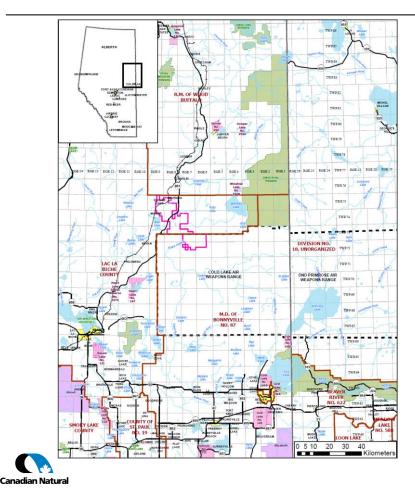
# **Canadian Natural** KIRBY IN SITU OIL SANDS PROJECT DIRECTIVE 54 ANNUAL PERFORMANCE PRESENTATION

Commercial Scheme Approval 11475 (as amended) June 30, 2023

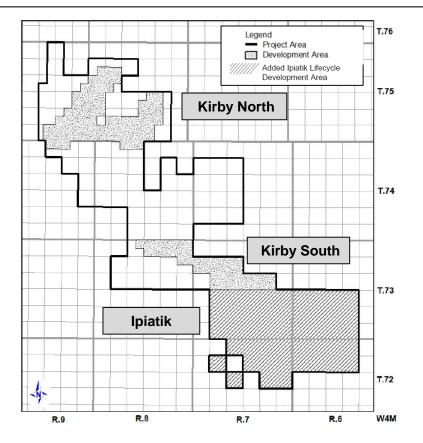


### 4.1, 1) Scheme Setting and Background



- Kirby South scheme approval granted September 2006
  - First steam October 2013
- Kirby Expansion (Kirby North) scheme approval granted May 2014
  - First steam May 2019
- Kirby South Pad Add Extension (Ipiatik) approval granted November 2021

### 4.1, 1) Scheme Setting and Background (cont'd)

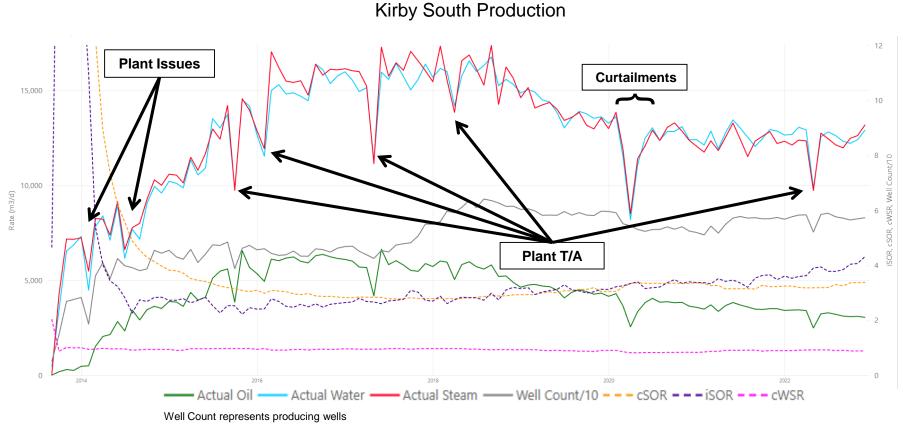


- The McMurray and Wabiskaw D formations are the bitumen-bearing sands and the target of steam injection in the Kirby Project operating areas.
- Recovery processes used is Steam Assisted Gravity Drainage (SAGD).
- The Kirby Project is split into the following areas:
  - Kirby South
  - Kirby North
  - Ipiatik



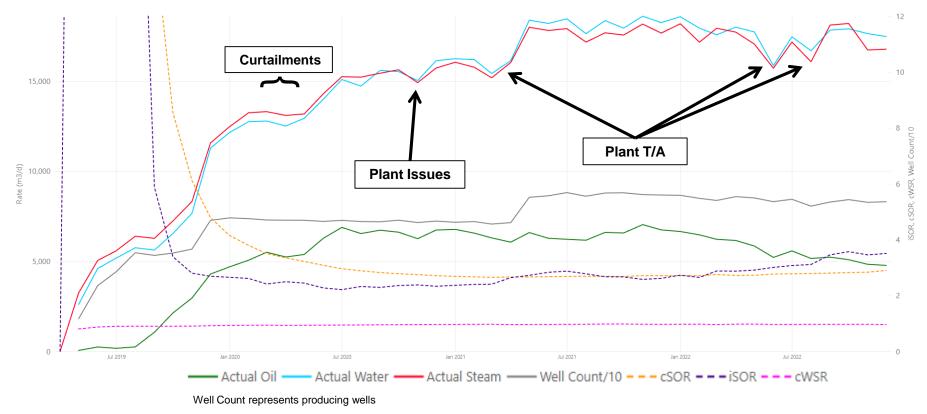


### 4.2, 2) Production Plot - Kirby South



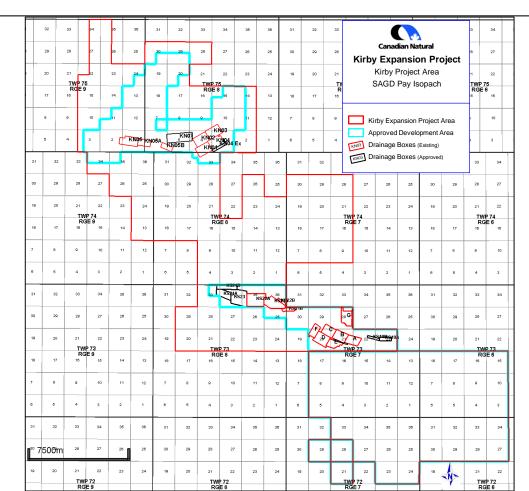


### 4.2, 2) Production Plot - Kirby North





#### 4.2, 3 a) Drilled and Approved Drainage Areas

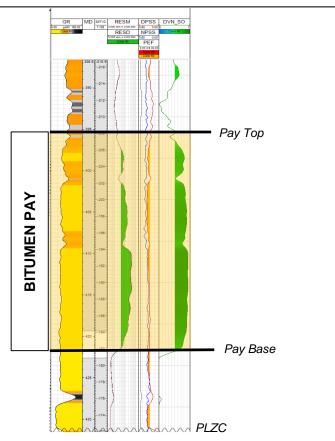




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### 4.2, 3 b) Resource Cut-off

