

PROVEN

EFFECTIVE

STRATEGY



**Canadian Natural**

**PRIMROSE/WOLF LAKE CSS**

***2015 WELL INTEGRITY ANNUAL  
PRESENTATION***

April 11, 2016

PREMIUM VALUE. DEFINED GROWTH. INDEPENDENT.

# CNRL'S Well Integrity Philosophy

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1. Develop a further understanding of well failure mechanisms
2. Use casing integrity monitoring systems to minimize risk to HSE and resource recovery
3. Prolong well life through improved well design and operational practices

# Agenda

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1. Review 2015 casing failure statistics
2. Review 2015 well integrity initiatives
3. Discuss future initiatives



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# 2015 Casing Failure Statistics

# Definitions of Well Failure Locations

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- Near-surface failure: 0 m – 25 m TVD
- Out of zone failure: failure depth is between 25 m TVD and the interface of the Grand Rapids/Clearwater formation
  - Includes failures within the Grand Rapids, Colorado, and Quaternary formations
- In zone failure: occurs within the Clearwater formation
  - Includes failures within the Clearwater capping shale and the Clearwater sands

# Well Failure Statistics - Summary



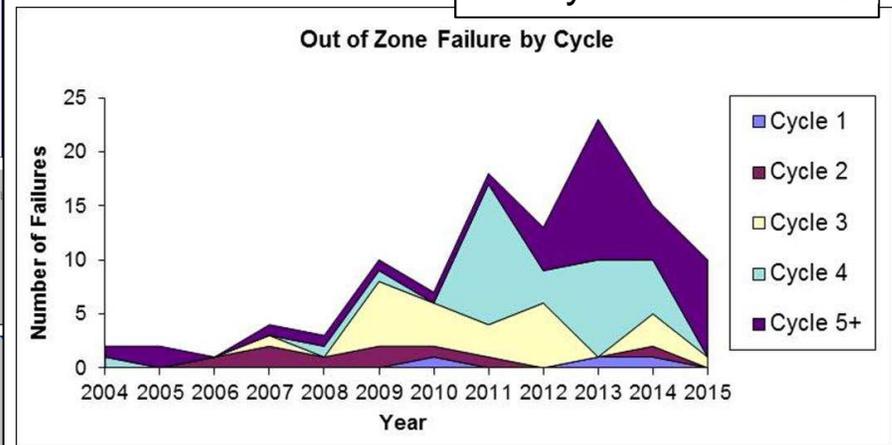
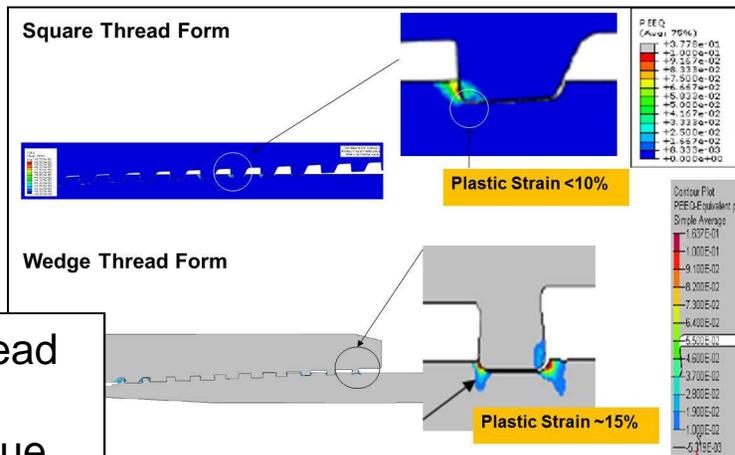
	Out of Zone	In Zone
<b>Number</b>	11	1
<b>Area</b>	Concentrated in PRN A2 & PRS Pads 30/31	PRN A3
<b>Connection/Pipe Body</b>	10 connection, 1 pipe body	connection
<b>Cycle</b>	91% of failures in cycle 5+	cycle 3
<b>Formation</b>	64% in Belle Fourche or West Gate	Clearwater Sand
<b>Pressure During Failure</b>	10/11 during low P or when well was killed, 1/11 time of failure unknown	low P

# Well Failures Reduced

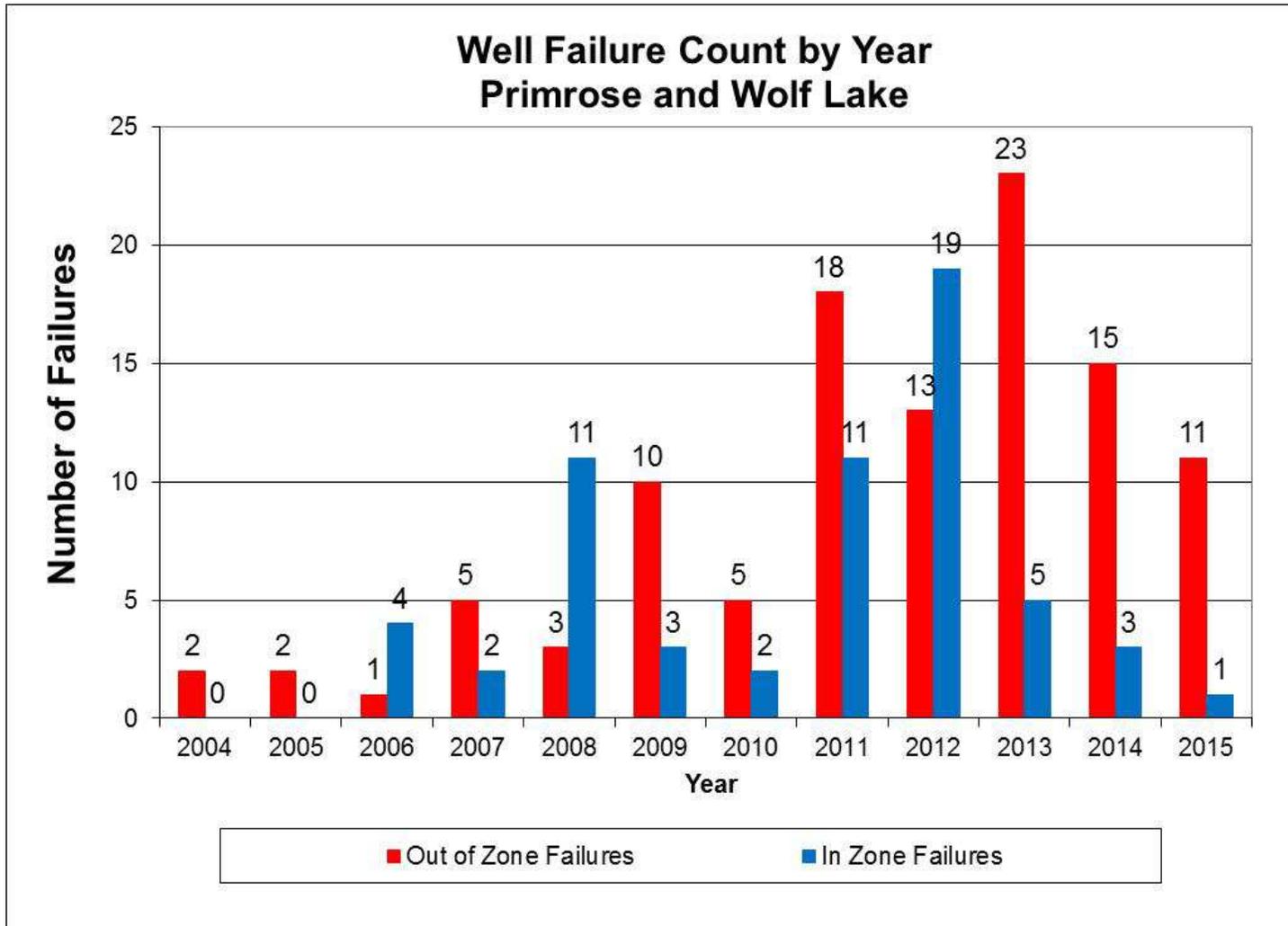
- Out of zone well failures at lowest level since 2010
- Variables positively influencing performance:
  - More fatigue resistant connection
  - Improved well construction:
    - Limited casing rotations
    - Connections away from Fish Scales top

Failures:

