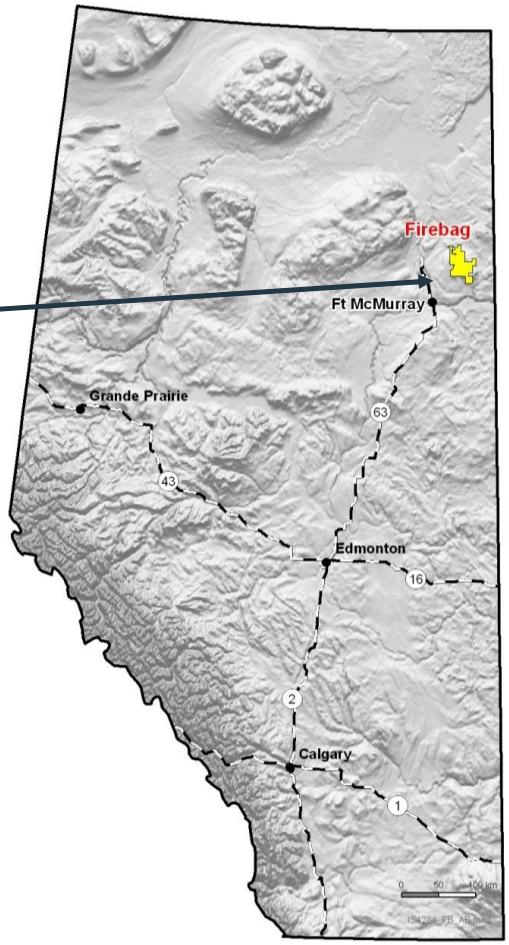
Suncor Firebag
2022 AER Scheme Performance Report
Commercial Scheme Approval No. 8870

Reporting Period:

January 1, 2022 to December 31, 2022

Introduction
4.1

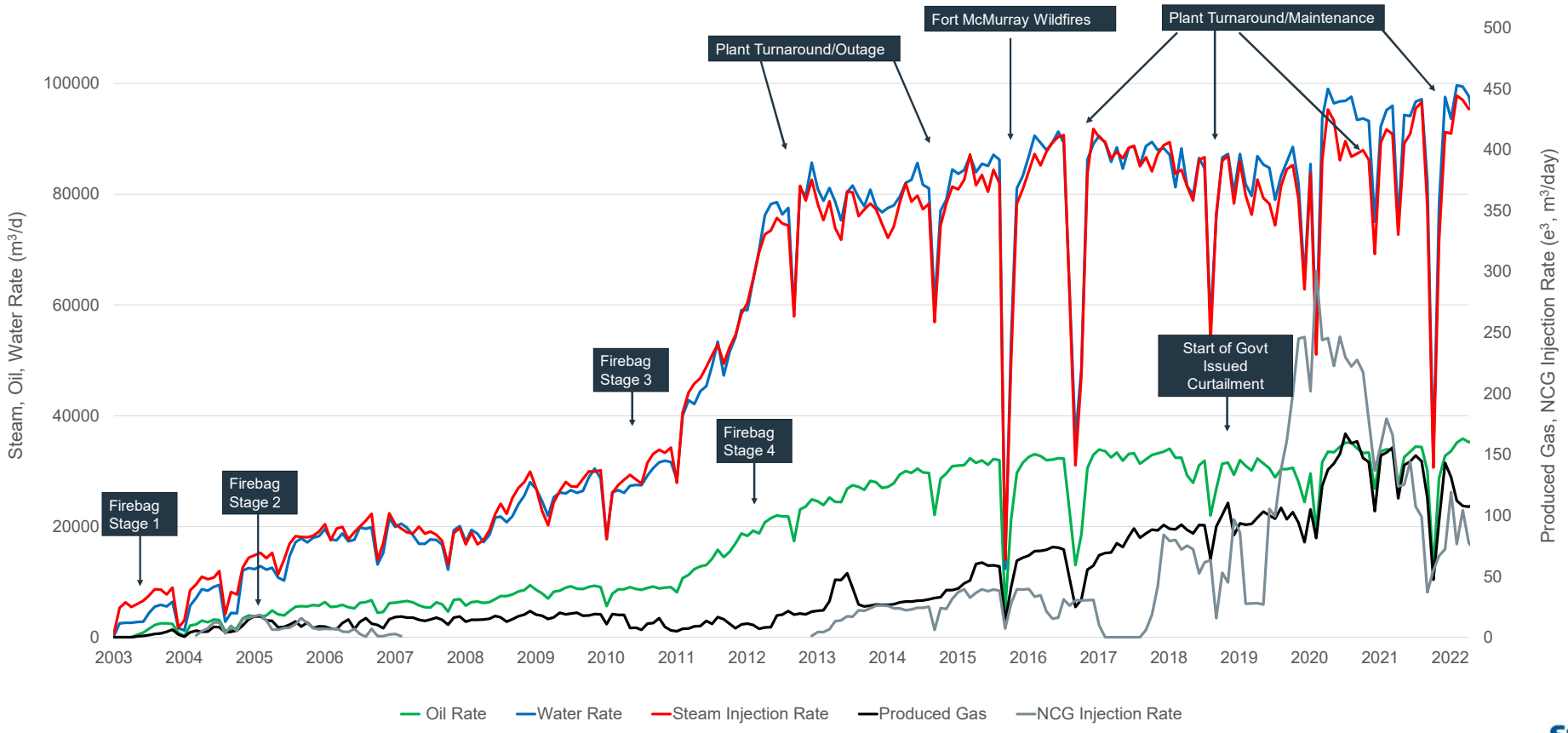
Firebag Project Overview



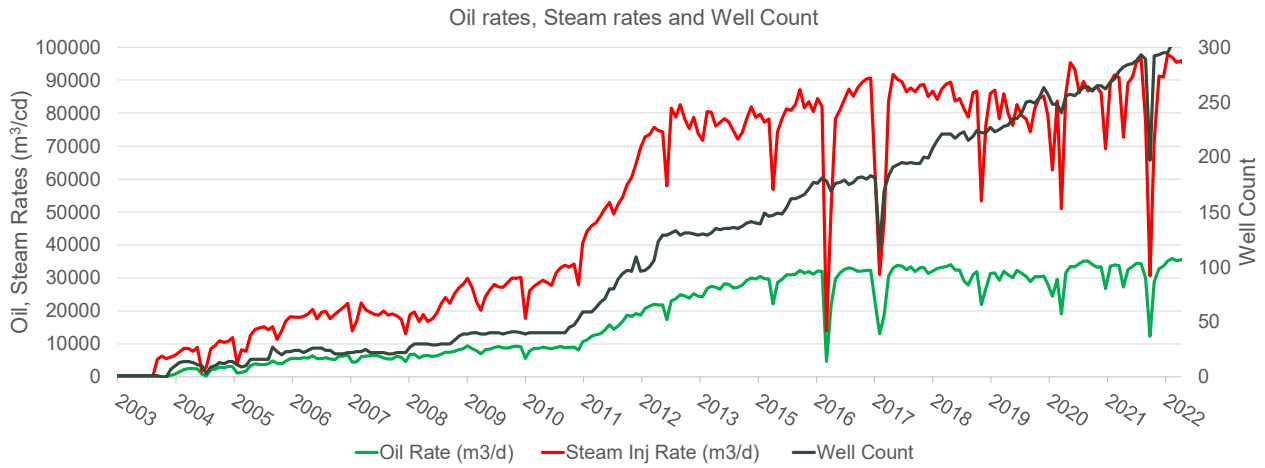
- The Firebag Project is a commercial Steam Assisted Gravity Drainage (SAGD) scheme.
- Supplies bitumen to the Oil Sands Upgrader and sales to market.
- Average bitumen production for the reporting period has been 31,597 m^3/day (199 kbbl/d) with an instantaneous steam to oil ratio (iSOR) of 2.7.