**Jackfish Bitumen Pay Definition** 

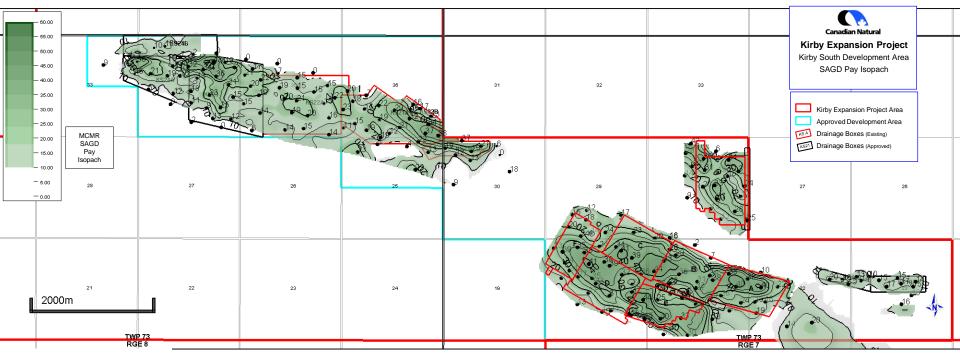


#### **Bitumen Pay**

- Characterizes the complete package accessible through SAGD.
- Defined by:
  - $S_o > 50\%$
  - Encompasses all brecciated intervals
  - May include minimal IHS
- S<sub>o</sub> is a standard petrophysical curve calculated from resistivity and porosity logs, and correlated to core data.



