Appendix A. Rules Establishing State Authority

This page intentionally left blank for correct double-sided printing.

Appendix A. Rules Establishing State Authority

IDAPA 58.01.01 Rules for the Control of Air Pollution in Idaho

http://adminrules.idaho.gov/rules/current/58/0101.pdf

IDAPA 58.01.23 Rules of Administrative Procedure before the Board of Environmental Quality

http://adminrules.idaho.gov/rules/current/58/0123.pdf

Idaho Administrative Code
Title 67 State Government and State Affairs
Chapter 52 Idaho Administrative Procedures Act

http://www.legislature.idaho.gov/idstat/Title67/T67CH52.htm

This page intentionally left blank for correct double-sided printing.

Appendix B. Legal Description for Northern Ada County PM10 Maintenance Area

This page intentionally left blank for correct double-sided printing.

Appendix B. Legal Description for Northern Ada County PM10 Maintenance Area

The legal description of the Northern Ada County PM_{10} area boundaries is as follows:

Beginning at a point in the center of the channel of the Boise River where the section line between Sections 15 and 16 of Township 3 North, Range 4 East, crosses the Boise River.

Northern Boundary

Thence down the center of the channel of the Boise River to a point opposite the mouth of Mores Creek.

Thence in a straight-line going 44 degrees north and 38 minutes west until said line intersects the north line of Township 5 North in Range 1 East.

Thence west to the northwest corner of Section 6, Township 5 North, Range 1 West.

Western Boundary

Thence south to the northwest corner of Section 6, Township 3 North, Range 1 West.

Thence east to the northeast corner of Section 5, Township3 North, Range 1 West.

Thence south to the southeast corner of Section 32, Township 2 North, Range 1 West.

Thence west to the northwest corner of Section 6, Township 1 North, Range 1 West.

Thence south to the southwest corner of Section 31, Township 1 North, Range 1 West.

Southern Boundary

Thence east to the southeast corner of Section 33, Township 1 North, Range 4 East.

Eastern Boundary

Thence north to the point of beginning.

This page intentionally left blank for correct double-sided printing.

Appendix C. Speciated Linear PM_{10} Roll-Forward Modeling Report: In Support of the Northern Ada County PM_{10} Maintenance Plan Renewal

This page intentionally left blank for correct double-sided printing.

Speciated Linear PM_{10} Roll-Forward Modeling Report

In Support of the Northern Ada County
PM_{10} Maintenance Plan Renewal

State of Idaho
Department of Environmental Quality

August 2012

Revised January 2013

Speciated Linear PM_{10} Roll-Forward Modeling Report

August 2012
Revised January 2013

Prepared by
Idaho Department of Environmental Quality
1410 North Hilton
Boise, Idaho 83706

This page intentionally left blank for correct double-sided printing.

Table of Contents

List of Tables

List of Figures

Acronyms and Abbreviations

$\mu g/m^3$	micrograms per cubic meter
CFR	Code of Federal Regulations
COMPASS	Community Planning Association of Southwest Idaho
DEQ	Idaho Department of Environmental Quality
EPA	United States Environmental Protection Agency
ERG	Eastern Research Group
FRM	Federal Reference Method
IMPROVE	Interagency Monitoring of Protected Visual Environments
MVEB	motor vehicle emission budget
MOVES	Motor Vehicle Emission Simulator—MOVES2010a
mph	miles per hour
NAAQS	National Ambient Air Quality Standard
NO_x	nitrogen oxides
PM	particulate matter
PM_{10}	particulate matter with an aerodynamic diameter of 10 micrometers or less
$PM_{2.5}$	particulate matter with an aerodynamic diameter of 2.5 micrometers or less
RRF	relative reduction factor
SANDWICH	**S**ulfate, **A**djusted **N**itrate, **D**erived **W**ater, **I**nferred **C**arbonaceous Mass and Estimated aerosol acidity (**H**+)
SIP	state implementation plan
STN	Speciated Trends Network
TC	total carbon
TCM	total carbon mass
TEOM	tapered element oscillating membrane
TVRDS	Treasure Valley road dust study
VMT	vehicle miles traveled
VOC	volatile organic compound
WSU	Washington State University

Chemical Symbols and Formulas

Al_20_3	aluminum oxide
Al	aluminum
Ca	calcium
CaO	calcium oxide
Fe	iron
Fe_2O_3	iron oxide
FeO	iron monoxide
HNO_3	nitric acid
MgO	magnesium oxide
Na_2O	sodium oxide
NH_3	ammonia
NH_4NO_3	ammonium nitrate
$(NH_4)_2SO_4$	ammonium sulfate
NO	nitric oxide
NO_2	nitrogen dioxide
NO_3	nitrate
NO_x	nitrogen oxides (= NO + NO_2)
Si	silicon
SiO_2	silicon dioxide
SO_2	sulfur dioxide
SO_4	sulfate
Ti	titanium
TiO_2	titanium dioxide

This page intentionally left blank for correct double-sided printing.

1 Introduction

1.1 Background Information

The Northern Ada County Maintenance Area was formally designated as a moderate PM_{10} nonattainment area upon passage of the 1990 Clean Air Act.[1] Idaho submitted the first PM_{10} attainment plan on November 14, 1991 (DEQ 1991). The United States Environmental Protection Agency (EPA) revised the PM_{10} National Ambient Air Quality Standard (NAAQS) in 1997, and Idaho demonstrated to the EPA's satisfaction compliance with the new standard (Federal Register 62). The *Northern Ada County PM_{10} SIP Maintenance Plan and Redesignation Request* (Environ 2002) was submitted to EPA in September 2002, and EPA approved the plan in September 2003, restoring northern Ada County to attainment status for PM_{10}.

In the period from 1992 through 2011, three exceedances were recorded; two resulted from an exceptional event clearly involving dust transport from the Black Rock Desert in northwest Nevada in February 2011 and the other was in 1997 and was agriculturally influenced. (DEQ is preparing exceptional event documentation for the February 2011 exceedances however this attainment demonstration does not rely on its approval.) Thus, the average number of exceedances in any 3 years was less than one per year. Based upon monitoring data, the area has clearly attained the 24-hour and annual PM_{10} NAAQS for all years since 1991. It should be noted, however, that the annual standard has been replaced by the annual $PM_{2.5}$ standard and is no longer relevant; annual PM_{10} monitoring and modeling results are carried along in this report for information only.

The State of Idaho is submitting this analysis along with its maintenance plan to cover northern Ada County's second 10-year maintenance period for PM_{10}. This roll-forward modeling analysis has been conducted to demonstrate that the area will remain in compliance throughout the second 10-year maintenance period. The modeling was also conducted for mobile source conformity to provide motor vehicle emission budgets for evaluating transportation plans through 2050.

1.2 Approach

Since the 3-year average 24-hour PM_{10} values have been significantly lower than the PM_{10} NAAQS (i.e., 150 $\mu g/m^3$) in the last two decades in northern Ada County, the Idaho Department of Environmental Quality (DEQ) determined and EPA agreed that the roll-forward model is a proper tool to demonstrate compliance in future years.

Linear roll-forward modeling is a relatively simple technique for evaluating the effect of emissions reductions or increases on future ambient concentrations of air pollutants. The model assumes that ambient concentrations above some regional background level are proportional to the estimated emissions of the local sources. By reducing the size of one or more of the local sources, the resulting reduction in ambient concentrations can be estimated. Since PM_{10} is composed of several different components (mainly geologic/crustal material, carbon mass, ammonium nitrate, and ammonium sulfate), roll-forward calculations can be performed on each of these species individually to more accurately evaluate different emission reduction or control options.

[1] PM_{10} is particulate matter with an aerodynamic diameter of 10 micrometers or less.

Although the roll-forward model does not analyze the chemical reactions and dispersion of the pollutants, and it provides neither spatial nor temporal information for pollutant concentrations, it does provide a low-cost and relatively reliable approach to estimate the pollutant levels for worst-case meteorology, annual average conditions, and seasonal average conditions. The roll-forward model can be used to safely estimate whether the PM_{10} concentrations can be maintained below the NAAQS in future years.

To support this attainment demonstration, a high-quality, state implementation plan (SIP)-level emissions inventory was developed by Eastern Research Group (ERG) and Environ International Corporation (ERG and Environ 2010) for the base year 2008 and future years 2015 and 2023. The emissions inventory was developed originally using the MOBILE6 model for on-road mobile emissions. EPA released a new mobile source model, MOVES2010a (MOVES), after the emissions inventory was completed (EPA 2011b). DEQ replaced the MOBILE6 on-road emission estimates with MOVES results. While use of this new model is not yet required by EPA (until March 2013), DEQ made the change now so that future conformity determinations based on MOVES will be comparable to motor vehicle emission budgets established in this SIP renewal. DEQ also re-estimated road dust using the new EPA AP-42 approach (EPA 2011a). The updated MOVES modeling and road dust calculations are fully documented in Appendix E of the Northern Ada County Limited Maintenance Plan Renewal.

2 Roll-Forward Model

Figure 1 shows the elements involved in roll-forward modeling. The governing equation of the roll-forward model is:

$$C_i^f = \left(\frac{E_i^f}{E_i^b}\right)(C_i^b - bg_i) + bg_i \qquad \text{(Equation 1)}$$

where E_i, C_i, and bg_i are the emissions, concentrations, and background concentrations, respectively, of component *i*. The superscripts *f* and *b* indicate future (controlled) and base cases. The ratio of future-year emissions and base-year emissions (E^f/E^b) is defined as the relative reduction factor (RRF).

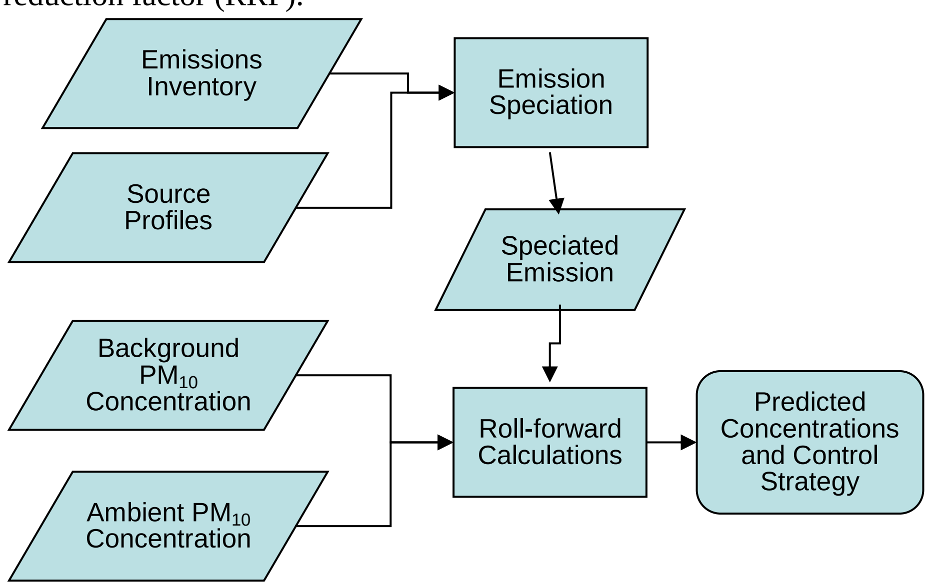


Figure 1. Flowchart for roll-forward modeling.

The emission source profiles are needed when the emissions inventory only provides the information on total PM_{10} emissions. Because the current emissions inventory was speciated for secondary aerosol precursors, only limited source profiles were necessary for speciating the organic carbon and elemental carbon emissions from combustion sources.

Ambient PM_{10} is primarily composed of five major components: geologic/crustal material, organic mass and elemental carbon (collectively carbon mass), ammonium sulfate, and ammonium nitrate. The geologic material component is estimated by summing the elements predominantly associated with soil plus oxygen for the normal oxides (Al_2O_3, SiO_2, CaO, FeO, Fe_2O_3, and TiO_2) plus a correction for other compounds such as MgO, Na_2O, water, and carbonate (Sisler et al. 1996). The final equation for the geologic component of aerosol mass is:

$$[\text{Geologic}] = 2.20\,[\text{Al}] + 2.49\,[\text{Si}] + 1.63\,[\text{Ca}] + 2.42\,[\text{Fe}] + 1.94\,[\text{Ti}] \qquad \text{(Equation 2)}$$

where all concentrations have units of mass per volume air ($\mu g/m^3$). The components of these factors were confirmed in a comparison of local resuspended soils and ambient aerosols in the western United States (Cahill et al. 1981; Pitchford et al. 1981).

Based on the assumption that aerosol organic mass is 70% carbon (Watson et al. 1988), the organic mass component can be calculated from measured organic carbon as:

$$[\text{Organic Mass}] = 1.4\,[\text{OC}] \qquad \text{(Equation 3)}$$

where [OC] is organic carbon.

Elemental carbon exists by itself in the aerosol such that:

$$[\text{Elemental Carbon}] = [\text{EC}]. \qquad \text{(Equation 4)}$$

In rural areas in the western United States, particulate sulfate and particulate nitrate are usually fully neutralized with ammonium. The equations for the sulfur and nitrate components of the aerosol are:

$$[\text{Ammonium Sulfate}] = 1.375\,[SO_4] \qquad \text{(Equation 5)}$$

$$[\text{Ammonium Nitrate}] = 1.29\,[NO_3]. \qquad \text{(Equation 6)}$$

The combination of the 5 individual components is frequently referred to as the reconstructed aerosol mass.

2.1 Assumptions

Three key assumptions apply to current conditions in the Treasure Valley and are expected to remain relatively unchanged over the future-year modeling horizon planned for this attainment demonstration:

- The same primary emission components remain dominant.
- The same spatial and temporal emissions distributions are expected.
- The area is ammonia rich; the sulfate and nitrate are fully neutralized. This topic is discussed in more detail in section 6.5.

These conditions have not changed in the years that have passed since the last PM_{10} maintenance plan was submitted in 2002. Therefore, reviewing the historical data will aid in understanding the current situation and how to utilize the available data.

2.2 Specific Considerations for Northern Ada County

PM_{10} evaluation in the Treasure Valley has some unique characteristics due to the geographical location and meteorological conditions of the area. Cold, wet winters and hot, dry summers produce different patterns of emissions, transport, dispersion, and deposition. Natural events, such as wildfires and windblown dust storms, make significant contributions to the ambient PM_{10} concentrations, and while EPA does not intend for such events to influence SIP attainment demonstrations (EPA 1986), it is difficult to separate them completely in the observed data.

An analysis of observed speciation data showed that the composition of ambient PM_{10} varies. In winter, defined here as November through February, the highest levels of secondary aerosols, especially ammonium nitrate, are recorded under the severe stagnation and high-moisture conditions. While the total PM_{10} can reach similar levels in a stagnant but drier event, the secondary aerosol concentration is typically much lower than in the wet, stagnant events. In hot, dry summer and fall periods, the high PM_{10} concentrations can be driven by carbon mass and/or crustal mass (geological material). For these reasons, the specific speciation profiles for the corresponding scenarios are needed to properly estimate potential PM_{10} concentrations under different conditions and evaluate the contributions from the major species. Effective control strategies can be considered from these estimates for these different events.

DEQ has identified four speciation profile scenarios to characterize the conditions that dominate elevated PM_{10} events: (1) wintertime “stagnation” (severe stagnation events with wet conditions); (2) wintertime “high winter” (drier winter stagnation conditions); (3) high carbon mass events in nonwinter seasons; and (4) high crustal mass events in nonwinter seasons. An annual profile was also created. Although the highest PM_{10} value will be used for compliance purposes, emission changes and, if necessary, effective control strategies will be evaluated for all these different types of elevated PM_{10} scenarios.

Because no speciated PM_{10} data are available for recent years from Ada County, DEQ developed PM_{10} speciation profiles using speciated $PM_{2.5}$ data (i.e., particulate matter with a diameter of 2.5 micrometers or less). EPA SANDWICHed Speciated Trends Network (STN) $PM_{2.5}$ speciation data serves well for this purpose.[2] Assuming the observed $PM_{2.5}$ concentration is the fine portion of the PM_{10} on the same day, and particles in the coarse portion are all crustal mass, we can reasonably speciate the PM_{10} samples.

We used all 4 years (2006–2009) of SANDWICHed STN data available at the St. Luke’s/Meridian site to construct the PM_{10} speciation profile

3 Data

The data required to conduct roll-forward modeling include base-year and projected future-years emissions data (i.e., emissions inventory data), ambient PM_{10} monitoring data, speciation data, and background PM_{10} data. All data must be speciated for major PM_{10} components (i.e., geological/crustal mass, carbon mass, ammonium sulfate, and ammonium nitrate) and the emissions inventory must include the precursor emissions (nitrogen oxides [NO_x], SO_2, and NH_3) for the secondary aerosols. The PM_{10} data from 2007 through 2009 are used for the attainment demonstration because they make up the most recent complete data set at the time this analysis

[2] Sulfate, Adjusted Nitrate, Derived Water, Inferred Carbonaceous Mass and Estimated aerosol acidity (H+)

was initiated (including ambient concentrations, background, and speciation). The recently available 2010 ambient PM_{10} data and an exceedance observed in February 2011 are also analyzed and discussed but do not affect the conclusions drawn from the modeling results.

3.1 Emissions Inventory

SIP-level emissions inventory data were developed by ERG and Environ (2010). The base year is 2008, and the projected years are 2015 and 2023. Summaries of the emissions are shown in Table 1 through Table 3, and future growth rates are summarized in Table 4. Total carbon was speciated by DEQ using speciation profiles from the *Receptor Model Source Composition Library* (EPA 1984). DEQ re-modeled the mobile emissions portion of the inventory using MOVES and re-estimated the road dust using the new AP-42 method (EPA 2011a).

ERG and Environ (2010) used the *Treasure Valley Road Dust Study* (TVRDS) (Etyemezian et al. 2002) for road dust emission factors, along with the 2008 vehicle miles traveled (VMT) based on the Community Planning Association of Southwest Idaho (COMPASS) travel demand model projections. However, after the inventory was completed, DEQ became aware of a calibration problem associated with the paved road dust emission factors in the 2002 TVRDS, as described in *Development of the Base- and Future-Year Mobile Source Emissions Inventory for the Treasure Valley, Idaho* (DEQ 2012), included as Appendix E to the maintenance plan renewal documentation. As a result, DEQ determined that the most accurate paved road dust emissions estimates going forward for the current maintenance plan would result from applying EPA's new paved road dust calculation method, released in January 2011 (EPA 2011a), along with locally measured silt loadings from the 2002 TVRDS (silt loadings were not affected by the emission factor calibration problem). Unpaved roadway emission estimates developed by ERG and Environ based on the TVRDS were not affected by the paved roadway calibration problem and remain unchanged.

Table 1. Annual emissions.

Year	Source Type	NO_x	SO_2	TC	PM_{10}	$PM_{2.5}$
		(tons per year)				
2008	Point	356	66	77	169	143
	Area	921	27	6522	19555	3551
	On-Road	9775	67	384	413	330
	Nonroad	2895	90	227	258	245
	Biogenic	202	0	0	0	**0**
	Total	14149	250	7210	20395	4269
2015	Point	356	66	68	169	143
	Area	900	24	7806	21107	3651
	On-Road	5857	33	246	283	193
	Nonroad	1980	28	173	197	186
	Biogenic	202	0	0	0	0
	Total	9294	151	8293	21756	4173
2023	Point	391	72	75	186	157
	Area	952	24	9776	25268	4073
	On-Road	4306	42	229	285	157
	Nonroad	1355	34	120	136	126
	Biogenic	202	0	0	0	0
	Total	7207	172	10199	25875	4512

Note: NO_x = nitrogen oxides; SO_2 = sulfur dioxide; TC = total carbon

Table 2. Average daily emissions for nonwinter seasons.

Year	Source Type	NO_x	SO_2	TC	PM_{10}	$PM_{2.5}$
		(tons per day)				
2008	Point	0.96	0.16	0.21	0.46	0.38
	Area	1.36	0.04	12.31	43.50	6.58
	On-Road	28.47	0.20	1.01	1.09	0.86
	Nonroad	10.06	0.31	0.82	0.93	0.89
	Biogenic	0.70	0.00	0.00	0.00	0.00
	Total	41.54	0.70	14.35	45.99	8.71
2015	Point	0.96	0.16	0.23	0.46	0.38
	Area	1.33	0.03	15.10	45.63	7.11
	On-Road	16.92	0.10	0.63	0.74	0.48
	Nonroad	6.84	0.08	0.60	0.71	0.67
	Biogenic	0.70	0.00	0.00	0.00	0.00
	Total	26.75	0.37	16.56	47.54	8.64
2023	Point	1.05	0.17	0.24	0.51	0.42
	Area	1.40	0.03	19.10	51.18	7.87
	On-Road	12.35	0.12	0.58	0.75	0.37
	Nonroad	4.55	0.10	0.39	0.47	0.44
	Biogenic	0.70	0.00	0.00	0.00	0.00
	Total	20.05	0.42	20.30	52.91	9.10

Note: NO_x = nitrogen oxides; SO_2 = sulfur dioxide; and TC = total carbon

Table 3. Average daily emissions for winter seasons.

Year	Source Type	NO_x	SO_2	TC	PM_{10}	$PM_{2.5}$
		(tons per day)				
2008	Point	1.00	0.22	0.22	0.45	0.39
	Area	4.37	0.14	19.86	67.53	15.10
	On-Road	24.00	0.16	1.12	1.19	0.98
	Nonroad	5.55	0.17	0.66	0.42	0.40
	Biogenic	0.30	0.00	0.00	0.00	0.00
	Total	35.22	0.69	21.86	69.59	16.87
2015	Point	1.00	0.22	0.23	0.45	0.39
	Area	4.26	0.12	22.74	74.93	14.88
	On-Road	14.66	0.08	0.74	0.83	0.61
	Nonroad	3.83	0.07	0.29	0.32	0.30
	Biogenic	0.30	0.00	0.00	0.00	0.00
	Total	24.05	0.50	24.00	76.54	16.18
2023	Point	1.10	0.24	0.25	0.50	0.43
	Area	4.52	0.13	28.00	94.70	16.61
	On-Road	10.91	0.10	0.71	0.84	0.53
	Nonroad	2.81	0.09	0.20	0.23	0.21
	Biogenic	0.30	0.00	0.00	0.00	0.00
	Total	19.64	0.56	29.16	96.26	17.77

Note: NO_x = nitrogen oxides; SO_2 = sulfur dioxide; and TC = total carbon

Table 4. Growth rates of speciated annual and seasonal emissions, as percentage increases above 2008 levels.

	NO_x	SO_2	TC	PM_{10}	$PM_{2.5}$
Annual					
2008–2015	65.7%	60.3%	115.0%	106.7%	97.7%
2008–2023	50.9%	68.7%	141.4%	126.9%	105.7%
Nonwinter					
2008–2015	64.4%	52.1%	115.4%	103.4%	99.3%
2008–2023	48.3%	60.1%	141.5%	115.0%	104.6%
Winter					
2008–2015	68.3%	71.9%	109.8%	110%	95.9%
2008–2023	55.8%	80.6%	133.4%	138.3%	105.4%

Note: NO_x = nitrogen oxides; SO_2 = sulfur dioxide; and TC = total carbon

Table 5 shows the comparison of total PM_{10} and paved road dust emissions. The annual emission of paved road dust was 36.8% of the total primary PM_{10} emission in 2008, and it is projected to increase to 51.2% in 2023. Thus, the paved road dust is the dominating specie and increases fastest in the future years, so it will greatly influence the roll-forward forecasting.

Table 5. Paved road dust emissions.

	Road Dust Emissions (% of Total PM_{10})			Total PM_{10} Emissions		
	2008	**2015**	**2023**	**2008**	**2015**	**2023**
Annual (tons per year)	7,501 (36.8%)	9,164 (42.1%)	13,243 (51.2%)	20,395	21,756	25,875
Nonwinter (tons per day)	10.4 (22.5%)	12.4 (26.1%)	17.9 (33.7%)	46.0	47.5	52.9
Winter (tons per day)	34.8 (49.9%)	43.1 (56.3%)	62.4 (64.8%)	69.6	76.5	96.3

3.2 Ambient PM_{10} Concentrations

Two PM_{10} tapered element oscillating membrane (TEOM) monitoring stations currently operate in the Treasure Valley: one is at Boise Fire Station No. 5 in Ada County and the other is at the Nampa Fire Station No. 1 in Canyon County. The measured values at the two stations are usually comparable; however, because some data are missing from the Nampa station and the Nampa site is outside of the Northern Ada County Maintenance Area, we only used data from the Boise Fire Station No. 5 monitor.

This section discusses PM_{10} concentration trends in the past decade and exceptional events. It should be noted that this analysis began in 2010 when the latest approved data was from 2009. Since then, additional data for 2010 and 2011 has become available and while it does not materially change the conclusions, it is discussed in Section 4.1.2.

3.2.1 PM_{10} Concentration Trends in Ada County

Federal regulations state the following regarding PM_{10} NAAQS compliance:

> The standards are attained when the expected number of days per calendar year with a 24-hour average concentration above 150 µg/m^3, as determined in accordance with appendix K to this part, is equal to or less than one. (40 CFR 50.6)

No exceedances have been recorded in the Treasure Valley in the period from 1999 to 2009. The highest PM_{10} concentrations during the modeling period are considerably lower than the standards.

Table 6 shows the four highest values (with probably "exceptional events" included) at the Boise Fire Station No. 5 from 1999 through 2009. Figure 2 is a graphical presentation of the table and shows the declining trend of highest PM_{10} levels in Boise.

Table 6. The highest 24-hour average PM_{10} values measured at Boise Fire Station No. 5 in the past 11 years (exceptional events included). The 24-hour standard is 150 µg/m^3.

Year	PM_{10} Concentrations (µg/m^3)			
	Highest	2nd Highest	3rd Highest	4th Highest
1999	123	108	94	89
2000	95	92	88	81
2001	95	84	83	82
2002	150	91	89	85
2003	88	88	85	69
2004	70	57	53	51
2005	89	88	63	55
2006	97	89	69	69
2007	88	79	77	69
2008	92	91	75	68
2009	118	71	66	56

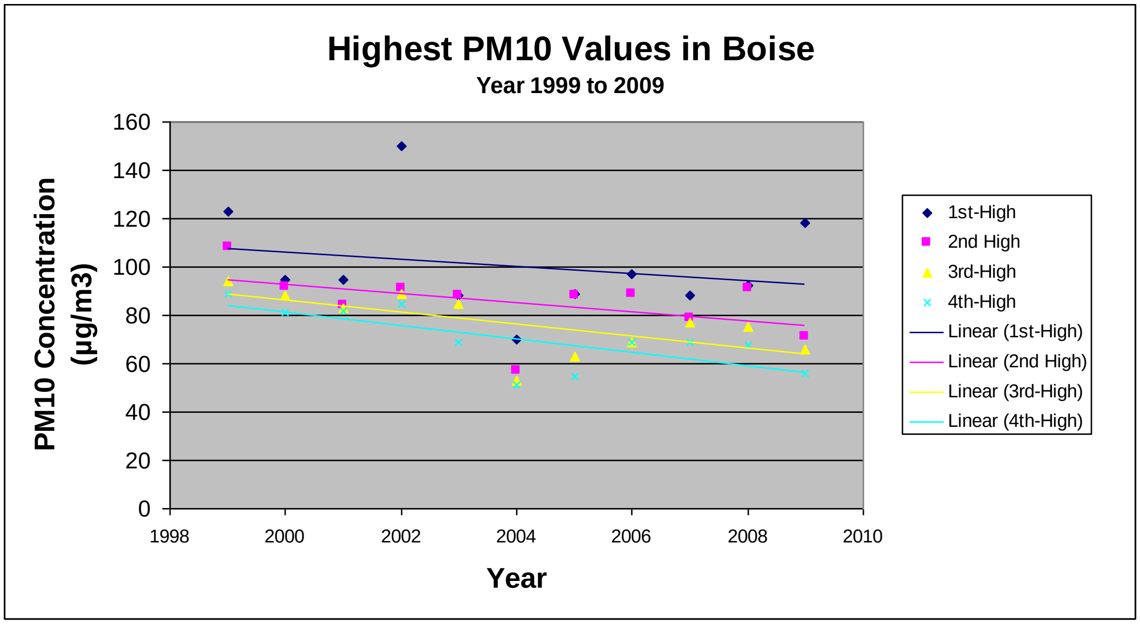


Figure 2. 24-hour average PM_{10} trend in Ada County.

Table 7 shows the frequency of elevated PM_{10} events (24-hour average > 75 µg/m^3) in each year (1999–2009). The trend at this level is also declining.

Table 7. The frequency of high PM_{10} events (24-hour average > 75 µg/m^3), including exceptional events.

24-Hour Average PM_{10} Concentrations (µg/m^3)										
1999	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
7	5	4	4	3	0	2	2	3	3	1

Both data sets clearly indicate that the air quality due to PM_{10} in Boise has been consistently improving in the past decade. These data include some days of unofficial "exceptional events." The higher levels on these days were caused by dust storms or wildfires. Because all PM_{10} values were lower than or equal to the standard (150 µg/m^3), these exceptional events were not officially excluded. Due to the small number of these exceptional events, these higher values do not significantly affect the overall trend. Exceptional events are discussed in detail in the following section.

3.2.2 Exceptional Events

EPA guidance offers the following definition:

> …an exceptional event is defined as an event that is not expected to recur routinely at a given location, or that is possibly uncontrollable or unrealistic to control through the SIP process. (EPA 1986)

However, not all days strongly influenced by windblown dust or wildfires can be excluded based on the EPA guidance (e.g., if winds are high but less than 40 miles per hour [mph]). All days with high PM_{10} concentrations, even those that were obviously influenced by windblown dust or wildfire smoke were included in the design value determination. The effects on the modeling conclusions will be discussed in section 6.3. It should be noted here that DEQ does not expend the significant resources necessary to document and propose official exclusion of high PM_{10} samples that appear to meet the EPA guidelines for exclusion as exceptional natural events unless it is both an exceedance of the standard and would trigger a nonattainment designation or have other regulatory impact. However, in this document, DEQ generally refers to high values that would probably meet the guideline criteria for exceptional events as "exceptional events" even though they are not officially flagged or documented and approved by EPA as such. Including such values results in a conservative analysis, i.e. future predicted concentrations are expected to be even lower than presented here.

3.3 Speciation Data

The PM_{10} monitor currently in use is a TEOM continuous monitor located near downtown Boise at Fire Station No. 5. No speciated PM_{10} data are available for the most recent 10 years at Fire Station No. 5. To overcome this difficulty, we have used SANDWICH $PM_{2.5}$ data (Frank 2006), which are collected at the St. Luke's STN site. The SANDWICH technique is designed to provide estimates of $PM_{2.5}$ components as they might be measured by the $PM_{2.5}$ Federal Reference Method (FRM). The data are available at EPA's AirData website (www.epa.gov/airdata). The averaged SANDWICHed speciation profiles of the highest $PM_{2.5}$ days are converted to the PM_{10} speciation using the PM_{10} values of the same days. The details of the procedure are described in section 4.2.

3.4 Background PM_{10} Concentration

Regional background concentrations must be known to estimate what fraction of the PM_{10} is due to emission sources within the Treasure Valley. The roll-forward model assumes that the difference between the total PM_{10} levels in the airshed and the background PM_{10} levels is proportional to the emissions generated within the airshed.

The IMPROVE (Interagency Monitoring of Protected Visual Environments) network was established to monitor visibility impairment from fine particles in Class I areas throughout the United States (Sisler et al. 1996).[3] IMPROVE stations typically measure the chemical composition of $PM_{2.5}$ and light-absorbing properties of the aerosol. Some stations also feature a channel to measure PM_{10} concentrations, but chemical speciation is seldom done on these samples. The six IMPROVE stations closest to the Treasure Valley are Bridger Wilderness Area, Wyoming; Craters of the Moon National Monument, Idaho; Jarbidge Wilderness Area, Nevada; Salmon Wilderness Area, Idaho; Sawtooth Wilderness Area, Idaho; and Yellowstone National Park, Wyoming. The Jarbidge Wilderness Area station is located approximately 200 miles south of Boise and is the closest IMPROVE site to the Treasure Valley with a PM_{10} channel. Both PM_{10} and $PM_{2.5}$ samples are collected at Jarbidge twice per week. Measurements from this relatively remote site are used to estimate the background PM_{10} concentrations in the Treasure Valley.

PM_{10} and $PM_{2.5}$ mass and chemically speciated $PM_{2.5}$ data are available for the Jarbidge Wilderness Area beginning in 1988. Average annual PM_{10} mass and an estimate of the average concentration of each major PM_{10} component (coarse particles [mostly geologic material], organic mass, elemental carbon, ammonium nitrate, and ammonium sulfate) were determined using 3-year average monitored data from Jarbidge. Average winter concentrations were also estimated using data for the three winters (December–February) in 2006, 2007, and 2008.

The measured background concentrations are listed in Table 8. These values are elevation adjusted for consistency with temperature and pressure conditions in northern Ada County.

Table 8. Background concentrations used for the roll-forward model.

Time Period	PM_{10} (2006–2008) ($\mu g/m^3$)
Annual	8.45
Winter Season	2.62
Nonwinter Season	11.3

4 Procedures

4.1 Determining the Design Value

Although only ambient PM_{10} data from a recent 3-year period are required for this modeling demonstration, DEQ analyzed data from 5 years to better understand the PM_{10} concentration trend and ensure the data set is a good representation of the true trend.

[3] The Clean Air Act defines Class I areas as certain national parks (over 6,000 acres), wilderness areas (over 5,000 acres), national memorial parks (over 5,000 acres), and international parks that were in existence as of August 1977.

4.1.1 Design Values

Figure 3 shows the highest 24-hour average and annual average PM_{10} levels in the different seasons (winter season is defined as November through February). As expected, the annual and seasonal averages are stable with little variance, while the peak levels, especially during the winter season, vary more widely.

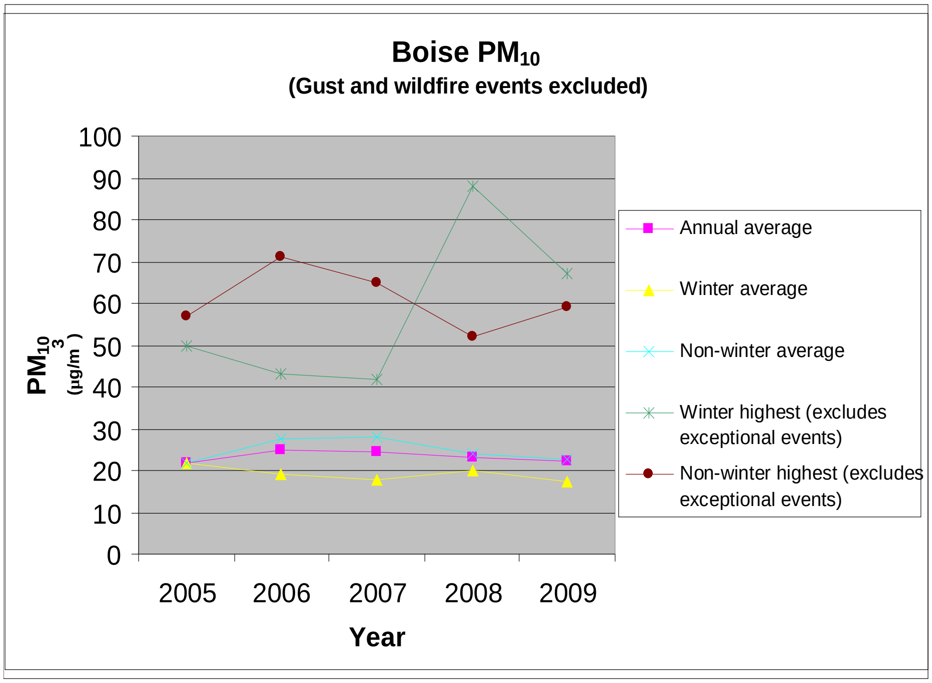


Figure 3. Highest PM_{10} levels and annual and 24-hour averages—trend from 2005 through 2009. All (probable) exceptional events were excluded.

Table 9 shows the annual average PM_{10} concentrations for 2005–2009. The data show that the annual average has been fairly stable. The annual design value would be 23.3 µg/m^3 based on 2007–2009 data (the annual 50 µg/m^3 PM_{10} standard no longer exists, however this is provided for informational purposes).

Table 9. Annual average PM_{10} concentrations (exceptional events included).

Year	Annual Average PM_{10} Concentration (µg/m^3)
2007	25
2008	23
2009	22
2007–2009 average	23.3

There are 931 total valid daily values in the three years from 2007 to 2009; therefore, the third-highest value during this 3-year period is the design value based on the EPA "table method" for determining PM_{10} design values (EPA 1987). The highest 24-hour average PM_{10} concentrations are listed in Table 10. The third-highest value in the three years is 90 µg/m^3 recorded in 2008. More recent data (2010 and partial 2011) became available at the time the analysis was finalized.

However, these data, which are discussed in the next section, do not affect the conclusions of this analysis.

Table 10. 24-hour design value (µg/m^3) based on the highest observed PM_{10} 24 hour average concentrations from 2007 through 2009. The design value is the third-highest value during the 3 years and is indicated in bold.

Year	First	Second	Third	Fourth
2007	88	79	74	67
2008	91	**90**	74	67
2009	118	71	66	56

4.1.2 Recent Data

While too late to be included in the original modeling, more recent data became available for 2010 and 2011. The 2010 and 2011 PM_{10} data from Boise Fire Station No. 5 have now been fully audited. The highest four PM_{10} values for 2010 and 2011 are listed in Table 11.

Table 11. The highest 24-hour average PM_{10} values and annual average in 2010 and 2011 (µg/m^3).

Year	First	Second	Third	Fourth	Annual
2010	95	55	51	45	18.1
2011	183	156	59	55	19.9

The 2010 highest value of 95 µg/m^3—recorded on August 21, 2010—was determined to qualify as an exceptional event due to winds over 30 mph and gusts over 40 mph (however DEQ does not intend to pursue an EE concurrence for this event). The annual average is lower than the maximum value of 23 µg/m^3 in 2007–2009. In addition, two 2011 exceedances, 183 and 156 µg/m^3 were recorded on February 15 and 16, 2011 respectively, resulting from an extreme high-wind dust event originating in northwest Nevada. DEQ has determined these two days qualify for exceptional event status.

5-year design values are the metric typically used in Maintenance Plan demonstrations. The 5-year design value for the years 2007-2011 is the fifth highest value, 91 µg/m^3, if the "table method" is used or the sixth highest value if the 40 CFR 51 Appendix W calculation method is used. 91 µg/m^3 is only 1 µg/m^3 higher than the design value of 90 µg/m3 based on 2007–2009 data and would not significantly change the predictions nor the conclusions of this attainment demonstration analysis. Since the future year projections for attainment in 2023 (115.7 µg/m^3, Table 19) and for conformity in 2050 (136 µg/m^3, Table 24), are both well below the NAAQS (150 µg/m^3), it can be seen that a 1 µg/m^3 increase will not bring the projection close to the standard, and is, in fact, well within the uncertainty of the original modeling based on a design value of 90 µg/m^3. Thus, the original modeling described in this report is a sufficient demonstration of attainment in 2023 for SIP renewal purposes and in 2050 for conformity purposes.

DEQ intends to seek Exceptional Event concurrence for the February 15 and 16, 2011 values, but does not anticipate, nor need concurrence as the attainment demonstration is sufficient without it (see previous paragraph). While the original modeling will not be updated, it may be concluded that the final design value used in this analysis (90 µg/m^3) is more conservative than it would be using the final design value obtained after concurrence on the February 15 & 16, 2011 values. This serves as strong "weight of evidence" support, resulting in a very conservative attainment demonstration.

4.2 Constructing Speciation Profiles

The procedures to construct PM_{10} speciation profiles and their relationship to the roll-forward model are presented in the Figure 4.

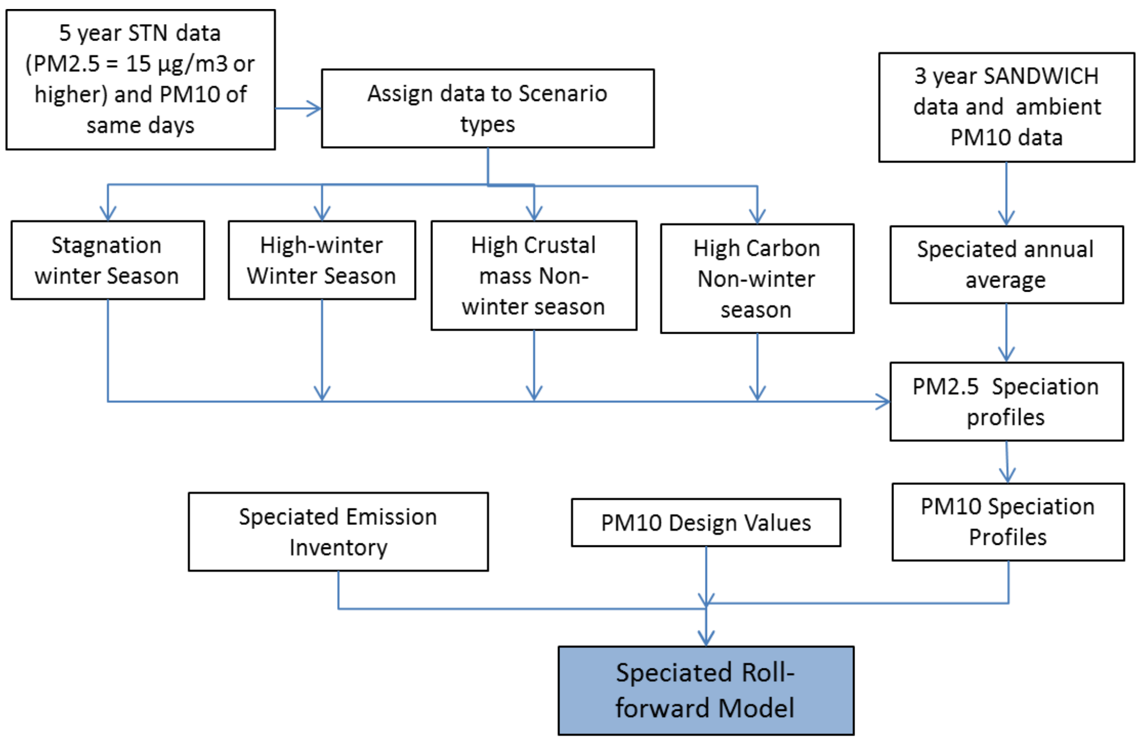


Figure 4. Procedures for constructing PM_{10} speciation profiles using SANDWICHed STN $PM_{2.5}$ data.

4.2.1 Historical Speciation Data

Two types of high-PM scenarios in the Treasure Valley were identified in past studies: *stagnation* events and *high-winter* events. These terms were used in the 1995 SIP and 2002 maintenance plan (Environ 2002). A stagnation event is a high-PM scenario with a severely stagnant atmosphere; very cold and wet conditions, such as snow cover on the ground; and a typical duration of a week or longer. The high-winter event is also a stagnant scenario but with relatively drier and warmer conditions than stagnation events. The highest PM levels were observed in the stagnation events, with high concentrations of secondary aerosols and relatively lower geological material due to the wet conditions. In recent years, the impact from secondary aerosols has been decreasing, making the contributions from secondary aerosols less important than 20 years ago.

As mentioned above, geologic material, organic carbon, elemental carbon, ammonium nitrate, and ammonium sulfate are the major components of PM_{10} in the Treasure Valley. Filter analysis revealed that PM_{10} compositions were different depending on meteorological conditions. The winter season PM_{10} composition in the historical data (1988–1996) is shown in Figure 5. Figure 6 shows the average percent composition of PM_{10} during stagnation and high-winter scenarios. PM levels were considerably higher during the stagnation scenario than the high-winter scenario. During the stagnation events, secondary aerosols (i.e., ammonium sulfate and ammonium nitrate) and organic mass dominate. Geologic material contributes a considerably higher fraction during the high-winter events.

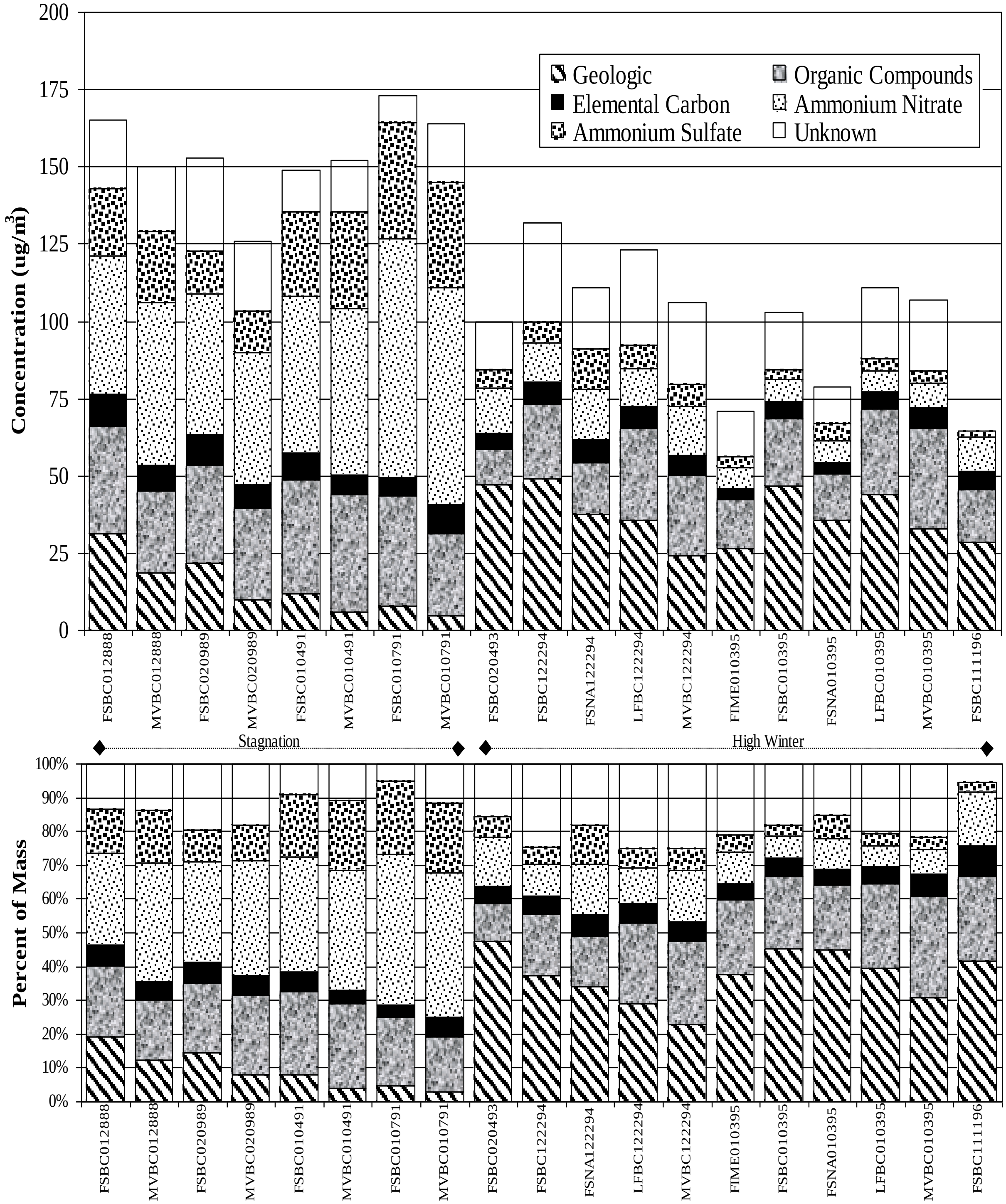


Figure 5. Wintertime absolute and relative speciated contributions to PM_{10} in Ada and Canyon Counties. The labels on the *x*-axis show station and dates (Kuhns et. al. 1998).

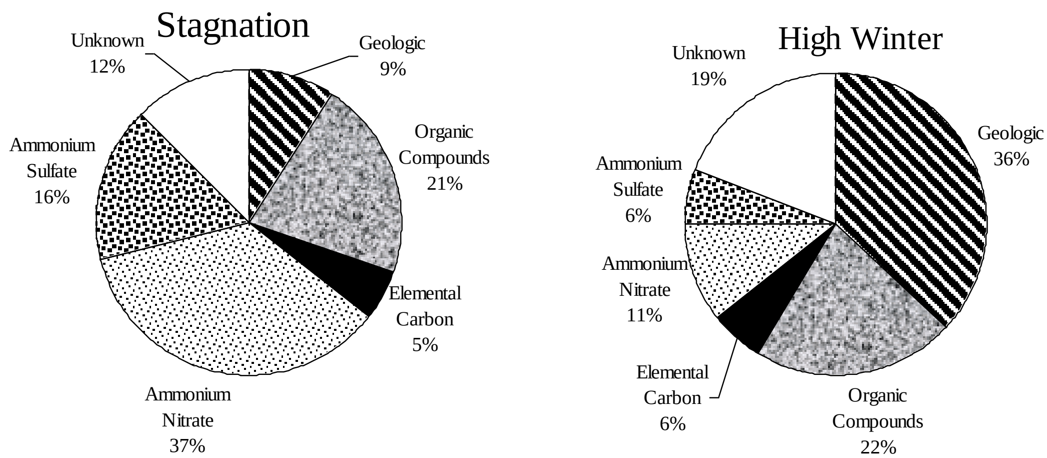


Figure 6. Average composition of stagnation and high-winter scenarios (from DEQ 2002)

4.2.2 Speciation for Winter

To characterize stagnation and high-winter scenarios in recent years, the 16 highest $PM_{2.5}$ days in winter seasons from 2006 through 2009 with concentrations of 14 $\mu g/m^3$ or higher were selected, as shown in Table 12. The events were divided into two groups based on the order of secondary inorganic aerosol concentrations (secondary inorganic aerosol = sulfate mass + nitrate mass): the first group (stagnation scenario) includes the 8 days with the highest secondary aerosol concentrations, while the second group (high-winter scenario) includes the remaining 8 days. Table 13 shows the converted PM_{10} speciation percentage composition for the winter season. The “Crustal Mass” category defined in the SANDWICH data set is equivalent to the “Geologic” material in Figure 5 and Figure 6. Total carbon is defined as TCM (total carbon mass) in the SANDWICH data set, while it is separated into elemental and organic carbon mass in the past studies. A “passive artifact” related to passive adsorption or evaporation of semivolatile organic carbon matter on quartz fiber filters, shown in Tables 12 and 14, is typically assumed to be ~ 0.5 $\mu g/m^3$ in the STN data. The “unknown artifact” in subsequent tables (Tables 15, 16, etc.) results from this passive artifact in the sampling data.

Table 12. Days with $PM_{2.5}$ values 15 µg/m^3 or higher (after rounding) from 2006 through 2009 (from EPA AirData). All values in µg/m^3.

Date	SANDWICH Sulfate Mass	SANDWICH Nitrate Mass	SANDWICH TCM	SANDWICH Crustal Mass	Passive Artifact	$PM_{2.5}$ FRM	PM_{10}
Winter Stagnation Scenario							
1/25/2008	4.6	21.56	2.55	0.19	0.5	29.4	N/A
1/22/2009	4.15	21.49	3.9	0.35	0.5	30.4	N/A
12/7/2006	2.82	18.69	11.49	1	0.5	34.5	35.7
1/19/2008	1.11	11.04	4.45	0.4	0.5	17.5	26.5
12/30/2009	2.33	9.69	6.54	0.24	0.5	19.3	N/A
11/26/2008	1.98	9.85	15.94	0.73	0.5	29	35.5
1/30/2007	1.37	9.58	2.83	0.36	0.45	14.6	24
11/8/2007	2.02	8.1	8.89	1.4	0.5	20.9	42.3
Average	**2.55**	**13.75**	**7.07**	**0.58**	**0.49**	**24.45**	**33**
High-Winter Scenario							
1/31/2009	1.35	8.17	5.95	0.43	0.5	16.4	24.3
11/27/2009	0.99	6.88	7.94	0.29	0.5	16.6	10.1
11/26/2007	1.84	5.43	8.77	0.26	0.5	16.8	28.7
12/1/2006	1.22	6	6.98	0.2	0.5	14.9	15.3
12/11/2008	0.96	5.17	10.16	0.71	0.5	17.5	31.4
11/8/2008	0.95	4.04	10.69	0.22	0.5	16.4	18.9
11/3/2009	1.51	3.22	9.2	0.37	0.5	14.8	25.8
11/17/2008	0.91	3.3	11.29	0.7	0.5	16.7	30.7
Average	**1.22**	**5.28**	**8.87**	**0.40**	**0.50**	**16.26**	**23**

Note: TCM = total carbon mass, FRM = Federal Reference Method

Table 13. Converted PM_{10} speciation for winter season.

Scenario	Sulfate Mass	Nitrate Mass	Total Carbon Mass	Crustal Mass	Unknown Artifact	Total PM_{10}
Winter Stagnation	7.8%	41.9%	21.6%	27.2%	1.5%	100%
High-winter	5.3%	22.8%	38.3%	31.5%	2.2%	100%

Figure 7 and Figure 8 are the graphical presentations of the converted PM_{10} speciation profiles for both winter scenarios.

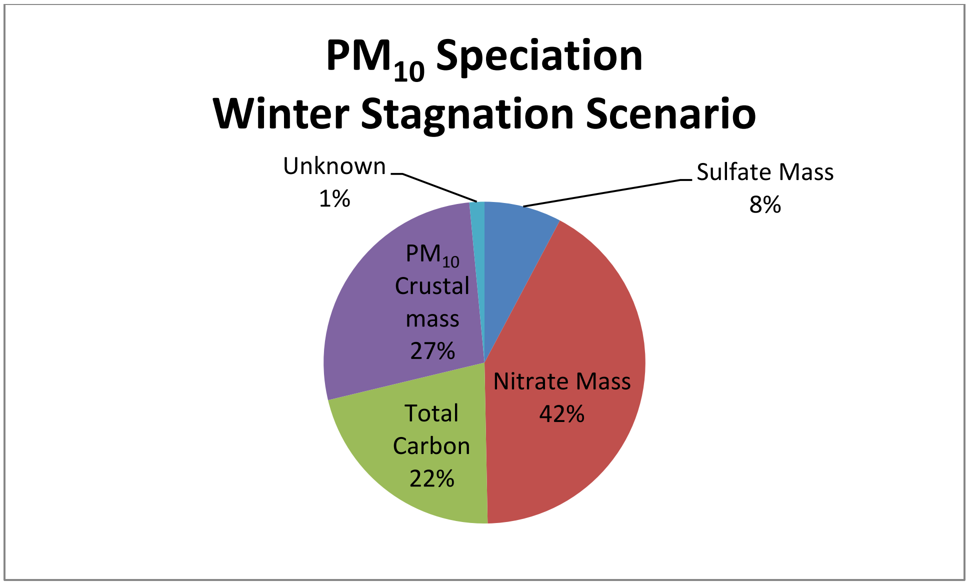


Figure 7. PM_{10} speciation for stagnation scenarios. The small differences from the table are due to rounding.

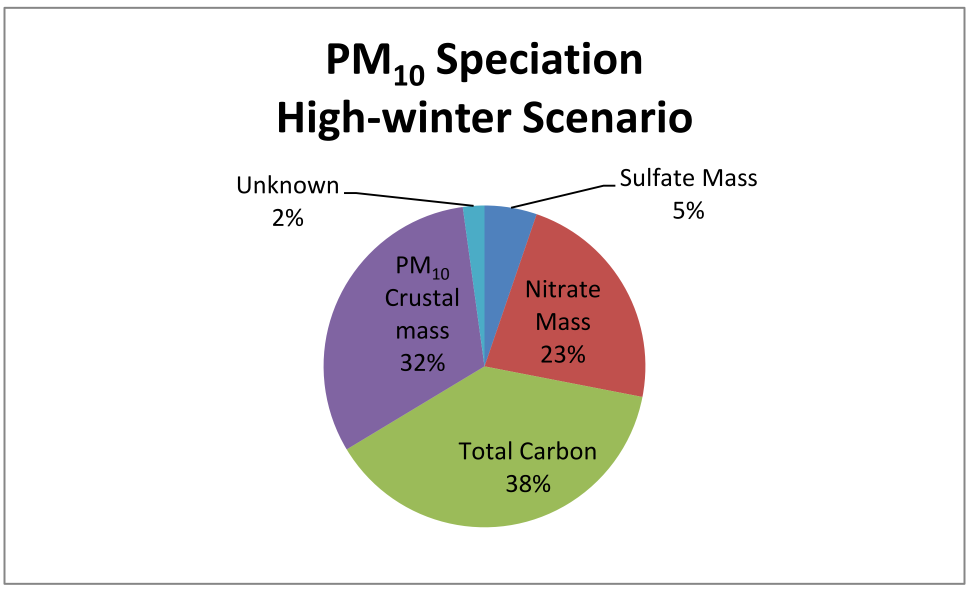


Figure 8. PM_{10} speciation for high-winter scenarios. The small differences from the table are due to rounding.

4.2.3 Speciation for Nonwinter Seasons

The magnitudes of the average highest PM_{10} values in winter and nonwinter seasons are comparable; however, the compositions of nonwinter and winter PM_{10} are very different. Ammonium nitrate is one of the most important components of PM_{10} in the winter stagnation scenario but is negligible in nonwinter due to its volatility at warmer temperatures. Although exceptional events (windstorms and wildfires) are excluded, the composition of nonwinter PM_{10} is more or less influenced by moderately high winds and/or suspected smoke from wildfires that cannot be positively confirmed as “exceptional events” strictly following EPA’s guidelines (EPA 1986).

Table 14 shows the SANDWICH data for nonwinter seasons. Table 15 shows the converted PM_{10} speciation percentage composition for the nonwinter season.

Table 14. SANDWICH data from nonwinter seasons, 2006–2009. Sorted by total carbon mass (TCM). All values in μg/m^3.

Date	SANDWICH Sulfate Mass	SANDWICH Nitrate Mass	SANDWICH TCM	SANDWICH Crustal Mass	Passive Artifact	$PM_{2.5}$ FRM	PM_{10} FRM
Nonwinter High Carbon							
10/24/2008	1	2.46	13.88	0.96	0.5	18.8	39.7
10/14/2006	1.23	0.57	13.88	0.82	0.5	17	49
9/15/2007	1.18	0	13.68	1.44	0.5	16.8	43
10/31/2009	0.88	1.89	13.44	0.29	0.5	17	26.1
10/27/2008	1.98	0	12.68	1.54	0.5	16.7	40.8
7/29/2008	1.01	0	10.7	1.69	0.5	13.9	44.4
10/18/2008	0.84	0	10.52	0.65	0.5	12.5	31.6
7/23/2008	1.22	0	10.07	0.91	0.5	12.7	24.8
Average	**1.17**	**0.62**	**12.36**	**1.04**	**0.50**	**15.68**	**37**
Nonwinter High Crustal							
10/30/2008	1.35	0	9.74	1.91	0.5	13.5	47.4
9/25/2009	0.86	0	9.19	1.95	0.5	12.5	52.8
4/18/2008	3.31	0	3.9	1.79	0.5	9.5	33.1
9/18/2008	1.99	0	3.74	2.66	0.5	8.9	39.5
9/9/2008	1.16	0	3.33	2.11	0.5	7.1	37.3
9/15/2008	1.59	0	3.04	2.97	0.5	8.1	41.1
5/18/2007	2.37	0	2.94	1.99	0.5	7.8	41.2
9/28/2009	1.36	0	2.44	2.59	0.5	6.9	59.3
3/20/2009	1.13	0	2.19	1.88	0.5	5.7	48.1
7/11/2008	0.58	0	1.44	1.78	0.5	4.3	40
Average	**1.57**	**0.00**	**4.20**	**2.16**	**0.50**	**8.43**	**44**

Note: TCM = total carbon mass, FRM = Federal Reference Method

Table 15. PM_{10} speciation profiles for nonwinter PM_{10} scenarios.

Scenario	Sulfate Mass	Nitrate Mass	Total Carbon	Crustal Mass	Unknown Artifact	PM_{10}
High Crustal	3.6%	0%	9.5%	85.8%	1.1%	100%
High Carbon	3.1%	1.64%	33.0%	60.9%	1.3%	100%

cannot be positively confirmed as "exceptional events" strictly following EPA's guidelines (EPA 1986).

Table 14 shows the SANDWICH data for nonwinter seasons. Table 15 shows the converted PM_{10} speciation percentage composition for the nonwinter season.

Table 14. SANDWICH data from nonwinter seasons, 2006–2009. Sorted by total carbon mass (TCM). All values in μg/m^3.

Date	SANDWICH Sulfate Mass	SANDWICH Nitrate Mass	SANDWICH TCM	SANDWICH Crustal Mass	Passive Artifact	$PM_{2.5}$ FRM	PM_{10} FRM
Nonwinter High Carbon							
10/24/2008	1	2.46	13.88	0.96	0.5	18.8	39.7
10/14/2006	1.23	0.57	13.88	0.82	0.5	17	49
9/15/2007	1.18	0	13.68	1.44	0.5	16.8	43
10/31/2009	0.88	1.89	13.44	0.29	0.5	17	26.1
10/27/2008	1.98	0	12.68	1.54	0.5	16.7	40.8
7/29/2008	1.01	0	10.7	1.69	0.5	13.9	44.4
10/18/2008	0.84	0	10.52	0.65	0.5	12.5	31.6
7/23/2008	1.22	0	10.07	0.91	0.5	12.7	24.8
Average	**1.17**	**0.62**	**12.36**	**1.04**	**0.50**	**15.68**	**37**
Nonwinter High Crustal							
10/30/2008	1.35	0	9.74	1.91	0.5	13.5	47.4
9/25/2009	0.86	0	9.19	1.95	0.5	12.5	52.8
4/18/2008	3.31	0	3.9	1.79	0.5	9.5	33.1
9/18/2008	1.99	0	3.74	2.66	0.5	8.9	39.5
9/9/2008	1.16	0	3.33	2.11	0.5	7.1	37.3
9/15/2008	1.59	0	3.04	2.97	0.5	8.1	41.1
5/18/2007	2.37	0	2.94	1.99	0.5	7.8	41.2
9/28/2009	1.36	0	2.44	2.59	0.5	6.9	59.3
3/20/2009	1.13	0	2.19	1.88	0.5	5.7	48.1
7/11/2008	0.58	0	1.44	1.78	0.5	4.3	40
Average	**1.57**	**0.00**	**4.20**	**2.16**	**0.50**	**8.43**	**44**

Note: TCM = total carbon mass, FRM = Federal Reference Method

Table 15. PM_{10} speciation profiles for nonwinter PM_{10} scenarios.

Scenario	Sulfate Mass	Nitrate Mass	Total Carbon	Crustal Mass	Unknown Artifact	PM_{10}
High Crustal	3.6%	0%	9.5%	85.8%	1.1%	100%
High Carbon	3.1%	1.64%	33.0%	60.9%	1.3%	100%

Figure 9 and Figure 10 show the graphical presentations of the PM_{10} speciation for the nonwinter scenarios with high carbon mass and high crustal mass. The highest carbon days are also the highest $PM_{2.5}$ (but not PM_{10}) days, indicating the strong influence of fires.

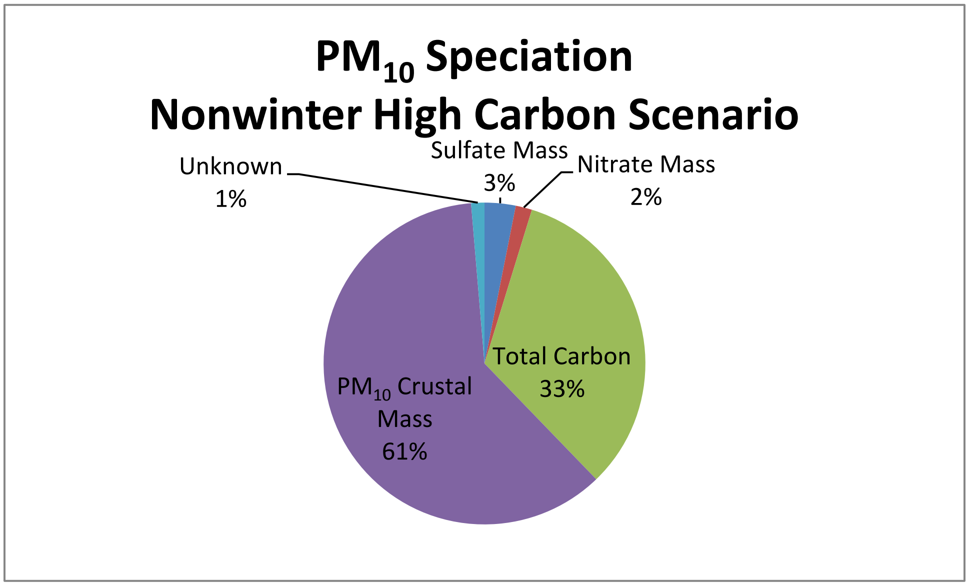


Figure 9. PM_{10} speciation converted from the 8 highest nonwinter $PM_{2.5}$ samples with highest carbon mass. While the crustal mass is the dominating specie, carbon is an important specie in these samples. Small differences from the table are due to rounding.

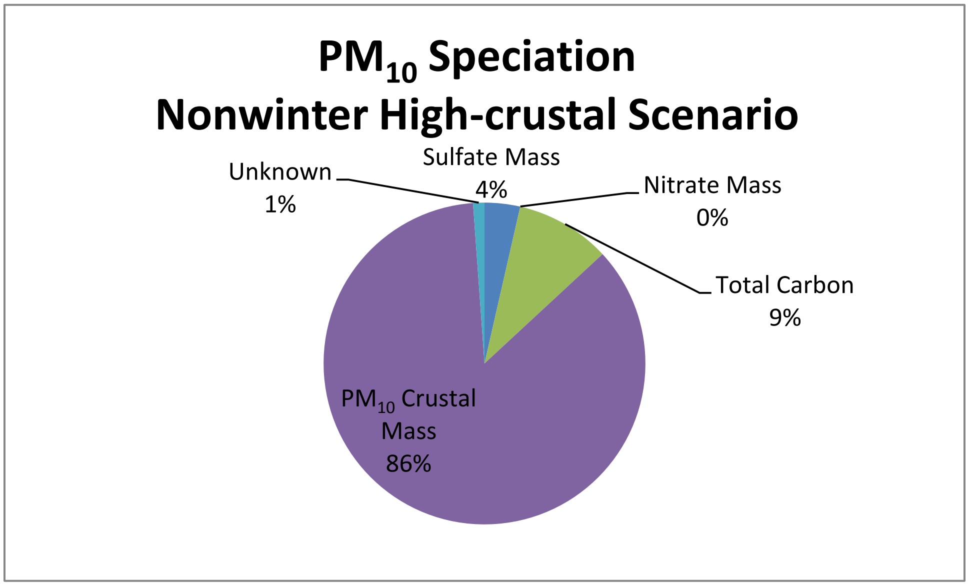


Figure 10. PM_{10} speciation converted from the 10 highest nonwinter $PM_{2.5}$ samples with highest crustal mass. The portion of crustal mass is significantly higher than in the cases shown in Figure 9. Small differences from the table are due to rounding.

5 Results

The speciated linear roll-forward model has demonstrated that PM_{10} levels in northern Ada County will remain well under the NAAQS in future years for all scenarios.

5.1 NAAQS Attainment Demonstration

After the design values, background ambient concentrations, and RRFs are determined, the roll-forward equation (Equation 1, section 2) is applied for each specie. The RRFs for each specie are computed by $RRF_i = E_i^f / E_i^b$, where E_i^f is the future emission total for each specie and E_i^b is the base-year emission total for each specie. The total predicted PM_{10} concentration is equal to the sum of the predicted concentrations of all species. The sum of the species is slightly lower than the design value (up to 2 µg/m^3) because the passive FRM sampling artifact (0.5 µg/m^3) in SANDWICH data was omitted. This bias is corrected by adding an “unknown artifact” portion to the final results.

Table 16 shows the speciated concentrations in the base year (2008) for the high-PM_{10} scenarios discussed earlier, and Table 17 lists the background concentrations. Table 18 shows the final RRF values used in the roll-forward analysis. Background emissions are assumed to remain constant (RRF = 1), and the sulfate and nitrate components are held constant (RRF = 1) to account for any potential uncertainty in nitrate neutralization (see section 6.5).

Table 16. Predicted base-year (2008) design value speciation (µg/m^3).

	Sulfate Mass	Nitrate Mass	Total Carbon	Crustal Mass	Unknown Artifact	Design Value
Annual average	1.07	1.19	3.76	16.14	1.17	23.33
Nonwinter high-crustal	3.21	0.14	8.58	77.18	0.88	90.00
Nonwinter high-carbon	2.81	1.48	29.71	54.80	1.20	90.00
Winter stagnation	7.10	37.73	19.41	24.51	1.25	90.00
High winter	4.80	20.51	34.49	28.32	1.87	90.00

Table 17. Background speciated PM_{10} concentrations (µg/m^3).

Background PM_{10}	Sulfate Mass	Nitrate Mass	Total Carbon	Crustal Mass	Total PM_{10}
Annual average	0.66	0.13	0.87	6.78	8.45
Winter average	0.34	0.14	0.24	1.89	2.62
Nonwinter average	0.82	0.13	1.18	9.17	11.30

Table 18. RRF values used for all species for future years in different scenarios.

	Sulfate Mass	Nitrate Mass	Total Carbon	Crustal Mass
Annual				
2015/2008 RRF	1.00	1.00	1.15	1.09
2023/2008 RRF	1.00	1.00	1.41	1.32
Nonwinter Day				
2015/2008 RRF	1.00	1.00	1.15	1.04
2023/2008 RRF	1.00	1.00	1.41	1.17
Winter Day				
2015/2008 RRF	1.00	1.00	1.10	1.14
2023/2008 RRF	1.00	1.00	1.33	1.49
Background				
2015/2008 RRF	1.00	1.00	1.00	1.00
2023/2008 RRF	1.00	1.00	1.00	1.00

The roll-forward results are presented in Table 19. The predicted annual PM_{10} concentration is 24.7 $\mu g/m^3$ in 2015 and 27.9 $\mu g/m^3$ in 2023, which are 50% and 56% of the NAAQS, respectively. The highest predicted 24-hour average PM_{10} levels are 97.6 $\mu g/m^3$ in 2015 and 115.7 $\mu g/m^3$ in 2023 (both in the high-winter scenario), which represent 65% and 77% of the NAAQS, respectively. Crustal mass is an important contributor in most scenarios including the annual average, while nitrate mass is the major contributor in the winter stagnation scenario and carbon-mass is the major contributor in the high-winter scenario. Nitrate and sulfate mass are held constant in future years to allow for uncertainty in the linearity of nitrate neutralization. Section 6.5 discusses nitrate neutralization in more detail.

Table 19. Predicted PM_{10} concentrations and species composition in future years (µg/m^3). When the RRFs for nitrate and sulfate mass are less than 1.0, their forecasted concentrations are kept at 2008 levels (RRF = 1.0).

Year	Sulfate Mass	Nitrate Mass	Total Carbon	Crustal Mass	Unknown Artifact	Total PM_{10}
Annual						
2008	1.1	1.2	3.8	16.9	0.4	23.3
2015	1.1	1.2	4.2	17.9	0.4	24.7
2023	1.1	1.2	5.0	20.2	0.4	27.9
Nonwinter High Crustal Day						
2008	3.2	0.0	8.6	77.2	1.0	90.0
2015	3.2	0.0	9.7	80.1	1.1	94.1
2023	3.2	0.0	11.7	89.1	1.2	105.1
Nonwinter High Carbon Day						
2008	2.8	1.5	29.7	54.8	1.2	90.0
2015	2.8	1.5	34.1	56.8	1.3	96.5
2023	2.8	1.5	41.5	62.8	1.5	110.1
Winter Stagnation Day						
2008	7.1	37.7	19.4	24.5	1.2	90.0
2015	7.1	37.7	21.3	27.8	1.3	95.2
2023	7.1	37.7	25.8	35.6	1.5	107.7
High-winter Day						
2008	4.8	20.5	34.5	28.3	1.9	90.0
2015	4.8	20.5	37.8	32.4	2.0	97.6
2023	4.8	20.5	45.9	42.0	2.4	115.7

Figure 11 through Figure 15 are the graphic presentations of the modeling results.

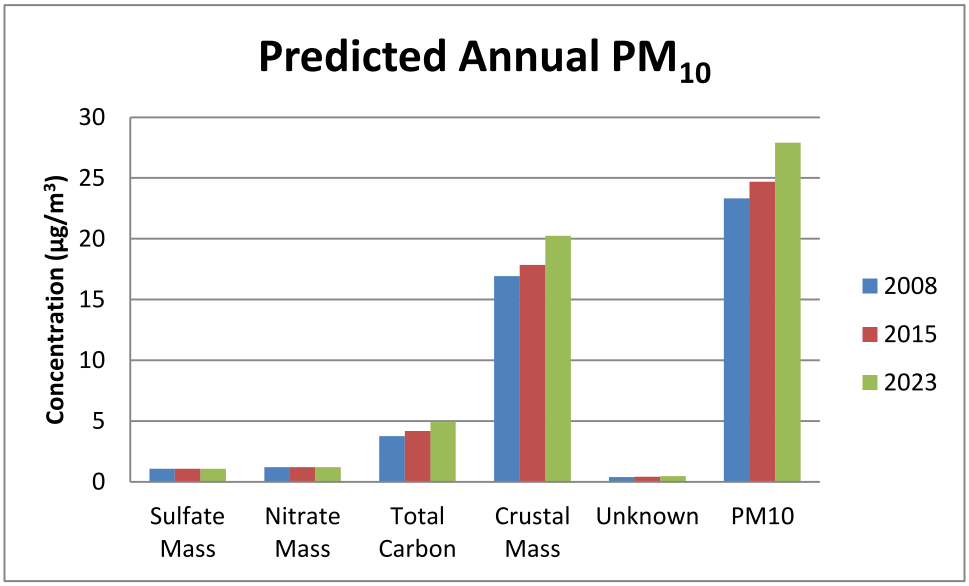


Figure 11. Predicted annual average PM_{10} concentrations.

