



BlackGold Oil Sands Project

Directive 054 2021 Annual Performance Report

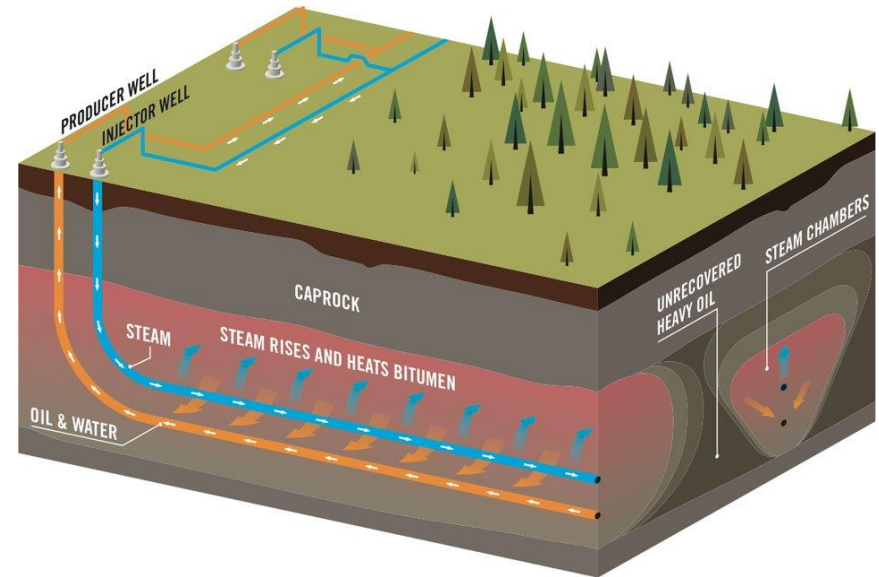
Commercial Scheme Approval No. 11387

January 11, 2023 Update



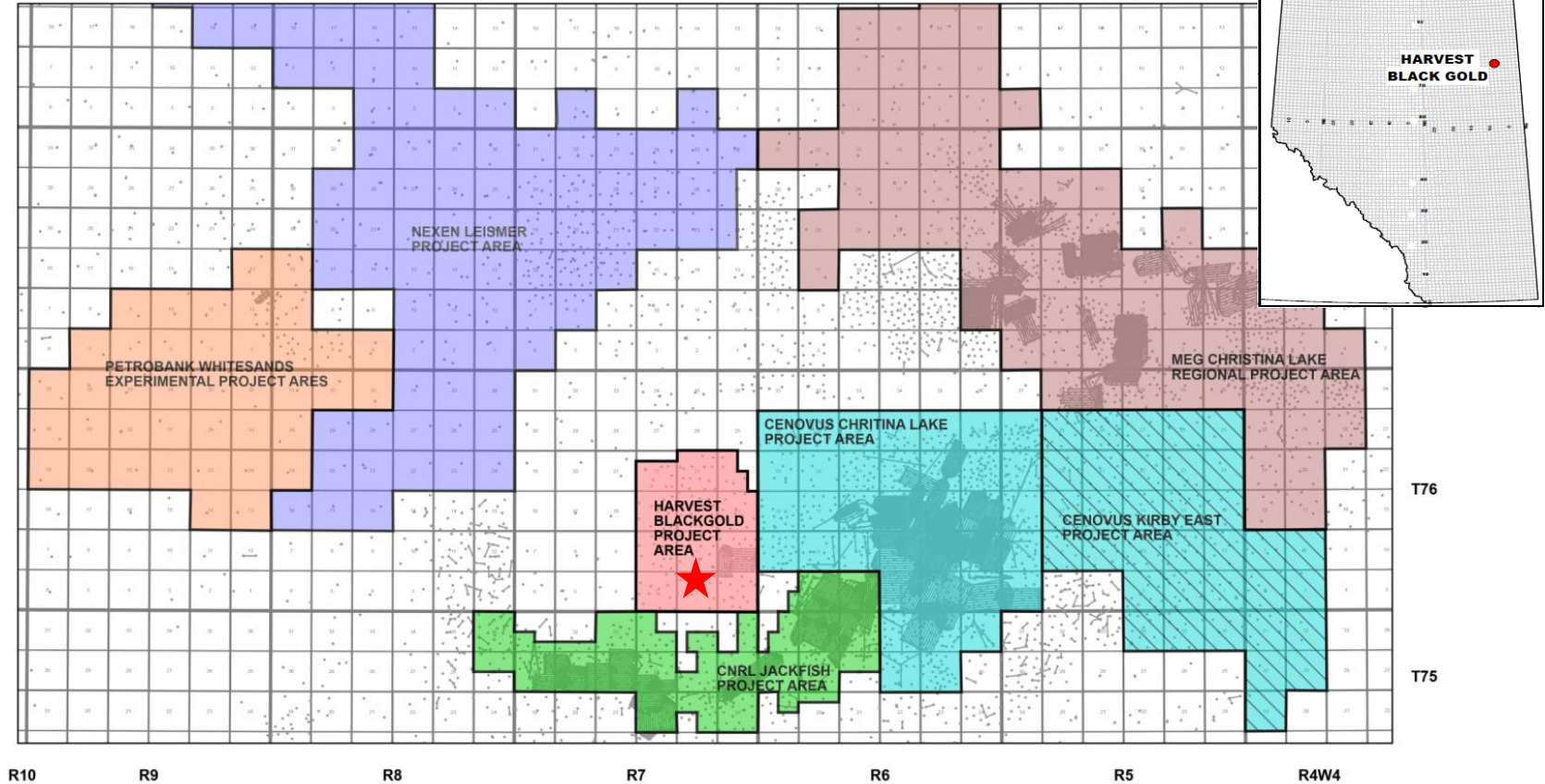
Introduction

- BlackGold is a steam-assisted gravity drainage (SAGD) project owned and operated by Harvest Operations Corp.
- Phase 1 Commercial Scheme Approval received in 2010 for 1,590 m³/d bitumen production on an annual average basis
- Phase 2 approved in 2013 for an additional 3,180 m³/d (4,770 m³/d total) bitumen production
- Phase 1 became operational in 2018
- Phase 2 has not yet received final investment decision (FID)



SAGD Recovery Process

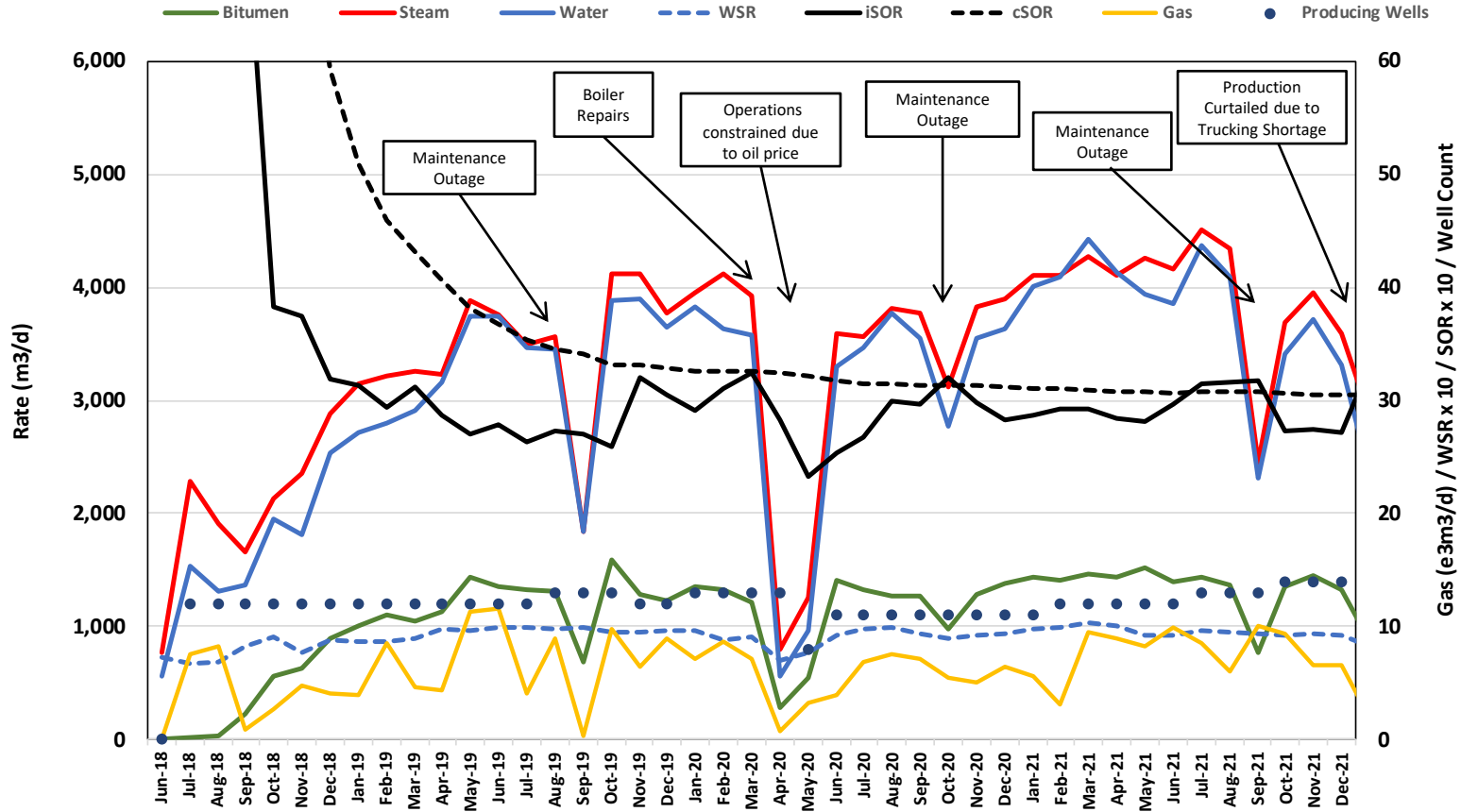
- Project area covers 12 sections of land in 76-7-W4M, approximately 10km southeast of Conklin, Alberta