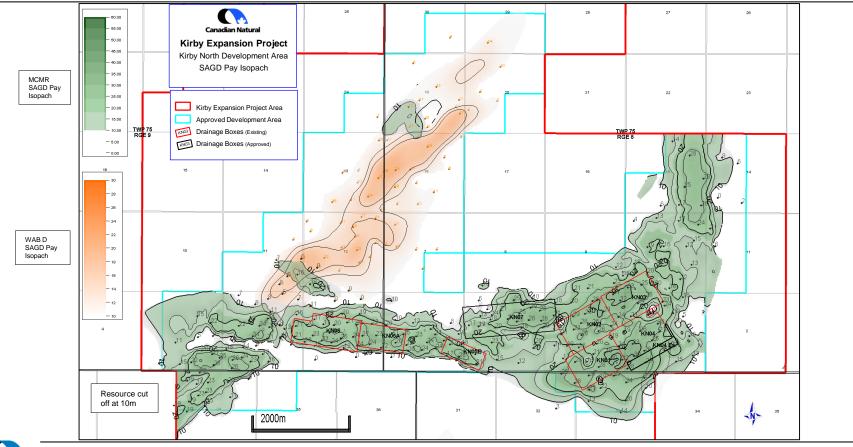
### 4.2, 3 b) Pay Isopach - Kirby South



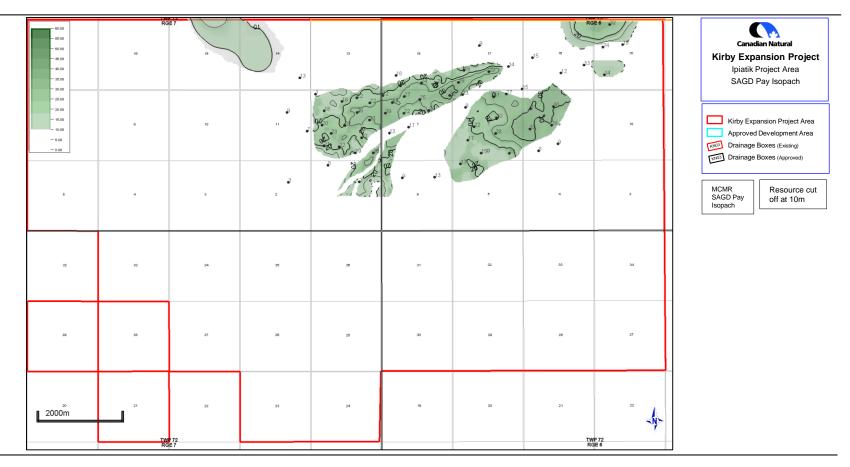
Resource cut off at 10m



### 4.2, 3 b) Pay Isopach - Kirby North

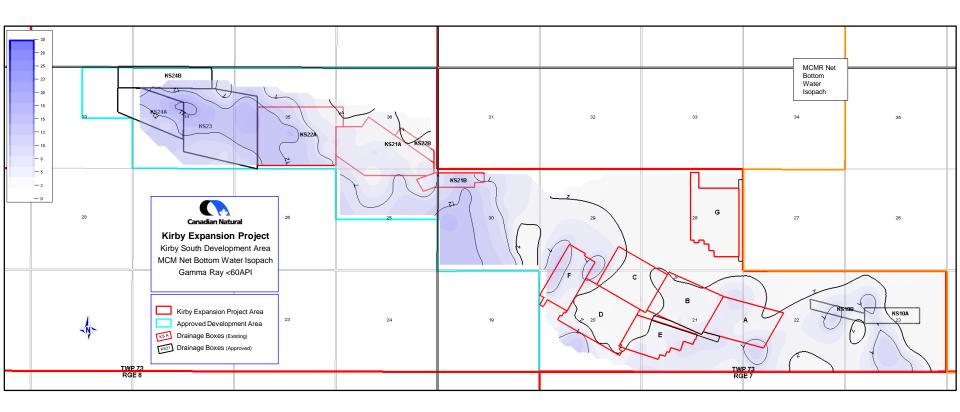


### 4.2, 3 b) Pay Isopach - Ipiatik



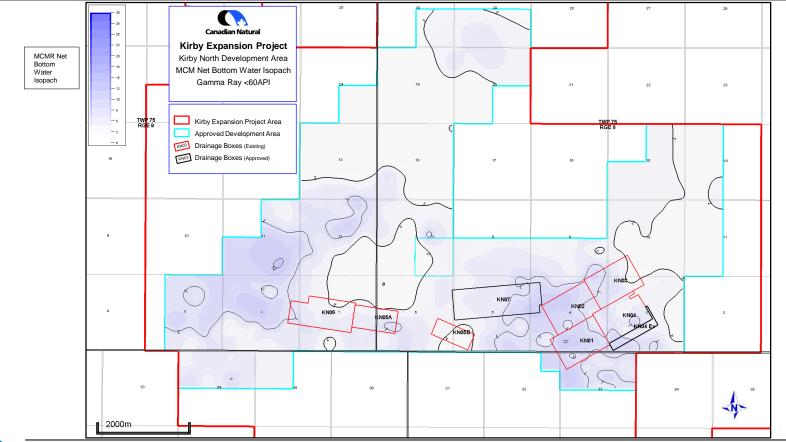


Kirby South McMurray Net Bottom Water Isopach



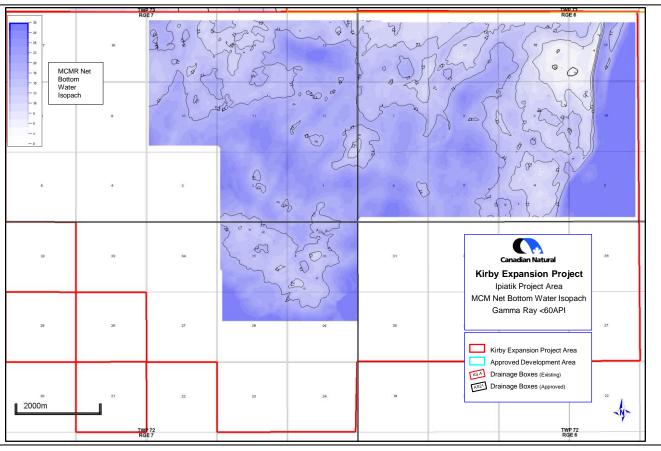


Kirby North McMurray Net Bottom Water Isopach



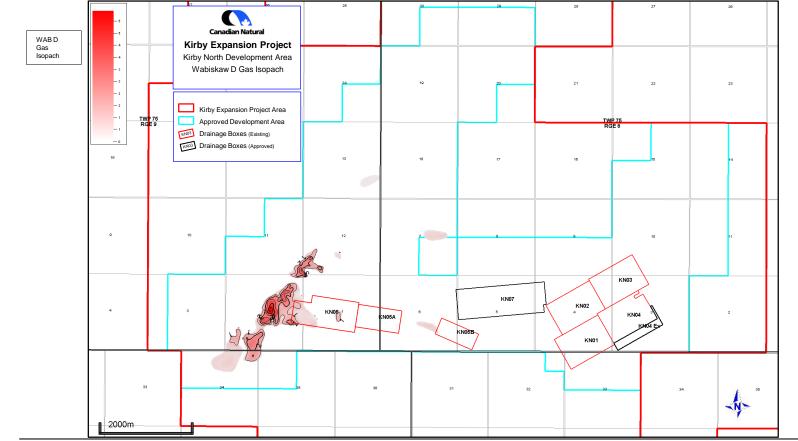


Ipiatik McMurray Net Bottom Water Isopach





Kirby North Gas Isopach - Wabiskaw D





### 4.2, 3 d) Geomechanical Anomalies

• No known geomechanical anomalies identified since last reporting period.

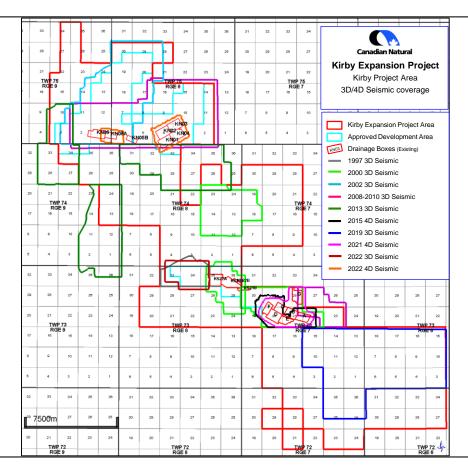


### 4.2, 3 d) Heave Monitoring

- No heave monitoring was conducted in 2022
- Heave monitoring is not a condition of approval
  - As there are no significant geomechanical issues observed at Kirby (associated with low pressure long-term SAGD operations) heave monitoring is not considered to be required



