CLOSING ROCKY FLATS: BALANCING COMPLEX ISSUES

Federal Remediation Technologies Roundtable

May 14, 2014

Carl Spreng
Rocky Flats Cleanup
Building Decommissioning & Demolition
Site Complexities

- Radionuclides in building materials (5/10; 13)
- Radionuclides in environmental media
- Co-mingled ground water plumes
- 650,000 cubic meters of radioactive waste
- 21 tons of weapons-grade plutonium
- 100 tons of Pu residues (no disposal path)
- Nearly 400 potentially contaminated sites
- Culture of strained relationships and community mistrust
Closure milestones

- **1989**: production ended; Site listed on NPL
- **1995**: estimated $37 billion over 65 years
- **1996**: new contractor; new cleanup agreement
- **1996**: new closure date – 2010
- **2001**: new closure date - 2006
- **2005**: December - construction complete
- **2006**: September – Record of Decision
- **2007**: partial delisting; majority of site turned over to USFWS to create new Refuge
GAO reports

United States General Accounting Office

GAO
Report to the Chairman, Subcommittee on Military Procurement, Committee on National Security, House of Representatives

May 1968

NUCLEAR WASTE

Greater Use of Removal Actions Could Cut Time and Cost for Cleanups

United States General Accounting Office

GAORCE-68-124
GAO reports

United States General Accounting Office

GAO
Report to the Chairman, Committee on Armed Services, U.S. Senate

DEPARTMENT OF ENERGY

April 1999

Accelerated Closure of Rocky Flats: Status and Obstacles
NA

United States General Accounting Office

Report to the Chairman, Committee on the Budget, House of Representatives

April 1999

NUCLEAR WASTE

DOE's Accelerated Cleanup Strategy Has Benefits but Faces Uncertainties

GAO/RCD-99-100

GAO/RCD-99-129
GAO reports

GAO

May 1998

GAO

April 1999

GAO

February 2001

NUCLEAR CLEANUP

Progress Made at Rocky Flats, but Closure by 2006 Is Unlikely, and Costs May Increase
GAO reports

United States Government Accountability Office

Report to Congressional Requesters

NUCLEAR CLEANUP OF ROCKY FLATS
DOE Can Use Lessons Learned to Improve Oversight of Other Sites’ Cleanup Activities

GAO-06-352
Elements of Success

- Single site mission
- Closure vision with upfront land use assumptions
- Steady, reliable funding; supportive congressional delegation
- Community & worker acceptance of site closure
- Significant public involvement
- Appropriately-scoped performance-based contract
- Flexible cleanup agreement w/ accelerated decision-making
- Collaborative process among DOE/contractors & regulators
- Technological innovations
- Waste acceptance for a variety of waste streams
Special Nuclear Material and Waste Shipping
<table>
<thead>
<tr>
<th>Regulatory Framework</th>
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<tbody>
<tr>
<td>• Atomic Energy Act (AEA)</td>
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<td>• Occupational Safety and Health Act (OSHA)</td>
</tr>
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<td>• Oil Pollution Act (OPA)</td>
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<tr>
<td>• Pollution Prevention Act (PPA)</td>
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<td>• Resource Conservation and Recovery Act (RCRA)</td>
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CERCLA Cleanup Process

- Preliminary Assessment / Site Investigation
- NPL Listing
- Remedial Investigation
- Feasibility Study
- Record of Decision
- Remedial Design
- Remedial Action
- Construction Completion
- Long-Term Management
- NPL Delete

Investigation

Cleanup

LTM
Modified CERCLA Cleanup Process

- Preliminary Assessment / Site Investigation
  - NPL Listing
  - Action Levels; SOPs
  - Accelerated Actions
  - Remedial Investigation / FS
  - Record of Decision
  - Long-Term Management
  - NPL Delete

Investigation + Cleanup
LTM
Regulatory Framework

- State regulations:
  - Radiation Control
  - Solid Waste Disposal
  - Air Pollution Prevention
  - Water Quality Control
  - Hazardous Waste Regulations (RCRA)
Regulatory Agreements

- **Compliance Agreement - 1986**
  - Allowed regulation of radioactive & hazardous waste

- **Agreement in Principle (AIP) – 1989**

- **Interagency Agreement (IAG) - 1991**
  - 178 IHSSs in 16 Operable Units
  - Rigid schedule with detailed milestones
  - Treatability studies and characterization reports
Regulatory Agreements:

Federal Facilities Compliance Act (1992)

1. Removed federal government’s sovereign immunity
2. Required DOE to inventory mixed waste
3. Required DOE to develop cleanup plans
Regulatory Agreements

Rocky Flats Cleanup Agreement (RFCA)

- Intended to guide active remediation
- Adaptive regulatory structure
- Perform cleanup under “interim removal actions”
- Action Levels triggered remediation
- Consultative process
- In-the-field decisions
2003 Radionuclide Soil Action Levels

Input from:

- Actinide Migration Evaluation (AME) study
- Stakeholder Focus Group
- RSALs Oversight Panel
  - Task 1 - Regulatory analysis
  - Task 2 - Computer modeling
  - Task 3 - RSAL calculations
  - Task 4 - New scientific information
  - Task 5 - Determining cleanup levels at other sites
### RSALs Task 3: Calculation of RSALs

#### Wildlife Refuge Worker

<table>
<thead>
<tr>
<th>Radionuclide</th>
<th>Percentile</th>
<th>RSALs (pCi/g) at Selected Target Risks</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>$10^{-4}$</td>
</tr>
<tr>
<td>Am-241</td>
<td>10th</td>
<td>904</td>
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<tr>
<td></td>
<td>5th</td>
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<td>Pu-239</td>
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<tr>
<td></td>
<td>5th</td>
<td>1,160</td>
</tr>
<tr>
<td></td>
<td>1st</td>
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<tr>
<td></td>
<td>Point estimate</td>
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Applying RSALs during Cleanup

Remediation at the 903 Pad
Complexities of remedy selection

Interest groups

Remedy Decision Makers

DOE / contractors

Public involvement
### Applying RSALs During Cleanup

**CERCLA Nine Criteria:**

<table>
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<th>Category</th>
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<tbody>
<tr>
<td><strong>Threshold criteria</strong></td>
<td>1. Overall protection of human health and the environment</td>
</tr>
<tr>
<td></td>
<td>2. Compliance with applicable or relevant and appropriate requirements (ARARs)</td>
</tr>
<tr>
<td><strong>Balancing criteria</strong></td>
<td>3. Long-term effectiveness and permanence</td>
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<td></td>
<td>4. Reduction in toxicity, mobility, or volume through treatment</td>
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<td></td>
<td>5. Short-term effectiveness</td>
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<td></td>
<td>6. Implementability</td>
</tr>
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<td></td>
<td>7. Cost</td>
</tr>
<tr>
<td><strong>Modifying criteria</strong></td>
<td>8. State acceptance</td>
</tr>
<tr>
<td></td>
<td>9. Community acceptance</td>
</tr>
</tbody>
</table>
Remedy Selection Balancing Act

cost

protection
Rocky Flats Site today

Average Residual Pu Contamination:
- Refuge = 1.1 pCi/g
- DOE = 2.3 pCi/g
Legacy