



Oregon

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January 16, 2025

via email delivery

Todd Slater
Legacy Site Services, LLC
3553 West Chester Pike, #413
Newtown Square, PA 19073

Subject: *In Situ Stabilization Pre-Design Investigation*
Arkema Facility, ECSI No. 398

Dear Mr. Slater:

The Oregon Department of Environmental Quality received and reviewed the December 9, 2024 *In Situ Stabilization Pre-Design Investigation* (ISS PDI) report, prepared by Environmental Resources Management, Inc. for Legacy Site Services LLC. The ISS PDI documents results of investigation and sampling activities completed to inform the design for the implementation of an interim remedial action measure to address the monochlorobenzene source area originating from the former acid plant area using a combination of excavation and ISS and/or in situ chemical oxidation technologies.

DEQ has the following comments on the ISS PDI report.

- 1) **Section 2.2.1, Delineation Soil Samples.** This section states that unknown substances were identified in four soil cores collected as part of the PDI, and that samples of soil containing these unknown substances were submitted for laboratory analysis. DEQ requests that this section be expanded to provide a brief description of the nature of these unknown substances, and the key field observations that identified the substances as unique.
- 2) **Section 3.1, Field Results.** The first sentence states that field observations and measurements collected in the field are presented in boring logs. DEQ requests that the ISS PDI report also include representative photographs of field observations. To the extent possible, representative photographs should include examples of each hydrogeologic unit, examples of each category of contamination, examples of unknown substances, examples of petroleum-based non-aqueous phase liquid (NAPL), and examples of pesticide- and petroleum-related contamination.
- 3) **Section 4.1, DNAPL Conceptual Site Model.** Section 4.1 indicates that "...DNAPL is presented on Figure 11." The report should clarify whether the "DNAPL Plume" in Figure 11 includes "Some contamination soil" or just "Contaminated soils" as defined in Section 1
- 4) **Section 5.2, Preliminary Design Considerations.** This section discusses a summary of design criteria that will be considered during the 30 percent design. DEQ understands that the ISS PDI report was intended to represent the preliminary design and that the next design deliverable will be the Pre-Final Design Report. In addition to the design criteria

listed in this section, DEQ requests that the next design deliverable includes information related to the following:

- a. Continue identifying likely equipment and construction approaches. DEQ understands that the selected construction contractor will determine some of the means and methods for achieving the design criteria. However, the next design deliverable should refine the discussion of likely construction approaches and identify key considerations for these approaches.
- b. Identify construction specifications and quality assurance metrics and methods for ISS based on likely construction approaches. These should include requirements for ISS column overlaps, mast verticality, amendment dosing, mixing, and sampling.
- c. Discuss any potential geotechnical considerations during and following ISS treatment (e.g., settlement or fill consolidation).
- d. Discuss considerations for ISS treatment near groundwater extraction trenches, including cure time and the potential need to pause pumping during ISS cure to avoid drawing grout towards the trenches. Discuss any potential changes to the groundwater treatment system influent characteristics during application and cure (e.g., changes in pH, increases in chlorobenzene concentrations resulting from ISCO).
- e. Estimate production rates.
- f. Discuss batch plant configurations and layouts and material delivery logistics and staging.
- g. Identify material testing requirements and environmental monitoring and control (e.g., dust) during construction.

5) **Section 5.3, IITA Treatment Area and Volume.** DEQ has the following comments:

- a. The principal dense non-aqueous phase liquid (DNAPL) impact area descriptions do not always clearly match the depiction of the DNAPL areas shown on cross sections. For example, the shallow vadose zone DNAPL between PDI-01 and PDI-13 is described as occurring between elevation 24 to 30 feet NAVD88, with the shallow zone DNAPL extending between 12 and -4 feet NAVD 88 (an approximately 12-foot separation between vadose zone and shallow zone DNAPL). However, Figure 14 depicts vadose zone DNAPL extending below 24 feet NAVD88, with only a short separation between the vadose zone DNAPL and shallow zone DNAPL. DEQ recommends that future deliverables clarify descriptions of various DNAPL impact areas.
- b. This section describes the overburden above DNAPL impact areas as ‘clean soil.’ Please clarify whether ‘clean’ indicates that contaminant of concern (COC) concentrations in these soils are below clean fill screening level values.
- c. Section 5.3 makes reference to Appendix E, Sheet 7 as a conceptual layout for the area to be treated using in situ stabilization (ISS). The ISS treatment area should be shown

in a figure in the main body of report superimposed on the plumes depicted in Figure 11. This will allow the reader to evaluate the extent of treatment relative to the mapped plume.

