



Update on the Use of Treatment, Source Control, and “Green” Remediation Techniques in the US

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United States Environmental Protection Agency
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Superfund

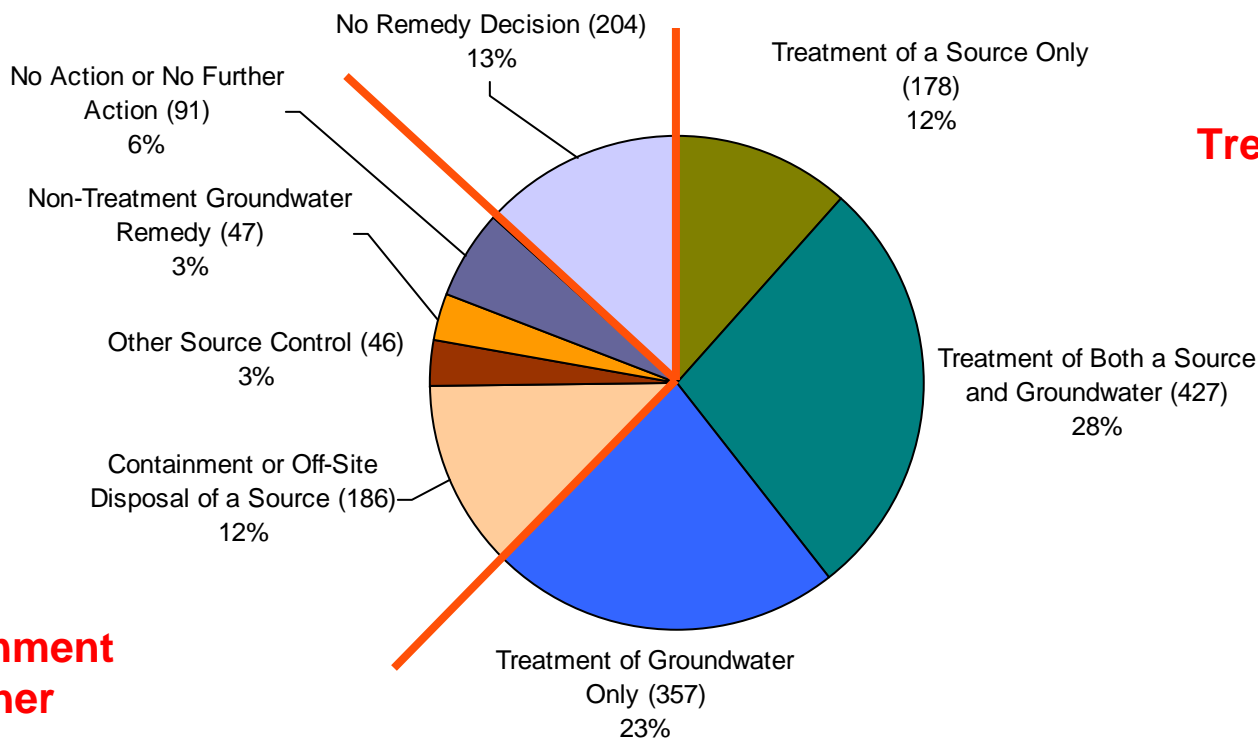
- Federal program for the cleanup of nation's most contaminated properties.
- >1500 National Priorities List (NPL) sites.
- Preference for permanent remedies.
- Remedies must be cost effective.
- National guidelines for assessment of risk and decision making.



Remedy Types

FY'82-'05 (1,536 Sites)

