

Letter Health Consultation

Technical Document Review – Comprehensive Vapor Intrusion Evaluation
and Indoor Air Monitoring Plan

PORT OF VANCOUVER – CADET AND SWAN SITES
VANCOUVER, CLARK COUNTY, WASHINGTON

**Prepared by the
The Washington State Department of Health**

FEBRUARY 10, 2010

Prepared under a Cooperative Agreement with the
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

A health consultation is a verbal or written response from ATSDR or ATSDR's Cooperative Agreement Partners to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR or ATSDR's Cooperative Agreement Partner which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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LETTER HEALTH CONSULTATION

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and Indoor Air Monitoring Plan

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

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 hazardous waste. This health consultation was prepared in accordance with methodologies and guidelines developed 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 who prepared this document:

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For persons with disabilities this document is available on request in other formats. To submit a request, please call 1-800-525-0127 (voice) or 1-800-833-6388 (TTY/TDD).

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STATE OF WASHINGTON
DEPARTMENT OF HEALTH

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Health Consultation Memorandum

January 21, 2010

TO: Craig Rankine
Washington Department of Ecology

FROM: Barbara Trejo
Washington Department of Health

SUBJECT: Health Consultation – Technical Document Review
Draft Comprehensive Vapor Intrusion Evaluation/Indoor Air Monitoring Plan
Port of Vancouver - Cadet and Swan Sites
Vancouver, Clark County, Washington

Summary

Introduction:

In communities where chemical releases pose a possible threat to human health, the Washington State Department of Health's (DOH) goal is to ensure that the potential health effects are appropriately evaluated and steps taken, where needed, to safeguard the community's health. The purpose of this health consultation is to evaluate the Port of Vancouver's (Port's) assessment of the threat posed by solvent contaminated groundwater on indoor air (i.e., vapor intrusion) in the Fruit Valley neighborhood as well as its plans for future indoor air monitoring. The health department's work was done at the request of the Washington State Department of Ecology (Ecology).

Conclusion:

Previously, DOH concluded that indoor air solvent levels associated with the underlying contaminated groundwater in the Fruit Valley neighborhood posed a low risk and were not expected to harm people's health when inhaled. While the overall health risk to building occupants remains low, indoor air monitoring at the most potentially vulnerable residences is necessary while groundwater cleanup activities continue.

Residences with the highest indoor air cancer risk levels were identified and selected by the Port as potential future long-term monitoring locations during the development of the draft Comprehensive Vapor Intrusion Evaluation/Indoor Air Monitoring Plan (CAMP). While not an unreasonable first step, it was the only step considered by the Port. This resulted in the selection of some residences where the impact from contaminated groundwater did not seem likely. Ecology and DOH agreed that such locations were not appropriate long-term monitoring locations and selected some other locations where indoor air cancer risk levels were slightly elevated and the vapor intrusion pathway appeared complete.

Basis for decision:

The indoor air solvent levels associated with contaminated groundwater at Fruit Valley neighborhood residences are currently low and only pose a small theoretical health risk. That risk could, however, be as low as zero.

Ecology and DOH selected long term monitoring locations based on risk level and whether the groundwater to indoor air pathway appeared completed to ensure that a meaningful long term monitoring plan was included in the CAMP.

Next Steps: DOH will evaluate future indoor air data and other vapor intrusion information as it becomes available.

For More Information: Please contact Barbara Trejo 360- 236-3373 or 1-877-485-7316, if you have any questions about this memo.

Statement of Issues

The Washington Department of Health completed its review of the Port of Vancouver's (Port) *Revised Draft Comprehensive Vapor Intrusion Evaluation and Indoor Air Monitoring Plan (CAMP), Port of Vancouver: SMC and Cadet Sites*, dated January 21, 2009. This review was done at the request of the Washington Department of Ecology (Ecology). DOH conducts health consultations in cooperation with the Agency for Toxic Substances and Disease Registry (ATSDR).

Background

Past releases of solvents, predominantly trichloroethylene (TCE) and tetrachloroethylene (PCE), occurred to soil and groundwater at the Cadet Manufacturing Company (Cadet) and former Swan Manufacturing Company (Swan) properties in Vancouver, Clark County, Washington. This contamination was first discovered in the late 1990s. The contaminated groundwater has migrated from the two properties and underlies a large portion of the Fruit Valley neighborhood, an adjacent residential community. The contaminated groundwater also underlies some Port property.