- Number ↓
- Cycle of failure ↑



# Number of Well Failures by Year



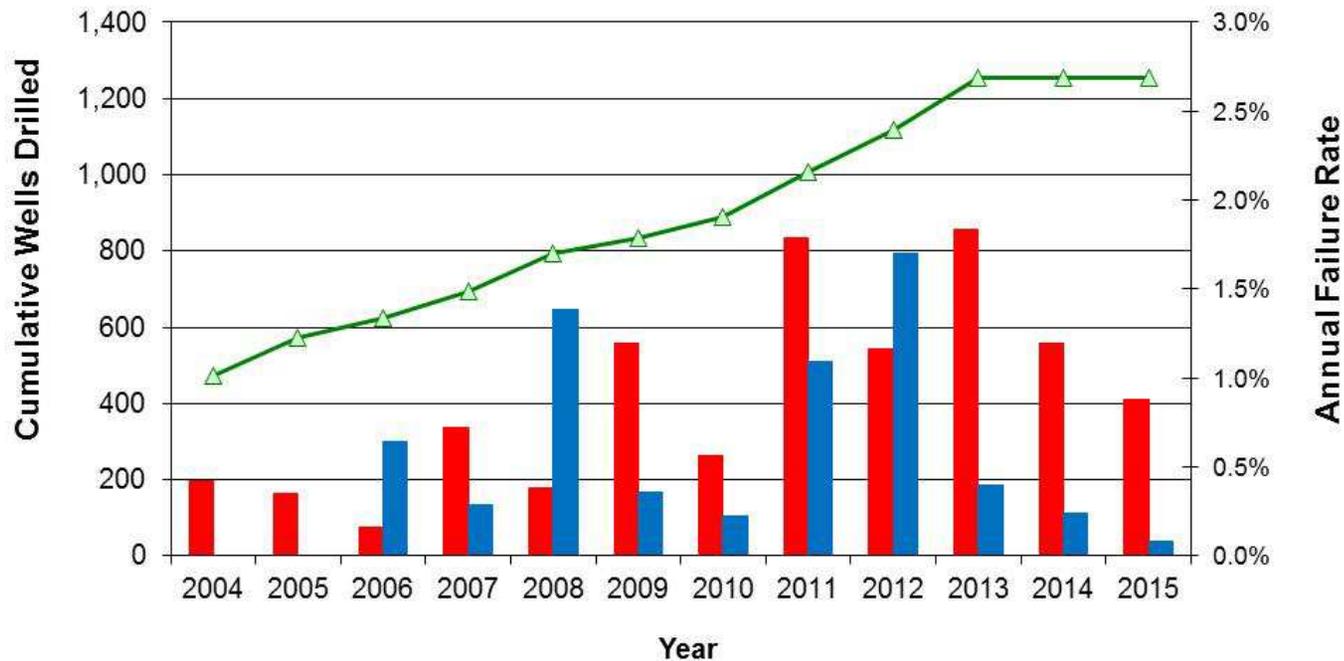
In 2015:

- 11 wells had an out of zone failure
- 1 well had an in zone failure

# Well Failures by Year (%)



**Well Count and Failure Rate by Year  
Primrose and Wolf Lake**

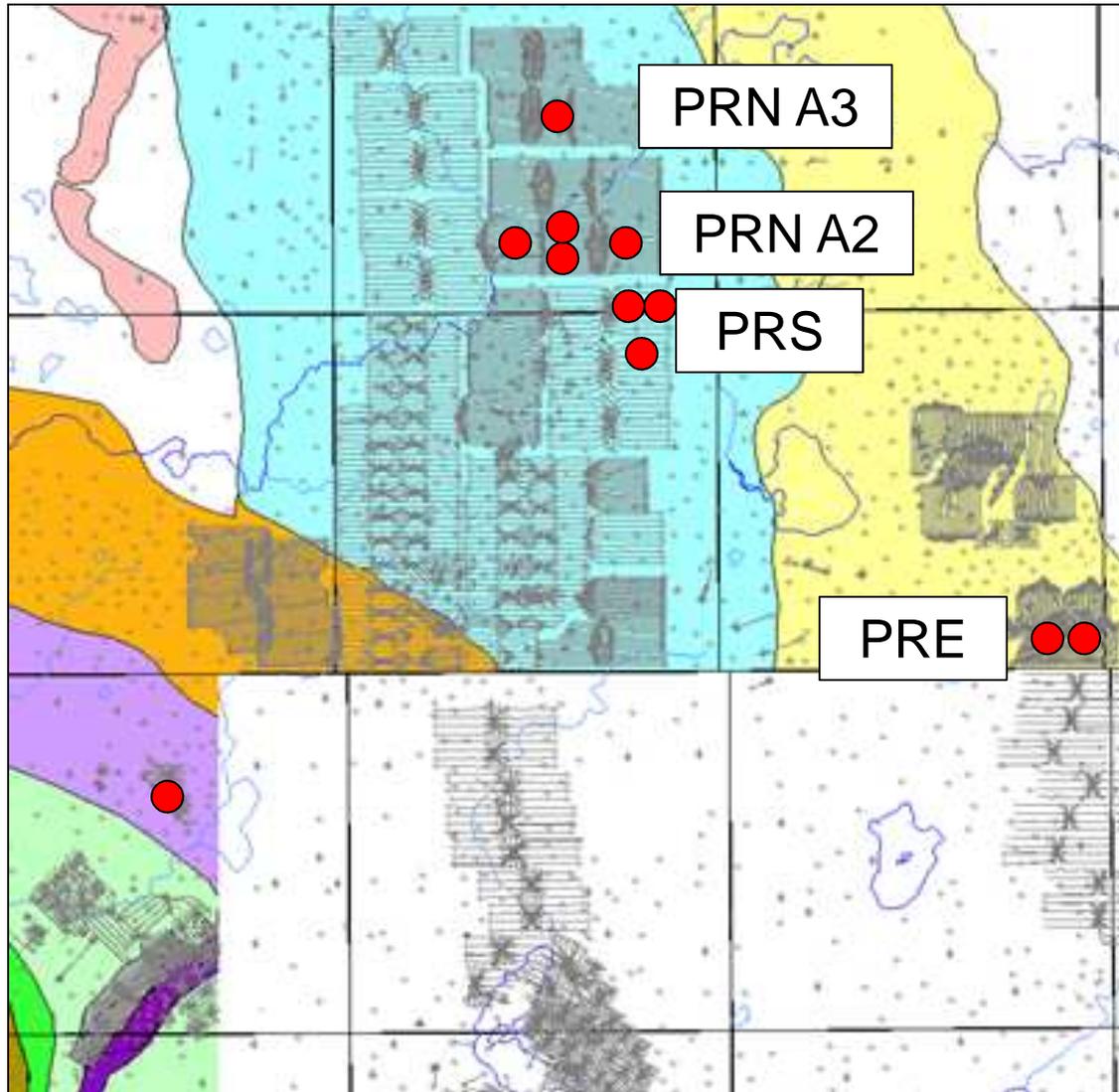


In 2015:

- 0.88% of wells had an out of zone failure
- 0.08% of the wells had an in zone failure

2015 failure rate lower than in 2014

# Out of Zone Well Failures Locations



2015 Out of Zone Well Failures
4A31
5C30
1A31
6A77
14A74
5A66
1A58
12A62
11A62
14A64
3-Z8

Well failures concentrated:

- PRN A2, Pads 58/62/66 (4)
- PRS, Pads 30/31 (3)

# 2015 Out of Zone Well Failures



- Primary out of zone casing failures – 11 wells

Well	Area	Lisc #	Failure of	Detection Method	Reason Detection Method not Passive Seismic	Confirmation Date	Measured Depth (mKB)	Total Vertical Depth (m)	Formation
4A31	PRS	301759	SLIMHOLE	IMPAIR	in slimhole	18-Jan-15	407.00	398.4	UPPER GR
5C30*	PRS	284605	CASING	PS		3-Feb-15	284.30	284.2	WEST GATE
1A31	PRS	301741	CASING	PS		5-May-15	326.00	317.94	WEST GATE
6A77	PRE	378148	CASING	PS		7-Jun-15	272.40	270.00	BELLE FOURCHE
14A74	PRE	380849	CASING	PS		7-Jun-15	259.60	259.1	BELLE FOURCHE
1A58	PRN	396747	CASING	PIT	wildfire, PS down	11-Jul-15	306.20	297.5	WEST GATE
5A66	PRN	396920	CASING	PS		18-Jul-15	344.80	335.0	JOLI FOU
12A62	PRN	402533	CASING	PIT	wildfire, PS down	8-Sep-15	262.90	262.2	BELLE FOURCHE
11A62*	PRN	402532	CASING	PS		23-Sep-15	325.80	323.7	VIKING
14A64*	PRN	445699	CASING	PS		24-Nov-15	265.10	263.4	BELLE FOURCHE
3-Z8	WL CSS	132128	CASING	MFC	no PS on Z8	7-Dec-15	326.20	316.2	JOLI FOU

