

Into the MStC: ASTM's E3488-25 Standard Guide for Moving Sites to Closure (MStC) for Petroleum Underground Storage Tank (UST) Release

CLUIN

February 18, 2026

Tom Schruben

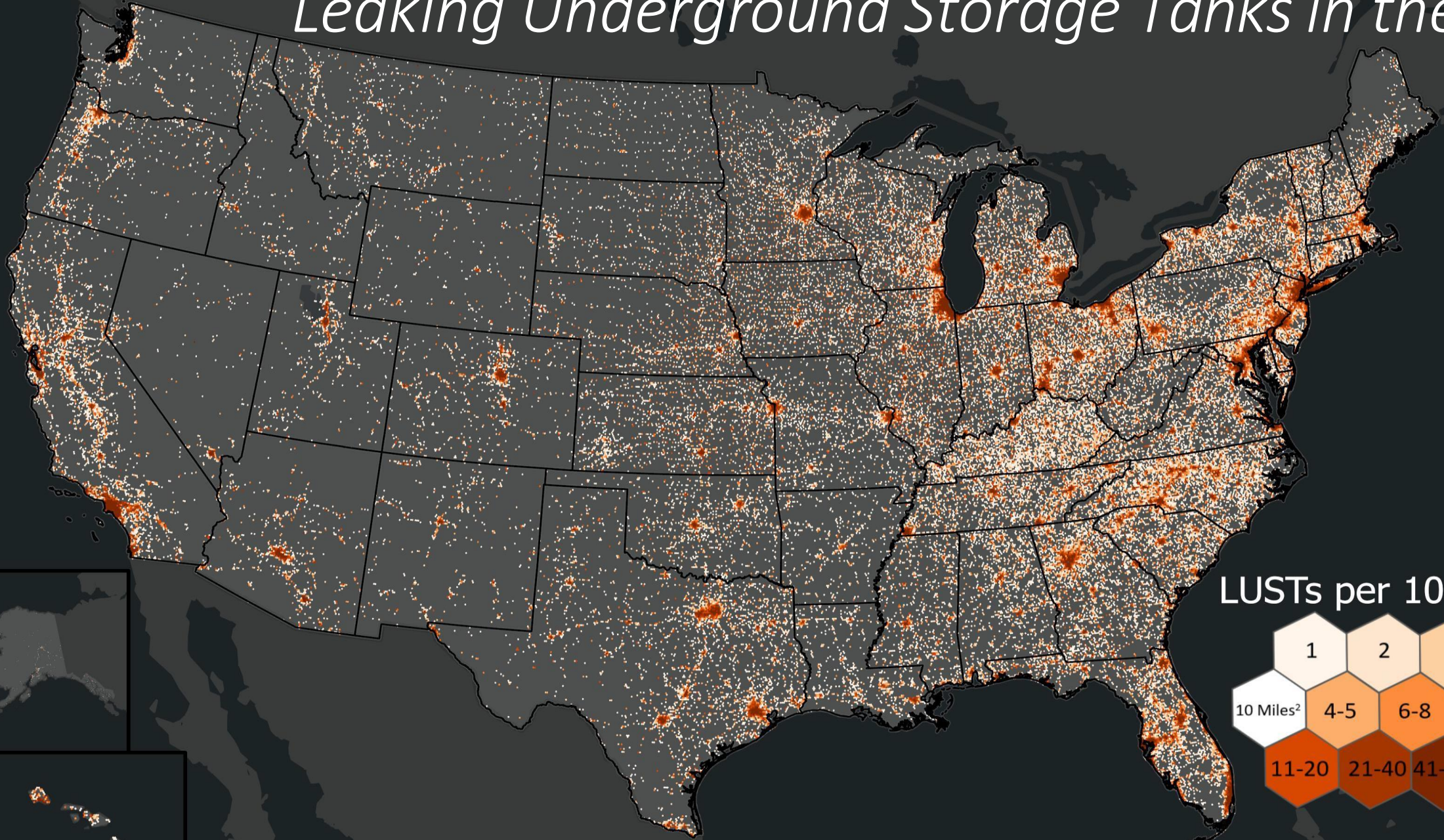
US EPA Office of Underground Storage Tanks



Today's Discussion Outline

1. Technical background
2. EPA clarification of free product removal
3. EPA exposure threat assessment policy statement
4. ASTM Moving Sites to Closure standard
5. Implementation

Leaking Underground Storage Tanks in the US



LUSTs per 10 miles²



From Alex Hall, EPA ORD.

Poll Question

In your experience, what is the most frequent reason petroleum UST release cases do not reach closure:

A. Lack of funding

B. Nonresponsive Owner

C. No access to properties to perform site assessment

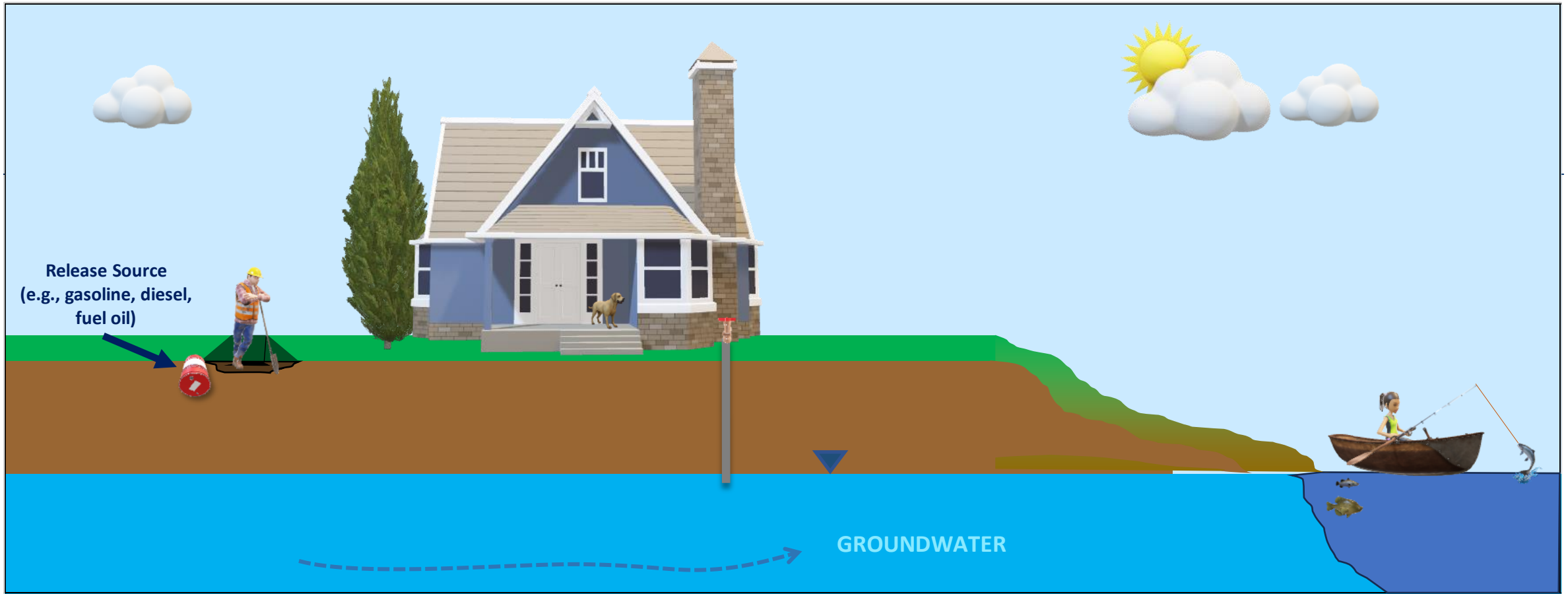
D. LNAPL in monitoring wells above state standards

E. Groundwater contamination above state standards

Evolution of Petroleum UST Corrective Action

	1980s	1990s	Current Best Practice
Cleanup goals	Universal Worst case exposure	Source, pathway, receptor Site-specific target concentrations	Screening distances Stability Alternative end points
Remedial Methods	Physical extraction	<i>in-situ</i> methods	Recoverability Natural Source Zone Depletion (NSZD) Enhanced biodegradation
Natural Degradation	A mystery	Tests for biodegradation	Rely on biodegradation Calculate rate

