

**2003 PM10 Plan  
Appendix G, Exhibit C  
Supplemental BACM Analysis**

Added December 18, 2003

Prepared by the San Joaquin Valley Air Pollution Control District

**INTRODUCTION**

During review of the 2003 PM10 Plan, United States Environmental Protection Agency (EPA) informed the District that in some cases the information submitted with the plan was not sufficient for a positive Best Available Control Measure (BACM) determination. The District has worked closely with EPA staff to provide the necessary information and justification to support BACM findings for the measures submitted. In some cases, the District's new analysis supported the control measures submitted in the plan. In other cases, measures that were more stringent were found to be cost-effective and technically feasible and should be included in the District's 2003 PM10 Plan (PM10 Plan or Plan). In still other cases, the District's new analysis along with information provided by stakeholder comments indicated that measures included in the Plan had technical or economic feasibility problems that were not addressed at the time of Plan submittal to EPA and should be eliminated.

To correct the problems identified and to ensure a positive BACM finding, EPA has requested that the District prepare this plan amendment. The Supplemental BACM Analysis provides additional justification to support the plan amendment.

**ANALYSIS OF PROPOSED AMENDMENTS TO THE 2003 PM10 PLAN**

The following section provides analysis of each change to the control measure commitments contained in the 2003 PM10 Plan for Regulation VIII – Fugitive Dust Prohibitions. The revised commitments are provided for each rule. A list of the current control measure language and the proposed change are provided in a table for easy comparison. Each control measure is identified by a "Measure ID" that refers to the related section of the Final Best Available Control Measure Technological and Economic Feasibility Analysis prepared by Sierra Research (See Appendix G of the 2003 PM10 Plan). The measures listed in this analysis are only those proposed for revision. Chapter 4 provides the complete list of measures adopted in the 2003 PM10 Plan with revisions provided in strikeout and underline format along with those measures that are unchanged.

**Rule 8021 - Construction, Demolition, Excavation, Extraction and Other Earthmoving Activities**

Comments received during the PM10 Plan workshop identified feasibility issues with several provisions of the proposed amendments to Rule 8021. The following table provides the current control measure commitment language and the proposed action and/or new language.

PM10 Plan Rule 8021 Commitment Amendments		
Measure ID	2003 PM10 Plan	Plan Amendment
4a	For demolition activities: Add a visible plume distance limit of 100 feet.	Eliminate: This measure is not technically feasible under a variety of circumstances as discussed below.
4a	For construction activities: add a visible plume distance limit of 100 feet.	Eliminate: This measure is not technically feasible under a variety of circumstances as discussed below.
7a	Cease construction activities when a wind event is declared.	Revise: Cease construction activities that disturb the soil when a wind event is declared.
7b	Cease construction activities when 20% opacity is exceeded and plume distance exceeds 100 feet due to wind.	Revise: Cease construction activities that disturb the soil when 20% opacity is exceeded due to wind.

#### 4a. Eliminate proposed 100 foot plume limit

The PM10 Plan proposed to add a requirement for a 100-foot plume limit for various soil disturbing activities. Originally, the District's BACM analysis was investigating a 100-yard plume length based on South Coast AQMD requirements, but later in the process it was learned that Clark County, Nevada was proposing a 100-foot plume requirement in an update to their existing rule. Numerous comments were received during PM10 Plan development regarding the feasibility of this measure. First, a 100-foot plume limit may not be appropriate for a moving vehicle or mobile construction equipment. A vehicle traveling 25 mph travels 36.6 feet/second; at this rate a vehicle would have traveled over 100 feet in just 3 seconds. On a still, windless day, entrained dust would float in the air and remain visible for more than 3 seconds even with controls in place. It was also noted that it is difficult to gauge distance between a moving vehicle and a moving plume.

The District proposes to include the plume length as a management practice or guidance for site operators as an indication that additional control is required. It may be an indicator for a District inspector to attempt to conduct an opacity test.

The BACM analysis conducted by Sierra Research found no research data that would relate emission strength with plume density or length. No emission reductions were claimed from the implementation of this measure; therefore, its removal will have no impact on the District's attainment strategy. EPA indicates that elimination of this measure will not create a BACM deficiency.

### **7a, 7b Cease construction activities during a wind event or when wind causes the exceedance of the 20 percent opacity requirement**

The District received comments regarding the appropriateness of suspending all construction activities when there are many activities on construction sites that do not involve disturbing the soil or moving on unpaved surface areas. For example, house framing, roofing and indoor finish work are not likely to create blowing dust. To accommodate this situation, the District proposes to clarify the control measure to apply to activities that disturb the soil. Since activities that do not disturb the soil or involve travel on unpaved surfaces are not expected to cause significant amounts of PM10 emissions, this change will have no impact on emission reductions expected from the measure. The District also proposes to eliminate the reference to a 100-foot plume due to technical infeasibility. EPA's natural event policy recognizes that under very high wind conditions no amount of control is available to totally eliminate wind blown dust.

