Annual Performance Presentation

In Situ Oil Sands Schemes
9673 / 10147 / 10423 / 10787

April 2015

Premium Value | Defined Growth | Independent

Canadian Natural
Agenda

- Current Approvals
- Geological Overview
- Drilling, Completions, and Artificial Lift
- Field Performance and Surveillance
- Cap Rock Integrity & Monitoring
- Future Development Plans
- Facilities
- Measuring & Reporting
- Facility Future Plans
- Water Use, Conservation & Disposal
- AER Compliance
- Conclusions
Brintnell Location

Map showing the Brintnell Location with Twp. 82, 81, 80, 79, R23, R22, R21, R20, R19W4.
Oil Sands Royalties (OSR 101, OSR 006)
Primary and Enhanced Approval Regions

Enhanced Recovery Schemes
- 10147
- 9673
- 10787
- 10423

Primary Recovery Schemes
- 6619
- 9466
- 9884
CNRL Brint 6-14-81-21 W4M Type Log
Produced Oil Viscosity Map
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
Drilling, Completions, and Artificial Lift
Typical Drilling Configuration

- Build Section
- Intermediate Casing Points
- Lined Horizontal Section

- Scale: 100 - 200 m
- Depth: 2400 - 2800 m
Typical Well Configurations

**Producer**

- Intermediate Casing landed in Wabiskaw sand (producers and injectors).
EOR History and Current Approvals
Polymer Flood Development

Polymer Pilot started May 2005

Polymer Flood Start Dates
- 2006
- 2007
- 2008
- 2009
- 2010
- 2011
- 2012
- 2013
- 2014
The areas highlighted in blue for the map below started on waterflood (WF) prior to being converted to polymer flood (PF). All CNRL Pelican Lake water flood schemes have now been converted to polymer flood. Since 2007, all new enhanced recovery schemes are converted directly to polymer flooding.
Approximately 63% of the approved EOR scheme areas are currently developed and under flood as of the end of 2014
Field Performance and Surveillance
Approval 10147
Approval 10147 Production Update

On Stream: 03/01/1997

Started Polymer Injection

Cumulative Gas Prod: 2231.61 Kscm
Cumulative Water Prod: 1342.34 Km3
Cumulative Oil Prod: 2231.61 Km3

Approval 10147

Cum oil: 2,202 E3m3
Cum water: 1,296 E3m3
Cum injection: 4,322 E3m3
Approval 10147 Discussion

• Contains the most mature polymer flood patterns including the original pilot area which began flooding in 2005.

• Entire scheme area is currently under flood. Cenovus injection started along the west border of the area. Otherwise no changes to patterns or well counts in 2014.

• First Polymer Response in April 2006 from the HTL6 Pilot area.

• Peak production occurred from mid 2007 to early 2010 at 650 m³/d oil.

• Injection returned to normal in 2014 following a significant reduction in the previous year for offset drilling.

• Water cuts had declined in 2013 are associated with this reduced injection but have climbed back towards 60% at the end of 2014.

• Producer cleanouts executed since 2013 have helped recent production

• Oil viscosity ranges from 1,300 cp to 2,800 cP.
Approval 10423
Approval 10423 Production Update

Cum oil: 15,641 E3m3  Cum water: 13,991 E3m3  Cum injection: 31,703 E3m3
Polymerflood started in 2006 covering roughly 5% of the approval area split between 3 small groups. The flood was expanded every year up to 2010. In 2012, small area from PRSA 9884 was added to the approval.

Currently 73% of the approval area is under flood.

Small portion of approval area under waterflood starting in 2003. This area was converted to polymer in 2008 and 2010.

First polymer response in July 2007 but due to the size and staged flood expansion, did not see a ramp up in oil volumes until early 2009.

 Portions of the approval area are affected by higher in-situ water saturation and/or oil viscosity. Response in these regions has been more delayed and erratic when compared to other portions of the pool.

Oil viscosity ranges from 1,100 cp to 50,000 cp.
2014 Activity

• Oil volumes continued to ramp up through 2014 and does not appear to have plateaued; watercut has remained flat through 2014.

• 12 producers were converted to injectors in the WB14 area following a period of primary production.

• Drilled 20 wells in this approval area. 10 of these wells have been or will be completed as new injectors in the flood. The remaining 10 wells are completed and will remain as producers.

• 3 of the injectors were originally planned for the 2013 program but spilled over into the Q1 2014 drill program.
Approval 10787 Production Update

On Stream: 04/01/1983

Cumulative Gas Prod: 7524.86 Kscm
Cumulative Water Prod: 3820.85 Km3
Cumulative Oil Prod: 7524.86 Km3

Oil Rate (CD) (m3/d)
Water Rate (CD) (m3/d)
Water Cut (%)

Number of Injection Wells
Number of Producing Wells

Oil Rate: 7,413 E3m3
Water Rate: 3,681 E3m3
Injection Rate: 9,648 E3m3
Polymerflood started in Dec 2007 covering roughly 4% of the approval area split into 2 small groups. There were no expansions until 2010, since then there has been an expansion completed in every year including 2013. Currently 45% of the approval area is under flood.

First polymer response in Nov 2008 but due to the size and staged flood expansion, did not see a ramp up in oil volumes until mid 2012.

Oil production increased in the late part of 2013 and early 2014, mostly due to new well activations.

Operational problems with the Grosmont source well and injection skid led to reduced injection during parts of 2014.

