



# Appendix B

## Emissions Inventory



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## Appendix B: Emissions Inventory

Emissions inventories are estimates of the amount and type of pollutants emitted into the atmosphere by industrial facilities, mobile sources, and smaller sources such as consumer products and paint. Emissions inventories serve as 1) a primary input to air quality modeling used in attainment demonstrations; 2) the emissions data used for developing control strategies; and 3) a means to track progress in meeting the emission reduction commitments. The inventories in this appendix are used to study and propose control measures, to track emissions for Rate of Progress (ROP), to track Emissions Reduction Credits (ERCs), to establish motor vehicle conformity budgets for transportation planning, and to assist in demonstrating attainment.

An emissions inventory is a critical tool in the evaluation of air pollution. In simple terms, an emissions inventory is a systematic listing of the sources of air pollution along with the amount of pollution emitted from each source or category over a given time period. Emissions inventories are an estimate of the air pollution emissions that are actually released into the environment—they are not measurements of ambient concentrations. The following are examples of pollution sources by key sectors:

- Industrial or stationary point sources—power plants and oil refineries;
- Area-wide sources—consumer products and residential fuel combustion;
- On-road sources—passenger vehicles and heavy-duty trucks;
- Off-road mobile sources—aircraft, trains, ships, recreational boats, construction equipment and farm equipment; and
- Nonanthropogenic (natural) sources—biogenic (or vegetation), geogenic (petroleum seeps), and wildfires.

The United States Environmental Protection Agency (U.S. EPA) establishes requirements pertaining to emissions information that must be included as part of the SIP submittal package. For the PM<sub>2.5</sub> Plan, the regulations require that the emissions inventory contain emissions data for directly emitted PM<sub>2.5</sub> and its precursors: oxides of nitrogen (NO<sub>x</sub>), reactive organic gases (ROG), sulfur oxides (SO<sub>x</sub>), and ammonia (NH<sub>3</sub>).

As discussed in Appendix A and throughout this plan, the Valley's attainment challenges under the national 24-hour PM<sub>2.5</sub> standard set in 2006 occur in the winter months. For this reason, this plan focuses on winter average daily emissions inventories, with emissions presented as tons per day (tpd). This winter average daily inventory represents emissions from the months of November to April.

Emissions inventories are usually developed at various geographical resolutions encompassing district, air basin, and county levels. The inventories presented in this appendix are the total emissions for the San Joaquin Valley Air Basin.

This appendix includes emissions for the San Joaquin Valley Air Basin for the years 2007, 2012, 2014, 2015, 2016, 2017, 2018, and 2019. The base year (the year from which the inventory is projected forward and backward) for these inventories is 2007. The year 2012 has been included as a reference point for the current year. Years 2014 and 2019 have been included as 2014 is the attainment deadline for the 1997 federal PM<sub>2.5</sub> standard, and 2019 is the longest attainment timeframe allowed under the 2006 federal PM<sub>2.5</sub> standard. Naturally, the years in between 2014 and 2019 have been included to show the progression of the inventory.

The tables in this appendix include:

- Table B-1 Directly emitted PM<sub>2.5</sub>, Winter Daily Averages
- Table B-2 NO<sub>x</sub>, Winter Daily Averages
- Table B-3 SO<sub>x</sub>, Winter Daily Averages
- Table B-4 VOC, Winter Daily Averages
- Table B-5 Ammonia, Winter Daily Averages

Tables B-1 through B-5 are followed by an overview of emissions inventory calculations and revisions, as well as a discussion on population projections that influence the emissions inventory.

**B.1 EMISSIONS INVENTORY TABLES****Table B-1 Directly Emitted PM2.5 (Winter Daily Averages in tons per day)**

Directly Emitted PM2.5 (tpd)								
SUMMARY CATEGORY NAME	WINTER AVERAGE							
	2007	2012	2014	2015	2016	2017	2018	2019
<b>STATIONARY SOURCES</b>								
<b>FUEL COMBUSTION</b>								
ELECTRIC UTILITIES	1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.3
COGENERATION	0.8	0.8	0.8	0.9	0.9	0.9	1.0	1.0
OIL AND GAS PRODUCTION (COMBUSTION)	1.9	1.7	1.6	1.6	1.6	1.5	1.5	1.5
PETROLEUM REFINING (COMBUSTION)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
MANUFACTURING AND INDUSTRIAL	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
FOOD AND AGRICULTURAL PROCESSING	0.8	0.5	0.5	0.5	0.4	0.4	0.4	0.4
SERVICE AND COMMERCIAL	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
OTHER (FUEL COMBUSTION)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>* TOTAL FUEL COMBUSTION</b>	<b>5.6</b>	<b>5.1</b>	<b>5.0</b>	<b>4.9</b>	<b>4.9</b>	<b>4.9</b>	<b>4.9</b>	<b>4.9</b>
<b>WASTE DISPOSAL</b>								
SEWAGE TREATMENT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LANDFILLS	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
INCINERATORS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SOIL REMEDIATION	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER (WASTE DISPOSAL)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>* TOTAL WASTE DISPOSAL</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>
<b>CLEANING AND SURFACE COATINGS</b>								
LAUNDERING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DEGREASING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
COATINGS AND RELATED PROCESS SOLVENTS	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
PRINTING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ADHESIVES AND SEALANTS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER (CLEANING AND SURFACE COATINGS)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>* TOTAL CLEANING AND SURFACE COATINGS</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>
<b>PETROLEUM PRODUCTION AND MARKETING</b>								
OIL AND GAS PRODUCTION	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PETROLEUM REFINING	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
PETROLEUM MARKETING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER (PETROLEUM PRODUCTION AND MARKETING)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Directly Emitted PM2.5 (tpd)								
SUMMARY CATEGORY NAME	WINTER AVERAGE							
	2007	2012	2014	2015	2016	2017	2018	2019
<b>* TOTAL PETROLEUM PRODUCTION AND MARKETING</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>
<b>INDUSTRIAL PROCESSES</b>								
CHEMICAL	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
FOOD AND AGRICULTURE	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8
MINERAL PROCESSES	1.5	1.5	1.6	1.6	1.7	1.7	1.8	1.8
METAL PROCESSES	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
WOOD AND PAPER	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
GLASS AND RELATED PRODUCTS	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5
ELECTRONICS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER (INDUSTRIAL PROCESSES)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
<b>* TOTAL INDUSTRIAL PROCESSES</b>	<b>3.4</b>	<b>3.2</b>	<b>3.4</b>	<b>3.4</b>	<b>3.5</b>	<b>3.6</b>	<b>3.7</b>	<b>3.7</b>
<b>** TOTAL STATIONARY SOURCES</b>	<b>9.4</b>	<b>8.7</b>	<b>8.8</b>	<b>8.7</b>	<b>8.8</b>	<b>8.9</b>	<b>9.0</b>	<b>9.0</b>
<b>AREA-WIDE SOURCES</b>								
<b>SOLVENT EVAPORATION</b>								
CONSUMER PRODUCTS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ARCHITECTURAL COATINGS AND RELATED PROCESS SOLVENTS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PESTICIDES/FERTILIZERS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ASPHALT PAVING / ROOFING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>* TOTAL SOLVENT EVAPORATION</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>
<b>MISCELLANEOUS PROCESSES</b>								
RESIDENTIAL FUEL COMBUSTION	21.5	9.4	9.1	9.1	9.1	9.1	9.1	9.1
FARMING OPERATIONS	12.0	11.8	11.8	11.8	11.7	11.7	11.7	11.6
CONSTRUCTION AND DEMOLITION	1.1	1.0	1.0	1.0	1.0	1.1	1.1	1.1
PAVED ROAD DUST	4.8	4.5	4.5	4.5	4.5	4.5	4.5	4.5
UNPAVED ROAD DUST	4.5	4.3	4.3	4.4	4.4	4.4	4.4	4.4
FUGITIVE WINDBLOWN DUST	5.0	4.8	4.7	4.7	4.7	4.6	4.6	4.6
FIRES	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
MANAGED BURNING AND DISPOSAL	10.1	7.4	7.4	7.4	7.3	7.3	7.3	7.3
COOKING	3.5	3.6	3.7	3.8	3.9	3.9	4.0	4.1
OTHER (MISCELLANEOUS PROCESSES)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>* TOTAL MISCELLANEOUS PROCESSES</b>	<b>62.5</b>	<b>47.1</b>	<b>46.7</b>	<b>46.7</b>	<b>46.8</b>	<b>46.8</b>	<b>46.8</b>	<b>46.8</b>
<b>** TOTAL AREA-WIDE SOURCES</b>	<b>62.5</b>	<b>47.1</b>	<b>46.7</b>	<b>46.7</b>	<b>46.8</b>	<b>46.8</b>	<b>46.8</b>	<b>46.8</b>
<b>MOBILE SOURCES</b>								
<b>ON-ROAD MOTOR VEHICLES</b>								
LIGHT DUTY PASSENGER (LDA)	1.0	0.9	0.9	1.0	1.0	1.0	1.0	1.0
LIGHT DUTY TRUCKS - 1 (LDT1)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
LIGHT DUTY TRUCKS - 2 (LDT2)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4