### **Rule 8031 – Bulk Materials**

Comments received during the final PM10 Plan workshop identified feasibility issues with one provision of the proposed amendments to Rule 8031. The following table provides the current control measure commitment language and the proposed new action and/or language.

<b>PM10 Plan Rule 8031 Commitment Amendments</b>		
<b>Measure ID</b>	<b>2003 PM10 Plan</b>	<b>Plan Amendment</b>
4a	Add a visible plume distance limit of 100 feet	Eliminate: This measure is not technically feasible under a variety of circumstances as discussed below

#### **4a. Eliminate: This measure is not technically feasible under a variety of circumstances**

The PM10 Plan proposed to add a requirement for a 100-foot plume limit for various soil disturbing activities. Numerous comments were received during PM10 Plan development regarding the feasibility of this measure. First, a 100-foot plume limit may not be appropriate for a moving vehicle or mobile construction equipment. A vehicle traveling 25 mph travels 36.6 feet/second; at this rate a vehicle would have traveled over 100 feet in just 3 seconds. On a still, windless day, entrained dust could float in the air and remain visible for more than 3 seconds even with controls in place. It is difficult to gauge distance between a moving vehicle and a moving plume. The District proposes to include the plume length as a management practice or guidance for site operators as an indication that control is required. It may be an indicator for an inspector to attempt to conduct an opacity test. Based on comments received on the draft amendments, the District reconsidered this measure and proposes to eliminate this requirement for bulk material storage piles consistent with other source categories. The

existing requirement to limit opacity to 20% and provide a stabilized surface on inactive piles provides adequate reductions from this source. Although Clark County is proposing to adopt this measure, no convincing information has been identified that indicates that it is needed to meet the BACM requirement. No emission reductions were claimed from the implementation of this measure since no method of quantifying emissions from plume density or length is available; therefore, its removal will have no impact on the District's attainment strategy. EPA indicates that this is not a BACM deficiency.

### Rule 8041 – Carryout and Trackout

Comments received during the final PM10 Plan workshop identified feasibility issues with several provisions of the proposed amendments to Rule 8041. In addition, EPA identified changes during their review of the plan that they believe impacted approvability as BACM. The following table provides the current control measure commitment language and the proposed new action and/or language.

<b>PM10 Plan Rule 8041 Commitment Amendments</b>		
Measure ID	2003 PM10 Plan	Plan Amendment
2a	Add requirements applicable to vehicles with three or more axles.	Revise: Add requirements applicable to 20 or more vehicle trips per day with three or more axles.
2b	Require trackout control devices to be a minimum of 25 feet in length and full width of the unpaved road.	Revise: Require trackout control devices to be a minimum of 25 feet in length and full width of the unpaved road (where entry and exit roads are separated and clearly designated, control devices are only required for the exit roads).
2d	Require gravel pads to be 3 inches deep, 50 feet long, and cover the full width of the unpaved road (including the turning radius where an unpaved road meets a paved public road).	Revise: Require gravel pads to be 3 inches deep, 50 feet long, and cover the full width of the unpaved road (including the turning radius where an unpaved road meets a paved public road) (where entry and exit roads are separated and clearly designated, gravel is only required for the exit roads).
2e	Remove trackout onto public paved roads within one hour of occurrence.	Eliminate: This measure was included in error. The existing measure in Rule 8041 requires immediate clean up of trackout in

<b>PM10 Plan Rule 8041 Commitment Amendments</b>		
<b>Measure ID</b>	<b>2003 PM10 Plan</b>	<b>Plan Amendment</b>
		urban areas and is more stringent.
<i>PA-1</i>		Add: In rural areas, remove trackout onto public paved roads from construction sites 10.0 acres or larger immediately when trackout extends 50 feet from the nearest exit point of a site.

*Items in italics indicate a new measure ID – PA-1 refers to Plan Amendment 1*

### **2a Add requirements applicable to vehicles with three or more axles**

EPA requested the District to provide additional justification of the proposed BACM thresholds for trackout. Based on the original analysis of the trackout potential for larger vehicles (see 2a), the District determined that a lower threshold is appropriate for vehicles with 3 or more axles. The number of tires and weight of the vehicle are important factors in the emission calculations for trackout. The original cost-effectiveness, based on ten (10) 3-axle vehicles, was \$22.04/lb or \$44,078/ton. Accordingly, a threshold of twenty (20) 3-axle-vehicles would result in a cost-effectiveness of \$11/lb or \$22,000/ton of PM10 reductions. \$22,000/ton is considered to be marginally cost-effective compared to other measures adopted by the District. This measure will result in a small benefit to the emission reductions claimed for the rule.

