



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION 10**

1200 Sixth Avenue, Suite 900  
Seattle, Washington 98101-3140

August 18, 2008

The Honorable Herman Dillon Senior  
Chairman, Puyallup Tribe  
1850 Alexander Avenue  
Tacoma, Washington 98421

Re: U. S. Environmental Protection Agency's Intended Clean Air Act Designations for the Fine Particle Standard

Dear Chairman Dillon:

The purpose of this letter is to update you on EPA's intended designation decision for the fine particle (PM<sub>2.5</sub>) standard for your Reservation, to describe the designation process and timeline, and to offer you the opportunity to consult with EPA.

Fine-particle pollution is linked to a variety of significant health problems. Based on a review of the latest science available, EPA revised the National Ambient Air Quality Standards for fine particulate matter on December 18, 2006. EPA strengthened the 24-hour fine particle standard from 65 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ) to 35  $\mu\text{g}/\text{m}^3$ , and retained the current annual fine particle standard at 15  $\mu\text{g}/\text{m}^3$ .

Once a standard is revised, EPA must determine what areas of the country, including Indian country, are meeting the standard and what areas are not meeting the standard. Areas where available data shows that the standards are not met are designated as nonattainment areas and areas where available data shows that the standards are met, or where data is insufficient to make a determination, are designated as attainment/unclassifiable areas. Areas that are designated nonattainment will have to go through a planning process to implement measures to improve air quality. Additionally, air pollution sources in nonattainment areas will have to meet more stringent air quality permitting requirements. While attainment/unclassifiable areas will not have to meet these more stringent requirements, they will need to take measures to prevent air quality from deteriorating.

In July 2007, we sent letters to Tribes and States requesting designation recommendations and inviting consultation. A copy of EPA's July 18, 2007 letter to the Puyallup Tribe is enclosed. The State of Washington, in a letter to EPA dated December 18, 2007 recommended a nonattainment designation for the 24-hour PM<sub>2.5</sub> standard for the monitor located at 7802 South L Street (South L Street monitor) in Tacoma based on violations of the 24-hour fine particulate standard from 2004-2006. On March 18, 2008, the State submitted a nonattainment area boundary recommendation for South L Street Monitor that included any non-trust lands within the exterior boundary of the Puyallup Reservation. See enclosed map. EPA has reviewed the State's recommendation and intends to agree with the State's recommendation.

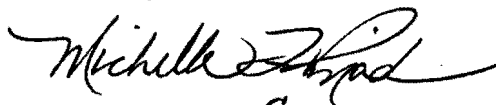
Enclosed is a copy of our nine factors analysis for the State of Washington which includes our analysis of the Tacoma area and areas within the exterior boundary of the Puyallup Reservation. The State specifically excluded from its recommendation any trust lands within the exterior boundary of the Puyallup Reservation. The Puyallup Tribe of Indians Settlement Act of 1989, 25 U.S.C. § 1773, provides that restricted and trust lands within Puyallup Reservation, which is referred to as the 1873 Survey Area, are the responsibility of EPA and the Tribe.

We did not receive any designation recommendations from the Puyallup Tribe for the restricted and trust lands within the 1873 Survey Area. After review of the air quality data and other related information, EPA intends to designate as nonattainment at this time all restricted and trust lands within the Puyallup Reservation. These lands are adjacent to and share an airshed with State and non-trust lands that the State has recommended for nonattainment based on violations at the Tacoma L Street Monitor. Together with the adjacent State land that EPA intends to designate as nonattainment, these lands will be considered one nonattainment area. However, while the State is responsible for meeting Clean Air Act planning requirements for non-trust lands within the boundary of the Puyallup Reservation, EPA and the Puyallup Tribe have responsibility for air quality planning and implementing measures to improve air quality for restricted and trust lands within the boundary of the Puyallup Reservation. EPA intends to work closely with the Tribe and with the State to develop air quality plans for the area. We expect to begin this work shortly after final designations.

There will be a 30-day public comment period on our intended designation decisions. We plan to make final designation decisions by December 18, 2008 and we will communicate with you again at that time. For additional information about PM<sub>2.5</sub> and the designation process, please see the enclosed fact sheet and the EPA website at <http://www.epa.gov/pmdesignations>.

We welcome your participation in this designation process. On April 14 of this year, we met with your staff to discuss the PM<sub>2.5</sub> designations process and in July 2008, we held two conference calls with tribal environmental / air quality staff to discuss the designation process and the results of our review. We look forward to a continued dialogue with you as we work together to implement the revised PM<sub>2.5</sub> standard. Should you have any questions or want to initiate consultation with EPA, I invite you to contact me at 206-553-1234. You or your staff may also contact Rick Albright, Director of the Office of Air, Waste & Toxics, at 206-553-1847; Mahbubul Islam, State and Tribal Air Programs Unit Manager, at 206-553-6985; or Krishna Viswanathan, PM<sub>2.5</sub> staff lead, at 206-553-2684, with any questions concerning the designation for your Reservation.

Sincerely,



Elin D. Miller *fr*  
Regional Administrator

Enclosures



## Fact Sheet

# PM<sub>2.5</sub> Designations

### Common Sources of PM<sub>2.5</sub>

#### Woodstoves



Photo Credit: WA Dept. of Ecology

Woodstoves are a primary source of PM<sub>2.5</sub>, especially when wood is burned improperly or in uncertified devices. Control measures include public education for proper burning and woodstove changeout programs to replace outdated stoves.

#### Garbage & Open Burning



Burning trash is a dangerous and localized source of PM<sub>2.5</sub> which is especially dangerous to elders, children, pregnant women and people with respiratory or heart disease. Control measures include recycling and safe disposal of waste in a landfill.

#### Field, Forest & Rangeland Burning



Photo credit: Nez Perce Tribe

Large scale burns are major sources of PM<sub>2.5</sub>, especially in areas where air pollution is trapped by topography or weather conditions. Control measures include airshed-wide monitoring for PM<sub>2.5</sub>, phased burns, burn bans or "no burn" days, burn permits and other methods to ensure air quality conditions allow burning.

#### Mobile Sources / Diesel



Emissions from mobile sources such as cars, trucks, tractors and train engines are significant sources of particulate matter and air toxics. Control measures include diesel retrofits, use of low sulfur fuel and educational outreach campaigns to encourage less driving and idling.

#### Stationary Sources



Industrial activities are an additional source of PM<sub>2.5</sub>, but actually are a smaller contributor to high PM<sub>2.5</sub> levels across Region 10 compared with woodsmoke or field or forest burning.

### What is PM<sub>2.5</sub>?

PM<sub>2.5</sub> is particulate matter less than 2.5 microns in diameter composed of very small bits of ash, wood tars, soot and other substances created by combustion. To give you a sense for how tiny this is, the period at the end of this sentence is about 500 microns across. PM<sub>2.5</sub> particles are so small that they can evade the body's natural defense mechanisms and penetrate deep into lung tissue. The PM<sub>2.5</sub> particles can damage lung tissue, which can lead to serious respiratory problems. In 2006, EPA lowered the 24-hour fine particle standard from 65 micrograms per cubic meter (µg/m<sup>3</sup>) to 35 µg/m<sup>3</sup> to provide greater protection to public health from exposure to fine particles.

### What are important sources of PM<sub>2.5</sub> in the Northwest and Alaska?

During the winter, when PM<sub>2.5</sub> levels are highest, key contributors in the Northwest and Alaska include burning of wood in woodstoves and fireplaces. During the summer, spring and fall, open burning, which has long been used as a waste disposal practice and as a management tool for croplands, rangelands, and forests, is a key source of PM<sub>2.5</sub>. In addition, mobile sources and stationary sources can contribute to PM<sub>2.5</sub> levels.

### What are PM<sub>2.5</sub> designations?

When EPA revises a standard, we are then required to designate all geographic areas within the United States as attainment, unclassifiable, or nonattainment under Section 107 of the Clean Air Act (CAA). Designating an area under the CAA is accomplished through a formal rulemaking process outlined in Section 107(d) of the Act. If an area does not meet the national standard for PM<sub>2.5</sub>, an area will be designated as nonattainment. Attainment areas are areas that meet the standard, and unclassifiable areas are areas that cannot be classified on the basis of available information as meeting or not meeting the standard.

### ***Which areas are subject to EPA's designations?***

EPA will be making designations for all areas in the country, both for state lands and for Indian country. Under the process set out in the Clean Air Act, only states are required to submit recommendations for designations to EPA December 18, 2007.

### ***How can tribes participate in the designations process?***

Unlike states, tribes are not obligated to submit designation recommendations but are invited to participate in the designations process by submitting a designation recommendation for Indian country and/or by engaging in formal or informal consultation with EPA and states. Tribal consultation is important part of the designations process. Through consultation EPA can gather important information from tribes about designations of areas in Indian country or adjacent state land. Tribes can also through consultation, learn about state plans to prepare their recommendations for designation of lands which may surround Indian country.

### ***What is the timeline for PM<sub>2.5</sub> designations?***

**December 18, 2006** - PM<sub>2.5</sub> standard strengthened.

**Summer 2007** – EPA sends letters to states/tribes asking for designation recommendations and inviting consultation.

**December 18, 2007** – States' designation recommendations are due to EPA. Tribes requested to send by this date.

**August 2008** – EPA will send letters to states/tribes announcing whether or not we agree with their designation recommendations and to all areas that did not send letters announcing our proposed designation for their area.

**August/Sept 2008** – EPA will open a 30 day public comment period on EPA's response to states/tribes recommendations.

**December 18, 2008** – By this date EPA will issue final designations for all areas.

**March 2012** - State attainment plans are due for state areas designated as nonattainment for PM<sub>2.5</sub>.

### ***What are the requirements for state or tribal areas that have been designated unclassifiable for PM<sub>2.5</sub>?***

An unclassifiable designation does not trigger any additional requirements for states/tribes. Existing requirements (Prevention of Significant Deterioration, FARR, etc.) do not change as a result of this designation.

### ***What are the requirements for state or tribal areas that have been designated attainment?***

An attainment designation does not trigger any additional requirements for states/tribes. Existing requirements (Prevention of Significant Deterioration, FARR, etc.) do not change as a result of this designation.

### ***What are the requirements for state or tribal areas that have been designated nonattainment?***

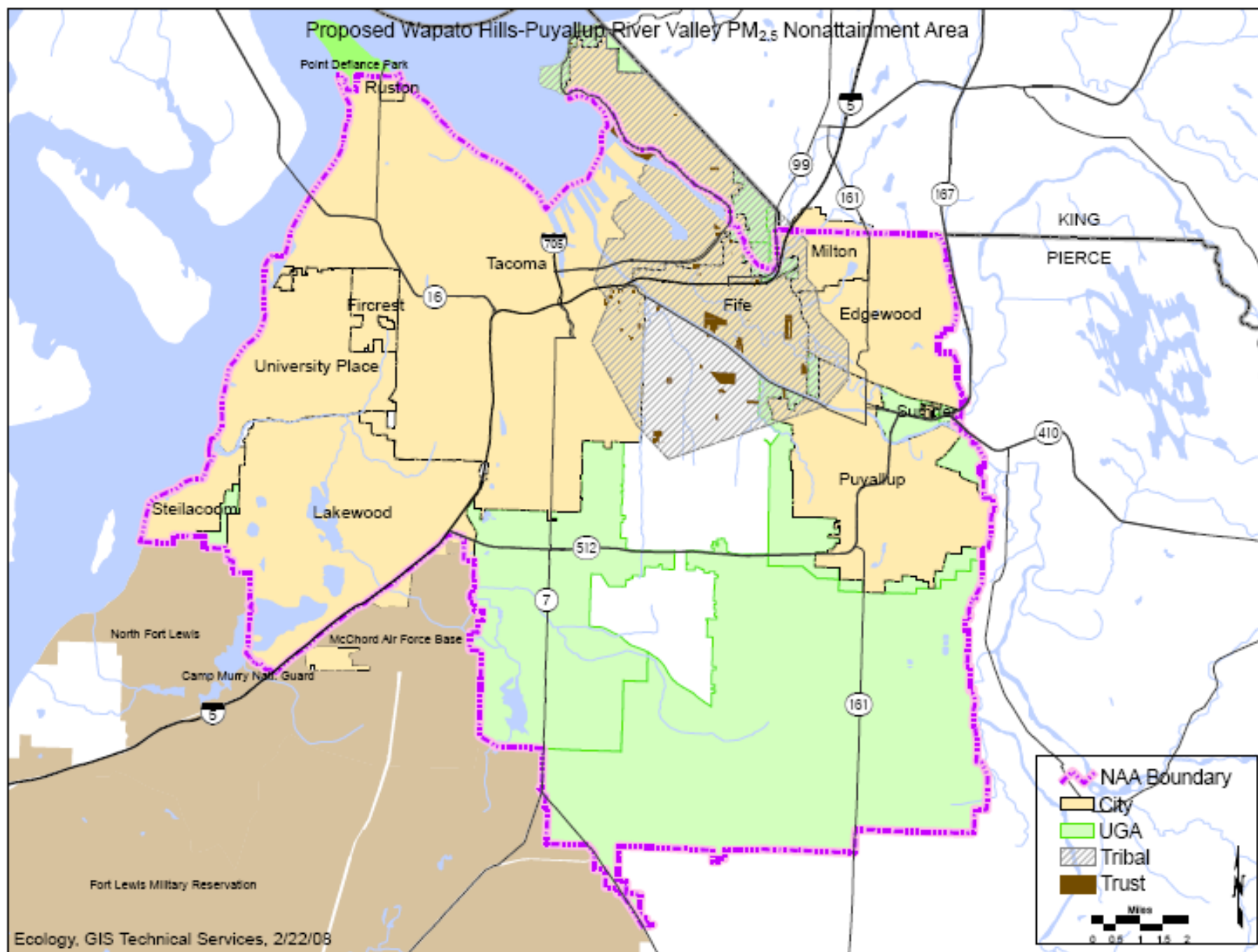
States with nonattainment areas are required to develop and submit plans to show how they will attain the PM<sub>2.5</sub> standard as expeditiously as possible. These plans are referred to as State Implementation Plans or SIPs. These plans are due in 2012 and should contain regulations and technical justification for how those regulations will result in attainment in the future. In addition, states are required to meet the standard within 5-10 years of the submittal of the attainment plan (or attainment SIP). Tribes with areas of Indian country adjacent to state nonattainment areas should work with states as they develop these plans. Tribes with nonattainment areas are not required to follow a specific timeline for submitting plans and attaining the standard but EPA encourages tribes to work with EPA to take appropriate actions to reduce PM<sub>2.5</sub> emissions.

### ***What are the requirements for tribal stationary sources located in PM<sub>2.5</sub> nonattainment areas?***

New and modified major sources must utilize control technologies that achieve the lowest emissions possible and must offset their increased emissions with reductions from existing sources. Existing sources must employ reasonable controls. Stationary sources may be required to reduce emissions further in order to attain the PM<sub>2.5</sub> standard.

### ***Where can the public get more information about PM<sub>2.5</sub> designations?***

Visit the EPA website <http://epa.gov/pmdesignations> or contact Krishna Viswanathan (206-553-2684) or Gina Bonifacino (206-553-2970) at the Regional Office.





**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**

**REGION 10**  
1200 Sixth Avenue  
Seattle, WA 98101

Reply to  
Attn of: AWT-107

18 JUL 2007

The Honorable Herman Dillon, Sr.  
Chairman  
The Puyallup Tribe  
1850 Alexander Avenue  
Tacoma WA, 98421

Re: Designations Under 24-Hour PM<sub>2.5</sub> National Ambient Air Quality Standard (NAAQS)

Dear Chairman Herman Dillon, Sr.,

The purpose of this letter is: (1) to provide Tribes an explanation of the Clean Air Act Section 107 designation process and how it relates to them; (2) to describe EPA's guidance for designations which contains the factors a Tribe should consider when providing input to EPA regarding a designation for areas of the Tribe's Indian country; and (3) to explain how we will offer the opportunity to consult with EPA officials.

EPA promulgated a new 24-Hour PM<sub>2.5</sub> National Ambient Air Quality Standard (NAAQS) on October 17, 2006 to provide increased protection of public health and the environment from fine particle pollution. When EPA promulgates a new NAAQS, we are then required to designate all geographic areas within the United States as attainment, unclassifiable, or nonattainment under Section 107 of the Clean Air Act (CAA). Designating an area under the CAA is accomplished through a formal rulemaking process outlined in Section 107(d) of the Act. If an area does not meet the national standard for PM<sub>2.5</sub>, an area will be designated as nonattainment.

Under this process, States are required to submit recommendations for designations to EPA by December 18, 2007. A State may recommend a designation of attainment, unclassifiable or nonattainment area for areas surrounding or adjacent to an area of Indian country based on the available PM<sub>2.5</sub> monitoring data. Unlike States, Tribes are not obligated to participate in the process, but we invite you to do so. By participating in the process, you will learn about State plans to prepare their recommendations for designation of lands which may surround your Indian country. You may also provide relevant information to EPA regarding appropriate designations for your Indian country areas. In accordance with Section 107(d)(1)(B) of the Clean Air Act, we plan to issue final designations by December 18, 2008, although this deadline may be extended up to one additional year if EPA determines that insufficient information is available to establish final designations.

Attached is EPA's guidance document to assist States and Tribes in formulating their own recommendations and understanding the criteria for designating and drawing boundaries. Interested Tribes should submit relevant information, including any recommendations for area designations and boundaries, with supporting documentation to EPA by December 18, 2007.



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I want to emphasize EPA's willingness to provide you the opportunity to learn about, and participate in, this designation process. In June we held a conference call to discuss the tribal designations process with your environmental/air quality staff. If you wish to learn more about making a designation recommendation and would like us to provide assistance, please have your staff contact Gina Bonifacino at 206-553-2970.

If your tribal government is interested in consulting with EPA officials about specific aspects of this guidance or the designations process, please contact me at 206-553-1847.

Sincerely,

A handwritten signature in black ink, appearing to be 'R. Albright', with a stylized, cursive-like script.

Richard Albright  
Director, Office of Air Waste and Toxics

Enclosure

CCw/enclosure: Environmental Director

## **Attachment 1**

### **Washington Area Designations For the 24-Hour Fine Particle National Ambient Air Quality Standard**

The table below identifies the counties in the State of Washington that EPA intends to designate as not attaining the 2006 24-hour fine particle (PM<sub>2.5</sub>) standard.<sup>1</sup> A county (or portion thereof) will be designated as nonattainment if it has an air quality monitor that is violating the standard or if the county is determined to be contributing to the violation of the standard.

Area	WA Recommended Nonattainment Counties	EPA's Intended Nonattainment Counties
Tacoma, Washington	Pierce (partial)	Pierce (partial)

### **EPA Technical Analysis for Tacoma (Pierce County), Washington**

#### **Discussion**

Pursuant to section 107(d) of the Clean Air Act, EPA must designate as nonattainment those areas that violate the NAAQS and those areas that contribute to violations. This technical analysis for Tacoma identifies the nearby areas with monitors that violate the 24-hour PM<sub>2.5</sub> standard and evaluates the areas that potentially contribute to fine particle concentrations in the area. EPA has evaluated these areas based on the weight of evidence of the following nine factors recommended in EPA guidance and any other relevant information:

- pollutant emissions
- air quality data
- population density and degree of urbanization
- traffic and commuting patterns
- growth
- meteorology
- geography and topography
- jurisdictional boundaries
- level of control of emissions sources

#### **Background**

Figure 1 is a map of the counties in the area and other relevant information such as the locations and design values of air quality monitors, the metropolitan area boundary, and counties recommended as nonattainment by the State. The violating monitor in the Pierce County area is

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<sup>1</sup> EPA designated nonattainment areas for the 1997 fine particle standards in 2005. In 2006, the 24-hour PM<sub>2.5</sub> standard was revised from 65 micrograms per cubic meter (average of 98<sup>th</sup> percentile values for 3 consecutive years) to 35 micrograms per cubic meter; the level of the annual standard for PM<sub>2.5</sub> remained unchanged at 15 micrograms per cubic meter (average of annual averages for 3 consecutive years).



