Assessment of Alternatives to Proposed Mine Water Releases in the Oil Sands Mining Sector

Request for Proposal

Prepared on behalf of and in participation with the Crown-Indigenous Working Group on the Proposed *Oil Sands Mining Effluent Regulations*, established by Environment and Climate Change Canada.

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Posting date: **July 13, 2022**
Proposal submission deadline: **July 29, 2022**

1.0 Background:

Oil Sands Mines in the Athabasca region of northeastern Alberta currently have no federal authorization to release wastewater from their operations. Subsection 36(3) of the *Fisheries Act* prohibits the deposit of deleterious substances into waterbodies that are frequented by fish, unless authorized by regulations. There is currently no regulation for oil sands mines under the *Fisheries Act*, therefore oil sands mining operations are subject to the section 36(3) general prohibition. While tailings water is not currently released to the receiving environment, provincial regulators do allow for releases of other site industrial wastewaters.

In 2020, approximately 479.3 billion liters (479 Mm^3) of water was held by oil sands tailings ponds and mine facilities, while total fluid tailings volumes were estimated at 1.4 trillion liters (1400Mm^3).[1] Environment and Climate Change Canada (ECCC) and indigenous communities are exploring options for managing oil sands mine water (OSMW), to reduce the risks of continued tailings growth during operations and allow for future reclamation of mining sites.

The options being looked at include potential regulations that would authorize release of treated water from oil sands mining operations under strict conditions that are protective of the environment. Regulatory development is in the early stages, however the Government of Canada is exploring effluent quality standards, including rules related to limits on harmful substances and toxicity, as well as conditions on testing, monitoring and reporting of releases.

The Crown-Indigenous Working Group (CIWG) was established by Environment and Climate Change Canada and indigenous communities to inform the potential development of oil sands mining effluent regulations under the *Fisheries Act*. Indigenous groups on the CIWG have expressed serious concerns with any releases of effluent from oil sands operations, and the potential for impacts to the environment and to their treaty and Aboriginal rights.

The CIWG is therefore exploring alternatives to effluent release; namely whether the reduction of OSMW held by tailings ponds can be achieved in whole or in part without the release of treated oil sands mining effluent to the Athabasca River or to its tributaries. Understanding alternatives to release of treated oil sands mine waters (OSMW) is the highest priority activity for some of the participating Indigenous communities of the CIWG.

[1] State of Fluid Tailings Management for Mineable Oil Sands. Alberta Energy Regulator. 2020.

2.0 Project overview:

This project will identify alternative options for the management of oil sands mine waters (OSMW) other than releases to the Athabasca River or its tributaries. While releases of treated water may be a part of the solution, they are not the only possible solution. The focus of the assessment should be on alternatives and their capability to reduce volumes of OSMW without releases. For the purposes of this contract, OSMW refers to both water held in tailings ponds and any other industrial wastewaters from all oil sands mine sites.

The work in this RFP is divided into two phases;

1) Broad literature review of options for liquid waste management around the world that could potentially reduce or eliminate the need for discharges of OSMW to the Athabasca River or to its tributaries. Include general suitability to the oil sands region, readiness for implementation, identify risks, by-products, seepage, GHG intensity, and determine hypothetical volumes that each option could manage.

2) With input from the CIWG sub-group, develop a qualitative and/or quantitative framework for analysis and detailed comparison of the identified alternative water management strategies.

Following discussion with the successful contractor, additional background materials will be provided; including upper case water quality concentration data and other resources for consideration.

3.0 Objectives

<u>Phase 1 Objectives</u>

3.1 Identify, compare and contrast mine water management strategies or technologies, to reduce tailings stored volumes without releases to the Athabasca River. Alternatives to release that are considered should include, but not be limited to the list under 4.1.1.

Alternatives should be considered from both the oil sands context and other sectors, with consideration for the realities of the oil sands region. The contractor should consider leading management strategies from around the world, and identify potential contractors in the oil sands region where available. Alternatives should be reflective of the significant scale of volumes, and relative quality of OSMW in the oil sands sector.

3.2 Assess and describe for each option all aspects enumerated under 4.1.2 to build qualitative and quantitative knowledge of identified management options. This information will be used to support further analyses under phase 2. Case studies should detail risks and waste generation and scalability. Case studies also should broadly consider whether management strategies identified are applicable to Alberta oil sands mines in different stages of operations and future closure.

Phase 2 Objectives

3.3 Develop a qualitative and/or quantitative framework for analysis of management strategies, with regular input from the CIWG sub-group according to section 4. This framework should be flexible to allow for adaptation based on CIWG feedback.

