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# Tank 16 Radiological and Chemical Screening

**Analyte Screening Approach for the Tank 16 Primary and Annulus Residual Materials**

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SRR-CWDA-2013-00054

# Screening Overview

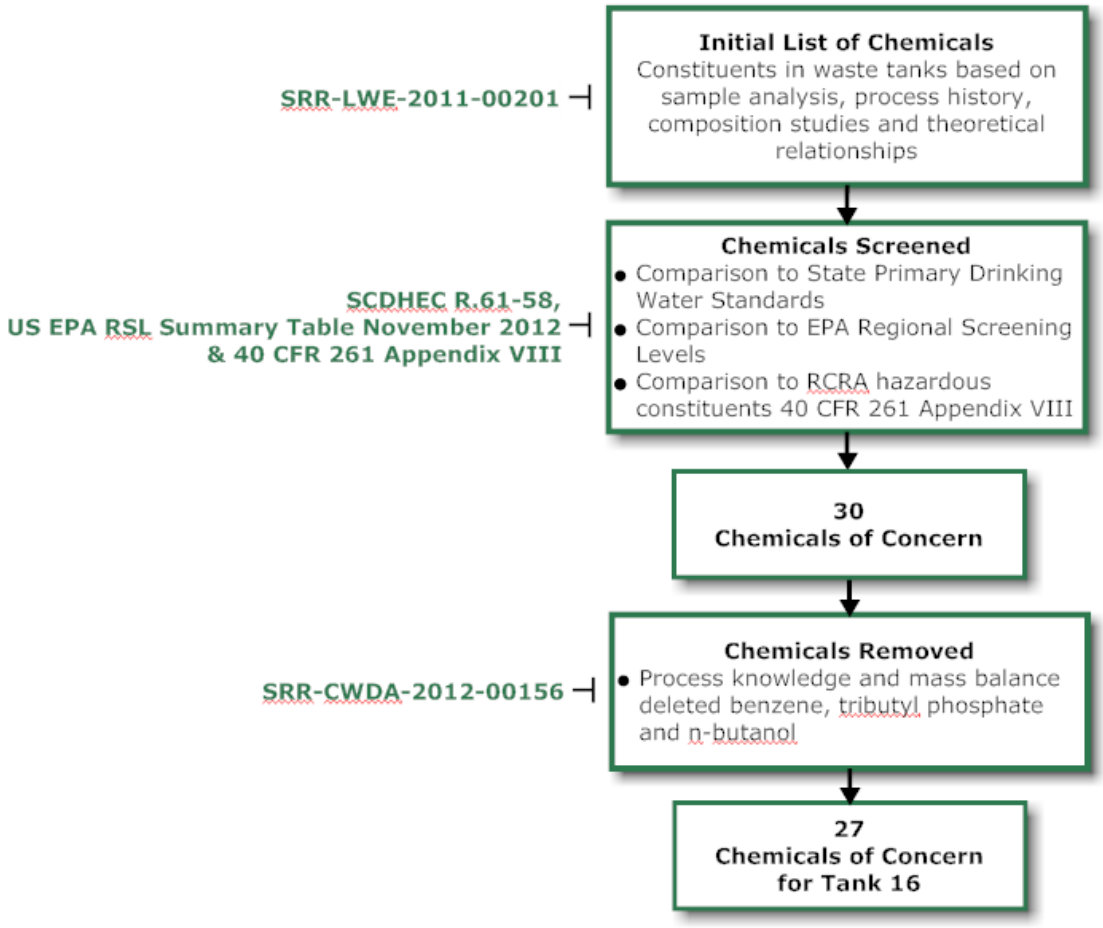


Radiological and chemical analyte screening process for Tank 16H followed the same process that was used for Tanks 5F, 6F, 18F and 19F

- H Modified process in H Canyon similar to F Canyon PUREX process but concentrations may vary
- Same analyte list for primary tank and annulus samples
- Flowsheets (Slide 3 for chemicals and Slide 6 for radionuclides) show screening process for radionuclides and chemicals
  - Begin with known waste characterization data and process knowledge

