

# CLOSING ROCKY FLATS: BALANCING COMPLEX ISSUES

*Federal Remediation  
Technologies Roundtable*

*May 14, 2014*

Carl Spreng



# Rocky Flats – Then and Now



*201*



*1995*

# Rocky Flats Cleanup Building Decommissioning & Demolition



# Rocky Flats Cleanup Environmental Restoration



# 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

GAO

United States General Accounting Office

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

May 1996

## NUCLEAR WASTE

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



GAO/RCED-96-124

# GAO reports

GAO

May 1996

GAO/RCED-96-124

GAO

April 1999

GAO/RCED-99-100

United States General Accounting Office  
Report to the Chairman, Committee on  
Armed Services, U.S. Senate



## DEPARTMENT OF ENERGY

### Accelerated Closure of Rocky Flats: Status and Obstacles








# GAO reports

<p>GAO</p> <p>May 1996</p> <p>GAO/RCED-96-124</p>	<p>GAO</p> <p>April 1999</p> <p>GAO/RCED-99-100</p>	<p>GAO</p> <p>United States General Accounting Office Report to the Chairman, Committee on the Budget, House of Representatives</p> <p>April 1999</p> <p>NUCLEAR WASTE</p> <p>DOE's Accelerated Cleanup Strategy Has Benefits but Faces Uncertainties</p>  <p> Accountability * Integrity * Reliability</p> <p>GAO/RCED-99-129</p>
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# 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



