

Investment Strategy in SERDP and ESTCP

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DoD's Environmental Technology Programs



Demonstration/Validation

Basic and Applied Research



Improving Mission Readiness Through
Environmental Research



Environmental Drivers: Sustainability of Ranges and Range Operations



Maritime Sustainability

Threatened and Endangered Species



Toxic Air Emissions and Dust

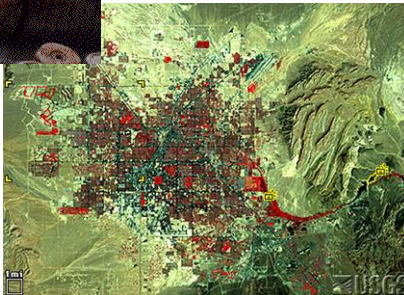


Unexploded Ordnance



Urban Growth & Encroachment

Noise NOX and PM



Environmental Drivers: Reduction of Current and Future Liability

Current Liabilities



Contamination from Past Practices

- Chlorinated Solvents
- UXO
- Emerging Contaminants (Perchlorate)



Improving Mission Readiness Through
Environmental Research

Future Liabilities

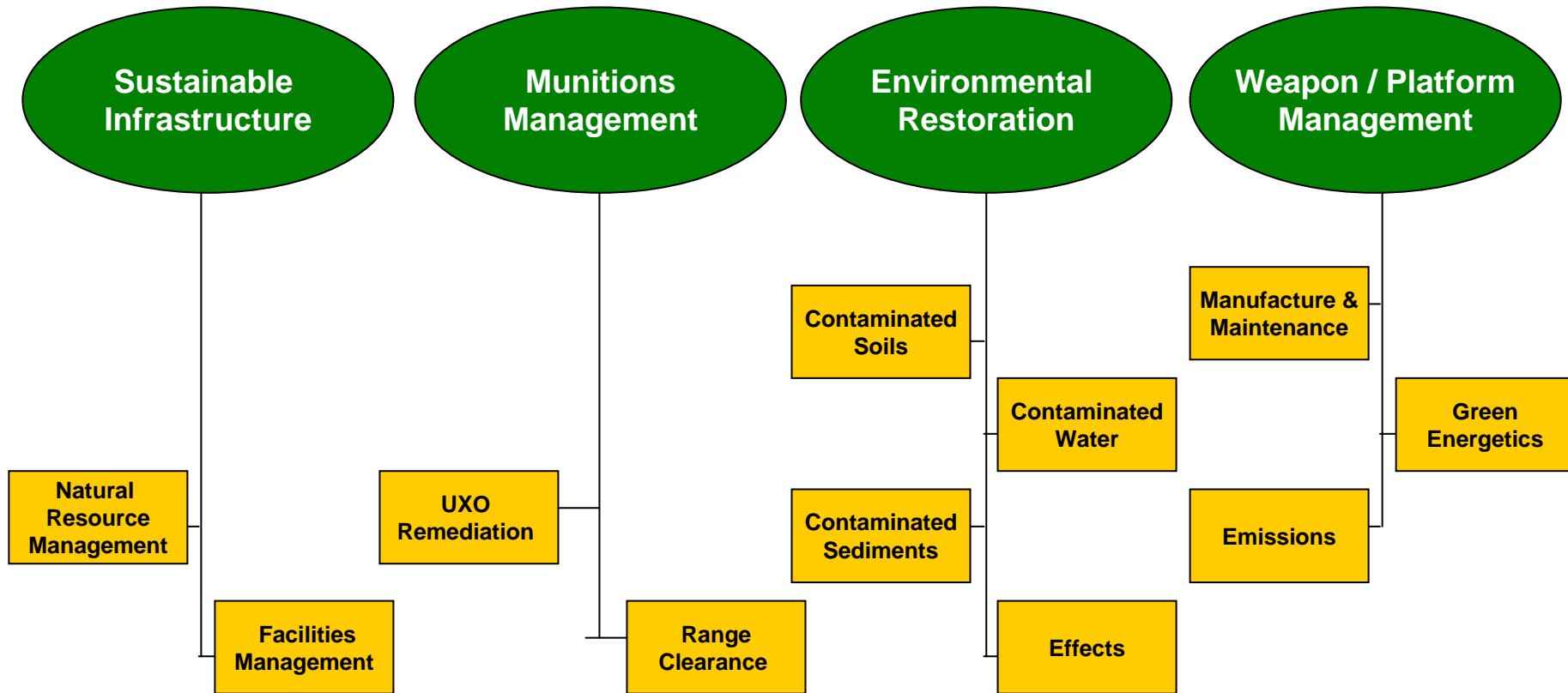


Control Life Cycle Costs

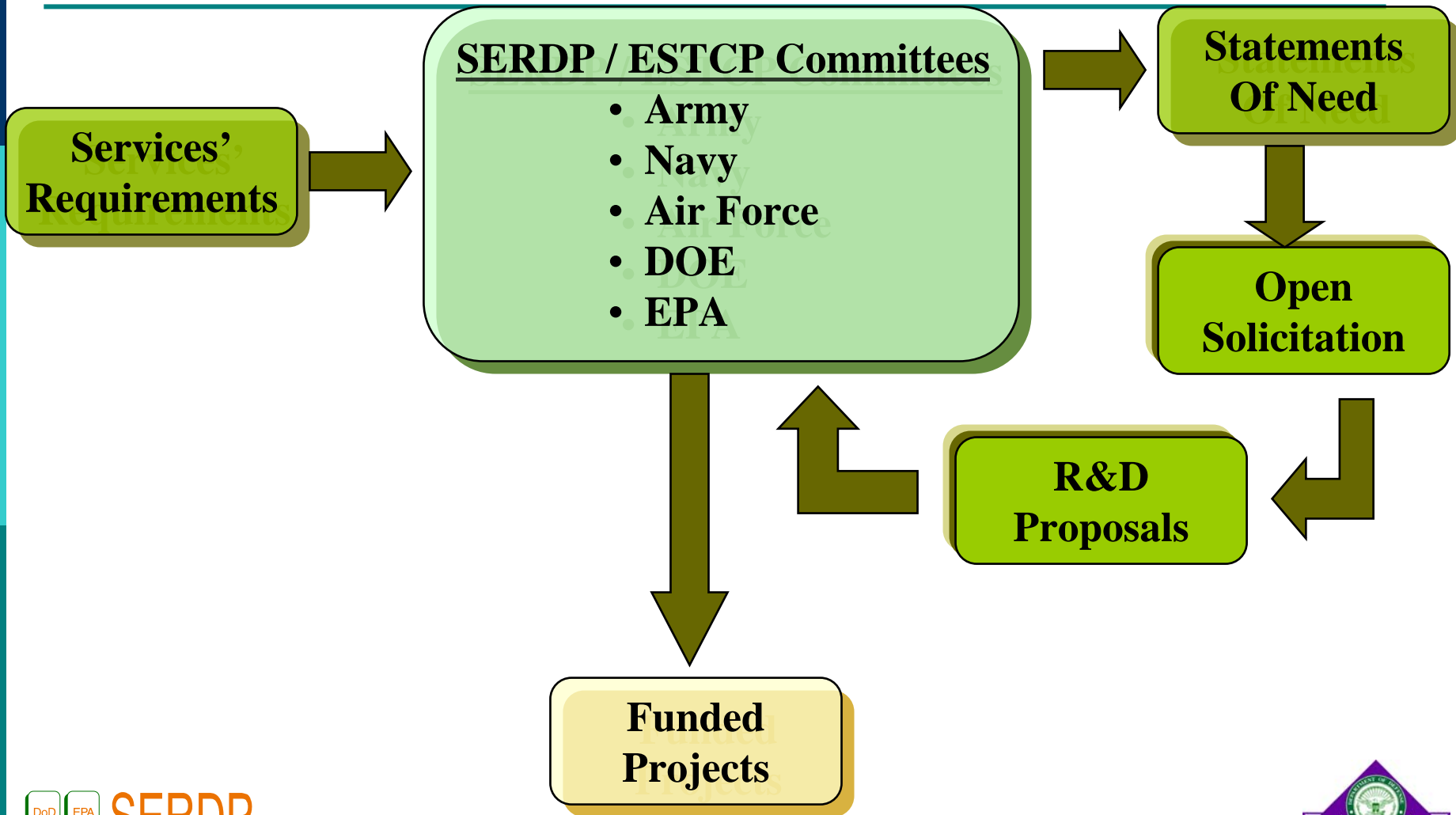
- Elimination of Hazardous Materials
- Achieve Compliance Through
Pollution Prevention