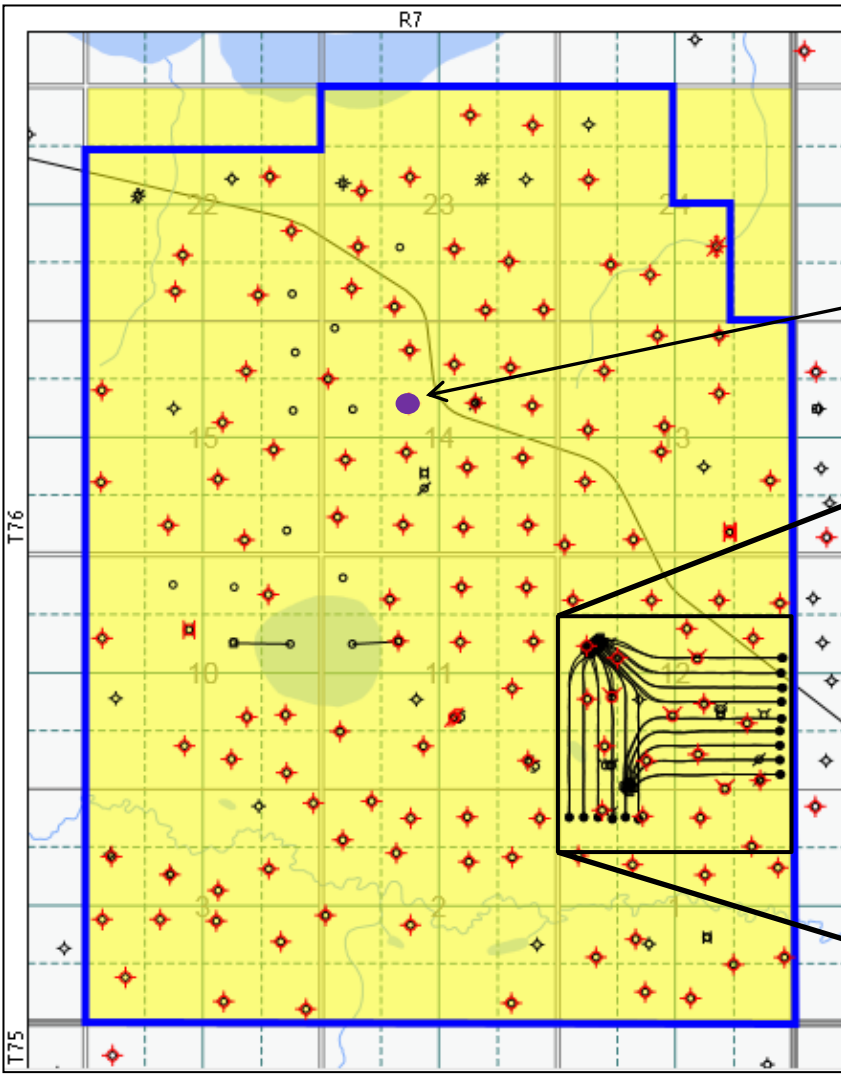


Subsurface

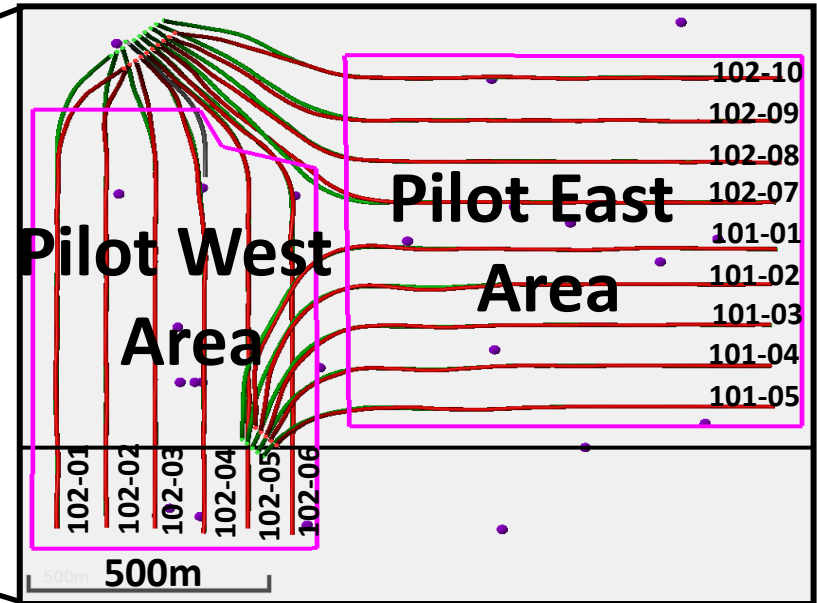
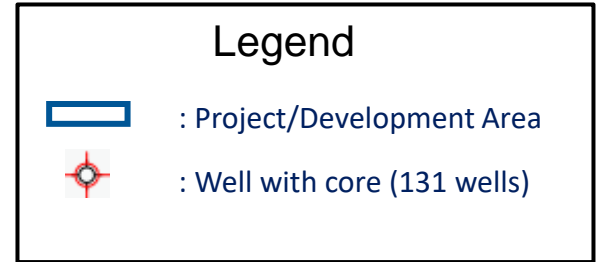
Scheme Performance



