Appendix A.2

Emissions Inventory Documentation for the Wallula PM_{10} Second 10-Year Maintenance Plan

FINAL DRAFT

Washington State Department of Ecology
Air Quality Program

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ABBREVIATIONS

BCAA	Benton Clean Air Agency
Ecology	Washington State Department of Ecology
EI	emissions inventory
EPA	Environmental Protection Agency
IPP	inventory preparation plan
NEI	National Emissions Inventory
NOMAD	EPA Nonpoint Methods Advisory Committee
NW-AIRQUEST	Northwest International Air Quality Environmental Science and Technology Consortium
PM_{10}	particulate matter less than or equal to 10 microns in diameter
$PM_{2.5}$	particulate matter less than or equal to 2.5 microns in diameter
ppd	pounds per day
PTE	potential to emit
QA	quality assurance
QC	quality control
tpy	tons per year
ug/m^3	micrograms per cubic meter
USDA	United States Department of Agriculture
VMT	vehicle miles traveled
WMA	Wallula maintenance area
WMP1	First 10 year Wallula maintenance plan
WMP2	Second 10 year Wallula maintenance plan
WSDA	Washington State Department of Agriculture
WSDOT	Washington State Department of Transportation
WRAP	Western Regional Air Partnership

1 Introduction

This document describes the emissions inventories prepared for the second 10-year maintenance plan for the 24-hour PM_{10} National Ambient Air Quality Standard (NAAQS) in Wallula, WA.

1.1 Inventory Preparation Plan

An Inventory Preparation and Quality Assurance Plan was submitted to EPA in December 2017. The plan was utilized during preparation and finalization of the inventories. A complete list of source categories required for a PM_{10} inventory was included as an appendix to the Inventory Preparation and Quality Assurance Plan. Many sources on the list either did not exist in the nonattainment area, or were only present at very insignificant levels. These sources were not included in the inventory. Similar to prior attainment and maintenance inventories, these inventories were crafted for low-wind days; therefore, windblown dust was not included. High wind events are addressed in the Natural Events Action Plan and Exceptional Events Rule requirements.

1.2 Inventory Types and Years

Four emissions inventories (EIs) were developed: a base year inventory (2014), a mid-term projection inventory (2020), and two final projection year inventories (2025, 2030). While 2025 is the anticipated final year of the maintenance plan, the 2030 projection was prepared in the event of a delay in plan approval. The base year is the most recent year of the National Emissions Inventory (NEI) and is an inventory of actual emissions. The projection year inventories include all the sources inventoried for the base year. The projections are based on future activity levels and effects of current and future controls. The base year and projected year inventories include annual and seasonal weekday emissions.

1.3 Responsibility

The inventory process was a cooperative effort between Washington State Department of Ecology (Ecology) and the Benton Clean Air Agency (BCAA).

- **Ecology** inventoried all sources in the Wallula maintenance area (WMA) except for point sources in Benton County. Ecology wrote the inventory preparation and quality assurance plan, carried out the tasks in the quality assurance plan, and wrote the final inventory documentation.
- **BCAA** provided point source emissions estimates and locations and assisted Ecology in identifying nonpoint emissions sources in the Benton County portion of the WMA. BCAA reviewed the IPP and final emissions estimates documents.

1.4 Contact Person

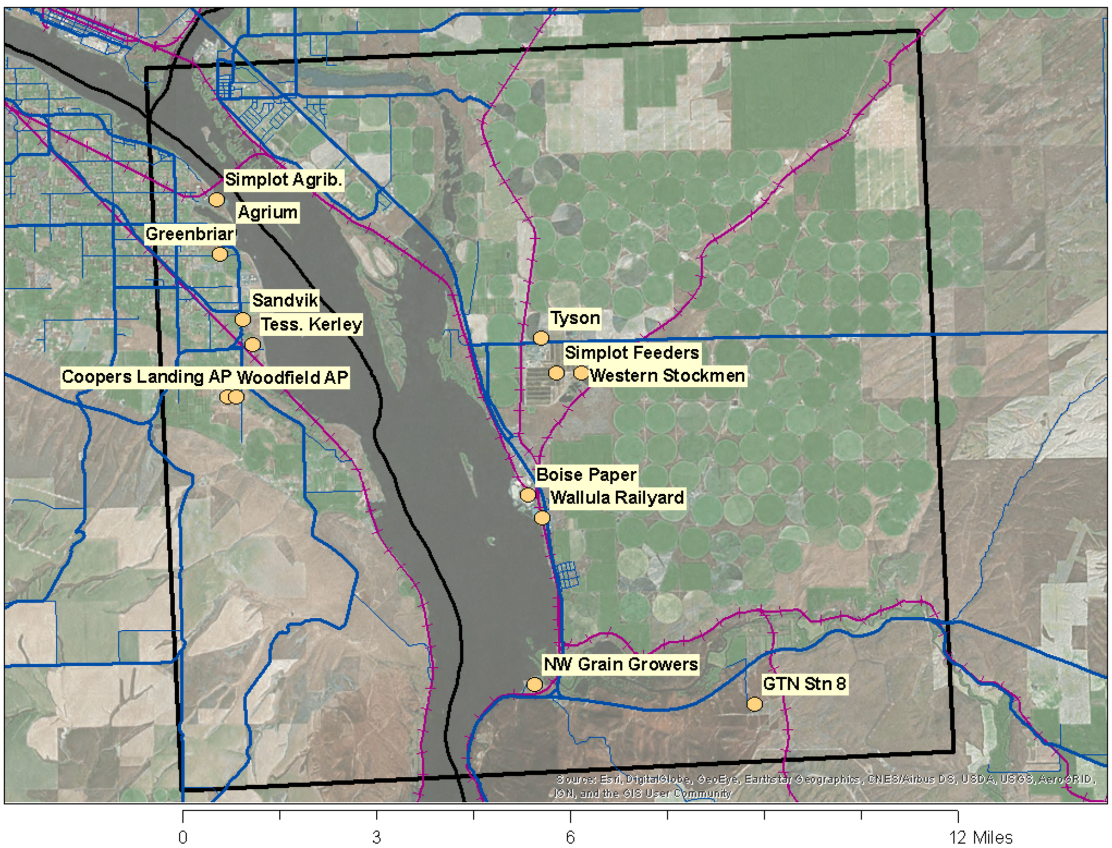
Any questions about the information contained in this report may be directed to Farren Herron-Thorpe, Air Quality Program, Department of Ecology (360) 407-7658 (e-mail fher461@ecy.wa.gov).

2 Geographic Area

The WMA is a square-shaped area of approximately 144 square miles encompassing portions of Walla Walla and Benton Counties, and a very small portion of Franklin County. The boundaries were defined using Universal Transverse Mercator Coordinates (zone 11). In meters, the southwest corner coordinates are (342500, 5099975) and the northeast corner coordinates are (362500, 5118600).

The WMA is a rural, primarily agricultural area with grain and row crops, poplar plantations, and a large cattle feedlot. There is a pulp mill and several smaller commercial/industrial sources. There are public roads, rail lines, and marine traffic. Population in 2014 was estimated at 5,700.

Wallula PM10 Maintenance Area



3 Season Determination

The PM_{10} season defined in the first 10-year maintenance plan was based on monitoring data from 1996 - 2000. The season was re-evaluated using concentrations measured at the Kennewick-Metaline monitoring site from 2012 - 2016.

Table 3-1~~Table 3-1~~ shows the 30 highest 24-hour average concentrations from 2012 - 2016. The exceedances (> 150 µg/m^3) and most other high concentration events were associated with high winds. The data also show that the percentage of coarse mass was greater than 84% for all but 4 days. Extreme wildfire smoke was monitored during the four days when the coarse mass was less than 84%. This indicates that wind-blown dust sources dominated the high concentration days.