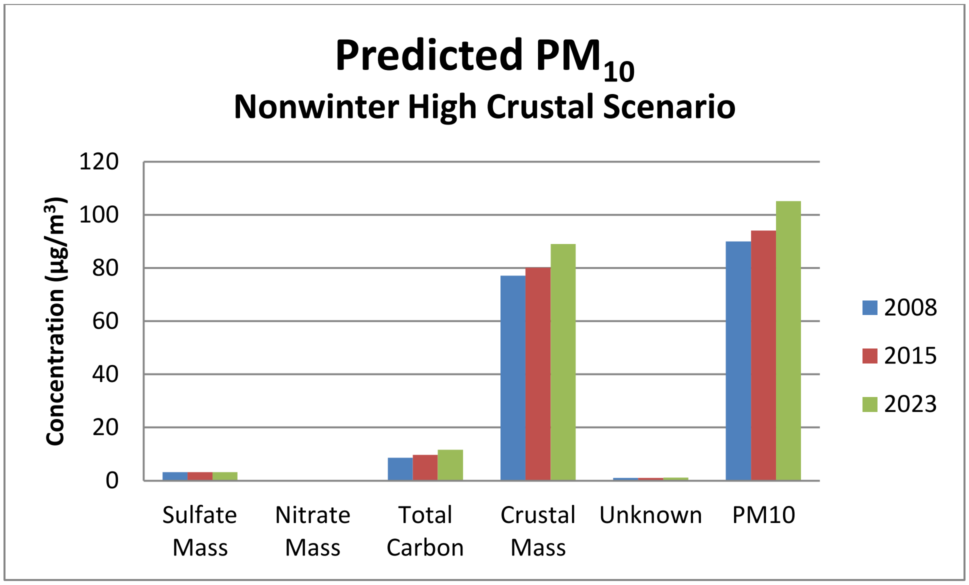


Figure 12. Predicted 24-hour average PM_{10} concentrations for high-crustal scenario in nonwinter seasons.

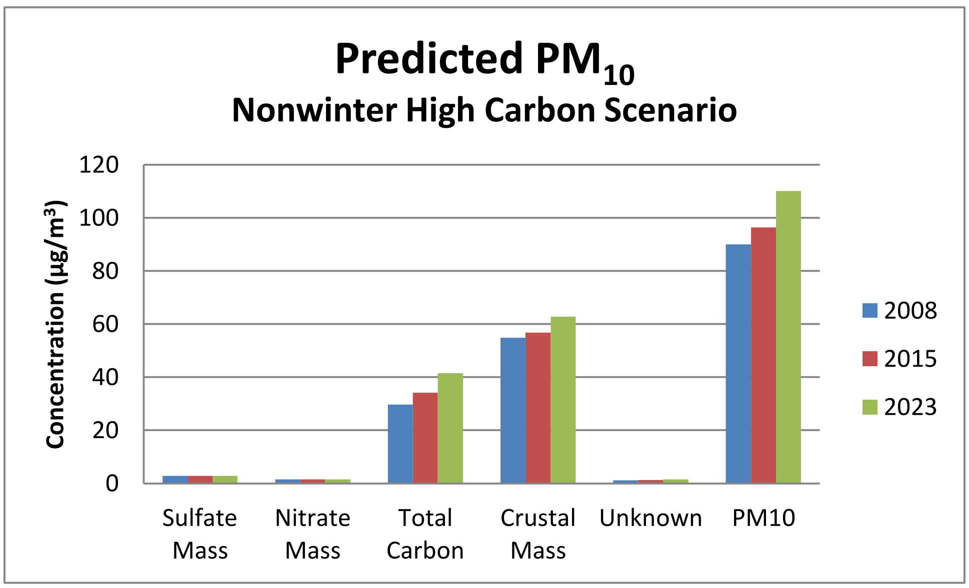


Figure 13. Predicted 24-hour average PM_{10} concentrations for high-carbon scenario in nonwinter season.

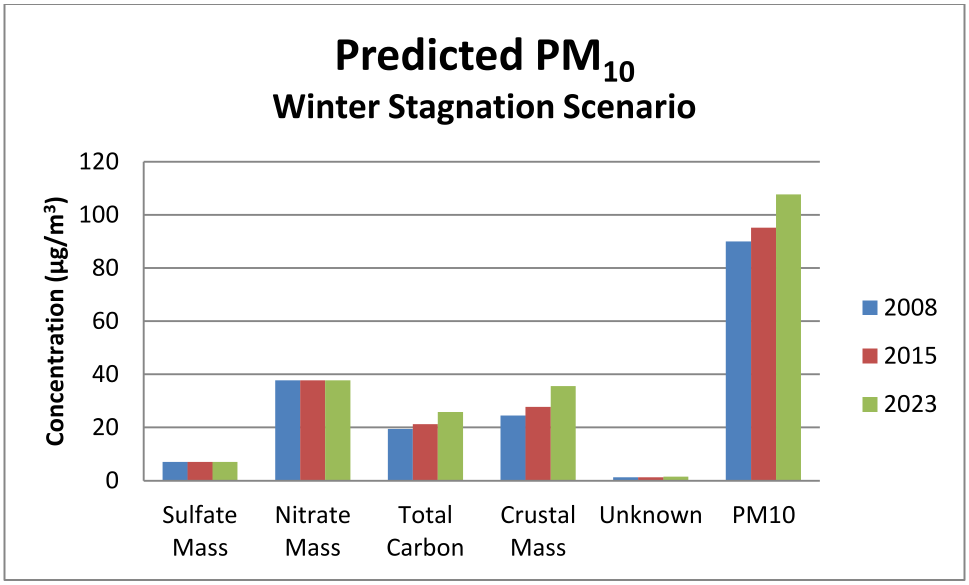


Figure 14. Predicted 24-hour average PM_{10} concentrations for stagnation scenario in winter season.

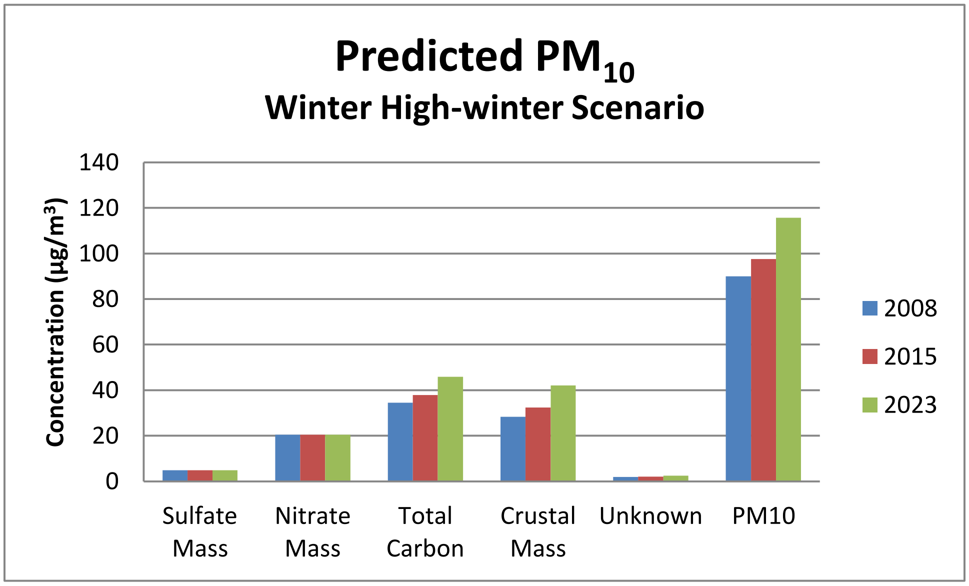


Figure 15. Predicted 24-hour average PM_{10} concentrations for high-winter scenario in winter season.

5.2 Results for On-road Emission Conformity

The modeling was also performed separately for the purpose of on-road emissions conformity. This process establishes motor vehicle emission budgets (MVEBs) consistent with the attainment demonstration that transportation planners may use to demonstrate conformity with the SIP and with the NAAQS. To provide a safety factor, the on-road mobile emissions used for the 2008–2015 period are represented by 110% of the 2015 mobile emissions and 100% of 2008 emissions for all other categories. The emissions used for the 2015–2023 conformity demonstration period represent 110% of 2023 on-road emissions and 100% of 2015 emissions for all other categories. The emissions used for the 2023–2050 conformity demonstration are 100% of projected on-road mobile emissions for 2050 with the other 2023 emission categories remaining unchanged. Because information is lacking for the period between 2023 and 2050, the MOVES on-road emission rates are kept at 2023 levels for the modeling demonstration and projected out to 2050 using only the predicted VMT. This is conservative because the vehicle exhaust emission rates should continue to trend downward after 2023 as cleaner cars continue to be developed and introduced into the fleet.

Table 20 shows the estimated emissions used for PM_{10} attainment demonstration for conformity, while Table 21 shows the estimated motor vehicle emissions including road dust (paved and unpaved) and on-road emissions. Table 22 shows the RRF values used in the demonstration. The RRF values for NO_x and SO_2 are assigned to 1.0 if the predictions are decreasing. The RRF value for NO_x for the 2023–2050 period in the table is greater than 1.0 because the on-road NO_x emission for 2050 is based on the VMT changes only. The real NO_x emissions in the period are expected to continue to decrease, but MOVES cannot predict to 2050 so forecasted VMT are used to conservatively extrapolate 2015 emissions to 2050.

Table 20. Total emissions from all categories used for conformity analysis.

	SO_2	NO_x	Total Carbon	Crustal Mass
2008–2015				
Annual (tons per year)	220	10,816	8,318	17,414
Nonwinter (tons per day)	0.60	29.2	16.6	40.1
Winter (tons per day)	0.62	27.3	24.1	64.7
2015–2023				
Annual (tons per year)	164	8,175	10,222	22,690
Nonwinter (tons per day)	0.4	21.1	20.4	45.7
Winter (tons per day)	0.5	23.0	29.2	84.6
2023–2050				
Annual (tons per year)	201	15,395	10,495	28,380
Nonwinter (tons per day)	0.5	43.8	21.1	55.3
Winter (tons per day)	0.6	40.0	30.0	108.2

Table 21. The motor vehicle PM_{10} emissions (road dust and on-road emissions) for conformity.

	Paved	Unpaved	On-road	Total PM_{10}
2008–2015				
Annual (tons per year)	10,080	926	311	11,317
Nonwinter (tons per day)	13.7	2.9	0.8	17.4
Winter (tons per day)	47.4	1.6	0.9	49.9
2015–2023				
Annual (tons per year)	14,568	791	314	15,672
Nonwinter (tons per day)	19.6	2.5	0.8	22.9
Winter (tons per day)	68.6	1.3	0.9	70.9
2015–2050				
Annual (tons per year)	19,550	1,795	604	21,949
Nonwinter (tons per day)	26.5	5.6	1.6	33.7
Winter (tons per day)	91.9	3.1	1.8	96.8

Table 22. RRFs used for conformity demonstration, for all emission categories. The RRFs for NO_x and SO_2 are assigned to 1.0 if the predicted emissions are decreasing. The RRF for NO_x is greater than 1.0 for 2023–2050 as opposed to 2008–2025 because the on-road emission estimate for 2050 is based on the VMT increase only and the expected vehicle emission improvement is not considered.

	SO_2	NO_x	Total Carbon	Crustal Mass
2008–2015				
Annual	1.00	1.00	1.15	1.08
Nonwinter	1.00	1.00	1.16	1.07
Winter	1.00	1.00	1.10	1.23
2015–2023				
Annual	1.00	1.00	1.42	1.41
Nonwinter	1.00	1.00	1.42	1.23
Winter	1.00	1.00	1.34	1.60
2023–2050				
Annual	1.00	1.09	1.46	1.76
Nonwinter	1.00	1.05	1.47	1.48
Winter	1.00	1.14	1.37	2.05

Table 23 summarizes the annualized motor vehicle emissions resulting from the conformity attainment demonstration. Volatile organic compound (VOC) emissions are not used in the PM_{10} roll-forward modeling but are replicated from the mobile source emissions inventory (DEQ 2012) for completeness. These values are recommended for use as the MVEBs. The PM_{10} emissions include paved road dust, unpaved road dust, and on-road primary PM_{10} emissions. Because the roll-forward model does not treat the nonlinear chemical processes and the forecasted NO_x and VOC emissions are declining, the NO_x and VOC emission budgets are kept at 2008 levels plus a 10% safety factor for both the 2008–2015 and 2015–2023 periods. The motor vehicle emissions in the last period (2023–2050) are forecasted 2050 emissions based only on VMT increases from 2015 to 2050. The emission estimates presented in Table 23 are calculated daily values (tons per day) based on the annual emissions.

Table 23. Summary of motor vehicle emissions. The listed emission rates are 110% of the highest rates of the beginning or ending year (as applicable) for the 2008–2015 and 2015–2023 periods and 100% for the 2023–2050 period.

Period	PM_{10}	NO_x	VOC
	(tons per day)		
2008–2015	31.0	29.5	12.6
2015–2023	42.9	29.5	12.6
2023–2050	60.1	34.2	17.2

Table 24 presents the forecasted PM_{10} levels using the estimated RRFs in Table 22. All future-year predicted levels are below NAAQS. The high-winter scenario provides the highest predictions.

Table 24. PM_{10} attainment demonstration—PM_{10} and composition recomputed for on-road emission conformity purposes (μg/m^3).

Year	Sulfate Mass	Nitrate Mass	Total Carbon	Crustal Mass	Unknown Artifact	PM_{10}
Annual						
2008–2015	1.1	1.2	4.2	17.7	0.4	24.6
2015–2023	1.1	1.2	5.0	21.1	0.5	28.3
2023–2050	1.1	1.3	5.1	24.7	0.5	32.6
Nonwinter Season High Crustal Day						
2008–2015	3.2	0.0	9.8	82.3	1.0	96.3
2015–2023	3.2	0.0	11.7	92.6	1.2	108.7
2023–2050	3.2	0.0	12.1	110.0	1.4	126.7
Nonwinter Season High Carbon Day						
2008–2015	2.8	1.5	34.2	58.2	1.2	97.9
2015–2023	2.8	1.5	41.7	65.1	1.5	112.6
2023–2050	2.8	1.6	43.1	76.8	1.7	126.0
Winter Season Stagnation Day						
2008–2015	7.0	37.7	21.3	29.6	1.4	97.1
2015–2023	7.0	37.7	25.9	38.2	1.7	110.4
2023–2050	7.0	42.9	26.6	48.3	1.9	126.6
Winter Season High-winter Day						
2008–2015	4.7	20.5	38.0	34.3	1.9	99.5
2015–2023	4.7	20.5	46.0	45.3	2.6	119.1
2023–2050	4.7	23.3	47.3	57.9	2.9	136.1

5.3 Discussion

The model results clearly demonstrate that PM_{10} levels in northern Ada County will remain below NAAQS in the modeled period despite the predicted increase in county-level road dust emission rates. The design value is conservative because some high PM_{10} days influenced by windblown dust and wildfire smoke were included in the calculation. Figure 16 through Figure 20 show the relative importance of the major species in the present and future years. Three species—crustal mass, carbon mass (total carbon), and ammonium nitrate (nitrate mass)—will continue to play important roles in future years.

In the case of annual average PM_{10} contributions (Figure 16), the crustal mass is primarily responsible for the increase in PM_{10} concentration due to the road dust increase with VMT; however, the relative contributions from all species remain virtually unchanged. A similar situation occurs for the high crustal mass scenario in nonwinter seasons (Figure 17), where the crustal mass is the only major contributor for PM_{10} throughout the modeling period. In the scenario of high carbon mass in nonwinter seasons (Figure 18), carbon mass and crustal mass together contribute more than 95%, with the crustal contribution decreasing as the carbon contribution increases. In the winter stagnation scenario (Figure 19), nitrate mass is the most important contributor but decreases in the future years, while crustal mass and carbon mass are predicted to increase. In the high-winter scenario (Figure 20), carbon plays the most important role, followed by crustal matter and nitrate. The importance of nitrate decreases with time as a result of tightening federal motor vehicle standards (however nitrate and sulfate are assumed constant in the modeling). In all scenarios and all time periods, the contribution of sulfate remains low and steadily decreasing.

The most noticeable feature of this analysis is that the contributions of inorganic secondary aerosols (ammonium nitrate and ammonium sulfate) will continue to decline in the winter season, which was historically the season in which most PM_{10} violations took place as a result of high secondary aerosols. Another major historical contributor for winter PM_{10} was carbon mass, which has been controlled by improved heating devices and through mandatory burning curtailment ordinances. The contributions from carbon mass will increase slightly due to population and VMT growth. The most important contributor is dust (crustal mass), which plays a major role both in winter and nonwinter seasons. The estimate of the dust contribution is conservative for various reasons, as discussed in section 6.

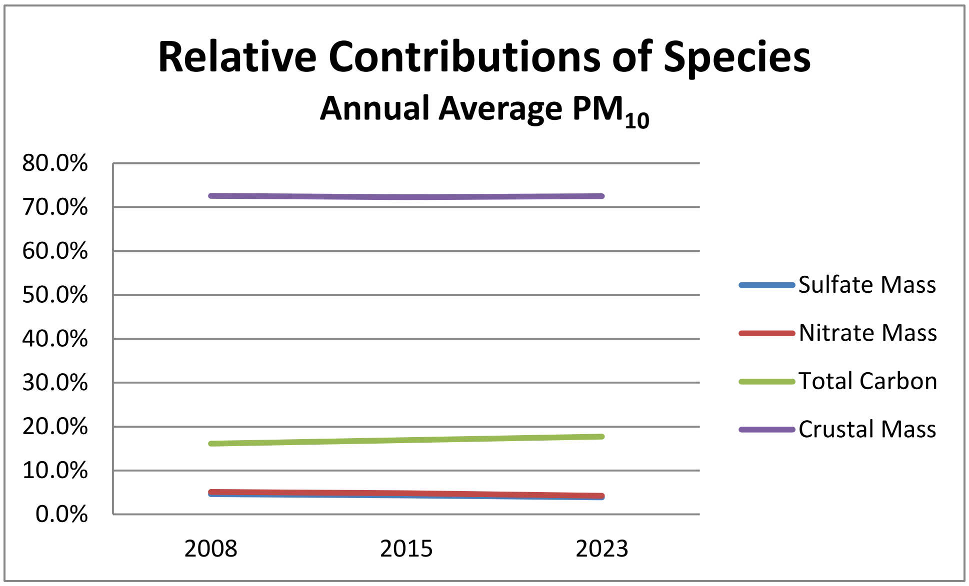


Figure 16. Relative contributions of species for annual average PM_{10} model results. Crustal mass is the major contributor. The relative contributions from all species do not change significantly in the modeling period.

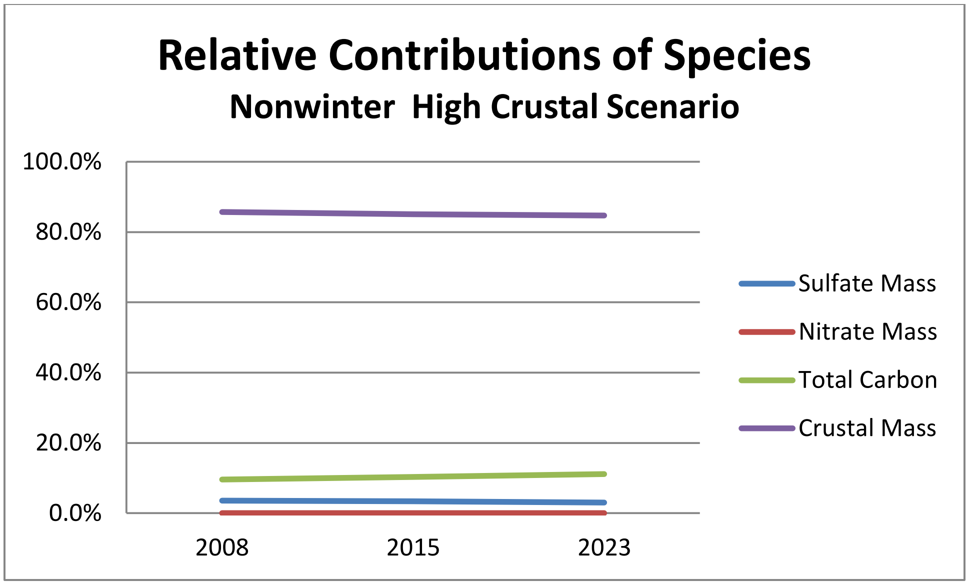


Figure 17. Relative contributions of species for high-crustal scenario in nonwinter seasons. Crustal mass is the only major contributor. The relative importance of each contributor remains virtually unchanged.

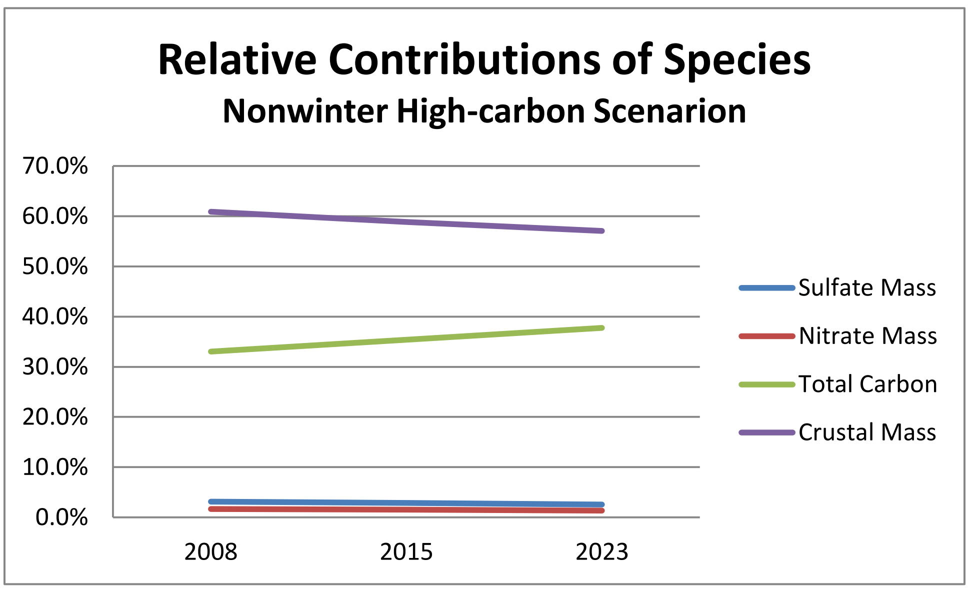


Figure 18. Relative contributions of species for high-carbon scenario in nonwinter seasons. The crustal mass and carbon mass together contribute more than 95% to PM_{10} concentrations.

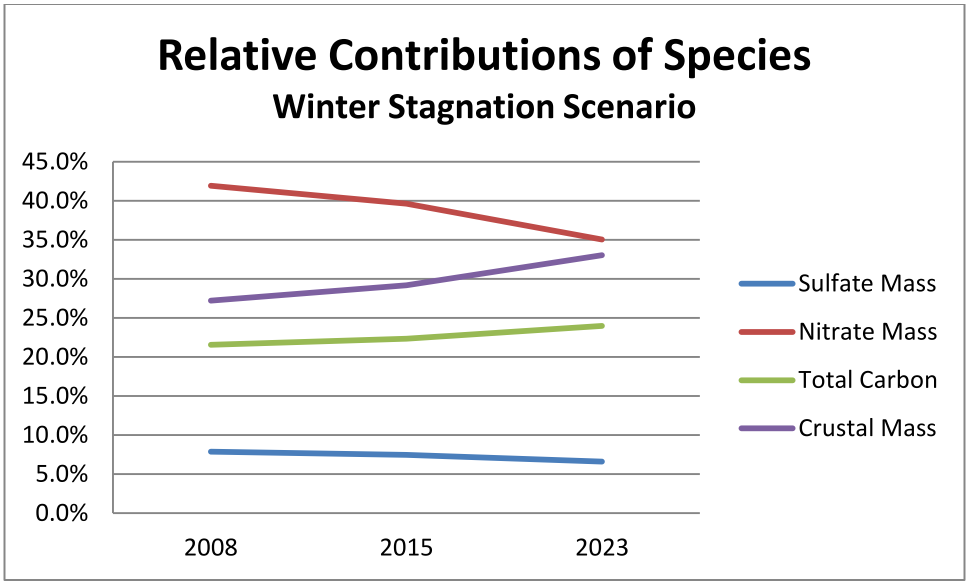


Figure 19. Relative contributions of species for the stagnation scenario in winter season. Major contributors are nitrate mass, crustal mass, and carbon mass. The relative importance of nitrate mass decreases in the future years, while crustal mass and carbon mass play more import roles in future years.

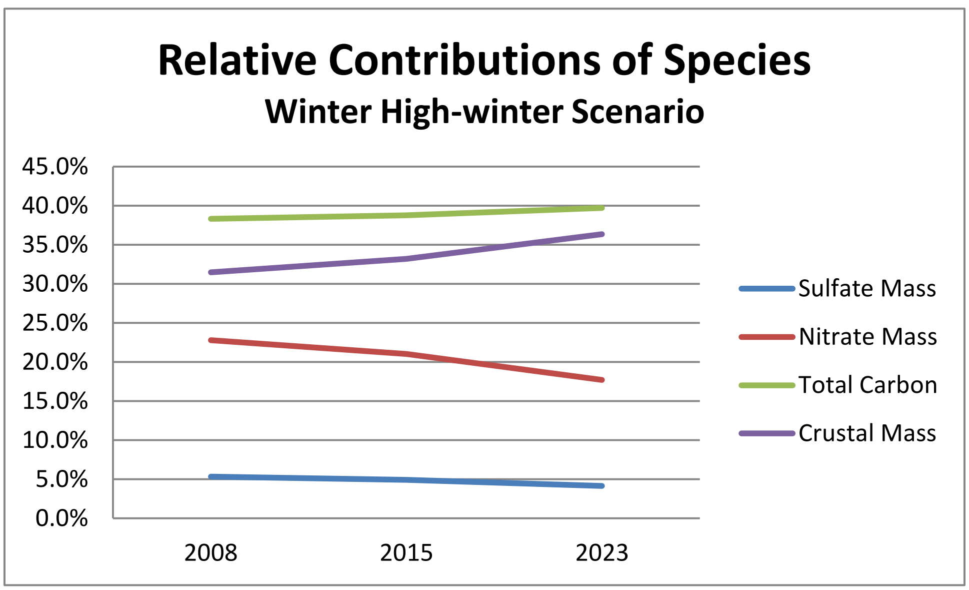


Figure 20. Relative contributions of species for high-winter scenario in winter season. Similar as in the stagnation scenario, the relative impact from nitrate decreases in future years, while carbon mass, which plays a major role currently, will increase its impact in the future, as will the crustal mass.

6 Sources of Uncertainties

Several factors may produce uncertainties in the modeling results. Therefore, conservative assumptions are used, and the final modeled 24-hour average PM_{10} concentration in the future years is estimated to be conservative by over 20 µg/m^3. These factors are discussed below.

6.1 Model Assumptions

The basic assumption of roll-forward modeling is that the ambient pollutant concentration is proportional to the total emissions. The validity of this assumption depends on factors such as the domain size, spatial and temporal distribution of emission sources, and weather conditions. Therefore, we have to assume these conditions are not changing as mentioned in section 2.1. For the annual average, these assumptions are satisfied. For the 24-hour average, the unpredictable weather conditions may increase uncertainty, especially for secondary aerosol formation. However, since the PM_{10} concentration has remained at a low level over the past two decades, and the importance of the secondary aerosols has been decreasing and will continue to do so in future years, the uncertainty due to this factor is not of significant magnitude to affect future NAAQS compliance.

6.2 Bias from the Speciation Profiles

The PM_{10} speciation profiles were constructed from $PM_{2.5}$ STN data. Because $PM_{2.5}$ and PM_{10} monitors are not located at the same site, this approach can introduce bias in the profiles. For the winter season, the highest $PM_{2.5}$ samples were selected. The cut-off concentration was relatively low (15 $\mu g/m^3$) due to the limited number of high days, so it is possible that the profiles are lower in nitrate mass but enhanced for crustal mass. Because the crustal mass is expected to increase and the nitrate mass is expected to decrease, this possible bias makes the predicted total PM_{10} potentially higher. For the nonwinter seasons, nitrate and sulfate mass have minimal impact; the major players are carbon mass and crustal mass, which are well separated into the fine and coarse portions. Therefore, we do not expect significant bias in the nonwinter profiles.

6.3 Effect of Wildfires and Windblown Dust

The Treasure Valley is at times impacted by wildfires and windblown dust in summer and fall. Some high PM_{10} days that were obviously influenced by fire or dust storms could not be excluded by the EPA guidance and were used in the design value determination and construction of PM_{10} speciation profiles. The design value would be 71 $\mu g/m^3$ if only the exceedance days that appeared to be influenced by high windblown dust or wild fire smoke were excluded, which is 19 $\mu g/m^3$ lower than the design value used in the modeling. In addition, two types of profiles—high crustal mass and high carbon mass—were constructed and used for two types of nonwinter scenarios. The profiles are either enhanced in carbon mass or crustal mass due to the influences from fires or windblown dust. The model results have demonstrated PM_{10} levels well below the NAAQS in both cases. Because the crustal mass is the dominating specie in the emissions inventory, and it increases faster than other species in future years due to the growth in VMT, the model results are conservative due to the crustal-rich profiles.

6.4 Effects of Changing Nitrogen Oxides and Road-Dust Emissions

Nitrogen oxides (NO_x) emissions are expected to decrease in the future years, and the importance of nitrate, the dominant specie in the winter fine particulate portion ($PM_{2.5}$), will decline. However, while the total NO_x emissions are expected to decrease, the total VMT continues to increase, and as a result, the emission of coarse particulates, mainly due to road dust, is expected to increase in future years. Because the roll-forward model's forecasting is linearly proportional to the county-level emission rate, the predicted coarse portion of PM_{10} will increase accordingly. However, the road dust estimates depend on the total VMT, which is related more to expanding development in the valley rather than increased density in the urban area. Due to the fast deposition and reduced transport of the coarse particles, especially during stagnation scenarios, the coarse particle concentrations at hot spots (e.g., Boise Fire Station No. 5) should increase at a lower rate than the total emission growth rate. Thus, we expect the model to overestimate the coarse particulate increase at the compliance monitor in the downtown Boise area and any other areas with fully developed high-density traffic and home heating. In summary, we believe that this approach produces a conservative estimate of future PM_{10} concentrations.

6.5 Nitrate Neutralization

The nitrate neutralization rate has an important role in determining the effectiveness of emission reduction and control strategies. In ammonia-limited areas, sulfate is neutralized first, followed by nitrate until insufficient ammonia remains, then excess nitrate will be observed. The occurrence of excess nitrate may potentially result in a slightly nonlinear response in the changes of nitrate aerosol due to changes in precursor emissions. In the ammonia-limited case, every mole of sulfate reduced by emissions control strategies will release up to two moles of ammonium ions that will be available to neutralize more than one mole of nitrate, resulting in higher ambient secondary aerosol concentrations.

Excess nitrate has been found in some areas such as Klamath Falls, Oregon (Robert Kotchenruther, EPA Region 10, personal communication). More recently, excess nitrate was observed by Washington State University (WSU), mainly as nitric acid (HNO_3) absorbed onto aqueous aerosol mass in a small number of St. Luke's (Meridian) samples during the 2008–2009 winter $PM_{2.5}$ aerosol study. However, the analysis of STN speciation data showed full neutralization of nitrate with very few exceptions, as shown in Figure 21. Figure 21 shows the highest concentrations of 20 samples (the rest of the data with smaller concentrations have similar character). Almost all days, except one sample (July 5, 2007), have a near 100% neutralization ratio. The lower ratio of July 5, 2007, was probably due to the high nitrate emissions from fireworks on the Fourth of July.

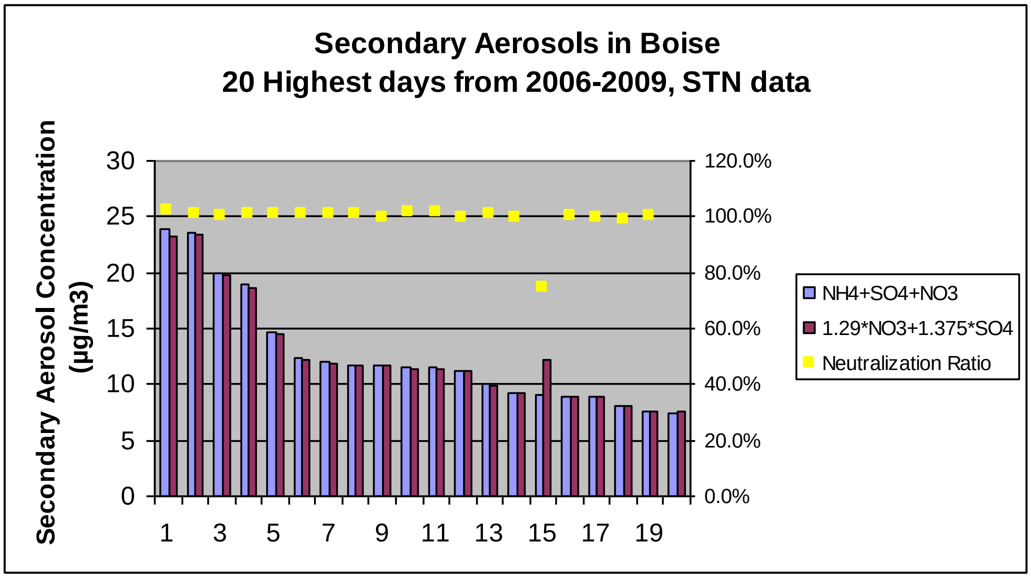


Figure 21. Neutralization ratio of nitrate in Boise. (From STN data, 20 highest concentration samples). The single sample with incomplete neutralization (ratio < 80%) is July 5, 2007, a probable result of Independence Day fireworks.

Figure 22 shows the STN speciation data from the same period of the WSU secondary aerosol study mentioned above. This data set also shows full neutralization of nitrate. The difference between the WSU study and STN data might be due to the different measurement technologies.

Secondary PM formation has the potential to react nonlinearly to controls on precursor gases such as NO_x, SO_2, and NH_3. This nonlinearity stems from the complex interaction of these gaseous species with meteorology and the available oxidants (which are additionally influenced by NO_x emissions). The measured full neutralization of NO_3 and SO_4 aerosols and likely excess NH_3 in the Ada County airshed suggests that the nonlinear behavior due to potential excess nitrate will be mitigated.

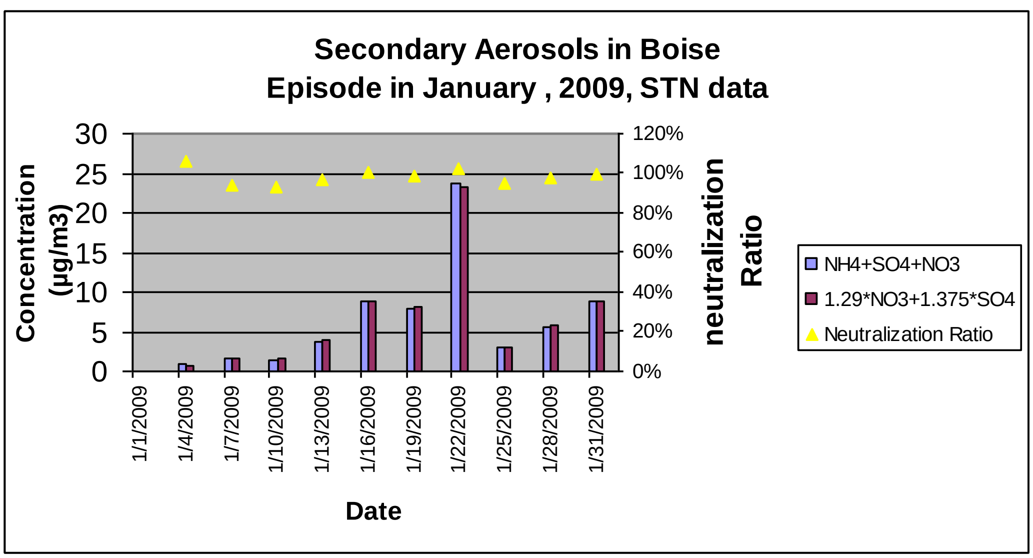


Figure 22. Nitrate neutralization in Boise, Idaho—January 2009,

For comparison, the Klamath Falls STN data are shown in Figure 23 with identical treatment of the neutralization ratio. Klamath Falls does show a lower neutralization ratio and therefore an excess of nitrate in most samples. The concentrations of secondary aerosols are much lower than those in the Boise region. Thus, based on the widely accepted STN monitoring methodology, which uses special nylon filters to chemically trap all the nitrate, we believe the Treasure Valley airshed does not have a significant excess nitrate problem that could result in a bias that could significantly affect future PM_{10} concentration projections. Nevertheless, in view of the uncertainty in nitrate neutralization, this roll-forward analysis very conservatively assumes no reduction in nitrate and sulfate precursor emissions in future years, even though new vehicle emission standards are projected to produce lower emissions. DEQ will continue to monitor the possible excess nitrate by evaluating STN data and emission data in future years.

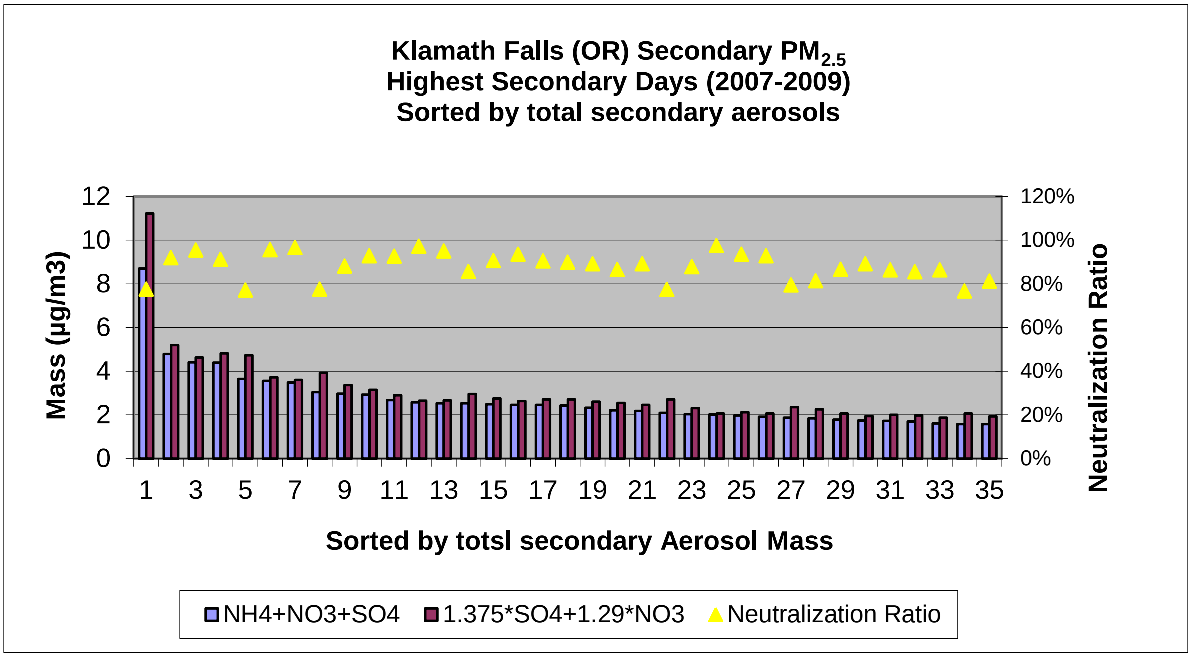


Figure 23. Nitrate neutralization in Klamath Falls, Oregon, 2007–2009 (35 samples of highest secondary aerosol concentrations).

7 Conclusions

The roll-forward modeling has demonstrated that northern Ada County will meet the PM_{10} 24-hour NAAQS in future years up to 2023 with a large margin of safety. The model results for mobile emission conformity also show that the ambient PM_{10} concentrations will be below the NAAQS up to year 2050. The nitrate mass contributes much less to the total ambient PM_{10} compared to the early 1990s. The model predicted that this trend will continue into the next decade; however, nitrate mass is held constant in the analysis to ensure the result is conservative. Carbon mass will remain an important contributor in future years. Sulfate mass makes minimal contributions currently and even less in the future. Crustal mass will be the important contributor to ambient PM_{10} in all conditions and its relative importance will increase in winter due to the nitrate decrease. However, the model results are conservative since the design value was determined based on the high PM_{10} days that were influenced by windblown or wildfire smoke. Also, the projected future VMT increase will be spread out throughout the valley rather than concentrated near the downtown Boise Fire Station No. 5 PM_{10} monitor. As a result, future concentrations at that monitor are not expected to increase with the same rate as the valley-wide VMT growth assumed in this simplified roll-forward model. This conclusion is reinforced by the steady decline in PM_{10} levels that we have seen over the past decade.

8 References

"National Ambient Air Quality Standards for Particulate Matter, Final Rule." 1997. Federal Register 62. July 18, 1997.

"Revised Requirements for Designation of Reference and Equivalent Methods for PM2.5 and Ambient Air Quality Surveillance for Particulate Matter, Final Rule." 1997. Federal Register 62. July 18, 1997.

Cahill, T.A., L. Ashbaugh, R. Eldred, P. Feeney, B. Kusko, and R. Flocchini. 1981. "Comparisons between Size-Segregated Resuspended Soil Samples and Ambient Aerosols in the Western United States." In *Atmospheric Aerosol: Source/Air Quality Relationships*, E. Macias and P. Hopke, eds., 269–285. Washington DC: American Chemical Society.

CFR (Code of Federal Regulation). 2006. "National Primary and Secondary Air Quality Standards for PM10." 40 CFR 50.6.

DEQ (Idaho Department of Environmental Quality). 1991. *Northern Ada County/Boise Particulate (PM-10) Air Quality Improvement Plan*. Boise, ID: DEQ.

DEQ (Idaho Department of Environmental Quality). 2002. *Rollback Analysis for PM_{10} Concentrations in Ada County, Idaho*. Boise, ID: DEQ.

DEQ (Idaho Department of Environmental Quality). 2012. *Development of the Base- and Future-Year Mobile Source Emissions Inventory for the Treasure Valley, Idaho*. Boise, ID: DEQ.

EPA (US Environmental Protection Agency). 1984. *Receptor Model Source Composition Library*. Research Triangle Park, NC: EPA, Office of Air Quality Planning and Standards. EPA-450/4-85-002.

EPA (US Environmental Protection Agency). 1986. *Guideline on the Identification and Use of Air Quality Data Affected by Exceptional Events*. Research Triangle Park, NC: EPA, Office of Air Quality Planning and Standards. EPA-450/4-86-007.

EPA (US Environmental Protection Agency). 1987. *PM_{10} SIP Development Guidance*. Research Triangle Park, NC: EPA, Office of Air Quality Planning and Standards. EPA-450/2-86-001.

EPA (US Environmental Protection Agency). 2011a. *AP-42 Compilation of Air Pollutant Emission Factors*. Available at: http://www.epa.gov/ttn/chief/ap42/index.html.

EPA (US Environmental Protection Agency). 2011b. "MOVES (Motor Vehicle Emission Simulator)." Available at: *http://www.epa.gov/otaq/models/moves/index.htm*.

ERG and Environ (Eastern Research Group and Environ International Corporation). 2010. *2008, 2015, and 2023 Emission Inventories for the Treasure Valley Airshed*. Rancho Cordova, CA: ERG and Environ.

Environ. 2002. *Northern Ada County PM_{10} SIP Maintenance Plan and Redesignation Request*. Novato, CA: Environ.

Etyemezian V., H. Kuhns, J. Gillies, M. Green, J. Chow, S. Kohl, and J. Watson. 2002. *The Treasure Valley Road Dust Study*. Las Vegas, NV: Desert Research Institute.

Frank, N. 2006. “Retained Nitrate, Hydrated Sulfates, and Carbonaceous Mass, in Federal Reference Method Fine Particulate Matter for Six Eastern U.S. Cities.” *J. Air & Waste Manage. Assoc*. 56(4):500–11.

Kuhns, H., M. Green, J. Watson, M. McGown, and D. Riley. 1998. *Analyzing Speciated Ambient PM_{10} Concentrations and Emissions in Ada and Canyon Counties, Idaho*.

Pitchford, M., R. Flocchini, R. Draftz, T. Cahill, L. Ashbaugh, and R. Eldred. 1981. “Silicon in Sub-Micron Particles in the Southwest.” *Atmospheric Environment* 15:321–333.

Sisler, J., W. Malm, and K. Gebhart. 1996. “Spatial and Seasonal Patterns and Long Term Variability of the Composition of the Haze in the United States.” CIRA internal document. ISSN: 0737-5352-32.

US Congress. 1970. Clean Air Act. 42 USC §7401 et seq.

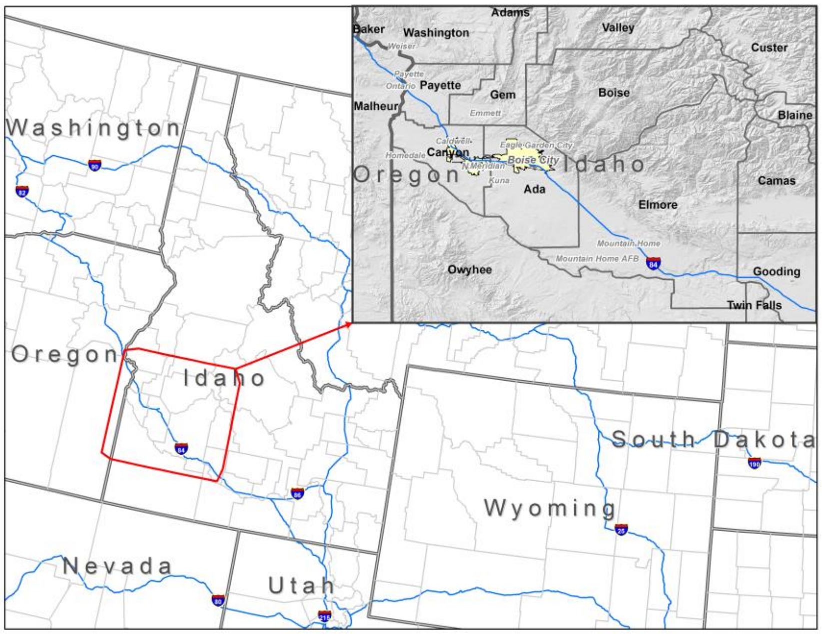
Watson, J.G, J. Chow, L. Pritchett, W. Pierson, C. Frazier, R. Purcell, and I. Olmez. 1988. *The 1987–88 Metro Denver Brown Cloud Study*. Reno, NV: Desert Research Institute. Doc. 8810 1F2.

Appendix D. 2008, 2015, and 2023 Emissions Inventories for the Treasure Valley Airshed

This page intentionally left blank for correct double-sided printing.

2008, 2015, AND 2023 EMISSIONS INVENTORIES FOR THE TREASURE VALLEY AIRSHED

Final Report



Submitted to:
Idaho Department of Environmental Quality
1410 North Hilton
Boise, ID 83706

Submitted by:

Eastern Research Group, Inc.
10860 Gold Center Drive, Suite 275
Rancho Cordova, CA 95670

Eastern Research Group, Inc.
8950 Cal Center Drive, Suite 348
Sacramento, CA 95826
Contact: Paula Fields
916-361-6751

ENVIRON International Corporation
773 San Marin Drive, Suite 2115
Novato, CA 94998

August 31, 2010

Revised by DEQ in February 2013 to reflect updated MOVES and paved road dust emission estimates.

This page intentionally left blank for correct double-sided printing.

2008, 2015, AND 2023 EMISSIONS INVENTORIES FOR THE TREASURE VALLEY AIRSHED

Final Report

Prepared for:

Idaho Department of Environmental Quality
1410 North Hilton
Boise, ID 93706

Prepared by:

Eastern Research Group, Inc. (ERG)
10860 Gold Center Drive, Suite 275
Rancho Cordova, CA 95670

and

ENVIRON International Corporation
773 San Marin Drive, Suite 2115
Novato, CA 94998

August 31, 2010

Revised by DEQ in February 2013 to reflect updated MOVES and paved road dust emission estimates.

This page intentionally left blank for correct double-sided printing.

TABLE OF CONTENTS

Section **Page**

Tables **Page**

Figures **Page**

ACRONYMS

$\mu g/m^3$	microgram per cubic meter
µm	micrometers
AAR	Association of American Railroads
ADT	average daily traffic
AEO	Annual Energy Outlook
AFB	Air Force Base
AFS	Air Facility System
ALVW	adjusted loaded vehicle weight
AP-42	*Compilation of Air Pollutant Emission Factors*
APU	auxiliary power units
ASCII	American Standard Code for Information Interchange
ATADS	Air Traffic Activity Data System
Atm	standard atmosphere, a unit of pressure
ATR	automatic traffic recorder
BEIS	Biogenic Emission Inventory System
BLS	Bureau of Labor Statistics
CARB	California Air Resources Board
CDL	cropland data layer
CH_4	methane
CMAQ	Congestion Mitigation and Air Quality
CMU	Carnegie Mellon University
CO	carbon monoxide
CO_2	carbon dioxide
COMPASS	Community Planning Association of Southwest Idaho
CONCEPT MV	Consolidated Community Emissions Processing Tool On-Road Motor Vehicle Model
CTIC	Conservation Technology Information Center
DEQ	Department of Environmental Quality
DQOs	Data Quality Objectives
EDMS	Emissions and Dispersion Modeling System
EEA	European Environment Agency

EIA	Energy Information Administration
EIIP	Emission Inventory Improvement Program
ERG	Eastern Research Group, Inc.
ETBE	ethyl tert-butyl ether
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FIPS	Federal Information Processing Standards
FRA	Federal Railroad Administration
FRS	Facility Registry System
ft^3	cubic feet
g/l	grams per liter
GIS	Geographic Information System
Gmol	grams per mole
GSE	ground support equipment
GTM	gross ton-mile
GVWR	gross vehicle weight rating
HC	hydrocarbons
HDDV	Heavy-Duty Diesel Vehicle
HDGV	Heavy-Duty Gasoline Vehicle
HP	horsepower
HPMS	Highway Performance Monitoring System
I/M	inspection and maintenance
ICAO	International Civil Aviation Organization
ID	identification number
IDPR	Idaho Department of Parks and Recreation
IDWR	Idaho Department of Water Resources
IFIRS	Idaho Fire Incident Reporting System
INPR	Idaho Northern Pacific Railroad
IPM	Integrated Pest Management
IPP	Inventory Preparation Plan
ISDA	Idaho State Department of Agriculture

ITD	Idaho transportation department
km	kilometers
lbs	pounds
LDDT	Light-Duty Diesel Truck
LDDV	Light-Duty Diesel Vehicle
LDGT	Light-Duty Gasoline Truck
LDGV	Light-Duty Gasoline Vehicle
LPG	liquefied petroleum gas
LTOs	landing-takeoff cycles
LULC	land use-land cover
MC	Motorcycles
MEGAN	Model of Emissions of Gases and Aerosol from Nature
Mg	Megagrams
MM5	Fifth-Generation NCAR/Penn State Mesoscale Model
mmHG	millimeters of mercury
MMscf	million standard cubic feet
MOVES	MOtor Vehicle Emission Simulator
mph	miles per hour
mps	meters per second
MSDS	Material Safety Data Sheets
MTBE	methyl tert-butyl ether
NAAQS	National Ambient Air Quality Standards
NAICS	North American Industry Classification System
NASS	National Agricultural Statistics Service
NEI	National Emissions Inventory
NH_3	ammonia
NO	nitric oxide
NO_x	nitrogen oxides
O_3	ozone
ORIS	Office of Regulatory Information Systems
OSD	ozone season daily

PAN	Pesticide Action Network
PBR	permit by rule
PM	particulate matter
PM_{10}	particulate matter with an aerodynamic diameter of 10 micrometers or less
$PM_{2.5}$	particulate matter with an aerodynamic diameter of 2.5 micrometers or less
POSST	Point Source Survey Tool
ppm	parts per million
ppmv	parts per million by volume
psi	pounds per square inch
PTC	Permit to construct
QA	quality assurance
QAP	Quality Assurance Plan
QC	quality control
RVP	Reid vapor pressure
RWC	residential wood combustion
SCC	Source Classification Code
scf	standard cubic feet
SIC	Source Industrial Classification
SIP	State Implementation Plan
SMOKE	Sparse Matrix Operator Kernel Emissions
SO_2	sulfur dioxide
SSURGO	Soil Survey Geographic Database
STATSGO	State Soil Geographic Database
TAF	Terminal Area Forecast
TAME	tert-amyl methyl ether
TAZ	Transportation Analysis Zone
TDM	Transportation Demand Model
TIMs	Time-in modes
TPD	tons per day
TPY	tons per year
TRI	Toxic Release Inventory

TVRDS	Treasure Valley Road Dust Study
U.S. EPA	United States Environmental Protection Agency
UP	Union Pacific
USDA	United States Department of Agriculture
USGS	United States Geological Survey
UW	University of Washington
VIN	vehicle identification number
VKT	vehicle kilometers travelled
VMT	vehicle miles travelled
VOC	volatile organic compounds
VTRIS	Vehicle Travel Information System
WRAP	Western Regional Air Partnership
WRCC	Western Regional Climate Center
WRF	Weather Research and Forecasting
WSFO	National Weather Service Forecast Office
WWTPs	wastewater treatment plants

This page intentionally left blank for correct double-sided printing.

1.0 INTRODUCTION

This report was originally prepared by the team of Eastern Research Group, Inc. (ERG) and ENVIRON International Corporation (ENVIRON), with assistance from Aurora Research Group (Aurora), according to the scope of Idaho Department of Environmental Quality (DEQ) Contract C774, dated March 26, 2009.

Between completion of the ERG/Environ emissions inventory final report in 2010 and application of the emissions inventories in the attainment demonstration for the Northern Ada County PM_{10} *Limited Maintenance Plan Ten-Year Update, four events dictated that updates were necessary:*

1. *The Motor Vehicle Emission Simulator (MOVES) model became a requirement for all state implementation plans (SIPs) and conformity tests to be based on SIPs (EPA, 2011a);*

2. *The methodology originally used for paved road dust emission estimates was found to be flawed;*

3. *Small errors in ozone season distillate combustion sulfur dioxide (*SO_2*) emissions were discovered; and,*

4. *On-road and paved road emission projections out to 2050 were added to support conformity evaluations of the Community Planning Association of Southwest Idaho (COMPASS) long-range transportation plans with horizons out to 2050.*

As a result of the first two events, DEQ updated the on-road and paved road dust emissions in 2012. The development of updated on-road (MOVES) and paved road dust emission estimates are both described in "Development of the Base- and Future-Year Mobile Source Emissions Inventories for the Treasure Valley, Idaho" (DEQ, 2012), included as Appendix E of the Northern Ada County PM_{10} *Limited Maintenance Plan Ten-Year Update. For clarity and ease of use, this report was also updated (all revised text and values are shown in italic to clearly distinguish the DEQ updates from the original of ERG/Environ report).*

1.1 Background

The Treasure Valley Airshed consists of Ada and Canyon counties in total; portions of Elmore, Boise, Gem, Payette, and Owyhee counties in Idaho; plus, a portion of Malheur County, Oregon (see report cover). This airshed boundary was determined using population, model runs, seasonal episodic events for particulate matter (PM) with an aerodynamic diameter of 2.5 µm or less ($PM_{2.5}$) and ozone (O_3), and meteorological data such as average mixing heights. Activity in all of the counties contributes to the air quality conditions, as emissions mix within and are essentially trapped in the roughly 60-mile by 100-mile bathtub-shaped Treasure Valley. The terrain includes mountains northwest-north-northeast that rise to more than 7,000 feet (i.e., the Boise Front); a nearly closed end of the valley to the southeast where a rise off the Boise Front sometimes keeps pollutants from being transported away; mountains to the south-southwest rise to over 8,000 feet (i.e., the Owyhee Mountains); and the valley is open to the west-northwest.

The Treasure Valley, and especially Ada County, has a history of problems with PM with an aerodynamic diameter of 10 micrometers (µm) or less (PM_{10}), and carbon monoxide (CO). Local weather patterns that occur in winter months, terrain, and human activities contributed to episodes of particulate build-up. Northern Ada County was designated as in nonattainment of the PM_{10} National Ambient Air Quality Standard (NAAQS) in 1986. Violations of the PM_{10} NAAQS have not occurred since 1991 and northern Ada County remains in maintenance.

The CO problem stems from automobile exhaust and residential wood heating during winter inversions. Exceedance of the 8-hour CO NAAQS has not occurred since January 1991 and the area remains in maintenance since that time.

Currently, the Treasure Valley is close to violating the O_3 NAAQS. Air quality monitoring data indicate the area has equaled the 0.075 parts per million (ppm) NAAQS when averaging the fourth-highest readings from 2006, 2007, and 2008. Sunny summer weather, air stagnation, increased vehicle miles traveled from rapid population growth, industrial activity, and the terrain all contribute to high O_3 levels. The occasional nearby wildfire and transport from other urban areas in the region also contribute to high levels of O_3 in the valley.

After approaching the 35 microgram per cubic meter ($\mu g/m^3$) 24-hour NAAQS for $PM_{2.5}$, favorable meteorological conditions in the Treasure Valley during the winters of 2006/2007 and 2007/2008 have allowed the $PM_{2.5}$ design value to decrease. Lower frequency and shorter duration inversion conditions have occurred as synoptic weather systems passed through Southwestern Idaho with more regularity. Although the Treasure Valley is not in danger of violating the annual $PM_{2.5}$ standard in the short term, interest remains in obtaining accurate $PM_{2.5}$ emissions data for use in modeling and air quality studies should the typical winter inversions return.

Planning efforts and special projects have identified certain contributors to the O_3, PM_{10}, and $PM_{2.5}$ issues in the Treasure Valley, as well as a need for more recent SIP-level emissions inventory data. DEQ has begun an extensive effort to reduce O_3 levels in the valley, as well as ensuring $PM_{2.5}$ problems remain in check even if stagnant winter weather patterns return. To be fully able to control certain pollutant contributions to the airshed, DEQ must first have the emissions inventory data to be able to determine controls and the human behavioral changes necessary to possibly keep the area from going into nonattainment for one or both of these pollutants.

Idaho DEQ needed an accurate emissions inventory of O3 precursors, and primary PM_{10} and $PM_{2.5}$ and their precursors for the Treasure Valley Airshed. This emissions inventory must be of sufficient quality and detail to:

- Support development of O_3, PM_{10}, and $PM_{2.5}$ control strategies;
- Support photochemical grid modeling for control strategy development; and
- If necessary, in the event of a non-attainment designation, to fully meet U.S. Environmental Protection Agency (U.S. EPA) expectations and guidance as part of an O3, PM_{10}, or $PM_{2.5}$ non-attainment area SIP and maintenance plan submittal.

The Treasure Valley emissions inventory project was funded through the Congestion Mitigation and Air Quality (CMAQ) grant program, which is distributed via the Idaho Transportation Department (ITD). DEQ is the lead agency on the project, working cooperatively with ITD; the local Metropolitan Planning Organization, COMPASS; and the contractor team of ERG, ENVIRON, and Aurora.

The emissions inventory was developed according to Emission Inventory Improvement Program (EIIP) Level II requirements (EIIP, 1997a).

1.2 Inventory Scope

The scope of the Treasure Valley emissions inventory includes these characteristics:

- Pollutants: Emissions were estimated for the following pollutants:
  - Ozone precursors: nitrogen oxides (NO_x), volatile organic compounds (VOC), and CO;
  - Primary PM_{10} and $PM_{2.5}$; and
  - Precursors of PM_{10} and $PM_{2.5}$: NO_x, sulfur dioxide (SO_x), VOC, and ammonia (NH_3).
- Time Frame and Temporal Resolution: The base year inventory was developed is for calendar year 2008. Projections were developed for years 2015 and 2023. In addition to annual inventories, estimates were also developed for ozone season daily (OSD) and PM_{10}/$PM_{2.5}$ (PM) season daily emissions. The ozone season is April 1 through October 31, and the PM season is November 1 through February 28.
- Sources: The inventories included estimates of emissions from industrial point sources, area sources, and nonroad mobile sources. Also, ENVIRON estimated link-level on-road motor vehicle emissions for the 15-day period of February 1-15, 2008. DEQ then used the CONCEPT-MV system and identical methodologies, with assistance and peer review by ENVIRON, to estimate on-road emissions for each season during all three inventory years (i.e., 2008, 2015, and 2023) using the MOBILE6.2 model. In 2012 DEQ recomputed the 2008, 2015, and 2023 on-road emissions inventories using the MOVES2010a model and EPA's AP-42 Paved Road Dust method. *Finally, DEQ has also completed the on-road modeling for 2050 to support the Northern Ada County* PM_{10} *Limited Maintenance Plan Ten-Year Update and subsequent conformity determinations in the long-range transportation planning cycle that must be based on the plan.*
- Geographic Domain and Resolution: The inventories were estimated for the subject pollutants and sources located entirely within Ada, Canyon, and Elmore counties, Idaho. For the point sources, specific location coordinates will be provided. For area and nonroad mobile sources, emissions will be provided at the county level.

Table 1-1 lists the source types and pollutants included in the Treasure Valley emissions inventory.

The contract scope includes the following tasks:

- Task 1: Work Plan for the Development of the Emissions Inventory
- Task 2: Inventory Preparation Plan and Quality Assurance Plan (IPP/QAP)
- Task 3: 2008 Point Sources Emissions Inventory
- Task 4: 2008 Area Sources Emissions Inventory

- Task 5: 2008 Nonroad Mobile Sources Emissions Inventory
- Task 6: Emissions Inventory Document
- Task 7: Emissions Inventory Data Spreadsheets
- Task 8: Peer Review Biogenic and On-Road Motor Vehicle Emissions

Table 1-1. Source Types and Categories Included in the Treasure Valley Emissions Inventories

Source Type	Source Category	Pollutants
Point	Industrial Facilities (Various)[a]	NO_x, SO_2, VOC, CO, PM_{10}, $PM_{2.5}$, NH_3
Area	Industrial Fuel Combustion (distillate, LPG, natural gas)	NO_x, SO_2, VOC, CO, PM_{10}, $PM_{2.5}$, NH_3
	Commercial/ Institutional Fuel Combustion (distillate, kerosene, LPG, natural gas)	NO_x, SO_2, VOC, CO, PM_{10}, $PM_{2.5}$, NH_3
	Residential Fuel Combustion (distillate, kerosene, LPG, natural gas)	NO_x, SO_2, VOC, CO, PM_{10}, $PM_{2.5}$, NH_3
	Residential Wood Combustion (fireplaces, woodstoves, fireplaces with inserts, pellet stoves)	NO_x, SO_2, VOC, CO, PM_{10}, $PM_{2.5}$, NH_3
	Paved Road Dust	PM_{10}, $PM_{2.5}$
	Unpaved Road Dust	PM_{10}, $PM_{2.5}$
	Commercial Cooking	NO_x, SO_2, VOC, CO, PM_{10}, $PM_{2.5}$, NH_3
	Construction Dust	PM_{10}, $PM_{2.5}$
	Architectural Surface Coating	VOC
	Traffic Markings	VOC
	Autobody Refinishing	VOC
	Industrial Surface Coating	VOC
	Degreasing	VOC
	Graphic Arts	VOC
	Industrial Refrigeration/Cold Storage	NH_3
	Consumer Solvent Use	VOC
	Bakeries	VOC
	Dry Cleaning	VOC
	Asphalt Application	VOC
	Agricultural Pesticides	VOC
	Gasoline Transport and Distribution	VOC
	Wastewater Treatment Plant	VOC
	Landfills	VOC
	Open Burning (yard waste, household waste)	NO_x, SO_2, VOC, CO, PM_{10}, $PM_{2.5}$, NH_3
	Agricultural Tilling	PM_{10}, $PM_{2.5}$
	Agricultural Harvesting	PM_{10}, $PM_{2.5}$
	Agricultural Burning (fields, irrigation ditches)	NO_x, SO_2, VOC, CO, PM_{10}, $PM_{2.5}$, NH_3
	Beef Cattle Feedlots	VOC, PM_{10}, $PM_{2.5}$
	Structural Fires	NO_x, SO_2, VOC, CO, PM_{10}, $PM_{2.5}$, NH_3
	Vehicle Fires	NO_x, SO_2, VOC, CO, PM_{10}, $PM_{2.5}$, NH_3
	Windblown Dust	PM_{10}, $PM_{2.5}$
	Livestock Ammonia	NH_3
	Agricultural Fertilizer	NH_3
	Domestic Ammonia	NH_3
	Wild Animals	NH_3
	Native soils	NH_3
Nonroad	Nonroad Equipment	NO_x, SO_2, VOC, CO, PM_{10}, $PM_{2.5}$, NH_3

Source Type	Source Category	Pollutants
Mobile	Aircraft	NO_x, SO_2, VOC, CO, PM_{10}, $PM_{2.5}$, NH_3
	Locomotives	NO_x, SO_2, VOC, CO, PM_{10}, $PM_{2.5}$, NH_3
On-Road Motor Vehicles	• Vehicle Types (8) • Roadway Types	NO_x, SO_2, VOC, CO, PM_{10}, $PM_{2.5}$, NH_3
Biogenics	To be provided by DEQ	NO_x, VOC

[a] Industrial point sources include facilities that emit pollutant quantities above the following amounts: 5 tons per year (TPY) PM_{10}, $PM_{2.5}$, SO_2, or NH_3; 10 TPY VOC; 25 TPY NO_x or CO. Sources with annual emissions below these amounts will be included in the area sources inventory.

- Task 9: Provide all Data to DEQ
- Task 10: Emissions Inventory Projections (2015 and 2023)
- Task 11: CONCEPT MV Motor Vehicle Emissions Modeling

All work under all tasks has been completed. The methods used and results achieved are documented in this final report. All data files (e.g., emissions inventory calculation spreadsheets, model-ready formatted files, etc.) are being submitted along with this final report.

1.3 Report Contents

The remainder of this report is organized as follows:

- Section 2.0 presents the methodologies and results for the 2008 point source inventory;
- Section 3.0 provides the methodologies and results for the 2008 area source inventory;
- Section 4.0 presents review and results for the 2008 on-road motor vehicle inventory;
- Section 5.0 provides the methodologies and results for the 2008 nonroad mobile source inventory;
- Section 6.0 provides the review and results for the 2008 biogenic inventory;
- Section 7.0 outlines the methodologies used to project the 2008 point, area, on-road motor vehicle, nonroad mobile, and biogenic inventories to the future years of 2015 and 2023;
- Section 8.0 describes the emissions inventory data formatting that was conducted;
- Section 9.0 lists all of the references that were used in the development of the overall emissions inventory.

The report appendices contain various supplemental information, including the following:

- Appendix A – Listing of PBR and Unpermitted Facilities

- Appendix B – Letters to Tier 1 and 2 Facilities; PBR and Unpermitted Facilities
- Appendix C – Area Source Surveys (Fuel Dealer and Distributor Survey, Dry Cleaning Survey, Wastewater Treatment Survey, and Landfill Survey)
- Appendix D – Aurora Residential Wood Combustion Survey Report
- Appendix E – DEQ CONCEPT-MV Technical Memorandum
- Appendix F – Biogenics Technical Memorandum
- Appendix G – Detailed Area Source Emission Inventory Summaries

This page intentionally left blank for correct double-sided printing.

2.0 2008 POINT SOURCE EMISSIONS INVENTORY

2.1 Point Source Data Collection

Early in the development of the point source inventory, it was decided that the industrial point source facilities would be divided into two categories: permitted sources and unpermitted sources. The permitted sources include facilities that operate under a current Tier 1 permit (i.e., Title V) or a Tier 2 (including permit to construct [PTC]) permits. The unpermitted sources include facilities that were operating under a permit by rule (PBR) (i.e., portable sand and gravel equipment and dairies), as well as the possible universe of industrial facilities that do not possess current DEQ air permits. DEQ provided a list of the Tier 1 and Tier 2 permitted facilities and the PBR facilities, including facility and contact name and address.

For the Treasure Valley emissions inventory, point sources are defined to include industrial facilities emitting greater than one of the following thresholds:

- 5 tons per year (tpy) of PM_{10}, $PM_{2.5}$, SO_x, or NH_3;
- 10 tpy of VOC; or
- 25 tpy of NO_x or CO.

Sources with annual emissions below these levels will be included in the area sources inventory.

The procedure described below was used to develop a master database of potential point source facilities located within the Treasure Valley Airshed (i.e., Ada, Canyon, and Elmore counties) in order to include full contact information needed for mailing point source survey letters. The data sources used were DEQ's Tier 1, Tier 2/PTC, and PBR lists; 2002 and 2005 National Emissions Inventory (NEI); the U.S. EPA's Facility Registry System (FRS); Idaho Secretary of State Business Listing; and 2005-2007 Toxic Release Inventories (TRI). The procedure steps included the following:

- The starting point was the DEQ's Tier 1 and Tier 2/PTC permit lists (109 facilities). Information for these facilities included contact person, facility name(s), and address. A unique facility identification number (ID) was assigned. This information was given the highest priority in the merged database.
- Using the 2002 and 2005 NEI, facility information was merged with the above permits list (42 facilities). For overlapping facilities, IDs were updated. Non-

overlapping facilities were appended into the master database and a unique Facility ID was assigned. Information included: facility name(s), address information, SIC/NAICS/Industry codes and descriptors, location coordinates, and other facility identifiers (i.e., NEI Site ID, ORIS Facility Code, TRI ID and FRS ID). This information was assigned the second highest priority.

- Using DEQ's listing of facilities with PBRs (i.e., portable rock crushers and dairies), facility information was added to database. Information for these facilities included contact person, facility name(s), and address. Also, these facilities were assigned an SIC of either 1442 (Construction Sand and Gravel) or 0241 (Dairy Farms). A unique Facility ID was assigned, along with a POSST User Name and Password. This information was assigned the third highest priority.

- The next data source used for the merge was from U.S. EPA's FRS. For Ada, Canyon, and Elmore counties, over 2,100 unique facilities were identified. For non-overlapping facilities, the information obtained from FRS included facility name(s), address information, location coordinates, SIC/NAICS codes, and other facility identifiers (i.e., FRS ID, NEI ID, AFS ID, and TRI ID). This information was assigned the fourth highest priority.

- A business listing provided by the Idaho Secretary of State was merged with the above list, and appended to the master database for non-overlapping businesses. Information included contact person, facility name(s), and address information. This information was assigned the fifth highest priority.

- The final data source to be merged into the master database was the 2005 through 2007 TRI datasets. While the basic facility information was contained in the FRS data source, the TRI datasets also contained contact information. This information was assigned the lowest priority.

Using this procedure, the following quantities of potential point source facilities were identified:

- Tier 1 and Tier 2 permitted facilities: 109 (see Table 2-1)

- PBR facilities (portable rock crushers and dairies): 23 portable plants and 6 dairies (see Table 2-2)

- Unpermitted facilities: 1,654 facilities

A listing of the 1,683 total PBR and unpermitted facilities is presented in Appendix A.

