Pelican Lake SAGD Pilot

AER Approval 11469B

Annual Update

January 1, 2014 – December 31, 2014

April 16, 2015

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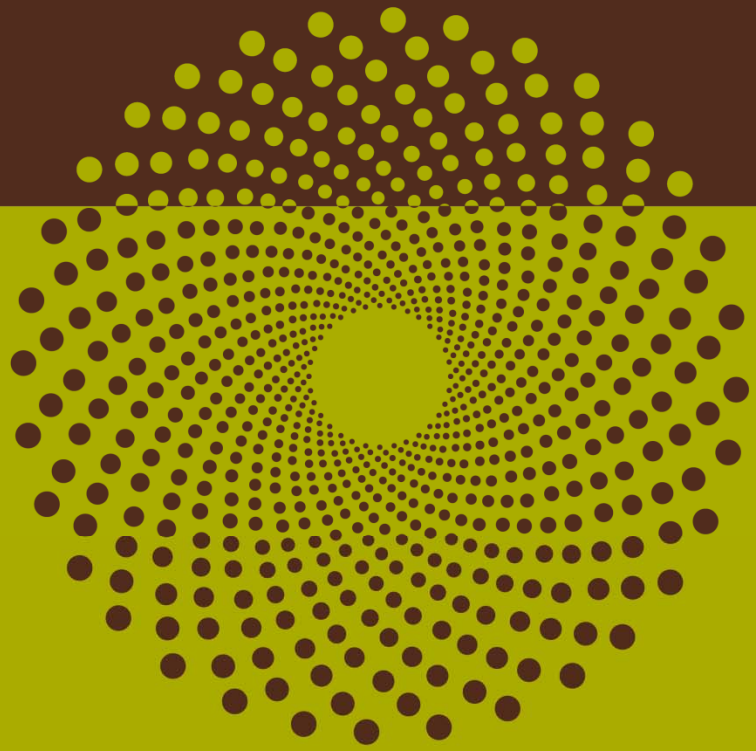
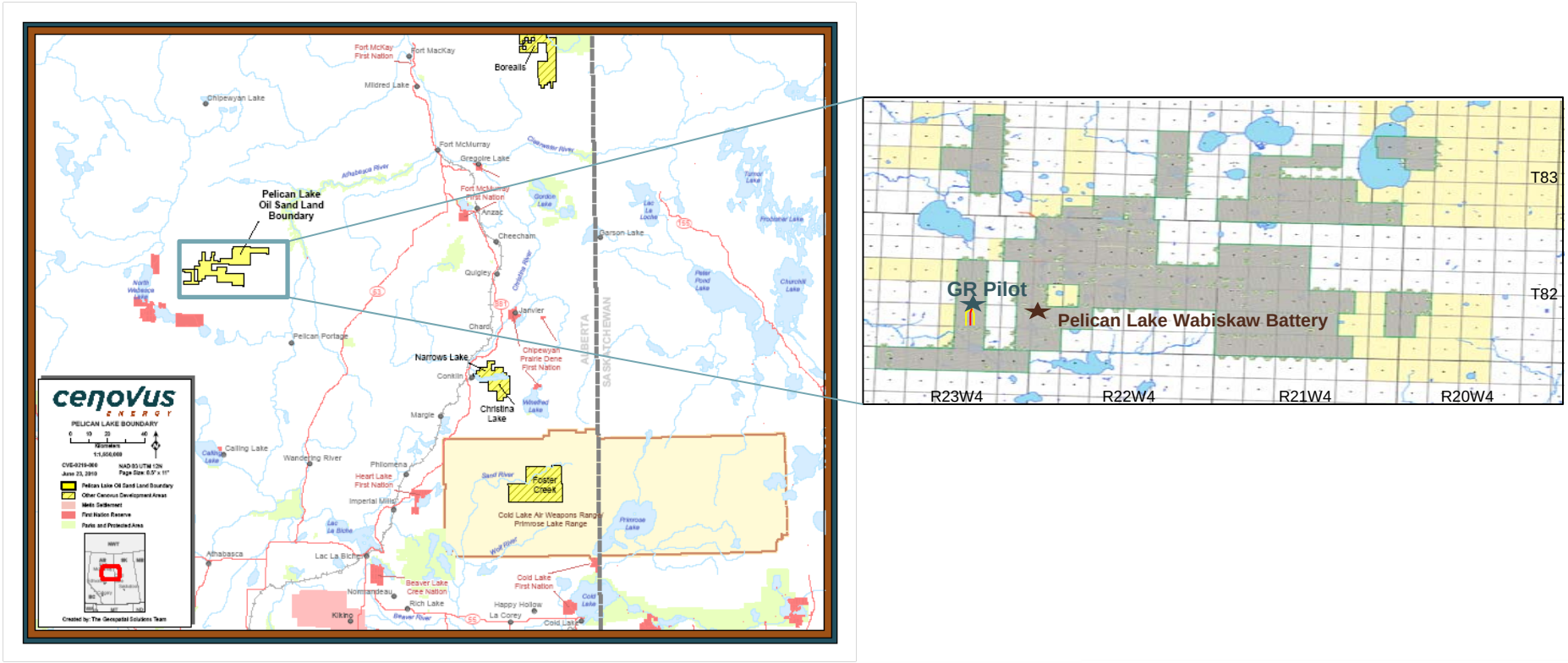
Agenda

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

Subsection 3.1.1

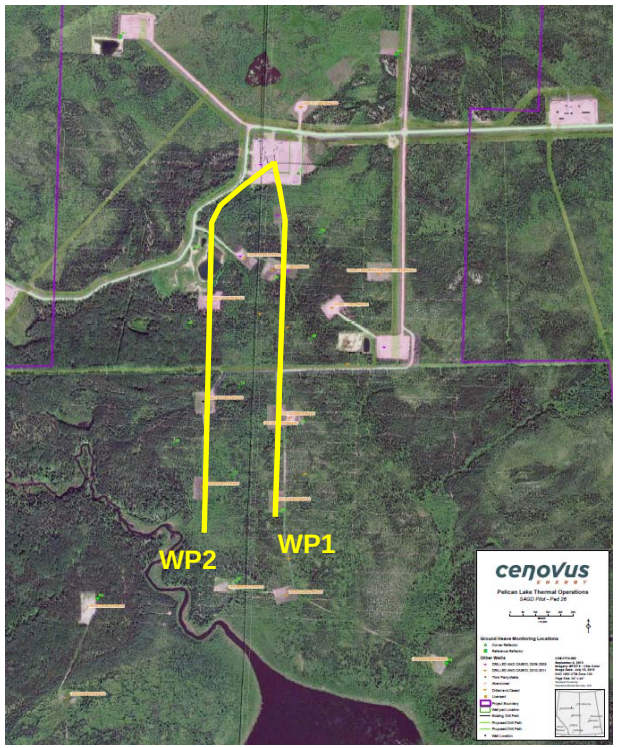


Cenovus SAGD Pilot Lease

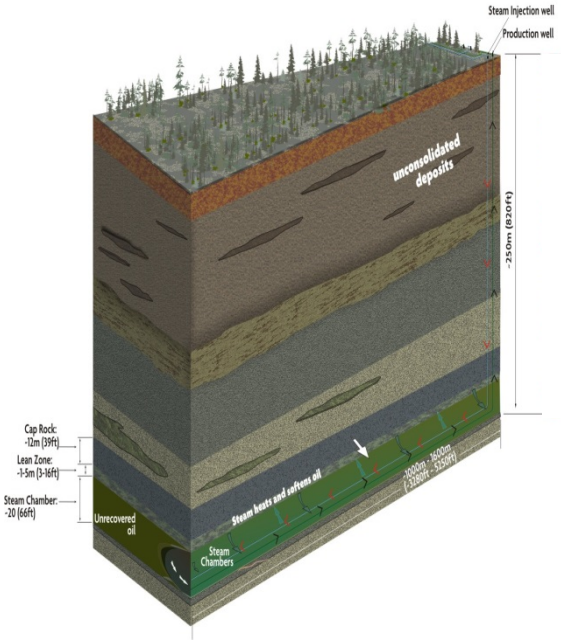


Scheme Description & Overview

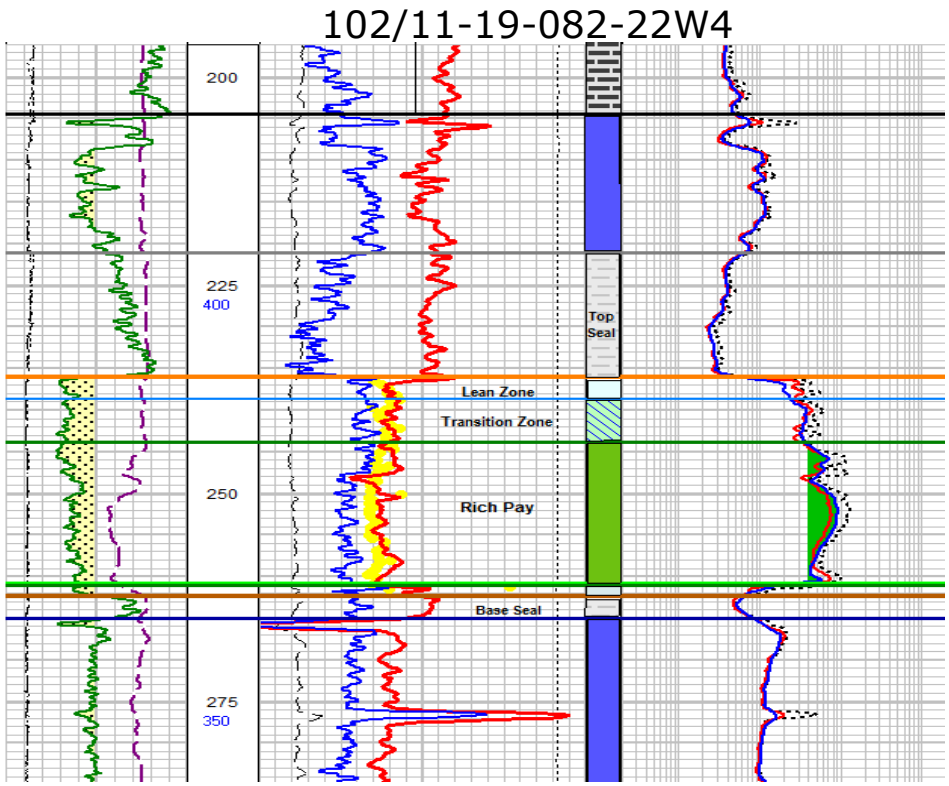
Base of Grand Rapids 'A'	357-363 m Subsea
Average Gross Thickness	23 m
Average SAGD Pay Thickness	18 m
Average Porosity	35 %
Average Water Saturation	46 % (Gross)
	38 % (SAGD Pay Zone)
Average Permeability	2.9 D
OBIP (Internal CVE estimate)	33 MMbbl
Drilled well pairs	2
Source water well	1
Disposal well	1
Oil Viscosity	1,000,000 cp+
Oil Gravity	7.5-8.5 API
Initial Reservoir Pressure	1200 kPa
Fracture Gradient	21.3 kPa/m
Fracture Closure Pressure	4.75 MPa



Geology & Geoscience



Grand Rapids 'A' Type Log



Viking / Pelican Fm. sands contain a non saline aquifer

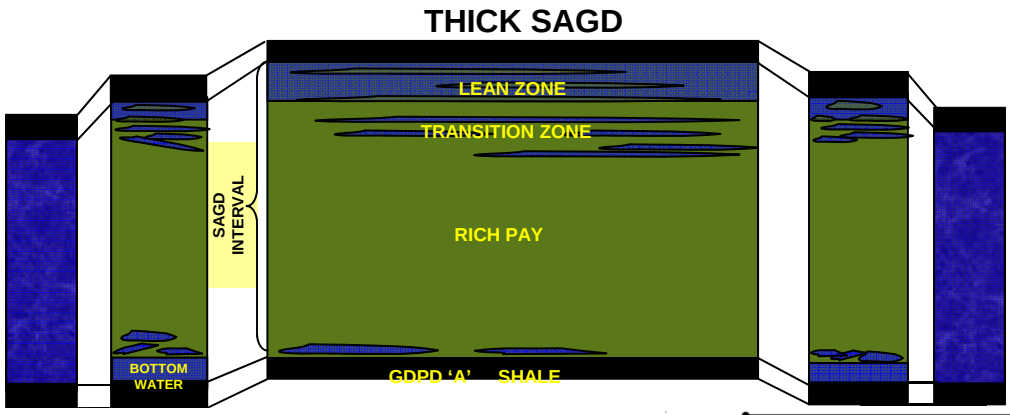
Joli Fou Fm. marine shale is the cap rock

Grand Rapids 'A' mbr. are bitumen charged reservoir sands

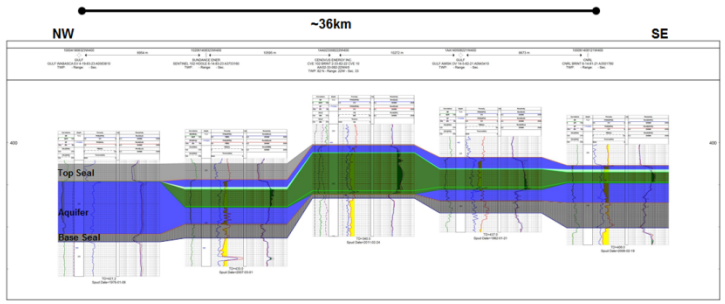
Grand Rapids 'A' shale forms the base seal

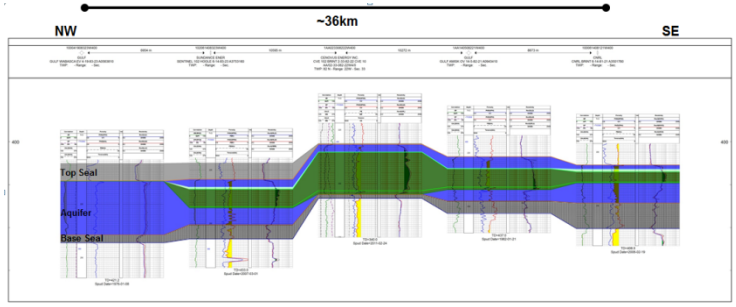
Grand Rapids 'B' mbr. sands contain a non saline aquifer

