REGION 10
SEATTLE, WA 98101

June 5, 2024

MEMORANDUM

SUBJECT: Comments on the In Situ Stabilization Pre-Design Investigation Work Plan
Arkema Inc. Facility, Portland, Oregon
ECSI # 398
May 17, 2024

FROM: Laura Hanna, RG, Remedial Project Manager
Superfund and Emergency Management Division, EPA

TO: Katie Daugherty, RG, Project Manager
NWR Cleanup, Oregon Department of Environmental Quality

The following are the U.S. Environmental Protection Agency's (EPA's) comments on the document titled *In Situ Stabilization Pre-Design Investigation Work Plan* (ISS PDI Work Plan). The ISS PDI WP was prepared by Environmental Resources Management, Inc. (ERM) for Legacy Site Services LLC. The Former Arkema Inc. Facility (site) is located at 6400 NW Front Avenue in Portland, Oregon and listed as Environmental Cleanup Site Information (ECSI) #398. The site is located adjacent to the Willamette River upland of the River Mile 7 West (RM7W) remedial design project area within the Portland Harbor Superfund Site (PHSS). The ISS PDI Work Plan has been prepared to describe investigation sampling and activities at the site to inform the pre-design of Interim Remedial Action Measure (IRAM 1). EPA understands the goal of IRAM 1 is to address the monochlorobenzene source area using in situ stabilization/solidification (ISS) and/or in situ chemical oxidation (ISCO) technologies, and the treatment area of IRAM 1 focuses on dense nonaqueous-phase liquid (DNAPL) present in soil and groundwater.

EPA's comments are categorized as "Primary," which identify concerns that must be resolved to achieve the objective; "To Be Considered," which, if addressed or resolved, would reduce uncertainty, improve confidence in the document's conclusions, and/or best support the objectives; and "Matters of Style," which substantially or adversely affect the presentation of the technical information provided in the report.

Primary Comments

1. The work plan does not provide a means to investigate the bedrock surface (if consistent with the CSM). As a dense NAPL (density = 1.11 g/mL), chlorobenzene will accumulate within bedrock lows or on low permeability layers if present. Please indicate within the Work Plan how the bedrock surface will be investigated. For example, if one or more of the 20-30 borings indicate a bedrock (or low hydraulic conductivity [K] layer) low with DNAPL a procedure should be in place to map out the extent of the low area. Geophysical techniques could also be used as a guide to locate borings depending on the CSM.

2. The work plan should include a QAPP that addresses QA/QC requirements, includes standard operating procedures (SOPs) and additional information on the treatability testing procedures and processes. While not an exhaustive list, EPA recommends the following information should be provided in a revised ISS PDI Work Plan:

    a. Sample containers, preservatives, holding times, methods, reporting limits, and method detection limits.

    b. Details concerning sample selection from cores for actual testing and formulating mixtures; including an explanation on how the samples selected for analysis will be handled to prevent or minimize volatilization,

    c. Criteria for sample selection, lab processing, compositing, homogenization, subsampling, number of samples, etc.; General subsampling procedures should reference ASTM D6323 with a preference for riffle splitting,

    d. EPA recommends that detailed evaluations of leaching tests and associated leaching and overall performance criteria be included, including the modified SPLP procedure. Additional testing conditions/modifications typically incorporated into the testing may include those in ASTM C1308 and in "The Tank Test" (Environmental Agency EA NEN 7375:2004)

    e. EPA recommends if NAPL is identified by visual indicators (i.e., blebs; coated or saturated soil) a shake test should be administered. A shake test should be administered for each interval with visible NAPL. ASTM International E3281 – 21, Standard Guide for NAPL Mobility and Migration in Sediments – Screening Process to Categorize Samples for Laboratory NAPL Mobility Testing should be followed for NAPL identification and for performing a shake test.

    f. EPA recommends including the reference ASTM E3281-21a Section 10.4 when discussing the Sudan IV and Oil Red O dye.

3. Section 2.2 Soil Sampling – Add section to describe geologic units. The ISS PDI Work Plan mentions that each boring will be drilled and cased off when the different units are encountered (shallow intermediate silt, intermediate, and deep zones) but do not provide insight into how they will determine these units in the field. The geologic unit descriptions would provide context for field staff to know what unit they are in.

a. The UCS test method is listed as D2166 but ITRC (2011) lists D1633 as the preferred method. Explain the rationale for using D2166 over D1633. Additional consideration should be given for index testing of soil before amendment mixing including water content, Atterberg limits, sieve analysis, hydrometer analysis, specific gravity, total organic carbon, sulfate, chloride, bulk density. These are important parameters to consider in mix design (e.g., sulfate content can affect the performance of the cement; selection of cement type may depend on the amount of sulfate; chloride content can affect the performance of the bentonite). In addition, changes in temperature should be noted and any odor generation. The amount of swelling is important and hazardous waste characterization should be conducted if off-site disposal of the back flow from the swelling during ISS is necessary.

To Be Considered

1. EPA recommends inclusion of bentonite in the treatability testing to achieve hydraulic conductivity criteria and assist the in situ mixing. Note: Cement alone may not be an effective amendment in achieving a hydraulic conductivity performance criterion. An effective amendment in achieving a hydraulic conductivity criterion is bentonite. Bentonite is also more cost-effective (1-2 % reagent dose) compared to cement (5-15 % reagent dose) and also an important lubricant to enable adequate in situ mixing.

2. The Work Plan would benefit from a Data Quality Objectives (DQOs) section. DQOs should be written using the EPA guidance document "Guidance on Systematic Planning Using the Data Quality Objectives Process EPA QA/G-4, EPA/240/B-06/001 February 2006" or a more recent update of this guidance, if available.

3. Introduction – The use of ISCO for NAPL is possible, but challenging and generally requires high doses of oxidant (ITRC 2005). ISCO may effectively supplement ISS, but probably will not replace ISS. Please remove the "/or" from "and/or" in this sentence.

4. Section 2.2 Soil Sampling, 2nd bullet – There should be an additional category for samples with no evidence of DNAPL, but a positive PID reading.

References

EPA. 2006. *Guidance on Systematic Planning Using the Data Quality Objectives Process EPA QA/G-4*. EPA/240/B-06/001 February.

Interstate Technology Regulatory Council (ITRC). 2005. Technical and Regulatory Guidance for In Situ Chemical Oxidation of Contaminated Soil and Groundwater.

Interstate Technology and Research Council (ITRC). 2011. *Development of Performance Specifications for Solidification/Stabilization. S/S-1. Washington, D.C.: Interstate Technology & Regulatory Council, Solidification/Stabilization Team*. July.

EPA, 2011. Environmental Cleanup Best Management Practices: Effective Use of the Project Life Cycle Conceptual Site Model. EPA 542-F-11-011. July 2011.

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