### 4.2, 3 e) Seismic

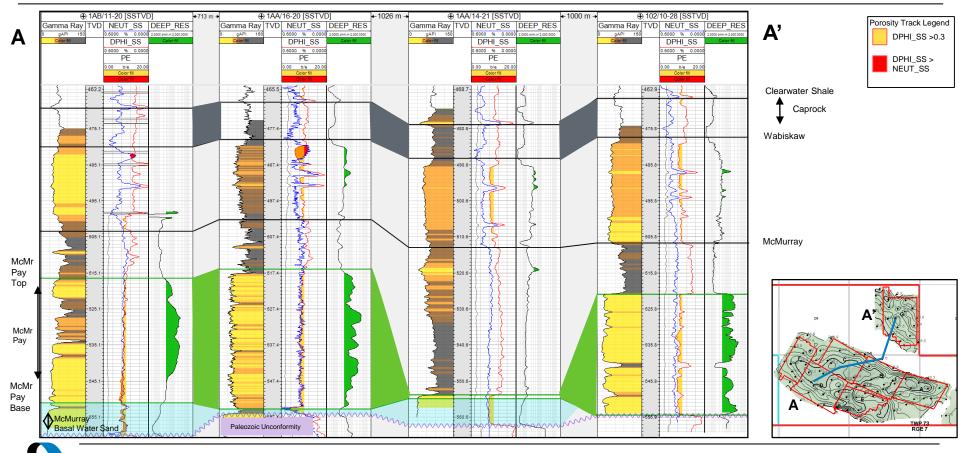




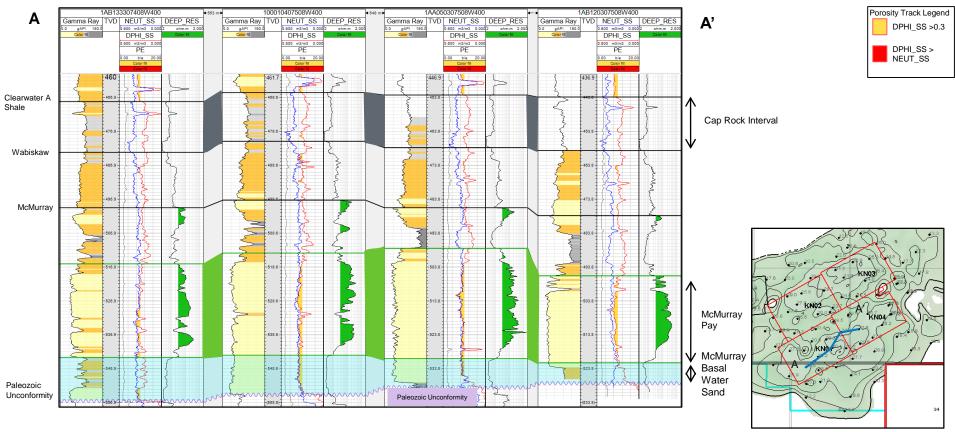
#### 4.2, 4) Cross-Section

**Canadian Natural** 

**Kirby South Structural Cross-Section** 



#### **4.2, 4) Cross-Section** Kirby North Structural Cross-Section





#### 4.2, 5) Project, Development and Combined Active Well Pattern Volumetrics

	Average pay thickness (m)	Average oil saturation (%)	Average porosity (%)	Average Permeability (D)	Original bitumen in place (e <sup>6</sup> m <sup>3</sup> )	Cumulative % bitumen recovery
KS Combined Active Well Pattern	25.3	73	33	4.7	31	47.2%
KN Combined Active Well Pattern	23.9	81	33	5.3	24	28.8%
Kirby South Approved Development Area	22.9	74	33	4.5	54	-
Kirby North Approved Development Area (McMurray)	17.6	81	33	4.8	78	-
Kirby North Approved Development Area (Wabiskaw D)	15.6	78	33	3.5	44	-
Kirby Approved Project Area	14.7	79	33	4.6	273	-

Volumetric calculation = Area within 10m contour **x** SAGD thickness **x** avg. oil saturation **x** avg. porosity



### 4.2, 6) Well Patterns Volumetrics – Kirby South

Drainage Area	Area (m²)	Average pay thickness (m)	Average porosity (%)	Average oil saturation (%)	Average permeability (D)	OBIP/PBIP (e <sup>6</sup> m <sup>3</sup> )	Total recovery % of original bitumen in place	Ultimate recovery % of original bitumen in place
Α	650,936	27.0	33	76	4.6	4	36.6%	50-70%
В	669,008	29.9	32	70	4.1	4	48.5%	50-70%
С	631,017	32.2	33	75	4.8	5	56.7%	50-70%
D	808,782	28.6	32	70	4.4	5	46.8%	50-70%
E	487,683	27.6	33	70	4.5	4	53.6%	50-70%
F	596,898	19.8	32	70	4.6	3	38.6%	50-70%
G	905,529	20.5	34	90	5.7	5	47.0%	50-70%

Note: in Kirby, PBIP=OBIP

**OBIP** = Original Bitumen in Place

PBIP = Producible Bitumen In Place

Volumetric calculation = Area within drainage box boundary and 10m contour x SAGD thickness x avg. oil saturation x avg. porosity



### 4.2, 6) Well Patterns Volumetrics – Kirby North

Drainage Area	Area (m²)	Average pay thickness (m)	Average porosity (%)	Average oil saturation (%)	Average permeability (D)	OBIP/PBIP (e <sup>6</sup> m <sup>3</sup> )	Total recovery % of original bitumen in place	Ultimate recovery % of original bitumen in place
KN01	763,253	25.0	32	80	4.7	5	13.2%	50-70%
KN02	754,806	24.3	32	82	5.0	5	36.3%	50-70%
KN03	763,821	25.0	33	84	5.6	5	37.0%	50-70%
KN04	763,330	24.9	33	85	5.4	5	28.7%	50-70%
KN05a	443,979	23.5	33	81	5.3	3	30.4%	50-70%
KN05b	205,465	20.6	33	75	5.6	1	20.7%	50-70%

Note: in Kirby, PBIP=OBIP

OBIP = Original Bitumen in Place

PBIP = Producible Bitumen In Place

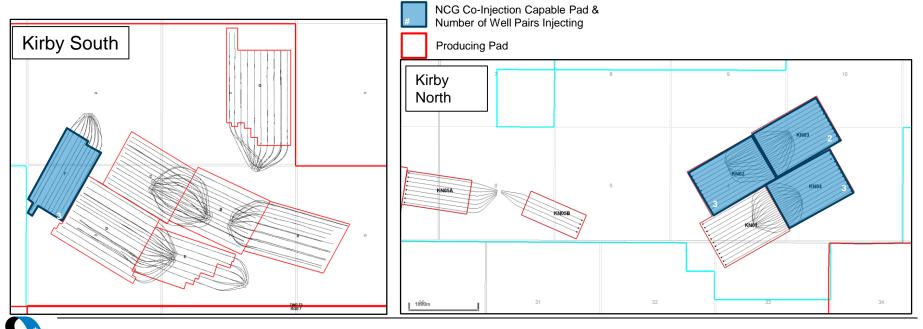
Volumetric calculation = Area within drainage box boundary and 10m contour x SAGD thickness x avg. oil saturation x avg. porosity



## 4.2, 7) Co-Injection

- Co-Injection: NCG (fuel gas, predominantly methane)
- Target Concentration:
  - KS: 0.5-2.75 mol%
  - KN: ~0.3 mol%

