

# Letter Health Consultation

Vapor Intrusion Pathway Evaluation  
Park Laundry Site  
Ridgefield, Clark County, Washington

January 11, 2012

**Prepared by**

**The Washington State Department of Health  
Under a Cooperative Agreement with the  
Agency for Toxic Substances and Disease Registry**



DOH 334-282 January 2012

## Foreword

The Washington State Department of Health (DOH) has prepared this health consultation in cooperation with the Agency for Toxic Substances and Disease Registry (ATSDR). ATSDR is part of the U.S. Department of Health and Human Services and is the principal federal public health agency responsible for health issues related to releases of hazardous substances. This report was supported by funds from the Comprehensive Environmental Response, Compensation, and Liability Act through a cooperative agreement with ATSDR. It was completed in accordance with approved methodologies and procedures existing at the time the health consultation was initiated. However, it has not been reviewed and cleared by ATSDR.

The purpose of this health consultation is to identify and prevent harmful human health effects resulting from exposure to hazardous substances in the environment. Health consultations focus on specific health issues so that DOH can respond to requests from concerned residents or agencies for health information on hazardous substances. DOH evaluates sampling data collected from a hazardous waste site, determines whether exposures have occurred or could occur, reports any potential harmful effects, and recommends actions to protect public health. The findings in this report are relevant to conditions at the site during the time of this health consultation, and should not necessarily be relied upon if site conditions or land use changes in the future.

For additional information or questions regarding DOH or the contents of this health consultation, please call the health advisor:

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January 11, 2012

Guy Barrett  
Washington State Department of Ecology  
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Re: Draft Letter Health Consultation  
Vapor Intrusion Pathway Evaluation  
Park Laundry Site  
Ridgefield, Clark County, Washington

Dear Mr. Barrett:

At the request of the Washington Department of Ecology (Ecology), the Washington Department of Health (DOH) reviewed the following documents to assess the vapor intrusion pathway investigation work that has been done to date for the Park Laundry site:

- Maul Foster & Alongi, *Draft Supplemental Soil Gas Sampling Work Plan for Former Park Laundry Site*, February 24, 2010;
- Maul Foster & Alongi, *Data Submittal for March 2010 Site Investigation at the Union Ridge Investment Company Property in Ridgefield, Washington*, June 29, 2010;
- Maul Foster & Alongi, *Data Submittal for October 2010 Phase 2 Remedial Investigation at the Union Ridge Investment Company Property in Ridgefield, Washington*, June 29, 2010; and
- Maul Foster & Alongi, *Data Submittal for Former Park Laundry Property, Ridgefield, Washington*, August 29, 2011.
- Maul Foster & Alongi, *Geologic Borehole Log/Well Construction Logs*, September 28, 2011.

This review was done to assist Ecology in identifying possible data gaps because the vapor intrusion pathway, when complete, poses a potential indoor air health threat. DOH conducts health consultations in cooperation with the Agency for Toxic Substances and Disease Registry (ATSDR).

## Background and Statement of Issues

The former Park Laundry operated at 122 N. Main Avenue, Ridgefield, Clark County, Washington. The laundry may also have performed dry cleaning operations that resulted in the release of the dry cleaning chemical tetrachloroethylene (also known as “perc” or PCE). PCE is considered a volatile organic compound (VOC) that can pose an indoor air health threat if released to soil and/or groundwater.

During past site investigations, PCE was found in soils located above and below the groundwater table at the now vacant former Park Laundry property. PCE was also found in soils at the vacant property located directly to the north of the former laundry property and the developed property directly to the south. A shallow plume of predominantly PCE contaminated groundwater, which appears to have originated at the former laundry, was also identified. The plume extends approximately 1,300 feet to the west/northwest and may be discharging into Lake River. The lateral extent of the groundwater plume, however, has not been fully characterized, particularly to the north, south, southeast, and west.