# Chemical Screening Flowsheet





# Tank 16 Chemical Analytes



- Chemical – 27 Analytes
  - Same list as Tank 6

| | | | | | | |
|---|---|---|---|---|---|---|
| Ag | Al | As | B | Ba | Cd | Cl |
| Co | Cr | Cu | F | Fe | Hg | I |
| Mn | Mo | Ni | $NO_2$ | $NO_3$ | Pb | $PO_4$ |
| Sb | Se | $SO_4$ | Sr | U | Zn | |

# Chemicals not Analyzed

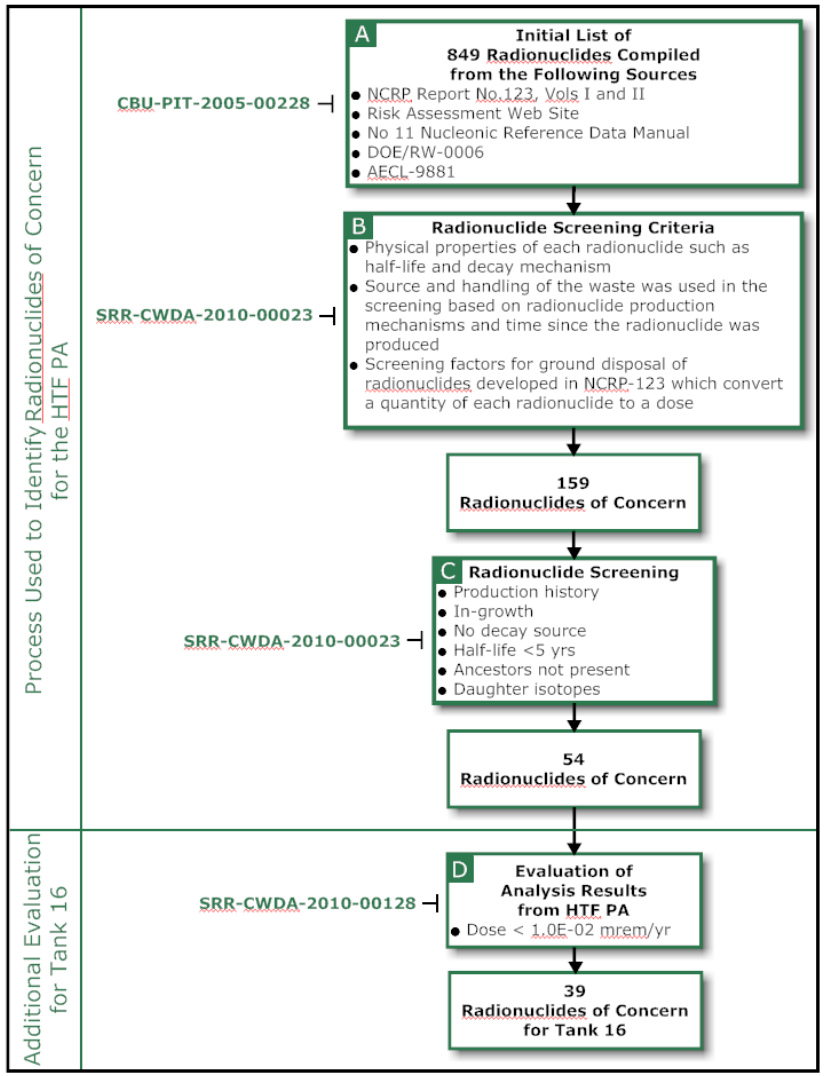
Chemicals on screening list not to be analyzed in Tank 16 samples (same as Tanks 5, 6, 18 & 19):

- Benzene – Not present by process knowledge, no In-Tank Precipitation solutions in Tank 16
- Tributyl phosphate – Not present by process knowledge, would have degraded quickly to butanol in high caustic environment
- Butanol - Not present by process knowledge, would have evaporated or been washed out of the tanks during waste removal activities

# Radionuclide Screening Flowsheet



SRR-CWDA-2013-00054



# Tank 16 Radionuclides



- Radiological –39 Analytes (See Table)
  - Started with HTF PA list (54 radionuclides)
    - Not the same 54 radionuclides as FTF list
      - Added Ra-228, Th-232, Cf-251 due to H Canyon process history
      - Deleted Nb-93m, Sb-126, Sb-126m (Zr-93 and Sn-126 daughters)
  - Deleted 15 radionuclides because:
    - Not HRRs or Class C radionuclides (as defined by WD Basis Document) and
    - Each less than 1.0E-02 mrem/yr PA dose estimate

