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ASTSWMO
Green Remediation at LUST Sites
Fact Sheet

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Green Remediation at Leaking Underground Storage Tank Sites

Introduction

This fact sheet has been developed for State and Territorial regulators who oversee the investigation and cleanup of petroleum releases at leaking underground storage tank (LUST) sites. Specifically, the fact sheet summarizes background information on green remediation techniques applied at the retail gasoline station scale.

Background

In 2008, EPA released *Incorporating Sustainable Practices into Site Remediation* [EPA-542-F-08-002]. The document was an introduction to opportunities for implementing best management practices, collectively referred to as "green remediation" techniques, at remediation sites. These green remediation techniques were initially recognized as best management practices beneficial in the Superfund and RCRA corrective action programs. The challenge has been to apply these techniques, which have obvious benefits at large remediation efforts, to the much smaller scale efforts typically employed at LUST facilities.

Green Remediation of LUST Sites

Green remediation at LUST sites is really a coalescence of three fundamental concepts: general best management practices, common sense, and fiscal responsibility.

Green remediation techniques result in remediation efforts that are less polluting, and thereby increase the environmental benefits of remediation. It is a process of decision-making that considers the sustainability trade-offs among remediation and re-use choices.

It is natural to ask why, given the small scale of most LUST sites, is it beneficial to consider green remediation techniques? First, there is an economy of scale between LUST sites; a green remediation technique that proves effective at one site may have immediate applicability to dozens of similar sites. Second, what LUST sites lack in size they make up in sheer numbers. There are literally thousands of LUST sites nationwide that could reap environmental benefits

from the application of green remediation techniques, collectively resulting in significant environmental benefit. Lastly, given the current economic climate, State programs that have corrective action funds are being entreated to protect those funds by using them judiciously, taking advantage of all available efficiencies in the cleanup approach, the amount of time needed, and reuse options.

Guiding Principles

Primarily, as with any other cleanup, a green remediation approach must ensure that every clean up is protective of public health and the environment. It is a decision process that incorporates best management practices into project planning and integrates site reuse plans into the clean-up strategy. Proper project pre-planning is essential to successful green remediation application. It allows for sequencing of work to improve efficiency while recognizing and taking advantage of re-use opportunities where they exist. The application of green remediation methodologies is not intended to short circuit proper corrective action protocols in any way.

There are several methodologies by which a remediation strategy can be considered “green”. Remediation strategies that conserve energy by simply reducing energy consumption or use renewable energy sources to power engineered systems are good examples of green clean-up techniques. However, remediation strategies are also green when pre-planning and mindful implementation allows for a reduction in the amount of waste disposed, a reduction in the need for new materials, using deconstruction techniques in lieu of demolition, or the re-use of existing infrastructure to support the remediation or the redevelopment.

The concept of adequate pre-planning cannot be stressed enough when working in the arena of green remediation. It is ideal to consider green practices from the start but project managers should not be discouraged from "greening up" their ongoing cleanups. Ongoing remediation sites can benefit from the application of "green principals" to increase system efficiency, decrease carbon footprint, and potentially decrease time to closure via system optimization.

Careful evaluation of treatment technologies being considered as a remedy can save time, reduce costs, and produce significant long-term cleanup benefits. Will the contaminants be permanently destroyed? Does this “remediation” only amount to a contaminated media transfer? Is it best to manage the contamination in-place? After all, completed exposure pathways represent a much greater threat than the presence of petroleum in the subsurface by itself without a completed exposure pathway. Can the exposure pathway be managed through reuse strategies, mitigated by using engineering controls or prevented through institutional controls? These kinds of project evaluations are inherently “green” and will lead to more energy-efficient and thus more cost-effective remediation project designs.

From the discussion above, it should be clear that green remediation is rooted in risk-based decision-making (RBDM) at LUST sites. In its fundamental application, we think of RBDM as comparing a site’s contaminant concentration to a table of screening levels that were devised using acceptable methodologies. However, there are other risks involved with remediation that should be considered when devising a remediation strategy. Careful consideration of all risks is the first step of a successful green remediation project.

Consider the risk involved in a fairly common practice of source removal: digging the contamination up and transporting it to a landfill. There is the very real health and environmental risk associated with the volatilization of contaminants at the site, dust generation, and site erosion. Even with quarterly groundwater monitoring of a site there are green remediation savings that can be made when the risks associated with gasoline consumption, contaminated media transfer and construction are taken into consideration in a comprehensive remediation strategy.

Green Remediation at Petroleum Retail Facilities

Keeping in mind the guiding principles discussed above, green remediation at the scale of a typical petroleum retail facility could incorporate the following strategies:

- Reduced monitoring schedules
- Re-use of major remediation equipment
- Prescribed approach to site investigation
- Use of direct push technology
- Combining investigative stages and minimizing mobilizations
- Remote system operation
- Remote site sampling
- On-site laboratory analysis
- Use of innovative technologies for in-place treatment of contamination
- Risk-based decision-making
- Appropriate land use and revitalization
- Sound excavation practices
- Continued assessment and optimization of existing remediation systems to maintain peak operating performance
- Evaluating ways to decrease a remediation system's net energy demand via innovative design or existing system optimization
- Consideration of net environmental benefit as a component of remedy selection
- Use of real-time qualitative site assessment techniques (Membrane Interface Probes, or Laser Induced Fluorescence) to minimize mobilizations and investigation derived waste generation
- Proper sizing of remediation equipment
- Switching immediately to a "polishing" remedy once the effectiveness of the existing system declines (i.e., mass recovery significantly decreases for same amount of operation).
- Use of alternative energy sources (e.g., wind, solar, geothermal)

Threaded through each of the strategies listed above is the application of pre-planning and use of available or creative technologies to increase communication among all of the affected parties. The ability to be flexible and modify corrective action plans as the dynamic character of a remediation unfolds, use electronic communication tools for report submittal,

regulation/guidance dissemination, and communicate concerns in real time is fundamental to green remediation implementation.

References

U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response (2008). *Green Remediation: Incorporating Sustainable Environmental Practices into Remediation of Contaminated Sites*. April, 2008 (EPA 542-R-08-002)

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U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response (2008). *Green Remediation: Best Management Practices for Excavation and Surface Restoration.* December, 2008 (EPA 542-F-08-012)

Albarracin, Hernando. (2009*). Applying Greener Cleanup Principles to Tank Sites*. National Tanks Conference, March 30-April 1, 2009.

U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response (2009). *Green Remediation Best Management Practices: Pump and Treat Technologies*. December, 2009 (EPA 542-F-09-005)

U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response (2009). *Green Remediation Best Management Practice: Site Investigation.* December, 2009 (EPA 542-F-09-004)

Web Sites

EPA's Clu-in website: www.clu-in.org/greenremediation

The Greener Cleanups Resources webpage on the ASTSWMO website developed by the ASTSWMO Green Cleanups Task Force includes links to States with Green Remediation initiatives/policies: http://astswmo.org/resources_sustainability_greenercleanups.html

The **Interstate Technology and Regulatory Council (ITRC)** Green and Sustainable Remediation www.**itrcweb.org**/teampublic_GSR.asp

The U.S. Sustainable **Remediation** Forum (**SURF**): www.**dtsc.ca.gov**/OMF/Grn_**Remediation**.cfm