Table 3-1 Kennewick-Metaline 30 Highest PM_{10} Concentrations in ug/m^3: 2012 - 2016

PM_{10}	$NPM_{2.5}$	Max. Wind Speed (mph)	Coarse Mass	Date	Notes
619	6	38	99%	11/2/2013	
589	14.9	28.6	97%	8/14/2015	
331	2.3	32.8	99%	11/17/2015	
222	7.5	20.4	97%	10/28/2013	
215	2.4	31	99%	1/11/2014	
208	3	29.5	99%	10/30/2015	
130	12.4	NA	90%	8/12/2014	
113	3.2	21.9	97%	9/20/2015	
112	10	20.8	91%	9/9/2012	
104	3.3	26	97%	3/19/2014	
103	3	29.4	97%	1/13/2014	
98	5	NA	95%	6/12/2014	
92	5.2	24.3	94%	10/7/2013	
91	5	23	95%	10/10/2015	
89	2.1	27.6	98%	2/25/2012	
87	6.8	NA	92%	7/23/2014	
83	2.1	33.3	97%	4/7/2013	
82	45.7	8.6	44%	8/24/2015	wildfire
76	35	7.5	54%	9/21/2012	wildfire
72	3.8	24.2	95%	4/27/2013	
72	9.4	20.2	87%	7/10/2015	
71	4.9	20.2	93%	8/2/2016	
71	6.1	15.8	91%	8/27/2016	
69	5.7	11.1	92%	8/19/2016	
68	30.4	4.9	55%	9/20/2012	wildfire
68	5.6	13.6	92%	3/1/2014	
67	3.2	29.2	95%	4/10/2013	
67	35.8	6.4	47%	8/22/2015	wildfire
66	10.4	19.8	84%	9/18/2014	
66	9.5	15.3	86%	10/2/2015	

Monthly median, mean, 3rd quartile, and max 24-hour average concentrations ~~are shown in Table 3-2. The statistics~~ were calculated ~~both~~ with and without exceedance days (Table 3-2~~top~~) and also without high wind events (~~bottom~~Table 3-3). Using the median, mean, and 3rd quartile, higher values generally occur May - October. However, exceedances are associated with high wind events. High wind events are not considered in this inventory; they are addressed in the Natural Events Action Plan and Exceptional Events Rule requirements. Focusing on the days without high winds, higher values generally occur July - October. On March 1, 2014 there was a max value of 68 ug/m^3 that was not associated with high winds. However, March was not included in the PM_{10} season since this was a lone event during the five~~r~~-year period that occurred on a day with 3 hours of missing data.

The emissions inventory requires that emissions be estimated for a typical season day. Agricultural tilling is the largest source of emissions, and the peak month is variable depending on crop type. Other sources also vary. Emissions were estimated for each source and month from June through October. In order not to underestimate emissions from any source, daily emissions from the highest month of emissions for each source were summed to represent a typical season day's emissions.

Table 3-2 Kennewick-Metaline Monthly PM_{10} ~~Concentrations~~ Statistics in ug/m^3: 2012 ~~-~~– 2016

(Statistics that changed when exceedance days were excluded are shown in parentheses)

Month	Median	Mean	3rd Quartile	Max
1~~1~~	7~~7~~	9.8 (8.4)~~9.834~~	10~~10~~	215 (103)~~215~~
2~~2~~	9~~9~~	11.4~~11.39~~	12~~12~~	89~~89~~
3~~3~~	10~~10~~	13.9~~13.91~~	16~~16~~	104~~104~~
4~~4~~	12~~12~~	15.4~~15.41~~	18~~18~~	83~~83~~
5~~5~~	17~~17~~	17.8~~17.83~~	23~~23~~	63~~63~~
6~~6~~	15~~15~~	18.1~~18.12~~	22~~22~~	98~~98~~
7~~7~~	20.5~~20.5~~	22.9~~22.91~~	27~~27~~	87~~87~~
8~~8~~	25~~25~~	34.1 (29.9)~~34.13~~	36 (35)~~36~~	589 (130)~~589~~
9~~9~~	21.5 (21)~~21.5~~	27.7 (26.2)~~27.66~~	31.3 (31)~~31.25~~	226 (113)~~226~~
10~~10~~	14~~14~~	20.8 (18.2)~~20.79~~	24~~24~~	222 (92)~~222~~
11~~11~~	10~~10~~	17.8 (11.5)~~17.76~~	14.3 (14)~~14.25~~	619 (33)~~619~~
12~~12~~	7~~7~~	8.7~~8.687~~	10~~10~~	34~~34~~

Table 3-3 Kennewick-Metaline Monthly PM_{10} Statisics in ug/m^3 with High-Wind events greater than 25mph excluded: 2012 – 2016
(Statistics that changed when high-wind threshold was set to 18 mph are shown in parentheses)

Month	Median	Mean	3rd Quartile	Max
1	7	7.4 (7.6)~~21~~	10	19
2	9	10.2 (9.6)~~3~~	12	64 (27)
3	10	12.2 (12.4)~~2~~	15	68
4	12	14.5 (13.3)~~49~~	18 (17)	72 (37)
5	16 (15)	17.3 (16.9)~~3~~	23 (22.5)	39 (38)
6	16	18.3 (17)~~3~~	23 (22)	60 (41)
7	20 (19)	22.1 (20.7)~~09~~	27 (26)	72 (60)
8	27.5 (27)	32.7 (32.2)~~2~~	41~~.25~~	82
9	22 (21)	27.1 (25.6)~~07~~	32	113 (76)
10	14 (14.5)	19.3 (17.4)~~28~~	24 (23.8)	222 (66)
11	10 (10.5)	11.4 (12)~~1~~	14 (15)	33
12	7	8.8 (9)~~789~~	10	34 (30)

4 Emissions Summaries and Charts

The emissions summaries and charts shown below represent the annual emissions in the maintenance area (Tons per Year) and the seasonal emissions in the maintenance area (pounds per day). The seasonal emissions (pounds per day) are calculated such that the month of the PM10 season with the highest emissions for each category is used.

Table 4-1: Base Year 2014 PM_{10} Emissions Summary

Source Type	Category	Tons per Year	Pounds per Day	% Pounds per Day
Point	≥ 70 Tons PTE	~~453~~330	~~2,485~~1,806	~~35~~29%
Point	< 70 Tons PTE	32	206	3%
Nonpoint	Ag. Burning	11	0	0%
Nonpoint	Ag. Tilling Dust	231	2,380	~~34~~38%
Nonpoint	Ag. Harvesting Dust	14	324	5%
Nonpoint	Construction Dust	92	700	~~10~~11%
Nonpoint	Paved Road Dust	53	412	~~6~~7%
Nonpoint	Unpaved Road Dust	62	448	~~6~~7%
Onroad	Mobile	10	57	1%
	All Sources Total	~~958~~835	~~7,013~~6,334	

Table 4-2: Projection Year 2020 PM_{10} Emissions Summary

Source Type	Category	Tons per Year	Pounds per Day	% Pounds per Day
Point	≥ 70 Tons PTE	654	3,588	42%
Point	< 70 Tons PTE	80	532	6%
Nonpoint	Ag. Burning	11	0	0%
Nonpoint	Ag. Tilling Dust	231	2,380	28%
Nonpoint	Ag. Harvesting Dust	14	324	4%
Nonpoint	Construction Dust	97	742	9%
Nonpoint	Paved Road Dust	56	435	5%
Nonpoint	Unpaved Road Dust	66	471	6%
Onroad	Mobile	8	46	1%
All Sources Total		1,216	8,519	

Table 4-3: Projection Year 2025 PM_{10} Emissions Summary

Source Type	Category	Tons per Year	Pounds per Day	% Pounds per Day
Point	≥ 70 Tons PTE	654	3,588	42%
Point	< 70 Tons PTE	80	532	6%
Nonpoint	Ag. Burning	11	0	0%
Nonpoint	Ag. Tilling Dust	231	2,380	28%
Nonpoint	Ag. Harvesting Dust	14	324	4%
Nonpoint	Construction Dust	102	780	9%
Nonpoint	Paved Road Dust	59	459	5%
Nonpoint	Unpaved Road Dust	68	492	6%
Onroad	Mobile	7	42	0%
	All Sources Total	1,226	8,599	

Table 4-~~2~~4: Projection Year 2030 PM_{10} Emissions Summary

Source Type	Category	Tons per Year	Pounds per Day	% Pounds per Day
Point	≥ 70 Tons PTE	654	3,588	41%
Point	< 70 Tons PTE	80	532	6%
Nonpoint	Ag. Burning	11	7	0%
Nonpoint	Ag. Tilling Dust	231	2,380	27%
Nonpoint	Ag. Harvesting Dust	14	324	4%
Nonpoint	Construction Dust	106	813	9%
Nonpoint	Paved Road Dust	66	514	6%
Nonpoint	Unpaved Road Dust	71	515	6%
Onroad	Mobile	7	43	0%
	All Sources Total	1,241	8,710	

Table 4-25: Point Source DetailEmissions, Base and Projection Years

Source Name	2014 (tons/year)	2020-2030 (tons/year)	2014 (pounds/day)	2020-2030 (pounds/day)
Sources ≥> 70 tpy				
Boise Paper	120	184	659	1,010
Simplot Feeders	333209	471	1,8261,147	2,578
Sources < 70 tpy				
Agrium US Inc	2	3	27	30
Gas Transmission NorthwestW Station 8	2	4	11	22
Greenbriar Rail Services	1	1	7	14
NW Grain Growers	4	30	34	230
Simplot Agribusiness	1	4	9	31
Tessenderlo Kerley Inc	4	5	24	27
Tyson	14	27	76	148
Western Stockmen	3	6	19	31
All Point Sources Total	485360	734	2,691013	4,120

5 Base Year 2014 Inventory

The base year inventory is an inventory of actual emissions in 2014. The sources included are shown in Table 5-1~~Table 5-1~~. All source categories inventoried in the first 10-year maintenance plan are included. Dust emissions from two new categories, construction activities and agricultural harvesting, were included. While wildfire emissions can impact the WMA, they were not included since they are unpredictable and uncontrollable. Windblown dust was not included as explained in section 1.1. Residential wood combustion was not included for two reasons: 1) it is only a small source in October and 2) days with large PM_{10} concentrations only have a small fraction of fine particulate matter.