\*Denotes wells with multiple failures

# 2015 Out of Zone Well Failures



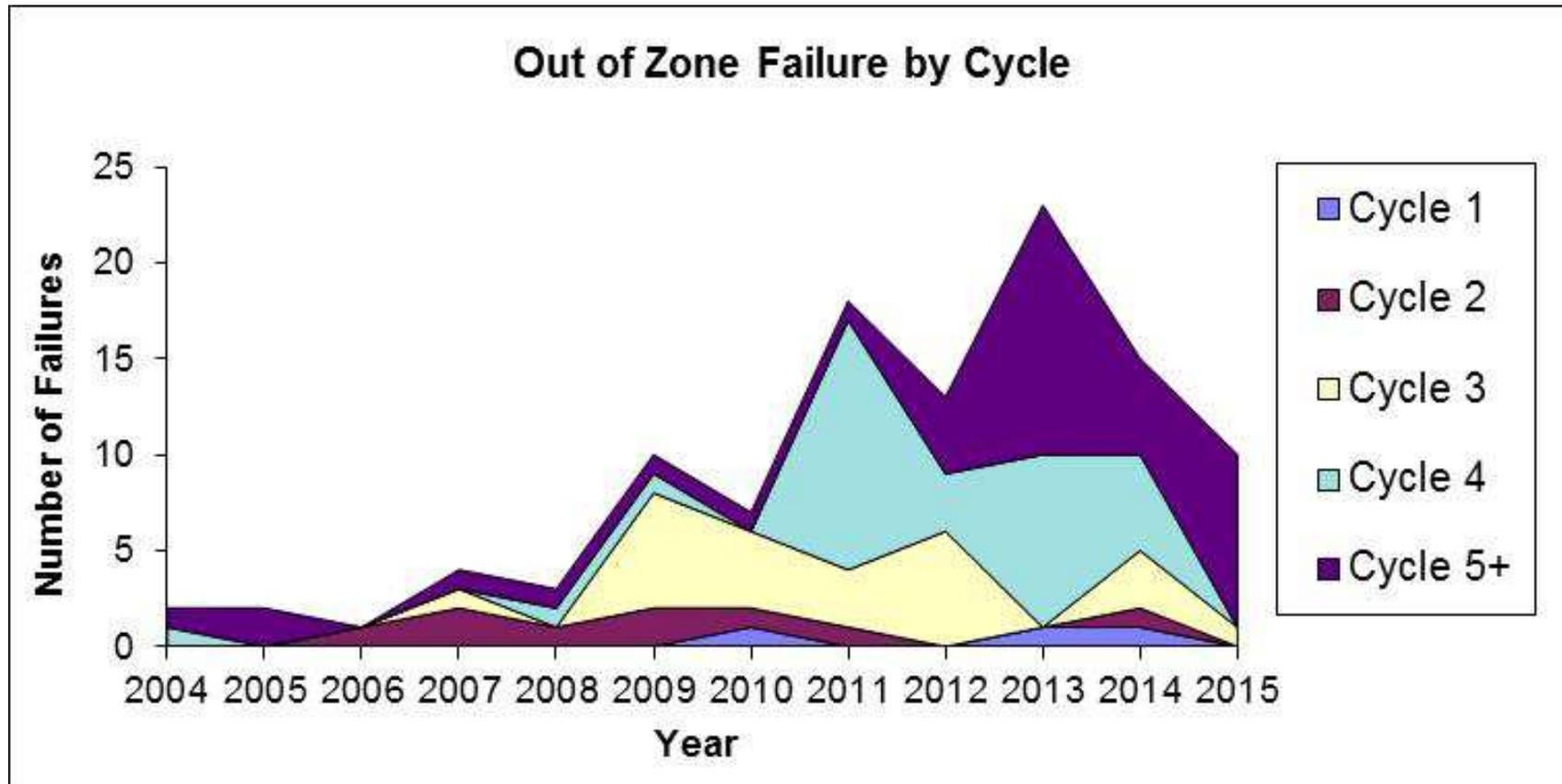
- Primary Out of Zone Casing Failures – 11 wells

Well	Tubular OD (mm)	Failure In	Connection Type	Cycle of Failure	Well Phase During Failure	Repair Method
4A31	177.8	PIPE BODY	PREMIUM - SQUARE THREAD	5	UNKNOWN	MILL OUT IMPAIRMENT
5C30*	244.5	CONN	PREMIUM - WEDGE THREAD	5	PUMP - WORKOVER	PATCH
1A31	244.5	CONN	PREMIUM - WEDGE THREAD	5	PUMP - WORKOVER	PATCH
6A77	244.5	CONN	PREMIUM - WEDGE THREAD	5	SHUT IN	7" MH PATCH
14A74	244.5	CONN	PREMIUM - WEDGE THREAD	6	SHUT IN	7" MH PATCH
1A58	244.5	CONN	PREMIUM - WEDGE THREAD	6	SHUT IN	SLIMHOLE
5A66	244.5	CONN	PREMIUM - WEDGE THREAD	6	PUMP - WORKOVER	SLIMHOLE
12A62	244.5	CONN	PREMIUM - WEDGE THREAD	6	SHUT IN	ZONAL W/ CEMENT
11A62*	244.5	CONN	PREMIUM - WEDGE THREAD	5	SHUT IN	ZONAL W/ CEMENT
14A64*	244.5	CONN	PREMIUM - WEDGE THREAD	3	SHUT IN	SLIMHOLE
3-Z8	177.8	CONN	OBTC	11	PUMP PHASE	PATCH

- 10 at a connection, 1 in the pipe body (slimhole)
- 10 wells that failed at the connection: 9 premium wedge thread, 1 OBTC

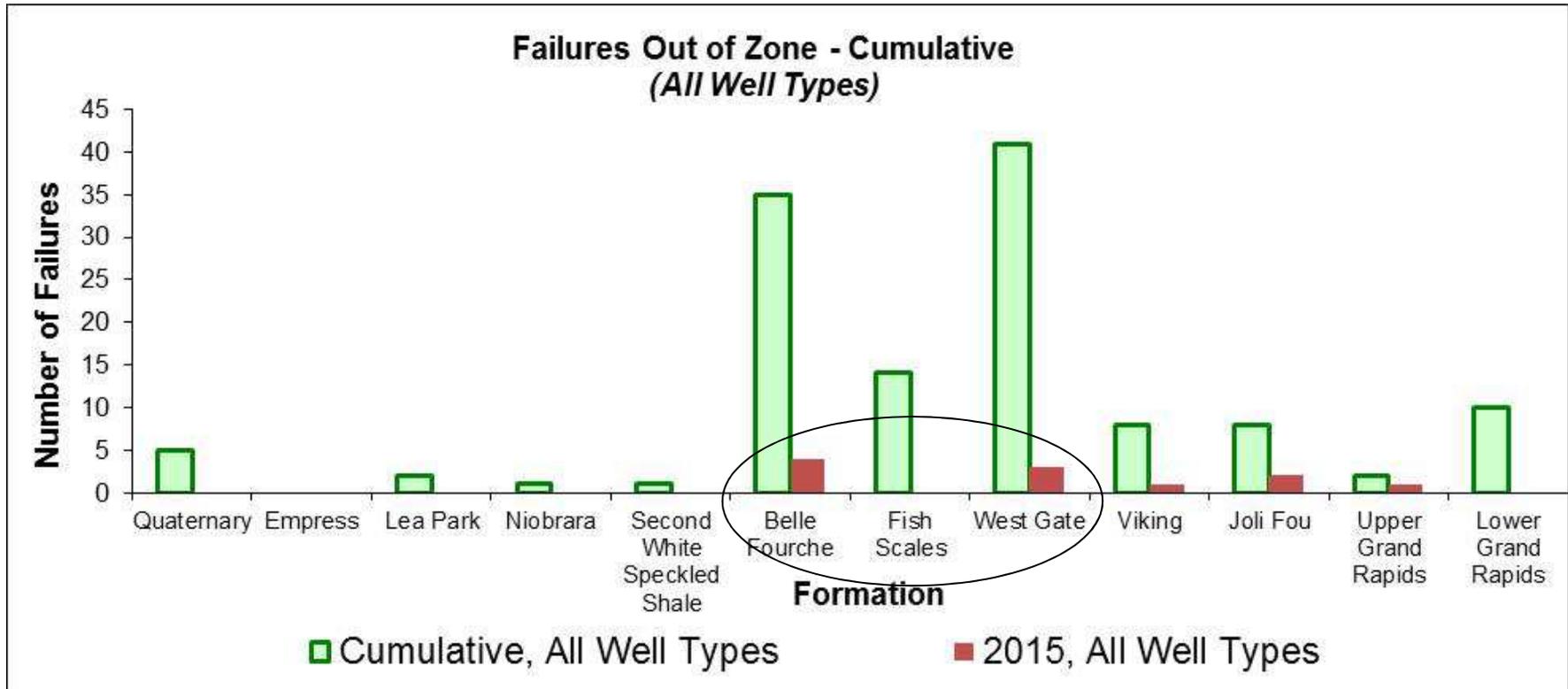
\*Denotes wells with multiple failures

# Out of Zone Failures by Cycle



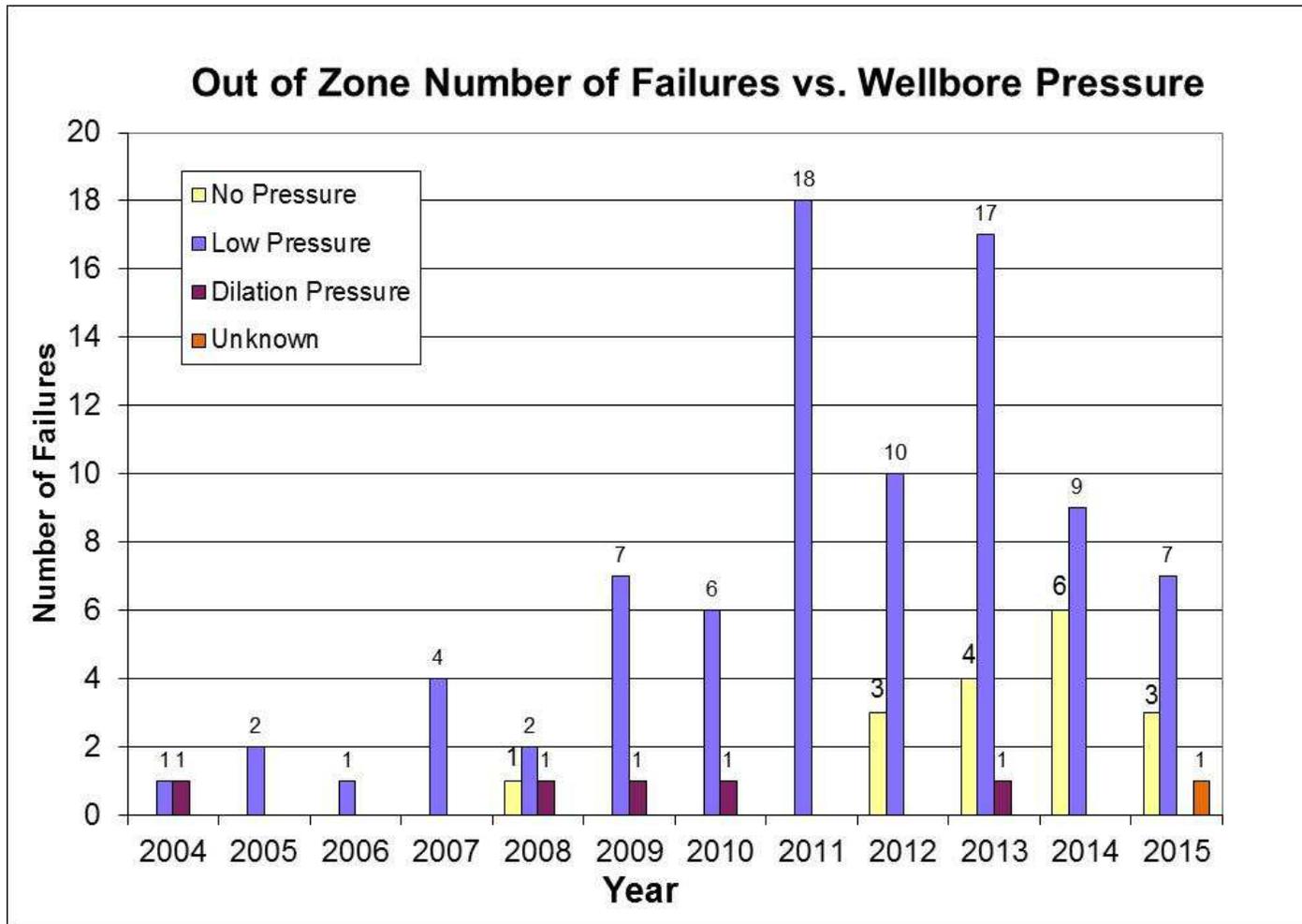
- In 2015, 91% of out of zone failures occurred in commercial cycle 5 or higher

