PENGROWTH

PENGROWTH ENERGY CORPORATION

LINDBERGH SAGD PROJECT

2019 ANNUAL PERFORMANCE PRESENTATION

SCHEME APPROVAL 6410T

2020 01 15

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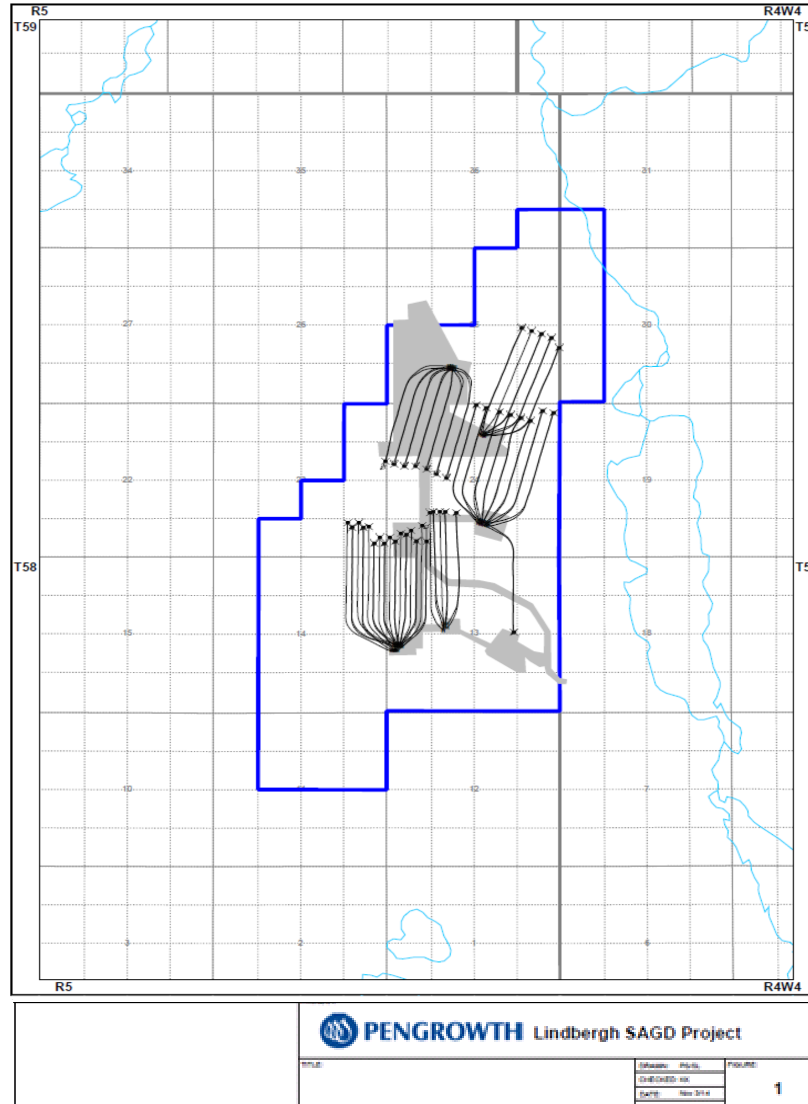
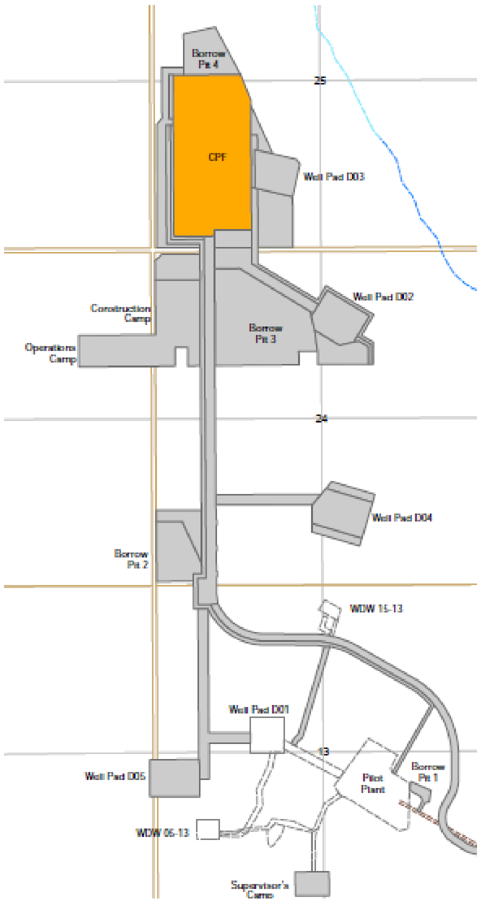
BACKGROUND AND OVERVIEW

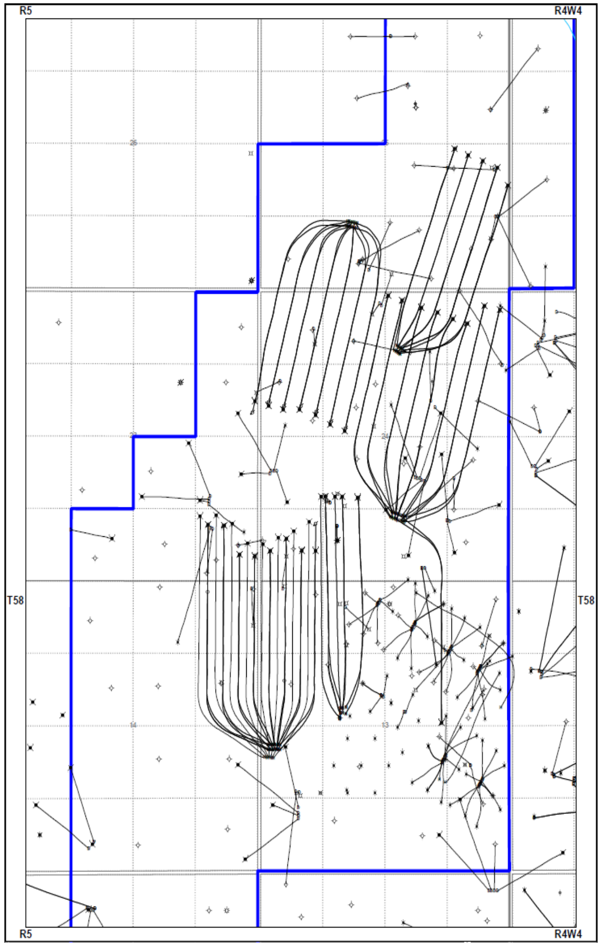
PROJECT LOCATION



PROJECT OVERVIEW AND 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
- Pilot project implemented to evaluate the SAGD recovery process in the Mannville Lloydminster Formation
  - 2 pilot SAGD wells – began steam circulation Feb 2012
- 12,500 bpd SAGD facility completed Q4, 2014
  - 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
  - 3 new SAGD wells – began steam circulation Feb 2018
  - 8 infill wells – began steam circulation July 2018
- Pilot SAGD CPF decommissioned upon start-up of the Phase 1 CPF and then recommissioned in April 2018 to handle increasing production from the field.
- Approved to increase production to 40,000 bpd





CSS IMPACT ON FUTURE DEVELOPMENT IN SEC 13

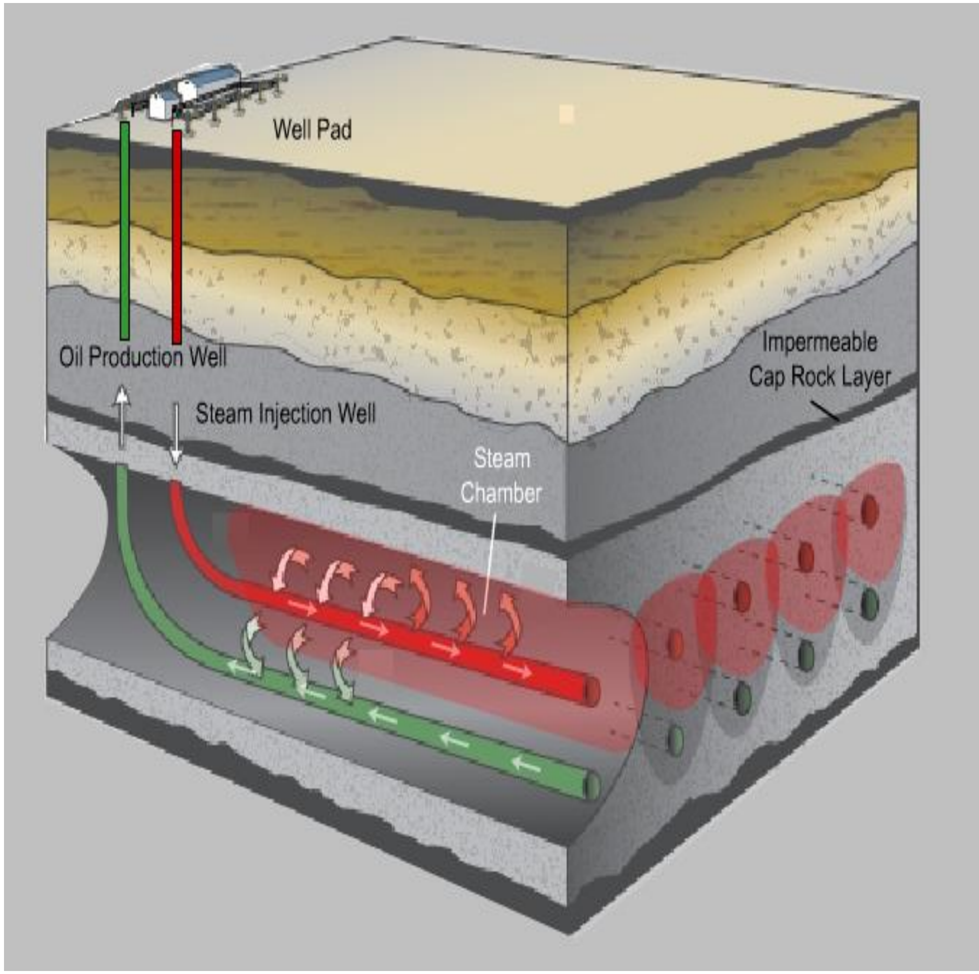
- Murphy produced a total of 2.3 MMbbls of oil and 7.6 MMbbls of water with 8.2 MMbbls (CWE) steam injection
- 71 vertical wells and 3 horizontal wells used in CSS operations
- The average recovery factor for the CSS area is 5-6% of the OOIP (up to 10% in various wells)
- CSS injection operations were 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. 1 well pair was 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
- Performance of D04-06 drilled in the CSS area in 2017 has been as expected
- The success of drilling and producing D04-06 has de-risked future production from this part of the reservoir

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
	Nov 2014	Scheme Amended – 6410K Facility de-bottlenecking
	Jun 2015	Scheme Amended – 6410L Section 13 addition
	May 2016	Scheme Amended – 6410M EIA approval to 30kbbl/d
	Nov 2016	Scheme Amended – 6410N Infill wells
	May 2017	Scheme Amended – 6410O Legacy well remediation scheduling
	Jun 2017	Scheme Amended – 6410P Phase II treater addition to 40kbbl/d
	May 2018	Scheme Amended – 6410Q Gas co-injection
	Dec 2018	Scheme Amended – 6410R Expansion of project dev area
	May 2019	Scheme Amended – 6410S Cogeneration addition
	Sep 2019	Scheme Amended – 6410T Additional well pairs and infills

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

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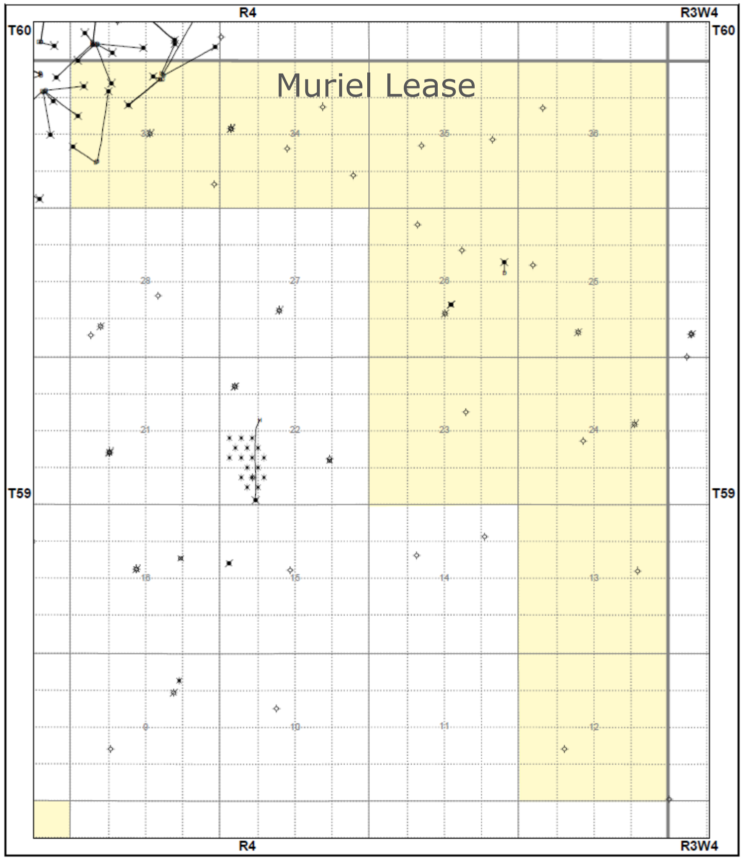
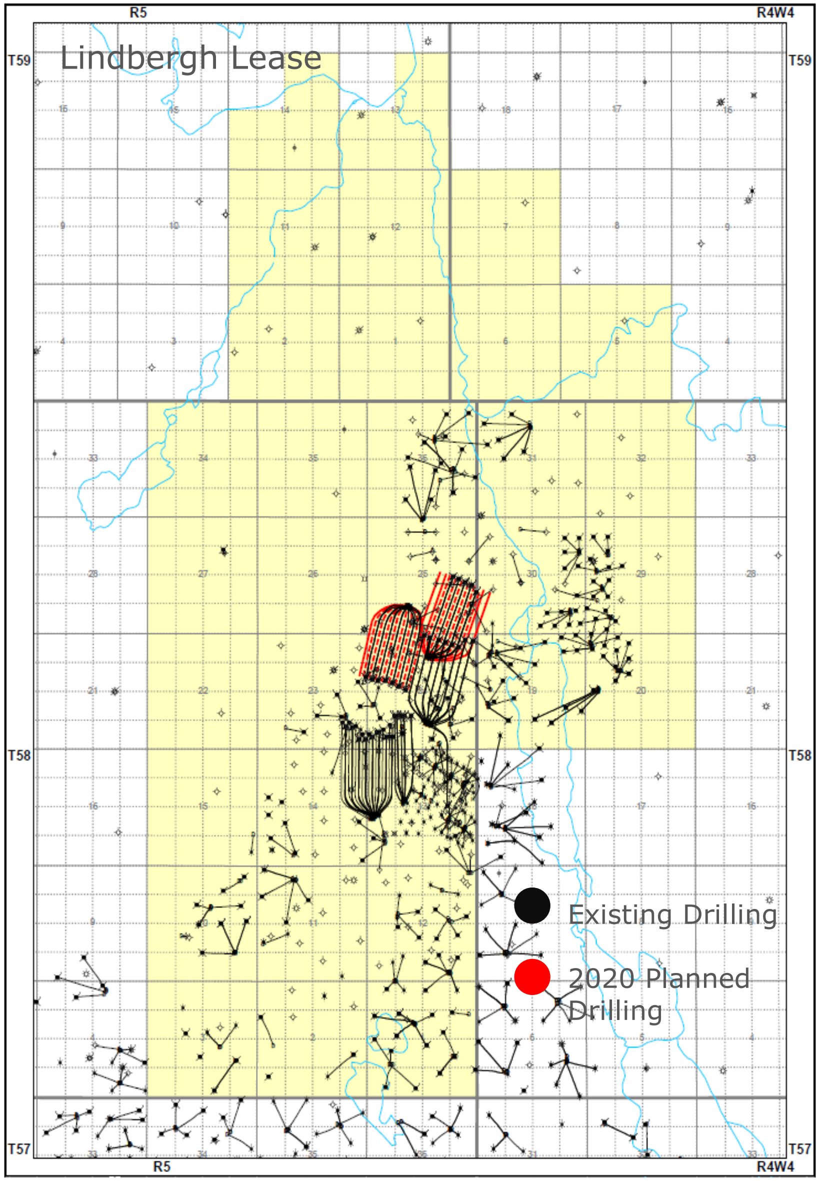
2019 DRILLING

- No wells drilled at Lindbergh
- No wells drilled at Muriel Lake
- 5 well pairs and 13 infill wells planned for 2020





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

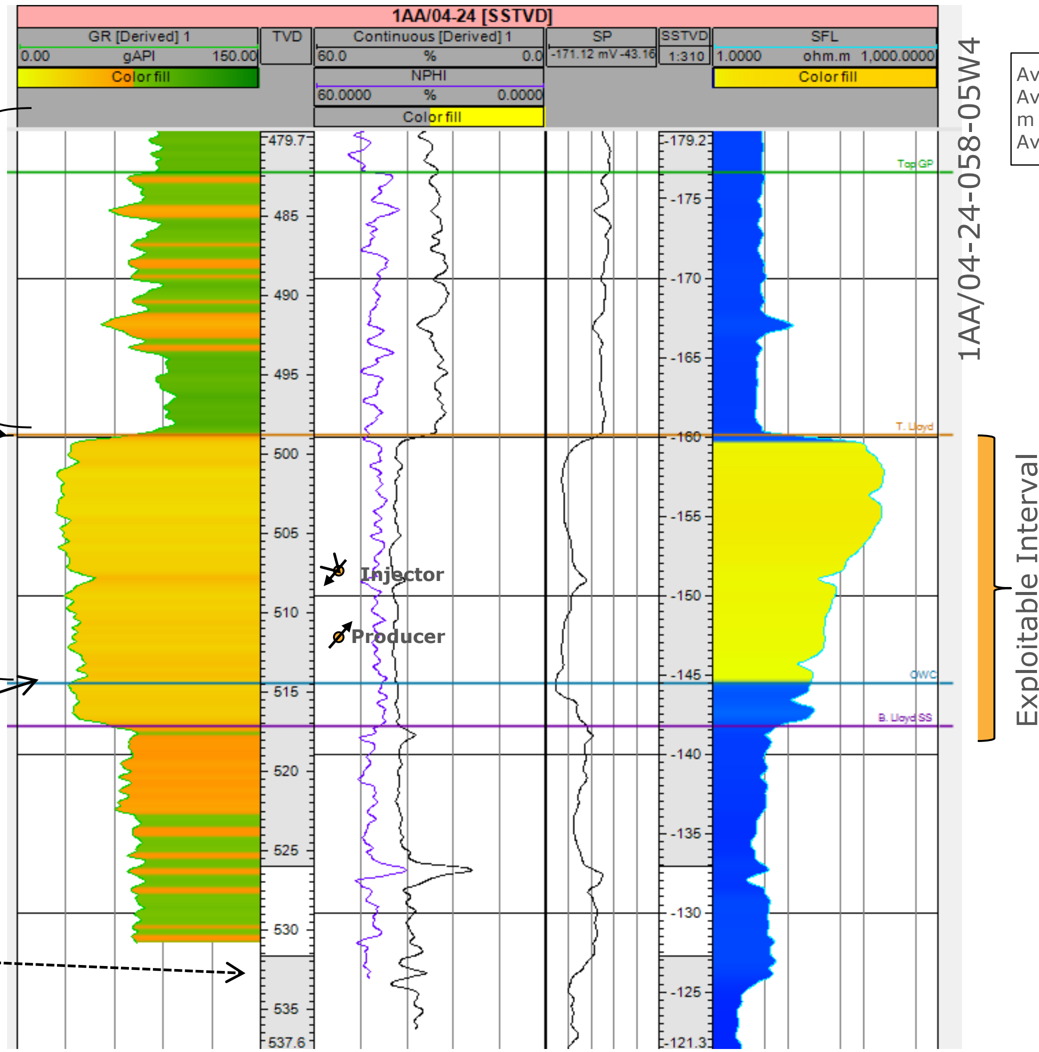
REPRESENTATIVE COMPOSITE WELL LOG

Cap Rock

Top Lloydminster Fm Reservoir

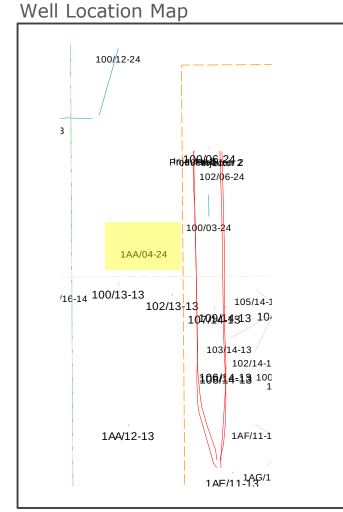
Oil/Water Contact Defined at 10 Ωm

Estimated Top Cummings Fm

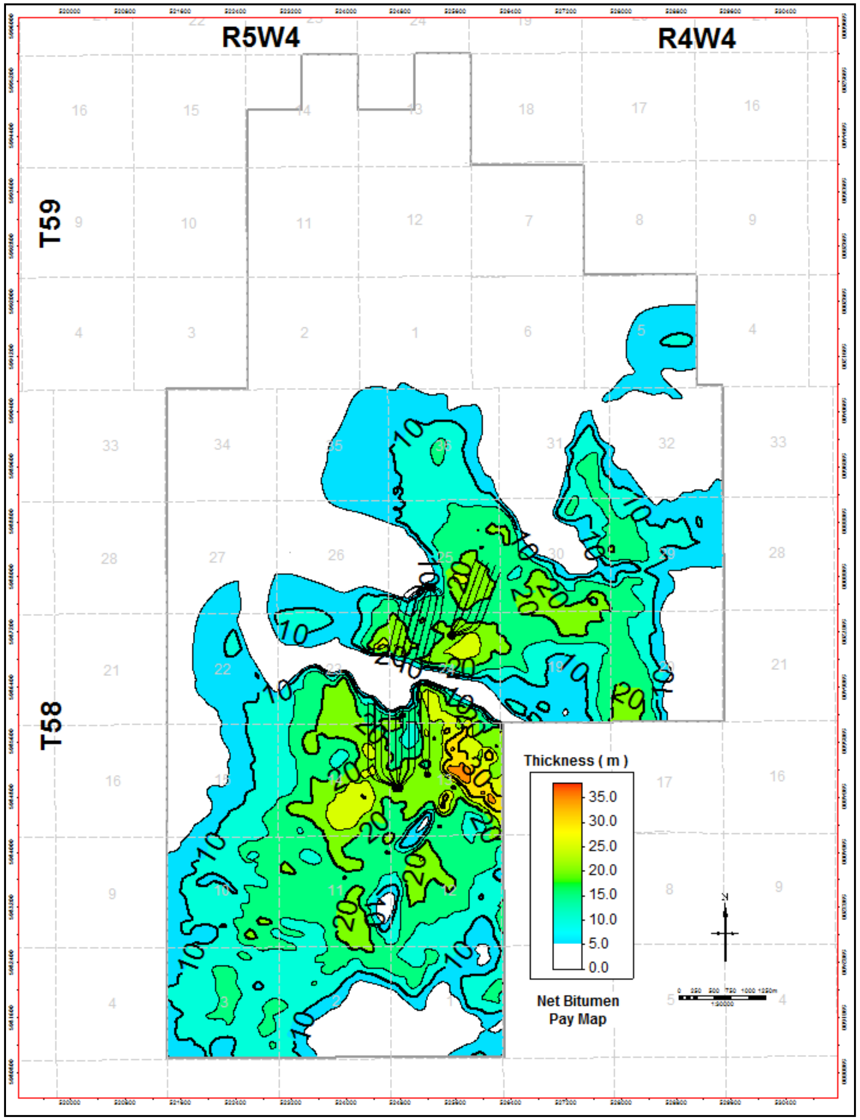


Average Pay Thickness = 20m
Average Producer to Injector Spacing = 5 m
Average O/W to Producer Distance = 3 m