### **2b Require trackout control devices to be a minimum of 25 feet in length and full width of the unpaved road**

The District received comments during the plan development process requesting that the control measure be revised to account for situations where the construction site provides separated entry and exit roads. Caltrans guidelines for preventing trackout illustrate the use of separate entrance and exit roads and placement of trackout prevention devices. Trackout is only caused by vehicles exiting the site, so this change will result in no impact on emission reductions claimed in the PM10 plan.

### **2d Remove trackout onto public paved roads within one hour of occurrence**

This measure is less stringent than the measure adopted in the 2001 revisions to Rule 8041 and was placed in the plan by error. Therefore, elimination of this measure will have no impact on the emission reductions claimed in the PM10 Plan.

**PA-1 In rural areas, remove trackout onto public paved roads from construction sites 10.0 acres or larger immediately when trackout extends 50 feet from the nearest exit point of a site**

EPA expressed concern that the current exemption of all trackout in rural areas would not be approvable as BACM. Although lower traffic volumes typical of rural areas will produce fewer PM10 emissions from entrainment of trackout and carryout, large construction sites (ten or more acres) have the potential to produce emissions in quantities warranting control (see Appendix G, Exhibit A, 4m). In addition, the rules must be designed to provide adequate protection for residents in rural areas. The District believes that this provision in conjunction with other measures required for agricultural sources provide the needed protection to all areas of the Valley. Since this is an increase in stringency over what was proposed in the plan, the District expects that emission reductions will be slightly improved.

**Rule 8061 – Paved and Unpaved Roads**

EPA requested that the District provide analysis supporting the 75 vehicle trips per day (VT/day) threshold for unpaved roads. The BACM Analysis in Appendix G of the plan justified the current 75 VT/day threshold based on a comparative analysis with other serious PM10 nonattainment areas, but did not specifically address the economic and technical feasibility of pursuing a lower threshold. In addition, due to the limited amount of travel data available for unpaved roads, there was no indication of the percentage of roads expected to be covered by a 75 VT/day threshold. The District analysis provided below gives an estimate of the effect of setting the trip threshold at various levels. Other comments were received from public works and roads departments regarding the feasibility of requiring all new and modified roads to have at least 4-foot paved shoulders. The following table provides the current control measure commitment language and the proposed new action and/or language.

<b>PM10 Plan Rule 8061 Commitment Amendments</b>		
<b>Measure ID</b>	<b>2003 PM10 Plan</b>	<b>Plan Amendment</b>
1a	Require 4-foot paved shoulders on new or modified paved roads where right of way is available	Eliminate: Retain the existing threshold of 500-3000 average daily trips (ADT) to trigger requirement to pave shoulders consistent with AASHTO standards on new or modified paved roads.

<i>PA-3</i>		Add: Require application of specified controls to prevent visible dust emissions (VDE) and provide a stabilized surface on unpaved roads exceeding 25 annual average daily trips (AADT) (currently 75 VT/day).
<i>PA-4</i>		Add: Require public agencies responsible for public unpaved roads to report ADT estimates to the District in addition to the current reporting requirement for road miles and controls implemented.

*Items in italics indicate a new measure ID*

**1a Require 4-foot paved shoulders on new or modified paved roads where right of way is available**

The proposed control measure in the PM10 Plan would require all new or modified paved roads to have a minimum of 4 foot paved shoulder. This was proposed based on its inclusion in Clark County, NV regulations. According to the BACM Demonstration analysis conducted by Sierra Research (see Appendix G, Exhibit A, 1a of the PM10 Plan), the cost-effectiveness of this measure for roads with 2,700 trips per day is \$13,756/ton. The cost-effectiveness of this measure for roads with 100 trips per day is \$554,142/ton. The District considers \$13,756/ton to be marginally cost-effective. The current requirement for 4-foot shoulders to be paved for roads with ADT between 500 and 3,000 is based on AASHTO standards. Therefore, although the existing cost-effectiveness is poor at 500 trips, the local jurisdictions charged with maintaining these roads will be meeting the requirement to be consistent with AASHTO standards. Requiring paving of shoulders below 500 trips per day would be an inefficient use of local resources that could be better utilized with more cost-effective controls.