Source, Pathways, and Receptors for Petroleum UST Releases



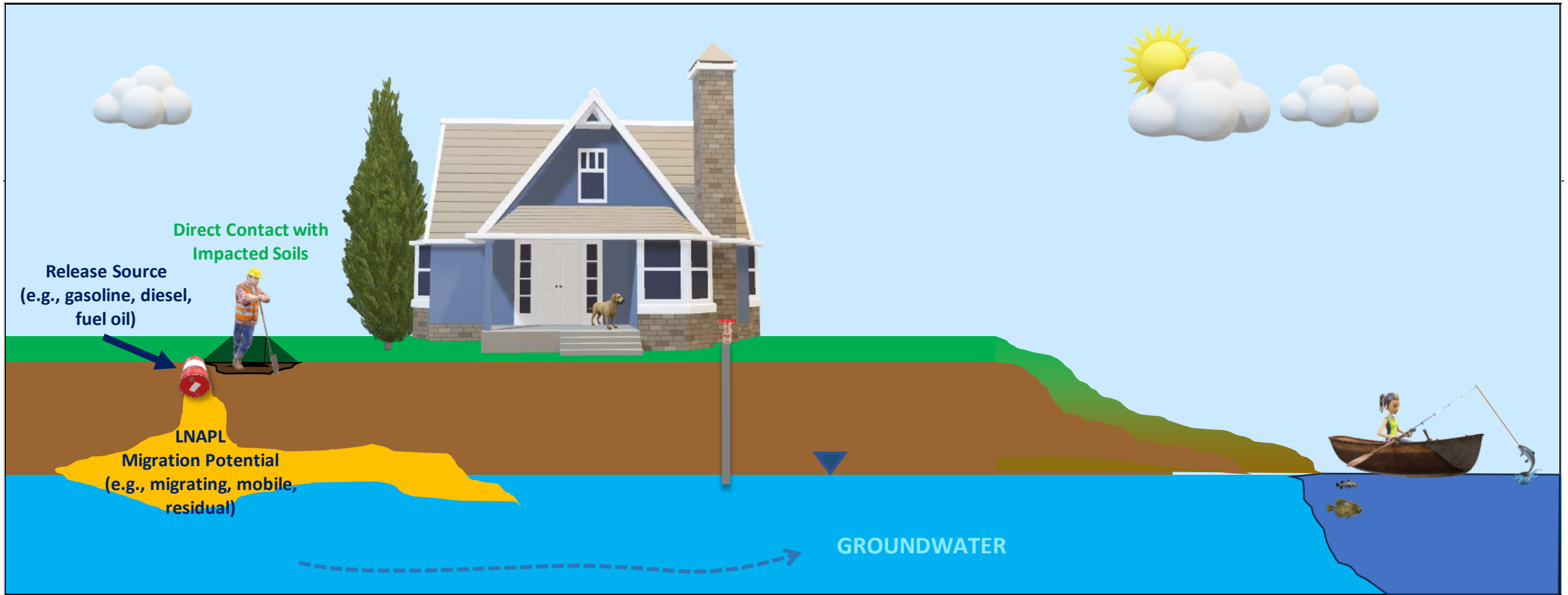
COLOR KEY

Sources: identified with dark blue text

Migration Pathways: identified with lighter blue text

Receptors and Exposure: identified with green text

Source, Pathways, and Receptors for Petroleum UST Releases



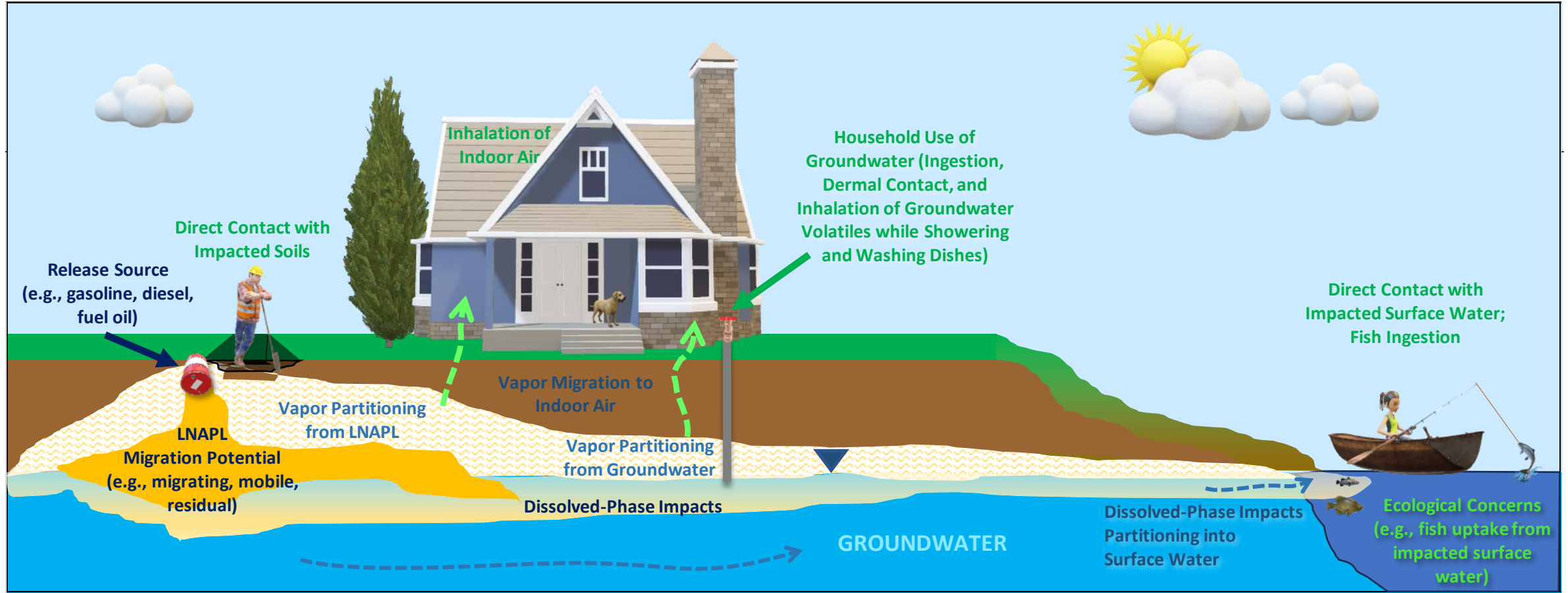