Table 2-1. Permitted Point Sources in the Treasure Valley

Co.	Facility Name	2008 Emissions Data	Co.	Facility Name	2008 Emissions Data
Ada	Ada Animal Crematorium	✓	Ada	Western Aircraft	
	Ada County/Hidden Hollow Landfill			Western Electronics Inc	✓
	American Paving Company	✓		Western Idaho Cabinets	✓
	Arrow Planers & Moulding		Canyon	Ace Supply Inc	
	B & D Foods	✓		The Amalgamated Sugar Co (TASCO)-Nampa	✓
	BFI Boise	✓		Boise Packaging & Newsprint LLC Nampa	✓
	Boise Independent School District - Victory	✓		C & B Quality Trailer Works Inc	✓
	Boise Moulding & Lumber			Carco Mineral Resources Inc	
	C Wright Construction	✓		Chevron USA Inc SS 98628	
	Chen Northern Inc			Crookham Company	
	Chevron/NW Terminalling Boise	✓		Darigold-Caldwell	✓
	Circle K Store #440			Eco-Tech Services Inc	
	Classic Kitchen Doors			Environmental Oil Services	
	Cremation Society Of Idaho	✓		Flahiff Funeral Chapels Inc	✓
	Darling International			Fleetwood Homes of Idaho Inc 04-1	✓
	Earl Scheib Inc			Idaho Ethanol Processing	
	Empire Transport Inc Cloverdale			Interstate Group LLC	✓
	Envirosafe Svcs of Idaho Inc			JC Penney Co Inc	
	EPSCO Corporation			J.R. Simplot Company-Diversified Nampa	✓
	Fiber Composites LLC	✓		J.R. Simplot	
	Fiberglass Systems Inc Kuna			J.R. Simplot Company - Food Group	✓
	Fiberglass Systems Incorporated	✓		Low's Ready Mix Inc	✓
	G2 Energy LLC			Mercy Medical Center	✓
	Hewlett Packard Co - Boise Site	✓		Micron Technology Inc Nampa	✓
	Idaho Timber of Boise LLC	✓		Mirage Enterprises Inc	✓
	Jack's Tire & Oil Inc	✓		Oldcastle Precast Inc	✓
	Lar-Ken Septic Tanks Inc	✓		Pacific Press Publishing Assoc	✓
	Larson Miller Inc			Pyro Energy	
	MAACO Collision Repair And Auto Center			Rogers NK Seed Co	
	Michaels of Oregon	✓		Seedbiotics	✓
	Micron Technology Inc.	✓		Seminis Vegetable Seeds	✓
	Mike's Sand & Gravel			Snake River Chemicals Caldwell	
	Motivepower Truck and Engine Annex (TEA)	✓		Snake River Trailer Company	✓
	Mountain View Animal Clinic			Sorrento Lactalis Inc Swiss Village Plant	✓
	Mountain View Funeral Home Boise	✓		Summit Seed Coatings	✓
	Mountain View Power			Teton Sales Co	✓
	Northwest Pipeline GP Boise	✓		Univar USA Inc Nampa	
	Nxedge Inc Of Boise	✓		US Army National Guard OMS2	
	Plum Creek Northwest Lumber	✓		Western Farm Service – Caldwell	✓
	Pre Cote Industries	✓		Western Stockmens Inc	✓
	Safety Kleen Corporation	✓		Western World Incorporated	
	Saint Alphonsus Regional Medical Center	✓		White's Hauling & Farm	✓
	Saint Luke's Meridian Medical Center	✓		Woodgrain Millwork Inc Nampa	
	Semmaterials L.P.-Boise Id Plant	✓		XI Four Star Beef	
	Sinclair Pipeline Company	✓		Z Casting Inc	
	St. Luke's Regional Medical Center		Elmore	Double J Milling LLC	✓
	Summers Funeral Home			Evander Andrews Power Complex	✓
	Tesoro Refining and Marketing Co., Boise	✓		Glenns Ferry Cogeneration Partners Ltd	
	Treasure Valley Forest Products Boise	✓		Idaho Fresh Pak (Plant #4) Glenns Ferry	
	Turner Sand & Gravel			Idaho Power Co - Bennett Mountain	✓
	Turner Sand & Gravel			Northwest Pipeline Gp Mountain Home	✓
	USAF Idaho Air National Guard			Simplot Livestock Company Grandview	
	US DOT FAA Traffic Control Tower			Treasure Valley Forest Products	
	Valley Sand & Gravel			US Air Force-Mountain Home	✓
	West Park/Walla Walla Shopping Center				

Table 2-2. Facilities Operating Under Permit by Rule in the Treasure Valley Air Shed

DEQ ID or County	Type of Facility	Facility Name
1677700335	Portable	C Wright Construction Co Inc
1677700418	Portable	C Wright Construction Co Inc
1677700158	Portable	Camas Gravel Company
1677700093	Portable	Central Paving Company
1677700024	Portable	Central Paving Company
1677700243	Portable	Central Paving Company
1677700304	Portable	Combined Districts Crushing Fund
1677700099	Portable	Concrete Placing Company Inc
1677700389	Portable	Debco Construction
1677700370	Portable	Deerflat Sand & Gravel
1677700378	Portable	Knife River (Masco Inc)
1677700209	Portable	Nelson-Deppe Inc
1677700390	Portable	Rambo Crushing Company
1677700162	Portable	River Rock Sand & Gravel LLC
1677700100	Portable	Seubert Excavators Inc
1677700103	Portable	Seubert Excavators Inc
1677700373	Portable	Staker & Parson Companies
77700407	Portable	Staker & Parson Company
777-00422	Portable	STP Concrete Co., Inc
041-00007	Portable	Treasure Canyon Calcium
1677700231	Portable	Western Construction
1677700042	Portable	Western Construction
1677700212	Portable	Western Construction
Ada	Dairy	Degroot Dairy
Canyon	Dairy	Beranna Dairy
Canyon	Dairy	Dry Lakes Dairy
Canyon	Dairy	Sun Ridge Dairy
Canyon	Dairy	T&T Cattle
Elmore	Dairy	TLK Dairy

It should be noted that the listing of PBR and unpermitted sources does not include landfills, fuel suppliers/distributors, dry cleaners, municipal wastewater treatment plants (WWTPs), beef cattle feedlots, and airports (to the extent that they could be identified). The reason for excluding these sources is because their activity data will be collected separately to use with methods for estimating their emissions which are unique to those source categories. These methodologies for these source categories are discussed in the following sections:

- Fuel suppliers/distributors (Section 3.1.1)
- Dry cleaners (Section 3.1.13)
- Wastewater treatment plants (Section 3.1.17)

- Landfills (Section 3.1.18)
- Beef cattle feedlots (Section 3.1.23)
- Airports (Section 5.1.2)

The final database was provided to DEQ. DEQ then assigned a POSST User Name and Password to each record, and used the file to print names and contact information on each of the letters for both the permitted and PBR/unpermitted sources. Letters were then developed to mail to each facility to request completion of the POSST forms. The permitted sources were requested to complete the full POSST form (previously developed by DEQ for annual reporting), while the unpermitted facilities were allowed to complete a simplified "EZ" form (i.e., emission estimates were not required). Examples of these letters (i.e., one for the Tier 1 and Tier 2 permitted facilities, and another for the PBR and unpermitted facilities) are included in Appendix B. Finally, the contact information and POSST User Names and Passwords from the final merged database were transferred to the POSST survey letters and mailed to each facility.

2.2 Emission Calculation Methodologies – Annual

The methodologies used to calculate annual point source emissions for the 2008 base year are presented in this section. The estimation of the seasonal ozone and PM daily emissions for 2008 is discussed in Section 2.3, while the development of the future 2015 and 2023 projected point source emissions inventories is presented in Section 7.1.1.

Annual point source emissions were developed from data collected electronically by DEQ using the POSST submittal process. Of the 109 permitted facilities, a total of 60 facilities submitted 2008 annual emissions either through the complete POSST or as a separate facility-wide emissions inventory (see Table 2-1). Initial quality assurance (QA) was conducted by DEQ before emissions data were compiled.

Following DEQ's QA, an additional QA step was conducted for consistency. The PM data submitted through POSST was very inconsistent. Some facilities submitted primary PM_{10} (PM_{10}-PRI) emissions, while others submitted filterable PM_{10} (PM_{10}-FIL) emissions. Most combustion sources did not submit condensable PM (PM-CON) emissions, even though such emissions would be expected. Some facilities submitted $PM_{2.5}$ emissions that were identical to PM_{10} emissions based on an apparent assumption of equality, even though such an assumption was incorrect. In order to address the inconsistency in PM emissions, the PM augmentation scheme utilized in the 2002 NEI was implemented (U.S. EPA, 2006). The PM augmentation scheme provided look-up tables of SCC-specific conversion factors (e.g., PM_{10}-PRI to PM_{10}-FIL, PM_{10}-FIL to PM-CON, PM_{10}-FIL to $PM_{2.5}$-FIL, etc.). The augmentation scheme was applied to either PM_{10}-PRI or PM_{10}-FIL emissions for every point source process reported in POSST. Wherever possible, identified controls were accounted for in this augmentation procedure. Application of the augmentation procedure resulted in PM_{10}-FIL, $PM_{2.5}$-FIL, and PM-CON emissions for every point source process. For inclusion in this report, these point source emissions were reported as PM_{10}-PRI (i.e., sum of PM_{10}-FIL and PM-CON) and $PM_{2.5}$-PRI (i.e., sum of $PM_{2.5}$-FIL and PM-CON). However, in the formatted data files to be provided along with the final report, the filterable and condensable PM emissions will be provided, instead of the primary PM emissions.

Of the 1,683 unpermitted and PBR facilities included in Appendix A, a total of 632 facilities (i.e., nearly a 38 percent return rate) submitted a simplified "EZ" form to DEQ. DEQ then performed the initial compilation of the EZ data. Subsequent QA was then conducted and facilities with unusable data were discarded.   Because the unpermitted and PBR facilities had little or no previous interaction with DEQ concerning air emissions, there were considerable amounts of invalid data that were submitted to DEQ. Some issues included:

- Because the selection of the 1,683 unpermitted and PBR facilities was fairly broad, there were a large number of facilities that did not have emissive processes (e.g., businesses run out of homes, land management companies, etc.).
- Some facilities reported nonsensical units (e.g., tons of electricity, million cubic feet of heat, 1000 gallons of vehicles, gallons of steel, etc.).
- Some reported material quantities were not reasonable (e.g., a particular facility's reported fuel use was a significant fraction of the state's total industrial or commercial fuel use, etc.).
- Some reported material quantities did not match the reported SCC.
- There were handful of instances where submitted incorrect or missing data were corrected (i.e., typically based upon notes found elsewhere in the submitted data records), but, in general, the intent of incorrect or missing data was not discernible and so these facilities were discarded.

After these QA steps, a total of 291 facilities that submitted EZ data remained with valid and reasonable activity data.

The next step for these 291 facilities was to determine which facilities exceeded the point source thresholds (i.e., 5 tpy for PM_{10}, $PM_{2.5}$, SO_x, and NH_3; 10 tpy for VOC; and 25 tpy for NO_x and CO). This was accomplished by using emission factors from a variety of sources including emission factors from AP-42 and other guidance documents, as well as information submitted by respondents (e.g., paint or adhesive VOC content, etc.). For example, the threshold determination for natural gas combustion used the AP-42 emission factors for small natural gas boilers (i.e., 100 lbs $NO_x/10^6$ ft^3, 0.6 lbs $SO_2/10^6$ ft^3, 5.5 lbs $VOC/10^6$ ft^3, 84 lbs $CO/10^6$ ft^3, 7.6 lbs $PM_{10}/10^6$ ft^3, and 7.6 lbs $PM_{2.5}/10^6$ ft^3) (U.S. EPA, 2010). The resultant natural gas quantities needed to exceed the respective pollutant thresholds were: 500×10^6 ft^3 for NO_x, $16,667 \times 10^6$ ft^3 for SO_2, $3,636 \times 10^6$ ft^3 for VOC, 595×10^6 ft^3 for CO, and $1,316 \times 10^6$ ft^3 for PM_{10} and $PM_{2.5}$. The lowest quantity (i.e., 500×10^6 ft^3 for NO_x) was then used to determine which facilities had natural gas combustion sources that exceeded the thresholds and should be considered to be point sources. Threshold determinations were conducted for the following source categories: fuel combustion (i.e., natural gas, LPG, distillate oil, and waste oil), gasoline distribution, rock crushing, concrete batching, graphic arts, aviation gasoline distribution, and adhesive application. Following the threshold determination, a total of 33 non-permitted sources were identified as exceeding DEQ's point source thresholds with 24 of these being gasoline stations. Because of the potential difficulty associated with modeling some gasoline stations as point sources and some as area sources, all gasoline stations were kept in the gasoline distribution area source category, even though 24 gasoline stations exceeded DEQ's point source thresholds. The remaining nine non-permitted sources that exceeded DEQ's point source thresholds are listed in Table 2-3.

The reconciliation between point source activity data and area source activity data was performed. Due to incompatibilities between activity data and estimation methodologies, activity data reconciliation was only possible for natural gas combustion in the industrial and commercial sectors. The activity data reconciliation is described further in Section 3.1.1 (industrial and commercial natural gas combustion).

Table 2-3. Unpermitted Facilities that Exceeded Point Source Thresholds in 2008 Emissions

Facility Name	County
C Wright Construction Co., Inc. (Fac Id: 1677700418)	Ada
Guerdon Enterprises LLC	Ada
Knife River	Ada
Western Construction (Portable Plant)	Ada
C Wright Construction Co., Inc. (Fac Id: 1677700335)	Canyon
Combined Districts Crushing Fund	Canyon
Kit Home Builders West	Canyon
Nelson-Deppe Inc.	Canyon
River Rock Sand & Gravel LLC	Canyon

2.3 Emission Calculation Methodologies – Ozone and PM Season

After the annual point source emissions were estimated using the methodologies described in Section 2.2, the daily ozone season and PM season emission estimates were developed. The ozone season extends from April 1 through October 31 (i.e., 214 days), while the PM season is from November 1 through February 29 (2008 is a leap year) (i.e., 121 days). The seasonal emissions were developed using a seasonal temporal allocation profiles. All of the sources that submitted electronic data via the POSST or EZ submittal identified the percent of operations, as number between 0 and 100, that occurred during the spring (i.e., March through May), summer (i.e., June through August), fall (i.e., September through November), and winter (i.e., December through February) for each process. In a few instances, the seasonal percent of operations was not identified for a particular process at a facility. These were gapfilled based upon seasonal percent information for other processes at the same facility.

The ozone season and PM season factors were developed using the following equations:

$$OSF = \left(\frac{\text{SPR}}{100}\right)\times\left(\frac{61}{92}\right)+\left(\frac{\text{SUM}}{100}\right)+\left(\frac{\text{FAL}}{100}\right)\times\left(\frac{61}{91}\right)$$

$$PSF = \left(\frac{\text{FAL}}{100}\right)\times\left(\frac{30}{91}\right)+\left(\frac{\text{WIN}}{100}\right)$$

Where:

OSF	=	Ozone seasonal factor
PSF	=	PM seasonal factor
SPR	=	Percent of operations in spring
SUM	=	Percent of operations in summer
FAL	=	Percent of operations in fall
WIN	=	Percent of operations in winter

The ozone season and PM season daily emissions were calculated by multiplying annual emissions by the ozone/PM season factors and then dividing by the number of days in the ozone/PM season. This is shown with the following equations:

$$E_{OS} = \frac{E_A \times OSF}{214}$$

$$E_{PS} = \frac{E_A \times PSF}{121}$$

Where:

E_A	=	Annual emissions (tons/year);
E_{OS}	=	Ozone season daily emissions (tons/day);
E_{PS}	=	PM season daily emissions (tons/day);
OSF	=	Ozone seasonal factor; and
PSF	=	PM seasonal factor.

2.4 Emission Results by Facility

The facility-level annual point source emissions are presented in Table 2-4. The facilities are listed alphabetically by county. The permitted point sources are identified as a POSST facility type; the unpermitted point sources are identified as an EZ facility type. Table cells containing a value of 0.0 represent some non-zero value less than 0.05 tons per year (tpy); blank cells represent zero emissions. One facility listed in Table 2-1 (Fiberglass Systems in Ada County) submitted a POSST submittal with zero emissions and was not included in Table 2-4. Similarly, the facility-level ozone season and PM season emissions are presented in Table 2-5 and 2-6, respectively. Table cells containing a value of 0.00 represent some non-zero value less than 0.005 tons per day (tpd); blank cells represent zero emissions. All facility-level point source data presented in Tables 2-4, 2-5, and 2-6 are included in the electronic data files submitted in conjunction with this final report.

2.5 QA/QC Procedures

For the point source inventory development, a number of QA/QC procedures were described in the project IPP/QAP (ERG and ENVIRON, 2009). However, the actual point source inventory development process was somewhat different than envisioned in the IPP/QAP. ERG's involvement with the POSST and EZ data processing and manipulation was considerably reduced with DEQ taking on a larger role. However, ERG did conduct some QA/QC following

Table 2-4. 2008 Annual Point Source Emissions (Tons/Year)

Facility Name	County	Facility Type	NO_x	SO_2	VOC	CO	PM_{10}	$PM_{2.5}$	NH_3
Ada Animal Crematorium	Ada	POSST	0.4	0.1	0.0	0.2	0.1	0.1	
American Paving Company	Ada	POSST				4.5	1.3	0.3	
B & D Foods	Ada	POSST	1.2	0.0	0.1	1.0	0.6	0.4	
BFI Boise	Ada	POSST							0.0
Boise Independent School District - Victory	Ada	POSST			0.0		0.0	0.0	
C Wright Construction	Ada	POSST	0.6	0.1	1.1	3.1	1.1	0.3	
C Wright Construction Co., Inc. (Fac Id: 1677700418)	Ada	EZ					5.2	1.7	
Cremation Society Of Idaho	Ada	POSST	0.1		0.0	0.1	0.1	0.1	
Fiber Composites LLC	Ada	POSST					29.5	21.3	
Guerdon Enterprises LLC	Ada	EZ			21.4				
Hewlett Packard Co - Boise Site	Ada	POSST	50.4	2.0	3.0	16.2	3.0	2.9	
Idaho Timber of Boise LLC	Ada	POSST					0.1	0.0	
Jack's Tire & Oil Inc	Ada	POSST	0.1	0.0	0.1	0.1	0.0	0.0	0.0
Knife River	Ada	EZ	7.2	5.3	2.2	24.0	0.3	0.2	
LAR KEN Septic Tanks Inc	Ada	POSST					0.5	0.2	
Micron Technology Inc	Ada	POSST	34.0	1.4	17.1	24.6	36.7	34.2	45.9
MotivePower Truck & Engine Annex (TEA)	Ada	POSST	10.2	0.8	33.8	5.1	0.6	0.6	
Mountain View Funeral Home Boise	Ada	POSST	0.5	0.0	0.0	0.1	0.1	0.1	
Northwest Pipeline - Boise	Ada	POSST	84.6		0.5	2.9	2.9	2.9	
NW Terminalling, Boise	Ada	POSST	4.5		74.4	11.2	2.7	1.9	
Nxedge Inc of Boise	Ada	POSST	0.3	0.0	0.1	0.3	0.1	0.1	
Plum Creek Northwest Lumber	Ada	POSST					25.2	24.4	
Pre Cote Industries	Ada	POSST			11.5				
Safety Kleen Corporation	Ada	POSST			0.2				
Saint Alphonsus Regional Medical Center	Ada	POSST	14.3	0.1	0.4	6.3	0.6	0.6	
Saint Luke's Meridian Medical Center	Ada	POSST	21.7	3.7	1.2	17.5	7.6	7.4	
Saint Luke's Regional Medical Center	Ada	POSST	115.1	46.9	4.1	52.9	23.6	23.3	
Semmaterials L.P.- Boise Plant	Ada	POSST	2.7	0.0	2.9	2.2	0.9	0.5	
Sinclair Pipeline	Ada	POSST			54.8				

Table 2-4. Continued

Facility Name	County	Facility Type	NO_x	SO_2	VOC	CO	PM_{10}	$PM_{2.5}$	NH_3
Company									
Tesoro Refining and Marketing Company, Boise	Ada	POSST	0.0	0.0	20.9	0.0	0.0	0.0	
Treasure Valley Forest Products, Boise	Ada	POSST	0.5	0.0	1.1	1.9	25.8	18.9	
Western Construction (Portable Plant)	Ada	EZ	7.3	5.4	2.2	24.4	0.3	0.2	
Western Electronics Inc	Ada	POSST	0.0		0.0	0.0			0.0
Western Idaho Cabinets	Ada	POSST			15.1		0.1	0.1	
Boise Packaging & Newsprint LLC Nampa	Canyon	POSST	2.1	0.0	25.2	2.2	1.8	1.3	
C Wright Construction Co., Inc. (Fac Id: 1677700335)	Canyon	EZ					9.7	3.1	
C&B Quality Trailer Works	Canyon	POSST	0.1	0.0	33.1	0.0	0.2	0.2	
Combined Districts Crushing Fund	Canyon	EZ					11.3	3.7	
Darigold-Caldwell	Canyon	POSST	16.0	0.1	0.9	13.0	8.4	5.4	
Flahiff Funeral Chapels Inc	Canyon	POSST	1.2	0.4	0.0	0.0	0.2	0.1	
Fleetwood Homes of Idaho Inc 04-1	Canyon	POSST			10.6		0.3	0.2	
Interstate Group LLC	Canyon	POSST	0.0		14.3	0.0	0.7	0.5	
JR Simplot Company – Diversified Nampa	Canyon	POSST	31.3	0.2	41.6	32.5	52.1	39.0	
JR Simplot Company - Food Group	Canyon	POSST	57.0	36.0	17.9	67.5	119.6	102.2	240.1
Kit Home Builders West	Canyon	EZ			36.1				
Low's Ready Mix, Inc.	Canyon	POSST					0.2	0.1	
Mercy Medical Center	Canyon	POSST	1.8	0.0	0.1	1.5	0.1	0.1	
Micron Technology Inc Nampa	Canyon	POSST	3.1	0.1	40.6	2.1	1.0	0.9	0.5
Mirage Enterprises Inc	Canyon	POSST			12.7		0.3	0.2	
Nelson-Deppe Inc.	Canyon	EZ					36.8	12.0	
Oldcastle Precast Inc	Canyon	POSST	0.0	0.0	0.0	0.0	0.0	0.0	
Pacific Press Publishing Assoc	Canyon	POSST	1.3	0.0	20.0	1.1	0.1	0.1	
River Rock Sand & Gravel LLC	Canyon	EZ					6.1	2.0	
Seedbiotics	Canyon	POSST					9.4	8.7	
Seminis Vegetable Seeds	Canyon	POSST	0.9		2.9	21.6	0.1	0.1	
Snake River Trailer Company	Canyon	POSST			0.0				
Sorrento Lactalis Incorporated Swiss Village Plant	Canyon	POSST	37.6	0.3	2.1	40.4	17.5	17.2	
Summit Seed Coatings	Canyon	POSST	0.3	0.0	0.0	0.2	0.3	0.2	
TASCO Nampa	Canyon	POSST	1,203.5	1,969.9	29.2	862.4	219.0	80.2	175.7

Table 2-4. Continued

Facility Name	County	Facility Type	NO_x	SO_2	VOC	CO	PM_{10}	$PM_{2.5}$	NH_3
Teton Sales Company	Canyon	POSST	0.1	0.0	16.2	0.1	0.1	0.1	
Western Farm Service - Caldwell	Canyon	POSST	0.1	0.3	0.0	0.0	0.1	0.1	4.3
Western Stockmens Inc	Canyon	POSST	0.1	0.0	0.0	0.1	0.3	0.1	
White's Hauling & Farm	Canyon	POSST					0.2	0.1	
Double J Milling LLC	Elmore	POSST	5.3	0.0	0.3	4.5	5.3	3.1	
Evander Andrew Complex	Elmore	POSST	29.1	0.5	1.8	32.7	5.6	5.6	
Idaho Power - Bennett Mountain	Elmore	POSST	18.6	0.1	0.6	6.4	1.7	1.7	
Mountain Home Air Force Base	Elmore	POSST	100.6	1.8	18.1	49.3	123.2	48.2	
Northwest Pipeline - Mountain Home	Elmore	POSST	206.6	0.0	5.8	12.3	0.0	0.0	
Ada County			**355.6**	**65.7**	**268.1**	**198.5**	**169.1**	**142.6**	**46.0**
Canyon County			**1,356.5**	**2,007.3**	**303.4**	**1,044.7**	**495.9**	**277.8**	**420.6**
Elmore County			**360.3**	**2.5**	**26.6**	**105.3**	**135.9**	**58.7**	**0.0**
Total			**2,072.4**	**2,075.4**	**598.1**	**1,348.5**	**800.9**	**479.0**	**466.6**

Table 2-5. 2008 Ozone Season Point Source Emissions (Tons/Day)

Facility Name	County	Facility Type	NO_x	SO_2	VOC	CO	PM_{10}	$PM_{2.5}$	NH_3
Ada Animal Crematorium	Ada	POSST	0.00	0.00	0.00	0.00	0.00	0.00	
American Paving Company	Ada	POSST				0.01	0.00		
B & D Foods	Ada	POSST	0.00	0.00	0.00	0.00	0.00	0.00	
BFI Boise	Ada	POSST							0.00
Boise Independent School District - Victory	Ada	POSST			0.00		0.00	0.00	
C Wright Construction	Ada	POSST	0.00	0.00	0.00	0.01	0.00	0.00	
C Wright Construction Co., Inc. (Fac Id: 1677700418)	Ada	EZ					0.01	0.00	
Cremation Society Of Idaho	Ada	POSST	0.00		0.00	0.00	0.00	0.00	
Fiber Composites LLC	Ada	POSST					0.08	0.06	
Guerdon Enterprises LLC	Ada	EZ			0.06				
Hewlett Packard Co - Boise Site	Ada	POSST	0.14	0.01	0.01	0.04	0.01	0.01	
Idaho Timber of Boise LLC	Ada	POSST					0.00	0.00	
Jack's Tire & Oil Inc	Ada	POSST	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Knife River	Ada	EZ	0.03	0.02	0.01	0.10	0.00	0.00	
LAR KEN Septic Tanks Inc	Ada	POSST					0.00	0.00	
Micron Technology Inc	Ada	POSST	0.08	0.00	0.05	0.06	0.10	0.09	0.12
MotivePower Truck & Engine Annex (TEA)	Ada	POSST	0.03	0.00	0.09	0.01	0.00	0.00	
Mountain View Funeral Home Boise	Ada	POSST	0.00	0.00	0.00	0.00	0.00	0.00	
Northwest Pipeline - Boise	Ada	POSST	0.23		0.00	0.01	0.01	0.01	
NW Terminalling, Boise	Ada	POSST	0.01		0.21	0.03	0.01	0.01	
Nxedge Inc of Boise	Ada	POSST	0.00	0.00	0.00	0.00	0.00	0.00	
Plum Creek Northwest Lumber	Ada	POSST					0.07	0.07	
Pre Cote Industries	Ada	POSST			0.03				
Safety Kleen Corporation	Ada	POSST			0.00				
Saint Alphonsus Regional Medical Center	Ada	POSST	0.04	0.00	0.00	0.02	0.00	0.00	
Saint Luke's Meridian Medical Center	Ada	POSST	0.06	0.01	0.00	0.04	0.02	0.02	
Saint Luke's Regional Medical Center	Ada	POSST	0.29	0.09	0.01	0.13	0.05	0.05	
Semmaterials L.P.- Boise Plant	Ada	POSST	0.01	0.00	0.01	0.01	0.00	0.00	
Sinclair Pipeline	Ada	POSST			0.15				

Table 2-5. Continued

Facility Name	County	Facility Type	NO_x	SO_2	VOC	CO	PM_{10}	$PM_{2.5}$	NH_3
Company									
Tesoro Refining and Marketing Company, Boise	Ada	POSST	0.00	0.00	0.06	0.00	0.00	0.00	
Treasure Valley Forest Products, Boise	Ada	POSST	0.00	0.00	0.00	0.01	0.08	0.06	
Western Construction (Portable Plant)	Ada	EZ	0.03	0.02	0.01	0.09	0.00	0.00	
Western Electronics Inc	Ada	POSST	0.00		0.00	0.00			0.00
Western Idaho Cabinets	Ada	POSST			0.04		0.00	0.00	
Boise Packaging & Newsprint LLC Nampa	Canyon	POSST	0.01	0.00	0.07	0.01	0.01	0.00	
C Wright Construction Co., Inc. (Fac Id: 1677700335)	Canyon	EZ					0.03	0.01	
C&B Quality Trailer Works	Canyon	POSST	0.00	0.00	0.10	0.00	0.00	0.00	
Combined Districts Crushing Fund	Canyon	EZ					0.03	0.01	
Darigold-Caldwell	Canyon	POSST	0.04	0.00	0.00	0.04	0.02	0.01	
Flahiff Funeral Chapels Inc	Canyon	POSST	0.00	0.00	0.00	0.00	0.00	0.00	
Fleetwood Homes of Idaho Inc 04-1	Canyon	POSST			0.03		0.00	0.00	
Interstate Group LLC	Canyon	POSST	0.00		0.04	0.00	0.00	0.00	
JR Simplot Company – Diversified Nampa	Canyon	POSST	0.09	0.00	0.11	0.09	0.14	0.11	
JR Simplot Company - Food Group	Canyon	POSST	0.13	0.10	0.05	0.16	0.32	0.28	0.65
Kit Home Builders West	Canyon	EZ			0.10				
Low's Ready Mix, Inc.	Canyon	POSST					0.00	0.00	
Mercy Medical Center	Canyon	POSST	0.00	0.00	0.00	0.00	0.00	0.00	
Micron Technology Inc Nampa	Canyon	POSST	0.01	0.00	0.11	0.00	0.00	0.00	0.00
Mirage Enterprises Inc	Canyon	POSST			0.03		0.00	0.00	
Nelson-Deppe Inc.	Canyon	EZ					0.11	0.04	
Oldcastle Precast Inc	Canyon	POSST	0.00	0.00	0.00	0.00	0.00	0.00	
Pacific Press Publishing Assoc	Canyon	POSST	0.00	0.00	0.06	0.00	0.00	0.00	
River Rock Sand & Gravel LLC	Canyon	EZ					0.02	0.01	
Seedbiotics	Canyon	POSST					0.01	0.01	
Seminis Vegetable Seeds	Canyon	POSST	0.00		0.01	0.07	0.00	0.00	
Snake River Trailer Company	Canyon	POSST			0.00				
Sorrento Lactalis Incorporated Swiss Village Plant	Canyon	POSST	0.10	0.00	0.01	0.11	0.05	0.05	
Summit Seed Coatings	Canyon	POSST	0.00	0.00	0.00	0.00	0.00	0.00	
TASCO Nampa	Canyon	POSST	3.14	5.10	0.06	1.63	0.57	0.21	0.40

Table 2-5. Continued

Facility Name	County	Facility Type	NO_x	SO_2	VOC	CO	PM_{10}	$PM_{2.5}$	NH_3
Teton Sales Company	Canyon	POSST	0.00	0.00	0.04	0.00	0.00	0.00	
Western Farm Service - Caldwell	Canyon	POSST	0.00	0.00	0.00	0.00	0.00	0.00	0.02
Western Stockmens Inc	Canyon	POSST	0.00	0.00	0.00	0.00	0.00	0.00	
White's Hauling & Farm	Canyon	POSST					0.00	0.00	
Double J Milling LLC	Elmore	POSST	0.01	0.00	0.00	0.01	0.01	0.01	
Evander Andrew Complex	Elmore	POSST	0.11	0.00	0.01	0.13	0.02	0.02	
Idaho Power - Bennett Mountain	Elmore	POSST	0.04	0.00	0.00	0.01	0.00	0.00	
Mountain Home Air Force Base	Elmore	POSST	0.27	0.00	0.05	0.13	0.34	0.13	
Northwest Pipeline - Mountain Home	Elmore	POSST	0.56	0.00	0.02	0.03	0.00	0.00	
Ada County			**0.96**	**0.16**	**0.75**	**0.58**	**0.46**	**0.38**	**0.12**
Canyon County			**3.52**	**5.20**	**0.82**	**2.11**	**1.31**	**0.73**	**1.07**
Elmore County			**1.00**	**0.01**	**0.07**	**0.32**	**0.38**	**0.17**	**0.00**
Total			**5.48**	**5.36**	**1.64**	**3.01**	**2.15**	**1.28**	**1.20**

Table 2-6. 2008 PM Season Point Source Emissions (Tons/Day)

Facility Name	County	Facility Type	NO_x	SO_2	VOC	CO	PM_{10}	$PM_{2.5}$	NH_3
Ada Animal Crematorium	Ada	POSST	0.00	0.00	0.00	0.00	0.00	0.00	
American Paving Company	Ada	POSST				0.00	0.00		
B & D Foods	Ada	POSST	0.00	0.00	0.00	0.00	0.00	0.00	
BFI Boise	Ada	POSST							0.00
Boise Independent School District - Victory	Ada	POSST			0.00		0.00	0.00	
C Wright Construction	Ada	POSST	0.00	0.00	0.00	0.00	0.00	0.00	
C Wright Construction Co., Inc. (Fac Id: 1677700418)	Ada	EZ					0.01	0.00	
Cremation Society Of Idaho	Ada	POSST	0.00		0.00	0.00	0.00	0.00	
Fiber Composites LLC	Ada	POSST					0.08	0.06	
Guerdon Enterprises LLC	Ada	EZ			0.05				
Hewlett Packard Co - Boise Site	Ada	POSST	0.14	0.01	0.01	0.04	0.01	0.01	
Idaho Timber of Boise LLC	Ada	POSST					0.00	0.00	
Jack's Tire & Oil Inc	Ada	POSST	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Knife River	Ada	EZ	0.00	0.00	0.00	0.01	0.00	0.00	
LAR KEN Septic Tanks Inc	Ada	POSST					0.00	0.00	
Micron Technology Inc	Ada	POSST	0.11	0.00	0.05	0.09	0.10	0.10	0.13
MotivePower Truck & Engine Annex (TEA)	Ada	POSST	0.03	0.00	0.09	0.01	0.00	0.00	
Mountain View Funeral Home Boise	Ada	POSST	0.00	0.00	0.00	0.00	0.00	0.00	
Northwest Pipeline - Boise	Ada	POSST	0.23		0.00	0.01	0.01	0.01	
NW Terminalling, Boise	Ada	POSST	0.01		0.19	0.03	0.01	0.01	
Nxedge Inc of Boise	Ada	POSST	0.00	0.00	0.00	0.00	0.00	0.00	
Plum Creek Northwest Lumber	Ada	POSST					0.07	0.07	
Pre Cote Industries	Ada	POSST			0.03				
Safety Kleen Corporation	Ada	POSST			0.00				
Saint Alphonsus Regional Medical Center	Ada	POSST	0.04	0.00	0.00	0.02	0.00	0.00	
Saint Luke's Meridian Medical Center	Ada	POSST	0.06	0.01	0.00	0.07	0.03	0.03	
Saint Luke's Regional Medical Center	Ada	POSST	0.36	0.19	0.01	0.17	0.08	0.08	
Semmaterials L.P.- Boise Plant	Ada	POSST	0.00	0.00	0.01	0.00	0.00	0.00	
Sinclair Pipeline	Ada	POSST			0.15				

Table 2-6. Continued

Facility Name	County	Facility Type	NO_x	SO_2	VOC	CO	PM_{10}	$PM_{2.5}$	NH_3
Company									
Tesoro Refining and Marketing Company, Boise	Ada	POSST	0.00	0.00	0.06	0.00	0.00	0.00	
Treasure Valley Forest Products, Boise	Ada	POSST	0.00	0.00	0.00	0.00	0.04	0.03	
Western Construction (Portable Plant)	Ada	EZ	0.00	0.00	0.00	0.01	0.00	0.00	
Western Electronics Inc	Ada	POSST	0.00		0.00	0.00			0.00
Western Idaho Cabinets	Ada	POSST			0.04		0.00	0.00	
Boise Packaging & Newsprint LLC Nampa	Canyon	POSST	0.01	0.00	0.07	0.01	0.01	0.00	
C Wright Construction Co., Inc. (Fac Id: 1677700335)	Canyon	EZ					0.03	0.01	
C&B Quality Trailer Works	Canyon	POSST	0.00	0.00	0.06	0.00	0.00	0.00	
Combined Districts Crushing Fund	Canyon	EZ					0.03	0.01	
Darigold-Caldwell	Canyon	POSST	0.04	0.00	0.00	0.04	0.02	0.01	
Flahiff Funeral Chapels Inc	Canyon	POSST	0.00	0.00	0.00	0.00	0.00	0.00	
Fleetwood Homes of Idaho Inc 04-1	Canyon	POSST			0.03		0.00	0.00	
Interstate Group LLC	Canyon	POSST	0.00		0.04	0.00	0.00	0.00	
JR Simplot Company – Diversified Nampa	Canyon	POSST	0.09	0.00	0.11	0.09	0.14	0.11	
JR Simplot Company - Food Group	Canyon	POSST	0.21	0.10	0.05	0.23	0.33	0.28	0.66
Kit Home Builders West	Canyon	EZ			0.10				
Low's Ready Mix, Inc.	Canyon	POSST					0.00	0.00	
Mercy Medical Center	Canyon	POSST	0.00	0.00	0.00	0.00	0.00	0.00	
Micron Technology Inc Nampa	Canyon	POSST	0.01	0.00	0.11	0.01	0.00	0.00	0.00
Mirage Enterprises Inc	Canyon	POSST			0.03		0.00	0.00	
Nelson-Deppe Inc.	Canyon	EZ					0.09	0.03	
Oldcastle Precast Inc	Canyon	POSST	0.00	0.00	0.00	0.00	0.00	0.00	
Pacific Press Publishing Assoc	Canyon	POSST	0.00	0.00	0.05	0.00	0.00	0.00	
River Rock Sand & Gravel LLC	Canyon	EZ					0.02	0.01	
Seedbiotics	Canyon	POSST					0.05	0.04	
Seminis Vegetable Seeds	Canyon	POSST	0.00		0.01	0.06	0.00	0.00	
Snake River Trailer Company	Canyon	POSST			0.00				
Sorrento Lactalis Incorporated Swiss Village Plant	Canyon	POSST	0.10	0.00	0.01	0.11	0.05	0.05	
Summit Seed Coatings	Canyon	POSST	0.00	0.00	0.00	0.00	0.00	0.00	
TASCO Nampa	Canyon	POSST	3.94	6.40	0.14	4.22	0.72	0.27	0.68

Table 2-6. Continued

Facility Name	County	Facility Type	NO_x	SO_2	VOC	CO	PM_{10}	$PM_{2.5}$	NH_3
Teton Sales Company	Canyon	POSST	0.00	0.00	0.04	0.00	0.00	0.00	
Western Farm Service - Caldwell	Canyon	POSST	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Western Stockmens Inc	Canyon	POSST	0.00	0.00	0.00	0.00	0.00	0.00	
White's Hauling & Farm	Canyon	POSST					0.00	0.00	
Double J Milling LLC	Elmore	POSST	0.01	0.00	0.00	0.01	0.01	0.01	
Evander Andrew Complex	Elmore	POSST	0.03	0.00	0.00	0.03	0.01	0.01	
Idaho Power - Bennett Mountain	Elmore	POSST	0.07	0.00	0.00	0.03	0.01	0.01	
Mountain Home Air Force Base	Elmore	POSST	0.28	0.00	0.05	0.14	0.34	0.13	
Northwest Pipeline - Mountain Home	Elmore	POSST	0.57	0.00	0.02	0.03	0.00	0.00	
Ada County			**1.00**	**0.22**	**0.70**	**0.48**	**0.45**	**0.39**	**0.13**
Canyon County			**4.41**	**6.50**	**0.86**	**4.76**	**1.49**	**0.83**	**1.34**
Elmore County			**0.97**	**0.01**	**0.07**	**0.24**	**0.37**	**0.15**	**0.00**
Total			**6.38**	**6.73**	**1.63**	**5.48**	**2.31**	**1.37**	**1.47**

the transmittal of the POSST and EZ data from DEQ. Before initiating any emission calculations, ERG conducted a high-level review of the transmitted POSST and EZ data files and examined the data for any questionable outliers. Questions regarding these outliers were then communicated to DEQ staff. Analysis of the EZ data did involved some QA/QC procedures (e.g., identification of non-emissive processes, nonsensical units, unreasonably high material quantities, SCC-material inconsistencies, incorrectly input information, etc.). Subsequent manipulation of point source data included frequent summation checks to ensure that individual process emissions were not accidentally omitted.

This page intentionally left blank for correct double-sided printing.

3.0 2008 AREA SOURCE EMISSIONS INVENTORY

Area sources are defined as those sources emitting annual emissions less than the point source thresholds. The Treasure Valley emissions inventory includes all of the area source emission categories listed in Table 1-1. In general, these are identical to the categories identified in the IPP/QAP document (ERG and ENVIRON, 2009). The only significant changes are that a few additional ammonia source categories (i.e., wild animal ammonia and soil ammonia) and a few specialized categories (i.e., industrial refrigeration/cold storage and irrigation ditch burning) have been added.

3.1 Emissions Calculation Methodologies – Annual

The annual area source emissions calculation methodologies are briefly summarized in Table 3-1 (i.e., the Area Source Matrix). The Area Source Matrix was previously presented in the IPP/QAP and summarized the preferred and alternative methodologies for each area source category, as well as activity data and emission factors. The Area Source Matrix has been modified based upon the methodologies, activity data, and emission factors actually used; in addition, each details of each methodology are presented in the subsections below.

3.1.1 Fuel Combustion

Fuel combustion includes three distinct sectors (i.e., industrial, commercial/ institutional, and residential) and a number of different fuels (e.g., natural gas, distillate fuel oil, liquefied petroleum gas [LPG], etc.); residential wood combustion is treated as a separate area source category, which is described in the following section.

Activity data for industrial, commercial/institutional, and residential fuel combustion were collected using a mail-out survey (included as Appendix C) that was sent to fuel dealers and distributors in September 2009. The survey was mailed to a total of 66 fuel dealers and distributors located in Ada, Canyon, or Elmore counties, or in adjacent counties (i.e., Boise, Gem, Gooding, Owyhee, Payette, and Twin Falls counties) that might sell fuel within Ada, Canyon, or Elmore counties. The list of fuel dealers and distributors was compiled from four on-line business directories or listings (i.e., Yellow Pages, Dun & Bradstreet, Manta, and Hoover's).

Table 3-1. Area Source Matrix

Source Category	Pollutants	Methodology	Activity Data	Notes
Industrial Fuel Combustion	NO_x, SO_2, VOC, CO, PM_{10}, $PM_{2.5}$, NH_3	Emission factors: AP-42 (Sections 1.3, 1.4, and 1.5); 2002 NEI Documentation; EIIP Ammonia Report	Local fuel survey (fuel quantities and sulfur content)	Includes distillate, natural gas, and LPG. Point source reconciliation conducted for natural gas only.
Commercial/ Institutional Fuel Combustion	NO_x, SO_2, VOC, CO, PM_{10}, $PM_{2.5}$, NH_3	Emission factors: AP-42 (Sections 1.3, 1.4, and 1.5); 2002 NEI Documentation; EIIP Ammonia Report	Local fuel survey (fuel quantities and sulfur content)	Includes distillate, natural gas, LPG, and kerosene. Point source reconciliation conducted for natural gas only.
Residential Fuel Combustion (excluding wood)	NO_x, SO_2, VOC, CO, PM_{10}, $PM_{2.5}$, NH_3	Emission factors: AP-42 (Sections 1.3, 1.4, and 1.5); 2002 NEI Documentation; EIIP Ammonia Report	Local fuel survey (fuel quantities and sulfur content)	Includes distillate, natural gas, LPG, and kerosene.
Residential Wood Combustion	NO_x, SO_2, VOC, CO, PM_{10}, $PM_{2.5}$, NH_3	Emission factors: 2002 NEI Documentation	Local residential wood combustion survey	
Paved Road Dust	PM_{10}, $PM_{2.5}$	*2011 AP-42 Section 13.2.1 (Ada and Canyon); 1996 AP-42 (Section 13.2.1) (Elmore)*	VMT, silt loading	
Unpaved Road Dust	PM_{10}, $PM_{2.5}$	TVRDS methodology (Ada and Canyon); AP-42 (Section 13.2.2) (Elmore)	VMT, silt content	
Commercial Cooking	VOC, CO, PM_{10}, $PM_{2.5}$	Emission factors: 2002 NEI Documentation	Number of equipment, annual meat cooked per equipment	Includes charbroiling, deep fat frying, and griddle frying
Bakeries	VOC	Per capita emission factors: EIIP (Vol. III, Abstracts)	Population, per capita bread consumption	
Construction	PM_{10}, $PM_{2.5}$	Emission factors: 2002 NEI Documentation	Number of building permits	
Industrial Refrigeration/ Cold Storage	NH_3	Per employee emission factors: EIIP Ammonia Report	Employee counts	
Architectural Surface Coating	VOC	Emissions ratioing based on population and employment: 2002 NEI Documentation	2002 NEI emissions; population and employee counts	
Autobody Refinishing	VOC	Per employee emission factors: 2002 NEI Documentation	Employee counts	
Traffic Markings	VOC	Mass balance	Traffic marking quantities; VOC content	

Table 3-1. Continued

Source Category	Pollutants	Methodology	Activity Data	Notes
Industrial Surface Coating	VOC	Emissions ratioing based on employment: 2002 NEI Documentation	2002 NEI emissions; employee counts	No point source reconciliation conducted.
Degreasing	VOC	Emissions ratioing based on employment: 2002 NEI Documentation	2002 NEI emissions; employee counts	No point source reconciliation conducted.
Dry Cleaning	VOC	Mass balance	Local survey (quantity of solvent used)	
Graphic Arts	VOC	Per employee emission factors: 2002 NEI Documentation	Employee counts	
Consumer Solvent Use	VOC	Per capita emission factors: 2002 NEI Documentation	Population	
Pesticide Application	VOC	Emission factors: EIIP (Vol. III, Chap. 9)	Planted acreage, application rates, % active ingredient, formulation type	
Gasoline Transport and Distribution	VOC	Emission factors: AP-42 (Section 5.2), on-road motor vehicle modeling files	Quantity of fuel, Stage I/II controls	Point source reconciliation conducted.
Open Burning (Household and Yard)	NO_x, SO_2, VOC, CO, PM_{10}, $PM_{2.5}$	Emission factors: 2002 NEI Documentation	Population not subject to burn bans	
Wastewater Treatment	VOC, NH_3	Emission factors: 2002 NEI Documentation	Local survey (quantity of water treated)	
Landfills	VOC	Theoretical first-order kinetic model: AP-42 (Section 2.4)	Local survey (refuse acceptance rate, landfill opening/closing)	
Agricultural Tilling	PM_{10}, $PM_{2.5}$	Emission factors: ARB Area Source Method (Section 7.4)	Acreage planted, planting practices	
Agricultural Harvesting	PM_{10}, $PM_{2.5}$	Emission factors: ARB Area Source Method (Section 7.5)	Acreage harvested, harvesting practices	
Agricultural Burning – Fields	VOC, CO, PM_{10}, $PM_{2.5}$	Emission factors: AP-42 (Section 2.5)	Burned acreage, fuel loading, burning practices	
Agricultural Burning – Irrigation Ditches	VOC, CO, PM_{10}, $PM_{2.5}$	Emission factors: AP-42 (Section 2.5)	Burned acreage, fuel loading, burning practices	
Beef Cattle Feedlots	VOC, PM_{10}, $PM_{2.5}$	Emission factors: ARB Area Source Method (Section 7.6)	Head of cattle, residence time	
Structural Fires	NO_x, VOC, CO, PM_{10}, $PM_{2.5}$	Emission factors: EIIP (Vol. III, Chap. 18)	Number of houses burned	
Vehicle Fires	NO_x, VOC, CO,	Emission factors: EIIP (Vol. III, Abstracts)	Number of vehicles	

Table 3-1. Continued

Source Category	Pollutants	Methodology	Activity Data	Notes
	PM_{10}, $PM_{2.5}$		burned	
Windblown Dust	PM_{10}, $PM_{2.5}$	WRAP windblown dust model	Wind speeds, soil textures, crop acreages, crop calendars	
Livestock Ammonia	NH_3	WRAP NH_3 emissions model	Livestock population	
Agricultural Fertilizer	NH_3	WRAP NH_3 emissions model	Harvested acreage, type and quantity of fertilizers	
Domestic Ammonia	NH_3	WRAP NH_3 emissions model	Population	
Wild Animals	NH_3	WRAP NH_3 emissions model	Wild animal population	
Soil Ammonia	NH_3	WRAP NH_3 emissions model	Land use/land cover acreages	

Out of the 66 surveys that were mailed out, 7 of the surveys were returned as undeliverable. Of the 59 surveys that were successfully delivered, only 16 surveys were returned by actual active fuel dealers or distributors. However, an additional 11 surveys were identified as being associated with these 16 fuel dealers/distributors (e.g., duplicates, under common ownership, recently purchased, etc.). In addition, another 20 surveys were returned with an indication of no fuel sales or distribution. Based on these actual positive and negative responses, the nominal fuel survey return rate was nearly 80 percent (i.e., 47 surveys returned out of 59 delivered). However, examination of the remaining 12 non-respondent surveys points to a potentially even higher return rate; a total of 9 of the non-respondent surveys were identified as being either definitively out of business or potentially out of business based upon a number of factors (e.g., available contact numbers being disconnected, all available contact numbers being wrong numbers, no answer after repeated calls, no available contact numbers, etc.). Actual contact was only made with 3 of the 12 non-respondent surveys; in spite of this contact, these 3 companies failed to return the survey.

Based upon the survey results, the following 11 sector/fuel combinations were included in the Treasure Valley emissions inventory:

- Industrial distillate oil
- Industrial natural gas
- Industrial LPG
- Commercial/institutional distillate oil
- Commercial/institutional natural gas
- Commercial/institutional LPG
- Commercial/institutional kerosene
- Residential distillate oil
- Residential natural gas
- Residential LPG
- Residential kerosene

Although the IPP/QPP indicated an expectation that residual fuel oil and coal would be sold or distributed in the inventory domain, neither of these fuels were identified in the returned surveys. The industrial and commercial/institutional natural gas quantities were adjusted downward as part of the point and area source reconciliation based upon the quantities identified by point source facilities during the POSST submittal process.

In general, fuel combustion emissions were estimated using emission factors from *AP-42* (U.S. EPA, 1995). Additional emission factors for kerosene combustion and distillate combustion (NH_3 only) were obtained from other guidance documents (U.S. EPA, 2006; EIIP, 2004). Two different distillate sulfur contents (i.e., 15 ppm and 500 ppm) were identified by the fuel survey respondents; both sulfur contents were used to calculate weighted SO_x estimates.

The general equation used to estimate emissions from fuel combustion was:

$$E_{f,p} = U_f \times EF_{f,p} \times \left(\frac{1\,\text{ton}}{2{,}000\,\text{lbs}} \right)$$

Where:

$E_{f,p}$ = Emissions for fuel *f* and pollutant *p* (tons/year);
U_f = Fuel usage for fuel *f* (10^6 ft^3 or 10^3 gal); and
$EF_{f,p}$ = Emission factor for fuel *f* and pollutant *p* (lb/10^6 ft^3 or lb/10^3 gal).

A sample calculation using this equation for estimating annual NO_x emissions from Ada County residential natural gas usage is as follows:

U_{NG} = 9,321 MMscf (i.e., 10^6 ft^3) natural gas
$EF_{NG,NOx}$ = 94 lbs NO_x/MMscf natural gas
$E_{NG,NOx}$ = 9,321 MMscf × 94 lbs NO_x/MMscf natural gas × (1 ton/2,000 lbs)
= 438.1 tons NO_x

3.1.2 Residential Wood Combustion

The residential wood combustion source category includes emissions from fireplaces, woodstoves, fireplaces with inserts, and pellet stoves. Activity data for residential wood combustion were obtained from a residential wood combustion (RWC) survey conducted by Aurora (ERG's subcontractor) (Aurora, 2009). The RWC survey report is included as Appendix D. The following steps were followed to derive activity data for each county.

1. Determine number of existing devices (i.e., fireplace, woodstove/insert, and pellet stove) by applying existing device ratio from RWC survey to the number of households.
2. Disaggregate number of woodstoves/inserts into number of woodstoves and number of inserts using woodstove/insert ratio from RWC survey.
3. Determine number of actively used devices by applying device-specific use ratio from RWC survey to number of existing devices.
4. For woodstoves and inserts, determine the number of conventional, catalytic, and non-catalytic devices by applying device type ratios from RWC survey to number of actively used devices.
5. For each group of devices (i.e., fireplace, woodstove, insert, and pellet stove) determine the average wood use (i.e., cordwood and processed log) per device using RWC survey response – assumed weight of cordwood is 1.163 tons/cord and assumed weight of processed logs is 6 lbs/log. Based upon survey findings, the predominant wood type used in fireplaces, woodstoves, and inserts is softwood; lesser amounts of hardwood and unspecified wood are also used. Only minor amounts of processed wood logs, scrap wood/building materials, and other materials are burned.

The general equation used to estimate emissions from residential wood combustion was:

$$E_p = D \times W \times EF_p \times \left(\frac{1\,\text{ton}}{2{,}000\,\text{lbs}} \right)$$

Where:

E_p = Emissions for pollutant *p* (tons/year);
D = Number of in-use devices;
W = Wood usage per device (tons/yr); and
EF_p = Emission factor for fuel *f* and pollutant *p* (lb/ton).

A sample calculation using this equation for estimating annual NO_x emissions from Ada County residential natural gas usage is as follows:

D = 20,608 in-use fireplaces
W = 0.739 tons wood/device
EF_{NOx} = 2.6 lbs NO_x/ton wood
E_{NOx} = 20,608 in-use fireplaces × 0.739 tons wood/fireplace × 2.6 lbs NO_x/ton wood × (1 ton/2,000 lbs) = 19.8 tons NO_x

Emission factors for the residential wood combustion category were obtained from a recent review of residential wood combustion emission factors (Houck and Eagle, 2006).

3.1.3 Paved Road Dust

Fugitive dust from paved roads can be a significant source of PM emissions. In general, the factors that affect paved road dust emissions include weight of the vehicles driving on the roadway surface, vehicle speed, fine particle (silt) loading on the roadway surface available for entrainment, and precipitation on the roadway that decreases road dust emissions.

In 2010, the 2008, 2015, and 2023 paved road dust emission estimates were completed for the Treasure Valley by DEQ's contractor team, ERG/Environ, as part of the SIP-level emissions inventories (ERG and Environ, 2010). The paved road dust emissions inventories were completed using an emission factor methodology and local data developed during the Treasure Valley Road Dust Study (TVRDS) (Etyemezian et al., 2002). DEQ subsequently learned after ERG/Environ prepared the 2008 emissions inventories (this report) that the TVRDS paved road dust emissions estimates were based on a calibration originally established for unpaved roads, not paved roads. This calibration was believed to be appropriate and the best available approach at the time. However, in studies following the TVRDS when Etyemezian et al. (2002) recalibrated the system specifically for paved roads, they determined that the 2002 TVRDS emission factor measurements in the Treasure Valley were "unreasonably high" in their own review of the 2002 study (Langston et al., 2008). As a result, when completing the final emissions inventories in support of the Northern Ada County PM_{10} Limited Maintenance Plan Ten-Year Update, DEQ abandoned the 2002 TVRDS emission factors for paved roads and recalculated Ada and Canyon counties paved road dust emissions using a new emission factor method published in "AP-42 Compilation of Air Pollutant Emission Factors" (EPA, 2011b; section 13.2.1). However, since the silt loadings measured by Etyemezian et al. (2002) in the TVRDS are based on local conditions and are somewhat more conservative than the default silt loadings published in the EPA (2011) AP-42 method, the local silt loadings were retained rather than using the default loadings in the new AP-42 method. Local $PM_{2.5}/PM_{10}$ emission fractions measured during the TVRDS were also used in the updated calculations to better reflect local conditions. This approach is described in Appendix E of the Northern Ada County PM_{10} Limited Maintenance Plan Ten-Year Update, entitled "Development of the Base- and Future-Year Mobile Source Emission Inventories for the Treasure Valley, Idaho." Unpaved road dust calibrations from the TVRDS were not flawed (Langston et al., 2008) so unpaved road dust estimates made by ERG/Environ were not updated by DEQ in 2012.

Elmore County

Because Elmore County was not included in the TVRDS, paved road dust emission estimates for Elmore County were computed *by ERG/Environ* based upon the AP-42 methodology (U.S. EPA, 2010a). *Although the original Elmore estimates were based on an earlier version of the EPA AP-42 method, they were not "unreasonably high" as were Ada and Canyon counties estimates based on the TVRDS, so the Elmore County paved road dust estimates were not revised.* The estimation equation used for Elmore County paved roads is shown below:

$$E = \left(k \left[\frac{sL}{2} \right]^{0.65} \left[\frac{W}{3} \right]^{1.5} - C \right) \left(1 - \frac{P}{4N} \right)$$

Where:

E	=	particulate emission factor (g/VMT);
k	=	particle size multiplier for particle size range and units of interest (g/VMT);
s	=	road surface silt loading (g/m^2);
W	=	mean vehicle weight (tons);
C	=	emission factor for 1980's vehicle fleet exhaust, brake wear and tire wear;
P	=	number of days with at least 0.01 inch of precipitation; and
N	=	number of days in the averaging period.

The AP-42 default input parameters that were used are shown in Table 3-2 (U.S. EPA, 2010a). A mean vehicle weight of 3.58 tons was estimated based upon the estimated on-road vehicle mix (DEQ, 2006). Silt loading estimates were estimated as shown in Table 3-3.

Table 3-2. Elmore County Paved Road Parameters

Parameter	PM_{10}	$PM_{2.5}$
k (g/VMT)	7.3	1.1
C (g/VMT)	0.2119	0.1617

Table 3-3. Elmore County Silt Loading Estimates

Road Type	Winter Silt Loading (g/m^2)	Summer Silt Loading (g/m^2)	Source
Arterial	1.9	0.5	Etymezian et al., 2002
Local	4.0	0.4	Etymezian et al., 2002
Freeway	0.015	0.015	DEQ, 2006

The precipitation correction factors for Elmore County were estimated using 2008 precipitation data from the Western Regional Climate Center (WRCC) (WRCC, 2009). Data from the Mountain Home Station (No. 106174) was used. These data are shown in Table 3-4.

Table 3-4. Elmore County Days with at Least 0.01 Inches of Rain

Month	Elmore
January	8
February	7
March	7
April	6
May	5
June	4
July	2
August	1
September	2
October	4
November	8
December	8

The resultant paved road dust emission estimates by county are shown in Table 3-5.

Table 3-5. 2008 Annual Paved Road Dust Emission Estimates

County	Annual (TPY)	
	PM_{10}	$PM_{2.5}$
Ada County[a]	*7,501*	*428*
Canyon County[a]	*4,154*	*237*
Elmore County[b]	1,253	284

[a] *Ada and Canyon counties paved road dust updated by DEQ in 2012; see Appendix E of the Northern Ada County PM_{10} Limited Maintenance Plan Ten-Year Update.*
[b] *Elmore road dust original estimates were not needed for Northern Ada County PM_{10} Limited Maintenance Plan Ten-Year Update and were not updated in 2012.*

3.1.4 Unpaved Road Dust

Similar to paved roads, fugitive dust from unpaved roads can be a significant source of PM emissions. In general, the processes that affect unpaved road dust emissions include roadway surface material properties and moisture content, vehicle speed, and precipitation on the roadway. *Unlike the paved road dust emissions estimates, which were revised by DEQ in 2012, the primary source of data used in the development of unpaved road dust emissions remains the 2002 TVRDS. ERG/Environ developed the 2008 and future year unpaved road dust using the original TVRDS methodology. The TVRDS methodology for unpaved roads was not flawed; only the calibration factors used for paved roads were flawed. Thus, unpaved road calibration factors* *were used for the unpaved emission estimates by ERG/Environ and that analysis is described below.*

Unpaved roadway activity estimates were obtained from a number of sources including highway districts (HDs), cities, and COMPASS as shown in Table 3-6. In most cases, the data available was limited to unpaved roadway length, although in some cases estimates of average daily traffic (ADT) was available. In cases where average daily traffic estimates were not available, an ADT estimate was assigned based on existing data as identified in Table 3-6. Annual VMT was estimated as unpaved roadway length multiplied by average daily traffic. Average speed estimates were not available; therefore, an average speed of 25 mph was assumed for all unpaved roads per the TVRDS.

Ada and Canyon Counties

The unpaved road dust emissions estimation methodology was taken from the TVRDS for Ada and Canyon counties. Emissions were estimated according to the following equation:

$$EF = b \times s$$

Where:

EF	=	roadway PM_{10} emissions factor (grams PM_{10}/VMT);
b	=	roadway emissions potential (grams PM_{10}/VMT/mph); and
s	=	roadway speed (mph).

Table 3-6. 2008 Unpaved Road Dust Activity Data and Sources

City/Highway District /Area	Length (miles)	ADT (vehicles per day)	Annual VMT (miles)	Source
Ada County				
Included in TDM	6	36	73,910	Waldinger, 2010
Not in TDM	70	129[a]	3,292,940	Waldinger, 2010
Totals	88		4,220,303	
Canyon County				
City of Caldwell	11.4	20[a]	82,892	Baker, 2010
City of Greenleaf	0	-	0	Amick, 2010
City of Middleton	0.3[c]	20[a]	2,518	[c]
City of Melba	0.1[c]	20[a]	371	[c]
City of Nampa	8.9[c]	20[a]	64,755	[c]
City of Wilder	0.1	20[a]	438	Lane, 2010
Nampa Highway District	2	30	21,900	Bequeath, 2010
Notus-Parma Highway District	9	20	65,700	Bowman, 2010a
Canyon Highway District	3	67	78,790	Richard, 2010a
Golden Gate Highway District	18	40	259,150	Norris, 2010b
Totals	53		576,514	
Elmore County				
Atlanta Highway District	54	87.5	1,724,625	Gill, 2010
Mountain Home Highway District	291	87.5[b]	9,293,813	Tindall, 2010a
Glenns Ferry Hwy Highway District	250	87.5[b]	7,984,375	Gluch, 2010
Totals	595		19,002,813	

[a]Estimate taken from TVRDS (Etymezian et al., 2002).

[b]Assumed equivalent to Atlanta Highway District since these data were not available.

[c]Estimated based on average length of unpaved roadway per population identified for other cities.

A dry emissions potential value of 11.9 grams/VMT/mph from TVRDS was used across all unpaved roads.

Unpaved road dust precipitation related control estimates were based directly on TVRDS observations (Etymezian et al., 2002). Table 3-7 shows the adjustment factors used to account for precipitation. It should be noted that although precipitation events might have an effect on unpaved roadway activity, data were not available to estimate the influence of such an effect. Therefore, while unpaved roadway VMT activity was adjusted for seasonality as described in Section 3.2.4, the specific effect that precipitation events may have on unpaved roadway activity was not accounted for. Accounting for seasonality as described above is typical for regional unpaved road dust emission inventories.

Table 3-7. Unpaved Road Dust Precipitation Adjustments

Month	Fractional discount due to snow	Fractional discount due to precipitation effects	Total fractional discount	Dry emissions multiplier
January	0.118	0.120	0.237	0.763
February	0.118	0.113	0.231	0.769
March	0.118	0.098	0.215	0.785
April	0.000	0.133	0.133	0.867
May	0.000	0.119	0.119	0.881
June	0.000	0.095	0.095	0.905
July	0.000	0.038	0.038	0.962
August	0.000	0.038	0.038	0.962
September	0.000	0.057	0.057	0.943
October	0.000	0.090	0.090	0.910
November	0.000	0.161	0.161	0.839
December	0.000	0.176	0.176	0.824

Based upon the TVRDS, the $PM_{2.5}$ fraction of PM_{10} was estimated to be 0.057 (Etymezian et al., 2002).

Elmore County

For Elmore County, the AP-42 methodology (U.S. EPA, 2010a) was used to estimate unpaved road dust emissions as shown below:

$$E = \left\{ \left[\frac{k(s/12)^a (S/30)^d}{(M/0.5)^c} \right] - C \right\} \times \left(\frac{N-P}{N} \right)$$

Where:

E = particulate emission factor (lb/VMT);
k, a, c, d = empirical constants;
s = road surface silt content (%);
M = road surface moisture content (%);
S = mean vehicle speed (mph);
C = emission factor for 1980's vehicle fleet exhaust, brake wear and tire wear (g/VMT);
P = number of days with at least 0.01 inch of precipitation; and
N = number of days in the averaging period.

The summer and winter road surface material silt content estimates were taken from the TVRDS and annual silt content was assumed to be the average of winter and summer silt content (Table 3-8). The AP-42 empirical constants, brake and tire wear emission factor estimates, and road surface moisture content defaults were used and are shown in Table 3-9.

Table 3-8. Elmore County Unpaved Road Surface Silt Content

Description	Silt Content (%)
Summer	3.5
Winter	1.4
Annual average	2.45

Table 3-9. Unpaved Emissions Estimation Parameters

Parameter	AP-42 Default
k – PM_{10} (lb/VMT)	1.8
k – $PM_{2.5}$ (lb/VMT)	0.18
a	1
d	0.5
c	0.2
M (%)	0.5
C – PM_{10} (g/VMT)	0.00047
C – $PM_{2.5}$ (g/VMT)	0.00036

The days of precipitation greater than 0.01 inches estimated for Elmore County paved roads (see Table 3-4) was also used for Elmore County unpaved roads.

The resultant emission estimates by county are presented in Table 3-10. Elmore County contains the highest unpaved roadway mileage and therefore has the highest unpaved road dust emission estimates of the three counties in the Treasure Valley.

Table 3-10. 2008 Annual Unpaved Road Dust Emission Estimates

County	Annual (TPY)	
	PM_{10}	**$PM_{2.5}$**
Ada	966	55
Canyon	165	9
Elmore	2,648	262
Totals	**3,779**	**327**

3.1.5 Commercial Cooking

The commercial cooking category includes five subcategories: conveyerized (or chain-driven) charbroiling, under-fired charbroiling, deep fat frying, flat griddle frying, and clamshell griddle frying.

Commercial cooking emissions were estimated using the methodology (e.g., national average number of equipment pieces, meat cooking quantities, etc.) and associated emission factors presented in the 2002 National Emissions Inventory documentation (U.S. EPA, 2006). The number of county-level establishments was obtained from *2007 County Business Patterns* (U.S. Census, 2009a). The types of restaurant were determined from the *2002 Economic Census* (U.S. Census, 2005a).

The equation for estimating emissions from each of the commercial cooking subcategories is the following is:

$$E_p = EF_p \times EQ \times M \times \left(\frac{1\,\text{ton}}{2{,}000\,\text{lbs}} \right)$$

Where:

E_p	=	Emissions for pollutant *p* (tons/year);
EF_p	=	Emission factor for pollutant *p* (lbs/ton meat cooked);
EQ	=	Number of pieces of equipment; and
M	=	Annual meat cooked per piece of equipment (tons meat cooked/equipment-year).

A sample calculation using this equation for estimating annual VOC emissions from chain-driven charbroilers is as follows:

EF_{VOC}	=	4 lbs VOC/ton meat cooked
EQ	=	892 chain-driven charbroilers
M	=	1,623.6 lbs meat/equipment-week × 52 weeks = 84,427.2 lbs/equipment-year
E_{VOC}	=	892 × 84,427.2 lbs/equipment-year × 4 lbs VOC/ton meat × (1 ton VOC/2,000 lbs VOC) = 75.3 tons VOC

3.1.6 Construction

County-level residential building permit data were obtained from the U.S. Census (U.S. Census, 2010). Construction durations and construction dust emission factors were obtained from the 2002 NEI methodology document for the following residence types: single family, two family, three and four family, and five or more family units (U.S. EPA, 2006). Discussions with government agencies that issue building permits indicated that industrial and commercial building activity during 2008 was minimal and that relevant activity data were not available (Webb, 2009; Radek, 2009; Hunter, 2009; Winterfield, 2009).

3.1.7 Architectural Surface Coatings

The architectural surface coatings category was estimated following the hybrid approach outlined in the 2002 NEI methodology document (U.S. EPA, 2006). The hybrid approach utilized national-level emissions that were scaled down using both county-level population and county-level employee statistics. The scaling was weighted 40 percent for population and 60 percent for employees. The employee portion of the scaling was conducted in the same manner as industrial surface coating (Section 3.1.9), degreasing (Section 3.1.10), and other per employee source categories (Section 3.1.11) and was based on employee counts for NAICS 238320 (Painting and Wall Covering Contractors).

3.1.8 Traffic Markings

Usage quantities of traffic markings within the three-county area, as well as relevant material safety data sheets (MSDS) and product specifications, were obtained through telephone contacts with nine different government agencies (i.e., Idaho Transportation Department, county highway departments, city public works departments, and local highway districts). The identified traffic marking usage quantities were 45,250 gallons for Ada County, 40,381 gallons for Canyon County, and 6,590 gallons for Elmore County. The MSDSs and product specifications indicated various VOC contents; however, 150 grams per liter (g/l) was the most prevalent. Therefore, this VOC content was used for the estimating emissions. Emissions were calculated using the methodologies identified in the EIIP guidance document (EIIP, 1997b).

3.1.9 Industrial Surface Coating

The industrial surface coating category consists of 13 subcategories (e.g., factory finished wood, wood furniture, plastic products, etc.) that were inventoried for the Treasure Valley inventory. These subcategories were all estimated by ratioing emission estimates from the 2002 NEI. Each of the 13 industrial surface coating subcategories were assigned a specific NAICS code for which county-level employee data for 2002 and 2007 were obtained from County Business Patterns (U.S. Census, 2009a). Employee data were not available for 2008, so it was assumed that 2007 employee data were a reasonable approximation of 2008 employee data.

The specific county-level NAICS code assignments for the 13 industrial surface coating subcategories are shown in Table 3-11. The 2007 employee data were adjusted downward based upon employee counts obtained from telephone contacts with permitted point sources having NAICS codes relevant to the industrial surface coating area source category. These adjustments are also indicated in Table 3-11.

Table 3-11. NAICS Code Assignments for Industrial Surface Coating Subcategories

Industrial Surface Coating Subcategory	NAICS Codes
Factory Finished Wood	321XXX (Wood Product Manufacturing)[a]
Wood Furniture	337XXX (Furniture and Related Product Manufacturing)[b]
Metal Furniture	337XXX (Furniture and Related Product Manufacturing)[b]
Paper	322XXX (Paper Manufacturing)[c]
Plastic Products	326XXX (Plastics and Rubber Products Manufacturing)
Miscellaneous Finished Metals	332XXX (Fabricated Metal Product Manufacturing)[b]
Machinery and Equipment	333XXX (Machinery Manufacturing)
Electronic and Other Electrical	334XXX (Computer and Electronic Product Manufacturing)[a]
Motor Vehicles	3362XX (Motor Vehicle Body and Trailer Manufacturing)[c]
Aircraft	3364XX (Aerospace Products and Parts Manufacturing)
Marine	3366XX (Ship and Boat Building)
Railroad	3365XX (Railroad Rolling Stock Manufacturing)[b]
Miscellaneous Manufacturing	31XXXX (Manufacturing)

[a]Employee counts adjusted downward for Ada and Canyon counties.
[b]Employee counts adjusted downward for Ada County.
[a]Employee counts adjusted downward for Canyon County.

The Area Source Matrix previously presented in the IPP/QAP indicated that emission factors from EIIP guidance would be used for all industrial surface coating subcategories. As discussed for other categories above, it was felt that the per capita factors from the 2002 NEI documentation would be more representative of current conditions associated with industrial surface coating since the EIIP guidance is from 1997.

The general equation used to estimate emissions for the industrial surface coating subcategories was:

$$E_{2007} = E_{2002} \times \left(\frac{\mathrm{EM}_{2007}}{\mathrm{EM}_{2002}} \right)$$

Where:

E_{2007} = Emissions for 2007 inventory year (tons/year);
E_{2002} = Emissions for 2002 inventory year (tons/year);
EM_{2007} = Employees for 2007 inventory year (adjusted for point source employment, if necessary) (people); and
EM_{2002} = Employees for 2002 inventory year (people).

A sample calculation using this equation for estimating annual VOC emissions from factory finished wood industrial surface coating in Ada County is as follows:

E_{2002} = 79.9 tons VOC
EM_{2002} = 883 people
EM_{2007} = 1,029 people
E_{2007} = 79.9 tons VOC × (1,029 people/883 people) = 93.1 tons VOC

3.1.10 Degreasing

The degreasing category consists of open top degreasing and cold cleaning for 13 sectors (e.g., furniture and fixtures, primary metal industries, fabricated metal products, etc.) for a total of 26 subcategories that were inventoried for the Treasure Valley inventory. As with industrial surface coating, these subcategories were estimated by ratioing emission estimates from the 2002 NEI with employee count data. Each of the 26 degreasing subcategories were assigned a specific NAICS code for which county-level employee data for 2002 and 2007 were obtained from *County Business Patterns* (U.S. Census, 2009a). Employee data were not available for 2008, so it was assumed that 2007 employee data were a reasonable approximation of 2008 employee data.

The specific county-level NAICS code assignments for the 26 degreasing subcategories are shown in Table 3-12. The 2007 employee data were adjusted downward based upon employee counts obtained from telephone contacts with permitted point sources having NAICS codes relevant to the degreasing area source categories. These adjustments are also indicated in Table 3-12.

Table 3-12. NAICS Code Assignments for Degreasing

Degreasing Subcategory (Open Top Degreasing and Cold Cleaning)	NAICS Codes
Furniture and Fixtures	337XXX (Furniture and Related Product Manufacturing)[a]
Primary Metal Industries	331XXX (Primary Metal Manufacturing)
Secondary Metal Industries	331XXX (Primary Metal Manufacturing)
Fabricated Metal Products	332XXX (Fabricated Metal Product Manufacturing)[a]
Industrial Machinery and Equipment	333XXX (Machinery Manufacturing)
Electronic and Other Electrical	334XXX (Computer and Electronic Product Manufacturing)[b]
	335XXX (Electrical Equipment, Appliance, and Component Manufacturing)
Transportation Equipment	336XXX (Transportation Equipment Manufacturing)[b]
Instruments and Related Products	3345XX (Navigational, Measuring, Electromedical and Control Instruments Manufacturing)
Miscellaneous Manufacturing	339XXX (Miscellaneous Manufacturing)
Transportation Maintenance Facilities	488XXX (Support Activities for Transportation)
Automotive Dealers	4411XX (Automobile Dealers)
Auto Repair Services	8111XX (Automotive Repair and Maintenance)[a]
Miscellaneous Repair Services	811XXX (Repair and Maintenance) except 8111XX (Automotive Repair and Maintenance)

[a]Employee counts adjusted downward for Ada County.
[b]Employee counts adjusted downward for Ada and Canyon counties.

The Area Source Matrix previously presented in the IPP/QAP indicated that emission factors from EIIP guidance would be used for all of the degreasing subcategories. As discussed for other categories above, it was felt that the per capita factors from the 2002 NEI documentation would be more representative of current conditions associated with degreasing since the EIIP guidance is from 1997.

The general equation used to estimate emissions for the degreasing subcategories was:

$$E_{2007} = E_{2002} \times \left(\frac{\text{EM}_{2007}}{\text{EM}_{2002}} \right)$$

Where:

E_{2007} = Emissions for 2007 inventory year (tons/year);
E_{2002} = Emissions for 2002 inventory year (tons/year);
EM_{2007} = Employees for 2007 inventory year (adjusted for point source employment, if necessary) (people); and
EM_{2002} = Employees for 2002 inventory year (people).

A sample calculation using this equation for estimating annual VOC emissions from furniture and fixture open top degreasing in Ada County is as follows:

E_{2002} = 12.6 tons VOC
EM_{2002} = 325 people
EM_{2007} = 566 people
E_{2007} = 12.6 tons VOC × (566 people/325 people) = 21.9 tons VOC

3.1.11 Other Per Employee Emission Factor Source Categories

In addition to industrial surface coating and degreasing, there were three other area source categories that were estimated using employee counts and per employee emission factors. These categories were autobody refinishing, industrial refrigeration/cold storage (NH_3), and graphic arts.

County-level employee data were obtained from *County Business Patterns* (U.S. Census, 2009a) for 2007; employee data were not available for 2008, so it was assumed that 2007 employee data were a reasonable approximation of 2008 employee data. The specific county-level NAICS code assignments for autobody refinishing, industrial refrigeration/cold storage, and graphic arts are shown in Table 3-13. For autobody refinishing and graphic arts, the 2007 employee data were adjusted downward based upon employee counts obtained from telephone contacts with permitted point sources having relevant NAICS codes. These adjustments are also indicated in Table 3-13.

Table 3-13. NAICS Code Assignments for Autobody Refinishing, Industrial Refrigeration/Cold Storage, and Graphic Arts Categories

Category	NAICS Codes
Autobody Refinishing	492XXX (Couriers and Messengers)
	5321XX (Automotive Equipment Rental and Leasing)
	8111XX (Automotive Repair and Maintenance)[a]
Industrial Refrigeration/ Cold Storage	31132X (Chocolate and Confectionery Manufacturing from Cacao Beans)
	31133X (Confectionery Manufacturing from Purchase Chocolate)
	3114XX (Fruit and Vegetable Preserving and Specialty Food Manufacturing)
	3115XX (Dairy Product Manufacturing)
	3116XX (Animal Slaughtering and Processing)
	3117XX (Seafood Product Preparation and Packaging)
	31181X (Bread and Bakery Product Manufacturing)
	311991 (Perishable Prepared Food Manufacturing)
	311999 (Other Miscellaneous Food Manufacturing)
	3121XX (Beverage Manufacturing)
	325211 (Plastics Material and Resin Manufacturing)
	493120 (Refrigerated Warehousing and Storage)
Graphic Arts	3222XX (Converted Paper Product Manufacturing)[b]
	32311X (Printing)

[a]Employee counts adjusted downward for Ada County.
[b]Employee counts adjusted downward for Canyon County.

