

## Executive Summary

This document summarizes the calculations for verification of continued attainment of National Ambient Air Quality Standards (NAAQS) in Washington’s Limited Maintenance Areas.

## Maintenance Areas

Washington has ten maintenance areas for criteria pollutants. Only those areas that qualified for the Limited Maintenance Plan approach must submit verification documentation. These maintenance areas are marked with an (\*). Maintenance areas demonstrate continued attainment of the NAAQS either through monitoring or through EPA-approved alternate methods. These methods are summarized in Table 1.

**Table 1. Washington maintenance areas and methods of demonstrating NAAQS attainment**

Maintenance Area (Pollutant)	End of Maintenance Period	NAAQS Attainment Method
Seattle (PM <sub>10</sub> )*	5/14/2021	Estimated PM <sub>10</sub> from Seattle-Duwamish PM <sub>2.5</sub> (530330057)
Kent (PM <sub>10</sub> )*	5/14/2021	Estimated PM <sub>10</sub> from Kent-Central & James PM <sub>2.5</sub> (530332004)
Tacoma (PM <sub>10</sub> )*	5/14/2021	Estimated PM <sub>10</sub> from Tacoma-Alexander nephelometer PM <sub>2.5</sub> (530530031)
Thurston County (PM <sub>10</sub> )*	12/4/2020	Estimated PM <sub>10</sub> from Lacey-College St nephelometer PM <sub>2.5</sub> (530670013)
Wallula (PM <sub>10</sub> )	9/26/2025	Kennewick-Metaline PM <sub>10</sub> monitor (530050002) until 2017; Burbank-Maple St PM <sub>10</sub> monitor (530710006) as of January 1, 2018
Spokane (PM <sub>10</sub> )*	8/30/2025	Spokane-Augusta PM <sub>10</sub> monitor (530630021)
Yakima (PM <sub>10</sub> )	3/10/2025	Yakima-4 <sup>th</sup> Ave S PM <sub>10</sub> monitor (530770009)
Tacoma (PM <sub>2.5</sub> )	3/12/2035	Tacoma-L St PM <sub>2.5</sub> monitor (530530029)
Yakima (CO)	12/31/2022	Modeled CO vehicle emissions
Spokane (CO)*	8/30/2025	Modeled onroad, nonroad and residential wood combustion CO emissions

\* indicates Limited Maintenance Areas where submission of verification documentation is required.

## **Thurston County PM<sub>10</sub> Maintenance Area**

As detailed in the 2nd PM<sub>10</sub> Maintenance Plan for Thurston County Washington, ORCAA submitted the design value estimates for the Lacey-College Street nephelometer site (530670013). The 5-year PM<sub>10</sub> design value estimate for 2015-2019 was 62 µg/m<sup>3</sup>. The PM<sub>10</sub> design value estimate for 2017-2019 was 74 µg/m<sup>3</sup>.

Despite wildfire smoke incursions in 2017 and 2018 causing higher than expected design values, both are below the Limited Maintenance Plan threshold of 98 µg/m<sup>3</sup>.

Design values were determined using the following method: Ecology provided the daily 24-hour NPM<sub>10</sub> averages for the two previously mentioned timespans. The 5-year design value estimate was determined using 1740 days of data. The 3-year design value estimate was based on 1080 values. Table 6-1 contained in the PM<sub>10</sub> SIP Development Guidance document specifies which value represents the design value for a given number of days. For 1740 and 1080 days, the design value is given by the sixth highest and the fourth highest values, respectively.

As the Thurston County maintenance period ends in 2020, the final design values for the maintenance period will be submitted in the 2021 Verification of Continued Attainment in Limited Maintenance Areas document.

## **Kent, Seattle and Tacoma PM<sub>10</sub> Maintenance Areas**

Three- and five-year design values were calculated using the table lookup method and the statistical fit method outlined in the PM<sub>10</sub> SIP Development Guideline and The Kent, Seattle, and Tacoma PM<sub>10</sub> Limited Maintenance Plan. A 3-year PM<sub>10</sub> design value of 150 µg/m<sup>3</sup> or below demonstrates continued compliance with the PM<sub>10</sub> NAAQS. A 5-year design value below 98 µg/m<sup>3</sup> is required to qualify for the LMP approach. Since only PM<sub>2.5</sub> concentrations have been measured during 2013-2019, daily PM<sub>10</sub> concentrations are modeled using two site-dependent linear relationships, one for summer (Apr-Sep) and one for winter (Oct-Mar), established for 1999-2007 when PM<sub>10</sub> and PM<sub>2.5</sub> were recorded simultaneously at each site.