Ecology estimated emissions and collected modeling tool parameters for the 2014 National Emissions Inventory. The 2014 Ecology inventory, which was submitted to EPA for inclusion in the 2014 NEI, was used for the base year annual inventory, except as noted in the category sections below. For some sources this required allocating county emissions to the WMA using spatial surrogates (see Section 6). A description of the estimation methods and data sources used in the inventory is provided in category sections below.

Table 5-1 Inventory Source List

Source Type~~Point Sources~~	**Category~~Nonpoint Sources~~**
Point ~~Point Sources ≥ 70 T PTE~~	≥ 70 Tons PTE~~Agricultural Tilling~~
Point~~Point Sources < 70 T PTE~~	< 70 Tons PTE~~Agricultural Harvesting~~
Nonpoint~~-~~	Ag. Burning~~Construction Dust~~
Nonpoint~~**Mobile Sources**~~	Ag. Tilling Dust~~Paved and Unpaved Road Dust~~
Nonpoint~~Onroad Mobile~~	Ag. Harvesting Dust~~Agricultural Field Burning~~
Nonpoint	Construction Dust
Nonpoint	Paved Road Dust
Nonpoint	Unpaved Road Dust
Onroad	Mobile

The emissions estimation methods and data sources for each source category are described below.

5.1 Point Sources

5.1.1 Point Sources ≥ 70 (tpy) Potential to Emit

For Serious nonattainment areas, the federal Clean Air Act defines point sources as any stationary source having the potential to emit 70 tons per year of PM_{10} (≥ 70 tpy PTE). This point source cutoff value was retained for the first 10-year maintenance plan, and is also retained for this second 10-year plan.

Benton Clean Air Agency (BCAA) and Ecology point source permitting records showed that Boise Paper and Simplot Feeders are the only sources with a PTE of 70 tpy PM_{10}.

Boise Paper is a federal Title V source and is required to report emissions annually. The 2014 annual emissions report was used to develop the base year point source inventory.

Simplot Feeders is a cattle feedlot. It is not a federal Title V source, but it is required to report emissions annually. In 2016, Ecology conducted a literature search to update emission factors for beef cattle feedlots. Ecology recommended the PM_{10} emission factor from a study done by Bonifacio, et al. (2012).[1] In a separate effort, EPA sponsored development of a spreadsheet tool to estimate PM_{10} emissions from beef feedlots and other livestock types.[2] EPA also chose the PM_{10} emission factor from Bonifacio, et al. (2012) for the tool. The tool was developed under the 2014 NEI process, and emissions are included in version 2 of the NEI. The Bonifacio factor included dust from unpaved roads. Ecology removed the unpaved dust portion of the factor, so it reflects feedlot pen emissions only. A 50% control factor was applied to the factor for the combined controls of sprinklers, cross-fencing, and pen scraping. Use of the new emission factor results in higher emissions than those reported by Simplot Feeders in their 2014 inventory. Ecology used the new emission factor with Simplot Feeders' 2014 number of head to estimate 2014 emissions from cattle.

Simplot also has emissions from grain and hay operations, a baghouse, and travel on unpaved roads. The unpaved road dust estimate includes a 70% reduction in emissions from watering. Emissions from grain and hay operations, the baghouse, and unpaved roads were estimated in 2016, but not 2014. Estimates were made for 2014 by multiplying the 2016 emissions by the ratio of 2014 to 2016 average head of cattle.

Table 5-2 Boise Paper 2014 Emissions

Unit	Unit Description	tpy	ppd
01	Lime Kilns	11.7	64
02	Smelt Tank Vent Rec Furn No 2	0.0	0
03	Kraft Rec Furn No 2 (Startup Dec 80)	0.6	3
04	Smelt Tank Vent Rec Furn No 3	47.0	258
10	Kraft Rec Furn No 3	12.0	66
21	Boiler #1 Nat Gas Res Oil	1.6	9
22	Boiler #2 Nat Gas Res Oil	1.9	10
23	Boiler Hog Fuel	23.0	126
24	Fugitive Emissions	6.8	37
28	All Other Processes	15.3	84
	TOTAL	**119.9**	**659**

Table 5-3 Simplot Feeders 2014 Emissions

Source	tpy	ppd
Feedlot		
Cattle	~~280.4~~156	~~1,536~~856
Grain and Hay Operations		
Receiving/shipping/handling	0.1	1

Source	tpy	ppd
Processing	0.3	2
Baghouse	6.9	38
Unpaved Roads		
Facility trucks	32.6	179
Delivery trucks	0.9	5
Feed preparation equipment	12.1	66
TOTAL	~~333~~209~~.3~~	1,~~826~~147

5.1.2 Point Sources < 70 tpy Potential to Emit

BCAA and Ecology permit stationary emissions sources in Benton and Franklin/Walla Walla Counties, respectively. Though they fall below the point source cutoff of 70 tons PTE, all permitted sources emitting PM_{10} were included in the inventory. Several sources are not inventoried annually. For those, the nearest year to 2014 was used. The facilities and their year of emissions are shown below. Sandvik Special Metals, LLC was identified in the Inventory Preparation Plan as a small source. Emissions were so low (0.06 tons per year of total particulate), that it was not included in the inventory.

~~5.1.21.1.1 Point Sources < 70 tpy Potential to Emit~~

~~BCAA and Ecology permit stationary emissions sources in Benton and Franklin/Walla Walla Counties, respectively. Though they fall below the point source cutoff of 70 tons PTE, all permitted sources emitting PM_{10} were included in the inventory. Several sources are not inventoried annually. For those, the nearest year to 2014 was used. The facilities and their year of emissions are shown below. Sandvik Special Metals, LLC was identified in the Inventory Preparation Plan as a small source. Emissions were so low (0.06 tons per year of total particulate), that it was not included in the inventory.~~

Table 5-4 Point Sources < 70 T Potential to Emit

Facility	Permitting Agency	Inventoried Annually?	Year	tpy
Agrium US Inc	BCAA	yes	2014	2.4
Gas Transmission Northwest Station 8	Ecology	yes	2014	2.0
Greenbriar Rail Services	BCAA	yes	2014	0.6
NW Grain Growers	Ecology	no	2015	4.5
Simplot Agribusiness	BCAA	yes	2014	1.1
Tessenderlo Kerley Inc	BCAA	yes	2014	4.3
Tyson	Ecology	no	2014	13.9
Western Stockmen	Ecology	no	2015	3.4

5.2 Nonpoint Sources - General Information

Nonpoint sources include a variety of sources such as road and agricultural dust. Emissions are typically estimated by multiplying an activity level by an emission factor in mass per activity.

5.2.1 Agricultural Burning

All agricultural burning in Washington requires a permit by law, but compliance is not 100%. Ecology compiled burn permit information for the 2014 inventory. Additionally, satellite-detected hot-spot data for agricultural land was obtained from EPA. The burn data for agricultural land from EPA was checked for errors (e.g. incorrect fire type, size, or crop) and then spatiotemporally cross-checked against the permit data for redundancy. Both datasets were then aggregated together. The burn permit and satellite detected locations were mapped using GIS tools to select the burns that occurred in the WMA.