### Figure 1

Washington

Oregon

Legend:

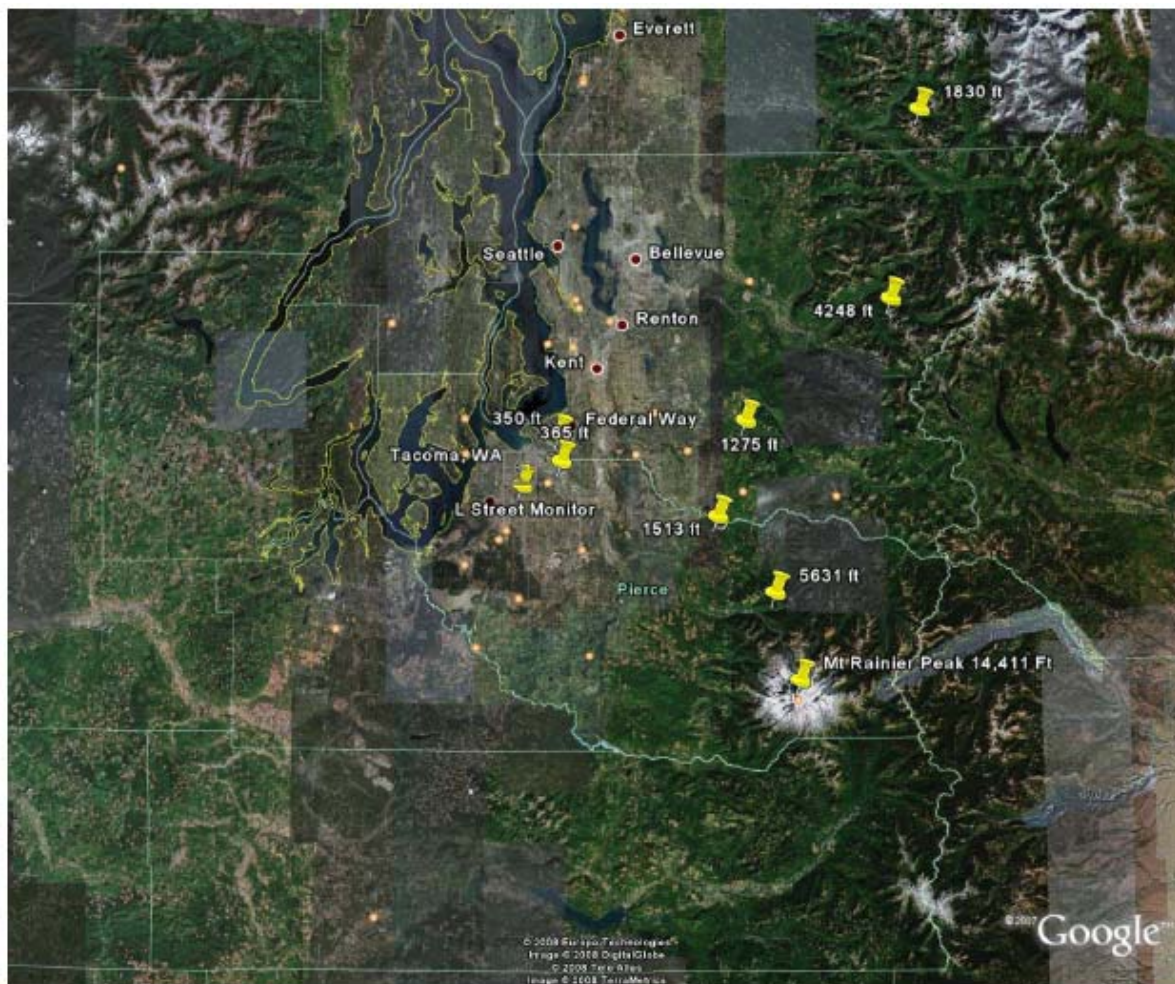
- State recommendation for nonattainment
- State recommendation for partial nonattainment
- State recommendation for a different metro area
- Monitor violating 24-hr PM2.5 NAAQS (prelimin. 2005-2007 design values)
- Monitor attaining 24-hr PM2.5 NAAQS (prelimin. 2005-2007 design values)
- Monitor violating 24-hr PM2.5 NAAQS (prelimin. 2005-2007 incomplete design values)
- National highways
- 2006 Combined Statistical Area
- PM2.5 Nonattainment Area (1997 NAAQS)
- All PM2.5 Nonattainment Areas (1997 NAAQS)
- Nonattainment/Maintenance Area for 8-hour Ozone
- EGU with total CAP emissions > 5,000 tons/year in 2002
- Other Point Source with total CAP emissions > 5,000 tons/year in 2002
- Contributing Emissions Score (40 units)

Inset map: Fairbanks, AK

58

2

**Figure 2 Southern Puget Sound area topography**



On December 18, 2007, the State of Washington (the State) recommended that the monitor located at 7802 South L Street in Tacoma, Pierce County, WA be designated as “nonattainment” for the monitor based on air quality data from 2004-2006.<sup>2 3</sup> The State of Washington (the State) also recommended that monitors located in Vancouver, Clark County, WA and Yakima, Yakima County, WA be designated as “unclassifiable” for the purpose of extending the deadline based on missing years of air quality data for the period 2004-2006.<sup>4</sup>

The December 18, 2007 letter did not include a boundary recommendation for the nonattainment area or a nine factors analysis. The letter indicated that the State was still completing its evaluation of an appropriate area for the recommended “nonattainment” designation for the South L Street monitor. The December 17<sup>th</sup> letter addressed tribal lands in the vicinity of the violating monitor, and indicated that the State’s recommendation did not apply

<sup>2</sup> See December 18, 2007 letter from Jay Manning, Director of the Washington Department of Ecology to Elin Miller, Regional Administrator EPA Region 10.

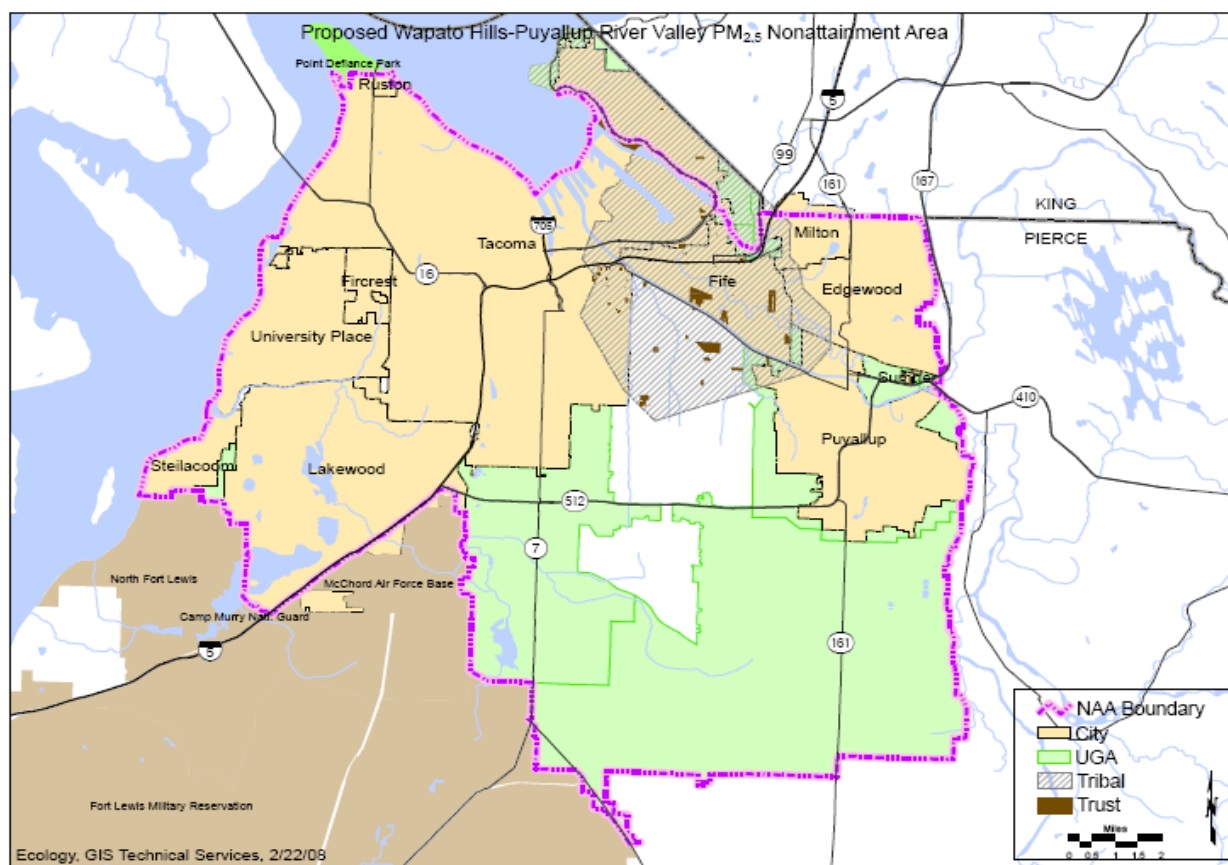
<sup>3</sup> The 7802 L Street monitor is within the jurisdiction of the Puget Sound Clean Air Agency (PSCAA), which manages air quality programs for areas in King County, Pierce County, Snohomish County and Kitsap County.

<sup>4</sup> These data are from Federal Reference Method (FRM) and Federal Equivalent Method (FEM) monitors located in the State.

to trust lands within the Puyallup Indian Reservation under the Puyallup Tribe of Indians Settlement Act of 1989, 25 U.S.C. §1773.

On March 13, 2008, the State submitted a supplement to the December 18<sup>th</sup> letter and included a boundary recommendation for the area surrounding the monitor at 7802 South L Street (South L Street monitor). Figure 3 is the State's recommendation included in the March 13, 2008 letter. Tribal trust lands are in brown. The reservation is shown with cross-hatch. See Figure 4 for an aerial image of the immediate area surrounding the monitor. In addition to the March 13<sup>th</sup> letter, the State submitted a letter dated July 28, 2008 containing addition technical information for EPA's consideration.<sup>5</sup>

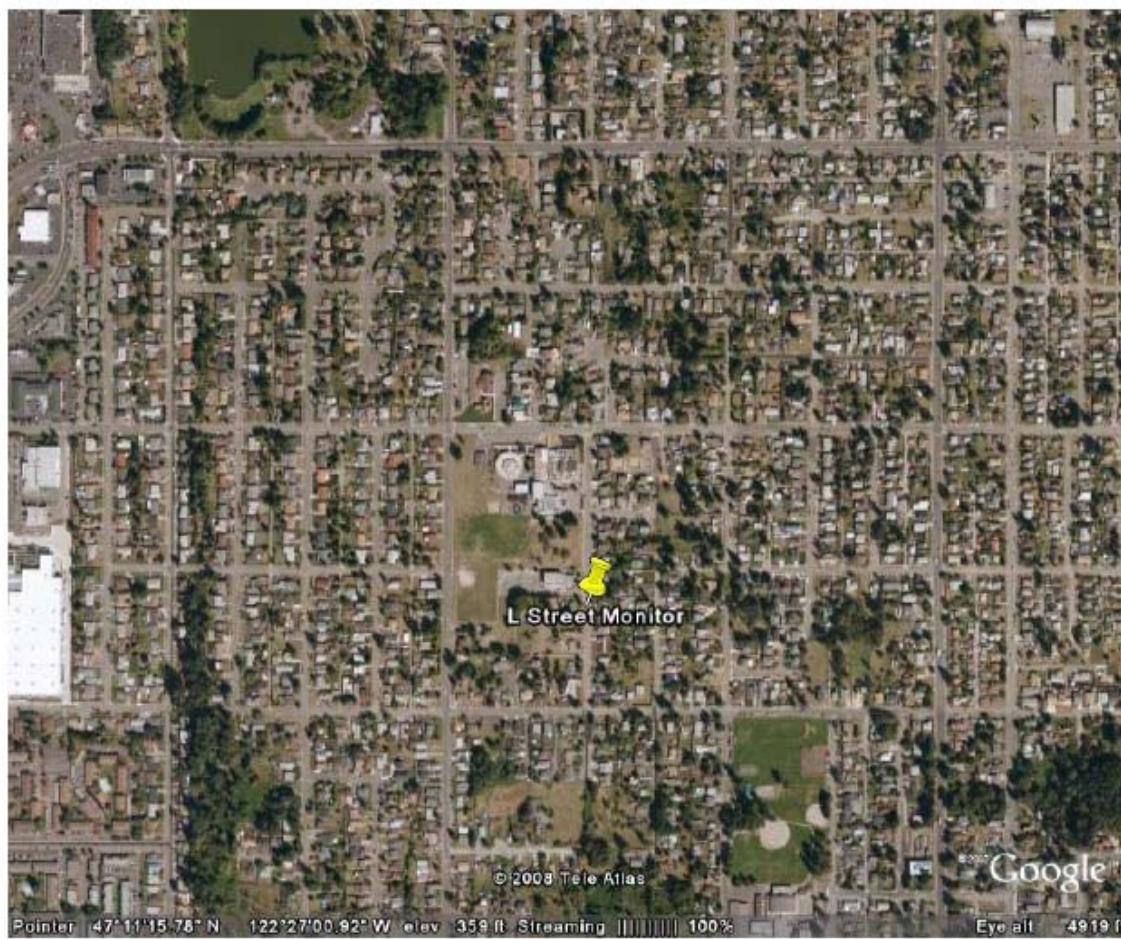
**Figure 3 Washington's recommended nonattainment area boundary for the Tacoma Area**



<sup>5</sup> See July 25, 2008 letter from Stuart Clark, Program Manager, Air Quality Program, Washington Department of Ecology to Rick Albright, Director, Office of Air Waste and Toxics EPA Region 10.



**Figure 4 South L Street Monitor Immediate Area**



Air quality monitoring data on the composition of fine particle mass are available from a chemical speciation monitoring site co-located with the South L Street monitor and operated by the State. The State submitted data from this site along with its nine factors analysis and as an attachment to their July 28, 2008 letter. The State's analysis of this data indicates that the days with the highest fine particle concentrations occur exclusively in the winter, and the average chemical composition of the highest days in the winter season is over 70% carbonaceous  $PM_{2.5}$ , 3-4% percent sulfate, 6% nitrate and 18% other components including crustal  $PM_{2.5}$ .

Based on EPA's 9-factor analysis described below and currently available information, EPA agrees with the State's boundary recommendation for the Tacoma area. Under the Puyallup Tribe of Indians Settlement Act of 1989, 25 U.S.C. §1773, Congress explicitly provided State and local agencies in Washington authority over activities on non-trust lands within the 1873 Survey Area. Accordingly, EPA's designation of State's nonattainment area includes non-trust land within the boundary of the Puyallup Reservation. However, consistent with the Puyallup Tribe of Indians Settlement Act of 1989, 25 U.S.C. §1773, our intended State nonattainment area boundary does not include areas, sources and activities on restricted and trust lands within the Puyallup Reservation.

EPA will be designating restricted and trust lands within the boundary of the Puyallup Reservation separately and EPA and the Tribe will be responsible for air quality planning activities for those areas. However, since Puyallup tribal restricted and trust lands are surrounded by state lands and non-trust lands and share an airshed with these surrounding areas, this analysis also covers these restricted and trust lands within the exterior boundary of the Puyallup Reservation.

The following is a summary followed by EPA's detailed 9-factor analysis for the Tacoma area.

### **Summary of the State's submittal**

The State submitted to EPA the partial county boundary shown in Figure 3 in its March, 2008 submittal. In its nine factors analysis included with this submittal, the State focused on local sources potentially contributing to the violating monitor at South L Street. The State explained in its submittal that air quality data indicates that exceedences occur during the winter months (November-February), when meteorology is conducive to inversions that trap pollutants and people use wood to heat their homes. Continuous air quality monitors and woodstove survey data indicate that concentrations are highest during evening hours, and this corresponds to times when people burn in woodstoves and fireplaces. The State also reviewed PM<sub>2.5</sub> speciation data from the South L Street monitor for the highest day in 2006 that indicates that carbonaceous PM<sub>2.5</sub>, which is an indicator of emissions from burning of wood, accounts for 74% or more of the total PM<sub>2.5</sub> observed at the South L Street monitor.

The State's conclusion from this air quality data as well as the other data it analyzed in its nine factors analysis was that elevated concentrations at the South L Street monitor are due to local emissions (dominated by woodstove and fireplace emissions) occurring under meteorological conditions conducive to trapping those emissions locally. Accordingly, the State used the comprehensive urban growth area (CUGA) as a starting point for defining the nonattainment area because it encompasses woodstoves and other sources in Tacoma, its suburbs and the Urban Growth Area. They further excluded areas in the CUGA from inclusion in the boundary based on lack of population or sources of emissions. These areas include Port Defiance Park, Fort Lewis Base and McChord Air Force Base to the south and a topographic bluff to the northernmost edge of the the (CUGA). See Figure 2. The State's basis for excluding these areas is:

- 1) The Fort Lewis and McChord Air Force Bases have minimal PM<sub>2.5</sub> emissions, population density and forecasted growth. The State also argued that these areas are not upwind of the violating monitor when it experiences elevated PM<sub>2.5</sub> concentrations.
- 2) The far eastern peninsula of the CUGA, east of the Puyallup River and White River valley do not likely have PM<sub>2.5</sub> emissions.
- 3) Throughout the area near the Pierce-King County line, sites are either on highlands or in valleys with little in between. The State's analysis found that the highlands along the northern county line are in a different air shed from the land to the south and that the bluffs bordering Commencement Bay and the river valley to the south help trap fine particulates and increase pollutant concentrations during inversions that occur in the winter months. The State drew the northwestern boundary of the proposed nonattainment area to exclude these bluffs. They used surrogates of a road (S.R 509) and a stream to

draw the boundary. This use of surrogates does not exclude any major sources from the nonattainment area.

- 4) The State excluded Point Defiance Park from the proposed nonattainment area because the area does not contribute to nonattainment. Only 105 of the Park's 702 acres are maintained.

In focusing its initial analysis on the CUGA and local sources, the State did not directly address whether or not contributions from areas outside of the CUGA contribute to the violations at the L Street monitor. After EPA shared information with the states from contributing emissions score (CES) modeling which indicated a potential contribution from regional sources to the north, the State submitted additional analyses and data that focused on assessing regional contributions to the Tacoma L Street Monitor. This information included the following:

- 1) Hourly monitoring data over 24-hour periods for the South L Street site and other sites in Puget Sound that show 24-hour patterns in PM<sub>2.5</sub> levels at sites in the southern King County industrial areas (Duwamish and Kent), differ from those observed at monitors in N. King County (Lake Forest Park) and in Tacoma. In N. King County and in Tacoma, "v" shaped diurnal patterns are observed. These patterns indicate that peak PM<sub>2.5</sub> concentrations occur at night and concentrations decrease during the day. These patterns generally correspond with periods of increased woodstove use in the evening hours noted on surveys conducted by the Puget Sound Clean Air Agency.
- 2) Speciated PM<sub>2.5</sub> data for the South L Street monitor compared with data for other sites indicating that carbonaceous PM impacts the Tacoma monitor predominantly in the winter when fractions of sulfate and nitrate compared with total PM<sub>2.5</sub> are low. The Duwamish monitor shows ratios of sulfate/total PM that are more consistent throughout the year.
- 3) Additional meteorological data for the L Street Monitor showing that exceedences occur in the winter during very low wind speeds (less than 5 mph) indicating stagnant conditions.