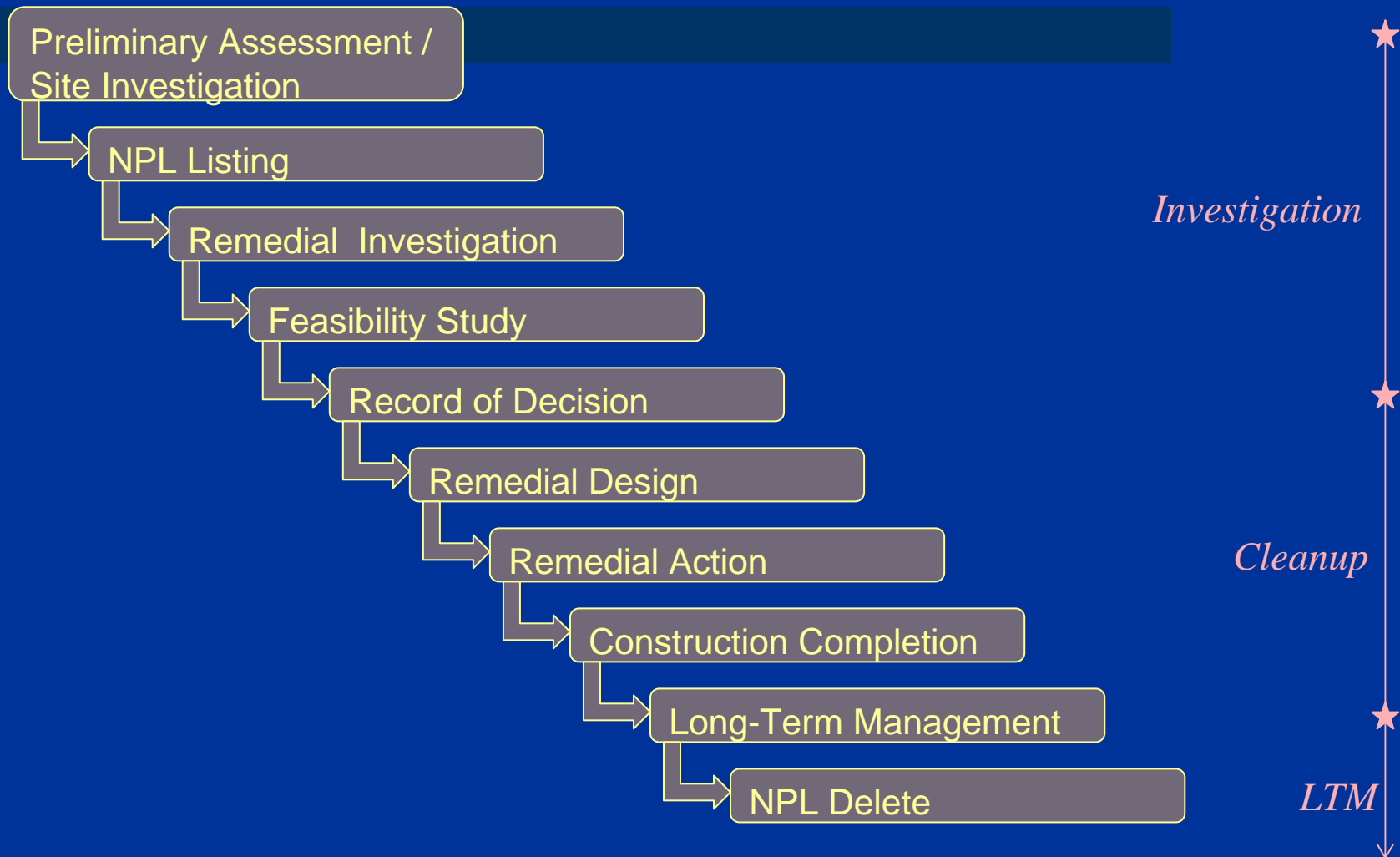
# Regulatory Framework

- *Atomic Energy Act (AEA)*
- *Chemical Safety Information, Site Security and Fuels Regulatory Relief Act*
- *Clean Air Act (CAA)*
- *Clean Water Act (CWA)*
- *Comprehensive Environmental Response, Compensation and Liability Act (CERCLA or Superfund)*
- *Emergency Planning and Community Right-to-Know Act (EPCRA)*
- *Endangered Species Act (ESA)*
- *Energy Independence and Security Act (EISA)*
- *Energy Policy Act*
- *Federal Food, Drug, and Cosmetic Act (FFDCA)*
- *Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)*