- 6) **Section 5.4, Excavation of Overburden Soil.** DEQ has the following comments:
- a. This section states that waste characterization and soil handling approaches will be presented in a forthcoming Contaminated Material Management Plan (CMMP). Please clarify when the CMMP submittal will be sequenced with forthcoming design deliverables. The next design deliverable should discuss material handling approaches and disposal options.
 - b. The next design deliverable should identify overburden soil exceeding direct contact hot spot thresholds.
- 7) **Section 7, Conclusions.** The first paragraph of this section states the horizontal extent of DNAPL does not extend into the Willamette River sediments. This statement is not supported by the data submitted to DEQ and is premature. Revise or delete this statement.
- 8) **Consistent Use of Identifiers.** Identification of the various areas of contamination varies throughout the report, which creates confusion. Section 3.2.2 provides relatively clear identification based on soil boring locations PDI-15, PDI-20, and PDI-24. These definitions are also used in Section 4.2. However, Section 5.3 makes reference to the area around PDI-20 but not to the areas around PDI-15 and PDI-24. Further, Section 7 refers to “a petroleum hydrocarbon source...Southeast of the DNAPL [dense non-aqueous phase liquid]”—it is unclear to which area this refers. A consistent set of identifiers should be developed and used throughout the report. Section 5.3 should also discuss all identified areas of soil contamination, even if only to indicate that plans for treatment for some areas will be developed in the future.

EPA has also reviewed the ISS PDI report. EPA’s comments are enclosed for your consideration. Please contact me at 503-860-3943 or by email at Katie.Daugherty@deq.oregon.gov if you have any questions.

Sincerely,

Katie DAUGHERTY

Katie Daugherty, R.G.
Project Manager
Cleanup Program
Northwest Region

Enclosure - EPA Comments

ecc Eva DeMaria, EPA
 Brendan Robinson, ERM



REGION 10

SEATTLE, WA 98101

January 10, 2025

MEMORANDUM

SUBJECT: EPA Comments on In Situ Stabilization Pre-Design Investigation
Arkema Inc. Facility, Portland, Oregon
ECSI #398
December 9, 2024

FROM: Eva DeMaria, Remedial Project Manager
Superfund and Emergency Management Division

TO: Katie Daugherty, Project Manager
Northwest Region Cleanup Section, 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* (ISS PDI Report). The ISS PDI Report 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 Report has been prepared to present Phase 1 of the investigation and sampling activities completed 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 a combination of excavation, 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; and "To Be Considered," which, if addressed or resolved, would reduce uncertainty, improve confidence in the document's conclusions, and/or best support the objectives.

Primary Comments

1. The Arkema upland remedy design group should evaluate, parallel with the design and construction of this ISS remedy, the potential influence the proposed ISS remedy will have to the

current groundwater flow regime. This evaluation would focus on understanding potential effects of the displacement of groundwater storage replaced by the remedy feature, resulting changes to groundwater level conditions (if any) and changes in groundwater flow and flow paths that may require adjustments in the existing hydraulic containment control system upgradient of the barrier wall.

2. The conclusion in Section 7, first paragraph, second sentence stating that *“The horizontal extent of DNAPL is well constrained, and DNAPL does not extend into Willamette River sediments.”* should be removed as it is premature to make this conclusion until PDI Phase 2 data, which are intended to refine the lateral extent of the DNAPL, are presented and evaluated. For example, Cross-Section 1-1’ (Figure 12) shows the NAPL extent abruptly ending at PDI-08 where it is present, yet there is no additional subsurface data towards the river to confirm the absence of NAPL.

To Be Considered

1. EPA recommends providing an explanation on how the offshore borings, presented in the transect location map and cross-sections (transects) extending into the river, were used in evaluating and delineating the horizontal extent of the DNAPL.
2. It is apparent the approved PDI Work Plan used sonic boring drilling methods with no split spoon sampling noted. Performing traditional geotechnical soil sampling to obtain additional soil parameters could be used with correlations for soil parameters. Since the treatment area is contained to the upland area and the final product will be stronger than the existing soils, strength data for constructability may be needed for the design. Presenting historical borings showing blow counts or any other lab testing may be useful to inform this topic.
3. The proposed use of sodium persulfate ISCO in combination with stabilization/solidification may have some synergies. For example, the high pH of the Portland cement environment can favor the formation of highly reactive sulfate and hydroxide free radicals, particularly under the higher temperatures due to the heat of formation generated during curing of the cement. Persulfate reacts slowly with natural soil organic matter preserving reactant for chlorobenzene. However, high concentrations of chloride can act as scavengers for sulfate free radicals, resulting in a reduction in the effectiveness of persulfate. The former salt pads are adjacent to the NAPL plume suggesting that chloride concentrations may be high in some areas. Consider addressing chloride in the bench-scale study.
4. Residual or mobile DNAPL which cannot be destroyed by ISCO may require stabilization/solidification additives such as organoclay or lime/fly ash. Consider these additives in the bench-scale study.
5. Section 5 (Interim Remedial Action Measure #1 Conceptual Design), discusses, but does not fully explain the difference between this conceptual design option and others considered. It is confusing in Section 5.3 Paragraph 2 Bullet Points 1 and 3 which state that clean soil from 0 – 10 feet below ground surface (bgs) will be excavated and stockpiled but Section 5.4 states that approximately 5.0 to 15.0 feet bgs will be excavated. This is further exacerbated in Appendix E

which provides figures showing 3 different options of excavation depths (5, 10, and 15 feet bgs) but the Conceptual Mixing Plan in Sheets 7 and 8 only indicate 5 feet bgs excavation depth. Please add clarification on the extent of the proposed conceptual design.