- KS: F Pad co-Injection started in 2021 and has been injecting continuously
- KS: E Pad produced gas co-Injection restarted Q1, 2022 and injected for 166 days intermittently in 2022
- KN: Co-Injection trial executed Q2 Q3, 2022 due to steam limitations



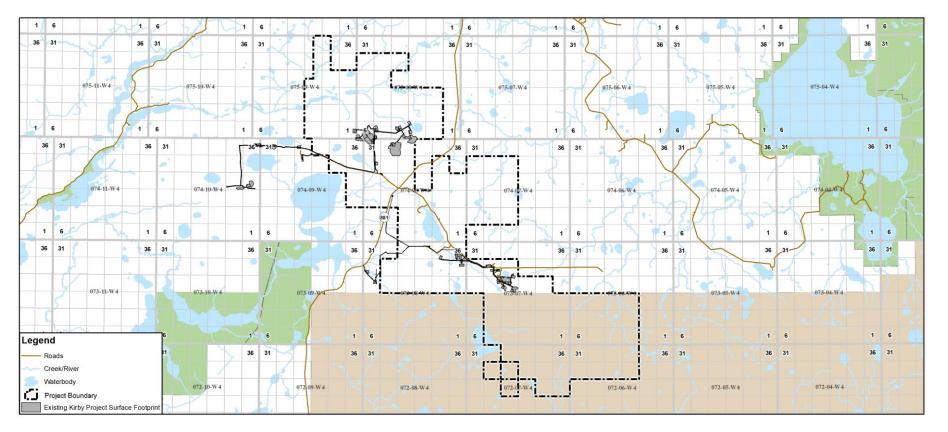
### 4.2, 7) Co-Injection (cont'd)

- NCG Recovery: Current estimation of NCG recycle rates is between 30 70%
  - As observed throughout industry, the recovery of injected NCG is difficult to differentiate from steam, solution gas and lift gas where applicable.
- Learnings to date:
  - Evidence shows a decrease in SOR while maintaining reservoir pressures and oil production.
  - No negative impact to resource recovery observed in non-late life NCG co-injection.
  - No McMurray aquifer or well integrity impacts evident to date.





### 4.3, 8 a) Built and Planned Surface Infrastructure Map





### 4.3, 8 b) Modifications to the Central Processing Facility

- Summary of facility modifications at the Kirby South CPF in 2022 that required AER approval:
  - Sulphur Removal Unit
    - Construction commenced Q4 2022, operational Q2 2023.
- No facility modifications at the Kirby North CPF in 2022 requiring AER approval.



#### 4.3, 8 c) Annual Operational Bitumen and Steam Rates

Kirby South	Actual Operational	Facility Design	
Bitumen	3,191 m <sup>3</sup> /cd	7,532 m <sup>3</sup> /sd*	
Steam (Sm <sup>3</sup> /d)	12,209	18,720	

Kirby North	Actual Operational	Facility Design		
Bitumen	5,600 m <sup>3</sup> /cd	8,368 m <sup>3</sup> /sd*		
Steam (Sm <sup>3</sup> /d)	17,233	18,720		

\* Note: Directive 056 License Limit





### 4.4, 9) Suspension and Abandonment Activity

- No well patterns suspended or abandoned during the reporting period.
- No well patterns in active blow-down or ramp down during the reporting period.



## 4.4, 10 a) Regulatory Approvals

Application Description	Application Number	Submission Date	Approval Date
KN01 to KN05 Light Hydrocarbon Enhanced SAGD	1934894	11/16/2021	1/11/2022
KN06 Light Hydrocarbon Enhanced SAGD	1935021	11/30/2021	1/11/2022
Kirby North Sulphur Management Strategy	1935312	12/21/2021	2/28/2022
KN04 Drainage Box Expansion	1935313	12/21/2021	4/25/2022
KN24 and KN25 Surface Pad Location Change	1935524	1/18/2022	2/14/2022
KN02/3/4 NCG Co-injection Measurement	1936050	3/10/2022	3/10/2022
KN24 and KN25 Surface Pad Location Change	1935866	2/16/2022	3/21/2022
KN08 and KN09 Development	1936092	3/11/2022	Under Review
Kirby South Ipiatik Area Brownfield Lifecycle	1936272	3/29/2022	9/08/2022
Kirby South Pad G Drainage Box Expansion	1936552	6/15/2022	4/27/2022
Kirby South Pad B Drainage Box Expansion	1937710	5/13/2022	6/24/2022



## 4.4, 10 a) Regulatory Approvals (cont'd)

Application Description	Application Number	Submission Date	Approval Date
Kirby North NCG Temporary Measurement Variance	1937713	5/13/2022	5/30/2022
Kirby South Sulphur Removal Unit	1937922	5/18/2022	8/24/2022
Kirby South D Pad NCG Co-Injection	1938647	7/13/2022	10/25/2022
Kirby North Light Hydrocarbon Recovery Facility	1938635	7/12/2022	12/5/2022
KS21, KS22 and KS23 Warm Hydrocarbon Agent-Assisted Start-up	1939324	9/15/2022	10/25/2022
Process Application			
Amendment to Clause 12(a) Monitoring of Basal McMurray Push-	1939393	9/21/2022	10/25/2022
Pull			
Kirby North KN02 Drainage Box Expansion	1939696	10/14/2022	2/15/2023
Kirby Project East Extension	1941332	12/6/2022	Under Review
Kirby South Quarterly SO2 Amendment	016-237382	12/12/2022	03/28/2023



### 4.4, 10 b) and c) Impacts to Scheme Performance and Learnings

#### Scheme Performance:

- Kirby North
  - KN06 drilling completed Q4 2022
- Kirby South
  - KS21 drilling commenced Q3 2022 (completed Q1 2023)
  - KS22 drilling commenced Q1 2022, steam-in Q4 2022
- Successes and Lessons Learned in 2022:
  - Successful drill and completion of long wells up to 2,500m
    - Lateral lengths >1,000m



### 4.4, 10 d) Regulatory and Operational Changes

- There are no reportable updates on pilots or major technical innovations at the Kirby Project associated with Scheme Approval No. 11475 during 2022.
- Canadian Natural continues to evaluate emerging technology.



