PENGROWTH ENERGY CORPORATION

LINDBERGH SAGD PROJECT

2016 ANNUAL PERFORMANCE PRESENTATION

SCHEME APPROVAL 6410M

2016 11 09

INTRODUCTION AND OVERVIEW

- Introduction
- Subsurface Issues Related to Resource Evaluation and Recovery
  - Directive 054, Section 3.1.1
- Surface Operations, Compliance, and Issues Not Related to Resource Evaluation and Recovery
  - Directive 054, Section 3.1.2

SUBSURFACE ISSUES: TABLE OF CONTENTS

1. Brief Background of the Scheme
2. Geology/Geoscience
3. Drilling and Completions
4. Artificial Lift
5. Instrumentation in Wells
6. Seismic
7. Scheme Performance
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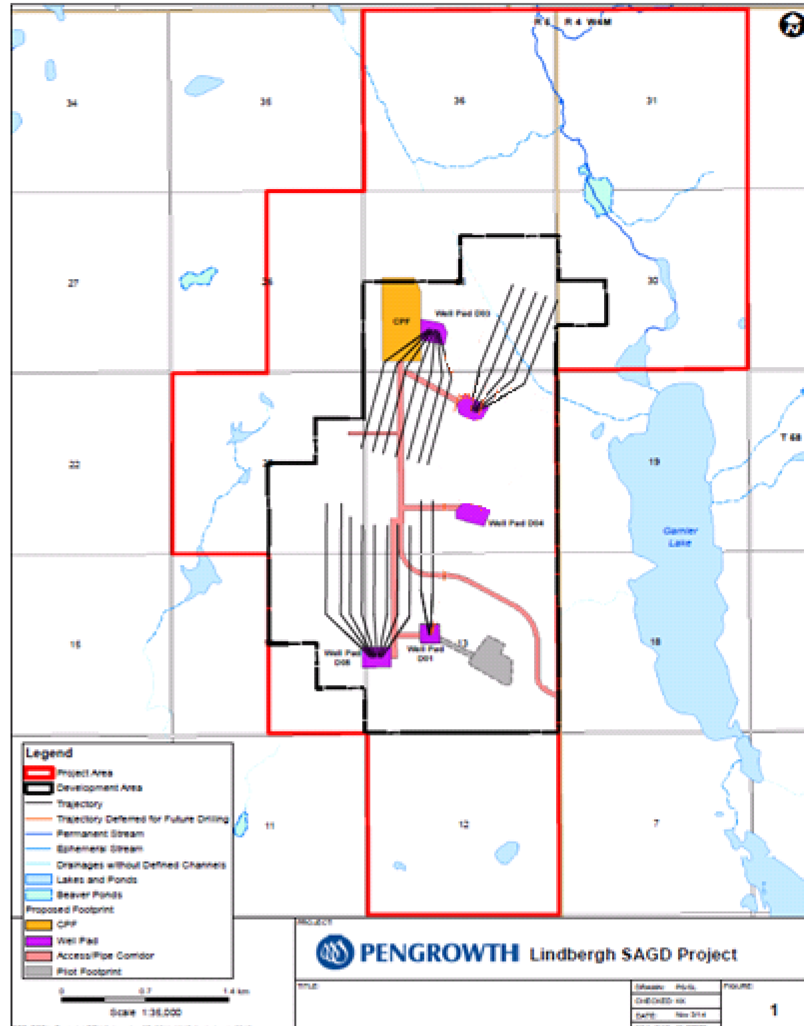
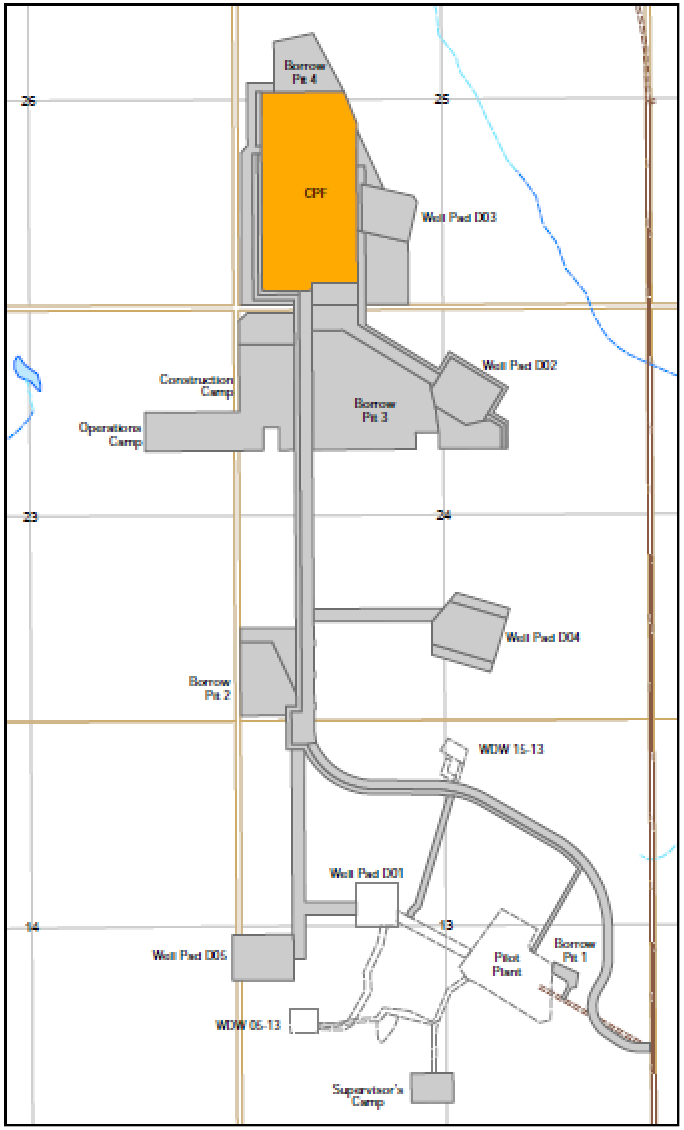
BACKGROUND AND OVERVIEW

PROJECT LOCATION



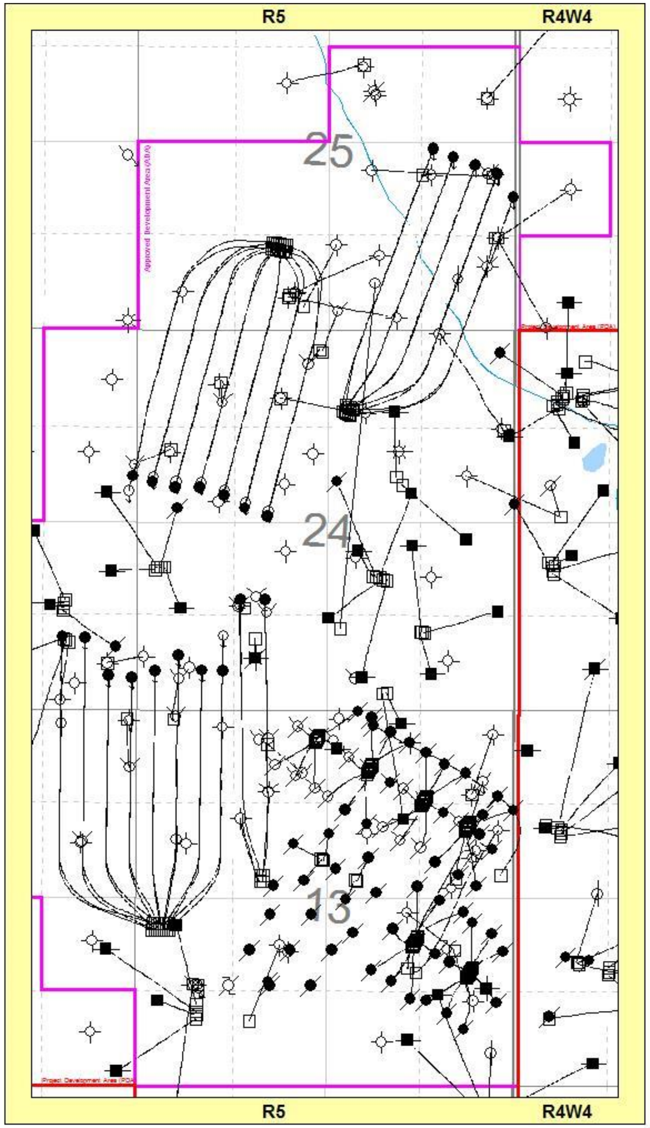
PROJECT OVERVIEW

- 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
- Pilot SAGD well production moved to 12,500 bpd facility
- Pilot facility mothballed
- Application 1784285 to increase production to 30,000 bpd has been approved



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



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
- 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
- Proposal is to drill and complete one well pair in 2017 with circulation to follow

LINDBERGH APPLICATION HISTORY

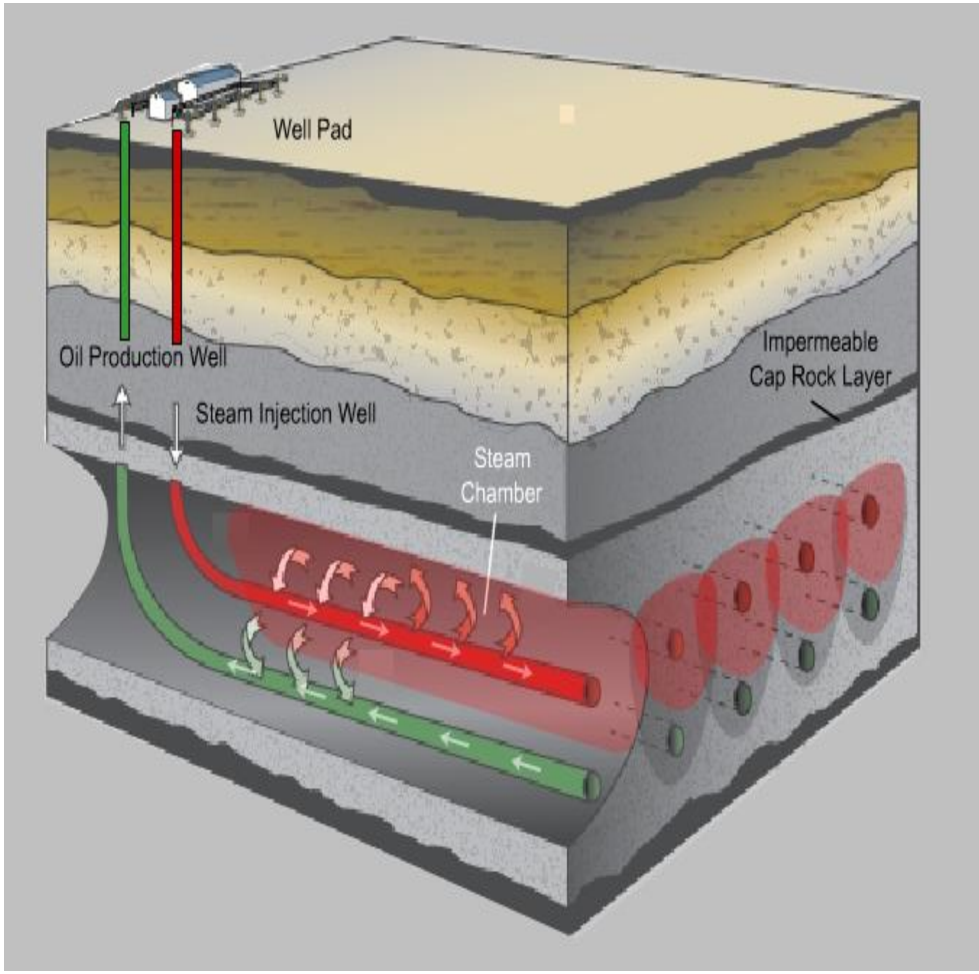
OPERATOR	DATE	EVENT
Murphy	May 1991	ERCB Scheme Approval 6410 granted
	Aug 1993	ERCB Amended Scheme Approval 6410B granted
	Dec 1996	ERCB Amended Scheme Approval 6410C granted
	Aug 1997	ERCB Amended Scheme Approval 6410D granted
	Jun 1999	ERCB Amended Scheme Approval 6410E granted
Pengrowth	Apr 2004	ERCB Amended Scheme Approval 6410F granted
	Apr 2008	Application to Amend for SAGD Production submitted
	Nov 2009	Commercial Scheme Amend 6410G Extension of App Expiry
	Dec 2010	SAGD Application Updated and Re-submitted
	July 2011	EPEA Approval 1581-02-00 granted
	July 2011	Commercial Scheme Amend - 6410H SAGD Pilot Project
	Aug 2012	D78 Cat 3 Amend - 6410I Expansion to 12,500 bopd
	Apr 2014	D78 Cat 2 Amend - 6410J Solvent Soak Trial

LINDBERGH APPLICATION HISTORY (CONTINUED)

OPERATOR	DATE	TYPE	DESCRIPTION
Pengrowth	Sep 2014	D78 Cat 2 Amend Amend 6410K Commercial Scheme Amend – 6410K	Debottleneck Oil Train
	Jun 2015	Commercial Scheme Amend – 6410L	Add Sec 13 Well Pairs
	Dec 2014	D56 Sales & Diluent PL Application (PLA#141430, C&R#001-356469)	Tie-in to Husky PL infrastructure
	May 2016	Commercial Scheme Amend – 6410M	Expand to 30,000 bopd
	Sep 2016	Application to Amend 6410M	Infill Wells

SAGD RECOVERY PROCESS

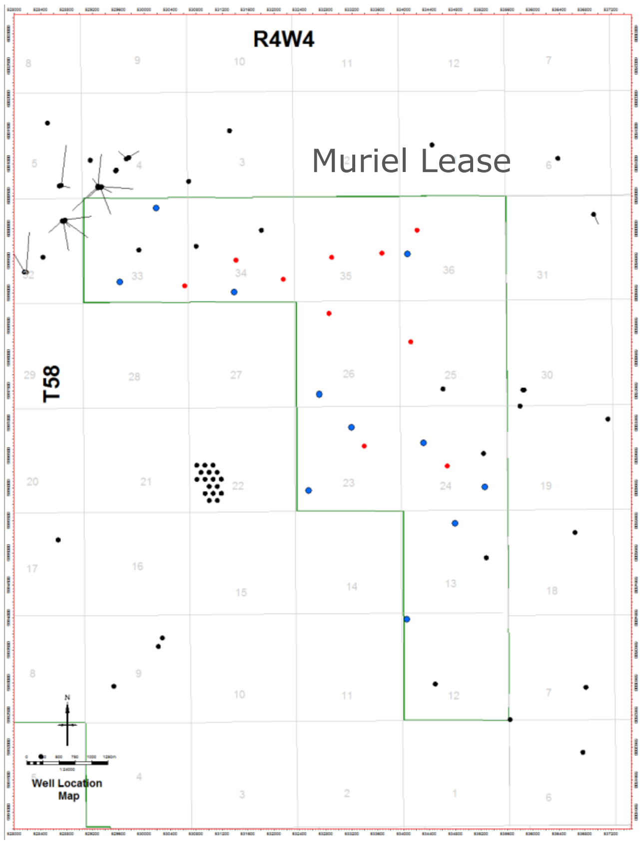
- Stacked horizontal wells
- Steam injected into top well and forms steam chamber
- Steam condenses on boundary of chamber and releases heat into the bitumen
- Bitumen and condensed water drain by gravity to the bottom well
- Bottom well produces liquid bitumen to surface

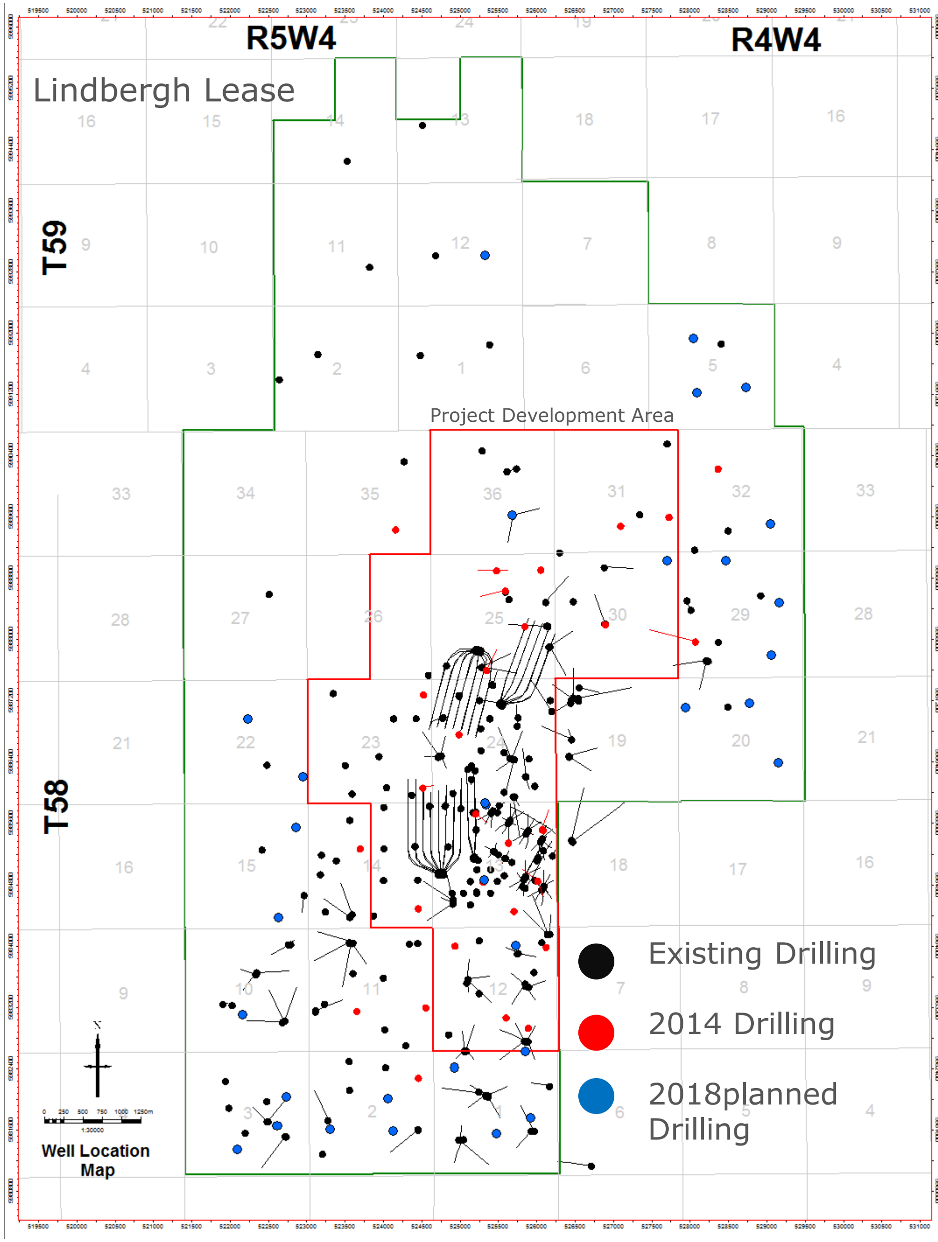


GEOLOGY AND GEOSCIENCE

2015 & 2016 DRILLING

- No delineation wells drilled in 2016 in Lindbergh and Muriel Lake Leases
- 44 delineation wells planned for 2018



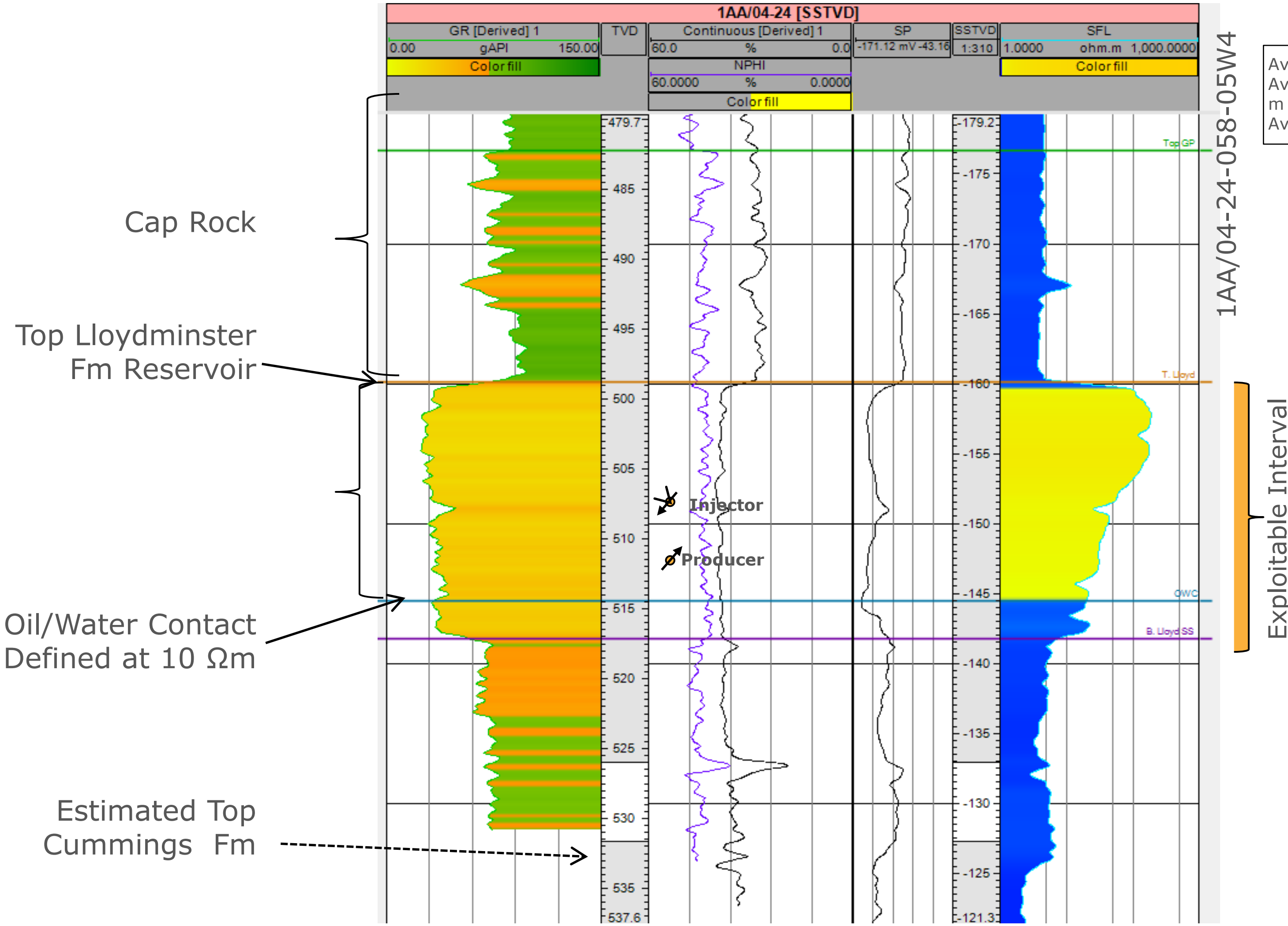


BITUMEN VOLUMES & RESERVOIR PROPERTIES

- All values shown for S_w, Φ and bitumen volume are measured from the Petrel geology model
- 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 OWC
- 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 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

