

## **Chapter 7 – RATE OF PROGRESS DEMONSTRATION**

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## **7 RATE OF PROGRESS**

### **7.1 INTRODUCTION**

The FCAA specifies that ozone nonattainment areas must submit to EPA SIP revisions documenting that emissions of volatile organic compounds (an ozone precursor—see Chapter 2) are declining at rates that meet or exceed levels specified in the FCAA. These SIP revisions are termed Rate of Progress (ROP) Plans. The FCAA identifies two types of ROP requirements: (i) a 15% VOC emission reduction to be achieved from 1990 to 1996 (termed the “15 percent Rate of Progress Plan” and (ii) an actual VOC emission reduction of at least three percent per year averaged over each consecutive 3-year period beginning November 15, 1996 until the area’s attainment date (termed the “Post-1996 Rate of Progress Plan”). EPA guidance allows substitution of NO<sub>x</sub> emissions (the other significant ozone precursor—see Chapter 2) for VOC emissions in the Post-1996 Rate of Progress Plan, provided certain conditions are met (EPA 1993, EPA 1994b). The three percent per year requirement should be viewed as a minimum annual emission reduction; the underlying requirement for a nonattainment area’s SIP is to achieve attainment by the requisite date, even if the emission reductions necessary to achieve attainment exceed three percent per year (EPA 1994a). The SJVAB has met all ROP Plan requirements through 2005 (SJVUAPCD 1994; SJVUAPCD, 1995; SJVUAPCD, 2000).

This section provides the remaining ROP Plan requirements for the SJVAB out to its projected attainment date of November 15, 2010 for the federal 1-hour ozone standard. It then shows that prior ROP Plan calculations are still valid given the most recent emissions inventory information. As discussed in Chapter 3, emissions inventories change over time to reflect implementation of control measures, adjustments to improve accuracy, and other factors. Consequently, the most recent inventories are generally believed to be more accurate, even for past years. Therefore, Section 7.6 re-examines the ROP calculations in the most recent SJVAB ROP Plan in light of current planning emissions inventories for the SJVAB to demonstrate that the ROP requirements are still met.

### **7.2 1990 RATE-OF-PROGRESS BASELINE INVENTORIES**

The FCAA requires that milestone year emission reductions be based on the 1990 baseline emission inventory. As noted in Chapter 3, the 1990 emission inventory has been reconstructed to account for updated information and new air quality models. Table 7-1 summarizes the total reconstructed 1990 baseline year emissions inventory, which serves as the starting point for all other FCAA-required inventories (see Table 3-1). As noted in Section 3, Emissions Inventories represent tons/day emissions for the ozone season (May 1 through October 31) for the year in question.

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**Table 7-1**  
**1990 ROP Baseline Year Inventory (tons/day)**

<b>Emission Sources</b>	<b>VOC</b>	<b>NOx</b>
Point Sources	193.0	289.7
Area Sources	153.9	6.5
Other Mobile	72.6	211.3
On-road Mobile	213.7	297.6
<b>TOTAL</b>	<b>633.2</b>	<b>805.1</b>

Finally, the FCAA specifies the “baseline” from which each milestone’s emission reduction is calculated [Title I, Part D, Section 182 (b)(1)(C) and (D)]. This baseline is termed the 1990 Adjusted Base Year Inventory. It is defined as “the total amount of actual VOC or NOx emissions from all anthropogenic sources in the area during the calendar year of the enactment of the Clean Air Act of 1990”, minus the emissions that would be eliminated by federal motor vehicle control program (FMVCP) regulations promulgated by January 1, 1990, and Reid Vapor Pressure (RVP) regulations promulgated by the time of enactment [FCAA, Title I, Part D, Section 182 (b)(1)]. Consequently, the FMVCP and RVP emissions must be subtracted from the 1990 emissions in order to develop a baseline inventory for ROP demonstration. Furthermore, the 1990 Adjusted Base Year Inventory must be recalculated relative to each ROP milestone (2008 and 2010) because the emission reductions associated with the FMVCP increase each year due to fleet turnover. The only adjustment needed is to recalculate mobile source emissions, using a mobile source emission factor for each year, multiplied by 1990 VMT. This yields the adjusted emissions for each of these years that are subtracted from the 1990 Actual Emissions to determine 1990 Adjusted Baseline Year Inventories. Table 7-2 shows the calculations for VOC; no adjustments are needed for NOx because the FMVCP and RVP deductions are zero for NOx emissions. As shown in Table 7-2, these adjustments reduce the base year VOC inventory of 633.2 tons/day to the adjusted base year inventories of 552.9 tons/day for 2008 and to 548.4 tons/day for 2010. The 1990 adjusted base year NOx inventory is 805.1 tons/day for each of 2008 and 2010. ARB provided the numeric values for the FMVCP and RVP emission reductions.

The FCAA does not allow emissions credits toward the 51 percent reduction from corrections stemming from the Reasonably Available Control Technology (RACT) and federally-mandated Inspection and Maintenance (I&M) programs [Title I, Part D, Section 182(b)(1)(D)]. The District is claiming no reductions for federally-mandated I&M corrections for the 2008 ROP demonstration. Any emissions reductions to satisfy RACT requirements in this plan are less than 0.05 tons/day (see Table 4-1) and are too small to be reflected in the ROP results.

