
THINK. RESTORE, SUSTAINABLY
Partnering for Smarter Sustainable Solutions
COLUMBIA
TECHNOLOGIES
www.columbiatechnologies.com
Financial Sustainability Through Innovation
September 2018
John Sohl, CEO

OUR RESPONSIBILTIES


SOCIAL
ECONOMIC
ENVIRONMENT

AGENDA

1. **Program results – where are we?**
2. **What does financial sustainability look like?**
3. **What is the role of innovation?**
4. **How do we measure success?**

RESULTS – WHERE ARE WE?

NATIONAL BACKLOG STUDY - 2014

- 14 states representing 66% of the national LUST cleanup backlog
- High degree of variability in the availability and quality of data from the states
- Open releases
  - 48% were >15 years old including 40% of high priority sites
  - <50% had NOT begun remediation
  - 27% had not yet been characterized
  - 78% had impacts to groundwater

2014 NBS – CHALLENGES

- Insufficient state funding leads to indefinite postponement of cleanups
- Many releases considered ineligible for state funding
- Many older privately-financed cleanups remain in early stages of cleanup
- On average states spending more money per ongoing cleanup than earlier in the program
- State fund case manager workload had doubled to over 200 cases per manager

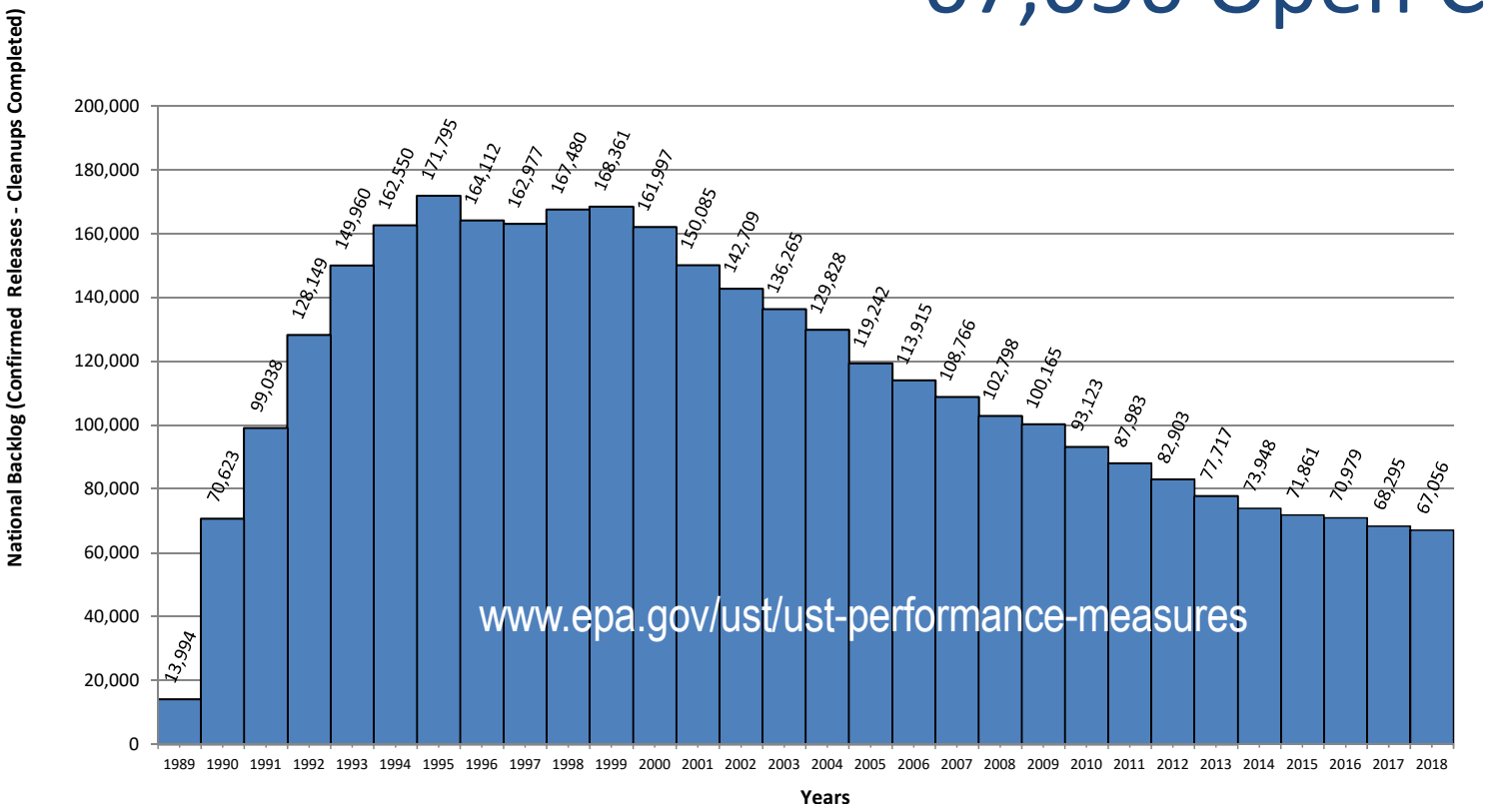
2014 NBS – OPPORTUNITIES

1. **Accelerating corrective action**
2. **Pursuing targeted initiatives**
3. **Improving program implementation**

