Pelican Lake SAGD Pilot

AER Approval 11469C

April 13, 2016

AER D054 Annual Update

January 1, 2015 – December 31, 2015

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Disclaimer

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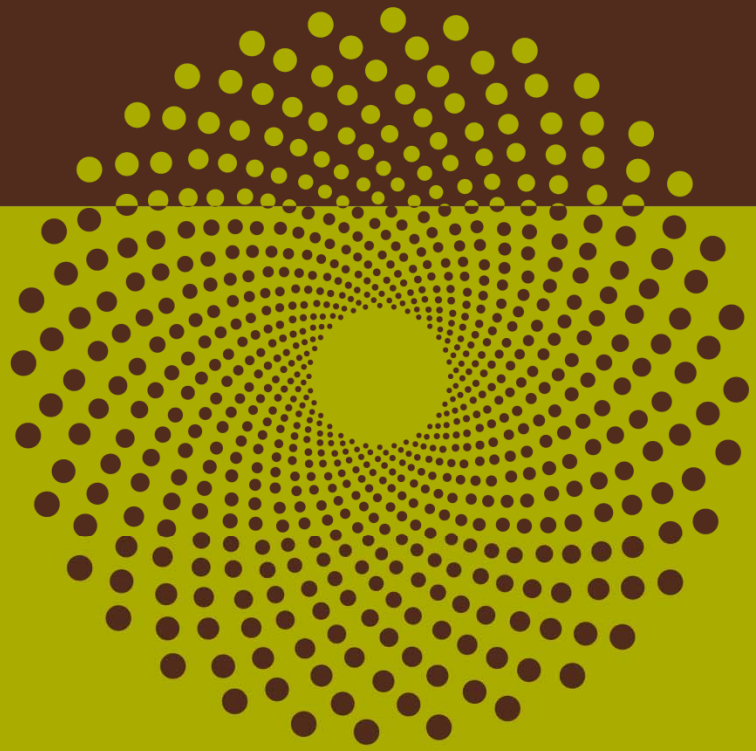
Agenda

- Project Overview
- Geological Overview
- Resource Recovery
- Facility Update
- Compliance

Subsection 3.1.1

1) Scheme Overview



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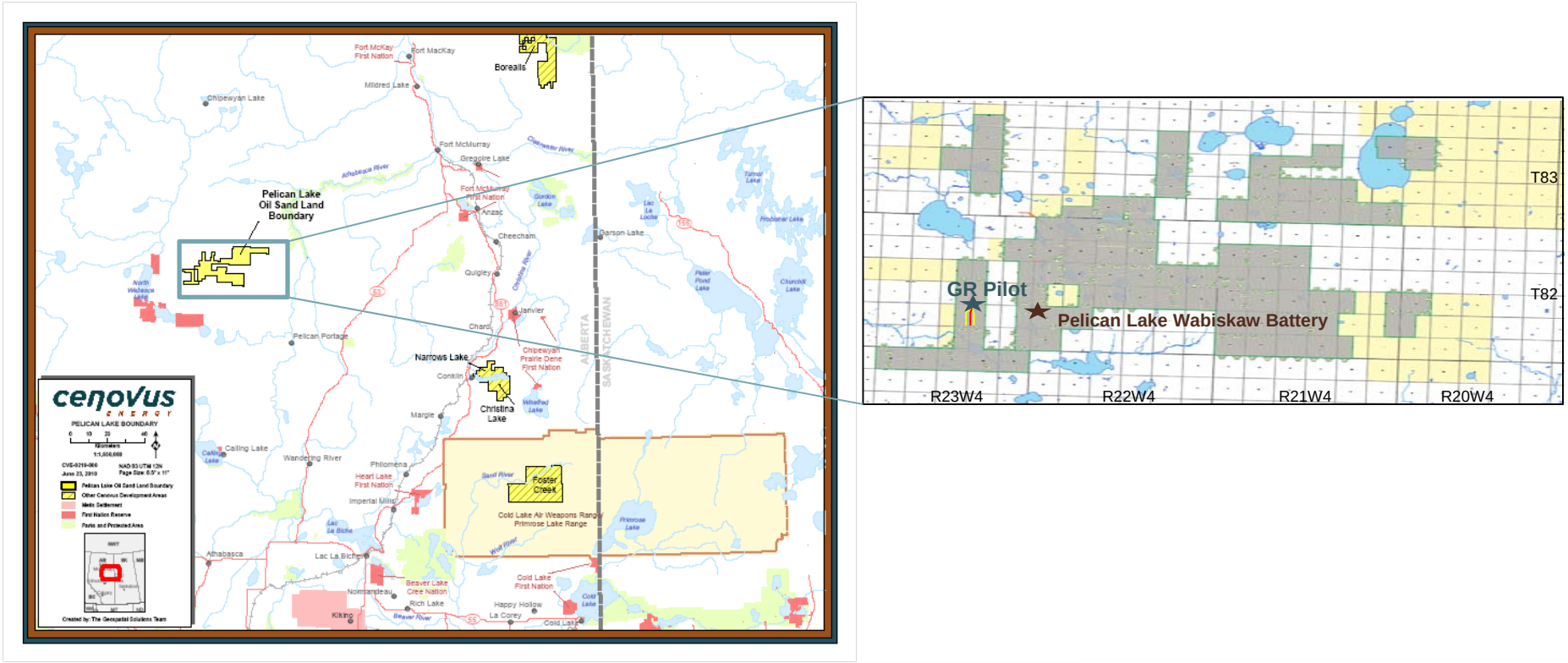
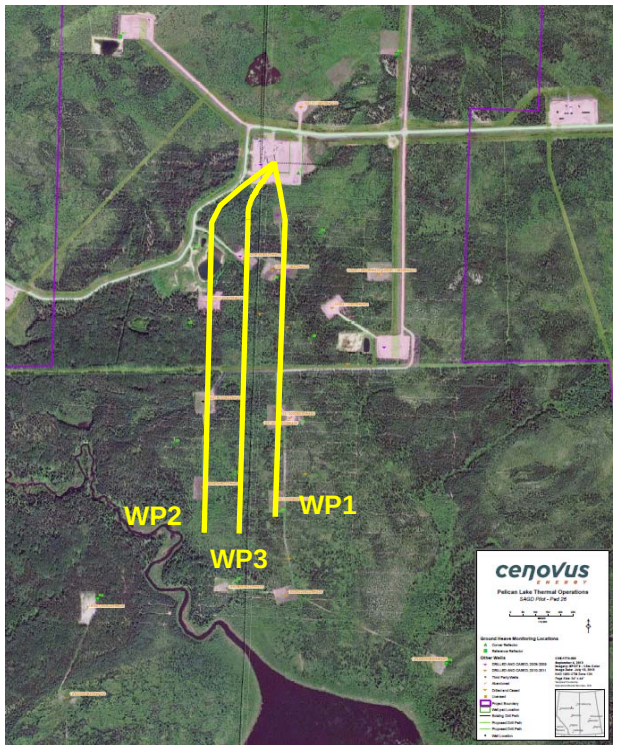
Cenovus SAGD Pilot Lease



Scheme Description & Overview

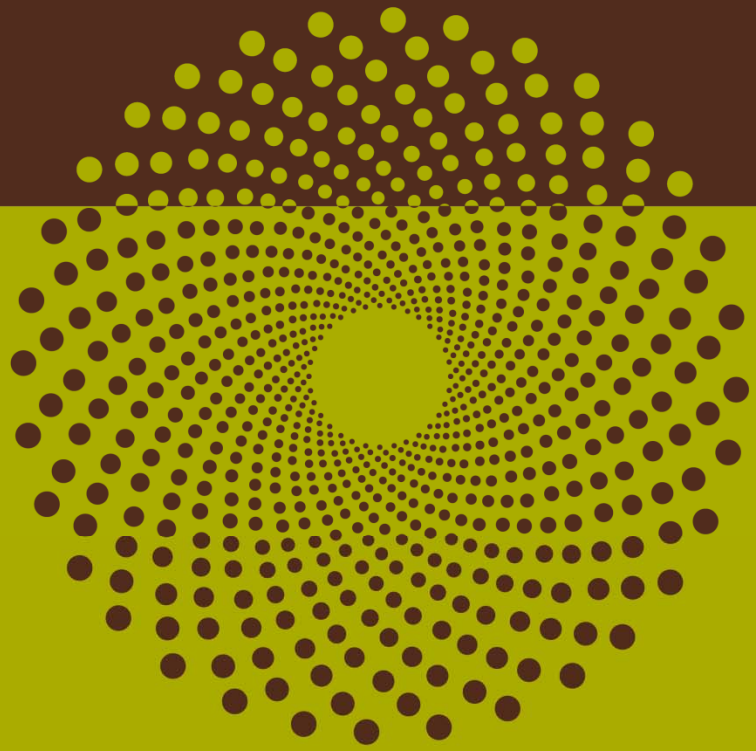
Base of Grand Rapids 'A'	357-363 m Subsea
Average Gross Thickness	22 m
Average SAGD Pay Thickness	18 m
Average Porosity	36 %
Average Water Saturation	44 % (Gross)
	38 % (SAGD Pay Zone)
Average Permeability	2.9 D
OBIP (2015 Cenovus internal estimate)	45 MMbbl
Drilled well pairs	3
Source water well	1
Disposal well	1
Oil Viscosity	1,000,000 cp+
Oil Gravity	7.5-8.5 API
Initial Reservoir Pressure	1300 kPa
Fracture Gradient	21.3 kPa/m
Fracture Closure Pressure	4.75 MPa



* not to scale

Subsection 3.1.1

2) Geology/Geoscience



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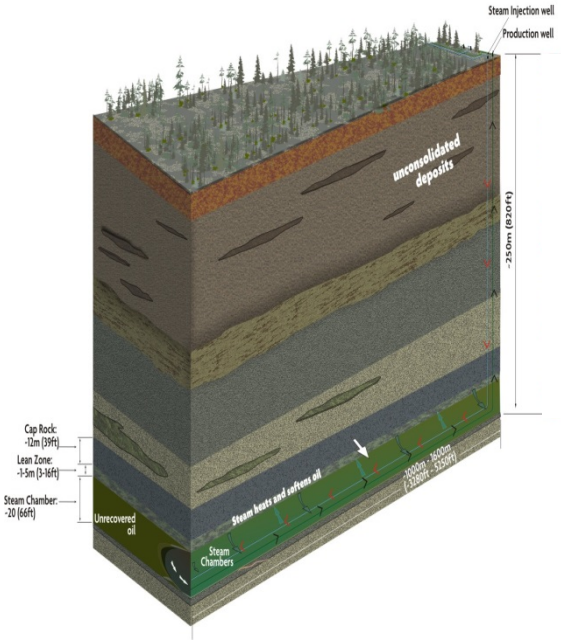
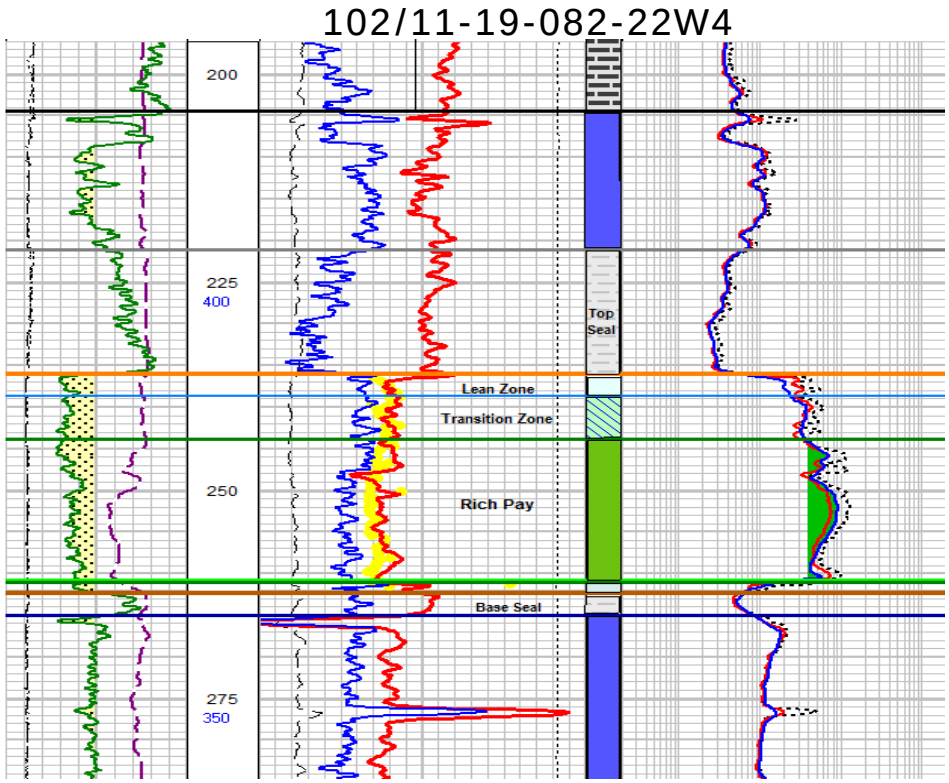
Geology & Geoscience



Grand Rapids ‘A’ Type Log



Viking / Pelican Fm sands contain a non saline aquifer

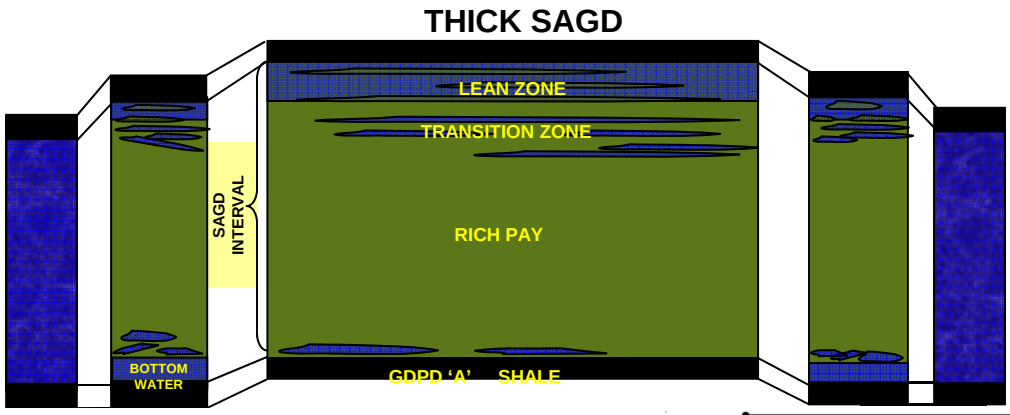
Joli Fou Fm marine shale is the cap rock

Grand Rapids ‘A’ Mbr are bitumen charged reservoir sands

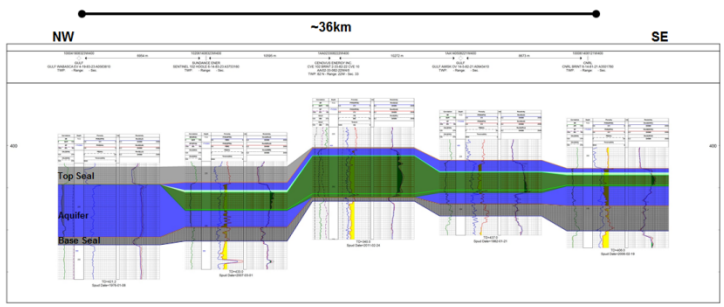
Grand Rapids ‘A’ shale forms the base seal

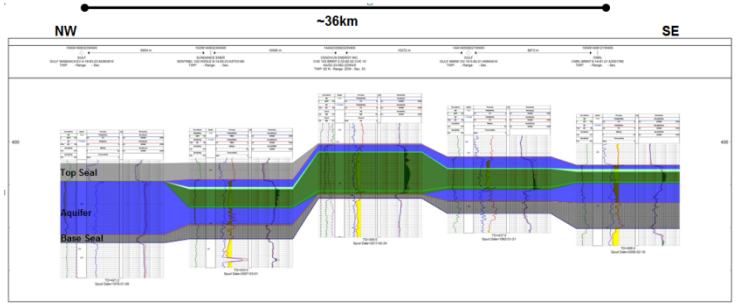
Grand Rapids ‘B’ Mbr sands contain a non saline aquifer

Bitumen Accumulation



- Grand Rapids bitumen is a plug within the Grand Rapids 'A' non-saline aquifer
- Minimal bottom water in the project area except on the structural flanks to the NW and SE
- Bitumen trapping is a combination of stratigraphic and degradation mechanisms
- Regional dip is SW to NE

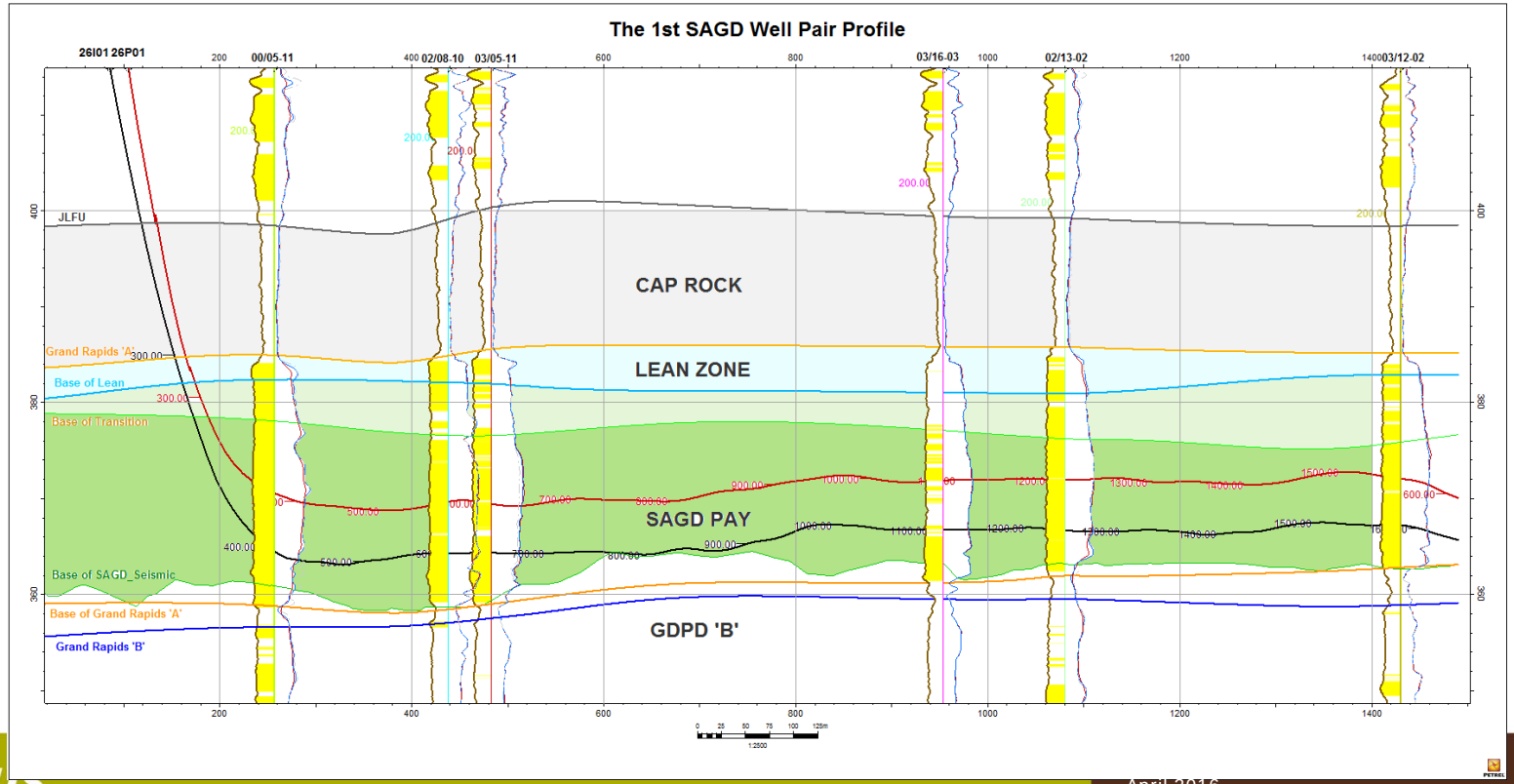




Joli Fou - Top Seal
Grand Rapids 'A' Aquifer
Grand Rapids 'A' Transition Zone
Grand Rapids 'A' Rich Pay Zone
Grand Rapids 'A' Shale – Base Seal

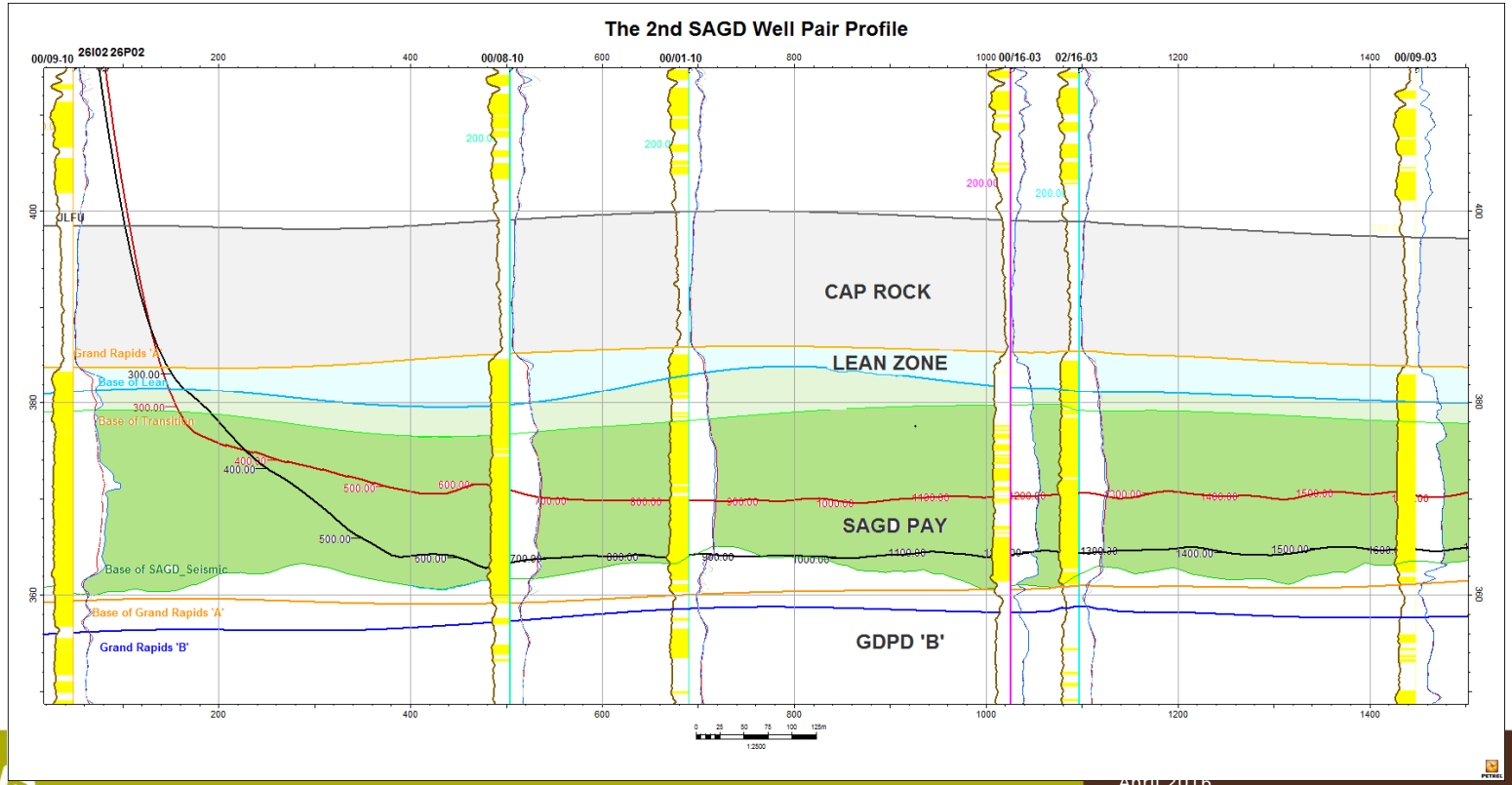
Well Pair 1 Trajectories/Cross-Section

I01 UWI: 100/12-02-082-23W4
P01 UWI: 102/12-02-082-23W4



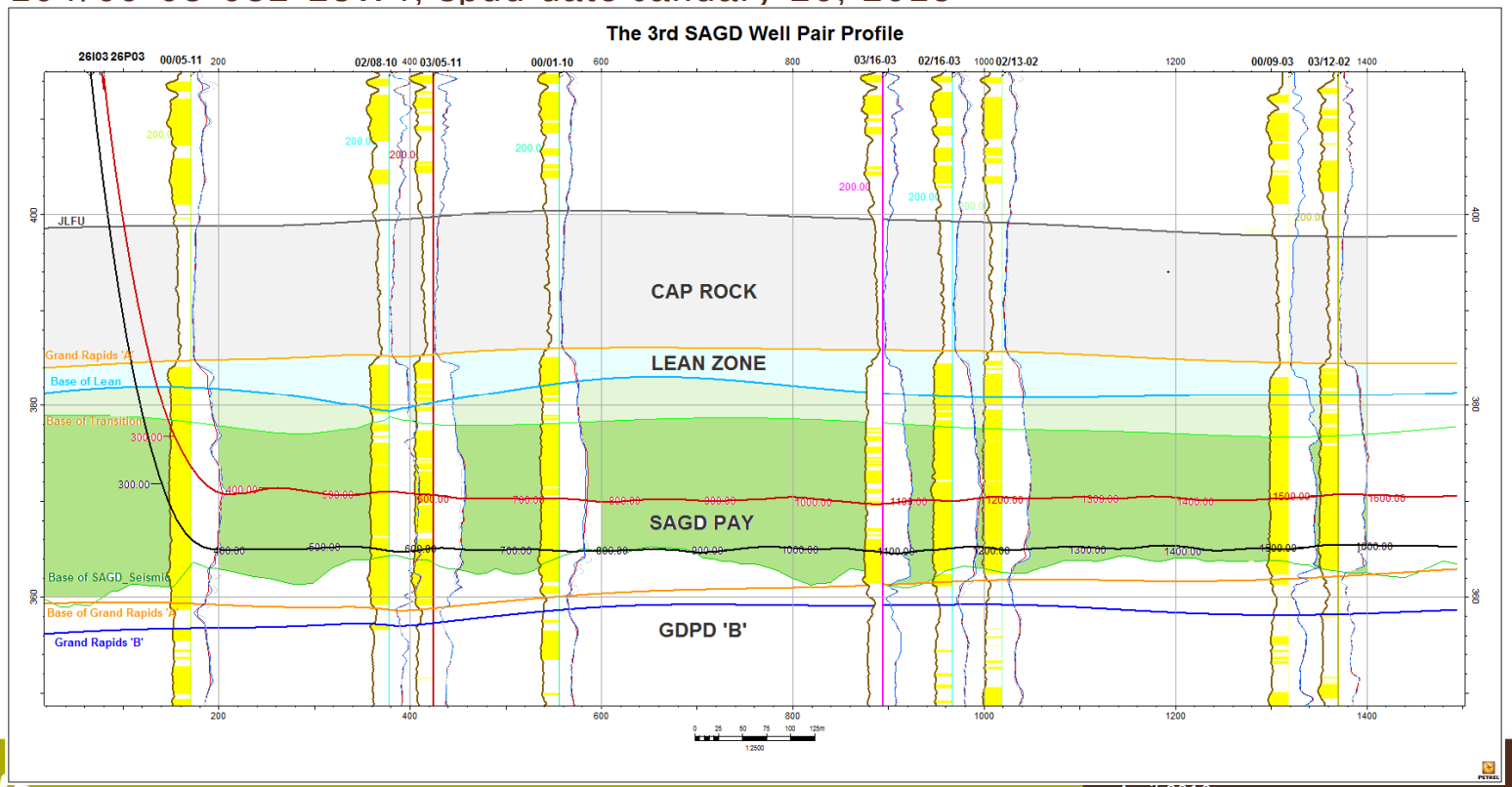
Well Pair 2 Trajectories/Cross-Section

I02 UWI: 102/09-03-082-23W4
P02 UWI: 103/09-03-082-23W4



Well Pair 3 Trajectories/Cross-Section

I03 UWI: 105/09-03-082-23W4, spud date February 5, 2015
P03 UWI: 104/09-03-082-23W4, spud date January 26, 2015



Surface Heave Monitoring (InSAR)

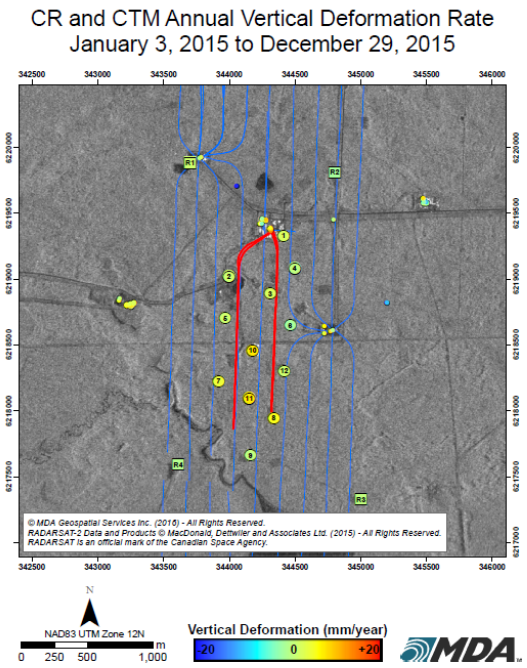


Figure 1: CR and CTM annual vertical deformation rates at Pelican Lake. The deformation rate is calculated from January 3, 2015 to December 29, 2015.

