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MINE ENVIRONMENT NEUTRAL DRAINAGE (MEND) PROJECT

Study of Tailings Management Technologies

MEND
NEDEM

ASSOCIATION OF CONSULTING ENGINEERING COMPANIES | CANADA

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CANADIAN CONSULTING ENGINEERING AWARDS 2019

INNOVATION

The study is a review to present the state-of-practice on tailings technologies and provides recommendations on future areas of investigation. Tailings dewatering process technologies that are currently used in Canada and other jurisdictions with similar climatic conditions were examined. The strengths, limitations, and physical and environmental risks of these alternative technologies were compared to those of conventional slurry and were considered across the entire life cycle of tailings facilities, from design and construction through to long-term post-closure. We believe this is the first time a comprehensive review of tailings projects has been done in Canada.

Internal resources and expertise we used included the knowledge and project history of our senior engineers and our professional librarian.

Facilities built to store mine tailings pose both physical and geochemical risks that must be managed throughout the life of the facility, from design and construction, through to the closure of the mine and beyond. In Canada, most mines manage their tailings as a slurry deposited behind containment dams (designated in the report as “conventional tailings facilities”). Recent tailings facility failures have led to the risks posed by conventional tailings facilities to come under increased scrutiny. A common contributing factor to the higher consequence of failure includes the storage and behaviour of water within the facilities. This has led the industry to reconsider alternatives to conventional tailings facilities, including dewatering tailings prior to deposition and considering different facility types.

The objectives of this study were to (1) present the use of dewatering tailings technologies and associated alternatives to conventional tailings facilities in Canada (and in other locations with similar climates), (2) evaluate the applicability and efficacy of the alternatives at reducing physical and geochemical risk compared to conventional tailings facilities, and (3) identify opportunities for further research and development.

COMPLEXITY

The study followed a three-step approach:

Step 1: Identification of the current state-of-practice and projects using alternative technologies in Canada through literature review, database research, and a questionnaire sent to all Canadian mine sites.

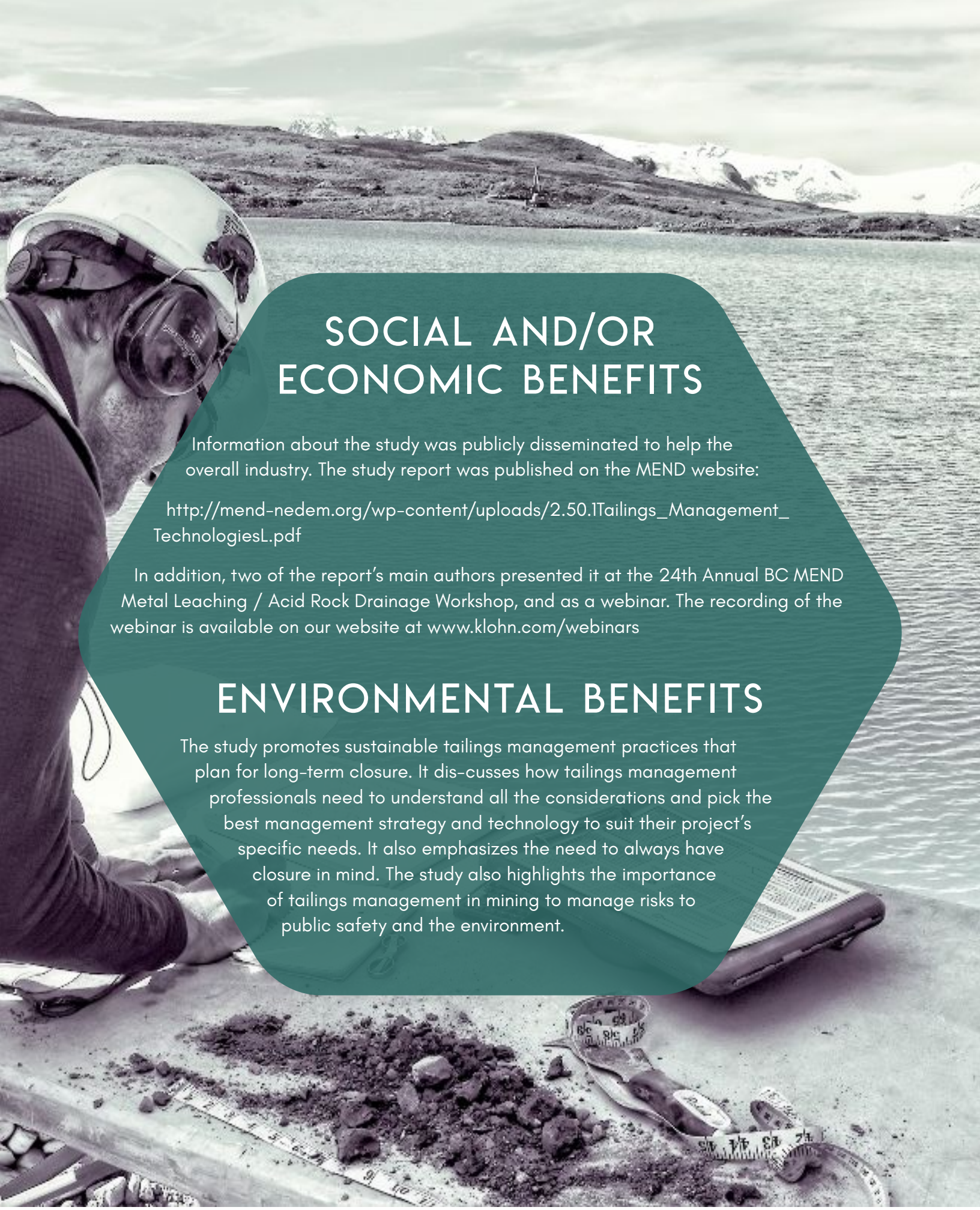
Step 2: Evaluation of the alternatives, comparing tailings management technologies and costs using the information compiled as part of the identification of the current state-of-practice and case study information provided by select mine sites.