The shallow portion of the solvent contaminated groundwater poses an indoor air health threat to the overlying community because solvents are evaporating from the groundwater, moving through the spaces in the soil, and entering some buildings through foundation cracks or other openings. Because of this health threat, building surveys were completed by Cadet and the Port to learn more about characteristics of the buildings that might make them vulnerable to vapor intrusion. Cadet, Port, Ecology, and DOH used this survey information to select a subset of buildings, which were thought to be at the most risk from vapor intrusion for indoor air sampling.

Indoor air sampling was conducted intermittently beginning in 2002 in the northern part of the Fruit Valley neighborhood. Sampling continued through 2008 and included homes in both the northern and southern portions of the Fruit Valley neighborhood.¹ The indoor air sampling was often conducted concurrently with groundwater, soil gas, and outdoor air sampling. Based on all this sampling, the Port,

¹ Residents at some homes considered "worst case" were unwilling to participate in the indoor air sampling; so the possible risk at those buildings could not be determined.

Ecology, and DOH (and Cadet, in the past) agree that the vapor intrusion pathway is a completed exposure pathway at some residences in the Fruit Valley neighborhood.

Six residences in the north Fruit Valley neighborhood were found to contain the highest indoor air levels associated with the contaminated groundwater. Ecology required Cadet to install soil vapor vacuum systems to reduce exposures at these residences. When these systems became operational in 2003, indoor air solvent levels dropped below levels of health concern. Those systems continue operating today.

Indoor air at some other Fruit Valley residences also appears to be affected by the contaminated groundwater. However, Ecology has not required Cadet or the Port to take steps to reduce exposures at those locations because the risks appear to be relatively low. At other residences, whether the pathway is complete is uncertain. Such uncertainty about the pathway is not uncommon given the complexity of vapor intrusion pathway.

Interim cleanup activities at the Cadet and Swan properties (e.g., air sparging and soil vapor extraction, removing contaminated soils, in-situ groundwater treatment) and below the northern portion of the Fruit Valley neighborhood (recirculating groundwater remediation wells) have been conducted or are on-going. These cleanup activities have helped reduce the shallow groundwater solvent levels over time. This has resulted in a drop in soil gas solvent levels, which in turn, reduces the risk to indoor air in overlying buildings. The Port also installed and began operating a groundwater pump and treat system in June 2009, which it is hoped will continue to contain the solvent plume and reduce groundwater contaminant levels.

In 2003, DOH recommended that a comprehensive plan be developed to assess the vapor intrusion pathway.(1) Cadet began doing some of this work in 2005. The Port acquired the Cadet property in May 2006, took over this work, and began developing a draft CAMP. The first draft was submitted to Ecology and DOH in January 2007.(2) DOH and Ecology provided comments to the Port in March and April 2007, respectively. (3;4) The Port resubmitted a revised draft CAMP in January 2009, which is the subject of this health consultation report.

DOH considers the purpose of the CAMP as fourfold:

- Summarize activities used to investigate the vapor intrusion pathway.
- Evaluate the vapor intrusion investigation data.
- Identify homes where a completed exposure pathway exists or where it is likely.
- Determine what further actions (e.g., soil vapor vacuum system installation, monitoring) are needed to monitor and/or reduce exposures.

Discussion

Overall, the revised CAMP is a significantly improved document. It provides a good summary of vapor intrusion investigation activities. A risk based approach was used to evaluate vapor intrusion data collected from 2002 through 2008. This provides a better understanding about the possible risks posed by the levels of solvent found in indoor air at the tested homes. The Port's assessment, however, did not take the next step, which was to determine whether the source of the solvents found in individual residences was a result of background outdoor air levels, indoor air sources, groundwater, or some combination. Such a pathway assessment should be conducted and summarized in the next revision of the CAMP. DOH acknowledges that this assessment will not be straightforward. However,

this assessment is important because indoor air data obtained from homes where groundwater has or had affected indoor air quality (i.e., completed exposure pathway) will be needed for developing soil gas attenuation factors and screening levels.