The State concluded from this additional analysis that high Tacoma concentrations are due to local emissions dominated by emissions of carbonaceous PM<sub>2.5</sub> occurring under conditions conducive to high concentrations (meteorology) and not transport.

#### **EPA's review of the State's submittal**

EPA examined data on counties in the Seattle-Tacoma-Olympia CMSA as well as the information that the State submitted on March 13, 2008 focused on the Tacoma CUGA as well as the information it later submitted on July 25, 2008 and has determined that the State's boundary is large enough to encompass sources that contribute to the exceedences and violations of the 24-hour PM<sub>2.5</sub> standard at the South L Street monitor. EPA is agreeing with the State's boundary recommendation. The State has noted that its boundary recommendation does not include trust lands within the boundary of the Puyallup Reservation and we agree. The State has defined a boundary for land within the state's jurisdiction. EPA and the Tribe are responsible for tribal trust lands.

The following information was important considerations in EPA's conclusion:

Chemical speciation data indicates 74% or more contribution from carbonaceous PM which is associated with burning in woodstoves and fireplaces, and 10% or less contribution from PM<sub>2.5</sub> components that are typically regional such as sulfate and nitrate. The State's boundary includes potential sources of these contributions in the Tacoma area including the Port of Tacoma and sections of Interstate 5 and State Highway 99.

EPA's analysis of positive matrix factorization data indicates that 60-90% of total PM<sub>2.5</sub> on exceeding days at the Tacoma L Street monitor is from wood smoke. There are no other sources of smoke during the winter season in the CUGA. By law outdoor burning is prohibited in this area.

Hourly PM<sub>2.5</sub> levels at the Tacoma L Street monitor peak in the evenings and decrease dramatically during the day. These patterns are consistent with woodstove surveys conducted in Tacoma which show that on high PM<sub>2.5</sub> days, woodstove use PM<sub>2.5</sub> peaks in the late evening and is lowest around noon.

Meteorological data shows very low mixing heights during stagnation events when the exceedences are occurring, and low wind speeds (typically less than 5 mph).

Local topographical features in the area influence pollution flow in the Tacoma area during stagnation events.

Population density in Pierce County is concentrated within the CUGA and emissions from the Fort Lewis and McCord Air force Military base to the south are less than .2% contribution to the total inventory of PM<sub>2.5</sub> emissions in the area.

Emissions from the Port of Tacoma are estimated at 90 tons per year. This does not include off-terminal emissions, which contribute additional PM<sub>2.5</sub>. The Port projects a dramatic increase of its cargo handling capacity in the next two decades, with an estimated cargo growth factor of 4.8 from 1999 to 2015.

## **Factor 1: Emissions data**

For this factor, EPA evaluated county level emission data for the following PM<sub>2.5</sub> components and precursor pollutants: "PM<sub>2.5</sub> emissions total," "PM<sub>2.5</sub> emissions carbon," "PM<sub>2.5</sub> emissions other," "SO<sub>2</sub>," "NO<sub>x</sub>," "VOCs," and "NH<sub>3</sub>." "PM<sub>2.5</sub> emissions total" represents direct emissions of PM<sub>2.5</sub> and includes: "PM<sub>2.5</sub> emissions carbon," "PM<sub>2.5</sub> emissions other", primary sulfate (SO<sub>4</sub>), and primary nitrate. (Although primary sulfate and primary nitrate, which are emitted directly from stacks rather than forming in atmospheric reactions with SO<sub>2</sub> and NO<sub>x</sub>, are part of "PM<sub>2.5</sub> emissions total," they are not shown in Table 1 as separate items.) "PM<sub>2.5</sub> emissions carbon" represents the sum of organic carbon (OC) and elemental carbon (EC) emissions, and "PM<sub>2.5</sub> emissions other" represents other inorganic particles (crustal). Emissions of SO<sub>2</sub> and NO<sub>x</sub>, which are precursors of the secondary PM<sub>2.5</sub> components sulfate and nitrate, are also considered. VOCs (volatile organic compounds) and NH<sub>3</sub> (ammonia) are also potential PM<sub>2.5</sub> precursors and are included for consideration. Emissions data were derived from the 2005 National Emissions Inventory (NEI), version 1.

In addition, the State of Washington submitted seasonal emissions data for Pierce County (Tacoma, WA), the location of the violating monitor. Table 1 shows emissions of PM<sub>2.5</sub> components (given in tons per year) and the CESs for potentially contributing counties to the violating monitor in Pierce County WA (Seattle Tacoma Olympia Area).

Emissions data were derived from the 2005 National Emissions Inventory (NEI), version 1. See [http://www.epa.gov/ttn/naaqs/pm/pm25\\_2006\\_techinfo.html](http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html).

EPA also considered the Contributing Emissions Score (CES) for each county. The CES is a metric that takes into consideration emissions data, meteorological data, and air quality monitoring information to provide a relative ranking of counties in and near an area. Note that this metric is not the exclusive way for consideration of data for these factors. A summary of the CES is included in attachment 2, and a more detailed description can be found at [http://www.epa.gov/ttn/naaqs/pm/pm25\\_2006\\_techinfo.html#C](http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html#C). ]

**Table 1 PM<sub>2.5</sub> 24-hour Component Emissions, and CESs.**

County	CES Score (Rank)	PM2.5 emissions - total (tpy)	PM2.5 emissions - carbon (tpy)	PM2.5 emissions - other (tpy)	SO2 emissions (tpy)	NOx emissions (tpy)	VOC emissions (tpy)	NH3 emissions (tpy)
King, WA	100 (1)	6,362	4,168	2,194	7,361	75,825	89,446	2,564
Pierce	60 (2)	3,766	2,255	1,511	3,200	31,905	32,097	1,410
Thurston	17 (3)	2,221	1,348	873	478	8,389	14,985	1,620
Kitsap	14 (4)	2,204	1,201	1,004	442	6,199	9,588	274
Snohomish	13 (5)	3,714	2,223	1,492	2,256	22,687	28,861	1,932
Skagit	11	1,605	819	786	10,345	12,417	11,173	1,809
Island	4	841	453	388	485	4,463	4,128	358
Mason	3	767	439	328	100	1,623	3,846	90

Total PM<sub>2.5</sub> emissions in King County as well as individual chemical precursor components of PM<sub>2.5</sub> are generally two times the emissions in Pierce County, the county which contains the violating monitor. In addition, the CES score of 100 indicates potential contributing emissions from King County. The next highest CES score of 17 was for Thurston County, which contains the City of Olympia located 36 miles to the South of the violating monitor. Given the low CES scores and relatively low emissions in Thurston County, Kitsap, Snohomish, Skagit, Island and Mason Counties these counties are less likely to contribute to the exceedences at the South L Street monitor than King County and Pierce County which have higher emissions and CES scores. We note that in large areas such as King County, the CES does not account for diurnal variation in hourly PM<sub>2.5</sub> and sharp spatial gradients in emissions within counties that represent large land areas.<sup>6</sup> Those factors were separately considered in developing the final conclusions.

The State of Washington submitted seasonal emissions inventory data as part of its nine factors analysis attachment to its letter to EPA dated December 18, 2007. Figure 5 and Table 2

<sup>6</sup> See supporting documentation section on limitations. Because of differences in county size, and topography across the country, the score may require careful interpretation for some areas, particularly in the western United States.



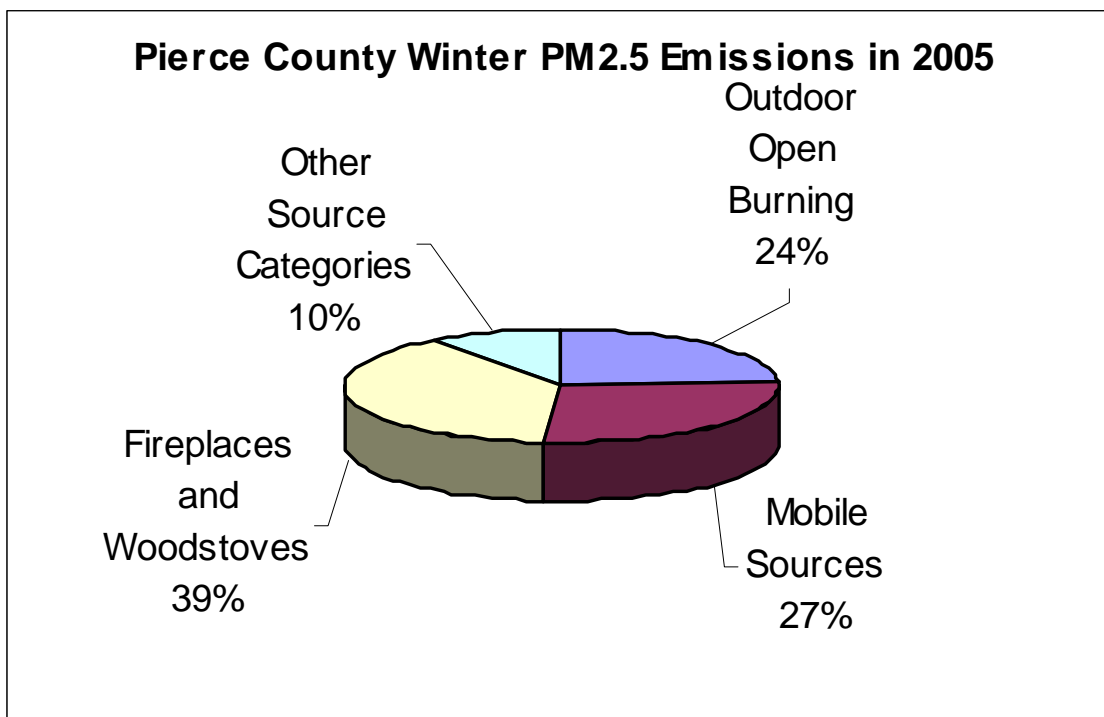
display seasonal emissions in Pierce County, Washington for 2005 from the State's submittal. PM<sub>2.5</sub> exceedences at the violating monitor in Pierce County have occurred in the months of November, December, January and February during the years 2004-2007.

Winter season (December through February) air emissions of PM<sub>2.5</sub> in Pierce County are balanced among:

- (1) outdoor open burning (202 tons per season, 24%),
- (2) mobile sources (230 tons per season, 27%),
- (3) fireplaces and woodstoves (326 tons per season, 39%), and
- (4) other sources (84 tons per season, 10%)

Washington noted that these are estimates for a countywide emission inventory, and that outdoor open burning (with an estimated 24% contribution) is likely not occurring in the urban portion of the county near the violating monitor. Open burning is prohibited in these areas.

**Figure 5**



**Table 2 Pierce County Seasonal PM<sub>2.5</sub> Emission Sources in 2005**

2005 Category PM2.5 Emissions					PM2.5 Emission Source Categories and Subcategories	2005 Subcategory PM2.5 Emissions				
tpy	tons/season					tpy	tons/season			
Annual	Summer	Fall	Winter	Spring		Annual	Summer	Fall	Winter	Spring
1,258	377	377	202	302	Outdoor Open Burning					
					Land clearing burning	941	282	282	151	226
					Yard waste burning	185	56	56	30	44
					Forest wildfires and managed burns	117	35	35	19	28
					Structural fires	11	3	3	3	3
					Agricultural waste burning	4	1	1	1	1
1,036	284	259	230	263	Mobile Sources					
					On-road gasoline vehicles	296	77	74	71	74
					Non-road diesel engines	280	78	67	62	73
					On-road diesel vehicles	201	52	50	48	50
					Non-road gasoline engines	80	22	19	18	21
					Ocean-going vessels	54	14	14	14	14
					Harbor vessels	35	9	9	9	9
					Railroad diesel engines	27	7	7	7	7
					On-road CNG and LPG engines	4	1	1	1	1
					Aircraft ground support engines	3	1	1	1	1
					Aircraft	2	1	1	1	1
					Non-road LPG engines	2	1	1	1	1
					Recreational boats	52	22	17	0	13
679	34	95	326	224	Fireplaces and Woodstoves					
					Wood stove wood burning	430	22	60	206	142
					Fireplace wood burning	165	8	23	79	54
					Fireplace and wood stove firelog burning	78	4	11	37	26
					Pellet stove wood burning	6	0	1	3	2
261	49	56	84	72	Other Source Categories					
					Industrial point sources	181	45	45	45	45
					Natural gas burning	67	3	9	32	22
					Boiler and furnace distillate oil burning	11	1	2	5	4
					Propane furnaces and boilers	2	0	0	1	1
3,234	744	787	842	860	Totals	3,234	744	787	842	860

Fireplaces and woodstoves are the largest source of emissions in Pierce County (39%). The State conducted additional analyses to determine the spatial variation in wood burning activities. Figure 6 displays the number of people using wood as a primary source of heat in the immediate area of the South L monitor, per square mile. The information source is the 2000 census, and is presented at a block group level<sup>7</sup>. This information does not capture those who use wood as a secondary heat source, or those who use fireplaces for ambiance. The highest density of woodstove/fireplace use occurs within the urban growth boundary and in census blocks north of SR 512 in the vicinity of the monitor. See Figures 6 and 7.

Conclusion: Based on annual emissions inventory data for Pierce, King and surrounding counties, VOC and NO<sub>x</sub> emissions comprise the largest portion of total PM<sub>2.5</sub> emissions. However, this data is annual data and exceedences and violations at the South L Street monitor occur exclusively in the late fall-winter seasons. Seasonal emissions inventory data submitted by the State indicates that emissions from woodstoves and fireplaces account for over 40% of the total emissions in Pierce County, while mobile sources account for 27% of total emissions in Pierce County.

<sup>7</sup> US Census Bureau. <http://factfinder.census.gov/home/saff/main.html>

Figure 6

**Tacoma Area Households  
Using Wood for Primary Heat, per Square Mile**

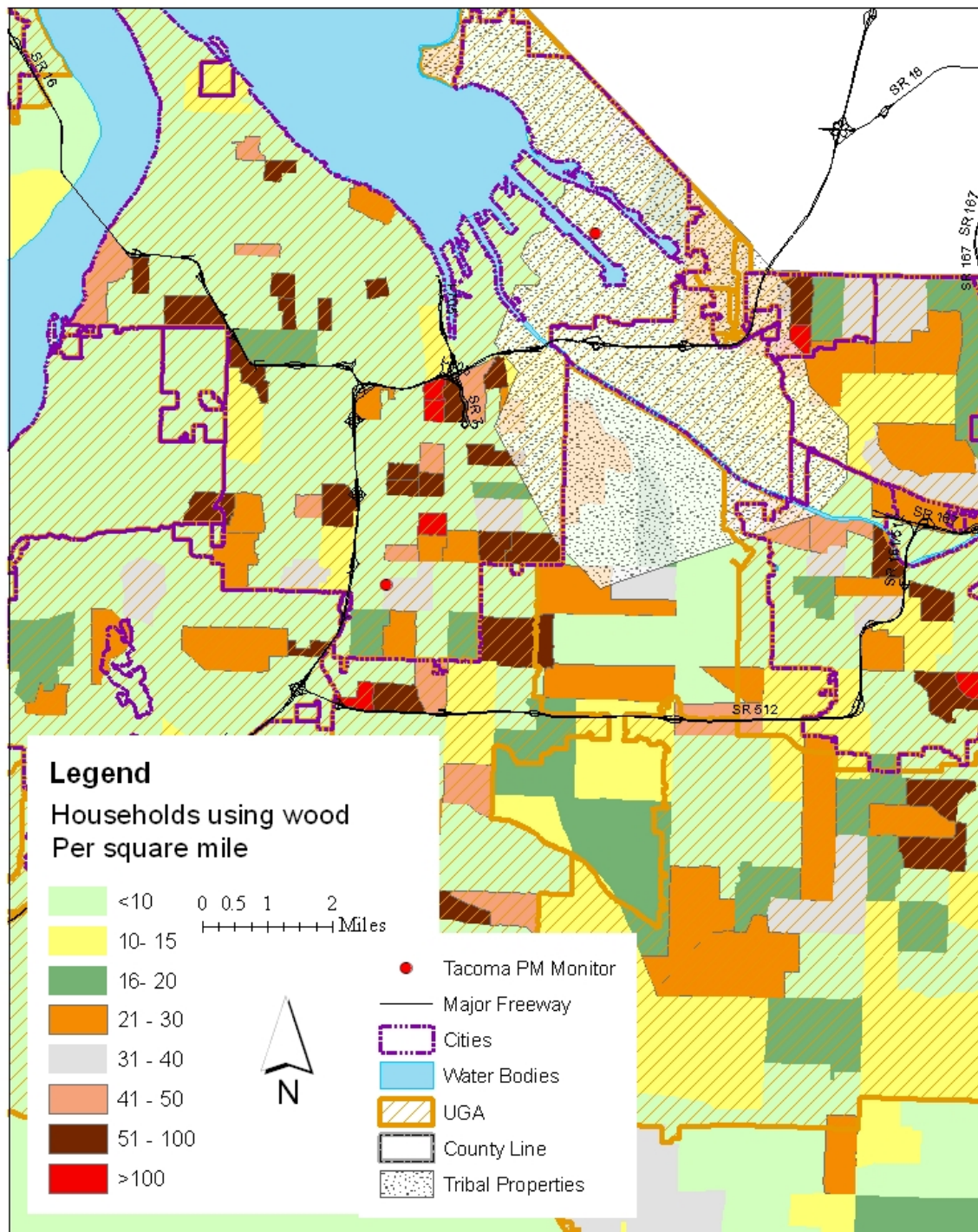
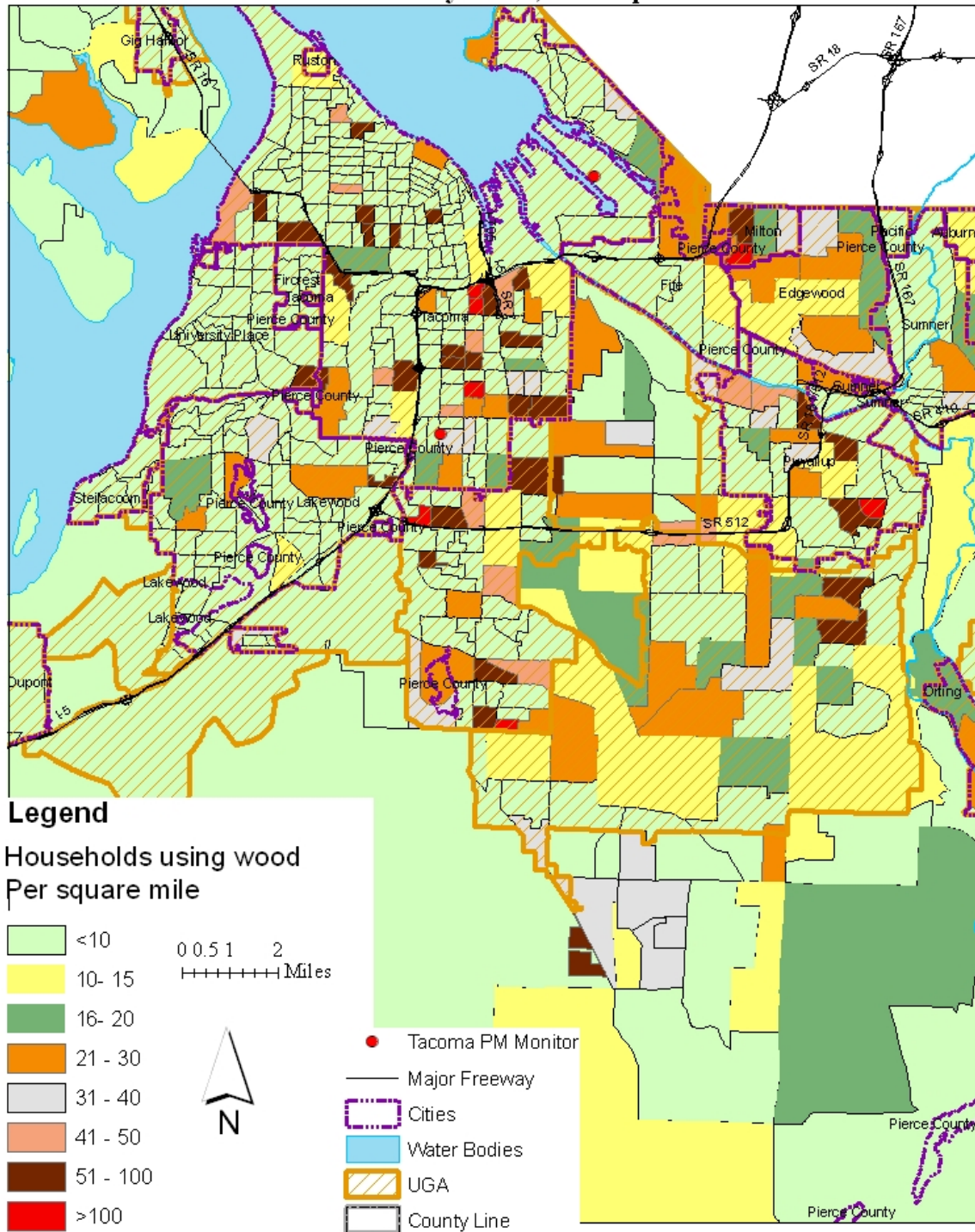




Figure 7

# Pierce County Tacoma Area Households Using Wood for Primary Heat, Per Square Mile



## Factor 2: Air quality data

This factor considers the 24-hour PM<sub>2.5</sub> design values (in µg/m<sup>3</sup>) for air-quality monitors in counties in the Seattle-Tacoma-Olympia area based on data for the 2005-2007 period. For a more robust analysis, this factor also considers data from the previous period 2004-2006. A monitor's design value indicates whether that monitor attains a specified air-quality standard. The 24-hour PM<sub>2.5</sub> standards are met when the 3-year average of a monitor's 98<sup>th</sup> percentile values are 35 µg/m<sup>3</sup> or less. A design value is only valid if minimum data completeness criteria are met.<sup>8</sup>

The 24-hour PM<sub>2.5</sub> design values for counties in the Seattle-Tacoma-Olympia area are shown in Table 3.

