ATHABASCA OIL CORPORATION

AER HANGINGSTONE PROJECT UPDATE

January 2019

ATHABASCA OIL CORPORATION

INTRODUCTION

PROJECT DESCRIPTION AND STATUS

SUBSURFACE

- Geoscience
- Well Design and Instrumentation
- 4-D Seismic and Monitoring
- Scheme Performance
- Future Plans

SURFACE

- Facilities
- Measurement and Reporting
- Water Production, Injection and Uses
- Sulphur Production
- Compliance
- Future Plans

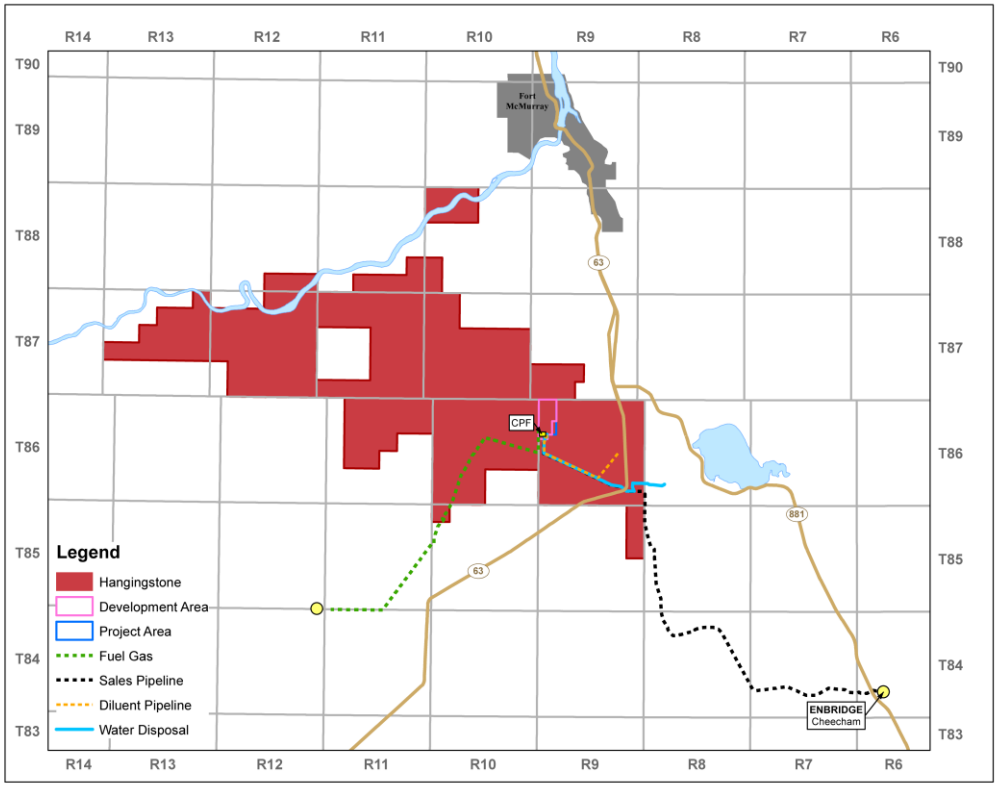
DEVELOPMENT OVERVIEW

PROJECT DETAILS

- Located 20 km south of Fort McMurray, AB
- 5 production pads
- 25 horizontal well pairs (5 well pairs per pad)
- Central Processing Facility (CPF)
- Offsite services and utilities

INFRASTRUCTURE

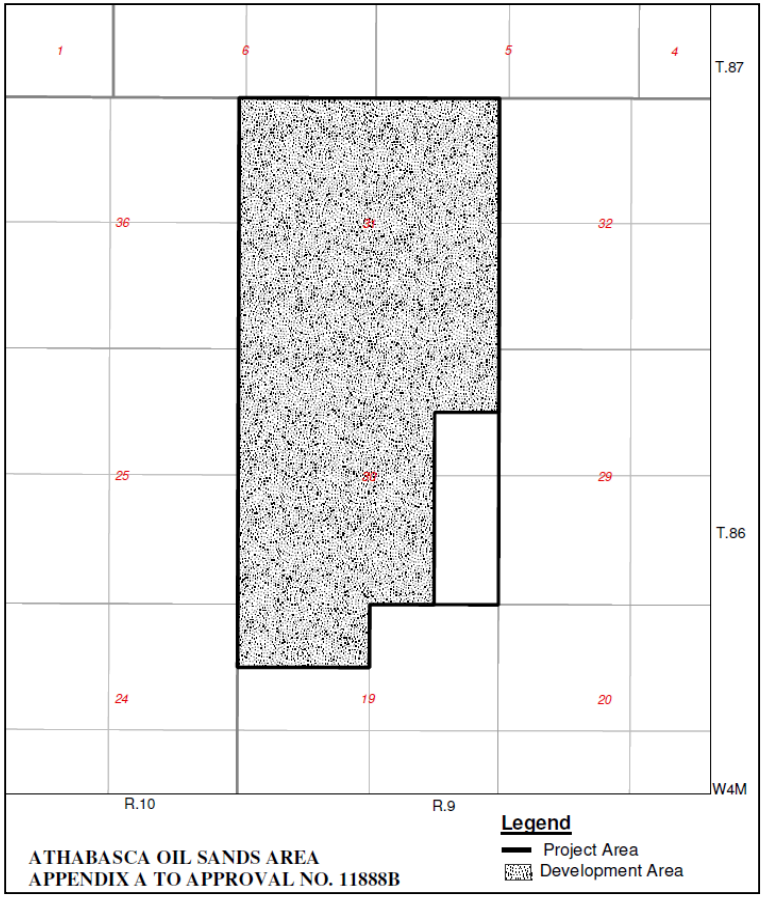
- Fuel gas from TransCanada Pipeline (TCPL)
- Dilbit export to Enbridge Cheecham Terminal
- Diluent from Inter Pipeline (IPL)



STATUS AND SCHEME MAP

HANGINGSTONE PROJECT

- First steam (downhole) achieved March 2015
  - *First oil produced July 2015*
- 24 well pairs in SAGD mode and 1 standing well pair
  - *AA05 converted to SAGD in June 2018*
  - *Last well pair (AA03) to be brought on-stream when steam is available*
- Expansion application submitted in 2013
  - *Environmental Impact Assessment report deemed complete by the AER pursuant to Section 53 of EPEA*
  - *Expands Project Area and Development Area*
  - *Application includes 3 phases (+70,000 bbl/d)*



SUBSURFACE

GEOSCIENCES

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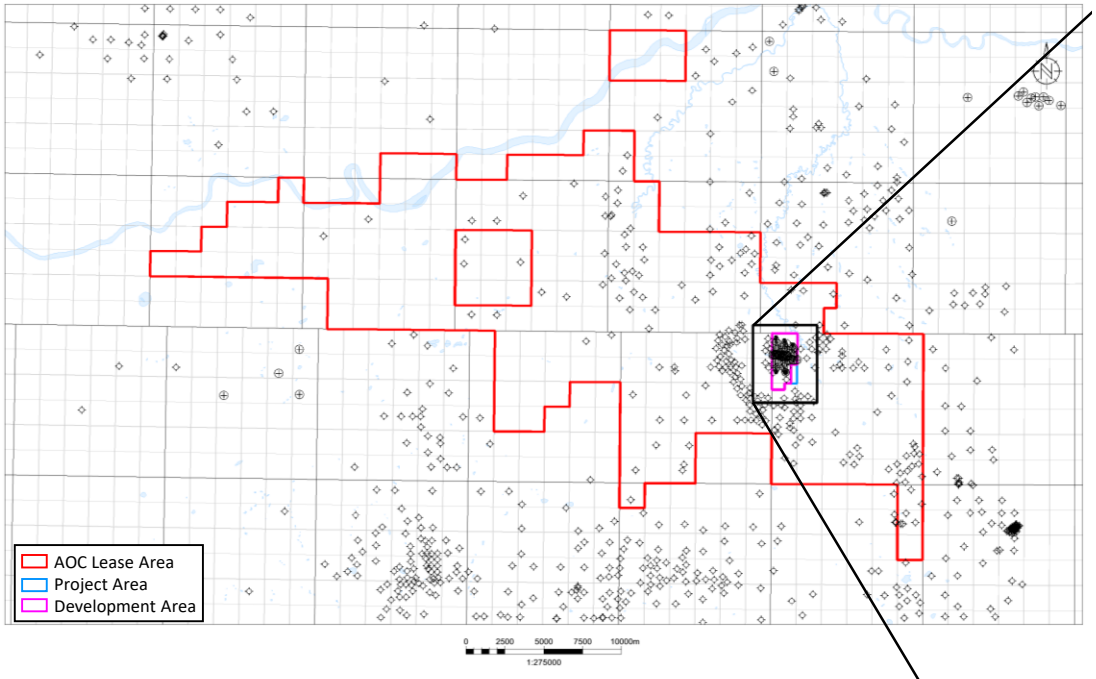
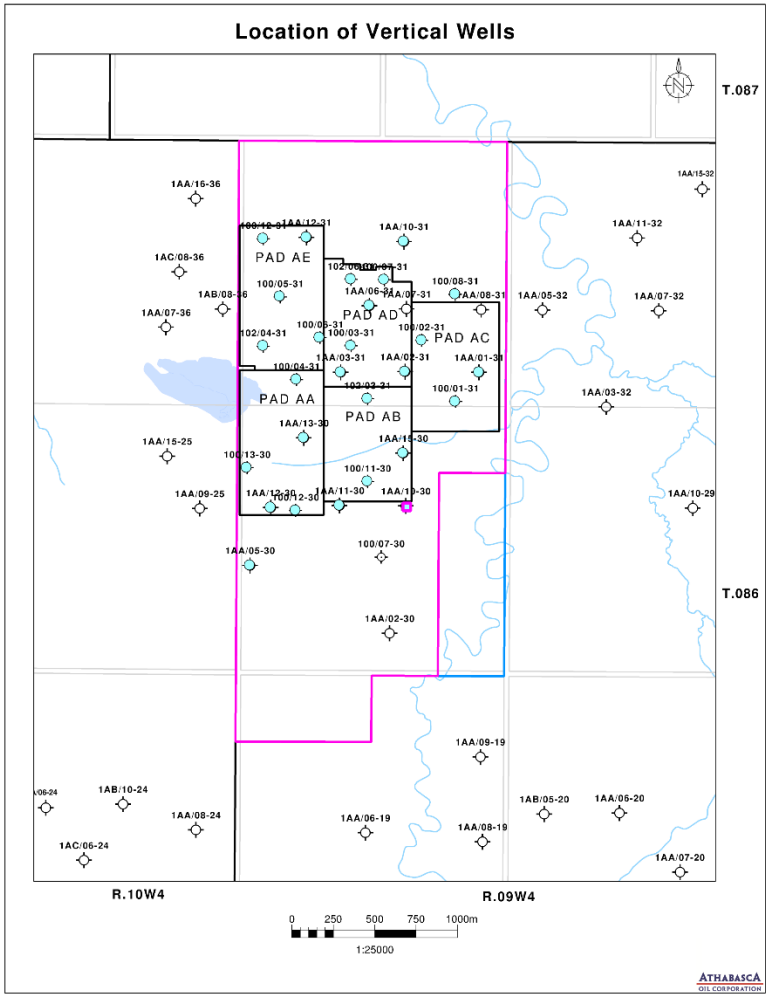
SURFACE DATA OVERVIEW

IN THE REPORTING PERIOD THERE WERE NO NEW GEOSCIENCE ANALYSES OBTAINED

- i.e. cores, petrographic, geomechanical or fracture pressure or caprock integrity tests

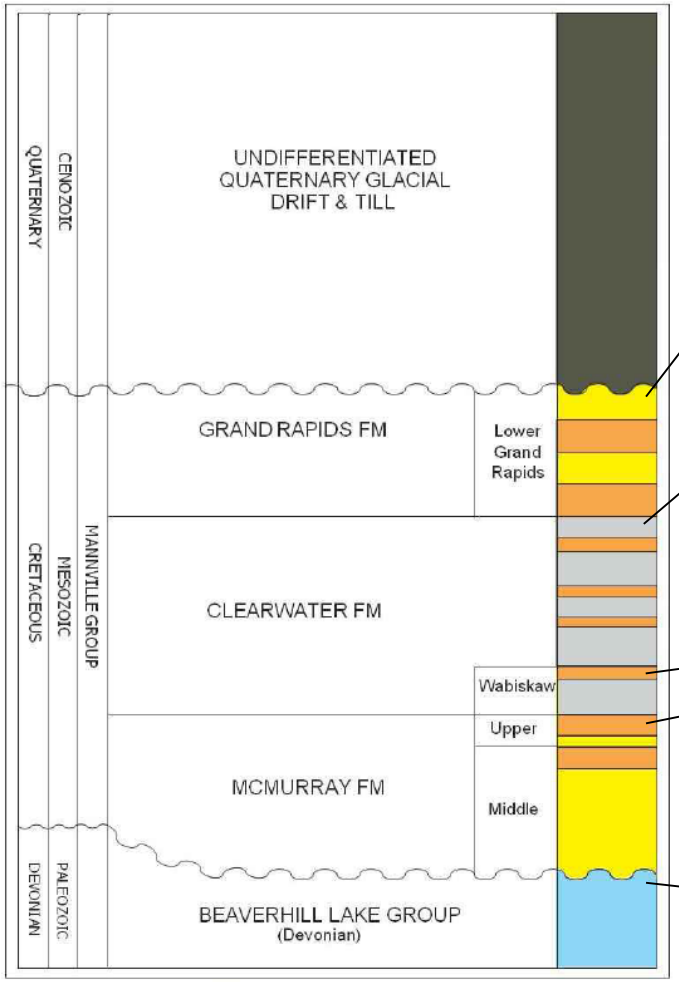




Area	Area (km^2)	MCMR Cored Wells	Image Logs	Caprock Core
Development Area	5.1	26	31	1
Project Area	5.6	26	31	1

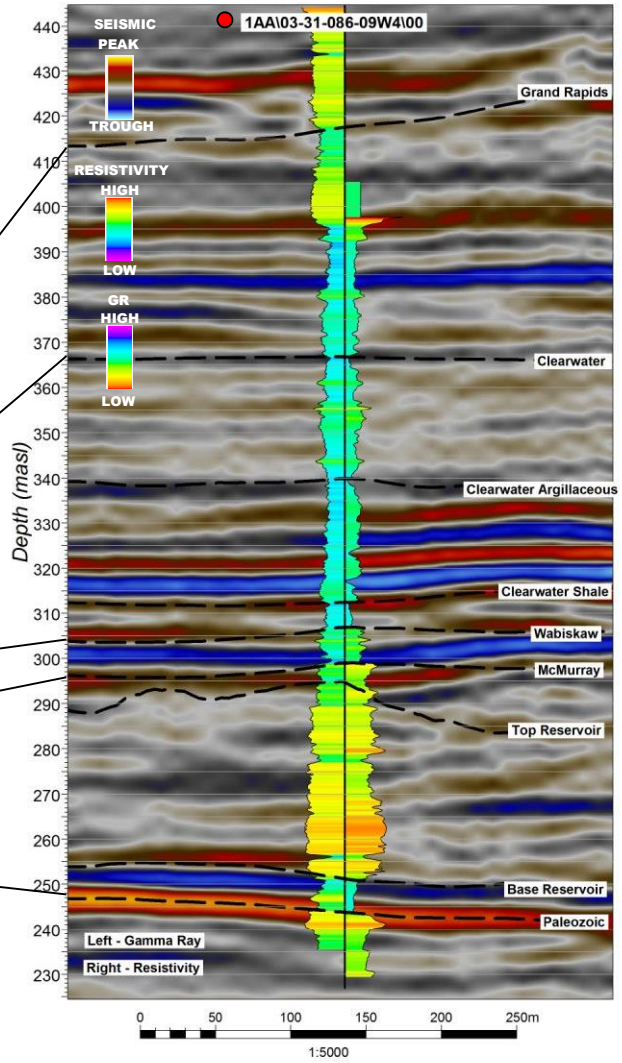
STRATIGRAPHY AND REFERENCE WELL

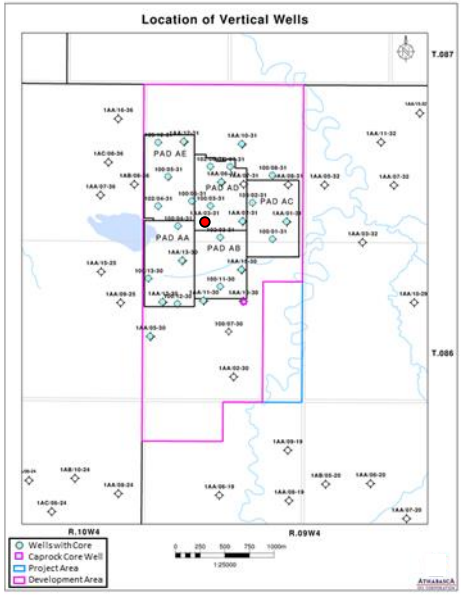
MIDDLE MCMURRAY TARGET RESERVOIR



FACIES

Sand	
Sandy IHS	
Muddy IHS	
Mudstone	
Limestone	



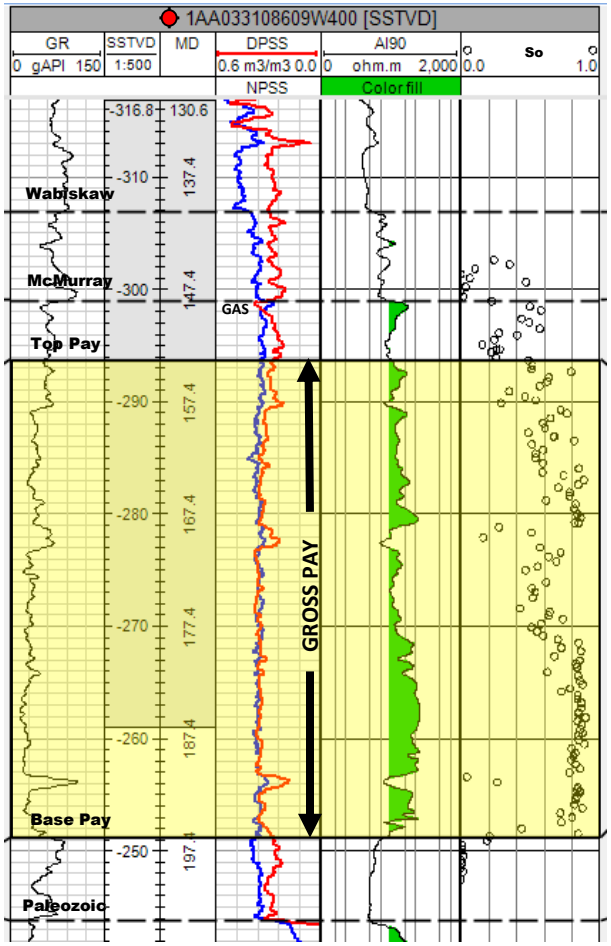


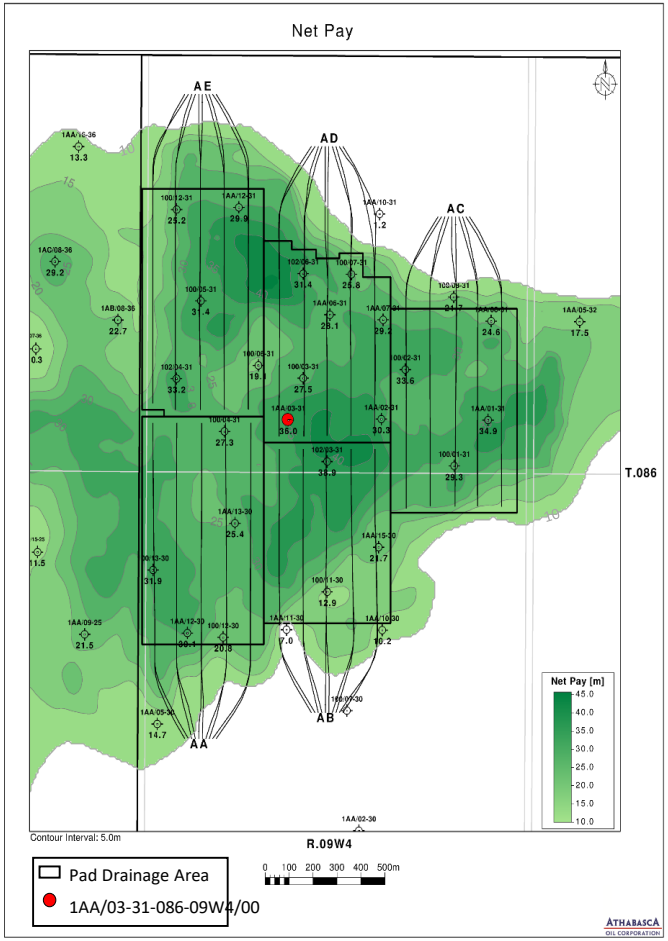
GROSS AND NET PAY

MIDDLE MCMURRAY GROSS PAY DEFINITION

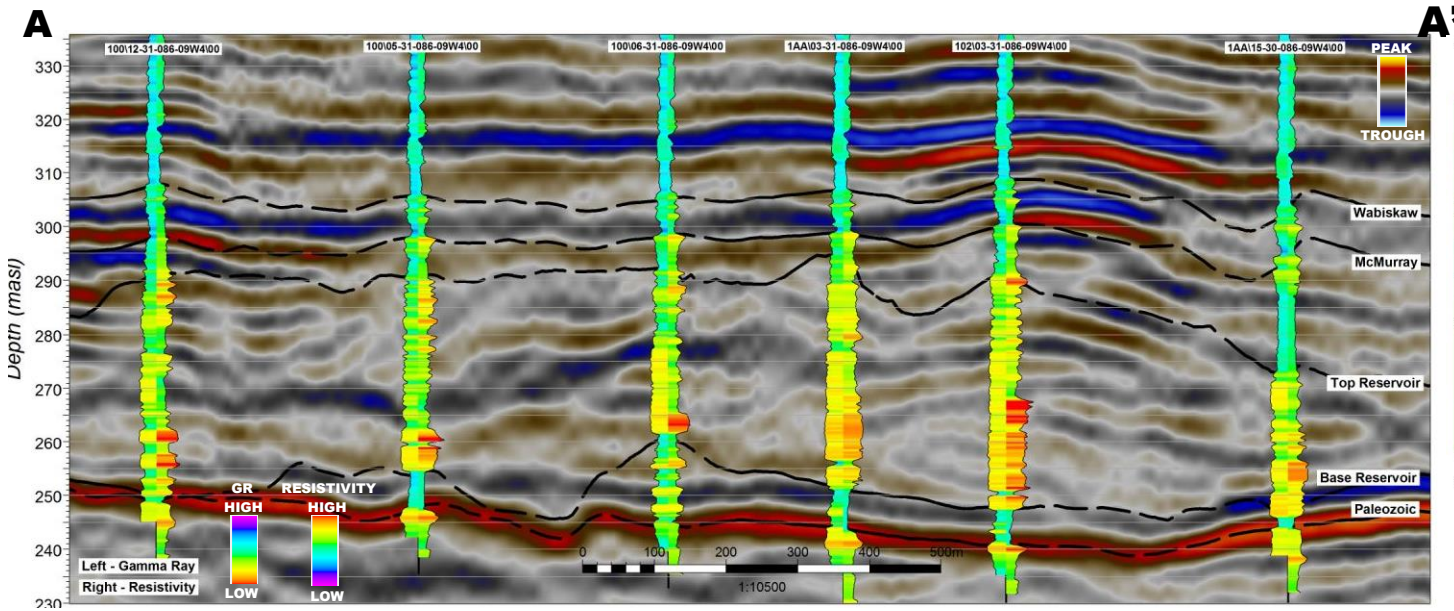
- Thickness >= 10 m
- GR < 70 API
- Density > 27%
- Resistivity >18 ohm-m
- Water Saturation < 50%
- Includes < 1 m thick mud

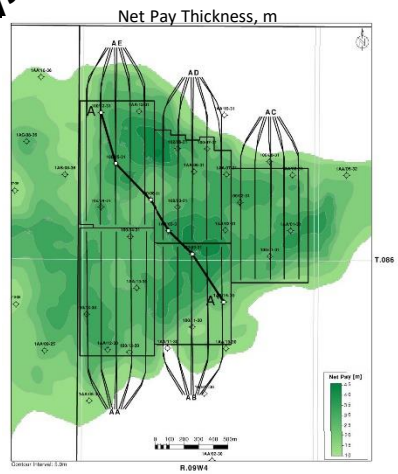
- Net pay thickness uses gross pay criteria but excludes mud