# 4.4, 11) Compliance History

- Reportable Incidents Releases:
  - 1 reportable release with a volume of 0.5m<sup>3</sup>
    - December 12, 2022: Ref. #20222816
- Voluntary Self-Disclosures:

- None

- Contraventions: Environmental Protection and Enhancement Act & Water Acts
  - April 5, 2022: pressure gauge malfunction at a groundwater monitoring well resulting in a loss of instrumentation between March 4 to April 5. The gauge was sent to a third party for data retrieval (Ref. #20220823).
  - May 3, 2022: pressure gauge malfunction at a groundwater monitoring well. Pressure data between March 4 to April 5, 2022 was corrupt and non-retrievable (Ref. #20221036).

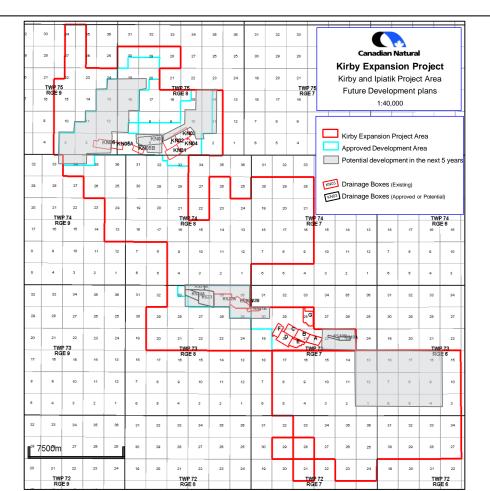


# 4.4 12 a) Future Plans: Upcoming 12 Month Activity

- Pending favorable economic conditions, the following potential future plans are under evaluation for 2023:
  - Kirby North:
    - KN06: Circulation commenced Q2 2023
    - KN07: Drilling commenced Q1 2023, circulation forecasted for Q3 2023
    - Continuing to evaluate re-drill opportunities
      - Executed 3 re-drills in Q1 2023
    - SRU operational Q1 2024
  - Kirby South:
    - KS21 and KS22 SAGD operations
    - An additional 2 well pairs, 6 re-entry wells were drilled in Q1 2023 from existing pads on Pads B, C, D, E, F & G
    - SRU operational Q2 2023
    - NCG/produced gas Co-Injection: E pad & F pad operational in 2023



#### 4.4, 12) 5-Year Potential Development Plan





# 4.4, 12 c) Future Plans: Upcoming 12 Month Applications

Application Description	Application Number	Submission Date	Approval Date
Deferral of Groundwater Sampling of Basal McMurray Water Sand Aquifer Observation Wells 100/08-26-074-10W4M and 100/07-29-074-09W4M	1941789	1/19/2023	1/20/2023
KN Butane Recovery Facility Equipment Amendment (EPEA)	018-00237382	5/9/2023	Under Review
KN02 NCG Co-injection Measurement	1943346	6/21/2023	Under Review

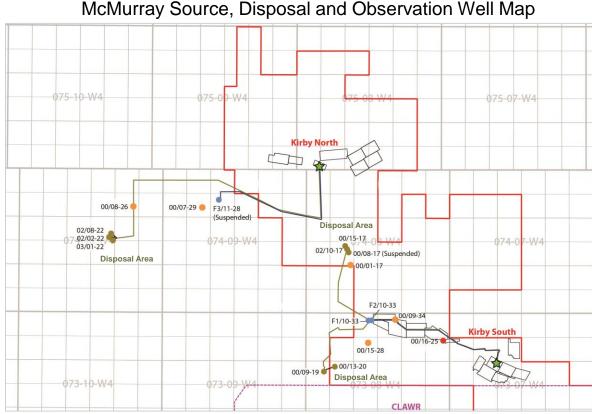
Continuing to evaluate future development applications



#### Scheme Approval No. 11475 Directive 054 Requirements Clause 10, 11(2) b/c and 12

• The required information associated with the identified clauses of the scheme approval will be provided following the start of steam injection on the KN06 well pad.



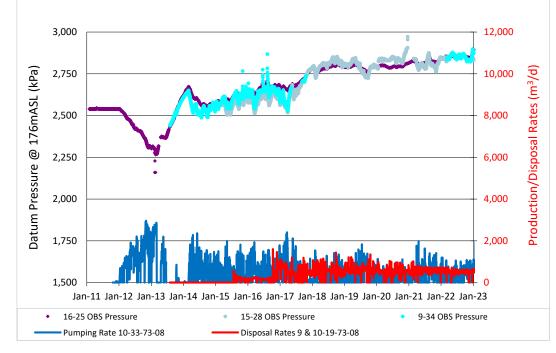


#### Legend

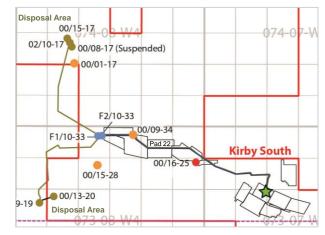




#### McMurray Fm. Basal Aquifer Pressures: Kirby South 10-33 Well Area



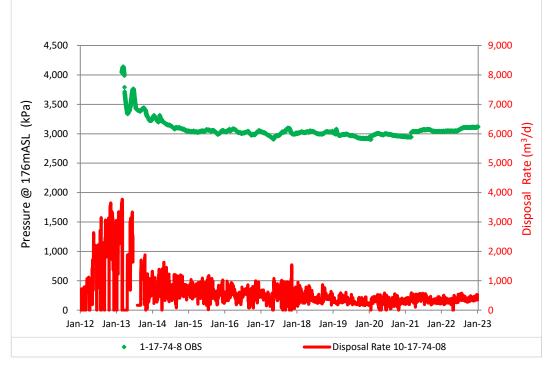
- Notification of 15-28 pressure data issues was submitted to the AER on February 8, 2022 as per Scheme Approval requirements
- 09-34 OBS was added to the Scheme Approval on October 31, 2022 and 16-25 OBS was removed

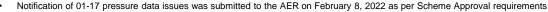


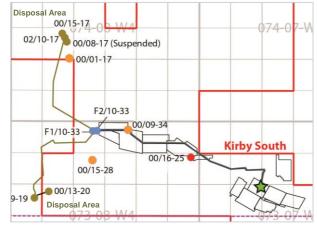
- Pressures in all observation wells have increased by ~ 300 kPa
  - Recent increase due to Pad 22 circulation
- Over the last four years, balanced McMurray sourcing and disposal has stabilized regional pressures between 2,800 - 2,850 kPa
- Successful McMurray pressure balance system in Kirby South area.