Residences with the highest indoor air cancer risk levels were selected by the Port as potential future long-term monitoring locations. This is not an unreasonable first step. However, it was the only step considered by the Port. This resulted in the selection of some residences where the impact from contaminated groundwater did not seem likely. Ecology and DOH agreed that such locations were not appropriate long-term monitoring locations and selected some other locations where the vapor intrusion pathway appeared complete. The long-term monitoring locations selected by Ecology and DOH are summarized in the July 27, 2009 Ecology indoor air sampling program approval letter sent to the Port (see Appendix). The CAMP, when finalized, should be revised to reflect these changes.

The following numbered items summarize additional comments and recommendations regarding specific sections of the draft CAMP:

1. **Executive Summary** - The executive summary should be revised to reflect DOH's comments.
2. **Section 1, Introduction** – DOH submitted comments on the Port's January 2007 version of the draft CAMP in March 2007, not April 2007. Please correct the text.
3. **Section 1.1, Approach** – It was noted that “other agency documents were important to provide a context for exposure assumptions and . . .” It is not clear what this means, particularly since the Model Toxics Control Act (MTCA) cleanup regulation provides exposure assumptions. Some clarifying language should be added to the CAMP.
4. **Section 1.3, DOH Health Consultation** – The DOH health consultation conclusion, as presented in the CAMP, leaves out some important information. DOH requests that the actual language from the health consultation report be added at the end of Section 1.3. Here is the language, we would like to see added:

“DOH concluded that the levels of chemicals found in indoor air in the Fruit Valley neighborhood from 2002 through February 2007 are not expected to make people sick (i.e., no apparent public health hazard). However, further actions to reduce or eliminate some of these indoor air exposures will occur in accordance with the Model Toxics Control Act (MTCA) cleanup regulation and be monitored by Ecology. These actions might include further groundwater remediation, vapor extraction, and installation and/or operation of soil vapor vacuum systems in individual homes. Such steps will likely reduce or eliminate risks associated with exposure to individual or multiple solvents found at low levels in indoor air.” (5)
5. **Section 3, Summary of Vapor Intrusion Investigations, paragraph 4** – It was noted that DOH requested that historical groundwater data be added to the CAMP, which has been done. It is fine to note that as long as the revised CAMP also notes that the reason DOH made that request was to help verify plume maps created by the Port.
6. **Section 3.1, North Fruit Valley Neighborhood** – As noted, DOH conducted a number of health consultations that included recommendations for addressing the vapor intrusion pathway in the northern part of the Fruit Valley neighborhood. However, Ecology, through its Agreed Order with

Cadet, was the agency that required Cadet to investigate the vapor intrusion pathway as part of the remedial investigation. This fact should be added to the revised CAMP.

7. **Section 3.1.3.1, Soil Gas Analytical Results** – Anomalies in soil gas results were briefly mentioned along with one example. However, one significant anomaly, which was not mentioned, occurs at CM-SG-7 where the 10 foot TCE and PCE sample results are periodically higher than the 15 foot and/or 20 foot sample results. SG-7 is located on Unander Avenue near two homes where soil vapor vacuum systems were installed. This information about CM-SG-7 should be included and discussed in the revised CAMP.
8. **Section 3.1.4.2, October 2003 Through February 2004, first sentence** – It is noted in the first sentence of this section that “. . . it was identified that vapor intrusion was a potential complete pathway at the site.” However, available information, at that time, indicated that the pathway was complete at least at some residences (see discussion in Section 3.1.4.1) while at other residences it was uncertain. The first sentence should be revised accordingly.
9. **Section 3.3.2.1, Analytical Results** – The Port’s Building 2400 contained 1.2 ug/m³ of TCE during the September 2006 indoor air sampling. Although not a large amount, it does suggest that vapor intrusion could be occurring at this building. DOH suggests comparing the results from the September 2006 sampling to the results from the nearest upgradient outdoor air sample collected at that time to see if outdoor air might be the possible source. If outdoor air is not the source, the results should be compared to the appropriate MTCA cleanup level, not to OSHA standards unless the tenant has a health and safety plan that addresses exposures to solvents like TCE and PCE and the tenants are made aware of the vapor intrusion pathway. These steps and findings should be added to the revised CAMP.
10. **Section 3.4, Contaminants of Potential Concern** – It is noted in the CAMP that “[t]he primary source of constituents detected in indoor air samples collected from residential properties in the NFVN [North Fruit Valley neighborhood] and SFVN [South Fruit Valley neighborhood] is groundwater containing VOCs beneath these neighborhoods.” However, that appears to be an overstatement based on the findings presented in the rest of the CAMP. DOH suggested that the Port consider revising the statement.
11. **Section 4, Soil Gas and Indoor Air Correlation** – The Port, at Ecology’s request, developed a soil gas screening level for TCE (333 ug/m³) that is intended to be protective of indoor air (0.1 ug/m³). Because the Port found that there is a weak correlation between indoor air and soil gas, they indicate that the screening level “should only be used as a general guideline for future monitoring” and indicated that future assessment of indoor air quality will primarily rely on empirical indoor air data.