3.4 Analyze the alternatives according to the resulting framework from 3.3. This analysis will provide a detailed comparison of options for prioritization and provide the foundation for potential future site-specific feasibility evaluations.

4.0 Scope of work (SOW)

SOW for Phase 1

4.1 Complete a literature review of water management options (alternatives) that do not include discharges into the aquatic environment.

4.1.1 The contractor should identify other water management options for review by the CIWG sub-group, before moving on to item 4.1.2. Example management options include, but are not limited to:

- Disposal wells
- Treatment and Storage at the site for safe future use (i.e., for reclamation)
- Treat and manage cleaner water as a beneficial use in mining (reuse/recycling/redirection). Use treated mine water rather than fresh water for mining
- Treat and manage cleaner water as a beneficial use in other industrial processes. This could be considered redirection of treated mine water
- Consider clean effluent and brine disposal options following treatment (other than release) such as saltwater stratified pit lakes with freshwater cap (similar to well disposal to groundwater as saltier water is deeper than freshwater)
- Water management strategies taking consideration of 5 R's
    - Reduce (reducing on site inventories of stored OSMW)
    - Recycle (including local reuse within a mine),
    - Regional reuse, e.g. by in situ-operations or other applications
    - Recover (extract resources held in wastewater)
    - Release (as a less favourable option)

4.1.2 For each option identified, identify the potential risks and applications of the water management strategy and provide case studies of implementation where available. This should include, at a minimum:

- Temporal and spatial requirements or limitations

- Applicability to different stages of mine operations and closure
- Identify which water management strategies are already in use in oil sands mining operations based on publicly available information or, when available, information provided by industry.
- Hypothetical volume of OSMW that can be consumed, stored, or otherwise managed without discharge to the river.
    - Where possible include case studies for comparison, and rates of water use
- Water quality limitations for each management option, if applicable. I.e. is the method suitable for brine, high solids waters, or do other water chemistry parameters pose limitations?
    - Consider applicability of alternatives to compositions of different mine water streams
- Risks to:
    - Public safety
    - Human health
    - Environment E.g. risks of seepage, groundwater contamination, geotechnical stability, potential impacts to wildlife
        - Provide a qualitative overview of potential risks, that could support future site specific risk assessment
    - risks to ability to reclaim landscape
- Byproduct generation including emissions/GHG intensity
    - Where possible include comparable metrics such as energy use per volume of water managed and fuel sources used
    - Include options for management of by-product or wastes generated by the alternatives identified
- Economic factors and industry incentives
    - Where information is publicly available, capital and operational costs per m^3 of water managed without discharge should be included for information only, not used to exclude options or assess economic achievability.
    - Support cost information with case studies where possible;
    - Include factors driving cost for different management strategies
- Readiness for implementation; (is the state of development in the conceptual research phase, piloted, or commercially available) provide examples of uses of the management strategy
    - Management strategies in the 'research stage' of development should not be excluded, but barriers to implementation should be elucidated.

- Where a technology based solution is recommended, conduct a regional scan of potential service providers. Determine whether the technology is covered by a patent or other intellectual property restrictions, whether the technology can be adopted,

purchased and whether the owner is the sole-source. Seek examples of similar work by the service provider that include;

- Examples of similar work by the service provider
- Estimated volumes of water that can be managed or have been managed previously
- Overview of feasibility constraints, e.g. geotechnical requirements, and;
- Limitations on water quality that can be managed

4.1.3 Per the deliverables section; provide draft Phase 1 report, comparing non-release options for CIWG discussion. Document and incorporate changes based on feedback, and produce a final Phase 1 report. The research collected under phase 1 will support analysis under phase 2.

SOW for Phase 2

4.2 Discussions/workshops with the CIWG sub-group and wider CIWG, with a schedule to be proposed by the contractor per section 5.1.

4.2.1 The contractor will present on the alternative management strategies identified, and their comparative attributes and risks.

4.2.2 The CIWG sub-group will provide feedback, and additional criteria to further evaluate the alternatives in sections 4.3-4.5

4.3 Develop a Risk Profile of options, informed by the literature review in 4.1, and to support the options analysis in 4.5

4.4 Develop a comparison table of different options and associated characteristics researched in the literature review

4.5 Propose a framework for conducting an options analysis (E.g. multiple accounts analysis, lifecycle analysis, etc.) based on workshops from 4.2. Provide a discussion of the key factors that should be evaluated and of how quantitative and/or qualitative analyses will be included in the comparative evaluation.

4.5.1 Once approved by the CIWG sub-group, conduct the analysis of water management strategies, seeking input from the CIWG sub-group.