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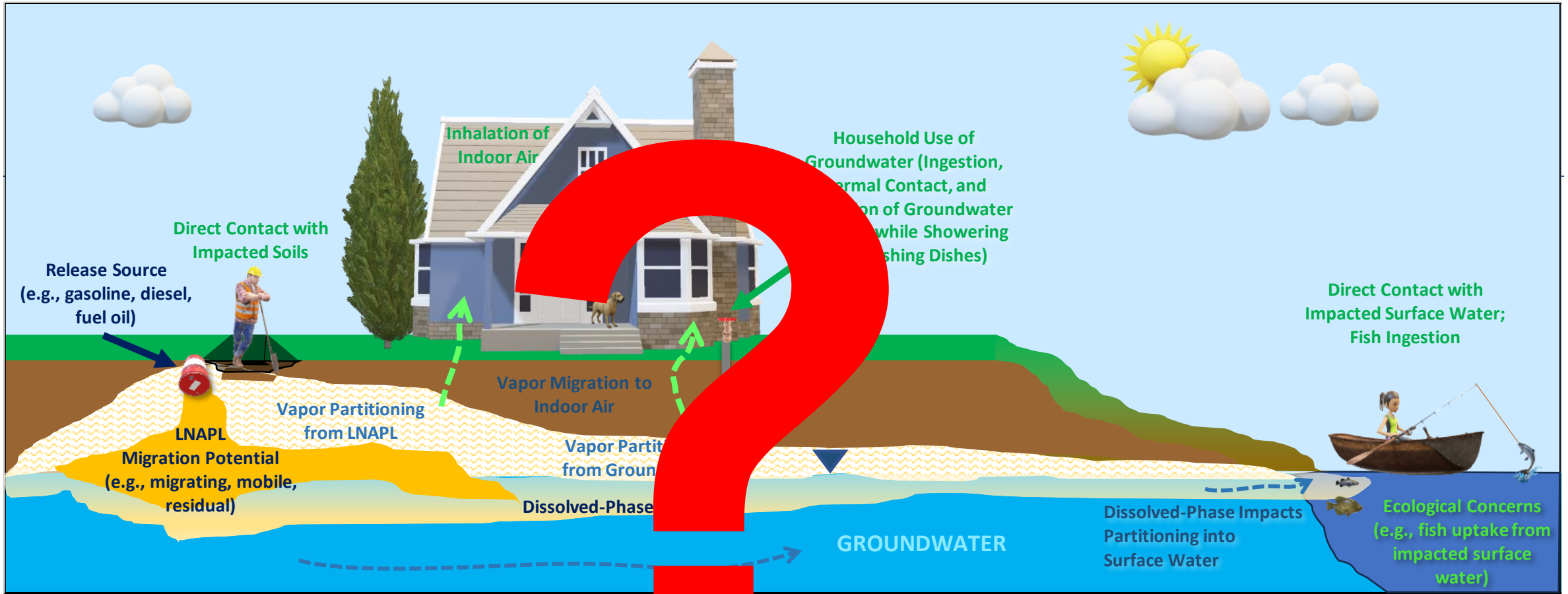
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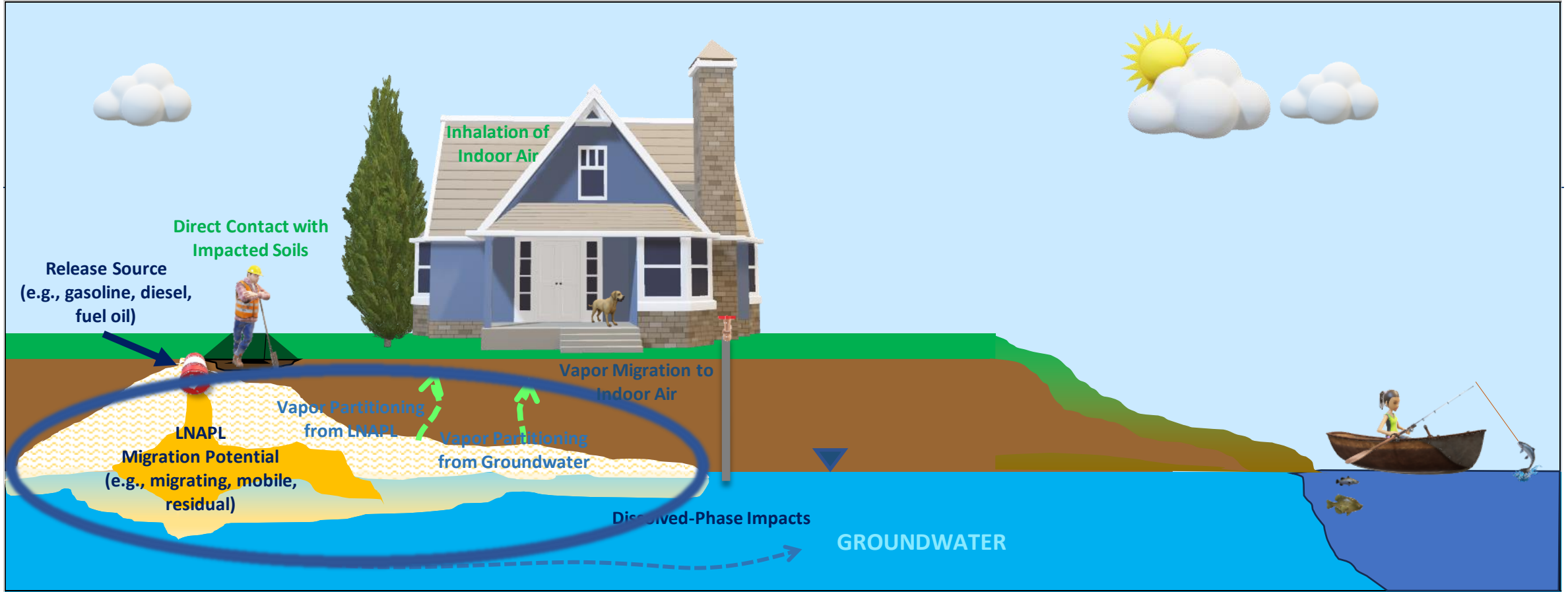
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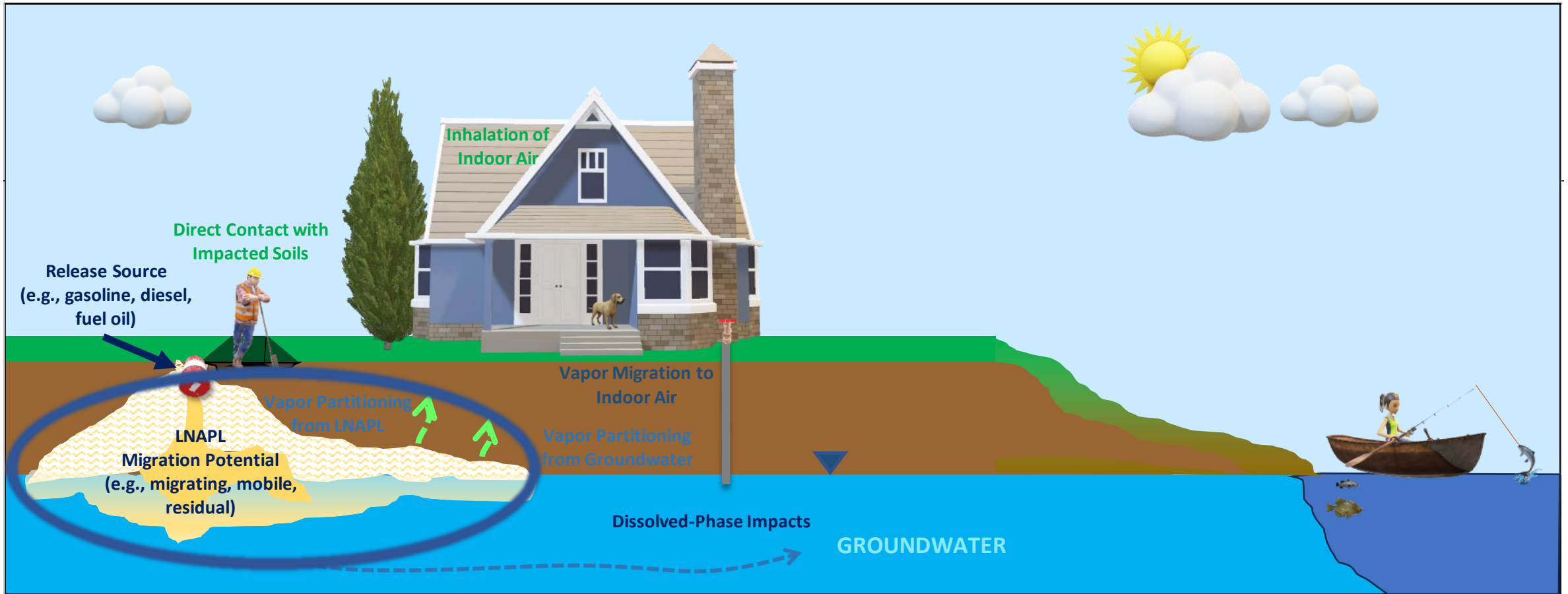
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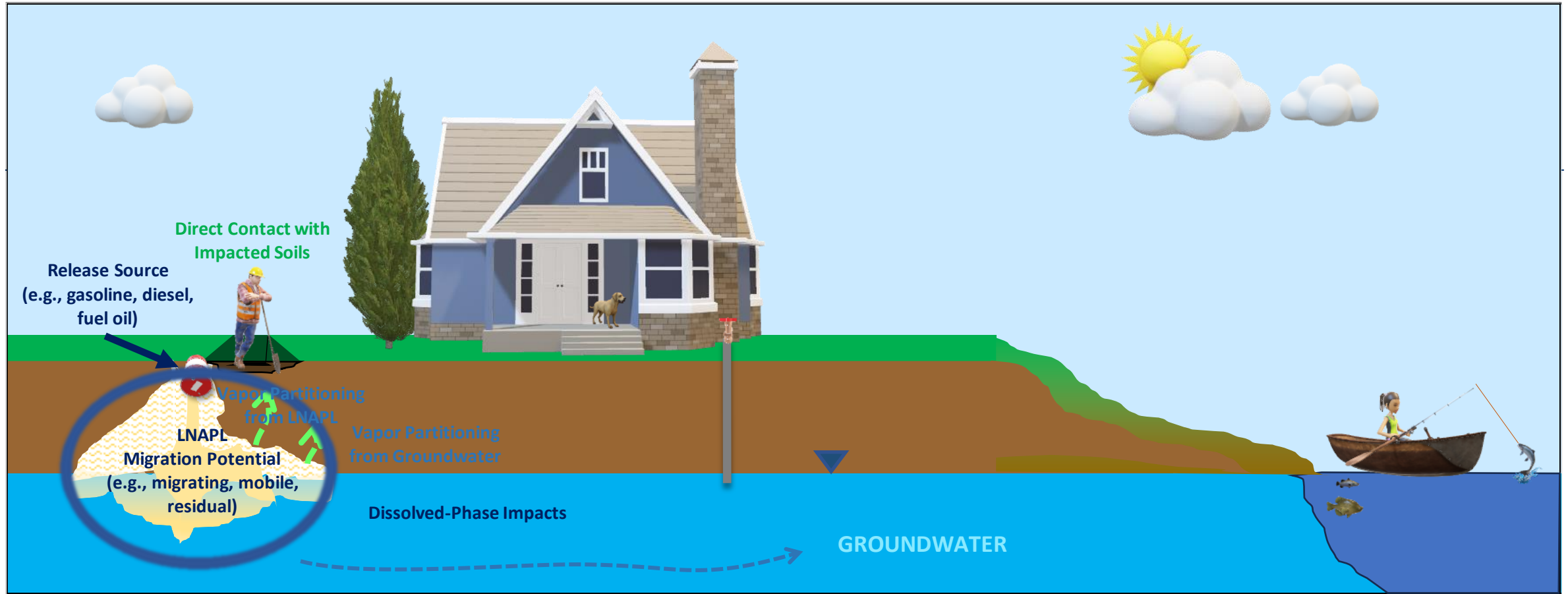
