# Cenovus Energy Inc.
# Foster Creek In-situ Progress Report
# Scheme 8623
# 2021 update

*June 30, 2022*

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# Oil & gas and financial information

Oil & gas information

The estimates of reserves were prepared effective December 31, 2021. All estimates of reserves were prepared by independent qualified reserves evaluators, based on definitions contained in the Canadian Oil and Gas Evaluation Handbook and in accordance with National Instrument 51-101 *Standards of Disclosure for Oil and Gas Activities*. Additional information with respect to pricing and additional reserves and other oil and gas information, including the material risks and uncertainties associated with reserves estimates, is contained in our AIF and Form 40-F for the year ended December 31, 2021 available on SEDAR at www.sedar.com, EDGAR at www.sec.gov and on our website at cenovus.com.

Certain natural gas volumes have been converted to barrels of oil equivalent (BOE) on the basis of one barrel (bbl) to six thousand cubic feet (Mcf). BOE may be misleading, particularly if used in isolation. A conversion ratio of one bbl to six Mcf is based on an energy equivalency conversion method primarily applicable at the burner tip and does not represent value equivalency at the well head.

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# Advisory

This presentation contains information in compliance with:

*AER Directive 054 - Performance Presentations, Auditing, and Surveillance of In Situ Oil Sands Schemes*

This document contains forward-looking information prepared and submitted pursuant to Alberta regulatory requirements and is not intended to be relied upon for the purpose of making investment decisions, including without limitation, to purchase, hold or sell any securities of Cenovus Energy Inc.


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# Subsection 4.1 1 Introduction

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# CENOVUS AT A GLANCE

## TSX, NYSE | CVE

| | |
|---|---|
| Market capitalization | **$44 billion** |
| 2022E production | **780 MBOE/d** |
| • Oil Sands | **580 Mbbls/d** |
| • Conventional | **126 MBOE/d** |
| • Offshore | **70 MBOE/d** |
| Upgrading and refining capacity | **660 Mbbls/d** |
| 2021 proved & probable reserves | **8.3 BBOE** |
| Reserves life index | **~29 years** |

*Note: Market capitalization as at April 22, 2022. Values are approximate. Expected production based on April 26, 2022 guidance midpoints. Refining capacity represents net capacity to Cenovus. See Advisory.*

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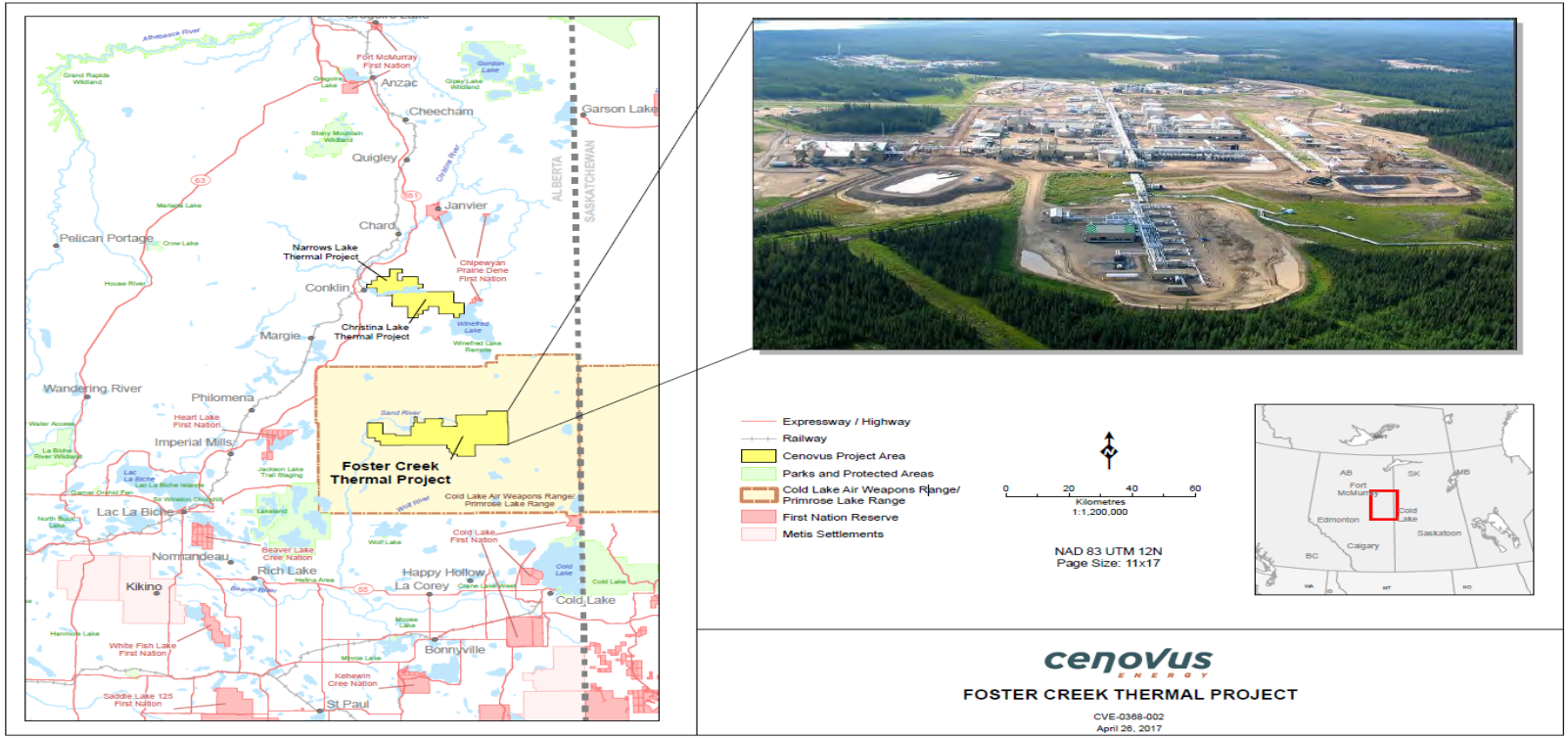
# Area map



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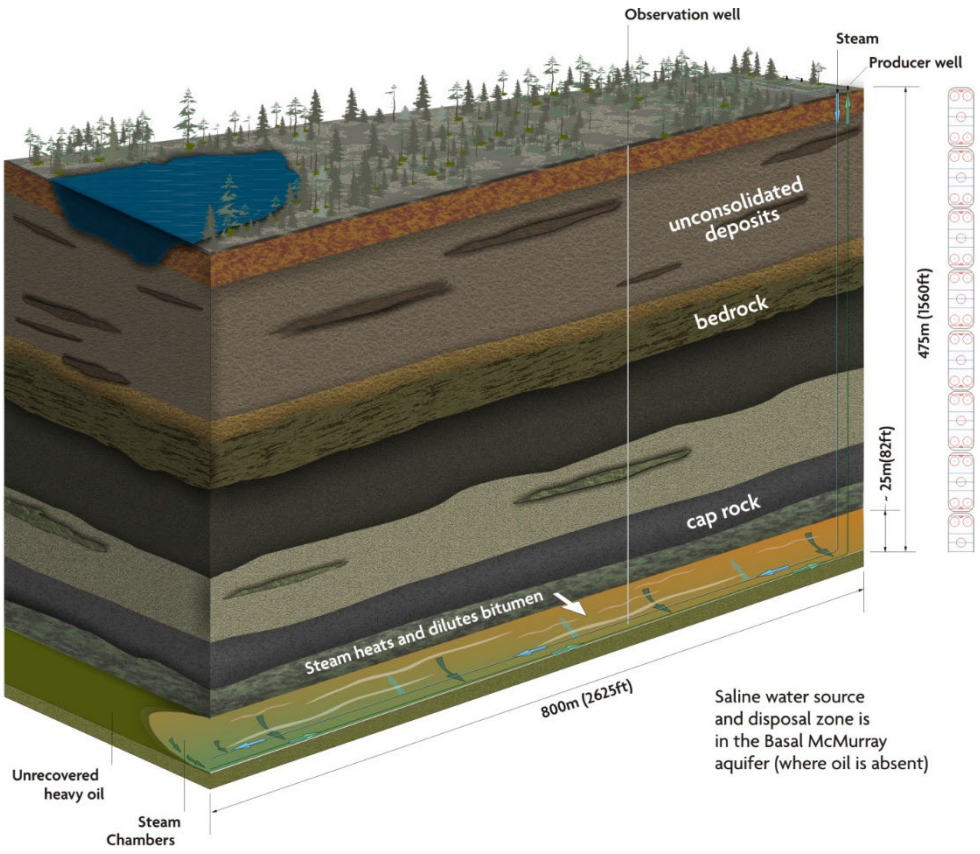
# Recovery process

- The Foster Creek Thermal Project uses the dual-horizontal well SAGD (steam-assisted gravity drainage) process to recover oil from the McMurray formation
- Two horizontal wells one above the other approximately 5 m apart
- Steam is injected into the upper well where it heats the oil and allows it to drain into the lower well
- Oil and water emulsion pumped to the surface and treated





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# Subsection 4.2 2-7 Subsurface

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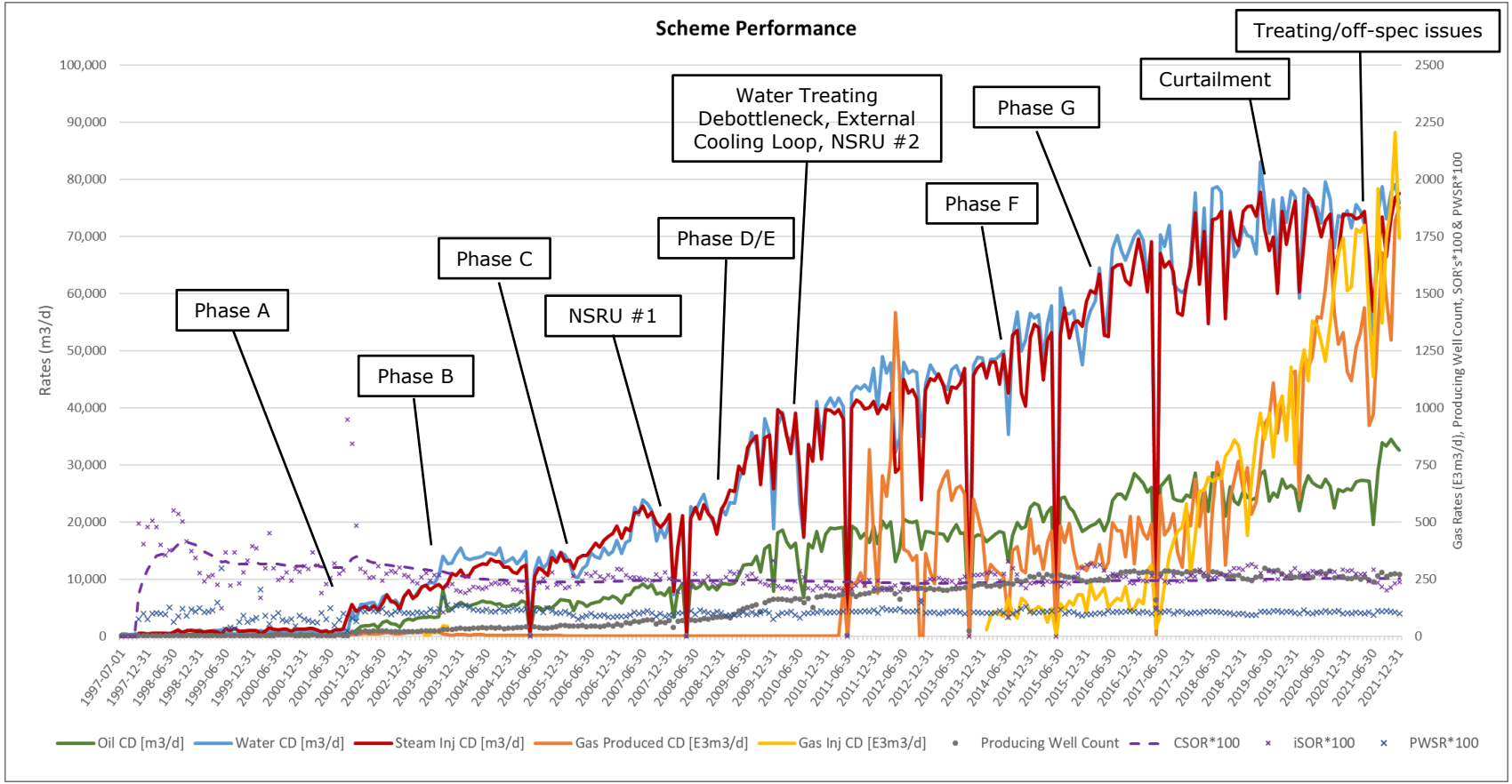
# Performance: full historical





