Active Management of Superfund Remedies

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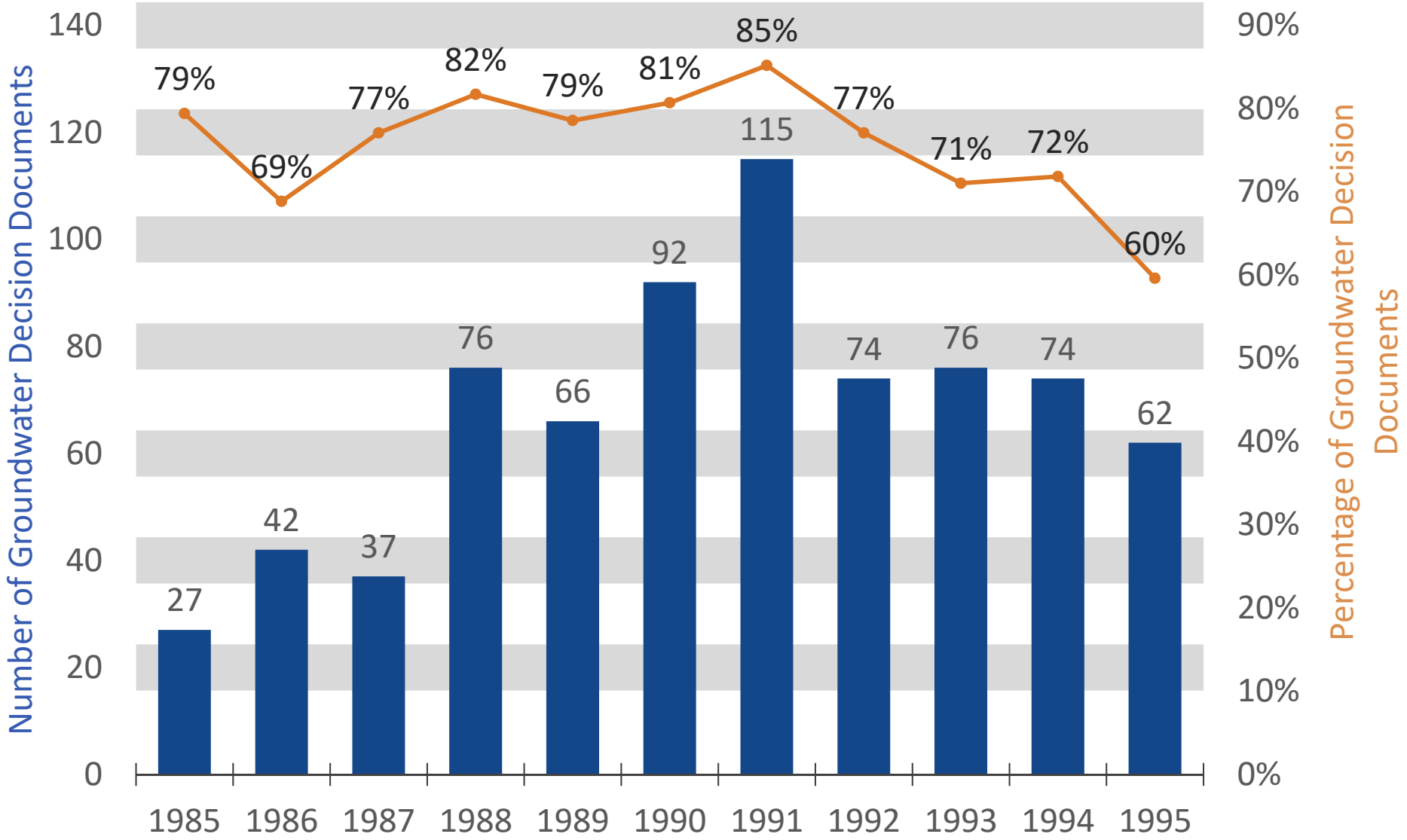
Kirby Biggs, Linda Fiedler. Ed Gilbert, Matt Jefferson,
Carlos Pachon (USEPA, Superfund)