**Table 3 Air Quality Data for Seattle-Tacoma-Olympia Area**

County	State Recommended Nonattainment?	Design Values 2004-06 (µg/m <sup>3</sup> )	Design Values 2005-07 (µg/m <sup>3</sup> )
Pierce, WA	Yes	42	43
King, WA	No	29	31
Snohomish, WA	No	33	35
Thurston, WA	No	N/A	N/A
Island, WA	No	N/A	N/A
Kitsap, WA	No	N/A	N/A
Mason, WA	No	N/A	N/A

In Washington State, the monitor at 7802 South L Street in Tacoma (Pierce County) is the only monitor that violates the 24-hour PM<sub>2.5</sub> standard based on 2005-2007 data. King and Snohomish County do not violate based on 2004-2006 or 2005-2007 data. The remaining counties do not have Federal Reference Method monitor, therefore Federal Reference Method<sup>9</sup> data is not available for these counties.

Although the surrounding counties of King and Snohomish do not violate the standard, this alone is not sufficient information to eliminate King County or Snohomish County as candidates for inclusion in the nonattainment area. Nearby counties could be contributing to the violations at the South L Street monitor even though there are no violating monitors in those counties. Washington included in its nine factor analysis additional air quality data for the Pierce, King and Snohomish County Areas to better understand sources contributing to the violations at the L Street monitor. EPA will consider this as well as additional air quality data and the other 8 factors in determining whether or not to include King County and other counties

<sup>8</sup> Eligible monitors for providing design value data generally include State and Local Air Monitoring Stations (SLAMS) at population-oriented locations with a FRM or FEM monitor. All data from Special Purpose Monitors (SPM) using an FRM, FEM, or Alternative Reference Method (ARM) which has operated for more than 24 months is eligible for comparison to the relevant NAAQS, subject to the requirements given in the October 17, 2006 Revision to Ambient Air Monitoring Regulations (71 FR 61236). All monitors used to provide data must meet the monitor siting and eligibility requirements given in 71 FR 61236 to 61328 in order to be acceptable for comparison to the 24-hr PM<sub>2.5</sub> NAAQS for designation purposes.

<sup>9</sup> Design values are based on data collected at FRM or FEM monitors. The State operates other monitors in these counties but they are not FRM or FEM monitors.

in Puget Sound Area in the nonattainment area. Figure 8 shows the location of monitors in the Puget Sound area. EPA analyzed data from several sites in addition to the Pierce County Tacoma South L Street Site to better characterize PM<sub>2.5</sub> in Tacoma and in the surrounding counties. As mentioned above, this analysis will focus on further examining contributions from King County since the CES indicates a potential contribution from these areas. The following is a discussion of air quality data from these sites. Marysville, Lynnwood, Lake Forest Park and Tacoma are suburban, residential areas, while the Duwamish, Puyallup South and Kent Valley are industrial areas. Table 4 displays the top 5% of concentrations at Tacoma L Street Monitor from 2004-2007 from EPA's Air Quality System (AQS) repository of ambient air quality data. All of these concentrations occurred during the months of November, December, January or February with the exception of one which occurred in late October, 2007. The exceedences at the South L Street monitor occur during the winter as the State suggests in their nine factor analysis.

**Table 4 Top 5% values at Tacoma L Street Monitor from 2004-2007**

Top 5% PM2.5 Values at L Street FRM for 2004-2007								
Rank	Date	ug/m3	Date	ug/m3	Date	ug/m3	Date	ug/m3
1	11/4/2004	57.00	12/15/2005	45.50	12/16/2006	68.00	1/15/2007	58.60
2	11/20/2004	51.30	12/6/2005	43.50	12/31/2006	50.20	2/2/2007	46.70
3	1/7/2004	43.70	11/15/2005	40.50	12/28/2006	42.70	11/23/2007	45.20
4	11/13/2004	39.50	2/9/2005	40.30	2/19/2006	33.70	1/12/2007	44.70
5	1/13/2004	33.50	1/25/2005	39.00	12/19/2006	32.60	1/30/2007	38.20
6	12/23/2006	31.90	12/9/2005	38.70	11/1/2006	32.30	10/27/2007	31.70
7			2/21/2005	38.70				



This is a detailed topographic map of the Puget Sound region in Washington state. The map shows the intricate coastline of the sound, with numerous islands and inlets. Major cities and towns are labeled, including Seattle, Tacoma, Everett, Lynnwood, and Kent. The map also shows the surrounding mountain ranges and the intricate coastline of the sound. Major highways such as I-5, I-90, and SR-520 are clearly marked. The map also shows the surrounding mountain ranges and the intricate coastline of the sound.

## Speciation Profiles

Beginning on January 11, 2006, the State began chemical speciation monitoring at the L Street monitoring site. Monitoring data was collected on a 1:6 schedule with a total of 59 samples collected in 2006. Out of these 59 samples, three days were above  $30 \mu\text{g}/\text{m}^3$ , one day was above  $30 \mu\text{g}/\text{m}^3$  and 55 days were below  $20 \mu\text{g}/\text{m}^3$ . Figure 9 displays percentage of the speciated components of total  $\text{PM}_{2.5}$  for the two highest days in 2006 for which the speciation data was collected. On December 19<sup>th</sup>,  $21.57 \mu\text{g}/\text{m}^3$  (74%) of the total  $\text{PM}_{2.5}$  was organic and elemental carbon. Sulfate and nitrate were  $.87 \mu\text{g}/\text{m}^3$  (3%) and  $1.86 \mu\text{g}/\text{m}^3$  (6%) respectively of the total  $\text{PM}_{2.5}$ . On December 31,  $37.67 \mu\text{g}/\text{m}^3$  of  $\text{PM}_{2.5}$  (69%) was organic carbon,  $2.86 \mu\text{g}/\text{m}^3$  was elemental carbon (5%),  $1.94 \mu\text{g}/\text{m}^3$  was sulfate (4%) and  $1.54 \mu\text{g}/\text{m}^3$  (3%) was nitrate.

**Figure 9 Speciated components from the L Street Monitor on high days in 2006**

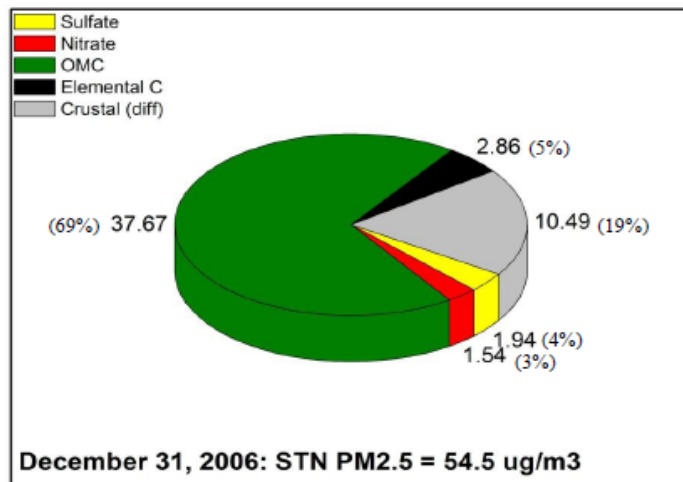
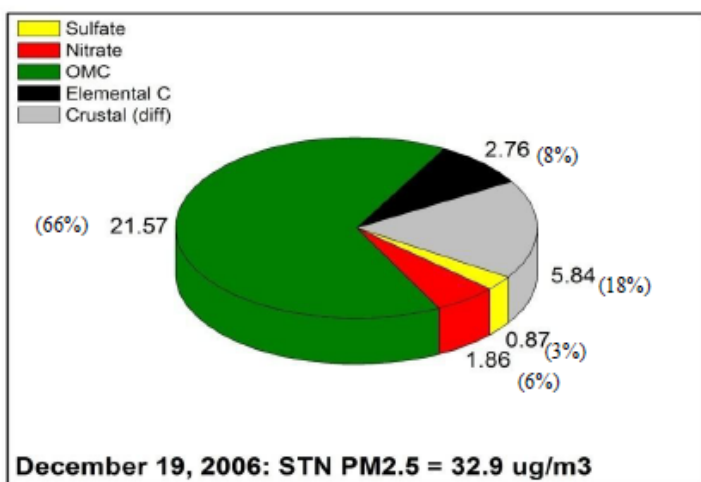
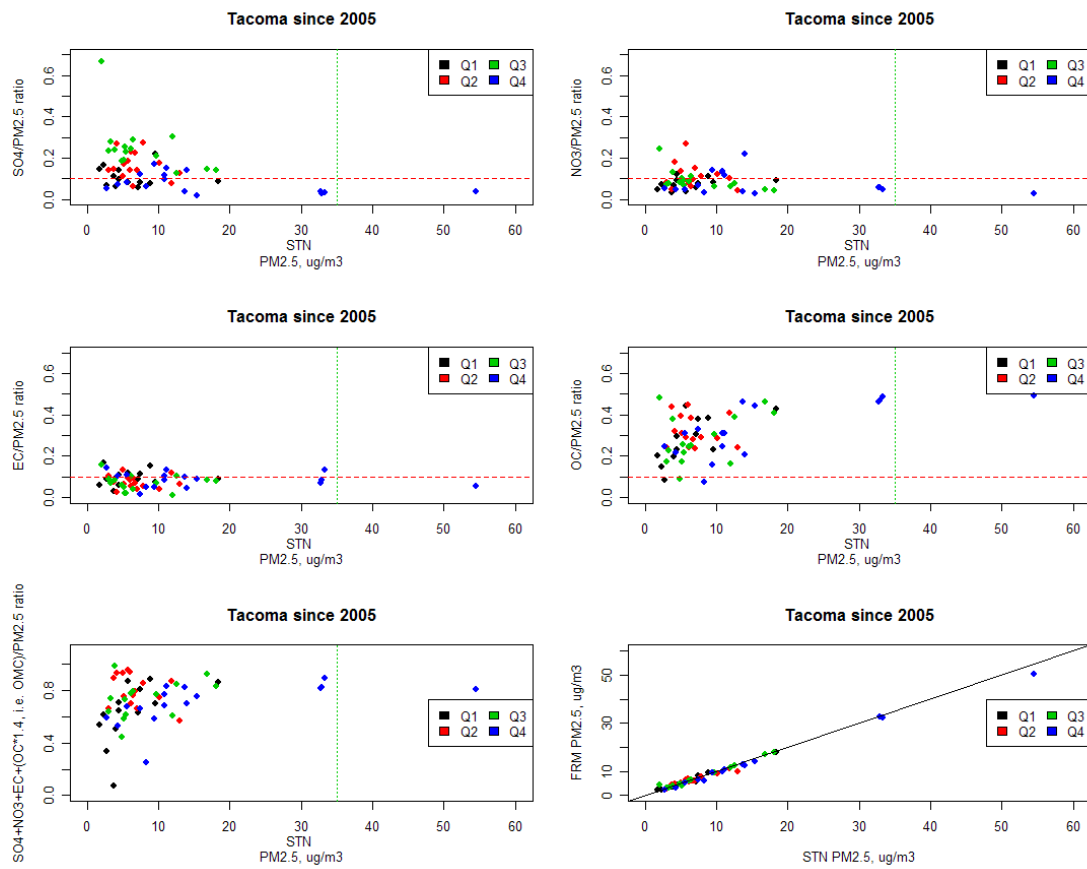


Figure 10 is a plot of  $\text{PM}_{2.5}$  fraction components by season against  $\text{PM}_{2.5}$  concentration. The highest concentrations of  $\text{PM}_{2.5}$  occur at the L Street monitor in November and December. During the first (Jan- March winter) and fourth (Oct-Nov-Dec late fall) quarters when the exceedences occur, the ratios of sulfate and nitrate with total  $\text{PM}_{2.5}$  are generally less than 0.2. The highest ratios of sulfate to nitrate (above 0.2) occur in the second (April-June) and third (June-August) quarters when  $\text{PM}_{2.5}$  concentrations are less than  $15 \mu\text{g}/\text{m}^3$ . The organic carbon fraction to total  $\text{PM}_{2.5}$  ratio is highest of any component at all times during the year ranging from 0.2-0.5). In the fourth quarter, the OC/total PM reaches its highest levels when  $\text{PM}_{2.5}$  concentrations are greater than  $30 \mu\text{g}/\text{m}^3$ .



**Figure 10 Seasonal PM2.5 components at the L Street monitor (Tacoma) in 2006.**



## Positive Matrix Factorization analysis of chemical components on Pierce County filter

EPA conducted a positive matrix factorization analysis data from the co-located speciation monitor at L Street to provide more information on sources potentially contributing to the violations at the L Street Monitor. The Tacoma 2006-07 data set included 111 data points (a sample every 6th day). EPA's PMF indicates that wood smoke contributed 60-90% of the mass on 6 out of 7 days when total PM<sub>2.5</sub> mass exceeded 30 µg/m<sup>3</sup>. See Table 5.

**Table 5 Positive Matrix Factorization Results for L Street monitor for days over 30 in 2006 and 2007**

Date	Nitrate	Soil	Sulfate	Marine	Mobile	Smoke	% Smoke
11/1/06	1.46	4.76	0.70	0.04	5.39	23.14	65
12/19/06	2.87	1.50	0.00	0.08	2.64	22.77	76
12/31/06	0.71	1.04	2.11	0.03	0.71	43.73	90
1/12/07	5.97	0.00	0.00	0.11	2.23	28.80	78
1/30/07	5.47	4.94	1.20	0.05	3.47	26.75	64
10/27/07	3.79	1.82	1.69	0.09	4.27	18.05	61
11/8/07	5.10	4.24	4.84	0.04	5.77	9.93	33

## Comparison with monitoring data from other sites in King County

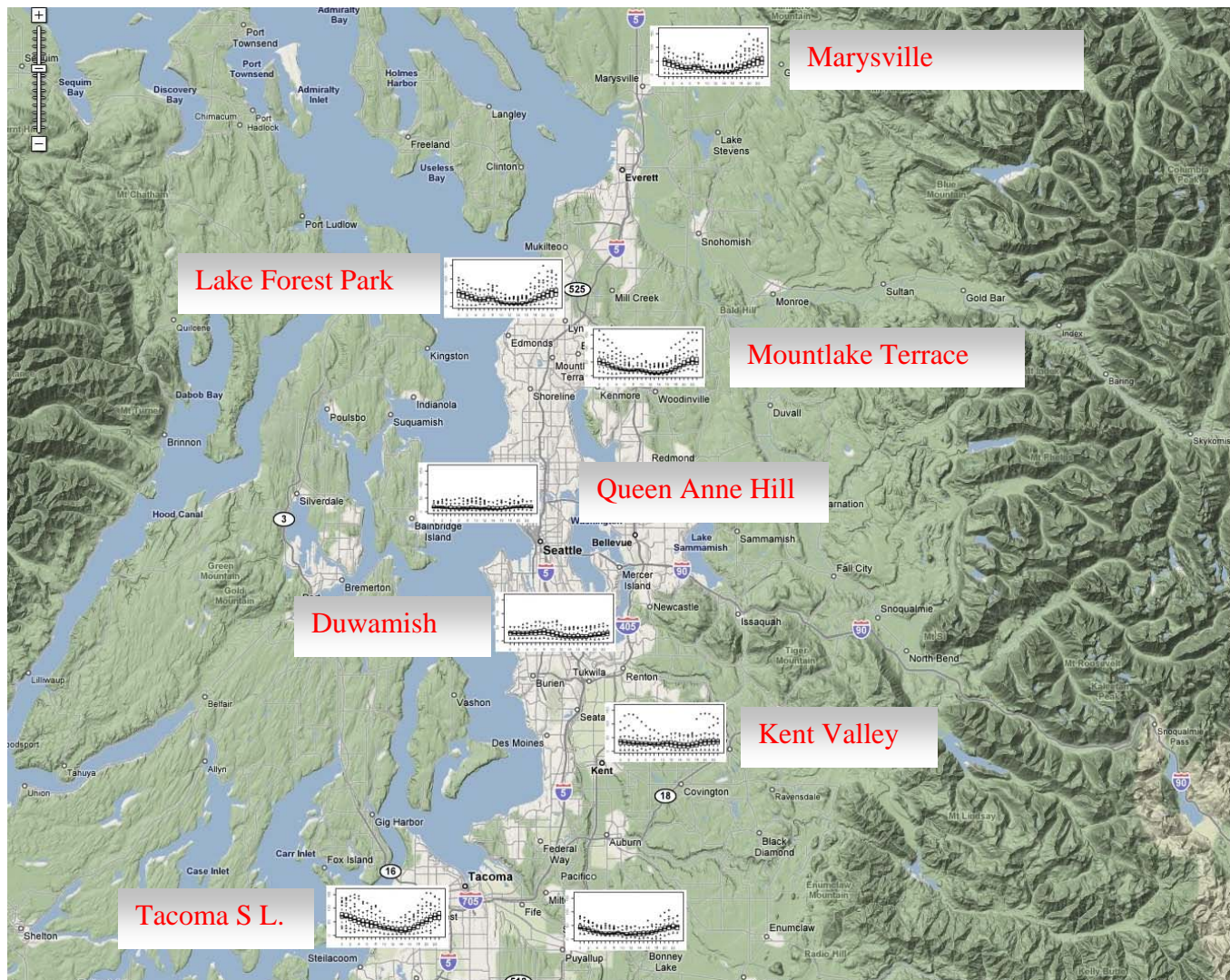
Figure 12 contains seasonal PM<sub>2.5</sub> components from two monitors, one in an industrialized area the southern portion of King County (Duwamish) and the other in northern King County in a residential area, Lake Forest Park. The Lake Forest Park monitor is a neighborhood scale site and is representative of the Lake Forest Park general area. <sup>10</sup>Figure 11 shows the location of these monitors in relation to the L Street Monitor in Tacoma. The Duwamish monitor is about 30 miles north of the L Street Monitor and the Lake Forest Park Monitor is about 50 miles N of the L Street Monitor.

