

# **Selection of Drilling Method for Effective Amendment Delivery**

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Session A8 – Innovative and Efficient  
Amendment Delivery Strategies

# What is the problem?

- The most appropriate drilling method is not always selected for placement of remedial amendments
- Thorough review of actual lithologic conditions, project goals, and remedial amendment design are required
- Appropriate assessment of cost and risk must be completed
- If refusal, then what?

# Common Remedial Drilling Methods

- Direct push
- Solid flight auger
- Hollow stem auger
- Sonic

# Uncommon Remedial Drilling Methods

- Air rotary
- Mud rotary
- Combined approaches

# Direct Push

- Generally fastest and most cost effective
- Prone to difficulty in harder formations
- Can be problematic in flowing sands or high pressure water bearing formations with high organic silt content





# Solid Flight Auger

- Reduces challenges in difficult but consolidated formations
- Generally requires an additional step, open borehole only
- Often used to “pre drill” for later direct push applications





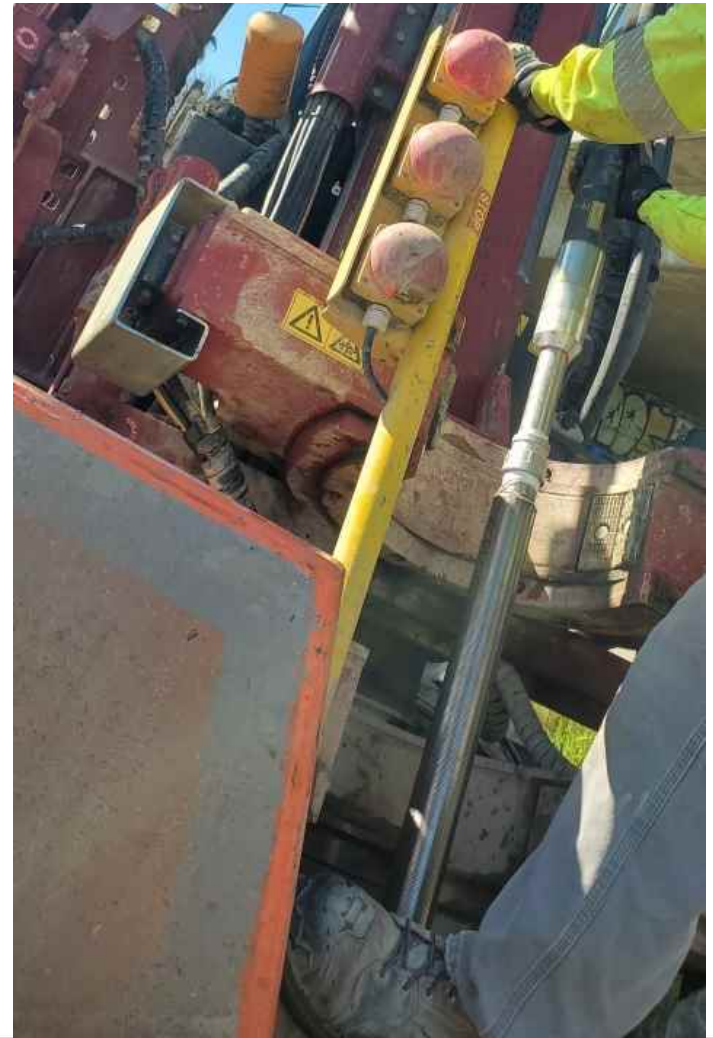
# Hollow Stem Auger

- Used in formations where direct push is ineffective and borehole stability is a concern
- Waste generation is high
- Borehole interface is large, but borehole is large leading to increased cost



# Sonic / Wireline Coring

- Very effective method, generally expensive and large footprint
- Requires additional steps
- Creates a very controllable injection environment



# Air/Mud Rotary

- Very fast rate of penetration, generally expensive and messy
- Air rotary only used in high stability formations
- Mud rotary must be carefully evaluated due to increase in variables



# Selection Criteria

- Past performance? (has anything failed previously?)
- Known lithologic conditions?
- Predictable lithologic conditions? (i.e. widespread flowing sands in a geographic area?)
- Conditions change expected based on remedial method? (i.e. high volumes or high flowrates anticipate to create subsurface issues?)
- Site accessibility?
- Noise and work hours issues?
- Ability to leave equipment onsite overnight?



# Remedial Approach

- Often approach of remediation is decided prior to decision on how any remedial amendments will be delivered.
- Delivery method needs to be understood, or options to delivery method needs to be understood, prior to approach selection
- Chemical compatibility may create delivery method issues
- Involve your contractor early!



# Conclusions / Questions

- One or more drilling methods can be utilized on the same project site.
- Drilling methodology should be understood prior to finalizing remediation compound of choice to ensure application issues are identified.
- Lithologic changes during and after remediation compound installation may create second order impacts to overall project