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March 15, 2022

Doug Hillman
Aspect Consulting, LLC
710 2nd Ave, Ste 550
Seattle, WA 98104
dhillman@aspectconsulting.com

Re: Technical Assistance at the following contaminated Site:

- **Site Name:** Norge Laundry & Cleaning Village
- **Site Address:** 869 Commerce Ave, Longview, Cowlitz County, WA 98632
- **Facility/Site ID:** 6101
- **Cleanup Site ID:** 258
- **VCP Project ID:** SW1065

Dear Doug Hillman:

The Washington State Department of Ecology (Ecology) received your request for an opinion on your independent cleanup of the (former) Norge Laundry & Cleaning Village facility (Site). This letter provides our opinion. We are providing this opinion under the authority of the Model Toxics Control Act (MTCA),[1] chapter 70A.305 Revised Code of Washington (RCW).[2]

Issue Presented and Opinion

Ecology appreciates your continued efforts to independently[3] clean up this toxics cleanup Site. On June 15, 2021, Ecology received Aspect Consulting, LLC's (Aspect), *Feasibility Study Report* (Report). The Report includes additional data related to the remedial investigation,[4] as well as a review and selection of cleanup alternatives by using the feasibility study (FS)[5] and disproportionate cost analysis (DCA)[6] process. This combined process is allowed under WAC 173-340-350(7)(a). This letter comments on the additional data collected and proposed cleanup alternatives presented in the FS/DCA.

[1] https://fortress.wa.gov/ecy/publications/SummaryPages/9406.html
[2] https://app.leg.wa.gov/RCW/default.aspx?cite=70A.305
[3] WAC 173-340-515
[4] Dated October 22, 2019
[5] WAC 173-340-350
[6] WAC 173-340-360

This opinion is based on an analysis of whether the remedial action meets the substantive requirements of MTCA, chapter 70A.305 RCW, and its implementing regulations, Washington Administrative Code (WAC) chapter 173-340[7] (collectively "substantive requirements of MTCA"). The analysis is provided below.

Description of the Site

This opinion applies only to the Site described below (**Enclosure A**). The Site is defined by the nature and extent of contamination associated with the following release:

- Tetrachloroethylene (PCE) and its degradation products (trichloroethylene [TCE], 1,1-dichloroethylene [DCE] and vinyl chloride [VC]) into the soil, groundwater, and/or air.

Basis for the Opinion

This opinion is based on the information contained in the following documents:

1. Aspect Environmental Consulting, LLC (Aspect), Draft *Pilot Test Work Plan*, July 21, 2021.[8]

2. Aspect, *Feasibility Study Report*, June 15, 2021.

3. Ecology, Re: *Technical Assistance at the following Site*, January 26, 2021.

4. Aspect, *Remedial Investigation Report*, October 22, 2019.

Those documents are kept in the Central Files of the Southwest Regional Office of Ecology (SWRO) for review by appointment only. Information on obtaining the records can be found on Ecology's public records requests web page.[9] Additional site documents may be available on Ecology's Cleanup Site Search web page.[10]

This opinion is void if any of the information contained in those documents is materially false or misleading.

Analysis of the Cleanup

Ecology has concluded that **further remedial action** is necessary to clean up contamination at the Site. That conclusion is based on the following analysis:

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[7] https://apps.leg.wa.gov/WAC/default.aspx?cite=173-340
[8] Received by Ecology on August 9, 2021.
[9] https://ecology.wa.gov/About-us/Accountability-transparency/Public-records-requests
[10] https://apps.ecology.wa.gov/gsp/Sitepage.aspx?csid=258

1. Characterization of the Site.

Based on Ecology's January 26, 2021, opinion and the information you provided in the Report, Ecology provides the following comments on the FS.

Refined Hydrogeological Zones

Since the submittal of Aspect's *Remedial Investigation Report*,[11] borings AB-5, B-101, B-103, B-104, B-108, and B-111 have been drilled at the Site. Groundwater monitoring results from the Site well network, including those new monitoring wells in the water table and shallow to alluvium zone with the beginning designation MW-14 through MW-18, is listed in Table 1b of the Report. Various Site monitoring wells were sampled in June 2020, November 2020, and April 2021.

Data collected from the additional sampling points appears to confirm that three, interconnected water bearing zones are present at the Site. However, flow between zones is limited in places by layers with silts and clays, as further shown by reporting of hydraulic conductivity values at various depths for the Site. The groundwater zones are:

- Water table (5 feet to 15 feet below ground surface [bgs]).
- Shallow to lower alluvium (aka, the shallow zone, from 15 feet to approximately 40-45 feet bgs). Many monitoring wells in this zone have been identified with an "I" for intermediate.
- Lower alluvium, referred to herein as the deep aquifer. The deep aquifer is beneath the Site from approximately 40-45 feet bgs up to the maximum explored depth at the Site of up of to 95 feet bgs.

Site Delineation

Additional monitoring well installation and sampling has continued to delineate concentrations of Site hazardous substances in Site media. Additional groundwater and air samples have been collected since Aspect's *Remedial Investigation Report*, on which Ecology based its January 26, 2021, opinion letter. Since the January 26, 2021, opinion, these additional data have been collected to 1) delineate Site hazardous substance concentrations in groundwater; 2) monitor indoor air in applicable buildings; 3) monitor sump discharges to the City of Longview's stormwater system; 4) refine source area characterization; and 5) update the conceptual Site model (CSM).