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

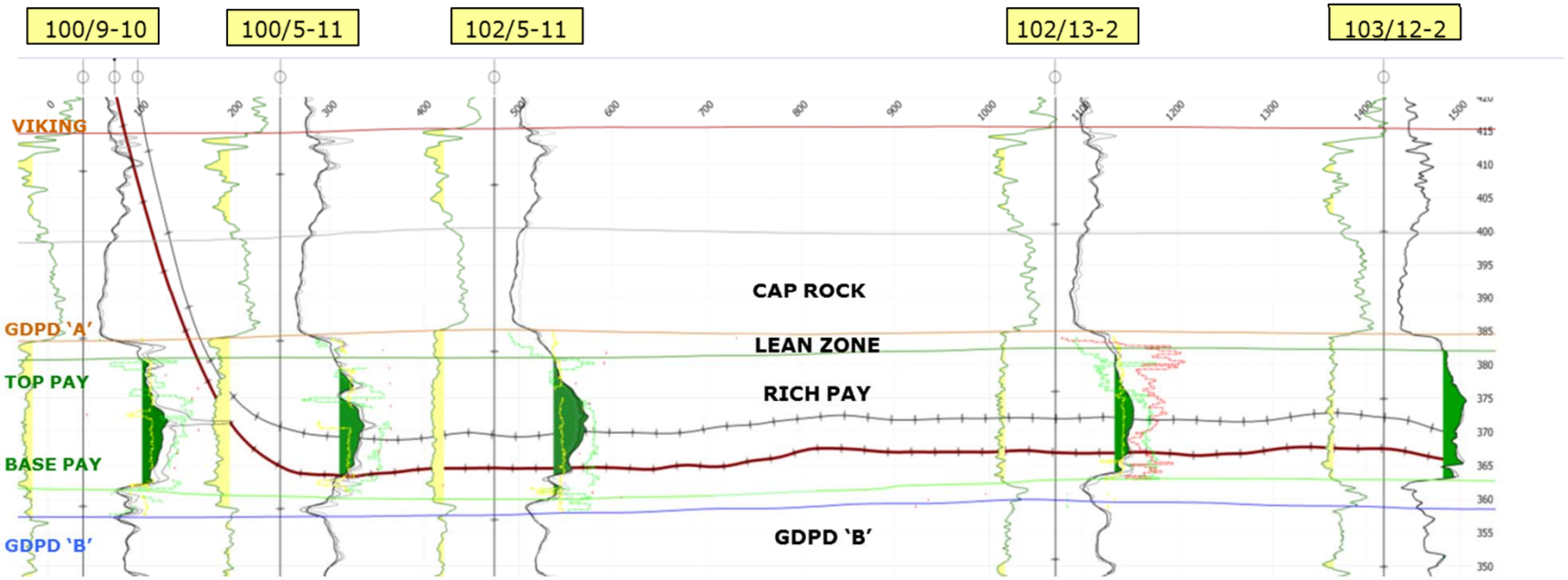




Joli Fou - Top Seal
Grand Rapids 'A' Aquifer
Grand Rapids 'A' Transition Zone
Grand Rapids 'A' Rich Pay Zone
Grand Rapids 'A' Shale – Base Seal

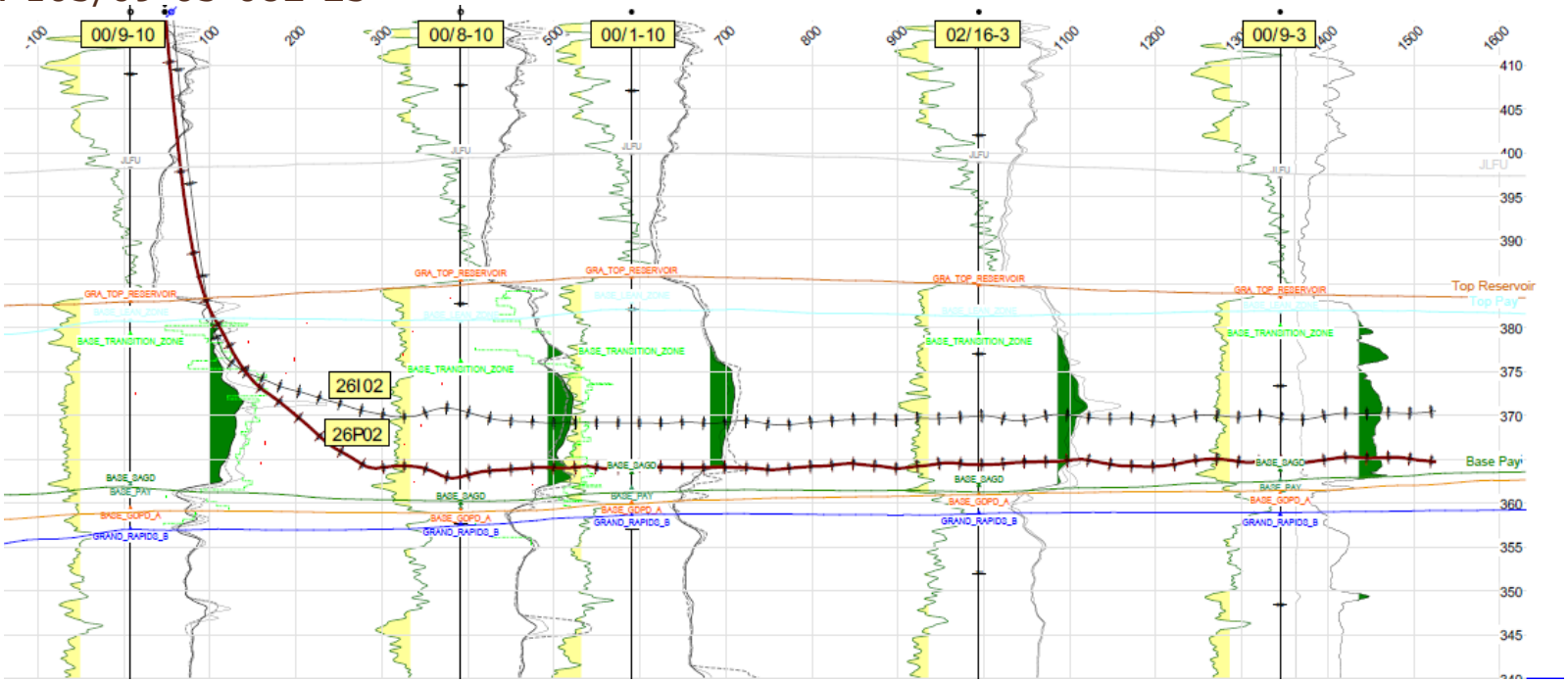
Well Pair 1 Trajectories/Cross-Section

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



Well Pair 2 Trajectories/Cross-Section

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



Surface Heave Monitoring (InSAR)

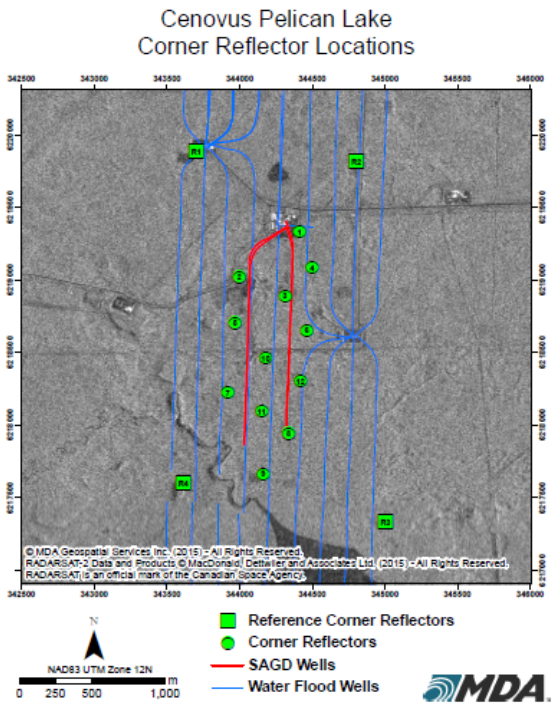


Figure 1: Corner Reflector Locations at Cenovus Pelican Lake, Alberta. Well layouts provided by Cenovus in 2012 and 2013.

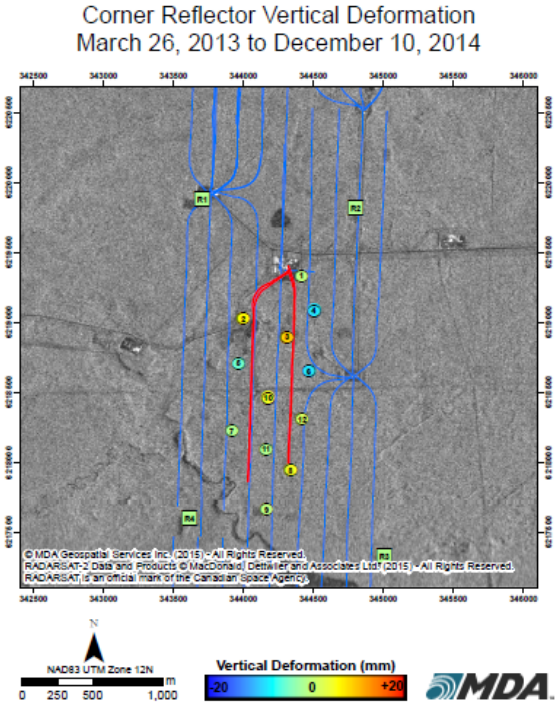
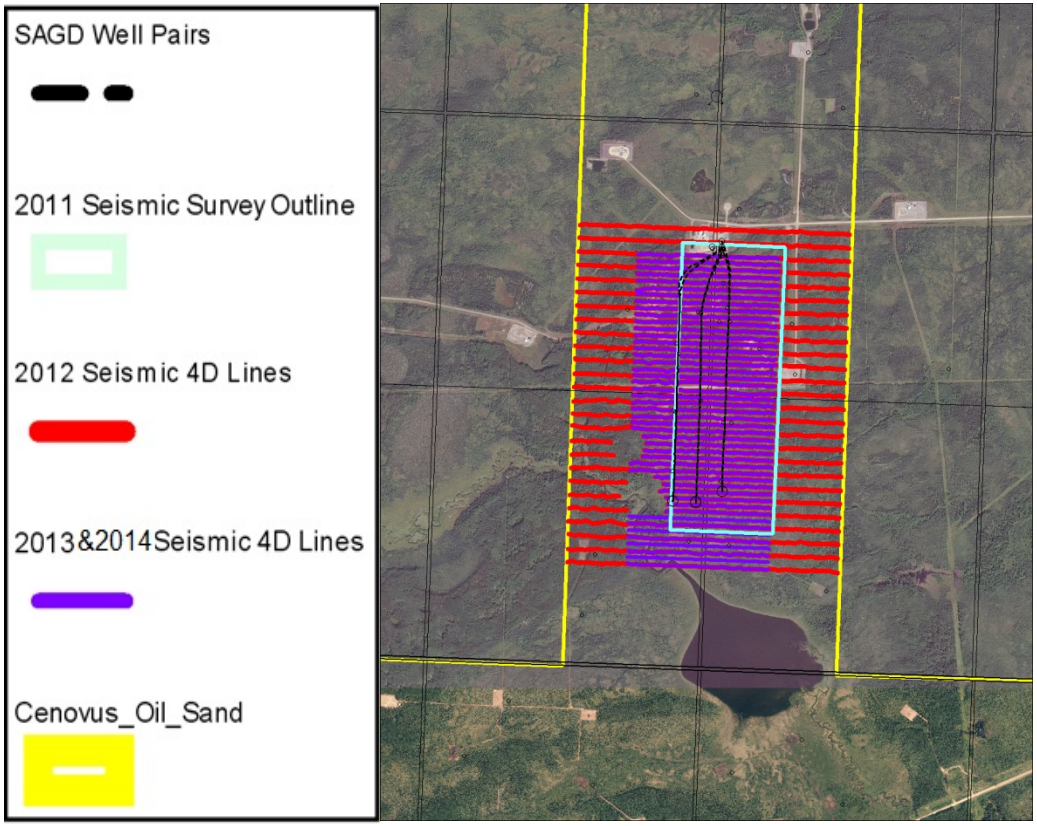


Figure 4: Cumulative corner reflector vertical deformation: March 26, 2013 to December 10, 2014.

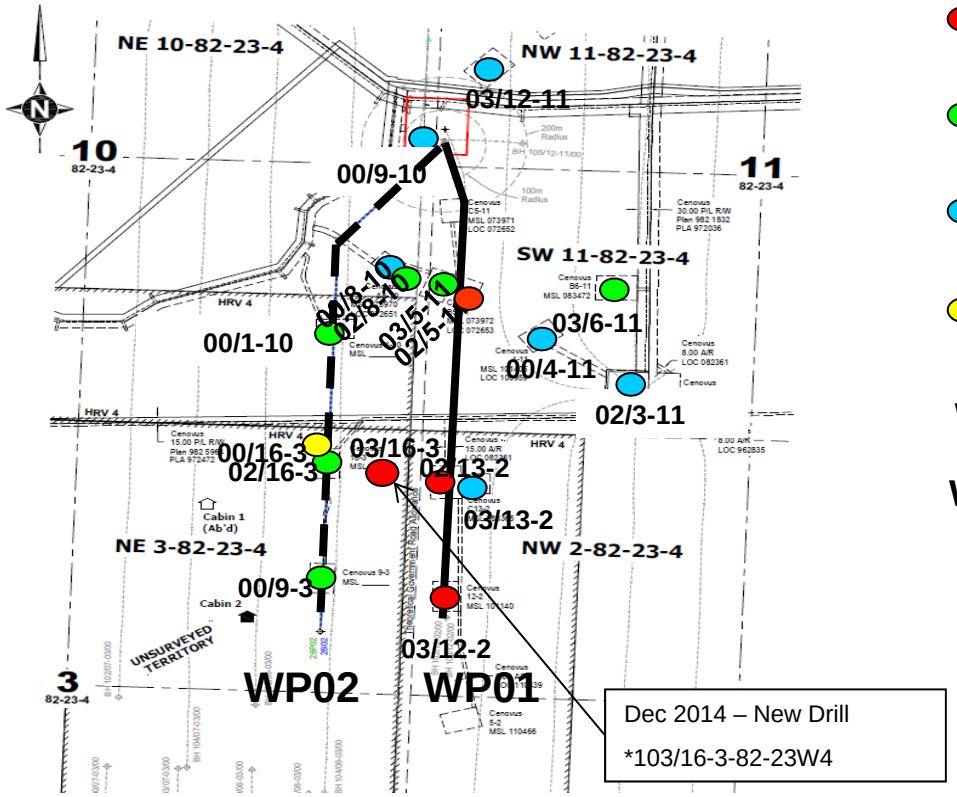
- March 26, 2013 <20mm total vertical displacement observed
- 15 RADARSAT-2 scenes were acquired in 2014
- Measurements to June 25, 2014 do not indicate incremental displacement

4D Seismic Lines



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

Pilot Monitoring Network



- Temperature
- Temperature & Pressure
- Ground Water observation
- Thermal compliancy observation