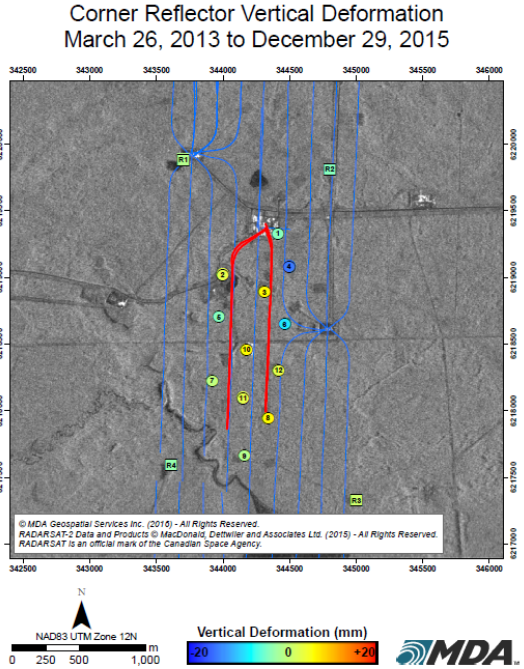
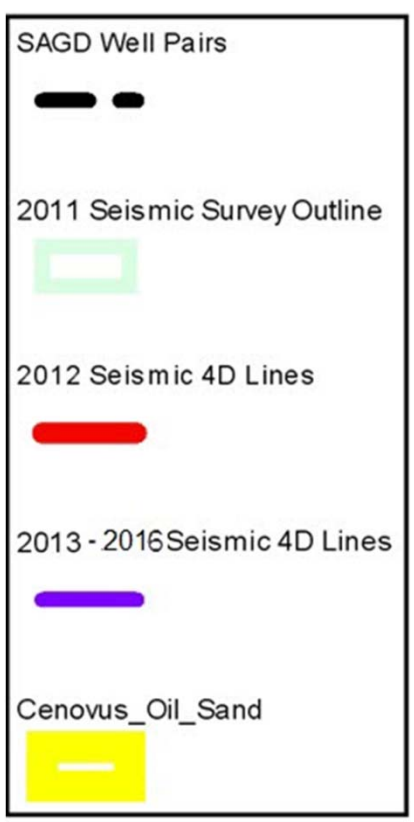
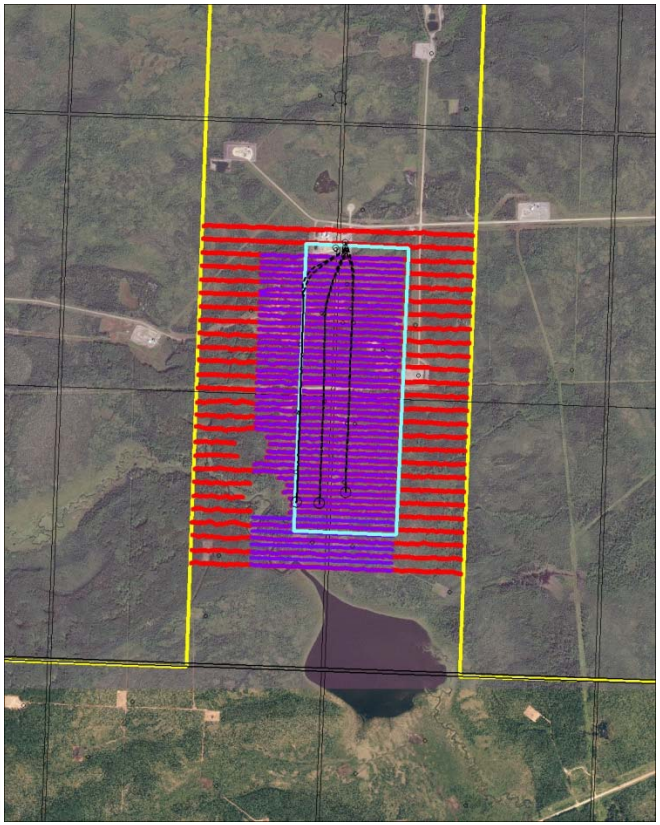


Figure 6: Cumulative corner reflector vertical deformation: March 26, 2013 to December 29, 2015.

- Since March 26, 2013 < 8 mm total vertical displacement observed
- 8 RADARSAT-2 scenes were acquired in 2015
- Measurements to December 29, 2015 do not indicate incremental displacement.
- Very little ground motion has been observed. Most of the Corner Reflectors are relatively stable since the beginning of the monitoring program.

4D Seismic Lines

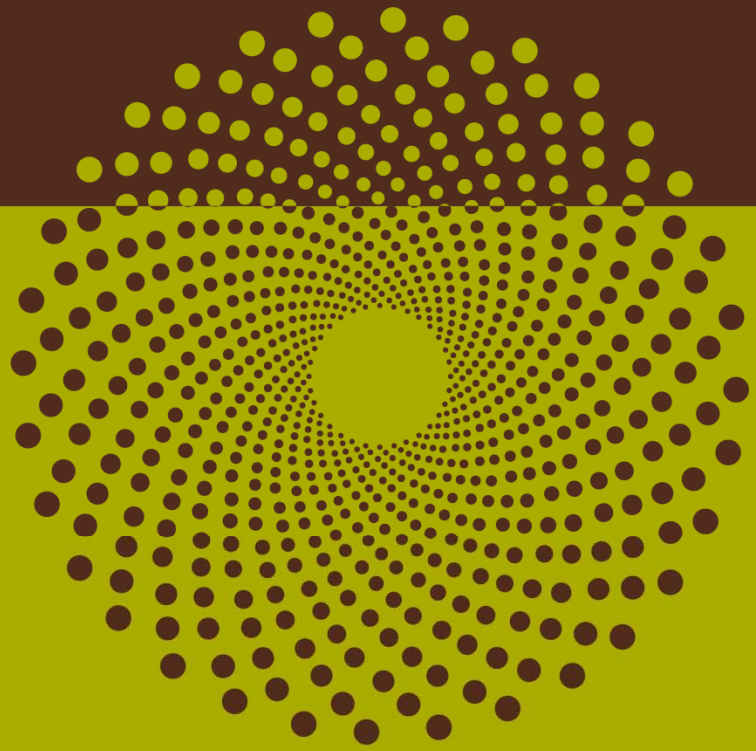




- **Baseline 3D - January 2011**
- **4D Shoots:**
  - 1st - January 2012
  - 2nd - March 2013
  - 3rd - January 2014
  - 4th - January 2015
- **4D seismic shows the areas of steam chamber development and connection to the lean zone**

Subsection 3.1.1

3) Drilling/Completions



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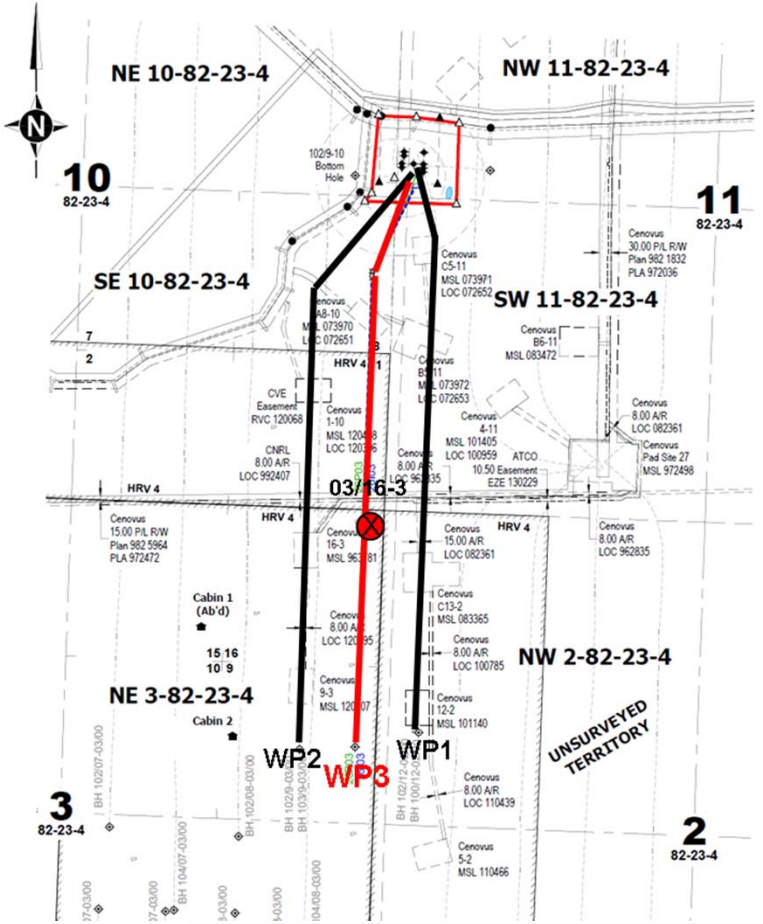
2015 New Wells

Well	Purpose	2015 Activity
04/09-03-082-23W4/0	Producer 26P03	Drilled & Completed
05/09-03-082-23W4/0	Injector 26I03	Drilled & Completed
03/16-3-082-23W4/0	Observation Well	Completed with thermocouple