**PA-3 Require application of specified controls to prevent VDE and provide a stabilized surface on unpaved roads exceeding 25 AADT**

The current threshold in Rule 8061 for applying controls is 75 vehicle trips per day. The District conducted a cost-effectiveness analysis and found that treating unpaved roads with chemical dust suppressants was cost-effective at 26 AADT. The analysis conducted by the District's consultant, Mel Zeldin arrived at a cost-effectiveness value of \$3000/ton at 26 AADT. This is considered to be a reasonable cost-effectiveness value compared to other PM10 controls. A summary of the cost effectiveness analysis for using dust suppressants at the 26 ADT threshold is as follows:

Total miles subject to 26 ADT threshold = 90 (estimated)

Total PM10 emissions subject to 26 ADT threshold = 3.75 tpd

Control effectiveness of dust suppressants is 42.4% reduction

Reductions by dust suppressants  $0.424 \times 3.75 \text{ tpd} = 1.59 \text{ tpd}$  or 580.74 tpy

Cost per mile (see 3a) is \$19,360

Total cost:  $\$19,360 \times 90 \text{ miles} = \$1,742,400$

Cost effectiveness:  $\$1,742,400 / 580.74 \text{ tpy} = \$3000.30/\text{ton}$

Claiming the full credit allowed by EPA for maintaining a stabilized surface would increase emission reduction effectiveness used in the PM10 Plan from 25 percent to 50 percent for roads covered by this provision. Certain chemical dust suppressant products are certified to 84% control effectiveness. Using that figure instead of the 42.4% used in the 2001 amendments to Regulation VIII will improve the cost-effectiveness to about \$1,500/ton. Lowering the threshold from the existing 75 VT/day to 26 AADT will result in more road miles being captured by the rule. The analysis also attempted to determine the effect on emissions of adopting the lower threshold. A 75 vehicle trips per day threshold would cover about 9 percent of applicable emissions. A 26 vehicle trips per day threshold would cover 42 percent of applicable emissions resulting in a 33 percent improvement in coverage over the existing rule.

This provision would require local agencies to treat approximately 90 miles of public unpaved roads per year. With the current state budget crisis and delay in reauthorization of the federal Congestion Mitigation Air Quality (CMAQ) program, significant uncertainty exists over the availability of funding to accomplish this task. The District commits to work with the local agencies to identify alternative funding sources and to develop a phase-in schedule if needed. Cost for owners of private roads is also an issue. One way that the impact can be reduced on roads shared by small numbers of homeowners is to require control only on the portion of the road that exceeds the threshold. So for example, a road with 5 houses along a private unpaved road that generates 8 trips/house/day (40 trips/day total) would control only the segment of the road from the public road to the second house. Beyond the second house the trips would not exceed 25 trips/day since the remaining three houses would generate 24 trips. This option will be considered during rule development.

#### **PA-4 Require public agencies responsible for public unpaved roads to report ADT estimates to the District**

There is very little data available to help determine the ADT experienced on unpaved roads. Information used to create the emission inventory was based on average trip rates applied to all public unpaved road miles. The current estimates used for the PM10 Plan rely on engineering judgment to determine the impact of threshold levels on emissions. EPA indicated that public agencies responsible for public unpaved roads should be required to provide ADT estimates for roads under their jurisdiction to verify the emission reduction estimates. This measure has no direct impact on emissions, but could impact emission reduction estimates used in the PM10 Plan. If the results indicate that estimates used in the PM10 Plan are inaccurate, the emission reductions



will need to be recalculated. The data must be available for use in the 2005 Reasonable Further Progress Plan that will be prepared during 2005.

### Rule 8071 - Unpaved Vehicle/Equipment Traffic Areas

EPA requested that the District provide additional analysis supporting the trip thresholds for this source category. In addition, EPA questioned the appropriateness of the three-tiered approach that required a stabilized surface only after 75 vehicle trips was exceeded. The District considered whether this source category should use an annual average daily trip count or a daily peak vehicle trip count for the threshold. Compliance staff indicated that retaining the use of a peak vehicle threshold would be preferable from an enforcement standpoint; however, cost-effectiveness of control is high for sources that seldom exceed the threshold. Sources with a high degree of seasonality could opt for short term controls such as watering when needed, but at a relatively poor cost-effectiveness. Sources with steady volumes of trips throughout the year or a significant peak season will find it economically advantageous to implement long term controls such as chemical stabilization and paving rather than watering. The District analysis provided below includes an estimate of the effect of setting the trip threshold at various levels.

<b>PM10 Plan Rule 8071 Commitment Amendments</b>		
Measure ID	2003 PM10 Plan	Plan Amendment
3e*	Require watering and speed controls on unpaved areas receiving up to 25 VT/day	Eliminate: BACM analysis showed that this measure was not cost-effective.
3f*	Establish a vehicle threshold limit of 26-75 vehicle trips before specified controls must be used to prevent VDE	Revise: Establish a vehicle threshold limit of 50 AADT before specified controls must be used to prevent VDE and to provide a stabilized surface. Add a single day peak threshold of 150 VT/day or require control for sources that exceed the 150 VT/day threshold limit on at least 30 days per year.
3g*	Establish a vehicle threshold limit of 75 or more vehicle trips/day before specified controls must be used to prevent VDE and to provide a stabilized surface	Eliminate: This measure is consolidated with the previous measure that requires limiting VDE and a stabilized surface at the same threshold.
3h	Establish a threshold limit of 25 or more vehicle trips/day for vehicles with three or more axles	Retain: This threshold is marginally cost-effective

\*The measure IDs are based on Sierra Research's identification in Appendix G. The 2003 PM10 Plan commitments modified the thresholds in the measures based on supplemental analyses. Therefore, the measure ID and plan commitment may differ slightly.