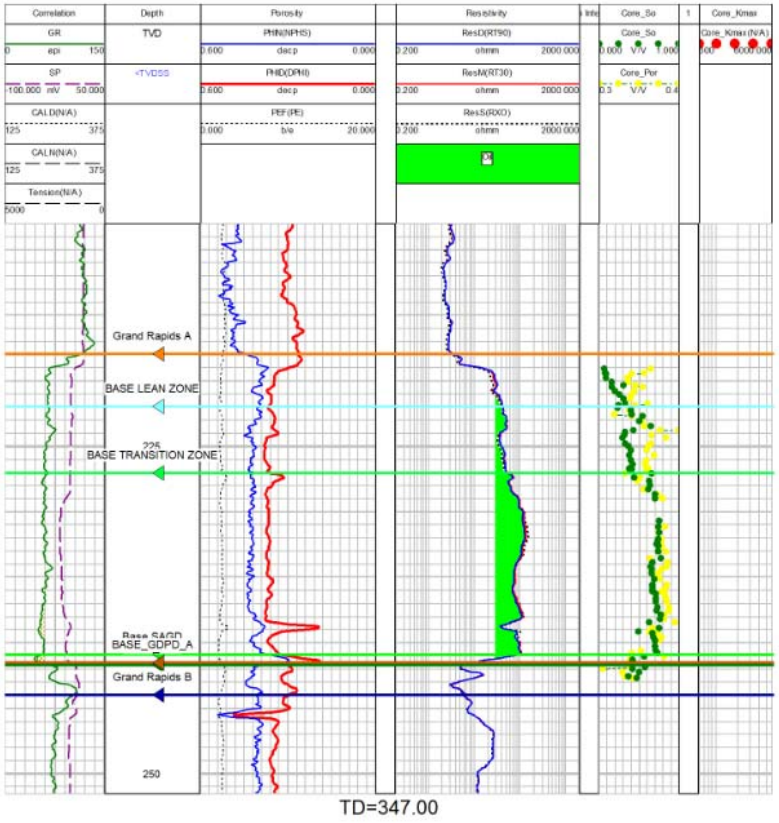
WP01 Equipped with fiber-optic string for temperature monitoring

WP02 Equipped with 6-point thermocouple string for temperatures

Ground water observation wells not illustrated on map:

- 100/04-27-82-22
- 1F1/13-07-82-22
- 16-07-82-22 (camp 1 water source well)

