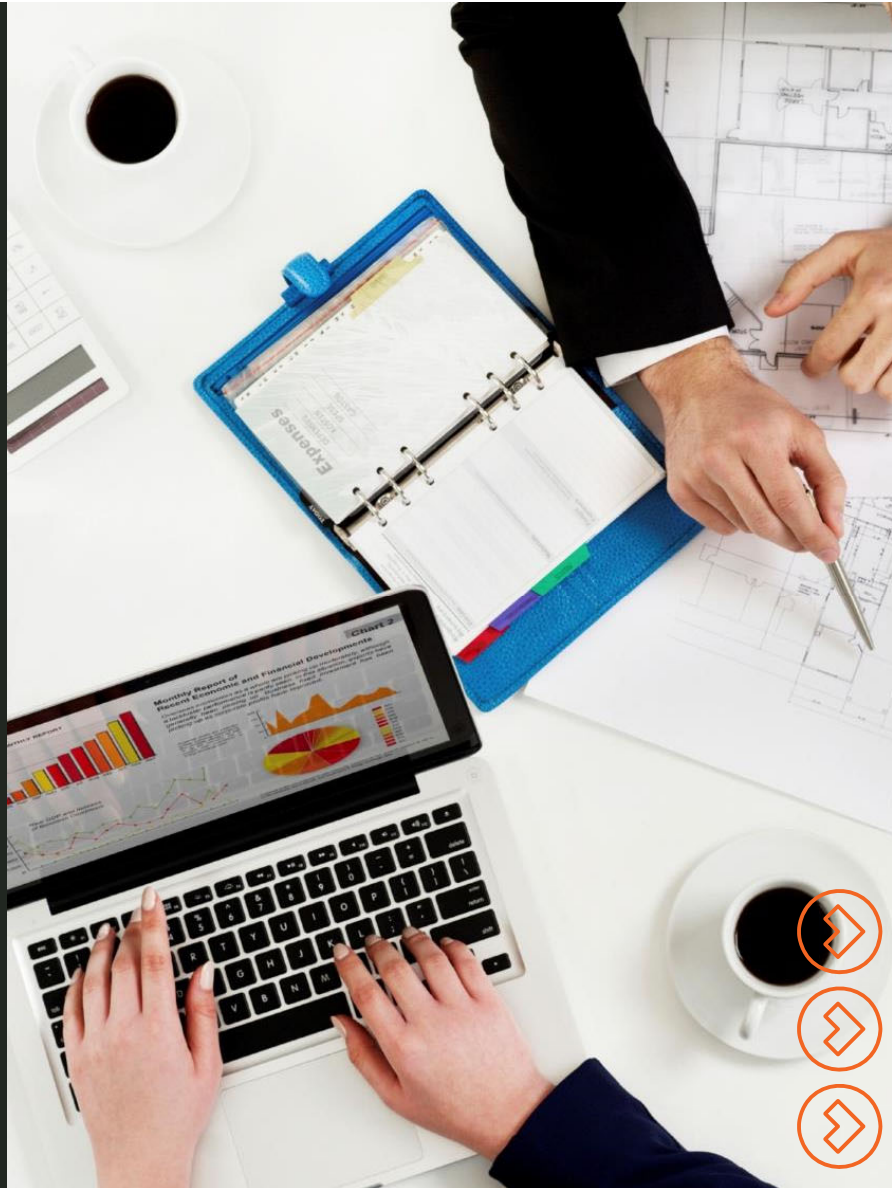




PRESENTS:

Best Practices for NAPL Mobility Core Collection in Sediment

A Systematic Approach to Maximize Sample Integrity



AGENDA

Trends in NAPL Mobility Testing

Why Now?

Framework for Core Collection

Target Interval

Conclusion





Trends in NAPL Mobility Testing

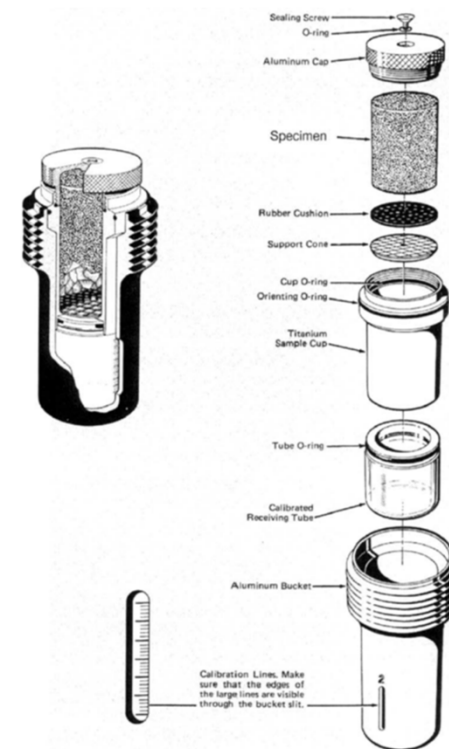
Trend 1 – Increased Sophistication in Testing