Polymer injection was commenced in the Peerless and Sandy Lake portions of the area in 2013; production wells are activated/reactivated as dictated by fluid levels and/or surface pressure readings.

Oil viscosity ranges from 1,100 cp to 14,400 cp.
• In May 2012, the 03/16-36-079-22W4 well intersected the 00/01-24-079-22W4 wellbore while drilling

• Numerous attempts were made to repair the 00/01-24 well but ultimately the wellbore could not be returned to service. A non-routine abandonment was conducted on 00/01-24 in March 2013. The 04/01-24-079-22W4 observation well was drilled in September 2013 to monitor the polymer flood near the 00/01-24 offset following consultations with the AER (Approval 10787K).

• 04/01-24-079-22W4 Monitoring Program:
  – Reservoir pressure and produced water was monitored quarterly for Q4 2013 and the first three quarters of 2014
  – The reservoir pressure declined in each observation indicating normal primary decline and no communication from outside the Wabiskaw
  – Produced watercut was less than 10% throughout 2014 therefore could not obtain a sufficient volume of water to analyze
  – CNRL will continue to monitor the produced watercut and take yearly pressure measurements on this well
Approval 9673 Production Update

Cum oil: 6,267 E3m3  Cum water: 10,137 E3m3  Cum Injection: 25,496 E3m3
• Originally approved for waterflood in 2004; waterflood was expanded in 2005/2006 to cover roughly 40% of the current approval area.

• Waterflood peak production occurred from late 2007 to early 2009 at 1850 m³/d oil.

• Polymerflood began in Sept 2008 covering 6% of approval area. Existing waterflood patterns remained unchanged at this time.

• In 2009 all waterflood areas were converted to polymer and a small expansion area from primary was added; additional small expansions from primary were conducted in each year from 2010 to 2012. Currently 70% of the approval area is under flood.

• First polymer response occurred in Sept 2009 but due to declining production from the waterflood areas, have only recently started to see a ramp up in oil volumes from the polymer flood.
In 2014, CNRL re-drilled two wells in the area. One was to replace a producer which had a downhole failure; the other was to replace an injector which was found to have poor well placement within the flood pattern. Both of the original wellbores are now abandoned.

The conversion from water to polymer has had a dramatic effect on the conformance of the flood. Within two years of conversion for most areas, watercuts declined.

In 2014, following several months of declining watercut for converted polymerflood areas, the watercut trend has been stable.

Oil viscosity ranges from 600 cp to 13,000 cp.
Estimated Ultimate Recovery Factors for Flooded Areas (includes primary)

- **Approval 9673**
  - Total area OBIP: 97,439,555 m$^3$
  - OBIP under flood: 78,437,884 m$^3$
  - RF to date: 8%
  - Estimated ultimate recovery factors: 16-20%

- **Approval 10787**
  - Total area OBIP: 205,220,952 m$^3$
  - OBIP under flood: 81,382,556 m$^3$
  - RF to date: 9%
  - Estimated ultimate recovery factors: 20-27%

- **Approval 10147**
  - Total area OBIP: 8,987,327 m$^3$
  - OBIP under flood: 8,987,327 m$^3$
  - RF to date: 25%
  - Estimated ultimate recovery factors: 31-37%

- **Approval 10423**
  - Total area OBIP: 229,018,235 m$^3$
  - OBIP under flood: 167,396,677 m$^3$
  - RF to date: 10%
  - Estimated ultimate recovery factors: 20-25%

*The recovery factors shown for each area represent the recovery for the portions of the scheme approval areas that are currently under polymer flood and includes primary production.*
Good Performance – HTL1

• HTL1 Pad
  ▪ Well list and allocation factors:
    Injectors
    ➢ 100/14-31-081-22W4/0 (50%)
    ➢ 100/15-31-081-22W4/0 (100%)
    Producers
    ➢ 102/15-31-081-22W4/0 (50%)
    ➢ 102/14-31-081-22W4/0 (100%)
Good Performance – HTL1
Average Performance – NHT P10

- NHT Pad 10 subgroup
  - Well List and allocation factors:
    - Injectors:
      - 100/02-02-082-23W4/0 (50%)
      - 100/01-02-082-23W4/0 (100%)
    - Producers:
      - 102/01-02-082-23W4/0 (100%)
      - 102/04-01-082-23W4/0 (50%)

Approval 10423
Average Performance – NHTP10
Below Average Performance – SB 26

- SB 26 103/10-24 Pattern
  - Well List and allocation factors:
    - **Injector**
      - 103/10-24-080-22W4/2 (100%)
    - **Producers**
      - 102/11-24-080-22W4/0 (50%)
      - 104/07-24-080-22W4/0 (50%)

Approval 10423
Below Average Performance – SB 26

Polymer flood after Primary
Summary of Good/Average/Poor Areas

Plot showing Recovery Factor (RF) versus Pore Volume (PV) Injected. Indicates effectiveness and performance of the flood.
Cap Rock Integrity
Cap Rock Integrity

• 2014 Anomalies (7 in total):