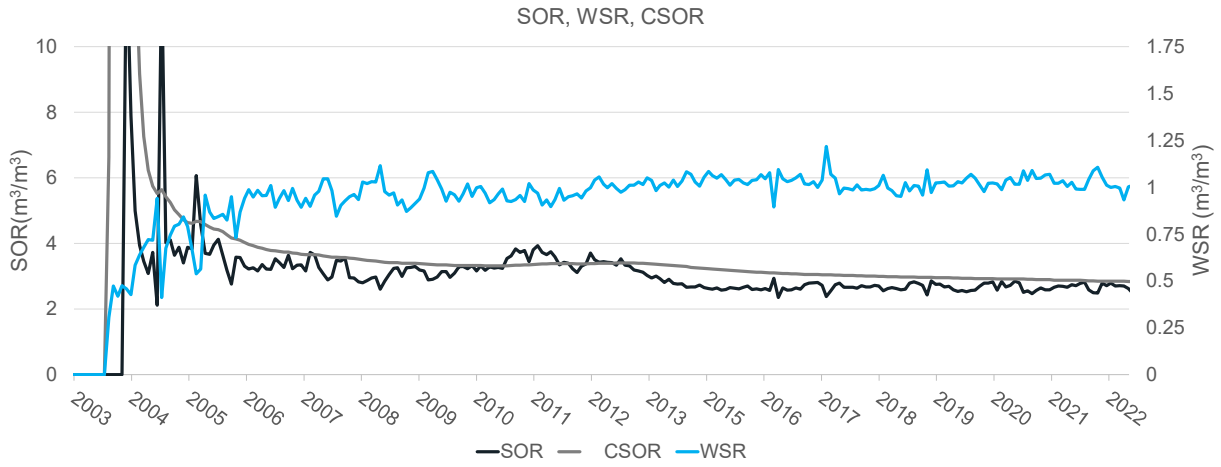
Subsurface
4.2

Scheme Performance – Well Production History

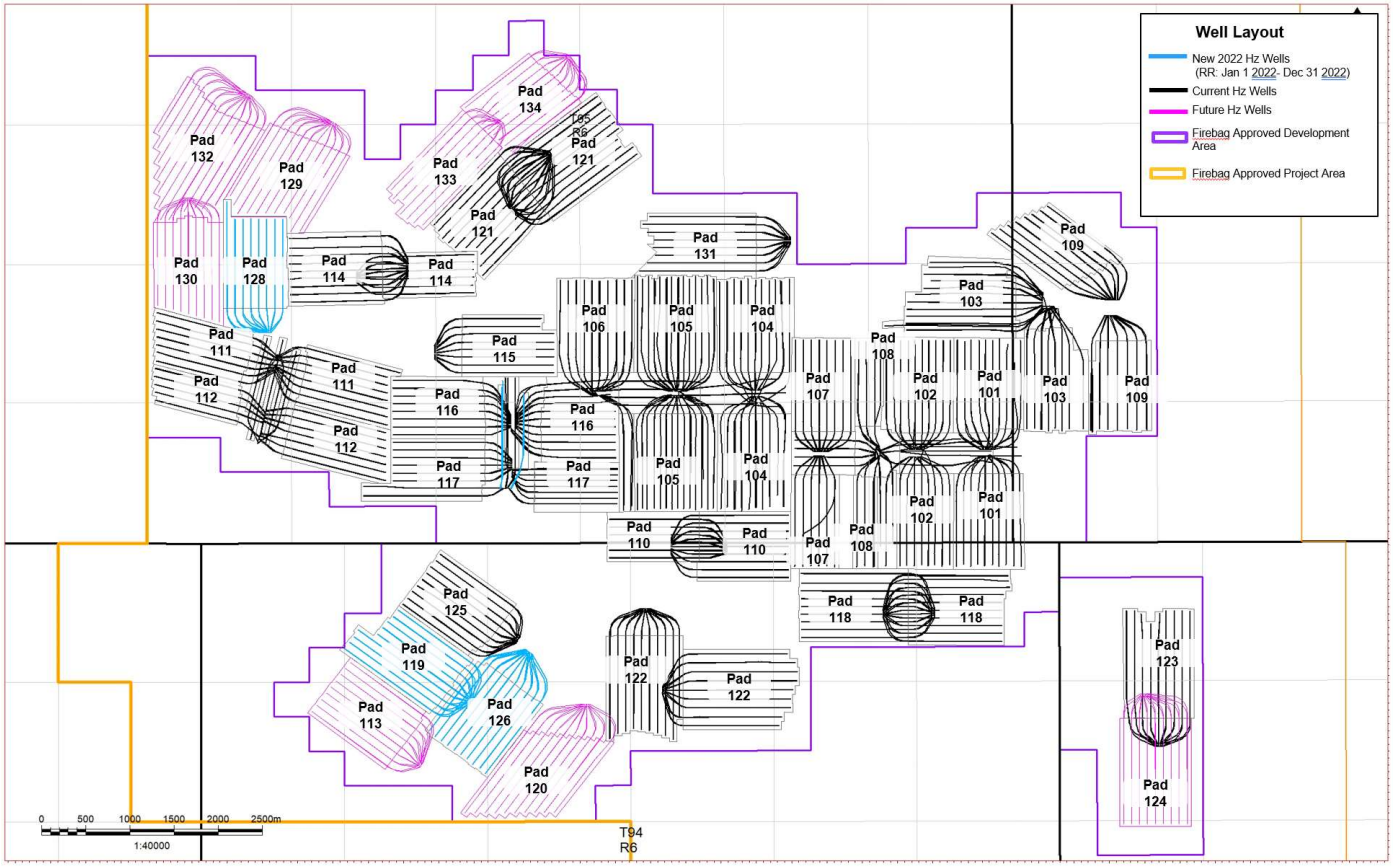


Scheme Performance – Well Production History



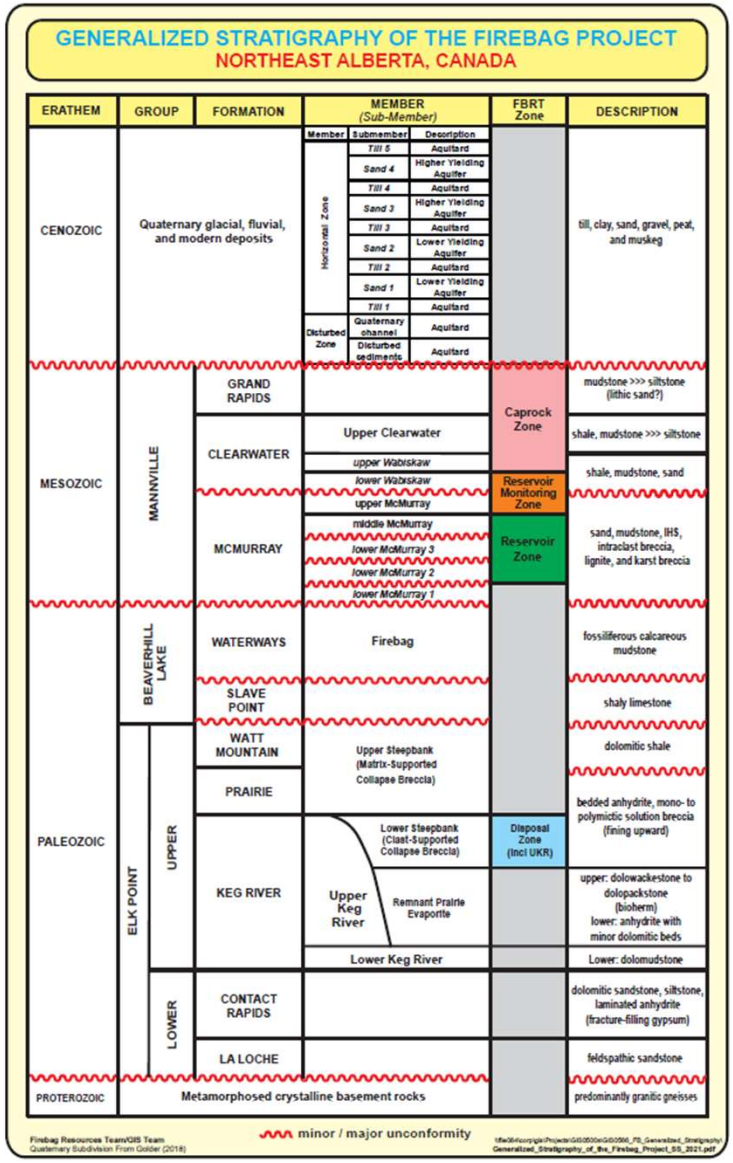


AER Project & Approved Development Areas

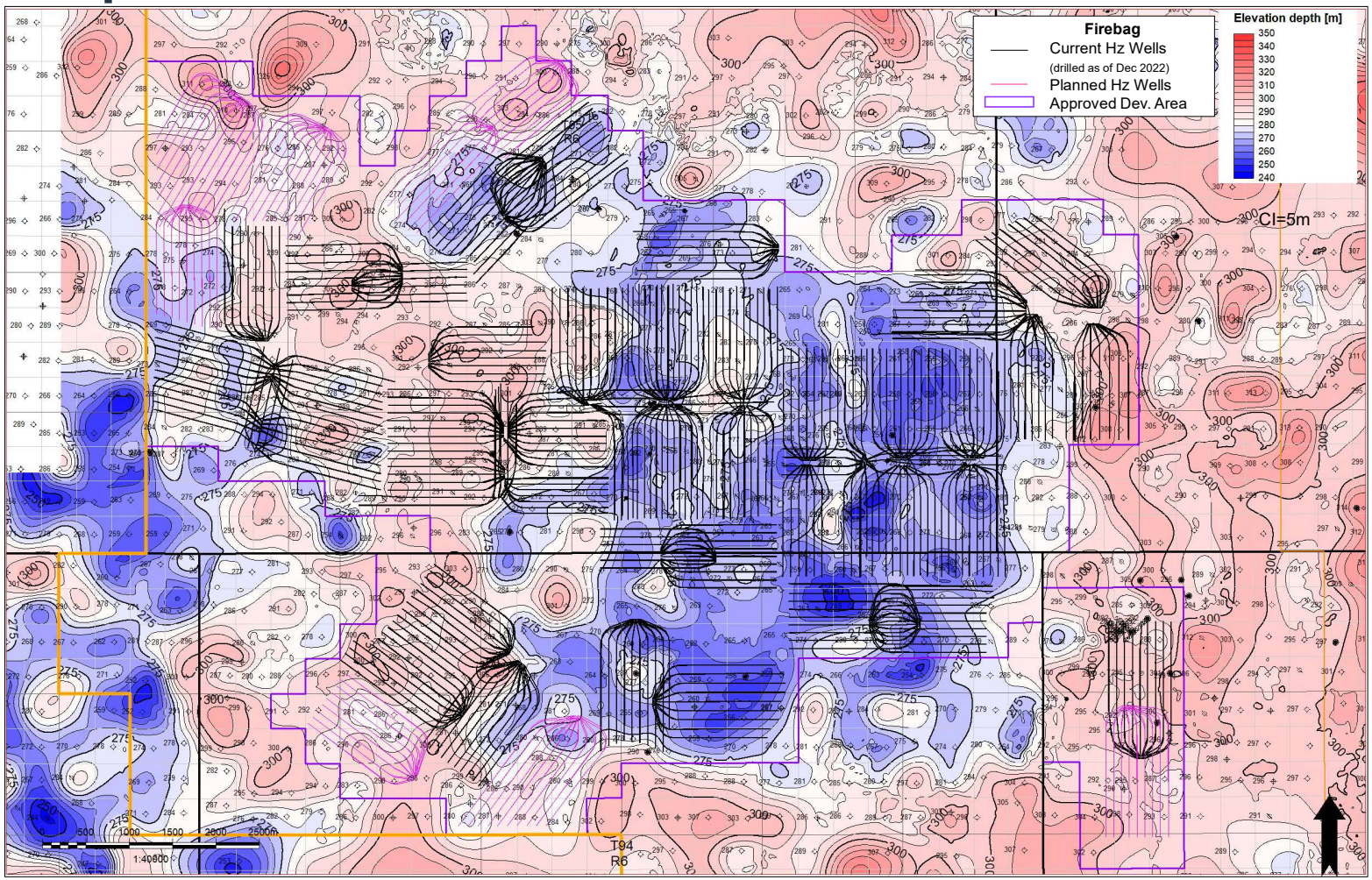


7 Firebag Approval 8870 as of December 2022

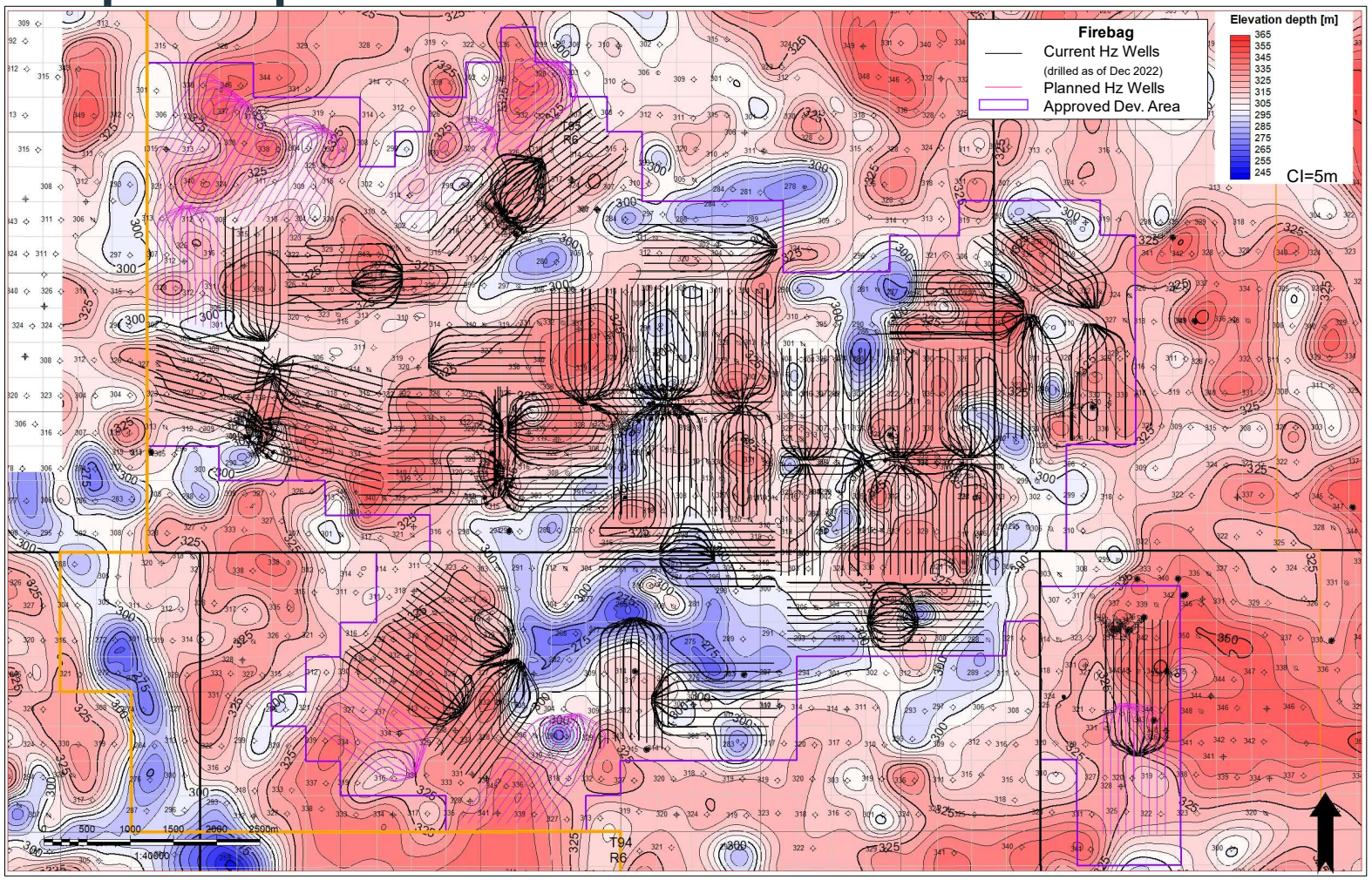
Firebag Stratigraphic Chart



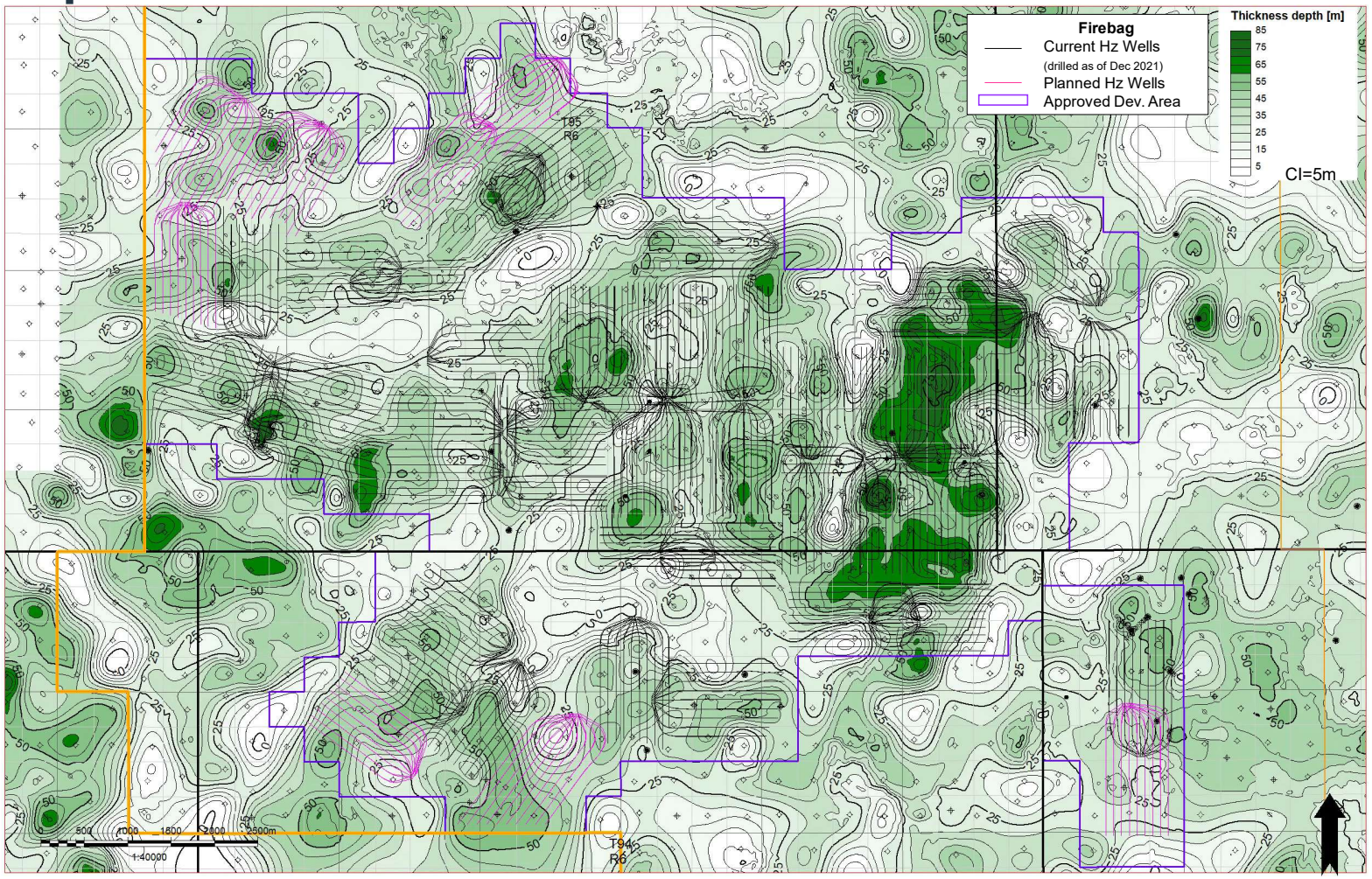
Structure Map of Base Continuous Reservoir