The Lake Forest Park monitor generally shows the same pattern observed at the Tacoma L Street monitor. Organic carbon dominates all fractions but the highest (>20 ug/m<sup>3</sup> occur) fraction occurs in the first and third quarter. The highest fractions of sulfate and nitrate occur in the second and third quarters of the year when PM<sub>2.5</sub> concentrations are lowest (generally below 10). The Duwamish monitor chart shows a shift upward of sulfate/ PM<sub>2.5</sub> ratio for all quarters. Ratios of sulfate to total PM<sub>2.5</sub> are more consistent throughout the year at the Duwamish monitor and generally range between .1-.3. The data points at this monitor are more tightly clustered showing less seasonal variation than at the Lake Forest Park and Tacoma monitor.

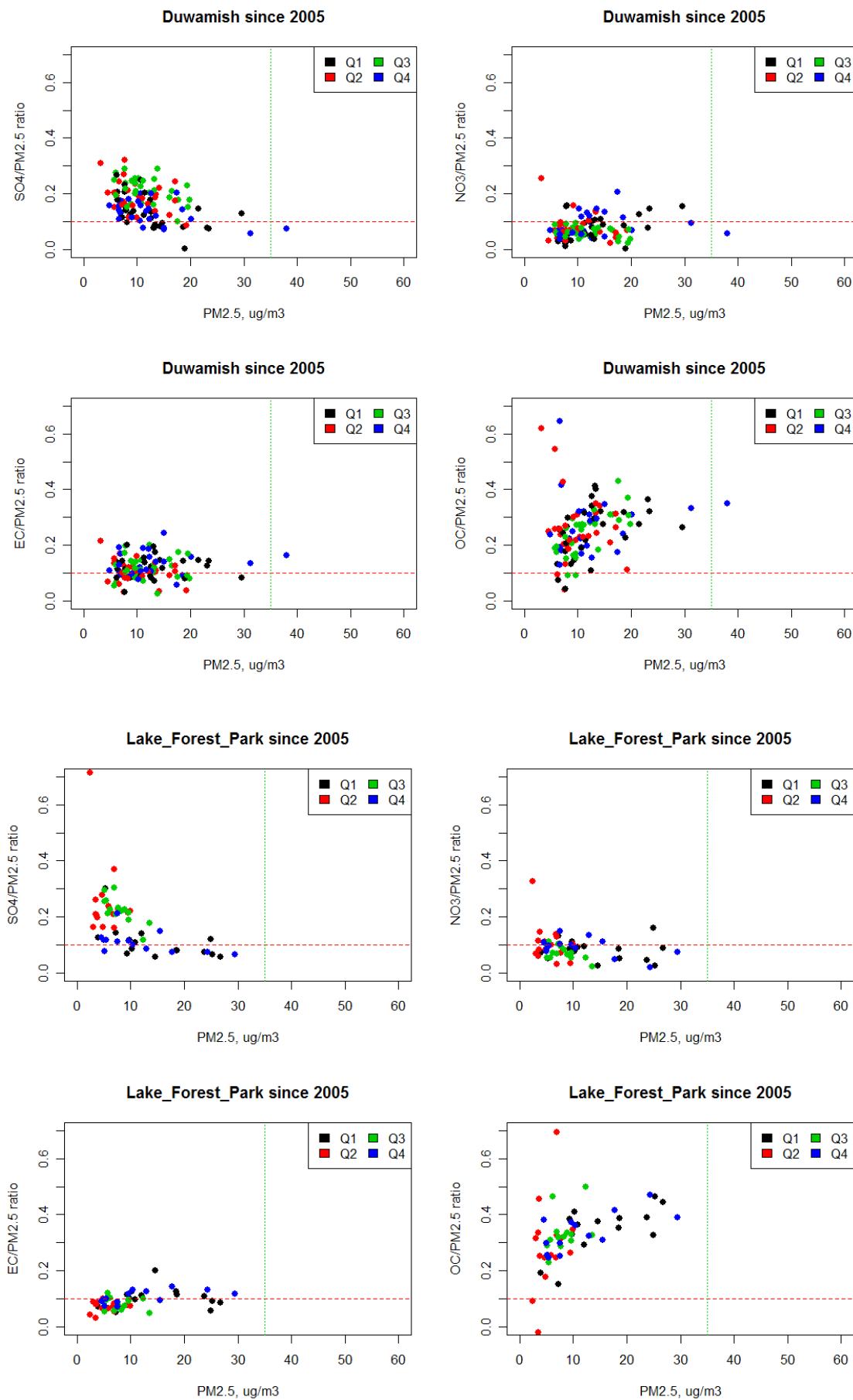
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<sup>10</sup> Washington State Department of Ecology 2008 Ambient Air Monitoring Network Report

**Figure 11 Location of monitors in the Southern Puget Sound Area**



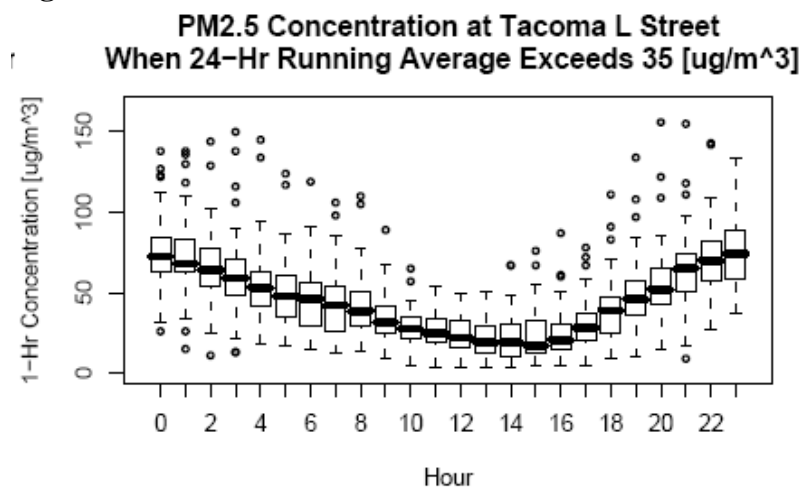
**Figure 12 Seasonal PM<sub>2.5</sub> components at Lake Forest Park and Duwamish since 2005**



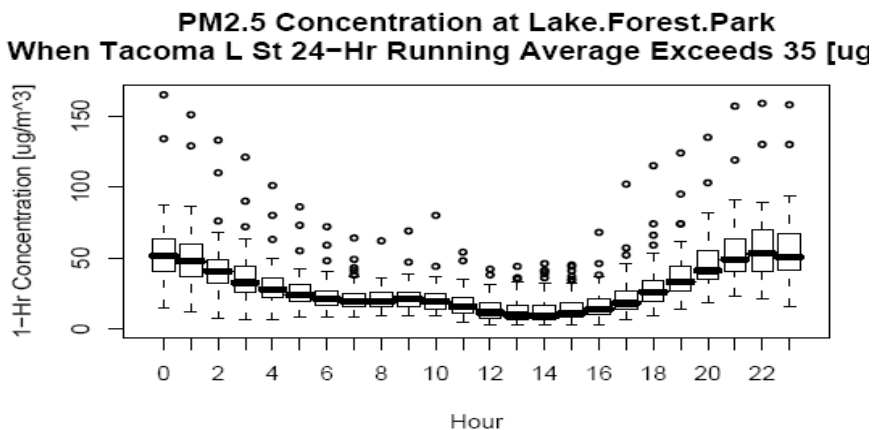
## Diurnal Profiles

Figures 13-15 display diurnal PM<sub>2.5</sub> concentrations at monitors throughout the Puget Sound Area. Figure 13 shows diurnal PM<sub>2.5</sub> concentrations at the South L Street monitor for the period 2001-2007. PM concentrations at the L Street monitor rise sharply beginning in the late afternoon and then peak around midnight then tail off around mid day. Survey data from Washington State indicate that this profile is related to woodstove use<sup>11</sup>. Surveys indicate that individuals ignite or add fresh fuel in the late afternoon or early evening and often add fuel before bedtime resulting in peak concentrations at night and lowest concentrations during the day while individuals are away from home. The diurnal profile for the Lake Forest Park monitor (Figure 14) shows a similar “V” shaped profile to the profile observed at the L Street monitor while the profile while the profile for the Duwamish monitor (Figure 15) is relatively flat. Figure 16 shows a map of the entire Puget Sound area. The “V” shaped profile is observed at monitors in the communities in Snohomish County to the North (Lynnwood, Lake Forest Park and Marysville). A flatter profile is observed at the monitors in central and southern King County; the Queen Anne monitor, the Seattle Duwamish Valley monitor and the Kent Valley monitor.

**Figure 13**



**Figure 14**

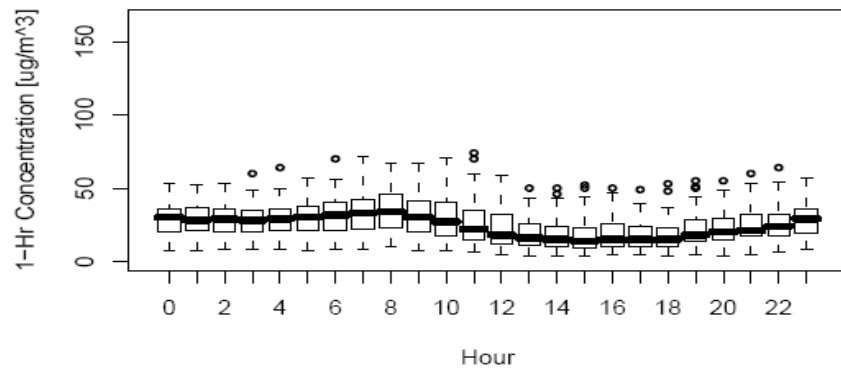


<sup>11</sup> Puget Sound Clean Air Agency 2007 woodstove use survey



**Figure 15**

**PM<sub>2.5</sub> Concentration at Seattle.Duwamish.Valley  
When Tacoma L St 24-Hr Running Average Exceeds 35 [ $\mu\text{g}/\text{r}^3$ ]**



**Figure 16 Diurnal profiles at monitoring sites in Pierce, King and Snohomish Counties**

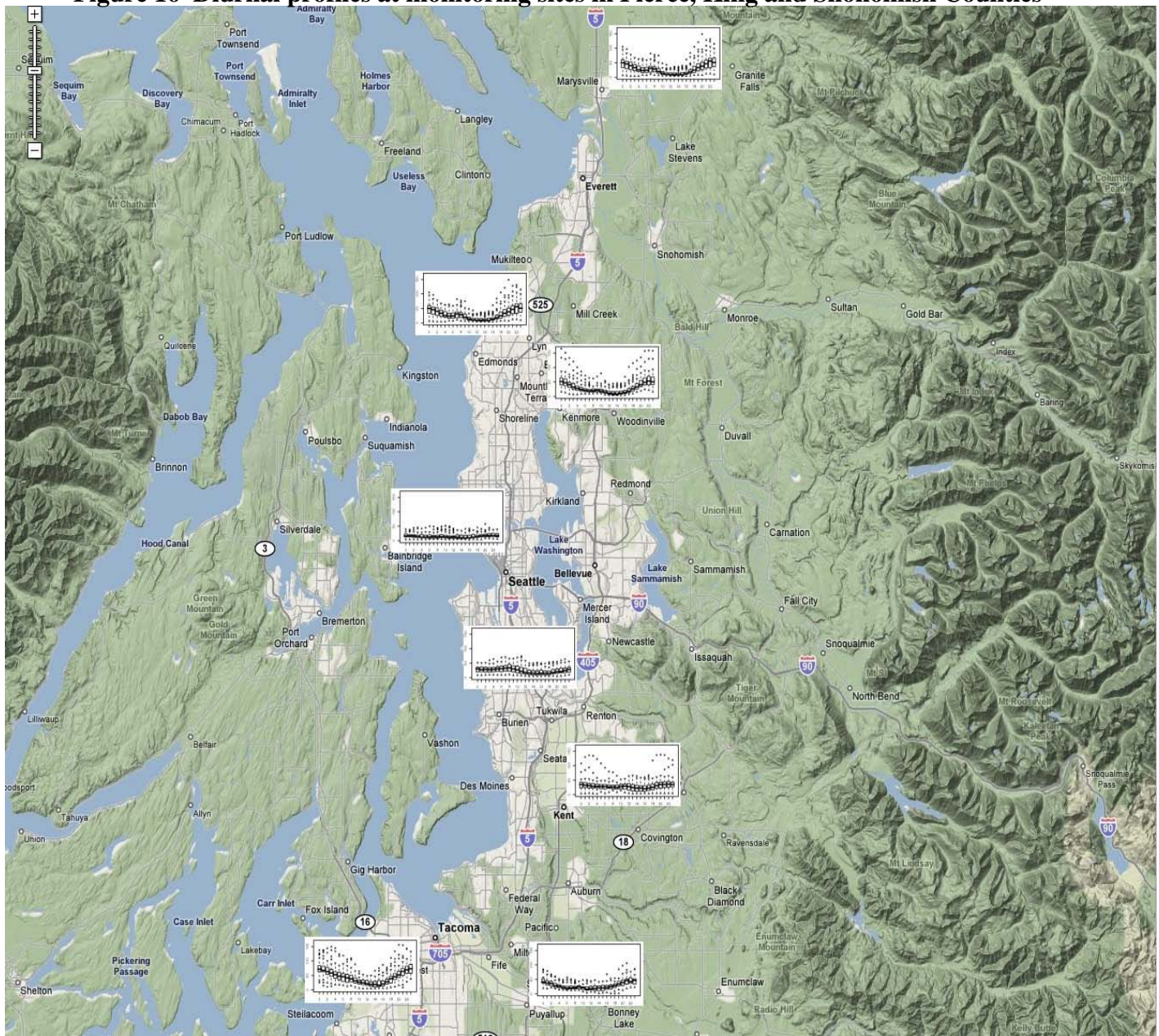
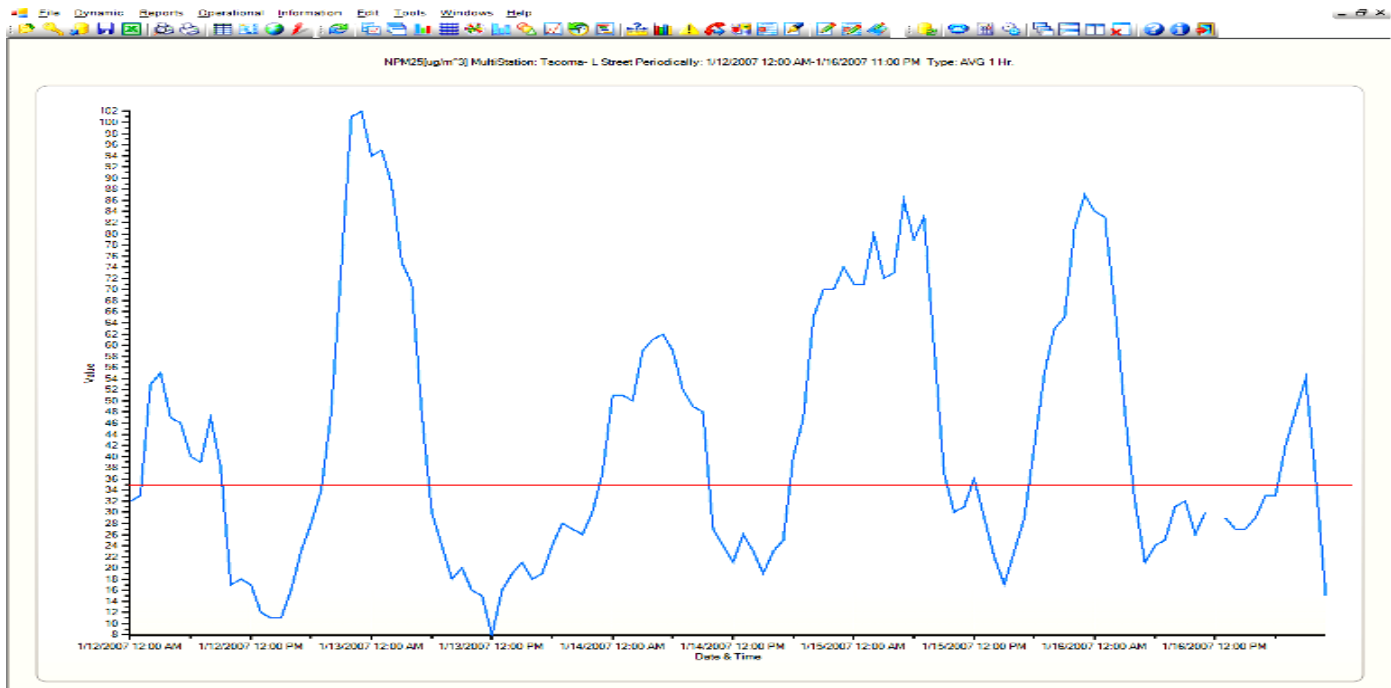


Figure 17 plots one hour averages from a co-located nephelometer at the Tacoma L Street monitor during an episode. On January 12, 2007 the 24-hour design value at the L Street monitor was 44.7  $\mu\text{g}/\text{m}^3$  and on January 15, 2007, the 24-hour design value at the L Street monitor was 58.6. The red line indicates the 24-hour standard, 35  $\mu\text{g}/\text{m}^3$ . Peak  $\text{PM}_{2.5}$  during this episode occurred around midnight on January 13 and January 15. During the day of the 12<sup>th</sup> and the 13<sup>th</sup>  $\text{PM}_{2.5}$  levels dropped to less than 10  $\mu\text{g}/\text{m}^3$ . The pattern repeats with nighttime highs climbing well above the standard and daytime lows.

**Figure 17  $\text{PM}_{2.5}$  Tacoma L Street January 11-16 2007**

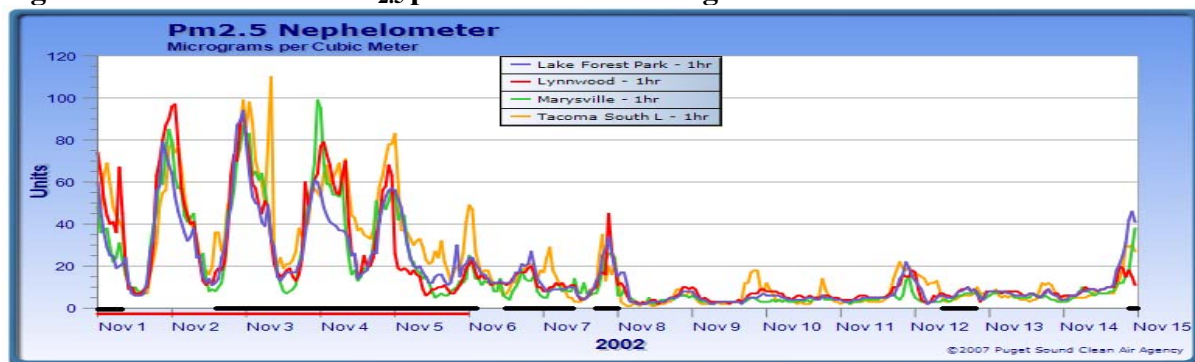


When this pattern is observed at Tacoma, an identical pattern is noted at the other monitors throughout the Region with the V shaped profile.

