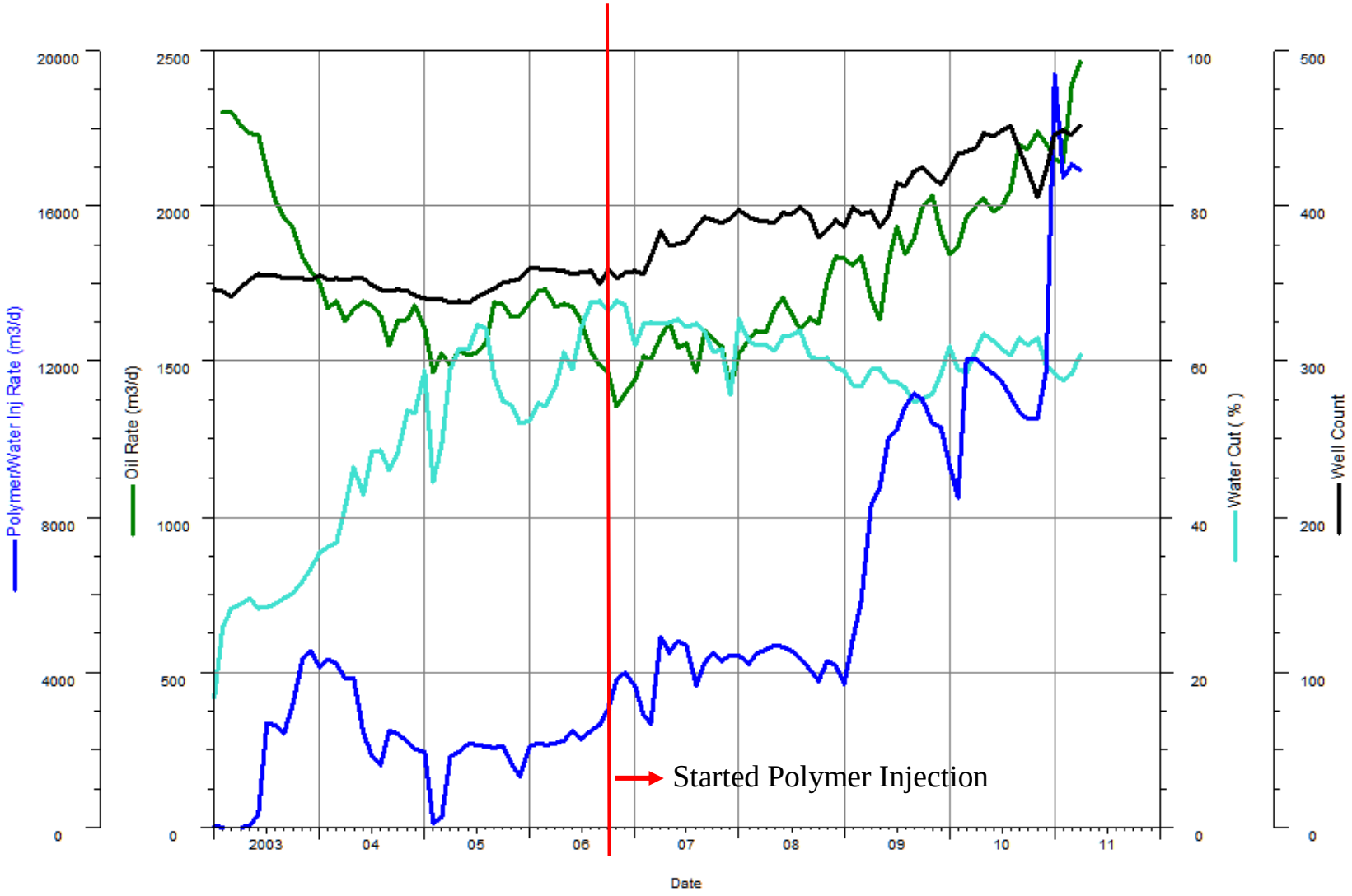
10147 Discussion

- First Area expanded after Pilot
- Oil viscosity ranges 1300-2800cp
- Entire scheme area is currently under polymer flood
- Polymer Response January 2007
- Average Watercuts have increased over the last year to 50%
- Parts of the area have exceeded the results from the pilot area
- Cumulative oil recovered to date is 11 MMbbl