<table>
<thead>
<tr>
<th>Date of Event</th>
<th>Location</th>
<th>Cause of Alarm</th>
<th>Operations Review of Injection Well</th>
<th>Initial Injection Pressure</th>
<th>Anomalous Pressure</th>
<th>Current Pressure (Apr 2015)</th>
<th>Suspected Cause</th>
</tr>
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<tbody>
<tr>
<td>(MM/DD/YYYY)</td>
<td>(UWI)</td>
<td></td>
<td></td>
<td>(kPag)</td>
<td>(kPag)</td>
<td>(kPag)</td>
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<tr>
<td>March 12, 2014</td>
<td>00/06-22-081-22W4</td>
<td>Drop in injection pressure/injection rate increase</td>
<td>Everything working operationally.</td>
<td>5,670</td>
<td>5,163</td>
<td>5,270</td>
<td>Breakthrough to producer</td>
</tr>
<tr>
<td>April 19, 2014</td>
<td>00/06-20-081-22W4</td>
<td>Drop in injection pressure/injection rate increase</td>
<td>Everything working operationally.</td>
<td>5,950</td>
<td>5,450</td>
<td>5,980</td>
<td>Breakthrough to producer</td>
</tr>
<tr>
<td>April 20, 2014</td>
<td>00/09-19-79-21W4</td>
<td>Drop in injection pressure/injection rate increase</td>
<td>Everything working operationally.</td>
<td>5,650</td>
<td>4,243</td>
<td>5,994</td>
<td>Accessing new highly permeable reservoir</td>
</tr>
<tr>
<td>May 1, 2014</td>
<td>00/03-10-80-22W4</td>
<td>Drop in injection pressure</td>
<td>Everything working operationally.</td>
<td>5,500</td>
<td>5,065</td>
<td>5,850</td>
<td>Breakthrough to producer</td>
</tr>
<tr>
<td>May 10, 2014</td>
<td>103/02-09-080-21W4</td>
<td>Drop in injection pressure/injection rate increase</td>
<td>Everything working operationally.</td>
<td>4,990</td>
<td>4,086</td>
<td>6,003</td>
<td>Accessing new highly permeable reservoir</td>
</tr>
<tr>
<td>June 13, 2014</td>
<td>02/13-18-81-22W4</td>
<td>Drop in injection pressure/injection rate increase</td>
<td>Everything working operationally.</td>
<td>5,970</td>
<td>5,450</td>
<td>5,927</td>
<td>Accessing new highly permeable reservoir</td>
</tr>
<tr>
<td>June 24, 2014</td>
<td>00/01-16-081-22W4</td>
<td>Drop in injection pressure/injection rate increase</td>
<td>Everything working operationally.</td>
<td>5,800</td>
<td>5,235</td>
<td>5,674</td>
<td>Accessing new highly permeable reservoir</td>
</tr>
</tbody>
</table>

• 4 anomalies in 2013, 9 anomalies in 2012; 18 anomalies in 2011

All seven 2014 anomalies were fully investigated and reported. All injectors are back on-stream under normal operating conditions and have regained pressure following the event.
100/06-20-081-22W4/0: Well was shut in for 2 weeks as a precaution. Rates and pressures returned to normal upon restarting injection.
Hall plots are reviewed regularly to investigate potential cap rock breaches. A sudden change in the Hall Plot slope may indicate a potential issue.
Future Development Plans
• Canadian Natural plans to continue with the expansion of the polymer flood at Brintnell over the next several years. Expansion will push the flood to the southeastern and western edges of the pool.
• The focus of this year’s capital program will be optimization of the existing well patterns. No drilling is planned for 2015.
• CNRL received approval in 2012 to implement a surfactant pilot in the field. CNRL is not pursuing surfactant flooding at the present time.
Facilities
Brintnell Batteries

- North Brintnell Battery
- Central 1-36 Brintnell Battery
- South Brintnell Battery
Facility: NB 07-27-82-21W4 Battery Plot Plan

Refer to Appendix A
Facility: SB 09-02-81-23W4 Battery Plot Plan

Refer to Appendix A
Facility: CB 01-36-80-22W4 Battery Plot Plan

Refer to Appendix A
Facility: Typical Brintnell Battery PFD

Refer to Appendix B
Facility Modifications

- Reasons for Modifications:
  - **Oil Treating:**
    - Heat integration: Installing indirect heating projects to reduce OPEX. Currently investigating other opportunities.
    - Optimizing battery process
  - **Integrity:**
    - Implementing plan to rebuild existing flood areas; future flood areas to be rebuilt as the flood is expanded
    - All high risk sour pipelines have been lined as of Feb, 2014
## Battery Performance

