ENVIRONMENTAL MANAGEMENT SPECIALISTS, INC.
Remediation & Environmental Construction Services

What About the Soil?

Introduction of Key Speakers

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- Contact information to follow

Overview

- What is the treatment process?
- Where this process works.
- How this process works.
- Why this process is viable.
- When to utilize this process.
- Case Studies
- Conclusion

Introduction

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What is the treatment process?

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This presentation will explain how On Site (In-Situ) Soil Treatment can achieve remediation goals for VOC contaminated unsaturated soils.

- Timely (fast acting)
- Reduce Costs
- Minimize Waste

What is the treatment process?

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- On site treatment/ mixing
- Treatment/mixing within the area of contamination (“in-situ”)
- Chemical oxidation
- Spray application in lifts with excavators and mixer attachments

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Oxidation is a chemical process in which electrons are transferred from an atom, ion or compound. The in-situ chemical oxidation process is designed to destroy organic contaminants. Oxidants most frequently used in chemical oxidation include hydrogen peroxide (H_2O_2), potassium permanganate ($KMnO_4$), sodium permanganate ($NaMnO_4$), persulfate ($Na_2O_8S_2$) and ozone (O_3).

- Rapid treatment time
- Ability to treat contaminants present at high concentrations
- Effective on a diverse group of contaminants

Where this process works

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This chemical oxidation treatment process is best applied to sites with:

- Contaminated soil 0-15 feet below ground surface (bgs)
- Levels of VOC contamination above hazardous waste standards

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Not enough time

The on site treatment process typically takes 1-2 weeks to achieve the necessary contaminant reductions. The alternative (off site disposal as hazardous waste) typically requires 1-2 weeks to secure an EPA ID# and waste approvals. And daily acceptance limits typically apply to off site disposal of hazardous waste.

Not enough money

On site treatment is simply the most effective way to meet budgetary goals when dealing with relatively high levels of VOC soil contamination which are above the LDR's and/or failing a TCLP.

Not enough space

On site treatment takes place within the area of contamination, hence no stockpiling is necessary. On site treatment requires no more space than typical dig and haul operations.

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In-Situ Chemical Oxidation (ISCO)

- Sodium Persulfate oxidation with activators
  - Caustic
  - Zero Valent Iron
  - Chelated Iron
  - Hydrogen Peroxide
- Sodium and Potassium Permanganate

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- Create a “mixing pit,” if required
- Spray application of chemicals
- Mechanical mixing with excavators and attachments
- Allow 1-4 weeks (typically 1-2 weeks) for treatment via chemical oxidation
- Conduct composite sampling and confirmatory analysis per US EPA guidelines
- After analysis confirms soil treatment has been successful, the soil can be loaded out for non-hazardous disposal or possibly can remain on site depending on site specifics
- The soil may require some solidification using saw dust or lime

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Concern: How can you conduct treatment of hazardous waste without a permit?

- Contaminated soil becomes a hazardous waste when it is removed from the “area of contamination” **if** it has contamination levels above hazardous waste standards when it is removed.
- If levels of contamination are reduced in-situ prior to removal/waste generation, then the soil can be sent for disposal as non-hazardous waste or can be reused on site (depending on site specific and/or cleanup standards dictated by regulatory authority).

Why this process is viable

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Concern: What about air emissions, hazardous vapors and odor control?

- Air emissions are no more of an issue with on site (in-situ) treatment than they are with a dig and haul, and actually less in most cases.
- The atmosphere (similar to a dig and haul) is monitored for health and safety purposes and appropriate levels of personal protective equipment (PPE) are employed.
- Hazardous vapors and odors are effectively mitigated by using vapor suppressing foam in conjunction with excavation and mixing operations.

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- To achieve soil cleanup and site remediation within a short time frame.
- To significantly reduce costs versus removal/disposal of contaminated soil as hazardous waste.
- When traditional in-situ remediation systems/processes are too slow, too costly or cannot guarantee cleanup goals will be met.
- To minimize or eliminate hazardous waste generation and related regulatory burdens.

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Reduced Liability

-No liability associated with transportation/disposal of hazardous waste
-No PRP liability associated with disposal in landfill (if soil remains on site)

Effective Delivery

-Uniform delivery of remedial compounds (especially in unsaturated zones)
-Production rates comparable to dig and haul
-No RCRA TSD permits required as remediation is completed within the area of contamination (in-situ)
-Wide variety of compounds treated (chlorinated, PAH's, etc.)
-Ability to treat soils at very shallow depths not conducive to other methods of in-situ treatments
-Well suited for highly concentrated LNAPL and DNAPL source zones

Cost Savings

-Savings typically 4-10 times less expensive than dig and haul depending on type and level of contamination
-Timeframe typically 1 week to 1 month to meet treatment goals

Case Study - Former Automotive Manufacturing Facility

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Contaminants of Concern:

- Trichloroethylene (TCE)
- cis-1, 2-dichloroethylene (c-DCE)
- Vinyl chloride (VC)
- Mixed petroleum compounds

Results:

- Treated over 7,000 tons of silty clay soil in 6 weeks
- Concentrations of SVOC's up to 2000 ppm
- Treated 0-20' bgs in 6' lifts
- Average timeframe was 2 weeks per lift to meet site cleanup standards and TCLP treatment standard for TCE of <0.5 ppm
- All treated soils were used on project site

Case Study - Former Electronics Manufacturing Facility

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Contaminants of Concern:

- Tetrachloroethylene (PCE)
- Trichloroethylene (TCE)
- cis-1, 2-dichloroethylene (c-DCE)
- Vinyl chloride (VC)
- Mixed petroleum compounds

Results:

- Treated over 2,000 tons of clayey silt soil
- Concentrations of CVOC's up to 500 ppm
- Treated 4-12' bgs
- Average timeframe was 1 week to meet TCLP treatment standard for TCE of <0.5 ppm
- All treated soils were disposed as non-hazardous waste

Case Study – Former Cleaning Products Manufacturing Facility

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Contaminants of Concern:

- Tetrachloroethylene (PCE)
- Trichloroethylene (TCE)
- cis-1, 2-dichloroethylene (c-DCE)
- Vinyl chloride (VC)
- Mixed petroleum compounds

Results:

- Treated over 1,900 tons of silty clay and sandy soil
- Concentrations of CVOC's up to 1,200 ppm
- Treated 0-8' bgs
- Average time frame was 4 weeks to meet TCLP treatment standards (longer than usual due to unexpected variables)
- All treated soils were disposed as non-hazardous waste

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Additional Information

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Additional On Site Soil Treatment Options

- Reductive dechlorination of chlorinated solvent contaminated soil
- Treatment of DNAPL contaminated soil with Emulsified Zero Valent Iron (EZVI)
- Treatment of NAPL contaminated soil with In-Situ Geochemical Stabilization (ISGC)
- Stabilization/fixation of heavy metals contaminated soil

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