



THE MONITOR

Tracking Emerging Regulations & Technologies on Active Assessment & Remediation Projects

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ENVIRONMENTAL ALLIANCE

(Stimulated Microbial Anaerobic Reduction Treatment) Introducing S.M.A.R.T. Technology

At the forefront of the remediation of COCs, Environmental Alliance works towards reducing contaminants to levels that are protective of human health and the environment.

Environmental Alliance, Inc. stands on the forefront of Greengineering with the full-scale application of stimulated microbial anaerobic reduction treatment (S.M.A.R.T.) at several industrial sites to promote the complete degradation of residual chlorinated solvent and perchlorate contamination in soils and groundwater. Alliance completed several successful in situ and ex situ bioremediation pilot test projects on-site in 2002 for the degradation of these recalcitrant compounds and presented the findings at the 2003 In Situ and On Site Bioremediation

Conference and the 2004 Conference on the Remediation of Chlorinated and Recalcitrant Compounds. Alliance recently received approval to progress to the next phase of these projects by upgrading the pilot tests to full-scale bioremediation systems capable of reducing the contaminants of concern to levels that are protective of human health and the environment.

Very simply, the remediation of the contaminants of concern (COCs) is accomplished by the introduction of an environmentally safe substrate into the subsurface to stimulate the indigenous microorganisms (if available) to biodegrade the COCs. This process can also be described as enhanced or augmented natural attenuation. The substrates that are used are typically either soluble, such as ethanol, methanol, acetate and sodium lactate or insoluble, such as soybean oil, chitin, HRC™ and mulch. The use of a mixture of insoluble and soluble substrates appears to be the most effective at quickly creating the anaerobic environment necessary to stimulate the degradation of the contaminants while leaving an insoluble substrate to provide a carbon source as well as maintaining that anaerobic environment. The actual substrate utilized is both site and contaminant specific and can be determined through a site treatability study.

One of the most important aspects of the in situ bioremediation technology is that it involves the

For more information about how S.M.A.R.T. technology may be applied to your site please email a request for information to mgeary@envalliance.com.

complete destruction of the contaminants to benign end products where as other technologies, such as pump and treat, merely transfer the contaminant from one matrix (soil or water) to another (carbon or air). A pump and treat system may also have to be run for several decades before seeing significant contaminant reductions since the subsurface source is not being addressed. Conversely, in situ bioremediation involves the injection of the substrate directly into the heart of the plume, to attack the source. At least two of the full-scale bioremediation systems involved the conversion of a pump and treat system and an air-sparge/soil vapor extraction system into an active bioremediation system to address residual contamination that the more mature technologies had difficulty with. The use of multiple technologies for difficult sites is becoming the industry standard when dealing with recalcitrant compounds such as chlorinated solvents. This phased technology approach to site remediation is gaining acceptance and can often lead to reduced projects costs and timelines while still being protective of human health and the environment.



S.M.A.R.T. Cross Section.

Topics Presented

- Maximizing your Remediation Dollars – Pathway to Closure
- Natural Resource Damages in New Jersey

PLUS: What's New at Alliance



Maximizing Your Remediation Dollars – Pathway to Closure

By Joseph Zay

Recent studies by the U.S. Environmental Protection Agency (EPA) and the U.S. Navy indicate that the majority of groundwater remedial systems are not operating as designed and have not been optimized to meet new/changing site conditions. Representatives of the EPA, Navy, the Army Corps of Engineers and consultants/universities collaborated to address this issue through an Environmental Security Technology Certification Program (ESTCP) funded project. The project analyzed three large Department of Defense (DOD) remediation systems utilizing software packages and a non-automated trial and error process. The end results of this project indicated that if these large government systems are modified/reviewed every five years cost savings could exceed \$10 million dollars on the project.

Now not every remedial system is as large or operates for twenty-years, especial if it is designed correctly, but Environmental Alliance (Alliance) has seen the benefits of reviewing remediation system's performance from the two point soil vapor extraction system to the 150 gallon per minute pump and treat system.

