

May 25, 2017

Washington State Department of Ecology  
PO Box 47775  
Olympia, Washington 98504-7775

Attention: Tim Mullin, LG

Subject: Response to Ecology Comments on  
Shallow Soil and Groundwater Treatment Work Plan  
318 State Avenue NE  
Olympia, Washington  
File No. 0415-049-07

This letter presents a response to the Washington State Department of Ecology (Ecology) comments on the Shallow Soil and Groundwater Treatment Work Plan (Work Plan) (GeoEngineers 2016) for the City of Olympia's 318 State Avenue NE property in Olympia, Washington. The comments were provided by Ecology in an opinion letter dated February 10, 2017. The following presents each of Ecology's comments followed by a response to the comment.

## COMMENTS

1. Overall, Ecology concurs with the proposal of chemical injection to reduce VOC concentrations in shallow soil and groundwater. However, Ecology has the following comments.
  - a) VOC concentrations in shallow soil and groundwater have been identified primarily between approximately 2 to 9 feet below ground surface (bgs). Depth to groundwater in Site monitoring wells has fluctuated between approximately 3 and 5 feet below top of casing. Shallow groundwater beneath the Site is located in fill which sits atop an approximately 2-foot thick peat and silt layer observed from approximately 6 to 10 feet bgs. The work plan proposes injecting soluble iron, fermentable carbon, microorganisms (*Dehalococcoides* sp. [DHC]) from 2 to 9 feet bgs, targeting the smear zone as well as any residual concentrations which lie in the upper portion of the uppermost aquifer beneath the Site.

**Response:** Comment noted.



- b) Prior to starting the field work, register the Site with Ecology's Underground Injection Control (UIC) division. The injection points proposed in the work plan are considered Class V injection wells under WAC 173-218-040(5)(x). The online registration form is located here:

i. <http://WWW.ecy.wa.gov/programs/Wq/grndwtr/uic/UIConlineregis.html>

**Response:** The injection wells will be registered as noted.

2. Please provide additional detail (e.g., examples of commercially available product names) about the chemical composition of the products to be injected. Per WAC 173-218-080, the nonendangerment standard for groundwater must be met. The chemicals in these fluids cannot result in exceedances of groundwater cleanup levels.

**Response:** The treatment approach does not use any chemicals that would result in exceedances of groundwater cleanup levels and thus meets the non-endangerment standard for groundwater (WAC 173-218-080). Examples of commercially available product names include the following:

- PeroxyChem
  - EHC in situ chemical reduction (ISCR) (organic carbon and iron amendment)
- Regenesis Remediation Products
  - Bio-Dechlor Inoculum (BDI) Plus (microorganisms)
  - 3D-Microemulsion (electron donor)
  - CRS (Chemical Reducing Solution) (iron-based amendment)
  - Plume Stop Liquid Activated Carbon (activated carbon)
- RNAS Remediation Products
  - SDC-9 (microorganisms)
  - Newman Zone (electron donor)
- SiREM
  - KB-1 and KB-2 Plus bioaugmentation (microorganisms)

3. In the fifth paragraph of Section 4.0 (Treatment Approach), the work plan proposes approximately 55 direct-push borings as injection points. Ecology suggests referencing Section 5.4 (Treatment Monitoring) and elaborating on which field conditions may result in more than 55 injection points (in order to maximize degradation of chlorinated solvents).

**Response:** A reference to Section 5.4 has been added to Section 4.0 as requested. Conditions that may result in more than 55 injection points is if there are indications that the treatment reagents are not being adequately distributed at the proposed injection point distance of 15 feet. The results of monitoring of wells in the treatment area will provide indications of whether the reagents are being adequately distributed as described in Section 5.4. In general, field conditions that would result in more than 55 injection points would be the presence of lower permeability soil.



4. With regards to groundwater monitoring before, during, and after the injections, Ecology requests that you consider the following:

- a) Ecology concurs that the well network should be sampled prior to initiating the injections in order to establish a recent baseline of pre-injection conditions at the Site (Figure 1).

**Response:** Comment noted.

- b) Ecology concurs that MW-01 is the background well to use for determining background conditions at the Site before, during, and after injection (Figure 2).

**Response:** Comment noted.

- c) Ecology concurs with the contingency for quarterly groundwater monitoring past the 12-month mark. A post-injection rebound spike of VOC concentrations is likely as desorption of VOCs from soil causes residual contaminant concentrations to enter the groundwater dissolved phase. Any rebound spike of chlorinated VOC concentrations in groundwater may persist beyond 12 months.

