

Air Force Center for Engineering and the Environment

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The DoD Environmental Restoration Program: An Air Force Perspective and Status Update

**SERDP/ESTCP
2011 Annual Symposium**

Hunter Anderson

AFCEE/TDV

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KEYNOTE ADDRESS
**THE DoD ENVIRONMENTAL RESTORATION PROGRAM; AN AIR FORCE
PERSPECTIVE AND STATUS UPDATE**

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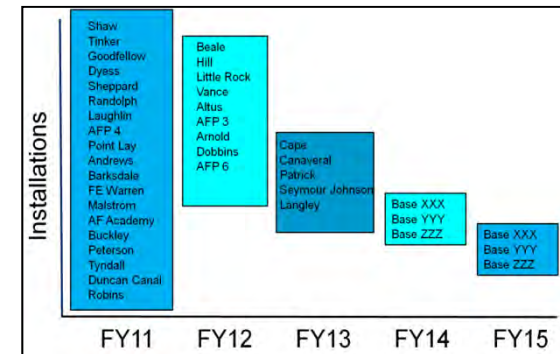
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Big Picture Restoration Goals

Objective 1: ENVIRONMENTAL

Reduce Liability and Close Sites

Design a strategy to obtain the Highest ROI for each dollar



Objective 2: MISSION

Invest to Enhance the Mission

Identify opportunities to enhance the mission and strategically invest to clear land of constraints



Objective 3: ASSETS

Leverage Assets to Create Value

Identify opportunities in hot markets and leverage the asset to offset liabilities or create value for the installation

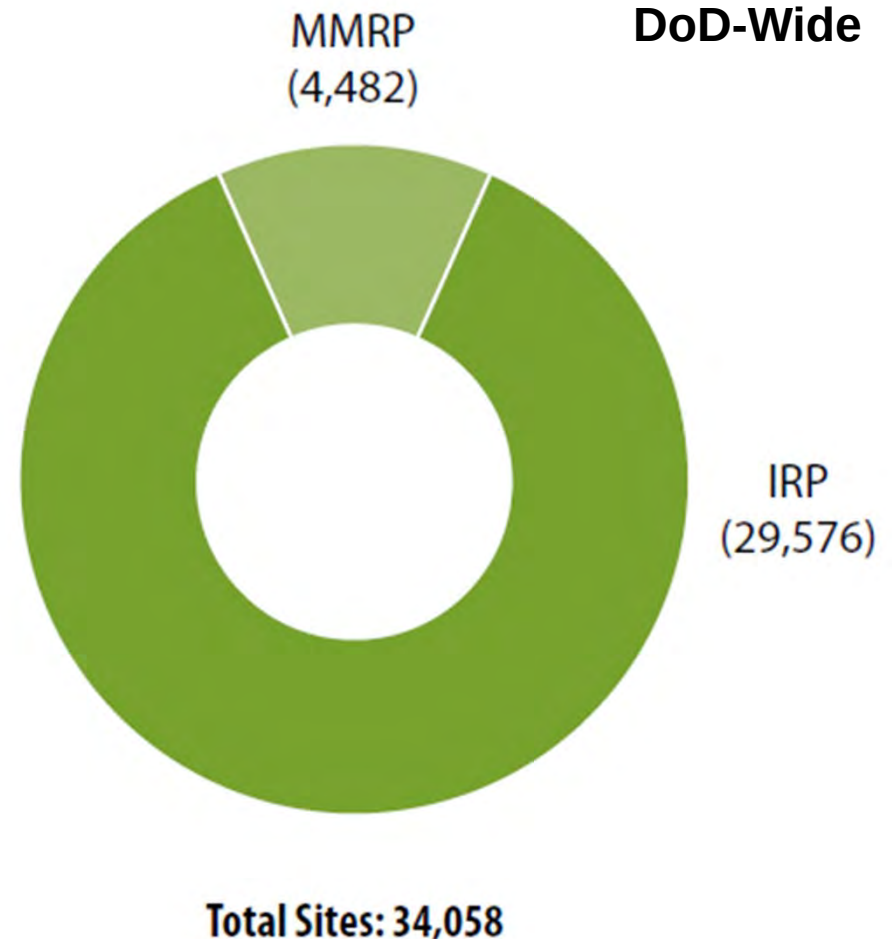


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Defense Environmental Restoration Program (DERP)

- Installation Restoration Program (IRP)
 - Established in 1975
 - Pre-1985 contamination
 - “Legacy Sites”
 - Expanded in 2011 to include compliance sites
 - Post-1985 contamination
- Military Munitions Response Program (MMRP)
 - Established in 2001
 - Sites continually discovered





Defense Environmental Restoration Program (DERP)

DoD-Wide

■ Active Installations

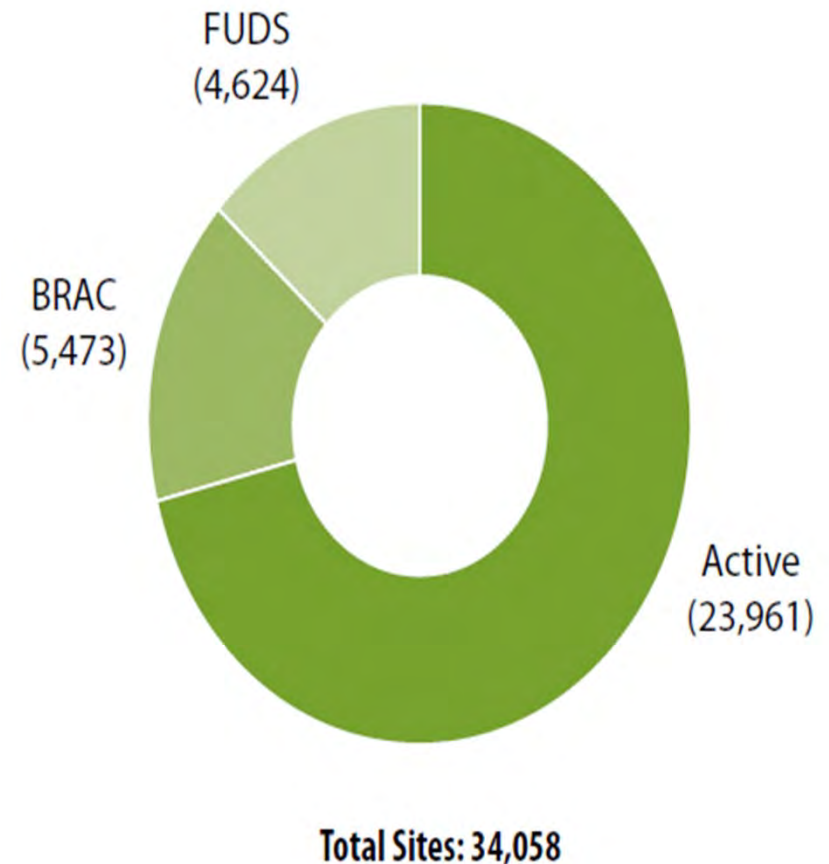
- All installations with active operations