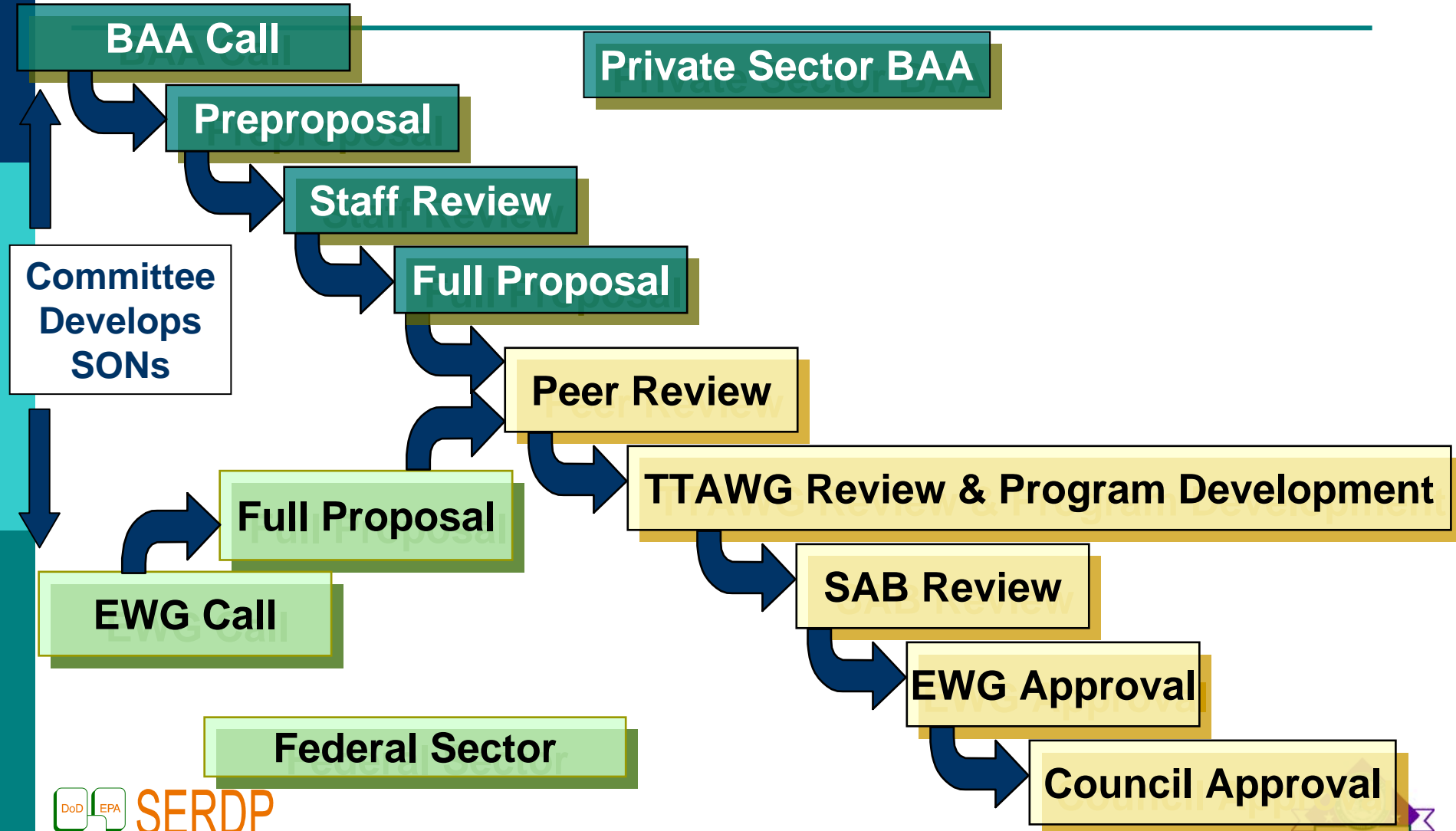
SERDP and ESTCP Pillars



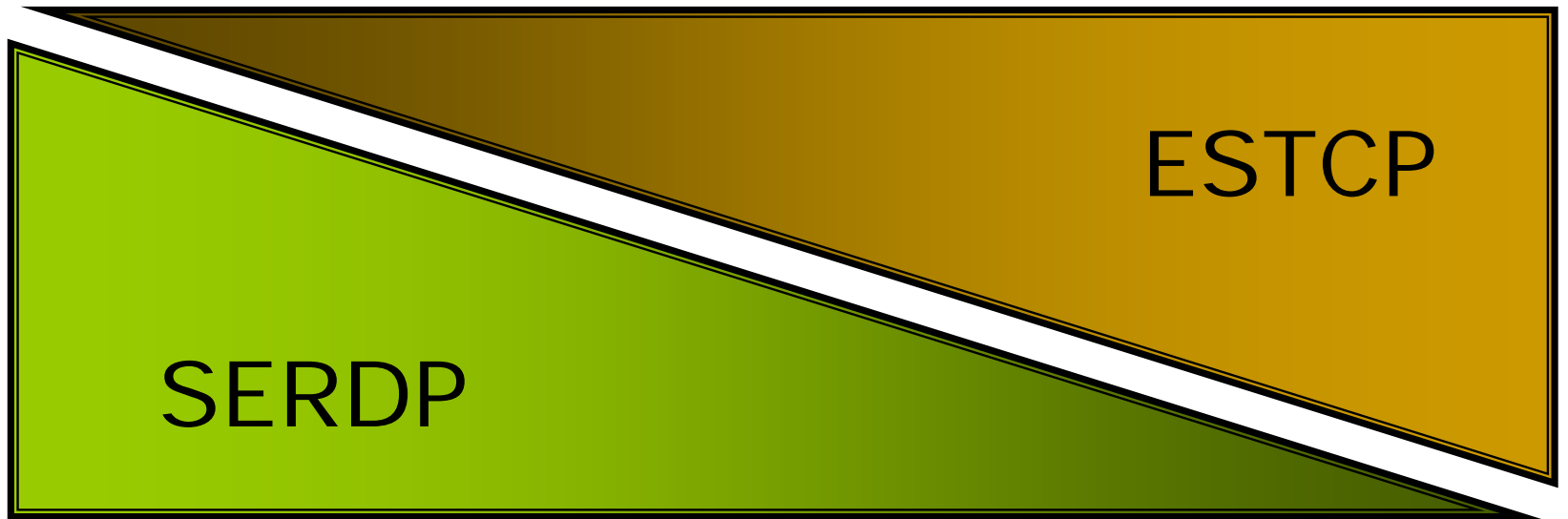
Service Coordination Process



SERDP Solicitation Process



Scales of Research



Small rxn vessels

Tanks, large reactors

Field sites

Columns, microcosms

Test cells, controlled field sites

Environmental Restoration Research Focus Areas

- Chlorinated Solvents
 - Dissolved Phase
 - DNAPL Source Zones
- Munitions Constituents
 - Perchlorate
 - Energetics
 - Heavy Metals
- Sediments
- Risk Assessment
- Site Characterization and Monitoring
- Performance Assessment & Optimization