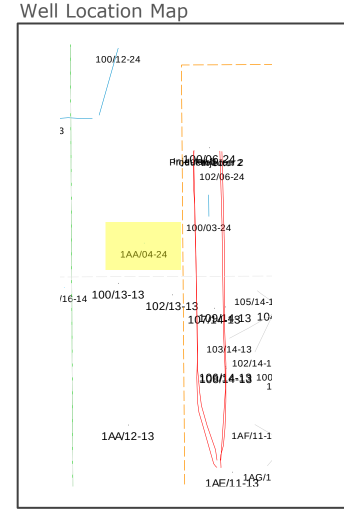
Region	OBIP Volume (m^3)	Porosity (%)	Sw (%)
Wellpad D01	993,543	34.6	26
Wellpad D02	2,022,905	35	22
Wellpad D03	2,725,190	36	20
Wellpad D05	3,003,181	35	22

REPRESENTATIVE COMPOSITE WELL LOG



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

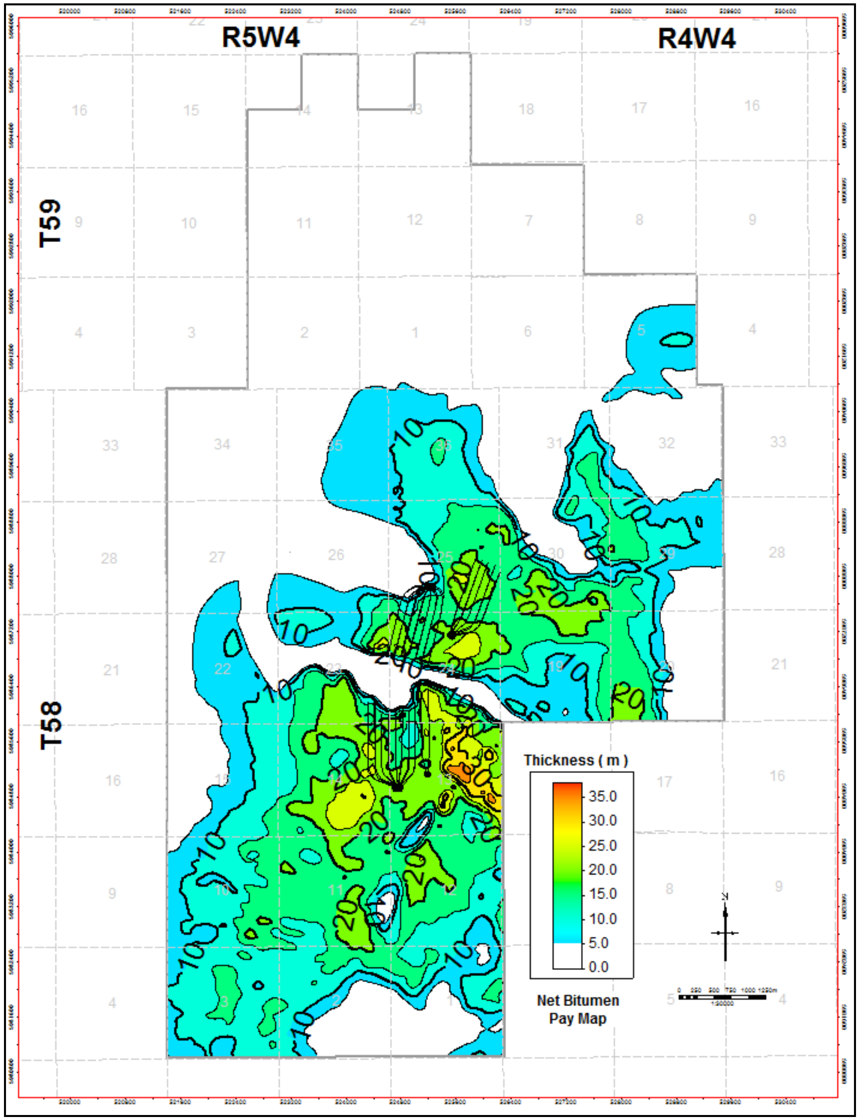
Well Location Map



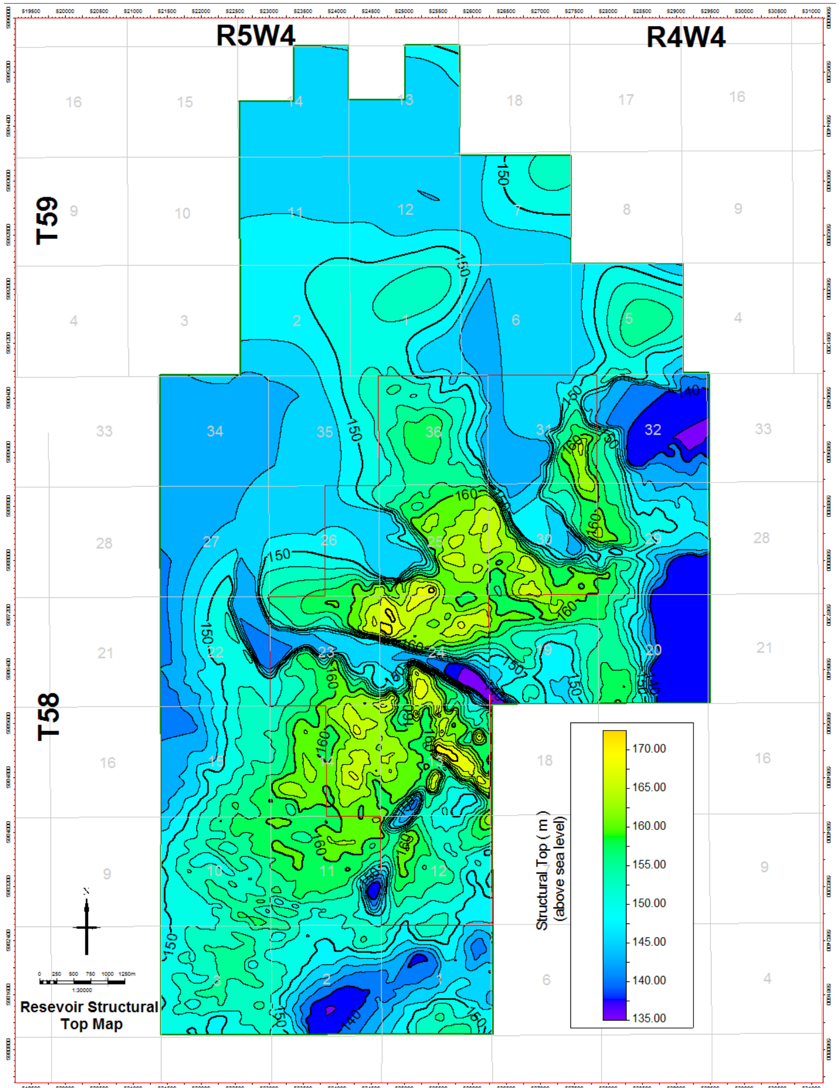
TSX:PGF NYSE:PGH

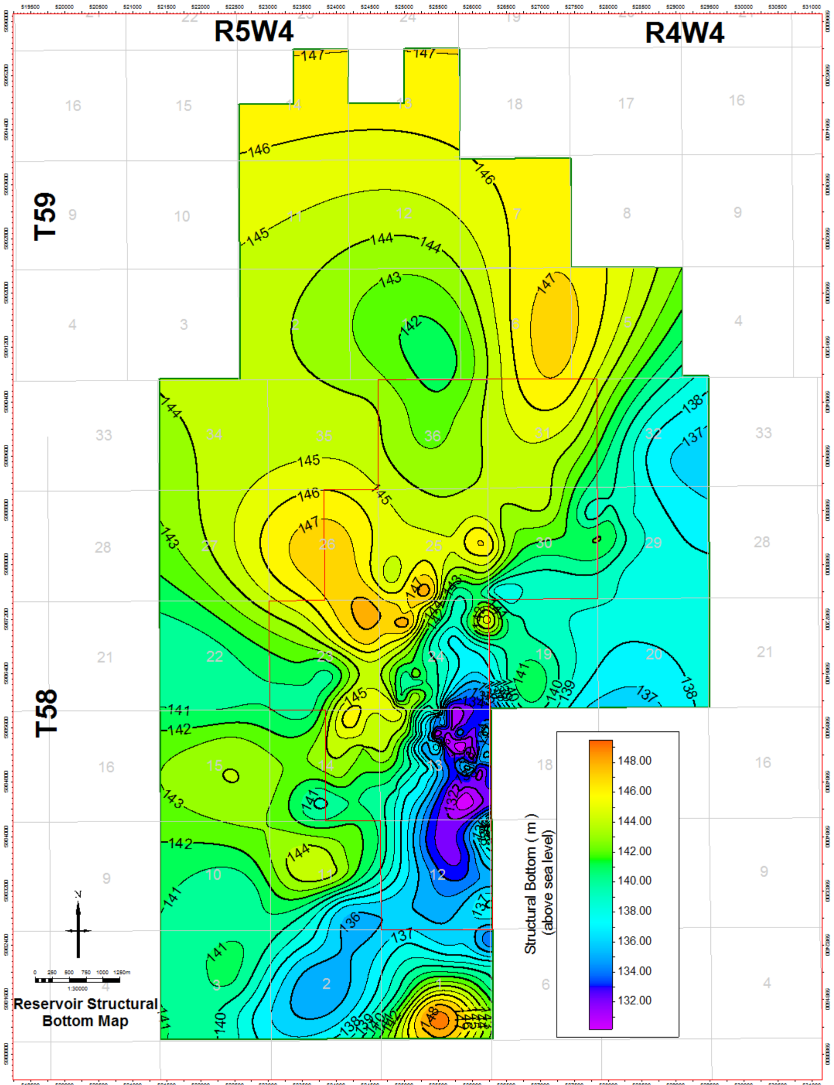
PENGROWTH

NET BITUMEN PAY

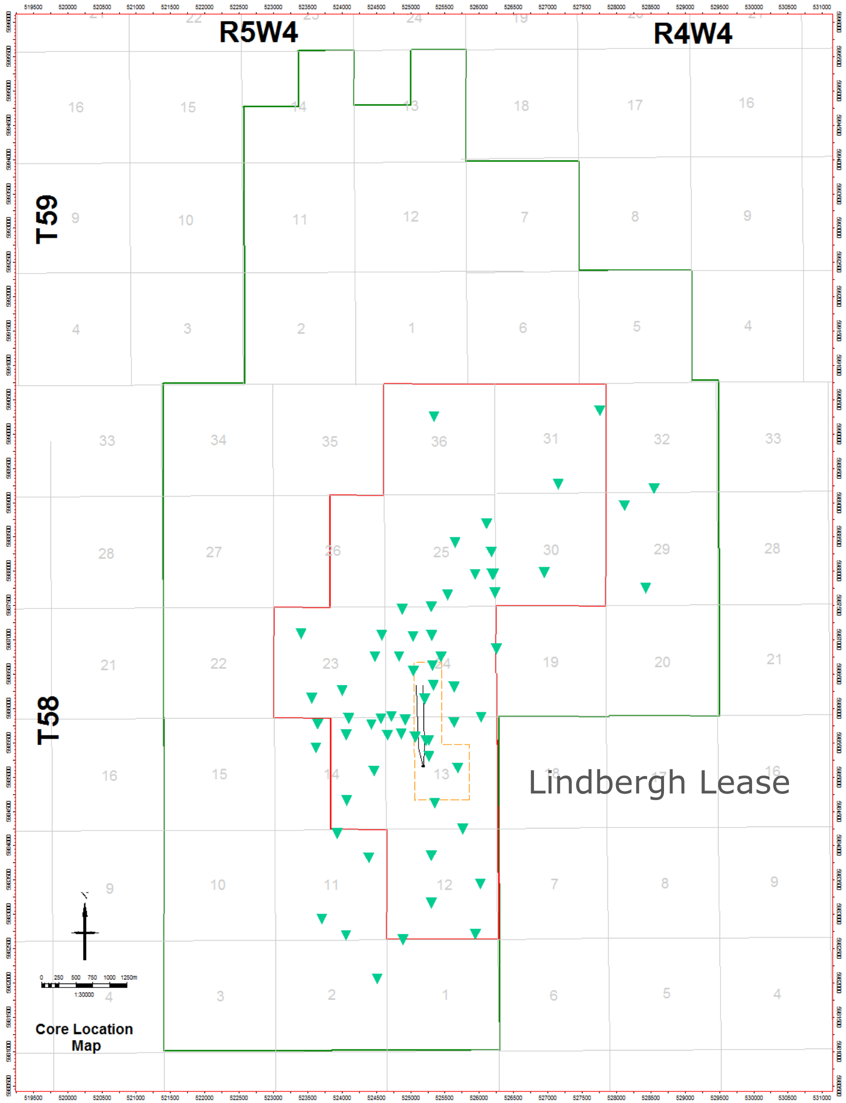


STRUCTURAL TOP AND BOTTOM OF BITUMEN RESERVOIR



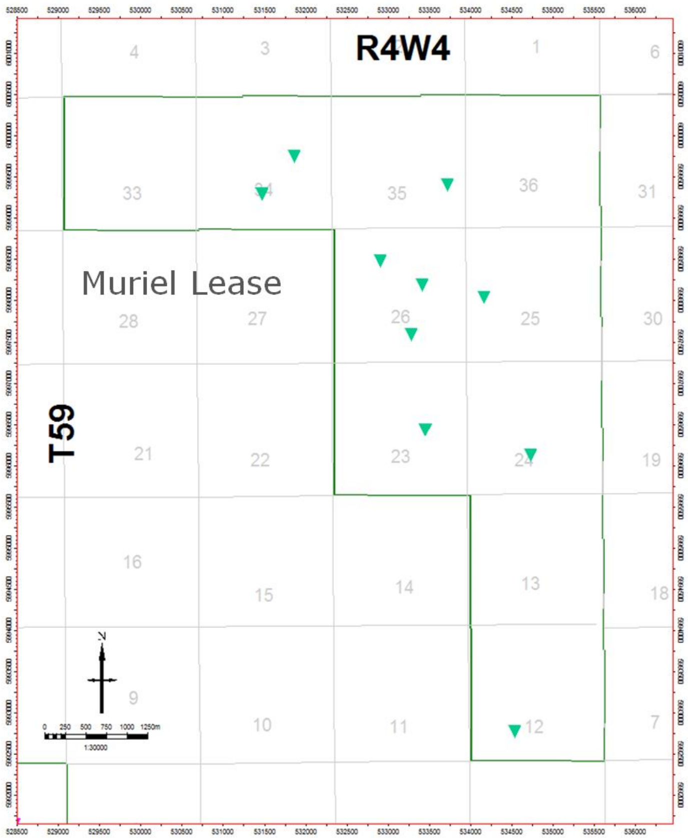


CORED WELLS AND SPECIAL CORE ANALYSIS



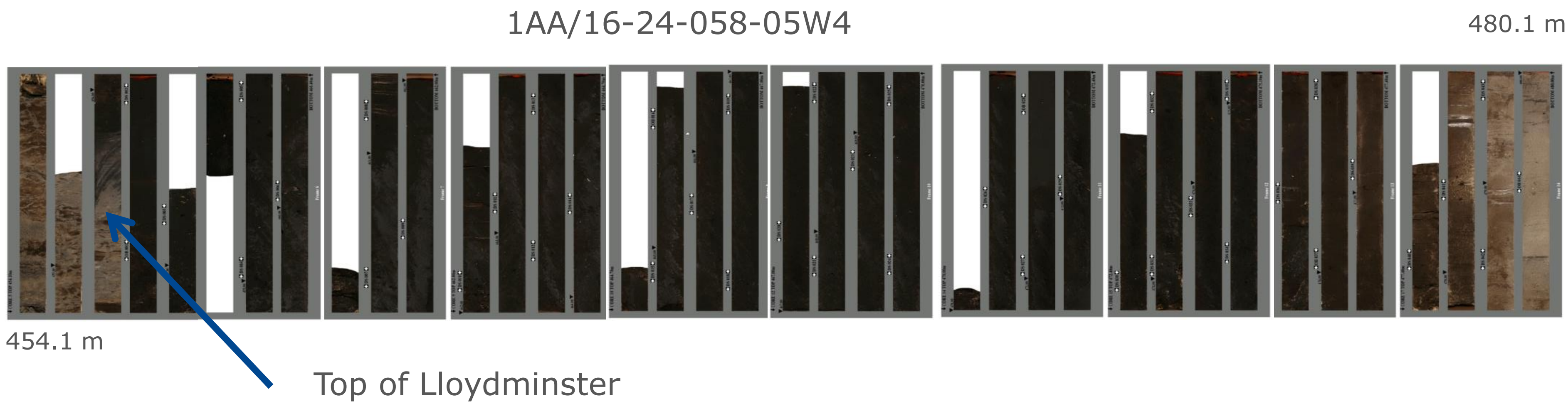
Core analysis typically consists of the following:

- Dean-Stark – 1762 samples
- Small plug Φ, K, Sw, - 2000 samples
- Grain size – 37 wells sampled
- Petrographic, XRD – 25 samples from 12 wells
- Special core analysis – 36 samples from 5 wells