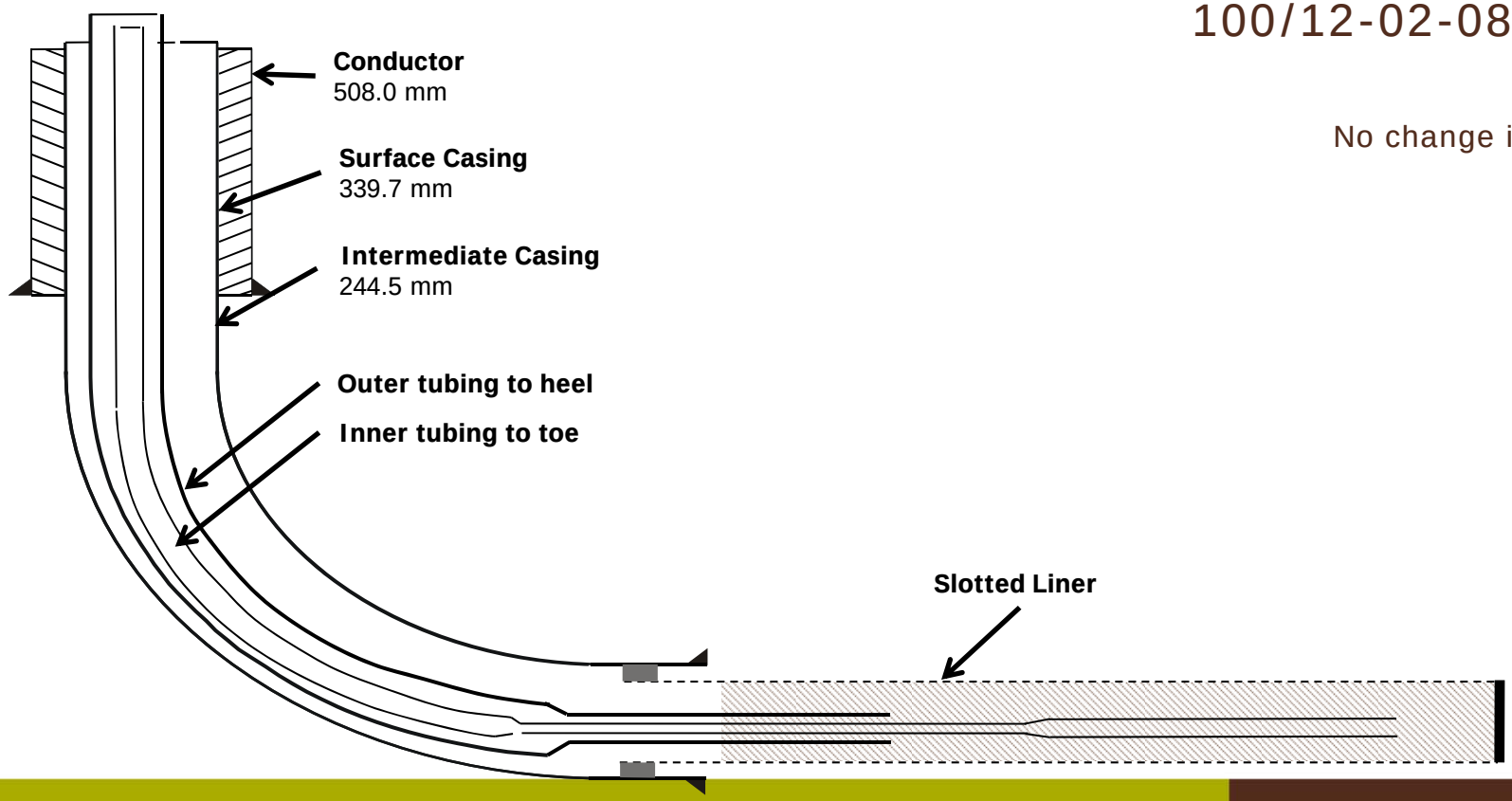
⊗ **2015 New Completion**



26I01 Injector Completion Schematic

100/12-02-082-23

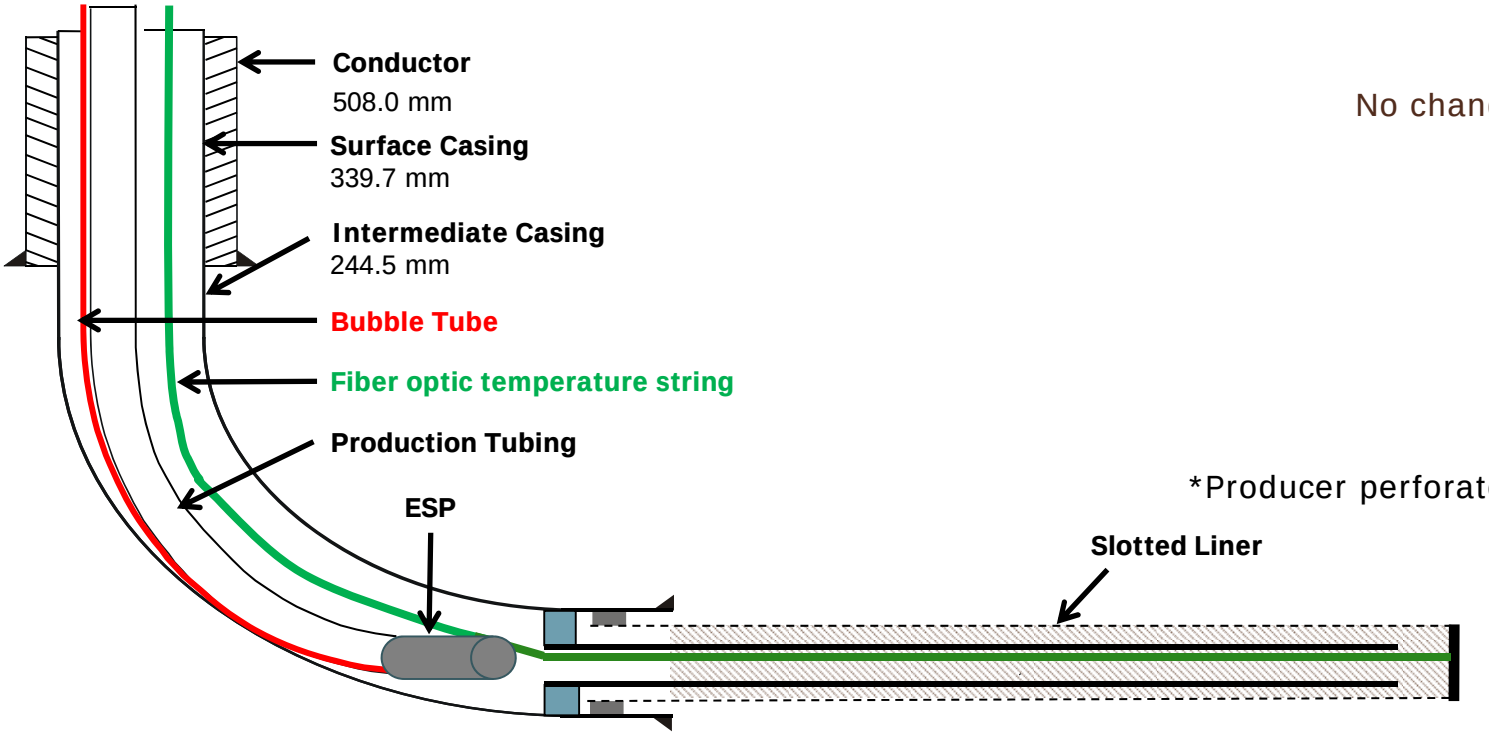
No change in 2015



26P01 Producer Completion Schematic

102/12-02-082-23

No change in 2015

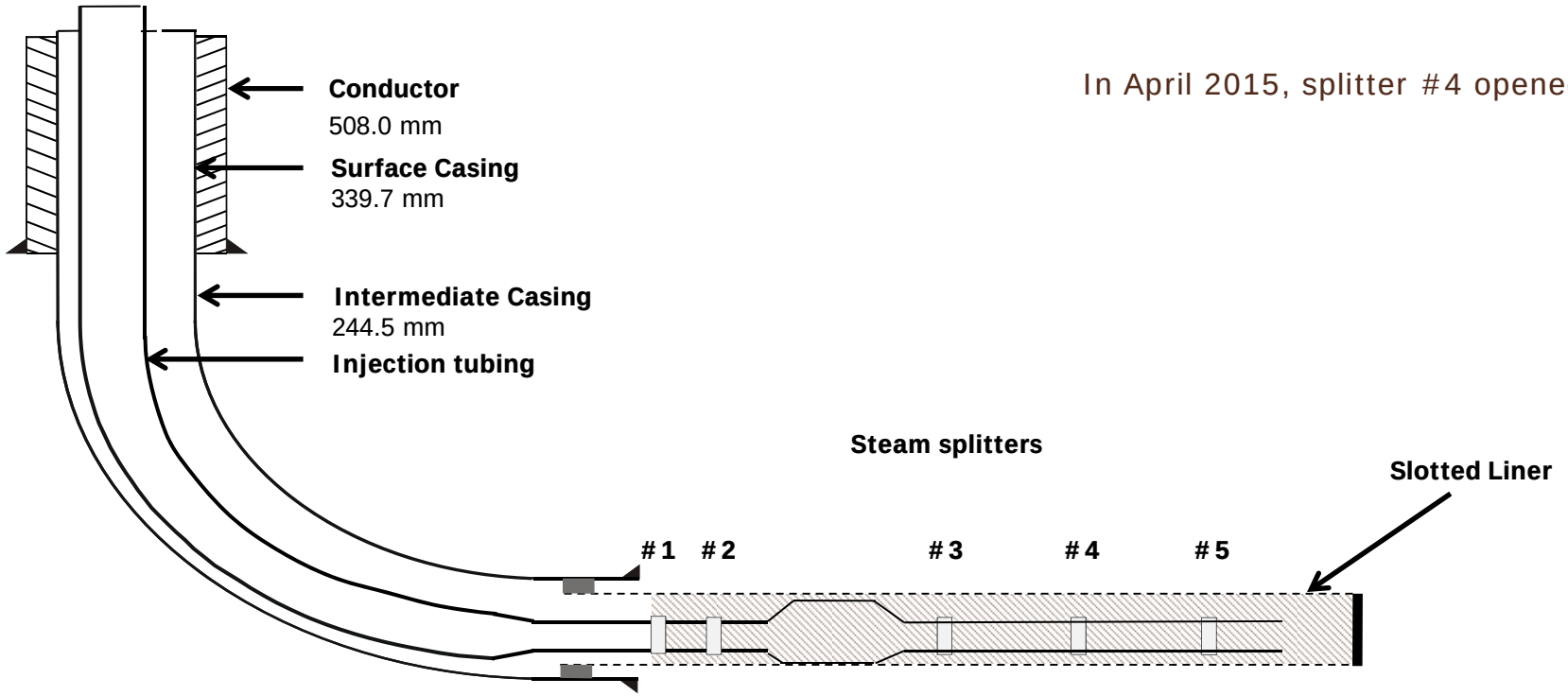


*Producer perforated

26I02 Injector Completion Schematic

102/09-03-082-23W4

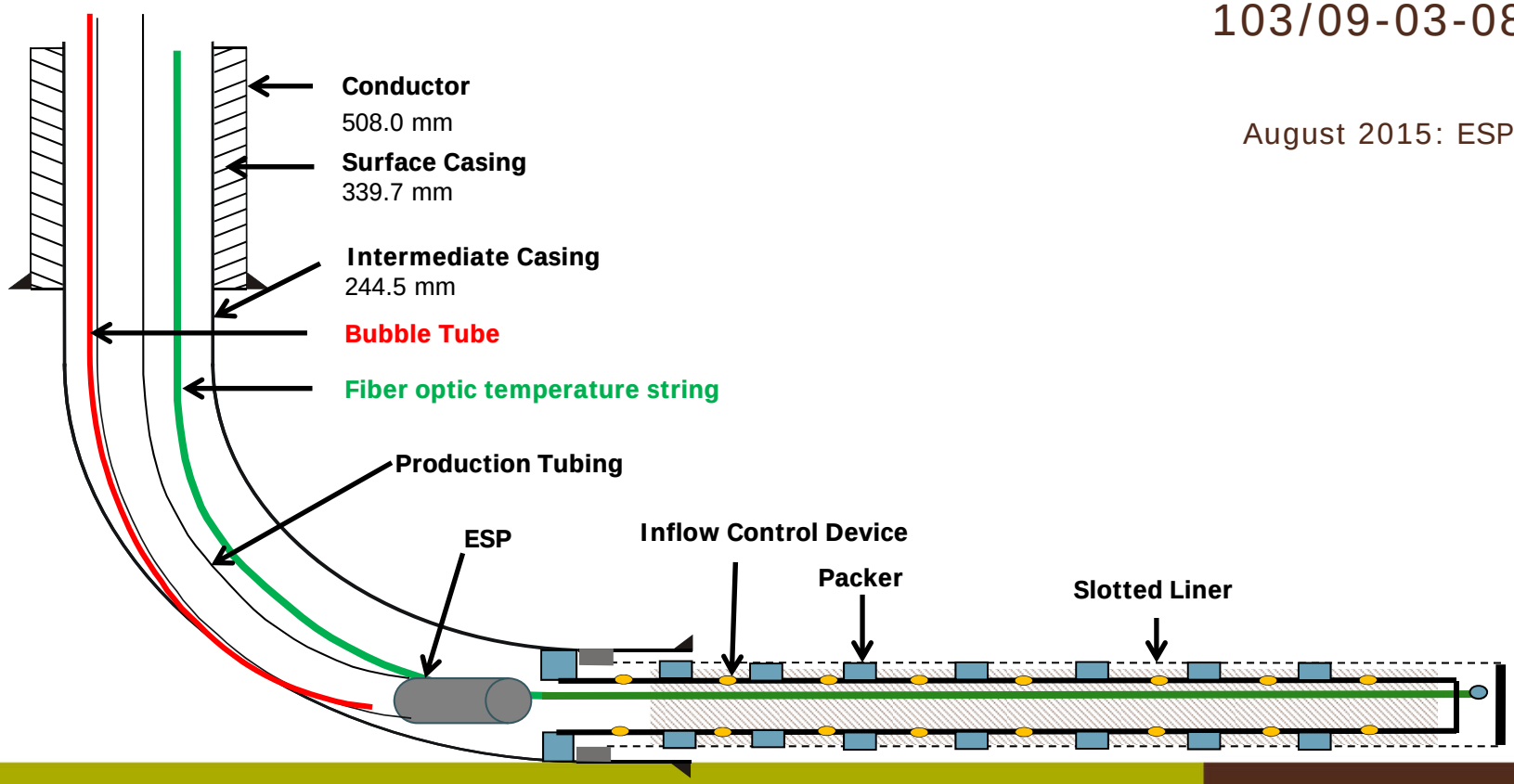
In April 2015, splitter #4 opened



26P02 Producer Completion Schematic

103/09-03-082-23

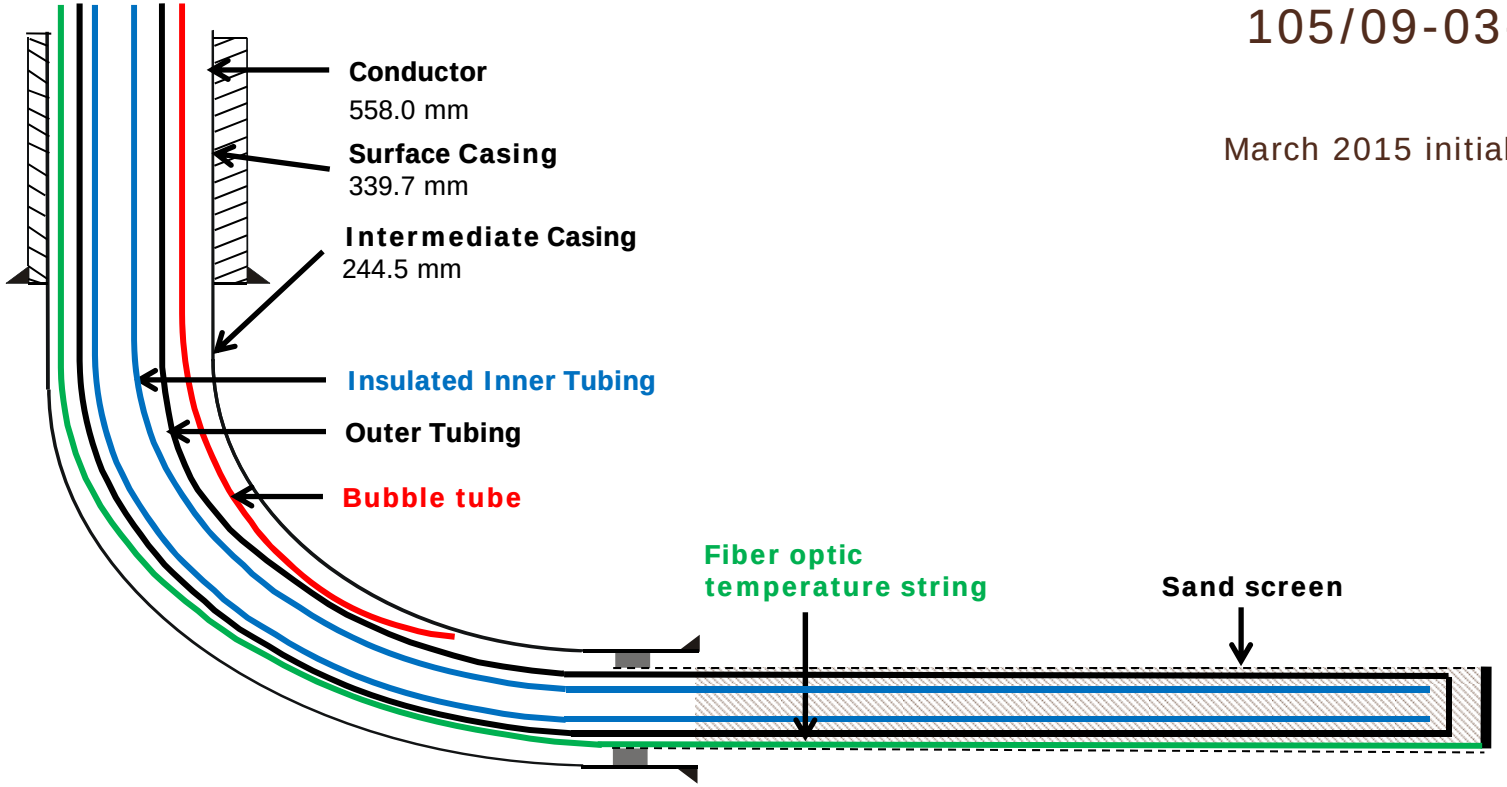
August 2015: ESP change



26I03 Injector Circulation Completion Schematic

105/09-03-082-23

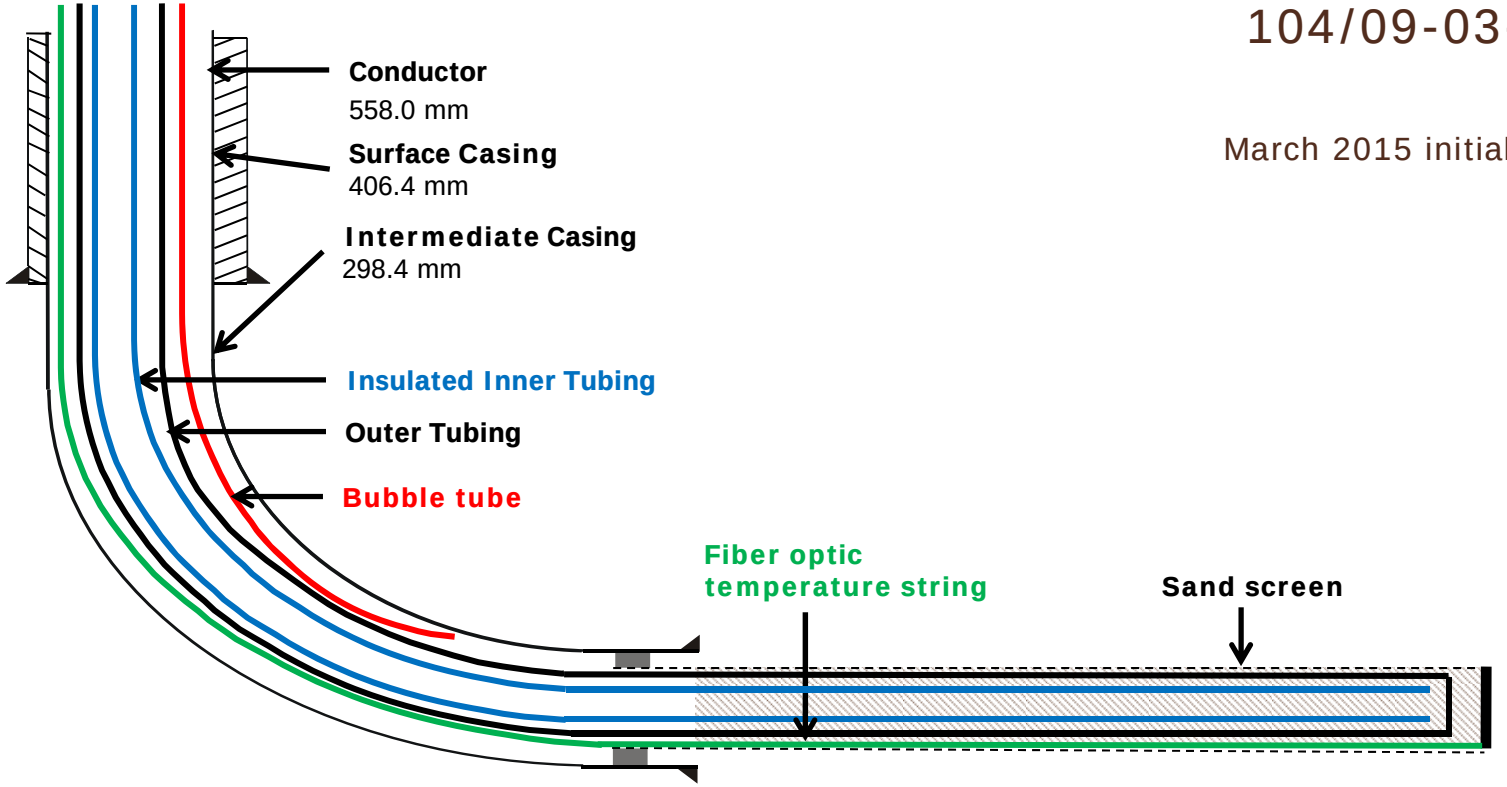
March 2015 initial completion



26P03 Producer Circulation Completion Schematic

104/09-03-082-23

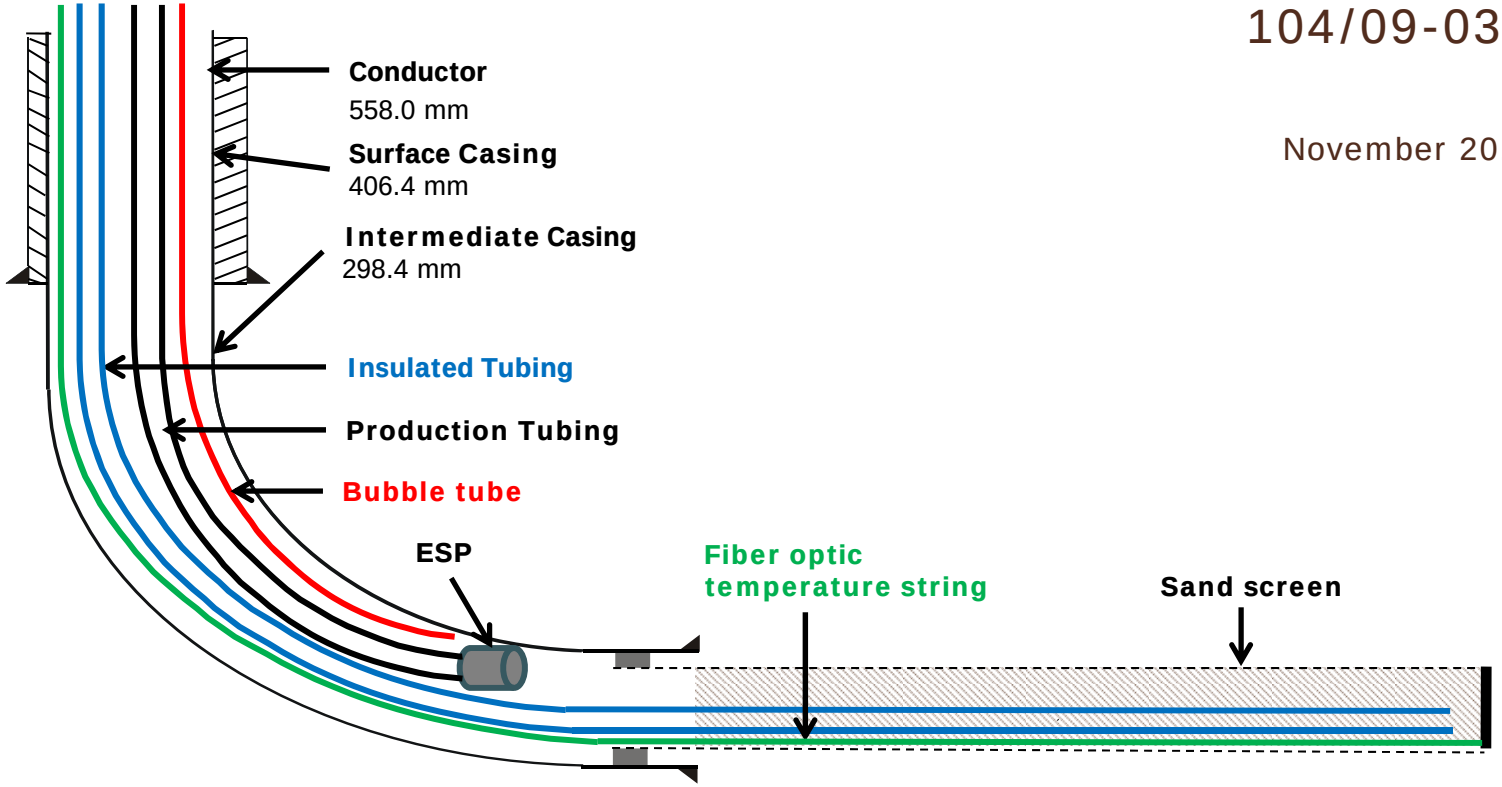
March 2015 initial completion



26P03 Producer Initial SAGD Completion Schematic

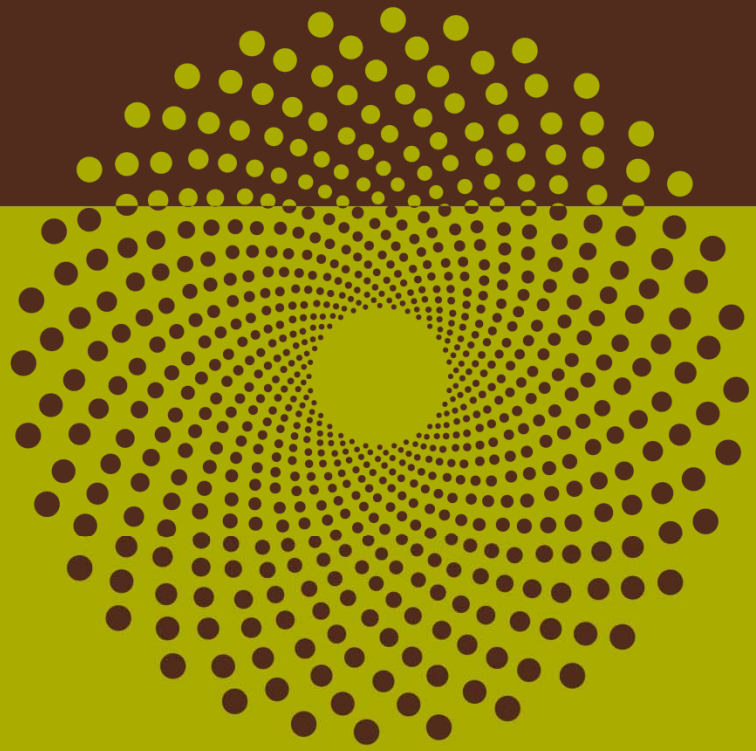
104/09-03-082-23

November 2015 workover



Subsection 3.1.1

4) Artificial Lift



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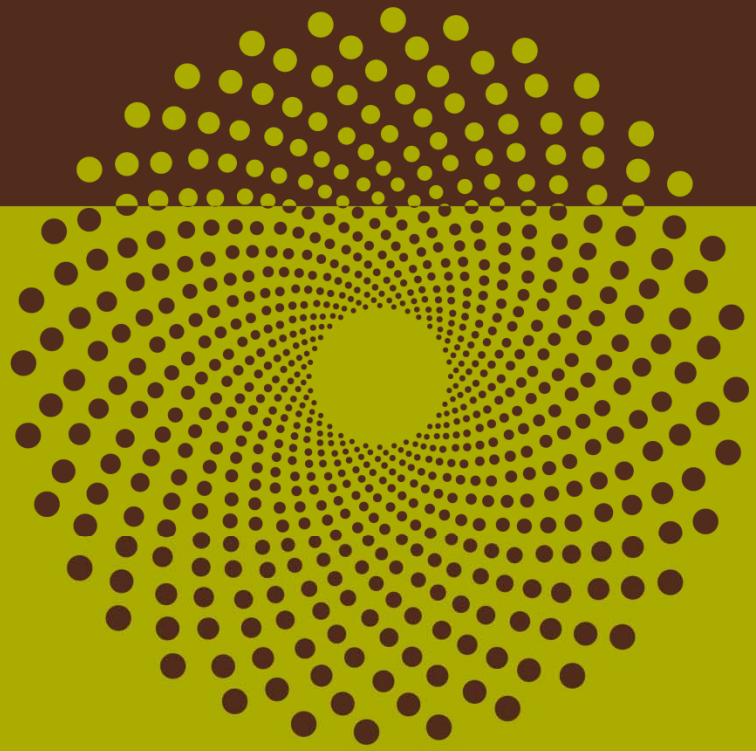
Artificial Lift – 26P01, 26P02, 26P03 SAGD

- All production and source wells use Electric Submersible Pumps (ESPs)
- Pump Sizing Range: 50-350 m^3/d
- Intake Pump Pressure: 600-1200 kPag (P01, P02), 1,500-2,500 kPag (P03)
- Pump Control: Variable Frequency Drives (VFD)
- Max Operating Temperature: 218-250°C
- Limitations: Low pump efficiency under saturation conditions
- Performance monitoring: standard deviation of ESP amp draw, run life

Subsection 3.1.1

5) Well Instrumentation



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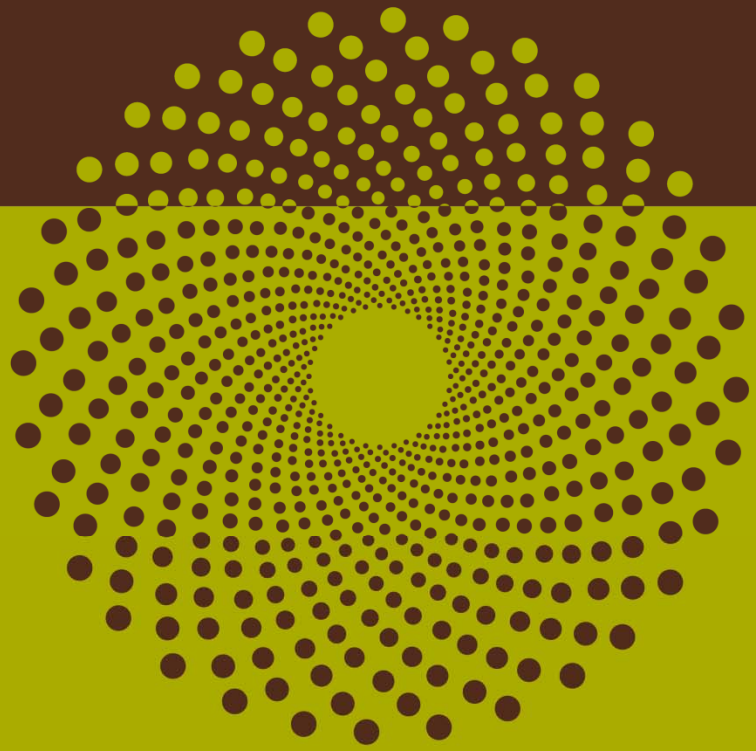
Well Instrumentation

Well	Pressure	Temperature
26I01	Casing annulus bubbler	None
26P01	Bubble tube	Fiber optic
26I02	Casing annulus bubbler	None
26P02	Bubble tube	Fiber optic
26I03	Bubble tube, Sensor at end of fiber	Fiber optic
26P03	Bubble tube, Sensor at end of fiber	Fiber optic
Observation Wells	Piezometer	Thermocouple

Subsection 3.1.1

6) 4-D Seismic



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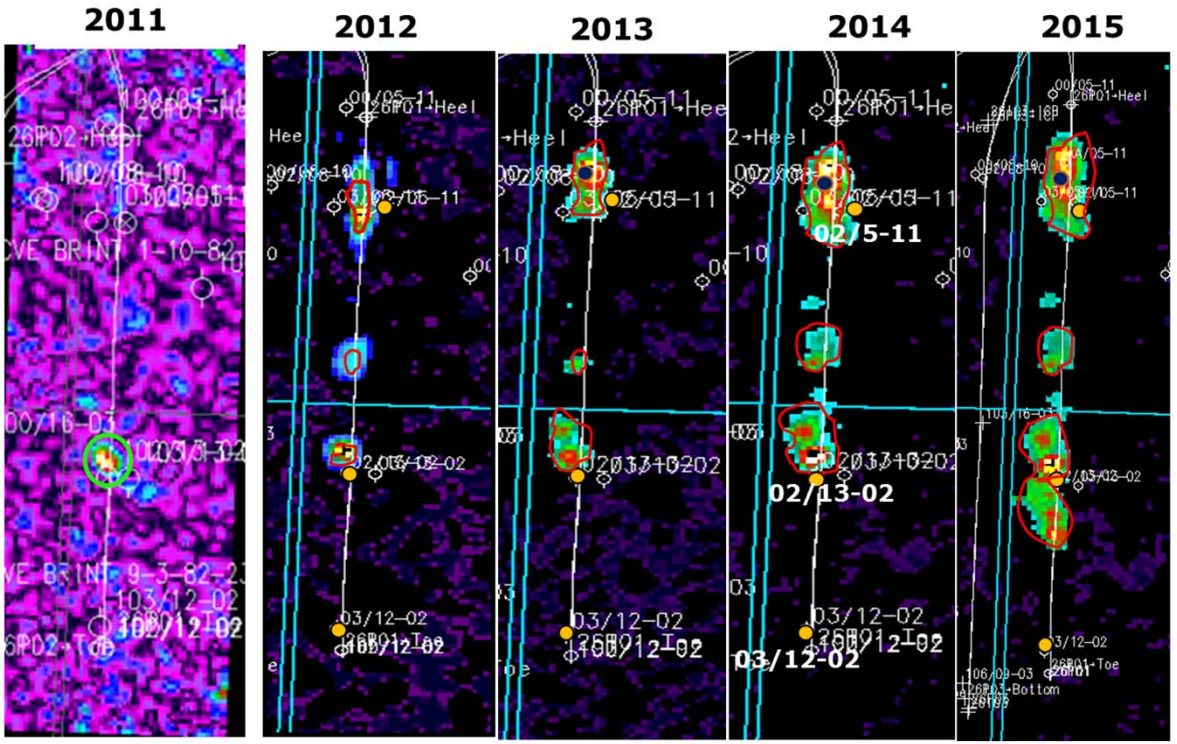
Well Pair 1: Steam Chamber in the Reservoir

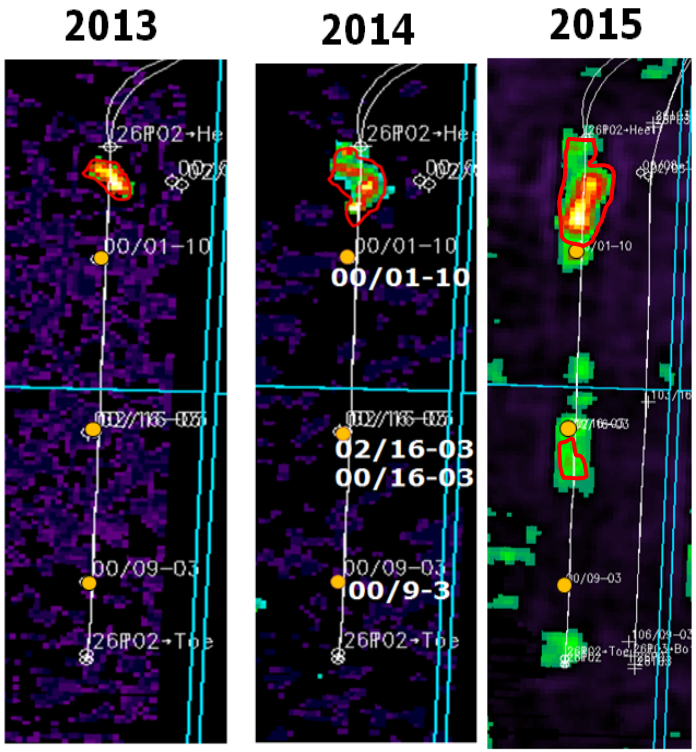
Baseline



- Temperature Observation Well

Steam Chamber Outline (amplitude cut-off)

Well Pair 2: Steam Chamber in the Reservoir



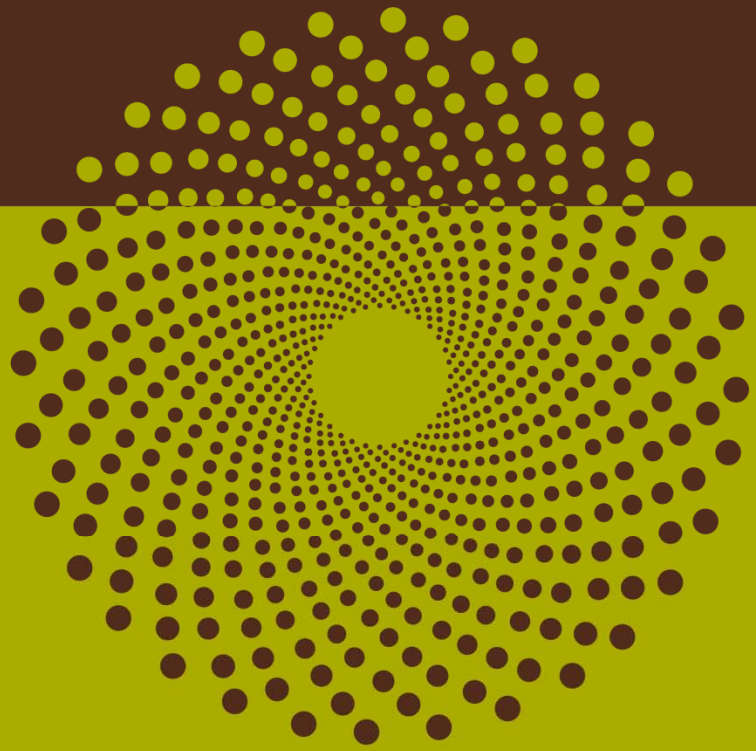
Temperature Observation Well

Steam Chamber Outline
(amplitude cut-off)