When a remedial system is



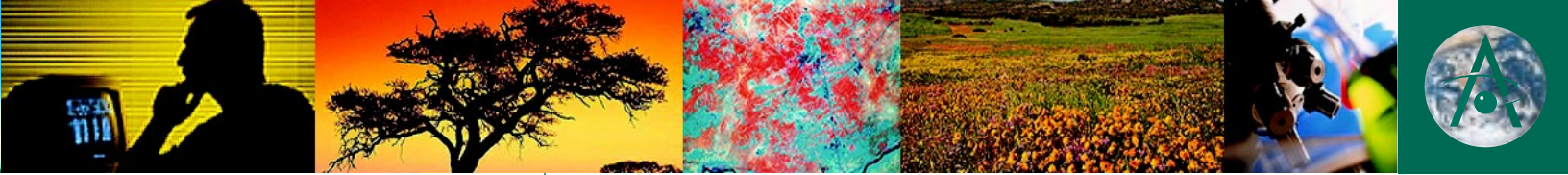
transferred to or designed/installed by Alliance, we implement a periodic review called a senior project evaluations. During these evaluations the original remedial design and timeline is compare to the current operating conditions and current site data. Annual budget, contaminant mass removal, dissolved groundwater trends, groundwater elevation and site-specific parameters (dissolved oxygen, pH, temperature, system influence, etc.) are also evaluated. From the results of the evaluation modifications to the remedial system are

proposed and implemented to assist in meeting the projects end goal "site closure". In some cases a change in the remedial technology (P&T to air sparge soil vapor extraction (AS/SVE) or AS/SVE to bio-remediation) is recommended based on a cost benefit analysis using net present value of costs over the operating timeframe. In some cases it may be cost beneficial to change the technological approach or in other cases minimizing operation and maintenance expenditures by reducing less critical items such as the amount and frequency of monitoring well sampling. To illustrate this the following presents a case study.

Dover, DE

In January 2000 Alliance received this project. The previous consultant installed a pump and treat (P&T) and soil vapor extraction (SVE) system to address a gasoline release from a product delivery line. The system was started in the spring of 1999 and upon transfer of the project to Alliance in 2000 the SVE system was observed to be operating ineffectively. To bring this system up to its design parameters a senior evaluation was completed. The evaluation indicated that the issues with the SVE system were a result of: 1.) Not measuring individual soil vapor flow and VOC concentrations





from the SVE wells, and 2.). That some SVE wells were not sealed properly, therefore soil gas vapors were not being extracted from these locations. For a cost of a few hundred dollars the remediation system effectiveness was improved 96% percent from under 1 pound per day hydrocarbon mass extraction to over 30 pounds per day. Modifications were made to the system and the system was shut down in April 2003 due to obtaining asymptotic hydrocarbon removal both in the P&T and SVE systems. Case closure was received in April 2004 after post remedial monitoring.

The evaluation allowed the proper operation of the SVE system, which removed over 5,000 pounds of gasoline hydrocarbons from the unsaturated soils (source area). If this was not identified the remedial system would likely still be operational at a cost of \$30,000/year until the 5,000 pounds of hydrocarbons moved into the groundwater via leaching for treatment by the P&T.

Conclusion

In completing the environmental assessment and remediation of sites significant dollars and efforts are spent in designing a remedial system to meet the site objectives. Investments in evaluating your progress in the O&M phase of remediation is to your advantage. A good design that is implemented poorly or that is not adjusted for new/changing site conditions will ultimately fail and additional costs will increase your environmental expenditures. In most cases poor cheaply designed systems will never achieve final closure which ultimately far outweighs the cost of a properly designed/installed remediation system that is operated in an intelligent cost effective manner. By using this dynamic turnkey system design, installation, and O & M approach Alliance has been successful in closing over 44% of our remediation sites in the last 14 years. Are you sure your site is on the pathway to closure?

Joe Zay is Vice President of Field Operations for Alliance.

Natural Resource Damages in New Jersey

New Jersey has initiated a large-scale directive to address more than 4,000 potential claims for Natural Resource Damages (NRD). The potential claims include sites that are currently undergoing remediation, sites with groundwater classification exception areas (CEAs), as well as sites that previously received No Further Action (NFA) letters from NJDEP. Many NRD claims were due to expire pursuant to the previous statute of limitations if not filed by January 1, 2002. The New Jersey legislature granted a four-year extension to the statute of limitations for sites that had completed their Remedial Investigation (RI) prior to 2002. For sites in the early stages of remediation, the four-year statute of limitations begins upon completion of the RI.