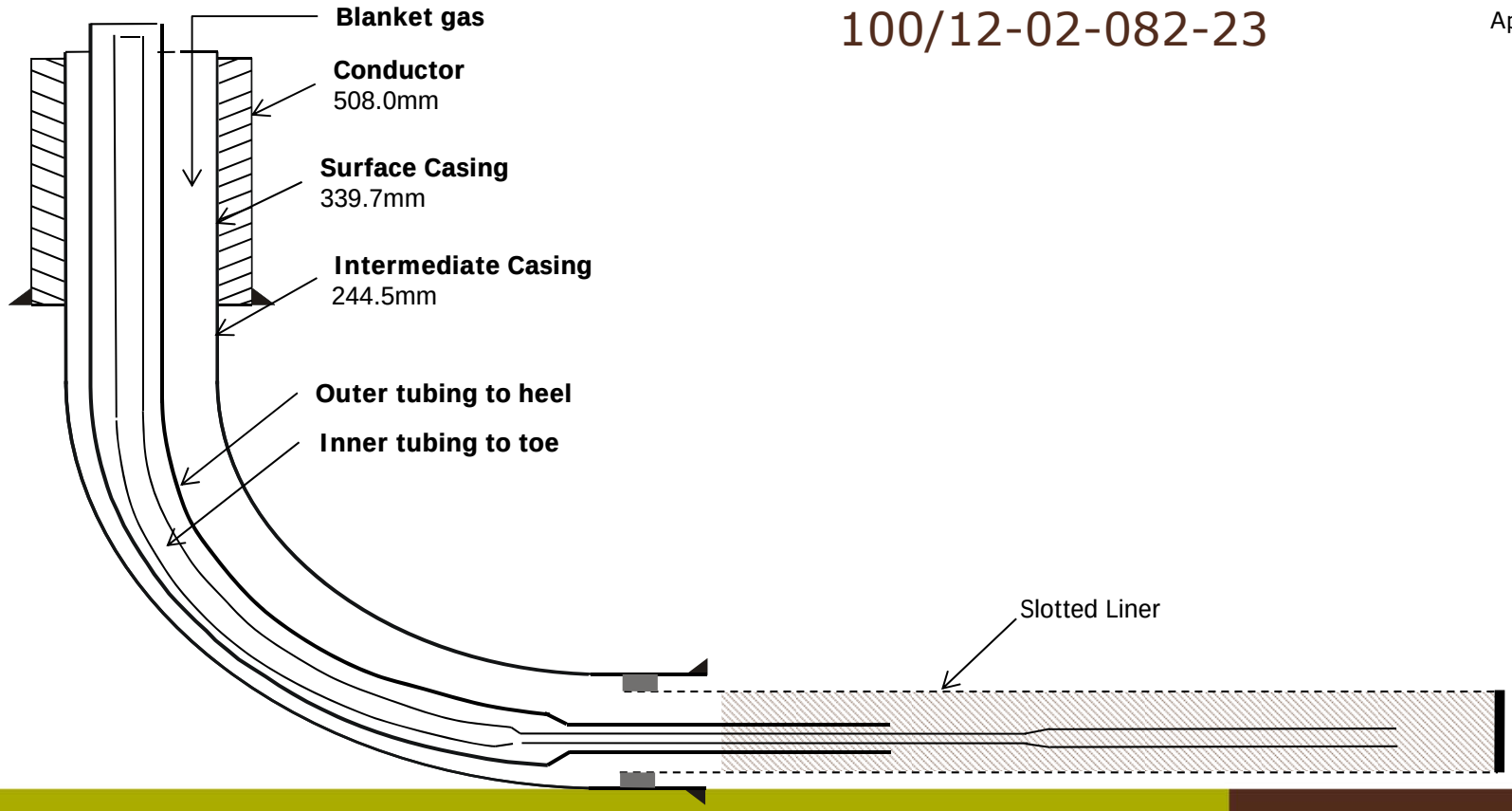
103/16-03-082-23W4 Observation well log



26I01 Injector Completion Schematic

100/12-02-082-23

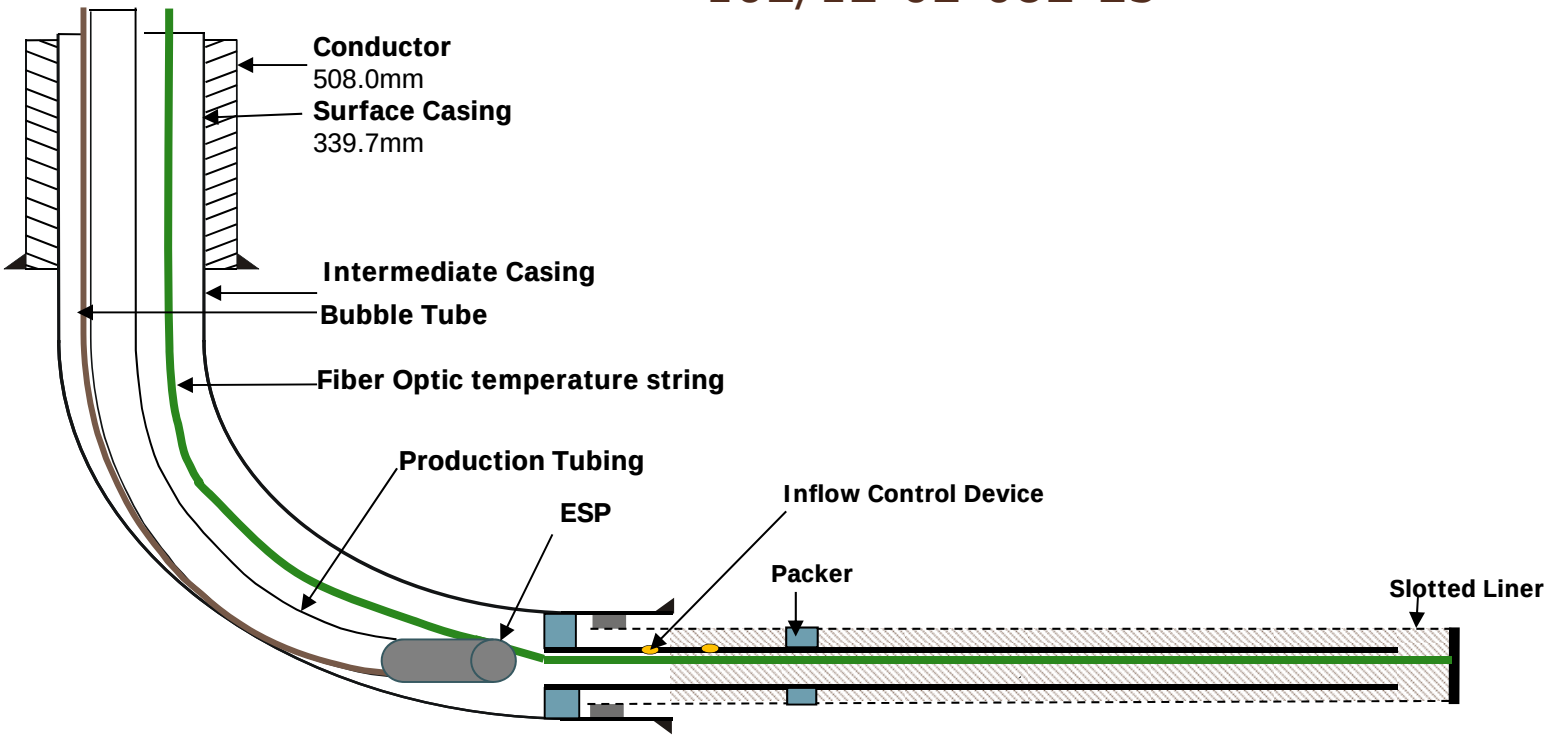
April 2014 - Present



26P01 Producer Completion Schematic

102/12-02-082-23

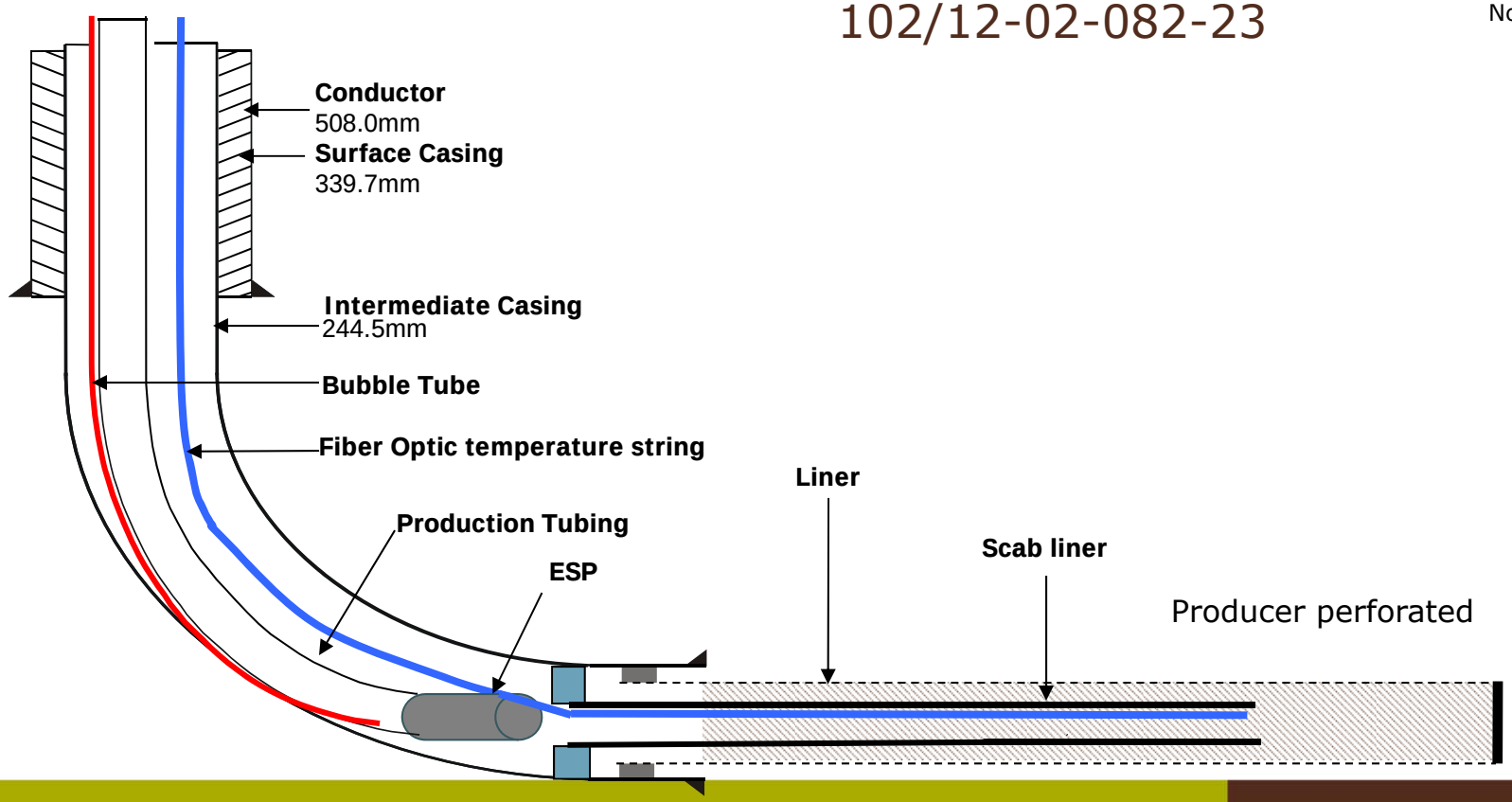
March 2014 – Nov 2014



26P01 Producer Completion Schematic

102/12-02-082-23

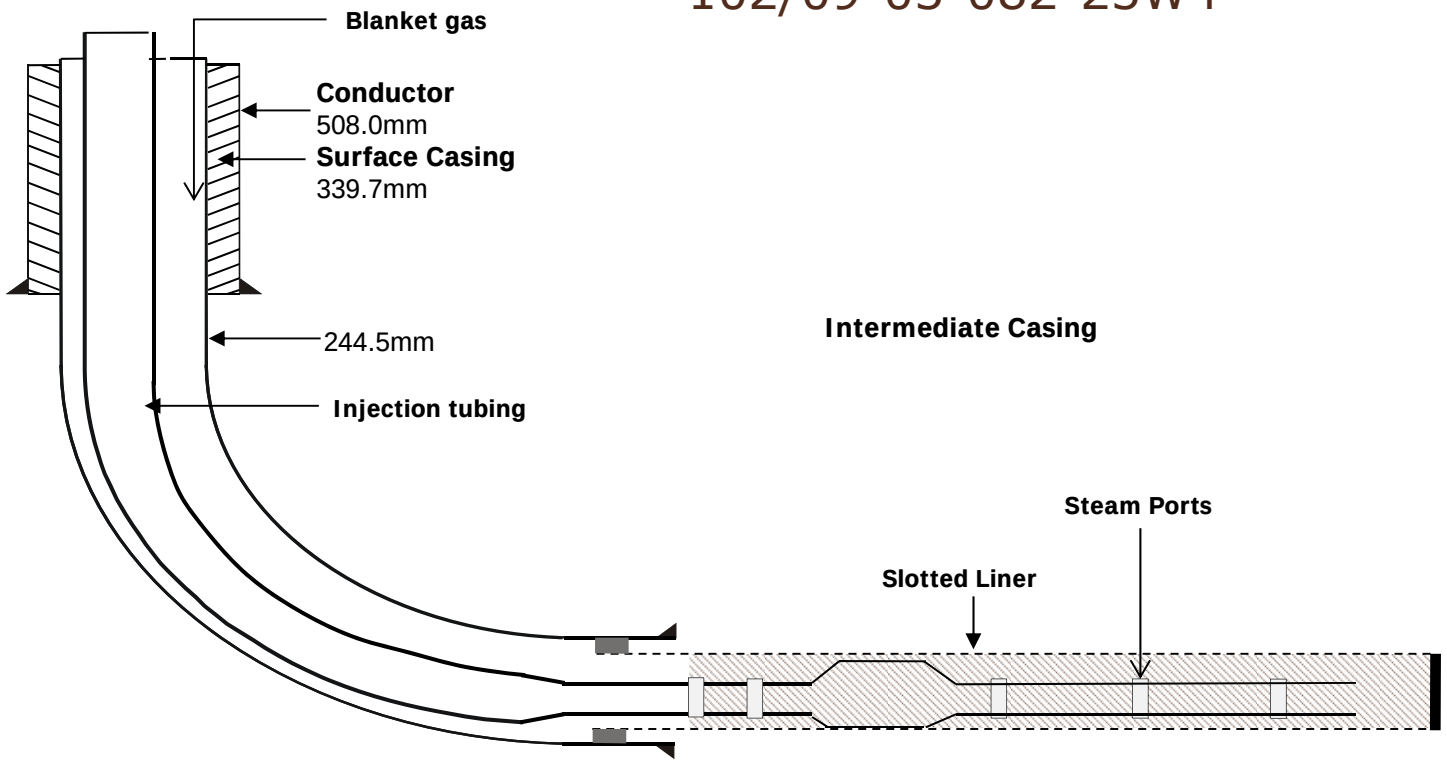
Nov 2014- Present



26I02 Injector Completion Schematic

102/09-03-082-23W4

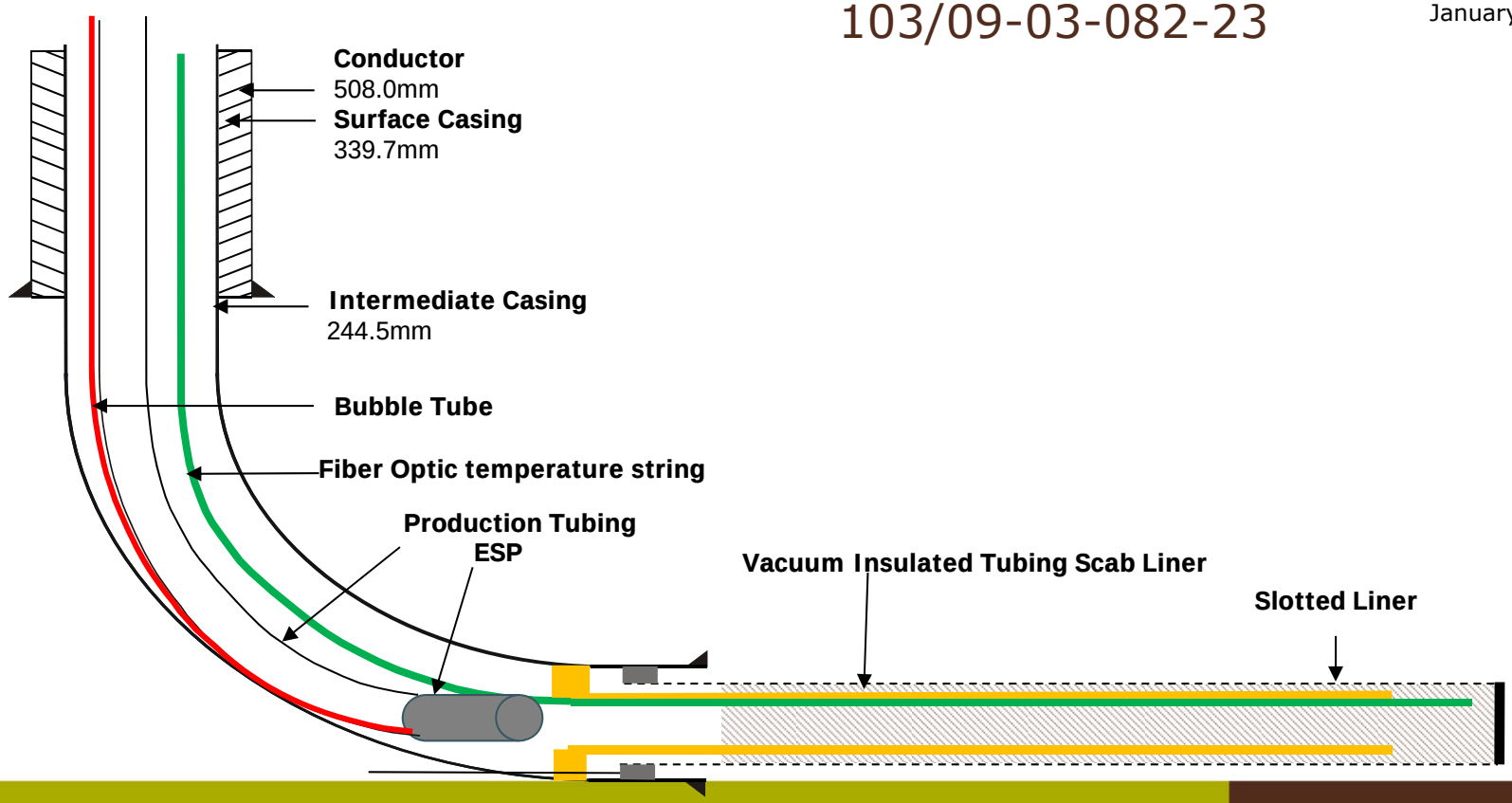
May 2014 - Present



26P02 Producer Completion Schematic

103/09-03-082-23

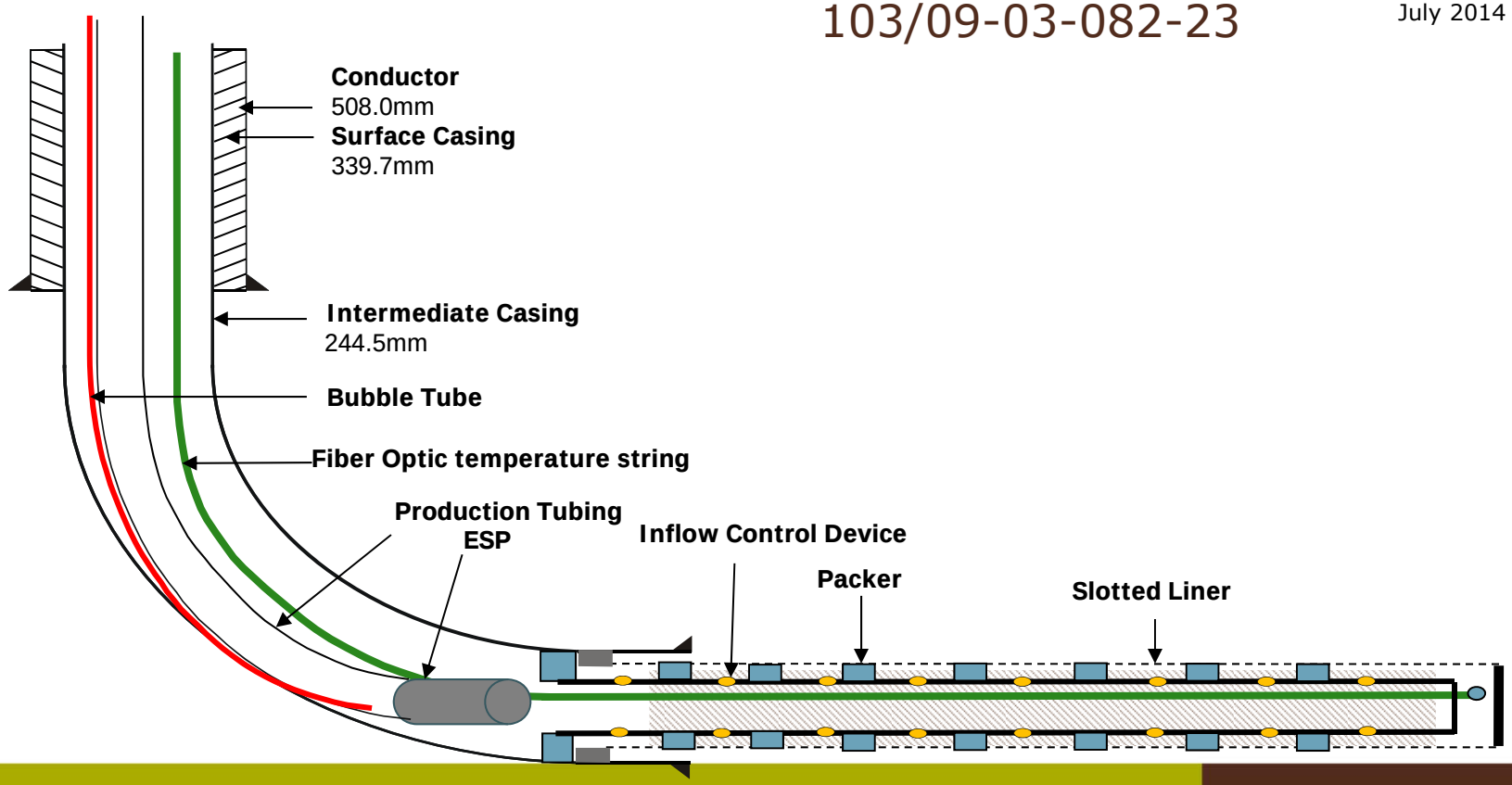
January 2014 – July 2014



26P02 Producer Completion Schematic

103/09-03-082-23

July 2014 - Present



Artificial Lift

Electric Submersible Pumps (ESP)

- Pump Range 60 -600 m^3/d
- Intake Pump Pressure 500-1150 kPaa
- Variable Frequency Drives (VFD)
- Operating Temperature limit 218°C
- Low pump efficiency under saturation conditions

Well Instrumentation

Pressure

- Injectors
  - Utilize annular space as gas blanket for bottom hole pressure measurement
- Producers
  - Utilize bubble tubes to heel with gas to measure bottom hole pressure
  - Pressure sensor at the toe of fiber optic string

Temperature

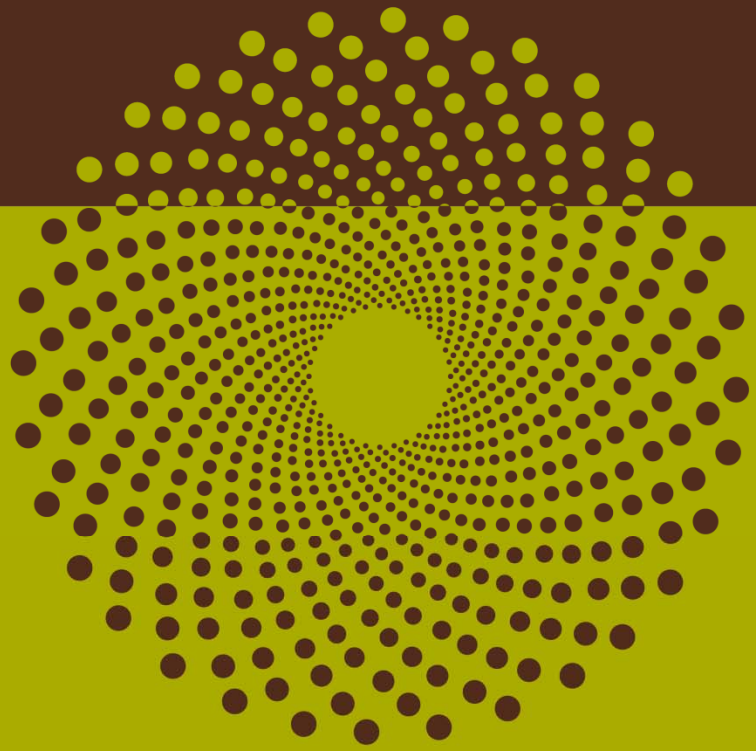
- Producers utilize 40-point temperature fiber c/w pressure sensor at the toe

Conformance Issues

- **Uneven Start-up**
- **Uneven Skin**
  - Scaling & plugging in slotted liners

Well Pair 1

Scheme Performance



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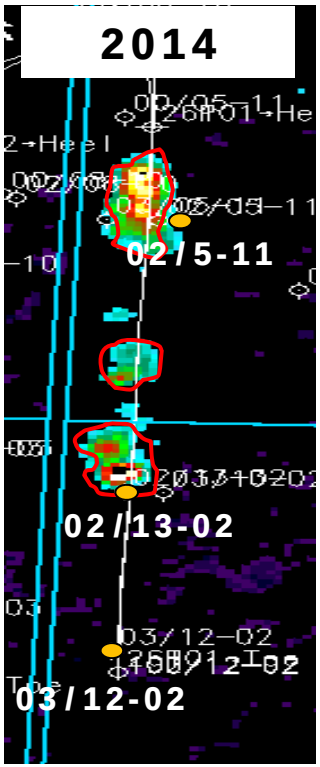
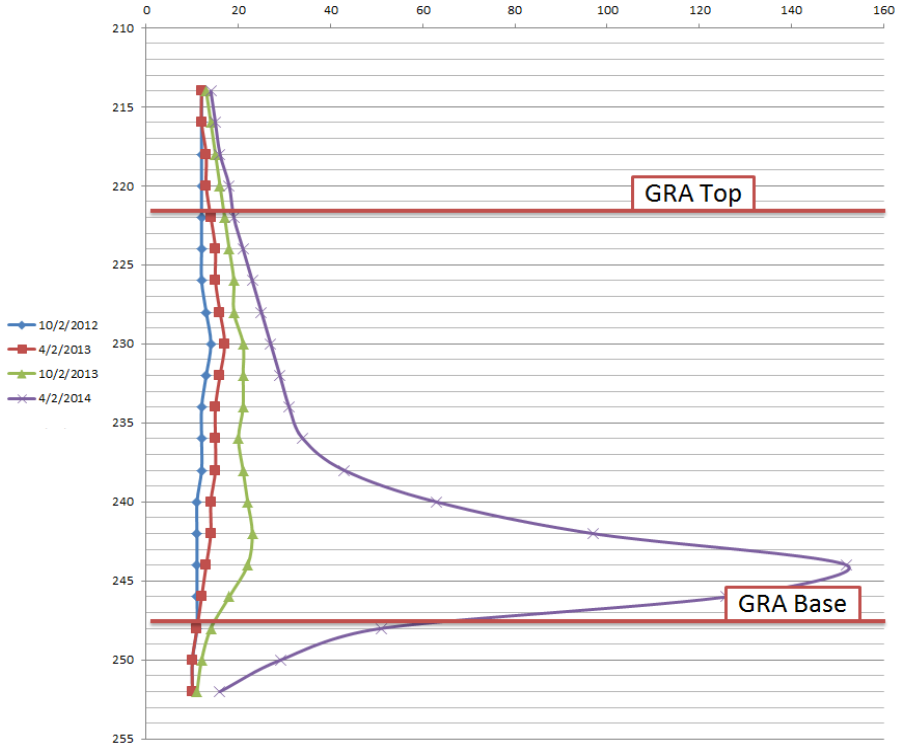
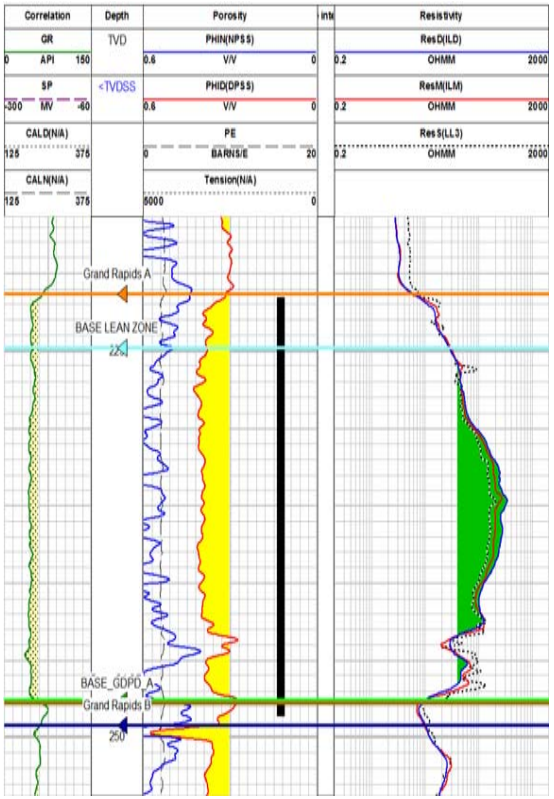
Well Pair 1 Steam Chamber Seismic