Approval 10423



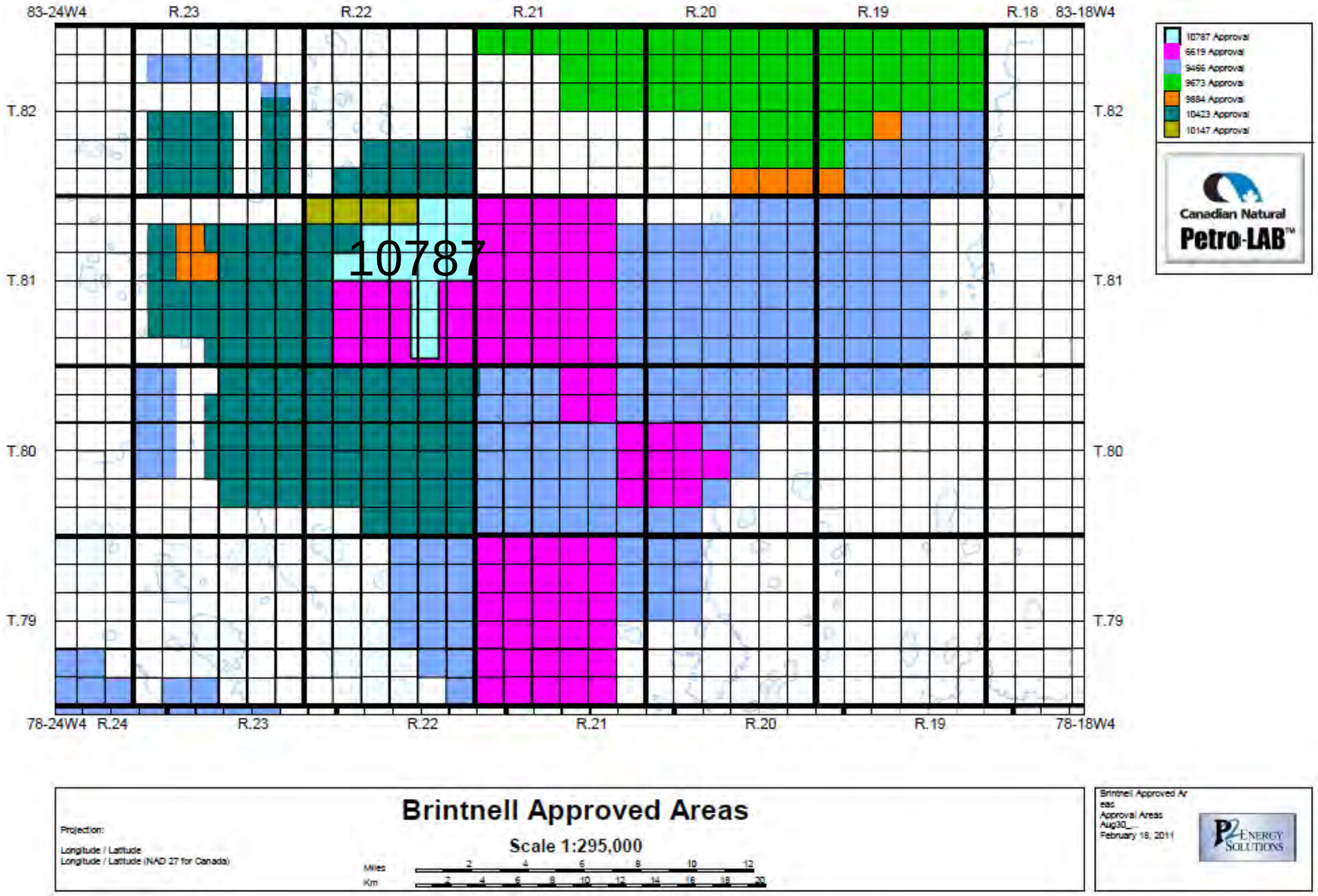
Approval 10423



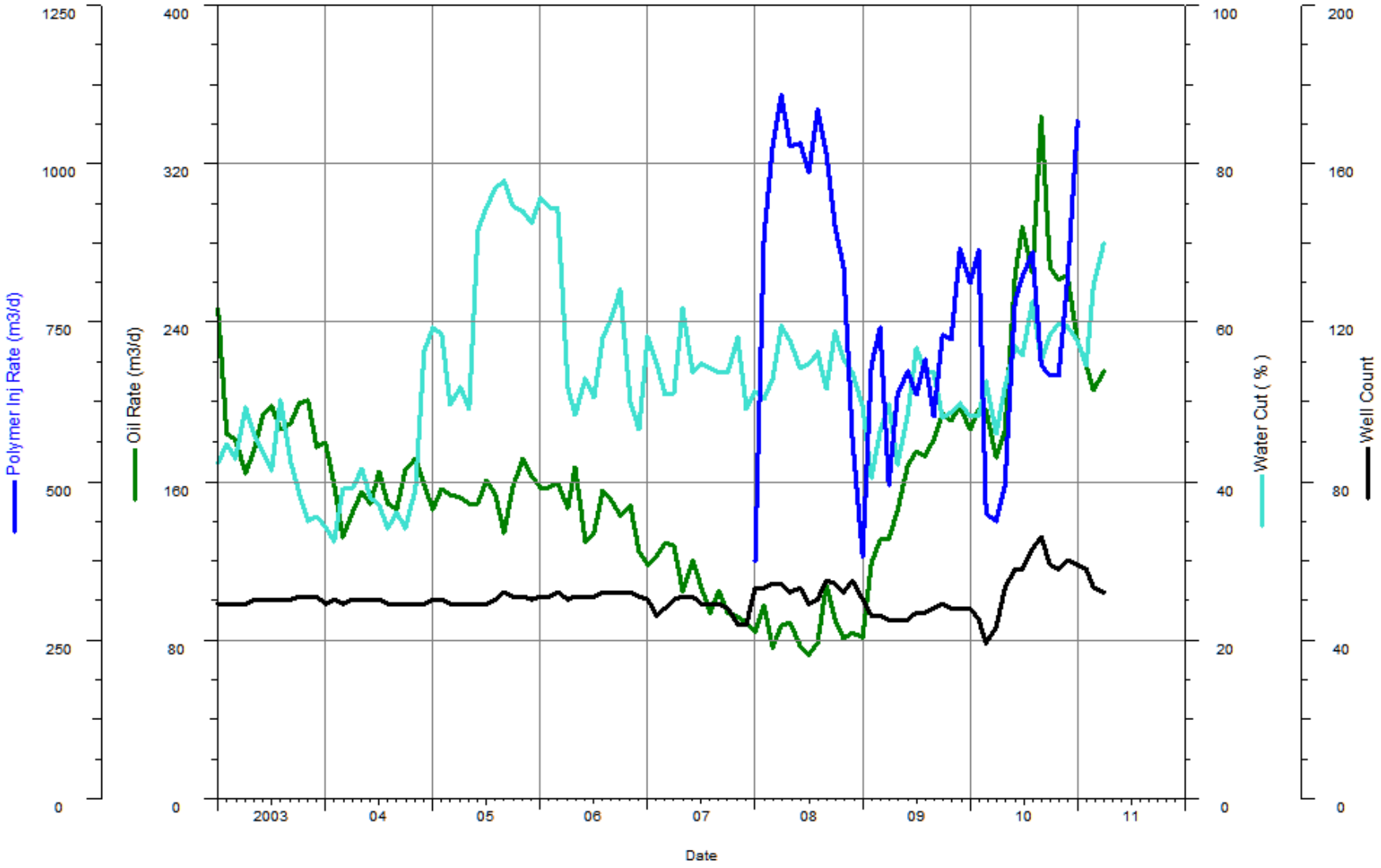
10423 Discussion

- Polymerflood started in 2006 and has been expanded through 2010. 71% of the scheme area is currently under polymer flood with only the western side left to implement
- Flood response has occurred and is in varying stages based on implementation timing
- Oil viscosity ranges from 1,100 cp to 50,000 cp
- Scheme has been expanded to include 9467 Approval formerly under waterflood starting in 2003
- Cumulative oil recovered to date is 73 MMbbl