### **3e Require watering and speed controls on unpaved areas receiving up to 25 VT/day**

The BACM analysis (see Appendix G, Exhibit A, 3e of the PM10 Plan) clearly indicated that this measure had extremely poor cost-effectiveness and stated that speed controls on unpaved areas are not generally needed because of the short travel distances and the nature of the sites. Therefore, removal of this measure will not impact the BACM determination.

The emissions inventory in the PM10 Plan estimates that private unpaved vehicle/equipment traffic areas contribute 1.0 ton/day of PM10 throughout the Valley in 2010 (Chapter 3) and claims reductions from all applicable measures of 0.3 tons/day from all controls on this source category (Chapter 4). The most important control for this source category is the existing requirement to limit visible dust emissions (VDE) to 20 percent opacity. The inclusion of specific requirements is an added preventative measure that improves the likelihood of achieving the VDE at all times. Therefore, the District believes that setting the threshold for requiring control at 50 vehicle trips will have a minor impact on the emission reductions from this source category (see PA-3). The removal of speed controls also is expected to have limited effect since very few vehicles travel at high speeds on these surfaces.

The analysis for this source category contained in Appendix G (see 3f) estimated cost-effectiveness at 25 trips per day to be \$45.68/lb or \$91,360/ton of PM10 reduced. This is clearly excessive and not cost-effective in comparison to controls available for other similar source categories. Therefore, the District has removed this measure from consideration.

### **3f Establish a threshold limit of 26-75 vehicle trips before specified controls must be used to prevent VDE**

The existing Rule 8071 contains a tiered approach to control with sources with daily trips ranging from 75 to 100 vehicle trips required to implement a specified control and sources over 100 vehicle trips required to also provide a stabilized surface. The 2003 PM10 Plan control measure proposed to lower the threshold based on a similar regulation by Clark County, NV, for this source category which has no minimum threshold before control is required. Upon further consideration of the BACM analysis conducted by Sierra Research (see Appendix G, 3f), by using the typical cost-effectiveness of sources that would fall between 26 and 75 vehicle trips per day on an average annual basis, this measure appears to be marginally cost-effective. The typical cost-effectiveness for this measure is \$4.71/lb or \$9,419/ton. This assumed 50 vehicle trips and heavy-duty vehicles using the site. This rate is similar to the cost-effectiveness of other PM10 control measures that have been adopted by the District. The District proposes to amend the control measure to require specified controls and to provide a stabilized surface for areas experiencing 50 average annual vehicle trips and greater. This action should have a minor effect on emission reductions since this

change impacts only a portion of a small source category. If at worst case, half of the emissions were no longer subject to the rule, emission reductions of .15 tons/day of PM10 valley-wide would occur. The District believes that because emission rates are proportional to trip rates, unpaved areas above the threshold offset the loss of coverage below 50 trips. For example one lot with 100 trips/day creates the same emissions as four lots with 25 trips and 10 lots with 10 trips/day. This tends to weight emissions toward those sources with higher trip counts.

The District conducted additional analysis to determine the cost-effectiveness of the current 75 trip per day threshold for requiring owners to implement specified controls. The following analysis provides this information (see App. G Exhibit A (3f.) for detailed assumptions):

Watering Unpaved Lots – 75 Vehicle Trips per day

**Cost-effectiveness analysis based on watering for dust suppression on unpaved parking lots and equipment staging areas with 75 vehicle trips per day:**

Cost of control using water:

Cost of water truck rental and driver = \$50/hour

Truck and driver used for 1 hour 1 x \$50 = \$50/day

Cost of water = .002 \$/gallon

Application rate = 629 gal/acre

Surface area watered = 1 acre

Water cost = .002 \$/gal x 629 gal/acre x 1 acre x 1 watering = \$1.25/day

Total cost per day = \$50/day + 1.25/day = \$51.25/day

Assumes that the lot owner could obtain dust control services only when needed.

Baseline emissions:

Minimum lot size = 1 acre (43,560 sq. ft.)

Daily vehicle trips = 75

Distance traveled per parking trip = 417 ft.