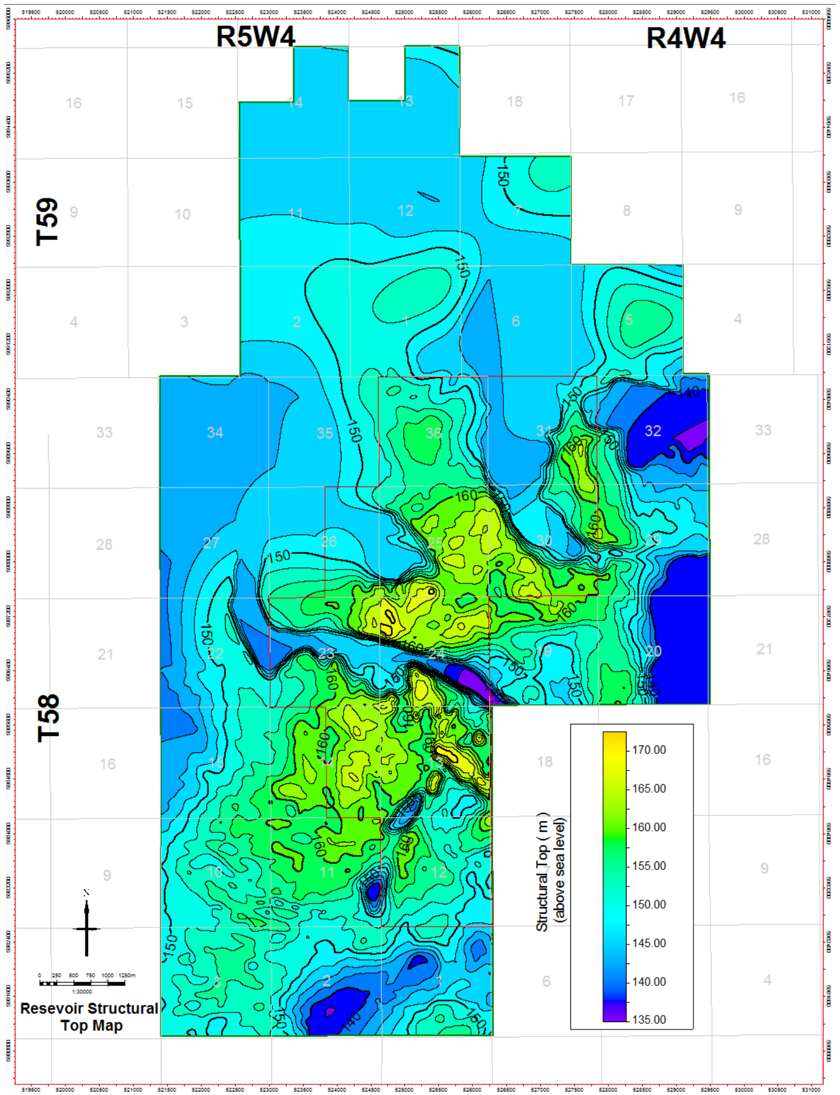
Well Location Map

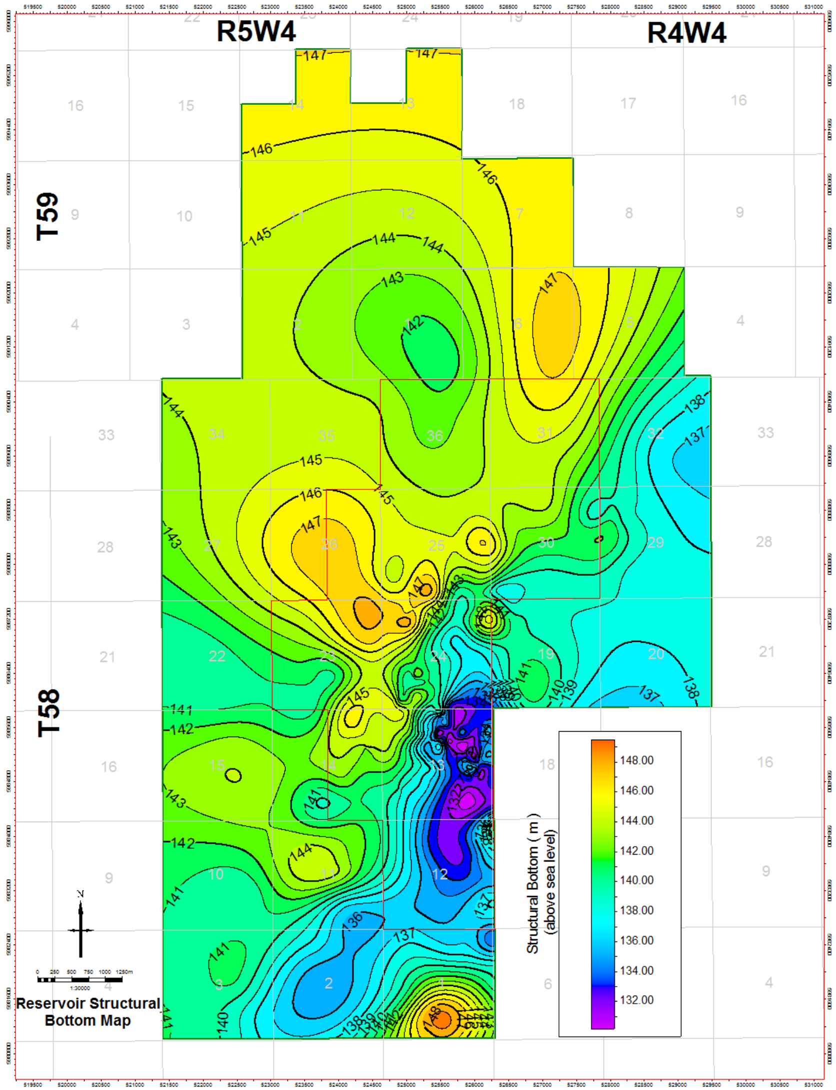


NET BITUMEN PAY

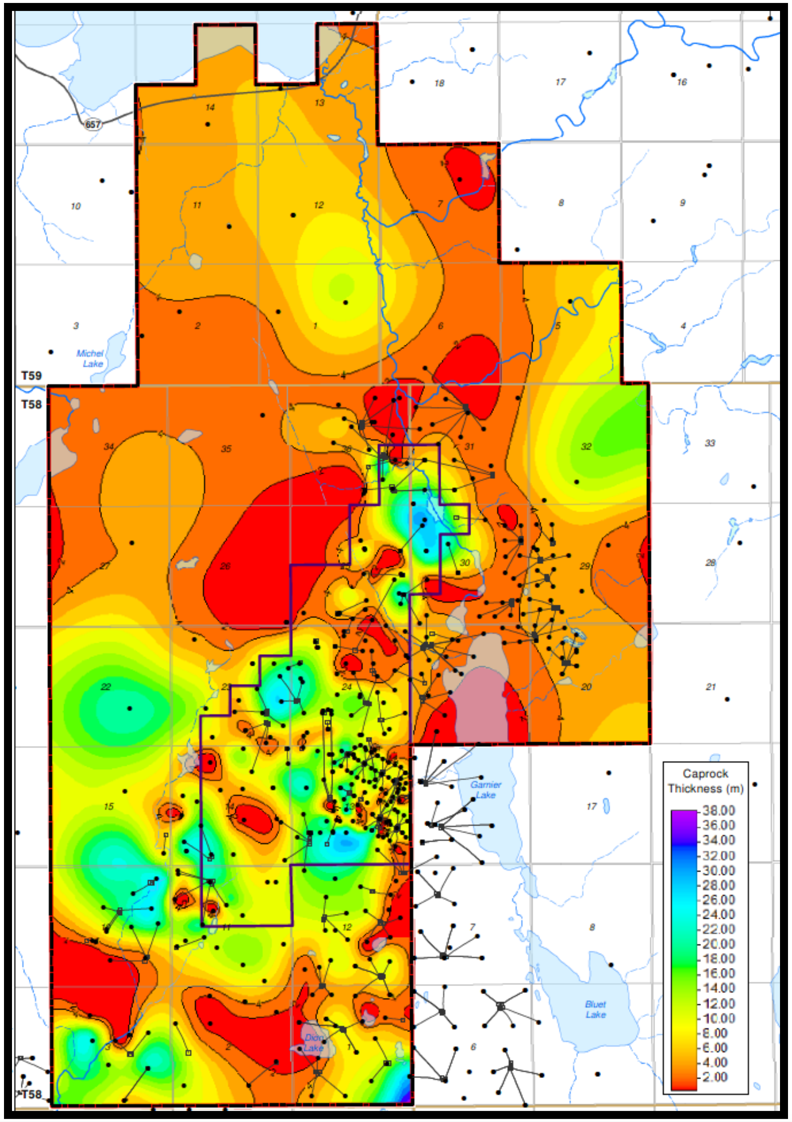


STRUCTURAL TOP AND BOTTOM OF BITUMEN RESERVOIR

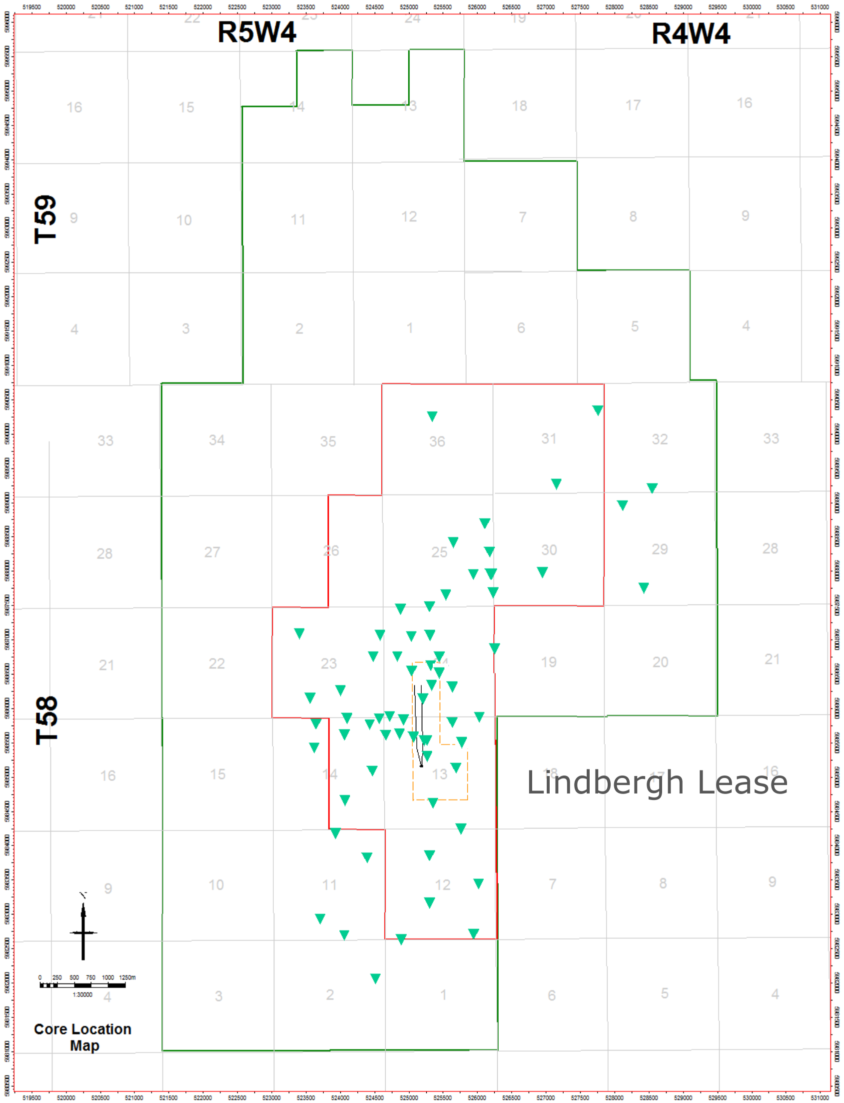




CAPROCK THICKNESS MAP

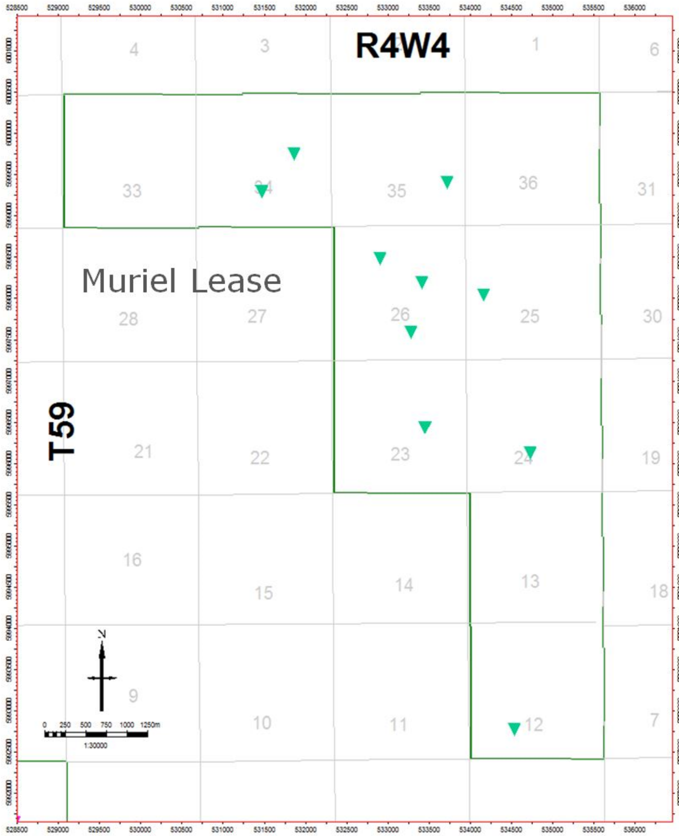


CORED WELLS AND SPECIAL CORE ANALYSIS



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



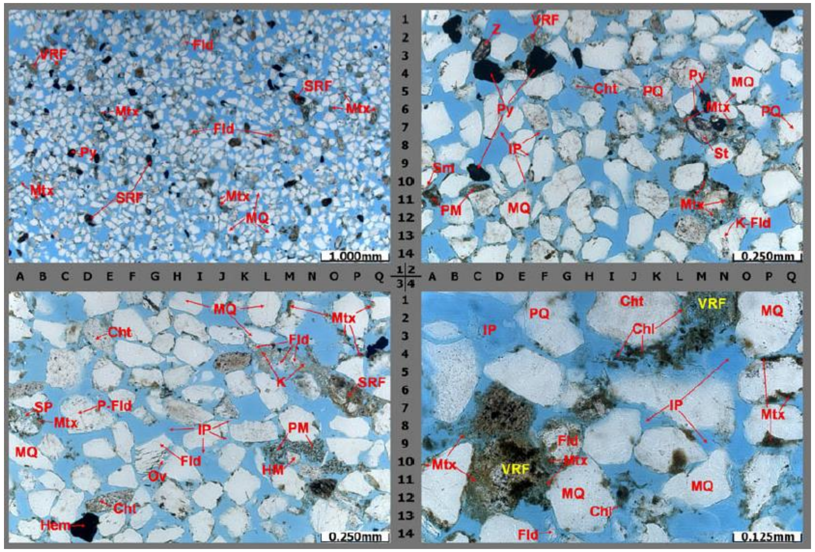
TYPICAL LINDBERGH CORE SAMPLE

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

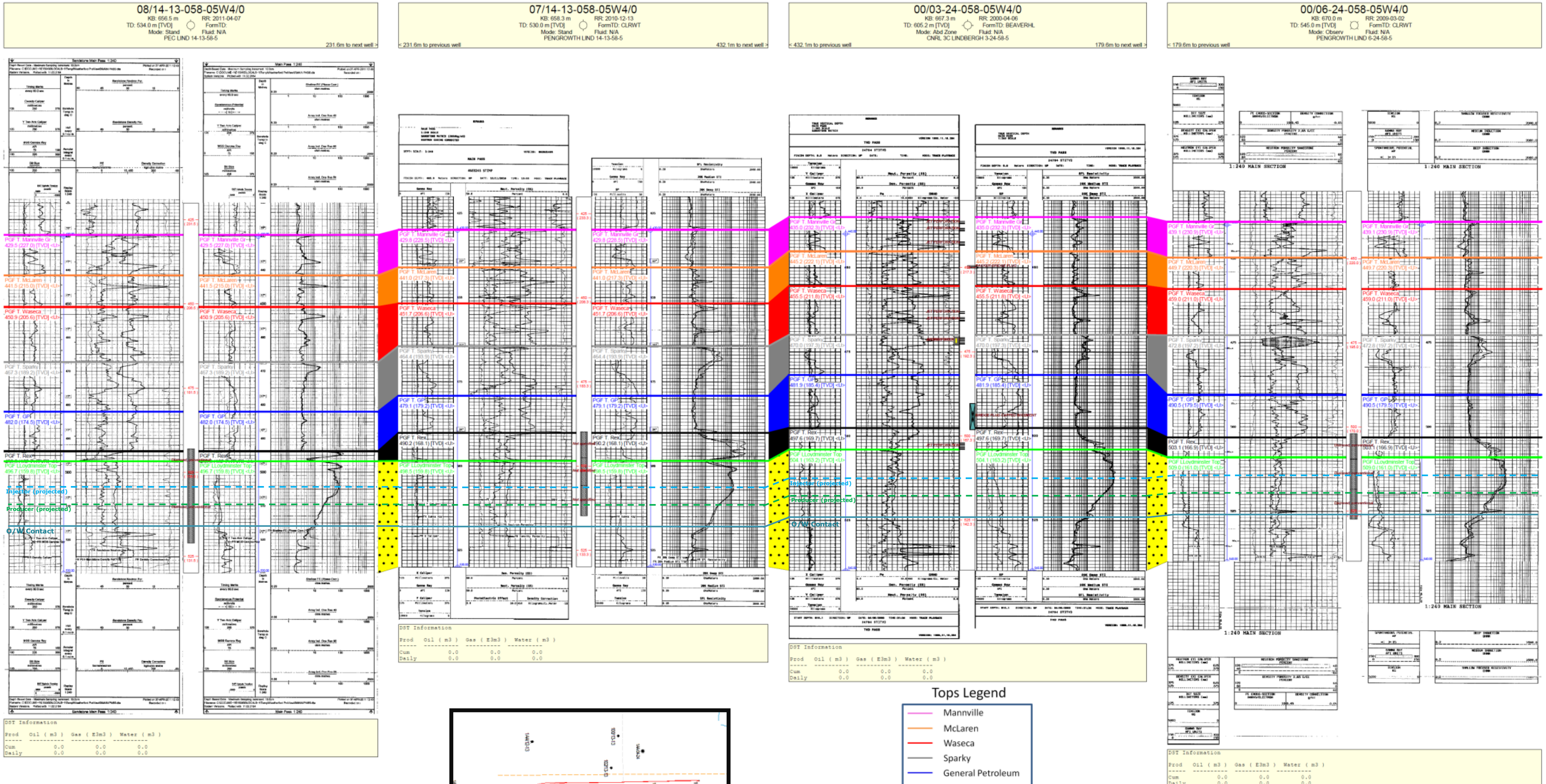
1AA/16-24-058-05W4

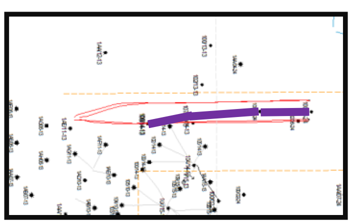
PETROGRAPHIC ANALYSIS

- 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

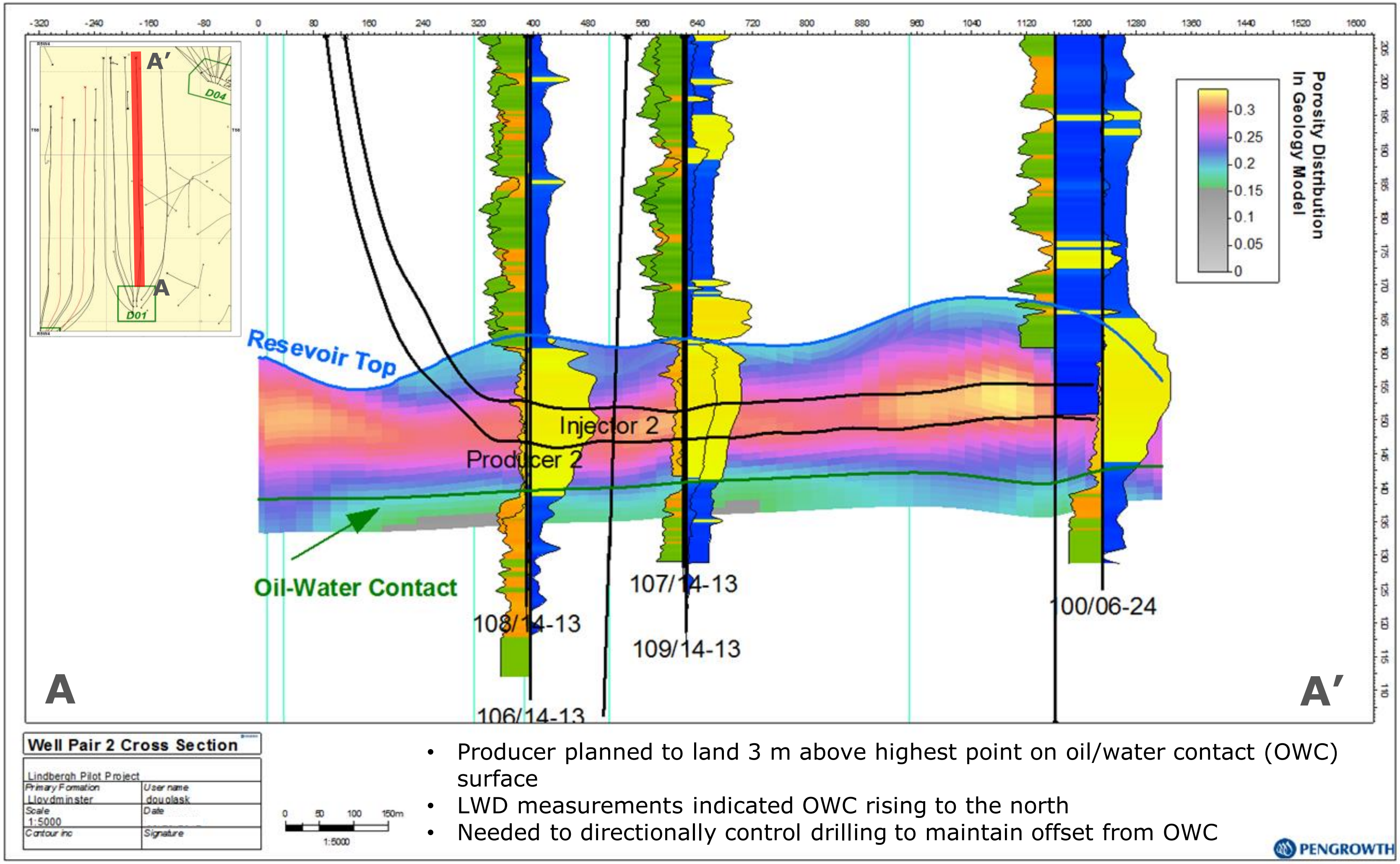




Tops Legend

- Mannville
- McLaren
- Waseca
- Sparky
- General Petroleum
- Rex
- Lloydminster
- Injector (Projected)
- Producer (Projected)
- O/W Contact