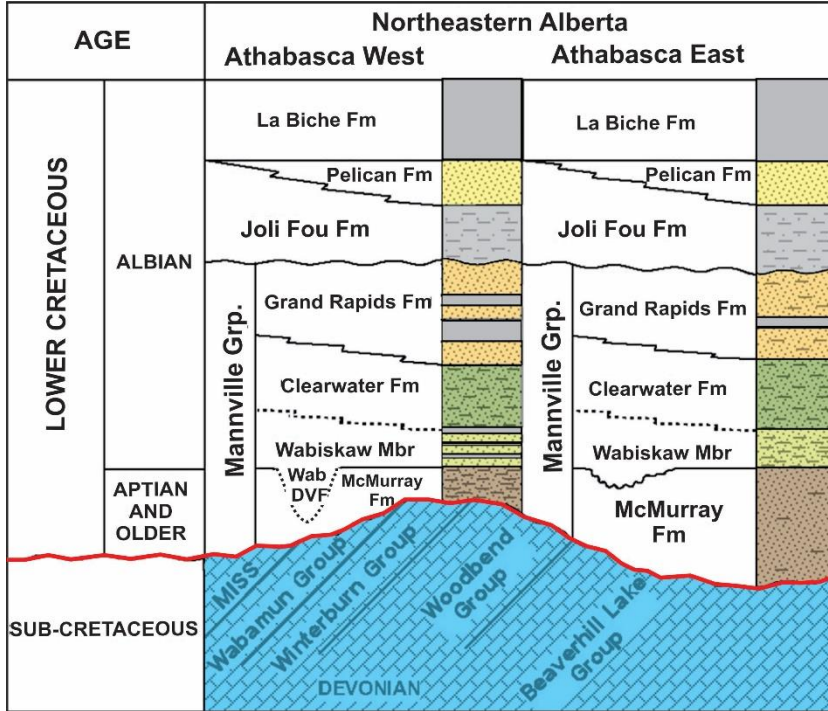
Drainage Patterns



Stratigraphic Reference Well
1AA/11-14-76-7W4



Stratigraphic Column



Source: Wightman & Pemberton, 1997

Stratigraphic Reference Well

1AA/11-14-76-7W4M

Clearwater

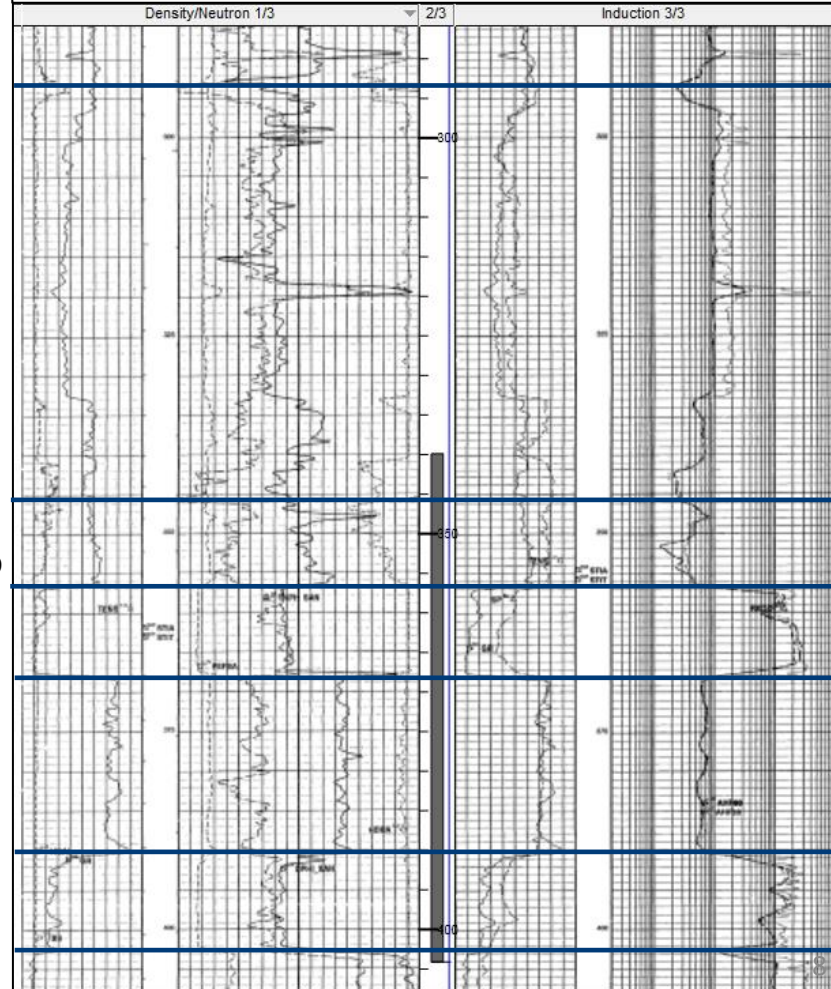
Wabiskaw

Wabiskaw D Sand

McMurray

McMurray Reservoir

Beaverhill Lake

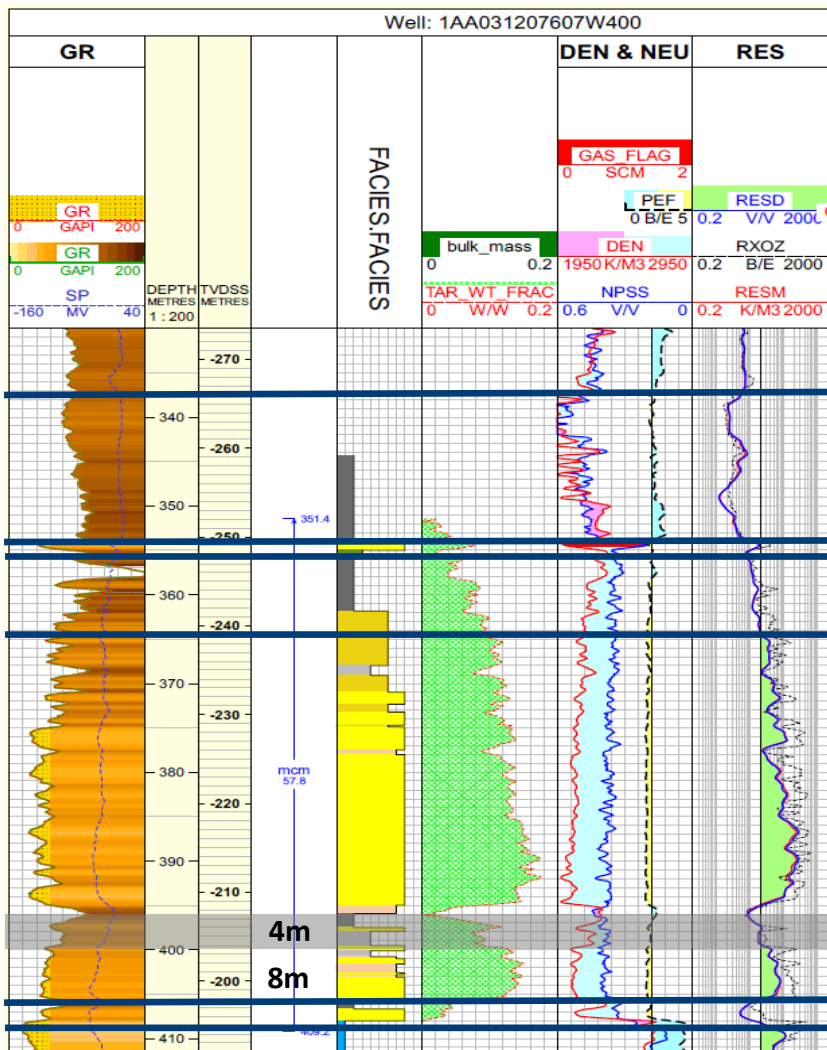


BlackGold SAGDable Net Pay Definition

Net Pay Criteria:

- Resistivity (RT) ≥ 20 ohm-m
- Porosity (DPSS) $\geq 27\%$
- > 10 m continuous net pay
- No continuous breaks > 1 m

NOTE: 10m continuous pay is defined from cores, images and well logs. Not all shale breaks are continuous

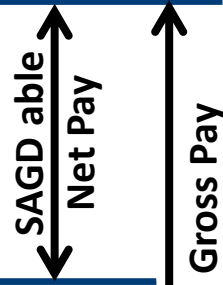


Wabiskaw Formation

Wabiskaw Sand

McMurray Formation

Top Pay

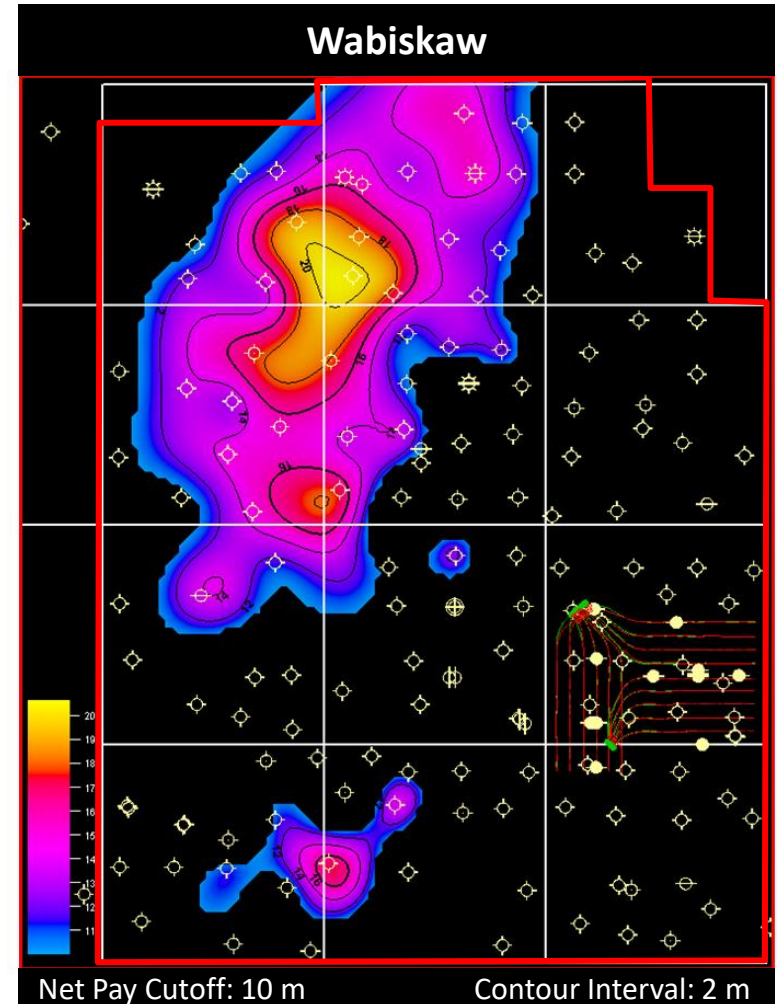
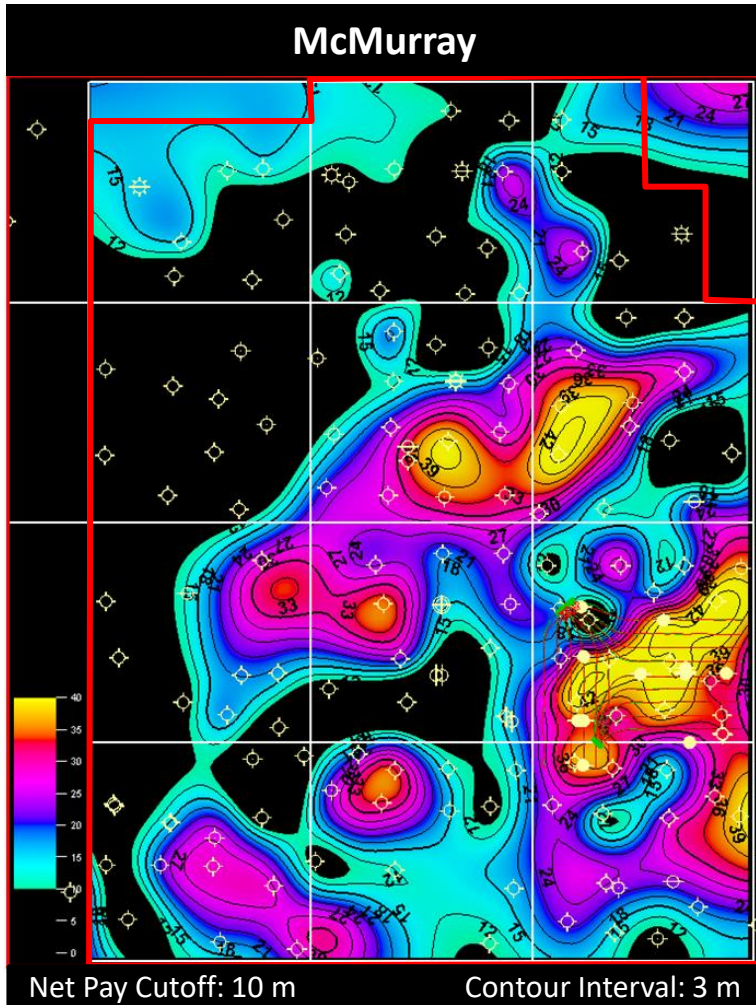


