



McClellan Lake Operation

Licence Amendment – JEB TMF Expansion



Commission Hearing
October 4, 2021
CMD 21-H6.A



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Presentation Outline

- Purpose of Hearing
- Facility Overview
- Review of Licence Amendment Application
- Technical Assessment
- Regulatory Focus Areas
- Other Matters of Regulatory Interest
- Conclusions and Recommendations



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Purpose of Hearing

Orano has submitted an application to the Commission to:

- Amend the CNSC licence issued to Orano for the McClellan Lake Operation to authorize the JEB Tailings Management Facility (TMF) expansion

CNSC staff recommend that the Commission:

- Amend the CNSC licence issued to Orano, UMOL-MINEMILL-McCLEAN.01/2027 as put forward in CMD 21-H6
- Accept the proposed revised financial guarantee for Orano's McClellan Lake Operation for decommissioning in the amount of C\$102,098,000



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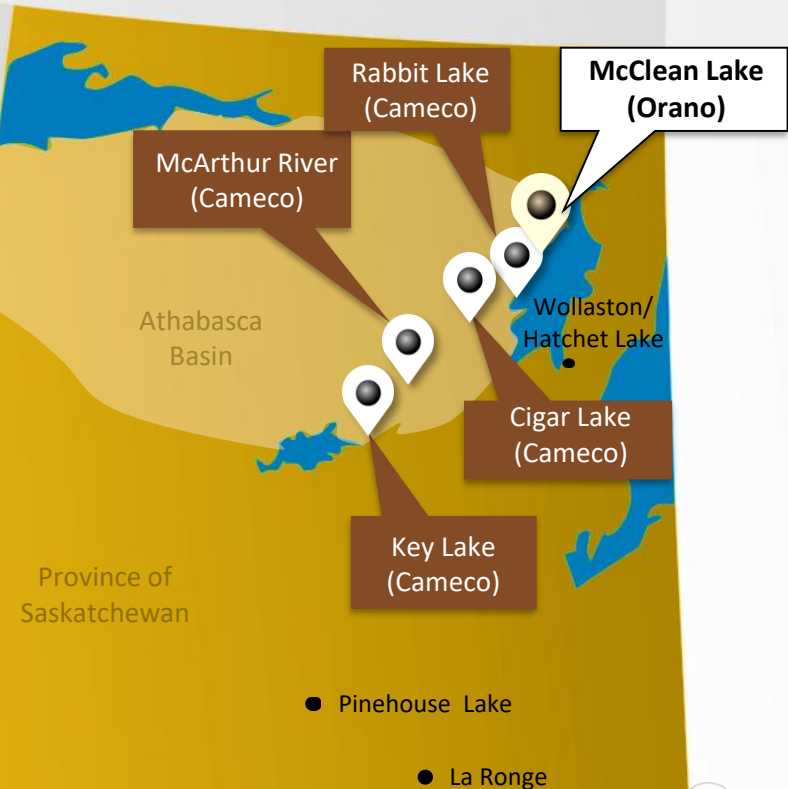
FACILITY OVERVIEW



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Facility Overview

- Located approximately 750 km north of Saskatoon, Saskatchewan
- Closest communities are Wollaston Post and Hatchet Lake Denesuline First Nation
- Owned by Orano (77.5%) and Denison Mines (22.5%)
- Includes the JEB mill and TMF, Sue mine area, and undeveloped deposits at the McClellan Lake Operation