EPA United States Environmental Protection Agency

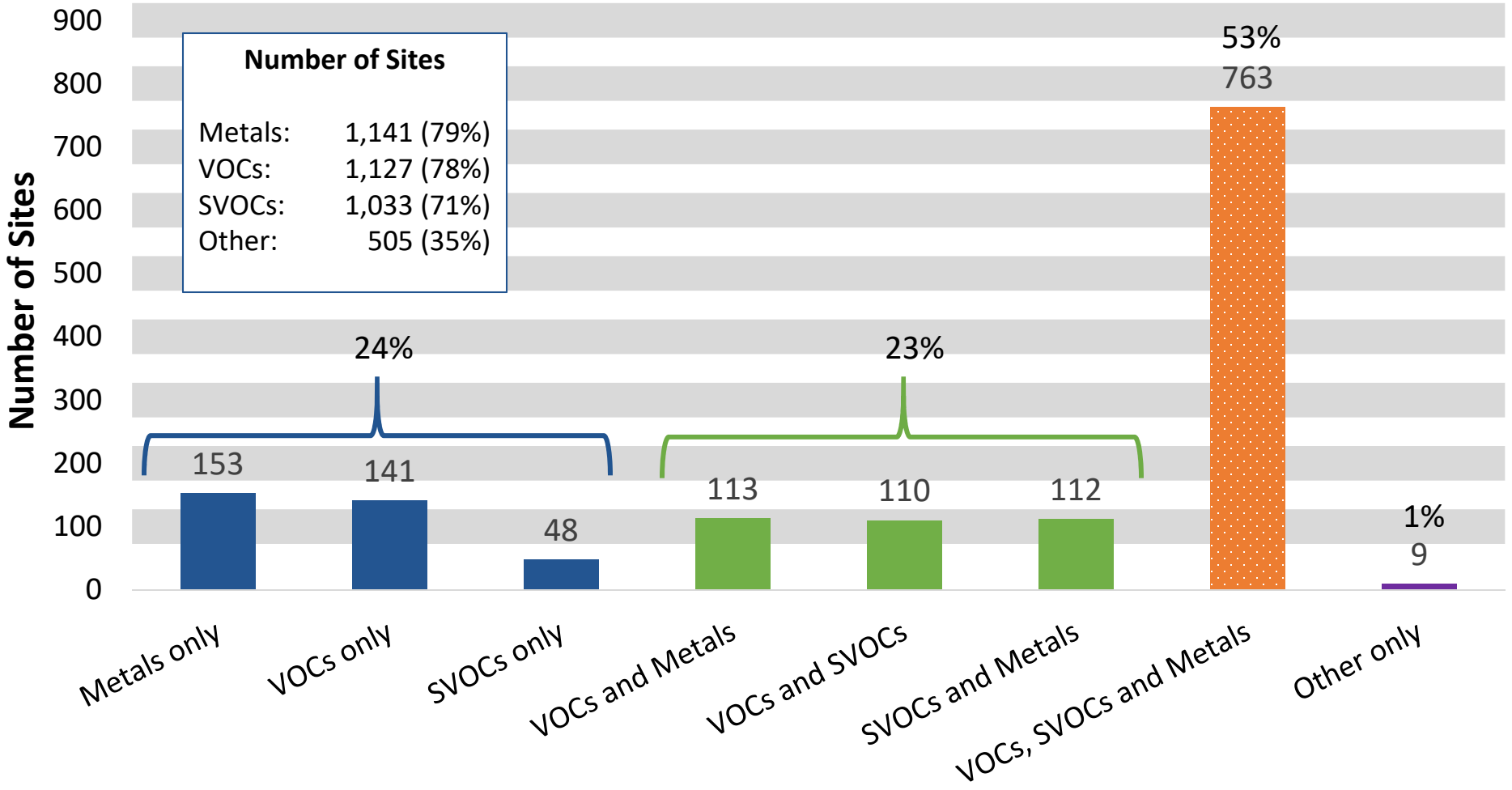
Briefing Outline

- Genesis of Superfund's optimization effort
- Active management of remedies through optimization and technical support
- Tools and techniques – institutionalizing lessons learned
- Nature of site operation and remedy changes at optimized projects
- Conceptual summary of recurring themes
- Conclusions

P&T Selection for Decision Documents with Groundwater Remedies (FY 1985-1995)