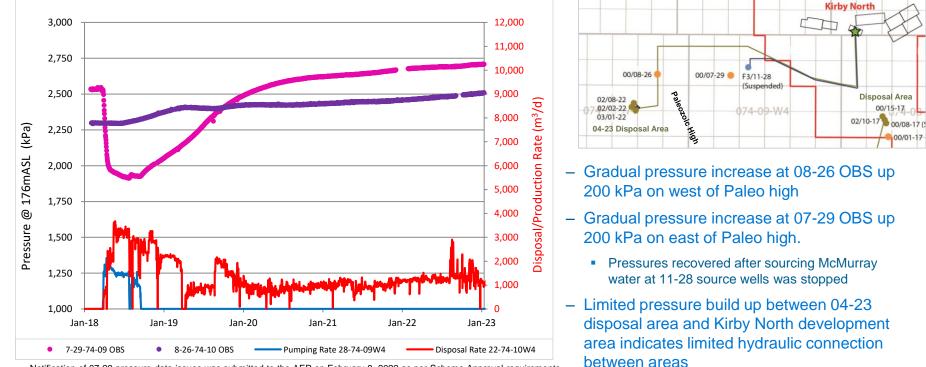






- Approximately 500 kPa above original static pressure
- Regional pressures at 01-17 OBS generally stabilized around ~3,000 kPa after cavern washing period (2012-2013)
  - Recent increase in 10-17 disposal volumes have resulted in the pressure increasing to ~3,100 kPa
- Successful McMurray pressure balance system





Notification of 07-29 pressure data issues was submitted to the AER on February 8, 2022 as per Scheme Approval requirements Notification of 08-26 pressure data issues was submitted to the AER on November 9, 2022 as per Scheme Approval requirements



#### **Groundwater Chemistry Analysis**

- All saline water source wells (annually)

	1F1/10-33-073-08W4 (McMurray) Kirby South	1F3/13-21-73-07W4 (Grand Rapids) Kirby South	1F1/13-05-075-08W4 (Clearwater) Kirby North	1F1/04-05-075-08W4 (Clearwater) Kirby North
Date	August 11, 2022	August 11, 2022	Not in use	September 7, 2022
Total Dissolved Solids	15,600 mg/L	4,710 mg/L	Not in use	6,080 mg/L

McMurray source wells in Kirby North were shut-in September 2018

#### - McMurray observation wells (every five years)

_	100/15-28-073- 08W4 Kirby South	100/01-17-074-08W4 Kirby South	100/08-26-074-10W4 Kirby North	100/07-29-074-09W4 Kirby North
Date	January 27, 2020	January 26, 2020	January 1, 2018	January 18, 2018
Total Dissolved Solids	16,900 mg/L	13,100 mg/L	10,900 mg/L	13,000 mg/L

McMurray observation wells were not required to be sampled in 2022

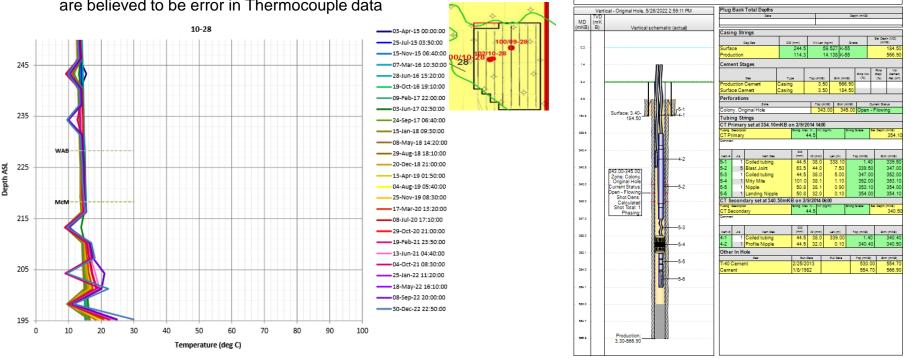


- Kirby Groundwater Model Update
  - Regional McMurray Basal Aquifer numerical groundwater model was updated for recent Kirby Project East Extension Application (2022).
    - Modelling results demonstrate on-going viability of the pressure balance system
  - Canadian Natural will provide an update to the AER on the groundwater model in 2023 including:
    - a comparison of observed pressure to modelled predictions,
    - a summary of the model, input parameters, and changes since the last model run,
    - and future predictions



## Kirby South Area 100/10-28-073-07W4 – Monitoring Results

- Colony gas well to evaluate the ability of non-thermal cement to maintain hydraulic isolation in a thermal environment
- Distinct jumps to cooler temperatures at 243, 213, 204 and 198 ASL are believed to be error in Thermocouple data





#### No thermal impacts seen to date. Hydraulic isolation maintained.

**Downhole Schematic** 

**RAX NCR KIRBY 10-28-73-7** 

0094383

WIAU LAKE

Alberta

Canadian Natura

100/10-28-073-07W4

### Approval 11475 OSCA Annual Report: Lifecycle Update

- No Lifecycle Developments were conducted in 2022
  - No new subsurface information is available related to approved lifecycle activities such as drainage area delineation and evaluation, well design, and development activity.
  - No new surface information is available related to approved lifecycle activities such as energy or material balances updates, and additional technologies that result in impacts of process changes on the operations of the facility.