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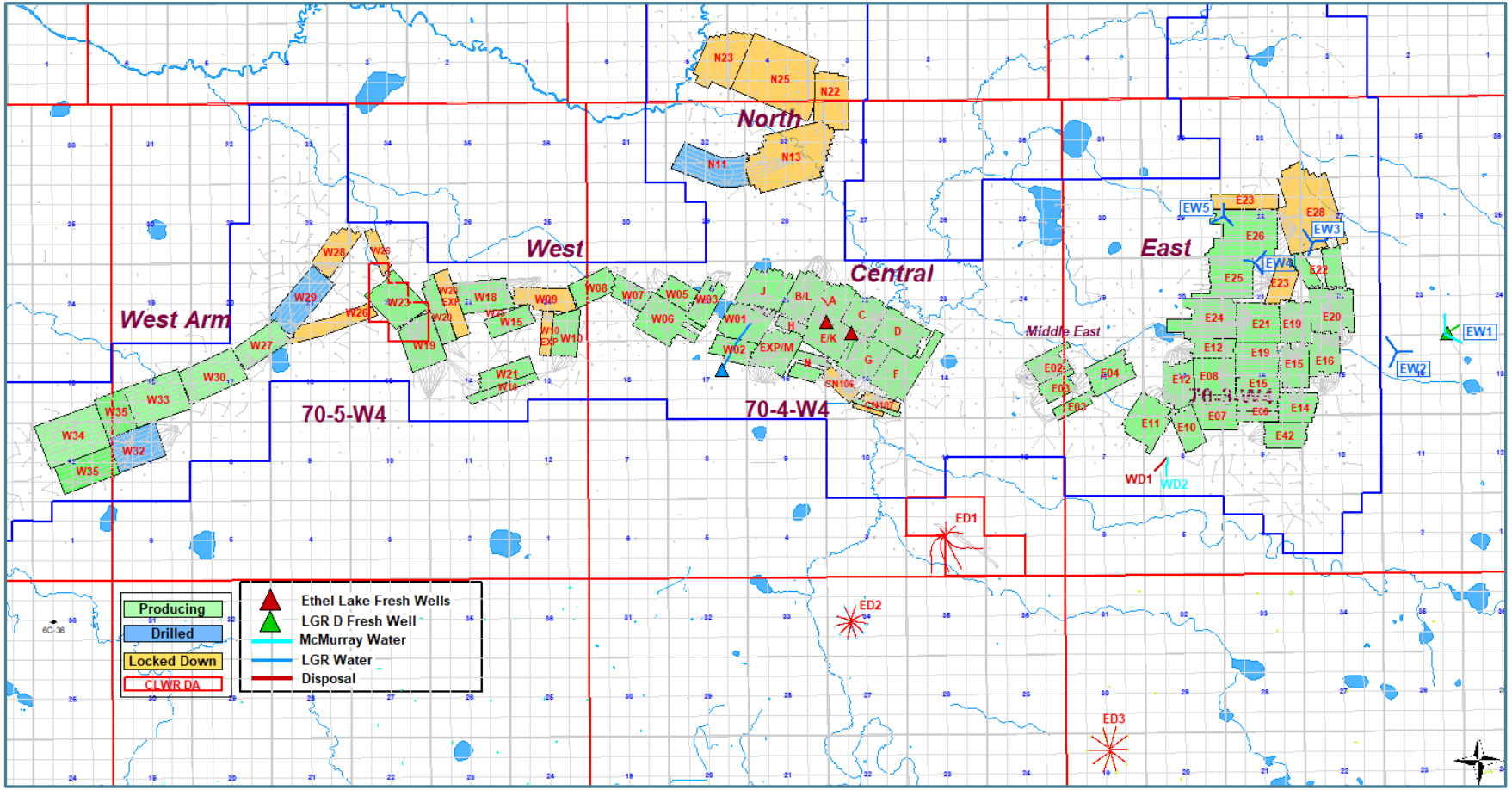
# Scheme Map



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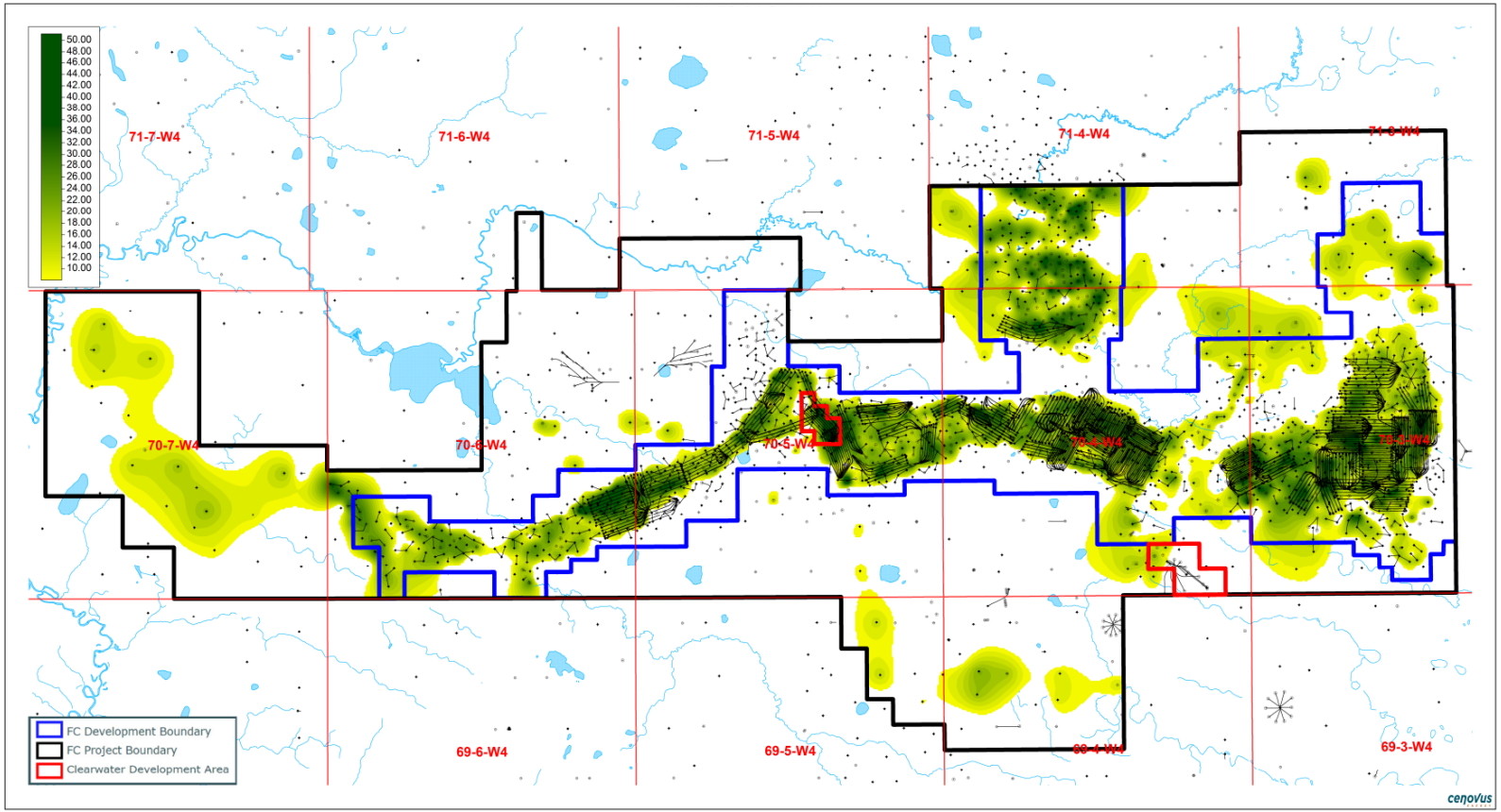
# 2021 SAGD Pay Isopach (m)




**SAGD Pay Cutoffs:**

Gamma <60 API, Porosity >27%, Rt > 20 ohm-m (=So>50%)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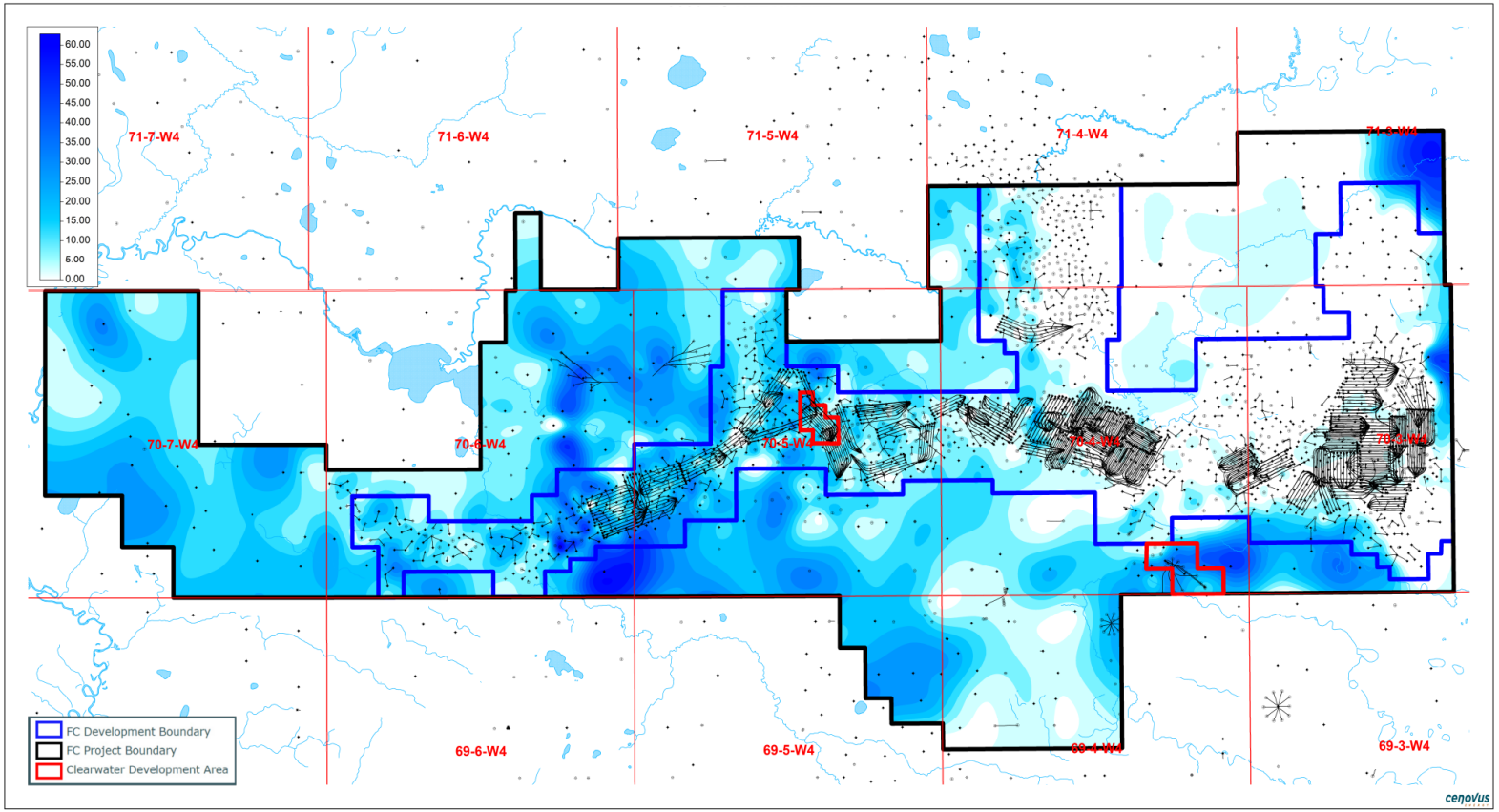
# McMurray Bottom Water Isopach (m)





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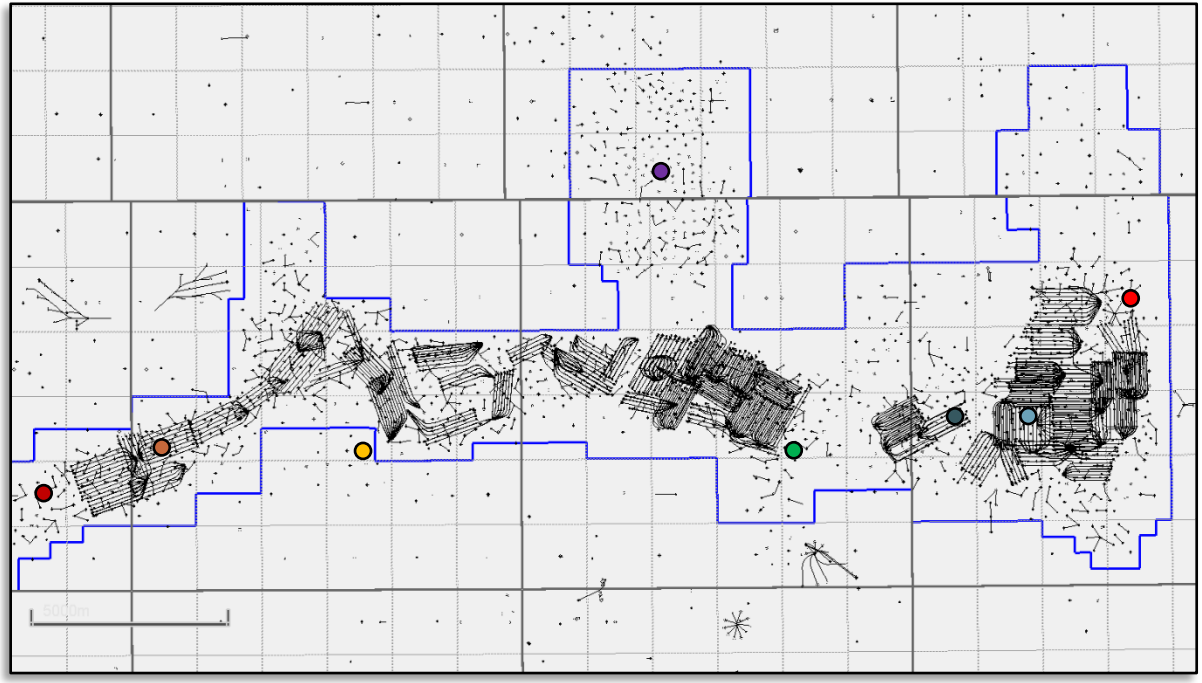
# Mini-frac and DFIT wells