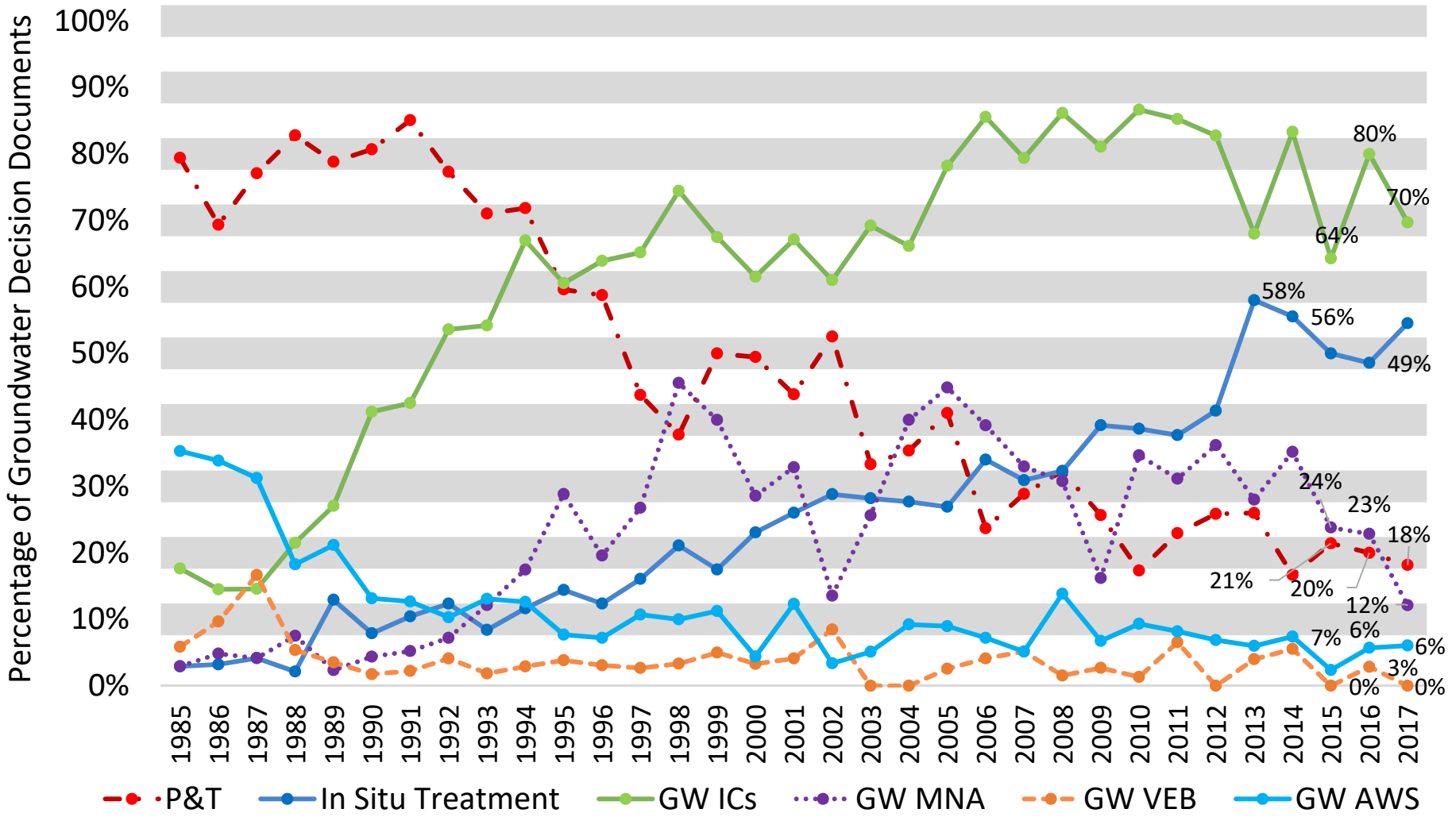


COCs at Superfund Sites (FY 1981-2017) – Draft Analysis



"Other" COCs may also be present at sites with metals, VOCs and/or SVOCs. At 9 sites they are the only COCs. Examples include cyanide, nitrate, sulfate and asbestos.

Selection Trends for Decision Documents with Groundwater Remedies (FY 1985-2017) – Draft Analysis
Groundwater Decision Documents = 2,506