MID-YEAR 2018 BACKLOG

UST National Backlog:
FY 1989 Through Mid-Year
FY 2018

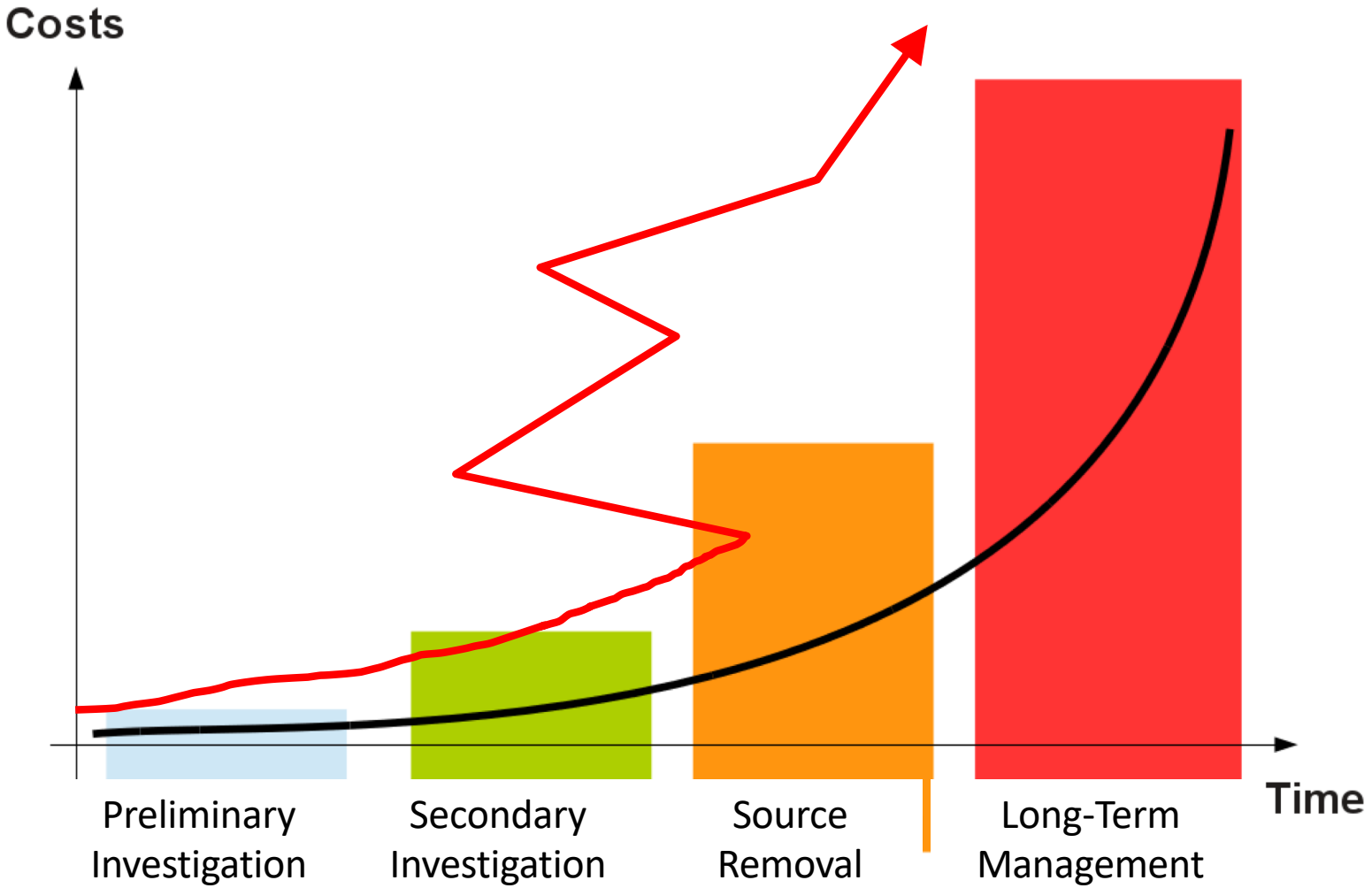