■ BRAC Installations

- Base Realignment and Closure real property

■ FUDS Properties

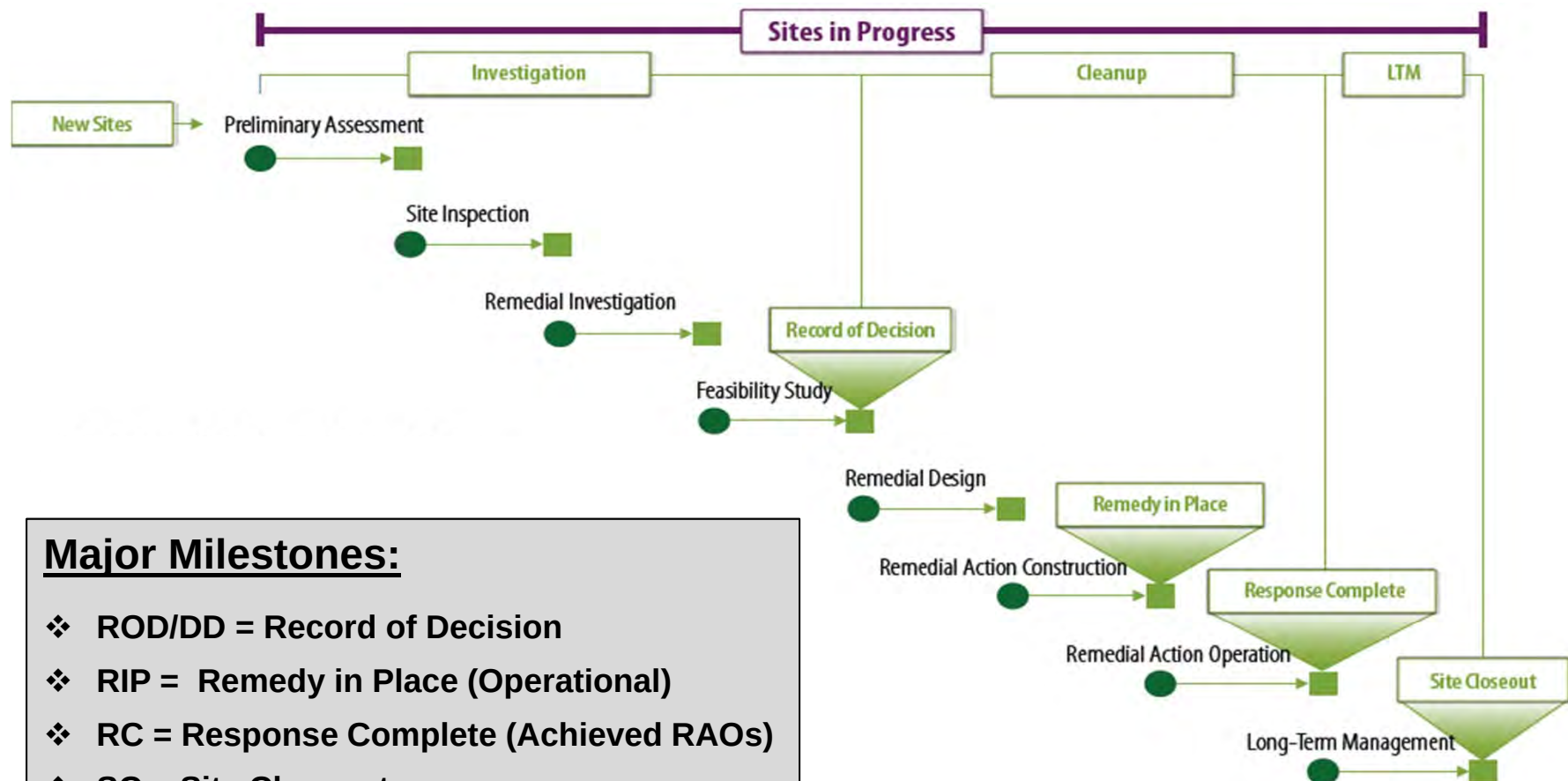
- Formerly Used Defense Sites real property
- Under jurisdiction of USACE





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DERP Follows CERCLA Process



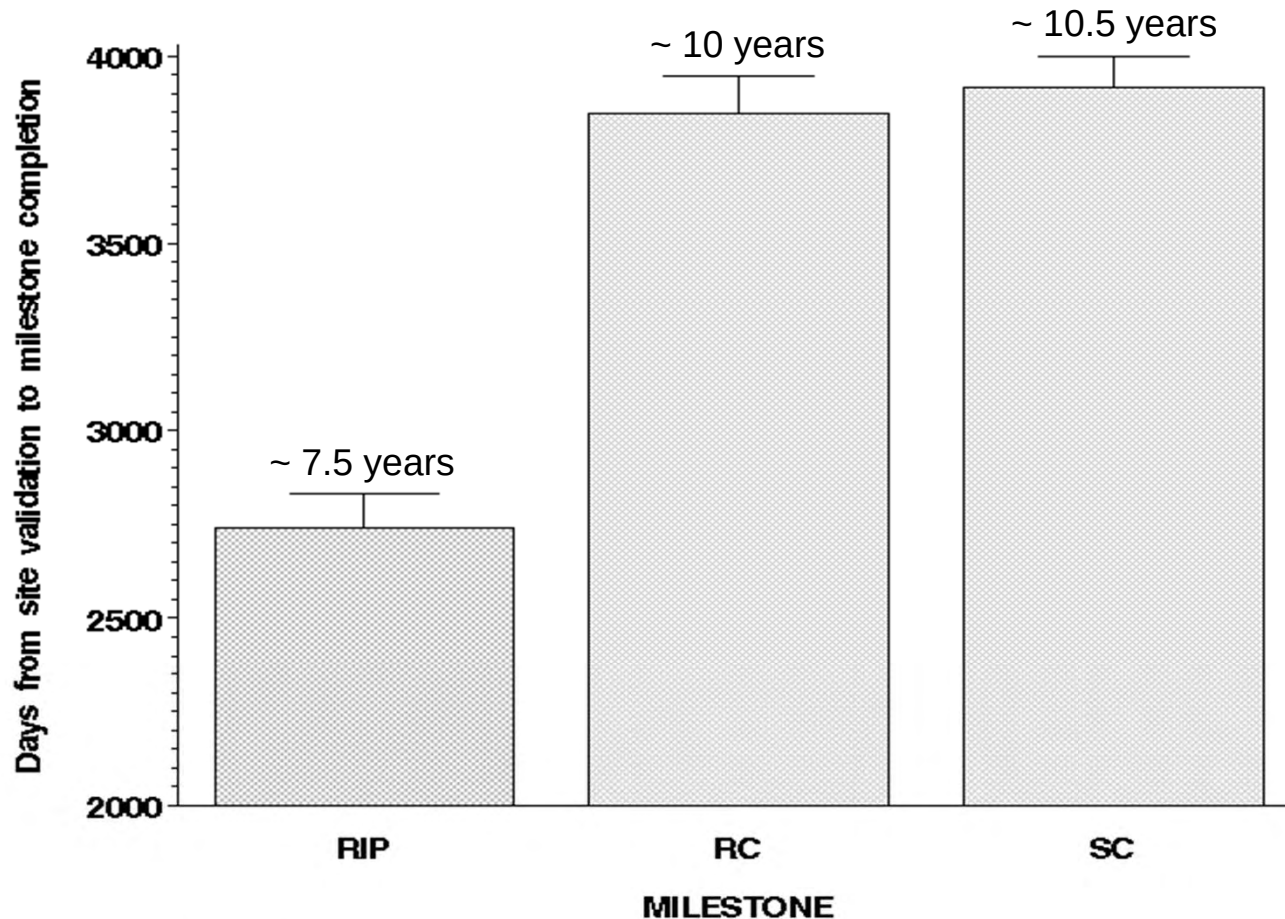
Major Milestones:

- ❖ ROD/DD = Record of Decision
- ❖ RIP = Remedy in Place (Operational)
- ❖ RC = Response Complete (Achieved RAOs)
- ❖ SC = Site Closeout
 - Industrial (Old Standard)
 - Residential (New Standard)



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Mean Time to Achieve Critical Milestones among AF Sites