Emission factor = 2.0 lbs PM10/VMT @ 25.9 mph

Emission factor @ 5 mph = .39 lbs/VMT

Emission factor @ 10 mph = .77 lbs/VMT

Baseline emissions = 75 x 417 ft = 31,275/5,280 = 5.92 mi./day

5.92 mi. x .39 lbs/VMT = 2.3 lbs/day

5.92 mi. x .77 lbs/VMT = 4.6 lbs/day

Control efficiency:

Assume one watering at the beginning of the day. It is usually impractical to water after vehicles begin using the site.

Hour 1 85%

Hour 2 50%

Hour 3 10%



Cost to treat 1 acre = \$4,008/yr.  
Cost-effectiveness @ 5 mph -  $\$4,008/115.5 \text{ lbs} = \$34.70/\text{lb}$   
 $= \$69,403/\text{ton}$

14 days @ 75 trips/day = 14 days x 4.6 lbs/day = 64.4 lbs  
351 days @ 10 trips/day = 351 days x .61 lbs/day = 215 lbs  
64.4 + 215 = 279 lbs  
Control efficiency 84% x 279 lbs = 234 lbs  
Cost to treat 1 acre = \$4,008/yr.  
Cost-effectiveness @ 10 mph -  $\$4,008/234 \text{ lbs} = \$17.13/\text{lb}$   
 $= \$34,256/\text{ton}$

Maricopa County requires unpaved traffic areas to implement control when the threshold level of 100 vehicles is exceeded on 35 or more days. A similar mechanism could be used here. The following example provides the cost-effectiveness of implementing controls on sites that exceed a trip threshold of 50 trips per day on 30 days and the rest of the year averages 10 trips per day.

Baseline emissions =  $50 \times 417 \text{ ft} = 23,750/5,280 = 4.50 \text{ mi./day}$   
 $4.5 \text{ mi.} \times .39 \text{ lbs/VMT} = 1.75 \text{ lbs/day}$   
 $4.5 \text{ mi.} \times .77 \text{ lbs/VMT} = 3.46 \text{ lbs/day}$

Emissions @ 50 trips/day = 1.75 lbs/day @ 5 mph  
Emissions @ 50 trips/day = 3.46 lbs/day @ 10 mph  
Emissions @ 10 trips/day = .35 lbs/day @ 5 mph  
Emissions @ 10 trips/day = .69 lbs/day @ 10 mph

30 days @ 50 trips/day - 30 days x 1.75 lbs/day = 52.5 lbs  
335 days @ 10 trips/day - 335 days x .35 lbs/day = 117.2 lbs  
52.5 + 117.2 = 169.7 lbs/year  
Control efficiency 84% x 169.7 lbs = 142.5 lbs  
Cost to treat 1 acre = \$4,008/yr.  
Cost-effectiveness @ 5 mph -  $\$4,008/142.5 \text{ lbs} = \$28.13/\text{lb}$   
 $= \$56,253/\text{ton}$

30 days @ 50 trips/day - 30 days x 3.46 lbs/day = 103.8 lbs  
335 days @ 10 trips/day - 335 days x .69 lbs/day = 231.1 lbs  
103.8 + 231.1 = 334.9 lbs/year  
Control efficiency 84% x 334.9 lbs = 281.3 lbs  
Cost to treat 1 acre = \$4,008/yr.  
Cost-effectiveness @ 10 mph -  $\$4,008/281.3 \text{ lbs} = \$14.24/\text{lb}$   
 $= \$28,496/\text{ton}$

At 150 trips/day using the same assumptions used for 50 and 75 trips/day, the cost-effectiveness would range from \$9,894/ton to \$18,751/ton. The requirement to do control at 75 appears to not be cost-effective. A threshold of 150 trips/day appears to be marginally cost-effective.

Cost-effectiveness could be improved by applying the dust suppressant material just prior to the peak season. The 84% control effectiveness certified by the ARB is after 6,780 trips and 339 days. The dust suppressant would be more effective closer to the date of application. Limiting the area subject to vehicle travel to a smaller area will result in less cost for materials and better cost-effectiveness. Sites where it is feasible to water the surface more than once per day will achieve greater emission reductions and better cost-effectiveness than sites that water only at the beginning of the day.

### **3g Establish a threshold limit of 75 or more vehicle trips/day before specified controls must be used to prevent VDE and to provide a stabilized surface**

EPA considers the stabilized surface requirement to be very important to improve the enforceability of this type of regulation. It allows an inspector to determine compliance at times when it is not practical to conduct an opacity test. EPA commented that the stabilized surface requirement should apply at the 26 vehicle trips per day threshold and not just at 75 or more vehicle trips per day. Since the District is proposing a 50 average annual trip threshold, the District anticipates that owners/operators of any area exceeding 50 vehicle trips on an average annual basis will choose chemical dust suppressants as their preferred control technique. These materials are very effective at creating a stabilized surface (Effectiveness Demonstration of Fugitive Dust Control Methods for Public Unpaved Roads and Unpaved Shoulders on Paved Roads, Desert Research Institute, Dec 1996). It is assumed that any material used to comply with the VDE requirement will also assist with compliance of the stabilized surface requirement, therefore, compliance with this requirement will not create additional costs for those responsible for the unpaved area.