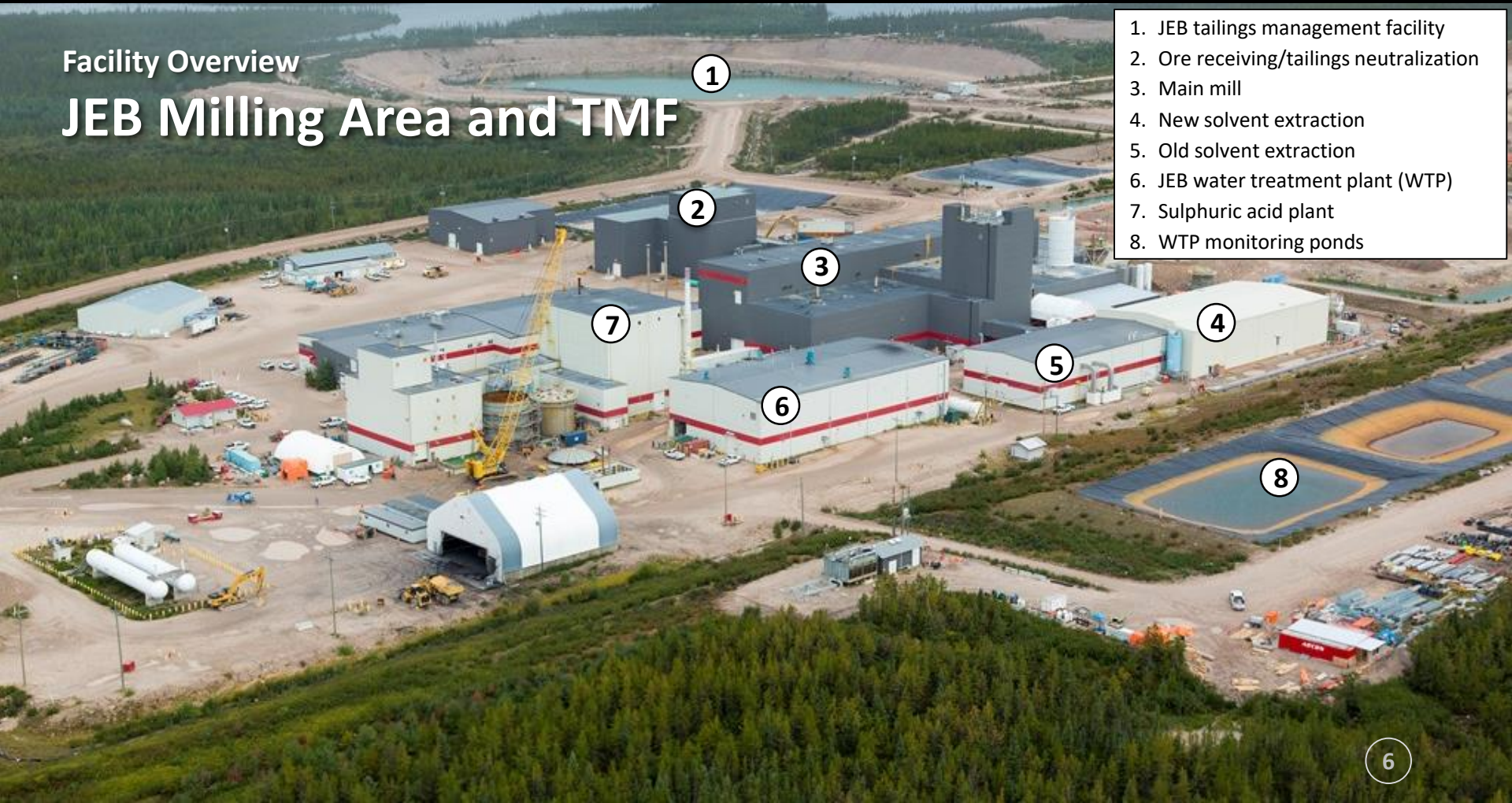




Facility Overview

JEB Milling Area and TMF

1. JEB tailings management facility
2. Ore receiving/tailings neutralization
3. Main mill
4. New solvent extraction
5. Old solvent extraction
6. JEB water treatment plant (WTP)
7. Sulphuric acid plant
8. WTP monitoring ponds





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McClean Lake CNSC Licence

- July 2017 – current CNSC licence was renewed for a 10-year term, valid until June 30, 2027
- July 2018 – CNSC licence was amended to update the licensee name from AREVA Resources Canada Inc. to Orano Canada Inc.



**URANIUM MINE OPERATING LICENCE
ORANO CANADA INC.
McCLEAN LAKE OPERATION**

- I) LICENCE NUMBER:** UMOL-MINEMILL-McCLEAN.01/2027
(Effective Date: July 12, 2018)
- II) LICENSEE:** Pursuant to section 24 of the *Nuclear Safety and Control Act*, this licence is issued to:
- Orano Canada Inc.**
817 – 45th Street West
P.O. Box 9204
Saskatoon, Saskatchewan S7K 3X5
- III) LICENCE PERIOD:** This licence is valid from July 1, 2017 to June 30, 2027, unless suspended, amended, revoked or replaced.
- IV) LICENSED ACTIVITIES:**
- This licence authorizes the licensee to:
- operate and modify a nuclear facility (hereinafter, “the facility”) for the mining of uranium ore and the production of uranium concentrate at a site known as the McClean Lake Operation in the province of Saskatchewan, as shown on the drawing referenced in appendix A to this licence
 - mine a nuclear substance (uranium ore)
 - produce a uranium concentrate
 - import, possess, use, store, transfer and dispose of nuclear substances and radiation devices that are required for or associated with laboratory studies, field studies, fixed gauge use and borehole logging devices