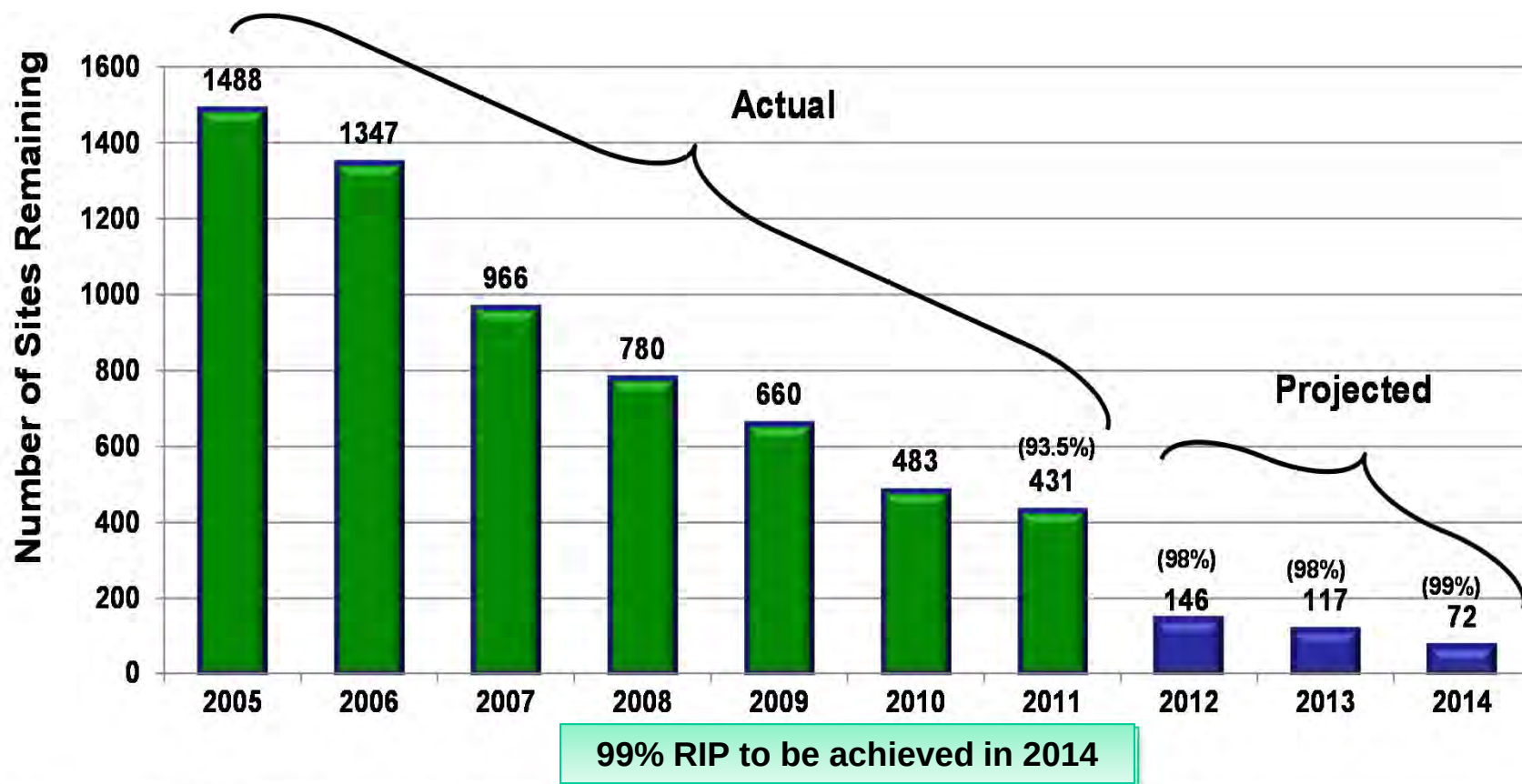
* Source: Enterprise Environmental, Safety & Occupational Health - Management Information System

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FY11 AF-IRP RIP Status



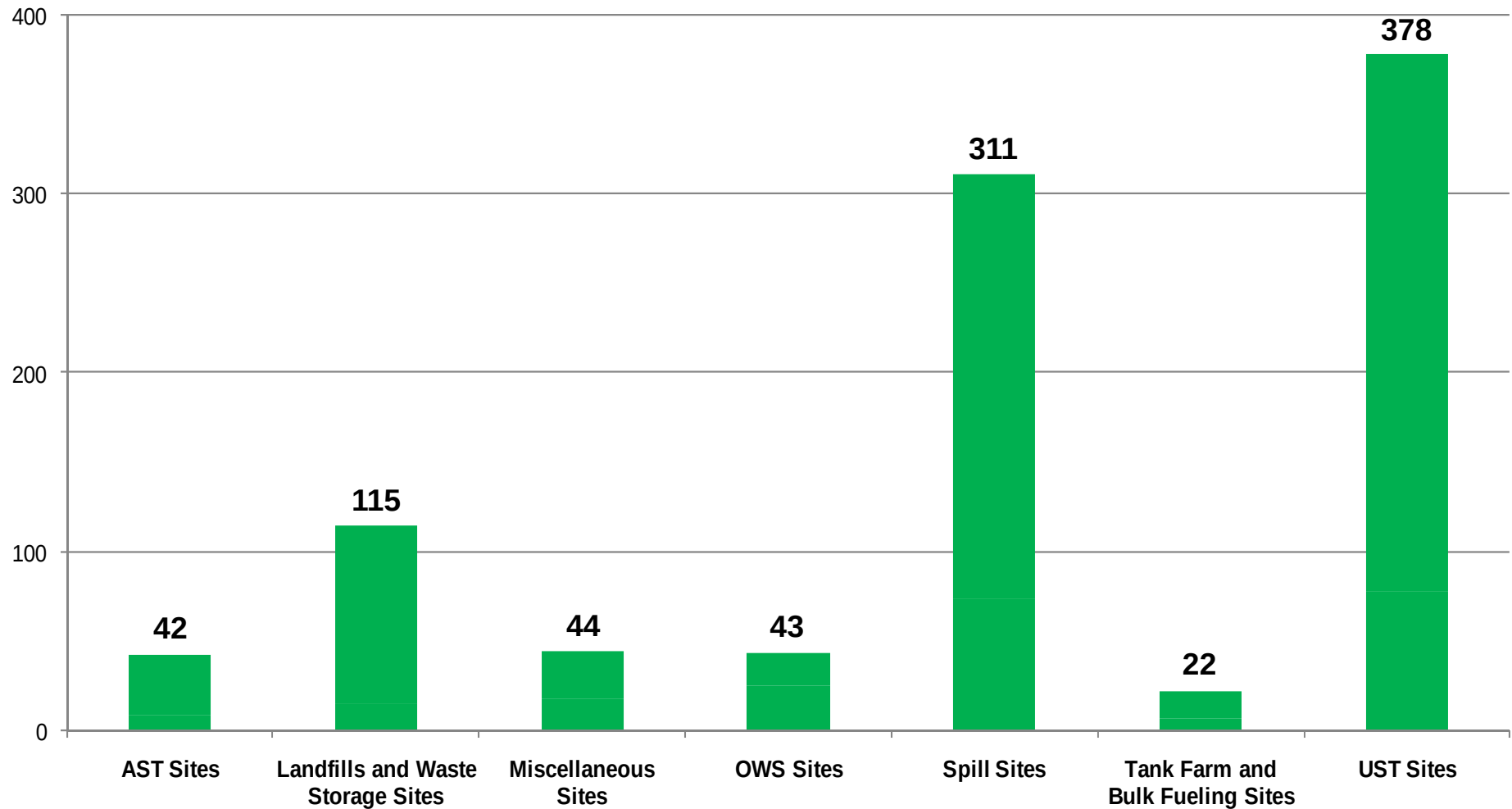
Legacy IRP RIP Projections	FY12	FY13	FY14	Beyond FY14
FY09 Baseline	170 (97.5%)	0 (100%)	0 (100%)	0 (100%)