Early – Mid 2000's - Centrifugation at 1000x gravity for 1 hour, after Brady and Kunkle Method

- **Advantages:** Economical, quantitative, short-duration, regulatory acceptance
- **Disadvantages:** Air is permeating fluid, excessive force

Current Trend – Rigid/flexible-walled permeameter

- **Advantages:** Water is permeating fluid, gradients or flux similar to site conditions
- **Disadvantages:** Can be expensive and time consuming for lower permeability sediments



Brady M.M., L.A. Kunkel, A screening Method for Determining Free Product Mobility, Petroleum Hydrocarbons and Organic Chemicals in Groundwater: prevention, Assessment and Remediation Conference, 2005

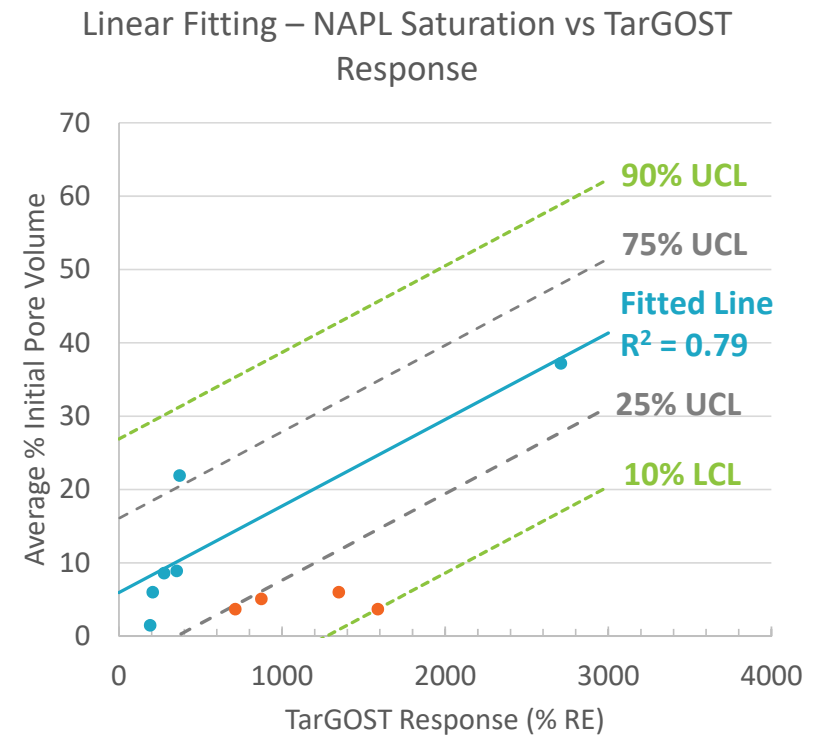
Trend 2 – Increased Evaluation by Practitioners

Early

- Mobility potential from discrete sample applied to a less surgical removal

Current Trend

- Multiple lines of evidence to assess the site significance of mobility test results
- Correlating discrete test results to other parameters (multiple lines of evidence)