Approval 10787



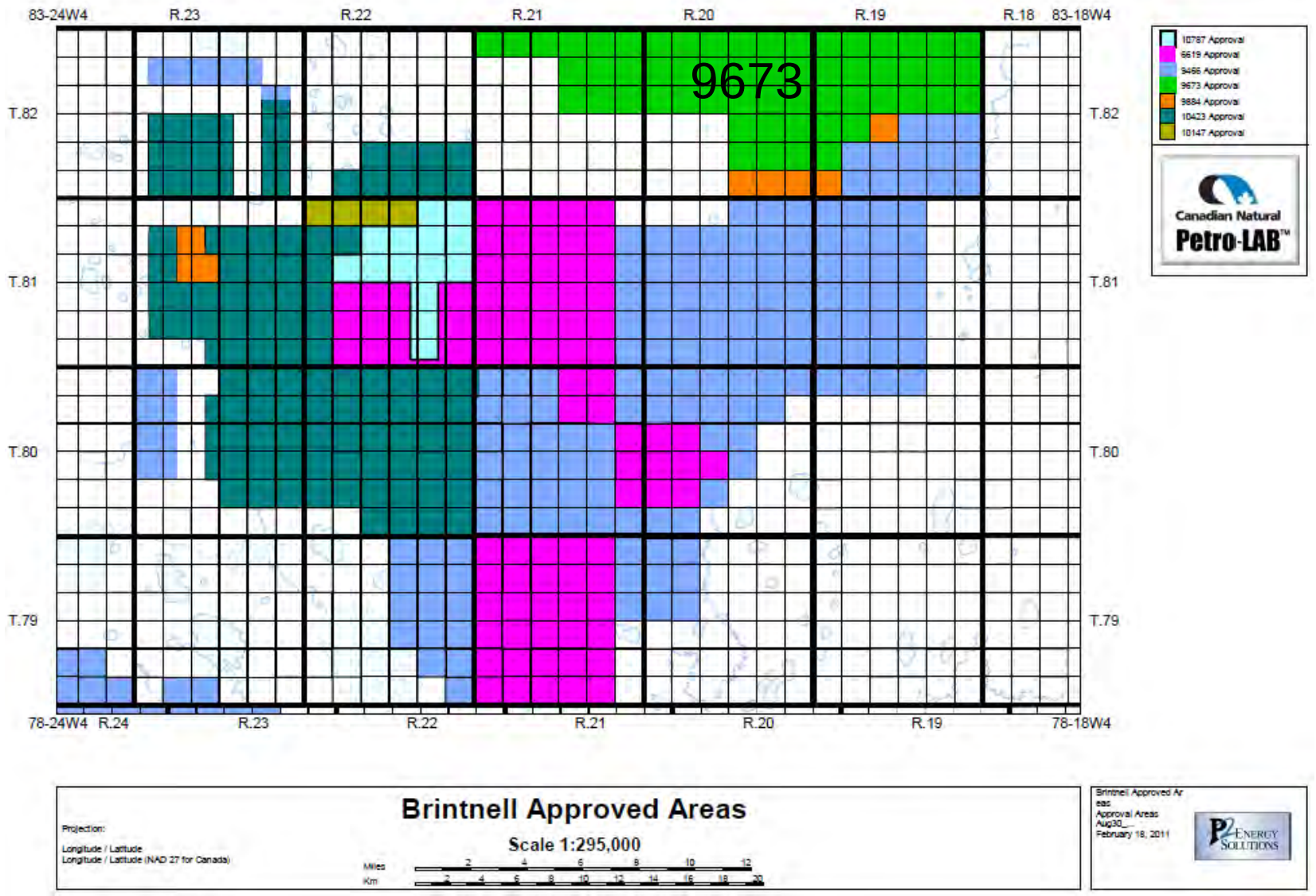
Approval 10787



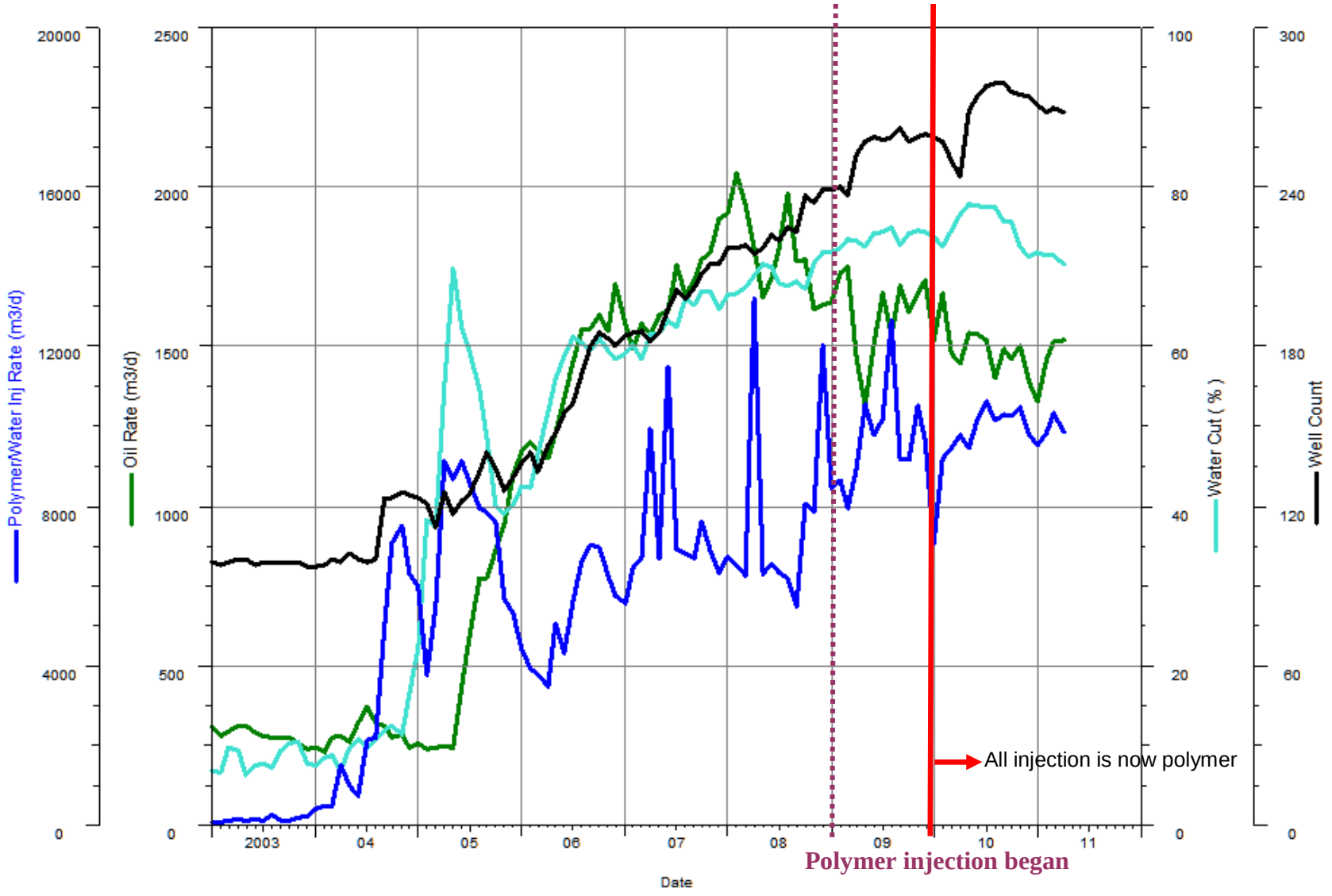
10787 Discussion

- Small area of Polymer flood started in 2007
- Scheme area expanded in 2010 with polymer injection starting late in the year. 100% of current scheme area will be under polymer flood in Q2 2011.
- First area to have a multilateral well being flooded by several injectors.
- Oil viscosity ranges from 1200 cp to 4300 cp.
- Cumulative oil recovered to date is 8 MMbbl
- Plans to expand scheme and flood again in 2011.

Approval 9673



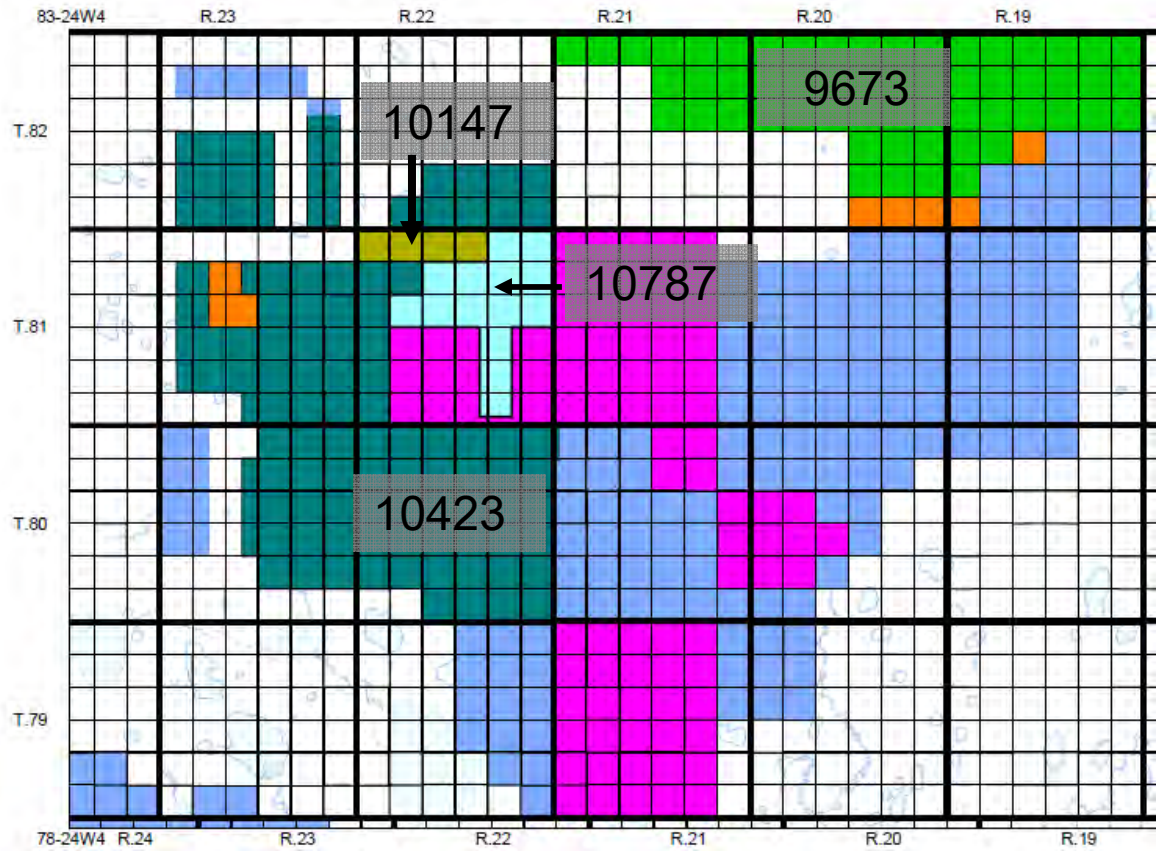
9673 North Brintnell Polymer Flood



Approval 9673 Summary

- Approval 9673 was approved and waterflood operations began in 2004.
- The waterflood was expanded during 2004-2006 within the 9673 approval area.
- In 2008 and 2009 additional lands were added to 9673 and Polymerflood was implemented on these new lands.
- In late 2009 the previously water flooded areas were converted to polymer flood - all areas of the approval which are under flood are now being flooded with polymer.
- 64% of the scheme area is currently under polymer flood.
- Oil viscosity ranges from 600 cp to 5700 cp
- Cumulative oil recovered to date 28 MMbbl

Approval Flood Recovery Factors



Approval 9673
Total area OBIP 97,411,452 m3
Estimated developed area ultimate Recovery factor ranges:
13-17%

Approval 10787
Total area OBIP 25,210,324 m3
Estimated developed area ultimate Recovery factor ranges:
15-21%

Approval 10147
Total area OBIP 7,133,455 m3
Estimated developed area ultimate Recovery factor ranges:
21-25%

Approval 10423
Total area OBIP 226,425,173 m3
Estimated developed area ultimate Recovery factor ranges:
16-21%

Injection Pressures - History

EOR Approval History

- **2003-2005 : EOR Approvals – MAWHIP = 3500kPa**

Approval 10147

- Sept 2005 – HTL6 pilot increased MAWHIP approved to 7650kPa

Approval 10423

- 2006-present – MAWHIP approved at varying pressures

Approx: 43%=7650kPa , 28%=6060kPa , 29%=3500kPa

Approval 10787

- Mar 2008 - increased MAWHIP approved to 7650kPa

Approval 9673

- July08-Jan09 - increased MAWHIP approved to 6060kPa

Injection Pressures

- **Initial Reservoir Pressure = 1900 – 2600 kPa**
  - **Via pressure gradients from gas wells in the pool**

- **Operating Pressure**
  - **Maximum allowable wellhead injection pressure (MAWHIP)**
    - **Approvals vary from 3500 – 7650 kPa**
    - **CNRL currently sets wellhead operating limit at 6,000 kPa**
  - **CNRL submitted Application 1641795 in February 2010 to increase the MAWHIP across all 4 ER Scheme Approval areas to 7650 kPa.**
    - **Interim approval granted December 22, 2010 allowing 7650 kPa on wells listed in the application. Amended on February 28, 2011 to include an additional 28 wells.**