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AF-IRP(Compliance Sites) Program Inventory

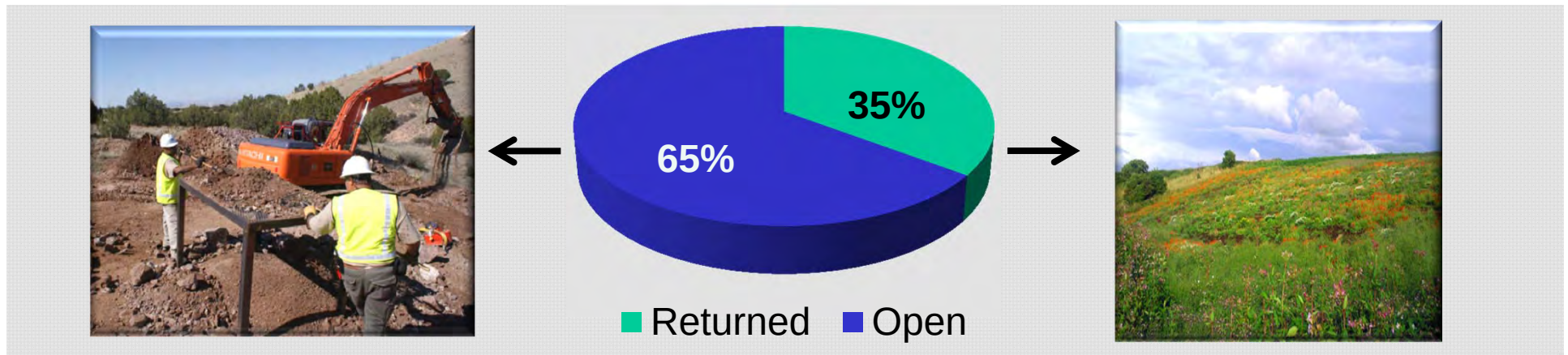


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AF-MMRP Program Status

■ Current Active Status

- 94 total installations with Munitions Response Sites (MRSs)
 - 63 legacy bases
- 890 total MRSs (719 Open, 171 Closed)



- Over 625,000 total acres
- Returned over 220,000 acres for mission use
- New sites continue to be discovered



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AF-MMRP Program Status

- Majority of AF MMRP sites are small arms ranges, open burning/open detonation areas, and disposal pits
 - 60% of AF program – Continue to focus on closure!
- The “Big Eight”—Large munitions/mixed use ranges will drive the long-term program
 - Bombing Ranges
 - Air-to-Ground Ranges
 - Historic Artillery Ranges



The **Big Eight** Air Force Installations:

■ Barksdale AFB	■ Kirtland AFB
■ Edwards AFB	■ Luke AFB/Barry M Goldwater Range
■ Eglin AFB	■ Nellis AFB
■ Hill AFB	■ Vandenberg AFB

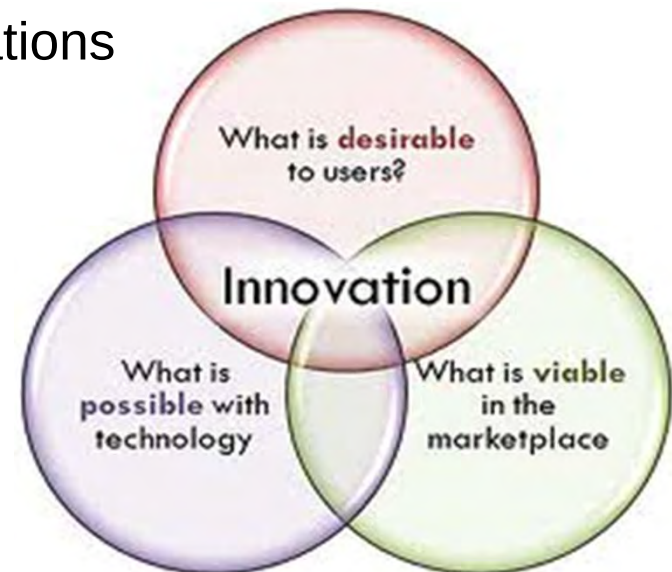


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Paradigm Shift in the AF-ERP

“Fence-to-Fence” Performance-Based Remediation

- Puts emphasis on innovation and leverages industry for technology
- Continued protection of human health and the environment
- Focus shift from RIP/RC to SC (Residential Levels)
- Maintain compliance with all laws and regulations
- Installation scope vs. site-specific approach
- Life cycle cost considerations
- Anticipated Outcomes
 - Reach site closure faster
 - Minimize life-cycle costs





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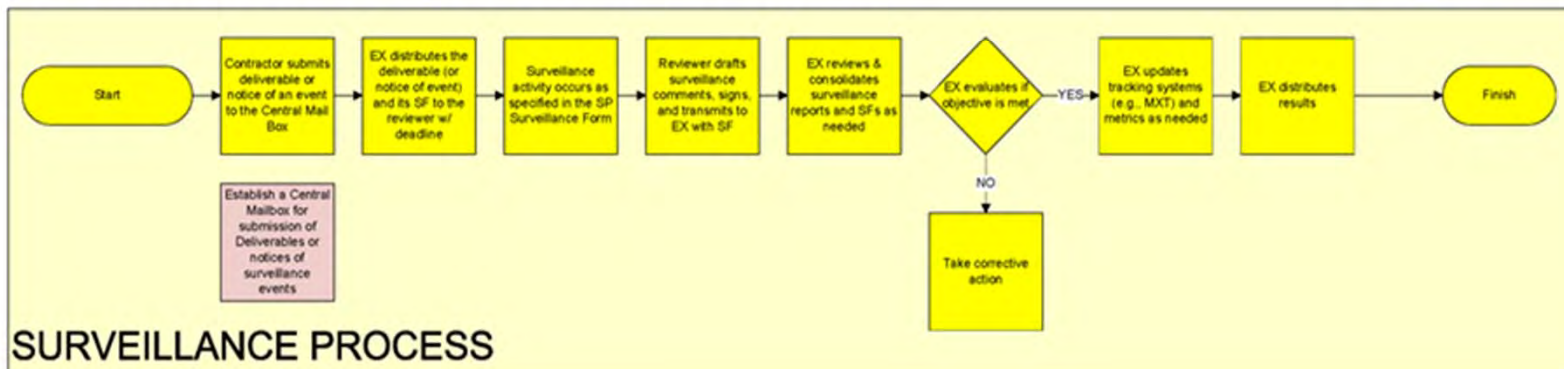
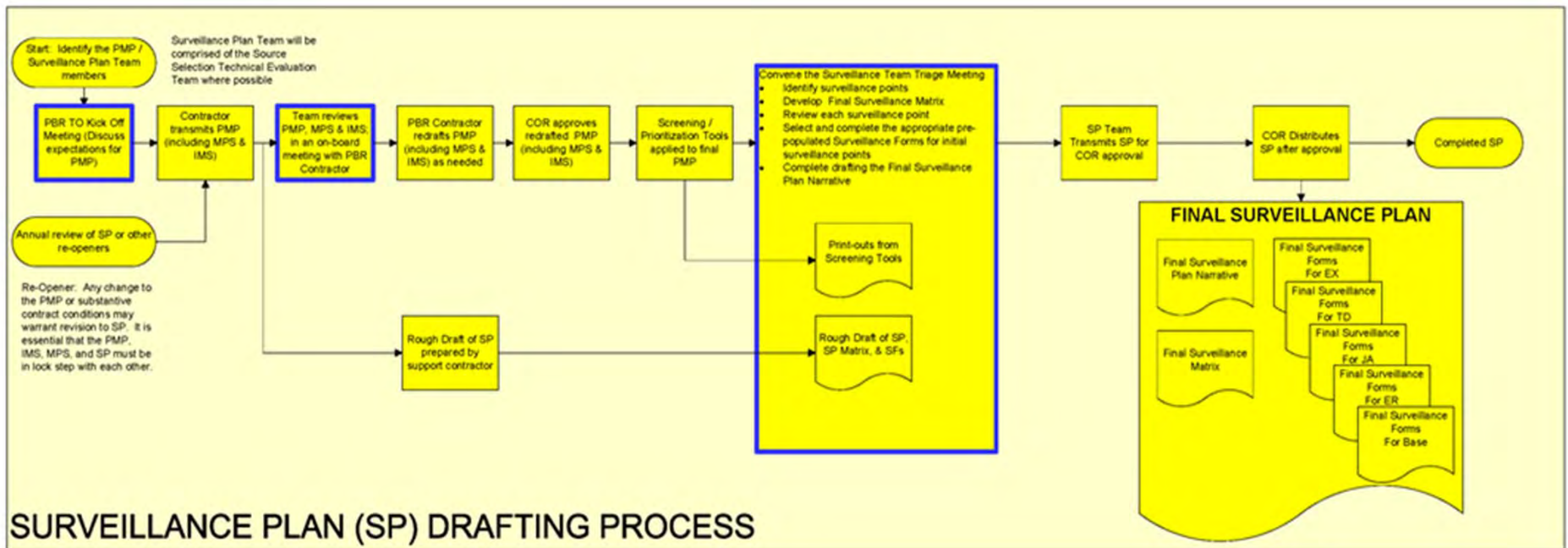
What's Different in the New AF PBR Initiative?