# Tank 16 Radionuclide Analyte List



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| HRRs | Am-241 | Am-243 | Cs-137 | I-129 | Np-237 | Pu-238 | Pu-239 |
| | Pu-240 | Sr-90 | Tc-99 | U-233 | U-234 | U-235 | |
| Class C Nuclides | Am-242m | Am-243 | C-14 | Cf-249 | Cf-251 | Cm-243 | Cm-244 |
| | Cm-245 | Cm-247 | Cm-248 | Co-60 | Nb-94 | Ni-59 | Ni-63 |
| | Pu-241 | Pu-242 | Pu-244 | | | | |
| Other Nuclides | ~~Ac-227~~ | ~~Al-26~~ | Ba-137m | Cl-36 | Cs-135 | ~~Eu-152~~ | ~~Eu-154~~ |
| | ~~H-3~~ | K-40 | ~~Nb-93m~~ | Pa-231 | ~~Pd-107~~ | ~~Pt-193~~ | Ra-226 |
| | ~~Ra-228~~ | ~~Sb-126~~ | ~~Sb-126m~~ | ~~Se-79~~ | ~~Sm-151~~ | ~~Sn-126~~ | ~~Th-229~~ |
| | Th-230 | ~~Th-232~~ | ~~U-232~~ | ~~U-236~~ | U-238 | Y-90 | Zr-93 |

| | |
|---|---|
| ~~Ac-227~~ | Deleted from Tank 16 analyte list |
| Cf-251 | Added to HTF PA List |
| ~~Nb-93m~~ | Deleted from HTF PA List |

# Summary

- Used same screening process as FTF Tanks 5, 6, 18 and 19 since waste source was similar
- Same analyte list for both primary tank and annulus samples
- Result:
  - 27 chemicals – no change from Tank 6
  - 39 radionuclides – slight reduction from Tank 6
    - Added 1 nuclide from HTF WD Basis Document
    - Deleted 15 nuclides due to low dose impact

# Current Status



- Tank 16 Radiological and Chemical Screening document approved and issued (SRR-CWDA-2012-00156) – copies available
- Analyte lists will feed into the Tank 16 Technical Task Request (TTR) to SRNL for sample analysis – under development
- SRNL will issue Task Technical Quality Assurance Plan (TTQAP)

# References




- CBU-PIT-2005-00228, Hamm, B.A., *Savannah River Site High-Level Waste Tank Farm Closure Radionuclide Screening Process (First-Level) Development and Application,* Savannah River Site, Aiken, SC, Rev. 0, November 7, 2006.
- SRR-CWDA-2010-00023, *H-Tank Farm Closure Inventory for Use in Performance Assessment Modeling*, Savannah River Site, Aiken, SC, Rev. 3, May 10, 2012.
- SRR-CWDA-2010-00128, *Performance Assessment for the H-Area Tank Farm at the Savannah River Site*, Savannah River Site, Aiken, SC, Rev. 1, November 14, 2012.
- SRR-CWDA-2012-00156, *Tank 16 Chemical Screening for Residual Inventory Determination*, Savannah River Site, Aiken, SC, Rev.0, January 2013.
- SRR-LWE-2011-00201, Pasala, N.R., *Information on the Radiological and Chemical Characterization of the Savannah River Site Tank Waste as of July 5, 2011*, Savannah River Site, Aiken, SC, Rev.0, September 26, 2011.

# Backup Slides

# Deleted Nuclides PA Dose Estimates



| Nuclide | PA Dose (mrem/yr) |
|---|---|
| Ac-227 | 4.00E-03 |
| Al-26 | 1.30E-10 |
| Eu-152 | 0.00E+00 |
| Eu-154 | 0.00E+00 |
| H-3 | 3.60E-04 |
| Pd-107 | 9.70E-03 |
| Pt-193 | 1.20E-10 |
| Ra-228 | 1.60E-05 |
| Se-79 | 9.50E-07 |
| Sm-151 | 2.50E-23 |
| Sn-126 | 5.70E-10 |
| Th-229 | 2.50E-03 |
| Th-232 | 1.00E-07 |
| U-232 | 2.70E-23 |
| U-236 | 3.80E-05 |