**Table 7-2  
1990 Adjusted Base Year VOC Inventory Calculations (tons/day)**

<b>Emissions Inventory Adjustment</b>	<b>2002</b>	<b>2005</b>	<b>2008</b>	<b>2010</b>
1990 Rate of Progress Base Year Inventory (VOC)	633.2	633.2	633.2	633.2
Minus FMVCP/RVP Reductions	53.6	70.1	80.2	84.7
<b>1990 Adjusted Base Year VOC Inventory</b>	<b>579.6</b>	<b>563.1</b>	<b>553.0</b>	<b>548.5</b>

### **7.3 FUTURE YEAR (2008 AND 2010) INVENTORIES**

In order to demonstrate that the 2008 and 2010 Target Levels for VOC and NOx emissions can be met, emissions are projected to 2008 and 2010 using techniques presented in Chapter 3. Table 3-1 summarizes the VOC and NOx inventories for 2008 and 2010. The emission inventories were projected from the 1999 actual emission inventory and do not include any reductions from rules or regulations adopted subsequent to 2002 (see Table 7-3), or from the measures that the District has committed to develop and implement prior to ozone season 2008 (See Chapter 4). These emission reductions are incorporated into the ROP demonstration in Sections 7.4 and 7.5.

### **7.4 1990-2008 MILESTONE (51 PERCENT) DEMONSTRATION**

Because the 1990 Base Year Emission Inventory was reconstructed, this report addresses the rate of progress from 1990 to 2008 and from 1990 to 2010. The FCAA requirements for demonstrating rate of progress require an initial 15 percent reduction in 1990—1996 emissions, followed by subsequent reductions of 3 percent per year averaged over consecutive 3 year periods; consequently, the District will demonstrate achievement of a 51 percent reduction in emissions for the 2008 rate of progress [42 percent for 1990—2005 plus 9 percent for 2006—2008] and a 57 percent reduction in emissions for the 2010 rate of progress (51 percent between 1990—2008 plus six percent for 2008—2010).

#### **7.4.1 Required 51 Percent Reduction for 2008**

As specified in the FCAA [Title I, Part D, Section 182 [c](2)] the total emissions reductions required for 2008 are equal to 51 percent of the adjusted base year inventory. The 51 percent reduction calculated for the Adjusted Base Year Inventory (Table 7-2) is therefore calculated to be 282.0 tons/day (51 percent of 553 tons/day is 282.0 tons/day). Subtracting the 51 percent emission reduction

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of 282.0 tons/day from the 1990 adjusted base year emissions inventory of 553 tons/day gives a target 2008 emissions inventory of 271 tons/day. In other words, achieving the 51 percent reduction from the adjusted baseline would produce a 2008 emissions inventory of 271 tons/day. If the actual 2008 emissions inventory is greater than this total, then VOC emissions reductions alone are insufficient to meet regulatory requirements, and reductions in NOx emissions must be sought in order to meet the 51 percent ROP requirements.

**7.4.2 2008 Rate of Progress Demonstration**

**7.4.2.1 VOC Emissions Reductions**

As noted in Section 7.2 and presented in Table 3-1, the 2008 actual VOC emissions inventory for the SJVAB is estimated to be 374.9 tons/day. Emission reductions from post-2002 state and District control measures reduce this total by an additional 16.4 tons/day (Table 7-3), which results in a revised 2008 VOC emission inventory of 358.5 tons/day. Thus the actual 2008 VOC emissions inventory for the SJVAPCD is too high by about 87.5 tons/day to meet the 51 percent reduction over the 1990-2008 time period. Therefore, the SJVAB's shortfall in VOC reductions for 2008 is about 15.8 percent of the adjusted 1990 base year VOC emissions inventory for 2008.

**TABLE 7-3  
Reductions From Adopted Rules and Regulations  
Not Included in the 2008 and 2010 Planning Inventories<sup>1</sup>**

Rule	Description	Action Date	NOx Reductions (tons/day)		VOC Reductions (tons/day)	
			2008	2010	2008	2010
Varies <sup>1</sup>	<i>PM10 Plan</i> District Measures <sup>1</sup>	2003-2007	25.6 <sup>1</sup>	26.3 <sup>1</sup>	8.7 <sup>1</sup>	9.4 <sup>1</sup>
Varies <sup>2</sup>	<i>PM10 Plan</i> State Measures	2002-2008	0	14.9	0	2.5
Varies <sup>3</sup>	<i>Extreme OADP</i> District Measures	2004-2007	0.4	1.9	7.7	21.3
Varies <sup>4</sup>	<i>Extreme OADP</i> State Measures	2004-2009	0	10	0	15
4313	Lime Kilns	March 2003	0.1	0.1	NA	NA
<b>Total</b>			26.1	53.2	16.4	48.2

<sup>1</sup>See Table 4-1 in this *Extreme OADP*, Footnote 6. Reflects updated estimates for District measures as given in Tables 4-17—4-20 in the 2003 *PM10 Plan* for the San Joaquin Valley Air Basin.

<sup>2</sup>Reflects updated estimates of emissions reductions from state measures as given in Table 4-14 in the 2003 *PM10 Plan* for the San Joaquin Valley Air Basin.

<sup>3</sup>See Table 4-1 in this *Extreme OADP*.

<sup>4</sup>See Table 4-3 in this *Extreme OADP*.

### **7.4.2.2 NOx Emissions Reductions**

As shown above, the District falls short of the VOC target level of emissions by about 15.8 percent of the adjusted 1990 base year VOC emissions inventory. The FCAA allows Districts to substitute reductions in NOx emissions when they are unable to achieve the necessary reductions with VOC emissions alone [Title 1, Part D, Section 182 (c)]. The District's rate of progress demonstration for 2008 therefore includes about 15.8 percent of NOx substitution, as discussed in the following paragraphs.