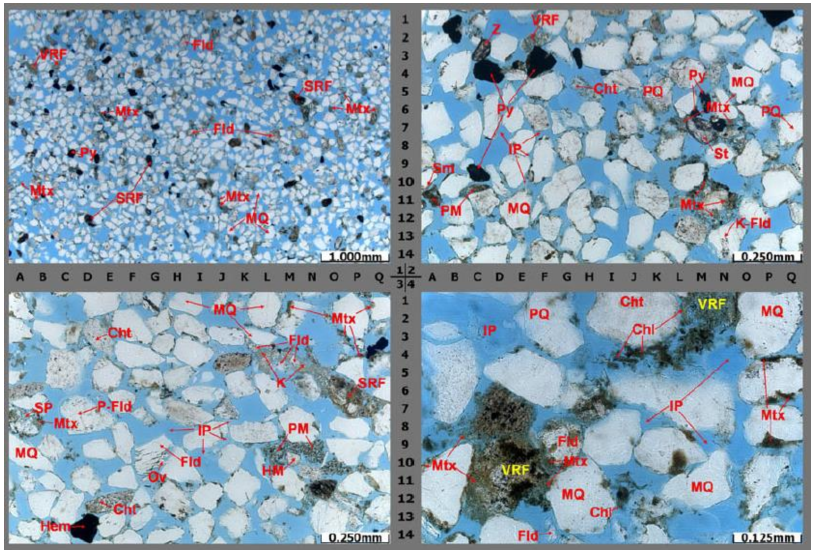
TYPICAL LINDBERGH CORE SAMPLE

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

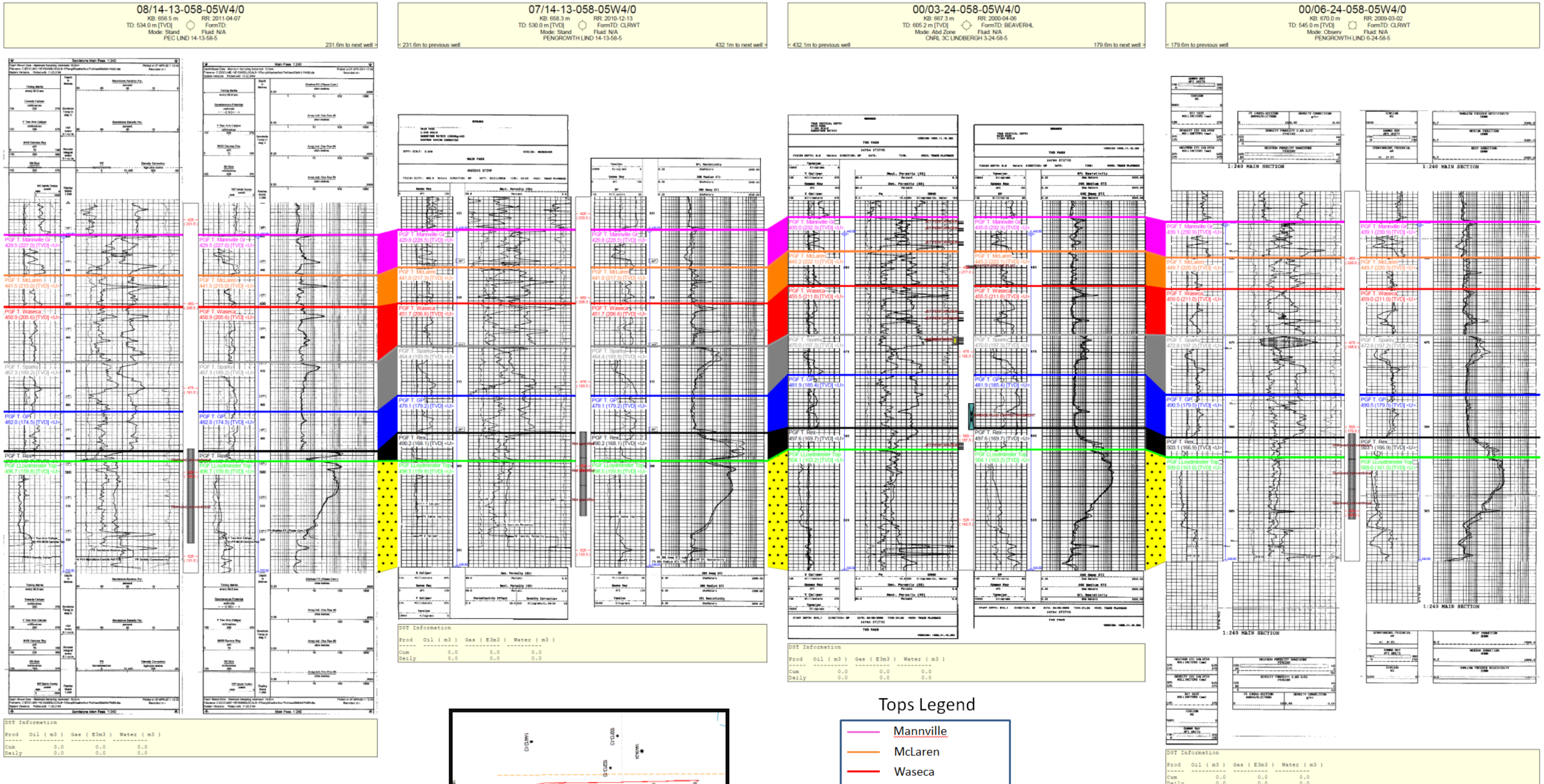


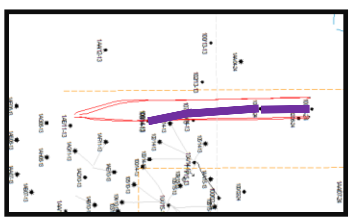
PETROGRAPHIC ANALYSIS

- 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

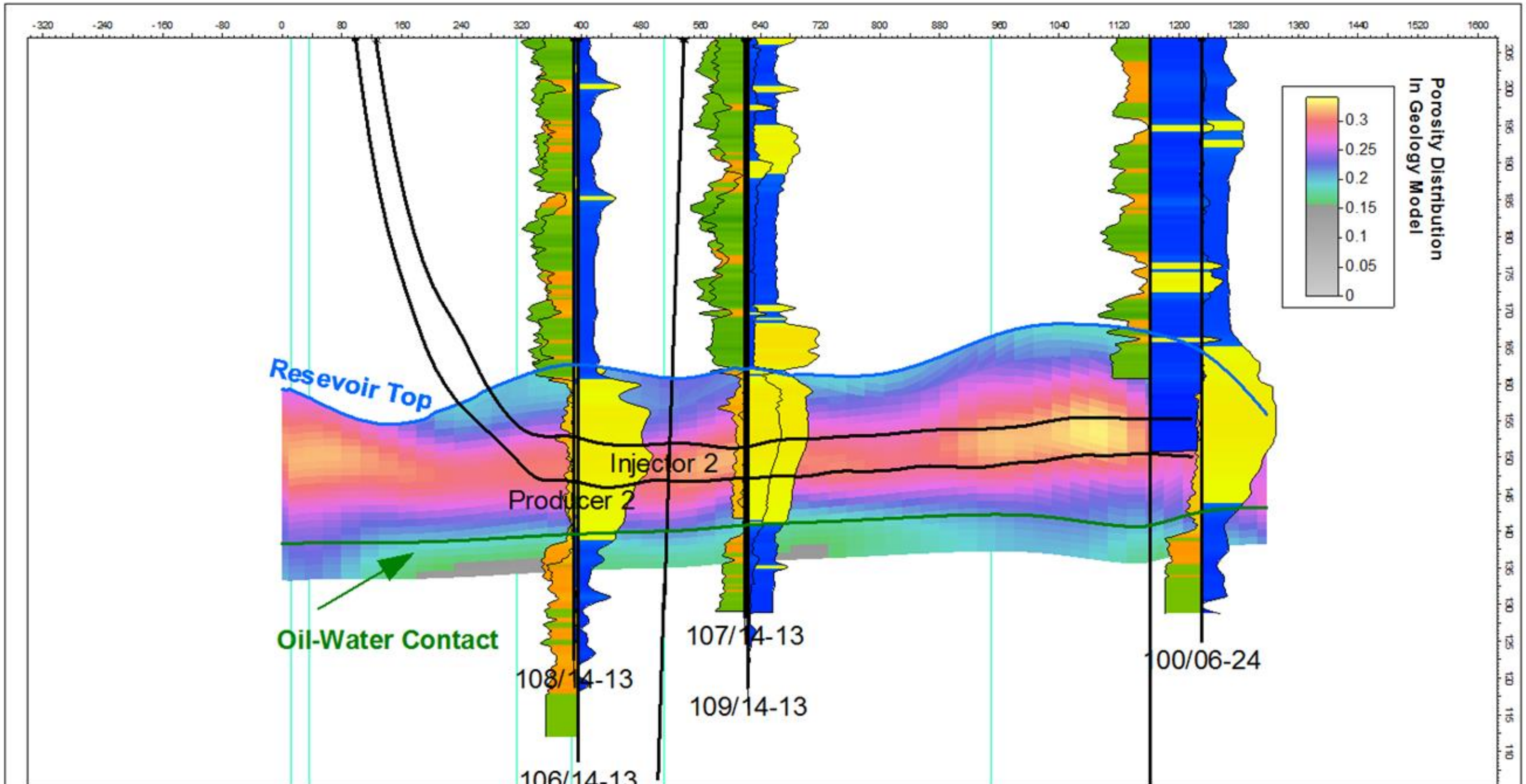


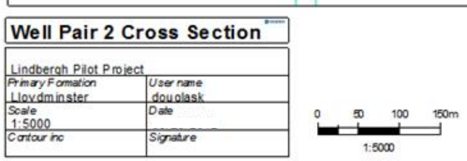


Tops Legend

- Mannville
- McLaren
- Waseca
- Sparky
- General Petroleum
- Rex
- Lloydminster

REPRESENTATIVE MODEL CROSS SECTION THROUGH PROJECT AREA



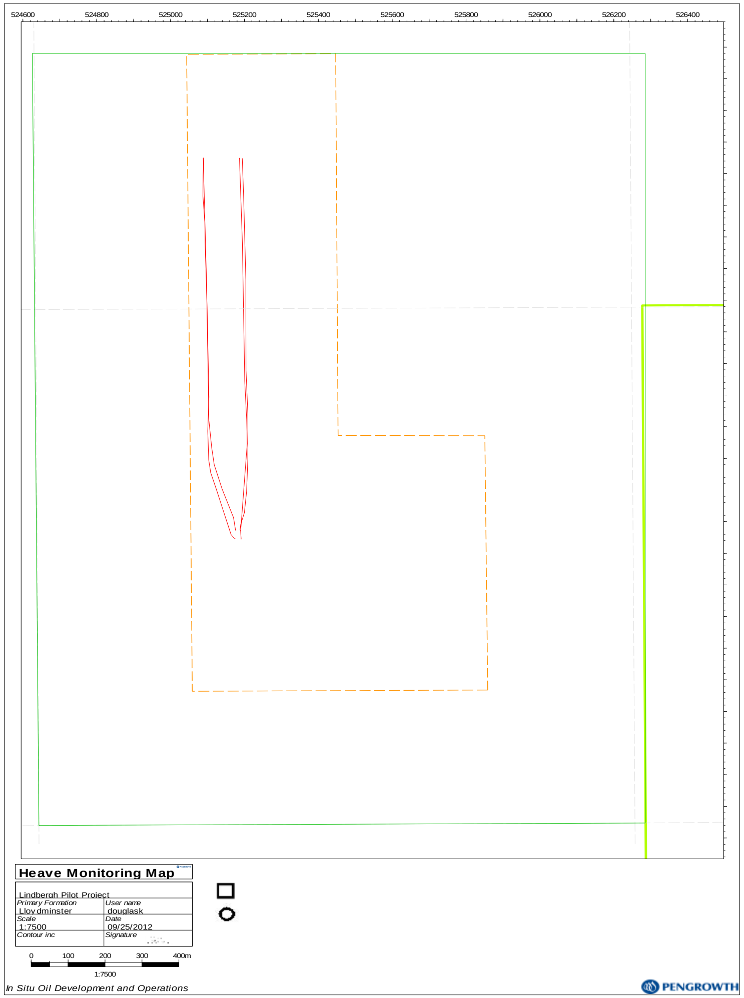


- Producer planned to land 3 m above highest point on oil/water contact (OWC) surface
- LWD measurements indicated OWC rising to the north
- Needed to directionally control drilling to maintain offset from OWC

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 - 0.022	-0.05 - -0.003	0.019 0.002 0.003
	WP02	0.014 0.046 -	0.011 -0.107 -	0.019 0.003 0.0022
Observation 7 (September 2014)	Control	0 0	0 0	0 0
	WP01	- - 0.016	- - 0.008	0.0019 0.0029 0.004
	WP02	0.012 0.044 0	0.021 -0.09 0.001	0.011 0.005 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

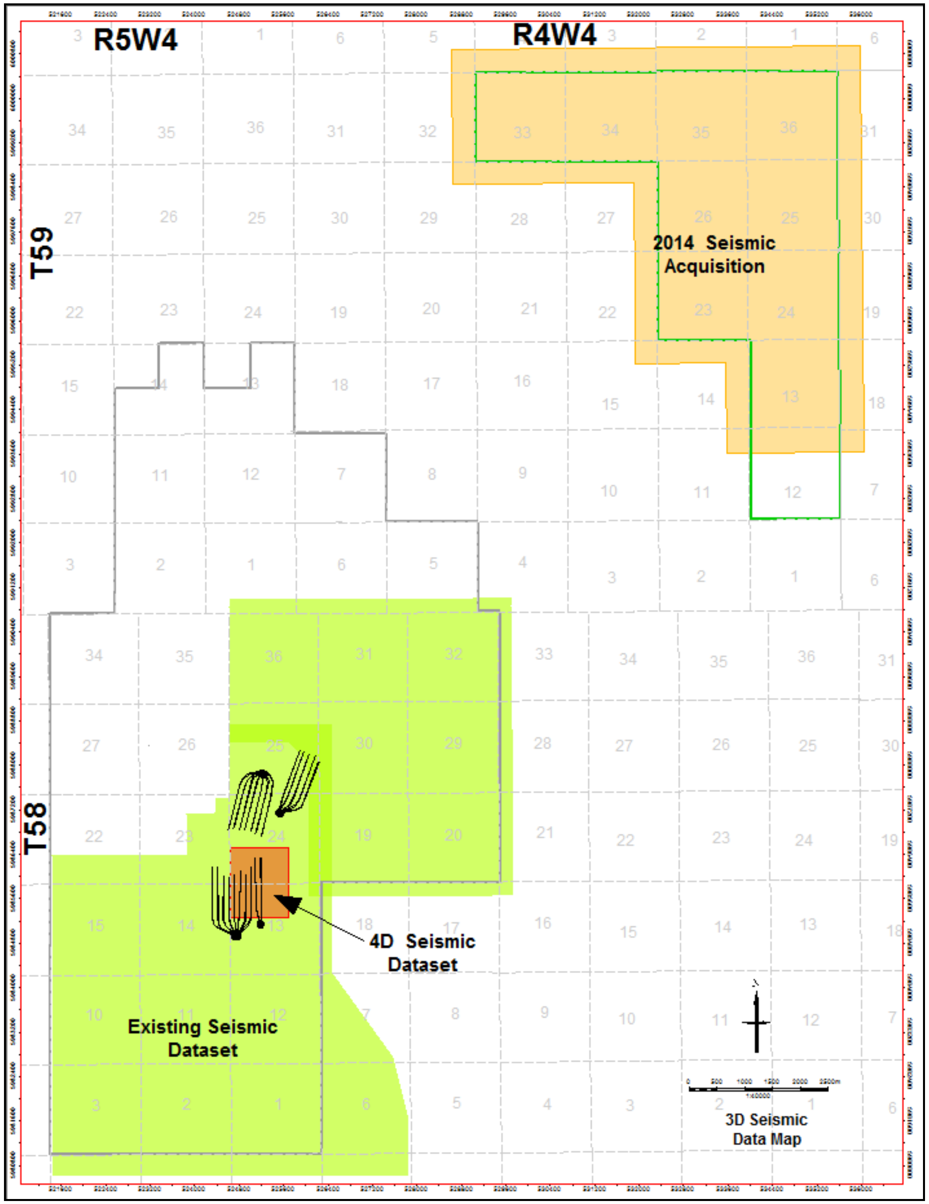
Pengrowth 1AB/13-13-58-05W4M						
Zone	TVD	Min Stress		Vert Stress		Stress Regime
	m	MPa	kPa/m	MPa	kPa/m	
Lloydminster	512.0	5.94	11.60	10.74	20.98	V. frac
GP Zone #1	493.0	7.48	15.17	10.34	20.97	V. frac
GP Zone #2	484.0	7.55	15.60	10.15	20.97	V. frac
GP Zone #3	476.0	6.80	14.29	9.97	20.95	V. Frac

- 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

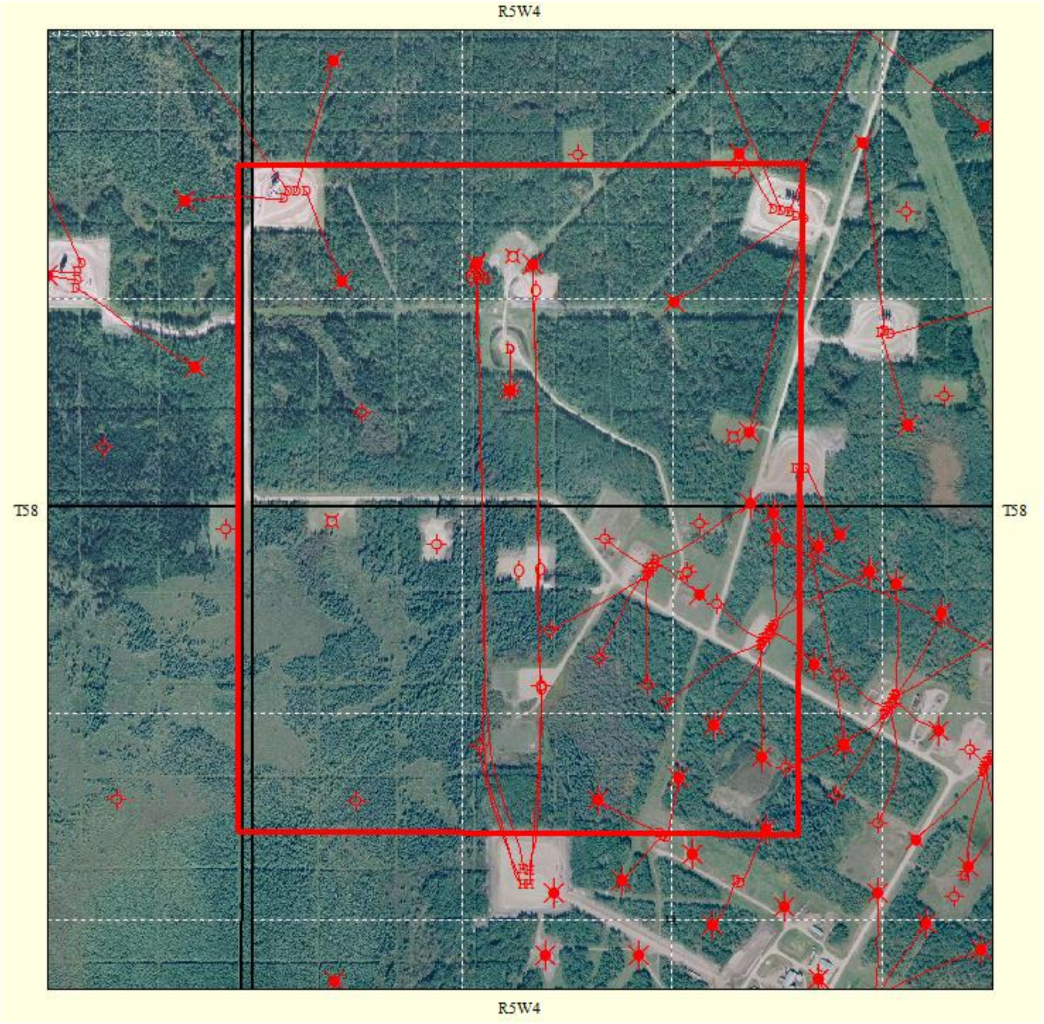
3D SEISMIC DATA COVERAGE

- New 3D seismic data acquired on Muriel Lake Lease in 2014
- New baseline 3D acquisition planned over well pads 2, 3 and 5 in 2017. This updated 3D will be used for 4D monitoring over future SAGD wellpairs in an old CSS area.
- 3D data now exists on most of the lease with exploitable resource



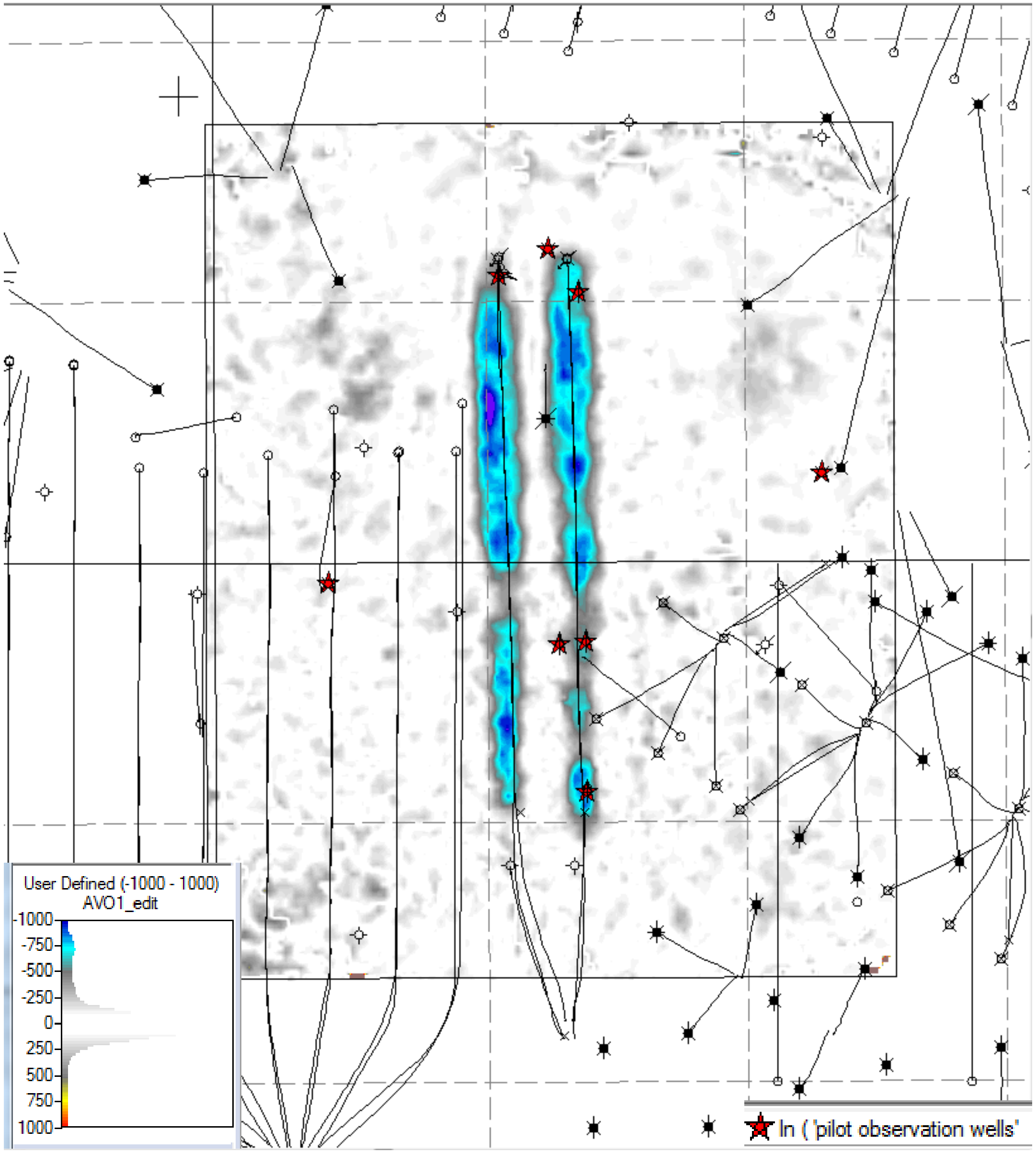
4D SEISMIC

- 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
  - First repeat survey in 2-3 years
- 1.32 sq km Monitor Survey acquired Dec 2013
  - Same acquisition parameters as baseline survey
- Area will be resurveyed in 2017



4D SEISMIC

- Time slice from the P impedance difference volume at 150m asl, approximately at injector/producer level
- Shows lower P impedance due to effects of steaming/methane