Emissions were calculated for each burn in the 2014 inventory. Emissions are dependent on the number of acres (or tons) burned, pre-burn fuel loading, fuel consumption, and PM_{10} emission rates. The 2014 permits included either acres burned with a fuel loading factor, or tons of residue burned in piles. EPA default fuel loadings were used for satellite-detected burns. Combustion completeness factors (fraction of fuel actually consumed) and PM_{10} emission rates for cereal grains were taken from an Air Sciences Incorporated report.[3] Emission rates for other crop types were taken from EPA's AP42 for total particulate. For all AP42 factors, PM_{10} was estimated from total particulate using size fraction profiles from the California Air Resources Board.[4]

5.2.2 Agricultural Tilling

EPA provided an equation to calculate county agricultural tilling emissions in the 2014 NEI. The equation requires the number of acres tilled by crop type, the number of tilling passes by crop type, and the soil silt content. The total number of acres by county were obtained from the USDA's 2012 Census of Agriculture for fallow, cover, and sugar beets. Fallow and cover were obtained from the ‘‘land’’ section of the report while sugar beet acres were obtained from the “Acres Harvested” report. The WA Dept. of Agriculture (WSDA) 2014 survey reported “Acres Planted”, which were used for all other crops in the region. Note that some data in the 2014 WSDA survey aggregates a few counties together. In those cases a split was used, which was based on the ratio derived from the 2012 USDA Ag Census. The USDA 2012 “Acres Harvested” report was used to split acreage into conservation, no-till, and conventional acres. The number of assumed tilling passes per farm type was augmented from the original EPA assumptions as shown in Table 5-3.[5] Soil silt content was taken from National Cooperative Soil Survey data.[6]

Table 5-5 Tilling Passes per Year: EPA Assumptions with Augmented Data in Parentheses

Crop	Conventional	Conservation	No-Till
Barley	5	3	3 (0)
Beans	3	3	3 (0)
Canola	3	3	3 (0)
Corn	6	2	2 (0)
Cover	1	1	1 (0)
Fallow	1 (4)	1	1 (0)
Winter Wheat	5 (4)	3 (2)	3 (0)
Hay	3 (1)	3 (1)	3 (0)
Oats	5	3	3 (0)
Peas	3	3	3 (0)
Permanent Pasture	1 (0)	1 (0)	1 (0)
Potatoes	3	3	3 (0)
Soybeans	6	1	1 (0)
Spring Wheat	4 (2)	1	1 (0)
Sugarbeets	3	3	3 (0)

5.2.3 Agricultural Harvesting

Dust from agricultural harvesting is not estimated in the National Emissions Inventory; however, the Western Regional Air Partnership (WRAP) published a handbook for calculating dust emissions which includes harvesting operations.[7] PM_{10} from harvesting operations were calculated using the 2012 USDA survey of acres harvested by crop type. In cases of confidentiality where only state data was provided, the data was split evenly between counties that had data withheld. Emission factors for harvesting were taken from the WRAP handbook. The alfalfa hay emission factor is zero in the handbook but was replaced with the silage emission factor. No control measures were assumed.

5.2.4 Construction Dust

Dust from road construction, residential construction, and nonresidential construction was estimated by the EPA Nonpoint Methods Advisory Committee (NOMAD) for the 2014 NEI. Construction dust emissions are based on the total amount of soil disturbed, soil silt content, and soil moisture. EPA acquired silt content factors for each county, but used a single soil moisture value the entire state. Ecology calculated soil moisture parameters for the three counties in the WMA using local meteorological data from airport weather stations. Construction dust emissions estimates were then recalculated using the county-specific soil moisture. This greatly reduced the assumed soil moisture and consequently increased construction emissions estimates by more than a factor of 3. The recalculated estimates were used for the maintenance plan.

5.2.5 Paved Road Dust

Ecology estimated county paved road dust emissions for the 2014 NEI. Dust emissions are generated as vehicles pass along paved roadways and disturb the layer of loose material on or near the road surface. Information from Ecology's 2014 inventory documentation follows.

Monthly emissions were calculated by multiplying the number of vehicle miles traveled (VMT) by road class by the emission rates in grams per mile. The number of VMT by county for 2014 was provided by the Washington State Department of Transportation (WSDOT).[8, 9] WSDOT also supplied monthly VMT allocation factors.[10] Emissions were allocated to the WMA using spatially resolved VMT as described in Section 6.

Table 5-6 County Vehicle Miles Traveled, 2014

Road type	Benton (Rural)	Benton (Urban)	Franklin (Rural)	Franklin (Urban)	Walla Walla (Rural)	Walla Walla (Urban)
Interstate	652	521	0	371	0	0
Freeway/Expressway	0	613	496	183	151	121
Other Principal Arterial	0	546	0	161	223	150
Minor Arterial	223	629	0	143	125	162
Major Collector	124	297	227	68	150	58
Minor Collector	69	6	61	1	31	1
Local Road	46	460	60	180	43	123
TOTAL	**1,114**	**3,072**	**844**	**1,107**	**723**	**615**

Table 5-7 WSDOT VMT Monthly Adjustment Factors

Month	Rural interstate	Rural arterial	Rural other	Urban interstate	Urban arterial
Jan	0.77	0.77	0.72	0.92	0.92
Feb	0.85	0.86	0.77	0.97	0.95
Mar	0.93	0.90	0.82	0.99	0.98
Apr	1.00	0.95	0.87	1.01	1.01
May	1.03	1.04	1.05	1.06	1.06
Jun	1.12	1.12	1.23	0.99	1.07
Jul	1.22	1.25	1.42	0.98	1.06
Aug	1.24	1.20	1.36	0.98	1.07
Sep	1.10	1.11	1.20	0.99	1.03
Oct	1.03	1.03	1.01	0.95	1.00
Nov	0.89	0.84	0.84	0.91	0.93
Dec	0.83	0.79	0.71	0.91	0.93

Emission Rates and Estimates

Monthly PM_{10} emission rates in grams per mile were calculated using equation 2 in EPA's AP42 paved road dust chapter.[11] The equation is uses silt loading, vehicle weight, and days of precipitation to calculate emission rates in grams per mile by road class.

Equation 2:

$$E = [k\ (sL)^{0.91}\ (W)^{1.02}\ ] \times [1-(P/4N)] \quad \text{equation (2)}$$

where E is the emission factor in g/VMT
- k = g/VMT particle size multiplier (1 for PM_{10})
- sL = silt loading in g/m^2
- W = mean vehicle weight (tons)
- P = number of days with at least 0.01 inches of precipitation in the given month
- N = number of days in the given month

AP42 provided average silt loading on roads for several average daily traffic (ADT) classes. The WSDOT road classes were assigned to ADT classes based on the number of average daily VMT per roadway miles. These classifications are shown in Table 5-8~~Tables 5-8~~a & 5-8b. Individual urban sampling areas are not shown in the table; though, with the exceptions of the smallest urban areas, they all showed the same ADT classification as their urban average.

Mean vehicle weight for the HPMS road classes was calculated using information from the onroad inventory (Section 5.3). MOVES default in-use vehicle weights for each MOVES vehicle type were weighted by WSDOT's VMT estimates to calculate average vehicle weight on each road class. The distribution of VMT by vehicle type over each road class was calculated using WSDOT's travel fractions for major vehicle types[9] and MOVES output of VMT by more specific vehicle classes.

Days per month of precipitation greater than 0.01 inches in 2014 were obtained from two meteorological sites: Walla Walla Airport (Walla Walla County), and Pasco/Tri-Cities (Benton, Franklin Counties).[12] Days of precipitation acts as a control efficiency term by assuming that emissions occur only on days where the precipitation is below 0.01 inches. Monthly emissions were calculated with the precipitation adjustment.

Monthly emissions (Tons) = V x M x D x E x (lb/454 g) x (1 T/2000 lb)
where V = ADVMT
M = monthly VMT adjustment factor (Table 5-7Table 5-7)
D = number of days in month, and
E = emission factor in g/VMT

Annual emissions were calculated by summing the monthly emissions. Daily emissions were calculated assuming dry conditions.