67,056 Open Cases



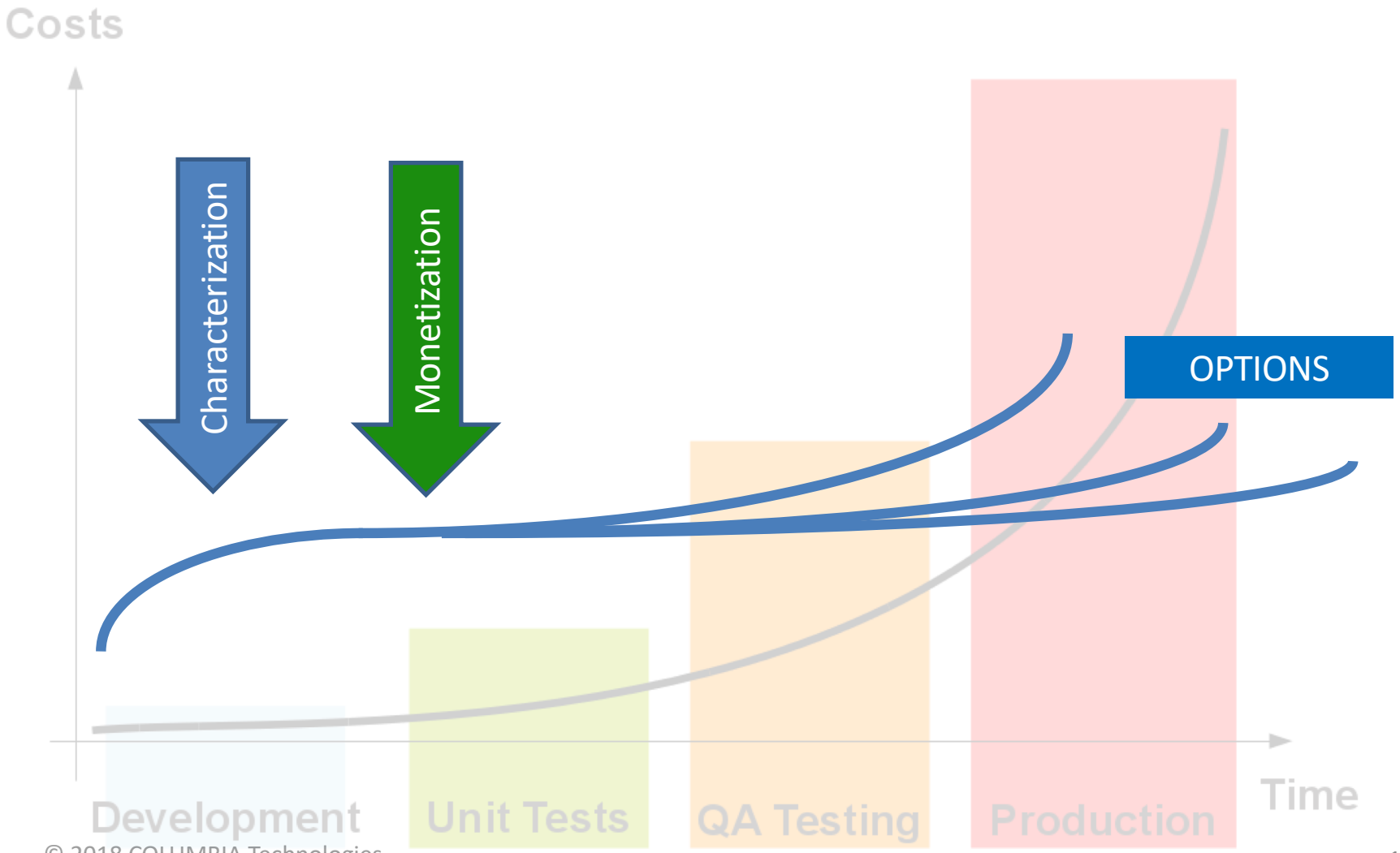
WHAT DOES FINANCIAL STABILITY LOOK LIKE?