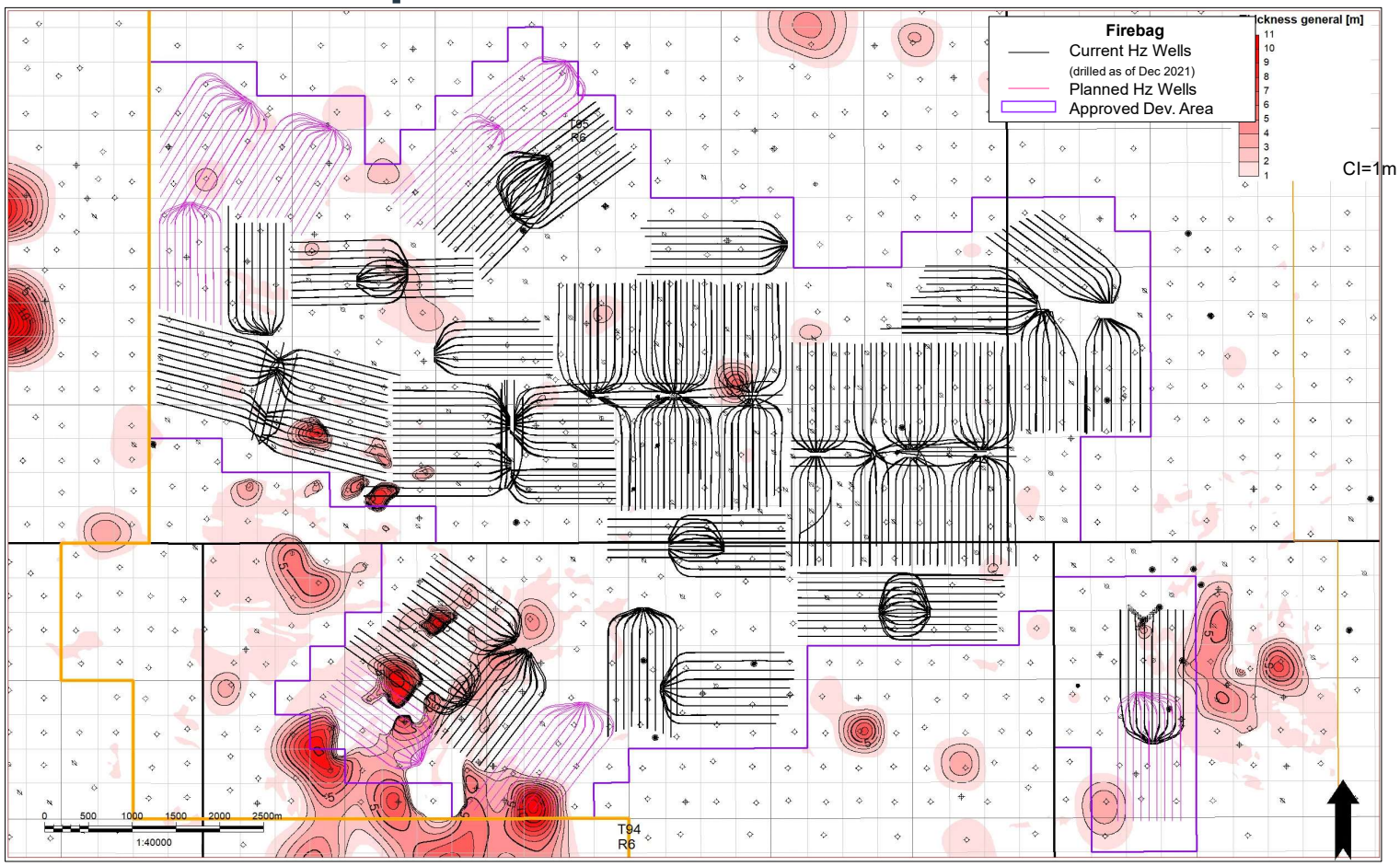
Structure Map of Top Continuous Reservoir



Isopach Map of Continuous Reservoir



Reservoir Zone Gas Isopach

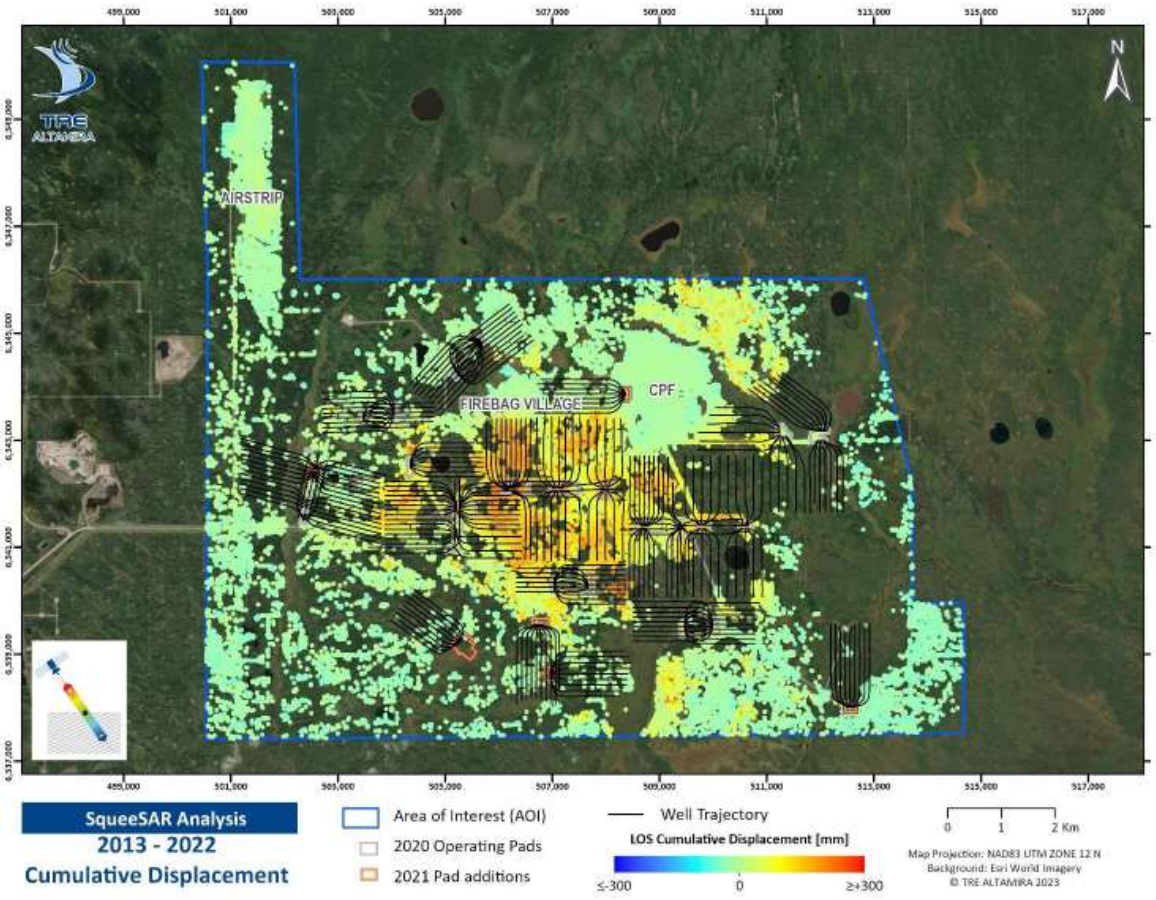


Gas zones shown are inconsequential to SAGD operations at Firebag but are included for reference.

Water and Lean Zones

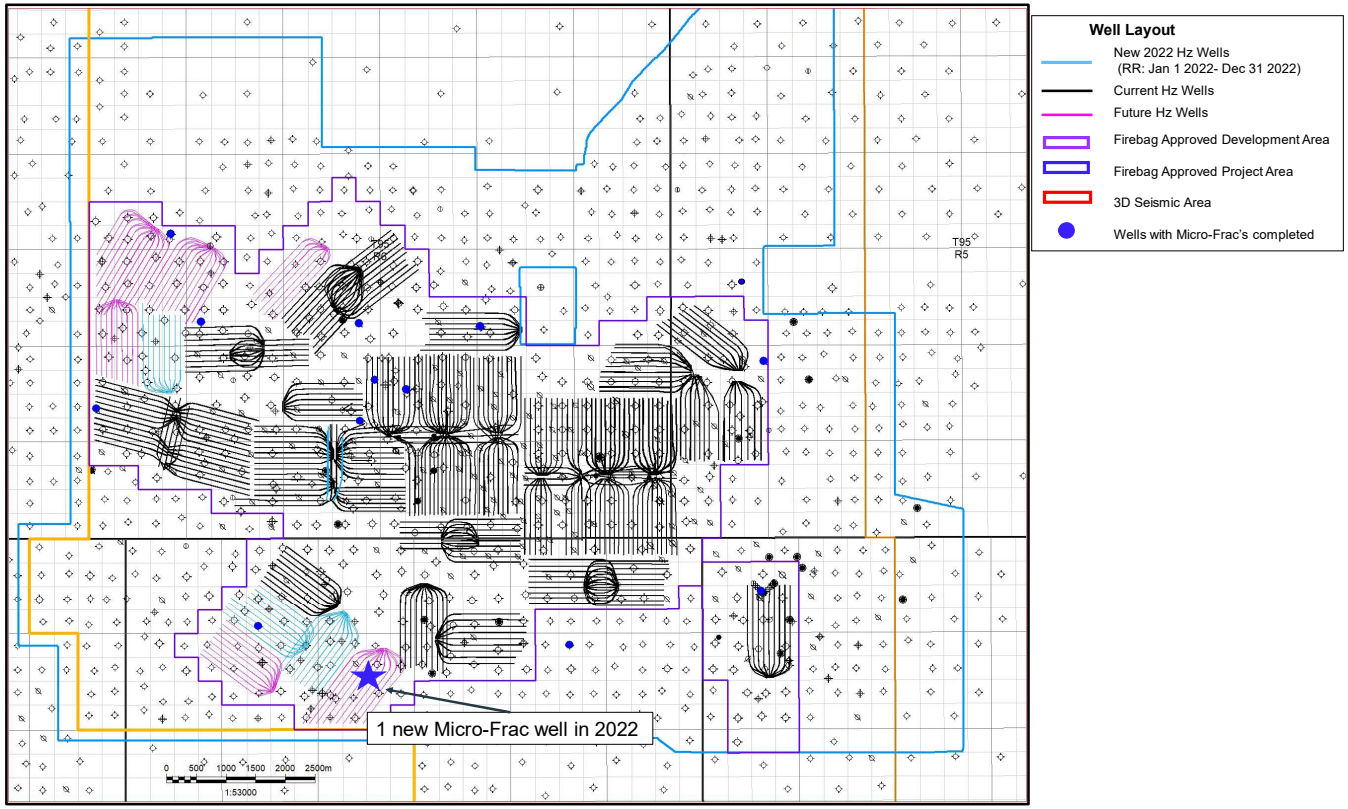
- No top or bottom water zones have been identified within the Firebag development area.
- Upper lean and middle lean are present in some parts of the Firebag development area. Thief zone potential is unknown at this time but is actively being investigated.
- For more information on lean zones, refer to applications 1871777 (Approval # 8870MMM) and 1925467 (Approval # 8870HHHH).

Firebag InSAR Cumulative Heave May 2013 - Nov 2022



- There are no geomechanical anomalies in the Firebag development area.
- Maximum heave of 384 mm observed at Pad 116
- Heave data is used to:
  - Calibrate geomechanical models
  - Monitor subsurface safety and flag areas that appear anomalous

Caprock Integrity Assurance



- **One new Micro-Frac well:**
  - SUNCOR FIREBAG 11-28-94-6 to assess the Clearwater
- **Three new caprock cores collected during the reporting period.**

- Geomechanical simulations are developed to assess all new pad startups.
- These activities confirm that operating at the approved maximum operating pressure (MOP) does not impact Firebag caprock integrity.

Fracture Closure Gradients

Date	Well	Well Alias	TVD Perforated Interval (mKB)	Target Formation	Fracture Closure Pressure (kPag)	Fracture Closure Gradient (kPag/mGL)
15-Mar-12	01-16-095-06W4	OB134	297-298	lower McMurray 3 sand	5145.9	17.6
17-Mar-12	09-09-095-06W4	OB135	263-264	middle McMurray sand	5013.1	19.3
13-Mar-12	11-10-095-06W4	OB136	268-269	middle McMurray sand	4742.6	18.0
23-Feb-14	16-07-095-05W4	OB205	273-274	lower McMurray 3 sand	4226.7	15.7
11-Feb-15	05-07-095-06W4	OB147	255-258	middle McMurray sand	3775.3	15.1
10-Feb-16	15-26-094-06W4	OB140	296-299	middle McMurray sand	6078.9	20.6
08-Jan-19	03-32-094-06W4	OB145	272-275	middle McMurray sand	6871.0	19.5
22-Feb-22	11-28-094-06W4	N/A	296.0-297.0	lower McMurray 3 sand	5237.4	22.7
16-Mar-12	01-16-095-06W4	OB134	277-278	middle McMurray mudstone	5305.7	19.4
18-Mar-12	09-09-095-06W4	OB135	247.5-248.5	middle McMurray mudstone	3927.2	16.1
13-Mar-12	11-10-095-06W4	OB136	257-258	middle McMurray mudstone	4817.0	19.0
24-Feb-14	16-07-095-05W4	OB205	247-248	middle McMurray IHS	4314.6	17.7
12-Feb-15	05-07-095-06W4	OB147	227-228	middle McMurray mudstone	4018.5	18.0
10-Feb-16	15-26-094-06W4	OB140	276-277	middle McMurray mudstone	4638.0	16.9
16-Mar-12	01-16-095-06W4	OB134	253.5-254.5	Wabiskaw/lower Clearwater	5389.5	21.6
18-Mar-12	09-09-095-06W4	OB135	231-232	Wabiskaw/lower Clearwater	4967.2	21.9
14-Mar-12	11-10-095-06W4	OB136	238-239	Wabiskaw/lower Clearwater	4439.7	19.0
05-Mar-13	01-09-095-06W4	OB182	232.5-233.5	Wabiskaw/lower Clearwater	5144.2	22.5
25-Feb-14	16-07-095-05W4	OB205	225.5-226.5	Wabiskaw/lower Clearwater	4859.2	22.0
12-Feb-15	05-07-095-06W4	OB147	209.5-210.5	Wabiskaw/lower Clearwater	4586.0	22.3
11-Feb-16	15-26-094-06W4	OB140	250.5-251.5	Wabiskaw/lower Clearwater	5341.6	22.3
16-Feb-17	07-31-094-05W4	OB184	225.5-226.5	Wabiskaw/lower Clearwater	4822.9	22.2
10-Jan-19	03-32-094-06W4	OB145	229.0-230.0	Wabiskaw/lower Clearwater	5371.9	23.8
03-Feb-19	04-17-095-06W4	OB148	219.5-220.5	Wabiskaw/lower Clearwater	4900.3	22.7
06-Feb-20	04-14-095-06W4	N/A	256.0-257.0	Wabiskaw/lower Clearwater	5259.0	20.8
15-Feb-21	01-19-095-06W4	N/A	214.4-215.4	Wabiskaw/lower Clearwater	4792.3	22.3
23-Feb-22	11-28-094-06W4	N/A	248.0-249.0	Wabiskaw/lower Clearwater	5299.3	21.7