No Decision
13%



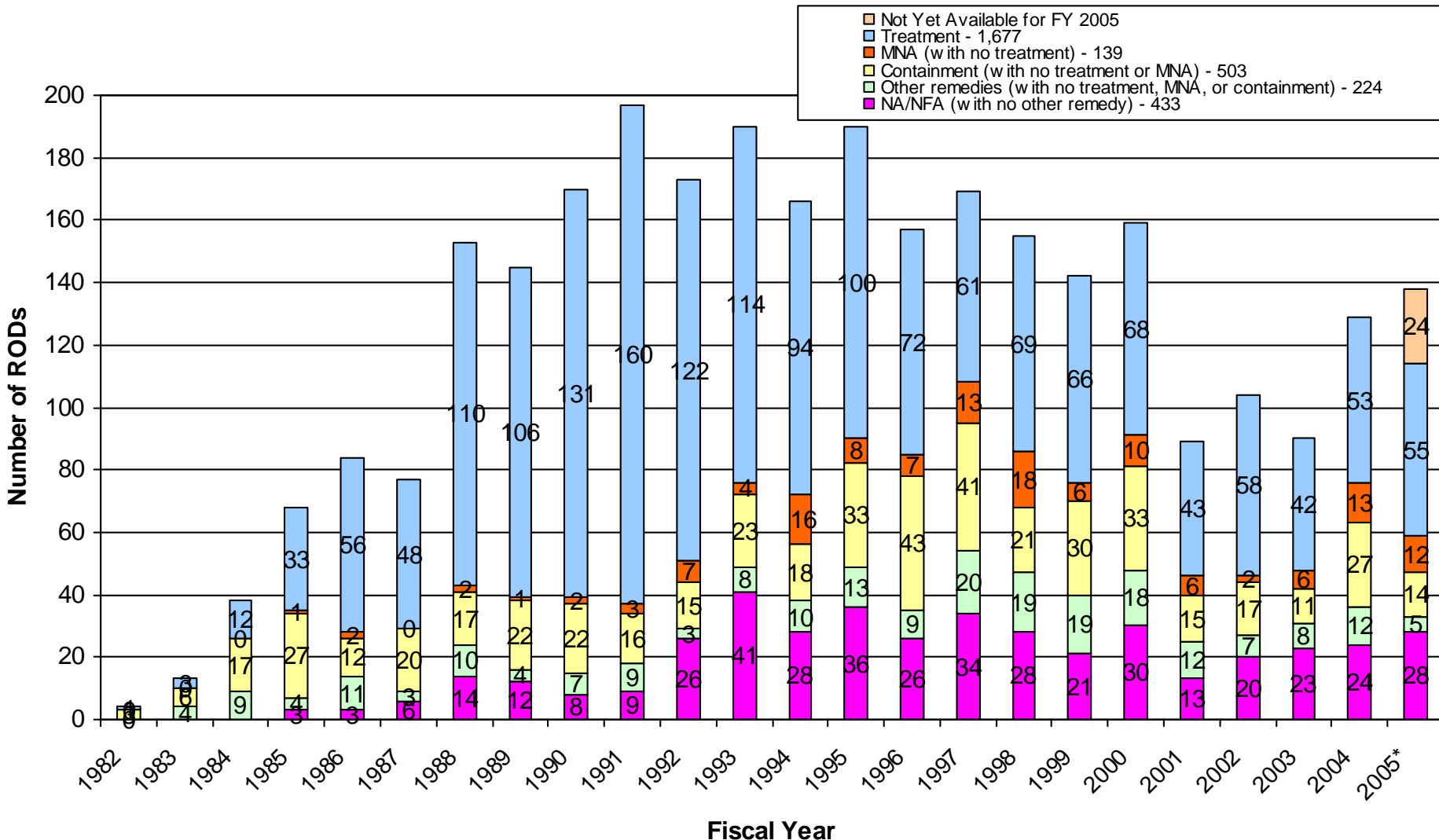
Treatment 63%

Containment and Other
24%



Remedy Types

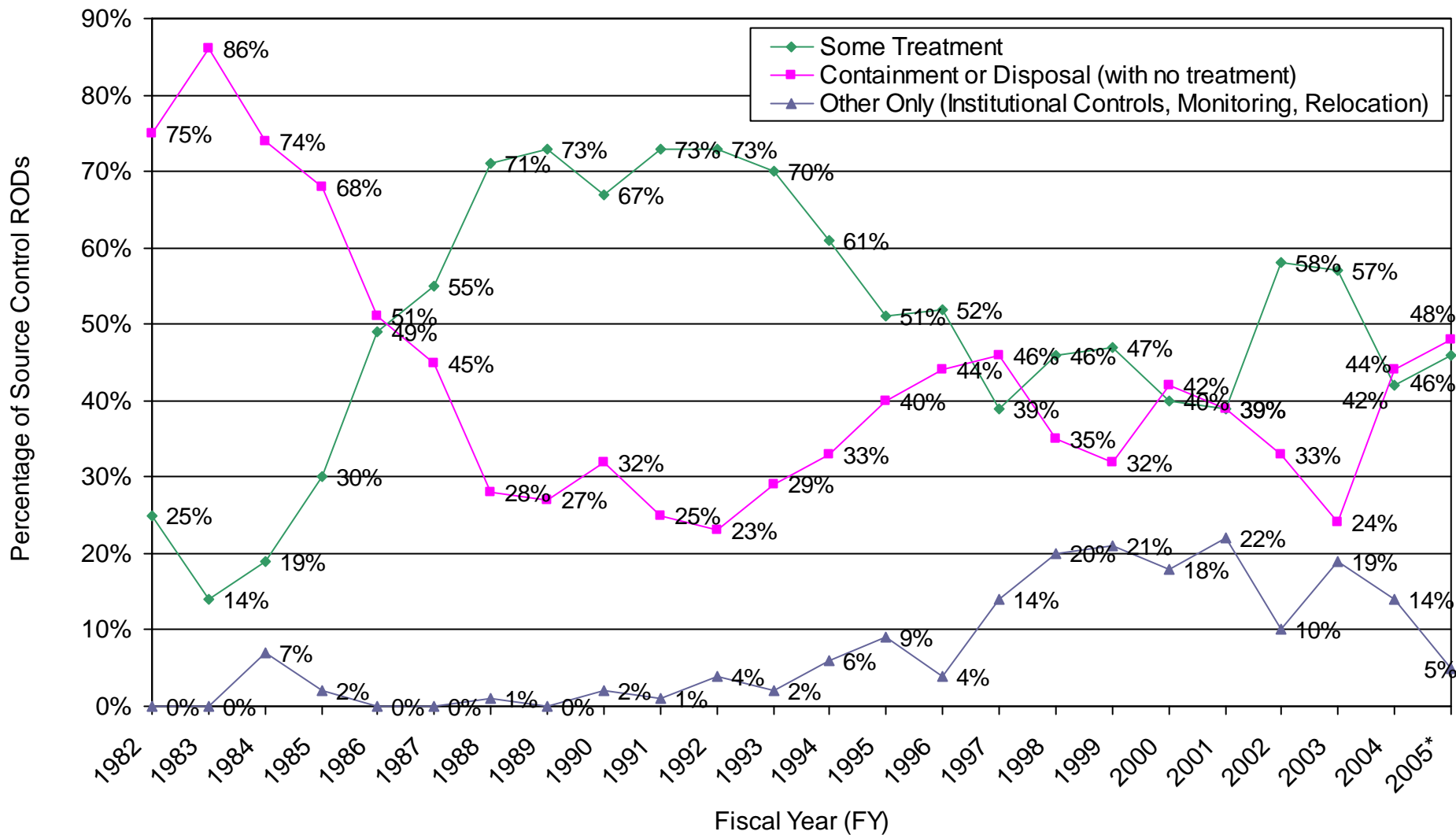
FY'82-'05 (2,976 RODs)