PM<sub>2.5</sub> concentrations from Kent-Central & James (530332004), Seattle-Duwamish (530330057), and Tacoma-Alexander Ave (530530031) were used to assure continued compliance with the PM<sub>10</sub> NAAQS and to confirm continued eligibility for the LMP approach. The PM<sub>2.5</sub> concentrations come from several instruments at each site. At all sites, Puget Sound Clean Air Agency (PSCAA) prioritizes instruments measuring PM<sub>2.5</sub> concentrations with missing values in the following way: FEM BAM > FEM TEOM (method code 181) > FEM TEOM (method code 581) > nephelometer. While data at Kent and Seattle-Duwamish were primarily collected with FEM instruments, only a nephelometer has been in operation at Tacoma-Alexander Ave for 2013-2019.

In 2017 and 2018, the western United States and Canada experienced severe wildfire seasons, resulting in significant wildfire smoke impacts that caused numerous exceedances of the PM<sub>2.5</sub> standard. Ecology placed informational flags (“i-flags”) in EPA’s Air Quality System (AQS)

database on the exceedances observed during these wildfire smoke events. Documentation supporting the exclusion of these values as exceptional events is provided in the “Consolidated 2018 Request for Exceptional Event Informational Flagging Memo” and “Informational Flagging Request for Wildfire Affected PM<sub>10</sub> and PM<sub>2.5</sub> Exceedances in 2017” in the Appendix of Verification of Continued Attainment in Limited Maintenance Areas (2019), available from Ecology’s website at <https://fortress.wa.gov/ecy/publications/SummaryPages/1902015.html>.

The DVs presented in the tables below are calculated following two scenarios:

- **Scenario 1** (most conservative DV estimates): All modeled PM<sub>10</sub> concentrations were included without excluding wildfire smoke or other exceptions.
- **Scenario 2** (with wildfire smoke days omitted): Daily PM<sub>10</sub> concentrations from 2017 and 2018 i-flagged wildfire smoke days were excluded from the DV calculations.

Tables 2 and 3 below show 5-year DVs for Kent, Seattle and Tacoma and 95% confidence intervals from the lognormal fit calculation. The associated number in parentheses represents the DV obtained using the table-look-up method. The gray numbers are previous DVs shared in the 2018 and 2019 Verification of Continued Attainment in Limited Maintenance Areas reports that presented a coding error.

**Table 2. 5-Year DVs - Scenario 1 + older DVs (gray)**

	2017	2017	2018	2018	2019
Kent	68±12	89±25 (82)	68±16	115±35 (118)	115±37 (118)
Seattle	73±12	72±11 (80)	69±14	119±45 (110)	117±46 (101)
Tacoma	71±19	93±39 (94)	71±16	163±69 (165)	163±70 (165)

**Table 3. 5-Year DVs - Scenario 2**

	2017	2018	2019
Kent	54±6 (53)	62±12 (65)	60±13 (64)
Seattle	53±3 (56)	52±3 (53)	48±4 (48)
Tacoma	60±16 (55)	60±12 (58)	59±13 (58)

Five-year DVs less than 98 µg/m<sup>3</sup> are required to qualify for the Limited Maintenance Plan. The most conservative scenario does not meet this qualification. Since the Tacoma site only has a nephelometer, this site is likely biased high as these instruments typically overestimate wildfire (and wood smoke) aerosols. However, scenario 2 is the more appropriate estimate and confirms continued eligibility for the LMP approach at our three Maintenance Areas excluding the unprecedented wildfire smoke events in 2017 and 2018.

## Spokane County PM<sub>10</sub> Maintenance Area

The design values for the Spokane County Maintenance Area are based on FEM PM<sub>10</sub> monitoring data from the Spokane-Augusta monitoring site (530630021) in Spokane, Washington.