As the Report identifies, the installation of monitoring wells MW-14 through MW-18 were necessary to continue to delineate groundwater contamination at the Site. Ecology concurs that these monitoring wells, and ongoing groundwater monitoring at these wells, are needed

[11] June 15, 2020

to further evaluate Site conditions. Of note, the Site is not within the 10-year wellhead travel zone of the City of Longview's drinking water supply or within any other 10-year wellhead travel zone. Based on the results of groundwater monitoring events, Site groundwater flow direction appears to be to the west-northwest, away from Sacajawea Lake, the Columbia River, and the Cowlitz River.

Additional groundwater sampling results from recently installed monitoring wells MW-13 through MW-18 appear to delineate concentrations of PCE in the water table and shallow to lower alluvium zones.[12] Sampling from the new monitoring well network appears to show that vinyl chloride is partially delineated in the water table and shallow to alluvium groundwater zones. However, vinyl chloride concentrations in groundwater appear to need additional delineation in groundwater to the northwest and southwest in the water table zone and delineation to the west, southwest, and south in the shallow to alluvium zone.

Updated Pathways Discussion

The Report identifies soil, groundwater, air (including vapor intrusion), and surface water as potential exposure pathways. Concentrations of Site hazardous substances exceed cleanup levels in groundwater and in soil at depths less than 15 feet bgs. Ecology concurs that both the soil direct contact and leaching to groundwater pathways are complete. Based on the 2020 sampling, the extent of vinyl chloride in groundwater is greater than previously known, but is better defined. The extent of PCE in groundwater appears to be generally understood based on the evaluation of the new data submitted.

Soil gas (vapor) and indoor sampling show that the groundwater to indoor air pathway is complete for at least the PeaceHealth and Columbia Wellness buildings (see additional vapor intrusion discussion below). There is also the potential for a complete pathway for groundwater to indoor air for the tenant space adjacent to the former Tip Top Cleaners building. Performance sampling to confirm that the implemented cleanup action is protective for these structures is likely necessary. The ecological pathway is incomplete, per discussion below.

Ecology concurs with the statement in the Report[13] that in areas where PCE concentrations exceed 1,000 micrograms per Liter (µg/L), dense non-aqueous phase liquid (DNAPL) has to be considered. This is even if DNAPL has not been directly observed at the Site. Ecology first identified the need for consideration of DNAPL in its opinion dated December 17, 2009,[14] suggesting that DNAPL should be considered if PCE concentrations exceed 1,500 µg/L. Additionally, a downward gradient has been observed[15] at monitoring wells MW-4I and MW-4D, located near the source area, where DNAPL would most likely be encountered.

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[12] Delineation discussion points are based on figure 3 in the Report.
[13] p. 11
[14] p. 6, Re: *Opinion on Proposed Cleanup at the Following Site*
[15] p. 3, PBS' *Semiannual Groundwater Monitoring and Analysis – September 2017*, November 17, 2017

Vinyl Chloride in Groundwater Plume – Expanding Footprint

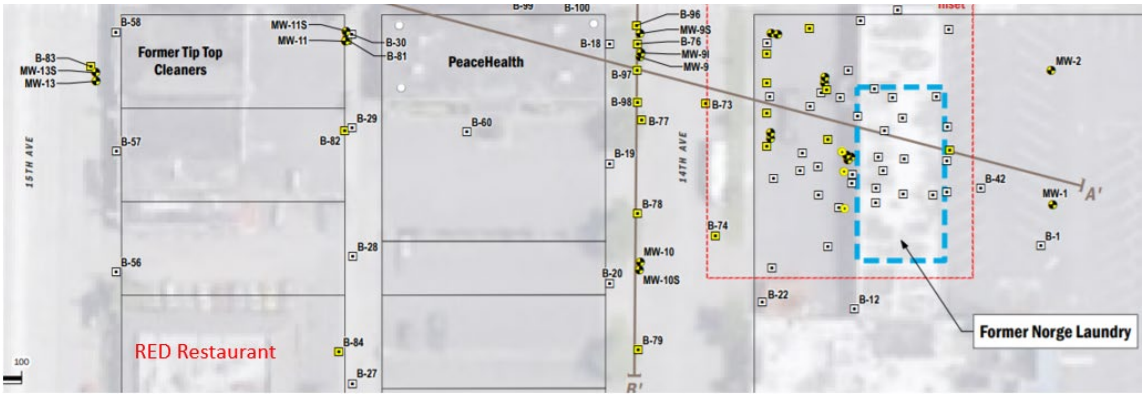
Based on additional data collected since the *Remedial Investigation Report*, and presented in the Report, two additional Cowlitz County parcels are also likely impacted by the Site. Specifically, vinyl chloride in groundwater in one or more of the identified groundwater zones associated with the Site is present beneath a portion of the parcels in question.

The newly identified potentially impacted parcels are in addition to those parcels and rights-of-way Ecology previously indicated were likely impacted by the Site, as listed in our January 26, 2021, opinion letter.