- CVE recognizes that tensile and shear failure are two possible ways for integrity to be compromised
- Mini-frac or DFIT data give information about failure mechanisms and stress magnitudes

**9-17-70-3 (2009)**
**2-15-70-5 (2010)**
**3-14-70-4 (2010)**
**6-27-70-3 (2011)**
**9-11-70-6 (2012)**
**5-4-71-4 (2017)**
**15-18-70-3 (2018)**
**3-18-70-5 (2020)**

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# Summary of Mini-frac and DFIT test results

| Test date | UWI | Zone | TVD (m) | First Closure Gradient (kPag/m) | Post-steam |
|---|---|---|---|---|---|
| 2009 | 9-17-70-3 | McMurray Sand | 500.30 | 12.49 | N |
| 2010 | 2-15-70-5 | Westgate Shale | 280.30 | 21.79 | N |
| 2010 | 2-15-70-5 | Grand Rapids Shale | 360.80 | 17.55 | N |
| 2010 | 2-15-70-5 | Clearwater Shale Caprock | 421.30 | 20.98 | N |
| 2010 | 2-15-70-5 | T31 (Clearwater Shale) Caprock | 437.50 | 22.24 | N |
| 2010 | 2-15-70-5 | Clearwater Sand | 447.30 | 14.09 | N |
| 2010 | 2-15-70-5 | Clearwater Sand | 455.80 | 14.88 | N |
| 2010 | 2-15-70-5 | Wabiskaw Shale (T11) Caprock | 477.80 | 18.13 | N |
| 2010 | 3-14-70-4 | Westgate Shale | 260.30 | 21.67 | N |
| 2010 | 3-14-70-4 | Grand Rapids Shale | 344.30 | 16.91 | N |
| 2010 | 3-14-70-4 | T31 (Clearwater Shale) Caprock | 416.50 | 21.25 | N |
| 2010 | 3-14-70-4 | Wabiskaw Shale (T11) Caprock | 447.30 | 20.00 | N |
| 2010 | 3-14-70-4 | McMurray Mudstone | 459.30 | 19.29 | N |
| 2011 | 6-27-70-3 | Westgate Shale | 270.30 | 21.05 | N |
| 2011 | 6-27-70-3 | Joli Fou Shale | 330.30 | 23.69 | N |
| 2011 | 6-27-70-3 | Grand Rapids Shale | 395.80 | 17.22 | N |
| 2011 | 6-27-70-3 | T31 (Clearwater Shale) Caprock | 470.00 | 21.08 | N |
| 2011 | 6-27-70-3 | T21 (Clearwater Shale) Caprock | 493.30 | 22.91 | N |
| 2011 | 6-27-70-3 | McMurray Sand | 532.30 | 12.56 | N |
| 2012 | 9-11-70-6 | Joli Fou Shale | 313.70 | 23.46 | N |
| 2012 | 9-11-70-6 | Clearwater Shale Caprock | 434.00 | 19.94 | N |
| 2012 | 9-11-70-6 | T31 (Clearwater Shale) Caprock | 449.50 | 20.41 | N |
| 2012 | 9-11-70-6 | T21 (Clearwater Shale) Caprock | 471.50 | 21.55 | N |
| 2012 | 9-11-70-6 | McMurray Sand | 525.50 | 11.73 | N |
| 2017 | 5-4-71-4 | T31 (Clearwater Shale) Caprock | 404.00 | 20.90 | N |
| 2018 | 15-18-70-3 | T31 (Clearwater Shale) Caprock | 419.25 | 19.56 | Y |
| 2020 | 3-18-70-5 | T31 (Clearwater Shale) Caprock | 425.32 | 21.96 | N |


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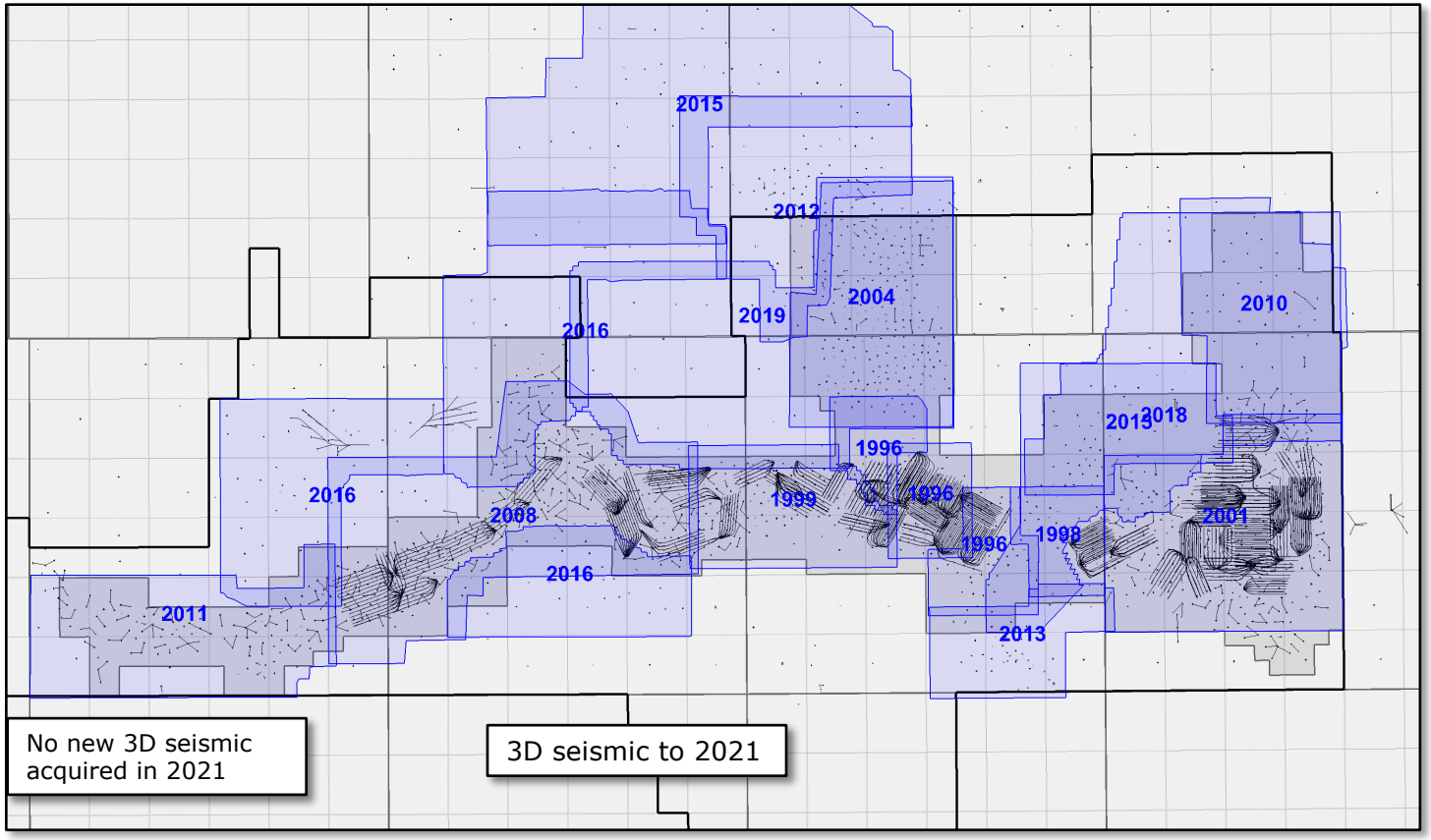
# 3D Seismic within Project Area





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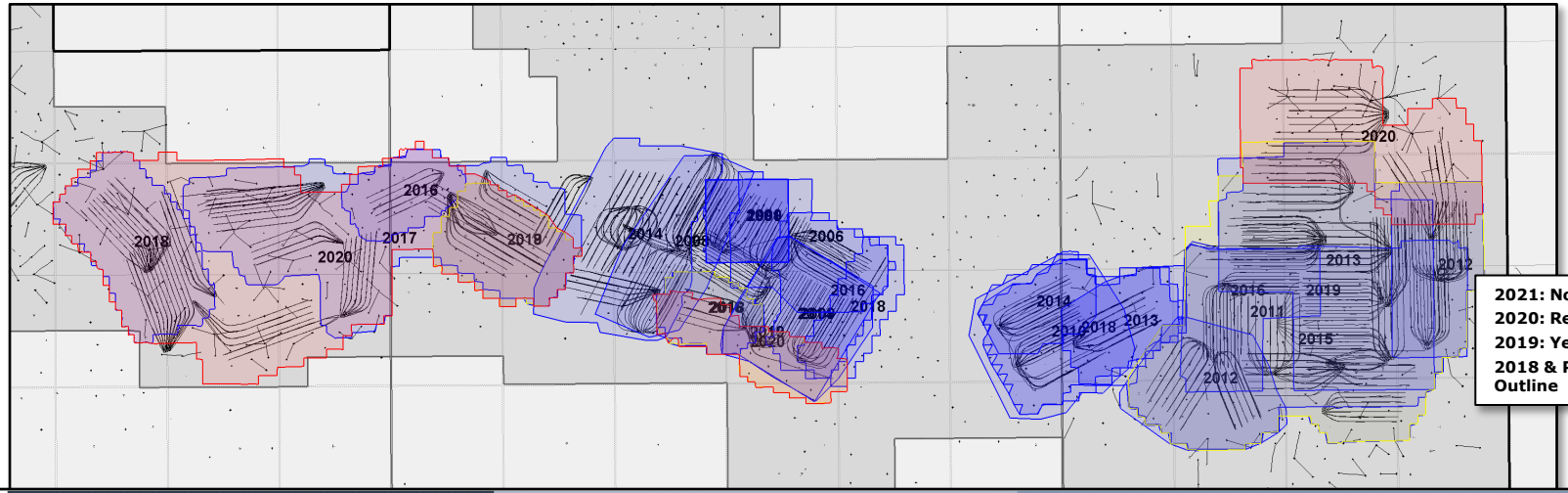
# 4D Seismic within Project Area




**2021: No new 4D acquired**
**2020: Red Outline**
**2019: Yellow Outline**
**2018 & Prior Years: Blue Outline**

| ACQUISITION YEAR | West Pod Pad Name | | | | | | | | | | | | Central Pod Pad Name | | | | | | | | | | | | | East Pod Pad Name | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | W03 | W05 | W06 | W08 | W10NS | W10EW | W15 | W18 | W19 | W20 | W21 | W23 | A | B/L | C | D | E/K | F | G | H | Exp M | N | W01 | W02 | J | E02 | E03 | E04 | E07 | E08 | E10 | E11 | E12 | E14 | E15 | E16 | E19 | E20 | E21 | E22 | E24 | E25 | E26 | E42 |
| 2006 | | | | | | | | | | | | | x | | x | x | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2007 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2008 | | | | | | | | | | | | | | x | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2009 | | | | | | | | | | | | | | | | | | x | x | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2010 | | | | | | | | | | | | | | | | | | | | | | | | | | x | x | | | | | | | | | | | | | | | | | | |
| 2011 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | x | | | | | | | | | | | | |
| 2012 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | x | x | | | | x | | x | | | | | | | |
| 2013 | | | | | | | | | | | | | | | | | | | | | | | | | | | | x | | | | | | | x | x | x | x | x | | | x | x | | |
| 2014 | | | | | | | | | | | | | | | | | | x | x | x | x | | x | x | x | x | | | | | | | | | | | | | | | | | | | |
| 2015 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | x | x | x | x | x | | x | | x | | | x | x | | |
| 2016 | | | | x | | | | | | | | | | | | x | | x | | | | x | | | | x | x | x | x | x | x | x | x | x | x | x | x | x | x | | | x | x | | x |
| 2017 | x | x | x | x | x | | x | x | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2018 | | | x | | | | | | x | | | x | | | | | | x | | | | x | | | | x | x | x | | | | | | | | | | | | | | | | | |
| 2019 | | | x | | | | | | | | | | | | | | | | | | | x | | | | | | | x | x | x | x | x | x | x | x | x | x | x | | | x | x | | x |
| 2020 | x | x | x | x | x | x | x | x | x | x | x | x | | | | | | | | | | x | | | | | | | | | | | | | | | | | | x | | | | x | | |
| 2021 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |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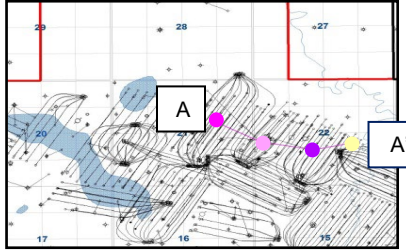
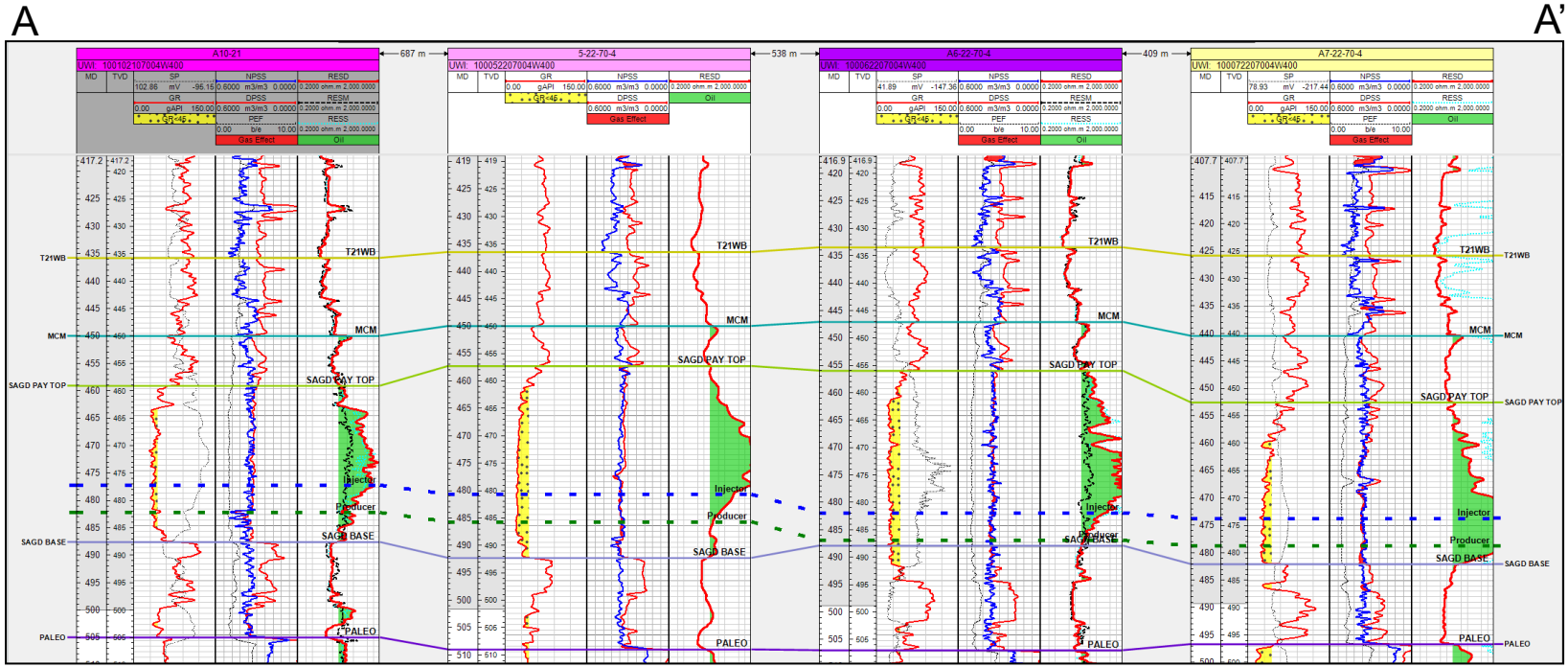
# Representative structural cross-section over Central area