Trend 3 – Increased Consideration By Regulatory Agency

Early

- Intrusive remedial decisions based on NAPL presence alone

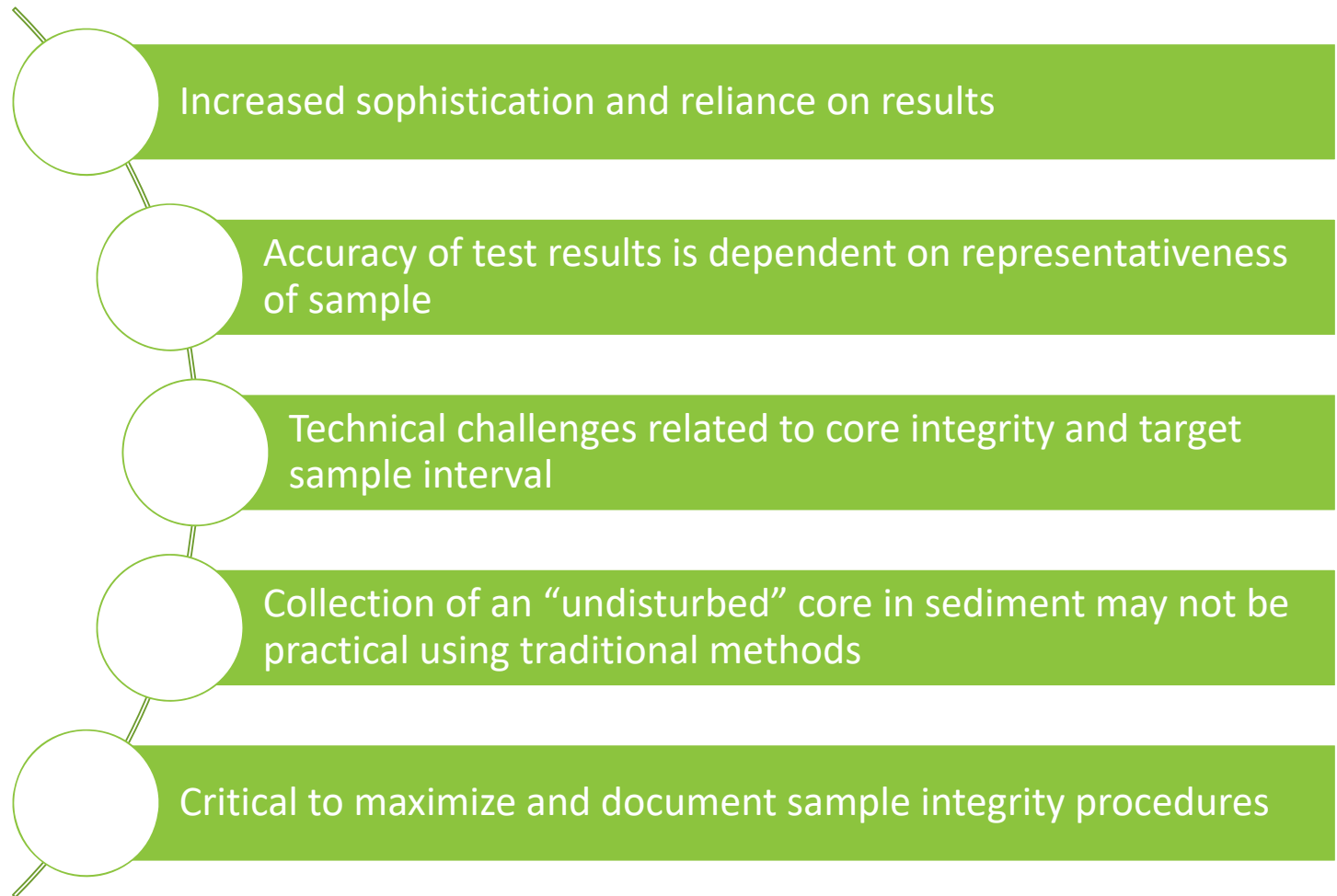
Current Trend

- Intrusive remedial decisions for potentially mobile NAPL
- Less intrusive remedial decisions for non-mobile NAPL



Why Think About Collection Methods Now?

Why Now?





Framework for NAPL Mobility Core Collection

Initial NAPL Distribution



Goal: Establish lateral and vertical distribution of NAPL



Coring Method: Disturbed sample is acceptable to maximize core recovery.



Advancement Method: Continuous sampling of entire sediment interval and noting potential NAPL presence