Table 5-8a Estimated Average Daily Traffic (Rural)

Rural	Interstate	Free/Expr	Prin Art	Min Art	Maj Coll	Min Coll	Local
Miles of Road	425.41	612	1,297	2,032	8,080	6,261	37,765
ADVMT (1,000s)	12,069	4,577	5,768	5,909	9,319	2,852	3,048
Estimated ADT	28,370	7,481	4,447	2,908	1,153	455	81
ADT Class	> 10,000 limited access	5,000-10,000	500-5,000	500-5,000	500-5,000	< 500	< 500
silt loading (g/m^2)	0.015	0.06	0.2	0.2	0.2	0.6	0.6
Urban	Interstate	Free/Expr	Prin Art	Min Art	Maj Coll	Min Coll	Local
Miles	338	415	1,420	2,724	2,727	184	17,137
ADVMT (1,000s)	31,502	15,016	25,504	21,105	9,407	284	12,708
Estimated ADT	93,133	36,211	17,957	7,749	3,450	1,541	742
ADT Class	> 10,000 limited access	5,000-10,000	500-5,000	500-5,000	500-5,000	< 500	< 500
silt loading (g/m^2)	0.015	0.015	0.03	0.06	0.2	0.2	0.2

Table 5-98b Estimated Average Daily Traffic (Urban)

Urban	Interstate	Free/Expr	Prin Art	Min Art	Maj Coll	Min Coll	Local
Miles of Road	338	415	1,420	2,724	2,727	184	17,137
ADVMT (1,000s)	31,502	15,016	25,504	21,105	9,407	284	12,708
Estimated ADT	93,133	36,211	17,957	7,749	3,450	1,541	742
ADT Class	> 10,000 limited access	5,000-10,000	500-5,000	500-5,000	500-5,000	< 500	< 500
silt loading (g/m^2)	0.015	0.015	0.03	0.06	0.2	0.2	0.2

Table 5-109 Mean Vehicle Weight in Tons

Rural/Urban	Interstate	Free/Expr	Prin Art	Min Art	Maj Coll	Min Coll	Local
Rural	5.07	3.84	3.84	3.83	3.47	3.46	3.47
Urban	3.46	2.94	2.94	2.94	3.02	3.03	3.02

Table 5-1110 Precipitation Days Greater Than 0.01 Inches, 2014

Met Site	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Walla Walla AP	11	18	17	12	7	8	3	5	2	8	13	17	**121**
Pasco/Tri-cities	4	12	10	8	6	5	2	4	2	8	7	15	**83**

5.2.6 Unpaved Road Dust

Similar to paved roads, Ecology estimated county unpaved road dust emissions for the 2014 NEI. Unlike paved roads, the activity level was obtained specifically for the WMA from the county engineers.

Activity Level

The county engineers for Walla Walla, Benton and Franklin Counties provided VMT estimates on unpaved roads in the WMA.[13, 14] All unpaved roads in the Walla Walla County portion of the WMA were included. In Benton County, the inventory includes roads meeting two conditions: 1) length greater than or equal to 0.5 miles, and 2) greater than 20 vehicle trips per day (per EPA guidance).[15] There were no unpaved roads in the Franklin County portion of the WMA.

Monthly adjustments for the VMT were made using the WSDOT temporal adjustment factors for urban roads shown in Table 5-7~~Table 5-7~~.

Table 5-12~~11~~: WMA ADVMT on Unpaved Roads

WMA County	ADVMT
Benton	832
Walla Walla	253

Emission Rates

Unpaved road dust emissions were estimated according to Equation 2 in AP42.[16] The equation includes an adjustment for rainfall which acts as a control efficiency term by assuming that emissions occur only on days where the rainfall is below 0.01 inches. The equation was modified to calculate monthly emission rates. The original and modified AP42 equations are shown below.

$$E = [k\ (s/12)^a\ (S/30)^d\ /\ (M_{dry}/0.5)^c - C] \times [(365-p)/365] \qquad \text{(original AP42 Equation 2)}$$

$$E = \{[k\ (s/12)^a\ (S/30)^d\ /\ (M_{dry}/0.5)^c] - C\} \times [(n-p)/n] \qquad \text{(modified AP42 Equation 2)}$$

where E is the emission factor in lb/VMT
- k = particle size multiplier (1.8 for PM_{10})
- s = silt content (%)
- a = PM_{10} constant (1)
- c = PM_{10} constant (0.2)
- d = PM_{10} constant (0.5)

S = speed in mph
C = material from exhaust, brake and tire wear in lb/mi (AP42 default: 0.00047 for PM_{10})
n = number of days in the given month
p = number of days with at least 0.01 inches of precipitation in the given month
M_{dry} = surface material moisture content (%)

Monthly days of precipitation greater than 0.01 inches were taken from Table 5-11~~Table 5-10~~. Vehicle speed was not available. The VMT-weighted average speed on local roads for Spokane in 2002 was used as an estimate (30 mph).[17]

The surface material silt content (3.2%) and moisture content (1%) were obtained from the Western Regional Air Partnership (WRAP).[18, 19]

Monthly emissions were calculated using the equations below. Annual emissions were calculated by summing the monthly emissions.

Monthly emissions (Tons) = V x M x D x E (1 T/2000 lb)
where V = ADVMT
M = monthly VMT adjustment factor (Table 5-7~~Table 5-7~~)
D = number of days in month, and
E = emission factor in lb/VMT

Daily emissions were calculated assuming dry conditions.

5.3 Onroad Mobile Sources

Onroad mobile source emissions are those generated by operating vehicles on public roadways. Emissions from fuel combustion and evaporation, and brake and tire wear were estimated.

EPA's Motor Vehicle Emission Simulator (MOVES) model version 2014 with database version 20141021 was used to calculate emissions. MOVES combines basic vehicle activity information with information about vehicle and fuel characteristics, emissions control programs, meteorological information, and other parameters to estimate county emissions. The basic activity data are vehicle miles traveled (VMT) and vehicle population. VMT, vehicle population, and a brief description of the MOVES input parameters are described below. The MOVES Technical Guidance for SIP inventories and the MOVES User's Guide were used in developing many of the inputs to MOVES.[20, 21] Emissions were allocated to the WMA using spatially resolved VMT as described in Section 6.

Vehicle Miles Traveled

VMT is used to calculate emissions from vehicles while they are in motion. VMT for onroad mobile is the same as that used to estimate emissions from paved road dust (Table 5-6~~Table 5-6~~).

Vehicle Population

Vehicle population is used to calculate emissions while a vehicle is stationary. The emissions come from engine starts, extended idling, and some fuel evaporation processes. Vehicles are classified by age and type. There are thirteen vehicle types in MOVES within six broader categories: cars, motorcycles, light-duty trucks, heavy-duty single unit trucks, heavy-duty combination unit trucks, and buses.

Three sources were used to calculate vehicle population. The first was the Washington State Department of Licensing (DOL). DOL registers non-governmental vehicles annually.[22] Government vehicles have a one-time registration. Because DOL does not register public transit and school buses each year, alternate sources of information were obtained. Transit and Intercity bus data came from the Federal Transit Administration (FTA) Annual Report data for 2013 (most recent available).[23] School bus information for 2014 was obtained from the Washington State Office of the Superintendent of Public Instruction (OSPI).[24]

Table 5-1312 Vehicle Population

Vehicle Type	Benton	Franklin	Walla Walla	TOTAL
Motorcycles	6,871	1,838	2,105	**10,814**
Cars	76,441	32,770	20,719	**129,930**
Light Trucks	84,520	37,195	26,829	**148,544**
Buses	384	162	108	**654**
Single Unit Trucks	3,941	2,484	1,614	**8,039**
Combination Unit Trucks	757	1,125	321	**2,203**
TOTAL	**172,914**	**75,574**	**51,696**	**300,184**

MOVES Input Parameters

MOVES includes a default database that summarizes emission relevant information for all counties in the United States. Default data may be replaced by local data to improve the estimates. Ecology developed local data for many of the parameters in MOVES.

Input parameters were developed that were characteristic of local conditions for each county and month. Some of the parameters presented here required local data. For others, EPA guidance recommended that local data be used. The parameters are shown in the table below.

Table 5-1413 MOVES Model Parameters

Parameter	Data Source	References
Vehicle population	DOL, OSPI, FTA	22, 23, 24
Vehicle miles traveled	WSDOT with EPA default tailoring	8, 9
Temporal allocation to month, day of week, and hour	WSDOT with EPA default tailoring	10
California Emissions Standards	CA standards are incorporated into the MOVES model as an option	25
Fuel parameters	State regulations and EPA default data	26
Hourly temperatures	County defaults	
Road type distribution	WSDOT with EPA default tailoring	8, 9

Parameter	Data Source	References
Vehicle age distribution	Local (DOL, OSPI, FTA)	22, 23, 24
Speeds	Default	
Ramp fraction	Default	
Vehicle refueling	Dept. of Ecology and Default	27, 28, 29, 30

6 Spatial Allocation Methods

Sources with coordinates or other location information were allocated to the WMA. For sources without specific coordinates or other location information, spatial surrogates were used to approximate the amount of the county emissions in the WMA. The surrogates were allocated to the WMA using GIS tools and scripts. Each emissions source was assigned to an appropriate surrogate. WMA emissions are estimated as:

$E_{WMA} = E_{County} * Surrogate_{WMA} / Surrogate_{County}$

Where E_{WMA} = emissions in the WMA
E_{County} = emissions in the county
$Surrogate_{WMA}$ = surrogate activity in the WMA
$Surrogate_{County}$ = surrogate activity in the county

The spatial allocation methods and data sources are shown in the table below. The surrogates are from EPA's 2011 modeling platform, the WA Dept. of Agriculture, or WSDOT.

