



STATE OF WASHINGTON
DEPARTMENT OF HEALTH
DIVISION OF ENVIRONMENTAL HEALTH
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January 22, 2010

William O. Dameworth
Executive Director
Spokane Regional Clean Air Agency
3104 E. Augusta Avenue
Spokane, Washington 99207

Dear Mr. Dameworth:

This letter is in response to a request from the Spokane Regional Clean Air Agency (SRCAA) for a cluster investigation in the Hillyard region of Spokane due to a perceived elevated risk of lung cancer. The specific focus area of the request was a two mile radius region surrounding the Burlington Northern Santa Fe (BNSF) rail yard.

The SRCAA requested the investigation based on the results of the SRCAA analysis that suggested there are exposures that pose a risk for lung cancer. The analysis used a risk assessment completed for a rail yard in California¹. The California rail yard had characteristics similar to the Spokane BNSF rail yard in terms of proximity to residential areas, amount of diesel particulate emissions, function, operating equipment, meteorological conditions, and surrounding population size. The California assessment was used to estimate risk level for the people living near the BNSF rail yard. The SRCAA analysis also used Washington State Department of Ecology and BNSF emissions inventory data and modeled these data to estimate concentrations of toxic air pollutants and National Ambient Air Quality Standards criteria pollutants. The toxic air pollutants acrolein, 1-3 butadiene, diesel particulate matter, formaldehyde, and hexavalent chromium and the criteria pollutant nitrogen oxides were found to exceed the acceptable source impact levels (ASIL) in the Washington State Department of Ecology's New Source Review Rule. ASILs were used in this study, even though they do not apply to mobile sources such as trains and mobile railroad equipment. Based on SRCAA findings, diesel particulate matter had the highest ASIL and was identified as the pollutant of greatest concern. SRCAA provided a geographic coordinates for a point location within the rail yard (Lat/Lon 11T 475194.76E 5279900.99) from which to define the two mile area (radius) around the rail yard.

¹ California Environmental Protection Agency, Air Resources Board (November 19, 2007). Health Risk Assessment for the Union Pacific Railroad Stockton Railyard. Accessed December 30, 2009 from http://www.arb.ca.gov/railyard/hra/up_stockton_hra.pdf.



To investigate SRCAA's concern, a cluster investigation was initiated focusing on cancers associated with diesel particulate matter. The Washington State Department of Health *Guidelines for Investigating Clusters of Chronic Disease and Adverse Birth Outcomes*² was developed for use in conducting potential disease clusters investigations and was followed for this investigation. The purpose of these guidelines is to assure that all investigations follow a standardized and coordinated approach. Investigations of potential cancer clusters require the use of data from the Washington State Cancer Registry (WSCR), which was established in 1991, and US Census data collected for the state.

Primary cancers associated with diesel particulate matter are lung and bladder cancer^{3,4}. We analyzed data separately for people with lung or bladder cancer reported to the Washington State Cancer Registry (WSCR) for the 15 year period from 1992-2006. Using all the available years of registry data provided us the greatest opportunity to find a statistically significant result.

To determine whether there was more cancer than "expected" in this area; we compared the number of cancer cases observed to the number of cancer cases expected. The expected number of cancers for a particular type of cancer is the number that would have occurred if the population such as that around the rail yard had the same cancer rate for that type of cancer as the reference population (i.e., city of Spokane minus the area of the rail yard or Washington State), with consideration of age, gender, and the sizes of the population in the area of interest. We used the 2000 US Census data to provide estimates of the number of people living near the rail yard. In this investigation, we used the rates of lung and bladder cancer in both the city of Spokane minus the area of the rail yard and the state in separate analyses.

If the number of cancers observed in the areas of interest is similar to that expected, the ratio of observed to expected (O/E) is one; if there is more cancer than expected in the area of interest, the O/E is larger than one; if there are fewer cancers, it is smaller than one. However, because of random variation, O/E's above or below one can occur by chance. To help determine whether the observed number of cancers is really higher than expected, or whether it is within the range that might be reasonably be caused by random variation, we compute 95 percent confidence intervals (CIs) for the O/E ratios. If the confidence interval does not include 1 and is greater than 1, then we say that the rail yard had significantly more cancers than expected (statistically significant).

Results from this analysis are summarized in the following table. The only result that was found to be statistically significant was the number of lung cancer cases among the population living in the Hillyard region compared to the population of Washington State overall (see table).

² Washington State Department of Health, Washington State Department of Health. (Revised July 2007). Guidelines for Investigating Clusters of Chronic Disease and Adverse Birth Outcomes.

³ Schottenfeld, D., Fraumeni, JF Jr. (2006). Cancer Epidemiology and Prevention (3rd ed.). New York:Oxford.

⁴ World Health Organization, International Agency for Research on Cancer (IARC). (updated 01/21/98) IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, volume 46 Diesel and Gasoline Engine Exhaust

Observed to Expected Ratio for Bladder and Lung Cancer Among Residents of the Hillyard Region in Spokane, Washington.

Reference Population	Number of People with Bladder cancer Within 2 Miles of the Rail Yard	O/E Bladder Cancer	95% CI	Number of People with Lung Cancer Within 2 Miles of the Rail Yard	O/E Lung Cancer	95% CI
City of Spokane minus the area of the rail yard	75	1.1	0.9-1.4	97	1.2	1.0-1.5
Washington State	75	1.2	0.9-1.5	97	1.4	1.1-1.7

Data Source: Washington State Cancer Registry (WSCR) 1992 – 2006.