# Out of Zone Failures by Formation



64% in 2015 occurred in the Belle Fourche and West Gate

# Out of Zone Number of Failures vs. Pressure



No dilation pressure failures in 2015

4A31 (unknown wellbore pressure): casing integrity (slimhole) confirmed by PIT

3-Z8 confirmed occurred after steaming

# 2015 In Zone Failure

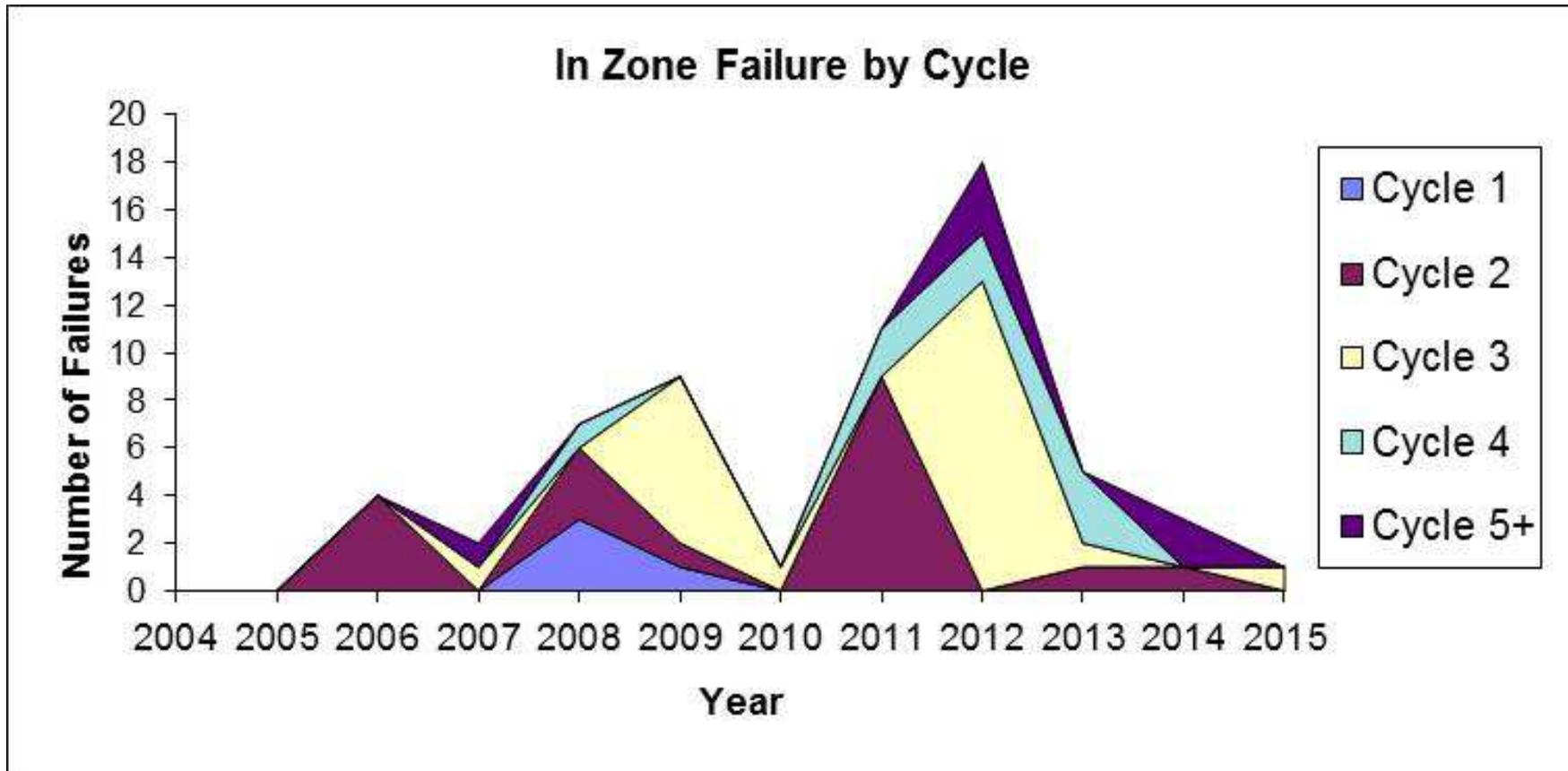


- In zone: 1 well failure

Well	Area	Lisc #	Failure of	Detection Method	Confirmation Date	Measured Depth (mKB)	Total Vertical Depth (m)	Formation
12A64	PRN	445697	CASING	PS	2-Aug-15	591.30	490.4	CLEARWATER SAND

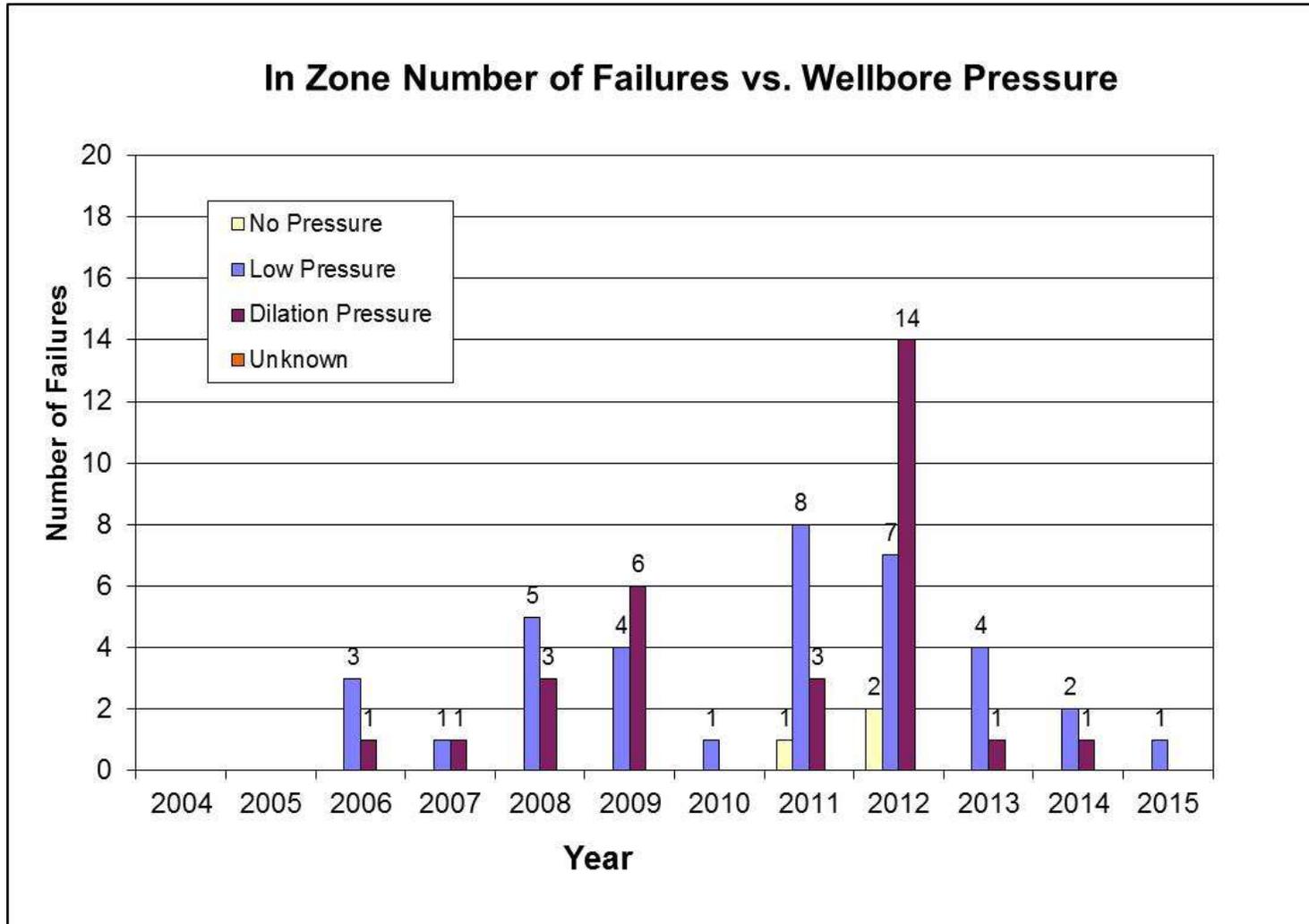
Well	Tubular OD (mm)	Failure In	Connection Type	Cycle of Failure	Well Phase During Failure	Repair Method
12A64	244.5	CONN	HYDRIL 563	3	SHUT IN	7" MH PATCH