- AF is utilizing a Statement of Objectives (SOO) that identifies the overarching objectives, then the PBR Contractors will propose an end state for each site, to be evaluated in the following preference:
 1. Site Closeout (SC)
 2. Response Complete (RC)
 3. Remedy in Place (RIP)
 4. RI/FS
- If the PBR Contractors determine they cannot achieve any of the above milestones for a given site, then they propose exit strategies to optimize or replace existing treatment systems and monitoring networks including monitoring optimization, contaminant removal and containment.
- Contracting Goals:
 - 60% of all sites under a PBC contract by end of FY12
 - 90% of all sites under a PBC contract by end of FY15



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Post-Award Surveillance



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AF-ERP PBR Report Card

- Performance Based Remediation (PBR) Goals (non-BRAC):
 - Accelerate Completion: 50% of all sites by FY12; 75% by FY15
 - PBR Contracts: 60% of sites under PBR by FY12; 90% by FY15
- PBR Plan and Accomplishments to Date:

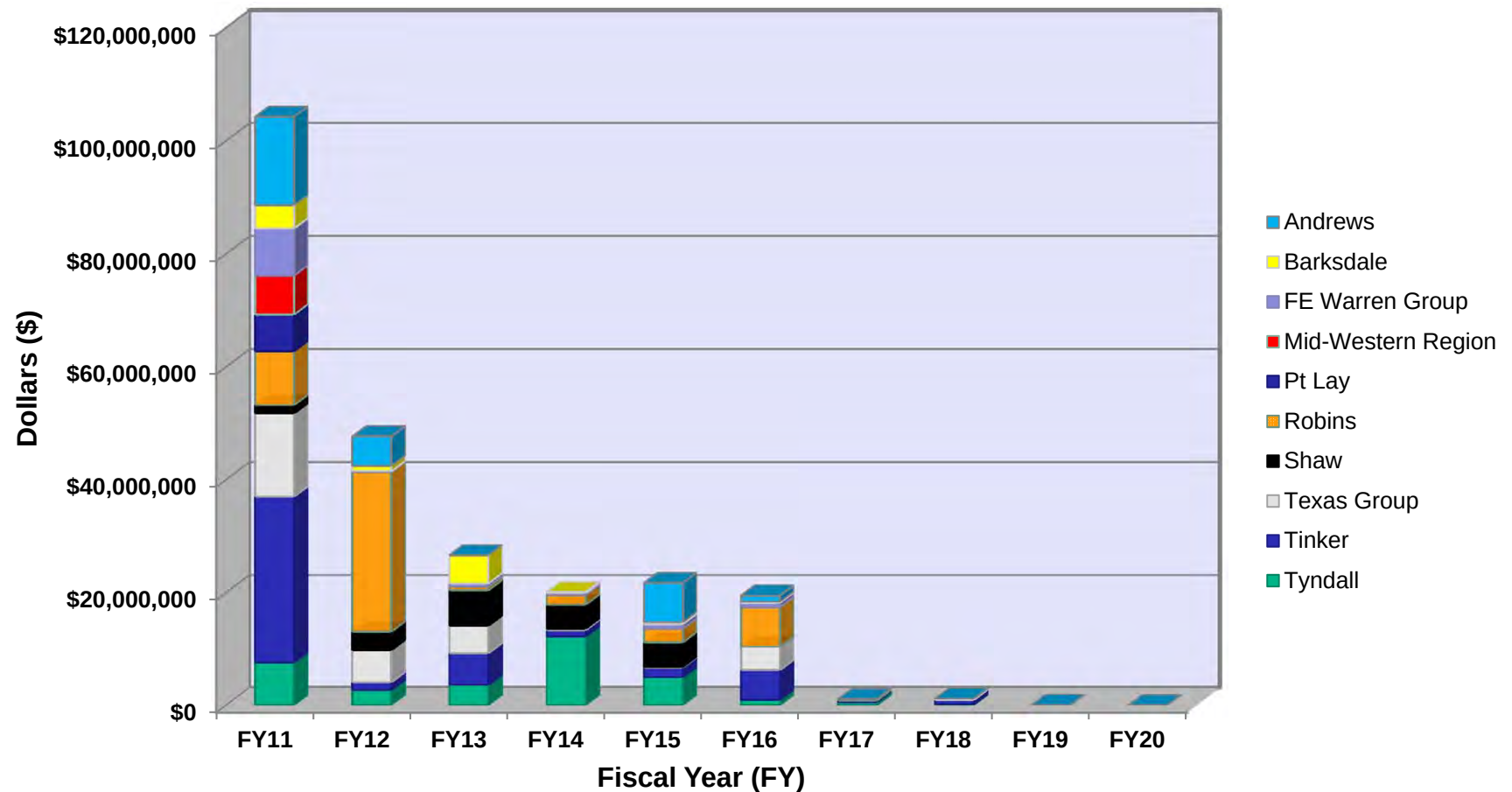
Fiscal Year	# of PBR Contracts	# of Bases	# of Sites	Value of PBRs	% Accelerated SCs	Savings within POP	Life Cycle Cost Reduction
FY11	10	22	408	\$242M	188% (from 66-190)	11.5% (\$31M)	19% (\$140M)
FY12	17	47	772	~\$384M			
FY13	14	27	977	~\$518M			
FY14/15	12	14	219	~\$270M			