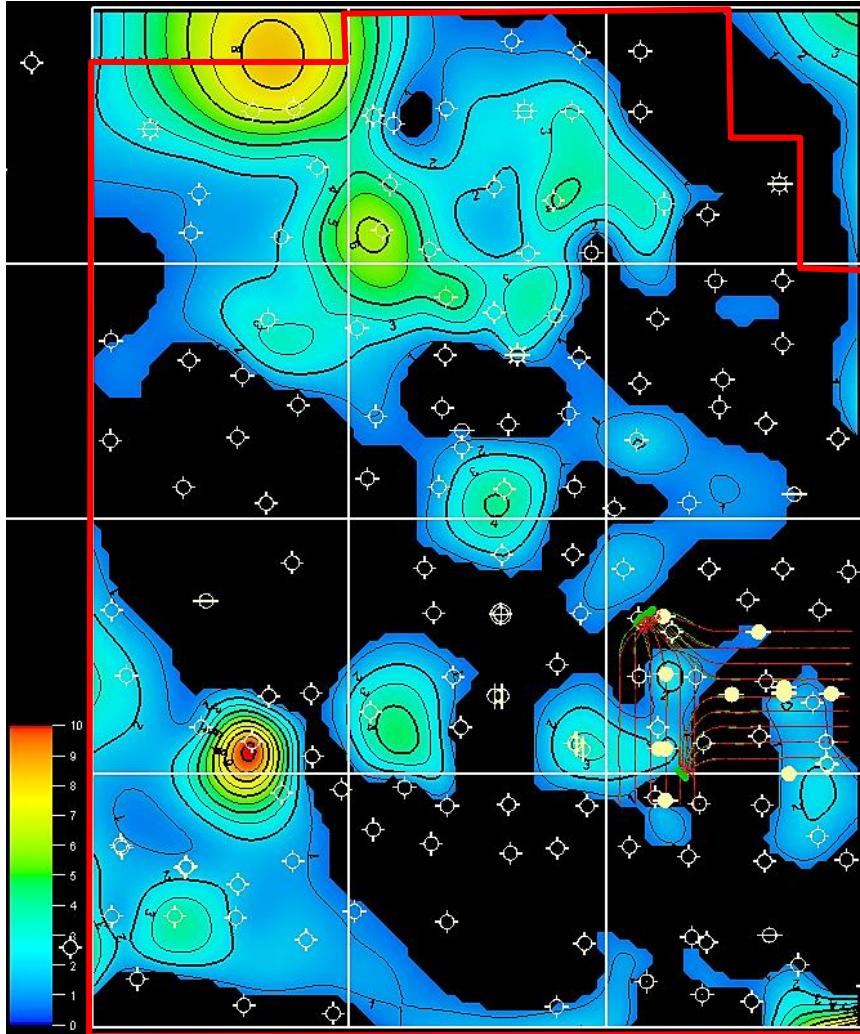
Non Pay

Base Pay

Top of Beaverhill Lake Formation

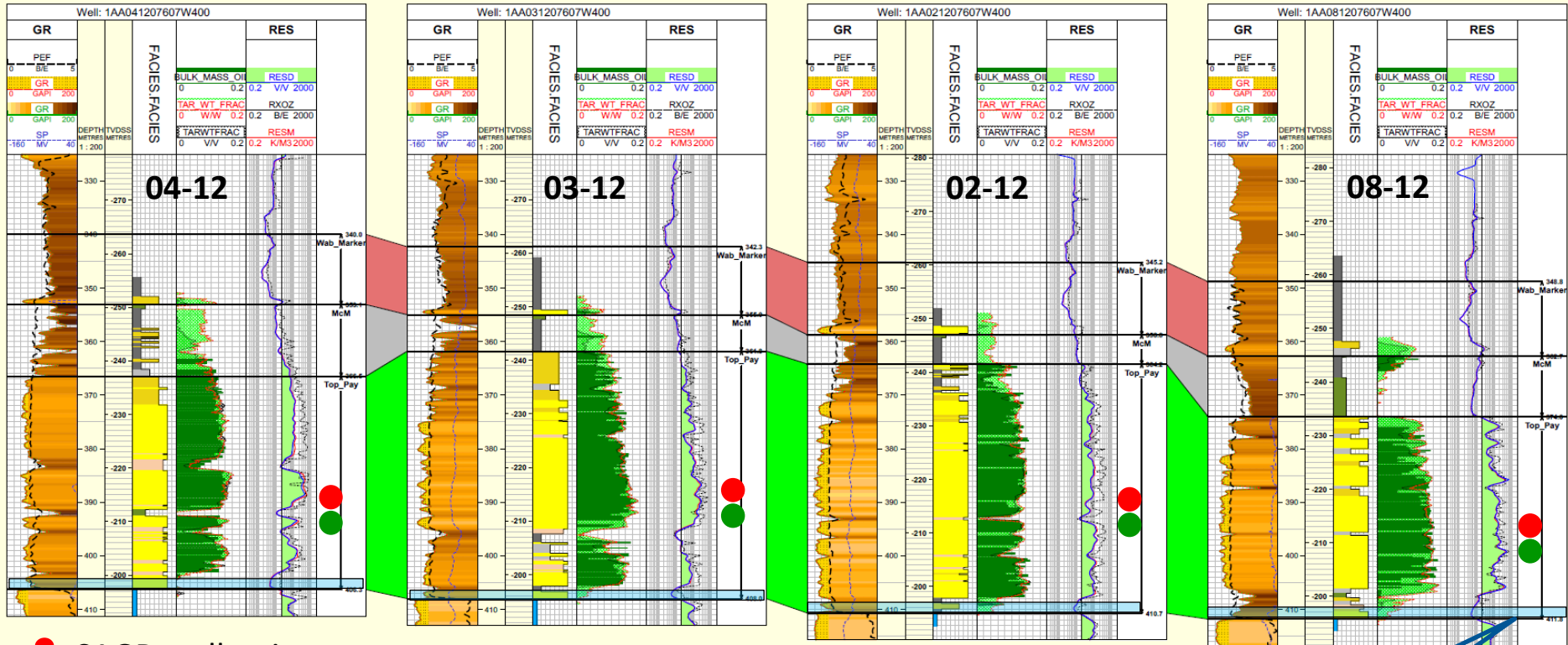
McMurray and Wabiskaw SAGDable Net Pay





- Localized bottom water present over project/development area
- No McMurray formation top gas identified

Contour Interval: 1 m
Project Area: —

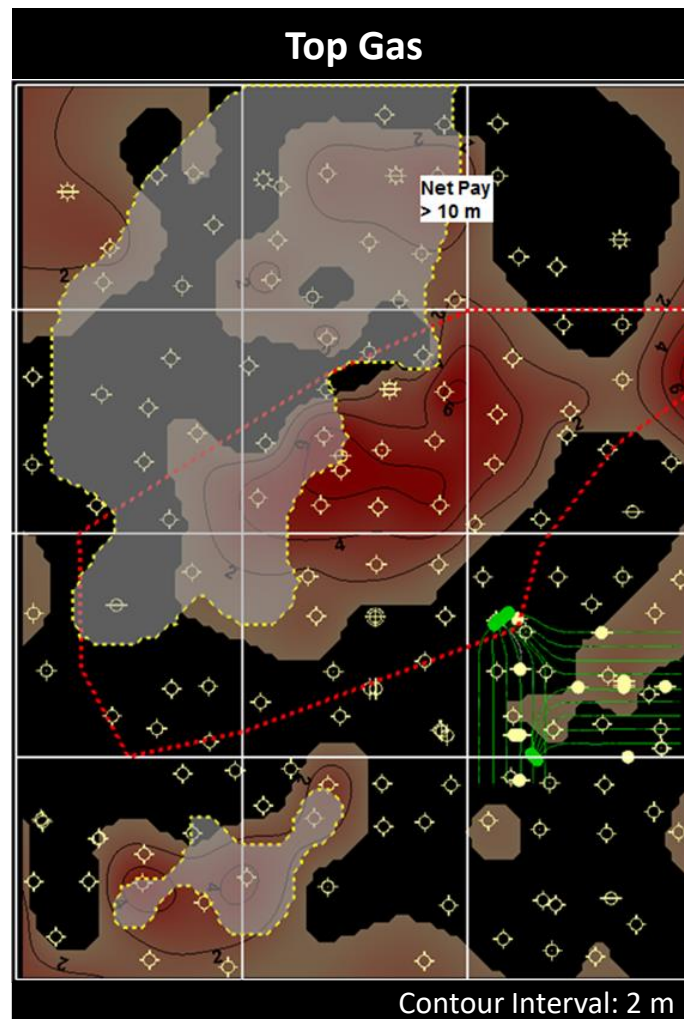
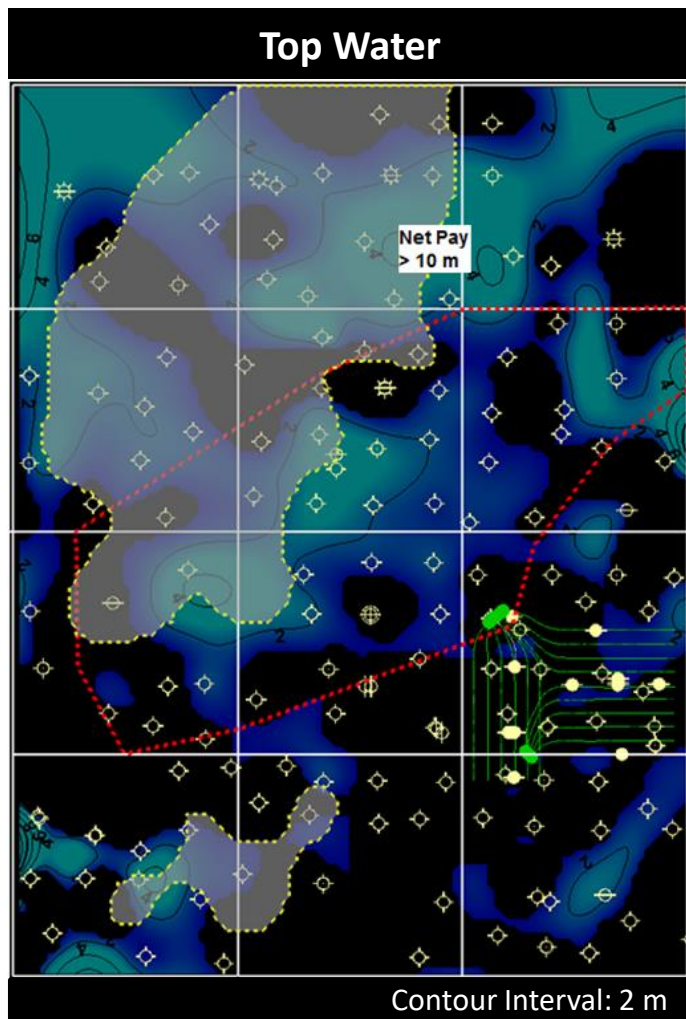