### Brintnell Water Recycle Analysis 2006 to 2014

<table>
<thead>
<tr>
<th>Location</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
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<tbody>
<tr>
<td><strong>North Brintnell 7-27</strong></td>
<td></td>
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<td></td>
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<tr>
<td>Produced Oil (m3)</td>
<td>705,917</td>
<td>809,627</td>
<td>959,335</td>
<td>988,448</td>
<td>957,855</td>
<td>835,263</td>
<td>1,075,836</td>
<td>1,027,258</td>
<td>937,154</td>
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<td>Produced Water (m3)</td>
<td>1,374,731</td>
<td>1,775,300</td>
<td>2,096,258</td>
<td>2,292,879</td>
<td>2,386,085</td>
<td>1,484,277</td>
<td>1,795,440</td>
<td>1,567,398</td>
<td>1,772,860</td>
</tr>
<tr>
<td>Recycle Rates (%)</td>
<td>1,220,482</td>
<td>1,779,160</td>
<td>2,057,161</td>
<td>2,238,740</td>
<td>2,330,418</td>
<td>1,453,371</td>
<td>1,786,316</td>
<td>1,559,325</td>
<td>1,772,860</td>
</tr>
<tr>
<td>Recycle %</td>
<td>88.8%</td>
<td>100.2%</td>
<td>98.1%</td>
<td>97.6%</td>
<td>97.7%</td>
<td>99.5%</td>
<td>99.5%</td>
<td>100.0%</td>
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<td>Average Recycle (m3/d)</td>
<td>3,444</td>
<td>4,874</td>
<td>5,621</td>
<td>6,134</td>
<td>6,385</td>
<td>3,982</td>
<td>4,881</td>
<td>4,272</td>
<td>4,857</td>
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<td>Average Disposal (m3/d)</td>
<td>423</td>
<td>-11</td>
<td>107</td>
<td>148</td>
<td>85</td>
<td>25</td>
<td>22</td>
<td>0</td>
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<td><strong>Central Brintnell 12-09</strong></td>
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<tr>
<td>Produced Oil (m3)</td>
<td>568,076</td>
<td>603,657</td>
<td>569,149</td>
<td>532,086</td>
<td>528,537</td>
<td>492,495</td>
<td>546,580</td>
<td>237,914</td>
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<td>Produced Water (m3)</td>
<td>167,755</td>
<td>193,349</td>
<td>267,607</td>
<td>378,988</td>
<td>323,086</td>
<td>402,772</td>
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<tr>
<td>Recycle Rates (%)</td>
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<td>1,786,316</td>
<td>1,559,325</td>
<td>1,772,860</td>
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<tr>
<td>Recycle %</td>
<td>0%</td>
<td>13.9%</td>
<td>59.5%</td>
<td>91.4%</td>
<td>93.4%</td>
<td>88.6%</td>
<td>81.9%</td>
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<td>Average Recycle (m3/d)</td>
<td>0</td>
<td>73</td>
<td>435</td>
<td>949</td>
<td>827</td>
<td>978</td>
<td>901</td>
<td>775</td>
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<td>Average Disposal (m3/d)</td>
<td>460</td>
<td>456</td>
<td>296</td>
<td>89</td>
<td>59</td>
<td>135</td>
<td>200</td>
<td>106</td>
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<td><strong>Central Brintnell 01-36</strong></td>
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<tr>
<td>Produced Oil (m3)</td>
<td>441,942</td>
<td>575,306</td>
<td>620,631</td>
<td>602,897</td>
<td>645,053</td>
<td>782,847</td>
<td>1,080,977</td>
<td>1,055,952</td>
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<td>Produced Water (m3)</td>
<td>341,034</td>
<td>413,480</td>
<td>501,318</td>
<td>544,390</td>
<td>776,095</td>
<td>1,014,789</td>
<td>1,505,393</td>
<td>1,494,985</td>
<td>1,205,459</td>
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<td>Recycle Rates (%)</td>
<td>565,099</td>
<td>1,018,607</td>
<td>1,537,918</td>
<td>2,047,885</td>
<td>2,389,460</td>
<td>2,812,357</td>
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<td>3,184,546</td>
<td>1,091,459</td>
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<td>Recycle %</td>
<td>0%</td>
<td>22.4%</td>
<td>34.5%</td>
<td>37.6%</td>
<td>22.3%</td>
<td>81.1%</td>
<td>93.9%</td>
<td>92.6%</td>
<td>90.5%</td>
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<td>473</td>
<td>561</td>
<td>474</td>
<td>2,259</td>
<td>3,861</td>
<td>3,793</td>
<td>2,990</td>
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<tr>
<td>Average Disposal (m3/d)</td>
<td>934</td>
<td>1,071</td>
<td>897</td>
<td>931</td>
<td>1,652</td>
<td>525</td>
<td>253</td>
<td>303</td>
<td>312</td>
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<td><strong>South Brintnell 9-02</strong></td>
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<tr>
<td>Produced Oil (m3)</td>
<td>1,715,934</td>
<td>1,988,589</td>
<td>2,149,115</td>
<td>2,124,523</td>
<td>2,131,175</td>
<td>2,110,605</td>
<td>2,703,393</td>
<td>2,905,421</td>
<td>2,938,034</td>
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<td>Produced Water (m3)</td>
<td>1,883,520</td>
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<td>3,485,267</td>
<td>2,901,838</td>
<td>3,703,800</td>
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<td>Recycle Rates (%)</td>
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<td>3,613,553</td>
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<td>Recycle %</td>
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<td>83.0%</td>
<td>83.4%</td>
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<td>90.8%</td>
<td>93.9%</td>
<td>92.6%</td>
<td>90.5%</td>
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<td>312</td>
</tr>
</tbody>
</table>

**Total Volumes**

| Produced Oil (m3) | 1,715,934  | 1,988,589  | 2,149,115  | 2,124,523  | 2,131,175  | 2,110,605  | 2,703,393  | 2,905,421  | 2,938,034  |
| Produced Water (m3) | 1,883,520  | 2,382,129  | 2,865,183  | 3,216,258  | 3,485,267  | 2,901,838  | 3,703,800  | 3,843,826  | 4,924,563  |
| Recycle Rates (%) | 1,220,482  | 1,828,451  | 2,389,460  | 2,805,257  | 2,633,505  | 3,529,061  | 3,613,553  | 4,479,577  |            |
| Recycle %         | 88.6%      | 83.0%      | 83.4%      | 86.7%      | 80.5%      | 90.8%      | 93.9%      | 92.6%      | 90.5%      |

**Battery Commissioned May 2014 - first oil May 15, 2013**
Measuring and Reporting
Measurement and Reporting

• Methods of Measurement:
  - Oil and Water: flow meters and test tanks (Primary only)
  - Solution Gas: orifice meters/GOR Testing

• Typical Well Testing:
  - Frequency and duration: well testing as per Directive 17.
  - Meter installations have replaced test tanks (high volume and flood producers).
    – Part of all new pad expansions and rebuilds.