Chlorinated Solvents Research

Well-Established Technologies

Dissolved Phase Technologies

Permeable Reactive Barriers

Air Sparging

Biostimulation

Monitored Natural Attenuation

Bioaugmentation

Bioaugmentation Assessment

More Data Gaps

DNAPL Source Zone Technologies

DNAPL Source Zone Initiative

Biostimulation

In Situ Chemical Oxidation Initiative

Thermal Treatment Initiative

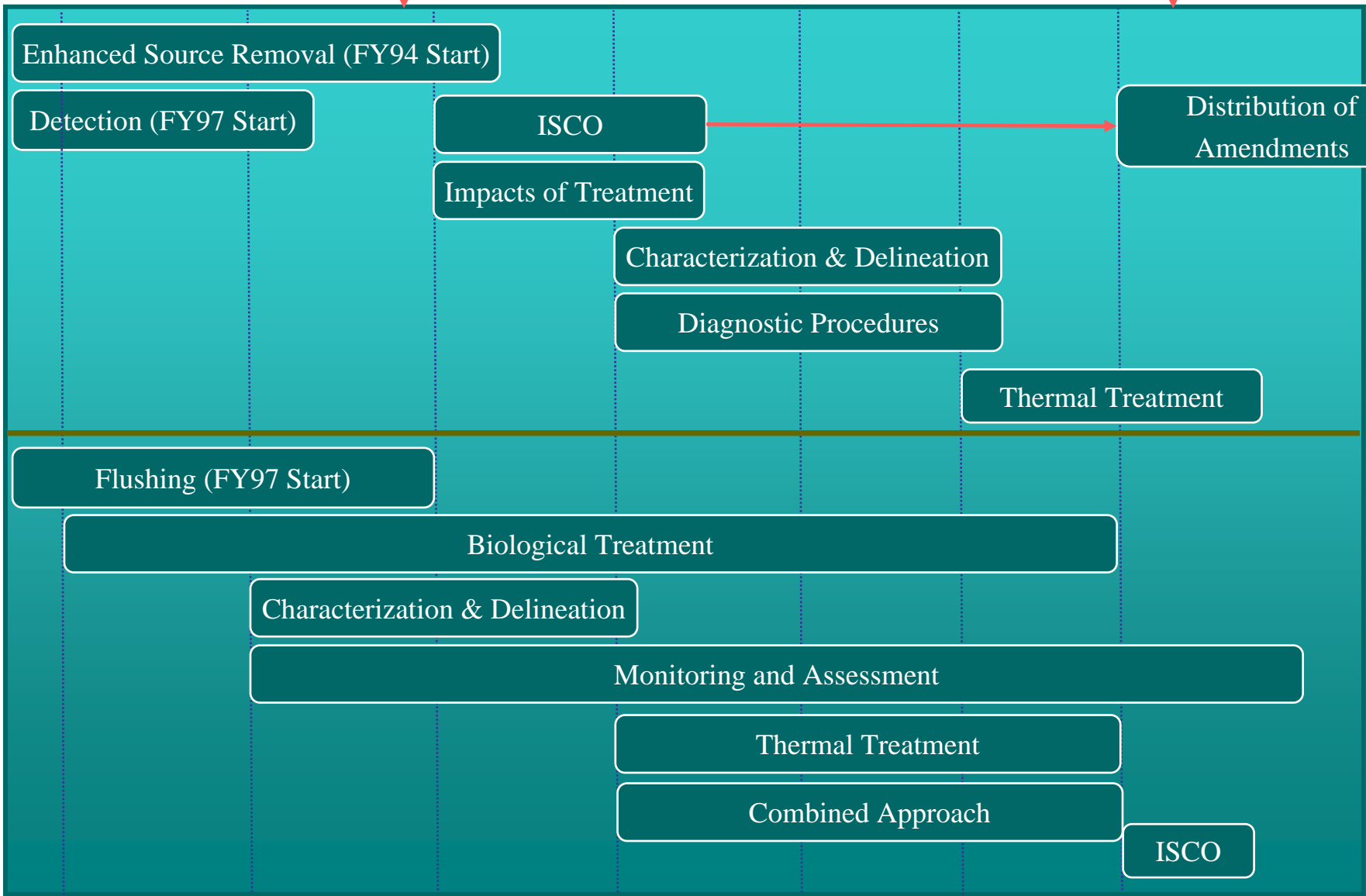
DNAPL Source Zone Research

Chlorinated Solvents Workshop

DNAPL Workshop

S&T

Dem/Val



FY00 FY01 FY02 FY03 FY04 FY05 FY06

DNAPL Source Zone Technologies

- ❑ In Situ Chemical Oxidation Initiative
 - Mode of action of oxidants on free phase & residual DNAPLs
 - Stability & reactivity of oxidants in an aquifer matrix with varying soil conditions
 - Impact of varying soil parameters on oxidant fate & overall destruction efficiency
- ❑ Thermal Treatment Initiative
 - Mechanisms of removal & destruction of free phase & residual DNAPLS
 - Impact of varying subsurface conditions on overall removal & destruction efficiency during thermal treatment.
 - Identification of the limitations associated with thermal treatment
 - Development of improved application & monitoring methodologies

SERDP/ESTCP DNAPL Workshop

- ❑ March 7-8. 2006 in Baltimore
- ❑ The workshop goal was to identify future research needed to provide useful guidance on:
 - Whether, and under what circumstances, source zone remediation should be attempted;
 - What objectives are reasonable for DNAPL source zone remediation at specific sites
 - How progress towards achieving those objectives should be measured
 - The ultimate goal of the workshop was to define a path forward to reducing this uncertainty.

SERDP/ESTCP DNAPL Workshop

- ❑ Two day meeting with ~60 attendees
- ❑ Overarching Issues
 - Integration of decision making processes for characterization and remediation, iterative process of updating the site conceptual model
 - Improved understanding of source function in relation to plume
 - More cost-effective use of characterization, remediation, and monitoring methods, need baseline on current costs
 - Realistic expectations for remedial timeframes and timing of transition from one approach/stage to another
 - Technology transfer

SERDP/ESTCP MBT Workshop

- August 9-10, 2006 Charlottesville VA
- Objectives
 - Examine the current state of the science and technology of molecular biological tools that are applicable to the cleanup of hazardous waste in the field
 - Assess the current operational usage of such tools and identify technical and other barriers to their use
 - Identify promising areas of research and development that have the potential to lead to improved cost-effective tools to support remedial design and decisions
 - Identify the most promising areas that are ready for and could benefit from rigorous field-scale demonstrations.

