EPA Session 2: Green Remediation: Reducing the Environmental Footprint of Cleanups
Presenters: Carlos Pachon (US EPA) and Doug Sutton (GeoTrans, Inc.)

Green Remediation is the practice of considering all environmental effects of remedy implementation and incorporating options to minimize the environmental footprint of cleanup actions. The U.S. EPA advocates applying five core elements for environmental footprint assessments as BMPs during the cleanup process:

- Minimizing total energy use and maximizing the use of renewable energy
- Minimizing emissions of air pollutants and greenhouse gases
- Minimizing water use and impacts to water resources
- Protecting land and ecosystems
- Reducing, reusing and recycling material and waste

Green Remediation can be incorporated into all phases of a site cleanup effort. For example, during site investigation the use of innovative field analytics and direct sensing tools can reduce the environmental footprint by increasing the density of analytical data, thus limiting the total number of field mobilizations required to characterize a site. Green concepts can also be incorporated into remedy design, implementation and operations and maintenance (O&M).

Examples of Green Remediation BMPs include:

<u>Energy Requirements</u>
- Selecting the optimal size and type of equipment for each task to avoid unnecessary energy consumption while achieving comparable outcome.
- Using "smart grid" meters for electricity consumption monitoring and control, enabling treatment processes to operate heavily during off-peak utility periods.

<u>Air Emissions</u>
- Covering excavated areas with single-use biodegradable fabric to suppress dust while providing a substrate for favorable ecosystems.
- Retrofitting equipment engines with high-performance features such as multi-stage filters for cleaner exhaust.

<u>Water Requirements and Resources</u>
- Designing a closed-loop engineered system to maximize use of grey water during an ex situ treatment process.
- Incorporating low-impact development concepts for stormwater treatment such as substituting traditional, non-porous concrete with newer forms of pervious concrete.

<u>Land & Ecosystems</u>
- Using geophysical methods to identify subsurface anomalies (such as underground storage tanks and buried drums) without disturbing land.
- Conducting an inventory of ecological species, land contours, and drainage patterns prior to remedy construction to facilitate restoration to original conditions.

<u>Material Consumption and Waste Generation</u>
- Salvaging uncontaminated objects with potential recycle, resale, donation, or onsite infrastructure value such as steel, concrete, granite, and storage containers.
- Reusing durable goods throughout remedy construction and maintenance.

This session will discuss EPA's Principles for Greener Cleanups as well as how environmental footprints are being evaluated. The training will also cover how project managers and other stakeholders can apply the principles of green remediation to the remediation of contaminated sites, while maintaining the cleanup objectives, ensuring protectiveness of a remedy, and improving its environmental outcome. Case studies that have shown successful use of Green Remediation Practices will also be presented.