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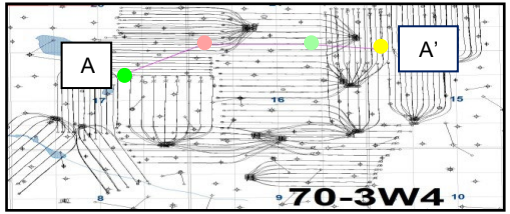
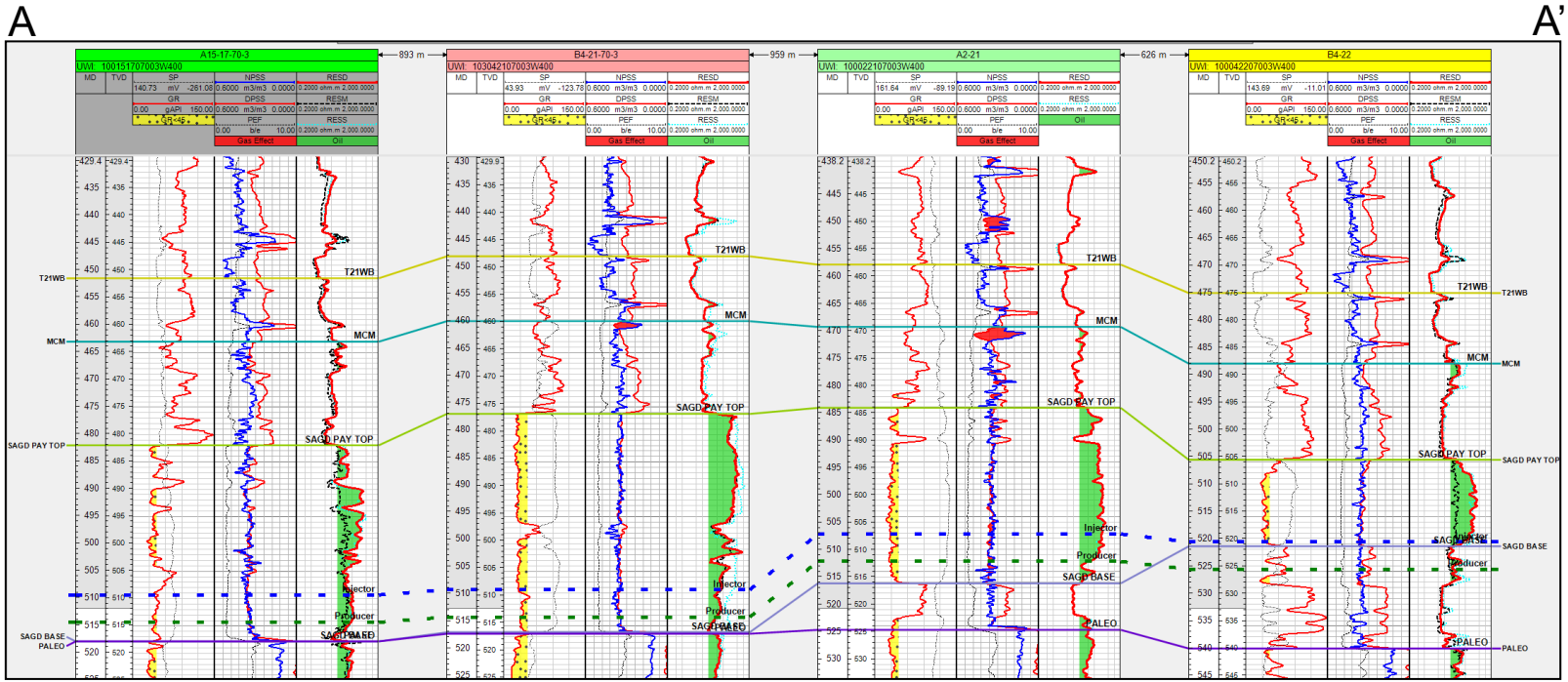
# Representative structural cross-section over East area



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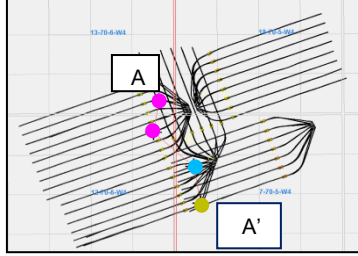
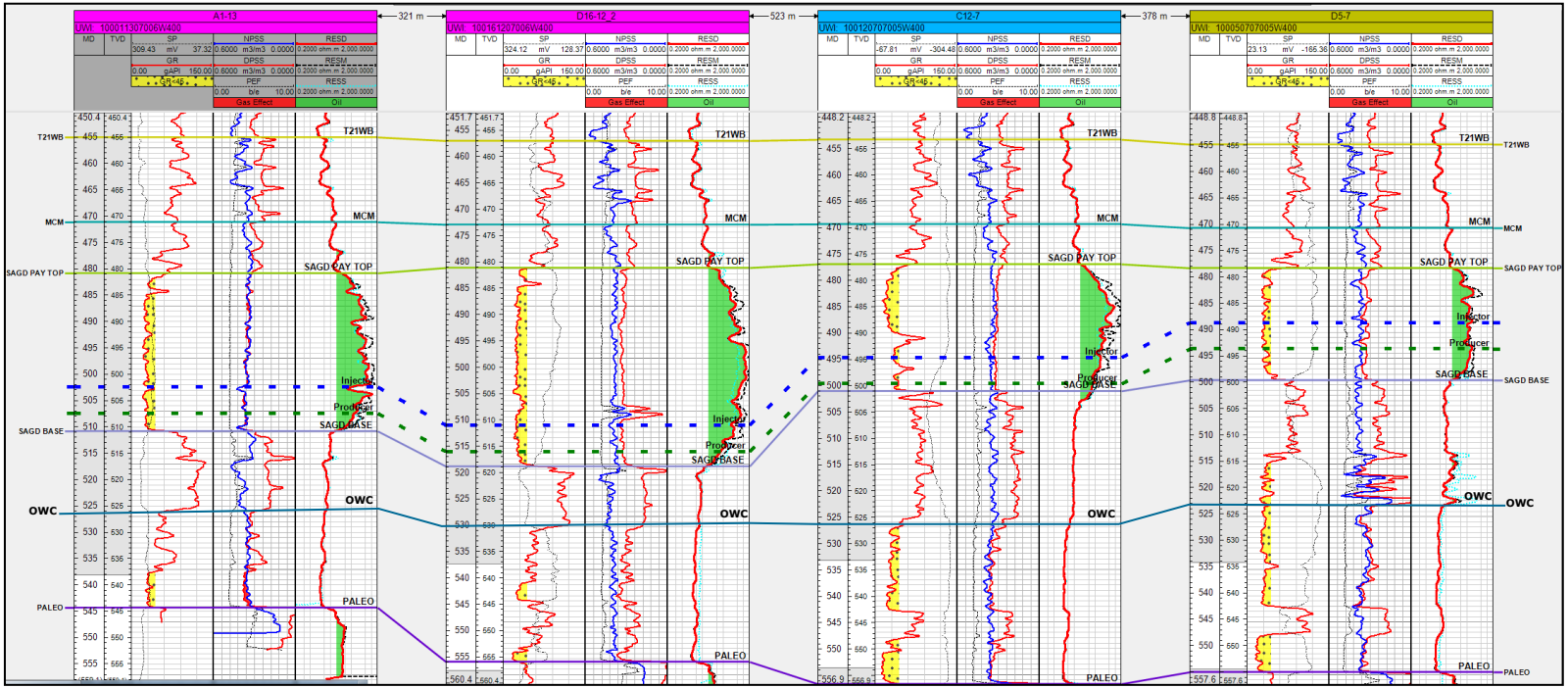
# Representative structural cross-section over West area




A

A'





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# OBIP Volumes

- Project Area OBIP
  - 724 $MMm^3$
- Development Area OBIP
  - 572 $MMm^3$

- Combined Active Well Patterns OBIP
  - 250 $MMm^3$
- Cumulative% Recovery OBIP
  - 46%


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# Reservoir properties

| Reservoir Characteristics | West Area | Central Area | East Area |
|---|---|---|---|
| Reservoir Depth (m subsea) | 180 - 225 | 180 - 225 | 180 - 225 |
| Average SAGD Pay Thickness (m) | Up to 30+ | Up to 30+ | Up to 30+ |
| Porosity (%) | 34% | 34% | 34% |
| Horizontal Permeability (D) | Up to 10 | Up to 10 | Up to 8 |
| Vertical Permeability (D) | Up to 8 | Up to 8 | Up to 6 |
| Oil Saturation (%) | ~85% | ~85% | ~85% |
| Water Saturation (%) | ~15% | ~15% | ~15% |
| Original Reservoir Pressure (kPa) | ~2700 | ~2700 | ~2700 |
| Original Reservoir Temperature (°C) | 12°C | 12°C | 12°C |


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# POIP & OBIP & percent recovery – Central

| Central Pad | Area (m2) | Height (m) | Average Permeability (D) | Porosity (%) | So (%) | POIP (Mm3) | OBIP (Mm3) | Cum Oil (Mm3) to Dec 31, 2021 | Recovery % POIP | Recovery % OBIP | Estimated Ultimate Recovery (m3) | Ultimate Recovery as % of POIP | Ultimate Recovery as % of OBIP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A PAD | 531,100 | 27 | 5.5 | 34% | 87% | 4,138 | 4,419 | 3,676 | 89% | 83% | 3,676 | 89% | 83% |
| B_L PAD | 569,545 | 25 | 5.5 | 33% | 87% | 4,032 | 4,250 | 2,740 | 68% | 64% | 2,742 | 68% | 65% |
| C PAD | 541,344 | 29 | 5.5 | 34% | 87% | 4,735 | 5,091 | 4,508 | 95% | 89% | 4,549 | 96% | 89% |
| D PAD | 676,265 | 27 | 5.5 | 31% | 88% | 4,918 | 5,280 | 4,600 | 94% | 87% | 4,639 | 94% | 88% |
| E_K PAD | 576,442 | 23 | 5.5 | 33% | 86% | 3,779 | 4,125 | 3,090 | 82% | 75% | 3,090 | 82% | 75% |
| EXP_M PAD | 583,159 | 24 | 5.5 | 33% | 87% | 4,027 | 4,590 | 2,750 | 68% | 60% | 2,808 | 70% | 61% |
| F PAD | 817,054 | 23 | 5.5 | 32% | 88% | 5,712 | 6,232 | 3,943 | 69% | 63% | 4,606 | 81% | 74% |
| G PAD | 619,866 | 22 | 5.5 | 32% | 89% | 4,381 | 4,879 | 3,082 | 70% | 63% | 3,294 | 75% | 68% |
| H PAD | 121,557 | 18 | 5.5 | 34% | 87% | 637 | 785 | 227 | 36% | 29% | 239 | 38% | 30% |
| J PAD | 722,666 | 23 | 5.5 | 29% | 86% | 4,272 | 4,800 | 2,070 | 48% | 43% | 2,165 | 51% | 45% |
| N PAD | 423,299 | 18 | 5.5 | 32% | 89% | 2,123 | 2,571 | 509 | 24% | 20% | 904 | 43% | 35% |
| W01 PAD | 673,003 | 23 | 5.5 | 32% | 87% | 4,311 | 4,675 | 2,527 | 59% | 54% | 2,847 | 66% | 61% |
| W02 PAD | 376,851 | 18 | 5.5 | 32% | 88% | 1,893 | 2,083 | 787 | 42% | 38% | 918 | 48% | 44% |
| **Total Central** | **7,232,150** | | | | | **48,957** | **53,781** | **34,508** | **70%** | **64%** | **36,476** | **75%** | **68%** |
| **Total FC** | **31,779,664** | | | | | **213,248** | **250,430** | **114,579** | **54%** | **46%** | **148,769** | **70%** | **59%** |