While the O/E for lung cancer in the population living near the BNSF rail yard is elevated and statistically significant compared to the reference population of the state, it is not sufficiently so to warrant a public health investigation. Based on the criteria outlined in the cluster guidelines there needs to be an O/E of at least 2.0 when there are 50 or more people with same type of cancer to carry an investigation forward. A total of 97 cases of lung cancer in the vicinity of the rail yard were reported to WSCR over the 15 year period. Using the state as a reference population and its rate of lung cancer a total of 72 people would have been expected to develop lung cancer in this period yielding an O/E = 1.4 for lung cancer. The O/E ratio is therefore below the level needed to continue the investigation, as outlined in our guidelines.

A number of exposures in addition to diesel exhaust are associated with either lung or bladder cancer. Cigarette smoking is associated with both types of cancers. Smoking is the leading cause of lung cancer. However, smoking rates are not available in an area as small as that surrounding the rail yard.

Additional environmental exposures that may contribute to lung or bladder cancer in this region include radon and arsenic. Radon is the second leading cause of lung cancer in the United States. Spokane County is classified by the United States Environmental Protection Agency (USEPA) as a Zone 1, i.e., having the highest potential for radon⁵. Data reported to the department indicate that the average indoor radon level of Spokane County is 9.3 pCi/L, whereas the national average indoor radon level is 1.3 pCi/L.⁶ The USEPA has conducted an assessment of “Risk from Radon in Homes” that uses a model based on the Biological Effects of Ionizing

⁵ United States Environmental Protection Agency. Where You Live, Washington, Map of Radon Zones for Washington. Accessed November 18, 2009 from <http://www.epa.gov/radon/states/washington.html#zone%20map>

⁶ Washington State Department of Health. Spokane County Radon Information. Accessed November 18, 2009 from <http://county-radon.info/WA/Spokane.html>

Radiation (BIER) IV report⁷. The USEPA has summarized this information online and estimates that among non-smokers with lifetime exposure to radon in a home at 8 pCi/L, 15 people among a 1000 could get lung cancer. People who smoke and are exposed to radon are at much higher risk of developing lung cancer. The USEPA estimates that among smokers with lifetime exposure to radon in a home at 8 pCi/L, 120 people among a 1000 could get lung cancer⁸. Variability in radon exposure and smoking status within Spokane County could contribute to the difference in rates of lung cancer in the various Spokane regions.

Arsenic exposure is linked to bladder cancer. The State Department of Ecology data indicate that levels of arsenic in surface soil are higher in Spokane County compared with Washington State as a whole. The 90th percentile value for arsenic statewide is 7 mg/kg, while in the Spokane Basin Region the 90th percentile value is 9 mg/kg⁹. Arsenic in soil can leach into ground or surface water¹⁰. The potential increased exposure to arsenic from soil or in water within the Spokane region may contribute to the burden of bladder cancer.

The rail yard is located near a number of other potential sources of toxic air pollutants that could contribute to lung cancer risk. Parts of two major roadways, Trent Avenue and Interstate 90 are within a mile or less of the rail yard. Trucking traffic on these roadways would contribute to diesel exhaust exposure by residents of the Hillyard region. Heavy and light industry including: a gravel mine, fire training center, metal recycling plants, fabrication shops, trucking repair, and a regional airport are other sources of air pollution.

Unfortunately cancer is a very common disease. Our cluster team has written a fact sheet on "Cancer and Cancer Cluster," which I am enclosing. The document discusses cancer clusters, their investigation, and common facts about cancer. Cancer is also a complex disease that is influenced by many causes, such as genetic patterns, lifestyle choices, and environmental exposures. Most cancers have a long latency period (time between development of a cancer and exposure to a cancer causing agent) so that exposures that occurred years or decades in the past may be linked to the cancer of interest. Quantifying the risk of any cancer causing chemical (carcinogen) can be difficult for a number of reasons. People often move from place to place, and their exposures change depending on where they live. People can also be exposed to carcinogens at work. People may be exposed to a number of different carcinogens that may all be linked to increasing the risk of developing a certain type of cancer.

⁷ United States Environmental Protection Agency. Office of Radiation and Indoor Air. (June 2003) EPA Assessment of Risks from Radon in Homes. Publication # EPA 402-R-03-003. Accessed December 30, 2009 from: <http://www.epa.gov/radiation/docs/assessment/402-r-03-003.pdf>

⁸ United States Environmental Protection Agency. Radon Health Risks. Accessed November 18, 2009 from <http://www.epa.gov/radon/healthrisks.html>

⁹ Washington State Department of Ecology. Natural Background Soil Metals Concentrations in Washington State. (1994). Accessed November 18, 2009 from <http://www.ecy.wa.gov/biblio/94115.html>

¹⁰ Agency for Toxic Substances and Disease Registry. (August 2007). Arsenic Toxicological Profile. Accessed January 12, 2010 from: <http://www.atsdr.cdc.gov/toxprofiles/tp2.html>

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Thank you for contacting us, regarding your concern that there might be an elevated risk for lung cancer present in the vicinity of the rail yard. I hope this information is helpful. If you have any questions about this investigation, please contact me either by phone directly at 360-236-3193, toll free at 1-877-485-7316, or by email Judy.Bardin@doh.wa.gov.

Sincerely



Judy Bardin, ScD
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Enclosure

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