



STATE OF WASHINGTON  
DEPARTMENT OF ECOLOGY

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November 12, 2019

Mr. Dan Hatch  
G-Logics, Inc.  
40 2nd Avenue SE  
Issaquah, WA

**Subject: Ecology Comments on Proposed Cleanup Action Alternatives  
Boeing Field Chevron  
10805 Tukwila International Blvd Tukwila, WA 98168  
Ecology Facility/Site No.: 2551  
Agreed Order No.: DE-10947**

Dear Dan Hatch:

Ecology greatly appreciates the opportunity to review the conceptual remedial alternatives being considered to address Site conditions.

An underlying understanding of our review of these alternatives is that:

- All applicable MTCA laws, policies, guidance and ARARs shall be incorporated by the Potentially Liable Persons (PLPs) into the Feasibility Study (FS),
- The selected remedial alternative (either individual or a combination of alternatives) shall address all contamination and exposure pathways at the site and
- That if a remedial alternative implemented by the PLPs fails to achieve cleanup standards, an alternative approach shall be identified and implemented. This process shall be repeated until the cleanup standards established for the Site are achieved.

**Feasibility Study**

Under the MTCA Cleanup Regulation, a FS must be conducted and a cleanup action selected in accordance with the requirements set forth in WAC 173-340-350. As part of that study, a range of cleanup action alternatives must be developed and evaluated based on the minimum requirements specified in WAC 173-340-360(2).

**Detailed Evaluation and Selection of Alternatives**

1. **Threshold and Other Requirements [see WAC 173-340-360(2)].** Describe in detail how each alternative meets the criteria outlined below. Alternatives must meet the threshold requirements and use permanent solutions to the maximum extent

practicable. If an alternative does not meet these criteria, it should be eliminated from further consideration.

- i. **Protect human health and the environment.** This is a critical requirement. Consider to what degree the alternative reduces risk, how much time it will take to meet cleanup standards, and any on-site or off-site risks related to implementing the cleanup. If necessary, evaluate residual threats posed by each alternative, and determine if remedies that are protective of human health are also protective of ecological receptors.
  - ii. **Comply with cleanup standards.** See WAC 173-340-700 through 173-340-760.
  - iii. **Comply with applicable state and federal laws.** See WAC 173-340-710.
  - iv. **Provide for compliance monitoring.** See WAC 173-340-410 and WAC 173-340-720 through 173-340-760.
  - v. **Reasonable Restoration Time Frame.** Describe the estimated restoration time frame for each alternative and the basis for this estimate. Discuss the reasonableness of this time frame using the criteria in WAC 173-340-360(4).
2. **Disproportionate Cost Analysis (DCA) Ranking Criteria.** Compare and contrast each alternative for each of the following criterion [WAC 173-340-360(3)(f)]. Rank each alternative from most to least permanent, based on the evaluation of the criteria below.
- i. **Protectiveness.** Overall protectiveness of human health and the environment.
  - ii. **Permanence.** The degree to which the alternative permanently reduces the toxicity, mobility, or volume of hazardous substances. Consider treatment capability, reduction of releases, management of the sources of release, degree of irreversibility of treatment, and the quantity and quality of treatment wastes.
  - iii. **Cost.** The cost to implement the alternative. Includes present capital costs, future capital costs, indirect costs, and operation and maintenance costs.
  - iv. **Effectiveness over the long-term.** Consider the degree of certainty for cleanup success, long-term reliability, and magnitude of residual risk, management of treatment wastes, and management of wastes left untreated.
  - v. **Management of short-term risks.** Assess the risk to human health and the environment associated with the alternative during construction and implementation.
  - vi. **Technical and administrative implementability.** Ability to be implemented including consideration of whether the alternative is technically and administratively possible.
  - vii. **Consider public concerns.** Provide a narrative regarding whether the community has concerns regarding the alternative and, if so, the extent to which the alternative addresses those concerns.

