Cenovus EnCAID approval #10440L Performance Presentation

Alberta Energy Regulator

Calgary

February 2018

cenovus ENERGY

Advisory

This document contains forward-looking information prepared and submitted pursuant to the Alberta Energy Regulator's requirements and is not intended to be relied upon for the purpose of making investment decisions, including without limitation, to purchase, hold or sell any securities of Cenovus Energy Inc. Additional information regarding Cenovus Energy Inc. is available at cenovus.com.

Cenovus EnCAID* introduction and overview

This presentation was prepared in accordance with AER Directive 054 - Performance presentations, auditing, and surveillance of in situ oil sands schemes

Subsurface issues related to resource evaluation and recovery

- Directive 054, Section 3.1.1

Surface operations, compliance, and issues not related to resource evaluation and recovery

- Directive 054, Section 3.1.2

*** Canadian patent CA2594413 (C)**

AER Dir 054 Section 3.1.1

Subsurface issues related to resource evaluation and recovery

Subsurface issues: table of contents

- Background
- Geology/geoscience
- Drilling and completions
- Instrumentation
- Scheme performance
- Future plans

Scheme background

Directive 54
Subsurface section 1

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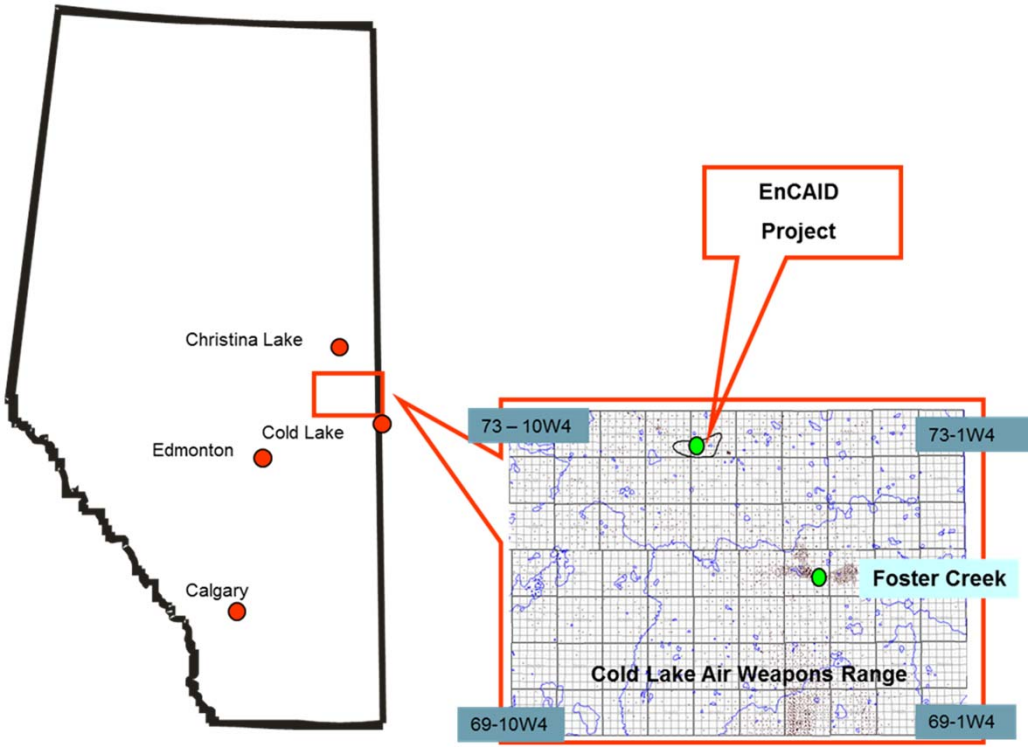
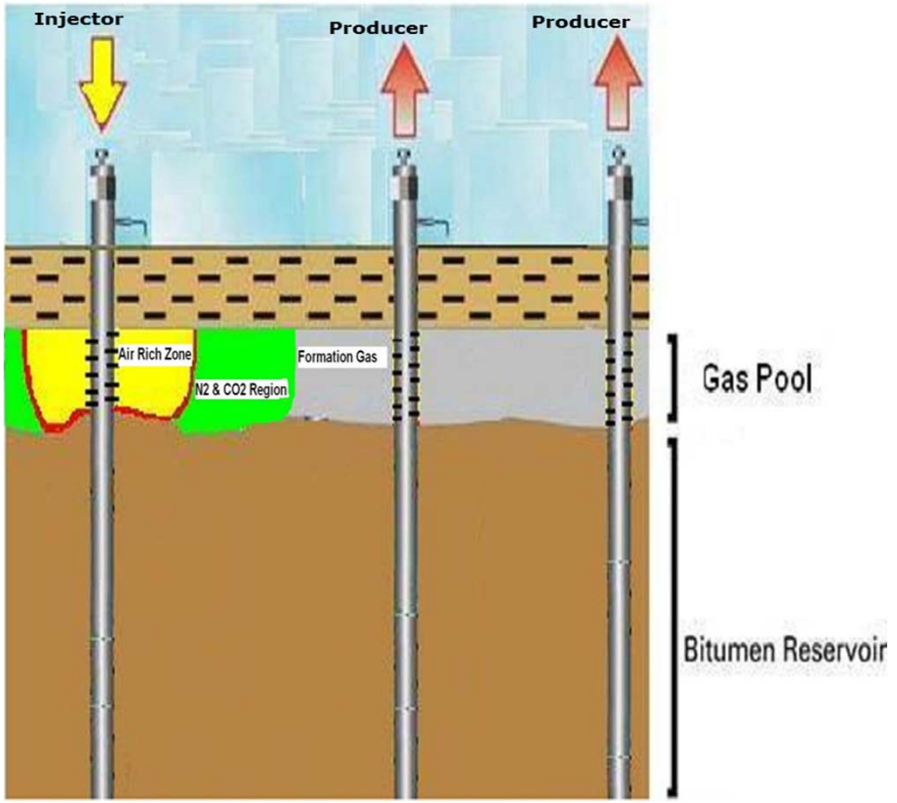
Background

- The EnCAID project is an enhanced recovery scheme which displaces natural gas with combustion gases that are the result of combustion of residual bitumen in gas cap



Project overview

- Combustion of residual bitumen in gas cap
- Allows for displacement and re-pressurization of gas zone
- 100% Cenovus Energy Inc.



Geological/geoscience

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Subsurface section 2

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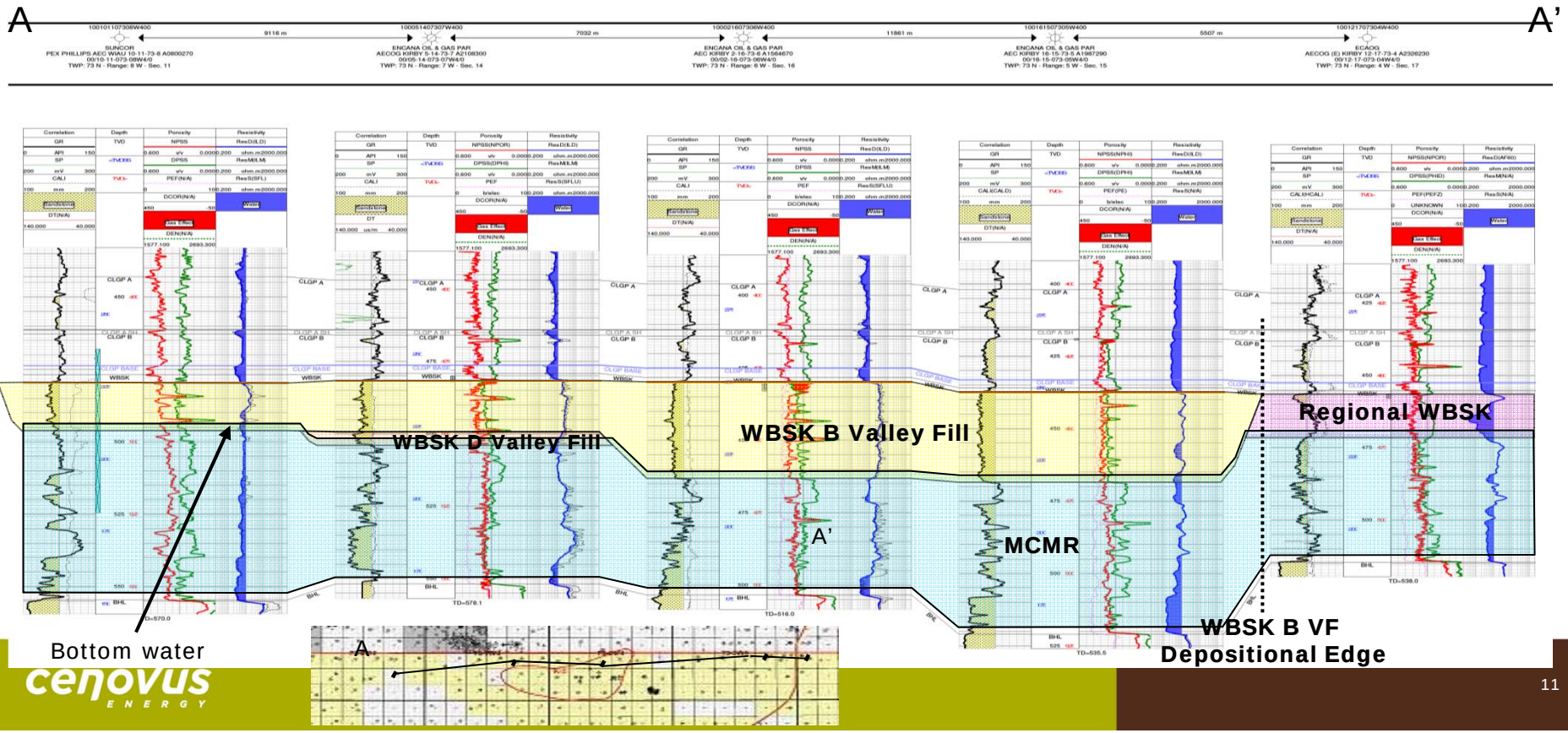
Summary of Wabiskaw gas properties

Depth	**465 TVD**
Thickness	**5 m**
Average porosity	**~36%**
Average gas saturation	**~50%**
Average water saturation	**~30%**
Average bitumen saturation	**~20%**

Wabiskaw stratigraphic cross-section



Drilling and completion

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Subsurface section 3

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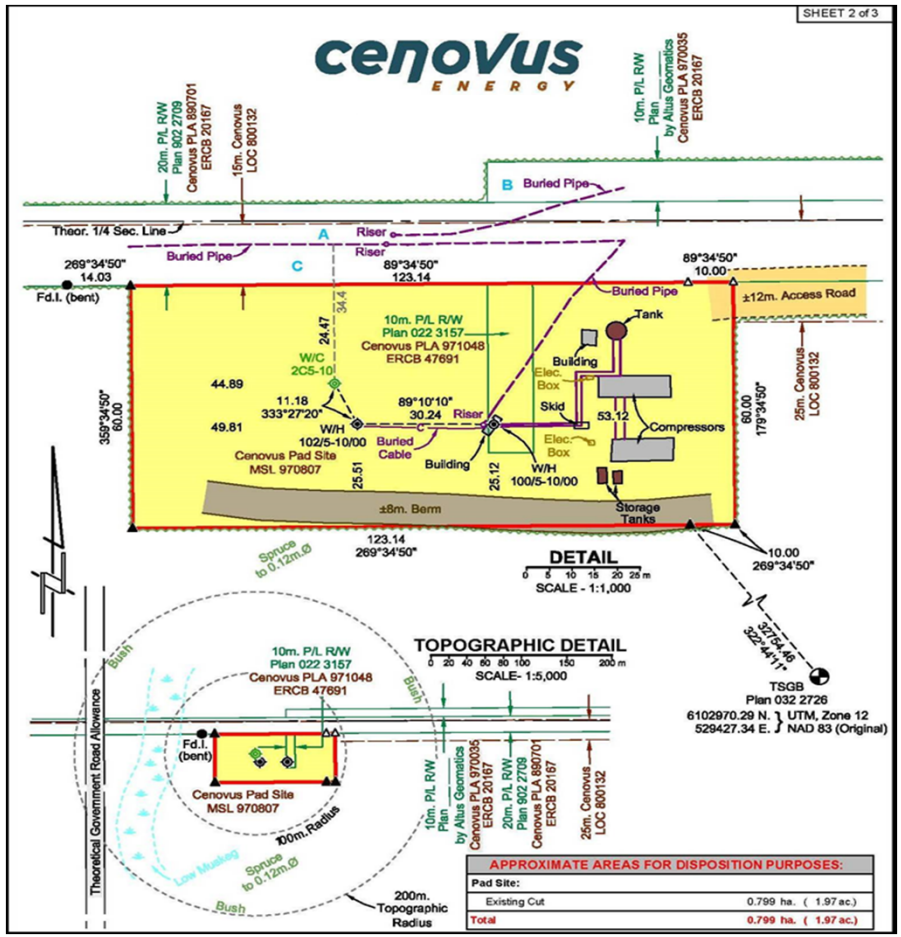
Well layout



Drilling and completion

- No new wells were drilled
- No recompletions
- No workovers

Requirements under subsection 3.1.1 3c – wellbore schematics are included in the appendix