SERDP/ESTCP MBT Workshop

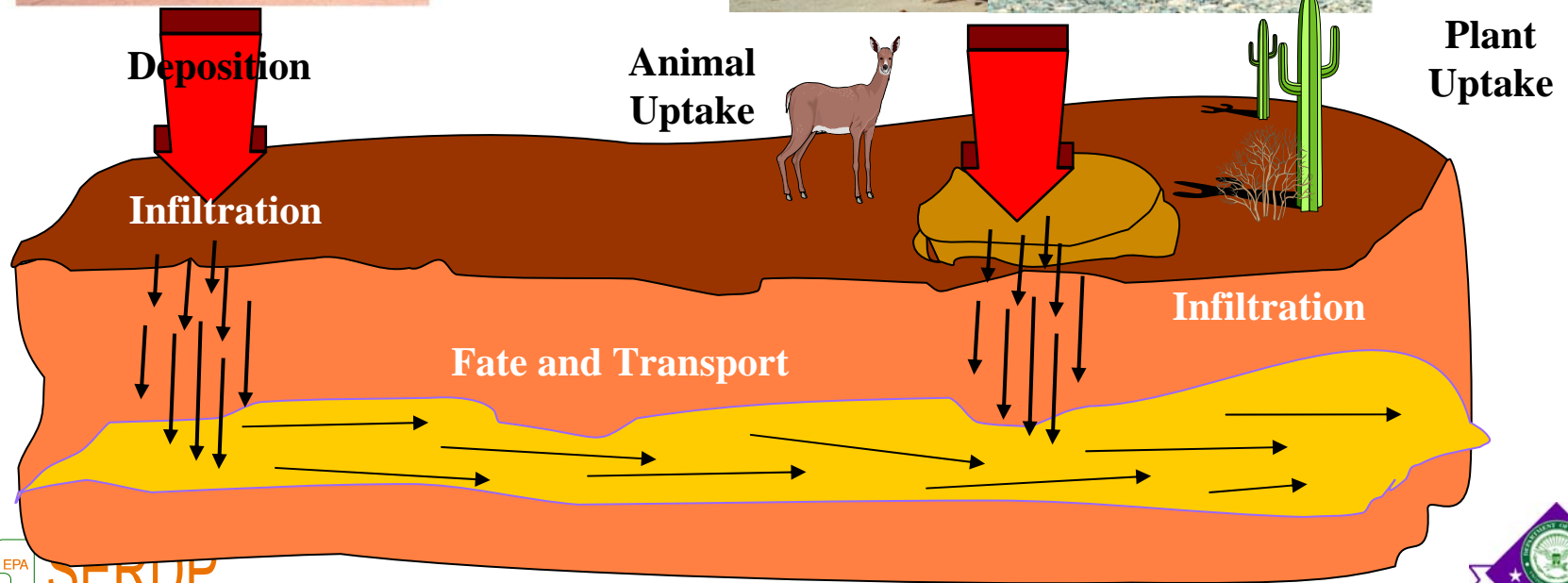
- ▣ Two day meeting with ~60 attendees
- ▣ Overarching Issues
 - Sampling needs
 - Identify additional biomarkers
 - Understanding of key microbial interactions
 - Standardization and validation of methods
 - Integrated field demonstration
- ▣ Summary report on SERDP and ESTCP web sites