Note - Suncor limits Fracture Closure Gradient to Overburden Gradient (~21.5 kPag/mGL)

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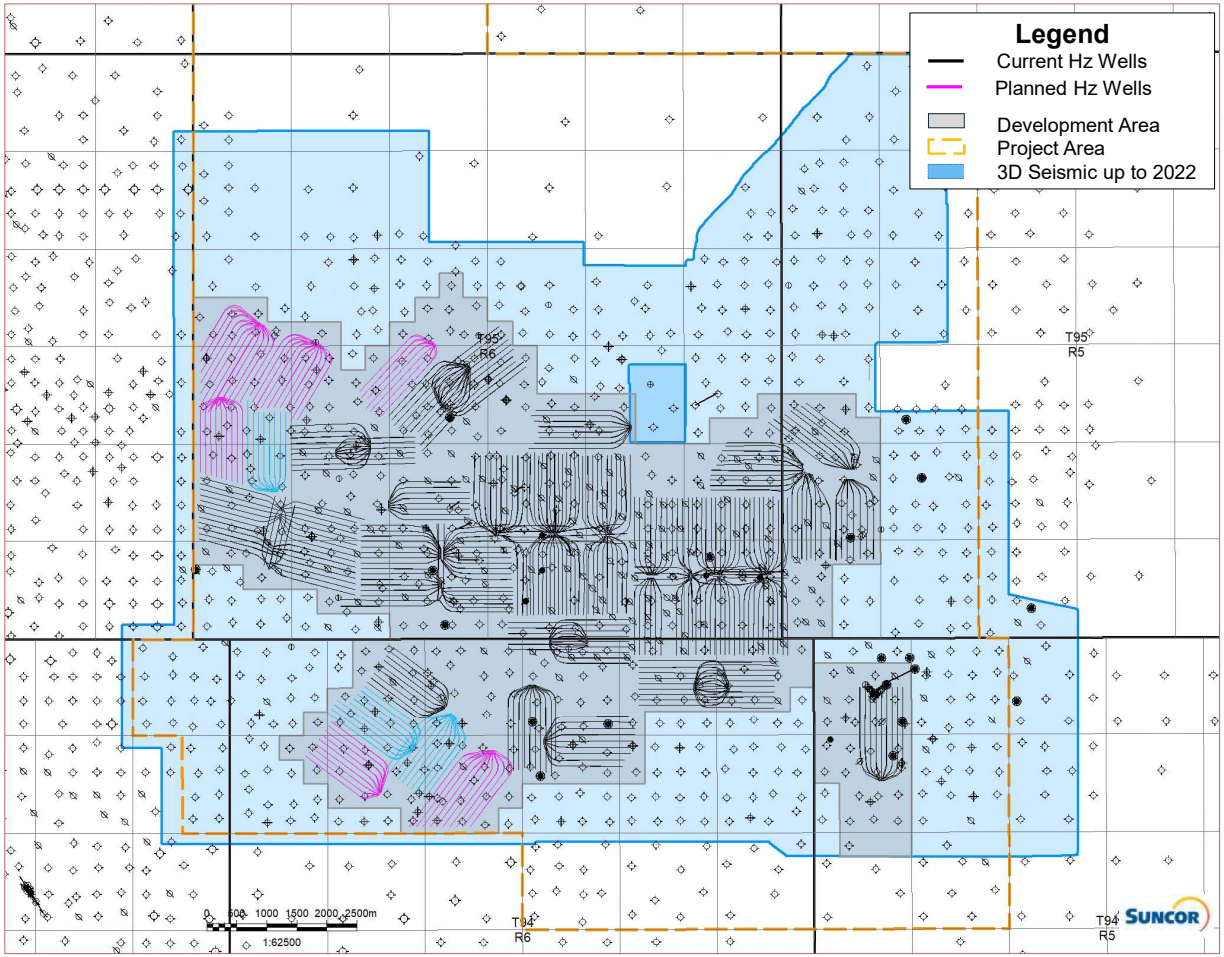
3D Seismic Survey Outlines

- No new 3D seismic acquired in 2022



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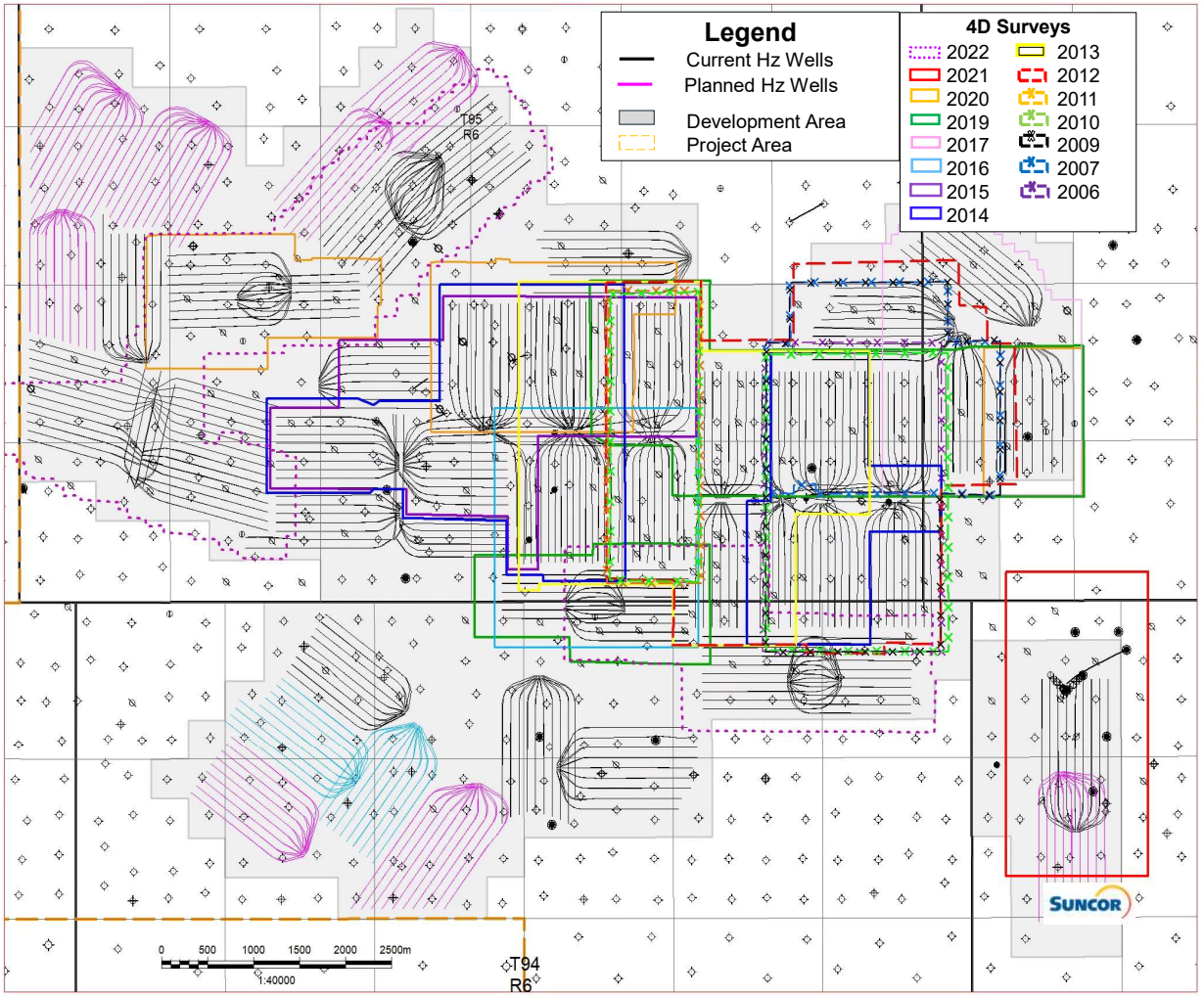
4D Seismic Survey Outlines



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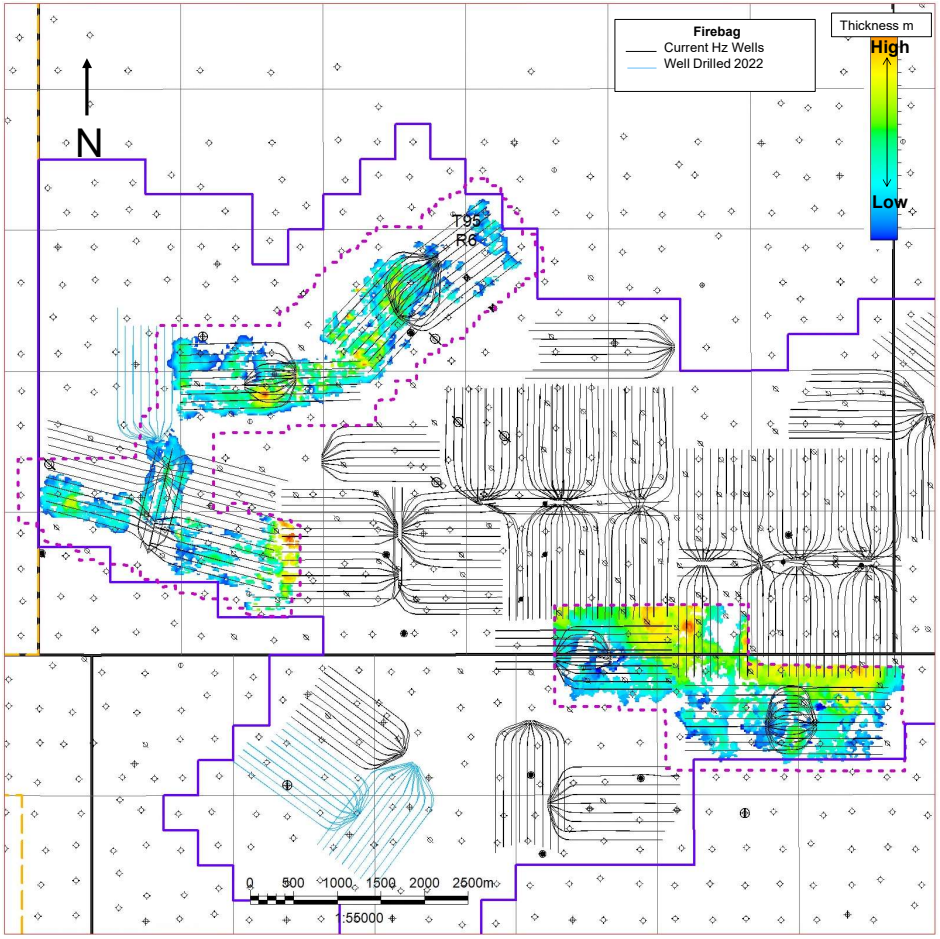
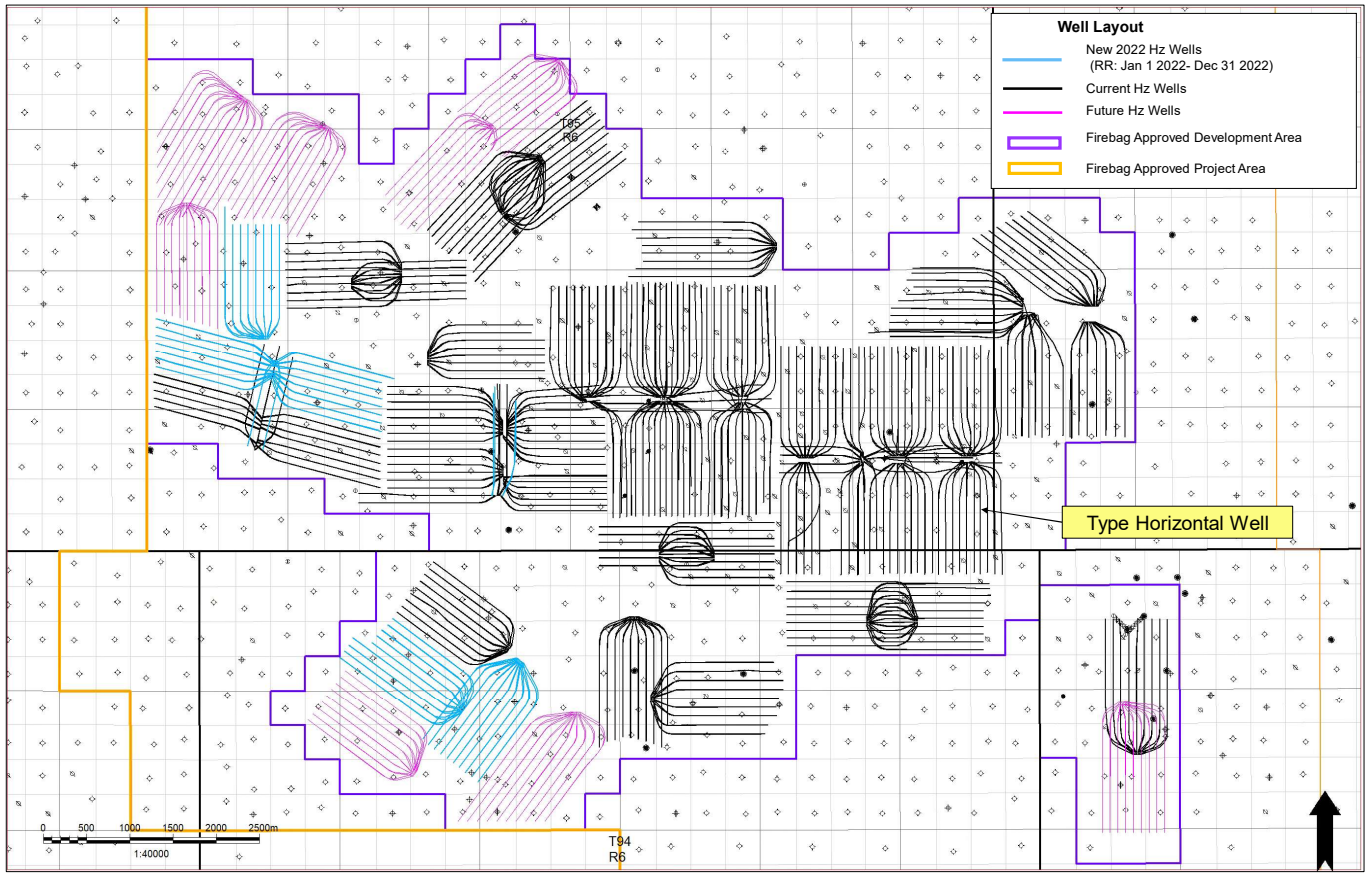
2022 4D Seismic Thickness Map