For autobody refinishing and graphic arts, the per employee emission factors were obtained from the 2002 NEI documentation (U.S. EPA, 2006). The Area Source Matrix previously presented in the IPP/QAP indicated that emission factors from EIIP guidance would be used for these categories (i.e. per employee factors for autobody refinishing and per capita factors for graphic arts). As discussed for other categories above, it was felt that the per capita factors from the 2002 NEI documentation would be more representative of current conditions. The per employee emission factor for industrial refrigeration/cold storage was obtained from EIIP ammonia guidance for anthropogenic nonagricultural sources (EIIP, 2004).

The general equation used to estimate emissions for categories using per employee emission factors was:

$$E = EF \times EM \times \left(\frac{1\,\text{ton}}{2{,}000\,\text{lbs}} \right)$$

Where:

E = Emissions (tons/year);
EF = Per capita emission factor (lbs/person-year); and
EM = Employees (people).

A sample calculation using this equation for estimating annual NH_3 emissions from Ada County cold storage is as follows:

EM = 635 people
EF = 30 lbs NH_3/person
E = 635 people × 30 lbs NH_3/person × (1 ton/2,000 lbs) = 9.5 tons NH_3

3.1.12 Bakeries and Consumer Solvents

Two source categories were estimated using per capita emission factors. These categories were bakeries and consumer solvents (e.g., personal care products, household products, etc.).

County-level population data were obtained from the U.S. Census (U.S. Census, 2009b). For bakeries, an annual per capita bread consumption rate of 70 lbs of bread/person was combined with an emission factor of 5 lbs VOC per 1,000 lbs of sponge-dough bread produced. Both the emission factor and the consumption rate were obtained from EIIP guidance (EIIP, 1999). The per capita emission factors for consumer solvents were obtained from the 2002 NEI documentation (U.S. EPA, 2006). The Area Source Matrix previously presented in the IPP/QAP indicated that the per capita emission factors from EIIP guidance would be used for consumer solvents; however, the EIIP guidance for consumer solvents is from 1996 and it was felt that the per capita factors from the 2002 NEI documentation would be more representative of current conditions associated with consumer solvents.

The general equation used to estimate emissions for categories using per capita emission factors was:

$$E = EF \times P \times \left(\frac{1\,\text{ton}}{2{,}000\,\text{lbs}} \right)$$

Where:

E = VOC emissions (tons/year);
EF = VOC per capita emission factor (lbs/person-year); and
P = Population (people).

A sample calculation using this equation for estimating annual VOC emissions from Ada County consumer products (personal care products) is as follows:

P	=	380,920 people
EF	=	2.04 lbs VOC/person
E	=	380,920 people × 2.04 lbs VOC/person × (1 ton/2,000 lbs) = 388.5 tons VOC

3.1.13 Dry Cleaning

Activity data for dry cleaning were collected using a mail-out survey (included as Appendix C) that was sent to dry cleaners located in Ada, Canyon, and Elmore counties in October 2009. Additional follow-up was conducted via phone during in January 2010. A total of 24 dry cleaners were identified as conducting on-site cleaning in the three counties. Of these 24 dry cleaners, 13 exclusively used perchloroethylene, 10 exclusively used petroleum solvents, and 1 used both perchloroethylene and petroleum solvents. Since perchloroethylene is not a VOC species, it was not included in the emission calculations. The petroleum solvents used by the 11 petroleum solvent dry cleaners included Stoddard solvent, ECOSOLV, and DF-2000. A total of 1,815 gallons of petroleum solvent were identified for Ada County; while a total of 600 gallons of petroleum solvent were identified for Canyon County. Only two dry cleaners identified solvent being sent off-site; for both of these facilities, the off-site quantities exceeded the purchase statistics, so the purchase statistics for these facilities were excluded. Solvent densities were obtained from material safety data sheets (MSDSs) provided by the dry cleaners. It was assumed that purchase statistics were equal to emissions (i.e., all purchased solvent was used and subsequently evaporated).

3.1.14 Asphalt Application

Usage quantities of asphalt within the three-county area, as well as relevant material safety data sheets (MSDS) and product specifications, were obtained through telephone contacts with 11 different government agencies. These government agencies included the following:

- Idaho Transportation Department (ITD), District 3 (Morrison, 2010a)
- Highway districts:
  - Ada County Highway District (including City of Boise) (Nobel, 2010)
  - Nampa (Canyon County) Highway District No. 1 (Kennedy, 2010)
  - Notus-Parma (Canyon County) Highway District No. 2 (Bowman, 2010b)
  - Golden Gate (Canyon County) Highway District No. 3 (Norris, 2010b)

  - Canyon (Canyon County) Highway District No. 4 (Richard, 2010c)
  - Mountain Home (Elmore County) Highway District (Tindall, 2010b)
- City public works departments:
  - City of Caldwell Streets Department (Caldwell, 2010)
  - City of Middleton Public Works Department (Green, 2010)
  - City of Mountain Home Public Works Department (Harvel, 2010)
  - City of Nampa Public Works Department (Barr, 2010)

Usage quantities were collected for hot mix asphalt, emulsified asphalt, and cutback asphalt. However, based upon the survey-based methodologies identified in EIIP guidance documents (EIIP, 2001a), emissions were only estimated for emulsified asphalt and cutback asphalt (i.e., emissions are typically not estimated for hot mix asphalt and an appropriate methodology was not identified).

Most of the asphalt applied in the three-county area is hot mix asphalt. Five agencies (i.e., ITD District 3, Nampa Highway District No. 1, City of Middleton, City of Mountain Home, and City of Nampa) used hot mix asphalt exclusively. Only two agencies (i.e., Golden Gate Highway District No. 3 and Mountain Home Highway District) identified any cutback asphalt usage with a total of only 75 tons. Emulsified asphalt usage was identified in four agencies (i.e., Ada County Highway District, Golden Gate Highway District No. 3, Canyon Highway District No. 4, and Mountain Home Highway District) with a total of 7,875 tons.

Asphalt usage could not be obtained from Notus-Parma Highway District No. 2 and the City of Caldwell. Consideration was given to gap fill the missing data for these two agencies, but a reasonable approach could not be identified. For the City of Caldwell, asphalt data from the other three cities contacted was limited to hot mix asphalt, so there was no basis for extrapolation of cutback or emulsified asphalt. For Notus-Parma Highway District No.2, data from the three other highway districts in Canyon County were examined. However, these three highway districts did not provide a reasonable set of data to base a gap filling extrapolation upon (i.e., hot mix asphalt only for Nampa Highway District No. 1, emulsified and cutback asphalt for Golden Gate Highway District No. 3, and emulsified asphalt only for Canyon Highway District No. 4.).

A number of assumptions from the EIIP guidance were used to calculate emissions (EIIP, 2001a). The cutback asphalt was assumed to be medium cure cutback and the emulsified asphalt was assumed to be medium set emulsified. In addition, asphalt densities of 7.8 lb/gal and 8.34 lb/gal were assumed for cutback and emulsified, respectively. Likewise, diluent densities of 6.67 lb/gal (cutback) and 8.34 lb/gal (emulsified) were also assumed. It was assumed that the diluent content of cutback asphalt was 35 percent (EIIP, 2001a), while recent research has indicated that the diluent content of emulsified asphalt is approximately 12 percent (Midwest, 2006). Finally, it was assumed that 75 percent of the cutback diluent evaporated, while 100 percent of the emulsified diluent evaporated..

Ozone seasonal daily emissions were estimated by dividing annual emissions by the number of days in the ozone season (i.e., 214 days). All of the agencies contacted indicated that asphalt application is typically not conducted during the PM season, so PM seasonal daily emissions were not calculated.

3.1.15 Pesticide Application

Emissions from agricultural pesticide application were estimated as indicated in the IPP/QAP Area Source Matrix. Planted crop acreage data were obtained from the *2007 Census of Agriculture* (USDA, 2009). Pesticide application information (i.e., fraction of acreage applied, quantity of active ingredient per acre, and applications per year) were obtained from crop profiles: however, only 11 crop profiles were available (i.e., apples, barley, dry beans, sweet corn, lentils, mint, dry peas, green peas, potatoes, sugar beets, and wheat) (IPM Center, 2010). Only pesticides with application rates in terms of pounds per acre were considered; pesticides with unusual application rates (e.g., ounces per hundredweight of seed, ounces per linear row, etc.) were not included. Emissions were estimated using the methodology outlined in the EIIP guidance (EIIP, 2001c). Typical pesticide characteristics (i.e., percent active ingredient and formulation type) were obtained from a pesticide database (PAN, 2010). Wherever possible, the product names and/or formulation types indicated by the IPM Center crop profiles were followed. If assumptions were made for specific pesticides, then pesticides with an active U.S. product regulatory status were selected.

Emissions were estimated using the methodology outlined in the EIIP guidance (EIIP, 2001c). Typical pesticide characteristics (i.e., percent active ingredient and formulation type) were obtained from a pesticide database (PAN, 2010). Wherever possible, the product names and/or formulation types indicated by the IPM Center crop profiles were followed. If assumptions were made for specific pesticides, then pesticides with an active U.S. product regulatory status were selected.

The equation for estimating emissions from pesticide application was as follows:

$$E_{p,t} = E_{p,a} + E_{p,i} = \left(R_p \times A_p \times a_p \times EF_p \times \frac{1\,\text{ton}}{2{,}000\,\text{lbs}} \right) + \left(R_p \times A_p \times i_p \times V_p \times \frac{1\,\text{ton}}{2{,}000\,\text{lbs}} \right)$$

Where:

$E_{p,t}$	=	Total emissions from pesticide *p* (tons VOC/year);
$E_{p,a}$	=	Emissions from active ingredient of pesticide *p* (tons VOC/year);
$E_{p,i}$	=	Emissions from inert ingredient of pesticide *p* (tons VOC/year);
R_p	=	Application rate of pesticide *p* (lbs/acre-year);
A_p	=	Harvested acreage that had application of pesticide p (acres);
a_p	=	Percent of active ingredient in pesticide *p* (%);
EF_p	=	Emission factor for active ingredient in pesticide *p* (lbs/ton);
i_p	=	Percent of inert ingredient in pesticide *p* (%); and
V_p	=	Volatile content of inert fraction of pesticide *p* (%).

A sample calculation using this equation for estimating annual VOC emissions from the application of Bravo 500 (active ingredient chlorothalonil) on potatoes in Elmore County is as follows:

R_p	=	9.282 lbs/acre-year
A_p	=	8,967 acres × 0.60 (application fraction) = 5,380.2 acres
a_p	=	40.4 percent active ingredient
i_p	=	59.6 percent inert ingredient
V_p	=	56 percent volatile content of inert ingredient
EF_p	=	1,160 lbs VOC/ton active ingredient applied (vapor pressure 1×10^{-3} mmHg)
$E_{p,a}$	=	9.282 lbs/acre-year × 5,380.2 acres × 0.404 × 1,160 lbs VOC/ton active ingredient applied × 1 ton VOC/2,000 lbs VOC = 5.85 tons VOC
$E_{p,I}$	=	9.282 lbs/acre-year × 5,380.2 acres × 0.596 × 0.56 × 1 ton VOC/2,000 lbs VOC
	=	8.34 tons VOC
$E_{p,t}$	=	$E_{p,a} + E_{p,i}$ = 5.85 tons VOC + 8.34 tons VOC = 14.19 tons VOC

3.1.16 Gasoline Distribution

State-level gasoline consumption statistics were obtained from the Idaho Tax Commission (Walters, 2010). These state-level gasoline statistics were disaggregated down to the individual county-level based upon 2008 population estimates (U.S. Census, 2009b). Although 24 gasoline stations were identified as exceeding DEQ's point source thresholds, all gasoline stations were kept in the gasoline distribution area source category in order to avoid potential modeling difficulty.

Emission factors for underground tank filling (Stage I), breathing and emptying losses, and tank truck transit losses were obtained from EIIP guidance (EIIP, 2001b). It was assumed that the Stage I underground tank filling was submerged fill throughout Ada, Canyon, and Elmore counties. Refueling (Stage II) emission factors were developed from MOBILE6 input files used by ENVIRON in their on-road motor vehicle analysis (Grant, 2010).

The equation for estimating emissions from gasoline distribution is as follows:

$$E = EF \times T \times \left(\frac{1\,\text{ton}}{2{,}000\,\text{lbs}} \right)$$

Where:

E	=	Emissions (tons VOC/year);
EF	=	Emission factor (lbs/gal throughput); and
T	=	Annual fuel throughput (gal/year).

A sample calculation using this equation for estimating annual VOC emissions from Ada County Stage I underground tank filling is as follows:

T	=	151,687,674 gallons (or 151,687.674 × 10^3 gallons)
EF	=	7.3 lbs VOC/10^3 gallons
E	=	151,687.674 × 10^3 gallons × 7.3 lbs VOC/10^3 gallons × (1 ton/2,000 lbs) = 553.7 tons VOC

3.1.17 Wastewater Treatment

Activity data for wastewater treatment were collected using a mail-out survey (included as Appendix C) was that sent to wastewater treatment facilities located in Ada, Canyon, and Elmore counties in October 2009. A total of 17 surveys were mailed out of which 14 surveys were returned that identified the monthly quantities of wastewater treated. Additional follow-up was attempted for the three non-respondent facilities (i.e., Glenns Ferry, Kuna, and Notus), but contact could not be made. Since these non-respondent facilities are located in small communities, they are likely comparatively small facilities and their missing data is unlikely to affect the overall uncertainty of the emission estimates. In addition, the wastewater quantities from the Eagle Sewer District Treatment Plant were not included since effluent from that facility is pumped to the West Boise Wastewater Treatment Plant for further processing. The emission factors were obtained from the 2002 NEI documentation report (U.S. EPA, 2006).

It should be noted that the WATER9 model was identified as the wastewater treatment source category methodology in the IPP/QAP Area Source Matrix. However, further investigation revealed that the collection of the activity data needed to run WATER9 was extensive and it would be infeasible to collect for all of the wastewater treatment facilities located in Ada, Canyon, and Elmore counties. Therefore, the alternate emission factor methodology described above was used to estimate emissions from wastewater treatment.

3.1.18 Landfills

Landfill gas is generated by microorganism within the landfill under anaerobic conditions. The primary landfill gas constituents are methane (CH_4) and carbon dioxide (CO_2); however, lesser amounts of VOC are also generated either from decomposition products or the volatilization of biodegradable wastes.

Activity data for landfills were collected using a mail-out survey (included as Appendix C) that was sent to landfills located in Ada, Canyon, and Elmore counties in October 2009. A total of 14 surveys were mailed out. However, not all locations identified as landfills were actually landfills (e.g., slash piles, illegal dump sites, etc.). Only 3 surveys were returned: Ada County Landfill (i.e., Hidden Hollow), Pickles Butte Sanitary Landfill (Canyon County), and Mountain Home AFB (Elmore County). Emissions calculations for these three landfills confirmed that none of them exceed the VOC point source threshold of 10 tpy VOC. Therefore, emissions from these landfills were inventoried as an area source.

Emissions were estimated using the methodology outlined in Section 2.4 of AP-42 (U.S. EPA, 2010). This methodology is based on a theoretical first-order kinetic model of CH_4 production.

The equations for estimating emissions from landfills are as follows:

$$Q_{CH4} = 1.3L_o \times R \times \left(e^{-kc} - e^{-kt}\right)$$

Where:

Q_{CH4} = Methane generation rate at time t (m^3/yr);
L_o = Methane generation potential (m^3 CH_4/Mg) (default value of 100 m^3 CH_4/Mg);
R = Average annual refuse acceptance rate during active life (Mg/yr);
k = Methane generation rate constant (yr^{-1}) (default value of 0.02);
c = Time since landfill closure (years); and
t = Time since the initial refuse placement (years).

$$Q_{VOC} = \frac{Q_{CH4} \times C_{VOC}}{C_{CH4} \times (1 \times 10^6)}$$

Where:

Q_{VOC} = Emission rate of VOC (m^3/yr);
C_{VOC} = Concentration of VOC in landfill gas (ppmv) (default value of 835 ppmv); and
C_{CH4} = Concentration of CH_4 in landfill gas (assumed to be 50% expressed as 0.5).

$$UM_{VOC} = Q_{VOC} \times \frac{MW_{VOC} \times (1\,\text{atm})}{\left(\frac{0.00008205\,\text{m}^3\text{ - atm}}{\text{gmol - K}}\right) \times \left(\frac{1000\,\text{g}}{\text{kg}}\right) \times (273 + \text{T})}$$

Where:

UM_{VOC} = Uncontrolled mass emissions of VOC (kg/yr);
Q_{VOC} = Emission rate of VOC (m^3/yr);
MW_{VOC} = Molecular weight of VOC (g/gmol) (default value of 86.18 as hexane); and
T = Temperature of landfill gas (°C).

A sample calculation using these equations for estimating annual VOC emissions from the Ada County Landfill is as follows:

L_o = 100 m^3 CH_4/Mg
R = 299,420 Mg refuse/year
k = 0.02
c = 0 years (active landfill)
t = 35 years
Q_{CH4} = 1.3(100 m^3 CH_4/Mg)(299,420 Mg refuse/year)($e^{-[0.02 \times 0]} - e^{-[0.02 \times 35]}$) = 19,595,216 m^3/yr CH_4

C_{VOC} = 835 ppmv
C_{CH4} = 0.5
Q_{VOC} = (19,595,216 m^3/yr CH_4 × 835 ppmv)/(0.5 × 1,000,000) = 32,724 m^3 VOC/yr

MW_{VOC} = 86.18 g/gmol
T = 25 °C
UM_{VOC} = [(32,724 m^3 VOC/yr)(86.18 g/gmol)(1 atm)]/{(0.00008205 m3-atm/gmol-K)(1000 g/1 kg)(273 + 25K)} = 5,038 kg VOC/yr = 5.6 ton VOC/yr

3.1.19 Open Burning (Yard Waste and Household Waste)

The methodology identified in the IPP/QAP Area Source Matrix was tentatively identified as a mass balance approach which incorporates waste generation rates and local landfilling and recycling rates. Some landfilling information was available; however, in general, it was not possible to positively distinguish between local landfill material (i.e., originating in Ada, Canyon, or Elmore counties) and landfill material originating outside of the three-county area. In addition, conversations with Ada County Solid Waste Management Department staff indicate that open burning activity, as reflected by public nuisance complaints, has dramatically decreased in recent years. Furthermore, concerns over air quality and fire hazards have also affected the public acceptance level of open burning (Hutchinson, 2010). Therefore, an alternative methodology was used to estimate open burning emissions.

The city and county codes were examined for all government entities located within Ada, Canyon, and Elmore counties. The codes were examined for mandatory residential waste collection requirements and prohibitions of household and/or yard waste burning. This examination was greatly facilitated by the availability of city/county codes on-line. The Boise city code was available from the City of Boise website (Boise, 2010). The city/county codes for 14 other government entities (i.e., Caldwell, Eagle, Garden City, Greenleaf, Kuna, Meridian, Middleton, Mountain Home, Nampa, Parma, Star, Wilder, Ada County, and Canyon County) were maintained on-line by a codifying company (Sterling, 2010). The city/county codes for only four government entities (i.e., Glenns Ferry, Melba, Notus, and Elmore County) could not be identified. Based on the review of these city/county codes, the following information was determined:

- Mandatory residential waste collection
  - Required in most areas located within Ada, Canyon, and Elmore counties
  - Not explicitly required in Glenns Ferry, Greenleaf, Melba, Notus, Parma, Star, and the unincorporated portions of Canyon and Elmore counties

- Household waste burning
  - Explicitly banned in most areas located within Ada, Canyon, and Elmore counties
  - Not explicitly banned in Glenns Ferry, Greenleaf, Melba, Notus, and the unincorporated portion of Elmore County
- Yard waste burning
  - Explicitly banned in only a few areas (i.e., Boise, Caldwell, Meridian, Nampa, and the unincorporated portion of Ada County)
  - Allowed in the other areas subject to necessary burn permits (typically from local fire agencies) and sufficiently low air quality index (AQI) values.

It was assumed that household waste (i.e., municipal solid waste) and yard waste burning was conducted in all areas without explicit codified bans. National per capita waste generation rates for 2008 were derived from national statistics (U.S. EPA, 2009a). The per capita yard waste generation was reduced by 50 percent to account for the grass clippings portion which is typically not burned. These per capita waste generation rates were applied to the populations in the non-ban areas (i.e., 18,691 for household waste burning and 139,846 for yard waste burning). Based upon the methodology used in the 2002 NEI, it was assumed that 28 percent of the household and yard waste generated was actually burned (U.S. EPA, 2006). Emission factors for the residential and yard waste burning were obtained from the documentation from the 2002 National Emissions Inventory (U.S. EPA, 2006).

The equation for estimating emissions open burning (household waste or yard waste) is:

$$E_p = [BF \times W \times P] \times EF_p \times \left(\frac{1\,\text{ton}}{2{,}000\,\text{lbs}} \right)$$

Where:

E_p	=	Emissions for pollutant *p* (tons/year);
BF	=	Fraction of generated waste burned;
W	=	Per capita waste generation rate (tons/person-day);
P	=	Population (people); and
EF_p	=	Emission factor for pollutant *p* (lbs/ton).

A sample calculation using this equation for estimating annual VOC emissions from Elmore County household waste burning is as follows:

BF	=	28% of generated waste is burned
W	=	3.18 lbs waste/day
P	=	16,615 people without household waste burning bans

EF_p = 30 lbs VOC/ton waste
E = 0.28 × 3.18 lbs waste/person-day × 16,615 people × 366 days/year × 1 ton waste/2,000 lbs waste × 30 lbs VOC/ton waste × (1 ton/2,000 lbs) = 40.6 tons VOC

3.1.20 Agricultural Tilling and Harvesting

Emissions from both agricultural tilling and agricultural harvest operations were estimated using per-acre emission factors developed by the California Air Resources Board (CARB, 2003a; CARB, 2003b). It was assumed that these per-acre emission factors provide a reasonable approximation of conditions in the Treasure Valley. Planted and harvested crop acreage data were obtained from the *2007 Census of Agriculture* (USDA, 2009).

The equation for estimating emissions from agricultural tilling and harvest activities is as follows:

$$E_c = EF_c \times A_c \times \left(\frac{1\,\text{ton}}{2{,}000\,\text{lbs}} \right)$$

Where:

E_c = Emissions for crop *c* (tons PM_{10}/year);
EF_c = Emission factor for crop *c* (lbs PM_{10}/acre planted/harvested); and
A_c = Acres planted/harvested for crop *c* (acres/year).

A sample calculation using this equation for estimating annual PM_{10} emissions from sugarbeet tilling in Ada County household waste burning is as follows:

EF_c = 22.8 lbs PM_{10}/acre planted
A_c = 1,976 planted acres of sugarbeets
E = 1,976 acres × 22.8 lbs PM_{10}/acre × 1 ton/2,000 lbs = 22.5 tons PM_{10}

3.1.21 Agricultural Burning – Fields

As part of the recently implemented Crop Residue Burning Program, agricultural field burning was only allowed between September 1 and October 31, 2008. County-level field burning acreage statistics for the Southwest Idaho Burn Management Area were obtained from DEQ staff (Pettit, 2009). Field burning acreage was limited to 29.2 acres of cereal grains in Ada County and 202 acres of other crops in Canyon County. For estimation purposes, backfired wheat fuel loading and emission factors were assumed for the Ada County cereal grain acreage. Likewise, backfired alfalfa loading and emission factors were assumed for the Canyon other acreage. Fuel loadings and emissions were estimated using appropriate emission factors from AP-42 (U.S. EPA, 2010a).

The equation for estimating emissions from agricultural open burning is as follows:

$$E_{p,c} = AB_c \times FL_c \times EF_{p,c} \times \left(\frac{1\,\text{ton}}{2{,}000\,\text{lbs}} \right)$$

Where:

$E_{p,c}$	=	Emissions for pollutant *p* and crop *c* (tons/year);
AB_c	=	Acreage burned for crop *c* (acres/year);
FL_c	=	Fuel loading for crop *c* (tons/acre); and
$EF_{p,c}$	=	Emission factor for pollutant *p* and crop *c* (lbs/ton).

A sample calculation using this equation for estimating annual CO emissions from field burning of other crops in Canyon County is as follows:

AB	=	202 acres other crops (assumed to be alfalfa)
FL	=	0.8 tons/acre
$EF_{p,c}$	=	119 lbs CO/ton
E	=	202 acres × 0.8 tons/acre × 119 lbs CO/ton × 1 ton/2,000 lbs = 9.6 tons CO

3.1.22 Agricultural Burning – Irrigation Ditches

An additional source of agricultural burning that was not identified in the IPP/QAP Area Source Matrix was the burning of weeds in irrigation canals and ditches. The weeds in the ditch bottoms are typically burned during the month of March just before the irrigation water is first released in the spring. Although the ditch width is quite variable (i.e., from 3 feet to over 70 feet), a typical ditch width was assumed to be 5 feet. The ditch length within a given irrigation district or ditch company can be quite extensive, but not necessarily well quantified. For instance, it was roughly estimated within the Nampa & Meridian Irrigation District that there were 500 to 600 miles of ditches (Anderson, 2010). A total of 56 irrigation districts and ditch companies have been identified by the Idaho Department of Water Resources in Ada and Canyon counties (IDWR, 2006; IDWR, 2007). Therefore, it was not feasible to contact all of the irrigation districts and ditch companies. An alternative data source for ditch lengths was identified in the U.S. Geological Service's National Hydrography Dataset (USGS, 2010); ditch lengths were derived from a data layer of canals and ditches. Based on the National Hydrography Dataset, the county ditch lengths were estimated to be 796.28 kilometers (km) for

Ada County, 1,980.25 km for Canyon County, and 366.00 km for Elmore County. Emissions were estimated using appropriate fuel loadings (assumed to be unspecified weeds) and emission factors from AP-42 (U.S. EPA, 2010a). The emission estimation equation is identical to that used for agricultural field burning.

3.1.23 Beef Cattle Feedlots

This category includes PM_{10} and $PM_{2.5}$ emissions from beef cattle feedlots and VOC emissions from all cattle and calves; NH_3 emissions are addressed under the livestock ammonia category in Section 3.1.26.

The total number of cattle and calves was obtained from the 2007 Census of Agriculture (USDA, 2009). In addition, the number of cattle on feed was also obtained from the same data source. The population of cattle on feed for Canyon County was explicitly reported; however, the population of cattle on feed for Ada County and Elmore County were not presented due to confidentiality reporting requirements. The overall population of cattle on feed for those counties in Idaho with confidentiality "shielded" data (including Ada and Elmore) was determined by subtracting known county populations of cattle on feed from the overall state population of cattle on feed resulting in the state shielded population. The state shielded population of cattle on feed was then allocated to the shielded counties based upon the reported quantity of other cattle (i.e., not beef cows or milk cows). The total number of cattle and calves was 66,476 head for Ada County, 129,561 head for Canyon County, and 109,065 head for Elmore County. The total number of cattle on feed was 13,770 head for Ada County, 7,221 head for Canyon County, and 24,862 head for Elmore County.

The emission factors were obtained from the California Air Resources Board (CARB, 2004). The PM_{10} emission factor was 28.9 lbs/1000 head-day, while the VOC emission factor was 12.8 lbs/head-year. Since the PM_{10} emission factor was units of lbs/head-day, it was necessary to determine how long each head of cattle on feed is typically present in the feedlot. A typical residence time of 136 days was obtained from a feedlot cattle behavioral study (Stanford et al., 2009). The annual VOC emissions were calculated for all cattle and calves regardless of whether or not they were located on a feedlot.

The equation for estimating emissions from beef cattle feedlots is as follows:

$$E = EF \times BC \times \left(\frac{1\,\text{ton}}{2{,}000\,\text{lbs}} \right)$$

Where:

E = Emissions (tons/year);
EF = Emission factor (lbs/head); and
BC = Beef cattle population (head).

A sample calculation using this equation for estimating annual VOC emissions from Ada County is as follows:

BC = 66,476 head
EF = 12.8 lbs VOC/head-year
E = 66,476 head × 12.8 lbs VOC/head-year × (1 ton/2,000 lbs) = 425.4 tons VOC

3.1.24 Other Fires

The other fire source category includes structural fires and vehicle fires. County-level structural and vehicle fire statistics were obtained from the Idaho State Fire Marshal's Idaho Fire Incident Reporting System (IFIRS) (Karnowski, 2009). Review of the statistics indicates nearly 100 percent reporting by the fire districts located in Ada, Canyon, and Elmore counties. Based on the IFIRS summary data, the assignment of fire types to the structural and vehicle sources categories is shown in Table 3-14. The specific county-level employee data obtained were for the following NAICS codes:

Table 3-14. Fire Code Assignments for the Structural Fire and Vehicle Fire Source Categories

Category	IFIRS Codes
Structural Fires	111 (Building fire)
	112 (Fire in structures other than buildings)
	120 (Fire in mobile property used as a fixed structure)
	121 (Fire in mobile home used as fixed residence)
	122 (Fire in motor home, camper, recreational vehicle used as fixed residence)
	123 (Fire in portable building at a fixed location)
Vehicle Fires	130 (Mobile property/vehicle fire)
	131 (Passenger vehicle fire)
	132 (Road freight or transport vehicle fire)
	134 (Water vehicle fire)
	137 (Camper or recreational vehicle fire)
	138 (Off-road vehicle or heavy equipment fire)

Emission factors for structural fires and vehicle fires were obtained from EIIP guidance documents (EIIP, 2001c; EIIP, 2000). Based on the EIIP guidance documents, a fuel loading of

1.15 tons/fire was assumed for structural fires and a fuel loading of 0.25 tons/fire was assumed for vehicle fires.

The general equation for estimating emissions from structural and vehicle fires is as follows:

$$E_p = F \times FL \times EF_p \times \left(\frac{1\,\text{ton}}{2{,}000\,\text{lbs}} \right)$$

Where:

E_p	=	Emissions for pollutant *p* (tons/year);
F	=	Annual structural or vehicle fires (fires/year);
FL	=	Fuel loading (tons material/fire); and
EF_p	=	Emission factor for pollutant *p* (lbs/tons material).

A sample calculation using this equation for estimating annual CO emissions from Ada County structural fire is as follows:

F	=	150 fires
FL	=	1.15 tons material/fire
EF	=	60 lbs CO/ton material
E	=	150 fires × 1.15 tons/fire × 60 lbs CO/person × (1 ton/2,000 lbs) = 5.2 tons CO

3.1.25 Windblown Dust

The windblown fugitive dust emissions for the Treasure Valley Airshed were developed using the estimation methodology developed for the Western Regional Air Partnership (WRAP) by a team of contractors led by ENVIRON (ENVIRON, 2004a) and subsequently revised by Mansell and others (Mansell, 2003a; 2003b; Mansell, et al. 2004). The methodology was based upon the results of wind tunnel studies and a detailed characterization of vacant lands. Windblown dust emissions were estimated hourly on a gridded modeling domain using hourly averaged wind speeds and other meteorological parameters. Hourly emission estimates were developed for each hour in 2008. The methodology involves application of wind speed- and soil-dependent emission factors to estimate emissions rates on a gridded modeling domain. Land use characteristics were used to estimate threshold friction velocities, based on gridded meteorological data, to determine the potential for wind erosion. Additional agricultural adjustments were applied to capture the impacts of crop-specific planting and harvesting practices. A detailed description of the windblown dust model estimation methodology and implementation is provided below.

While the Treasure Valley Airshed emissions inventory is limited to Ada, Canyon, and Elmore counties, the implementation of the modeling system for the development of windblown fugitive dust PM emissions requires the use of a larger Cartesian modeling grid domain. As such, the emission estimates described below include additional Idaho counties, as well as neighboring counties in Oregon. Figure 3-1 displays the modeling domain for which windblown dust PM emissions were estimated. In addition, the model requires hourly gridded meteorological data and generates emission estimates for each hour for the entire time period considered. For the DEQ inventory, these estimates are aggregated to counties and summed across all hours of calendar year 2008, as described below.

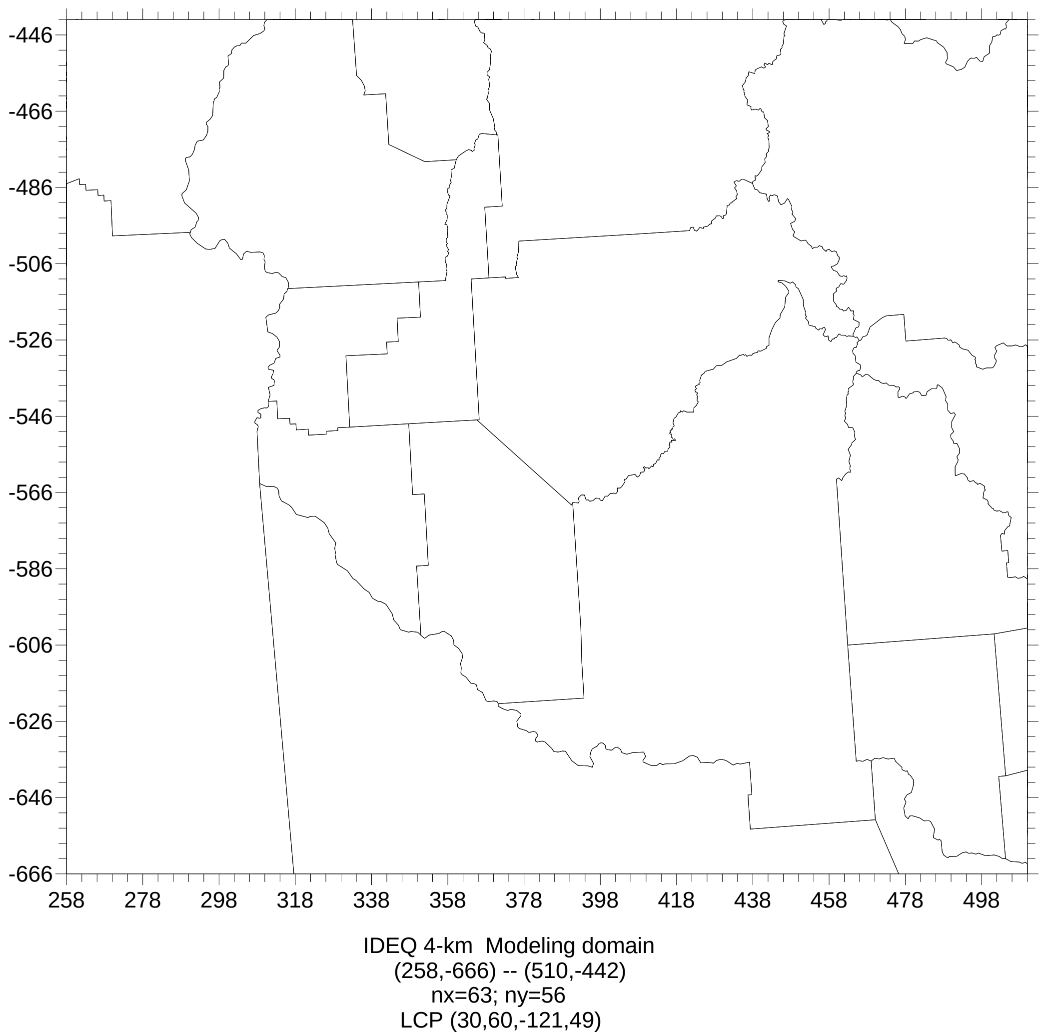


Figure 3-1. DEQ 4-km Modeling Domain for Windblown Dust Emissions Development

Data Collection

Input data required by the model include:

- Soil characteristics;
- Land use/land cover data;
- Crop-specific agricultural data; and
- Meteorology

Soil Characteristics

Application of the emission factor relations, described below, requires the characterization of soil texture in terms of the four soil groups considered by the model. The characteristics or type of soil is one of the parameters of primary importance for the application of the emission estimation relations derived from wind tunnel study results.

The windblown dust model utilized the Soil Survey Geographic Database (SSURGO) available from the USDA (USDA, 2010). In some parts of the country, the SSURGO data are incomplete. Alternatively, the State Soil Geographic Database (STATSGO) was used to gap-fill the SSURGO data for the modeling domain (USDA, 1994). The STATSGO database provides detailed information concerning the taxonomy of the soils, including soil texture class, percentage of sand, silt and clay, and the available water capacity of the soil. Figure 3-2 displays the final merged soil texture data, which combines the SSURGO and STATSGO databases, as used in the windblown dust model.

Land Use-Land Cover

Land use-land cover (LULC) data required for the windblown dust model was derived from crop-specific GIS data layers obtained from the USDA NASS Cropland Data Layer (CDL) Program and represent agricultural, as well as non-agricultural, lands throughout the region based on data for calendar year 2007 (NASS, 2007). The primary purpose of the CDL Program is to use satellite imagery to provide acreage estimates to the Agricultural Statistics Board for the state's major commodities and produce digital, crop-specific, categorized geo-referenced output products. These data were reviewed and processed for use in the windblown dust model. Figure 3-3 presents a display of the final land use/land cover data for the 4-km modeling domain.

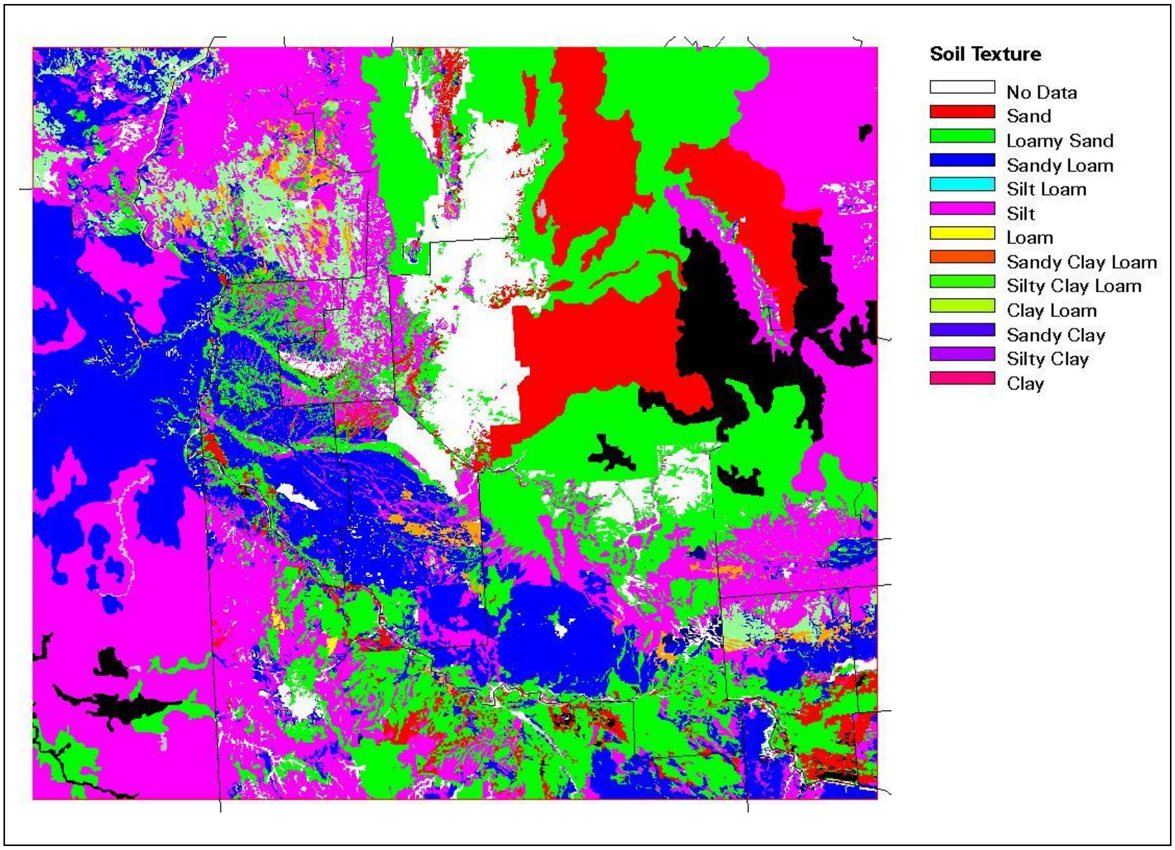


Figure 3-2. Merged Soil Texture Data from the SSURGO and STATSGO Databases

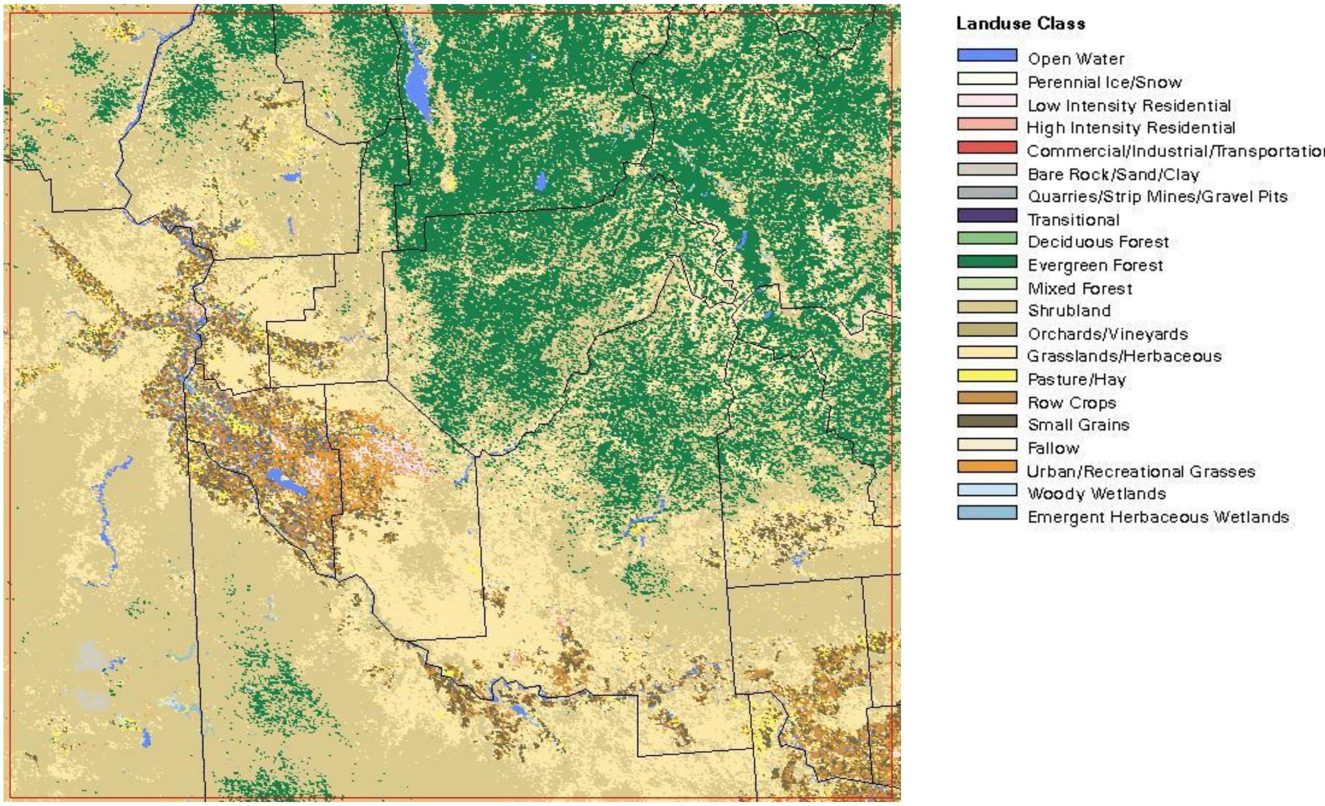


Figure 3-3. Land Use/Land Cover Data Used for the DEQ Windblown Dust PM Emissions Inventory Development

Agricultural Data

Unlike other types of vacant land, windblown dust emissions from agricultural land are subject to a number of non-climatic influences, including irrigation and seasonal crop growth. As a result, several non-climatic correction or adjustment factors were developed for applicability to the agricultural wind erosion emissions. These factors included:

- Long-term effects of irrigation (i.e., soil "clodiness");
- Crop canopy cover;
- Post-harvest vegetative cover (i.e., residue);
- Bare soil (i.e., barren areas within an agriculture field that do not develop crop canopy for various reasons, etc.); and
- Field borders (i.e., bare areas surrounding and adjacent to agricultural fields).

The methodology used to develop individual non-climatic correction factors was based upon previous work performed by the California Air Resources Board in their development of California-specific adjustment factors for the USDA's Wind Erosion Equation (CARB, 1997).

In order to apply the agricultural adjustments described above, crop information, including types of crops and planting schedules, were required. These crop data (i.e., crop types, tilling and harvesting practices, crop calendars, and planting and harvesting schedules) were obtained from the National Agricultural Statistics Service and the U.S. Department of Agriculture (NASS, 2009b; USDA, 1997; USDA, 2009). In the windblown dust model, specific crop types were mapped to those recognized by the model, based on the Conservation Technology Information Center (CTIC) crop database, in order to provide a link between specific crop planting and harvesting schedules, tilling and irrigation practices, and canopy growth curves. Table 3-15 summarizes the Idaho-specific crop types and the mapping between DEQ's data and the CTIC crop types.

The windblown dust model used the percentage of canopy cover for each crop type as crops are grown throughout the year to apply various adjustments to the estimated hourly wind blown dust emissions. For the 2008 inventory, the crop canopy cover data, developed from crop report data (NASS, 2009b; USDA, 1997), are summarized in Table 3-16, which provides the percentage of canopy cover for each crop type in 15-day increments throughout the year. Table 3-17 presents the Idaho crop canopy information regarding planting and harvesting dates by crop type and region used in combination with the canopy growth curves shown in Table 3-16. These data are available for broad regions within the State of Idaho including the Central (C), Southwestern (SW) and South Central (SC) regions of the state, as indicated in Table 3-17.

Table 3-15. DEQ and CTIC Crop Type Mapping and Descriptions

DEQ Crop Code	Description	CTIC Crop Name	CTIC Crop Code
FD01	Barley (grain)	Barley	BAR01
FD02	Corn (grain)	Corn	COR01
FD03	Dry edible beans (excluding limas)	Peas/Beans	BEA01
FD04	Dry lima beans	Peas/Beans	BEA01
FD05	Dry edible peas	Peas/Beans	BEA01
FD06	Mustard seed	Canola	POT01
FD07	Oats (grain)	Oats	OAT01
FD08	Safflower	Canola	POT01
FD09	Sugarbeets (sugar)	Sugar Beets	SUG01
FD10	Triticale	Wheat	WHE02
FD11	Winter wheat (grain)	Wheat	WHE02
FD12	Durum wheat (grain)	Wheat	WHE01
FD13	Spring wheat (grain)	Wheat	WHE01
SH01	All grass seeds	Forage Crops	HAY01
SH02	Hay (alfalfa)	Forage Crops	ALF01
SH03	Hay (small grain)	Forage Crops	HAY01
SH04	Hay (other tame)	Forage Crops	HAY01
SH05	Hay (wild)	Forage Crops	HAY01
SH06	Corn (silage and greenchop)	Corn	COR01
OT01	Hops	n/a	n/a
OT02	Mint for oil (peppermint)	Canola	POT01
OT03	Mint for oil (spearmint)	Canola	POT01
OT04	Sweet corn (for seed)	Corn	COR01
VG01	Onions, Dry	Vegetables	ONI01
VG02	Peas, Chinese (sugar and snow)	Vegetables	PEA01
VG03	Potatoes	Potatoes	POT01
VG04	Sweet Corn	Corn	COR01
FR01	Apples	n/a	n/a
FR02	Cherries, Sweet	n/a	n/a
FR03	Grapes	n/a	n/a
FR04	Peaches	n/a	n/a
FR05	Plums and Prunes	n/a	n/a

Table 3-16. Idaho Crop Canopy Cover by Crop Type and Julian Day Since Planting (%)

% canopy cover (CC)	**Day**																								
Canopy_Spr or Canopy_Fall	**0**	**15**	**30**	**45**	**60**	**75**	**90**	**105**	**120**	**135**	**150**	**165**	**180**	**195**	**210**	**225**	**240**	**255**	**270**	**285**	**300**	**315**	**330**	**345**	**360**
BAR01	0	1	15	55	95	95	95	95	95	95	95														
OAT01	0	10	35	60	85	95	95	95																	
SUG01	0	5	10	20	30	40	60	80	90	95															
POT01	0	10	25	40	55	65	80	70																	
WHE01	0	5	10	30	75	95	95	95	95	95	95														
WHE02	0	5	10	20	25	25	25	25	25	25	25	25	30	30	40	65	95	95	95	95	95				
COR01	0	5	10	50	75	95	95	95	95	95	85	65													
BEA01	0	5	15	40	65	75	75	60	30																
ONI01	1	5	7	10	15	20	15	10																	
HAY01	43	50	63	78	90	80	75	90	95	80	75	90	95	75	67	75	80	75	67	57	50	50	53	58	43
ALF01	47	55	67	25	47	67	82	92	95	42	48	53	48	43	40	37	35	35	35	35	37	38	45	55	47

Table 3-17. Idaho Planting and Harvesting Dates (Julian Day) and Crop Canopy Crop Type

Crop Code	Crop Description	Region	Plant_Spr	Harv_Spr	Plant_Fall	Harv_Fall	Canopy_Spr	Canopy_ Fall
FD01	Barley (grain)	SW	91	218			BAR01	
FD01	Barley (grain)	SC	102	228			BAR01	
FD01	Barley (grain)	E	129	251			BAR01	
FD02	Corn (grain)	SW	134	299			COR01	
FD02	Corn (grain)	SC	134	299			COR01	
FD02	Corn (grain)	E	134	299			COR01	
FD03	Dry edible beans	SW	148	261			BEA01	
FD03	Dry edible beans	SC	148	261			BEA01	
FD03	Dry edible beans	E	148	261			BEA01	
FD04	Dry lima beans	SW	148	261			BEA01	
FD04	Dry lima beans	SC	148	261			BEA01	
FD04	Dry lima beans	E	148	261			BEA01	
FD05	Dry edible peas	SW	133	235			BEA01	
FD05	Dry edible peas	SC	133	235			BEA01	
FD05	Dry edible peas	E	133	235			BEA01	
FD06	Mustard seed	SW	116	207			POT01	
FD06	Mustard seed	SC	116	207			POT01	
FD06	Mustard seed	E	116	207			POT01	
FD07	Oats (grain)	SW	118	242			OAT01	
FD07	Oats (grain)	SC	118	242			OAT01	
FD07	Oats (grain)	E	118	242			OAT01	
FD08	Safflower	SW	116	269			POT01	
FD08	Safflower	SC	116	269			POT01	
FD08	Safflower	E	116	269			POT01	
FD09	Sugarbeets (sugar)	SW	99	303			SUG01	
FD09	Sugarbeets (sugar)	SC	107	300			SUG01	
FD09	Sugarbeets (sugar)	E	114	295			SUG01	
FD10	Triticale	SW			268	217		WHE02
FD10	Triticale	SC			265	225		WHE02
FD10	Triticale	E			269	233		WHE02
FD11	Winter wheat (grain)	SW			268	217		WHE02
FD11	Winter wheat (grain)	SC			265	225		WHE02
FD11	Winter wheat (grain)	E			269	233		WHE02
FD12	Durum wheat (grain)	SW	83	220			WHE01	
FD12	Durum wheat (grain)	SC	90	227			WHE01	
FD12	Durum wheat (grain)	E	118	246			WHE01	
FD13	Spring wheat (grain)	SW	83	220			WHE01	
FD13	Spring wheat (grain)	SC	90	227			WHE01	
FD13	Spring wheat (grain)	E	118	246			WHE01	
FR01	Apples	SW						
FR01	Apples	SC						
FR01	Apples	E						
FR02	Cherries, Sweet	SW						
FR02	Cherries, Sweet	SC						
FR02	Cherries, Sweet	E						
FR03	Grapes	SW						
FR03	Grapes	SC						
FR03	Grapes	E						
FR04	Peaches	SW						
FR04	Peaches	SC						
FR04	Peaches	E						
FR05	Plums and Prunes	SW						
FR05	Plums and Prunes	SC						
FR05	Plums and Prunes	E						

Table 3-20. Continued

Crop Code	Crop Description	Region	Plant_Spr	Harv_Spr	Plant_Fall	Harv_Fall	Canopy_Spr	Canopy_ Fall
OT01	Hops	SW						
OT01	Hops	SC						
OT01	Hops	E						
OT02	Mint for oil (peppermint)	SW						
OT02	Mint for oil (peppermint)	SC						
OT02	Mint for oil (peppermint)	E						
OT03	Mint for oil (spearmint)	SW						
OT03	Mint for oil (spearmint)	SC						
OT03	Mint for oil (spearmint)	E						
OT04	Sweet corn (for seed)	SW	131	233			COR01	
OT04	Sweet corn (for seed)	SC	131	233			COR01	
OT04	Sweet corn (for seed)	E	131	233			COR01	
SH01	All grass seeds	SW	106	105			HAY01	
SH01	All grass seeds	SC	106	105			HAY01	
SH01	All grass seeds	E	106	105			HAY01	
SH02	Hay (alfalfa)	SW	122	121			ALF01	
SH02	Hay (alfalfa)	SC	122	121			ALF01	
SH02	Hay (alfalfa)	E	122	121			ALF01	
SH03	Hay (small grain)	SW	106	105			HAY01	
SH03	Hay (small grain)	SC	106	105			HAY01	
SH03	Hay (small grain)	E	106	105			HAY01	
SH04	Hay (other tame)	SW	106	105			HAY01	
SH04	Hay (other tame)	SC	106	105			HAY01	
SH04	Hay (other tame)	E	106	105			HAY01	
SH05	Hay (wild)	SW	106	105			HAY01	
SH05	Hay (wild)	SC	106	105			HAY01	
SH05	Hay (wild)	E	106	105			HAY01	
SH06	Corn (silage/greenchop)	SW	134	277			COR01	
SH06	Corn (silage/greenchop)	SC	134	277			COR01	
SH06	Corn (silage/greenchop)	E	134	277			COR01	
VG01	Onions, Dry	SW	96	263			ONI01	
VG01	Onions, Dry	SC	96	263			ONI01	
VG01	Onions, Dry	E	96	263			ONI01	
VG02	Peas, Chinese	SW	106	172			PEA01	
VG02	Peas, Chinese	SC	106	172			PEA01	
VG02	Peas, Chinese	E	106	172			PEA01	
VG03	Potatoes	SW	112	257			POT01	
VG03	Potatoes	SC	116	278			POT01	
VG03	Potatoes	E	133	280			POT01	
VG04	Sweet Corn	SW	131	233			COR01	
VG04	Sweet Corn	SC	131	233			COR01	
VG04	Sweet Corn	E	131	233			COR01	

Meteorological Data

Gridded hourly meteorological data, required for the dust estimation methodology, were based on MM5/WRF model simulation results provided by DEQ (Zhang, 2009). Required data fields included wind speeds, precipitation rates, soil temperatures and ice/snow cover. These data were obtained from DEQ and then reviewed and formatted for use in the windblown dust model.

Emissions Calculation

As noted above, the windblown fugitive dust PM emissions for the Treasure Valley Airshed were developed for each day of 2008 using the estimation methodology previously developed for the WRAP and were estimated hourly on a gridded modeling domain using hourly averaged meteorology, surface characteristics (soil and land use) and crop-specific agricultural information as described above. The windblown dust model estimation methodology was developed based on a review of wind tunnel studies which noted that the two important components to characterize the dust emission process from an erodible surface were the threshold friction velocity that defines the inception of the emission process as a function of the wind speed and as influenced by the surface characteristics, and the strength of the emissions that follow the commencement of particle movement. The two critical factors affecting emission strength are the wind speed (wind friction velocity) that drives the saltation system, and the soil characteristics.

Friction Velocities

Surface friction velocities are determined from the aerodynamic surface roughness lengths and wind speeds derived from the MM5/WRF model simulations. Friction velocity, u_*, is related to the slope of the velocity versus the natural logarithm of height through the relationship:

$$\frac{u_z}{u_*} = \frac{1}{\kappa} \ln \frac{z}{z_o}$$

Where:

u_z	=	wind velocity at height *z* (m/s);
u_*	=	friction velocity (m/s);
κ	=	von Karman’s constant (0.4); and
z_0	=	aerodynamic roughness height (m).

The threshold friction velocities, u_{*t}, are determined using empirical relationships that are functions of the aerodynamic surface roughness length, z_0 (Marticorena et al., 1997). Surface friction velocities, including the threshold friction velocity, are a function of the aerodynamic surface roughness lengths. The surface friction velocities are, in turn, dependent upon surface characteristics, particularly land use/land cover. The empirical relationships implemented in the model are shown in Figure 3-4.

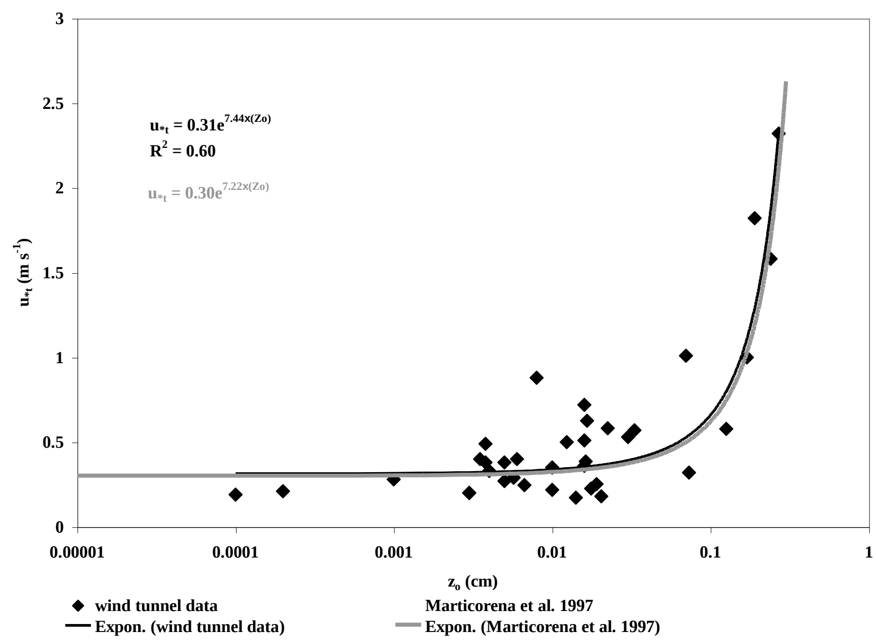


Figure 3-4. Comparison Between the Marticorena *et al.* (1997) Modeled Relationship of Threshold Friction Velocity and Aerodynamic Roughness Length and Wind Tunnel Data from Gillette *et al.* (1980, 1982), Gillette (1988) and Nickling and Gillies (1989)

Emission Fluxes

Emission fluxes, or emission rates, are determined as a function of surface friction velocity and soil texture. Key relationships were established between the 12 soil types in the classical soil texture triangle and their four dry soil types (i.e., silt [FSS], sandy silt [FS], silty sand [MS], and sand [CS]) (Chatenet et al., 1996). Dust emission fluxes were estimated using relationships developed for each of the soil texture groups (Alfaro and Gomes, 2001; Alfaro et al., 2004). These relationships are presented in Figure 3-5. The mapping used to relate the soil textures to the soil groups are presented in Table 3-18.

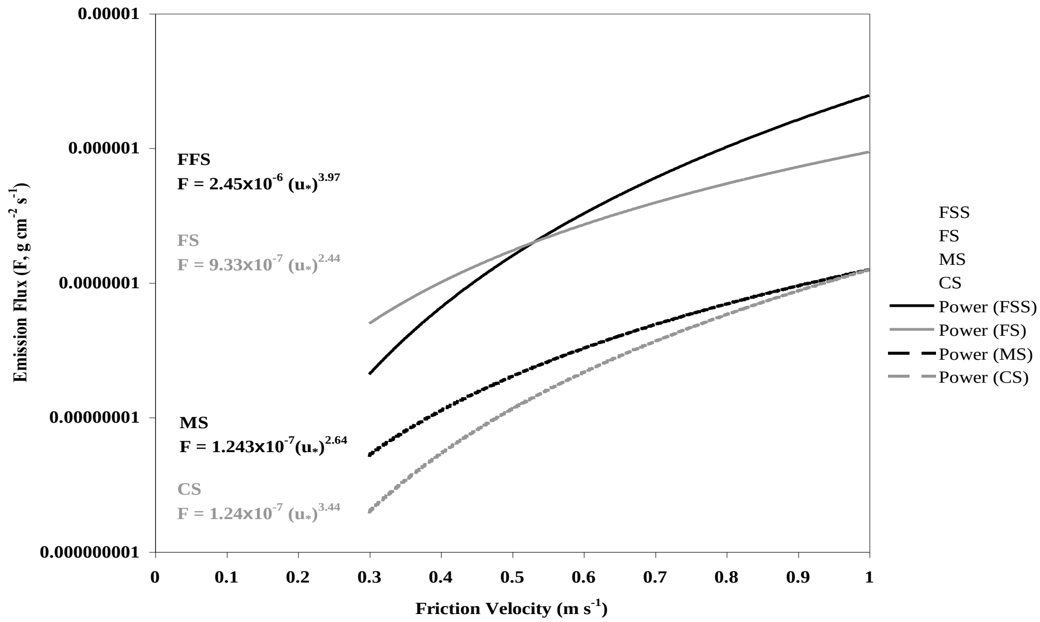


Figure 3-5. The Emission Flux as a Function of Friction Velocity Predicted by the Alfaro and Gomes (2001) Model Constrained by the Four Soil Geometric Mean Diameter Classes of Alfaro et al. (2004)

Table 3-18. Soil Texture and Soil Group Codes

Soil Texture	Soil Texture Code	Soil Group	Soil Group Code
No Data	0	N/A	0
Sand	1	CS	4
Loamy Sand	2	CS	4
Sandy Loam	3	MS	3
Silt Loam	4	FS	2
Silt	5	FSS	1
Loam	6	MS	3
Sandy Clay Loam	7	MS	3
Silty Clay Loam	8	FSS	1
Clay Loam	9	MS	3
Sandy Clay	10	MS	3
Silty Clay	11	FSS	1
Clay	12	FS	2

Surface Roughness Lengths

Surface roughness lengths can vary considerably for a given land type, and are assigned as a function of land use type based on a review of information reported in the literature. The disturbance level of various surfaces has the effect of altering the surface roughness lengths, which in turn impact the potential for vacant lands to emit dust from wind erosion.

An examination of the relationship between the threshold surface friction velocity and the aerodynamic surface roughness length, reveals that for surface roughness lengths larger than approximately 0.1 cm, the threshold friction velocities increase rapidly above values that can be realistically expected to occur in the meteorological data used in the model implementation. Therefore to simplify the model implementation, only those land types with roughness length less than or equal to 0.1 cm are considered as potentially erodible surfaces.

For a given surface roughness, as determined by the land use type, the threshold friction velocity has a constant value. Thus, the land use data is mapped to an internal dust code used within the model to minimize computer resource requirements and coding efforts. The mapping of land use types to dust codes 3 (agricultural), 4 (grassland), 6 (shrubland), and 7 (barren) is presented in Table 3-19; dust codes 1 (water/wetlands), 2 (forest/urban), and 5 (orchards/vineyards) are not included.

Table 3-19. Surface Characteristics by Dust Code and Land Use Category

Dust Code	**3**	**4**	**6**	**7**
Land use category	Agricultural	Grassland	Shrubland	Barren
Surface roughness length, $Z_{0\ (cm)}$	0.031	0.1	0.05	0.002
Threshold friction velocity (m/s)	3.72	6.17	4.30	3.04
Threshold wind velocity at 10 meter height (m/s [mph])	13.2 [29.5]	19.8 [44.3]	14.6 [32.8]	12.7 [28.5]

Soil Reservoir Characteristics

Soil reservoirs are classified as limited for stable land parcels and unlimited for unstable land parcels. Classification of soil reservoirs as limited or unlimited has implications with respect to the duration of time over which the dust emissions are generated. In general, soil reservoirs should be classified in terms of the type of soils, the depth of the soil layer, soil moisture content and meteorological parameters. Finally, the time required for a soil reservoir to recharge following a wind event is influenced by a number of factors, including precipitation and snow events and freezing conditions of the soils. A recharge time of 24 hours was assigned to all surfaces. In addition, it was assumed that no surface will generate emissions for more than 10 hours in any 24-hour period.

The duration and amount of precipitation and snow and freeze events will also affect the dust emissions from wind erosion. A set of conditions were developed for treating these events based on seasons, soil characteristics and the amounts of rainfall and snow cover (Barnard, 2003). In addition, the time necessary to re-initiate wind erosion after a precipitation event ranges from 1 to 10 days, depending on the soil type, season of the year, and whether the precipitation event rainfall amount exceeds 2 inches.

Soil Disturbance

The disturbance level of a surface has the effect of lowering the threshold surface friction velocity. Except for agricultural lands, which are treated separately in the model as described below, vacant land parcels are typically undisturbed unless some activity is present such as to cause a disturbance (e.g., off-road recreational vehicle activity in desert lands, animal grazing on rangelands, etc.). It was assumed that all non-agricultural land types were undisturbed, since there is no *a priori* information to indicate otherwise for the regional scale modeling domain.

Other Adjustments

Two other adjustments to modeled air quality impacts related to fugitive dust transportability and partitioning between fine and coarse fractions of PM_{10}. Transport fractions as a function of land use were assigned to all emission estimates (Pace, 2003; Pace, 2005). In addition, new fine fraction values developed from controlled wind tunnel studies of western soils were applied to determine the fine and coarse fractions of wind-generated fugitive dust emissions (MRI, 2005).

Model Application

The windblown fugitive dust model was applied for the entire calendar year 2008 at a spatial resolution of 4-km on a modeling domain encompassing the Treasure Valley Airshed. The model generates estimates of PM_{10} dust emissions. The fine fraction of dust is obtained by using a $PM_{2.5}/PM_{10}$ ratio of 0.10 (MRI, 2005). Gridded emissions estimates were allocated to counties using GIS processing techniques and are summarized below.

Emission Results for 2008

Annual 2008 windblown dust emissions are presented in Table 3-20 for Ada, Canyon and Elmore counties. Annual emissions were calculated by summing hourly emission estimates across all days in calendar year 2008.

Table 3-20. 2008 Annual Windblown Fugitive PM Dust Emissions for Ada, Canyon and Elmore Counties (Tons/Year)

Annual 2008 (tpy)			
County	**FIPS**	**PM_{10} (tpy)**	**$PM_{2.5}$ (tpy)**
Ada	16001	8,606	861
Canyon	16027	888	89
Elmore	16039	17,720	1,772
Total		**27,214**	**2,721**

3.1.26 Ammonia Emissions

Ammonia emissions come from a variety sources including: livestock, agricultural fertilizer application, natural soils, domestic sources, wild animals, and ammonia from cold storage/industrial refrigeration. With the exception of ammonia from cold storage/industrial refrigeration (see Section 3.1.11), emissions have been developed using a GIS-based ammonia emissions modeling system developed for the WRAP (Chitjian and Mansell, 2003a; Chitjian and Mansell, 2003b; Mansell, 2005). The activity and emission factor data and sources are described below. A description of the emission estimation methodology, as well as summaries of the ammonia emission estimates are also provided.

Like the windblown dust model, the implementation of the modeling system for the development of ammonia emissions for the Treasure Valley Airshed emissions inventory requires the use of a Cartesian modeling grid domain that is larger than Ada, Canyon, and Elmore counties. As such, the emission estimates described below include additional Idaho counties, as well as neighboring counties in Oregon. Figure 3-6 displays the modeling domain for which ammonia emissions were estimated. In addition, the model requires hourly gridded meteorological data and generates emission estimates for each hour for the entire time period considered. For the DEQ inventory, these estimates are aggregated to counties and summed across all hours of calendar year 2008, as described below.

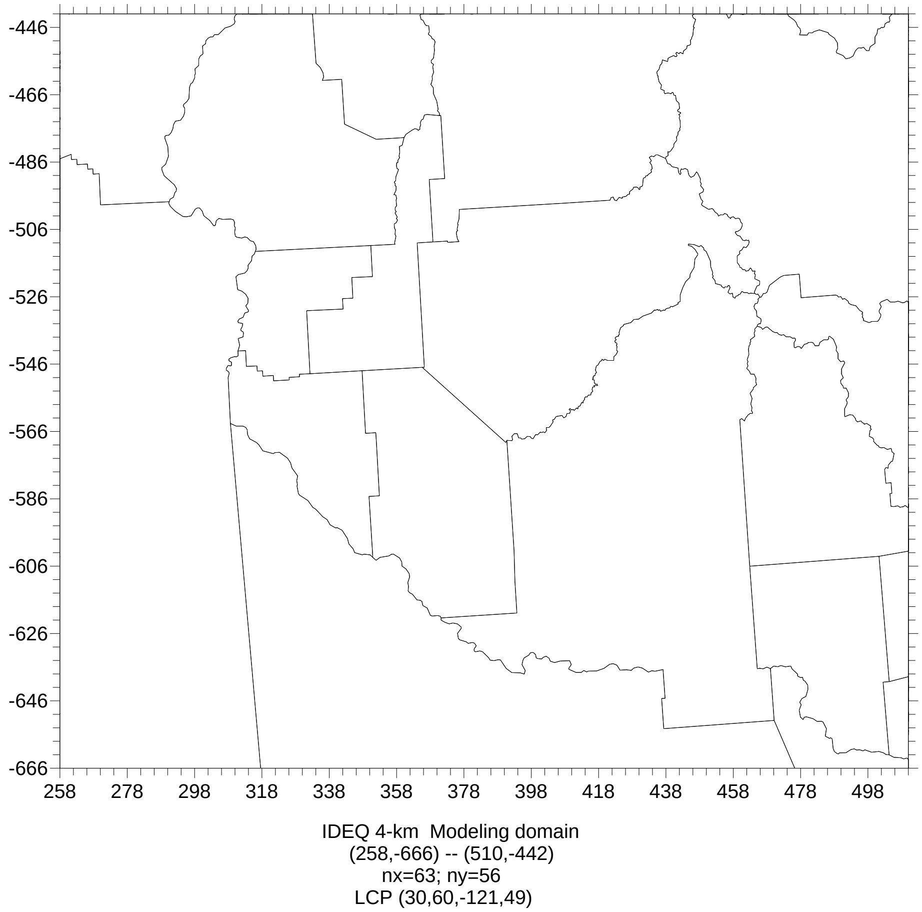


Figure 3-6. DEQ 4-km Modeling Domain for Ammonia Emissions Development

<u>Data Collection</u>

Input data required by the model for each subcategory (i.e., livestock, fertilizer application, natural soil, domestic sources, wild animals, etc.) include:

- Activity data;
- Emission factors; and
- Temporal variations.

In addition, land use/land cover data and meteorology data for the inventory domain were used to run the model.

Livestock Activity Data

Ammonia emissions from livestock were developed using county-level head counts and dairy and beef cattle feedlot estimates provided by the DEQ (Strachan, 2009). The DEQ obtained these data (i.e., headcounts for dairy cattle and beef cattle on feedlots, including specific locations of dairies and feedlots) from the Idaho State Department of Agriculture. However, in order to avoid disclosure of detailed information regarding any particular dairy or feedlot, DEQ subsequently aggregated these data to the 4-km grid cells within the modeling domain. The gridded dairy and beef cattle data for all Idaho counties were then used to spatially allocate county-level headcounts for 2008, obtained from the USDA National Agricultural Statistics Service (NASS, 2009a). All other livestock ammonia emissions (i.e., poultry, swine, sheep and horses) within Idaho were estimated based on 2007 county-level head counts, which were obtained from the *2007 Census of Agriculture* (USDA, 2009) and spatially allocated using gridding surrogates. For the portions of the two Oregon counties (i.e., Baker and Malheur) within the domain, livestock emissions were developed based on county-level activity data obtained from the USDA National Agricultural Statistics Service and spatially allocated as described below. Estimates for sheep, poultry and swine were obtained from NASS (NASS, 2009a). Table 3-21 summarizes the county-level livestock activity data for calendar year 2008.

Livestock Emission Factors

The approach used in the WRAP ammonia model does not treat the individual processes leading to ammonia emissions from various manure management practices, as has been the subject of recent research in the emission inventory development community. Instead, emission factors based on a "whole animal" approach are used. The emission factors are based on a recent literature review and are presented in Table 3-22 (Chinkin et al., 2003).

Table 3-21. 2008 Annual County-Level Livestock Head Counts

County	Beef Cattle	Dairy Cattle	Swine	Poultry	Sheep	Horses
Ada	10,065	56,411	1,837	1,948	1,806	3,904
Adams	6,175	6,543	41	206	609	749
Blaine	8,042	7,700	11	67	13,789	915
Boise	1,827	457	0	144	0	338
Camas	3,938	1,287	0	57	0	100
Canyon	13,908	115,653	1,534	6,737	19,627	6,525
Custer	18,057	8,008	99	218	481	1,625
Elmore	23,904	85,971	56	654	717	1,161
Gem	10,939	11,799	74	911	6,138	2,831
Gooding	11,035	270,877	160	459	0	1,826
Jerome	10,231	209,322	282	298	1,081	1,386
Lincoln	8,701	61,162	0	301	537	1,182
Owyhee	36,586	109,786	149	687	5,228	2,687
Payette	9,095	53,598	332	887	1,289	2,410
Twin Falls	25,898	146,861	0	982	14,007	2,457
Valley	3,024	3,545	18	196	120	235
Washington	19,154	28,522	300	400	15,532	1,551
Baker (OR)	46,608	34,273	111	663	5,509	4,211
Malheur (OR)	70,562	142,763	311	811	10,104	5,825

Table 3-22. Ammonia Emission Factors for Livestock

Source Category	Emission Factor (kg/animal-yr)
Beef Cattle	9.0
Dairy Cattle	25.0
Poultry	0.1
Swine	7.0
Horses	8.0
Sheep	1.34

Livestock Temporal Variations

A review of current literature reveals a lack in consistency of results quantifying temporal variations in ammonia emissions from livestock (Chitjian and Mansell, 2003a). However, a preponderance of the studies cited concluded that ammonia emissions from livestock display both a seasonal and diurnal variation consistent, in general, with increased ammonia emissions associated with warmer temperatures.