WA has noted that the background concentrations in the Tacoma area would be elevated at all times due to transport from either the north or the south. However, in between events,  $\text{PM}_{2.5}$  levels generally drop to very low levels ( $<10 \mu\text{g}/\text{m}^3$ ) indicating that there is not significant transport of PM precursors from other areas (Figure 18). Days that do not drop to very low levels are days where inversions have not broken down completely. All of the monitors in Figure 16 are neighborhood scale monitors (DOE Monitoring Report)



**Figure 18 simultaneous PM<sub>2.5</sub> peaks at Southern Puget Sound monitors**



### **Air Quality Data Discussion/Conclusions**

Concentrations of PM<sub>2.5</sub> throughout the Southern Puget Sound area peak at night and in the winter. The diurnal patterns are observed at neighborhood scale monitors in Pierce and King County and show peaks consistent with use of woodstoves collected through woodstove surveys. Industrial monitors in southern King County (Kent and Duwamish) between the neighborhood scale monitors to the north and the L Street monitor to the south do not exhibit strong diurnal patterns consistent with woodstove use surveys. Seasonality of sulfate and nitrate concentrations at these monitors is also less variable than the seasonality of sulfate, nitrate and organic carbon observed at the L Street monitor and other neighborhood monitors (Lake Forest Park). This suggests that there is an inconsistent influence of the regional PM<sub>2.5</sub> precursors (SO<sub>x</sub>, NO<sub>x</sub>) that dominate the King County 2005 emissions inventory at sites throughout the southern Puget Sound and that the variability during exceedences at individual sites may be more influenced by local (in the Tacoma area) pollution than pollution transported from neighboring counties.

Based on EPA's PMF analysis, organic carbon/woodstoves contribute 60-90% of PM<sub>2.5</sub> to the exceedences at the Tacoma L Street Monitor. Contributions of regional PM<sub>2.5</sub> precursors (SO<sub>x</sub> and NO<sub>x</sub>) that dominate the King County emissions inventory contribute less than 20-30% of the total to the Tacoma monitor. Based on speciation monitoring at the L Street monitoring site, organic carbon and elemental carbon (species that are associated with burning of wood) contribute over 70% of the PM<sub>2.5</sub> concentration on the highest days in 2006 and sulfate and nitrate contribute less than 10% combined of the total PM<sub>2.5</sub> concentration on these days.

Based on speciation monitoring, emissions from King County (over 75,000 tpy NO<sub>x</sub> and 7500 tpy SO<sub>x</sub> combined) as well as the other counties in the CMSA potentially contribute less than 10 % of total PM<sub>2.5</sub> concentrations on high days at the South L Street Monitor. This information along with the information discussed in the other factors, particularly factors 6 and 7 (meteorology and topography) indicates that the State's boundary which generally contains sources within the Tacoma UGA and does not include King County is sufficiently large enough to include sources contributing to the violations at the South L Street monitor.

### **Factor 3: Population density and degree of urbanization (including commercial development)**

Table 6 shows the 2005 population for each county in the Seattle-Tacoma-Olympia area being evaluated, as well as the population density for each County in that area. Population data give an



indication of whether it is likely that population-based emissions might contribute to violations of the 24-hour PM<sub>2.5</sub> standards. King County, Pierce County and Snohomish County contain large cities with large populations. Most of the areas in between are urban or suburban. The City of Everett is the largest city in Snohomish County. King County has the highest population (1.73 million) and the highest population density with 824 people/square mile. Pierce County has the next highest population at 753,209 with the third highest population density in the Seattle-Tacoma-Olympia area. Snohomish County has the third highest population in the area. King County and Pierce Counties have the highest CES scores at 100 and 60 respectively. The CES Score for Snohomish County is much lower at 13.

**Table 6 Population in the Puget Sound area**

County	State Recommended Nonattainment?	2005 Population	2005 Population Density (people/sq mi)	Percent Population Change (2000-05)
King	No	1,799,119	824	3
Pierce	Yes	753,209	445	7
Thurston	No	228,881	305	10
Kitsap	No	241,525	583	4
Snohomish	No	655,564	312	8
Skagit	No	113,181	65	9
Island	No	79,983	377	11
Mason	No	54,169	54	9

The State addressed population density in its nine factor analysis. Figure 19 shows population density for the city of Tacoma and surrounding Pierce County areas, at the 2000 census block group level.i Highest population density occurs inside of the CUGA in the vicinity of the L Street monitor, and along the eastern shore of the Puget Sound to the north of the Port of Tacoma. Population density generally decreases to the south and the east of the Port of Tacoma and the CUGA. Figure 20 shows the population of the recommended nonattainment area and the surrounding portions of Pierce County. Generally, the areas with the highest population density in Pierce County are contained within the boundary of the State's recommended nonattainment area.

EPA is concluding based on population density information for the Tacoma area that shows that population is concentrated in the CUGA as well as the air quality data we reviewed above and the additional factors that we review below that indicate that local sources cause the violations at the South L Street monitor, that the State's boundary includes populations/potential sources in the Tacoma area contributing to the violations at the L Street monitor.

**Figure 19**

**Tacoma Area Population Density  
2000 Census Block Groups**

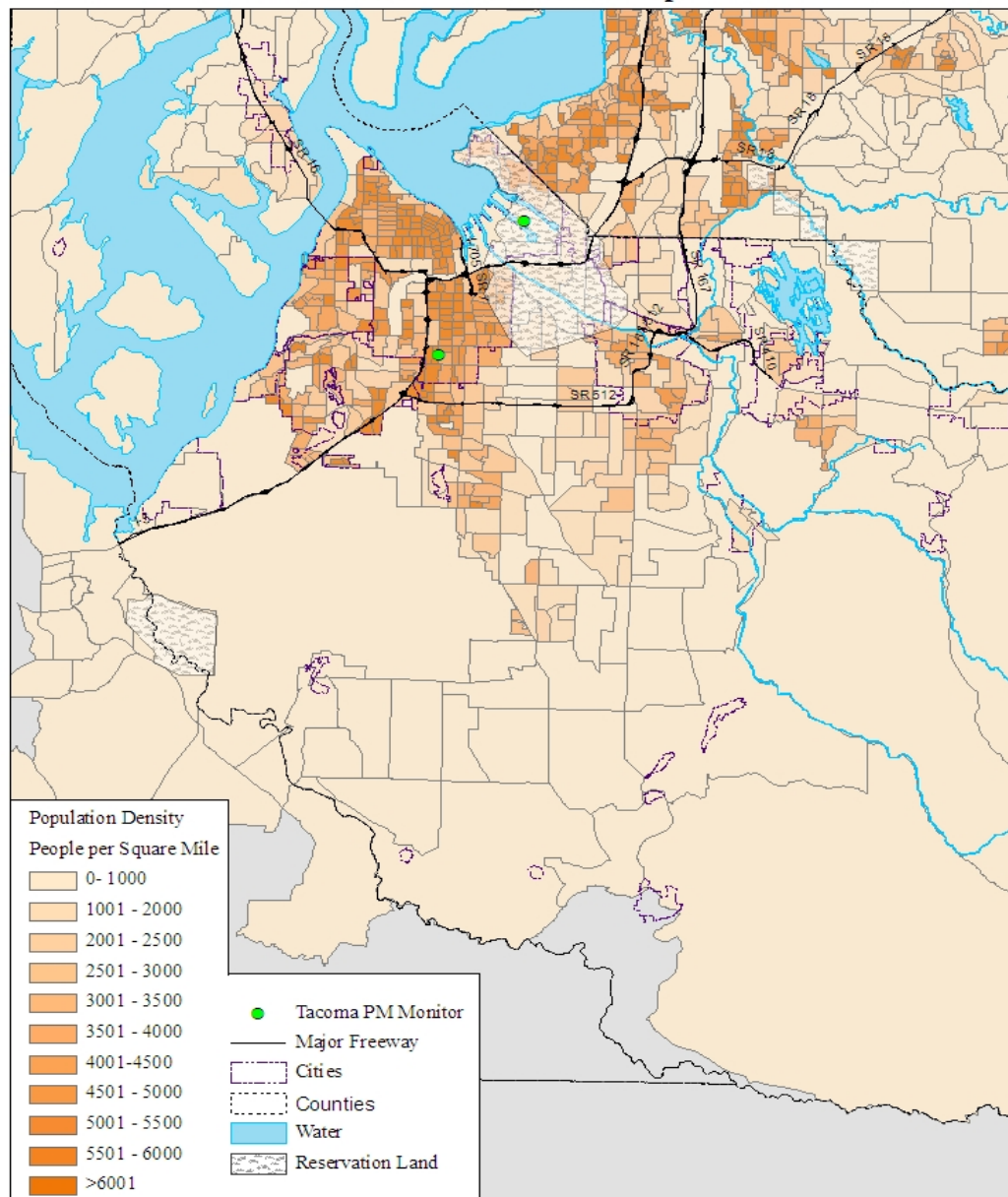
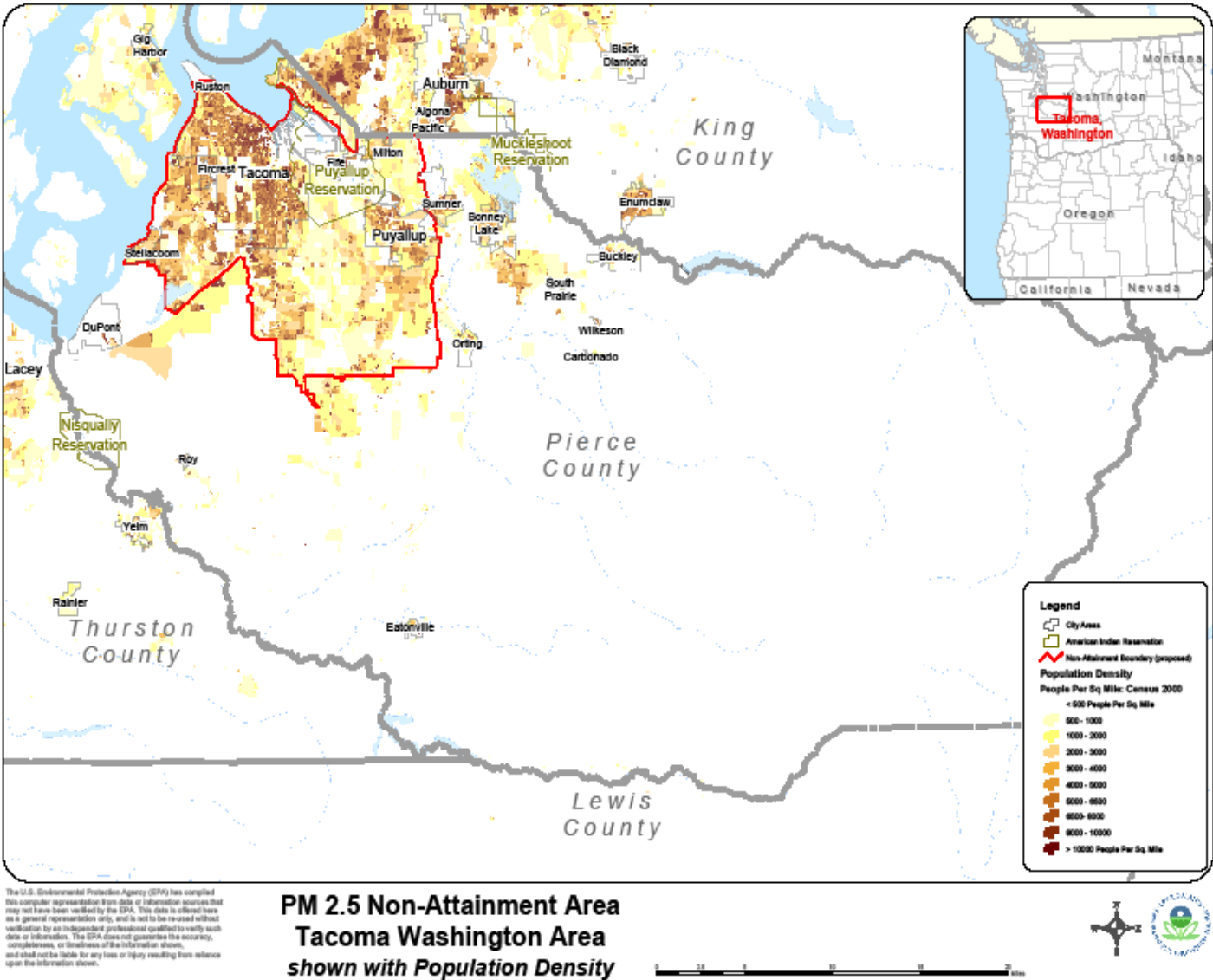


Figure 20 Pierce County Population Density with recommended nonattainment area boundary



#### Factor 4: Traffic and commuting patterns

This factor considers the number of commuters in each county who drive to another county within the Seattle-Tacoma-Olympia area, the percent of total commuters in each county who commute to other counties within the Seattle-Tacoma-Olympia area, as well as the total Vehicle Miles Traveled (VMT) for each county in thousands of miles (see Table 4). A county with numerous commuters is generally an integral part of an urban area and could be an appropriate county for implementing mobile-source emission control strategies, thus warranting inclusion in the nonattainment area.<sup>12</sup>

**Table 7 Traffic and commuting patterns in the Puget Sound area**

County	State recommended Nonattainment?	Vehicle Miles Traveled in 2005 (millions annually)	Percent VMT Growth (1996-2005)	Number commuting into any violating counties	Percent commuting into any violating counties	Number commuting into statistical area	Percent commuting into statistical area
King	No	16,806	10	18,560	2	903,520	99
Pierce	Yes (P)	6,247	13	228,280	70	319,830	99
Thurston	No	2,146	7	14,350	14	96,030	95
Kitsap	No	1,633	(10)	5,120	5	104,640	98
Snohomish	No	5,225	9	1,240	0	296,750	99
Skagit	No	1,185	35	140	0	42,950	95
Island	No	397	(5)	50	0	31,510	97
Mason	No	438	13	860	5	18,310	97

The listing of Counties on Table 7 reflects a ranking based on the number of people commuting to other Counties. King County VMT in 2005 was the highest in the area with historic VMT growth of 10%. 2% of commuters from King County commute into Pierce County, the County with the violating monitor. 70% of commuters in Pierce County remain within Pierce County. VMT growth in Pierce County was 13% between 1996-2005. Both King County and Pierce County contain major Ports (the Port of Tacoma and the Port of Seattle), so there are increased levels of diesel traffic to move goods at the Ports. Interstate 5 is a major N-S corridor along the West Coast of the United States with significant diesel truck traffic.

Washington looked at Pierce County VMT growth in its nine factors analysis. Washington obtained information from the Puget Sound Regional Council's recently released draft Vision 2040ii transportation plan for the region, incorporating known travel improvements and the preferred growth options emphasizing core centers for development. The output from

<sup>12</sup> Note: The 2005 VMT data used for table 5 and 6 of the 9-factor analysis has been derived using methodology similar to that described in "Documentation for the final 2002 Mobile National Emissions Inventory, Version 3, September 2007, prepared for the Emission Inventory Group, U.S. EPA. This document may be found at: [atftp://ftp.epa.gov/EmisInventory/2002finalnei/documentation/mobile/2002\\_mobile\\_nei\\_version\\_3\\_report\\_092807.pdf](http://ftp.epa.gov/EmisInventory/2002finalnei/documentation/mobile/2002_mobile_nei_version_3_report_092807.pdf) The 2005 VMT data were taken from documentation which is still draft, but which should be released in 2008.

PSRC's transportation demand model provides some travel growth estimates for the Pierce County area and is shown in Table 8.<sup>13</sup>

**Table 8 Pierce County Daily Travel Measures by Category in 2000 and 2040iii**

Daily Category of Travel	2000 Reference Data	2040	Units
Work Person Trips	293,886	535,330	Trips
Non-work Person Trips	1,757,784	3,183,447	Trips
Freeways Vehicle Miles Traveled	6,288,090	8,870,622	VMT
Arterials/Local Streets VMT	10,650,108	16,299,840	VMT
Freeways Vehicle Hours Traveled	129,929	191,106	VHT
Arterials/Local Streets VHT	363,175	617,769	VHT

Even with planned road and transit improvements, work and non-work person trips are estimated to increase by over 80%, while vehicle miles traveled and vehicle hours traveled are estimated to increase by 40% and 60%, respectively, from 2000 to 2040. However, based on EPA's analysis of air quality data, mobile emissions likely do not contribute more than 5-10% of total PM<sub>2.5</sub> at the L Street monitor on high days so the State's inclusion of information on growth in Pierce County was not an important consideration in our decision. The State's boundary includes potential mobile source related contributions in the Tacoma area including the Port of Tacoma as well as sections of Interstate 5 and State Highway 99 and EPA has concluded that the inclusion of these areas is sufficient to capture potential contributions from these sources.

### **Factor 5: Growth rates and patterns**

This factor looks at expected population and VMT for Counties in the Seattle-Tacoma-Olympia area from 2000 to 2005, as well as patterns of population and VMT growth. A county with rapid population or VMT growth is generally an integral part of an urban area and could be an appropriate county for implementing mobile-source and other emission-control strategies, thus warranting inclusion in the nonattainment area.

Table 9 below shows population, population growth, VMT and VMT growth for counties that are included in the Seattle-Tacoma-Olympia area. Counties are listed in descending order based on VMT growth between 2000 and 2005.

<sup>13</sup> Puget Sound Regional Council. Draft Vision 2040 Supplemental Draft Environmental Impact Statement (SDEIS). July 2007. <http://www.psrc.org/projects/vision/pubs/sdeis/index.htm> and <http://www.psrc.org/tpbgrowthandtrans2.pdf>.

Puget Sound Regional Council. Vision 2020 Update DEIS. Transportation Demand Model Output Data. Appendix D-5, pages D-18 to D-29. <http://www.psrc.org/projects/vision/deis/appd.pdf>.

**Table 9 Population and VMT Growth and Percent Change**

County	2005 Population	Percent Population Change (2000-05)	Percent VMT Growth (1996-2005)
King, WA	1,799,119	3	10
Pierce, WA	753,209	7	13
Thurston, WA	228,881	10	7
Kitsap, WA	241,525	4	(10)
Snohomish, WA	655,564	8	9
Skagit, WA	113,181	9	35
Island, WA	79,983	11	(5)
Mason, WA	54,169	9	13

King County has the highest population but had the lowest population growth rate from 2000-2005 (3%). Pierce County growth was double that of King County for the same time period. Thurston County and Island Counties experienced the highest growth in population from 2000-2005 at 10 and 11% respectively. However, the population of both of these areas is 2 orders of magnitude lower than that of King County and 3-8 times lower than that of Pierce County. As stated above, based on air quality data, mobile emissions likely do not contribute more than 5-10% of total PM<sub>2.5</sub> to L Street monitor PM<sub>2.5</sub> concentrations on high days. The State's boundary recommendation includes most of the Pierce County Growth area including the Port of Tacoma.

#### **Factor 6: Meteorology (weather/transport patterns)**

For this factor, EPA considered data from National Weather Service instruments in the area. Wind direction and wind speed data for 2004-2006 were analyzed, with an emphasis on "high PM<sub>2.5</sub> days" for each of two seasons (an October-April "cold" season and a May-September "warm" season). These high days are defined as days where any FRM or FEM air quality monitors had 24-hour PM<sub>2.5</sub> concentrations above 95% on a frequency distribution curve of PM<sub>2.5</sub> 24-hour values.