Instrumentation

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Subsurface section 5

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Instrumentation in wells

Observation Well: 102/05-10-73-6W4

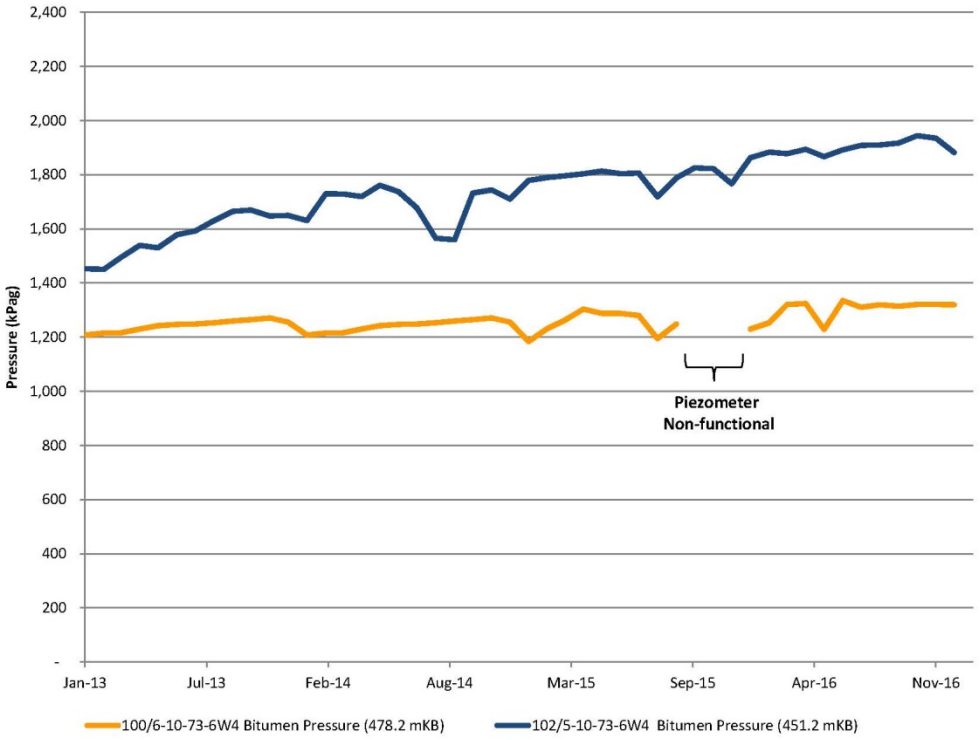
- Equipped with three piezometers
- Equipped with 10 thermocouples

Observation Well: 100/6-10-73-6W4

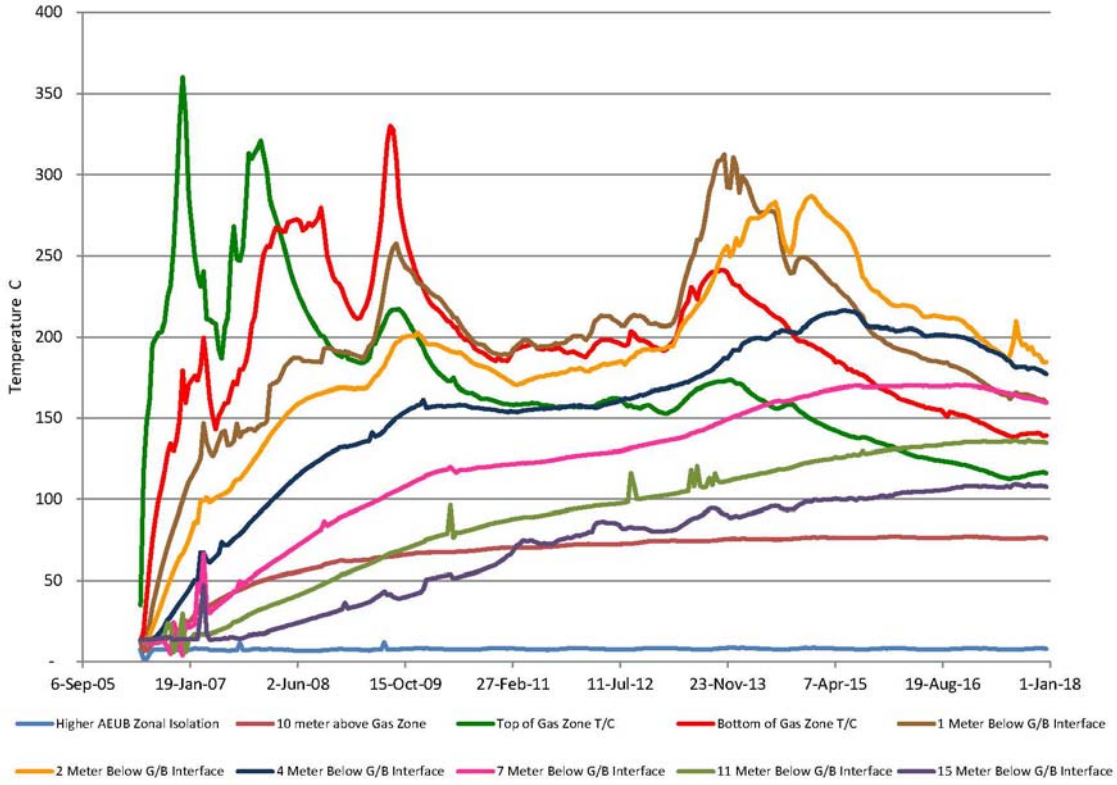
- Equipped with one piezometer
- Equipped with 10 thermocouples

Requirements under subsection 3.1.1 5a – wellbore schematics 5c and 5d are included in the appendix

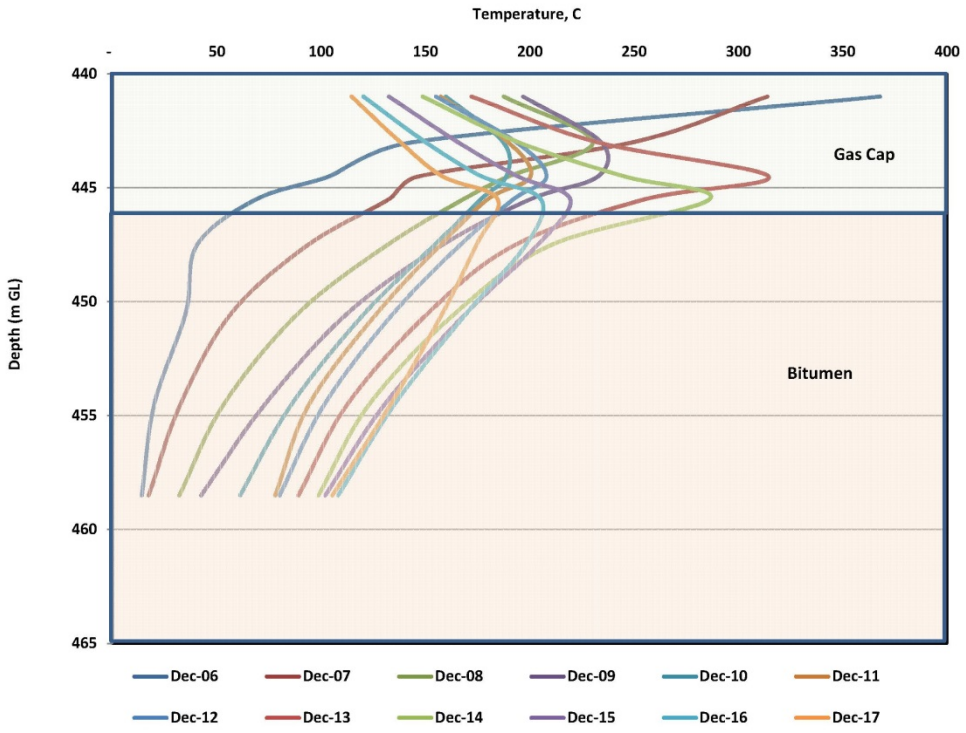
Observation wells bitumen pressure



102/05-10-073-06W4 – Temp history



102/05-10-073-06W4/0
Observation well temperature



Scheme performance

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Subsurface section 7

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Project performance history

Year	Activity		
2006	June: Ignition and start-up	2012	Jul: 00/6-7-76-6W4/00 startup Oct: Primrose sales volumes flowing to Caribou gas facility
2007	Q1: 00/14-9-73-6W4/00 nitrogen response a Q2: 00/2-16-73-6W4/00, 00/11-15-73-6W4/00 nitrogen response. 00/14-9-73-6W4/00 shut-in	2013	Feb: 00/6-6-73-6W4/00 startup of Mar:00/7-8-73-6W4/00 shut-in
2008	May: Nitrogen response at 00/1-17-73-6W4/00	2014	Dec: 00/10-12-73-7W4/00 startup
2009	Jan: 00/6-18-73-6W4/00 gas production shut-in due to segregation repair Jun: 00/7-8-73-6W4/00 nitrogen response Oct: Injectivity decrease observed	2016	Feb: 00/11-15-73-6W4 abandoned Jul: S00/10-11-73-7W4/00 startup
2010	Q1: 00/5-10-73-6W4/00 injector stimulation treatment Q4: 00/1-17-73-6W4/00, 00/2-16-73-6W4/00, 00/11-15-73-6W4/00 shut-in. 00/5-10-73-6W4/00 removal of thermocouple string and perform pressure fall off tests	2017	Mar/Apr: Production shut-in due to non-compliance event Aug: 00/06-05-073-06/W4 shut-in Oct: 00/10-11-073-06W4 returned to production at restricted rate
2011	Q1: 00/5-10-73-6W4/00 injector stimulation treatment Mar/Apr: 00/11-15-73-6W4/00 flowed N_2 85%		

Production/injection summary

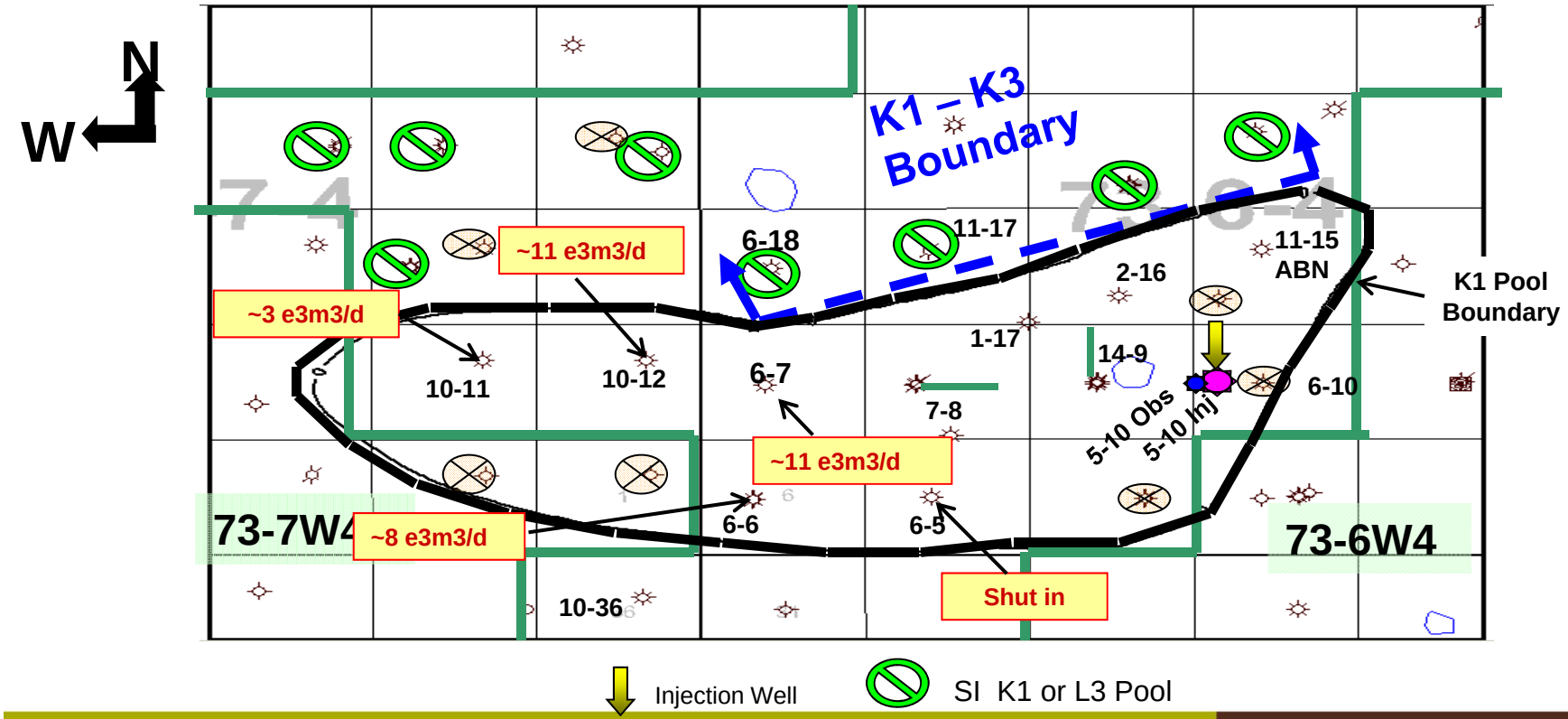
Production operations

Operating for	Air injected	Bulk gas recovered	Formation gas recovered
>11 years	~ 293 e^6m^3	~ 203 e^6m^3	~ 180 e^6m^3