Seasonal allocation factors have been developed using inverse modeling results (Chinkin et al., 2003; Gilliland et al., 2003). The factors were further adjusted to reflect the current ORDrecommended emission factors, which were not available when the initial modeling methodology was developed (U.S. EPA, 2002a), which were not available at the time the modeling was performed by Gilliland et al. The adjusted factors are shown on Table 3-23, which indicates over a threefold increase in emissions during the warmest months and minimum emissions during the late fall, as opposed to the coldest months. The minimum in the fall is explained by the relatively dry conditions at that time of the year.

Table 3-23. Monthly Livestock Allocation Factors

Month	Temporal Allocation Factor
January	67
February	75
March	75
April	82
May	126
June	164
July	183
August	154
September	115
October	73
November	51
December	51

The diurnal variation of livestock ammonia emissions was also previously investigated (Chitjian and Mansell, 2003a). In general, the literature reports an increase in daytime emissions relative to nighttime emissions. A theoretical equation (i.e., Russell and Cass equation) was developed to predict diurnal emission variations as a function of meteorological data (Russell and Cass, 1986). The Russell and Cass equation relates hourly ammonia emission rates to temperature and wind speed as follows:

$$E_i \propto \left[2.36^{(T_i - 273/10)}\right] V_i A$$

Where:

E_i = emission rate at hour *i* from animal waste decomposition;
A = daily total emission rate for ammonia from animal waste = $\sum E_i$;
T_i = ambient temperature in degrees Kelvin at hour *i*; and
V_i = wind speed in meters per second (m/s) at hour *i* (a minimum wind speed of 0.1 m/s).

Although the seasonal and diurnal variations presented above are empirically based, they are consistent with the theory that greater temperatures and greater wind speeds will result in larger ammonia volatilization rates.

For the 2008 DEQ inventory, the Russell and Cass equation was used to provide the diurnal variation of livestock ammonia emissions. This approach is consistent with first principal assumptions and with measurements showing increased ammonia release with increased temperature and wind speed. The monthly livestock allocation factors shown in Table 3-23 were used to allocate annual emission estimates to each month of the year.

Fertilizer Application Activity

Although the Idaho State Department of Agriculture (ISDA) was contacted in order to obtain local county-level data, ISDA only maintains these data at a state-wide basis. Additionally, ISDA's state-wide data did not include details on the specific types of fertilizers applied, as required by the WRAP GIS NH_3 model. Therefore, ammonia emissions from fertilizer application were developed using monthly county-level fertilizer activity data obtained from the Carnegie Mellon University (CMU) Ammonia Model input database developed from the USDA's National Agricultural Statistics Survey (NASS) (Strader et al., 2004). Table 3-24 summarizes the annual county-level fertilizer activity data used for modeling of the Treasure Valley inventory domain.

Fertilizer Emission Factors

Emission factors for ammonia emissions from fertilizer application were based upon data from the European Environment Agency (EEA, 2002) as recommended by the WRAP model methodology (Chitjian and Mansell, 2003b). Emission factors for fertilizer application are presented in Table 3-25. As discussed in the WRAP model methodology (Chitjian and Mansell, 2003a), fertilizer emission factors were adjusted as a function of the soil pH. Based upon recent research, the emission factors are scaled according to the following relation as a function of the soil pH (Potter et al., 2001):

$$a = 0.3125 \times pH - 1.01$$

Table 3-24. 2008 Annual Fertilizer Application Data by Type and County (kg/year)

County	State	Anhydrous Ammonia	Aqueous Ammonia	Nitrogen Solutions	Urea	Ammonium Nitrate	Ammonium Sulfate	Ammonium Thiosulfate	Ammonium Phosphates	Calcium Ammonium Nitrate	Potassium Nitrate
Ada	Idaho	313,638	14,867	332,092	898,450	300,150	284,480	48,777	3,050,300	325	34
Adams	Idaho	12,072	571	12,766	34,549	11,540	10,930	1,876	117,230	12	1
Blaine	Idaho	107,032	5,077	113,318	306,690	102,476	97,060	16,658	1,041,600	111	11
Boise	Idaho	4,426	210	4,690	12,698	4,243	4,020	689	43,076	4	0
Camas	Idaho	60,099	2,845	63,575	172,068	57,507	54,452	9,336	584,340	62	6
Canyon	Idaho	1,562,920	74,098	1,655,040	4,478,000	1,495,900	1,416,830	243,278	15,191,000	1,622	169
Custer	Idaho	34,458	1,632	36,479	98,748	32,971	31,237	5,365	334,960	35	3
Elmore	Idaho	541,010	25,648	572,460	1,549,100	517,810	490,700	84,235	5,257,700	561	58
Gem	Idaho	94,452	4,472	99,886	270,264	90,382	85,546	14,695	917,980	97	10
Gooding	Idaho	446,610	21,192	473,140	1,281,720	428,290	405,640	69,552	4,348,700	464	48
Jerome	Idaho	669,030	31,704	707,470	1,916,560	640,480	606,120	104,098	6,502,500	695	72
Lincoln	Idaho	151,368	7,163	160,234	432,790	144,836	137,088	23,523	1,473,100	157	16
Owyhee	Idaho	432,650	20,498	457,880	1,239,260	413,780	392,120	67,301	4,206,700	449	47
Payette	Idaho	259,124	12,298	274,398	741,760	248,242	235,088	40,327	2,519,900	269	28
Twin Falls	Idaho	1,131,320	53,482	1,201,180	3,269,500	1,091,410	1,038,610	177,732	11,252,000	1,151	124
Valley	Idaho	19,078	904	20,181	54,558	18,260	17,288	2,968	185,470	20	2
Washington	Idaho	193,948	9,191	205,400	555,660	185,754	175,930	30,170	1,884,600	201	21
Baker	Oregon	177,090	6,235	301,240	796,800	97,240	155,110	8,280	623,200	1,487	538
Malheur	Oregon	1,320,700	46,564	2,248,600	5,944,000	726,000	1,157,000	61,724	4,651,400	11,087	4,011

Table 3-25. Ammonia Emissions Factors for Fertilizer Application

Fertilizer Type	%N volatized as NH_3	kg NH_3/kg fertilizer applied
Anhydrous ammonia	4	0.04857
Aqueous ammonia	2.4	0.02914
Nitrogen solutions	8	0.09714
Urea	15	0.18214
Ammonium nitrate	2	0.02428
Ammonium sulfate	10	0.12143
Calcium ammonium nitrate	2	0.02428
Ammonium thiosulfate	2.4	0.02914
Other straight nitrogen	2.4	0.02914
Ammonium phosphates	5	0.06071
N-P-K	2	0.02428
Potassium nitrate	2.4	0.02914

Soil pH scalars were not applied to urea emission factors as research has indicated that urea emissions are not affected by initial soil pH. Soil pH data used for the Treasure Valley emissions inventory are described below.

Fertilizer Temporal Variation

Emissions from fertilizer application were temporally allocated monthly based on the monthly activity data. Diurnal variations in fertilizer emissions are expected as temperature and wind speed affect ammonia production and volatilization. The Russell and Cass equation, described above, was used to temporally allocate daily emissions to each hour of the day as a function of temperature and wind speed, as was done for livestock emissions.

Natural Soil Activity

Ammonia emissions from natural soils are based on land use/land cover acreages. The same database used for the windblown dust model was used for the estimation of ammonia emissions from natural soils. Land use-land cover (LULC) data required for the windblown dust model was derived from crop-specific GIS data layers obtained from the USDA NASS Cropland Data Layer (CDL) Program and represent agricultural, as well as non-agricultural, lands throughout the region based on data for calendar year 2007 (NASS, 2007). The primary purpose of the CDL Program is to use satellite imagery to provide acreage estimates to the Agricultural Statistics Board for the state's major commodities and produce digital, crop-specific, categorized geo-referenced output products. These data were reviewed and processed for use in the windblown dust model. Figure 3-3 (windblown dust section) presents a display of the final land use/land cover data for the 4-km modeling domain.

Natural Soil Emission Factors:

Natural soil ammonia emissions were estimated based on emission factors developed from recent research (Battye et al., 2003; Chinkin et al., 2003); these emission factors are presented in Table 3-26.

Table 3-26. Ammonia Emission Factors for Native Soils

Land type	Emission Factor (kg/km^2-yr)
Urban	10
Barren/Desert land	10
Deciduous Forest	174
Evergreen Forest	54
Mixed Forest	114
Shrubland	400
Grasslands	400
Fallow	205
Urban/Recreational Grasses	400
Wetlands	400

A previous study estimated ammonia emissions from native soils based on several environmental variables including monthly rainfall, surface air temperature, solar radiation, soil texture, land cover type and vegetative type (Potter et al., 2001). The model first calculated the available mineral nitrogen substrate for ammonia emissions and then modified this value by applying scalars for soil surface temperature (T_s), pH, and soil moisture content (M). The scalars are of the form:

$$\left\{ \frac{1}{1+10^{\left[0.09018+\left(\frac{2729.92}{273.16+T_s}\right)-(pH\times c)\right]}} \right\} \times (1-M)$$

where ‘c’ is a constant, which determines the sensitivity to pH. The study authors used ‘c’ values of 1.3 (i.e., consistent with measurements made) and 10 (i.e, to produce results with minimal pH effects). The emission factors presented in Table 3-26 were modified for temperature and pH effects using these scalars using a ‘c’ value of 1.3. Soil temperature and soil moisture content are taken from the meteorological data used for the project as discussed below.

Natural Soil Temporal Variation

The temporal allocation of native soil ammonia emissions were calculated using the emission factor scalars described above, which are temporally resolved based on the hourly meteorological data.

Domestic Sources Activity Data

Domestic sources of ammonia emissions considered in the current inventory include human respiration and perspiration, disposable and cloth diapers and domestic pets (cats and dogs). Ammonia emissions from domestic sources use county-level populations as activity data. County-level populations were obtained from the U.S. Census (U.S. Census, 2009c). Estimates of total county-level populations are needed for human perspiration and respiration. The number of cats and dogs are scaled based on total population. County-level estimates of infant populations are used to estimate ammonia emissions from cloth and disposable diapers. The 2008 county-level population estimates are presented in Table 3-27 for all counties within the 4-km modeling domain used for the project.

Table 3-27. 2008 County-Level Population Estimates

County	State	Total Population	Infant Population
Ada	Idaho	380,920	29,211
Adams	Idaho	3,499	184
Blaine	Idaho	21,731	1,437
Boise	Idaho	7,504	314
Camas	Idaho	1,126	85
Canyon	Idaho	183,939	17,764
Custer	Idaho	4,254	180
Elmore	Idaho	28,997	2,594
Gem	Idaho	16,513	1,113
Gooding	Idaho	14,295	1,212
Jerome	Idaho	20,468	1,955
Lincoln	Idaho	4,503	417
Owyhee	Idaho	10,877	852
Payette	Idaho	22,966	1,694
Twin Falls	Idaho	74,284	6,008
Valley	Idaho	8,862	531
Washington	Idaho	10,206	659
Baker	Oregon	15,983	791
Malheur	Oregon	30,907	2,192
Total		**861,834**	**69,193**

Domestic Source Emission Factors

Domestic source emissions were estimated based on emission factors recommended by recent studies (Chitjian et al., 2000; Chitjian and Mansell, 2003a). Table 3-28 presents the emission factors used for the project.

Table 3-28. Ammonia Emission Factors for Domestic Ammonia Sources

Source	Emission Factor	Unit
Cats	0.348	lb N/cat-yr
Dogs	2.17	lb N/dog-yr
Human Perspiration	0.55	lb NH_3/person-yr
Human Respiration	0.0035	lb NH_3/person-yr
Cloth Diapers	6.9	lb NH_3/infant-yr
Disposable Diapers	0.36	lb NH_3/infant-yr

Domestic Sources Temporal Variation

The ammonia emissions from domestic sources were assumed to be temporally invariant.

Wild Animal Activity Data

Although ammonia emissions from wild animals constitute a comparatively small portion of the overall ammonia emission inventory, these emissions were included given the availability of activity data. Ammonia emissions from wild animals are based upon estimates of the number of animals at the county level. These data were obtained from the Carnegie Mellon University (CMU) Ammonia Model input database (Strader et al., 2004). It should be noted that county-level wild animal populations are obtained from state-level data allocated to counties based on surrogates. Consequently, the county-level populations may result in fractional numbers, particularly for those animals with relatively small overall populations.

Wild Animal Emission Factors

Ammonia emissions from wild animals were estimated using emission factors obtained from the CMU NH_3 model (Strader, et al., 2004) and are presented in Table 3-29.

Table 3-29. Ammonia Emission Factors for Wild Animal Ammonia Sources

Source	Emission Factor	Unit
Black bears	4.536	kg NH_3/animal-yr
Grizzly bears	4.536	kg NH_3/animal-yr
Elk	24.48	kg NH_3/animal-yr
Deer	4.536	kg NH_3/animal-yr

Wild Animal Temporal Variations

The ammonia emissions from wild animals were assumed to be temporally invariant.

Land Use/Land Cover Data

The Land Use/Land Cover (LULC) data used for the ammonia inventory were developed from the NASS CDL database described above (NASS, 2007). LULC data is directly used for estimating natural soil ammonia emissions, as well as for spatial allocation of livestock and fertilizer application emissions, as described below. The land use classifications available in the CDL database are presented in Table 3-30. Figure 3-7 displays the CDL data for the 4-km DEQ modeling and are summarized at the county-level in Table 3-31.

Soil pH is used in the ammonia model for applying adjustments to emission factors for natural soil and fertilizer application emissions. The State Soil Geographic Database (STATSGO) was used to specify the soil pH necessary for the development of the emission inventory for the project (USDA, 1994). Figure 3-8 displays the mean soil pH for the DEQ modeling domain.

Meteorology

Gridded hourly meteorological data required for the model include wind speeds, ambient temperatures, soil temperatures and soil moisture and are based on the MM5/WRF model simulation results provided by DEQ (Zhang, 2009).

<u>Emission Calculation</u>

Model Application

A GIS-based modeling system was used to generate the gridded ammonia emissions inventory incorporating various improvements as implemented for the WRAP (Chitjian and

Table 3-30. CDL Classifications and NH_3 Model Cross-References

CDL Code	NH_3 Code	Crop Description	LU Description
1	10	Corn	Row Crops
2	10	Cotton	Row Crops
3	10	Rice	Row Crops
4	10	Sorghum	Row Crops
5	10	Soybeans	Row Crops
6	10	Sunflowers	Row Crops
10	10	Peanuts	Row Crops
11	10	Tobacco	Row Crops
21	10	Barley	Grains/Hays/Seeds
22	10	Durum Wheat	Grains/Hays/Seeds
23	10	Spring Wheat	Grains/Hays/Seeds
24	10	Winter Wheat	Grains/Hays/Seeds
25	10	Other Small Grains	Grains/Hays/Seeds
26	10	Winter Wheat/Soybeans Double-Cropped	Grains/Hays/Seeds
27	10	Rye	Grains/Hays/Seeds
28	10	Oats	Grains/Hays/Seeds
29	10	Millet	Grains/Hays/Seeds
30	10	Speltz	Grains/Hays/Seeds
31	10	Canola	Grains/Hays/Seeds
32	10	Flaxseed	Grains/Hays/Seeds
33	10	Safflower	Grains/Hays/Seeds
34	10	Rape seed	Grains/Hays/Seeds
35	10	Mustard	Grains/Hays/Seeds
36	10	Alfalfa	Grains/Hays/Seeds
37	10	Other Hays	Grains/Hays/Seeds
41	10	Sugarbeets	Other Crops
42	10	Dry Beans	Other Crops
43	10	Potatoes	Other Crops
44	10	Other Crops	Other Crops
45	10	Sugarcane	Other Crops
46	10	Sweet Potatoes	Other Crops
47	10	Miscellaneous Vegetables & Fruit	Other Crops
48	10	Watermelon	Other Crops
50	10	Pickles	Other Crops
51	10	Chick Peas	Other Crops
52	10	Lentils	Other Crops
53	10	Peas	Other Crops
58	10	Clover/Wildflowers	Other Crops
61	12	Fallow/Idle Cropland	Open Non-Crop
62	9	Grass/Pasture/Non-agricultural	Open Non-Crop
63	5	Woodland	Open Non-Crop
64	6	Shrubland	Open Non-Crop
65	2	Barren	Open Non-Crop
67	10	Peaches	Tree Crops
68	10	Apples	Tree Crops
69	10	Grapes	Tree Crops

Table 3-30. Continued

CDL Code	NH_3 Code	Crop Description	LU Description
70	10	Christmas Trees	Tree Crops
71	10	Other Tree Nuts & Fruit	Tree Crops
72	10	Citrus	Tree Crops
73	10	Other Tree Fruit	Tree Crops
80	10	Other Non-Tree Fruit	Tree Crops
81	13	Clouds	Other Non-Crops
82	1	Urban/Developed	Other Non-Crops
83	13	Water	Other Non-Crops
87	8	Wetlands	Other Non-Crops
92	13	Aquaculture	Other Non-Crops
111	13	NLCD-Open Water	NLCD Non-Crop
112	13	NLCD-Perennial Ice/Snow	NLCD Non-Crop
121	1	NLCD-Developed/Open Space	NLCD Non-Crop
122	1	NLCD-Developed/Low Intensity	NLCD Non-Crop
123	1	NLCD-Developed/Medium Intensity	NLCD Non-Crop
124	1	NLCD-Developed/High Intensity	NLCD Non-Crop
131	2	NLCD-Barren	NLCD Non-Crop
141	3	NLCD-Deciduous Forest	NLCD Non-Crop
142	4	NLCD-Evergreen Forest	NLCD Non-Crop
143	5	NLCD-Mixed Forest	NLCD Non-Crop
152	6	NLCD-Shrubland	NLCD Non-Crop
171	7	NLCD-Grassland Herbaceous	NLCD Non-Crop
181	9	NLCD-Pasture/Hay	NLCD Non-Crop
182	10	NLCD-Cultivated Crop	NLCD Non-Crop
190	8	NLCD-Woody Wetlands	NLCD Non-Crop
195	8	NLCD-Herbaceous Wetlands	NLCD Non-Crop

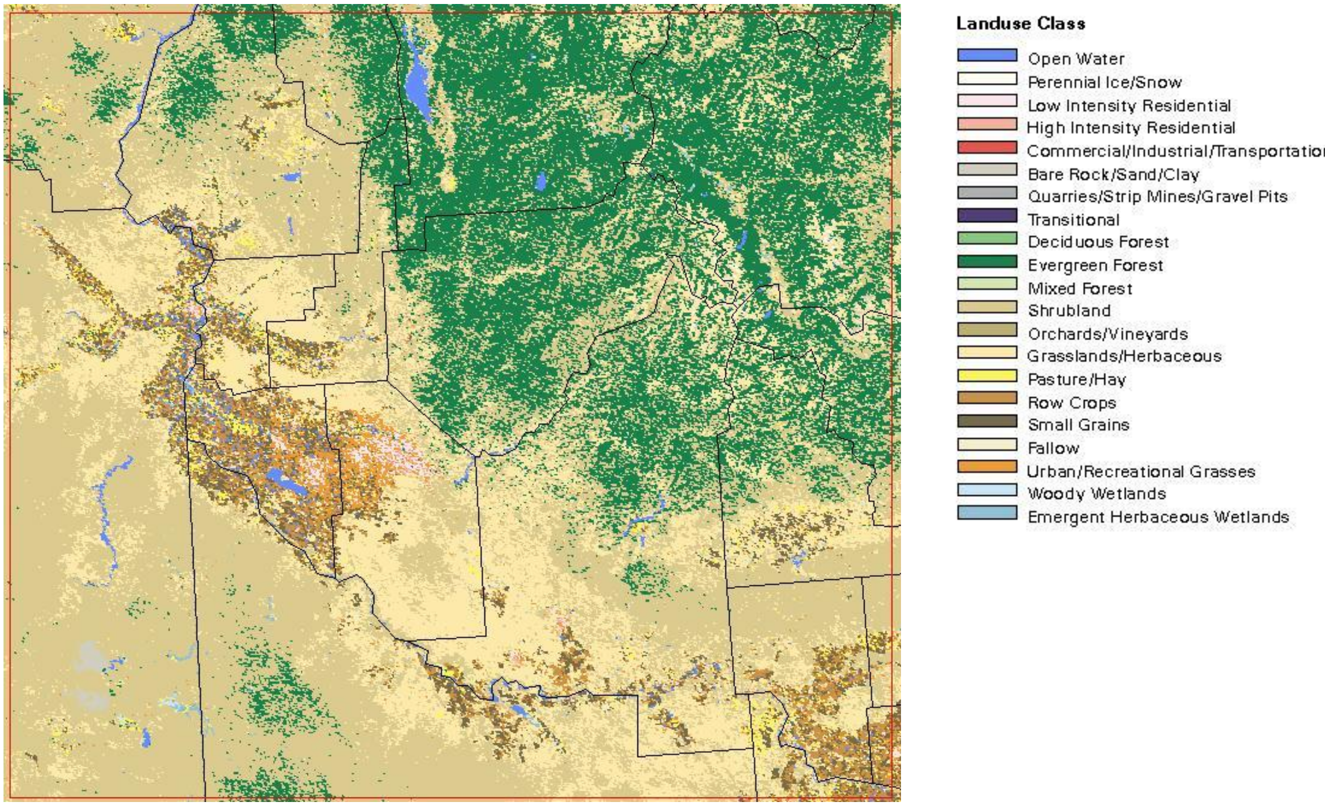


Figure 3-7. Land Use/Land Cover Data Used for the DEQ Ammonia Emissions Inventory Development

Table 3-31. Land Use Summary by Category and County for the 4-Km Modeling Domain (Acres)

County	State	Urban Land	Forest Land/Wetlands	Agricultural Lands	Grasslands	Shrublands	Barren Lands
Ada	Idaho	100,990	7,539	46,682	354,735	157,842	2,327
Adams	Idaho	2,078	113,107	494	18,003	152,634	0
Blaine	Idaho	655	170,408	140	59,807	81,215	2,988
Boise	Idaho	4,690	676,163	279	152,293	375,662	1,147
Camas	Idaho	5,950	167,759	29,348	196,542	257,873	1,346
Canyon	Idaho	80,459	3,183	186,583	83,998	9,364	4,942
Custer	Idaho	1,730	840,939	185	200,777	254,396	10,205
Elmore	Idaho	34,270	388,334	74,469	721,049	734,830	4,836
Gem	Idaho	10,231	51,890	23,639	117,980	153,711	309
Gooding	Idaho	23,664	844	107,229	104,031	226,637	556
Jerome	Idaho	5,171	0	21,756	7,751	4,025	62
Lemhi	Idaho	0	39,380	0	8,521	10,170	0
Lincoln	Idaho	2,093	0	6,552	12,035	50,050	62
Owyhee	Idaho	20,011	86,658	104,867	411,322	1,174,541	4,633
Payette	Idaho	12,667	2,612	39,963	159,559	41,392	1,173
Twin Falls	Idaho	5,831	453	33,579	50,096	30,445	310
Valley	Idaho	3,577	735,764	124	75,919	214,516	0
Washington	Idaho	9,404	117,440	30,869	199,095	549,927	611
Baker	Oregon	6,354	41,817	3,818	48,107	418,567	0
Malheur	Oregon	40,403	24,951	126,640	491,460	1,626,267	29,037
Domain Total		**370,227**	**3,469,242**	**837,215**	**3,473,078**	**6,524,066**	**64,545**

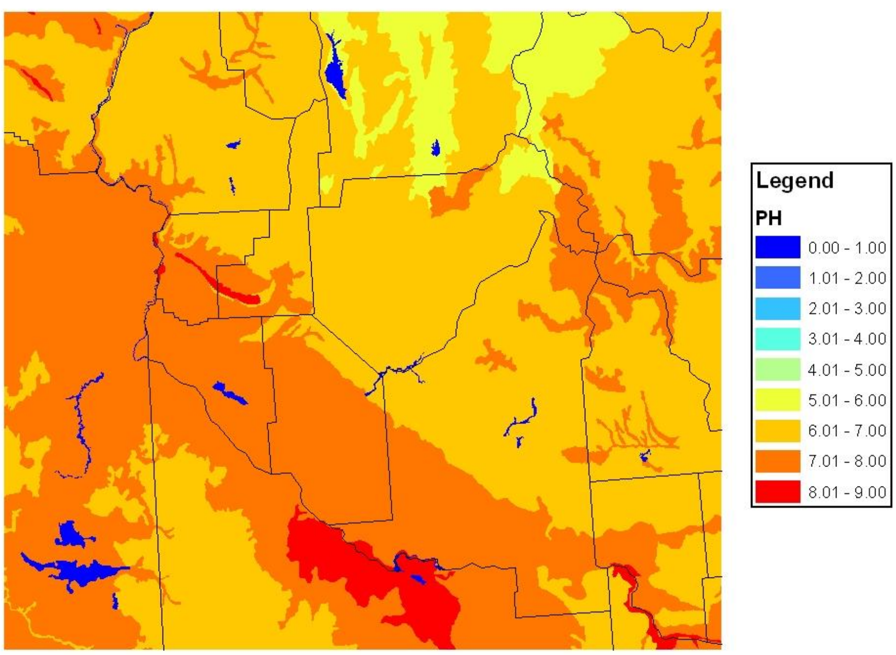


Figure 3-8. Mean Soil pH for the DEQ Modeling Domain from the STATSGO Database

Mansell, 2003a; Chitjian and Mansell, 2003b; Mansell, 2005). The county level activity data were used in conjunction with the emission factors and environmental factors described above to generate a gridded inventory of ammonia emissions on the DEQ 4-km resolution modeling domain. The gridded emission inventory was temporally resolved hourly.

The modeling system applied gridding surrogates (described below) to the county-level emission estimates on an annual basis (or monthly for fertilizer application emissions). The effects of soil pH on the emission factors for fertilizer application were applied to the annual gridded ammonia emission estimates. Other environmental factors were incorporated in the temporal allocation modules since these factors impact the diurnal variation of emissions through gridded, hourly temperatures and wind speeds. For natural soil emissions estimates, the effects of soil conditions (pH and moisture) and meteorological data were both incorporated in the emissions estimates during the temporal allocation process.

Spatial Surrogate

The GIS model used for estimating ammonia emissions applied gridded spatial surrogates to county-level activity and emission factor data to generate gridded hourly emission estimates. Spatial surrogates were developed based on population and land use/land cover data. The land use data used for the project was processed for developing spatial surrogates through aggregation of individual land use classes into more broadly defined classes for spatial allocation of emissions. The spatial surrogate codes, associated land use classes and descriptions, as used in the model, are presented in Table 3-32 and displayed graphically in Figure 3-7 above. Each ammonia emission source category considered was then cross-referenced to the appropriate spatial surrogate code (both primary and secondary surrogate assignments), as shown in Table 3-33. It should be noted that for beef and dairy cattle emissions, spatial surrogates were only used for the portions of the domain within Washington. Within Idaho, beef and dairy cattle were spatially allocated based on the gridded distribution of dairies and feedlots, as discussed above.

Table 3-32. Land Use/Surrogate Cross-Reference

Surrogate Number	CDL Classes	Description
1	1	Urban
2	2	Barren
3	3	Deciduous Forest
4	4	Evergreen Forest
5	5	Mixed Forest
6	6	Shrublands
7	7	Grasslands
8	8	Wetlands
9	9	Grass + Pasture
10	10	Agricultural
11	3-10,12	Rural
12	12	Fallow
13	13	Water
14	3-5,7	Forest + Shrub + Grasslands

Table 3-33. Source Category/Surrogate Cross-Reference

Source category	Primary Surrogate Code and Description	Secondary Surrogate Code and Description
Fertilizers	10 – Agricultural	11 – Rural
Livestock – Dairy & Beef Cattle	9 – Grass + Pasture	11 – Rural
Livestock – Other	9 – Grass + Pasture	11 – Rural
Domestic Respiration	Population	Population
Native Soils – Urban	1 – Urban	1 – Urban
Native Soils – Barren	2 – Barren	2 – Barren
Native Soils – Deciduous Forest	3 – Deciduous Forest	3 – Deciduous Forest
Native Soils – Evergreen Forest	4 – Evergreen Forest	4 – Evergreen Forest
Native Soils – Mixed Forest	5 – Mixed Forest	5 – Mixed Forest
Native Soils – Shrubland	6 – Shrublands	5 – Mixed Forest
Native Soils – Grassland	7 – Grasslands	7 – Grasslands
Native Soils – Fallow	12 – Fallow	12 – Fallow
Native Soils – Urban Grass	1 – Urban	1 – Urban
Native Soils – Wetlands	8 – Wetlands	8 – Wetlands
Wild Animals	14 – Forest + Shrub + Grasslands	14 – Forest + Shrub + Grasslands

Emission Results

The GIS NH_3 model was applied using the data as described above for each day in calendar year 2008 on the 4-km modeling domain. For reporting purposes, the hourly, gridded emissions were aggregated to the county level using a GIS processing approach. For each county border-line grid cell, emissions were distributed among the counties intersecting the grid cell in proportion to the area of each of these counties within the grid cell.

Annual 2008 ammonia emissions by source category are presented in Table 3-34 for Ada, Canyon and Elmore counties. Annual emissions were calculated by summing hourly emission estimates across all days in calendar year 2008. A comparison with previous inventories developed for calendar year 2010 by ERG/ENVIRON (ENVIRON and ERG, 2002) shows that the 2008 annual ammonia emission estimates for the Ada and Canyon counties are relatively consistent with the current estimates based on the WRAP GIS-based NH_3 model (11,535 tpy from all sources or 8,040 tpy from all non-soil sources versus 6,228 tpy based on previous work not inclusive of soils). Likely reasons for the 30 percent increase in emission estimates are differences in activity data and methodologies.

3.2 Emissions Calculation Methodologies – Ozone and PM Season

After the annual area source emissions were estimated using the methodologies described in the various subsections of Section 3.1, the daily ozone season and PM season emission estimates were developed. The ozone season extends from April 1 through October 31 (i.e., 214 days), while the PM season is from November 1 through February 29 (2008 was a leap year) (i.e., 121 days). Wherever possible, Idaho-specific activity/surrogate data were used to develop temporal allocation profiles. If Idaho-specific data were not available, then U.S. EPA's default temporal allocation profiles from its emissions modeling clearinghouse were used instead (U.S. EPA, 2002b).

3.2.1 Fuel Combustion

As part of the fuel survey mailed out to fuel dealers and distributors, monthly fuel quantity data were requested. In general, fuel respondents were able to furnish relevant monthly statistics. In a few cases, respondents were contacted by phone to clarify the appropriate seasonal distribution. These monthly fuel quantity data were used to develop seasonal fuel quantities which were then divided by the number of days in the season resulting in seasonal daily fuel use. As pointed out by several respondents, it should be noted that the monthly fuel quantity data were based upon fuel deliveries and not actual consumption. As a result, the reported monthly fuel quantity data probably lead consumption by a few weeks (i.e., fuel would ordered and stockpiled prior to the winter heating season).

Table 3-34. 2008 Annual Ammonia Emissions for Ada, Canyon, and Elmore Counties by Source Category (Tons/Year)

2008 Annual Ammonia Emissions (tpy)				
SCC	**Description**	**Ada**	**Canyon**	**Elmore**
2805023300	Dairy Cattle	1,554.56	3,187.14	2,369.17
2805003100	Beef Cattle	99.85	137.98	237.15
2805025000	Swine	14.17	11.84	0.43
2805030000	Poultry	0.21	0.74	0.07
2805035000	Horses	34.43	57.54	10.24
2805040000	Sheep	2.67	28.99	1.06
Total Livestock		**1,705.9**	**3,424.2**	**2,618.1**
9999101002	Native Soils – Urban	26.41	27.04	14.54
9999101003	Native Soils – Barren	0.00	0.00	0.24
9999101004	Native Soils – Deciduous Forest	0.19	0.00	0.02
9999101005	Native Soils – Evergreen Forest	4.92	0.45	103.55
9999101006	Native Soils – Mixed Forest	0.47	0.00	0.00
9999101007	Native Soils – Shrubland	49.55	3.10	100.11
9999101008	Native Soils – Grassland	127.48	22.80	173.45
9999101009	Native Soils – Fallow	19.45	31.57	19.30
9999101010	Native Soils – Urban Grass	1,056.44	1,081.63	581.46
9999101011	Native Soils – Wetlands	6.90	30.11	13.04
Total Native Soils		**1,291.8**	**1,196.7**	**1,005.7**
8888101001	Wild Animals – Black bears	1.26	0.12	4.58
8888101002	Wild Animals – Grizzly bears	0.00	0.00	0.01
8888101003	Wild Animals – Elk	35.08	3.32	127.37
8888101004	Wild Animals – Deer	2.07	0.20	7.55
Total Wild Animals		**38.4**	**3.6**	**139.5**
6906950001	Domestic – Respiration	0.66	0.32	0.05
6906950002	Domestic – Perspiration	104.75	50.58	7.97
6906950006	Domestic – Cloth Diapers	100.78	61.29	8.95
6906950007	Domestic – Disposable Diapers	5.26	3.20	0.47
6906950008	Domestic – Cats	6.43	3.10	0.49
6906950010	Domestic – Dogs	59.72	28.84	4.55
Total Domestic		**277.6**	**147.3**	**22.5**
2801700001	Fertilizer – Anhydrous Ammonia	21.52	109.18	39.05
2801700002	Fertilizer – Aqueous Ammonia	0.61	3.11	1.11
2801700003	Fertilizer – Nitrogen Solutions	45.57	231.23	82.63
2801700004	Fertilizer – Urea	180.39	899.07	311.02
2801700005	Fertilizer – Ammonium Nitrate	10.29	52.24	18.68
2801700006	Fertilizer – Ammonium Sulfate	48.80	247.45	88.54
2801700007	Fertilizer – Ammonium Thiosulfate	2.01	10.20	3.65
2801700009	Fertilizer – All Ammonium Phosphates	261.59	1,326.44	474.30
2801700011	Fertilizer – Calcium Ammonium Nitrate	0.01	0.06	0.02
2801700012	Fertilizer – Potassium Nitrate	0.00	0.01	0.00
Total Fertilizers		**570.8**	**2,879.0**	**1,019.0**
Grand Total		**3,884**	**7,651**	**4,805**

3.2.2 Residential Wood Combustion

Annual residential wood quantities were allocated to the ozone and PM seasons based upon results from the residential wood combustion survey (Aurora, 2010). The seasonal fractions were derived from survey responses concerning the number of times a particular device (i.e., fireplace, woodstove, insert, or pellet stove) was used each month. Seasonal fractions were estimated for each county and device type. These seasonal fractions were then multiplied by the annual residential wood quantities resulting in seasonal wood quantities. Finally, these seasonal wood quantities were then divided by the number of days in each season.

3.2.3 Paved Road Dust

The temporal allocation factors developed for on-road motor vehicles using traffic counter data were also used for paved road dust emissions. This is discussed further in Apppendix E of the Northern Ada County PM_{10} Limited Maintenance Plan Ten-Year Update. Nonwinter "ubiquitous" silt loadings were assumed for the ozone season, while winter season "ubiquitous" silt loadings were assumed for the PM season to reflect the higher silt that results from roadway sanding. Precipitation adjustment factors were estimated for each month based on the number of days with at least 0.01 inches of rain.

Seasonal emission estimates by county are shown in Table 3-35. As shown, emissions are higher in the winter PM season than the summer ozone season due to silt loadings that were generally higher in winter than in non-winter. Although precipitation factors and temporal activity factors have the effect of decreasing emissions in the PM season relative to the ozone season, differences in silt loading, relating to antiskid treatments, cause higher emissions in the PM season relative to the ozone season.

3.2.4 Unpaved Road Dust

Temporal allocation of unpaved road dust emissions was performed in the same way as described in Section 3.2.3 for paved road dust. Although it is possible that unpaved road dust temporal allocations may differ from paved road dust allocations, there were no seasonal activity data available specific to unpaved roads. Therefore, paved road temporal allocations were assumed. Summer and winter road surface material silt content estimates taken from the TVRDS were used for the ozone and winter season, respectively.

Emission estimates by county are presented in Table 3-36. As noted in Section 3.1.4, Elmore County contains the highest unpaved roadway mileage and the highest unpaved road dust emission estimates of all counties in the Treasure Valley. Ozone season emission estimates are considerably higher than PM season emission estimates due to seasonal precipitation adjustments and higher estimated activity levels in the ozone season.

Table 3-35. 2008 Seasonal Paved Road Dust Emission Estimates

Roadway Type	PM Season (TPD)		Ozone Season (TPD)	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Ada County[a]	*34.8*	*2*	*10.4*	*0.6*
Canyon County[a]	*34.8*	*2*	*10.4*	*0.6*
Elmore County[b]	5.1	1.2	1.7	0.3

[a] Ada and Canyon counties paved road dust updated by DEQ in 2012; see Appendix E of the Northern Ada County PM_{10} Limited Maintenance Plan Ten-Year Update.
[b] Elmore County road dust original estimates. Elmore County emissions were not needed for the Northern Ada County PM_{10} Limited Maintenance Plan Ten-Year Update and were not updated.

Table 3-36. 2008 Seasonal Unpaved Road Dust Emission Estimates

County	PM Season (TPD)		Ozone Season (TPD)	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Ada	1.65	0.09	3.03	0.17
Canyon	0.28	0.02	0.52	0.03
Elmore	3.44	0.34	12.20	1.21
Totals	**5.36**	**0.45**	**15.75**	**1.41**

3.2.5 Commercial Cooking

No definite seasonality could be established for the five commercial cooking subcategories. Therefore, it was assumed that emissions were equally distributed throughout the year, so seasonal daily emissions were calculated by dividing annual emissions by 366.

3.2.6 Construction

Inclement weather can possibly affect construction activities in the winter. The seasonal profile for construction activities was developed using precipitation adjustment factors based on the number of days with at least 0.01 inches of rain. For any day with precipitation, it was assumed that either construction activity did not occur or that the construction activities did occur did not have emissions due to wet soil.

3.2.7 Architectural Surface Coatings

Idaho-specific temporal usage patterns were not identified for architectural surface coatings. Therefore, the U.S. EPA's default temporal allocation profiles from its emissions modeling clearinghouse were used for architectural surface coating (U.S. EPA, 2002b). This temporal allocation profile is shown in Table 3-37.

Table 3-37. Temporal Allocation Profile Assignment for Architectural Surface Coating

Category	Profile ID	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ozone Factor	PM Factor
Architectural Surface Coating	199	82	82	81	81	81	85	85	85	85	85	85	82	0.5876	0.3313

3.2.8 Traffic Markings

Local staff at the Idaho Transportation Department and the Canyon Highway District were contacted regarding the seasonality of traffic marking application (Morrison, 2010b; Newlun, 2010; Richard, 2010c). These staff indicated that generally traffic marking application corresponds with the ozone season months and is not conducted during the winter (i.e., PM season). Therefore, daily ozone season traffic marking emissions were calculated by dividing annual emissions by the number of days in the ozone season (i.e., 214 days).

3.2.9 Industrial Surface Coating

Idaho-specific temporal usage patterns were not identified for industrial surface coating. Therefore, the U.S. EPA's default temporal allocation profiles from its emissions modeling clearinghouse were used for the 13 industrial surface subcategories (U.S. EPA, 2002b). The assignment of these temporal allocation profiles is shown in Table 3-38. The monthly values shown in Table 3-38 represent the monthly fractional value out of an annual total of 1,000. The ozone season and PM season factors are calculated by summing up the monthly fractional values for the respective seasons and then dividing by 1,000.

Table 3-38. Temporal Allocation Profile Assignments for Industrial Surface Coating Subcategories

Subcategory	Profile ID	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ozone Factor	PM Factor
Factory Finished Wood	173	81	81	82	82	82	86	86	86	85	85	85	81	0.5908	0.3273
Wood Furniture	287	84	84	79	79	79	84	84	84	86	86	86	84	0.5826	0.3383
Metal Furniture	287	84	84	79	79	79	84	84	84	86	86	86	84	0.5826	0.3383
Paper	257	83	83	82	82	82	84	84	84	84	84	84	83	0.5846	0.3333

Subcategory	Profile ID	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ozone Factor	PM Factor
Plastic Products	200	82	82	81	81	81	86	86	86	85	85	85	82	0.5888	0.3303
Miscellaneous Finished Metals	253	83	83	81	81	81	84	84	84	85	85	85	83	0.5846	0.3343
Machinery and Equipment	253	83	83	81	81	81	84	84	84	85	85	85	83	0.5846	0.3343
Electronic and Other Electrical	253	83	83	81	81	81	84	84	84	85	85	85	83	0.5846	0.3343
Motor Vehicles	140	80	80	79	79	79	87	87	87	87	87	87	80	0.5936	0.3273
Aircraft	169	81	81	80	80	80	87	87	87	86	86	86	81	0.5918	0.3283
Marine	266	83	83	83	83	83	84	84	84	83	83	83	83	0.5846	0.3323
Railroad	169	81	81	80	80	80	87	87	87	86	86	86	81	0.5918	0.3283
Miscellaneous Manufacturing	260	83	83	82	82	82	85	85	85	85	85	85	83	0.5861	0.3323

3.2.10 Degreasing

Idaho-specific temporal usage patterns were not identified for degreasing. Therefore, the U.S. EPA's default temporal allocation profiles from its emissions modeling clearinghouse were used for degreasing (U.S. EPA, 2002b). Unlike industrial surface coating, the same temporal allocation profile was assigned to all of the degreasing subcategories. This temporal allocation profile is shown in Table 3-39.

Table 3-39. Temporal Allocation Profile Assignment for Degreasing

Category	Profile ID	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ozone Factor	PM Factor
Degreasing	253	83	83	81	81	81	84	84	84	85	85	85	83	0.5846	0.3343

3.2.11 Other Per Employee Emission Factor Source Categories

No Idaho-specific seasonality could be established for two of the per employee emission factor source categories (i.e., autobody refinishing and industrial refrigeration/cold storage). Therefore, it was assumed that emissions were equally distributed throughout the year, so seasonal daily emissions were calculated by dividing annual emissions by 366.

For graphic arts, the U.S. EPA's default temporal allocation profiles from its emissions modeling clearinghouse were used (U.S. EPA, 2002b). This temporal allocation profile is shown in Table 3-40.

Table 3-40. Temporal Allocation Profile Assignment for Graphic Arts

Category	Profile ID	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ozone Factor	PM Factor
Graphic Arts	257	83	83	82	82	82	84	84	84	84	84	84	83	0.5846	0.3333

3.2.12 Bakeries and Consumer Solvents

No Idaho-specific seasonality could be established for the per capita emission factor source categories (i.e., consumer bakeries and solvents). Therefore, it was assumed that emissions were equally distributed throughout the year, so seasonal daily emissions were calculated by dividing annual emissions by 366.

3.2.13 Dry Cleaning

Although the dry cleaning survey included a question regarding month-to-month variations, almost all of the dry cleaning facilities that returned the survey did not respond to this question. Therefore, the U.S. EPA's default temporal allocation profiles from its emissions modeling clearinghouse were used for dry cleaning (U.S. EPA, 2002b). This temporal allocation profile is shown in Table 3-41.

Table 3-41. Temporal Allocation Profile Assignment for Dry Cleaning

Category	Profile ID	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ozone Factor	PM Factor
Dry Cleaning	199	82	82	81	81	81	85	85	85	85	85	85	82	0.5876	0.3313

3.2.14 Asphalt Application

Local staff at the Idaho Transportation Department and the Canyon Highway District were contacted regarding the seasonality of asphalt application (Morrison, 2010b; Newlun, 2010; Richard, 2010b). These staff indicated that generally asphalt application corresponds with the ozone season months and is not conducted during the winter (i.e., PM season). Therefore, daily ozone season asphalt emissions were calculated by dividing annual emissions by the number of days in the ozone season (i.e., 214 days).

3.2.15 Pesticide Application

As discussed below in Section 3.2.20, it was assumed that all tilling and harvesting activities occur during the ozone season. Based upon this assumption, it is also reasonable to assume that most pesticide application also occurs during the ozone season (i.e., between tilling and harvesting). The crop profiles examined during the development of the annual pesticide application emissions indicate only minimal amounts of pre-planting or off-season pesticide use. Daily emissions were calculated by dividing annual emissions by the number of days in the ozone season (i.e., 214 days).

3.2.16 Gasoline Distribution

The gasoline distribution statistics were originally provided on a monthly basis. These monthly gasoline quantities were then used to develop seasonal gasoline quantities which were then divided by the number of days in the season resulting in seasonal daily gasoline use.

3.2.17 Wastewater Treatment

As part of the fuel survey mailed out to wastewater treatment facilities, monthly treatment quantities were requested. In general, the treatment facilities were able to furnish relevant monthly statistics. In a few cases, respondents were contacted by phone to clarify the appropriate seasonal distribution. These monthly treatment quantities were used to develop seasonal treatment quantities which were then divided by the number of days in the season resulting in seasonal daily treatment quantities.

3.2.18 Landfills

Although emissions from landfills are affected by the landfill gas temperature, it was not clear what the relationship between landfill gas temperature and ambient temperature was. Therefore, it was assumed that emissions were equally distributed throughout the year, so seasonal daily emissions were calculated by dividing annual emissions by 366.

3.2.19 Open Burning (Yard Waste and Household Waste)

No definite seasonality could be established for the open burning of yard waste and household waste. Therefore, it was assumed that emissions were equally distributed throughout the year, so seasonal daily emissions were calculated by dividing annual emissions by 366. It is possible that an announced burn ban might prevent open burning on a particular day with poor air quality, but the open burning would likely only be postponed to the next allowable burn day and would not significantly affect the overall temporal profile. It is also possible that an announced burn ban might also be ignored.

3.2.20 Agricultural Tilling and Harvesting

Based upon the *Idaho Crop Progress and Condition Reports* issued by the National Agricultural Statistics Service (NASS, 2009b), the weekly crop progress (from April 6 to October 28) was identified. These weekly progress reports indicate regional climate, crop growth progress, and percent planted and harvested for the primary Idaho crops in four different regions. Nearly all of the Idaho crops within Ada, Canyon, and Elmore counties are planted and harvested during the crop progress reporting period. Since the crop progress reporting period very closely corresponds to the ozone season, it was assumed that all tilling and harvesting activities occur during the ozone season. Daily emissions were calculated by dividing annual emissions by the number of days in the ozone season (i.e., 214 days).

3.2.21 Agricultural Burning – Fields

As indicated in Section 3.1.21, agricultural field burning was only allowed between September 1 and October 31, 2008. Daily emissions were calculated by dividing annual emissions by the number of days in the ozone season (i.e., 214 days).

3.2.22 Agricultural Burning – Irrigation Ditches

As indicated in Section 3.1.22, irrigation ditch burning is typically conducted during the month of March. Since March is not included in either the ozone season or PM season, no daily seasonal emissions were calculated.

3.2.23 Beef Cattle Feedlots

No definite seasonality could be established for beef cattle feedlots. Therefore, it was assumed that emissions were equally distributed throughout the year, so seasonal daily emissions were calculated by dividing annual emissions by 366.

3.2.24 Other Fires

The Idaho Fire Incident Reporting System (IFIRS) did not provide any seasonal distribution of structure fires or vehicles. Therefore, it was assumed that emissions were equally distributed throughout the year, so seasonal daily emissions were calculated by dividing annual emissions by 366.

3.2.25 Windblown Dust

As discussed in Section 3.1.25, annual emissions were calculated by summing hourly emission estimates across all days in calendar year 2008. Ozone season day emissions were calculated by summing all hourly estimates across all days in the season (April through October) and dividing by the total number of days in the ozone season. Similarly, PM season emission estimates were obtained by summing across all hours from November through February and dividing by the total number of days in the PM season.

3.2.26 Ammonia Emissions

As discussed in Section 3.1.26, the GIS NH_3 model was run for each day in the 2008 calendar year on the 4-km modeling domain. Annual emissions were calculated by summing hourly emission estimates across all days in calendar year 2008. Ozone season day emissions were calculated by summing all hourly estimates across all days in the season (April through October) and dividing by the total number of days in the ozone season. Similarly, PM season emission estimates were obtained by summing across all hours from November through February and dividing by the total number of days in the PM season.

3.3 Emission Results

The 2008 annual area source emissions are presented in Table 3-42 (all counties), 3-43 (Ada County), 3-44 (Canyon County), and 3-45 (Elmore County). These emissions have been presented for aggregated source categories. Detailed 2008 annual area source emission inventories are presented in Appendix G. *The paved road dust* PM_{10} *and* $PM_{2.5}$ *emissions were updated by DEQ in 2012, as described in Appendix E of the Northern Ada County* PM_{10} *Limited Maintenance Plan Ten-Year Update.*

Table 3-42. Summarized 2008 Annual Area Source Emissions – All Counties

Aggregated Source Category	NO_x (tpy)	SO_2 (tpy)	VOC (tpy)	CO (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	NH_3 (tpy)
Industrial Combustion	269	2	13	194	19	17	9
Commercial/Institutional Combustion	311	11	15	226	22	22	4
Residential Combustion (excluding wood)	689	5	39	280	53	52	129
Residential Wood Combustion	269	33	2,760	14,774	2,712	2,712	0
Commercial Cooking	0	0	191	600	1,201	1,133	0
Other Industrial Activities[a]	0	0	104	0	161	16	51
Industrial Surface Coating	0	0	3,235	0	0	0	0
Other Surface Coating[b]	0	0	1,245	0	0	0	0
Degreasing	0	0	7,383	0	0	0	0
Consumer Solvents	0	0	2,142	0	0	0	0
Other Solvent Application[c]	0	0	1,541	0	0	0	0
Gasoline Transport and Distribution	0	0	1,397	0	0	0	0
Open Burning	9	2	70	262	87	82	0
Other Fires	1	0	5	23	7	7	0
Waste Disposal[d]	0	0	88	0	0	0	1
Agricultural Burning	0	0	20	174	31	31	0
Other Agricultural[e]	0	0	1,953	0	1,408	387	0
Paved Road Dust[f]	0	0	0	0	*12,908*	*949*	0
Unpaved Road Dust	0	0	0	0	3,779	327	0
Windblown Dust	0	0	0	0	27,214	2,722	0
Ammonia - Fertilizer	0	0	0	0	0	0	4,469
Ammonia - Livestock	0	0	0	0	0	0	7,748
Ammonia - Domestic Ammonia	0	0	0	0	0	0	447
Ammonia - Wild Animals	0	0	0	0	0	0	182
Ammonia - Soils	0	0	0	0	0	0	3,494
Total[f]	**1,547**	**52**	**22,201**	**16,533**	***49,602***	***8,457***	**16,534**

[a]Includes bakeries, construction, and industrial refrigeration.
[b]Includes architectural surface coating, autobody refinishing, and traffic markings.
[c]Includes dry cleaning, graphic arts, asphalt application, and pesticides application.
[d]Includes landfills and wastewater treatment.
[e]Includes agricultural tilling, agricultural harvesting, and beef cattle feedlots.
[f]Paved road dust emissions for Ada and Canyon counties (PM_{10} and $PM_{2.5}$) were revised in 2012.

Table 3-43. Summarized 2008 Annual Area Source Emissions – Ada County

Aggregated Source Category	NO_x (tpy)	SO_2 (tpy)	VOC (tpy)	CO (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	NH_3 (tpy)
Industrial Combustion	110	1	5	80	8	7	4
Commercial/Institutional Combustion	225	8	11	168	16	16	2
Residential Combustion (excluding wood)	463	3	27	194	37	37	94
Residential Wood Combustion	122	15	1,239	6,713	1,208	1,208	0
Commercial Cooking	0	0	145	455	912	860	0
Other Industrial Activities[a]	0	0	67	0	94	9	10
Industrial Surface Coating	0	0	2,229	0	0	0	0
Other Surface Coating[b]	0	0	889	0	0	0	0
Degreasing	0	0	4,749	0	0	0	0
Consumer Solvents	0	0	1,374	0	0	0	0
Other Solvent Application[c]	0	0	837	0	0	0	0
Gasoline Transport and Distribution	0	0	887	0	0	0	0
Open Burning	0	0	9	47	10	10	0
Other Fires	0	0	3	13	4	4	0
Waste Disposal[d]	0	0	63	0	0	0	1
Agricultural Burning	0	0	5	44	8	8	0
Other Agricultural[e]	0	0	425	0	185	49	0
Paved Road Dust[f]	0	0	0	0	*7,501*	*428*	0
Unpaved Road Dust	0	0	0	0	966	55	0
Windblown Dust	0	0	0	0	8,606	861	0
Ammonia - Fertilizer	0	0	0	0	0	0	571
Ammonia - Livestock	0	0	0	0	0	0	1,706
Ammonia - Domestic Ammonia	0	0	0	0	0	0	278
Ammonia - Wild Animals	0	0	0	0	0	0	38
Ammonia - Soils	0	0	0	0	0	0	1,292
Total[f]	**921**	**27**	**12,963**	**7,715**	***19,555***	***3,552***	**3,995**

[a]Includes bakeries, construction, and industrial refrigeration.
[b]Includes architectural surface coating, autobody refinishing, and traffic markings.
[c]Includes dry cleaning, graphic arts, asphalt application, and pesticides application.
[d]Includes landfills and wastewater treatment.
[e]Includes agricultural tilling, agricultural harvesting, and beef cattle feedlots.
[f]*Paved road dust emissions for Ada and Canyon counties (PM_{10} and $PM_{2.5}$) were revised in 2012.*

Table 3-44. Summarized 2008 Annual Area Source Emissions – Canyon County

Aggregated Source Category	NO_x (tpy)	SO_2 (tpy)	VOC (tpy)	CO (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	NH_3 (tpy)
Industrial Combustion	156	1	7	112	11	10	5
Commercial/Institutional Combustion	71	2	3	51	5	5	1
Residential Combustion (excluding wood)	195	2	10	74	14	13	31
Residential Wood Combustion	123	14	1,269	6,670	1,251	1,251	0
Commercial Cooking	0	0	39	123	246	232	0
Other Industrial Activities[a]	0	0	32	0	59	6	39
Industrial Surface Coating	0	0	905	0	0	0	0
Other Surface Coating[b]	0	0	327	0	0	0	0
Degreasing	0	0	2,403	0	0	0	0
Consumer Solvents	0	0	663	0	0	0	0
Other Solvent Application[c]	0	0	539	0	0	0	0
Gasoline Transport and Distribution	0	0	428	0	0	0	0
Open Burning	1	0	16	73	19	19	0
Other Fires	0	0	2	8	3	3	0
Waste Disposal[d]	0	0	22	0	0	0	0
Agricultural Burning	0	0	13	111	20	20	0
Other Agricultural[e]	0	0	829	0	720	206	0
Paved Road Dust[f]	0	0	0	0	*4,154*	*237*	0
Unpaved Road Dust	0	0	0	0	165	9	0
Windblown Dust	0	0	0	0	888	89	0
Ammonia - Fertilizer	0	0	0	0	0	0	2,879
Ammonia - Livestock	0	0	0	0	0	0	3,424
Ammonia - Domestic Ammonia	0	0	0	0	0	0	147
Ammonia - Wild Animals	0	0	0	0	0	0	4
Ammonia - Soils	0	0	0	0	0	0	1,197
Total[f]	**546**	**19**	**7,508**	**7,222**	***7,555***	***2,100***	**7,727**

[a]Includes bakeries, construction, and industrial refrigeration.
[b]Includes architectural surface coating, autobody refinishing, and traffic markings.
[c]Includes dry cleaning, graphic arts, asphalt application, and pesticides application.
[d]Includes landfills and wastewater treatment.
[e]Includes agricultural tilling, agricultural harvesting, and beef cattle feedlots.
[f]*Paved road dust emissions for Ada and Canyon (PM_{10} and $PM_{2.5}$) were revised in 2012.*

Table 3-45. Summarized 2008 Annual Area Source Emissions – Elmore County

Aggregated Source Category	NO_x (tpy)	SO_2 (tpy)	VOC (tpy)	CO (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	NH_3 (tpy)
Industrial Combustion	3	0	0	2	0	0	0
Commercial/Institutional Combustion	14	1	0	7	1	1	0
Residential Combustion (excluding wood)	30	0	2	12	2	2	4
Residential Wood Combustion	25	3	252	1,391	254	254	0
Commercial Cooking	0	0	7	22	44	41	0
Other Industrial Activities[a]	0	0	5	0	8	1	3
Industrial Surface Coating	0	0	102	0	0	0	0
Other Surface Coating[b]	0	0	29	0	0	0	0
Degreasing	0	0	231	0	0	0	0
Consumer Solvents	0	0	105	0	0	0	0
Other Solvent Application[c]	0	0	165	0	0	0	0
Gasoline Transport and Distribution	0	0	82	0	0	0	0
Open Burning	8	1	46	142	57	53	0
Other Fires	0	0	0	2	0	0	0
Waste Disposal[d]	0	0	4	0	0	0	0
Agricultural Burning	0	0	2	19	3	3	0
Other Agricultural[e]	0	0	698	0	502	133	0
Paved Road Dust	0	0	0	0	1,253	284	0
Unpaved Road Dust	0	0	0	0	2,648	262	0
Windblown Dust	0	0	0	0	17,720	1,772	0
Ammonia - Fertilizer	0	0	0	0	0	0	1,019
Ammonia - Livestock	0	0	0	0	0	0	2,618
Ammonia - Domestic Ammonia	0	0	0	0	0	0	22
Ammonia – Wild Animals	0	0	0	0	0	0	140
Ammonia - Soils	0	0	0	0	0	0	1,006
Total	**80**	**6**	**1,730**	**1,596**	**22,492**	**2,806**	**4,812**

[a]Includes bakeries, construction, and industrial refrigeration.
[b]Includes architectural surface coating, autobody refinishing, and traffic markings.
[c]Includes dry cleaning, graphic arts, asphalt application, and pesticides application.
[d]Includes landfills and wastewater treatment.
[e]Includes agricultural tilling, agricultural harvesting, and beef cattle feedlots.

3.4 QA/QC Procedures

For the area source inventory development, the procedures described in the project IPP/QAP (ERG and ENVIRON, 2009) were used to check, and correct when necessary, the area source emission estimates. Area source emissions were estimated using calculational spreadsheets. Separate spreadsheets were developed for each area source category; these category-specific spreadsheets were then linked to a summary spreadsheet. The calculation spreadsheets were well-documented and clearly identify the source of various activity data. All emission calculations were internally checked by senior ERG staff and reviewed by the project QA/QC manager. Special attention was paid to the source categories for which a survey was conducted (i.e., fuel dealers and distributors, dry cleaners, wastewater treatment, and landfills). After obtaining the returned survey forms in scanned PDF format, ERG manually transcribed the data into an Access database using a front-end form. All input data were checked against the returned survey forms by senior ERG staff for accuracy.

4.0 2008 ON-ROAD MOTOR VEHICLE SOURCE EMISSIONS INVENTORIES

On-road mobile source emission estimates prepared by Environ and DEQ in 2010 for this emission inventory were originally developed using U.S. EPA's MOBILE6.2 vehicle emissions model. U.S. EPA recently (December 2010) released an entirely new vehicle emissions model, the Motor Vehicle Emission Simulator 2010, Version a or MOVES2010a (U.S. EPA, 2010c). Referred to generically as "MOVES," this model is now the official U.S. EPA vehicle emissions model required to be used in all SIP modeling and conformity determinations. MOVES will completely replace its predecessor model, MOBILE6.2, after March 2013, which is the end of the grace period for SIPs that were already in progress at the time of the new model's release. Because the conformity requirements will be based on the MOVES model by March 2013, it became necessary for the purposes of the Northern Ada County PM_{10} Limited Maintenance Plan Ten-Year Update to establish new motor vehicle emission budgets (MVEB) based on the same model. As a result, DEQ proceeded with MOVES modeling to update the on-road mobile portion of this emissions inventory. DEQ used approximately the same methodologies originally used by Environ for processing Travel Demand Model outputs from COMPASS and detailed traffic count data and motor vehicle registration data from the Idaho Transportation Department in the preparation of local inputs for the MOVES2010a model. The sources of information and methods for processing the data into the MOVES input database are described in Appendix E of the Northern Ada County PM_{10} Limited Maintenance Plan Ten-Year Update, entitled "Development of the Base- and Future-Year Mobile Source Emission Inventories for the Treasure Valley, Idaho." Results from the updated MOVES modeling conducted by DEQ for Ada and Canyon counties are summarized in Table 4-1. All subsequent tables in this report summarizing on-road and area source emissions are updated to reflect the revised MOVES modeling and road dust emissions computations prepared by DEQ after ERG/Environ completed the emissions inventories in 2010. In all updated tables, DEQ-revised values based on the updated MOVES and paved road dust computations are shown in italic.

Table 4-1. 2008 On-road Emissions Summary (Tons/Year and Tons/Day)[a]

Averaging Period	County	NO_X	SO_2	VOC	CO	PM_{10}	$PM_{2.5}$	NH_3
Annual	Ada	*9,775.4*	*67.4*	*4,182.3*	*47,168.3*	*412.7*	*330.4*	*152.9*
	Canyon	*5,847.8*	*35*	*3,202.1*	*36,404.4*	*258.2*	*212.1*	*81.8*
	Elmore	576.6	3.1	529.8	5,460.8	14.7	9.3	30.7
Average Ozone Season Day	Ada	*28.5*	*0.2*	*10.9*	*110.9*	*1.09*	*0.86*	*0.45*
	Canyon	*16.7*	*0.1*	*8.4*	*87.9*	*0.65*	*0.52*	*0.24*
	Elmore	1.5	0.0	1.5	11.0	0.0	0.0	0.1
Average PM Season Day	Ada	*24*	*0.16*	*12.3*	*156.4*	*1.19*	*0.98*	*0.38*
	Canyon	*14.8*	*0.09*	*9.28*	*117.1*	*0.8*	*0.67*	*0.2*
	Elmore	1.6	0.0	1.1	17.2	0.0	0.0	0.1

[a] *On-road emission estimates were revised in 2012 for the Northern Ada County PM_{10} Limited Maintenance Plan Ten-Year Update using the MOVES2010a model. Ada and Canyon counties on-road emissions values are from Appendix E of the Ten-Year Update, entitled "Development of the Base- and Future-Year Mobile Source Emission Inventories for the Treasure Valley, Idaho." Elmore County emissions based on the MOBILE6.2 model were not revised. Table values revised in 2012 are shown in italic.*

5.0 2008 NONROAD MOBILE SOURCE EMISSIONS INVENTORY

Nonroad mobile sources encompass a wide variety of equipment types that either move under their own power or are capable of being moved from site to site. Nonroad mobile equipment sources, not licensed or certified as highway vehicles, are defined as those that move or are moved within a 12 month period and are covered under the U.S. EPA's emissions regulations as nonroad mobile sources. There are three types of nonroad mobile sources: nonroad equipment, locomotives, and aircraft

5.1 Emission Calculation Methodologies – Annual

The methodologies used to calculate annual nonroad mobile source emissions for the 2008 base year are presented in this section. Methods pertaining to nonroad equipment, aircraft, and locomotives are discussed.

5.1.1 Nonroad Equipment

The largest group of nonroad mobile sources are nonroad equipment that are estimated with the NONROAD2008 model (U.S. EPA, 2009b). The NONROAD model estimates emissions from nonroad equipment in the categories shown below; Treasure Valley emissions from all listed categories but airport ground support equipment were estimated using the NONROAD model.

- Agricultural equipment (e.g., tractors, combines, balers, etc.)
- Airport ground support (e.g., terminal tractors, etc.)
- Construction equipment (e.g., graders, backhoes, etc.)
- Industrial and commercial equipment (e.g., forklifts, sweepers, etc.)
- Recreational vehicles (e.g., all-terrain vehicles, off-road motorcycles, etc.)
- Residential and commercial lawn and garden equipment (e.g., lawnmowers, leaf blowers, snow blowers, etc.)
- Logging equipment (e.g., shredders, large chain saws, etc.)
- Recreational equipment (e.g., off-road motorbikes, snowmobiles, etc.)
- Recreational marine vessels (e.g., power boats, etc.).

Data Collection

Key inputs for determining nonroad equipment emissions using the NONROAD model are equipment population and activity data, and allocation factors. Nonroad equipment population by county is estimated in the model by geographically allocating national engine population through the use of econometric indicators, such as construction valuation. U.S. EPA encourages state and local agencies to develop local data from surveys, but such work is expensive and difficult to carry out, and only a few agencies in the country have done so. However, some local information for Idaho populations was available and these data were used to update the NONROAD model data as described below.

Pleasure Craft and Recreational Equipment Population

Pleasure craft and recreational equipment population data were collected from the Idaho Department of Parks and Recreation (IDPR, 2009a; IDPR, 2009b). The state registration data were assumed to be equal to the state total pleasure craft and recreational equipment population. Although county-level registration data were available, county-level data were not used for county allocation purposes. Registration is not considered to be a suitable surrogate for pleasure craft or recreational equipment activity because these types of equipment are often used in counties other than where they are registered. The current U.S. EPA NONROAD allocation method uses water surface area for pleasure craft and the number of RV parks and recreational camps (NAICS code 72121X) from *County Business Patterns* because they are considered to be better indications of actual usage in each area.

Table 5-1 shows a comparison of NONROAD model default and Parks and Recreation derived by-county population estimates for 2008.

Table 5-1. 2008 Pleasure Craft and Recreational Equipment Populations

	NONROAD Default			Revised		
Equipment Type	**Ada**	**Canyon**	**Elmore**	**Ada**	**Canyon**	**Elmore**
Pleasure Craft						
Inboards	94	242	396	100	256	420
Outboards	379	976	1599	412	1060	1737
Personal watercraft	51	132	216	56	143	235
Recreational Equipment						
All terrain vehicles	12539	1567	3135	10113	1264	2528
Motorcycles: off-road	3033	379	758	3093	387	773

One potential source of double-counting could not be eliminated in the recreational marine data. The Idaho Department of Parks and Recreation does not make a distinction in its boat registrations for boats that are completely non-motorized (i.e., sailboats with no on-board engines). Although these boats do not contribute to emissions, there was no way to determine the fraction of the registered boats that fit this category. It was assumed that these non-motorized sailboats comprise a negligible portion of the recreational marine population.

Agricultural Equipment Population

Agricultural equipment population estimates obtained from the *2007 Census of Agriculture* (USDA, 2009) were used to modify the NONROAD default population files. Table 5-2 shows the NONROAD model default and revised agricultural equipment populations. Given the large differences in agricultural tractor population estimates between the NONROAD model and the *Census of Agriculture*, it is important to note that the *Census of Agriculture* statistics may not be fully compatible with the NONROAD model activity estimates (hours per year). NONROAD equipment population estimates may consider only those pieces of equipment that are active, while the *Census of Agriculture* counts all equipment types including those pieces of equipment that are rarely used. In the NONROAD model, agricultural equipment population estimates are derived by allocating the nationwide population to the state level according to the fraction of harvested cropland within each state; statewide population is then allocated to the county level using the same metric. The advantage of using the *Census of Agriculture* is that it contains actual population estimates for specific types of agricultural equipment in each county, as opposed to the NONROAD model, which relies on the scaling of nationwide data to the county level.

Table 5-2. NONROAD Model Default and Revised Agricultural Equipment Populations

Equipment Type	NONROAD Default			Revised		
	Ada	Canyon	Elmore	Ada	Canyon	Elmore
Agricultural Equipment						
2-Wheel tractors	1	4	2	14	23	4
Agricultural tractors	320	971	482	1921	4335	878
Combines	65	196	97	59	201	34

Agricultural Equipment Temporal Profile

Areas of harvested crop acreage and crop budgets were obtained from the National Agricultural Statistics Service (NASS) (NASS, 2009a; NASS, 2009b). This information was used to develop the monthly agricultural equipment usage profile shown in Figure 5-1. Similar to the default profile, the local profile shows high activity for agricultural equipment in the summer, and it also incorporates higher activity in spring and fall months due to planting and harvesting operations which occur during these seasons.

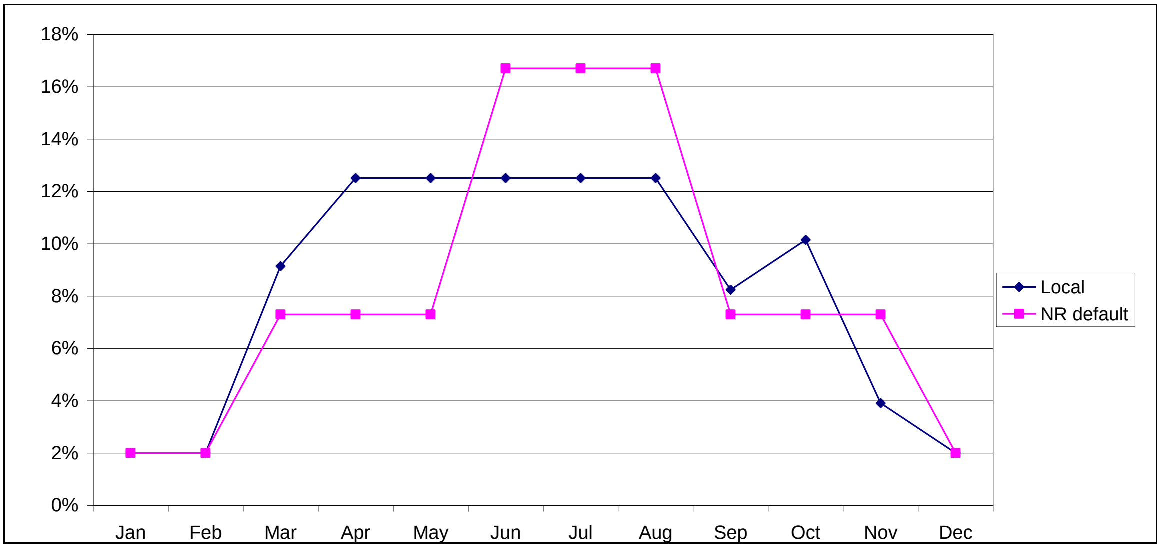


Figure 5-1. Local Off-Road Agricultural Equipment Monthly Temporal Profile

Construction Equipment Temporal Profile

Telephone interviews were conducted with municipal government staff located within the inventory domain with knowledge of various types of construction (McCain, 2010; Winterfeld, 2010; Walter, 2010; Chase, 2010; Girard, 2010). Based on employee input, local construction equipment monthly temporal profiles were estimated as shown in Figure 5-2. Similar to the default profile, the local profile shows high activity for construction equipment in the summer, and it incorporates higher activity in the late spring months relative to the default profile.

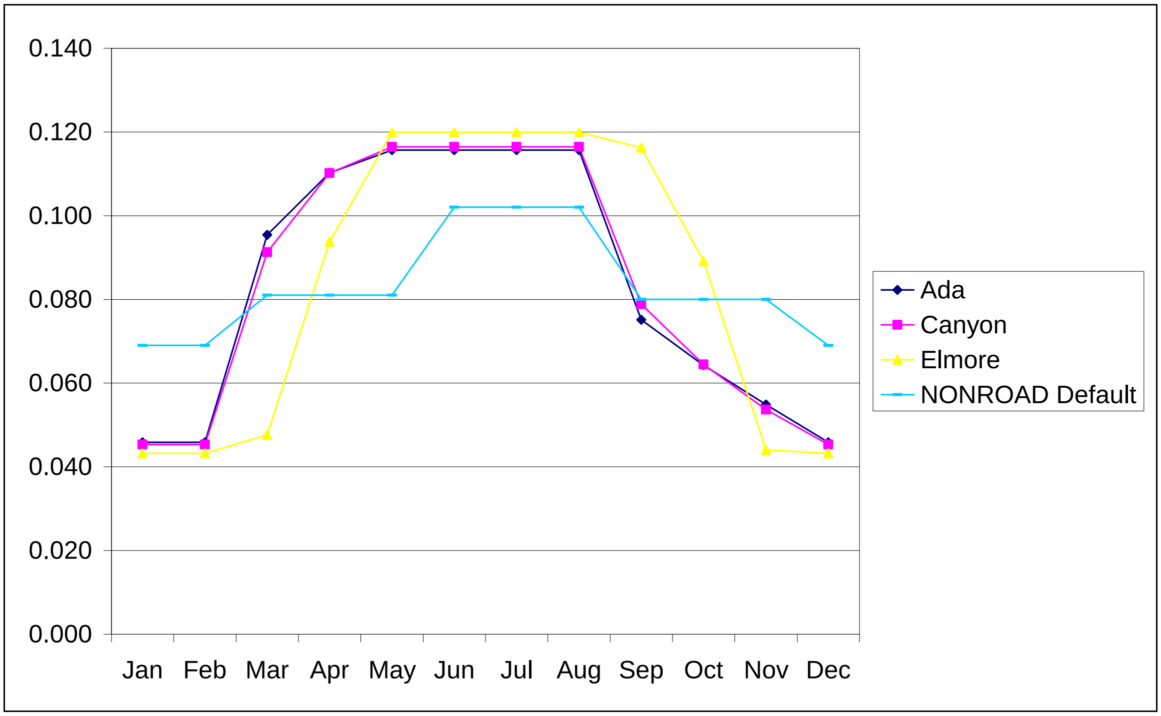


Figure 5-2. Local Construction Equipment Monthly Temporal Profile

Lawn and Garden Equipment Temporal Profiles

Lawn and garden equipment temporal profiles were developed using a methodology similar to what was applied to develop lawn and garden equipment temporal profiles for the Lake Michigan Air Directors Consortium (ECR, 2005). Lawn and garden equipment was divided into four usage associations: lawn-related, soil-related, leaf-related, and wood-related, the details of these usage associations are shown in Table 5-3.

Staff from the City of Boise Park and Recreational Service Department (Woodward, 2010; Teddicken, 2010), Ada County Highway District (Mills, 2010) and the City of Nampa Parks (Moran 2010) were contacted regarding monthly temporal profiles for the usage of each of these types of equipment. Based upon these local data, local lawn and garden equipment seasonal usage profiles were estimated as shown in Figures 5-3 and 5-4. The NONROAD default temporal profile is a single profile applied to all types of lawn and garden equipment and shows the highest activity in the summer and relatively lower activity in the spring and fall and very little activity in the winter. Local data indicated that lawn-related equipment usage was highest in the summer, as expected, with activity in the spring slightly higher than activity in the autumn and very low activity in the winter. For soil-related equipment, the highest activity was associated with the spring and fall due to activities such as planting and plant removal which occur during these seasons. Wood-related equipment activity was estimated to be the highest in the spring due to wood cutting activity that occurs during this season.