Munitions Constituents

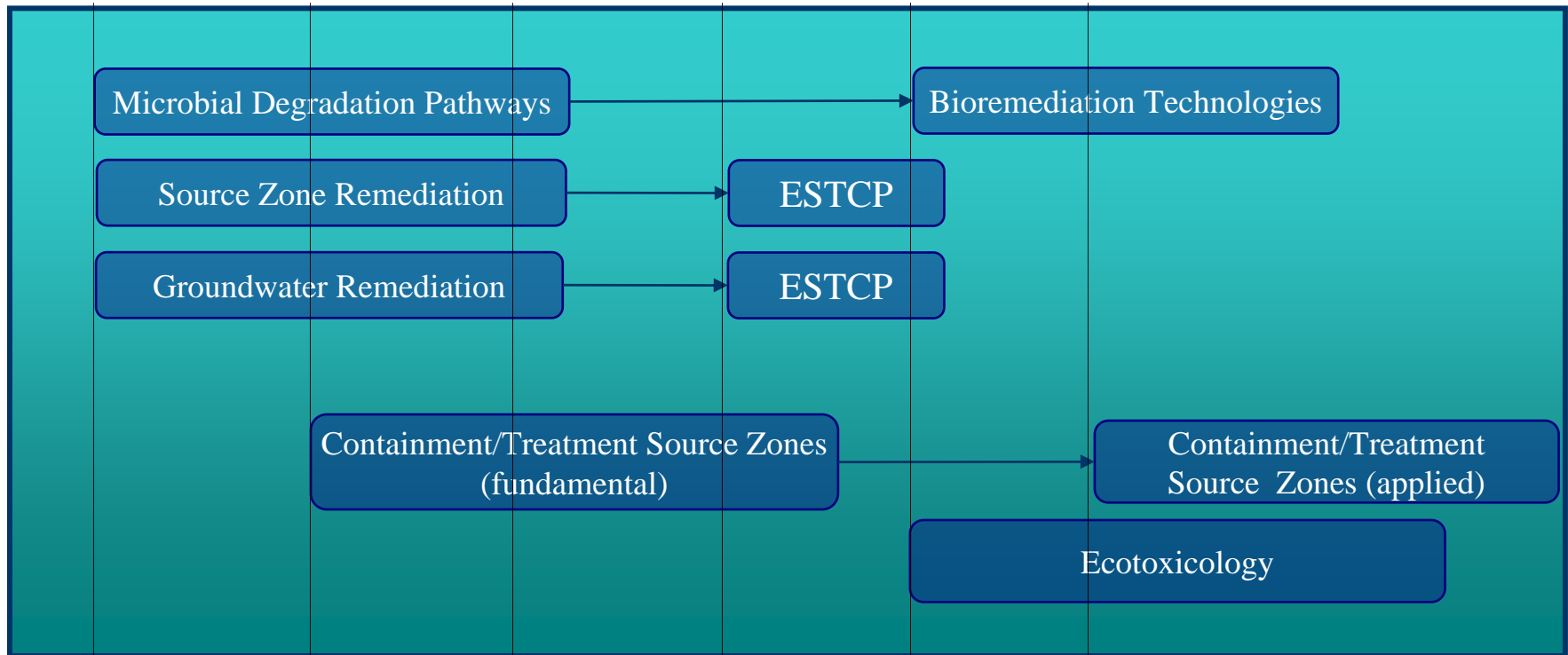
Firing Point



Impact Area



Energetics Remediation Research in SERDP/ESTCP



FY01

FY02

FY03

FY04

FY05

FY06



Improving Mission Readiness Through Environmental Research



Perchlorate Issue

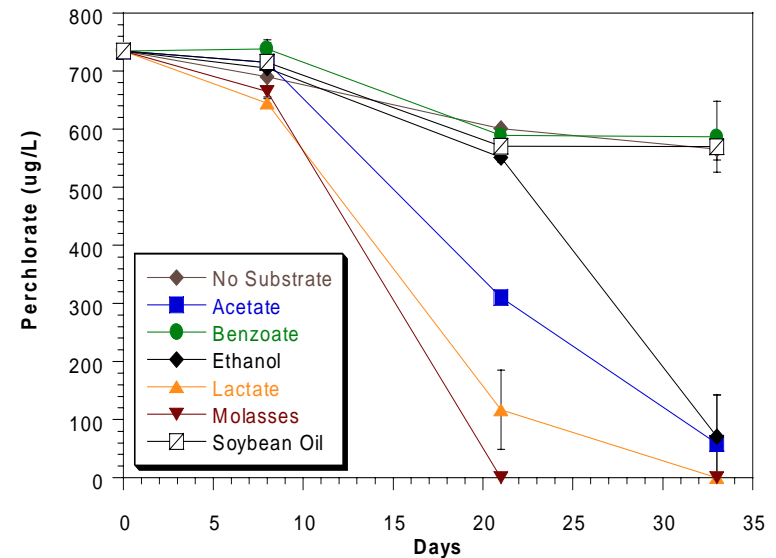
- ❑ Broad DoD Use
 - Rocket propellant
 - Insensitive munitions
 - Pyrotechnics and flares
- ❑ Drinking Water Issue
 - Political & emotional
 - Huge potential liability
 - Readiness impact
- ❑ RDT&E Focus Areas
 - Treatment
 - Sources
 - Alternatives
 - Eco-toxicology



In Situ Treatment

- ❑ SERDP initiated bioremediation R&D in 1998
 - Fundamental and applied studies
 - Showed potential and method for cost effective treatment
 - Investment Completed
- ❑ Dozens of Field Demonstrations Ongoing Across DoD
- ❑ \$6 M ESTCP program
- ❑ Impacting all Services
- ❑ Regulatory acceptance
- ❑ Fully commercialized

Influence of Different Electron Donors on Perchlorate Biodegradation in Aquifer Microcosms from Site 16



