Richland Operations Office
Plutonium/Uranium Extraction Facility (PUREX) Tunnels

Dr. John Marra, DOE-EM
Tom Fletcher, DOE-RL
PUREX Facility

- Processed vast majority of plutonium for US
- Reclaimed uranium for fuel rod production
PUREX Tunnels
PUREX Tunnel 1
Construction History

- Constructed 1954-1956 and filled between 1960-1965
- 358 feet long, 22 feet high x 19 feet wide
- 90-pound roofing material and tar were laid over the timbers
- Approximately 8 feet of overburden was placed on top
PUREX Tunnel 2
Construction History

- Constructed 1964-1966
- Different construction than Tunnel 1
- 1,688 feet long, steel and concrete
Options Evaluated

1. No Action
2. High Density Polyethylene Cover
3. Soft-Surface Tent Cover
4. Hard-Surface Tent Cover
5. Pre-Engineered Building
6. Injection of Poly-Foam Fill
7. Controlled Collapse
8. Sand or Clay Fill
9. Engineered Grout Fill
10. Waste Retrieval
11. Enhanced Surveillance & Monitoring
Input from Public Workshop

• Concerns
  – Risk, timeliness, future remediation/closure, costs, characterization

• Options
  – Fill with Sand/Soil
    • Angle of repose challenges void fill
    • Pneumatic conveyance introduces dispersion risk
    • Provides limited/no water intrusion protection

• Evaluation Criteria
  – Request for quantification, especially cost
Tunnel 1 Mock-Ups and Preparations
PUREX Tunnel 1 Grouting Complete

- In October 2017, grout placement began at PUREX Tunnel 1
- Workers completed the stabilizing in November
- Approximately 521 truckloads of grout were placed in the tunnel.
PUREX Tunnel 2 Analysis Results

<table>
<thead>
<tr>
<th>Element*</th>
<th>Max DCR</th>
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<tbody>
<tr>
<td>A: Arched Rib-beam/splice</td>
<td>1.09</td>
</tr>
<tr>
<td>B: Concrete Arch Girders</td>
<td>0.59</td>
</tr>
<tr>
<td>C: Steel Wale Beams</td>
<td>1.12</td>
</tr>
<tr>
<td>D: Wale Beam Anchors</td>
<td>1.04</td>
</tr>
<tr>
<td>E: Concrete Footing</td>
<td>1.09</td>
</tr>
<tr>
<td>F: Foundation Soil Load</td>
<td>1.03</td>
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 Loads on multiple structural members exceed building code design capacities; Tunnel 2 has a ‘potential high’ risk of collapse
PUREX Tunnel 2 Evaluation

• Inputs:
  – Construction drawings, photos & other files used
  – Structural integrity evaluation results
  – Public meeting

• Methodology:
  – Review of ‘safe storage’ experience
  – Defined key criteria for qualitative options analysis

• Other Considerations:
  – Tunnel 1 stabilization decision unchanged
  – Focused on Tunnel 2
  – Each option, even no action, has risk
PUREX Tunnel 2 – Recommendations

• Structural analysis of PUREX Tunnel 2 indicates that stabilization action is warranted
• Stabilization with grout viewed as preferred option
  – Favored in both ‘raw’ score and ‘weighted evaluation’
• Grout offers multiple advantages
  – Flowable, cost-effective & widely used
  – Allows either in-situ disposal or material removal depending on Record of Decision
• Expert Panel action
  – Tunnel 1 experience directly applicable to Tunnel 2 – Expert Panel can review Tunnel 1 process and provide recommendations for Tunnel 2
PUREX Tunnel 2 Expert Panel

Expert Panel charged to:
- Evaluate the current state of Tunnel 2
- Provide guidance and decision-making criteria for near-term stabilization of Tunnel 2 hazards.

Panel Members

<table>
<thead>
<tr>
<th>Name</th>
<th>Role/Title</th>
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<tbody>
<tr>
<td>John Marra, Chair</td>
<td>Chief Engineer, DOE Office of Environmental Management (DOE-EM)</td>
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<tr>
<td>Tom Fletcher</td>
<td>Deputy Manager, DOE Richland Operations Office (DOE-RL)</td>
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<td>David Kosson</td>
<td>Cornelius Vanderbilt Professor of Engineering, Civil &amp; Environmental Engineering, Vanderbilt University</td>
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<tr>
<td>Craig Benson</td>
<td>Dean, School of Engineering, Hamilton Endowed Chair in Civil &amp; Environmental Engineering, University of Virginia</td>
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<tr>
<td>Kathy Higley</td>
<td>Professor and Head, School of Nuclear Science and Engineering, Oregon State University</td>
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<tr>
<td>Christine Lee</td>
<td>Vice President, ESHQ, CH2MHiIl-BWXT West Valley</td>
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<tr>
<td>Kurt Kehler</td>
<td>Vice President, Decommissioning &amp; Waste Management, Canadian Nuclear Laboratories</td>
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<td>John Ballantyne</td>
<td>Chief Engineer, Nuclear Structures, CH2M-UK</td>
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Observers

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<tr>
<td>Mark Hasty</td>
<td>Chief Engineer, CH-Plateau Remediation Company (CH-PRC)</td>
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Class 3 Permit Modification

• DOE-RL is holding a 60-day public comment period starting approximately in February 2018.
• Modification addresses the stabilization of PUREX Tunnels 1 and 2 to reduce the potential for future structural impacts until final closure decisions are made and implemented.