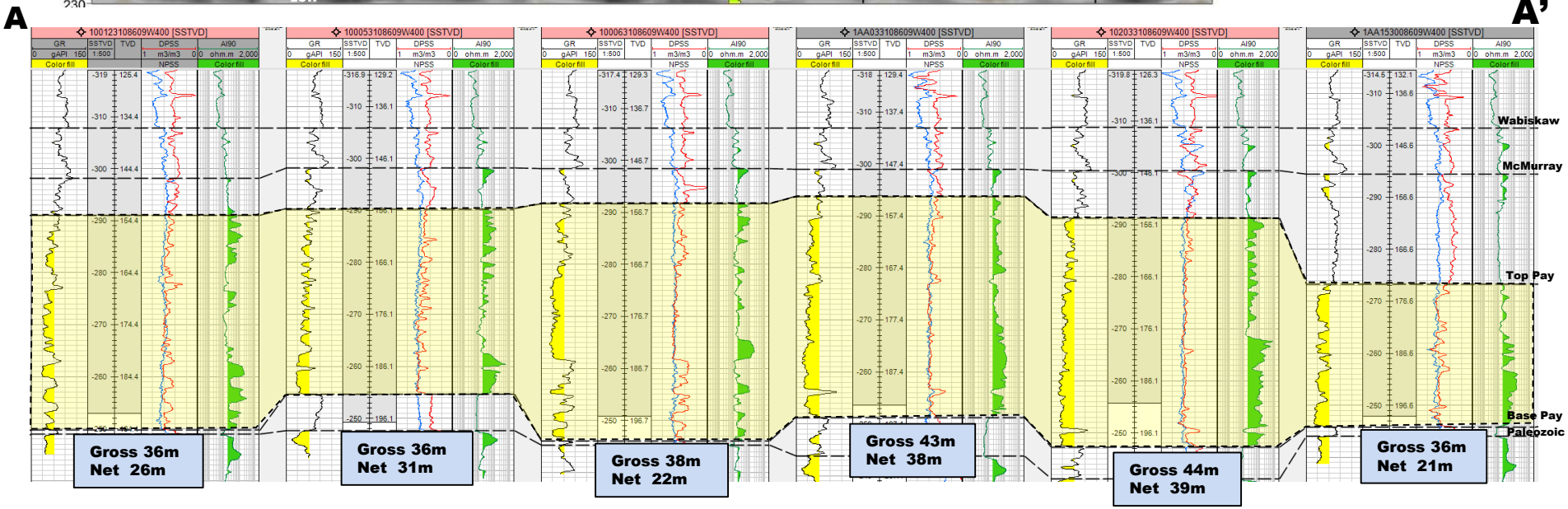




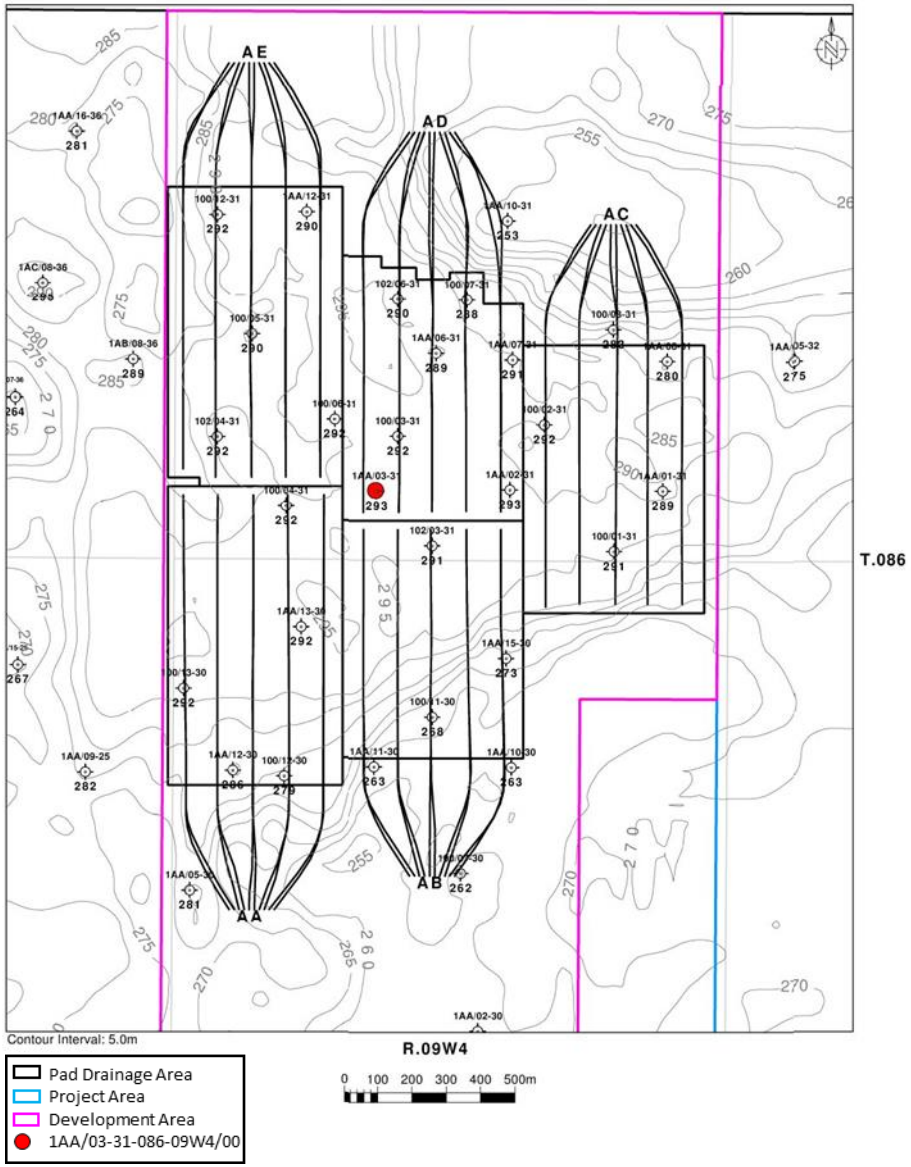
STRUCTURAL CROSS SECTION NW-SE ACROSS HS1 AREA





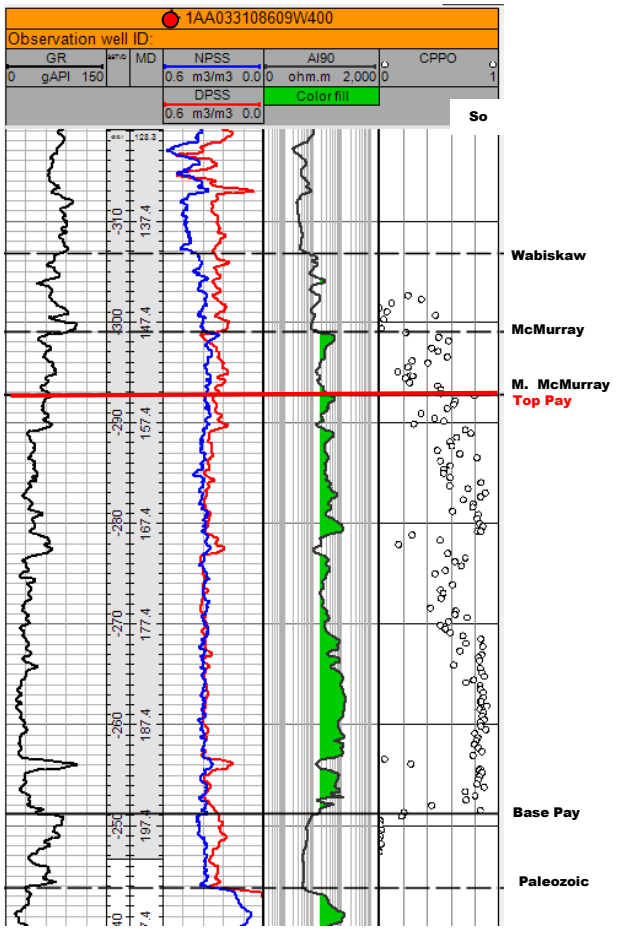


STRUCTURE MAP OF TOP OF BITUMEN PAY

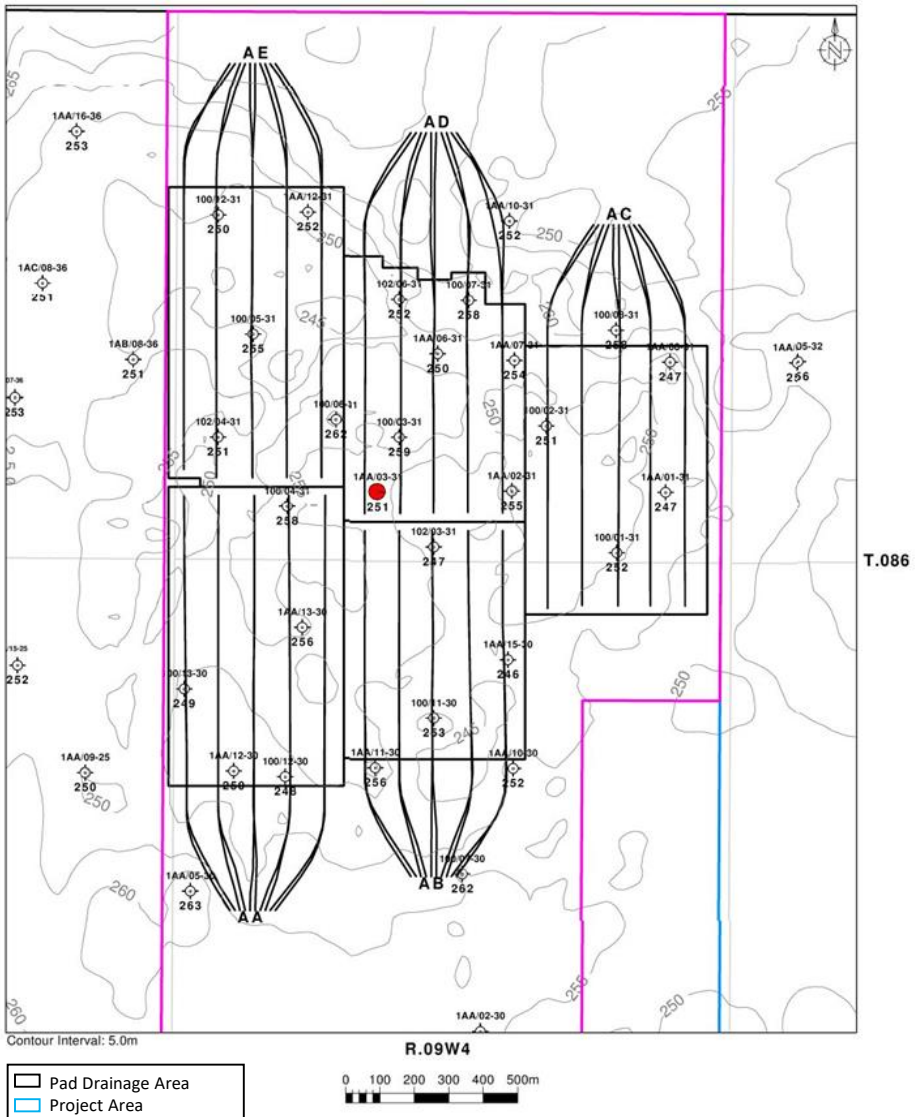


ELEVATION RANGE

- 262 -301 masl

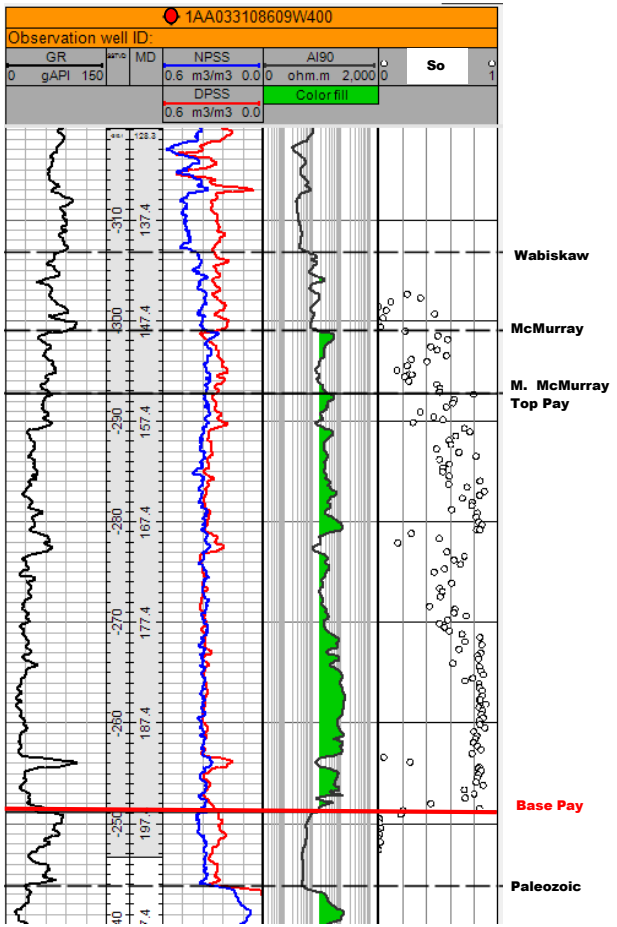


STRUCTURE MAP OF BASE OF BITUMEN PAY

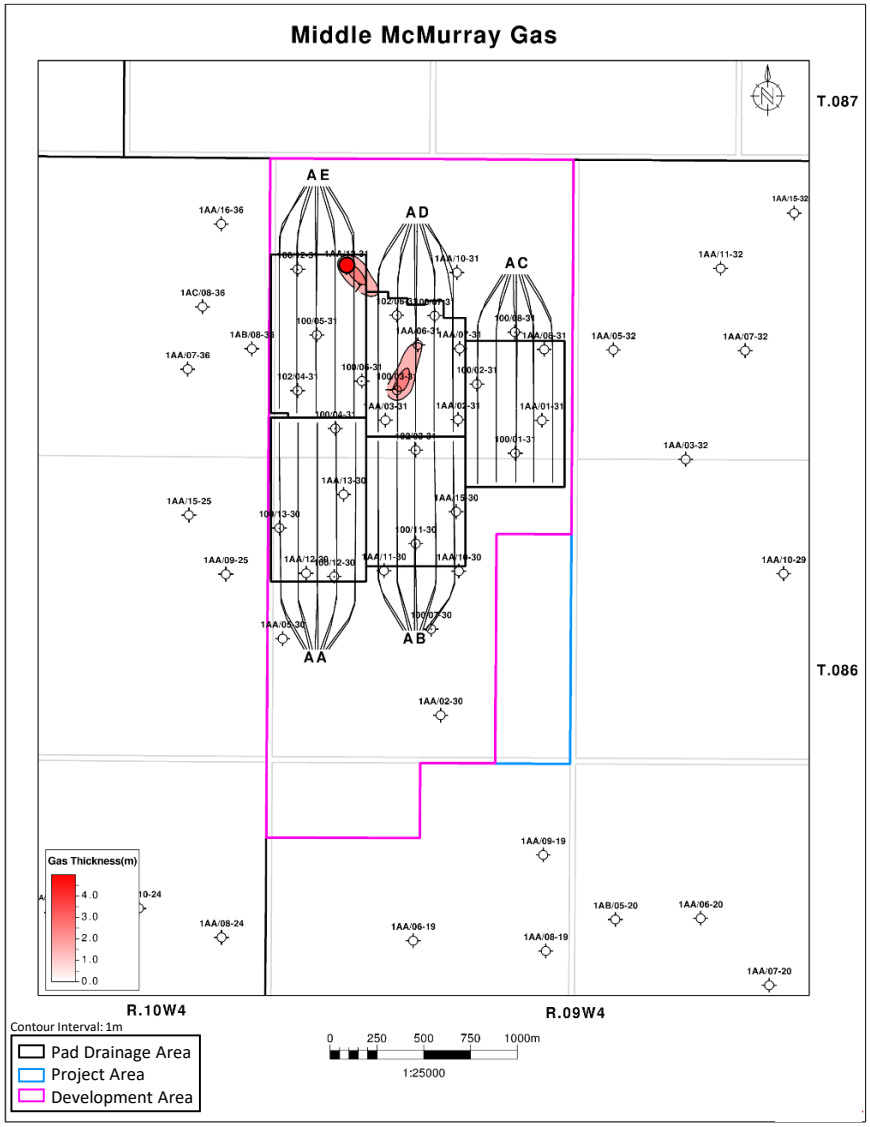


ELEVATION RANGE

- 241 to 262 masl

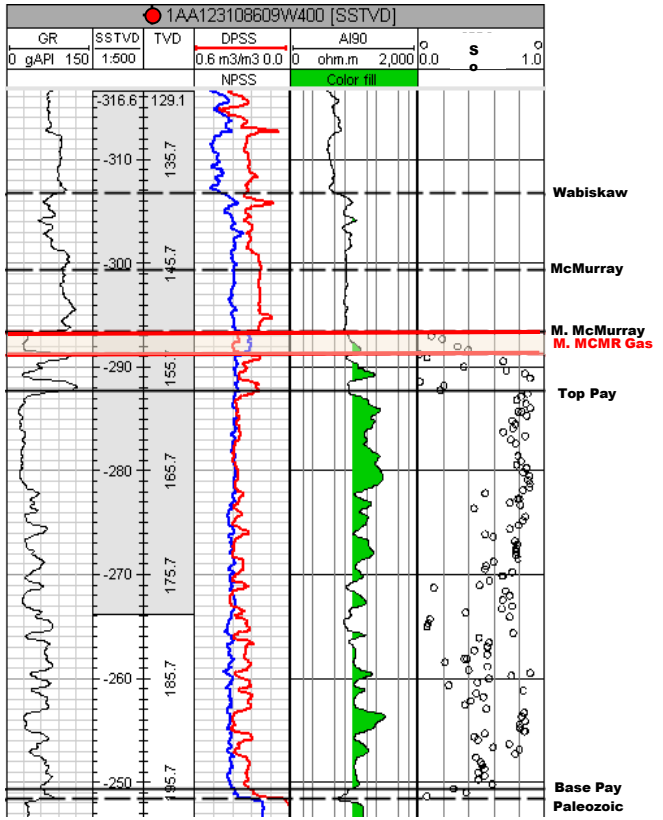


ISOPACH MAP OF MIDDLE MCMURRAY FM GAS

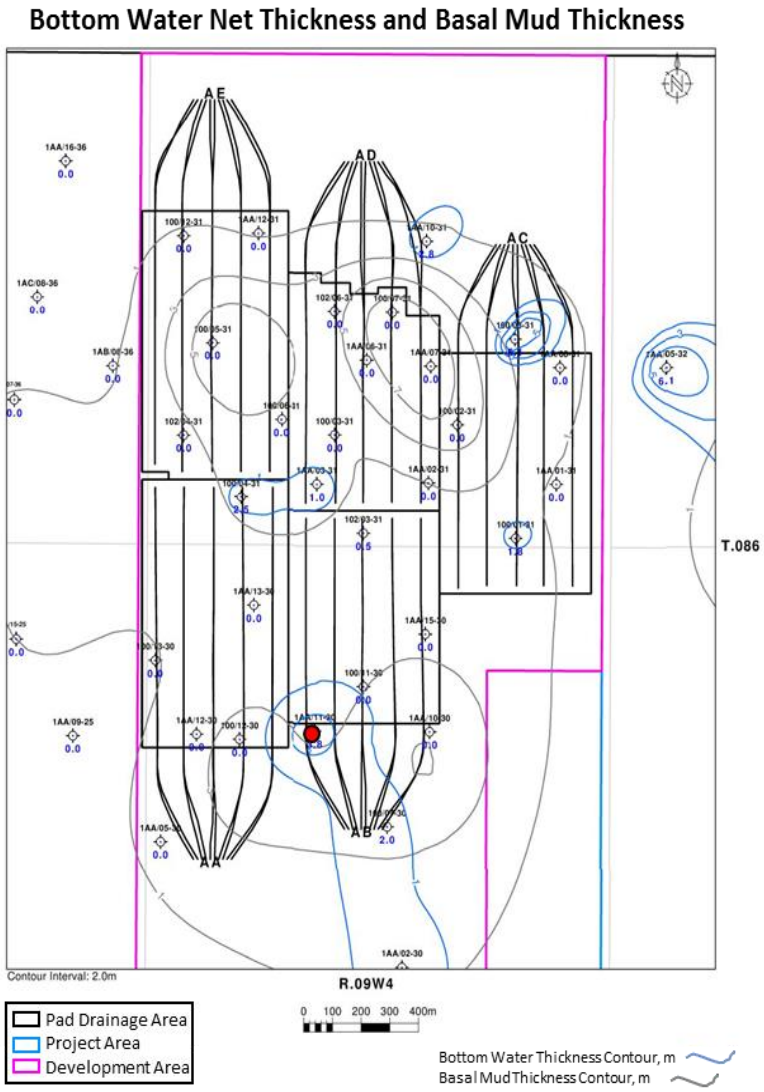


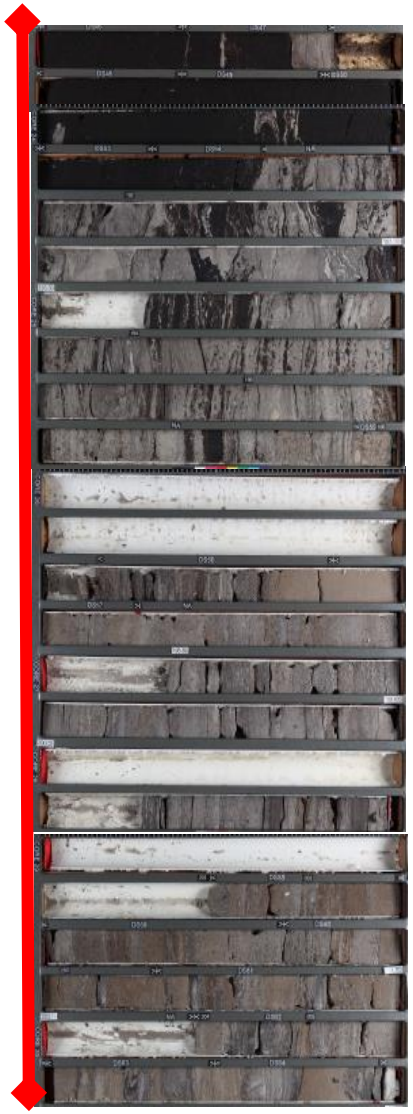
MIDDLE MCMURRAY GAS

- Minimal thickness and limited distribution within the development area

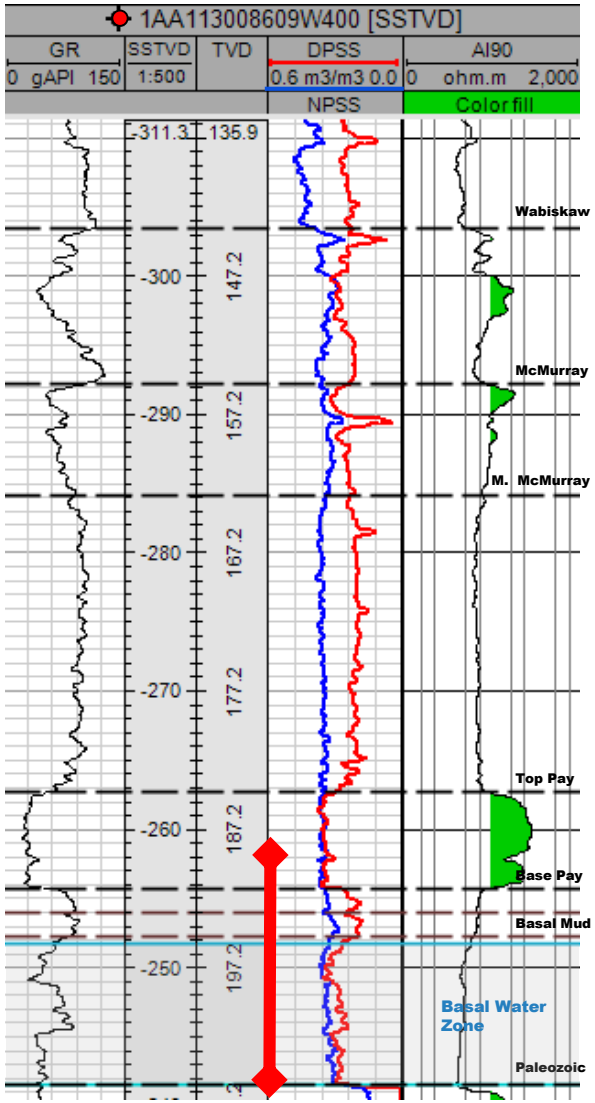


ISOPACH MAP OF MIDDLE MCMURRAY BOTTOM WATER





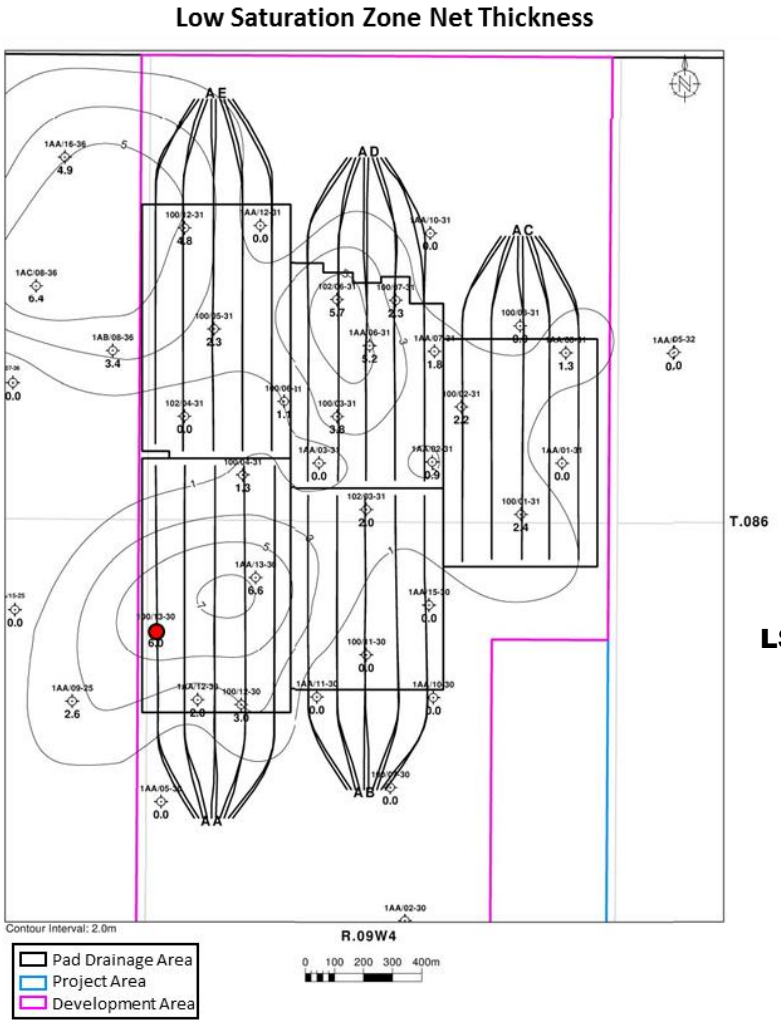
Interbedded mud and water saturated sand