Table 5-3. Lawn and Garden Equipment Temporal Profile Groupings

Equipment Type	Usage Association
Front mowers	Lawn
Lawn & garden tractors	
Lawn mowers	
Other lawn & garden equipment	
Rear engine riding mowers	
Trimmers/edgers/brush cutters	
Leafblowers/vacuums	Leaf
Commercial turf equipment	Soil
Rotary tillers < 6 HP	
Chain saws < 6 HP	Wood
Chippers/stump grinders	
Shredders < 6 HP	
Wood splitters	

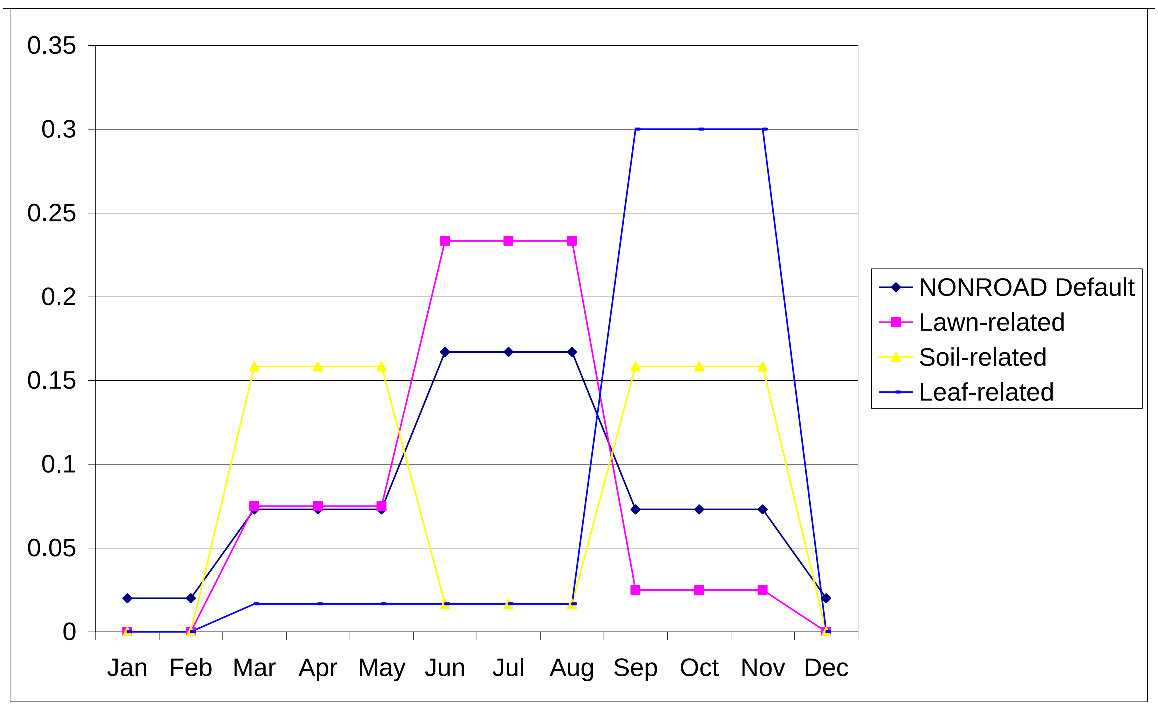


Figure 5-3. Local Lawn-, Soil-, and Leaf-Related Lawn and Garden Equipment Monthly Temporal Profiles

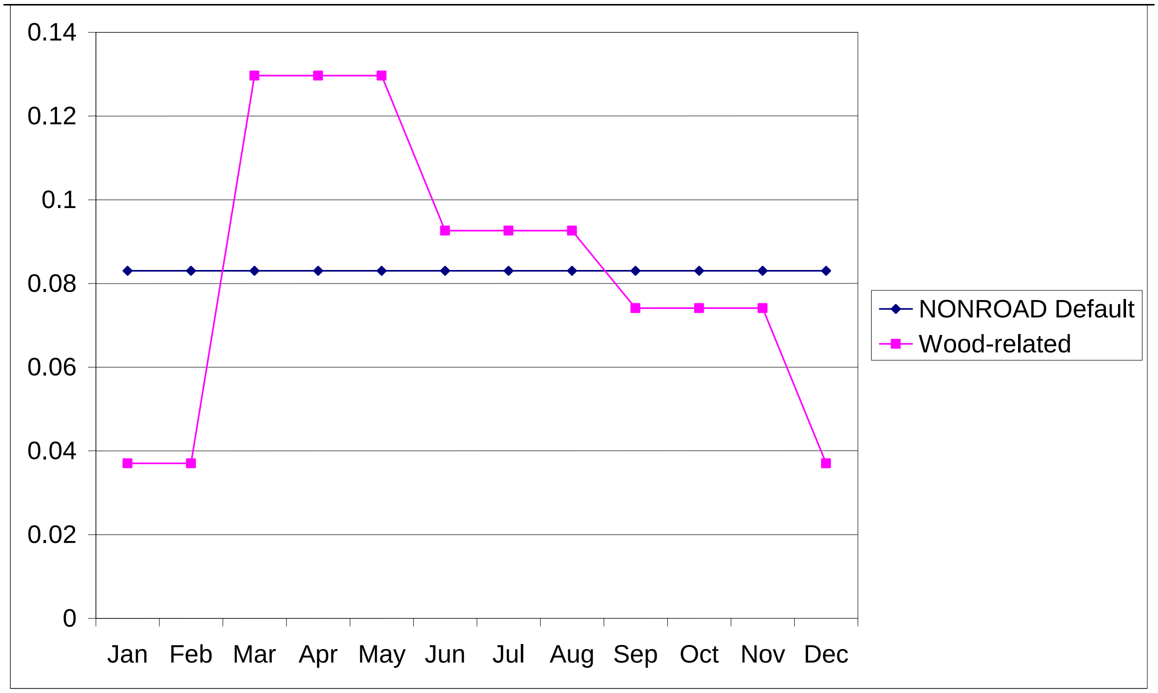


Figure 5-4. Local Wood-Related Lawn and Garden Equipment Monthly Temporal Profile

Emission Calculation Methodology

In order to incorporate seasonal changes in climate and fuels, annual emissions were estimated by running the NONROAD model for each of the four seasons, then summing the seasonal emissions to generate annual emissions. Seasonal average maximum, minimum, and mean temperatures were based on period of record monthly averages from the Western Regional Climate Center for the following stations: Boise WSFO Airport (Ada County), Nampa Sugar Factory (Canyon County), and Mountain Home (Elmore County) (WRCC, 2009). Gasoline Reid vapor pressure (RVP) consistent with on-road MOBILE6 inputs by county and season are shown in Table 5-4. Gasoline was assumed to have a fuel sulfur content of 30 parts per million, consistent with on-road gasoline, while diesel fuel was assumed to have a fuel sulfur content of 500 parts per million per the federal Tier 4 nonroad diesel rule.

Table 5-4. 2008 Gasoline RVP (psi) by Season

Season	Ada County	Canyon County	Elmore County
Winter	15	15	15
Spring	15	15	13.5
Summer	8.6	8.6	9
Autumn	8.6	8.6	11.5

Annual base year 2008 nonroad equipment emissions are shown in Table 5-5 and Table 5-6 by county and equipment type, respectively. A majority of the nonroad equipment emissions for all pollutants were emitted in Ada County. Like most nonroad emission inventories, the primary source of VOC and CO emissions was lawn and garden equipment which is primarily made up of gasoline fueled equipment. The highest contributors to NO_x, PM_{10}, $PM_{2.5}$, SO_2, and NH_3 emissions were agricultural and construction equipment, which are primarily diesel-fueled equipment.

Table 5-5. 2008 Annual Nonroad Equipment Emissions by County

County	VOC	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	NH_3
Annual Total (tons/year)							
Ada	1,946	23,923	2,402	236	226	66	2.5
Canyon	656	7,345	1,515	147	142	44	1.4
Elmore	316	1,566	328	35	34	9	0.3
Total	**2,918**	**32,835**	**4,245**	**418**	**402**	**119**	**4.2**

Table 5-6. 2008 Annual Nonroad Equipment Emissions by Equipment Type (Ada, Canyon, and Elmore Counties Combined)

Category	VOC	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	NH_3
Annual Total (tons/year)							
Agricultural Equipment	146	1,040	1,254	130	126	38	1.0
Commercial Equipment	343	6,766	240	21	20	5	0.4
Construction and Mining Equipment	284	2,326	1,919	171	166	64	1.8
Industrial Equipment	141	2,336	552	21	20	8	0.2
Lawn and Garden Equipment	1,162	17,215	214	52	48	3	0.7
Logging Equipment	4	38	7	1	1	0	0.0
Pleasure Craft	261	829	35	5	4	0	0.1
Railroad Equipment	1	12	5	1	1	0	0.0
Recreational Equipment	576	2,273	19	17	16	0	0.1
Underground Mining Equipment	0	0	0	0	0	0	0.0
Total	**2,918**	**32,835**	**4,245**	**418**	**402**	**119**	**4.2**

5.1.2 Aircraft

Base year 2008 emissions from aircraft and associated equipment (i.e., auxiliary power units [APU] and airport ground support equipment [GSE], for 2008 were obtained from work performed to develop U.S. EPA's 2008 National Emissions Inventory (NEI2008). Activity data for aircraft emissions are landing-takeoff cycles (LTOs), and emission factors are primarily from the Federal Aviation Administration (FAA) Emissions and Dispersion Modeling System (EDMS).

The FAA EDMS model combines specified aircraft and activity levels with default emissions factors in order to estimate annual inventories for a specific airport. Aircraft activity levels in EDMS are expressed in terms of LTOs, which consist of the four aircraft operating modes: taxi and queue, take-off, climb-out, and landing. Default values for the amount of time a specific aircraft spends in each mode, or the time-in-modes (TIMs), are coded into EDMS.

Aircraft emissions were estimated for four aircraft categories:

- Air carriers (i.e., larger turbine-powered commercial aircraft with at least 60 seats or 18,000 lbs payload capacity);
- Air taxis (i.e., commercial turbine or piston-powered aircraft with less than 60 seats or 18,000 lbs payload capacity);
- General aviation aircraft (i.e., small piston-powered, non-commercial aircraft); and
- Military aircraft.

Airport GSE includes equipment such as fuel trucks, cabin service truck, baggage belt loaders, and pushback tugs and tractors. Auxiliary power units are used to power ventilation, cooling, and heating systems when an aircraft's engine is off and to provide power to start the main aircraft engines.

Necessary LTO activity and emissions data in database format, as well as aircraft emissions documentation (ERG, 2010) were obtained from U.S. EPA's NEI2008 website (U.S. EPA, 2010b).

The Boise airport was the only airport in the study region for which EDMS was run with airport specific activity data. For all other airports, LTO data were applied to average LTO time-in-mode and emission factors. Additional calculations were performed to estimate ammonia emissions, which were not included in the NEI2008 data. For ammonia, air carriers and military aircraft were assumed to be dominated by turbine-powered aircraft running lean, thus producing a negligible amount of ammonia. For general aviation and air taxi piston engine aircraft LTOs, ammonia emissions were estimated using a fleet-average fuel consumption rate from the EDMS data for piston engines, operational mode-specific fuel flow rates weighted by the typical time spent in each mode, average hours of operation estimated from FAA data, and a grams per gallon emission factor for non-catalyst light-duty gasoline engines.

Airport GSE and APU emissions were estimated for the NEI2008 by using EDMS activity defaults associated with commercial aircraft LTOs and time-in-mode. Airport GSE emission factors in EDMS are derived from EPA's NONROAD2005 model. The main change to NONROAD2008 emission rates was incorporating recreational marine diesel and spark ignition engine standards; airport ground equipment emission rates did not undergo major changes. The NONROAD model estimates county level 2008 airport GSE populations by growing historic national population to 2008, and allocating national population according to 2002 National Emission Inventory (NEI2002) NO_x emissions. The NEI2008 airport GSE emission estimates were used because these emissions were based on actual 2008 commercial aircraft data rather than estimates based on growth projections and allocations used in the NONROAD model.

Aircraft associated emissions (including aircraft, APUs, and airport GSE) are presented by airport in Table 5-7 and graphically by emission source in Figure 5-5. Consistent with LTO activity distribution, Treasure Valley 2008 aircraft associated emissions were dominated by a few major airports: Boise Air Terminal/Gowen Field, Caldwell Industrial, and Nampa Muni. Together, these airports accounted for 80 percent or more of the aircraft emissions for all pollutants, except for NH_3. NO_x and SO_2 emissions are dominated by commercial aircraft, while VOC, CO, PM_{10}, $PM_{2.5}$, and NH_3 emissions are primarily from general aviation aircraft.

5.1.3 Locomotives

Locomotive emissions are a significant source of NO_x and PM emissions. The overwhelming majority of locomotive activity in the United States is from a handful of Class 1 freight railways, and only one of these, Union Pacific, operates in the Treasure Valley study region.

Railroads operate two types of locomotives – line-haul or switching. Line-haul locomotives pull trains over the main line rail system primarily between yards, but may also serve individual customers. Switching locomotives assemble and disassemble trains, and serve individual customers usually with small trains or individual cars. The line-haul locomotives are usually not based at any individual rail yard, and so can operate over a wide region, even across the entire country. Switching locomotives are based at individual rail yards for a longer period (i.e., 6 months or longer) and therefore operate close to that rail yard.

Table 5-7. 2008 Aircraft Associated Emissions by Airport (Tons/Year)

Facility Name	VOC	NO_x	CO	PM_{10}	$PM_{2.5}$	SO_2	NH_3
Ada County							
Boise Air Terminal/Gowen Field	64.573	208.339	856.022	12.532	9.991	21.498	0.0111
Boise Plaza	0.080	0.005	0.847	0.017	0.012	0.001	0.0000
Green Acres	1.486	0.086	15.810	0.311	0.215	0.013	0.0006
Larkin	1.142	0.066	12.151	0.239	0.165	0.010	0.0005
Nampa Valley	0.080	0.005	0.847	0.017	0.012	0.001	0.0000
Peaceful Cove	1.371	0.079	14.590	0.287	0.198	0.012	0.0006
St. Alphonsus	0.080	0.005	0.847	0.017	0.012	0.001	0.0000
St. Luke’s Boise Medical Center	0.080	0.005	0.847	0.017	0.012	0.001	0.0000
Young	0.080	0.005	0.847	0.017	0.012	0.001	0.0000
Ada County Total	**68.97**	**208.59**	**902.81**	**13.45**	**10.63**	**21.54**	**0.01**
Canyon County							
Caldwell Industrial	39.367	2.351	433.518	8.590	5.927	0.352	0.0170
Hubler Field	2.908	0.167	30.951	0.610	0.421	0.026	0.0012
Mercy	0.080	0.005	0.847	0.017	0.012	0.001	0.0000
Nampa Municipal	30.940	1.785	329.965	6.502	4.487	0.274	0.0132
Parma	0.960	0.055	10.212	0.201	0.139	0.009	0.0004
Sky Ranch North	1.075	0.062	11.436	0.225	0.155	0.010	0.0005
Sky Ranch South	1.075	0.062	11.436	0.225	0.155	0.010	0.0005
Snake River Skydiving	1.075	0.062	11.436	0.225	0.155	0.010	0.0005
Symms	0.960	0.055	10.217	0.201	0.139	0.009	0.0004
Whelan’s	0.080	0.005	0.847	0.017	0.012	0.001	0.0000
Canyon County Total	**78.52**	**4.61**	**850.87**	**16.81**	**11.60**	**0.70**	**0.03**
Elmore County							
Atlanta	0.254	0.015	2.703	0.053	0.037	0.002	0.0001
Coyote Run	0.850	0.049	9.049	0.178	0.123	0.008	0.0004
Dorothy Roeber Memorial	0.080	0.005	0.847	0.017	0.012	0.001	0.0000
Elmore Medical Center	0.080	0.005	0.847	0.017	0.012	0.001	0.0000
Glenns Ferry Municipal	0.113	0.007	1.201	0.024	0.016	0.001	0.0000
Graham USFS	0.254	0.015	2.703	0.053	0.037	0.002	0.0001
Health Center	0.080	0.005	0.847	0.017	0.012	0.001	0.0000
Mountain Home AFB	3.601	1.464	38.188	0.757	0.526	0.112	0.0015
Mountain Home Municipal	5.613	0.373	68.615	1.370	0.946	0.054	0.0024
P and R Field	1.944	0.112	20.688	0.408	0.281	0.017	0.0008
Pine	0.395	0.023	4.205	0.083	0.057	0.004	0.0002
Red Baron Airpark	1.996	0.115	21.245	0.419	0.289	0.018	0.0009
Smith Prairie	0.339	0.020	3.604	0.071	0.049	0.003	0.0001
South Fork Ranch	3.544	0.204	37.715	0.743	0.513	0.031	0.0015
Weatherby USFS	0.212	0.012	2.253	0.044	0.031	0.002	0.0001
Elmore County Total	**19.35**	**2.42**	**214.71**	**4.25**	**2.94**	**0.26**	**0.01**
Treasure Valley Total	**166.84**	**215.62**	**1968.38**	**34.52**	**25.17**	**22.49**	**0.06**

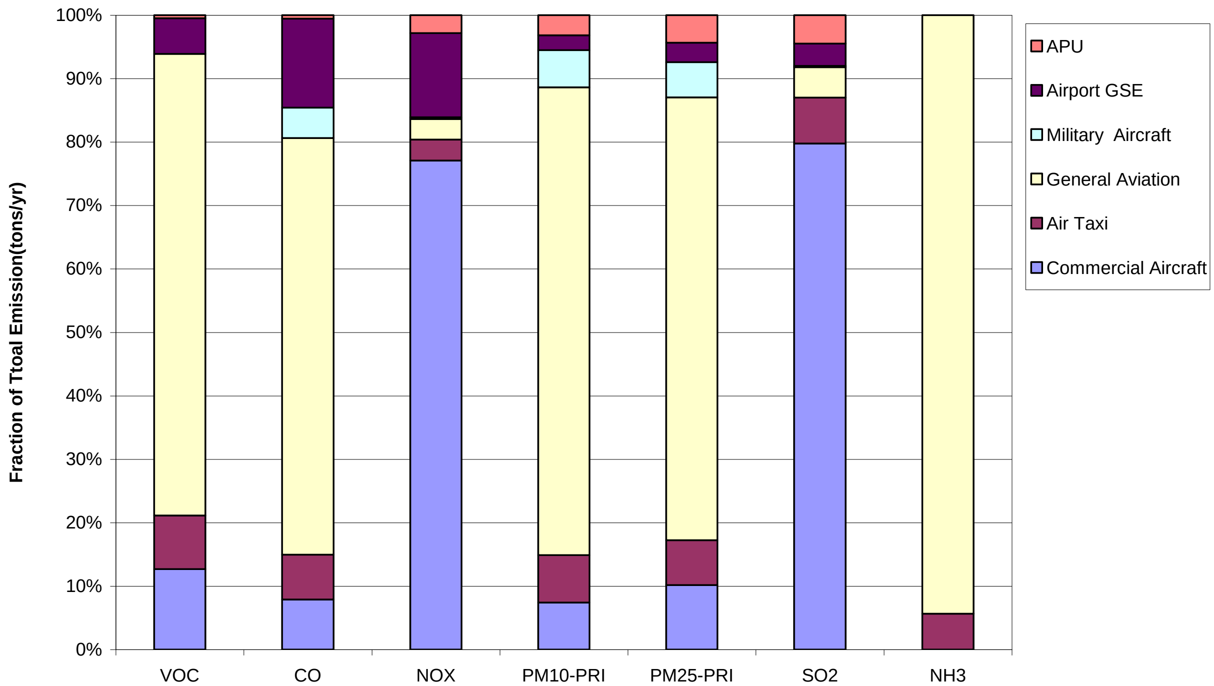


Figure 5-5. 2008 Aircraft Associated Emissions Contributions

Data for the Idaho Treasure Valley study region was gathered from the railroads operating within the region and public sources. The line-haul activity data were obtained through the Federal Railroad Administration (FRA) with the permission of the Class 1 railroad (Union Pacific) in the region. Smaller railroads received a data request for 2008 line-haul and switching locomotive activity estimates. Switching data was gathered by requesting for the typical shift schedules within each rail yard. The activity data gathered is presented in the sections below along with the procedures used to estimate emissions for 2008 and future years.

Line-haul

The activity data used for the line haul emission calculations were gathered from the FRA and through data requests. The primary activity data collected under this program are gross tonnage (combines the weight of the locomotives, cars, and freight) that are combined with the rail link length to estimate gross ton-miles of freight movements (Wright, 2010). Permission was obtained from the Class 1 railroad Union Pacific to release the railroad specific activity data for 2008 within the study domain. Public databases of rail activity for the National Transportation Atlas Database only provide link-level mainline activity in activity ranges (BTS, 2009), but the FRA data gathered specific activity for the purpose of estimating emission inventories. The FRA data was developed as a result of the request of the Eastern Regional Technical Advisory Committee Rail Subgroup, a group of state air quality agencies, to provide accurate rail activity estimates.

The FRA dataset attributes are described in Table 5-8. The FRA dataset provided information about rail links and nodes in the form of ArcGIS shapefiles that provide attribute information and location for all rail links at a 1:100,000 scale and was designed for use in regional network analysis applications. Rail links were spatially defined polylines that contain a large amount of attributes describing a link. The link data relevant to the project included the rail line spatial descriptions, as well as the specific activity. The node descriptions were latitude and longitude point estimates with actual sinuous link length between nodes. The rail owner field defined the primary owner and other railroads that operate on the link. The link status included what type of track (i.e., main line, siding, or yard trackage), as well as whether the link is in operation or abandoned. The FRA dataset is more precise than the National Transportation Atlas Data public databases that only provide ranges of gross ton activity rather than the specific values used in this report.

Table 5-8. FRA Rail Link Definitions

Data Field	Description
FRA Link ID	Numeric identifier
Link Node Descriptions	Spatial description
Length	Actual length of link
State	
County	
Rail Owner	Primary and secondary
Link Status	Operational, main line, etc.
Freight Density	Specific annual gross tonnage

Rail ownership was described within the FRA shapefiles in three separate fields. The primary owner was assumed to be the first, and most populated, rail owner provided in the dataset. Link status provided a code value describing whether the rail link was abandoned, an active mainline, or an active non-mainline. Upon review of the active mainline and non-mainline links, it was determined that active mainline links were representative of line-haul tracks and non-mainline links were representative of switch or siding tracks. In addition to the link route data, the FRA link nodes file spatially described the beginning and end point coordinates of every link. The detailed FRA freight tonnage data were cross-referenced with the mainline link route data. Figure 5-6 shows the network densities within the study domain.

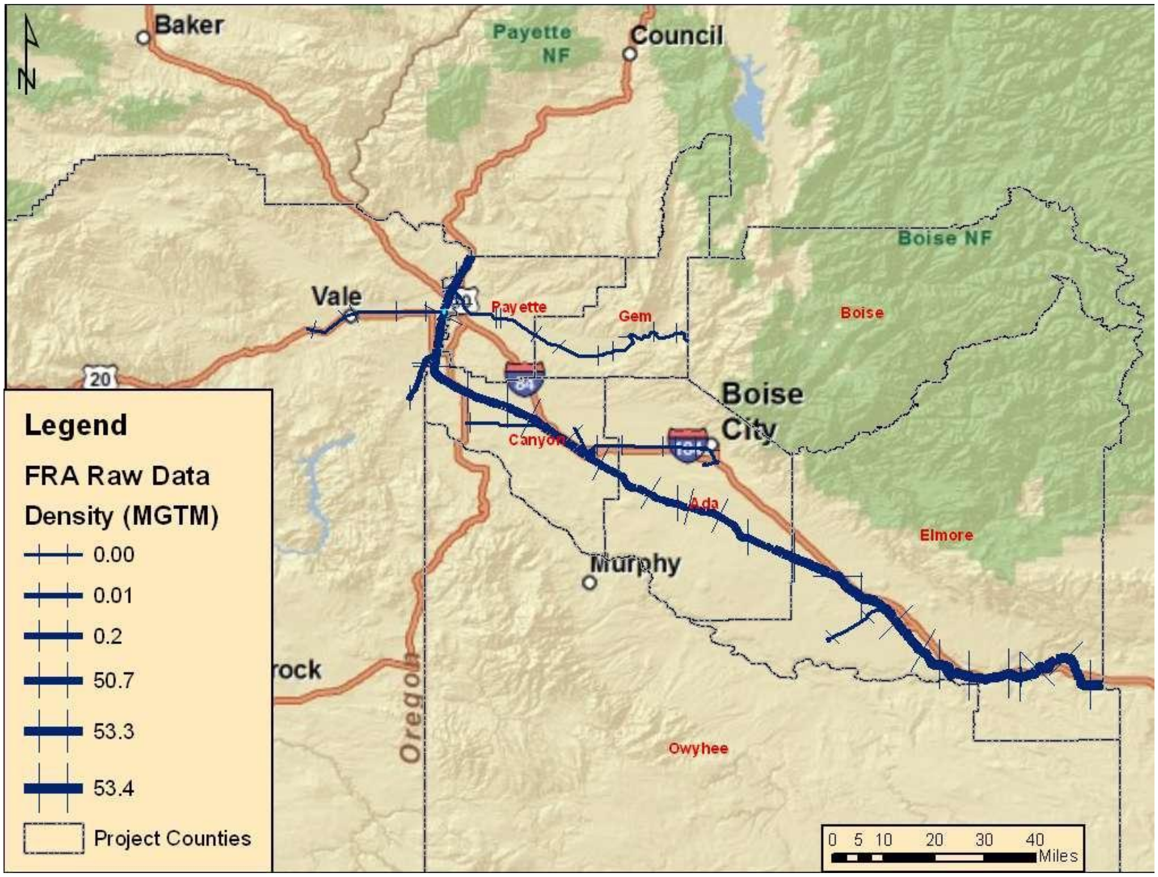


Figure 5-6. FRA Line-Haul Freight Density

The FRA data did not include the Idaho Northern Pacific Railroad (INPR) shortline activity that occurs between Boise and Nampa. INPR activity data were obtained through a data request to the company (Olmanson, 2010). The data received from INPR is provided in Table 5-9 below.

Table 5-9. Idaho Northern Pacific Railroad Activity Data

INPR Data Request	
Locomotive model	GP30s
Train count	1 train
Locomotives per train	2 locomotives
Weekly activity	5 days/week
Daily activity	9 hours/day
Fuel consumption[a]	226 gal/day
Annual fuel consumption	44,070 gal/year

[a] Fuel consumption based on 24 hours of operation per day

Line-haul

The 2008 line-haul emissions were estimated using the methodology described in the U.S. EPA final emission standards (U.S. EPA, 2009c). This method converted rail gross ton-miles to fuel consumption using railroad freight efficiency to estimate fuel consumption for each rail link. The U.S. EPA guidance provided fleet averaged emission factors in terms of grams per gallon. This calculation is as follows:

$$E = FT \times M \times FE \times EF$$

Where:

E	=	emissions (grams);
FT	=	freight tonnage (tons);
M	=	rail link mileage (miles);
FE	=	freight efficiency (gallons/ton-mile); and
EF	=	emission factor (grams/gallons)

The U.S. EPA final emission standards included an analysis of the expected benefit of normal fleet turnover and the additional benefit of the U.S. EPA rule. The emission standards included both new engine and existing equipment retrofit standards. Existing Tier 0, 1, and 2 engines will be subject to retrofit at the time of rebuild; so the engines will be rebuilt gradually throughout their remaining useful life. The emission standards and implementation dates are provided in Tables 5-10 and 5-11 for line-haul and switching locomotives; the emission standard values depend primarily upon the duty cycle (i.e., a schedule of time in modes).

The U.S. EPA final emission standards forecasted average emission factors for hydrocarbons (HC), carbon monoxide (CO), nitrogen oxides (NO_x), and particulate matter (PM) in terms of grams per gallon for the calendar years from 2006 to 2040. These U.S. EPA forecasts included the impact of new engine emissions standards and the expected rates of new locomotive purchases and older locomotive retirements.

Table 5-10. Locomotive Emission Standards for Line-haul (Duty Cycle) Engines

Emission Standard	Applicable Year	HC (g/hp-hr)	CO (g/hp-hr)	NO_x (g/hp-hr)	PM (g/hp-hr)
Uncontrolled Emissions	Pre-1973	0.48	1.28	13.0	0.32
Tier 0 – original	1973-2001	1.00	5.0	9.5	0.60
Tier 0 – final[a]	2008/2010	1.00	5.0	8.0	0.22
Tier 1 – original	2002-2004	0.55	2.2	7.4	0.45
Tier 1 – final[a]	2008/2010	0.55	5.0	7.4	0.22
Tier 2 – original	2005	0.30	1.5	5.5	0.20
Tier 2 – final[a]	2010/2013	0.30	1.5	5.5	0.10
Tier 3	2012-2014	0.30	1.5	5.5	0.10
Tier 4[b]	2015	0.14	1.5	1.3	0.03

[a]Retrofit standards at the time of rebuild and phased in as retrofit kit availability.
[b]The Tier 4 NO_x standard can be a 1.4 NO_x + HC standard.

Table 5-11. Locomotive Emission Standards for Switching (Duty Cycle) Engines

Emission Standard	Applicable Year	HC (g/hp-hr)	CO (g/hp-hr)	NO_x (g/hp-hr)	PM (g/hp-hr)
Uncontrolled Emissions	Pre-1973	1.01	1.83	17.4	0.44
Tier 0 – original	1973-2001	2.10	8.0	14.00	0.72
Tier 0 – final[a]	2008/2010	2.10	8.0	11.80	0.26
Tier 1 – original	2002-2004	1.20	2.5	11.00	0.54
Tier 1 – final[a]	2008/2010	1.20	2.5	11.00	0.26
Tier 2 – original	2005	0.60	2.4	8.10	0.24
Tier 2 – final[a]	2010/2013	0.60	2.4	8.10	0.13
Tier 3	2012-2014	0.60	2.4	5.00	0.10
Tier 4[b]	2015	0.14	2.4	1.30	0.03

[a]These are retrofit standards at the time of rebuild and phased in as retrofit kit availability allows.
[b]The Tier 4 NO_x standard can be a 1.3 NO_x + HC standard.

The U.S. EPA forecast emission factors were scaled from the 1999 uncontrolled emission factors (see Table 5-12) on a yearly basis (U.S. EPA, 1997b). The uncontrolled emission factors (g/hp-hr) are shown above in Table 5-10 and the 2008, 2015, and 2023 emission factors (g/gal) are provided in Table 5-13. The forecast emission factors were converted to grams per gallon of fuel using an average of 20.8 horsepower-hours per gallon of fuel for the larger Class 1 railroads and 18.2 horsepower-hours per gallon of fuel for other smaller Class 2/3 railroads as described in the U.S. EPA standards (U.S. EPA, 2009c). The CO emission rates were not predicted to change with the emission controls, so the CO emission rates remain 26.6 grams per gallon for Class 1 and 23.3 grams per gallon for smaller railroads for all calendar years. The SO_2 emission rates were determined by converting the fuel sulfur where the fuel sulfur level was assumed to be 351 ppm for 2008 based on the U.S. EPA standards (U.S. EPA, 2009c) and 15 ppm for 2015 and 2023 based on the implementation schedule for locomotive fuel regulations.

Table 5-12. Locomotive Emission Factors for Calendar Years 1999 and Earlier

Locomotive Type	HC (g/hp-hr)	CO (g/hp-hr)	NO_x (g/hp-hr)	PM (g/hp-hr)	Fuel Consumption (hp-hr/gallon)
Line-Haul[a]	0.48	1.28	13.0	0.32	20.8

[a]Line-haul locomotives over the line-haul duty-cycle.

Table 5-13. Average Line-Haul Locomotive Emission Factors

Year	Class 1			Class 2/3 Line-Haul		
	HC (g/gal)	NO_x (g/gal)	PM (g/gal)	HC (g/gal)	NO_x (g/gal)	PM (g/gal)
2008	9.0	169	5.1	11.7	242	5.7
2015	5.7	129	3.4	11.7	240	5.5
2023	3.0	84	1.9	11.7	223	5.2

In order to derive emission factors in terms of the gross tonnage activity, conversion factors from grams per gallon to grams per gross tonnage were estimated. Fuel usage and gross tonnage by railroad for the entire system-wide activity were obtained from the AAR (AAR, 2009). Table 5-14 presents the average system-wide fuel efficiency as well as the individual system-wide fuel efficiency for the Class 1 railroad operating in the study region. Combining the emission factors in Table 5-13 with the fuel efficiency estimates in Table 5-14, emission factors in units of grams per gross ton-mile (GTM) were developed as shown in Table 5-15.

Table 5-14. Fuel Efficiency by Railroad

Railroad	Fuel Gal/ (GTM)
Average Class 1	0.001020
UP	0.000971

Table 5-15. Class 1 Railroad Emission Factors for 2008

Year	Railroad	HC (g/GTM)	CO (g/GTM)	NO_x (g/GTM)	PM (g/GTM)
2008	Average	0.0092	0.027	0.172	0.0052
2008	UP	0.0087	0.026	0.164	0.0050

The emissions factors from Table 5-15 were applied to the FRA activity data by link and summed by county; the line-haul emissions results are shown in Table 5-16.

Table 5-16. 2008 Line-haul Locomotive Emissions (Tons/Year)

Railroad	County	HC	VOC	CO	NO_x	PM_{10}	SO_2	NH_3
UP	Ada	14.68	15.46	43.43	275.70	8.32	3.06	0.19
	Canyon	17.91	18.86	52.97	336.24	10.15	3.74	0.23
	Elmore	31.11	32.76	92.03	584.18	17.63	6.49	0.40
	Total	74.30	78.23	219.79	1395.13	42.10	15.50	0.96
INPR Shortline	Ada	0.41	0.43	0.82	8.52	0.20	0.004	0.07
	Canyon	0.16	0.16	0.31	3.24	0.08	0.002	0.03
	Total	0.57	0.60	1.13	11.76	0.28	0.01	0.09

Switching

Switching locomotives are used for a variety of tasks. The primary task for switchers is to break and assemble trains and shuttle rail cars around a rail yard; however, switchers also perform short haul duty that includes whole trains, sets of cars, and repositioning equipment along the mainline rail lines. The switching locomotives that reposition or short haul freight along the mainline were captured under the line-haul gross tonnage, so only the in-yard activity was considered for switching locomotive emissions estimates to avoid double counting the activity.

Shift schedules or other estimates of the hours of operation for switching locomotives were requested in order to identify the total engine hours of operation at each yard. In general, typical shifts were eight or twelve hours using one or two locomotives in tandem. The number of hours for each shift was assumed to be the engine operating time; however, this could be an overestimate if the engines have idle reduction devices or operators are encouraged to shut off the engines during inactive periods of the shift.

At any given time, the roster of switching locomotives assigned to a given yard was usually available and was collected as part of the information request. The roster of these locomotives could change from week to week, but in general, a sample of the locomotive roster at any time in 2008 could be considered a relatively constant fleet mix. The reported switching engines ranged from 1,200 to 3,800 rated horsepower. The switching locomotive models were all either Tier 0 or precontrolled with no Tier 1 or 2 models. The data in Table 5-17 represented the switching activity data for the Nampa Yard obtained from the railroad survey.

Table 5-17. Switching Locomotive Activity Data for the Nampa Yard

Number	Days per Week	Days per Year	Hours per Day	Hours per Year
Switcher No. 1	5	260	4.5	1170
Switcher No. 2	5	260	7.5	1950
Switcher No. 3	5	260	8.0	2080
Switcher No. 4	1	52	7.5	390
Switcher No. 5	5	260	7.5	1950

Base emission factors and expected forecasted emission rates for switching locomotives were provided in U.S. EPA documentation (U.S. EPA, 2008) and are shown in Table 5-18.

Table 5-18. Switching Locomotive Emission Factors

Year	HC (g/gal)	CO (g/gal)	NO_x (g/gal)	PM (g/gal)
2008	14.5	27.8	243	5.5
2015	12.6	27.8	215	4.8
2023	9.5	27.8	172	3.7

A daily fuel consumption estimate of 226 gallons of fuel per day was provided by other U.S. EPA locomotive guidance documentation (U.S. EPA, 1992). The provided fuel consumption estimate assumes continuous 24 hour activity resulting in a per hour fuel consumption of 9.42 gallons. Annual fuel consumption can be estimated using the following equation:

$$FC = A \times C$$

Where:

FC = fuel consumption (gallons/year);
A = activity (hours/year); and
C = fuel consumption per hour (9.42 gallons/hour).

The emission factors provided in Table 5-18 were combined with the engine-hours in Table 5-17 and 9.42 gallons per hour average fuel consumption rate to estimate per yard emissions as shown in Table 5-19.

Table 5-19. Estimated Switching Locomotive Emissions in 2008

Year	Fuel Consumption (gal)	HC (tons)	VOC (tons)	CO (tons)	NO_X (tons)	PM_{10} (tons)	SO_2 (tons)	NH_3 (tons)
2008	71,002	0.92	0.96	1.82	18.94	0.45	0.01	0.15

$PM_{2.5}$ emission estimates were estimated based on PM_{10} emission estimates. The percentage of PM_{10} emissions expected to be $PM_{2.5}$ is assumed to be 97% for locomotives (U.S. EPA, 2009c)

In general, the county assignment for the rail yard emissions was straightforward because the switching locomotive activity was specific to a particular yard. However, Nampa operations could span up to two counties since most of the Nampa tracks are in Canyon County where the emissions were allocated, but the tracks may also reach into Ada County.

The 2008 annual emissions by source category are provided in Table 5-20.

Table 5-20. 2008 Annual Locomotive Emissions by Source Category

SCC	SCC Description	County	FIPS	NO_x (tpy)	SO_2 (tpy)	VOC (tpy)	CO (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	NH_3 (tpy)
2285002006	Diesel Line Haul Locomotives: Class I operations	Ada	16001	275.70	3.06	15.46	43.43	8.32	8.07	0.19
2285002006	Diesel Line Haul Locomotives: Class I operations	Canyon	16027	336.24	3.74	18.86	52.97	10.15	9.84	0.23
2285002006	Diesel Line Haul Locomotives: Class I operations	Elmore	16039	584.18	6.49	32.76	92.03	17.63	17.10	0.40
2285002007	Diesel Line Haul Locomotives: Class II/III operations	Ada	16001	8.52	0.00	0.43	0.82	0.20	0.19	0.07
2285002007	Diesel Line Haul Locomotives: Class II/III operations	Canyon	16027	3.24	0.00	0.16	0.31	0.08	0.07	0.03
2285002010	Diesel Yard Operations	Canyon	16027	18.94	0.01	0.96	1.82	0.45	0.43	0.15

5.2 Emission Calculation Methodologies – Ozone and PM Season

After the annual nonroad mobile source emissions were estimated using the methodologies described in Section 2.4.1, the daily ozone season and PM season emission estimates were developed. The ozone season extends from April 1 through October 31 (i.e., 214 days), while the PM season is from November 1 through February 29 (2008 is a leap year) (i.e., 121 days).

5.2.1 Nonroad Equipment

Ozone and PM season daily emission estimates for nonroad equipment were based on NONROAD model runs for the summer and winter season, respectively. Fuel properties for the ozone and $PM_{2.5}$ season were set to summer and winter season values, respectively, as described in Section 2.4.1.1. Climate inputs were derived based on ozone and PM season averages as obtained from the WRCC (WRCC, 2009).

Seasonal base year 2008 nonroad equipment emissions are shown in Table 5-21 and Table 5-22 by county and equipment type, respectively. Since most equipment (except snowmobiles and snowblowers) were used more frequently in the summer compared to the winter, ozone season emissions are greater than PM season emissions in all counties.

Table 5-21. 2008 Seasonal Nonroad Equipment Emissions by County

County	VOC	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	NH_3
Ozone Season (tons/day)							
Ada	6.97	82.83	8.70	0.87	0.84	0.24	0.009
Canyon	2.51	26.38	5.84	0.58	0.56	0.17	0.005
Elmore	1.56	7.18	1.35	0.15	0.14	0.04	0.001
Total	**11.03**	**116.40**	**15.89**	**1.59**	**1.53**	**0.45**	**0.016**
PM Season (tons/day)							
Ada	4.24	60.18	4.21	0.36	0.35	0.10	0.005
Canyon	1.20	16.85	1.88	0.16	0.16	0.05	0.002
Elmore	0.34	2.36	0.32	0.03	0.03	0.01	0.000
Total	**5.78**	**79.39**	**6.42**	**0.56**	**0.54**	**0.16**	**0.007**

Table 5-22. 2008 Seasonal Nonroad Equipment Emissions by Equipment Type (Ada, Canyon, and Elmore Counties Combined)

Category	VOC	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	NH_3
Ozone Season (tons/day)							
Agricultural equipment	0.59	4.26	5.12	0.53	0.52	0.15	0.004
Commercial equipment	0.93	18.69	0.64	0.06	0.05	0.01	0.001
Construction and mining equipment	1.07	8.86	7.27	0.65	0.63	0.24	0.007
Industrial equipment	0.46	7.64	1.80	0.07	0.07	0.03	0.001
Lawn and garden equipment	3.79	60.76	0.73	0.18	0.16	0.01	0.002
Logging equipment	0.01	0.11	0.02	0.00	0.00	0.00	0.000
Pleasure craft	1.52	5.16	0.22	0.03	0.03	0.00	0.000
Railroad equipment	0.00	0.03	0.01	0.00	0.00	0.00	0.000
Recreational equipment	2.65	10.89	0.08	0.08	0.07	0.00	0.001
Underground mining equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.000
Total	**11.03**	**116.40**	**15.89**	**1.59**	**1.53**	**0.45**	**0.016**
PM Season (tons/day)							
Agricultural equipment	0.10	0.69	0.84	0.09	0.08	0.03	0.001
Commercial equipment	0.90	18.30	0.70	0.06	0.05	0.01	0.001
Construction and mining equipment	0.43	3.48	2.92	0.26	0.25	0.10	0.003
Industrial equipment	0.32	5.20	1.24	0.05	0.05	0.02	0.001
Lawn and garden equipment	3.09	48.33	0.64	0.08	0.07	0.01	0.002
Logging equipment	0.01	0.10	0.02	0.00	0.00	0.00	0.000
Pleasure craft	0.15	0.44	0.02	0.00	0.00	0.00	0.000
Railroad equipment	0.00	0.03	0.01	0.00	0.00	0.00	0.000
Recreational equipment	0.78	2.81	0.03	0.02	0.02	0.00	0.000
Underground mining equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.000
Total	**5.78**	**79.39**	**6.42**	**0.56**	**0.54**	**0.16**	**0.007**

5.2.2 Aircraft

To estimate seasonal emission inventories, the monthly distribution of activity for the Boise airport in the Treasure Valley study region was obtained from the FAA's Air Traffic Activity Data System (ATADS) (FAA, 2010). The ATADS is the official source for historical monthly or annual air traffic statistics for airports with FAA-operated or FAA-contracted traffic control towers. The average seasonal activity fractions were calculated by aircraft type from the ATADS dataset. The seasonal activity fractions (shown in Table 5-23) were then applied to the Treasure Valley annual emission by aircraft type to derive the ozone and PM season emissions.

Table 5-23. Fraction of Aircraft Activity Occurring in the Ozone and PM Seasons

Type	Ozone Season	PM Season
Commercial aircraft	59%	32%
Ground support equipment	59%	32%
Auxiliary power units	59%	32%
Air taxi aircraft	62%	28%
General aviation aircraft	66%	26%
Military aircraft	61%	30%

5.2.3 Locomotives

The daily emissions for locomotives are reported as the equivalent of the annual emissions on a daily scale. The railroads do not report temporal activity and typical of locomotive emission inventories, emissions are assumed to be constant year-round. The daily emissions were determined by dividing the annual emissions by 365 days per year.

The 2008 ozone and PM season daily emissions by source category are provided in Table 5-24.

Table 5-24. 2008 Ozone and PM Season Daily Locomotive Emission Estimates by Source Category

SCC	SCC Description	County	FIPS	NO_x (tpd)	SO_2 (tpd)	VOC (tpd)	CO (tpd)	PM_{10} (tpd)	$PM_{2.5}$ (tpd)	NH_3 (tpd)
2285002006	Diesel Line Haul Locomotives: Class I operations	Ada	16001	0.755	0.008	0.042	0.119	0.023	0.022	0.0005
2285002006	Diesel Line Haul Locomotives: Class I operations	Canyon	16027	0.921	0.010	0.052	0.145	0.028	0.027	0.0006
2285002006	Diesel Line Haul Locomotives: Class I operations	Elmore	16039	1.600	0.018	0.090	0.252	0.048	0.047	0.0011
2285002007	Diesel Line Haul Locomotives: Class II/III operations	Ada	16001	0.023	0.000	0.001	0.002	0.001	0.001	0.0002
2285002007	Diesel Line Haul Locomotives: Class II/III operations	Canyon	16027	0.009	0.000	0.000	0.001	0.000	0.000	0.0001
2285002010	Diesel Yard Operations	Canyon	16027	0.052	0.000	0.003	0.005	0.001	0.001	0.0004

5.3 QA/QC procedures

In order to ensure the highest quality emissions estimates, a number of different QA/QC steps were implemented during the development of the nonroad mobile source emissions inventory. These are outlined below:

- Nonroad Equipment
  - NONROAD model inputs, outputs and message files were checked by the data generator and reviewed by QA/QC staff.
  - QA/QC staff reviewed local data collected and evaluated against national defaults.
  - Base year emission inventories were compared to U.S.EPA NEI inventories.
- Aircraft
  - Aircraft compilation spreadsheets were reviewed by QA/QC staff.
  - For airports in the FAA TAF database, NEI2008 LTO activity was checked against FAA TAF activity.
- Locomotives
  - Locomotive spreadsheets were reviewed by the data generator and reviewed by QA/QC staff to assure that calculation inputs and equations were correct.
  - Senior QA/QC staff approved emission estimation methodologies and reviewed the reference activity data for validity.
  - Source identification and data collection were approved by the DEQ staff.
  - Senior QA/QC staff confirmed thorough pollutant coverage.
  - QA/QC staff reviewed and approved the emission factors and activity data used within the emission calculations.

6.0 2008 BIOGENIC SOURCE EMISSIONS INVENTORY

Under Task 8 of the contract, the ERG/ENVIRON team provided review of DEQ's 2008 biogenic emissions inventory. This review was summarized in a technical memorandum submitted to DEQ (Mansell and Sakulyanonvittaya, 2009); this technical memo is provided in Appendix F. The technical memo examined the available biogenic emission inventory modeling systems, as well as the land cover and vegetation data required for implementation of these models. The review also focused on a comparison between DEQ's biogenics inventory developed using the Biogenic Emission Inventory System (BEIS) and an alternative inventory developed by ENVIRON using the Model of Emissions of Gases and Aerosol from Nature (MEGAN).

6.1 Emissions Calculation Methodologies – Annual

Input from DEQ modeling staff indicate that the BEIS emission estimates should be incorporated into the draft final report and its emission inventory (Hardy, 2010). Therefore, the annual biogenic emission summaries for BEIS from Table 2 of the memo were used (Mansell and Sakulyanonvittaya, 2009).

6.2 Emissions Calculation Methodologies – Ozone and PM Season

Monthly biogenic emission summaries for BEIS from Table 2 of the memo were used to develop ozone and PM season daily emissions (Mansell and Sakulyanonvittaya, 2009). The monthly emissions from April to October were summed and then divided by 214 (i.e., the number of days in the ozone season) to derive ozone season daily emissions. Likewise, the monthly emissions from November to February were summed and then divided by 121 (i.e., the number of days in the PM season) to derive PM season daily emissions.

6.3 Emission Results

The emissions presented in the biogenics technical memorandum were developed for nitric oxide (NO), CO, VOC, and isoprene. These emissions are shown in Table 6-1.

Table 6-1. Annual, Ozone Season, and PM Season Biogenic Emissions

	Ada	Canyon	Elmore	Total
Annual – NO (tpy)	202.3	283.9	465.2	951.3
Annual – CO (tpy)	2,246.5	1,650.2	6,425.0	10,321.8
Annual – VOC (tpy)	12,802.5	8,902.4	30,982.3	52,687.1
Annual – Isoprene (tpy)	741.2	139.1	2,073.0	2,953.4
Ozone Season – NO (tpd)	0.7	1.0	1.7	3.4
Ozone Season – CO (tpd)	9.4	6.9	26.7	43.0
Ozone Season – VOC (tpd)	55.6	38.5	132.4	226.5
Ozone Season – Isoprene (tpd)	3.4	0.6	9.6	13.6
PM Season – NO (tpd)	0.3	0.4	0.7	1.4
PM Season – CO (tpd)	1.5	1.1	4.7	7.3
PM Season – VOC (tpd)	5.8	4.2	17.3	27.2
PM Season – Isoprene (tpd)	0.1	0.0	0.1	0.2

For purposes of the overall summary tables (Tables 7-5 through 7-16), NO was considered to be equivalent to NO_x while isoprene was not included since it is a VOC species.

7.0 2015 AND 2023 PROJECTED EMISSIONS INVENTORIES

The development of the 2008 base year emissions inventory was described in Sections 2.0 through 6.0. This was followed by the development of projected emissions inventories for the future years of 2015 and 2023. The methodologies used to develop these projections are described in this section. In general, the projection methodologies identified in the IPP/QAP were used; however, some minor adjustments were made based upon projections information availability and are identified herein.

7.1 Development of 2015 and 2023 Projection Factors

7.1.1 Point Sources

In an effort to ascertain the future plans for expansion, etc., (on which to base growth factors) for the point source facilities located in the Treasure Valley, a total of 18 permitted point source facilities were contacted by telephone in May 2010. The facility contacts were informally surveyed regarding overall short- and long-term growth and expansion plans. The 18 permitted point source facilities constituted the 10 largest VOC emitting facilities, the 3 largest NH_3 emitting facilities, and the 5 largest emitting facilities for each of the other pollutants; in some cases, a particular facility was a significant emitter of multiple pollutants. Of the 18 facilities contacted, a total of 14 contacts responded to the request for information. The facilities that responded included the following (listed alphabetically):

- Boise Packaging and Newsprint
- C & B Quality Trailer Works
- Fiber Composites LLC
- Micron Technology
- MotivePower
- Mountain Home Air Force Base
- Northwest Pipeline
- Pacific Press Publishing Association
- Plum Creek Northwest Lumber

- Saint Alphonsus Regional Medical Center
- Sinclair Boise Products Terminal
- Sorrento Lactalis
- TASCO – Nampa
- Tesoro Refining and Marketing

Based on these contacts' responses, the overall short-term outlook (i.e., out to 2015) for these facilities is essentially "maintenance of the current status quo"; while the long-term outlook (i.e., out to 2023) is basically "unforeseeable", but some minimal growth is expected. The recent economic recession apparently has dampened most expectations for growth in the near-term with most facilities moving into a survival posture until the recession has passed. Given these anecdotal responses, a 2015 growth factor of 1.0000 (i.e., no growth) and a 2023 growth factor of 1.1000 (i.e., minimal 10 percent growth between the years 2015 and 2023) were assigned to all point sources. The only exception to this general growth factor assignment was that Sorrento Lactalis is currently expanding their facility processing capacity from 4 million gallons of milk per day to 5 million gallons of milk per day. This expansion commenced after the 2008 annual emissions submittal and so it is not reflected in the base year 2008 inventory (York, 2010). Thus, a growth factor of 1.2500 reflecting expanded facility capacity was assigned to both 2015 and 2023 for the Sorrento Lactalis facility.

7.1.2 Area Sources

The 2015 and 2023 area source projections were developed using a variety of sources of projections data. These are described below.

7.1.2.1 Fuel Combustion

All fuel combustion area source categories (i.e., distillate, natural gas, liquefied petroleum gas [LPG], kerosene, and wood for the industrial, commercial/ institutional, and residential sectors) were estimated using projections data from the *Annual Energy Outlook (AEO)* published by the Energy Information Administration (EIA) (EIA, 2010). Regional consumption projections for the Mountain Census Division (i.e., Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming) were used to develop growth factors for 2015 and 2023.

7.1.2.2 Population

Population projections were used to develop projection factors for a wide range of area source categories where population is an appropriate surrogate for growth. These categories include the following:

- Commercial cooking (i.e., charbroiling and frying)
- Architectural surface coating
- Graphic arts
- Consumer solvents
- Open burning (i.e., yard waste and household waste)
- Wastewater treatment
- Structure fires
- Vehicle fires

Population projections for Ada and Canyon counties were obtained from the Community Planning Association of Southwest Idaho (COMPASS) (COMPASS, 2010). However, county-level population projections were not available for Elmore County; therefore, the overall state-level population projections for Idaho were used as a surrogate for Elmore County (U.S. Census, 2005b). The population projections for 2015 were used directly, while the population projection for 2023 was derived from a linear interpolation of the 2020 and 2025 population projections.

7.1.2.3 Industrial Output Projections

Industrial output projections for 2008, 2015, and 2023 (in terms of constant 2000 year dollars) were used to project emissions for a number of industrial area sources, including:

- Industrial surface coating (all subcategories)
- Degreasing (all subcategories)

- Autobody refinishing
- Dry cleaning
- Construction
- Bakeries
- Industrial refrigeration/cold storage

Appropriate output projections were selected at the 4-digit NAICS level from data obtained from Economy.com (Economy.com, 2010). The growth factors were developed by ratioing the future year output for a particular NAICS code by the 2008 year output for the same NAICS code.

7.1.2.4 Long-Term Agricultural Averages

Unlike many other area source categories, agricultural sources are thought to be somewhat cyclical in nature. This is due to limited arable land, cyclical commodity prices, and a number of other factors. As a result, long-term averages of county-level agricultural acreage were used to develop appropriate projection factors. Specifically, the total average acreage of significant Idaho field crops (i.e., alfalfa, barley, corn for grain, corn for silage, potatoes, sugarbeets, and wheat) from 1988 to 2007 was calculated. Data were obtained from the National Agricultural Statistics Service (NASS) (NASS, 2010). The projection factor is the ratio of this total average acreage divided by the 2008 acreage for these same crops. The resultant factors are 1.1548 for Ada County, 1.0562 for Canyon County, and 0.8255 for Elmore County.

7.1.2.5 Vehicle Miles Travelled (VMT)

As is typically done, future year vehicle miles travelled (VMT) projections were developed for estimating projected on-road motor vehicle emissions (see Section 3.1.3). These future year VMT projections were also used to develop growth factors for the source categories associated with gasoline marketing (i.e., Stage I, Stage II, breathing and emptying losses, and tank truck transport). As described in Section 7.1.1, the effects of Idaho Rule 592 were also incorporated with future year area source Stage I emissions.

7.1.2.6 No Growth

For a few area source categories, no growth (i.e., a growth factor of 1.0000) was assigned. In these cases, either no growth was anticipated to occur in the future or no appropriate growth surrogate could be reasonably determined. These categories included the following:

- Traffic markings
- Asphalt application
- Irrigation ditch burning
- Beef cattle feedlots

7.1.2.7 Ammonia Sources

With the exception of ammonia from industrial refrigeration/cold storage, ammonia emissions were estimated using an ammonia model as described in the previous progress reports. The projected ammonia emissions were also modeled using the same model. Finally, a few area source categories emitting ammonia were assigned no growth (i.e., a growth factor of 1.0000). The following assumptions were made for the various modeled ammonia emission source categories:

- Population projection factors described above (Section 7.1.2.2) were used for domestic ammonia emissions;
- Long-term agricultural average projection factors described above (Section 7.1.2.4) were used for fertilizer emissions; and
- No growth was assumed for livestock (i.e., due to apparent cyclical production trends), wild animals, and soils

7.1.2.8 Road Dust

Future year emissions for paved road dust were estimated using the same methodology as used for the 2008 base year (see Section 2.3) along with estimates of 2015 and 2023 VMT. Elmore County 2015 and 2023 VMT estimates were based on data developed for the on-road vehicle emission estimates as described above. Ada and Canyon County VMT estimates were taken from COMPASS transportation demand model (TDM) output for 2015 and 2025. COMPASS 2015 VMT estimates were used directly while 2023 VMT was estimated by linearly interpolating between the 2015 and 2025 data provided by COMPASS. *No change in the per-VMT paved road dust emission rates was estimated based on the assumption of unchanged future maintenance practices; however, VMT estimates increase in future years based on the COMPASS TDM, resulting in increased paved road dust.*

Future year emissions for unpaved road dust were estimated using the same methodology as the base year. In Ada County, a reduction in VMT of 1.95 percent per year was assumed per the Ada County conformity documentation (COMPASS, 2005). *For all other areas, unpaved roadway VMT was assumed unchanged from 2008 based on conversations with local highway districts and municipalities, which indicated that even minimal projected conversion of unpaved to paved roads in future years would depend on funding levels.* No change in unpaved road dust emission rates was estimated based on the assumption of unchanged future maintenance practices.

7.1.3 On-Road Motor Vehicles

Ada and Canyon counties on-road emissions in future years 2015, 2023, and 2050 were estimated by DEQ as an update to this emissions inventory (DEQ, 2012). COMPASS provided DEQ with TDM output from 2015 and 2023. DEQ ran MOVES2010a using the TDM output for 2008, 2015, and 2023 for those calendar years. To generate the 2050 VMT and emissions data required for establishing motor vehicle emission budgets for conformity evaluations of the COMPASS long-range transportation plan out to 2050, COMPASS provided DEQ with population and VMT forecasts for 2050. DEQ used these forecasts along with the 2015 TDM model runs to develop 2050 motor vehicle emission estimates for the species used in the speciated linear rollback modeling attainment demonstration (NOx, SO_2, PM_{10}, $PM_{2.5}$).

Anti-tampering and I/M programs were not in place for Canyon County in 2008, but were added for 2015 and 2023. The parameters are similar to the 2008 Ada County programs, except for the program change to biennial testing and testing of light-duty vehicles only. Tables 7-1 and 7-2 show the future year updated parameters for anti-tampering and I/M, respectively. Alcohol blend E10 market share also changed from 68% in 2008 to 100% in future years. There were no other changes in inputs for the future year MOVES2010a modeling work.

Table 7-1. 2015 and 2023 I/M Inputs by County: Anti-Tampering Program Parameters[a]

Anti-Tampering Program Parameters	Ada County	Canyon County	Elmore County
Program Start Year	2010	2010	-
First Vehicle Model Year Applied	Same as Ada 2008	Same as Ada 2008	-
Last Vehicle Model Year Applied	Same as Ada 2008	Same as Ada 2008	-
Vehicle Types Applied	Same as Ada 2008	LDGV, LDGT1, LDGT2 LDGT3, LDGT4	-
Inspection Frequency	Biennial	Biennial	-
Compliance Rate	Same as Ada 2008	Same as Ada 2008	-
Inspection Conducted	Same as Ada 2008	Same as Ada 2008	-

[a] *See Appendix E of Northern Ada County PM_{10} Limited Maintenance Plan Ten-Year Update for 2008 I/M parameters.*

Table 7-2. 2015, 2023, and 2030 MOBILE6 Inputs by County: I/M Program Parameters [a]

I/M Program Type	I/M Program Parameters	Ada County	Canyon County	Elmore County
Exhaust Test Only Program – Two speed test (idle and 2500 RPM)	Start Year	2010	2010	-
	End Year	2050	2050	-
	Frequency	Biennial	Biennial	-
	First Vehicle Model Year Applied	1981	1981	-
	Last Vehicle Model Year Applied	1995	1995	-
	Vehicle Types Applied	Same as Ada 2008	LDGV, LDGT1, LDGT2, LDGT3, LDGT4	-
	Stringency (pre-1981 only)	Same as Ada 2008	Same as Ada 2008	-
	Compliance Rate	Same as Ada 2008	Same as Ada 2008	-
	Waiver Rate (expressed as a percentage of the vehicles that fail the I/M program)	Same as Ada 2008	Same as Ada 2008	-
	Grace Period (the age at which vehicle first become subject to I/M testing)	4	5	-
Exhaust Test Only Program – OBD I/M	Start Year	2010	2010	-
	End Year	2050	2050	-
	Frequency	Biennial	Biennial	-
	First Vehicle Model Year Applied	Same as Ada 2008	Same as Ada 2008	-
	Last Vehicle Model Year Applied	2050	2050	-
	Vehicle Types Applied	Same as Ada 2008	LDGV, LDGT1, LDGT2, LDGT3, LDGT4	-
	Stringency (expected exhaust inspection failure rate for pre-1981 model year vehicles)	Same as Ada 2008	Same as Ada 2008	-
	Compliance Rate	Same as Ada 2008	Same as Ada 2008	-
	Waiver Rate (expressed as a percentage of the vehicles that fail the I/M program)	Same as Ada 2008	Same as Ada 2008	-
	Grace Period (the age at which vehicle first become subject to I/M testing)	4	5	-

[a] *See Appendix E of Northern Ada County PM_{10} Limited Maintenance Plan Ten-Year Update for 2008 I/M parameters.*

Elmore County motor vehicle emissions were not used in the Northern Ada County PM_{10} Limited Maintenance Plan Ten-Year Update demonstration and were not updated by DEQ in 2010 using MOVES2010a. Thus, the original MOBILE6.2 emissions appear for Elmore County in the remainder of this document as originally prepared by DEQ/Environ for 2008 and future years 2015 and 2023. For the future years, Elmore County emissions were estimated by multiplying emission factors specific to 2015 and 2023 with projected VMT increases from 2008 to the future years. Elmore County emissions were not estimated for 2050. Emission factors for 2015 and 2023 were generated by running MOBILE6.2 for those calendar years, which accounts for federally mandated gasoline sulfur reductions by calendar year and captures emission rate reductions due to increasingly stringent vehicle emission standards. The MOBILE6.2 national default registration distribution was used in all three years 2008, 2015 and 2023. Per DEQ, fuel parameters and vehicle inspection and maintenance programs do not change from 2008 in Elmore County. The MOBILE6.2 national default registration distribution was used in all three years 2008, 2015 and 2023. In addition, MOBILE6.2 accounts for federally mandated gasoline sulfur reductions by year and contains estimates of emission rate reductions due to increasingly stringent vehicle emission standards.

2008 Elmore County VMT was projected to 2015 and 2023 using scaling factors based on the COMPASS TDM outputs for 2008, 2015 and 2025. The COMPASS TDM includes link-level volumes and distances (thus VMT) by urban and rural roadway types that were readily classifiable into the three road types of the original 2008 Elmore County total VMT: "interstate," "arterial," and "other" for roadways that were not interstate or arterial. VMT estimates for 2023 were calculated by linearly interpolating VMT between 2015 and 2025 datasets. The final projection factors for rural interstates, rural arterials and rural "other" roadways were developed by scaling 2015/2008 and 2023/2008. The projected VMT and future year emission factor sets were used to estimate future year emissions using the same approach as the base year modeling.

7.1.4 Nonroad Mobile Sources

The 2015 and 2023 nonroad mobile source projections were developed using a variety of sources of projections data. These are described below.

7.1.4.1 Nonroad Equipment

The NONROAD model incorporates the effects of all “on the books” regulations. The model also contains growth factors for all equipment types, which have been derived by U.S. EPA from a proprietary database of equipment sales for several years.

The NONROAD model was run for 2015 and 2023 analogous to what was done for 2008. Climate, local population, and temporal profiles used in the base year inputs were similarly used in the development of future year emissions. Fuel properties remained unchanged from base year estimates, except for the nonroad diesel sulfur level which was set to 15 ppm for 2015 and 2023 as required by the federal Tier 4 nonroad diesel rule.

7.1.4.2 Aircraft

Aircraft emissions were projected to future years from the 2008 emissions, by airport and aircraft type, using LTO forecasts available from the FAA. Aircraft and APU emission factors were assumed to be unchanged over time. The International Civil Aviation Organization (ICAO) has promulgated NO_x and CO emission standards for commercial aircraft (exempting general aviation and military engines from the rule) (ICAO, 1998); the majority of engines are already meeting this standard. U.S. EPA officially promulgated the ICAO standards for air carriers in a final rule in November 2005.

The historic and projected LTO data by airport are available online from the Federal Aviation Administration (FAA) Terminal Area Forecast (TAF) database for all aircraft categories for which emissions were estimated (FAA, 2008). Projected LTO data for years 2015, 2023, and historic data for 2008 were used to develop future year growth factors for all aircraft types by airport. Growth factors were calculated as the ratio of the sum of LTOs by airport and aircraft type in each future year to the sum of LTOs by airport and aircraft type in 2008. For airports that were included in the 2008 analysis, but are not in the FAA TAF database, growth factors were calculated as the ratio of the sum of LTOs by aircraft type in each future year over the entire Treasure Valley study region to the sum of LTOs by aircraft type in 2008 over the entire Treasure Valley study region. These future year growth factors were then applied to 2008 emission estimates by airport and aircraft type to develop future year emission inventories. Base year LTOs and future year growth factors are shown in Table 7-3.

Auxiliary power unit activity growth was assumed equivalent to commercial aircraft activity growth estimates. Airport GSE engines are subject to U.S. EPA nonroad engine standards. Fleet turnover to newer, engines meeting more stringent standards over time will decrease fleetwide airport GSE emission rates over time. Therefore, airport GSE projection factors must incorporate estimates of both activity growth and fleetwide emission rate decreases due to fleet turnover. Airport GSE fleetwide emission rate decreases were calculated based on the NONROAD model estimates of emission changes by fuel type in airport GSE emissions due to fleet turnover. To incorporate future year activity growth in airport GSE, commercial aircraft growth rates were applied.

Table 7-3. Base Year Aircraft LTO Activity Data and Future Year Projection Factors

Airport	Commercial Aircraft	Air Taxi Aircraft	General Aviation Aircraft	Military Aircraft
2008 LTOs				
Boise Air Terminal/Gowen Field	20,636	12,804	36,557	6,158
Caldwell Industrial	0	2,000	67,486	0
Nampa Municipal	0	0	54,813	50
Mountain Home Municipal	0	254	9,657	500
Other airports not in TAF database[a]	14	0	46,578	0
2015/2008 LTOs				
Boise Air Terminal/Gowen Field	105%	67%	95%	104%
Caldwell Industrial	-	100%	118%	100%
Nampa Municipal	-	-	123%	100%
Mountain Home Municipal	-	100%	114%	100%
Other airports not in TAF database[a]	105%	-	113%	104%
2023/2008 LTOs				
Boise Air Terminal/Gowen Field	130%	88%	116%	104%
Caldwell Industrial	-	100%	141%	100%
Nampa Municipal	-	-	157%	100%
Mountain Home Municipal	-	100%	131%	100%
Other airports not in TAF database[a]	130%	-	138%	104%

[a] Emissions projected for these airports based on estimated projections of total activity at the four airports for which data was available from FAA's TAF database

7.1.4.3 Locomotives

Future year locomotive emission estimates were based on projections of activity growth and emission reductions. The activity growth was forecasted on the basis fuel consumption. The emission reduction forecasts account primarily for the fleet turnover and the lower emission standards, which were based on data available in EPA documents (U.S. EPA, 1997a; U.S. EPA, 1997b; U.S. EPA, 2008).

A fuel consumption trend was estimated using a least squares regression analysis of annual fuel consumption obtained from the Association of American Railroads (AAR) for six years between 1999 and 2008 (AAR, 2009). Within the study domain the only Class 1 railroad operating was Union Pacific (UP). To accurately forecast activity, UP nationwide fuel consumption was analyzed (see Table 7-4). The UP data were also used to forecast the Idaho Northern Pacific Railroad and switching locomotive emissions; it is expected that the short-line and switching activity will have similar growth to the estimates for the mainline railroad (i.e., UP) that operates in the study domain. Based on the least squares linear regression analysis, a growth rate of 4,264,472 gallons of fuel per year was estimated.

Table 7-4. Union Pacific Historic Fuel Consumption

Year	Fuel (gallons)
1999	1,252,111,733
2002	1,325,049,398
2005	1,362,933,944
2006	1,382,778,469
2007	1,338,300,581
2008	1,240,874,008

The growth rate was applied to the 2008 fuel consumption to generate 2015 and 2023 estimates of 1,270,725,311 gallons and 1,304,841,085 gallons, respectively. The 2015 and 2023 fuel consumption estimates represent a 2.40% and 5.16% increase from 2008, respectively.

The emission reduction estimates were based on the U.S. EPA line-haul and switching locomotive forecasted emission reductions relative to the locomotive fleets (U.S. EPA, 1997a; U.S. EPA, 1997b; U.S. EPA, 2008). Based on the U.S. EPA reports estimates of future year average emissions by the fleet type, representative emissions reductions from 2008 to 2015 and 2008 to 2023 were extracted.

7.1.5 Biogenic Sources

Although it is expected that there will be year-to-year variability in biogenic emissions, it is not possible to predict this variability. Therefore, the 2008 biogenic emission estimates were also used for the 2015 and 2023 emission inventories.

7.2 2015, 2023, and 2050 Inventory Summaries

Using all of the projection factors described in Section 7.1, the 2015 and 2023 projected emissions inventories were developed. In addition VMT projections to 2050 were used to project on-road and paved road dust emissions only to 2050 to support conformity evaluations of the COMPASS long-range transportation plans. County-level summaries of these inventories by source type are provided in this section. For ease of comparison, the 2008 county-level summaries are also presented. The annual summaries are presented in Tables 7-5 (2008), 7-6 (2015), 7-7 (2023), and 7-8 (2050). The ozone season summaries are provided in Tables 7-9 (2008), 7-10 (2015), 7-11 (2023), and 7-12 (2050), while the PM season summaries are shown in Tables 7-13 (2008), 7-14 (2015), 7-15 (2023), and 7-16 (2050). Note, all values updated in these tables are shown in italic. The totals and subtotals are updated as well, shown in bold and italic.

The inventory summaries presented in Tables 7-5 through 7-16 reflect four categories of revisions that DEQ made to the emissions inventories in 2012 during preparation of the Northern Ada County PM_{10} Limited Maintenance Plan Ten-Year Update:

1. *On-road emissions of all pollutants were revised using the MOVES model;*
2. *Area source emissions were updated to include revisions to the paved road dust emissions included in the area source category;*
3. *Area source SO_2 emissions included in the ozone season summary tables contained calculation errors in the ozone season distillate combustion worksheets prepared by ERG/Environ. These errors have been corrected.*
4. *DEQ projected 2015 on-road and paved road dust emissions to 2050 using COMPASS VMT projections and 2015 emission estimates.*

Table 7-5. 2008 County-Level Annual Emissions Summarized by Source Type

County	Source Type	NO_x (tpy)	SO_2 (tpy)	VOC (tpy)	CO (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	NH_3 (tpy)
Ada	Point	355.6	65.70	268.1	198.5	169.1	142.6	46.0
	Area[a]	920.7	26.90	12,962.8	7,715.1	*19,555.0*	*3,552.0*	3,995.3
	On-Road[a]	*9,775.4*	*67.40*	*4,182.3*	*47,168.3*	*412.7*	*330.4*	*152.9*
	Nonroad	2,894.6	90.40	2,031.2	24,870.5	257.8	244.8	2.8
	Biogenic	202.3	0.00	12,802.5	2,246.5	0.0	0.0	0.0
	Total	***14,148.6***	***250.40***	***32,246.9***	***82,198.9***	***20,394.6***	***4,269.8***	***4,197.0***
Canyon	Point	1,356.5	2,007.30	303.4	1,044.7	495.9	277.8	420.6
	Area[a]	545.8	19.10	7,507.9	7,221.7	*41,974.4*	*9,372.2*	7,726.9
	On-Road[a]	*5,847.8*	*35.00*	*3,202.1*	*36,404.4*	*258.2*	*212.1*	*81.8*
	Nonroad	1,878.3	47.90	754.1	8,251.3	174.7	164.0	1.8
	Biogenic	283.9	0.00	8,902.4	1,650.2	0.0	0.0	0.0
	Total	***9,912.3***	***2,109.30***	***20,669.9***	***54,572.3***	***42,903.2***	***10,026.1***	***8,231.1***
Elmore	Point	360.3	2.50	26.6	105.3	135.9	58.7	0.0
	Area	80.5	5.80	1,730.0	1,595.8	22,491.9	2,806.1	4,812.3
	On-Road[a]	576.6	3.10	529.8	5,460.8	14.7	9.3	30.7
	Nonroad	914.8	16.10	368.6	1,873.0	56.8	53.6	0.7
	Biogenic	465.2	0.00	30,982.3	6,425.0	0.0	0.0	0.0
	Total	***2,397.4***	***27.50***	***33,637.3***	***15,459.9***	***22,699.3***	***2,927.7***	***4,843.7***
Total	Point	2,072.4	2,075.40	598.1	1,348.5	800.9	479.0	466.6
	Area[a]	1,547.1	51.80	22,200.7	16,532.7	*84,021.3*	*15,730.3*	16,534.5
	On-Road[a]	*16,199.8*	*105.50*	*7,914.2*	*89,033.5*	*685.6*	*551.8*	*265.4*
	Nonroad	5,687.6	154.50	3,153.8	34,994.8	489.3	462.4	5.4
	Biogenic	951.4	0.00	52,687.2	10,321.7	0.0	0.0	0.0
	Total	***26,458.3***	***2,387.20***	***86,554.0***	***152,231.2***	***85,997.1***	***17,223.5***	***17,271.9***

[a] On-road emission estimates were revised in 2012 for the Northern Ada County PM_{10} Limited Maintenance Plan Ten-Year Update. Ada and Canyon counties on-road emissions values and paved road dust emissions (PM_{10} and $PM_{2.5}$ in Area category) are from Appendix E of the Ten-Year Update, entitled "Development of the Base- and Future-Year Mobile Source Emission Inventories for the Treasure Valley, Idaho." Elmore County emissions were not revised. Table values revised in 2012 are shown in italic.