Directly Emitted PM2.5 (tpd)								
SUMMARY CATEGORY NAME	WINTER AVERAGE							
	2007	2012	2014	2015	2016	2017	2018	2019
MEDIUM DUTY TRUCKS (MDV)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5
LIGHT HEAVY DUTY GAS TRUCKS - 1 (LHDV1)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
LIGHT HEAVY DUTY GAS TRUCKS - 2 (LHDV2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MEDIUM HEAVY DUTY GAS TRUCKS (MHDV)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HEAVY HEAVY DUTY GAS TRUCKS (HHDV)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LIGHT HEAVY DUTY DIESEL TRUCKS - 1 (LHDV1)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
LIGHT HEAVY DUTY DIESEL TRUCKS - 2 (LHDV2)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
MEDIUM HEAVY DUTY DIESEL TRUCKS (MHDV)	0.8	0.5	0.4	0.4	0.3	0.3	0.3	0.3
HEAVY HEAVY DUTY DIESEL TRUCKS (HHDV)	5.8	3.8	2.0	1.6	1.5	1.4	1.4	1.4
MOTORCYCLES (MCY)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HEAVY DUTY DIESEL URBAN BUSES (UB)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
HEAVY DUTY GAS URBAN BUSES (UB)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SCHOOL BUSES (SB)	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
OTHER BUSES (OB)	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MOTOR HOMES (MH)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>* TOTAL ON-ROAD MOTOR VEHICLES</b>	<b>9.1</b>	<b>6.7</b>	<b>4.8</b>	<b>4.4</b>	<b>4.3</b>	<b>4.2</b>	<b>4.2</b>	<b>4.3</b>
<b>OTHER MOBILE SOURCES</b>								
AIRCRAFT	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.6
TRAINS	0.6	0.4	0.4	0.4	0.4	0.4	0.4	0.4
SHIPS AND COMMERCIAL BOATS	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RECREATIONAL BOATS	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1
OFF-ROAD RECREATIONAL VEHICLES	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OFF-ROAD EQUIPMENT	2.1	1.4	1.3	1.2	1.1	1.1	1.0	0.9
FARM EQUIPMENT	2.1	1.6	1.3	1.2	1.1	1.0	0.9	0.8
FUEL STORAGE AND HANDLING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>* TOTAL OTHER MOBILE SOURCES</b>	<b>6.1</b>	<b>4.6</b>	<b>4.1</b>	<b>4.0</b>	<b>3.8</b>	<b>3.6</b>	<b>3.4</b>	<b>3.8</b>
<b>** TOTAL MOBILE SOURCES</b>	<b>15.2</b>	<b>11.3</b>	<b>8.9</b>	<b>8.4</b>	<b>8.0</b>	<b>7.8</b>	<b>7.7</b>	<b>8.1</b>
<b>GRAND TOTAL FOR SAN JOAQUIN VALLEY</b>	<b>87.1</b>	<b>67.1</b>	<b>64.4</b>	<b>63.9</b>	<b>63.6</b>	<b>63.5</b>	<b>63.4</b>	<b>64.0</b>

Table B-2 NOx (Winter Daily Averages in tons per day)

NOx (tpd)								
SUMMARY CATEGORY NAME	WINTER AVERAGE							
	2007	2012	2014	2015	2016	2017	2018	2019
<b>STATIONARY SOURCES</b>								
FUEL COMBUSTION								
ELECTRIC UTILITIES	7.1	5.4	5.4	5.4	5.6	5.6	5.7	5.7
COGENERATION	3.0	1.6	1.7	1.8	1.8	1.9	2.0	2.0
OIL AND GAS PRODUCTION (COMBUSTION)	3.5	1.9	1.7	1.6	1.6	1.5	1.5	1.4
PETROLEUM REFINING (COMBUSTION)	0.7	0.5	0.5	0.5	0.5	0.5	0.5	0.5
MANUFACTURING AND INDUSTRIAL	5.1	4.8	4.8	4.8	4.8	4.8	4.8	4.7
FOOD AND AGRICULTURAL PROCESSING	12.7	7.5	7.1	5.1	3.8	3.5	3.3	3.2
SERVICE AND COMMERCIAL	4.0	3.6	3.6	3.5	3.6	3.6	3.6	3.6
OTHER (FUEL COMBUSTION)	0.6	0.5	0.5	0.4	0.4	0.4	0.4	0.4
<b>* TOTAL FUEL COMBUSTION</b>	<b>36.6</b>	<b>25.9</b>	<b>25.3</b>	<b>23.1</b>	<b>22.0</b>	<b>21.9</b>	<b>21.8</b>	<b>21.7</b>
WASTE DISPOSAL								
SEWAGE TREATMENT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LANDFILLS	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2
INCINERATORS	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
SOIL REMEDIATION	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER (WASTE DISPOSAL)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>* TOTAL WASTE DISPOSAL</b>	<b>0.3</b>	<b>0.3</b>	<b>0.3</b>	<b>0.3</b>	<b>0.3</b>	<b>0.3</b>	<b>0.3</b>	<b>0.3</b>
CLEANING AND SURFACE COATINGS								
LAUNDERING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DEGREASING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
COATINGS AND RELATED PROCESS SOLVENTS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PRINTING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ADHESIVES AND SEALANTS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER (CLEANING AND SURFACE COATINGS)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>* TOTAL CLEANING AND SURFACE COATINGS</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>
PETROLEUM PRODUCTION AND MARKETING								
OIL AND GAS PRODUCTION	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1
PETROLEUM REFINING	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
PETROLEUM MARKETING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER (PETROLEUM PRODUCTION AND MARKETING)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0



NOx (tpd)								
SUMMARY CATEGORY NAME	WINTER AVERAGE							
	2007	2012	2014	2015	2016	2017	2018	2019
<b>* TOTAL PETROLEUM PRODUCTION AND MARKETING</b>	<b>0.3</b>	<b>0.3</b>	<b>0.3</b>	<b>0.3</b>	<b>0.3</b>	<b>0.3</b>	<b>0.3</b>	<b>0.3</b>
<b>INDUSTRIAL PROCESSES</b>								
CHEMICAL	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.5
FOOD AND AGRICULTURE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MINERAL PROCESSES	0.2	0.1	0.1	0.2	0.2	0.2	0.2	0.2
METAL PROCESSES	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WOOD AND PAPER	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GLASS AND RELATED PRODUCTS	7.8	6.1	4.0	4.1	4.2	4.3	4.3	4.4
ELECTRONICS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER (INDUSTRIAL PROCESSES)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>* TOTAL INDUSTRIAL PROCESSES</b>	<b>8.4</b>	<b>6.7</b>	<b>4.6</b>	<b>4.7</b>	<b>4.8</b>	<b>4.9</b>	<b>5.0</b>	<b>5.0</b>
<b>** TOTAL STATIONARY SOURCES</b>	<b>45.6</b>	<b>33.1</b>	<b>30.5</b>	<b>28.4</b>	<b>27.4</b>	<b>27.4</b>	<b>27.3</b>	<b>27.3</b>
<b>AREA-WIDE SOURCES</b>								
<b>SOLVENT EVAPORATION</b>								
CONSUMER PRODUCTS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ARCHITECTURAL COATINGS AND RELATED PROCESS SOLVENTS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PESTICIDES/FERTILIZERS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ASPHALT PAVING / ROOFING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>* TOTAL SOLVENT EVAPORATION</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>
<b>MISCELLANEOUS PROCESSES</b>								
RESIDENTIAL FUEL COMBUSTION	12.0	10.3	10.3	10.3	10.3	10.4	10.4	10.5
FARMING OPERATIONS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CONSTRUCTION AND DEMOLITION	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PAVED ROAD DUST	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UNPAVED ROAD DUST	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FUGITIVE WINDBLOWN DUST	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FIRES	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MANAGED BURNING AND DISPOSAL	7.1	5.3	5.3	5.2	5.2	5.2	5.2	5.2
COOKING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER (MISCELLANEOUS PROCESSES)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>* TOTAL MISCELLANEOUS PROCESSES</b>	<b>19.0</b>	<b>15.6</b>	<b>15.6</b>	<b>15.6</b>	<b>15.6</b>	<b>15.6</b>	<b>15.7</b>	<b>15.7</b>
<b>** TOTAL AREA-WIDE SOURCES</b>	<b>19.0</b>	<b>15.6</b>	<b>15.6</b>	<b>15.6</b>	<b>15.6</b>	<b>15.6</b>	<b>15.7</b>	<b>15.7</b>
<b>MOBILE SOURCES</b>								
<b>ON-ROAD MOTOR VEHICLES</b>								
LIGHT DUTY PASSENGER (LDA)	18.8	11.3	8.6	7.6	6.9	6.1	5.6	5.2

NOx (tpd)								
SUMMARY CATEGORY NAME	WINTER AVERAGE							
	2007	2012	2014	2015	2016	2017	2018	2019
LIGHT DUTY TRUCKS - 1 (LDT1)	6.3	3.8	3.2	2.9	2.7	2.5	2.3	2.1
LIGHT DUTY TRUCKS - 2 (LDT2)	13.1	8.3	6.3	5.6	5.0	4.4	3.9	3.6
MEDIUM DUTY TRUCKS (MDV)	16.8	13.3	11.4	10.6	9.9	9.2	8.7	8.1
LIGHT HEAVY DUTY GAS TRUCKS - 1 (LHDV1)	5.2	4.7	4.4	4.3	4.2	4.0	4.0	3.9
LIGHT HEAVY DUTY GAS TRUCKS - 2 (LHDV2)	0.5	0.4	0.3	0.3	0.3	0.3	0.3	0.3
MEDIUM HEAVY DUTY GAS TRUCKS (MHDV)	1.2	0.9	0.7	0.7	0.6	0.6	0.5	0.5
HEAVY HEAVY DUTY GAS TRUCKS (HHDV)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5
LIGHT HEAVY DUTY DIESEL TRUCKS - 1 (LHDV1)	15.2	12.0	10.5	9.9	9.3	8.7	8.1	7.7
LIGHT HEAVY DUTY DIESEL TRUCKS - 2 (LHDV2)	3.7	2.9	2.5	2.4	2.2	2.1	2.0	1.9
MEDIUM HEAVY DUTY DIESEL TRUCKS (MHDV)	19.7	13.0	11.9	10.6	9.7	8.8	8.1	7.3
HEAVY HEAVY DUTY DIESEL TRUCKS (HHDV)	187.4	106.0	91.2	80.9	72.3	66.5	61.8	58.4
MOTORCYCLES (MCY)	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.2
HEAVY DUTY DIESEL URBAN BUSES (UB)	2.1	2.1	1.9	1.9	1.9	1.9	1.9	1.8
HEAVY DUTY GAS URBAN BUSES (UB)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
SCHOOL BUSES (SB)	1.5	1.1	1.0	1.0	1.0	1.1	1.0	1.0
OTHER BUSES (OB)	2.3	1.6	1.4	1.2	1.1	1.0	0.9	0.9
MOTOR HOMES (MH)	0.9	0.7	0.7	0.6	0.6	0.6	0.5	0.5
<b>* TOTAL ON-ROAD MOTOR VEHICLES</b>	<b>296.5</b>	<b>184.1</b>	<b>157.9</b>	<b>142.5</b>	<b>129.5</b>	<b>119.6</b>	<b>111.4</b>	<b>104.9</b>
<b>OTHER MOBILE SOURCES</b>								
AIRCRAFT	2.6	2.7	2.7	2.7	2.7	2.7	2.7	5.0
TRAINS	21.7	16.4	17.0	17.1	17.0	16.9	16.7	16.5
SHIPS AND COMMERCIAL BOATS	1.1	0.9	0.9	0.8	0.8	0.8	0.8	0.8
RECREATIONAL BOATS	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6
OFF-ROAD RECREATIONAL VEHICLES	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
OFF-ROAD EQUIPMENT	40.2	27.2	25.8	25.3	24.4	23.7	22.2	21.2
FARM EQUIPMENT	37.7	28.7	24.7	22.8	21.0	19.5	17.9	16.4
FUEL STORAGE AND HANDLING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>* TOTAL OTHER MOBILE SOURCES</b>	<b>103.9</b>	<b>76.6</b>	<b>71.7</b>	<b>69.4</b>	<b>66.7</b>	<b>64.3</b>	<b>61.0</b>	<b>60.6</b>
<b>** TOTAL MOBILE SOURCES</b>	<b>400.5</b>	<b>260.7</b>	<b>229.6</b>	<b>211.9</b>	<b>196.3</b>	<b>183.9</b>	<b>172.4</b>	<b>165.5</b>
<b>GRAND TOTAL FOR SAN JOAQUIN VALLEY</b>	<b>465.1</b>	<b>309.4</b>	<b>275.7</b>	<b>255.9</b>	<b>239.3</b>	<b>226.9</b>	<b>215.4</b>	<b>208.5</b>