Newly Identified Potentially Impacted Parcels

Address	Cowlitz County tax parcel	Occupying business (August 2021)
848 15th Ave	09321	RED Kitchen (restaurant)
N/A	09307	Parking lot

The RED kitchen is a restaurant located in a building to the south of the parking lot south of the row of buildings containing the Tip Top Cleaners. The RED kitchen is located on the east side of 15th Ave, across from the parking garage for the hospital. Ecology shows this snippet from Figure 3 of Aspect's Remedial Investigation report (October 22, 2019) to highlight the location of the RED Restaurant.



TCE Acute Risk Update

Ecology evaluated the most recent groundwater data against the acute risk screening criterion of 31 µg/L for TCE in groundwater.[16] This screening criterion is not a cleanup level for the Site. This discussion reviews the new data in context of the TCE acute risk discussion from our January 26, 2021, opinion.

[16] Ecology publication no. 18-09-047, *Implementation Memorandum No. 22: Vapor Intrusion (VI) Investigations and Short-Term Trichloroethene (TCE) Toxicity*, October 2019

The concentration of TCE exceeding the acute risk screening criterion appears to be primarily limited to the source area and to the shallow to lower alluvium groundwater zone. Based on the groundwater sampling events from 2020 and 2021, TCE concentrations in groundwater sampled from properly constructed monitoring wells exceeding 31 µg/L are MW-8S, MW-9, MW-9S, MW-14S, and MW-19S.

Any TCE in groundwater concentrations, at 5 to 15 feet bgs and intercepted by basement sumps for the PeaceHealth and Columbia Wellness buildings, represent the greatest risk for TCE into indoor air vapor intrusion. The most recent indoor air sampling at the now vacant PeaceHealth building, the Columbia Wellness building, and the vacant former Norge Laundry space shows that TCE concentrations for indoor air continue to be protective. It appears that indoor air concentrations for TCE are protective of workers and patients because past adjustments to the HVAC and sump systems are working. Ecology concurs that these adjustments need to continue to be maintained to ensure workers and patients continue to be protected. Based on the data available for review, there does not appear to be an active acute risk from TCE vapor intrusion at this time.

Ecology also concurs with the continued proposed ongoing monitoring in the Report to sample groundwater at least once every six months and after the pilot test to ensure the degradation of PCE doesn't cause unexpected exceedances of the acute risk screening criterion for TCE in groundwater.

Terrestrial Ecological Evaluation (TEE)

In the Report,[17] a simplified TEE has been completed using Table 749-1, determining that the Site can be excluded from further TEE. Ecology concurs with this conclusion and no further TEE is necessary for the Site.

Former Tip Top Cleaners

It is Ecology's current understanding that, for the purposes of the cleanup under Voluntary Cleanup Program (VCP) project SW1065, your future cleanup action(s) are anticipated to coincidentally address contamination potentially sourced from the former Tip Top Cleaners.

To date, Ecology has not completed an initial investigation related to the former Tip Top Cleaners facility, nor has Ecology listed Tip Top Cleaners on our Confirmed and Suspected Contaminated Sites List (CSCSL). If Ecology makes a future determination to list Tip Top Cleaners, we will issue that determination in writing. If you believe that Tip Top Cleaners has contributed to contamination at your Site, your options regarding a private right of action are detailed in RCW 70A.305.080 and WAC 173-340-545.

[17] Section 3.6

Groundwater Concentrations Trend Analysis

Generally, at least eight sampling events of groundwater from a given monitoring well is necessary to determine a trend. Depending on the data, it may take more than eight events. Many Site monitoring wells lack the minimum eight sampling events to determine the statistical significance of a trend.

Where at least eight sampling results were available, Ecology evaluated concentrations trends in groundwater for PCE, TCE, and vinyl chloride. Ecology evaluated datasets for MW-3, MW-6, and MW-7. Data were evaluated using Mann-Kendall trend analysis to determine statistically significant trends using USEPA's ProUCL 5.1 software.

For those monitoring wells where at least eight data points existed to determine a trend, it appears that PCE and TCE in groundwater from monitoring wells MW-3 and MW-7, and vinyl chloride in groundwater from MW-7, show a statistically significant downtrend.

This analysis supports the conclusion that some degree of natural attenuation of PCE and TCE in groundwater appears to be occurring at the Site. However, as contaminated groundwater has been present at the Site since at least 1987, this natural attenuation process has been insufficient to clean up the source zone and the Site through natural attention. The result of Ecology's analysis should be interpreted as another line of evidence which supports the selected cleanup alternative for the Site.

Iron in Groundwater

Concentrations of iron in groundwater sampled from monitoring wells in all zones exceed the CLARC MTCA Method B screening level of 11,000 µg/L.[18] For example, see iron concentrations in groundwater sampled from monitoring wells MW-2, MW-5S, MW-5I, MW-6, and MW-8 in 2019.[19] Ecology supports first focusing on efforts to reduce the source mass concentrations of PCE and its degradation products. However, concentrations of iron in groundwater appear to represent potential exceedances of a cleanup level and should be further evaluated.

We recommend collecting the current biogeochemical parameters suite from all Site monitoring wells and comparing concentrations of iron in groundwater from inside and outside the PCE and vinyl chloride plume in groundwater. This is in order to evaluate whether the iron is representative of natural background conditions and the result of the strong reducing conditions in Site groundwater, or if the presence of Site hazardous substances influences iron in groundwater concentrations at the Site. Following WAC 173-340-709, Ecology also recommends evaluating the concentrations of biogeochemical parameters over time in a multiple line of evidence approach to determining if the iron is a result of natural reduced conditions or if other factors are a concern.