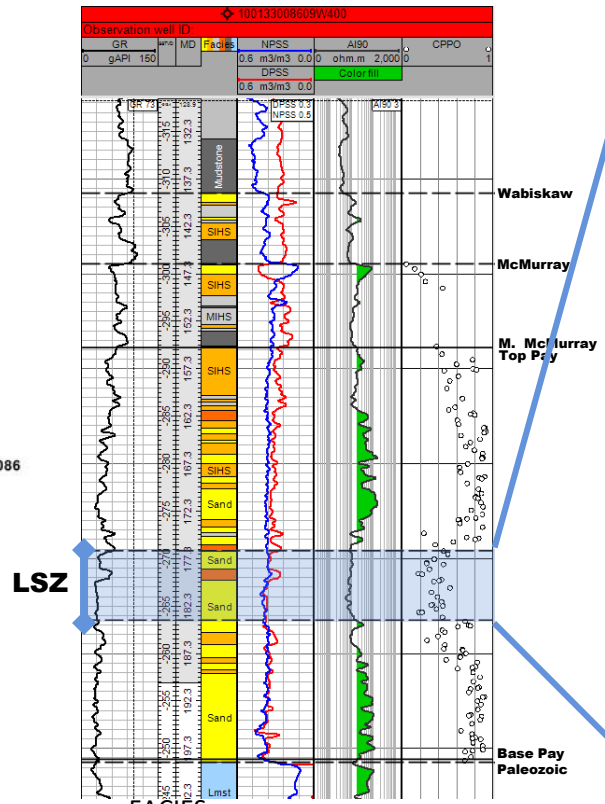


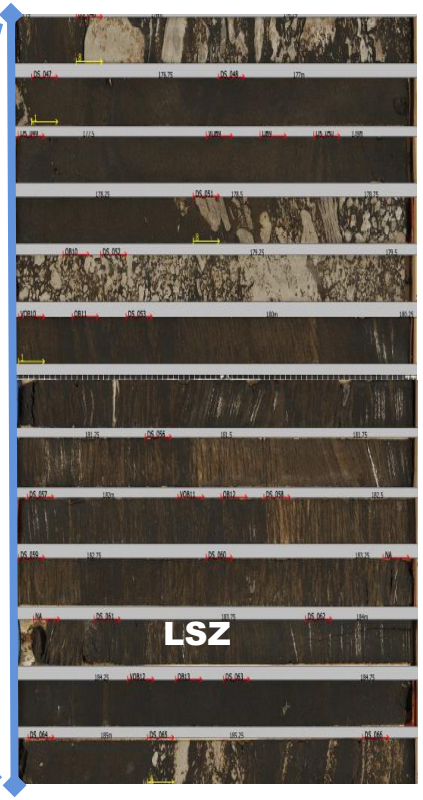
ISOPACH MAP OF MIDDLE MCMURRAY LOW BITUMEN SATURATION

LOW BITUMEN SATURATION ZONE (LSZ)

- GR<60 API, density porosity >0.27 and resistivity 10-18 ohm-m and core water saturation >50%
- Core So= 0.36 and porosity = 0.37, thus the LSZ will still contribute to the overall bitumen production







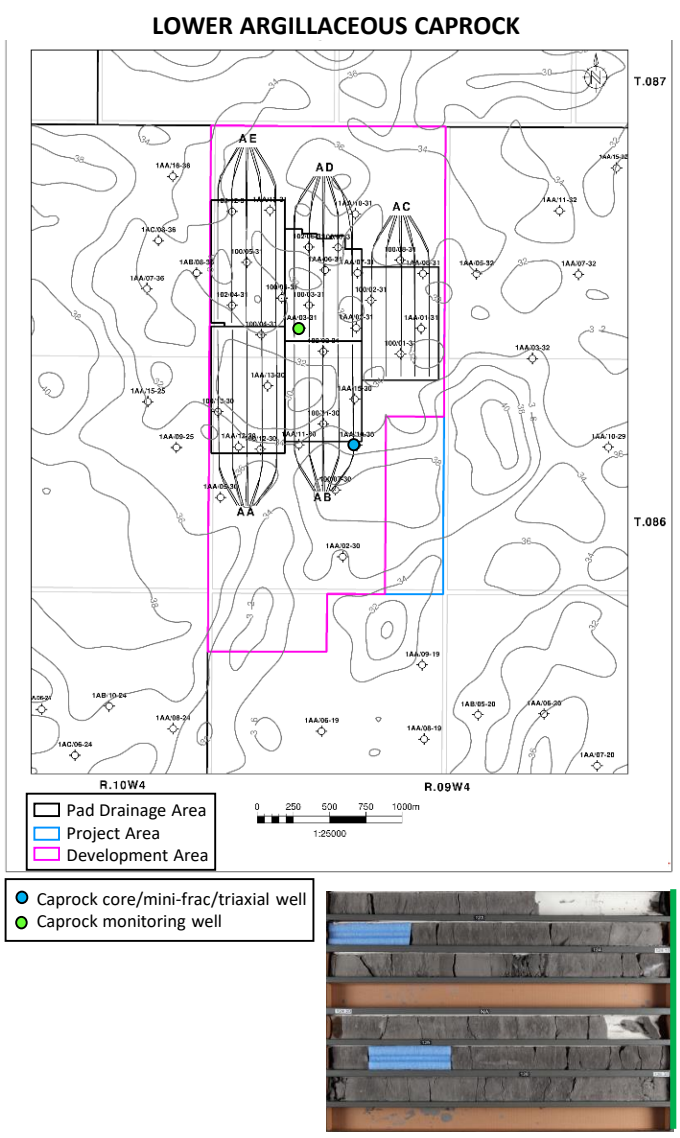
CAPROCK DESCRIPTION

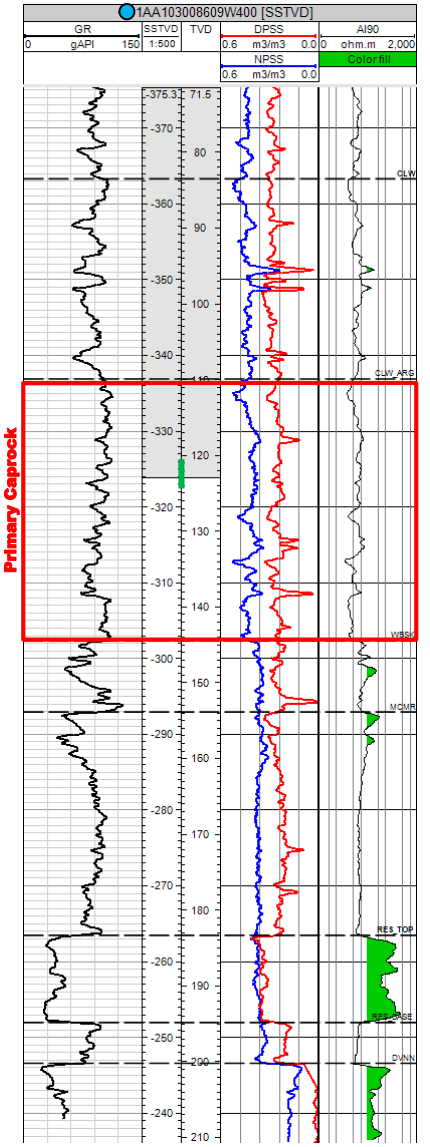
2018

- No pressure or temperature change has been observed in the caprock during the reporting period
- No new caprock core, mini-frac or tri-axial testing completed during the reporting period

HISTORICAL

- Caprock is defined as the unit between the top of the Clearwater and Wabiskaw
- One observation well has one piezometer and two thermocouples in the caprock





RESERVOIR PROPERTIES AND OBIP ABOVE PRODUCER

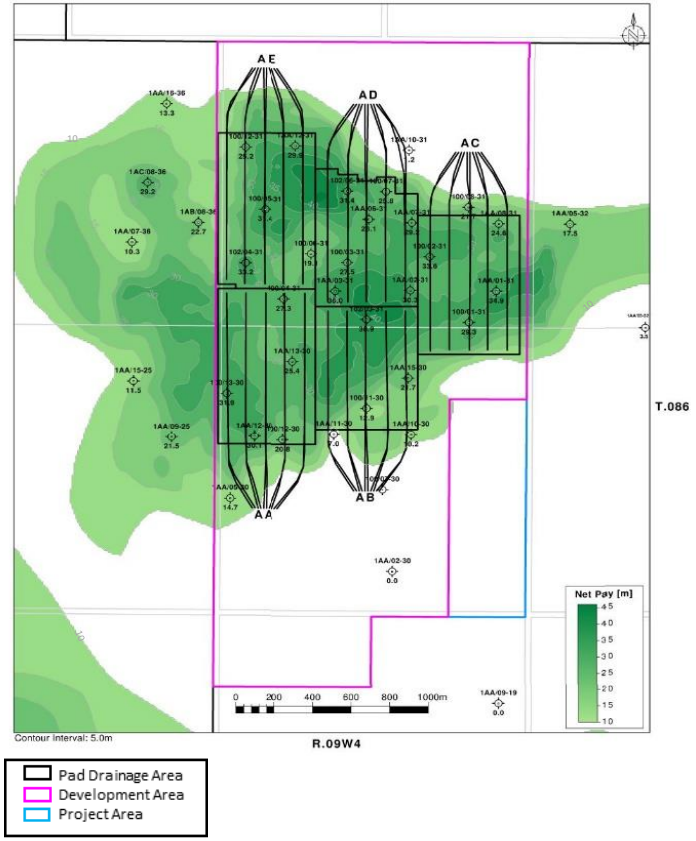
RESERVOIR PROPERTIES

- Typical Producer Depth: 191 TVD (258 masl)
- Initial Reservoir Pressure @ 190m TVD: 600 kPaa
- Initial Reservoir Temperature: 8°C
- Horizontal Permeability: 3,500-4,300 mD
- Vertical Permeability: 2,800-3,600 mD
- Bitumen Viscosity @ initial reservoir temperature: >1mln cP

Gross OBIP = Thickness from Top to Base Pay x Area x Porosity x So

	Avg Por (frac)	Avg So (frac)	OBIP (mln m^3)
Drainage Areas	0.36	0.72	15.6
Development Area	0.36	0.72	18.6
Project Area	0.36	0.72	18.6

Net Pay Thickness (m) from Top to Base Pay



SUBSURFACE

WELL DESIGN AND INSTRUMENTATION

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SAGD DRILLING SUMMARY

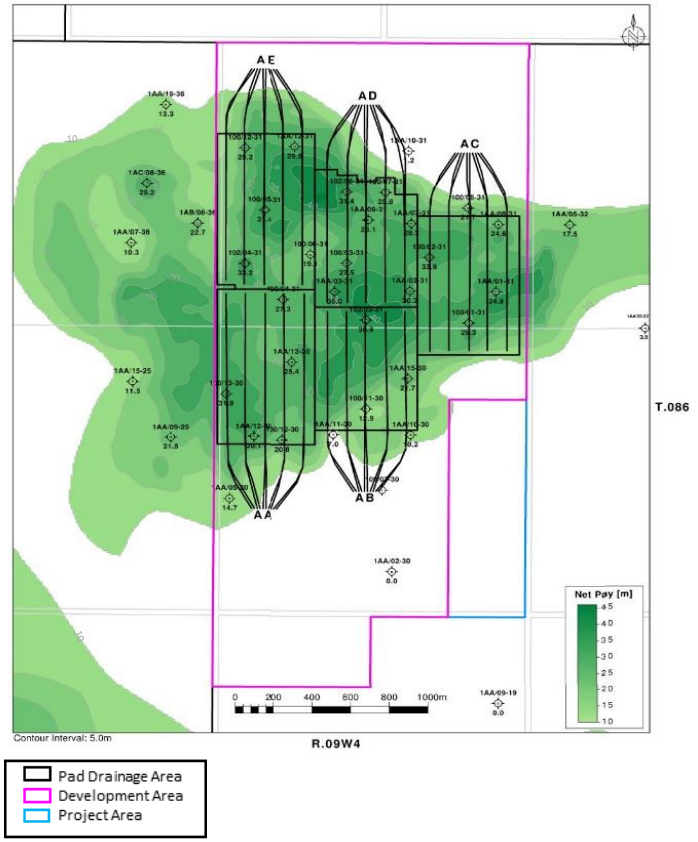
2018

- No new wells were drilled during this reporting period

HISTORICAL

- 5 well pads with 25 well pairs

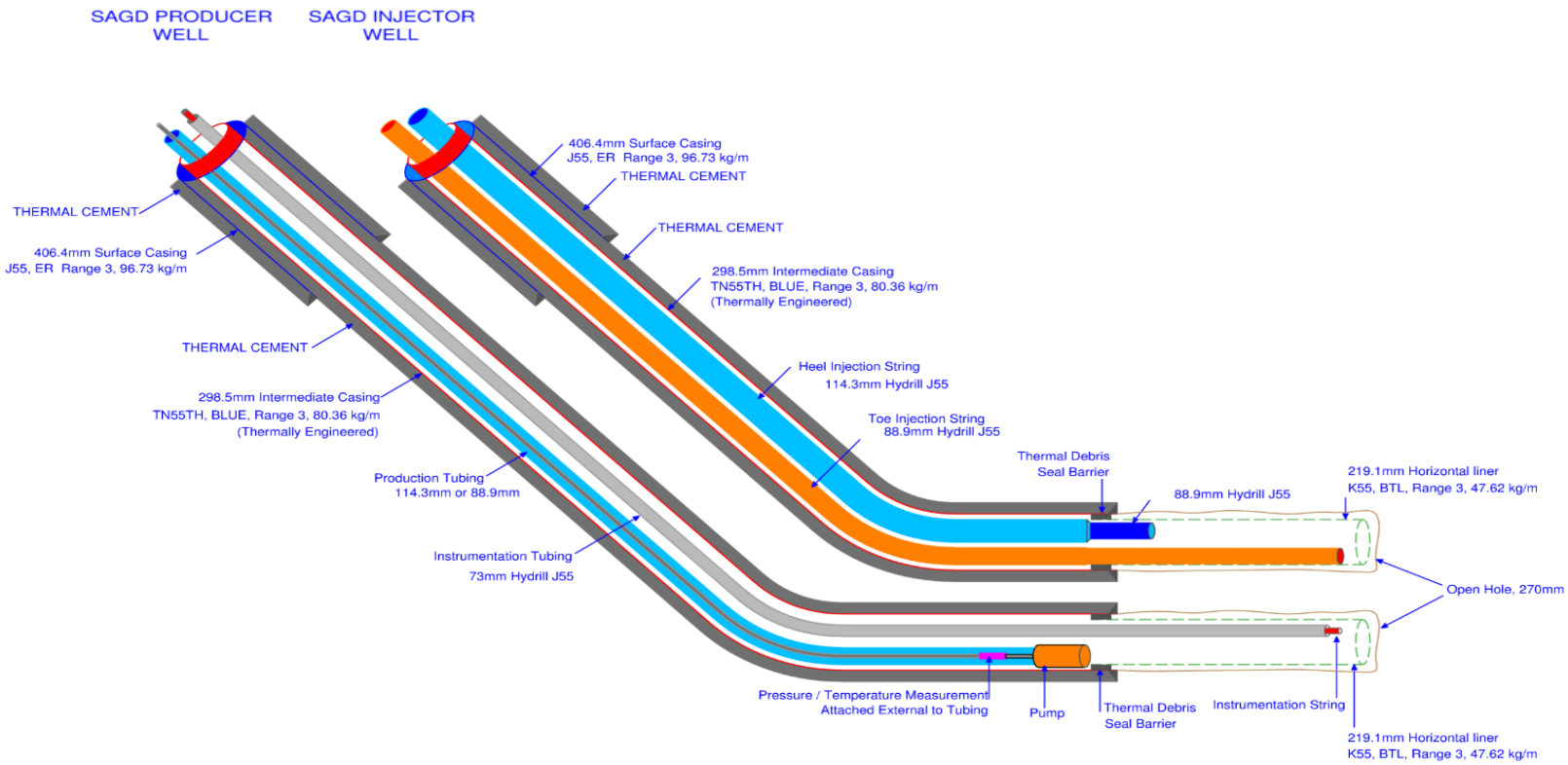
Net Pay Thickness (m) from Top to Base Pay



TYPICAL COMPLETION & ARTIFICIAL LIFT

- All wells initially completed with all-metal PCP
- Wells and facilities built with flexibility to convert from PCPs to ESPs
- Converted from PCPs to ESPs as rates improved and the wells matured
- Typical pump operating conditions:
  - *Average bottomhole pressure = 1,800 kPag*
  - *Average bottomhole temperature = 180 °C*

Artificial Lift Performance	PCP	ESP
Typical Minimum Rate (m^3/d)	100	125
Typical Maximum Rate (m^3/d)	600	825



Well	Type
AA1	ESP
AA2	ESP
AA3	PCP*
AA4	ESP
AA5	PCP
AB1	ESP
AB2	ESP
AB3	ESP
AB4	ESP
AB5	ESP
AC1	ESP
AC2	PCP
AC3	ESP
AC4	ESP
AC5	ESP
AD1	ESP
AD2	ESP
AD3	ESP
AD4	PCP
AD5	ESP
AE1	ESP
AE2	ESP
AE3	ESP
AE4	ESP
AE5	ESP

*Production assurance well

INSTRUMENTATION & FLOW CONTROL

TEMPERATURE

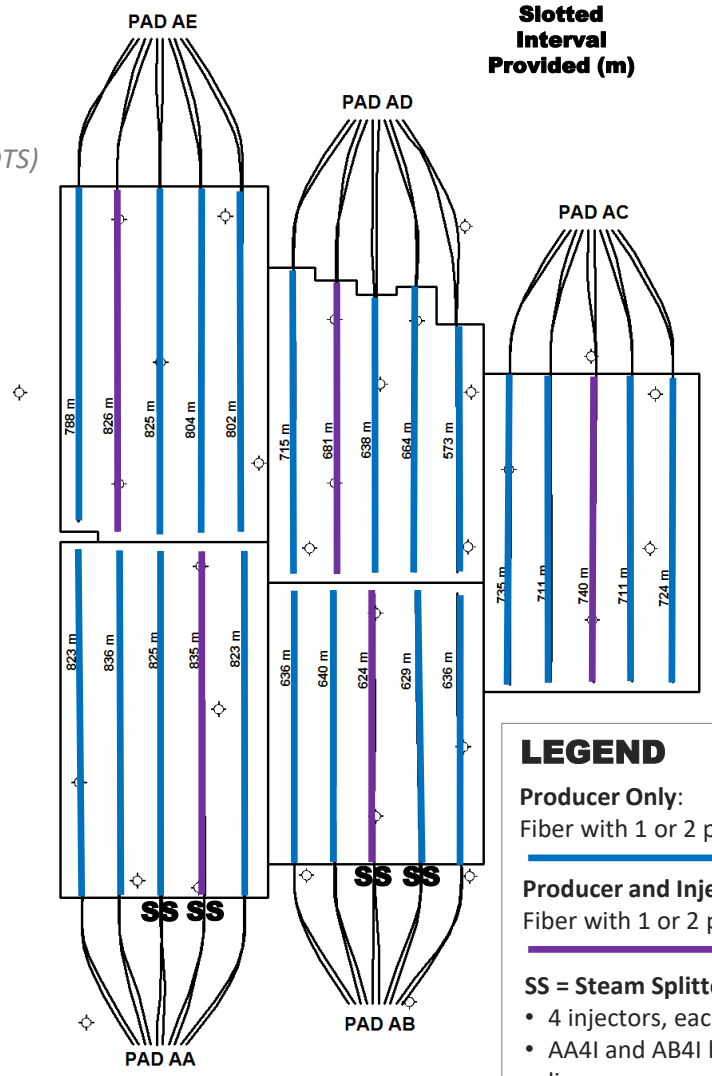
- Two types of fiber for temperature measurements
  - *Fiber Bragg Grating (FBG) and Distributed Temperature Sensing (DTS)*
- Both systems adequate for temperature management along the wellbore

PRESSURE

- Injector BHP is measured with blanket gas
- Producer BHP is measured using optical gauges and/or bubble tubes

FLOW CONTROL DEVICES (FCDs)

- FCD installed in well AB04, March 2018
- Evaluation of performance is on-going



LEGEND

Producer Only:
Fiber with 1 or 2 pressure sensors

Producer and Injector:
Fiber with 1 or 2 pressure sensors

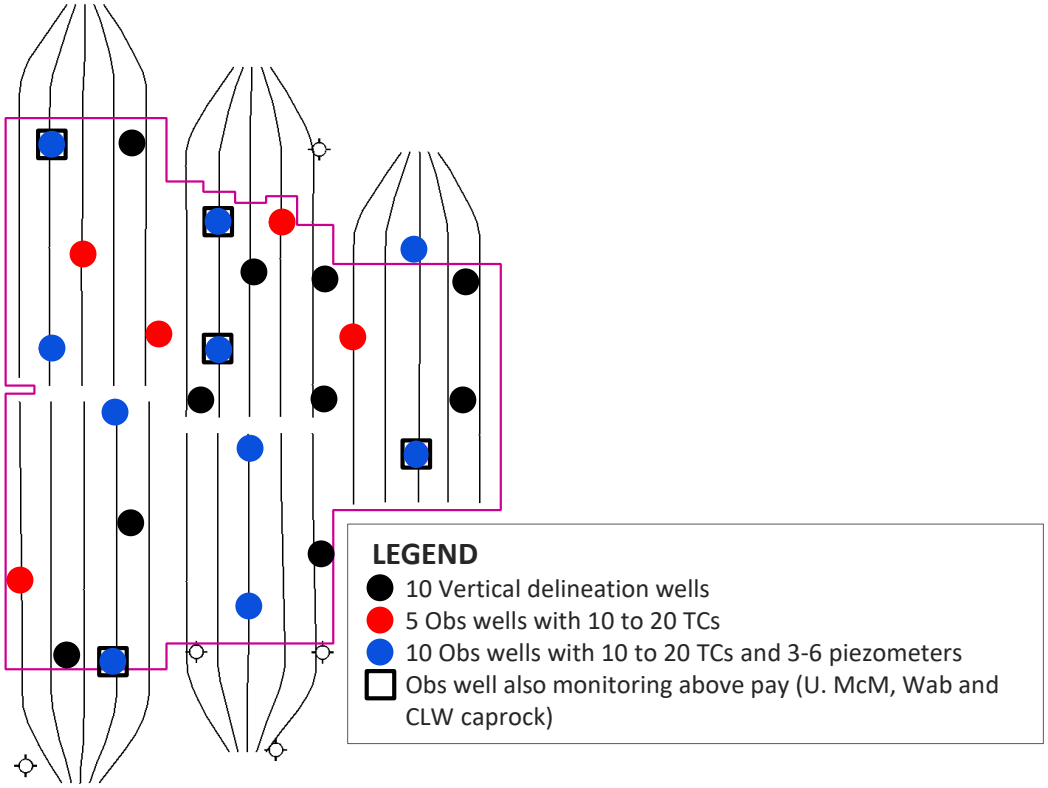
SS = Steam Splitters
- 4 injectors, each with 2 ports
- AA4I and AB4I have slimbore 7" liner

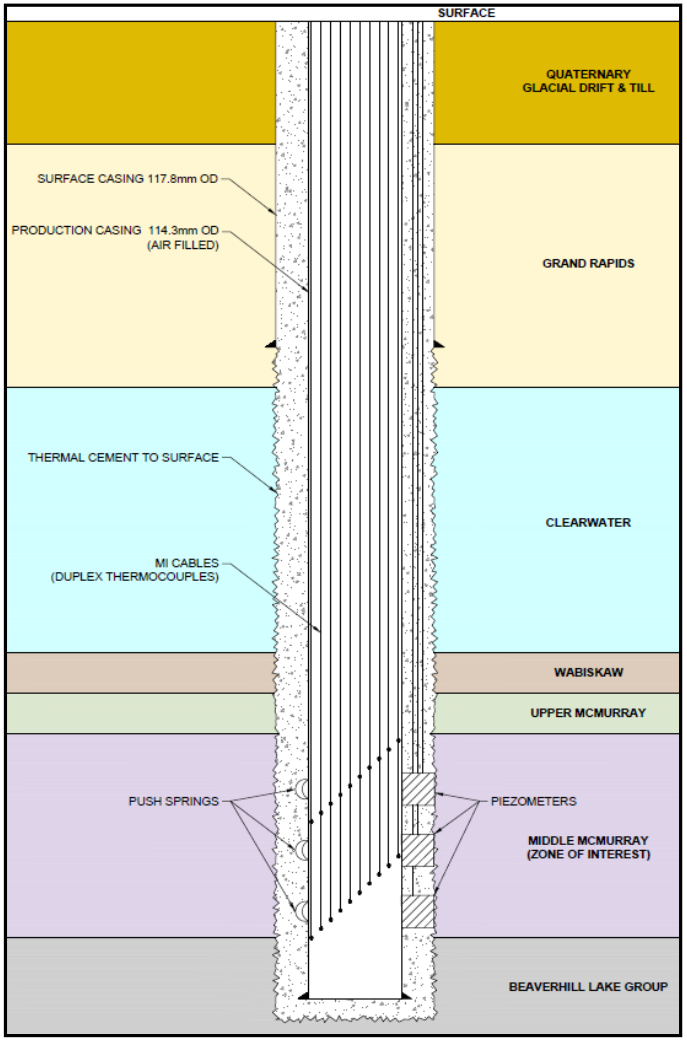
FCDs installed on one producer to date (AB04)

INSTRUMENTATION – OBSERVATION WELLS

OBSERVATION WELLS

- Some pressure sensors have failed (typically after steam conditions observed)
- Instrumentation used to monitor reservoir pressure and temperature growth