Table B-3 SO<sub>x</sub> (Winter Daily Averages in tons per day)

SO <sub>x</sub> (tpd)								
SUMMARY CATEGORY NAME	WINTER AVERAGE							
	2007	2012	2014	2015	2016	2017	2018	2019
<b>STATIONARY SOURCES</b>								
FUEL COMBUSTION								
ELECTRIC UTILITIES	1.4	1.3	1.3	1.3	1.3	1.3	1.4	1.4
COGENERATION	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2
OIL AND GAS PRODUCTION (COMBUSTION)	2.0	1.1	0.5	0.4	0.4	0.4	0.4	0.4
PETROLEUM REFINING (COMBUSTION)	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1
MANUFACTURING AND INDUSTRIAL	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0
FOOD AND AGRICULTURAL PROCESSING	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1
SERVICE AND COMMERCIAL	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3
OTHER (FUEL COMBUSTION)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>* TOTAL FUEL COMBUSTION</b>	<b>5.6</b>	<b>4.3</b>	<b>3.4</b>	<b>3.4</b>	<b>3.4</b>	<b>3.4</b>	<b>3.4</b>	<b>3.4</b>
WASTE DISPOSAL								
SEWAGE TREATMENT	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1
LANDFILLS	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
INCINERATORS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SOIL REMEDIATION	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER (WASTE DISPOSAL)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>* TOTAL WASTE DISPOSAL</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>
CLEANING AND SURFACE COATINGS								
LAUNDERING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DEGREASING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
COATINGS AND RELATED PROCESS SOLVENTS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PRINTING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ADHESIVES AND SEALANTS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER (CLEANING AND SURFACE COATINGS)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>* TOTAL CLEANING AND SURFACE COATINGS</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>
PETROLEUM PRODUCTION AND MARKETING								
OIL AND GAS PRODUCTION	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PETROLEUM REFINING	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
PETROLEUM MARKETING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER (PETROLEUM PRODUCTION AND MARKETING)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

SOx (tpd)								
SUMMARY CATEGORY NAME	WINTER AVERAGE							
	2007	2012	2014	2015	2016	2017	2018	2019
<b>* TOTAL PETROLEUM PRODUCTION AND MARKETING</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>
<b>INDUSTRIAL PROCESSES</b>								
CHEMICAL	1.0	0.8	0.8	0.8	0.8	0.8	0.8	0.9
FOOD AND AGRICULTURE	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
MINERAL PROCESSES	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4
METAL PROCESSES	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WOOD AND PAPER	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GLASS AND RELATED PRODUCTS	3.0	1.9	1.8	1.8	1.8	1.9	1.9	1.9
ELECTRONICS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER (INDUSTRIAL PROCESSES)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>* TOTAL INDUSTRIAL PROCESSES</b>	<b>4.6</b>	<b>3.2</b>	<b>3.2</b>	<b>3.3</b>	<b>3.3</b>	<b>3.3</b>	<b>3.4</b>	<b>3.4</b>
<b>** TOTAL STATIONARY SOURCES</b>	<b>10.4</b>	<b>7.7</b>	<b>6.8</b>	<b>6.9</b>	<b>7.0</b>	<b>7.0</b>	<b>7.1</b>	<b>7.1</b>
<b>AREA-WIDE SOURCES</b>								
<b>SOLVENT EVAPORATION</b>								
CONSUMER PRODUCTS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ARCHITECTURAL COATINGS AND RELATED PROCESS SOLVENTS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PESTICIDES/FERTILIZERS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ASPHALT PAVING / ROOFING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>* TOTAL SOLVENT EVAPORATION</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>
<b>MISCELLANEOUS PROCESSES</b>								
RESIDENTIAL FUEL COMBUSTION	0.6	0.3	0.3	0.3	0.3	0.3	0.3	0.3
FARMING OPERATIONS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CONSTRUCTION AND DEMOLITION	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PAVED ROAD DUST	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UNPAVED ROAD DUST	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FUGITIVE WINDBLOWN DUST	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FIRES	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MANAGED BURNING AND DISPOSAL	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
COOKING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER (MISCELLANEOUS PROCESSES)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>* TOTAL MISCELLANEOUS PROCESSES</b>	<b>0.8</b>	<b>0.5</b>	<b>0.5</b>	<b>0.5</b>	<b>0.5</b>	<b>0.5</b>	<b>0.5</b>	<b>0.5</b>
<b>** TOTAL AREA-WIDE SOURCES</b>	<b>0.8</b>	<b>0.5</b>	<b>0.5</b>	<b>0.5</b>	<b>0.5</b>	<b>0.5</b>	<b>0.5</b>	<b>0.5</b>
<b>MOBILE SOURCES</b>								
<b>ON-ROAD MOTOR VEHICLES</b>								
LIGHT DUTY PASSENGER (LDA)	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2
LIGHT DUTY TRUCKS - 1 (LDT1)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

SOx (tpd)								
SUMMARY CATEGORY NAME	WINTER AVERAGE							
	2007	2012	2014	2015	2016	2017	2018	2019
LIGHT DUTY TRUCKS - 2 (LDT2)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
MEDIUM DUTY TRUCKS (MDV)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
LIGHT HEAVY DUTY GAS TRUCKS - 1 (LHDV1)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LIGHT HEAVY DUTY GAS TRUCKS - 2 (LHDV2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MEDIUM HEAVY DUTY GAS TRUCKS (MHDV)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HEAVY HEAVY DUTY GAS TRUCKS (HHDV)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LIGHT HEAVY DUTY DIESEL TRUCKS - 1 (LHDV1)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LIGHT HEAVY DUTY DIESEL TRUCKS - 2 (LHDV2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MEDIUM HEAVY DUTY DIESEL TRUCKS (MHDV)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HEAVY HEAVY DUTY DIESEL TRUCKS (HHDV)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
MOTORCYCLES (MCY)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HEAVY DUTY DIESEL URBAN BUSES (UB)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HEAVY DUTY GAS URBAN BUSES (UB)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SCHOOL BUSES (SB)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER BUSES (OB)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MOTOR HOMES (MH)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>* TOTAL ON-ROAD MOTOR VEHICLES</b>	<b>0.6</b>	<b>0.7</b>	<b>0.7</b>	<b>0.7</b>	<b>0.7</b>	<b>0.7</b>	<b>0.8</b>	<b>0.8</b>
<b>OTHER MOBILE SOURCES</b>								
AIRCRAFT	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5
TRAINS	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SHIPS AND COMMERCIAL BOATS	0.5	0.1	0.1	0.1	0.1	0.1	0.1	0.1
RECREATIONAL BOATS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OFF-ROAD RECREATIONAL VEHICLES	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OFF-ROAD EQUIPMENT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FARM EQUIPMENT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FUEL STORAGE AND HANDLING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>* TOTAL OTHER MOBILE SOURCES</b>	<b>1.0</b>	<b>0.5</b>	<b>0.5</b>	<b>0.5</b>	<b>0.5</b>	<b>0.5</b>	<b>0.6</b>	<b>0.6</b>
<b>** TOTAL MOBILE SOURCES</b>	<b>1.6</b>	<b>1.2</b>	<b>1.2</b>	<b>1.2</b>	<b>1.3</b>	<b>1.3</b>	<b>1.3</b>	<b>1.4</b>
<b>GRAND TOTAL FOR SAN JOAQUIN VALLEY</b>	<b>12.8</b>	<b>9.4</b>	<b>8.6</b>	<b>8.6</b>	<b>8.7</b>	<b>8.8</b>	<b>8.9</b>	<b>9.0</b>

Table B-4 VOC (Winter Daily Averages in tons per day)