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Proposed Licence Amendment

- CNSC staff recommend the Commission amend the CNSC licence to add a new licensed activity in section IV) *Licensed Activities*:
 - b) modify the outer perimeter of the JEB Tailings Management Facility for the vertical expansion up to 468 metres above sea level (mASL) and to accommodate disposal of tailings up to a consolidated tailings elevation of 462 mASL
- No change to the licence term and licence conditions



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**URANIUM MINE LICENCE
ORANO CANADA INC.
McCLELLAN LAKE OPERATION**

- I) **LICENCE NUMBER:** UML-MINEMILL-McCLELLAN.02/2027
(Effective Date: July 12, 2018)
- II) **LICENSEE:** Pursuant to section 24 of the *Nuclear Safety and Control Act*, this licence is issued to:

Orano Canada Inc.
100 – 833 45th Street West
Saskatoon, Saskatchewan S7L 5X2
- III) **LICENCE PERIOD:** This licence is valid from July 1, 2017 to June 30, 2027, unless suspended, amended, revoked or replaced.
- IV) **LICENSED ACTIVITIES:**
This licence authorizes the licensee to:
- a) operate and modify a nuclear facility (hereinafter, “the facility”) for the mining of uranium ore and the production of uranium concentrate at a site known as the McClellan Lake Operation in the province of Saskatchewan, as shown on the drawing referenced in appendix A to this licence
 - b) modify the outer perimeter of the JEB Tailings Management Facility for the vertical expansion up to 468 metres above sea level (mASL) and to accommodate disposal of tailings up to a consolidated tailings elevation of 462 mASL
 - c) mine a nuclear substance (uranium ore)
 - d) produce a uranium concentrate
 - e) import, possess, use, store, transfer and dispose of nuclear substances and radiation devices that are required for or associated with laboratory studies, field studies, fixed gauge use and borehole logging devices



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REVIEW OF LICENCE AMENDMENT APPLICATION



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JEB TMF Expansion – Project History

August 2011 to November 2014

- Orano submitted a project description for the JEB TMF expansion to 468 mASL elevation
- CNSC staff determined a federal screening level EA was required
- Orano revised forecasted mine development plans resulting in reduced tailings volume
- Alternative assessment confirmed JEB TMF vertical expansion to a lower elevation
- Orano withdrew the application

June 2016 to April 2017

- Orano submitted a new project description with reduced scope for the JEB TMF expansion to 457.5 mASL elevation
- CNSC staff concluded the reduced proposed expansion was within licensing basis
- CNSC staff approved the project in 2017
- Reported to the Commission during licence renewal hearing CMD 17-H9

November 2019 to June 2020

- Orano submitted a project description for the JEB TMF expansion to 468 mASL elevation
- CNSC staff determined the project could continue to the licensing process under the [Nuclear Safety and Control Act](#)
- CNSC staff concluded that the project is outside the licensing basis and required a licence amendment
- Orano submitted the licence amendment application



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Review of Orano's Licence Amendment Application

CNSC staff assessed Orano's application for a licence amendment against:

- Regulatory requirements, including the *Nuclear Safety and Control Act* (NSCA), associated regulations, CNSC REGDOCs, guides and standards for all 14 safety and control areas (SCAs)
- Past performance and records (compliance activities and environmental monitoring)
- Public information, community outreach, and consultation activities

***CNSC staff
concluded
Orano meets
regulatory
licensing
requirements***



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Environmental Protection Review under the NSCA

- CNSC staff conducted an Environmental Protection Review (EPR) under the NSCA of Orano's application for a licence amendment
- EPR assessed the environmental and health effects of the JEB TMF expansion
- CNSC staff's assessment was based on information submitted by Orano, as well as compliance, technical assessment and past environmental performance
- EPR is appended to, and supports the recommendations in, CNSC staff's CMD 21-H6

CNSC staff concluded Orano will continue to adequately protect the environment and the health and safety of persons