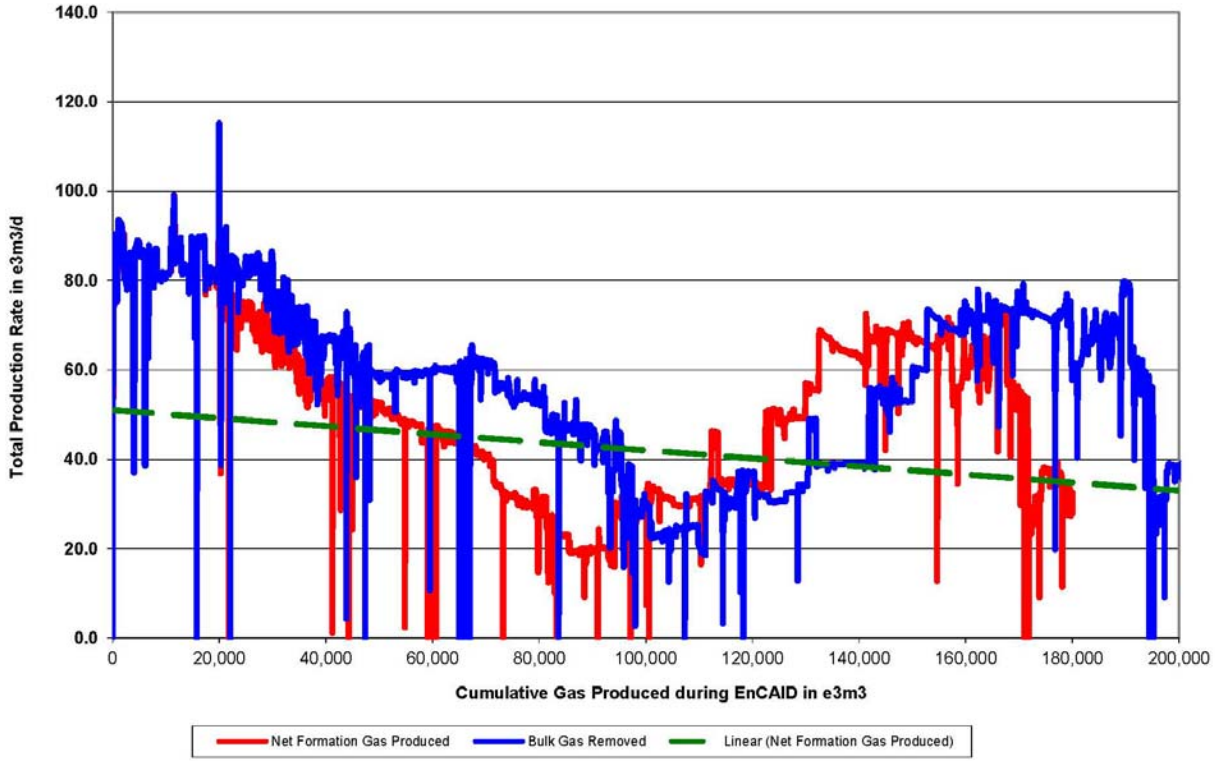
Approved producers

UWI	Status	UWI	Status
00/06-05-073-06W4/0	Shut-in ~ 76% N_2	00/02-16-073-06W4/0	Shut-in ~ 85% N_2
00/06-06-073-06W4/2	Flowing <1% N_2	00/01-17-073-06W4/0	Shut-in ~ 85% N_2
00/06-07-073-06W4/2	Flowing <1% N_2	00/10-11-073-07W4/0	Flowing <1% N_2
00/07-08-073-06W4/0	Shut-in ~ 88% N_2	00/10-12-073-07W4/0	Flowing <1% N_2
00/11-15-073-06W4/0	Abandoned	00/14-09-073-06W4/0	Shut-in ~ 87% N_2

K3 pool production



History production



Voidage replacement ratio (VRR) - 2018

January to June

Steady high air injection rates

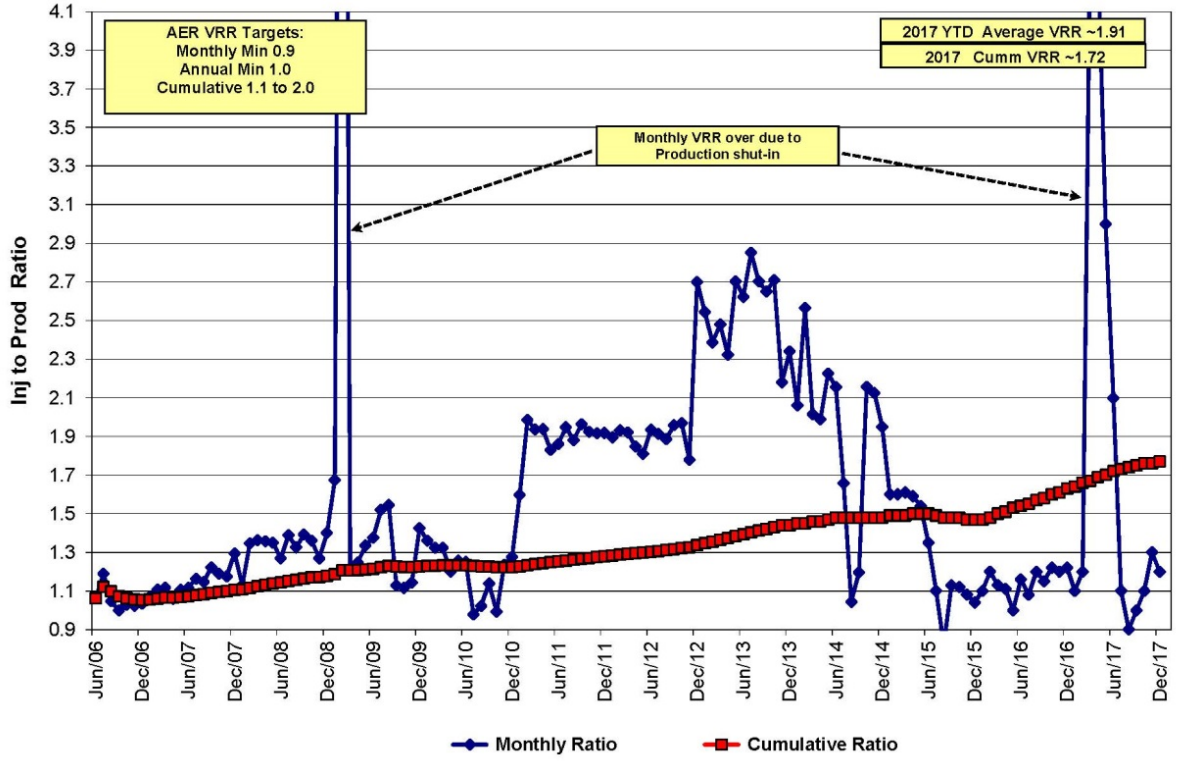
July to December

Reduce air injection rates to manage operating costs with intermittent high air injection rates to ensure that the minimum monthly VRR of 0.90 was met

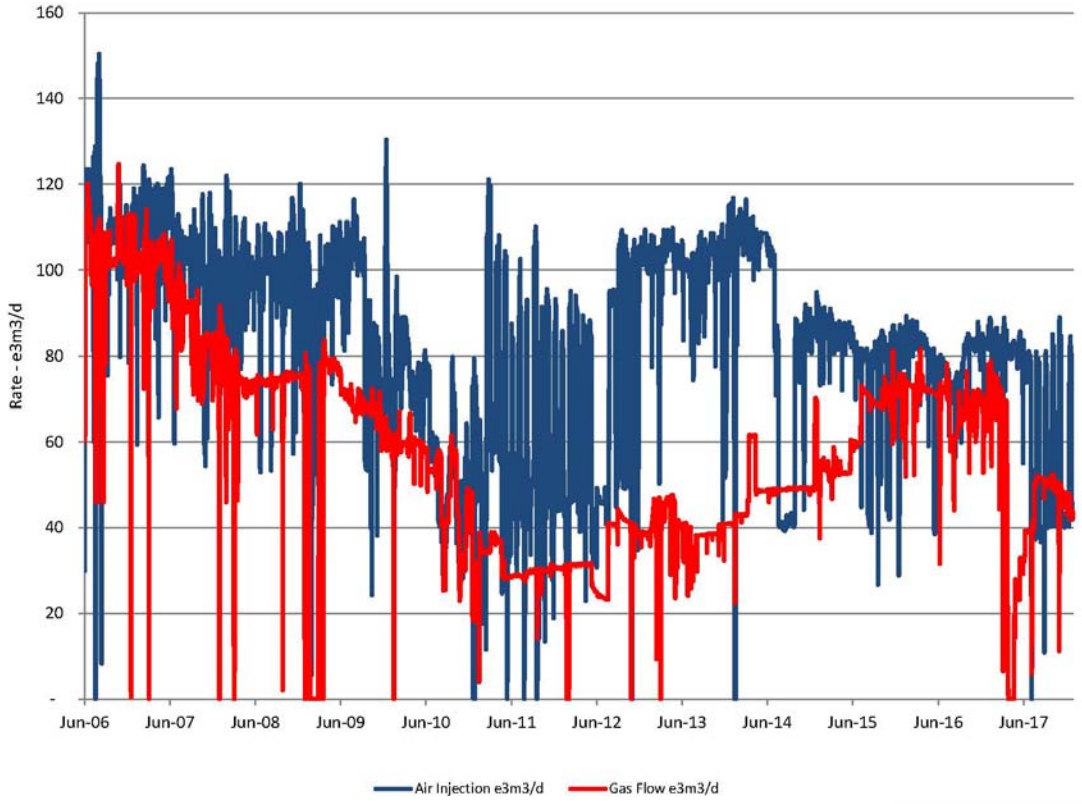
Voidage replacement ratio

	Monthly VRR	Cumulative VRR	VRR regulatory approved limit (Min monthly)
January	1.10	1.64	0.90
February	1.20	1.66	0.90
March	4.50	1.67	0.90
April	4.40	1.69	0.90
May	3.00	1.70	0.90
June	2.10	1.72	0.90
July	1.10	1.73	0.90
August	0.90	1.74	0.90
September	1.00	1.75	0.90
October	1.10	1.76	0.90
November	1.30	1.76	0.90
December	1.20	1.77	0.90