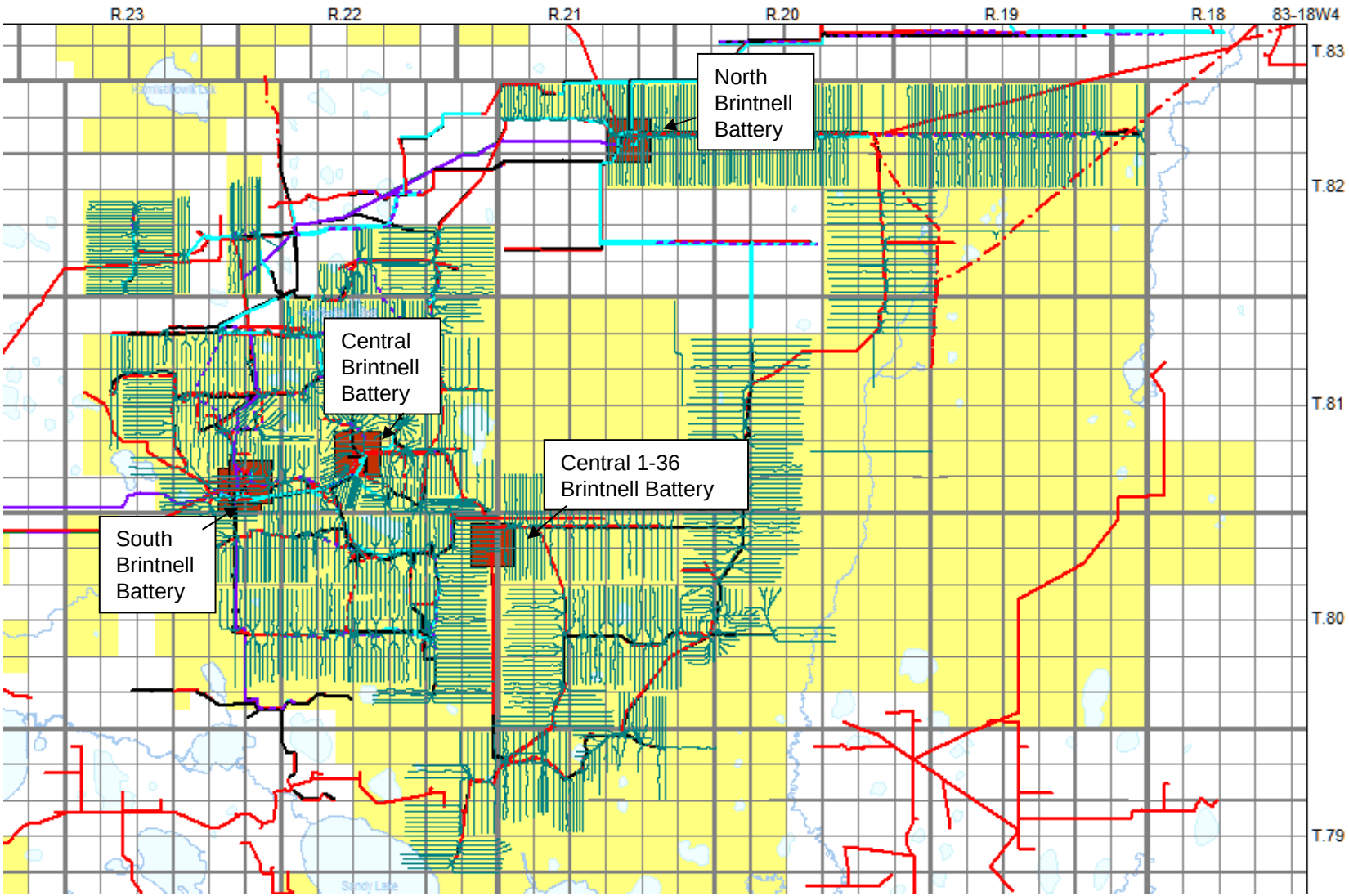
Caprock Integrity

- CNRL is working with the ERCB to address caprock integrity concerns as they pertain to our Application 1641795.
  - 3 wells are currently being drilled to gather additional caprock core, conduct mini-frac analysis and FMI logs.
  - Caprock has been mapped.
  - Fracturing simulation model has been run.
  - Geomechanical modeling being conducted.
  - Grand Rapids observation plan being reviewed and updated.
  - Wabiskaw zone injection pressure and rate data continues to be monitored via Hall plots.

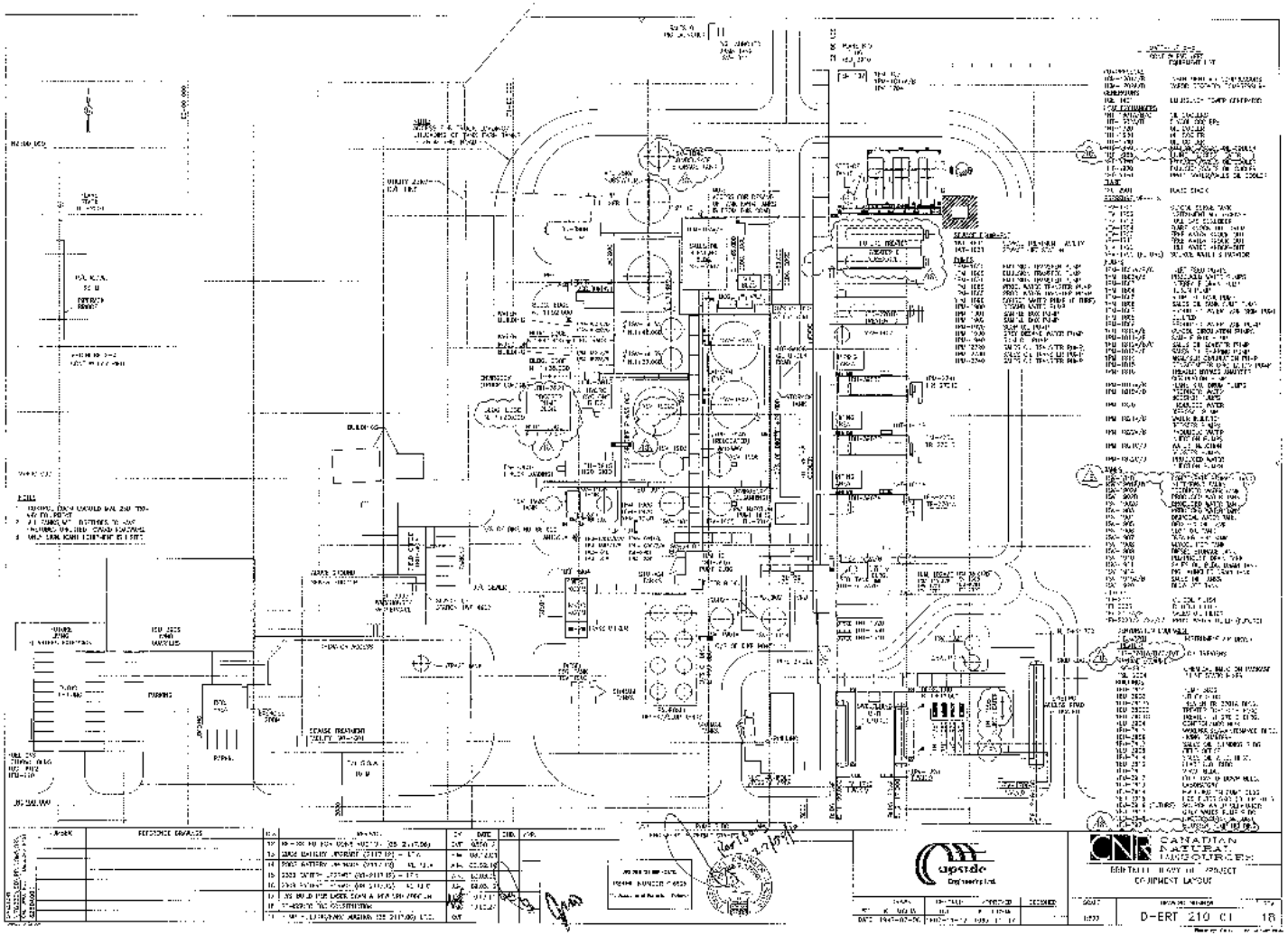
Future Development Plans

- Canadian Natural plans to continue with the expansion of the polymer flood at Brintnell over the next several years pending satisfactory resolution to the caprock integrity / MAWHIP issue.
- Expansion will push the flood to the east, south-east and western edges of the pool.
- Drilling plans for 2011 are contingent on resolution to the caprock integrity issue and are therefore uncertain for the remainder of the year and into 2012.
- In all areas, CNRL continues to learn and optimize from past flood areas.
- CNRL continues to evaluate different polymer options for the polymer flood, but at present no changes are imminent.
- Surfactant injection in conjunction with polymer is under consideration for a possible trial in 2011 subject to ERCB approval.