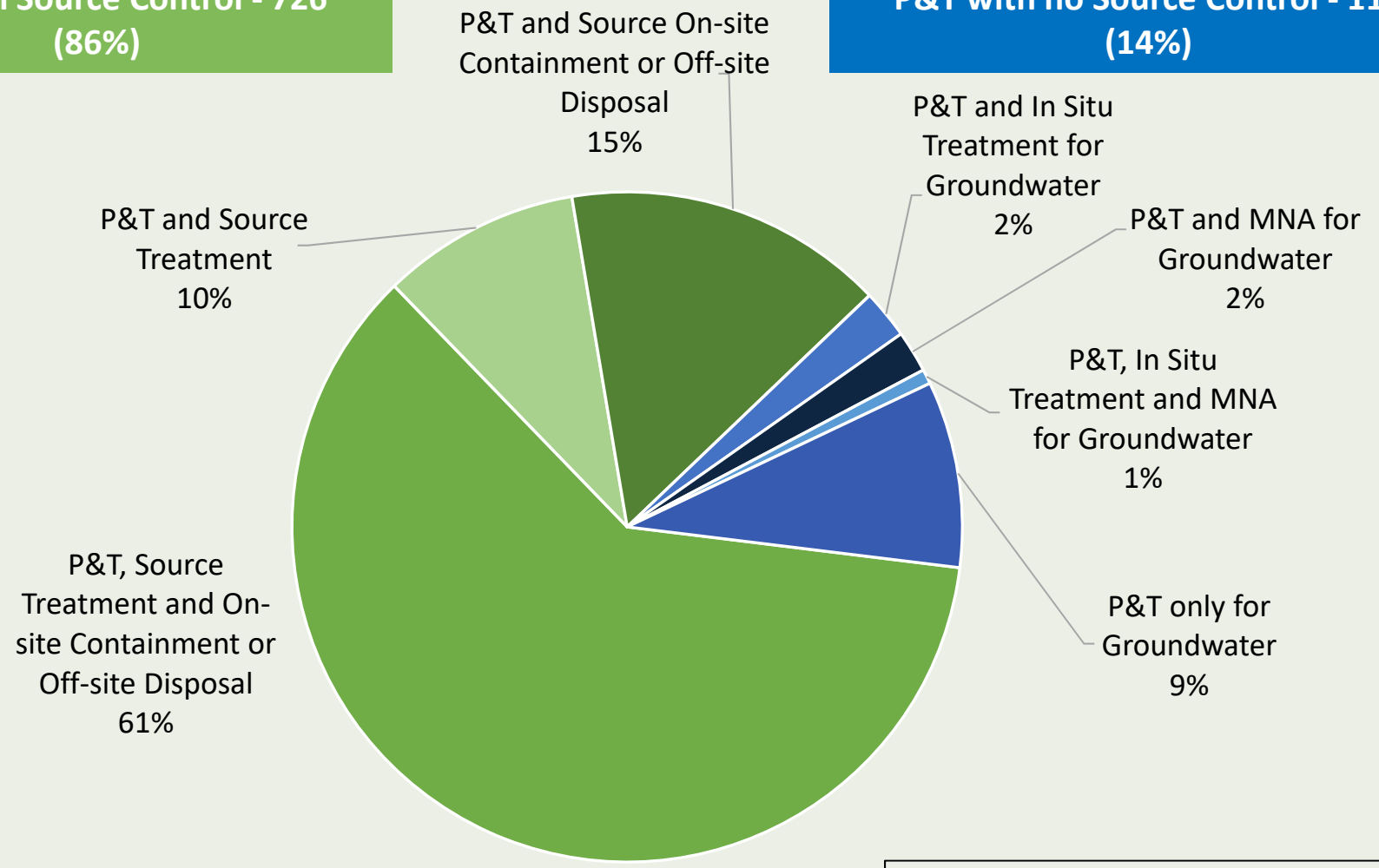


Summary of Selected Groundwater P&T Remedies (FY 1981-2017) – Draft Analysis

P&T Sites = 845

P&T with Source Control - 726 (86%)

P&T with no Source Control - 119 (14%)

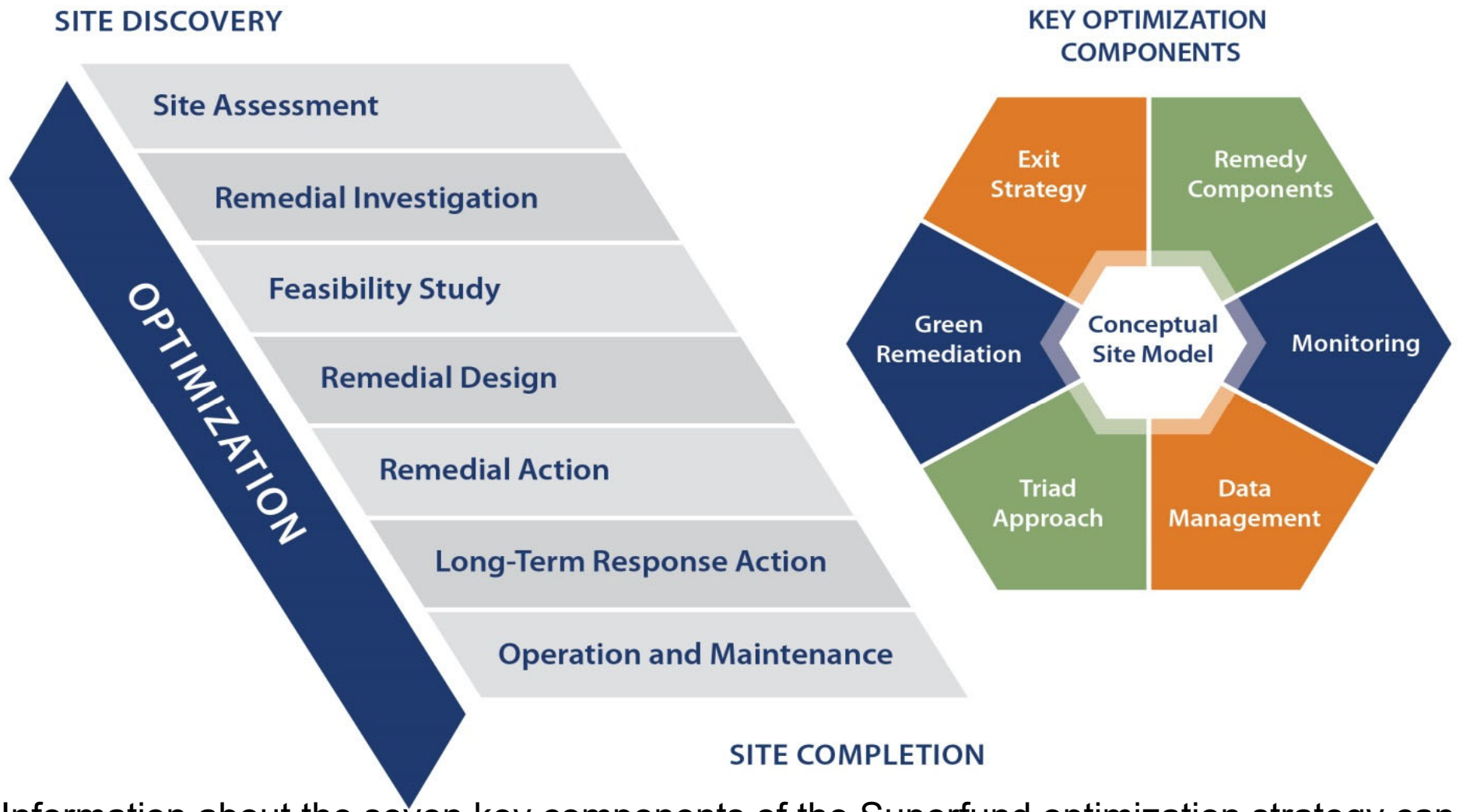


MNA = monitored natural attenuation
P&T = pump and treat

Optimization & Related Technical Support

- **Optimization reviews result in site-specific reports with recommendations concerning:**
  - remedy effectiveness
  - cost reduction
  - technical improvement
  - site closure
  - green remediation.
- **Tech support generally include activities such as:**
  - conducting systematic project planning
  - developing a strategic sampling approach
  - A focused technical review of a specific aspect of a site
  - visualizing and analyzing data to help identify data gaps in conceptual site models (CSM).