Section 182 (c) and 182 (d) of the FCAA state that NOx emissions reductions that occurred after 1990 can be used to meet post-1996 emission reduction requirements, provided that they meet the criteria outlined in the EPA's *NOx Substitution Guidance* (EPA 1993). The 1993 Guidance establishes two criteria for use of these emission reductions. First, the sum of all creditable VOC and NOx emission reductions must equal three percent per year averaged over each applicable milestone period. The percent VOC reduction is determined from the VOC rate of progress inventory and the percent NOx reduction is determined from the NOx rate of progress inventory. Second, the overall VOC and NOx reductions must be consistent with the area's modeled attainment demonstration. In other words, NOx emission reductions creditable toward rate of progress plans cannot be greater than the cumulative reductions dictated by the modeled attainment demonstration (because the ROP plans must be consistent with the strategy selected by the District as its attainment strategy). The guidance also notes a third condition of "the periodic emission reductions must be consistent with the modeled attainment demonstration."

With regards to the second requirement, as noted in Chapter 1, the District cannot identify enough emission reductions from existing and new control measures that will allow the SJVAB to attain the one-hour ozone standard by 2008<sup>1</sup>. Thus a modeled attainment demonstration for 2008 for the SJVAB does not exist, so the comparison with a cumulative attainment total for this year is not relevant. Consequently the District may use NOx substitution for 2008 in accordance with the FCAA.

The NOx base year emissions inventory is 805.1 tons/day (Table 7-1); the FMCVP correction for NOx is zero for 2008 (and 2010), so the adjusted base year NOx inventory is also 805.1 tons/day. Computing the necessary NOx emissions reductions thus involves multiplying the adjusted base year inventory

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<sup>1</sup> The state measures that are critical for demonstrating attainment do not go into effect in time to help demonstrate attainment for 2008. As noted in Chapter 4, ARB developed these measures primarily to help the South Coast Air Basin reach attainment by 2010, so the measures are geared towards a 2010 attainment deadline (for the South Coast as well as the SJVAB).

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by 15.8 percent, which produces a total of 127.2 tons/day of NO<sub>x</sub> reductions needed to help the VOC emission reductions meet the 51 percent.

The actual 2008 NO<sub>x</sub> inventory is 429.1 (Table 3-1), emission reductions from post-2002 control measures reduce this total by an additional 26.1 tons/day (Table 7-3), which results in a revised 2008 NO<sub>x</sub> emission inventory of 403 tons/day; actual NO<sub>x</sub> emissions reductions achieved [the difference between 2008 and the 1990 base year] are therefore 402.1 tons/day. Since the total is greater than the 127.2 tons/day needed to meet the 51 percent requirement, sufficient rate of progress in reducing ozone precursor emissions has been demonstrated.

### **7.4.2.3 Summary**

Table 7-4 summarizes the emission calculations performed to demonstrate achievement of a 51 percent reduction in ozone precursor emissions from 1990 through 2008 for the SJVAB. Figure 7-1 provides a graphical illustration of the emission trends and reductions.

## **7.5 1990-2010 MILESTONE (57 PERCENT) DEMONSTRATION**

### **7.5.1 Required 57 Percent Reduction for 2010**

As specified in the FCAA [Title I, Part D, Section 182 (c)(2)], the total ozone precursor emissions reductions required for 2010 must equal 57 percent<sup>2</sup> of the adjusted base year inventory. As shown in Table 7-2, the adjusted 1990 Base Year VOC inventory for the SJVAB is 548.5 tons/day. The 57 percent reduction for the 1990 adjusted base year emissions inventory (Table 7-2) is therefore calculated to be 312.6 tons/day (57 percent of 548.5 tons/day). Subtracting the 57 percent emission reduction of 312.6 tons/day from the adjusted base year inventory of 548.5 tons/day gives a target 2010 VOC emissions inventory of 235.9 tons/day. In other words, achieving the 57 percent reduction from the adjusted base year emissions inventory would produce a 2010 VOC emissions inventory of 235.9 tons/day. If the actual 2010 VOC emissions inventory is greater than this, then VOC emission reductions alone are insufficient to meet regulatory requirements, and reductions in NO<sub>x</sub> emissions must be sought in order to meet the 57 percent requirement.

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<sup>2</sup> Because 2008 is an ROP milestone year and 2010 is the attainment year for extreme nonattainment areas, the final ROP post-1996 interval is actually two years rather than the usual three, so reductions of six percent (3 percent/year for two years) are added to the reductions required by the 2008 milestone year (51 percent) to arrive at a total of 57 percent [EPA 1994a].



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**TABLE 7-4  
2008 Rate of Progress Demonstration Summary**

<b>Line #</b>	<b>Emission Calculation</b>	<b>Emissions (tons/day)</b>
1	Adjusted 1990 Base Year VOC Inventory <sup>1</sup>	553.0
2	VOC Reduction Required (51% of Line 1)	282.0
3	Target 2008 VOC Emissions Inventory (Line 1 minus Line 2)	271.0
4	Actual 2008 VOC Emissions Inventory <sup>2</sup>	358.5
5	VOC Reductions Achieved (Line 1 minus Line 4)	194.5
6	VOC Reduction Shortfall (Line 2 minus Line 5) <sup>3</sup>	87.5
7	Adjusted 1990 Base Year NOx Inventory <sup>4</sup>	805.1
8	NOx Reductions Required <sup>5</sup>	127.2
9	Actual 2008 NOx Emissions Inventory <sup>6</sup>	403
10	NOx Reductions Achieved (Line 7 minus Line 9)	402.1
11	Rate of Progress Achieved? <sup>7</sup>	<b>Yes</b>

<sup>1</sup>Computed by subtracting the Federal Motor Vehicle Control Program (FMVCP) and Reid Vapor Pressure (RVP) emission reductions (Table 8-2) from the 1990 base year inventory (Table 3-1): 633.2 tons/day-80.2 tons/day=553.0 tons/day.