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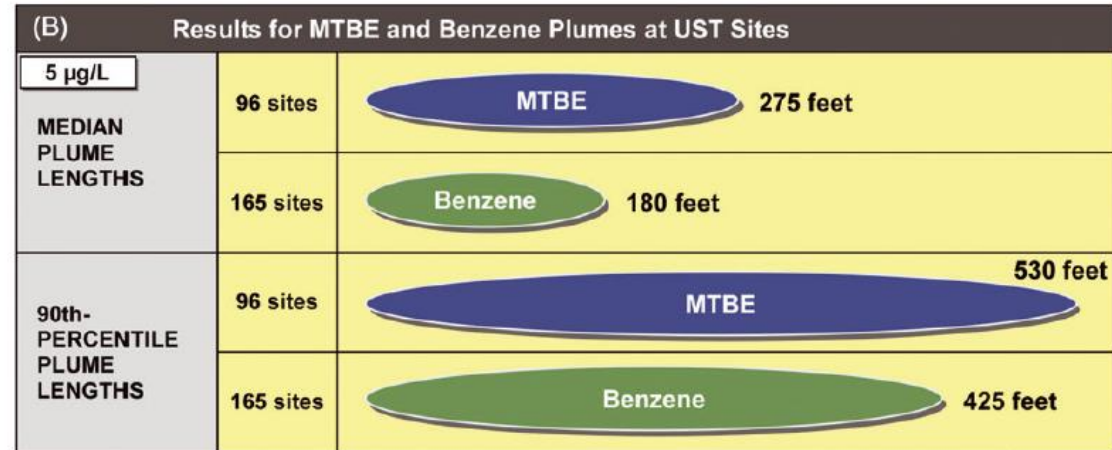
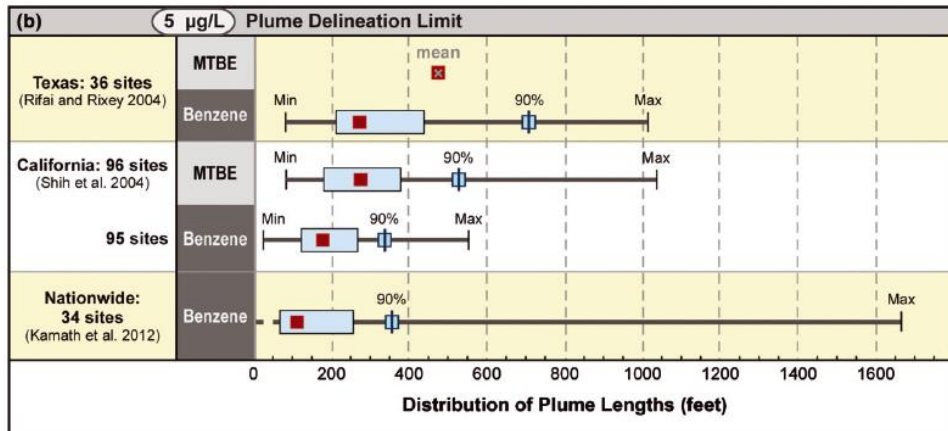
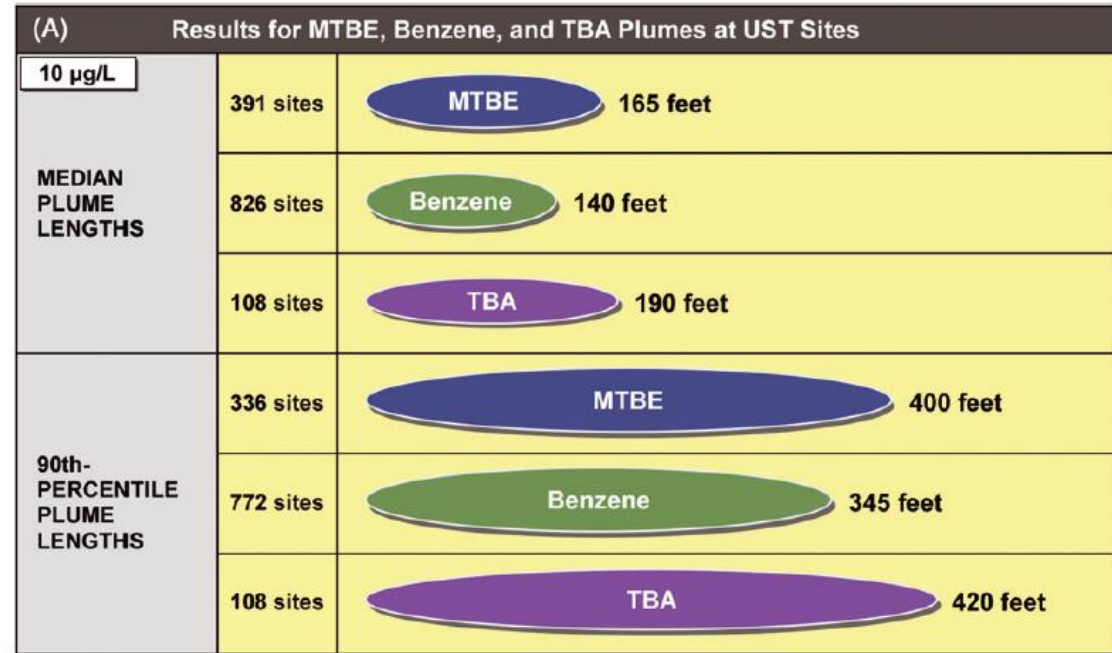
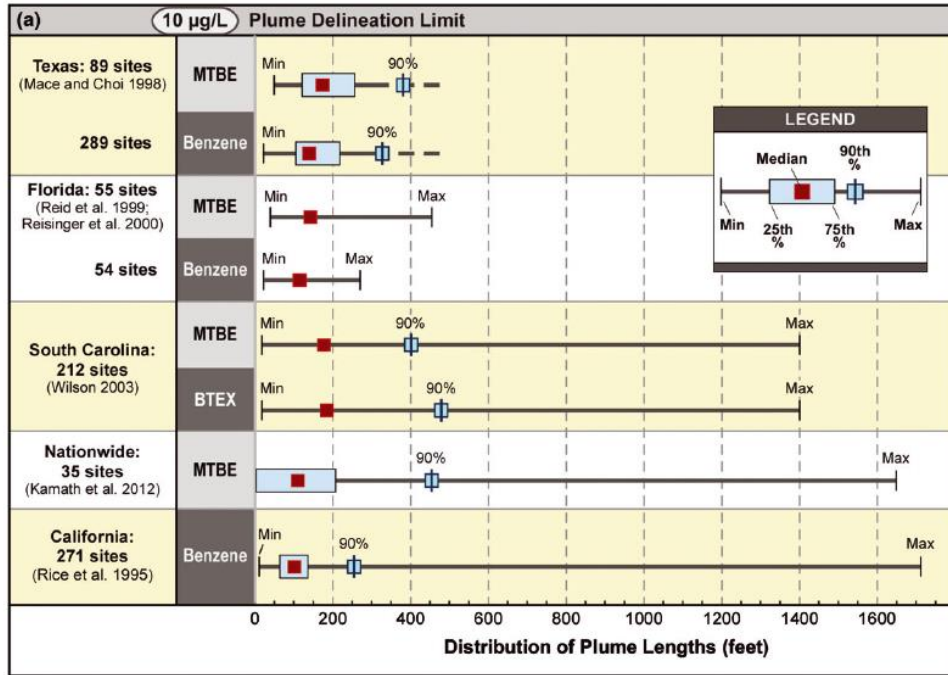
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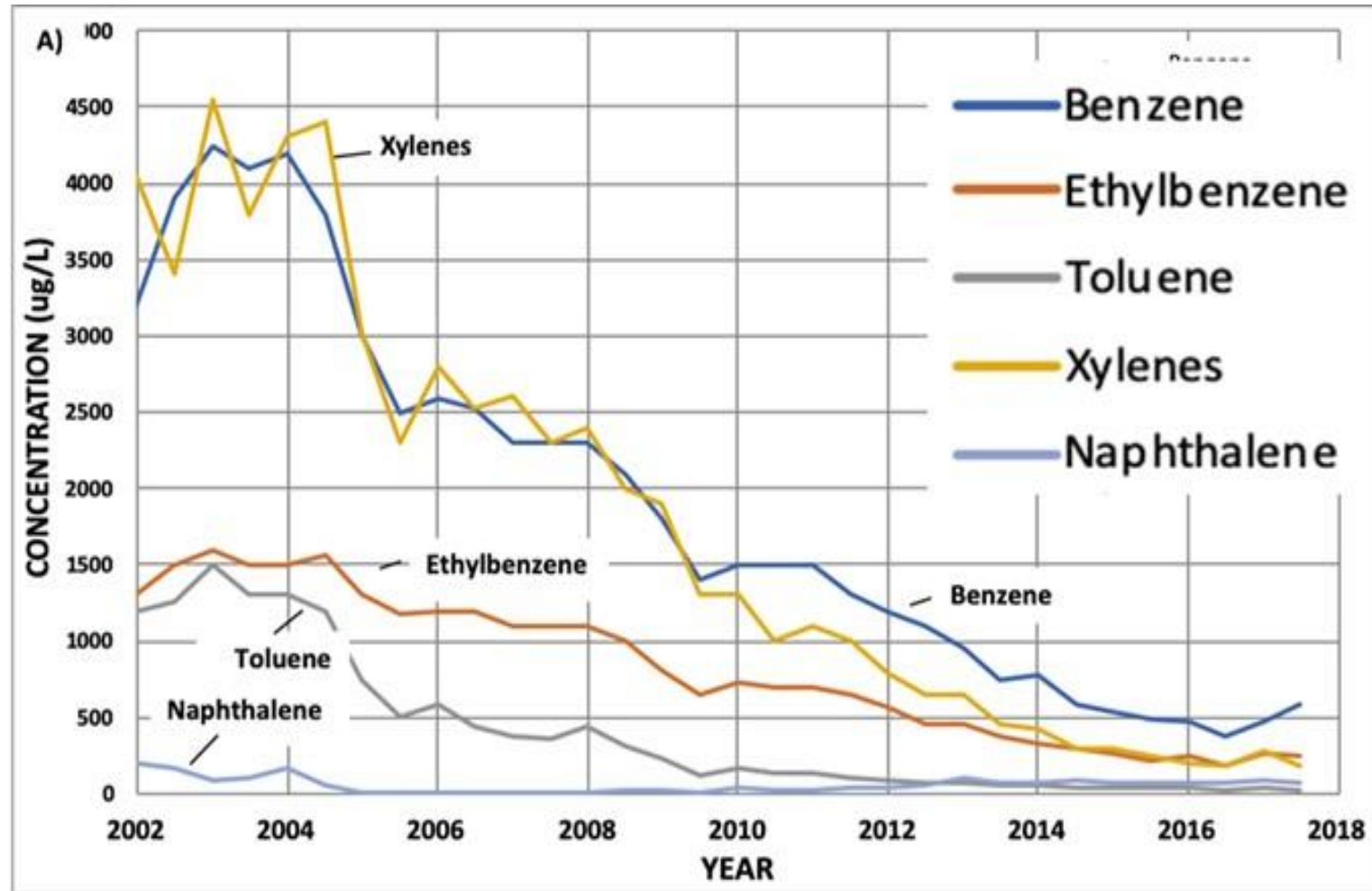
Science to Support Screening Distances for Groundwater Plumes



