PENGROWTH ENERGY CORPORATION

LINDBERGH SAGD PROJECT

2017 ANNUAL PERFORMANCE PRESENTATION

SCHEME APPROVAL 6410P

2018 01 17

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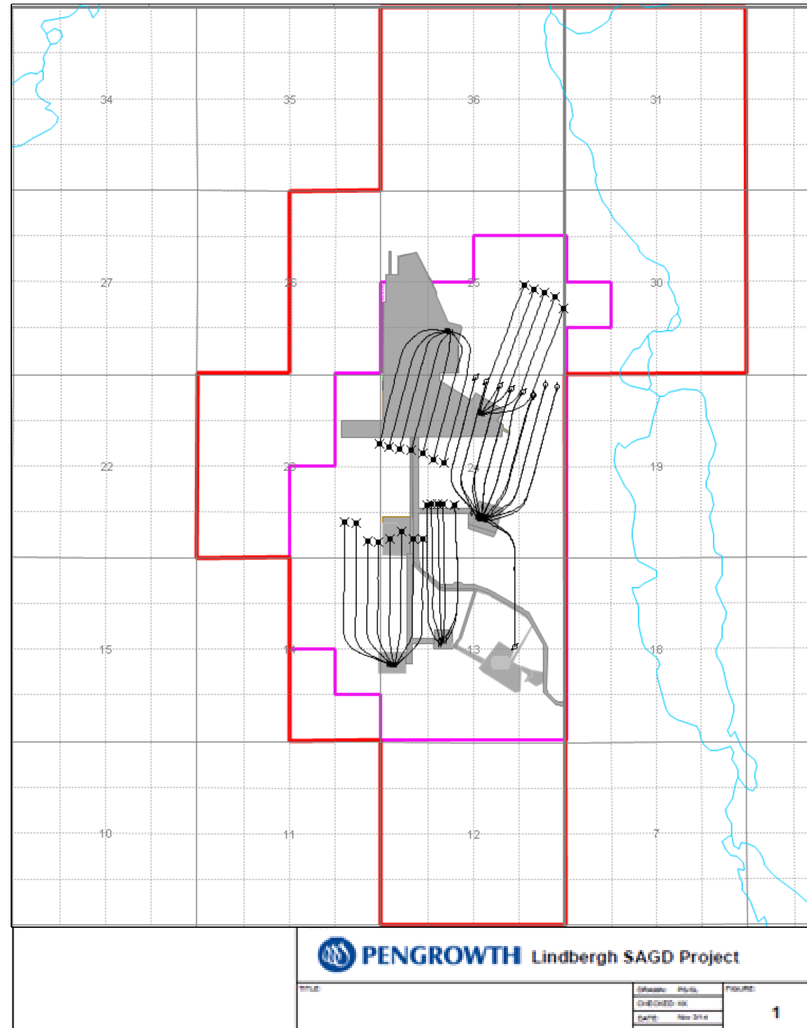
BACKGROUND AND OVERVIEW

PROJECT LOCATION



TSX:PGF NYSE:PGH

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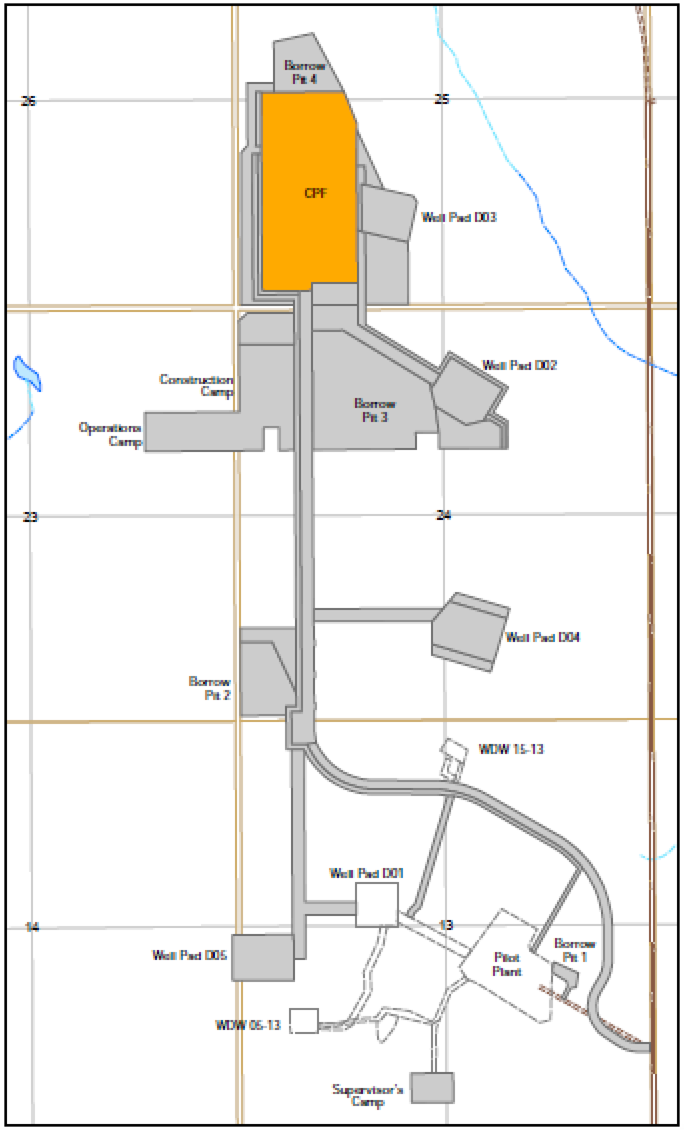
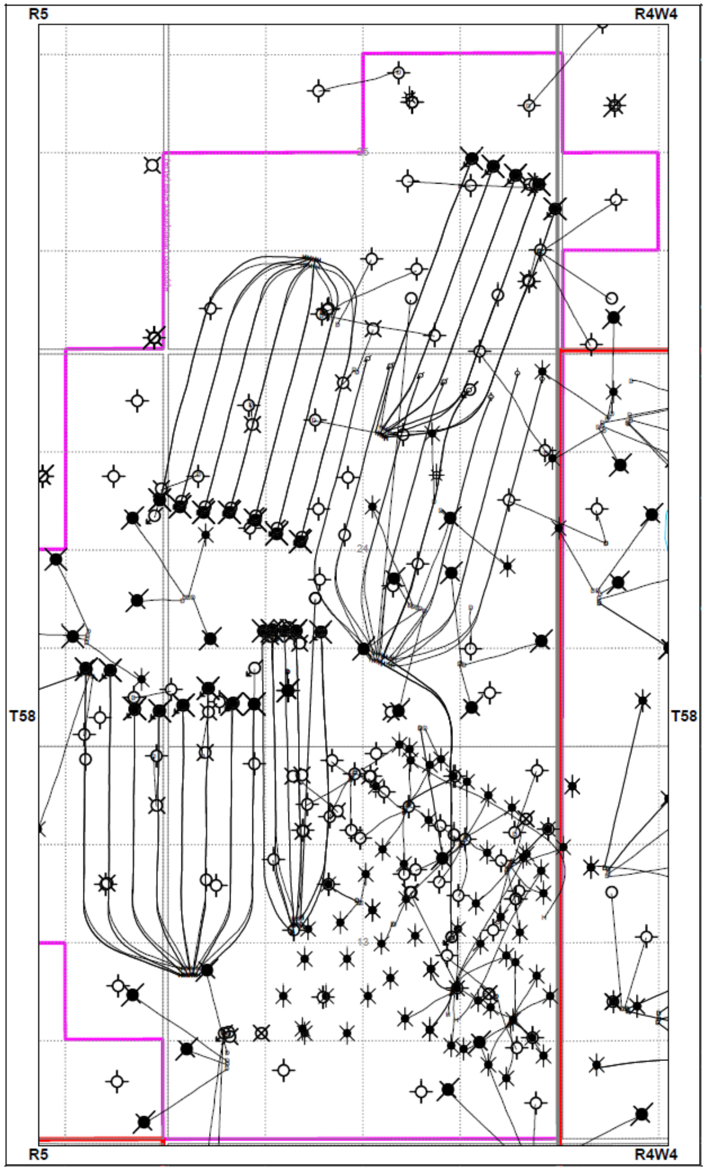
PROJECT OVERVIEW

- Pilot project implemented to evaluate the SAGD recovery process in the Mannville Lloydminster Formation
- 12,500 bpd SAGD facility completed Q4, 2014
  - 2 pilot SAGD wells – began steam circulation Feb 2012
  - 20 new SAGD wells – began steam circulation Dec 2014
  - 1 new SAGD well/2 Infill wells – began steam circulation June 2017
  - 6 new SAGD wells – began steam circulation Sept 2017
- Pilot SAGD well production moved to 12,500 bpd facility
- Pilot facility mothballed
- Approved to increase production to 40,000 bpd



LINDBERGH HISTORY

- Murphy piloted and then commercialized CSS production in the Lloydminster and Rex formations in Section 13 from 1972-1998
- Pengrowth acquired the Lindbergh lease from Murphy Canada in April, 2004
- All CSS wells have been abandoned
- Two pilot well pairs are on the western edge of the CSS area
  - Steam circulation commenced Feb 2012
- Commercial 12,500 bpd commissioned Q4 2015
  - Bitumen production from 20 new well pairs and 2 original pilot well pairs
  - Pilot plant mothballed for future use
- Phase 1 Optimization commissioned Q2 2017 – Q2 2018
  - Bitumen production from 10 new well pairs and 2 infill wells.



CSS IMPACT ON FUTURE DEVELOPMENT IN SEC 13

- Murphy produced a total of 2.3 MMbbls of oil and 7.6 MMbbls of water with 8.2 MMbbls (CWE) steam injection
- 71 vertical wells and 3 horizontal wells used in CSS operations
- The average recovery factor for the CSS area is 5-6% of the OOIP (up to 10% in various wells)
- CSS injection operations were at pressures over 10 MPa with injection at various depths within the target formation
- Pengrowth received D78 Category 2 Amendment Approval to install 2 additional horizontal well pairs on well pad 4 to test SAGD production performance in the CSS impacted area. Well drilled in 2017 and placed on circulation in September.
- Potential impacts of the CSS operations are:
  - Channeling of steam, breakthrough to bottom water, increased SOR with decreased recovery, increased water production from residual CSS steam condensate

LINDBERGH APPLICATION HISTORY

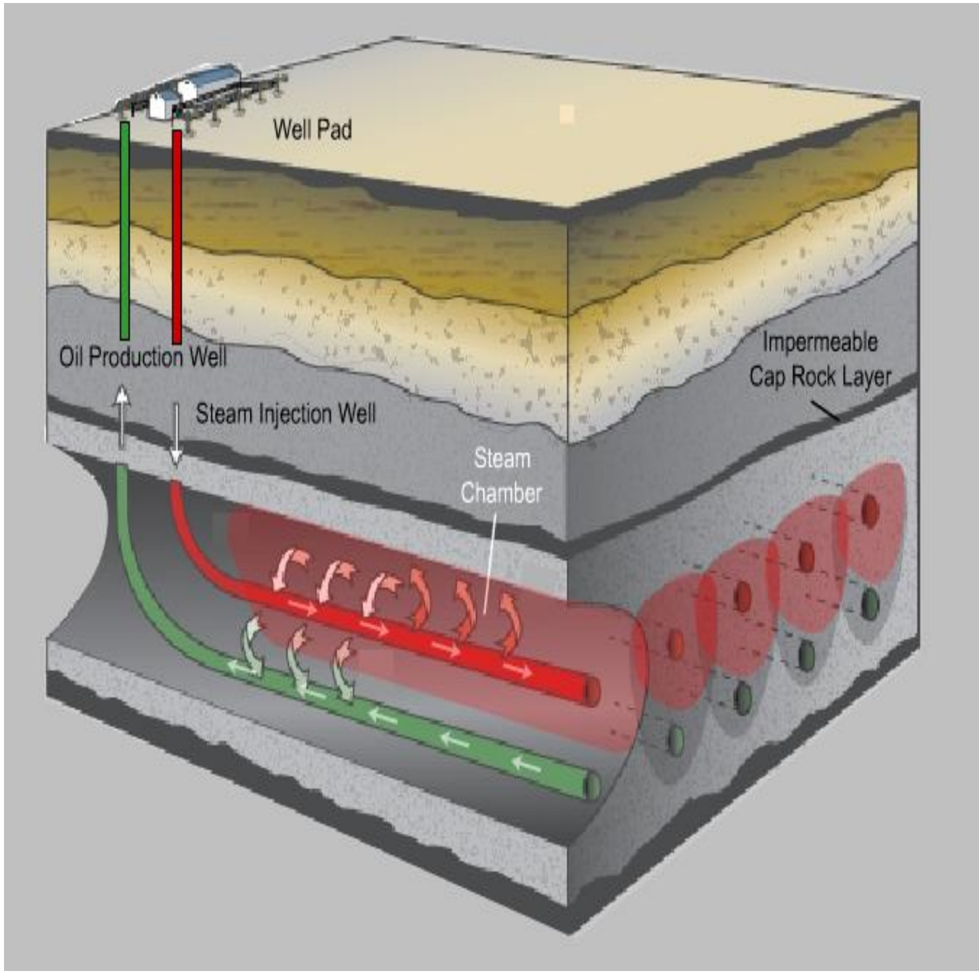
OPERATOR	DATE	EVENT
Murphy	May 1991	ERCB Scheme Approval 6410 granted
	Aug 1993	ERCB Amended Scheme Approval 6410B granted
	Dec 1996	ERCB Amended Scheme Approval 6410C granted
	Aug 1997	ERCB Amended Scheme Approval 6410D granted
	Jun 1999	ERCB Amended Scheme Approval 6410E granted
Pengrowth	Apr 2004	ERCB Amended Scheme Approval 6410F granted
	July 2011	Scheme Amended - 6410H SAGD Pilot Project granted
	Aug 2012	Scheme Amended - 6410I Expansion to 12,500 bopd granted
	Apr 2014	Scheme Amended - 6410J Solvent Soak Trial granted

LINDBERGH APPLICATION HISTORY (CONTINUED)

OPERATOR	DATE	TYPE	DESCRIPTION
Pengrowth	Dec 2014	D56 Sales & Diluent PL Application (PLA#141430, C&R#001-356469)	Tie-in to Husky PL infrastructure - granted
	Sep 2016	Scheme Amended 6410M	30,000 bopd granted
	Nov 2016	Scheme Amended 6410N	Infill Wells granted
	May 2017	Scheme Amended 6410O	Legacy well remediation schedule granted
	June 2017	Scheme Amended 6410P	40,000 bopd granted

SAGD RECOVERY PROCESS

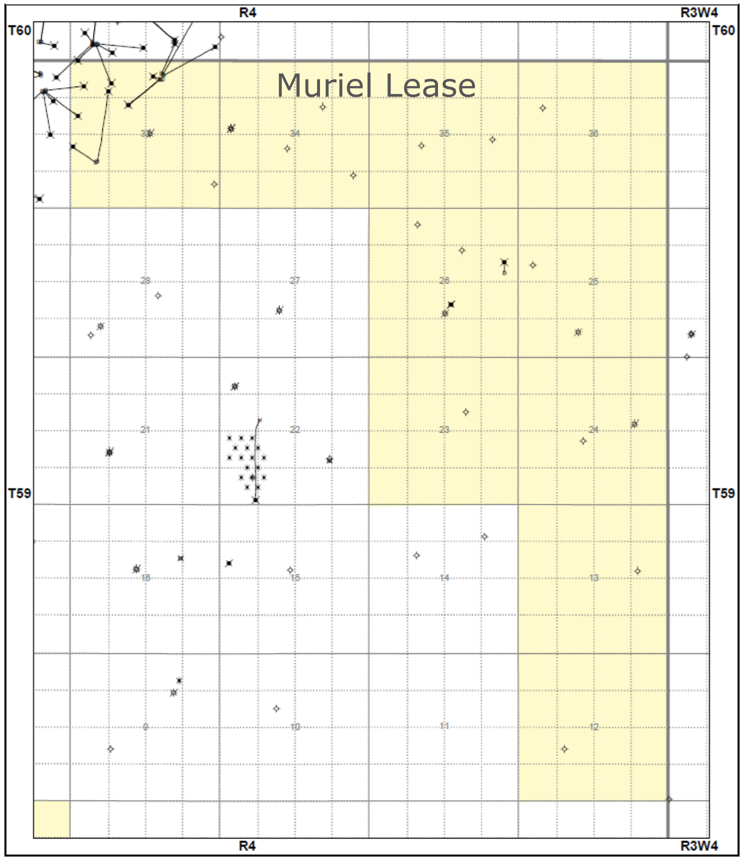
- Stacked horizontal wells
- Steam injected into top well and forms steam chamber
- Steam condenses on boundary of chamber and releases heat into the bitumen
- Bitumen and condensed water drain by gravity to the bottom well
- Bottom well produces liquid bitumen to surface

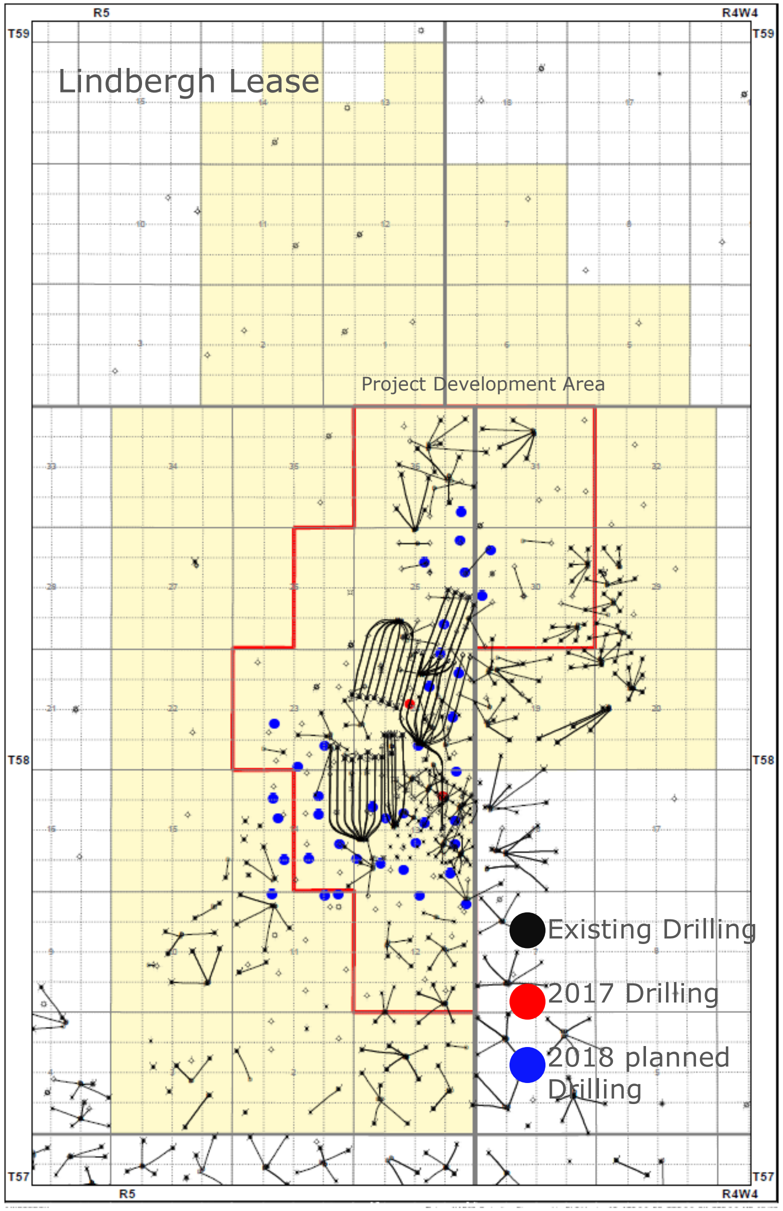


GEOLOGY AND GEOSCIENCE

2016 & 2017 DRILLING

- 2 Observation wells drilled in 2017 at Lindbergh
- No wells drilled at Muriel Lake
- 26 delineation wells planned for 2018



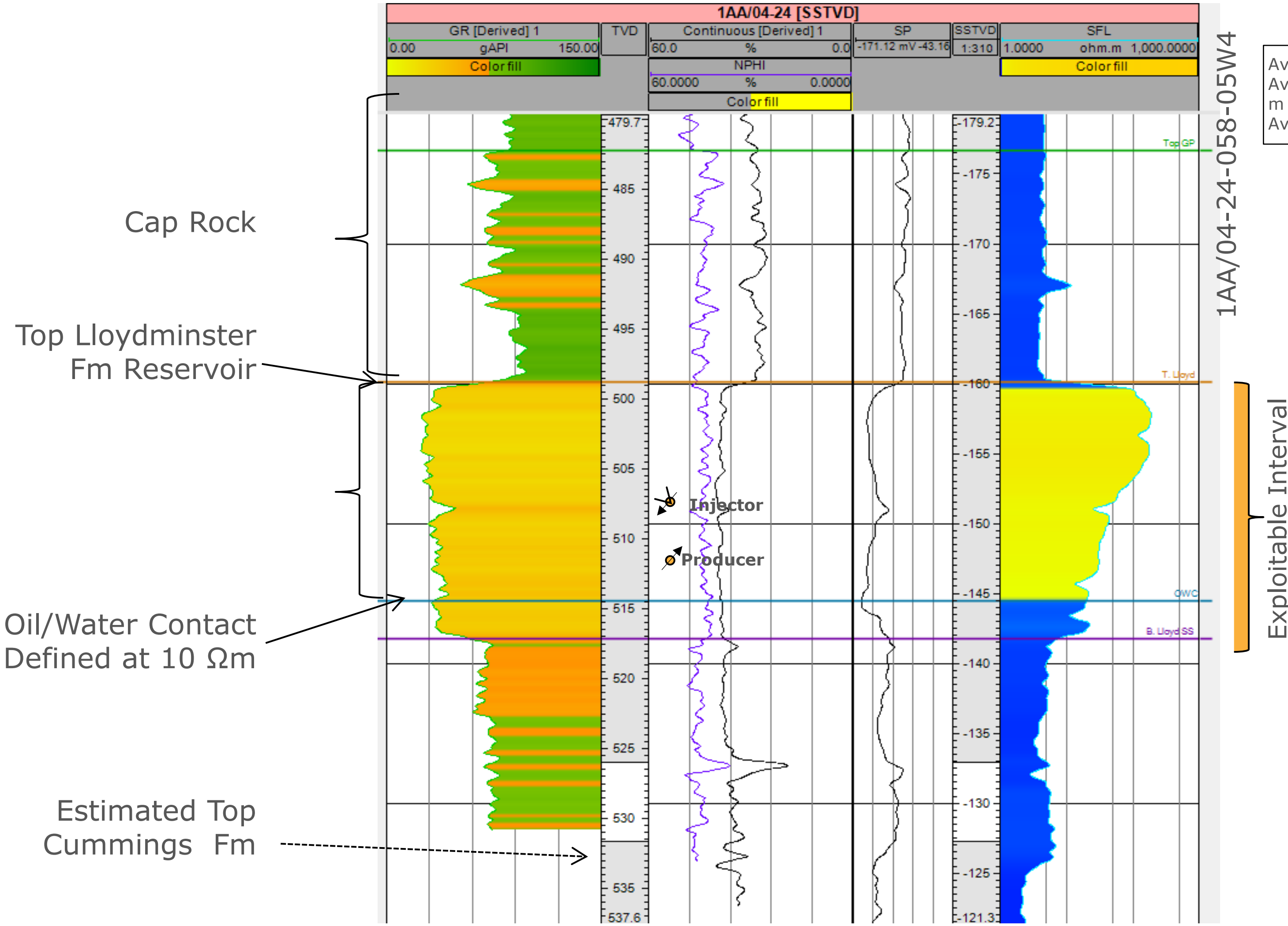


BITUMEN VOLUMES & RESERVOIR PROPERTIES

- All values shown for S_w, Φ and bitumen volume are measured from the Petrel geological model which was recently updated
- Boundaries defining the area and the top and bottom surfaces of the reservoir are used to confine the volume calculation
- Bitumen volume extends below well pairs to the 10 ohm.m resistivity level
- S_w, Φ are averages for the volume shown
- Average horizontal permeability = 3500 md: Kv / Kh = 0.86
- Viscosity of the bitumen decreases upwards through the reservoir from approximately 600,000 cP at the base to 50,000 cP near the top
- Mean reservoir thickness over entire lease is 16.7 m. This includes all areas having a minimum thickness of 10 meters
- Initial reservoir temperature = 20 Celsius, initial reservoir pressure 2800-3000 kPa
- Reservoir pressure in bottom water interval = 2850 kPa
- Reservoir depth ~ 500 mKB