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Safety and Control Areas

- Regulatory oversight is performed in accordance with a standard set of safety and control areas (SCAs)
- SCAs are used across all CNSC-regulated facilities and activities
- Orano maintained a satisfactory rating across all SCAs during the current licence period (2017-2021*)

Risk-informed and performance-based approach



Safety and Control Areas	Rating 2017-2021*
Management system	SA
Human performance management	SA
Operating performance	SA
Safety analysis	SA
Physical design	SA
Fitness for service	SA
Radiation protection	SA
Conventional health and safety	SA
Environmental protection	SA
Emergency management and fire protection	SA
Waste management	SA
Security	SA
Safeguards and non-proliferation	SA
Packaging and transport	SA



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TECHNICAL ASSESSMENT



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Technical Assessment SCA Performance Highlights

- Assessment of all 14 SCAs is discussed in CMD 21-H6
- Five SCAs are highlighted in this presentation:
 - Operating performance
 - Safety analysis
 - Physical design
 - Environmental protection
 - Waste management



McClellan Lake Mill: Packaging facility – control screen
(Source: Orano)



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Technical Assessment Operating Performance

- Proposed expansion will increase JEB TMF height by 10.5 metres and consolidated tailings height by 14 metres
- CNSC staff's technical assessments of Orano's application included topics such as, but not limited to:
 - Slope stability, till collapse potential, groundwater flow, soil liner design
 - Hypothetical beyond-design basis erosion event
- CNSC staff completed the technical assessment in March 2021 and accepted that Orano's application was complete

***CNSC staff
concluded the
proposed JEB
TMF expansion
will continue to
ensure
protection of the
environment***



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Technical Assessment Safety Analysis - Hazards (1/3)

CNSC staff verified Orano's safety analysis case for the JEB TMF expansion:

- Safety of the containment structure is assessed against the regulatory requirements and the Canadian best practice represented by the *Dam Safety Guidelines* (2007, revised 2013) of the Canadian Dam Association
- Hazards associated with the expansion are identified and their risks to the environment and human health are assessed
- CNSC staff assessed impacts of the identified hazards through review of slope stability analysis and failure of embankment structure



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Technical Assessment Safety Analysis – Containment Structure (2/3)

- **Deterministic slope stability analyses:**
 - **Criteria:** *Dam Safety Guidelines* (2007, revised 2013) of the Canadian Dam Association (CDA)
 - **Results:** Proposed design satisfies CDA criteria for slope stability for all loading conditions

- **Probabilistic slope stability analyses:**
 - **Criteria:** Reliability index ≥ 2.5
 - **Results:** Reliability index = 3.89
Probability of failure = 3×10^{-5}

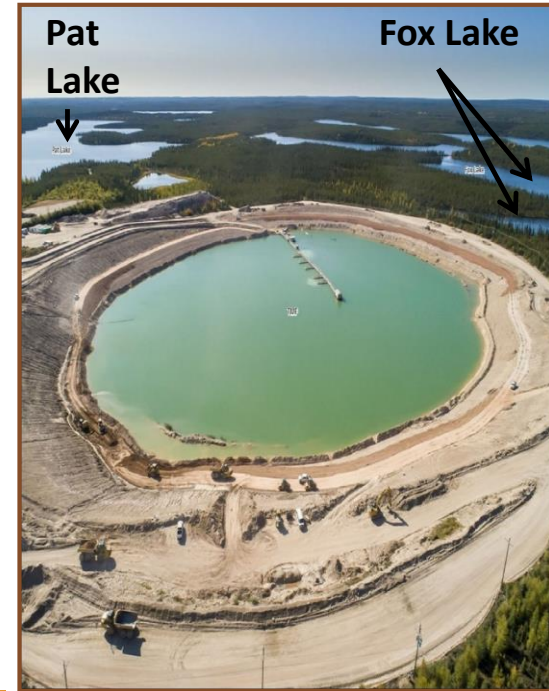
Loading condition	Minimum factor of safety (CDA)	Slope	Calculated factor of safety
End of construction (including staged construction)	1.3	Upstream	1.49 (2H:1V)
		Downstream	1.55 (2H:1V)
Long-term (steady state seepage, maximum storage)	1.5	Downstream	1.55 (2H:1V)
Pseudo-static (for seismic loading)	1.0	Upstream	1.09 (2H:1V)
		Downstream	1.14 (2H:1V)



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Technical Assessment Safety Analysis – Severe Accident Analysis (3/3)