Subsection 3.1.1

7) Scheme Performance

Well Pair 1



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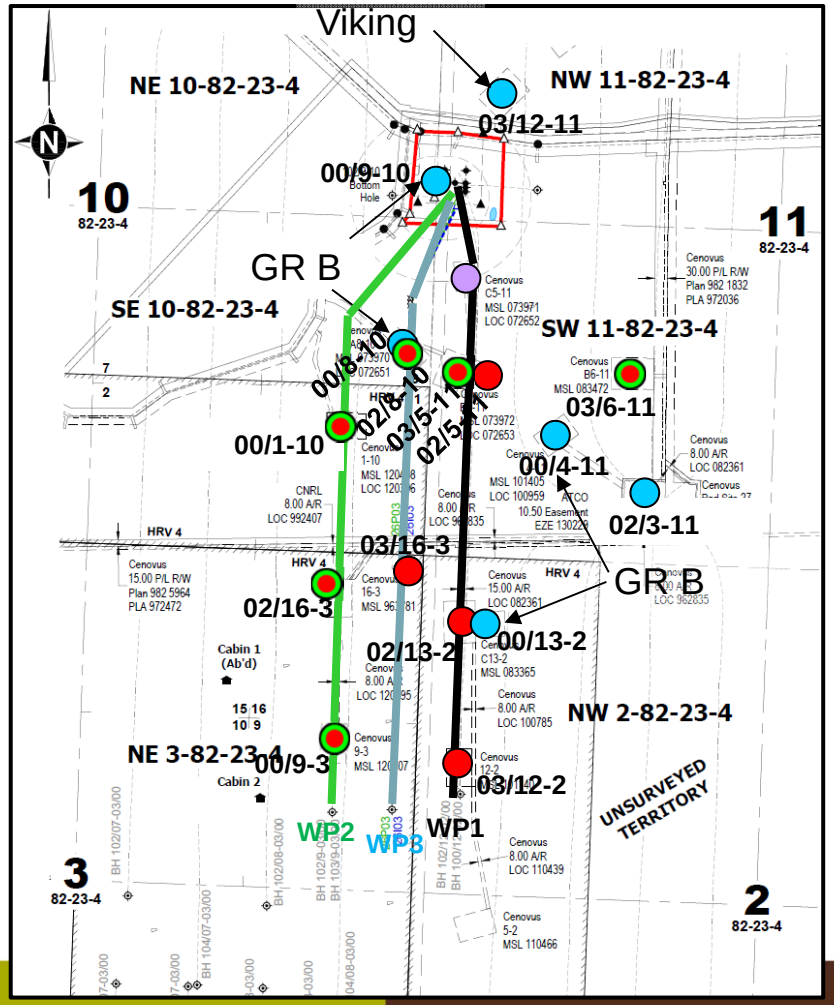
Pilot Monitoring Network

- Thermocouples
- Piezometers
- Ground Water Obs
- 100/5-11 (Swab/Inj test)

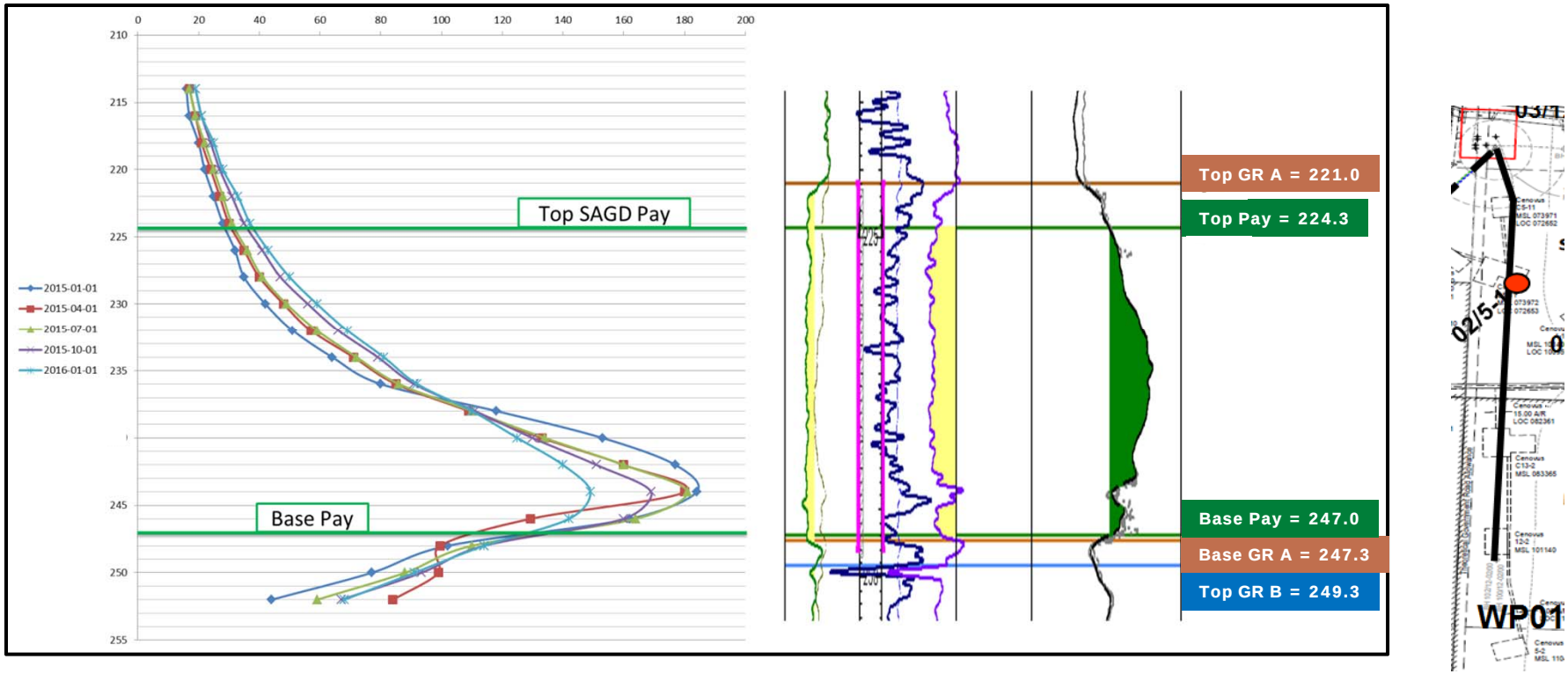
All wells not labelled are GR A



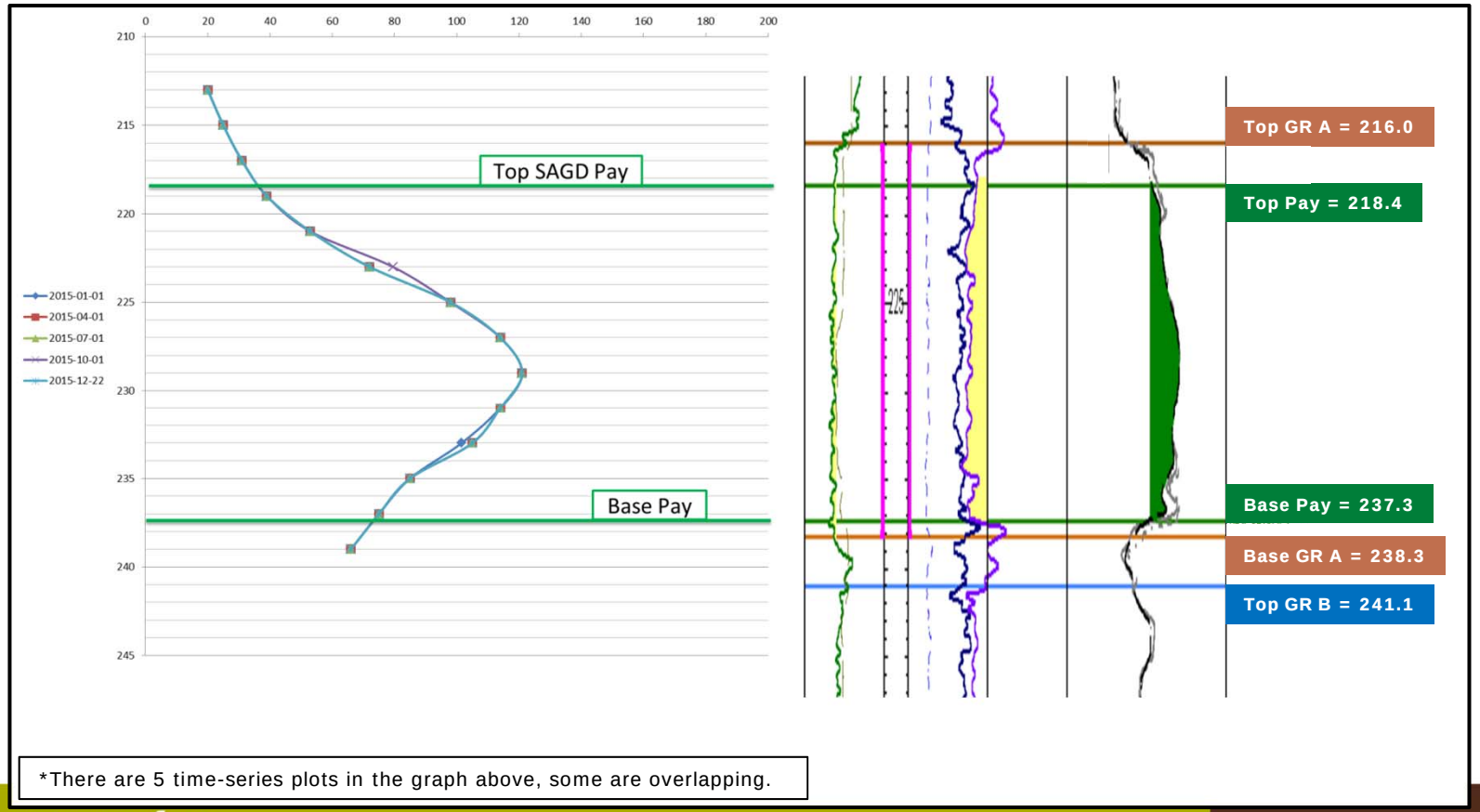
Well Pair 1: 2015 Summary

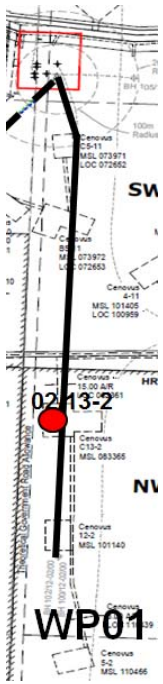
- I01/P01 drawdowns were lower due to P01 perforation in Q4 2014 with no significant sand production issues
- Continued to improve thermal conformance
- Results from six day temperature fall-off in April 2015 (facility turnaround) for 26P01 shows steam chamber growth at the toe

102/05-11-082-23W4/0 Observation Well Temperature



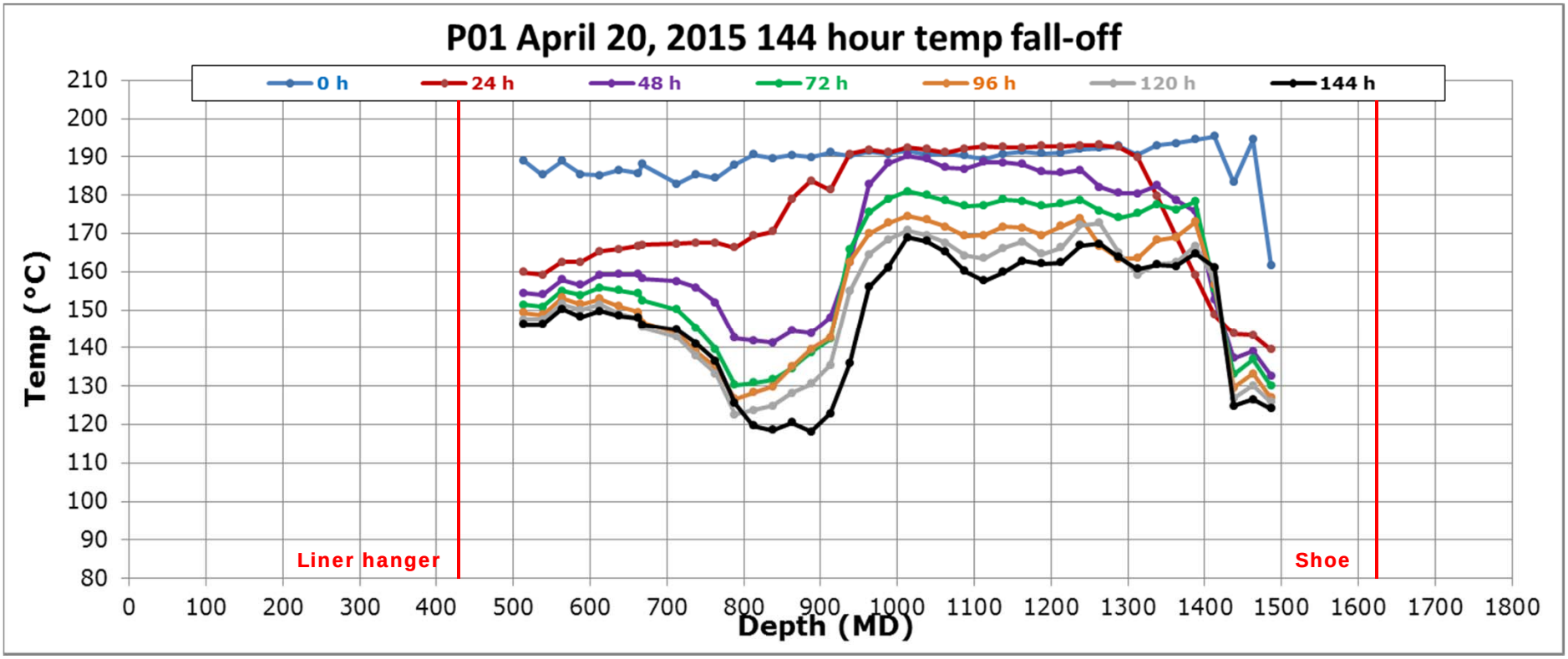
102/13-02-082-23W4/0 Observation Well Temperature



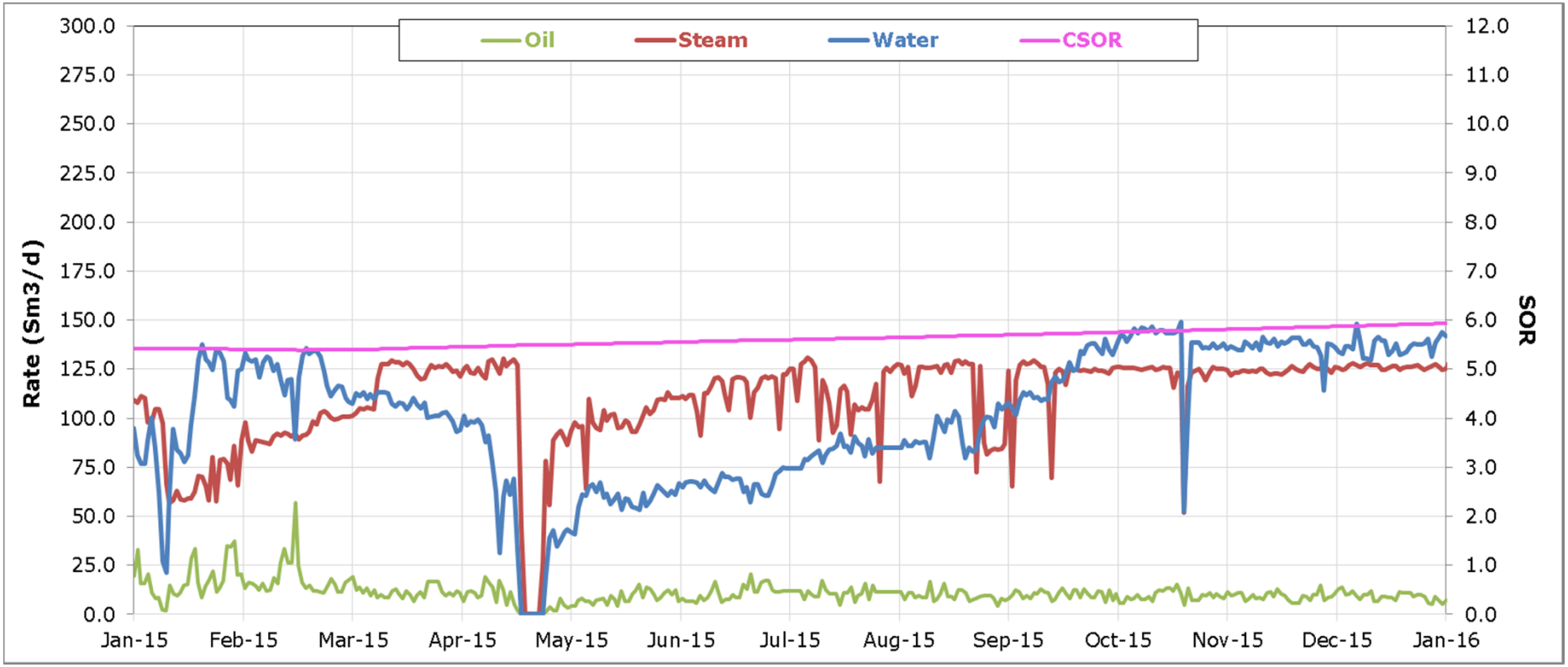


*There are 5 time-series plots in the graph above, some are overlapping.

Well Pair 1 Producer Temperature Profiles



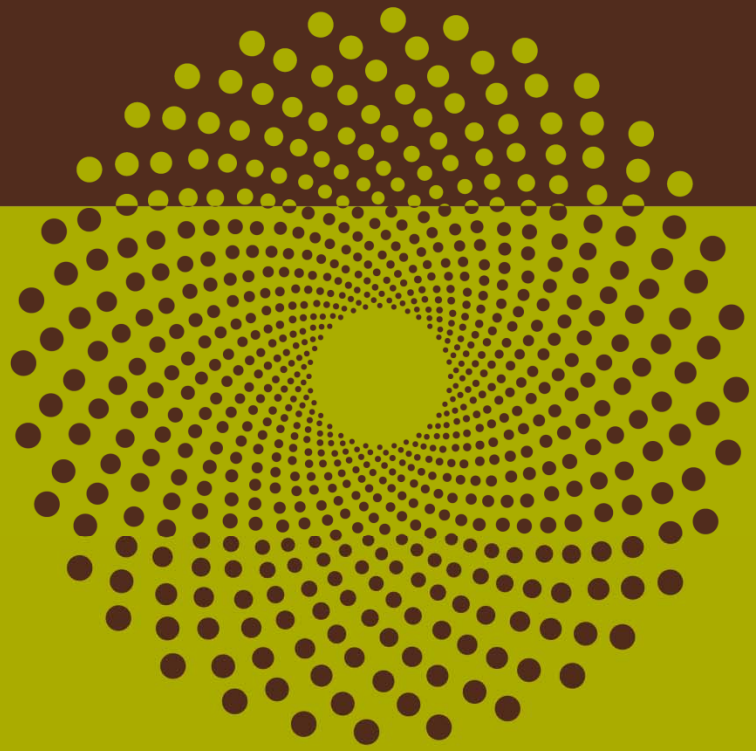
Well Pair 1 Production



Subsection 3.1.1

7) Scheme Performance

Well Pair 2



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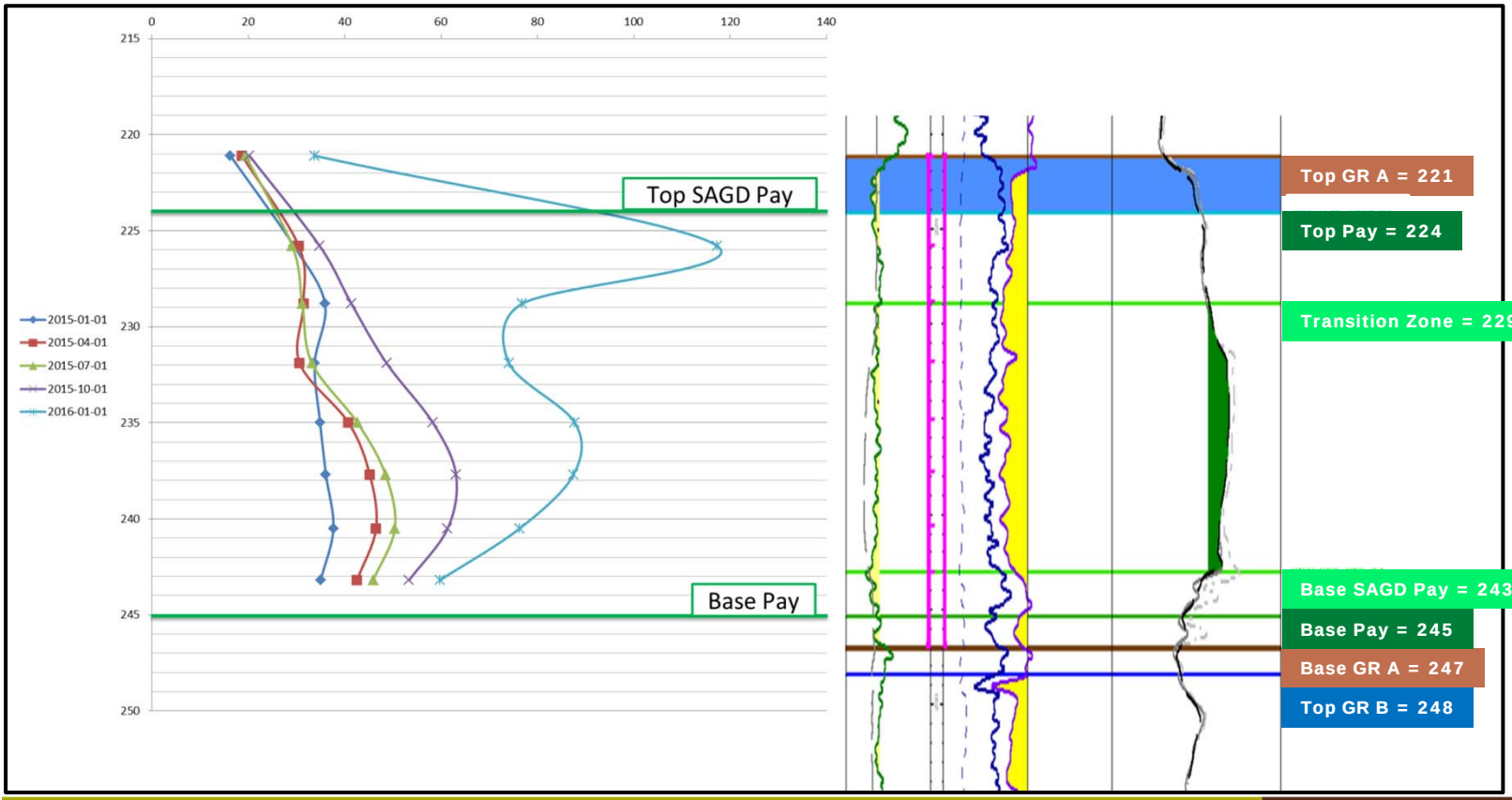
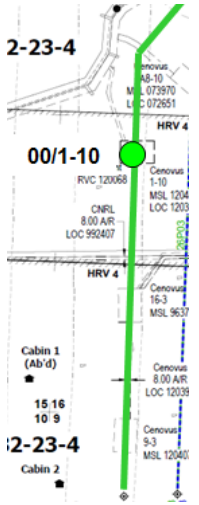
Well Pair 2: 2015 Summary

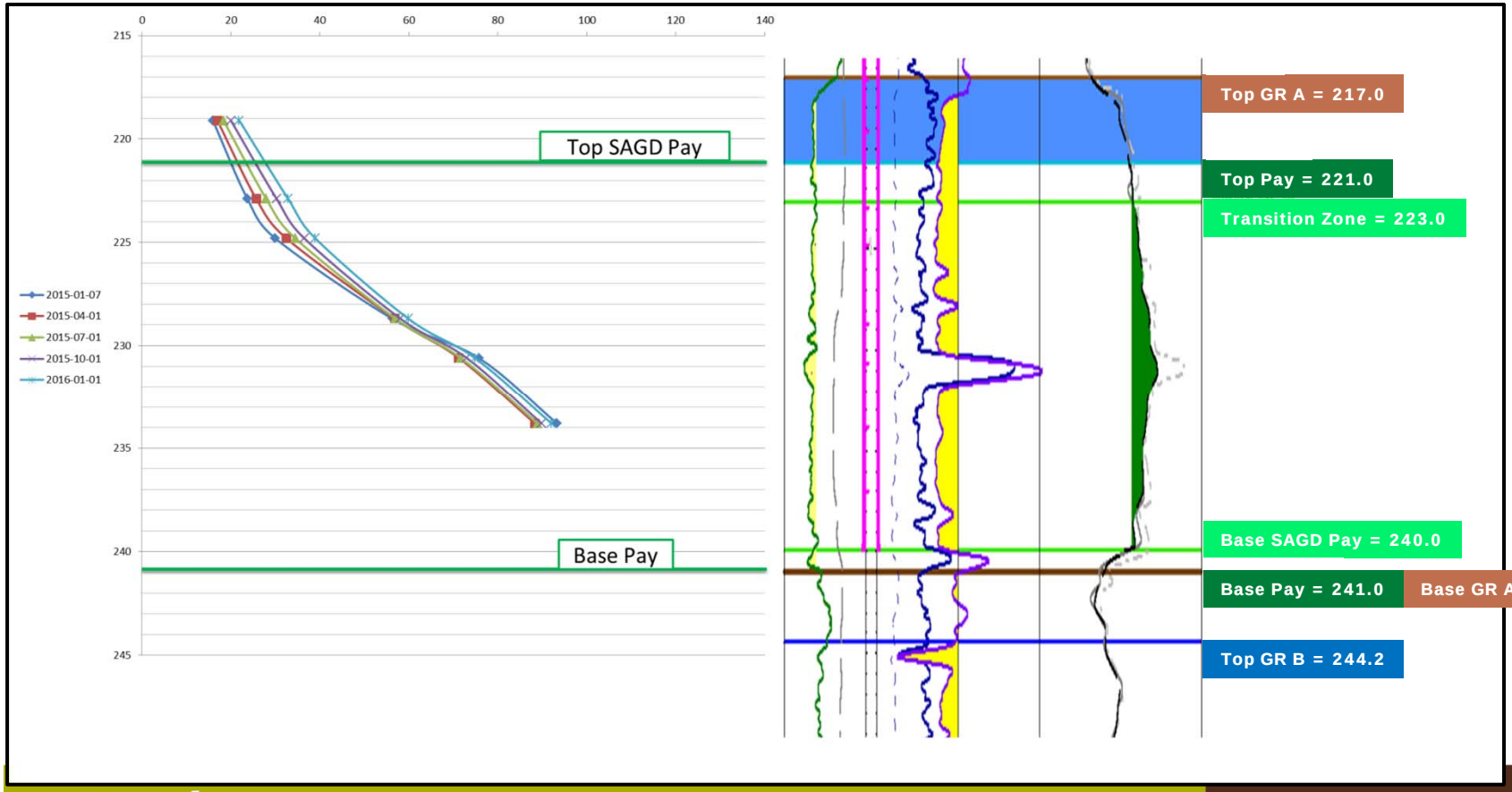
- Successful workover in April 2015 to open a shiftable steam splitter
- Sought to maintain pressure balance with lean zone
- Continued to improve thermal conformance
- Continued to evaluate effect of steam splitter shift and tubing-deployed Inflow Control Devices (ICDs) installed in P02