Fence-to-Fence, Leveraging Competition & Best Practices to Reduce Cost



Funding Profile for FY11 PBRs

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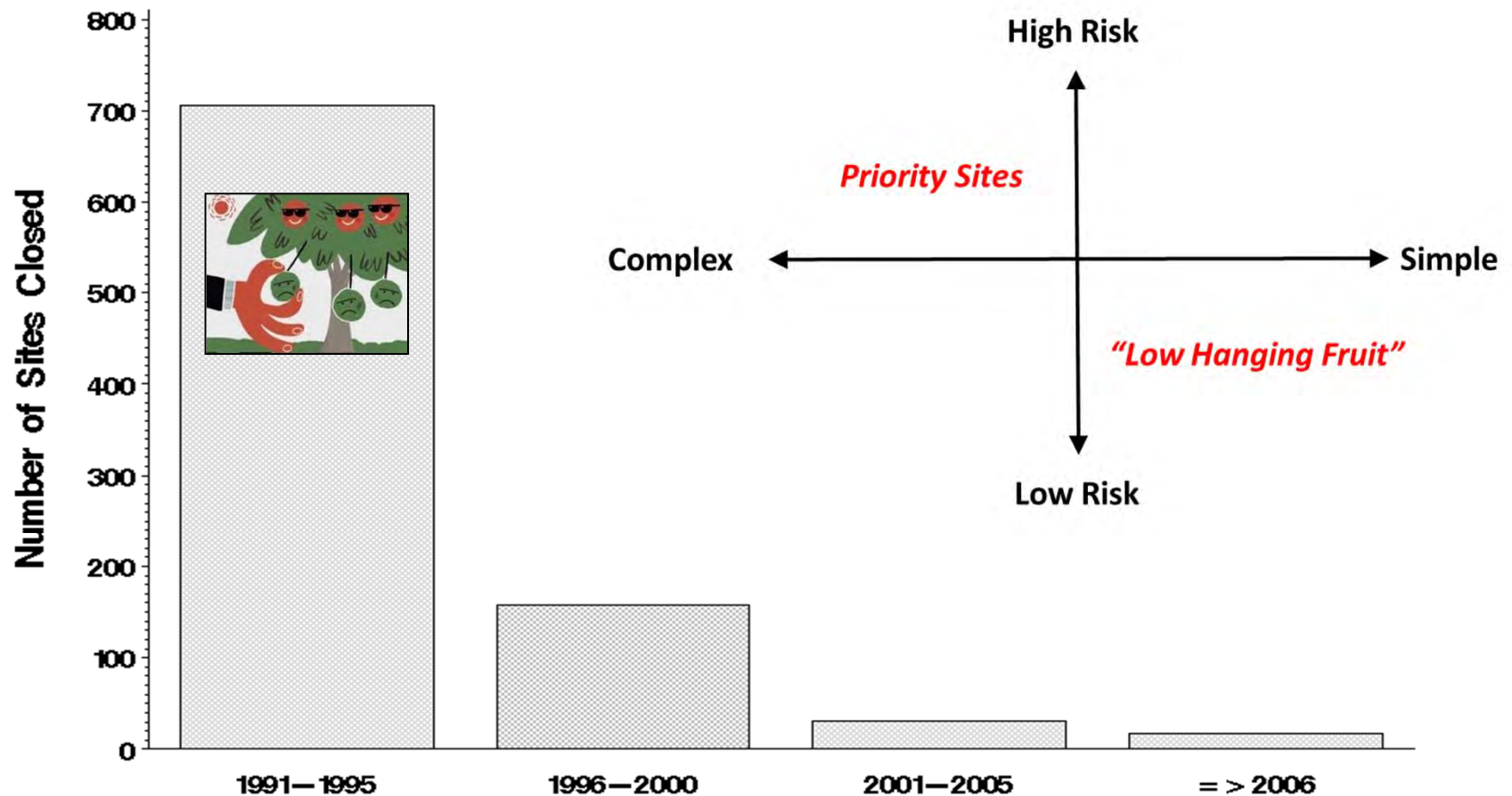
FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20
\$104,244,215	\$47,663,179	\$26,599,588	\$20,088,533	\$21,659,061	\$19,450,627	\$1,101,411	\$1,170,665	\$69,785	\$0

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Overall Objective: Closeout Sites



* Source: Enterprise Environmental, Safety & Occupational Health - Management Information System

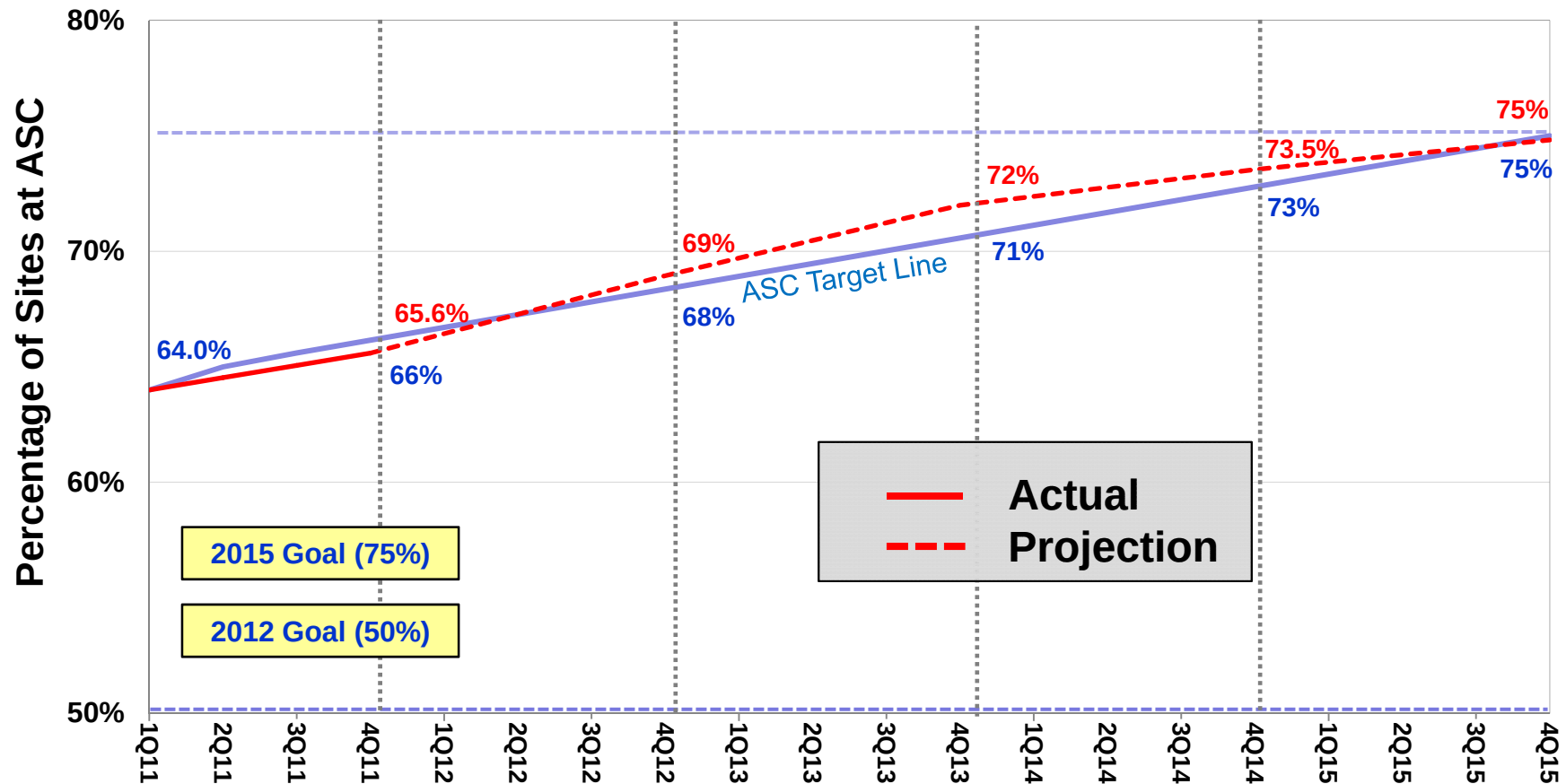
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Accelerated Site Completion: New Goal for IRP