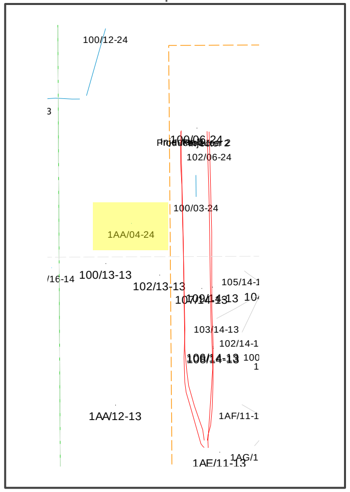
Region	OBIP Volume (E3m^3)	Porosity (%)	Sw (%)
Wellpad D01	1,407.5	36	19
Wellpad D02	2,160.1	35	21
Wellpad D03	2,886.5	35	17
Wellpad D04	4,295.3	36	22
Wellpad D05	3,493.0	37	20

REPRESENTATIVE COMPOSITE WELL LOG



Average Pay Thickness = 20m
Average Producer to Injector Spacing = 5 m
Average O/W to Producer Distance = 3 m

Well Location Map



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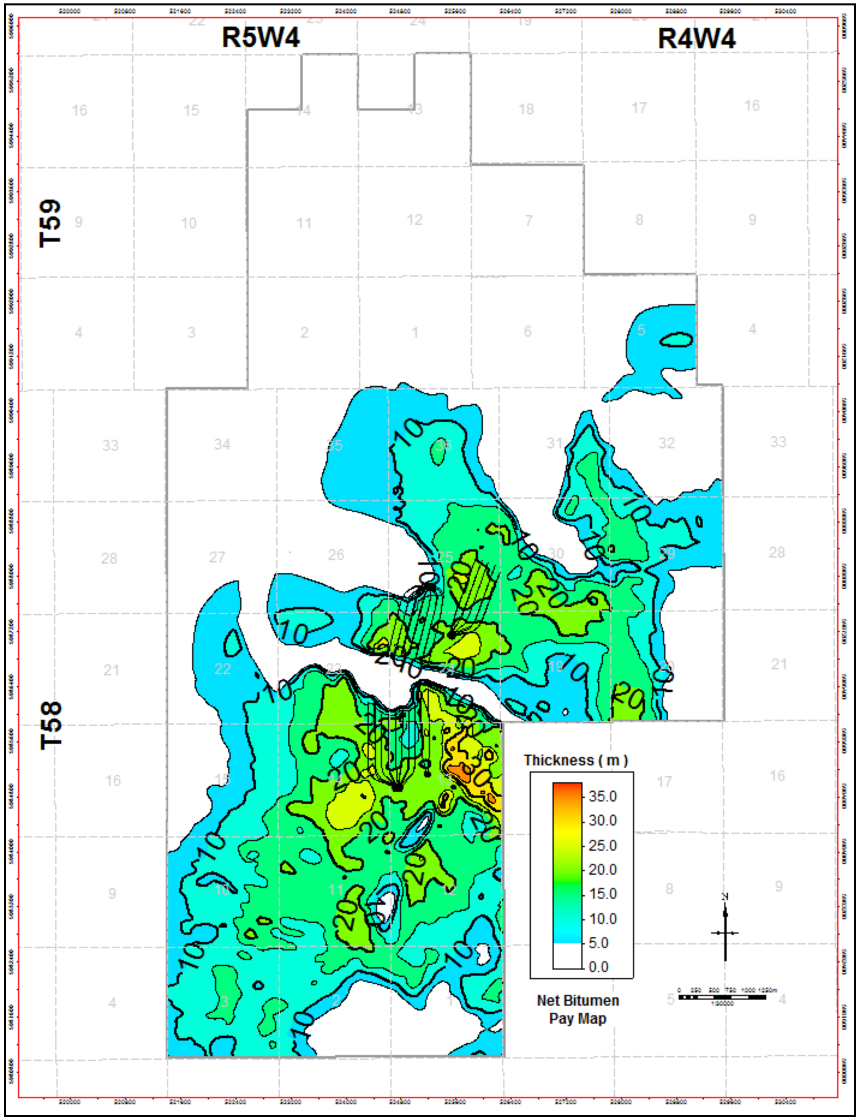
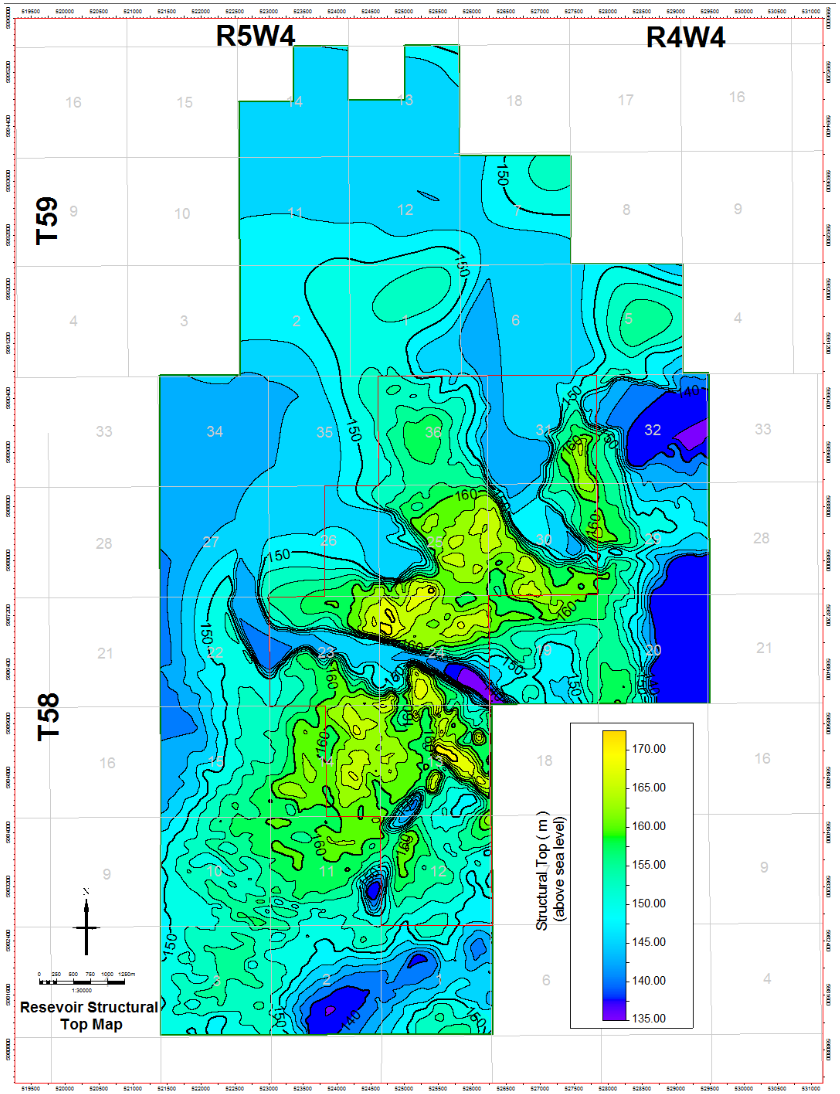
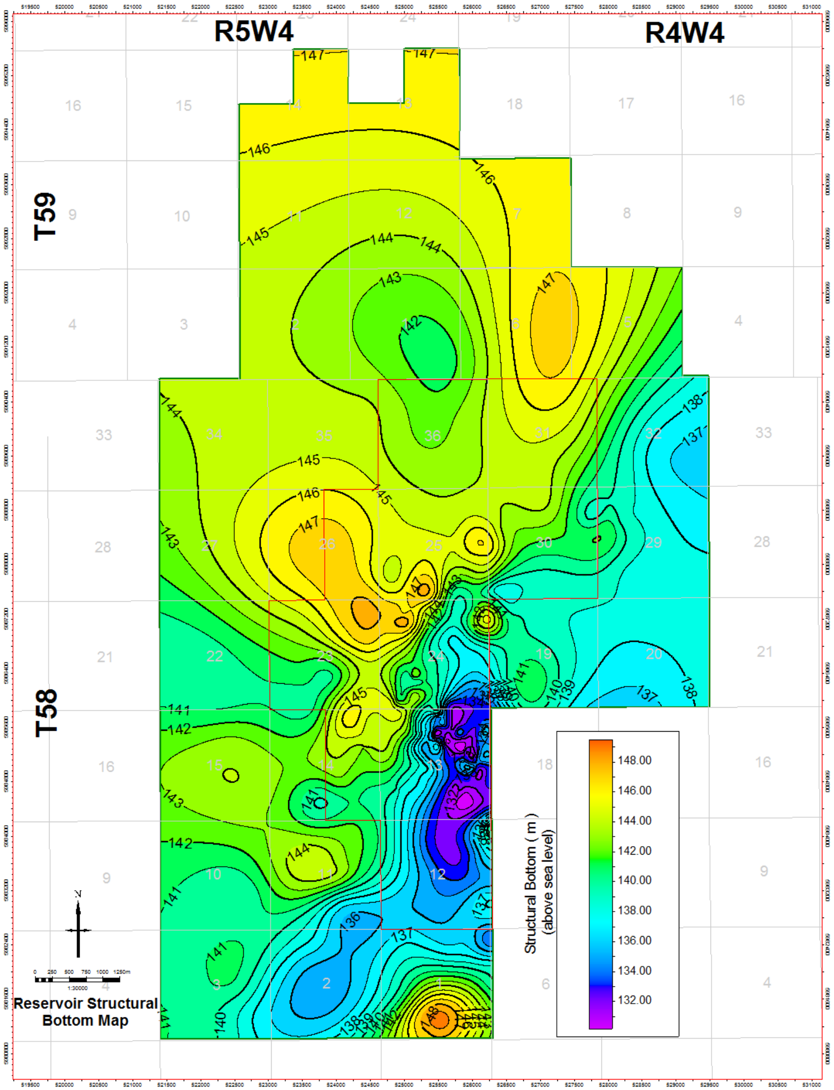
NET BITUMEN PAY

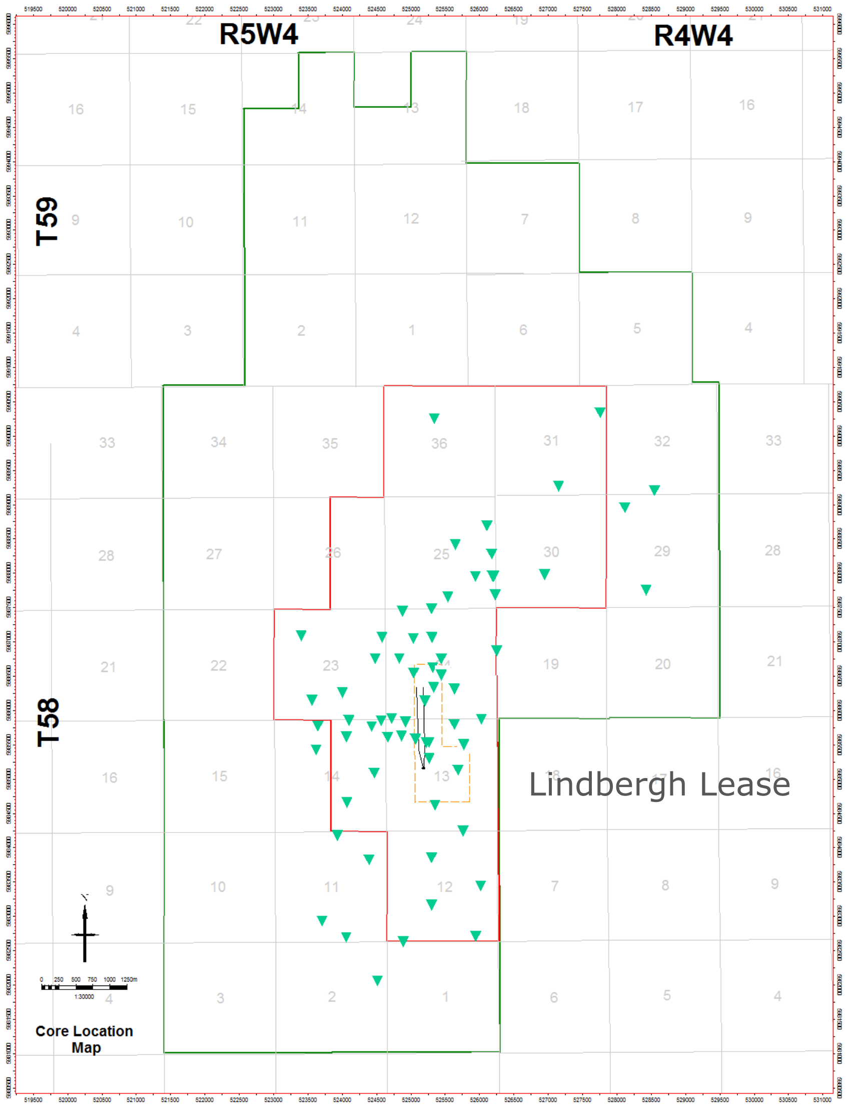


STRUCTURAL TOP AND BOTTOM OF BITUMEN RESERVOIR



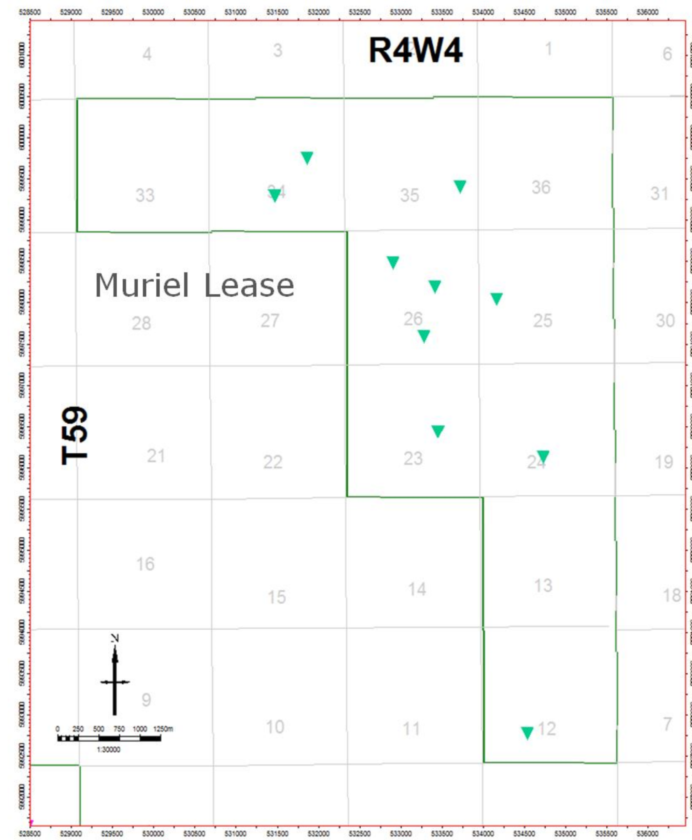


CORED WELLS AND SPECIAL CORE ANALYSIS



Core analysis typically consists of the following:

- Dean-Stark – 1762 samples
- Small plug Φ, K, Sw, - 2100 samples
- Grain size – 39 wells sampled
- Petrographic, XRD – 50 samples from 15 wells
- Special core analysis – 140 samples from 20 wells

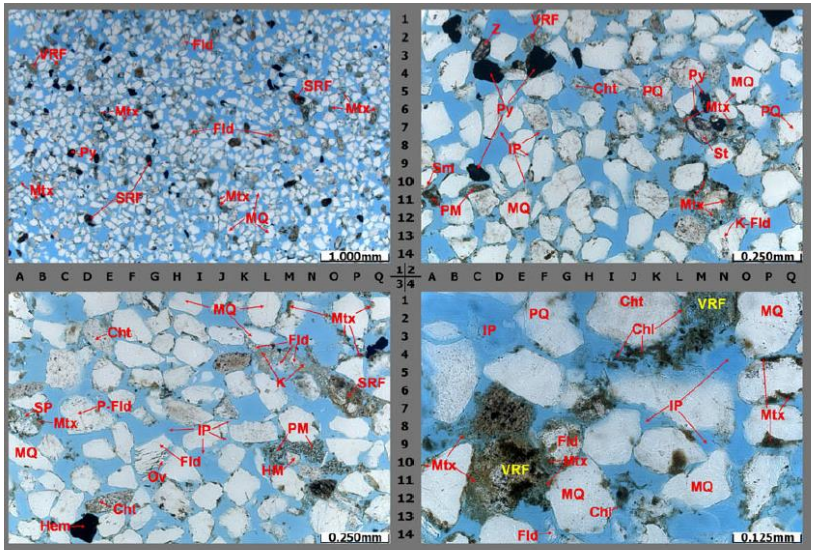


TYPICAL LINDBERGH CORE SAMPLE

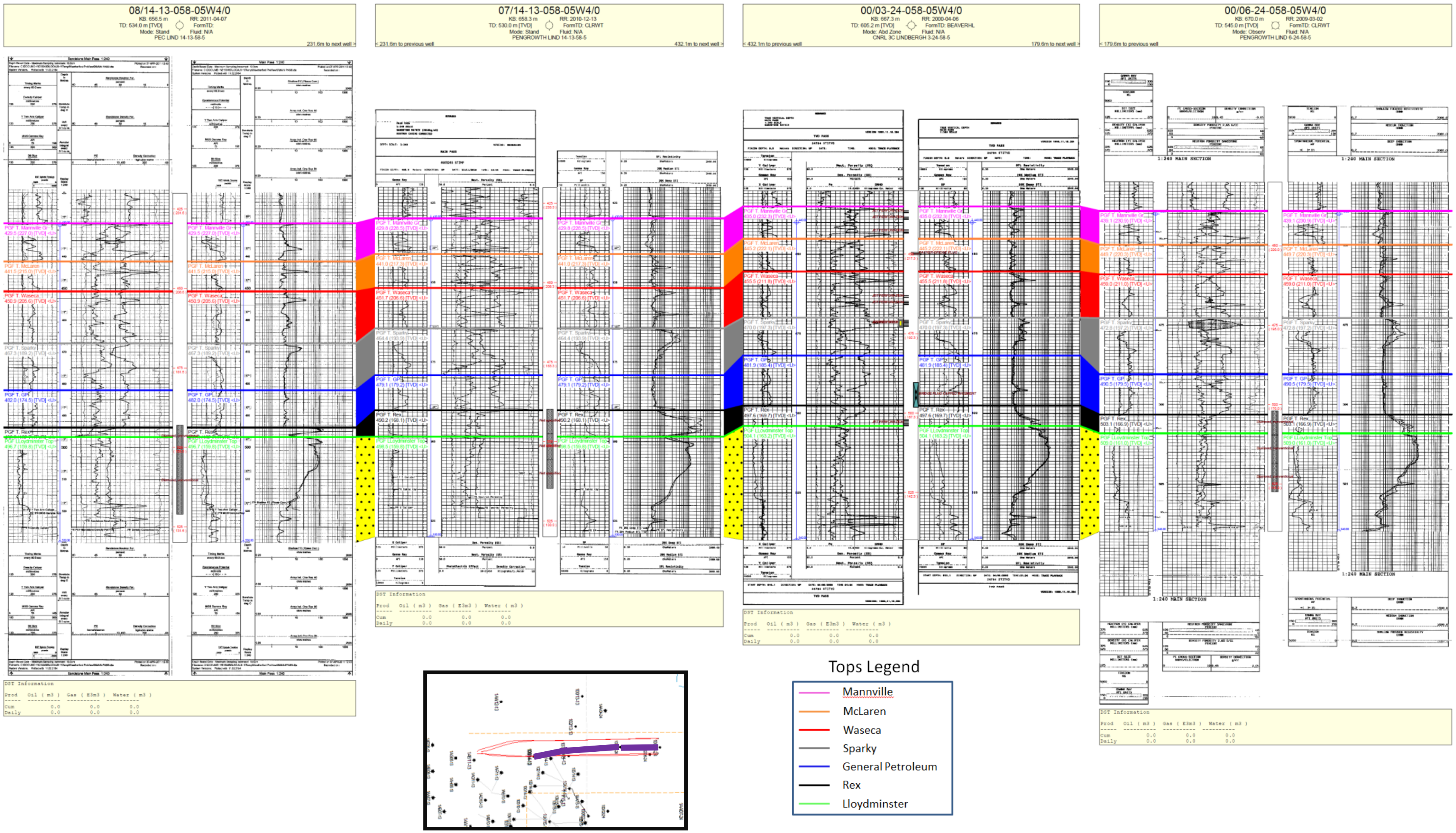
- Lloydminster sands are continuous and contain rare shale interbeds
- Typically the reservoir is composed of very fine grained sands throughout the interval

PETROGRAPHIC ANALYSIS

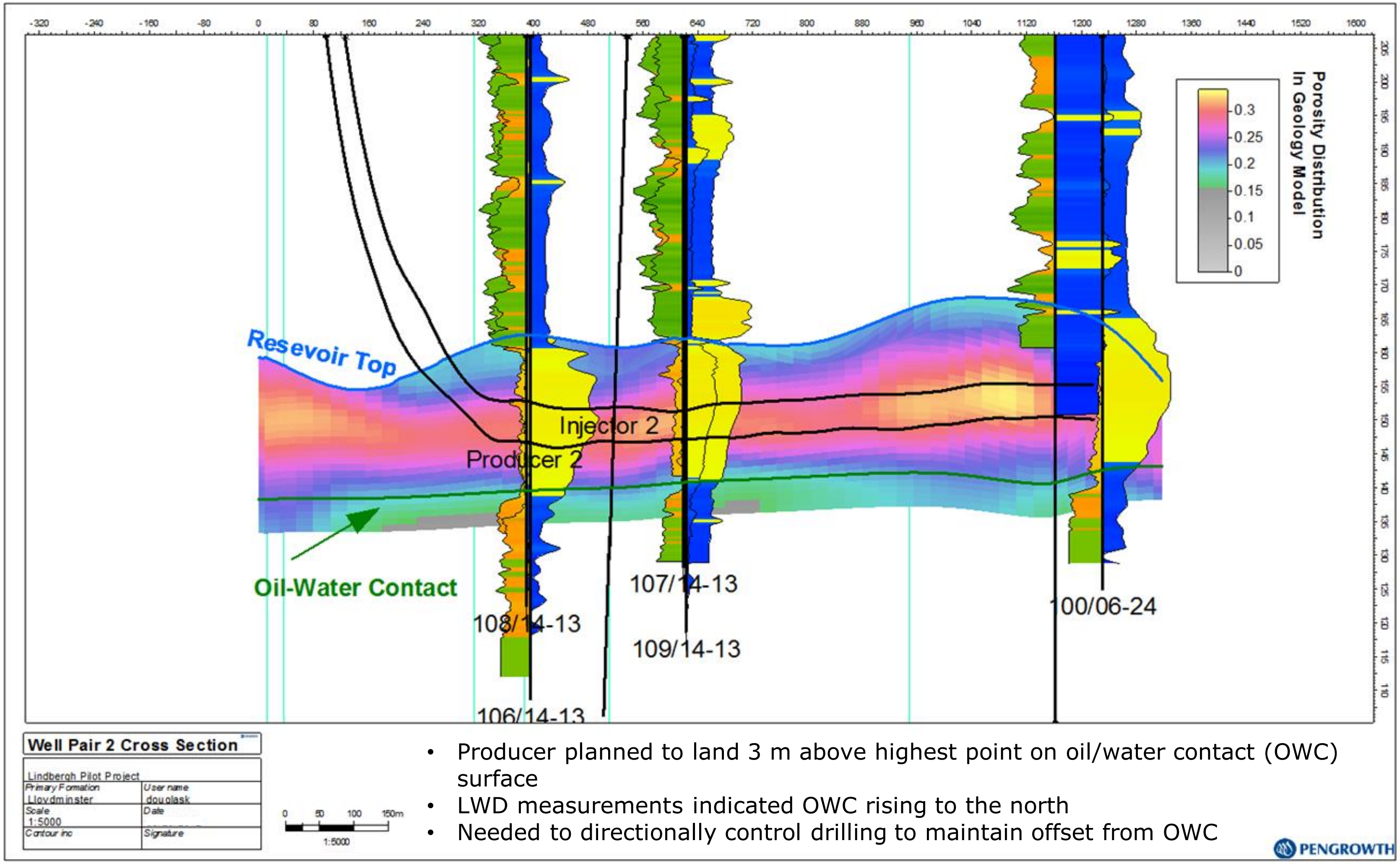
- Some Petrographic analysis has been done on core samples in the Lloydminster Reservoir
- Sands are typically classified as Feldspathic Litharenite to Sublitharenite on the Folk scale (Folk, 1974)
- The clay fraction is less than 10% of the bulk sample
- Grain sizes range from coarse silt to lower medium grained sand
- Critical velocity testing indicates that clays remain non-mobile during steam injection. The clays will not block pore throats



