BPSS–12D – Multi-Phase Extraction Pilot Test Guidance

This document provides general guidelines for developing a multi-phase extraction (MPE) pilot test. MPE is an in-situ remedial technology for light non-aqueous phase liquids (LNAPLs) and for volatile and semi-volatile contaminants of concern (COCs) in groundwater and in the vadose zone (i.e., unsaturated soil). It may be utilized as a sole remedial technique or incorporated with other technologies (e.g., prior to bioventing, in-situ air sparging, or natural attenuation, etc.).

A MPE system pilot test is required to evaluate the feasibility of the technology and to effectively design the final treatment system. Prior to implementation of the pilot test a pilot test plan must be submitted for approval by the FDEP or local program. The pilot test plan must include, at a minimum, the following information:

1. A site diagram (indicating the North direction, drawn to scale, and including a graphical representation of the scale) depicting the following:

    a. The horizontal and vertical delineation of the plumes for each impacted medium and any other pertinent features (e.g., underground utilities, nearby surface water bodies, backfill areas, drainage systems, surface seal, aquifer heterogeneity, etc.);

    b. The location of the test well network, consisting of dedicated extraction wells and observation wells, and the location and description of condition of the surface seal; and

    c. The description of the known range of groundwater fluctuation and relevance to the effectiveness and design of MPE.

2. Design details for the MPE pilot test. Dedicated extraction well(s) are required to effectively implement the pilot test. Consider the following during the extraction well design:

    a. The extraction well(s) must be located within the most contaminated area of the plume (i.e., the area of highest COC concentrations), or as close as is physically practicable;

    b. The extraction well(s) must be screened based on site specific factors (e.g., the concentration profile of the COCs in soil and groundwater, LNAPL thickness, the depth to groundwater, historical seasonal fluctuations, tidal fluctuations, etc.) to optimize COC recovery; and

    c. The pilot test extraction well(s) should be utilized, if feasible, in the final design.

3. Dedicated vadose zone and aquifer observation wells are recommended to accurately monitor the parameters throughout the test. Consider the following during the observation well design:

    a. The number of observation wells must be sufficient to properly evaluate the operational conditions;

    b. The screened intervals of the observation well must be appropriate to monitor vadose zone or groundwater conditions;

    c. The observation wells must be located at appropriate distances (e.g., 10 ft., 20 ft., 30 ft., and 40 ft.) from the VEW(s); and

    d. The observation wells must be appropriately located to evaluate any anisotropic conditions (e.g., backfill, tank farms, drainage structures, etc.), considering areas of potential preferential pathways (e.g., grassy areas, dispenser islands, etc.) resulting from varying surface seals.

4. The impervious surface seal (e.g., concrete), if utilized, should be representative of the final design. Be advised that if a surface seal is not used in the final design, the pilot test results must demonstrate that a seal is unnecessary.

5. Construction details of all the extraction and observations wells.

6. Off-gas discharge and, if necessary, treatment design. A minimum off-gas discharge stack of fifteen (15) feet is required. The discharge stack must not be located in close proximity to any potential receptors (e.g., workers, air intake systems, etc.). Off-gas treatment must be provided if any of the following conditions exist:

    a. The system is operated for more than eight (8) hours (therefore, limiting the pilot test to no more than eight (8) hours is recommended);

    b. The site of the pilot test is in close proximity to inhabited areas such that health nuisance conditions may result from the pilot study; or

    c. Operation of the system is likely to result in adverse health effects or nuisance conditions regardless of proximity to residences due to high soil or groundwater concentrations or presence of free product.

7. A monitoring proposal, including parameters and frequency, considering the following:

    a. A step increase application, performed using a minimum of four (4) step increases in the applied vacuum/flow, is required to fully evaluate the flow processes. Equipment must be properly designed to adequately influence contaminant zone

(e.g., soil/groundwater interface, etc.) at the highest steps. The following should be measured at each step interval:

i. Applied vacuum at the vacuum extraction well head;

ii. Observed vacuum at each observation well;

iii. Vapor flow rate, including the flow stream temperature and pressure at the location of the flow rate measurement to accurately convert the rate to standard temperature and pressure;

iv. Recovered fluids flow rate;

v. Volume of groundwater recovered and LNAPL recovered; and

vi. Water table and LNAPL measurements at each observation well.

b. A minimum of two (2) off-gas samples for total petroleum hydrocarbons or total hazardous air pollutants (HAPs) (see BPSS-2) must be obtained during the step that is considered to be most representative of the final design; and

c. A minimum of two (2) groundwater samples for COCs must be obtained during the step that is considered to be most representative of the final design.

8. An evaluation of the efficiency of the air/water separator and, if applicable, separation of product/water.

9. Method of groundwater disposal and treatment, if applicable.