The soil gas screening level selected by the Port is based primarily on the south Fruit Valley indoor air and soil gas data and the TCE Method B indoor air cleanup level. Only one shallow soil gas probe in the northern portion of the Fruit Valley neighborhood exceeds that screening level. However, empirical indoor air data suggests that other areas of the north Fruit Valley neighborhood, as well as a portion of the south Fruit Valley neighborhood, have residences that are being affected by the soil gas. One of the reasons for these different findings, and why the Port believes there is a weak correlation between soil gas and indoor air may be because all the homes selected by the Port when developing the TCE attenuation factor and screening level do not appear to have been affected by the solvent contaminated groundwater.

DOH suggests that a better process for developing attenuation factors for the north and south Fruit Valley neighborhood be used and that soil gas screening levels be recalculated.

Finally, it is unclear what soil gas screening levels “used as a general guideline” means. This should be clarified.

12. **Section 5.2, Residence Foundation Sealing** – The residence at 2113 W. 28th Street has had levels of TCE above the MTCA Method B air cleanup level since sampling began at that location in January 2004. Initially the levels were the highest seen in the Fruit Valley neighborhood (95 ug/m³ TCE in the basement and 20 ug/m³ TCE in the living space). Sub-slab sampling ports were installed in July 2004, which showed that significant levels of TCE existed directly below the slab. However, it was learned that the property owner was also using and storing chemicals that contained TCE in the residence. Those labeled TCE containing products were subsequently removed and indoor air TCE levels dropped significantly. However, the levels were still above Ecology’s 3 ug/m³ action level. The basement floor was then sealed, and the Port provided the homeowner with an air filter to try to reduce contaminant levels. It should be noted that basement sealing and use of an air filter are not common vapor intrusion remedies.

The last indoor sampling was conducted in September 2007 with the basement and living space TCE levels at 2.5 and 2.1 ug/m³, respectively. February 2007 sub-slab sampling indicated that TCE levels below the basement floor ranged from 470 to 510 ug/m³. It is uncertain, at this point, whether the source of the TCE is the underlying groundwater or products used in the house (some unlabeled TCE-containing products might remain in the house). If the upcoming 2009 indoor air and sub-slab sampling show TCE levels remain elevated, and the property owner is willing, an appropriately designed soil vapor vacuum system should be seriously considered for this home to reduce long-term exposures to TCE.

13. **Section 6, Evaluation of Cleanup Levels and Remediation Levels, second sentence** – It was noted that site specific, risk-based cleanup levels have not been identified by Ecology or DOH. Cleanup levels are established by Ecology, not DOH. The sentence should be revised accordingly.
14. **Section 7.1, Sub-slab Monitoring** – The Port suggests that sub-slab soil gas data collected below homes in the Fruit Valley neighborhood might not provide meaningful data. This is contrary to what is being considered when evaluating the vapor intrusion pathway in other parts of the country. There are many homes with low levels of TCE and PCE above MTCA Method B air cleanup levels where it is uncertain whether contaminated soil gas underlies the residence. Sub-slab soil gas levels would help answer that question. However, without that information, DOH assumes that contaminated soil gas is the source of TCE and PCE when indoor air levels exceed outdoor air background levels and there is no suspected indoor source.
15. **Section 8.2.2.2, Receptor Intake Assumptions** – It is noted that the receptor intake assumptions are presented in Table I-2. However, that table contains a summary of toxicity values. The receptor intake assumptions should be added to the CAMP.
16. **Section 8.4.1.1, NFN, 2809 Unander Avenue** – It is noted that TCE was detected at this address at 313 ug/m³ early in the investigation. This is inaccurate. TCE was actually detected early in the investigation at 31 ug/m³.