To Dec 31, 2021


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# POIP & OBIP & percent recovery – East

| East Pad | Area (m2) | Height (m) | Average Permeability (D) | Porosity (%) | So (%) | POIP (Mm3) | OBIP (Mm3) | Cum Oil (Mm3) to Dec 31, 2021 | Recovery % POIP | Recovery % OBIP | Estimated Ultimate Recovery (m3) | Ultimate Recovery as % of POIP | Ultimate Recovery as % of OBIP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E02 PAD | 400,709 | 29 | 5.5 | 31% | 80% | 2,820 | 3,843 | 1,910 | 68% | 50% | 1,953 | 69% | 51% |
| E03 PAD | 459,410 | 34 | 5.5 | 30% | 83% | 3,879 | 5,434 | 1,864 | 48% | 34% | 2,068 | 53% | 38% |
| E04 PAD | 522,570 | 29 | 5.5 | 30% | 84% | 3,778 | 5,453 | 1,575 | 42% | 29% | 2,001 | 53% | 37% |
| E07 PAD | 532,122 | 15 | 5.5 | 26% | 81% | 1,661 | 2,903 | 366 | 22% | 13% | 449 | 27% | 15% |
| E08 PAD EW | 163,743 | 17 | 5.5 | 30% | 82% | 672 | 992 | 489 | 73% | 49% | 539 | 80% | 54% |
| E08 PAD NS | 484,928 | 21 | 5.5 | 31% | 87% | 2,785 | 3,540 | 1,428 | 51% | 40% | 1,695 | 61% | 48% |
| E10 PAD | 431,584 | 20 | 5.5 | 28% | 83% | 1,978 | 3,415 | 1,151 | 58% | 34% | 1,309 | 66% | 38% |
| E11 PAD | 715,946 | 29 | 5.5 | 31% | 86% | 5,454 | 7,687 | 3,613 | 66% | 47% | 4,093 | 75% | 53% |
| E12 PAD EW | 355,868 | 32 | 5.5 | 34% | 89% | 3,422 | 3,598 | 2,402 | 70% | 67% | 2,548 | 74% | 71% |
| E12 PAD NS | 532,039 | 33 | 5.5 | 33% | 85% | 4,837 | 5,944 | 3,365 | 70% | 57% | 3,644 | 75% | 61% |
| E14 PAD | 432,151 | 20 | 5.5 | 32% | 88% | 2,391 | 2,908 | 1,326 | 55% | 46% | 1,588 | 66% | 55% |
| E15 PAD EW | 613,225 | 19 | 5.5 | 32% | 88% | 3,280 | 3,911 | 2,376 | 72% | 61% | 2,661 | 81% | 68% |
| E15 PAD NS | 478,421 | 29 | 5.5 | 32% | 89% | 3,935 | 4,371 | 2,469 | 63% | 56% | 2,664 | 68% | 61% |
| E16 PAD | 540,428 | 24 | 5.5 | 34% | 90% | 3,983 | 4,376 | 3,021 | 76% | 69% | 3,157 | 79% | 72% |
| E19 PAD EW | 626,620 | 23 | 5.5 | 32% | 89% | 4,148 | 4,620 | 2,864 | 69% | 62% | 2,872 | 69% | 62% |
| E19 PAD NS | 509,920 | 24 | 5.5 | 33% | 88% | 3,590 | 3,929 | 3,063 | 85% | 78% | 3,190 | 89% | 81% |
| E20 PAD | 782,583 | 27 | 5.5 | 33% | 89% | 6,277 | 6,824 | 4,979 | 79% | 73% | 5,154 | 82% | 76% |
| E21 PAD | 792,643 | 18 | 5.5 | 30% | 88% | 4,257 | 5,089 | 2,519 | 59% | 49% | 2,849 | 67% | 56% |
| E22 PAD | 572,024 | 19 | 5.5 | 33% | 88% | 3,173 | 4,115 | 1,172 | 37% | 28% | 2,175 | 69% | 53% |
| E24 PAD | 924,102 | 27 | 5.5 | 33% | 88% | 7,273 | 8,013 | 5,168 | 71% | 65% | 5,634 | 77% | 70% |
| E25 PAD | 865,015 | 22 | 5.5 | 31% | 86% | 5,163 | 6,273 | 3,065 | 59% | 49% | 3,401 | 66% | 54% |
| E26 PAD | 1,197,131 | 18 | 5.5 | 32% | 87% | 5,996 | 7,348 | 2,187 | 36% | 30% | 4,243 | 71% | 58% |
| E42 PAD | 348,633 | 16 | 5.5 | 29% | 85% | 1,415 | 2,065 | 943 | 67% | 46% | 968 | 68% | 47% |
| **Total East** | **13,281,815** | | | | | **86,168** | **106,651** | **53,316** | **62%** | **50%** | **60,856** | **71%** | **57%** |
| **Total FC** | **31,779,664** | | | | | **213,248** | **250,430** | **114,579** | **54%** | **46%** | **148,769** | **70%** | **59%** |

To Dec 31, 2021


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# POIP & OBIP & percent recovery – West

| West Pad | Area (m2) | Height (m) | Average Permeability (D) | Porosity (%) | So (%) | POIP (Mm3) | OBIP (Mm3) | Cum Oil (Mm3) to Dec 31, 2021 | Recovery % POIP | Recovery % OBIP | Estimated Ultimate Recovery (m3) | Ultimate Recovery as % of POIP | Ultimate Recovery as % of OBIP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| W03 PAD | 425,325 | 21 | 5.5 | 30% | 86% | 2,346 | 2,880 | 840 | 36% | 29% | 1,086 | 46% | 38% |
| W05 PAD | 341,146 | 17 | 5.5 | 30% | 77% | 1,287 | 2,561 | 420 | 33% | 16% | 453 | 35% | 18% |
| W06 PAD | 762,639 | 23 | 5.5 | 31% | 88% | 4,795 | 5,334 | 1,761 | 37% | 33% | 2,239 | 47% | 42% |
| W07 PAD | 337,372 | 24 | 5.5 | 32% | 86% | 2,255 | 2,958 | 971 | 43% | 33% | 1,542 | 68% | 52% |
| W08 PAD | 437,329 | 25 | 5.5 | 32% | 88% | 3,030 | 3,348 | 1,592 | 53% | 48% | 2,214 | 73% | 66% |
| W10 PAD | 464,355 | 23 | 5.5 | 31% | 87% | 2,903 | 3,376 | 1,758 | 61% | 52% | 2,555 | 88% | 76% |
| W15 PAD | 379,950 | 20 | 5.5 | 31% | 88% | 2,138 | 2,618 | 1,119 | 52% | 43% | 1,511 | 71% | 58% |
| W18 PAD | 691,116 | 24 | 5.5 | 33% | 90% | 4,945 | 6,171 | 3,249 | 66% | 53% | 3,763 | 76% | 61% |
| W19 PAD | 809,984 | 29 | 5.5 | 33% | 90% | 6,813 | 8,194 | 3,673 | 54% | 45% | 4,622 | 68% | 56% |
| W20 PAD | 426,744 | 29 | 5.5 | 32% | 89% | 3,443 | 3,902 | 1,232 | 36% | 32% | 1,586 | 46% | 41% |
| W21 PAD | 704,560 | 23 | 5.5 | 33% | 89% | 4,673 | 5,646 | 1,539 | 33% | 27% | 2,557 | 55% | 45% |
| W23 PAD | 789,579 | 26 | 5.5 | 32% | 90% | 5,935 | 6,571 | 3,758 | 63% | 57% | 4,489 | 76% | 68% |
| W27 PAD | 566,098 | 20 | 5.5 | 33% | 89% | 3,391 | 3,735 | 901 | 27% | 24% | 2,398 | 71% | 64% |
| W30 PAD | 816,182 | 17 | 5.5 | 33% | 90% | 4,167 | 4,746 | 1,002 | 24% | 21% | 2,910 | 70% | 61% |
| W33 PAD | 950,787 | 26 | 5.5 | 34% | 90% | 7,416 | 7,939 | 519 | 7% | 7% | 4,637 | 63% | 58% |
| W34 PAD | 1,160,643 | 31 | 5.5 | 33% | 91% | 10,864 | 11,548 | 1,516 | 14% | 13% | 7,245 | 67% | 63% |
| W35 PAD EW | 668,110 | 19 | 5.5 | 29% | 89% | 3,387 | 3,659 | 166 | 5% | 5% | 2,295 | 68% | 63% |
| W35 PAD NS | 533,779 | 27 | 5.5 | 33% | 90% | 4,336 | 4,810 | 740 | 17% | 15% | 3,337 | 77% | 69% |
| **Total West** | **11,265,699** | | | | | **78,124** | **89,997** | **26,755** | **34%** | **30%** | **51,438** | **66%** | **57%** |
| **Total FC** | **31,779,664** | | | | | **213,248** | **250,430** | **114,579** | **54%** | **46%** | **148,769** | **70%** | **59%** |

To Dec 31, 2021


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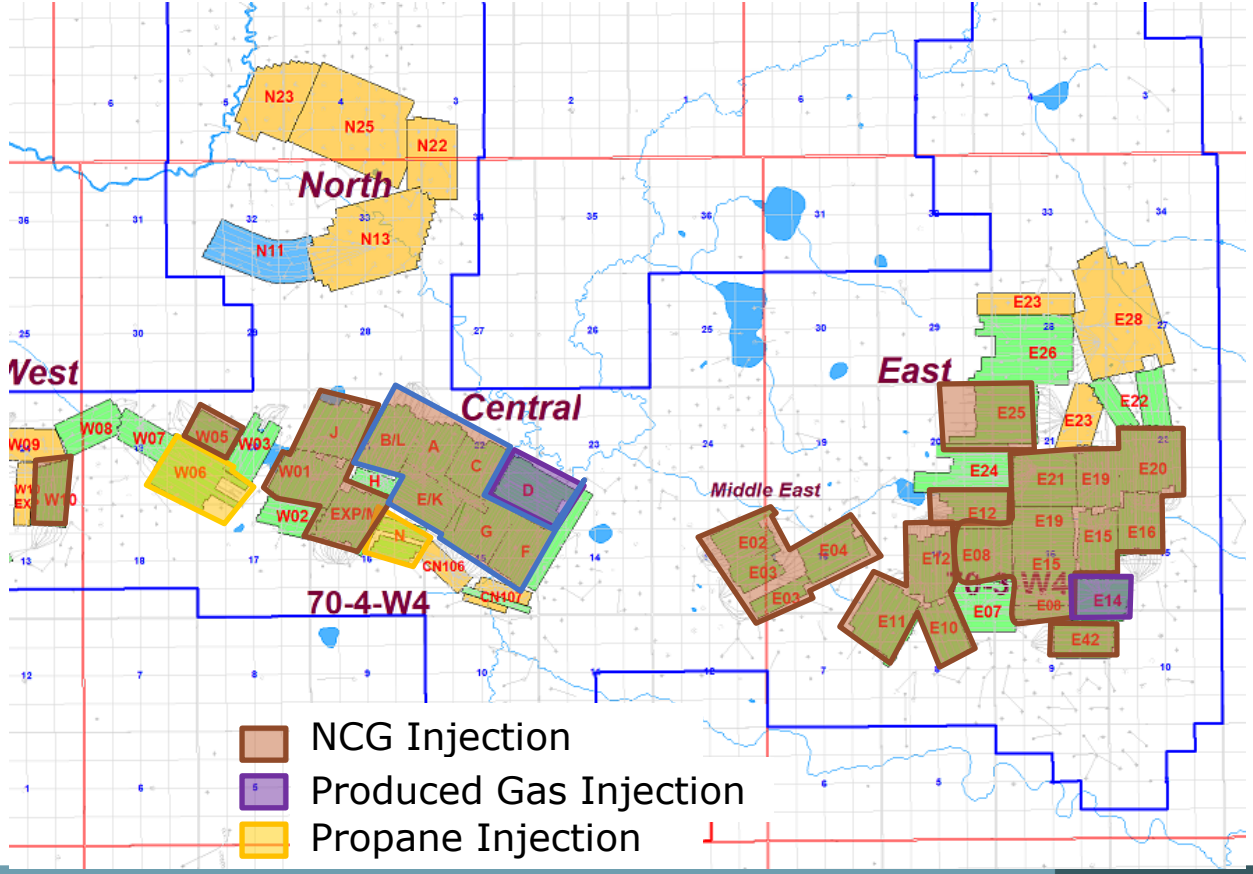
# Map of co-injection Wells





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# Injected fluids

## Non-condensable gas:

- Fuel gas up to 36% mol fraction during co-injection*; 100% gas mol fraction during blowdown
- Composition of the injected non-condensable gas is methane (fuel gas)
- Some pads receive NCG injection support from neighboring coalesced pads
- NCG injection and injection support on A, C, F, G, J, M_Exp, B/L, E/K, E02, E03, E04, E08, E10, E11, E12, E15, E16, E19, E20, E21, E25, E42, W01, W05, W10
- No measurable impacts observed to the aquifer

## Produced gas Injection

- PG is currently injected on D Pad at 100% gas mol fraction
- In 2021, PG injection commenced on one injector on E14 pad at 100% gas mol fraction

## Stimulation treatments

- Wells are occasionally treated with HCl and/or Thermosolv to minimize skin

## Solvent

- Have used solvent in start-up work-overs and have approval to use this as a potential start-up process
- N pad propane (3 to 10 wt%) SAP pilot
- W06 pad propane (60 – 80 wt%) co-injection pilot

*Based on current approval of 100 t/d min steam and 75 $e^3m^3$/d max gas injection per injector well on pad average basis during co-injection.


