EXAMPLES OF SPECIAL ANALYSES

October 18, 2017

Kent Rosenberger
Savannah River Remediation
Overview

- Often discuss Performance Assessments but rarely discuss Special Analyses which are vital to continued safe operations and closure of Department of Energy (DOE) facilities.


- We will discuss two “types” of Special Analyses (SAs) performed at Savannah River Site (SRS) including an SA for a disposal facility and one for a closure facility.
The SRS Liquid Waste Performance Assessment Program is a continual process over the life of disposal and closure operations.
DOE requires a PA Maintenance Program to evaluate new information to ensure performance objectives continue to be met. Identifies research, field studies, and monitoring needed to address uncertainties in existing data. Sensitive parameters associated with existing data identified by the PA analyses. Identifies need for additional research and development or modeling as program progresses.
Research & Development and New Information

- Information must be evaluated for its impact on the potential risk documented in the approved Performance Assessment.

- The evaluation could result in actions including:
  - Unreviewed Waste Management Question Evaluation (UWMQE)
  - Special Analysis (SA)
  - New Performance Assessment
Unreviewed Waste Management Question Evaluation

- Documented process to evaluate new R&D results or new information
- Typically does not result in an impact to the potential risk documented in the PA
- If impact is indeterminate would result in a Special Analysis
- Becomes part of the documentation envelope along with the PA
Special Analysis

- Includes new analyses as necessary to evaluate the potential risk associated with the new information
- Not enough significant changes to require a PA revision
- An example is to revisit tank closure calculations after the final residual inventory is determined
Liquid waste facilities at SRS include two tank farms and the Saltstone Disposal Facility.

Disposal and/or closure activities are subject to a variety of regulations and agreements:
- DOE Orders and implementing guidance
- Federal Facility Agreement
- South Carolina industrial solid waste landfill or industrial waste water permits

Involves stakeholders including DOE, South Carolina Department of Health and Environmental Control, Environmental Protection Agency, Nuclear Regulatory Commission and other interested parties.
We do the right thing.

SRS occupies approximately 803 km\(^2\) (310 miles\(^2\))
General Separations Area & Liquid Waste Facilities

Legend

- Facility Area
- Surface Contours (20 ft)
- Stream
- Lake/Pond
- Watershed Upper Three Runs
- Watershed Fourmile Branch
- Tank Farm
Liquid waste treatment will generate ≈100 million gallons of low-level salt solution containing <0.1% of total SRS radionuclide inventory.

Salt solution combined with cementitious materials in the SPF to form saltstone ⇒ emplaced in SDUs for permanent disposal.
SDF Layout Changes

= SDU Location
Before Update

= SDU Location in
FY2016 SDF SA

Note: No changes to
the planned locations
for SDUs 10, 11, or 12
Modeling in the FY2016 SDF SA is based on the FY2014 SDF SA with limited changes

- Revised the SDF Layout
- Applied SDU 6 “as-built” conditions to SDU 6 and SDU 7
- Revised SDUs 8 through 12 based on Lessons Learned
- Unlike previous SAs, this SA did not update the inventory
The modeled elevations were also updated for SDUs 7 through 12.

- Based on new information, the average depth from the SDU to the water table was estimated to be 39 feet.

<table>
<thead>
<tr>
<th>SDU</th>
<th>Elevation of the Bottom of the SDU (ft above MSL)</th>
<th>Water Table Elevation Beneath SDU (ft above MSL)</th>
<th>Distance (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDU 6</td>
<td>270</td>
<td>226.8</td>
<td>43.2</td>
</tr>
<tr>
<td>SDU 7</td>
<td>265</td>
<td>228.4</td>
<td>36.6</td>
</tr>
<tr>
<td>SDU 8</td>
<td>265</td>
<td>224.2</td>
<td>40.8</td>
</tr>
<tr>
<td>SDU 9</td>
<td>260</td>
<td>224.4</td>
<td>35.6</td>
</tr>
<tr>
<td>SDU 10</td>
<td>270</td>
<td>232.1</td>
<td>37.9</td>
</tr>
<tr>
<td>SDU 11</td>
<td>270</td>
<td>228.3</td>
<td>41.7</td>
</tr>
<tr>
<td>SDU 12</td>
<td>270</td>
<td>230.9</td>
<td>39.1</td>
</tr>
</tbody>
</table>
The changes incorporated for this SA did not adversely impact any of the conclusions from the FY2014 SDF SA (previous baseline)
F-Area Tank Farm