REPRESENTATIVE MODEL CROSS SECTION THROUGH PROJECT AREA

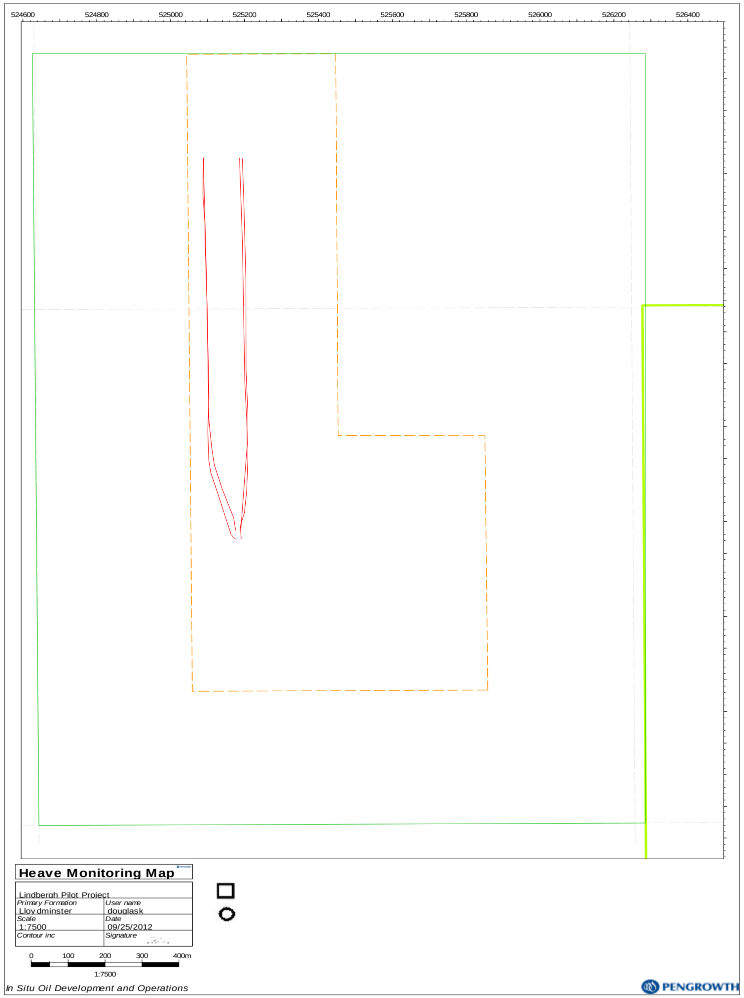


- Producer planned to land 3 m above highest point on oil/water contact (OWC) surface
- LWD measurements indicated OWC rising to the north
- Needed to directionally control drilling to maintain offset from OWC

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



TSX:PGF

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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

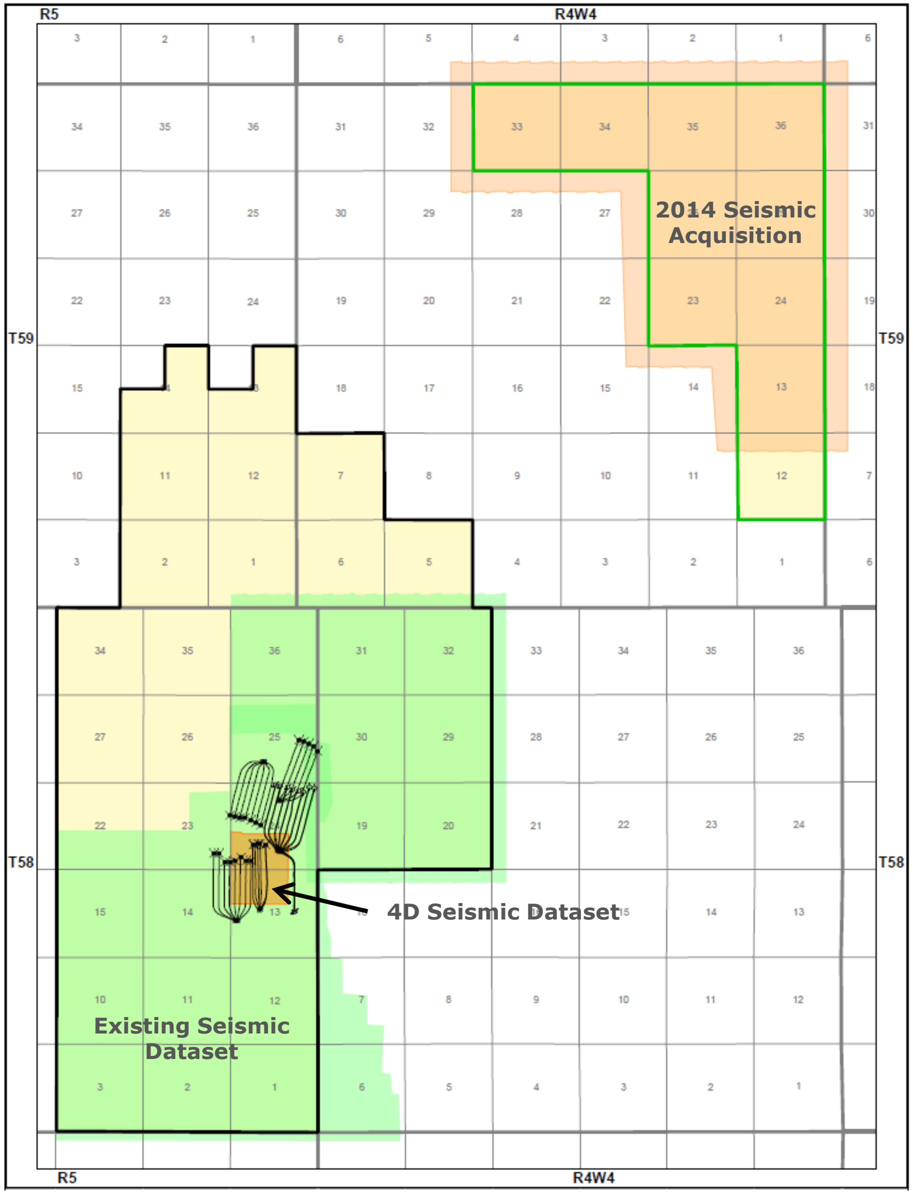
Pengrowth 1AB/13-13-58-05W4M						
Zone	TVD	Min Stress		Vert Stress		Stress Regime
	m	MPa	kPa/m	MPa	kPa/m	
Lloydminster	512.0	5.94	11.60	10.74	20.98	V. frac
GP Zone #1	493.0	7.48	15.17	10.34	20.97	V. frac
GP Zone #2	484.0	7.55	15.60	10.15	20.97	V. frac
GP Zone #3	476.0	6.80	14.29	9.97	20.95	V. Frac

- 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

LINDBERGH SEISMIC

- 102 sq km of 3D data exist over most of the Lindbergh and Muriel Lake leases with exploitable resource
- 1.32 sq km 4D Seismic over D01 wellpad:
  - Baseline acquired Feb 2012
  - First monitor acquired Dec 2013
  - Second monitor acquired Dec 2016
- No new seismic acquired in 2019

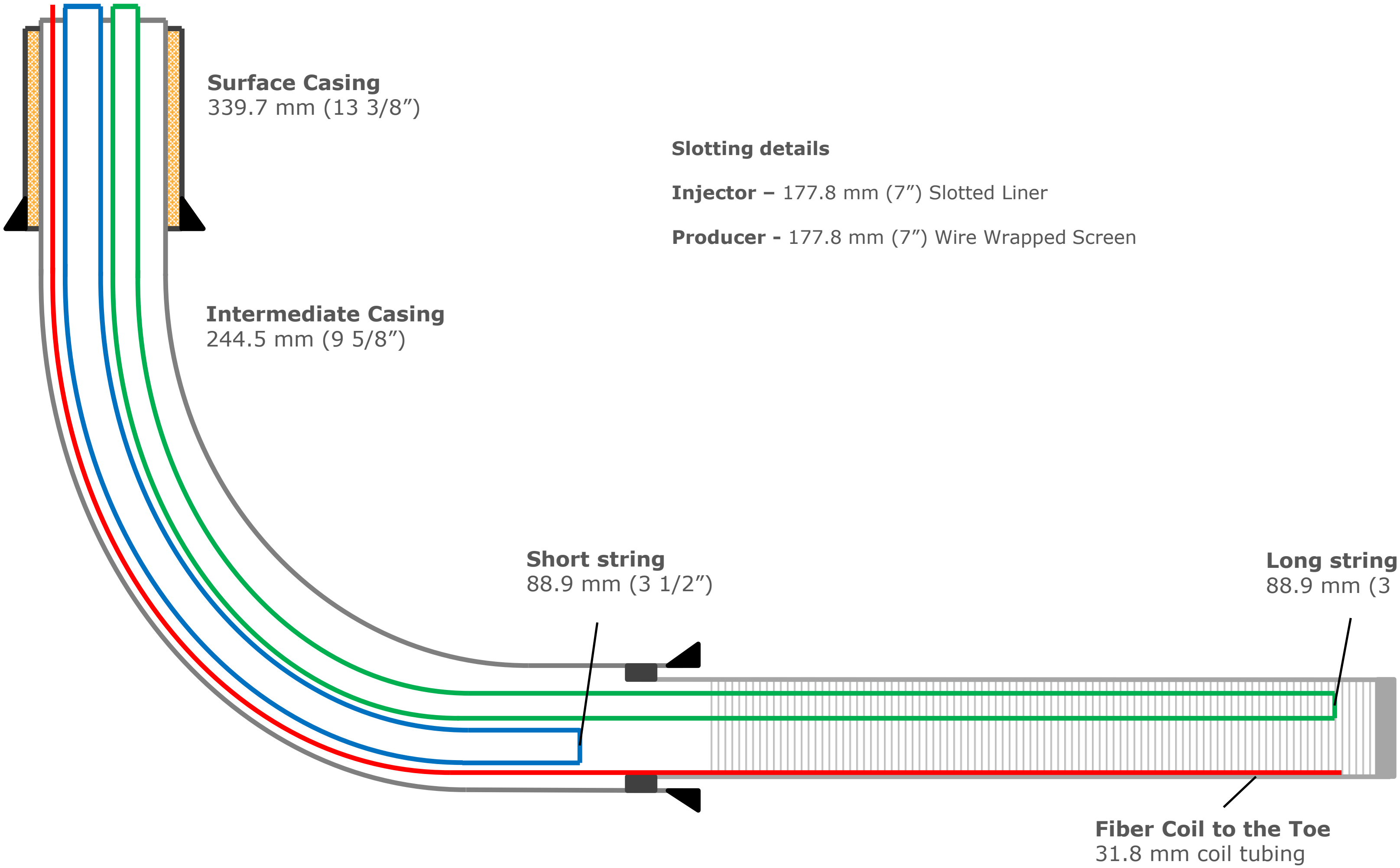


DRILLING AND COMPLETIONS

COMMERCIAL DRILLING & COMPLETIONS

- No new SAGD well pairs or infill well additions in 2019

TYPICAL SAGD PAIR CIRCULATION COMPLETION



Slotting details

Injector – 177.8 mm (7") Slotted Liner

Producer - 177.8 mm (7") Wire Wrapped Screen

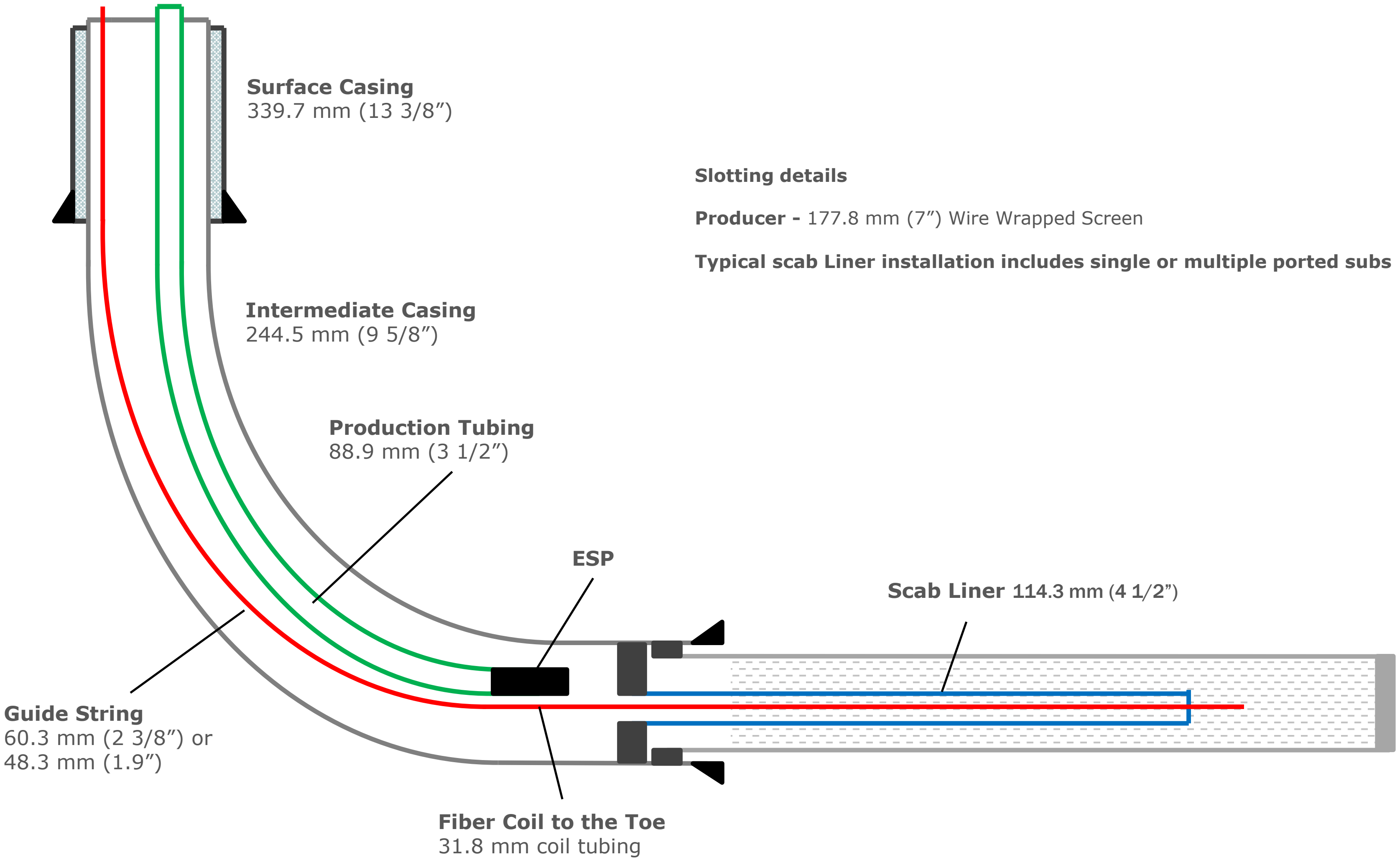
LINER DESIGN

- 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 SAGD PAIR ARTIFICIAL LIFT COMPLETION

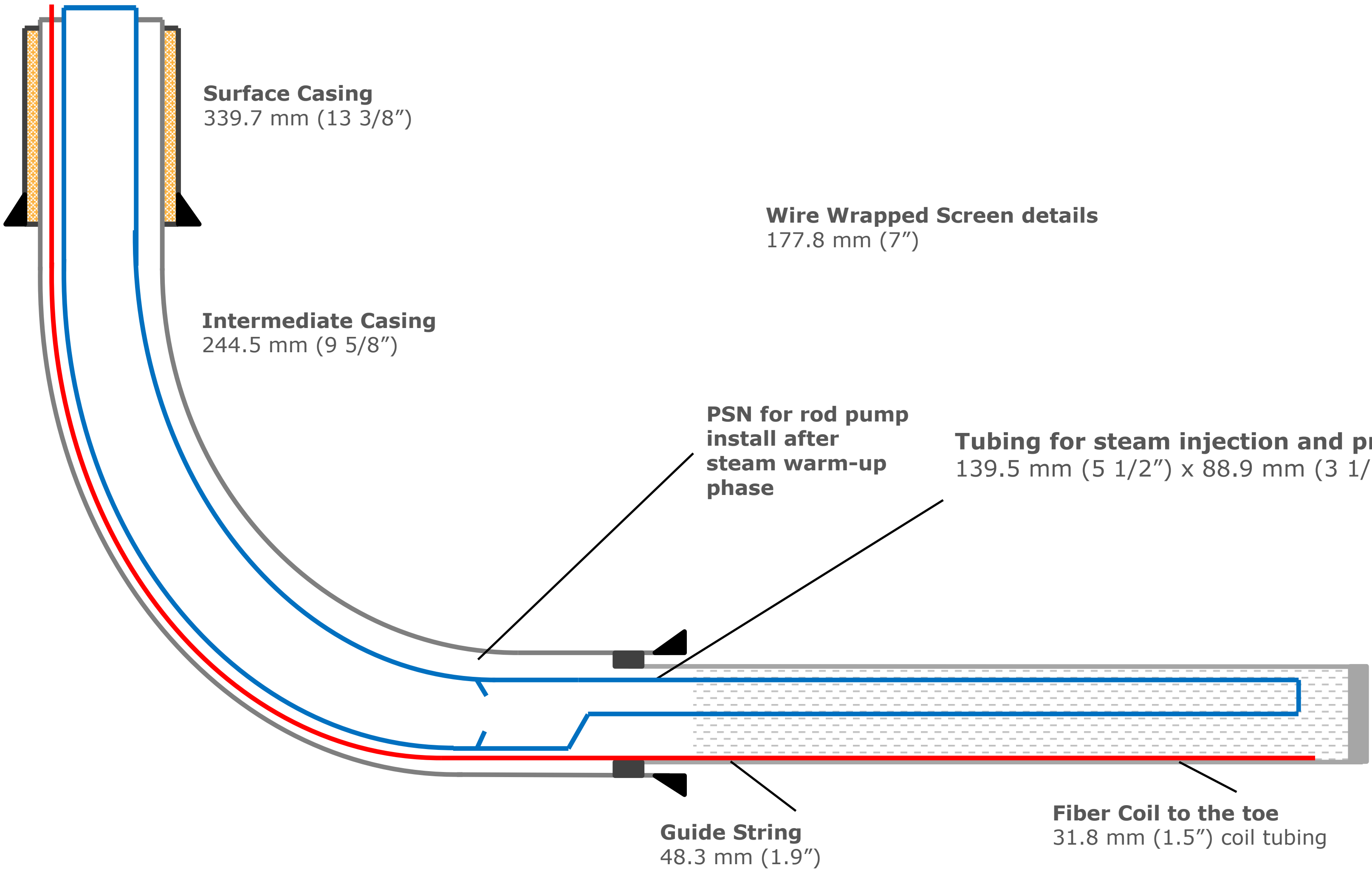


Slotting details

Producer - 177.8 mm (7”) Wire Wrapped Screen

Typical scab Liner installation includes single or multiple ported subs

D05 INFILL WELL TYPICAL 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 75-80% of the lateral length to aid in toe development early in SAGD production and mitigate flow breakthrough at the heel
- Mechanical perforation or recompletion of scab liner
  - Mechanical perforation performed concurrently with pump changes where applicable in past years
  - Pengrowth has transitioned to scab liner recompletes (pulls, redesigns) over mechanical perforation based on learning's over several years
  - Both options open 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
    - All Lindbergh well pairs are continually being monitored and analyzed for possible scab liner modifications to optimize production and reservoir conformance
  - Scab liner recomplete is preferred over mechanical perforation
    - Avoid scale deposition in the liner upon cutting the tubing
    - Workover risk and cost is comparable with both methods
    - Scab liner remains structurally intact by recompleting and not perforating base pipe

COMPLETION CHANGES

- Well D05-P07 had a tubing-conveyed ICD (first in the field) installed in June 2018
  - Pulled original scab liner (installed in 2015), cleaned out lateral and installed tubing-conveyed ICD string to mitigate high vapour production and improve overall reservoir conformance
  - Production results following the workover have been favorable and led to further use of ICD systems across the Field
- Two tubing-conveyed ICD systems installed in December 2018 to remediate failed liners resulting in favorable production results from both wells
- Two commercial scab liners pulled and re-landed in 2019 to optimize well conformance, producer drawdown and production rates
- One commercial scab liner installed in 2019 to remediate a failed liner, mitigate vapour production and optimize well conformance
- Metrics that PGF is using to measure success of tubing-conveyed ICD systems is very similar to liner-conveyed ICD's; produced emulsion rates, overall well pair operation (steam injection rates and ESP stability), subcool control and inflow characteristics based on downhole temperature data

SAGD 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	Jan-18	
D04-J04	Injector	109152405805W40	1	Jan-18	Jul-19
D04-J05	Injector	104162405805W40	1	Dec-17	Jul-19
D04-J06	Injector	109101305805W40	1		
D04-J07	Injector	108162405805W42	1		
D04-J08	Injector	109162405805W40	1	May-18	
D04-J09	Injector	110162405805W40	1	May-18	
D05-J03	Injector	109012305805W40	1	Nov-15	
D05-J04	Injector	110012305805W40	1		
D05-J06	Injector	107042405805W40	1	Nov-15	

SAGD PRODUCER COMPLETIONS CHANGES

Well Name	Well Type	UWI	Scab Liner Installed	Production Ports Installed	Scab Liner Perforated	Scab Liner Pulled/Relanded
D01-P01	Producer	106062405805W42	Y	0		
D01-P02	Producer	108062405805W40	Y	1		
D01-P03	Producer	114062405805W40	N	Liner-conveyed ICD		
D02-P04	Producer	102082505805W40	Y	1		
D02-P05	Producer	100082505805W40	Y	1	17-Jul	
D02-P06	Producer	103082505805W40	Y	1	16-Oct	
D02-P07	Producer	104082505805W40	Y	1		
D02-P08	Producer	105082505805W42	Y	1	16-Jun	
D03-P01	Producer	103112405805W40	Y	1	17-Sep	
D03-P02	Producer	102112405805W40	Y	0		May-19
D03-P03	Producer	107122405805W40	Y	1		
D03-P04	Producer	102122405805W40	Y	1		
D03-P05	Producer	108122405805W40	Y	1		Dec-18
D03-P06	Producer	109122405805W40	Y	1		
D03-P07	Producer	103092305805W40	Y	1	16-Jul	
*D04-P01	Producer	102152405805W40	N	Tubing-conveyed ICD		Dec-18
D04-P02	Producer	103152405805W40	Y	2		
D04-P03	Producer	104152405805W40	Y	2		
D04-P04	Producer	108152405805W40	Y	2		
D04-P05	Producer	103162405805W42	Y	2		
D04-P06	Producer	108101305805W40	N	Liner-conveyed ICD		
D04-P07	Producer	105162405805W40	N	Liner & tubing – conveyed ICD		Dec-18
D04-P08	Producer	106162405805W40	Y	Liner-conveyed ICD		Nov-19
D04-P09	Producer	107162405805W43	Y	2		
D05-P01	Producer	104012305805W42	Y	1	17-Jul	
D05-P02	Producer	105012305805W40	Y	1	17-Jan	
D05-P03	Producer	106012305805W40	Y	2		
D05-P04	Producer	103012305805W40	Y	1		
D05-P05	Producer	102042405805W40	Y	1	17-Sep	
D05-P06	Producer	103042405805W40	Y	1	16-Dec	
*D05-P07	Producer	104042405805W40	N	Tubing-conveyed ICD	18-Jun	
D05-P08	Producer	105042405805W40	N	Liner-conveyed ICD		

*Original scab liner pulled and tubing-conveyed ICD system installed

INFILL WELL COMPLETIONS CHANGES

Well Name	Well Type	UWI	Scab Liner/Tail pipe Installed	Production Ports Installed	Scab Liner/Tail Pipe Perforated	Scab Liner/Tail Pipe Pulled/Relanded
D01-INF01	Infill	102052405805W40	N	0		
D01-INF02	Infill	113062405805W42	Y	0		
D05-INF01	Infill	111012305805W40	Y	0		Oct-19
D05-INF02	Infill	112012305805W40	Y	0		Oct-19
D05-INF03	Infill	113012305805W40	Y	0		
D05-INF04	Infill	114012305805W40	Y	0		Oct-19
D05-INF05	Infill	110042405805W40	Y	0		May-19
D05-INF06	Infill	111042405805W40	Y	0		
D05-INF07	Infill	112042405805W40	Y	0		
D05-INF08	Infill	113042405805W40	Y	0		Oct-19

COMMERCIAL ARTIFICIAL LIFT

- Required to convert from circulation to typical SAGD operations
- All SAGD producers and Pilot infill 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
- D05 infill wells utilize hydraulic lift rod pump systems
  - Lower capital cost when compared to ESP, better for higher viscosity emulsion, more variability in re-steaming operations if required
- 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 in ESP's 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.