- 2 4D surveys completed over Pad 118 & 110E and over Pad 112, 114, and 121

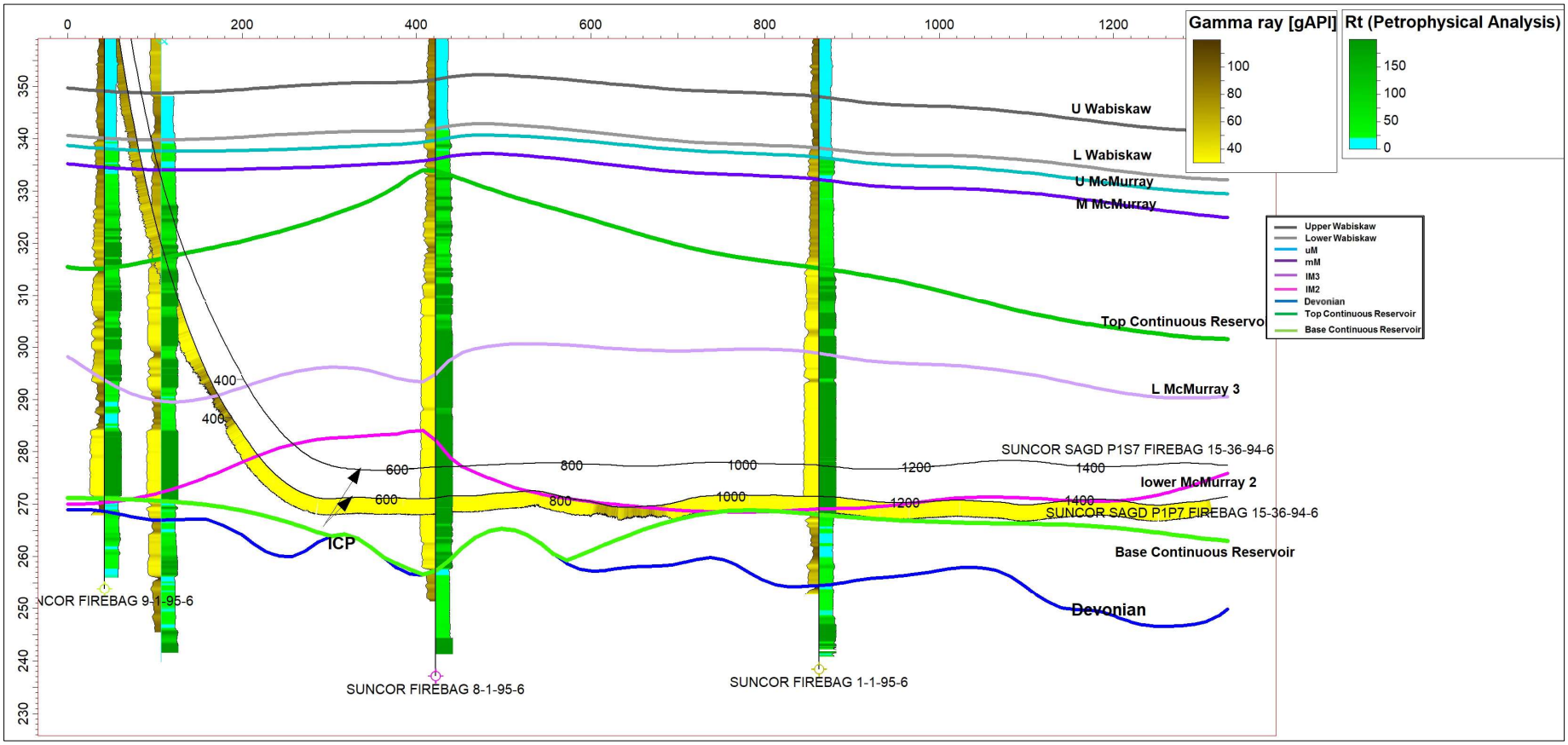


Type Well Location Map

Type Horizontal Well – Pad 101 Pair 7



Structural Cross Section Example

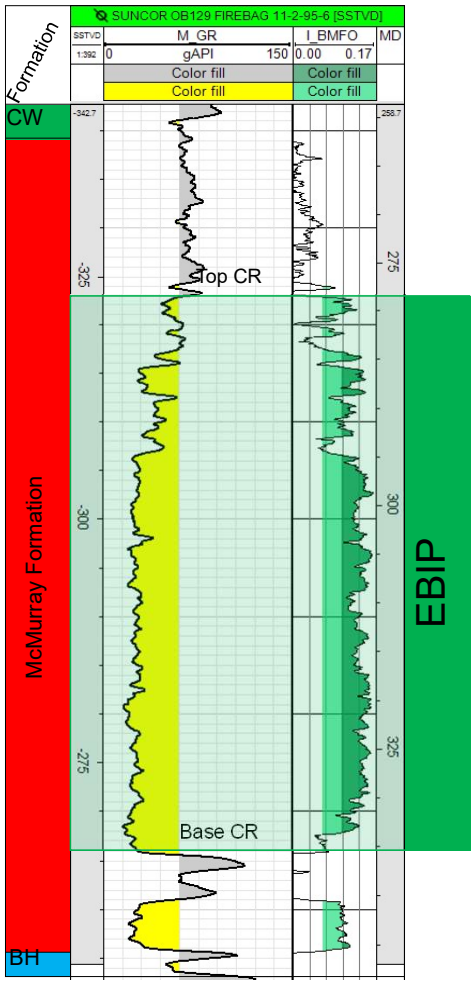


Pad 101 Well Pair 7

**Coreholes are projected onto cross section*

Exploitable Bitumen in Place Methodology

- Exploitable Bitumen in Place (EBIP) is defined in each well by the top and base of Continuous Reservoir. It is selected at the base of a continuous sand unit either developed or most likely to be developed.
  - Continuous Reservoir base: lowest portion of the continuous reservoir sandstone with Bulk Mass Fraction of Oil (BMFO) cut off of 6%, <3m of >50% mud/breccia in the lower portion.
  - Continuous Reservoir top: 2m of mudstone, no BMFO or porosity cut offs.
- Upper Lean, Middle Lean, and Gas Zones that are in pressure communication with the continuous reservoir are included with no thickness cutoffs.
- Observation wells and 4D seismic will take precedence over pre-operations core and log based picks.



CW: Clearwater Formation
BH: Beaverhill Lake Group

Exploitable Bitumen in Place & Average Reservoir Properties

Pad	HC Area (e^3m^2)	Continuous Reservoir Thickness (m)	Porosity	Average Permeability (mD)	Oil Saturation	EBIP (e^6m^3)	EBIP (MMbbl)
SAGD Pad 101	1,756	52.3	0.320	5000 - 8000	0.78	23.0	144.8
SAGD Pad 102	1,608	59.9	0.315	5000 - 7000	0.73	21.9	137.8
SAGD Pad 103	1,927	43.3	0.316	5000 - 7000	0.73	20.1	126.2
SAGD Pad 104	1,910	45.0	0.321	5000 - 8000	0.76	21.1	133.0
SAGD Pad 105	2,625	37.1	0.326	5000 - 8000	0.78	24.1	151.9
SAGD Pad 106	1,602	38.5	0.324	5000 - 8000	0.79	17.2	108.3
SAGD Pad 107	1,381	46.1	0.319	5000 - 8000	0.74	13.7	86.3
SAGD Pad 108	1,726	46.1	0.321	5000 - 7000	0.76	19.5	122.8
SAGD Pad 109	1,486	27.9	0.328	5000 - 7000	0.76	10.3	64.9
SAGD Pad 110	1,449	35.0	0.322	4000 - 6000	0.70	11.4	71.9
SAGD Pad 111	1,590	41.7	0.324	5000 - 8000	0.79	14.5	91.2
SAGD Pad 112	1,458	38.8	0.332	5000 - 8000	0.78	15.9	99.7
SAGD Pad 114	1,473	34.2	0.322	5000 - 7000	0.76	12.5	78.5
SAGD Pad 115	749	30.1	0.324	4000 - 7000	0.71	5.2	32.9
SAGD Pad 116	1,661	39.9	0.326	5000 - 8000	0.78	16.9	106.4
SAGD Pad 117	1,744	33.0	0.321	5000 - 8000	0.72	13.8	87.0
SAGD Pad 118	2,028	40.2	0.312	5000 - 8000	0.75	19.0	119.8
SAGD Pad 121	2,094	41.5	0.324	5000 - 8000	0.72	20.2	126.9
SAGD Pad 122	2,165	36.3	0.314	5000 - 8000	0.70	17.3	108.5
SAGD Pad 123	998	42.3	0.318	6000 - 9000	0.75	10.1	63.3
SAGD Pad 131	918	36.9	0.324	5000 - 8000	0.79	8.7	54.4
Combined Operating Pads	34,346	40.3	0.322	N/A	0.75	336.5	2116.5
Firebag Approved Development Area	71,675	34.3	0.321	N/A	0.74	583.4	3669.2
Firebag Approved Project Area	**193,513**	**30.3**	**0.319**	**N/A**	**0.71**	**1,323.1**	**8,322.1**

EBIP: Exploitable Bitumen In Place. Without modification this generally stands for SAGD EBIP or producible bitumen in place.
HC: Hydrocarbon
EBIP = OBIP

Changes from last year reflect data from new coreholes, observation wells, time lapse seismic and some reinterpretation. EBIP procedure remains unchanged.

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Pad Recoveries

Pad	101	102	103	104	Stage 1 & 2 Totals
Recovery to Date, e3m3	18,546	14,800	13,484	13,156	59,986
Recovery Factor to Date, %	81%	68%	67%	62%	70%
Expected Ultimate Recovery, e3m3	21,876	19,650	15,032	16,584	73,142
Expected Ultimate Recovery Factor, %	95%	90%	75%	78%	85%
EBIP, e3m3	23,020	21,901	20,060	21,139	86,120

Pad	105	106	107	108	109
Recovery to Date, e3m3	13,999	9,907	8,230	7,119	3,566
Recovery Factor to Date, %	58%	58%	60%	36%	35%
Expected Ultimate Recovery, e3m3	19,182	12,481	9,997	11,172	6,331
Expected Ultimate Recovery Factor, %	79%	73%	73%	57%	61%
EBIP, e3m3	24,147	17,214	13,721	19,520	10,323

Pad	110	114	115	116	117	118	111	112	121	123	131	122	Stage 3 & 4 Totals
Recovery to Date, e3m3	4,307	2,848	2,825	9,173	3,926	2,996	48	2,056	1872	645	408	605	74,529
Recovery Factor to Date, %	38%	23%	54%	54%	28%	16%	0%	13%	9%	6%	5%	4%	30%
Expected Ultimate Recovery, e3m3	6,328	6,595	3,798	12,121	9,263	10,389	8,111	8,181	10,801	4,640	6,111	10,692	156,191
Expected Ultimate Recovery Factor, %	55%	53%	73%	72%	67%	55%	56%	52%	54%	46%	71%	62%	62%
EBIP e3m3	11,435	12,477	5,234	16,917	13,831	19,046	14,502	15,858	20,171	10,071	8,653	17,256	250,376

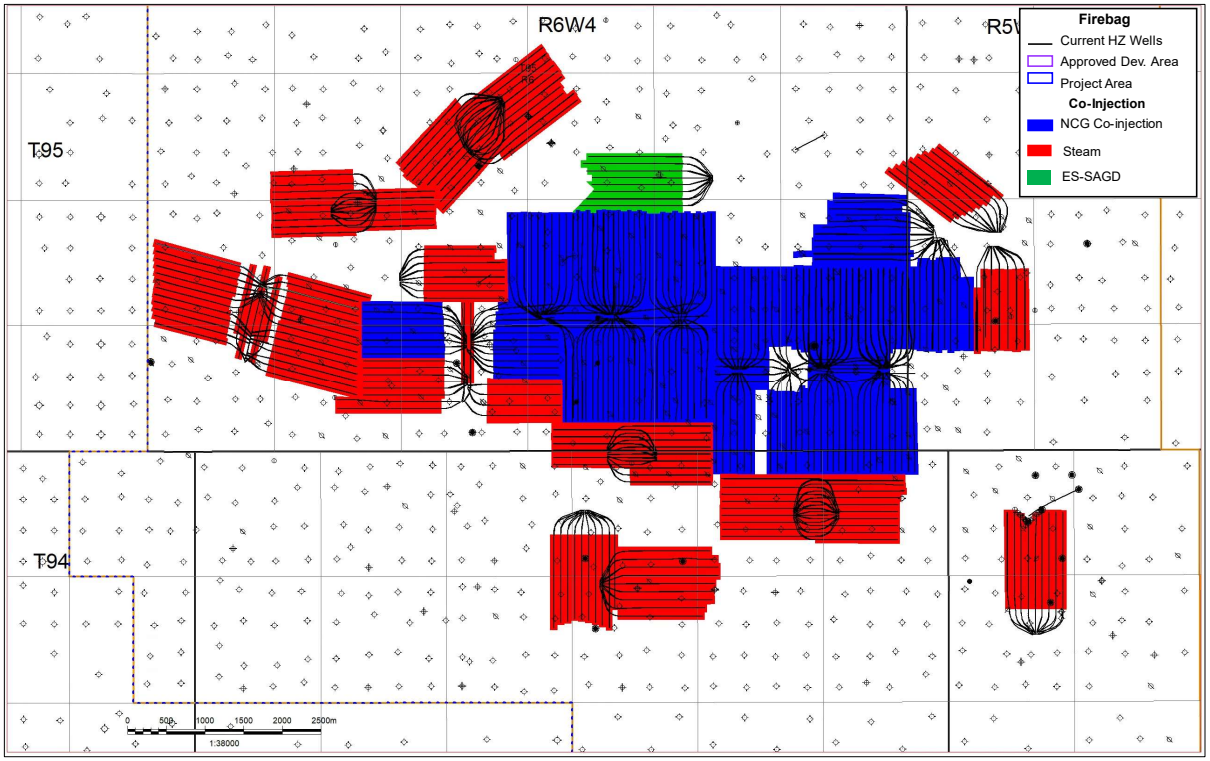
EBIP = OBIP

Average Reservoir Properties

Average reservoir properties for the operating portion of the scheme (Pads **101-112** and Pads **114-118, 121-123,** and Pad **131**)