REPRESENTATIVE CROSS SECTION THROUGH PROJECT AREA



REPRESENTATIVE MODEL CROSS SECTION THROUGH PROJECT AREA

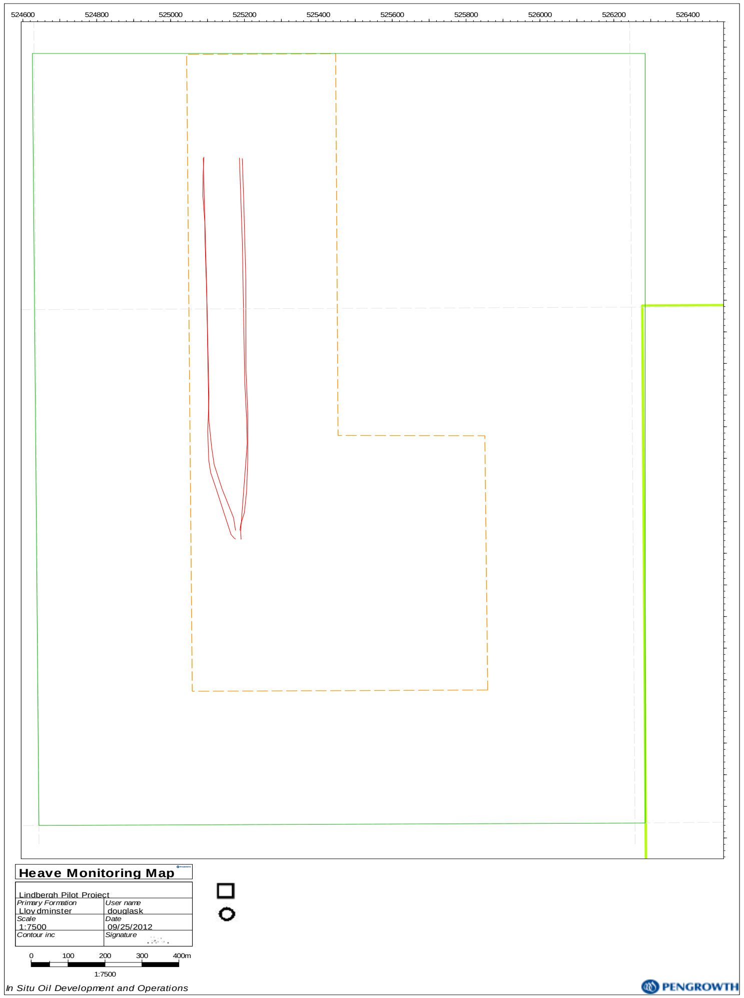


- Producer planned to land 3 m above highest point on oil/water contact (OWC) surface
- LWD measurements indicated OWC rising to the north
- Needed to directionally control drilling to maintain offset from OWC

HEAVE MONUMENTS

- Baseline readings were taken in March 2012
- Most recent observations were taken in February and September of 2014
- Based on current analysis we do not anticipate additional monitoring within the next year

		Point Differences vs Observation 1		
		ΔN(m)	ΔE(m)	ΔElev(m)
Observation 6 (February 2014)	Control	0	0	0
		0	0	0
	WP01	0.051	-0.05	0.019
		-	-	0.002
		0.022	-0.003	0.003
	WP02	0.014	0.011	0.019
		0.046	-0.107	0.003
		-	-	0.0022
Observation 7 (September 2014)	Control	0	0	0
		0	0	0
	WP01	-	-	0.0019
		-	-	0.0029
		0.016	0.008	0.004
	WP02	0.012	0.021	0.011
		0.044	-0.09	0.005
		0	0.001	0.003



CAPROCK INTEGRITY AND RESERVOIR OPERATING PRESSURE

- Mini-frac testing was done on the 1AB/13-13-58-5W4 (March 2011), 100/13-24-58-5W4 (December 2011), and 1AF/10-13-58-5W4 (March 2014)
  - All showed – comparable results
- Approved maximum ongoing operating pressure = 5500 kPa, less than 80% of minimum stress in caprock at reservoir depth

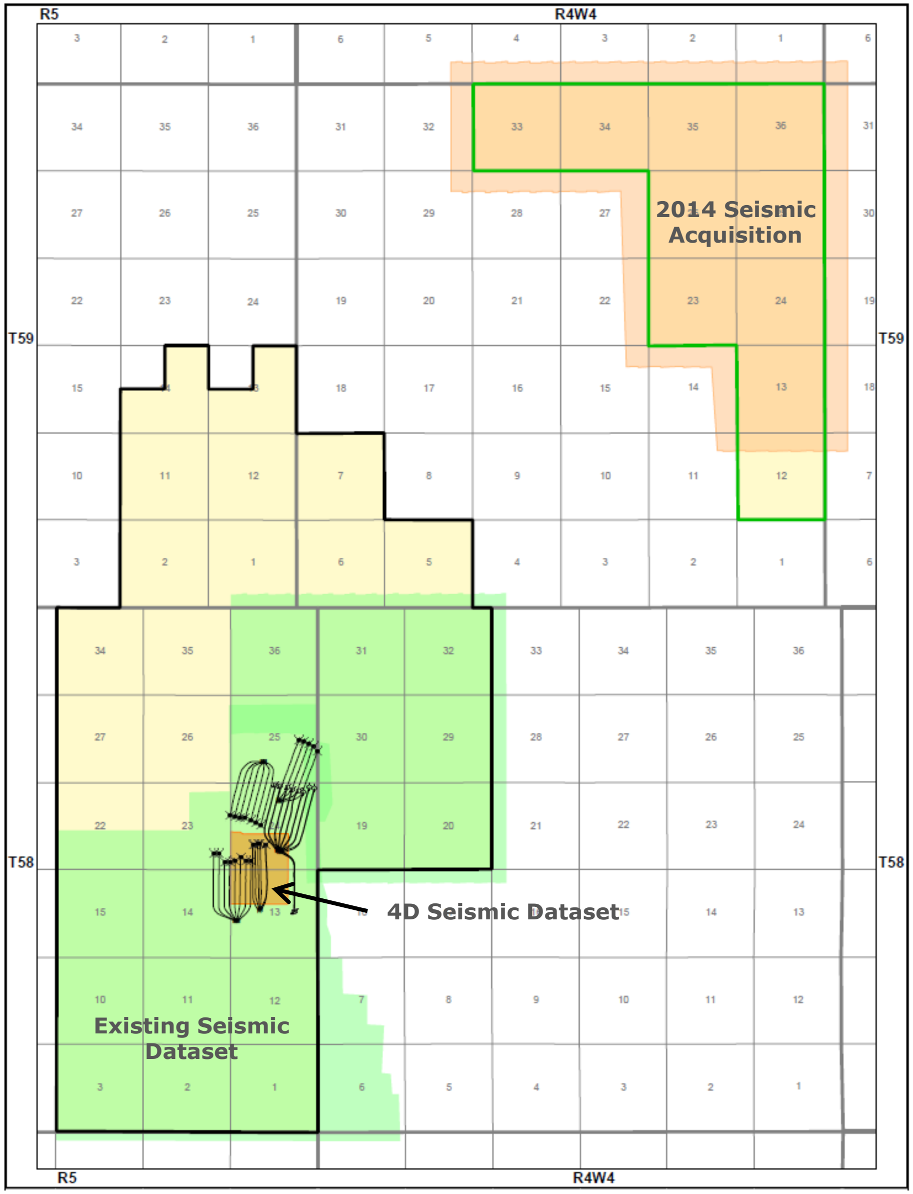
Pengrowth 1AB/13-13-58-05W4M						
Zone	TVD	Min Stress		Vert Stress		Stress Regime
	m	MPa	kPa/m	MPa	kPa/m	
Lloydminster	512.0	5.94	11.60	10.74	20.98	V. frac
GP Zone #1	493.0	7.48	15.17	10.34	20.97	V. frac
GP Zone #2	484.0	7.55	15.60	10.15	20.97	V. frac
GP Zone #3	476.0	6.80	14.29	9.97	20.95	V. Frac

- Caprock Shale Core Preservation on 1AF/10-13-58-5W4 in March 2014 shows several fractures

PENGROWTH 1AF/10-13-058-05W4				
Fracture No.	**Formation**	**Fracture Type**	**Depth (m)**	**Dip (Degrees)**
F1	GP	Small fracture	480.6	65
F2	GP	Small Fracture	480.9	70
F3	GP	Small Fracture	482.9	70
F4	GP	Hairline fracture	484.2	60

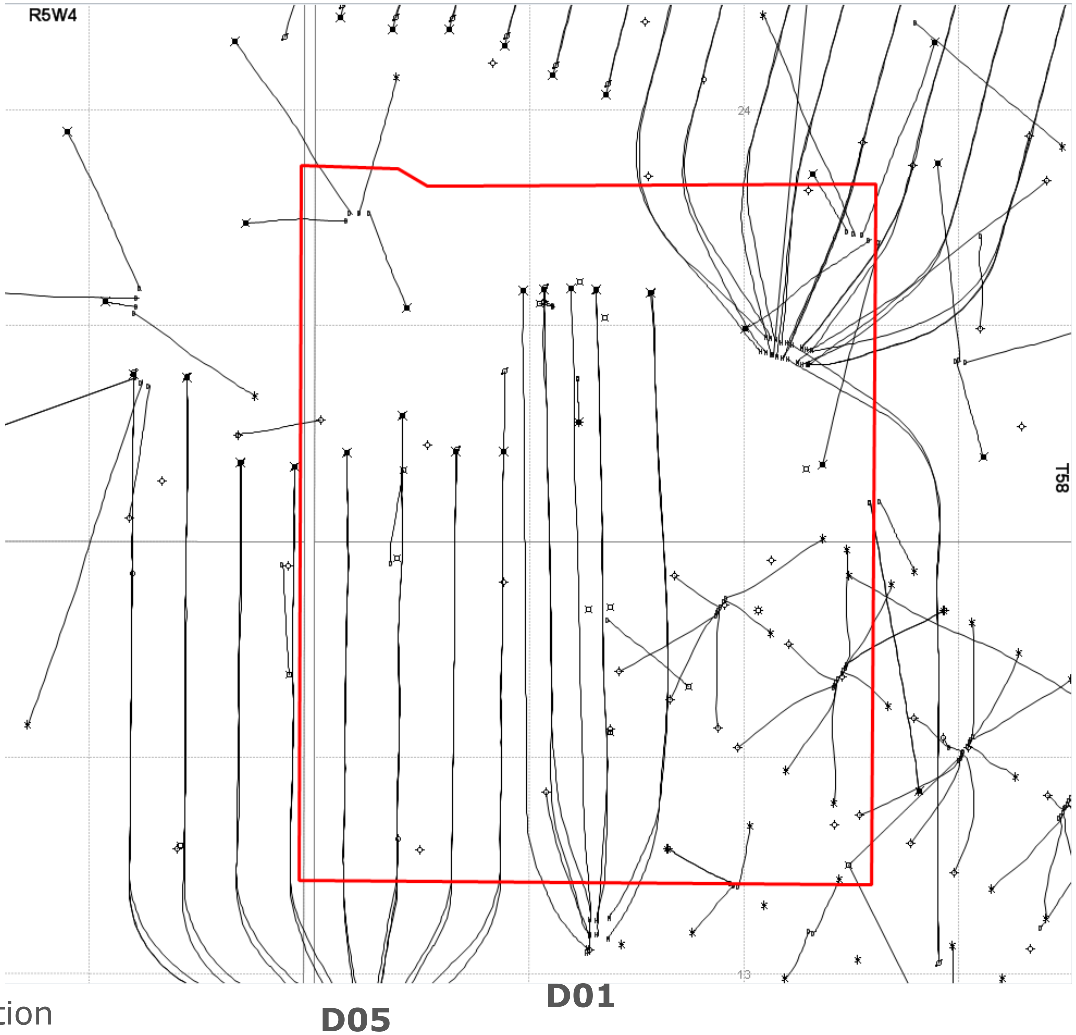
3D SEISMIC DATA COVERAGE

- 102 sq km of 3D data exist over most of the Lindbergh and Muriel Lake leases with exploitable resource
- New 4D 1.32 sq km monitor acquired Q4 2016 over D01 wellpad.



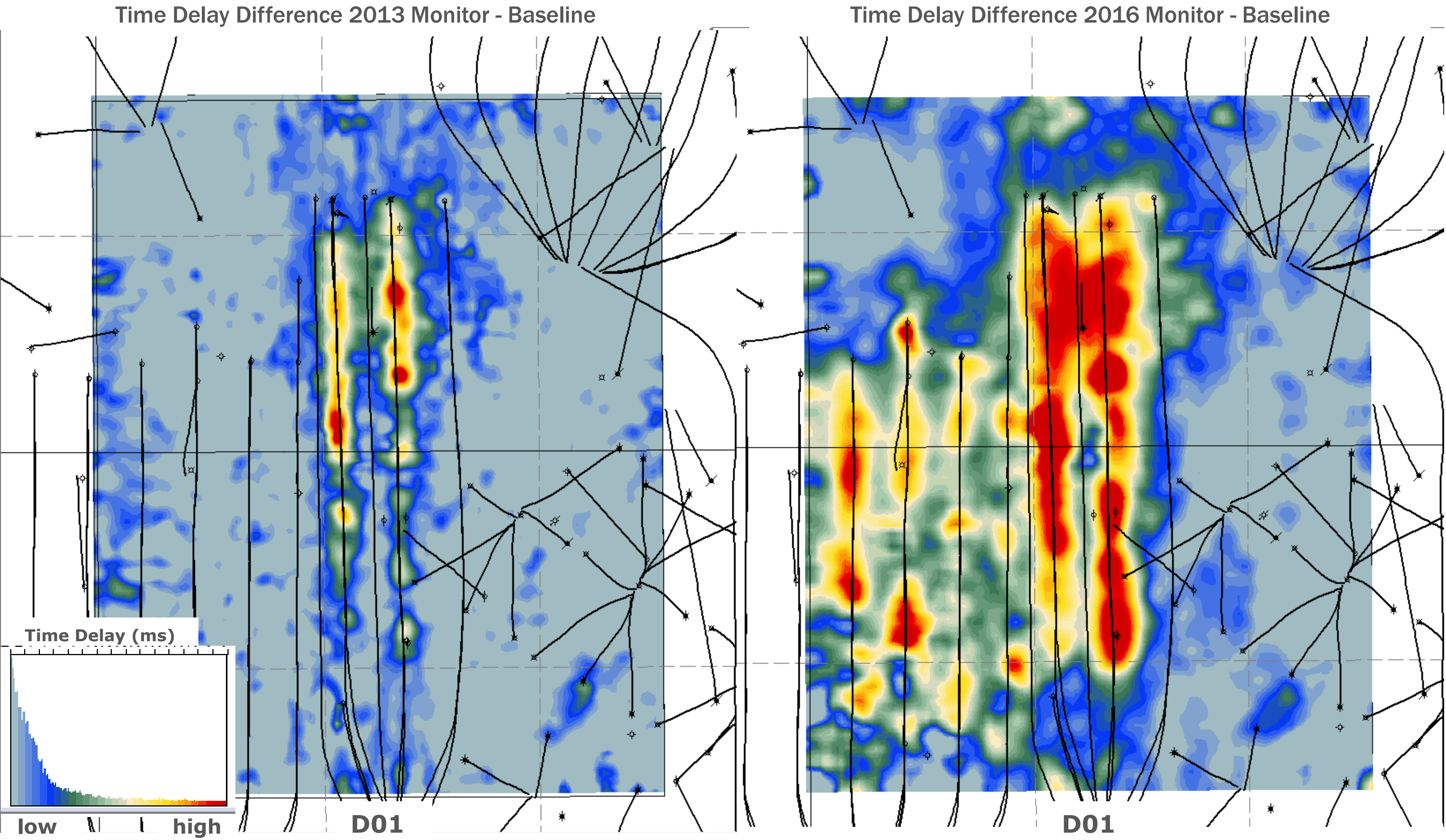
4D SEISMIC

- 1.32 sq km Baseline Survey acquired Feb 2012
  - Source, dynamite 0.25 kg @ 6m
  - Source line interval (E-W) 90m
  - Receiver line interval (N-S) 75m
  - Source and receiver interval 24m
  - Analog geophones 6 over 8m
- 1.32 sq km Monitor Survey acquired Dec 2013
  - Same acquisition parameters as baseline survey
- 1.32 sq km Monitor Survey acquired Dec 2016
  - Single 3C sensors used. All other acquisition parameters remained the same



4D SEISMIC

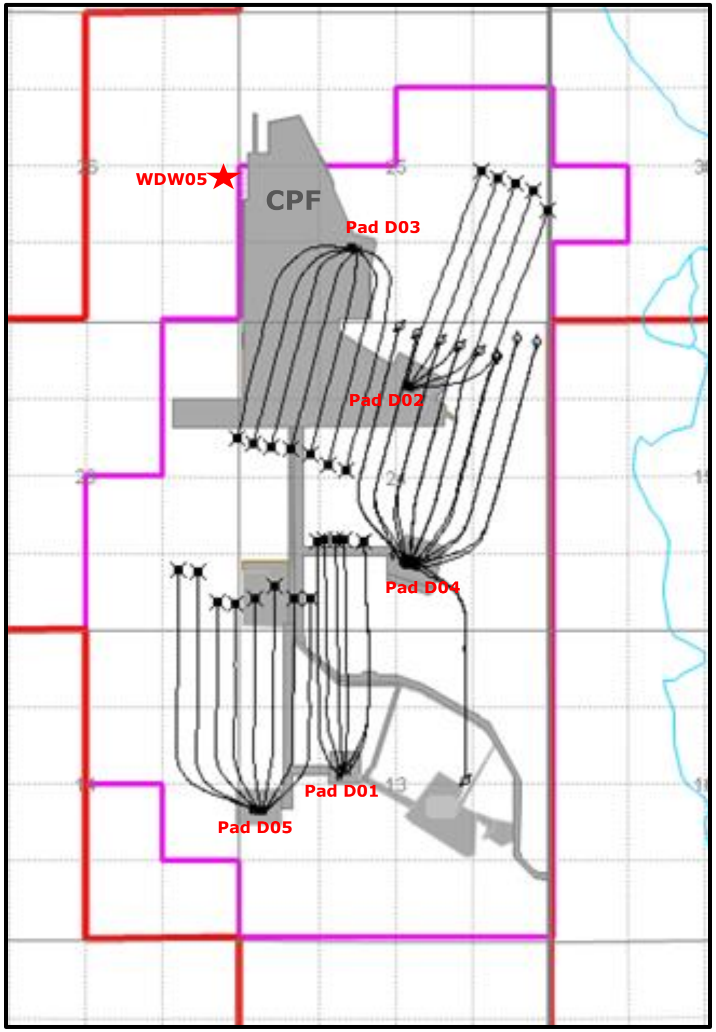
TIME DELAY DIFFERENCE MAPS DERIVED FROM LLOYD BASE REFLECTOR SHOWS STEAM CHAMBER DEVELOPMENT



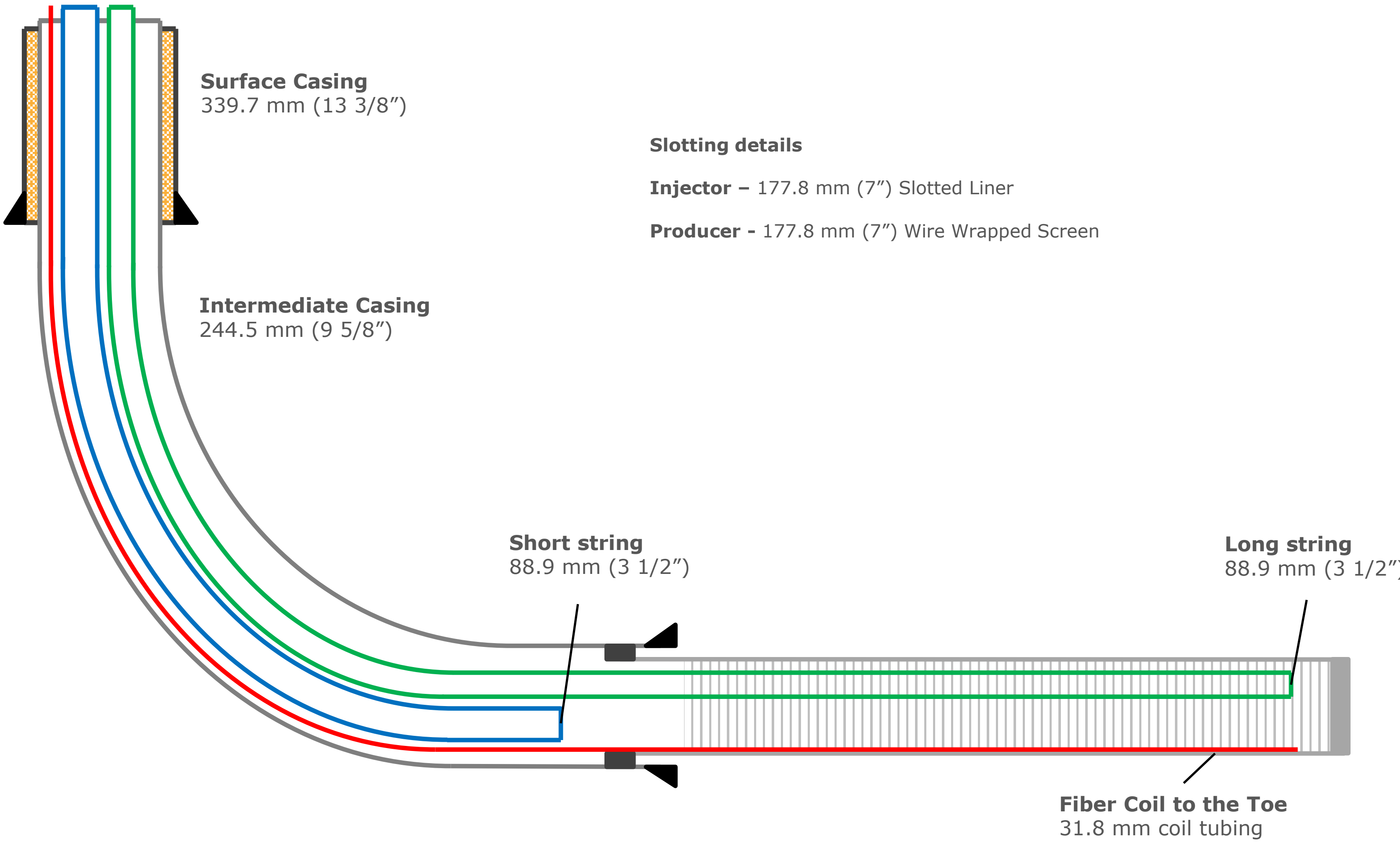
DRILLING AND COMPLETIONS

COMMERCIAL DRILLING & COMPLETIONS

- Ten new well pairs drilled and completed in 2017
  - Nine well pairs on new D04 Pad
  - One well pair on existing D01 Pad
- Two single infill wells drilled and completed on existing D01 Pad
- Artificial lift installed in one new well pair and two new infill wells in 2017
  - Infill well ESP's installed in July 2017
  - D01-03 ESP installed in September 2017