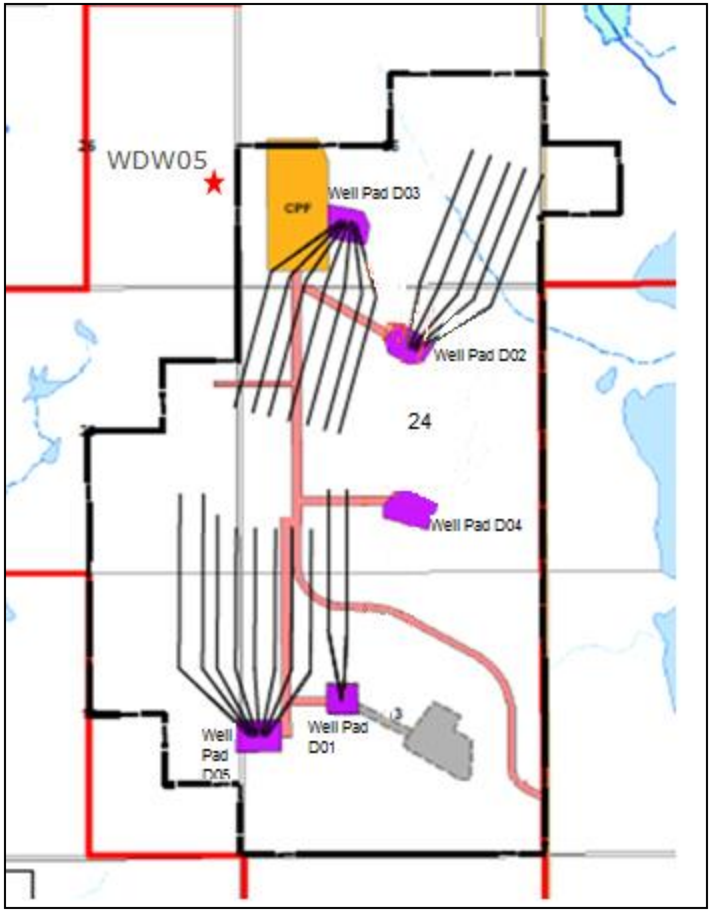


DRILLING AND COMPLETIONS

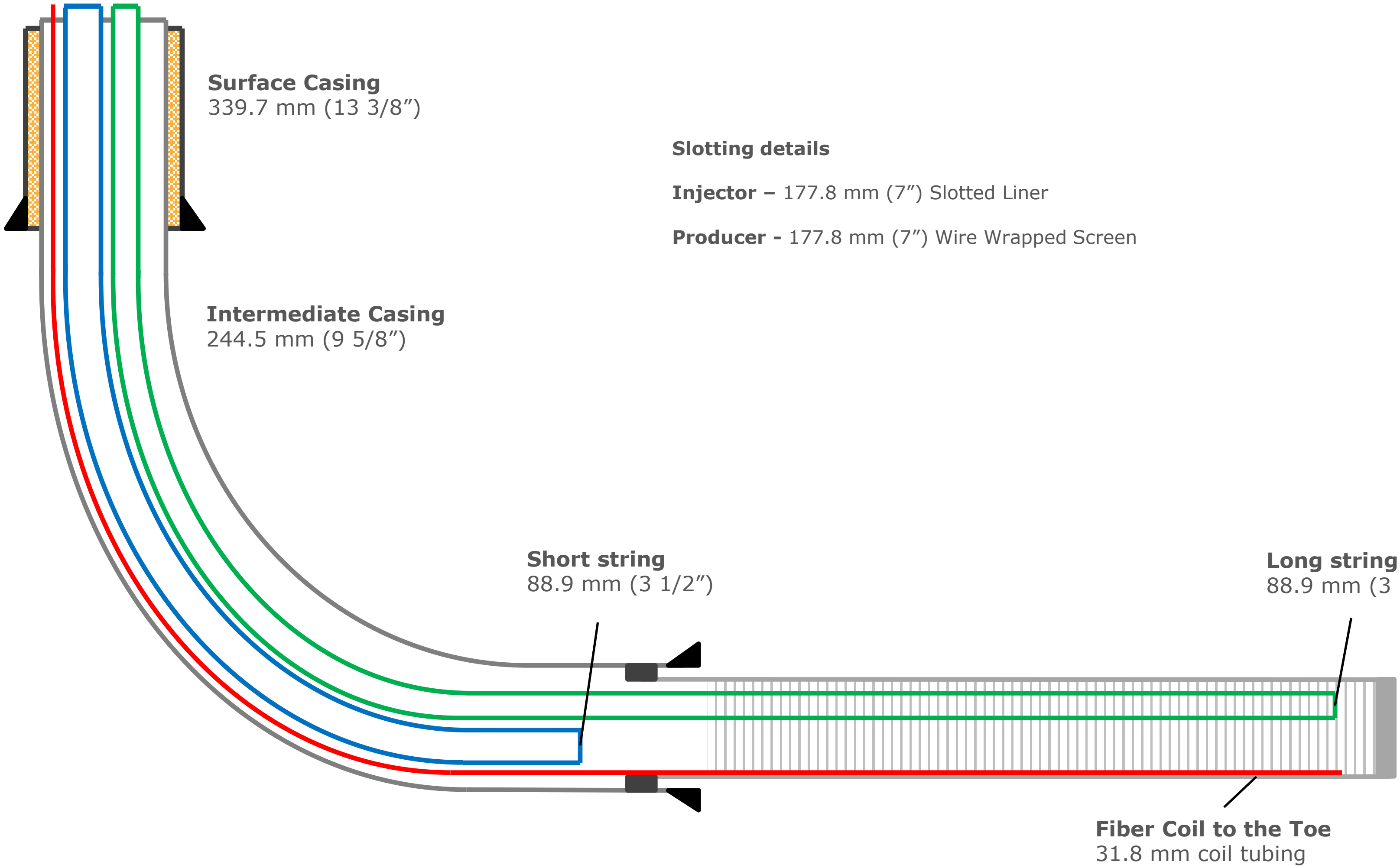
PENGROWTH

COMMERCIAL DRILLING & COMPLETIONS

- Artificial lift installed in 20 commercial well pairs on 3 Pads
  - Conversion from circulation to typical SAGD operations
  - Installed first ESP in March 2015; completed all wells by June 2015



TYPICAL CIRCULATION COMPLETION



Slotting details

Injector – 177.8 mm (7") Slotted Liner

Producer - 177.8 mm (7") Wire Wrapped Screen

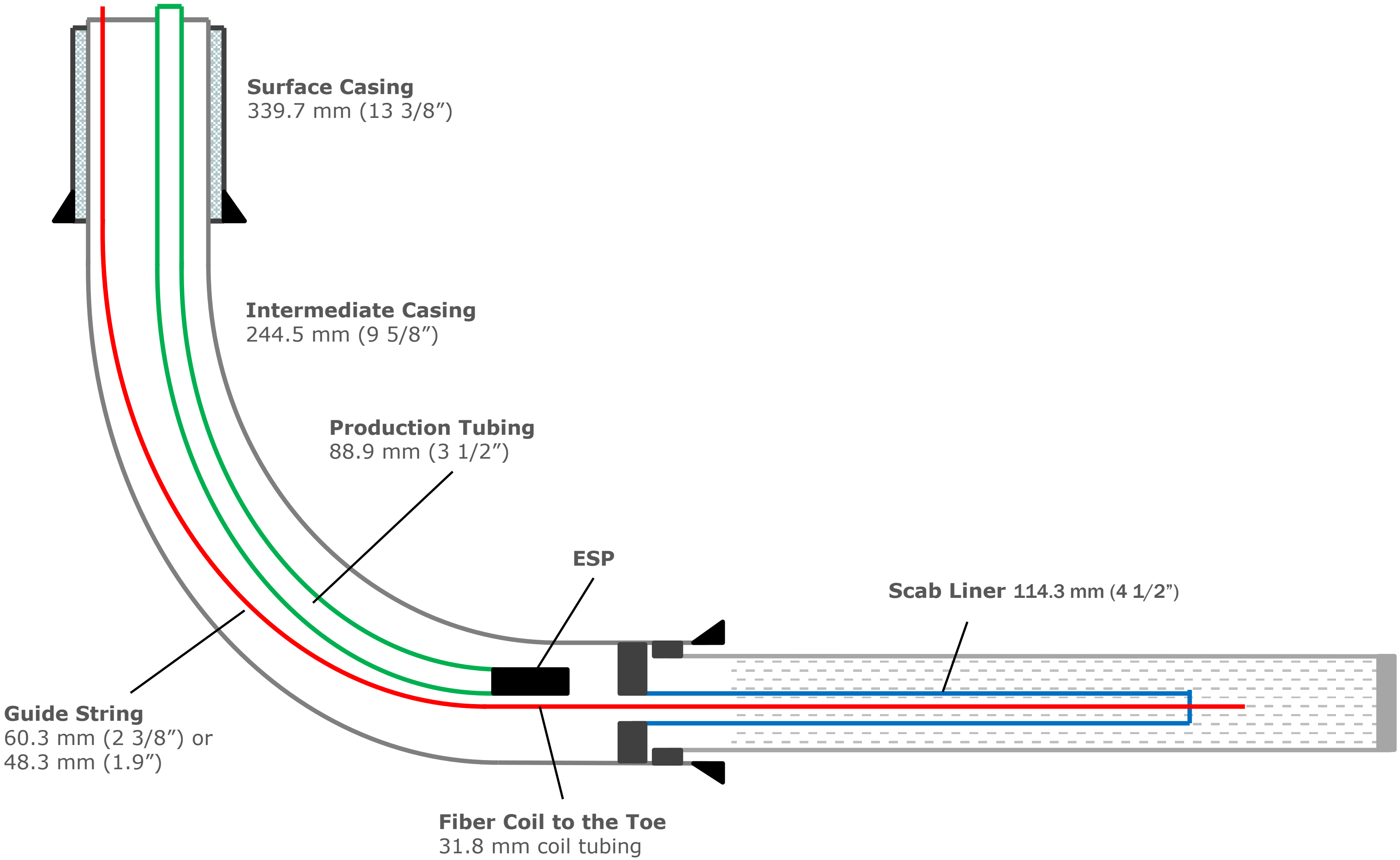
LINER DESIGN

- 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 device
  - Liner deployed system installed across D05-P08 to test its performance with thinner pay and bottom water
  - Application of ICD system 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



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 50-75% of the lateral length to aid in toe development early in SAGD production and mitigate flow breakthrough at the heel
- 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

COMPLETION CHANGES

Well Name	Well Type	UWI	Steam Splitter(s) Installed	Shifted Open	Shifted Closed
D03-J03	Injector	103122405805W40	1		
D03-J04	Injector	104122405805W40	1	Nov-15	
D03-J05	Injector	105122405805W40	2		
D03-J06	Injector	106122405805W40	1	Nov-15	Sep-16
D03-J07	Injector	102092305805W40	1		
D05-J03	Injector	109012305805W40	1	Nov-15	
D05-J04	Injector	110012305805W40	1		
D05-J06	Injector	107042405805W40	1	Nov-15	
D02-J04	Injector	106082505805W40	1		
D02-J06	Injector	108082505805W40	1		
D02-J07	Injector	109082505805W42	1		

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	
D03-P01	Producer	103112405805W40	Y	1	
D03-P02	Producer	102112405805W40	Y	1	
D03-P03	Producer	107122405805W40	Y	1	
D03-P04	Producer	102122405805W40	Y	1	
D03-P05	Producer	108122405805W40	Y	1	
D03-P06	Producer	109122405805W40	Y	1	
D03-P07	Producer	103092305805W40	Y	1	Jul-16
D05-P01	Producer	104012305805W42	Y	1	
D05-P02	Producer	105012305805W40	Y	1	
D05-P03	Producer	106012305805W40	Y	2	
D05-P04	Producer	103012305805W40	Y	1	
D05-P05	Producer	102042405805W40	Y	1	
D05-P06	Producer	103042405805W40	Y	1	
D05-P07	Producer	104042405805W40	Y	1	Apr-16
D05-P08	Producer	105042405805W40	N	Liner-conveyed ICD	
D02-P04	Producer	102082505805W40	Y	1	
D02-P05	Producer	100082505805W40	Y	1	
D02-P06	Producer	103082505805W40	Y	1	Oct-16
D02-P07	Producer	104082505805W40	Y	1	
D02-P08	Producer	105082505805W42	Y	1	Jun-16

COMMERCIAL ARTIFICIAL LIFT

- Required to convert from circulation to typical SAGD operations
- All wells utilize high temperature ESP's (22)
  - 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
- Expected to see longer run life as plant operations stabilize
  - Initial pump installs following conversion were put through a high number of start/stop cycles during the end of commissioning
- Current Lindbergh MTTF ~ 764 days (based on 19 months of data)

DRILLING SCHEDULE

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

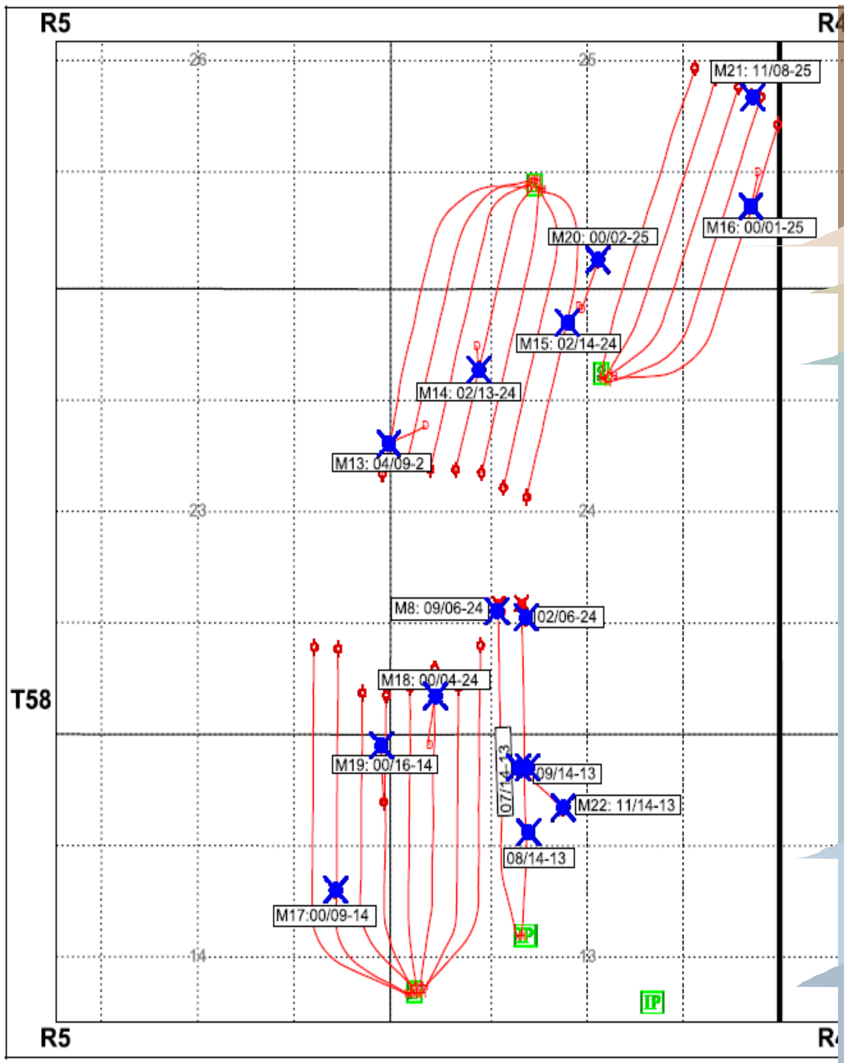
- Pad D02
  - Two new wellpairs (2017)
- Pad D01
  - One new wellpair (2017)
  - Two new infill wells (2017)
    - Pending regulatory approval
- Pad D04
  - Four new wellpairs (2017)
    - One wellpair will be drilled south into section 13 as per approval 6410K

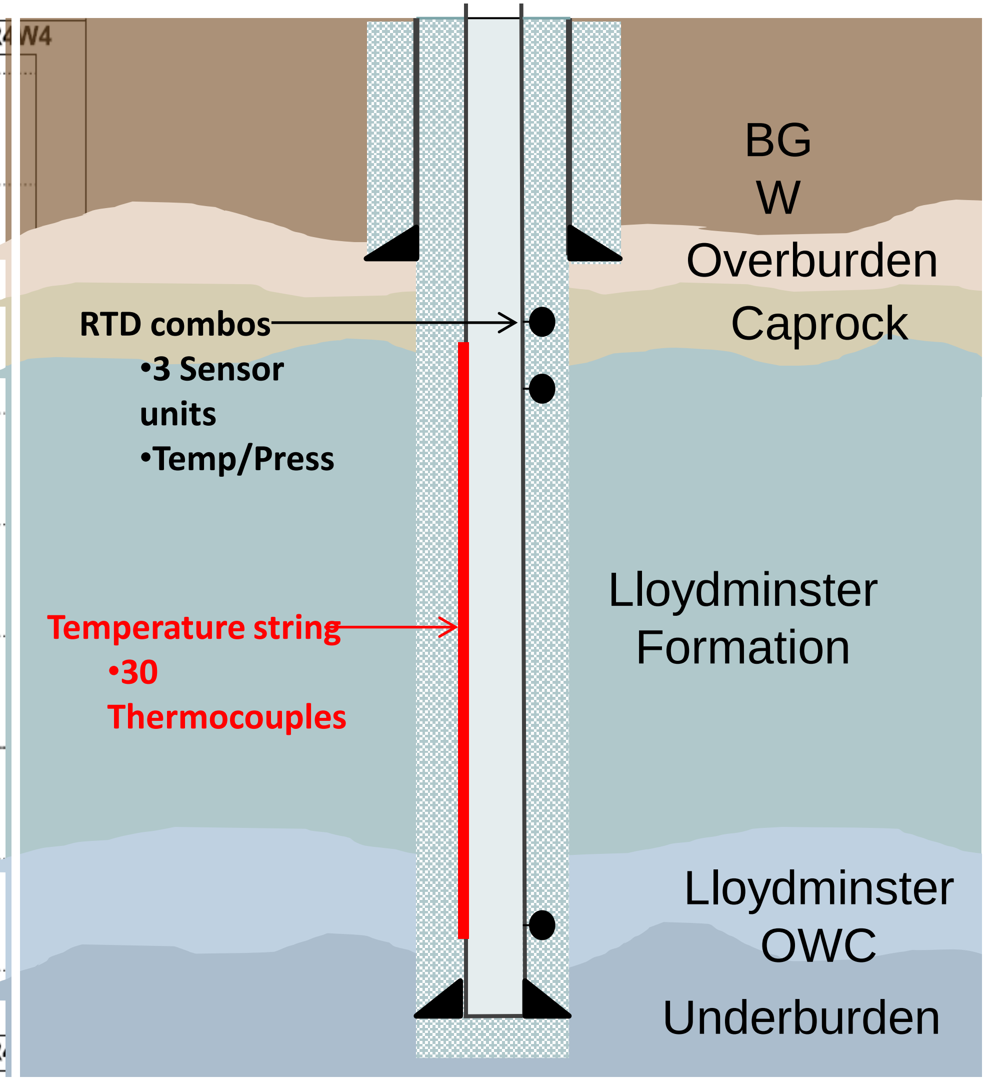
INSTRUMENTATION

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

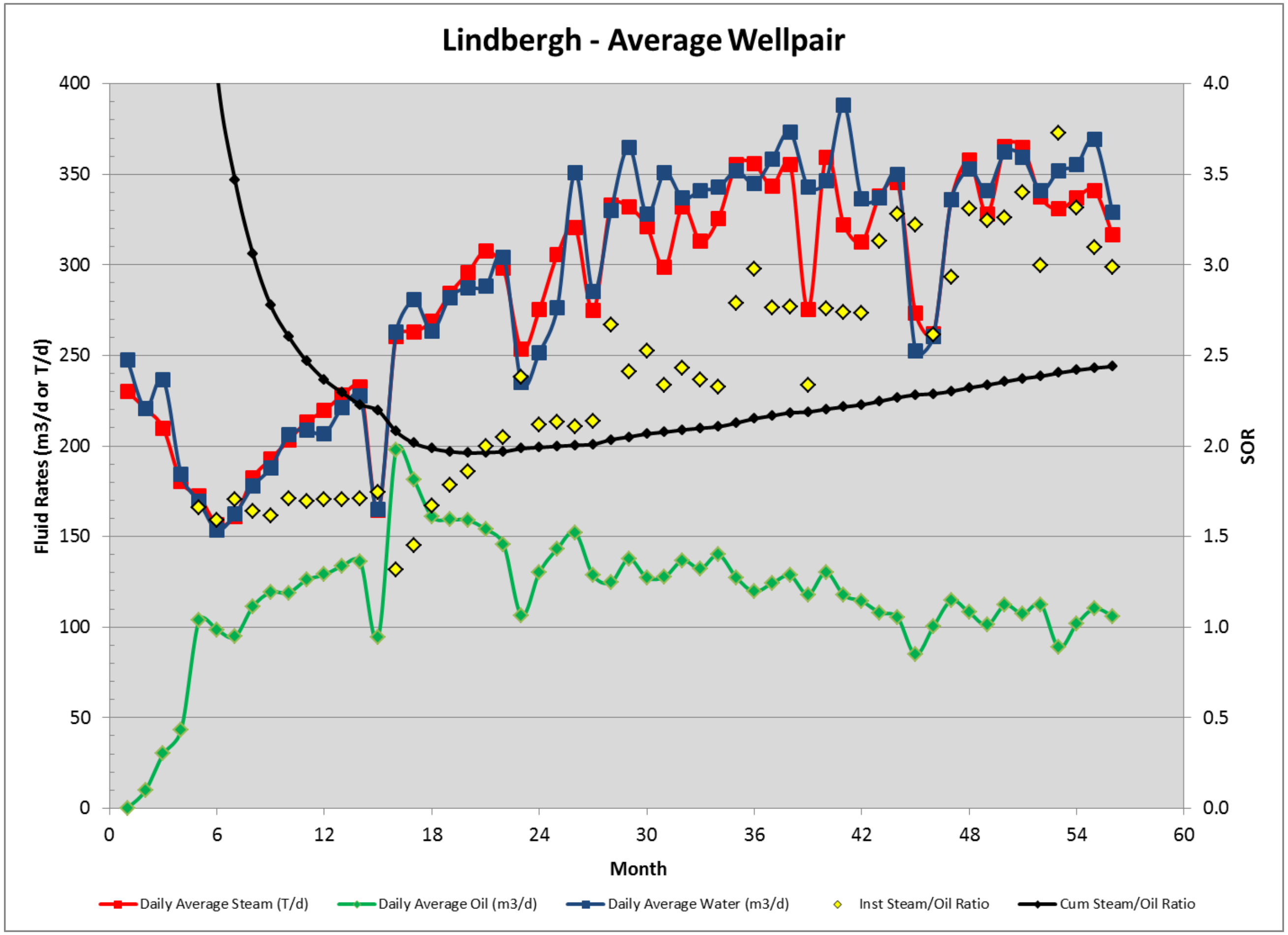
SCHEME PERFORMANCE

SAGD SUMMARY

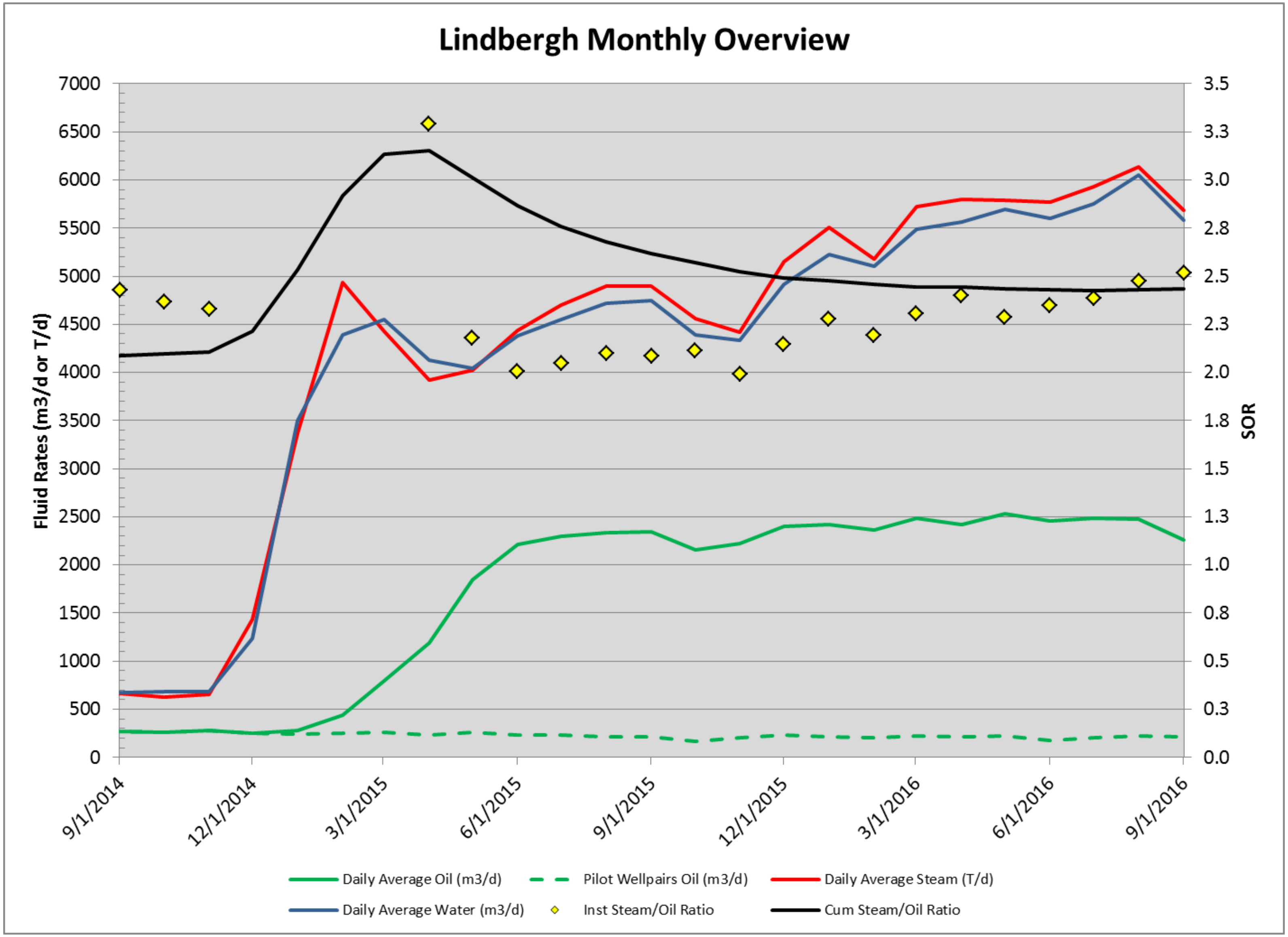
- Lindbergh CPF commissioning completed December 2014
- Circulation Learnings
  - Slightly higher differential pressure required than needed with pilot wellpairs to induce communication (125 kPa vs 50 kPa)
  - Solvent soak had no significant impact on circulation
  - Lower wellpair landing depth increased steam loss initially and increased sensitivity bottom hole pressure variation
- Pad D03; seven well pairs had first steam December 15th, 2014
  - ~Ave 3.2 months of circulation
- Pad D05; eight well pairs had first steam January 10th, 2015
  - ~3.3 months of circulation
- Pad D02; five well pairs had first steam January 29th, 2015
  - ~Ave 3.6 months of circulation
    - Service rig equipment failure while on first wellpair SAGD conversion resulted in delay to SAGD