NAPL Mobility Core



Goal: Understand NAPL mobility potential

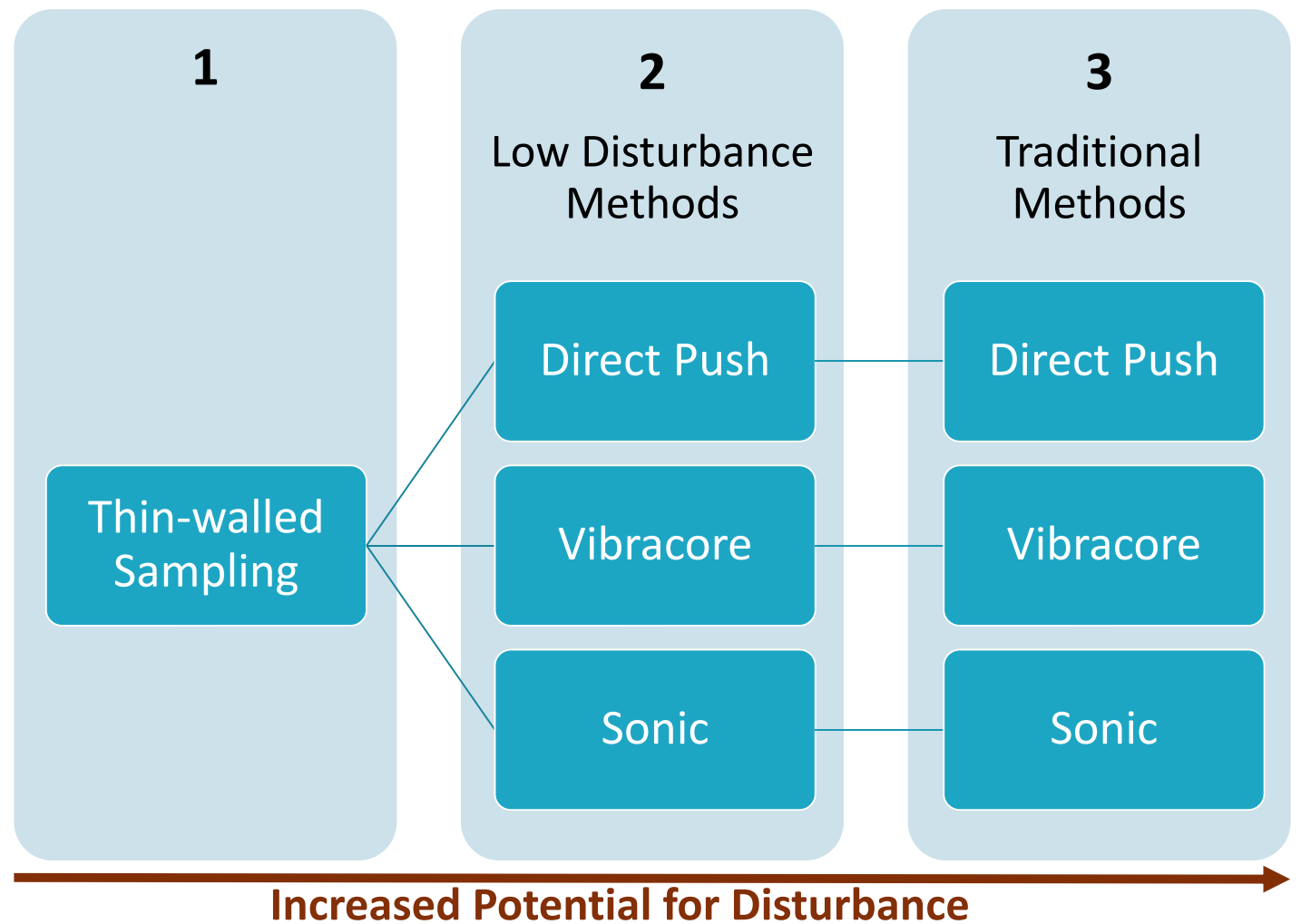


Coring Method: Undisturbed core



Advancement Method: Typically discrete at NAPL-bearing interval

Framework for NAPL Mobility Core Collection



Thin-walled Sampling

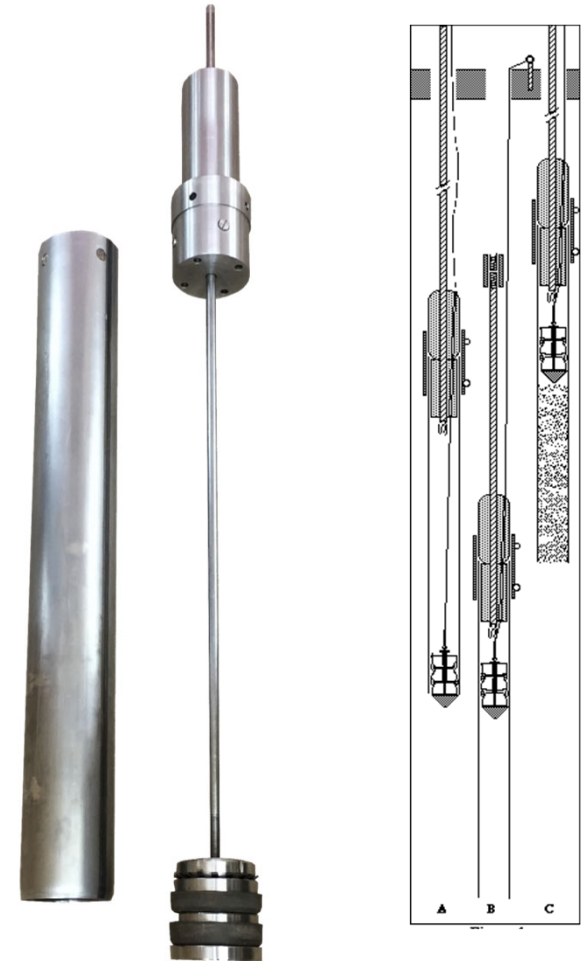
Traditional “Gold” Standard for Undisturbed Core

Draw Backs:

- Not recommended for coarse sand, gravel, or larger size soil particles, cemented, or very hard soils
- Recovery in soft silt

Potential Resolutions:

- Modify with Piston Sampler



<http://www.damascopenna.com.br/en/GridPortfolio/shelby/>

Direct Push

Approach

Largest diameter possible

Use most versatile machine available

Attempts

Attempt 1:
Hydraulic advancement

Attempt 2:
Automatic drop hammer

Attempt 3:
Traditional percussion

Increased Potential for Disturbance



<http://www.geoprobe.com/probingtimes>

Vibracore

Approach

Largest diameter possible

Tapered tube/
cutting shoe



Attempts

Attempt 1: Use
push core
techniques

Attempt 2: Pause
vibratory motor
at interval

Attempt 3: Use
vibratory motor
throughout

Increased Potential for Disturbance



Sonic

ASTMD6169 – vibratory/sonic may be required to obtain intact samples in cohesionless sediments