TYPICAL CIRCULATION COMPLETION



Slotting details

Injector – 177.8 mm (7”) Slotted Liner

Producer - 177.8 mm (7”) Wire Wrapped Screen

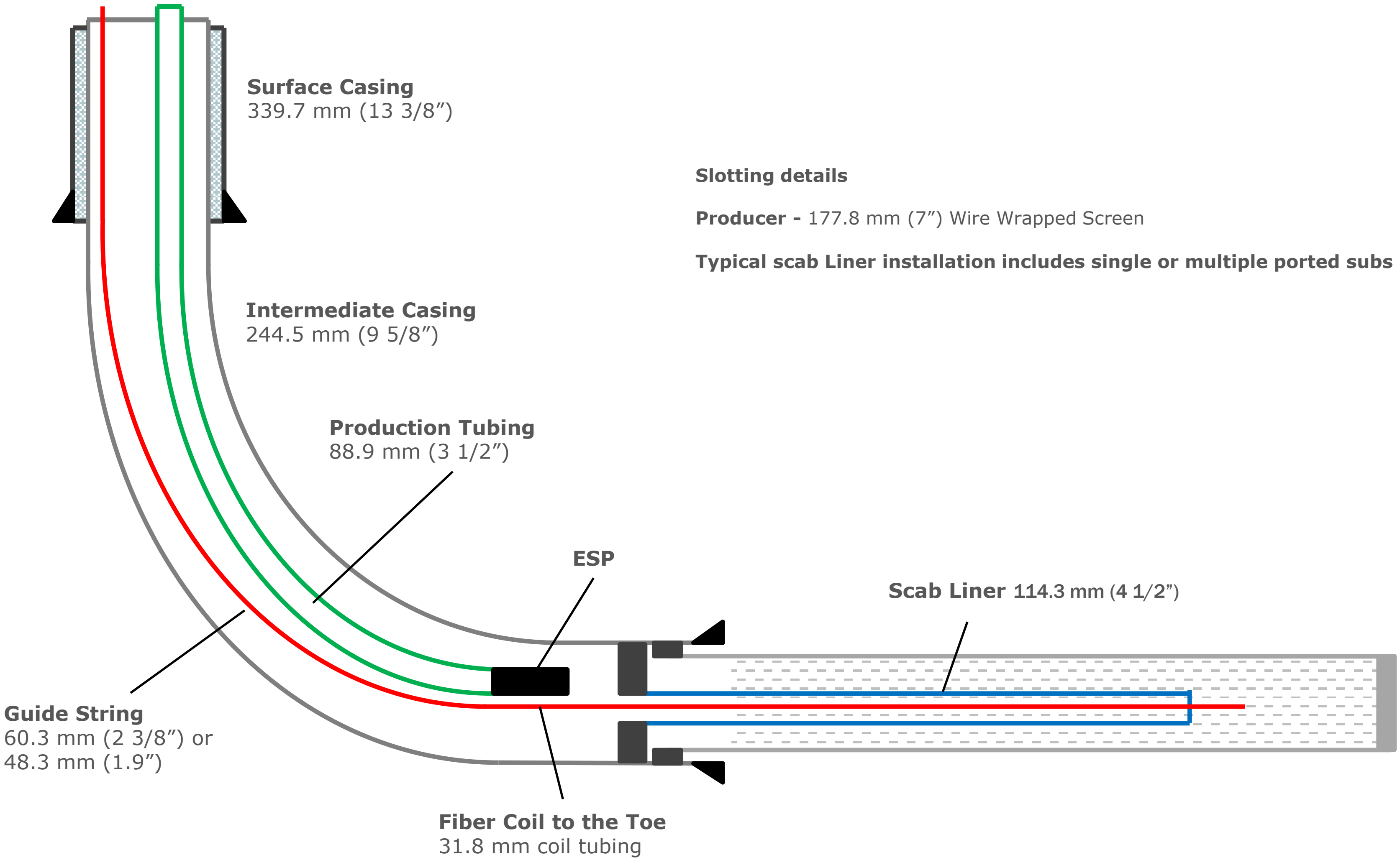
LINER DESIGN

- The relatively small grain size, the presence of fines in the reservoir and combined laboratory flow testing indicated a liner slot width of 0.009” would be required
- This small slot width can lead to quality control problems in the manufacturing process
- The presence of fines with the small slot widths increased the potential for slot plugging
- Therefore, Pengrowth chose to utilize wire wrap screens with a 0.009” wrap for the producer well liners
  - This increased the open flow area from about 2.5% to over 9%
- Straight cut slots were utilized in the injector wells

LINER DESIGN

- Pilot wells utilize 219.1 mm slotted liners in the injector wells and 219.1 mm wire wrap screens in the producer wells
- Phase 1 Commercial wells utilize 177.8 mm slotted liners in the injector wells and 177.8 mm wire wrap screens in the producer wells
- Both Pilot and Phase 1 Commercial well pairs are completed with the same slot and wire wrap screen design
- Wellbore was downsized from the Pilot to the Phase 1 Commercial wells to optimize drilling costs and complexity as the larger liners were not required for forecast flow rates
- Inflow control devices
  - Liner deployed systems have been installed in five producer wells (D05-P08, D03-P01, D04-P06, D04-P07, D04-P08) across the field to test the performance in variable pay thicknesses, with bottom water interaction and overall steam chamber conformance
  - Application of the first ICD system installed in well D05-P08 (started-up in 2015) has been deemed a success as this has been one of the highest performing well pairs across the field
  - Metrics that PGF is using to measure success is produced emulsion rates, overall well pair operation (steam injection rates and ESP stability), subcool control and inflow characteristics based on downhole temperature data

TYPICAL ARTIFICIAL LIFT COMPLETION



Slotting details

Producer - 177.8 mm (7”) Wire Wrapped Screen

Typical scab Liner installation includes single or multiple ported subs

COMPLETION CHANGES

- Scab liners
  - Initially installed in the producers based on shut-in temperature profiles across the lateral, drill profiles of the injector and producer and steam splitter locations in the injectors
  - Typical target landing depth is approximately 75-80% of the lateral length to aid in toe development early in SAGD production and mitigate flow breakthrough at the heel; learnings include two ported subs for optimal pressure drop and drawdown along the lateral
- Mechanical perforation of scab liner
  - Performed concurrently with pump changes where applicable
  - Opens flow to selected intervals along the scab liner
    - Wells and corresponding perforation intervals selected based on fall off temperature response; typically targeting areas of high subcool that would indicate cooler stranded emulsion
    - Producers that show signs of being very hot (near saturated temperature during fall off) are typically not candidates for scab liner modifications
    - All Lindbergh well pairs are continually being monitored and analyzed for possible scab liner modifications to optimize production and reservoir conformance
  - Reduces the risks and cost associated with pulling and/or modifying the scab liner
- No scab liners have been repositioned in the commercial well pairs to date

INJECTOR COMPLETION CHANGES

Well Name	Well Type	UWI	Steam Splitter(s) Installed	Shifted Open	Shifted Closed
D02-J04	Injector	106082505805W40	1		
D02-J06	Injector	108082505805W40	1		
D02-J07	Injector	109082505805W42	1		
D03-J03	Injector	103122405805W40	1		
D03-J04	Injector	104122405805W40	1	Nov-15	Nov-17
D03-J05	Injector	105122405805W40	2		
D03-J06	Injector	106122405805W40	1	Nov-15	Sep-16
D03-J07	Injector	102092305805W40	1		
D04-J01	Injector	105152405805W40	1		
D04-J02	Injector	106152405805W40	1		
D04-J03	Injector	107152405805W40	1		
D04-J04	Injector	109152405805W40	1		
D04-J05	Injector	104162405805W40	1		
D04-J06	Injector	109101305805W40	1		
D04-J07	Injector	108162405805W42	1		
D04-J08	Injector	109162405805W40	1		
D04-J09	Injector	110162405805W40	1		
D05-J03	Injector	109012305805W40	1	Nov-15	
D05-J04	Injector	110012305805W40	1		
D05-J06	Injector	107042405805W40	1	Nov-15	

PRODUCER COMPLETIONS CHANGES

Well Name	Well Type	UWI	Scab Liner Installed	Production Ports Installed	Scab Liner Perforated
D01-P01	Producer	106062405805W42	Y	0	
D01-P02	Producer	108062405805W40	Y	1	
D01-P03	Producer	114062405805W40	N	Liner-conveyed ICD	
D01-INF01	Infill	102052405805W40	N	0	
D01-INF02	Infill	113062405805W42	Y	0	
D02-P04	Producer	102082505805W40	Y	1	
D02-P05	Producer	100082505805W40	Y	1	Jul-17
D02-P06	Producer	103082505805W40	Y	1	Oct-16
D02-P07	Producer	104082505805W40	Y	1	
D02-P08	Producer	105082505805W42	Y	1	Jun-16
D03-P01	Producer	103112405805W40	Y	1	Sep-17
D03-P02	Producer	102112405805W40	Y	1	
D03-P03	Producer	107122405805W40	Y	1	
D03-P04	Producer	102122405805W40	Y	1	
D03-P05	Producer	108122405805W40	Y	1	Jan-17
D03-P06	Producer	109122405805W40	Y	1	
D03-P07	Producer	103092305805W40	Y	1	Jul-16

Well Name	Well Type	UWI	Scab Liner Installed	Production Ports Installed	Scab Liner Perforated
D04-P01	Producer	102152405805W40	To be installed (TBI)	2 (TBI)	
D04-P02	Producer	103152405805W40	To be installed (TBI)	2 (TBI)	
D04-P03	Producer	104152405805W40	To be installed (TBI)	2 (TBI)	
D04-P04	Producer	108152405805W40	To be installed (TBI)	2 (TBI)	
D04-P05	Producer	103162405805W42	To be installed (TBI)	2 (TBI)	
D04-P06	Producer	108101305805W40	No	Liner-conveyed ICD	
D04-P07	Producer	105162405805W40	No	Liner – conveyed ICD	
D04-P08	Producer	106162405805W40	No	Liner-conveyed ICD	
D04-P09	Producer	107162405805W43	To be installed (TBI)	2 (TBI)	
D05-P01	Producer	104012305805W42	Y	1	Jul-17
D05-P02	Producer	105012305805W40	Y	1	Jan-17
D05-P03	Producer	106012305805W40	Y	2	
D05-P04	Producer	103012305805W40	Y	1	
D05-P05	Producer	102042405805W40	Y	1	Sep-17
D05-P06	Producer	103042405805W40	Y	1	Dec-16
D05-P07	Producer	104042405805W40	Y	1	Apr-16
D05-P08	Producer	105042405805W40	N	Liner-conveyed ICD	

COMMERCIAL ARTIFICIAL LIFT

- Required to convert from circulation to typical SAGD operations
- All wells utilize high temperature ESP's
  - Vendor and pump type selected based on expected well performance, target landing locations and historical run life
  - Pumps rated to 260°C
- Pumps designed to handle full flow rate range from initial install through ramp up to peak emulsion rates
- Vapour interference in the pump has been higher than anticipated in certain cases
  - Mitigating operational problems due to higher vapour loading through the use of AGH stages and completion modifications
- Continuing to work closely with ESP vendors to improve performance and run time
- Run time improvement due to decreased start/stops as a result of improved plant reliability
- Technological improvements and advancements
    - Higher temperature motors
    - Improved seal systems
    - Improved bearing design
    - Shorter design resulting in less stress running in severe doglegs

DRILLING SCHEDULE

New drilling subject to market conditions, internal approval and regulatory approval where applicable.

- Future considerations pending internal approval
  - Drilling of 8 infill wells on Pad D05 in 2018

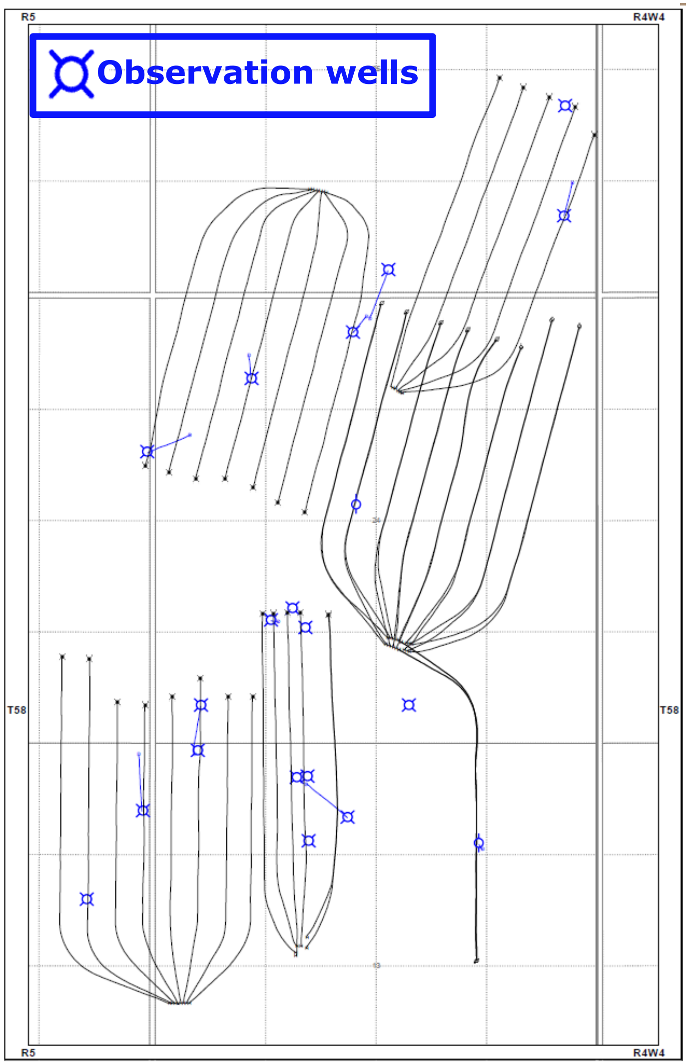
INSTRUMENTATION

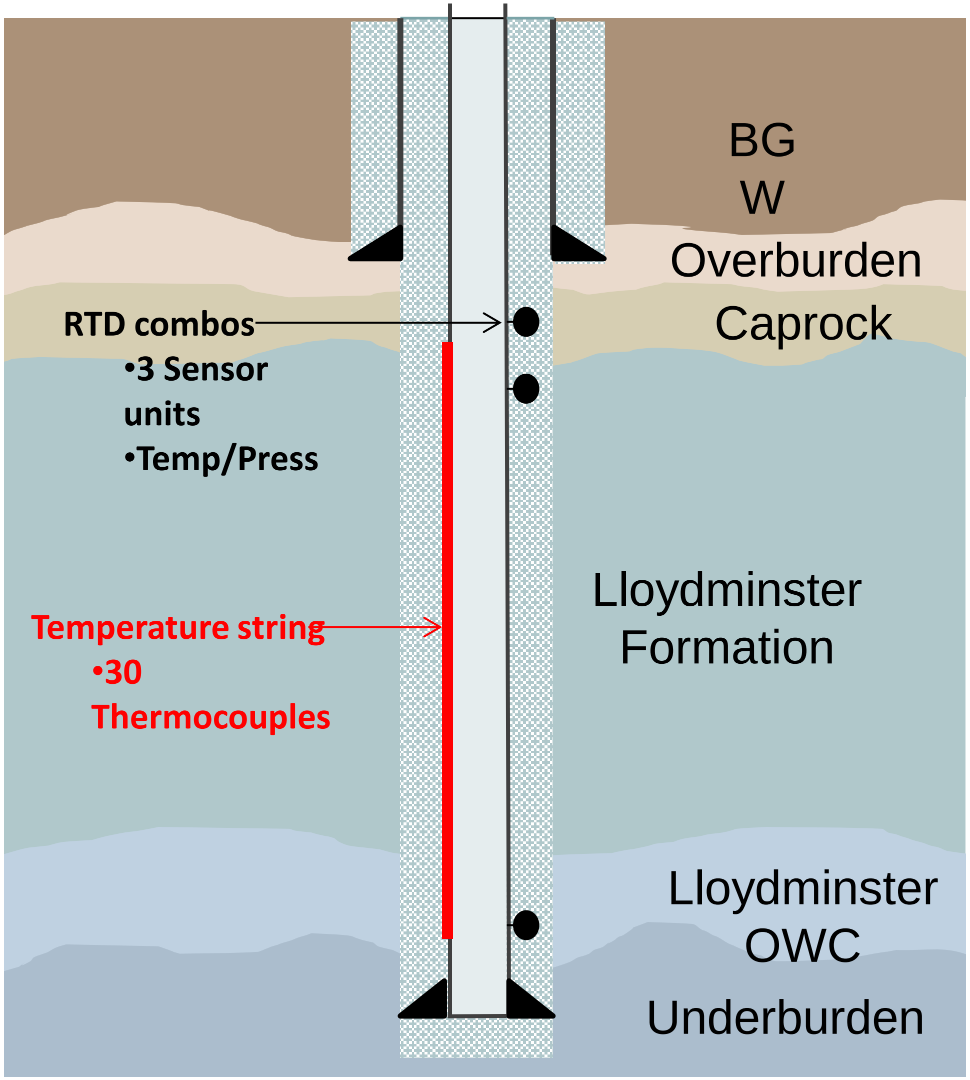
PENGROWTH

SAGD WELL PAIR INSTRUMENTATION

- Single point pressure measurement is taken at the heel of both the injector and producer via bubble tube
  - Methane is injected in the casing of the injector and in the guide string annulus of the producer to provide a reading at surface via a pressure transmitter
  - Gas gradient calculations are accounted for in the pressure reading
  - Purging of the bubble tubes is completed on an as needed basis to limit the overall volume of gas being injected
  - Differential pressure is monitored between the injector and producer to provide insight into the accuracy of the pressure reading and subsequent purge timing
  - Producer bubble tubes are purged more frequently than injector bubble tubes due to the guide string annular volume and potential for plugging
- Fiber optic DTS (distributed temperature sensors) are run in all of the producer wells to provide real-time temperature data along the entire wellbore

OBSERVATION LOCATIONS/ TYPICAL COMPLETION





OBSERVATION LOCATIONS/ TYPICAL COMPLETION

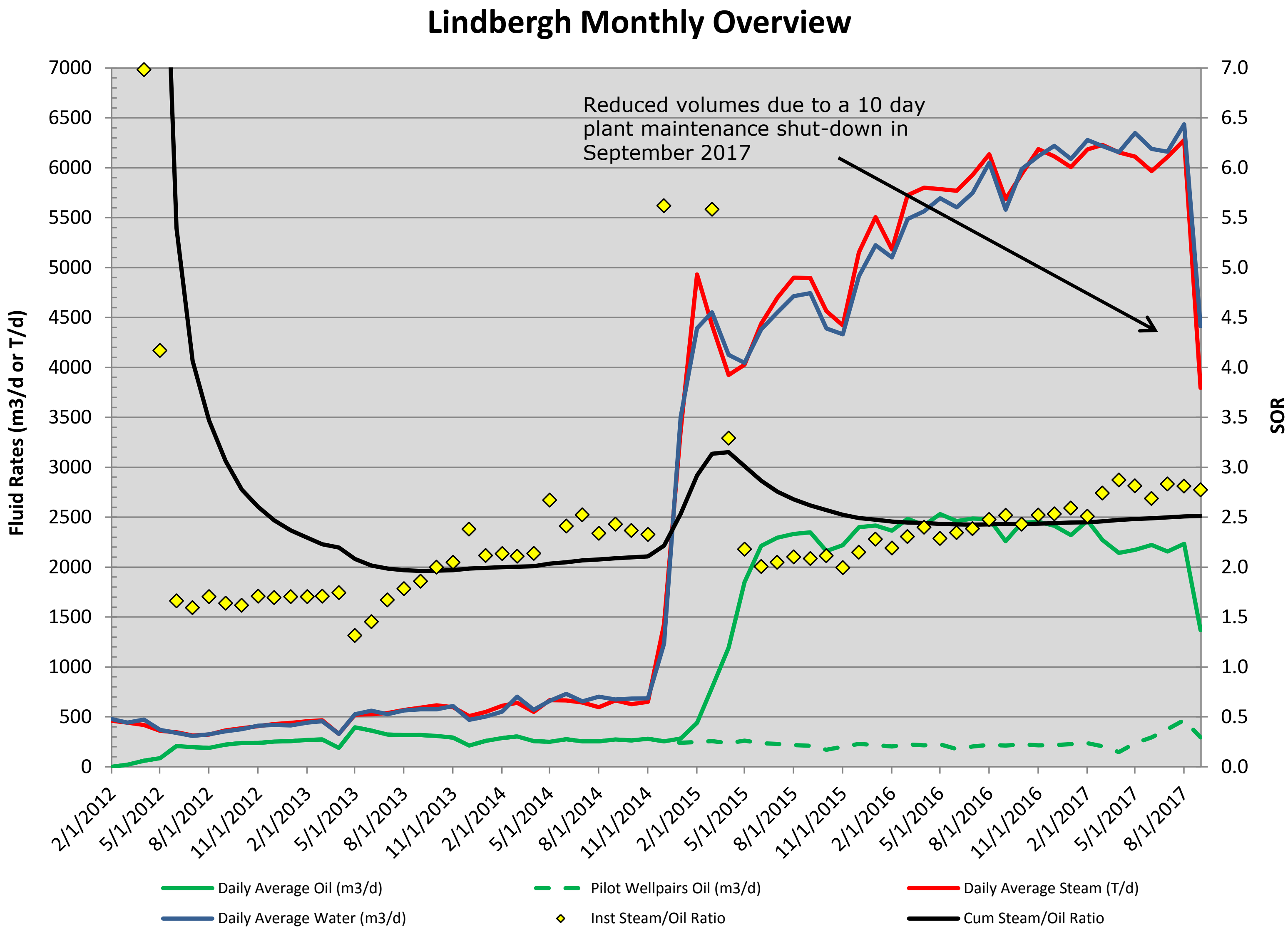
- Downhole pressure/temperature gauge reliability has been good overall
  - As the thermocouple and pressure monitoring equipment is cemented on the backside of the casing, remediation of any failed downhole equipment is challenging
  - Pengrowth therefore runs multiple temperature and pressure points if this is encountered
- Surface equipment reliability has been an issue at times as all observation well locations rely on solar panels/battery combos for power
- Line of sight is also required for the Commercial observation wells to transmit data
- Pengrowth is continuing to work with the vendors on increasing the number of solar panels and battery capacity on location; especially important in winter months
- Data transmission accuracy is also being rectified between Pengrowth and the instrumentation vendors on an as needed basis
- Site Engineers check locations monthly

SCHEME PERFORMANCE

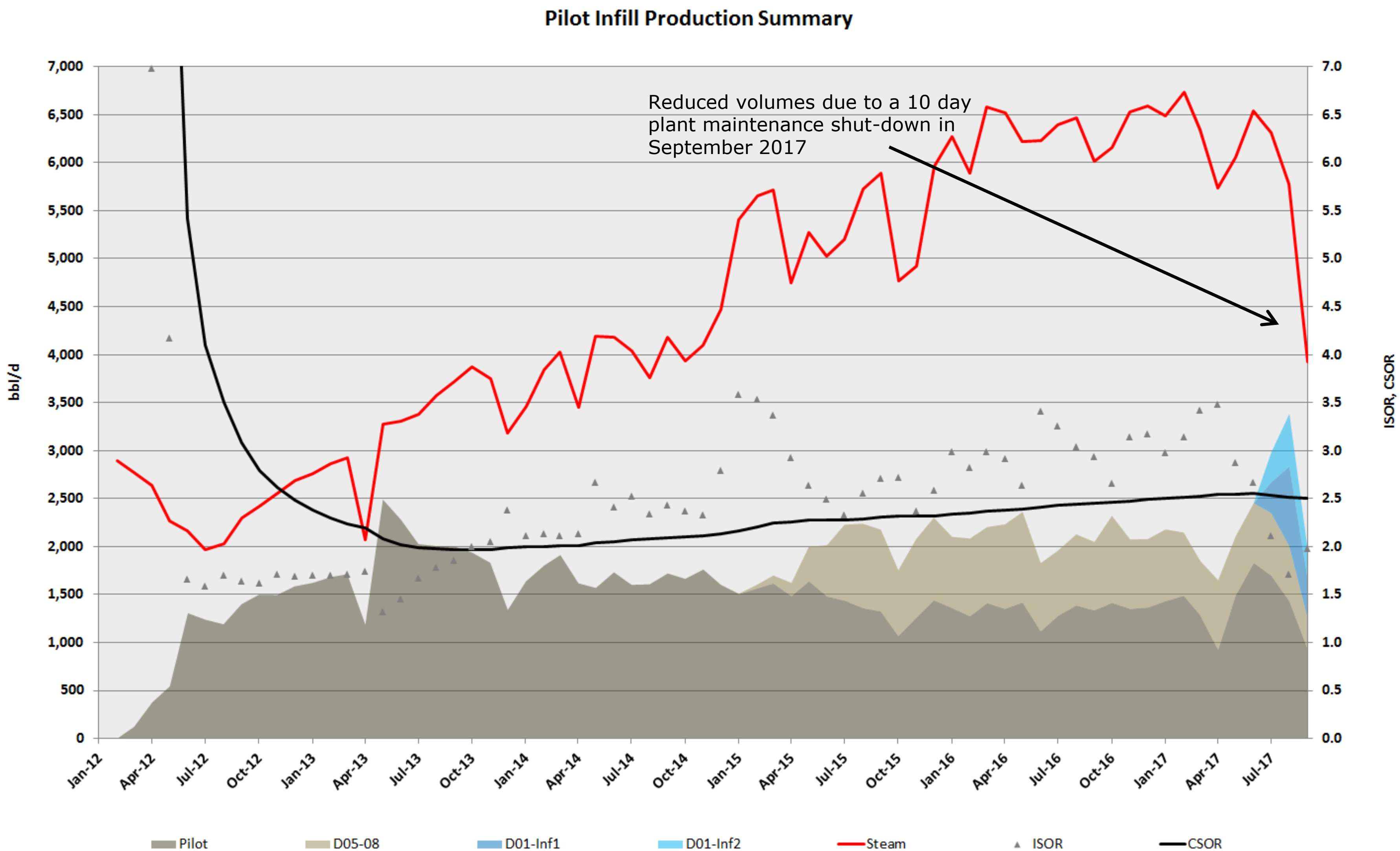
PREDICTING SAGD PERFORMANCE

- SAGD well production type curves are created using historical production data on the pilot and phase 1 wells.
- Butler's equation is used to modify each type curve based on the geological data available.
- Infill wells are forecasted based on the production forecast of the parent well