PREDICTING COMMERCIAL SCHEME PERFORMANCE

- Analogues
  - Pilot well pairs
- Simulations
  - CSS historical match
  - SAGD modeling
- One of the purposes of the Lindbergh pilot was to establish a baseline for predicting commercial performance

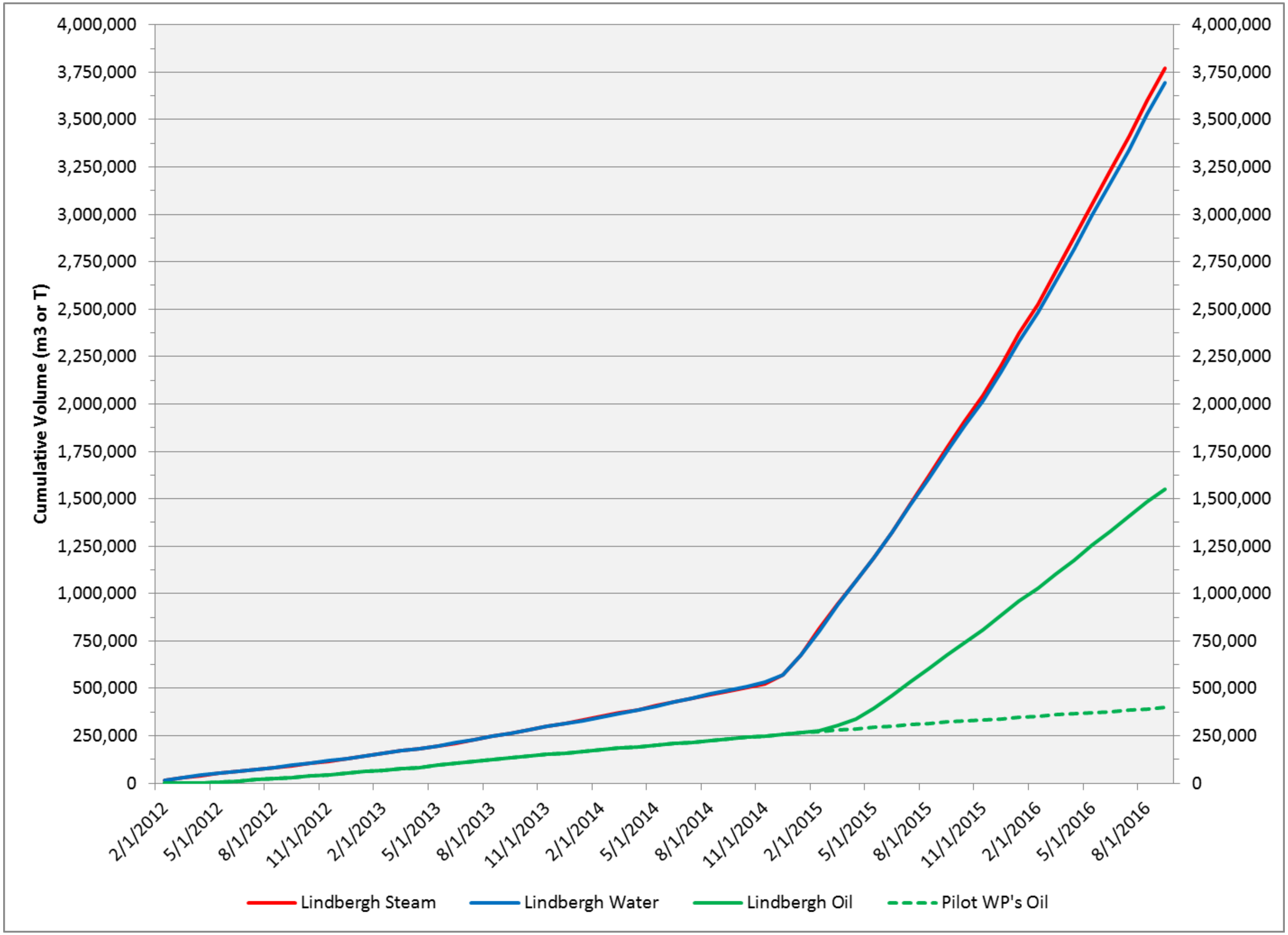


LINDBERGH PERFORMANCE



PENGROWTH

CUMULATIVE VOLUMES



PAD RECOVERIES

OBIP - Recovery and % recovery by pad

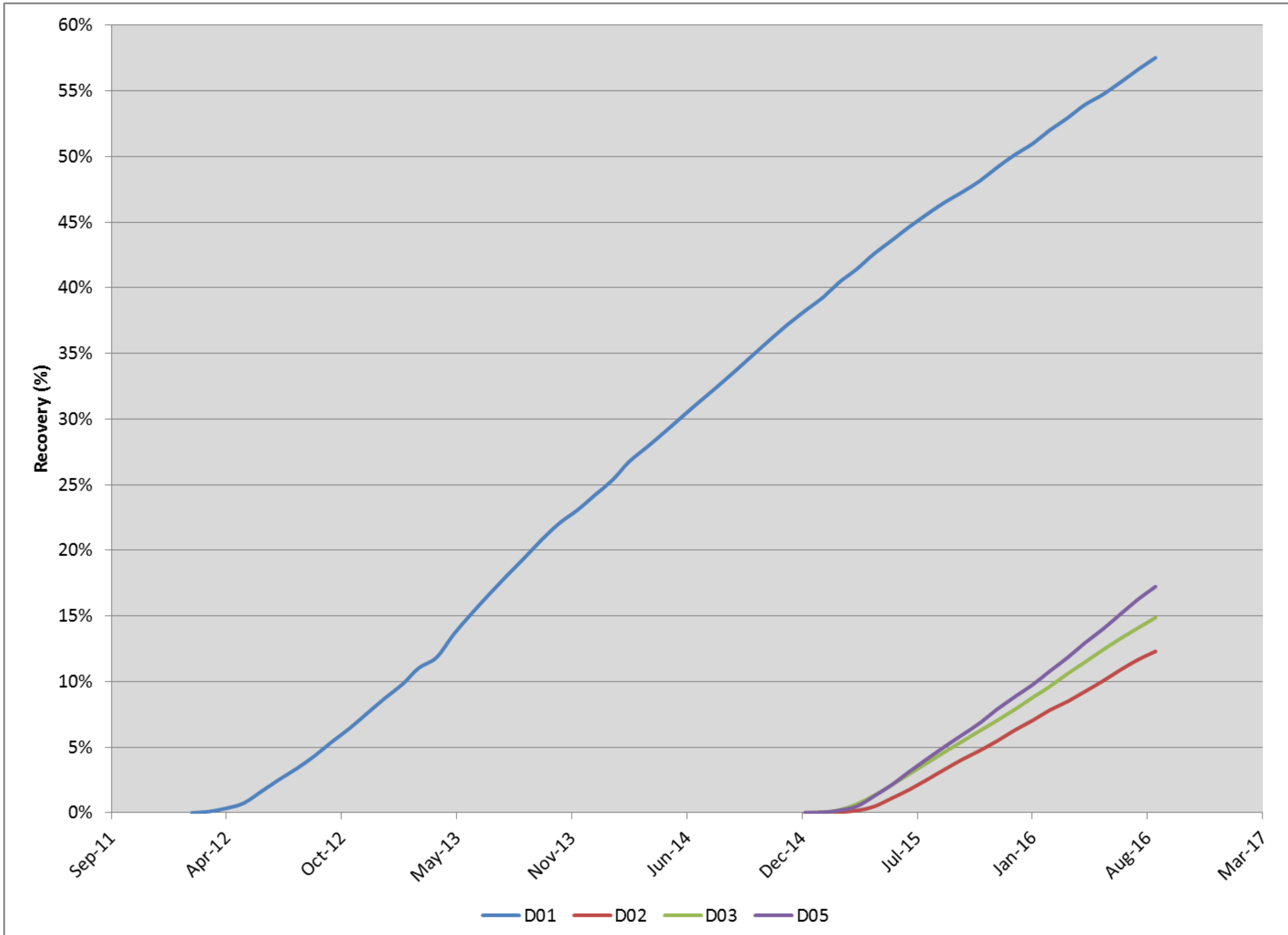
	Thickness	Length*	Spacing	Ave ϕ	Ave So	OBIP	Recovery**	Recovery
Pad	(m)	(m)	(m)	(%)	(%)	(e3m3)	(e3m3)	**(%)**
D01	21.1	900	100	35	74	993.5	398	**40**
D02	20.0	817	100	35	78	2,265	246	**10.9**
D03	18.4	788	100	36	80	2,981	400	**13.4**
D05	17.7	800	100	38	78	3,366	507	**15.1**

Developed BIP - Recovery and % recovery by pad

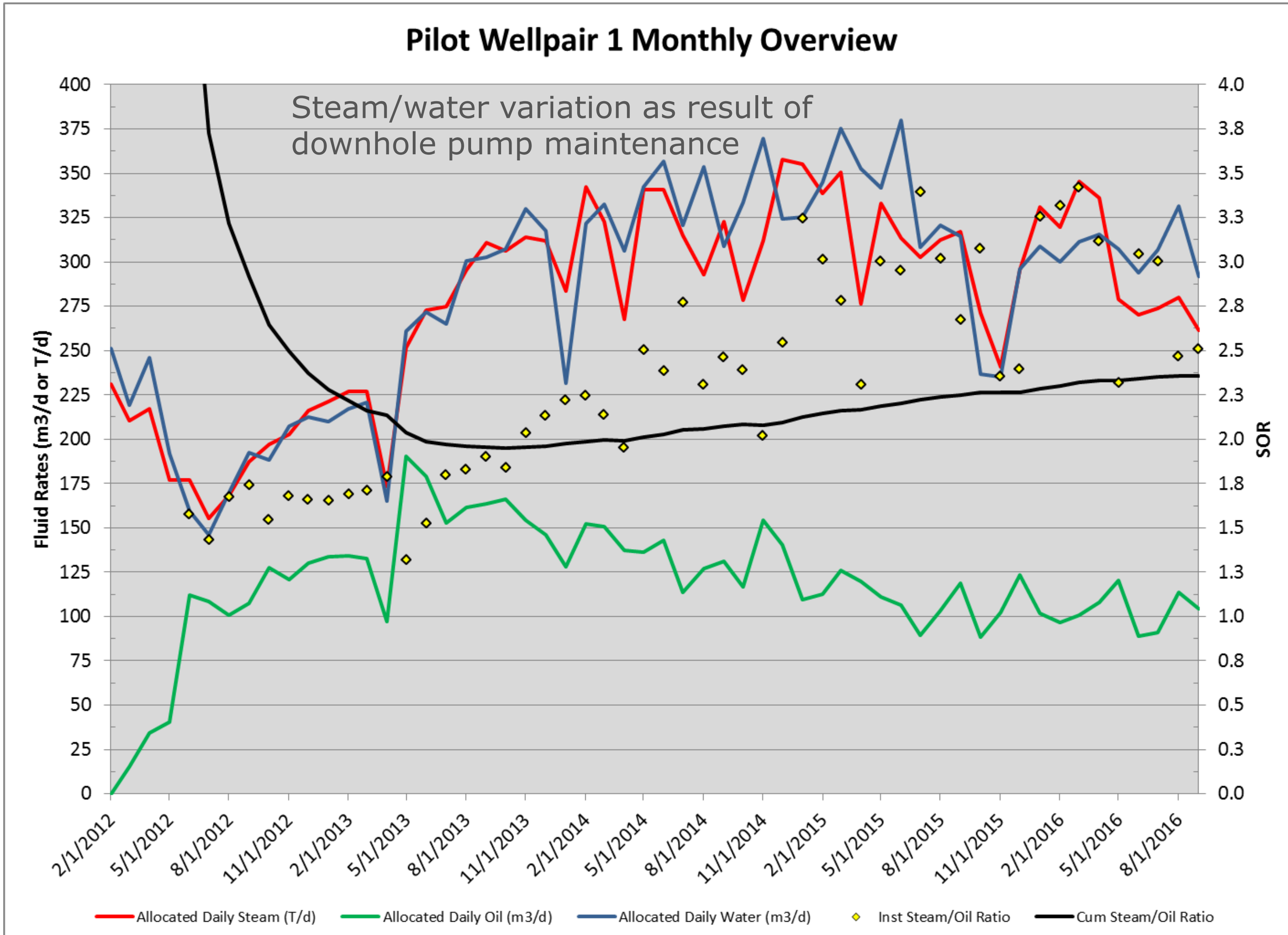
	Thickness	Length *	Spacing	Ave ϕ	Ave So	DBIP	Recovery**	Recovery	EUR
Pad	(m)	(m)	(m)	(%)	(%)	(e3m3)	(e3m3)	**(%)**	(%)
D01	15.3	872.5	100	35	74	692	398	**57.5**	74
D02	17.5	817	100	35	79	1,999	246	**12.3**	70
D03	15.9	788	100	35	83	2,563	400	**15.6**	70
D05	15.2	800	100	37	80	2,940	507	**17.2**	70

*Length is average slotted length plus 25 meters per end (50 m total)
**Recovery to Oct 1 2016