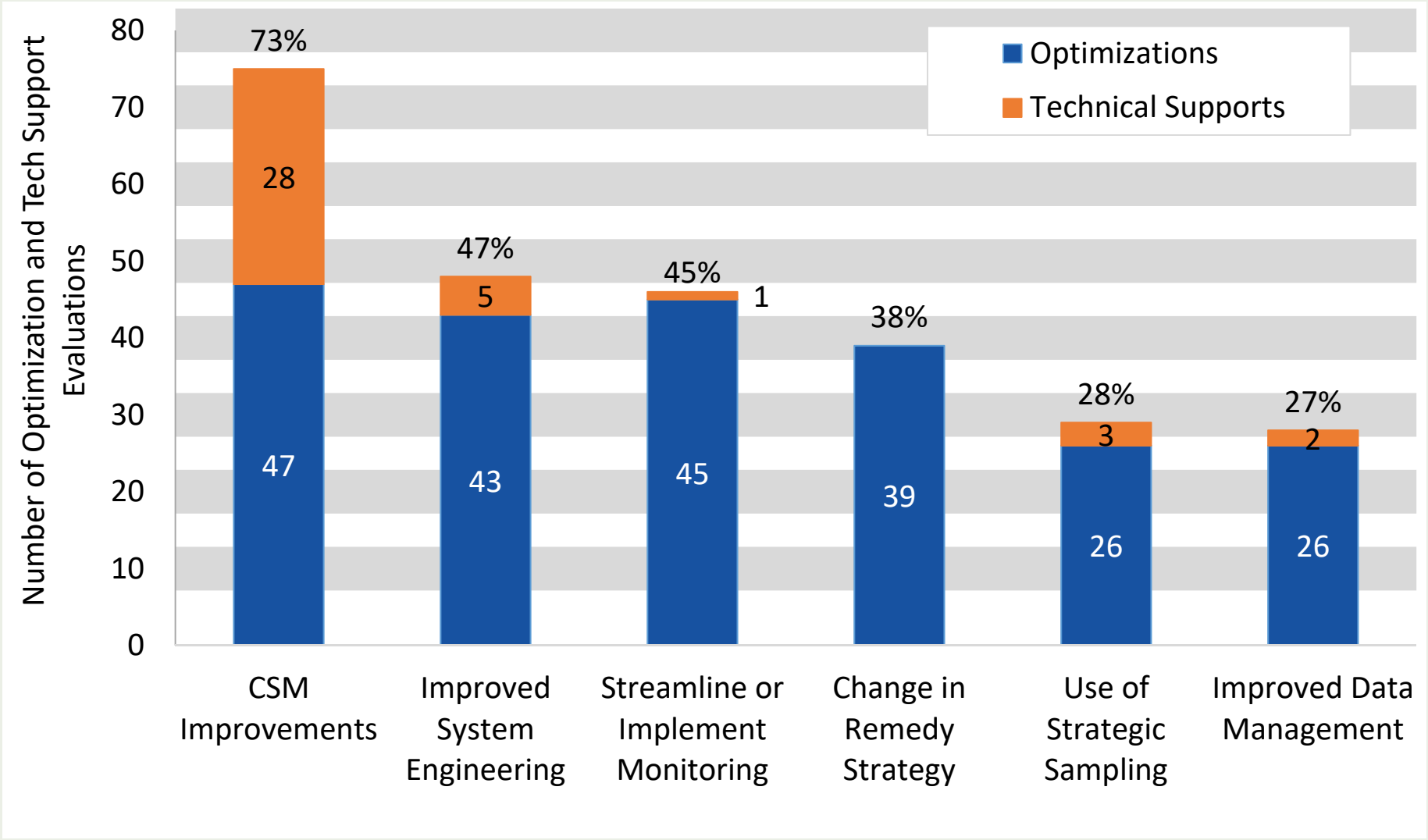
Key Optimization Components and Superfund Pipeline Activities



Information about the seven key components of the Superfund optimization strategy can be found at https://www.epa.gov/superfund/cleanup-optimization-superfund-sites

Number of Implemented Tools and Techniques Draft Analyses 2019 Progress Report

Total Number of Optimization Events = 103



Conceptual Optimization Lessons Learned Chart (Exploratory)

Phase	Problem	Tool/Analysis	Common Recommendation	Example Outcomes
RA	Treating low concentrations of contaminants	Evaluate operating data as outlined in the Groundwater Completion Strategy	Eliminate extraction points, evaluation multiple lines of evidence for MNA	Downsized P&T system, supplement with MNA, ICs, etc.
RA	Insufficient progress to RAOs	Analysis of data gaps in CSM, improved source and plume delineation	Identify and address source zone, fully delineate plume and capture zone	Improved CSM, source treated, downsize or shutdown P&T, earlier exit
RA	Inefficient P&T or monitoring	Evaluate design and operations	Adjust extraction and treatment components	Continued operation of P&T but more cost effectively
RI/FS or RD	Large and complex site	Improve CSM, better define source area, plume delineation	Source treatment, combine remedies and actively manage in time and space	Adaptively managed system of combined remedies, including P&T
PA/SI or RI/FS	Planning for site characterization and site management	CSM development, 3DVA, incremental sampling, systematic planning	Filling data gaps identified through CSM development, 3DVA and systematic planning	Implement incremental sampling, develop HRSC plan, implement early action