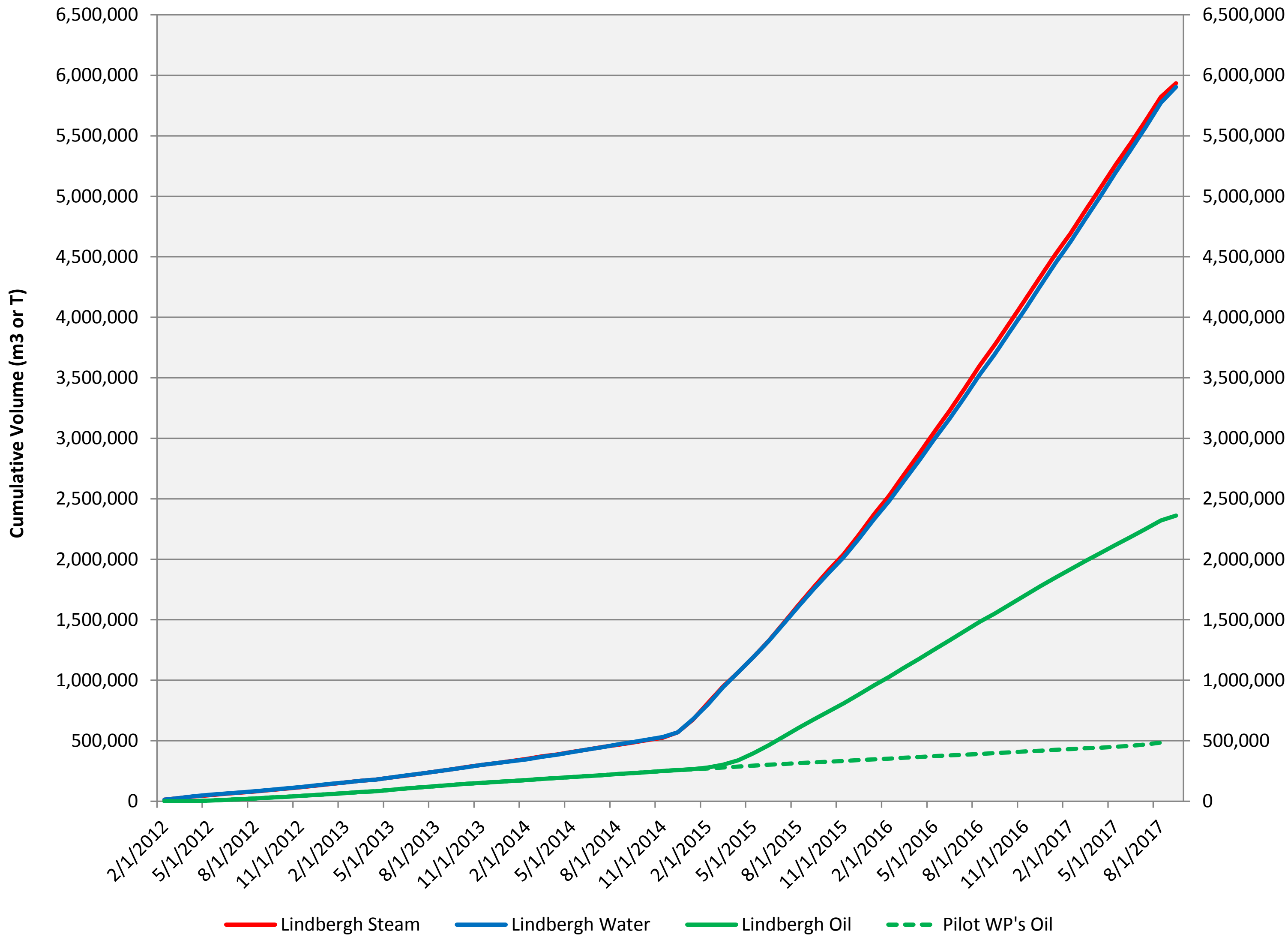
LINDBERGH PERFORMANCE



LINDBERGH PERFORMANCE



CUMULATIVE VOLUMES



PAD RECOVERIES

OBIP - Recovery and % recovery by pad

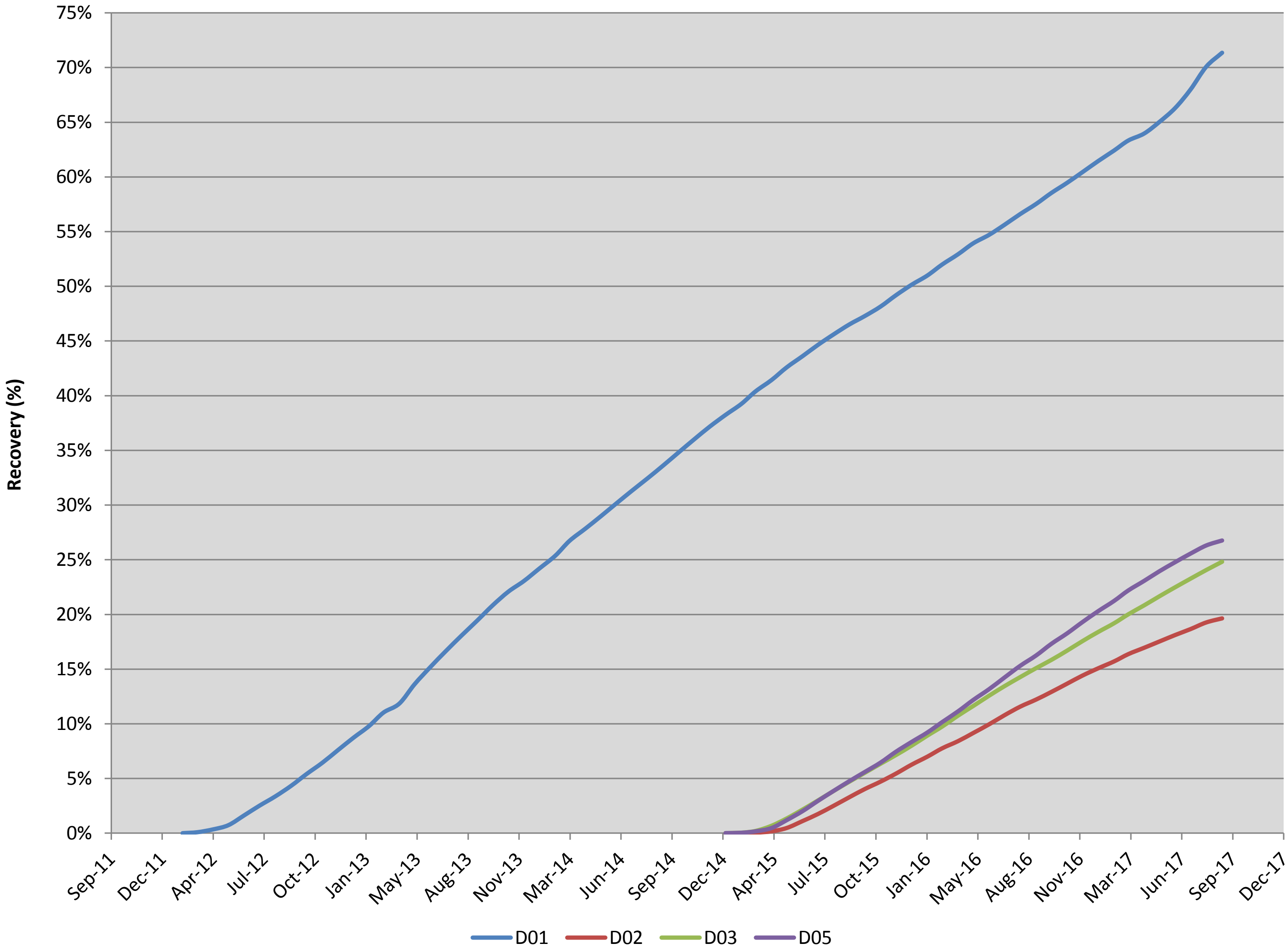
	Thickness	Length†	Spacing	Ave ϕ	Area	Ave So	OBIP	Recovery††	Recovery
Pad	(m)	(m)	(m)	(%)	(Ha)	(%)	(e3m3)	(e3m3)	**(%)**
D01†††	19.5	828	100	36	24.8	81	1407.5	493.5	**35.1**
D02	19.0	817	100	35	40.9	79	2160.1	395.3	**18.3**
D03	18.1	787	100	35	55.1	83	2886.5	637.6	**22.1**
D04	20.6	833	100	36	75.0	78	4295.3	0	**0**
D05	18.3	801	100	37	64.1	80	3493.0	835.6	**23.9**

Developed BIP - Recovery and % recovery by pad

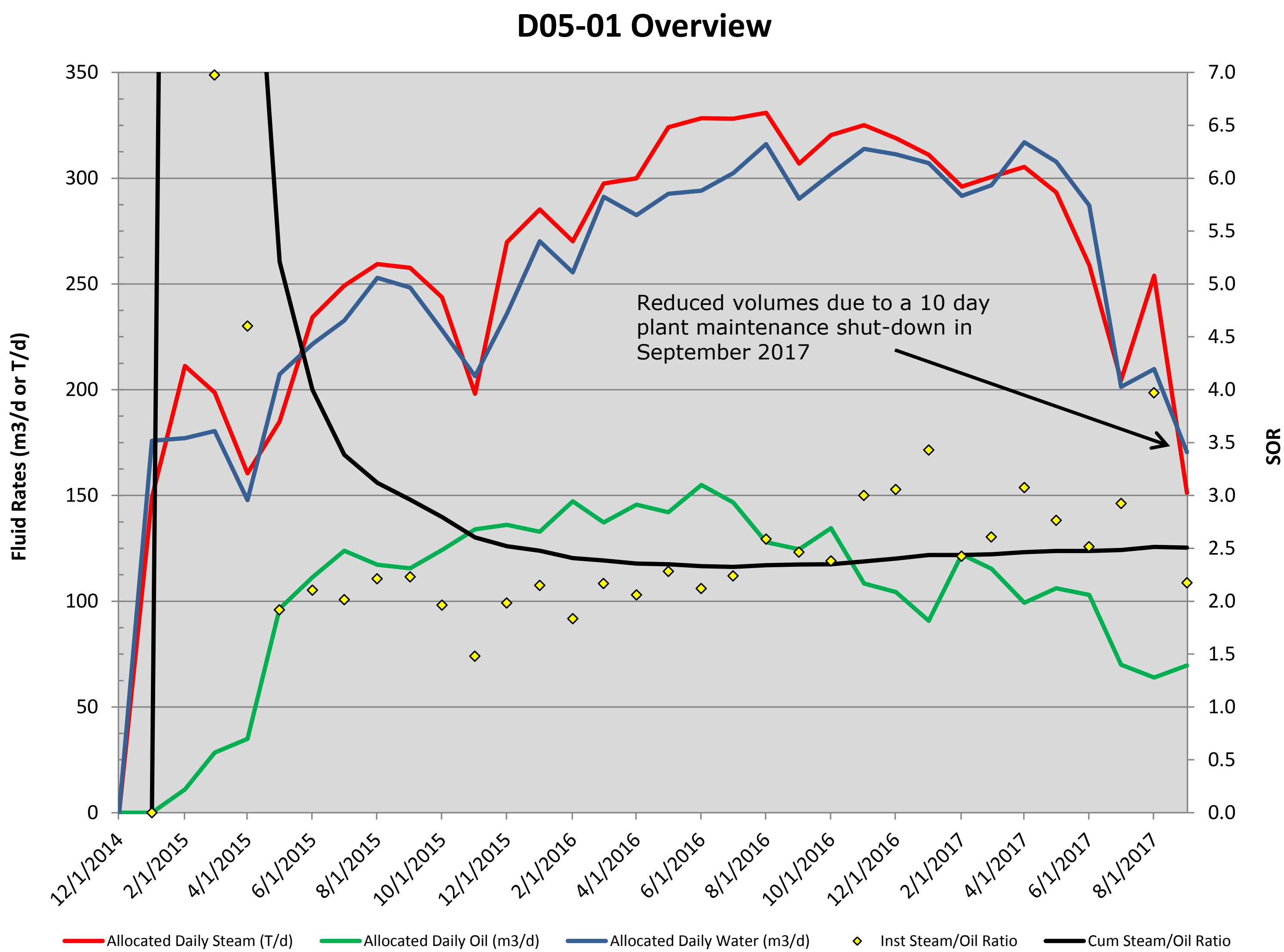
	Thickness	Length†	Spacing	Ave ϕ	Ave So	DBIP	Recovery††	Recovery	EUR
Pad	(m)	(m)	(m)	(%)	(%)	(e3m3)	(e3m3)	**(%)**	(%)
D01†††	15.2	828	100	36	81	1093.6	493.5	**45.1**	80
D02	17.7	817	100	35	79	2012.8	395.3	**19.6**	70
D03	15.9	787	100	35	83	2526.2	637.6	**25.2**	70
D04	16.3	833	100	36	78	3385.7	0	**0**	70
D05	16.3	801	100	37	80	3122.9	835.6	**26.8**	70

† Length is average slotted length plus 25 meters per end (50 m total)
†† Recovery to Oct 1 2017
††† D01 numbers include a new well pair and two new infill wells

