Monitored Natural Attenuation

NAS CECIL FIELD

Monitored Natural Attenuation (MNA) as a remedial action is the verification that natural processes, including biological reduction, are effectively reducing groundwater contamination and providing required protection of receptors. Field and laboratory analyses are performed to evaluate various biological, geochemical, and contaminant degradation parameters to assess the effectiveness of the natural attenuation processes. Monitoring for these parameters during a site investigation allows MNA to be evaluated in lieu of, or in combination with, other remedial alternatives. In many cases, MNA alone proves to be a much more cost-effective remedy than more aggressive remedial alternatives. In other cases, MNA can be an efficient polishing remedy following source reduction with more aggressive technologies.

Extensive evaluation of the effectiveness of natural attenuation at NAS Cecil Field has been conducted and currently five sites exist where this remedial technology is being instituted. Monitoring of the natural attenuation parameters have indicated these sites are good candidates for this technology and evaluation of site contaminants have shown successful reduction.

Project Summary

Natural attenuation is being implemented, either by itself or in conjunction with another Remedial Action, at five sites within four operable units. The sites employing natural attenuation are as follows:

- Site 3 – OU8, Oil/Sludge Disposal Pit. The final groundwater remedial design, submitted October 1998, identified air sparging of the source and natural attenuation of the plume. Natural attenuation sampling started in November 1998 and the air sparging system began operation in May 1999. Quarterly sampling will continue to determine the effects of the air sparging system on the aquifer. The monitoring program will then be evaluated and recommendations made.
- Site 5 - OU2, Northwest Oil Disposal Pit. The groundwater remedial design was submitted in May 1998 which identified Air Sparging as the selected remedial solution. However, groundwater sampling suggested natural attenuation had significantly reduced the contaminant concentrations. Additional quarterly sampling rounds were conducted to determine if a change in remediation strategy should be made. The results indicated that there is adequate evidence to change the remedial alternative to monitored natural attenuation from air sparging.
- Site 8 – OU3, Haz Waste Storage and Fire Fighting Training Area. The remedial design for this site included removal of contaminated soil and monitored natural attenuation of the groundwater. The baseline/1st quarter natural attenuation sampling was conducted in August 1998 and quarterly evaluations are ongoing. The soil removal action is scheduled for July 1999.
- Site 16 – OU7, AIMD Seepage Pit. The groundwater remedial action included air sparging of the source, natural attenuation of the plume, and repair of the storm sewer system. The baseline/1st quarter natural attenuation samples were collected in August 1998 and quarterly sampling is on going. The Air Sparging / Soil Vapor Extraction system was started in June 1999.

Site/Location:	Naval Air Station Cecil Field, Jacksonville, FL Site 3 – OU8, Oil/Sludge Disposal Pit Site 5 - OU2, Northwest Oil Disposal Pit Site 8 – OU3, Haz Waste Storage and Fire Fighting Training Area Site 16 – OU7, AIMD Seepage Pit Site 17 – OU2, Southwest Oil/Sludge Disposal Pit
Site Description:	Natural attenuation is being implemented, either by itself or in conjunction with another Remedial Action, at six sites within two operable units. The sites employing natural attenuation are as follows: Site 3 – Air sparging in conjunction with natural attenuation is the selected remedial alternative for a chlorinated solvent plume. Site 5 – Natural attenuation has been selected to remediate a petroleum-contaminated plume which also contains low levels of TCE. Additionally, a soil source removal has been conducted. Site 8 – Natural attenuation is the selected remedy for remediation of a petroleum-contaminated plume combined with a solvent plume. A source area remediation is planed for TRPH contaminated soil. Site 16 – Air sparging combined with natural attenuation is the selected remedy for the chlorinated solvent plume. The source area where air sparging will be conducted is suspected of having DNAPLs present. Site 17 – Natural attenuation has been selected to remediate a plume containing chlorinated solvents and petroleum by-products.
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Technology:	Natural Attenuation
Contaminant:	TCE, DCE, Benzene, Ethylbenzene, Toluene, and Xylene
Action Levels:	Florida Administrative Code 62-777 and Federal Maximum Contaminant Level.
Legal Driver:	Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)
Decision Document:	Record of Decision

- Site 17 – OU2, Southwest Oil/Sludge Disposal Pit. The first year of quarterly natural attenuation sampling was completed in June 1998. The annual report recommended that the sampling events be reduced from quarterly to semi-annual monitoring. The natural attenuation-sampling program is ongoing.

Regulatory Requirements/Community Involvement

All of the sites employing monitored natural attenuation as a remediation strategy are CERCLA sites.

Through the implementation of Partnering and public involvement by means of RAB participation, the perception of "nothing being done" with natural attenuation monitoring has been changed to the realization of its effectiveness and applicability as a remedial alternative.

Construction Challenges

An air sparging pilot study and monitoring of biodegradation natural attenuation parameters were conducted at Site 5 which resulted in a determination that the proposed remedial alternative of air sparging was not required and that monitored natural attenuation was sufficient to obtain compliance. By changing the remedial alternative a cost saving of approximately $250,000 was observed.

Cost Avoidance Measures

The costs associated with the monitoring of natural attenuation parameters are less than other more aggressive groundwater remedial alternatives. Through proper selection of monitoring wells and collection of only meaningful parameters, monitoring cost can be minimized.

Project Successes

Site 8 has been identified and described as an excellent natural biodegradation cell. Given the similar geological site makeup throughout NAS Cecil Field, the implementation of natural remediation through monitoring has proven very cost effective at many sites.

Similarly, Site 3 has been identified as having the appropriate site characteristics to support natural attenuation. Specifically, Rowell Creek sediments, which is the discharge point for the surficial aquifer from Site 3, has been shown to have the capability to significantly reduce chlorinated solvent contamination in the surficial groundwater aquifer prior to discharging to the surface water. The ability of the organic rich sediments to support an effective reductive dechlorination environment has resulted in significant cost savings since an active remediation system has not been required prior to the aquifer discharging to the surface water.

Lesson Learned

At the five sites where monitoring of natural attenuation parameters is being conducted at Cecil Field, data indicates that a reduction of groundwater contamination is occurring and it can be directly related to biodegradation processes that are being evaluated by the natural attenuation sampling. The evaluation of the MNA data has led to a reduction in the number of analytes being tested, the number of wells being sampled, and the frequency of sampling events without jeopardizing the quality of the MNA assessments.

Figure 1: ***Site map.***

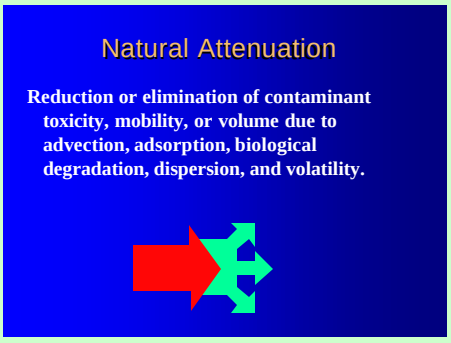

Figure 2*: Natural attenuation definition.*

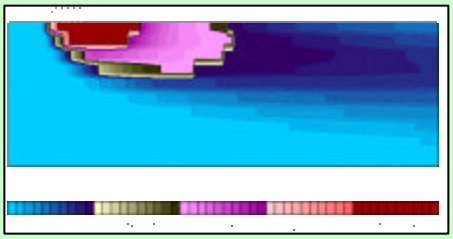

Figure 3*: Schematic diagram of redox zones.*

Figure 4*: Typical well setup for analytical field tests.*