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# Injection Strategy and Impacts

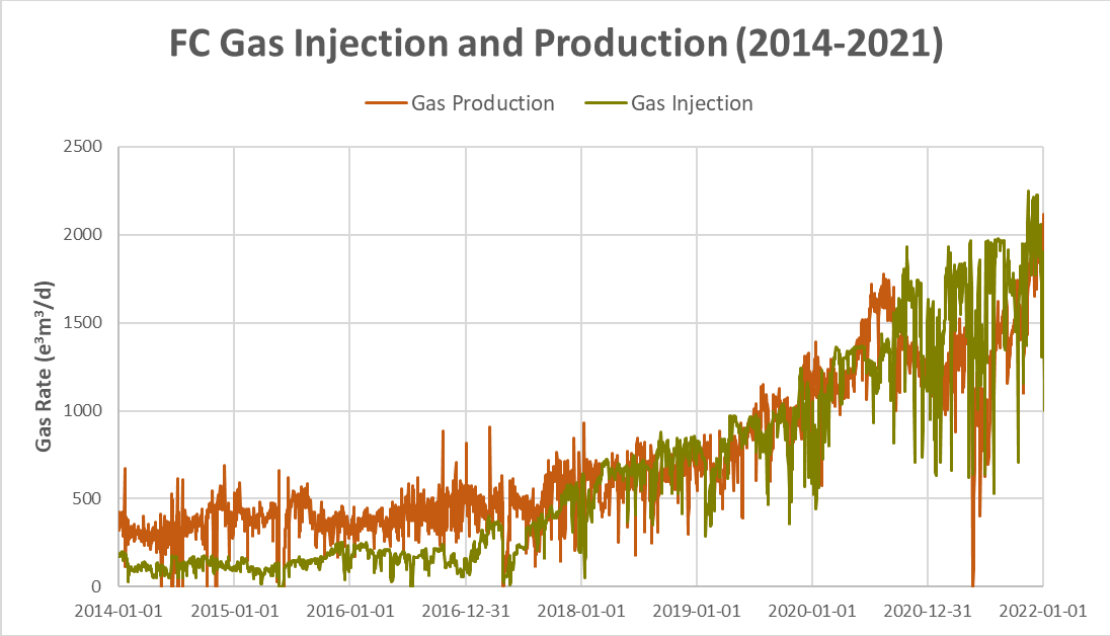
**NCG Injection commencement is based on:**

- Pads with high RF
- Pads with high SOR/declining oil rates

Steam cuts are typically made in 25% increments.

**Impact of co-injection:**

- Trials underway to optimize late life strategy and reduce gas production.
- Based on data to date, Cenovus does not expect material impact to ultimate recovery due to co-injection.





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# Co-injection Impact to Wellbore Integrity

To date, no impacts of co-injection on wellbore integrity and aquifer have been seen:

- Well Integrity Management Program (WIM, refer to slide 39) supports the monitoring of co-injection wells and manages the mitigation of near surface casing corrosion.
- Corrosion rate of the co-injection wells are evaluated with casing age and operating condition.


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# Subsection 4.3 8
# Surface

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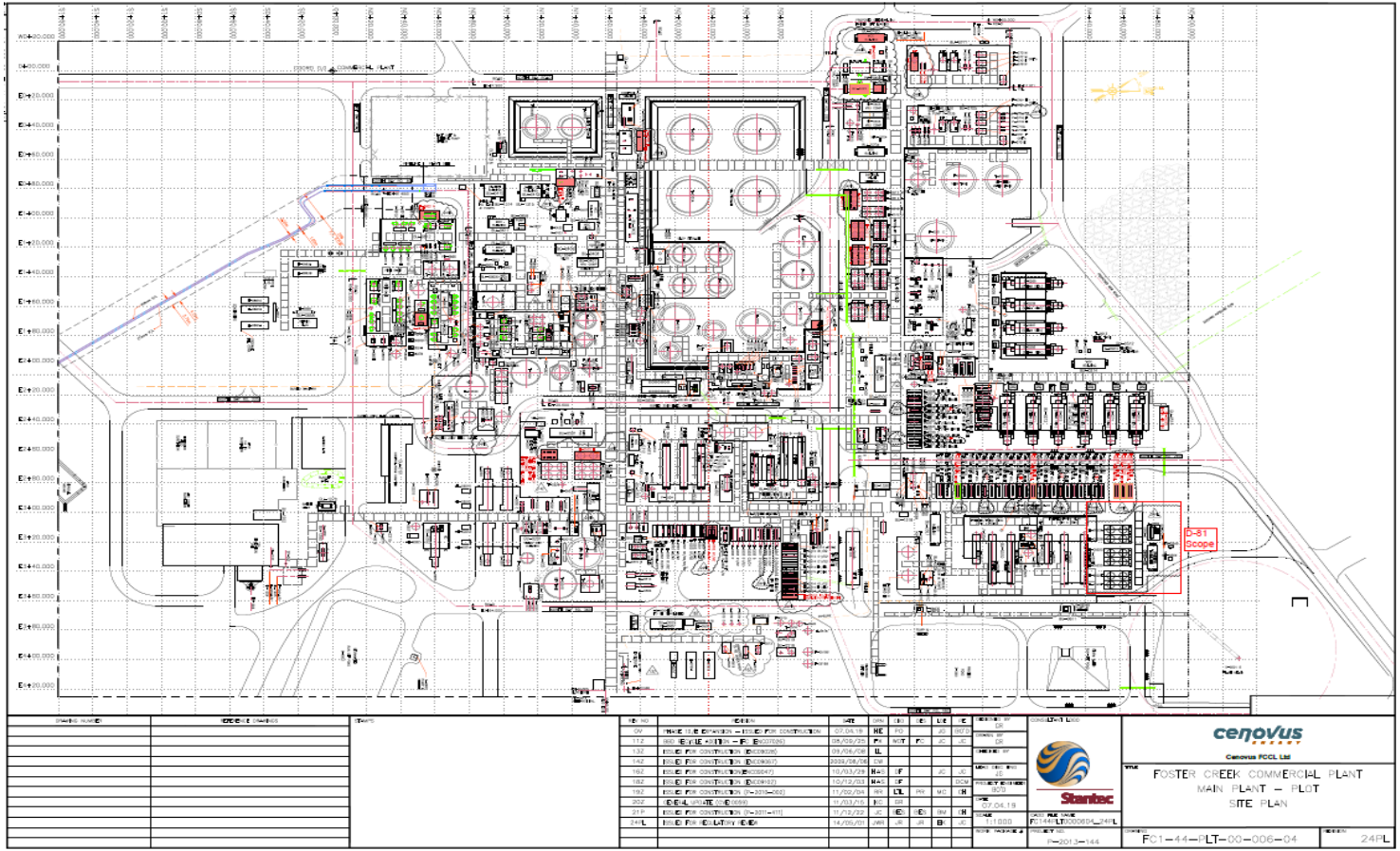
# Foster Creek A/E Plot Plan




**A high-resolution drawing has been included as an attachment (FC1-44-PLT-00-0006-004)*



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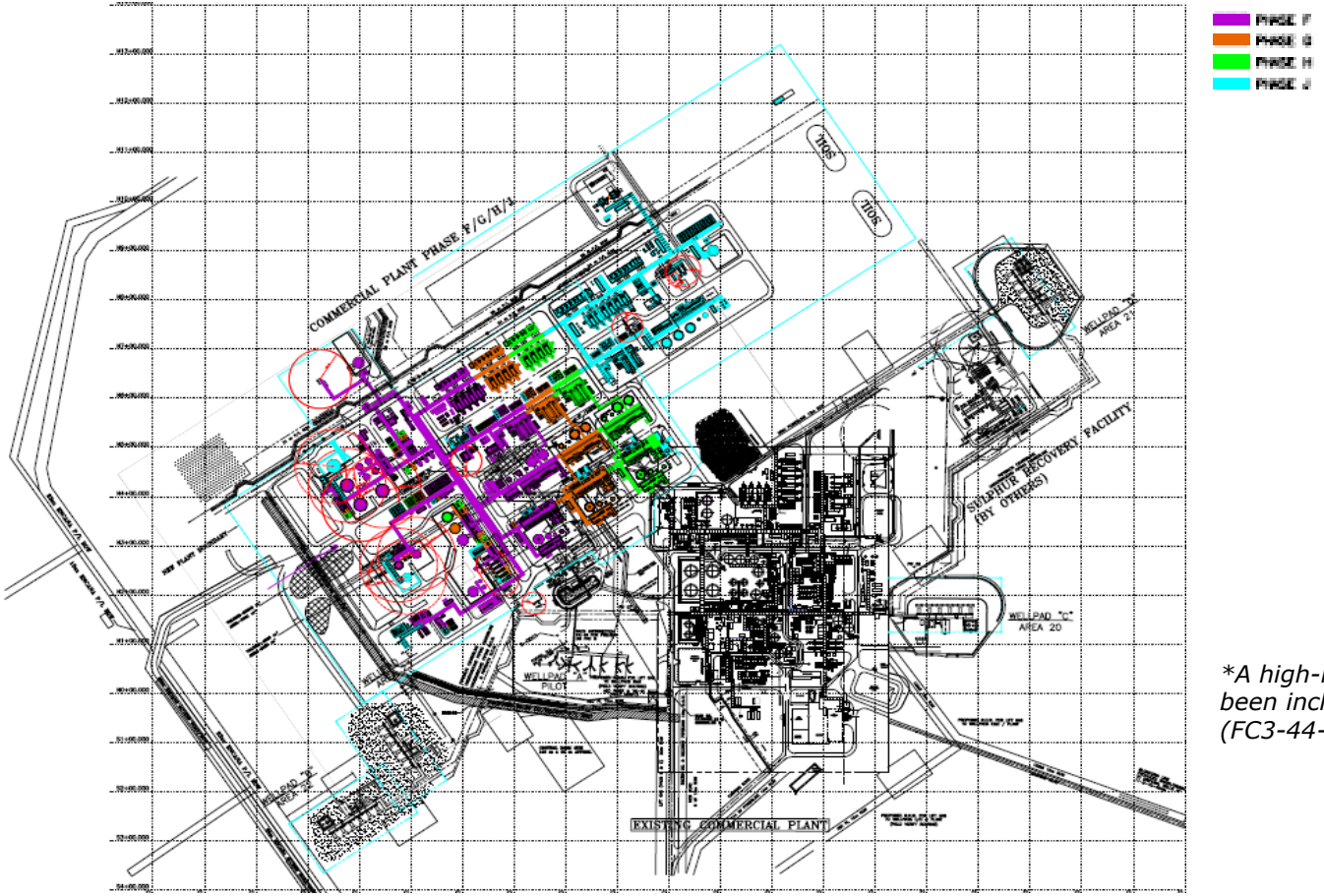
# Foster Creek F/J Plot Plan




**A high-resolution drawing has been included as an attachment (FC3-44-SK-00-003-01)*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# Brackish Source Wells

Source LGR Wells:

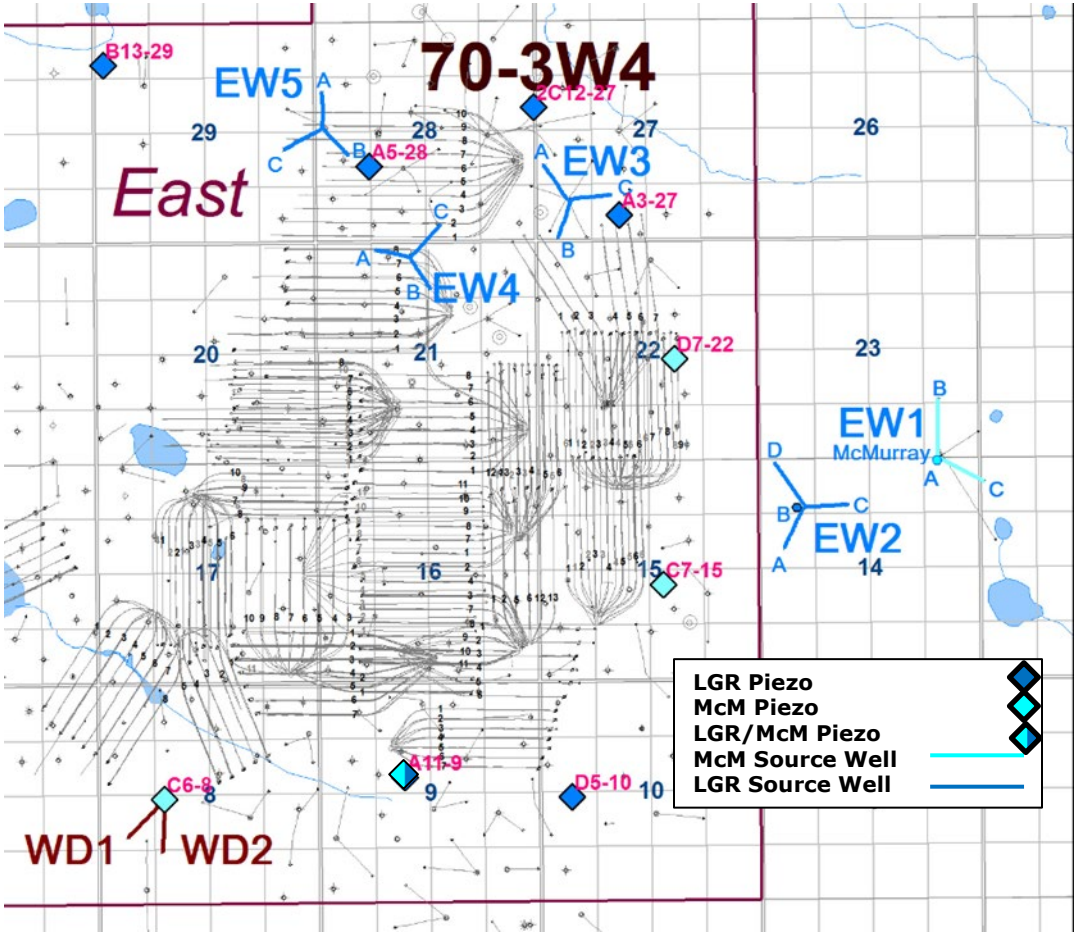
| | |
|---|---|
| EW2-A | 1F1/12-14-070-03W4 |
| EW2-C | 1F1/14-14-070-03W4 |
| EW2-D | 1F2/13-14-070-03W4 |
| EW3-A | 1F1/05-27-070-03W4 |
| EW3-B | 1F1/04-27-070-03W4 |
| EW3-C | 1F2/03-27-070-03W4 |
| EW4-A | 1F1/14-21-070-03W4 |
| EW4-B | 1F1/15-21-070-03W4 |
| EW4-C | 1F1/02-28-070-03W4 |
| EW5-A | 1F2/12-28-070-03W4 |
| EW5-B | 1F1/05-28-070-03W4 |
| EW5-C | 1F2/08-29-070-03W4 |