Connor, J.A., Kamath, R., Walker, K.L., and T.E. McHugh. 2015. Review of quantitative surveys of the length and stability of MTBE, TBA, and benzene plumes in groundwater at UST sites. *Groundwater Monitoring and Remediation*. 53:195-206. <https://ngwa.onlinelibrary.wiley.com/doi/epdf/10.1111/gwat.12233>.

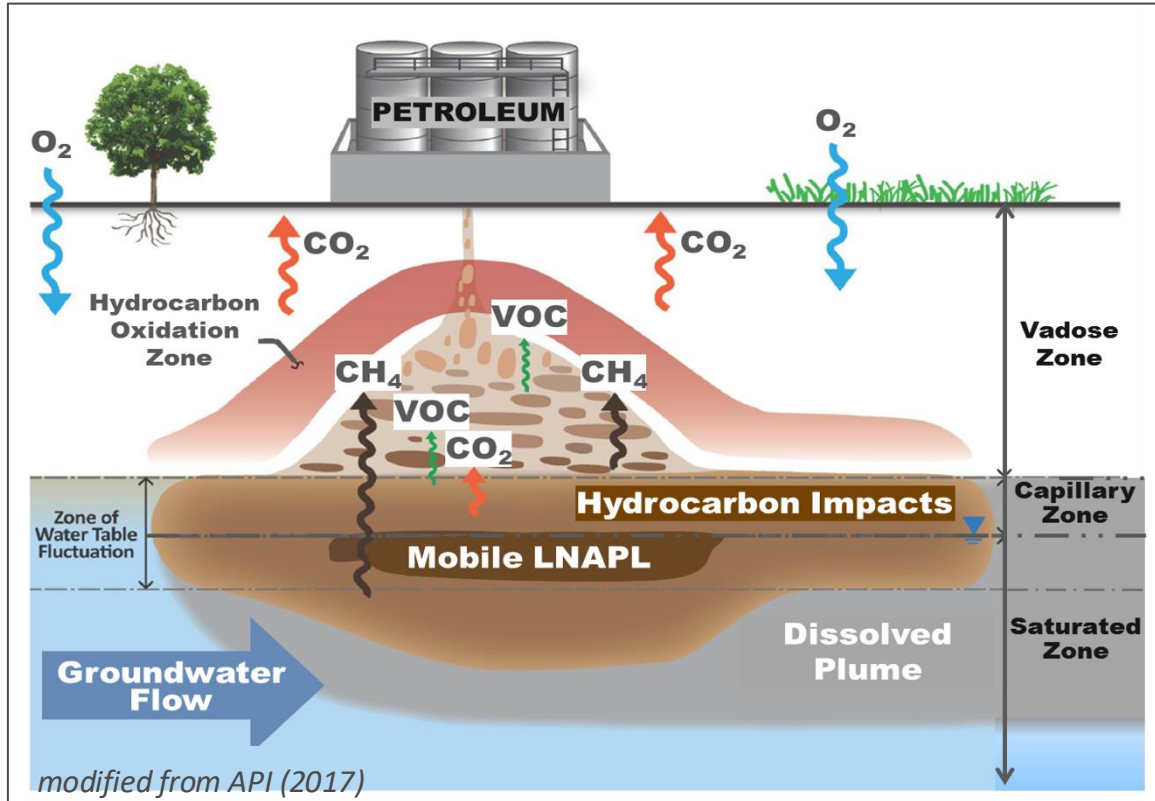
Science to Support Natural Attenuation Remedy

Median GW Source Area Concentrations over Time (at 1000s of Sites)



McHugh, T.E., Newell, C.J., Beckley, L.M., Adamson, D.T., DeVaul, G.D., and M.A. Lahvis. 2022. Forecasting groundwater remediation timeframes: Site-specific-temporal monitoring results may not predict future performance. *Groundwater Monit. Rem.* <https://doi.org/10.1111/gwmr.12508>

Science to Support Transitioning from Active Remediation to Natural Attenuation



NSZD is critical hydrocarbon mass-loss pathway that should be factored into remedial decision making:

70% of hydrocarbon can directly outgas to vadose zone (Ng et. al., 2015)

Rates consistent w/ some engineered remediation (700 – 4,000 gal/acre/yr - - Garg et al., 2017; 50 - 6,000 gal/acre/yr – Zimbron, 2025)