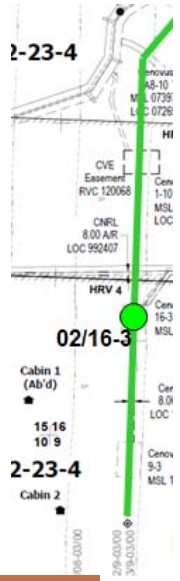
100/01-10-082-23W4/0 Observation Well Temperature



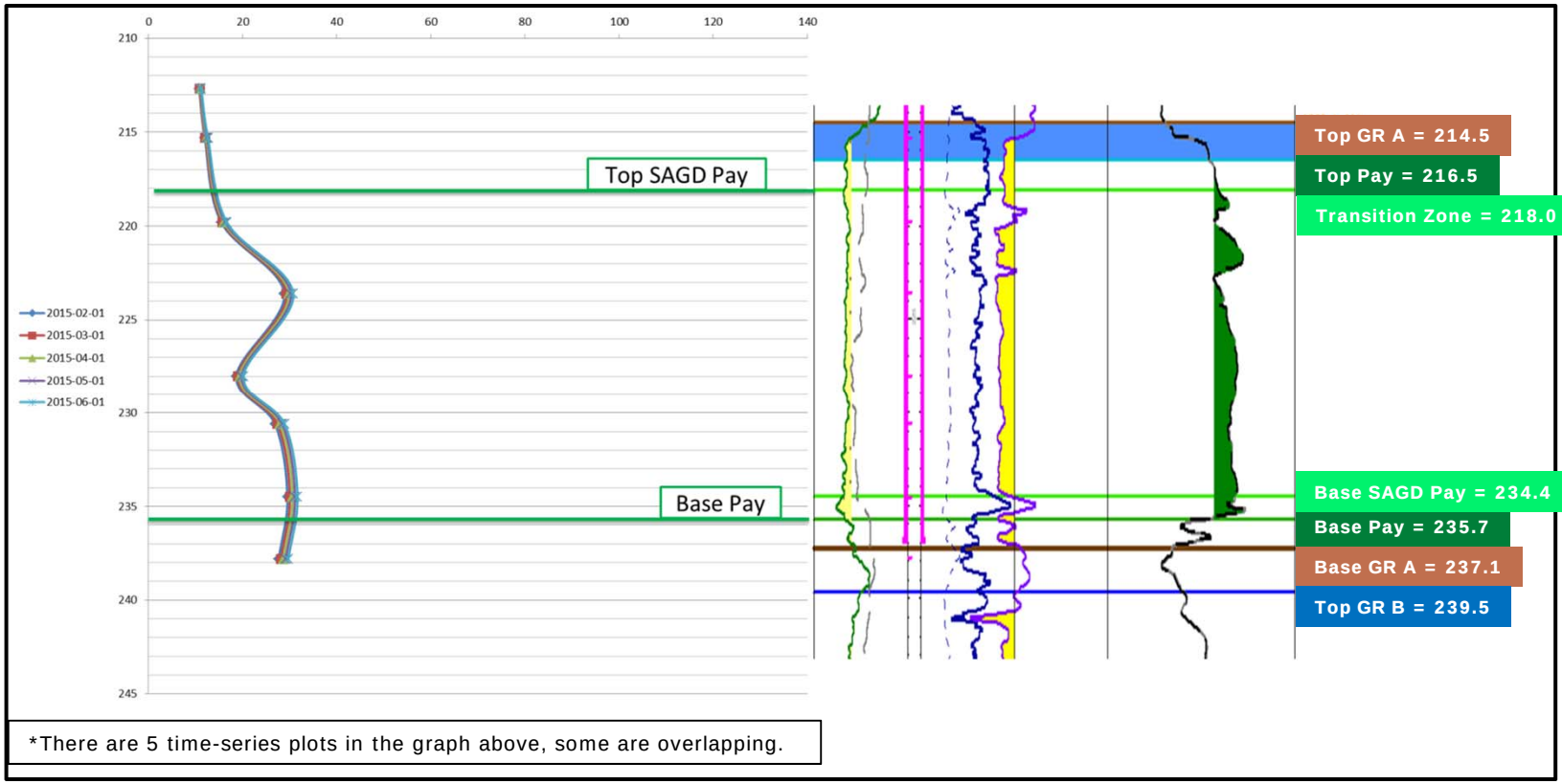


102/16-03-082-23W4/0 Observation Well Temperature





100/09-03-082-23W4/0 Observation Well Temperature



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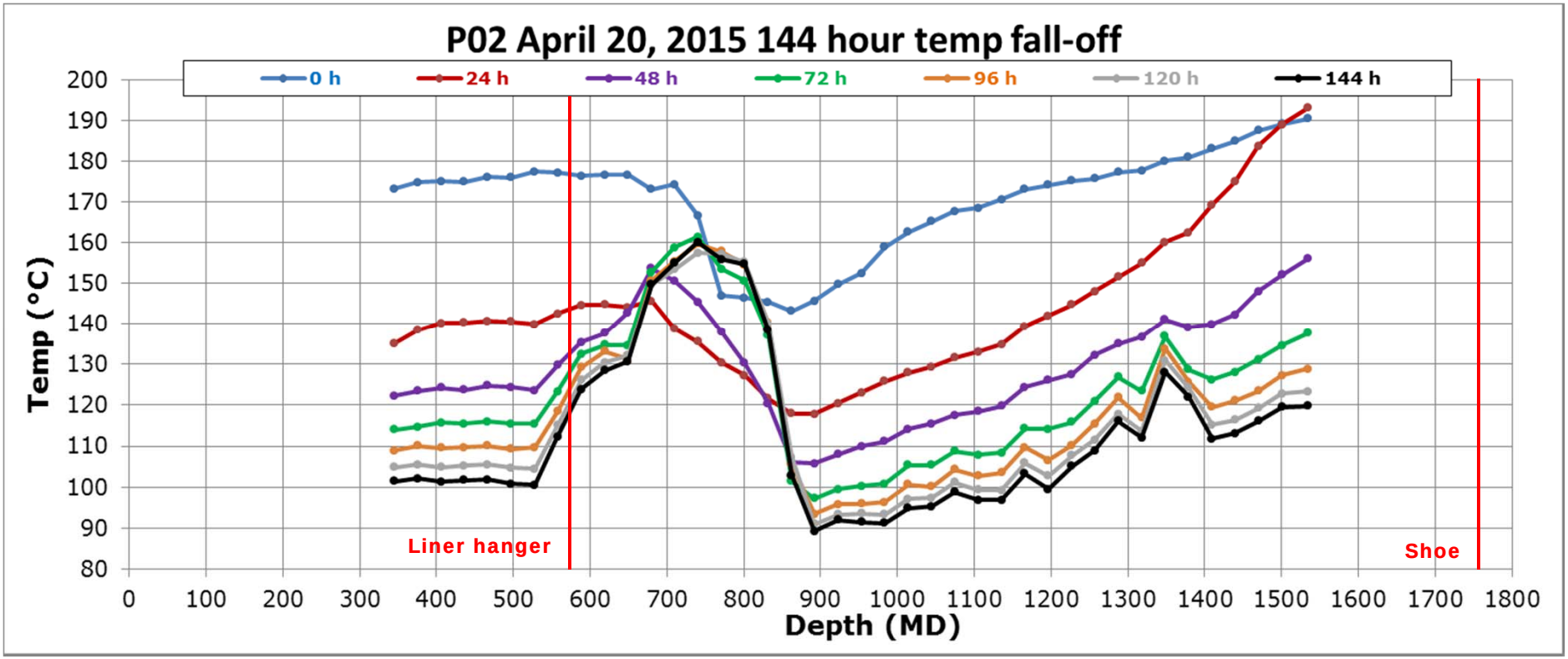
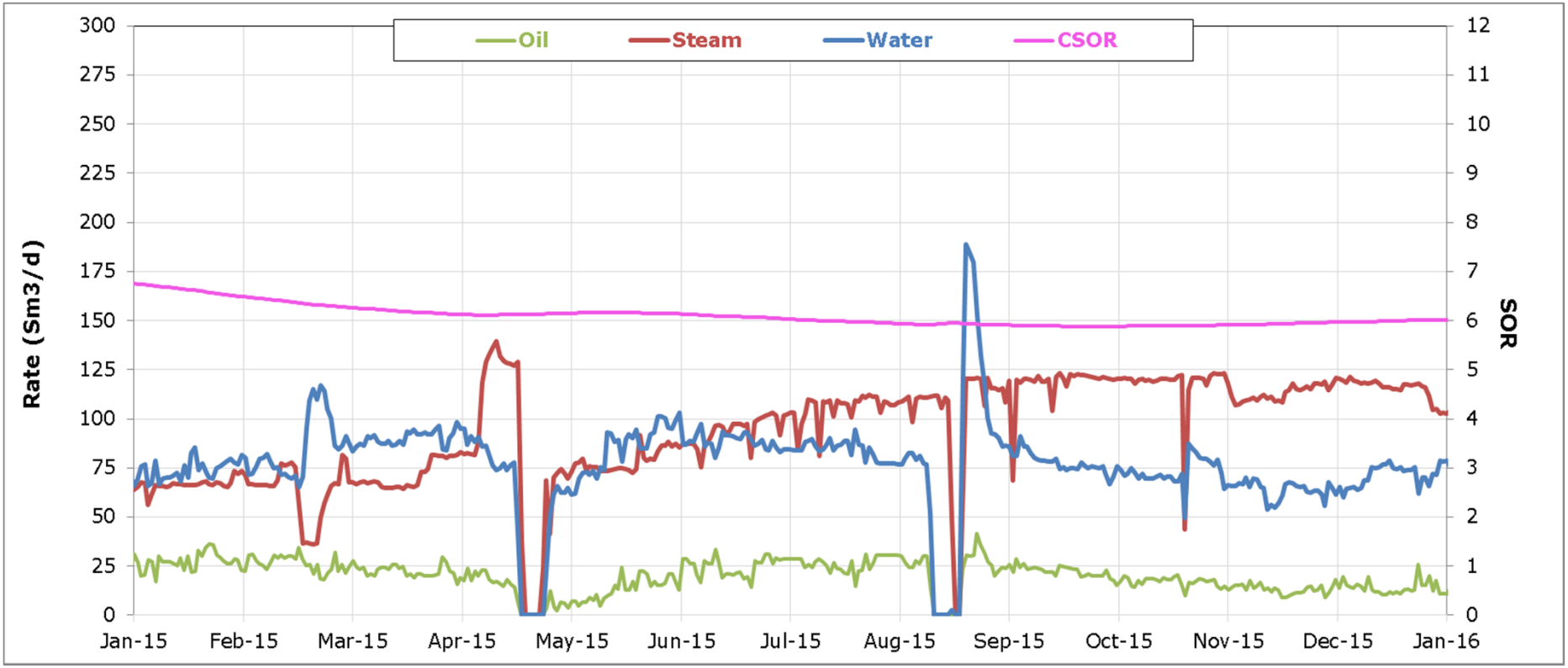
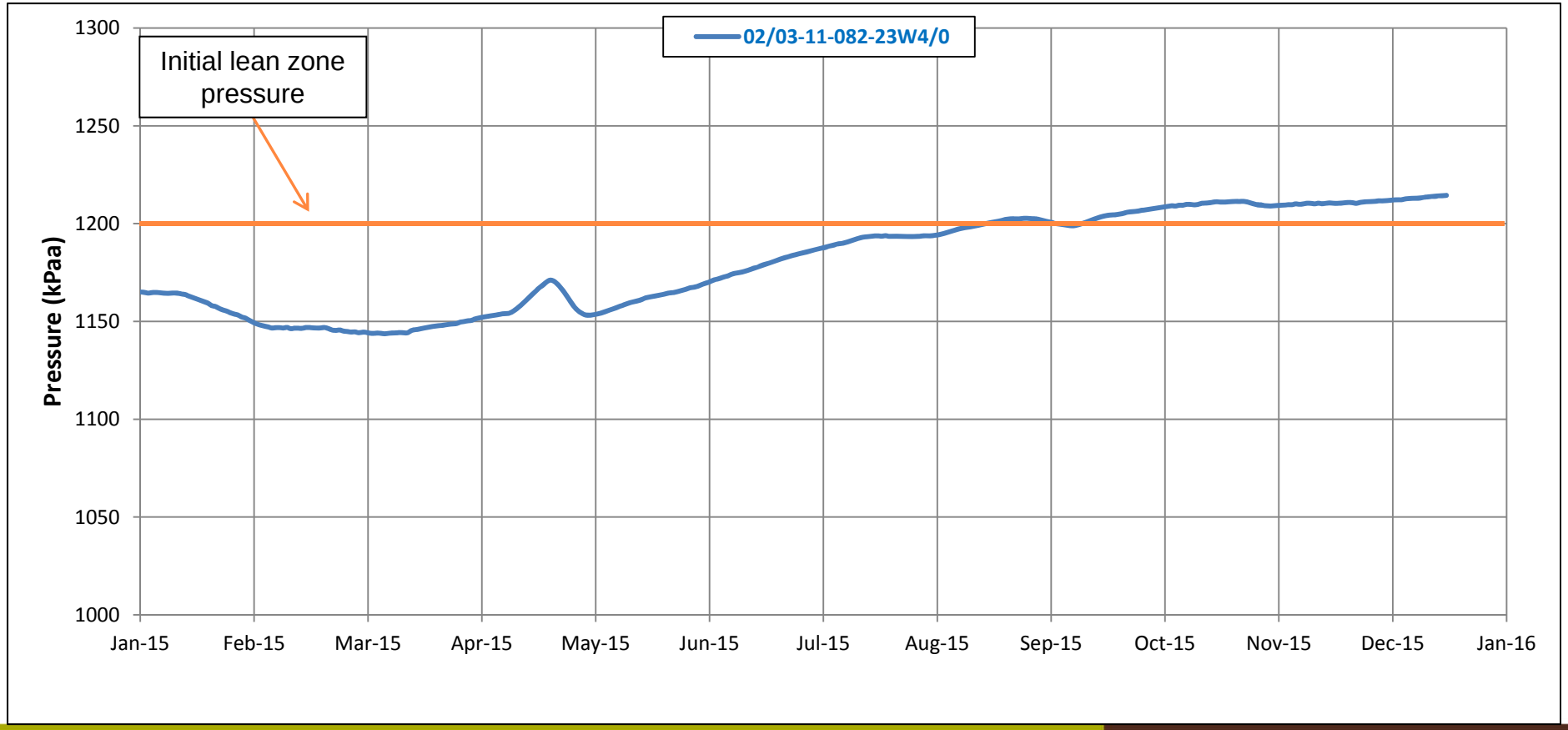
Well Pair 2 Temperature Profiles



Well Pair 2 Production



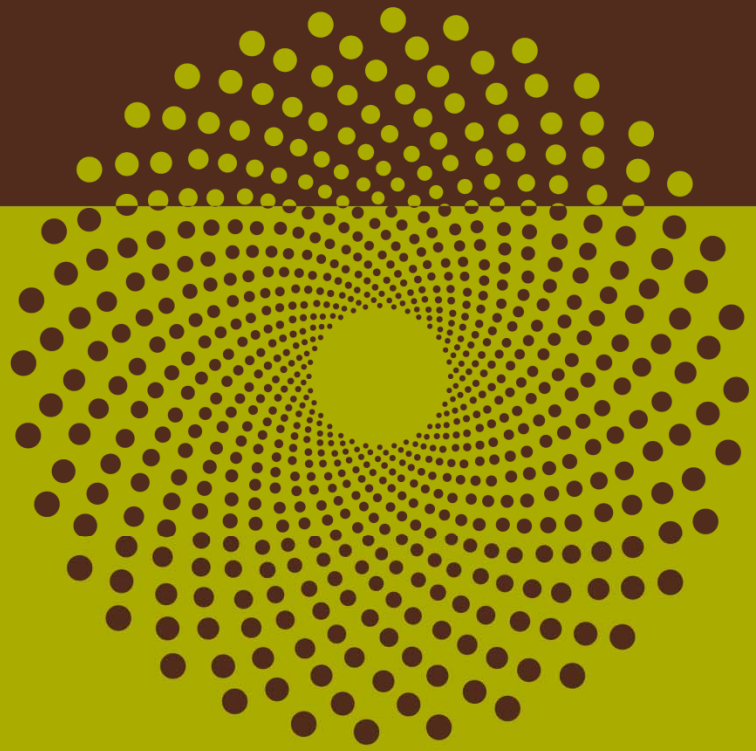
Lean Zone Pressure



Subsection 3.1.1

7) Scheme Performance

Well Pair 3



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Well Pair 3 Startup

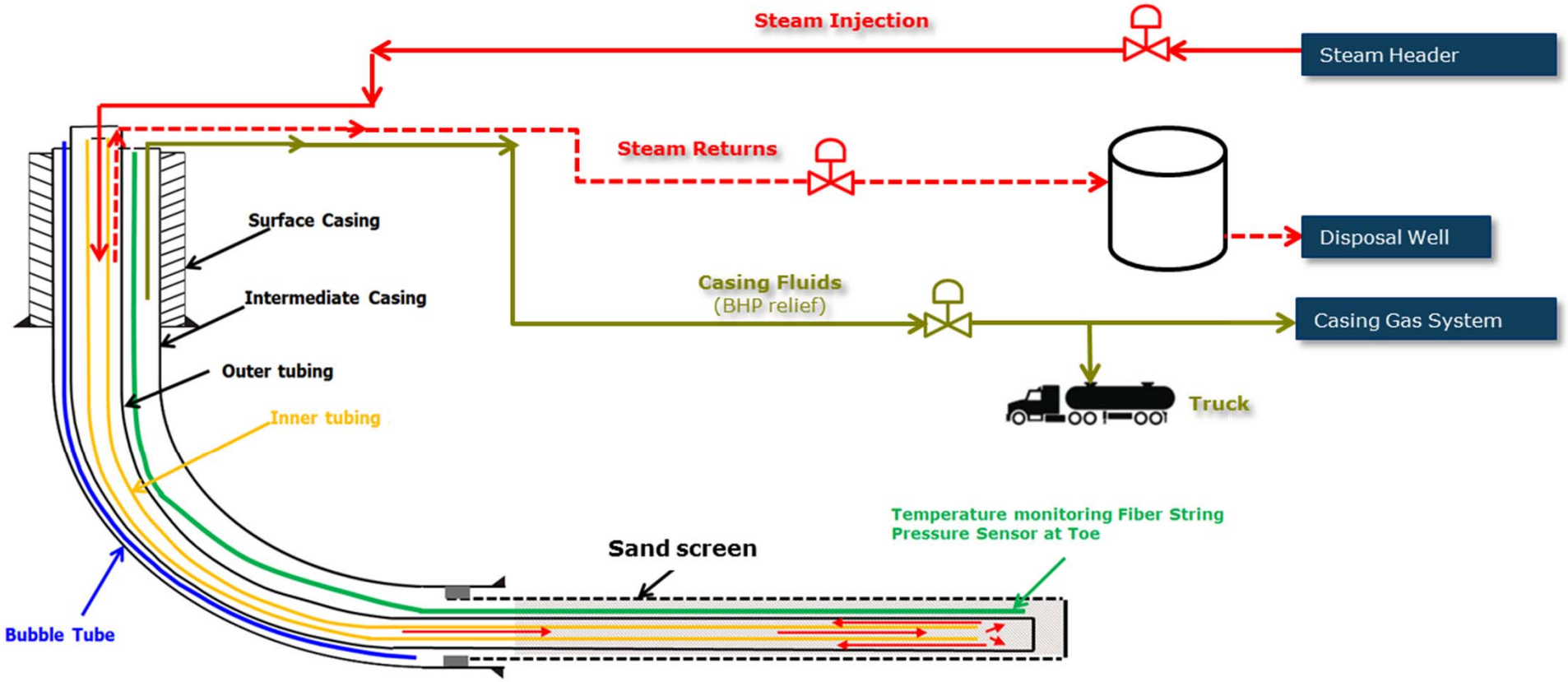
Description

- Proprietary Closed Circuit conductive heating startup (patent pending)
- Permits operation at higher temperatures compared with existing circulation practice
- Promotes uniform temperature distribution along lateral

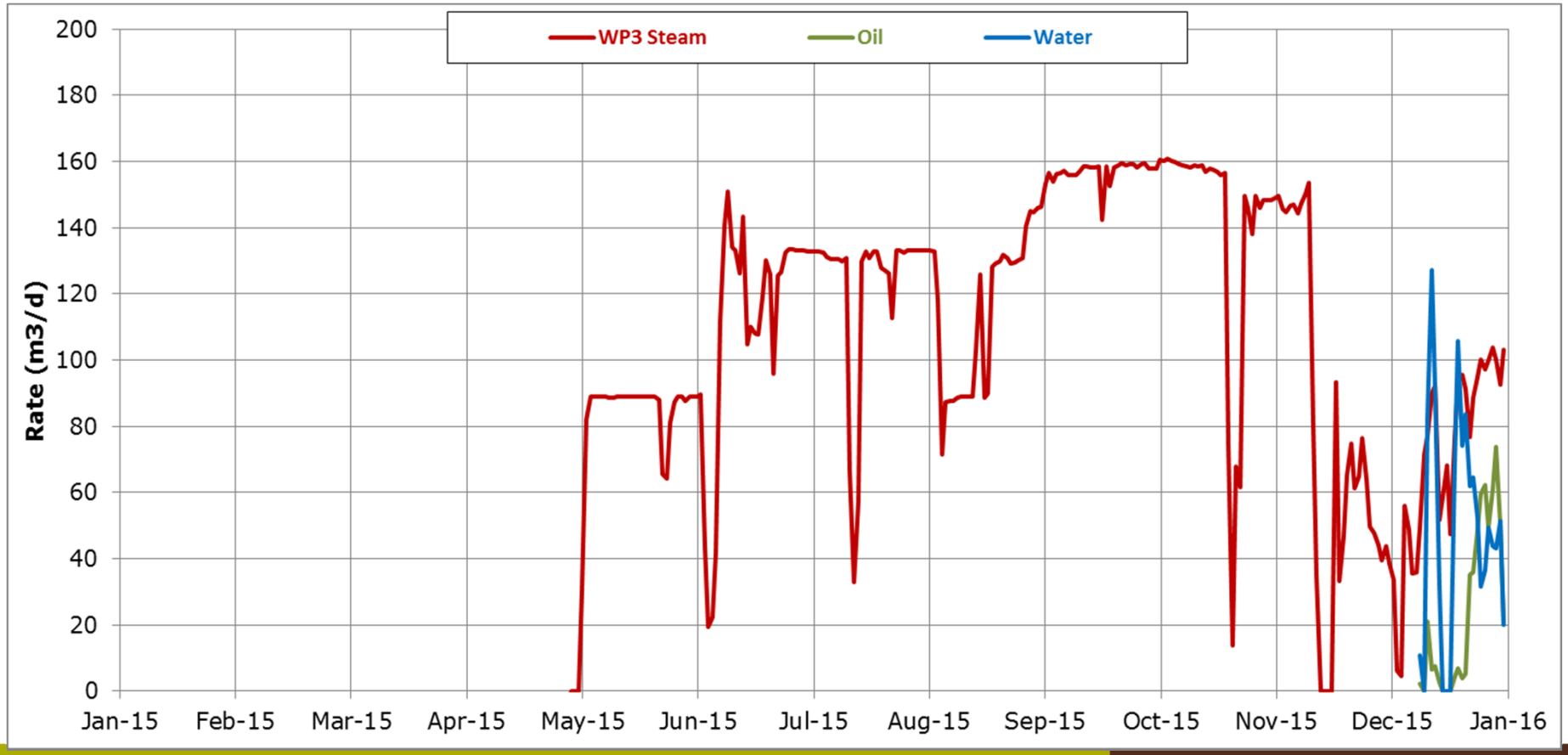
Timeline

- 26P03 and 26I03 initial completions in February 2015
- 26P03 began circulation May 4, 2015
- 26I03 began circulation June 9, 2015
- 26P03 converted to SAGD mode November 18, 2015