During a March 2010 geoprobe investigation, shallow groundwater levels measured in temporary borings ranged from approximately 4.5 to 9 feet below ground surface (bgs). During a follow-up geoprobe investigation in June 2011, groundwater levels measured in temporary borings ranged from approximately 9 to 12.5 feet bgs.

Shallow groundwater samples collected in March 2010, October 2010, and June 2011 were collected below the top of the water table from approximately 11 to 22 feet bgs. PCE concentrations in shallow groundwater ranged from 1U<sup>a</sup> to 37,700 micrograms per liter (µg/l). Trichloroethylene (TCE), a breakdown product of PCE, was also detected at some locations. TCE concentrations ranged from 1U to 436 µg/l. The highest PCE groundwater concentrations were found at the former laundry property. The highest TCE concentration was found near the post office building, which is located northwest of the former laundry.

To evaluate the vapor intrusion pathway at the site, the potentially liable party (PLP) collected 14 soil gas samples above the shallow contaminated groundwater plume. Three soil gas samples were collected in unpaved areas at the vacant former laundry property, and a single soil gas sample was collected in an unpaved area at the vacant property located directly to the north. Soil gas samples were also collected at nine developed properties. Only one soil gas sample was collected on each of the developed properties, with the exception of the post office, where two samples were collected. Soil gas samples at developed properties were collected either below a paved parking area or in an unpaved area adjacent to the building.

In March 2010, 9 of the 14 soil gas samples were collected from 2.5 to 4 feet bgs. Two of these nine soil gas samples were collected below areas where shallow contaminated soil was found. In June 2011, 5 additional soil gas samples were collected at 5 feet bgs. The March 2010 samples were analyzed for PCE and some of its breakdown products (TCE, cis-1, 2-dichloroethene [DCE], trans-1, 2-DCE, and vinyl chloride). The June 2011 analytical parameters were the same as March 2010, however, 1,1-dichloroethene (1,1-DCE) was added as an additional analyte.

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<sup>a</sup> U – not detected at or above the method reporting limit

PCE was detected above the reporting limits in 10 of the 14 soil gas samples. The PCE soil gas concentrations ranged from 0.22U to 3,800 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ). TCE was detected in only 1 of the 14 soil gas samples. However, two samples had elevated TCE reporting limits (3.3U and 17U  $\mu\text{g}/\text{m}^3$ ). TCE concentrations ranged from 0.15U to 32  $\mu\text{g}/\text{m}^3$ . The highest PCE concentrations occurred at the vacant property locations with the highest detection found on the vacant property located north of the former laundry property. The highest concentration of TCE was found at the former laundry property.

The PLP used the five highest soil gas PCE results from the March 2010 sampling in the Johnson and Ettinger model (JEM) to predict indoor air PCE concentrations at existing buildings and within potential future buildings. Two of the PCE results were obtained near existing buildings and three of the results from vacant properties including the former dry cleaner property and the property north of the former laundry. TCE soil gas results were highest at the vacant properties (TCE was either detected or reported as having elevated reporting limits). These TCE results were used to predict indoor air concentrations within potential future buildings. Indoor air TCE concentrations were not estimated for existing buildings.

The JEM estimated indoor air PCE concentrations at the two properties with existing buildings to be 0.06 to 0.30  $\mu\text{g}/\text{m}^3$ . Indoor air PCE concentrations were estimated to be one to two orders of magnitude higher (3.31 – 6.95  $\mu\text{g}/\text{m}^3$ ) if buildings were built on the vacant properties. TCE concentrations at the vacant properties were estimated to be 0.007 to 0.056  $\mu\text{g}/\text{m}^3$ .

According to Ecology and the PLP, no building survey was conducted to document the type and condition of the building foundations (e.g., basement, slab-on-grade, crawl space) prior to, during, or after the soil gas sampling. Ecology, however, plans to conduct a building survey in early 2012. While there is currently no information available about preferential pathways at the site, DOH understands the PLP will be collecting that information soon.

According to the August 2011 update report, the PLP plans to contact the City of Ridgefield about the investigation findings so it can take steps to protect workers that may come in contact with groundwater or soil gas in the plume area.