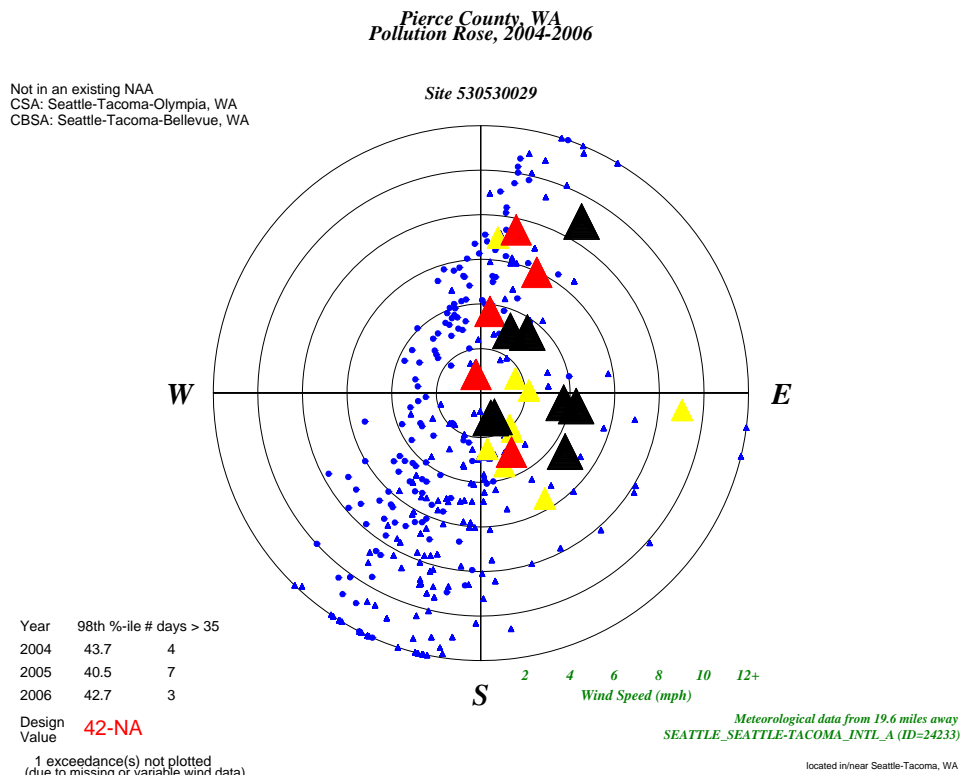
For each air quality monitoring site, EPA developed a "pollution rose" to understand the prevailing wind direction and wind speed on the days with highest fine particle concentrations. The figure identifies 24-hour PM<sub>2.5</sub> values by color; days exceeding 35 ug/m<sup>3</sup> are denoted with a red or black icon. A dot indicates the day occurred in the warm season; a triangle indicates the day occurred in the cool season. The center of the figure indicates the location of the air quality monitoring site, and the location of the icon in relation to the center indicates the direction from which the wind was blowing on that day. An icon that is close to the center indicates a low average wind speed on that day. Higher wind speeds are indicated when the icon is further away from the center.

Figure 21 is a pollution rose from instrumentation at the Seattle Tacoma International Airport (Sea-Tac), a site which is located about 25 miles north of the violating monitor. Based on this pollution rose, the average prevailing surface wind direction for high PM<sub>2.5</sub> days in Pierce County is from the northeast, or the southeast of the violating monitor.

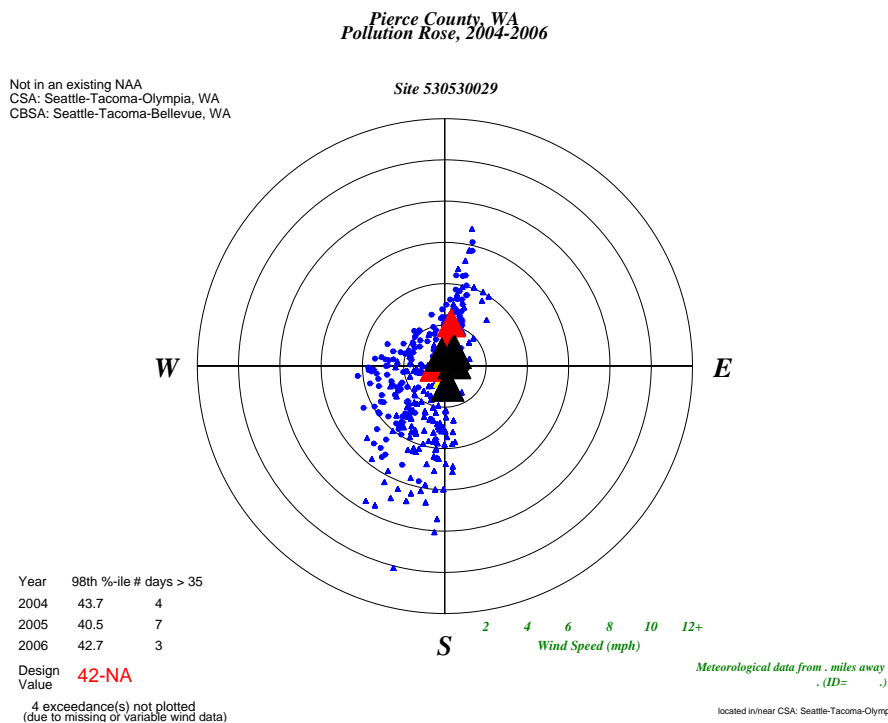
However, given terrain influence and complex meteorology in the area, EPA created a pollution rose using local data from the Puget Sound Clean Air Agency's meteorological

instrumentation co-located with the South L Street monitor. Figure 22 is a pollution rose created with data from this co-located meteorological station. Based on this pollution rose, during high days at the Tacoma L Street monitor, wind speeds are less than 4 miles per hour and there is no average prevailing surface wind direction for high PM<sub>2.5</sub> days.

**Figure 21 Pollution rose for Pierce County WA (Source: Sea-Tac Airport)**



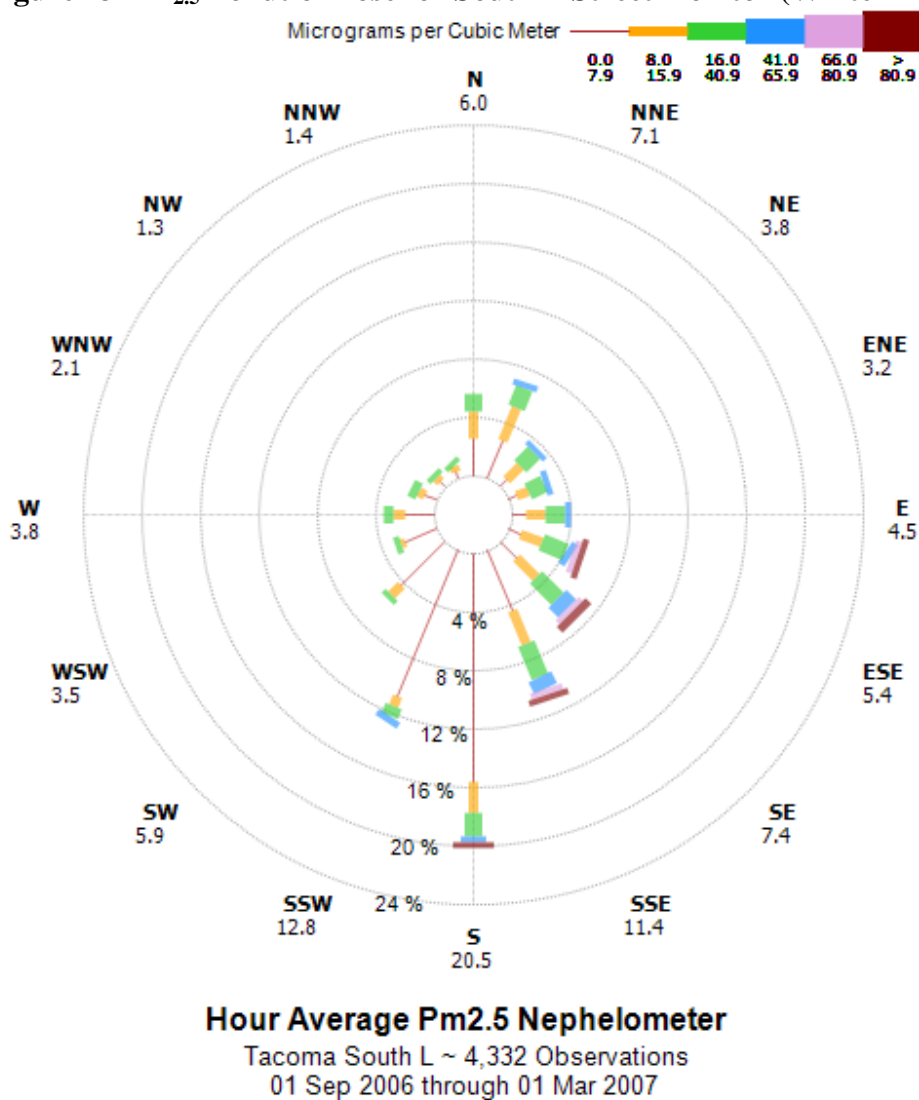
**Figure 22 Pollution rose for Pierce County WA (Source: South L Street Met Station)**



We note that the meteorology factor is also considered in each county's Contributing Emissions Score because the method for deriving this metric included an analysis of trajectories of air masses for high PM<sub>2.5</sub> days. The data used to create the CES for the Tacoma monitor was from the Sea-Tac Airport. Given the complex meteorology and topography of the area, and given that EPA's pollution roses for the co-located meteorological site and the site at Sea-Tac Airport show very different wind patterns, EPA considered the data from the co-located meteorological site in lieu of the CES for the meteorological factor analysis for the Tacoma area.

The State's nine-factors analysis also contained wind rose data collected from a meteorological station co-located with the L Street monitor. Figures 23 and 24 are wind roses for the area from the State's nine factors analysis for the winter season and for the summer season.

**Figure 23 PM<sub>2.5</sub> Pollution rose for South L Street monitor (Winter Months)**



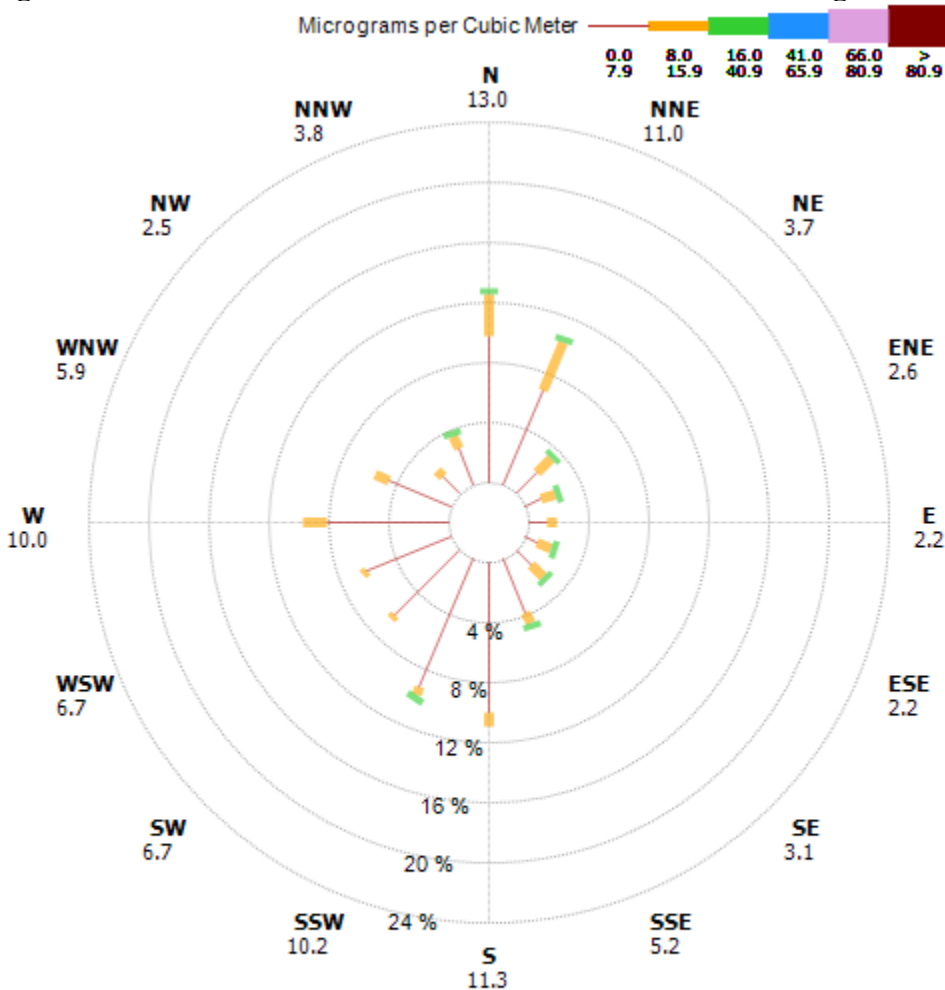


The State's analysis indicated that meteorology plays a critical role in PM<sub>2.5</sub> concentrations at the South L Tacoma monitor and drives a consistent seasonal relationship to PM<sub>2.5</sub> concentrations.

The State noted in its submittal that elevated levels of PM<sub>2.5</sub> occur only during the fall and winter seasons, when regional air stagnations interrupt westerly wind flows and strong subsidence temperature inversions trap pollution levels. During these seasons, colder mean temperatures stimulate the use of residential heating devices. The winter month pollution rose in Figure 23 indicates the highest contributions of PM<sub>2.5</sub> during the winter months when winds are predominantly from the south/southeast.

Figure 24 is a pollution rose for the period of the spring of 2006 through the fall of 2006. This spring-summer month wind rose indicates the highest contributions of PM<sub>2.5</sub> during the spring-summer months occur when winds are predominantly from the north and northeast.

**Figure 24 PM<sub>2.5</sub> Concentrations and wind direction at violating monitor, summer months**



### Hour Average Pm2.5 Nephelometer

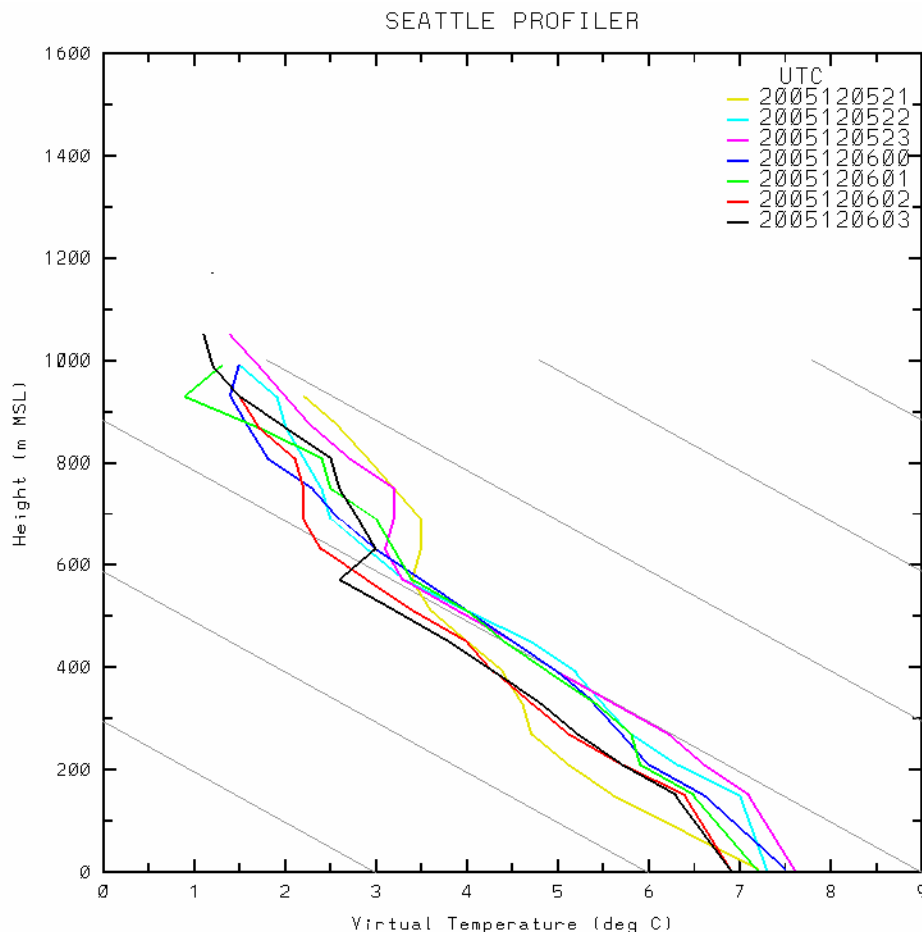
Tacoma South L ~ 4,382 Observations  
01 Mar 2006 through 01 Sep 2006

The State of Washington's nine factors analysis described the weather pattern influencing the Tacoma area as typical of the mild Pacific Coast climate, which is modified by the Cascade Mountains to the east and to a lesser extent, by the Olympic Mountains to the Northwest. The area's climate is characterized by mild temperatures, a pronounced though not sharply defined rainy season, and considerable cloudiness, particularly during the winter months.

These three factors are heavily influenced by persistent Pacific onshore wind patterns and storm tracks. These features intensify in the late fall and diminish in the late spring. Periodically, the cleansing westerly flows are diverted away from the area and replaced by high pressure systems. During these periods, wind flows become offshore and the area's most extreme temperatures are observed. Temperature inversions of varying intensity form routinely during these patterns. These inversions change the mixing layer depth dramatically but generally lower the layer to less than 800m. During persistent winter stagnations, mixing heights less than 300m are frequently observed. The eastward movement of this synoptic pattern is variable. When stationary or slow moving, the area stagnates allowing air quality levels to decline. Typically these conditions occur when the duration of stable conditions extends beyond three days. This occurs approximately 3-4 times during the fall and winter seasons.

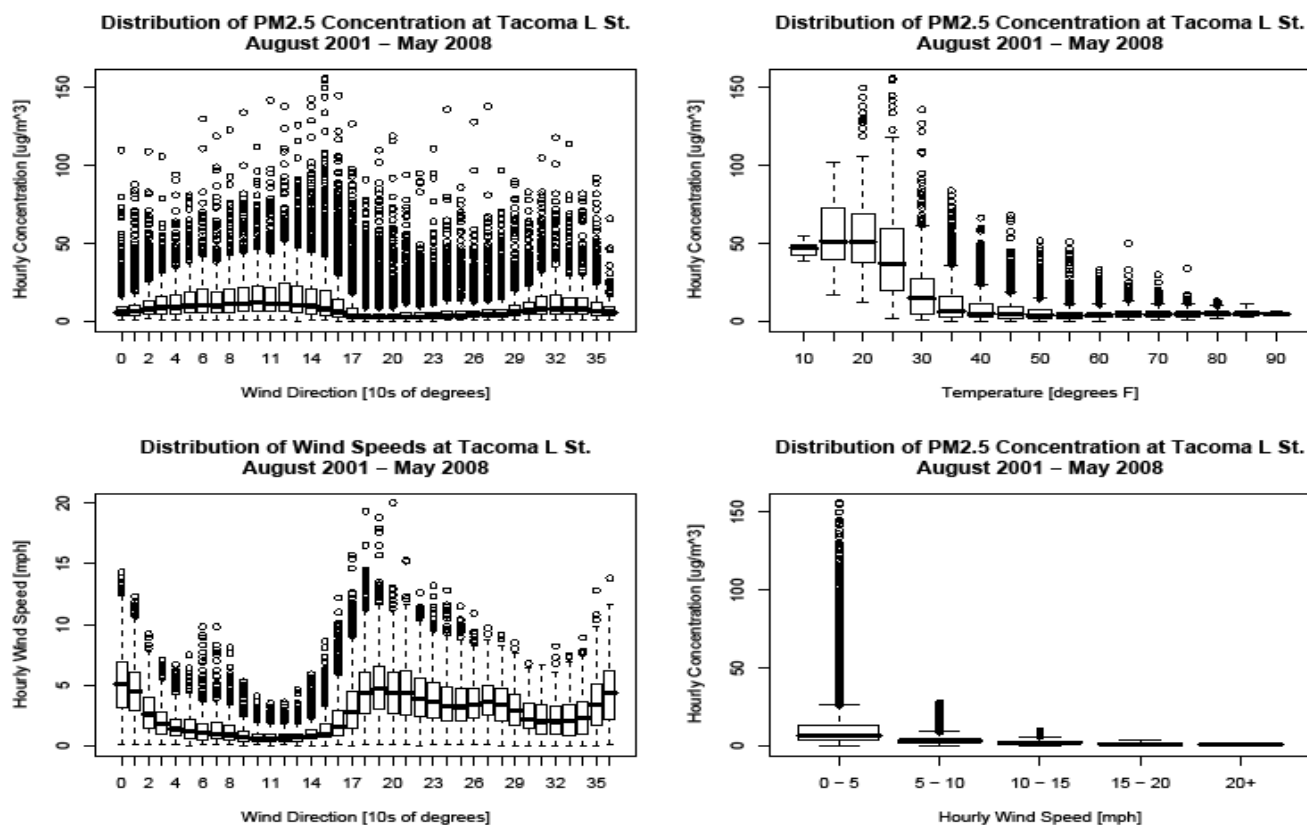
Puget Sound Clean Air Agency in coordination with the National Weather Service office in Seattle operates a radar wind profiler at the Sand Point Laboratory of the NOAA. Figure 25 displays the mixing height during the typical stagnation event in the Puget Sound area. Mixing heights at 600 meters or less are observed during the typical PM<sub>2.5</sub> event.