Cumulative ASC Progress at End of Quarter



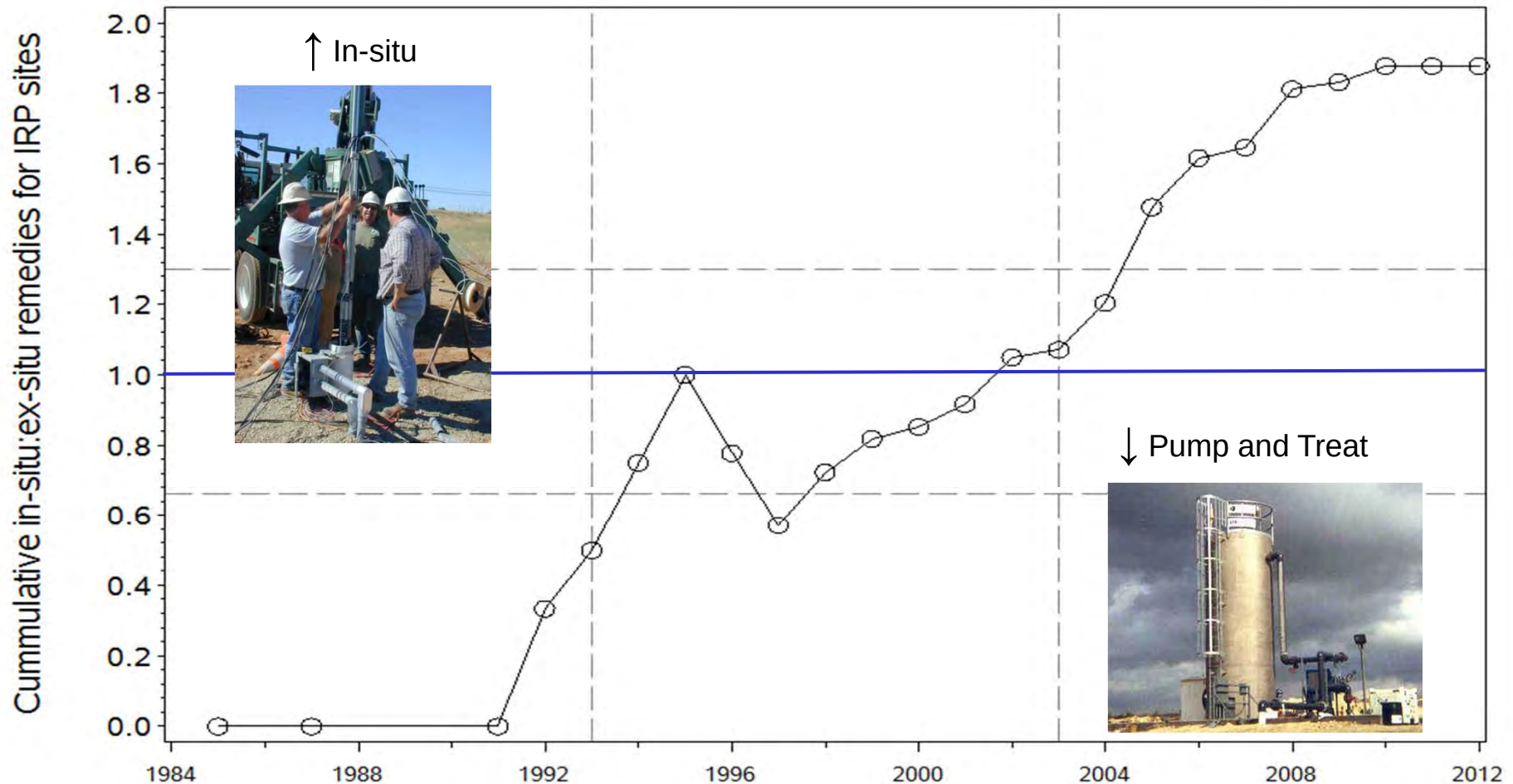
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Innovation: Necessity for Closing Remaining Sites

* Source: Environmental Decision Information Tracking Tool (EDITT)



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Challenges for Closing Remaining Sites

1. Budget
2. Ulterior Mandates
 - GSR
3. Regulatory Cooperation
4. Complex Sites “High Hanging Fruit”
 - DNAPL in Fractured Bedrock
5. Rate Limiting Environmental Processes
 - Mass Diffusion in Fine-Grain Aquifers
6. Emerging Regulatory Issues and Contaminants
 - Vapor Intrusion
 - PFCs and 1,4 Dioxane
 - Changing Regulatory Standards (e.g., ClO_4)





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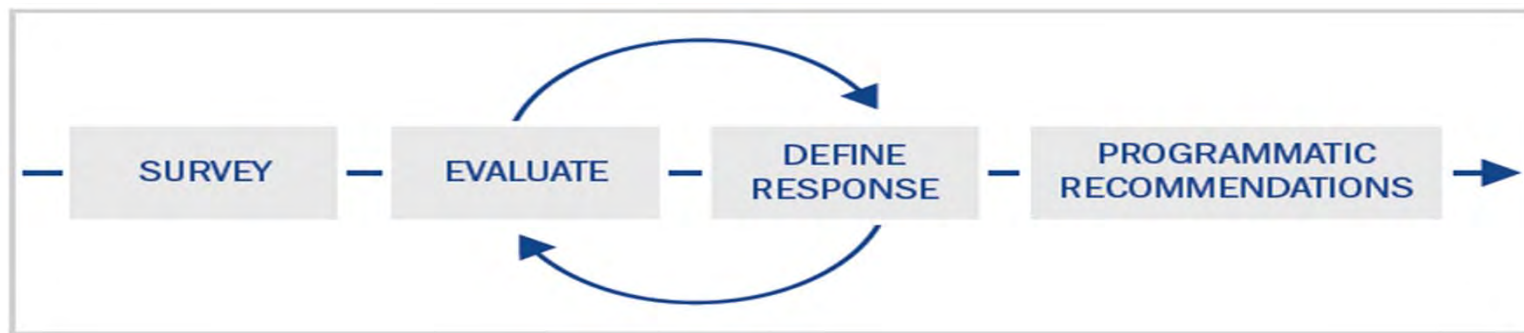
Emerging Contaminants

- Emerging Contaminants have the potential to impact cleanup schedules, increase cost, alter technical approaches
- ECs may not be commonly monitored
- Often undetectable with current analytical methods
- Represent “future” potential environmental liability
- DoD has Emerging Contaminants Program
 - Focuses on chemicals that may impact: Environment Safety & Health, Training and Readiness, Acquisition, O&M, Cleanup
- Air Force – Emerging Issues Program
 - Focuses on environmental contaminants that may impact AF Environmental Restoration and Compliance Programs
 - Mission is to identify and reduce future AF Environmental Liability



AF Emerging Issues and Contaminants Program

- Air Force Center for Engineering and the Environment, Emerging Issues Program
 - Proactive identification of “Emerging Issues”
 - Determines potential impact to the AF environmental programs (IRP and MMRP)
 - Involves a systematic, standardized, quantitative/data-driven process with stakeholder/customer engagement





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AF Emerging Issues and Contaminants Program