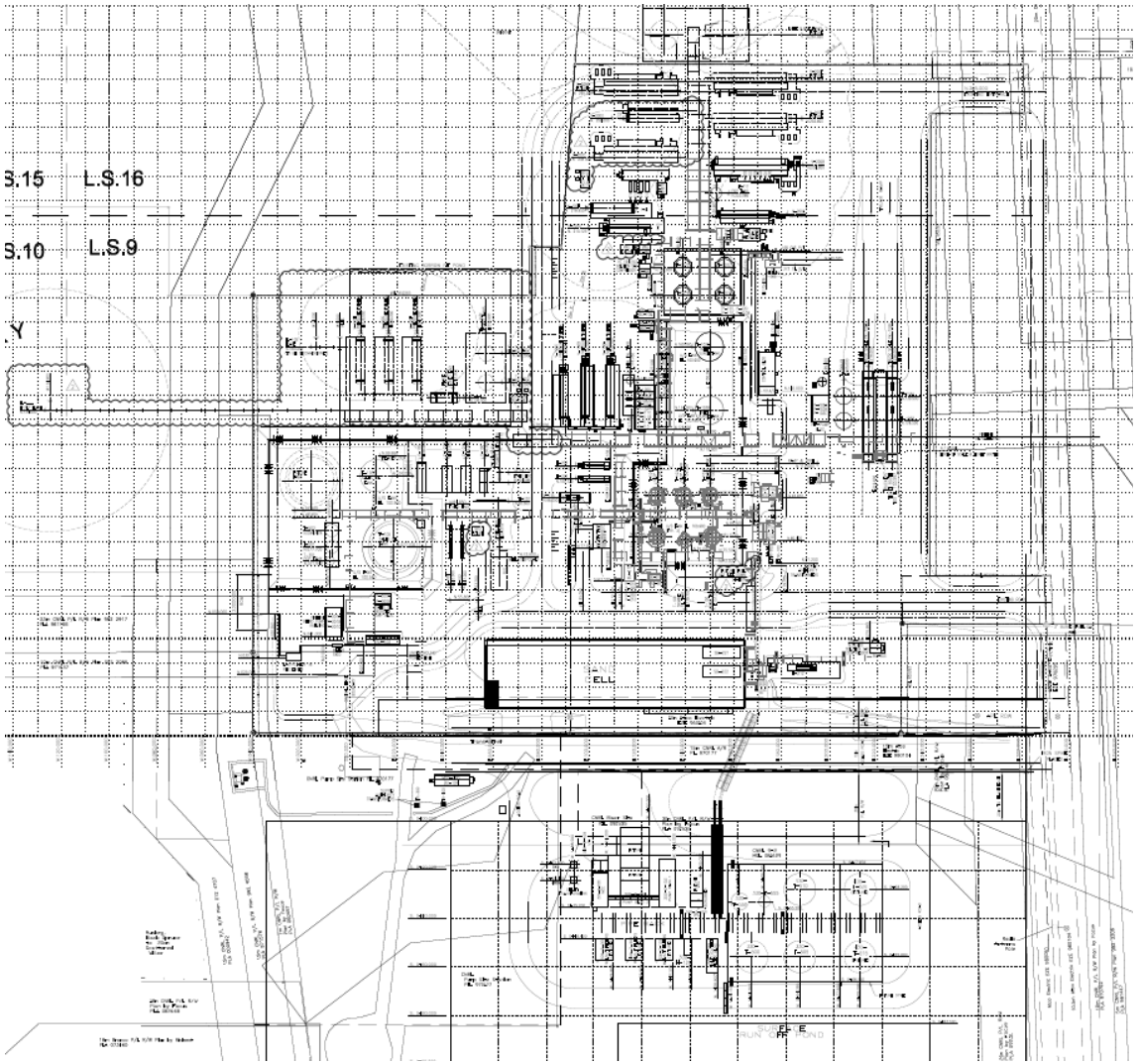
Facilities


R.23
R.22
R.21
R.20
R.19
R.18
83-18W4
T.83
T.82
T.81
T.80
T.79
North Brintnell Battery
Central Brintnell Battery
Central 1-36 Brintnell Battery
South Brintnell Battery

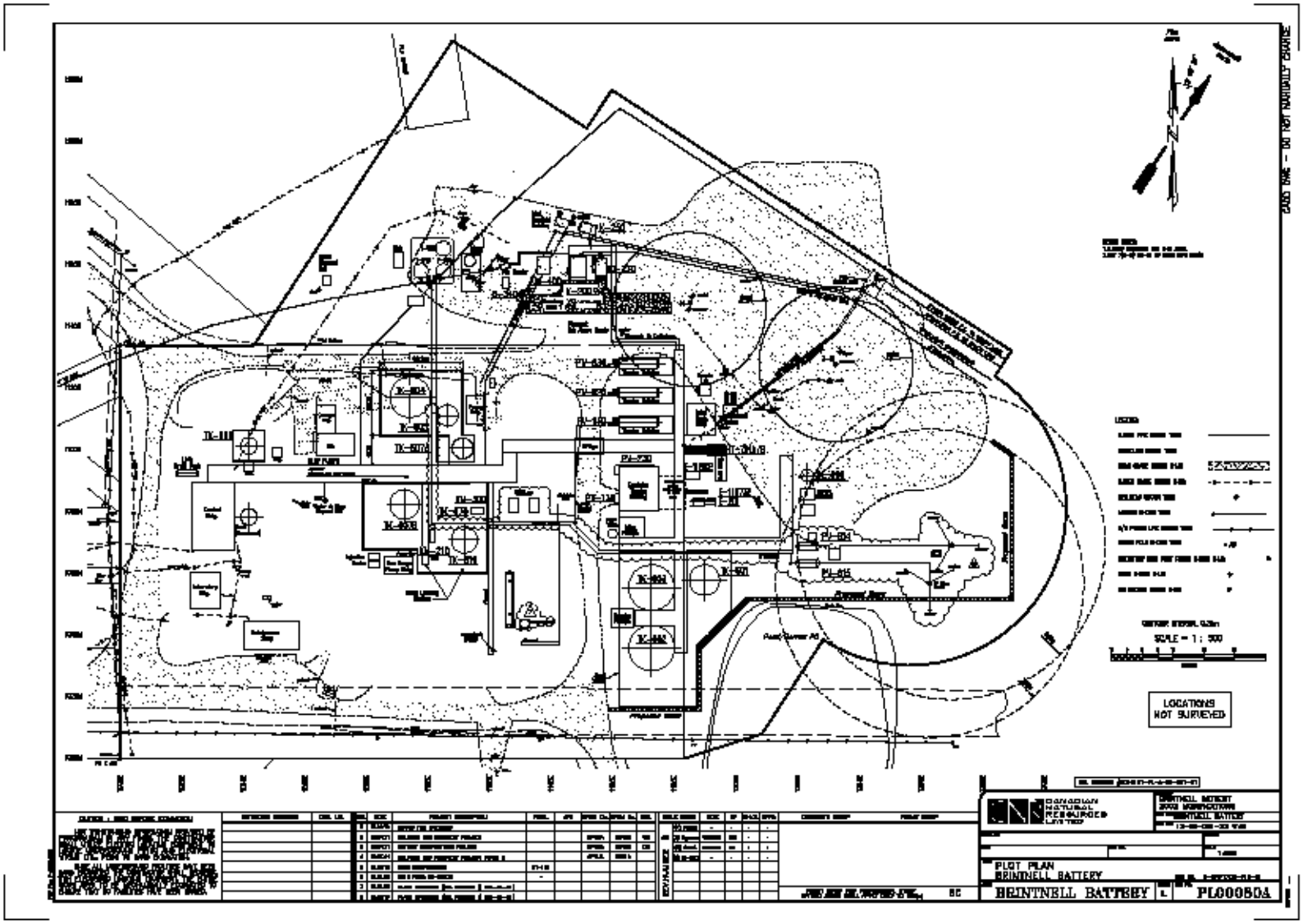
Facility: NB 7-27-82-21W4 Battery Plot Plan



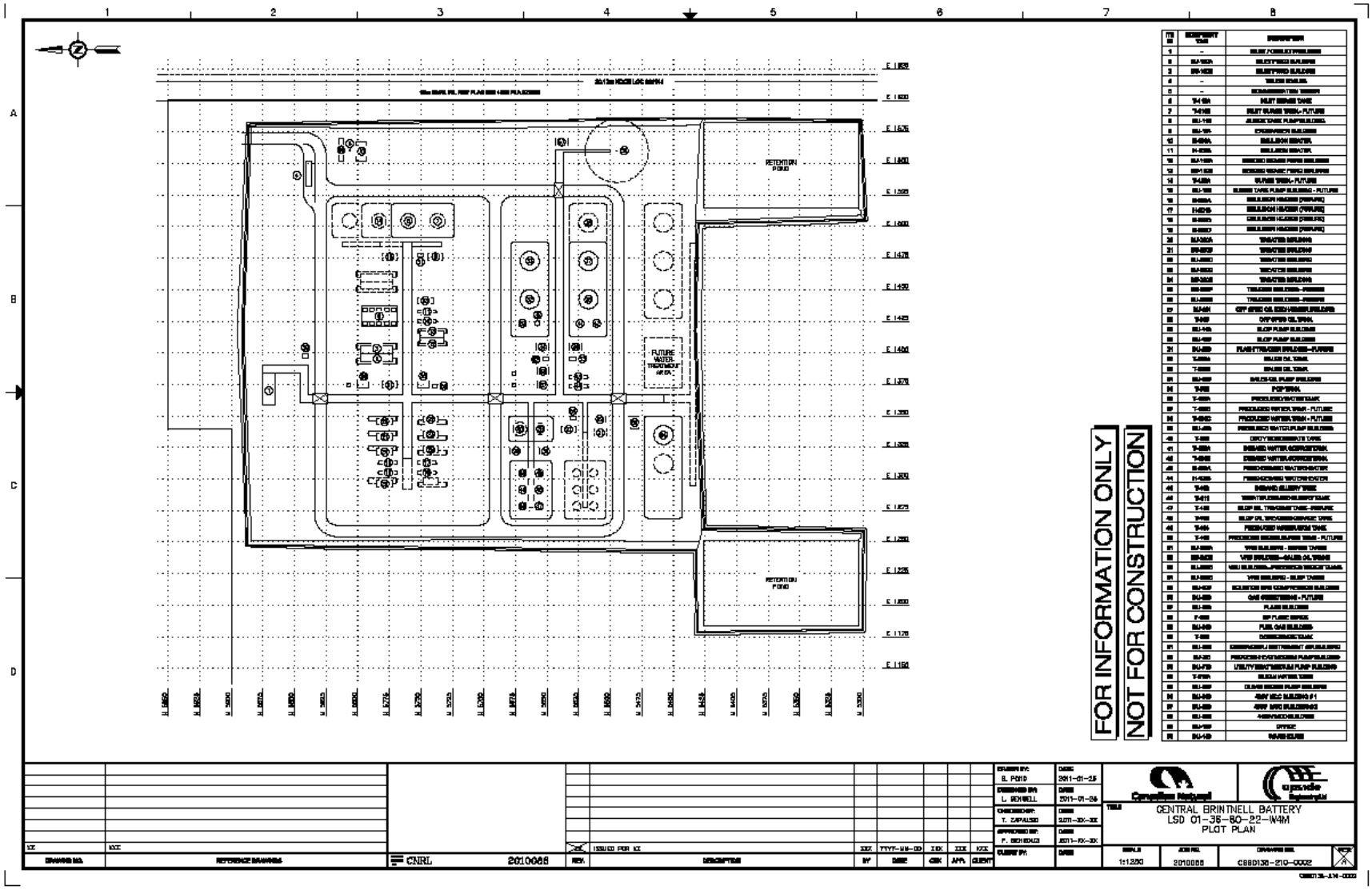
Facility: SB 9-2-81-23W4 Battery Plot Plan