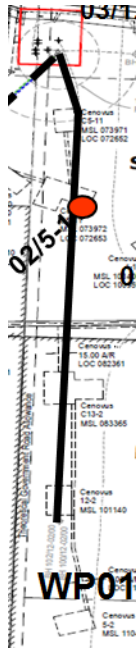


Temperature Observation Well

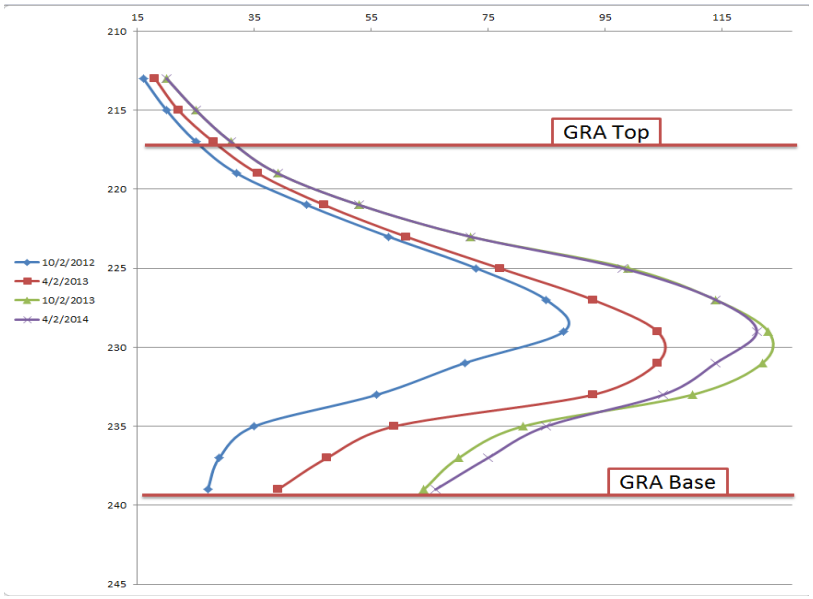
102/05-11-082-23 Observation Well Temperature

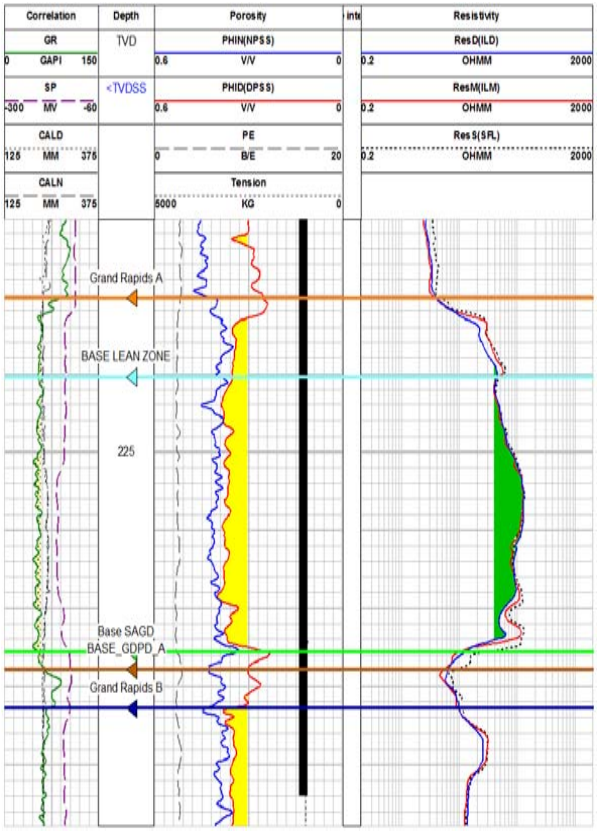


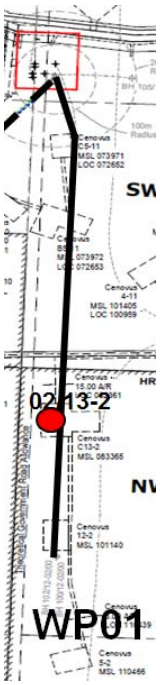




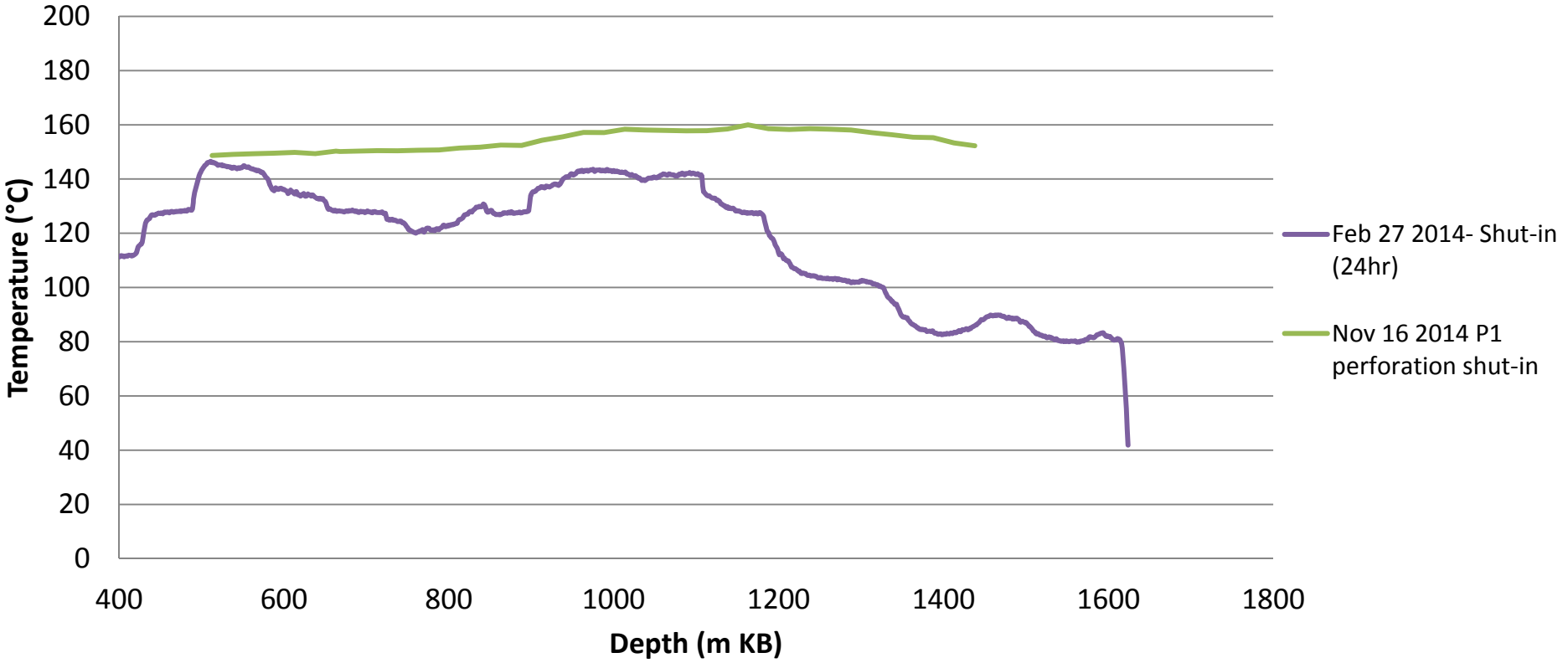
102/13-02-082-23 Observation Well Temperature



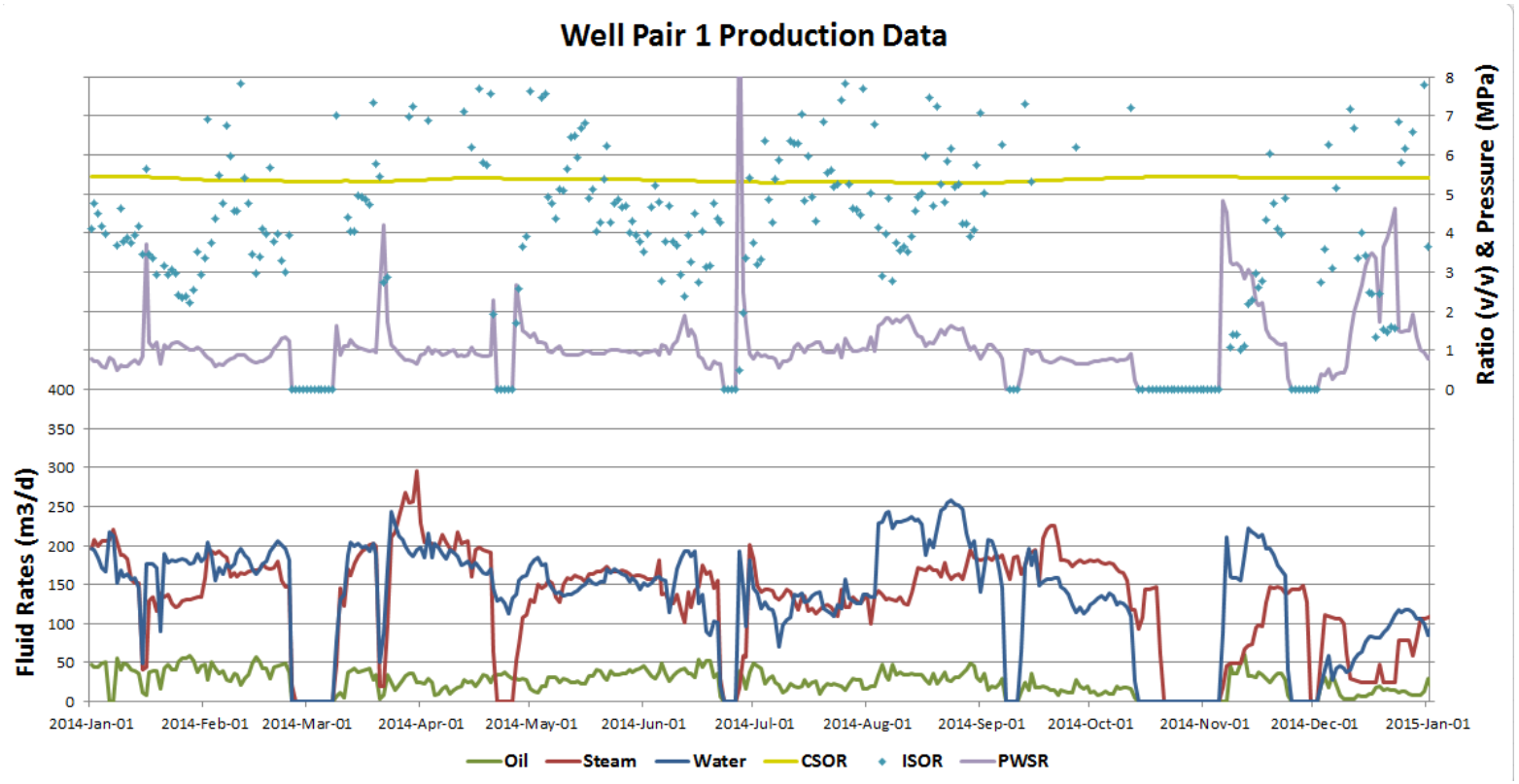




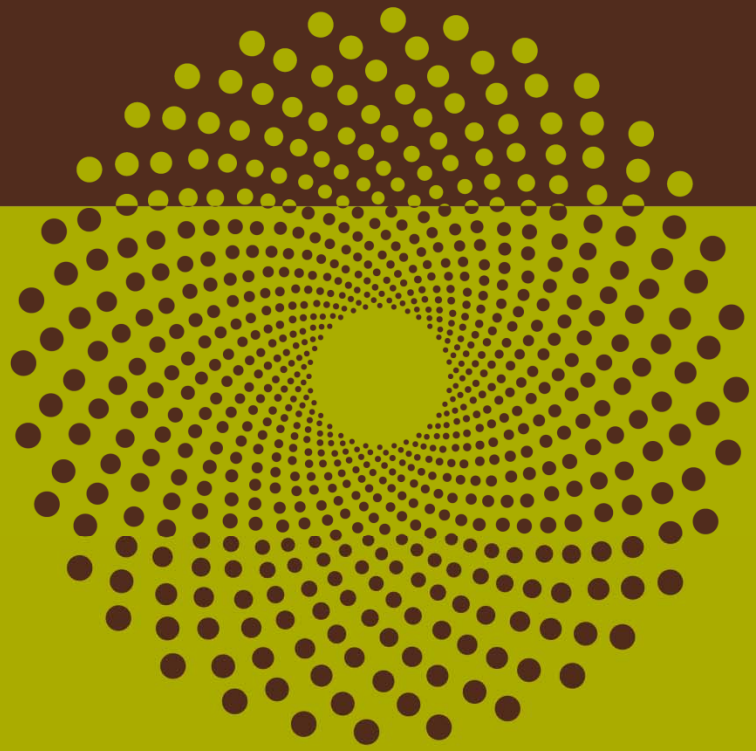
Well Pair 1 Producer Temperature Profiles