#### Special Note Regarding Forward-Looking Statements

Certain statements relating to Canadian Natural Resources Limited (the "Company") in this document or documents incorporated herein by reference constitute forward-looking statements or information (collectively referred to herein as "forward-looking statements") within the meaning of applicable securities legislation. Forward-looking statements can be identified by the words "believe", "anticipate", "expect", "plan", "estimate", "target", "continue", "could", "intend", "may", "potential", "predict", "should", "intend", "any", "potential", "predict, "should", "intend", "any", "potential", "predict to expected future outcome or statements regarding an outlook. Disclosure regarding an outlook. Disclosure regarding an outlook. Disclosure or statements relating to formany's danagement's Discussion and Analysis ("MD&A") of the financial condition and results of operations of the Company, constitute forward-looking statements. Disclosure of plans relating to and expected results of existing and future developments, including, without limitation, those in relation to the Company's assets at Horizon Oil Sands ("Horizon"), the Athabasca Oil Sands Project ("AOSP"), Primrose thermal oil projects, the Pelican Lake water and polymer flood projects, the Kirby Thermal Oil Sands Project, the Jackfish Thermal Oil Sands Project ("AOSP"), Primrose thermal oil projects, or dher means of transportation of bitumen, crude oil, natural gas, natural gas, liquids ("NGLs") or synthetic crude oil ("SCC") that the Company may be reliant upon to transport its products on market, the development and deployment of technological innovations, and the financial capacity of the Company to complete its growth projects and responsibly and sustainably grow in the long term also constitute forward-looking statements are based on annual budgets and multi-year forecasts, and are reviewed and revised throughout the year as necessary in the context of targeted financial ratios, project returns, product pricing risk and time horizons. These statements are

In addition, statements relating to "reserves" are deemed to be forward-looking statements as they involve the implied assessment based on certain estimates and assumptions that the reserves described can be profitably produced in the future. There are numerous uncertainties inherent in estimating quantities of proved and proved plus probable crude oil, natural gas and NGLs reserves and in projecting future rates of production and the timing of development expenditures. The total amount or timing of actual future production may vary significantly from reserves and proved plus probable crude oil, natural gas and NGLs reserves and in projecting future rates of production and the timing of development expenditures.

The forward-looking statements are based on current expectations, estimates and projections about the Company and the industry in which the Company operates, which speak only as of the date such statements were made or as of the date of the report or document in which they are contained, and are subject to known and unknown risks and uncertainties that could cause the actual results, performance or achievements of the Company to be materially different from any future results. performance or achievements expressed or implied by such forward-looking statements. Such risks and uncertainties include, among others: general economic and business conditions (including as a result of effects of the novel coronavirus ("COVID-19") pandemic and the actions of the Organization of the Petroleum Exporting Countries Plus ("OPEC+") which may impact, among other things, demand and supply for and market prices of the Company's products, and the availability and cost of resources required by the Company's operations: volatility of and assumptions regarding crude oil and natural gas and NGLs prices including due to actions of OPEC+ taken in response to COVID-19 or otherwise: fluctuations in currency and interest rates: assumptions on which the Company's current targets are based; economic conditions in the countries and regions in which the Company conducts business; political uncertainty, including actions of or against terrorists, insurgent groups or other conflict including conflict between states; industry capacity; ability of the Company to implement its business strategy, including exploration and development activities; impact of competition; the Company's defense of lawsuits; availability and cost of seismic, drilling and other equipment: ability of the Company and its subsidiaries to complete capital programs; the Company's and its subsidiaries' ability to secure adequate transportation for its products; unexpected disruptions or delays in the mining, extracting or upgrading of the Company's bitumen products; potential delays or changes in plans with respect to exploration or development projects or capital expenditures; ability of the Company to attract the necessary labour required to build, maintain, and operate its thermal and oil sands mining projects; operating hazards and other difficulties inherent in the exploration for and production and sale of crude oil and natural gas and in mining, extracting or upgrading the Company's bitumen products; availability and cost of financing; the Company's and its subsidiaries' success of exploration and development activities and its ability to replace and expand crude oil and natural gas reserves; the Company's ability to meet its targeted production levels; timing and success of integrating the business and operations of acquired companies and assets: production levels: imprecision of reserves estimates and estimates of recoverable quantities of crude oil. natural gas and NGLs not currently classified as proved; actions by governmental authorities (including production curtailments mandated by the Government of Alberta); government regulations and the expenditures required to comply with them (especially safety and environmental laws and regulations and the impact of climate change initiatives on capital expenditures and production expenses); asset retirement obligations; the sufficiency of the Company's liquidity to support its growth strategy and to sustain its operations in the short, medium, and long term; the strength of the Company's balance sheet; the flexibility of the Company's capital structure; the adequacy of the Company's provision for taxes; the continued availability of the Canada Emergency Wage Subsidy ("CEWS") or other subsidies; and other circumstances affecting revenues and expenses.

The Company's operations have been, and in the future may be, affected by political developments and by national, federal, provincial, state and local laws and regulations such as restrictions on production, changes in taxes, royalties and other amounts payable to governments or governmental agencies, price or gathering rate controls and environmental protection regulations. Should one or more of these risks or uncertainties materialize, or should any of the Company's assumptions prove incorrect, actual results may vary in material respects from those projected in the forward-looking statements. The impact of any one factor on a particular forward-looking statement is not determinable with certainty as such factors are dependent upon other factors, and the Company's course of action would depend upon its assessment of the future considering all information then available.

Readers are cautioned that the foregoing list of factors is not exhaustive. Unpredictable or unknown factors not discussed in this presentation or the Company's MD&A could also have adverse effects on forward-looking statements. Although the Company believes that the expectations conveyed by the forward-looking statements are reasonable based on information available to it on the date such forward-looking statements are made, no assurances can be given as to future results, levels of activity and achievements. All subsequent forward-looking statements, whether written or oral, attributable to the Company or persons acting on its behalf are expressly qualified in their entirety by these cautionary statements. Except as required by applicable law, the Company assumes no obligation to update forward-looking statements in this presentation or the Company's MD&A, whether as a result of new information, future events or other factors, or the foregoing factors affecting this information, should circumstances or the Company's estimates or opinions change.



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