[18] https://www.ezview.wa.gov/Portals/_1987/Documents/Documents/CLARC_GWMethodABandARARs.pdf
[19] Table 1B in the Report.

Additional Vapor Intrusion Considerations

Ecology's current CLARC screening value for vinyl chloride in groundwater protective of vapor intrusion is 0.34 µg/L. The Site-specific cleanup level proposed for vinyl chloride in groundwater is 0.22 µg/L, which, when met, would also be protective of the vapor intrusion pathway. Figure 3 in the Report shows vinyl chloride concentrations in groundwater in both the water table and shallow to alluvium zones (see sampling results from MW-16 and MW-16s) which exceed the proposed cleanup level for vinyl chloride in groundwater.

Concentrations of vinyl chloride for vapor intrusion and indoor air have been evaluated for the PeaceHealth, Columbia Wellness, and former Norge Laundry buildings. Additional soil gas and/or indoor air sampling may be necessary for the building occupied by the RED Kitchen (restaurant).

Surface Water and Sediment Pathways Update

Additional testing of the stormwater system was completed to determine if shallow groundwater being re-directed by building basement sumps (especially the Columbia Wellness building) into the stormwater system was discharging to the Columbia River. It does appear that Site hazardous substances are still being discharged from the Columbia Wellness building stormwater discharge point, flowing over a paved surface, and entering the nearest catch basin east of the building. Ongoing stormwater line sampling at the Site shows that contaminant concentrations are not present at the sampling point downstream from these discharges, and Site hazardous substances are not reaching the Columbia River.

Standard MTCA Method B surface water cleanup levels for Site hazardous substances are less stringent than the proposed Site cleanup levels, so meeting cleanup levels for groundwater at the Site will also be protective of surface water and sediment pathways. Based on the new information presented, Ecology concurs that the surface water and sediment pathways are incomplete.

However, Ecology supports and concurs with the proposed continued periodic sampling of the stormwater system to ensure that contaminant concentrations in groundwater diverted by basement sumps and potentially discharged into the stormwater system remain protective of surface water.

Remedial Investigation Update

Per WAC 173-340-350(7)(a), the purpose of the remedial investigation is to collect data necessary to adequately characterize the site for the purpose of developing and evaluating cleanup action alternatives. Ecology concurs that sufficient data have been collected to evaluate and select a cleanup alternative. We recognize the need to select and implement a cleanup action at the Site in order to begin cleanup and reduce the spreading footprint of contaminated groundwater.

However, we also note that concentrations of vinyl chloride in groundwater in the water table and shallow to alluvium zones remain to be delineated fully to the south and southwest of the Site. Ecology requests delineation of contaminants in groundwater continue, as the selected cleanup alternative is pilot tested.

Ecology also supports your proposal in the Report to complete a hydrogeologic study to improve the understanding of groundwater flow and gradients to support treatment design. Though the Report does not provide details of the proposed hydrogeologic study, any additional data and evaluation to refine our understanding of the Site and improve cleanup outcomes is encouraged.

Electronic Information Management Database (EIM) Data

Please continue to upload Site data to EIM, ensuring all data are correct and up-to-date based on Toxics Cleanup Program Policy 840,[20] Data Submittal Requirements. EIM data uploads are one of the primary sources Ecology uses to evaluate cleanup sites, and the data you upload must reflect written reporting exactly. To date, Ecology has accepted and reviewed uploaded Site data through August 6, 2019.[21] Please ensure all Site data collected after August 6, 2019, have been uploaded to EIM.

Future Contained in Determination

Concentrations of Site hazardous substances in source area media likely are subject to the Dangerous Waste Regulations under WAC 173-303. Toxicity Characteristic Leaching Procedure (TCLP) analysis should be completed on site soils for PCE, TCE, DCE, and vinyl chloride. Resulting concentrations should be compared to the value in Table 1 under WAC 173-303-090.

Exceedances are most likely to occur when digging out the contaminated soils in the source area adjacent to and beneath the former Norge Laundry and Cleaning Village tenant space. Ecology recognizes that the Report anticipates this need.[22]

Prior to digging out any contaminated soil, please review and follow the information provided on the Ecology Hazardous Waste Management Program's webpage.[23] Any contained in determination, or decision that one is not needed for the cleanup, must be provided in writing by Ecology before any excavation or off-Site disposal of contaminated soil begins.

[20] https://apps.ecology.wa.gov/publications/SummaryPages/1609050.html
[21] Per Ecology email dated July 23, 2020.
[22] Appendix E
[23] https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Contained-in-Determinations

2. Establishment of Cleanup Standards.

Ecology has determined the cleanup levels and points of compliance you established for the Site will likely meet the substantive requirements of MTCA.

Cleanup Standards: Under MTCA, cleanup standards consist of three primary components; points of compliance,[24] cleanup levels,[25] and applicable state and federal laws.[26]

a. <u>Points of Compliance</u>. You proposed standard points of compliance for the Site, summarized in the table below, which Ecology supports. Current data show that the incomplete pathways are the terrestrial (soil-protection of plants, animals, and soil biota), surface water, and sediment pathways.