- *Marine Protection, Research, and Sanctuaries Act (Ocean Dumping Act)*
- *National Environmental Policy Act (NEPA)*
- *National Technology Transfer and Advancement Act (NTTAA)*
- *Noise Control Act*
- *Nuclear Waste Policy Act (NWPA)*
- *Occupational Safety and Health Act (OSHA)*
- *Oil Pollution Act (OPA)*
- *Pollution Prevention Act (PPA)*
- *Resource Conservation and Recovery Act (RCRA)*
- *Safe Drinking Water Act (SDWA)*
- *Shore Protection Act (SPA)*
- *Toxic Substances Control Act (TSCA)*

# Regulatory Framework

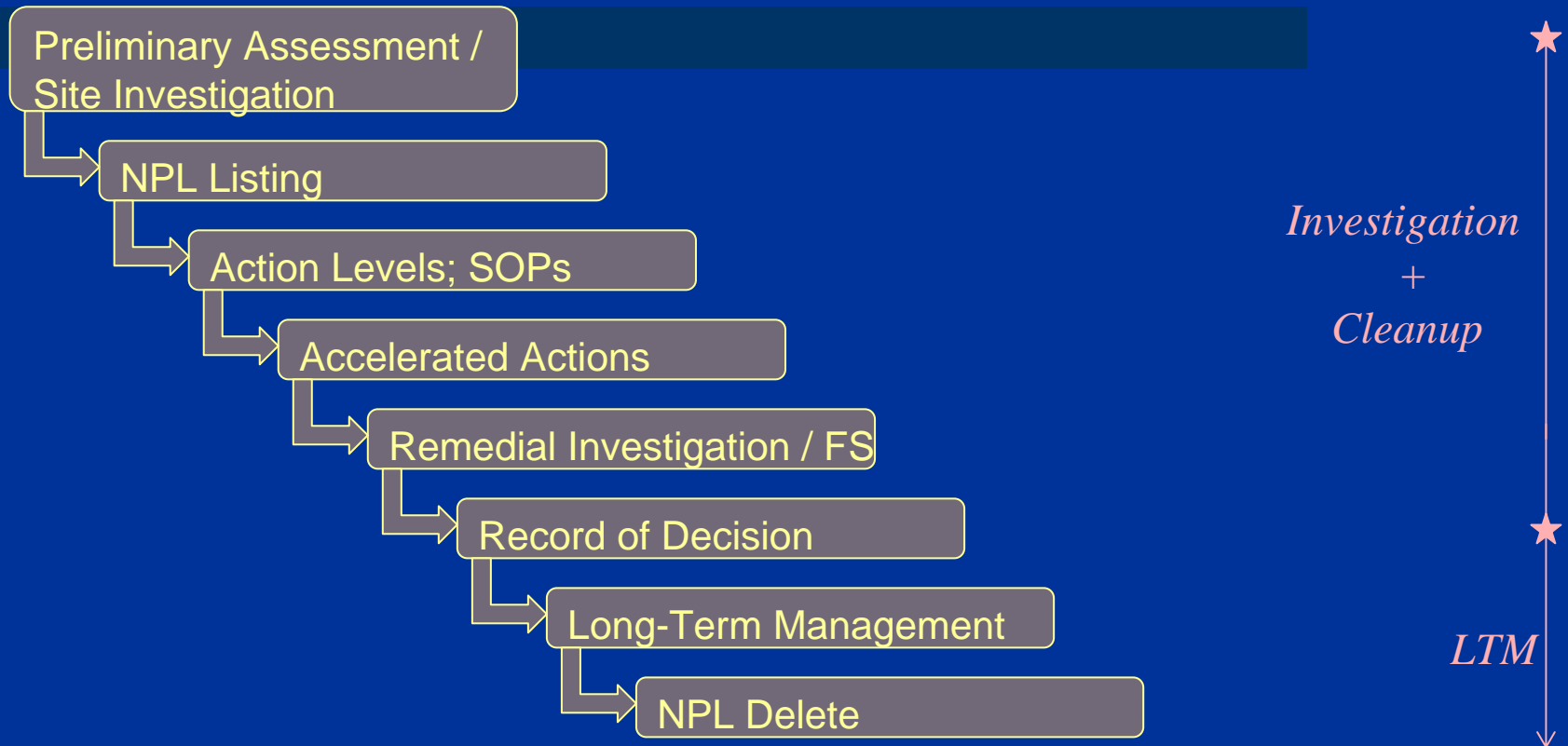
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# CERCLA Cleanup Process