Source McM Wells:

| | |
|---|---|
| EW1-A | 1F2/01-23-070-03W4 |
| EW1-B | 1F1/08-23-070-03W4 |
| EW1-C | 1F1/13-13-070-03W4 |
| EW2-B Redrill | 1F1/13-14-070-03W4/02 |

Pressure Sink Wells:

| | |
|---|---|
| WD1 (LGR Disposal) | 100/05-08-070-03W4 |
| WD2 (McM Source) | 1F1/03-08-070-03W4 |





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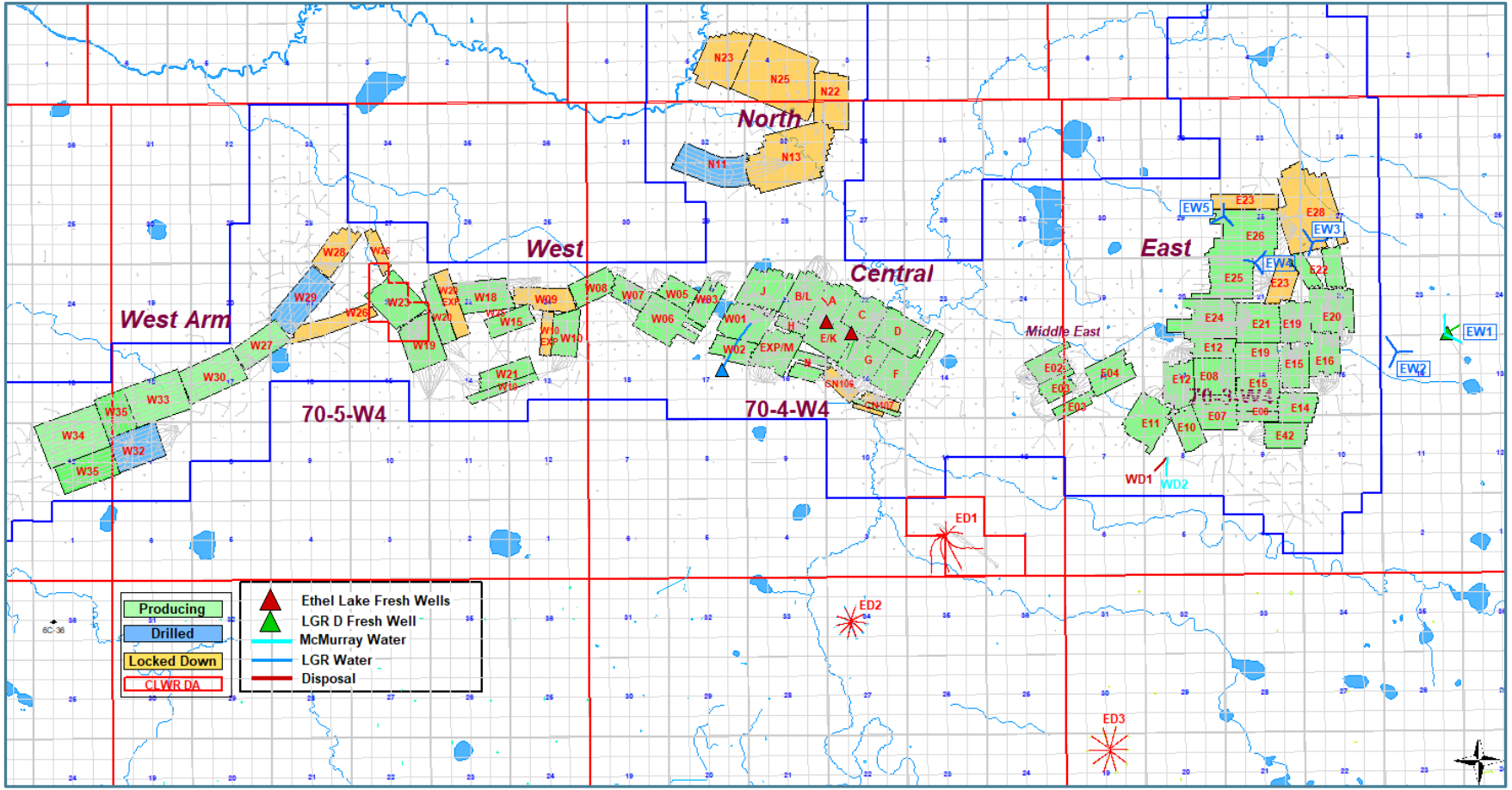
# Location of Fresh Source Wells



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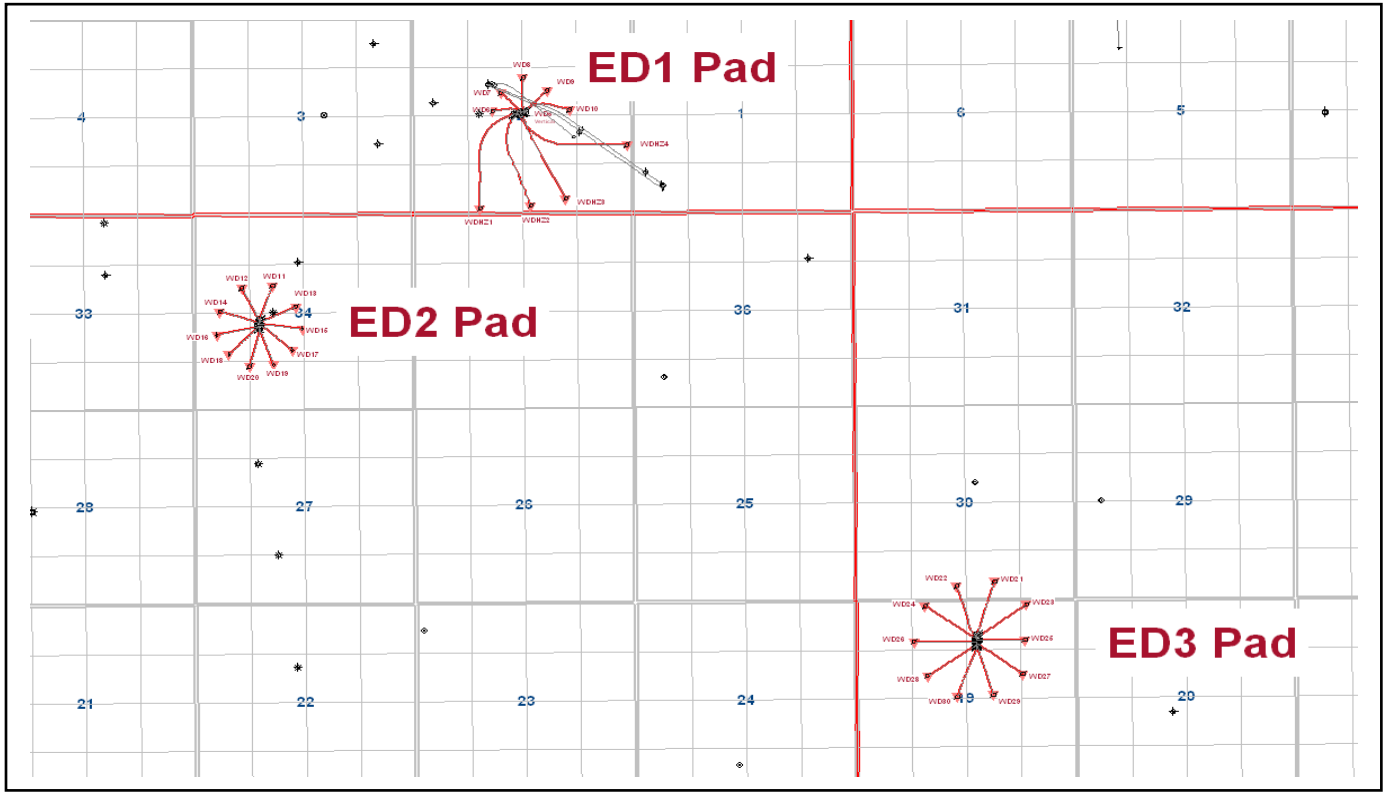
# Current Disposal Well Locations




**Legend**

Disposal Wells:

ED1 Pad:

**WDHZ 1 – 100/03-02-070-04W4 (McM)**
**WDHZ 4 – 100/08-02-070-04W4 (McM)**
**WD6 – 104/11-02-070-03W4 (McM)**
**WD10 – 103/10-02-070-03W4 (McM)**

ED2 Pad (McMurray):

**WD11 – 102/11-34-069-04W4**
**WD12 – 100/12-34-069-04W4**
**WD13 – 103/11-34-069-04W4**
**WD14 – 102/12-34-069-04W4**
**WD15 – 100/06-34-069-04W4**
**WD16 – 100/05-34-069-04W4**
**WD17 – 102/06-34-069-04W4**
**WD18 – 102/05-34-069-04W4**
**WD19 – 100/03-34-069-04W4**
**WD20 – 100/04-34-069-04W4**

ED3 Pad (McMurray):

**WD21 – 100/02-30-069-03W4**
**WD22 – 100/03-30-069-03W4**
**WD23 – 100/16-19-069-03W4**
**WD24 – 100/14-19-069-03W4**
**WD25 – 100/16-19-069-03W4**
**WD26 – 102/14-19-069-03W4**
**WD27 – 100/09-19-069-03W4**
**WD28 – 100/11-19-069-03W4**
**WD29 – 100/10-19-069-03W4**
**WD30 – 102/11-19-069-03W4**

Suspended Disposal Wells:

**WDHZ 2 – 100/02-02-070-04W4 (LGR)**
**WDHZ 3 – 102/02-02-070-04W4 (LGR)**
**WD7 – 105/11-02-070-03W4 (LGR)**
**WD8 – 104/10-02-070-03W4 (LGR)**
**WD9 – 102/10-02-070-03W4 (LGR)**

Abandoned Disposal well:

**WD5 – 103/11-02-070-03W4**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# Facility Summary

- East Casing Gas Re-Injection at E14 Pad started November 2021


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# Plant Performance

**Steam**

- System capacity at 77,400 $Sm^3/d$
- Calendar year 2021 average flowrate is 69,955 $Sm^3/d$ | 90.4% of Capacity
- Continued operation at high steam qualities

**Oil**

- System capacity at 34,818 $Sm^3/d$ (219,000 bbl/d)
- Calendar year 2021 average flowrate is 28,591 $Sm^3/d$ (179,833 bbl/d) | 82% of Capacity


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# Subsection 4.4 9-12 Historical and Upcoming Activity

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# Pad Abandonments

- No pad abandonments are currently planned at Foster Creek in the next 5 years.


