Sustainable Choices Are Everywhere!

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Outline

• Green and sustainable remediation background and considerations

• Opportunities for sustainable practices and examples
  – Site Assessment
  – Remedial Design and implementation
  – Remedy optimization
Remediation can be a Dirty Job!
EPA’s “Green Remediation”

- EPA Green Remediation 2010
  - “The practice of considering all environmental effects of remedy implementation and incorporating options to minimize the environmental footprints of cleanup actions”

- Examples
  - Conserve natural resources
  - Reduce, reuse and recycle material
  - Minimize energy use, waste generation
  - Use renewable energy
  - Reduce air emissions
  - Water re-use and minimize consumption
  - Minimize habitat disturbance
  - Insitu better than invasive
Background

Increased interest in sustainability in all aspects of business

• Many companies have appointed Chief Sustainability Officers – power sector, mfg, universities

• Common to see “sustainability”, “green” in mission statements

• Advancement from “program” or “initiative” to core operation
Guidance Available

• EPA and CLU-IN (www.clu-in.org) under green remediation
• Webinars via ITRC and others
Considerations for Sustainable & Green Practices

• What is motivation?
• Who are stakeholders?
• Is there a desired or pre-ordained outcome?
• Can sustainable practices be implemented step-wise?
• Are there BMPs in place? Can they be optimized?
Opportunities During Project Progression

1. Site Assessment
2. Remedial Design/Implementation
3. Optimization
   • Long-Term Monitoring
Site Assessment

• ITRC’s Triad Approach – incorporate sustainable practices in work strategies via
  – Systematic planning
  – Dynamic work strategies
  – Real-time data acquisition

• 2008 EPA (OSWER, EPA 542-R-08-002)
  – Waste minimization & IDW mgmt
  – Incorporate practices that rely on re-use/recycling
  – Equipment with low environmental impacts
  – Geophysical tools to reduce invasive work
Site Assessment Tools

• Direct push technology
  – Less IDW
  – Low energy
  – Shorter field durations

• Innovative real-time sensor technology
  – laser induced fluorescence
  – cone penetrometer testing
  – membrane interface probe
  – hydraulic profiling tool
Site Assessment Tools

- Geophysics – GPR, EM, surface resistivity, seismic reflection & refraction
- Screening tools
  - XRF for metals in lieu of sample
  - Color-TEC groundwater sampler
  - Immunoassay kits
  - Organic vapor analyzers
- Passive sampling – PDBs, hydrasleeves, snap samplers, soil gas samplers
Site Assessment Take-Home

• There are LOTS of opportunities for adopting sustainable practices!
Remedial Design – Passive Remedies

• Less energy intensive and environmentally disruptive than active remedies

• Rely on groundwater moving to treatment zone.
  – Insitu bioremediation – microbial reactions to transform contaminants to benign products
  – Insitu chemical oxidation – mass destruction via chemical injection
More Passive Remedies

- Phytoremediation – root uptake, transpiration, biomass, minimal O&M
- Reactive barrier walls – groundwater flow through reactive treatment zone in subsurface
- Monitored natural attenuation
- Sub-slab venting or passive vapor mitigation
Constructed Wetlands

- Mimics natural wetland systems - no chemical treatment
- Stormwater/wastewater flows through at low velocity
- Bioretention
  - Metals
  - BOD
- Viewshed & greenspace
- Biodiversity
Alternate Energy Sources

• Solar powered for low energy demands
  – free product recovery/belt skimmers
  – recirculation systems

• Wind - passive soil venting, sub-slab vapor mitigation
Alternate Energy Sources

- Geothermal
  - Provide alternative means of cooling for equipment
  - 150-200 ft per ton of cooling
Effluent Considerations

• Reuse of treatment effluent
  – Recirculation systems – liquid or vapor
  – Reclaimed water, irrigation
  – Process water
  – Waste to energy (landfill gas)
Solid Waste Considerations

• Reuse of solid waste
  – Recycled asphalt millings for temporary cover of contaminated soils
  – Street sweepings – asphalt and concrete, roadbase, medians
  – Re-use of concrete rubble for shore stabilization
Excavation - Transportation

- Onsite landfill and treatment
- No idling of trucks
- Efficient route-planning
- Stockpiling and sequencing of backfill delivery – fewer round trips
Remote Monitoring

• Reduces man power
• Varying degrees of data collection
• Improves reaction time $\rightarrow$ performance
• Low energy demands (solar)
O&M/Long-Term Monitoring

- Preventive maintenance
- Retrofit with more efficient components (submersible pumps, transfer pumps, variable frequency drives, cycling opportunities, blowers, etc.)
- Passive sampling techniques
- Waste minimization
Remedy Optimization

• Reasonable vs. expected performance
• Means to reduce energy & environmental footprints?
• Focused feasibility studies or remedial system evaluation for aging or poorly performing remedies
  – Re-visit CSM - unresolved sources/source areas?
  – New technologies
  – Updated objectives (time & $ spent)
  – Adjust ARARs
  – Employ GSR Metrics – tip the balance?
Remedy Optimization

• Updated risk assessment and institutional controls
• Optimization tools – MAROS, non-parametric statistics
  – Reduce monitoring frequency but preserve integrity
  – Remove redundancies in locations
  – Reduce parameters
  – Preserve site management objectives
Conclusions

• Sustainable and green practices can be made at multiple junctures throughout a project.

• Continued evaluation of remedy objectives, performance, and optimization are critical processes that can lead to sustainable choices, cost savings over the long run, and more site cleanups.
Thank You!

Questions/Comments?

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