Optimization Highlight
Pemaco Maywood Site

Key Challenges

- Modify remediation system now that significant mass reduction has occurred to address operational costs and energy use

Primary Recommendations

- Reduce groundwater monitoring
- Shut down 6 of 8 dual-phase extraction and SVE wells
- Removed one blower and replace other blower with a regenerative blower

Implementation Outcomes

- Reduced electricity usage by reducing the operation of the system to one blower and by installing a variable frequency drive to the operating blower
- Reduced costs by modifying the groundwater monitoring system

Optimization Highlight
Groveland Wells No. 1 & 2 Site

Key Challenges

- Subsurface contamination difficult to remediate with P&T and SVE
- P&T required for long time if source material remains untreated

Primary Recommendations

- Additional characterization of sources and groundwater
- More aggressive treatment of sources
- Close monitoring of groundwater P&T system after source treatment

Implementation Outcomes

- In situ thermal (IST) remedy implemented in subsurface source area
- P&T system shut down in April 2014 and restart criteria have not been exceeded to date

Optimization Highlight
Baytown Township Ground Water Plume Site

Key Challenges

- Contaminant mass in subsurface not adequately addressed by P&T
- Source not adequately characterized

Primary Recommendations

- Consider implementing technologies to remove contaminant mass in subsurface
- Use Membrane Interface Probe (MIP) to assess the source mass distribution

Implementation Outcomes

- Changed remedial approach for groundwater by adopting ISCO followed by ISB using ERD
- Used MIP to assess the source mass distribution

Optimization Highlight
Benfield Industries, Inc. Site

Key Challenges

- Several carcinogenic polycyclic aromatic hydrocarbons (PAHs) have been detected above cleanup levels in one monitoring well

Primary Recommendations

- Identify additional areas of PAH contamination and consider use of ISCO and in situ enhanced bioremediation (ISEB)
- Consider Monitored Natural Attenuation (MNA) as a groundwater remedial strategy rather than the existing groundwater system

Implementation Outcomes

- Changed remedial strategy from P&T to in situ treatment of source contamination documented in a ROD Amendment in FY 2015
- 2019 Update: ISCO using alkaline activated persulfate is effective in reducing PAH concentrations in soil and groundwater

Optimization Highlight
Jones Road Ground Water Plume Site

Key Challenges

- Selected remedy of extensive P&T system may not provide an optimal approach to address site groundwater contamination
- Unsaturated zone contamination not fully characterized