• Field Proration Factors:
  - Within acceptable range (Oil: 0.892, Water: 1.13).
• Optimization:
  - Remove test tanks and install flow meters on pads/wells
    - Increase testing frequency and duration
    - Perform testing inline
    - Eliminates gas venting from tanks
    - Reduces fuel gas consumption
    - Reduces potential for spill
  - Standardize testing equipment across field
    - Reduce downtime and maintenance
    - Increase reliability in calibration
    - Improve & revise BS&W testing procedures for better accuracy
Brintnell Gas Balance

<table>
<thead>
<tr>
<th></th>
<th>2014 Annual volumes (E6M3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROD</td>
<td>81.9</td>
</tr>
<tr>
<td>FLARE</td>
<td>5.2</td>
</tr>
<tr>
<td>VENT</td>
<td>6.1</td>
</tr>
<tr>
<td>FACILITY DISPOSITION</td>
<td>74.1</td>
</tr>
<tr>
<td>FUEL</td>
<td>65.2</td>
</tr>
<tr>
<td>SALES GAS DISPOSITION</td>
<td>10.8</td>
</tr>
</tbody>
</table>

- Produced gas is captured, processed and used throughout the field as consumable fuel gas.
- Venting only occurs at the well leases when D-60 requirements have been approved by the AER.
Future Facility Plans
Facility Future Plans

- **Major Activities:**
  - Pad Rebuilds
  - Future Polymer Expansions
  - Water Management Plan
Water Use
Non-Saline Water Use

- Canadian Natural currently has license 00249595-00-00 with Alberta Energy Regulator for the annual diversion of up to 2,151,310 m³ of non-saline water for injection with an expiry date of 2019-01-25.
  - CNRL received a renewal of this license in early 2014.
- 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.
- Working to optimize the use of fresh water for polymer hydration to maximize its benefit
- 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.
- In Compliance with Alberta Environment and Water regarding monthly reporting, observation well monitoring, and all other terms of the License.
# 2014 Injection Water Summary

## 2014 Polymer Injection Volumes (m³)

<table>
<thead>
<tr>
<th></th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Produced Water to Injection</td>
<td>316,272</td>
<td>304,442</td>
<td>357,665</td>
<td>357,531</td>
<td>381,366</td>
<td>359,115</td>
<td>386,342</td>
<td>383,574</td>
<td>395,613</td>
<td>416,934</td>
<td>363,870</td>
<td>367,896</td>
</tr>
<tr>
<td>Fresh Make-Up Water</td>
<td>167,905</td>
<td>154,136</td>
<td>171,583</td>
<td>170,617</td>
<td>165,091</td>
<td>176,116</td>
<td>175,006</td>
<td>167,581</td>
<td>174,534</td>
<td>168,175</td>
<td>171,295</td>
<td></td>
</tr>
<tr>
<td>Saline Make-Up Water</td>
<td>259,497</td>
<td>248,601</td>
<td>327,332</td>
<td>310,220</td>
<td>322,748</td>
<td>336,600</td>
<td>332,962</td>
<td>297,830</td>
<td>306,600</td>
<td>321,503</td>
<td>291,466</td>
<td>310,762</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>743,674</strong></td>
<td><strong>707,178</strong></td>
<td><strong>856,580</strong></td>
<td><strong>838,367</strong></td>
<td><strong>870,806</strong></td>
<td><strong>860,806</strong></td>
<td><strong>895,420</strong></td>
<td><strong>856,410</strong></td>
<td><strong>869,794</strong></td>
<td><strong>912,971</strong></td>
<td><strong>823,510</strong></td>
<td><strong>849,953</strong></td>
</tr>
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</table>

## Total Injection Volumes (m³)

<table>
<thead>
<tr>
<th></th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Produced Water to Injection</td>
<td>2,382,129</td>
<td>2,865,183</td>
<td>3,216,258</td>
<td>3,485,267</td>
<td>3,901,838</td>
<td>3,388,006</td>
<td>3,522,671</td>
<td>4,390,618</td>
</tr>
<tr>
<td>Fresh Make-Up Water</td>
<td>1,026,684</td>
<td>1,493,264</td>
<td>1,433,242</td>
<td>1,553,045</td>
<td>1,479,780</td>
<td>1,876,840</td>
<td>2,041,938</td>
<td>2,028,731</td>
</tr>
<tr>
<td>Saline Make-Up Water</td>
<td>1,661,989</td>
<td>764,664</td>
<td>2,963,684</td>
<td>3,999,848</td>
<td>6,274,361</td>
<td>4,780,011</td>
<td>3,800,437</td>
<td>3,666,120</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>5,070,802</strong></td>
<td><strong>5,123,111</strong></td>
<td><strong>7,613,184</strong></td>
<td><strong>9,038,160</strong></td>
<td><strong>10,655,979</strong></td>
<td><strong>10,044,856</strong></td>
<td><strong>9,365,047</strong></td>
<td><strong>10,085,470</strong></td>
</tr>
</tbody>
</table>
## Non-Saline Water Make up Wells