## **Discussion**

The vapor intrusion pathway is complex and to begin assessing whether the pathway poses a potential indoor air health threat at contaminated sites, like the Park Laundry site, requires knowledge about the nature and extent of contaminated soils, shallow groundwater, and soil gas. To conduct further assessment, such as predicting indoor air concentrations using the JEM, requires additional knowledge about the site including:

- Vadose zone soil types.
- Seasonal shallow groundwater depths.
- Building characteristics (e.g. foundation type and condition).
- Building use (i.e., residential, commercial, industrial).
- Preferential pathways.<sup>b</sup>

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<sup>b</sup> Preferential pathways are natural or manmade features that provide paths for vapors to collect and/or travel toward buildings such as granular backfills placed around underground utility lines

Depending on site specific conditions, sub-slab and indoor air sampling may also be necessary to determine the indoor air health threat.

While the Park Laundry investigation data collected to date provides a good start to understanding the nature and extent of contaminated soils, shallow groundwater, and soil gas as well as the vadose zone soil type(s), more characterization work is needed. This includes, but may not be limited to, determining the lateral extent of the contamination and obtaining information about seasonal groundwater depths, buildings characteristics and uses, and preferential pathways. This additional characterization information is critical for assessing the vapor intrusion pathway and determining whether the site poses an indoor air health threat to nearby buildings using the JEM or evaluating sub-slab and outdoor/indoor air results at individual existing buildings.

Upon review of the information found in the listed reports, DOH also made the following observations:

- 1,1- dichloroethane (1,1-DCA); 1,2- dichloroethane (1,2-DCA); and chloroethane, additional PCE breakdown products were not analyzed during the past site investigations.
- Groundwater samples were collected below the top of the water table. As a result, contaminant concentrations at the water table, where they volatilize, are unknown.
- State and federal guidance recommend that soil gas samples collected below unpaved ground not be shallower than 5 feet bgs because of possible dilution from ambient air.<sup>c d e</sup> The guidance also points out that sampling above a shallow ground water table, may lead to high moisture content in samples, which can affect results. Consequently, the March 2010 soil gas results, which were obtained shallower than 5 feet bgs, likely underestimate soil gas contaminant concentrations.
- Only one soil gas sample was collected on 9 of the 11 tested properties where buildings are located. Because of the demonstrated variability of the groundwater and soil gas concentrations across the site, this is not sufficient data to properly assess potential indoor air impacts.
- When using the JEM there are a number of assumptions and limitations that need to be considered before using this model. These assumptions are summarized in the Environmental Protection Agency<sup>f</sup> (EPA) and state guidance but were not addressed in the listed reports. Many of the assumptions and limitations can be addressed by conducting building surveys and preferential pathway assessments.

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<sup>c</sup> Washington State Department of Ecology, Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action, Review Draft, October 2009.

<sup>d</sup> U.S. Environmental Protection Agency, OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance), November 2002.

<sup>e</sup> New Jersey Department of Environmental Protection, Vapor Intrusion Guidance, October 2005 and Draft Revised Version, May 2011.

<sup>f</sup> U.S. Environmental Protection Agency, User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings, revised February 2004.

- As noted in the EPA guidance for evaluating subsurface vapor intrusion into buildings, when using the JEM, “[v]apor from the source is assumed to diffuse directly upward (one-dimensional transport) through uncontaminated soil (including an uncontaminated capillary fringe if groundwater is the vapor source.” Shallow contaminated soils were found on the now vacant, former laundry property above the depth where soil gas samples were collected. Given this situation, the estimated indoor air concentrations for this property are likely to be underestimated.

## **Conclusion**

DOH cannot currently conclude whether PCE and its breakdown products found in soil, shallow groundwater, or soil gas at the Park Laundry site could harm people’s health at existing or future buildings via the vapor intrusion pathway. Additional information and data is needed.