Operating Configuration for WP3 Startup



Field Data

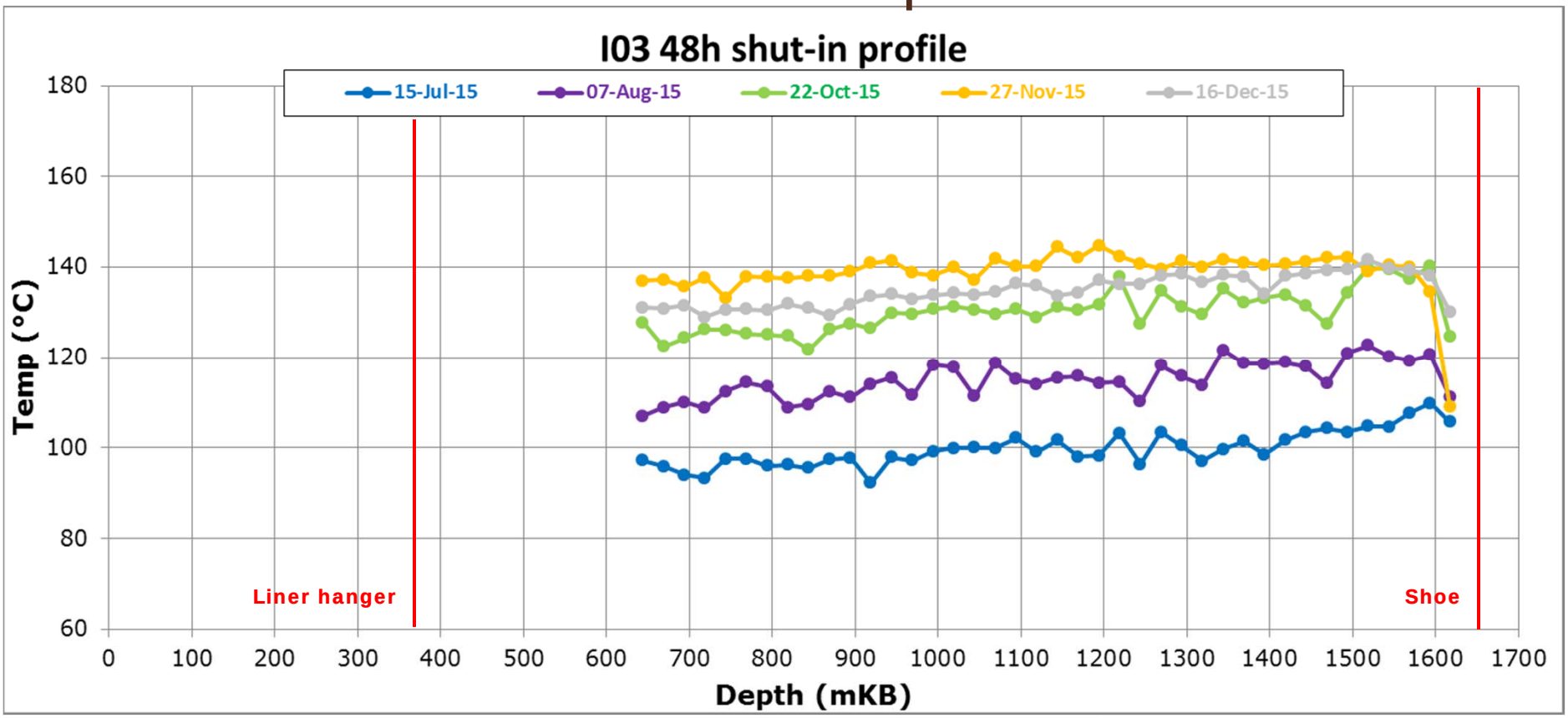

WP3 Steam
Oil
Water
Rate (m3/d)
200
180
160
140
120
100
80
60
40
20
0
Jan-15
Feb-15
Mar-15
Apr-15
May-15
Jun-15
Jul-15
Aug-15
Sep-15
Oct-15
Nov-15
Dec-15
Jan-16

2015 Casing Fluid Volumes During WP3 Startup

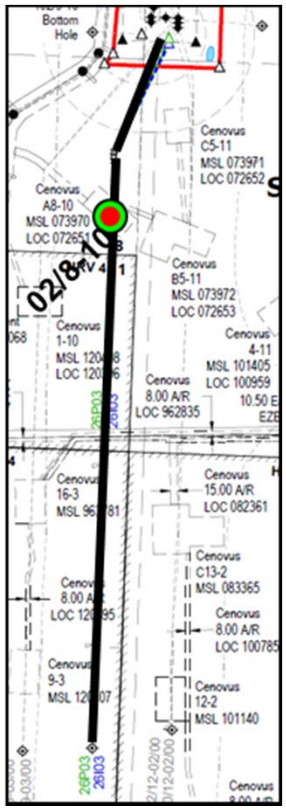
- Total oil produced in 2015 during WP3 startup is 746 m^3
- Total water produced in 2015 during WP3 startup is 893 m^3

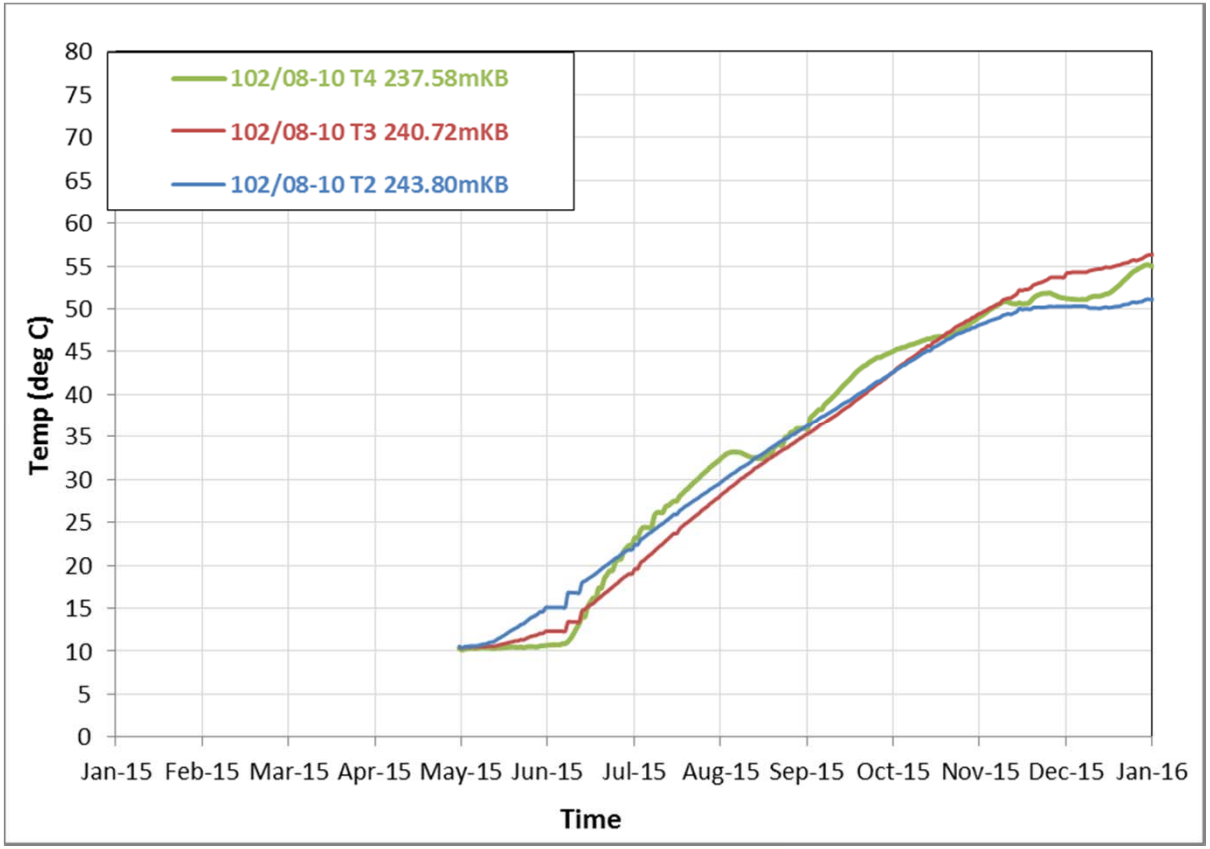
	May 4 - November 13	November 13 – December 31	2015 Total
P03 water	48 m^3	0	48 m^3
P03 oil	431 m^3	0	431 m^3
I03 water	387 m^3	458 m^3	845 m^3
I03 oil	161 m^3	154 m^3	315 m^3

Field Data – I03 Shut-in Temperatures



Field Data – Observation Well 102/08-10-082-23W4



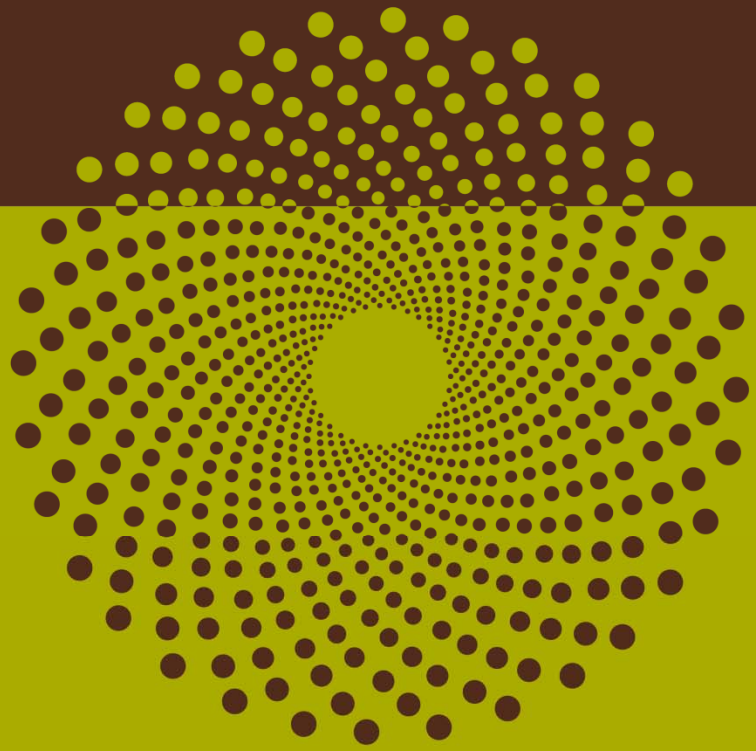


WP3 Startup Learnings

- Operated at higher temperatures compared with existing circulation practice
- Achieved uniform temperature distribution along lateral
- Fluids were produced as a result of bottomhole fluid expansion
- Temperature profiles, wellbore dynamics, and pace of heating within design expectations

Subsection 3.1.1

8) Future Plans



Future Plans

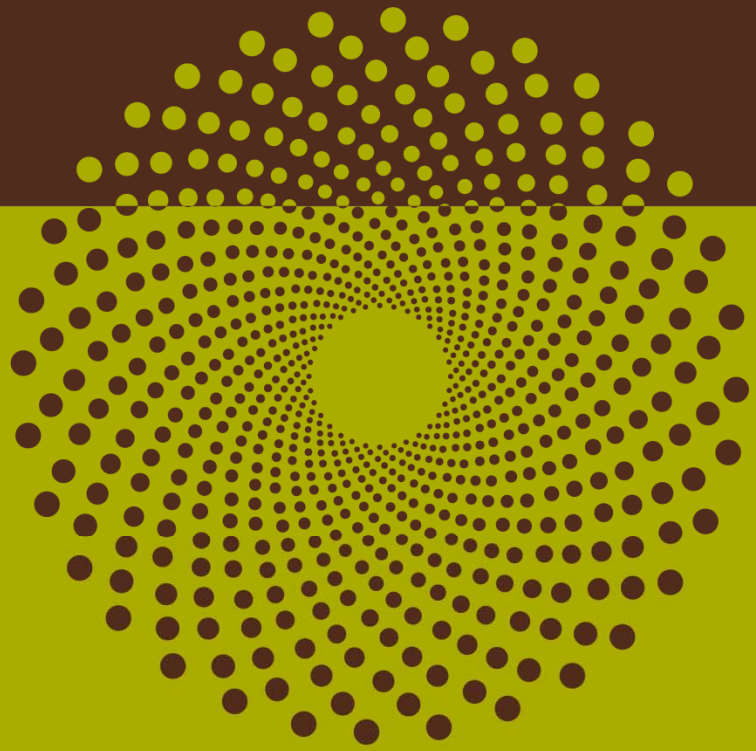
- Temporary suspension of SAGD pilot in Q1 2016
- No drilling plans for 2016

Subsection 3.1.2

Surface Operations,

Compliance,

Non-Related Resource Evaluation Issues



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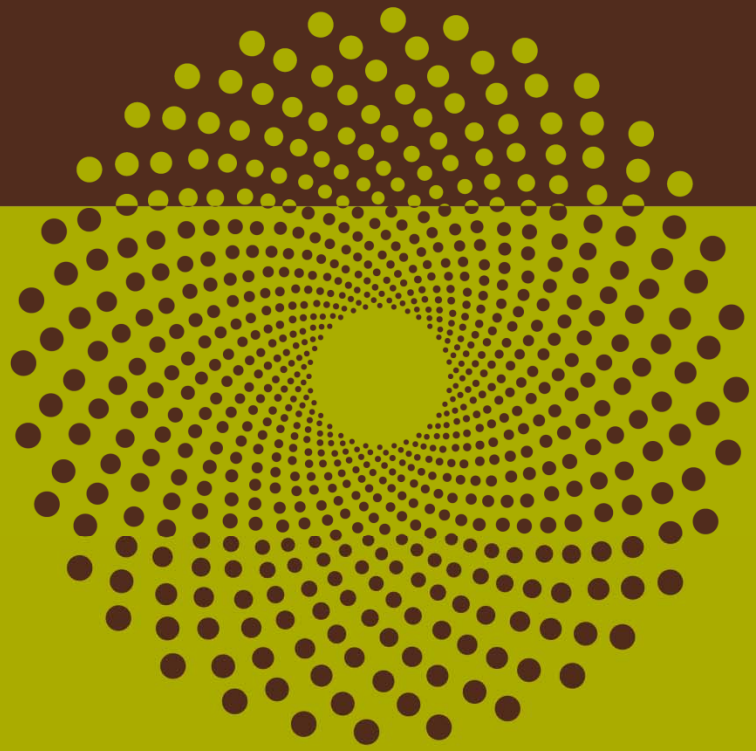
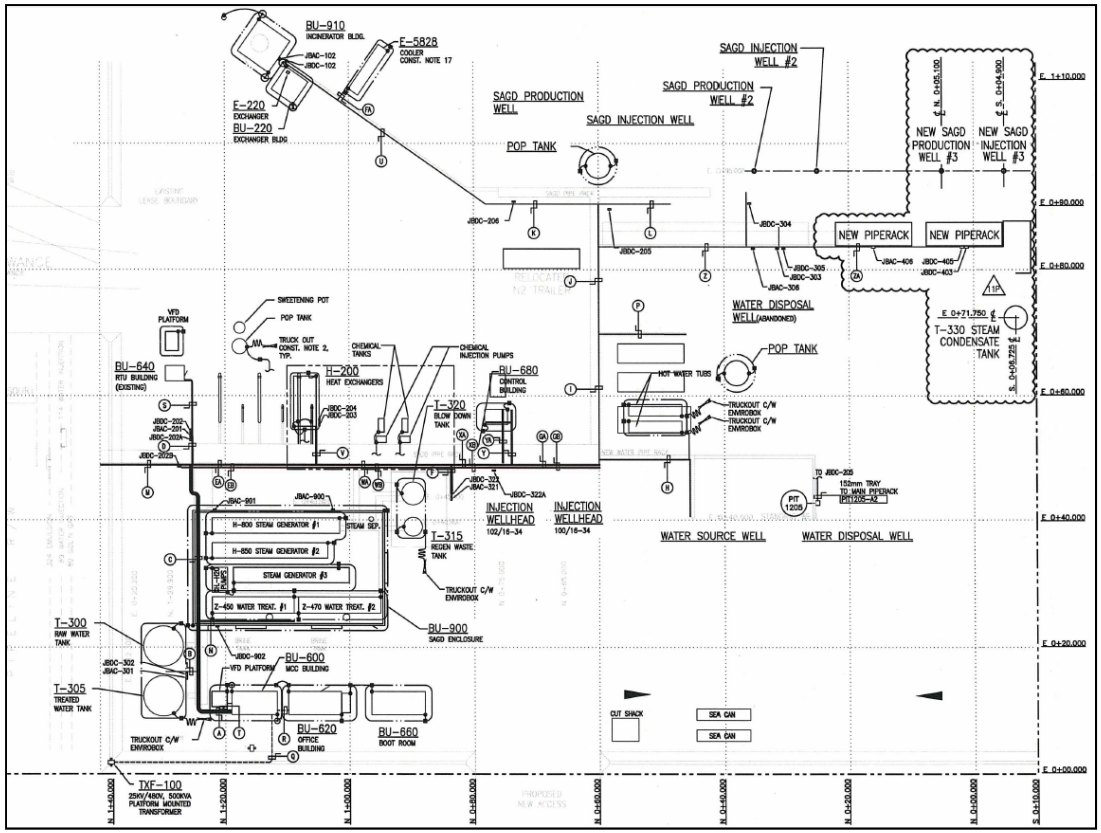
Subsection 3.1.2

1) Facilities



2015 Pad 26 Plot Plan



2015 Facility Summary

Facility Updates

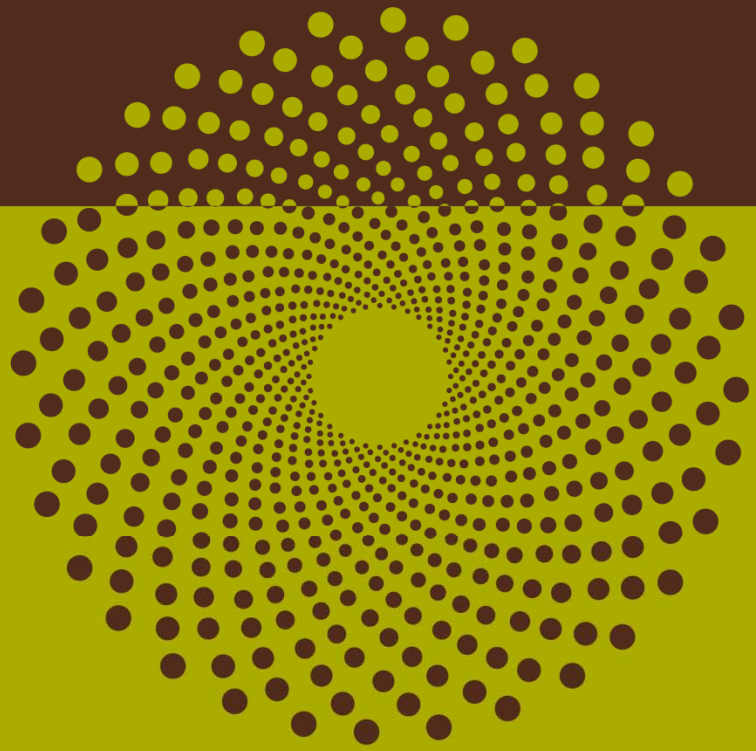
- Completed 26I03 and 26P03 facility tie-ins
- Added temporary steam condensate returns tank (T-330) for WP3 startup
- Flue gas O_2 analyzers installed in the radiant section of two of the OTSGs (H-800 and H-850) to improve combustion efficiency
- No major changes to existing facility

Plant Performance

- Annual plant turnaround executed April 19-27
- No lost production exceeding 1 day from unplanned plant outages
- Steam quality at the injection wellheads estimated at 95-99%
- Flue gas O_2 Analyzers have not been installed long enough to quantify the improved boiler controls

Subsection 3.1.2

2) Measurement and Reporting



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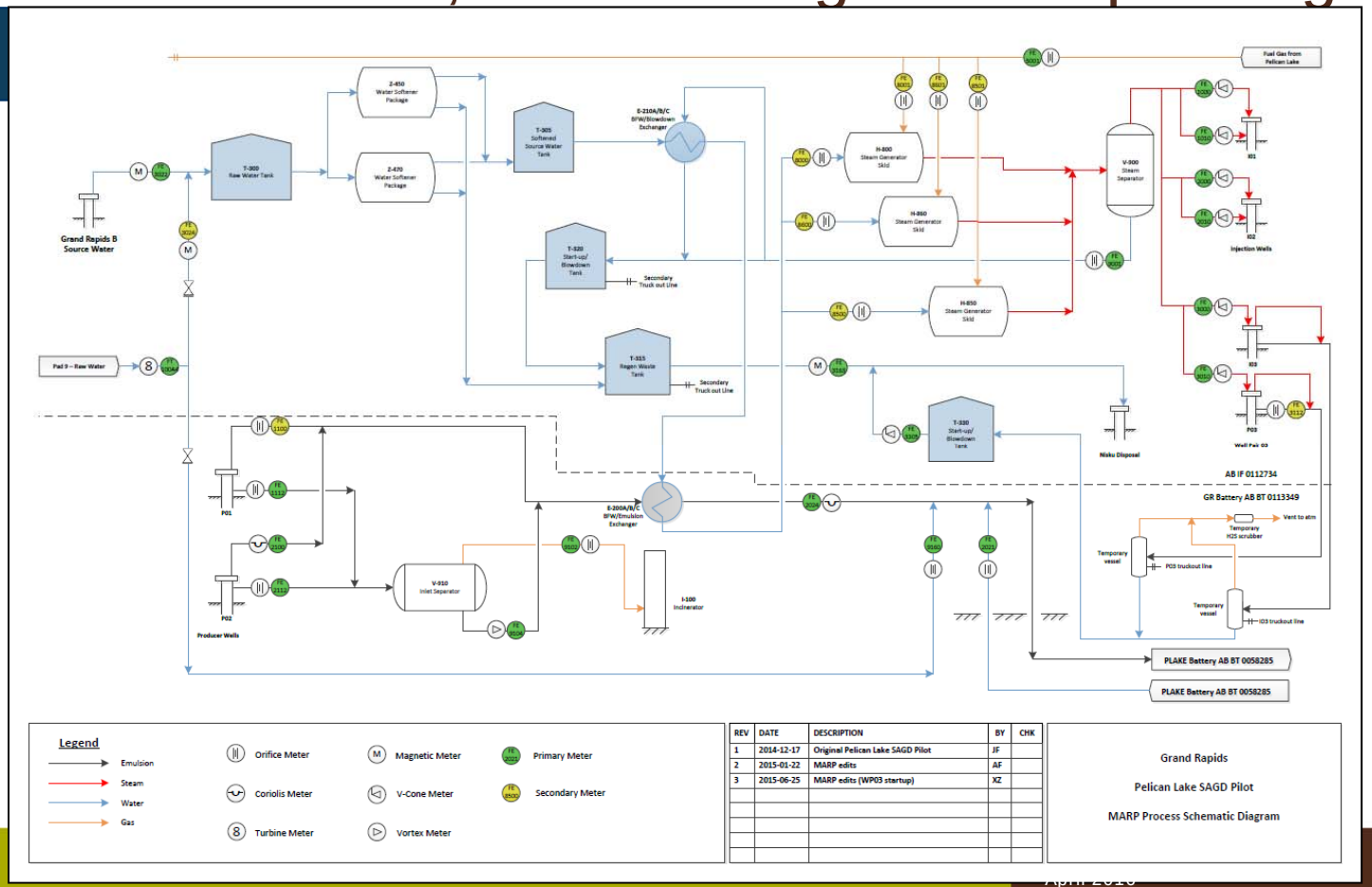
MARP (Measurement, Accounting and Reporting Plan)

WP3 Startup Schematic



Measurement and reporting

Estimated well production (oil and water)

- Coriolis meters have proven to be effective measurement tools at the pad
- 26P02 & 26P03 oil production is estimated by applying manual wellhead cuts to measured fluid production
- 26P01 oil production is estimated by applying manual wellhead cuts to measurement by difference:
  - 26P01 fluid = Pad 26 total fluid – 26P02 fluid – 26P03 (SAGD) fluid
- Produced oil and water is transferred to Pelican Lake 11-7 battery (AB BT0058285) for separation and all produced water is used for injection within scheme approval no. 9404V

Estimated well production (gas)

- Total gas production is obtained from a meter measuring the amount of produced gas going to the incinerator
- Gas proration for each production well is calculated using the gas-steam ratio determined from partial pressures

Measurement and reporting (continued)

Proration Factor

- Proration Factor reported to Petrinex on a monthly basis
  - Proration Factor (PF) for oil & water = $\frac{\text{Total pad production}}{\text{P01 + P02 + P03 production}}$

Meter Calibration

- Annual MARP meter calibrations were completed in Q3 2015, as per D017 requirements

Water Balance

GR Battery (AB BT 0113349)

In:

- Produced water (26P01, 26P02, 26P03)
- Pad 9 source water for quench (1F1/13-07-082-22W4/0)
- Pelican Lake produced water for quench (AB BT 0058285)
- WP3 startup steam condensate
- WP3 casing fluid returns

Out:

- Produced/quench water to Pelican Lake (AB BT 0058285)
- WP3 startup steam condensate to T-330 (AB IF 0112734)
- Truck out (WP3 casing fluid returns)

Water Balance

Injection Facility (AB IF 0112734)

In:

- Inventory open
- Source water (1F1/01-15-082-23W4/0)
- Source water (1F1/13-07-082-22W4/0) [upset conditions]
- Truck in [upset conditions]

Out:

- Inventory close
- Disposal (regen waste, boiler blowdown, T-330 WP3 startup steam condensate)
- Steam injection (26I01, 26I02, 26I03, 26P03)
- Truck out [upset conditions]

Gas Balance

GR Battery (AB BT 0113349)

In:

- Produced gas (26P01, 26P02, 26P03, 26I03)

Out:

- Produced gas to incinerator
- Vent to atmosphere (WP3 startup)

Injection Facility (AB IF 0112734)

In:

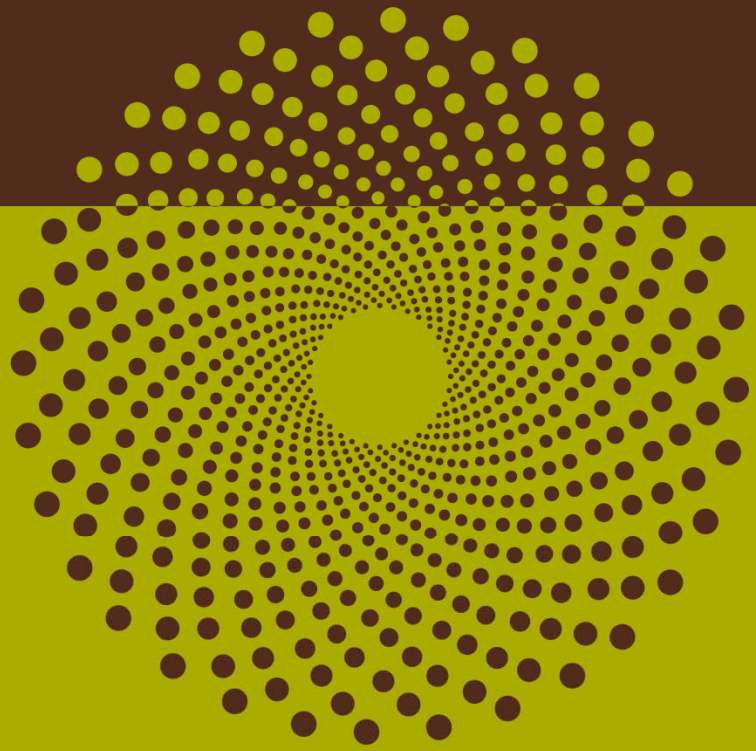
- Fuel gas from TCPL via Pelican Lake main gas line (AB MS 00094854)

Out:

- Fuel gas to OTSGs
- Fuel gas to incinerator

Subsection 3.1.2

3) Fresh and Brackish Water



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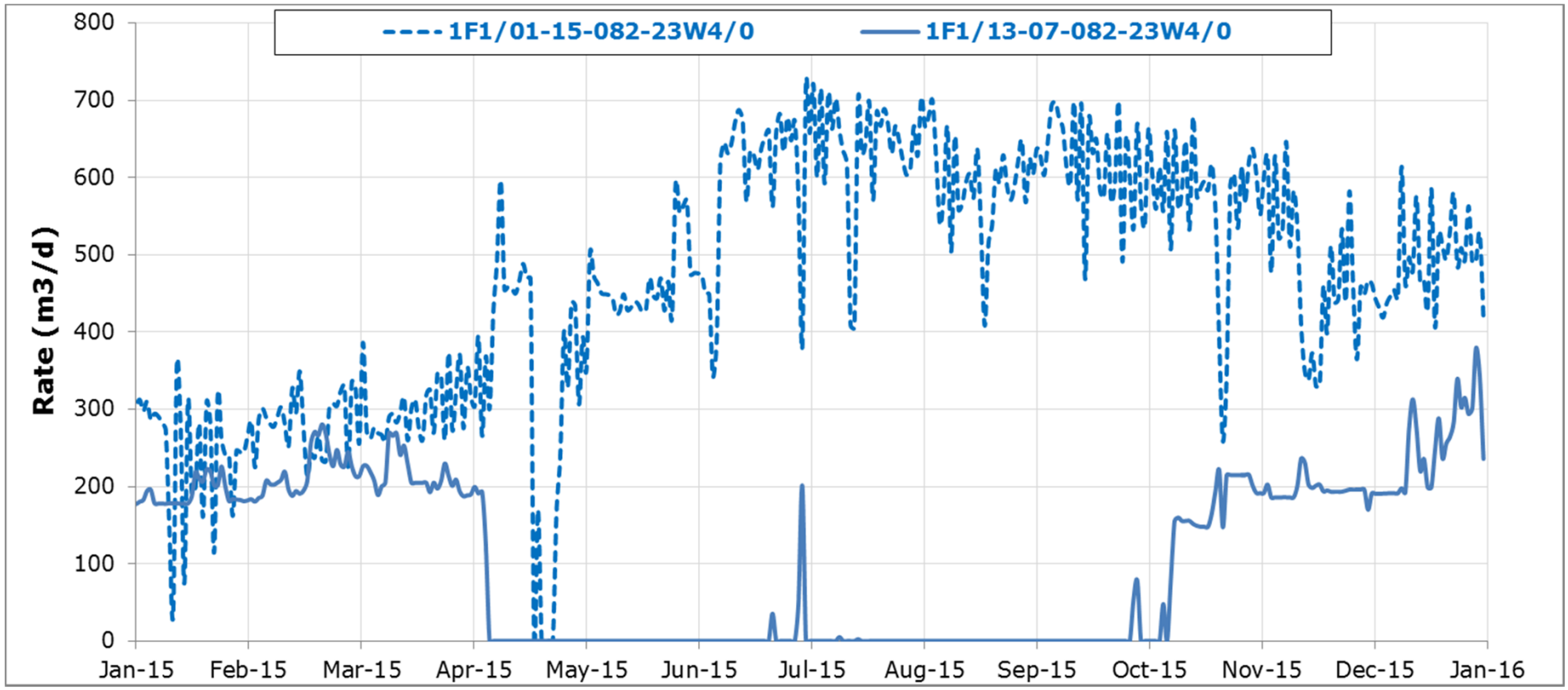
Water Source Wells

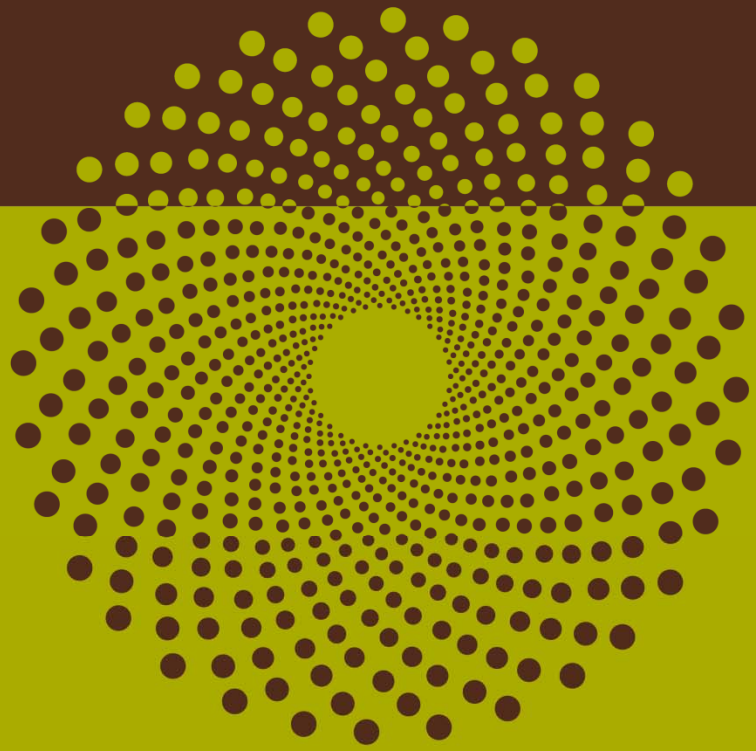
- Source water from Grand Rapids B water well (1F1/01-15-082-23W4/0) is used to generate steam for injection wells
- Source water from Grand Rapids B water well (1F1/13-07-082-22W4/0) is used for management of emulsion temperature in pipelines and primary source water upsets
- No brackish water wells

Source Water Well Rates



Subsection 3.1.2

4) Water Treatment Technology



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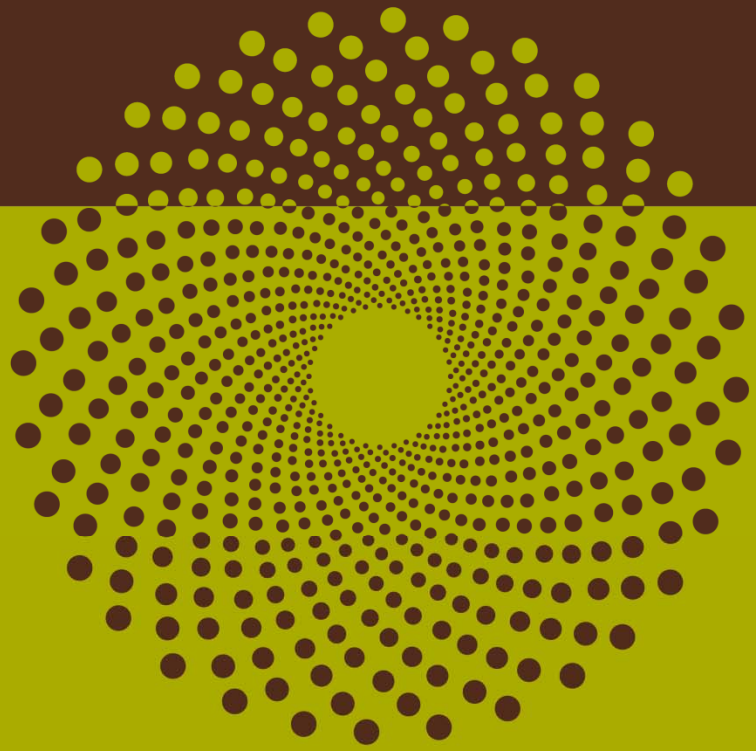
Water Treatment Overview

- Media Filtering
- Primary Strong Acid Cation (SAC) Exchange
- Secondary SAC polisher
- Source water for brine regeneration
- Low concentrations of Acid Producing Bacteria (APB) were identified in the sand filters in December 2015

Subsection 3.1.2

5) Waste Disposal



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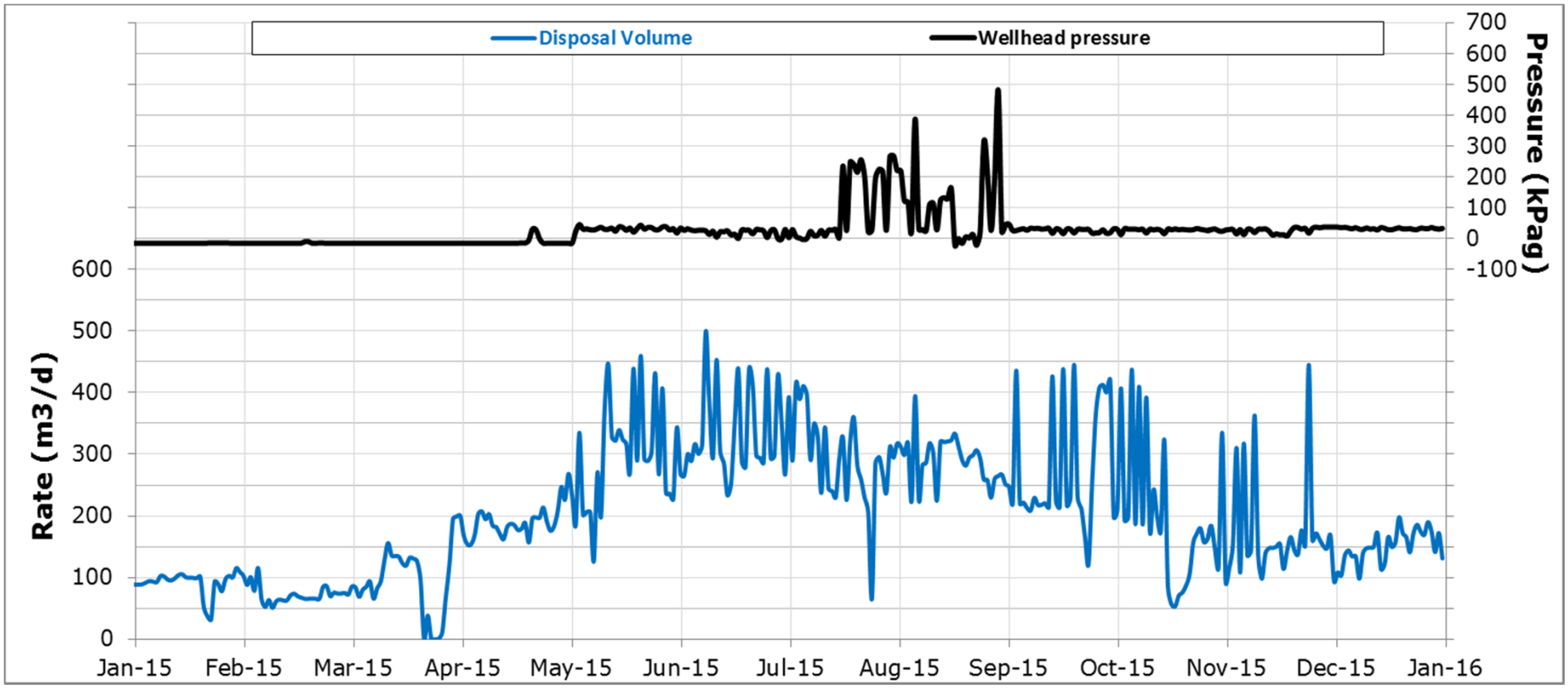
Disposal

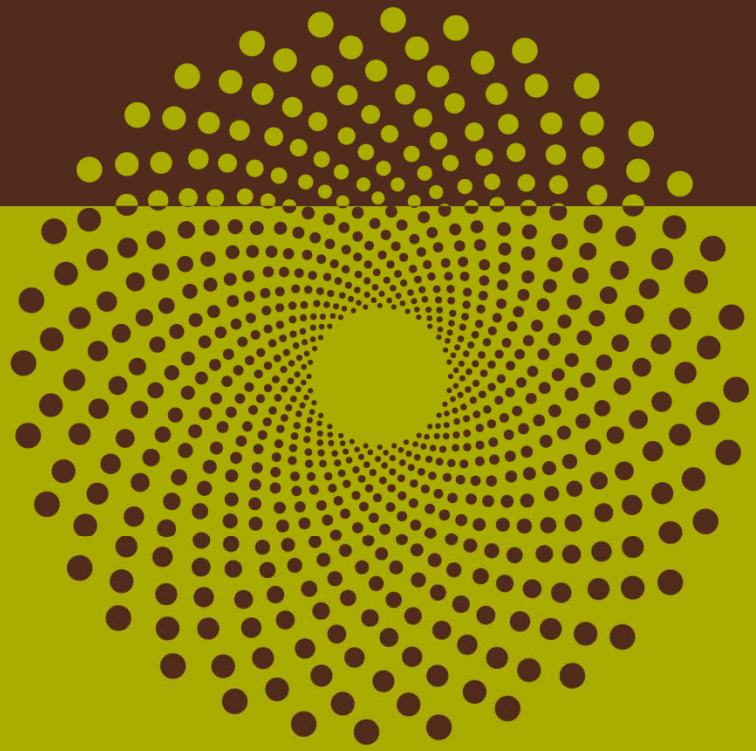
- Disposed fluids injected into a Class 1B disposal well (102/09-10-082-23W4/0)
- Disposed fluids include boiler blowdown, ion exchange regeneration waste, and WP3 steam condensate

Disposal Well Rates (102/09-10-082-23W4)



Subsection 3.1.2

6) Air Emissions



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2015 Air Emissions Reporting

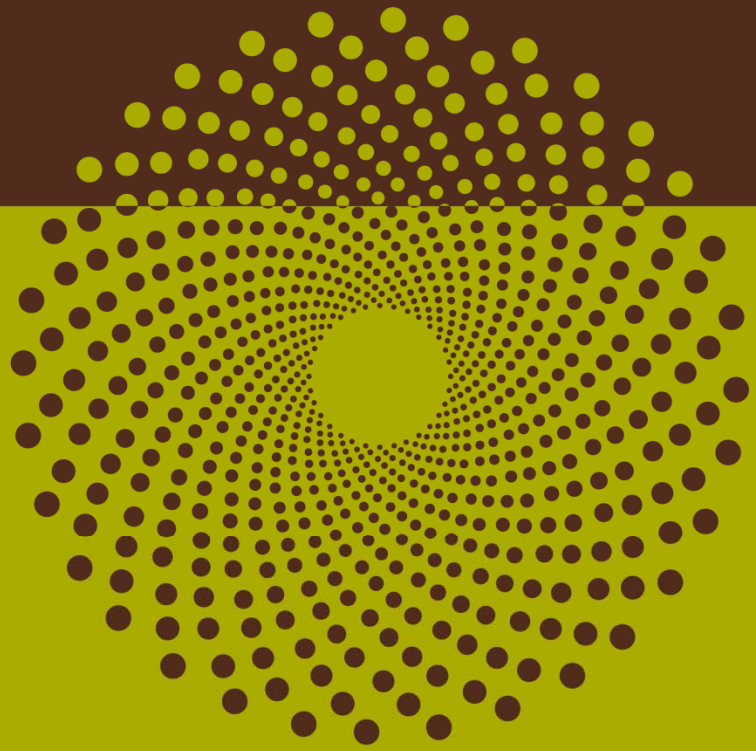
- Sulphur emissions generated from incineration of casing gases
  - SO_2 calculated from H_2S level in monthly casing gas analysis
  - Based on the calculated sulphur content, the facility is not required to complete quarterly sulphur emissions reporting

- Oxides of nitrogen (NO_x) emissions generated from boiler combustion

- During 2015:
  - Total SO_2 emissions were 0.011 tonnes
  - Total NO_x emissions (NO_2 equivalent) were 11.35 tonnes

Subsection 3.1.2

7-9) Environmental & Compliance



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Environmental Summary

- No environmental events to report

Non-compliance

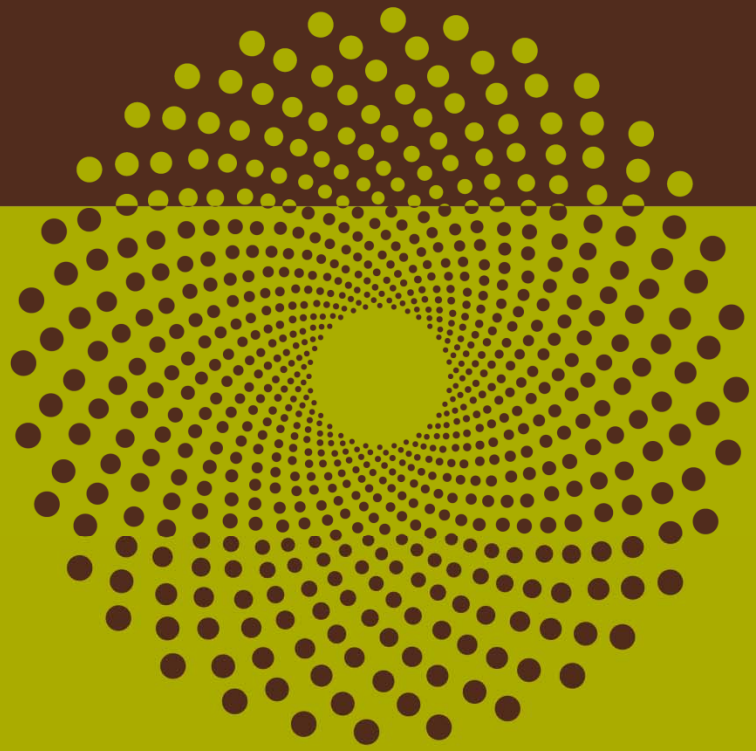
WP3 startup venting

- Venting started on May 4, 2015 for 26P03 and June 9, 2015 for 26I03
- Venting ceased on December 31, 2015 for 26P03 and January 20, 2015 for 26I03
- Total vent volumes in 2015 from 26I03 and 26P03 is 6.0 e^3m^3

- AER notified of venting May 22, 2015
- Met all reporting requirements following initial notification
- No regulatory enforcement as a result of the non-compliance

Subsection 3.1.2

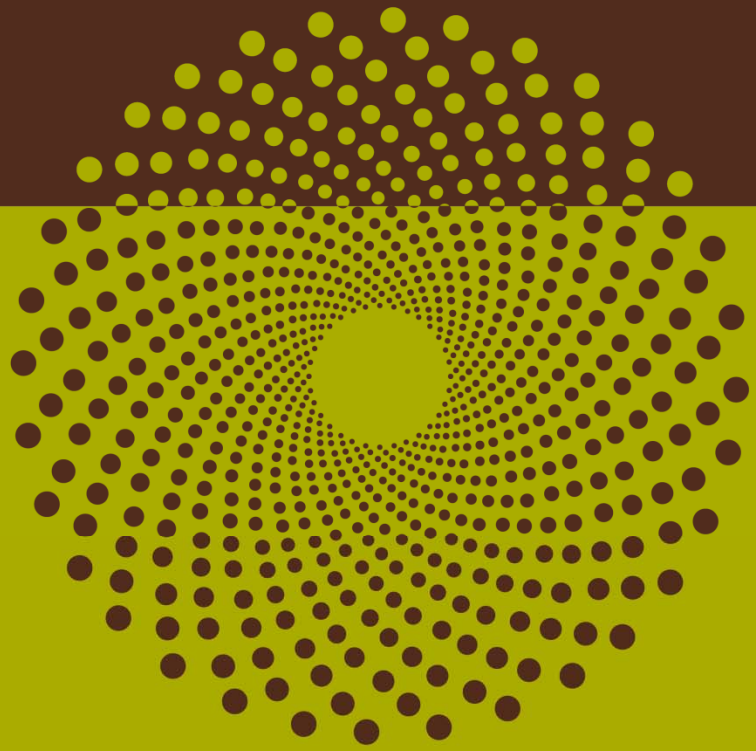
10) Future Plans



Future Plans

- Temporary suspension and preservation of SAGD pilot facility in Q1 2016
  - Plans to restart SAGD Pilot in the future
- May require additional facility tie-ins for WP3 restart
- OTSG compliance with the updated CSA B.149.3 code
  - Upgrades to Burner Management Systems (BMS), PLC, valving, and instrumentation required
  - Boiler and economizer inspections

Appendices

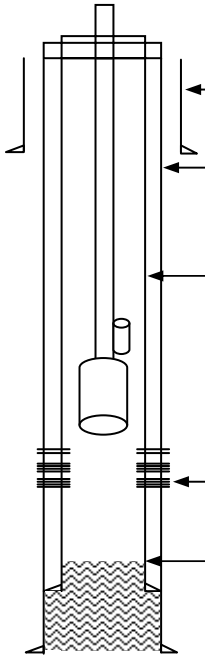


Appendix: Pelican Lake SAGD Pilot Observation Wellbore Schematic

ECA ECOG A8 BRINT 8-10-82-23

100/08-10-082-23W4 LSD 8-10-82-23W4M

KB= 607.7 mKB
GRD= 603.9 mKB
PBTD = 326.9 mKB



Conductor:
Landed at 20 m KB / 244.5mm

Intermediate Casing:
139.7 mm , 25.30 kg/m , K-55
Landed at 342.5 mKB
Cemented to surface with Thermal Cement 2.0m3 of returns

Secondary Intermediate Casing:
88.9 mm , 13.84 kg/m , J-55
Landed at 327.26 mKB
Cemented to surface with Thermal Cement 6.1m3 of returns

Tubing String:
31.8mm, 1.697kg/m, Galvonized Steel
Landed at 193.21mKB
ESP Pump - 193.21-194.21mKB (Pressure/Temperature sensor for fluid level calculation @ 193.75mKB)

Perforations:
254-256mKB
263-267 mKB
276-280 mKB

PBTD Cement Top in Secondary Intermediate Casing @ 326.9 mKB

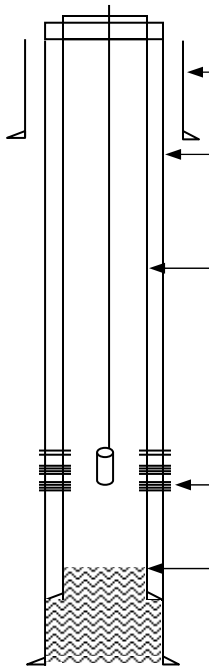
Intended Purpose:
Pressure (Fluid Level), Temperature, Water quality monitoring of Grand Rapids B aquifer

Appendix: Pelican Lake SAGD Pilot Observation Wellbore Schematic

ECA ECOG A9 BRINT 9-10-82-23

100/09-10-082-23W4 LSD 9-10-82-23W4M

KB= 608.9 mKB
GRD= 605.1 mKB
PBTD = 308.4 mKB



Conductor:
Landed at 20 m KB / 244.5mm

Intermediate Casing:
139.7 mm , 25.30 kg/m , K-55
Landed at 337.0 mKB
Cemented to surface with Thermal Cement 2.0m3 of returns

Secondary Intermediate Casing:
88.9 mm , 13.84 kg/m , J-55
Landed at 321.30 mKB
Cemented to surface with Thermal Cement 2.0m3 of returns

Tubing String:
31.8mm, 1.697kg/m, Galvonized Steel
Landed at 188mKB
ESP Pump - 193.21-196.78mKB (Pressure/Temperature sensor for fluid level calculation @ 196.32mKB)
Pressure/Temperature sensor for fluid level calculation suspended on cable and landed @ 257.0mKB

Perforations:
257-259mKB
266-270 mKB
276-280 mKB

PBTD Cement Top in Secondary Intermediate Casing @ 308.4 mKB

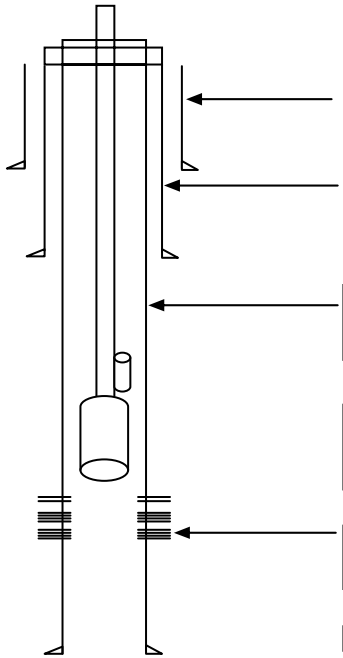
Intended Purpose:
Pressure (Fluid Level) and Temperature monitoring of Grand Rapids B aquifer

Appendix: Pelican Lake SAGD Pilot Observation Wellbore Schematic

CVE BRINT 4-11-82-23

100/04-11-082-23W4 LSD 4-11-82-23W4M

KB= 608.5 mKB
GRD= 604.3 mKB
PBTD = 336.0 mKB



Conductor:
Landed at 20 m KB / 406.4mm

Surface Casing:
177.8 mm , 25.30 kg/m , H-40
Landed at 99.5 mKB
Cemented to surface with Thermal Cement 1.0m3 of returns

Intermediate Casing:
114.3 mm , 17.26 kg/m , L-80
Landed at 335.9 mKB
Cemented to surface with Thermal Cement 4.0m3 of returns

Tubing String:
31.8mm, 1.697kg/m, Galvonized Steel
Landed at 194.35mKB
ESP Pump - 194.35 - 195.35mKB (Pressure/Temperature sensor for fluid level calculation @ 193.89mKB)