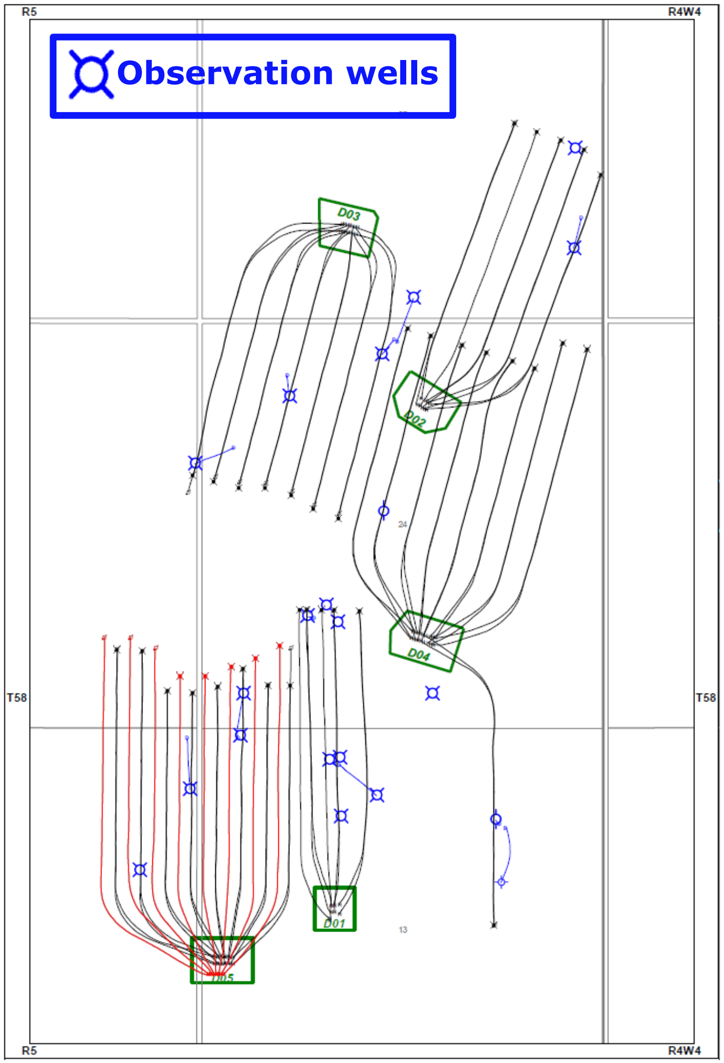
- Future considerations pending internal approval
  - 5 well pairs and 13 infill wells planned for 2020

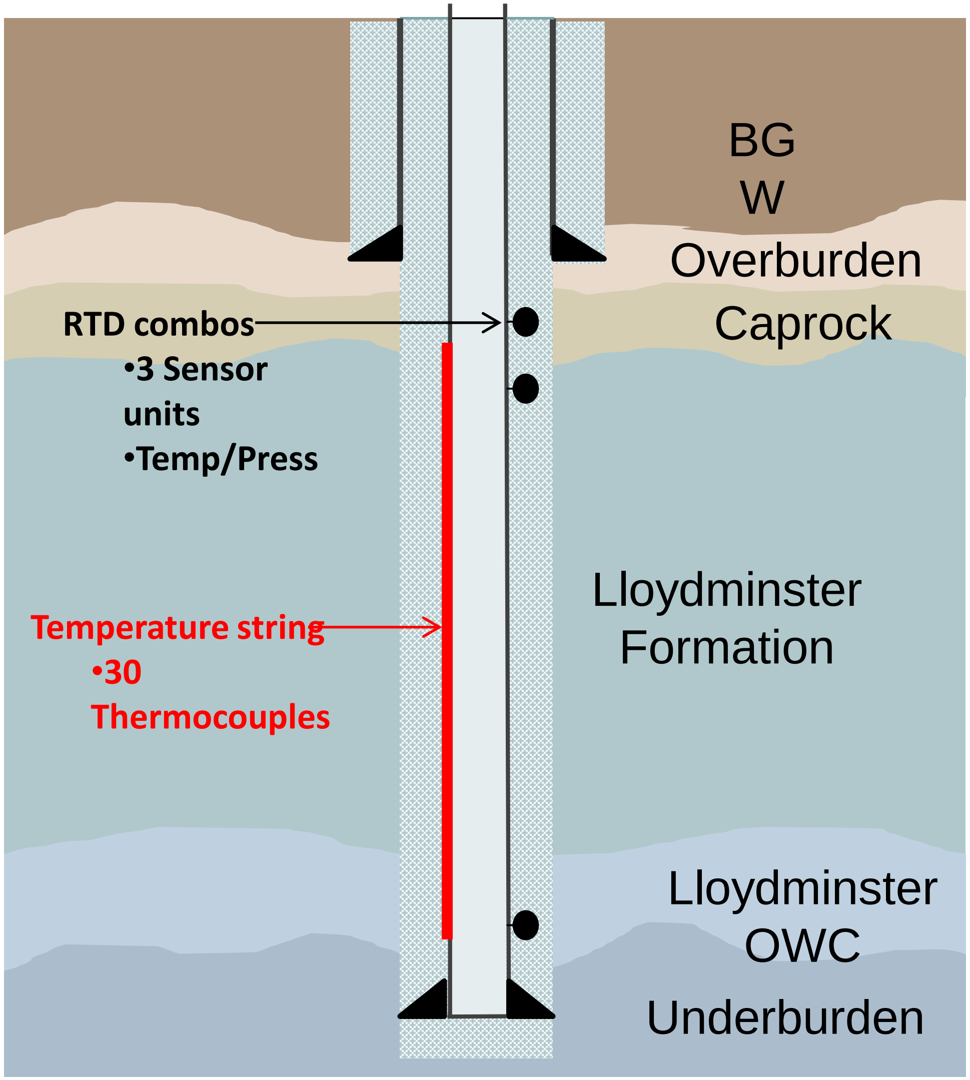
INSTRUMENTATION

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 and infills wells to provide real-time temperature data along the entire wellbore

OBSERVATION LOCATIONS/ TYPICAL COMPLETION





OBSERVATION LOCATIONS/ TYPICAL COMPLETION

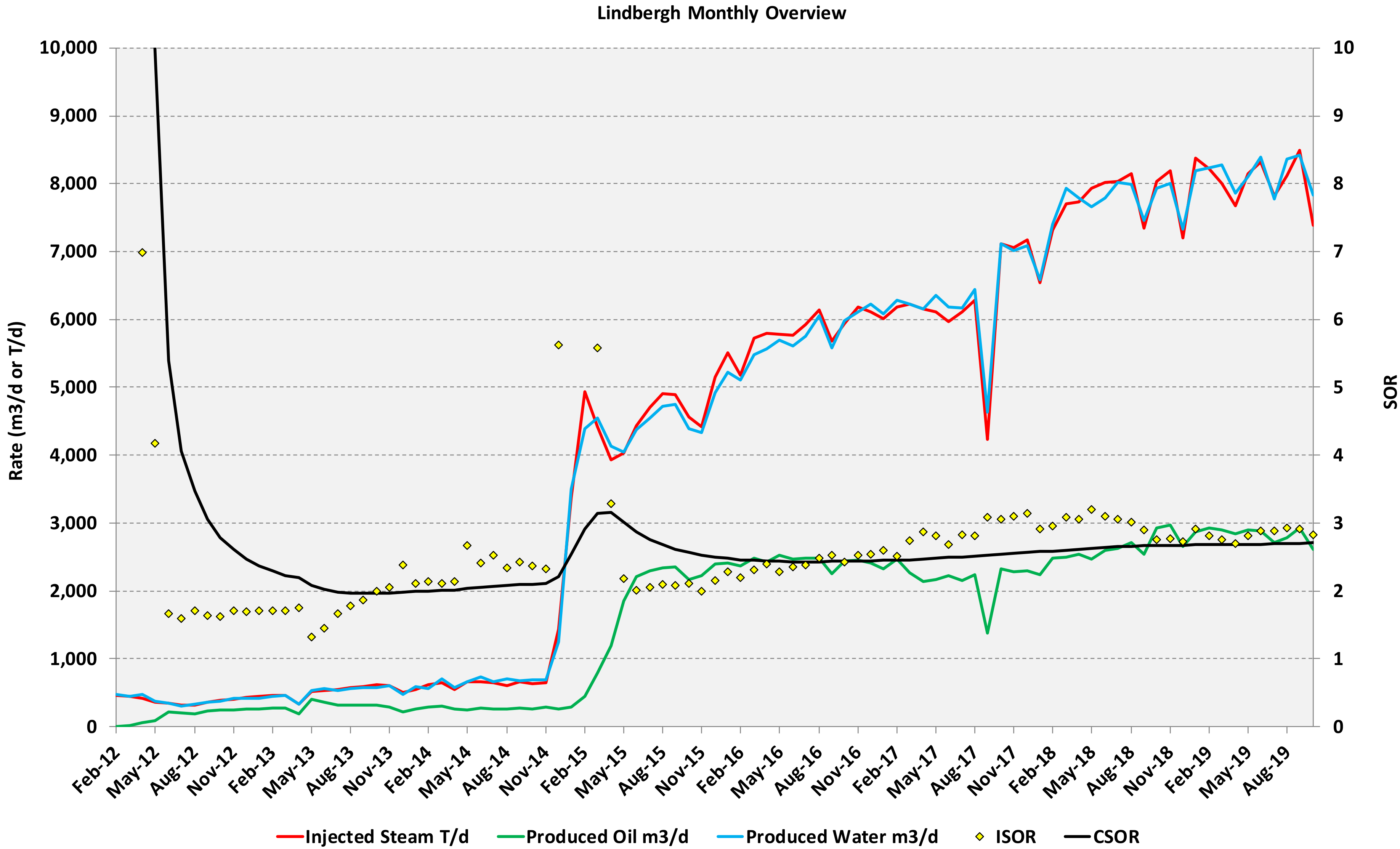
- Downhole pressure/temperature gauge reliability has been good overall
  - As the thermocouple and pressure monitoring equipment is cemented on the backside of the casing, remediation of any failed downhole equipment is challenging
  - Pengrowth therefore runs multiple temperature and pressure points 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
- Operations team checks locations monthly

SCHEME PERFORMANCE

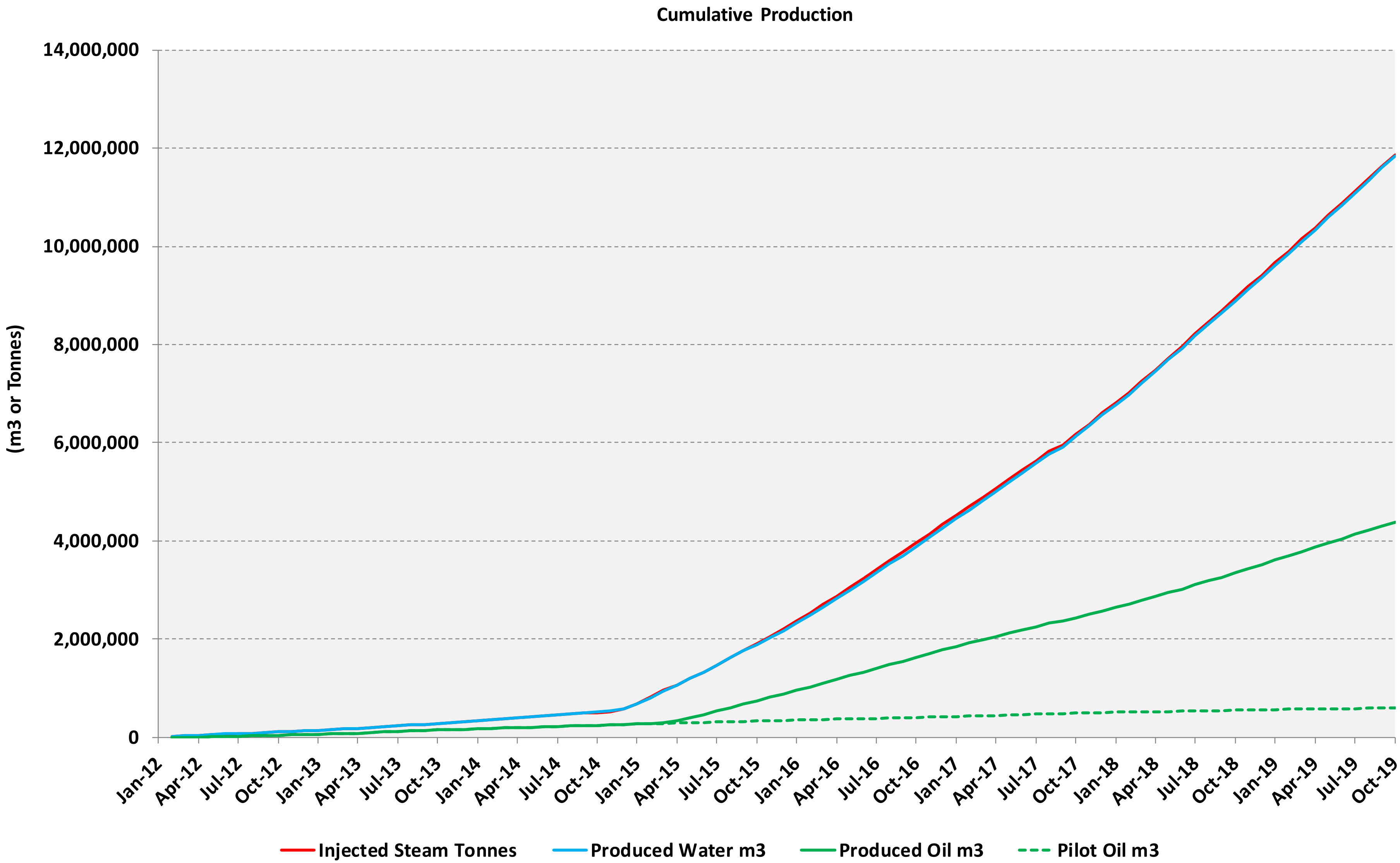
PREDICTING SAGD PERFORMANCE

- 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



CUMULATIVE VOLUMES



PAD RECOVERIES

OBIP - Recovery and % recovery by pad

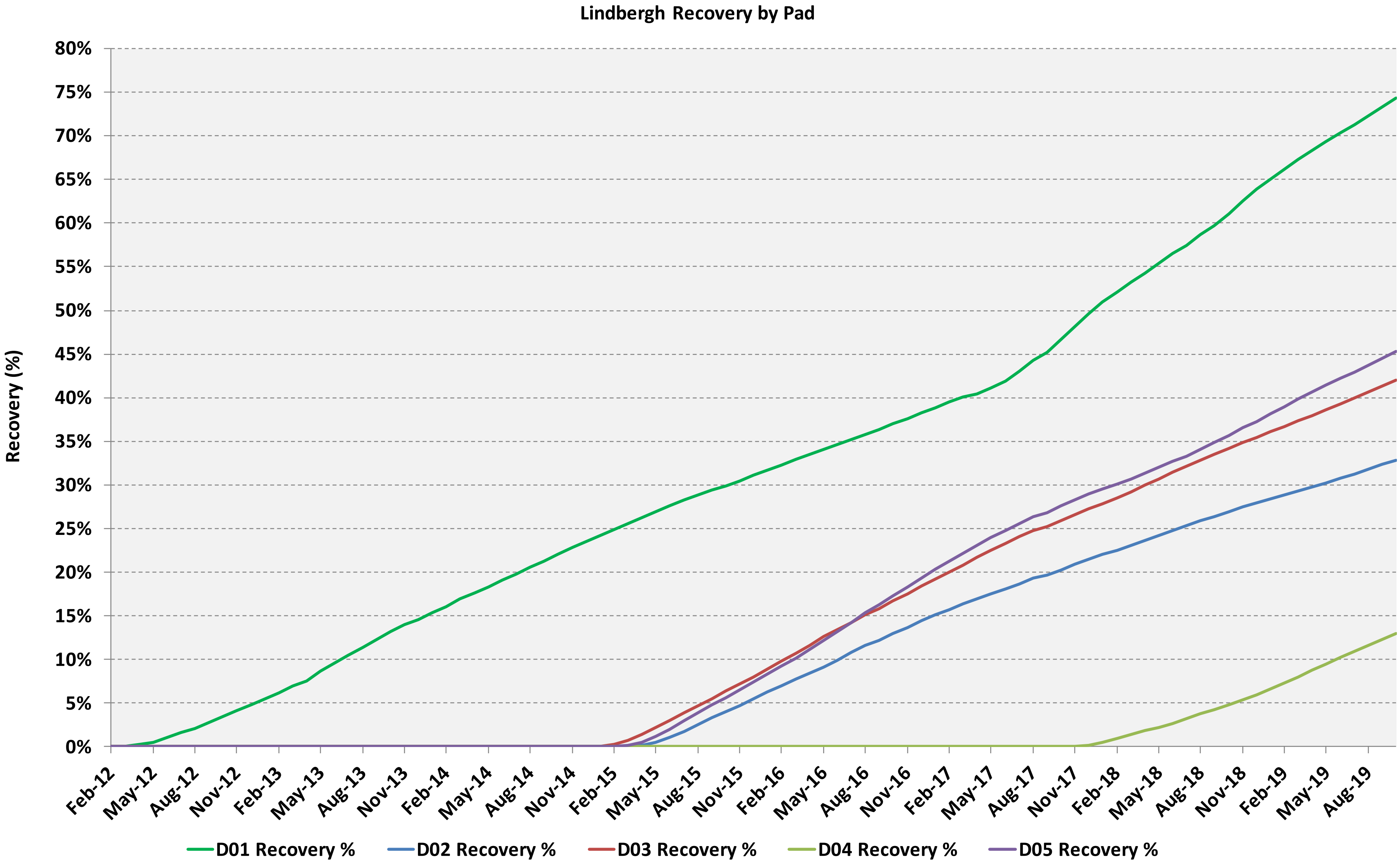
	Thickness	Length†	Spacing	Ave ϕ	Area	Ave So	OBIP	Recovery††	Recovery
Pad	(m)	(m)	(m)	(%)	(Ha)	(%)	(e3m3)	(e3m3)	**(%)**
D01†††	19.5	828	100	36	24.8	81	1407.5	812.8	**57.7**
D02	19.0	817	100	35	40.9	79	2160.1	675.6	**31.3**
D03	18.1	787	100	35	55.1	83	2886.5	1087.8	**37.7**
D04	20.6	833	100	36	75.0	78	4295.3	452.1	**10.5**
D05	18.3	801	100	37	64.1	80	3493.0	1411.6	**40.4**

Developed BIP - Recovery and % recovery by pad

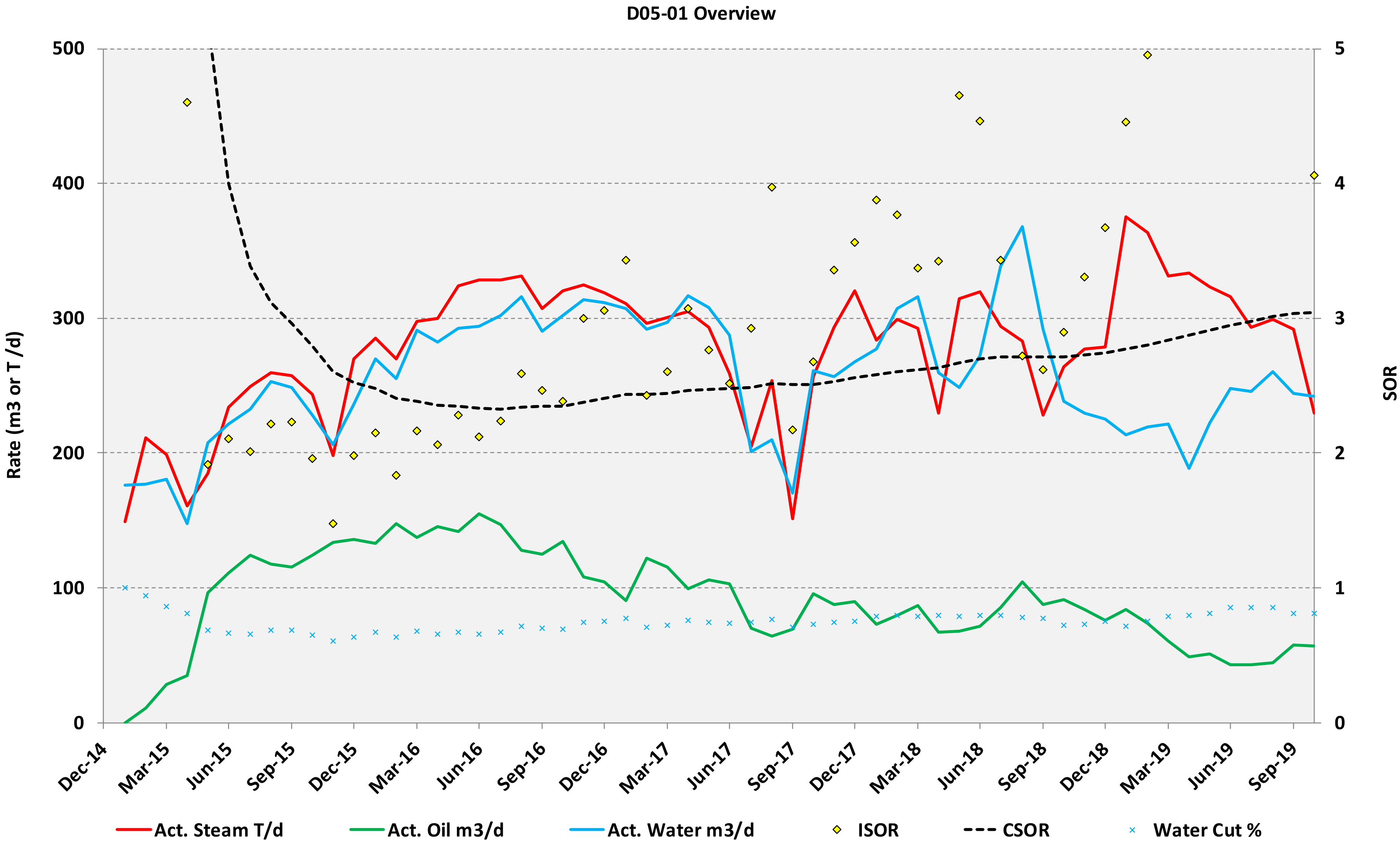
	Thickness	Length†	Spacing	Ave ϕ	Ave So	DBIP	Recovery††	Recovery	EUR
Pad	(m)	(m)	(m)	(%)	(%)	(e3m3)	(e3m3)	**(%)**	(%)
D01†††	15.2	828	100	36	81	1093.6	812.8	**74.3**	80
D02	17.7	817	100	35	79	2012.8	675.6	**33.6**	70
D03	15.9	787	100	35	83	2526.2	1087.8	**43.1**	70
D04	16.3	833	100	36	78	3385.7	452.1	**13.4**	70
D05	16.3	801	100	37	80	3122.9	1411.6	**45.2**	70