SUBSURFACE

4D SEISMIC AND MONITORING

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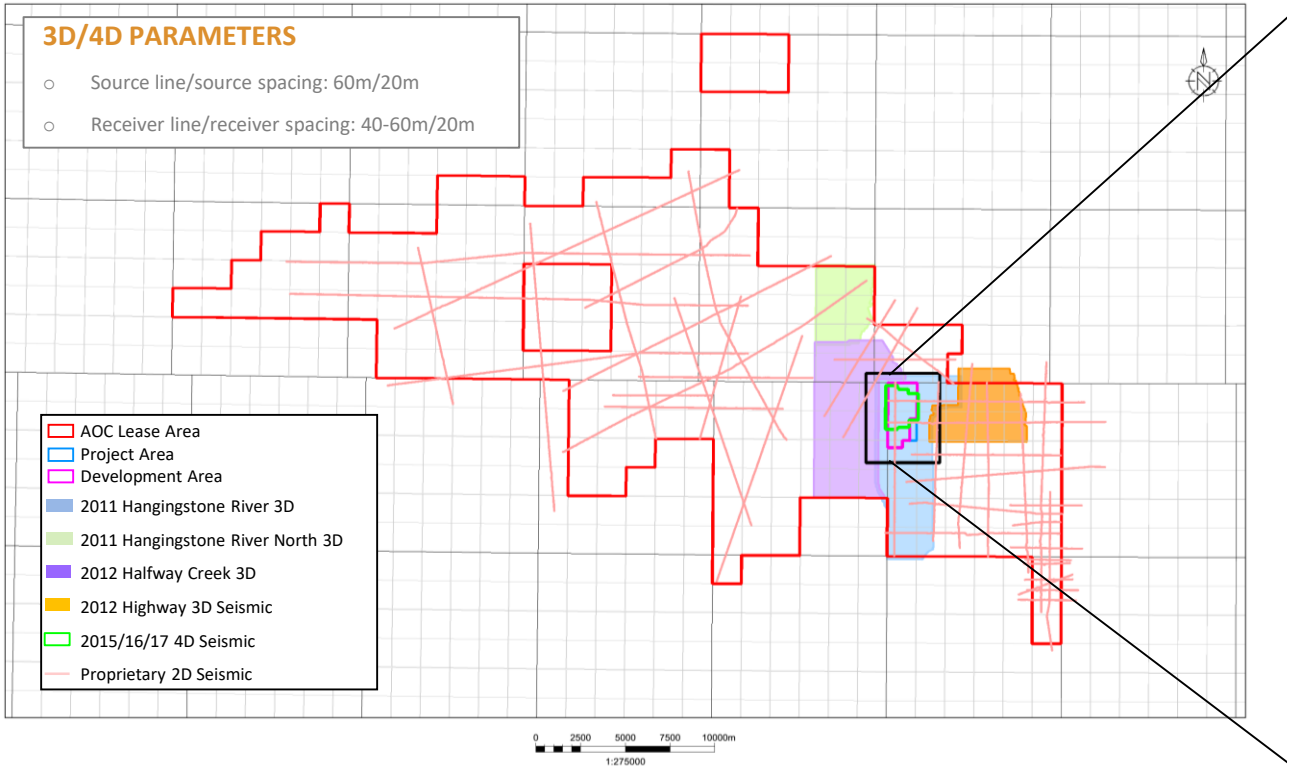
SEISMIC DATA OVERVIEW

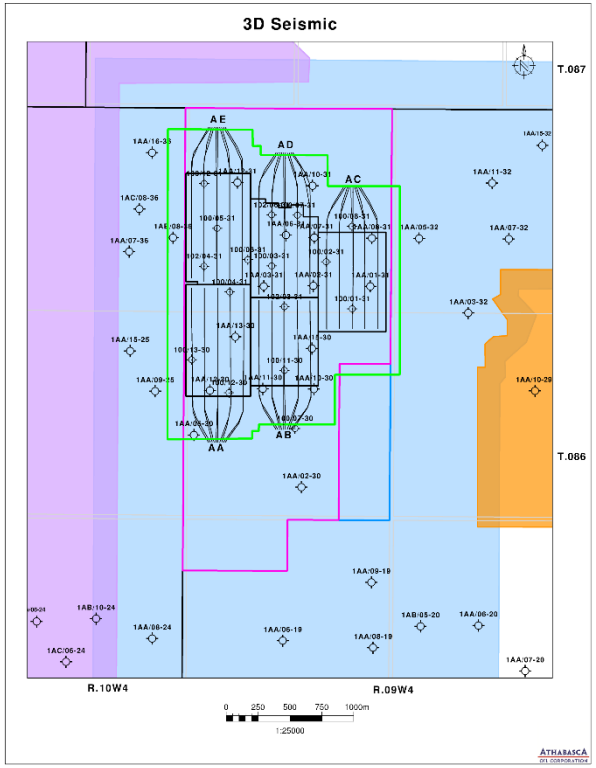
2018

- No new data acquired in reporting period

HISTORICAL

- 3D acquired in 2011 and 2012, merged in 2012
- Total proprietary 2D ~ 450 km
- Total 3D area ~98 km^2 (merged), covers development area
- Total 4D area ~3.72 km^2
  - *Baseline acquired Q1 2014*
  - *First Monitor acquired Q1 2016 / Second Monitor acquired Q1 2017*





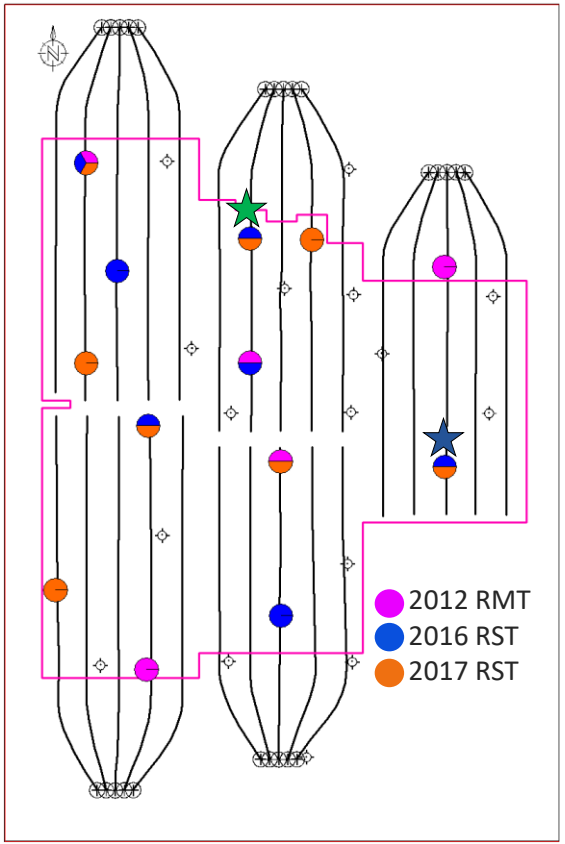
RESERVOIR SATURATION TOOL (RST)

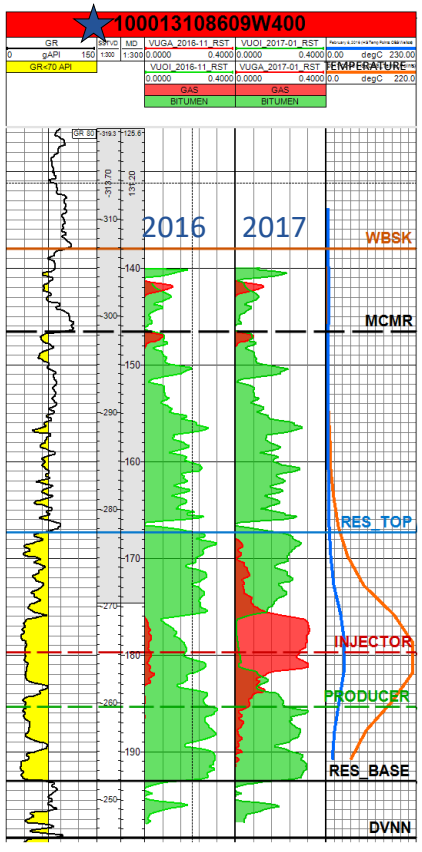
2018

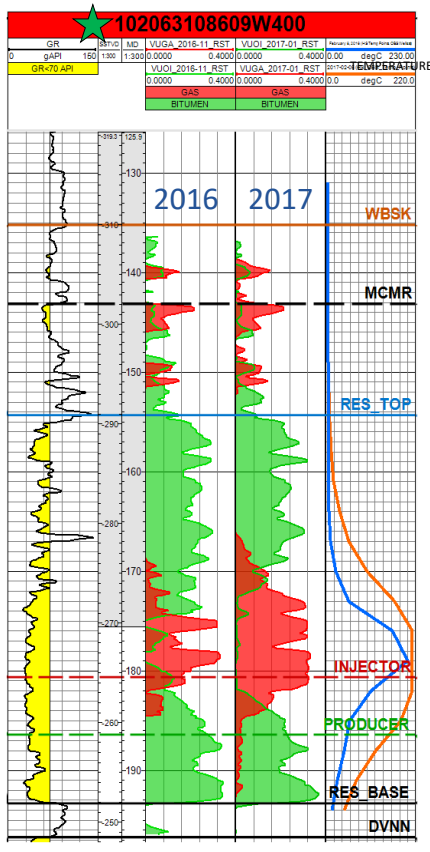
- No new data acquired in reporting period

HISTORICAL

- Baseline acquired in 2012
- 2016 acquired 7 saturation logs; 2017 acquired 8 saturation logs
- RST results show steam chamber thickness correlates with observation well temperature profiles







SURFACE HEAVE MONITORING

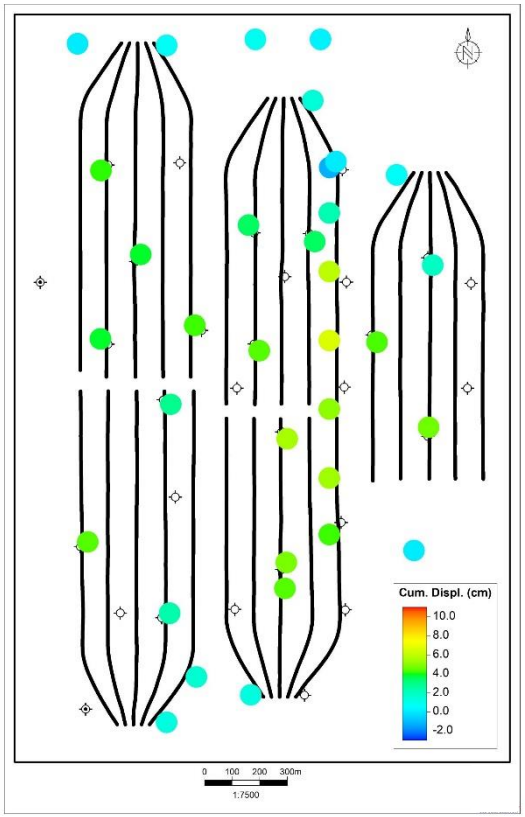
PROGRAM DESIGN

- 31 permanent surface heave monuments (0.30 x 0.30 m plate)
- Real-time Kinematic (RTK) survey method was used, survey tolerance range is +/- 2 cm

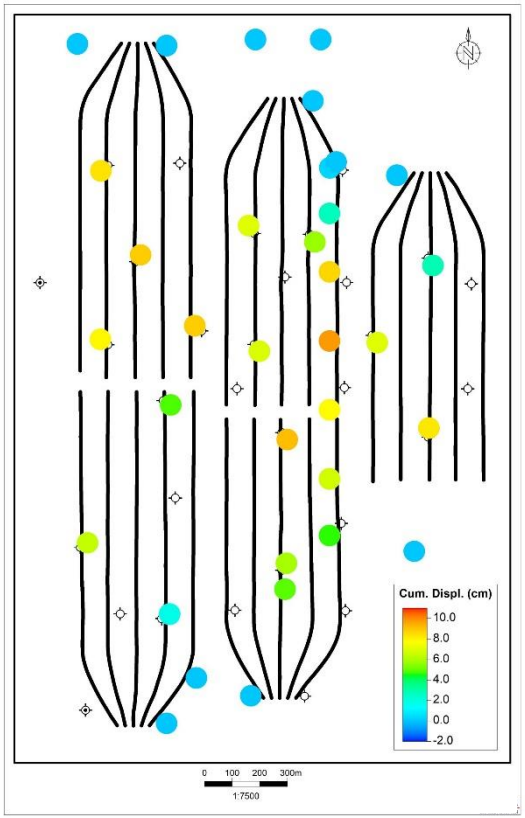
SURVEY/RESULTS

- During 2018 the maximum change observed was 7 cm over Pad AD
- The maximum change observed between February 2015 and January 2018 was 9 cm

2017-18 Cumulative Displacement, cm



2015-18 Cumulative Displacement, cm



SUBSURFACE

SCHEME PERFORMANCE

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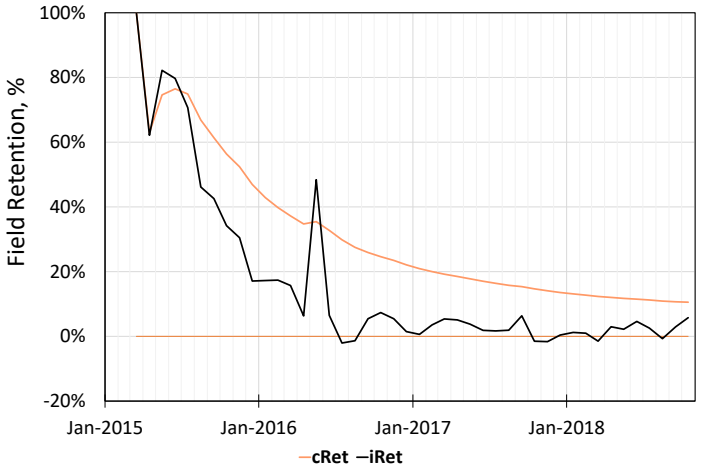
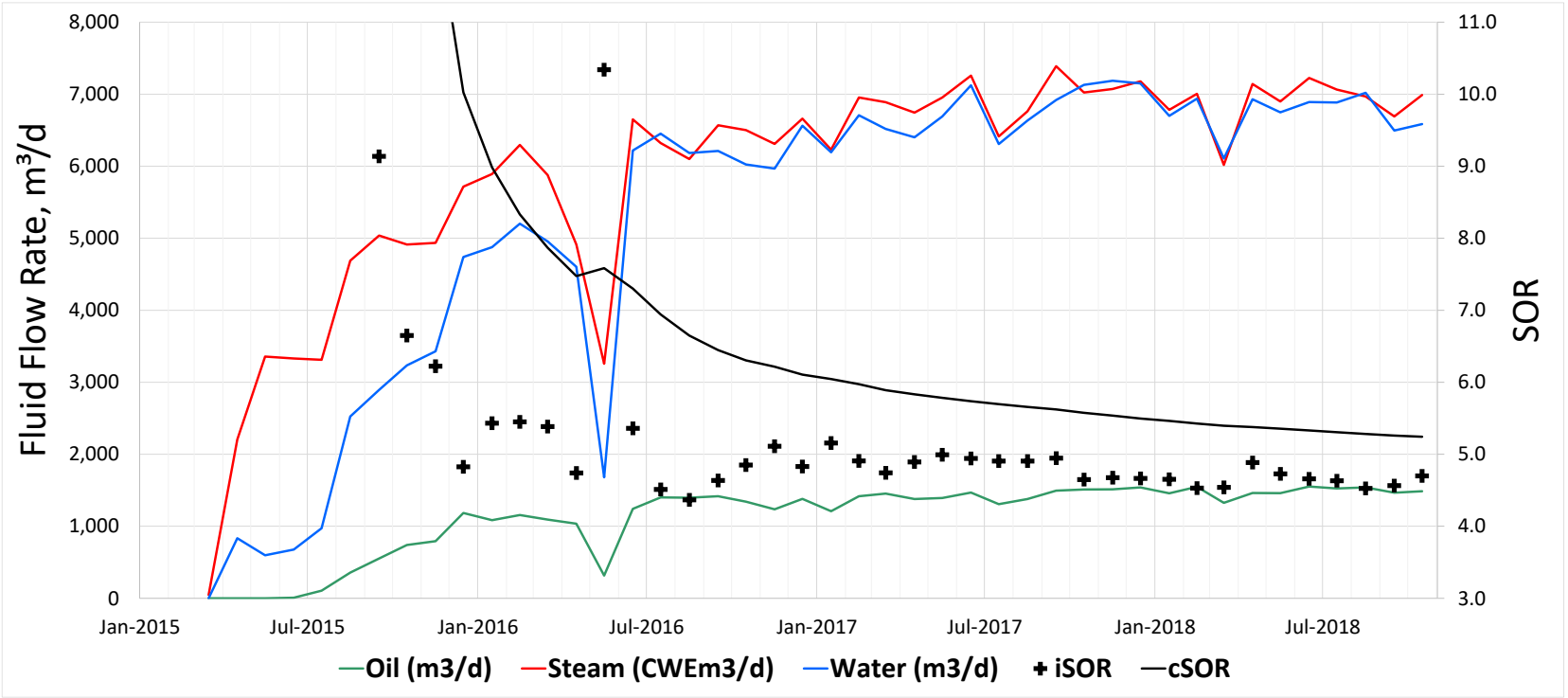
FIELD HISTORY

- Field continuing to ramp-up
  - *Currently 24 of the 25 SAGD well pairs on production*
  - *Injectors have reached target operating pressure*
  - *SOR declining as upper portions of the reservoir begin to drain*
  - *FCD installed on AB04*
  - *AA05 brought on-stream*

- Maximum monthly bitumen rate 1,551 m³/d (9,754 bbl/d) with SOR of 4.7 (Jun 2018)





PAD RECOVERY

Pad	Well Pairs	Average Lateral Length (m)	Average Net Pay above Producer (m)	Oil Saturation (frac)	Total Net Pay Porosity (frac)	OBIP (10^6 m^3)	Current Recovered[1] (10^6 m^3)	Current Recovery Factor (%)	Predicted Recovery Factor (%)
AA	4/5	850	23.7	0.71	0.35	3.3	0.21	6.5	50-70
AB	5/5	640	22.4	0.73	0.37	2.9	0.54	18.7	50-70
AC	5/5	750	24.3	0.70	0.36	3.0	0.20	6.7	50-70
AD	5/5	670	26.2	0.71	0.35	3.2	0.26	8.2	50-70
AE	5/5	830	22.6	0.70	0.35	3.2	0.29	9.1	50-70
TOTAL	24/25					15.6	1.51	9.7	50-70

[1] Recovery Factor based on cumulative oil production in Oct 2018

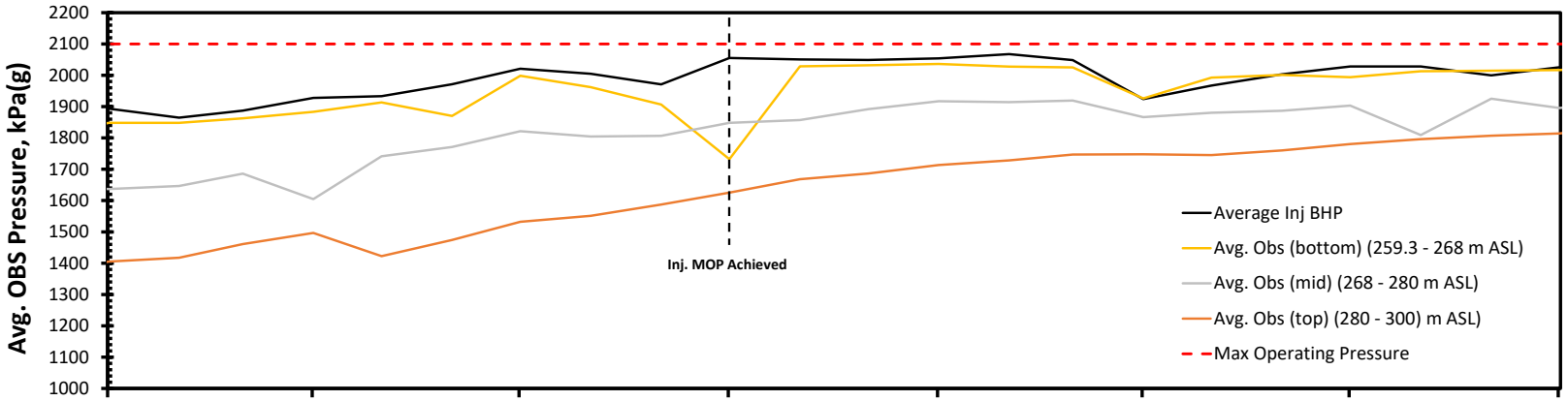
Notes:

- Well Spacing: 100 m, Spacing between pads: 130 m
- Volumetrics include 25 m at heel and toe of the well pair
- OBIP is gross oil volume between base and top of pay
- Predicted recovery factor accounts for drainage through the low bitumen saturation zone and from the IHS

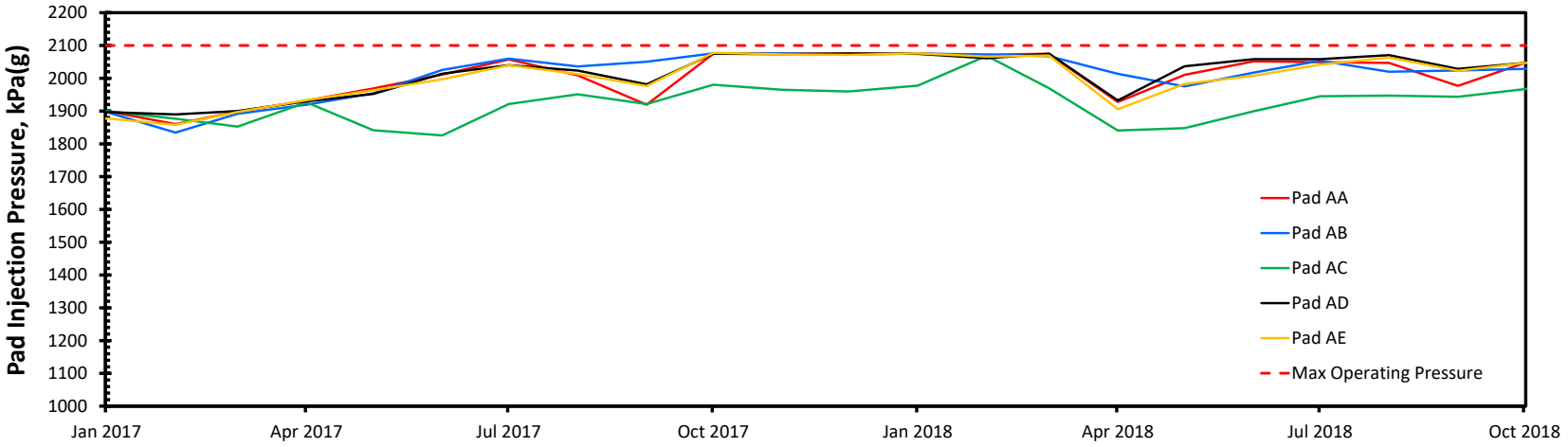
RESERVOIR PRESSURE

- Approved Maximum Operating Pressure is 2,100 kPag
- Throughout the reporting period, the reservoir continues pressuring up
  - *Pressure data shows vertical and horizontal pressure communication throughout the entire pay interval across entire field*
- No pressure change in caprock

Average daily field pressure at base, middle and top of reservoir



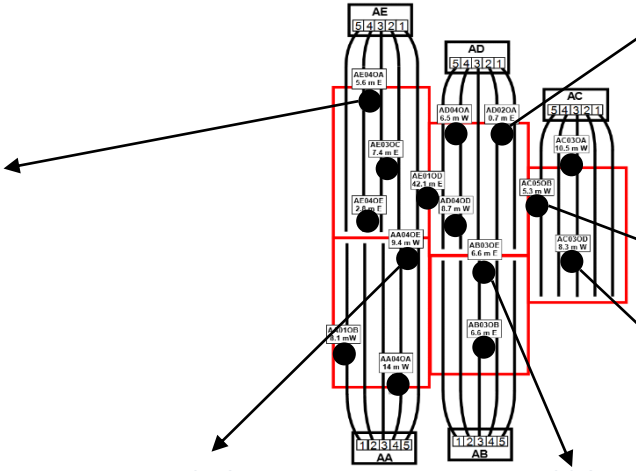
Average daily injection pressure in each Pad



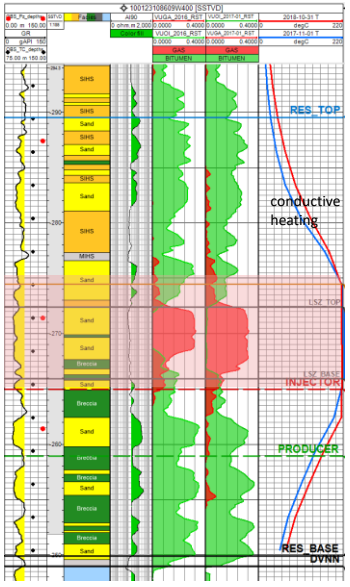
STEAM CHAMBER PROGRESSION IN OBSERVATION WELLS

PROGRESSING THROUGH IHS

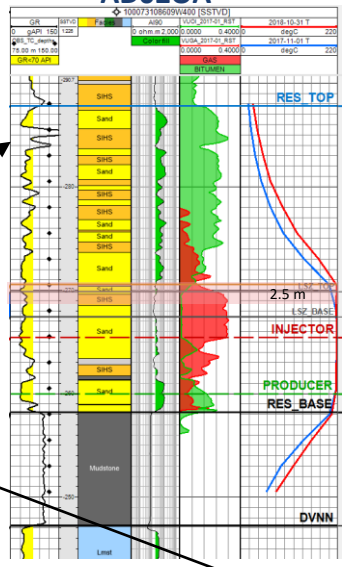
- Significant steam chamber growth through the Low Bitumen Saturation Zone and into the IHS across all pads in 2018
- Conductive heating into IHS observed in all OBS wells