VOC (tpd)								
SUMMARY CATEGORY NAME	WINTER AVERAGE							
	2007	2012	2014	2015	2016	2017	2018	2019
<b>STATIONARY SOURCES</b>								
FUEL COMBUSTION								
ELECTRIC UTILITIES	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
COGENERATION	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
OIL AND GAS PRODUCTION (COMBUSTION)	1.5	1.3	1.2	1.2	1.2	1.2	1.1	1.1
PETROLEUM REFINING (COMBUSTION)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
MANUFACTURING AND INDUSTRIAL	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
FOOD AND AGRICULTURAL PROCESSING	1.2	0.7	0.7	0.6	0.4	0.4	0.4	0.4
SERVICE AND COMMERCIAL	0.6	0.5	0.6	0.6	0.6	0.6	0.6	0.6
OTHER (FUEL COMBUSTION)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
<b>* TOTAL FUEL COMBUSTION</b>	<b>4.0</b>	<b>3.3</b>	<b>3.2</b>	<b>3.1</b>	<b>3.0</b>	<b>2.9</b>	<b>2.9</b>	<b>2.9</b>
WASTE DISPOSAL								
SEWAGE TREATMENT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LANDFILLS	1.3	1.4	1.4	1.4	1.5	1.5	1.5	1.5
INCINERATORS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SOIL REMEDIATION	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
OTHER (WASTE DISPOSAL)	23.1	19.3	20.1	20.5	20.9	20.6	21.0	21.4
<b>* TOTAL WASTE DISPOSAL</b>	<b>24.6</b>	<b>21.0</b>	<b>21.8</b>	<b>22.2</b>	<b>22.7</b>	<b>22.3</b>	<b>22.7</b>	<b>23.2</b>
CLEANING AND SURFACE COATINGS								
LAUNDERING	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
DEGREASING	1.5	1.5	1.5	1.6	1.6	1.6	1.6	1.6
COATINGS AND RELATED PROCESS SOLVENTS	7.3	7.8	8.2	8.4	8.5	8.7	8.9	9.1
PRINTING	4.4	4.9	5.1	5.2	5.3	5.4	5.5	5.6
ADHESIVES AND SEALANTS	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6
OTHER (CLEANING AND SURFACE COATINGS)	3.6	4.2	4.4	4.5	4.6	4.7	4.8	4.9
<b>* TOTAL CLEANING AND SURFACE COATINGS</b>	<b>17.6</b>	<b>19.1</b>	<b>20.0</b>	<b>20.4</b>	<b>20.7</b>	<b>21.1</b>	<b>21.5</b>	<b>21.8</b>
PETROLEUM PRODUCTION AND MARKETING								
OIL AND GAS PRODUCTION	28.5	25.2	24.1	23.5	23.0	22.5	22.0	21.5
PETROLEUM REFINING	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
PETROLEUM MARKETING	6.7	7.3	7.5	7.7	7.8	8.0	8.1	8.3
OTHER (PETROLEUM PRODUCTION AND MARKETING)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

VOC (tpd)								
SUMMARY CATEGORY NAME	WINTER AVERAGE							
	2007	2012	2014	2015	2016	2017	2018	2019
<b>* TOTAL PETROLEUM PRODUCTION AND MARKETING</b>	<b>36.3</b>	<b>33.6</b>	<b>32.7</b>	<b>32.4</b>	<b>32.0</b>	<b>31.6</b>	<b>31.3</b>	<b>31.0</b>
<b>INDUSTRIAL PROCESSES</b>								
CHEMICAL	3.4	2.7	2.8	2.8	2.9	2.9	2.9	3.0
FOOD AND AGRICULTURE	9.5	10.4	10.8	11.0	11.2	11.4	11.6	11.9
MINERAL PROCESSES	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4
METAL PROCESSES	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
WOOD AND PAPER	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GLASS AND RELATED PRODUCTS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ELECTRONICS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER (INDUSTRIAL PROCESSES)	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4
<b>* TOTAL INDUSTRIAL PROCESSES</b>	<b>13.7</b>	<b>14.0</b>	<b>14.5</b>	<b>14.8</b>	<b>15.0</b>	<b>15.3</b>	<b>15.5</b>	<b>15.9</b>
<b>** TOTAL STATIONARY SOURCES</b>	<b>96.2</b>	<b>91.0</b>	<b>92.3</b>	<b>92.8</b>	<b>93.4</b>	<b>93.2</b>	<b>94.0</b>	<b>94.7</b>
<b>AREA-WIDE SOURCES</b>								
<b>SOLVENT EVAPORATION</b>								
CONSUMER PRODUCTS	22.8	21.0	20.6	20.8	21.2	21.5	21.9	22.2
ARCHITECTURAL COATINGS AND RELATED PROCESS SOLVENTS	9.8	7.7	7.8	7.9	8.0	8.0	8.1	8.2
PESTICIDES/FERTILIZERS	18.1	16.5	16.3	16.3	16.2	16.1	16.1	16.0
ASPHALT PAVING / ROOFING	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9
<b>* TOTAL SOLVENT EVAPORATION</b>	<b>51.5</b>	<b>46.0</b>	<b>45.6</b>	<b>45.9</b>	<b>46.2</b>	<b>46.5</b>	<b>46.9</b>	<b>47.2</b>
<b>MISCELLANEOUS PROCESSES</b>								
RESIDENTIAL FUEL COMBUSTION	21.9	10.7	10.2	10.2	10.2	10.2	10.2	10.2
FARMING OPERATIONS	130.6	103.5	105.8	107.0	108.1	109.2	110.4	111.5
CONSTRUCTION AND DEMOLITION	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PAVED ROAD DUST	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UNPAVED ROAD DUST	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FUGITIVE WINDBLOWN DUST	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FIRES	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
MANAGED BURNING AND DISPOSAL	8.5	6.5	6.4	6.4	6.4	6.4	6.4	6.3
COOKING	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6
OTHER (MISCELLANEOUS PROCESSES)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>* TOTAL MISCELLANEOUS PROCESSES</b>	<b>161.7</b>	<b>121.4</b>	<b>123.1</b>	<b>124.2</b>	<b>125.4</b>	<b>126.5</b>	<b>127.6</b>	<b>128.8</b>
<b>** TOTAL AREA-WIDE SOURCES</b>	<b>213.2</b>	<b>167.4</b>	<b>168.7</b>	<b>170.1</b>	<b>171.6</b>	<b>173.1</b>	<b>174.5</b>	<b>176.0</b>
<b>MOBILE SOURCES</b>								
<b>ON-ROAD MOTOR VEHICLES</b>								
LIGHT DUTY PASSENGER (LDA)	20.2	13.2	8.8	7.7	6.8	5.9	5.2	4.7

VOC (tpd)								
SUMMARY CATEGORY NAME	WINTER AVERAGE							
	2007	2012	2014	2015	2016	2017	2018	2019
LIGHT DUTY TRUCKS - 1 (LDT1)	7.0	4.9	3.6	3.3	3.0	2.8	2.5	2.4
LIGHT DUTY TRUCKS - 2 (LDT2)	8.9	6.8	4.9	4.4	4.0	3.5	3.2	3.0
MEDIUM DUTY TRUCKS (MDV)	8.5	8.4	7.0	6.8	6.6	6.3	6.1	6.0
LIGHT HEAVY DUTY GAS TRUCKS - 1 (LHDV1)	3.8	3.4	2.7	2.6	2.5	2.4	2.3	2.3
LIGHT HEAVY DUTY GAS TRUCKS - 2 (LHDV2)	0.5	0.3	0.2	0.2	0.2	0.2	0.1	0.1
MEDIUM HEAVY DUTY GAS TRUCKS (MHDV)	1.4	1.0	0.6	0.5	0.5	0.4	0.3	0.3
HEAVY HEAVY DUTY GAS TRUCKS (HHDV)	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1
LIGHT HEAVY DUTY DIESEL TRUCKS - 1 (LHDV1)	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5
LIGHT HEAVY DUTY DIESEL TRUCKS - 2 (LHDV2)	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1
MEDIUM HEAVY DUTY DIESEL TRUCKS (MHDV)	1.1	0.8	0.6	0.5	0.5	0.4	0.4	0.4
HEAVY HEAVY DUTY DIESEL TRUCKS (HHDV)	9.8	6.4	4.5	4.2	4.1	4.2	4.3	4.4
MOTORCYCLES (MCY)	4.2	3.7	3.1	3.1	3.0	3.0	3.0	3.1
HEAVY DUTY DIESEL URBAN BUSES (UB)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
HEAVY DUTY GAS URBAN BUSES	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
SCHOOL BUSES (SB)	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
OTHER BUSES (OB)	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.1
MOTOR HOMES (MH)	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0
<b>* TOTAL ON-ROAD MOTOR VEHICLES</b>	<b>67.3</b>	<b>50.5</b>	<b>37.5</b>	<b>34.7</b>	<b>32.4</b>	<b>30.4</b>	<b>28.8</b>	<b>27.7</b>
<b>OTHER MOBILE SOURCES</b>								
AIRCRAFT	4.1	4.2	4.2	4.2	4.2	4.3	4.3	6.0
TRAINS	1.6	1.1	1.0	1.0	0.9	0.9	0.8	0.8
SHIPS AND COMMERCIAL BOATS	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
RECREATIONAL BOATS	3.6	2.9	2.6	2.5	2.4	2.3	2.3	2.2
OFF-ROAD RECREATIONAL VEHICLES	3.7	2.9	2.8	2.8	2.8	2.7	2.7	2.7
OFF-ROAD EQUIPMENT	13.8	10.2	9.3	9.1	8.8	8.5	8.3	8.1
FARM EQUIPMENT	8.0	5.9	4.9	4.5	4.1	3.7	3.4	3.1
FUEL STORAGE AND HANDLING	3.1	1.7	1.5	1.4	1.4	1.3	1.3	1.3
<b>* TOTAL OTHER MOBILE SOURCES</b>	<b>38.0</b>	<b>28.9</b>	<b>26.5</b>	<b>25.6</b>	<b>24.7</b>	<b>23.9</b>	<b>23.1</b>	<b>24.2</b>
<b>** TOTAL MOBILE SOURCES</b>	<b>105.3</b>	<b>79.4</b>	<b>64.0</b>	<b>60.3</b>	<b>57.1</b>	<b>54.3</b>	<b>52.0</b>	<b>51.9</b>
<b>GRAND TOTAL FOR SAN JOAQUIN VALLEY</b>								
	<b>414.8</b>	<b>337.8</b>	<b>324.9</b>	<b>323.2</b>	<b>322.0</b>	<b>320.6</b>	<b>320.5</b>	<b>322.6</b>



Table B-5 Ammonia (Winter Daily Averages in tons per day)