Media	Points of Compliance
Soil-Direct Contact	Based on human exposure via direct contact, the standard point of compliance is throughout the Site from ground surface to fifteen feet below the ground surface.[27]
Soil- Protection of Groundwater	Based on the protection of groundwater, the standard point of compliance is throughout the Site.[28]
Soil-Protection of Plants, Animals, and Soil Biota	Based on ecological protection, the standard point of compliance is throughout the Site from ground surface to fifteen feet below the ground surface.[29] Site excluded from further TEE based on simplified TEE. ***Pathway is incomplete.***
Groundwater	Based on the protection of groundwater quality, the standard point of compliance is throughout the Site from the uppermost level of the saturated zone extending vertically to the lowest most depth which could potentially be affected by the Site.[30]
Groundwater-Surface Water Protection	Based on the protection of surface water, the standard point of compliance is all locations where hazardous substances are released to surface water.[31] ***Pathway is incomplete.***
Air Quality	Based on the protection of air quality, the point of compliance is indoor and ambient air throughout the Site.[32]
Sediment	Based on the protection of air quality, the point of compliance is indoor and ambient air throughout the Site.[33] ***Pathway is incomplete.***

[24] WAC 173-340-200 "Point of Compliance."
[25] WAC 173-340-200 "Cleanup level."
[26] WAC 173-340-200 "Applicable state and federal laws," WAC 173-340-700(3)(c)
[27] WAC 173-340-740 (6)(d)
[28] WAC 173-340-747
[29] WAC 173-340-7490(4)(b)
[30] WAC 173-340-720(8)(b)
[31] WAC 173-340-730(6)
[32] WAC 173-340-750(6)
[33] WAC 173-340-750(6)

b. <u>Cleanup Levels</u>. Site screening levels for soil and groundwater are presented in Tables 7a and 7b, respective, from the Report. Cumulative effects analysis is presented in table 7c of the Report, satisfying Ecology's request in our January 26, 2021, opinion letter. Final proposed cleanup levels for the Site are proposed in section Table 7d under section 4.1.1.d in the Report.[34]

To summarize the proposed cleanup levels from the Report to which Ecology concurs:

Site Hazardous Substance	**Soil Cleanup Level** (mg/kg)[35]	**Groundwater Cleanup Level** (µg/L)	**Residential Air Cleanup Level** (for Reference)	**Site-specific Air Cleanup Level** (µg/m^3)[36]
PCE	0.05	5.0	9.6	32
TCE	0.03	1.4	0.33	1.1
DCE	0.025	16	NE[37]	NE
VC	0.025	0.22	0.28	0.95

Cleanup Level Concurrence

Ecology concurs with the proposed cleanup levels and that they could be established at the Site, with the exception of TCE in groundwater protective of vapor intrusion. The proposed cleanup level could be adjusted up to in groundwater from the proposed 1.1 µg/L. TCE concentrations at 1.4 µg/L in groundwater appear to be sufficiently protective of vapor intrusion, the most stringent applicable pathway, and are the MTCA Method B cleanup value in Ecology's CLARC database. This is a Site-specific determination.

Additional Site Cleanup Level Comments

Concentrations of vinyl chloride in groundwater at monitoring wells MW-11 and MW-13 also suggest a potential vapor intrusion risk for the former Tip Top Cleaners and the adjacent tenant spaces. Based on available information, all of these buildings are commercial in terms of zoning and business occupancy.

At the PeaceHealth and Columbia Wellness buildings, exceedances of Site hazardous substances for indoor air has been confirmed. Adjustments to the airflow around the sumps, and then, more importantly, adjustments to the HVAC systems in each building, appear to have currently mitigated the Site hazardous substances concentrations in indoor air. Ecology views these adjustments which, based on current data, must be maintained as engineered controls in perpetuity to continue to protect human health.

[34] p. 21
[35] Milligrams per kilogram
[36] Micrograms per cubic meter
[37] Not Established

Preliminary data from the most recent sampling event in 2020 showed that only one location of TCE in indoor air (northwestern corner of the second floor of the Columbia Wellness building) exceeded the unrestricted MTCA Method B screening value for indoor air. All concentrations in indoor air were less than the screening values for a commercial worker scenario.[38] Indoor air in the former Norge Laundry & Cleaning Village space contained concentrations of PCE and TCE less than the MTCA Method B unrestricted screening level.

The concentration of 1,2-dichloroethane (EDC), identified at the same concentration in both indoor and ambient air samples, is not likely related to a release(s) at the Site. The concentration of EDC in each sample collected was less than the cleanup level for air. EDC was also not detected in soil or groundwater as part of the standard volatile organic compounds (VOC) analysis. Unless new data suggested otherwise, Ecology concurs that EDC requires no further evaluation at the Site.

Though it appears that at this time no additional interim actions are necessary to mitigate indoor air concentrations in the PeaceHealth and Columbia Wellness buildings, in order to be sufficiently protective, Ecology supports that any final remedy be protective to an unrestricted MTCA Method B cleanup level for indoor air. If a commercial worker scenario is determined to be appropriate for the cleanup remedy implemented, compliance for indoor air at the PeaceHealth and Columbia Wellness buildings will likely require use of institutional controls and maintaining and monitoring the sump and HVAC adjustments.

