Grassy Mountain Gold Project
Best Available, Practicable, and Necessary Technology

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August 22, 2018
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Introduction

Background and Purpose
(1) Chemical process mining including extraction, processing, and reclamation, must be undertaken in a manner that minimizes environmental damage through the use of the best available, practicable, and necessary technology to ensure compliance with environmental standards.

(a) The technical review team shall determine the necessary technologies if such technologies exist;

(b) The technical review team shall determine which, if any, of the necessary technologies is available;

(c) The technical review team shall determine which, if any, of the necessary and available technologies is practicable;

(d) The technical review team will review, determine, and rank the necessary, available and practicable technologies by their potential environmental benefits;

(e) The technical review team shall recommend to the Department, the technology that the technical review team has determined is the best available, necessary, and practicable technology to ensure compliance with environmental standards...

(3) The department will require the applicant to use the best available, practicable, and necessary technology to ensure compliance with the environmental standards...

(4) If the technical review team or the Department is unable to identify a necessary technology that is available and practicable, the Department shall not issue an operating permit.
Introduction: Definitions

> **Available**: technology that is obtainable and has been demonstrated to meet environmental standards at an existing mine or a demonstration project of similar size and scale, or is reasonably expected to meet or exceed environmental standards at the proposed mine. OAR 632-037-0010(2)

> **Practicable**: costs are not significantly disproportionate to the potential environmental benefits; a technology is not practicable if the cost is so high it renders a mining operation infeasible. OAR 632-037-0010(24)

> **Necessary**: technology that is required to ensure compliance with environmental standards. OAR 632-037-0010(19)
Introduction: Types of Technologies for Consideration

- **Mine construction methods** – design of underground structure; materials and equipment to be used; reuse of materials on site; waste disposal options
- **Extraction of ore and backfilling** – minimizing waste rock; maximizing use of waste rock as aggregate and/or in backfilling; alternative waste storage options
- **Transportation of materials** – minimizing distance between related mine sites, containment during transport
- **Milling operations** – different technologies for crushing of rock and separation of gold, cyanide leaching, gold refining, cyanide destruction, and management of chemicals used in gold processing
- **Tailings disposal** – tailings sampling methods; locations for the TSF; options for liners, drainage, and leak detection; groundwater sampling and protection options; long term pollution prevention controls
Introduction: Types of Technologies for Consideration

- **Operational monitoring and pollution control methods** – various sampling methods for soil, air, water and waste; dust control options; different scrubber and air purification systems

- **Mine closure methods** – TSF dry closure, wet closure, wetland establishment closure, and water saturation closure options

- **Wildlife and habitat protection** – barriers and fencing options; wildlife and bird deterrent methods, mitigation strategies

- **Reclamation and long term monitoring** – monitoring types, equipment, and schedule options
Proposed Approach
Proposed Approach

1. Identify
   • What is the potential environmental damage, what processes contribute, and what are the relevant environmental standards?

2. Research
   • Conduct a focused search for technologies that minimize or avoid environmental damage

3. Screen
   • Eliminate any technologies from consideration that are not available, practicable, or necessary

4. Rank & Recommend
   • Rank alternative technologies to recommend the best technology
Hypothetical Example
Identify: A focus for research

(1) Chemical process mining…must be undertaken in a manner that minimizes environmental damage through the use of the best available, practicable, and necessary technology to ensure compliance with environmental standards”.

What is the potential environmental damage?
• Release from the Tailings Storage Facility (TSF)

What processes contribute to the potential environmental damage?
• Liner degradation over time
• Failure of warning systems

What are the environmental standards?
• OAR Chapter 690, Division 20 – Dam Safety, administered by the Water Resources Department.
• OAR Chapter 340, Division 43 – Chemical Mining, administered by the Department of Environmental Quality
Research

(a) The TRT shall determine the **necessary** technologies if such technologies exist;
(b) The TRT shall determine which, if any, of the necessary technologies is **available**;
(c) The TRT shall determine which, if any, of the necessary and available technologies is **practicable**;

**Technology that Minimizes Liner Degradation Overtime**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Technology A</th>
<th>Technology B</th>
<th>Technology C</th>
<th>Technology D</th>
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</thead>
<tbody>
<tr>
<td>Necessary</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Available</td>
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<td>✓</td>
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<tr>
<td>Practicable</td>
<td>✓</td>
<td>X</td>
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**Technology that Minimizes Risk of Warning System Failure**

<table>
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<th>Technology E</th>
<th>Technology F</th>
<th>Technology G</th>
<th>Technology H</th>
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<tbody>
<tr>
<td>Necessary</td>
<td>X</td>
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<td>Available</td>
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<tr>
<td>Practicable</td>
<td>✓</td>
<td>X</td>
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(d) The technical review team will **review, determine, and rank** the necessary, available and practicable technologies **by their potential environmental benefits**;

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<thead>
<tr>
<th>Criteria</th>
<th>Technology A</th>
<th>Technology D</th>
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<tr>
<td>Minimizes risk of liner degradation overtime</td>
<td>Lower benefit</td>
<td>Higher benefit</td>
</tr>
<tr>
<td>Meets environmental standards in OAR Chapter 690, Division 20</td>
<td>Yes</td>
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<tr>
<td>Meets environmental standards in OAR Chapter 340, Division 43</td>
<td>Yes</td>
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<tr>
<th>Criteria</th>
<th>Technology G</th>
<th>Technology H</th>
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<tbody>
<tr>
<td>Minimizes risk of warning system failure</td>
<td>Higher benefit</td>
<td>Lower benefit</td>
</tr>
<tr>
<td>Meets environmental standards in OAR Chapter 690, Division 20</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Meets environmental standards in OAR Chapter 340, Division 43</td>
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</tr>
</tbody>
</table>
(e) The technical review team shall recommend to the Department, the technology that the technical review team has determined is the best available, necessary, and practicable technology to ensure compliance with environmental standards.

Liner degradation overtime: best available, necessary, and practicable technology to ensure compliance with environmental standards

✓ Technology D

Failure of warning systems: best available, necessary, and practicable technology to ensure compliance with environmental standards

✓ Technology G