### **3h Establish a threshold limit of 25 or more vehicle trips/day for vehicles with three or more axles**

EPA requested that the District justify the threshold level for vehicles with three or more axles to demonstrate BACM compliance. The BACM analysis in Appendix G only examined a truck threshold for unpaved parking areas with 10 trips; however the data may be used to calculate the cost-effectiveness of a 25 trip or alternative threshold level.

The analysis used for measure 3h assumed that a three-axle vehicle would weigh 2.3 tons or 4,600 lbs and emit .43 lbs PM10/VMT. This is the weight of Chevrolet Silverado with dual rear axles. This would be considered the worst case scenario where only the lightest vehicles with 3 or more axles travel across the site. Using the same method used in section 3h by Sierra Research, light heavy-duty trucks with a gross vehicle weight rating of 14,000 lbs would emit at a rate of .67 lbs/VMT. Trucks with a gross vehicle weight rating of 40,000 lbs would emit at 1.02 lbs/VMT. Trucks with a vehicle weight rating of 80,000 lbs would emit at 1.35 lbs/VMT. Based on Sierra's analysis based on application of polymer dust suppressant, 10 truck trips would provide a cost-effectiveness of 103.48/lb PM10 reduced. This is clearly not cost-effective. However, if the trucks are assumed to be larger vehicles weighing 40,000 lbs the cost-effectiveness improves to \$32.90/lb PM10. At 25 trips/day the cost-effectiveness would be reduced to

\$13.16/lb, which would be in the upper range of cost-effectiveness for measures adopted by the District. The District proposes to leave the 25 trip threshold as an annual average for three axle vehicles and larger based on poor cost-effectiveness at lower thresholds.

The District proposes to add thresholds for sources with low annual average trip rates, but relatively high peak trips. Rule 8071 is proposed to have a trip threshold for any single day that exceeds the threshold. Based on the analysis performed above, a threshold for single day control using water could be set at 150 VT/day and achieve marginal cost-effectiveness. Sites that exceed 150 trips on 30 days per year can control emissions cost-effectively using chemical dust suppressants. Sites that have average annual trips of 50 or greater can also implement controls cost-effectively. Sites that have special requirements that require the use of water may prepare a Fugitive PM10 Management Plan to allow alternative compliance.

### Rule 8081 Agricultural Sources

Rule 8081 was a new rule adopted in the 2001 Amendments to Regulation VIII to address the unique aspects of off-field agricultural sources of PM10. This rule covers many of the same sources included in Rules 8031, 8061, and 8071, but in an agricultural setting. This includes storage and handling of bulk materials, unpaved roads, and unpaved equipment storage and staging areas.

The District received comments from agricultural representatives that a consolidation of Rule 8081 requirements with the CMP Program would eliminate confusion regarding overlap and applicability. The resulting changes if this suggestion was accepted are too complex to undertake in the Amendments to the 2003 PM10 Plan. Rule development for Rule 8081 and the CMP Program are proceeding simultaneously with both approaching the point of release of draft rules. The District commits to addressing this as an outstanding issue during rule development for those two rules. If the measures are included in the CMP Program, they would have to be at least as stringent and enforceable as proposed for Rule 8081 to ensure that BACM control is met.

<b>PM10 Plan Rule 8081 Commitment Amendments</b>		
Measure ID	2003 PM10 Plan	Plan Amendment
4a	Add a visible plume limit of 100 feet.	Eliminate: This measure is not technically feasible under a variety of circumstances as discussed below
7e	Require that visible emissions do not travel beyond the property line.	Eliminate: This measure is not technically feasible for most applications.
3a	Limit vehicle speeds to 15 mph on agricultural unpaved	Clarify: Limit vehicle speeds to 15 mph on agricultural unpaved