TIME VS MONEY

UNSUSTAINABLE COST CURVE



CREATING SUSTAINABLE OPTIONS



BUILDING FINANCIAL SUSTAINABILITY

- Federal and state funding is a shared resource for all stakeholders – a “common grazing area”
- Approach for a sustainable financial future
  - Establish a longer vision to give people a reason to cooperate over a sustained period of time
  - Build trust and open communications to encourage cooperation
  - Uses collective decision making to foster a forum to cooperate
  - Set rules and ensure they are followed
  - Treat participants fairly under the rules

Shayne Kavanagh
Government Finance Officers Association
www.GFOA.org/financial-sustainability

IMPROVING PROGRAM IMPLEMENTATION

- Rely on small, incremental investments (little bets) instead of Hail Mary's
- Emphasize *sustainability of results* over immediate results
- Design to adapt to feedback
- Inspire by bottom-up action (chaotic but smart) and not top-down systems (orderly but dumb)
- Obsess about *measuring &* accounting for results

www.StrongTowns.org
Charles Marohn, Jr.
Brainerd, MN)

WHAT IS THE ROLE OF INNOVATION?

SYSTEMATIC APPROACH

473,000 cleanups complete …
"What's the rubric"?

- ITRC LNAPL-3
  www.itrcweb.org
  - Appendix A –
    LNAPL Technologies
  - Appendix B –
    Natural Source Zone Depletion (NSZD)
- Advanced Site Characterization Technologies
  (in development)

THE LNAPL CSM RUBRIC

- Site history, sources, type of LNAPL, remedial system performance, risks, other factors
- Where is the MASS? Is it STABLE? What is the level of LNAPL SATURATION in the SOIL?
- What is the permeability profiles of the soil containing the mass?
- What is the transmissivity, potential mobility or recoverability of the LNAPL?
- What are groundwater conditions surrounding the LNAPL?
- Are there any DISSOLVED PHASE plume concerns?
- Are there any VAPOR INTRUSION concerns?
- What is the alignment of the monitoring and recovery systems to the LNAPL mass, the soil permeability, and groundwater?
- What degree is NATURAL SOURCE ZONE DEPLETION occurring?
- What data is needed to inform other potential remedial technologies?