- **Scenarios for severe accident analysis:**
 - Release of JEB TMF water to the environment when the JEB TMF is at maximum capacity
 - Release of JEB TMF water and tailings solids to the environment when the JEB TMF is at maximum capacity
- **CNSC staff conclusions:**
 - No significant effects on the Collins Creek watershed, approximately 5 km downstream of the facility
 - Water and sediment quality and the health of aquatic biota in Fox Lake and Pat Lake would be affected
 - Fox Lake is the closest water body to the JEB TMF, completely within the licensed site, and is not used for fishing during operation



Aerial view of the JEB TMF, Pat Lake and Fox Lake (Source: Orano)

CNSC staff concluded the JEB TMF expansion can be constructed and operated safely throughout the facility lifecycle

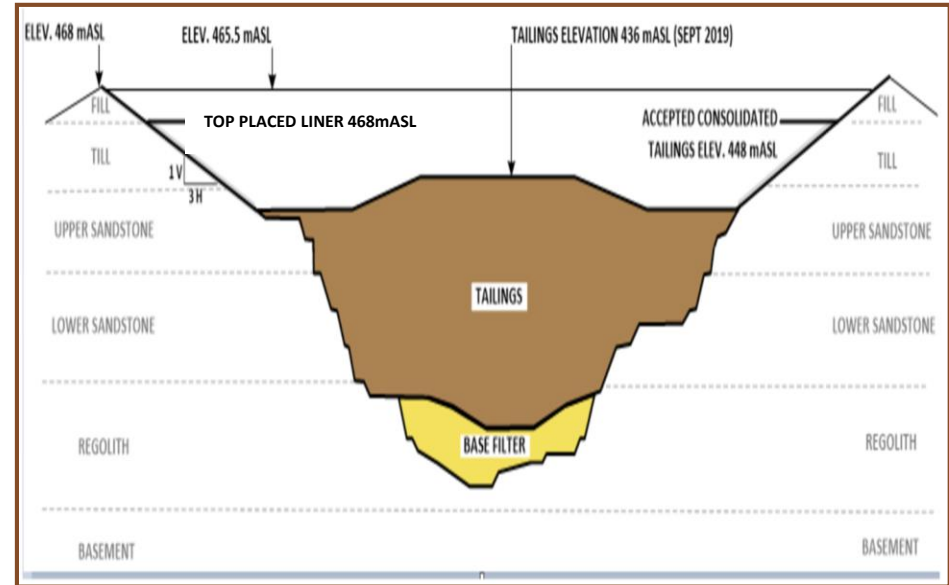


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Technical Assessment Physical Design (2/5)

Site Characterization:

- Site investigation
 - Organics or organic soils: 0 - 4 m
 - Till: 10 - 28 m
 - Sandstone: ~ 60 - 200 m
 - Regolith: ~ 50 m
 - Crystalline basement rock
- Material characterization



Components of JEB TMF and stratigraphy of the site (image not to scale)
(Source: Orano)

Site investigation and material characterization has verified appropriate site soil conditions for the JEB TMF expansion



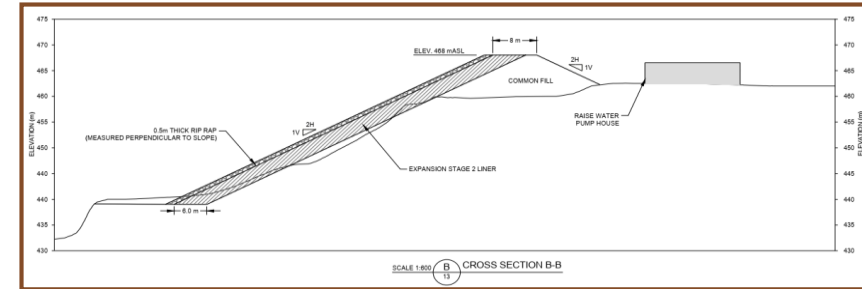
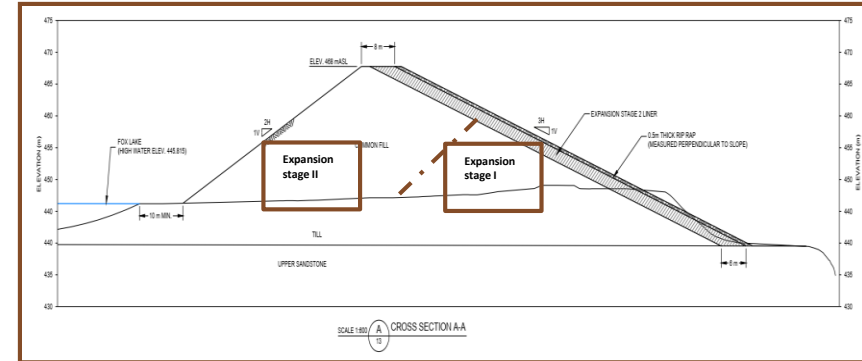
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Technical Assessment Physical Design (3/5)