# In Zone Failures by Cycle



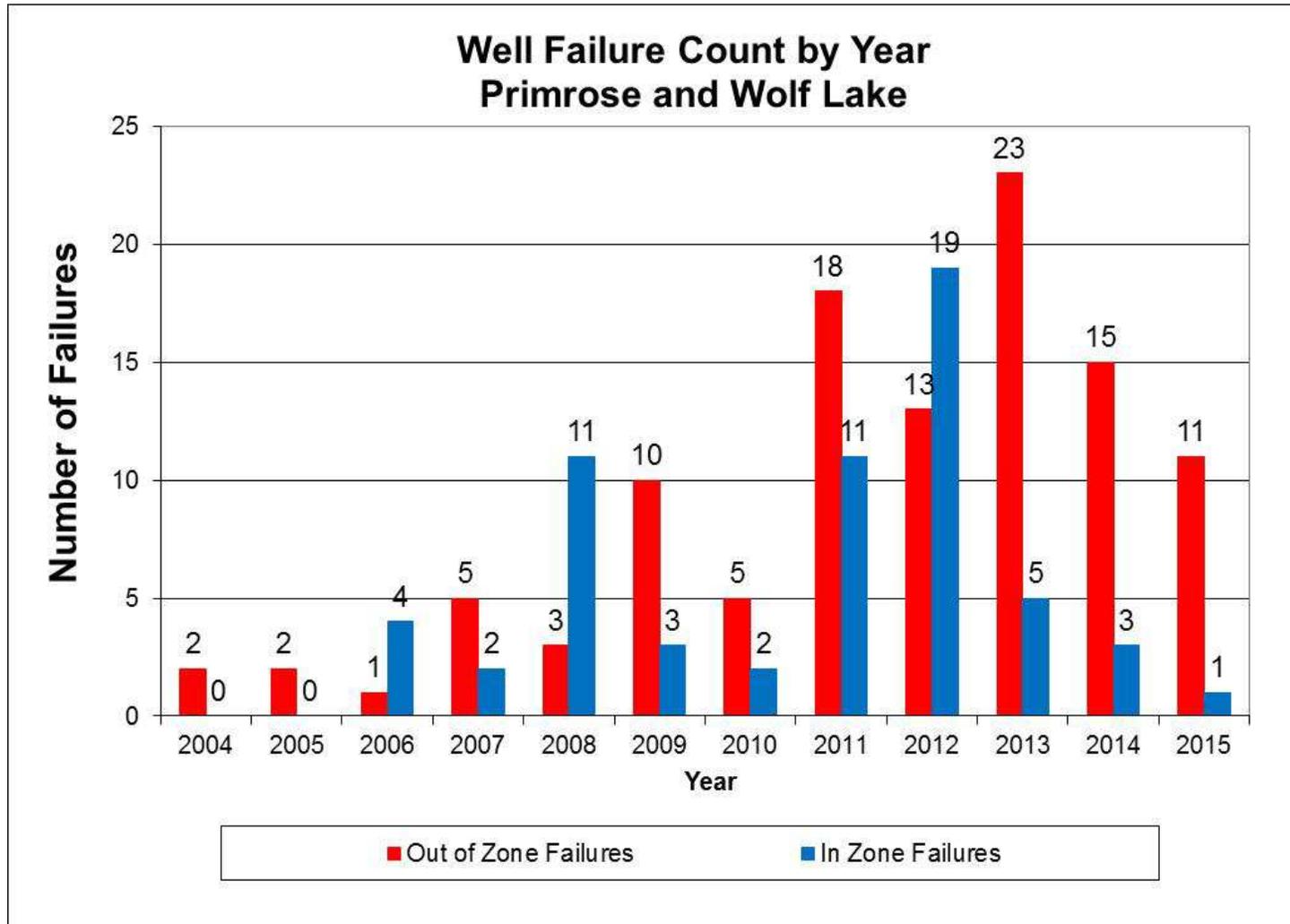
In 2015, there was one in zone failure which occurred in commercial cycle 3

# In Zone Number of Failures vs. Pressure



1 low pressure failure

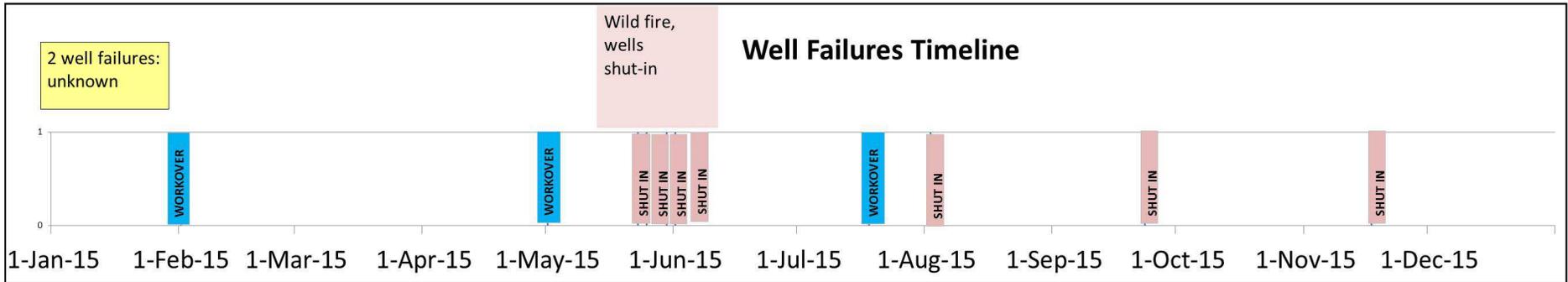
# Decreasing Well Failures Trend Expected to Continue



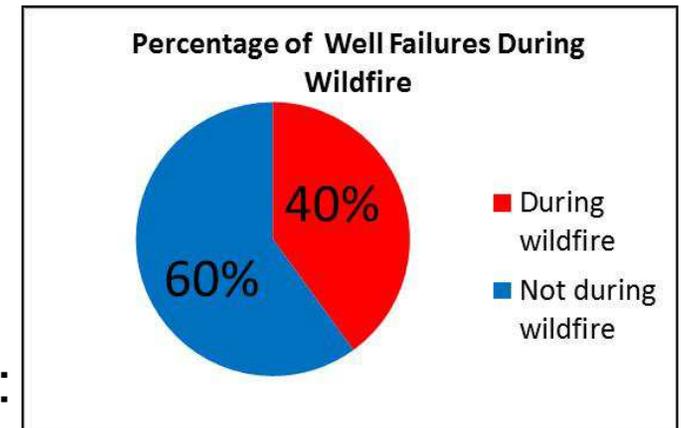
# The Wildfire Precipitated Four Failures