LINDBERGH DEVELOPED RECOVERY



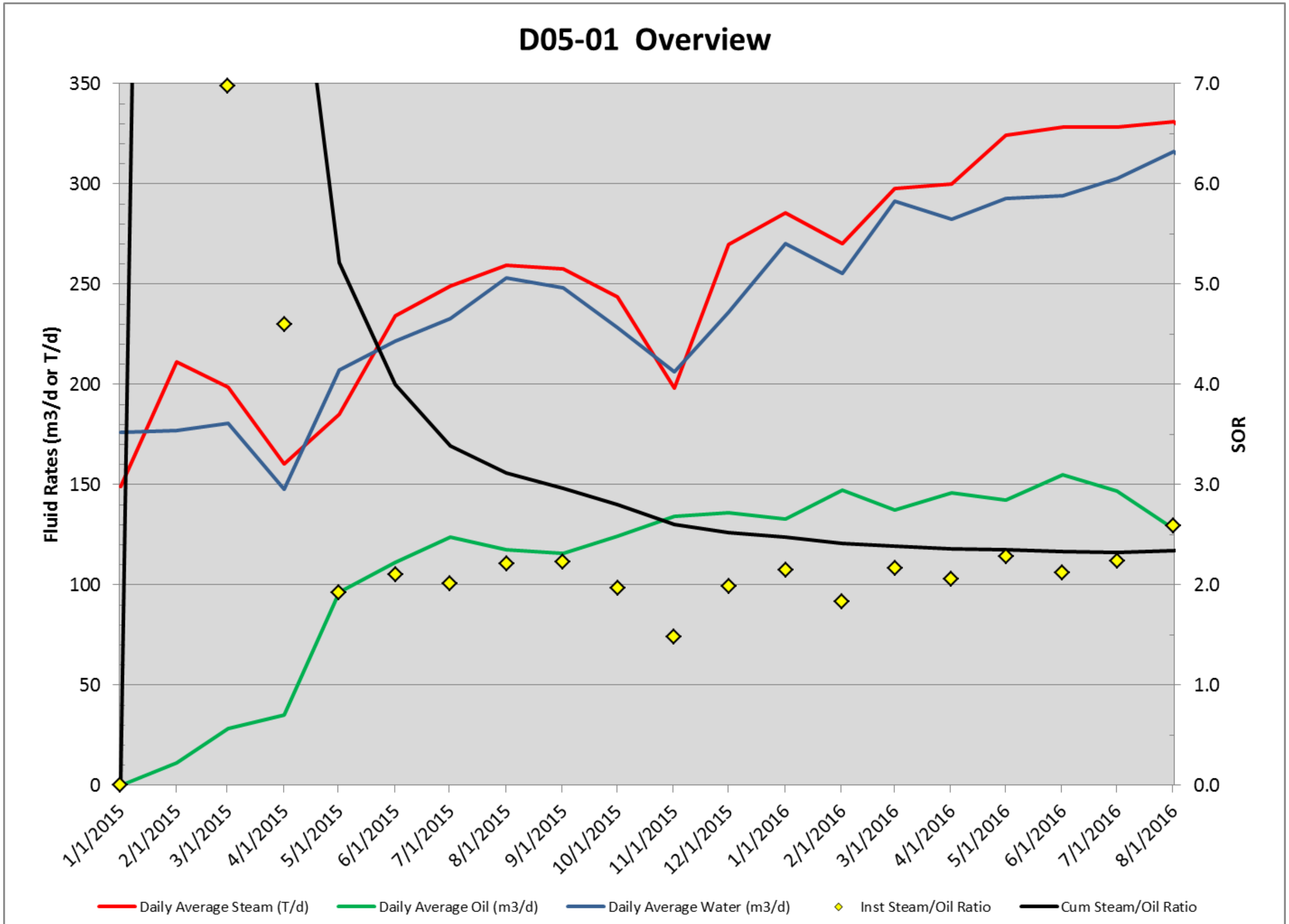
PILOT PERFORMANCE



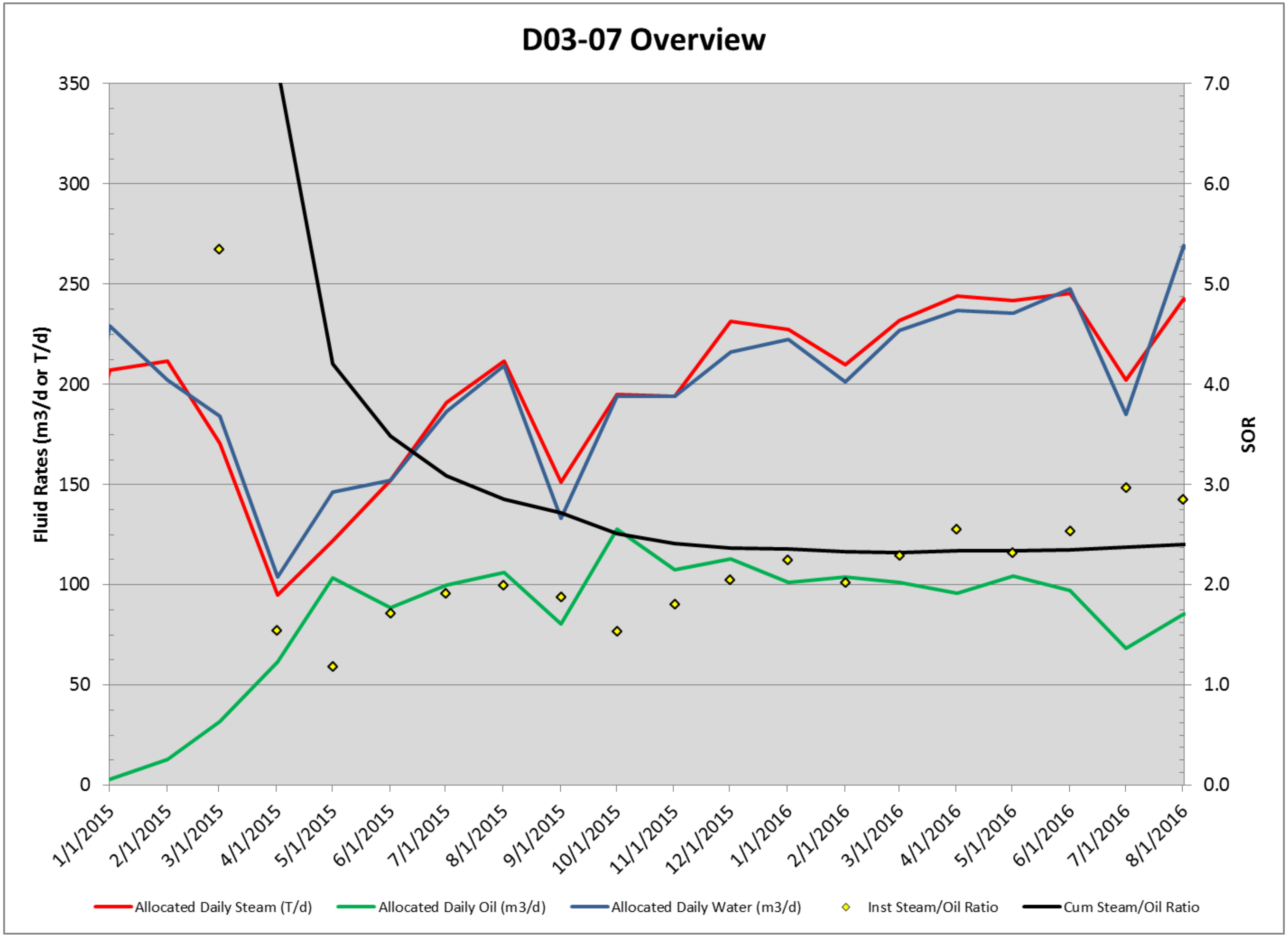
TSX:PGF NYSE:PGH

PENGROWTH

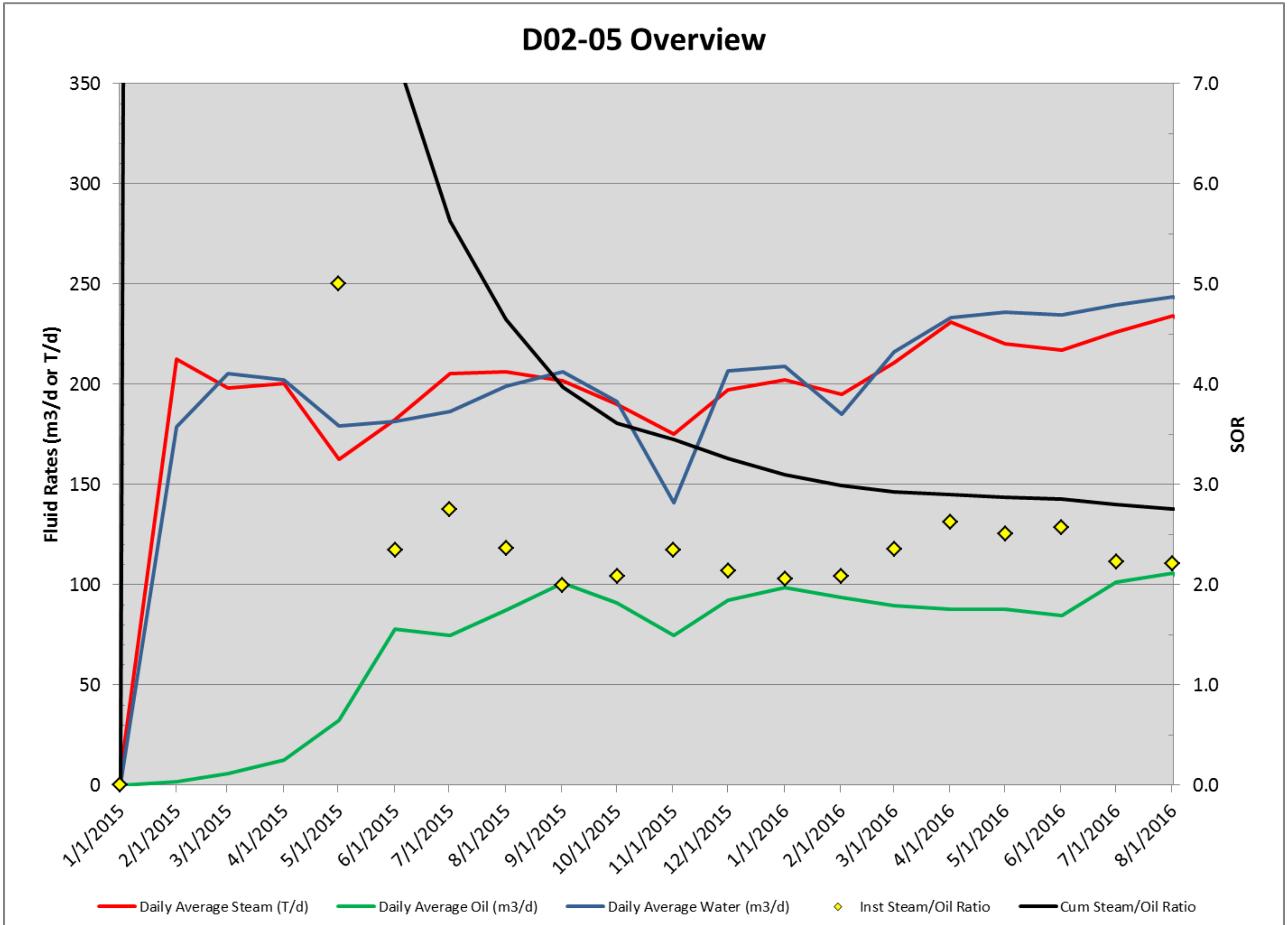
PHASE 1 HIGH PERFORMER



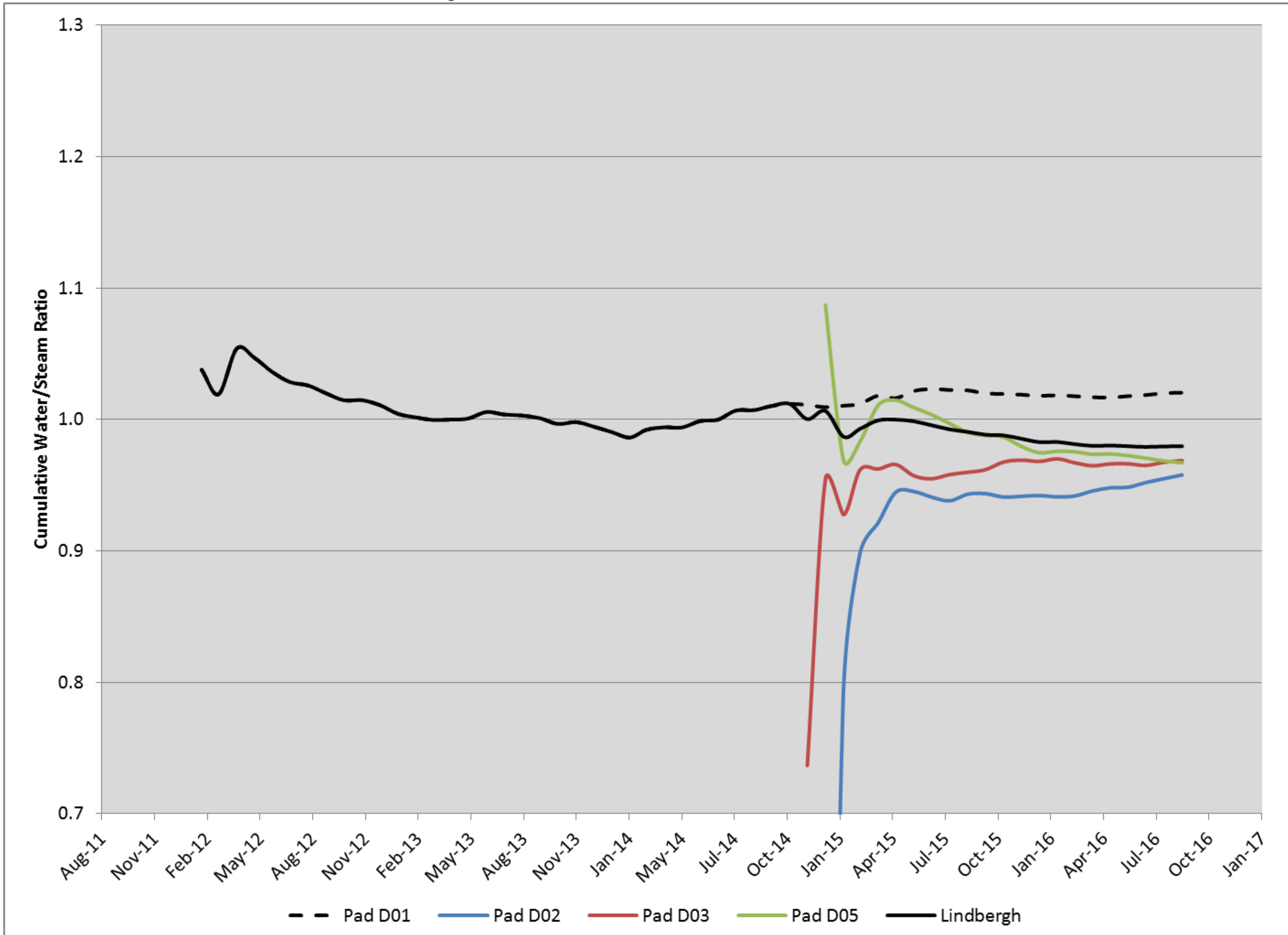
PHASE 1 MEDIUM PERFORMER



PHASE 1 POOR PERFORMER

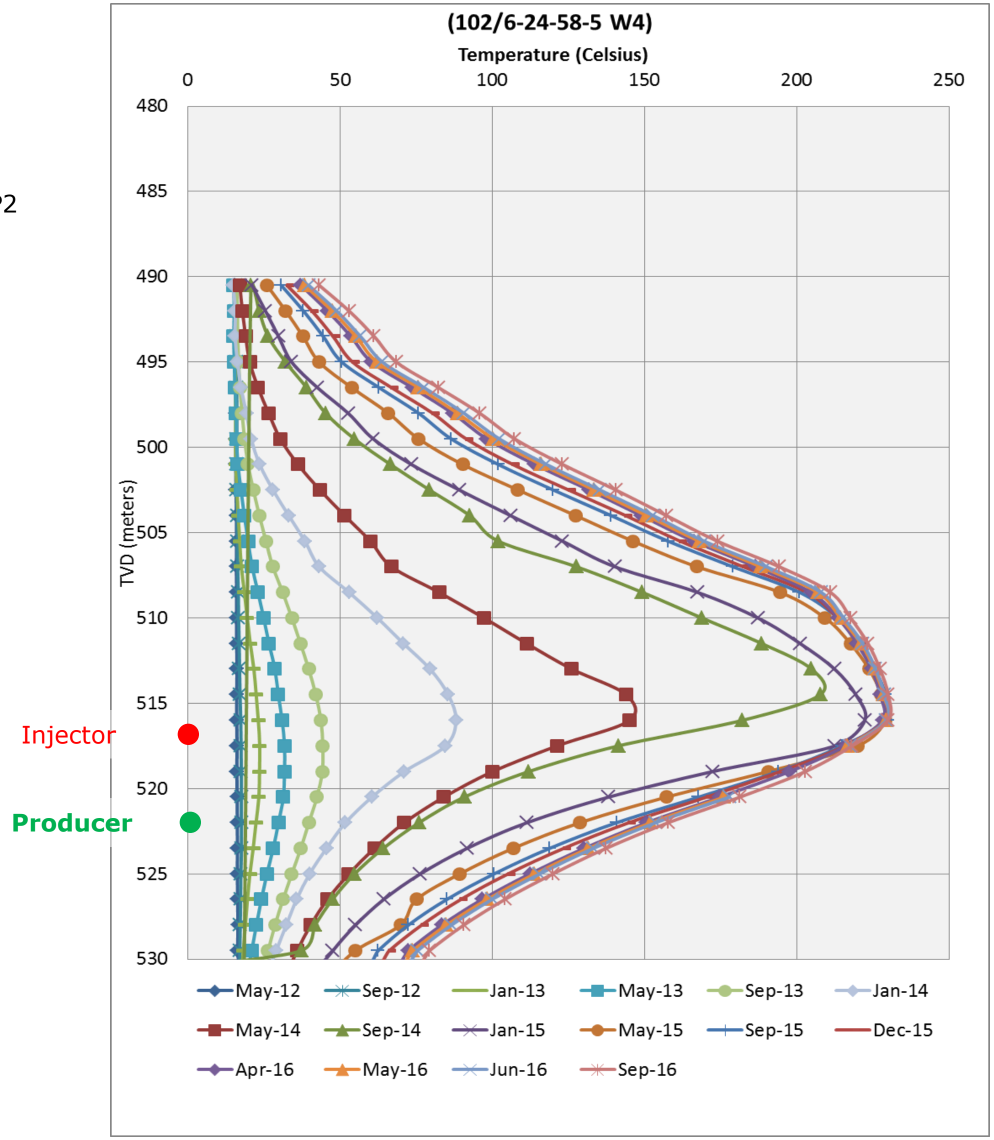


CUMULATIVE WATER/STEAM RATIO

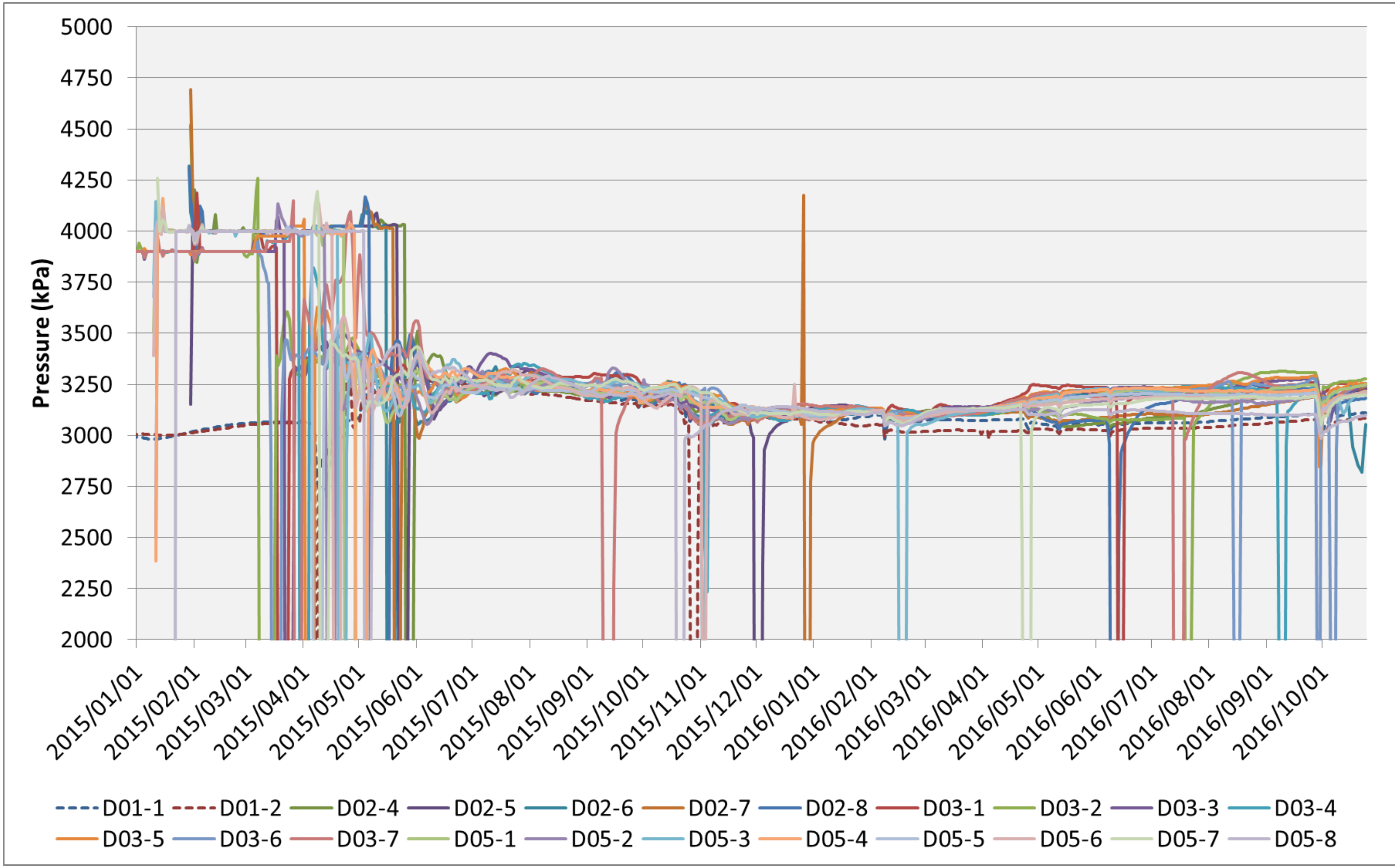


D01-02 OBSERVATION WELL EXAMPLE

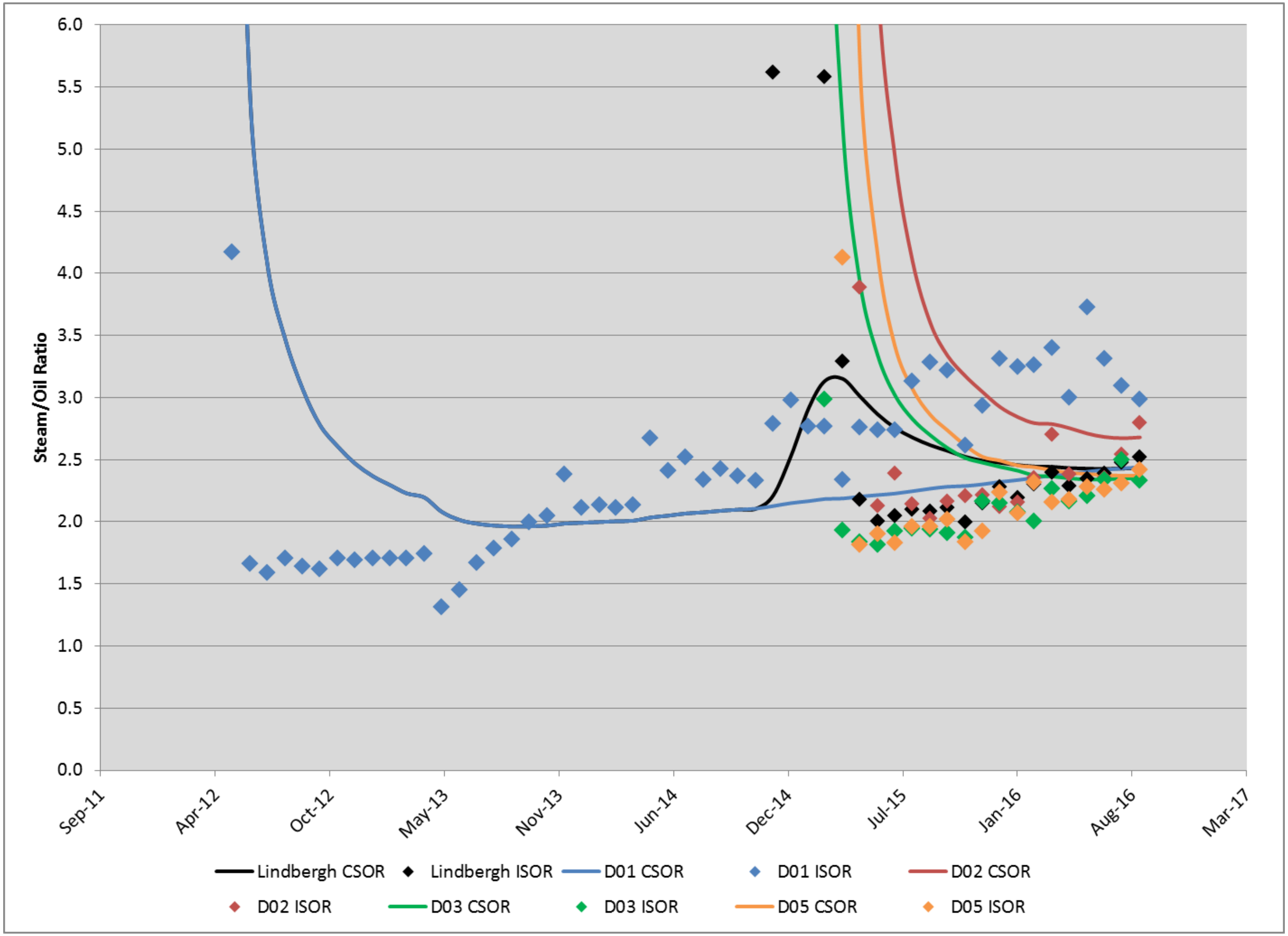
~11 m offsetting WP2



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

SOLVENT SOAK

- Solvent was pumped into the injectors on two well pairs; D03-02 and D03-04
- Forward circulated and spotted 25 m3 of condensate in each injector well
  - Fort Saskatchewan condensate utilized
- Drop spool pressure gauges were installed in the wells to monitor the bottom hole pressure and associated leak-off post-injection
- Solvent soak took place for approximately 6 months prior to circulation start-up
- Nitrogen was injected in the long tubing string at approximately month 3 to promote maximum leak-off of the solvent into the formation before start-up
- Solvent leak off to the formation occurred quickly, likely associated with initial reservoir mobility rather from the influence of the solvent

SOLVENT SOAK - RESULTS

- Total circulation duration and steam volume of the two solvent soak well pairs was similar to the non-solvent soak well pairs
  - Circulation rates and pressures were identical to that of non-solvent soak start-up wells
  - No noticeable timing impact was identified when comparing communication characteristics between the injector and producer
- There has been no noticeable production difference in the well pairs to date that can be attributed to just the solvent soaks
- The well pair drill profile, completion and landing elevation (offset from transition zone) have a significant impact on wellpair performance

	Cum Oil (m3)	CSOR	CWSR
D03-02	360,000	2.53	0.89
D03-04	403,550	2.33	0.96
Pad D03 Ave Well	378,800	2.34	0.98

KEY LEARNINGS

- ESP continues to be the preferred artificial lift technology
  - Operability, no surface maintenance and overall longevity
- Bottom hole pressure target changes over time
  - Will vary with oil/water contact changes and steam chamber size
  - Produced water has not shown significant impacts on wire wrap screen
- Smaller well design when compared to Pilot has not impacted production rates and well operability
- Scab liner design
  - In some cases, a shorter scab liner preferred when compared to pilot to help increase steam chamber conformance and reduce hydraulic restriction at liner end
  - Production port beneficial for uniform fluid level
  - Scab liner perforating (select cases) has proven beneficial during pump changes to improve wellbore conformance, pump operation and well KPI’s
- ESP design to include AGH stages has proven beneficial with higher vapour producing wells

FUTURE PLANS - SUBSURFACE

PENGROWTH

FUTURE PLANS - SUBSURFACE

- Future considerations pending internal and regulatory approval
  - Pad D01 wellpair (1)
  - Pad D01 infill wells (2)
  - Pad D02 wellpairs (2)
  - Pad D04 well pad (4 well pairs)
    - Section 13 test wellpair (Drilled from Pad D04 surface)