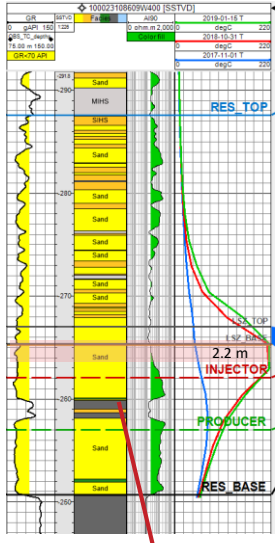
AE04OA



AD02OA

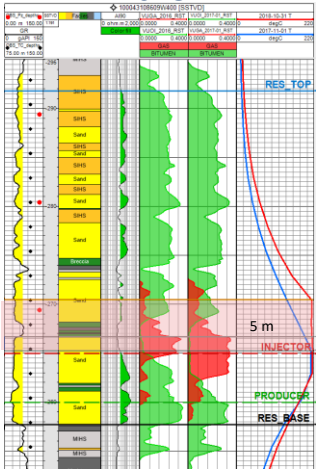


AC05OB

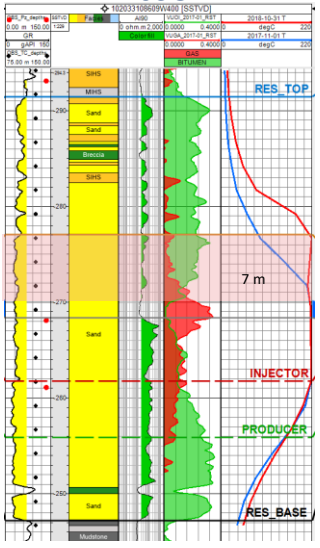


AC05OB: Steam chamber development above mudstone in September; 1 to 2 m mudstone acted as a baffle, not barrier, to flow

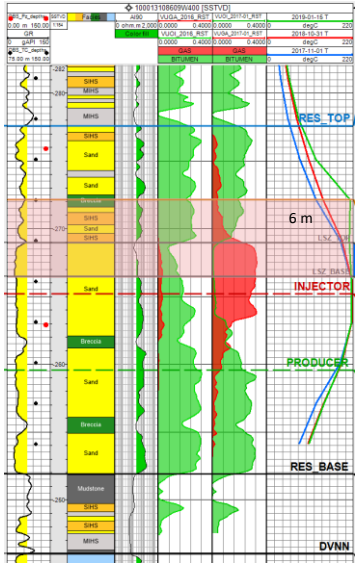
AA04OE



AB03OE

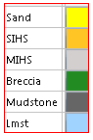


AC03OD



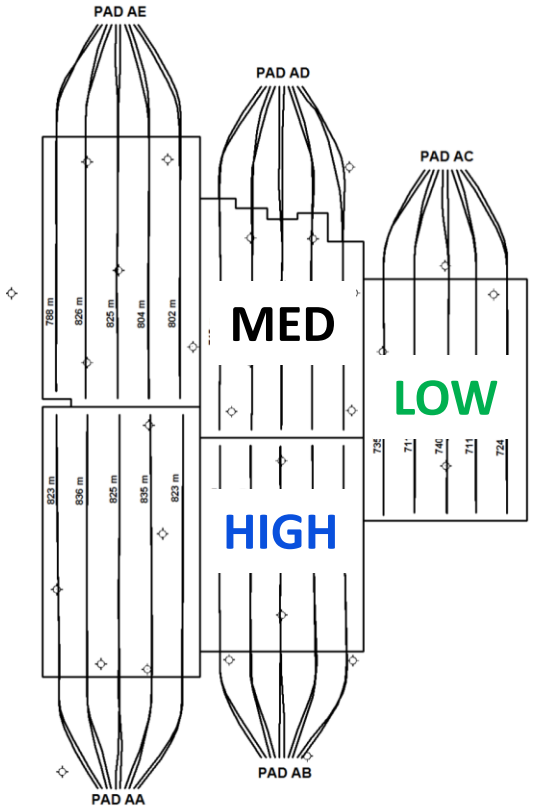
Temperature Plots
- Nov 1, 2017
- Oct 31, 2018
- Jan 15, 2019
- Low Saturation Zone
- m — Top of Steam Chamber
- Steam chamber growth

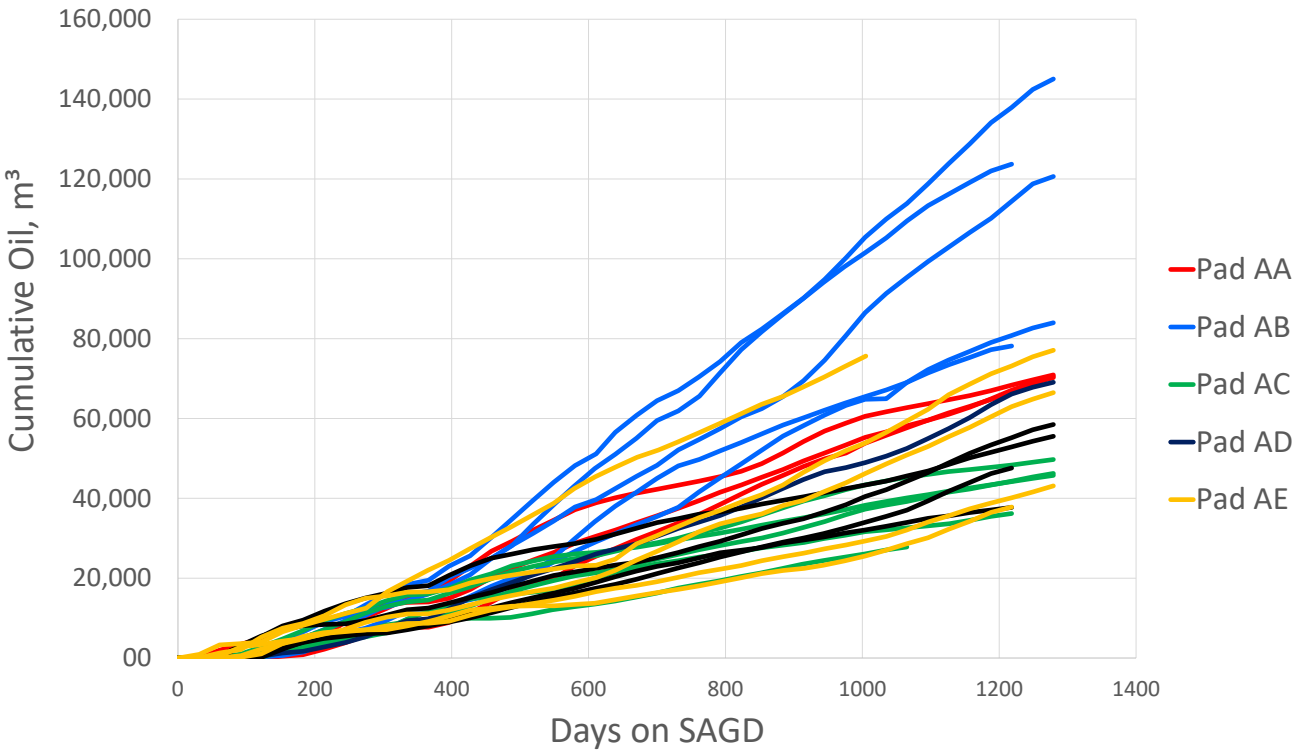
FACIES



PAD PERFORMANCE

- Variation of pad performance depends on geology, pad boundary, well pair trajectories, pump performance and subcool conformance
  - *Pads AB, AD and AE selected as examples of high/medium/low performing pads*
    - *Selection based on cumulative oil recovery and cSOR*
    - *Differences in the productivity of the wells primarily due to geological variability*





PAD PERFORMANCE – HIGH PAD AB

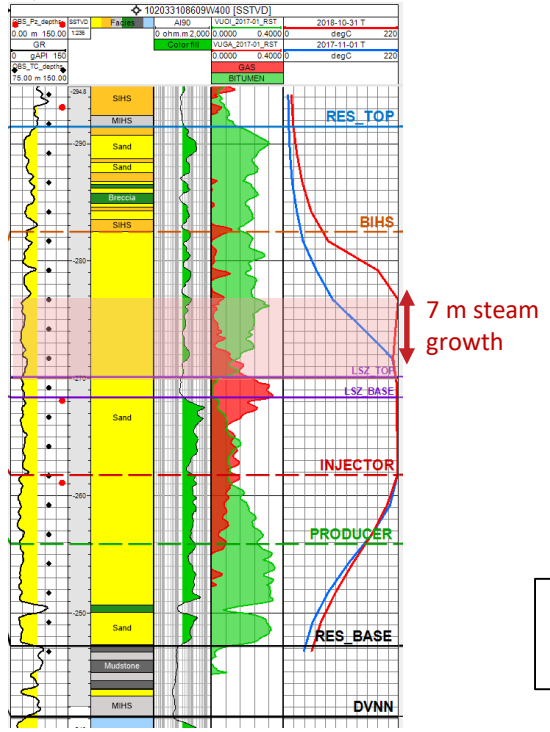
PAD AB

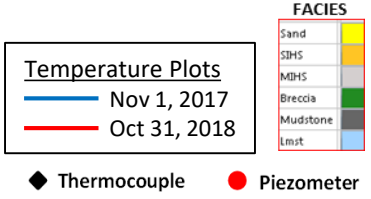
- Cumulative production: 543,061 m^3
- Highest reservoir quality
  - *Mostly sandy reservoir*
  - *High oil saturation around well pairs*
  - *Thin low bitumen saturation zone*
- Highest average effective wellbore (97%)
- Peak well pair monthly rates >1,000 bbl/d

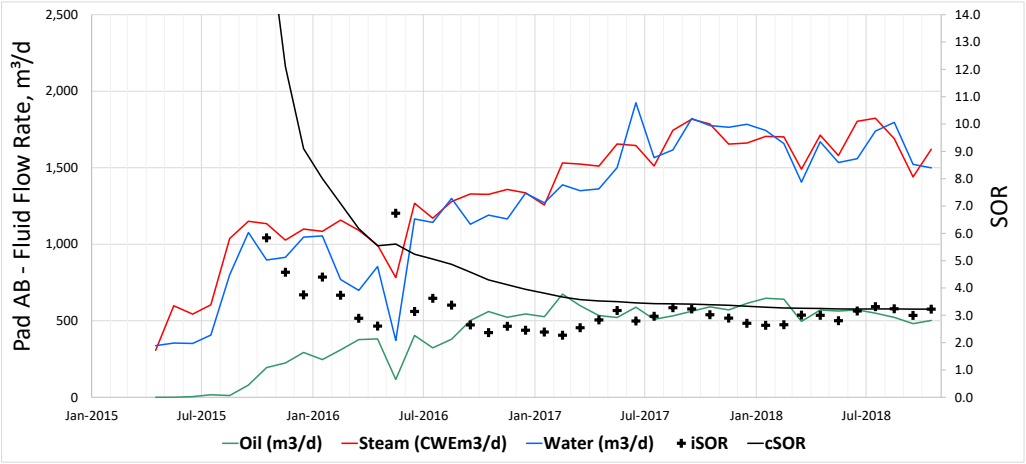
CHANGES SINCE LAST REPORTING PERIOD[1]

- Oil: relatively constant at 3,523 bbl/d (+0.4%)
- Oil Cut: decreased from 27% to 25.5% (-6%)
- cSOR: decreased from 3.4 to 3.2 (-6%)
- Significant steam chamber development
  - *Well AB03OE shows 7 m steam chamber rise near toe of AB03*
- Pressure increase at top of reservoir through IHS

AB03OE, 102/03-31-86-09W4 TOE (6.6m OFFSET)







1 Annualized: (Nov 2016 – Oct 2017) to (Nov 2017 – Oct 2018)

PAD PERFORMANCE – MID PAD AD

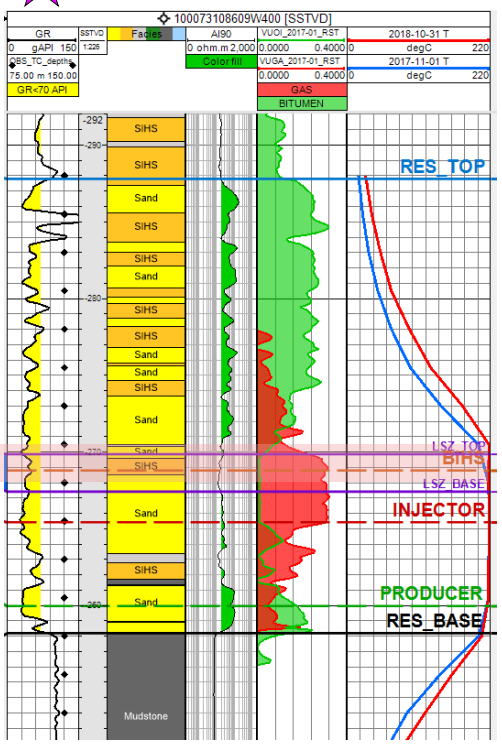
PAD AD

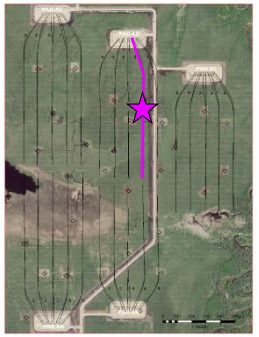
- Cumulative production: 262,614 m^3
- Average reservoir quality
  - *Thickest net pay (26.2 m)*
  - *IHS with high oil saturation in upper reservoir*
  - *Thick low bitumen saturation zone above injection well*
- Shortest wells
- Most bounded pad
- High average effective wellbore (96%)

CHANGES SINCE LAST REPORTING PERIOD[1]

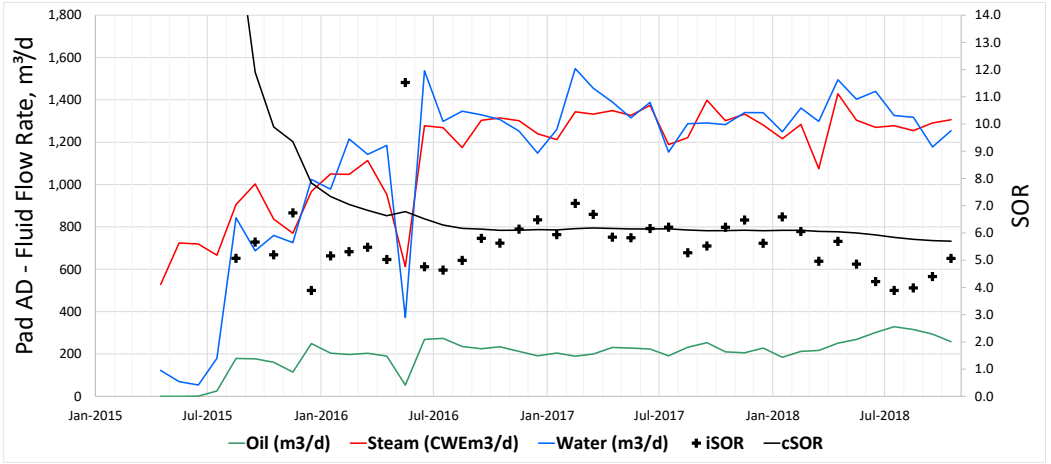
- Oil: increased from 1,344 to 1,607 bbl/d (+20%)
- Oil Cut: increased from 14.0% to 16.1% (+15%)
- cSOR: decreased from 6.1 to 5.7 (-7%)
- Well AD02OA shows 2.5m steam chamber development at heel of AD02
  - *Temperature increase through IHS*
  - *Steam chamber advancing through LSZ*
- Increased contribution from upper reservoir (IHS) resulting in improved rates and oil cut

AD02OA, 100/07-31-86-09W4 HEEL (0.7 m OFFSET)





2.5 m steam growth



* Annualized: (Nov 2016 – Oct 2017) to (Nov 2017 – Oct 2018)

PAD PERFORMANCE – LOW PAD AC

PAD AC

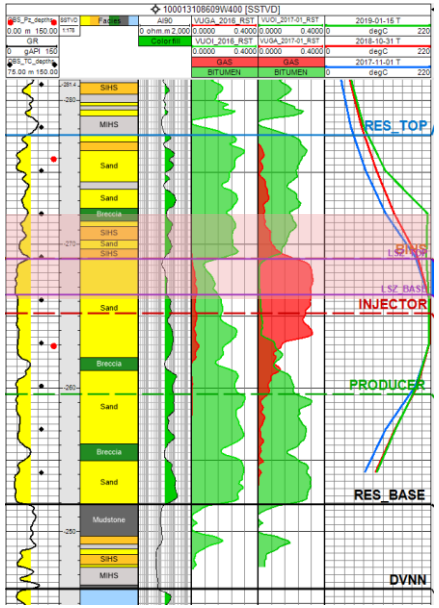
- Cumulative production: 201,960 m^3
- Heterogeneous reservoir
  - *IHS dominated*
  - *Thin low bitumen saturation zone above injection well*
- Bounded at east of pad
- Sharing west boundary with pads AB and AD

CHANGES SINCE LAST REPORTING PERIOD[1]

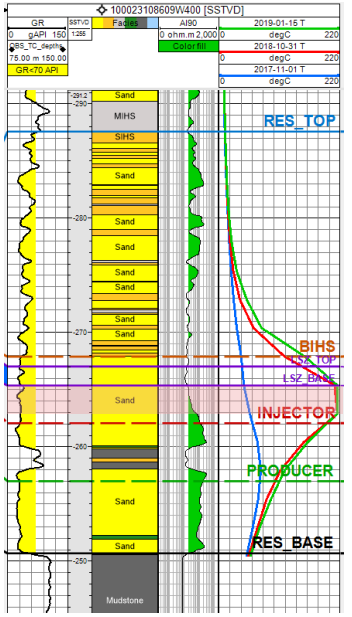
- Oil: relatively constant at 978 bbl/d (-2%)
- Oil Cut: unchanged from 14.2%
- cSOR: increased from 6.0 to 6.4 (+6%)
- OBS wells AC03OD and AC05OB show appreciable steam chamber progression over the year
  - *AC03OD passed through LSZ and is now advancing through SIHS and Breccia*
  - *AC05OB shows drainage around a thick mudstone between the Producer and Injector, proving its limited lateral extent.*

★ **AC03OD, 100/01-31-86-09W4**
TOE (8.3 m OFFSET)

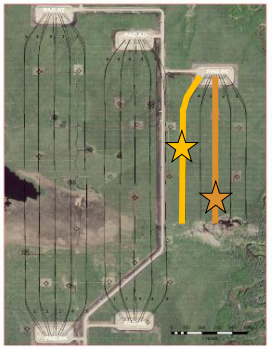
★ **AC05OB, 100/02-31-86-09W4**
MID (5.3 m OFFSET)



6m steam growth



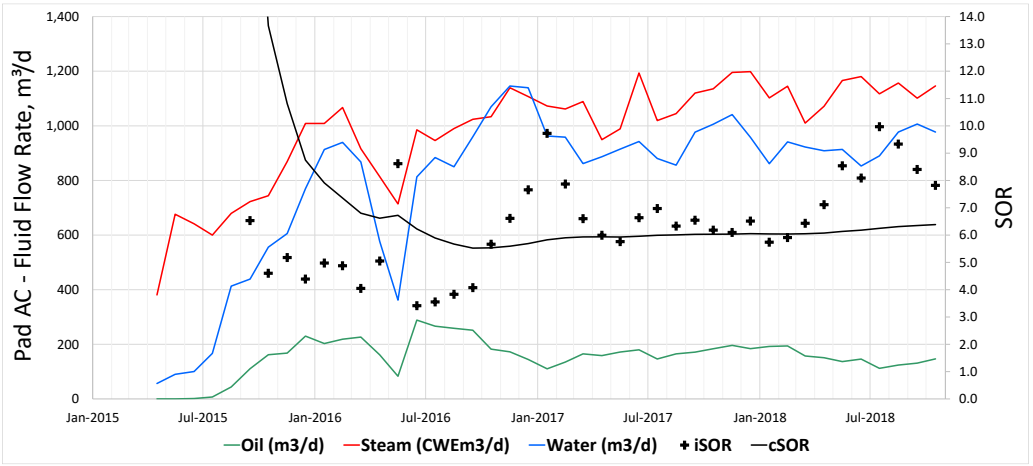
2.2m steam growth



FACIES
Sand
SIHS
MIHS
Breccia
Mudstone
Lmst

Temperature Plots
Nov 1, 2017
Oct 31, 2018
Jan 15, 2019

◆ Thermocouple ● Piezometer



1 Annualized: (Nov 2016 – Oct 2017) to (Nov 2017 – Oct 2018)

STEAM QUALITY

- Steam quality leaving the plant is approximately 98% (incl. Continuous Blow Down (CBD) at typically 6,000 kPag
- Steam quality decreases to wellheads and is not measured but is modeled to be ~95%
- These conditions align with the original design

WELL INTEGRITY & ABANDONMENTS

WELL INTEGRITY

- Well integrity is addressed by using thermally engineered casing, thermal cement and completing cement bond logs in accordance with Directive 051
  - No wellbore integrity failures during the reporting period
  - No non-compliances of reporting and repairing wellbore integrity issues during the reporting period
- AOC has in place a wellhead valve maintenance program to prevent wellhead valve failures
  - No wellhead failures during the reporting period

ABANDONMENTS

- No wells have been abandoned or suspended within the project area to date

FUTURE PLANS

- No plans for the drilling of any new SAGD well pairs for next reporting period
- No abandonments planned in the next 5 years
- Production assurance well AA03 to be brought online pending steam availability
- Expect to convert remaining active PCP wells to ESPs as required
- Evaluating opportunities for Flow Control Devices (FCDs) into producer wells

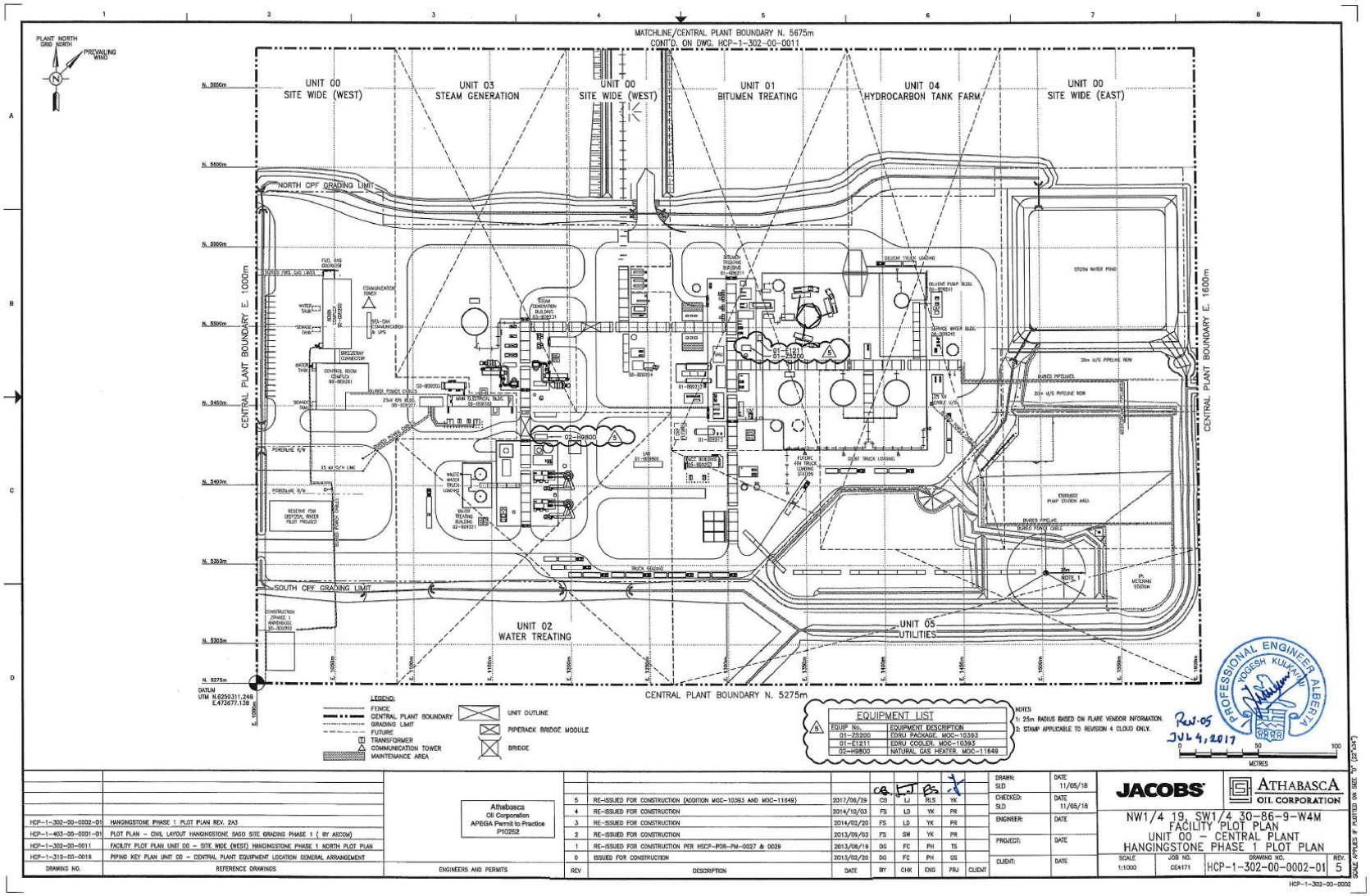
SURFACE OPERATIONS

FACILITIES

ATHABASCA OIL CORPORATION

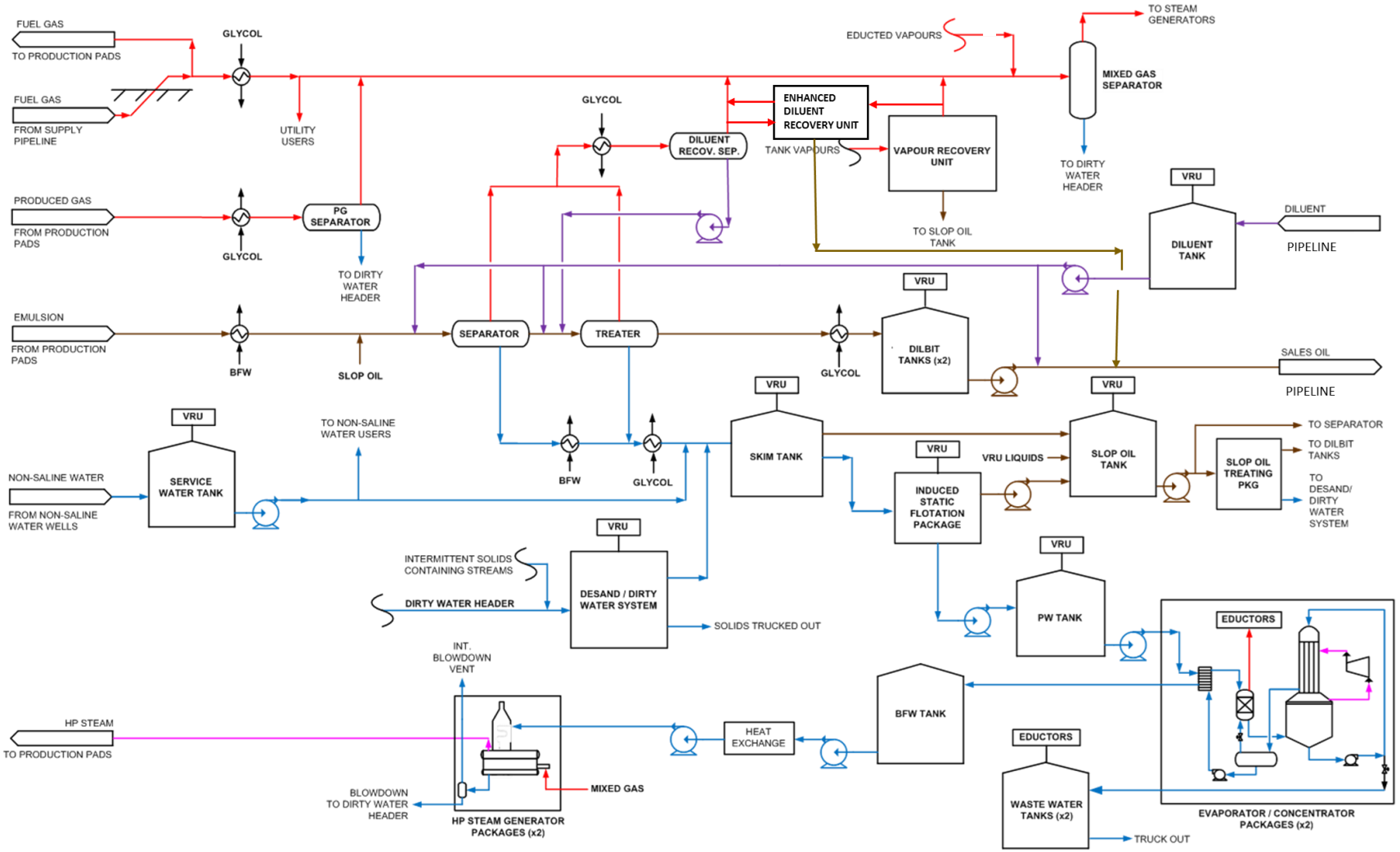
APPROVED PLOT PLAN

- No major facility modifications during this reporting period



FACILITY SCHEMATIC

- No modifications during this reporting period



SURFACE

MEASUREMENT, ACCOUNTING AND REPORTING PLAN (*MARP*)