REMEDIATION VS. RISK METRICS

- Mass, volume, and chemical composition of the LNAPL *in the soil*
- Permeability characteristics of the soil
- Transmissivity of the LNAPL
- Groundwater conditions
- State of Natural Source Zone Depletion

UNSUSTAINABLE COST OF MONITORING WELLS

- Every monitoring well creates a long-term liability for the financial responsible party or fun
- Monitoring wells provide a quite diffused understanding of LNAPL distribution, soil behavior, and vertical distribution of soil, groundwater, and soil gas conditions.
- Monitoring wells do not provide the needed characteristics of the LNAPL mass loading in the soil required for remedial design and performance monitoring
- Monitoring wells often short-circuit remedial designs decreasing performance and increasing cost

HOW DO WE MEASURE SUCCESS?

PERFORMANCE METRICS

- How much money are you spending on compliance compared to remediation in your state?
- How do you measure remediation performance in your state?

LNAPL-3 METRICS

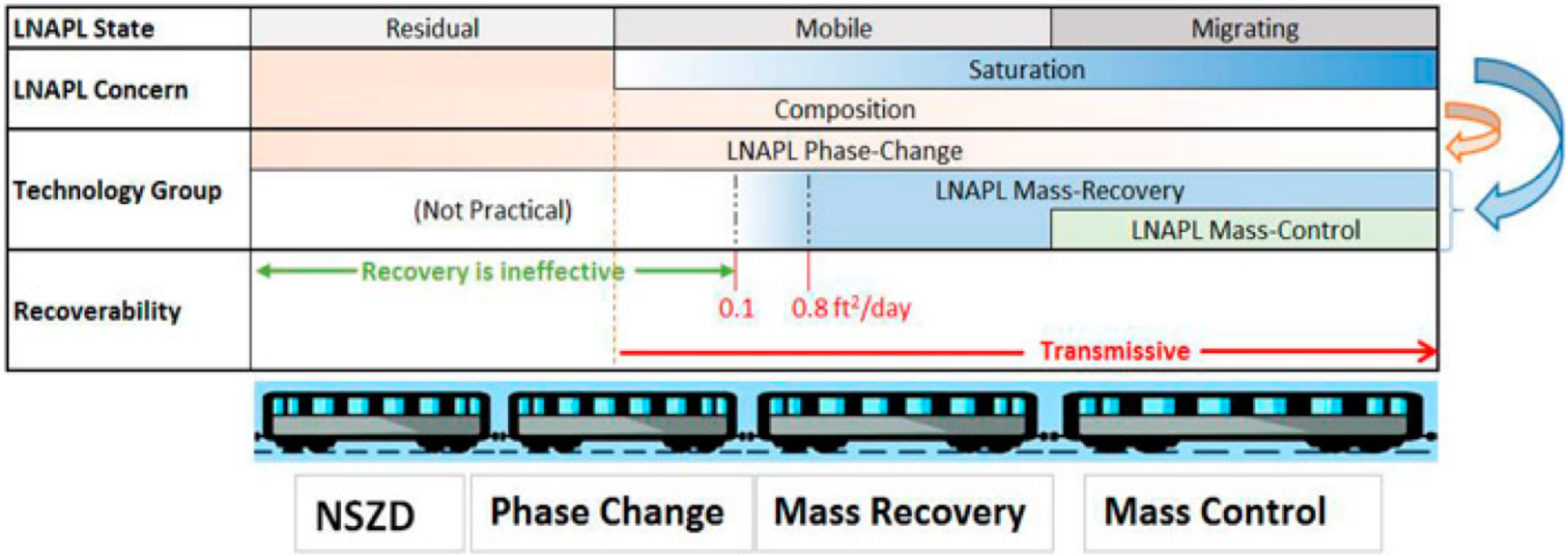
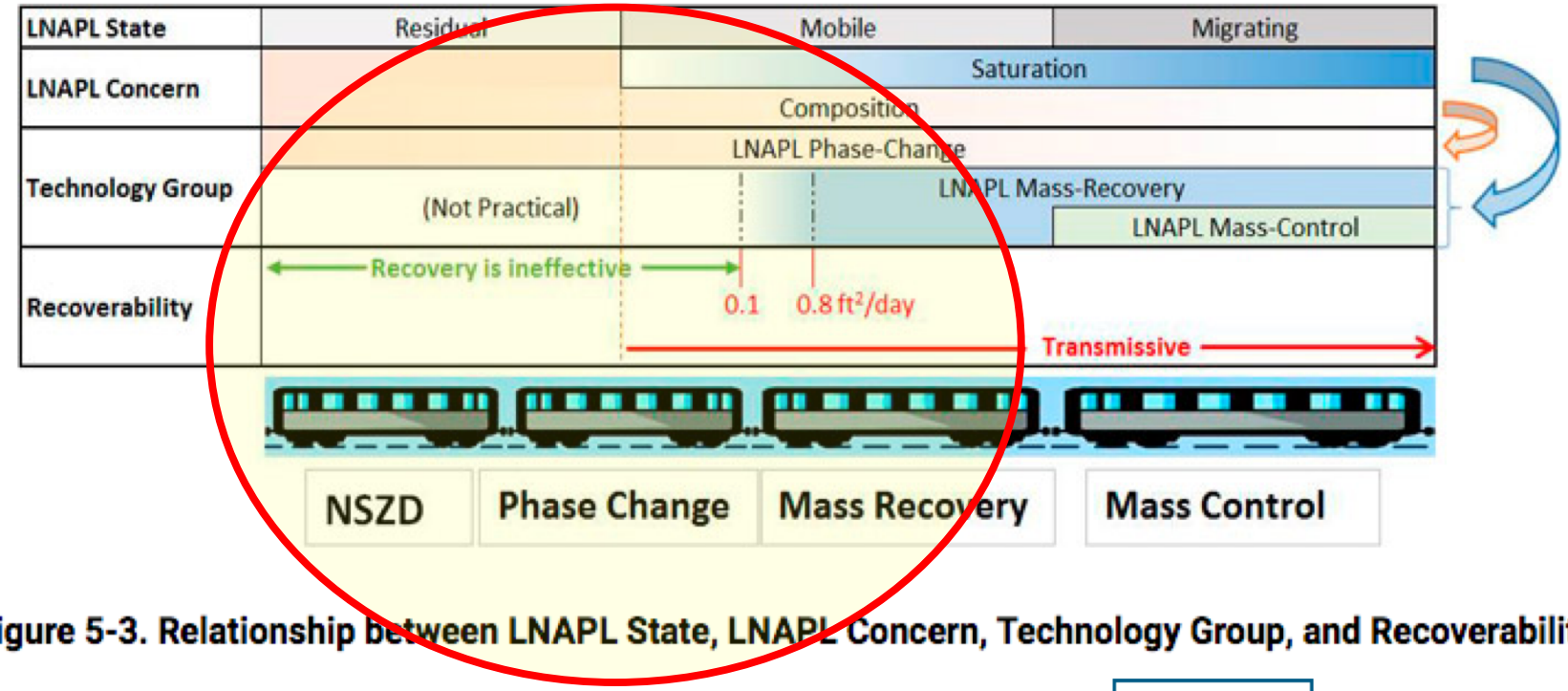