Structure Design:

CNSC staff evaluation of embankment design

- Supported with slope stability analysis
- Sufficient capacity for extreme weather
- Slopes will be flattened during decommissioning
- Lessons learned from Mount Polley tailings dam breach taken into account



Two cross-sections showing designed embankment slope configuration (Source: Orano)

JEB TMF expansion embankment is designed to ensure both short-term and long-term stability and safety



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Technical Assessment Physical Design (4/5)

Structure Design as Part of Lifecycle Assessment:

Landform design

- Used a geomorphic approach and a structural approach
- Current design is preliminary
- Final detailed design will be provided prior to the JEB TMF decommissioning

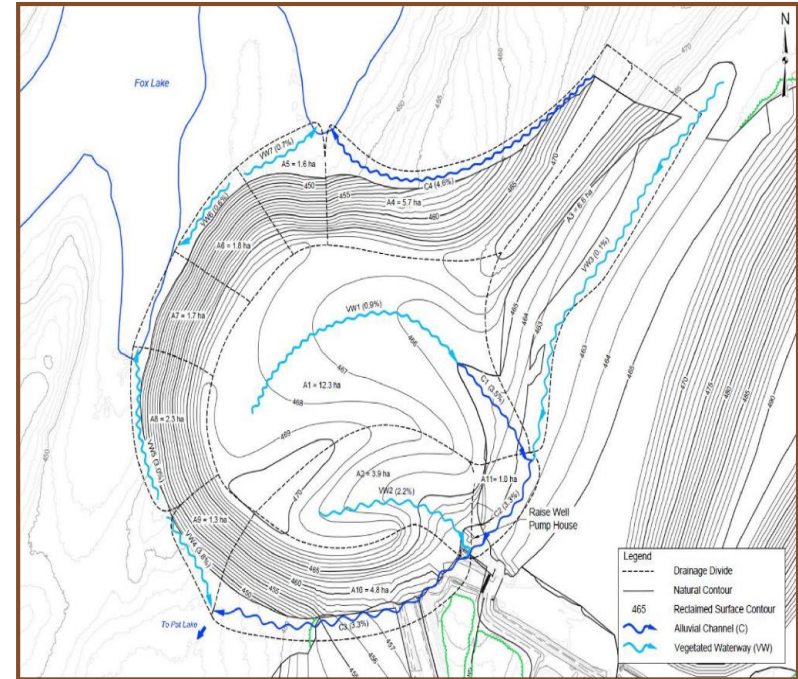


Illustration of proposed landform for decommissioned JEB TMF (Source: Orano)

The final landform will ensure the long-term performance of the decommissioned JEB TMF