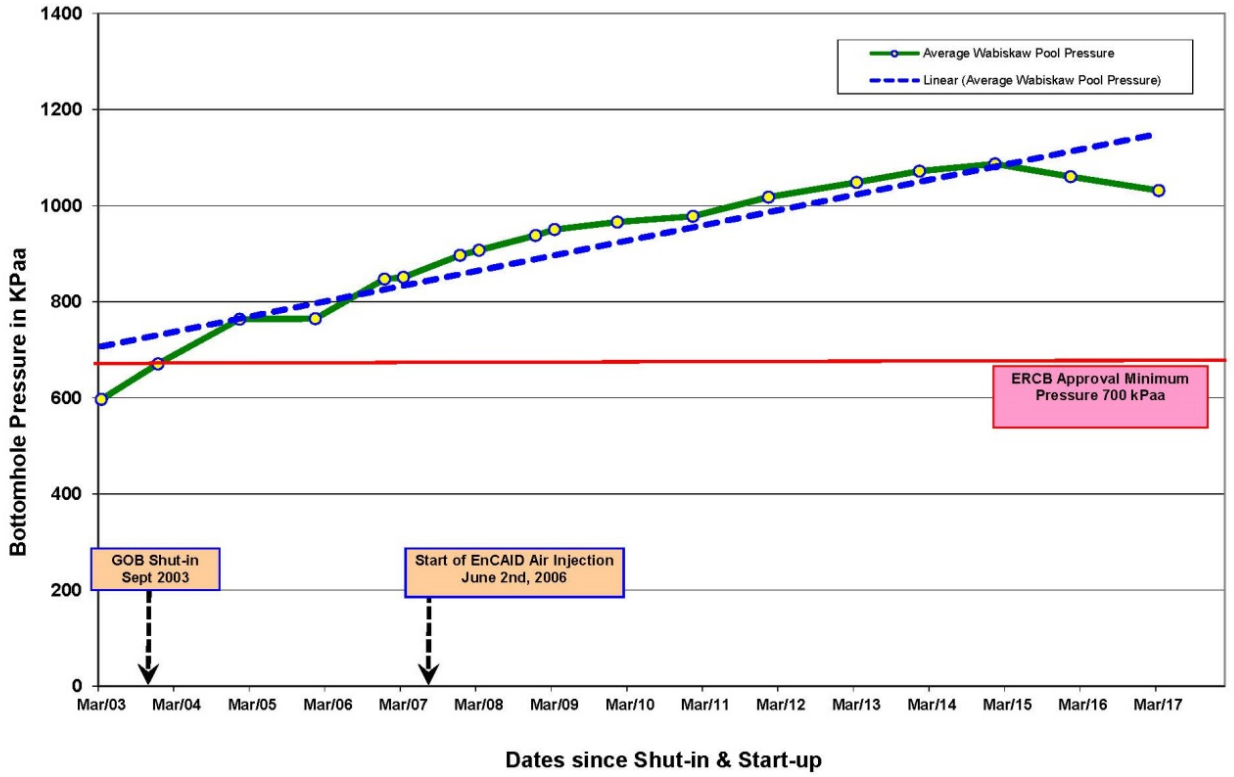
VRR performance



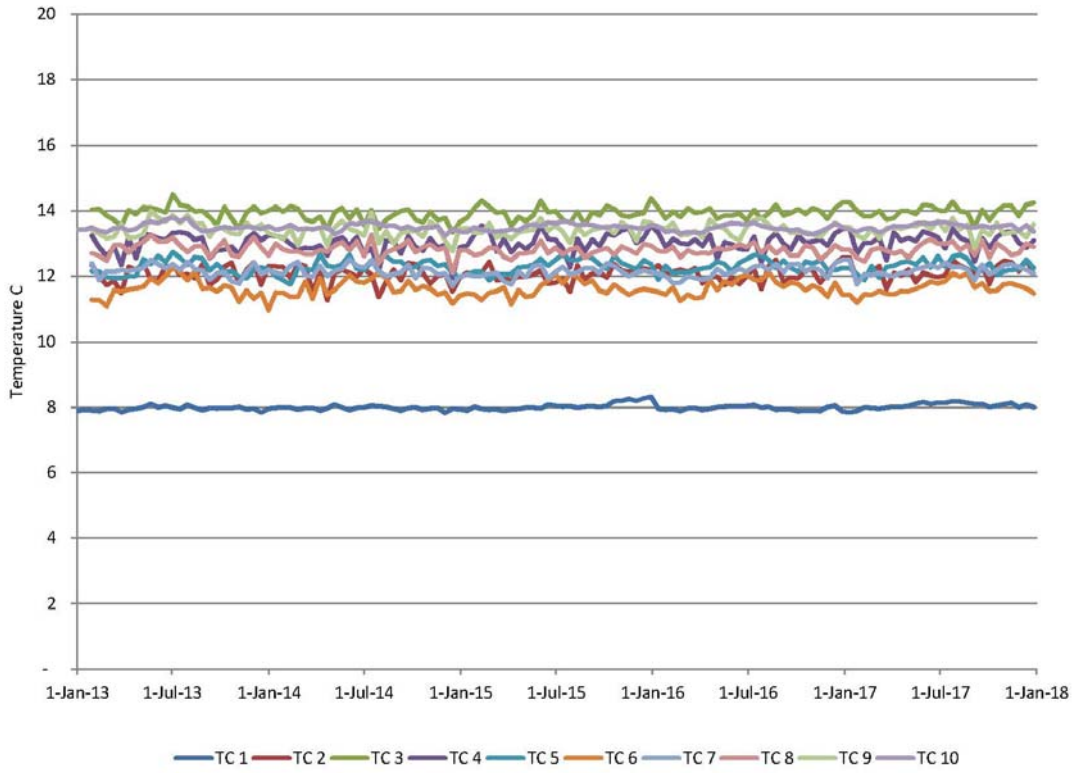
VRR history



K3 pool pressure



Observation 6-10 well temperature

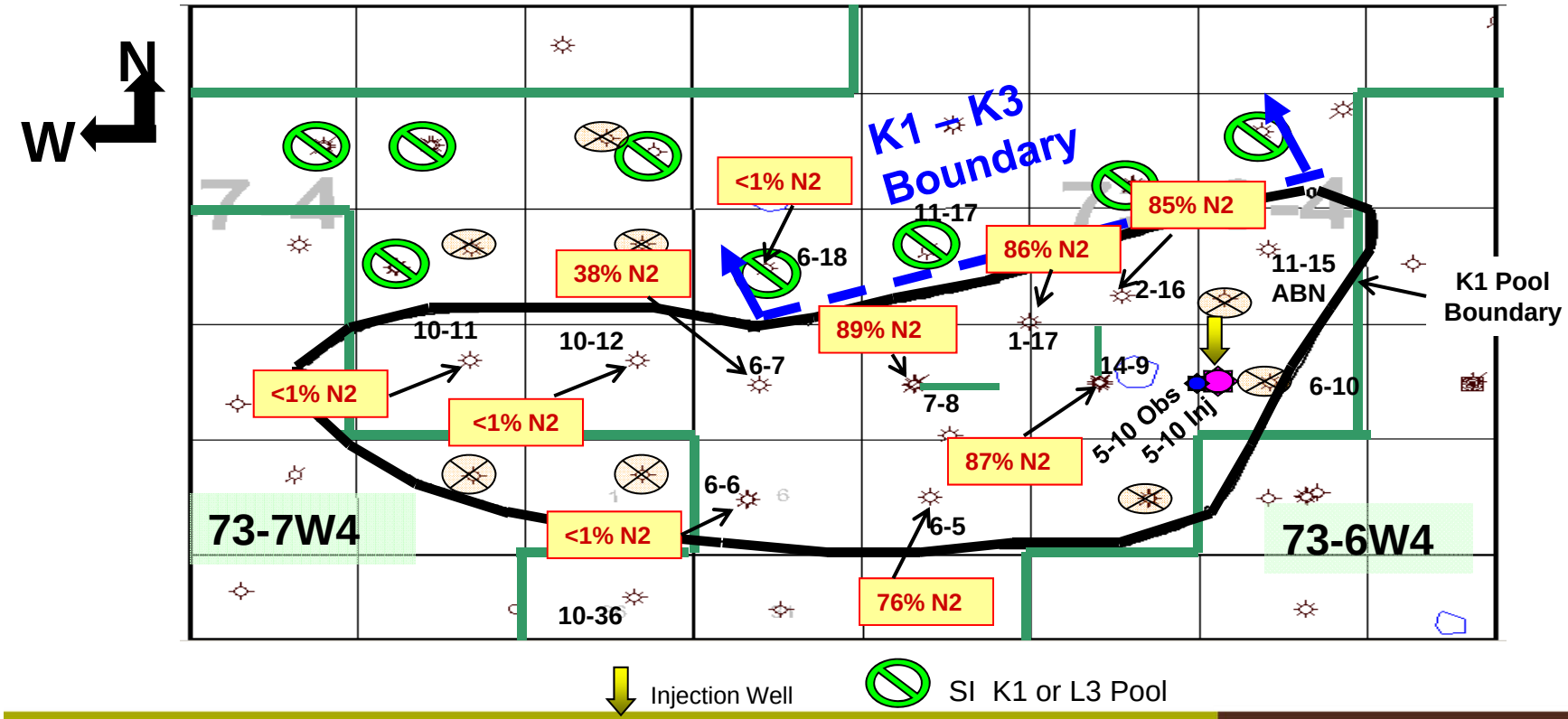


Composition of injected/produced fluids

- EnCAID does not currently sample air injected
- EnCAID captures gas samples for analysis on the schedule located to the right and monitors compositional changes for each well
- Cenovus samples selective wells on more frequent basis than required under Approval 10440L

	Sampling Frequency
00/01-17-073-06W4/0	Annual
00/02-16-073-06W4/0	Annual
00/06-05-073-06W4/0	Semi-annual
00/06-06-073-06W4/2	Semi-annual
00/06-07-073-06W4/2	Semi-annual
00/06-10-073-06W4/2	Annual
00/06-18-073-06W4/0	Annual
00/07-08-073-06W4/0	Annual
00/10-11-073-07W4/0	Semi-annual
00/10-12-073-07W4/0	Semi-annual
00/10-36-072-07W4/2	Annual
00/11-17-073-06W4/0	Annual
00/14-09-073-06W4/0	Annual

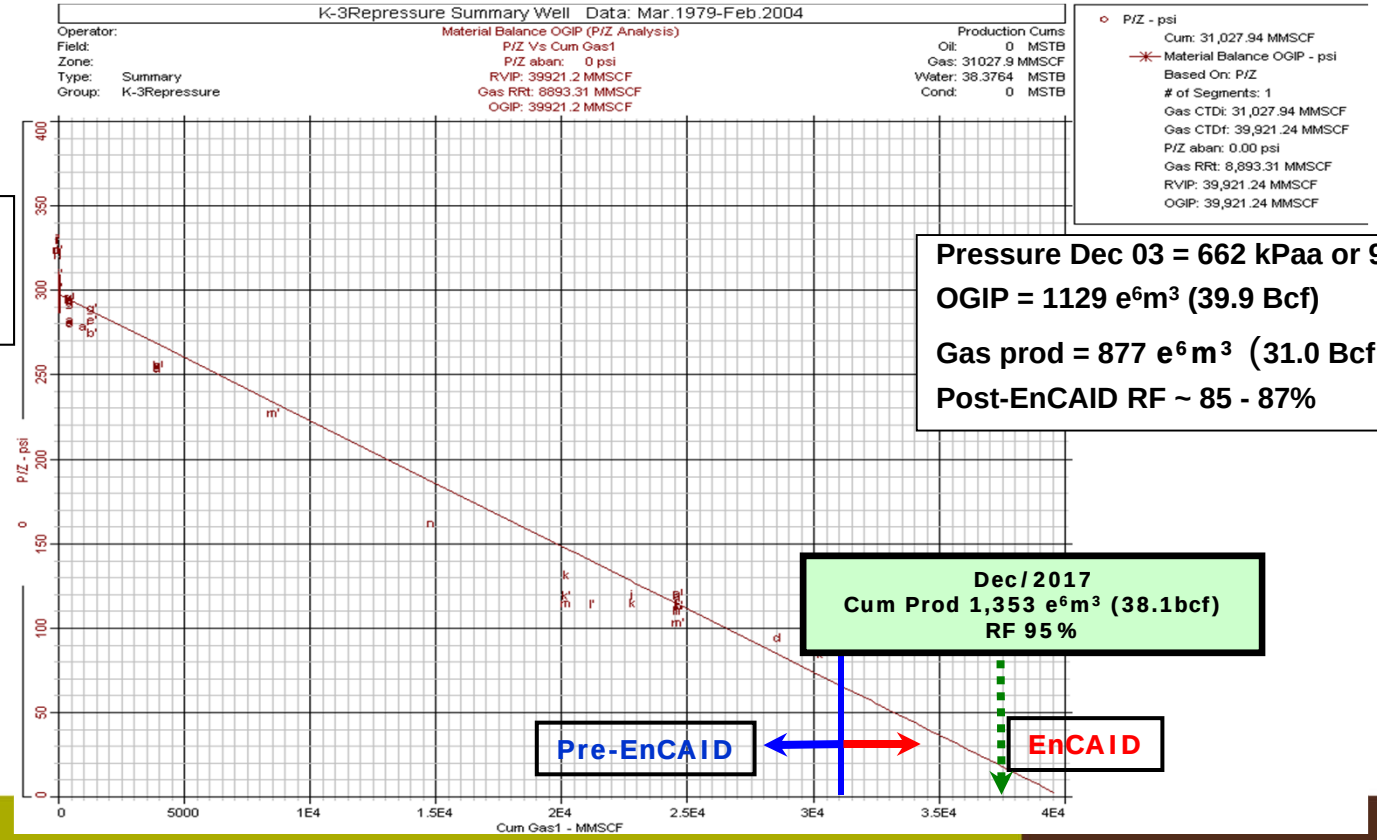
Nitrogen response



Wabiskaw K-3 Pool material balance

Original Pressure – 2050 kPaa

(300 psia)



Pressure Dec 03 = 662 kPaa or 96 psia

OGIP = 1129 e^6m^3 (39.9 Bcf)

Gas prod = 877 e^6m^3 (31.0 Bcf 77% RF)

Post-EnCAID RF ~ 85 - 87%

Dec/2017
Cum Prod 1,353 e^6m^3 (38.1bcf)
RF 95%

Pre-EnCAID

EnCAID

Subsurface key learnings

Presence of more than one oxidation front indicates

- fuel remaining in the region swept by the combustion front
- could be either residual oil left behind first oxidation front, or re-saturation with oil from adjacent rock or, possibly from flammable vapor produced from the oxidation and cracking reactions

Continues to be strong correlations between air-injection rate and temperature changes

- first oxidation zone at the bottom of the gas cap was truncated by a reduction in injection rate
- increase in injection rate performed in early 2013 resulted in ignition and combustion of the top of the bitumen

Future plans

Subsurface section 8

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Future plans

- No changes in overall recovery strategy are planned at this time

AER Dir 54 Section 3.1.2

Surface operations, compliance and issues not related to resource evaluation and recovery

Surface operations: table of contents

- Facility overview/modifications
- Measurement and reporting
- Environmental issues
- Compliance statement
- Future plans