Cover crops are not included in the WA Dept. of Agriculture Land Use shapefile. So, local knowledge was used to estimate the acres of cover crops in the maintenance area.[31]

Table 6-1 Spatial Surrogates

Sector and Category	Spatial Surrogate	Data Source
Agricultural Burning	Burn coordinates used. *Surrogate not needed*	Ecology and BCAA burn permit records. Satellite burn detects.
Agricultural Tilling	2016 WSDA Ag. Land Use	2016 WSDA Ag. Land Use
Agricultural Harvesting	2016 WSDA Ag. Land Use	2016 WSDA Ag. Land Use
Construction Dust - Ind/Comm/Instit	2010 50% Housing change and 50% population	US Census Bureau (EPA platform)
Construction Dust - Residential	2010 50% Housing change and 50% population	US Census Bureau (EPA platform)
Construction Dust - Roads	2010 50% Housing change and 50% population	US Census Bureau (EPA platform)
Paved Road Dust	Vehicle miles traveled	WSDOT 2015 GIS VMT
Unpaved Road Dust	County engineer estimates. *Surrogate not needed.*	County engineering estimate
Onroad Mobile Sources	Vehicle miles traveled	WSDOT 2015 GIS VMT

7 Temporal Allocation Methods

Emissions were estimated for a weekday during each source's peak month of emissions from the months June - October. The daily emissions were calculated in one of four ways:

1) Source-specific operating schedule (point sources only).
2) Calculation using season-specific information (nonpoint and mobile only).
3) Temporal profiles.
4) Assume uniform distribution throughout the year.

The temporal profiles were developed by EPA and supplemented with information from the Northwest International Air Quality Environmental Science and Technology Consortium (NW-AIRQUEST). Monthly temporal profiles assign the fraction of annual emissions occurring each month, and day of week temporal profiles assign the monthly fractions to individual days. Wednesday was chosen as a typical weekday. The method used or each source is described below.

7.1 Point Sources

Source-specific operating schedules from their annual emissions reports were used to calculate daily emissions from Agrium US Inc., Boise Paper, Gas Transmission Northwest Station 8, Greenbriar Rail Services, Simplot Agribusiness, and Tessenderlo Kerley Inc.

Operating schedule information was not collected for NW Grain Growers, Simplot Feeders, Tyson, or Western Stockmen. NW Grain Growers was assumed to operate uniformly, five days per week. Simplot Feeders, Tyson, and Western Stockmen were assumed to operate uniformly seven days per week.

7.2 Nonpoint Sources

7.2.1 Agricultural Burning

One orchard burn was permitted in the WMA in 2014 during the PM10 season, generating 209 lbs of PM_{10}. This burn will not be counted in the daily inventory. For the daily inventory, Ecology will assume that no burning occurs. Although it is possible to generate significant emissions from agricultural field burning during individual days, daily burn permit decisions are made to minimize impacts on the WMA. This assumption was also made in the first 10-year maintenance plan inventories.

7.2.2 Agricultural Tilling and Harvesting

Temporal profiles were used to estimate emissions. Monthly profiles for agricultural harvesting were constructed from usual Washington State harvesting times, as reported by the National Agricultural Statistics Service. The EPA profile for agricultural tilling from the 2011 modeling platform was used for all crop tilling.

7.2.3 Dust from Construction, and Paved and Unpaved Roads

The equations for calculating dust emissions include a precipitation variable. For the seasonal day inventory, Ecology assumed there is no rainfall since PM_{10} exceedances are not likely on rainy days. Adjustments for expected activity rates were made using the EPA temporal profile for construction from the 2011 modeling platform.

7.3 Onroad Mobile Sources

Daily emissions were outputs from the MOVE model runs used to construct Ecology's 2014 inventory. Meteorological conditions (temperature, humidity) and monthly and day-of-week profiles are an integral part of MOVES. Emissions for a July and October weekday were output from MOVES. July had the highest emissions in the WMA; therefore, July weekday emissions were used as the seasonal day estimate.

8 Projection Years Inventory Development

The 2014 emission inventories were projected to 2020, 2025 and 2030 using EPA guidance. Though not irrelevant, guidance documents for projecting PM_{10} emissions are outdated. EPA recently published guidance for ozone, $PM_{2.5}$, and regional haze.[32] Ecology used the goals and advice in the new guidance to project the baseline inventory:

> The primary goal in making projections is to obtain a reasonable and technically credible estimate of future-year emissions that accounts for key variables. The EPA encourages the air agencies to incorporate in their analyses the variables that have historically been shown to drive their economy and emissions, as well as the changes in growth patterns and regulations that are expected to take place between the time of their base year and projected attainment year.

Projection methods are described for each source category below.

8.1 Point Sources

In the first 10-year maintenance plan, Ecology was required to project emissions by using allowable emissions for point sources with 70 tpy PTE. This resulted in emissions estimates that were up to four times higher than the highest actual emissions during the maintenance planning period and later. Under the new guidance allowables are not required, so more reasonable estimates were made. Permit conditions, controls, orders, and future activity levels were considered in making emissions projections for all point sources.

Table 8-1 Point Source Projection Methods

Source	Projection Methods
Sources > 70 tpy	
Boise Paper	Facility estimated expected emissions
Simplot Feeders	Estimated based on permitted cattle capacity. Feedlot is expected to increase current cattle to the maximum capacity.
Sources < 70 tpy	
Agrium US Inc	Highest actual emissions from 2009-2016.
Gas Transmission Northwest Station 8	Highest actual emissions over 12 years. (This source changes very little from year to year.)
Greenbriar Rail Services	Highest actual emissions from 2009-2016.
NW Grain Growers	Emissions associated with high end of estimated annual grain production. Variable from year to year.
Simplot Agribusiness	Highest actual emissions from 2009-2016.
Tessenderlo Kerley Inc	Highest actual emissions from 2009-2016.
Tyson	Emissions are the facility potential to emit from the permit's technical support document.
Western Stockmen	Emissions are the facility potential to emit from the permit's technical

Source	Projection Methods
	support document.

Table 8-2 Boise Paper 2020 - 2030 Projected Emissions

Unit	Unit Description	tpy	ppd
01	Lime Kilns	40.0	220
02	Smelt Tank Vent Rec Furn No 2	4.0	22
03	Kraft Rec Furn No 2 (Startup Dec 80)	8.0	44
04	Smelt Tank Vent Rec Furn No 3	42.0	231
10	Kraft Rec Furn No 3	32.0	176
21	Boiler #1 Nat Gas Res Oil	2.0	11
22	Boiler #2 Nat Gas Res Oil	2.0	11
23	Boiler Hog Fuel	32.0	176
24	Fugitive Emissions	6.8	37
28	All Other Processes	15.0	82
	TOTAL	**183.8**	**1,010**

The maximum capacity for Simplot Feeders is 80,000 head. Emissions were projected by multiplying the 2014 base year estimates by the ratio of the maximum head capacity (80,000) to 2014 actual head (56,635).

Table 8-3 Simplot Feeders 2020 - 2030 Projected Emissions

Source	tpy	ppd
Feedlot		
Cattle	395.8	2,169
Grain and Hay Operations		
Receiving/shipping/handling	0.2	1
Processing	0.5	3
Baghouse	9.7	53
Unpaved Roads		
Facility trucks	46.1	253
Delivery trucks	1.2	7
Feed preparation equipment	17.0	93
TOTAL	**470.6**	**2,578**

8.2 Nonpoint Sources

Nonpoint source projections are typically made using local information and/or growth surrogates using the equation:

$$\textit{Emissions}_{\textit{projected year}} = \textit{Emissions}_{\textit{base year}} \times \textit{Growth Indicator Factor}_{\textit{surrogate activity}}$$

8.2.1 Agricultural Burning, Tilling, and Harvesting

Fallowed land and cover crops are the source of the majority of agricultural dust emissions in the Wallula Maintenance Area. There is no known growth trend indicator for fallowed or cover crops. There are growth trend indicators for the dominant crops in the maintenance area (corn and wheat), such as state statistics on acres harvested and crop production, but those indicators show no clear trend. In fact, agricultural activity varies each year depending on meteorology, crop rotation, and the anticipated market price of crops. Therefore, agricultural activity (burning, tilling, and harvesting) was held constant in the projected emissions.

8.2.2 Dust from Construction

Dust from construction was projected using county population predictions acquired from the WA Office of Financial Management (OFM) Growth Management Act (GMA) county projections. The growth factors derived from the OFM population projections are shown in the table below.