# Modified CERCLA Cleanup Process





# 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)

- Timeframe: 1996 – 2007
- 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
- RSALs Working Group (1999 – 2002)
  - 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

Radionuclide	Percentile	RSALs (pCi/g) at Selected Target Risks		
		$10^{-4}$	$10^{-5}$	$10^{-6}$
Am-241	10 <sup>th</sup>	904	90	9
	5 <sup>th</sup>	760	<b>76</b>	7.6
	1 <sup>st</sup>	560	56	5.6
	Point estimate	514	51	5.1
Pu-239	10 <sup>th</sup>	1,472	147	14.7
	5 <sup>th</sup>	1,160	<b>116</b>	11.6
	1 <sup>st</sup>	737	74	7.4
	Point estimate	670	67	6.7

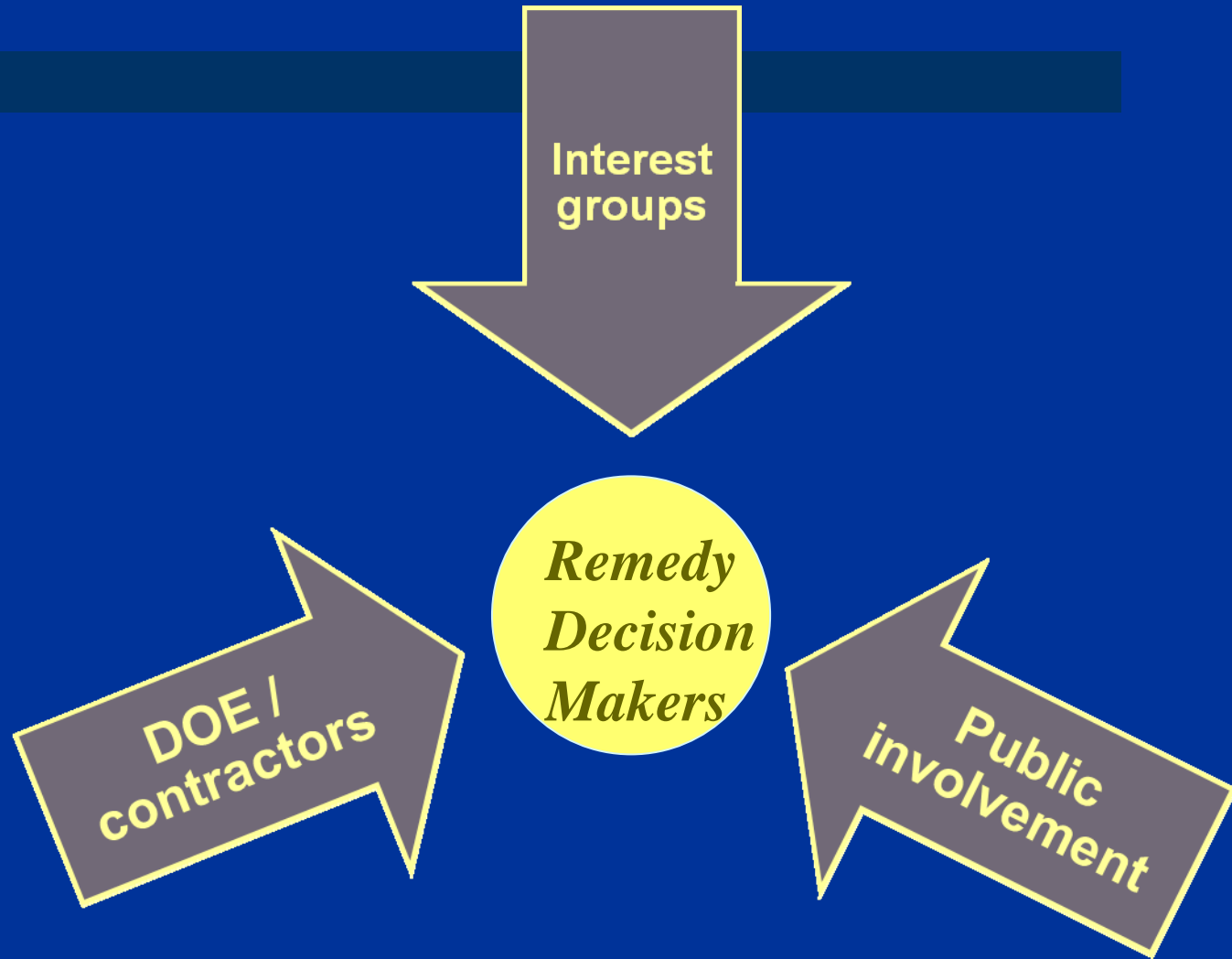
# Applying RSALs during Cleanup

## *Remediation at the 903 Pad*





# Complexities of remedy selection



# Applying RSALs During Cleanup

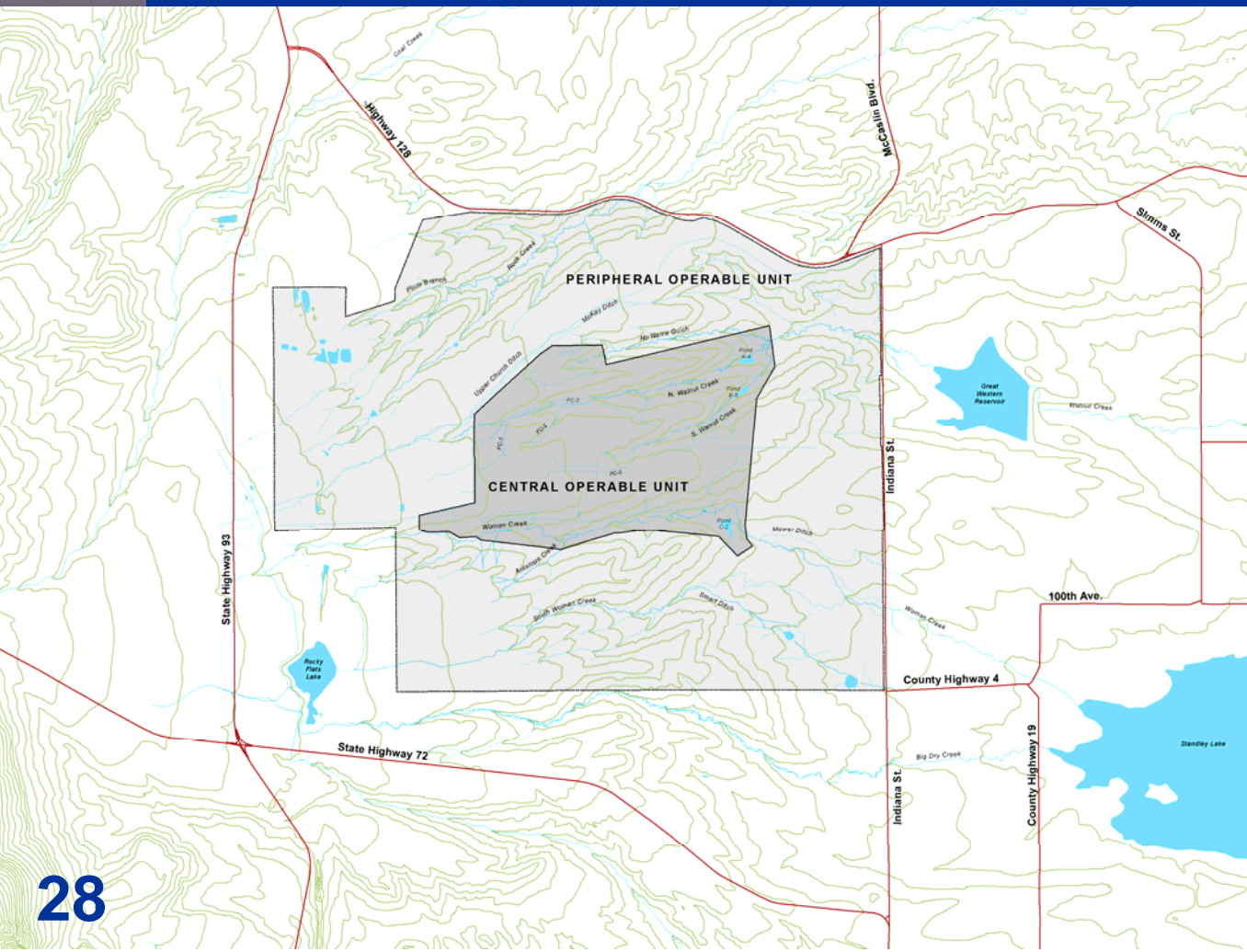
## *CERCLA Nine Criteria:*

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

# Remedy Selection Balancing Act

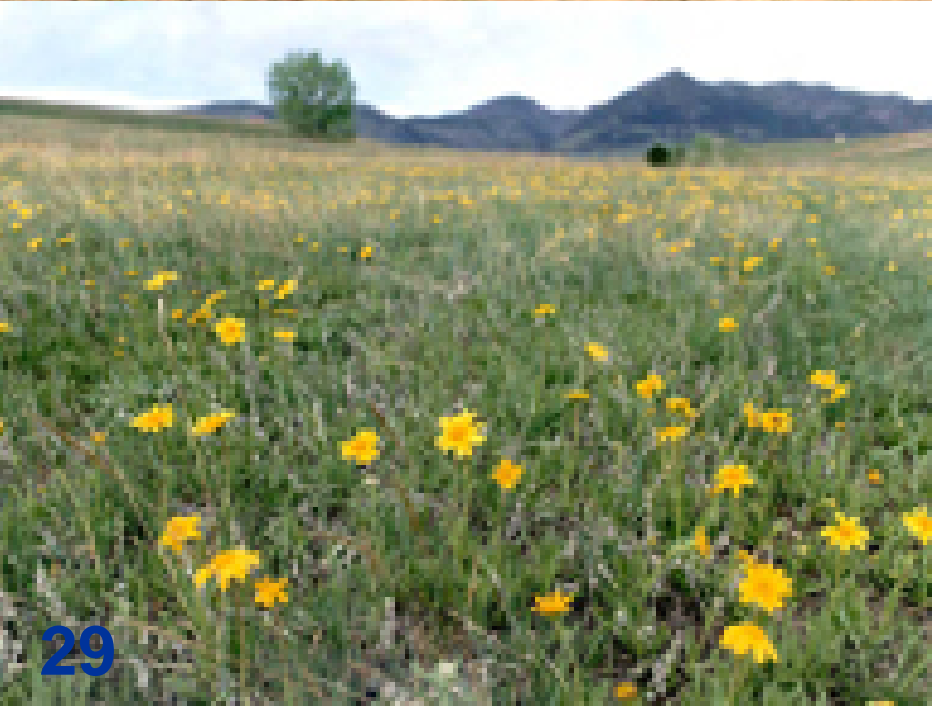


# Rocky Flats Site today



Average Residual Pu Contamination:

- Refuge = 1.1 pCi/g
- DOE = 2.3 pCi/g



# Legacy