Perforations:
253-255 mKB
263-267 mKB
277-281 mKB

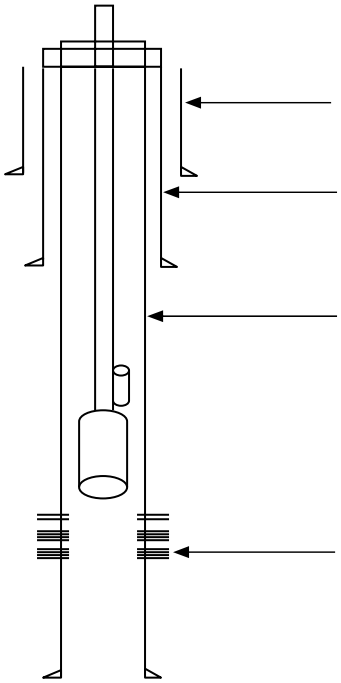
Intended Purpose:
Pressure (Fluid Level), Temperature, Water quality monitoring of Grand Rapids B aquifer

Appendix: Pelican Lake SAGD Pilot Observation Wellbore Schematic

CVE 2C13 BRINT 13-2-82-23

103/13-02-082-23W4 LSD 13-2-82-23W4M

KB= 601.2 mKB
GRD= 596.9 mKB
PBTD = 328.0 mKB



Conductor:

Landed at 20 m KB / 406.4mm

Surface Casing:

177.8 mm , 25.30 kg/m , H-40
Landed at 86.25 mKB
Cemented to surface with Thermal Cement 1.5m3 of returns

Intermediate Casing:

114.3 mm , 17.26 kg/m , L-80
Landed at 328.0 mKB
Cemented to surface with Thermal Cement 4.0m3 of returns

Tubing String:

31.8mm, 1.697kg/m, Galvonized Steel
Landed at 194.05mKB
ESP Pump - 194.05 - 195.05mKB (Pressure/Temperature sensor for fluid level calculation @ 193.77mKB)

Perforations:

246-248 mKB
256-260 mKB
273-277 mKB

Intended Purpose:

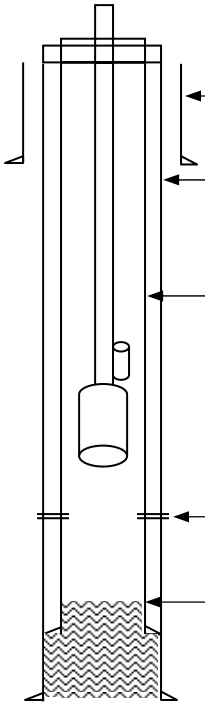
Pressure (Fluid Level), Temperature, Water quality monitoring of Grand Rapids B aquifer

Appendix: Pelican Lake SAGD Pilot Observation Wellbore Schematic

ECA ECOG B3 BRINT 3-11-82-23

102/03-11-082-23W4 LSD 3-11-82-23W4M

KB= 611.7 mKB
GRD= 607.9 mKB
PBTD = 326.0 mKB



Conductor:
Landed at 20 m KB / 244.5mm

Intermediate Casing:
139.7 mm , 25.30 kg/m , K-55
Landed at 345.0 mKB
Cemented to surface with Thermal Cement 2.0m3 of returns

Secondary Intermediate Casing:
88.9 mm , 13.84 kg/m , J-55
Landed at 329.66 mKB
Cemented to surface with Thermal Cement 2.0m3 of returns

Tubing String:
38.1mm, 1.697kg/m, Galvonized Steel
Landed at 149.1mKB
ESP Pump - 149.1-150.0mKB (Pressure/Temperature sensor for fluid level calculation @ 149.5mKB)

Perforations:
228-230mKB

PBTD Cement Top in Secondary Intermediate Casing @ 326.0 mKB

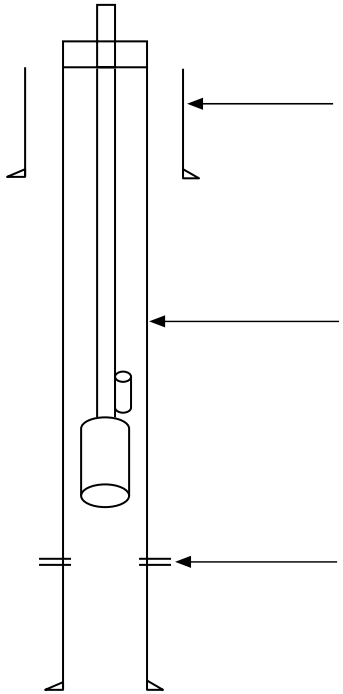
Intended Purpose:
Pressure (Fluid Level), Temperature, Water quality monitoring of Grand Rapids A aquifer

Appendix: Pelican Lake SAGD Pilot Observation Wellbore Schematic

CVE C12 BRINT 12-11-82-23

103/12-11-082-23W4 LSD 12-11-82-23W4M

KB= 606.3 mKB
GRD= 602.3 mKB
PBTD = 335.0 mKB



Conductor:

Landed at 22 m KB / 244.5mm

Intermediate Casing:

177.8 mm , 38.69 kg/m , L-80
Landed at 335.0 mKB
Cemented to surface with Thermal Cement 2.0m3 of returns

Tubing String:

31.8mm, 1.697kg/m, Galvonized Steel
Landed at 150.0mKB
ESP Pump - 149.0 - 150.0mKB (Pressure/Temperature sensor for fluid level calculation @ 150.4mKB)

Perforations:

196-198 mKB

Intended Purpose:

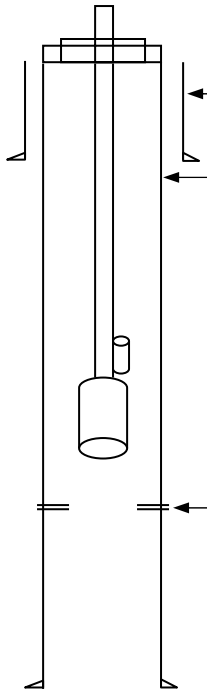
Pressure (Fluid Level), Temperature, Water quality monitoring of Viking aquifer

Appendix: Pelican Lake SAGD Pilot Observation Wellbore Schematic

CVE BRINT 4-27-82-22

100/04-27-082-22W4 LSD 4-27-82-22W4M

KB= 627.00 mKB
GRD= 622.9 mKB
TD = 341.0 mKB



Surface Casing:

177.8 mm , 25.30 kg/m , H-40
Landed at 166.0 mKB

Intermediate Casing:

114.3 mm , 22,471 kg/m , L-80
Landed at 341.0 mKB
Cemented to surface with Thermal Cement 2.0m3 of returns

Tubing String:

33.4mm, 2.53kg/m, C-75 Galvonized Steel
Landed at 111.4 mKB
ESP Pump - 111.4 mKB (Pressure/Temperature sensor for fluid level calculation @ 110.4mKB)

Perforations:

197.0-202.0 mKB

Intended Purpose:

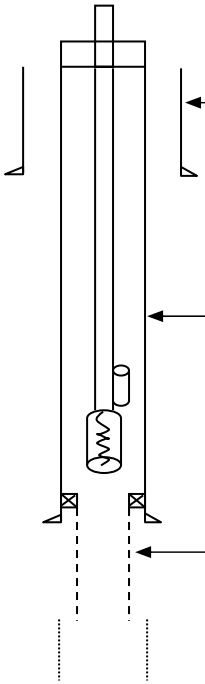
Pressure (Fluid Level), Temperature, Water quality monitoring of Tertiary aquifer

Appendix: Pelican Lake SAGD Pilot Observation Wellbore Schematic

CVE WS2 BRINT 13-7-82-22

1F2/13-07-082-22W4 LSD 13-7-82-22W4M

KB= 623.9 mKB
GRD= 620.4 mKB
PBTD = 191.0 mKB



Conductor:

Landed at 20 m KB / 406.4mm

Intermediate Casing:

219.1 mm , 35.72 kg/m , J-55
Landed at 152.0mKB
Cemented to surface with Thermal Cement 2.0m3 of returns

Tubing String:

88.9mm, 13.69kg/m, J-55
Landed at 132.65mKB
PCP landed @ 127.0mKB (Pressure/Temperature sensor for fluid level calculation @ 97.0mKB)

Liner:

139.7mm, 29.48kg/m, J-55
0.381mm slot size (15 thou)
Set depth 142.13 - 183 mKB (open hole from 183 - 191 mKB)

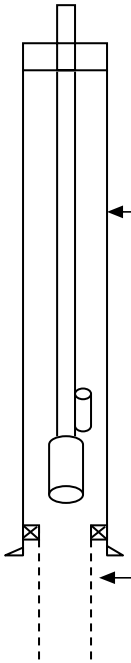
Intended Purpose:

Pressure (Fluid Level), Temperature, Water quality monitoring of Quaternary/Tertiary aquifer (well pumping consistantly as it provides fresh water for current Wabiskaw polymer flood in the area)

Appendix: Pelican Lake SAGD Pilot Observation Wellbore Schematic

2003 Camp Water Supply Well No. 16-07

1F1/16-07-082-22W4 LSD 16-7-82-22W4M



PBTD = 117.0 mKB

Intermediate Casing:

152.4 mm, Plastic (PVC)
Landed at 112.2mKB
Bentonite Chips/Tablets to 106.68mKB

Tubing String:

31.75mm, Plastic (PVC)
Landed at 140.0mKB
ESP landed @ 100.6mKB (Pressure/Temperature sensor for fluid level calculation @ 95.0mKB)

Liner:

152.4mm, Stainless Steel
0.381mm slot size (15 thou)
Set depth 112.2 - 116.7mKB

Intended Purpose:

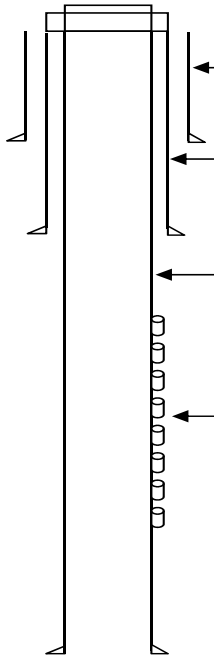
Pressure (Fluid Level), Temperature, Water quality monitoring of Quaternary aquifer (well pumping consistantly as it provides fresh water Pelican Lake Camp)

Appendix: Pelican Lake SAGD Pilot Observation Wellbore Schematic

CVE BRINT 8-10-82-23

102/08-10-082-23W4 LSD 8-10-82-23W4M

KB= 607.8 mKB
GRD= 603.6 mKB
PBTD = 334.0 mKB



Conductor:

Landed at 22 m KB / 406.4mm

Surface Casing:

219.1 mm , 35.72 kg/m , J-55
Landed at 69.5 mKB
Cemented to surface with Thermal Cement 2.0m3 of returns

Intermediate Casing:

114.3 mm , 17.26 kg/m , L-80
Landed at 333.85 mKB
Cemented to surface with Thermal Cement 4.5m3 of returns

Sensors:

8 Piezometers Cemented to Casing
Pressure/Temperature Sensor Set Depths:
225.0 mKB
228.2 mKB
231.3 mKB
234.4 mKB(Pressure sensor failed)
237.6 mKB(Pressure sensor failed)
240.7 mKB
243.8 mKB
247.0 mKB

Intended Purpose:

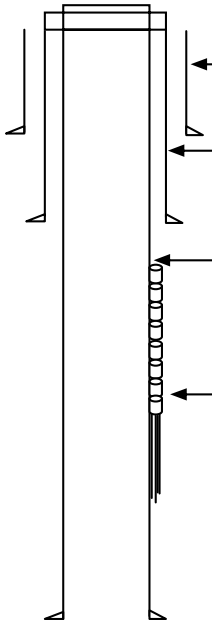
Pressure and Temperature through Grand Rapids A steam chamber

Appendix: Pelican Lake SAGD Pilot Observation Wellbore Schematic

CVE 2B BRINT 5-11-82-23

103/05-11-082-23W4 LSD 5-11-82-23W4M

KB= 606.4 mKB
GRD= 602.4 mKB
PBTD = 333.0 mKB



Conductor:

Landed at 20 mKB / 406.4mm

Surface Casing:

219.1 mm , 35.72 kg/m , J-55
Landed at 98.70 mKB
Cemented to surface with Thermal Cement 3.0m3 of returns

Intermediate Casing:

114.3 mm , 17.26 kg/m , L-80
Landed at 332.15 mKB
Cemented to surface with Thermal Cement 4.0m3 of returns

Sensors:

8 Piezometers (Pressure) Cemented to Casing

Pressure Measurement Depths:
224.0 mKB(Pressure sensor failed)
227.1 mKB(Pressure sensor failed)
230.3 mKB
233.4 mKB
236.6 mKB
239.7 mKB
242.9 mKB
246.0 mKB(Pressure sensor failed)

Intended Purpose:

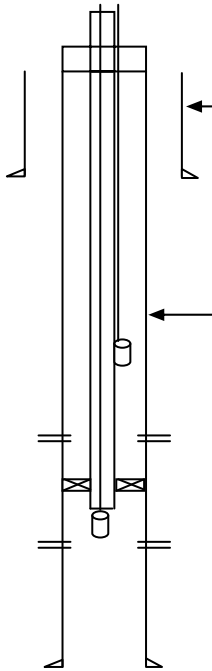
Pressure and Temperature through Grand Rapids A steam chamber

Appendix: Pelican Lake SAGD Pilot Observation Wellbore Schematic

CVE B6 BRINT 6-11-82-23

103/06-11-082-23W4 LSD 6-11-82-23W4M

KB= 611.3 mKB
GRD= 607.3 mKB
PBTD = 339.5 mKB



Conductor:
Landed at 25 m KB / 244.5mm

Intermediate Casing:
177.8 mm , 38.69 kg/m , L-80
Landed at 339.5 mKB
Cemented to surface with Thermal Cement 2.0m3 of returns

Tubing String:
73.0 mm, 9.67kg/m, J-55
Landed at 241.92mKB
Packer to isolate zones landed at 236.49mKB
Pressure/Temperature Sensor banded to tubing at 208.2mKB (above packer)
Pressure/Temperature Sensor deployed through tubing landed at 241.6mKB (below packer)

Perforations:
228-230 mKB
244-246 mKB

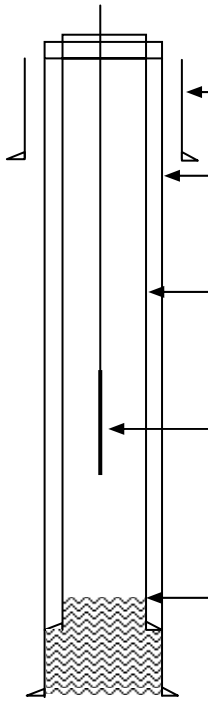
Intended Purpose:
Pressure (Fluid Level) and Temperature monitoring of Grand Rapids A zone

Appendix: Pelican Lake SAGD Pilot Observation Wellbore Schematic

ECA ECOG B5 BRINT 5-11-82-23

102/05-11-082-23W4 LSD 5-11-82-23W4M

KB= 606.9 mKB
GRD= 603.1 mKB
PBTD = 312.7 mKB



Conductor:
Landed at 20 mKB / 244.5mm

Intermediate Casing:
139.7 mm , 25.30 kg/m , K-55
Landed at 339.5 mKB
Cemented to surface with Thermal Cement 2.0m3 of returns

Secondary Intermediate Casing:
88.9 mm , 13.84 kg/m , J-55
Landed at 317.9 mKB
Cemented to surface with Thermal Cement 1.5m3 of returns

Thermocouple String:
WIKA 20 Point Thermocouple
Landed 214.0 - 252.0 mKB
Each Thermocouple is 2 m apart along the landing depth length

PBTD Cement Top in Secondary Intermediate Casing @ 312.7 mKB

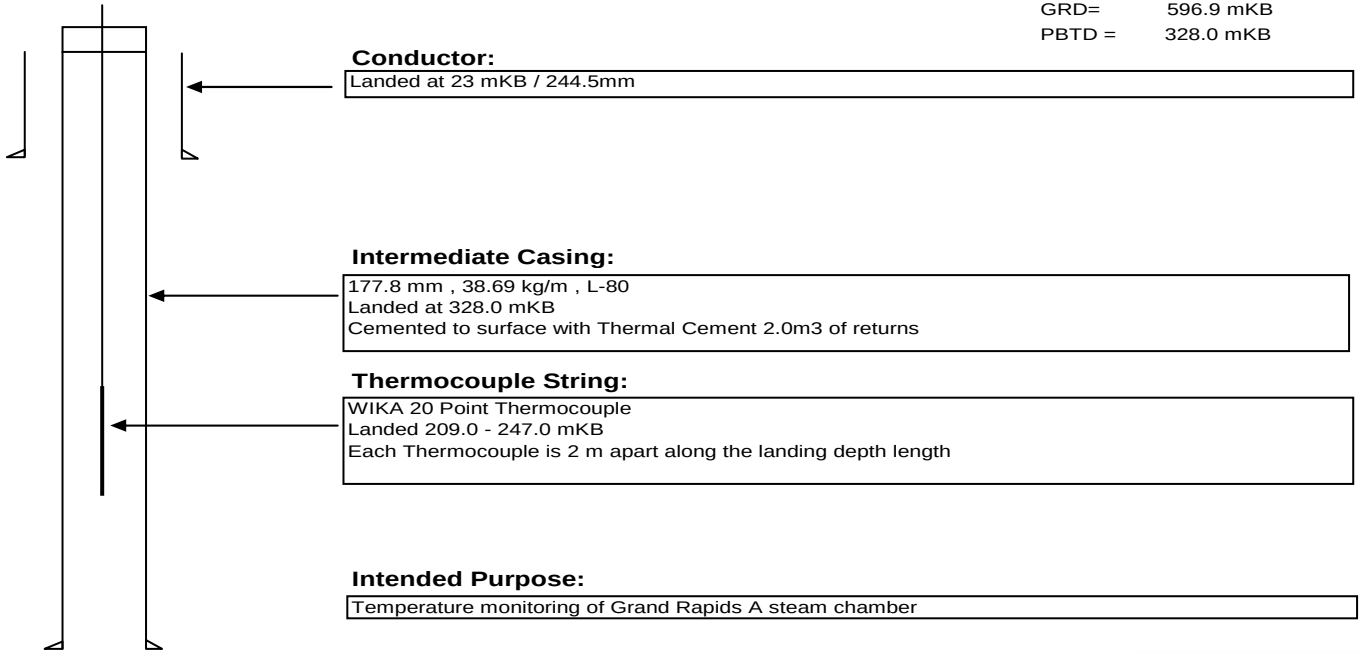
Intended Purpose:
Temperature monitoring of Grand Rapids A steam chamber

Appendix: Pelican Lake SAGD Pilot Observation Wellbore Schematic

ECA ECOG C13 BRINT 13-2-82-23

102/13-02-082-23W4 LSD 13-2-82-23W4M

KB= 601.0 mKB
GRD= 596.9 mKB
PBTD = 328.0 mKB



Conductor:
Landed at 23 mKB / 244.5mm

Intermediate Casing:
177.8 mm , 38.69 kg/m , L-80
Landed at 328.0 mKB
Cemented to surface with Thermal Cement 2.0m3 of returns

Thermocouple String:
WIKA 20 Point Thermocouple
Landed 209.0 - 247.0 mKB
Each Thermocouple is 2 m apart along the landing depth length

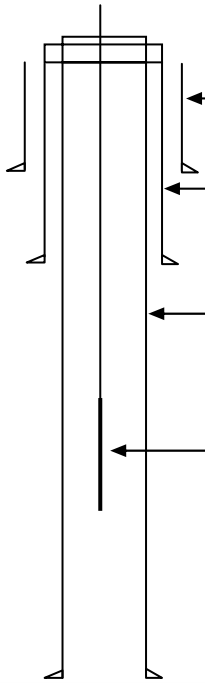
Intended Purpose:
Temperature monitoring of Grand Rapids A steam chamber

Appendix: Pelican Lake SAGD Pilot Observation Wellbore Schematic

CVE BRINTNELL 12-2-82-23

103/12-02-082-23W4 LSD 12-2-82-23W4M

KB= 599.9 mKB
GRD= 595.7 mKB
PBTD = 325.0 mKB



Conductor:
Landed at 24.2 m KB / 406.4mm

Surface Casing:
177.8 mm , 25.30 kg/m , H-40
Landed at 86.25 mKB
Cemented to surface with Thermal Cement 2.0m3 of returns

Intermediate Casing:
114.3 mm , 17.26 kg/m , L-80
Landed at 324.0 mKB
Cemented to surface with Thermal Cement 1.0m3 of returns

Thermocouple String:
WIKA 20 Point Thermocouple
Landed 209.0 - 247.0 mKB
Each Thermocouple is 2 m apart along the landing depth length

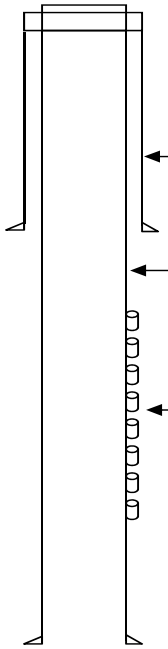
Intended Purpose:
Temperature monitoring of Grand Rapids A steam chamber

Appendix: Pelican Lake SAGD Pilot Observation Wellbore Schematic

CVE BRINT 1-10-82-23

100/01-10-082-23W4 LSD 1-10-82-23W4M

KB= 607.1 mKB
GRD= 603.0 mKB
PBTD = 334.0 mKB



Surface Casing:

219.1 mm , 35.72 kg/m , J-55
Landed at 117 mKB
Cemented to surface with Thermal Cement 4.0m3 of returns

Intermediate Casing:

114.3 mm , 17.26 kg/m , L-80
Landed at 334 mKB
Cemented to surface with Thermal Cement 3.0m3 of returns

Sensors:

8 Piezometers Cemented to Casing
Pressure/Temperature Sensor Set Depths:
221.1.0 mKB
225.8 mKB
228.8 mKB
231.9 mKB
235.0 mKB
237.7 mKB
240.5 mKB
243.0 mKB

Intended Purpose:

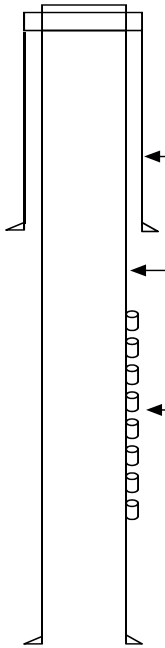
Pressure and Temperature through Grand Rapids A steam chamber

Appendix: Pelican Lake SAGD Pilot Observation Wellbore Schematic

CVE BRINT 16-3-82-23

102/16-03-082-23W4 LSD 16-3-82-23W4M

KB= 602.0 mKB
GRD= 597.9 mKB
PBTD = 329.0 mKB



Surface Casing:

219.1 mm , 35.72 kg/m , J-55
Landed at 117 mKB
Cemented to surface with Thermal Cement 3.0m3 of returns

Intermediate Casing:

114.3 mm , 17.26 kg/m , L-80
Landed at 329.0 mKB
Cemented to surface with Thermal Cement 3.0m3 of returns

Sensors:

8 Piezometers Cemented to Casing
Pressure/Temperature Sensor Set Depths:
214.6 mKB
217.2 mKB
221.0 mKB
223.0 mKB
227.0 mKB
228.8 mKB
232.0 mKB
235.2 mKB

Intended Purpose:

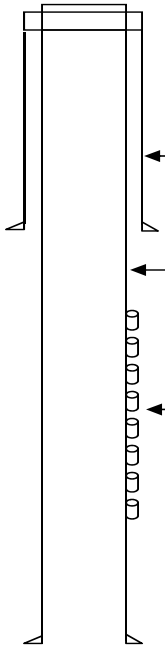
Pressure and Temperature through Grand Rapids A steam chamber

Appendix: Pelican Lake SAGD Pilot Observation Wellbore Schematic

CVE BRINT 9-3-82-23

100/09-03-082-23W4 LSD 9-3-82-23W4M

KB= 598.5 mKB
GRD= 594.4 mKB
PBTD = 325.0 mKB



Surface Casing:

219.1 mm , 35.72 kg/m , J-55
Landed at 119.0 mKB
Cemented to surface with Thermal Cement 3.0m3 of returns

Intermediate Casing:

114.3 mm , 17.26 kg/m , L-80
Landed at 325.0 mKB
Cemented to surface with Thermal Cement 3.0m3 of returns

Sensors:

8 Piezometers Cemented to Casing
Pressure/Temperature Sensor Set Depths:
211.1 mKB
213.6 mKB
218.1 mKB
221.9 mKB
226.3 mKB
228.9 mKB
232.9 mKB
236.1 mKB

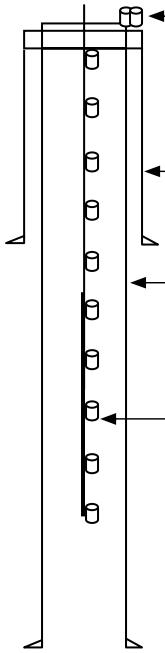
Intended Purpose:

Pressure and Temperature through Grand Rapids A steam chamber

Appendix: Pelican Lake SAGD Pilot Observation Wellbore Schematic

CVE BRINT 16-3-82-23

100/16-03-082-23W4 LSD 16-3-82-23W4M



Real Time Pressure & Temperature gauge at Wellhead

KB= 602.0 mKB
GRD= 598.1 mKB
PBTD = 432.2 mKB

Surface Casing:

219.1 mm , 35.72 kg/m , J-55
Landed at 105 mKB
Cemented to surface with Thermal Cement

Intermediate Casing:

139.7mm , 23.067 kg/m , J-55
Landed at 432.2 mKB
Cemented to surface with Thermal Cement 3.0m3 of returns

Sensors:

10 points Acoustic fibre and 34 Thermocouples (Temperature) Hang off
Temperature Sensor Set Depths:
216.0 mKB - 250 mKB (Temperature every meter)
Acoustic Fibre Sensor Set Depths:
0.0 mKB - 250 mKB (Acoustic point every 25 meter)

Intended Purpose:

Acoustic Fibre through out wellbore to measure noise and Temperature through Grand Rapids A steam chamber - Non thermal casing with thermal cement monitoring wellbore

Appendix: Pelican Lake SAGD Pilot Observation Wellbore Schematic