Approach

Use rigid core barrel liner

Use most versatile machine available



Attempts

Attempt 1:
Hydraulic
advancement

Attempt 2:
Automatic drop
hammer

Attempt 3:
Traditional
Sonic

Increased Potential for Disturbance



Keys to Success



Work Plan Flexibility



Driller Versatility



Time



Target Interval

Target Interval

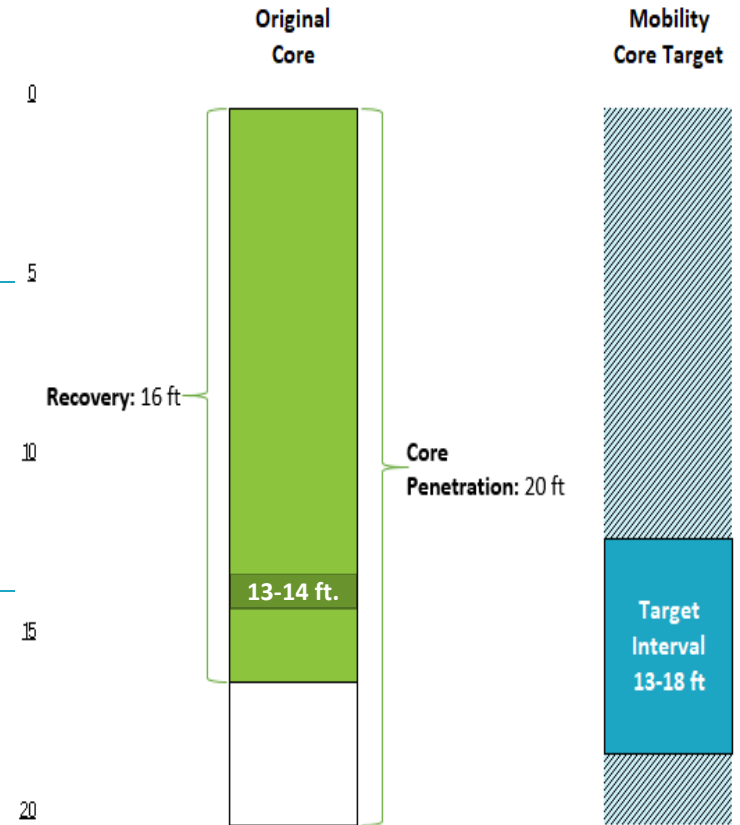
Lacks Field Visual Confirmation

Identify Uncertainty

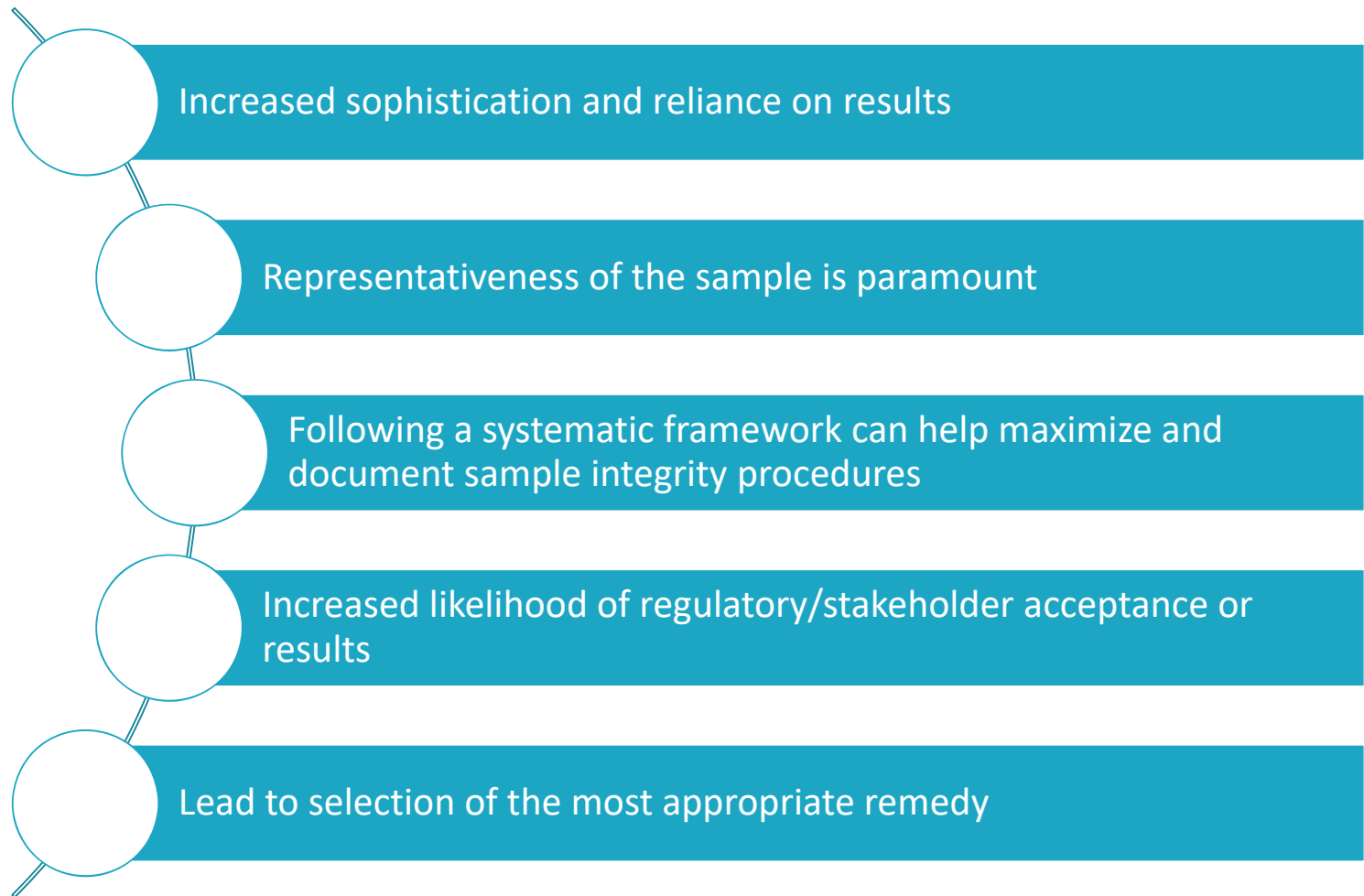
- Recovery of original core
- Sediment Elevation

Incorporate Safety Factor

When possible, increase target interval to address uncertainty



Conclusion





QUESTIONS AND REVIEW



Thank you!

Marcus D. Byker, PE – marcus.byker@obg.com