● SAGD well-pair

- Bottom water is generally localized and thin, and is either vertically distant or stratigraphically separate from identified SAGDable pay
- Stand off from well-pairs is often >10m

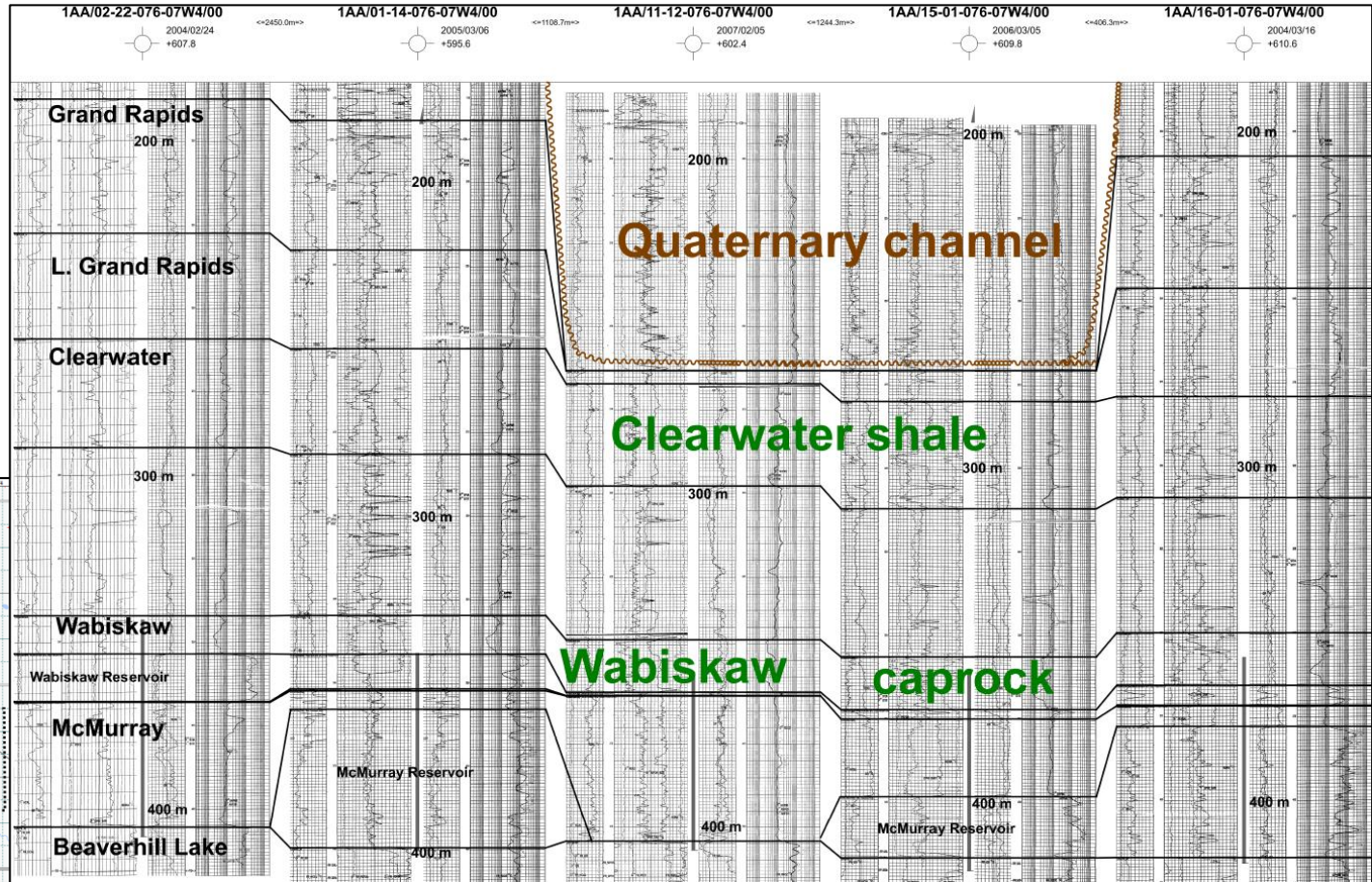
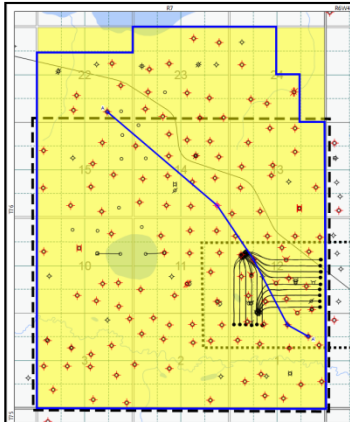
Localized bottom water

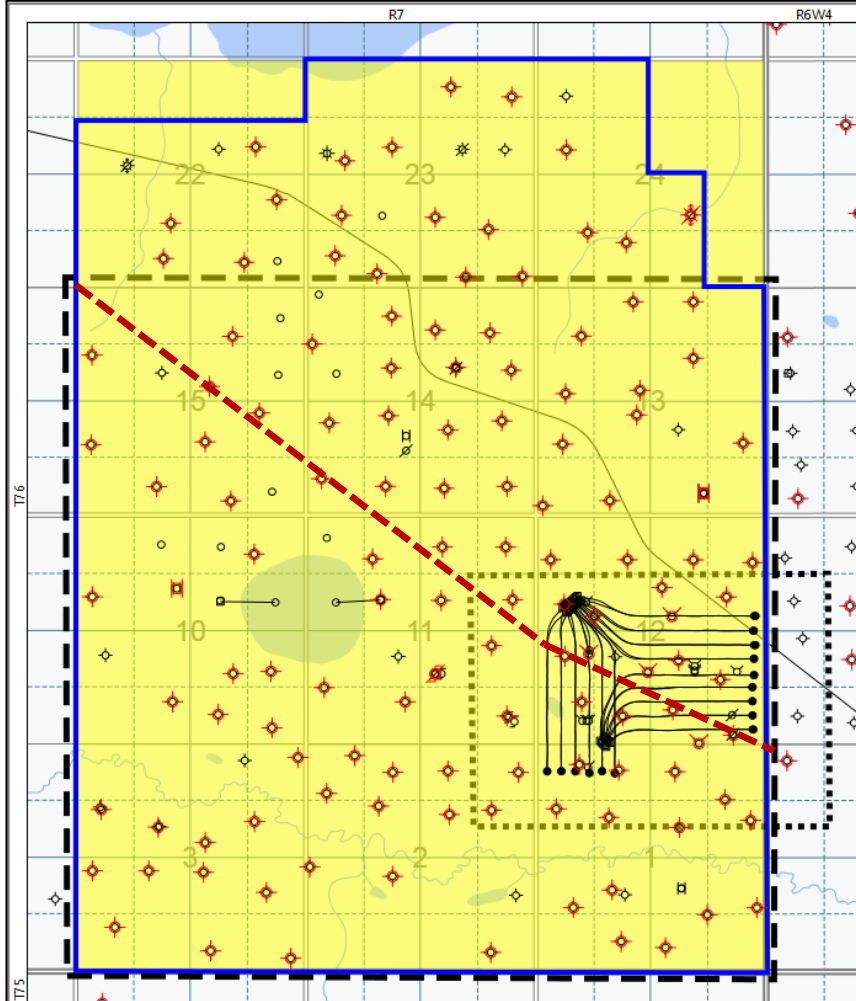
Wabiskaw Top Water and Top Gas Isopach



Geomechanical Anomalies

- No karsting
- No salt dissolution
- Quaternary channel does not incise Clearwater shale, or Wabiskaw caprock
- Datum: sea level





