

Petroleum Cleanup Program

REMEDIAL ACTION PLAN GUIDELINES

BUREAU OF PETROLEUM STORAGE SYSTEMS

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Topic of Guideline: In Situ Sparging, Pilot Studies, Design Requirements

Signature and Date
PE ADMINISTRATOR

Signature and Date
BUREAU CHIEF

In situ sparging is a process in which air is injected into the contaminated aquifer with the intent of causing volatilization of the dissolved hydrocarbons from the groundwater and/or enhancement of bioremediation processes within the aquifer by the addition of oxygen to the groundwater. Air sparging may also result in more rapid desorption of petroleum hydrocarbons from the soil matrix within the aquifer than could be effected by conventional pump and treat processes. Different engineering firms have proposed a number of variations of this technology.

This is now considered to be a proven technology in Florida and has been demonstrated to be effective in many hydrogeological conditions. Therefore, a pilot study is not mandatory prior to design of in situ sparging in a RAP. A pilot study is recommended if the suitability of the site conditions for in situ sparging is marginal or if the performance of a pilot study will result in a more efficient design that would outweigh the cost of the pilot study. If there is another petroleum contaminated site in close proximity which is under remediation, the Department should be contacted to determine if there is useful in situ pilot study information available for the other site. Prior to performing a pilot study, a proposal should be submitted to the Department or contracted local program for review and approval. If the size of the plume and confidence in the site's suitability for in situ sparging do not warrant performance of a pilot study, a proposal explaining the rationale for the decision to not perform a pilot study should be submitted to the Department or to the appropriate local program for review and approval. The Department (or contracted local cleanup program) will respond in writing approving the pilot study

proposal, providing comments on the pilot study proposal, or notifying the responsible party whether to proceed with RAP design without performing a pilot study. The following must be demonstrated to support a pilot study proposal and be presented in a RAP to support an in situ sparging design.

Air Sparging Pilot Study

The air sparging pilot study proposal must be submitted to the Bureau of Petroleum Storage Systems (or contracted local program) for petroleum cleanup program funded sites. For voluntary cleanups or cleanups being managed by a DEP District Office through a consent agreement or similar enforcement measure, the pilot study proposal must be submitted to the appropriate district office. The pilot study proposal shall include or demonstrate the following:

1. The Site Assessment Report has been approved.
2. Sampling results must be current (less than 9 months) to verify the correct aerial and vertical extent of the contaminant plume.
3. A summary must be provided of the site lithology, hydrogeology, contaminant type, and the aerial and vertical extent of the groundwater contaminant plume. The occurrence of free product and extent of soil contamination must be considered. The summary of site geological conditions and the degree and extent of contamination should support the conclusion that in situ sparging may be an appropriate technology considering these site specific characteristics and circumstances. This discussion should include a description of the particular variation of in situ sparging proposed and any other enhancements which may be included in the RAP design.
4. Operation of groundwater recovery in conjunction with in situ sparging is not mandatory. However, the pilot study proposal should include an evaluation of the groundwater gradient and current downgradient extent of the contaminant plume along with a recommendation of whether groundwater recovery will be necessary in conjunction with in situ sparging to prevent off-site migration of the contaminant plume or to recover off-site contaminated groundwater.
5. For petroleum cleanup program funded sites, a preliminary cost evaluation must be provided to demonstrate that in situ sparging would be a cost-effective cleanup method considering the extent and degree of contamination. The cost of performing the pilot study should be included.

6. Vacuum extraction should also be evaluated during the air sparging pilot study. Design information should also be obtained during the pilot study to allow an efficient full scale vacuum extraction system design.
7. A description of the pilot study procedures must be provided, including the location of the air sparging well(s), vacuum extraction well(s), and observation wells. The information to be gathered during the air sparging and vacuum extraction pilot study should be described. As a minimum, air flow rate, vacuum, water elevation, dissolved oxygen, groundwater concentration levels, and concentration of recovered vapors should be recorded. The data gathered should be sufficient to define the radius of influence for both air sparging and vacuum extraction. Samples and measurements must be taken before, during, and after the test. A base line of the recovered vapors concentration with only the vacuum extraction operating should be obtained to support the effectiveness of sparging.
8. A site schematic should be provided to show the location and construction details of the proposed pilot injection and extraction wells and observation wells.
9. The pilot study should be conducted no longer than 8 hours unless air emissions treatment on the vacuum extraction system is provided. Judgment should be used in providing air emissions treatment on a system to be operated for less than eight hours if it is in close proximity to inhabited areas and likely to result in adverse health or nuisance conditions.

The Department (or contracted local program) will review the pilot study proposal and, in writing, request supplemental information or concur that air sparging may be an appropriate technology and authorize the pilot study.

Remedial Action Plan Design

The results of the pilot study must be summarized in the remedial action plan (RAP). The RAP air sparging design must identify or demonstrate the following in addition to normally required RAP details:

1. Location and construction details (diameter, depth, and screened interval) of all sparging wells and vacuum extraction wells. The RAP must relate the results of the pilot study to appropriate spacing of air sparging wells.

2. The need for groundwater recovery wells in conjunction with air sparging to recover off-site contaminated groundwater, prevent off-site migration, or recover the vertical extent of the contaminant plume must be considered and provided for in the design, if appropriate.
3. The design details of air flow rate of both sparging and vacuum extraction, blower design details, sampling ports, valves, condensation trap, and treatment of the emission vapors must be described and shown in design schematics. The department recommends a moderate pressure above that necessary to overcome the static water pressure based on the design depth of the sparging wells. The rationale for the selection of the emissions treatment system must be provided. Treatment of the vacuum extraction emissions is normally required for the first 30 days of operation. Air emissions treatment may be discontinued after 30 days if the total volatile organic compound emissions, as determined by EPA Method 18, is less than 13.7 pounds per day.
4. For petroleum cleanup program funded sites, a detailed cost estimate along with a comparison with other cleanup techniques, including natural attenuation, may be requested by the Department prior to the approval of the RAP. The estimated time of cleanup must be specified along with a comparison of the time of cleanup of other cleanup methods which are considered.
5. The RAP must include a monitoring proposal to demonstrate the effectiveness of air sparging during remediation in addition to normal monitoring procedures required during remediation.