Trends in Source Control

Total of 1,994 RODs



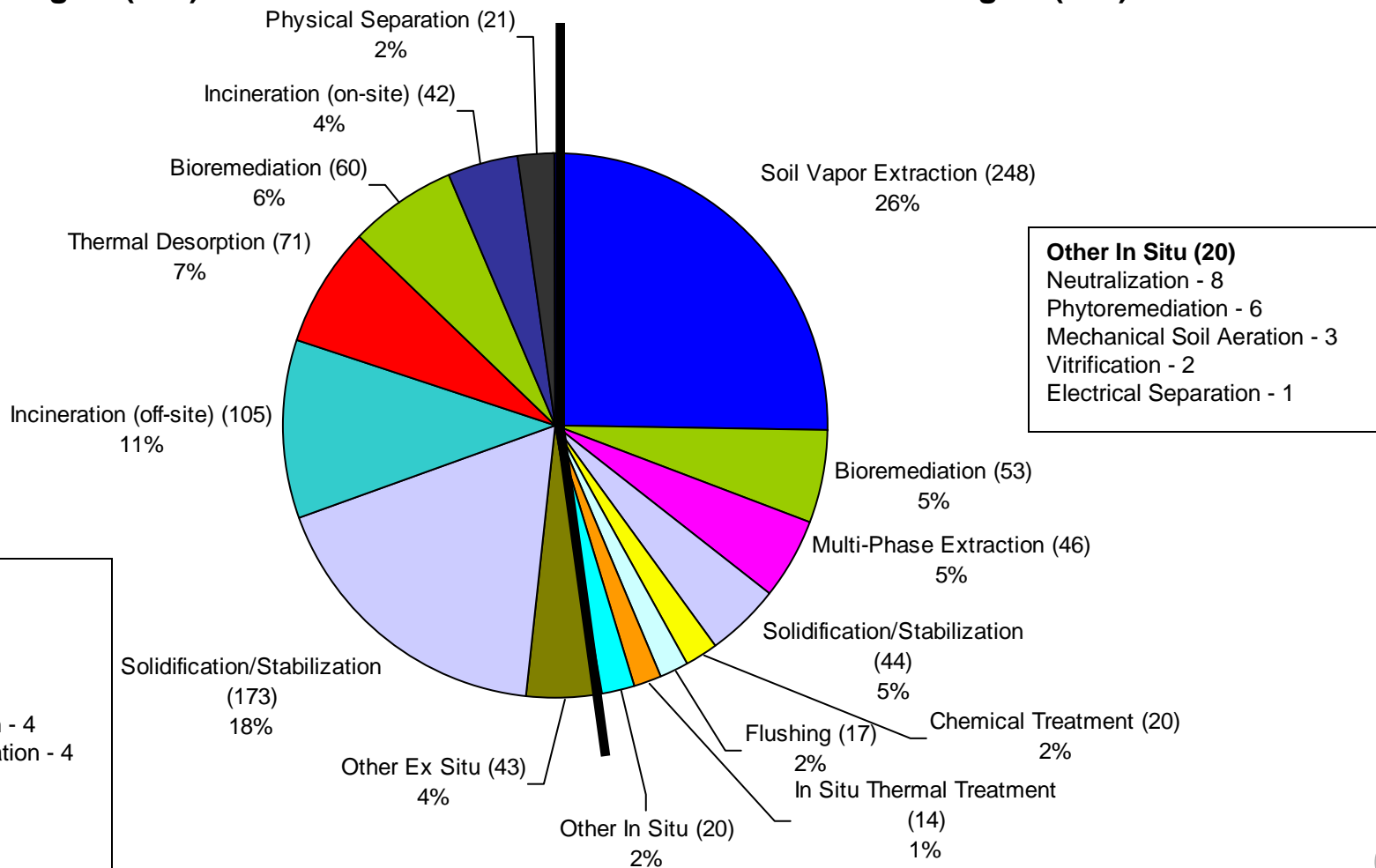


Source Control Treatment

FY'82-'05 (977 projects)

Ex Situ Technologies (515) 53%

In Situ Technologies (462) 47%



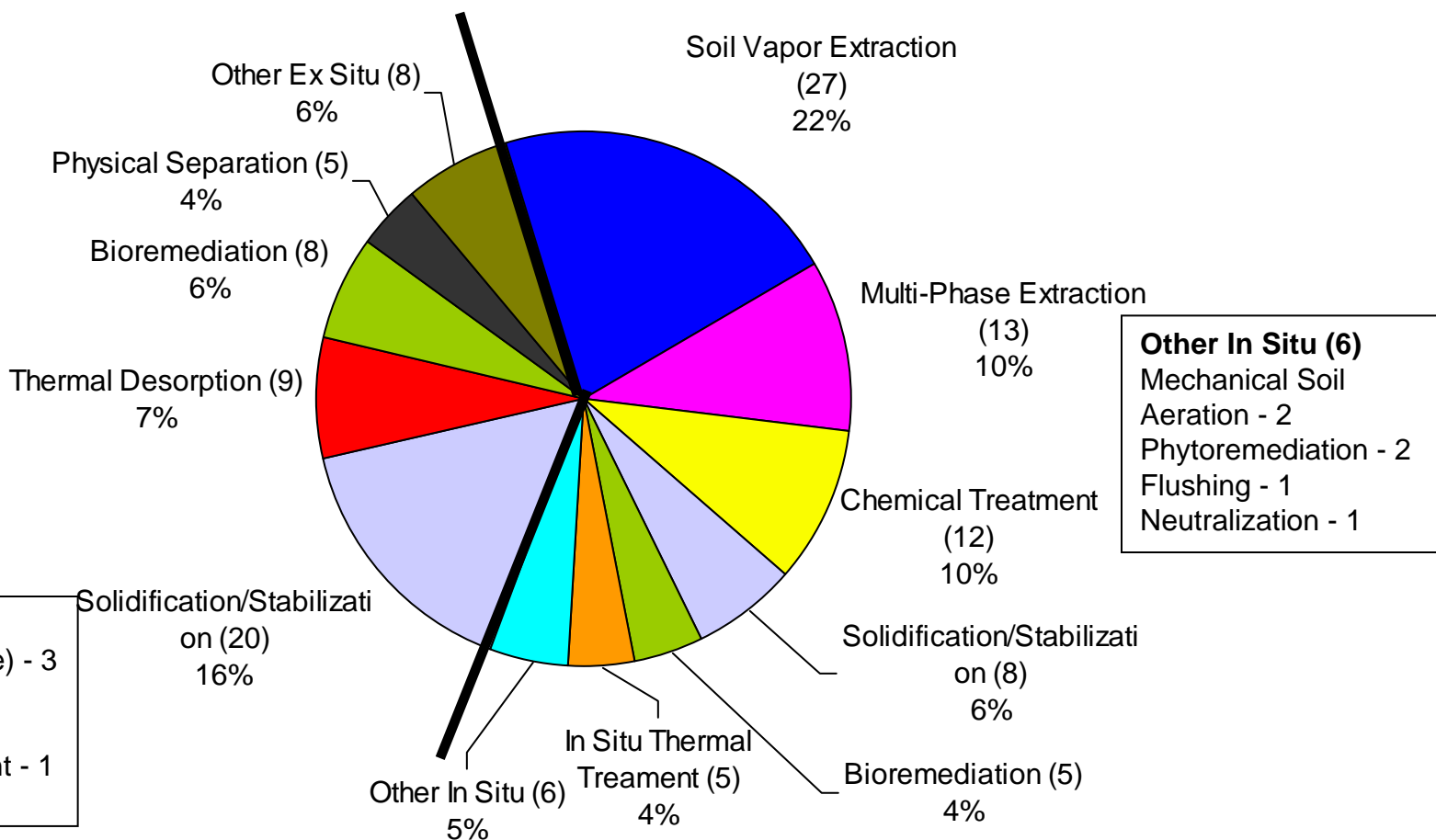


Source Control Treatment

FY'02-'05 (126 projects)