4.6 Sensitivity analysis of the quantitative factors used in 4.5.1. (to support the options analysis)

4.7 Draft Final Report combining all work under Phases 1 and 2, for CIWG discussion and comment. The report should include all sections outlined under 5.7 and be in the format of a written technical report.

4.8 Presentation of the draft final report to the CIWG

4.9 Document and address comments received, then produce a Final Report.

4.10 Additional presentations may be required to communicate findings to external stakeholders.

4.11 Aspects outside the scope of work

4.11.1 The contractor should not seek to establish targets for reclamation timelines and objectives, economic objectives, or any other criteria other than the objective of non-release. Other data may be collected and compared per the scope of work, however alternatives should not be excluded by those data.

I.e. Assessment of economic achievability is out of scope.

4.11.2 Solid tailings treatment technologies

4.11.3 Assessment of impacts to culture and rights of indigenous communities

4.11.4 Evaluation of tailings treatment technologies and operator specific tailings reserves

5.0 Deliverables

5.1 Project schedule including regular updates (minimum of 3) to the full CIWG. Updates should be linked to project milestones and allow for CIWG feedback to be incorporated.

5.2 Bi-weekly, minimum 2 hour meetings with CIWG sub-group to track progress and budget, build consensus on work methods, and provide project feedback.

- The contractor is responsible to keep on budget and communicate regularly if costs are on track with the proposed schedule and budget.

5.3 Draft Phase 1 Report for review 3 weeks before the end of Phase 1

5.4 Documentation of review comments and reconciliation of issues noted.

5.5 Final Phase 1 Report and presentation to CIWG on key findings and recommendations at beginning of Phase 2.

5.6 Workshops to develop framework for the options analysis, and build consensus with the CIWG sub-group

5.7 Draft final report provided 4 weeks before end of project, including;

5.7.1 Plain language summary

5.7.2 Executive summary

5.7.3 Introduction

5.7.4 Methods section

5.7.5 Risk profiles of alternatives

5.7.6 Options analysis

- (include consideration of CIWG sub-group technical contributions from 5.6)

5.7.7 Sensitivity analysis (where appropriate, i.e. for quantitative analyses)

5.7.8 Discussion section elaborating on results of analyses, assumptions and limitations

5.7.9 Recommendations

5.7.10 Conclusion

5.8 Documentation of review comments and reconciliation of issues noted.

5.9 Final Report including all subsections detailed under 5.7

5.10 Additional presentations may be required to communicate findings to external stakeholders.

6.0 Evaluation metrics and criteria:

6.1 Project team expertise (including descriptions of previous experience) (40 points)

- Includes consideration of experience in the Oil Sands Sector, other wastewater management sectors, and experience with options analyses (e.g. MAA, life cycle analyses, etc.)

6.2 Understanding of scope of work (25 points)

6.3 Previous experience with multi-stakeholder projects (skills and management) and disclosure of potential conflicts of interest with previous or current oil sands tailings projects. If previous or current projects are identified, please provide a brief description of the project. (25 points)

6.4 Proposed budget (10 points)

7.0 Submission and project requirements:

7.1 Proposal (maximum 7 pages) describing:

- How will project goals be achieved
- Methods to complete the identified scope of work
- Project schedule including meetings, deliverables, responsibilities
- Research team biographies
- Project highlights from three previous projects
- Proposed budget, to a maximum of **$ 120,000 (including GST)**

7.2 Acceptable appendices:

- Project team resumes
- Supplemental information
- Project organization chart
- Project schedule

7.3 Proposal submission.

Proposals must be submitted electronically by **July 29, 2022** to Ryan Abel at rabel@fortmckay.com

7.4 Anticipated contracting and project timelines (2022)

- RFP published (July 13, 2022)
- Proposal submission deadline (July 29, 2022)
- Contract awarded (By August 15, 2022)
- Project kick off (By August 31, 2022)
- Bi-weekly project updates (TBD with Contractor)
- Phase 1 Preliminary results on options identified (TBD with Contractor)
- Draft Phase 1 report to CIWG for review (TBD with Contractor)
- CIWG sub-group provides Draft Phase 1 report comments to contractor (TBD with Contractor)
- Final Phase 1 report and presentation to the CIWG (November 1, 2022 or earlier preferred)
- Draft Phase 2 report to CIWG for review (TBD with Contractor)
- CIWG sub-group provides Draft Phase 2 report comments to contractor (TBD with Contractor)
- Final Phase 2 report and presentation to the CIWG (No later than November 25, 2022)
- Presentation to external stakeholders (TBD with Contractor)

7.5 Contact information:

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