Project Area —————

3D Seismic (23 km²) 2009 - - - - -

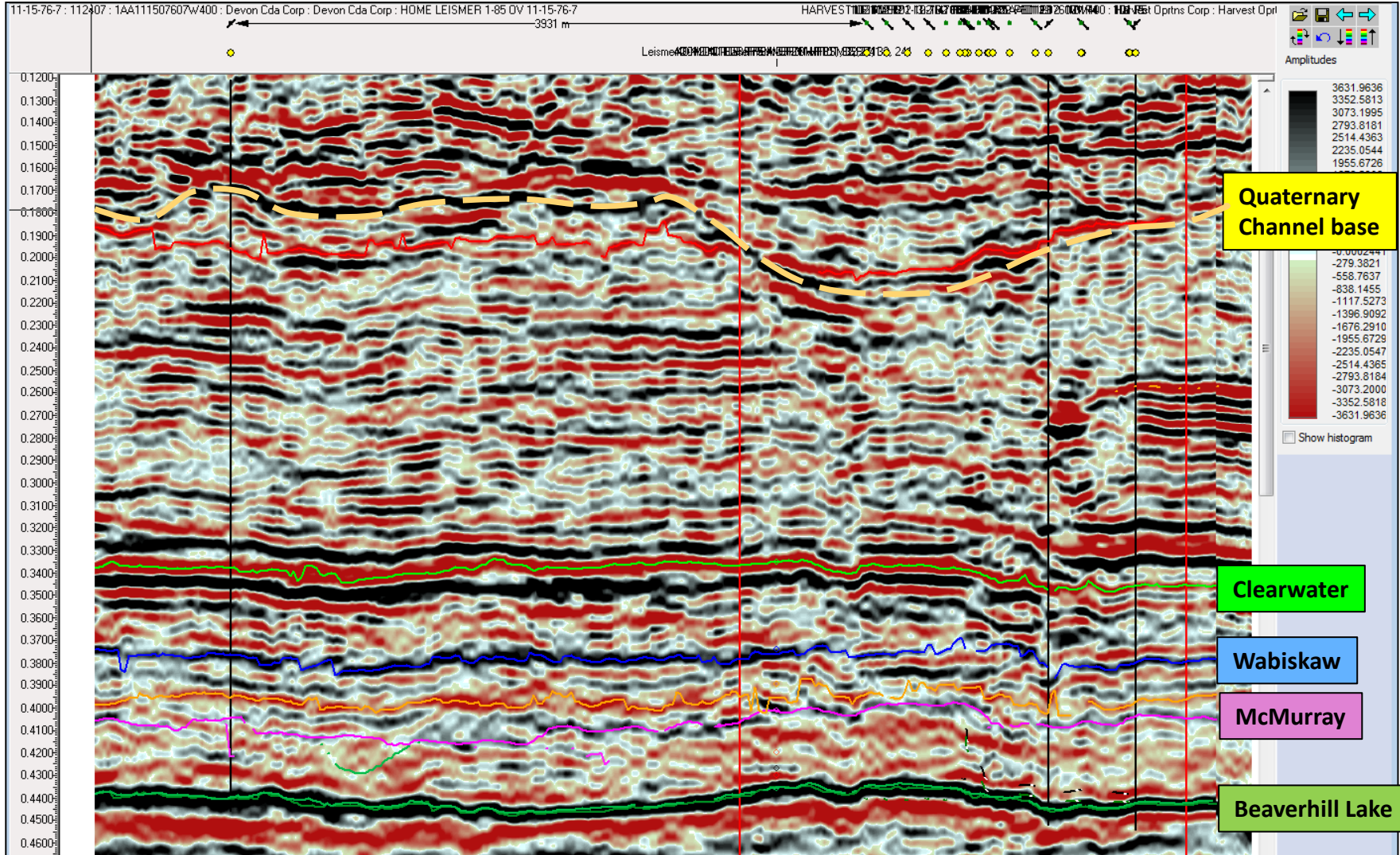
4D Seismic (4.5 km²)
Baseline: 2012

Monitor: 2020*

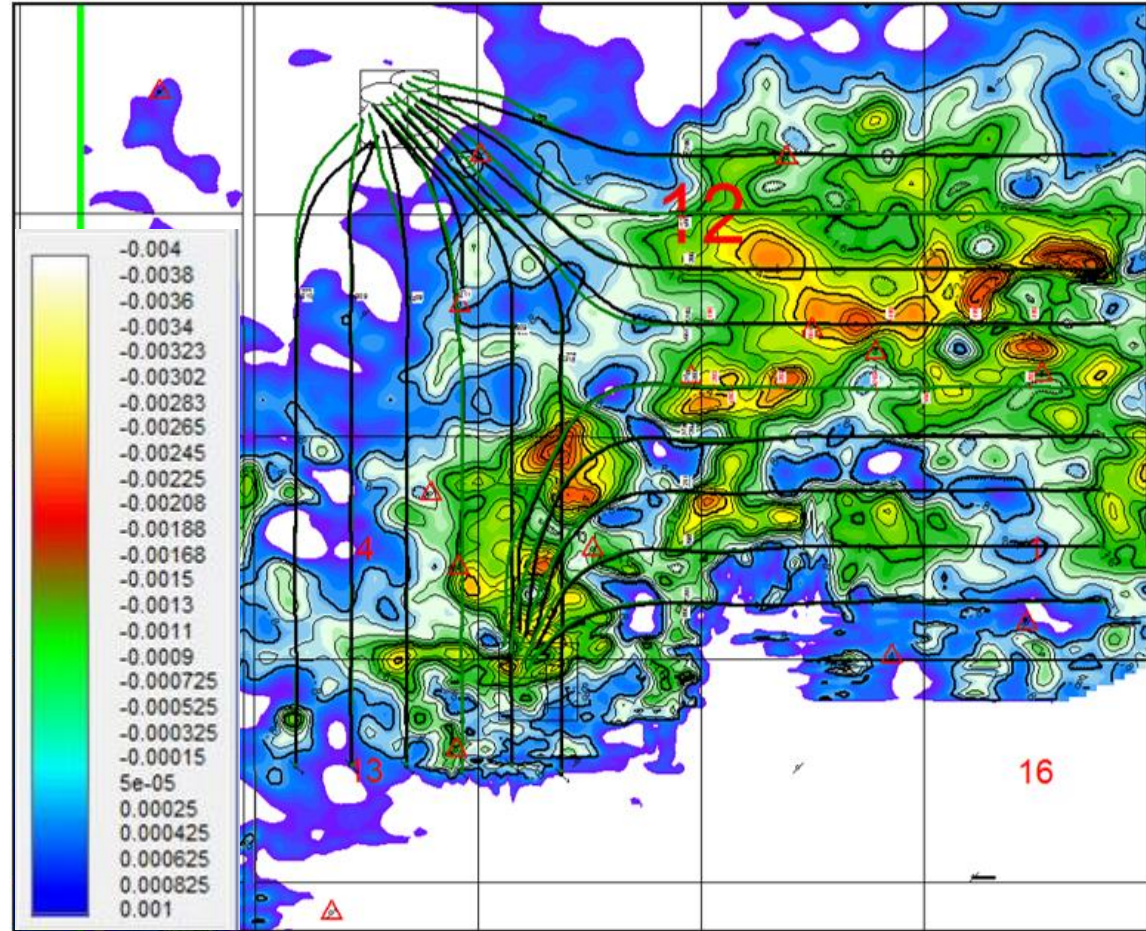
Seismic example - - - - -

* 2020 was last seismic acquisition

Example Seismic Line from 3D



- Reservoir heating by steam injection decreases sonic velocity of “heated zone”, resulting in depressed Beaverhill Lake (BHL) formation top in time domain (2020 BHL 2-way time > 2012 BHL 2-way time).
- No 2021 update
- Map is BHL time 2012 – BLH time 2020. Scale is seconds.
- Negative numbers show increase in 2-way travel time due to reservoir heating



Representative Well Cross Section



North

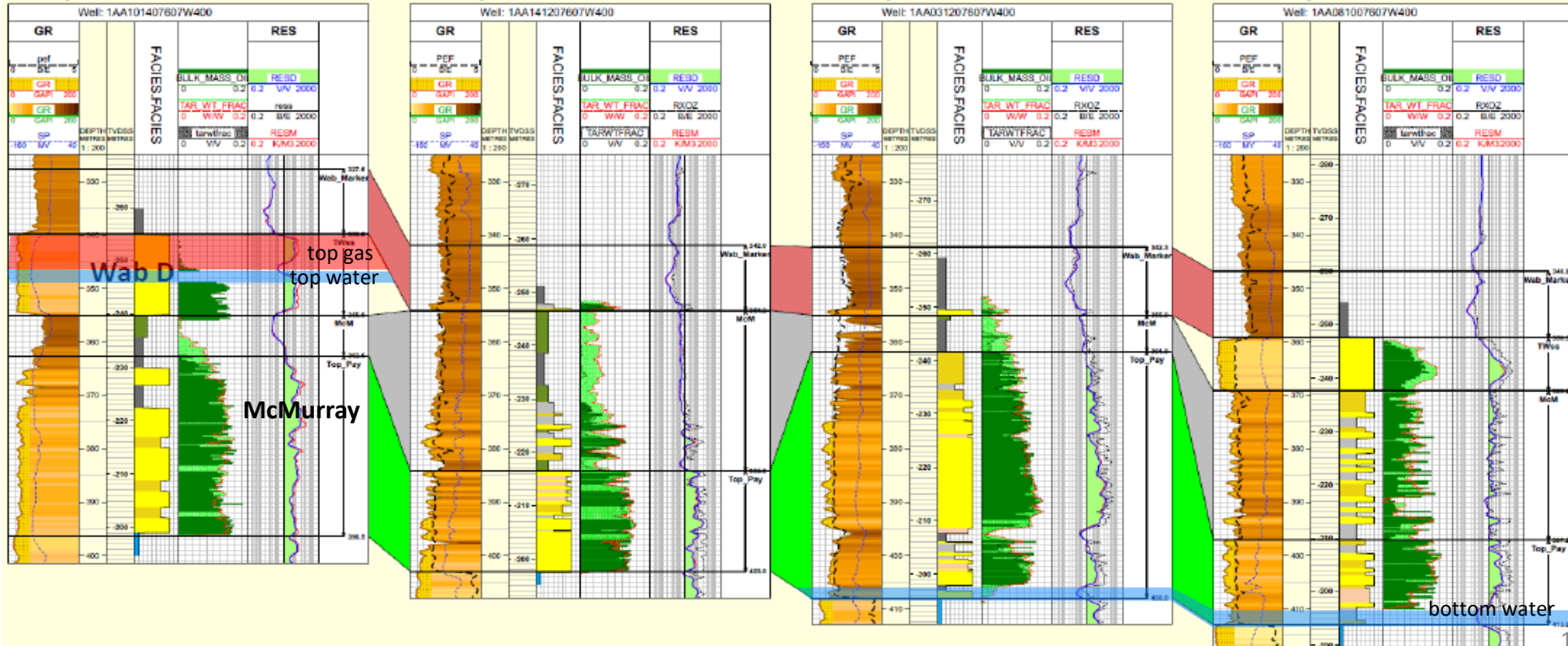
South

1AA/10-14-076-07W4

1AA/14-12-076-07W4

1AA/03-12-076-07W4

1AA/08-01-076-07W4



Original Bitumen in Place and Well Pattern Properties

Property	McMurray			Wabiskaw
	Project / Development Area	Pilot East	Pilot West	Project / Development Area
Area (ha)	2946	86.3	52.9	2946
Original bitumen in place (MM m ³)	68.8	6.7	3.7	17.7
Produced to date (MM m ³)*	1.43	1.03	0.39	0
Recovery to Date (%)*	2.1	15.4	10.5	0
Producible Bitumen (MM m ³)	32.8	3.5	1.4	7.5
Ultimate Recoverable (MM m ³)	33.7	4.3	1.5	7.5
Ultimate Recoverable (%)	49	64	41	42
Net Pay (m)	15.3	26.0	26.7	12.7
Porosity (%)	0.31	0.31	0.31	0.33
Oil Saturation	0.77	0.77	0.77	0.77
Vertical Permeability (mD)	2600	2600	2600	TBD
Horizontal Permeability (mD)	4500	4500	4500	5000