Microbial Biodegradation of Perchlorate

Ex Situ Treatment

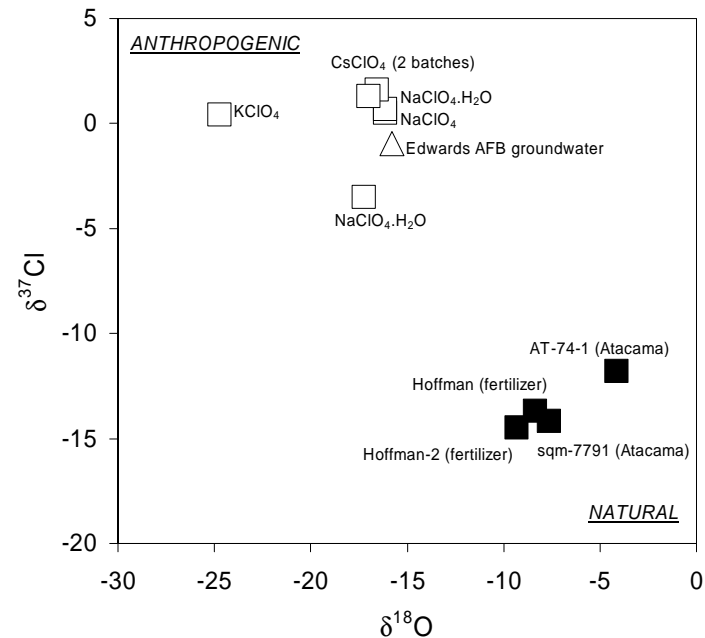
- ❑ 1998 drinking water treatment R&D was initiated by an industry consortium (AWWARF)
 - Completed in 2004
- ❑ Successful ESTCP waste water bio-treatment transitioned in 2000
- ❑ Only ion-exchange currently used for drinking water
- ❑ FY2005 initiatives
 - ESTCP Congressional program to dem/val new approaches
 - SERDP develop program for next generation treatment



Ex-Situ Bio-Reactor

Sources

- DoD Sources
 - Manufacturing
 - Demilitarization
 - Test and Training Ranges
- Natural Sources (FY05 Start)
 - Cause
 - Distribution
 - Fate
 - Identification
- Non Military Sources (FY05 Start)
 - Magnitude
 - Extent
 - Identification



Isotopic Identification of
Perchlorate Sources

Heavy Metals Research

- ❑ Initial research focus on small arms lead
 - Several ESTCP demonstrations on lead removal from soil
- ❑ Bioavailability of heavy metals an issue of concern
 - Investigated under SERDP in FY00 SON and follow-on FY03 SON
- ❑ SERDP FY04 SON to investigate remediation of heavy metals in groundwater
 - Three projects selected

Sediments Research

- August 2004: Needs analysis workshop on sediments
- FY06 SONs:
 - Development of new tools for assessing processes that impact fate and transport of contaminants in sediments
 - Development of emplacement techniques for sediment caps and amendments to enhance remediation and/or sequestration of contaminants in sediments
- FY07: Ecosystem Impact Assessment

SERDP FY06 SONs

- ❑ Improved Understanding of the Distribution & Impacts of Subsurface Remedial Amendments in Groundwater
- ❑ Development & Placement of Amendments for In Situ Remediation of Contaminated Sediments
- ❑ Assessment & Measurement of Processes Impacting Fate & Transport of Contaminants in Sediments
- ❑ Containment/Treatment of Energetic & Propellant Material Releases on Testing & Training Ranges

SERDP FY07 SONs

- ❑ Ecosystem Risk & Recovery Assessment for Contaminated Sediments
- ❑ Improved Understanding of Remediation Performance in Fractured Geological Settings
- ❑ Identification of Biomarkers to Assess Groundwater Contaminant Degradative Potential of a Microbial Population
- ❑ Investigation of *cis*-DCE & Vinyl Chloride Degradation Mechanisms & Environmental Relevance
- ❑ Improved Sampling Techniques for Efficient Use of Molecular Biological Tools to Assess Groundwater Remediation

Future Research Direction

- ❑ Chlorinated Solvents: Key R&D Needs
 - Emphasize DNAPL source zone treatment
 - Evaluate true cost & performance
 - Improved performance assessment tools
 - Improved measurements of source mass & mass flux
 - Focus on existing technologies
- ❑ Sustainable Ranges: Munitions Constituents
 - Fate & Effects
 - ❑ Degradation of Energetics in the Environment
 - ❑ Ecotoxicity of Energetics
- ❑ Sustainable Ranges: Munitions Constituents (cont'd)
 - Characterization and Remediation
 - ❑ Rapid Detection of/Screening for Energetics
 - ❑ In-Situ Remediation of Energetics
 - ❑ Sequestration/Containment of Energetics
 - ❑ Decontamination of Range Scrap
- ❑ Emerging Contaminants
- ❑ Sediments
 - In situ technologies

Web Resources

- ❑ Project fact sheets: <http://www.estcp.org/projects/cleanup/>
- ❑ Cost & performance reports:
<http://www.estcp.org/documents/techdocs/index.cfm>
- ❑ Technology assessments:
<http://www.estcp.org/documents/techdocs/index.cfm>
- ❑ Protocols:
<http://www.estcp.org/documents/techdocs/index.cfm>
- ❑ Quarterly Information Bulletin
 - Email notifications of upcoming solicitations and Symposium
 - <http://www.estcp.org/subscribe/index.cfm>
 - http://www.serdp.org/subscribe/form_subscribe.cfm

Home Pages

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