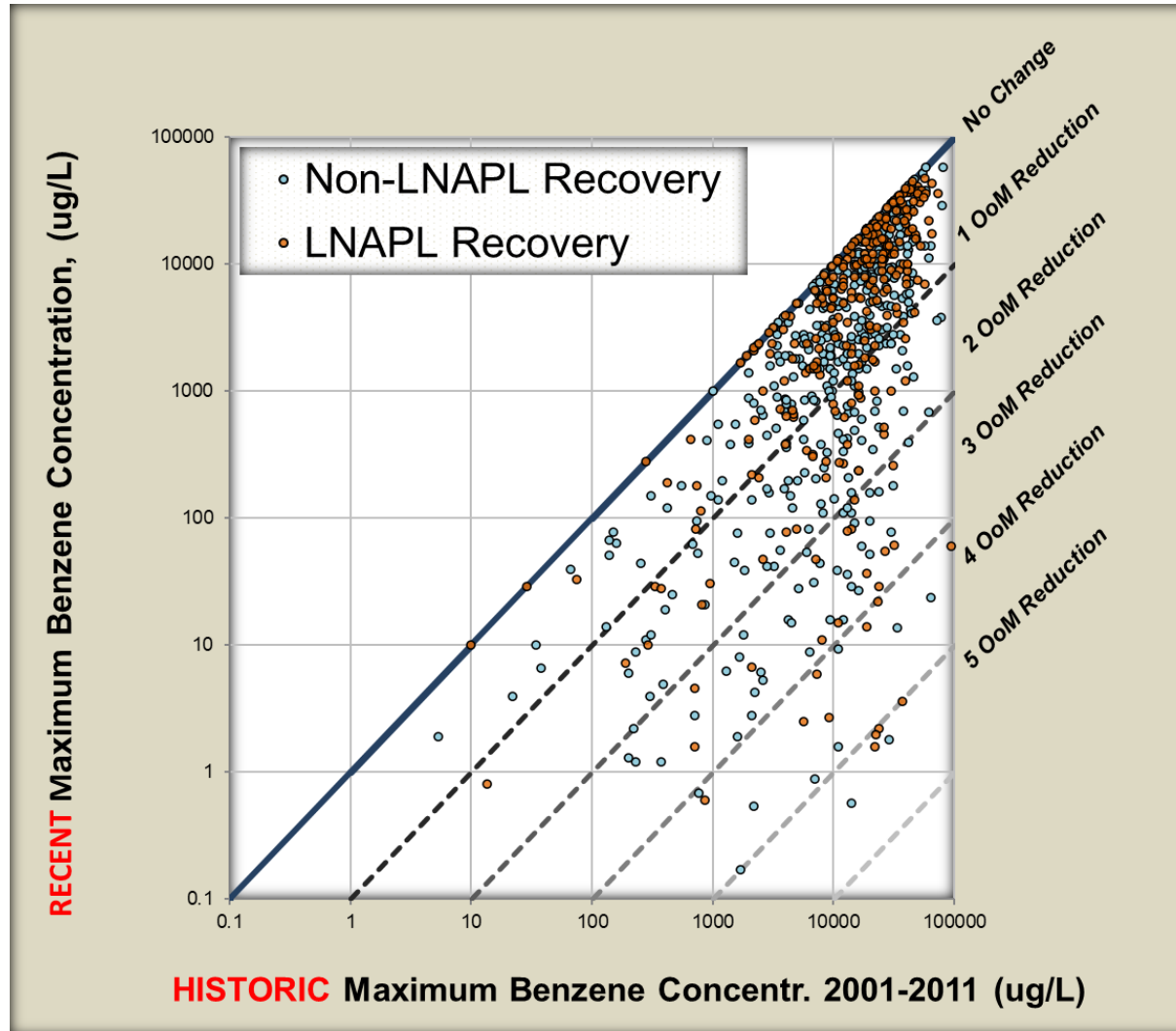
API, 2017. Quantification of vapor phase-related natural source zone depletion processes. American Petroleum Institute Publication #4784. API Publishing Services, 1220 L. Street, NW, Washington, DC. May 2017.

Garg, S., C.J. Newell, P.R. Kulkarni, D.C. King, D.T. Adamson, M.I. Renno, and T. Sale. 2017. Overview of Natural Source Zone Depletion: Processes, Controlling Factors, and Composition Change. Groundwater Monit. Rem. 37, 62-81. <https://doi.org/10.1111/gwmr.12219>

Ng, G.-H.C., Bekins, B.A., Cozzarelli, I.M., Baedecker, M.J., Bennett, P.C., Amos, R.T., and W.N. Herkelrath, 2015. Reactive transport modeling of geochemical controls on secondary water quality impacts at a crude oil spill site near Bemidji, MN, Water Resour. Res., 51, 4156–4183, <http://doi:10.1002/2015WR016964>

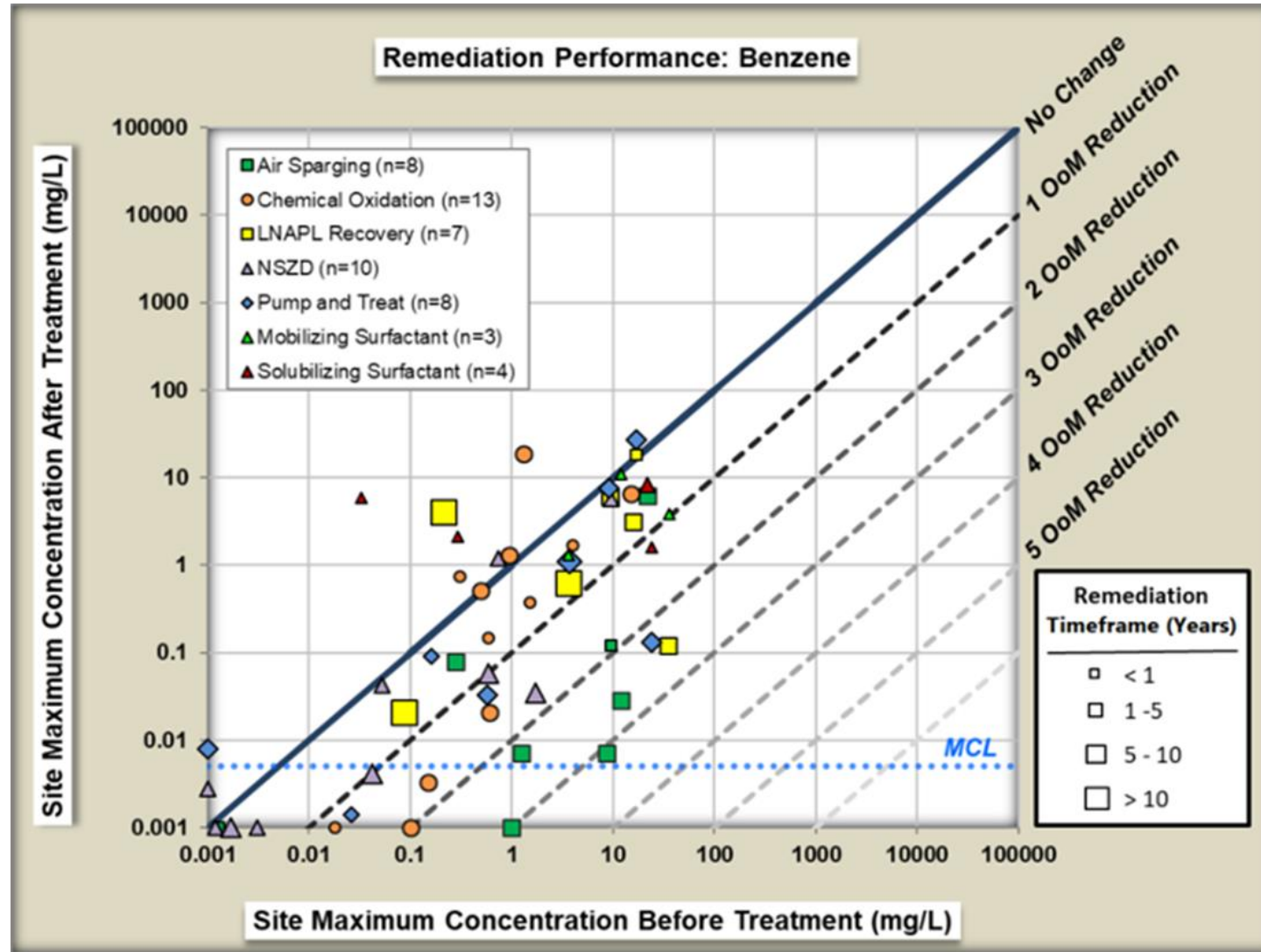
Zimbron, J., Resetting Expectations for the Rates of Natural Source Zone Depletion ;LUSTLine #95, 2025, <https://neiwpc.org/lustline/95/resetting-expectations-for-the-rates-of-natural-source-zone-depletion/>

Science to Support Remedial Decision Making at LNAPL Sites



From: McHugh, T.E., Kulkarni, P.R., Newell, C.J., Connor, J.A., and S. Garg. 2014. Progress in Remediation of Groundwater at Petroleum Sites in California. *Groundwater Monit. Remed.*, <https://doi.org/10.1111/gwat.12136>

Science to Support Remedial Decision Making at LNAPL Sites



Farhat, S., McHugh, T., and DeBlanc, P. 2022. LNAPL Remediation Technologies, ESTCP EnviroWiki. https://www.enviro.wiki/index.php?title=LNAPL_Remediation_Technologies

Clarification of Free Product Removal Requirements



EPA UST Technical Compendium: Release Investigation, Confirmation, and Corrective Action; Question 6:

- LNAPL vs. Free Product.
- 40 CFR 280.64 requires LNAPL recovery if it is migrating to clean areas.
- 40 CFR 280.65 and .66 require assessment and remediation of LNAPL if needed to protect human health and the environment.