Ex Situ Technologies (50) 40%

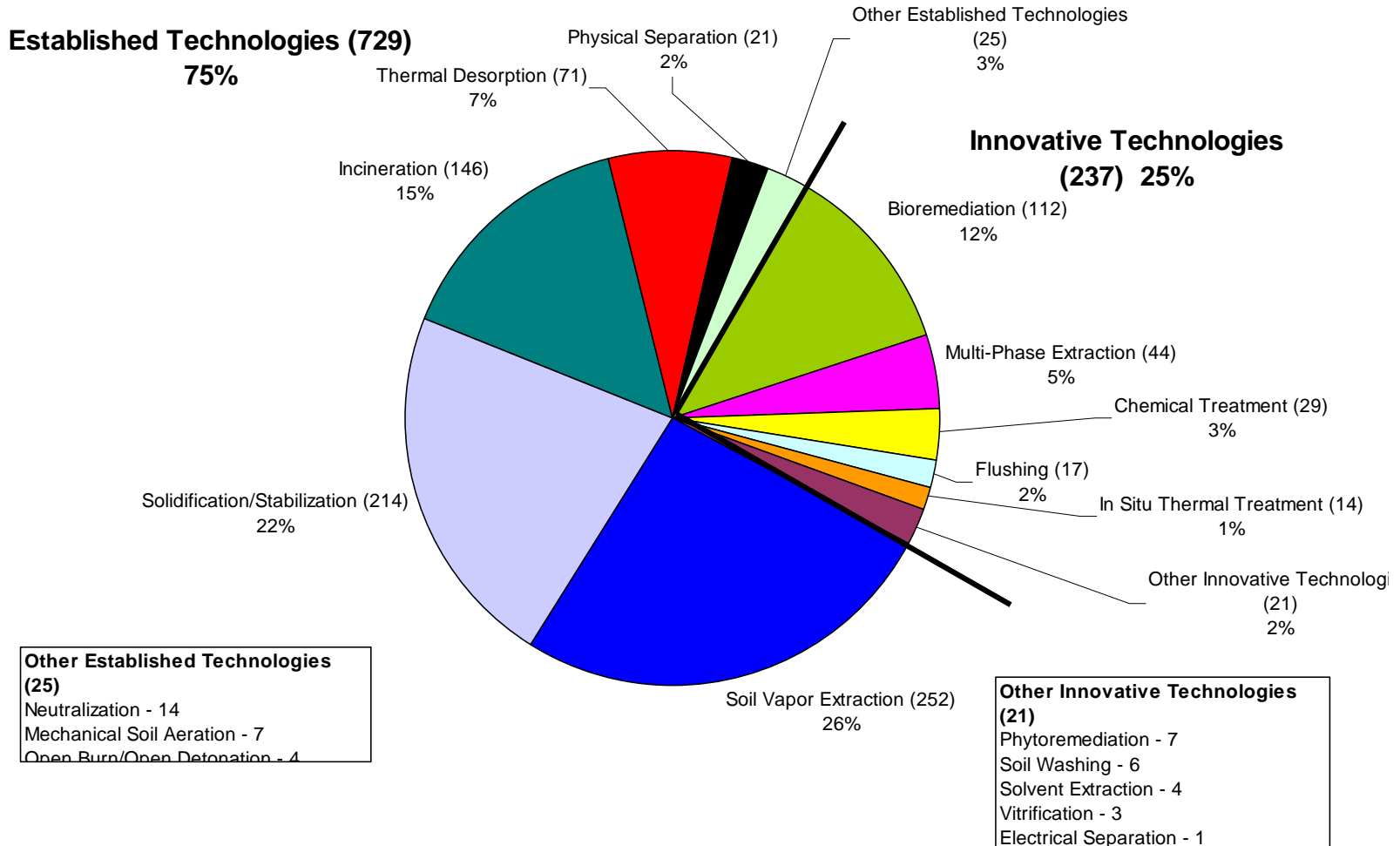
In Situ Technologies (76) 60%





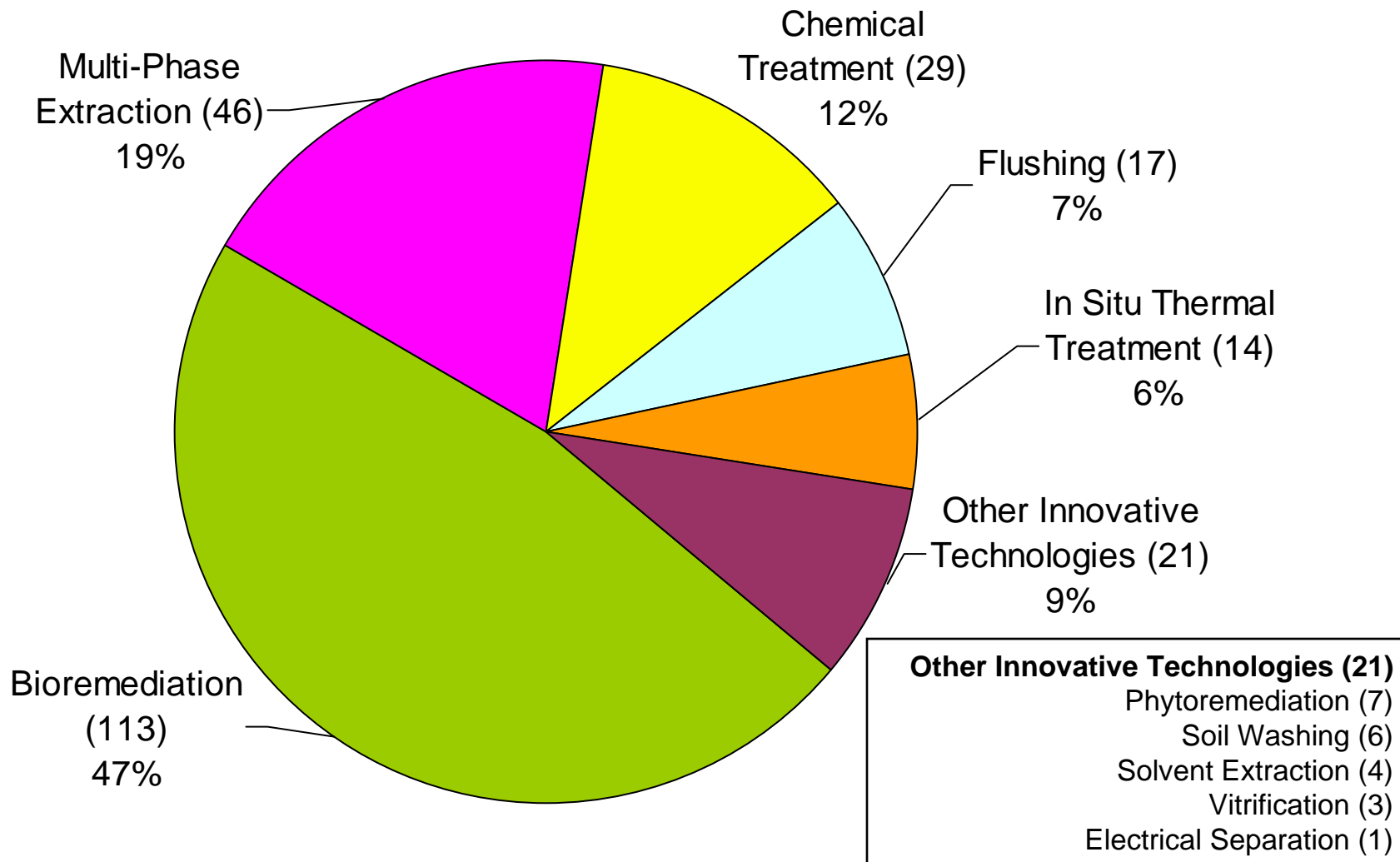
