Management and Treatment of Complex Groundwater Contamination at DoD Installations

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Ms. Deborah Morefield
Office of the Deputy Under Secretary of Defense
(Installations & Environment)

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DoD Cleanup Program Scope

- The Defense Environmental Restoration Program (DERP) addresses the impacts of releases of hazardous substances, military munitions, and building demolition and debris removal
- Authorities: CERCLA, SARA, RCRA, and EO 12580
- DoD budgets over $2 billion annually
- There are 34,058 DERP sites at:
  - 1,729 Active installations
  - 234 BRAC installations
  - 2,691 FUDS properties
- Program supports military readiness by protecting human health and the environment, and access to critical resources vital to mission training and operations
  - In 50 states, District of Columbia and U.S. Territories

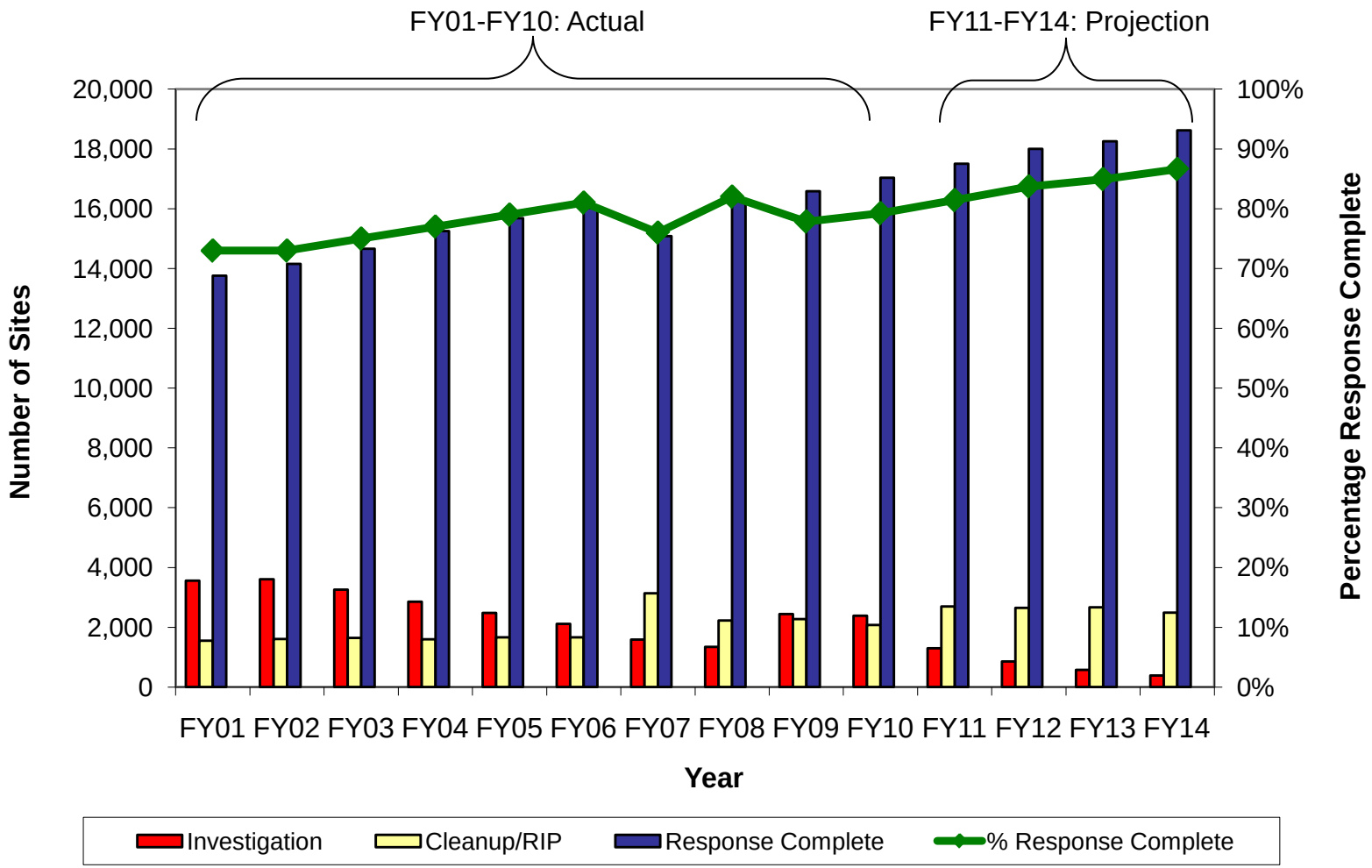
DERP Goals

- Select and implement remedies at all sites to be protective of human health and the environment and reduce risk
- DERP uses a prioritization system to address highest risk sites first
- Make well informed, intelligent, responsible remedy decisions:
  - Ensure adequate site characterization data is obtained
  - Consider current and reasonably anticipated land use
  - Evaluate risk scenarios and appropriate response actions to be protective
  - Consider time and points of compliance when selecting remedies
  - Consider regulatory and stakeholder concerns
  - Consider green and sustainable remediation scenarios
  - Implement fiscally responsible remedial solutions