In 2017 and 2018, the western United States and Canada experienced severe wildfire seasons, resulting in significant wildfire smoke impacts that caused:

- Six PM<sub>10</sub> exceedances on September 4, 5, 6, and 7, 2017, and August 19 and 20, 2018. The exceedances affect the LMP design value and the NAAQS design value.
- Four elevated PM<sub>10</sub> concentrations, September 8, 2017; August 14, 15, and 23, 2018, that are eligible for exclusion from LMP design value calculations following the guidance in the EPA memorandum “Additional Methods, Determinations, and Analyses to Modify Air Quality Data Beyond Exceptional Events.”<sup>1</sup>

Ecology placed informational flags (“i-flags”) in EPA’s Air Quality System (AQS) database on all hourly PM<sub>10</sub> concentrations on these ten days. Documentation supporting the exclusion of these values as exceptional events is provided in the “Consolidated 2018 Request for Exceptional Event Informational Flagging Memo” and “Informational Flagging Request for Wildfire Affected PM<sub>10</sub> and PM<sub>2.5</sub> Exceedances in 2017” in the Appendix of Verification of Continued Attainment in Limited Maintenance Areas (2019), available from Ecology’s website at <https://fortress.wa.gov/ecy/publications/SummaryPages/1902015.html>. The LMP 5-year design value and NAAQS 3-year design value are shown with and without the ten Ecology i-flagged elevated PM<sub>10</sub> days.

### LMP Design Value

A 5-year PM<sub>10</sub> design value below 98 µg/m<sup>3</sup> demonstrates that the Spokane County Maintenance Area continues to qualify for the LMP approach. Note: in Quarter 3 of 2015, data completeness was only 30% (28 samples in 92 days).

**Table 4. Spokane County Maintenance Area LMP Design Values**

	2015-2019 LMP Design Value (DV)
DV with i-flagged data	168 µg/m <sup>3</sup>
DV without i-flagged data <sup>2</sup>	87 µg/m <sup>3</sup>

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<sup>1</sup> *Additional Methods, Determinations, and Analyses to Modify Air Quality Data Beyond Exceptional Events* [Memorandum]. Research Triangle Park, NC: Environmental Protection Agency. Retrieved from [https://www.epa.gov/sites/production/files/2019-04/documents/clarification\\_memo\\_on\\_data\\_modification\\_methods.pdf](https://www.epa.gov/sites/production/files/2019-04/documents/clarification_memo_on_data_modification_methods.pdf).

<sup>2</sup> Six PM<sub>10</sub> exceedances and four PM<sub>10</sub> elevated concentrations

## NAAQS Design Value

A 3-year PM<sub>10</sub> design value at or below 1.0 expected exceedances demonstrates compliance with the PM<sub>10</sub> NAAQS. The design value is the expected number of annual 24-hour exceedances of 150 µg/m<sup>3</sup>, averaged over 3 years.

**Table 5. Spokane County Maintenance Area NAAQS Design Values**

	<b>2017-2019 NAAQS Design Value (DV)</b>
DV with i-flagged data	2.0 expected exceedances
DV without i-flagged data	0.0 expected exceedances

The 2017 and 2018 wildfire smoke impacts generated at total of six PM<sub>10</sub> exceedances. The Spokane County PM<sub>10</sub> LMP contingency measures in the LMP are for road dust, windblown dust, and solid fuel burning devices. The contingency measures do not address wildfire air quality impacts; therefore they have not been implemented.

## Spokane County CO Maintenance Area

EPA approved an alternate method of verification of attainment of the CO NAAQS and qualification for the limited maintenance plan option under 40 CFR 58.14(C) (Federal Register # 81 FR 45417; July 14, 2016). Under this alternative, EPA considers the limited maintenance plan criteria met and continued verification of attainment of the CO NAAQS if the total of the three predominant CO emission source categories calculated as part of the triennial emissions inventory (onroad mobile, nonroad, and residential wood combustion) remain below the corresponding total of the 2002 emission inventory source categories approved at the time the Spokane-area was redesignated to attainment. SRCAA and Ecology will compare future year 2017, 2020 and 2023 triennial emission analysis results to the baseline 2002.