Natural Resource Damage is the dollar value of the total restoration that NJDEP determines is necessary to compensate the residents of New Jersey for the injury to natural resources. Injuries can be ecological in nature with impacts to wetlands, wildlife, groundwater or surface water and human use injuries such as the closure of a waterway to fishing, a beach to swimming or an aquifer to drinking water supply. Restoration may include compensation for the natural resource services lost from the beginning of the injury through the full recovery of the resource.

The Office of Natural Resource Restoration and the Site Remediation Program are prioritizing sites for which NRD claims are due to expire by the January 1, 2006 deadline. Sites will undergo an initial screening process to determine if an NRD claim will be filed. Sites that are not being considered for an NRD claim include the following:

- Sites for which the only responsible parties are residential homeowners residing at the site at which the claim arises.

- Sites for which the only responsible parties are small businesses with a limited ability to pay.
- Sites that meet the qualifying criteria for NJDEP's new "Cleanup Star" Program (See related article in this edition of the Monitor). Sites that are likely to be cleaned up under this new "Cleanup Star" program will likely involve homeowner underground storage tank (UST) cases, brownfields sites that do not trigger a groundwater investigation, recent discrete spill sites, and simple Industrial Site Recovery Act (ISRA) sites.
- Brownfields developers meeting the innocent purchaser defense requirements under New Jersey law at sites at which there is a historical natural resource injury.

Determining NRD settlement amounts for ecological and human use injuries is a complicated process. However, NJDEP has established groundwater injury formulas that can be used to calculate cash settlement amounts. NJDEP is encouraging responsible parties to step forward and initiate settlement discussions. As an incentive to coming forward to settle groundwater injuries, NJDEP will use the groundwater injury formula developed and applied by the Office of Natural Resource Restoration in past years. Groundwater injuries are calculated with this formula by estimating the volume of contaminated groundwater, the value of the water, and duration of the injury to arrive at a settlement amount. For those parties that do not initiate settlement discussions, a new formula that is currently under development will be used to arrive at a settlement amount. This new formula will use volumetric calculations, which take into account the depth of groundwater contamination. The older formula uses a simplistic conceptual model and in most cases underestimates the volume of impacted

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groundwater resulting in a smaller settlement amount compared to the one that is currently being developed. In addition, contrary to past guidance, on-site groundwater will NOT be excluded from injury calculations.

The NRD initiative is also having an impact on sites requesting No Further Action. NJDEP stated that they are currently holding issuing NFA letters until official NRD procedures are established. The NJDEP policy directive issued on September 24, 2003 states that an assessment of ecological injuries and resolution of potential natural resource injuries, if any, should precede SRP's issuance of NFA letters.

Alliance recommends discussing the potential implications that NRD may have on your site. Responsible parties should consider being proactive with regard to NRD claims as the current NJDEP Administration plans on filing as many claims as possible before the statute of limitations expires. Ways to possibly limit your environmental exposure include approaching NJDEP with an NRD settlement plan and performing a cost analysis on active versus passive remedial approaches taking into account the anticipated NRD settlement amount and then implementing the most cost effective approach. Future decisions should also take this into account when deciding on active versus passive remedial scenarios. The time to be proactive and options for limiting the NRD claim settlement amount are running out. Contact your local Alliance representative to discuss how this NRD initiative will affect you and your business.

What's New with Alliance Personnel...

Jason Early presented a paper on Alliance's S.M.A.R.T. technology (see Page 1) entitled "Reclaiming Groundwater Contaminated by VOCs and Perchlorate" at the Virginia Water Resources Research Symposium on October 6, 2004 at Virginia Tech. **William Smith, Andrew Applebaum,** and **Kevin Morris** were co-authors.

The NJ office welcomes **Ben Montgomery**, Environmental Scientist, the VA office welcomes **Vanessa Christian**, Environmental Engineer and the DE office welcomes **Chris Hines**, Chemist /Environmental Scientist each is helping their respective office grow.

Matt Geary was promoted to the position of Vice President of Sales and Marketing and **Joseph Zay** was promoted to the position of Vice President of Field Operations.

Paul Miller, PE, William Smith, PG and **Matt Geary** all participated in panels at the recent Delaware Brownfield Conference held in Wilmington in October.