## Wildfire: May 23 – June 15, 2015



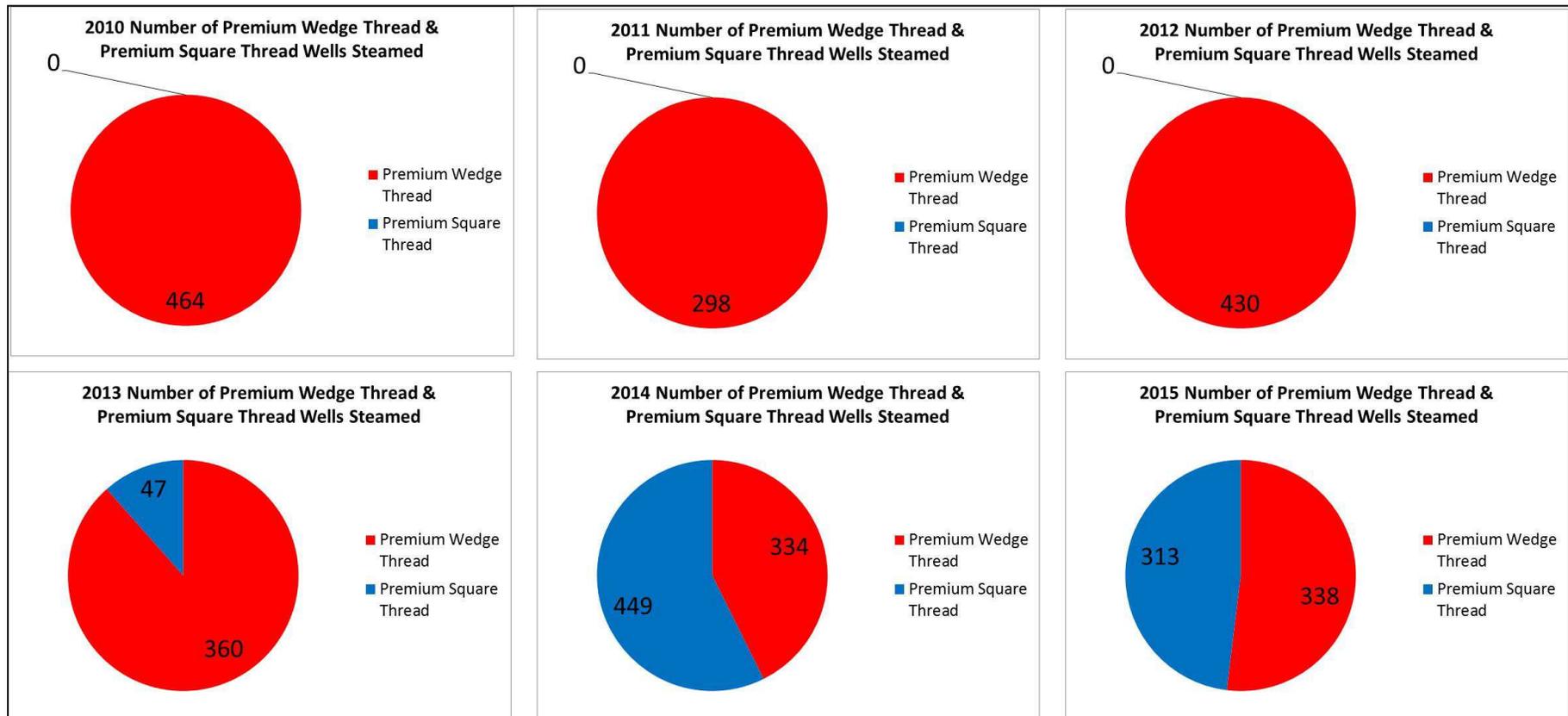
Well	Well Failure Occurred During Wildfire?	In or Out of Zone
4A31	unknown	out of zone
5C30	no	out of zone
1A31	no	out of zone
6A77	yes	out of zone
14A74	yes	out of zone
1A58	yes	out of zone
5A66	no	out of zone
12A62	yes	out of zone
11A62	no	out of zone
14A64	no	out of zone
Z8-3	unknown	out of zone
12A64	no	in zone



12 well failures:

- 10 timing known, 2 unknown
- Out of 10 that timing is known:
  - 4 during wildfire (40%)
  - 6 not during wildfire (60%)

# Premium Wedge Thread and Premium Square Thread Connections Steamed

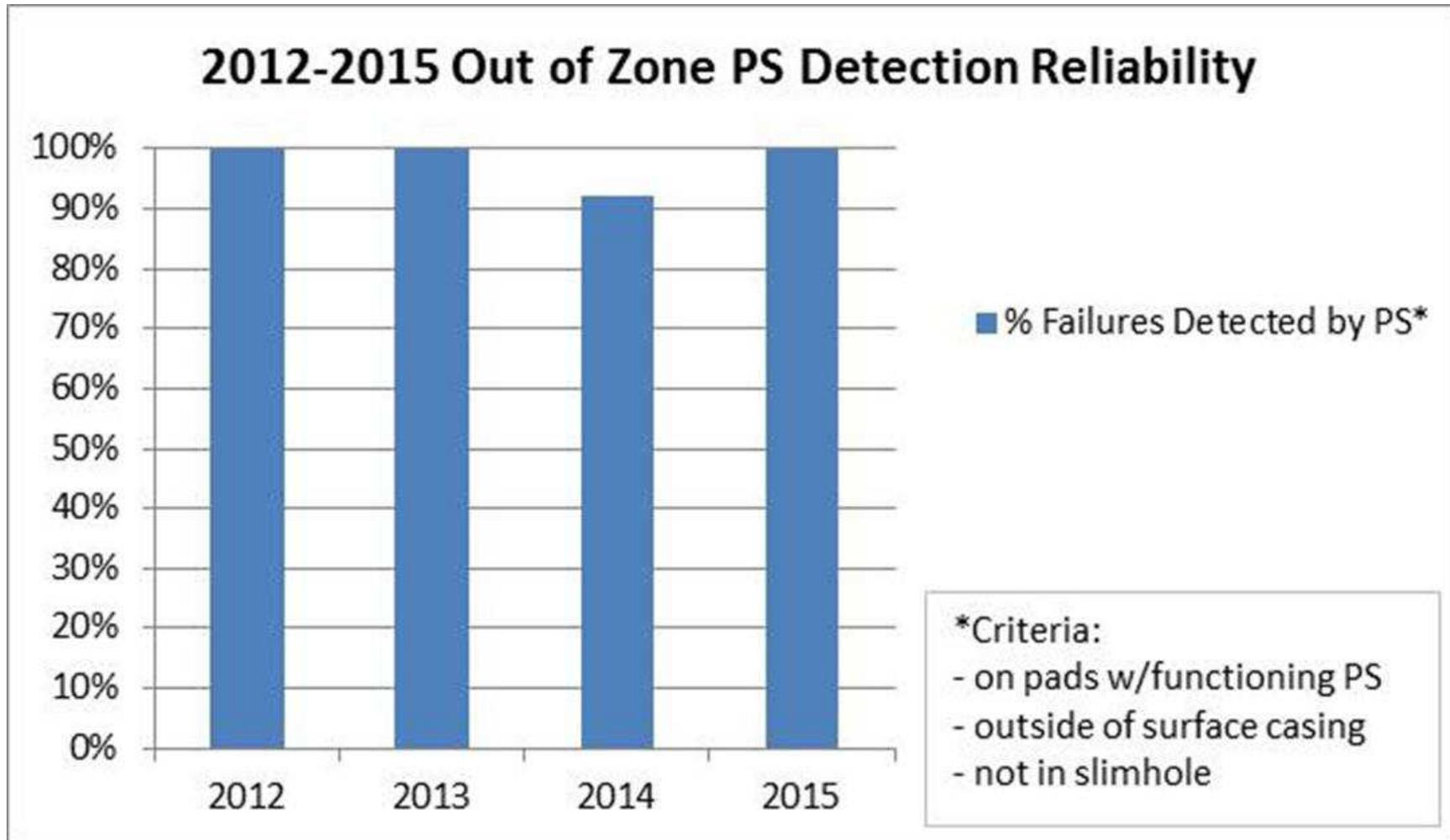


- In 2015, 313 of 651 wells (48%) steamed had square thread connections
- Change to square thread connection is helping reduce well failure rates

# Passive Seismic Detection Reliability



**2015 out of zone passive seismic detection rate 100%\***





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# 2015 Well Integrity Initiatives

# 2015 Well Integrity Initiatives

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- CSS Casing Integrity Protocol
  - Revisions 2 and 3 issued
- Caliper Log Interpretations
  - Caliper log interpretation software development
- High Temperature CSS Wells Patches Installations
  - MH patches and expandable patches
- Qualification of through-tubing casing inspection logs
  - In-shop testing completed, tools providing clear and consistent results

# Casing Integrity Checks



- Protocol adjusted to align with historical failure frequencies
- In conjunction with online monitoring, test proportions ensure high level of confidence of casing integrity prior to steaming

## GR/scrapper runs:

- Completed trial of running GR/scrapper every time tubing is pulled
- Now start pre-commercial cycle 6

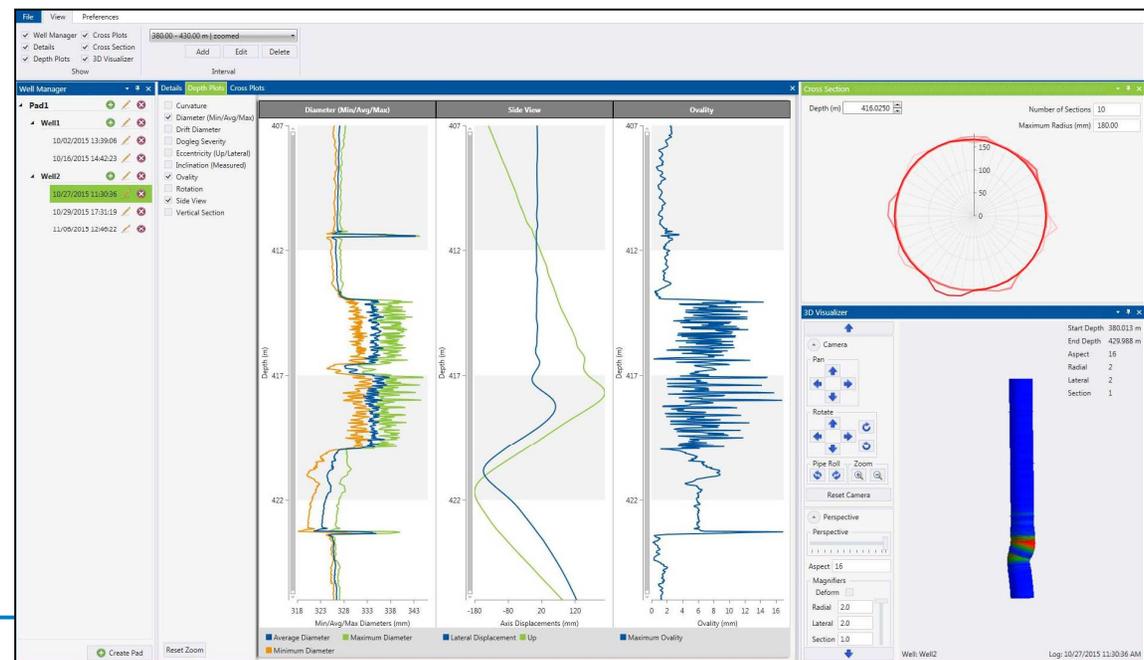
Prior to Commercial Steam Cycle #	Gauge Ring/Scrapper Test Proportion (% of wells/pad)		Pressure Integrity Test Proportion (% of wells/pad)	
	Prior	Current	Prior	Current
1	when production tubing is pulled	-	100% (part of the completion process)	100% (part of the completion process)
2	when production tubing is pulled	-	no scheduled test	no scheduled test
3	when production tubing is pulled	-	no scheduled test	no scheduled test
4	25%	-	25%	no scheduled test
5	25%	-	25%	no scheduled test
6	50%	25%	50%	25%
7	50%	25%	50%	25%
8	50%	25%	50%	25%
9+	100%	50%	100%	50%