† Length is average slotted length plus 25 meters per end (50 m total)
†† Cumulative production to Oct 31 2019
††† D01 numbers include a new well pair and two new infill wells, D05 number include 8 new infill wells

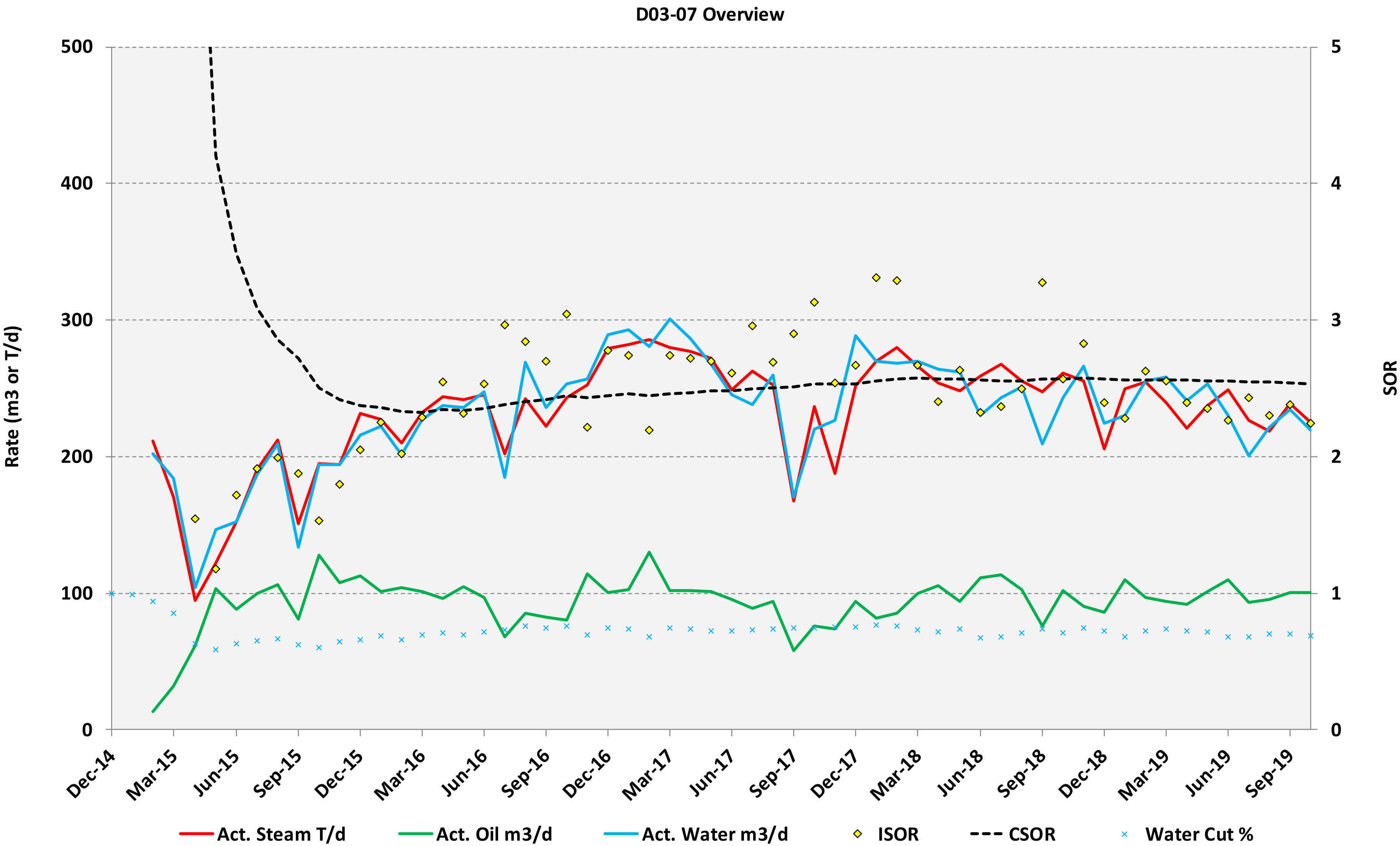
LINDBERGH DEVELOPED RECOVERY



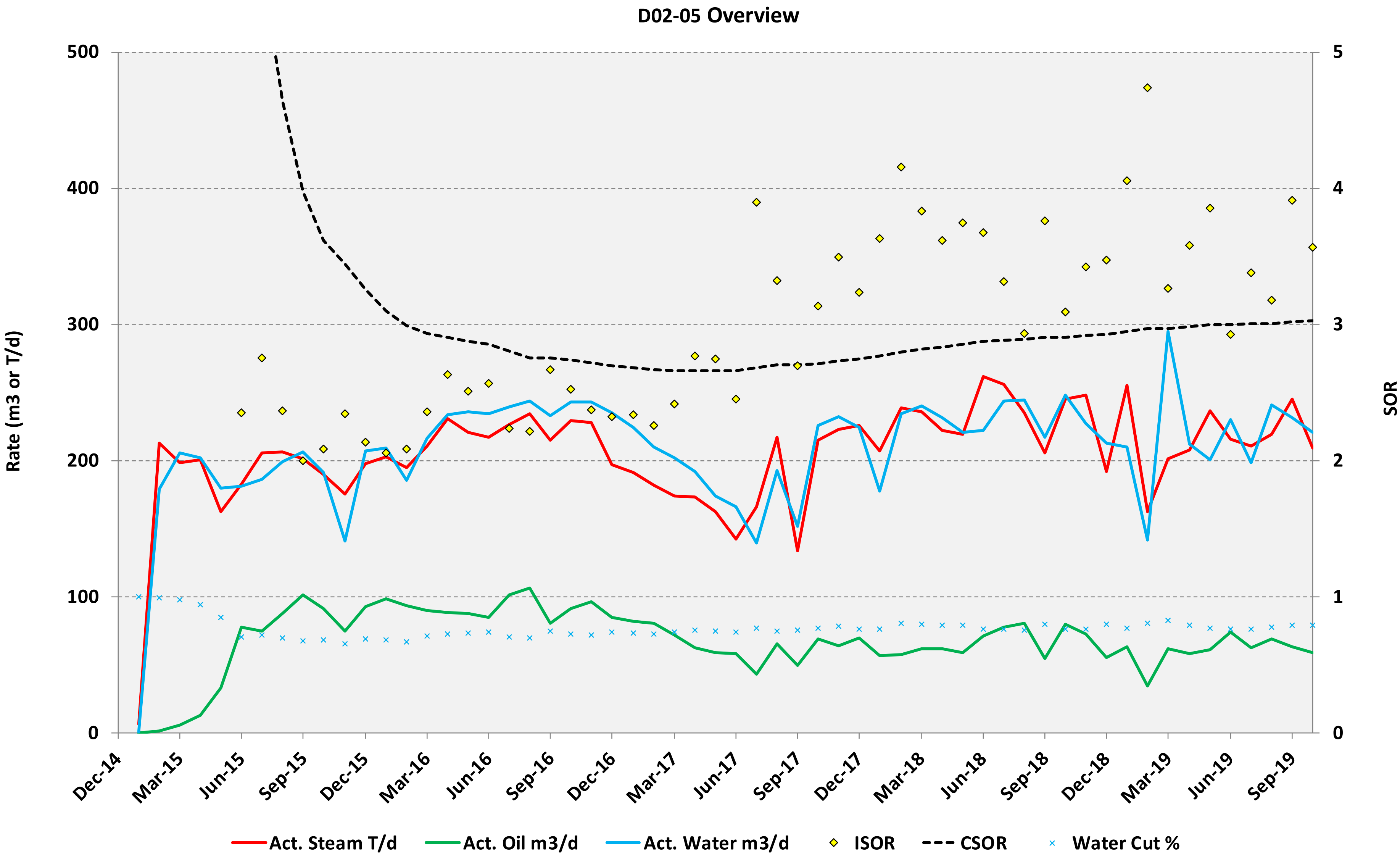
PHASE 1 HIGH PERFORMER



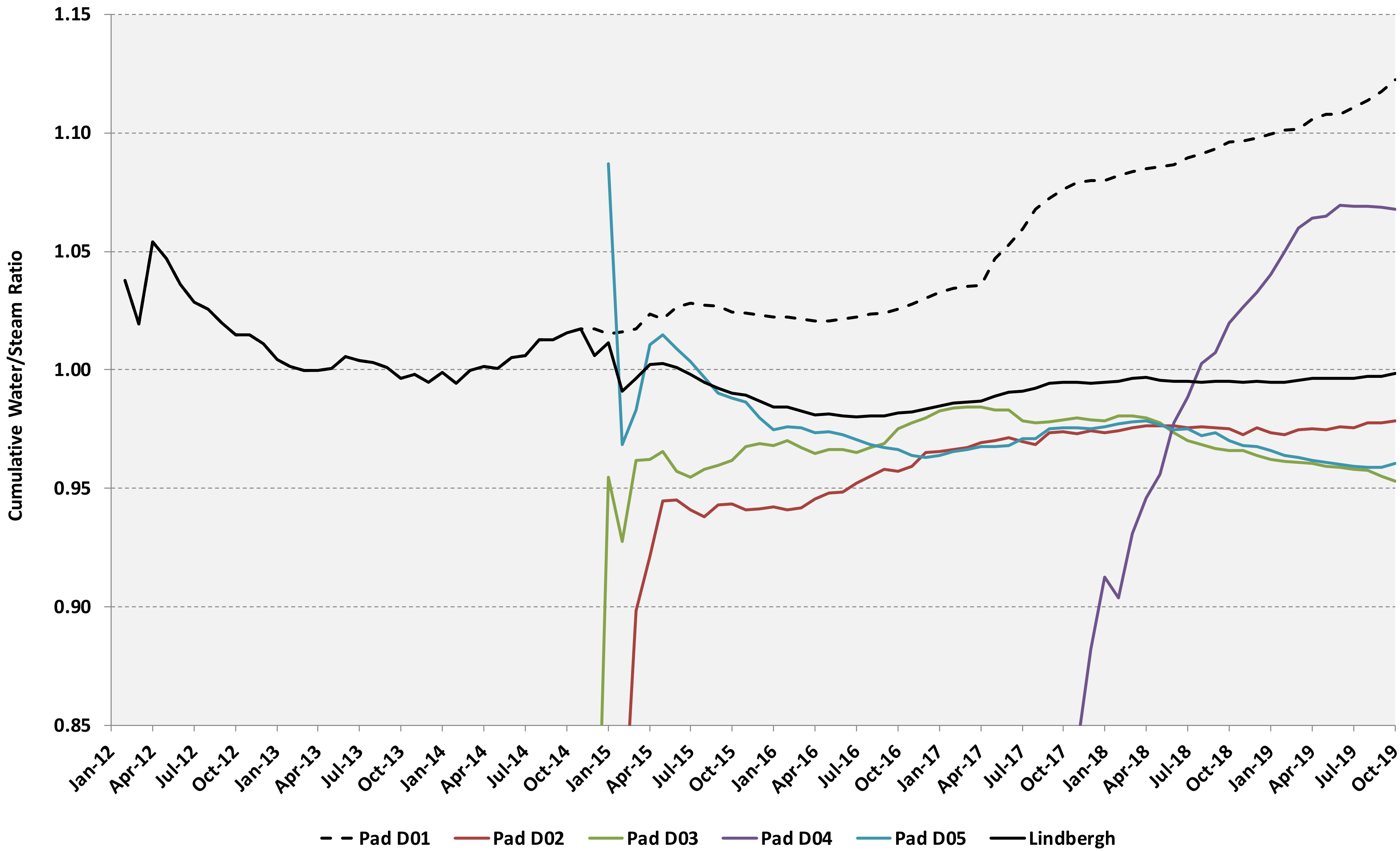
PHASE 1 MEDIUM PERFORMER



PHASE 1 POOR PERFORMER



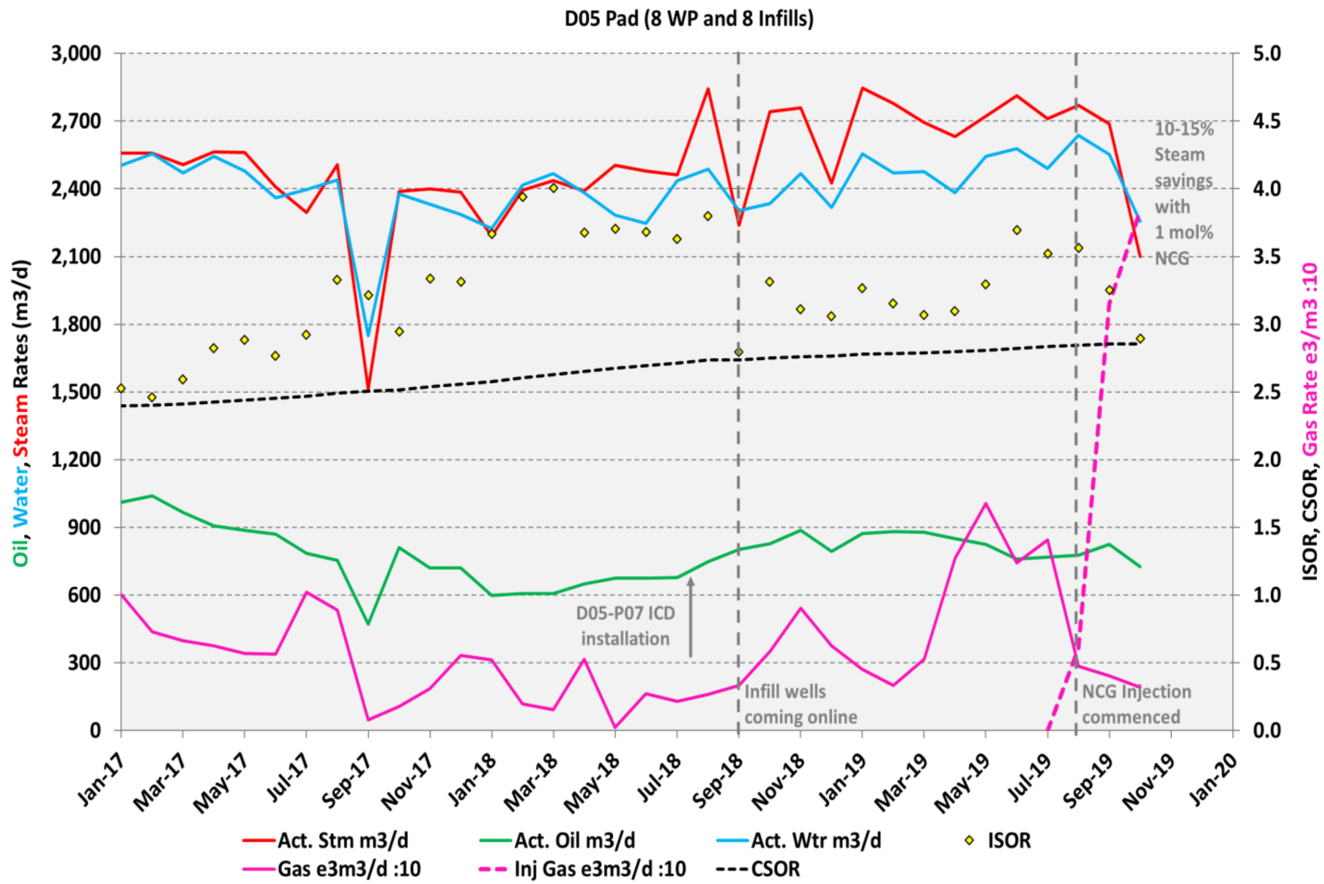
CUMULATIVE WATER/STEAM RATIO



PENGROWTH

NCG INJECTION IN PAD D05

- NCG injection was commenced at Pad D05 in August 2019
- Gas injection was ramped up to 1 mol% over a 3 month period
- Steam volume was cut by 10 to 15% per WP without a negative impact in oil production
- Steam to oil ratio has been reduced from 3.5 to 3.0
- Gas mol fraction will be slowly increased within the limits of AER approval
- Planning to initiate gas injection in Pad D01

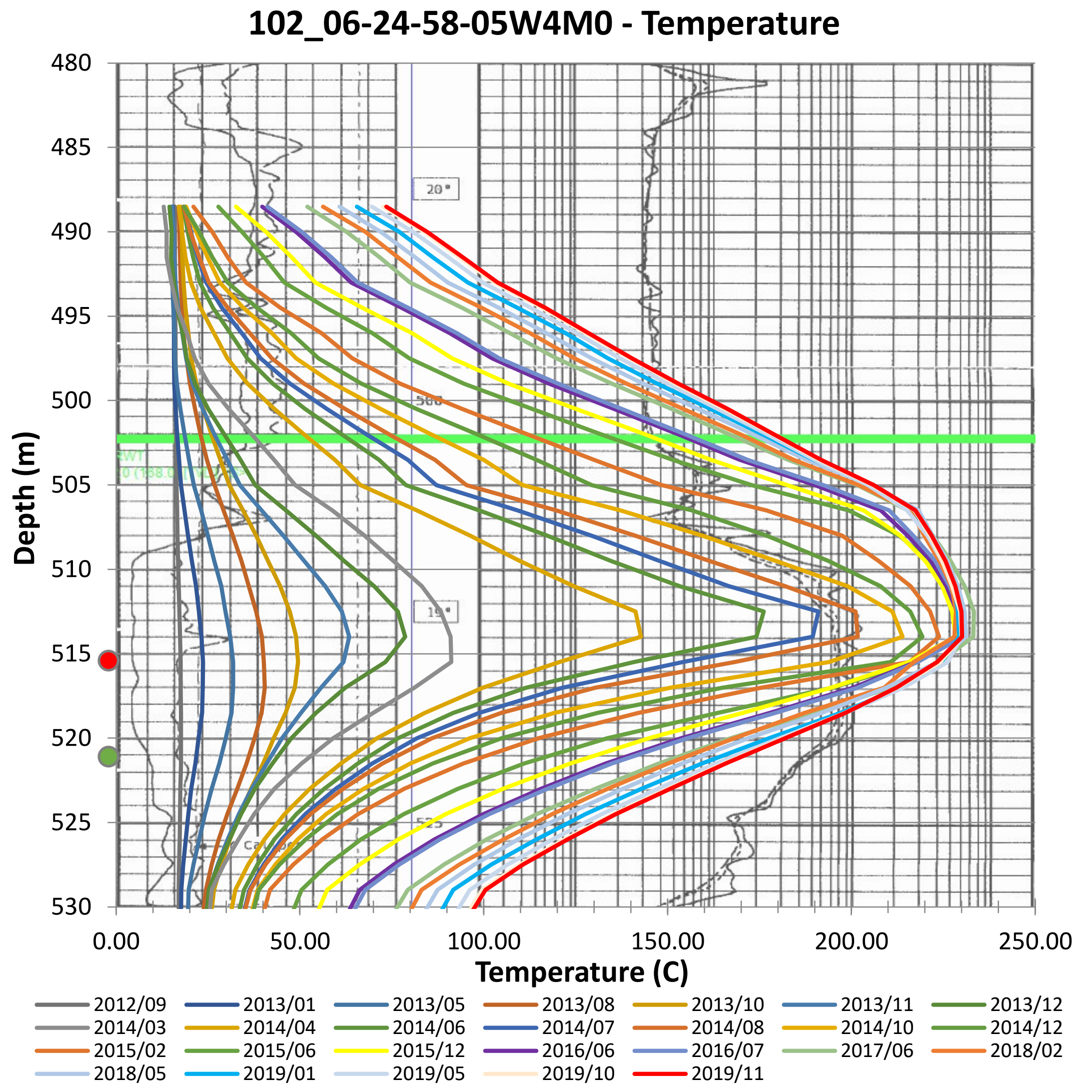


TSX:PGF

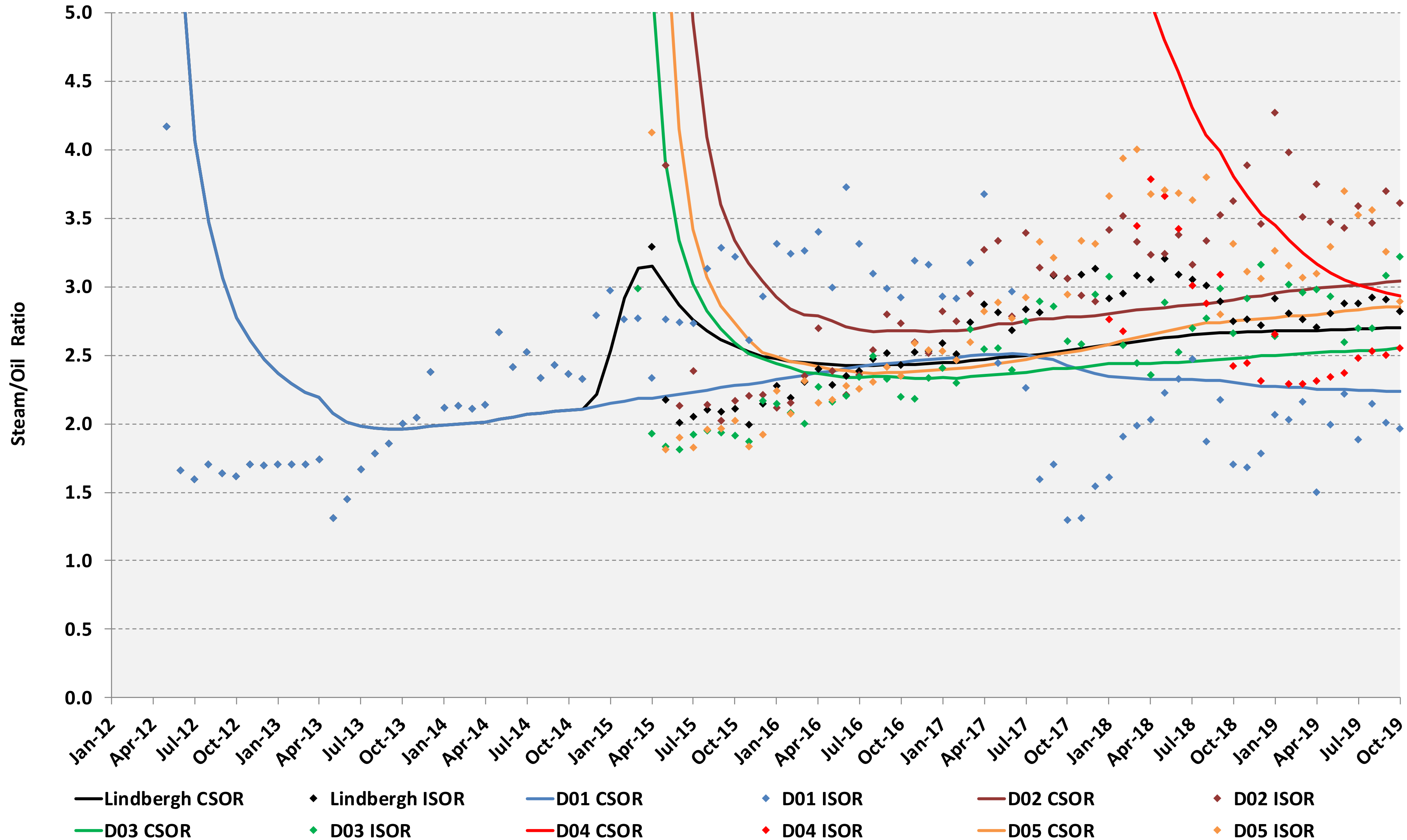
PENGROWTH

D01-02 OBSERVATION WELL EXAMPLE

~11 m offsetting WP2



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

- D05 infill wells meeting expectations
  - Learnings on circulation strategy will be incorporated into future infill well plans
- D05 NCG Injection meeting expectations
  - Current target of 1 mol% of gas injection has resulted in ~12% steam savings with no negative impact on oil production
- 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 shift-able 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 and tubing deployed flow control devices showing encouraging results
- Continuous improvement in ESP run life