Performance Goals

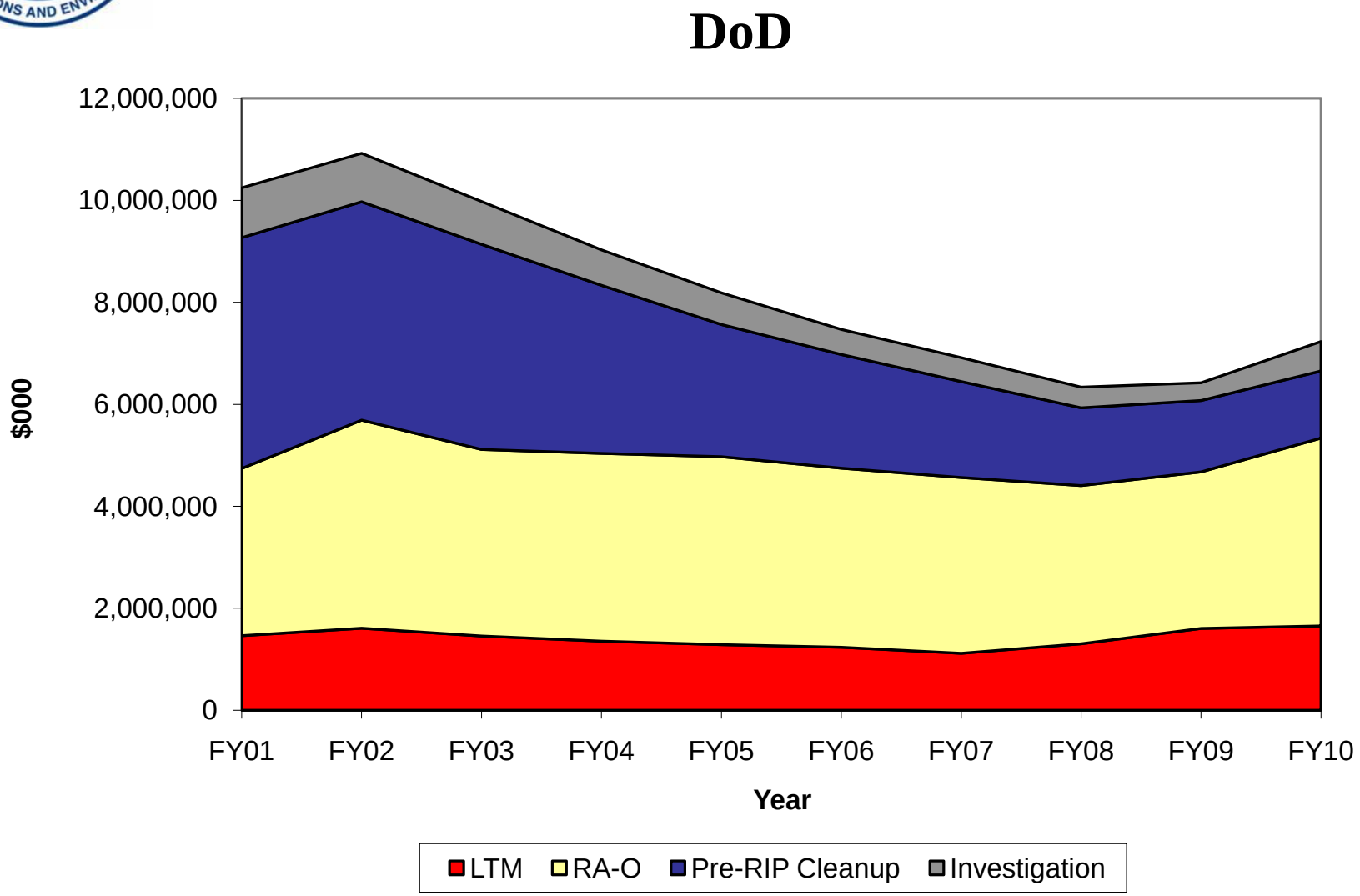
Goal: Achieve RIP/RC at Army, Navy, Air Force, and DLA sites by FY2014

DoD Response Complete



Restoration: Active Installations
Historic IRP Cost-to-Complete Estimates*

Acquisition, Technology and Logistics



* Includes installation project funding allocated to individual sites and does not include program management and other support costs.