<table>
<thead>
<tr>
<th>Well Name</th>
<th>UWI</th>
<th>Production Interval</th>
<th>Maximum Rate of Diversion (m³/day)</th>
<th>Maximum Annual Diversion Vol (m³)</th>
<th>2014 Average Diversion Volumes (m³/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WSW BP25 - QUAT</td>
<td>100/08-04-081-22W4/00</td>
<td>53.3 - 65.2</td>
<td>818</td>
<td>247,470</td>
<td>679</td>
</tr>
<tr>
<td>WSW BP11 - QUAT</td>
<td>1F2/13-04-081-22W4/00</td>
<td>34.3 - 38.8</td>
<td>1,200</td>
<td>153,300</td>
<td>417</td>
</tr>
<tr>
<td>WSW BP2 - GR</td>
<td>1AA/12-16-081-22W4/02</td>
<td>270.6 - 317.6</td>
<td>1,200</td>
<td>1,750,540</td>
<td>831</td>
</tr>
<tr>
<td>WSW BP11 - GR</td>
<td>1F1/13-04-081-22W4/00</td>
<td>258.5 - 315.9</td>
<td>812</td>
<td>705</td>
<td></td>
</tr>
<tr>
<td>WSW HTP2 - GR</td>
<td>1F1/13-29-081-22W4/00</td>
<td>265.8 - 326.8</td>
<td>2,250</td>
<td>1458</td>
<td></td>
</tr>
<tr>
<td>WSW HTP6 - GR</td>
<td>1F1/15-27-081-22W4/00</td>
<td>264.8 - 317.8</td>
<td>468</td>
<td>347</td>
<td></td>
</tr>
<tr>
<td>WSW NHTP16 - GR</td>
<td>1F1/01-17-082-23W4/00</td>
<td>253.0 - 310.0</td>
<td>933</td>
<td>509</td>
<td></td>
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<tr>
<td>WSW WBP30 - GR</td>
<td>100/15-20-081-22W4/00</td>
<td>260-315</td>
<td>750</td>
<td>204</td>
<td></td>
</tr>
<tr>
<td>WSW NHP 13 - GR</td>
<td>100/07-05-082-23W4/00</td>
<td>232-302</td>
<td>325</td>
<td>260</td>
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<tr>
<td>WSW HHP 15 - GR</td>
<td>100/08-08-082-23W4/00</td>
<td>243-305</td>
<td>225</td>
<td>144</td>
<td></td>
</tr>
</tbody>
</table>

**Total Fresh Water 2014**

![Graph showing total fresh water volumes and percentage differences]

1,627,170
Saline Water Source Map
### 2014 Saline Water Source Well Diversion Volumes (m³)

<table>
<thead>
<tr>
<th>Well Name</th>
<th>January-14</th>
<th>February-14</th>
<th>March-14</th>
<th>April-14</th>
<th>May-14</th>
<th>June-14</th>
<th>July-14</th>
<th>August-14</th>
<th>September-14</th>
<th>October-14</th>
<th>November-14</th>
<th>December-14</th>
<th>TOTALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>BR NORTH 1F1/11-26-082-21W4/00 SRC</td>
<td>50,849</td>
<td>58,901</td>
<td>67,625</td>
<td>69,792</td>
<td>67,014</td>
<td>61,322</td>
<td>58,742</td>
<td>60,381</td>
<td>73,719</td>
<td>83,191</td>
<td>46,696</td>
<td>47,540</td>
<td>745,772</td>
</tr>
<tr>
<td>BR NORTH NBP24 1F1/11-26-082-20W4/00</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>BR NORTH NBP6 1F1/12-27-082-21W4/00 SRC</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>BR NORTH NHP5 1F1/06-02-082-22W4/00</td>
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<td>0</td>
<td>0</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>BR NORTH NHP9 1F2/14-11-082-22W4/00</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>BR SOUTH SBP16 1F1/13-26-080-22W4/00</td>
<td>52,820</td>
<td>45,631</td>
<td>16,387</td>
<td>2,164</td>
<td>69,734</td>
<td>54,840</td>
<td>42,481</td>
<td>42,992</td>
<td>46,760</td>
<td>48,103</td>
<td>46,893</td>
<td>56,075</td>
<td>524,879</td>
</tr>
<tr>
<td>BR SOUTH SBP28 1F1/12-14-080-22W4/00</td>
<td>9,934</td>
<td>8,527</td>
<td>63,120</td>
<td>56,567</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>138,148</td>
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<tr>
<td>BR SOUTH SBP4 1F1/02-32-080-22W4/00</td>
<td>44,673</td>
<td>7,349</td>
<td>35,434</td>
<td>50,448</td>
<td>55,841</td>
<td>61,415</td>
<td>64,719</td>
<td>62,345</td>
<td>60,620</td>
<td>61,787</td>
<td>55,940</td>
<td>64,276</td>
<td>624,847</td>
</tr>
<tr>
<td>BR SOUTH SBP6 1F1/13-28-080-22W4/00</td>
<td>0</td>
<td>37,750</td>
<td>0</td>
<td>0</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>37,750</td>
</tr>
<tr>
<td>BR SOUTH WSW 1F1/01-36-080-22W4/00</td>
<td>0</td>
<td>32,131</td>
<td>96,394</td>
<td>85,093</td>
<td>97,980</td>
<td>88,264</td>
<td>90,652</td>
<td>33,616</td>
<td>94,786</td>
<td>87,201</td>
<td>88,443</td>
<td>103,559</td>
<td>898,121</td>
</tr>
<tr>
<td>BR SOUTH WSW 1F1/12-01-081-23W4/00</td>
<td>67,979</td>
<td>42,463</td>
<td>29,135</td>
<td>26</td>
<td>0</td>
<td>0</td>
<td>19,242</td>
<td>98,496</td>
<td>30,719</td>
<td>41,221</td>
<td>53,493</td>
<td>39,312</td>
<td>422,082</td>
</tr>
<tr>
<td>BRINTNELL BP9 1F1/08-08-081-22W4/00</td>
<td>33,242</td>
<td>15,849</td>
<td>19,237</td>
<td>46,130</td>
<td>32,179</td>
<td>70,759</td>
<td>57,126</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>274,521</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td><strong>259,497</strong></td>
<td><strong>248,601</strong></td>
<td><strong>327,332</strong></td>
<td><strong>310,220</strong></td>
<td><strong>322,748</strong></td>
<td><strong>336,600</strong></td>
<td><strong>332,962</strong></td>
<td><strong>297,830</strong></td>
<td><strong>306,600</strong></td>
<td><strong>321,503</strong></td>
<td><strong>291,466</strong></td>
<td><strong>310,762</strong></td>
<td><strong>3,666,120</strong></td>
</tr>
</tbody>
</table>