**Figure 25 Typical inversion profile for the Southern Puget Sound Region stagnation.**



The area surrounding the South L St. monitoring station is influenced by the same meteorological conditions. Figure 26 plots wind direction against hourly concentrations, wind direction against wind speed, wind speed against hourly concentrations and temperature against hourly concentrations. The highest hourly concentrations are observed when temperatures are the lowest, and are observed when wind speeds are less than 5 mph. The meteorological conditions during the 2001-2007 temporary monitoring study were typical of the area's fall and winter seasons including periods influenced by moderate temperatures, strong Pacific storms, and air stagnations. Highest hourly concentrations occur at temperatures below freezing, highest concentrations associated with winds below 5 mph and often times less than 1 mph, the highest winds from the south and the southwest quadrant correspond to lowest  $PM_{2.5}$  concentrations and the lowest winds from the east to southeast correspond to highest  $PM_{2.5}$  concentrations. These low wind-speeds indicate transport from King County and other areas is not occurring during the periods of the highest concentrations and that the boundary submitted by the State is sufficiently large enough to include local sources of emissions that contribute to the violations at the South L Street monitor.

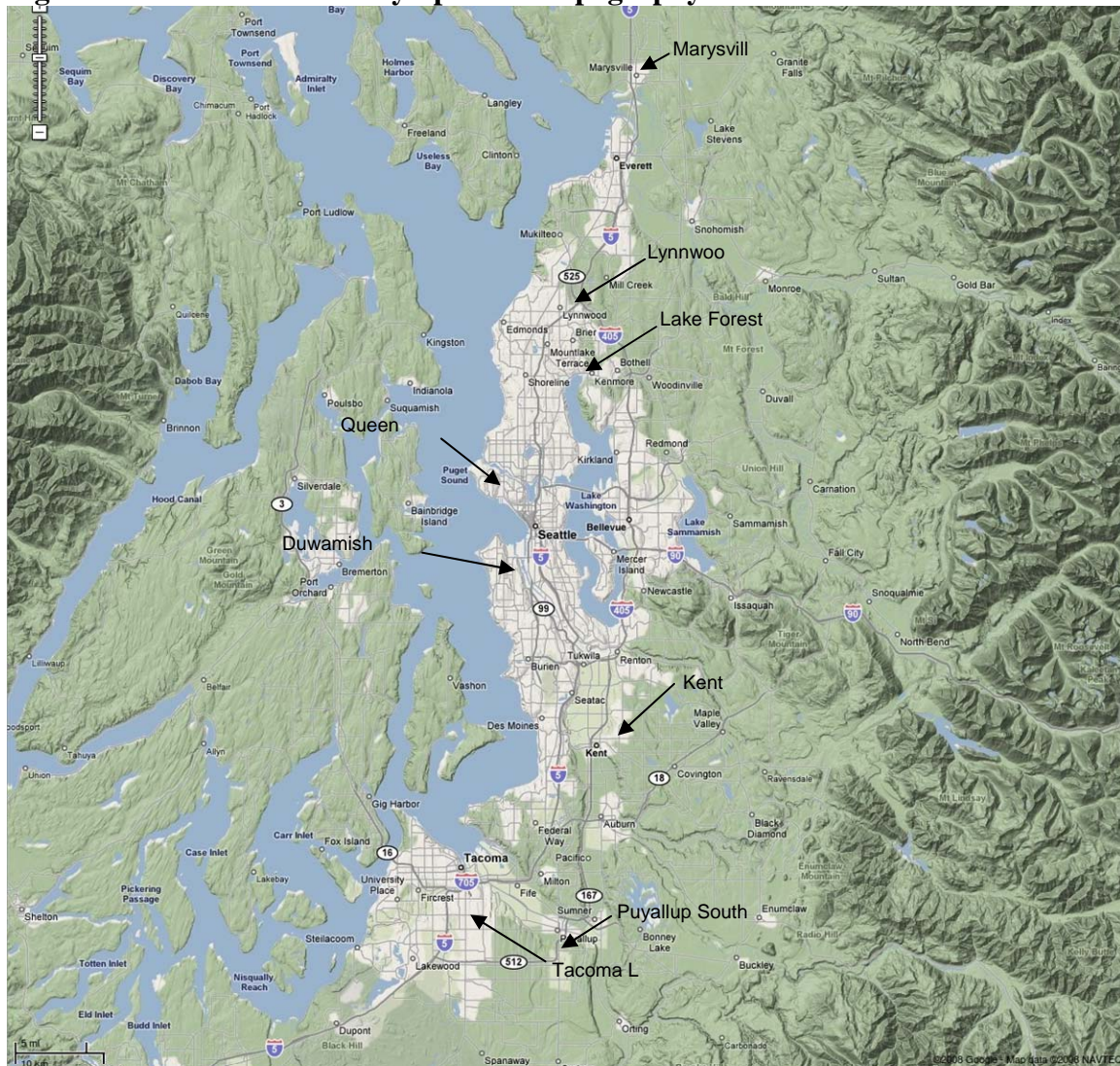
**Figure 26 Hourly concentrations and wind speed at Tacoma L Street Monitor from 2001-2008**



## **Factor 7: Geography/topography (mountain ranges or other air basin boundaries)**

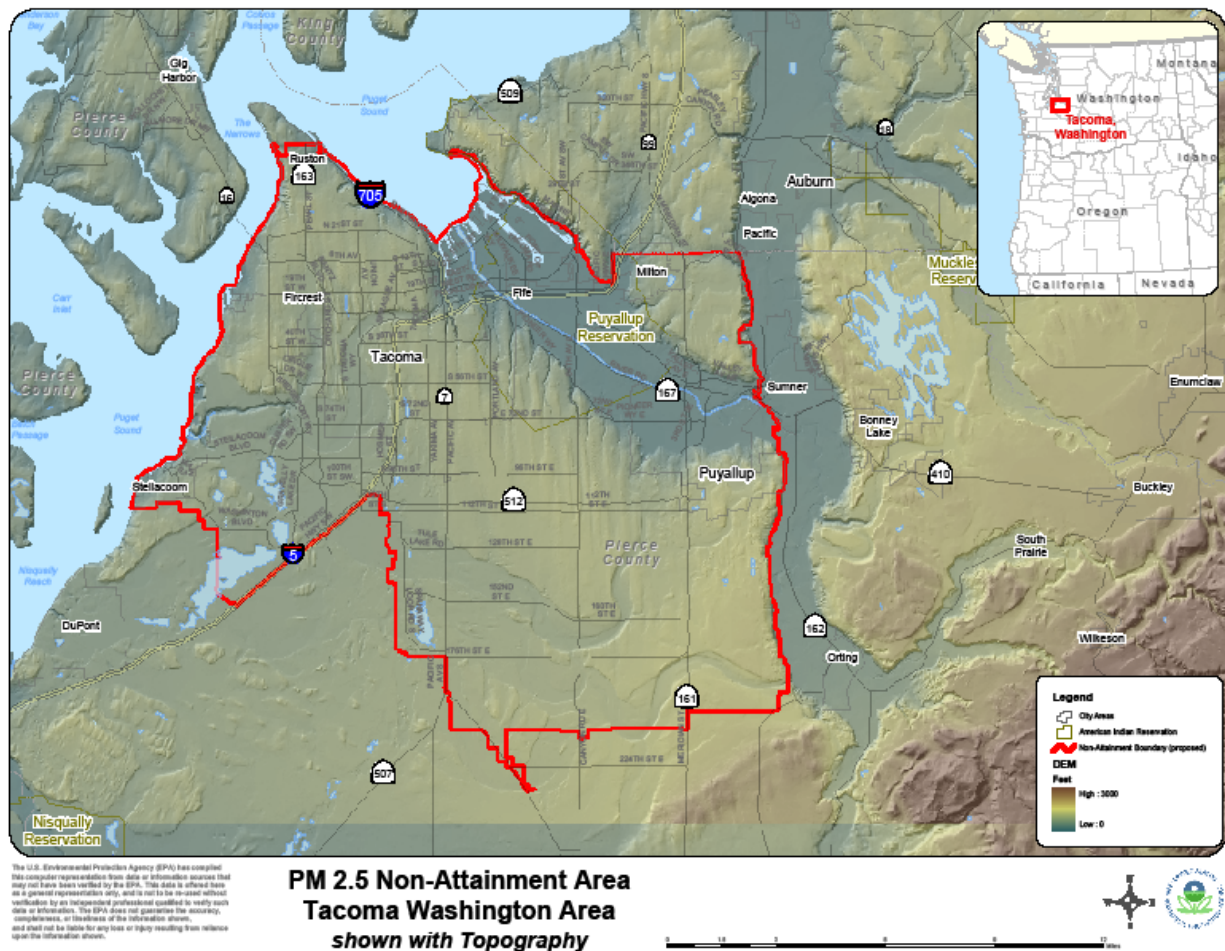
Tacoma lies east of the Cascade Mountains, which act as a topographical barrier to pollution flow from east to west. The Olympic Mountains to the west result also influence pollution flow. Air flow from the west typically flows around the Olympics and converges in the Seattle Tacoma area. See Figure 27. As stated above, this flow is interrupted during periods of stagnation during which low lying topographic features can influence the flow of pollution. Local topography also has an influence on pollutant transport. Figure 28 displays topography in the Tacoma area. The Port area of Tacoma is surrounded by bowl like topography. Beyond the Port to the north, hills rise to 400 ft creating a topographical barrier between the north and the south. The northernmost boundary occurs at the foot of this bluff along SR 509. Based on our review of topographical information, as well as air quality data which shows that local sources contribute to the violations at the South L Street monitor and meteorology data which indicates that wind speeds are less than 5 mph during exceedences, EPA is concluding that the State's boundary and particularly the northernmost boundary which follows the topographical bluff along SR 509 is sufficiently large enough to capture the sources in the area contributing to the violations at the South L Street monitor.

**Figure 27 Seattle-Tacoma-Olympia area topography**





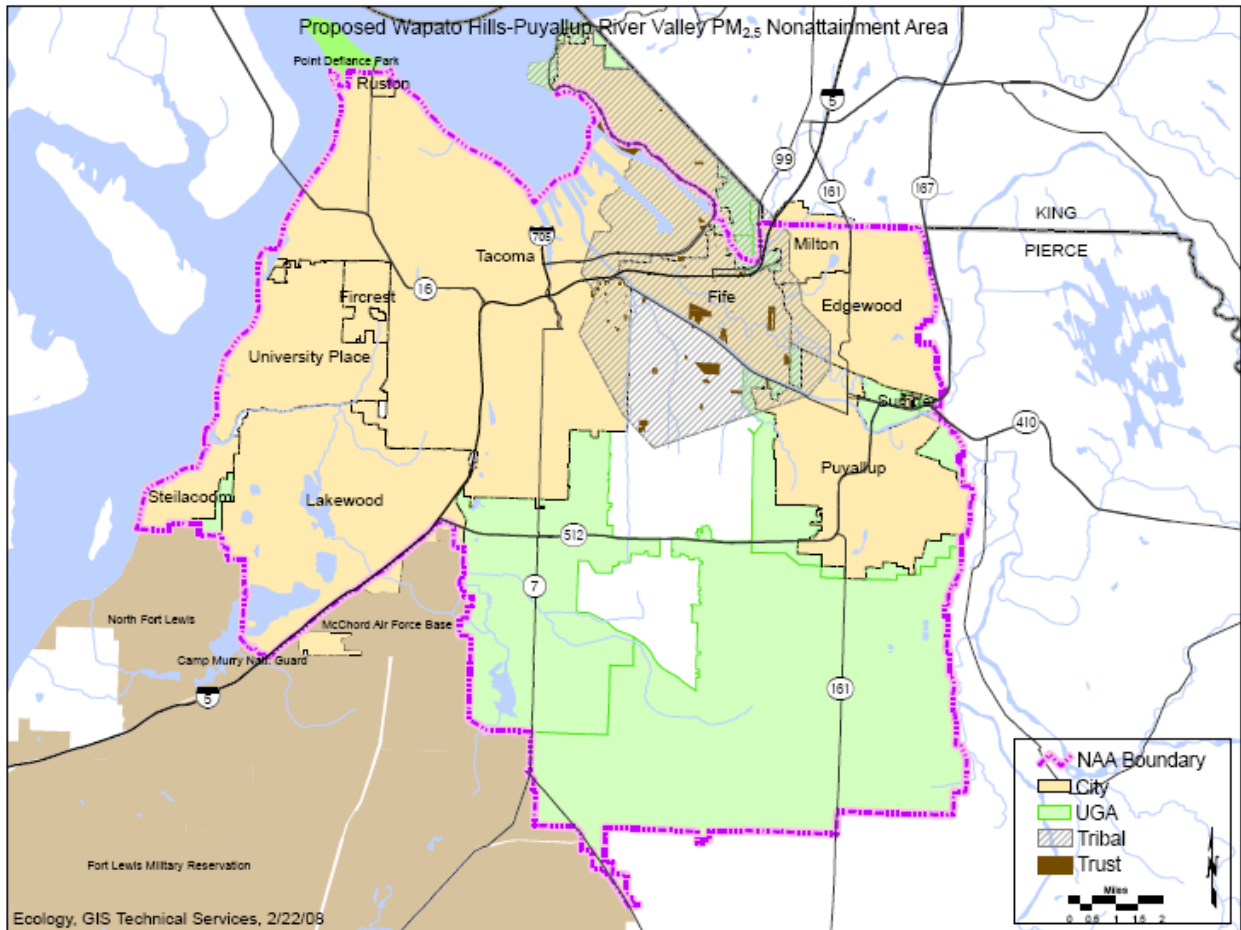
**Figure 28 Tacoma area topography**



## Factor 8: Jurisdictional boundaries

The analysis of jurisdictional boundaries considered the planning and organizational structure of the Seattle-Tacoma-Olympia area to determine if the implementation of controls in a potential nonattainment area can be carried out in a cohesive manner. The boundary of King and Pierce County is less than 5 miles north of the Port of Tacoma and runs east-west along the top of the bluff north of the Port of Tacoma. Puyallup Tribal trust land parcels are located within 5-10 miles to the north and northwest of the L Street monitor and are contained within the boundary of the nonattainment area recommended by the State. To the south of the L Street monitor, Fort Lewis and the McChord Airforce base form a jurisdictional boundary (federal/state) land. (Figure 29).

**Figure 29 Tacoma area nonattainment area and jurisdictional boundaries of surrounding areas**



The State addressed comments on emissions from the McChord Airforce base during their public comment period. They found emissions to be less than 1.5 tons in 2006. On base housing units include only 11 wood burning fireplaces and no woodstoves. Additionally, emissions at Fort Lewis are 5 tons per year or less than .2% of the total PM<sub>2.5</sub> for the PM2.5 inventory for Pierce County

Tribal land is within the jurisdiction of EPA. As stated above, the State's recommended nonattainment area does not include trust lands within the boundary of the Puyallup Indian Reservation. Congress explicitly provided state and local agencies authority over activities only on non-trust lands within the Puyallup Indian Reservation under the Puyallup Tribe of Indians Settlement Act of 1989, 25 U.S.C. 1773. Trust lands within the boundary of the Puyallup Reservation are the responsibility of EPA and the Tribe. EPA will be making a separate designation for Puyallup tribal trust lands.

Given the low potential contributions of the McChord Airforce Base, the Fort Lewis Military Base, and King County to the north (based on the air quality, topography and meteorology data discussed above), EPA is concluding that the State's boundary which follows jurisdictional boundaries to the south and north roughly along the Pierce-King County line and along the boundaries of the military bases, appropriately considers jurisdictional boundaries as well as includes sources contributing to the violations at the South L Street monitor.

#### **Factor 9: Level of control of emission sources**

This factor considers emission controls currently implemented in the Seattle Tacoma Olympia area. The emission estimates on Table 1 (under Factor 1) include any control strategies implemented by the States in the Seattle Tacoma Olympia area before 2005 that may influence emissions of any component of PM<sub>2.5</sub> emissions (i.e., total carbon, SO<sub>2</sub>, NO<sub>x</sub>, and crustal PM<sub>2.5</sub>).

The State addressed the level of control of emission sources in the Seattle-Tacoma-Olympia area in their nine factors analysis noting a number of regulatory and non-regulatory programs in the area.

However, given that EPA's analysis of the other eight factors has shown that the State's boundary is sufficient to capture sources contributing to the violations at the South L Street monitor, this information was not an important consideration in our decision on our intended boundary.

In certain cases where level of control of emission sources is important, EPA will consider additional information on emission controls in making final designation decisions. In cases where specific plants already have installed emission controls or plan to install such controls in the near future, EPA requests additional information on:

- the plant name, city, county, and township/tax district
- identification of emission units at the plant, fuel use, and megawatt capacity
- identification of emission units on which controls will be installed, and units on which controls will not be installed
- identification of the type of emission control that has been or will be installed on each unit, the date on which the control device became / will become operational, and the emission reduction efficiency of the control device
- the estimated pollutant emissions for each unit before and after implementation of emission controls
- whether the requirement to operate the emission control device will be federally enforceable by December 2008, and the instrument by which federal enforceability will be ensured (e.g. through source-specific SIP revision, operating permit requirement, consent decree)

## Attachment 2

### Description of the Contributing Emissions Score

The CES is a metric that takes into consideration emissions data, meteorological data, and air quality monitoring information to provide a relative ranking of counties in and near an area. Using this methodology, scores were developed for each county in and around the relevant metro area. The county with the highest contribution potential was assigned a score of 100, and other county scores were adjusted in relation to the highest county. The CES represents the relative maximum influence that emissions in that county have on a violating county. The CES, which reflects consideration of multiple factors, should be considered in evaluating the weight of evidence supporting designation decisions for each area.

The CES for each county was derived by incorporating the following significant information and variables that impact PM<sub>2.5</sub> transport:

- Major PM<sub>2.5</sub> components: total carbon (organic carbon (OC) and elemental carbon (EC)), SO<sub>2</sub>, NO<sub>x</sub>, and inorganic particles (crustal).
- PM<sub>2.5</sub> emissions for the highest (generally top 5%) PM<sub>2.5</sub> emission days (herein called “high days”) for each of two seasons, cold (Oct-Apr) and warm (May-Sept)
- Meteorology on high days using the NOAA HYSPLIT model for determining trajectories of air masses for specified days
- The “urban increment” of a violating monitor, which is the urban PM<sub>2.5</sub> concentration that is in addition to a regional background PM<sub>2.5</sub> concentration, determined for each PM<sub>2.5</sub> component
- Distance from each potentially contributing county to a violating county or counties

[A more detailed description of the CES can be found at  
[http://www.epa.gov/ttn/naaqs/pm/pm25\\_2006\\_techinfo.html#C.](http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html#C.)]