Step 3: Assessing applicability to Canadian mines and identifying knowledge gaps. Lessons learned from the case histories in the context of mining in Canada were summarized and knowledge gaps identified for further research.

A report was produced and should help guide which technologies and strategies should be considered for a project, taking into account site conditions, project constraints (e.g. production schedule), tailings' physical properties (e.g. grain-size, and plasticity), and geochemical properties (e.g. the potential for tailings to generate metal leaching and/or acid rock drainage).

The main challenge we needed to overcome was the collection and compilation of a large amount of information and data. This was completed in several ways, including researching publicly available information, distributing a questionnaire, reviewing historic project documents, and calling mining companies. An industry expert was needed to analyze the compiled information and make meaningful conclusions. The project schedule was extended to accommodate additional data collection for case studies. Two scope increases resulted in change orders.

As the project required coordination of data collection from several sources with a relatively small budget, project management played a critical role in completing the project successfully and meeting the objectives.



SOCIAL AND/OR ECONOMIC BENEFITS

Information about the study was publicly disseminated to help the overall industry. The study report was published on the MEND website:

http://mend-nedem.org/wp-content/uploads/2.50.1Tailings_Management_TechnologiesL.pdf

In addition, two of the report's main authors presented it at the 24th Annual BC MEND Metal Leaching / Acid Rock Drainage Workshop, and as a webinar. The recording of the webinar is available on our website at www.klohn.com/webinars