- Increased produced water recycle rates have reduced saline source demand at these above locations. Inactive wells above have been suspended and could be reactivated for future use.
Water Usage and Disposal

- Continued to focus on maintaining high water recycling ratios.
  - 2014 recycle at 91.0%.
- CNRL continues to be in compliance with AENV water diversion license.

<table>
<thead>
<tr>
<th>Total Volumes</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Produced Water (m3)</td>
<td>1,883,520</td>
<td>2,382,129</td>
<td>2,865,183</td>
<td>3,216,258</td>
<td>3,485,267</td>
<td>2,901,838</td>
<td>3,703,800</td>
<td>3,843,826</td>
<td>4,924,563</td>
</tr>
<tr>
<td>Fresh Water (m3)</td>
<td>512,766</td>
<td>1,026,684</td>
<td>1,493,264</td>
<td>1,433,242</td>
<td>1,553,045</td>
<td>1,479,780</td>
<td>1,876,840</td>
<td>2,041,938</td>
<td>2,028,731</td>
</tr>
<tr>
<td>Brackish Water (m3) - Grosmont</td>
<td>1,438,110</td>
<td>1,661,989</td>
<td>764,664</td>
<td>2,963,684</td>
<td>3,999,848</td>
<td>6,274,361</td>
<td>4,780,011</td>
<td>3,800,437</td>
<td>3,666,120</td>
</tr>
<tr>
<td>Disposal Volume (m3)</td>
<td>663,038</td>
<td>553,678</td>
<td>475,723</td>
<td>426,373</td>
<td>680,010</td>
<td>268,333</td>
<td>174,739</td>
<td>222,200</td>
<td>464,554</td>
</tr>
<tr>
<td>Total Produce Recycle (%)</td>
<td>64.8%</td>
<td>76.8%</td>
<td>83.4%</td>
<td>86.7%</td>
<td>80.5%</td>
<td>90.8%</td>
<td>95.3%</td>
<td>94.0%</td>
<td>91.0%</td>
</tr>
<tr>
<td>Average Daily Recycle (m3/d)</td>
<td>3,344</td>
<td>5,009</td>
<td>6,529</td>
<td>7,644</td>
<td>7,686</td>
<td>7,215</td>
<td>9,642</td>
<td>9,900</td>
<td>12,273</td>
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</table>
### Pelican Lake Water Information

<table>
<thead>
<tr>
<th></th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresh Water (m3/day) - Quaternary and Grand Rapids</td>
<td>1405</td>
<td>2813</td>
<td>4091</td>
<td>4255</td>
<td>4054</td>
<td>5142</td>
<td>5594</td>
<td>5558</td>
<td></td>
</tr>
<tr>
<td>Total Water per barrel of oil</td>
<td>1.1</td>
<td>1.4</td>
<td>1.1</td>
<td>2.6</td>
<td>3.7</td>
<td>3.0</td>
<td>2.3</td>
<td>2.0</td>
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</tr>
<tr>
<td>Fresh Water per barrel of oil</td>
<td>0.3</td>
<td>0.5</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
<td>0.8</td>
<td>0.8</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td>Recycle Rates</td>
<td>64.8%</td>
<td>76.8%</td>
<td>83.4%</td>
<td>86.7%</td>
<td>90.8%</td>
<td>95.3%</td>
<td>94.0%</td>
<td>91.4%</td>
<td></td>
</tr>
<tr>
<td>Oil Produced (bbl/day)</td>
<td>29570</td>
<td>34269</td>
<td>37035</td>
<td>36612</td>
<td>36726</td>
<td>36372</td>
<td>38656</td>
<td>42934</td>
<td>50194</td>
</tr>
</tbody>
</table>