Facility overview/modifications

Directive 54
Subsurface Operations section 1

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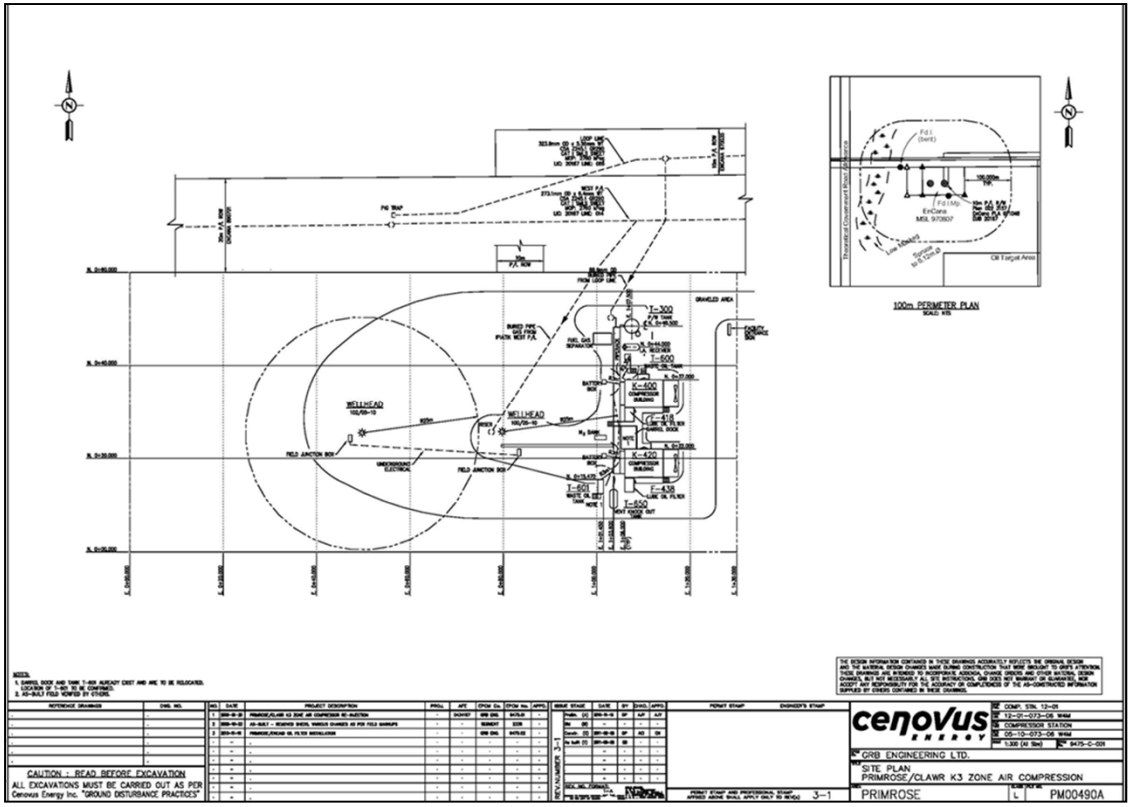
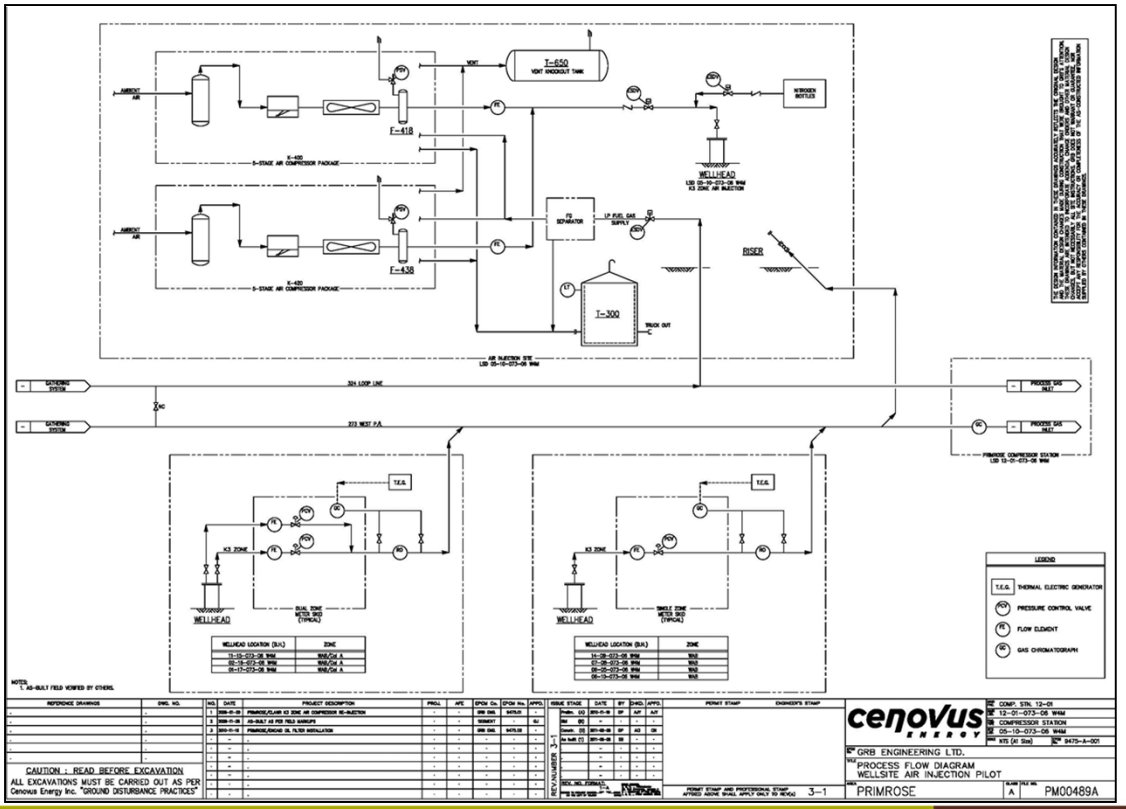
Site Layout



Process flow schematic



Plant performance - 2018

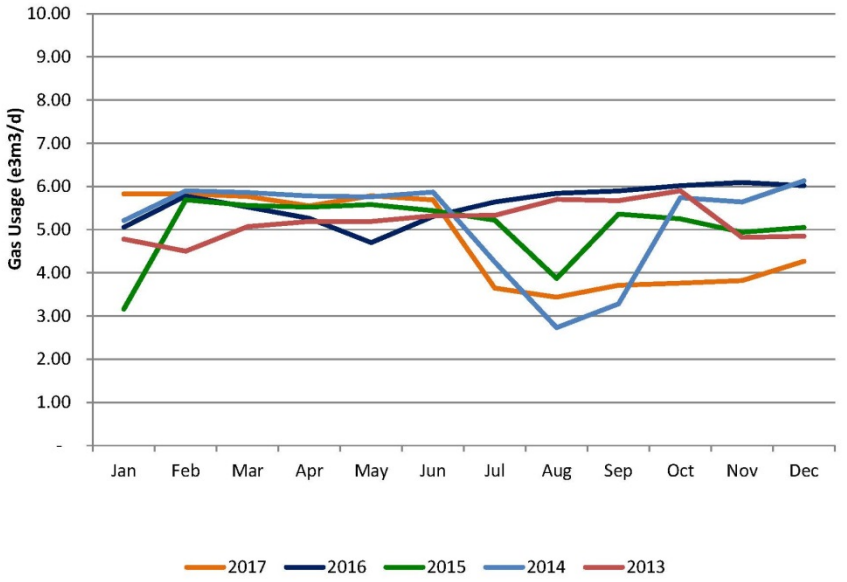
Facility is operating as expected

- Steady air injections
- Some weather related reductions

Gas usage

Usage is as fuel gas for air compressor operations

- Gas source Primrose plant fuel gas
- Total 2017 usage 1,727 e^3m^3



Greenhouse gas emissions

	2017 (tonnes)
January	498.72
February	450.19
March	486.36
April	463.91
May	490.85
June	473.46
July	307.69
August	294.32
September	307.01
October	325.18
November	317.18
December	343.09

Surface facility key learnings

- Safe operation of production and injection wells
- Geographical location provides challenges for instrumentation operations utilizing solar panels during the winter season
- Purity of injection gases plays key role in maintaining injectivity
- Marginal economics to operate in today's pricing environment

Measurement and reporting

Directive 54
Surface Operations section 2

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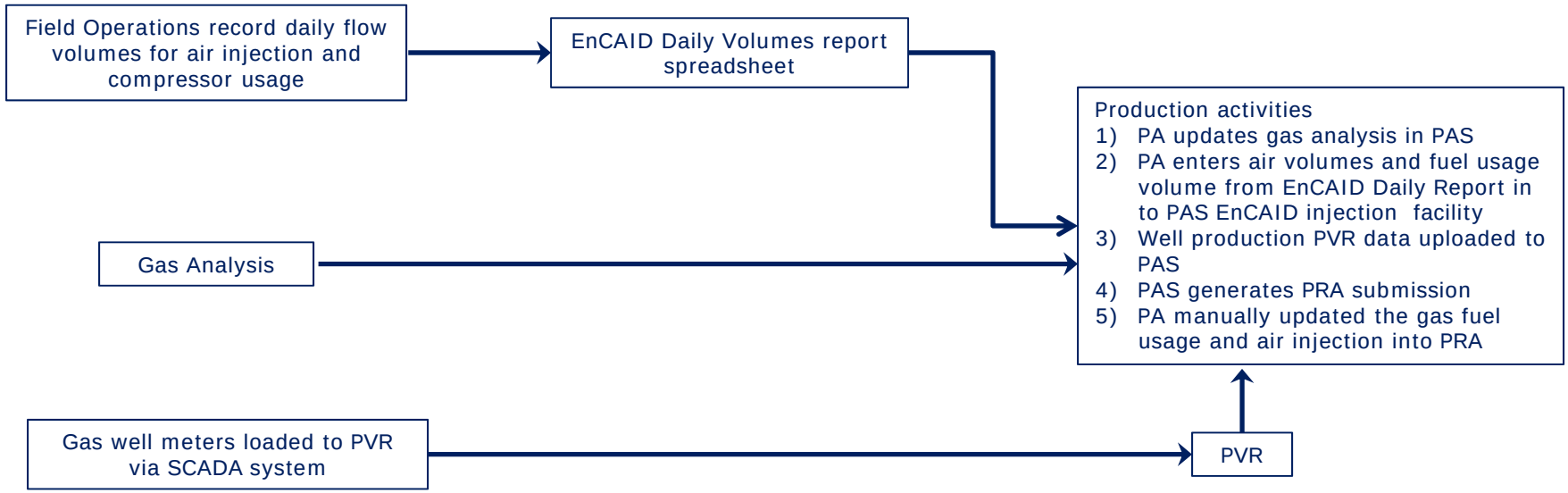
Measurement reporting



Environmental issues

Directive 54
Subsurface Operations section 7

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Environmental compliance

No environmental non-compliance events occurred related to EnCAID occurred in 2017

Compliance statement

Directive 54
Subsurface Operations section 8

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Compliance confirmation

Two non-compliance events related to EnCAID Approval 10440L occurred in 2017

- **10440L Section 7) (2)**
  - Non-continuous monitoring of surface pressure on 00/14-09-073-06W4/0
- **10440L Section 13)**
  - Bottom hole stabilized pressure fell below 700 kPaa

Non-compliance discussion

Directive 54
Surface operations section 9

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Non-compliance discussion

10440L Section 7) (2) - Non-continuous monitoring of surface pressure on 00/14-09-073-06W4/0

- March 17, 2017 - Shared electronic equipment was accidently removed when an adjacent well was abandoned
- March 22, 2017 - Event was detected by CVE staff
- March 22, 2017 - Mitigation to ensure compliance implemented and continued until permanent repair was carried out.
- March 23, 2017 - Disclosed to AER

Non-compliance confirmation

10440L Section 13) - Bottom hole stabilized pressure fell below 700 kPaa

- March 21, 2017 – Evaluation of static gradients revived non-compliance event
- March 24, 2017 – AER notified and deemed event low risk
- March 24, 2017 – Mitigation action to shut-in producers completed until approval of restart plan from AER
- April 20, 2017 AER approval received for restart of shut-in producers
- April 21, 217 – Producers restarted

Future plans

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Subsurface Operations section 10