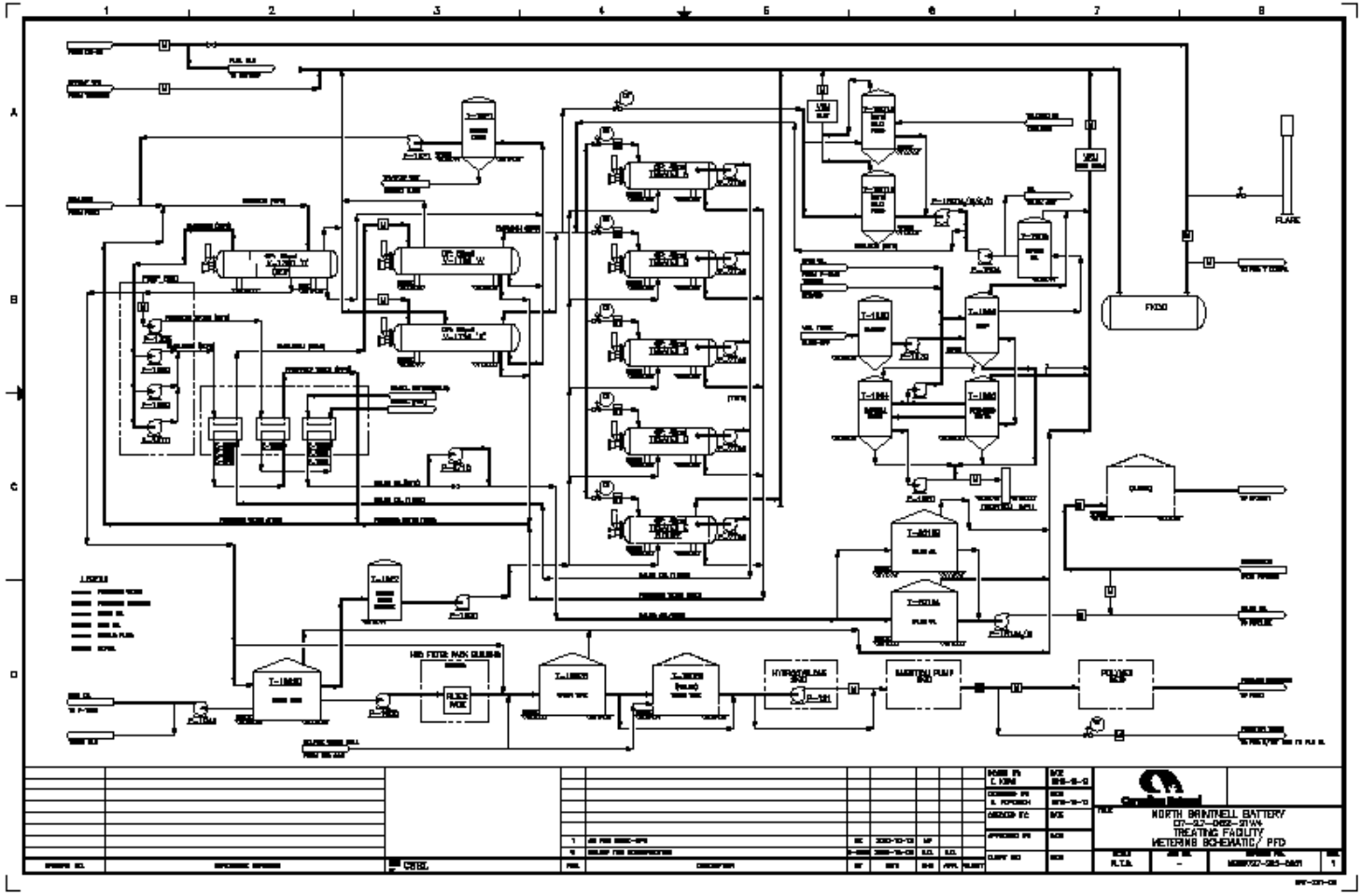
Facility: BT 12-9-81-22W4 Battery Plot Plan



Facility: CB 1-36-80-22W4 Battery Plot Plan



Facility: Typical Brintnell Battery PFD



Facility Modifications

- **Reasons for Modifications:**
  - **Oil Treating:**
    - Additional treating required as a result of polymer flood expansion.
    - Treating capability: change in process efficiency as a result of increased polymer returns (tight emulsion, reduced heat).
    - Heat integration: indirect heating of fluid to reduce OPEX.
  - **Water Handling:**
    - Additional vessels/tanks/pumps required to improve produced water recycle percentages.
    - Allow adequate storage for polymer injection systems – reduce effect battery upset has on polymer injection.
  - **Integrity:**
    - Expecting souring of production over time as a result of injection.
    - Battery souring: proper equipment and specs, and integrity to handle higher WCT, TDS, and sour off gases.
    - Integrity – expect high WCT and TDS as polymer flood matures.
    - Working details of plan to rebuild all existing flood areas over next 3 years; future flood areas to be rebuilt as the flood is expanded (identify higher risk areas to complete first).

Measurement and Reporting

- **Methods of Measurement:**
  - Oil and Water: flow meters and test tanks.
  - Solution Gas: orifice meters.

- **Typical Well Testing:**
  - Frequency and duration: well testing as per Directive 17.
  - Meter installations to replace test tanks (high volume producers).
    - Part of all new pad expansions and rebuilds.

- **Field Proration Factors:**
  - Within acceptable range (Oil: 0.93, Water: 1.10).

Measurement and Reporting – Continued

- **Optimization:**
  - **Remove test tanks and install flow meters on pads/wells**
    - **Increase testing frequency and duration**
    - **Improvements to proration factors**
    - **Perform testing inline**
    - **Eliminates gas venting from tanks**
    - **Reduces potential for spill**
  - **Standardize field equipment across field**
    - **Reduce maintenance**
    - **Increase reliability in calibration**

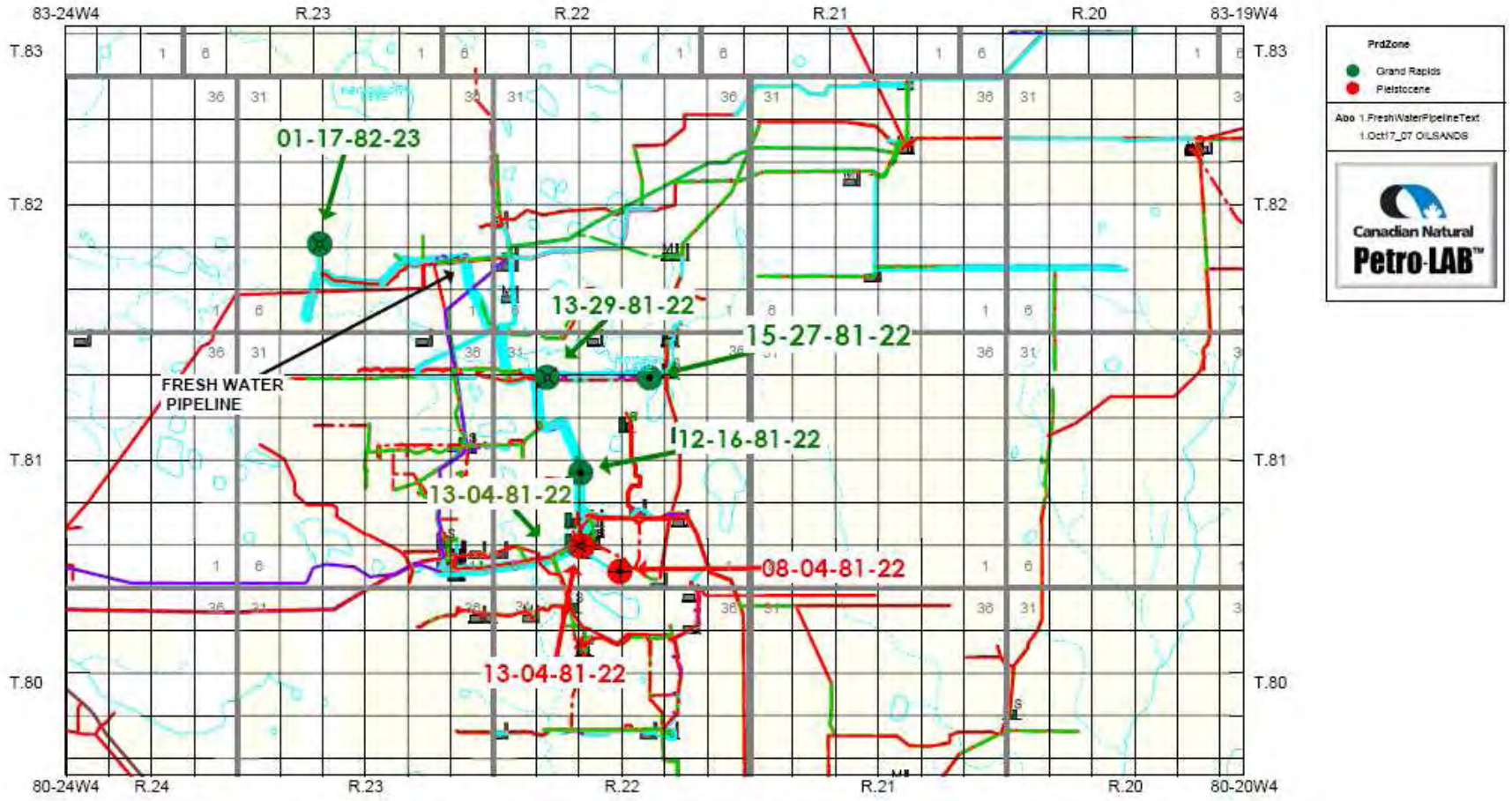
Facility Future Plans

- **Major Activities:**
  - Continue with Polymer Expansions
  - CBB0136 Battery Construction
- **New Initiatives:**
  - SP Pilot
- **Future Approvals:**
  - Polymer Expansions:
    - Facility and pipelines licenses
    - Injection well (D51)