### Pelican Lake Water Information 2014 Monthly

<table>
<thead>
<tr>
<th></th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresh Water (m3/day) - Quaternary and Grand Rapids</td>
<td>5,416</td>
<td>5,505</td>
<td>5,535</td>
<td>5,687</td>
<td>5,377</td>
<td>5,681</td>
<td>5,645</td>
<td>5,586</td>
<td>5,630</td>
<td>5,606</td>
<td>5,526</td>
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<tr>
<td>Brackish Water (m3/day) - Grosmont</td>
<td>8,371</td>
<td>8,879</td>
<td>10,559</td>
<td>10,341</td>
<td>10,411</td>
<td>11,220</td>
<td>10,741</td>
<td>9,607</td>
<td>10,220</td>
<td>10,371</td>
<td>9,716</td>
<td>10,025</td>
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<tr>
<td>Total Makeup Water (m3/day)</td>
<td>13,787</td>
<td>14,383</td>
<td>16,094</td>
<td>16,028</td>
<td>15,788</td>
<td>16,723</td>
<td>16,422</td>
<td>15,253</td>
<td>15,806</td>
<td>16,001</td>
<td>15,321</td>
<td>15,550</td>
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<tr>
<td>Total Makeup Water per barrel of oil</td>
<td>1.8</td>
<td>1.9</td>
<td>2.1</td>
<td>2.0</td>
<td>2.1</td>
<td>2.1</td>
<td>2.0</td>
<td>1.8</td>
<td>1.9</td>
<td>2.0</td>
<td>1.9</td>
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<tr>
<td>Fresh Water per barrel of oil</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
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<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
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<tr>
<td>Oil Produced (bbl/day)</td>
<td>47,362</td>
<td>48,045</td>
<td>49,285</td>
<td>49,593</td>
<td>48,395</td>
<td>51,011</td>
<td>51,242</td>
<td>53,312</td>
<td>51,688</td>
<td>50,323</td>
<td>50,850</td>
<td>51,218</td>
</tr>
</tbody>
</table>
• Striving to improve field performance by increasing throughput through injectivity improvements
• Optimize polymer loading with the use of existing fresh water volumes
• Additional water treatment processes previously piloted but not implemented – economics and operating limitations posed challenges
• 2015 – Small water treatment pilot to investigate new technologies to improve produced water quality
• Additional Grosmont Source/Disposal options are being investigated as we plan the long-term Water Sourcing options.
Water and Oilfield Disposal Map

R23W4  R22W4  R21W4

02/07-27-082-21W4/2

00/04-12-080-23W4/3

00/05-02-081-23W4/3
00/01-36-080-22W4/0

00/02-35-080-22W4/2*

02/12-09-081-22W4/0
00/14-04-082-22W4/0

Abandoned Disposal wells
00/05-02-081-23W4/2  Grosmont
02/09-02-081-23W4/0  Nisku
00/13-01-081-23W4/2  Nisku

Approval 8309C

Approval 8898D

8898D
00/12-09-081-22W4/0  Nisku
02/12-09-081-22W4/0  Grosmont
00/05-02-081-23W4/3  Nisku
00/04-12-081-23W4/3  Nisku
00/01-36-080-22W4/0  Nisku
00/02-35-080-22W4/2*  Nisku
(*amendment underway)

8309C
00/14-04-082-22W4/0  Nisku**
(**to be amended)
02/07-27-082-21W4/2  Grosmont

(To be amended)
**TABLE 1**

<table>
<thead>
<tr>
<th>1</th>
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<th>3</th>
<th>4</th>
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</thead>
<tbody>
<tr>
<td>Unique Well Identifiers (Directive 051 satisfied)</td>
<td>Unique Well Identifiers (Directive 051 not satisfied)</td>
<td>Disposal Zone</td>
<td>Top of Injection Interval (Measured depth - metres KB)</td>
<td>Depth of Production Packer (Measured depth - metres KB)</td>
<td>Maximum Wellhead Injection Pressure (kilopascals gauge)</td>
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<tr>
<td>00/12-09-081-22W4/0</td>
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<td>Nisku</td>
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<td>Grosmont</td>
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<td>Nisku</td>
<td>458.1¹</td>
<td>454.0</td>
<td>3200</td>
</tr>
</tbody>
</table>

*00/02-35-080-22W4/2

-  re-perfed and acidized within the Nisku, March 28-April 4, 2015, to optimize disposal capacity
-  D65 application underway to amend perf interval & injection packer depth; submission pending AER review of event sequence
Disposal Well Data

01-36-080-22W4/00

02-35-080-22W4/00

05-02-081-23W4/03

04-12-081-23W4/03

- Injected Volume (7 Day Average m³/d)
- Injection Pressure (7 Day Average kPa)
AER Compliance
Hydrogen Sulphide

- Sourcing of production to occur over time, currently in Engineering and Construction 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 solution gas at batteries and wellsites in a common solution gas gathering system.
- Several locations approved for venting under D-60 Regulations.
- Gas to be sweetened in field and at major facility sites (emulsion batteries, compressor station).
AER Compliance

• CNRL continues to work with AER regarding injection well integrity:
  ▪ Formation/hydraulic isolation
  ▪ Cement bond
  ▪ Casing corrosion

• Process of upgrading existing wells site 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 2-3 years throughout field (existing facilities met regulations at time of original construction).
  ▪ Priority on areas where we have seen corrosion through inspections, and areas with high water cut
AER Compliance

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

- No outstanding applications
Conclusion

• Canadian Natural continues to be committed to maximizing the value of the resource for the both itself and the Province of Alberta through it’s Royalty Interest
  ▪ 2014 – Record production year from Pelican Lake
• Results from the polymer flood continue to be encouraging
  ▪ Continuing to evaluate the impacts of oil viscosity and water production on the ultimate performance and recovery under polymer flooding
• CNRL continues to optimize the operation of the flood and expand to new, more challenging areas
• CNRL is working on an injection plan to maximize field throughput and thus ultimate recovery of the field. Several options are being investigated over the next several years.
• Compliance with all AER regulations, including cap rock integrity monitoring, and communication with the AER remains a top priority for CNRL.
THE FUTURE CLEARLY DEFINED

Premium Value | Defined Growth | Independent

Canadian Natural