### Verification of Attainment

Total emissions for the 2017 evaluation year were compared to the 2002 attainment year emissions. The 2017 evaluation year was lower than the attainment year; therefore, the Spokane CO maintenance area continues to qualify for the limited maintenance plan option and continued verification of attainment of the CO NAAQS. SRCAA and Ecology's next analysis will be with the 2020 triennial emissions inventory.

**Table 6. Spokane CO maintenance area total emissions (tons per year)**

	<b>Onroad</b>	<b>Nonroad</b>	<b>Residential Wood Combustion</b>	<b>Total</b>
2002	48,878	23,795	7,199	80,872
2017	18,678	12,586	8,260	39,524

## **Wallula PM10 Maintenance Area**

Ecology submitted a full maintenance plan — not a limited maintenance plan — for the Wallula PM<sub>10</sub> maintenance area. Continued attainment of the PM<sub>10</sub> standard is demonstrated by the Burbank-Maple Street monitor as of January 2018. Ecology submitted the Second Ten-Year Maintenance Plan for Particulate Matter (PM<sub>10</sub>) for Wallula to EPA November 22, 2019. Final EPA approval is pending.

## Appendix. Maintenance Plan Correspondence from Local Air Agencies.

To: Jill Schulte, Ecology

From: Robert Moody, ORCAA

Re: PM10 Design Values for Lacey, Washington 2015-2019

Date: January 23, 2020

As stated in the 2<sup>nd</sup> PM<sub>10</sub> Maintenance Plan for Thurston County Washington, ORCAA is submitting the design value estimates for the Lacey-College Street nephelometer site (53670013). The 5-year PM<sub>10</sub> design value estimate for 2015-2019 is 62 µg/m<sup>3</sup>. The PM<sub>10</sub> design value estimate for 2017-2019 is 74 µg/m<sup>3</sup>. Despite wildfire smoke incursions in 2017 and 2018 causing higher than expected design values, both are below the Limited Maintenance Plan threshold of 98 µg/m<sup>3</sup>.

Design values were determined using the following method. Ecology provided the daily 24-hour NPM10 averages for the two previously mentioned timespans. The 5-year design value estimate was determined using 1740 days of data. The 3-year design value estimate was based on 1080 values. Table 6-1 contained in the PM10 SIP Development Guidance document specifies which value represents the design value for a given number of days. For 1740 and 1080 days, the design value is given by the sixth highest and the fourth highest value respectively.

The final report for the PM10 design values will be completed in January 2021 as specified in the 2<sup>nd</sup> Thurston County Maintenance Plan.

**DATE:** February 28, 2020

**TO:** Jill Schulte

**CC:** Erik Saganić

**FROM:** Clément Miège

**SUBJECT:** Design Values (2017–2019) for Kent, Seattle, and Tacoma PM<sub>10</sub> Maintenance Areas

Dear Jill Schulte,

Please find in this memo a compilation of five-year design values (DVs) calculated for Kent (AQS Site ID: 53 033 2004), Seattle-Duwamish (53 033 0057), and Tacoma-Tideflats (53 053 0031) PM<sub>10</sub> Maintenance Areas for the last three years (2017, 2018 & 2019). These DVs have been calculated using a table-look-up method and a statistical-fit method, both described in the SIP Development Guideline<sup>1</sup>. Since only PM<sub>2.5</sub> concentrations have been measured during 2013–2019, daily PM<sub>10</sub> concentrations are modeled using two site-dependent linear relationships (one for summer (Apr-Sep) and one for winter (Oct-Mar)) established for 1999–2007 when PM<sub>10</sub> and PM<sub>2.5</sub> were recorded simultaneously at each site.

The PM<sub>2.5</sub> concentrations come from several instruments at each site. At all sites, we prioritize instruments measuring PM<sub>2.5</sub> concentrations with missing values in the following way: FEM BAM > 1400ab/8500 FEM TEOM > 1405 FEM TEOM > nephelometer. While Kent and Seattle-Duwamish have the majority of their data coming from TEOM (2013–2018) and BAM (2018–2019), only a nephelometer has been in operation at Tacoma-Tideflats for 2013–2019.