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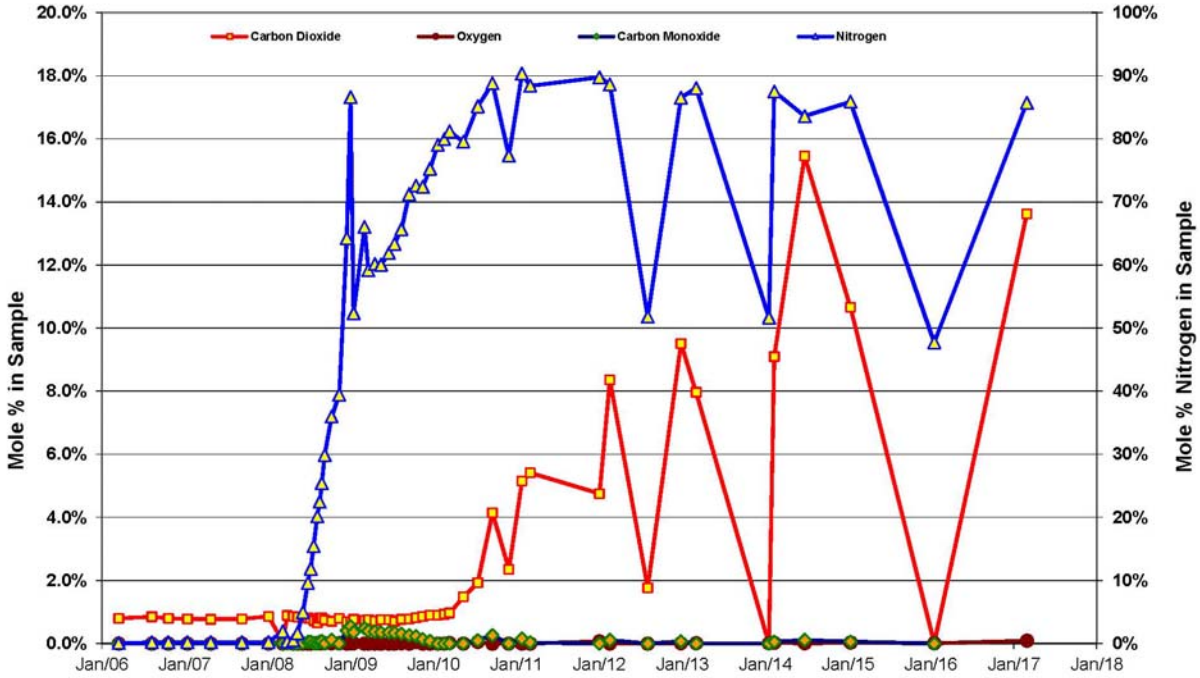
Future plans

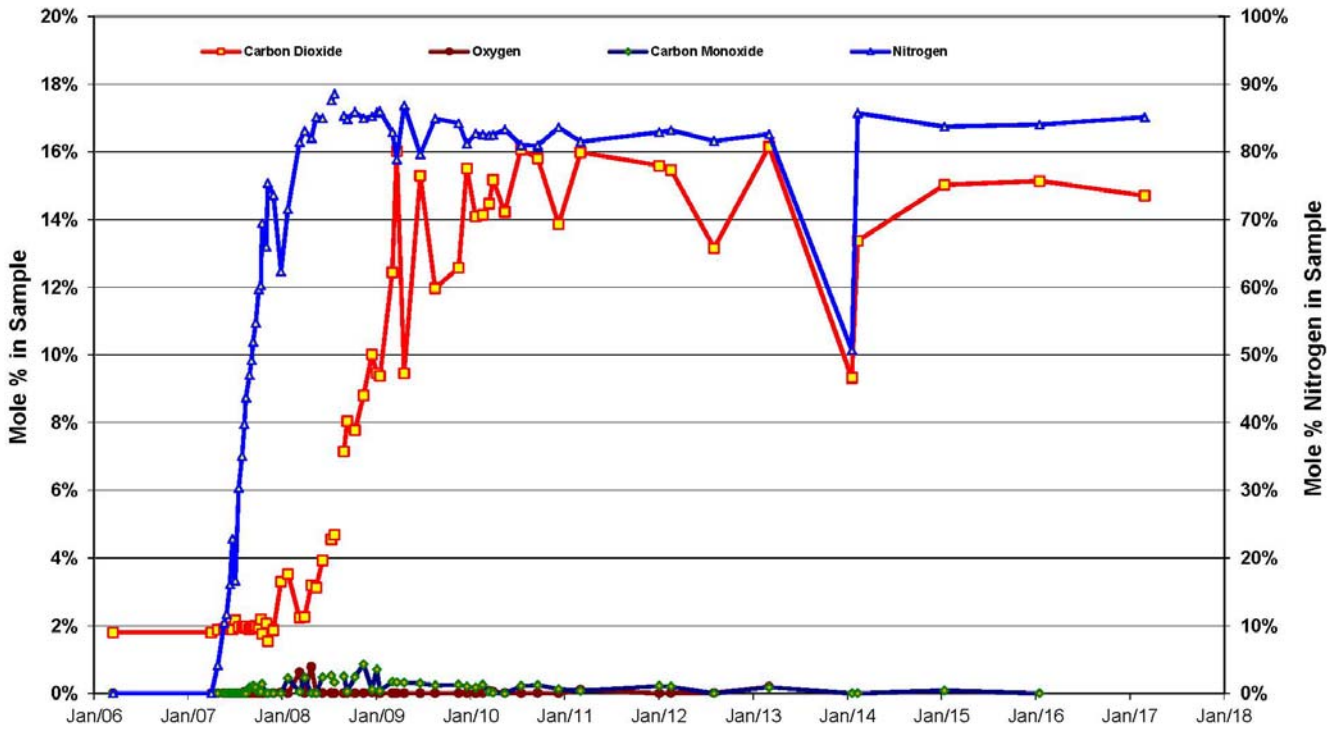
- No major initiatives or plans that may require submission of an application are being contemplated at this time
- No changes to overall plant design or amendments are anticipated at this time
- Operate the project until it is uneconomic