**Response:** Comment noted.

- d) Ecology recommends that all monitoring wells identified in the work plan (MW-01, MW-03, MW-16, MW-18, and MW-19) be sampled for the parameters and constituents proposed in the work plan (Tables 1 and 2). Except for MW-01, VOC concentrations have been identified in each monitoring well proposed for sampling, including MW-18, which is located at the northern property boundary.

**Response:** VOCs (chlorinated solvents and degradation products) have been added to the analyte list for MW-01.

- e) If in fact "contaminant concentrations are anticipated to be below cleanup levels within the first three months" (Section 4.0, fourth paragraph), monthly sampling should be completed for the first three months after injection in order to establish concentration trends. However, Ecology suggests revising this statement, as it is unlikely that concentrations trends will comply with Site cleanup levels within three months after injection without a subsequent rebound spike.

**Response:** The identified statement has been deleted from the Work Plan.

5. In Section 5.3, paragraph 2, it is stated: "Each injection point will be abandoned in accordance with Washington State law (WAC 173-160-381) using bentonite grout." Injection points advanced using direct push probe should be decommissioned consistent with WAC 173-218-120 and WAC 173-160-460. Bentonite grout is satisfactory to use for injection point decommissioning. Ecology recommends finishing each decommissioned injection point with a surface seal of concrete.

**Response:** The Work Plan has been revised in response to the comment.

6. As a fermentable carbon source is proposed for injection into the subsurface, total organic carbon (TOC) should be added to the groundwater sampling list.

**Response:** TOC has been added to the groundwater analyte list as requested.

7. In Section 5.4 (Treatment Monitoring) of the work plan, it is proposed to measure the following groundwater quality parameters during treatment: depth to water, pH, temperature, dissolved



oxygen (DO), conductivity, and oxidation-reduction potential (ORP). For consistency with past groundwater monitoring and to compare groundwater quality parameter data across monitoring events, Ecology recommends collecting data for all groundwater quality parameters, as identified in Table 2.

**Response:** All groundwater quality parameters identified in Table 2 will be monitored as part of remedial action monitoring as requested.

8. Though a contractor to complete the injections has not yet been selected, and thus the specific design of the field implemented chemical injection system may vary slightly, please provide a diagram of a standard design for the chemical injection system based on the equipment described in work plan Sections 5.1 (Equipment) and 5.3 (Treatment. Methods).

**Response:** Provided with the response to comments is a conceptual design of the chemical injection system based on the equipment described in the Work Plan.

9. Specify what is meant in Section 5.4 (Treatment Monitoring) by "alternative injection tooling or techniques."

**Response:** A remediation contractor should have a few different types of injection tooling since one tool doesn't work in all situations. Standard types of injection tooling include retractable screen, expendable tip, open screen top-down tool, and pressure activated tool. The type of tooling has been added to the Work Plan.

10. Identify if any air monitoring is required based on the injection chemicals in addition to the photoionization detector (PID) based air monitoring proposed in the Air Monitoring Plan (Section 6.0) of the health and safety plan (HASP; Appendix A of workplan).

**Response:** No air monitoring is required as the reagents that are used are not volatile.

11. In accordance with WAC 173-340-840(5) and Ecology Toxics Cleanup Program Policy 840 (Data Submittal Requirements), data generated for Remedial Actions shall be submitted simultaneously in both a written and electronic format.

For additional information regarding electronic format requirements, see the website <http://www.ecy.wa.gov/eim>. Be advised that according to the policy, any reports containing sampling data that are submitted for Ecology review are considered incomplete until the electronic data has been entered. Please ensure that data generated during on-site activities is submitted pursuant to this policy. Data must be submitted to Ecology in this format for Ecology to issue a No Further Action determination; however, Ecology highly recommends that this data be submitted concurrently with submittal of the environmental report.

Please be sure to submit all soil and groundwater data collected to date, as well as any future data, in this format. Be advised that Ecology requires up to two weeks to process the data once they are received.

**Response:** Data generated as part of the remedial action will be submitted to the EIM in accordance with WAC 173-340-840(5) and Ecology Toxics Cleanup Program Policy 840 (Data Submittal Requirements). The data will be submitted as closely as possible to the submittal of the written report.



We would like to set up a meeting to discuss any additional questions you may have on the Work Plan as well as discuss the process to receive a No Further Action (NFA) or the 318 State Avenue property. I will contact you to schedule a time that we can meet with you.

Sincerely,  
GeoEngineers, Inc.