Non-Saline Water Use

- Canadian Natural currently has license 00249595-00-00 with Alberta Environment for the annual diversion of up to 2,151,310 m^3 of non-saline water for injection with an expire date of 2014-01-25.
- Significant investment has been made in infrastructure and increased operating cost in order to continue to expand the polymer flood without the use of additional non-saline water to our current license.
- Canadian Natural has not increased the amount of licensed non-saline water since 2006, yet has significantly increased the amount of area under flood as seen in the polymer flood section of this presentation.
- In Compliance with Alberta Environment regarding monthly reporting, observation well monitoring, and all other terms of the License.

Non-Saline Well Locations



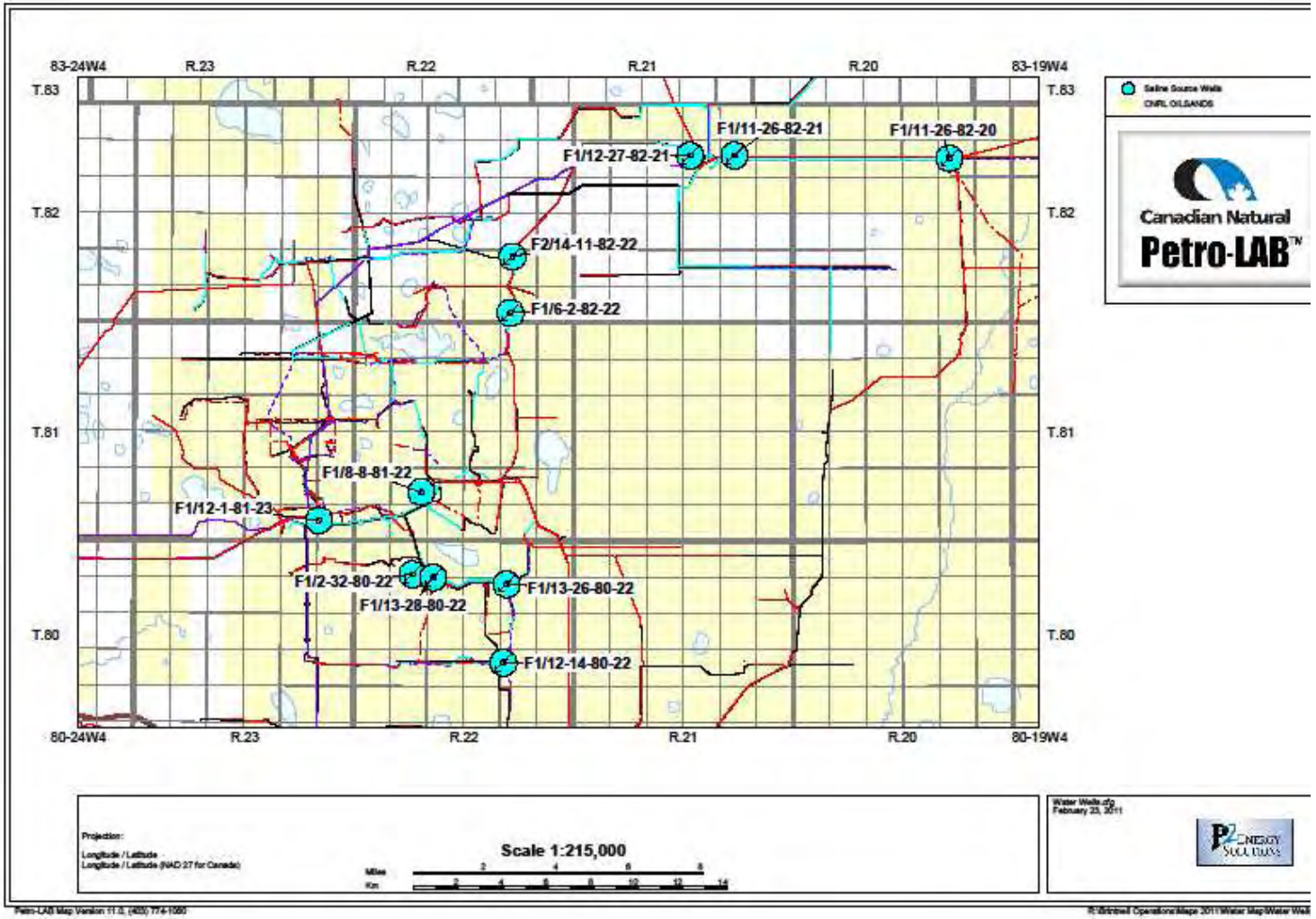
Approval 10423, 10147, and 10787 water use

- These approvals include the 2005 Polymer pilot, and expansions during 2006 and 2007 which were designed to use only non-saline water.
- Conversion have been completed on several facilities to partially use saline water as part of the mixing process, therefore reducing the amount of non-saline used per unit of polymer. Further conversions being reviewed.
- All project expansions after 2007 have been designed for use with saline only water.

Saline Water Use

- Significant infrastructure and capital investment committed in developing saline water system (pipelines, storage, and artificial lift).
- Water quality:
  - Significantly higher TDS than non-saline source
  - H2S
  - Scaling (compatibilities)
- Proposed source for future polymer expansion projects.
  - Modifications to existing polymer sites ongoing to convert a portion of water stream (non-saline water conservation).