Table 7-6. 2015 County-Level Annual Emissions Summarized by Source Type

County	Source Type	NO_x (tpy)	SO_2 (tpy)	VOC (tpy)	CO (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	NH_3 (tpy)
Ada	Point	355.6	65.70	268.1	198.5	169.1	142.6	46.0
	Area[a]	900.0	23.60	14,551.2	6,885.8	*21,107.4*	*3,651.0*	4,143.2
	On-Road[a]	*5,856.6*	*33.40*	*2,939.7*	*39,263.4*	*283.0*	*193.0*	*126.4*
	Nonroad	1,979.8	28.20	1,480.7	21,192.5	196.9	185.8	3.2
	Biogenic	202.3	0.00	12,802.5	2,246.5	0.0	0.0	0.0
	Total	***9,294.3***	***150.90***	***32,042.2***	***69,786.7***	***21,756.4***	***4,172.4***	***4,318.8***
Canyon	Point	1,365.9	2,007.30	303.9	1,054.8	500.3	282.1	420.6
	Area[a]	509.7	16.70	7,690.9	6,310.3	*8,494.0*	*2,025.6*	7,907.8
	On-Road[a]	*3,870.5*	*17.70*	*2,177.2*	*27,974.3*	*178.4*	*127.6*	*74.4*
	Nonroad	1,351.8	6.60	546.1	7,047.7	126.9	116.8	2.0
	Biogenic	283.9	0.00	8,902.4	1,650.2	0.0	0.0	0.0
	Total	***7,381.8***	***2,048.30***	***19,620.5***	***44,037.3***	***9,299.6***	***2,552.1***	***8,404.8***
Elmore	Point	360.3	2.50	26.6	105.3	135.9	58.7	0.0
	Area	74.0	5.30	1,781.0	1,412.5	22,923.7	2,876.3	4,636.3
	On-Road	425.7	4.60	458.9	6,040.8	15.8	8.3	46.9
	Nonroad	701.7	7.30	260.1	1,723.9	39.7	37.0	0.8
	Biogenic	465.2	0.00	30,982.3	6,425.0	0.0	0.0	0.0
	Total	**2,026.9**	**19.70**	**33,508.9**	**15,707.5**	**23,115.1**	**2,980.3**	**4,684.0**
Total	Point	2,081.8	2,075.50	598.6	1,358.6	805.3	483.3	466.6
	Area[a]	1,483.7	45.60	24,023.1	14,608.6	*52,525.1*	*8,552.8*	16,687.3
	On-Road[a]	*10,152.8*	*55.70*	*5,575.8*	*7,3278.5*	*477.2*	*328.9*	*247.7*
	Nonroad	4,033.2	42.10	2,286.8	2,9964.1	363.6	339.6	6.0
	Biogenic	951.4	0.00	52,687.2	10,321.7	0.0	0.0	0.0
	Total	***18,702.9***	***2,218.90***	***85,171.5***	***129,531.5***	***54,171.2***	***9,704.6***	***1,7407.6***

[a] *On-road emission estimates were revised in 2012 for the Northern Ada County PM_{10} Limited Maintenance Plan Ten-Year Update. Ada and Canyon counties on-road emissions values and paved road dust emissions (PM_{10} and $PM_{2.5}$ in Area category) are from Appendix E of the Ten-Year Update, entitled "Development of the Base- and Future-Year Mobile Source Emission Inventories for the Treasure Valley, Idaho." Elmore County emissions were not revised. Table values revised in 2012 are shown in italic.*

Table 7-7. 2023 County-Level Annual Emissions Summarized by Source Type

County	Source Type	NO_x (tpy)	SO_2 (tpy)	VOC (tpy)	CO (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	NH_3 (tpy)
Ada	Point	391.2	72.30	294.9	218.4	186.0	156.8	50.6
	Area[a]	951.9	23.80	18,062.8	7,146.3	*25,267.1*	*4,072.7*	4,207.4
	On-Road[a]	*4,306.4*	*42.00*	*2,396.8*	*38,771.8*	*285.2*	*157.1*	*146.6*
	Nonroad	1,355.0	33.80	1,407.9	22,622.6	135.8	125.9	3.6
	Biogenic	202.3	0.00	12,802.5	2,246.5	0.0	0.0	0.0
	Total	***7,206.8***	***171.90***	***34,964.9***	***71,005.6***	***25,874.1***	***4,512.5***	***4,408.2***
Canyon	Point	1,497.7	2,208.00	334.0	1,155.2	548.1	308.1	462.7
	Area[a]	519.3	16.90	8,820.6	6,469.1	*11,753.2*	*2,260.0*	7,930.7
	On-Road[a]	*3,273.6*	*25.10*	*1,935.0*	*27,684.6*	*191.5*	*112.3*	*95.0*
	Nonroad	860.7	6.90	504.2	7,402.5	83.6	73.5	2.3
	Biogenic	283.9	0.00	8,902.4	1,650.2	0.0	0.0	0.0
	Total	***6,435.2***	***2,256.90***	***2,0496.2***	***4,4361.6***	***12,576.4***	***2,753.9***	***8,490.7***
Elmore	Point	396.3	2.70	29.3	115.8	149.5	64.5	0.0
	Area	75.2	5.40	1,900.3	1,459.2	23,710.4	30,66.6	4,639.0
	On-Road	340.6	6.50	422.6	7,416.2	19.8	9.4	66.0
	Nonroad	457.5	7.60	191.7	1,714.4	25.0	22.5	0.8
	Biogenic	465.2	0.00	30,982.3	6,425.0	0.0	0.0	0.0
	Total	**1,734.8**	**22.20**	**33,526.2**	**17,130.6**	**23,904.7**	**3,163.0**	**4,705.8**
Total	Point	2,285.3	2,283.00	6,58.2	1,489.4	883.6	529.5	513.2
	Area[a]	1,546.4	46.10	28,783.7	15,074.6	*60,730.6*	*9,399.3*	16,777.1
	On-Road[a]	*7,920.6*	*73.60*	*4,754.4*	*73,872.6*	*496.5*	*278.8*	*307.6*
	Nonroad	2,673.1	48.30	2,103.8	31,739.4	244.5	222.0	6.8
	Biogenic	951.4	0.00	52,687.2	10,321.7	0.0	0.0	0.0
	Total	***15,376.8***	***2,451.00***	***88,987.3***	***132,497.7***	***62,355.2***	***10,429.6***	***17,604.7***

[a] On-road emission estimates were revised in 2012 for the Northern Ada County PM_{10} Limited Maintenance Plan Ten-Year Update. Ada and Canyon counties on-road emissions values and paved road dust emissions (PM_{10} and $PM_{2.5}$ in Area category) are from Appendix E of the Ten-Year Update, entitled" Development of the Base- and Future-Year Mobile Source Emission Inventories for the Treasure Valley, Idaho." Elmore County emissions were not revised. Table values revised in 2012 are shown in italic.

Table 7-8. 2050 County-Level Annual On-Road Emissions for Ada County

County	Source Type	NO_x (tpy)	SO_2 (tpy)	VOC (tpy)	CO (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	NH_3 (tpy)
Ada	On-Road (MOVES)[a]	*12,494*	*71.3*	*6,271*	*83,763*	*603.7*	*411.8*	*269.7*
Ada	Paved Road Dust[a]	*N/A*	*N/A*	*N/A*	*N/A*	*19,550*	*N/A*	*N/A*
Ada	Unpaved Road Dust[a]	*N/A*	*N/A*	*N/A*	*N/A*	*1,795*	*N/A*	*N/A*

[a] For conformity demonstration in the Northern Ada County PM_{10} Limited Maintenance Plan Ten-Year Update. Projected by scaling 2015 emissions using 2050/2015 ratio VMT projected by COMPASS.

Table 7-9. 2008 County-Level Ozone Season Emissions Summarized by Source Type

County	Source Type	NO_x (tpd)	SO_2 (tpd)	VOC (tpd)	CO (tpd)	PM_{10} (tpd)	$PM_{2.5}$ (tpd)	NH_3 (tpd)
Ada	Point	1.0	0.20	0.7	0.6	0.5	0.4	0.1
	Area[a]	1.4	*0.04*	33.7	4.8	*43.6*	*6.6*	12.7
	On-Road[b]	*28.5*	*0.20*	*10.9*	*110.9*	*1.1*	*0.9*	*0.5*
	Nonroad	10.1	0.30	7.2	85.6	0.9	0.9	0.0
	Biogenic	0.7	0.00	55.6	9.4	0.0	0.0	0.0
	Total	***41.7***	***0.74***	***108.1***	***211.3***	***46.1***	***8.7***	***13.3***
Canyon	Point	3.5	5.20	0.8	2.1	1.3	0.7	1.1
	Area[a]	0.9	*0.02*	18.4	3.8	*13.0*	*2.8*	23.8
	On-Road[b]	*16.7*	*0.1*	*8.4*	*87.9*	*0.65*	*0.52*	*0.24*
	Nonroad	6.8	0.20	2.8	29.2	0.7	0.6	0.0
	Biogenic	1.0	0.00	38.5	6.9	0.0	0.0	0.0
	Total	***28.9***	***5.52***	***68.9***	***129.9***	***15.6***	***4.6***	***25.1***
Elmore	Point	1.0	0.00	0.1	0.3	0.4	0.2	0.0
	Area[a]	0.1	*0.01*	4.5	1.4	73.5	8.3	15.2
	On-Road	1.5	0.00	1.5	11.0	0.0	0.0	0.1
	Nonroad	3.0	0.10	1.7	8.1	0.2	0.2	0.0
	Biogenic	1.7	0.00	132.4	26.7	0.0	0.0	0.0
	Total	**7.3**	***0.11***	**140.2**	**47.5**	**74.1**	**8.7**	**15.3**
Total	Point	5.5	5.40	1.6	3.0	2.2	1.3	1.2
	Area[a]	2.4	*0.06*	56.6	10.1	*130.0*	*17.6*	51.8
	On-Road[b]	*46.7*	*0.3*	*20.8*	*209.8*	*1.7*	*1.4*	*0.8*
	Nonroad	19.8	0.60	11.7	122.8	1.8	1.7	0.0
	Biogenic	3.4	0.00	226.5	43.0	0.0	0.0	0.0
	Total	***77.8***	***6.36***	***317.2***	***388.7***	***135.8***	**22.0**	***53.8***

[a] Small errors in ozone season distillate combustion sulfur dioxide (SO_2) emissions were corrected.

[b] On-road emission estimates were revised in 2012 for the Northern Ada County PM_{10} Limited Maintenance Plan Ten-Year Update. Ada and Canyon counties on-road emissions values and paved road dust emissions (PM_{10} and $PM_{2.5}$ in Area category) are from Appendix E of the Ten-Year Update, entitled "Development of the Base- and Future-Year Mobile Source Emission Inventories for the Treasure Valley, Idaho." Elmore County on-road and paved road emissions were not revised. Table values revised in 2012 are shown in italic.

Table 7-10. 2015 County-Level Ozone Season Emissions Summarized by Source Type

County	Source Type	NO_x (tpd)	SO_2 (tpd)	VOC (tpd)	CO (tpd)	PM_{10} (tpd)	$PM_{2.5}$ (tpd)	NH_3 (tpd)
Ada	Point	1.0	0.20	0.7	0.6	0.5	0.4	0.1
	Area[a]	1.3	*0.03*	38.4	4.7	*45.6*	*7.1*	13.1
	On-Road[b]	*16.9*	*0.10*	*7.7*	*83.8*	*0.7*	*0.5*	*0.37*
	Nonroad	6.8	0.10	5.2	72.6	0.7	0.7	0
	Biogenic	0.7	0.00	55.6	9.4	0.0	0.0	0
	Total	***26.7***	***0.43***	***107.6***	***171.1***	***47.5***	***8.6***	***13.57***
Canyon	Point	3.5	5.20	0.8	2.1	1.3	0.7	1.1
	Area[a]	0.9	*0.01*	19.3	3.5	*14.5*	*2.9*	24.3
	On-Road[b]	*11.0*	*0.05*	*5.7*	*61.1*	*0.5*	*0.3*	*0.22*
	Nonroad	4.9	0.00	2.0	24.6	0.5	0.4	0
	Biogenic	1.0	0.00	38.5	6.9	0.0	0.0	0
	Total	***21.3***	***5.26***	***66.3***	***98.2***	***16.8***	***4.3***	***25.62***
Elmore	Point	1.0	0.00	0.1	0.3	0.4	0.2	0
	Area[a]	0.1	*0.01*	4.7	1.3	74.1	8.4	14.8
	On-Road	1.1	0.00	1.3	11.8	0.1	0	0.1
	Nonroad	2.3	0.00	1.1	7.4	0.1	0.1	0
	Biogenic	1.7	0.00	132.4	26.7	0	0	0
	Total	**6.20**	***0.01***	**139.60**	**47.50**	**74.70**	**8.70**	**14.90**
Total	Point	5.5	5.40	1.6	3	2.2	1.3	1.2
	Area[a]	2.3	*0.1*	62.4	9.5	*134.2*	*18.4*	52.2
	On-Road[b]	*29.0*	*0.15*	*14.7*	*156.7*	*1.3*	*0.8*	*0.7*
	Nonroad	14	0.10	8.3	104.6	1.3	1.2	0
	Biogenic	3.4	0.00	226.5	43	0	0	0
	Total	***54***	***5.70***	***314***	***317***	***139***	***22***	***54***

[a] *Small errors in ozone season distillate combustion sulfur dioxide (SO_2) emissions were corrected.*
[b] *On-road emission estimates were revised in 2012 for the Northern Ada County PM_{10} Limited Maintenance Plan Ten-Year Update. Ada and Canyon counties on-road emissions values and paved road dust emissions (PM_{10} and $PM_{2.5}$ in Area category) are from Appendix E of theTen-Year Update, entitled "Development of the Base- and Future-Year Mobile Source Emission Inventories for the Treasure Valley, Idaho." Elmore County on-road and paved road emissions were not revised. Table values revised in 2012 are shown in italic.*

Table 7-11. 2023 County-Level Ozone Season Emissions Summarized by Source Type

County	Source Type	NO_x (tpd)	SO_2 (tpd)	VOC (tpd)	CO (tpd)	PM_{10} (tpd)	$PM_{2.5}$ (tpd)	NH_3 (tpd)
Ada	Point	1.1	0.20	0.8	0.6	0.5	0.4	0.1
	Area[a]	1.4	*0.03*	48.0	5.1	*51.2*	*7.8*	13.3
	On-Road[b]	*12.4*	*0.12*	*6.6*	*78.5*	*0.8*	*0.4*	*0.4*
	Nonroad	4.5	0.10	4.8	77.0	0.5	0.4	0.0
	Biogenic	0.7	0.00	55.6	9.4	0.0	0.0	0.0
	Total	***20.1***	***0.45***	***115.8***	***170.6***	***52.9***	***9.0***	***13.8***
Canyon	Point	3.9	5.70	0.9	2.3	1.5	0.8	1.2
	Area[a]	0.9	*0.01*	22.3	3.6	*18.5*	*3.2*	24.4
	On-Road[b]	*9.2*	*0.07*	*5.2*	*57.2*	*0.5*	*0.3*	*0.3*
	Nonroad	3.1	0.00	1.7	25.4	0.3	0.3	0.0
	Biogenic	1.0	0.00	38.5	6.9	0.0	0.0	0.0
	Total	***18.1***	***5.78***	***68.6***	***95.4***	***20.8***	***4.5***	***25.9***
Elmore	Point	1.1	0.00	0.1	0.4	0.4	0.2	0.0
	Area[a]	0.1	*0.01*	5.0	1.4	74.5	8.6	14.8
	On-Road	0.9	0.00	1.2	14.5	0.1	0.0	0.2
	Nonroad	1.5	0.00	0.8	7.2	0.1	0.1	0.0
	Biogenic	1.7	0.00	132.4	26.7	0.0	0.0	0.0
	Total	**5.3**	***0.01***	**139.5**	**50.2**	**75.1**	**8.9**	**15.0**
Total	Point	6.0	5.90	1.8	3.3	2.4	1.4	1.3
	Area[a]	2.4	*0.1*	75.3	10.1	*144.2*	*19.6*	52.4
	On-Road[b]	*22.5*	*0.19*	*13.0*	*150.2*	*1.3*	*0.6*	*0.9*
	Nonroad	9.1	0.10	7.3	109.6	0.9	0.8	0.0
	Biogenic	3.4	0.00	226.5	43.0	0.0	0.0	0.0
	Total	***43.4***	***6.24***	***323.9***	***316.2***	***148.9***	***22.4***	***54.6***

[a] Small errors in ozone season distillate combustion sulfur dioxide (SO_2) emissions were corrected.
[b] On-road emission estimates were revised in 2012 for the Northern Ada County PM_{10} Limited Maintenance Plan Ten-Year Update. Ada and Canyon counties on-road emissions values and paved road dust emissions (PM_{10} and $PM_{2.5}$ in Area category) are from Appendix E of theTen-Year Update, entitled "Development of the Base- and Future-Year Mobile Source Emission Inventories for the Treasure Valley, Idaho." Elmore County on-road and paved road emissions were not revised. Table values revised in 2012 are shown in italic.

Table 7-12. 2050 Ozone Season On-Road Emissions for Ada County

County	Source Type	NO_x (tpd)	SO_2 (tpd)	VOC (tpd)	CO (tpd)	PM_{10} (tpd)	$PM_{2.5}$ (tpd)	NH_3 (tpd)
Ada	On-Road (MOVES)[a]	*36.1*	*0.21*	*16.4*	*178.9*	*1.6*	*1.02*	*0.79*
Ada	Paved Road Dust[a]	*N/A*	*N/A*	*N/A*	*N/A*	*26.5*	*N/A*	*N/A*
Ada	Unpaved Road Dust[a]	*N/A*	*N/A*	*N/A*	*N/A*	*5.6*	*N/A*	*N/A*

[a] For conformity demonstration in the Northern Ada County PM_{10} Limited Maintenance Plan Ten-Year Update. Projected by scaling 2015 emissions using 2050/2015 ratio VMT projected by COMPASS.

Table 7-13. 2008 County-Level PM Season Emissions Summarized by Source Type

County	Source Type	NO_x (tpd)	SO_2 (tpd)	VOC (tpd)	CO (tpd)	PM_{10} (tpd)	$PM_{2.5}$ (tpd)	NH_3 (tpd)
Ada	Point	1.0	0.20	0.7	0.5	0.5	0.4	0.1
	Area[a]	4.4	0.10	39.1	49.7	*67.6*	*15.1*	8.5
	On-Road[a]	*24.0*	*0.16*	*12.3*	*156.4*	*1.2*	*1.0*	*0.4*
	Nonroad	5.6	0.20	4.4	62.5	0.4	0.4	0.0
	Biogenic	0.3	0.00	5.8	1.5	0.0	0.0	0.0
	Total	***35.3***	***0.66***	***62.3***	***270.6***	***69.7***	***16.9***	***9.0***
Canyon	Point	4.4	6.50	0.9	4.8	1.5	0.8	1.3
	Area[a]	2.4	0.10	24.4	46.2	*32.0*	*10.6*	17.7
	On-Road[a]	*14.8*	*0.09*	*9.3*	*117.1*	*0.8*	*0.7*	*0.2*
	Nonroad	2.9	0.10	1.4	18.9	0.2	0.2	0.0
	Biogenic	0.4	0.00	4.2	1.1	0.0	0.0	0.0
	Total	***24.9***	***6.79***	***40.2***	***188.1***	***34.5***	***12.2***	***19.2***
Elmore	Point	1.0	0.00	0.1	0.2	0.4	0.2	0.0
	Area	0.4	0.00	5.1	9.0	47.2	7.1	10.5
	On-Road	1.6	0.00	1.1	17.2	0.0	0.0	0.1
	Nonroad	1.9	0.00	0.5	3.1	0.1	0.1	0.0
	Biogenic	0.7	0.00	17.3	4.7	0.0	0.0	0.0
	Total	**5.6**	**0.00**	**24.1**	**34.2**	**47.7**	**7.4**	**10.6**
Total	Point	6.4	6.70	1.6	5.5	2.3	1.4	1.5
	Area[a]	7.1	0.30	68.6	104.9	*146.8*	*32.7*	36.7
	On-Road[a]	*40.4*	*0.25*	*22.7*	*290.7*	*2.0*	*1.7*	*0.7*
	Nonroad	10.4	0.30	6.3	84.5	0.7	0.7	0.0
	Biogenic	1.4	0.00	27.3	7.3	0.0	0.0	0.0
	Total	***65.7***	***7.55***	***126.5***	***492.9***	***151.7***	***36.5***	***38.9***

[a] On-road emission estimates were revised in 2012 for the Northern Ada County PM_{10} Limited Maintenance Plan Ten-Year Update. Ada and Canyon counties on-road emissions values and paved road dust emissions (PM_{10} and $PM_{2.5}$ in Area category) are from Appendix E of the Ten-Year Update, entitled "Development of the Base- and Future-Year Mobile Source Emission Inventories for the Treasure Valley, Idaho." Elmore County emissions were not revised. Table values revised in 2012 are shown in italic.

Table 7-14. 2015 County-Level PM Season Emissions Summarized by Source Type

County	Source Type	NO_x (tpd)	SO_2 (tpd)	VOC (tpd)	CO (tpd)	PM_{10} (tpd)	$PM_{2.5}$ (tpd)	NH_3 (tpd)
Ada	Point	1.0	0.20	0.7	0.5	0.5	0.4	0.1
	Area[a]	4.3	0.10	42.8	43.5	*75.0*	*14.9*	8.9
	On-Road[a]	*14.7*	*0.08*	*8.7*	*144.3*	*0.8*	*0.6*	*0.3*
	Nonroad	3.8	0.10	3.3	54.5	0.3	0.3	0.0
	Biogenic	0.3	0.00	5.8	1.5	0.0	0.0	0.0
	Total	***24.1***	***0.48***	***61.3***	***244.3***	***76.6***	***16.2***	***9.3***
Canyon	Point	4.4	6.50	0.9	4.8	1.5	0.8	1.3
	Area[a]	2.3	0.10	24.2	40.0	*36.2*	*9.7*	18.2
	On-Road[a]	*9.9*	*0.05*	*6.5*	*100.6*	*0.6*	*0.4*	*0.2*
	Nonroad	2.0	0.00	1.1	16.6	0.2	0.2	0.0
	Biogenic	0.4	0.00	4.2	1.1	0.0	0.0	0.0
	Total	***19.0***	***6.65***	***36.9***	***163.1***	***38.5***	***11.2***	***19.7***
Elmore	Point	1.0	0.00	0.1	0.2	0.4	0.2	0.0
	Area	0.3	0.00	5.2	7.9	48.5	7.2	10.0
	On-Road	1.2	0.00	0.9	18.8	0.0	0.0	0.1
	Nonroad	1.5	0.00	0.4	2.9	0.1	0.1	0.0
	Biogenic	0.7	0.00	17.3	4.7	0.0	0.0	0.0
	Total	**4.7**	**0.00**	**23.9**	**34.5**	**49.0**	**7.5**	**10.1**
Total	Point	6.4	6.70	1.6	5.5	2.3	1.4	1.5
	Area[a]	6.8	0.20	72.2	91.4	*159.7*	*31.8*	37.1
	On-Road[a]	*25.8*	*0.13*	*16.0*	*263.7*	*1.4*	*1.0*	*0.6*
	Nonroad	7.3	0.10	4.8	74.0	0.6	0.5	0.0
	Biogenic	1.4	0.00	27.3	7.3	0.0	0.0	0.0
	Total	***47.7***	***7.13***	***121.9***	***441.9***	***164.0***	***34.7***	***39.2***

[a] On-road emission estimates were revised in 2012 for the Northern Ada County PM_{10} Limited Maintenance Plan Ten-Year Update. Ada and Canyon counties on-road emissions values and paved road dust emissions (PM_{10} and $PM_{2.5}$ in Area category) are from Appendix E of theTen-Year Update, entitled "Development of the Base- and Future-Year Mobile Source Emission Inventories for the Treasure Valley, Idaho." Elmore County emissions were not revised. Table values revised in 2012 are shown in italic.

Table 7-15. 2023 County-Level PM Season Emissions Summarized by Source Type

County	Source Type	NO_x (tpd)	SO_2 (tpd)	VOC (tpd)	CO (tpd)	PM_{10} (tpd)	$PM_{2.5}$ (tpd)	NH_3 (tpd)
Ada	Point	1.1	0.20	0.8	0.5	0.5	0.4	0.1
	Area[a]	4.5	0.10	52.6	44.8	*94.7*	*16.6*	9.1
	On-Road[a]	*10.9*	*0.10*	*6.6*	*149.7*	*0.8*	*0.5*	*0.4*
	Nonroad	2.8	0.10	3.3	59.2	0.2	0.2	0.0
	Biogenic	0.3	0.00	5.8	1.5	0.0	0.0	0.0
	Total	***19.6***	***0.50***	***69.1***	***255.7***	***96.3***	***17.7***	***9.6***
Canyon	Point	4.9	7.20	0.9	5.3	1.6	0.9	1.5
	Area[a]	2.3	0.10	27.4	41.0	*52.0*	*10.9*	18.3
	On-Road[a]	*8.5*	*0.06*	*5.5*	*105.3*	*0.6*	*0.4*	*0.2*
	Nonroad	1.3	0.00	1.1	18.0	0.1	0.1	0.0
	Biogenic	0.4	0.00	4.2	1.1	0.0	0.0	0.0
	Total	***17.4***	***7.36***	***39.1***	***170.7***	***54.3***	***12.3***	***20.0***
Elmore	Point	1.1	0.00	0.1	0.3	0.4	0.2	0.0
	Area	0.3	0.00	5.5	8.1	51.4	7.9	10.0
	On-Road	0.9	0.00	0.9	23.0	0.1	0.0	0.2
	Nonroad	1.0	0.00	0.3	3.1	0.0	0.0	0.0
	Biogenic	0.7	0.00	17.3	4.7	0.0	0.0	0.0
	Total	**4.0**	**0.00**	**24.1**	**39.2**	**51.9**	**8.1**	**10.2**
Total	Point	7.0	7.40	1.8	6.0	2.5	1.5	1.6
	Area[a]	7.2	0.30	85.5	93.9	*198.1*	*35.4*	37.4
	On-Road[a]	*20.3*	*0.16*	*12.9*	*278.0*	*1.5*	*0.9*	*0.8*
	Nonroad	5.1	0.10	4.7	80.3	0.4	0.4	0.0
	Biogenic	1.4	0.00	27.3	7.3	0.0	0.0	0.0
	Total	***41.0***	***7.96***	***132.2***	***465.5***	***202.5***	***38.2***	***39.8***

[a] On-road emission estimates were revised in 2012 for the Northern Ada County PM_{10} Limited Maintenance Plan Ten-Year Update. Ada and Canyon counties on-road emissions values and paved road dust emissions (PM_{10} and $PM_{2.5}$ in Area category) are from Appendix E of the Ten-Year Update, entitled "Development of the Base- and Future-Year Mobile Source Emission Inventories for the Treasure Valley, Idaho." Elmore County emissions were not revised. Table values revised in 2012 are shown in italic.

Table 7-16. 2050 County-Level PM Season On-Road Emissions for Ada County

County	Source Type	NO_x (tpd)	SO_2 (tpd)	VOC (tpd)	CO (tpd)	PM_{10} (tpd)	$PM_{2.5}$ (tpd)	NH_3 (tpd)
Ada	On-Road (MOVES)[a]	*31.3*	*0.18*	*18.5*	*307.8*	*1.8*	*1.3*	*0.66*
Ada	Paved Road Dust[a]	*N/A*	*N/A*	*N/A*	*N/A*	91.9	*N/A*	*N/A*
Ada	Unpaved Road Dust[a]	*N/A*	*N/A*	*N/A*	*N/A*	3.1	*N/A*	*N/A*

[a] For conformity demonstration in the Northern Ada County PM_{10} Limited Maintenance Plan Ten-Year Upate. Projected by scaling 2015 emissions using 2050/2015 ratio VMT projected by COMPASS.

8.0 EMISSIONS INVENTORY DATA FORMATTING

As indicated in the discussion of contract scope in Section 1.2, all contract tasks have been completed. The emissions results presented in this final report have been generated using either calculation spreadsheets or computer models.

In order to facilitate their use in air quality models, the relevant emissions data were exported to ASCII comma-delimited (.csv) files for re-formatting as input files to the Sparse Matrix Operator Kernel Emissions (SMOKE) model. Relevant parameters included pollutant emissions (i.e., annual, ozone season daily, and PM season daily), pollutant codes, SCCs, and county FIPS codes. For stationary point sources, information related to stack parameters and operating schedules were also needed. Where applicable, local temporal and speciation profiles were also provided in spreadsheet format. Computer scripts developed with Perl were then used to re-format emissions data for SMOKE. These script procedures were implemented by ENVIRON, who routinely performs these procedures and has developed a robust set of scripts, including limited internal data consistency checks, to accomplish this task.

Besides the final emissions inventory report, all inventory data (i.e., supporting data, spreadsheets, SMOKE-ready files, and all other ancillary information needed to duplicate the emissions inventory) have also been submitted to DEQ. The level of detail provided by the ERG/ENVIRON team ensures a transparent and defensible inventory that DEQ will be able to understand and replicate.

9.0 REFERENCES

AAR, 2009. *Analysis of Class 1 Railroad, 2008*. Association of American Railroads.

Alfaro, S.C. and Gomes, L., 2001. "Modeling mineral aerosol production by wind erosion: emission intensities and aerosol size distributions in source areas." *J. Geophys. Res.* 106 (16): 18075-18084.

Alfaro, S.C., Rajot, J.L., and Nickling, W.G., 2004. "Estimation of PM20 emissions by wind erosion: main sources of uncertainties." *Geomorphology* 59: 63-74.

Amick, 2010. Personal communication between Doug Amick (Greenleaf Deparment of Public Services) and John Grant (ENVIRON). April.

Anderson, 2010. Personal communication between John Anderson (Nampa & Meridian Irrigation District) and Marty Wolf (ERG). January 26.

Aurora, 2010. *State of Idaho Department of Environmental Quality's Residential Wood Combustion Inventory Survey: Treasure Valley Airshed. August 2008 to July 2009*. Final Report. Aurora Research Group, Sacramento, CA. January.

Baker, 2010. Personal communication between Carla Baker (City of Caldwell) and John Grant (ENVIRON). April.

Barnard, 2003. Personal communication between Bill Barnard (MACTEC Engineering & Consulting, Gainesville, FL) and Gerry Mansell (ENVIRON). April.

Barr, 2010. Personal communication between Don Barr (City of Nampa Public Works Department) and Marty Wolf (ERG). August 23.

Battye, W., V.P. Aneja, and P.A. Roelle, 2003. "Evaluation and improvement of ammonia emission inventories." *Atmospheric Environment* 37: 3873-3883.

Bequeath, 2010. Personal communication between Casey Bequeath (Nampa Highway District) and John Grant (ENVIRON). April.

Boise, 2010. Boise City Code. Internet address: http://www.cityofboise.org/Departments/City_Clerk/CityCode/

Bowman, 2010a. Personal communication between Von Bowman (Notus-Parma Highway District No. 2) and John Grant (ENVIRON). January.

Bowman, 2010b. Personal communication between Von Bowman (Notus-Parma Highway District No. 2) and Marty Wolf (ERG). August 24.

BTS, 2009. *National Transportation Atlas Database*. Bureau of Transportation Statistics, Research and Innovative Technology Administration. Internet Address: http://www.bts.gov/publications/national_transportation_atlas_database/

Caldwell, 2010. Personal communication between City of Caldwell Streets Department and Marty Wolf (ERG). August 24.

CARB, 1997. "Section 7.11 – Supplemental Documentation for Windblown Dust – Agricultural Lands." *Area Source Methods*. California Air Resources Board, Emission Inventory Analysis Section, Sacramento, CA. April.

CARB, 2003a. "Section 7.4 – Agricultural Land Preparation." *Area Source Methods*. California Air Resources Board, Emission Inventory Analysis Section, Sacramento, CA. January.

CARB, 2003b. "Section 7.5 – Agricultural Harvest Operations." *Area Source Methods*. California Air Resources Board, Emission Inventory Analysis Section, Sacramento, CA. January.

CARB, 2004. "Section 7.6 – Livestock Husbandry." *Area Source Methods*. California Air Resources Board, Emission Inventory Analysis Section, Sacramento, CA. May.

Chase, 2010. Personal communication between Doug Chase (Idaho Transportation Department) and Lan Ma (ENVIRON). January.

Chatenet, B., Marticorena, B., Gomes, L., and Bergametti, G., 1996. "Assessing the microped size distributions of desert soils erodible by wind." *Sedimentology* 43: 901-911.

Chinkin, L.R., P.A. Ryan, and D.L. Coe, 2003. *Recommended Improvements to the CMU Ammonia Emission Inventory Model for Use by LADCO*. Prepared for Lake Michigan Air Directors Consortium.

Chitjian, M., J. Koizumi, C.W. Botsford, G. Mansell, and E. Winegar, 2000. *1997 Gridded Ammonia Emissions Inventory Update for the South Coast Air Basin*. Final Report. Prepared for the South Coast Air Quality Management District.

Chitjian, M. and G. Mansell, 2003a. *An Improved Ammonia Inventory for the WRAP Domain – Literature Review*. Prepared for the WRAP Emissions Forum. October.

Chitjian, M. and G. Mansell, 2003b. *An Improved Ammonia Inventory for the WRAP Domain – Technical Description of the Modeling System*. Prepared for the WRAP Emissions Forum. November.

COMPASS, 2005. *Particulate Matter Air Quality Conformity Demonstration of the FY 2006-2010 Northern Ada County TIP*. Report No. 11-2005. Community Planning Association of Southwest Idaho. September.

COMPASS, 2010. Ada and Canyon county population forecasts for 2015, 2020, and 2025. Community Planning Association of Southwest Idaho (COMPASS).

DenBleyker, A., A. Pollack, J. Grant, and M. Jimenez, 2010. *Peer Review of CONCEPT-MV Work*. Technical memorandum prepared for Christopher Ramsdell, Idaho Department of Environmental Quality. May 21.

DEQ, 2006. *2005 Mobile Sources Emissions Inventory Report*. Internal Technical Memorandum prepared for Christopher Ramsdell by Jen Cole. Idaho Department of Environmental Quality. October.

DEQ, 2012. Base- and Future-Year Mobile Source Emissions Inventories for the Treasure Valley, Idaho. Idaho Department of Environmental Quality. July.

Economy.com, 2010. 4-digit NAICS-level Industrial Output Projections in Constant 2000 Dollars. Moody's Economy.com, West Chester, PA. May.

ECR, 2005. *Improving Model Inventory Data: Temporal Profiles, Final Technical Report*. February.

EEA, 2002. *Joint EMEP/CORINAIR Atmospheric Emission Inventory Guidebook, Third Edition.* European Environment Agency, Copenhagen, Denmark.

EIA, 2010. *Annual Energy Outlook 2010*. DOE/EIA-0383(2010). Energy Information Administration. April.

EIIP, 1997a. *Volume VI, Chapter 2 – Planning and Documentation*. Emission Inventory Improvement Program (EIIP). January.

EIIP, 1997b. *Volume III, Chapter 14 – Traffic Marking*. Final. Emission Inventory Improvement Program (EIIP). May.

EIIP, 1999. *Volume III, Area Source Method Abstract – Bakeries*. Emission Inventory Improvement Program (EIIP). June 21

EIIP, 2000. *Volume III, Area Source Method Abstract – Vehicle Fires*. Emission Inventory Improvement Program (EIIP). May 15.

EIIP, 2001a. *Volume III, Chapter 17 – Asphalt Paving*. Revised Final. Emission Inventory Improvement Program (EIIP). January.

EIIP, 2001b. *Volume III, Chapter 11 - Gasoline Marketing (Stage I and Stage II)*. Revised Final. Emission Inventory Improvement Program (EIIP). January.

EIIP, 2001c. *Volume III, Chapter 18 – Structure Fires*. Revised Final. Emission Inventory Improvement Program (EIIP). January.

EIIP, 2003. *Volume IX (Fugitive Dust from Beef Cattle Feedlots)*. Emission Inventory Improvement Program (EIIP). January.

EIIP, 2004. *Estimating Ammonia Emissions from Anthropogenic Nonagricultural Sources*. Draft final report. Emission Inventory Improvement Program (EIIP). April.

ENVIRON and ERG, 2002. *Development of Base and Future Year Emissions Inventories for the Northern Ada County PM10 SIP Maintenance Plan*. Prepared for the Idaho Department of Environmental Quality by ENVIRON International Corporation, Novato, CA and Eastern Research Group, Inc., Sacramento, CA. September 25.

ENVIRON et al., 2004. *Determining Fugitive Dust Emissions from Wind Erosion*. Prepared for the Western Governors' Association by ENVIRON International Corporation, Novato, CA; Eastern Research Group, Inc., Sacramento, CA; and Desert Research Institute, Reno, NV.

EPA (US Environmental Protection Agency). 2011a. "MOVES (Motor Vehicle Emission Simulator)." Available at: *http://www.epa.gov/otaq/models/moves/index.htm*.

EPA (US Environmental Protection Agency). 2011b. *AP-42 Compilation of Air Pollutant Emission Factors*. Accessed October 2011 at: *http://www.epa.gov/ttn/chief/ap42/index.html*.

ERG and ENVIRON, 2009. *2008, 2015, and 2023 Emissions Inventories for the Treasure Valley Airshed – Inventory Preparation Plan and Quality Assurance Plan*. Prepared for the Idaho Department of Environmental Quality by Eastern Research Group, Inc., Sacramento, CA and ENVIRON International Corporation, Novato, CA. July 15.

ERG, 2010. *Documentation for Aircraft Component of the National Emissions Inventory Methodology*. Eastern Research Group. April.

Etymezian, V., H. Kuhns, J. Gillies, M. Green, J. Chow, S. Kohl, and J. Watson, 2002. *Treasure Valley Road Dust Study*. Final Report. Prepared for Idaho Department of Environmental Quality by Desert Research Institute, Las Vegas, NV.

FAA, 2008. *Terminal Area Forecast (TAF).* Federal Aviation Administration (FAA). Internet address: http://aspm.faa.gov/main/taf.asp

FAA, 2010. *Air Traffic Activity Data System (ATADS).* Federal Aviation Administration (FAA). Internet address: http://www.apo.data.faa.gov/main/atads.asp

FRA, 2009. Locomotive Activity Dataset. Federal Railroad Administration.

Fugit, 2010. Electronic automatic traffic recorder data provided by Scott Fugit (Idaho Transportation Department). January

Gill, 2010. Personal communication between Dave Gill (Atlanta Highway District) and John Grant (ENVIRON). January.

Gilliland, A.K., R.L. Dennis, S.J. Roselle, and T.E. Pierce, 2003. "Seasonal NH_3 emissions for the eastern United States based on ammonium wet concentrations and inverse modeling". *Atmospheric Environment* 43: 5197-5206.

Girard, 2010. Personal communication between Rich Girard (Ada County Highway District) and Lan Ma (ENVIRON). January.

Gluch, 2010. Personal communication between Jim Gluch (Glenns Ferry Highway District) and John Grant (ENVIRON). January.

Grant, 2010. MOBILE6 input files provided by John Grant, ENVIRON. January 18.

Green, 2010. Personal communication between Brad Green (City of Middleton Public Works Department) and Marty Wolf (ERG). August 23.

Hardy, 2010. Personal communication between Rick Hardy (Idaho DEQ) and Alison Pollack (ENVIRON). May 25.

Harvel, 2010. Personal communication between Rick Harvel (City of Mountain Home Public Works Department) and Marty Wolf (ERG). August 20.

Houck, J.E. and B.N. Eagle, 2006. *Control Analysis and Documentation for Residential Wood Combustion in the MANE-VU Region*. Technical Memorandum 4 (Final Report) prepared for the Mid-Atlantic Regional Air Management Association, Inc. by OMNI Environmental Services, Inc., Beaverton, OR. December 19.

Hunter, 2009. Personal communication between Dan Hunter (Canyon County) and Gopi Manne (ERG). November.

Hutchinson, 2010. Personal communication between Ted Hutchinson (Ada County Solid Waste Management Department) and Marty Wolf (ERG). January.

ICAO, 1998. *Committee on Aviation Environmental Protection Fourth Meeting Report*. International Civil Aviation Organization, Doc 9720, CAEP/4, Montreal, 6-8 April.

IDPR, 2009a. *Idaho Primary Boat Registration Designation Statistics 2004-2008*. Provided by the Idaho Department of Parks and Recreation.

IDPR, 2009b. *Idaho OHV Registrations by Residence*. Provided by the Idaho Department of Parks and Recreation.

IDWR, 2006. *Canyon County, Idaho Irrigation Districts (map)*. Idaho Department of Water Resources. October 30. Internet address: http://www.idwr.idaho.gov/WaterManagement/WaterRelatedDistricts/PDFs/MAP%20FOR%20CANYON%20COUNTY.pdf

IDWR, 2007. *Irrigation Organizations with Service Areas in Ada County (map)*. Idaho Department of Water Resources. April 11. Internet address: http://www.idwr.idaho.gov/WaterManagement/WaterRelatedDistricts/PDFs/IrrMapAdaCounty.pdf

IPM Center, 2010. Idaho crop profiles. National Information System for the Regional IPM Centers, Raleigh, North Carolina. Internet address: http://www.ipmcenters.org/cropprofiles/CP_form.cfm

Karnowski, 2009. Summary reports from the Idaho Fire Incident Reporting System (IFIRS) provided by Cheryl Karnowski (Idaho State Fire Marshal). November 19.

Kennedy, 2010. Personal communication between Frank Kennedy (Nampa Highway District No. 1) and Marty Wolf (ERG). August 23.

Lane, 2010. Personal communication between Craig Lane (Wilder Deparment of Public Works) and John Grant (ENVIRON). April.
Langston R., S. Russell, R.S. Merle, D. Hart, V. Etyemezian, H. Kuhns, J. Gillies, D. Fritz, K. Bumiller, and D. James, 2008. *The Preferred Alternative Method for Measuring Paved Road Dust Emissions for Emissions Inventories: Mobile Technologies vs. The Traditional AP-42 Methodology*. In: 16th Annual International Emissions Inventory Conference. Mansell, G.E., 2003a. *Revised Windblown Fugitive Dust Emission Estimation Methodology*. Technical memorandum prepared for Michael Uhl, Department of Air Quality Management, Clark County, NV. October 6.

Mansell, G.E., 2003b. *Summary of WRAP Fugitive Dust Methodology Assumptions Model Sensitivity*. Technical memorandum prepared for Michael Uhl, Department of Air Quality Management, Clark County, NV. November 14.

Mansell, G.E., 2005. *Final Report Volume I: An Improved Ammonia Inventory for the WRAP Domain*. Prepared for the Western Regional Air Partnership by ENVIRON International Corporation, Novato, CA.

Mansell, G.E., R. Morris and M. Omary, 2004. *Recommendations and Model Performance Evaluation for the Phase II Windblown Fugitive Dust Emission Project*. Technical memorandum prepared for the WRAP Dust Emission Joint Forum. July.

Mansell, G. and T. Sakulyanonvittaya, 2009. *Review of DEQ Biogenic Emission Inventory for the Treasure Valley*. Revised technical memorandum prepared for Christopher Ramsdell and Rick Hardy, Idaho Department of Environmental Quality. December 31.

Marticorena, B., Bergametti, G., Gillette, D., and Belnap, J. 1997. "Factors controlling threshold friction velocity in semiarid and arid areas of the United States." *J. Geophysics Research* 102 (D19): 23277-23287.

McCain, 2010. Personal communication between Mike McCain (City of Mountain Home, Public Works Department) and Lan Ma (ENVIRON). January.

Midwest, 2006. *Midwest RPO Candidate Control Measures – Asphalt Paving*. Interim White Paper. Midwest Regional Planning Organization. March 10. Internet address: http://www.greenpatch.com/pdf/Midwest_OTC_VOC_laws.pdf

Mills, 2010. Personal communication between Jon Mills (Ada County Highway District) and Lan Ma (ENVIRON). January.

Moran, 2010. Personal communication between Earl Moran (City of Nampa Parks and Recreation Department) and Lan Ma (ENVIRON). January.

Morrison, 2010a. Personal communication between Jim Morrison (Idaho Transportation Department) and Marty Wolf (ERG). August 20.

Morrison, 2010b. Personal communication between Jim Morrison (Idaho Transportation Department) and Gopi Manne (ERG). January 27.

MRI, 2005. *Analysis of the Fine Fraction of Particulate Matter in Fugitive Dust. Draft Project Report*. Prepared for the Western Regional Air Partnership by Midwest Research Institute, Kansas City, MO. August 17.

NASS, 2007. *Cropland Data Layer*. U.S. Department of Agriculture, National Agricultural Statistics Service. Internet address: http://www.nass.usda.gov/research/Cropland/SARS1a.htm.

NASS, 2009a. NASS website, National Agricultural Statistics Service, U.S. Department of Agriculture. Internet address: http://www.nass.usda.gov/

NASS, 2009b. *Idaho Crop Progress and Condition Reports,* Issue ID-CW1408 (Week Ending April 6, 2008) through Issue ID-CW4308 (Week Ending October 26, 2008). National Agricultural Statistics Service, U.S. Department of Agriculture. Internet address: http://www.nass.usda.gov/Statistics_by_State/Idaho/Publications/Crop_Progress_&_Condition/index.asp

NASS, 2010. Quick Stats for Ada, Canyon, and Elmore Counties, Idaho. National Agricultural Statistics Service. Internet address: http://www.nass.usda.gov/Statistics_by_State/Idaho/index.asp

Newlun, 2010. Personal communication between Gail Newlun (Idaho Transportation Department) and Gopi Manne (ERG). January 27.

Nobel, 2010. Personal communication between Randy Nobel (Ada County Highway District) and Marty Wolf (ERG). August 23.

Norris, 2010a. Personal communication between David Norris (Golden Gate Highway District No. 3) and John Grant (ENVIRON). January.

Norris, 2010b. Personal communication between David Norris (Golden Gate Highway District No. 3) and Marty Wolf (ERG). August 23.

Olmanson, 2010. Personal communication between Ken Olmanson (Idaho Northern Pacific Railroad) and Tim Sturtz (ENVIRON). January.

Pace, T.G., 2003. *A Conceptual Model to Adjust Fugitive Dust Emissions to Account for Near Source Particle Removal in Grid Model Applications*. U.S. Environmental Protection Agency. August 22.

Pace, T.G., 2005. *Methodology to Estimate the Transportable Fraction (TF) of Fugitive Dust Emissions for Regional and Urban Scale Air Quality Analyses*. U.S. Environmental Protection Agency. June 2.

Pettit, 2009. County-level extracts from the *Southwest Burn Management Area Report* provided by Jonathan Pettit, Idaho Department of Environmental Quality. November 19.

Potter, C., C. Krauter, and S. Klooster, 2001. *Statewide Inventory Estimates of Ammonia Emissions from Native Soils and Chemical Fertilizers in California*. Prepared for the California Air Resources Board. June

Radek, 2009. Personal communication between Kyle Radek (City of Meridian, Buildings Department) and Gopi Manne (ERG). November.

Richard, 2010a. Personal communication between Timothy Richard (Canyon Highway District No. 4) and John Grant (ENVIRON). January.

Richard, 2010b. Personal communication between Timothy Richard (Canyon Highway District No. 4) and Marty Wolf (ERG). August 20.

Richard, 2010c. Personal communication between Timothy Richard (Canyon Highway District No. 4) and Gopi Manne (ERG). January 27.

Russell, A.G. and G.R. Cass, 1986. "Verification of a Mathematical Model for Aerosol Nitrate and Nitric Acid Formation and Its Use for Control Measure Evaluation." *Atmospheric Environment* 20: 2011-2025.

Sierra, 2006. *Development of Fleet Characteristics Data for the Idaho On-Road Motor Vehicle Fleet*. Sierra Research, Inc. January.

Stanford, K., R. Silasi, T.A. McAllister, and K.S. Schwartzkopf-Genswein, 2009. "Behavior of feedlot cattle affects voluntary oral and physical interactions with manila ropes." *Journal of Animal Science* 87: 296-303.

Sterling, 2010. City/county codes (Caldwell, Eagle, Garden City, Greenleaf, Kuna, Meridian, Middleton, Mountain Home, Nampa, Parma, Star, Wilder, Ada County, and Canyon County), Sterling Codifiers, Coeur d'Alene, ID. Internet address: http://www.sterlingcodifiers.com/

Strachan, 2009. Personal communication between Sara Strachan (Idaho Department of Environmental Quality) and Gerard Mansell (ENVIRON). September.

Strader, R., N. Anderson, and C. Davidson, 2004. *CMU Ammonia Model*. Version 3.6. Internet address: http://www.cmu.edu/ammonia/July 7.

Teddicken, 2010. Personal communication between Ed Teddicken (City of Boise Parks and Recreation Department) and Lan Ma (ENVIRON). January.

Tindall, 2010a. Personal communication between Wayne Tindall (Mountain Home Highway District) and John Grant (ENVIRON). January.

Tindall, 2010b. Personal communication between Wayne Tindall (Mountain Home Highway District) and Marty Wolf (ERG). August 24.

U.S. Census, 2005a. *2002 Economic Census (Sector 72: Accommodation and Food Services: Subject Series – Misc. Subjects: Principal Menu Type or Specialty for the United States and States: 2002).* U.S. Census Bureau. December 7.

U.S. Census, 2005b. *Interim Projections of the Total Population for the United States and States: April 1, 2000 to July 1, 2030 (Table A1)*. U.S. Census Bureau, Washington, DC. April 21.

U.S. Census, 2009a. *2007 County Business Patterns*. U.S. Census Bureau. July. Internet address: http://www.census.gov/econ/cbp/index.html

U.S. Census, 2009b. *Annual Estimates of the Resident Population for Incorporated Places in Idaho, Listed Alphabetically: April 1, 2000 to July 1, 2008*. SUB-EST2008-04-16. U.S. Census Bureau, Population Division. July 1.

U.S. Census, 2009c. *Annual Estimates of the Resident Population by Age, Sex, Race, and Hispanic Origin for Counties: April 1, 2000 to July 1, 2008*. U.S. Census Bureau. Internet address: http://www.census.gov/popest/counties/asrh/CC-EST2008-alldata.html

U.S. Census, 2010. *Building permit database*. Internet address: http://censtats.census.gov/bldg/bldgprmt.shtml

USDA, 1994. *State Soil Geographic (STATSGO) Data Base, Data use information*, Miscellaneous Publication Number 1492. U.S. Department of Agriculture, Natural Resources Conservation Service, National Soil Service Center. Internet address: http://www.essc.psu.edu/soil_info/. December.

USDA, 1997. *Usual Planting and Harvesting Dates for U.S. Field Crops*, Agricultural Handbook Number 628. U.S. Department of Agriculture.

USDA, 2009. *2007 Census of Agriculture, Idaho State and County Data (Volume 1 Geographic Area Series, Part 12)*, AC-07-A-12. U.S. Department of Agriculture. February 4. Internet address: http://www.agcensus.usda.gov/Publications/2007/Full_Report/Volume_1,_Chapter_2_County_Level/Idaho/index.asp

USDA, 2010. *Soil Survey Geographic Database (SSURGO)*. U.S. Department of Agriculture, Natural Resources Conservation Service. Internet address: http://soils.usda.gov/survey/geography/ssurgo/

U.S. EPA, 1992. *Procedures for Emission Inventory Preparation – Vol. IV: Mobile Sources*. EPA420-R-92-009. December.

U.S. EPA, 1997a. *Locomotive Emission Standards, Regulatory Support Document (RSD),* U.S. Environmental Protection Agency, Office of Mobile Sources, April.

U.S. EPA, 1997b. *Emission Factors (EF) for Locomotives*. EPA420-F-97-051. U.S. Environmental Protection Agency. December.

U.S. EPA, 2002a. *Review of Emission Factors and Methodologies to Estimate Ammonia Emissions from Animal Waste Handling*. EPA-600/R-02-017. U.S. Environmental Protection Agency, National Risk Management Research Laboratory, Research Triangle Park, NC. April.

U.S. EPA, 2002b. *Emissions Modeling Clearinghouse Temporal Allocation Files*. U.S. Environmental Protection Agency. April 29. Internet address: http://www.epa.gov/ttnchie1/emch/temporal/index.html

U.S. EPA, 2006. *Documentation for the Final 2002 Nonpoint Sector (FEB 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants*. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC. July.

U.S. EPA, 2007. *Development Work for Improved Heavy-Duty Vehicle Modeling Capability Data Mining – FHWA Datasets.* EPA/600/R-07/096. U.S. Environmental Protection Agency. July.

U.S. EPA, 2008. *Regulatory Impact Analysis (RIA): Control of Emissions of Air Pollution from Locomotive Engines and Marine Compression Ignition Engines Less than 30 Liters Per Cylinder*. EPA420-R-08-001. U.S. Environmental Protection Agency. March.

U.S. EPA, 2009a. *Municipal Solid Waste Generation, Recycling, and Disposal in the United States – Detailed Tables and Figures for 2008*. U.S. Environmental Protection Agency, Office of Resource Conservation and Recovery. November.

U.S. EPA, 2009b. *NONROAD2008* model. U.S. Environmental Protection Agency, Office of Transportation and Air Quality. Internet address: http://www.epa.gov/otaq/ nonrdmdl.htm#model

U.S. EPA, 2009c. *Emission Factors for Locomotives*. EPA-420-F-09-025. Office of Transportation and Air Quality. April.

U.S. EPA, 2010a. *Compilation of Air Pollution Emission Factors – Volume 1: Stationary Point and Area Sources (AP-42), Fifth Edition (and subsequent updates)*. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina.

U.S. EPA, 2010b. *U.S. EPA's NEI2008*. Internet address: http://www.epa.gov/ttn/chief/net/ 2008inventory.html).

U.S. EPA, 2010c. *Motor Vehicle Emission Simulator 2010 (MOVES2010)* model. U.S. Environmental Protection Agency, Office of Transportation and Air Quality. Internet address: http://www.epa.gov/otaq/models/moves/index.htm

USGS, 2010. *National Hydrography Dataset*. U.S. Geological Service. Internet address: http://nhd.usgs.gov/data.html

Waldinger, 2009. Personal communication between Mary Ann Walldinger (COMPASS) and Alison Pollack (ENVIRON). August.

Waldinger 2010. Personal communication between Mary Ann Walldinger (COMPASS) and John Grant (ENVIRON). January.

Walter, 2010. Personal communication between Craig Walter (City of Boise, Public Works Department) and Lan Ma (ENVIRON). January.

Walters, 2010. State-level gasoline statistics provided by Dar Walters, Idaho Tax Commission.

Webb, 2009. Personal communication between Steve Webb (City of Boise, Buildings Department) and Gopi Manne (ERG). November.

Winterfield, 2009. Personal communication between Steve Webb (Elmore County, Growth and Development Department) and Gopi Manne (ERG). November.

Winterfeld, 2010. Personal communication between Bob Winterfeld (Elmore County, Growth and Development Department) and Lan Ma (ENVIRON). January.

Woodward, 2010. Personal communication between Mike Woodward (City of Boise Parks and Recreation Department) and Lan Ma (ENVIRON). January.

WRCC. 2009. *Idaho Climate Summaries: Period of Record General Climate Summaries*. Western Regional Climate Center, Desert Research Institute. December.

Wright, 2010. Personal communication between Raquel Wright (Federal Railroad Administration) and Tim Sturtz (ENVIRON). January.

York, 2010. Personal communication between Wendy York (Sorrento Lactalis) and Marty Wolf (ERG). May 5.

Zhang, 2009. Personal communication regarding MM5 modeling from Wei Zhang (Idaho Department of Environmental Quality). August 8.

Appendix E. Development of the Base- and Future-Year Mobile Source Emissions Inventory for the Treasure Valley, Idaho

This page intentionally left blank for correct double-sided printing.

Development of the Base- and Future-Year Mobile Source Emissions Inventory for the Treasure Valley, Idaho

July 2012

Prepared by
Idaho Department of Environmental Quality
Technical Services Division
1410 N. Hilton
Boise, Idaho 83706

This page intentionally left blank for correct double-sided printing.

Table of Contents

List of Figures

List of Tables

Abbreviations, Acronyms, and Symbols

ATR	automatic traffic recorder
AVFT	alternative vehicle fuels and technology
BPR	Bureau of Public Roadways
CBD	central business district
CNG	compressed natural gas
CO	carbon monoxide
COMPASS	Community Planning Association of Southwest Idaho
DEQ	Idaho Department of Environmental Quality
DMV	Idaho Department of Motor Vehicles
E10	fuel blend of 10% ethanol and 90% gasoline
EI	emissions inventory
EPA	US Environmental Protection Agency
ERG	Eastern Research Group
FHWA	Federal Highway Administration
HOV	high-occupancy vehicle
HPMS	Highway Performance Monitoring System
I/M	inspection and maintenance
ITD	Idaho Transportation Department
MOVES	Motor Vehicle Emissions Simulator
mph	miles per hour
NH_3	ammonia
NO_x	nitrogen oxides
PM	particulate matter
PM_{10}	particulate matter with a diameter less than 10 microns
$PM_{2.5}$	particulate matter with a diameter less than 2.5 microns
SH	state highway
SIP	state implementation plan
SO_2	sulfur dioxide
TDM	travel demand model
TVRDS	Treasure Valley road dust study
US	United States
VHT	vehicle hours traveled
VIN	vehicle identification number
VMT	vehicle miles traveled
VOC	volatile organic compound

This page intentionally left blank for correct double-sided printing.

1 Introduction

The State of Idaho contracted with Eastern Research Group (ERG) and Environ International Corporation (Environ) to complete state implementation plan (SIP)-quality emissions inventories (EIs) for the Treasure Valley of Idaho. ERG and Environ jointly completed the 2008, 2015, and 2023 EIs (ERG and Environ 2010) using the MOBILE6.2 model for on-road mobile source emissions. The Idaho Department of Environmental Quality (DEQ) contracted with ERG and Environ to prepare these EIs to support renewal of the northern Ada County PM_{10} maintenance plan and other projects.[1] As a result, Elmore and Canyon Counties are included in the EIs.

Since completing these EI estimates, the US Environmental Protection Agency (EPA) has released a new mobile source emissions model, the Motor Vehicle Emissions Simulator (MOVES2010a) (EPA 2011a). In an effort to ensure that the State of Idaho is using the most recent emissions models for SIP and maintenance plan development and for developing motor vehicle emission budgets for subsequent conformity determinations, the mobile source portion of each EI was redone using the MOVES2010a emissions model (hereafter referred to simply as MOVES), and the paved road dust emissions were developed using the latest EPA-recommended (AP-42) method (EPA 2011b). Unpaved road dust emission estimates included in the 2010 EI were used as reported (ERG and Environ 2010). This report details the methodologies and results for the MOVES on-road emissions modeling and road dust computations.

MOVES is the EPA-designated model for on-road mobile EI development for SIPs and maintenance plans and for Federal Highway Administration (FHWA) transportation conformity determinations. The on-road mobile source EI was developed using MOVES according to the *Technical Guidance on the Use of MOVES2010 for Emission Inventory Preparation in State Implementation Plans and Transportation Conformity* (EPA 2010). The results will be reviewed through an interagency consultation process.

Paved and unpaved road dust emission estimates were included in the 2008, 2015, and 2023 Treasure Valley EIs (ERG and Environ 2010). For the PM_{10} maintenance plan update, new paved road dust emissions estimates were developed by DEQ; however, unpaved road dust emissions estimates included in this update were not changed from those presented in the 2008, 2015, and 2023 Treasure Valley EIs (ERG and Environ 2010).

The Northern Ada County PM_{10} Maintenance Area only includes the northern, populated portion of Ada County. The southern portion is largely unpopulated, but all emission estimates represent the entire county. The EI for the entire county provides a conservative surrogate for emissions in the Northern Ada County Maintenance Area. In addition, the adjacent Canyon County is not within the PM_{10} maintenance area. However, since this mobile source EI must meet other purposes, such as photochemical modeling, and since the airshed today includes Canyon County, the Canyon County emissions are retained in this report.

[1] PM_{10} is particulate matter with an aerodynamic diameter less than 10 microns. $PM_{2.5}$, discussed later in this report, has an aerodynamic diameter less than 2.5 microns.

2 Methodology: MOVES Input Database Development

To operate the MOVES model at the county-level as required by EPA for SIP-level EIs, DEQ developed an input database for each specific combination of inputs. This section discusses the assumptions, sources of input information, and calculation methodologies involved in developing SIP-level MOVES input databases.

Figure 1 describes the required MOVES input databases, grouped by common data source. For example, inputs related to vehicle miles traveled (VMT) (top box in Figure 1)—such as road type distribution and monthly, daily, and hourly traffic profiles—require detailed information on the VMT within the modeling domain. DEQ prepared input files for each group using a combination of (primarily) local data and national default values where good local data were not available. This section discusses the creation of each input. The input data file format under discussion is provided after each section heading for clarification.

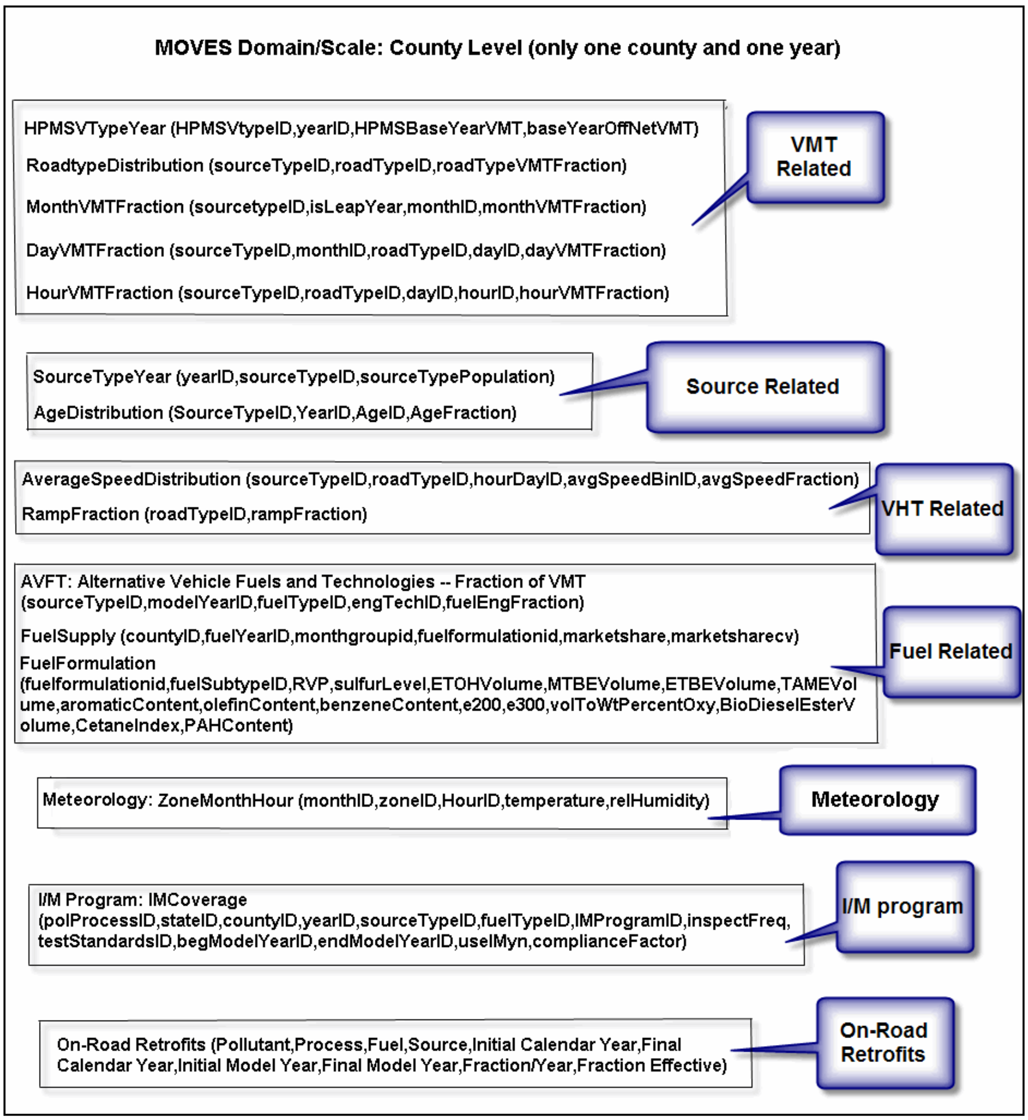


Figure 1. MOVES input files and groups.

2.1 VMT-Related Inputs

VMT inputs describe the distance traveled on different roadways by the various source types (vehicles). VMT-related inputs include road type distribution and VMT (annual, monthly, daily, and hourly estimates). The road type VMT distribution data set was developed from the Ada/Canyon County travel demand model (TDM), and the monthly, weekday/weekend, and hourly VMT profiles were developed from permanent automatic traffic recorders (ATRs). The TDM results for the 2008 base year were prepared by the Community Planning Association of Southwest Idaho (COMPASS) in 2009 and updated in early 2011 to reflect the recently released 2010 census data. This 2011 update allowed COMPASS to make some minor adjustments in the 2008 model to reflect real variations in population shifts in some areas reflected in the first new census tract data in 10 years (M. Waldinger, COMPASS, personal communication, 2011).

MOVES road types and source (vehicle) types are defined in Table 1 and Table 2.

Table 1. MOVES road type descriptions.

Road Type	Description
1	Off-Network
2	Rural Restricted Access
3	Rural Unrestricted Access
4	Urban Restricted Access
5	Urban Unrestricted Access

Table 2. MOVES source type descriptions.

MOVES Source Type	Description
11	Motorcycle
21	Passenger Car
31	Passenger Truck
32	Light Commercial Truck
41	Intercity Bus
42	Transit Bus
43	School Bus
51	Refuse Truck
52	Single Unit Short-haul Truck
53	Single Unit Long-haul Truck
54	Motor Home
61	Combination Short-haul Truck
62	Combination Long-haul Truck

2.1.1 Road Type

RoadtypeDistribution(sourceTypeID, roadTypeID, roadTypeVMTFraction)

The road type distribution describes the fraction of fleet miles driven on each of the four applicable MOVES road types (rural restricted, rural unrestricted, urban restricted, and urban unrestricted) within the modeling domain for each source (vehicle) type. Road type distribution inputs were derived from TDM outputs provided by COMPASS, annual Highway Performance Monitoring System (HPMS) VMT by FHWA road type, and link-level Idaho Transportation Department (ITD) ATR data. A crosswalk table in Appendix A shows the relationships between COMPASS TDM road types, the HPMS/FHWA road types, and the MOVES roadway types. ITD ATR data were aggregated by county and used to allocate the annual VMT for each source type to road types. When the annual road distributions were complete for the FHWA road types, the distributions were aggregated into the four MOVES road types.

2.1.2 Annual VMT

HPMSVTypeYear(HPMSVtypeID, yearID, HPMSBaseYearVMT, baseYearOffNetVMT)

Annual VMT is the yearly VMT for each HPMS vehicle type for each county in the domain. ITD ATR data were used to generate a weekday/weekend ratio and fleet mix for each road type, which were then applied to COMPASS TDM annual average weekday VMT outputs to estimate annual VMT for base and future years.

Comparing annual VMT attributed to local roads from the TDM output to annual local road VMT from ITD fuels sales data indicated that the TDM underestimates VMT from local roads, a common trait of TDM models nationwide. To compensate for this, DEQ scaled up TDM local road VMT to match ITD HPMS estimates. For base and future years, annual local road VMT estimates were adjusted up using the same scaling factor. The final TDM-based VMT after the local road reconciliation are summarized in Table 3.

Table 3. TDM-based annual vehicle miles traveled.[a]

County	Year	Vehicle Miles Traveled
Ada	2008	3,203,969,729
Ada	2015	3,887,965,879
Ada	2023	5,533,619,325
Canyon	2008	1,574,168,589
Canyon	2015	1,992,190,855
Canyon	2023	3,164,270,684

a After adjustment of local road vehicle miles traveled to match HPMS

2.1.3 Monthly, Daily, and Hourly VMT

MonthVMTFraction(sourcetypeID, isLeapYear, monthID, monthVMTFraction)
DayVMTFraction(sourceTypeID, monthID, roadTypeID, dayID, dayVMTFraction)
HourVMTFraction(sourceTypeID, roadTypeID, dayID, hourID, hourVMTFraction)

Temporal distribution profiles further divided the source type annual VMT into finer time increments. Temporal profiles were derived from ATR data and annual VMT by FHWA road type, the latter of which were calculated from TDM outputs provided by COMPASS.

ATR data contain hourly vehicle counts for each of 5 length categories or “bins.” Counts for each length bin were converted to temporal distributions for each MOVES vehicle type and roadway type using a crosswalk scheme developed based on discussions with ITD and 2007–2009 Idaho statewide vehicle classification data (Scott Fugit, ITD, personal communication). The final crosswalk table, which maps ATR length bins to MOVES vehicle types, is provided in Appendix B, and the 2007–2009 classification data are provided in Appendix C. Neither ATR data nor FHWA vehicle classification data distinguish between personal or commercial trips, and long or short-haul truck trips, so it was necessary to use national default fractions available in the MOVES model to make the final splits from FHWA classes to MOVES vehicle types in these areas. For each ATR site, a full year of ATR data were processed. Hourly, weekday/weekend, and monthly statistics were calculated for each vehicle type. Finally, ATR sites were grouped based on MOVES road types, and each site was weighted equally in constructing the final temporal profiles. For the purposes of the MOVES modeling and paved road dust calculations, winter (particulate matter, or PM) season is defined as November 1–February 29, and the summer or “nonwinter” season is defined as April 1–October 31.

Future-year temporal profiles for each road type were developed from the TDM output using the base-year ATR-based temporal profiles along with future-year VMT.

2.2 Source-Related Inputs

This group of inputs includes source type population and age distribution. Source-related inputs describe and group the vehicles in the modeling domain and are compiled using a variety of data sources (Table 4). The fleet mix distribution is a key component of on-road mobile source emissions.

In March 2011, DEQ decoded individual Idaho Department of Motor Vehicles (DMV) registration records of vehicles registered in the Treasure Valley using the Polk vehicle identification number (VIN) decoding system. The decoded VINs provide information regarding the vehicle make, model, age, and fuel types. This information was then used to develop the MOVES source type population input and fleet age distribution input. An earlier VIN decoding project by Sierra Research (Sierra Research 2006) is used to provide source population data for the years prior to 1981.

Table 4. Crosswalk between MOVES source types and data sources for source-related MOVES input parameters.

MOVES Source Type	Source-Related Input Data Source
Motorcycle	ITD—DMV Registration Database (2011), Sierra Research (2006)
Passenger Car	ITD—DMV Registration Database (2011), Sierra Research (2006)
Passenger Truck	ITD—DMV Registration Database (2011), Sierra Research (2006)
Light Commercial Truck	ITD—DMV Registration Database (2011), Sierra Research (2006)
Intercity Bus	MOVES Default Database, Annual Local VMT, Sierra Research (2006)
Transit Bus	ValleyRide
School Bus	Idaho Department of Education
Refuse Truck	MOVES Default Database, Annual Local VMT, Sierra Research (2006)
Single Unit Short-haul Truck	MOVES Default Database, Annual Local VMT, Sierra Research (2006)
Single Unit Long-haul Truck	MOVES Default Database, Annual Local VMT, Sierra Research (2006)
Motorhome	ITD—DMV Registration Database (2011), Sierra Research (2006)
Combination Short-haul Truck	MOVES Default Database, Annual Local VMT, Sierra Research (2006)
Combination Long-haul Truck	MOVES Default Database, Annual Local VMT, Sierra Research (2006)

2.2.1 Source Type Population

SourceTypeYear(yearID, sourceTypeID, sourceTypePopulation)

The source type population input describes the types and numbers of vehicles that make up the fleet. Five major data sources were used to develop the source type population inputs: VIN-decoded ITD registration data, MOVES national default population and activity data, local activity data derived from TDM output, ValleyRide transit bus fleet data, and Idaho Department of Education school bus fleet data (Table 4).

Direct population data were available for transit buses from ValleyRide and for school buses from the Idaho Department of Education. For motorcycle, passenger car, passenger truck, light commercial truck, and motorhome source types, VIN-decoded registration data were used to determine vehicle populations.

For all other heavy-duty source types, a factor was used to estimate the local source type populations using local activity data, MOVES national default activity data, and MOVES national default source type populations (Equation 1).

$$Population_{Local}^{SourceType} = VMT_{Local}^{SourceType}\left(\frac{Population_{NatlDefault}^{SourceType}}{VMT_{NatlDefault}^{SourceType}}\right)$$

Equation 1. Estimate of vehicle population for source types without local data available.

Equation 1 was used to estimate the MOVES source type population inputs for most heavy-duty vehicle types for Ada and Canyon Counties, except transit buses, school buses, and motorhomes. Future-year source type populations were estimated using Equation 1 by substituting local future-year annual VMT for base-year annual VMT, future-year national default population for base-year national default population, and future-year national default VMT for base-year national default VMT.

2.2.2 Age Distribution

AgeDistribution(SourceTypeID, YearID, AgeID, AgeFraction)

This input provides an age profile of the fleet. Separate age distributions were developed for Ada and Canyon Counties using VIN-decoded vehicle registration data, pre-1981 vehicle population data from an earlier VIN-decoder study (Sierra Research 2006), transit bus fleet age data from ValleyRide, and school bus fleet age data from the Idaho Department of Education. The same age distribution inputs were used for base and future years.

2.3 VHT-Related Inputs

Vehicle hours traveled (VHT) inputs capture the time spent on roads by vehicles. This group of inputs includes ramp fractions and average speed distribution.

2.3.1 Ramp Fractions

RampFraction(roadTypeID, rampFraction)

Ramp fraction defines the portion of VHT on roadways that contain entrance and exit ramps for restricted access roadways. Base- and future-year ramp fractions for urban and rural freeways were calculated by aggregating VHT on ramps and restricted access roadways using TDM output from COMPASS, then dividing ramp VHT by total restricted access roadway VHT to get the fraction of restricted access VHT attributed to ramps. Urban ramp fractions are 0.085 for winter season and 0.086 for summer season, while rural ramp fractions are 0.010 for both seasons in Ada and Canyon Counties.

2.3.2 Average Speed Distribution

AverageSpeedDistribution(sourceTypeID, roadTypeID, hourDayID, avgSpeedBinID, avgSpeedFraction)

The average speed distribution allocates the different source types (vehicles) for each roadway type to 16 speed bins ranging from 0 to >75 miles per hour (mph) (Table 5). This input reflects levels of congestion on roadways. Average speed distributions were developed from TDM average daily traffic counts for each roadway segment and hourly traffic count statistics developed from detailed ATR traffic count data provided by ITD.