- Evaluate scab liner modifications on a continual basis

- Evaluate steam port opening and closing on a continual basis

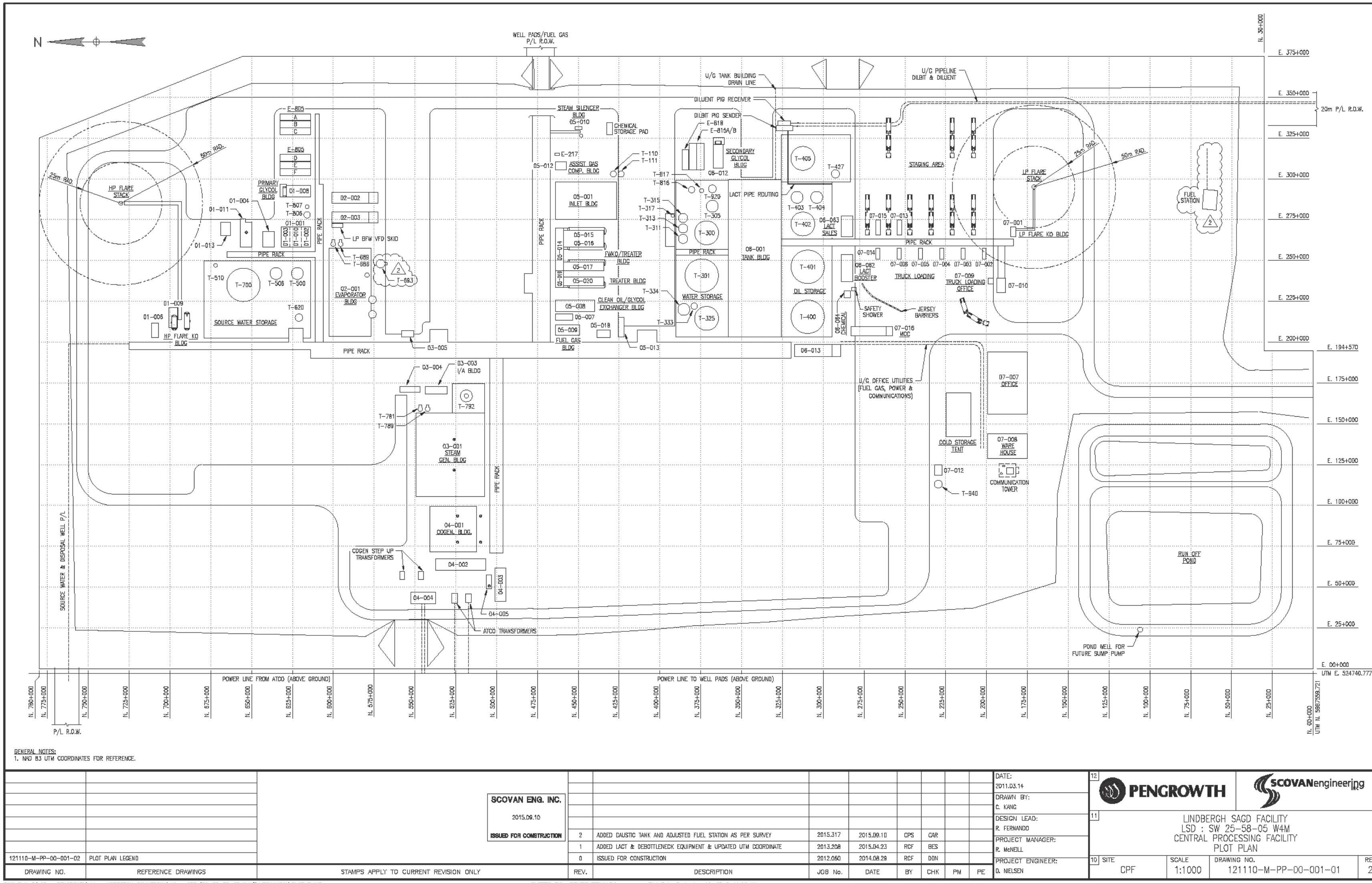
- Evaluate the potential for gas co-injection on pad D01
  - Forecasting and simulation work on-going to support eventual application

FACILITIES

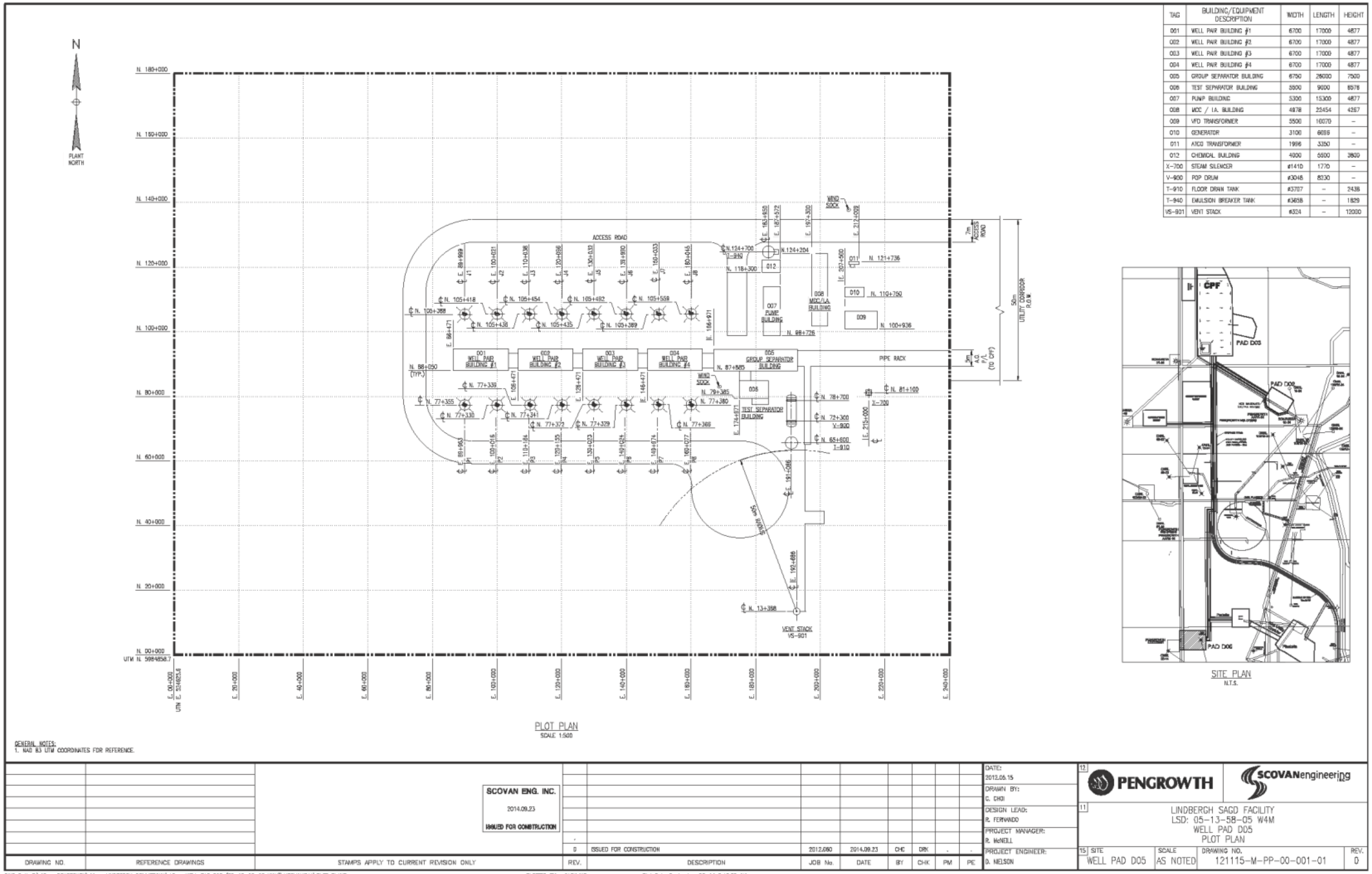
LINDBERGH SAGD COMMERCIAL FACILITY

- 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
  - 80000 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



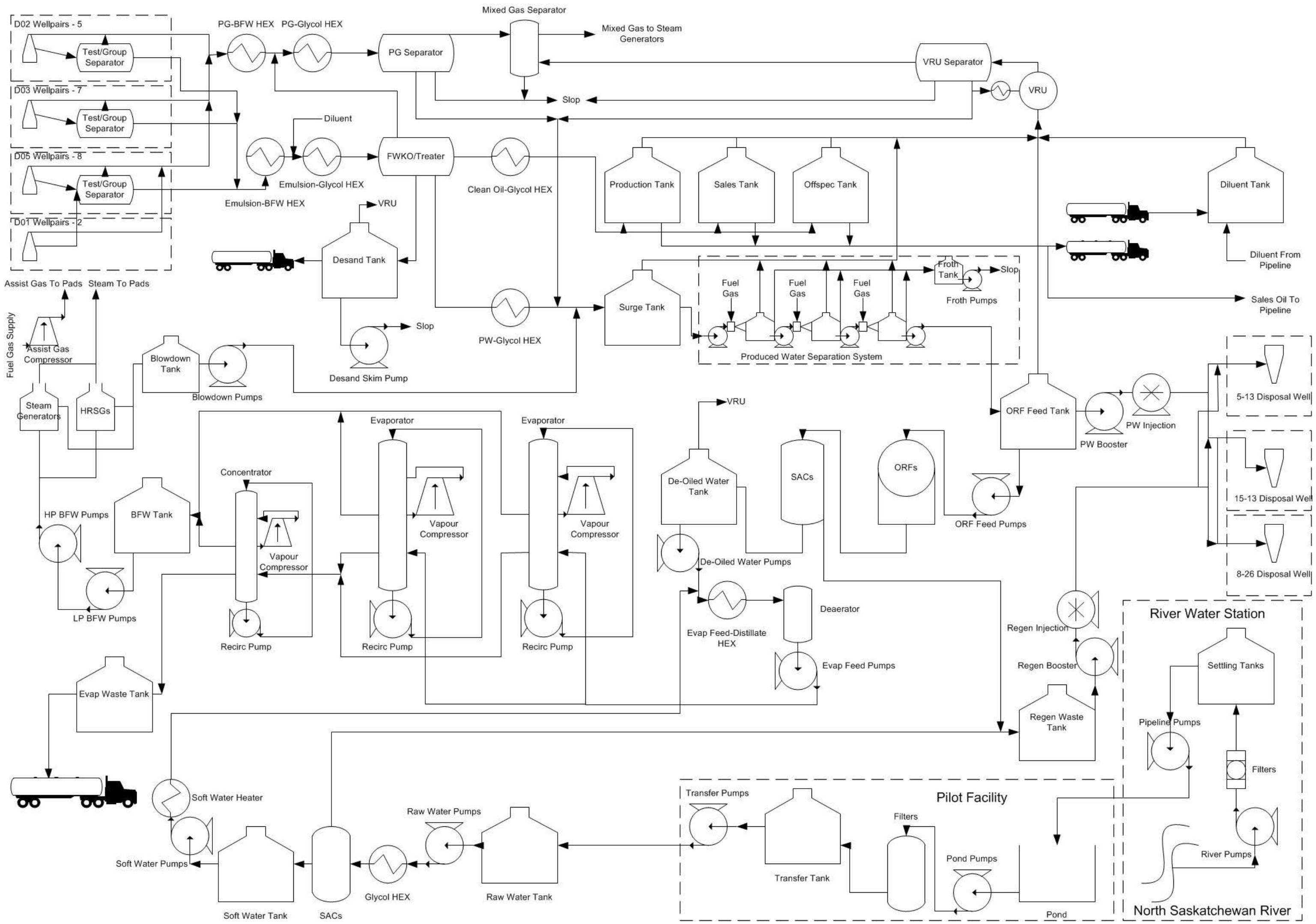
LINDBERGH COMMERCIAL TYPICAL WELLPAD PLOT PLAN



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	5500	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 Well pairs D03 – 7 Well pairs D05 – 8 Well pairs

LINDBERGH SCHEMATIC



LINDBERGH SAGD COMMERCIAL FACILITY MODIFICATIONS

- Replacement of welded block style PG inlet HEX
  - Shell & tube HEX installed
- Replacement of welded block style clean oil HEX
  - Gasketed plate & frame installed
- Addition of mixed gas coalescing filter
  - Removal of liquid droplets in steam generator gas train
- Pipeline reroutes within the CPF
  - 3 pipelines rerouted for future Phase 2 work

LINDBERGH SAGD COMMERCIAL FACILITY PERFORMANCE

- September 2016 outage to install replacement PG HEX and coalescing filter
- 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
  - Temperature fluctuations with unreliability of welded block HEX cooling, increased loading on VRUs due to light end flashing in sales tanks
  - Producing on spec oil with use of lighter density diluent from pipeline
- Water treatment
  - Pad build up in PW SACs creating higher than expected dPs
  - Higher solids concentration in concentrator tower has caused more frequent plugging of tubes, operations continually balancing chemical treatment to keeps solids in solution, cleaning roughly once every two months
  - Oxygen content in softened make-up water causing internal corrosion in utility system piping, UT testing, and chemical treatment underway

LINDBERGH SAGD COMMERCIAL FACILITY PERFORMANCE

- Steam generation
  - 4 tube rolls discovered leaking during Sept 2016 outage, repaired, believed to be thermal related due to amount of boiler cycling
- 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

- High import values in Sept/Oct 2015 due to HRSG repairs
- Import blip in Apr 2016 due to Cogen maintenance
- Import blip in June 2016 due to sync breaker issue

	Lindbergh Commercial				Lindbergh Pilot	Lindbergh River Station
	Generation	Consumption	Import	Export	Import/Consumption	Import/Consumption
	MWh	MWh	MWh	MWh	MWh	MWh
Jan-15	3900	6242	3266	924	658	134
Feb-15	8646	6062	122	2706	617	127
Mar-15	9483	6262	16	3179	629	113
Apr-15	9500	6266	43	3360	Mothballed	56
May-15	9791	6374	75	3395		38
Jun-15	9031	6437	188	2894		34
Jul-15	9746	6923	81	2999		27
Aug-15	10123	7310	3	2816		26
Sep-15	6543	7253	1479	770		28
Oct-15	7297	7488	1497	1306		41
Nov-15	9740	7847	353	2246		49
Dec-15	11246	8509	67	2805		79
Jan-16	11622	8980	32	2674		83
Feb-16	10311	8154	57	2214		61
Mar-16	11300	8823	2	2480		61
Apr-16	10091	8442	368	2016		47
May-16	10633	8427	0	2207		32
Jun-16	9930	7924	0	2007		26
Jul-16	9651	8267	286	1670		29
Aug-16	10206	8696	0	1510		27
Sep-16	10081	8615	0	1466		28

LINDBERGH – GAS

	Lindbergh Commercial					Lindbergh Pilot			
	FG Purchased (e3m3)	SG Produced (e3m3)	SG Flared (e3m3)	SG Vented (e3m3)	SG Conserved (%)	FG Purchased (e3m3)	SG Produced (e3m3)	SG Flared (e3m3)	SG Conserved (%)
Jan-15	6395	2691	107	0	96.2	1783	137	6	96.0
Feb-15	8848	4513	134	0	97.1	1636	103	5	95.7
Mar-15	9179	4060	69	0	98.3	1786	138	6	96.0
Apr-15	8672	2894	322	0	90.0	Mothballed			
May-15	9624	2458	108	0	95.8				
Jun-15	9516	2042	91	0	95.7				
Jul-15	10736	1956	109	0	94.7				
Aug-15	10894	3479	420	6	89.1				
Sep-15	10062	2078	210	0	90.8				
Oct-15	9890	1616	2889	0	35.9				
Nov-15	9681	1222	190	0	86.5				
Dec-15	11193	1701	74	75	91.9				
Jan-16	11935	1644	389	28	79.8				
Feb-16	10641	1027	64	60	89.3				
Mar-16	12002	1160	34	0	97.2				
Apr-16	12071	1161	32	0	97.3				
May-16	12171	2462	29	0	98.8				
Jun-16	11634	1660	78	0	95.5				
Jul-16	12117	1470	32	0	97.9				
Aug-16	12688	1624	37	0	97.8				
Sep-16	12015	1374	64	265	80.7				

* estimated

LINDBERGH – GAS

- Flare high in April 2015 due to impact of lighter diluent switch
- Flare high in August & September 2015 due to inlet PG cooling issues
- Flare high in October/November 2015 & January 2016 due to flare meter reading error and plant trips
- Flaring volumes through 2016 due to inlet PG HEX issue – replaced Sept 2016
- Venting in August from oil storage tanks due to heat exchange issues
- Venting in December 2015 & January/February 2016 due to evaporator vent O2 reading errors
- Venting in September 2016 due to evaporator vent O2 reading errors
- No routine venting in the field or at CPF
- EPEA Approval for Phase 2 received May 2016 – increased SO2 limit

LINDBERGH – EMISSIONS

	Pilot Monthly Sulphur				Commercial Monthly Sulphur				
	Total SO2	Flare Stack	OTSGs	Peak Day	Total SO2	Flare Stack	Steam Gens	Peak Day	Approved Limit
	t/month	t/month	t/month	t/d	t/month	t/month	t/month	t/d	t/d
Jan-15	3.205	0.011	3.194	0.131	1.434	0.013	1.421	0.069	1.000
Feb-15	2.346	0.001	2.345	0.102	0	0	0	0	1.000
Mar-15	2.823	0.012	2.810	0.102	0	0	0	0	1.000
Apr-15	Mothballed				0.065	0.065	0	0.014	1.000
May-15					2.178	0.027	2.151	0	1.000
Jun-15					8.696	0.043	8.653	0.304	1.000
Jul-15					8.127	0.093	8.033	0.287	1.000
Aug-15					12.076	0.328	11.748	0.450	1.000
Sep-15					11.268	0.559	10.708	0.415	1.000
Oct-15					12.194	1.292	10.902	0.637	1.000
Nov-15					10.216	0.109	10.107	0.364	1.000
Dec-15					14.103	0.184	13.919	0.528	1.000
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									

LINDBERGH – EMISSIONS

- 2015 data amended - reporting by third party was found to have a calculation error
- 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

Emission Source	May 2015 NOx Emission Rate (kg/hr)	Sept 2016 NOx Emission Rate (kg/hr)	NOx Approval Limit (kg/hr)
H-710 (Steam Gen 1)	7.56	---	16.6
H-720 (Steam Gen 2)	6.81	13.0	16.6
H-730 (Cogen 1)	1.00	1.21	5.0
H-740 (Cogen 2)	1.16	---	5.0
H-942 (Utility Boiler)	0.0434	---	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, and H-730 & H-740, and continuous monitoring via CEM for one of H-710 & H-720.

CEMS Data - Monthly Average - H-720	
	NOx (kg/h)
Jan-15	6.26
Feb-15	5.35
Mar-15	4.83
Apr-15	4.81
May-15	5.11
Jun-15	5.40
Jul-15	5.10
Aug-15	6.25
Sep-15	7.08
Oct-15	8.59
Nov-15	8.18
Dec-15	9.05
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

MEASUREMENT AND REPORTING

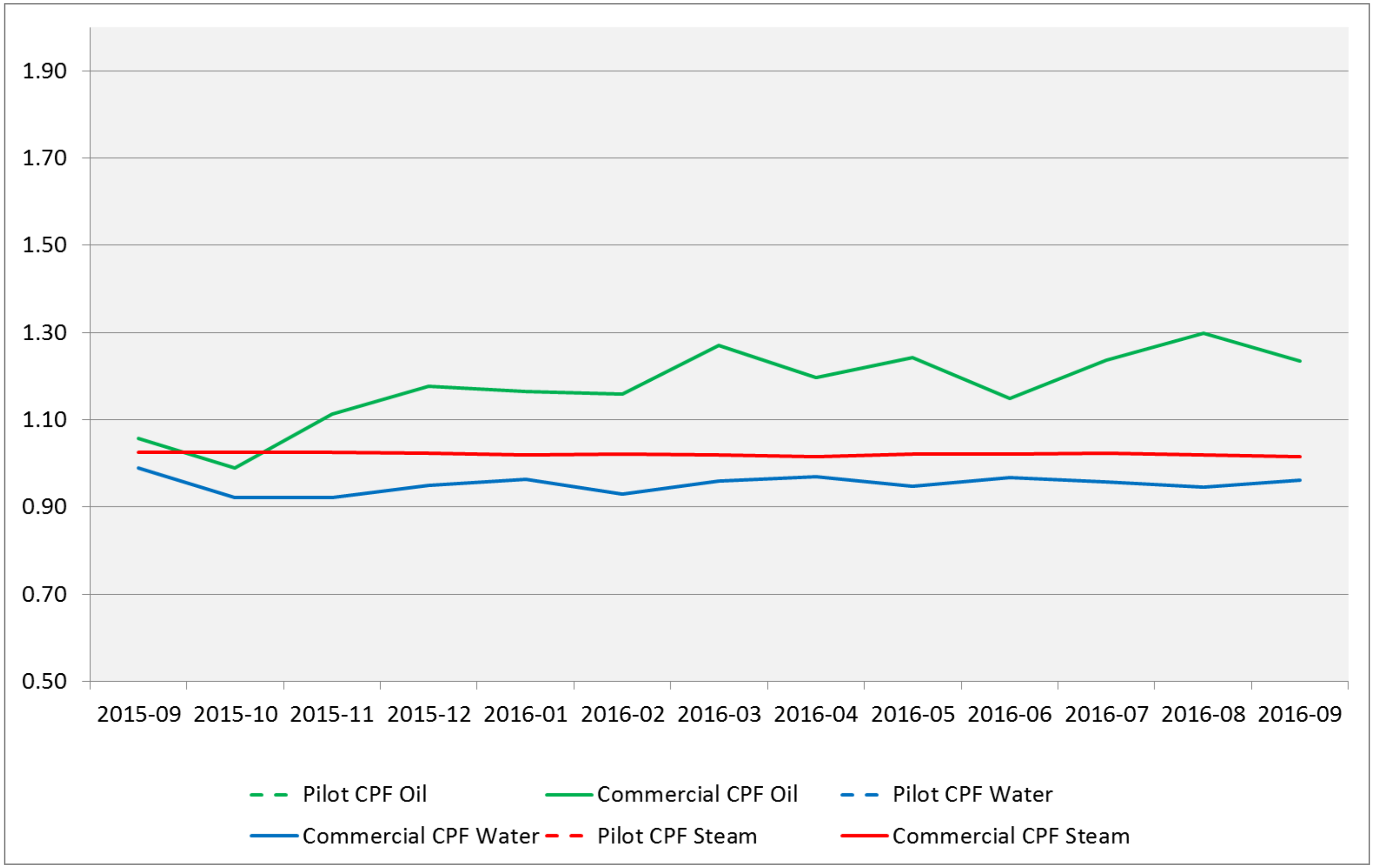
PENGROWTH

MARP SUMMARY

- Testing
  - Test separator located at D02, D03 and D05
    - Pad D01 pilot wellpairs tested at D05
  - 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

- Significant difficulty with consistent sample cut results initially
  - Continue to optimize chemical in manual samples
  - Ongoing AGAR calibration utilizing pressurized sample bombs and lab analysis