Regardless of the final cleanup remedy implemented, Ecology supports the proposed continued periodic indoor air sampling for those buildings where soil gas or indoor air concentrations of Site hazardous substances have historically exceeded screening levels to ensure that any interim actions taken remain effective.

c. Applicable State and Federal Laws

The Report lists applicable state and federal laws. Ecology concurs with the proposed list and that these laws were sufficiently considered during the development of Site cleanup levels and points of compliance.

3. Selection of Cleanup Action.

The Report selects cleanup alternative 2 for the Site. Pilot testing is proposed for the selected cleanup alternative. Based on the FS/DCA results, Ecology concurs with selecting cleanup alternative 2 and with evaluating the pilot testing results prior to full-scale implementation. Ecology's concurrence with the selected cleanup alternative for a full-scale

[38] Modified MTCA Method B calculation under WAC 173-340-750 for an exposure duration of 10 hours per day, 5 days per week.

implementation is contingent upon successful pilot test results. Please also see the comments below regarding the proposed monitored natural attenuation (MNA) for groundwater at the Site.

Remedial technologies considered and retained are provided in section 5 of the Report. Potential cleanup alternatives involving air sparge (AS), soil vapor extraction (SVE), and containment walls were also considered; however, AS and SVE were not retained due to concerns with effectiveness and/or feasibility. Containment walls were not retained as an option because the plume in groundwater is already far off-Property. Screened technologies are summarized in Table 9 of the Report.

Five retained cleanup alternatives were evaluated in the Report:

Alternative 1: Institutional controls, MNA for groundwater, excavation and removal of shallow PCE-impacted soil, and *in-situ* chemical reduction (ISCR) injections for downgradient groundwater off-Property.

Alternative 2: Institutional controls, MNA (with contingency) for groundwater, excavation and removal of shallow PCE-impacted soil, ISCR injections for downgradient groundwater off-Property, and enhanced anaerobic bioremediation (EAB) injections for downgradient off-Property after ISCR injection media no longer provides treatment.

Alternative 3: Institutional controls, MNA of groundwater, *in-situ* thermal remediation of source area treatment of soils, and EAB injections.

Alternative 4: Institutional controls, MNA of groundwater, excavation and removal of shallow PCE-impacted soil, ISCR injections, and EAB injections.

Alternative 5: Institutional controls, MNA of groundwater, excavation and removal of shallow PCE-impacted soil, ISCR via soil mixing, and ISCR by installing a zero-valent iron (ZVI) permeable reactive barrier (PRB).

Based on the results of the FS/DCA, Alternative 2 is selected as the preferred remedial alternative. Pilot testing of the alternative is planned to start in late 2021.

Methane Evaluation Comments

The presence of methane in groundwater at the solubility limit in the deep aquifer (up to 24,000 µg/L in groundwater—deep zone at MW-5I) suggests a highly anaerobic environment. Methane concentrations in groundwater are substantially less in the shallow to lower alluvium zone at up to 7,900 µg/L (MW-14S) and up to 1,700 µg/L (MW-8) in the water table zone. Though Ecology does not have a cleanup level for concentrations of methane in groundwater, there is a concern that remediation could increase methane production in the strongly anaerobic environment and pose a risk to soil vapor or indoor air.

WAC 173-340-750(3)(b)(iii) requires that any MTCA Method B cleanup level established for air (including soil vapor) be less than 10% of the lower explosive limit (LEL). The LEL for methane is 5.0% by volume, so 10% of the LEL is 0.5% by volume or 5,000 parts per million (ppm). For quick reference, the Indiana Department of Environmental Management (IDEM) provides a succinct technical guidance[39] discussing methane risks at anaerobic remediation Sites. These threshold values for concern of methane at a Site would be 10,000 µg/L in groundwater and 5,000 ppm in soil vapor, which correspond to 10% of the LEL for methane.

No concentration of methane in groundwater in the perched water table zone (nearest the surface and buildings) exceeds the LEL. However, because remediation might make anaerobic conditions more anoxic as part of the process to destroy PCE and its degradation products, methane concentrations could increase. Upon completion of the pilot testing, Ecology requests sufficient methane monitoring to confirm that no soil vapor concentrations exceed 5,000 ppm or that groundwater concentrations in the water table zone do not exceed 10,000 µg/L.

Example locations for buildings of where to consider monitoring for methane include the source area adjacent to the former Norge Laundry and Cleaning Village facility, the PeaceHealth Building, and the Columbia Wellness building. Other potential vapor testing (for example, testing for methane using a 4-gas meter) locations are manhole vaults, in the monitoring wellheads, or in the monitoring wells pipes, should the wells be potential conduits for methane.

Monitored Natural Attenuation (MNA) Comments

For the plume of PCE and vinyl chloride in groundwater outside of the identified remediation areas, MNA over a 20-year period is proposed as the cleanup alternative. Estimates of the total PCE and vinyl chloride in groundwater plumes are provided in Table 8 of the Report. Twenty years is chosen as a reasonable restoration timeframe for the dissolved phase cleanup. The Report presents a contingency[40] should 20 years not be sufficient, and Ecology supports having said contingency.

Additionally, Ecology recognizes that 1) at least 8 consecutive sampling events to determine a statistically significant concentration trend in groundwater; and 2) that source area concentrations of PCE, TCE, DCE, and vinyl chloride must be reduced in order for MNA to work to clean up the dissolved phase plume. Ecology also wants to be clear that compliance monitoring is not enough for Ecology to concur that MNA can be implemented at the Site.