Problematic GW Sites

- Technical Issues
  - Large (expansive) plumes with low concentrations
  - High concentration source areas where even very aggressive treatment has little effect on mass flux, site risk, or timeframe for remediation
  - Source term desorbing from low permeability layers at low concentrations for long periods
  - Karst/Fractured rock sites
- Regulatory Issues
  - MNA Perception is No Action
  - TI Waiver Inconsistencies across Regions and States
  - ARAR (i.e., MCL) applied at Remedial Investigation phase without site-specific risk assessment; can result in an unattainable goal where risk reduction plateaus.

Thoughts for Better Decision Making

- When practical, use treatment trains/adaptive site management
  - Reduce source terms
  - Mitigate plume migration
  - Transition from aggressive active treatment to more passive alternatives based on technology capabilities
  - MNA is a viable remedy option in some cases, particularly in latter stage
  - Monitor and maintain LUCs to prevent risk pathway
  - More discussion upfront on cleanup goals and long-term objectives
- Consider cost/benefit trade-off
  - Green and Sustainable Remediation Strategies
  - Is benefit defined as mass removal or reduced risk or beneficial reuse?
  - Which benefit should be the driver and when?
  - How should benefits be evaluated, quantified, and ranked?
- When is plume treatment not feasible? Should wellhead treatment be considered more often to balance resource requirements while ensuring safe drinking water?

Regulatory Initiatives Recognizing Technical Limitations

- EPA Guidance on TI Waivers (1993) for Superfund sites – new guidance pending (2010)
- ITRC initiatives on site management issues
- State designations regarding beneficial uses of groundwater
- Containment Zone policy in California
- Numerous state initiatives to address “low risk” sites (e.g., Region 2, CA-RWQCB)

Groundwater Contamination Issues Discussed in Several National Reports

- EPA, 2004, DNAPL Remediation: Selected Projects Approaching Regulatory Closure
- EPA, 2003, The DNAPL Remediation Challenge: Is There a Case for Source Depletion
- Environment Agency (England), 2003, Illustrated Handbook of DNAPL Transport and Fate in the Subsurface
- ITRC, 2002, DNAPL Source Reduction: Facing the Challenge
- ESTCP (Project ER-0832) - Alternative Endpoints and Strategies Selected for the Remediation of Contaminated Groundwater

Select DoD Groundwater Projects at ESTCP - SERDP

- Quantifying Life-Cycle Environmental Footprints of Soil and Groundwater Remedies for Green and Sustainable Remediation – January 2011 (ER-201127)
- Screening Tool for High-Resolution, Real-Time Mapping of Chlorinated Solvent DNAPL Architecture – January 2011
- Alternative Endpoints and Strategies Selected for the Remediation of Contaminated Groundwater – Dr. Rula Deeb
- Improved Understanding of Sources of Variability in Groundwater Sampling for Long-Term Monitoring Programs - Dr. Chuck Newell
- Novel Sensor for Real-Time Characterization and Monitoring of Chlorinated Hydrocarbons in Groundwater (ER-1605)

Source: www.serdp.org

National Academies of Science National Research Council Study

- Future Options for Management in the Nation's Subsurface Remediation Effort
  - Ongoing project: September 2009 – December 2011
- Objective: To improve hazardous waste management at problematic sites where the presence of recalcitrant and/or poorly accessible contaminants is preventing site closure.
  - Size of the Problem
  - Current Capabilities
  - Correlating Source Removal with Risks
  - Future of Treatment Technologies
  - Better Decision Making

Remaining Afternoon GW Sessions

- Overview of ITRC Studies related to complex groundwater sites and DNAPL – Anna Willett (ITRC)
- Groundwater Plume Behaviors: Matrix Diffusion and Mass Discharge – Dr. Chuck Newell (GSI Environmental)
- Alternative Endpoints as Treatment Objectives – Dr. Rula Deeb (ARCADIS / Malcolm Pirnie)
- Importance of Hydrogeologic Characterization to treatment design – Ms. Claire Tiedeman (USGS)
- Development and Documentation of Exit Strategies leading to Site Closure / Response Complete – Joann Socash (Booz Allen Hamilton)

Questions?

Ms. Deborah Morefield
Office of the Deputy Under Secretary of Defense
(Installations & Environment)
703-571-9067
Deborah.Morefield@osd.mil

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