Figure 5-3. Relationship between LNAPL State, LNAPL Concern, Technology Group, and Recoverability.

LNAPL-3 METRICS



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LNAPL RECOVERY DECLINES TO NSZD

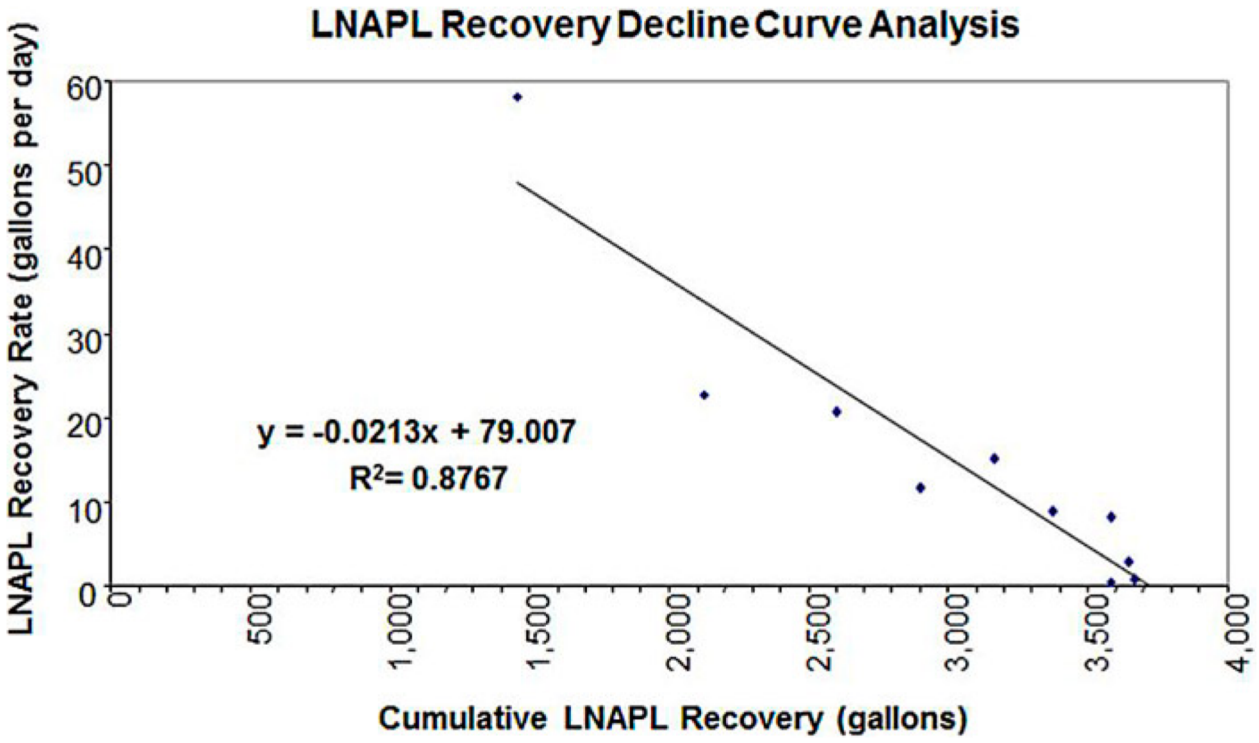


Figure 3-13. LNAPL recovery rate vs. cumulative volume recovered. *(courtesy of AECOM)*

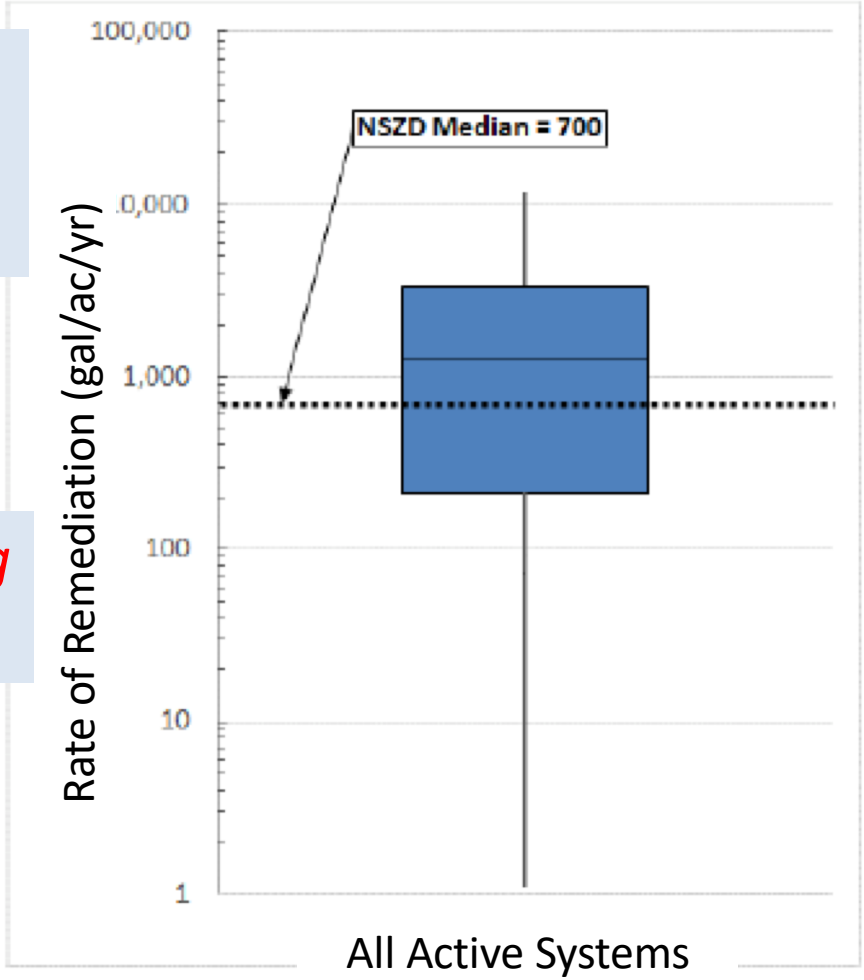
Empirical data suggests that LNAPL transmissivity values below 0.1 to 0.8 ft²/day indicate low recoverability and therefore, the majority of the LNAPL at a site is in a state of lesser mobile and residual saturation.