- Initial reservoir pressure: 800kPa
- Initial reservoir temperature: 8°C
- Average continuous reservoir: 40.3 m
- Average porosity: 0.322
- Average oil saturation: 0.75
- Effective horizontal permeability: 3 to 4 D
- Effective vertical permeability: 2 to 3 D
- Viscosity: ~ 11-13.5 cp @ 215°C

Co-Injection Overview



Non-condensable gas (NCG) co-injection has been implemented on the following well pads at Firebag:

<u>Phase 1</u>

- Pad 101
- Pad 102
- Pad 103
- Pad 104
- Pad 107

<u>Phase 2</u>

- Pad 105
- Pad 106
- Pad 108
- Pad 116

Plan for NCG co-injection for Pad 109 on Q1 2023

Co-Injection Strategies

- Non-Condensable-Gas (i.e. methane fuel gas) co-injected with steam has been implemented on 9 mature pads (Pad101-108 and Pad116) since May of 2018.
- In Firebag, NCG and steam co-injection typically commence on a pad when estimated ultimate recovery (EUR) recovery has exceeded 65%, through normal SAGD operations.
- Geological characteristics, SAGD performances/optimization approaches and surface infrastructure are also considered when evaluating timelines for NCG co-injection.
- Main factors considered to determine, execute and monitor NCG steam co-injection rates:
  - Monitor reservoir responses and main KPIs (key performance indicator) to adjust NCG target rates.
  - Field wide strategies to cut steam from mature pads and replace with NCG
  - Maintain the desired chamber pressure for the matured pads.
  - NCG retention within the reservoir, considering the balance between NCG leak off and volume of the NCG produced back.
  - Sulphur Recovery Unit (SRU) capacity limit to handle the level of produced gas at the field level

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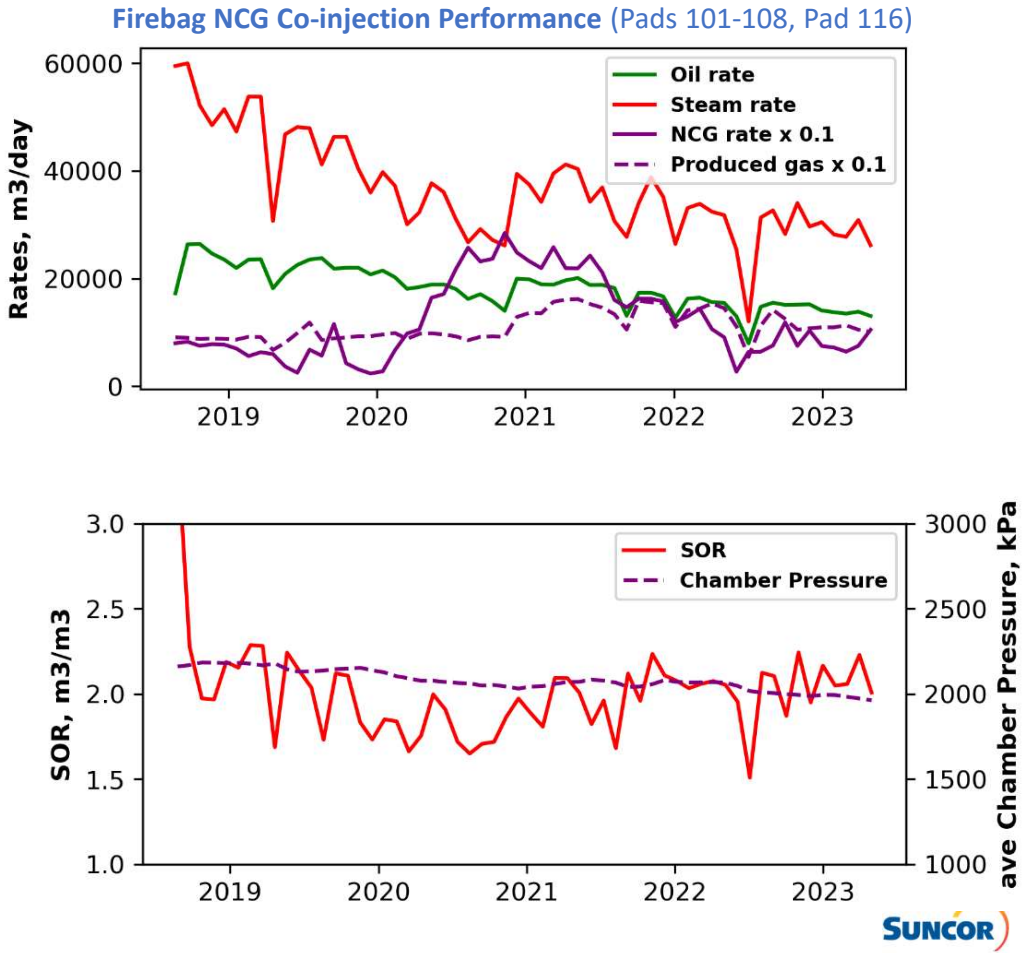
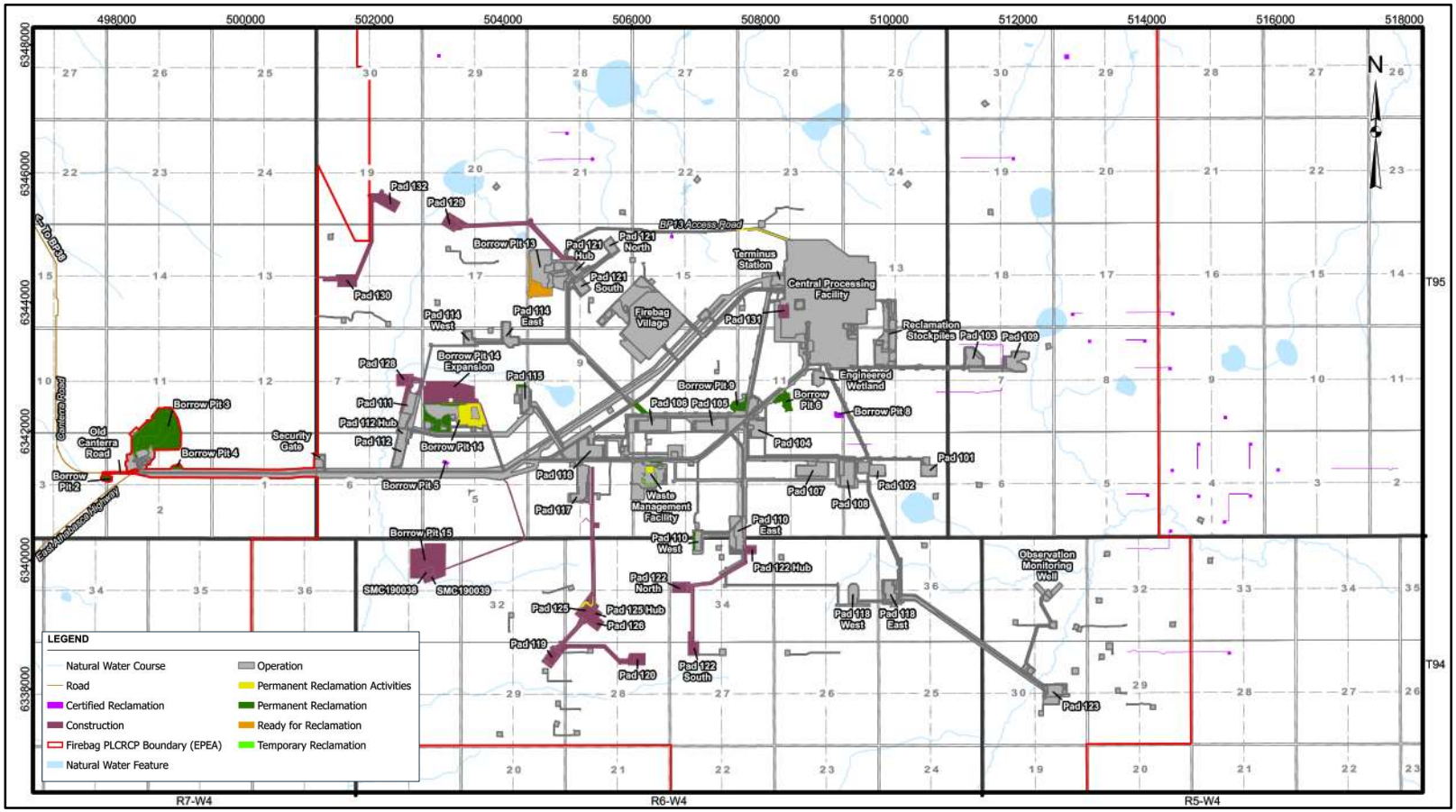
Co-Injection Observations

- No negative impacts on oil rate after NCG co-injection, other than natural decline
- Continuous reduction of steam injection rate.
  - Steam re-allocated to younger SAGD pads.
  - Unable to increase NCG injection and further cutting steam in 2022 due to reaching the gas handling capacity limit
  - SOR has generally decreasing trend, except recently as explained above
- Maintained the decreasing trend in reservoir pressure targets by NCG co-injection.
- Co-injected NCG with steam in the range of 0.15-0.35% mole fraction during January 2022 to December 2022.
- Gradual increase in produced gas from reservoir (40% of injected NCG is produced back).
- No significant temperature reductions have been observed within existing steam chambers from observation well temperature/pressure data.



Surface
4.3

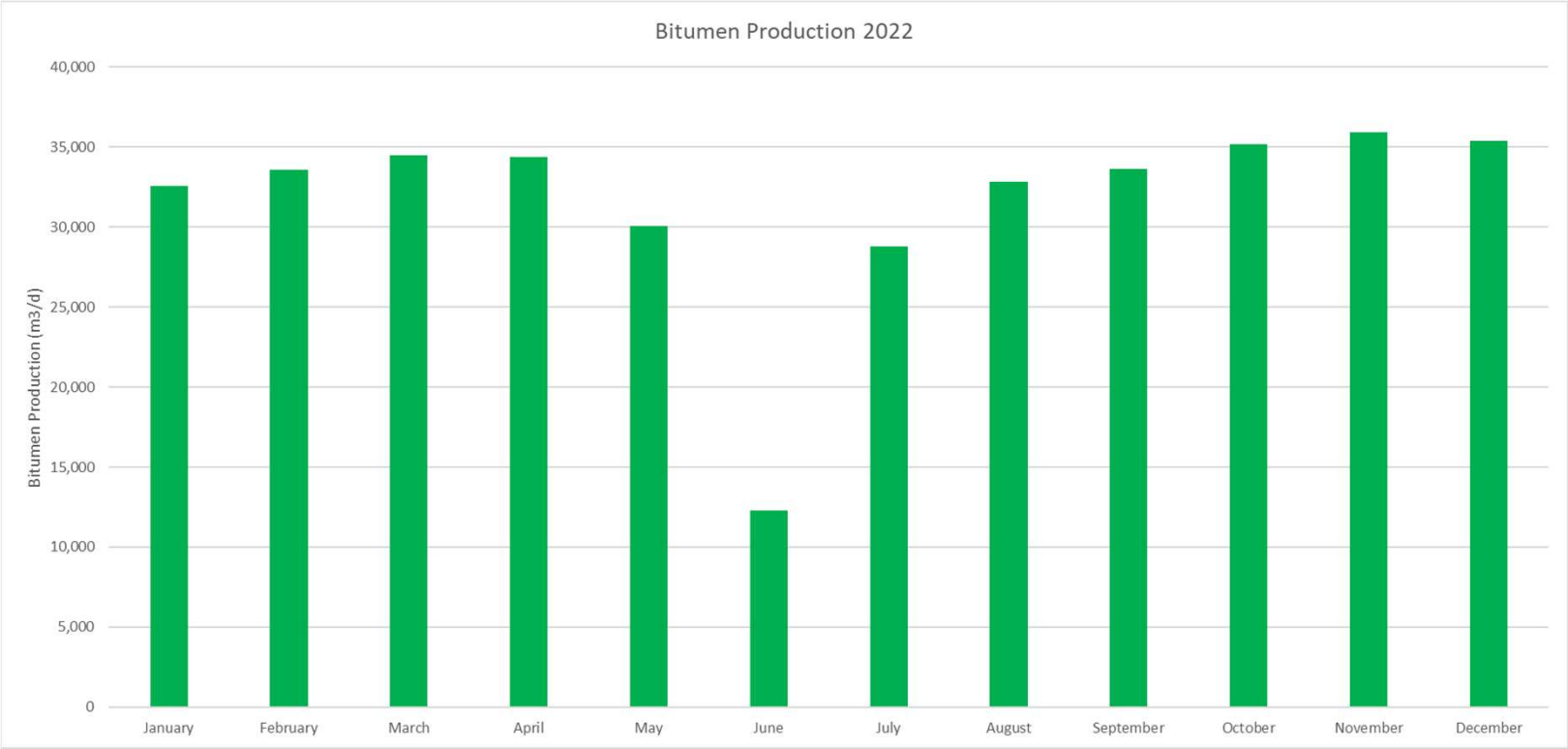
Overview of Built and Planned Surface Infrastructure



There have been no modifications to the Central Processing Plant (CPF) during the reporting period that have required an Alberta Energy Regulator (AER) application approval.