The DVs presented in the table below are calculated following two scenarios:

- **Scenario 1** (most conservative DV estimates): All modeled PM<sub>10</sub> concentrations are included without excluding wildfire smoke or other exceptions.
- **Scenario 2** (with wildfire smoke days omitted): Daily PM<sub>10</sub> concentrations are excluded in the DV calculation during 2017–2018 wildfire-smoke days (I-Flags<sup>2-3</sup>).





Table 1: 5-year DVs for Kent, Seattle and Tacoma. DV associated with an uncertainty interval come from a lognormal fit to the data and its 95% prediction interval. The associated number in between parentheses represents the DV obtained using the table-look-up method. The gray numbers present previous DVs shared with ECY in 2018 and 2019 memos that presented a coding error.

Sites:	5-yr DVs - Scenario 1 + older DVs (gray)					5-yr DVs - Scenario 2		
	2017	2017	2018	2018	2019	2017	2018	2019
Kent	68±12	89±25 (82)	68±16	115±35 (118)	115±37 (118)	54±6 (53)	62±12 (65)	60±13 (64)
Seattle	73±12	72±11 (80)	69±14	119±45 (110)	117±46 (101)	53±3 (56)	52±3 (53)	48±4 (48)
Tacoma	71±19	93±39 (94)	71±16	163±69 (165)	163±70 (165)	60±16 (55)	60±12 (58)	59±13 (58)

Five-year DVs less than 98 µg/m³ are required to qualify for the Limited Maintenance Plan<sup>4</sup> (LMP). The most conservative scenario doesn't meet this qualification. Since the Tacoma site only has a nephelometer, this site is likely biased high as these instruments typically overestimate wildfire (and wood smoke) aerosols. However, scenario 2 is the more appropriate estimate and confirms continued eligibility for the LMP approach at our three Maintenance Areas even with the unprecedented wildfire smoke levels in 2017 and 2018.

Please let us know if you have any questions, thank you and all the best,

Clément Miège

References:

- <sup>1</sup>PM<sub>10</sub> SIP Development Guideline - United States Environmental Protection Agency. June 1987. EPA-450/2-86-001
- <sup>2</sup>Informational Flag request for 2017 Wildfire Affected Exceedances - WA Dept. of Ecology. Flagging Memo. Feb 2018.
- <sup>3</sup>Informational Flag request for 2018 Wildfire Affected Exceedances - WA Dept. of Ecology. Flagging Memo. Feb 2019.

Dates excluded at each site:

Date	Site		
	Duwamish	Kent	Tideflats
8/2/2017	x	x	x
8/3/2017	x	x	x
8/4/2017	x	x	x
8/7/2017	x	x	x
8/8/2017	x	x	x
8/9/2017	x	x	x
8/10/2017	x	x	x
9/5/2017	x	x	x
9/6/2017	x	x	x
9/7/2017	x	x	x
8/14/2018	x	x	x
8/15/2018	x	x	x
8/19/2018		x	x
8/20/2018	x	x	x
8/21/2018	x	x	x
8/22/2018	x	x	x
8/23/2018	x		
8/24/2018	x		x
8/25/2018	x		

Note that August 3<sup>rd</sup> and August 9<sup>th</sup> of 2017 were added to the list from the I-Flag memo as these days were not included as they were based solely on Darrington, which missed a sample and was not listed in the I-Flag memo. These days were also clearly wildfire smoke influenced days based on satellite observations.

<sup>4</sup>Memorandum: Limited Maintenance Plan Option for Moderate PM<sub>10</sub> Nonattainment Areas. U.S. EPA. Aug 2001.



Date: April 1, 2020  
To: Jill Schulte, Beth Friedman, Sean Lundblad  
CC: Laurie Hulse-Moyer, Jacob Berkley, Julie Oliver, Mark Rowe  
From: Margee Chambers *Margee Chambers*  
Subject: Spokane County PM<sub>10</sub> and CO Design Values for Air Monitoring Network Report

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### PM<sub>10</sub> Design Values

Included in this memo are the 5-year and 3-year design values for the Spokane County Maintenance Area, in Spokane, Washington. The design values are based on FRM and FEM 24-hour PM<sub>10</sub> monitoring data from the Augusta Avenue site (530630021), in Spokane, Washington.