Well Pair 1 Production



Well Pair 2



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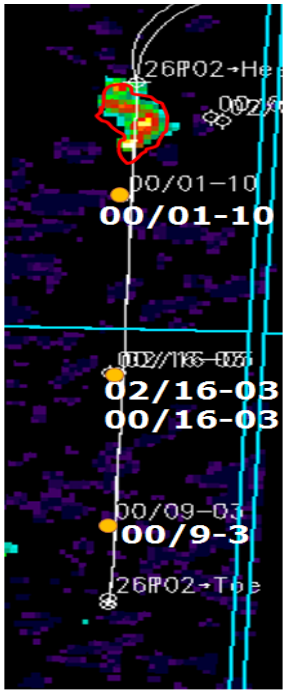
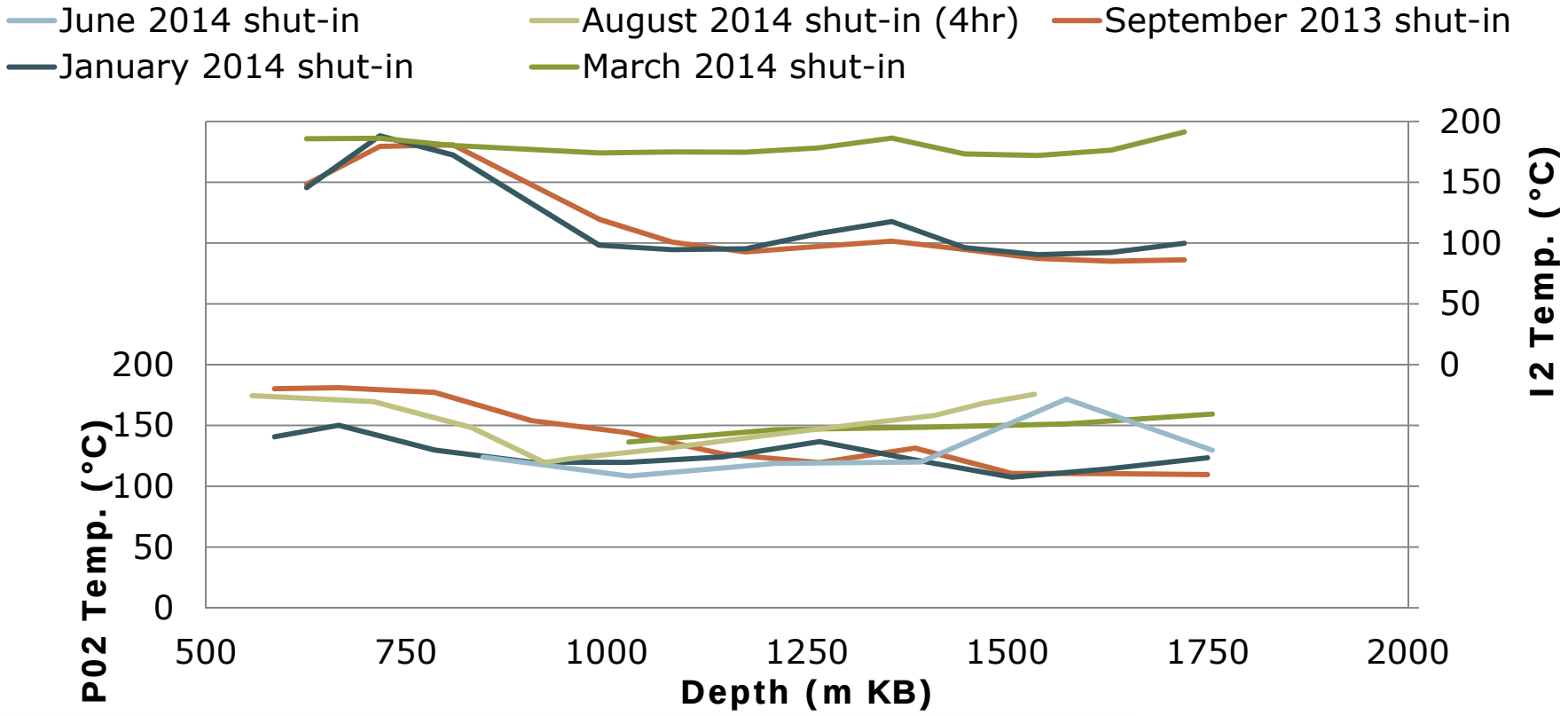
Well Pair 2 Steam Chamber Seismic

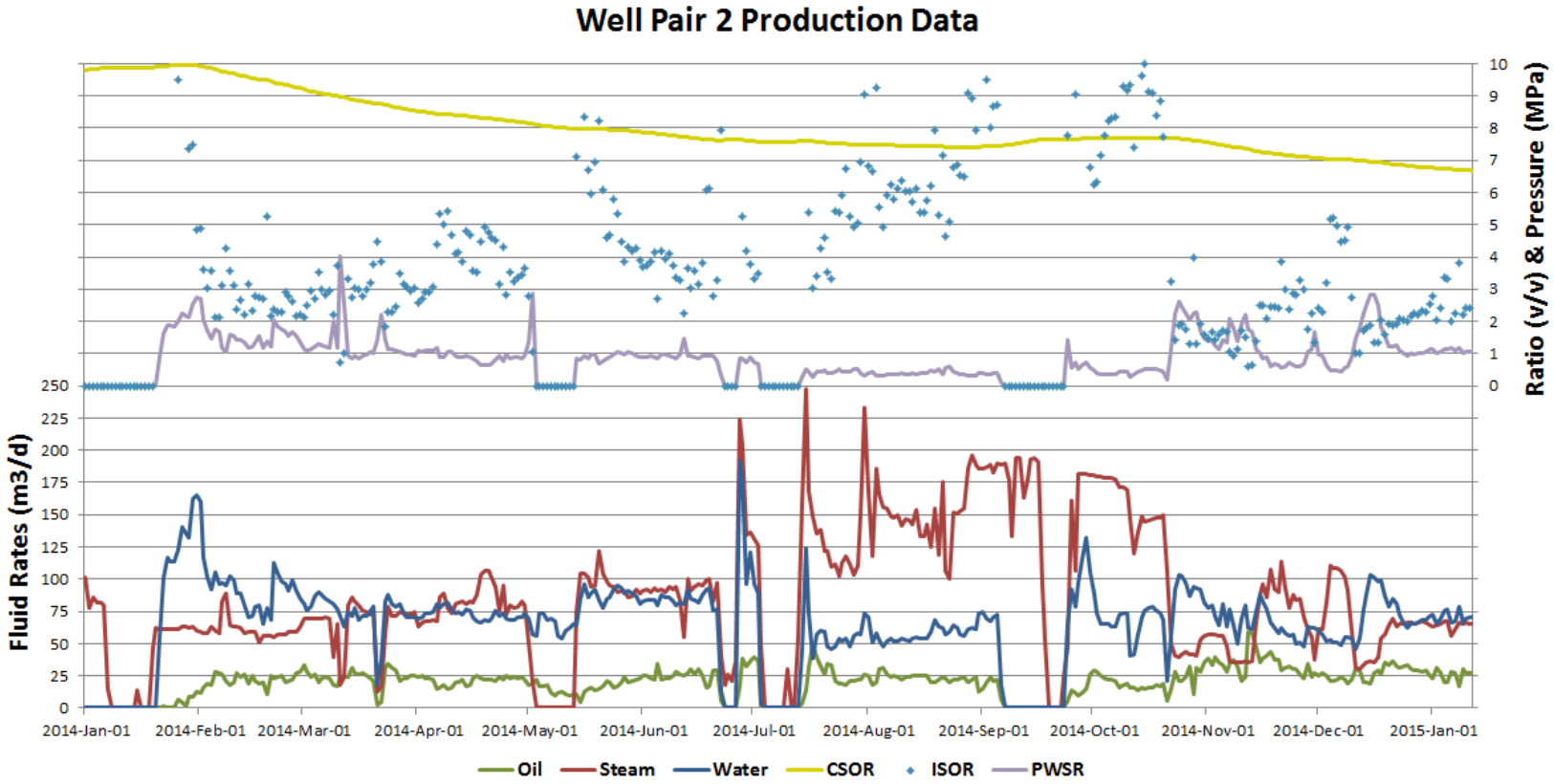
2014



Well Pair 2 Temperature Profiles



Well Pair 2 Production



Lean Zone Pressure History

Production Summary

WP01	Cumulative
Oil (m^3)	31,570
Water (m^3)	117,814
WOR (m^3/m^3)	3.6
Steam Injection (m^3)	171,092
SOR (m^3/m^3)	5.4
WSR (m^3/m^3)	0.68
WP02 **	Cumulative
Oil (m^3)	12,813
Water (m^3)	52,496
WOR (m^3/m^3)	4.09
Steam Injection (m^3)	92,359
SOR (m^3/m^3)	7.2
WSR (m^3/m^3)	0.57

- Significant steam losses to lean zone to maintain pressure.
- WP01 steam injection volumes include steam injected into P01
- WP01 water does not include quench

2014 Key learnings

WP1 and WP2 learnings

- Conventional circulation is challenging for low pressure shallow reservoirs such as Grand Rapids
- Reheating of circulated fluids and deviated well trajectory both contribute to creation of hot spot
- Hot spots are difficult to remediate after development and recompletions are necessary to alleviate hotspot issues
- Sand influx is not an issue in wellbore perforation
- Thermocouple failures for observation wells can be mitigated by increasing battery capacity and decreasing frequency of data acquisition
  - Reduces loss of communication thus improving consistency of data

Future Plans

Learnings to be applied in future

- Completion for startup using vacuum insulated tubing (VIT) enables high quality steam downhole
- Managing lean zone is important to achieving conformance
- Even steam distribution along the injector can be achieved with steam subs

Future plans

- Well Pair 3 drill and complete Q1/Q2 2015
- Complete observation well 103/16-3-82-23W4
- Continuing operation of Well Pairs 1 and 2
- Directive 51 application for Well Pair 3

Subsection 3.1.2

Surface Operations,

Compliance,

Non-Related Resource Evaluation Issues

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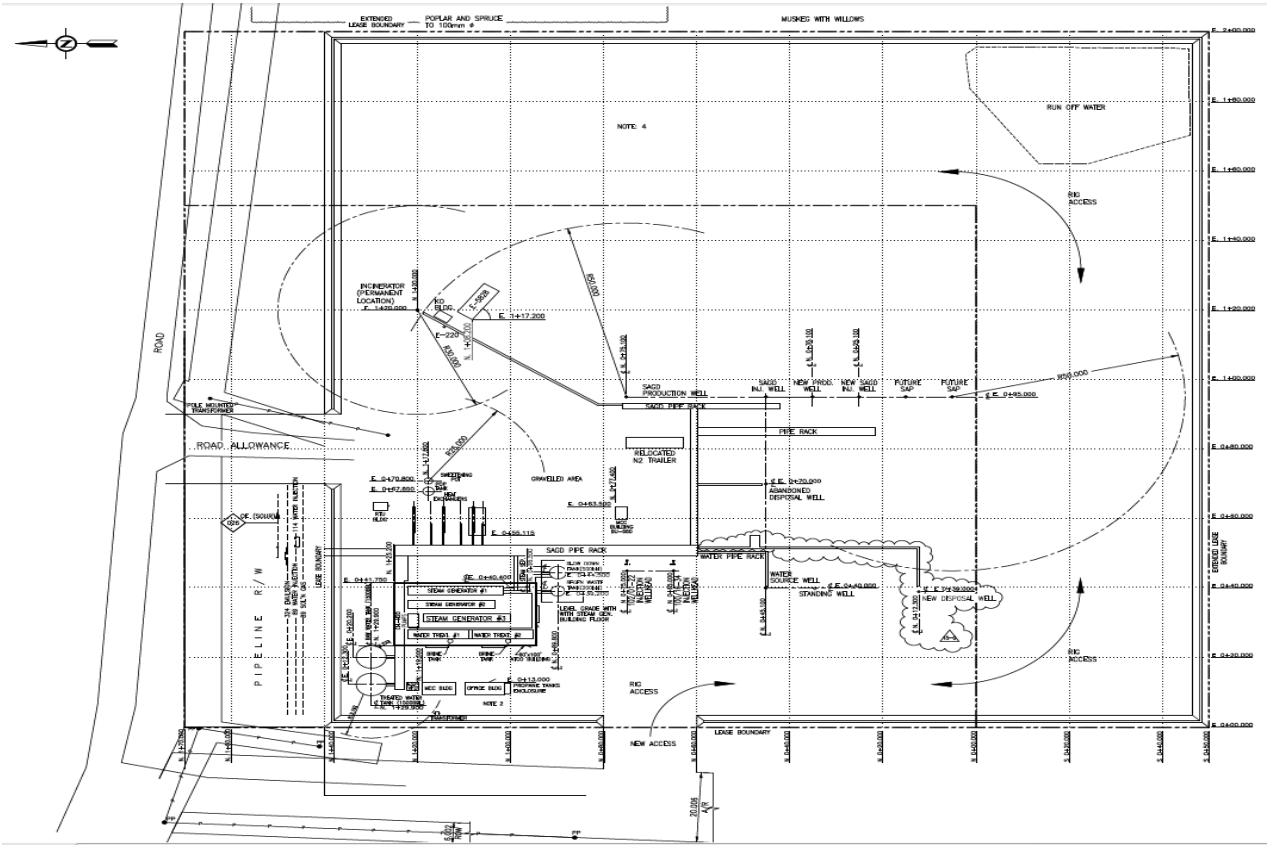
Site Plan


EXTENDED LEASE BOUNDARY
POPLAR AND SPRUCE TO 100mm ø
MUSKEG WITH WILLOWS
NOTE 4
RUN OFF WATER
RIG ACCESS
INCINERATOR (PERMANENT LOCATION)
ROAD
ROAD ALLOWANCE
SAGD PRODUCTION WELL
SAGD PIPE RACK
PIPE RACK
RELOCATED N2 TRAILER
ABANDONED DISPOSAL WELL
GRAVELLED AREA
WATER PIPE RACK
WATER SOURCE WELL
STANDING WELL
NEW DISPOSAL WELL
STEAM GENERATOR #1
STEAM GENERATOR #2
STEAM GENERATOR #3
WATER TREAT #1
WATER TREAT #2
PIPELINE R/W
NEW ACCESS
LEASE BOUNDARY

Plant performance

- **Battery code for Pad 26 is solely for purpose of production accounting**
- **All emulsion fluids are transferred to Pelican Lake 11-7 battery**

Water treatment

- Disposed fluids injected into one disposal well at 09-10-082-23W4M
- Fresh water for steam generation is treated at Pad 26 using ion-exchange water softening

Bitumen treatment

- No oil treating equipment at the pilot site as all production is transferred to Pelican Lake battery (AB BT0058285)

Steam generation

- Three steam generators use source water (01-15-082-23W4)
- Pad 9 (13-07-082-22W4) water used in upset conditions only