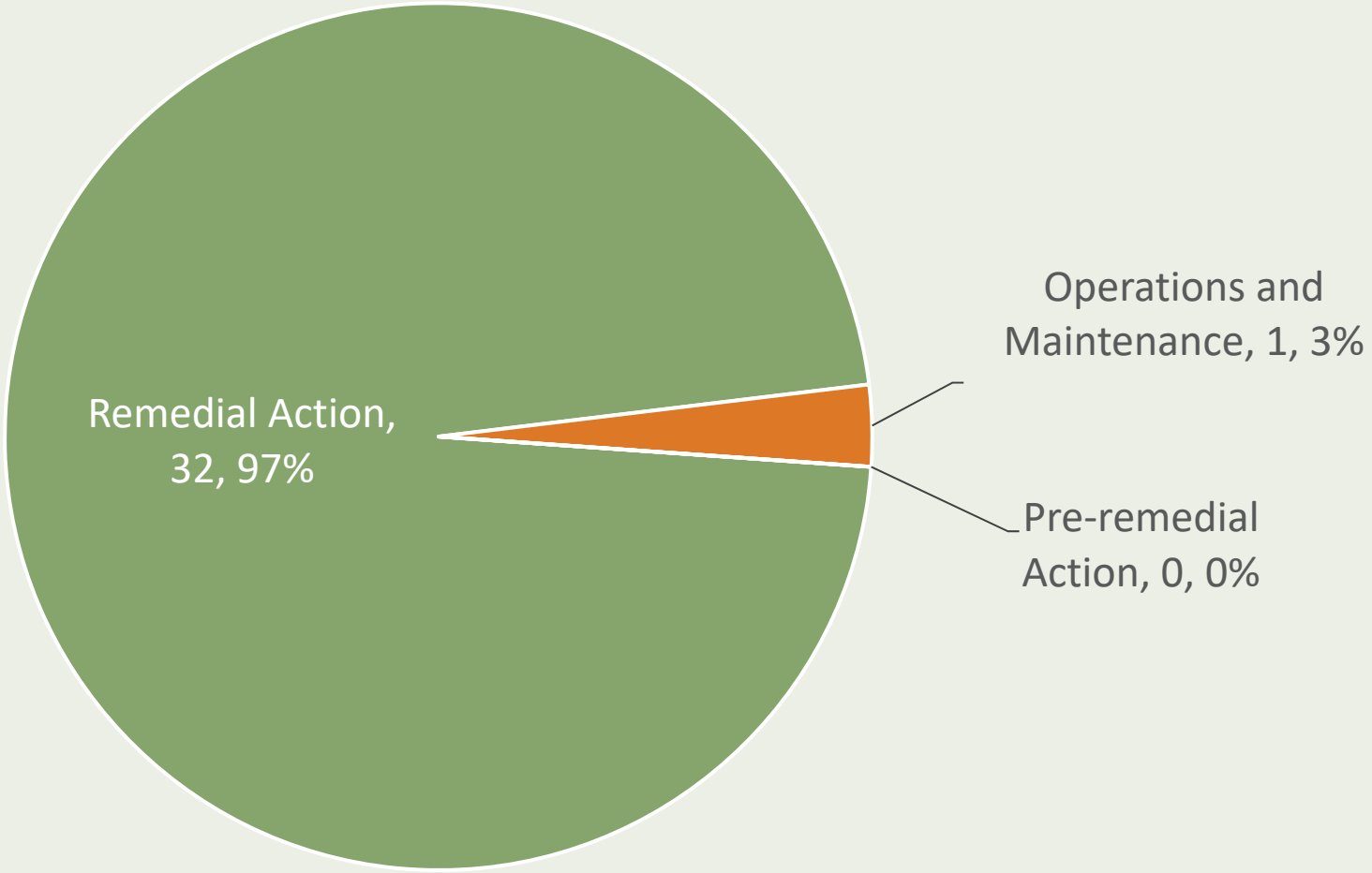
Primary Recommendations

- Install SVE in the unsaturated Chicot sand unit
- Initiate ISB in high-concentration areas of shallow water bearing zone
- Limited groundwater P&T system

Implementation Outcomes

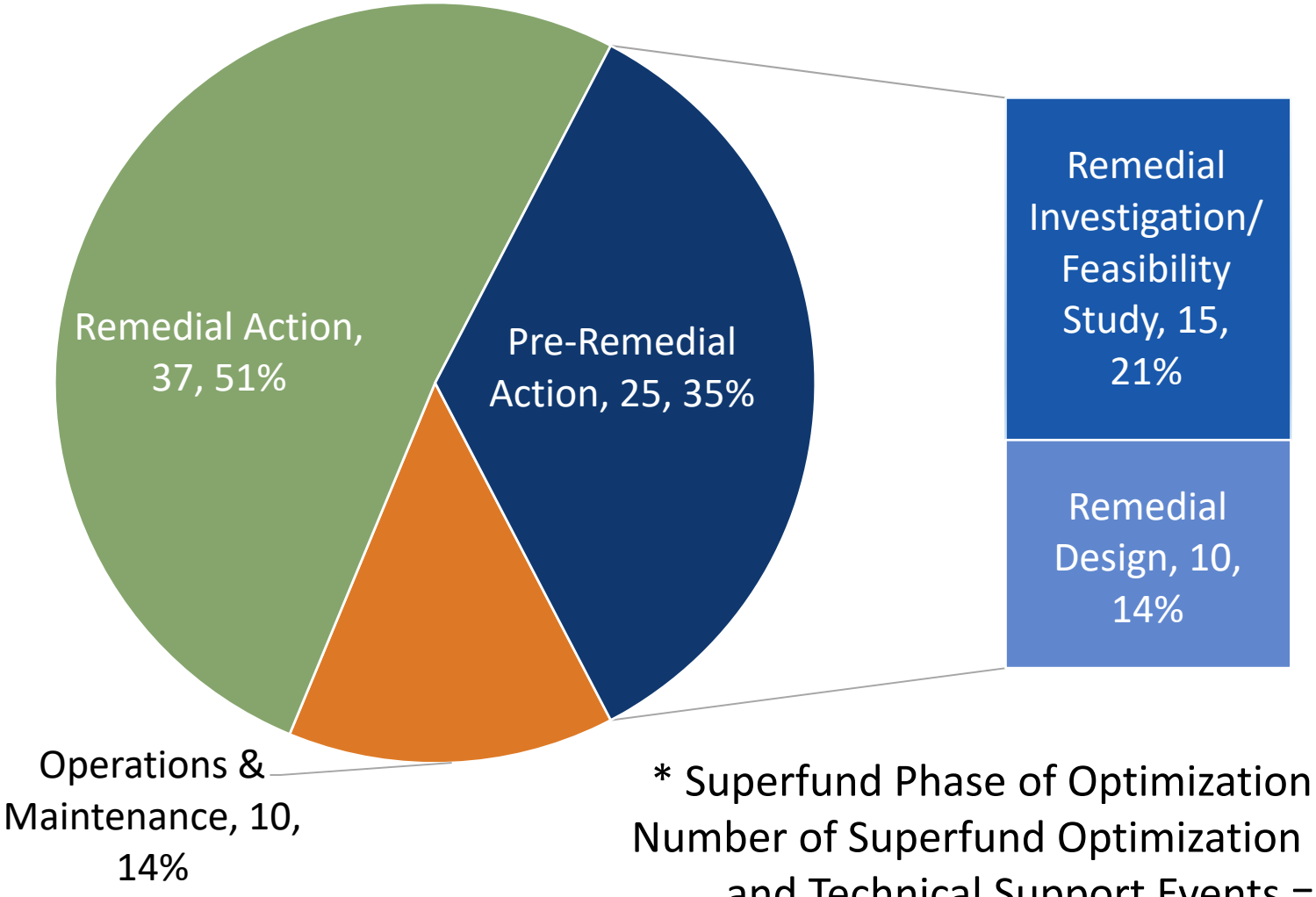
- Delineated shallow groundwater plume
- Installed nested wells to delineate contamination vertically
- Plan to scale up use of ISB for source and downgradient plume if source remedy alone does not adequately address the plume