Table 5. MOVES speed bins.

avgSpeedBinID	*avgBinSpeed*	*avgSpeedBinDesc*
1	2.5	speed < 2.5 mph
2	5	2.5 mph ≤ speed < 7.5 mph
3	10	7.5 mph ≤ speed < 12.5 mph
4	15	12.5 mph ≤ speed < 17.5 mph
5	20	17.5 mph ≤ speed <22.5 mph
6	25	22.5 mph ≤ speed < 27.5 mph
7	30	27.5 mph ≤ speed < 32.5 mph
8	35	32.5 mph ≤ speed < 37.5 mph
9	40	37.5 mph ≤ speed < 42.5 mph
10	45	42.5 mph ≤ speed < 47.5 mph
11	50	47.5 mph ≤ speed < 52.5 mph
12	55	52.5 mph ≤ speed < 57.5 mph
13	60	57.5 mph ≤ speed < 62.5 mph
14	65	62.5 mph ≤ speed < 67.5 mph
15	70	67.5 mph ≤ speed < 72.5 mph
16	75	72.5 mph ≤ speed

The hourly ATR-based traffic count profiles for each roadway type were used to estimated hourly volume on each segment, and the modified Bureau of Public Roadways (BPR) volume/capacity curve (Equation 2) was then used to develop the average speed distribution database for each hour.

$$Hourly\ Vehicle\ Speed = Free\ Flow\ Speed * \left(1 + A * \left(\frac{Volume}{Capacity}\right)^{B}\right)$$

Equation 2. BPR Curve

Where A and B are local coefficients used in the TDM as provided by COMPASS.

Base- and future-year average speed distributions were developed for all four MOVES road types using TDM base and future-year outputs developed by COMPASS for the Treasure Valley and detailed ATR data provided by ITD.

2.4 Fuel-Related Inputs

This group of inputs includes data regarding alternative vehicle fuels and technology (AVFT), fuel supply, and fuel formulation.

2.4.1 Alternative Vehicle Fuels and Technology (AVFT)

AVFT(sourceTypeID, modelYearID, fuelTypeID, engTechID, fuelEngFraction)

AVFT input files in MOVES allow the user to assign source type activity by model year to vehicles with different fuel and/or engine technologies. Ada and Canyon Counties were modeled using a custom AVFT input file derived from VIN-decoded registration data. The same AVFT input was used for base and future years.

2.4.2 Fuel Supply

FuelSupply(countyID, fuelYearID, monthgroupid, fuelformulationid, marketshare, marketsharecv)

National default fuel supply inputs were used for all source types except transit buses. A large portion of the transit bus fleet in the Treasure Valley operates on compressed natural gas (CNG). For this reason, CNG fuels were included in base- and future-year modeling.

2.4.3 Fuel Formulation

FuelFormulation(fuelformulationid, fuelSubtypeID, RVP, sulfurLevel, ETOHVolume, MTBEVolume, ETBEVolume, TAMEVolume, aromaticContent, olefinContent, benzeneContent, e200, e300, volToWtPercentOxy, BioDieselEsterVolume, CetaneIndex, PAHContent)

With the exception of 10% ethanol in gasoline (E10), MOVES national default fuel formulations were used as base-year inputs for each county. These default values were judged to be reasonable based on local knowledge, except for the E10 market share. The base-year E10 market share was updated with information provided by fuel suppliers (Table 6). Future-year runs used default values since the E10 market share is known to be nearly 100% at the present (late 2011) and is expected to remain so in the foreseeable future, consistent with the MOVES default database.

Table 6. E10 market share.

Year	Market Share
2008	0.68
2015	1.00 (National Default)
2023	1.00 (National Default)

2.5 Meteorology

ZoneMonthHour(monthID, zoneID, HourID, temperature, relHumidity)

The meteorology input compiles the average hourly temperature and relative humidity data for each county. Base- and future-year inventories were modeled using average hourly temperature and relative humidity data by county for each month from a representative weather station for each county. Ada County is represented by the National Weather Service station at the Boise Air Terminal and Canyon County is represented by the data set from the Caldwell Industrial Airport (Figure 2).

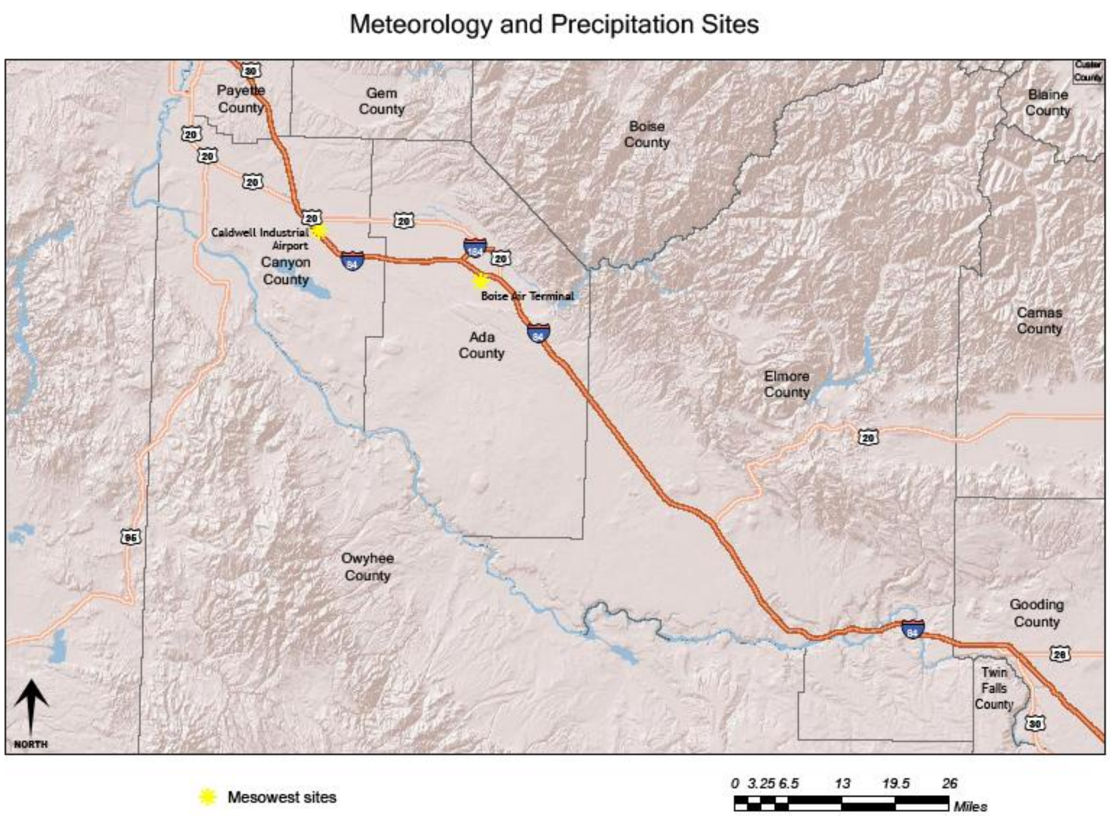


Figure 2. Meteorological and precipitation observation sites in Ada and Canyon Counties.

2.6 Inspection and Maintenance (I/M) Programs

IMCoverage(polProcessID, stateID, countyID, yearID, sourceTypeID, fuelTypeID, IMProgramID, inspectFreq, testStandardsID, begModelYearID, endModelYearID, useIMyn, complianceFactor)

Inspection and maintenance (I/M) programs require registered vehicles to undergo periodic emissions tests. During the 2008 base year, Ada County had an active I/M program and was modeled as such. Canyon County did not have an active I/M program during 2008 and was modeled without any I/M program active in MOVES.

For 2015 and 2023 future-year modeling, Ada and Canyon Counties were both modeled with active I/M programs to reflect the implementation of an I/M program in 2010 in Canyon County along with accompanying changes to the Ada County I/M program during the same time frame.

2.7 On-Road Retrofits

On-roadRetrofits(Pollutant, Process, Fuel, Source, InitialCalendarYear, FinalCalendarYear, InitialModelYear, FinalModelYear, Fraction/Year, FractionEffective)

Neither Ada nor Canyon County use on-road retrofits. Therefore, both counties were modeled without on-road retrofits specified in the MOVES input database.

3 Methodology: Paved and Unpaved Road Dust

Fugitive dust from paved and unpaved roads is a significant source of PM emissions. In general, the factors that affect paved road dust emissions include the weight of the vehicles that drive on the roadway surface, vehicle speed, fine particle (silt) loading on the roadway surface available for entrainment, and precipitation on the roadway that decreases road dust emissions. Unpaved road dust emission estimates are used directly as reported in the area sources category of the Treasure Valley base-year and future-year EIs (ERG and Environ 2010). Paved road dust emission estimates were developed by DEQ in 2011 to replace the ERG/Environ (2010) estimates, as described in the following sections.

In 2010, the 2008, 2015, and 2023 paved road dust emission estimates were completed for the Treasure Valley as part of the 2008 SIP-level EI (ERG and Environ 2010). The paved road dust EIs were completed using an emission factor methodology and local data developed during the Treasure Valley road dust study (TVRDS) (Etyemezian et al. 2002). DEQ subsequently learned that the TVRDS paved road dust emissions estimates were based on a calibration originally established for unpaved roads, not paved roads. In subsequent studies when Etyemezian et al. recalibrated the system for paved roads, they determined that the 2002 TVRDS emission factor measurements in the Treasure Valley were “unreasonably high” (Langston et al. 2008). As a result, DEQ abandoned the 2002 TVRDS emission factors and recalculated Ada and Canyon County paved road dust emissions using a new emission factor equation published in January 2011 by EPA as the agency’s recommended method in *AP-42 Compilation of Air Pollutant Emission Factors* (EPA 2011b, section 13.2.1). However, since the silt loadings measured by Etyemezian et al. in the TVRDS are based on local conditions and are somewhat more conservative than default silt loadings published in the January 2011 AP-42 method, the local silt loadings were retained rather than using the default loadings. This approach is described in the following sections.

3.1 Road Dust Emission Factor

Paved road dust emissions were computed on a monthly basis using Equation 3 from the January 2011 *AP-42 Compilation of Air Pollutant Emission Factors* (EPA 2011b, section 13.2.1). This form of the equation accounts for the dust suppression effect of precipitation that occurs during each month.

$$E_{ext} = [\ k\ (sL)^{0.91} \times (W)^{1.02}\ ]\ (1 - P/4N)$$

Equation 3. Paved road dust emissions.

where

E_{ext} = PM_{10} or $PM_{2.5}$ emission factor in the same units as k

k = particle size multiplier (1.0 for PM_{10}) (grams/VMT)

sL = road surface silt loading (grams per square meter)

W = average weight of the vehicles traveling the road (tons)

P = number of “wet” days with at least 0.254 millimeters (0.01 inches) of precipitation during the averaging period (daily)

N = number of days in the averaging period (e.g., 28, 29, 30, or 31 for monthly)

The emissions for each county and each roadway type are computed as the product of the emission factor and the VMT on each roadway type and in each county. Therefore, for each roadway type, each county, and each month in the modeling period, VMT, road surface silt loading, average weight of the vehicles traveling the road, and the number of days with at least 0.254 millimeters (0.01 inches) of precipitation must be determined.

3.2 Vehicle Miles Traveled

To generate paved road mobile emissions estimates for each month, daily averaged VMT is required. The VMT was generated from the TDM outputs provided by COMPASS in spring 2011. The TDM for the base year 2008 was updated by COMPASS based on the newly released 2010 census information just prior to use in these mobile source emissions calculations. Prior to the 2010 census update, the areas of growth in the TDM model were based on projections from the 2000 census, so the 2010 census update provided verification and some minor corrections to the demographic basis of the TDM model (M. Waldinger, COMPASS, personal communication, 2011).

Since local roads are not captured in detail by the TDM, the local road VMT were adjusted to be consistent with HPMS-based local road VMT estimates. The adjustment to the HPMS VMT is normally applied in SIP inventories to ensure that the most accurate basis is used for total VMT—the total fuel sales volume at the county level. The annual VMT totals used in the road dust calculations are the same as those used in the MOVES modeling, summarized in Table 3, section 2.1.2.

3.3 Precipitation Data

Precipitation is used in Equation 3 to adjust the road dust emissions for rainy days when enough precipitation (≥0.01 inches) falls to suppress road dust emissions. The number of days in each month with at least a trace of precipitation were reported in the ERG and Environ (2010) report and originated from the 2008 precipitation data from the Western Regional Climate Center (WRCC 2009). Data from the Boise Airport Weather Service Forecast Office (WSFO No. 1001022) were used for Ada County, while data from the Caldwell Airport Station (No. 101380) were used for Canyon County. The precipitation data inputs are presented in Table 7.

Table 7. Days with at least 0.01 inches of rain in Ada and Canyon Counties.

Month	Ada County	Canyon County
January	12	10
February	10	8
March	10	8
April	8	7
May	8	6
June	6	5
July	2	2
August	2	2
September	4	3
October	6	5
November	10	9
December	11	10

3.4 Average Vehicle Weight by Roadway Type

Average vehicle weight for each roadway type is derived from the vehicle type fraction on each roadway type and average vehicle weight by vehicle type.

Permanent ATR data for Ada and Canyon Counties were provided by ITD and combined with statewide FHWA vehicle classification data from ITD to determine the vehicle type fractions traveling on each roadway type in the modeling domain. The ATR data identifies motorcycles, passenger vehicles, and two classes of heavy-duty vehicles by length measurement; however, the FHWA vehicle classification statistics by roadway type are needed to provide greater detail in vehicle classification. The average vehicle weight for each vehicle type was obtained from the MOVES default database (EPA 2010) as shown in Table 8. Source type IDs are provided in Table 2.

Table 8. Average vehicle weight by vehicle type.

SourceType ID	HPMS Vtype ID	SourceType Name	Source Mass (Metric Tons)
11	10	Motorcycle	0.285
21	20	Passenger Car	1.479
31	30	Passenger Truck	1.867
32	30	Light Commercial Truck	2.060
41	40	Intercity Bus	19.594
42	40	Transit Bus	16.556
43	40	School Bus	9.070
51	50	Refuse Truck	20.684
52	50	Single Unit Short-haul Truck	7.642
53	50	Single Unit Long-haul Truck	6.250
54	50	Motor Home	6.735
61	60	Combination Short-haul Truck	29.328
62	60	Combination Long-haul Truck	31.404

3.5 Silt Loading

General default silt loadings are available in the January 2011 emission factor methodology for paved roads (EPA 2011b); however, if local data are available, they are preferred. During the 2002 TVRDS, silt loading measurements were taken at numerous locations in Ada and Canyon Counties. An inquiry to the Ada County Highway District revealed that while there is some recent movement toward using more salt and less sand, there had not been any large shift away from sanding as of 2008, the year of the base inventory. This information confirmed that while sanding varies with the number of storms each year, the 2008 winter sanding practices and sand consumption were approximately the same as those observed in the 2002 period when the TVRDS was conducted. As a result, the local silt loading measurements made in the TVRDS on local and arterial roadways (Etyemezian et al. 2002) were determined to still be applicable and were used for silt loadings. These loadings are somewhat higher than the default loadings in the January 2011 EPA road dust method but were used as the best available representation of local conditions and to ensure that the results are conservative. For safety reasons, Etyemezian et al. (2002) did not make road dust measurements on the interstate, so the default values from the EPA methodology (EPA 2011b) are used in calculations for interstates. Silt loadings used for this mobile source inventory are shown in Table 9 below.

Table 9. Silt loadings used for paved road emission factor calculation.

Road Type	Winter Silt Loading (g/m^2)	Summer Silt Loading (g/m^2)	Source
Interstate	0.015	0.015	EPA 2011b
Arterial	1.9	0.5	Etyemezian et al. 2002
Local	4	0.4	Etyemezian et al. 2002

Note: grams per square meter (g/m^2)

3.6 Unpaved Road Dust Emissions

For the PM_{10} maintenance plan update, unpaved road dust emission estimates from the 2008, 2015, and 2023 EIs for the Treasure Valley airshed (ERG and Environ 2010) were used without adjustment. ERG and Environ obtained unpaved road traffic counts and road segment lengths for the 2008 base year from a survey of the city and county road departments in Ada and Canyon Counties and estimated annual VMT from that survey. An average speed of 25 mph was assumed for all unpaved roads. Then the unpaved road dust emission estimation methodology used in the TVRDS was adopted, as detailed in the EI report (ERG and Environ 2010). The unpaved road dust emission factor method used by Etyemezian et al. in the TVRDS was based on unpaved road dust calibrations conduced at Fort Bliss, Texas, prior to the TVRDS. As a result, DEQ believes that although there were problems with the paved road emission factors (discussed in Section 3, 2^{nd} paragraph), the unpaved road dust emission factors from the TVRDS should be accurate and reflect the best local data available. Therefore, the unpaved road dust emission estimates developed by ERG and Environ using the TVRDS emission factors were used as reported.

4 Results

On-road mobile source, paved road dust, and unpaved road dust emissions estimate results are presented in this section.

4.1 On-Road Mobile Source Emission Estimates

On-road mobile source emissions are reported annually, as an average ozone season day, and as an average PM season day. The ozone season is defined as April 1–October 31, and the PM season is November 1–February 29. This definition matches other emission sources developed by ERG and Environ in the EI. On-road mobile source emissions results from the MOVES model are shown in Table 10, Table 11, and Table 12 as annual total, average ozone season day, and average PM season day, respectively. These emission results include estimates for nitrogen oxides (NO_x), sulfur dioxide (SO_2), volatile organic compounds (VOC), carbon monoxide (CO), particular matter, and ammonia (NH_3). The PM_{10} and $PM_{2.5}$ emission estimates in these tables include particulate matter from direct exhaust, brake wear, and tire wear and do not include paved and unpaved road dust.

Table 10. Annual on-road emissions in the Treasure Valley.

Year	County	NO_x	SO_2	VOC	CO	PM_{10}	$PM_{2.5}$	NH_3
		(tons per year)						
2008	Ada	9775.4	67.4	4182.3	47168.3	412.7	330.4	152.9
2015		5856.6	33.4	2939.7	39263.4	283.0	193.0	126.4
2023		4306.4	42.0	2396.8	38771.8	285.2	157.1	146.6
2008	Canyon	5847.8	35.0	3202.1	36404.4	258.2	212.1	81.8
2015		3870.5	17.7	2177.2	27974.3	178.4	127.6	74.4
2023		3273.6	25.1	1935.0	27684.6	191.5	112.3	95.0

Table 11. Daily average on-road emissions in the Treasure Valley during the ozone season (summer).

Year	County	NO_X	SO_2	VOC	CO	PM_{10}	$PM_{2.5}$	NH_3
		(tons per day)						
2008	Ada	28.5	0.20	10.9	110.9	1.09	0.86	0.45
2015		16.9	0.10	7.7	83.8	0.74	0.48	0.37
2023		12.4	0.12	6.6	78.5	0.75	0.37	0.43
2008	Canyon	16.7	0.10	8.4	87.9	0.65	0.52	0.24
2015		11.0	0.05	5.7	61.1	0.45	0.31	0.22
2023		9.2	0.07	5.2	57.2	0.49	0.26	0.28

Table 12. Daily average on-road emissions in the Treasure Valley during the PM season (winter).

Year	County	NO_X	SO_2	VOC	CO	PM_{10}	$PM_{2.5}$	NH_3
		(tons per day)						
2008	Ada	24.0	0.16	12.30	156.4	1.19	0.98	0.38
2015		14.7	0.08	8.69	144.3	0.83	0.61	0.31
2023		10.9	0.10	6.57	149.7	0.84	0.53	0.36
2008	Canyon	14.8	0.09	9.28	117.1	0.80	0.67	0.20
2015		9.9	0.05	6.45	100.6	0.55	0.42	0.19
2023		8.5	0.06	5.46	105.3	0.59	0.39	0.24

4.2 Paved and Unpaved Road Dust Emission Estimates

Paved road dust emissions are reported annually, as an average ozone season day, and as an average PM season day (Table 13 through Table 15). Unpaved road dust is reported only as an annual total (Table 16).

Table 13. Annual paved road dust emissions in the Treasure Valley.

Year	County	PM_{10}	$PM_{2.5}$
		(tons per year)	
2008	Ada	7501	428
2015		9164	522
2023		13243	755
2008	Canyon	4154	237
2015		5211	297
2023		8417	480

Table 14. Daily average paved road dust emissions in the Treasure Valley during the ozone season (summer).

Year	County	PM_{10}	$PM_{2.5}$
		(tons per day)	
2008	Ada	10.4	0.6
2015		12.4	0.7
2023		17.9	1.0
2008	Canyon	5.2	0.3
2015		6.6	0.4
2023		10.6	0.6

Table 15. Daily average paved road dust emissions in the Treasure Valley during the PM season (winter).

Year	County	PM_{10}	$PM_{2.5}$
		(tons per day)	
2008	Ada	34.8	2.0
2015		43.1	2.5
2023		62.4	3.6
2008	Canyon	19.9	1.1
2015		25.2	1.4
2023		40.7	2.3

Table 16. Annual unpaved road dust emissions in the Treasure Valley.

Year	County	PM_{10}	$PM_{2.5}$
		(tons per year)	
2008	Ada	965.8	55.1
2015		841.5	48.0
2023		718.8	41.0
2008	Canyon	165.4	9.4
2015		165.4	9.4
2023		165.4	9.4

5 Quality Control and Quality Assurance

Quality control was achieved by a quality assurance check of each set of inputs by a team member not directly involved with developing the input. In general, each input was checked for internal consistency, compared with national defaults, and assessed for reasonableness. Input data and outputs were graphed and analyzed to ensure that the expected vehicle population, roadway activity, and seasonal patterns were obtained and that differences between these inputs and those of the national default data set for these counties were understood and justified. Paved road dust inputs and computations were checked for accuracy and reasonableness.

6 Conclusion

On-road mobile sources of particulate matter and secondary aerosol precursors represent the most significant source of particulate matter pollution in the Treasure Valley. Both the on-road mobile emissions and paved road dust components of the Treasure Valley EI were revised by DEQ in 2011 to ensure that the northern Ada County PM_{10} maintenance plan renewal would be as up-to-date and accurate as possible. This revision was made necessary by the advent of new EPA-recommended models for on-road emissions (MOVES2010a) and for paved road dust (EPA 2011a). By completing these updates for the northern Ada County PM_{10} maintenance plan renewal, DEQ ensured that the conformity determinations for years to come will be made on the same basis as the motor vehicle emission budgets and that artificial method-caused differences will be minimized.

Trends indicate that motor vehicle exhaust and evaporative emissions will decrease in the foreseeable future even though the VMT is projected to increase. On the other hand, paved road dust emissions are projected to increase roughly proportionally to VMT.

References

EPA (US Environmental Protection Agency). 2010. *Technical Guidance on the Use of MOVES2010 for Emission Inventory Preparation in State Implementation Plans and Transportation Conformity*. Washington, DC: EPA, Office of Transportation and Air Quality, Transportation and Regional Programs Division. EPA-420-B-10-023.

EPA (US Environmental Protection Agency). 2011a. "MOVES (Motor Vehicle Emission Simulator)." Available at: *http://www.epa.gov/otaq/models/moves/index.htm*.

EPA (US Environmental Protection Agency). 2011b. *AP-42 Compilation of Air Pollutant Emission Factors*. Accessed October 2011 at: *http://www.epa.gov/ttn/chief/ap42/index.html*.

ERG and Environ (Eastern Research Group and Environ International Corporation). 2010. “2008, 2015, and 2023 Emission Inventories for the Treasure Valley Airshed.” Cordova, CA: ERG and Environ.

Etyemezian V., H. Kuhns, J. Gillies, M. Green, J. Chow, S. Kohl, and J. Watson. 2002. *The Treasure Valley Road Dust Study*. Las Vegas, NV: Desert Research Institute.

Langston R., S. Russell, R.S. Merle, D. Hart, V. Etyemezian, H. Kuhns, J. Gillies, D. Fritz, K. Bumiller, and D. James. 2008. *The Preferred Alternative Method for Measuring Paved Road Dust Emissions for Emissions Inventories: Mobile Technologies vs. The Traditional AP-42 Methodology*. In: 16th Annual International Emissions Inventory Conference.

Sierra Research. 2006. *Development of Fleet Characteristics Data for the Idaho On-Road Motor Vehicle Fleet*. Sacramento, CA: Sierra Research. SR2006-01-01.

WRCC (Western Regional Climate Center). 2009. Accessed from http://www.wrcc.dri.edu/ in 2009.

Appendix A. Crosswalk between COMPASS TDM Road Types, FHWA Roadway Types, and MOVES Roadway Types

COMPASS Road Type ID	COMPASS Road Type Descriptions	Area Type	FHWA Road Type Code	FHWA Road Type Description	MOVES Road Type	MOVES Road Type Description
Parked vehicles and extended idle are not included in COMPASS or FHWA road types					1	Off Network
1	Interstate or expressway with urban interchanges (e.g., SH 16)[a]	Rural	01	Rural Principal Arterial—Interstate	2	Rural Restricted Access
2	HOV[b] (not currently in use)	Rural				
19	Interstate ramps	Rural				
3	Principal arterials in CBD[c] and/or are one-way	Rural	02	Rural Principal Arterial—Other	3	Rural Unrestricted Access
4	Expressway with at-grade intersections (e.g., Chinden Blvd)	Rural				
5	Principal arterials in urban areas (use area of impact)	Rural				
6	Principal arterial in rural areas (use area of impact)	Rural				
7	Minor arterials in CBD and/or are one-way	Rural	06	Rural Minor Arterial		
8	Minor arterials (not currently in use)	Rural				
9	Minor arterials in urban areas (use area of impact)	Rural				
10	Minor arterials in rural areas (use area of impact)	Rural				
11	Rural minor arterials	Rural				
12	Collectors in CBD and/or are one-way	Rural	07	Rural Major Collector		
13	Collectors in urban areas (use area of impact) and for subdivision access which allow through travel	Rural				
14	Collectors in rural areas (use area of impact)	Rural				
15	Collectors for subdivision access to local roads and no through travel	Rural	08	Rural Minor Collector		
16	Local roads for subdivision access	Rural	09	Rural Local		
17	Local roads in urban areas added for circulation	Rural				
18	Local roads in rural areas added for circulation	Rural				
20	Centroid connector	Rural				
1	Interstate or expressway with urban interchanges (e.g., SH 16)	Urban	11	Urban Principal Arterial—Interstate	4	Urban Restricted Access
19	Interstate ramps	Urban				
2	HOV (not currently in use)	Urban	12	Urban Principal Arterial—Other Freeways or Expressways		

COMPASS Road Type ID	COMPASS Road Type Descriptions	Area Type	FHWA Road Type Code	FHWA Road Type Description	MOVES Road Type	MOVES Road Type Description
3	Principal arterials in CBD and/or are one-way	Urban	14	Urban Principal Arterial—Other	5	Urban Unrestricted Access
4	Expressway with at-grade intersections (e.g., Chinden Blvd)	Urban				
5	Principal arterials in urban areas (use area of impact)	Urban				
6	Principal arterial in rural areas (use area of impact)	Urban				
7	Minor arterials in CBD and/or are one-way	Urban	16	Urban Minor Arterial		
8	Minor arterials (not currently in use)	Urban				
9	Minor arterials in urban areas (use area of impact)	Urban				
10	Minor arterials in rural areas (use area of impact)	Urban				
11	Rural minor arterials	Urban				
12	Collectors in CBD and/or are one-way	Urban	17	Urban Collector		
13	Collectors in urban areas (use area of impact) and for subdivision access which allow through travel	Urban				
14	Collectors in rural areas (use area of impact)	Urban				
15	Collectors for subdivision access to local roads and no through travel	Urban				
16	Local roads for subdivision access	Urban	19	Urban Local		
17	Local roads in urban areas added for circulation	Urban				
18	Local roads in rural areas added for circulation	Urban				
20	Centroid connector	Urban				

[a] SH = state highway
[b] HOV = high-occupancy vehicle
[c] CBD = central business district

Appendix B. Crosswalk between ATR Length Bins, FHWA Vehicle Classes, and MOVES Source Types

ATR Length Bin	ATR Length Bin Range	FHWA Vehicle Class	FHWA Vehicle Class Description	MOVES Source Type ID	MOVES Source Types
1	0–5.9 ft	1	Motorcycles	11	Motorcycle
2	6–22.9 ft	2	Passenger Cars	21	Passenger Car
		3	Other Two-Axle, Four-Tire, Single-Unit Vehicles	31	Passenger Truck
				32	Light Commercial Truck
3	23–39.9 ft	4	Buses	41	Intercity Bus
				42	Transit Bus
				43	School Bus
		5	Two-Axle, Six-Tire, Single-Unit Trucks	51	Refuse Truck
				52	Single Unit Short-haul Truck
				53	Single Unit Long-haul Truck
				54	Motor Home
		6	Three-Axle, Single-Unit Trucks	51	Refuse Truck
				52	Single Unit Short-haul Truck
				53	Single Unit Long-haul Truck
				54	Motor Home
		7	Four-or-More Axle, Single-Unit Trucks	51	Refuse Truck
				52	Single Unit Short-haul Truck
				53	Single Unit Long-haul Truck
				54	Motor Home
4	40–69.9 ft	8	Four-or-Less Axle, Single-Trailer Trucks	61	Combination Short-haul Truck
				62	Combination Long-haul Truck
		9	Five-Axle, Single-Trailer Trucks	61	Combination Short-haul Truck
				62	Combination Long-haul Truck
		10	Six-or-More Axle, Single-Trailer Trucks	61	Combination Short-haul Truck
				62	Combination Long-haul Truck
5	>70 ft	11	Five-or-Less Axle, Multi-Trailer Trucks	61	Combination Short-haul Truck
				62	Combination Long-haul Truck
		12	Six-Axle, Multi-Trailer Trucks	61	Combination Short-haul Truck
				62	Combination Long-haul Truck
		13	Seven-or-More Axle, Multi-Trailer Trucks	61	Combination Short-haul Truck
				62	Combination Long-haul Truck

This page intentionally left blank for correct double-sided printing.

Appendix C. ITD Statewide Vehicle Classification Data

CLASSIFICATION DATA 2007 THROUGH 2009
MANUAL AND DIAMOND SCALE
ALL LOCATIONS

08:23 THURSDAY, MARCH 11, 2010

PERCENTAGES	SCHEME F CATEGORIES												
	MTRCYC	CAR	PU/VAN	BUS	2 AX TRK	3 AX TRK	4 OR + AX 1 UNIT	4 OR - AX TRK/TR-LR	5 AX TRK/TR-LR	6 OR + AX TRK/TR-LR	5 OR - AX MULTI TRLR	6 AX MULTI TRLR	7 OR + AX MULTI TRLR
FNCT_CD													
RURAL INTERSTATE	0.38	36.48	28.69	0.32	3.96	0.63	0.02	2.28	19.36	3.66	0.37	0.35	3.49
RURAL PRINCIPAL ARTERIAL	1.02	44.10	40.19	0.51	6.32	1.00	0.05	1.20	3.20	1.28	0.07	0.04	1.01
RURAL MINOR ARTERIAL	1.04	46.50	40.27	0.33	6.07	0.99	0.04	1.10	1.74	1.21	0.06	0.02	0.62
RURAL MAJOR COLLECTOR	1.44	48.96	39.93	0.22	5.39	1.06	0.06	0.60	1.20	0.71	0.02	0.00	0.40
LOCAL ROAD	0.32	39.55	42.01	0.17	6.04	0.84	0.00	1.18	8.11	0.96	0.00	0.05	0.76
URBAN P.A. INTERSTATE	0.22	27.95	27.31	0.41	4.63	0.60	0.01	2.87	25.50	5.04	0.49	0.51	4.46
URBAN PRINCIPAL ARTERIAL	0.61	50.62	39.36	0.74	4.45	1.76	0.03	0.74	0.83	0.56	0.03	0.01	0.28
URBAN MINOR ARTERIAL	0.78	54.92	38.12	0.23	4.20	0.46	0.03	0.42	0.46	0.22	0.02	0.02	0.13
URBAN COLLECTOR	0.84	58.04	36.12	0.29	3.41	0.37	0.05	0.39	0.22	0.07	0.13	0.03	0.04
LOCAL SYSTEM	0.42	62.02	33.76	0.05	2.77	0.10	0.05	0.38	0.22	0.06	0.10	0.02	0.05
ALL	0.85	49.57	37.82	0.35	4.87	0.78	0.04	0.89	3.04	0.95	0.09	0.05	0.71

Appendix C. ITD Statewide Vehicle Classification Data

CLASSIFICATION DATA 2007 THROUGH 2009
MANUAL AND DIAMOND SCALE
ALL LOCATIONS

08:23 THURSDAY, MARCH 11, 2010

PERCENTAGES	SCHEME F CATEGORIES												
	MTRCYC	CAR	PU/VAN	BUS	2 AX TRK	3 AX TRK	4 OR + AX 1 UNIT	4 OR - AX TRK/TR-LR	5 AX TRK/TR-LR	6 OR + AX TRK/TR-LR	5 OR - AX MULTI TRLR	6 AX MULTI TRLR	7 OR + AX MULTI TRLR
FNCT_CD													
RURAL INTERSTATE	0.38	36.48	28.69	0.32	3.96	0.63	0.02	2.28	19.36	3.66	0.37	0.35	3.49
RURAL PRINCIPAL ARTERIAL	1.02	44.10	40.19	0.51	6.32	1.00	0.05	1.20	3.20	1.28	0.07	0.04	1.01
RURAL MINOR ARTERIAL	1.04	46.50	40.27	0.33	6.07	0.99	0.04	1.10	1.74	1.21	0.06	0.02	0.62
RURAL MAJOR COLLECTOR	1.44	48.96	39.93	0.22	5.39	1.06	0.06	0.60	1.20	0.71	0.02	0.00	0.40
LOCAL ROAD	0.32	39.55	42.01	0.17	6.04	0.84	0.00	1.18	8.11	0.96	0.00	0.05	0.76
URBAN P.A. INTERSTATE	0.22	27.95	27.31	0.41	4.63	0.60	0.01	2.87	25.50	5.04	0.49	0.51	4.46
URBAN PRINCIPAL ARTERIAL	0.61	50.62	39.36	0.74	4.45	1.76	0.03	0.74	0.83	0.56	0.03	0.01	0.28
URBAN MINOR ARTERIAL	0.78	54.92	38.12	0.23	4.20	0.46	0.03	0.42	0.46	0.22	0.02	0.02	0.13
URBAN COLLECTOR	0.84	58.04	36.12	0.29	3.41	0.37	0.05	0.39	0.22	0.07	0.13	0.03	0.04
LOCAL SYSTEM	0.42	62.02	33.76	0.05	2.77	0.10	0.05	0.38	0.22	0.06	0.10	0.02	0.05
ALL	0.85	49.57	37.82	0.35	4.87	0.78	0.04	0.89	3.04	0.95	0.09	0.05	0.71

This page intentionally left blank for correct double-sided printing.

Appendix F. Legal Notification of Public Comment Period, Public Comments Received, Public Hearing Documents, and Response to Public Comments

This page intentionally left blank for correct double-sided printing.

Legal Notification of Public Comment Period

This page intentionally left blank for correct double-sided printing.

Department of
Environmental Quality

DEQ seeks comment on draft air quality maintenance plan for Northern Ada County

Friday, September 14, 2012

BOISE - The Idaho Department of Environment Quality (DEQ) is seeking public comment on a draft particulate matter (PM10) air quality maintenance plan for Northern Ada County.

PM10 consists of airborne particles 10 microns or smaller in diameter. When inhaled, they can reach deep into lung tissue and cause respiratory disease and lung damage.

The *"Northern Ada County PM10 State Implementation Plan - Maintenance Plan"* demonstrates how the area will remain in compliance with the PM10 air quality standard for the next ten years.

A public hearing on the plan will be held at 3 p.m., Tuesday, October 16, 2012, at DEQ's State Office, Conference Room B, 1410 N. Hilton, Boise. Written and oral comments will be accepted at the hearing.

The Northern Ada County Maintenance Area was identified as an area of concern for PM10 when the standard was first issued in 1987 and was formally designated a moderate PM10 nonattainment area upon passage of the Clean Air Act in 1990. Northern Ada County has been classified in attainment of the PM10 air quality standard since September 2003.

The plan largely continues the same control measures outlined in the maintenance plan and redesignation request submitted to the U.S. Environmental Protection Agency in 2002. Those measures include operation of the air quality index, residential wood burning, and open burning ban programs as well as controls on emissions from stationary sources.

The plan is available for review at DEQ's Boise Regional Office and on DEQ's website (download at right).

The deadline for submitting written comments on the plan is 5 p.m. MDT, Tuesday, October 16, 2012.

Submit comments electronically on DEQ's website or by mail or email to:

David Luft
DEQ Boise Regional Office
1445 N. Orchard
Boise, ID 83706
Email: david.luft@deq.idaho.gov

Media Contact

Airshed Manager
David Luft
DEQ Boise Regional Office
1445 N. Orchard St.
Boise, ID 83706
(208) 373-0550
david.luft@deq.idaho.gov

Related Documents

- Draft Ada County PM10 Maintenance Plan
- Appendices

Related Pages

Particulate Matter

Attainment v. Nonattainment

STATE OF IDAHO

DEPARTMENT OF
ENVIRONMENTAL QUALITY

1410 North Hilton, Boise, ID 83706 · (208) 373-0502

C.L. "Butch" Otter, Governor
Curt Fransen, Director

September 7, 2012

Legal Ads Department

RE: PUBLICATION OF LEGAL NOTICE: Regarding AIR POLLUTION, Department of Environmental Quality.

Enclosed is a legal notice that is to be published ONE TIME ONLY on September 14, 2012 in The Idaho Statesman.

Please confirm by return email that this will publish on that date.

For each separate legal notice, please send the following to the undersigned:

- One affidavit
- One proof of publication
- The billing invoice (our billing guidelines require one legal notice per invoice).

Thank you.

Sincerely,

David Luft
Boise Regional Office
Dept.of Environmental Quality
1445 N. Orchard
Boise, ID 83706
(208) 373-0201

Attachment: Legal Notice

Idaho Statesman
The Newspaper of the Treasure Valley
IDAHOSTATESMAN.COM
PO Box 40, Boise, ID 83707-0040

RECEIVED
SEP 19 2012
DEPARTMENT OF ENVIRONMENTAL QUALITY
BOISE REGIONAL OFFICE

LEGAL PROOF OF PUBLICATION

Account #	Ad Number	Identification	PO	Amount	Cols	Lines
47653	0000614218	LEGAL NOTICE		$103.92	2	54

Attention: David Luft

IDAHO DEPT OF ENVIRONMENTAL QUALITY
1410 N HILTON ST
BOISE ID 83706

LEGAL NOTICE
NOTICE OF 30-DAY PUBLIC COMMENT PERIOD AND PUBLIC HEARING REGARDING INTENT TO AMEND THE STATE IMPLEMEN - TATION PLAN FOR PM10 (coarse particulate matter) IN NORTH - ERN ADA COUNTY

Notice is hereby given that the State of Idaho Department of Envi - ronmental Quality (DEQ) has scheduled a public comment period from now through October 16, 2012. DEQ will conduct a public hearing on Tuesday, October 16, 2012 at 3:00 p.m. in Confer - ence Room "B" of the DEQ office located at 1410 North Hilton, Boise.

PROPOSED ACTION: DEQ is proposing to submit a second 10-year plan for maintaining the National Ambient Air Quality Standard (NAAQS) for PM10 (coarse particulate matter) in the Northern Ada County Maintenance Area to the U.S. Environmental Protection Agency, for inclusion in the State Implementation Plan, as required by Section 175A of the Clean Air Act. The intent of the 10-year maintenance plan is to demonstrate how compliance with the NAAQS will be achieved in the ten year period following the expiration of the first 10-year plan.

AVAILABILITY OF MATERIALS AND PUBLIC HEARING: The draft Northern Ada County Second 10-Year Maintenance Plan is available for public review on the DEQ website at http://www.deq.idaho.gov/news-public-comments-events.aspx. Printed materials will be made available upon request at the DEQ Regional Office in Boise located at 1445 N. Orchard.

A public hearing will be held at the Department of Environmental Quality, 1410 North Hilton, Boise, Idaho on October 16, 2012, at 3:00 pm Oral and written testimony will be accepted at that time.

SUBMISSION OF WRITTEN COMMENTS-ASSISTANCE ON TECHNICAL QUESTIONS: Anyone may submit written comments regarding this proposal. To be most effective, comments should address air quality considerations and include supporting materials where available. Comments, requests, and questions regarding the public comment process should be directed to David Luft, Department of Environmental Quality, 1445 N. Orchard, Boise, ID 83706-1255, david.luft@deq.idaho.gov, or (208) 373-0201. Please reference 'PM10 Maintenance Plan' when sending comments or requesting information.

For technical assistance on questions concerning this project, please contact David Luft at (208) 373-0201 or david.luft@deq.idaho.gov.

All written comments concerning this proposal must be directed to and received by the undersigned on or before 5:00, p.m., MST/MDT, October 16, 2012.
DATED this 7th day of September, 2012.
David Luft
Air Quality Manager

Pub. Sept. 14, 2012

0000614218-01

JANICE HILDRETH, being duly sworn, deposes and says: That she is the Principal Clerk of The Idaho Statesman, a daily newspaper printed and published at Boise, Ada County, State of Idaho, and having a general circulation therein, and which said newspaper has been continuously and uninterruptedly published in said County during a period of twelve consecutive months prior to the first publication of the notice, a copy of which is attached hereto: that said notice was published in The Idaho Statesman, in conformity with Section 60-108, Idaho Code, as amended, for:

1 Insertions

Beginning issue of: 09/14/2012

Ending issue of: 09/14/2012

Janice Hildreth
(Legals Clerk)

STATE OF IDAHO)
.SS
COUNTY OF ADA)

On this 14 day of September in the year of 2012 before me, a Notary Public, personally appeared before me Janice Hildreth known or identified to me to be the person whose name subscribed to the within instrument, and being by first duly sworn, declared that the statements therein are true, and acknowledged to me that she executed the same.

Heather Harradine
Notary Public for Idaho
Residing at: Boise, Idaho
My Commission expires:
2/08/2014

HEATHER HARRADINE
NOTARY PUBLIC
STATE OF IDAHO

LEGAL NOTICE

NOTICE OF 30-DAY PUBLIC COMMENT PERIOD AND PUBLIC HEARING REGARDING INTENT TO AMEND THE STATE IMPLEMENTATION PLAN FOR PM10 (coarse particulate matter) IN NORTHERN ADA COUNTY

Notice is hereby given that the State of Idaho Department of Environmental Quality (DEQ) has scheduled a public comment period from now through October 15, 2012. DEQ will conduct a public hearing on Tuesday, October 16, 2012 at 3:00 p.m. in Conference Room "B" of the DEQ office located at 1410 North Hilton, Boise.

PROPOSED ACTION: DEQ is proposing to submit a second 10-year plan for maintaining the National Ambient Air Quality Standard (NAAQS) for PM10 (coarse particulate matter) in the Northern Ada County Maintenance Area to the U.S. Environmental Protection Agency, for inclusion in the State Implementation Plan, as required by Section 175A of the Clean Air Act. The intent of the 10-year maintenance plan is to demonstrate how compliance with the NAAQS will be achieved in the ten year period following the expiration of the first 10-year plan.

AVAILABILITY OF MATERIALS AND PUBLIC HEARING: The draft Northern Ada County Second 10-Year Maintenance Plan is available for public review on the DEQ website at http://www.deq.idaho.gov/news-public-comments-events.aspx. Printed materials will be made available upon request at the DEQ Regional Office in Boise located at 1445 N. Orchard.

A public hearing will be held at the Department of Environmental Quality, 1410 North Hilton, Boise, Idaho on October 16, 2012, at 3:00 pm. Oral and written testimony will be accepted at that time.

SUBMISSION OF WRITTEN COMMENTS-ASSISTANCE ON TECHNICAL QUESTIONS: Anyone may submit written comments regarding this proposal. To be most effective, comments should address air quality considerations and include supporting materials where available. Comments, requests, and questions regarding the public comment process should be directed to David Luft, Department of Environmental Quality, 1445 N. Orchard, Boise, ID 83706-1255, david.luft@deq.idaho.gov, or (208) 373-0201. Please reference "PM10 Maintenance Plan" when sending comments or requesting information.

For technical assistance on questions concerning this project, please contact David Luft at (208) 373-0201 or david.luft@deq.idaho.gov.

All written comments concerning this proposal must be directed to and received by the undersigned on or before 5:00, p.m., MST/MDT, October 16, 2012.

DATED this 7th day of September, 2012.

David Luft
Air Quality Manager

Pub. Sept. 14, 2012 0000614218-01

DEQ extends public comment period on draft air quality maintenance plan for Northern Ada County

Friday, October 12, 2012

BOISE - The Idaho Department of Environment Quality (DEQ) has extended the public comment period on a draft particulate matter (PM10) air quality maintenance plan for Norther Ada County to October 30, 2012.

The "*Northern Ada County PM10 State Implementation Plan - Maintenance Plan*" demonstrates how the area will remain in compliance with the PM10 air quality standard for the next ten years.

A public hearing on the plan will be held at 3 p.m., Tuesday, October 16, 2012, at DEQ's State Office, Conference Room B, 1410 N. Hilton, Boise. Written and oral comments will be accepted at the hearing.

The plan is available for review at DEQ's Boise Regional Office and on DEQ's website (download at right).

The deadline for submitting written comments on the plan is 5 p.m. MDT, Tuesday, October 30, 2012.

Submit comments electronically on DEQ's website or by mail or email to:

David Luft
DEQ Boise Regional Office
1445 N. Orchard
Boise, ID 83706
Email: david.luft@deq.idaho.gov

Media Contact

Airshed Manager
David Luft
DEQ Boise Regional Office
1445 N. Orchard St.
Boise, ID 83706
(208) 373-0550
david.luft@deq.idaho.gov

Related Documents

- Draft Ada County PM10 Maintenance Plan
- Appendices

Related Pages

Particulate Matter

Attainment v. Nonattainment

STATE OF IDAHO

DEPARTMENT OF
ENVIRONMENTAL QUALITY

1410 North Hilton, Boise, ID 83706 · (208) 373-0502

C.L. "Butch" Otter, Governor
Curt Fransen, Director

October 11, 2012

Legal Ads Department

RE: PUBLICATION OF LEGAL NOTICE: Regarding AIR POLLUTION, Department of Environmental Quality.

Enclosed is a legal notice that is to be published ONE TIME ONLY on October 16, 2012 in The Idaho Statesman.

Please confirm by return email that this will publish on that date.

For each separate legal notice, please send the following to the undersigned:

- One affidavit
- One proof of publication
- The billing invoice (our billing guidelines require one legal notice per invoice).

Thank you.

Sincerely,

David Luft
Boise Regional Office
Dept.of Environmental Quality
1445 N. Orchard
Boise, ID 83706
(208) 373-0201

Attachment: Legal Notice

Idaho Statesman
The Newspaper of the Treasure Valley
IDAHOSTATESMAN.COM
PO Box 40, Boise, ID 83707-0040

LEGAL PROOF OF PUBLICATION

Account #	Ad Number	Identification	PO	Amount	Cols	Lines
47653	0000618537	LEGAL NOTICE		$88.32	2	44

Attention: David Luft

IDAHO DEPT OF ENVIRONMENTAL QUALITY
1410 N HILTON ST
BOISE ID 83706

LEGAL NOTICE
NOTICE OF EXTENSION OF PUBLIC COMMENT PERIOD REGARDING INTENT TO AMEND THE STATE IMPLEMENTATION PLAN FOR PM10 (coarse particulate matter) IN NORTHERN ADA COUNTY

Notice is hereby given that the State of Idaho Department of Environmental Quality (DEQ) has extended the Northern Ada County PM10 Maintenance Plan public comment period to October 30, 2012.

PROPOSED ACTION: DEQ is proposing to submit a second 10-year plan for maintaining the National Ambient Air Quality Standard (NAAQS) for PM10 (coarse particulate matter) in the Northern Ada County Maintenance Area to the U.S. Environmental Protection Agency, for inclusion in the State Implementation Plan, as required by Section 175A of the Clean Air Act. The intent of the 10-year maintenance plan is to demonstrate how compliance with the NAAQS will be achieved in the ten year period following the expiration of the first 10-year plan.

AVAILABILITY OF MATERIALS AND PUBLIC HEARING: The draft Northern Ada County Second 10-Year Maintenance Plan is available for public review on the DEQ website at http://www.deq.idaho.gov/news-public-comments-events.aspx. Printed materials will be made available upon request at the DEQ Regional Office in Boise located at 1445 N. Orchard.

A public hearing will be held at the Department of Environmental Quality, 1410 North Hilton, Boise, Idaho on October 16, 2012, at 3:00 pm. Oral and written testimony will be accepted at that time.

SUBMISSION OF WRITTEN COMMENTS-ASSISTANCE ON TECHNICAL QUESTIONS: Anyone may submit written comments regarding this proposal. To be most effective, comments should address air quality considerations and include supporting materials where available. Comments, requests, and questions regarding the public comment process should be directed to David Luft, Department of Environmental Quality, 1445 N. Orchard, Boise, ID 83706-1255, david.luft@deq.idaho.gov, or (208) 373-0201. Please reference 'PM10 Maintenance Plan' when sending comments or requesting information.

For technical assistance on questions concerning this project, please contact David Luft at (208) 373-0201 or david.luft@deq.idaho.gov.

All written comments concerning this proposal must be directed to and received by the undersigned on or before 5:00, p.m., MDT, October 30, 2012.

DATED this 16th day of October, 2012.
David Luft, Air Quality Manager

Pub. Oct. 16, 2012

RECEIVED
OCT 19 2012
DEPARTMENT OF ENVIRONMENTAL QUALITY
BOISE R...

JANICE HILDRETH, being duly sworn, deposes and says: That she is the Principal Clerk of The Idaho Statesman, a daily newspaper printed and published at Boise, Ada County, State of Idaho, and having a general circulation therein, and which said newspaper has been continuously and uninterruptedly published in said County during a period of twelve consecutive months prior to the first publication of the notice, a copy of which is attached hereto: that said notice was published in The Idaho Statesman, in conformity with Section 60-108, Idaho Code, as amended, for:

1 Insertions

Beginning issue of: 10/16/2012

Ending issue of: 10/16/2012

Janice Hildreth
(Legals Clerk)

STATE OF IDAHO)
.SS
COUNTY OF ADA)

On this 16 day of October in the year of 2012 before me, a Notary Public, personally appeared before me Janice Hildreth known or identified to me to be the person whose name subscribed to the within instrument, and being by first duly sworn, declared that the statements therein are true, and acknowledged to me that she executed the same.

Heather Harradine
Notary Public for Idaho
Residing at: Boise, Idaho

My Commission expires: 2/08/2014

HEATHER HARRADINE
NOTARY PUBLIC
STATE OF IDAHO

0000618537-01

LEGAL NOTICE

NOTICE OF EXTENSION OF PUBLIC COMMENT PERIOD REGARDING INTENT TO AMEND THE STATE IMPLEMENTATION PLAN FOR PM10 (coarse particulate matter) IN NORTHERN ADA COUNTY

Notice is hereby given that the State of Idaho Department of Environmental Quality (DEQ) has extended the Northern Ada County PM10 Maintenance Plan public comment period to October 30, 2012.

PROPOSED ACTION: DEQ is proposing to submit a second 10-year plan for maintaining the National Ambient Air Quality Standard (NAAQS) for PM10 (coarse particulate matter) in the Northern Ada County Maintenance Area to the U.S. Environmental Protection Agency, for inclusion in the State Implementation Plan, as required by Section 175A of the Clean Air Act. The intent of the 10-year maintenance plan is to demonstrate how compliance with the NAAQS will be achieved in the ten year period following the expiration of the first 10-year plan.

AVAILABILITY OF MATERIALS AND PUBLIC HEARING: The draft Northern Ada County Second 10-Year Maintenance Plan is available for public review on the DEQ website at http://www.deq.idaho.gov/news-public-comments-events.aspx. Printed materials will be made available upon request at the DEQ Regional Office in Boise located at 1445 N. Orchard.

A public hearing will be held at the Department of Environmental Quality, 1410 North Hilton, Boise, Idaho on October 16, 2012, at 3:00 pm. Oral and written testimony will be accepted at that time.

SUBMISSION OF WRITTEN COMMENTS-ASSISTANCE ON TECHNICAL QUESTIONS: Anyone may submit written comments regarding this proposal. To be most effective, comments should address air quality considerations and include supporting materials where available. Comments, requests, and questions regarding the public comment process should be directed to David Luft, Department of Environmental Quality, 1445 N. Orchard, Boise, ID 83706-1255, david.luft@deq.idaho.gov, or (208) 373-0201. Please reference "PM10 Maintenance Plan" when sending comments or requesting information.

For technical assistance on questions concerning this project, please contact David Luft at (208) 373-0201 or david.luft@deq.idaho.gov.

All written comments concerning this proposal must be directed to and received by the undersigned on or before 5:00, p.m., MDT, October 30, 2012.

DATED this 16th day of October, 2012.
David Luft, Air Quality Manager

Pub. Oct. 16, 2012

0000618537-01

Public Comments Received

This page intentionally left blank for correct double-sided printing.

David Luft

From:	Webmaster
Sent:	Friday, September 14, 2012 11:22 AM
To:	David Luft
Subject:	Draft Air Quality Maintenance Plan for Northern Ada County

Name::

Jay Witt

Email::

Jay.Witt@URS.com

Affiliation::

Comments::

There seems to be a drastic change in the way paved road dust emissions were calculated between the last maintenance plan and this draft plan. The concern I have is the new MVEB for PM10 is not comparable to the current one. Currently the MVEB for PM10 is 153 TPD. The majority of the 153 TPD is paved road dust. The proposed MVEB for PM10 is 80% less. There has not been an 80% decrease in VMT, so why such a drastic decrease in the PM10 MVEB?

It is not clear in the documentation presented by DEQ how EPA's new paved road dust methodology compares to the Treasure Valley-specific road dust study conducted by DRI in 2002. Why would an area-specific study used for the initial 2008 base year emissions inventory be abandoned in favor of a new AP-42 methodology?

If the new EPA methodology is better, why hasn't DEQ amended the emissions inventory on which the maintenance plan is based so that it is consistent with the new PM10 MVEB? Per Table 3-8 in the emissions inventory, paved road dust emissions in 2008 are 26,669 TPY in Ada County, which equates to about 101.3 TPD. Yet the new PM10 MVEB is 31.0TPD. This is a huge difference! There is no documentation as to why there is such a huge discrepancy between the emissions inventory and the new MVEB for PM10. The memo in the appendix does not adequately justify why the emissions inventory is so different than the MVEB.

I feel more documentation is necessary to:

1). Justify the use of new AP-42 for road dust emissions methodologies vs. the Treasure-Valley specific DRI study (2002) that was used for the emissions inventory, and 2). The emissions inventory should be amended so that paved road dust emissions are consistently addressed through the maintenance plan. At this point the draft maintenance plan is not consistent in its estimation of paved road dust.

3). Recognize the drastic difference between the existing MVEB for PM10 (153 TPD) and the new proposed MVEB for PM10 (31.0 TPD).

Enter the code below:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue, Suite 900
Seattle, WA 98101-3140

OFFICE OF
AIR, WASTE AND TOXICS

October 26, 2012

David Luft
Air Quality Manager, Boise Regional Office
Idaho Department of Environmental Quality
1445 North Orchard
Boise, Idaho 83706

Dear Mr. Luft:

Thank you for the opportunity to review the draft Northern Ada County PM10 State Implementation Plan, Maintenance Plan Ten Year Update (Plan). The Environmental Protection Agency respectfully submits the following comments for your consideration in finalizing this Plan. At the outset, we would like to say that we appreciate that IDEQ incorporated the suggestions which EPA provided last year regarding your modeling approach. In this letter, we first comment on specific program issues and then identify some technical corrections and clarifications we recommend be made in the final plan.

A. Program Issues

1. Removal of Tier II Permits. The draft Maintenance Plan Update proposes to remove Tier II Permits as control strategies in the Plan. As stated in the Idaho SIP, EPA does not have the authority to remove these source-specific requirements in the absence of a demonstration that their removal would not interfere with attainment or maintenance of the NAAQS, violate any prevention of significant deterioration increment or result in visibility impairment. Idaho DEQ may request removal by submitting such a demonstration to EPA as a SIP revision. (See 40 CFR 52.670(c) and (d)). We recognize that this is an important issue for this Plan and for other Plans that IDEQ is developing, and we look forward to discussing it with you in greater depth at the face to face meeting we are planning for later this fall.

2. Air Quality Data: On Page 2, the draft plan uses preliminary data, EPA recommends that IDEQ update the tables in the plan to include the finalized 2011 data, along with a short explanation to clarify whether, based on the most recent (2011) data, the area is in attainment with the PM-10 NAAQS.

3. MS Adequacy Determination. After discussions with your office, we agree that it makes sense to start the adequacy review process when the final Maintenance Plan is submitted formally to EPA.

B. Technical Comments: Below are some technical comments to correct or better clarify certain points in the final plan.

1. Page 1 – footnote: The definition of PM10 should read "particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers." The same change should be made in section Page 7, 11, Tables 3-8: In the Note section -- The current definition is for PMcourse.

2. Section 4.4 (P. 5) – 1st paragraph under Table 1: Since the term "Exceptional Events" has a specific definition, EPA recommends that IDEQ use different language to avoid any confusion with the definition of an Exceptional Event. IDEQ could revise the language to indicate that the data may have been the result of a dust storm or a wildfire (without using the term exceptional event).

3. Section 5, (P. 6) – last sentence of first paragraph: DEQ defines the average winter season (PM season) and the summer season (Ozone Season). The month of March is not included in either. EPA recommends that DEQ add a clarifying sentence explaining that the month of March is not included in either season. In addition, it would be helpful if Table 4 and Table 5 listed the months represented in the tables (i.e. Emissions for winter seasons-2008: (November 1-Feb. 29)

4. Section 5.1.1 (P. 8) -- Last 2 sentences of the second paragraph: DEQ compares wintertime daily PM emissions in 1991 with total annual emissions in 2008. It would be helpful to revise this statement to compare wintertime values (1991) to wintertime values (2008) for woodstoves or to show that all woodstove emissions occur in the wintertime so this is a valid comparison.

5. Section 5.1.1 (P. 9) – first full paragraph – The last sentence states "...total emissions from *area sources* of 20,395 tons per year." The 20,395 tpy number includes the 169 tpy from point sources (see Table 3, page 7 and Table 6, page 9). Since the paragraph intends to compare road dust to other area sources, suggest subtracting annual point source emissions.

6. Section 5.1.4 (P. 10) – paragraph 5 – If modeling shows that emissions from TASCO (219 tpys) could interfere with maintenance in the area, please clarify why there is no apparent accounting of the TASCO impact in the point source emission inventory.

7. Section 5.2 (P. 10) – last paragraph: The text "Despite this expected increase, modeling shows that the PM10 standard will be protected. As such, the modeled concentrations are expected to be high (i.e., conservative) compared to actual expected concentrations." Please explain why the expected high concentrations are conservative.

8. Section 6.3 (P.19) – first paragraph: "Presently, nitrate mass contributes much less to the total ambient PM10 compared to the early 1990s. The model predicted that this trend will continue into the next decade." This model cannot predict trends in nitrate mass because it does not include PM chemistry.

9. Section 6.3, (P.19) – second paragraph: "The relative importance of crustal mass will increase in summer as the nitrate mass decreases." Since this model is not capable of demonstrating that nitrate mass will decrease in future years, consider rephrasing to something like "The relative importance of crustal mass will increase in summer as the nitrate mass is likely to remain level or decrease."

10. <u>Section 8 (P.23) Contingency Plan</u>

- First paragraph, last sentence – Change the sentence to read "Areas in attainment are not required to have *enacted* contingency measures…". In the Memo *Procedures for Processing Requests to Redesignate Areas to Attainment*, Sept. 4, 1992, (Calcagni Memo), contingency measures for maintenance plans do not have to be adopted at the time of the submittal but the plan still must identify the measures to be adopted and provide a schedule for adoption (see below).

- Triggering (Section 8.2) – The Calcagni Memo recommends setting an action level to allow the state to take early action to prevent actual violations of the NAAQS. We recommend adopting this approach instead of waiting for a violation of the NAAQS.

Thank you for the opportunity to review the draft Plan. We trust these comments are helpful as you finalize your Plan. If you have any questions or would like to discuss any of these points, please contact me or Lucy Edmondson, edmondson.lucy@epa.gov, or 360-753-9082.

Sincerely,

Debra M Suzuki

Debra M. Suzuki, Manager
State and Tribal Air Programs Unit

Public Hearing Documents

This page intentionally left blank for correct double-sided printing.

CERTIFICATE OF HEARING

SUBJECT: Northern Ada County PM_{10} Maintenance Area SIP Revision

LOCATION: DEQ State Office Conference Center, 1410 N. Hilton, Boise, Idaho

HEARING DATE: October 16, 2012

The undersigned designated hearing facilitator hereby certifies that on the 16th day of October 2012, a public hearing was held on on the Northern Ada County PM_{10} Maintenance Area SIP Revision, at the DEQ state office conference center in Boise, Idaho. The hearing commenced at 3 p.m. and was adjourned at 3:30 p.m. No members of the public attended the hearing.

Notice of this hearing appeared in the Idaho Statesman on September 14, 2012.

DATED this 16th day of October, 2012.

Paula J. Wilson
Hearing Facilitator

This page intentionally left blank for correct double-sided printing.

Response to Public Comments

This page intentionally left blank for correct double-sided printing.

Comment 1:

There seems to be a drastic change in the way paved road dust emissions were calculated between the last maintenance plan and this draft plan. The concern I have is the new MVEB for PM10 is not comparable to the current one. Currently the MVEB for PM10 is 153 TPD. The majority of the 153 TPD is paved road dust. The proposed MVEB for PM10 is 80% less. There has not been an 80% decrease in VMT, so why such a drastic decrease in the PM10 MVEB?

It is not clear in the documentation presented by DEQ how EPA's new paved road dust methodology compares to the Treasure Valley-specific road dust study conducted by DRI in 2002. Why would an area-specific study used for the initial 2008 base year emissions inventory be abandoned in favor of a new AP-42 methodology?

If the new EPA methodology is better, why hasn't DEQ amended the emissions inventory on which the maintenance plan is based so that it is consistent with the new PM10 MVEB? Per Table 3-8 in the emissions inventory, paved road dust emissions in 2008 are 26,669 TPY in Ada County, which equates to about 101.3 TPD. Yet the new PM10 MVEB is 31.0TPD. This is a huge difference! There is no documentation as to why there is such a huge discrepancy between the emissions inventory and the new MVEB for PM10. The memo in the appendix does not adequately justify why the emissions inventory is so different than the MVEB.

I feel more documentation is necessary to:
1). Justify the use of new AP-42 for road dust emissions methodologies vs. the Treasure-Valley specific DRI study (2002) that was used for the emissions inventory, and 2). The emissions inventory should be amended so that paved road dust emissions are consistently addressed through the maintenance plan. At this point the draft maintenance plan is not consistent in its estimation of paved road dust.
3). Recognize the drastic difference between the existing MVEB for PM10 (153 TPD) and the new proposed MVEB for PM10 (31.0 TPD).

Response to Comment:

This comment made it apparent that DEQ had not made completely clear where updated information related to new modeling and emission factors superseded the emissions inventory information developed by ERG/Environ in 2010 for the initial 10 year maintenance plan.

An explanation was provided in Appendix E, *Development of the Base- and Future-Year Mobile Source Emissions Inventories for the Treasure Valley, Idaho, Section 3,* stating "DEQ subsequently learned that the TVRDS paved road dust emissions estimates were based on calibration originally established for unpaved roads, not paved roads. In subsequent studies when Etyemezian et al. recalibrated the system for paved roads, they determined that the 2002 TVRDS emission factor measurements in the Treasure Valley were "unreasonably high" (Langston et al. 2008). As a result, DEQ abandoned the 2002 TVRDS emission factors and recalculated Ada and Canyon County paved road dust emissions using a new emission factor equation published in January 2011 by EPA…"

In order to make the information more evident, clarifying language has been added to the SIP document and DEQ has updated the ERG/Environ Emission Inventory Appendix D to eliminate confusion. These changes simply clarify which information was used to support this demonstration, but are not substantive changes (i.e. no changes were made in the analysis). All updates to EI summary tables in Appendix D are clearly indicated to be DEQ updates and all values reflect the work already described fully in Appendix E, *Development of the Base-and Future Year Mobile Source Emission Inventories for the Treasure Valley, Idaho*, none of which has changed.

EPA Comment 1:
Removal of Tier II Permits. The draft Maintenance Plan Update proposes to remove Tier II Permits as control strategies in the Plan. As stated in the Idaho SIP, EPA does not have the authority to remove these source-specific requirements in the absence of a demonstration that their removal would not interfere with attainment or maintenance of the NAAQS, violate any prevention of significant deterioration increment or result in visibility impairment. Idaho DEQ may request removal by submitting such a demonstration to EPA as a SIP revision. (See 40 CFR 52.670(c) and (d)). We recognize that this is an important issue for this Plan and for other Plans that IDEQ is developing, and we look forward to discussing it with you in greater depth at the face to face meeting we are planning for later this fall.

Response to Comment:
DEQ thanks EPA for acknowledging this long standing issue and for your willingness to work toward a solution. Therefore, DEQ has removed from this action the request that the existing permit conditions listed in Idaho's SIP for Northern Ada County be removed from the SIP. Instead DEQ will, in consultation with EPA, develop a plan to amend to Idaho's SIP. This future plan will address most of the permit limits listed in Idaho's SIP and will include demonstrations that Idaho's SIP has sufficient means to ensure that emissions from stationary sources will not interfere with attainment or maintenance of any NAAQS, violate any prevention of significant deterioration increment or result in visibility impairment.

EPA Comment 2:
Air Quality Data: on Page 2, the draft plan uses preliminary data, EPA recommends that IDEQ update the tables in the plan to include the finalized 2011 data, along with a short explanation to clarify whether, based on the most recent (2011) data, the area is in attainment with the PM-10 NAAQS.

Response to Comment:
At the time the modeling was conducted for this maintenance plan submittal, 2011 monitoring data was preliminary. It has since been certified. DEQ would like to remind EPA that significant time is required to conduct the modeling, draft the modeling report, then draft the plan. This time constraint limits the ability of DEQ, to include the most recent monitoring data in analyses required for the plan. In this case, inclusion of this data does not substantially affect the maintenance demonstration. The inclusion of the 2011 data would result in a 5-year design concentration (or value) of 91 $\mu g/m^3$, as opposed to the value of 90 $\mu g/m^3$ used in this plan.

Based on events of the summer of 2012 involving extreme wildfire and high wind dust impacts, DEQ will be submitting exceptional event analyses for the two days of exceedance in 2011, and will be asking for EPA concurrence. When the exceptional event request concurrence is granted by the EPA, the 3-year design concentration will become 71 $\mu g/m^3$ and the 5-year design concentration would become 88 $\mu g/m^3$. DEQ will continue to use 90 as the design concentration which results in an extremely conservative maintenance demonstration. The language in the plan has been modified based on DEQ's decision to submit exceptional event documentation for 2 exceedances in 2011.

DEQ will modify Table 2 to include the requested data.

EPA Comment 3:
MS Adequacy Determination. After discussions with your office, we agree that it makes sense to start the adequacy review process when the final Maintenance Plan is submitted formally to EPA.

Response to Comment:
No response required.

EPA Comment 4 (Technical Comment 1):
Page I -footnote: The definition of PM I 0 should read "particulate matter with an aerodynamic diameter less than or equal to a nominal I 0 micrometers." The same change should be made in section Page 7, II, Tables 3-8: In the Note section-- The current definition is for PM course.

Response to Comment:
DEQ agrees. The modification has been made.

EPA Comment 5 (Technical Comment 2):
Section 4.4 (P. 5) - 1'1 paragraph under Table I: Since the term "Exceptional Events" has a specific definition, EPA recommends that IDEQ use different language to avoid any confusion with the definition of an Exceptional Event. IDEQ could revise the language to indicate that the data may have been the result of a dust storm or a wildfire (without using the term exceptional event).

Response to Comment:
See exceptional event section of Response to EPA Comment 2 above. Modification has been made to avoid the term "exceptional event" prior to EPA concurrence.

EPA Comment 6 (Technical Comment 3):
Section 5, (P. 6) - last sentence of first paragraph: DEQ defines the average winter season (PM season) and the summer season (Ozone Season). The month of March is not included in either. EPA recommends that DEQ add a clarifying sentence explaining that the month of March is not included in either season. In addition, it would be helpful if Table 4 and Table 5 listed the months represented in the tables (i.e. Emissions for winter scasons-2008: (November 1-Feb. 29)

Response to Comment:

Text has been added explaining the reasoning for excluding March from the analysis. The text clearly states the dates applicable to the tables.

EPA Comment 7 (Technical Comment 4):
Section 5.1.1 (P. 8)-- Last 2 sentences of the second paragraph: DEQ compares wintertime daily PM emissions in 1991 with total annual emissions in 2008. It would be helpful to revise this statement to compare wintertime values (1991) to wintertime values (2008) for woodstoves or to show that all woodstove emissions occur in the wintertime so this is a valid comparison.

Response to Comment:
DEQ agrees. The text has been changed to make a more valid comparison.

EPA Comment 8 (Technical Comment 5):
Section 5.1.1 (P. 9)- first full paragraph- The last sentence states " ... total emissions from *area sources* of 20,395 tons per year." The 20,395 tpy number includes the 169 tpy from point sources (sec Table 3, page 7 and Table 6, page 9). Since the paragraph intends to compare road dust to other area sources, suggest subtracting annual point source emissions.

Response to Comment:
The language in the text and Figure 3 has been modified to more clearly state relationship of Road dust to total PM10 emissions.

EPA Comment 9 (Technical Comment 6):
Section 5.1.4 (P. 10)- paragraph 5- If modeling shows that emissions from TASCO (219 tpys) could interfere with maintenance in the area, please clarify why there is no apparent accounting of the TASCO impact in the point source emission inventory.

Response to Comment:
Only point sources located in the maintenance area were included in the emissions inventory. After closer examination of the 2002 SIP, DEQ has now concluded that the 2002 SIP indicates only that TASCO "was shown to potentially contribute to PM10 exceedances <u>in Canyon County</u>", and that neither the photochemical modeling nor the CMB modeling in 2002 indicated a significant TASCO contribution to PM10 in Northern Ada County. Nevertheless TASCO's permit-allowable emission levels were addressed in the Tier II operating permit issued as part of the control measures in the 2002 SIP "to insure that TASCO impacts in Ada County are at acceptable levels" Pertinent permit requirements are included in Idaho's SIP at 40 CFR 52.670.

In view of the 2002 concerns about potential Canyon County PM10 exceedances due to TASCO, it should be noted that TASCO's 2008 PM10 emissions (219 ug/m3) represent a 35% reduction over the 1999 base year emissions in the 2002 SIP. In addition, the Nampa, Idaho average 2nd high PM10 value for 2009 – 2011 is 85 ug/m3 at the Nampa Fire Station, approximately 2 miles from TASCO, therefore, TASCO emissions, as limited by the Tier II operating permit, appear to have effectively eliminated the threat to the PM10 NAAQS in Canyon County.

EPA Comment 10 (Technical Comment 7):
Section 5.2 (P. 10) -last paragraph: The text "Despite this expected increase, modeling shows that the PM 10 standard will be protected. As such, the modeled concentrations are expected to be high (i.e., conservative) compared to actual expected concentrations." Please explain why the expected high concentrations arc conservative.

Response to Comment:
Please see Section 6.3 of the SIP document which summarizes why the expected high concentrations are conservative. Also, Section 7, Conclusions of the *Speciated Linear PM10 Roll-Forward Modeling Report* explains why this is a conservative modeling approach.

EPA Comment 11 (Technical Comment 8):
Section 6.3 (P.I9)- first paragraph: "Presently, nitrate mass contributes much less to the total ambient PM10 compared to the early 1990s. The model predicted that this trend will continue into the next decade." This model cannot predict trends in nitrate mass because it does not include PM chemistry.

Response to Comment:
The referenced section has been modified to say: "Based on the future year inventories, particularly NOx reductions due to federal vehicle emission standards, this trend in declining nitrate aerosol will likely continue into the future or at least remain level."

EPA Comment 12 (Technical Comment 9):
Section 6.3, (P.19)- second paragraph: "The relative importance of crustal mass will increase in summer as the nitrate mass decreases." Since this model is not capable of demonstrating that nitrate mass will decrease in future years, consider rephrasing to something like "The relative importance of crustal mass will increase in summer as the nitrate mass is likely to remain level or decrease."

Response to Comment:
The section has been modified to read: "The relative importance of crustal mass will increase over time due to an increase in vehicle miles travelled. The relative importance of nitrate mass is likely to decreases with declining vehicle NOx emissions, or at least remain level. Nitrate mass was conservatively assumed to remain constant in the roll-forward modeling, rather than decrease as expected due to lower new car NOx emissions in the future. This conservative nitrate emissions treatment is intended to allow for potential uncertainty in the nitrate formation process (see Appendix C, Section 6.5).

EPA Comment 13 (Technical Comment 10, part 1):

First paragraph, last sentence- Change the sentence to read "Areas in attainment are not required to have *enacted* contingency measures ... ". In the Memo *Procedures for Processing Requests to Redesignate Areas to Attainment,* Sept. 4, 1992, (Calcagni Memo), contingency measures for maintenance plans do not have to be adopted at the time of the submittal but the plan still must identify the measures to be adopted and provide a schedule for adoption.

Response to Comment:
This change has been made.

EPA Comment 13 (Technical Comment 10, part 2):
Triggering (Section 8.2) -The Calcagni Memo recommends setting an action level to allow the state to take early action to prevent actual violations of the NAAQS. We recommend adopting this approach instead of waiting for a violation of the NAAQS.

Response to Comment:
DEQ will continue with the same triggering mechanism that was included in the EPA approved 2002 maintenance plan and redesignation request and codified in 40 C.F.R. § 52.670.