<sup>2</sup>The actual 2008 VOC inventory was calculated by subtracting 16.4 tons/day (reductions from new rules—see Table 7-3) from 374.9 tons/day (2008 planning inventory—see Table 3-1).

<sup>3</sup>The VOC emission reduction shortfall is about 15.8% of the 1990 adjusted base year VOC emissions inventory (87.5/553X100%=15.8%). The reduction shortfall can also be computed by subtracting line 4 (2008 actual emissions) from line 3 (2008 target emissions).

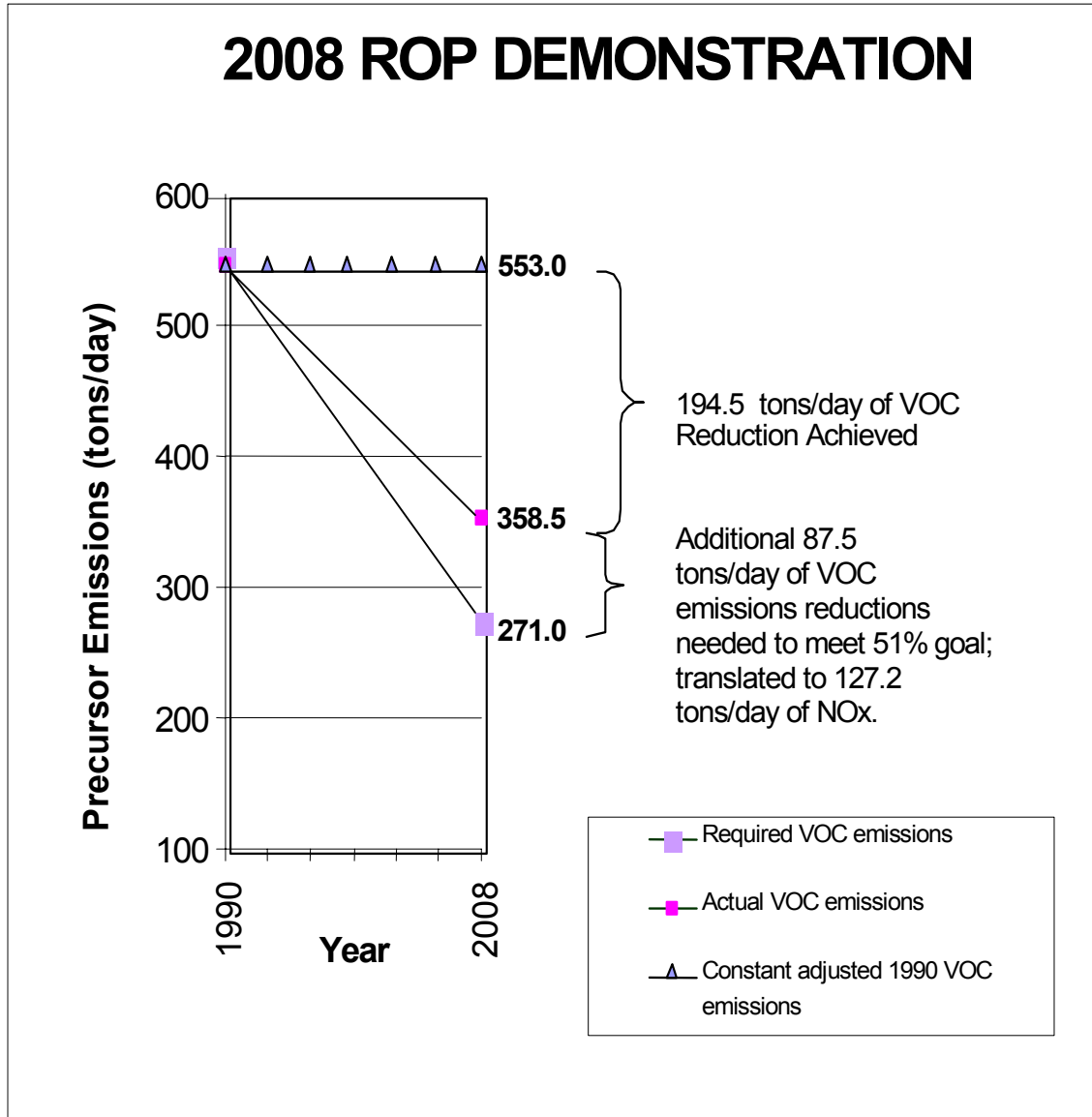
<sup>4</sup>The FMVCP and RVP program emission reductions are zero for NOx, so the adjusted 1990 base year emissions inventory is the same as shown in Table 3-1 (805.1 tons/day).

<sup>5</sup>Computed by multiplying the 1990 base year NOx inventory (805.1 tons/day) by 0.158 (Footnote 3).

<sup>6</sup>The actual 2008 NOx inventory was calculated by subtracting 26.1 tons/day (reductions from new rules—see Table 7-3) from 429.1 tons/day (2008 planning inventory—see Table 3-1).

<sup>7</sup>Because the 2008 Rate of Progress demonstration needs 127.2 tons/day of NOx reductions and 402.1 tons/day of NOx reductions are available, the Rate of Progress is achieved.

