Managing Risk:
Creating and Executing Practical Performance Specifications for Deep In-situ Solidification/Stabilization

Dan Amate, PE
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Site Circa 1926
Site Circa 2015
Conceptual Site Model

10’ Sand

6’ - 8’ Clay

28’ BGS Groundwater

150’ Lower Clay Unit
Conceptual Site Model
Prescriptive vs. Performance Specifications

Client → Risk

Engineer → Risk

Contractor

Client

Engineer

Contractor

Risk

Risk
Risk Types

Human Health and Ecological

Project

Corporate
Human Health/Ecological – Regulatory Driver

“Preserve, protect and enhance the natural and cultural resources.”

Groundwater Standard = Background (Naphthalene 0.002 ppm)
Human Health/Ecological – Proof of Concept
Human Health/Ecological – Proof of Concept

Performance Criteria
• Permeability = 1.0 E-06 cm/s (max.)
• UCS = 50 psi (min.)
• No Mobile Free Product
• Uniform Mixing

2017 Design and Construction Issues at Hazardous Waste Sites
Human Health/Environment – The Air We Breathe

FOAM
1 Drum Concentrate = 8,415 Gal Foam
1,100 Drums = 9.3 Million Gal Foam
Project Risk – Bidding Process

- Site Visit
- Questions
- Responses
Project Risk – Bidding Process

Client
• Contribute Rig
• Extend Bid Schedule

Bidders
• Observe Drilling Conditions
• Mini Bench Test

Project
• Competitive Bids
• Risk Better Understood
Project/Corporate Risk – Flexible Design

- 5’ Clean Fill
- ISS
- Swell
- ISS
- Swell
Project/Corporate Risk – Flexible Design
Project/Corporate Risk – Flexible Design
Corporate Risk – Design Intent

\[ K = 5.9 \times 10^{-8} \text{ cm/s} \]

\[ K = ??? \]
Corporate Risk – Design Intent

K = 1.5E-07 cm/s
Closing Thoughts