Innovative Technologies

FY'82-'05





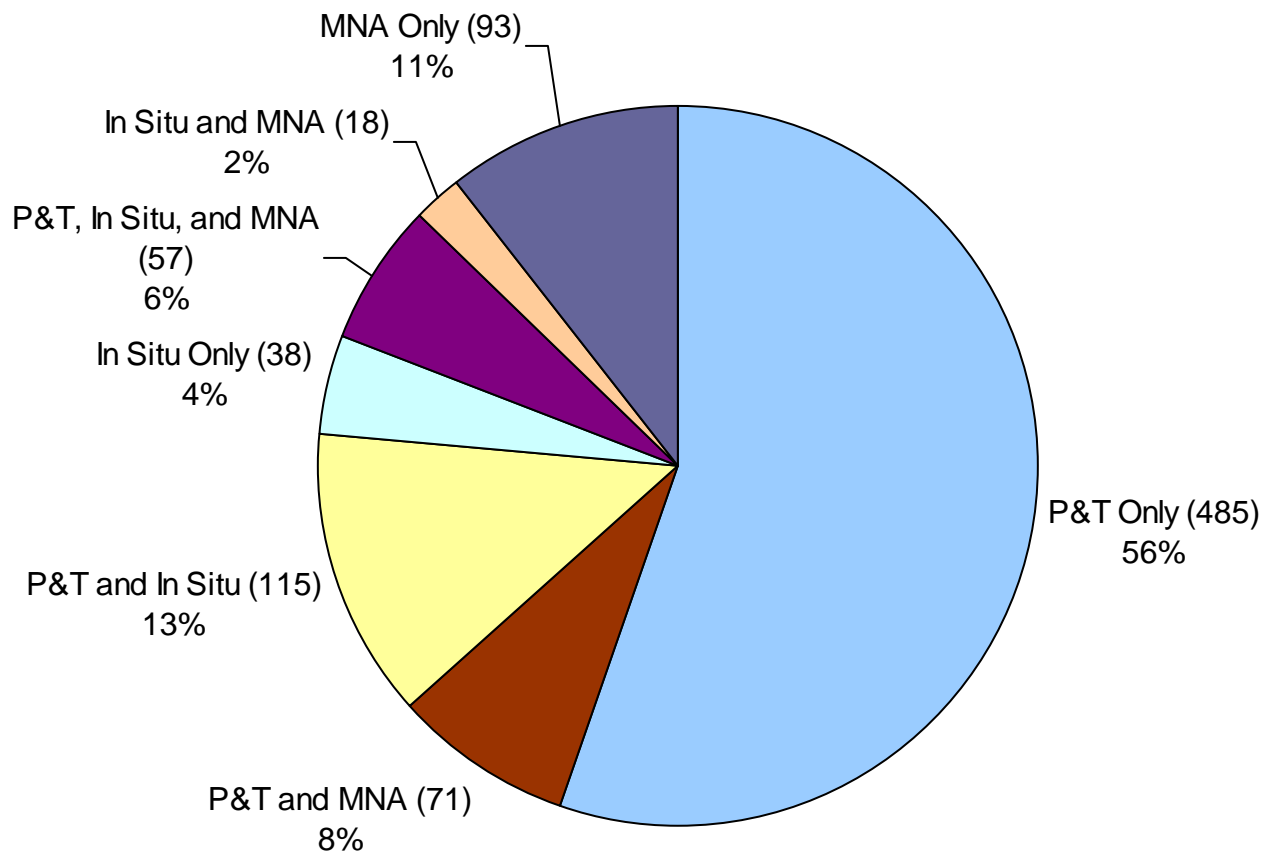
Use of Innovative Technologies FY'82-'05