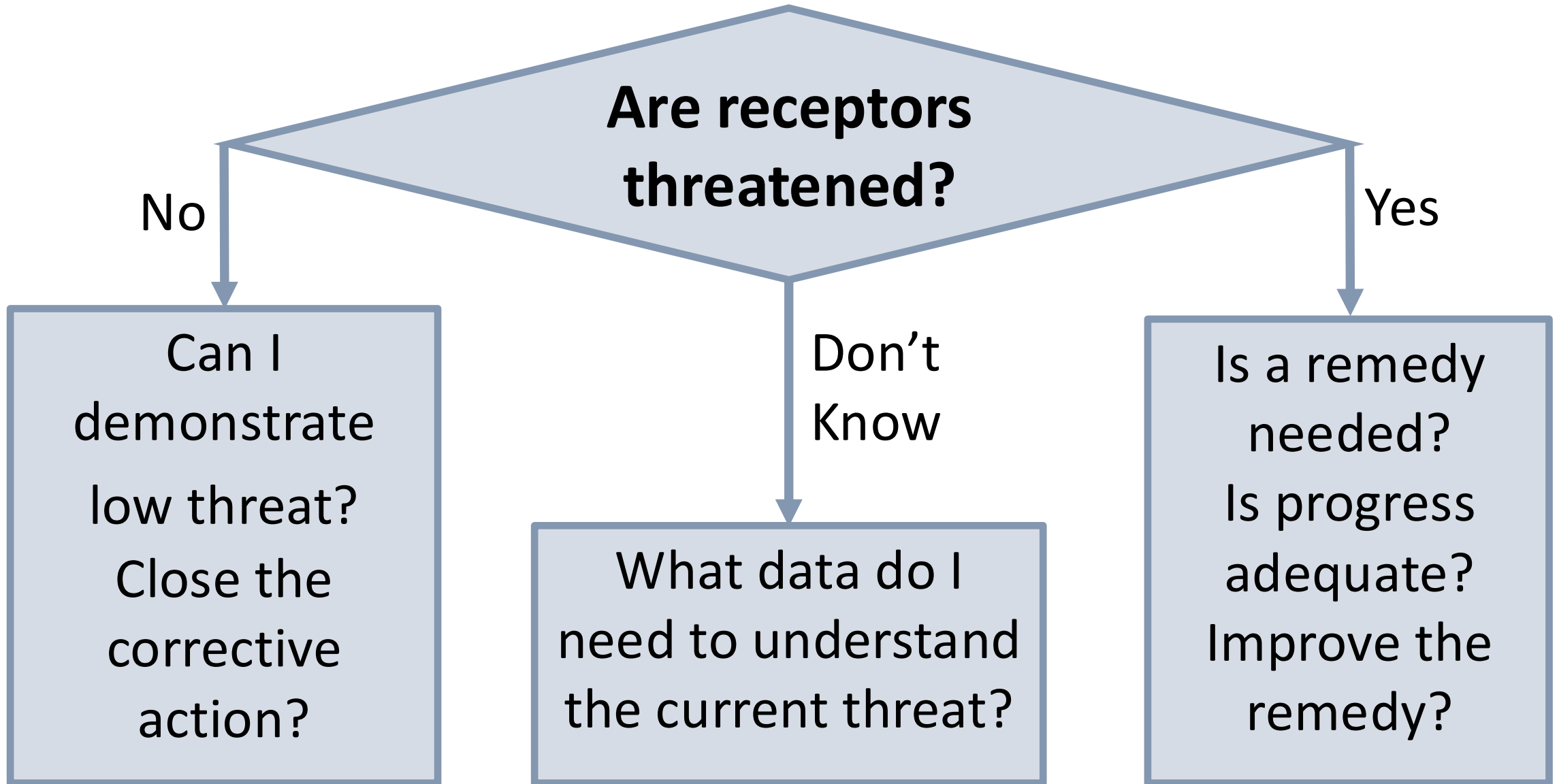
Reassessing Exposure Threats from Petroleum Underground Storage Tank Releases



Policy statement encourages Implementing Agencies to:

- Assess current threats at open sites using the latest science.
- Focus resources on high-threat sites and close low-threat sites.
- Make the assessment process open so owners can conduct assessments.
- Consider the ASTM Moving Sites to Closure standard as a framework.

Threat Assessment



Benefits of Threat Assessment at Open UST Release Sites



Define and respond to previously unrecognized threats.



Improve communication with owners and the public.



Minimize barriers to reuse or redevelopment caused by unknowns.

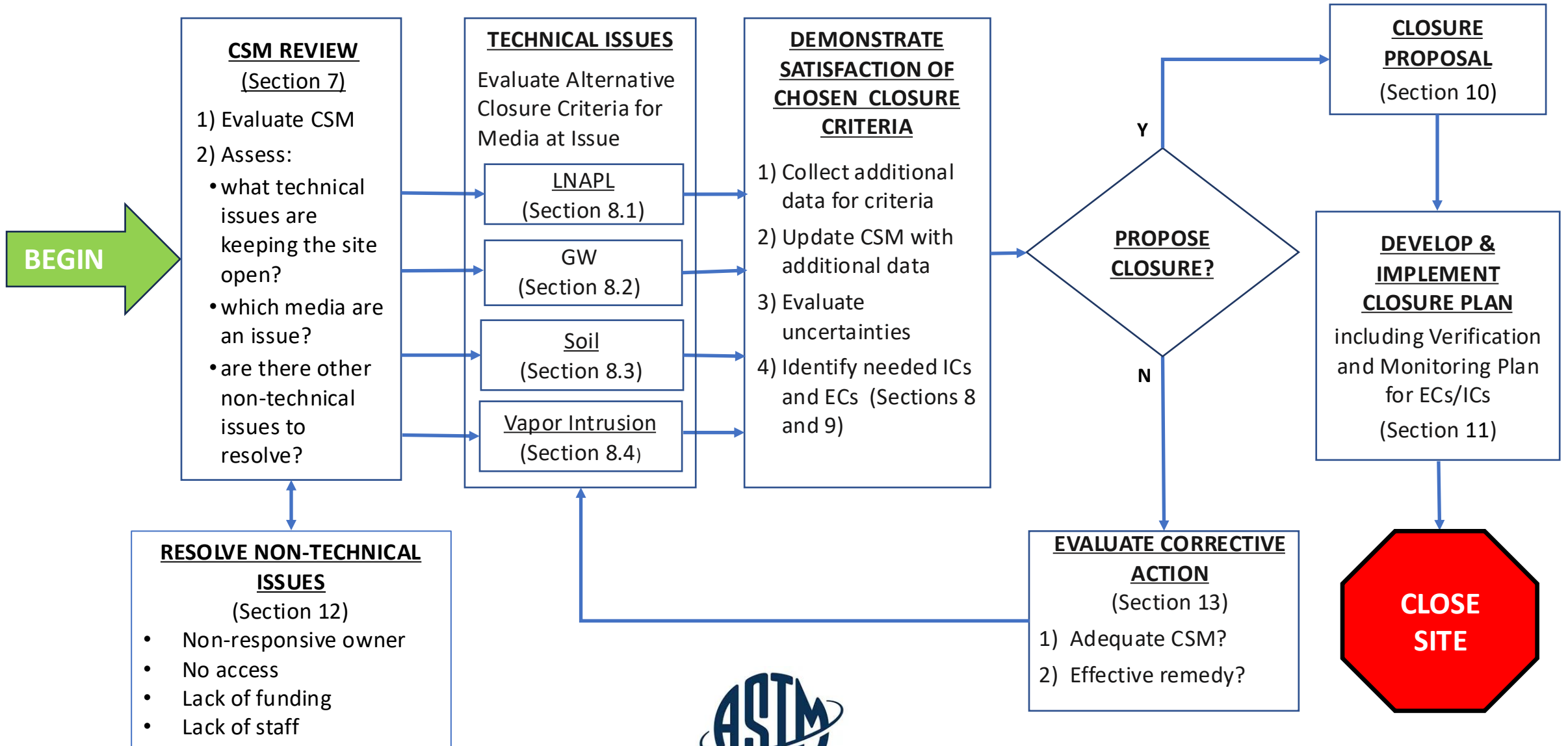


Enable efficient use of cleanup funds and staff resources.

ASTM's E3488-25 Standard Guide for Moving Sites to Closure for Petroleum Underground Storage Tank Releases (MStC)

- Four-year process to develop
- Broad, 90-person Task Group
- ASTM published in May 2025
- Outreach throughout

MStC Process



Prerequisites to Apply Alternative Closure Criteria

- The release has stopped.
- No current impacts to receptors.
- No migrating LNAPL.
- Basic CSM.