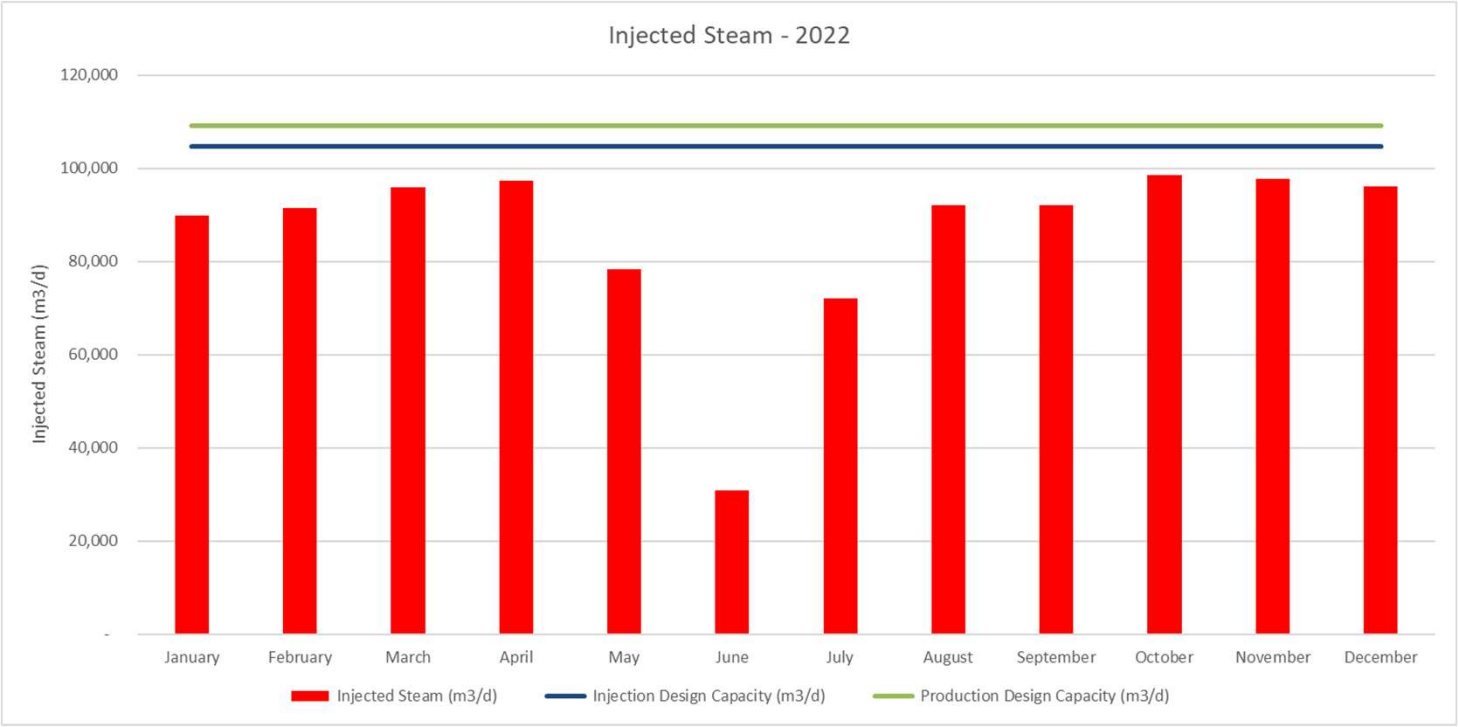
Annual Rates – Bitumen

- From January 2022 to December 2022 Firebag averaged 31,597 m^3/day (199 kbbl/d) of bitumen production.
- The design rate for Firebag is 34,182m^3/d (215 kbbl/d) at 2.8 SOR.



Annual Rates – Steam

- From January 2022 to Dec 2022 Firebag injected on average 86,004 CWE m^3/day (541 CWE kbbl/d) of steam into the wells.
- The average injection design capacity is 104,760 m^3/d (659 kbbl/d)
- The average production design capacity is 109,100 m^3/d (686 kbbl/d)



Historical and Upcoming Activity
4.4

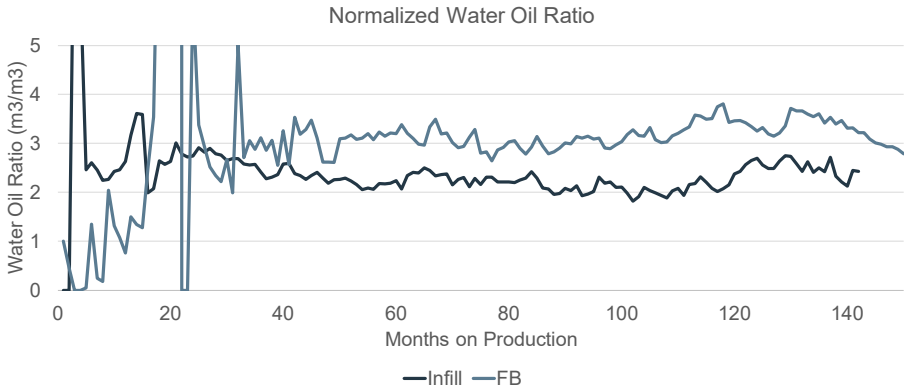
Summary of Key Learnings

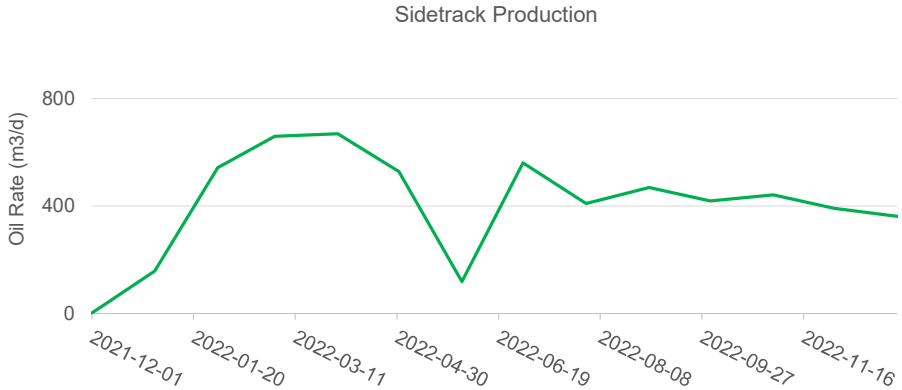
Infill Well Performance:

- 54 infill wells are currently in operation at Firebag.
- Infill well performance is optimized through effective management of infill and base well interactions at the steam chamber level.
- Infills are a reliable source of continued low water-oil ratio (WOR) production

Sidetrack Well Performance:

- 2 sidetrack wells were brought on production during the reporting period
  - Enables access to new resource from existing underperforming wells
- These sidetrack wells are demonstrating beneficial WOR and SOR metrics due to their pre-heated steam chambers.





Summary of Key Learnings

Observation Well Monitoring

- Observation wells continue to be utilized for both caprock integrity monitoring and optimization in the current operating area. They also continue to be incorporated into development planning and are drilled for new pads prior to first steam.
- Standard completion designs include a thermocouple string that spans the reservoir zone and into the caprock and/or individual pressure and temperature gauges in specific zones.
- Observation wells are useful in assessing reservoir connectivity and mobility using pressure monitoring gauges.

Pad Start Up

- Safe start-up of pad 111 (17 Well Pairs)
- Combined circulation and bullheading (i.e. without circulating a portion of the steam back to surface) methods have been applied to new pad start ups over the years.
- Bullheading requires less cumulative steam to achieve the same reservoir heating as circulation. This reduces cSOR and emissions produced.

Advanced Reservoir Management for Improved Energy Efficiency

- Firebag is actively exploring opportunities that incorporate data analytics to further optimize steam allocation and subsequently energy efficiency.
- Regional optimization has proven successful in leak-off management strategies, which mitigate the loss of injected energy.
- Steam chamber pressures are managed among pads to optimize heat efficiency.

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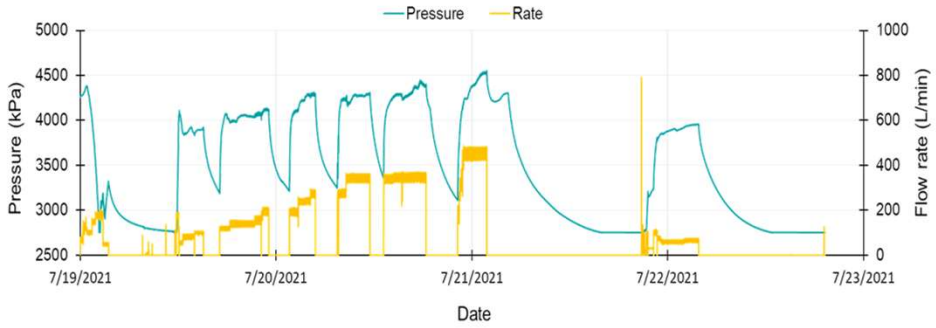
New Technology Update: Pad 123 Dilation Start-Up

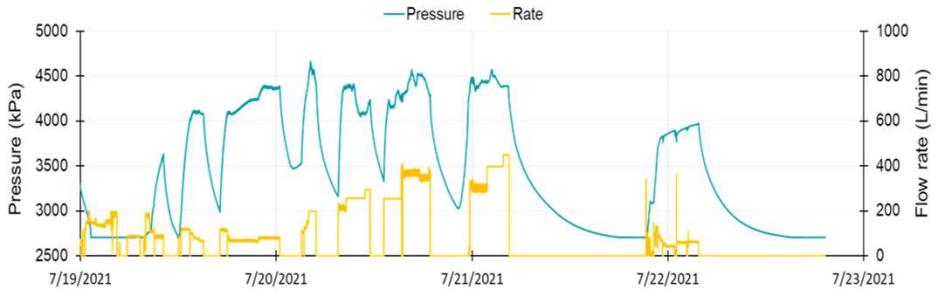
- Involves controlled high-pressure cold water injection to achieve shear failure of sand to permanently improve permeability by creating a dilated zone around SAGD wells
- Dilation start-up was tested as a solution to very low injectivity experienced at P123
- Application No. 1932797 under AER D023 Cat. 2, on April 23, 2021
- Approval No. 8870MMMM (24), on June 8, 2021, for Pads 122 and 123

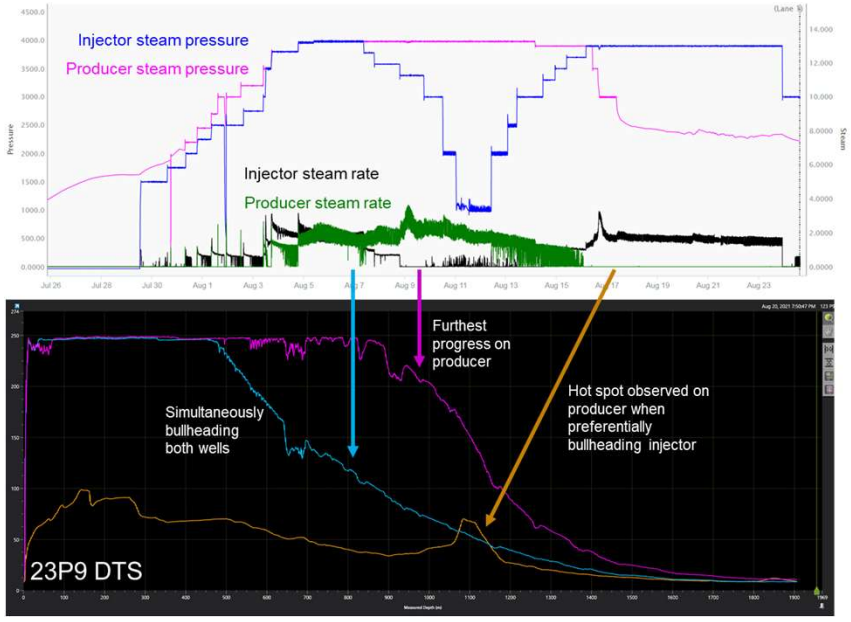
- Dilation start-up was conducted on one well pair only: 23S9 + 23P9
- Measured WHIP, calculated BHIP (shown below)
- DTS installed in producer well only
- 23P9 max pressure = 4750 kPa; Total volume injected = 456 m^3
- 23S9 max pressure = 4840 kPa; Total volume injected = 434 m^3
- Observed pressure-dependent injectivity improvement and prod-inj communication
- Steam rates at MOP could not sustain bullheading, reverted to circulation

23P9



23S9



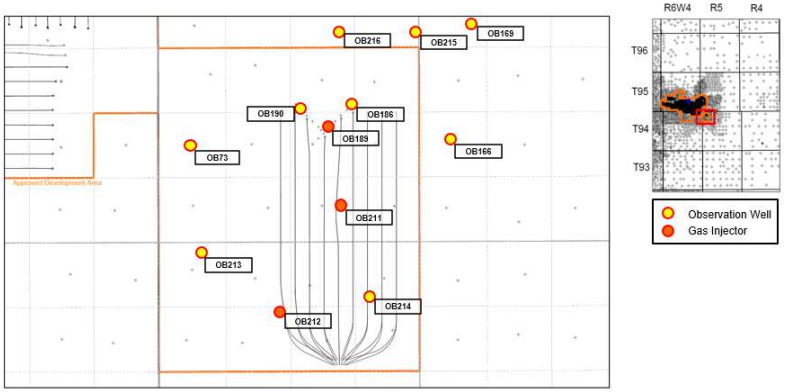


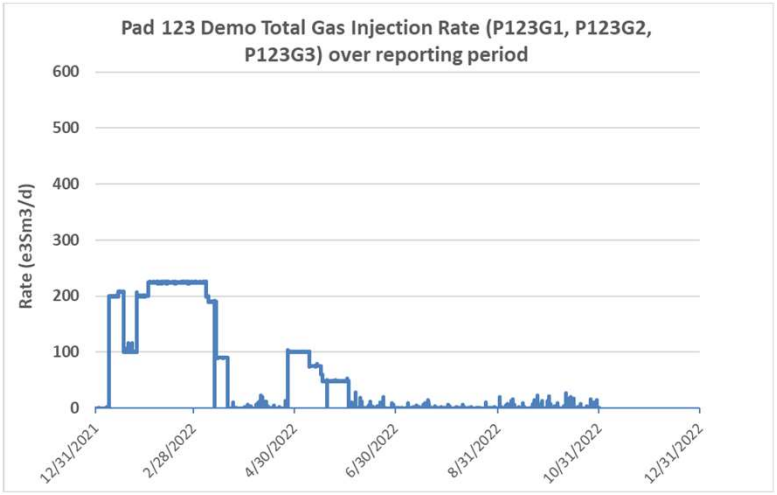
New Technology Update: Pad 131 ES-SAGD (Diluent Co-Injection)

- Pad 131 designed as an ES-SAGD pad (commercial demonstration)
- Equipped with a dedicated test separator (horizontal, vertical separators, instrumentation)
- Comprehensive surveillance program started with SAGD baseline (Mar-Sep 2022)
- All 8 well pairs are co-injecting HT-MUD (hydrotreated make-up diluent) since Nov 2022
- Target hydrocarbon co-injection concentration is 10 vol%
- Planned duration of co-injection is 2 years
- Pad 131 is designed to demonstrate that all KPIs meet or exceed those used in Commercial Project Business Case(s)
- Pad 131 is intended to operate as per commercial design, meaning starting diluent injection early in well life to maximize solvent recovery factor

New Technology Update: Pad 123 Gas Injection Demonstration

- Suncor started gas injection in Pad 123 on August 5, 2017 as per AER approval.
- Firebag fuel gas (primarily methane) is used for the current injection scheme.
- Suncor has safely utilized all 3 gas injectors (P123G1, P123G2, P123G3) throughout 2022 while adhering to the terms of the AER approval with respect to containment of gas in the McMurray zone.
- Suncor has optimized the gas injection rate/pressure in accordance with long term steam chamber operation associated with Pad 123 SAGD.
- Gas injection is currently shut-in based on Suncor's lean zone operating strategy.