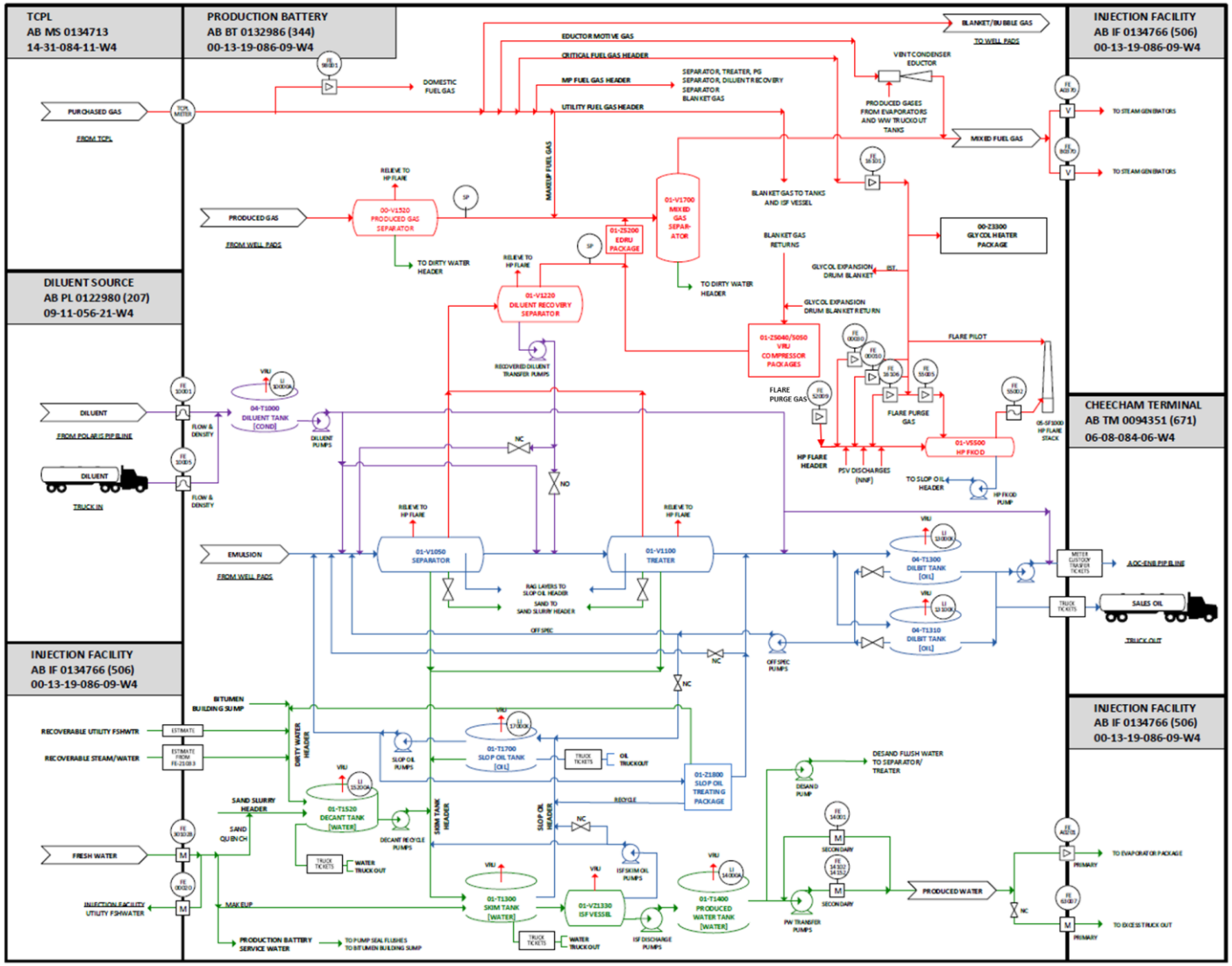
ATHABASCA OIL CORPORATION

MEASUREMENT AND REPORTING

MEASUREMENT, ACCOUNTING AND REPORTING PLAN (MARP)

- MARP approved October 5, 2012
- MARP variance for steam measurement meters approved in 2017
- No changes or alterations made during the 2018 reporting period

MEASUREMENT SCHEMATICS – BATTERY



LEGEND

STREAMS
WATER
BITUMEN
STEAM
GAS
DILUENT

WELL TYPES
OIL WELL
STEAM INJECTION WELL
WATER SOURCE WELL

METER TYPES
VORTEX METER
ULTRASONIC METER
CORIOLIS METER
MAGNETIC METER
V-CONE METER
PETRINEX ACCOUNTING METER
METER NOT REPORTING TO PETRINEX

TAGS
EQUIPMENT TAGS PRECEDED BY "HCP-"
INSTRUMENT TAGS PRECEDED BY "HCP-XX-" WHERE XX IS THE UNIT IDENTIFIER

ABBREVIATIONS
AE – ANALYZER
CBD – CONTINUOUS BLOWDOWN
FE – FLOW ELEMENT (ACCOUNTING METER)
H2O – WATER CUT
IBD – INTERMITTENT BLOWDOWN
U – LEVEL METER (RADAR TYPE)
NC – NORMALLY CLOSED
NNF – NORMALLY NO FLOW
NO – NORMALLY OPEN
SP – SAMPLE POINT

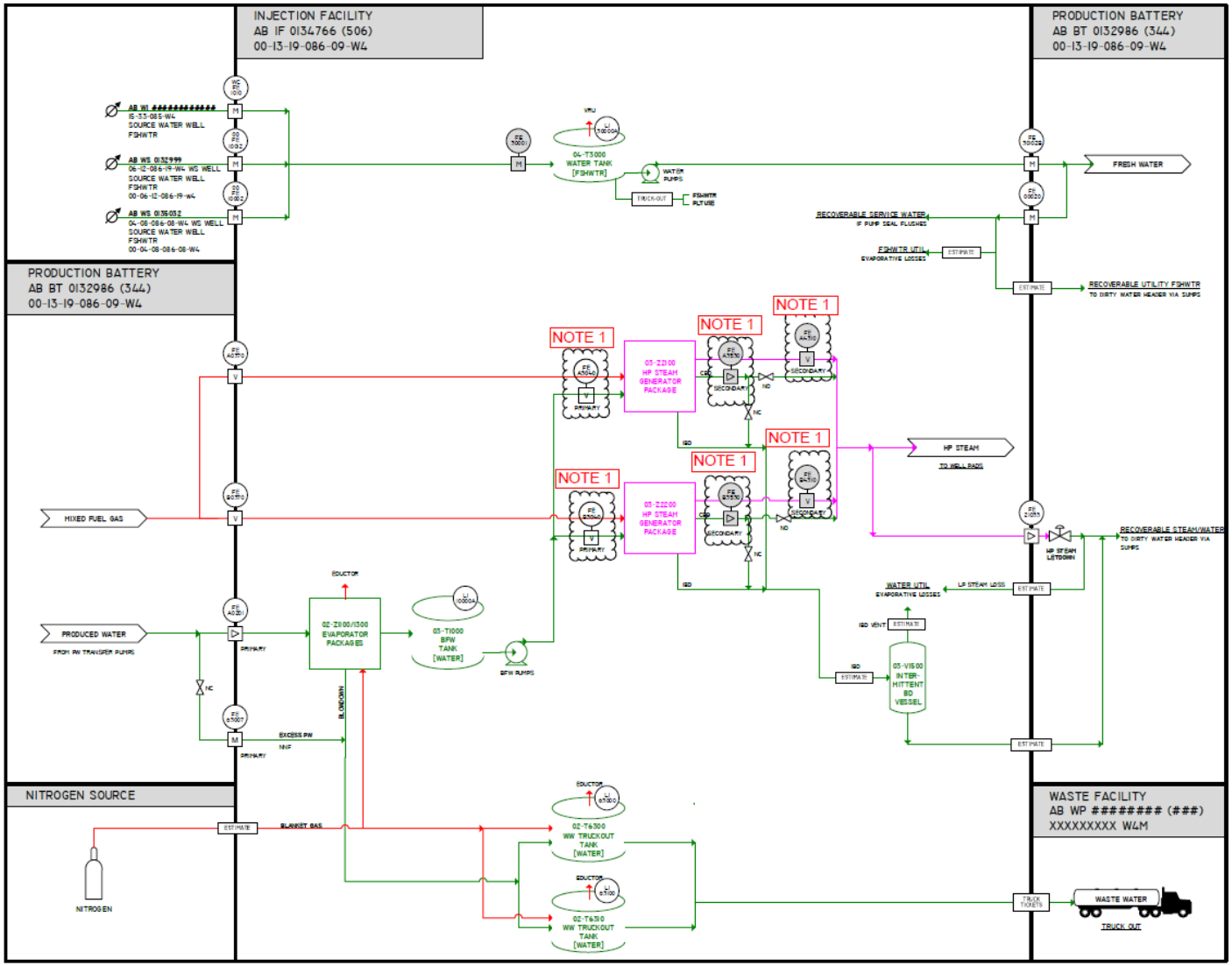
REV.	DESCRIPTION	DATE	BY
8	RE-IFA	16-FEB-2017	YK
7	RE-IFA	22-JUN-2016	YK
6	RE-IFA	04/02/16	YK
5	RE-IFA	24/02/15	SW
4	RE-IFA	18/03/14	YK
3	RE-IFA	06/02/14	YK
2	RE-IFA	01/02/13	SW
1	RE-IFA	05/06/12	SW
0	IFA	28/03/12	SW

ATHABASCA OIL CORPORATION

HANGINGSTONE PROJECT
MARP METERING SCHEMATIC

Production Battery (Pg 1 of 3)	REV. 8

MEASUREMENT SCHEMATICS – INJECTION FACILITY



NOTES:

1. NAMING OF PRIMARY & SECONDARY METERS HAS CHANGED

LEGEND

STREAMS
- WATER
- BITUMEN
- STEAM
- GAS
- DILUENT

WELL TYPES
- OIL WELL
- STEAM INJECTION WELL
- WATER SOURCE WELL

METER TYPES
- VORTEX METER
- ULTRASONIC METER
- CORIOLIS METER
- MAGNETIC METER
- V-CONE METER
- PETRINEX ACCOUNTING METER
- METER NOT REPORTING TO PETRINEX

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REV.	DESCRIPTION	DATE	BY
8	RE-IFA	16-FEB-2017	YK
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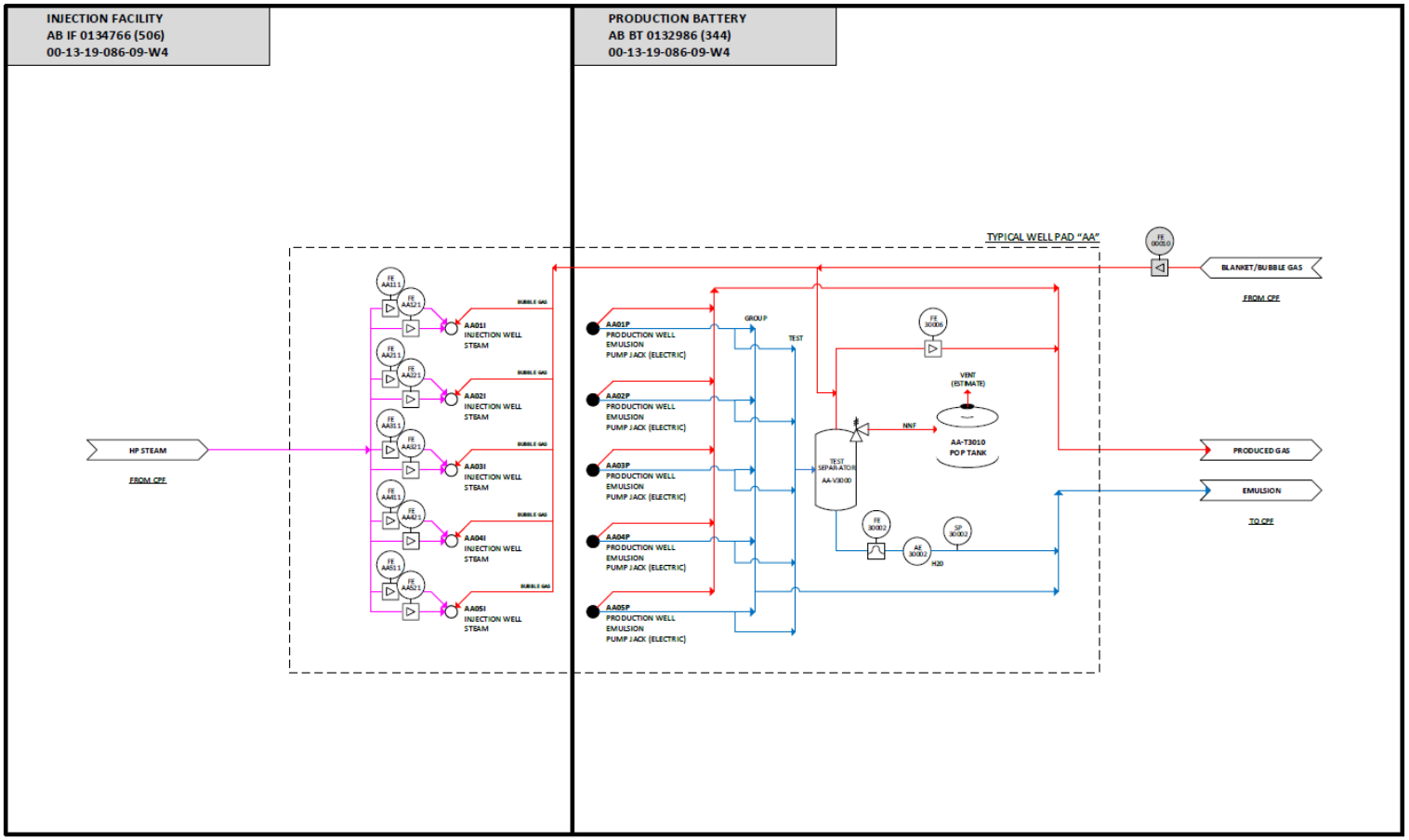
5	RE-IFA	24/02/15	SW
4	RE-IFA	18/03/14	YK
3	RE-IFA	06/02/14	YK
2	RE-IFA	01/02/13	SW
1	RE-IFA	05/06/12	SW
0	IFA	28/05/12	SW

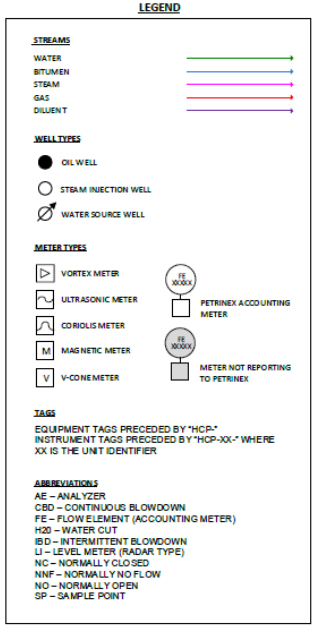
ATHABASCA OIL CORPORATION

HANGINGSTONE PROJECT
MARP METERING SCHEMATIC

INJECTION FACILITY (PG 2 OF 3)	REV. 8

MEASUREMENT SCHEMATICS – WELL PADS





REV.	DESCRIPTION	DATE	BY
8	RE-IFA	16-FEB-2017	YK
7	RE-IFA	22-Jun-2016	YK
6	RE-IFA	04/02/16	YK
5	RE-IFA	24/02/15	SW
4	RE-IFA	18/03/14	YK
3	RE-IFA	06/02/14	YK
2	RE-IFA	01/02/13	SW
1	RE-IFA	05/06/12	SW
0	IFA	28/03/12	SW

AOC WELL NAMES AND UNIQUE IDs

PAD AA		PAD AB		PAD AC		PAD AD		PAD AE	
AA01I	105/04-31-086-09W4/0	AB01I	106/03-31-086-09W4/0	AC01I	103/16-30-086-09W4/0	AD01I	109/02-31-086-09W4/0	AE01I	116/03-31-086-09W4/0
AA02I	106/04-31-086-09W4/0	AB02I	107/03-31-086-09W4/0	AC02I	100/16-30-086-09W4/0	AD02I	108/02-31-086-09W4/0	AE02I	114/04-31-086-09W4/0
AA03I	107/04-31-086-09W4/0	AB03I	108/03-31-086-09W4/0	AC03I	102/16-30-086-09W4/0	AD03I	118/03-31-086-09W4/0	AE03I	113/04-31-086-09W4/0
AA04I	108/04-31-086-09W4/0	AB04I	103/02-31-086-09W4/0	AC04I	102/15-30-086-09W4/0	AD04I	117/03-31-086-09W4/0	AE04I	112/04-31-086-09W4/0
AA05I	103/03-31-086-09W4/0	AB05I	104/02-31-086-09W4/0	AC05I	100/15-30-086-09W4/0	AD05I	105/03-31-086-09W4/0	AE05I	104/04-31-086-09W4/0
AA01P	103/04-31-086-09W4/0	AB01P	109/03-31-086-09W4/0	AC01P	106/16-30-086-09W4/0	AD01P	102/02-31-086-09W4/0	AE01P	104/03-31-086-09W4/0
AA02P	109/04-31-086-09W4/0	AB02P	110/03-31-086-09W4/0	AC02P	105/16-30-086-09W4/0	AD02P	107/02-31-086-09W4/0	AE02P	117/04-31-086-09W4/0
AA03P	110/04-31-086-09W4/0	AB03P	111/03-31-086-09W4/0	AC03P	104/16-30-086-09W4/0	AD03P	115/03-31-086-09W4/0	AE03P	118/04-31-086-09W4/0
AA04P	111/04-31-086-09W4/0	AB04P	105/02-31-086-09W4/0	AC04P	104/15-30-086-09W4/0	AD04P	114/03-31-086-09W4/0	AE04P	116/04-31-086-09W4/0
AA05P	112/03-31-086-09W4/0	AB05P	106/02-31-086-09W4/0	AC05P	103/15-30-086-09W4/0	AD05P	113/03-31-086-09W4/0	AE05P	115/04-31-086-09W4/0

ATHABASCA OIL CORPORATION

HANGINGSTONE PROJECT
MARP METERING SCHEMATIC

Well Pads (Pg 3 of 3)	REV. 8

MEASUREMENT METHODOLOGY

2018

- No changes or alterations made to measurement methodology in reporting period

MEASUREMENT METHODOLOGY

- WELL PRODUCTION AND INJECTION VOLUMES
  - *Each well pad has a dedicated test separator with liquid flow meter and water cut analyzer to determine well bitumen and water production*
  - *Wells are individually put on test for one valid testing hour for every 20 hours of operation*
    - *Valid well test criteria per approved MARP*
  - *Well gas production prorated from Battery Level GOR using a proration factor of 1*
    - *Battery Level GOR is updated monthly*
  - *Steam injection is metered at each individual wellhead. Primary and secondary steam production metering available at the central steam plant*

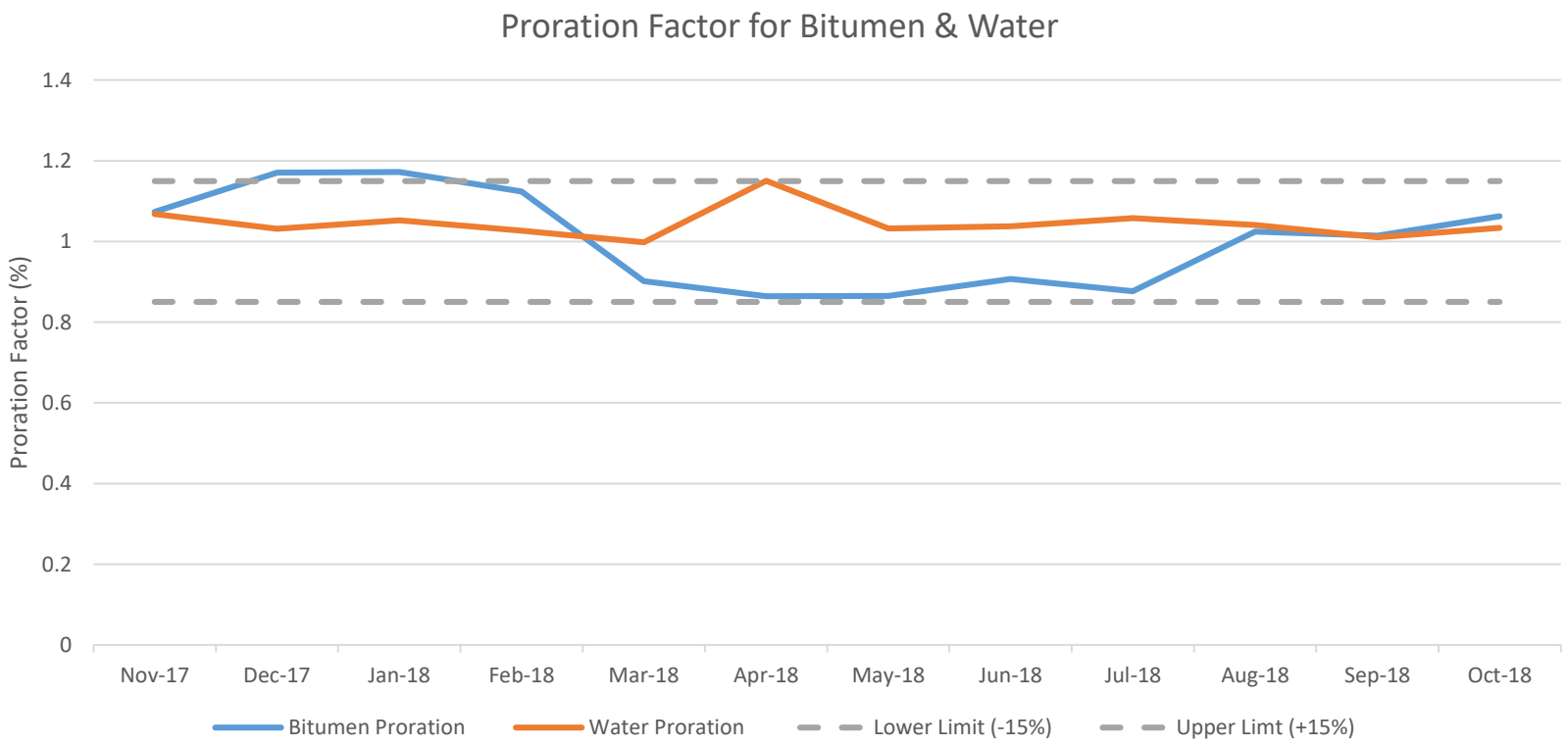
- BATTERY SALES OIL
  - *Sales oil is shipped via pipeline from the Hangingstone Battery. Custody transfer metering is done at receiving facility*

- MEASUREMENT TECHNOLOGY
  - *Well testing uses standard method of test separators with microwave water cut analyzers*

- STEAM VOLUMES
  - *Steam quality leaving the plant is approximately 98%*
  - *A continuous blowdown (CBD) of approximately 2% is added to the steam of each boiler and is injected into the wells*
  - *Intermittent blow down (IBD) flow is estimated at 0.02% of total water out of the facility using sound engineering practices*

- PRODUCED WATER VOLUMES
  - *Calculated using the measured Water Disposition to the Injection Facility plus the Water Dispositions from the Plant plus and changes in Water Inventory less any Water Receipts*

PRORATION OF BITUMEN AND WATER



SURFACE OPERATIONS

FACILITY PERFORMANCE

ATHABASCA OIL CORPORATION

FACILITY PERFORMANCE

SITE RELIABILITY > 95%

- Based on steam performance
- Integrity management program and predictive maintenance programs have been implemented to maintain higher site reliability