17. **Section 8.4.1.2, SFVN** – Only three of the tested residences in the southern portion of the Fruit Valley neighborhood reportedly have estimated lifetime cancer risk (ELCR) exceeding 1×10^{-4} (2216 Thompson Avenue, 2300 Thompson Avenue, and 2314 Simpson Avenue). However, Table I-5 shows that only 2314 Simpson Avenue exceeds that risk level. The revised CAMP should be corrected.
18. **Section 9.2.1, Tier 1 Houses, 2113 W. 28th Street** – Sub-slab sampling ports should be tested along with indoor air at 2113 W. 28th Street.
19. **Section 9.2.2, Tier 2 Houses** – The list of proposed Tier 2 houses is not included in the CAMP. That list should be added and the rationale for the selection of homes on the list provided.
20. **Section 9.4, Schedule** – DOH recommends that the indoor air sampling occur in the later part of September or October, rather than August, because the likelihood of people having their windows closed during the sampling event is higher. If sampled in August or early September, the indoor air results would likely represent outdoor air quality.
21. **Section 10, Conclusions** – The conclusion, particularly numbers 5, 6, and 7, should be revised as appropriate based on the comments above.
22. **Section 11, Recommendation** – DOH understands that Ecology does not concur with the Port's proposed TCE remediation level of 5.0 ug/m^3 and that an interim remediation level value will be used instead.
23. **Appendix A** – The acceptable final canister pressure for the soil gas (including sub-slab) and indoor and outdoor air samples should be added to each standard operating procedure (it is noted in the procedure for indoor air sampling at homes with soil vapor vacuum systems that the final pressure should be between -3 and -9 in/HG). Language should also be added to each procedure stating what should occur if these final pressures are not achieved.
24. **Appendix A, Soil Gas Well Installation and Sampling, Section 4.0** – The Port should confirm that the soil gas sampling procedures, issued in December 2006, are consistent with current acceptable practice. One source of information to consider is that done by the State of California.
25. **Appendix A, Soil Gas Well Installation and Sampling, Section 4.0, item 4** – It is noted that “[c]are should be taken during sampling collection to ensure that air from the surface is not being inadvertently sampled (resulting from well seal failure) and desorption of contaminants does not occur.” However, no details are provided to explain how either would be done. One way to ensure that air from the surface is not being sampled is to conduct leak testing. Leak testing should be added as part of the soil gas testing program. It is unclear where desorption of contaminants would be occurring. This should be clarified and steps to prevent it added to the sampling procedure.
26. **Appendix A, Building Sub-Slab Soil Gas Sampling** – Tedlar bags and SUMMA canisters are mentioned in the sub-slab soil gas sampling procedure. However, Tedlar bags are not suitable sampling devices. SUMMA canisters, as used with all the other soil gas testing at the Cadet and Swan site, should be used instead.

Conclusions

Previously, DOH concluded that indoor air solvent levels associated with the underlying contaminated groundwater in the Fruit Valley neighborhood posed a low risk and were not expected to harm people's health when inhaled. The indoor air solvent levels remain low and only pose a small

theoretical health risk. That risk could, however, be as low as zero. In the past, Ecology required Cadet to install soil vapor vacuum systems at six residences where the greatest impact from the solvent contaminated groundwater was observed. These systems, which continue operating today, have significantly reduced indoor air solvent levels at these residences. As a result, the indoor air health threat at these residences appears to be relatively small.

While the overall health risk to building occupants in the Fruit Valley neighborhood is currently low, indoor air monitoring at the most potentially vulnerable residences is necessary while groundwater cleanup activities continue. Residences with the highest indoor air cancer risk levels were selected by the Port as potential future long-term monitoring locations. While not an unreasonable first step, it was the only step considered by the Port. This resulted in the selection of some residences where the impact from contaminated groundwater did not seem likely. Ecology and DOH agreed that such locations were not appropriate long-term monitoring locations and after reviewing all the indoor air data, selected some other locations where indoor air cancer risk levels were slightly elevated and the vapor intrusion pathway appeared complete.