Summary of Events

- The following horizontal wells were drilled during the reporting period:
  - Pad 119 (9 well pairs)
  - Pad 126 (9 well pairs)
  - Pad 128 (8 well pairs)
  - Pad 117 infills (2 well pairs)

- The following SAGD well pads were started up during the reporting period:
  - Pad 111

Suspension and Abandonment Activity

4.4.9 a) b)

License	Well Type	Well Name	UWI	Spud Date	Activity	ABN/SUSP Date	Justification	Remaining Reserves
260999	Producer	SUNCOR SAGD P2P10 FIREBAG 16-35-94-6	103/16-35-094-06W4/00	12/17/2001	Suspension	9/30/2022	Lack of productivity, no cellar oil/not a good sidetrack candidate	382,000 m3
448420	Infill	SUNCOR P3N8 FIREBAG 11-12-95-6	107/11-12-095-06W4/00	10/22/2012	Suspension	10/25/2022	Lack of productivity, no cellar oil/not a good sidetrack candidate	890,000 m3 (some of it is recoverable by new sidetrack on 3P8 well)

- Suncor does not anticipate abandonment of any Firebag SAGD pads within the next 5 years.

Future Plans

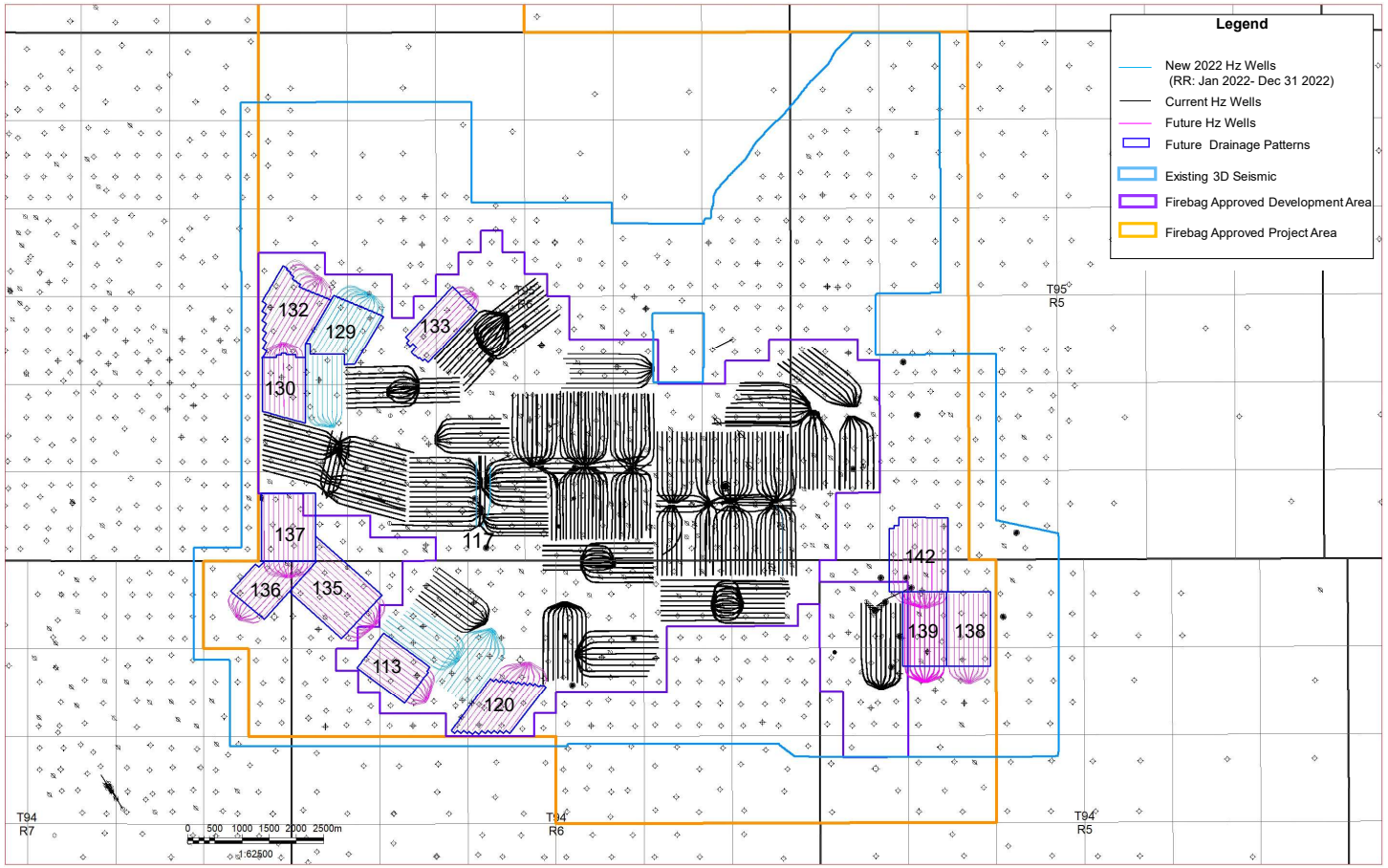
- The following horizontal drilling activities are expected to commence within the next year (2023):
  - Pad 129 (11 well pairs)
  - Pad 130 (9 well pairs)
  - Pad 132 (12 well pairs)
  - Production well horizontal sidetracks within existing pads (3 wells)

- The following first steam dates are planned to occur within the next year:
  - Pad 125: Q1 2023
  - Pad 126: Q1 2023
  - Pad 119: Q2 2023
  - Pad 128: Q3 2023

- Coreholes, observation wells, and 4D monitor surveys will be planned as necessary to:
  - Monitor SAGD operations
  - Adequately delineate the resource
  - Further caprock integrity analysis
  - Conduct hydrogeology analysis
  - Conduct water disposal analysis

- Development plans are evaluated annually and are therefore subject to change.

Future Plans - 5 Year Outlook



The above map highlights development activities that are planned at Firebag for the next 5 years.

Development plans are evaluated annually and are therefore subject to change.

Regulatory Applications

Approved Applications:

Application #	Description	Registration Date	Approval Date	Application Type
1935393	Logging waiver request	5-Jan-22	6-Jan-22	OS Drill/Log Waivers
1935637	Devonian Injectivity Tests	27-Jan-22	11-Feb-22	Injectivity Test
1935884	Drilling waiver request for Pad 119	17-Feb-22	23-Feb-22	OS Drill/Log Waivers
1935883	Logging waiver request for Pad 119	17-Feb-22	22-Feb-22	OS Drill/Log Waivers
1935973	Class 1 disposal application to increase max pH to 13 over 6-month period	1-Mar-22	25-Apr-22	Class I Disp: Amend
1936329	Temporary use of Emission Control Device	4-Apr-22	3-May-22	Comm Amend Category 1
1937704	Amendment Application for Pad 133 and 134	12-May-22	20-Jun-22	Comm Amend Category 2
1937705	Amendment Application for Pad 113	12-May-22	20-Jun-22	Comm Amend Category 2
1938281	Drilling waiver request for Pad 128	9-Jun-22	13-Jun-22	OS Drill/Log Waivers
1938282	Logging waiver request for Pad 128	9-Jun-22	13-Jun-22	OS Drill/Log Waivers
1938953	Amendment Application for Pad 122	11-Aug-22	30-Sep-22	Comm Amend Category 2
1939160	Amendment Application for Pad 121	31-Aug-22	30-Sep-22	Comm Amend Category 2
1939373	Drilling and logging waiver request for Pad 129	20-Sep-22	22-Sep-22	OS Drill/Log Waivers
1939429	Injectivity Test	26-Sep-22	14-Mar-23	Comm Amend Category 2
1934433	Injectivity Test	11-Nov-22	14-Dec-22	Comm Amend Category 1
1941236	DWT Bypass Trial Extension Request	30-Nov-22	27-Jan-23	Class I Disp: Amend
1941234	Devonian Injectivity Tests	30-Nov-22	3-Jan-23	Injectivity Test
1941520	Drilling waiver request for winter drilling program	20-Nov-22	21-Nov-22	OS Drill/Log Waivers

Future Applications: N/A

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Wellbore Integrity Failure

Well	Date of Failure	Cause
SUNCOR P111P3 FIREBAG 2-8-95-6	30-Dec-2022 (suspected)	Liner Failure (Sand Production)

*This well is being evaluated for a re-drill

Intermediate Casing Corrosion Prevention:

- Proactive corrosion batch inhibition performed semi-annually on wells that show signs of corrosion during pump changes
- Corrosion analysis logs like caliper, darkvision etc. planned on wells that show signs of corrosion during pump changes

Surface Casing Vent Flow Prevention:

- Following general industry best practices such as good thermal cementing, premium connections on intermediate casing, monitoring CBL logs

Initiatives for Improving Well Integrity:

- Various initiatives are underway and consideration such as proactively changing the wellhead wing valves to improve design (ported AV types) to prevent any freezing occurrences

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Compliance History

2022 (Jan-Dec)	Number of occurrences	Reference no.	Date of occurrences	Details of occurrences	Suncor Actions
SO2 CEMS Exceedance	1	386953	09-Jan-22	Sulphur Recovery Unit had one hourly SO2 exceedance	Performed actions to lower SO2 emissions to under the approved limit
Venting >10 min	19	387525, 389653, 389844, 390537, 391252, 391067, 400255, 400648, 400689, 400934, 401294, 401495, 401654, 401802, 401843, 402649, 403828, 404440, 404880	Various	Venting occurrences from tanks due to various reasons that lead to overpressure.	Stopped venting as soon as possible and investigations were performed, preventing further similar cases
Gas release	2	390948, 404815	Various	Natural gas releases from a vent	Stopped the venting as soon as possible and investigated causes of release
Contravention	5	387431, 388778, 390564, 391128, 404700	Various	Various approval violations (missed monitoring, CEMS availability, SRU temperature exceedance, etc.)	Performed necessary follow-up actions to be in compliance
Spill	12	388263, 388426, 388718, 388959, 390269, 390325, 390991, 391042, 391085, 400812, 401974, 405060	Various	Various liquid releases that occurred on site	Prevented further spilling, cleaned up spill, and investigated to prevent further similar occurrences

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Compliance with Daily Average Maximum Operating Pressure

The following occurrences have taken place from Jan 1, 2022 – Dec 31, 2022 and are reported as per the daily average Maximum Well Head Injection Pressure (MWHIP) Approval (No. 8870LLL):

Well	Date	Duration (hrs)	MOP (kPag)	Peak Pressure (kPag)	Daily Average Injection Pressure (kPag)
122P2 Bottomhole pressure	01/01/2022	1.5	4040	4124	3532
123S3 Bottomhole Pressure	01/06/2022	1.5	3570	3598	3561
123S3 Bottomhole Pressure	01/06/2022	11	3570	3602	3561
123S3 Bottomhole Pressure	01/07/2022	13	3570	3626	3032

- No occurrences resulted in a daily average injection pressure above the specified MOP.
- Learnings have been incorporated into future start ups to decrease the likelihood of reoccurrence.

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Update on Deferral Approval for 4P10 Repair of SCVF

- As per Nov 10, 2016 Approval, Suncor has drilled 3 Quaternary monitoring wells on Pad 104 to monitor for potential groundwater impacts around the SCVF at 4P10.
- Sampling results to date indicate no groundwater impacts from 4P10 SCVF. Based on groundwater sampling, geochemical and lab simulation conducted, increasing trends of a few parameters are attributed to heating as opposed to SCVF gases (2020 Groundwater Compliance Monitoring Report, Suncor Firebag Facility, Central Processing Facility and Well Pads, Approval No. 0080105-01-00, March 2021).
- As a result, in 2021, Suncor installed wells QW23 and QW25 upgradient of 4P10A, 4P10B and 4P10C as per the requirements of the Directive for the Assessment of Thermally-Mobilized Constituents for Thermal In Situ Operations.
- Suncor has received permission to remove sampling of 4P10A and 4P10B from the sampling program and continue with the sampling of the new upgradient wells.
- Results of groundwater sampling at 4P10C, QW23 and QW25 are to be reported in detail within the Firebag Annual Groundwater Compliance Monitoring Report as per Approval No. 0080105-01-00 going forward.
- Monitoring continued for SCVF events in 2022. None to report.

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Update on Deferral Approval for 8S3 & 14P10 Repairs

SUNCOR SAGD P8S3 FIREBAG 9-1-95-6

- Extension approval to the 8S3 SCVF repair was received on June 10, 2022.
- Suncor continuously monitors SCVF through a vent nanny, which had not shown a continuous flow.
- Suncor performs a shut in pressure build up test on 8S3 every quarter, and the tests show a declining trend in the pressure build up profile with time.

SUNCOR P114P10 FIREBAG 16-7-95-6

- Suncor Firebag well 14P10 had a casing failure at 12.80 mKB. The casing failure was previously repaired by installing a high temperature Saltel casing patch over the casing failure location.
- The casing patch leaked. Attempts to repress the patch did not stop the leak permanently. The well was shut down for several months while investigating next steps.
- Suncor received an approval on August 17, 2022 to defer the repair of the casing failure.
- As per the approval, Suncor conducts SCVF tests every six months. No significant pressure build up noticed.
- A vent nanny was set up for this well for continuous monitoring of SCVF.

Thank you