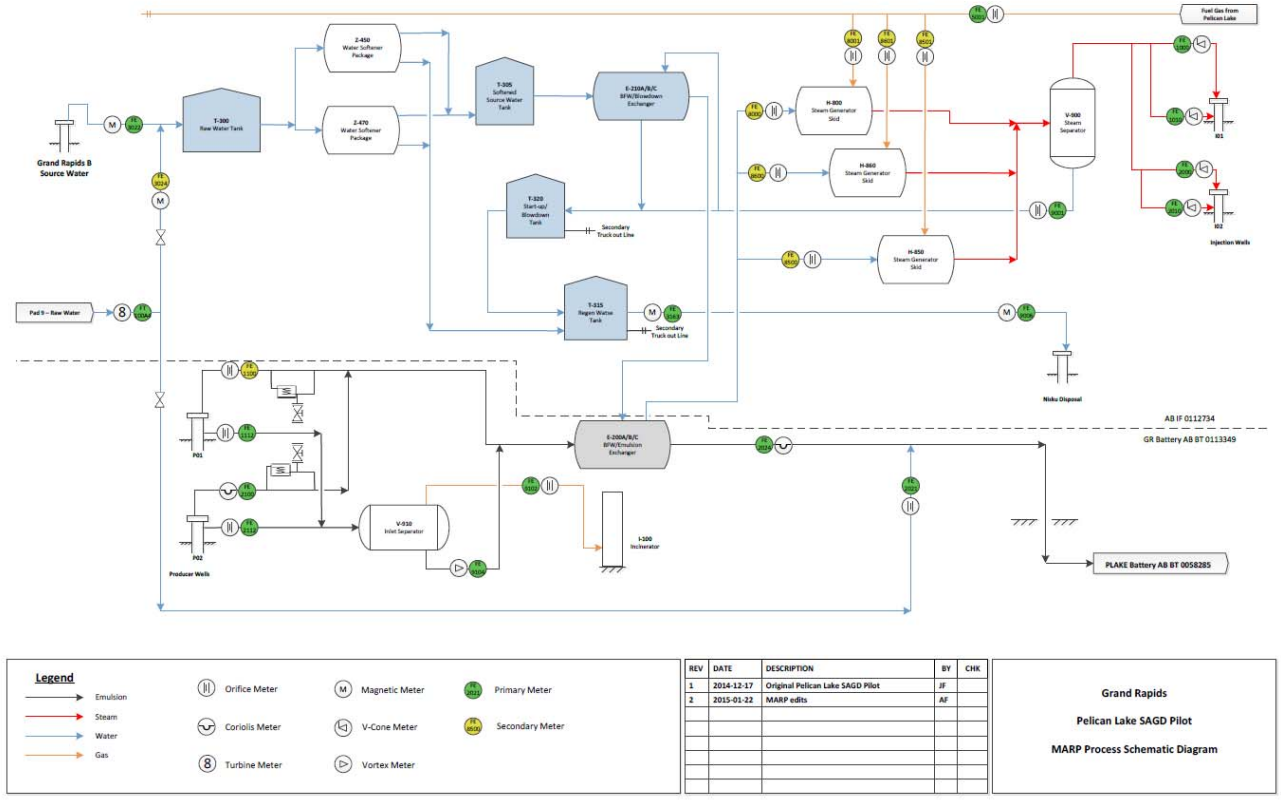
General facility performance

- Upgraded two boiler operating systems for improved control
- Steam quality estimated at 99% at injection wellheads

Plant Performance (continued)

- **Emulsion pipeline to battery temperature limited to 55°C**
  - Produced water temperature has increased from 40 to 80°C over the past 2 years
  - Production constraint reduced by installing Pad 9 quench to emulsion line out
  - Service change to the Heat Exchanger Shell and Tube – Reverse emulsion and BFW to test improved efficiency and aid in cooling pipeline for emulsion out
    - No significant improvement in heat exchanger performance
- **Modifications to boiler**
  - Upgraded operating systems from manual linkage to an automated system for better control and tuned to improved efficiency
- **No debottlenecking of facility or major MOC's**

MARP (Measurement, Accounting and Reporting Plan)



- **2013 MARP submission**
  - Updated MARP structure
  - Updated MARP schematic
  - Finalized February 2015
- **2014 MARP**
  - Submission due June 2015

Measurement and reporting

Estimated well production (oil and water)

- Pad 26 production is estimated by applying manual cuts to total measured volume at wellhead and measurement by difference
- Coriolis meters have proven to be an effective measurement at the pad as amounts of entrained gas and/or vapor are negligible and do not affect accuracy (difference of <2% for quarterly tests)
- All produced fluids are transferred to Pelican Lake 11-7 battery (AB BT0058285) for separation and all produced water is used for injection within scheme approval 9404K

- Proration Factor (PF) = $\frac{\text{Total P01 and P02 production}}{\text{Estimated production from well tests}}$

Proration factors

Month	Water Proration Factor	Oil Proration Factor
January	1.22415	1.02967
February	1.12636	0.99694
March	0.99166	0.98848
April	0.99946	0.9995
May	0.99934	0.99986
June	0.99595	0.99593
July	0.99666	1.0089
August	0.99827	1.00257
September	0.99733	1.00327
October	0.99901	0.99653
November	0.89756	0.98867
December	1.00247	0.98022

Measurement and reporting (continued)

Estimated well production (gas)

- Total gas production is obtained from a meter measuring the amount of production gas going to the incinerator
- Gas proration for each production well is calculated using the gas ratio determined from saturation conditions of the casing gas at the well head

Estimation of water production at injection facility

- Total dispositions includes steam injection and water to disposal
- Total receipts includes source water (01-15-082-23W4) and Pad 9 quench water (13-07-082-22W4) to Pelican Lake battery pipeline

Gas usage

- **Fuel gas purchased from TCPL for running steam generators and incinerator**
- **Gas Balance**
  - All produced gas volumes are incinerated
    - Gas has high CO_2 content at ≥70%
  - No flare stack
  - No venting of produced gas
  - The only received gas volumes are purchased fuel gas
  - No gas transferred

Gas balance

Month	Produced gas (e3m3)	Incinerator gas (e3m3)	Purchased gas (e3m3)
January	17.6	17.6	549.8
February	9.8	9.8	564.9
March	1.6	1.6	578
April	5.1	5.1	671.5
May	3.2	3.2	660.9
June	19.1	19.1	615.7
July	20.3	20.3	679.4
August	26.3	26.3	933.3
September	14.1	14.1	940
October	10.6	10.6	737.1
November	11	11	470.1
December	3.9	3.9	418.7

GHG emissions

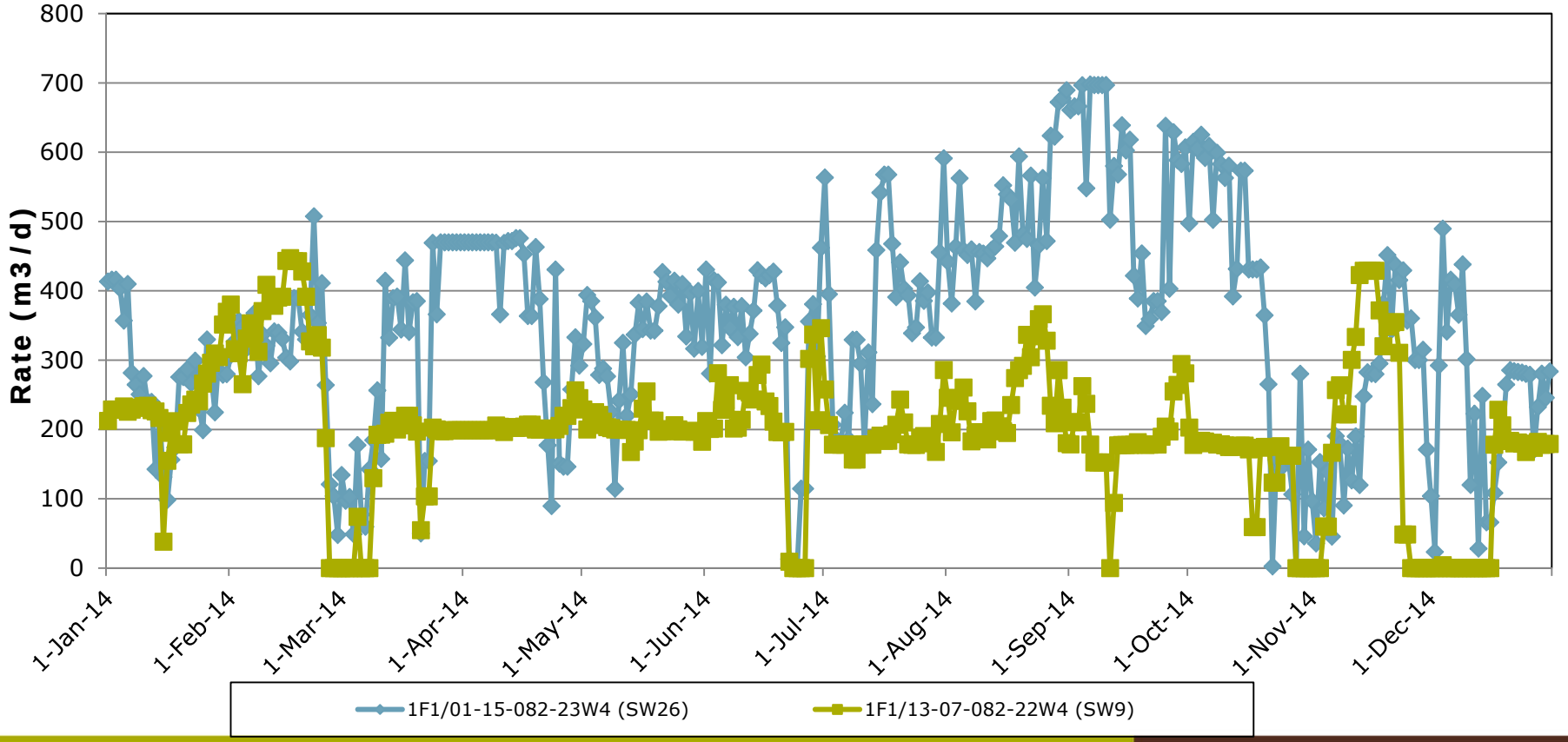
- **Calculation of GHG emissions (CO_2, CH_4, N_2O)**
  - Based on fuel gas for running steam generators and incinerator
  - NO_X is not a GHG emission and is not included in the calculation
- **Emission balance**
  - Tonnes CO_2 equivalent (CH_4 25 N_2O 298)= CO_2+(25*CH_4)+(298*N_2O)
- **SO_2 calculated from H_2S level in casing gas analysis**
  - H_2S samples on average in 2014 too small to measure (TSTM)
- **Annual reporting**
  - Facility is required to do annual reporting on NO_X and SO_2, produced gas flow rates, and stack temperatures
  - Facility is *not* required to do annual reporting on GHGs

Water Source Wells

- **Two source water wells**
  1. 1F1/01-15-082-23W4 in the Grand Rapids 'B' formation
  2. 1F1/13-07-082-22W4 in the Grand Rapids 'B' formation

- **No brackish water wells**
- Source water from Grand Rapids B water well (01-15-082-23W4) is used to generate steam for injection wells
- Raw water from Pad 9 (13-07-082-22W4) is used for management of emulsion temperature in pipelines

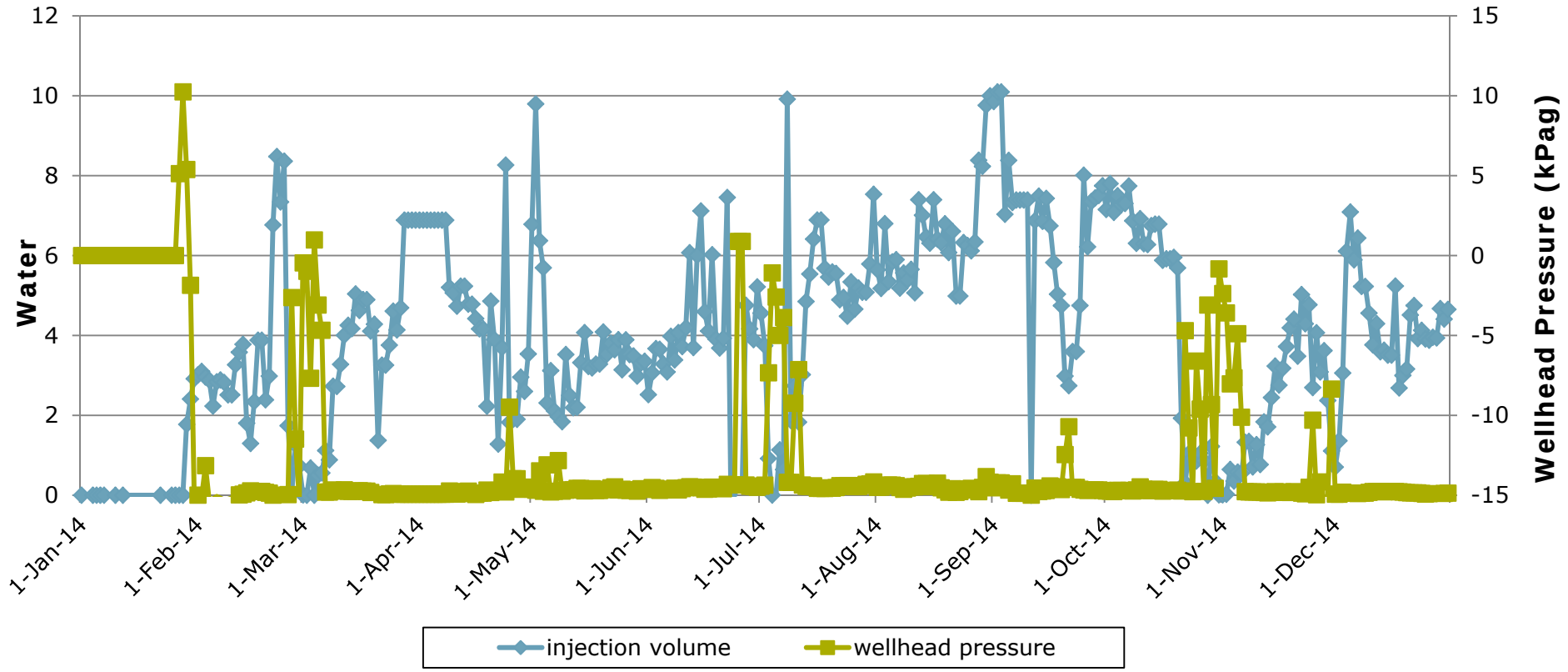
Source Water Well Rates



Water Treatment Technology

- **Media Filtering**
- **Primary Strong Acid Cation (SAC)**
- **Secondary SAC polisher**
- **Source water for brine regeneration**
- **Disposal well 105/12-11-082-23W4 located at Pad 26 – Abandoned July 2013**
- **New Disposal well 102/9-10-82-23W4 drilled and cased to Nisku Fm, July 2013**
  - Fluids trucked from site during 2013 until new Disposal approval received February 26, 2014

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



Water balance

Month	Steam (m3)	Produced water (m3)	Receipts (m3)	Disposal (m3)	Dispositions (m3)
January	5217.6	7788.4	5314.8	991.6	13103.2
February	4120.2	15165.1	7266.3	4127.2	15165.1
March	4131.5	6336.6	4047.5	4114.2	10384.1
April	4411.4	7249.6	5682.3	5693.1	12931.9
May	4851.6	7226.1	5735.2	4645.7	12961.3
June	3417.2	6126	5654	5659.2	11780
July	4061.3	5129	5987.6	6203.8	11116.6
August	4748	8679.7	7758.3	9551.6	16438
September	5569.1	5043.2	5272.4	9119.2	10315.6
October	2992.3	3839.1	4142.7	7231.3	7981.8
November	2406.7	4769.8	6994.1	3638.5	11763.9
December	3801.7	4389.3	3329.3	3095.7	7718.6

Sulphur production

- Casing gas is sampled for H2S upstream of the incinerator on a monthly basis
- Based on the calculated sulphur content, the facility is not required to complete quarterly sulphur emissions reporting
- Estimated 2014 sulphur emissions are approximately 0.002 tonnes

Emissions have been low to date and we *do not* expect an increase in sour gas production over time.