FUTURE PLANS - SUBSURFACE

FUTURE PLANS - SUBSURFACE

- Future considerations pending internal approval
  - Drilling of 4 SAGD well pairs in Pad D02 and 1 well pair in PadD03
  - Drilling 13 new infill wells in Pads D02 and D03
  - Commence non-condensable gas co-injection with steam in Pads D01 and D03 and continue it in Pad 05

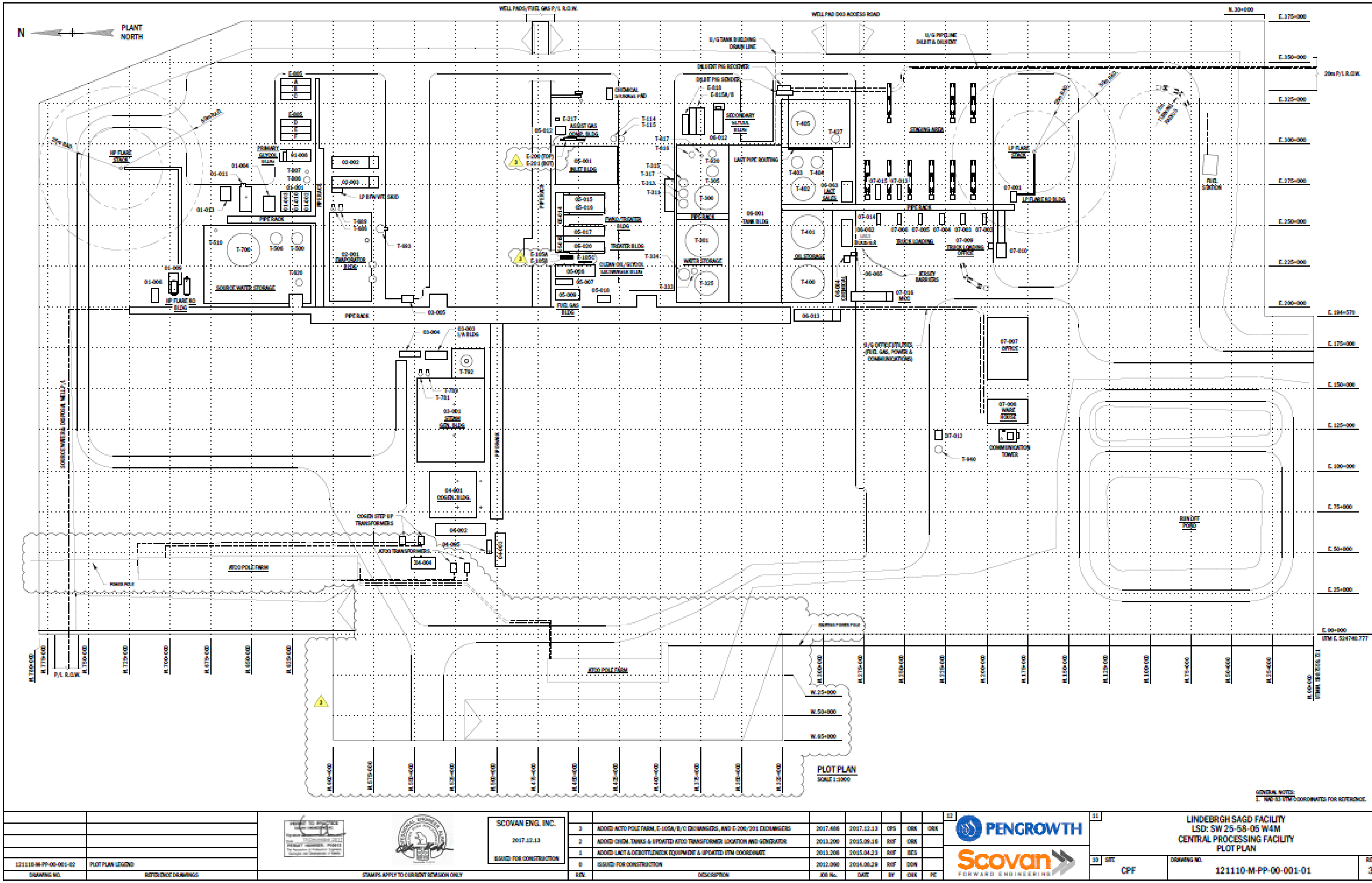
FACILITIES

PENGROWTH

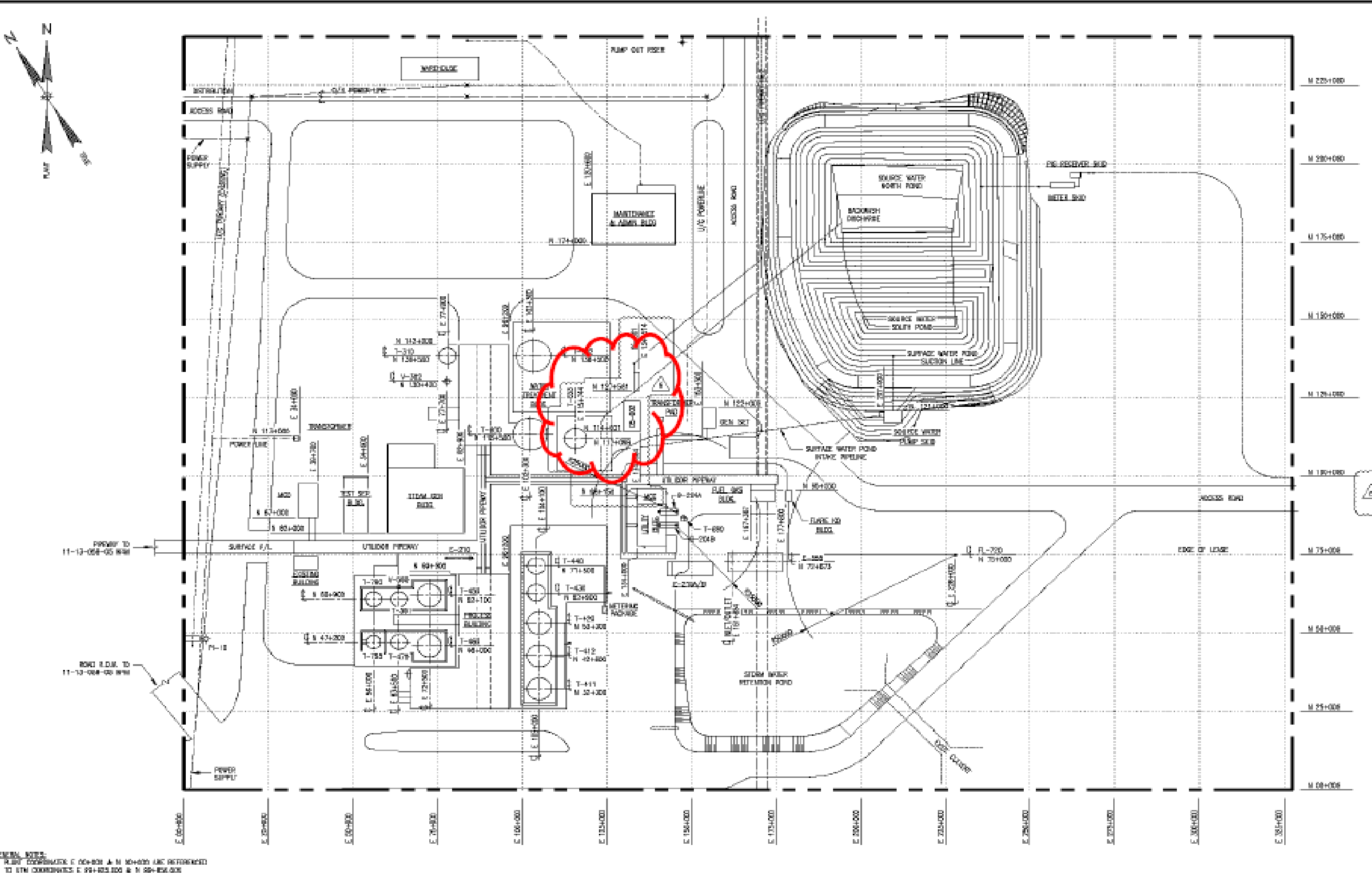
LINDBERGH SAGD COMMERCIAL FACILITY

- 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
- Commercial facility first steam December 2014

LINDBERGH COMMERCIAL CPF PLOT PLAN



LINDBERGH PILOT PLOT PLAN



TAG	BUILDING/EQUIPMENT DESCRIPTION	WIDTH	LENGTH	HEIGHT
	WATER TREATMENT BUILDING	15000	32000	5500
	PROCESS BUILDING	15000	43080	6108
	UTILITY BUILDING	8500	18400	3500
	FUEL GAS BUILDING	3700	7408	3600
	MAINTENANCE & ADMIN BUILDING	18600	34580	4100
	WAREHOUSE BUILDING	7300	33180	7100
	SOURCE WATER PUMP SKID	4000	5808	3800
	TEST SEPARATOR BUILDING	7300	18000	6418
	STEAM GENERATOR BUILDING	22700	39480	6508
	PIG RECEIVER SKID	1850	2828	–
	FLARE KO BUILDING	1829	3251	2281
	MCC BUILDING	4086	10820	3658
	METER SKID	2000	7808	2146
T–380	RAW WATER TANK	10300ø		9800
T–385	BOILER FEED WATER TANK	10300ø		9800
T–310	SOFTENER WASTE TANK	5101ø		3658
T–411	PRODUCTION SALES TANK #1	7163ø		7805
T–412	PRODUCTION SALES TANK #2	7163ø		7805
T–420	OFFSPEC OIL TANK	7153ø		7805
T–430	SLOP TANK	5858ø		7315
T–440	DILUENT TANK	5238ø		7315
T–450	PROD. WATER SKIM TANK	7155ø		9765
T–460	PROD. WATER STORAGE TANK	7166ø		9760
T–470	DESAND TANK	4725ø		7315
T–561	BLOWDOWN VENT TANK	4558ø		7315
T–790	POP TANK	4725ø		7315
T–785	FLOOR DRAIN TANK	4216ø		3658
T–680	GLYCOL STORAGE TANK	2380ø		1858
	METERING PACKAGE FOR T–440	1219	2438	2281
V–302	VACUUM DEAERATOR	1668 I.D.		11360
V–560	STEAM BLOWDOWN SEPARATOR	1600 I.D.		11360
E–210A/B	COOLING GLYCOL AERIAL COOLERS	4090	13290	
FL–720	FLARE STACK	219ø		18200
E–565	COOLING GLYCOL AERIAL COOLERS	8146	10788	4122
T–633	WATER TRANSFER TANK	6553ø		9754
[illegible]–001	WATER TRANSFER PIG LAUNCHER	1653	5898	1291
[illegible]–005	WATER TRANSFER PUMP SKID	4877	6754	4161

GENERAL NOTES:
PLANT COORDINATES E 00+000 & N 00+000 ARE REFERENCED TO UTM COORDINATES E 99+825.000 & N 60+856.000

REV.	DESCRIPTION	JOB No.	DATE	BY	CHK	PM	PE
6	REVISED WATER TRANSFER PUMP SKID, TANK AND PIG LAUNCHER AREA	2013.068	2014.07.09	MN	GRD		
5	ADDED WATER TRANSFER PUMP SKID, TANK AND PIG LAUNCHER	2013.006	2014.04.23	RCF	MGM		
4	AERIAL COOLER ADDITION (E–565)	2012.067	2012.03.21	RM	RF		
3	AS-BUILT	2010.030	2012.05.30	DFS	BN		
2	UPDATED SOURCE WATER POND & ADDED DIKE WALL	2010.030	2012.01.20	RF	BN		
1	REVISED AS SHOWN	2010.030	2011.11.14	RF	BN		
0	ISSUED FOR CONSTRUCTION	2010.038	2011.08.26	RF	BN		

DRAWING NO. | REFERENCE DRAWINGS | STAMPS APPLY TO CURRENT REVISION ONLY

SCOVAN ENG. INC.
ISSUED FOR CONSTRUCTION

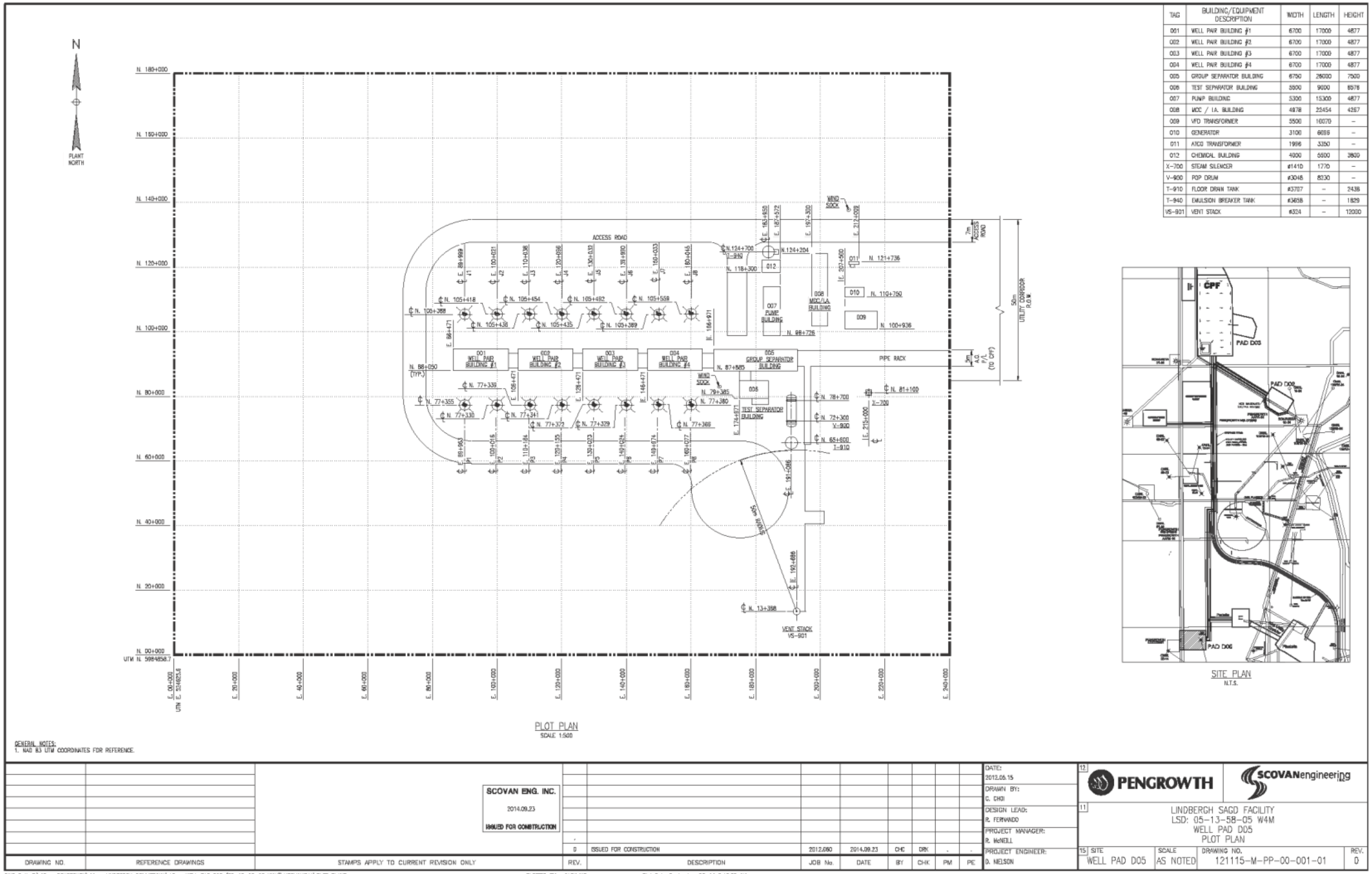
DATE: 2011.08.26
DRAWN BY: R. FERNANDO
DESIGN LEAD: R. FERNANDO
PROJECT MANAGER: R. McNEIL
PROJECT ENGINEER: B. NELSON

PENGROWTH | SCOVANengineering

LINDBERGH SAGD PILOT FACILITY
LSD: 07–13–068–05 W4M
CENTRAL PROCESSING FACILITY
PLOT PLAN

SITE	SCALE	DRAWING NO.	REV.
CPF	1:600	12–10–10–PP–001	6

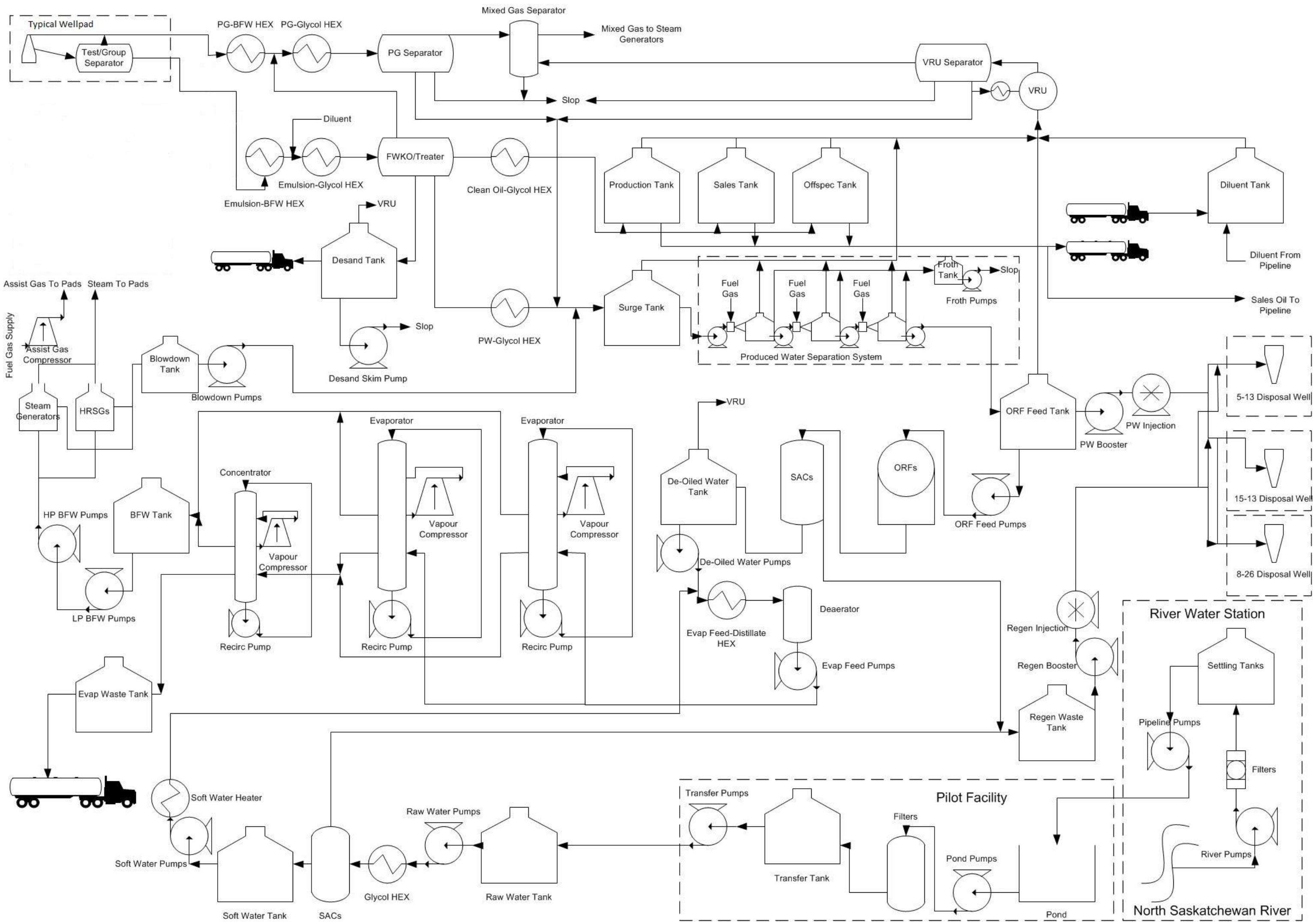
LINDBERGH COMMERCIAL TYPICAL WELLPAD PLOT PLAN



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

- Debottlenecking Progress
  - Installed additional secondary glycol aerial cooler to improve produced water cooling at front end of facility.
  - Purchased additional produced water exchanger for future install.
  - Installed dry salt storage and conveyor system to reduce risk from challenging salt supply environment

- WELL PAD EXPANSIONS
  - No expansions completed in 2019.

PILOT OPERATION

- No major regulatory equipment outages in 2019.
- Executed zero diluent bitumen treating trial.
- Produced Water from pilot transferred via pipeline to CPF for water treatment.
- Steam generation from the Pilot plant primarily feeds D01 Pad and is tied into the overall field distribution system.