## **Recommendations**

DOH recommends that a vapor intrusion assessment be conducted at the most vulnerable existing buildings overlying, and located 100 feet beyond, the shallow contaminated groundwater plume. The assessment should be conducted as soon as possible to determine whether there are any exposures of health concern occurring in those buildings. Additional vapor intrusion assessment may also be needed at the vacant properties; however, whether additional assessment at the vacant properties is needed depends on seasonal shallow groundwater levels.

Prior to beginning the vapor intrusion assessment, groundwater levels should be measured in the existing shallow monitoring wells and a building survey conducted at businesses and residences that overlie, and are located 100 feet beyond, the shallow groundwater plume. The building survey should include detailed questions about the building occupants and structure. Questions about the structure should include the number of floors, building foundation type (e.g., basement, crawlspace, slab-on-grade), foundation condition (e.g., cracks and other opening in the foundation, sumps, vents, utility penetrations, exposed soils, footing locations), and chemical use and storage within the building.<sup>8</sup> The building survey information can then be used to:

- Identify buildings most susceptible to vapor intrusion.
- Select sub-slab/crawlspace and indoor air sampling locations, if needed.
- Improve data analysis.

A preferential pathway assessment should also be conducted.

Once the shallow groundwater level results, building surveys, and preferential pathway information is collected, the agencies and PLP can work together to assess whether there are buildings susceptible to vapor intrusion. If there are such buildings or further work is needed at the vacant properties, a vapor intrusion work plan/sampling and analysis plan (WP/SAP) will be needed.

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<sup>8</sup> The Port of Vancouver developed a building survey form for the Cadet Manufacturing Company and former Swan Manufacturing sites that would be helpful for developing a survey for this site (Craig Rankine is the Ecology site manager).

When developing a WP/SAP, DOH recommends the PLP incorporate the following:

- PCE and the eight breakdown products (mentioned in this letter) should be included in future proposed soil gas and indoor and outdoor air analysis unless there is clear supporting evidence that some of these chemicals have not been detected, or will not be detected in the future.
- To better evaluate potential indoor air health risks at future building sites that are currently vacant, Ecology should ensure future soil gas samples are collected at depths greater than 5 feet, if possible. The results from these efforts could then be used in the JEM. Additionally, the exposure assumptions used in the model should accurately reflect future property use.
- When reporting the JEM results for the vacant properties, Ecology should ensure that any limitations are fully noted. For example, uncertainties such as areas where shallow vadose zone soils are contaminated or areas where preferential pathways exist.
- Because contaminant concentrations in indoor air and soil gas vapors below buildings have been demonstrated to be variable, more than one indoor air and crawlspace/sub-slab soil gas sample should be collected below each building. We recommend that the actual number of sub-slab and indoor air samples collected be a function of the building size, knowledge about the foundation, and other relevant factors discovered through the building survey.
- Because outdoor air can affect indoor air quality and often contains low concentrations of the contaminants being investigated, background outdoor air sample must be collected. We recommend background samples be collected upwind and outside of the plume boundaries.

Lastly, DOH recommends Ecology ensure that the City of Ridgefield and the local utilities are notified about the shallow contaminated groundwater and soil gas concerns. This should be done as soon as possible, to allow the city and utilities to take appropriate steps to prevent potential exposures to their workers who may encounter contaminated groundwater and soil gas in underground utility corridors and other excavations in and beyond the shallow groundwater plume boundaries.

DOH appreciates this opportunity to assist Ecology with these technical issues. We are available to assist Ecology with future vapor intrusion investigation scoping and review of any draft supplemental vapor intrusion plans. Please contact me at 360-236-3373 to arrange for this support.

Sincerely,

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cc: Gary Bickett, Clark County Health Department  
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## **Report Preparation**

This Health Consultation Letter for the Park Laundry site in Ridgefield, Washington was prepared by the Washington Department of Health (DOH) under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with the approved agency methods, policies, and procedures existing at the date of publication. Editorial review was completed by the cooperative agreement partner (DOH).

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