Environment Update

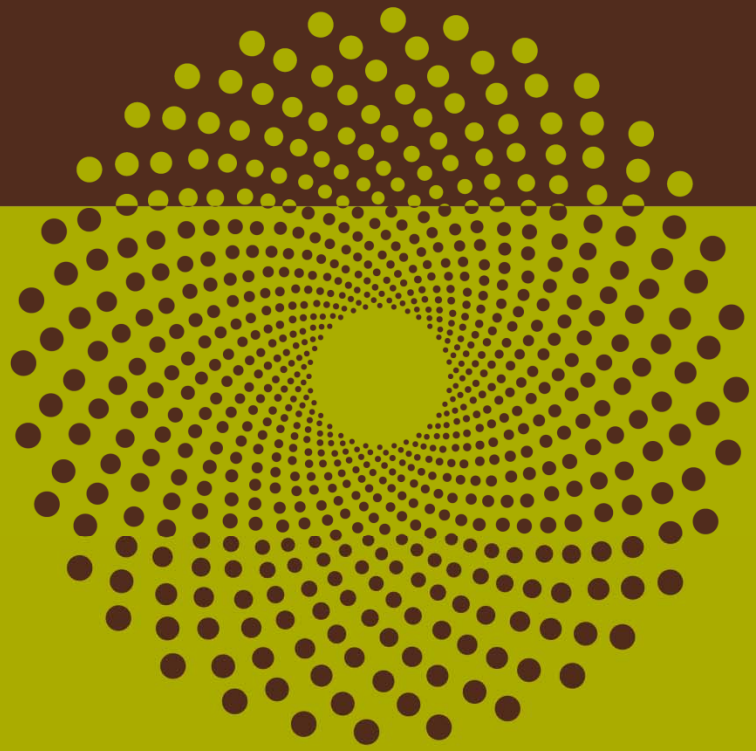
- **No environmental or regulatory compliance issues**

Future Plans

2015

- Well pair 3: tie-in and turnover to operations for circulation and SAGD
- Directive 42: 2014 MARP submission (June 2015 extension)

Appendices

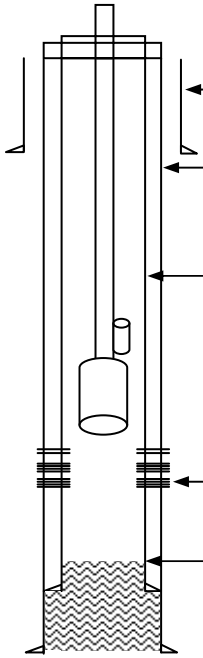


Appendix: Pelican Lake SAGD Pilot Observation Wellbore Schematic

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

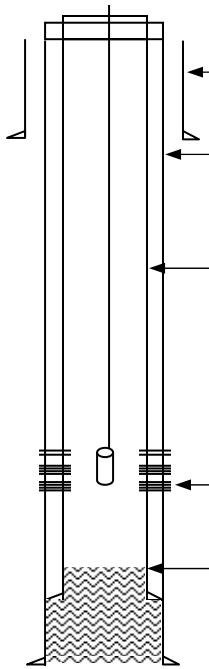
Intended Purpose:
Pressure (Fluid Level), Temperature, Water quality monitoring of Grand Rapids B aquifer

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

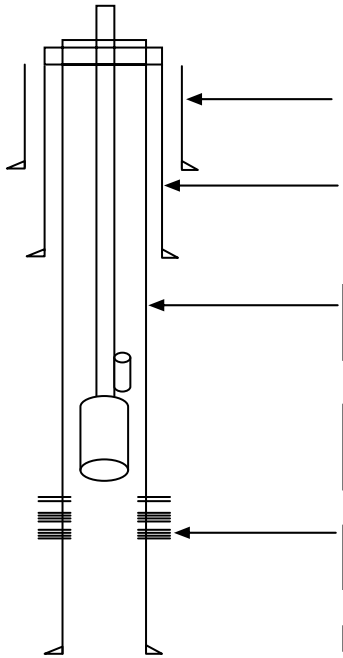
Intended Purpose:
Pressure (Fluid Level) and Temperature monitoring of Grand Rapids B aquifer

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

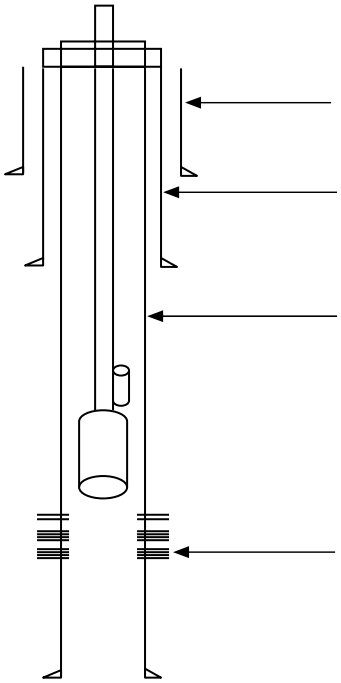
Intended Purpose:
Pressure (Fluid Level), Temperature, Water quality monitoring of Grand Rapids B aquifer

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

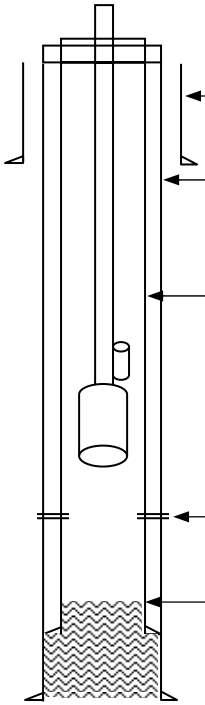
Intended Purpose:
Pressure (Fluid Level), Temperature, Water quality monitoring of Grand Rapids B aquifer

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

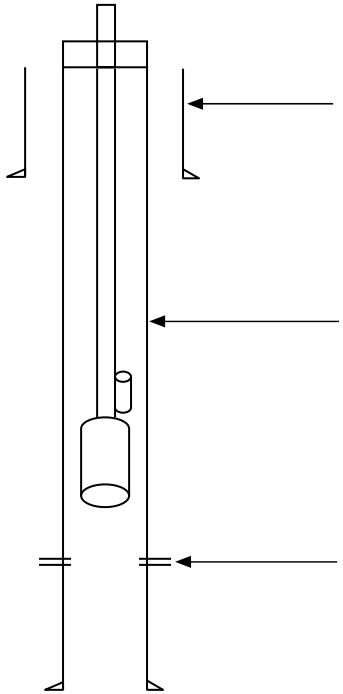
Intended Purpose:
Pressure (Fluid Level), Temperature, Water quality monitoring of Grand Rapids A aquifer

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:

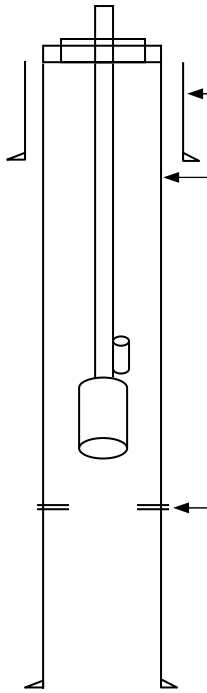
Pressure (Fluid Level), Temperature, Water quality monitoring of Viking aquifer

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:

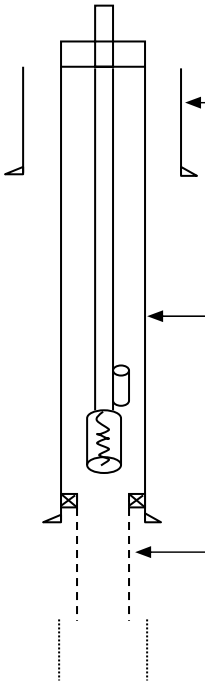
Pressure (Fluid Level), Temperature, Water quality monitoring of Tertiary aquifer

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)

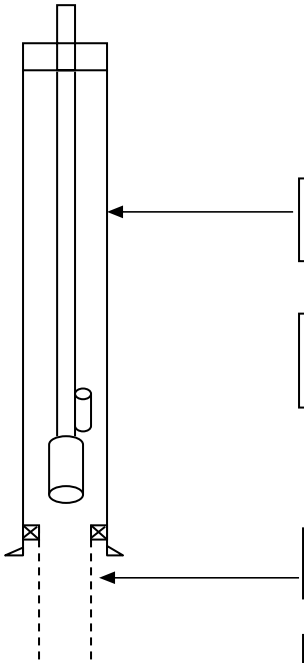
Intended Purpose:

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:

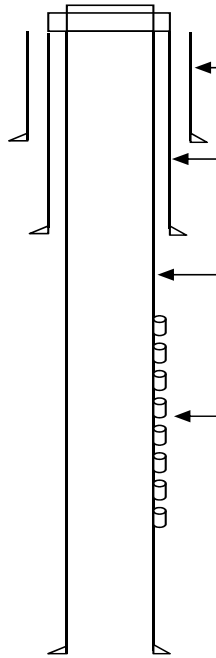
Pressure (Fluid Level), Temperature, Water quality monitoring of Quaternary aquifer (well pumping consistantly as it provides fresh water Pelican Lake Camp)

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:

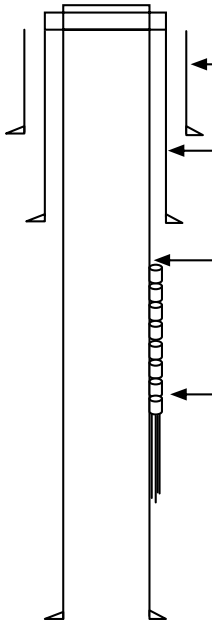
Pressure and Temperature through Grand Rapids A steam chamber

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)

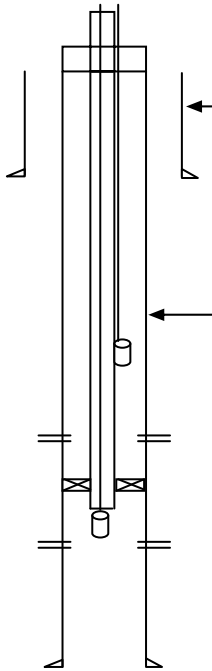
Intended Purpose:
Pressure and Temperature through Grand Rapids A steam chamber

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

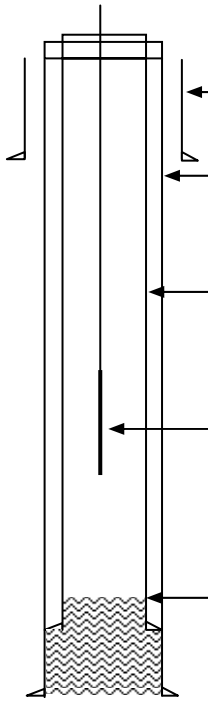
Intended Purpose:
Pressure (Fluid Level) and Temperature monitoring of Grand Rapids A zone

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

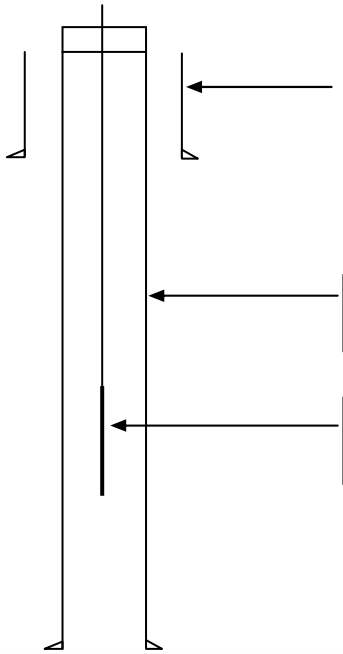
Intended Purpose:
Temperature monitoring of Grand Rapids A steam chamber

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

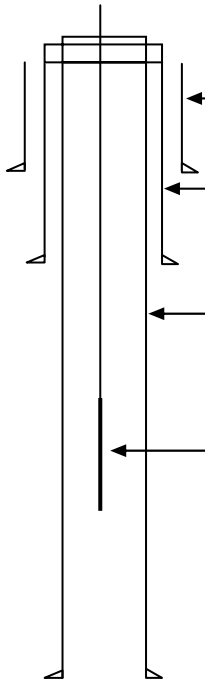
Intended Purpose:
Temperature monitoring of Grand Rapids A steam chamber

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

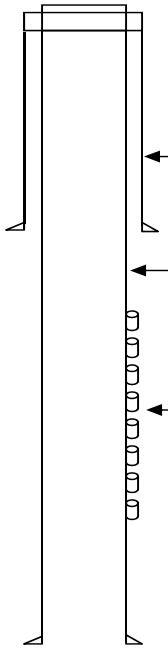
Intended Purpose:
Temperature monitoring of Grand Rapids A steam chamber

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:

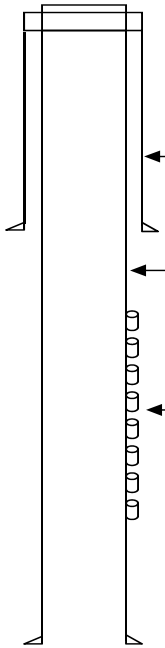
Pressure and Temperature through Grand Rapids A steam chamber

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:

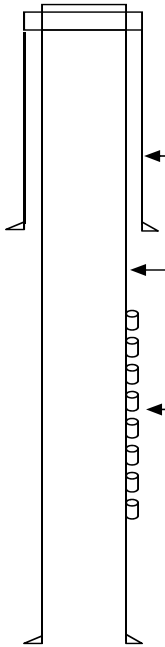
Pressure and Temperature through Grand Rapids A steam chamber

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

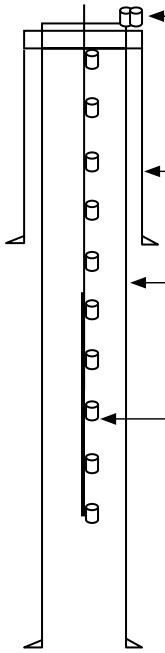
Intended Purpose:

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:

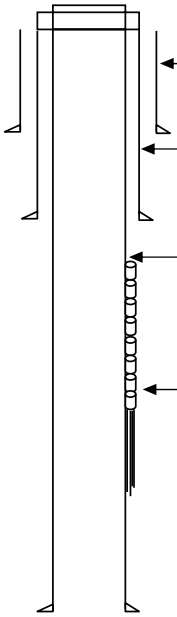
Acoustic Fibre through out wellbore to measure noise and Temperature through Grand Rapids A steam chamber - Non thermal casing with thermal cement monitoring wellbore

Appendix: Pelican Lake SAGD Pilot Observation Wellbore Schematic

CVE 103 BRINT 16-3-82-23

1AA/16-03-082-23W4 LSD 16-03-82-23W4

KB= 603.06 mKB
GRD= 599.06 mKB
PBTD = 347.0 mKB



Conductor:

Landed at 20 mKB / 406.4mm

Surface Casing:

177.8 mm , 25.3 kg/m , H-40
Landed at 95.00 mKB
Cemented to surface with Thermal Cement 3.0m3 of returns

Intermediate Casing:

101.6 mm , 17.26 kg/m , L-80
Landed at 345.00 mKB
Cemented to surface with Thermal Cement 4.0m3 of returns

Sensors:

Pressure/Temperature Sensor Depths:

204.0 mKB
236.0 mKB
224.0 mKB
212.0mKB
222.0 mKB
244.0mKB
230.0mKB
246.0 mKB
228.0mKB
208.0 mKB
242.0 mKB
232.0 mKB
218.0 mKB
240.0 mKB
220.0 mKB
234.0 mKB
216.0 mKB
226.0 mKB
238.0 mKB
248.0 mKB

Intended Purpose:

Pressure and Temperature through Grand Rapids A steam chamber