LINDBERGH SAGD COMMERCIAL FACILITY PERFORMANCE

- 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
- H-710 Steam Generator regulatory outage October 2019

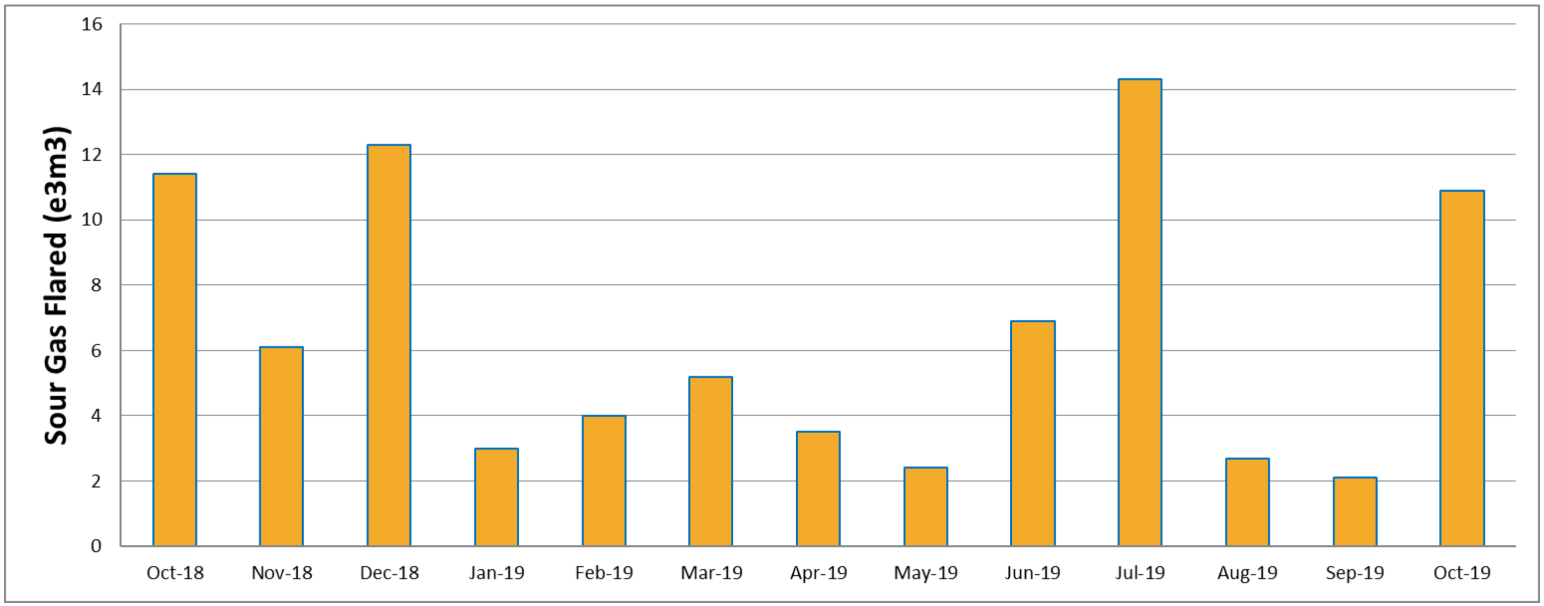
LINDBERGH SAGD COMMERCIAL FACILITY PERFORMANCE

- Steam generation
  - Operating at 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

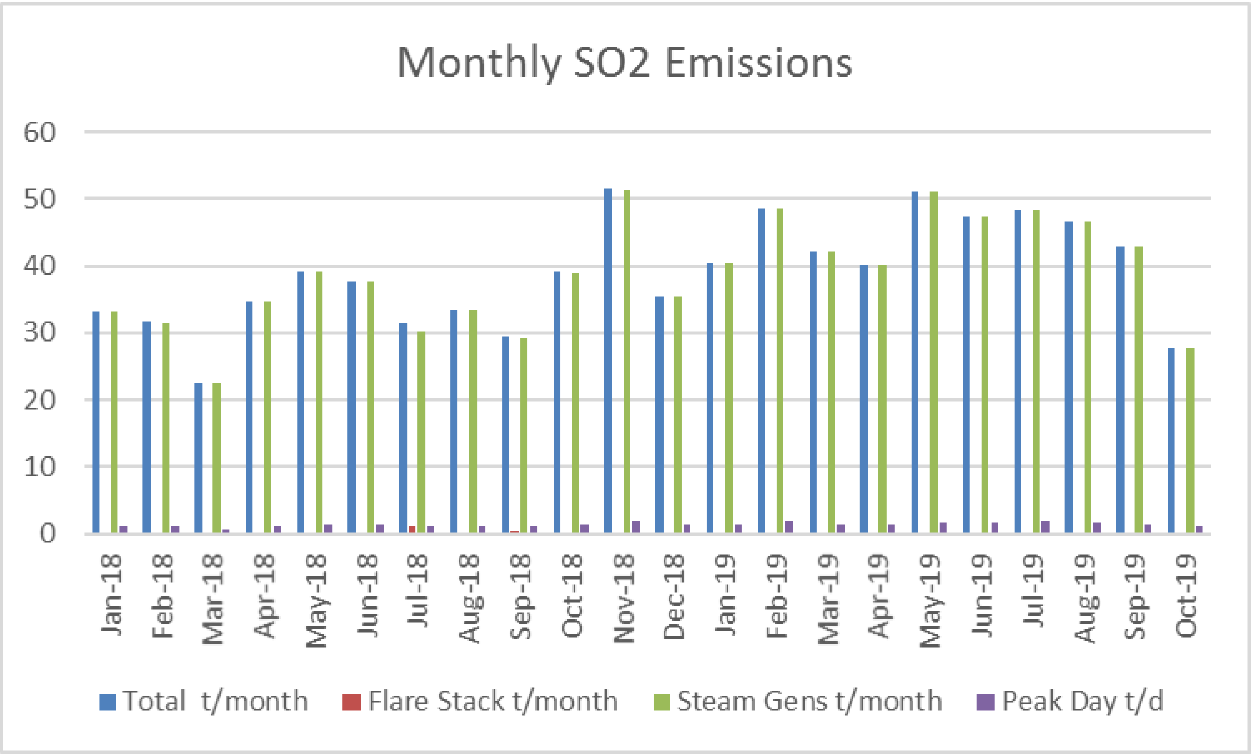
	Generation	Consumption	Import	Export
	MWh	MWh	MWh	MWh
Nov-17	11111	10346	517	1282
Dec-17	11483	10791	268	960
Jan-18	11285	10734	233	784
Feb-18	10625	10703	270	192
Mar-18	11676	11993	385	68
Apr-18	10667	10681	505	491
May-18	10005	9386	666	1285
Jun-18	9899	8858	37	1078
Jul-18	10120	9113	35	1042
Aug-18	10204	9905	145	444
Sept-18	10454	9244	2	1212
Oct-18	11012	11147	739	604
Nov-18	11716	12561	979	134
Dec-18	11462	12361	1179	279
Jan-19	13532	15154	1837	215
Feb-19	12005	12512	846	339
Mar-19	12526	13295	1332	563
Apr-19	11403	11517	589	475
May-19	12056	12267	360	149
Jun-19	11402	11959	640	83
Jul-19	11592	11790	512	314
Aug-19	11743	13282	1619	80
Sept-19	11838	13662	1828	4
Oct-19	12202	13760	2070	512

LINDBERGH – FLARED & VENTED GAS



- There was no sour gas venting during this period

LINDBERGH – SO_2 EMISSIONS



- Highest daily recorded SO_2 emissions were 1.82 t/day. SO_2 emission license limit is 3.0 t/day
- 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-18	13.19
Feb-18	15.27
Mar-18	14.92
Apr-18	14.69
May-18	14.31
Jun-18	13.99
Jul-18	13.40
Aug-18	14.23
Sep-18	14.22
Oct-18	14.18
Nov-18	15.39
Dec-18	14.15
Jan-19	15.44
Feb-19	15.47
Mar-19	13.50
Apr-19	13.87
May-19	13.74
Jun-19	14.05
Jul-19	13.06
Aug-19	13.12
Sep-19	14.80
Oct-19	15.27

	2018 Manual Stack Surveys		2019 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)	---	---	5-Nov-2019	15.4	16.6
H-720 (Steam Gen 2)	27-Mar-18	15.1	---	---	16.6
H-730 (Cogen 1)	1-Aug-2018	1.34	---	---	5.0
H-740 (Cogen 2)	---	---	4-Jul-2019	0.643	5.0

EPEA Approval 1581-02-03 Table 3.2 requires manual stack survey test frequency as:

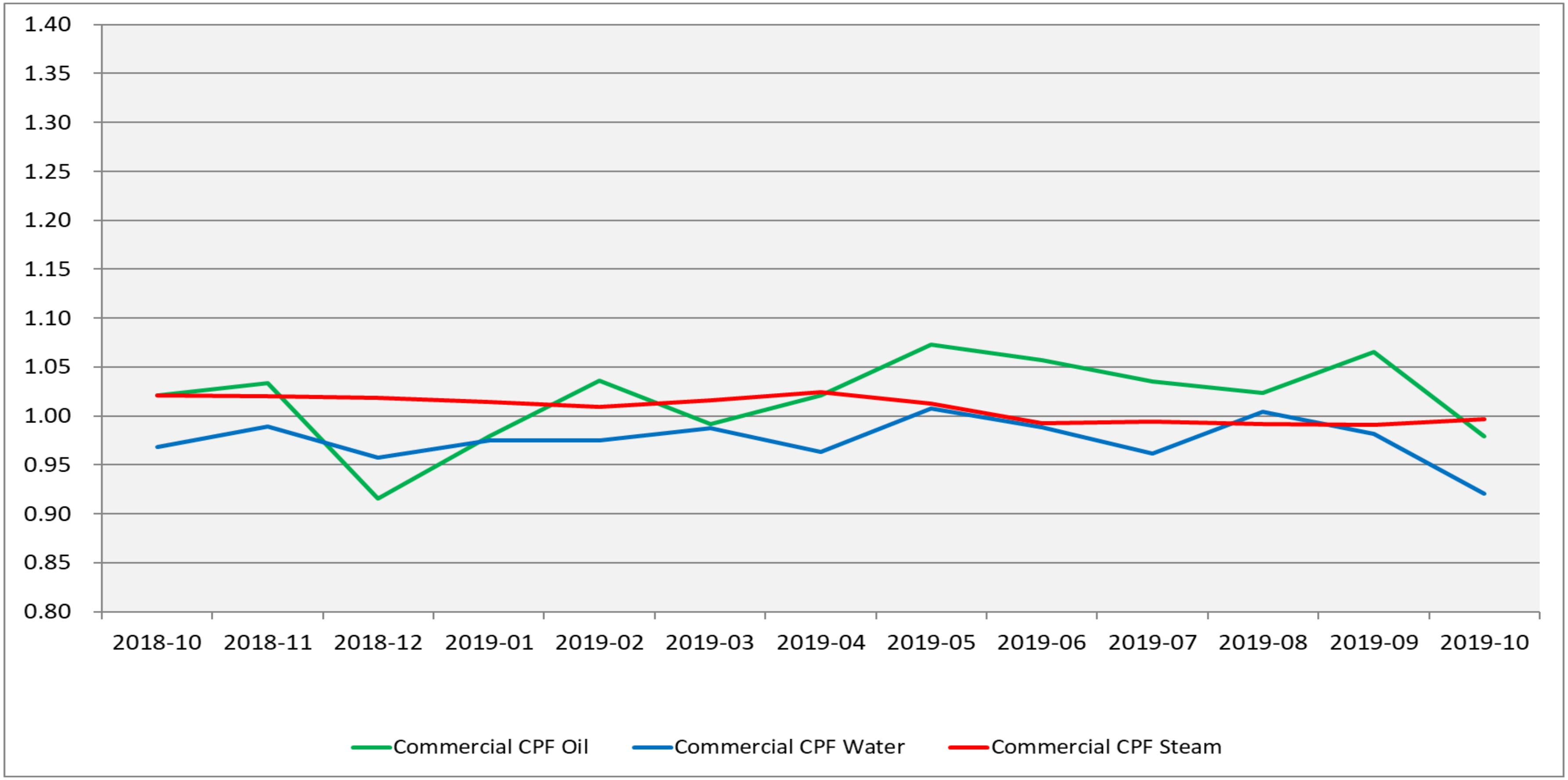
- H-710 & H-720 once per year on a rotating basis
- H-730 & H-740 once per year on a rotating basis
- H-710 & H-720 one with CEMS (Continuous Emission Monitoring System)

MEASUREMENT AND REPORTING

MARP SUMMARY

- Testing
  - Test separator located at D01, D02, D03, D04, and D05
  - 12-24 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 and manual testing
  - Pad D01, D02, D04, and D05 utilizing manual testing
    - 2 samples captured per test to improve accuracy
  - Pad D01, D02, D04 and D05 to be converted to AGAR meter in 2020
    - Calibration of the test separator AGAR meters on-going; numerous calibration points throughout 2018 and 2019 but with the addition of new wells in 2018 manual samples were deemed more accurate until steady state
    - Capital constraints in 2019 also deferred AGAR calibration project

PRORATION FACTOR



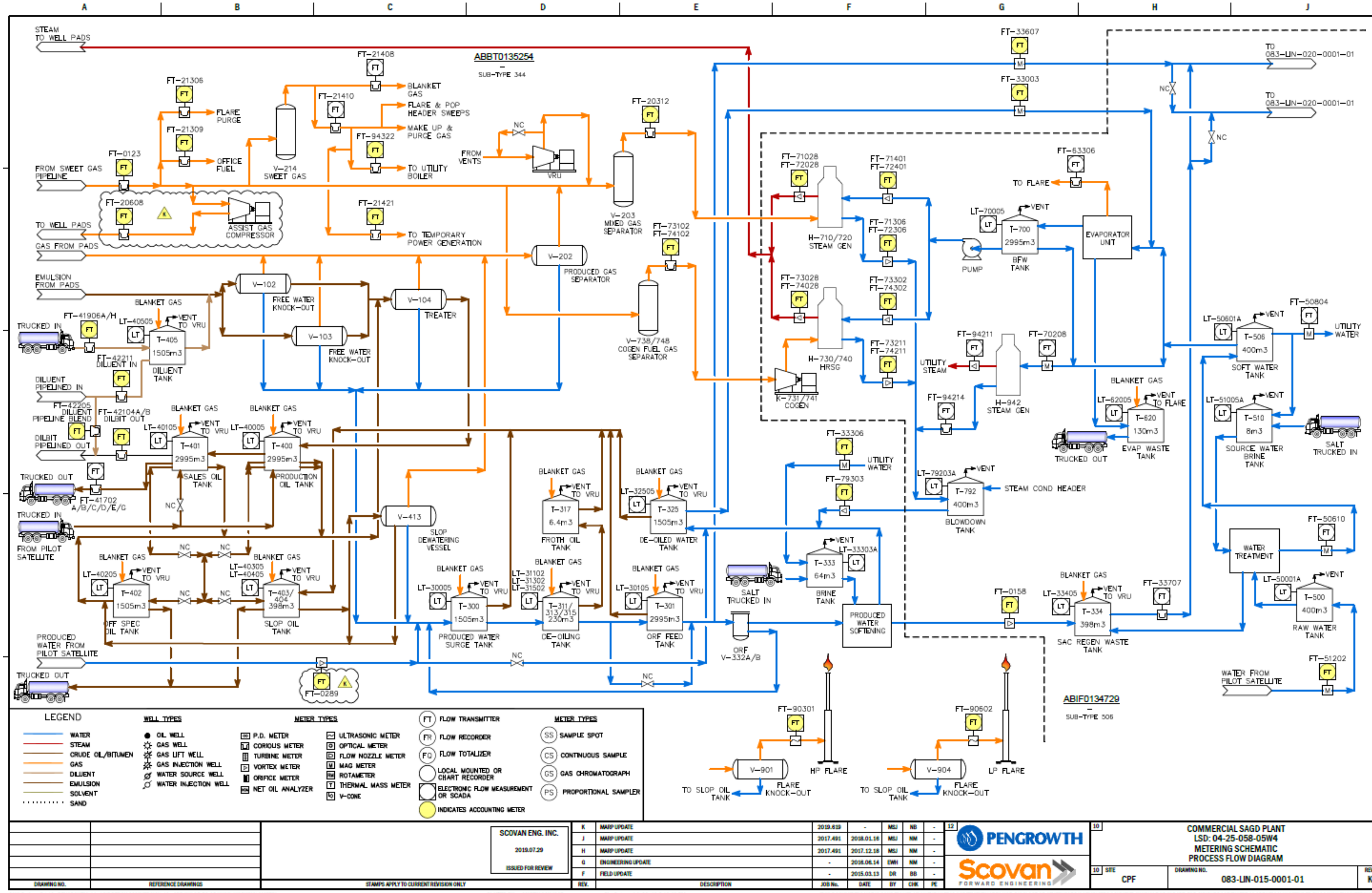
	2018-10	2018-11	2018-12	2019-01	2019-02	2019-03	2019-04	2019-05	2019-06	2019-07	2019-08	2019-09	2019-10
Oil	1.02	1.03	0.92	0.98	1.04	0.99	1.02	1.07	1.06	1.04	1.02	1.07	0.98
Water	0.97	0.99	0.96	0.98	0.98	0.99	0.96	1.01	0.99	0.96	1.00	0.98	0.92
Steam	1.02	1.02	1.02	1.01	1.01	1.02	1.02	1.01	0.99	0.99	0.99	0.99	1.00

PRORATION IMPROVEMENT INITIATIVES

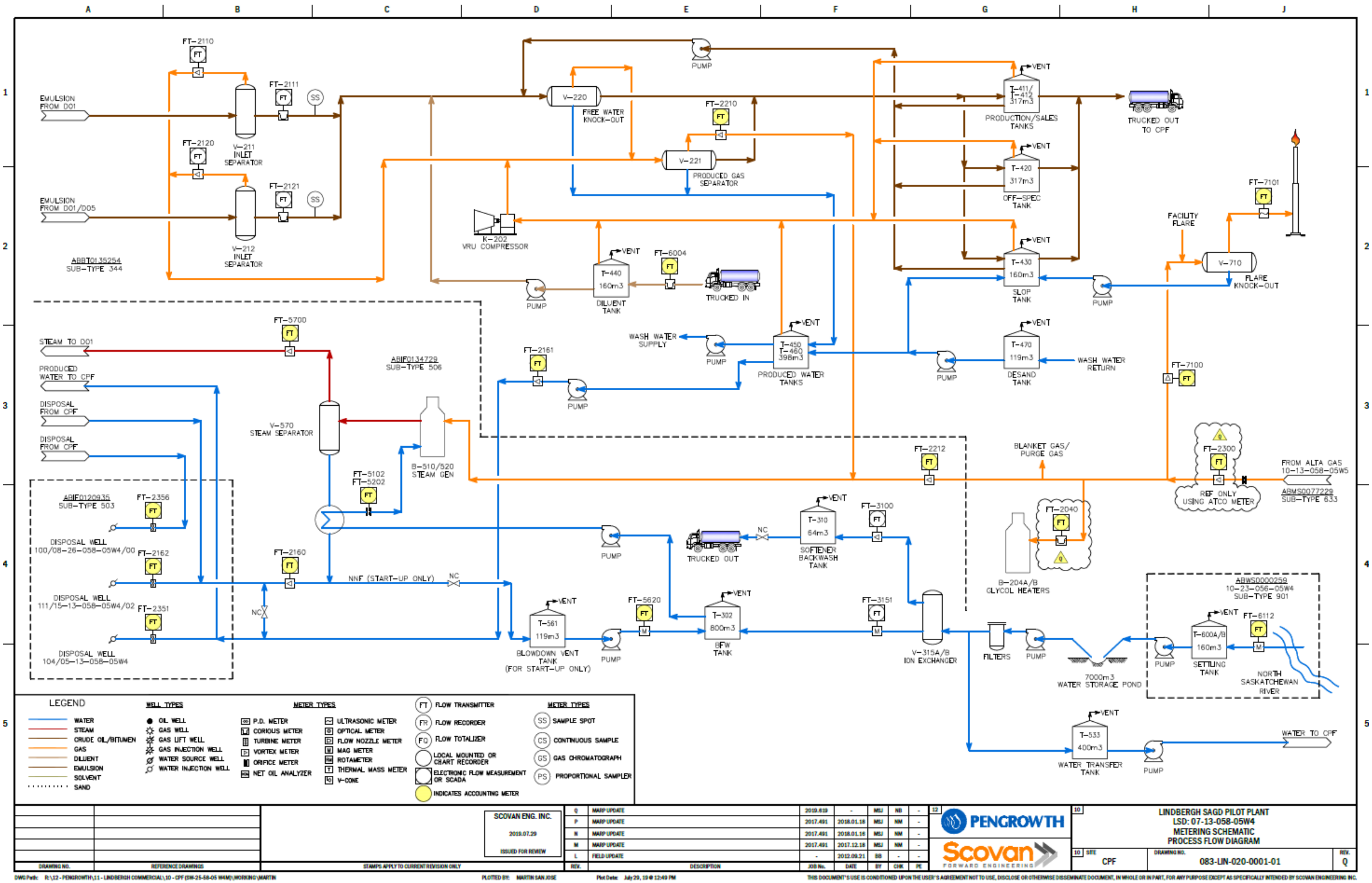
- Main issues associated with BS&W consistency
- Completed
  - Testing procedure (Sept 2015)
  - Chemical adjustments (Sept 2015)
  - Various piping changes for more accurate testing (2015-2016)
  - Pad D02, D03, D05 AGAR Calibrations (2016-2018)
  - Testing procedure review (2018/2019); 2 manual cuts per test and audit of test procedure and accuracy
- Ongoing (2020)
  - Pad D01 AGAR (new) calibration
  - Pad D04 AGAR (new) calibration
  - Pad D05 AGAR re-calibration testing
  - Pad D03 AGAR re-calibration testing
  - Pad D02 AGAR re-calibration testing

SAGD Production - BT0135254
SAGD Injection - IF0134729
Disposal -IF0120935

COMMERCIAL MARP SCHEMATIC



PILOT MARP SCHEMATIC



TSX:PGF
PENGROWTH

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, T-404, T-411, T-412, T-420 and T430		Opening Inventory T-400, T-401, T402, T403, T-404, T-411, T-412, T-420 and T-430		Blending Shrinkage Factor		Diluent Receipts		Opening Inventory T-405 and T-440		Closing Inventory T-405 and T-440

7.1.7. Battery Water Production

Dispositions	+	Δ Water Tanks	+	Δ De-oiling Tanks	+	Δ Slop Tank Water	+	Δ Off Spec Tank Water	-
Formula 7.1.8		Change in water tank inventory for T-300, T-301, T-325, T-450, T460, T400, T401		Change in water inventory in T-311, T-313 & T-315		Change in water inventory in T-403, T-404 and T-430		Change in water inventory in T-402 and T-420	
Water received with diluent	-	**FT-79303**	-	**Trucked in Water**	-	**FT-33306**			
		Blowdown water from IF T-792		Water trucked into T-333 from outside sources		Utility water from IF to T-333			

7.1.8. Battery Water Dispositions

FT-33607	+	FT-2161	+	FT-2160	+	FT-33003	+	Sales Water	+	Other water out	+
Water Delivery to Injection Facility for Disposal		Produced Water Delivery to Injection for Disposal from Satellite		Blowdown Water Delivery to Injection for Disposal from Satellite		Water Delivery to IF for treatment		S&W content of sales dilbit blend		Water Content of other fluid trucked out	
FT-0158	-	**FT-0289**									
Wastewater to IF T-334		Produced water to CPF from Satellite									

7.3.1. Primary Steam Calculation

FT-71028	+	FT-72028	+	FT-73028	+	FT-74028	+	FT-5700
Steam to Pads from Steam Generator		Steam to Pads from Steam Generator		Steam to Pads from HRSG		Steam to Pads From HRSG		Steam to Pads from Satellite V-570

7.3.2. Secondary Steam Injection Calculation

FT-71401	+	FT-72401	+	FT-73302	+	FT-74302	+	FT-5102	+
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		BFW to B-510	
FT5202	-	**(FT-71306**	+	**FT-72306**	+	**FT-73211**	+	**FT-74211**	+
BFW to B-520		Steam Condensate from Steam Gens		Steam Condensate from Steam Gens		Steam Condensate from HRSG		Steam Condensate from HRSG	
FT-2160)									
Pilot Steam Blowdown									

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
    - » 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
  - ~888 m3/d make-up water usage at commercial and pilot facility (2019 to date average)
  - 2019 make up water usage increased because of the increased production at both the pilot and commercial facility

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)
Oct-18	26,442
Nov-18	23,048
Dec-18	24,188
Jan-19	29,386
Feb-19	25,146
Mar-19	29,779
Apr-19	19,765
May-19	26,146
Jun-19	24,992
Jul-19	27,334
Aug-19	30,284
Sept-19	28,399
Oct-19	28,468

2018 Total: 289,220 m3

2019 YTD: 269,700 m3

Source water requirements increased because of the increased production at both the pilot and commercial facility

LINDBERGH COMMERCIAL DISPOSAL LIMITS

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

	Produced Water (m3/month)	Disposal Water (m3/month)	Source Water Makeup (m3/month)	Disposal Limit (%)	Actual Disposal (%)
Oct-18	2,346,560	168,027	274,956	9.28%	6.47%
Nov-18	2,590,610	182,108	304,541	9.27%	6.40%
Dec-18	2,819,400	201,459	335,981	9.26%	6.39%
Jan-19	253,418	15,331	42,849	9.09%	8.30%
Feb-19	484,437	35,188	78,981	9.02%	6.25%
Mar-19	740,030	63,046	121,757	9.03%	7.34%
Apr-19	975,197	86,076	155,471	9.04%	7.63%
May-19	1,227,590	106,306	195,816	9.04%	7.74%
Jun-19	1,480,020	128,258	235,267	9.04%	7.48%
Jul-19	1,728,390	150,825	274,654	9.04%	7.53%
Aug-19	1,989,130	174,771	318,759	9.04%	7.65%
Sep-19	2,247,210	196,921	363,280	9.03%	7.58%
Oct-19	2,490,910	221,990	404,081	9.03%	7.73%