AMMONIA (tpd)								
SUMMARY CATEGORY NAME	WINTER AVERAGE							
	2007	2012	2014	2015	2016	2017	2018	2019
<b>STATIONARY SOURCES</b>								
FUEL COMBUSTION								
ELECTRIC UTILITIES	0.8	0.7	0.7	0.6	0.6	0.7	0.7	0.7
COGENERATION	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
OIL AND GAS PRODUCTION (COMBUSTION)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PETROLEUM REFINING (COMBUSTION)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MANUFACTURING AND INDUSTRIAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FOOD AND AGRICULTURAL PROCESSING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SERVICE AND COMMERCIAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER (FUEL COMBUSTION)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>* TOTAL FUEL COMBUSTION</b>	<b>0.9</b>	<b>0.8</b>	<b>0.8</b>	<b>0.8</b>	<b>0.8</b>	<b>0.8</b>	<b>0.8</b>	<b>0.8</b>
WASTE DISPOSAL								
SEWAGE TREATMENT	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1
LANDFILLS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
INCINERATORS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SOIL REMEDIATION	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER (WASTE DISPOSAL)	17.9	19.3	20.1	20.5	20.9	21.3	21.7	22.1
<b>* TOTAL WASTE DISPOSAL</b>	<b>17.9</b>	<b>19.3</b>	<b>20.1</b>	<b>20.5</b>	<b>20.9</b>	<b>21.3</b>	<b>21.8</b>	<b>22.2</b>
CLEANING AND SURFACE COATINGS								
LAUNDERING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DEGREASING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
COATINGS AND RELATED PROCESS SOLVENTS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PRINTING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ADHESIVES AND SEALANTS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER (CLEANING AND SURFACE COATINGS)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>* TOTAL CLEANING AND SURFACE COATINGS</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>
PETROLEUM PRODUCTION AND MARKETING								
OIL AND GAS PRODUCTION	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PETROLEUM REFINING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PETROLEUM MARKETING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER (PETROLEUM PRODUCTION AND MARKETING)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

AMMONIA (tpd)								
SUMMARY CATEGORY NAME	WINTER AVERAGE							
	2007	2012	2014	2015	2016	2017	2018	2019
<b>* TOTAL PETROLEUM PRODUCTION AND MARKETING</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>
<b>INDUSTRIAL PROCESSES</b>								
CHEMICAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FOOD AND AGRICULTURE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MINERAL PROCESSES	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5
METAL PROCESSES	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WOOD AND PAPER	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GLASS AND RELATED PRODUCTS	0.5	0.3	0.4	0.4	0.4	0.4	0.4	0.4
ELECTRONICS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER (INDUSTRIAL PROCESSES)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>* TOTAL INDUSTRIAL PROCESSES</b>	<b>1.0</b>	<b>0.8</b>	<b>0.9</b>	<b>0.9</b>	<b>0.9</b>	<b>1.0</b>	<b>1.0</b>	<b>1.0</b>
<b>** TOTAL STATIONARY SOURCES</b>	<b>19.8</b>	<b>21.0</b>	<b>21.8</b>	<b>22.2</b>	<b>22.6</b>	<b>23.1</b>	<b>23.5</b>	<b>24.0</b>
<b>AREA-WIDE SOURCES</b>								
<b>SOLVENT EVAPORATION</b>								
CONSUMER PRODUCTS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ARCHITECTURAL COATINGS AND RELATED PROCESS SOLVENTS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PESTICIDES/FERTILIZERS	68.4	66.9	66.3	66.1	65.8	65.5	65.2	64.9
ASPHALT PAVING / ROOFING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>* TOTAL SOLVENT EVAPORATION</b>	<b>68.4</b>	<b>66.9</b>	<b>66.3</b>	<b>66.1</b>	<b>65.8</b>	<b>65.5</b>	<b>65.2</b>	<b>64.9</b>
<b>MISCELLANEOUS PROCESSES</b>								
RESIDENTIAL FUEL COMBUSTION	1.5	0.7	0.7	0.7	0.7	0.7	0.7	0.7
FARMING OPERATIONS	264.5	225.4	234.6	239.2	243.8	248.4	253.0	257.6
CONSTRUCTION AND DEMOLITION	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PAVED ROAD DUST	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UNPAVED ROAD DUST	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FUGITIVE WINDBLOWN DUST	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FIRES	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MANAGED BURNING AND DISPOSAL	1.4	1.1	1.0	1.0	1.0	1.0	1.0	1.0
COOKING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER (MISCELLANEOUS PROCESSES)	6.3	6.7	7.0	7.1	7.2	7.3	7.5	7.6
<b>* TOTAL MISCELLANEOUS PROCESSES</b>	<b>273.7</b>	<b>234.0</b>	<b>243.4</b>	<b>248.1</b>	<b>252.8</b>	<b>257.5</b>	<b>262.2</b>	<b>267.0</b>
<b>** TOTAL AREA-WIDE SOURCES</b>	<b>342.2</b>	<b>300.9</b>	<b>309.7</b>	<b>314.2</b>	<b>318.6</b>	<b>323.0</b>	<b>327.4</b>	<b>331.9</b>
<b>MOBILE SOURCES</b>								
<b>ON-ROAD MOTOR VEHICLES</b>								
LIGHT DUTY PASSENGER (LDA)	1.8	1.5	1.4	1.3	1.3	1.3	1.3	1.2

AMMONIA (tpd)								
SUMMARY CATEGORY NAME	WINTER AVERAGE							
	2007	2012	2014	2015	2016	2017	2018	2019
LIGHT DUTY TRUCKS - 1 (LDT1)	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2
LIGHT DUTY TRUCKS - 2 (LDT2)	1.0	0.8	0.8	0.7	0.7	0.7	0.7	0.7
MEDIUM DUTY TRUCKS (MDV)	1.6	1.4	1.3	1.3	1.3	1.3	1.3	1.2
LIGHT HEAVY DUTY GAS TRUCKS - 1 (LHDV1)	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3
LIGHT HEAVY DUTY GAS TRUCKS - 2 (LHDV2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MEDIUM HEAVY DUTY GAS TRUCKS (MHDV)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HEAVY HEAVY DUTY GAS TRUCKS (HHDV)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LIGHT HEAVY DUTY DIESEL TRUCKS - 1 (LHDV1)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LIGHT HEAVY DUTY DIESEL TRUCKS - 2 (LHDV2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MEDIUM HEAVY DUTY DIESEL TRUCKS (MHDV)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
HEAVY HEAVY DUTY DIESEL TRUCKS (HHDV)	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3
MOTORCYCLES (MCY)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HEAVY DUTY DIESEL URBAN BUSES (UB)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HEAVY DUTY GAS URBAN BUSES	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SCHOOL BUSES (SB)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER BUSES (OB)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MOTOR HOMES (MH)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>* TOTAL ON-ROAD MOTOR VEHICLES</b>	<b>5.3</b>	<b>4.7</b>	<b>4.4</b>	<b>4.3</b>	<b>4.3</b>	<b>4.2</b>	<b>4.2</b>	<b>4.2</b>
<b>OTHER MOBILE SOURCES</b>								
AIRCRAFT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TRAINS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SHIPS AND COMMERCIAL BOATS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RECREATIONAL BOATS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OFF-ROAD RECREATIONAL VEHICLES	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OFF-ROAD EQUIPMENT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FARM EQUIPMENT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FUEL STORAGE AND HANDLING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>* TOTAL OTHER MOBILE SOURCES</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>
<b>** TOTAL MOBILE SOURCES</b>	<b>5.4</b>	<b>4.7</b>	<b>4.5</b>	<b>4.4</b>	<b>4.3</b>	<b>4.3</b>	<b>4.2</b>	<b>4.2</b>
<b>GRAND TOTAL FOR SAN JOAQUIN VALLEY</b>								
	<b>367.3</b>	<b>326.6</b>	<b>336.0</b>	<b>340.7</b>	<b>345.5</b>	<b>350.4</b>	<b>355.2</b>	<b>360.1</b>

## B.2 EMISSIONS INVENTORY CALCULATIONS AND REVISIONS

ARB and the District continually collect information and conduct research to improve the emission estimates. During development of this Plan, both agencies allocated substantial resources to the improvement of the emissions inventory. In the two-year span leading to the release of the draft Plan, ARB headed a workgroup that focused on updating the inventory data in ARB's database. ARB and District staff conducted a thorough review of the inventory to ensure that the emission estimates reflected accurate emission reports for point sources, and that estimates for mobile and area-wide sources were based on the most recent methodologies. In cases where area-wide source methodologies were deemed to be out-of date (*i.e.*, if new emission factors or more recent activity data were available), the methodologies were updated. The updates were prioritized based on the overall contribution of each emission category to the total inventory for key pollutants (directly emitted PM<sub>2.5</sub>, NO<sub>x</sub>, SO<sub>x</sub>, VOCs, and ammonia).

ARB also conducts periodic evaluations and updates of the growth profiles to ensure that the emission forecasts are based on data that reflect historical trends, current conditions, and recent forecasts. The most significant challenge for this Plan was to ensure that the growth projections reflected the economic recession. Staff conducted a category-by-category review and update of the growth profile data for all the categories that, in aggregate, comprise more than 95 percent of the NO<sub>x</sub>, SO<sub>x</sub>, or PM<sub>2.5</sub> emissions. To capture the effects of the recession, staff ensured that the growth profiles included historical data through at least 2008 (data through 2009 or 2010 were included when available). Growth forecasts for the years 2009 and beyond were obtained primarily from government entities with expertise in developing forecasts for specific sectors, or in some cases, from econometric models.

In addition this comprehensive emissions inventory update process, modeling of the 24-hour PM<sub>2.5</sub> standard requires detailed information on the timing and locations of emission sources on the most severe air quality days. This poses a unique challenge to translate regional, annual emission estimates into the temporal and spatial resolution needed for 24-hour modeling. An iterative process was used as a means to refine the modeling emission inputs to better reflect observed conditions expected at a local, 24-hour scale. Model-simulated concentrations were compared with chemical species present in the ambient monitoring data, maps of emission sources known to surround the monitoring stations, and temporal trends in the monitoring data. This led to further updates in the spatial and temporal emissions data used in the modeling.

ARB and District staff worked jointly to develop a comprehensive emissions inventory for the *2012 PM<sub>2.5</sub> Plan*. The District worked closely with operators of major stationary facilities in their jurisdiction to develop the point source emission estimates. The District was also responsible for developing emission estimates for approximately one-third of the nonpoint (or area-wide) sources, such as commercial cooking and agricultural burning.