### **Monitored Natural Attenuation (MNA)**

In accordance with Ecology's Guidance on Remediation of Petroleum-Contaminated Ground Water By Natural Attenuation, Publication No. 05-09-091 (version 1.0), MNA may be suitable for addressing residual impacts (such as potential down-gradient contaminant migration in GW)

In most cases the soil contamination at a site has impacted the underlying ground water, and as such, the cleanup of the ground water is dependent on the cleanup of the contaminated soils.

A cleanup action that uses natural attenuation, either alone or in conjunction with other cleanup action components, to clean up petroleum-contaminated ground water **conforms** to the **expectations** set forth in WAC 173-340-370(7) if:

- **Source control** (including removal and/or treatment of hazardous substances) has been conducted to the **maximum extent practicable**;
- There is evidence **that natural biodegradation or chemical degradation** is occurring and will continue to occur at a **reasonable rate** at the site;
- The estimated restoration time frame for natural attenuation is reasonable compared to that of other more active cleanup action alternatives.

### **The following are Ecology's comments on your Proposed Cleanup Action Alternatives.**

You have listed seven cleanup Alternatives, however an additional "Gold Standard" Cleanup Alternative should be added. This Alternative should be the excavation of all contaminated soil (including beneath Tukwila International Blvd and E Marginal Way S), and the remediation of groundwater that does not require an Environmental Covenant.

Ecology suggests you also consider additional alternatives, especially for the lower semi-confined groundwater zone. For example: Pump and treat with upgradient re-injection and addition of oxygen, and nutrients.

Additionally if selected alternative or combination of alternatives were to be applied and were not successful in remediating the Site within an appropriate restoration time frame, the PLPs would be required to identify and implement other remedial approaches to address residual contamination in order to bring the Site to closure.

- An acceptable restoration time frame will be dependent upon how well remedial alternatives work in this hydro stratigraphic situation.

### **CAA1 Monitored Natural Attenuation (MNA) and Institutional Controls**

- MNA is not suitable alone, but potentially applicable as a final polishing step after concentrations of chemicals of concern (COCs) are reduced by other means.
- Given the high concentrations of COCs and light non-aqueous phase liquids (LNAPL) in the source areas, the remedial alternatives need to address these source(s) of contaminants to mitigate future down-gradient migration (as presented in other options below).
- Additionally, use of MNA would require demonstration that the Site conditions are conducive to MNA in accordance with Ecology guidance, would document how source mass will be addressed by other alternatives, would document that the

groundwater plume is not expanding, and would confirm that receptors would not be affected during the restoration time frame.

- Contaminant concentrations in soil and groundwater are very high in the source area, and there is significant off-property migration. Consequently, Ecology does not concur that the Site poses “low potential risks” to either human health or the environment.
- As with the City of Seattle, the City of Tukwila may not approve an Environmental Covenant within their right-of-way.

#### **CAA2 Light non-aqueous phase liquids (LNAPL) Removal, Oxygen Diffusion (upper and lower saturated zone), MNA, and Institutional Controls**

- Ecology agrees that removal of LNAPL is a necessary component of Site remediation. However, previous LNAPL recovery efforts at the Site were only partially successful, possibly due to the variability in subsurface soil types. Ecology recommends that the FS review the previous LNAPL recovery efforts, and the recent pilot test results where applicable, as part of the evaluation of this approach.
- A pilot test would be advised to assess influence radii in the upper and lower saturated zones. Oxygen would be expected to stimulate biodegradation of dissolved petroleum. However, the literature should be reviewed regarding concentrations ranges for which this method would be effective. Also may require prior reduction of concentrations by other means.
- Remediation levels may be appropriate as goals for specific remedial technologies; see WAC 173-340-355. However, remediation levels have not been proposed to Ecology for review and approval.
- The City of Tukwila may not approve an Environmental Covenant within their right-of-way.