*Note: Recovered volumes as of Dec 31, 2021

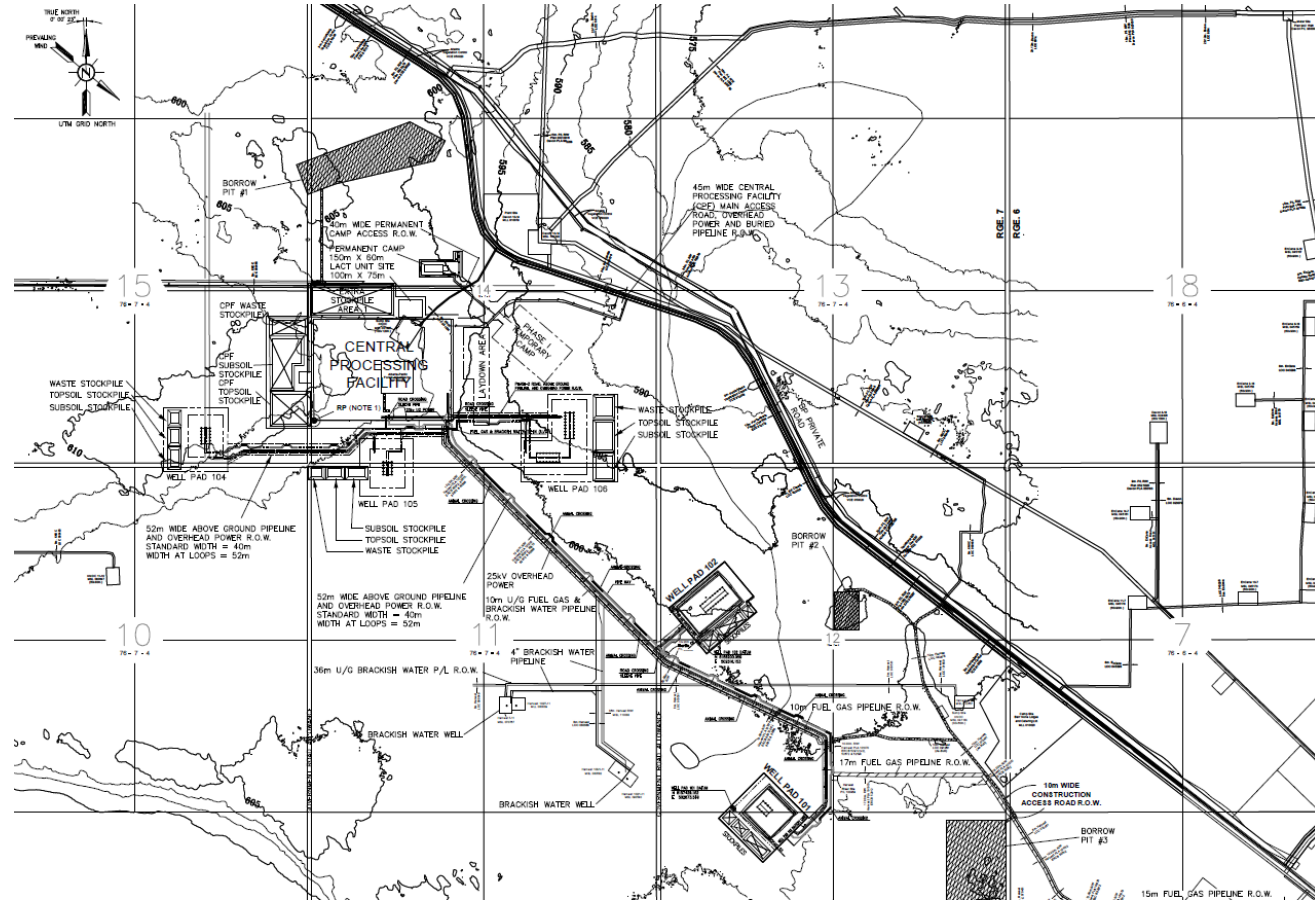
- Co-injection is not currently used at the BlackGold Project
- Harvest is continuing to evaluate optimal timing to initiate Non-Condensable Gas co-injection



Surface

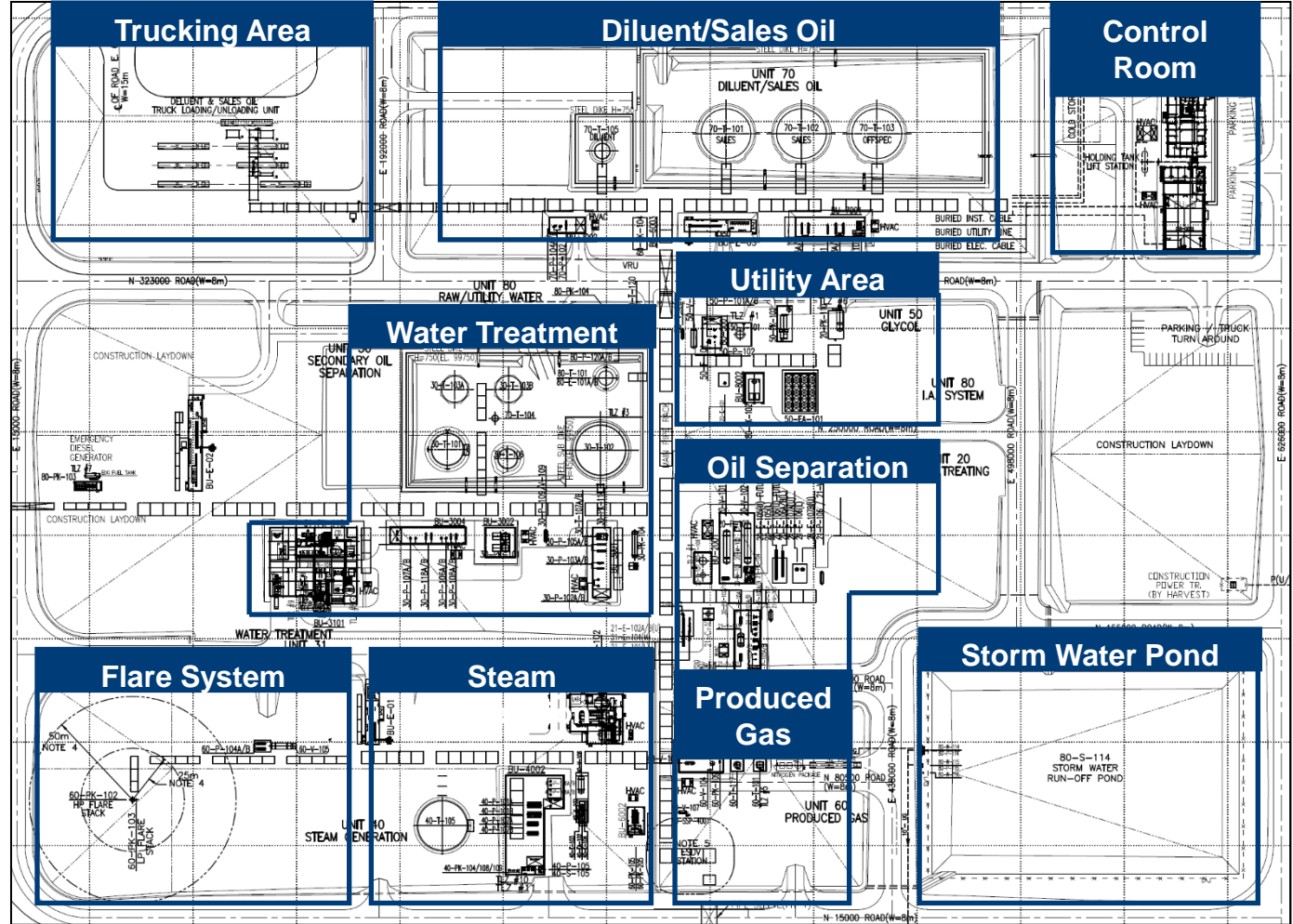
Built and Planned Surface Infrastructure

- As-built infrastructure includes a central processing facility, two SAGD well pads, source water pads, pipelines, roads and operations camp
- Location of planned Phase 2 well pad locations (Pad 104, 105, 106) subject to change