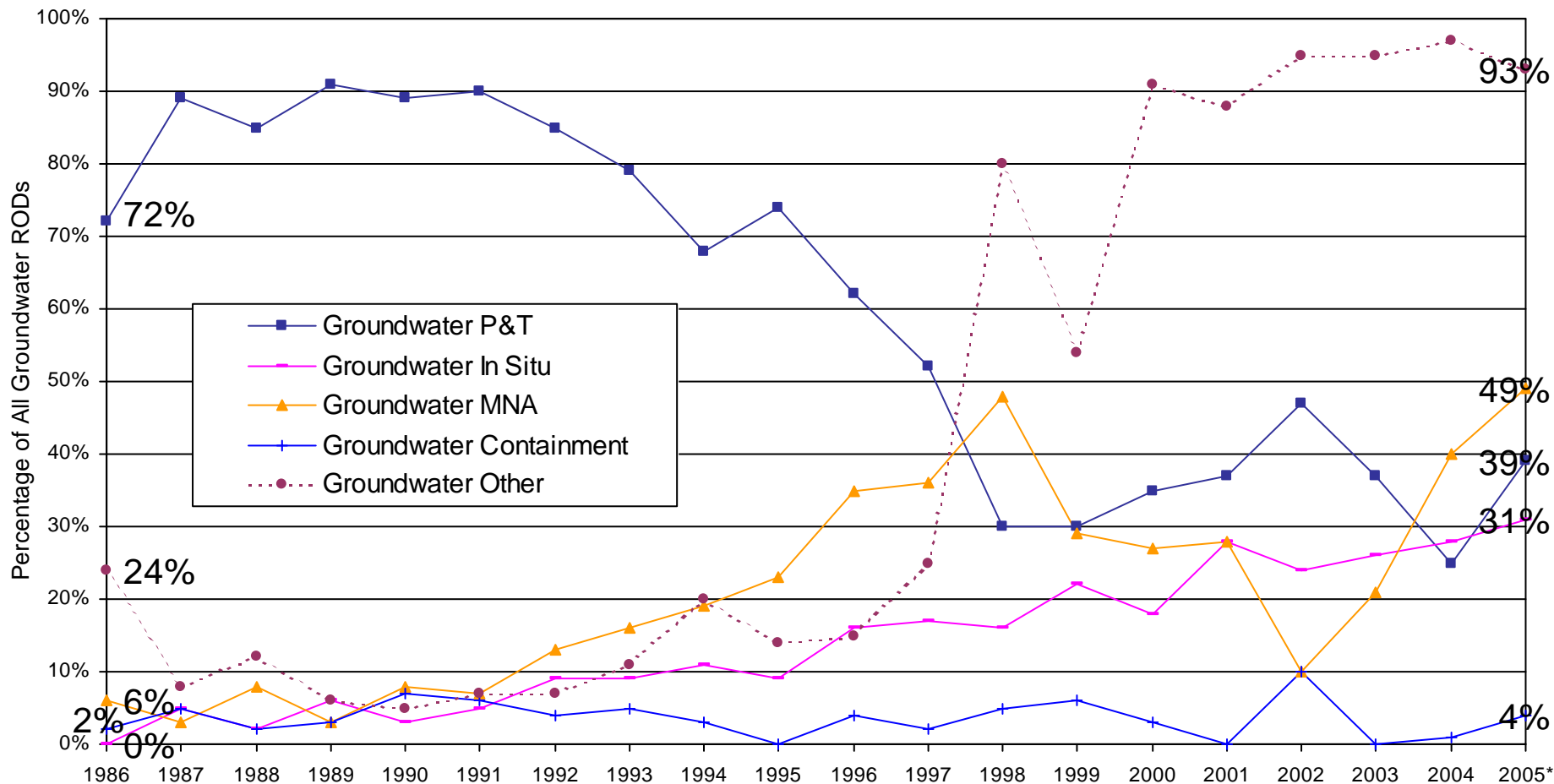
Groundwater Remedies

FY'82 – '05 (Sites = 877)





Trends in Groundwater Decisions*



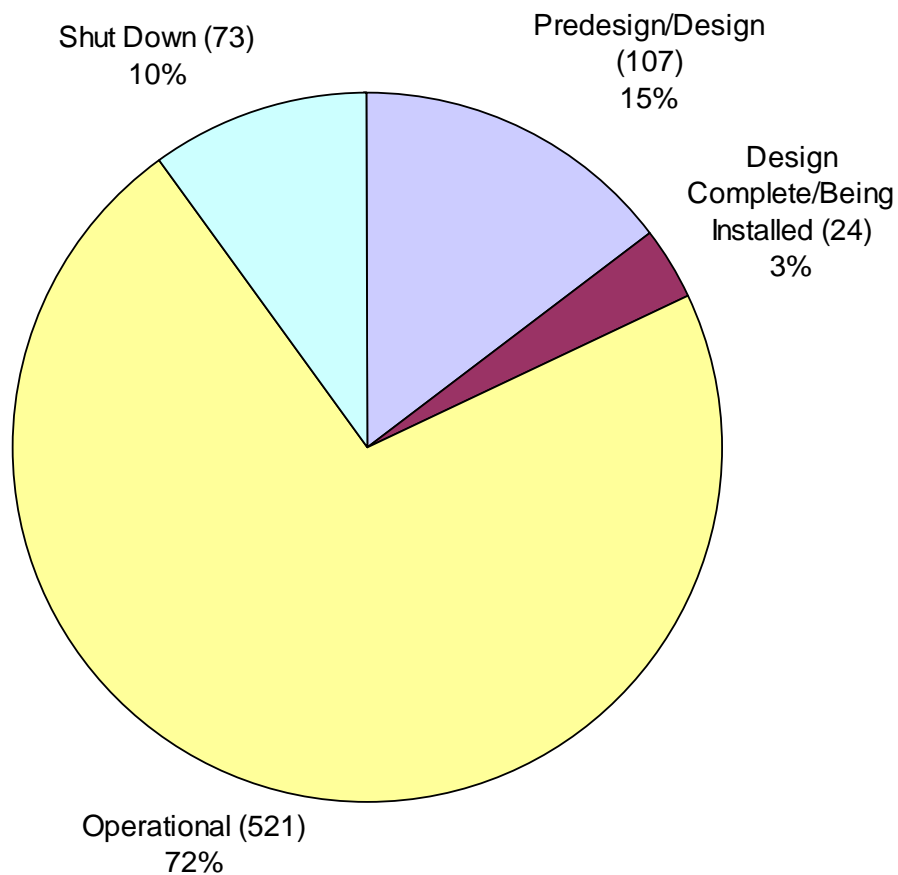
*Groundwater Containment” includes the use of vertical engineered barriers to contain groundwater.

“Groundwater other” includes water supply actions, institutional controls, monitoring, population relocation, and engineering controls.

*RODs and Amendments are included in this figure. RODs are counted in each category as appropriate; no hierarchy is used for this figure.