To concur with MNA as the final cleanup action for the dissolved groundwater plume at the Site as part of the cleanup action plan, Ecology would need to see confirmation of declining contaminant trends based on a sufficient number of sampling events and confirmation of a

[39] https://www.in.gov/idem/cleanups/files/remediation_tech_guidance_methane_mitigation.pdf
[40] p. 32

successful pilot test for the selected cleanup alternative number 2. Concurrence with MNA would also require continued mitigation or confirmation that vapor intrusion from groundwater into indoor air continues to be protective. Ecology would provide concurrence with full-scale implementation of the selected cleanup alternative as a response to the evaluation of the pilot testing results and other pertinent data, as presented in a revised FS or draft cleanup action plan.

Cleanup Alternative Expectations Comments

Under WAC 173-340-370, MTCA provides expectations regarding cleanup action alternatives, including MNA. These expectations have been partially discussed in section 5.14 of the Report. Beyond source control requirements as discussed in the Report, Ecology expects that any demonstration of the validity of MNA at the Site will be supported by multiple lines of evidence. All other requirements of WAC 173-340-370(7) will also need to be met.

Underground Injection Control (UIC)

Remedial injections are Class 5 wells and generally require registration with Ecology's UIC program. Please provide copies of the authorization letter for the UIC permit with the applicable deliverable. For reference, see Ecology's UIC webpage.[41] Current UIC application processing times are about 60 days. The webpage provides details for the application process and contact information for questions.

4. Cleanup.

Ecology generally concurs with the proposed selected cleanup alternative, contingent upon successful results of the pilot scale testing. Ecology's opinion regarding the selected cleanup alternative and the FS may need to be adjusted depending on these pilot test results.

Pilot Test Comments

The pilot test will reportedly include injecting approximately 11,200 pounds of ZVI agent and water at 10 locations. These are the ISCR injections from the selected cleanup alternative 2. The purpose is to promote *in-situ* chemical reduction of PCE and its degradation products. Ecology supported pilot test in our opinion letter dated January 26, 2021.[42]

For the proposed excavation, Ecology supports dewatering of the source area excavation in order to maximize source volume removal. Any groundwater removed from the excavation pit should be disposed of at an approved facility in accordance with all applicable local, state, and federal laws.

[41] https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Underground-injection-control-program
[42] p. 15

Injection points are to be installed using direct push drilling technology. Injection is anticipated to occur at rate of approximately 50 gallons of ZVI agent and water mix at a time for each of the 10 injection locations. Pumping rates are to be controlled to between an estimated 3 and 8 gallons per minute to ensure product does not breach the surface. The target remediation zone of PCE for the pilot is from 25-40 feet bgs. After the injections are complete, monitoring well MW-22S is planned to be installed. Site hazardous substances concentrations in groundwater will be monitored for at least three months at MW-22S, along with monitoring wells MW-9S, MW-14S, and MW-21I. This monitoring is necessary to evaluate the effectiveness of the pilot testing results before any full scale implementation of the selected cleanup alternative occurs.

Before concurring with a full-scale implementation of the proposed cleanup alternative, Ecology requests a review of the pilot scale results. Data, in addition to that mentioned elsewhere in the letter, which should be reviewed include the amount injected at each point, the flow rate at each injection point, estimates of reduction of dechlorination for each contaminant, changes in anaerobic markers in groundwater, and concentrations of secondary markers for degradation (for example, methane). The amounts and flow rates accepted at injection would be useful in confirming previously determined formation hydraulic conductivity values, refine lithology, especially for fine-grained layers, and confirm chemical contact with all zones of estimated contamination.

Another critical question which needs to be answered before any full-scale cleanup alternative implementation: is the 25-40 foot bgs injection interval and injection spacing overlap sufficient to ensure contact of chemicals injected to Site hazardous substances in each groundwater zone?

Concentrations of PCE in groundwater exceeding the solubility limit outside of the 25-40 feet bgs pilot test injection interval are reported for AB-02, B-76, B-89, B-95, and B-96. Pilot testing results should be carefully evaluated to determine if any lower or higher permeability zones outside of the 25-40 foot bgs injection interval are likely to contain high concentrations of Site hazardous substances requiring remediation as part of the full-scale cleanup alternative implementation. If so, the strategy for full-scale implementation may need to be adjusted accordingly. Ecology notes that flushing outside of the proposed injection zone is a potential mechanism for delivering the chemicals to dechlorinate those Site hazardous substances. The key result is to confirm contact of the injected media with contaminants to the greatest extent possible.

Ecology supports Aspect's proposed pilot test[43] for the selected cleanup alternative. The results of the pilot testing are needed to: 1) determine if full scale implementation of the selected cleanup alternative is appropriate for the Site; 2) revise the scope or anticipated restoration timeframe of the proposed cleanup alternative; and 3) determine if any

[43] Draft *Pilot Test Work Plan*, July 21, 2021

contingencies are needed. The results of the pilot test would need to be evaluated before Ecology is ready to review and determine whether we concur with any draft or final cleanup action plan for the final selected Site cleanup alternative. Ecology recommends reporting in a separate deliverable on the pilot testing results and what adjustments, if any, need to be made to the selected cleanup alternatives for full-scale implementation.