ARB staff developed the emission inventory for the mobile sources (both on-road and off-road) and the remaining two-thirds of the area-wide sources. ARB worked with several state and local agencies such as the Department of Transportation (Caltrans), the Department of Motor Vehicles (DMV), the Department of Pesticide Regulation (DPR), the California Energy Commission (CEC), and local councils of government (COGs) to assemble activity information necessary to develop the mobile and area-wide source emission estimates.

### **B.2.1 Base Year Inventory**

The base year inventory is an essential element of the Plan that forms the basis for all future year projections and also establishes the emission levels against which progress in emission reductions will be measured. U.S. EPA regulations establish general guidelines for selecting an inventory base year. Based on those guidelines, ARB and the District selected 2007 as the base year for this Plan. The design values recorded in 2007 were some of the highest in recent years. In addition, analysis of the impacts of meteorology on PM<sub>2.5</sub> levels in the Valley over the last ten years indicate that the 2007 meteorology was one of the most conducive to PM<sub>2.5</sub> formation. Thus, the selection of 2007 represents a health protective approach to the attainment demonstration.

### **B.2.2 Emission Forecasts**

In addition to a base year inventory, U.S. EPA regulations require future year inventories for specific milestone years. ARB develops emission forecasts for point and area-wide sources by applying growth and control factors to the base year inventory to account for year-to-year changes resulting from anticipated trends in economic conditions and population growth, and the effects of adopted emission control rules.

Growth factors are expressed as a ratio of the expected activity level in a future year relative to the base year. For point and area-wide sources, growth factors are derived from surrogates such as economic activity, fuel usage, population, dwelling-units, etc., that best reflect the expected growth or decline rates for each specific source category.

Control factors are percentages representing the extent to which a source category is controlled. These factors are derived from data provided by the regulatory agencies responsible for the affected emission categories. Developing control factors enables agencies to take appropriate credit for adopted rules and regulations that reduce emissions, remove exemptions, or improve compliance.

Mobile source projections are generated by emission models that employ sophisticated routines that predict vehicle fleet turnover by vehicle model year. As with stationary sources, the mobile source models include control algorithms that account for all adopted regulatory actions.

### **B.2.3 Annual, Seasonal, and Modeling Inventories**

Annual and seasonal emissions inventories, often referred to as planning inventories, are typically produced at a county or air basin level of resolution. Annual emissions inventories represent the total emissions over an entire year (tons per year), or a simple average of annual emissions divided by 365 days (tons per day).

Seasonal inventories (summer and winter) account for temporal activity variations throughout the year, as determined by actual data from point source facilities or by temporal profiles developed for area and mobile sources. Summer inventories include emissions from May to October, and winter inventories encompass November through April. Because PM<sub>2.5</sub> concentrations in the Valley are at their highest during the winter, the Plan's attainment demonstration is based on the winter inventory.

Modeling inventories (also referred to as gridded inventories), are estimated at finer spatial and temporal scales than planning inventories. Modeling inventories are used to support hour-by-hour, grid-based calculations of ambient pollutant concentrations. As a result, these inventories must characterize hourly emissions from all sources (stationary point, area-wide, mobile, and biogenic) located within each grid cell for the region and time being simulated. Modeling inventories account for day-specific variations within grid cells (such as actual plant shut-downs or wildfires) and the effects of meteorological conditions on emission rates (*e.g.*, the hour-specific ambient temperature effects on biogenic or evaporative emission releases). A more in-depth discussion of the temporal and spatial adjustments made to the Valley's modeling inventory is presented in the Modeling Protocol.

### **B.2.4 Quality Assurance and Quality Control**

ARB has established a quality assurance and quality control (QA/QC) process to ensure the integrity and accuracy of the emissions inventories used in the development of air quality plans. Emission inventory staff perform comprehensive QA/QC checks to confirm that inventory inputs have been reliably prepared and approved for use in photochemical modeling. This process involves collaboration among ARB and air district staff to develop base and future year emission estimates.

QA/QC occurs at the various stages of SIP emission inventory development. Base year emissions are assembled and maintained in the California Emission Inventory Development and Reporting System (CEIDARS). Inventory staff work with air districts, who are responsible for developing and reporting point source emission estimates, to verify these data are accurate. The locations of point sources, including stacks, are checked to ensure they are valid. Area-wide source emission estimates are developed by ARB staff as well as some air districts. The methodologies for estimating these are reviewed by ARB and district staff before their inclusion in the emission inventory. Additionally, CEIDARS is designed with automatic system checks to prevent errors such as double counting of emission sources. The system also makes various reports available to assist staff in their efforts to identify and reconcile anomalous emissions.

Future year emissions are estimated using the California Emission Forecasting and Planning Inventory System (CEFS). Growth and control factors are reviewed for each category and year along with the resulting emission projections. Year to year trends are compared to similar and past datasets to ensure general consistency. Emissions for specific categories are checked to confirm they reflect the anticipated effects of applicable control measures. Mobile categories are verified with mobile source staff for consistency with the on- and off-road emission models (EMFAC and OFFROAD).

Prior to input into the air quality model, the spatial and temporal parameters applied to the emissions are checked. Monthly, weekly, and diurnal emission profiles are examined to ensure they appear reasonable for the category. Emissions are again summarized by region (county, air basin, and district), category, and pollutant to confirm their consistency with the overall inventory.

As modeling results become available, the results are used to further validate the inventory. The modeled concentrations in a particular grid cell are reviewed for consistency with the types of sources present nearby in the emission inventory. Additionally, the inclusion of air quality monitor data, when available, is used to reaffirm that the types and magnitude of upwind sources are accounted for in the inventory.

### **B.3 EMISSIONS INVENTORY IMPROVEMENTS**

A summary of the major revisions that have been incorporated into the PM2.5 Plan emissions inventory is presented below.

#### **B.3.1 Stationary Sources**

Emission estimates from stationary sources (industrial point sources) are routinely updated on an annual basis by the District. District staff works with facility operators to ensure that emissions are reported accurately and in a timely manner. The point source emissions inventory for this PM2.5 Plan was compiled from emissions data reported by District staff for the year 2007.

Once the base year emissions are compiled by the District, ARB staff uses the base year inventory to forecast emissions into the future using relevant growth and control factors. Key updates to growth assumptions for stationary sources are discussed below.

#### **Stationary Source Growth Assumptions and Methodology Updates**

The growth profiles for key industrial categories were updated to reflect recent trends and growth forecasts in specific industrial sectors. To the extent feasible, these growth profile revisions capture the effects of the economic recession. Growth factors are derived from county-specific economic activity profiles, population forecasts, and other socio/demographic activity. These data are obtained from a number of sources such as local air districts, municipal planning agencies, economic studies sponsored by ARB,

and other State and federal agencies. Growth assumptions for the following point source categories were updated as described below:

- **Cogeneration:** Growth projections for emissions from natural gas use in the Cogeneration sector are based on the California Energy Commission's (CEC) 2009 Integrated Energy Policy Report (2009 IEPR) forecasts. For other fuels used in cogeneration facilities, ARB used forecasts from the U.S. Energy Information Administration's Annual Energy Outlook (AEO).
- **Cotton Gins:** The particulate matter (PM) size profile for cotton gins was updated to reflect lower PM<sub>2.5</sub> fractions (6.7% PM<sub>2.5</sub>/Total PM and 15% PM<sub>2.5</sub>/PM<sub>10</sub>) based on test data obtained from a study sponsored by the U.S. Department of Agriculture, the cotton industry, ARB and the District.
- **Electricity Generation:** Growth projections for emissions from natural gas use in the Electricity Generation sector are based on CEC data on electric utilities' contracts with operators of natural gas-fired power plants through 2020. Projections for power plant emissions driven by other fuels are based on AEO fuel use forecasts.
- **Glass and Related Products:** Growth projections for emissions from flat (architectural) glass manufacturing were adjusted to reflect the impact of the recession. The growth profile is based on ARB's growth curve for construction equipment, but it assumes no further growth once the curve returns to pre-recession levels. No growth was assumed for the Container and Cullet Glass manufacturing sectors.
- **Manufacturing and Industrial:** Growth projections for emissions from the Manufacturing and Industrial sector are based on the 2009 IEPR forecast for natural gas consumption and AEO forecasts for other fuels used by the manufacturing industry.
- **Mineral Processes:** Growth profiles for Mineral Processes associated with cement and concrete products manufacturing were derived from an econometric model run by Regional Economic Models Inc. (REMI). The profile for other mineral processes is based on an economic output forecast for non-metallic mineral product manufacturing, also from REMI.
- **Oil and Gas Production:** Growth projections for emissions from the Oil and Gas Production sector are based on a California Department of Conservation's Division of Oil, Gas and Geothermal Resources (DOGGR) forecast.



- **Petroleum Refining:** ARB assumes no growth for the Petroleum Refining sector based on assessments by District staff and DOGGR. While demand for petroleum based fuels and other products is expected to grow, District staff does not anticipate any expansion in capacity at the local facilities. The DOGGR assessment predicts that the increased demand will be satisfied by imports.
- **Service and Commercial:** Growth projections for emissions from the Service and Commercial sector are based on the 2009 IEPR forecast for natural gas consumption and AEO forecasts for other fuels used by the service and commercial industry.

### B.3.2 Area-wide Sources

Area-wide sources include source categories associated with human activity where emissions take place over a wide geographic area. Consumer products and unpaved road dust are examples of area-wide sources. Area-wide sources also include smaller point sources or facilities, such as gasoline-dispensing facilities, and residential water heaters that are not inventoried individually, but are estimated as a group and reported as a single source category. Improvements made to the area-wide emission inventory categories are described below.

- **Agricultural Harvest Operations:** ARB staff updated the methodology for Agricultural Harvest Operations to reflect 2007 farmland acreage based on estimates from the California Department of Conservation Farmland Mapping and Monitoring Program (FMMP). ARB staff also applied a lower emission factor for almond harvesting (31.2 lbs PM10/acre compared to the prior emission factor of 40.77 lbs PM10/acre) based on recent field research. Growth for this category is based on a linear regression analysis of the 2000-2008 FMMP farmland acreage for the Valley counties, which results in a slight decline of about 0.3 percent per year.
- **Agricultural Land Preparation:** ARB staff updated the Agricultural Land Preparation methodology to reflect 2007 farmland acreage estimates based on FMMP data. Growth for this category is based on a linear regression analysis of the 2000-2008 FMMP farmland acreage for the Valley counties, which results in a slight decline of about 0.3 percent per year.