LINDBERGH DEVELOPED RECOVERY



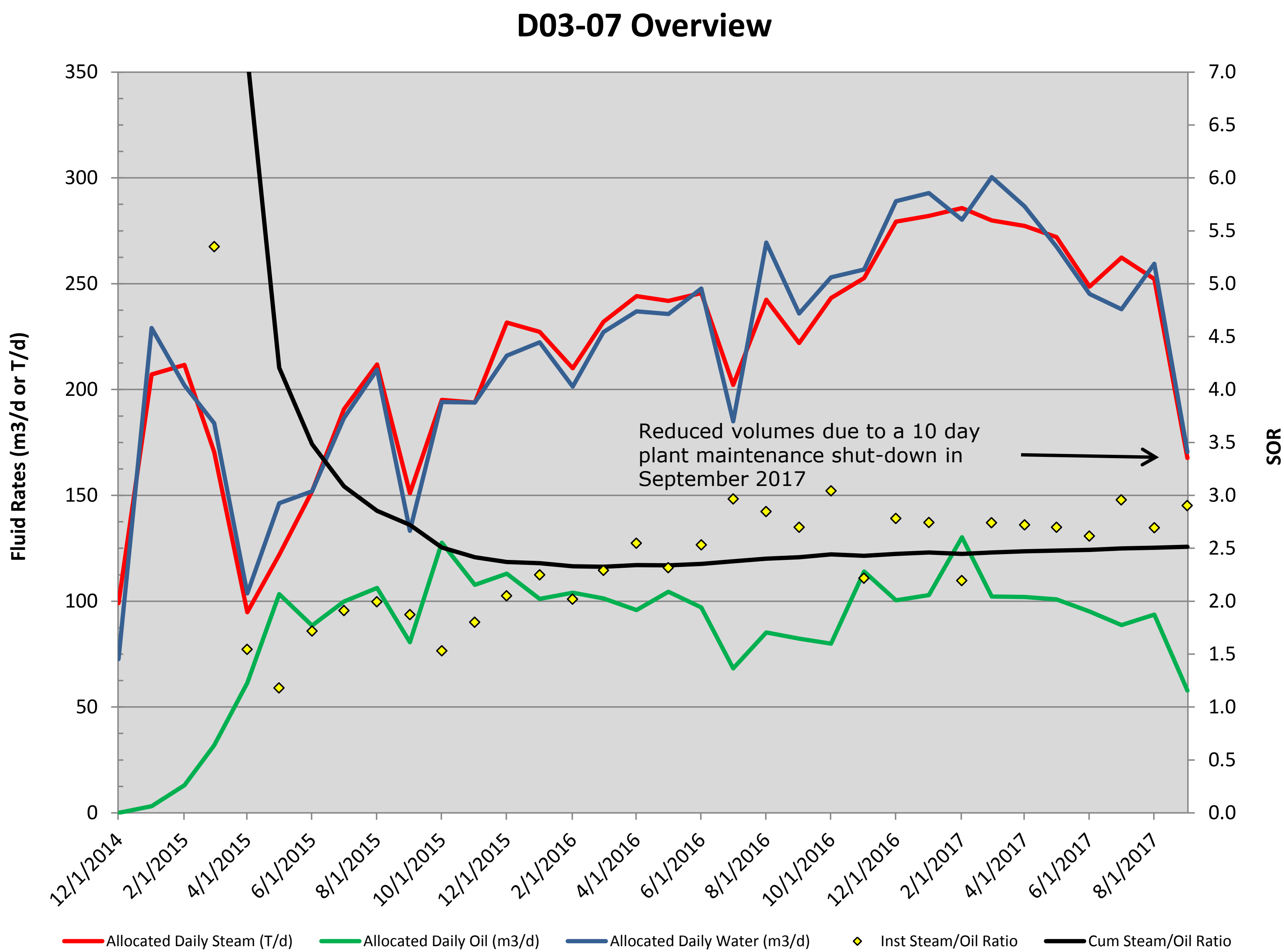
PHASE 1 HIGH PERFORMER



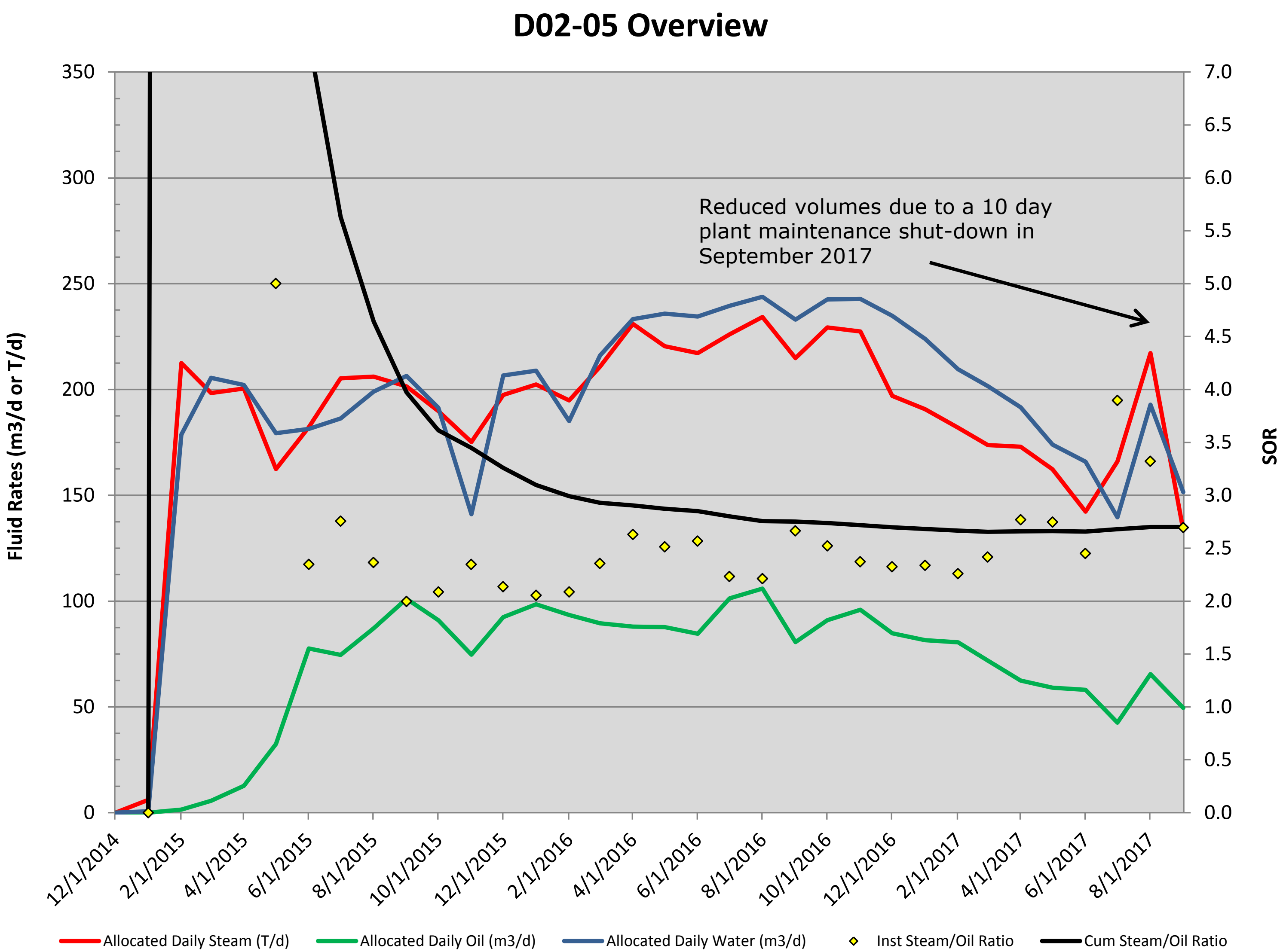
TSX:PGF NYSE:PGH

PENGROWTH

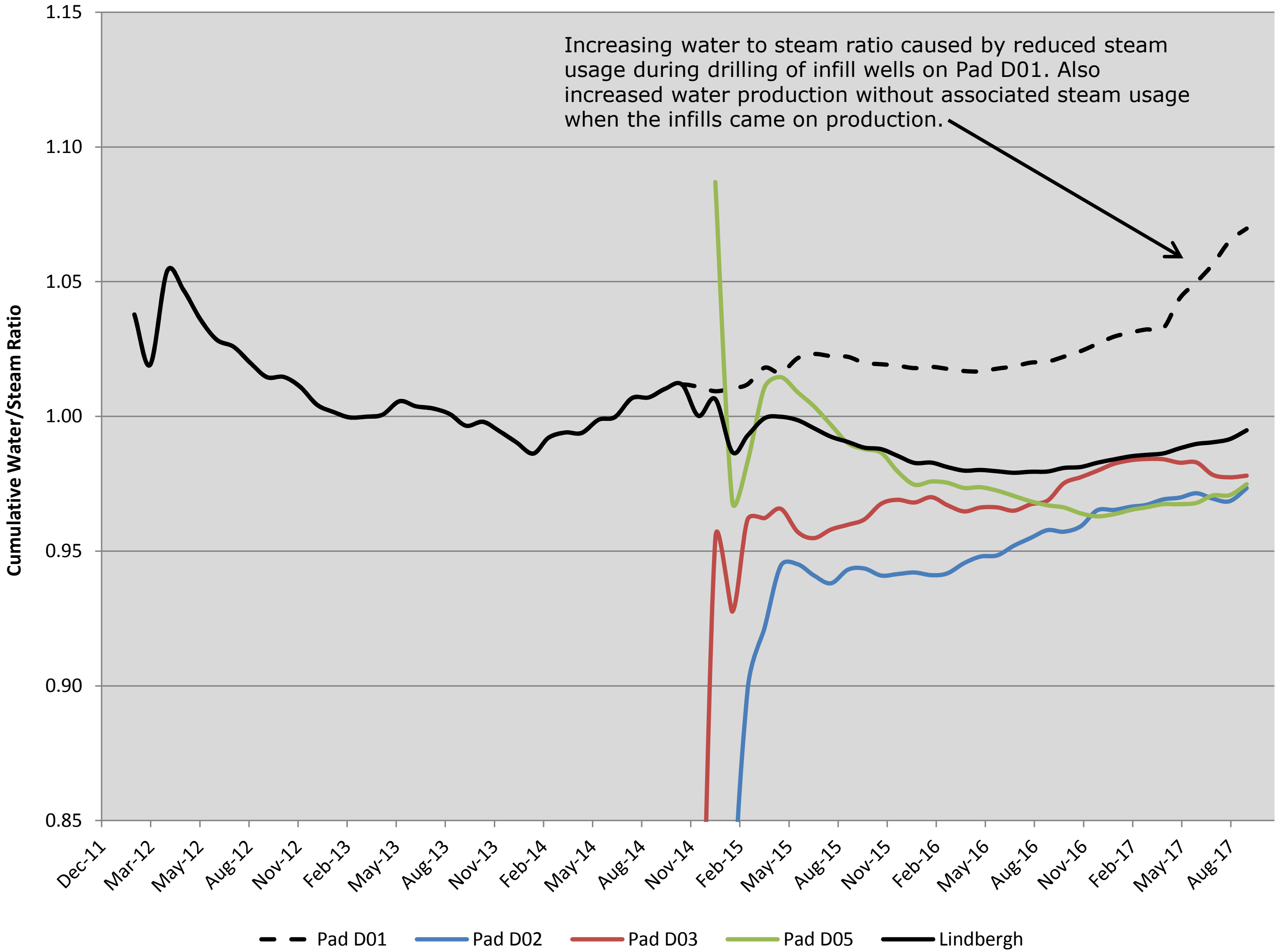
PHASE 1 MEDIUM PERFORMER



PHASE 1 POOR PERFORMER

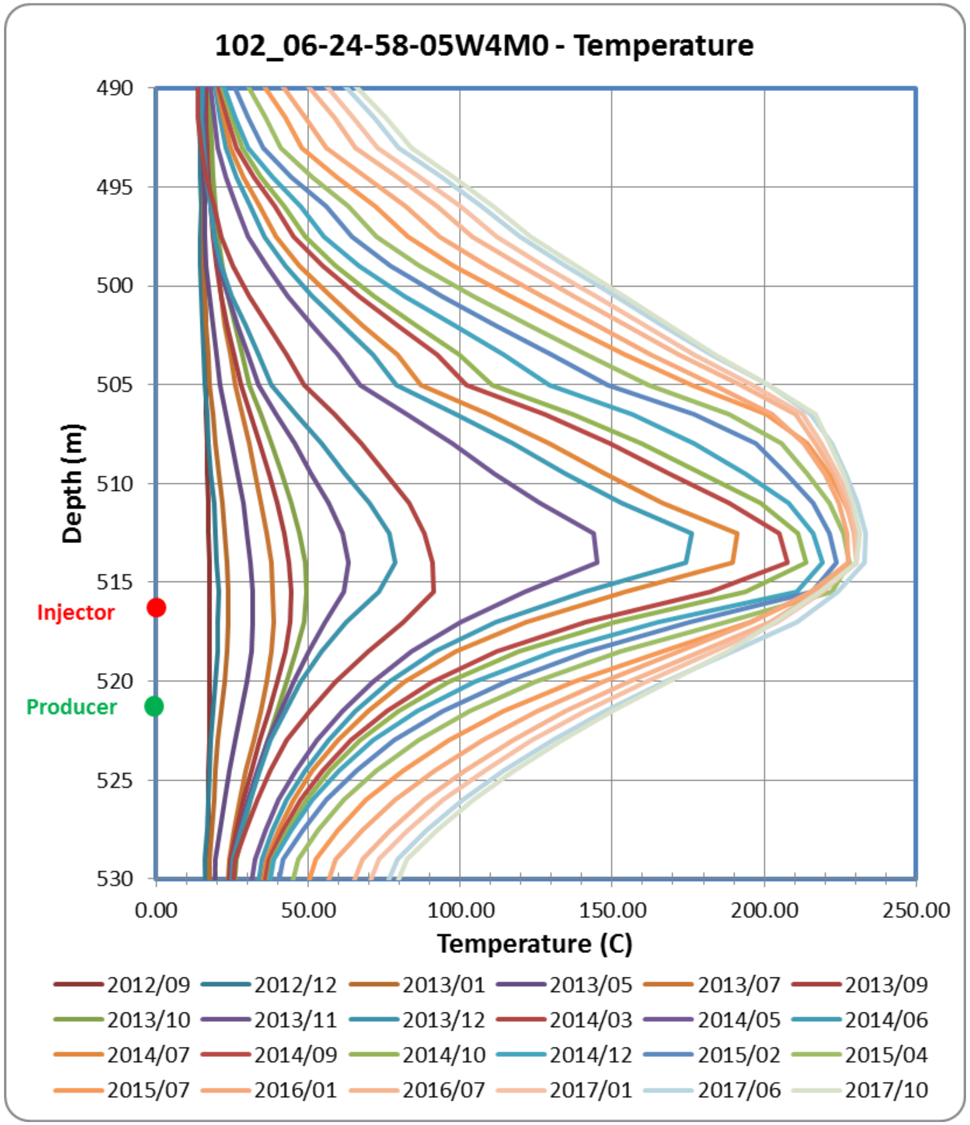


CUMULATIVE WATER/STEAM RATIO

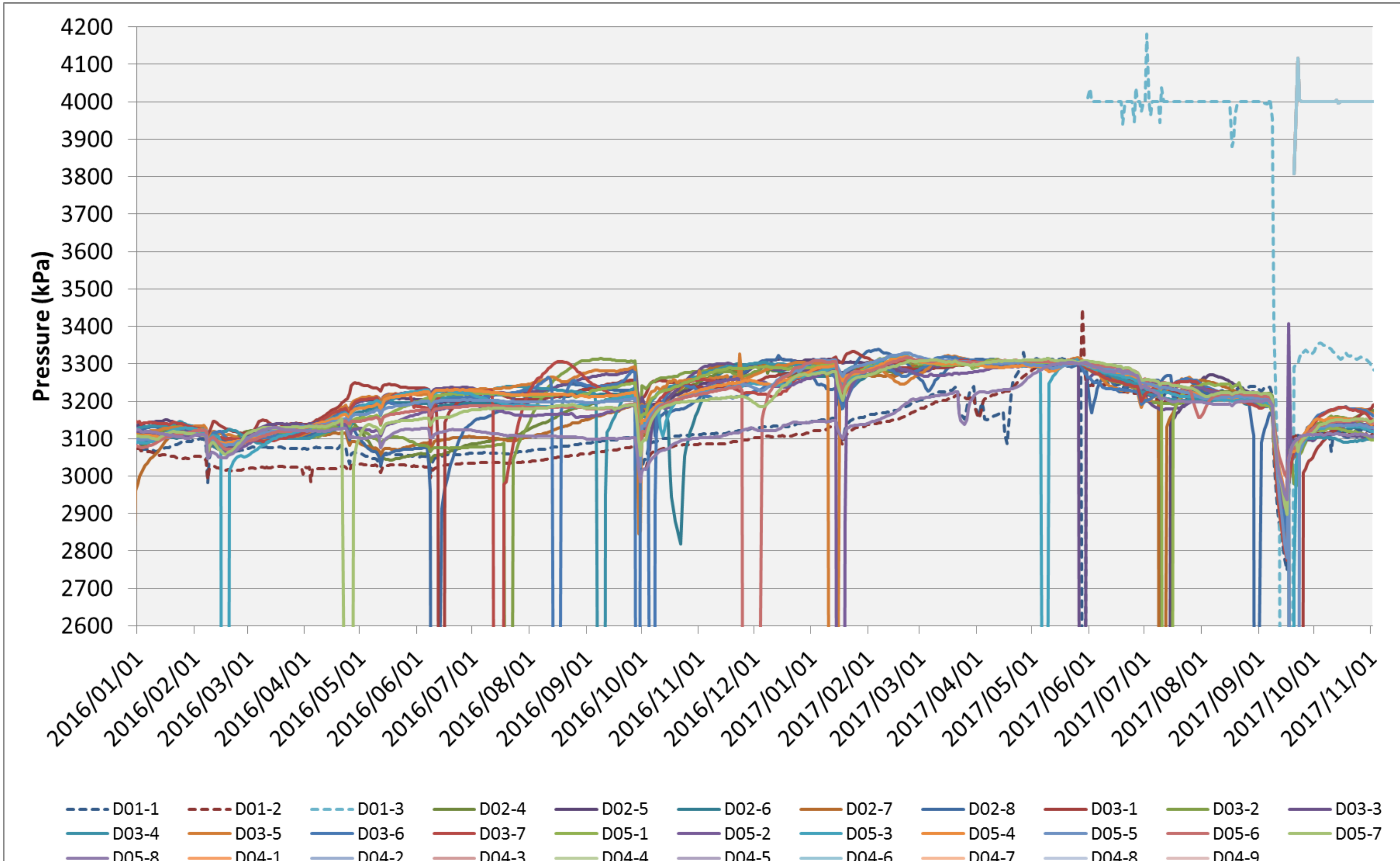


D01-02 OBSERVATION WELL EXAMPLE

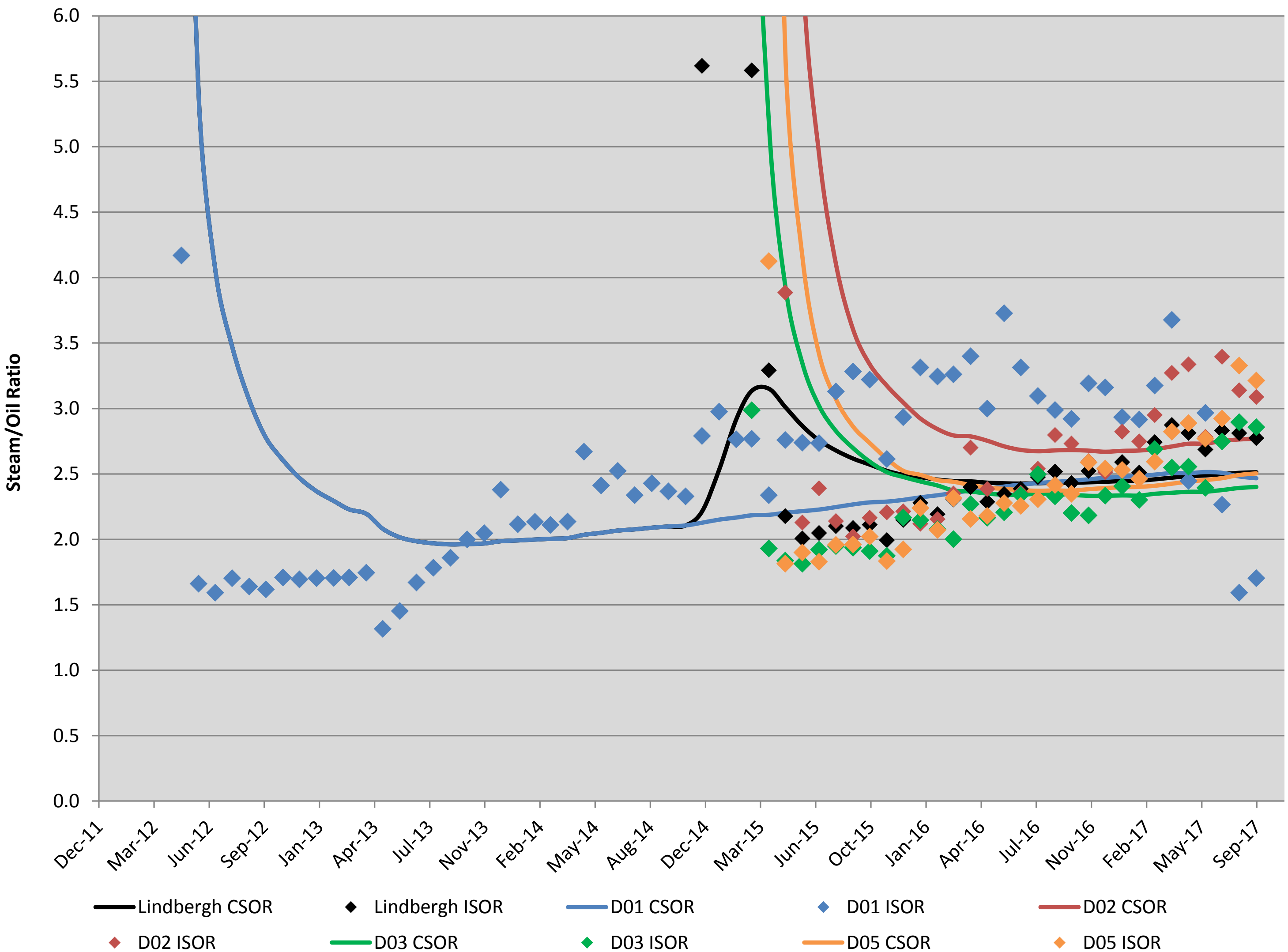
~11 m offsetting WP2



INJECTOR BOTTOM HOLE PRESSURE



LINDBERGH CSOR AND ISOR



WELLHEAD STEAM QUALITY

- Current steam quality injected at the well pad is ~98%
  - Close proximity to CPF

PAD ABANDONMENTS – 5 YEAR OUTLOOK

- No abandonments of SAGD wells or well pads are expected in the next 5 years

KEY LEARNINGS

- Pilot infill wells outperforming expectations
  - Learnings will be incorporated into future infill well plans
- Successful drilling and circulation of 2 SAGD well pairs in previously depleted cyclic steam stimulation area.
  - Significant de-risking of reserves
- Reduced steam chamber operating pressure
  - Managing steam chamber pressure slightly above bottom water pressure to optimize SOR
- Well bore hydraulics optimization
  - Production ports in the scab liner and shiftable ports in the steam injection string improve well conformance
  - Scab liner perforating (select cases) has proven beneficial during pump changes to improve wellbore conformance, pump operation and well KPI’s
  - Liner deployed flow control devices showing encouraging results
- Continuous improvement in ESP run life
  - Advanced gas handling stages improving performance in wells with high vapour production

FUTURE PLANS - SUBSURFACE

FUTURE PLANS - SUBSURFACE

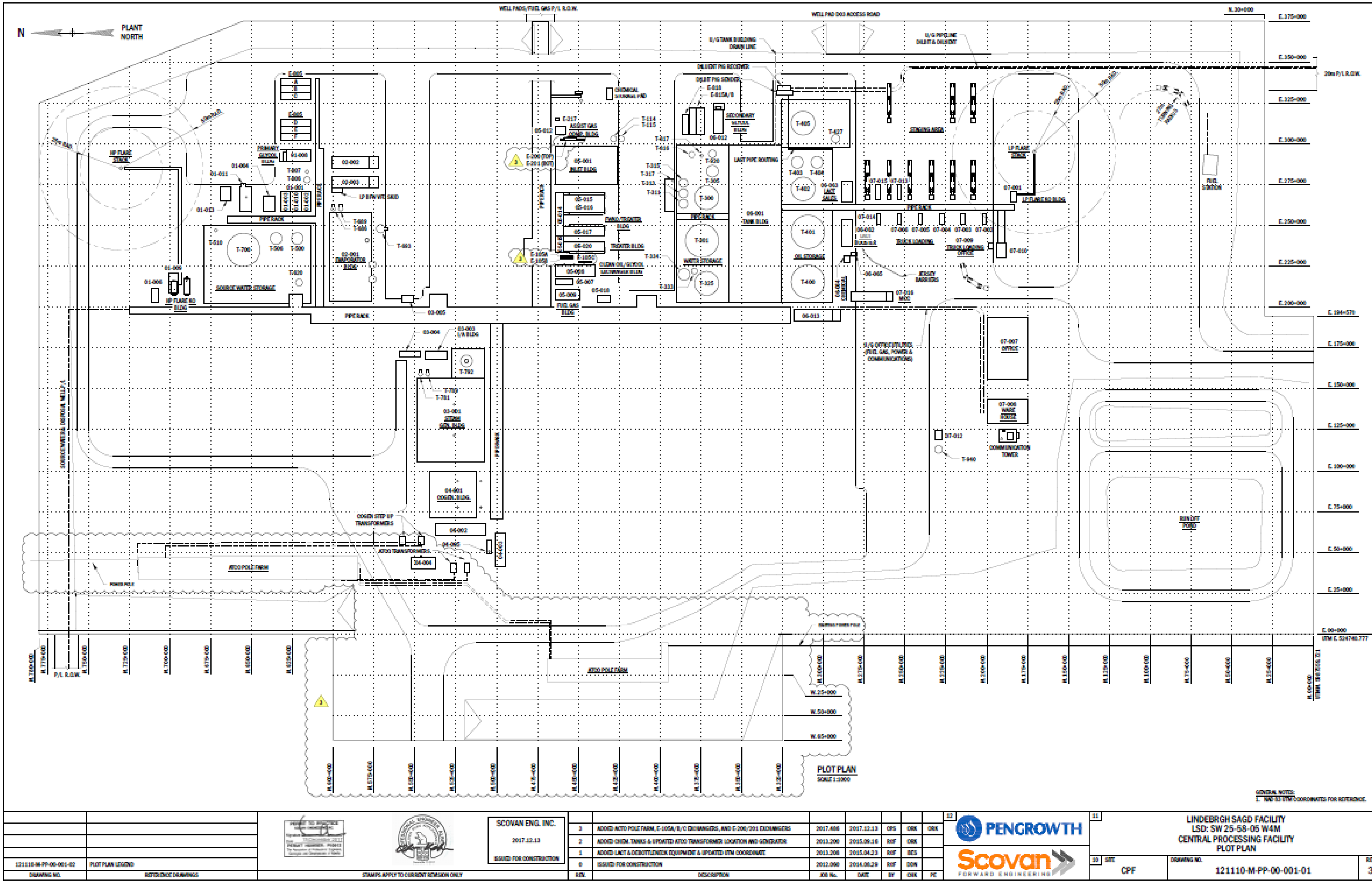
- Future considerations pending internal approval
  - Drilling of 8 infill wells on Pad D05 in 2018
- Future considerations pending regulatory approval
  - Commence non-condensable gas co-injection with steam
  - Application to be submitted in Q1 2018

FACILITIES

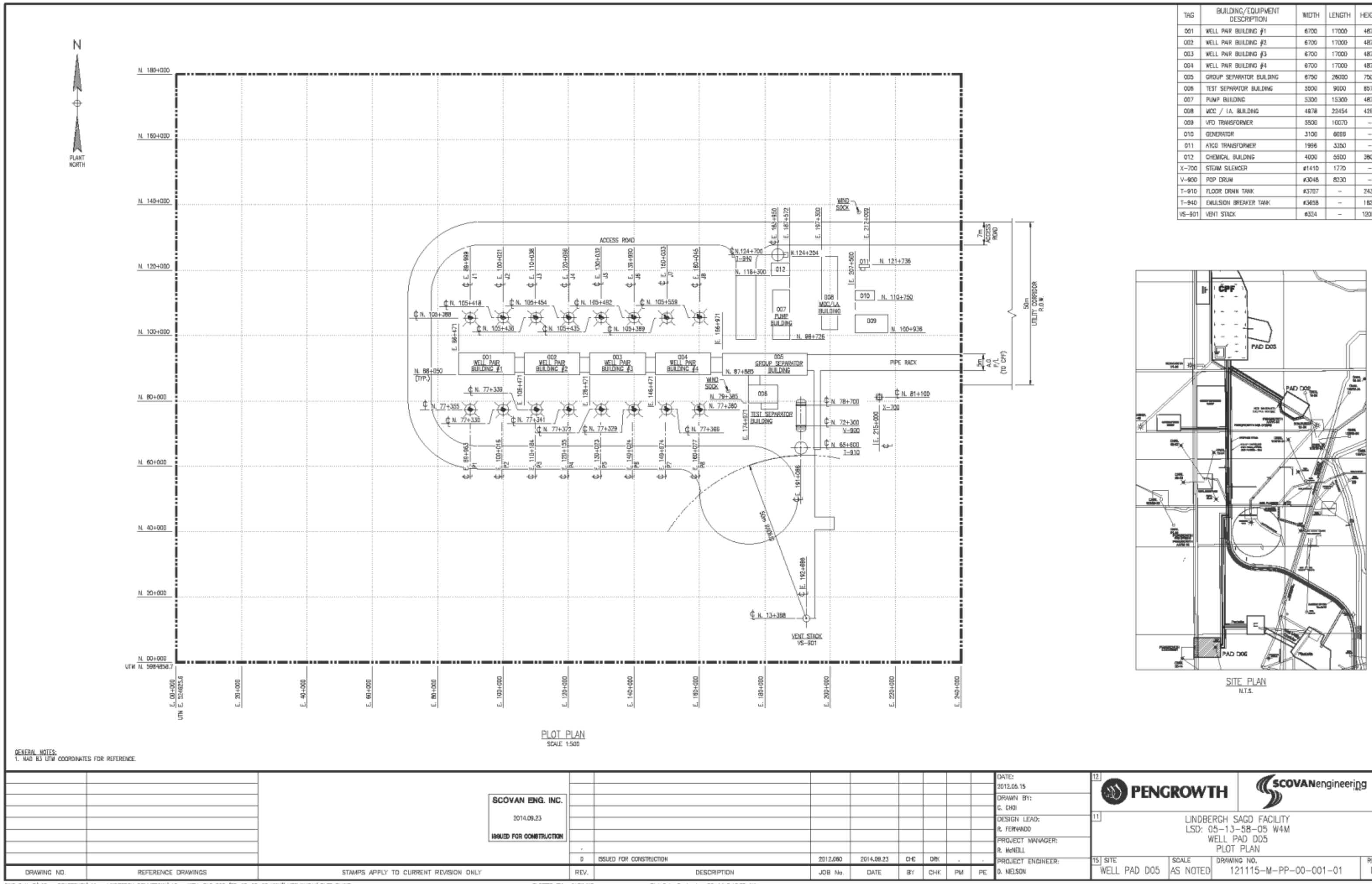
LINDBERGH SAGD COMMERCIAL FACILITY

- SW-25-058-05 W4M CPF site
- Original daily design capacity
  - 8000 m3/d (50,000 bwpd) CWE for steam generation
  - 2208 m3/d (13,888 bopd) bitumen production
  - SOR 3.61
- Debottlenecked daily design capacity
  - 8000 m3/d (50,000 bwpd) CWE for steam generation
  - 3180 m3/d (20,000 bopd) bitumen production
  - SOR 2.5
- Commercial facility equipped with water recycle
  - Falling film mechanical Vapour compression
  - >90% water recycle rate
- Qualified and experienced SAGD operations team
- Commercial facility first steam December 2014