Recommendations

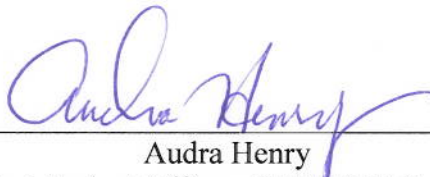
A broader evaluation of the vapor intrusion pathway is necessary to develop a comprehensive air monitoring plan. Additionally, future indoor air monitoring should focus on residences where contaminated groundwater appears to have historically been affecting indoor air. The detailed recommendations regarding these issues, along with other issues regarding the plan, are summarized in the “Discussion” section and “Appendix”. The CAMP should be revised to reflect DOH’s recommendations.

Please feel free to contact me if you have any questions about this memo.

cc: Scott Rose, Ecology – Toxics Cleanup Program
Rod Schmall, Ecology – Toxics Cleanup Program

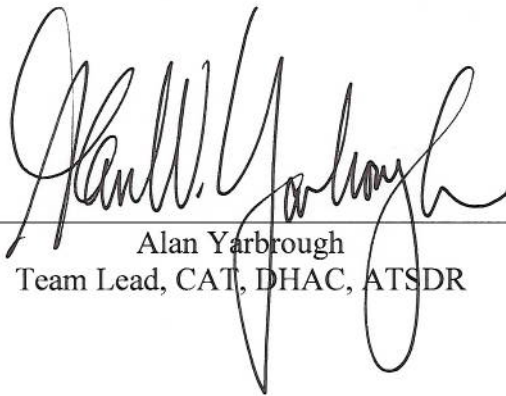
Certification

This Health Consultation report for the Cadet Manufacturing and former Swan Manufacturing sites was prepared by the Washington State Department of Health under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). It was completed in accordance with approved methodology and procedures existing at the time the health consultation was initiated. Editorial review was completed by the Cooperative Agreement partner.



Audra Henry
Technical Project Officer, CAT, DHAC, ATSDR

The Division of Health Assessment and Consultation (DHAC) ATSDR, has reviewed this health consultation and concurs with the findings.



Alan Yarbrough
Team Lead, CAT, DHAC, ATSDR

Appendix



STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

2108 Grand Boulevard ▪ Vancouver, Washington 98661-4622 ▪ (360) 690-7171

July 27, 2009

Patty Boyden
Director of Environmental Services
Port of Vancouver
3103 NW Lower River Road
Vancouver, WA 98660

Re: Written Approval of Indoor Air Sampling Program Proposed in the January 21, 2009
*Revised DRAFT Comprehensive Vapor Intrusion Evaluation and Indoor Air Monitoring
Plan (CAMP)*

Dear Ms. Boyden:

This letter provides the Port of Vancouver (Port) with the Washington Department of Ecology's (Ecology) written approval of the indoor air monitoring plan proposed in the above-referenced document. Ecology is providing approval of the indoor air monitoring program before approving the CAMP so indoor air data collection can begin during the summer or fall 2009 (August or September) multi-media sampling event. Ecology and the Washington Dept. of Health discussed the air monitoring program and sample locations presented in the CAMP and both agencies agree on the sample site selections outlined in this letter. Written approval by Ecology is required by Agreed Order Number 07-TC-S DE5189 executed by Ecology and the Port of Vancouver for work at the former Swan Manufacturing Company (SMC) and the active Cadet Manufacturing Company (Cadet) Site.

Regarding the selection of long term indoor air sampling locations, Ecology's goal is to use sample sites that best illustrate vapor intrusion occurrences. Ecology is in agreement with the sample site selection criteria in CAMP Section 9.2 that the need for willing participants is paramount. Ecology is in general agreement with the other sample site selection criteria:

- Locations that appear to have the highest estimated exposure risk.
- Locations with established data to evaluate ongoing trends.
- Locations representative of the spatial coverage of the North and South Fruit Valley Neighborhood (FVN).

Ecology believes the following additional selection criteria should be considered:

- Locations where volatile organic compounds (VOCs) are detected above their respective cleanup levels (taking background levels into consideration).
- Locations where it does not appear VOCs are sourced from indoor activity.

- Locations where compounds detected in indoor air are also found in groundwater and soil gas.

The selection of indoor air sampling sites should be based on locations that meet the most selection criteria in keeping with using a multiple lines of evidence assessment process.

Homes selected from Tier 1 indoor air monitoring are discussed below in the same order presented in CAMP Section 9.2.1.