In 2017 and 2018, the western United States and Canada experienced severe wildfire seasons, resulting in significant wildfire smoke impacts that caused:

- Six PM<sub>10</sub> exceedances on September 4, 5, 6, and 7, 2017, and August 19 and 20, 2018. The exceedances affect the LMP design value and the NAAQS design value.
- Four PM<sub>10</sub> elevated concentrations, September 8, 2017; August 14, 15, and 23, 2018, that is eligible for exclusion. The elevated concentrations have regulatory significance for the area to meet the LMP design value.
- Two PM<sub>10</sub> elevated concentrations, August 13 and 16, 2018, were flagged but not eligible for exclusion.

#### LMP Critical Design Value:

A 5-year PM<sub>10</sub> critical design value below 98 µg/m<sup>3</sup> demonstrates that the Spokane County Maintenance Area continues to qualify for the LMP approach. The limited maintenance plan (LMP) critical design value is shown with and without the six Ecology i-flagged PM<sub>10</sub> exceedance data and four PM<sub>10</sub> high concentration data. Note: in 3rd quarter 2015 data completeness was only 30% (28 samples in 92 days).

	2015-2019 LMP Design Value (DV)
DV with i-flagged data	168 µg/m <sup>3</sup>
DV without i-flagged data <sup>1</sup>	87 µg/m <sup>3</sup>

<sup>1</sup> Six PM<sub>10</sub> exceedances and four PM<sub>10</sub> elevated concentrations

### NAAQS Design Value:

A 3-year PM<sub>10</sub> design value at or below 1.0 demonstrates compliance with the PM<sub>10</sub> NAAQS. The design value is the number of 24-hour exceedances of 150 µg/m<sup>3</sup>, averaged over three years. The National Ambient Air Quality Standard (NAAQS) design value is shown with and without the six Ecology i-flagged PM<sub>10</sub> exceedance data.

	2017-2019 NAAQS Design Value (DV)
DV with i-flagged data	2.0
DV without i-flagged data <sup>2</sup>	0.0

The 2017 and 2018 wildfire smoke impacts generated at total of six PM<sub>10</sub> exceedances. The Spokane County PM<sub>10</sub> LMP contingency measures in the LMP are for road dust, windblown dust, and solid fuel burning devices. The contingency measures do not address wildfire air quality impacts; therefore they have not been implemented.

### CO Design Value

EPA approved an alternate method of verification of attainment of the CO NAAQS and qualification for the limited maintenance plan option under 40 CFR 58.14(C) (Federal Register # 81 FR 45417; July 14, 2016). Under this alternative, EPA considers the limited maintenance plan criteria met and continued verification of attainment of the CO NAAQS if the total of the three predominate CO emission source categories calculated as part of the triennial emissions inventory (onroad mobile, nonroad, and residential wood combustion) remain below the corresponding total of the 2002 emission inventory source categories approved at the time the Spokane-area was redesignated to attainment. SRCAA and Ecology will compare future year 2017, 2020 and 2023 triennial emission analysis results to the baseline 2002.

### Verification of Attainment:

Total emissions for the 2017 evaluation year were compared to the 2002 attainment year emissions. The 2017 evaluation year was lower than the attainment year; therefore, the Spokane CO maintenance area continues to qualify for the limited maintenance plan option and continued verification of attainment of the CO NAAQS. SRCAA and Ecology's next analysis will be with the 2020 triennial emissions inventory.

#### Spokane County CO Emissions in Tons per Year

Year	Onroad	Nonroad	Residential Wood Combustion	Total
2002	49,878 tons/yr	23,795 tons/yr	7,199 tons/yr	80,872 tons/yr
2017	18,678 tons/yr	12,586 tons/yr	8,260 tons/yr	39,524 tons/yr

<sup>2</sup> Six Ecology i-flagged PM<sub>10</sub> exceedance data

## Publication information

This report is available on the Department of Ecology's website at <https://fortress.wa.gov/ecy/publications/SummaryPages/2002018.html>

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