We do the right thing.
• Actual residual inventories were determined for Tanks 5 and 6.
• The final Tanks 5 and 6 residual inventories were used to update the inventories for all of the FTF Type I waste tanks (Tanks 1 - 8).
• Use of actual Tanks 5 and 6 residual inventories resulted in a significant decrease in the Tc-99 inventories projected in the Type I waste tanks and thus an out year calculated Tc-99 dose peak previously reported.
# Tanks 5 & 6 Inventories

<table>
<thead>
<tr>
<th>Element</th>
<th>Tank 5 Estimate from PA</th>
<th>Tank 5 Actual</th>
<th>Tank 6 Estimate from PA</th>
<th>Tank 6 Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ac-227</td>
<td>1.0E-03</td>
<td>6.9E-04</td>
<td>1.0E-03</td>
<td>8.1E-05</td>
</tr>
<tr>
<td>Al-26</td>
<td>1.0E+00</td>
<td>1.2E-01</td>
<td>1.0E+00</td>
<td>ND</td>
</tr>
<tr>
<td>Am-241</td>
<td>6.0E+02</td>
<td>6.9E+02</td>
<td>6.0E+02</td>
<td>1.3E+03</td>
</tr>
<tr>
<td>Am-242m</td>
<td>1.0E+00</td>
<td>1.7E+00</td>
<td>1.0E+00</td>
<td>1.8E+00</td>
</tr>
<tr>
<td>Am-243</td>
<td>1.4E+00</td>
<td>5.3E+00</td>
<td>1.4E+00</td>
<td>3.0E+01</td>
</tr>
<tr>
<td>Ba-137m</td>
<td>8.7E+03</td>
<td>3.3E+03</td>
<td>8.7E+03</td>
<td>6.3E+03</td>
</tr>
<tr>
<td>C-14</td>
<td>1.0E+00</td>
<td>7.1E-03</td>
<td>1.0E+00</td>
<td>3.1E-01</td>
</tr>
<tr>
<td>Cf-249</td>
<td>1.0E+00</td>
<td>7.0E-02</td>
<td>1.0E+00</td>
<td>6.4E-02</td>
</tr>
<tr>
<td>Cl-36</td>
<td>1.0E-03</td>
<td>2.8E-02</td>
<td>1.0E-03</td>
<td>ND</td>
</tr>
<tr>
<td>Cm-243</td>
<td>1.0E+00</td>
<td>4.5E-01</td>
<td>1.0E+00</td>
<td>6.2E+00</td>
</tr>
<tr>
<td>Cm-244</td>
<td>1.2E+02</td>
<td>2.2E+01</td>
<td>1.2E+02</td>
<td>7.3E+02</td>
</tr>
<tr>
<td>Cm-245</td>
<td>1.0E+00</td>
<td>5.4E-03</td>
<td>1.0E+00</td>
<td>1.0E-01</td>
</tr>
<tr>
<td>Cm-247</td>
<td>1.0E-03</td>
<td>9.7E-07</td>
<td>1.0E-03</td>
<td>2.4E-06</td>
</tr>
<tr>
<td>Cm-248</td>
<td>1.0E-03</td>
<td>1.3E-04</td>
<td>1.0E-03</td>
<td>1.2E-04</td>
</tr>
<tr>
<td>Co-60</td>
<td>1.8E+01</td>
<td>2.2E+01</td>
<td>1.8E+01</td>
<td>4.2E+01</td>
</tr>
<tr>
<td>Cs-135</td>
<td>1.0E+00</td>
<td>2.2E-02</td>
<td>1.0E+00</td>
<td>4.2E-02</td>
</tr>
<tr>
<td>Cs-137</td>
<td>9.2E+03</td>
<td>3.5E+03</td>
<td>9.2E+03</td>
<td>6.7E+03</td>
</tr>
<tr>
<td>Eu-152</td>
<td>1.9E+01</td>
<td>9.0E-01</td>
<td>1.9E+01</td>
<td>1.4E+00</td>
</tr>
</tbody>
</table>
Tanks 5 & 6 Special Analysis

We do the right thing.

Dose (mrem/yr) vs. Years After Closure

- **FTF PA, Rev. 1, Base Case**
- **Tank 18 and Tank 19 SA, Base Case**
- **Tank 5 and Tank 6 SA, Base Case**
- **Tank 5 and Tank 6 SA, Composite Sensitivity Case**

1,000 Years vs. 10,000 Years
Conclusion

- Special Analyses are an integral part of the Performance Assessment program and assure continued safe operations and closure of DOE facilities.

- Special Analyses can be conducted for disposal facilities and closure facilities.

- Questions?