NSZD VS ACTIVE REMEDIATION

What mass removal rate are your remediation systems achieving?

NSZD Performance

What should you be paying for that performance?



McCoy, K., Zimbron, J., Sale, T., and Lyverse, M. (2014) Measurement of natural losses of LNAPL using CO2 Traps. Groundwater. doi: 10.1111/gwat.12240.

Palaia, T. (2016) Natural Souce Zone Depletion Assessment. Applied NAPL Science Review. 6: Issue 1. May.

Sihota, N. J., Singurindy, O., Mayer, K.U. (2011) CO2-Efflux Measurements for Evaluation Source Zone Natural Attenuation Rates in a Petroleum Hydrocarbon Aquifer.

Environment, Science and Technology. 45: 482-488.

PERFORMANCE METRICS

Table 5-2. Example performance metrics and remediation endpoints

Example Performance Metrics And Remediation Endpoints	Description
Asymptotic performance of optimized recovery system	Analysis of unit volume of LNAPL recovery or recovery rate per unit of time, after considering optimization. Endpoint reached when asymptotic curve indicates the limit of recovery effectiveness (e.g., analysis indicates that further recovery of remaining LNAPL is impracticable).
Decline curve analysis	Analysis of unit volume of LNAPL recovery or recovery rate per unit of time. Endpoint reached when decline curve analysis indicates that the remaining LNAPL volume is below threshold of concern, or the time and effort to recover the remaining volume is impracticable.
Dissolved-phase concentration	Concentrations stable or decreasing; endpoint reached when reduced to regulatory standards at a compliance point.
Dissolved-phase plume stabilized	If exhibited, then it is also an indication of a stable LNAPL body.
Limited/infrequent in-well LNAPL thickness	Stated LNAPL thickness objective or LNAPL thickness typically not observed in monitoring well under average site conditions. Indicative that LNAPL is not consistently recoverable and the majority of remaining impacts are residual.

SUMMARY

- A large segment of the U.S. population relies on groundwater that continues to be impacted by LUSTs.
- Over half of the open releases either remain uncharacterized or linger in remediation that is growing more expensive each year.
- Our scientific knowledge and technologies have outpaced both law and regulations put into effect 10 to 30 years ago.
- Sustainable financial management is necessary to successfully serve the many stakeholders in the *long-term management of liabilities* created by LUST.
- Remediation and program performance metrics are needed provide a common measuring stick on the use of resources
- Unlocking the power of innovation will provide a better return on remediation investment

COLUMBIA TECHNOLOGIES

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RESTORE,

Sustainably

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