#### **CAA3 Dual-phase extraction (DPE) in upper saturated zone, Oxygen Diffusion in lower saturated zone, LNAPL Removal, MNA, and Institutional Controls.**

- As with CCA2, an assessment of the LNAPL distribution will be beneficial in evaluating the appropriateness of this alternative for both the shallow zone and the deeper saturated zone and provide needed information on where DPE should be performed spatially to be effective.
- LNAPL has been identified in the lower saturated zone (i.e., below the silt layer). The FS will need to specify how it will be addressed and effectively removed.
- A pilot test would likely be needed to assess the viability of DPE.
- The City of Tukwila may not approve an Environmental Covenant within their right-of-way.

#### **CAA4 Hot-Spot Excavation and Off-Site Disposal, MNA, and Institutional Controls**

- Ecology recommends that multiple scenarios of removal be evaluated as part of the FS and included as part of the DCA. What percentage of the overall on-property contaminants would be removed under a minimal-disruption scenario? Ecology expects that all known LNAPL accumulation would be addressed under the approved alternative.

- To remove soil as described, the existing Site facilities would need to be removed, perhaps temporarily, above the affected areas. If that level of effort is undertaken, all of the impacted soils should be removed.
- For each remedial alternative, the FS needs to identify the residual contamination that would remain following implementation (whether on-property or beneath the ROW) and identify a means and restoration timeframe for addressing the residual impacts.
- CAA4 may be appropriate, *however it should be followed* by some sort of active groundwater remediation, not just relying on MNA.
- The City of Tukwila may not approve an Environmental Covenant within their right-of-way.

**CAA5 Shallow Excavation (upper saturated zone), In-Situ Chemical Oxidation (lower saturated zone), MNA, and Institutional Controls**

- As with Ecology's comment for CAA4, to remove soil as described, the existing Site facilities would need to be removed above the affected areas. If that level of effort is undertaken, all of the impacted soils should be removed.
- Ecology recommends that the PLPs consider the following:
  - The incremental effort/cost effectiveness required to access LNAPL present in the lower saturated zone and
  - The potential for creating additional holes in the confining layer which could lead to the spread of contamination to remediated shallow zone soils.
- Ecology concurs with the use of treatment technologies for the Site. The FS will need to evaluate the In-Situ Chemical Oxidation (ISCO) options and identify the most effective product, delivery method, timeframe, and anticipated effort (i.e., number of treatment points and events). Ecology recommends that a range of approaches be identified with increasing aggressiveness in the event that the initial attempts are unsuccessful.
- This option does not appear to include LNAPL recovery in the lower saturated zone. While ISCO methods are appropriate to consider for soil and Groundwater impacts, LNAPL removal would also be needed and may not be feasible with ISCO alone.
- A pilot test would likely be needed to assess the viability of ISCO in the lower saturated zone.
- The City of Tukwila may not approve an Environmental Covenant within their right-of-way.

**CAA6 In-Situ Carbon Adsorption and Enhanced Bioremediation, MNA, and Institutional Controls**

- This alternative needs to be combined with other alternatives. PLPs should also check the literature regarding combining oxygen, microbes, nutrients, and activated carbon together.
- Ecology has reservations regarding the use of injected carbon sources as an effective means to facilitate bioremediation or mass removal. With any remedial alternative, the PLPs would need to demonstrate compliance with both soil and groundwater cleanup standards in order to achieve closure.
- The FS should include estimates of the amount and type of nutrient that will be required to mineralize the current mass of contaminants in soil and groundwater.

- It is unlikely that the City of Tukwila will approve an Environmental Covenant within their right-of-way.

**CAA7 Site-Wide Excavation, MNA, and Institutional Controls**

- You stated the goal of this alternative is removal of all accessible petroleum impacted soil, MNA, and Institutional Controls. This is not a Site wide Excavation that extends within the City of Tukwila's ROW, and does not require an Environmental Covenant. A Site wide Excavation is what Ecology considers the "Gold Standard" Cleanup Alternative that would include the excavation of all contaminated soil, including beneath Tukwila's ROW and would not require an Environmental Covenant.

If you have any questions about this response and comments, please contact me by phone at 425-649-4446 or by e-mail at [damy461@ecy.wa.gov](mailto:damy461@ecy.wa.gov).

Sincerely,



Dale Myers  
Site Manager  
NWRO Toxics Cleanup Program