PRORATION FACTOR



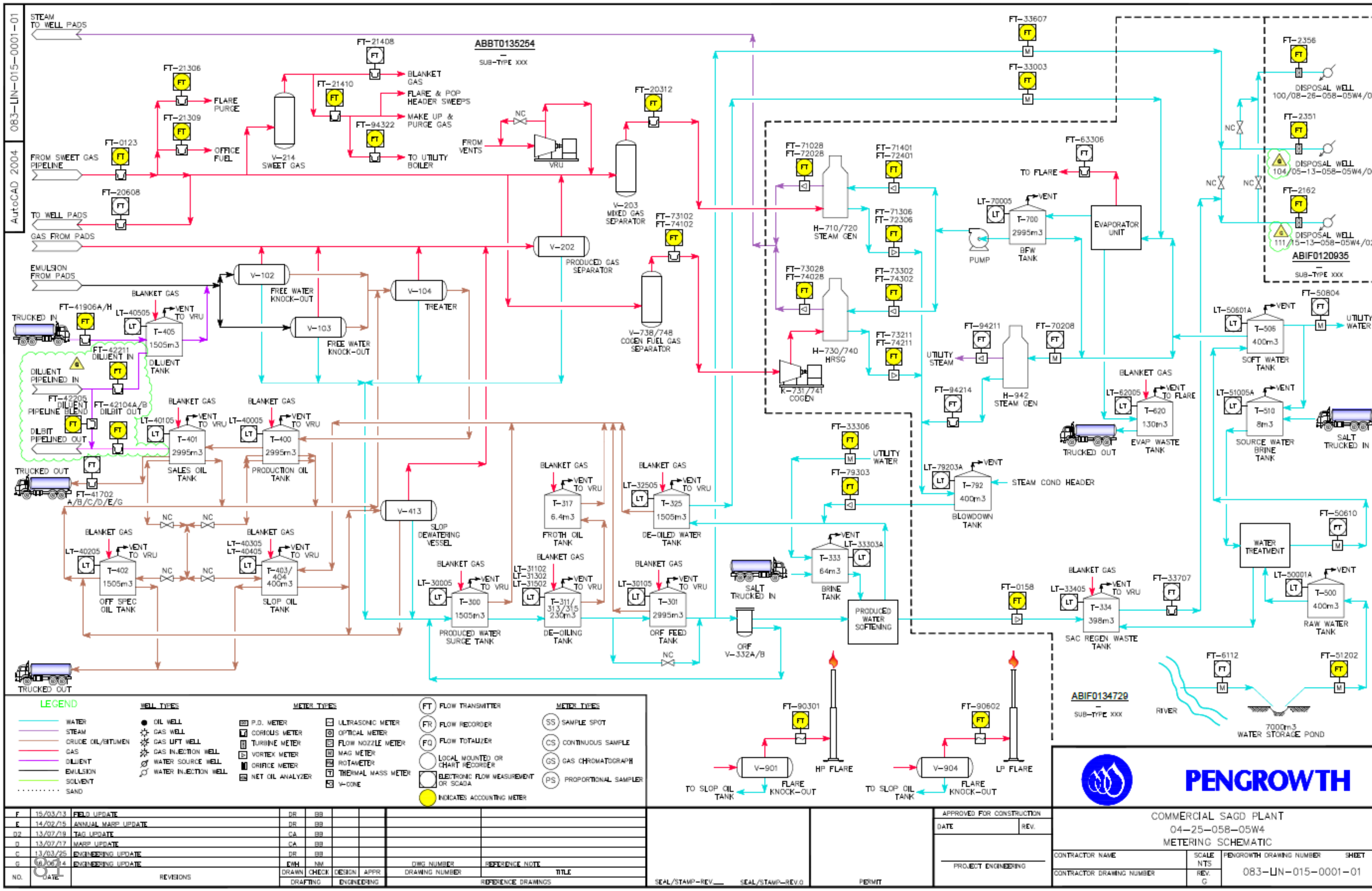
	2015-10	2015-11	2015-12	2016-01	2016-02	2016-03	2016-04	2016-05	2016-06	2016-07	2016-08	2016-09
Oil	0.99	1.11	1.18	1.16	1.16	1.27	1.20	1.24	1.15	1.24	1.30	1.23
Water	0.92	0.92	0.95	0.96	0.93	0.96	0.97	0.95	0.97	0.96	0.95	0.96
Steam	1.02	1.03	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02

PRORATION IMPROVEMENT INITIATIVES

- Main issues associated with BS&W consistency
- Completed
  - Testing procedure (Sept 2015)
    - Created consistent guidance on sampling procedure and sample analysis
  - Chemical adjustments (Sept 2015)
    - Optimized chemical and dosage to assist in breaking emulsion samples
  - Pad D05 piping modifications (Oct 2015)
    - Modified sampling piping to allow for pressurized sample to be taken
  - Pad D05 AGAR Calibration (Oct 2015)
    - Significant pressurized sampling and analysis to attempt to better calibrate AGAR probe at D05
  - Pad D05 flow transmitter relocation (June 2016)
    - Re-designed piping around flow meter to improve measurement accuracy
- Ongoing
  - Pad D03 piping modifications (Oct 2016)
  - Pad D03 AGAR calibration (Nov 2016)

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

PENGROWTH

LINDBERGH WATER SOURCES

- 10-23-056-05 W4M river water station
  - Fresh water source from the North Saskatchewan River
  - AENV License No.13844

- Pilot
  - Historical average usage of ~900 m3/d for BFW production for steam injection in 2014/2015
  - Pilot mothballed in Q2 2015
    - All go forward water usage associated with the commercial facility

- Commercial
  - ~530m3/d make-up water usage at commercial facility (2016 to date average)

LINDBERGH SOURCE WATER MAKE UP VOLUMES

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

	Source Water Make-Up	
	Commercial (m3)	Pilot (m3)
Jan-15	5004	31220
Feb-15	5409	28340
Mar-15	8211	26092
Apr-15	9099	Mothballed
May-15	11605	
Jun-15	9753	
Jul-15	13202	
Aug-15	13715	
Sep-15	14086	
Oct-15	12324	
Nov-15	12095	
Dec-15	15248	
Jan-16	16455	
Feb-16	12636	
Mar-16	17903	
Apr-16	20368	
May-16	13987	
Jun-16	15949	
Jul-16	17567	
Aug-16	16233	
Sep-16	13882	

LINDBERGH PRODUCED WATER, STEAM, AND RECYCLE

- Pilot had no produced water or blowdown recycle - streams sent to disposal
- Commercial has full blowdown recycle

	Commercial			Pilot	
	Steam (t/mth)	PW (m3/mth)	Water Recycle %	Steam (t/mth)	PW (m3/mth)
Jan-15	84620	87333	98.9	22070	22046
Feb-15	118828	113725	98.8	19936	21027
Mar-15	118819	115566	98.9	22018	22242
Apr-15	117743	115219	98.6	Mothballed	
May-15	124862	122849	98.3		
Jun-15	133102	128769	98.1		
Jul-15	145642	138787	98.0		
Aug-15	151893	143883	97.9		
Sep-15	146896	140109	97.9		
Oct-15	141468	134310	97.6		
Nov-15	132637	128170	97.5		
Dec-15	159783	150320	97.5		
Jan-16	170670	160634	98.2		
Feb-16	150294	145621	98.1		
Mar-16	177508	166682	98.0		
Apr-16	174035	164110	97.9		
May-16	179384	173576	97.9		
Jun-16	173131	165179	97.9		
Jul-16	183811	175358	97.9		
Aug-16	190293	184240	97.9		
Sep-16	170538	164270	97.9		

LINDBERGH COMMERCIAL DISPOSAL LIMITS

- The Lindbergh CPF is equipped with evaporator towers for PW recycle
- Future pilot operation would require integration of PW recycle to keep the scheme compliant

	Calculated Disposal Limit %	Actual Disposal %
Jan-15	9.51	1.13
Feb-15	9.64	1.16
Mar-15	9.61	1.10
Apr-15	9.59	1.40
May-15	9.53	1.70
Jun-15	9.53	1.92
Jul-15	9.51	2.04
Aug-15	9.49	2.07
Sep-15	9.47	2.05
Oct-15	9.47	2.38
Nov-15	9.46	2.46
Dec-15	9.45	2.53
Jan-16	9.33	1.82
Feb-16	9.37	1.90
Mar-16	9.37	2.03
Apr-16	9.35	2.08
May-16	9.35	2.05
Jun-16	9.36	2.08
Jul-16	9.36	2.09
Aug-16	9.36	2.09
Sep-16	9.38	2.09

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

Ion	mg/L	meq/L
Na	17300	752
K	230	5.88
Ca	2340	117
Mg	195	16.0
Ba	27.5	0.401
Sr	101	2.30
Fe	0.46	0.0164
H+		

ANIONS

Ion	mg/L	meq/L
Cl	32340	911
HCO3	130	2.12
SO4	81.0	1.69
CO3	<0.50	<0.02
OH	<0.50	<0.03

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

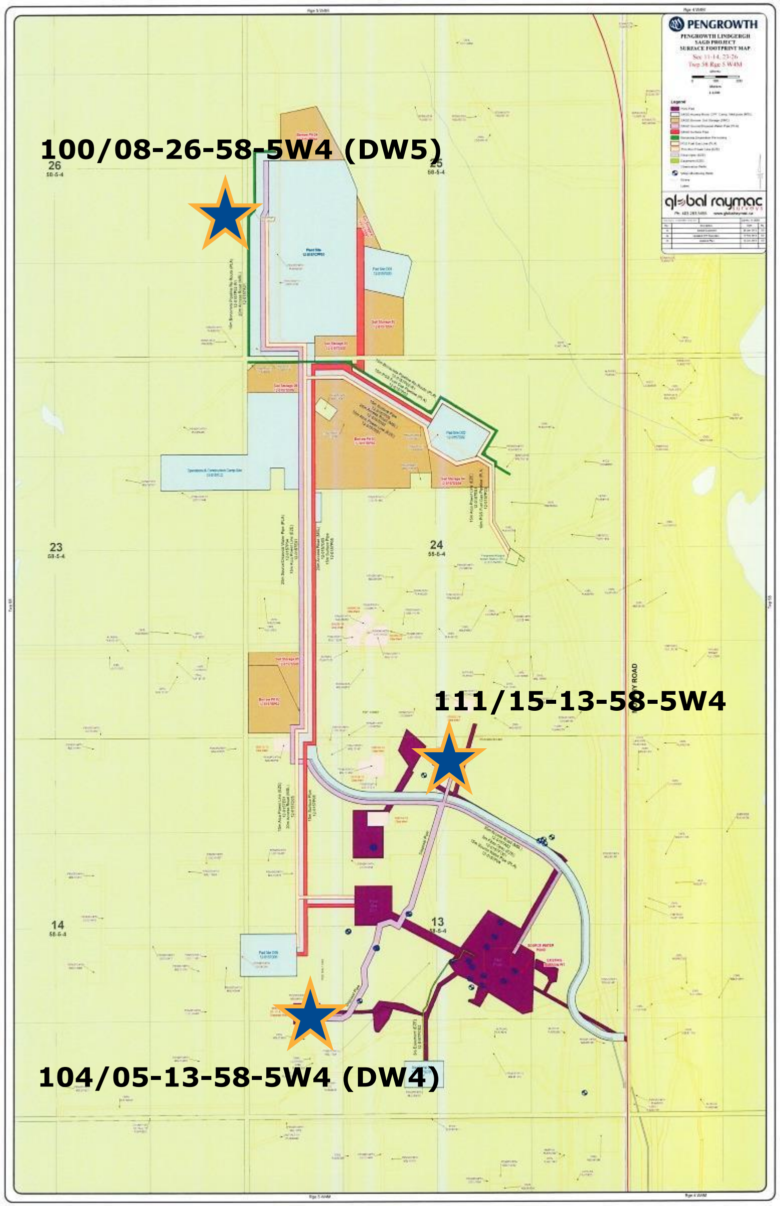
- 111/15-13-58-5W4
  - Well license number – 0126796
  - Disposal approval number – 5565
    - Completed in Basal Cambrian Sands
    - No rate limit
    - Max WHP – 10.9 MPa
  - Former blowdown disposal for Pilot

- 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)

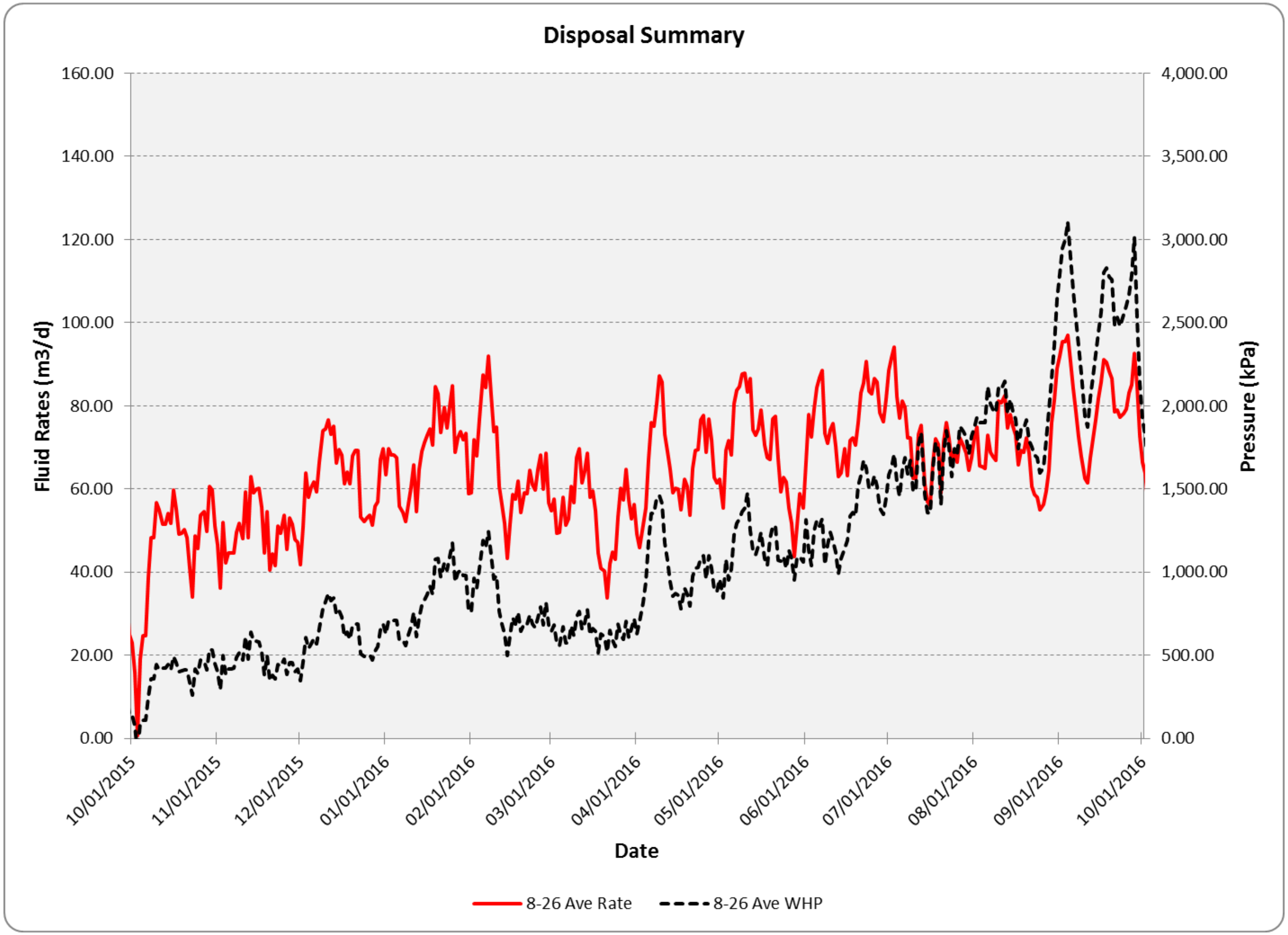
- 100/08-26-58-5W4 (DW5)
  - Well license number – 0469115
  - Disposal approval number – 12088B
    - Completed in Basal Cambrian Sands
    - Screened completion
    - No rate limit
    - Max WHP – 12.6 MPa
  - SAC regen and/or produced water disposal (if required)

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 2016

	NewAlta Elk Point (m3)	Tervita Lindbergh (m3)	Total Offsite (m3)	05-13 Prod Water (m3)	15-13 Prod Water (m3)	08-26 Softener Waste (m3)
Oct-15	207.0	2469.6	**2,677**	0.0	0.0	1487.4
Nov-15	174.5	2434.8	**2,609**	0.0	0.0	1471.0
Dec-15	37.5	2914.5	**2,952**	0.0	0.0	2017.7
Jan-16	0.0	2772.5	**2,773**	0.0	0.0	2055.8
Feb-16	0.0	3179.0	**3,179**	0.0	0.0	1787.8
Mar-16	0.0	3414.1	**3,414**	0.0	0.0	1652.4
Apr-16	0.0	3193.1	**3,193**	0.0	0.0	1973.3
May-16	0.0	3273.2	**3,273**	0.0	0.0	2076.3
Jun-16	0.0	3526.5	**3,526**	0.0	0.0	2250.4
Jul-16	0.0	3390.1	**3,390**	5.0	5.0	2047.1
Aug-16	0.0	3718.8	**3,719**	0.0	0.0	2147.0
Sep-16	0.0	3547.9	**3,548**	0.0	0.0	2226.5

AMBIENT AIR QUALITY

PENGROWTH

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

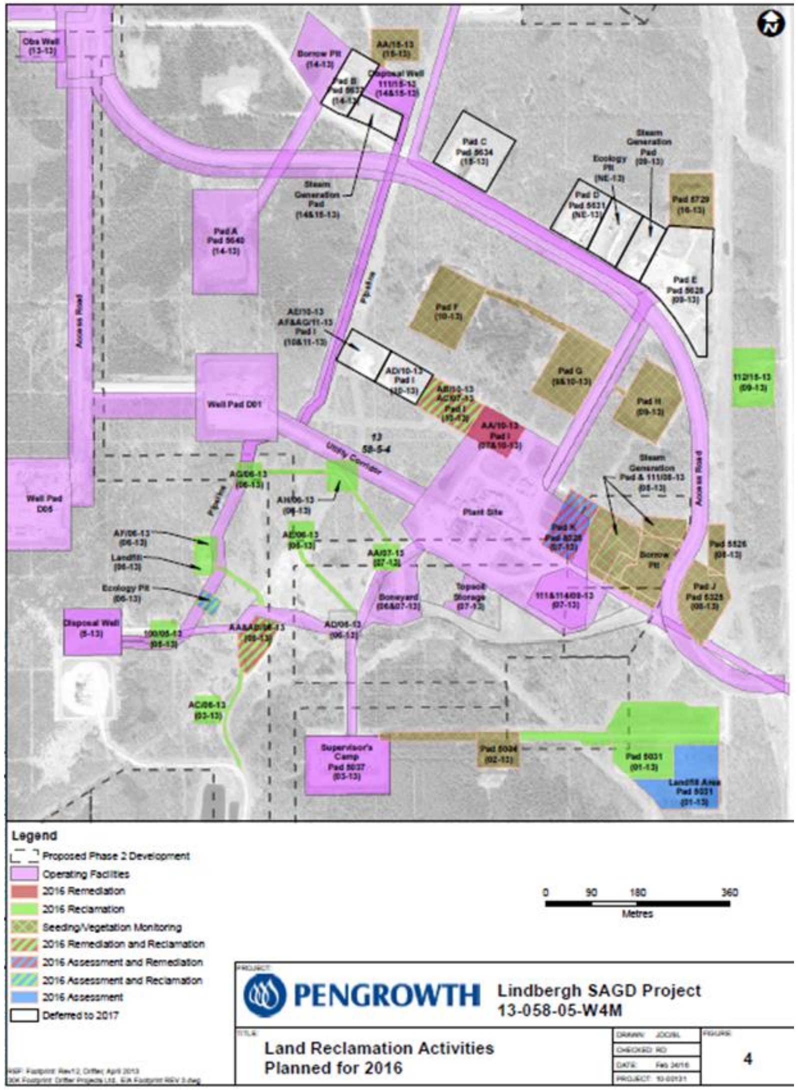
PENGROWTH

ENVIRONMENTAL ISSUES

- Pilot site mothballed for potential future use
- ENVIRONMENTAL ISSUES
- - In 2016, 2 sites have undergone remediation, with another potentially scheduled for remediation before the end of 2016
- - Three sites have undergone additional assessment work in 2016 (including a former 'Landfill' area at 1-13-058-05 W4M)
- - 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 recontouring 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) will take place at AG/11-13-058-05 W4M on Pad I before the end of 2016
- - Pad F, Pad 5729 and 112/15-13-058-05 W4M well site have been fenced off for reclamation

DECOMMISSIONING AND RECLAMATION

- Located, excavated and abandoned pipelines and risers from old CSS facilities
- Pulled and disposed of piles associated with decommissioned facilities
- Conducted remediation work in various areas in preparation for reclamation work
- Carried out contaminated soil removal for disposal at approved landfill



COMPLIANCE

PENGROWTH

COMPLIANCE

- A deficiency of the CEMS installation (monitoring plan) and reporting could not be submitted as a voluntary self- disclosure and therefore was submitted as a contravention to EPEA license 1581-02-01 in May 2015.
  - The CEMS Monitoring Plan was submitted to the AER on September 16 and was reviewed and accepted by the AER In-Situ Authorizations group.
  - CEMS certification testing, RATA and manual stack surveys were scheduled for Dec 6-12 but could not be completed due to flow measurement issues. Certification testing was rescheduled and completed March 12-19, 2016.
  - Following certification testing, CEMS monthly data was backfilled and submitted to AEP.
  - The AER issued an investigation due to CEMS deficiencies. Pengrowth submitted information requested by the investigation Sept 8/16. Currently waiting on outcome.
  - 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

- Pending regulatory approval and corporate sanctioning
  - Surface facilities associated with 4 well pairs on D04 - timing TBD
  - Surface pipeline tie in between D04 and existing SPL - timing TBD
  - Surface facilities associated with 1 well pair and 2 infills on D01 - timing TBD
  - Surface facilities associated with 2 well pairs on D02 - timing TBD
  - Surface facilities for project expansion to 30,000 bopd – timing TBD

- Evaporator blowdown treatment technologies
  - Reduction in offsite disposal
    - Solids sent to landfill
    - Utilize existing disposal wells for liquid disposal
    - Operating cost savings
  - Zero liquid discharge option
    - Reduced disposal percentage
  - Pending regulatory approval and internal project approval

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