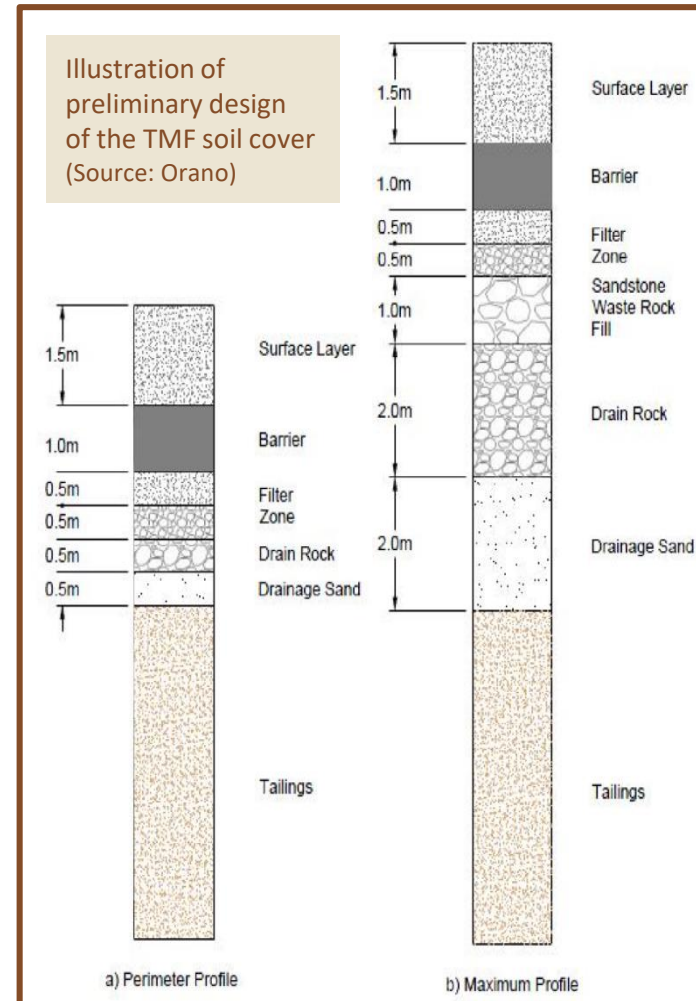


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Technical Assessment Physical Design (5/5)

Component Design:

- Liner design
 - Bentonite amended materials
 - Supported with numerical analysis of the liner hydraulic performance
 - Accepted for previous JEB TMF expansion to 457.5 mASL
- TMF cover design as part of lifecycle assessment
 - Capped with low hydraulic conductivity soil cover system
 - Current cover design is preliminary
 - Detailed final cover design will be completed prior to the JEB TMF decommissioning





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Technical Assessment Environmental Protection (1/4)

- Orano maintains a comprehensive environmental protection program
- As part of this program, Orano continues to:
 - Implement and maintain an environmental monitoring program and a groundwater protection program
 - Control and monitor releases to the environment
 - Periodically review and update their environmental risk assessment
 - Implement and maintain an Environmental Management System

Orano meets all requirements in CNSC REGDOC-2.9.1, Environmental Protection: Environmental Principles, Assessments and Protection Measures



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Technical Assessment Environmental Protection (2/4)

CNSC staff evaluated Orano's measures for potential interactions with the environment

- Airborne emissions generated from construction activities and road dust
 - Mitigation measures will be in place to reduce any potential impact to the environment
- Treated effluent is not expected to change as a result of the expansion
 - Existing WTP has capacity to treat reclaimed water from the proposed JEB TMF expansion
- CNSC staff will continue to monitor releases and ensure they remain below licensed release limits

***CNSC staff are satisfied that releases to the environment
are not expected to impact the environment***



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Technical Assessment Environmental Protection (3/4)

CNSC staff considered post-decommissioning of the facility

- Orano conducted a long-term assessment (post-decommissioning)
 - Engineered cover will prevent contaminants from migrating to the atmosphere
 - Surface water quality in Fox Lake and Pat Lake is expected to remain safe
 - Exposures to radiation for people using the site will be the same as natural background exposures
 - Orano committed to conduct a long-term assessment of contaminants in sediments in Fox Lake and Pat Lake, and will consider additional mitigation if necessary
- At the request of CNSC staff, Orano considered a beyond-design basis disruptive event scenario
 - Provides bounding assessment of potential long-term impacts in the event that the cover is significantly eroded; results demonstrated no additional risks are expected

***Risk to the environment and to people from the proposed
JEB TMF expansion is predicted to be negligible***



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Technical Assessment Environmental Protection (4/4)

- CNSC staff will ensure that Orano continues to evaluate the environmental monitoring program and make adjustments as required
- Groundwater monitoring used to demonstrate hydraulic containment is maintained
- At the request of CNSC staff, Orano has committed to implement a post-decommissioning environmental monitoring program focusing on the surrounding and downstream receiving environments

***Following decommissioning, the JEB TMF will
continue to contain and isolate the waste***



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Regulatory Focus Areas

CNSC staff will continue to:

- Evaluate licensee performance across all 14 SCAs
- Conduct inspections according to CNSC's compliance verification program
- Assess compliance reports, licensee programs and facility changes
- Verify and monitor licensee's implementation of CNSC regulatory documents in accordance with implementation plans
- Report annually to the Commission, in the form of a Regulatory Oversight Report

CNSC staff will continue to provide regulatory oversight through compliance activities