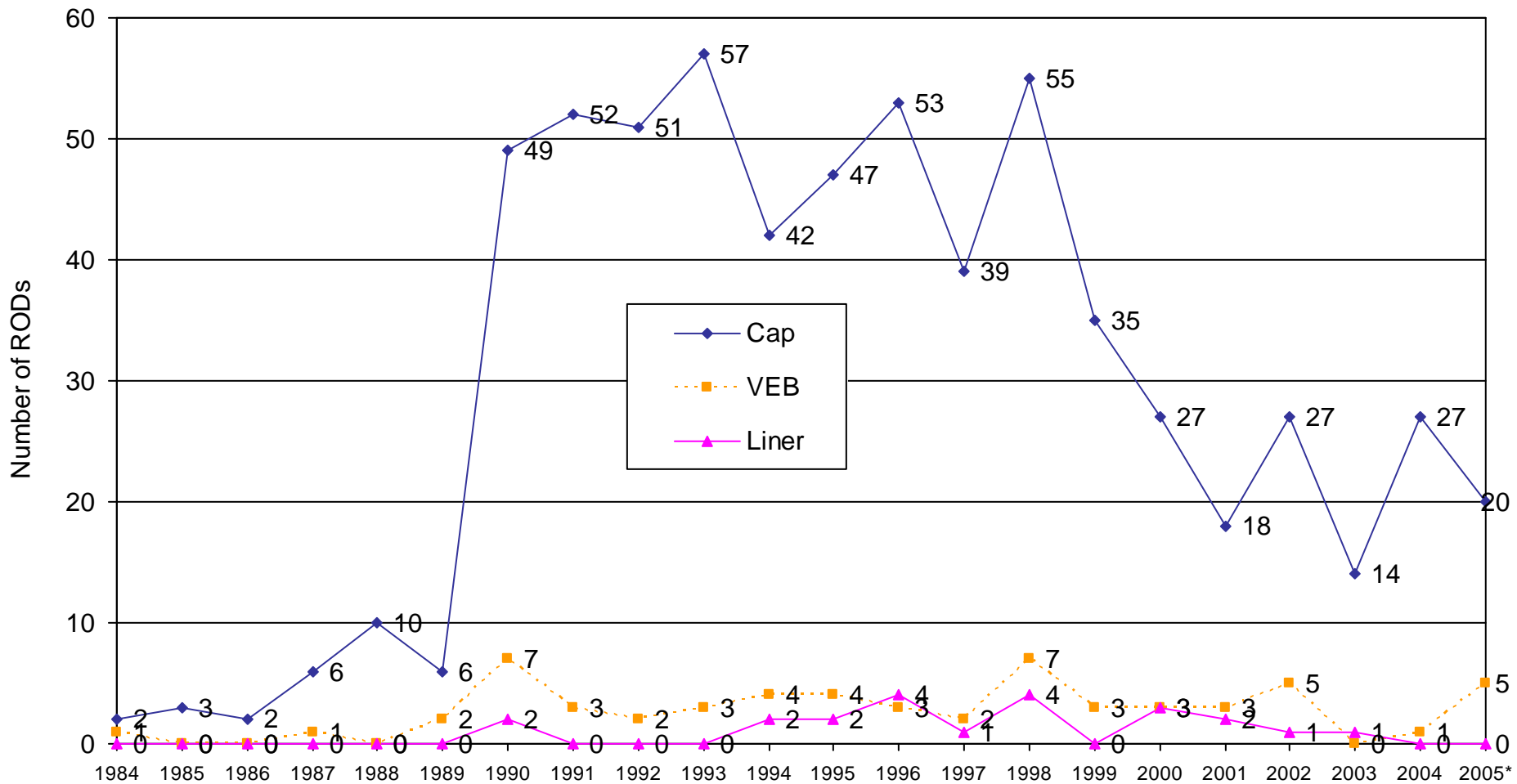
Status of P&T Projects (725 Projects)



*As of October 2006, 74% of FY 2005 RODs and Amendments were available.



On-Site Containment Decisions

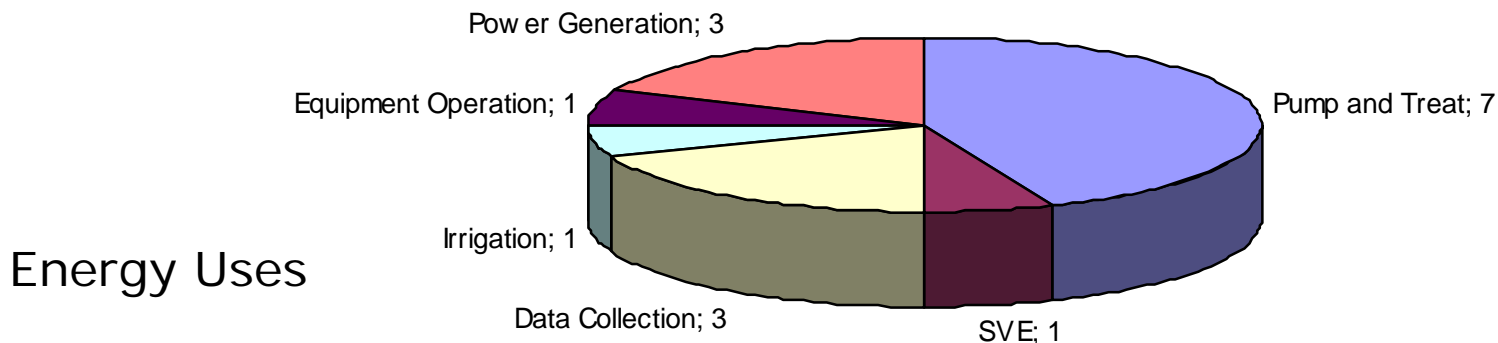
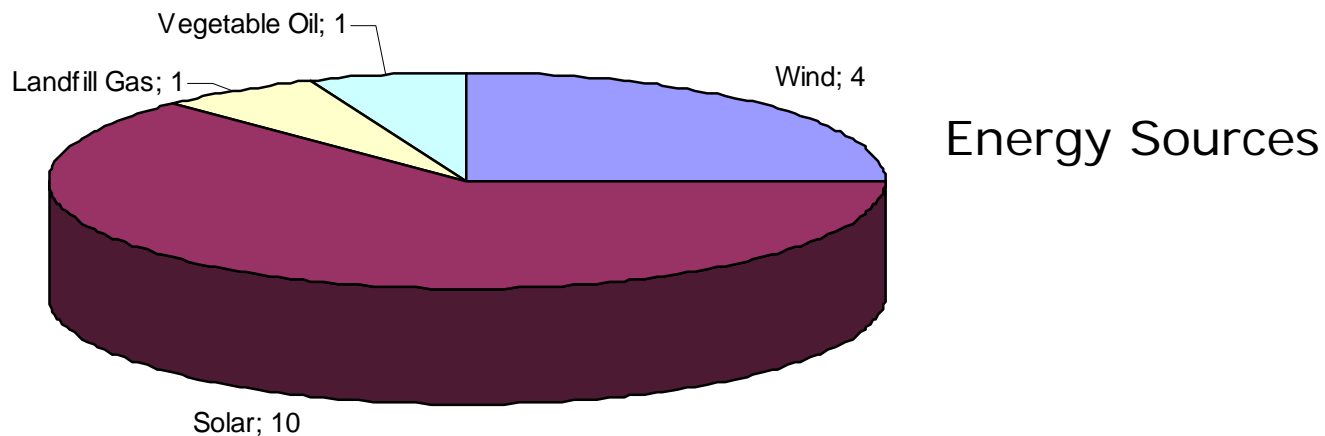


RODs = Record of Decision

*RODs and Amendments are included in this figure. As of October 2006, 74% of FY 2005 RODs and Amendments were available.