Questions for every CSM

- Are any receptors currently exposed? - What type of receptors?
- Is there a potential for exposure to receptors, including reasonably anticipated future receptors?
- Is there a potential for LNAPL migration?

Potential additional questions for CSM if the answer to any of the questions above is YES

- Are dissolved GW contaminants likely to migrate to the current and potential receptors?
- If it is likely that remedial action will be needed, what characteristics of the subsurface could affect removal or treatment of the LNAPL and dissolved groundwater contamination?

How much additional data should I collect?

A CSM is generally complete if additional data will not meaningfully alter the:

- Exposure assessment
- Corrective action, mitigation, and site closure decisions

Key Point: Don't collect data to collect data. Data should only be collected with a clear purpose and end use in sight.

Alternative Demonstrations that LNAPL is Not Migrating

- Decreasing LNAPL measurements.
- Stable groundwater plume.
- Residual footprint > mobile LNAPL footprint.
- LNAPL transmissivity.
- Residual LNAPL in the soil >> gauged LNAPL thickness.

Alternative Criteria for Closure for GW, Soil, and VI

Demonstrate low threat based on:

- Distance screening.
- Contaminant concentrations.
- Mass flux/Discharge.

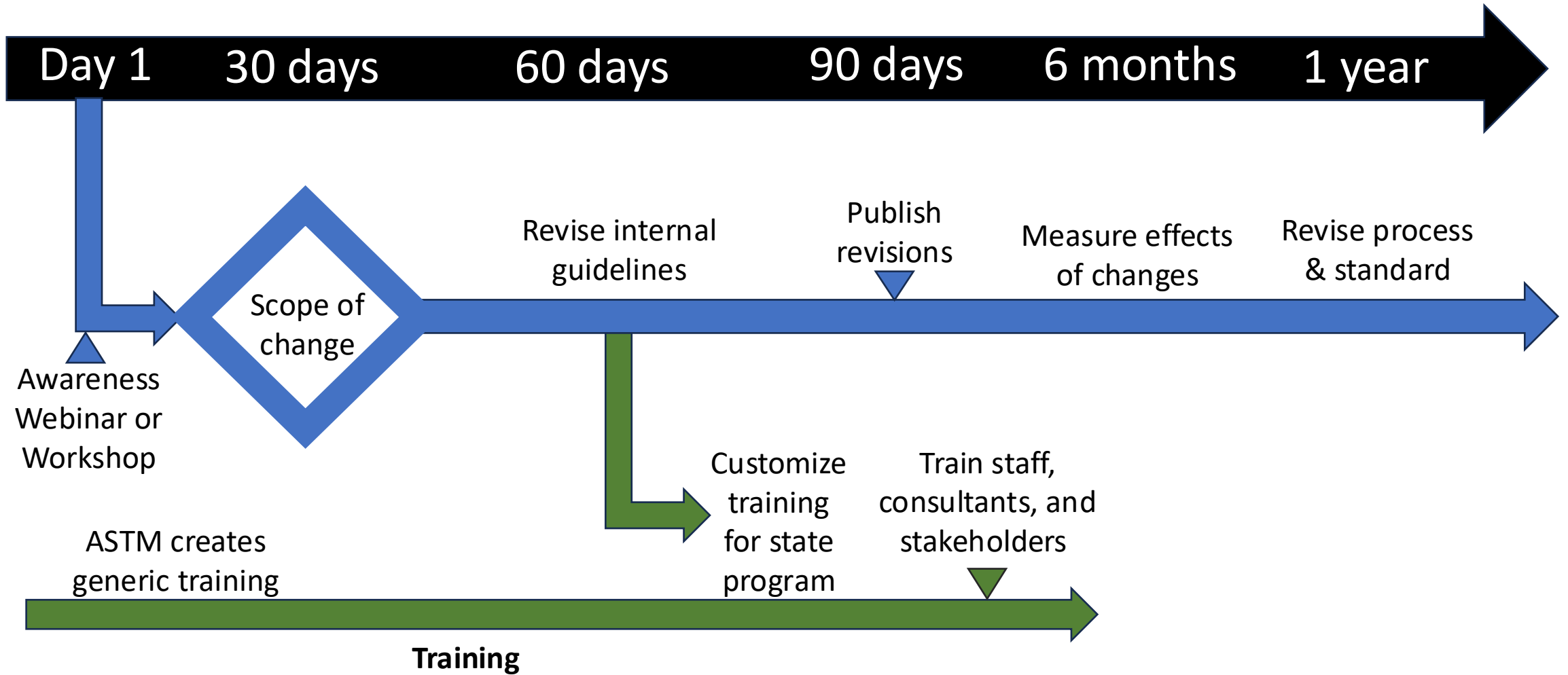
Major Changes from Prior Approaches

- Assess current threats.
- Consistent with groundwater non-degradation goals.
- Stability vs. concentrations – more descriptive than numeric.
- Groundwater stability by trends or retraction.
- LNAPL may be acceptable if not migrating.
- Less monitoring of natural attenuation.
- Review remediation effectiveness.

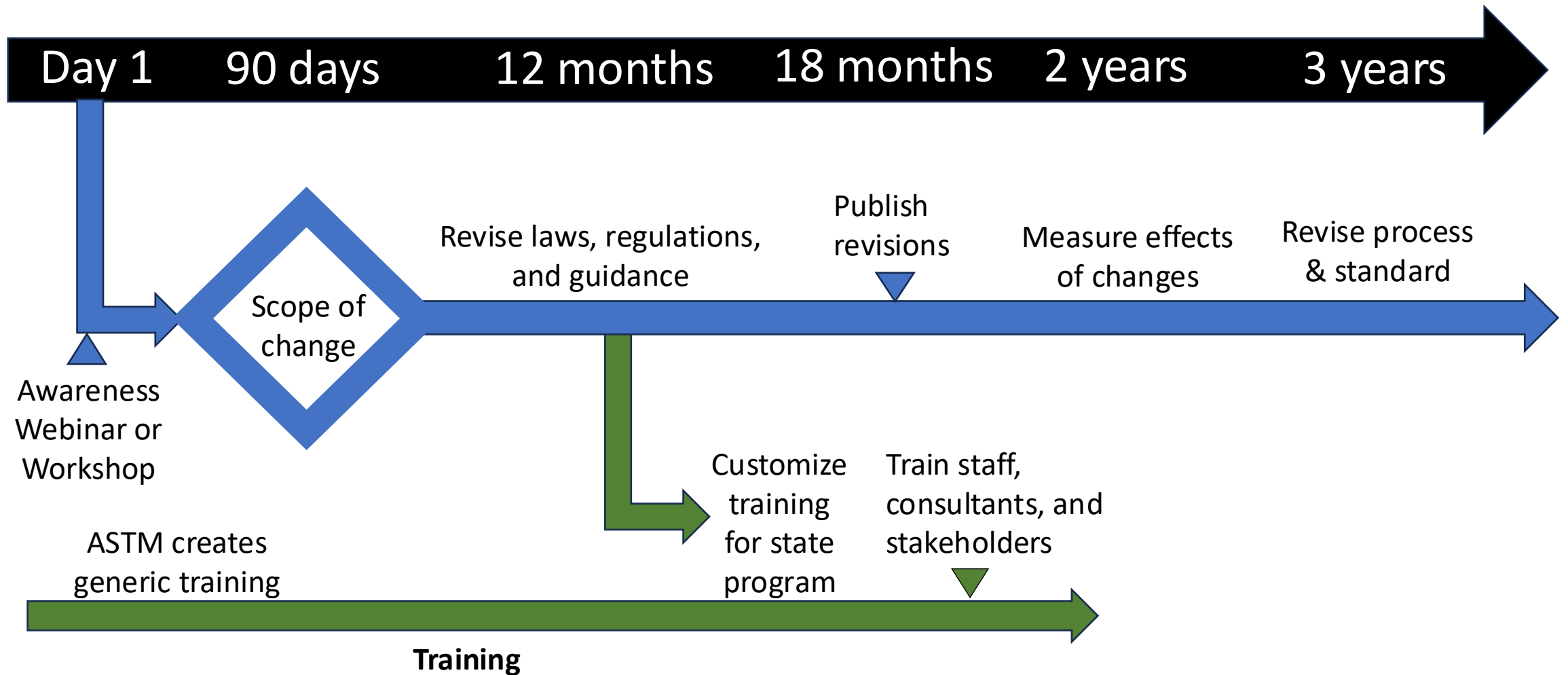
Implementation Approach

- Focus on training and assistance.
- Partnering with ASTM to develop and deliver training.
- Tailored training and assistance to implementing agencies.
- Presentations and workshops at industry meetings and professional conferences.

Pathway to MStC Adoption



Significant Barriers to MStC Adoption





Questions?

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