Table 8-4 Construction Dust Growth Projections from 2014 to Future Year

County	2020	2025	2030
Benton	8.08%	15.68%	22.34%
Walla Walla	3.16%	5.89%	8.15%
Franklin	15.14%	31.39%	47.16%

8.2.3 Paved and Unpaved Road Dust

Dust from paved road was projected using VMT growth rates provided by the Benton-Franklin Council of Governments.[33] The forecast VMT growth rate was approximately 1.1% per year.

Dust from unpaved road was projected using VMT growth rates provided by the Walla Walla County Department of Public Works and the Benton County Roads Department.[34, 35] The forecast growth rate was 2% per year for unpaved road in the Walla Walla County portion of the WMA, and 0.5% per year for the Benton County portion.

8.3 Onroad Mobile Sources

In the Inventory Preparation Plan, we planned to use local input data to run MOVES for each county and projection year. It is a time-consuming effort and since onroad mobile emissions were less than 0.5% of the WMA daily inventory, it was decided to take a simpler approach to projecting emissions, which is described below. This approach is often used by Ecology in evaluating mobile source strategies.

The 2014 county emissions were projected to 2020, 2025, and 2030 using VMT growth rates provided by the Benton-Franklin Council of Governments (same as for paved road dust)[33] and MOVES default emissions trends for Walla Walla County. The same trend was applied to the Benton and Franklin County portions of the WMA. The forecast VMT growth rate was approximately 1.1% per year. The approach was:

1) Use MOVES with default data to estimate emissions for each year. The annual emissions were calculated by running one month to represent each season (Jan, Apr, Jul, Oct). This is the same way annual emissions were estimated for the 2014 comprehensive inventory.
2) Construct annual and summer weekday ratios for PM10 and VMT relative to the 2014 estimates: Year N/Year 2014.
3) Use the ratios to adjust the comprehensive 2014 inventory estimates to each of the projection years.

Emissions were calculated using the equations below for each county:

Year N tons/yr = (2014 tons/yr) x (Year N VMT / 2014 VMT) x [(Year N g/mi) / (2014 g/mi)]
Year N lbs/day = (2014 lbs/day) x (Year N VMT / 2014 VMT) x [(Year N g/mi) / (2014 g/mi)]

where N = projection years 2020, 2025, and 2030
2014 tons/yr and lbs/day = emissions from the 2014 comprehensive inventory
Year N tons/yr and lbs/day = projection year N emissions estimate for the pollutant
VMT = county VMT from the 2014 comprehensive inventory
2014 g/mi = Walla Walla County MOVES default emission rate for 2014
g/mi = Walla Walla County MOVES default emission rate for projection year N

9 Quality Assurance Report

The quality assurance plan for the emissions inventory was described in the Inventory Preparation and Quality Assurance Plan (IPP). The data quality objectives were accuracy, completeness, comparability, and representativeness.

Data Quality Objectives
- *Accuracy:* Emissions estimates are made using acceptable methods and are documented.
- *Completeness:* The inventory includes all applicable source categories and contains all the information required to estimate emissions.
- *Comparability:* Base year and projection year estimates are comparable, and estimates are comparable to the estimates in the first 10-year maintenance plan. If estimates are outside of specified ranges, they are explained.
- *Representativeness:* Actual 2014 annual and PM_{10} season daily emissions for the base year inventory are estimated. Inventory calculations use local data wherever possible.

The plan specified four quality assurance procedures to address the data quality objectives:
- Reality/peer review checks
- Sample calculations
- Sensitivity analysis (ranking)
- Range checks

The results of the procedures are discussed below.

9.1 Quality Assurance Results

9.1.1 Plan Adherence, Reality/Peer Review, Sample Calculations

The inventory source category list in the inventory preparation plan was checked against the inventory for inclusion of all appropriate source categories. Information sources and emissions estimation methods specified in the inventory preparation plan were also checked against the inventory. Reality/peer review, and sample calculation checks were performed on the final inventory.

Overall, the IPP had been followed. Methods, data, and inventory assumptions were judged reasonable. Sample calculations verified inventory results. The checking procedure brought out areas in the inventory text where additional documentation or clarification was necessary. Follow-up actions were taken to supply the additional information.

9.1.2 Standard Range Check

The standard range check consisted of three major inventory comparisons. In the first comparison, the base year 2014 inventory was compared to the first 10-year maintenance plan 2002 base year and 2015 projection year inventories. In the second comparison, the 2020 - 2030 projection inventories were compared to the first 10-year maintenance plan 2015 projection year inventory. In the third comparison, the 2014 base year inventory was compared to the 2020 - 2030 projections. Differences greater than 20% involving sources that made up greater than 5% of any of the comparison inventories are justified.

The range check for the third comparison was a small deviation from the IPP. In the IPP, justification for the third comparison was to be made for differences greater than the population increase percentage plus 10% for sources that made up greater than 5% of any of the comparison inventories. Because the population increase percentage plus 10% was very close to 20%, the 20% check was used for all three comparisons.

Two major differences between the first and second 10 year plan inventories that affect the comparisons are noted. (1) Two new categories were included in the second 10 year plan: construction activities and agricultural harvesting. (2) In the first 10 year plan, Ecology was required to project allowable emissions for point sources with 70 TPY potential to emit. In the second 10 year plan, estimates are based on anticipated actual emissions.

It is also noted that there is no known growth trend indicator for crops, therefore, agricultural activity (burning, tilling, and harvesting) was held constant in the projected emissions in both the first 10-year plan and in this second 10-year plan.

Emissions estimates are compared between base years and projection years in Table 9-1, Table 9-3, and Table 9-4. Sources greater than 5% of any daily inventory are highlighted in blue in the tables. Differences greater than 20% are highlighted in peach. Differences meeting both the range check criteria are explained below each table.

Table 9-1 Comparison of WMP2 Base Year 2014 to WMP1 Base Year 2002 and WMP1 2015 Projections

Source	WMP2 ppd (2014)~~lbs per day~~	WMP1 ppd (2002)	WMP1 ppd (2015)	~~% lbs per day~~WMP 2 % (2014)	WMP1 % (2002)	WMP1 % (2015)	% change (2014-2002)	% change (2014-2015)
~~-~~	~~WMP2~~	~~WMP1~~		~~WMP2~~	~~WMP1~~		~~-~~	
~~-~~	~~2014~~	~~2002~~	~~2015~~	~~2014~~	~~2002~~	~~2015~~	~~2002~~	~~2015~~
POINT SOURCES								
≥ 70 Tons PTE	~~2,485~~1,806	1,035	6,923	~~35~~29%	20%	61%	~~140~~75%	-~~64~~71%
< 70 Tons PTE	206	965	1,027	3%	19%	9%	-79%	-80%
NONPOINT SOURCES								
Ag. Burning	0	0	0	0%	0%			
Ag. Tilling Dust	2,380	2,606	2,606	~~34~~38%	51%	23%	-9%	-9%
Ag. Harvesting Dust	324			5%				
Construction Dust	700			~~10~~11%				
Paved Road Dust	412	305	447	~~6~~7%	6%	4%	35%	-8%
Unpaved Road Dust	448	124	286	~~6~~7%	2%	3%	261%	57%
MOBILE SOURCES								
Mobile	57	53	35	1%	1%	0%	8%	63%

~~WMP1: First 10 year Wallula Maintenance Plan, WMP2: First 10 year Wallula Maintenance Plan~~

Point source~~s,~~, agricultural dust, ~~and~~ paved road dust, and unpaved road dust differences in Table 9-1 are explained below~~require explanation~~. ~~Agricultural dust differences will also be explained.~~

Point Sources: Individual point source differences help explain the overall difference in point sources. The largest differences occurred in Boise Paper, Simplot Feeders, and Wallula Power. each is discussed below.