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

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

Produced Water Properties

Component	mg/l as ion	mg/l as $CaCO_3$
Calcium (Ca^{++})	52.6	131.5
Magnesium (Mg^{++})	4.0	16.4
Sodium (Na^{+})	1660.0	3618.8
Potassium (K^{+})	61.2	78.3
Iron (Fe^{++})	0.1	0.2
Manganese (Mn^{++})	0.1	0.2
Hydrogen (H^{+})	0.0	0.0
Barium (Ba^{++})	0.7	0.5
Strontium (Sr^{++})	2.2	2.5
Sum Cations		3848.4
Bicarbonate (HCO_3^{-})	257.0	210.7
Carbonate (CO_3^{-})	0.0	0.0
Hydroxide (OH^{-})	0.0	0.0
Sulphate (SO_4^{-})	10.0	10.4
Chloride (Cl^{-})	2880.0	4060.8
Sum Anions		4281.9
Total Dissolved Solids (measured)	5130.0	
pH (units)	6.8	
Temperature (°C)	21.4	
Total Hardness		150.0
Silica (SiO_2)	264.0	
Conductivity (µS/cm)	8230	

LINDBERGH INDUSTRIAL RUNOFF MONITORING

Location	LSD	Number of Releases	Total Volume (m3)	pH	Oil and Grease	Chloride (mg/L)
CPF	04-25-058-05W4	5	58000	6.82 - 7.85	No sheen	6.9 - 35.3
Pilot	07-13-058-05W4	1	500	7.85	No sheen	24
Well Pad	15-24-058-05W4	9	3795	6.21 – 7.19	No sheen	<31
Well Pad	05-13-058-05W4	13	3410	6.80 – 7.89	No sheen	<31
Well Pad	11-13-058-05W4	13	1570	6.35 – 7.14	No sheen	<31
Well Pad	02-24-058-05W4	10	3250	6.68 – 7.34	No sheen	<31

- There were 51 surface water releases from Oct 2018 to Oct 2019
- Total volume discharged was 70,525 m^3
- All laboratory analytical and field screening results were within license requirements for pH, oil and grease, and chloride

DISPOSAL WELLS

PENGROWTH

DISPOSAL WELLS

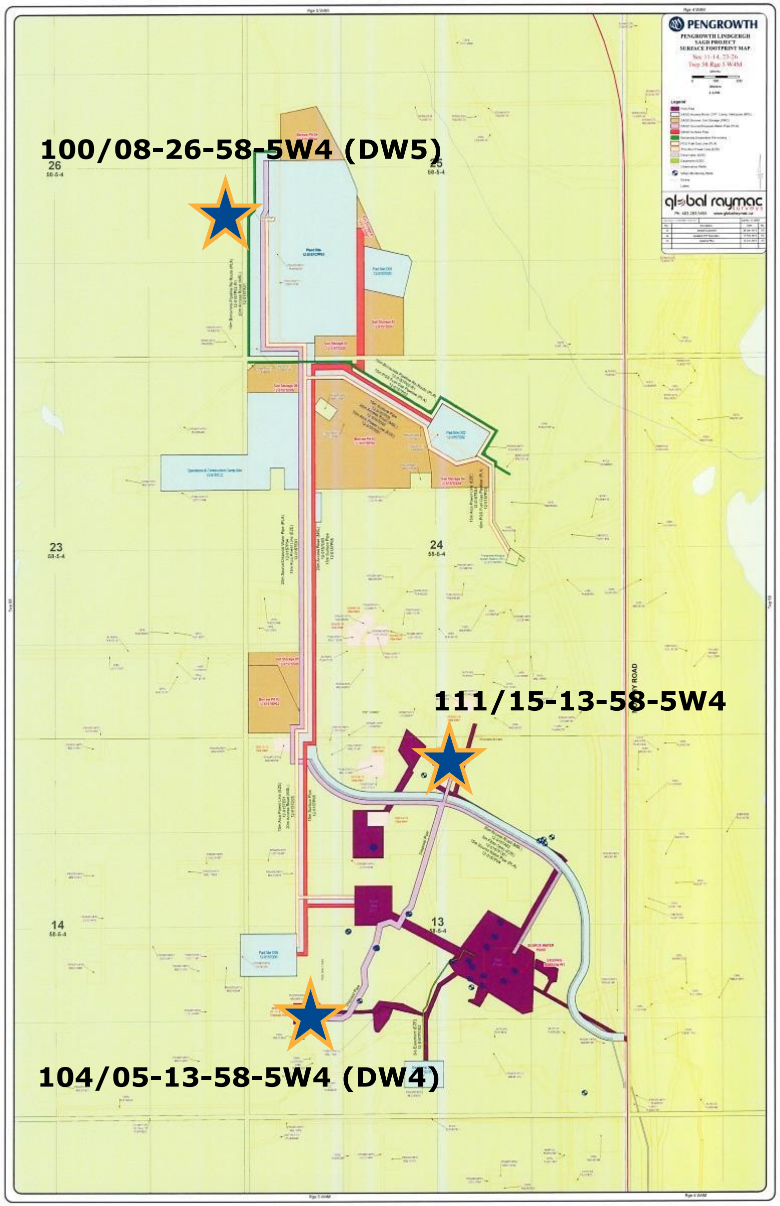
- 111/15-13-58-5W4
  - Well license number – 0126796
  - Disposal approval number – 5565
    - Completed in Basal Cambrian Sands
    - No rate limit
    - Max WHP – 10.9 MPa
  - Blowdown and/or produced water disposal (if required)

- 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)

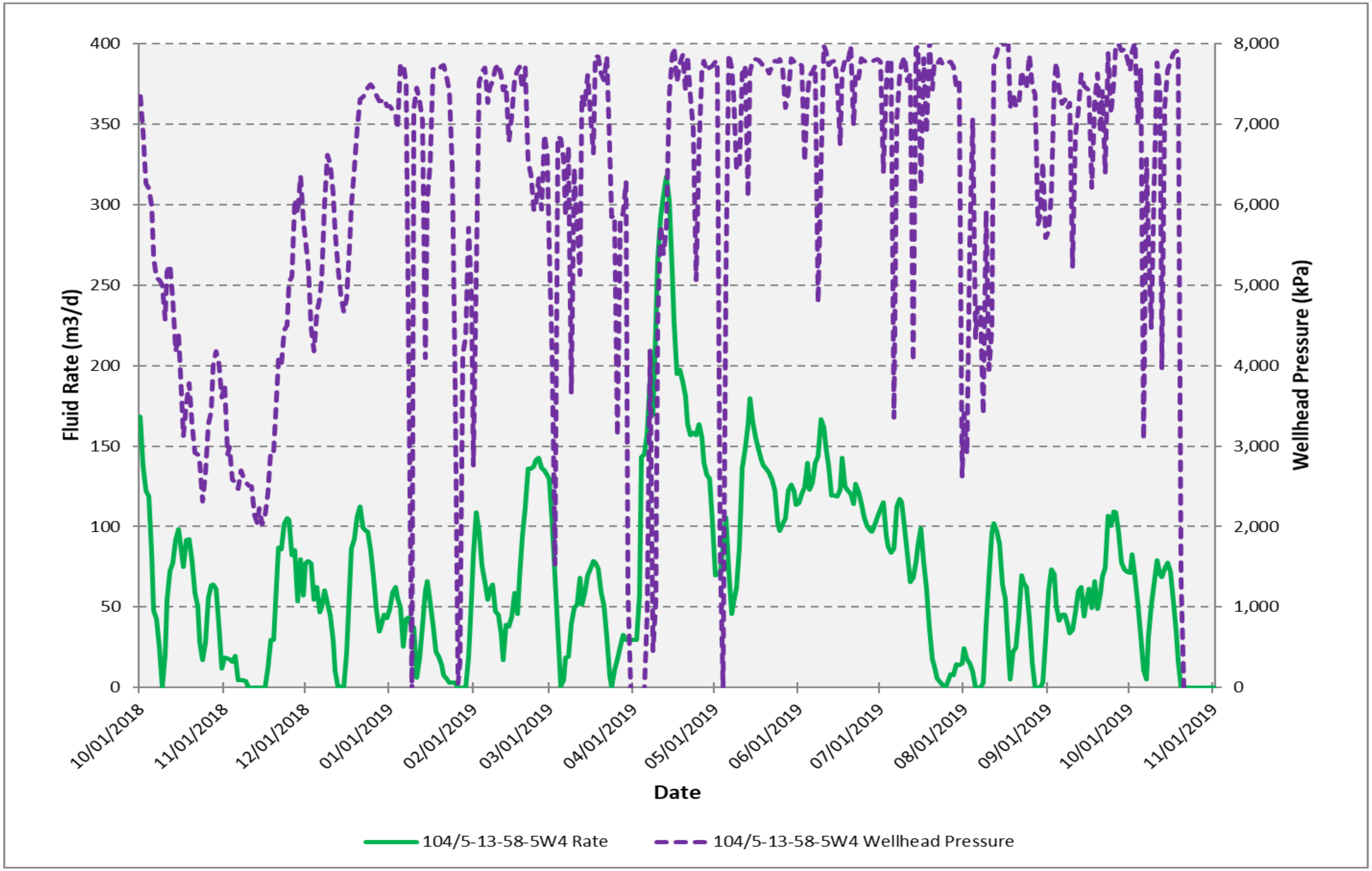
- 100/08-26-58-5W4 (DW5)
  - Well license number – 0469115
  - Disposal approval number – 12088B
    - Completed in Basal Cambrian Sands
    - Screened completion
    - No rate limit
    - Max WHP – 12.6 MPa
  - Softener backwash and/or produced water disposal (if required)

DISPOSAL WELLS

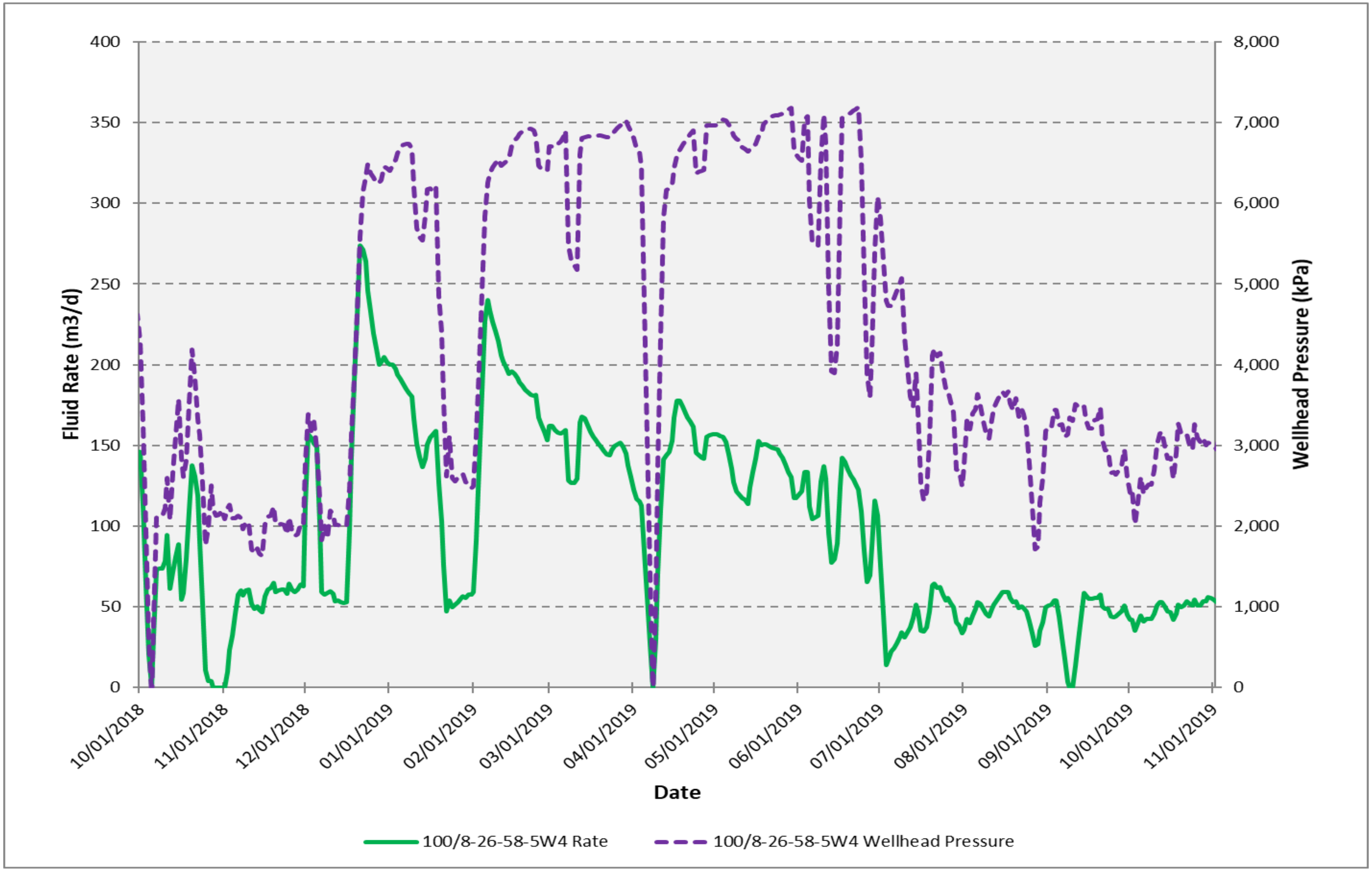
- Three water disposal wells (Basal Cambrian Sand) at ~ 1600 meters depth
- 11/15-13 disposes of Pilot blowdown or produced water
- 04/05-13 disposes of excess of produced water
  - Pilot was recommissioned in April 2018
- 00/08-26 was completed in November 2014 and disposes of softener regen or produced water
- All 3 wells are tied into the commercial CPF
  - 2 disposal streams into these wells are softener regeneration backwash and excess produced water



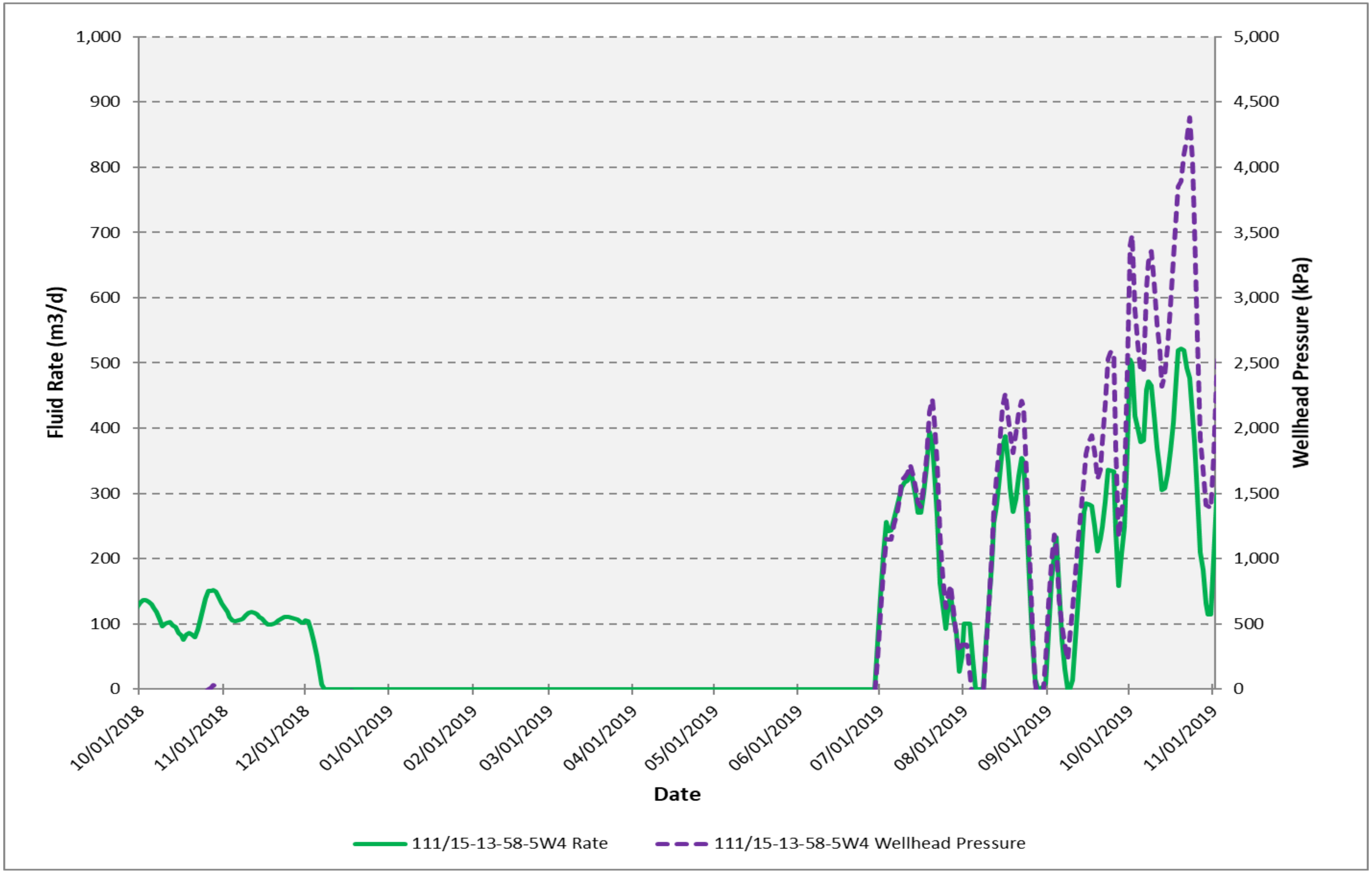
DISPOSAL HISTORY – 104/5-13-58-5W4



DISPOSAL HISTORY – 100/8-26-58-5W4



DISPOSAL HISTORY – 111/15-13-58-5W4



OFFSITE DISPOSAL VOLUMES AND LOCATIONS – OCT 2019

	NewAlta Elk Point (m3)	Tervita Lindbergh (m3)	Secure Edmonton (m3)	Secure Tulliby Lake (m3)	**Total Offsite (m3)**	05-13 Disposal (m3)	15-13 Disposal (m3)	08-26 Disposal (m3)
Oct-18	470	9027	374	0	**9,871**	1563	6700	1581
Nov-18	1227	6040	433	0	**7,700**	1094	6210	1699
Dec-18	2213	8487	210	0	**10,910**	1611	259	4537
Jan-19	146	11383	100	0	**11,629**	930	0	3374
Feb-19	2942	9109	0	0	**12,050**	2318	0	5220
Mar-19	8123	15308	0	0	**23,431**	1134	0	4386
Apr-19	1691	12493	0	0	**14,184**	5350	0	3811
May-19	537	11241	0	0	**11,778**	3546	0	4054
Jun-19	3860	9804	0	763	**14,427**	3581	571	3037
Jul-19	560	7099	0	5734	**13,393**	1451	6883	1279
Aug-19	1861	7173	0	7868	**16,902**	1230	5154	1446
Sep-19	2853	8569	0	807	**12,229**	1865	6593	1171
Oct-19	6038	9632	0	0	**15,670**	738	10546	1471

AMBIENT AIR QUALITY

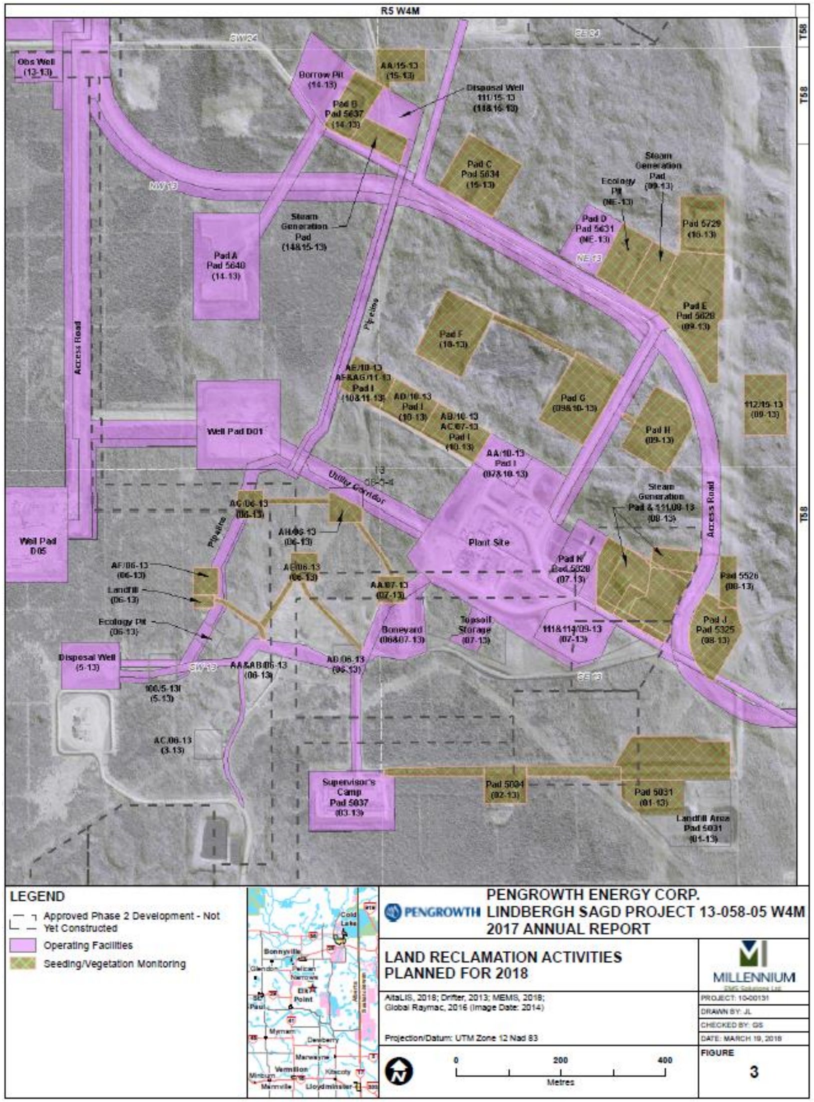
AMBIENT AIR QUALITY

- Continue to actively participate in LICA and the Air Quality Monitoring Program Network as per the Lindbergh SAGD EPEA Approval 1581-02-03
- We are compliant with the Joint Oilsands Monitoring (JOSM) requirements

ENVIRONMENTAL ISSUES

DECOMMISSIONING AND RECLAMATION

- The 5 year reclamation of legacy CSS facilities was completed in 2017.
- Reclamation monitoring continued in 2019.
- The project is in the early stages of development. No current facilities are scheduled for decommissioning at this time.



ENVIRONMENT (EPEA 1581-02-03)

EPEA Update:

- Wetland and Waterbody Monitoring Program Proposal is now fully approved.
- Amended Wildlife Mitigation & Monitoring Program is now fully approved (December 2019).
- Project Level Conservation and Reclamation Closure Plan submitted October 2019. Currently in review by AER.

COMPLIANCE

COMPLIANCE

Non-Compliances

- July 2019 – Non-compliance – Improper dike/spill mitigation measures for temporary dikes containing a brine solution. The tanks were removed to establish compliance.
- There were no other non-compliance events and no self-disclosures in 2019.

FUTURE PLANS

PENGROWTH

FUTURE PLANS

- Continuous incremental expansion of the CPF to 40,000 bbl/d
- Implementation of solvent assisted SAGD to improve efficiency and recovery
- Continue implementation of NCG injection with steam to improve efficiency and recovery
- Increased Cogeneration of steam and electricity

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