LINDBERGH COMMERCIAL CPF PLOT PLAN



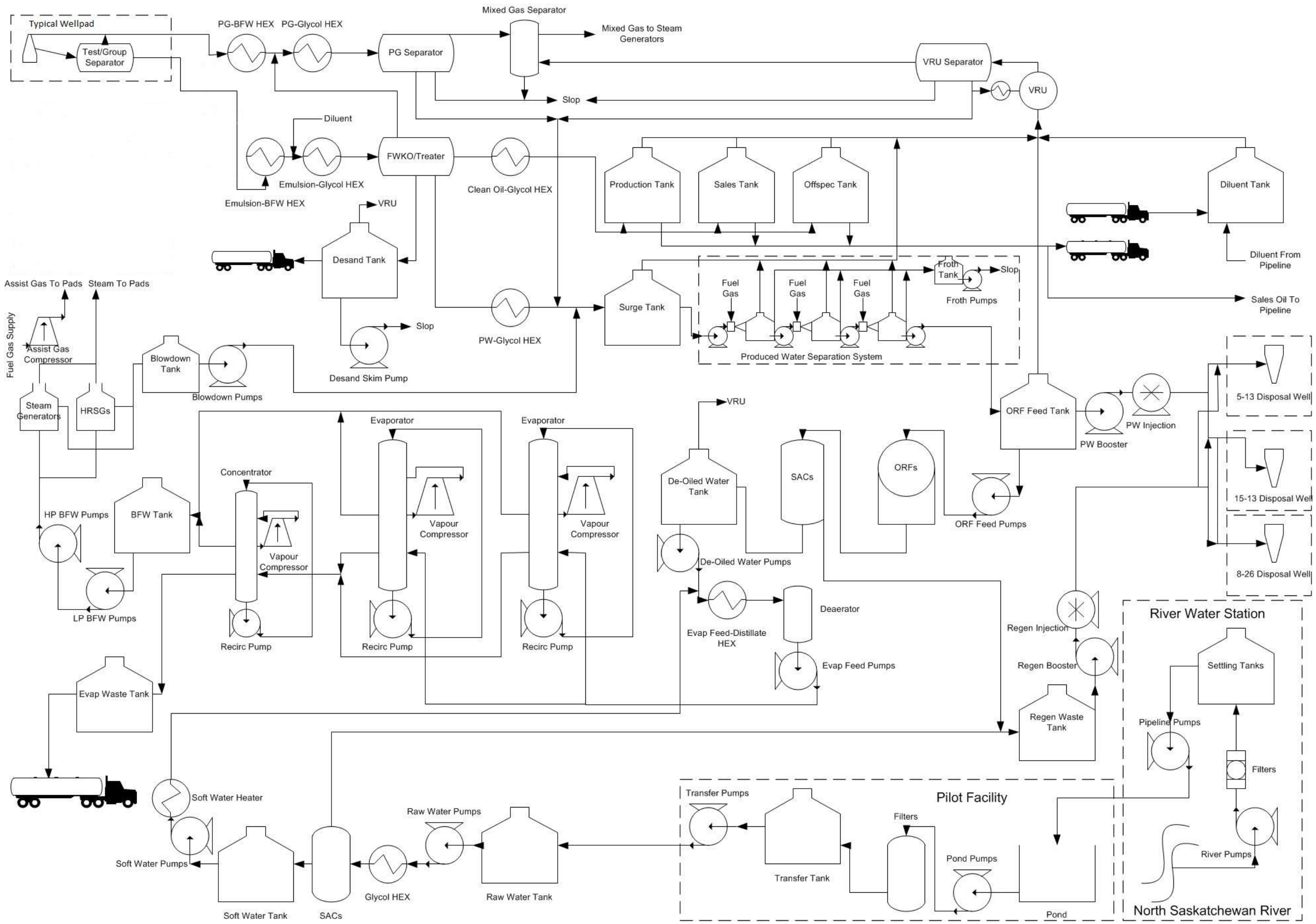
LINDBERGH COMMERCIAL TYPICAL WELLPAD PLOT PLAN



TAG	BUILDING/EQUIPMENT DESCRIPTION	WIDTH	LENGTH	HEIGHT
001	WELL PAIR BUILDING #1	6700	17000	4877
002	WELL PAIR BUILDING #2	6700	17000	4877
003	WELL PAIR BUILDING #3	6700	17000	4877
004	WELL PAIR BUILDING #4	6700	17000	4877
005	GROUP SEPARATOR BUILDING	6750	26000	7500
006	TEST SEPARATOR BUILDING	3500	9000	8578
007	PUMP BUILDING	5300	15300	4877
008	MCC / I.A. BUILDING	4978	22454	4267
009	VFD TRANSFORMER	5500	10070	–
010	GENERATOR	3100	6096	–
011	ATCO TRANSFORMER	1996	3350	–
012	CHEMICAL BUILDING	4000	5600	3800
X-700	STEAM SILENCER	ø1410	1770	–
V-900	POP DRUM	ø3048	8230	–
T-910	FLOOR DRAIN TANK	ø3707	–	2438
T-940	EMULSION BREAKER TANK	ø3658	–	1829
VS-901	VENT STACK	ø324	–	12000

D02 – 5 pairs   D03 – 7 pairs   D05 – 8 pairs   D04 – 6 pairs

LINDBERGH SCHEMATIC



LINDBERGH SAGD COMMERCIAL FACILITY MODIFICATIONS

- Replacement of welded block style PG/BFW inlet HEX
  - Shell & tube HEX installed
- Replacement of Gasketed plate & frame style clean oil HEX
  - Shell & tube HEX installed
- Addition of future tie in piping and valves within the CPF
  - To allow for Phase 2 construction without a Phase 1 shutdown

- WELL PAD EXPANSIONS
  - Added one well pair, two infills and a test separator package to well pad D01
  - Constructed new well pad D04 with 6 well pairs in 2017; 3 planned for 2018

LINDBERGH SAGD COMMERCIAL FACILITY PERFORMANCE

- September 2017 outage for Lindbergh Turnaround to complete the required regulatory inspections on vessels & PSVs and to establish baseline inspections on tanks, piping and rotating equipment
- Design
  - Debottleneck bitumen design rates not expected to be reached with current wellpairs
  - Water/Steam rates still ramping up as the field matures
- Bitumen treatment
  - Producing on spec oil with use of lighter density diluent from pipeline
- Water treatment
  - Increased hardness in the produced water causing more frequent regenerations of the softeners
  - Continual chemical treatment balancing in the evaporators to chelate any excess hardness and chemically cleaning the concentrator every 6 to 8 weeks
  - Oxygen content in softened make-up water causing internal corrosion in utility system piping; UT testing and chemical treatment continues

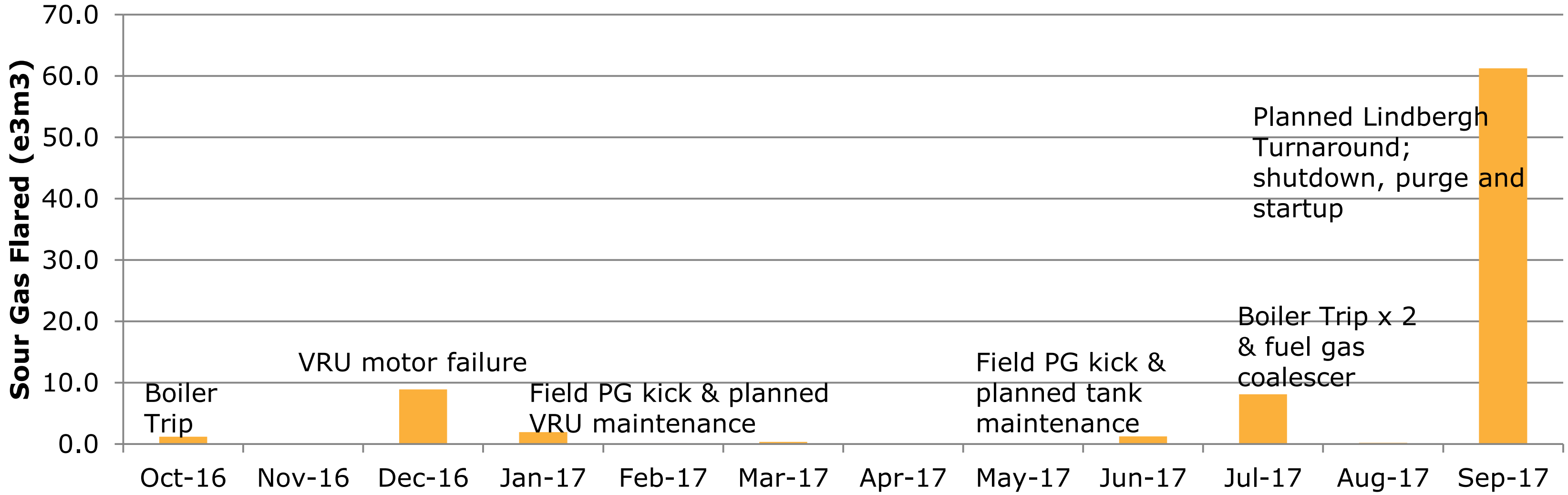
LINDBERGH SAGD COMMERCIAL FACILITY PERFORMANCE

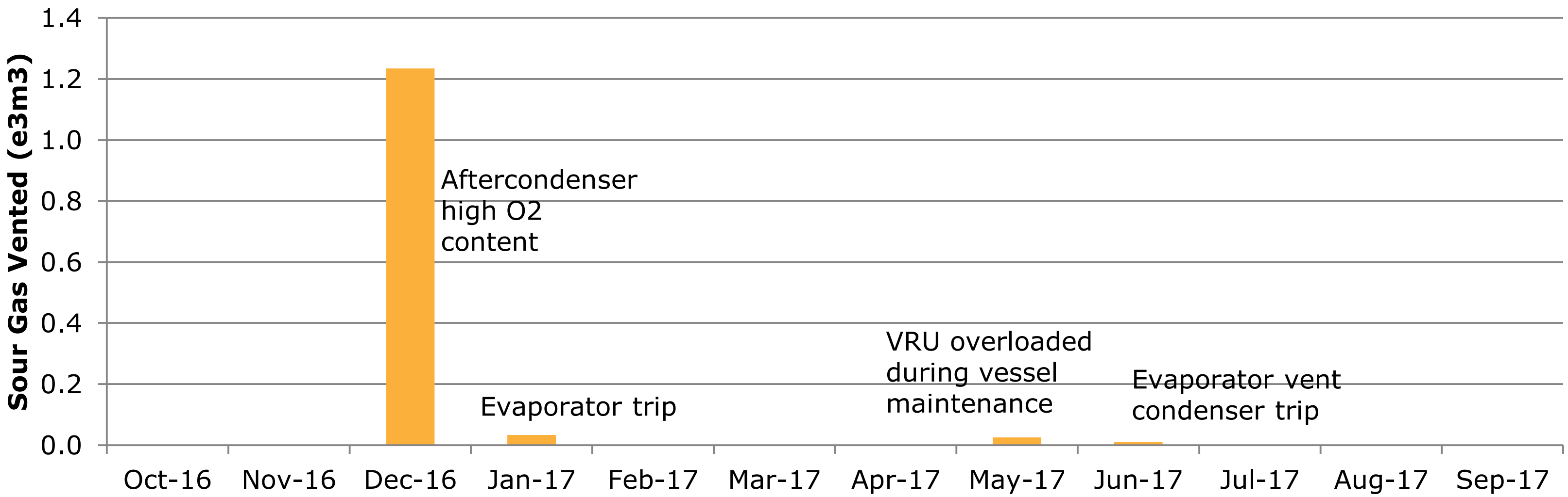
- Steam generation
  - Continuing to ramp up to full capacity
- Power
  - Generation steady outside of regular maintenance
  - Import/Export vary due to weather
    - Plant is islanded during thunderstorms
    - High line power is affected by thunderstorms, ice, human factors
  - Consumption increasing as loading on facility ramps up

LINDBERGH – POWER CONSUMPTION

	Lindbergh Commercial				Lindbergh River Station
	Generation	Consumption	Import	Export	Import/Consumption
	MWh	MWh	MWh	MWh	MWh
Jan-16	11622	8960	26	2687	83
Feb-16	10311	8152	57	2216	61
Mar-16	11300	8822	2	2481	61
Apr-16	10091	8446	368	2013	47
May-16	10633	8424	0	2209	32
Jun-16	9930	7923	0	2007	26
Jul-16	9651	8255	277	1673	29
Aug-16	10206	8697	0	1509	27
Sep-16	10081	8604	0	1477	28
Oct-16	10102	9065	617	1654	41
Nov-16	10790	9597	53	1247	59
Dec-16	11626	10381	41	1286	70
Jan-17	11441	9789	30	1682	73
Feb-17	10407	9140	0	1267	69
Mar-17	11457	10153	0	1304	74
Apr-17	10639	9431	0	1209	55
May-17	9991	8665	446	1773	25
Jun-17	9604	7740	0	1864	20
Jul-17	9352	7904	447	1894	20
Aug-17	10177	8453	0	1725	21
Sep-17	7226	6041	215	1400	38

LINDBERGH – FLARED & VENTED GAS





LINDBERGH – SULPHUR EMISSIONS

	Commercial Monthly Sulphur				
	Total SO2 t/month	Flare Stack t/month	Steam Gens t/month	Peak Day t/d	Approved Limit t/d
Jan-16	15.241	0.071	15.171	0.510	1.000
Feb-16	19.047	0.039	19.008	0.742	1.000
Mar-16	19.087	0.035	19.052	0.628	1.000
Apr-16	14.883	0.079	14.805	0.551	1.000
May-16	19.915	0.195	19.720	0.692	3.000
Jun-16	16.279	0.006	16.272	0.570	3.000
Jul-16	10.985	0	10.985	0.372	3.000
Aug-16	16.685	0.012	16.646	0.557	3.000
Sep-16	15.695	0.226	15.469	0.597	3.000
Oct-16	14.142	0.014	14.128	0.486	3.000
Nov-16	16.322	0	16.322	0.576	3.000
Dec-16	21.775	0.133	21.642	0.776	3.000
Jan-17	21.303	0.030	21.273	0.741	3.000
Feb-17	18.524	0.001	18.523	0.673	3.000
Mar-17	24.019	0.004	24.016	0.810	3.000
Apr-17	19.360	0	19.359	0.674	3.000
May-17	16.936	0	16.936	0.592	3.000
Jun-17	25.133	0.009	25.124	0.891	3.000
Jul-17	24.940	0.095	24.846	0.934	3.000
Aug-17	23.484	0.003	23.482	0.776	3.000
Sep-17	6.286	0.310	5.976	0.325	3.000

- Simulations based on historical pilot data do not indicate we will exceed our currently approved limit with the current production forecast of Phase 1
- Considerations will be given to the incorporation of sulphur recovery for future Phase 2 expansion

LINDBERGH – NO_X EMISSIONS

CEMS Data - Monthly Average - H-720	
	NOx (kg/h)
Jan-16	9.56
Feb-16	7.90
Mar-16	9.16
Apr-16	8.82
May-16	8.72
Jun-16	8.68
Jul-16	8.86
Aug-16	8.98
Sep-16	9.44
Oct-16	10.34
Nov-16	10.18
Dec-16	10.10
Jan-17	10.34
Feb-17	10.71
Mar-17	9.09
Apr-17	12.19
May-17	11.40
Jun-17	11.09
Jul-17	11.36
Aug-17	11.85
Sep-17	11.94

	2016 Manual Stack Surveys		2017 Manual Stack Surveys		
Emission Source	Date	NOx Emission Rate (kg/hr)	Date	NOx Emission Rate (kg/hr)	NOx Approval Limit (kg/hr)
H-710 (Steam Gen 1)	---	---	26-Apr-17	13.1	16.6
H-720 (Steam Gen 2)	20-Sep-16	13.1	25-Apr-17	12.2	16.6
H-730 (Cogen 1)	21-Sep-16	1.21	---	---	5.0
H-740 (Cogen 2)	---	---	16-Aug-17	1.25	5.0
H-942 (Utility Boiler)	---	---	---	---	0.54

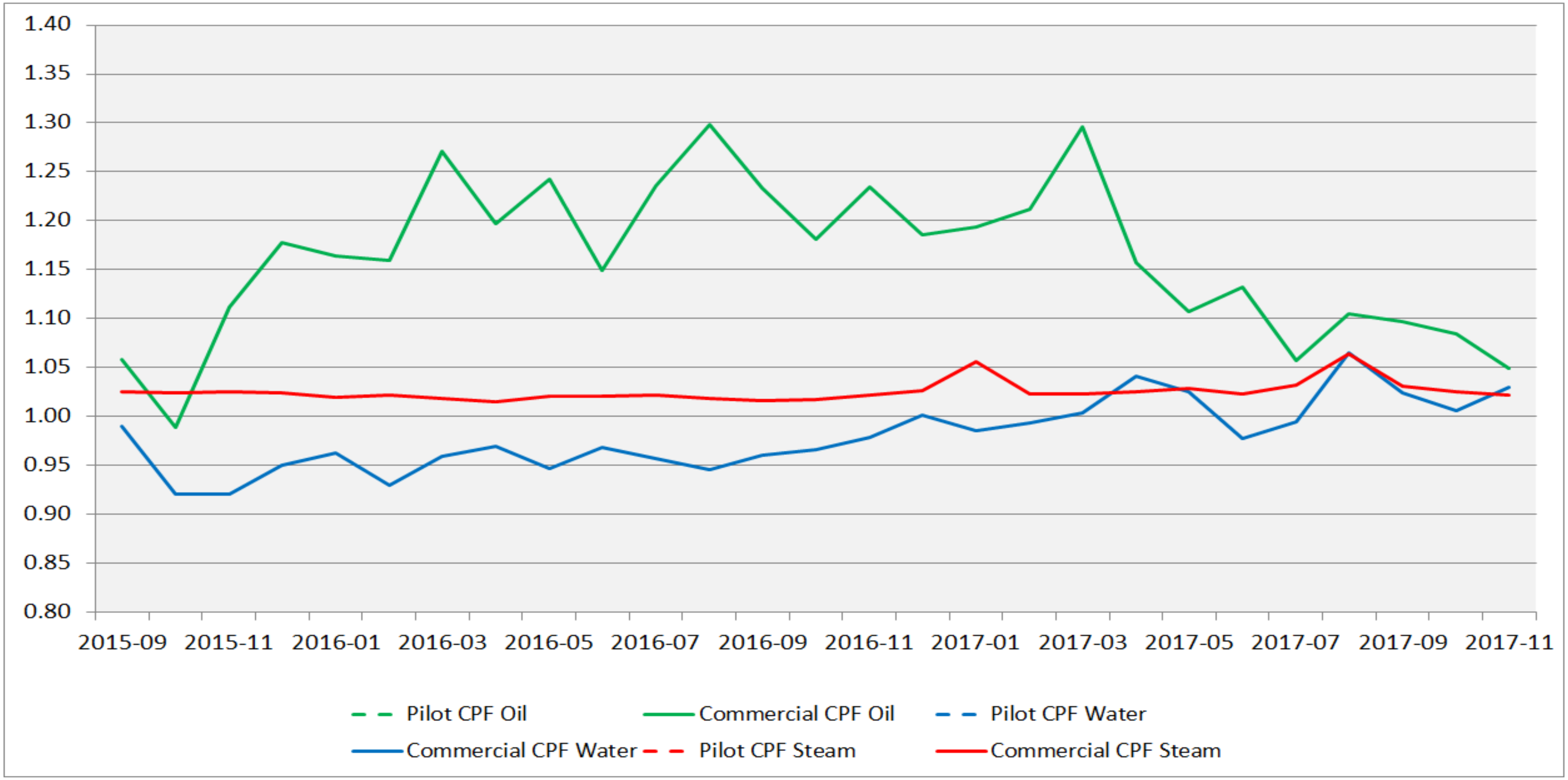
Commercial stack survey dictated as one manual stack survey within 6 months of commissioning for each source, once per year on a rotating basis for H-710 & H-720, once per year on a rotating basis for H-730 & H-740, and continuous monitoring via CEM for one of H-710 & H-720.

MEASUREMENT AND REPORTING

MARP SUMMARY

- Testing
  - Test separator located at D02, D03, D04, and D05
    - Pad D01 Test Separator installed and commissioned June 2017.
  - 12 hour tests
    - Within +/- 10% of previous results to be accepted
  - Individual well gas allocated as a function of facility GOR and monthly allocated production
  - Pad D03 utilizing AGAR Meter.
  - Pad D01, D02, D04, and D05 utilizing manual testing.
    - 2 samples captured per test to improve accuracy.
  - Pad D01, D02, and D05 to be converted to AGAR meter in Q1 2018.
  - Pad D04 to be converted to AGAR meter in Q4 2018 after all wells have reached steady state SAGD production.

PRORATION FACTOR



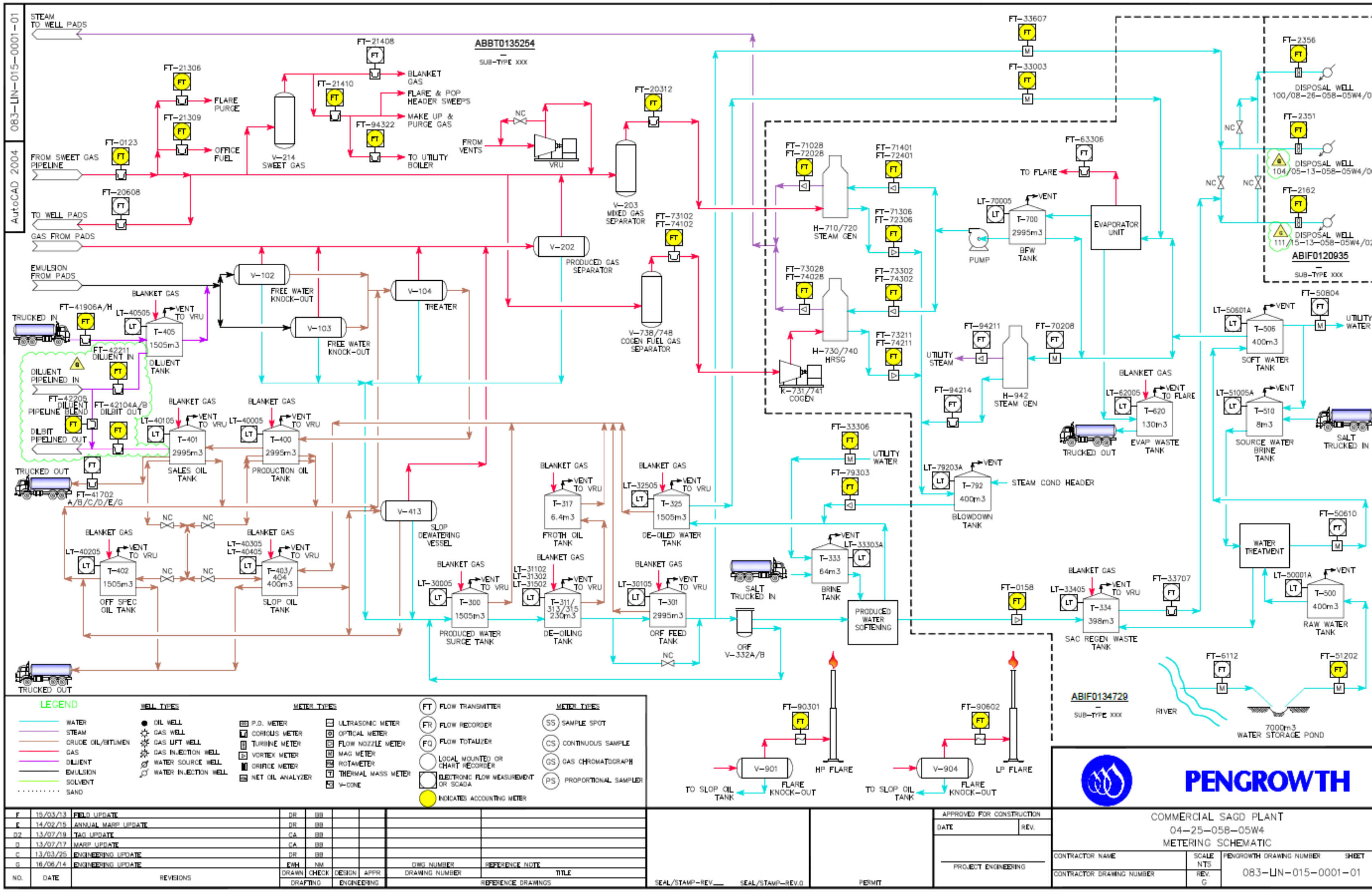
	2016-10	2016-11	2016-12	2017-01	2017-02	2017-03	2017-04	2017-05	2017-06	2017-07	2017-08	2017-09	2017-10
Oil	1.18	1.23	1.19	1.19	1.21	1.30	1.16	1.11	1.13	1.06	1.11	1.10	1.08
Water	0.97	0.98	1.00	0.99	0.99	1.00	1.04	1.03	0.98	0.99	1.07	1.02	1.01
Steam	1.02	1.02	1.03	1.06	1.02	1.02	1.03	1.03	1.02	1.03	1.06	1.03	1.03