- **Ammonia Emissions from Publicly Owned Treatment Works, Landfills, Composting, Fertilizer Application, Domestic Activity, Native Animals, and Native Soils** : ARB staff updated the ammonia emissions inventory methodology for publicly owned treatment works, landfills, composting, fertilizer application, domestic activity, native animals, and native soils. Revisions for these categories consist primarily of updated activity data. Emission factors were revised only for fertilizer application. Ammonia emissions for other categories such as residential wood combustion, livestock husbandry, agricultural open burning, on-road motor vehicles, wildfires, and wildland fire use (WFU) were updated as part of the methodology updates for those specific area source categories.
- **Architectural Coatings**: The Architectural Coatings category was updated to reflect emission estimates based on the comprehensive survey for the 2004 calendar year. The emission estimates include benefits of the 2003 and 2007 ARB Suggested Control Measures.
- **Biogenic Emissions**: The Biogenic Emissions category was updated to incorporate year-specific 8-day Leaf Area Index data from the Moderate Resolution Imaging Spectroradiometer (MODIS) instrument aboard NASA's Terra and Aqua satellites. The use of MODIS data result in higher biogenic emissions estimates. In addition, the planning and modeling inventories are based on observed gridded temperatures rather than climatologically average temperatures. Finally, ARB staff is now generating biogenic emissions through the Model of Emissions of Gases and Aerosols from Nature (MEGAN) v2.04 model, a state-of-the-science canopy scale model, using California-specific emission factor and plant functional type datasets. MEGAN is widely used in the global research and earth system modeling community as well as the U.S. regulatory modeling community.
- **Commercial Cooking**: ARB staff updated the growth profile for the Commercial Cooking category to reflect more recent population growth projections(San Joaquin Valley Demographic Forecasts 2010-2050) developed by The Planning Center | Design, Community, and Environment (DC&E) on behalf of the regional planning organizations in the Valley.
- **Consumer Products**: The Consumer Products category was updated to reflect the three most recent surveys conducted by ARB staff for the years 2003, 2006, and 2008. Together these surveys collected updated product information and ingredient information for approximately 350 product categories. Based on the survey data, ARB staff determined the total product sales and total VOC emissions for the various product categories. Before the emissions inventory was updated, some of the existing categories were split out into more specific categories, others were combined, and new categories were added to better reflect changes in formulations of existing products. The result of this update was an overall reduction in emissions from this category. After establishing revised baseline emissions, growth projections for this category are based the

May 2012 DOF Interim Population Projections for California and its Counties 2010-2050.

- **Livestock Husbandry:** ARB staff updated the Livestock Husbandry methodology to reflect livestock population data based on the U.S. Department of Agriculture's 2007 Census of Agriculture, and ammonia emission factors for dairy support cattle using data provided by District staff. The ROG and NH<sub>3</sub> emissions reflect updated control profiles to account for control requirements in District Rule 4570, Confined Animal Facilities, and a seasonal adjustment was added to account for the suppression of dust emissions in months in which rainfall occurs.
- **Managed Burning & Disposal:** ARB updated the Managed Burning and Disposal category with emissions data reported by District staff for the years 2005 to 2009. Growth for this category after 2009 is based on a linear regression analysis of the 2000-2008 FMMP farmland acreage for the Valley counties, which results in a slight decline of about 0.3 percent per year.
- **Paved Road Dust:** ARB updated the paved road dust methodology to be consistent with the current U.S. EPA AP-42 method (January 2011) to quantify dust emissions from paved roads. Revisions include reductions in silt loading values, updated vehicle miles traveled (VMT) data, and incorporation of precipitation correction factors. In addition, the revised method removed the vehicle exhaust, tire wear and brake wear PM, thereby avoiding double-counting of emissions which are already estimated in EMFAC. ARB assumes no growth for this category over the timeframe covered by the Plan.
- **Pesticides:** The Department of Pesticide Regulation (DPR) develops month-specific emission estimates for agricultural and structural pesticides. Each calendar year, DPR updates the inventory based on the Pesticides Use Report (PUR) that provides updated information from 1990 to the most current data year available. The inventory includes estimates through the 2009 calendar year. Emission forecasts for years beyond 2009 are based on the average of the most recent five years. Historical emissions estimates for the period 1990-2009 were retained exactly as provided by DPR (*i.e.*, emissions are not back casted).
- **Residential Wood Combustion:** ARB staff updated the Residential Wood Combustion methodology using U.S. EPA's National Emission Inventory emission factors and newer sales data for manufactured logs. The fireplace wood consumption rate for 2008 and previous years is based on a 1997 firewood usage survey sponsored by the District. Because of episodic wood burning curtailment requirements in District Rule 4901 that became fully effective in 2009, the fireplace wood consumption rate for 2009 and subsequent years is based on the values suggested in a report by U.S. EPA staff and others entitled "A Recommended Procedure for Compiling Emission Inventory National, Regional and County Level Activity Data for the Residential Wood Combustion Source Category." ARB assumed no growth for this category.

- **Unpaved Road Dust – Farm Roads:** ARB staff updated the methodology for Unpaved Road Dust (Farm Roads) to reflect 2007 farmland acreage estimates based on FMMP data. Growth for this category is based on a linear regression analysis of the 2000-2008 FMMP farmland acreage for the Valley counties, which results in a slight decline of about 0.3 percent per year.
- **Unpaved Road Dust – Nonfarm Roads:** ARB updated the Unpaved Nonfarm Roads methodology with a lower emission factor of 2.00 lbs PM10/ VMT based on studies sponsored by ARB and the District. The previously used emission factor of 2.27 lbs PM10/VMT was based on preliminary data from these same studies. Other revisions include updated road mile data and the addition of a rainfall correction factor. ARB assumed no growth for this category over the timeframe covered in the Plan.

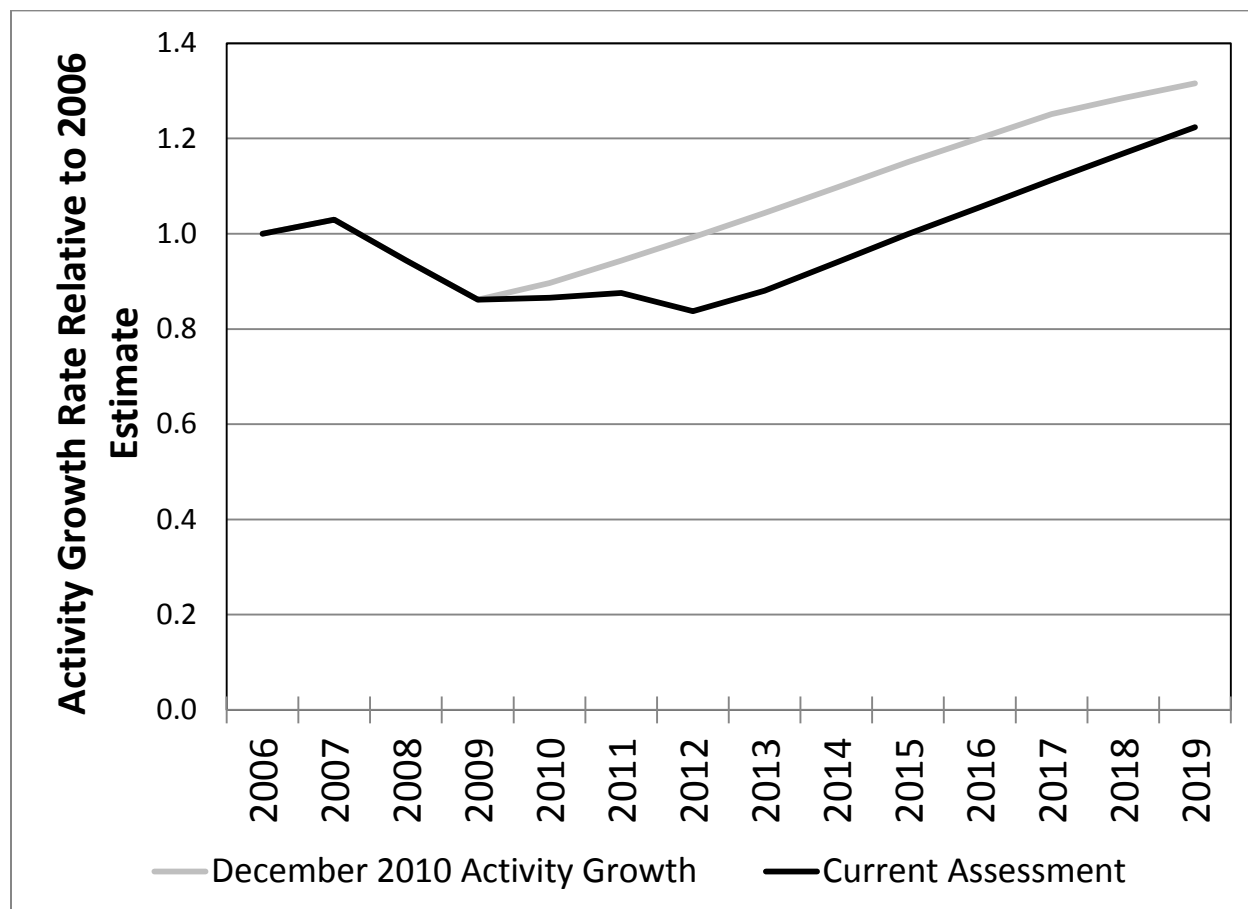
### B.3.3 Mobile Sources

Mobile source emissions are estimated using computer models that are designed to estimate emissions on a category-specific basis. ARB uses the EMFAC model to assess emissions from on-road vehicles. Off-road mobile source emissions are estimated using a new modular approach for different source categories. On-road and off-road models account for the effects of various adopted regulations, technology types, and seasonal conditions on emissions. The emissions inventories for on-road heavy-duty diesel vehicles and the off-road construction sector were also adjusted to reflect revised estimates of the impact of the economic recession on emissions. These adjustments reflect the latest forecasts and statistics for population growth, fuel sales, and construction employment in the Valley, which indicate that the pace of the economic recovery continues to lag previous forecasts.