In the early years of Superfund's optimization efforts, the focus was on the "backend" of project lifecycles



Superfund Phase of Optimization Events in 2004 Progress Report
Number of Superfund Optimization Reviews and Technical Support Events = 33

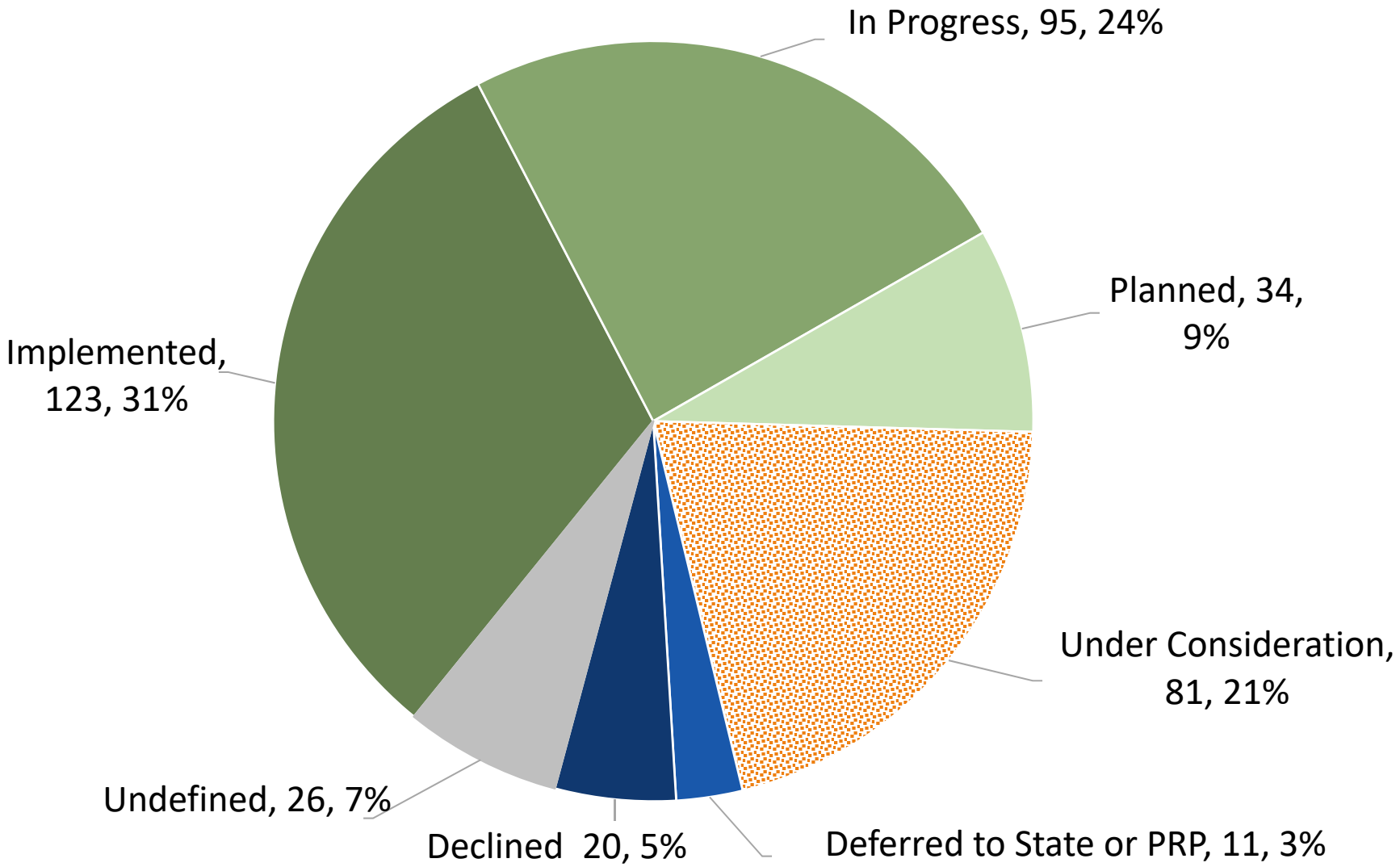
Optimization efforts are moving "upstream" in project lifecycles*



* Superfund Phase of Optimization Events
Number of Superfund Optimization Reviews and Technical Support Events = 72

Overall Status of all Optimization Recommendations Draft Analyses 2019 Progress Report

Most Recent batch of recommendations = 390



Conclusions

- In Superfund, optimization efforts indicates are becoming mainstream, with over 30 ongoing efforts in 2019.
- A healthy majority of the technical recommendations have been implemented, or are underway, planned, or under consideration.
- Beneficial results typically include improved remedy effectiveness, cost reduction, technical improvement, site closure, and lower environmental footprints.
- We see an expansion of the variety, sophistication, and acceptance of the optimization tools and techniques used to advance our projects.
- Remedies are actively managed at all stages applying a robust suite of technical a range of tolls and techniques.
- We see recurring patterns that facilitate capturing and transferring lessons learned in optimization and technical support .

See https://www.epa.gov/superfund/cleanup-optimization-superfund-sites