**Figure 7-1.  
Graphical Summary of 2008 ROP Demonstration  
For San Joaquin Valley Ozone**



## **7.5.2 2010 Rate of Progress**

### **7.5.2.1 VOC Emission Reductions**

As noted in Section 7.3 and presented in Table 3-1, the 2010 actual VOC emissions inventory is estimated to be 367.6 tons/day. Emission reductions from post-2002 state and District control measures reduce this total by an additional 48.2 tons/day (Table 7-3), which reduces the total 2010 VOC emissions to 319.4 tons/day. Since the target 2010 VOC emissions inventory is estimated at 235.9 tons/day, the actual inventory is too high by about 83.5 tons/day, or about 15.2 percent of the adjusted 1990 base year emissions inventory of 548.5 tons/day, to meet the required 57 percent reduction over the 1990—2010 time frame. Therefore, the District and ARB achieved all but about 15.2 percent of the required VOC emission reductions with control measures already adopted or committed to be adopted and implemented by December 31, 2010.

### **7.5.2.2 NOx Emissions Reductions**

As shown above, the District falls short of the VOC target level of emissions by about 15.2 percent of the adjusted 1990 base year VOC emission inventory. The FCAA allows Districts to substitute reductions in NOx emissions when they are unable to achieve the necessary reductions with VOC emissions alone [Title 1, Part D, Decision 182(c)], provided the conditions spelled out by the FCAA are met. More information on these terms and conditions is given in Section 7.4.2.2.

The NOx base year emissions inventory is 805.1 tons/day (Table 7-1). No corrections for FMCVP or RVP are needed. Computing the required NOx emissions reductions thus involves multiplying 805.1 by 15.2 percent, which produces a total of 122.4 tons/day of NOx emissions that are needed to help the VOC emission reductions meet the final ROP requirement of 57 percent reduction.

The actual 2010 NOx emissions inventory is 401.7 tons/day (Table 3-1); control measure emission reductions not reflected in this total will reduce emissions by an additional 53.2 tons/day (Table 7-3) to 348.5 tons/day. Actual emissions reductions achieved [the difference between the 2010 actual and 1990 base year (805.1 tons/day) emissions inventories] are therefore 456.6 tons/day. Since the 2010 ROP milestone requires NOx reductions of 122.4 tons/day, and 456.6 tons/day are available, adequate NOx emissions reductions have been achieved to meet the 15.2 percent requirement and therefore help the VOC emissions reductions meet the overall 2010 ROP requirement of a 57 percent reduction in precursor emissions.

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As discussed in Section 5, the NO<sub>x</sub> carrying capacity for attainment is about 344 tons/day in 2010<sup>3</sup>. The 1990 base year NO<sub>x</sub> inventory is about 805 tons/day. Thus attainment of the federal 1-hour ozone standard in the SJVAB requires a cumulative reduction in NO<sub>x</sub> emissions of about 461 tons/day over the period 1990—2010. As shown in the beginning of this section, NO<sub>x</sub> reductions needed to meet ROP reductions over the time frame 1990—2010 total 122.4 tons/day. Thus, the cumulative NO<sub>x</sub> reductions needed to meet the final ROP milestone are much less than the NO<sub>x</sub> reductions needed for attainment, and thus are consistent with EPA guidance (EPA 1993 and EPA 1994b).

Finally, it should be mentioned that a number of peer-reviewed studies [e.g., Pun et al. (1998) and SJVAQSA (1996)] have determined that attainment of the federal 1-hour ozone standard in the SJVAB requires NO<sub>x</sub> emissions controls<sup>4</sup>, so the use of NO<sub>x</sub> reductions in SJVAB ROP calculations over the 1990—2010 time frame is consistent with the overall attainment demonstration strategy for the SJVAB as determined by gridded photochemical modeling. EPA's guidelines on ROP plans and NO<sub>x</sub> substitution identify consistency with overall attainment strategy as a key factor affecting the appropriateness and extent of NO<sub>x</sub> substitution for ROP calculations (EPA 1994).

### **7.5.2.3 Summary**

Table 7-5 summarizes the emission calculations performed to demonstrate achievement of a 57 percent reduction in precursor emissions from 1990 through 2010. Figure 7-2 provides a graphical illustration of the emission trends and reductions.

## **7.6 PRIOR ROP AND MILESTONE COMPLIANCE DEMONSTRATION**

### **7.6.1 Prior ROP**

The *Amended 2002 and 2005 Rate of Progress Plan for San Joaquin Valley Ozone* adopted in December 2002 and submitted to EPA in 2003 is based upon an emissions inventory dated December 5, 2001 (except for the on-road mobile source emissions inventory, which is dated November 4, 2002). Emissions calculations in this *Extreme OADP* are based upon Version 2.11\_RF932PEI of the CCOS Inventory, accessed in January 2004. Given the over two-year

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<sup>3</sup> Based on gridded photochemical modeling and a reduction in NO<sub>x</sub> emissions of about 14% of the 2010 inventory and a reduction of about 15% of the 2010 VOC inventory. As shown in Figure 5-5, other combinations of NO<sub>x</sub> and VOC emissions reductions within this general range can also demonstrate attainment.

<sup>4</sup> Analyses done for this *Extreme OADP*, as presented in Chapter 5, also identify the need for NO<sub>x</sub> emissions controls to attain the federal 1-hour ozone standard in the SJVAB.