MAJOR ACTIVITIES

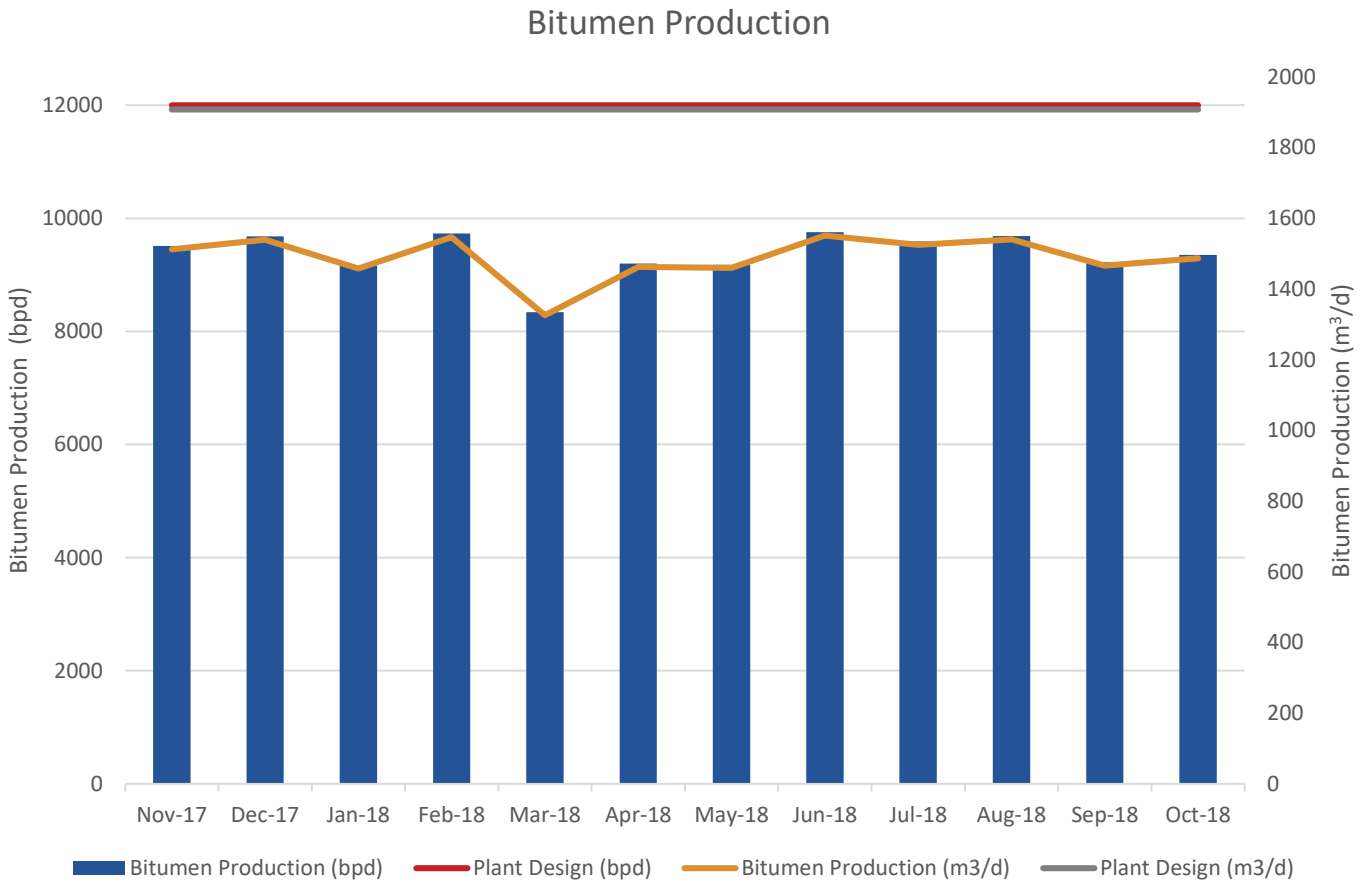
- Boiler Mechanical Cleaning
- Evaporator Mechanical Cleaning

MAJOR CHALLENGES

- De-oiling optimization

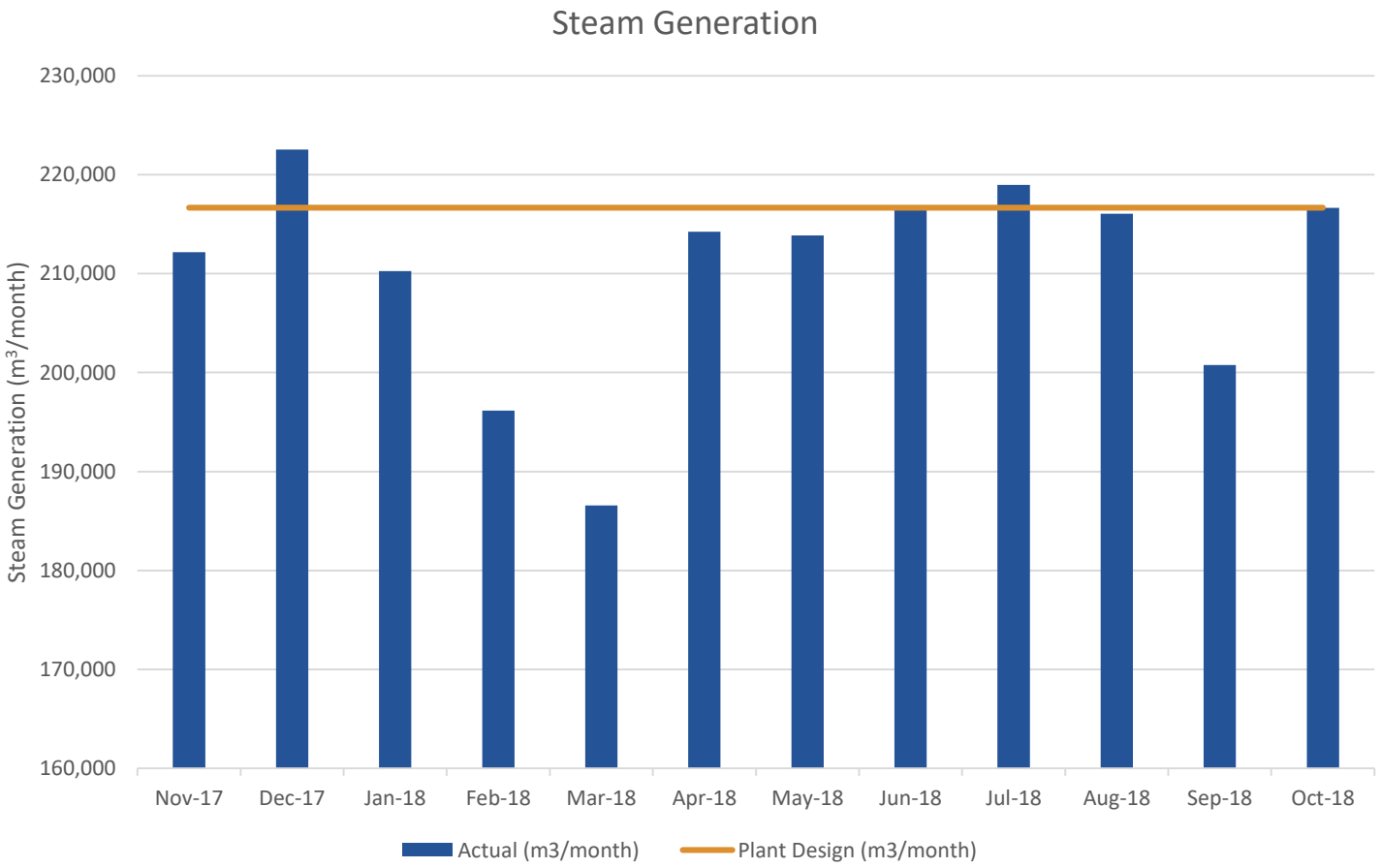
FACILITY PERFORMANCE

BITUMEN PRODUCTION



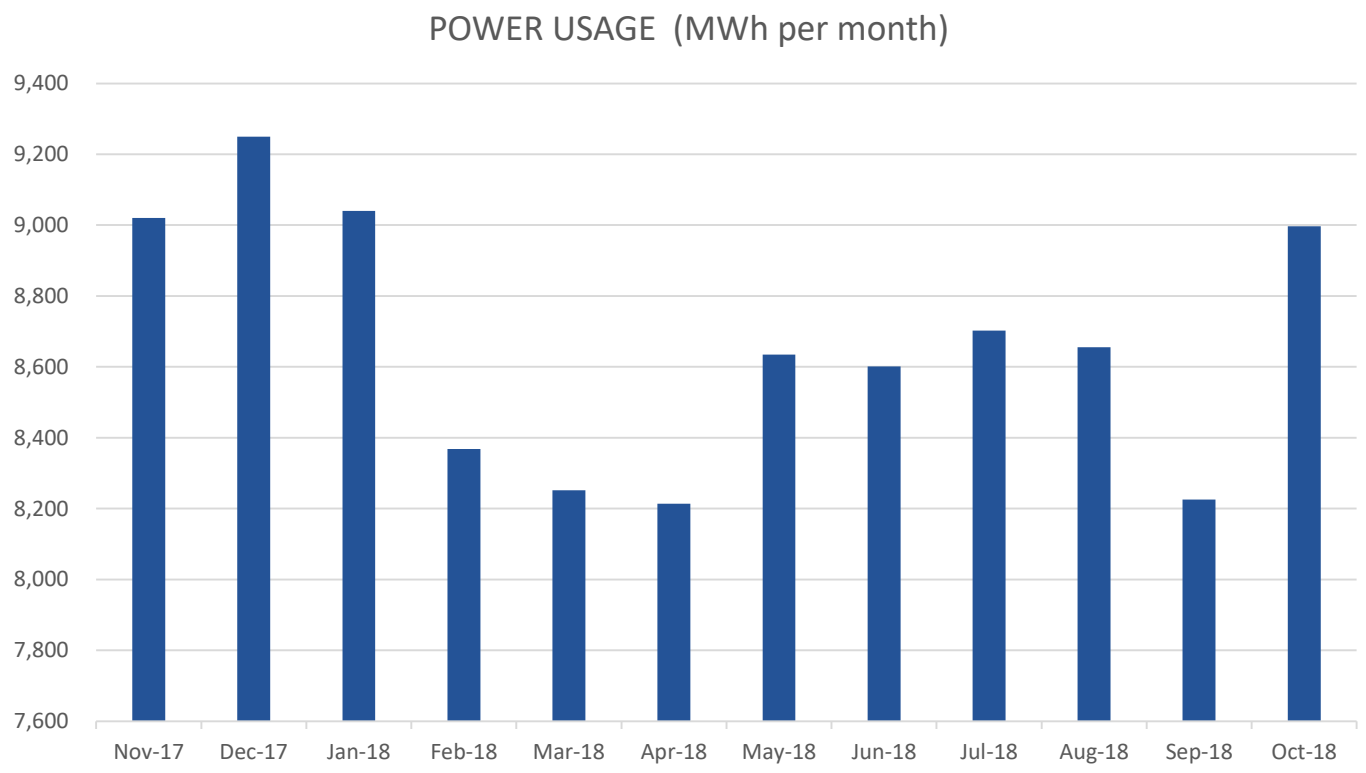
FACILITY PERFORMANCE

STEAM GENERATION



FACILITY PERFORMANCE

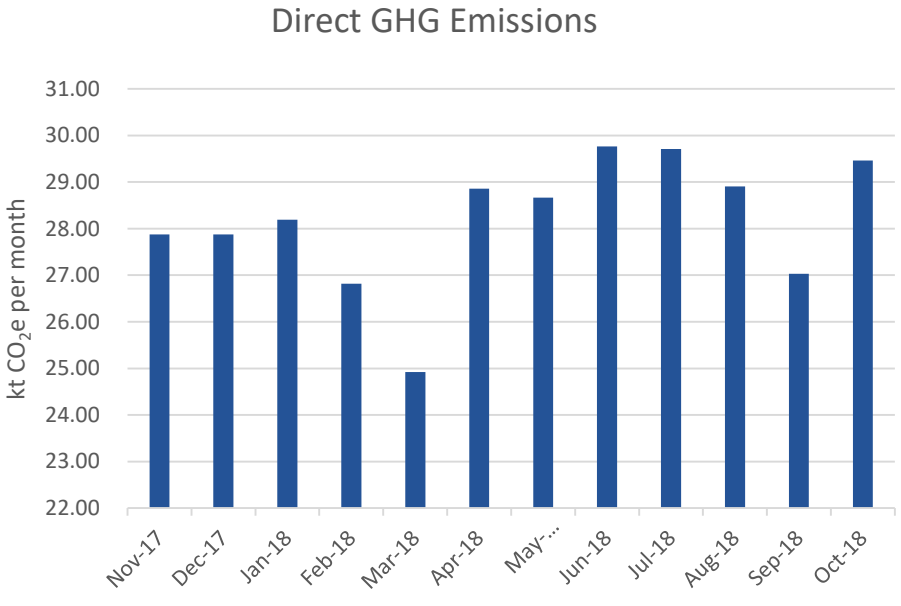
POWER USAGE YTD 103,961 MWH

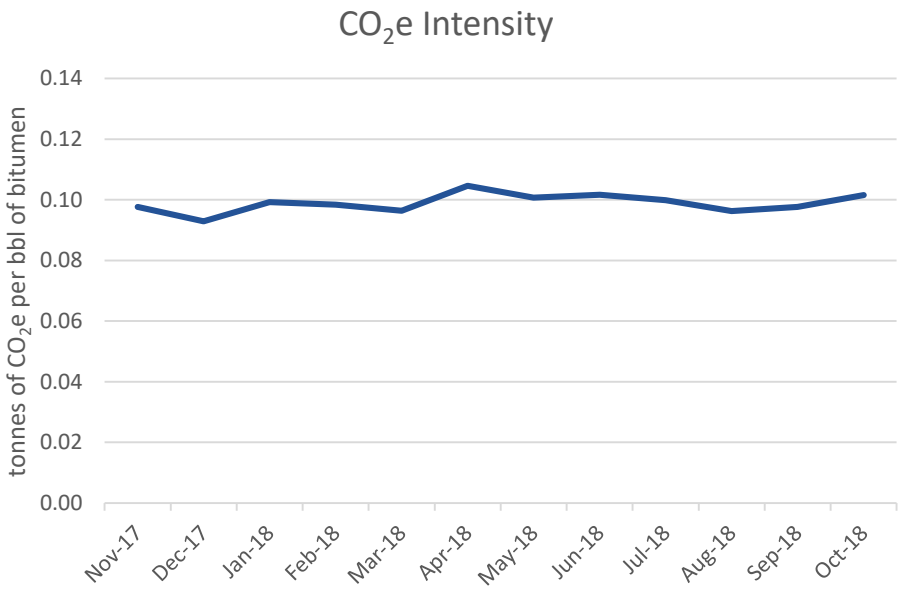


FACILITY PERFORMANCE

DIRECT GHG EMISSIONS FROM NOVEMBER 2017 – OCTOBER 2018 : 338 KT CO_2e

- Sources: stationary combustion, flaring, venting and fugitives
- Calculated using 2018 CCIR