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OTHER MATTERS OF REGULATORY INTEREST



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Decommissioning Preliminary Decommissioning Plan

Orano continues to maintain a Preliminary Decommissioning Plan (PDP) throughout the facility lifecycle. The PDP is required to:

- Meet regulations, CSA Group standards and regulatory guide documents
- Be reassessed every 5 years, next submission due in 2026

Orano's PDP meets CNSC regulatory requirements



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Decommissioning Preliminary Schedule

Area	Activity	Post-Operational		Initial Decommissioning			Interim Monitoring and Tailings Consolidation							Final Decommissioning	Post-Closure Monitoring					
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
McClellan	Preparation for Decommissioning	█	█																	
JEB Area	Demolition and Reclamation (Initial)			█	█	█														
	JEB WTP Operation	█	█	█	█	█	█	█	█	█	█	█	█	█						
	JEB Area Demolition and Reclamation (Final)														█					
Sue Area	Sue WTP Operation	█	█	█	█															
	Mining Area Closure					█														
Enviro Monitoring	Routine Environmental Monitoring	█	█	█	█	█														
	Interim Monitoring						█	█	█	█	█	█	█	█	█					
	Post-Closure Environmental Monitoring															█	█	█	█	█



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Financial Guarantees

- November 2020 - Orano submitted a revised PDP and reduced the financial guarantee (FG) from C\$107,241,000 to C\$102,098,000 (~ C\$5.1 million)
 - decrease due to: tailings volume in the JEB TMF, reduction in camp and operation costs
- PDP and FG includes all existing facilities as well as planned activities to end of 2025
- Saskatchewan Ministry of Environment (SMOE) is the beneficiary of the FG for all operating and decommissioned uranium mines and mills in Saskatchewan
- CNSC staff and SMOE officials reviewed the revised FG and concluded the proposed FG meets regulatory requirements

CNSC staff concluded Orano's proposed FG is sufficient to complete future decommissioning activities



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Indigenous Engagement and Consultation

- CNSC staff regularly engage with Indigenous groups through community meetings and workshops
- CNSC staff identified First Nation and Métis groups who previously expressed interest
 - February 2021 - letters of notification sent to the identified First Nation and Métis groups and organizations
 - March and May 2021 - follow-up emails sent to ensure receipt of notification letters and to offer virtual meetings
 - June 2021 – First Nation and Métis groups were provided a copy of CMD 21-H6 and offered virtual meetings
 - July 2021 – CNSC staff met virtually with Ya’thi Néné leadership, board, and staff
- CNSC staff monitored Orano’s engagement with Indigenous groups

CNSC staff continues to engage and consult with Indigenous peoples to build trust and foster relationships



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Public Outreach

- September 2019 – CNSC staff met with Indigenous groups and communities
- September 2020 - due to COVID-19 pandemic restrictions, a virtual Zoom meeting was conducted with northern community leadership
- February 2021 - notice of public hearing was posted on CNSC website, distributed to subscribers, and advertised in print and digital media



CNSC staff outreach session – February 2018
(Source: CNSC)



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Participant Funding Program

- CNSC allocated C\$105,680 in funding
- Made available to assist members of the public and Indigenous groups in providing valuable information directly to the Commission

Funding awarded to:

- *English River First Nation*
- *Métis Nation-Saskatchewan*
- *Ya'thi Néné Land and Resource Office**



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Interventions

CNSC received 6 interventions, main themes included:

- Support from local businesses and Indigenous persons and groups
- Indigenous engagement and consultation
- TMF facility integrity and human health
- Potential environmental risks



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CONCLUSIONS AND RECOMMENDATIONS



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Conclusions

CNSC staff:

- Reviewed Orano's licence amendment application and supporting documents
- Determined that Orano's proposed expansion of the JEB TMF is safe and will continue to protect the health and safety of persons and the environment

CNSC staff concluded that Orano meets CNSC's regulatory requirements



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Recommendations

CNSC staff recommend that the Commission:

- Conclude that Orano, pursuant to subsection 24(4) of the [*Nuclear Safety and Control Act*](#), is qualified to carry out the activities authorized by the uranium mine and mill licence
- Amend the CNSC-issued McClean Lake Licence UMOL-MINEMILL-McCLEAN.01/2027 as put forward in CMD 21-H6
- Accept the proposed revised financial guarantee amount for Orano's McClean Lake Operation for decommissioning



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