PRORATION IMPROVEMENT INITIATIVES

- Main issues associated with BS&W consistency
- Completed
  - Testing procedure (Sept 2015)
  - Chemical adjustments (Sept 2015)
  - Various piping changes for more accurate testing (2015-2016)
  - Pad D02, D03, D05 AGAR Calibrations (2016-2017)
- Ongoing
  - Pad D01 AGAR (New) calibration (Q1 2018)
  - Pad D04 AGAR (New) calibration (Q4 2018)
  - Pad D05 AGAR re-calibration testing(Q1 2018)
  - Pad D03 AGAR re-calibration testing(Q1 2018)
  - Pad D02 AGAR re-calibration testing(Q1 2018)

COMMERCIAL MARP SCHEMATIC

SAGD Production - BT0135254
SAGD Injection - IF0134729
Disposal -IF0120935



MARP CALCULATION SUMMARY

7.1.2. Total Battery Bitumen Production

Produced Bitumen = $((O_S + DBI_c - DBI_o)/SF) - (D_i + D_{Oi} - D_{Ci})$

$((O_s$	+	DBI_c	-	$DBI_o)$	/	SF)	-	$(D_i$	+	D_{Oi}	-	$D_{Ci})$
Sales Oil		*Closing Inventory T-400, T-401, T402, T403 and T-404*		*Opening Inventory T-400, T-401, T402, T403 and T-404*		*Blending Shrinkage Factor*		*Diluent Receipts*		*Opening Inventory T-405*		*Closing Inventory T-405*

7.1.7. Battery Water Production

Dispositions	+	Δ Water Tanks	+	Δ Deoiling Tanks	+	Δ Slop Tank Water	+	Δ Off Spec Tank Water	-
Formula 7.1.9		*Change in water tank inventory for T-300, T-301 & T-325*		*Change in water inventory in T-311, T-313 & T-315*		*Change in water inventory in T-403 & T-404*		*Change in water inventory in T-402*	
Water received with diluent	-	FT-79303	-	Trucked in Water	-	FT-33306			
		Blowdown water from IF T-792		*Water trucked in to T-333 from outside sources*		*Utility water from IF to T-333*			

7.1.8. Battery Water Dispositions

FT-33607	+	FT-33003	+	Sales Water	+	Other water out	+	FT-0158
Water Delivery to Injection Facility for Disposal		*Water Delivery to IF for treatment*		*S&W content of sales dilbit blend*		*Water Content of other fluid trucked out*		*Waste Water to IF T-334*

7.3.1. Primary Steam Calculation

FT-71028	+	FT-72028	+	FT-73028	+	FT-74028
Steam to Pads From Steam Generator		*Steam to Pads From Steam Generator*		*Steam to Pads from HRSG*		*Steam to Pads From HRSG*

7.3.2. Secondary Steam Injection Calculation

FT-71401	+	FT-72401	+	FT-73302	+	FT-74302	-
BFW to Steam Gen H710 from T-700 BFW tank		BFW to Steam Gen H720 from T-700 BFW tank		BFW To Cogen H730 from T-700		BFW to Cogen H740 from T700	
FT-71306	-	FT-72306	-	FT-73211	-	FT-74211	
Steam Condensate from Steam Gens		*Steam Condensate from Steam Gens*		*Steam Condensate from HRSG*		*Steam Condensate from HRSG*	

WATER

LINDBERGH WATER SOURCES

- 10-23-056-05 W4M river water station
  - Fresh water source from the North Saskatchewan River
  - AENV License No.13844
    - » Gross diversion, consumptive use: 2,272 acre-feet (2,802,467m3) annually
    - » Rate of diversion: 1.8 cubic feet per second (4403m3/d or 1,607,400m3 annually)

- Commercial
  - ~400m3/d make-up water usage at commercial facility (2017 to date average)
  - Down slightly from 2016 yearly average of 512m3/d
  - A higher water steam ratio in 2017 lowered the source water makeup to the evaporators as the evaporator feed stream is produced water supplemented with source water to meet total boiler feed water requirements

LINDBERGH SOURCE WATER MAKE UP VOLUMES

- Commercial volumes used primarily for soft de-oiled water make-up and miscellaneous utility services

	Source Water (m3 per month)
Jan-16	16,398
Feb-16	12,687
Mar-16	18,595
Apr-16	20,598
May-16	13,409
Jun-16	16,184
Jul-16	17,678
Aug-16	15,914
Sep-16	13,943
Oct-16	14,022
Nov-16	16,612
Dec-16	10,996
Jan-17	9,105
Feb-17	11,157
Mar-17	15,486
Apr-17	14,992
May-17	6,762
Jun-17	8,042
Jul-17	12,733
Aug-17	17,342
Sep-17	8,583

2016 Total: 187,036m3
- 6.7% of gross diversion license
- 11.6% of rate of diversion license

2017 YTD: 104,203m3

Lindbergh source water requirements are expected to increase in 2018 when the pilot facility is reactivated.

LINDBERGH PRODUCED WATER, STEAM, AND RECYCLE

- Commercial facility has full blowdown recycle

	Steam (tonnes/month)	Produced Water (m3/month)	Disposal Water (m3/month)	PW Recycle (monthly)
Jan-16	170,670	161,927	4,828	97.0%
Feb-16	150,294	147,975	4,967	96.6%
Mar-16	177,508	170,059	5,067	97.0%
Apr-16	174,035	166,900	5,166	96.9%
May-16	179,384	176,521	5,350	97.0%
Jun-16	173,131	168,111	5,777	96.6%
Jul-16	183,812	178,198	5,447	96.9%
Aug-16	190,227	187,609	5,866	96.9%
Sep-16	170,538	167,374	5,774	96.5%
Oct-16	184,092	185,593	7,012	96.2%
Nov-16	185,608	183,470	6,405	96.5%
Dec-16	189,552	192,810	6,391	96.7%
Jan-17	186,224	188,709	7,144	96.2%
Feb-17	173,185	175,819	6,381	96.4%
Mar-17	193,074	192,768	6,955	96.4%
Apr-17	184,619	184,678	6,871	96.3%
May-17	189,436	196,804	7,573	96.2%
Jun-17	178,978	185,660	12,824	93.1%
Jul-17	189,382	190,990	7,522	96.1%
Aug-17	194,621	199,497	8,550	95.7%
Sep-17	126,730	139,110	9,727	93.0%

PW Recycle Rate

- Calculation as per Directive 81 Appendix H

- 2016 Overall 96.7%
- 2017 YTD 95.6%

LINDBERGH COMMERCIAL DISPOSAL LIMITS

- The Lindbergh CPF is equipped with evaporator towers for PW recycle

	Disposal Limit % (monthly)	Actual Disposal % (monthly)
Jan-16	9.4%	2.7%
Feb-16	9.4%	3.1%
Mar-16	9.3%	2.7%
Apr-16	9.2%	2.8%
May-16	9.5%	2.8%
Jun-16	9.4%	3.1%
Jul-16	9.4%	2.8%
Aug-16	9.5%	2.9%
Sep-16	9.5%	3.2%
Oct-16	9.5%	3.5%
Nov-16	9.4%	3.2%
Dec-16	9.6%	3.1%
Jan-17	9.7%	3.6%
Feb-17	9.6%	3.4%
Mar-17	9.5%	3.3%
Apr-17	9.5%	3.4%
May-17	9.8%	3.7%
Jun-17	9.7%	6.6%
Jul-17	9.6%	3.7%
Aug-17	9.4%	3.9%
Sep-17	9.6%	6.6%

- Disposal Limit and Actual Disposal calculated as per Directive 81
- 2016 Overall:
  - Limit: 9.4%
  - Actual: 2.9%
- 2017 (YTD):
  - Limit: 9.6%
  - Actual: 4.3%
- The higher actuals in 2017 are attributed to excess produced water from the reservoir, increase in regen frequency from the softeners and one-time disposal volumes associated with the turnaround

LINDBERGH WATER QUALITY

Raw Water Properties

Turbidity	5 – 1000 NTU
Suspended Solids	5 – 600 mg/l
Total Dissolved Solids	250mg/l
Total Hardness	170 ppm (as $CaCO_3$)
Na	10.7
K	1.2
Mg	13.1
Ca	46.7
Chlorides	10.8 mg/l
Bicarbonate	180 mg/l
CO_3	<0.50 mg/l
Sulphate	44.2
Total Alkalinity	150

Produced Water Properties

Component	mg/l as Ion	mg/l as CaCO3
Calcium (Ca^{++})	34.6	86.5
Magnesium (Mg^{++})	2	8.2
Sodium (Na^{+})	1920.0	4166.4
Potassium (K^{+})	78.2	100.1
Iron (Fe^{++})	0.0	0.0
Manganese (Mn^{++})	2.0	3.6
Hydrogen (H^{+})	0.0	0.0
Barium (Ba^{++})	0.7	0.5
Strontium (Sr^{++})	2.2	2.5
Sum Cations		4367.9
Bicarbonate (HCO_3^-)	100.0	82.0
Carbonate ($CO_3^=$)	0.0	0.0
Hydroxide (OH^-)	0.0	0.0
Sulphate ($SO_4^=$)	100.0	104.0

Chloride (Cl^-)	3010	4244.1
Sum Anions		4430.1
Total Dissolved Solids (Measured)	5400	
pH (Units)	6.11	
Total Hardness		101.4
Silica (SiO_2)	163.0	
Insoluble Oil (oil & grease)	9	
Total Organic Carbon:		
Normal (non-volatile)	123	
Maximum	300	
Turbidity (NTU) (Max)		
Temperature (°C)	23.0	
Conductivity (µS/cm)	9600	

SAC Waste Properties

CATIONS			ANIONS		
Ion	*mg/L*	*meq/L*	*Ion*	*mg/L*	*meq/L*
Na	17300	752	Cl	32340	911
K	230	5.88	HCO3	130	2.12
Ca	2340	117	SO4	81.0	1.69
Mg	195	16.0	CO3	<0.50	<0.02
Ba	27.5	0.401	OH	<0.50	<0.03
Sr	101	2.30			
Fe	0.46	0.0164			
H+					

Total Dissolved Solids (mg/L)

Measured	Calculated
	53000

Relative Density: 1.039	Refractive Index: 1.339
Conductivity (uS/cm): 80200	Resistivity (ohm-m) @25°: 0.12
Total Hardness as CaCO3 (mg/L): 6600	Total Alkalinity as CaCO3 (mg/L): 110
Total Fe (mg/L): 13.9	Total Mn (mg/L): 5.65
Observed pH: 6.62	H2S Spot Test: FALSE

DISPOSAL WELLS

PENGROWTH

DISPOSAL WELLS

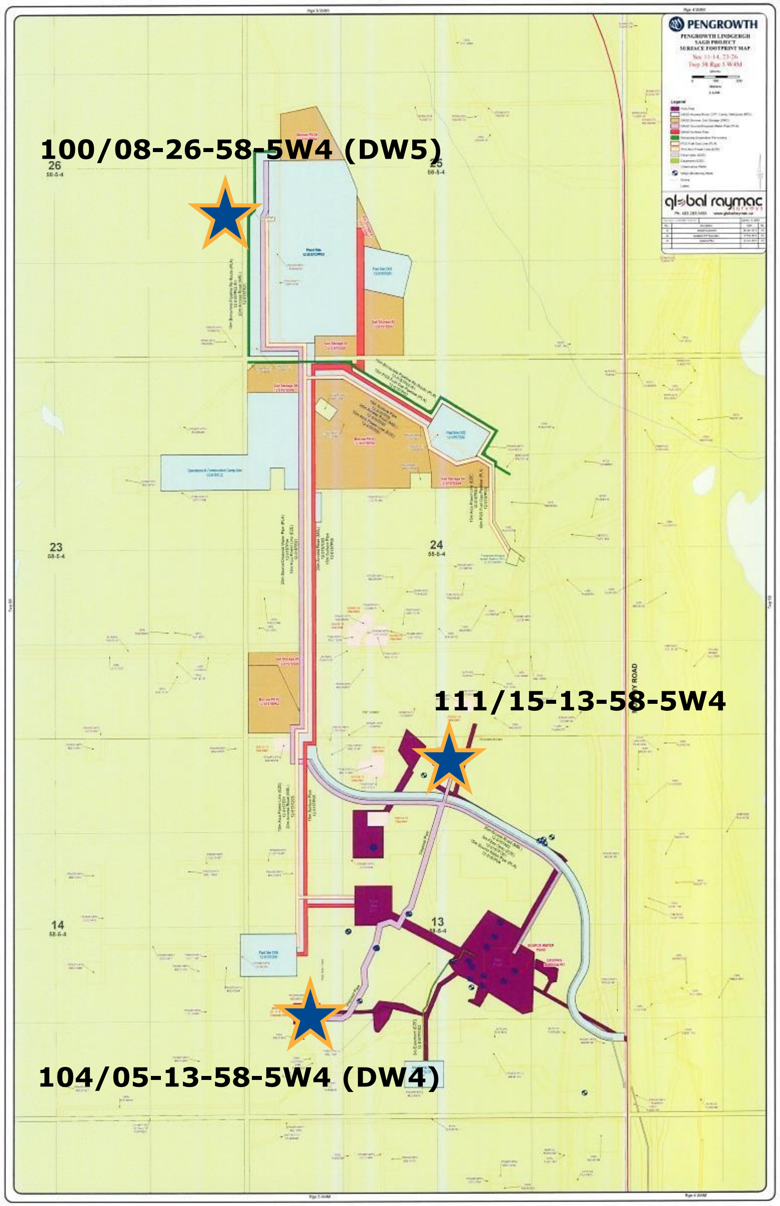
- 111/15-13-58-5W4
  - Well license number – 0126796
  - Disposal approval number – 5565
    - Completed in Basal Cambrian Sands
    - No rate limit
    - Max WHP – 10.9 MPa
  - Former blowdown disposal for Pilot

- 104/05-13-58-5W4 (DW4)
  - Well license number – 0454598
  - Disposal approval number – 12088
    - Completed in Basal Cambrian Sands
    - No rate limit
    - Max WHP – 13 MPa
  - Produced water disposal (if required)

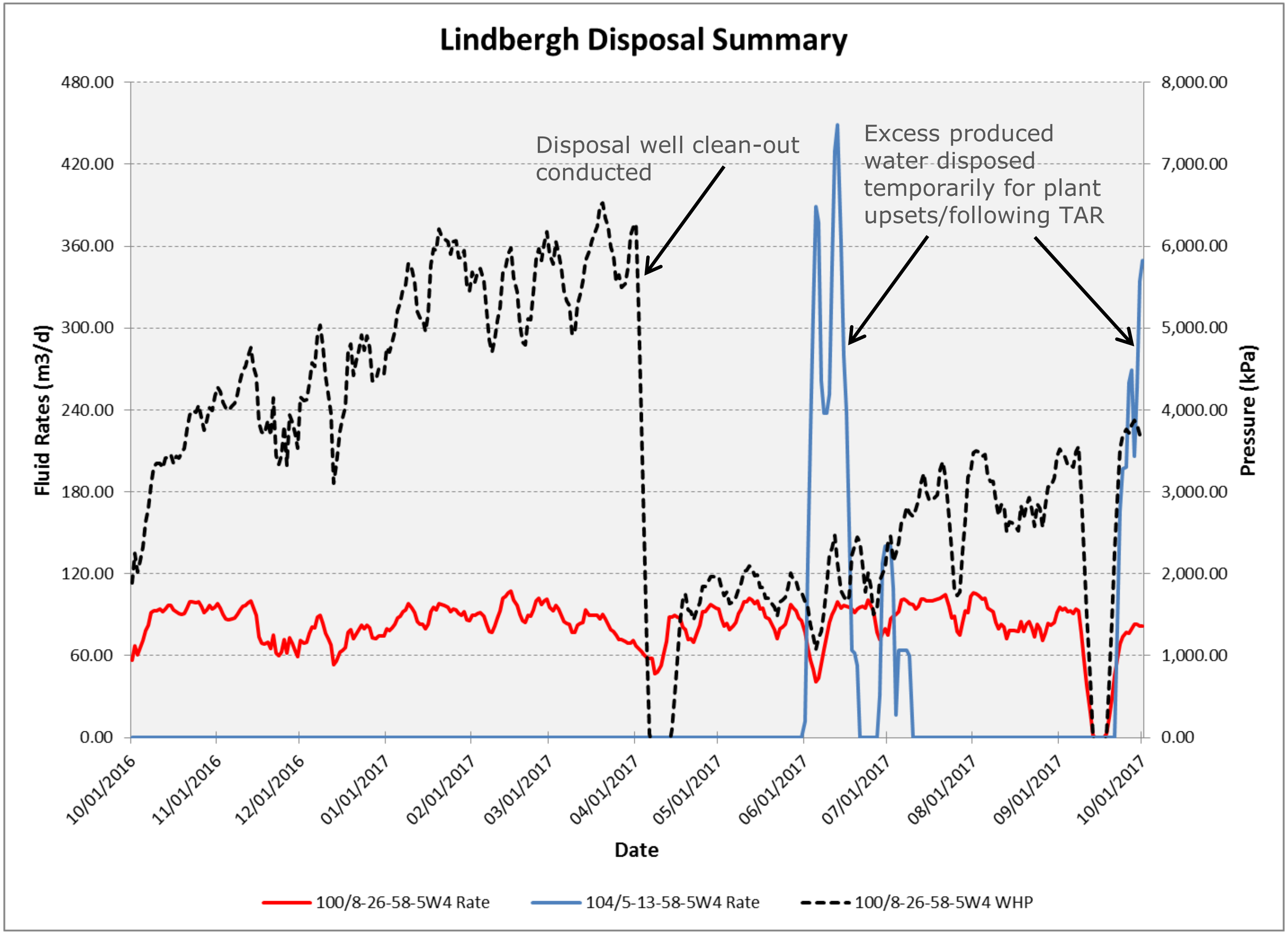
- 100/08-26-58-5W4 (DW5)
  - Well license number – 0469115
  - Disposal approval number – 12088B
    - Completed in Basal Cambrian Sands
    - Screened completion
    - No rate limit
    - Max WHP – 12.6 MPa
  - SAC regen and/or produced water disposal (if required)

DISPOSAL WELLS

- Three water disposal wells (Basal Cambrian Sand) at ~ 1600 meters depth
- 11/15-13 and 04/05-13 were disposing of produced water and boiler blowdown from the pilot
  - Pilot was shut down in Q2, 2015 and all volumes processed at new CPF
- 00/08-26 is new well that was completed in November 2014
- All 3 wells are tied into the commercial CPF
  - 2 disposal streams into these wells are softener regeneration backwash and excess produced water



DISPOSAL HISTORY



OFFSITE DISPOSAL VOLUMES AND LOCATIONS – YTD 2017

	Secure Chamberlain (m3)	NewAlta Elk Point (m3)	Secure Edmonton (m3)	Tervita Lindbergh (m3)	**Total Offsite (m3)**	05-13 Prod Water (m3)	15-13 Prod Water (m3)	08-26 Softener Backwash (m3)
Oct-16	0	0	0	4251	**4251**	0	0	2761
Nov-16	0	0	0	4163	**4163**	0	0	2243
Dec-16	0	0	226	3928	**4154**	0	0	2237
Jan-17	0	0	0	4443	**4443**	0	0	2702
Feb-17	0	0	0	3857	**3857**	0	0	2524
Mar-17	415	0	0	4107	**4522**	0	0	2433
Apr-17	559	0	0	4074	**4633**	0	0	2239
May-17	267	0	0	4658	**4925**	0	0	2648
Jun-17	624	459	0	3834	**4917**	5507	0	2399
Jul-17	390	0	0	3906	**4296**	319	6	2901
Aug-17	49	28	582	5370	**6028**	0	0	2522
Sep-17	0	1755	216	3513	**5483**	2662	0	1582

AMBIENT AIR QUALITY

AMBIENT AIR QUALITY

- Continue to actively participate in LICA and the Air Quality Monitoring Program Network as per the Lindbergh SAGD EPEA approval
- We are compliant with the Joint Oilsands Monitoring (JOSM) requirements

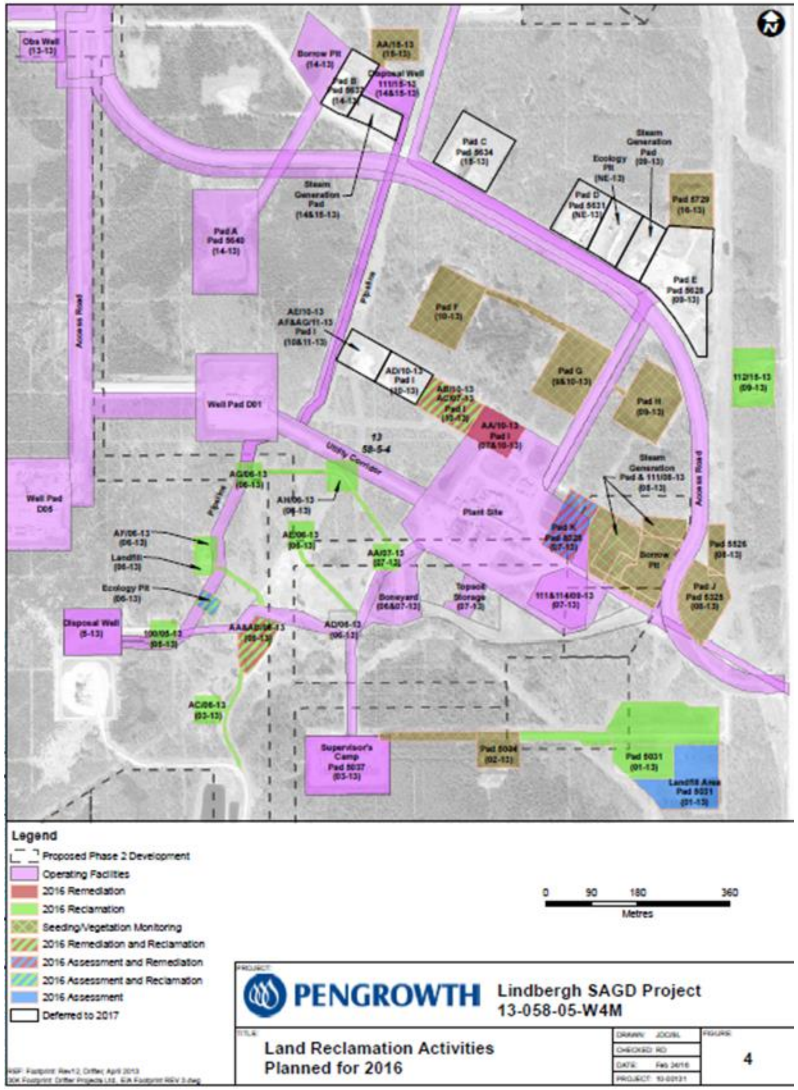
ENVIRONMENTAL ISSUES

ENVIRONMENTAL ISSUES

- ENVIRONMENTAL ISSUES
- - Three sites have undergone additional assessment work in 2016/17 (including a former 'Landfill' area at 1-13-058-05 W4M). No remediation was required.
- - Reclamation has been carried out on AG/06-13-058-05 W4M, AH/06-13-058-05 W4M, AA/07-13-058-05 W4M, AF/06-13-058-05 W4M, AE/06-13-058-05 W4M and final re-contouring and soils replacement for Pad 5031 and a borrow pit area at 1-13, and 112/15-13-058-05 W4M (9-13-058-05 W4M).
- - Reclamation (site recontouring) has taken place at AG/11-13-058-05 W4M on Pad I
- - Pad F, Pad 5729 and 112/15-13-058-05 W4M well site have been reclaimed.

DECOMMISSIONING AND RECLAMATION

- The 5 year reclamation of legacy CSS facilities has been completed.
- The project is in the early stages of development and as such no current facilities are schedules for decommissioning at this time.



COMPLIANCE

PENGROWTH

COMPLIANCE

- The AER issued an investigation due to CEMS deficiencies. Pengrowth submitted information requested by the investigation Sept 8/16.
- The CEMS is now compliant with all applicable regulations.

• Pengrowth believes that the Lindbergh project is in full compliance with AER regulatory approvals and regulatory requirements

FUTURE PLANS

PENGROWTH

FUTURE PLANS

- Infill wells to be drilled on pad D05
- Temporary power to be installed on the CPF
- The Pilot Facilities will be reenergized and incorporated in the currently operation facilities.

- Pending regulatory approval and corporate sanctioning
  - Surface facilities and additional well pads for project expansion to 40,000 bopd – timing TBD

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