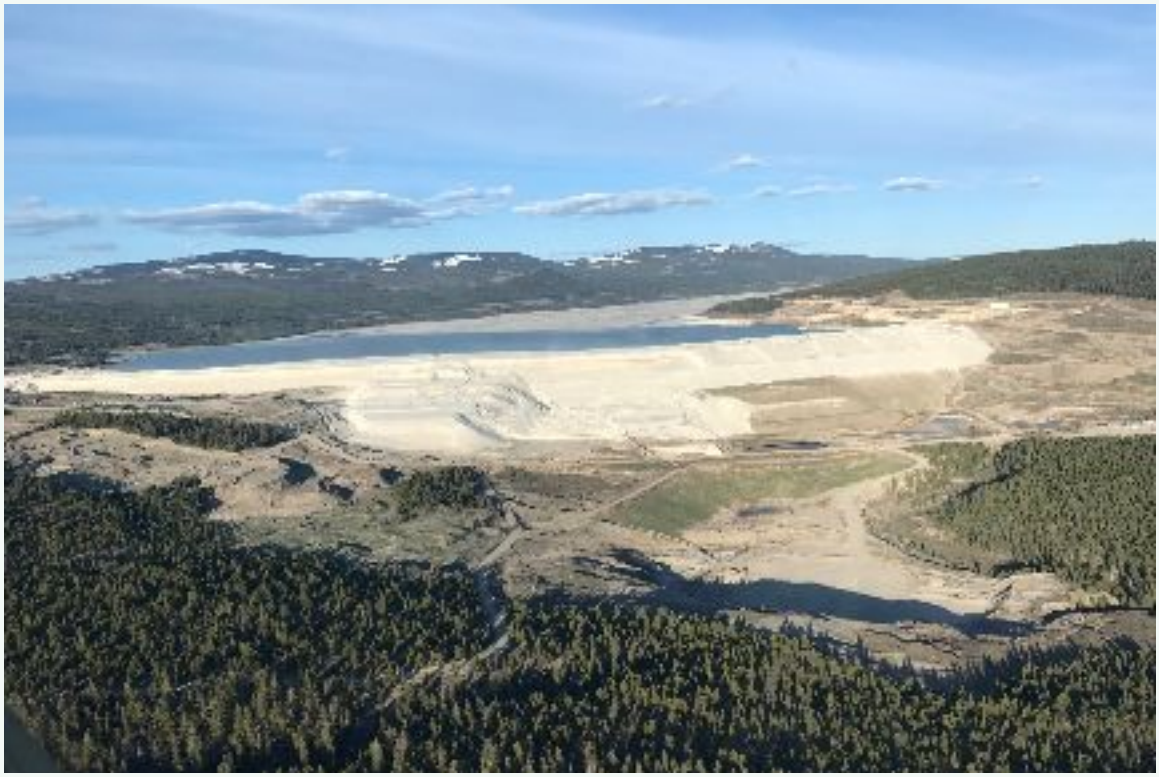
ENVIRONMENTAL BENEFITS

The study promotes sustainable tailings management practices that plan for long-term closure. It dis-cusses how tailings management professionals need to understand all the considerations and pick the best management strategy and technology to suit their project's specific needs. It also emphasizes the need to always have closure in mind. The study also highlights the importance of tailings management in mining to manage risks to public safety and the environment.

SAMPLE OF CASE HISTORY PROJECTS

PHOTOS

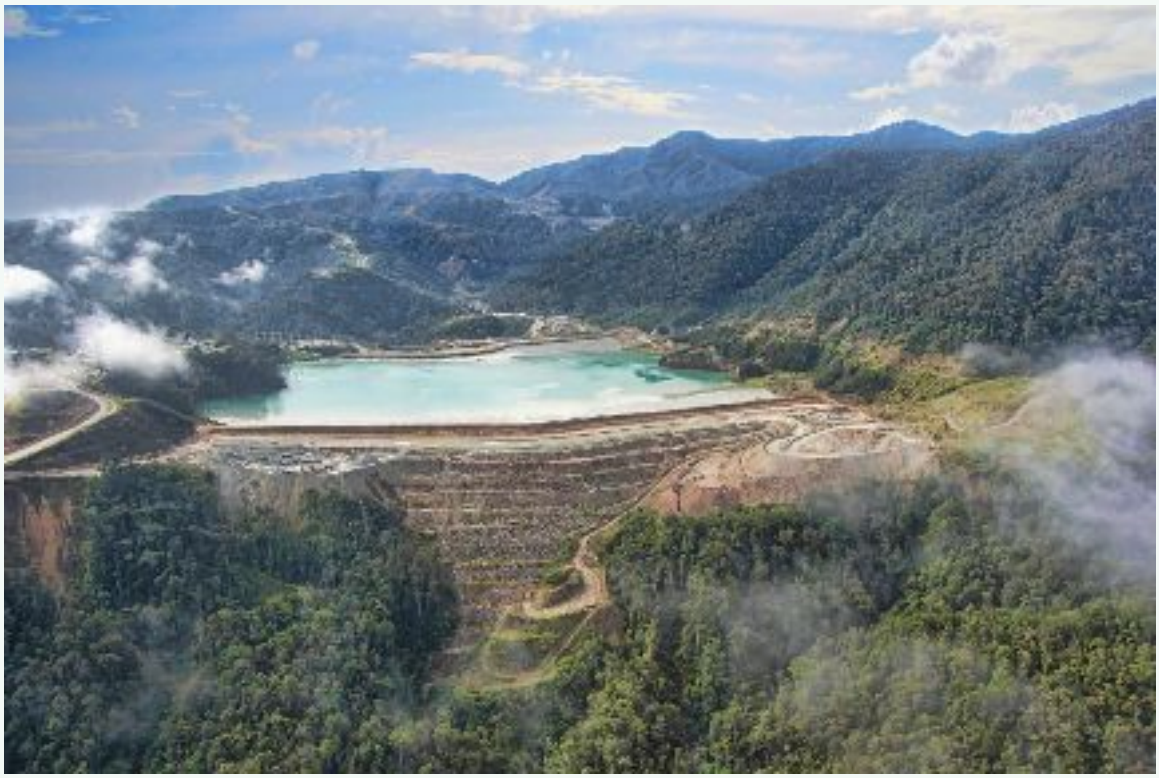
Highland Valley Copper, BC, Canada



Highland Valley Copper, BC, Canada

Greens Creek Mine, Alaska, USA

Greens Creek Mine, Alaska, USA



Hidden Valley, Papua New Guinea

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Tailings Beach, Northern BC, Canada

Cardinal River Mine, AB, Canada

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