Table 9-2 Point Source ~~Differences~~Comparison in pounds per day, WMP1 and WMP2

Source	WMP2 (2014)	WMP2 (2020-2030)	WMP1 (2002)	WMP1 (2015)
	~~2014~~	~~2020-2030~~	~~2002~~	~~2015~~
≥ 70 Tons PTE				
Boise Paper	659	1,010	1,035	4,834
Wallula Power			0	2,089
Simplot Feeders	~~1,826~~1,147	2,578	219	253
< 70 Tons PTE				
Agrium US Inc	27	30	472	494
Gas Transmission ~~Northwest~~ NW Station 8	11	22	37	70
Greenbriar Rail Services	7	14		
NW Grain Growers	34	230	28	28
Sandvik			1	1
Simplot Agribusiness	9	31	0	0

Source	WMP2 (2014)	WMP2 (2020-2030)	WMP1 (2002)	WMP1 (2015)
Tessenderlo Kerley Inc	24	27		
Tyson	76	148	208	180
Western Stockmen	19	31		
All Point Sources Total	*2,013~~691~~*	*4,120*	*2,000*	*7,949*

Boise Paper: The reduction from 2002 to 2014 was primarily due to reductions in emissions from the recovery furnaces, lime kiln, and hog fuel boiler. Emissions fluctuate from year-to-year according to production, fuels, controls, and emission factors and source test results. A full investigation was not made into the individual differences. Allowable emissions are responsible for the large reduction from the 2015 projection to the 2014 base year. The 2015 projection was based on allowable emissions, which are much higher than actual emissions. The 2014 emissions were actual emissions.

Wallula Power: The 2015 projection inventory included a newly permitted source, Wallula Power. Its permitted emissions were included in the projection; however, the source was never constructed.

Simplot Feeders: EPA and Ecology adopted a new emission factor for dust emissions from beef feedlots. The new emission factor is much high than the factor used in the WMP1. In the WMP1, Simplot Feeders was treated as a small point source (< 70 tons PTE). In the WMP2, it is treated as a large point source (≥ 70 tons PTE).

Agrium US Inc: Several emissions units that generated particulate emissions were shut down in 2005.

Agricultural Tilling: Agricultural tilling estimates decreased by 9%, relative to the WMP1, which is within the standard range check parameters. However, since tilling is such a large portion of the emissions inventory, the differences are explained here. The WMP1 only included tilling emission estimates from wheat, alfafa, and corn; of which only winter wheat was assumed to have tilling during the season. The WMP2 included tilling emission estimates from the additional crops of barley, cover crops, fallow land, non-alfalfa hay, peas, and potatoes; and the WMP2 uses temporal profiles based on the EPA modeling platform, which assumes tilling of all crops during all months. The WMP2 season also includes October, unlike the WMP1 season. Although these changes would serve to increase emissions, there was still a modest decrease in tilling emission estimates due to the assumed number of tilling passes for wheat farms. The WMP1 assumed 7 tilling passes per year for winter wheat farms, while the WMP2 assumes 4 tilling passes for conventional farms and 2 tilling passes for reduced-tillage (conservation) farms.

Paved Road Dust: Two factors influenced the difference in emissions. The EPA equation for calculating paved road dust emissions changed between the WMP1 and WMP2, and more finely resolved VMT and silt loading was used for the new 2014 base year inventory.

Unpaved Road Dust: The differences in emissions are explained by the higher VMT estimated in the 2014 inventory. Emissions increases were directly proportional to the increase in VMT. The county engineers estimated VMT for both the WMP1 and WMP2.

Table 9-3 Comparison of WMP1 2015 Projections to WMP2 2020 - 2030 Projections ~~to 2015 Projection~~

Source	WMP1 ppd (2015)	WMP2 ppd (2020)	WMP2 ppd (2025)	WMP2 ppd (2030)	WMP1 % (2015)	WMP2 % (2020)	WMP2 % (2025)	WMP2 % (2030)	% change (2015-2020)	% change (2015-2025)	% change (2015 - 2030)
POINT SOURCES											
≥ 70 Tons PTE	6,923	3,588	3,588	3,588	61%	42%	42%	41%	-48%	-48%	-48%
< 70 Tons PTE	1,027	532	532	532	9%	6%	6%	6%	-48%	-48%	-48%
NONPOINT SOURCES											
Ag. Burning	0	0	0	0	0%	0%	0%	0%			
Ag. Tilling Dust	2,606	2,380	2,380	2,380	23%	28%	28%	27%	-9%	-9%	-9%
Ag. Harvesting Dust		324	324	324		4%	4%	4%			
Construction Dust		742	780	813		9%	9%	9%			
Paved Road Dust	447	435	459	514	4%	5%	5%	6%	-3%	3%	15%
Unpaved Road Dust	286	471	492	515	3%	6%	6%	6%	65%	72%	80%
MOBILE SOURCES											
Mobile	35	46	42	43	0%	1%	0%	0%	32%	20%	21%

~~WMP1: First 10 year Wallula Maintenance Plan, WMP2: First 10 year Wallula Maintenance Plan~~

Point source~~s~~, agricultural dust, and unpaved road dust differences in Table 9-3 ~~require explanation~~are explained below.~~ Agricultural dust differences will also be explained.~~

Point Sources: See Table 9-2. Allowable emissions were used for Boise Paper and Wallula Power in the 2015 projection. Wallula Power was not constructed. The 2020 - 2030 projections for Boise Paper were based on expected actual emissions. The large increase in Simplot Feeders emissions resulted from using the new higher emission factor for dust from hooves~~, and expected increase in cattle throughput~~.

Agricultural Tilling: Tilling emissions were held constant in the projection years. So, the difference in emissions between WMP1 and WMP2 projections is due to the same reasons as the base year differences (discussed above).

Unpaved Road Dust: The differences in emissions are explained by the higher VMT estimated in the 2014 inventory. Emissions increases were directly proportional to the increase in VMT. The county engineers estimated VMT for both the WMP1 and WMP2.

Table 9-4 Comparison of WMP2 Base Year 2014 to 2020 - 2030 Projections

Source	WMP2 ppd (2014)	WMP2 ppd (2020)	WMP2 ppd (2025)	WMP2 ppd (2030)	WMP2 % (2014)	WMP2 % (2020)	WMP2 % (2025)	WMP2 % (2030)	% change (2014-2020)	% change (2014-2025)	% change (2014-2030)
POINT SOURCES											
≥ 70 Tons PTE	~~2,485~~ 1,806	3,588	3,588	3,588	~~35~~29%	42%	42%	41%	~~44~~99%	~~44~~99%	~~44~~99%
< 70 Tons PTE	206	532	532	532	3%	6%	6%	6%	158%	158%	158%
NONPOINT SOURCES											
Ag. Burning	0	0	0	0	0%	0%	0%	0%	0%	0%	0%
Ag. Tilling Dust	2,380	2,380	2,380	2,380	~~34~~38%	28%	28%	27%	0%	0%	0%
Ag. Harvesting Dust	324	324	324	324	5%	4%	4%	4%	0%	0%	0%
Construction Dust	700	742	780	813	~~10~~11%	9%	9%	9%	6%	11%	16%
Paved Road Dust	412	435	459	514	~~6~~7%	5%	5%	6%	5%	11%	25%
Unpaved Road Dust	448	471	492	515	~~6~~7%	6%	6%	6%	5%	10%	15%
MOBILE SOURCES											
Mobile	57	46	42	43	1%	1%	0%	0%	-19%	-26%	-25%

~~WMP1: First 10 year Wallula Maintenance Plan, WMP2: First 10 year Wallula Maintenance Plan~~

Point source~~s,~~ and paved road dust differences ~~require explanation~~in Table 9-4 are explained below.

Point Sources: Individual point source differences help explain the overall difference in point sources (see Table 8-1 and Table 9-2). The differences in large point source ~~s~~ (≥70 tons PTE) projections compared to the base year ~~are primarily~~is due to ~~an~~ the assumption that~~expected increase in~~ cattle throughput at Simplot Feeders -will increase to their maximum allowable 80,000 head~~in the projection years~~. The differences in the smaller point sources (< 70 tons PTE) are due to using maximum actual emissions over multi-year periods or PTEs for each source in the projection years.

Paved Road Dust: Only the 2030 projection exceeded the range check criteria. The increase is due to assumed VMT growth rates.

9.1.3 Sensitivity Analysis (Ranking)

Table 9-4 shows that agricultural tilling and large point sources (≥70 tons PTE) are the largest source of daily emissions at ~~35~~27% -~~42~~38% and ~~27~~29% - ~~34~~42%, respectively. All other sources compared range from < 1% to ~~10~~11% of the inventory. The daily emissions inventory is a simple accounting of emissions. Variability in meteorological conditions and source activity will affect emissions and their impact on air quality.

9.2 Corrective Action

Corrective and follow-up actions identified during the quality assurance checking process were referred to the appropriate staff. Follow-up actions were taken to supply additional documentation and clarification in the inventory text.

9.3 Conclusion

The inventory accuracy, completeness and comparability objectives were met. All estimates were calculated and documented using accepted methods (accuracy). All source categories in the IPP were addressed in the inventory, and all information required to estimate emissions was present (completeness). Comparisons were made between the WMP1 and WMP2 inventories and differences were explained.

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Appendix B. Strikeout changes made to Appendix A.2