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**TABLE 7-5  
2010 Rate of Progress Demonstration Summary**

<b>Line #</b>	<b>Emission Calculation</b>	<b>Emissions (tons/day)</b>
<b>1</b>	Adjusted 1990 Base Year VOC Inventory <sup>1</sup>	548.5
<b>2</b>	VOC Reduction Required (57% of Line 1)	312.6
<b>3</b>	Target 2010 VOC Emissions Inventory (Line 1 minus Line 2)	235.9
<b>4</b>	Actual 2010 VOC Emissions Inventory <sup>2</sup>	319.4
<b>5</b>	VOC Reductions Achieved (Line 1 minus Line 4)	229.1
<b>6</b>	VOC Reduction Shortfall (Line 2 minus Line 5) <sup>3</sup>	83.5
<b>7</b>	Adjusted 1990 Base Year NOx Inventory <sup>4</sup>	805.1
<b>8</b>	NOx Reductions Required <sup>5</sup>	122.4
<b>9</b>	Actual 2010 NOx Emissions Inventory <sup>6</sup>	348.5
<b>10</b>	NOx Reductions Achieved (Line 7 minus Line 9)	456.6
<b>11</b>	Rate of Progress Achieved? <sup>7</sup>	<b>Yes</b>

<sup>1</sup>Computed by subtracting the Federal Motor Vehicle Control Program (FMVCP) and Reid Vapor Pressure (RVP) emission reductions (Table 7-2) from the 1990 base year inventory (Table 3-1): 633.1 tons/day-84.7tons/day=548.4 tons/day.

<sup>2</sup>The actual 2010 VOC inventory was calculated by subtracting 48.2 tons/day [reductions from new rules—see Table 7-3 (48.2 tons/day)] from 367.6 tons/day (2010 planning inventory—see Table 3-1).

<sup>3</sup>The VOC emission reduction shortfall is about 15.2% of the 1990 adjusted base year VOC emissions inventory (83.6/548.5X100%=15.2%). The reduction shortfall can also be computed by subtracting line 4 (2010 actual emissions) from line 3 (2010 target emissions).

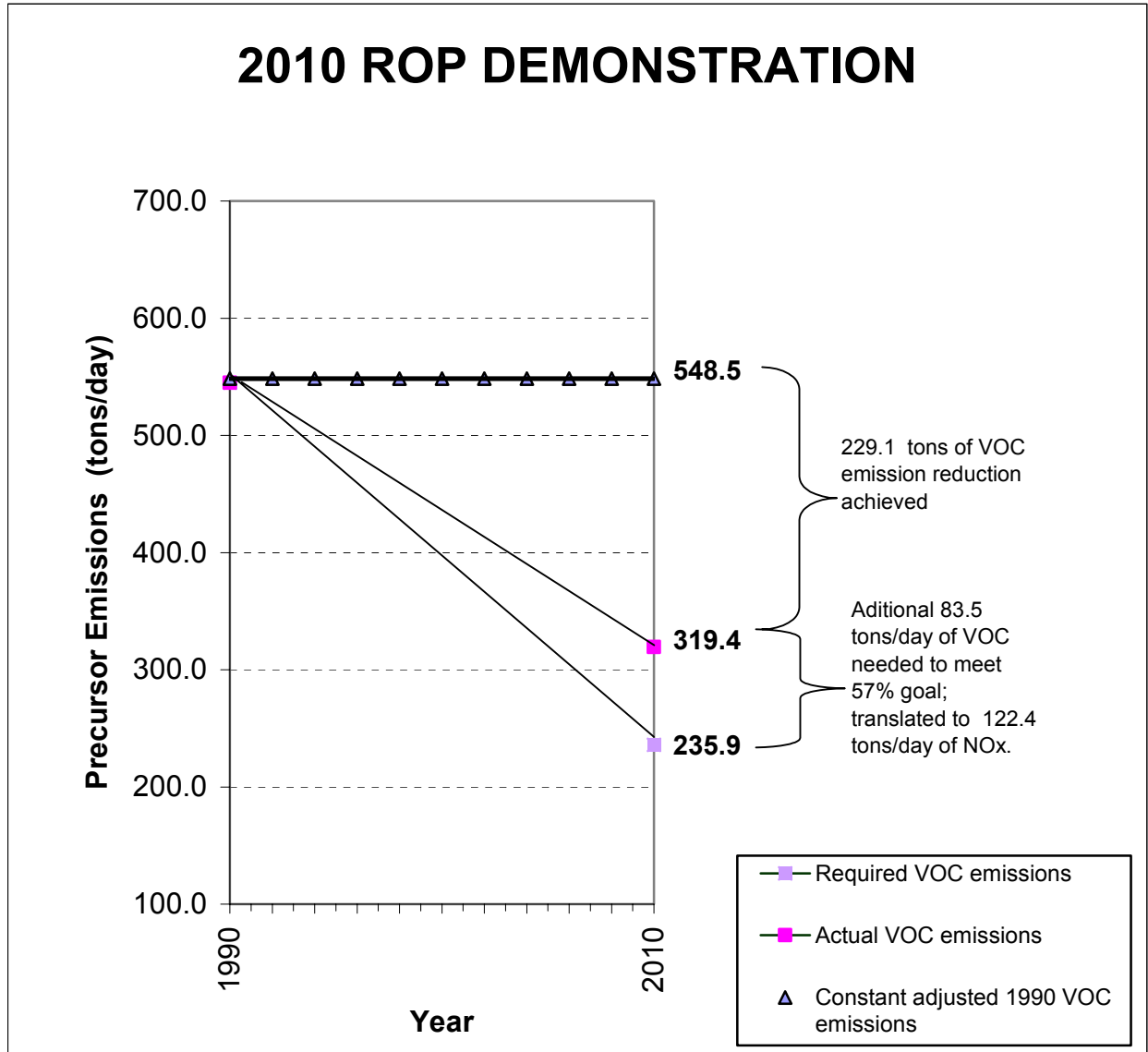
<sup>4</sup>The FMVCP and RVP program emission reductions are zero for NOx, so the adjusted 1990 base year emissions inventory is the same as shown in Table 7-1 (805.1 tons/day).