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# Well integrity - casing

Well Integrity Management (WIM) Program:

- Ongoing monitoring and inspection program to assess casing condition and repair as required, including EMAT and UT of surface casing depending on severity
- Cenovus complies with all regulations surrounding inactive wells, including tracking compliance status and reporting well suspensions in the DDS system
- Pursuing application and viability of Potassium Silicate coating on surface casing to prevent and/or slow down corrosion

## Casing Corrosion

| Corrosion Location | Status |
|---|---|
| Surface Casing Exterior | Mitigation program in place |
| Surface Casing Interior / Intermediate Casing Exterior | Mitigation program in place |
| Pack-Off | Investigation on-going |


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# Well Integrity - SCVF

- Cenovus complies with all regulations and when a surface casing vent flow is identified, Cenovus reports non-serious and serious surface casing vent flows into the DDS system per ID 2003-01
- Cenovus engages with the AER to discuss appropriate strategies related to managing SCVFs
- Cenovus communicates with the AER regularly on the status of the vents and presents an annual update on activities executed to manage surface casing vent flows
- Cenovus is currently tracking 41 separate SCVF events across FCCL which have been reported. Within 2021, only 2 new wells have been recorded (non-serious within DDS)

# Well Integrity - Wellheads

- Wellhead integrity monitoring is ongoing. No wellhead failures observed


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# Well integrity – strain monitoring

Strain monitoring wells installed:

- Baseline data in non-thermally affected zones and in lateral sections
  - 102/03-23-070-05W4/00 (FC W20 Pad)
  - 102/05-23-070-05W4/00 (FC W20 Pad)
  - 100/05-28-070-03W4/00 (FC E26 Pad)
  - 100/14-14-070-05W4/00 (FC W20 Pad)
  - 106/13-07-070-05W4/00 (FC W32/35 Pad)
  - 1AB/02-32-070-04W4/00 (FC North)
- Field measurements scheduled relative to milestone dates


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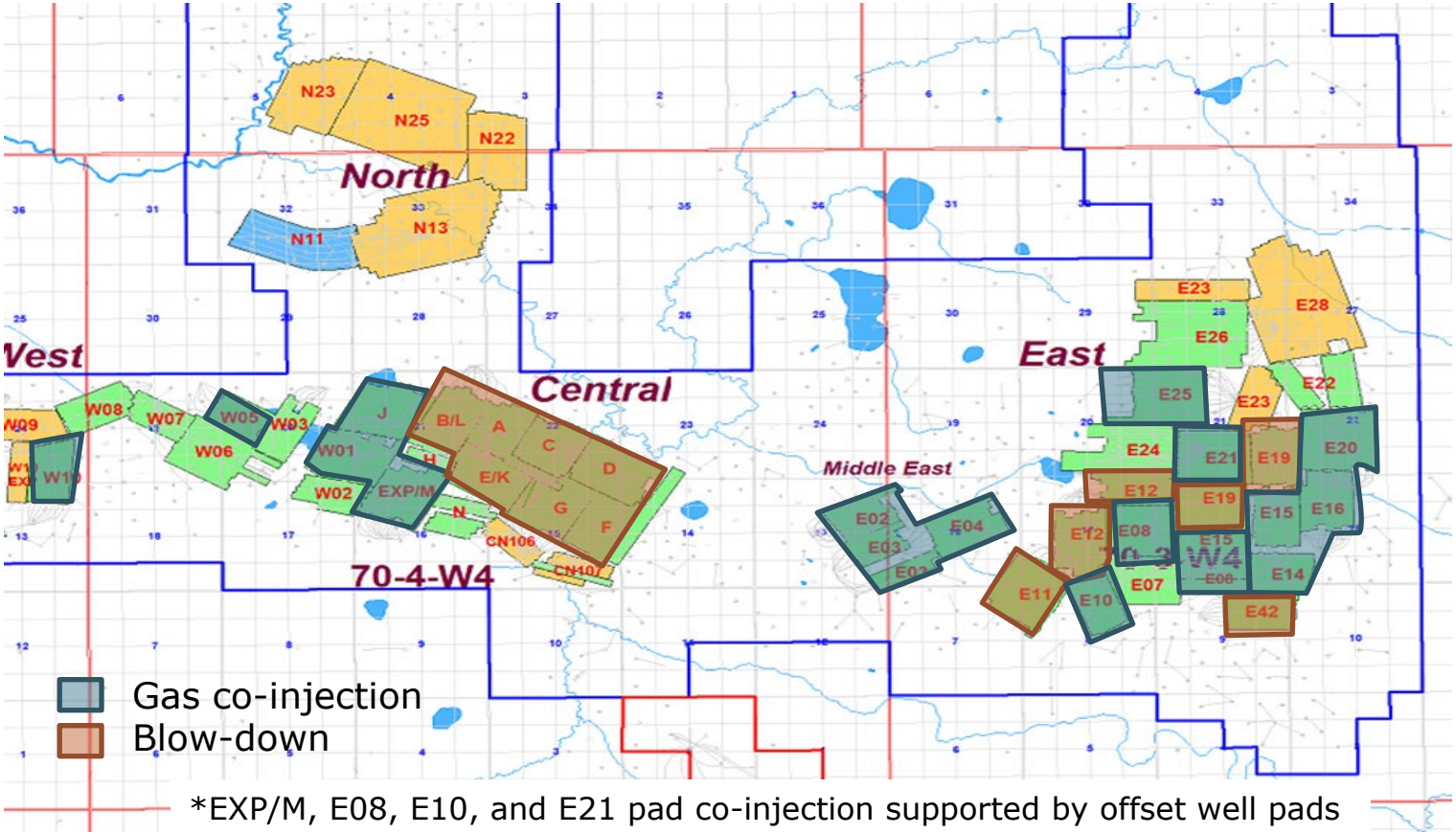
# Well patterns with active gas injection: Status as of January 1, 2022




*EXP/M, E08, E10, and E21 pad co-injection supported by offset well pads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# 2021 OSCA application/approval summary

| Act | Application No. | Application Description | Approval Date |
|---|---|---|---|
| OSCA | 1931746 | N11 Pad Well Pair Trajectory Amendment | 2021-01-12 (Category 1) |
| OSCA | 1932527 | F106 Pad Dilation Start-Up Application | 2021-07-09 |
| OSCA | 1933278 | W23P06 Clearwater Pay Well Application | 2021-09-03 |
| OSCA | 1933813 | W26 Trajectory Amendment Application | 2021-08-23 |
| OSCA | 1933981 | W12/W40/W41/W42 Trajectory Update Application | 2021-12-01 |
| OSCA | 1934139 | W27,30,33,34,35 Test Separator Variance | 2021-09-14 (Category 1) |
| OSCA | 1934237 | N13 Trajectory Update Application | 2021-09-27 |
| OSCA | 1934763 | W26 Trajectory Amendment Application (Well Extension) | 2021-11-23 |
| OSCA | 1934967 | N Pad P04-1 Well Pair Addition Application | 2022-01-21 |


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# 2021 OSCA/EPEA application/approval summary

| Act | Application No. | Application Description | Approval Date |
|---|---|---|---|
| OSCA/ EPEA | 1932382/ 030-68492 | Sulphur Management Plan Application | 2021-03-31 |
| OSCA/ EPEA | 1931500/ 030-68492 | East Pads Casing Gas Re-injection Application | 2021-01-25 (OSCA) 2021-05-17 (EPEA) |
| OSCA/ EPEA | 1934604/ 036-68492 | Sulphur Management Plan Update Application | 2021-12-10 |
| EPEA | 037-68492 | EPEA Renewal Application | 2021-11-03 (submission) |
| EPEA | 038-68492 | Predictive Emissions Monitoring System Application | 2021-11-09 (submission) |
| OSCA/ EPEA | 1935331/ 039-68492 | North Project Area Extension Application | 2021-12-17 (submission) |


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# Facility Modifications

- East Casing Gas Re-Injection at E14 Pad started Nov 2021


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# Facility performance

## Process Treating Area

- Facility performed very well after the process treating chemical package was changed in the summer.
- A period of low WOR's combined with new pad start ups allowed for record oil production in Q3/Q4.

## De-oiling

- Improved performance of de-oiling train after process chemicals change was made in the summer.


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# Facility performance

## Water Treatment

- Phases F/G turnaround and treating issues led to low produced water and boiler feed water volumes resulting in reduced OTSG firing and low steam output
- Extended outage to repair warm lime softener FC1-T-0804B corrosion issues
- Significant outage work for repairs and resin replacements in FC1-V-0811 strong acid cation vessels

## Steam Generation

- Significant downtime on FC1 steam generators for mechanical repairs
    - Regulatory inspections, radiant section bend replacements, and economizer replacements/repairs led to extended outages on multiple boilers


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# Facility performance

**Utilities**

- NRSU modifications (to improve operability) showing reductions in chemical carry-over and improved chemical efficiency


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# Pilots/technical innovations

**Solvent pilots**

- Solvent Assisted Process (SAP) using 10% solvent (propane) -Propane injection complete in Q4 2021, trial concluded
- Solvent Driven Process (SDP) using higher concentration solvent (propane) -Propane injection complete in Q4 2021, data collection on-going


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# 2021 Non-compliance summary - AER

| Date | Non-compliance | Follow-up |
|---|---|---|
| 2021-01-21 | Notice of Noncompliance - Casing Failure Reporting and Repair Requirements @ 10-08-070-03W4 | Compliance achieved – 2021-07-31 |
| 2021-03-25 | Voluntary Self-Disclosure – Kick notification for observation well 10-02-070-04W4 (W0498788) at ED1 disposal pad | Mitigation and monitoring plan discussed with AER on Nov 4, 2021 |
| 2021-09-01 | Notice of Noncompliance - Surface Casing Vent Flow/Gas Migration Testing, Reporting, and Repairs @ 01-21-070-03W4 | Compliance achieved – 2022-01-31 |


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# 2021 Non-compliance Summary – EPEA

| Date | Non-compliance | Follow-up |
|---|---|---|
| 2021-03-18 | EDGE Ref# 0377086. Failure to meet the RATA allowable performance specification of 10% on FC3-B-0205 due to drift of the NOx output channel. | NOx analyzer re-calibrated. Follow-up RATA met CEMS Code criteria. |
| 2021-04-13 | EDGE Ref# 0377857. The sulphur dioxide limit of 2.04 t/d (quarter-year average) was not met for the timeframe of January 1 to March 30, 2021. | Updated sulphur dioxide emission limit received on March 31, 2021; compliance attained. |
| 2021-04-21 | EDGE Ref# 0378475. Stormwater from North Storm Pond was released off-site without being tested due to high storm event. | Water tested; met release criteria. Water released off-site. |
| 2021-06-11 | EDGE Ref# 0379866. Stormwater from North Storm Pond was released off-site without being tested due to high storm event. | Water tested; met release criteria. Water released off-site. |
| 2021-07-29 | EDGE Ref# 0381860. Failure to meet the 90% uptime requirement on FC1-B-0205 due to beam splitter and voltage supply board outages. | Components replaced and CEMS unit re-calibrated. |


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# Future plans

## Potential Future Applications

- W19/W23 Pad Clearwater development
- North area well pad amendment

## Future Plant Activity

- Twinning of casing crossover pipeline
- FC1/FC3 Interconnect pipelines
- Oil Debottleneck (Phase H)


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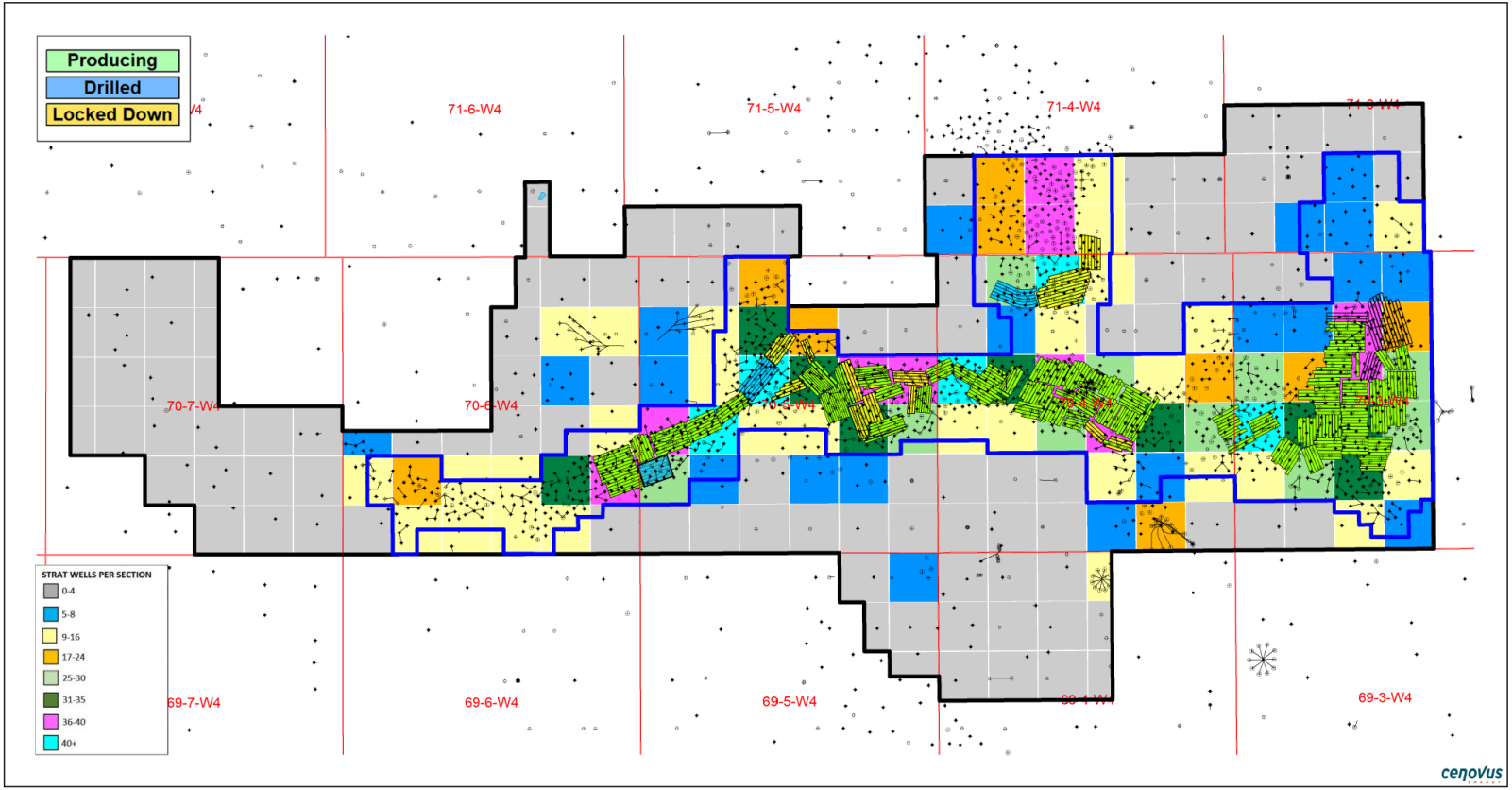
# Planned development map





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# Questions

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