Appendix

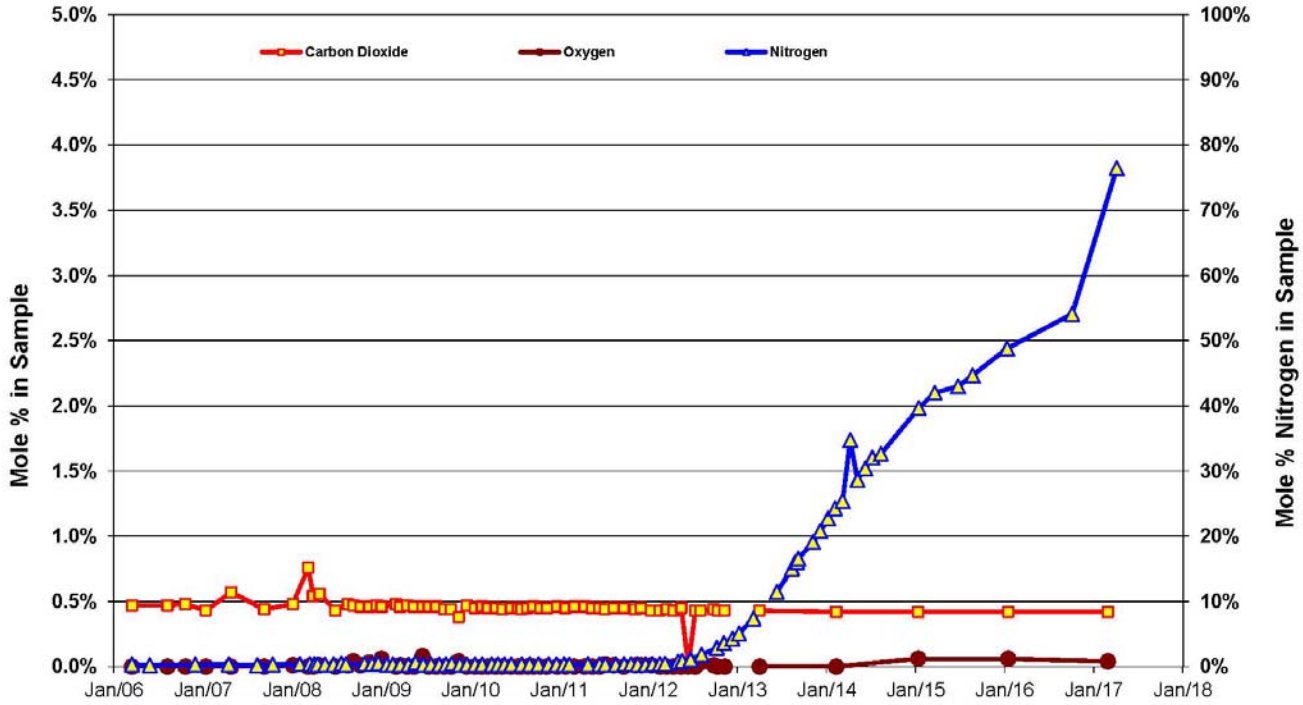
Gas composition 00/1-17-73-6W4/0



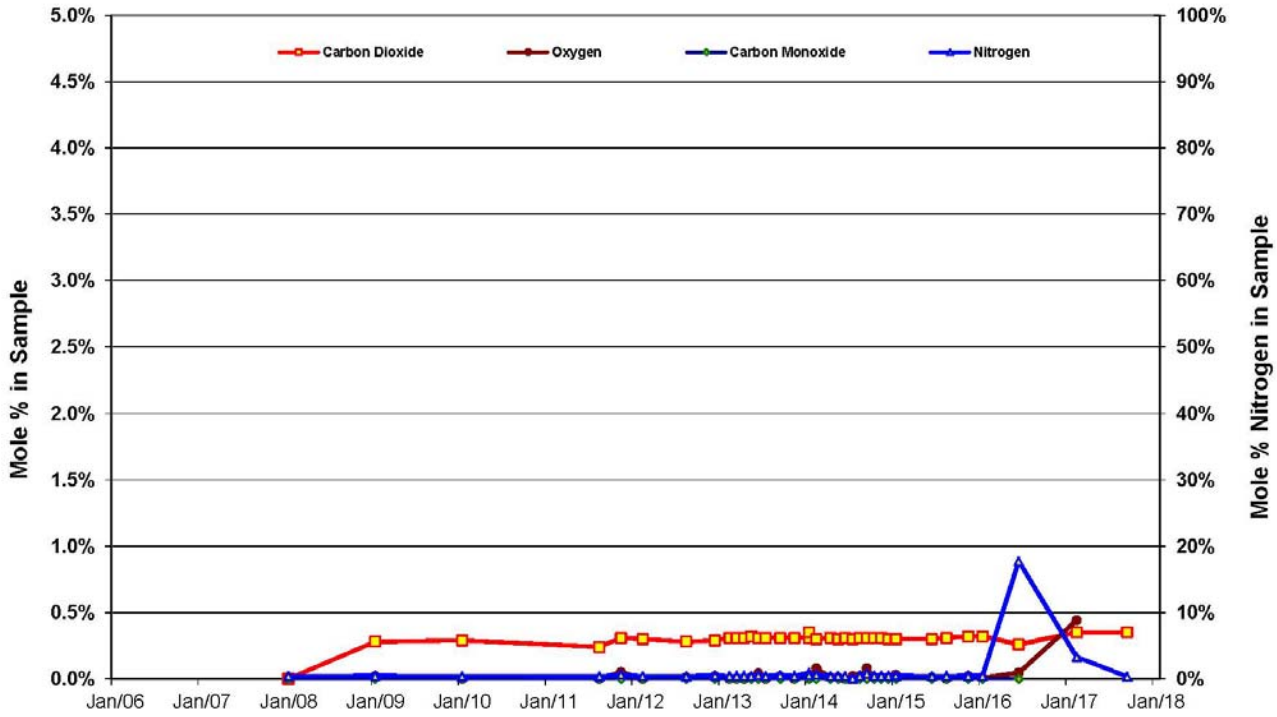
Gas composition 00/2-16-73-6W4/0



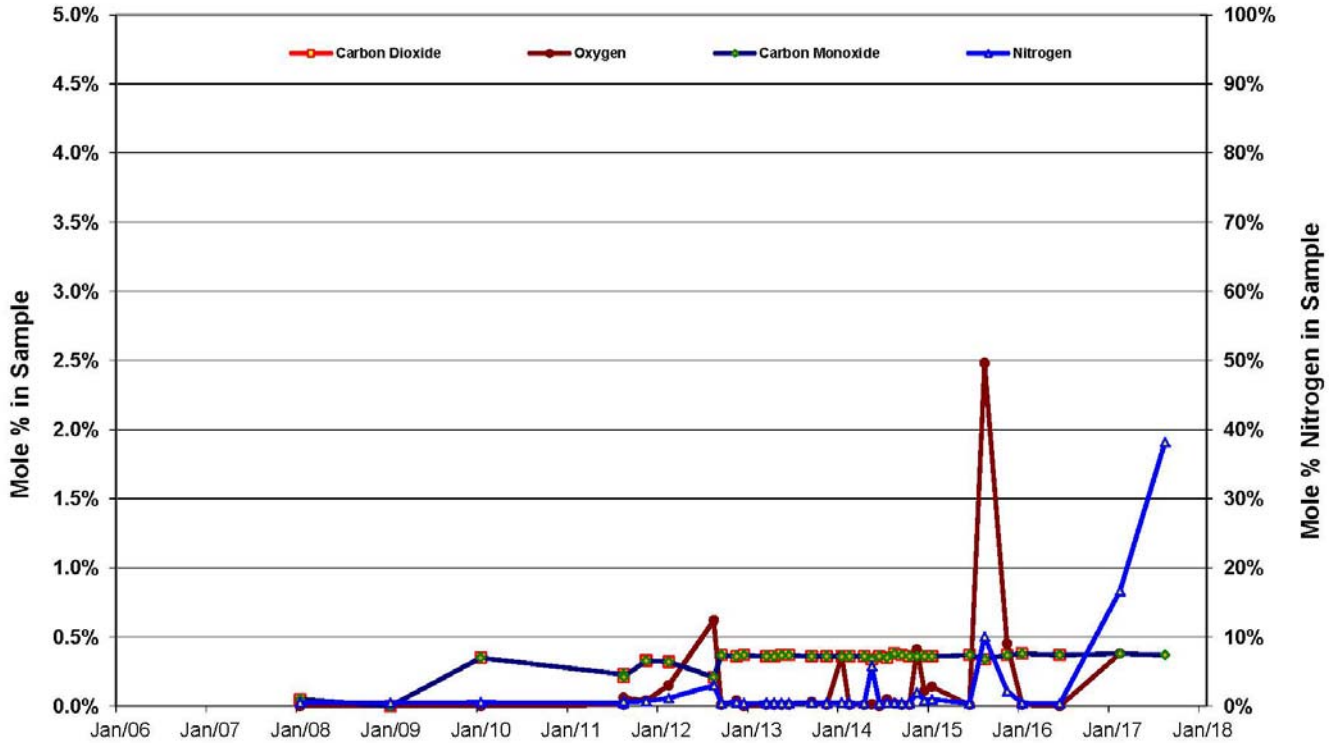
Gas composition 00/6-5-73-6W4/0



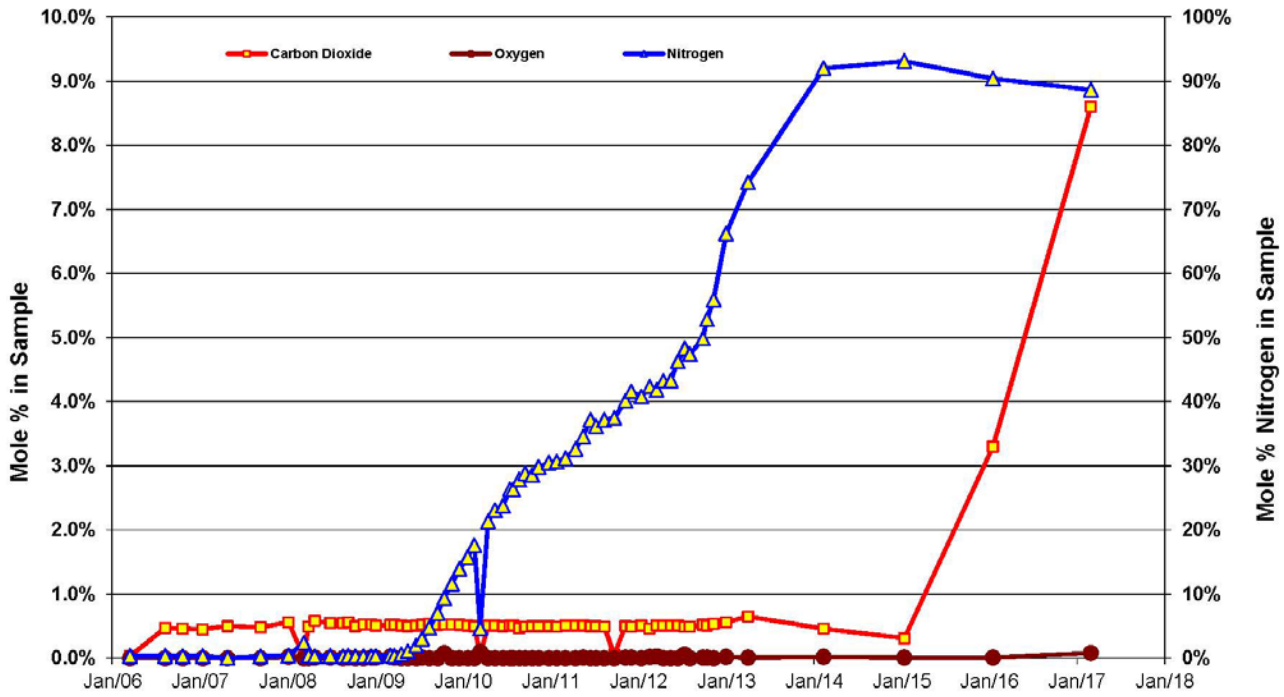
Gas composition 00/6-6-73-6W4/0



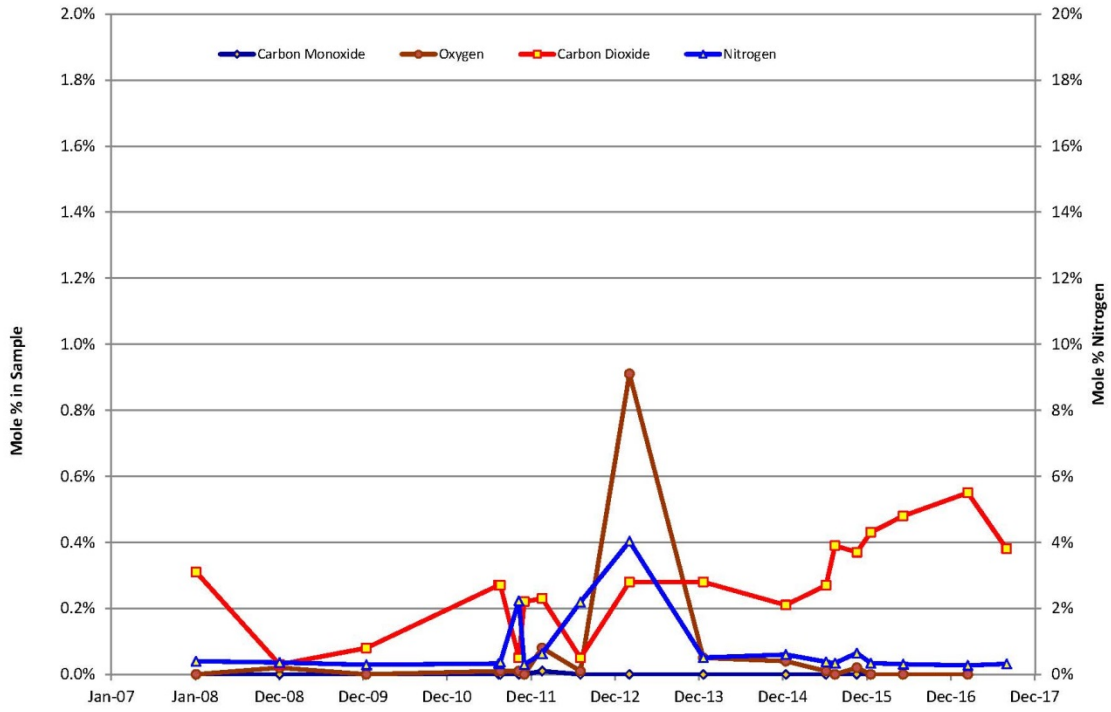
Gas composition 00/6-7-73-6W4/0



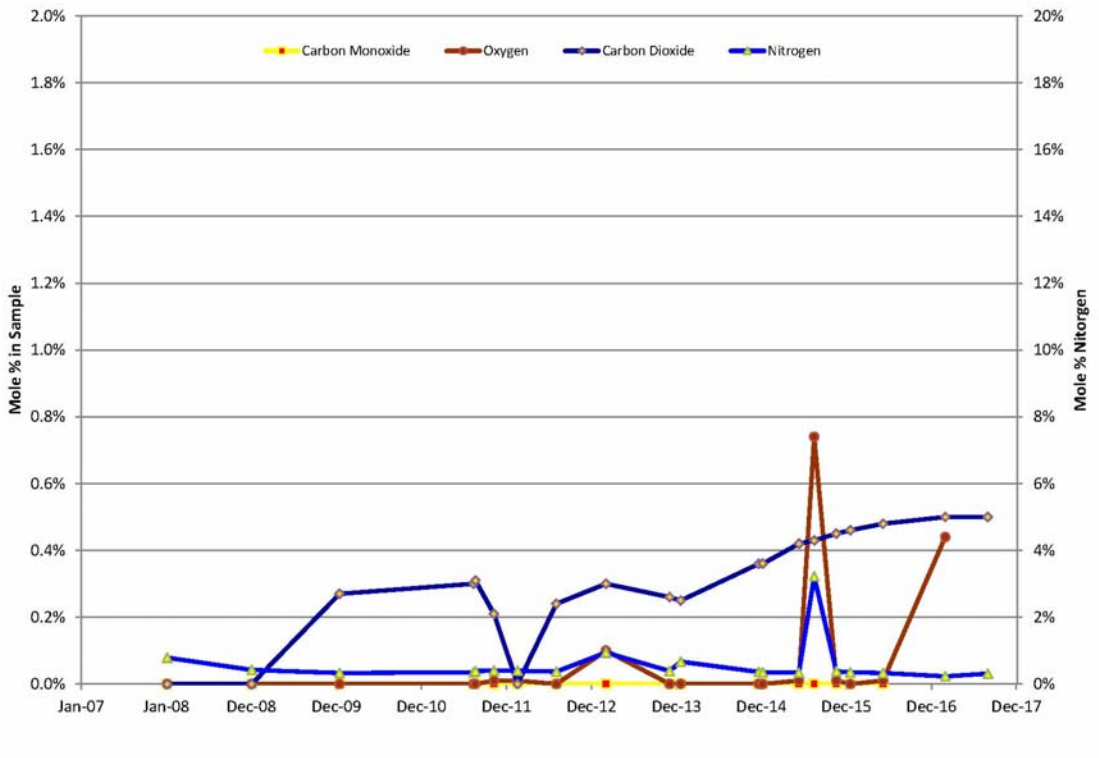
Gas composition 00/7-8-73-6W4/0



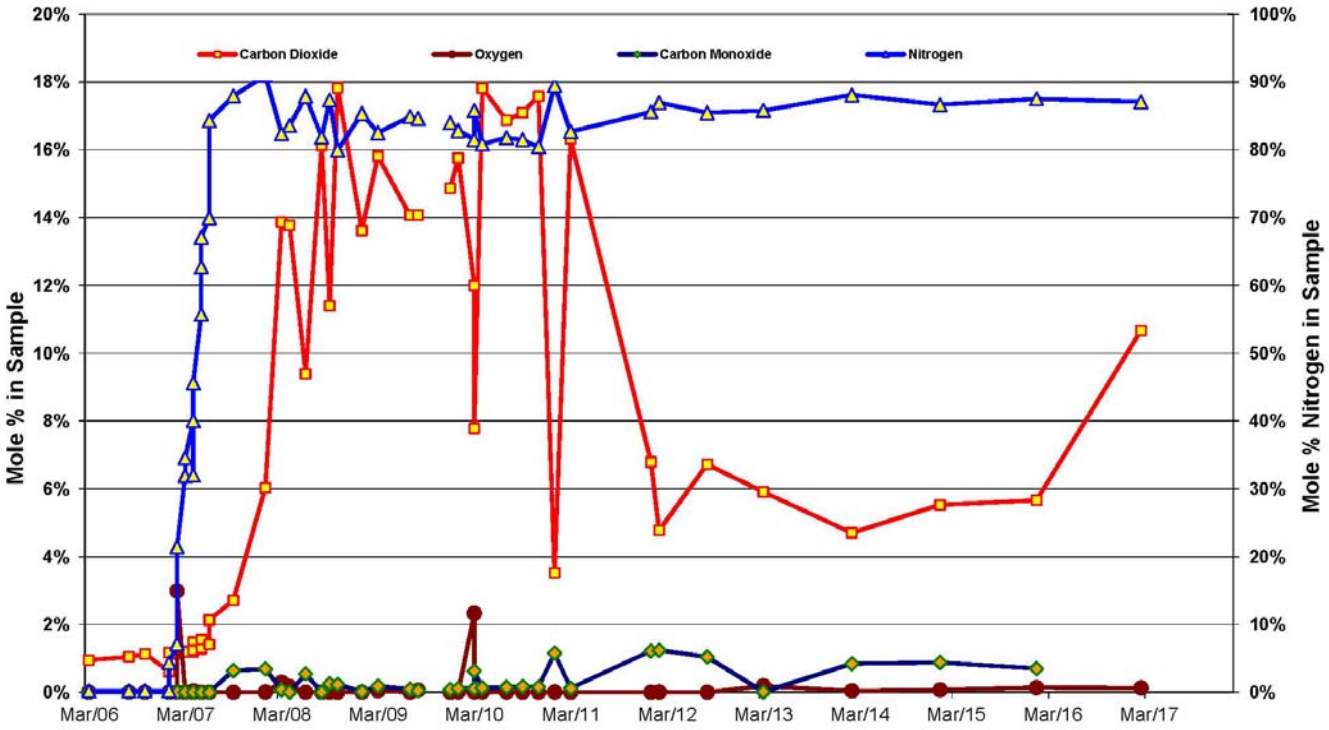