<sup>5</sup>Computed by multiplying the 1990 base year NOx inventory (805.1 tons/day) by 0.152 (Footnote 3).

<sup>6</sup>The actual 2010 NOx inventory was calculated by subtracting 53.2 tons/day (reductions from new rules—see Table 7-3) from 401.7 tons/day (2010 planning inventory—see Table 3-1).

<sup>7</sup>Because the 2010 Rate of Progress demonstration needs 122.4 tons/day of NOx reductions and 456.5 tons/day of NOx reductions are available, the Rate of Progress is achieved.

**Figure 7-2  
Graphical Summary of 2010 ROP Demonstration  
for San Joaquin Valley Ozone**



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difference in these inventories, and the rapidly changing state of knowledge of ozone precursor emissions in the SJVAB, the District chose to reexamine the rate of progress calculations in the *Amended 2002 and 2005 Rate of Progress Plan for San Joaquin Valley Ozone* to see if the rate of progress calculations still show that the SJVAB met its emissions reductions requirements for 2002 and 2005. This section revisits the demonstration of rate of progress with the more recent inventory used in this *Extreme OADP*. This reexamination is not required by the federal Clean Air Act or associated regulations, but is done to provide the public with a full accounting of emissions as related to regulatory requirements. Furthermore, this reexamination in no way affects SJVAB conformity budgets established for 2002 and 2005 in the *Amended 2002 and 2005 Rate of Progress Plan for San Joaquin Valley Ozone*; EPA found these budgets to be adequate on July 10, 2003 (Broadbent 2003).

In general, emissions inventories improve over time through incorporation of more accurate activity data, new emissions factors, new control factors, and better coverage and allocation of emissions to sources. The District and ARB prepare SIP submittals with the best available emissions data at the time of plan development. The emissions inventory used in this *Extreme OADP* (CCOS Version 2.11\_RF932PEI) is generally thought to be a more accurate reflection of emissions than the inventory used in the *Amended 2002 and 2005 Rate of Progress Plan for San Joaquin Valley Ozone* (December 2002).<sup>5</sup> Table 7-6 compares the two inventories for the two ozone precursors of interest and the three years relevant to the *Amended 2002 and 2005 Rate of Progress Plan*.

**Table 7-6**  
**Comparison of Unadjusted<sup>a</sup> Emissions Inventories Used**  
**in *Amended 2002/2005 ROP Plan* and *Extreme OADP***  
**(Summer, tons/day)**

Ozone Precursor	<i>Amended ROP Plan</i> <sup>b</sup>			<i>Extreme OADP</i> <sup>c</sup>		
	1990	2002	2005	1990	2002	2005
VOC	670.4	464.3	439.1	633.2	422.9	388.4
NOx	787.0	533.4	492.2	805.1	519.3	477.3
Total	1457.4	997.7	931.3	1438.3	942.2	815.7

<sup>a</sup> Emission reductions from federal, state and District rules for year of inventory not reflected

<sup>b</sup> Inventory dated December 5, 2001 except for mobile [dated November 4, 2002]

<sup>c</sup> CCOS Version 2.11\_RF932PEI accessed January 2004

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<sup>5</sup> The more recent inventory does not reflect any changes to the 2002 or 2005 emissions for the emission inventory category of on-road motor vehicles. Most of the inventory changes pertain to the stationary and area source categories.

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As noted previously in this chapter and in the *Amended 2002 and 2005 Rate of Progress for San Joaquin Valley Ozone*, the federal Clean Air Act specifies ROP milestones as minimum percentages by which 1990 VOC emissions must be reduced at a future date. The emissions reduction for 1990—2002 must be 33%, and the reduction for 1990—2005 must be 42% [Title I, Part D, Section 182 [c](2)].<sup>6</sup> Alternatively, the 2002 VOC emissions inventory must be no greater than 67% of the 1990 inventory, and the 2005 VOC inventory must be no greater than 58% of the 1990 inventory. Therefore, for the purposes of this section, the relationship between future milestone year emissions and the base year emissions can be compared from inventory to inventory as a screening tool to see if the change in emissions from one inventory to another warrant a full ROP calculation for the new inventory. Since the SJVAB met the federal Clean Air Act ROP requirements with the “old” inventory, all we need to show is that the ratio of future year to base year emissions for the new inventory is equal to or less than the same ratios for the old inventory to know that ROP milestones will be met for the new inventory as well.

Analysis of the data in Table 7-6 shows the following for the future year/1990 ratios of unadjusted<sup>7</sup> VOC emissions for the two different inventories:

<i>Amended ROP Plan</i>		<i>Extreme OADP</i>	
2002/1990	2005/1990	2002/1990	2005/1990
0.69 <sup>8</sup>	0.66 <sup>5</sup>	0.67	0.61

As can be seen, the inventory used in the *Extreme OADP* has lower future year/1990 ratios of VOC emissions, so rate of progress calculations for this updated inventory would show better progress than those done using the older inventory. Consequently, no additional ROP calculations need to be done to determine if the newer emissions inventory adversely affected rate of progress calculations for the most recent ROP milestone years (2002 and 2005).