Iain H. Wingard  
Associate

IHW:ch

Attachment:  
Regenesis Remediation Services Injection Trailer

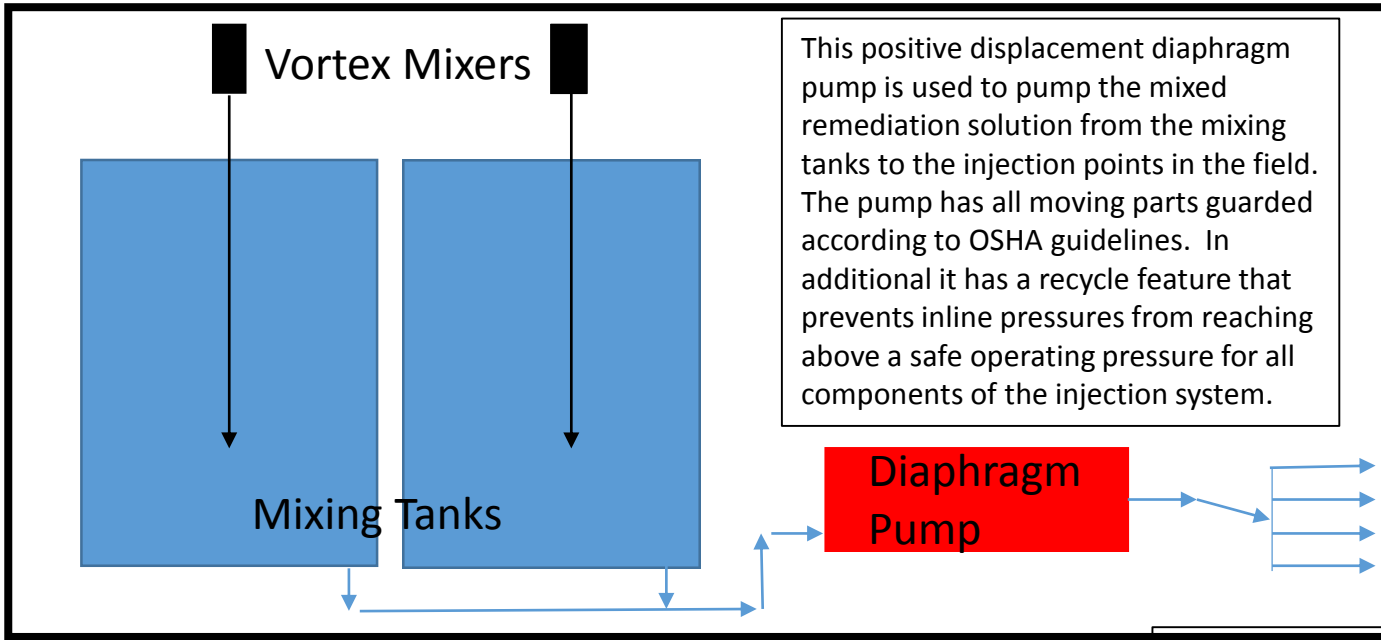
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# Regenesis Remediation Services Injection Trailer



The injection trailer receives its power from a 220 volt generator mounted outside of the enclosed cargo area. The generator is grounded and protected from rain. All exhaust fumes are released outside of the enclosed portion of the trailer.



This positive displacement diaphragm pump is used to pump the mixed remediation solution from the mixing tanks to the injection points in the field. The pump has all moving parts guarded according to OSHA guidelines. In addition it has a recycle feature that prevents inline pressures from reaching above a safe operating pressure for all components of the injection system.



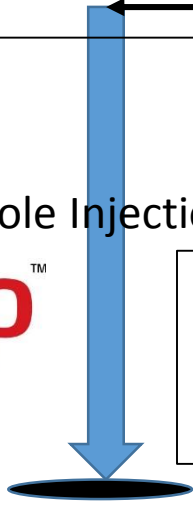
Injection Hoses – RRS will run up to four hoses from the trailer to 4 locations of injection.

Mixing Tanks with mounted vortex mixers used to mix the remediation products into the correct wt/wt solution with water. The tanks are covered to prevent operator exposure to the remediation chemistry.

Manifold system allowing for injection at up to 4 locations at once. Flow into each leg of the manifold is controlled using a ball valve.



## Downhole Injection Tooling



Composite metal piping is advanced into the ground reaching the depth that corresponds to the remedial design. Remediation chemistry will be applied using a retractable dropout screen tool to ensure horizontal distribution.

The hard pipe flow meter assembly has a digital flow meter, to monitor the volume of solution applied at each injection location. This assembly also has a pressure gauge to monitor pressure, and a valve system to control flow and expel pressure.