Saline Water Map

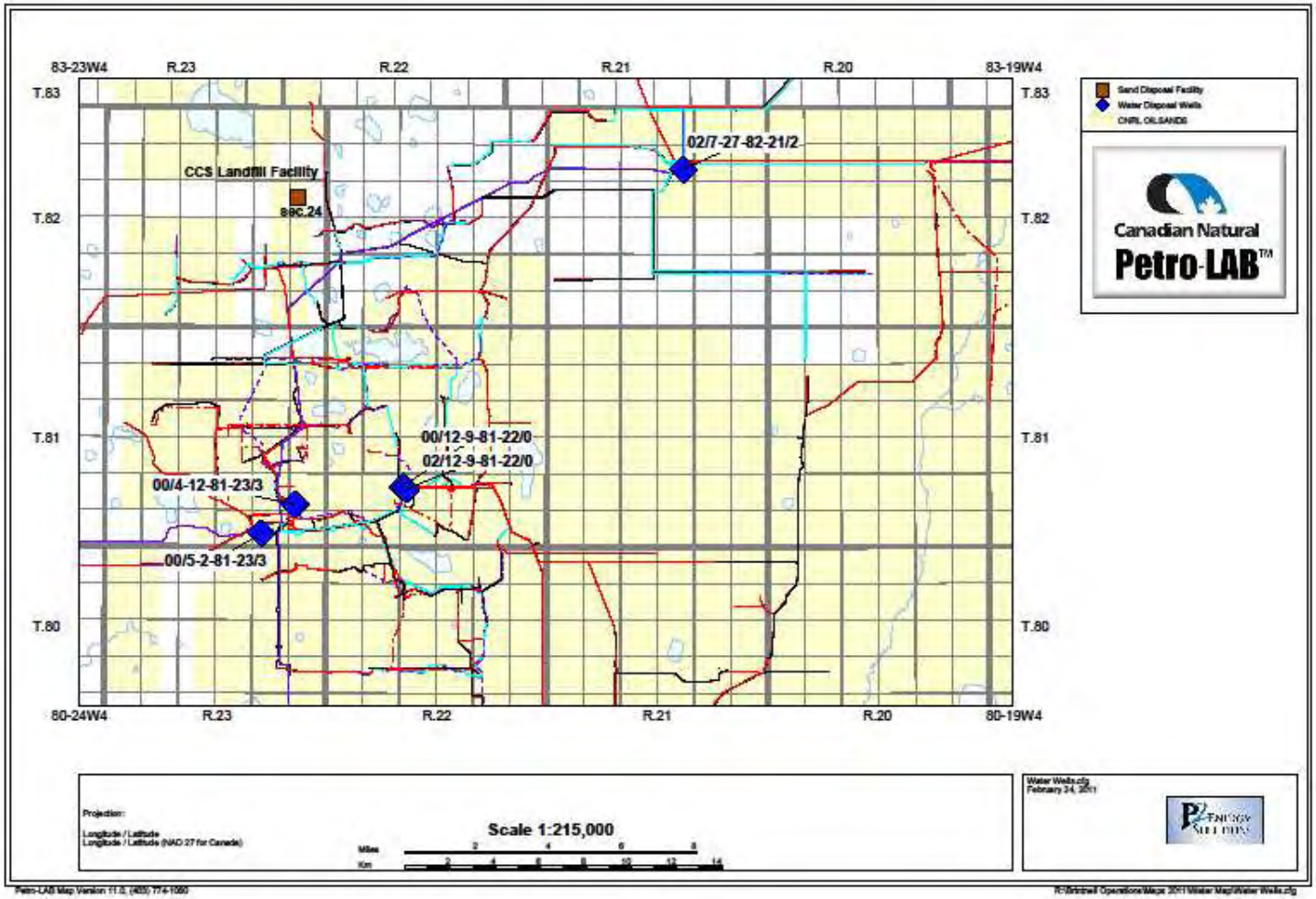


Water Usage and Disposal

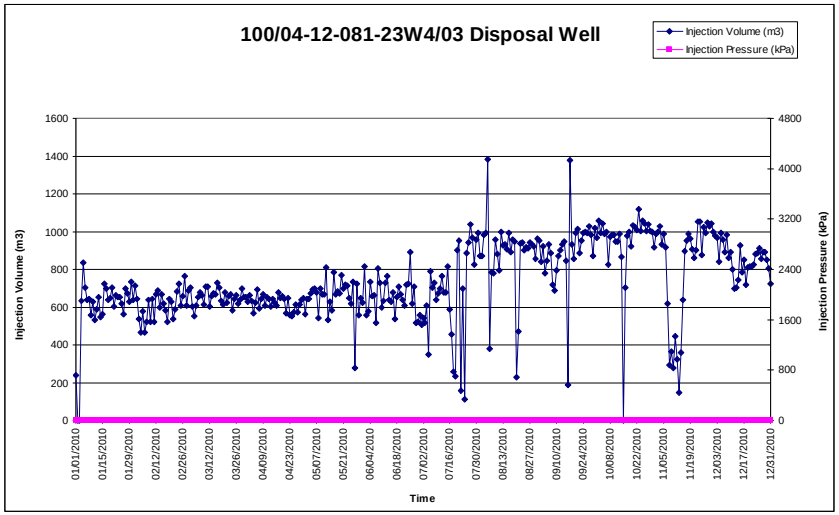
	2006	2007	2008	2009	2010	Q1 2011
Total Water Volumes						
Fresh Water (m3)	512766	1026684	1493264	1433242	1553045	383400
Brackish Water (m3)	1438110	1661989	764664	2963684	3999848	1307720
Disposal Volume (m3)	663038	553678	475723	426373	680010	111638

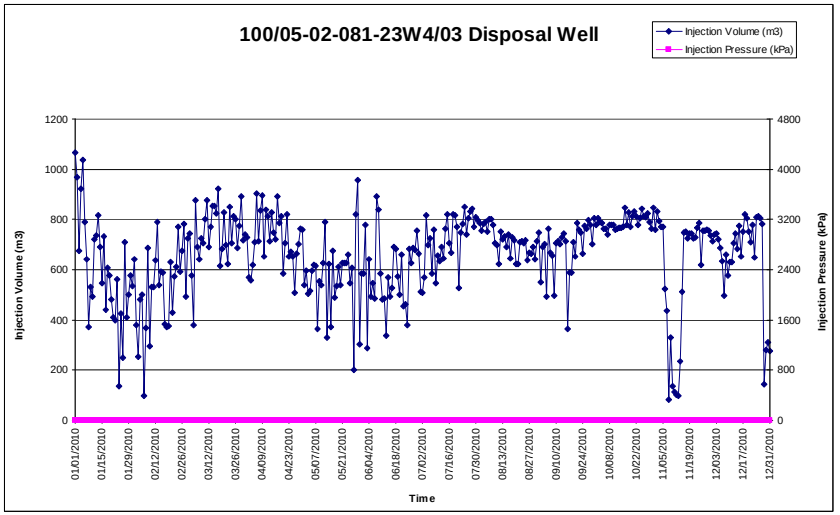
- **Improvements to water system include upgrading water handling capability at batteries to reduce disposal water and increase produced water recycling ratios.**
- **First major expansion expected May 2011 – expect ratios to be in 95-97% range.**
- **CNRL continues to be in compliance with AENV water diversion license (current utilization of 72.2%).**
- **CNRL Disposal injection in compliance with Directive 51 Guidelines and Approvals.**

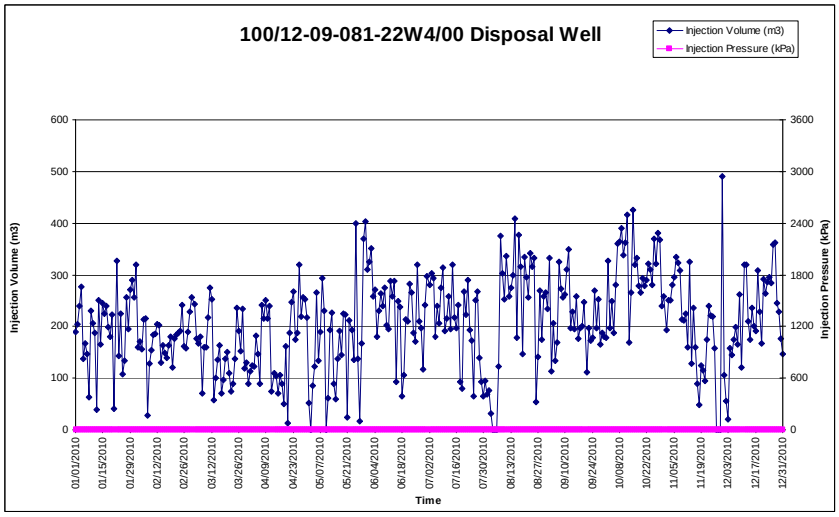
Water and Oilfield Disposal Map

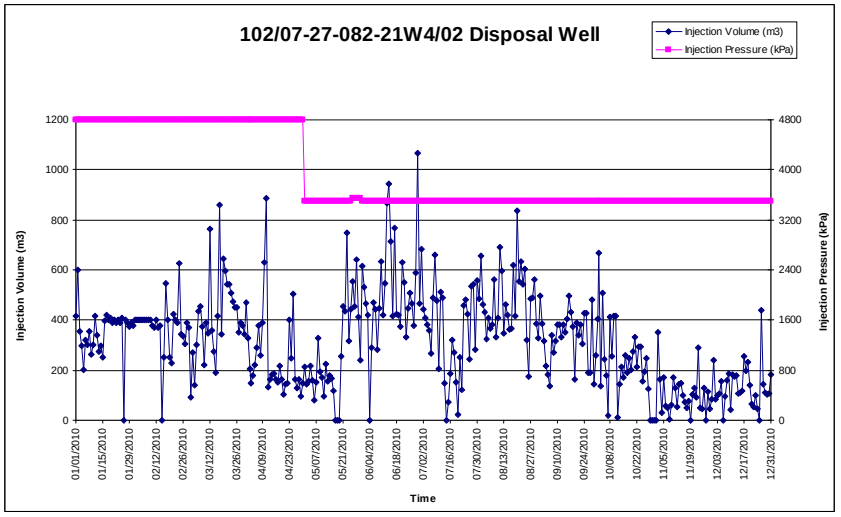


Disposal Well Data









Hydrogen Sulphide

- Souring of production to occur over time, currently in Engineering phase to ensure compliance across the entire Field to handle sour production (<1% H2S).
- H2S produced at padsites and batteries is expected to be in low concentration and volume.
- CNRL collects all solution gas at batteries and wellsites in a common solution gas gathering system.
- Gas to be sweetened in field and at major facility sites (emulsion batteries, compressor station).

ERCB Compliance

- Canadian Natural Resources is not aware of any outstanding compliance issues regarding the current approvals
- CNRL currently in compliance with other regulatory bodies (SRD, DFO, AENV).
- Reclamation programs: Well and Pipeline abandonments as required by Directives 65 and 13.
- Inactive wells: currently compliant.
  - Review future flood areas to properly downhole suspend wells within a reasonable time of start of injection (some wells to be completed for monitoring).

ERCB Compliance

- CNRL currently working with ERCB to prove cap rock and injector well integrity
  - Formation/hydraulic isolation
  - Cement bond
  - Casing corrosion
- Facility souring – gas gathering system conversion to handle solution gas production before it becomes an issue (integrity, licensing, environmental).
- Process of upgrading existing batteries and wellsite facilities to meet current regulations and codes for the expected service (higher WCT, higher TDS, less than 1% H2S). Timeline to be completed over next 3 years throughout field (existing facilities met regulations at time of original construction).

Outstanding Applications

- **Outstanding applications with the ERCB include:**
  - **Application 1641795 to provide approval at the scheme level to inject at a maximum wellhead pressure of 7650kpa – February 2010.**
  - **Application 1672297 to add injectors in Approval 9673 - Dec 2010**
  - **Application 1672316 to add injectors in Approval 10423 – Dec 2010**
  - **Application 1680650 to add injectors in Approval 10423 – Dec 2010**
  - **Application 1680657 to add injectors in Approval 10423 – Feb 2011**

Conclusion

- Canadian Natural is committed to maximizing the value of the Resource for the both itself and the Province of Alberta through it's Royalty Interest
- Results over the last year have continued to be excellent, and support the future expansion of the polymer flood to other parts of the reservoir
- Compliance with all ERCB regulations continues to be a top priority