### 7.6.2 Milestone Compliance Demonstration

Section 182 (g) of the federal Clean Air Act requires nonattainment areas to determine if they have achieved the emissions reductions identified during previous three-year reasonable further progress (RFP)/rate of progress (ROP) intervals (see Section 7.4) as being needed to meet the RFP/ROP milestones for the intervals in question. In other words, nonattainment areas must look back

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<sup>6</sup> These are minimum percentages; gridded photochemical modeling showing that reductions in excess of these levels are needed supersedes the 3%/year requirement (EPA 1994).

<sup>7</sup> Emissions have not been reduced to account for federal, state and local control programs.

<sup>8</sup> The *Amended ROP Plan* demonstrated ROP for these years (even though the ratios shown would suggest otherwise) because state and District control measures reduced future year VOC emissions and because NOx substitution allowed the ROP requirements to be met.



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following the completion of an RFP/ROP interval (e.g., 2000 to 2002) to see if control measures achieved the reductions necessary for that milestone (e.g., 2002).

The District prepared this *Extreme OADP* in 2004 using the CCOS emissions inventory version 2.11 that reflects state and District control measures adopted through September 2002. For the purposes of this section, this inventory is assumed to be the best available actual 2002 emissions inventory. Since the most recent ROP three-year interval that has been completed is 2000—2002, it is of interest to examine the SJVAB's 2002 inventory from CCOS version 2.11 to see if the year 2002 ROP milestone of a 33% reduction in emissions (from the 1990 base year specified in the federal Clean Air Act) occurred in the SJVAB.

The adjusted 1990 SJVAB base year VOC emissions (for the 2002 ROP milestone) from the CCOS version 2.11 emissions inventory total 579.6 tons per day (Table 7-2). The 2002 VOC emissions from the same CCOS inventory total 422.9 tons per day (Table 7-6). The 1990—2002 improvement, according to data in version 2.11 of the CCOS inventory, is therefore 156.7 tons per day, or about 27% of the adjusted base year inventory. This is about 6% short of the 33% reduction required for the 2002 milestone. As discussed in the previous sections, the District is allowed to use NO<sub>x</sub> substitution for ROP in the SJVAB. The adjusted 1990 SJVAB base year NO<sub>x</sub> emissions from the CCOS version 2.11 inventory total 805.1 tons per day, and the 2002 NO<sub>x</sub> emissions from the same inventory total 519.3 tons per day (Table 7-6). Transferring this 6% shortfall to the CCOS version 2.11 1990 NO<sub>x</sub> emissions shows that about 47.5 tons per day of NO<sub>x</sub> reductions (6% of 805.1 tons per day) are needed over the time frame 1990—2002 to meet the 2002 ROP milestone. The NO<sub>x</sub> reductions achieved in this time, as given in CCOS version 2.11, are 285.8 tons per day (805.1 tons per day minus 519.3 tons per day), which greatly exceeds the amount required. Therefore, the SJVAB met the 2002 ROP milestone.

The above information clearly shows that the SJVAB's 2002 ozone precursor emissions, as accessed in 2004 from the CCOS version 2.11 inventory, meet the federal Clean Air Act requirements for ozone precursor emissions reductions for the 2002 ROP milestone year. Consequently, the SJVAB meets Section 182(g) requirements at this point in time.

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### **7.7 REFERENCES**

- Broadbent 2003 Jack Broadbent, Director, Air Division, U.S. Environmental Protection Agency, Region IX, 75 Hawthorne Street, San Francisco, California. Letter to Catherine Witherspoon, Executive Officer, California Air Resources Board, Sacramento, California, July 10, 2003.
- EPA 1993 U.S. Environmental Protection Agency. *NOx Substitution Guidance*, Office of Air Quality Planning and Standards, Research Triangle Park, NC, December 1993
- EPA 1994a United States Environmental Protection Agency. *Guidance on the Post-1996 Rate-of-Progress Plan and the Attainment Demonstration*. EPA-452/R-93/015 (corrected version, February 18, 1994).
- EPA 1994b U.S. Environmental Protection Agency. *Clarification of Policy for Nitrogen Oxides (NOx) Substitution*, Memorandum from John S. Seitz to EPA Directors, Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina, August 5, 1994.
- Pun, B.K., 1998 *A Conceptual Model for Ozone Formation in the San Joaquin Valley*, Prepared for Pacific Gas and Electric Company, December 15, 1998 (with J-F Louis and C. Seigneur)
- SJVAQSA 1996 San Joaquin Valley Air Quality Study Agency, *San Joaquin Valley Air Quality Study, Policy Relevant Findings*, November 1996.
- SJVUAPCD 2000 *2000 Ozone Rate of Progress Report*, San Joaquin Valley Unified Air Pollution Control District, Fresno, California, April 20, 2000 (revised April 27, 2000).
- SJVUAPCD 1994 *Revised 1993 Rate of Progress Plan*. San Joaquin Valley Unified Air Pollution Control District, Fresno, California, November 4, 1994.
- SJVUAPCD 1995 *Revised Post 1996 Rate of Progress Plan*. San Joaquin Valley Unified Air Pollution Control District, Fresno, California, September 20, 1995.
- SJVUAPCD 2002 *Amended 2002 and 2005 Rate of Progress Plan for San Joaquin Valley Ozone*. San Joaquin Valley Unified Air Pollution Control District, Fresno, California, December 31, 2002.