Draft Cleanup Action Plan Comments

Under WAC 173-360-380, if the Site were being cleaned up under a formal process (order or consent decree), Ecology would draft and issue the cleanup action plan and provide for public notice and comment on that draft cleanup action plan.

For VCP project SW1065, as an independent cleanup, Ecology does not draft or issue the cleanup action plan. For more information about the draft cleanup plan for an independent cleanup Site, please see this checklist.[44] Therefore, Ecology supports additional deliverable(s) provided by the VCP customer team as needed to report on the results of the pilot testing, additional cleanup completed at the Site, additional delineation of Site hazardous substances, as well any additional stormwater, air, and groundwater monitoring results. Future cleanup work is proposed to be included in a draft cleanup action plan as stated in the Report.

As the Site is not ranked, and no public requests for comment have been made to date pursuant to WAC 173-340-600, Ecology does not plan at this time to issue any Site cleanup document for public notice and comment. All cleanup documents will continue to be made publicly available via Ecology's cleanup site search webpage for the Site.

Ecology supports your continued engagement with affected Property owners and the City of Longview. These relationships and reporting to these entities about cleanup progress helps maintain transparency and are valuable. Ecology also reserves the right to communicate with other parties as specified under WAC 173-340-600.

[44] https://apps.ecology.wa.gov/publications/documents/1609008.pdf

Limitations of the Opinion

1. Opinion Does Not Settle Liability with the State.

Liable persons are strictly liable, jointly and severally, for all remedial action costs and for all natural resource damages resulting from the release or releases of hazardous substances at the Site. This opinion **does not**:

- Resolve or alter a person's liability to the state.
- Protect liable persons from contribution claims by third parties.

To settle liability with the state and obtain protection from contribution claims, a person must enter into a consent decree with Ecology under RCW 70A.305.040(4).

2. Opinion Does Not Constitute a Determination of Substantial Equivalence.

To recover remedial action costs from other liable persons under MTCA, one must demonstrate that the action is the substantial equivalent of an Ecology-conducted or Ecology-supervised action. This opinion does not determine whether the action you performed is substantially equivalent. Courts make that determination.
See RCW 70A.305.080 and WAC 173-340-545.

3. State is Immune from Liability.

The state, Ecology, and its officers and employees are immune from all liability, and no cause of action of any nature may arise from any act or omission in providing this opinion.
See RCW 70A.305.170(6).

Contact Information

Thank you for choosing to clean up the Site under the VCP. After you have addressed our concerns, you may request another review of your cleanup. Please do not hesitate to request additional services as your cleanup progresses. We look forward to working with you.

For more information about the VCP and the cleanup process, please visit our Voluntary Cleanup Program webpage.[45] If you have any questions about this opinion, please contact me at (360) 999-9589 or tim.mullin@ecy.wa.gov.

Sincerely,

Tim Mullin, LHG
Toxics Cleanup Program
Southwest Regional Office

TCM/tam

Enclosure: A – Site Description

cc by email: Gordon Ferrell, Lakeway Investments Corporation; gordonferrell@yahoo.com
Adam Griffin, Aspect Consulting, LLC; agriffin@aspectconsulting.com
Jasmin Toro, Aspect Consulting, LLC; jtoro@aspectconsulting.com
Ecology Site File

[45] https://www.ecy.wa.gov/vcp

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Enclosure A

Site Description

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Site Description

The (former) Norge Laundry & Cleaning Village is located at 869 Commerce Avenue, Longview, Cowlitz County, Washington. Within a one mile radius of the Site, zoning is mostly commercial and industrial, but residential is also present. The source of the release is believed to be the former dry cleaning and laundry facility, specifically near the back door and/or a vault beneath the back area of the former tenant space. The release mechanism (dumping waste fluid out the back door, leaky dry cleaning machine(s), disposal to the vault, or a combination of the above or other mechanisms) is uncertain. The former Norge Laundry & Cleaning Village appears to have also included a self-service laundromat and operated from approximately 1962 to 1987.

As currently known, groundwater impacts related to the Site extend approximately 600 feet west-northwest of the facility. The vinyl chloride plume in groundwater is the largest by area and volume, and the PCE plume is next largest. TCE and DCE (including 1,1-DCE, cis-1,2 DCE, and trans-1,2 DCE) comprise smaller plumes in groundwater.

Local topography is relatively flat. Most surfaces within the Site boundaries are covered with asphalt, concrete, building footprints, or planting strips. The Site is located on the floodplain of the Cowlitz and Columbia Rivers, and is located about 0.75 mile west of the former and 1.8 miles north of the latter. Lake Sacajawea is located about 0.2 miles southwest of the Site.

Site lithology consists of silts, sands, and gravels in varying percentages to the maximum depth explored of 95 feet bgs. Groundwater is present in three connected water-bearing zones, arbitrarily divided at approximately 5-15 feet bgs, 15-45 feet bgs, and deeper than 45 feet bgs. Increasing silts and clays have been observed with depth, especially below 65 feet bgs, potentially acting as an aquitard. This aquitard may be present at shallower depths and likely underlies the entire Site. Groundwater flow direction is generally to the west-northwest, but foundation (basement) sump pumps at two buildings, PeaceHealth and Columbia Wellness, influence groundwater flow in the water table zone.