Emerging Issue/Contaminant	Reason Considered	Current Status
1,4-Dioxane	New/change in regulatory status	Undergoing evaluation; BAAs underway
Benzo-a-Pyrene	Change in regulatory standards	Evaluation in progress
Chlorinated Pesticides	Change in regulation (RCRA Hazardous Waste)	Initial stages of evaluation, assessing updating tox values
Hexavalent Chromium	Change in regulatory status	Evaluation in progress
Manganese	Change in science and regulatory interest (Mn in soil/inhalation)	Initial stages of evaluation
Naphthalene	Change in regulatory standards	On hold unless environmental issue emerges
PAH Mixtures	Change in science/methods	Evaluation in progress
Perchlorate	Lower regulatory standards	Continue to monitor
PFCs (PFOS/PFOA)	Regulatory interest, potential high impact to Air Force	Additional sampling and characterization underway

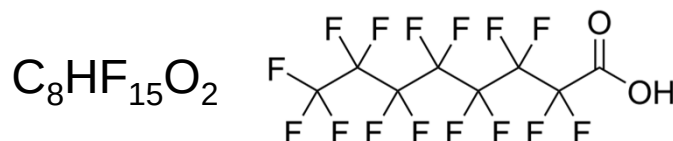
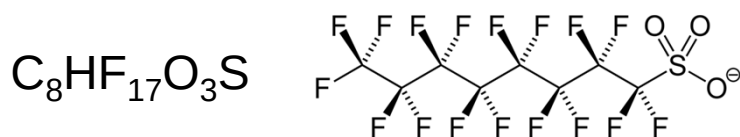
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Perflourinated Compounds

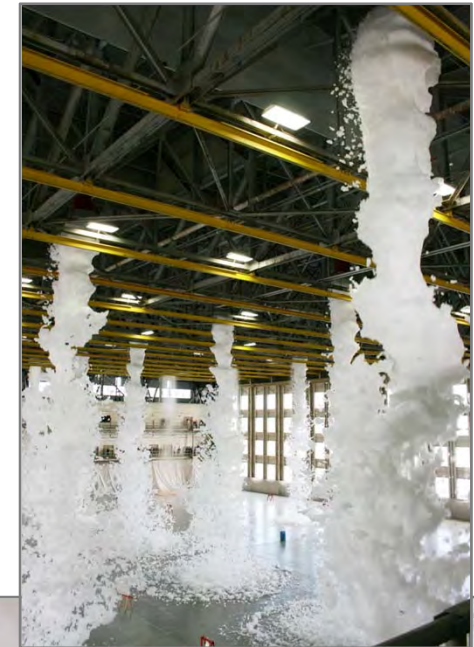
- General formula: $F(CF_2)_n-R$
 - Hydrophobic alkyl chain of varying length (typically C_4 to C_{16})
 - Hydrophilic end group
- Man-made compounds with unique chemical properties
 - Very stable and persistent in the environment
 - Ionic form of PFCs – highly soluble, non-volatile, and poorly sorbed
- Primary PFCs of interest
 - Perfluorooctane sulfonate (PFOS)
 - Perfluorooctanoic acid (PFOA)





AF EI/EC Program PFCs: Why Emerging?

- Growing Regulatory Interest
 - Not currently covered under CERCLA/RCRA or USEPA SDWA
 - Recently added to USEPA DW Contaminant Candidate List (CCL3)
 - USEPA Provisional Health Advisory values
- Aqueous Film Forming Foam (AFFF)
 - Developed in 1960s by 3M and USN for use on Class B fires (flammable liquids)
 - AF began using in early 1970's
 - 1970-late 1990's contained PFOS/PFOA
 - Current formulations contain $<C_6$ PFCs





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Potential Impacts to the AF IRP

DoD Fire/Crash/Training Sites

Service	Total Sites	Remedy in Place (RIP)		Response Complete (RC)	
		RIP $\leq$ 2008	RIP > 2009	RC $\leq$ 2008	RC > 2009
Air Force	353	296	47	249	104
Army	94	7	6	79	15
Navy	132	115	17	51	56
DLA	3	1	0	3	0
FUDS	12	0	1	7	5
Total	594	419	71	389	180

* Source: DoD Knowledge Based Corporate Reporting System, 2008

- Scope of potential problem can be estimated using the number of “Fire/Crash/Training” sites as a surrogate for actual site data
 - May underestimate problem by not including AFFF spills, pipeline leaks, or aircraft hangar fire suppression systems



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DoD Activities: PFCs

- PFOA/PFOS on the DoD Emerging Contaminant Watch List for continued surveillance of regulatory actions
- SERDP solicited proposals on “*In Situ Remediation of Perfluoroalkyl Contaminated Groundwater*”
 - Improved understanding of fate and transport mechanisms
 - Improved understanding of their behavior under typical remedial technologies for co-contaminants (e.g., petroleum hydrocarbons)
 - Develop innovative remedial strategies





AF EI/EC Response to PFCs: Fill Data Gap

- Preliminary assessment (where and how much?)
 - Sampling at AF installations; FTA's operational btwn 1970-2000
 - "Round Robin" analytical methods comparisons
- Cleanup Challenges and Environmental Fate and Transport
 - AFCEE Broad Agency Announcement
 - Additional site characterizations (nature and extent)
 - Field dem/val for alternative treatment approaches (biodegradation)





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1,4-Dioxane: Why Emerging

Reasons for Interest:

- US EPA is developing standards for 1,4-dioxane via oral and inhalation routes
- 1,4-Dioxane has not been consistently regulated in the past
- 1,4-Dioxane is environmentally persistent
- Remedial technologies for 1,4-dioxane are not well established
- Reliable analytical data given sensitive reporting limits and lower screening levels will be problematic

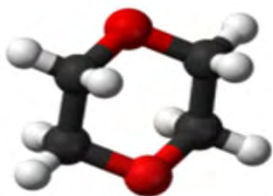
Data Gaps:

- Uncertain toxicity to humans at environmentally relevant levels
- Association of 1,4-dioxane with TCA and/or TCE GW plumes
- Fate and transport of 1,4-dioxane in the environment
- Remediation of 1,4-dioxane (Green & Sustainable Remediation [GSR])
- The full extent of 1,4-dioxane contamination across AF installations



AF EI/EC Response to 1,4-Dioxane: Fill Data Gap

- Preliminary assessment (background papers and fact sheets)
- State survey for current 1,4-dioxane regulations, and where new regulations may be pending
- Evaluating environmental monitoring data
- Funding dem/val projects through AFCEE BAA Program
 - In situ remediation
 - Molecular biomarkers of natural attenuation & bioremediation
- Strategically align with SERDP/ESTCP on FY13 SON





AF EI/EC Response to 1,4-Dioxane: Fill Data Gap

Anderson, et al. (In Review). Co-occurrence of 1,4-Dioxane with 1,1,1-Trichloroethane and Trichloroethylene in Chlorinated Solvent Groundwater Plumes at US Air Force Installations: Fact or Fiction. Integrated Environmental Assessment and Management.

Table 1. 1,4-Dioxane records by co-occurrence with TCE and TCA[†].

TCE	TCA	1,4 Dioxane	
		Non-Detect	≥RL
Non-Detect	Non-Detect	1543	49
	≥RL	36	2
≥RL	Non-Detect	3010	503
	≥RL	418	227

[†]Only monitoring wells that contained records for all three analytes were evaluated.

- 5,788 wells from 49 installations contained records for TCE, TCA, and 1,4-dioxane
- 1,4-dioxane was observed in 17.6% of the wells with records for TCE and/or TCA detections, which accounted for 93.7% of all 1,4-dioxane detections
- Median 1,4-dioxane levels were observed to increase between ~6% and ~20% of the increase in TCE levels

* Source: Environmental Restoration Program Information Management System (ERPIMS)



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Thank You Very Much

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