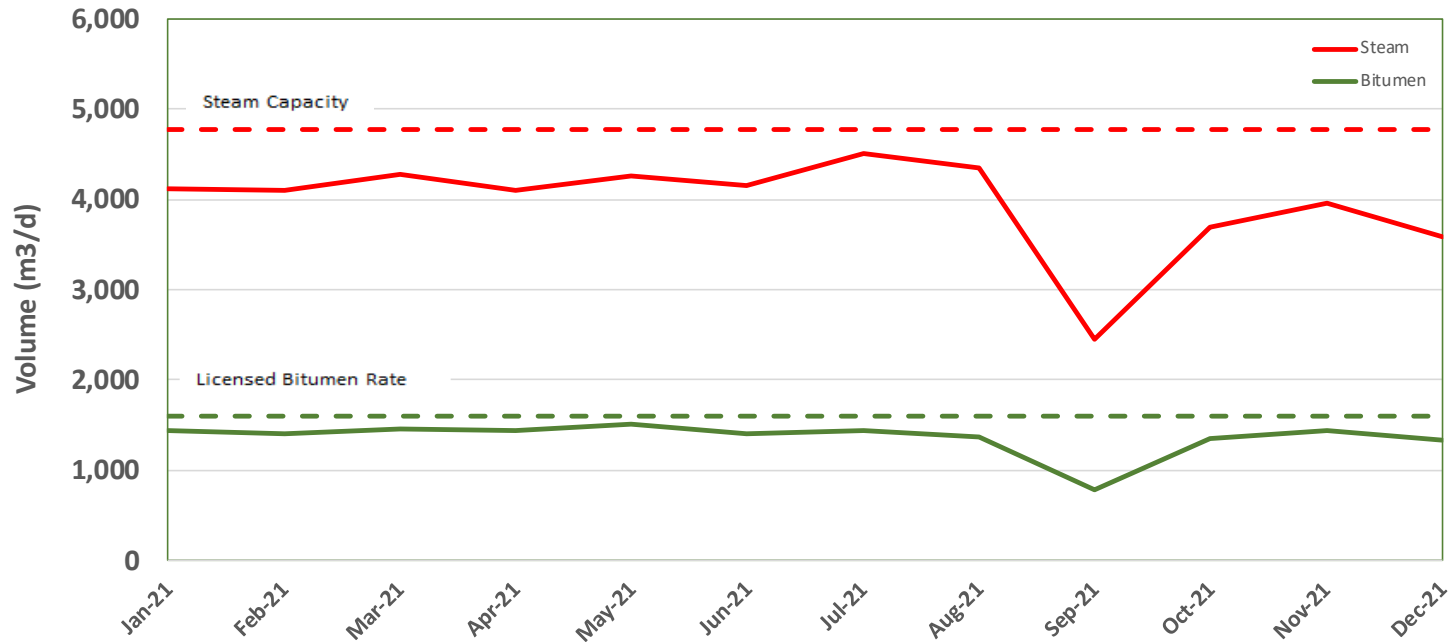
Built and Planned Surface Infrastructure

- Existing Phase 1 infrastructure shown
- Phase 2 infrastructure to be located within same plot space as Phase 1



- Harvest applied and received AER approval on August 16, 2021 (246984-00-05) to increase the Plant Sulphur Dioxide Limit to 2.0 tonnes per day.
- The following modifications, which did not require AER applications, were completed in 2021:
 - Due to ongoing issues with the Continuous Emissions Monitoring System (CEMS), Harvest initiated the procurement of a new CEMS unit in 2021. The new CEMS was commissioned and went online on May 6, 2022.
 - A second section of the make-up water pipeline's liner was replaced

- September 2021 - Maintenance Outage
- December 2021 - Production curtailed as COVID-19 and weather-related issues led to a shortage of trucks available to transport sales oil



An aerial photograph showing a pipeline construction site in a forested area. The pipeline is laid out in a zig-zag pattern across a cleared path. The surrounding area is densely wooded with tall trees. The image has a blue tint.

**Historical and
Upcoming Activity**

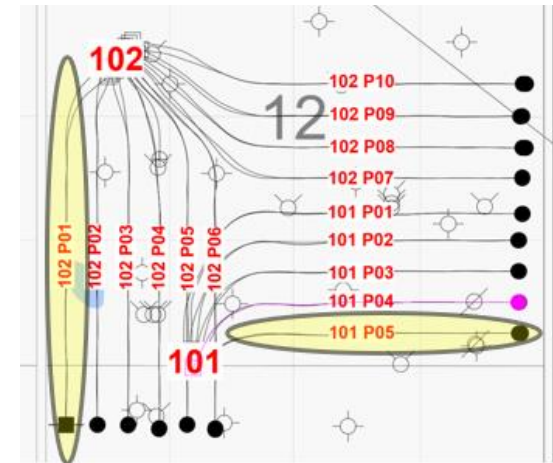
- On October 27, 2019, 101-02 ESP failed due to high solids loading and the well was later diagnosed with a compromised sand control liner
 - In March 2021, the injector was returned to service to provide pressure support for the neighboring well pairs
 - The existing producer is currently suspended as per *Directive 013: Suspension Requirements for Wells* (2021)
- None of BlackGold's wells have reached the ramp-down or blow-down stage

Regulatory Changes

- May 4, 2021, Method 4 Variance Application – Backfilling Continuous Emissions Monitoring System (CEMS) data due to ongoing issues with the CEMS unit. May 4, 2021, application replaced by November 26, 2021, Method 4 Variance Application. Method 4 Variance Approval received from the AER on December 15, 2021.
- May 12, 2021, EPEA Amendment Application submission to increase the Plant Sulphur Dioxide Limit to 2.0 tonnes per day. AER authorized 246984-00-05 on August 16, 2021.
- July 26, 2021, EPEA Renewal Application submission. AER authorized 246984-01-00 on December 10, 2021.

Operational Changes

- **102-01 Well Pair Started**
 - Circulation of well pair began in March 2021 and ended in June 2021
 - ESP Conversion completed in June 2021
- **101-05 Well Pair Re-Started**
 - Initial circulation of well pair began in Jan 2020 and ended in April 2020 without ESP conversion due to oil price collapse
 - Circulation resumed in June 2021 and ended in October 2021
 - ESP Conversion completed in October 2021



- Completed 2 additional injector well recompletions with distributed passive flow control devices (FCDs) on 102-04 and 102-06
- 102-06 injector well also equipped with Vacuum Insulated Tubing (VIT)
- Shiftable FCDs allow further optimization post installation and remain part of Harvest's future completion design strategy

- Production curtailed late Q4 2021 as COVID-19 and weather-related issues led to a shortage of trucks available to transport sales oil
- Improvements seen in ESP run-life

2021 Compliance History

EDGE Reference	Date	Reportable Incident/ Voluntary Self-Disclosure/ Contravention	Remediation or Compliance Efforts
0377466	February 2021	Exceeded daily SO ₂ limit of 0.75 tonnes/day – 5 days	Obtained EPEA Amendment Approval on August 16, 2021. Daily SO ₂ limit increased to 2.0 tonnes/day (246984-00-05)
0376715	March 6, 2021	2.00 m ³ release of steam condensate at the Central Processing Facility	Spill cleaned up and remediated
0378455	March 2021	Exceeded daily SO ₂ limit of 0.75 tonnes/day – 13 days	Obtained EPEA Amendment Approval on August 16, 2021. Daily SO ₂ limit increased to 2.0 tonnes/day (246984-00-05)
0378850	April 2021	Exceeded daily SO ₂ limit of 0.75 tonnes/day – 18 days Exceeded oxides of nitrogen limit of 22.8 kilograms/hour – two days	Obtained EPEA Amendment Approval on August 16, 2021. Daily SO ₂ limit increased to 2.0 tonnes/day (246984-00-05)
0380079	May 2021	Exceeded daily SO ₂ limit of 0.75 tonnes/day – 27 days	Obtained EPEA Amendment Approval on August 16, 2021. Daily SO ₂ limit increased to 2.0 tonnes/day (246984-00-05)

2021 Compliance History

EDGE Reference	Date	Reportable Incident/ Voluntary Self-Disclosure/ Contravention	Remediation or Compliance Efforts
0379652	June 5, 2021	Off-lease trucking roll-over. 13.753 m3 of dilbit released.	Spill cleaned up and remediated
0380586	June 17, 2021	Steam generator flex joint leak. Contravention of EPEA Approval No. 246984-00-02, Schedule IV: Air Emissions, Condition 1 (not a approved location for the release of an air effluent stream).	Replaced the steam generator flex joint to the exhaust stack
0381095	June 2021	Exceeded daily SO2 limit of 0.75 tonnes/day – 9 days	Obtained EPEA Amendment Approval on August 16, 2021. Daily SO2 limit increased to 2.0 tonnes/day (246984-00-05)
0381344	June 17, 2021	Failed relative accuracy test audit (RATA). Continuous Emissions Monitoring System (CEMS) in an out-of-control state and failure to meet 90% uptime.	Method 4 variance application; AER Method 4 approval on December 15, 2021
0381399	July 19, 2021	Off-lease trucking roll-over. 0.05 m3 of dilbit released.	Spill cleaned up and remediated
0382241	July 2021	Exceeded daily SO2 limit of 0.75 tonnes/day – 18 days	Obtained EPEA Amendment Approval on August 16, 2021. Daily SO2 limit increased to 2.0 tonnes/day (246984-00-05)

2021 Compliance History

EDGE Reference	Date	Reportable Incident/ Voluntary Self-Disclosure/ Contravention	Remediation or Compliance Efforts
0383611	August 2021	Exceeded daily SO ₂ limit of 0.75 tonnes/day – 4 days	Obtained EPEA Amendment Approval on August 16, 2021. Daily SO ₂ limit increased to 2.0 tonnes/day (246984-00-05)
0383177	September 2, 2021	CEMS NO _x analyzer O ₃ scrubber/catalytic converter completely plugged off. CEMS unit in an out-of-control state and failure to meet 90% uptime.	Replaced the NO _x analyzer O ₃ scrubber/catalytic converter.
0384617	October 14, 2021	Failed RATA. CEMS in an out-of-control state and failure to meet 90% uptime.	Method 4 variance application; AER Method 4 approval on December 15, 2021
0386322	December 12, 2021	Continuous air ambient monitoring trailer recorded an hydrogen sulphide hourly exceedance of the Alberta Ambient Air Quality Objectives. The 1-hour average was recorded at 24 ppb.	No environmental impact.

Planned 2022 activities:

- Execution of re-drills

Anticipated applications in 2022/2023:

- Re-drill 101-02 producer and injector
- Re-drill 102-10 producer
- Re-drill 101-03 producer
- Well Pad 102 expansion – additional well pairs
- Well Pad 103 relocation
- Non-Condensable Gas co-injection

Anticipated five-year development plan:

- Drill additional wellpairs off Well Pad 102*
- Drill sustaining pad*
- Re-drills/In-fills as required
- Drill observation wells
- Additional 4D seismic over pilot area
- Additional OSE wells to de-risk development
- Investment decision on Phase 2
- Cogeneration

*Note: Locations shown are approximate and subject to change