Gas composition 00/10-11-73-7W4/0



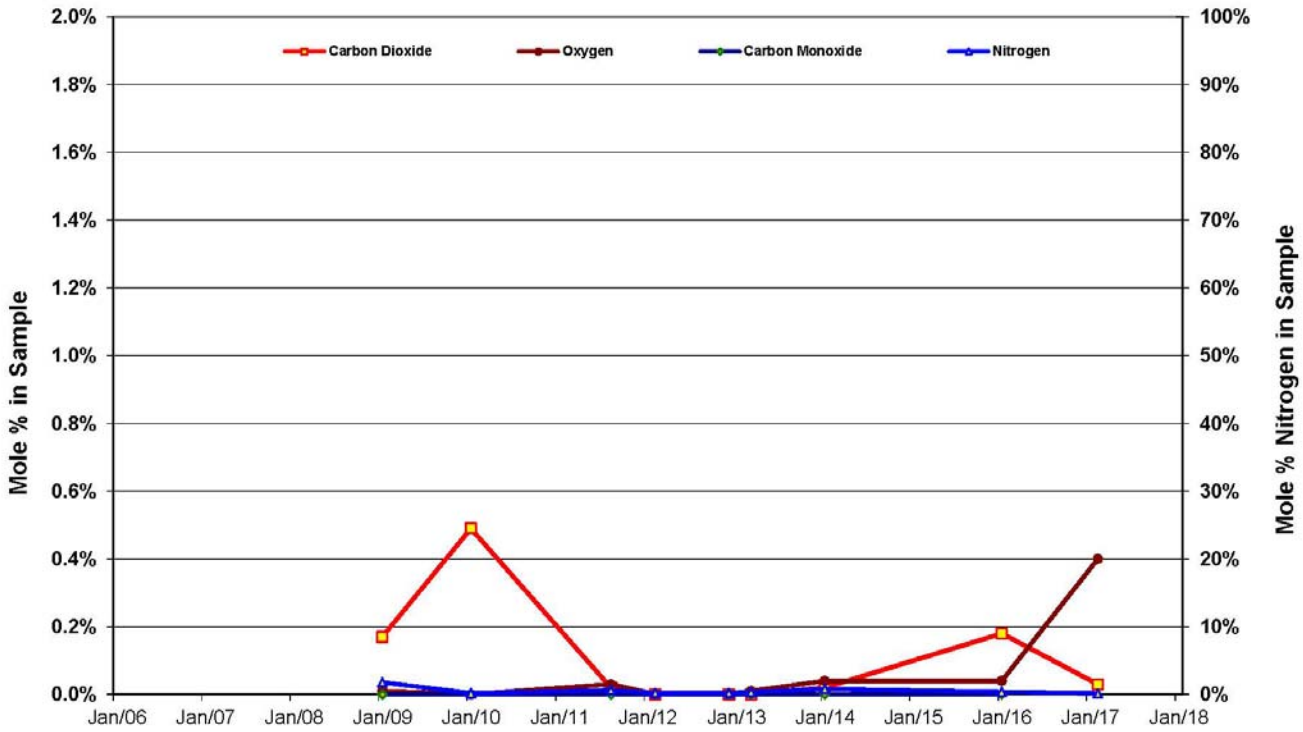
Gas composition 00/10-12-73-7W4/0



Gas composition 00/14-9-73-6W4/0

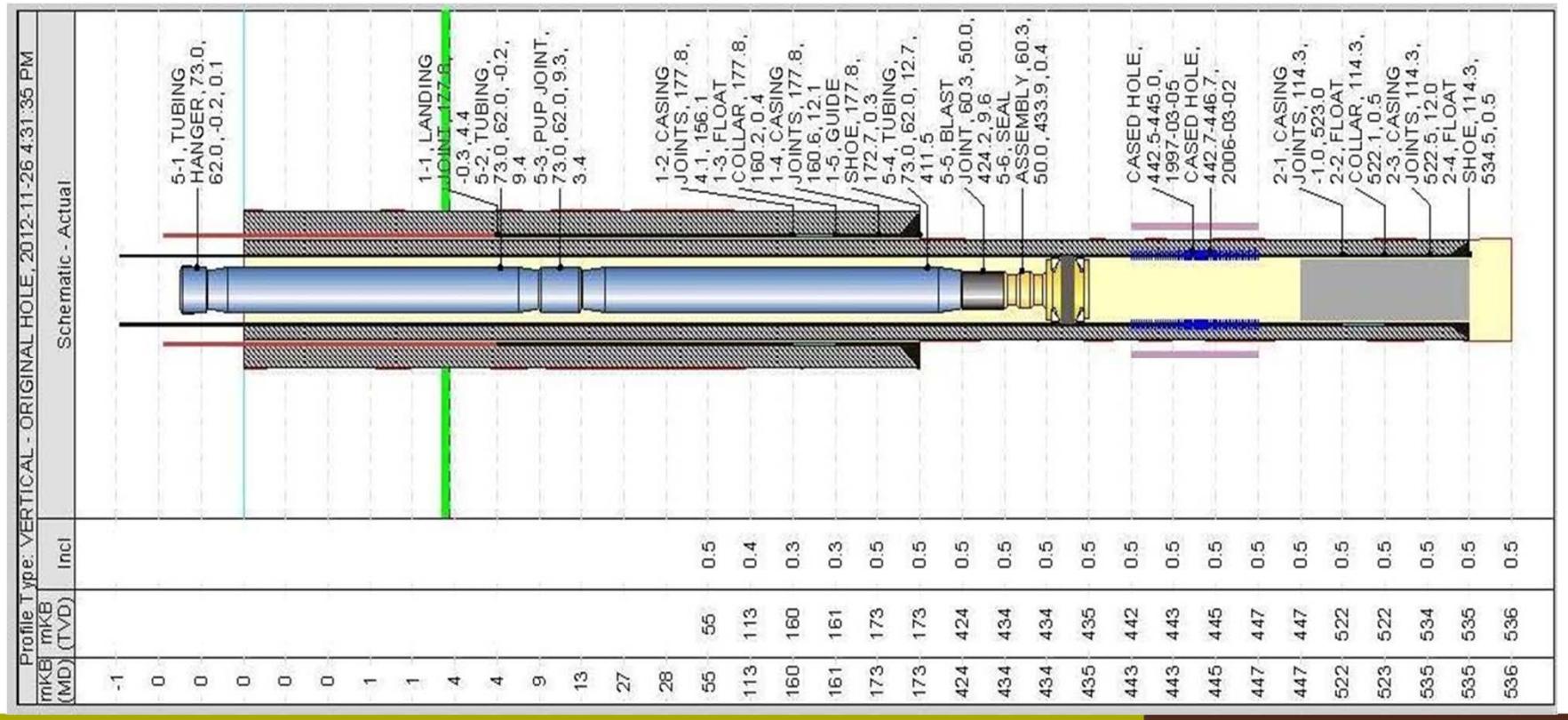


Gas composition 00/6-18-73-6W4/0

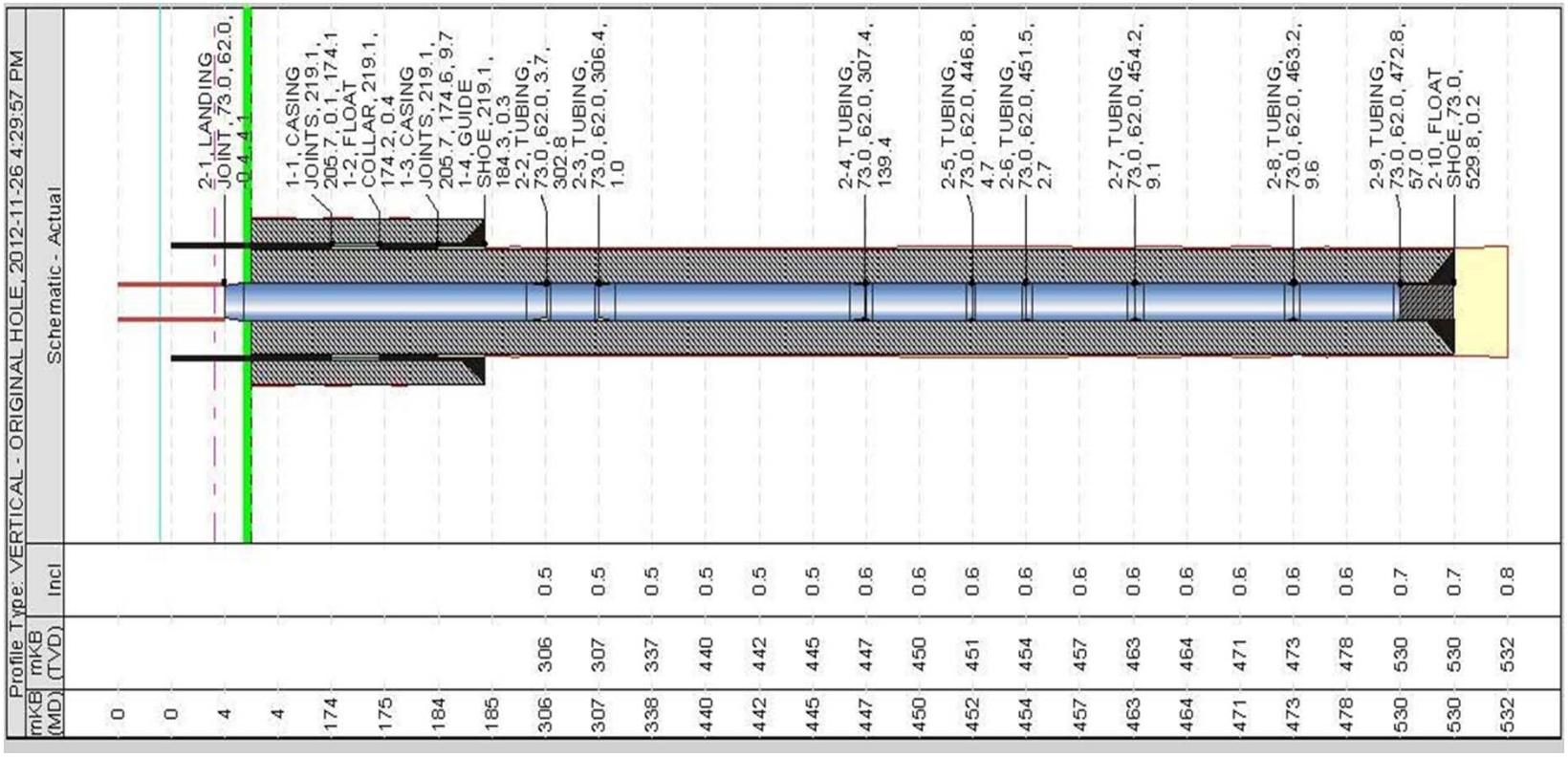


Downhole instrumentation layout

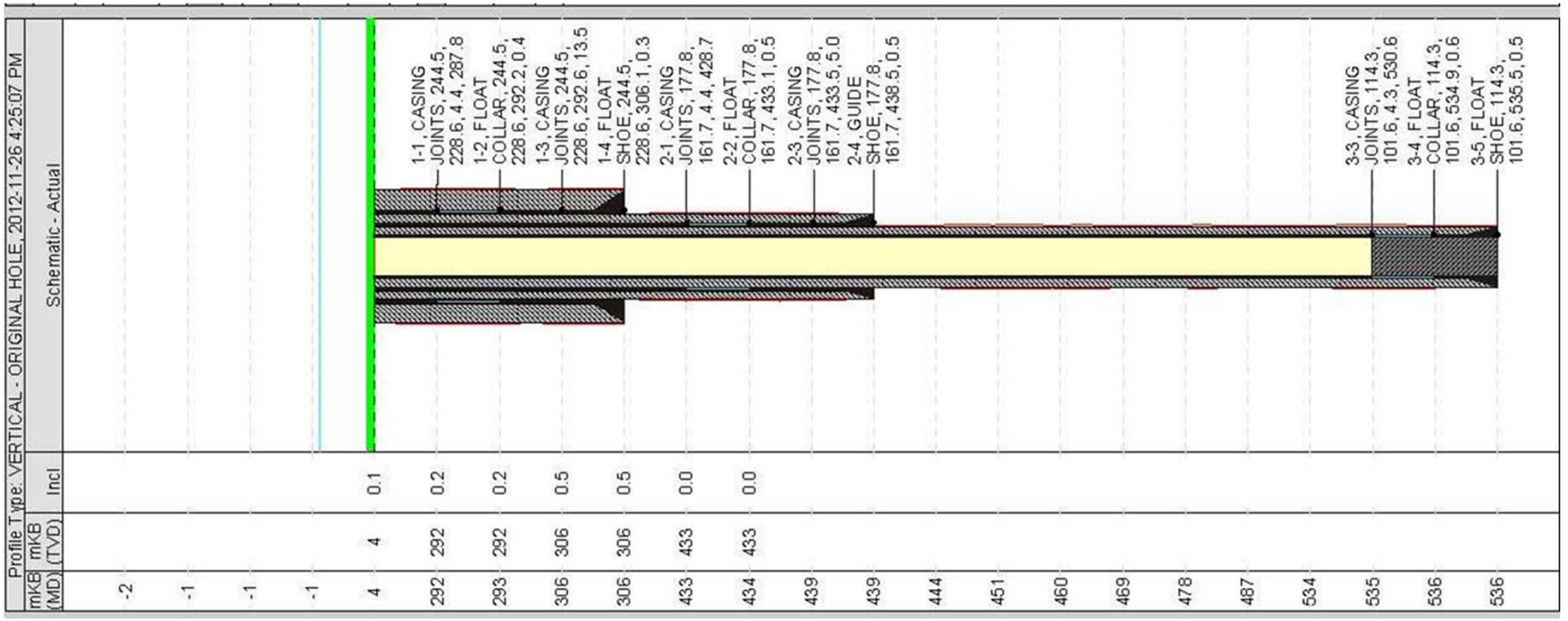
100/05-10-073-06W4 wellbore schematic



102/05-10-073-06W4 wellbore schematic



103/05-10-073-06W4 wellbore schematic



Thank you