Renewable Energy Sources and Uses





Renewable Energy Trends

- Solar and wind most common (remediation systems).
- Remediation supplemented with renewable energy for smaller energy requirements:
 - » Low flow pumps
 - » Data collection or monitoring
 - » Irrigation
- Renewable energy systems ranged from 200W to 275kW (not including power generation sites)
- Limitations included:
 - » Lack of financial resources
 - » Community acceptance



Future Potential Benefit

Example

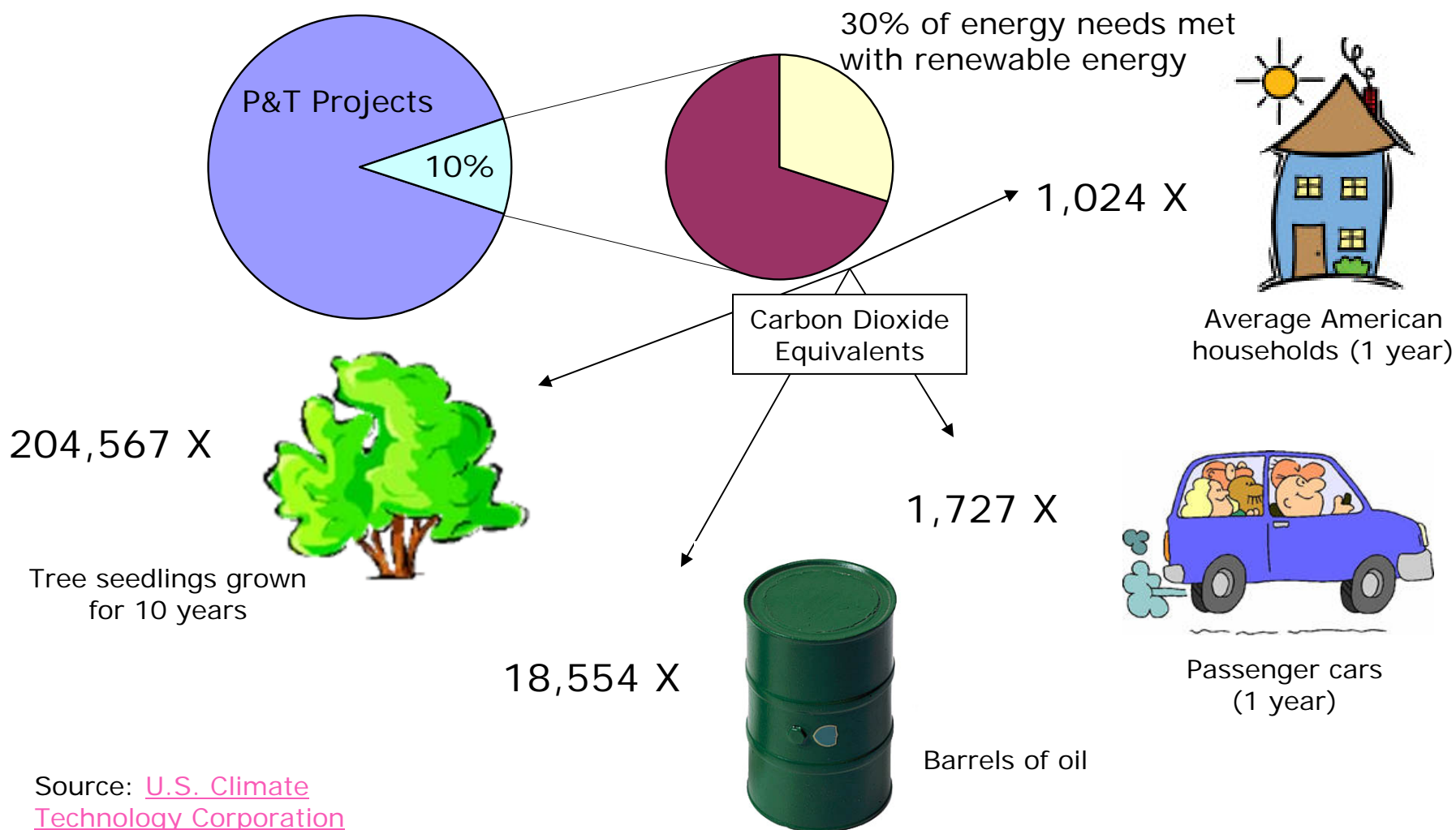
- 545 operational pump and treat systems (ASR 12th ed. Draft).
- 10% of these systems use renewable energy for 30% of their energy needs.
- 12,838,469 kWh of energy consumption generated from renewable energy
- 8,794.36 tons of CO₂ per year.

NOTES: An average pump and treat system uses 778,089 kWh per year;
DOE estimates 1.37 pounds of CO₂ emissions for each kWh generated.



Future Potential Benefits

Example: CO₂ Reductions



Source: [U.S. Climate Technology Corporation](#)



Conclusions

- Making full use of remedy tool box.
- Innovative technologies gaining ground / becoming mainstream.
- Prevalence of *in situ* treatment remedies suggests we focus on innovations to *in situ* performance monitoring.
- 72% of GW P&T projects are operational.
- Increasing use of renewable energy... greater emphasis in remedy selection warranted.
- Most common applications of renewable energy at remediation sites include pump and treat systems (low flow pumps), remote locations.



Further Information

- Treatment Technologies for Site Cleanup: Annual Status Report (12th Edition).
 - » Carlos Pachon, US EPA, Office of Superfund Remediation and Technology Innovation.
 - » Email: pachon.carlos@epa.gov

- Use of “green remediation” at contaminated sites in the US.
 - » Amanda D. Dellens, Case Western Reserve University.
 - » Carlos Pachon, US EPA, Office of Superfund Remediation and Technology Innovation.



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