# Caliper Log Software Development JIP

Goal: improve software for interpreting caliper logs

Status:

- 3<sup>rd</sup> party developing new features (efficiency/functionality), user interface
  - Multiple wells 3D viewer w/deformation direction vectors
  - Manage all logs for a pad/field in a database
  - Easily see deformations development over time
  - Plot logs side-by-side
  - Colour 3D viewer
- 2015: interim development
- 2016: implementation



# HT CSS Patches Installations

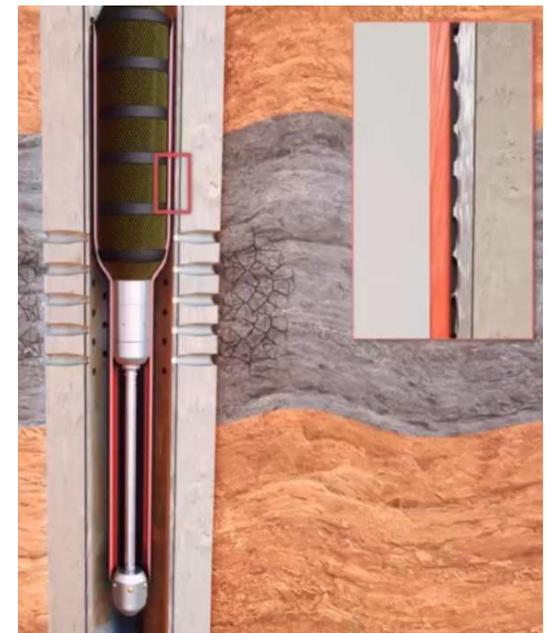
Goal: find a technical solution as an alternative to slimhole repairs

Status:

- Trialing HT rated MH patches and expandable patches
- 2 MH patches (12A64 & 17A77) and 1 expandable (Z8-3) in the ground
  - 12A64: in zone repair on CSS well
  - 17A77: steamflood producer
  - Z8-3: steamflood injector
- Plan to confirm casing integrity post-steam



MH patch: pipe spring, setting element and slips



expandable patch

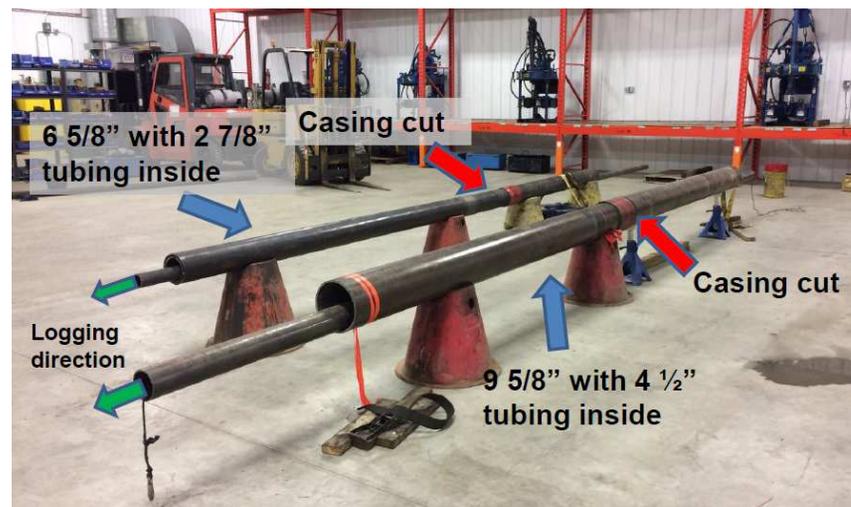
# Through-tubing Casing Inspection Logs

## Goals:

- Reduce casing integrity checks impact on casing fatigue life
- Optimize casing integrity checks workovers

## Update:

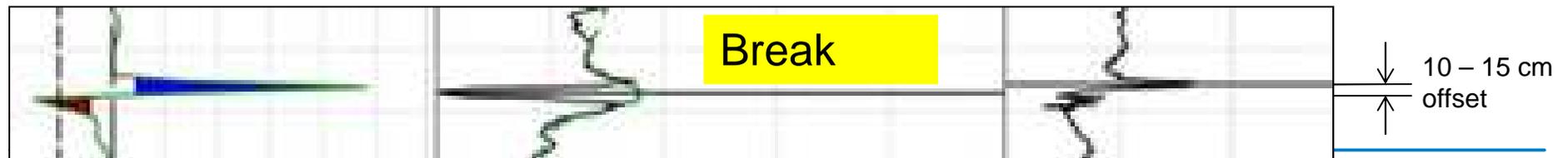
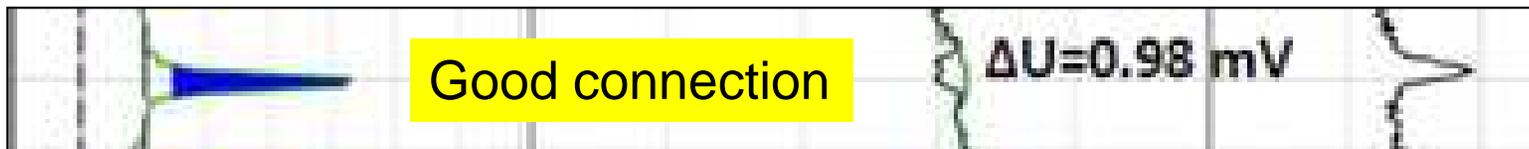
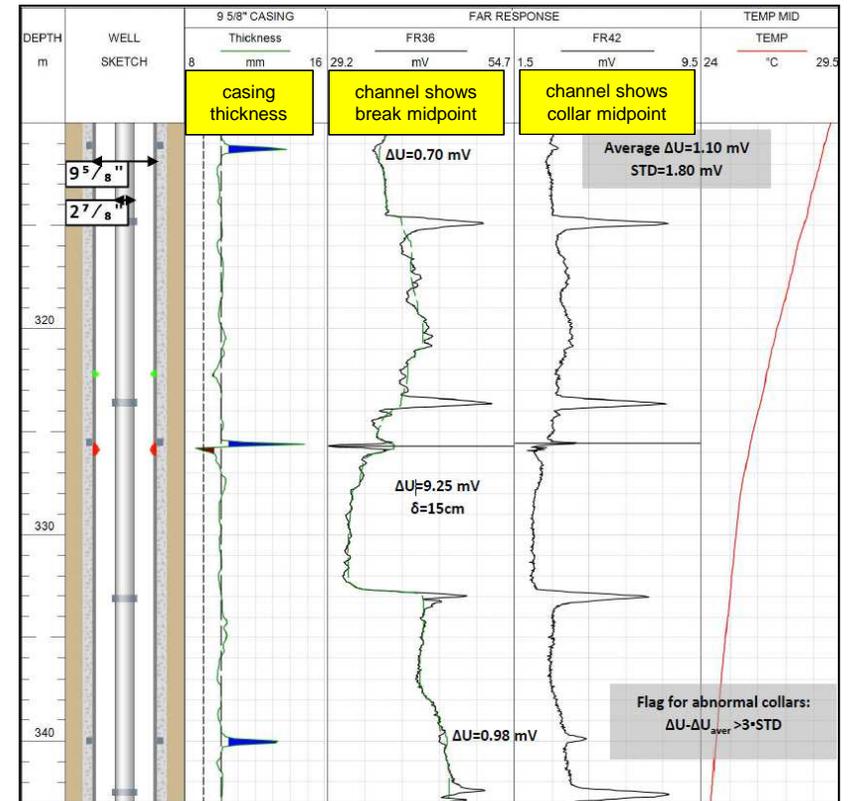
- 2014: started trialing through-tubing (metal thickness detector) logs
- 2015-Dec: performed in-shop test
- Results: clear and consistent casing break identification



# Through-tubing Acceptable for Casing Integrity

## Clear and consistent casing break ID:

- Casing thickness deflection to left
- Collar midpoint offset from break midpoint (10 – 15 cm)
- FR36 channel large deflection to left





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# Future Well Integrity Initiatives

# Future Initiatives

- CSS Casing Integrity Protocol
  - Continue to enhance the protocol
    - Evaluating further optimization opportunities
    - Continued data gathering on through-tubing logs performance
- JIP Participation
  - Caliper Log Interpretation Software
    - Development group participation; implement new version
    - Progress interpretation to learn more about mechanisms of failure
  - Cement Alternates
    - 2015: ranking of alternate cement materials completed
    - 2016: starting to test 3 materials under thermal conditions
- Well Integrity Management System
  - Further enhance internal WIMS