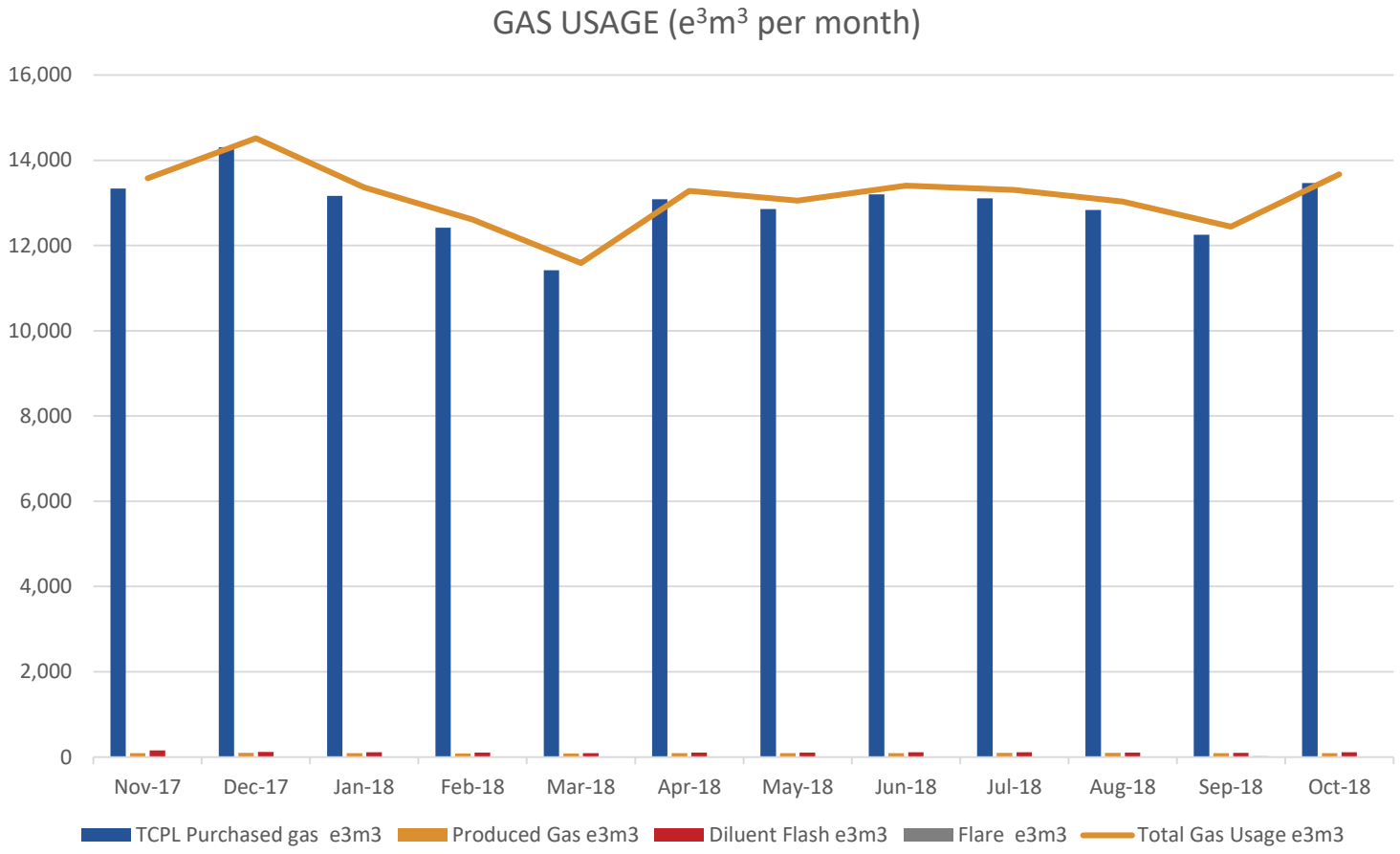




FACILITY PERFORMANCE

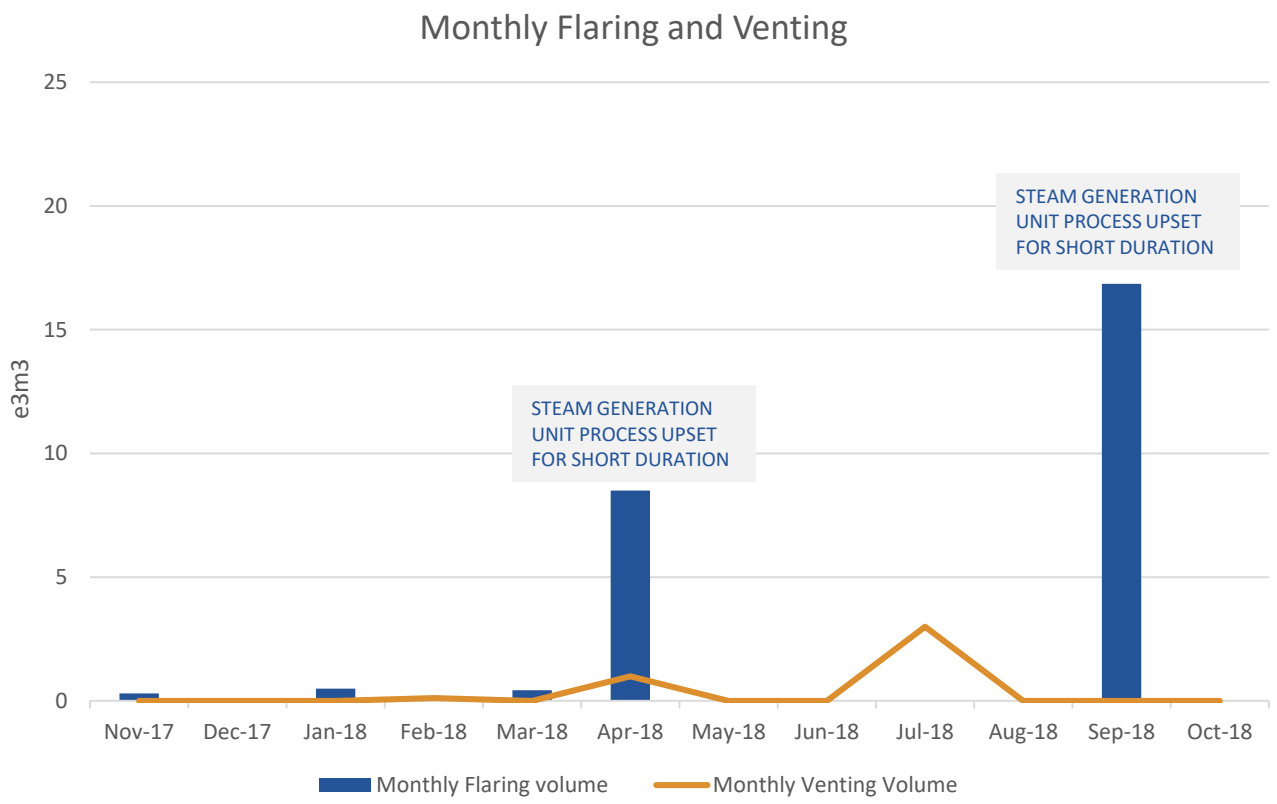
TOTAL GAS USAGE YTD 157,853 e^3m^3

SOLUTION GAS RECOVERY 100%



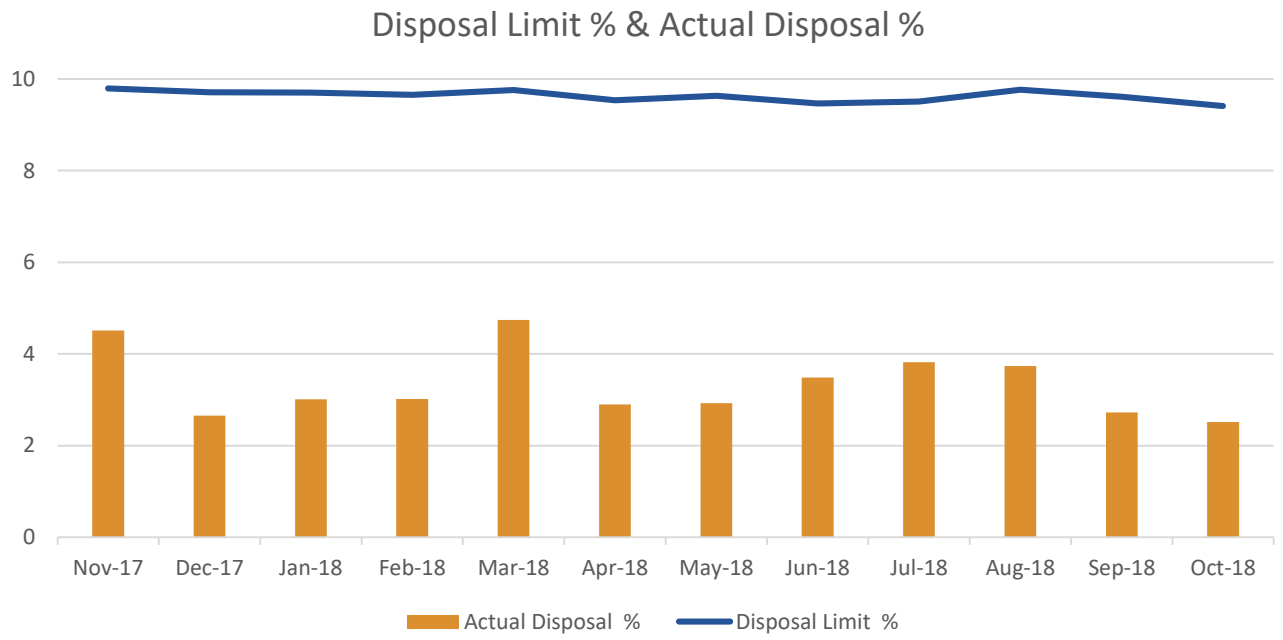
FACILITY PERFORMANCE

MONTHLY FLARING AND VENTING



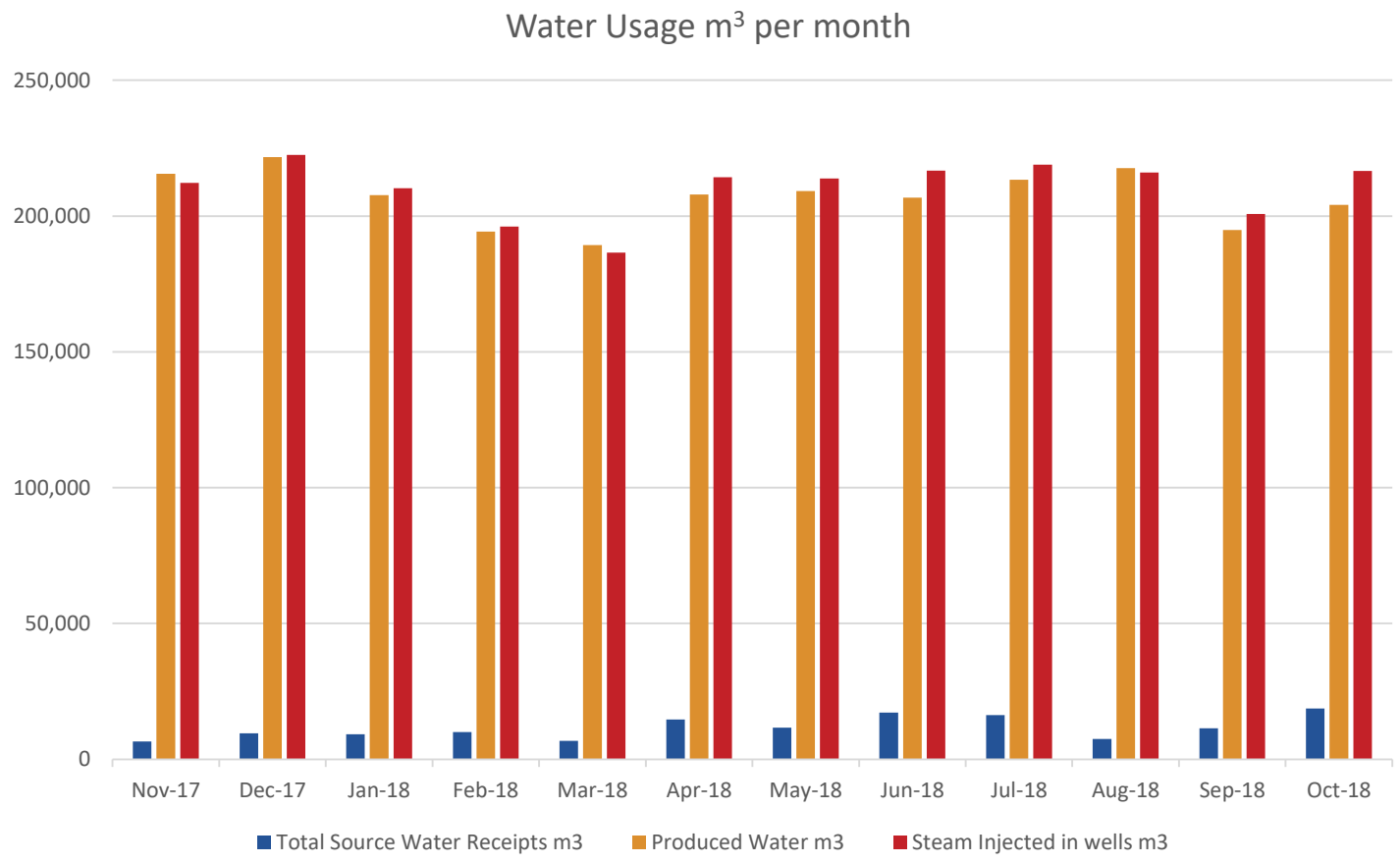
FACILITY PERFORMANCE

- Disposal limit calculated as per Directive 081



FACILITY PERFORMANCE

WATER USAGE

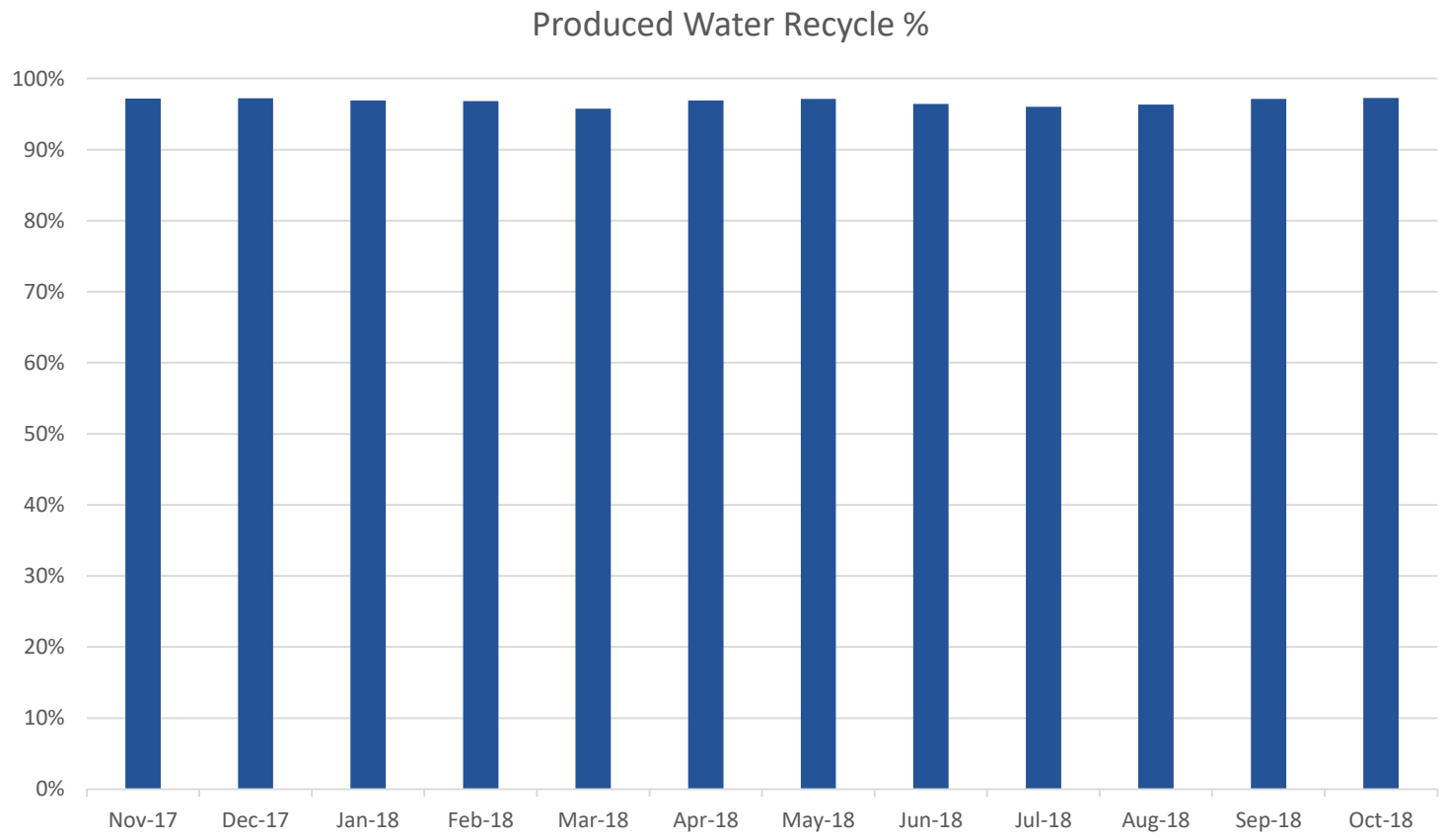


FACILITY PERFORMANCE

PRODUCED WATER RECYCLE (AVG. 97%)

Directive 081 , Appendix H, Equation 6

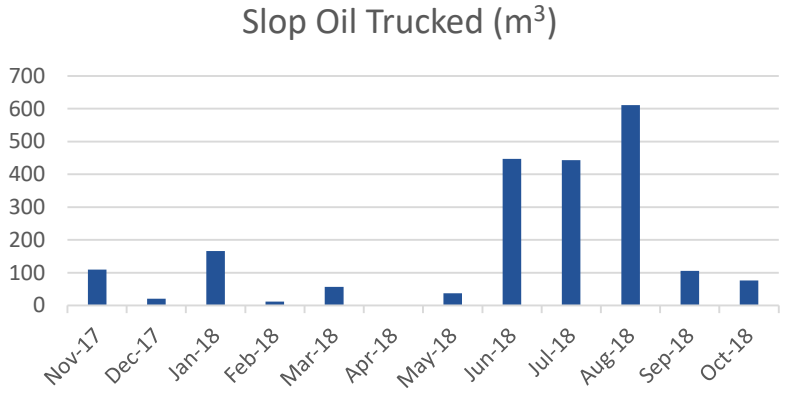
Produced Water Recycle improved by 1%

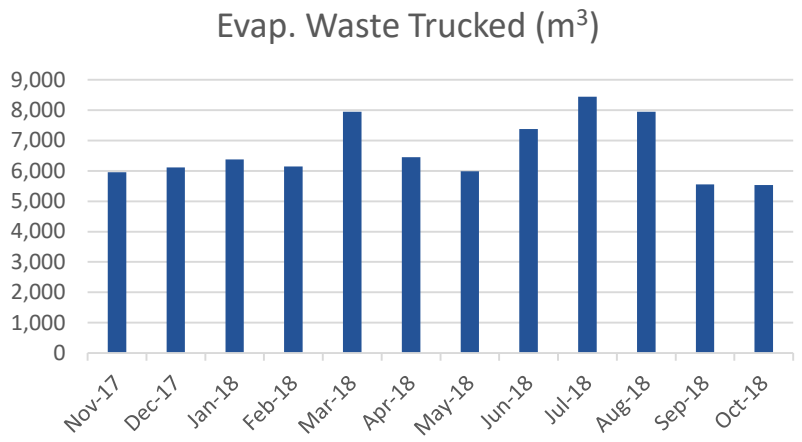


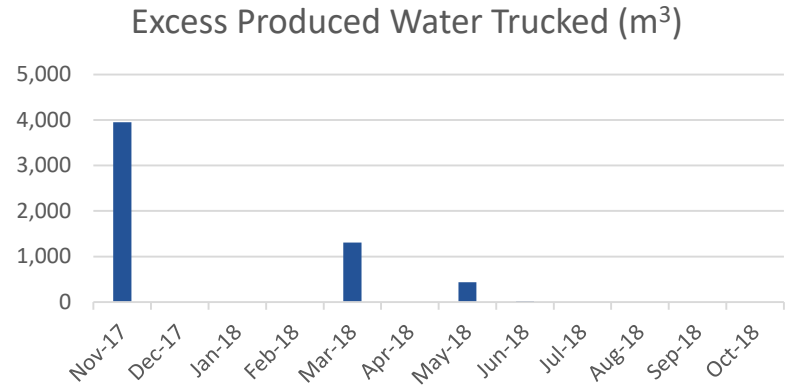
FACILITY PERFORMANCE

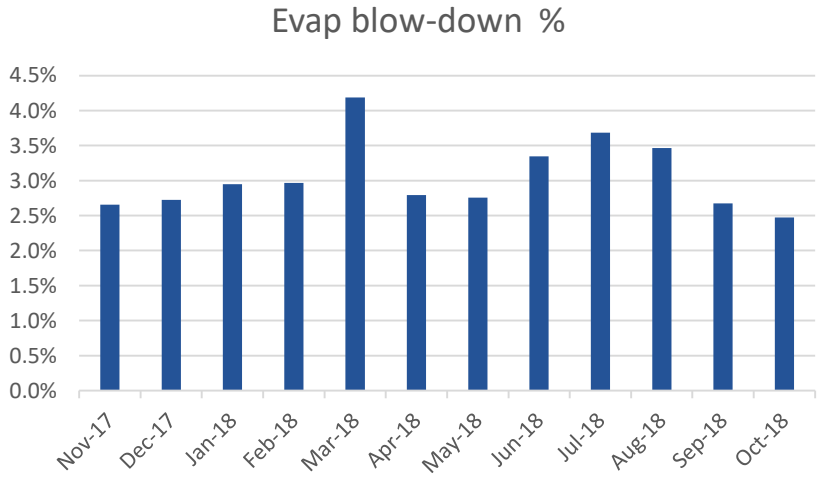
WASTE DISPOSAL

- Waste streams are slop oil, evaporator blowdown and excess produced water
- Evap. Waste disposal volume reduced by 8,908 m^3
- Slop oil disposal volume reduced by 3,737 m^3





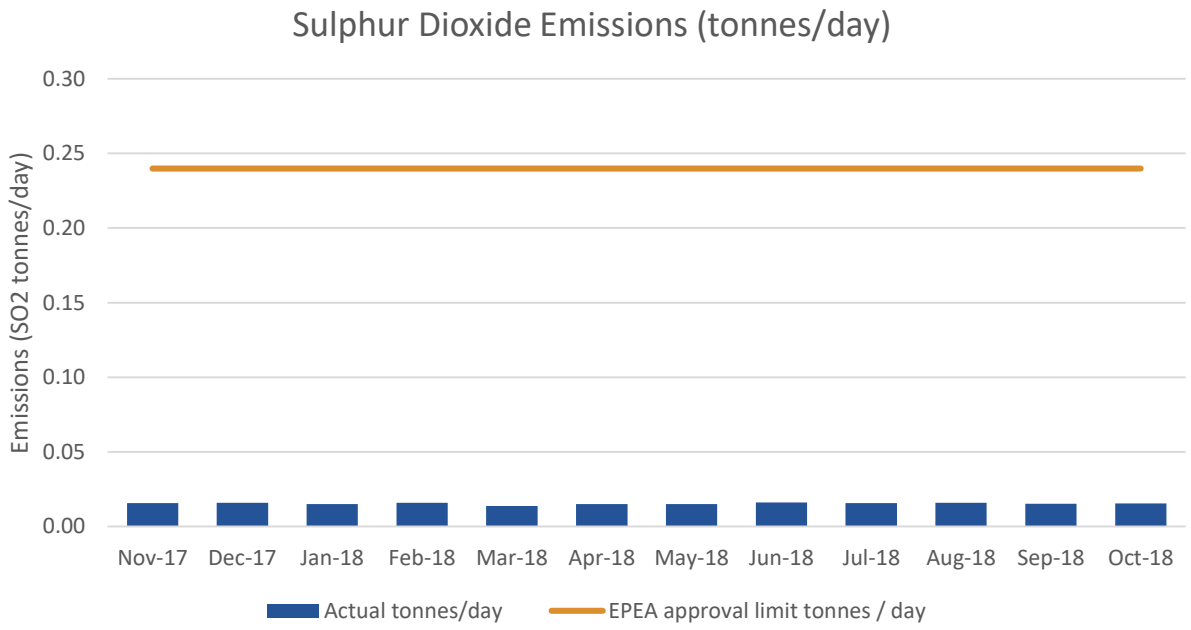




Volumes reported via Petrinex

SULPHUR PRODUCTION

- Currently there are no sulphur recovery facilities at the Hangingstone Project



- SO_2 emissions are calculated based on analytical results of produced gas samples

SURFACE

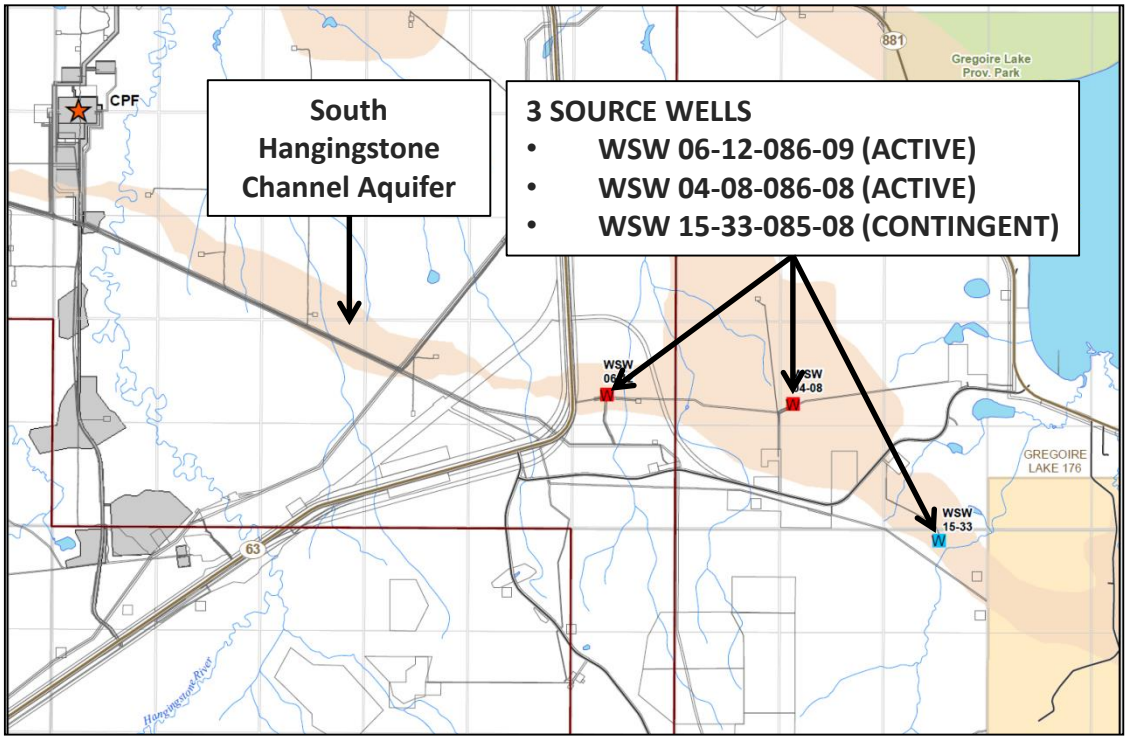
SOURCE WATER AND WATER CHEMISTRY

ATHABASCA OIL CORPORATION

SOURCE WATER

NON-SALINE WATER WELLS

- Hangingstone Water Act License 00316166-01-00 annual allocation is 479,975 m^3
- During Nov. 1, 2017 to Oct. 31, 2018 AOC diverted 139,671 m^3
- Aquifer drawdown is stable and within the allowable as specified in the *Water Conservation and Allocation Guideline for Oilfield Injection (AENV 2006)*



Well ID	Location	Formation	TDS (mg/L)	Maximum Rate of Diversion (m^3/d)
WSW153308508W400	15-33-085-08-W4	Quaternary	286	3,000
WSW061208609W400	06-12-086-09-W4	Quaternary	310*	3,000
WSW040808608W400	04-08-086-08-W4	Quaternary	320*	3,000

Wells are less than 150 m in depth and not licenced with the AER.
Well IDs are AOC internal identifiers, not UWIs.
* 2018 Analysis

FACILITY PERFORMANCE

TYPICAL WATER ANALYSIS

Parameter	Non-Saline Make-up Water (mg/L)	Produced Water (mg/L)	Disposal Water (Evap blow-down) (mg/L)
pH	7.97	7.36	11.8
Total Dissolved Solids (TDS)	320	2,300	130,000
Chlorides	7.4	1,200	49,000
Hardness as $CaCO_3$	220	14.5	550
Alkalinity as $CaCO_3$	270	320	25,000
Silica	5	150	7,000
Total Organic Carbon	<1	180	6,000
Oil Content	<1	20	500

COMPLIANCE

ENVIRONMENTAL

ATHABASCA OIL CORPORATION

COMPLIANCE - REGULATORY

APPROVALS AND AMENDMENTS

- November 2017, AOC received approval for the short-term exceedance of Maximum Operating Pressure to 2,500 kPag.

COMPLIANCE – MONITORING PROGRAMS

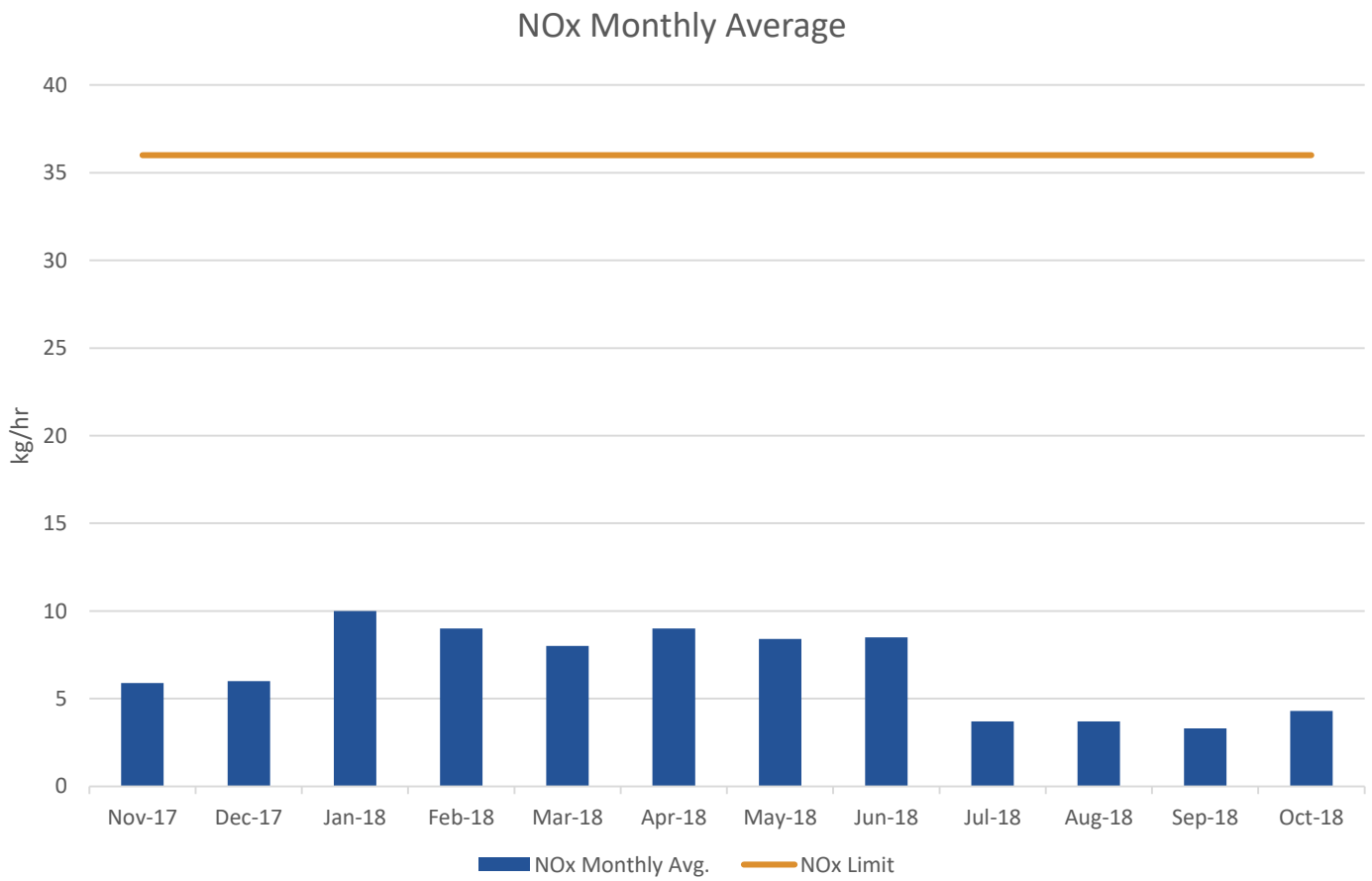
MONTHLY AND ANNUAL MONITORING PROGRAMS

- Passive air monitoring stations– no exceedances (SO_2, NO_2, H_2S) of the Alberta Ambient Air Quality Objectives
- A continuous air monitoring station **is not** an EPEA approval requirement
- Continuous NO_2 emissions monitored using a Continuous Emissions Monitoring System (CEMS) as required under the EPEA approval (Boiler A)
- SO_2 and NO_2 emissions were summarized in monthly and annual EPEA Air Emissions Reports
- Industrial wastewater and runoff – all releases monitored with no exceedances
- Groundwater water monitoring completed (2 events)
  - *Completed thermal groundwater screening assessment (well pad) new requirement June 2018*
- No soil management or monitoring events were required in the reporting period
- Water Act Licenses (term & surface) all conditions met and reporting completed

COMPLIANCE - MONITORING PROGRAMS

NO_X MONTHLY AVERAGE

- Boiler A NO_x calculated using AER approved Method 4 during CEMS unit repair (July-Nov.)



COMPLIANCE – AUDITS AND INSPECTIONS

AUDITS

- AER Compliance Audit for Aboveground Pipeline Wildlife Crossing Directive.
  - *Submitted November 30, 2017*
  - *No further follow-up required*

INSPECTIONS

- AER Inspection of CPF and Pad AD conducted on November 20, 2017
  - *Follow-up action plan submitted January 4, 2018*
  - *Inspection closed out February 3, 2018*

COMPLIANCE – SUMMARY OF NON-COMPLIANCE

Notices of Non-Compliance and Voluntary Self Disclosures	
Event	**Corrective Action**
November 26, 2017 - Voluntary Self-Disclosure: MOP Exceedance	Control systems operated as designed, the well was quickly brought into compliance. No further follow-up identified.
January 12, 2018 - Voluntary Self-Disclosure: MOP Exceedance	Root cause investigation resulted in an update to the winter start-up procedure for steam injection. No further follow-up identified.
April 18, 2018 – AER Notice of Non-Compliance: Measurement	AOC responded to the AER May 23, 2018. No further follow-up identified.
August 31, 2018 – CEMS Code violation: unable to meet 90% availability requirement (July to November) (CIC# 343415)	CEMS analyzer was removed for repair and the reinstallation completed in 2018. Method 4 proposal to address interim data management and reporting was approved by the AER.

From November 1, 2017 to October 31, 2018 there were

- 3 reportable spills and
- 4 reportable venting occurrences.

COMPLIANCE – RECLAMATION PROGRAMS

- Completed off disposition reclamation work in response to the 2016 Ft. McMurray wildfire (Temporary Field Authorization 17382)
- OSE reclamation assessment work is ongoing

COMPLIANCE – REGIONAL INITIATIVES

AOC IS A FUNDING MEMBER OF:

- Oil Sands Environmental Monitoring Program
- Wood Buffalo Environmental Association (WBEA) – air shed monitoring
- Regional Industry Caribou Collaboration (RICC)
- Oil Sands Black Bear Partnership
- Faster Forests – reclamation research industry collaboration
- Industrial Footprint Reduction Options Group (iFROG) – wetland reclamation research industry collaboration

AOC PARTICIPATES IN:

- Various regional CAPP Committees
  - *Oil Sands Environmental Policy and Regulatory Committee*
  - *NE Alberta Caribou Working Group*
  - *Indigenous Affairs Committee*
  - *Air Issues Committee*

COMPLIANCE – STATEMENT OF COMPLIANCE

ATHABASCA OIL CORPORATION HANGINGSTONE PROJECT IS IN COMPLIANCE WITH AER APPROVALS AND REGULATORY REQUIREMENTS

- For the period of November 1, 2017 to October 31, 2018, AOC has no unaddressed non-compliant events

FUTURE PLANS

- No new initiatives planned

ATHABASCA
OIL CORPORATION

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