Item 1. As indicated in the multi-media monitoring plan (3MP) Ecology agrees with the indoor air monitoring of homes with soil vapor vacuum systems. This monitoring is needed to evaluate system effectiveness but is not used to evaluate long term neighborhood vapor intrusion trends. Those homes include:

- 2809 and 2805 Unander Avenue
- 2206, 2202, 2105 and 2103 West 28th Street

Item 2. Ecology agrees with indoor air monitoring at 2113 West 28th Street to evaluate long-term indoor air quality there. Again, however, this home is not a good measuring point of neighborhood indoor air intrusion trends because of the questions regarding VOC source from hobby activity and the use of an indoor air filter.

Item 3. Ecology is in agreement to sample indoor air in homes monitored during the air sparging/soil vapor extraction system evaluation at 2806 and 2710 Weigel Avenue.

Item 4. Of the homes with the highest risk for exposure Ecology is in agreement with sampling at 2203 and 2102 West 27th Street and 2211 West 28th Street. It appears detections of tetrachloroethylene in living space air at 2604 Weigel Avenue and 2409 West 31st Street are indoor sourced and Ecology is not in agreement that these be Tier 1 sampling locations. Instead Ecology recommends 2709 Weigel Avenue and 1927 and 2203 West 28th Street as replacement Tier 1 sample locations. On West 27th, Ecology recommends that 1927, 2206 and 2104 be added to the Tier 1 sampling program. See table below for a summary of sample locations discussed under Items 3 and 4.

Summary Table

Tier 1 Approved Locations	Tier 1 Approved Replacement/Additions	Tier 1 Alternates
2806 Weigel	2709 Weigel	2604 Weigel
2710 Weigel		
2211 West 28 th St.	1927 West 28 th St.	
	2203 West 28 th St.	
2203 West 27 th St.	1927 West 27 th St.	
2102 West 27 th St.	2206 West 27 th St.	
	2104 West 27 th St.	
		2409 West 31 st St.

Patty Boyden
July 27, 2009
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Item 5. Ecology is in agreement with homes selected for indoor air sampling in the South FVN including 2216 and 2300 Thompson Avenue and 2314 Simpson Avenue.

Ecology agrees with a bi-annual indoor air sampling schedule in August/September and February/March. The indoor air sampling will be concurrent with other multi-media sampling locations and schedule outlined in the 3MP submitted with the May 19, 2009 Technical Memorandum from Parametrix. Ecology requires outdoor air sampling any time indoor air sampling is done at the locations detailed in CAMP Section 9.3. Please be sure outdoor air sampling location RGRW-3 is added to the outdoor air sampling sites, it was missing from CAMP Section 9.3 but is included in the 3MP. Ecology anticipates indoor air sampling discussed in this approval letter can start August/September 2009. Please updated the 3MP with the indoor air sampling locations and schedule and provide a revised 3MP to Ecology.

After two years of indoor air sampling (four bi-annual events) groundwater, soil gas, indoor and outdoor air data will be evaluated to assess what changes, if any, could be made to the indoor air sampling plan and the 3MP. If data shows an increase in indoor air levels above normal data variation immediate assessment may be required as to the source and may include additional indoor air sampling to confirm previous elevated results.

If you have any questions or desire to discuss items in this letter, please contact me by telephone at (360) 690-4795 or by e-mail at cran461@ecy.wa.gov.

Sincerely,

Craig Rankine, RG, LHG
Site Manager/Hydrogeologist
Toxic Cleanup Program
Vancouver Field Office

CR

cc: Rick Wadsworth, Rick Malin and Richard Roche, Parametrix Inc, Portland, OR
Barbara Trejo, DOH, Olympia, WA
Scott Rose, Ecology Southwest Regional Office, Lacey, WA
Ecology Southwest Regional Office Central Files, Lacey, WA

Reference List

1. Washington Department of Health. Health consultation report, indoor air quality evaluation, Cadet Manufacturing Company site, Vancouver, Clark County, Washington. Tumwater, Washington: 2003.
2. Parametrix. Draft comprehensive vapor intrusion evaluation and indoor air monitoring plan (CAMP), prepared for the Port of Vancouver SMC and Cadet sites. Portland, Oregon: 2007 Jan 12.
3. Washington Department of Health. Washington Department of Health comments - sections 1 through 4 of the draft comprehensive vapor intrusion evaluation and indoor air monitoring plan. Olympia, Washington: 2007 Mar 30.
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