# Forward Looking Statements

Certain statements relating to Canadian Natural Resources Limited (the "Company") in this document or documents incorporated herein by reference constitute forward-looking statements or information (collectively referred to herein as "forward-looking statements") within the meaning of applicable securities legislation. Forward-looking statements can be identified by the words "believe", "anticipate", "expect", "plan", "estimate", "target", "continue", "could", "intend", "may", "potential", "predict", "should", "will", "objective", "project", "forecast", "goal", "guidance", "outlook", "effort", "seeks", "schedule", "proposed" or expressions of a similar nature suggesting future outcome or statements regarding an outlook. Disclosure related to expected future commodity pricing, forecast or anticipated production volumes, royalties, operating costs, capital expenditures, income tax expenses, and other guidance provided throughout this presentation constitute forward-looking statements. Disclosure of plans relating to and expected results of existing and future developments, including but not limited to the Horizon Oil Sands operations and future expansion, Septimus, Primrose thermal projects, Pelican Lake water and polymer flood project, the Kirby Thermal Oil Sands Project, construction of the proposed Keystone XL Pipeline from Hardisty, Alberta to the US Gulf coast, the proposed Kinder Morgan Trans Mountain pipeline expansion from Edmonton, Alberta to Vancouver, British Columbia, the proposed Energy East pipeline from Hardisty to Eastern Canada, and the construction and future operations of the North West Redwater bitumen upgrader and refinery also constitute forward-looking statements. This forward-looking information is based on annual budgets and multi-year forecasts, and is reviewed and revised throughout the year as necessary in the context of targeted financial ratios, project returns, product pricing expectations and balance in project risk and time horizons. These statements are not guarantees of future performance and are subject to certain risks and the reader should not place undue reliance on these forward-looking statements as there can be no assurances that the plans, initiatives or expectations upon which they are based will occur.

In addition, statements relating to "reserves" are deemed to be forward-looking statements as they involve the implied assessment based on certain estimates and assumptions that the reserves described can be profitably produced in the future. There are numerous uncertainties inherent in estimating quantities of proved and proved plus probable crude oil and natural gas and natural gas liquids (NGLs) reserves and in projecting future rates of production and the timing of development expenditures. The total amount or timing of actual future production may vary significantly from reserve and production estimates.

The forward-looking statements are based on current expectations, estimates and projections about the Company and the industry in which the Company operates, which speak only as of the date such statements were made or as of the date of the report or document in which they are contained, and are subject to known and unknown risks and uncertainties that could cause the actual results, performance or achievements of the Company to be materially different from any future results, performance or achievements expressed or implied by such forward-looking statements. Such risks and uncertainties include, among others: general economic and business conditions which will, among other things, impact demand for and market prices of the Company's products; volatility of and assumptions regarding crude oil and natural gas prices; fluctuations in currency and interest rates; assumptions on which the Company's current guidance is based; economic conditions in the countries and regions in which the Company conducts business; political uncertainty, including actions of or against terrorists, insurgent groups or other conflict including conflict between states; industry capacity; ability of the Company to implement its business strategy, including exploration and development activities; impact of competition; the Company's defense of lawsuits; availability and cost of seismic, drilling and other equipment; ability of the Company and its subsidiaries to complete capital programs; the Company's and its subsidiaries' ability to secure adequate transportation for its products; unexpected disruptions or delays in the resumption of the mining, extracting or upgrading of the Company's bitumen products; potential delays or changes in plans with respect to exploration or development projects or capital expenditures; ability of the Company to attract the necessary labour required to build its thermal and oil sands mining projects; operating hazards and other difficulties inherent in the exploration for and production and sale of crude oil and natural gas and in mining, extracting or upgrading the Company's bitumen products; availability and cost of financing; the Company's and its subsidiaries' success of exploration and development activities and their ability to replace and expand crude oil and natural gas reserves; timing and success of integrating the business and operations of acquired companies; production levels; imprecision of reserve estimates and estimates of recoverable quantities of crude oil, natural gas and NGLs not currently classified as proved; actions by governmental authorities; government regulations and the expenditures required to comply with them (especially safety and environmental laws and regulations and the impact of climate change initiatives on capital and operating costs); asset retirement obligations; the adequacy of the Company's provision for taxes; and other circumstances affecting revenues and expenses. The Company's operations have been, and in the future may be, affected by political developments and by federal, provincial and local laws and regulations such as restrictions on production, changes in taxes, royalties and other amounts payable to governments or governmental agencies, price or gathering rate controls and environmental protection regulations. Should one or more of these risks or uncertainties materialize, or should any of the Company's assumptions prove incorrect, actual results may vary in material respects from those projected in the forward-looking statements. The impact of any one factor on a particular forward-looking statement is not determinable with certainty as such factors are dependent upon other factors, and the Company's course of action would depend upon its assessment of the future considering all information then available. For additional information refer to the "Risks Factors" section of the AIF. Readers are cautioned that the foregoing list of factors is not exhaustive. Unpredictable or unknown factors not discussed in this report could also have material adverse effects on forward-looking statements.

Although the Company believes that the expectations conveyed by the forward-looking statements are reasonable based on information available to it on the date such forward-looking statements are made, no assurances can be given as to future results, levels of activity and achievements. All subsequent forward-looking statements, whether written or oral, attributable to the Company or persons acting on its behalf are expressly qualified in their entirety by these cautionary statements. Except as required by law, the Company assumes no obligation to update forward-looking statements, whether as a result of new information, future events or other factors, or the foregoing factors affecting this information, should circumstances or Management's estimates or opinions change.

# Reporting Disclosures

## Special Note Regarding Currency, Production and Reserves

In this document, all references to dollars refer to Canadian dollars unless otherwise stated. Reserves and production data are presented on a before royalties basis unless otherwise stated. In addition, reference is made to crude oil and natural gas in common units called barrel of oil equivalent ("BOE"). A BOE is derived by converting six thousand cubic feet of natural gas to one barrel of crude oil (6Mcf:1bbl). This conversion may be misleading, particularly if used in isolation, since the 6Mcf:1bbl ratio is based on an energy equivalency conversion method primarily applicable at the burner tip and does not represent a value equivalency at the wellhead. In comparing the value ratio using current crude oil prices relative to natural gas prices, the 6Mcf:1bbl conversion ratio may be misleading as an indication of value.

This document, herein incorporated by reference, have been prepared in accordance with IFRS, as issued by the International Accounting Standards Board.

For the year ended December 31, 2014 the Company retained Independent Qualified Reserves Evaluators ("IQREs"), Sproule Associates Limited and Sproule International Limited (together as "Sproule") and GLJ Petroleum Consultants Ltd. ("GLJ"), to evaluate and review all of the Company's proved and proved plus probable reserves with an effective date of December 31, 2014 and a preparation date of February 2, 2015. Sproule evaluated the North America and International light and medium crude oil, primary heavy crude oil, Pelican Lake heavy crude oil, bitumen (thermal oil), natural gas and NGLs reserves. GLJ evaluated the Horizon SCO reserves. The evaluation and review was conducted in accordance with the standards contained in the Canadian Oil and Gas Evaluation Handbook ("COGE Handbook") and disclosed in accordance with National Instrument 51-101 – Standards of Disclosure for Oil and Gas Activities ("NI 51-101") requirements. Reserves disclosure is presented in accordance with Canadian reporting requirements using forecast prices and escalated costs.

The Company annually discloses net proved reserves and the standardized measure of discounted future net cash flows using 12-month average prices and current costs in accordance with United States Financial Accounting Standards Board Topic 932 "Extractive Activities - Oil and Gas" in the Company's Form 40-F filed with the SEC in the "Supplementary Oil and Gas Information" section of the Company's Annual Report.

## Resources Other Than Reserves

The contingent resources other than reserves ("resources") estimates provided in this presentation are internally evaluated by qualified reserves evaluators in accordance with the COGE Handbook as directed by NI 51-101. No independent third party evaluation or audit was completed. Resources provided are best estimates as of December 31, 2014. The resources are evaluated using deterministic methods which represent the expected outcome with no optimism or conservatism.

Resources, as per the COGE Handbook definition, are those quantities of petroleum estimated, as of a given date, to be potentially recoverable from known accumulations using established technology or technology under development, but are not currently considered commercially viable due to one or more contingencies. There is no certainty that it will be commercially viable to produce any portion of these resources.

Due to the inherent differences in standards and requirements employed in the evaluation of reserves and contingent resources, the total volumes of reserves or resources are not to be considered indicative of total volumes that may actually be recovered and are provided for illustrative purposes only.

Crude oil, bitumen or natural gas initially-in-place volumes provided are discovered resources which include production, reserves, contingent resources and unrecoverable volumes.

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## Special Note Regarding non-GAAP Financial Measures

This document includes references to financial measures commonly used in the crude oil and natural gas industry, such as adjusted net earnings from operations, cash flow from operations, cash production costs and net asset value. These financial measures are not defined by International Financial Reporting Standards ("IFRS") and therefore are referred to as non-GAAP measures. The non-GAAP measures used by the Company may not be comparable to similar measures presented by other companies. The Company uses these non-GAAP measures to evaluate its performance. The non-GAAP measures should not be considered an alternative to or more meaningful than net earnings, as determined in accordance with IFRS, as an indication of the Company's performance. The non-GAAP measures adjusted net earnings from operations and cash flow from operations are reconciled to net earnings, as determined in accordance with IFRS, in the "Net Earnings and Cash Flow from Operations" section of the Company's MD&A. The derivation of cash production costs is included in the "Operating Highlights – Oil Sands Mining and Upgrading" section of the Company's MD&A. The Company also presents certain non-GAAP financial ratios and their derivation in the "Liquidity and Capital Resources" section of the Company's MD&A.

Volumes shown are Company share before royalties unless otherwise stated.

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