- **On-Road Mobile Sources:** EMFAC2011 was released in October 2011 and reflects current mobile source emissions inventory methods used by the ARB. The EMFAC model is comprised of several modules; EMFAC2011-HD is used to estimate emissions from heavy-duty diesel truck operations. Truck activity estimates in EMFAC2011-HD reflect the emissions inventory presented to the Board in December 2010. Since that time, new information has become available on statewide diesel fuel usage as well as updated economic forecasts. Truck activity estimates were updated using the same methods and data sources as in the December 2010 inventory.

Figure B-1 compares the EMFAC2011 forecast to the updated forecast. Data suggest that truck emissions will be roughly 6 percent lower in 2019 in the San Joaquin Valley than previously estimated in EMFAC2011. For the PM2.5 plan, EMFAC2011 emissions estimates for heavy-duty trucks were adjusted to reflect this new information. This adjustment also resulted in a redistribution of VMT between heavy duty and light duty vehicle classes, to maintain the total county VMT in EMFAC2011.

**Figure B-1.** Heavy Heavy-Duty Diesel Truck Emissions Forecast: EMFAC2011 vs. Current Assessment

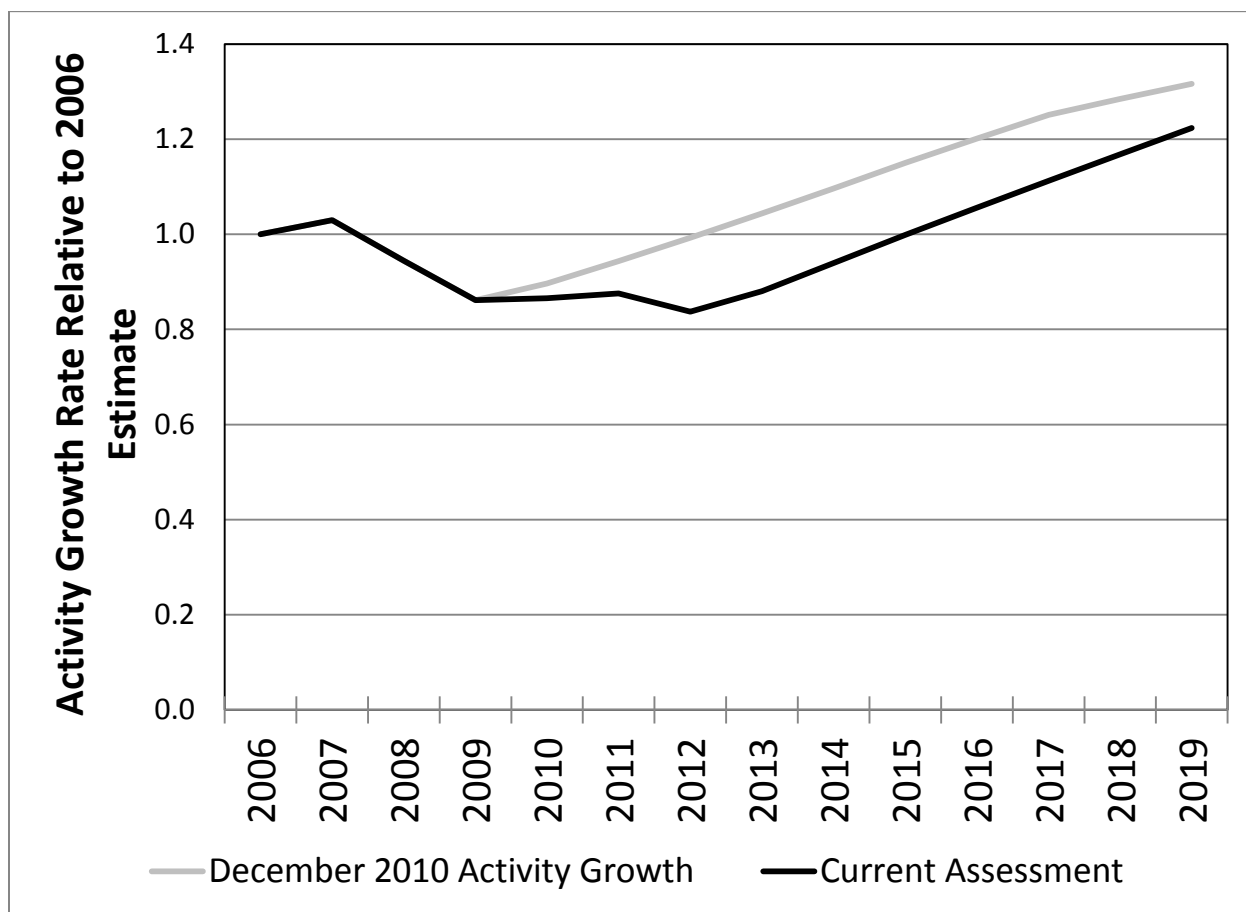


- Off-Road Mobile Sources:** Off-Road emissions are generated by many different types of equipment including equipment used in construction and at industrial sites; airport ground support equipment; cargo handling equipment used at California's Ports and Railyards; locomotives; pleasurecraft; recreational vehicles; commercial harborcraft and ocean-going vessels. Emissions from these equipment are estimated using a suite of models that provide inventory estimates specific to different categories of vehicles. Many of these category-specific models were developed to support recent ARB Rulemaking and are available through the ARB website. Emissions estimates for pleasurecraft and recreational vehicles were developed using new models. Category-specific models have not yet been created for remaining categories and in those cases OFFROAD2007 was used.

The In-Use Off-Road equipment inventory was developed in 2009 and 2010, and was presented to the Board in December 2010. Since that time updated economic forecasts have become available. This new information was used to

update the in-use construction equipment inventory forecast. Staff evaluated these economic forecasts to estimate the impact on construction equipment. Results indicated that in 2019 that construction employment would be roughly 10 percent lower than previously anticipated. Figure B-2 compares the December 2010 and updated growth estimate.

**Figure B-2. In-Use Construction Equipment Revised Activity Growth Estimate**



**B.4 FUTURE POPULATION ESTIMATES**

Future population estimates play a key role in emissions inventory projections. Population increases and decreases are directly linked to emissions categories such as residential fuel combustion, commercial cooking, consumer products, mobile sources, and more. There are often competing population projection models that can be used for inclusion in the emissions inventory. The following is a discussion of two such models.

The Valley’s population increases make it one of the fastest growing regions in the state. Population growth estimates for the Valley and for California as a whole have been under review in 2012. The Population Research Unit of the Department of

Finance (DOF) released interim revised population growth projections in May 2012<sup>1</sup>. For the 2012 data, DOF used currently available 2010 census data and demographic trends showing slower growth than projected in DOF's 2007 series projections. The DOF developed these interim projections per its duties under California Government Code Sections 13073 and 13073.5 to provide sound and current population data for use in developing state, regional, and local agency policies. The DOF's final projections will be completed by January 2013.

The Valley's Metropolitan Planning Organizations (MPOs) released their revised population growth projections on March 27, 2012<sup>2</sup>. The MPOs use their forecasts to analyze potential development densities, run MPO traffic models, formulate Sustainable Community Strategies for SB375, and more.

Population data is factored into air quality planning in a few ways. For example, a county's population is one factor in determining the minimum number of air monitoring stations required for that county, and data from these air monitoring stations are used to determine attainment status and show the extent of a region's attainment challenges. Population also affects the emissions inventory, with emissions growth projections from categories like consumer products, architectural coatings, commercial cooking, and light duty vehicles linked to anticipated growth in population. Increasing population generally increases air pollutant emissions from these categories, offsetting some of the emissions reductions progress made by control measures and improved pollution control technologies.

The population data displayed in Table B-6 and Figure B-3 show that although newer estimates show less population growth in the Valley than was previously estimated, the population of the Valley is still growing over the 2010-2020 time period covered by this plan. Population growth is a component of the Valley's air quality challenges.

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<sup>1</sup> DOF Interim Population Projections for California and its Counties, 2010-2050.

<http://www.dof.ca.gov/research/demographic/reports/projections/interim/view.php>

<sup>2</sup> San Joaquin Valley Demographic Forecasts, 2010-2015 (March 27, 2012)

[http://www.valleyblueprint.org/files/San%20Joaquin%20Valley%20Demographic%20Forecasts%20-%20Final%2027%20Mar%202012\\_0.pdf](http://www.valleyblueprint.org/files/San%20Joaquin%20Valley%20Demographic%20Forecasts%20-%20Final%2027%20Mar%202012_0.pdf)

Table B-6 Comparison between DOF and MPO Population Projections

County	Old DOF (2007 Series)			New DOF			MPO		
	2010	2020	% change	2010	2020	% change	2010	2020	% change
Fresno	983,478	1,201,792	22%	932,926	1,083,889	16%	930,000	1,082,000	16%
Kern*	871,728	1,086,113	25%	841,609	1,041,469	24%	840,000	1,004,000	20%
Kings	164,535	205,707	25%	152,996	179,722	17%	153,000	181,000	18%
Madera	162,114	212,874	31%	151,136	183,176	21%	150,900	154,500	2%
Merced	273,935	348,690	27%	256,345	301,449	18%	256,000	303,000	18%
San Joaquin	741,417	965,094	30%	686,651	795,631	16%	685,000	807,000	18%
Stanislaus	559,708	699,144	25%	515,229	582,746	13%	514,000	594,000	16%
Tulare	466,893	599,117	28%	443,567	536,429	21%	442,000	501,000	13%
<b>Total</b>	<b>4,223,808</b>	<b>5,318,531</b>	<b>26%</b>	<b>3,980,459</b>	<b>4,704,511</b>	<b>18%</b>	<b>3,970,900</b>	<b>4,626,500</b>	<b>17%</b>
<b>California Total</b>	39.1 million	44.1 million	12.8%	37.3 million	40.8 million	9%	NA	NA	NA
<b>% Calif. pop. in Valley</b>	10.8%	12.1%		10.7%	11.5%		NA	NA	NA

Figure B-3 Temporal Comparison of Population Projections