	roads	roads that do not meet the applicability threshold(s) for VDE or surface stabilization.
3e*	Require watering and speed controls on unpaved areas receiving up to 25 VT/day.	Eliminate: Roads and unpaved areas at this level are included in the Ag CMP Program.
3e*	Establish a vehicle threshold limit of 26 VT/day before specified controls must be used to prevent VDE.	Change: Establish a vehicle threshold limit of 75 before specified controls must be used to limit VDE and to provide a stabilized surface.
3d/3g*	Establish a vehicle threshold limit of 75-100 vehicle trips/day before specified controls must be used to prevent VDE and to provide a stabilized surface.	Change: Set a single threshold at 75 VT/day and provide stabilized surface. This allows for improved enforceability.
3e/3f/3g	Eliminate the existing one-acre exemption for unpaved vehicle and equipment parking and traffic areas.	Revise: Eliminate the existing one-acre exemption for unpaved vehicle and equipment parking and traffic areas for farms within one mile of any incorporated city or unincorporated rural community.
PA-5		Add: The District will incorporate the language of California Vehicle Code 23112-23113 into Rule 8081. This section requires material, including dirt deposited on any public highway or street to be cleaned up immediately.
PA-6		Establish a vehicle threshold limit for unpaved vehicle/equipment traffic areas of 50 AADT before specified controls must be used to prevent VDE and to provide a stabilized surface. Add a single day peak threshold of 150 VT/day or require control for sources that exceed the 150 VT/day threshold limit on at least 30 days per year (water would only be allowed as a control option for those exceeding 30



		days per year if necessary due to special operating circumstances at the site).
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*\*The measure IDs are based on Sierra Research's identification in Appendix G. The 2003 PM10 Plan commitments modified the thresholds in the measures based on supplemental analyses. Therefore, the measure ID and plan commitment may differ slightly.*

#### **4a Eliminate proposed 100 foot plume limit**

The PM10 Plan proposed to add a requirement for a 100-foot plume limit for various soil disturbing activities. Numerous comments were received during PM10 Plan development regarding the feasibility of this measure. First, a 100-foot plume may not be appropriate for a moving vehicle or mobile construction equipment. A vehicle traveling 25 mph travels 36.6 feet/second; at this rate a vehicle would have traveled over 100 feet in just 3 seconds. On a still, windless day, entrained dust would float in the air and remain visible for more than 3 seconds even with controls in place. It is difficult to gauge distance between a moving vehicle and a moving plume. The District proposes to include the plume length as a management practice or guidance for site operators as an indication that control is required. It may be an indicator for an inspector to attempt to conduct an opacity test. The District proposes to maintain the control measure for bulk material storage piles since those provide a stationary point from which to measure. No emission reductions were claimed from the implementation of this measure; therefore, its removal will have not impact on the District's attainment strategy.

#### **7e Eliminate proposed requirement that visible emissions do not travel beyond the property line**

The PM10 Plan proposed to add a requirement that visible emissions do not travel beyond the property line. Based on comments received during plan development, the District has concluded that this measure is not feasible under many circumstances. Vehicle travel on roads running along a property line would probably cause a plume to cross the property line. If a farm's unpaved road or equipment storage area is adjacent to residential development or a school and causes dust to travel over the property line, it is currently subject to the District's Nuisance Rule. No emission reductions were claimed from this measure; therefore, elimination of this requirement will not impact the District's attainment demonstration.

#### **3a Revise requirement for limiting speed to 15 miles per hour on unpaved roads**

The PM10 Plan added a commitment to limit speed limits on unpaved agricultural roads to 15 miles per hour. Based on comments received during the workshop and the development process for the plan, the District now recognizes that this is not appropriate for all circumstances. Unpaved roads that have been treated with chemical dust suppressant materials can comply with the opacity limits of Regulation VIII at speeds higher than 15 miles per hour; therefore, there is limited benefit from imposing this requirement on all roads. The District proposes to revise this requirement to limit

speed to 15 miles per hour on agricultural unpaved roads that do not meet the applicability threshold(s) for VDE or surface stabilization.

Review of the emission reduction calculations in the PM10 Plan indicates that no emission reductions were taken for this measure for Regulation VIII. However, limiting speed is one of the practices included in the proposed CMP Program and reductions were claimed therein. The BACM Analysis measure 3a examined the effect of limiting speeds on unpaved roads based on an uncontrolled surface and reductions to 25 mph. There is a linear relationship between speed and emissions; therefore, reducing speed to 15 mph from the uncontrolled speed will result in proportional emission reductions. This measure is intended to cover any potential gaps in rule coverage between Rule 8081 and the CMP Program, if any occur. Therefore, this change will not result in an impact on the District's emission reduction estimates and attainment demonstration.

The District received additional comments from agricultural stakeholders regarding the 15 MPH speed limit provision and its relationship to the CMP Program. To clarify this provision, the District offers the following discussion:

Roads always under 75 VT/day

Requirement: Implement one of the following CMPs:

- Treat road
- Limit speed
- Restrict access

Roads exceeding 75 VT/day

Requirement: Limit VDE and provide a stabilized surface on any day threshold is exceeded per Rule 8081.

Those using a temporary control method (water)

- Implement one CMP on days when 75 VT/day not exceeded
  - Treat road (continue to water)
  - Limit speed
  - Restrict access

Those using longer lasting controls (chemical suppressants, road oil, etc.)

No additional CMP is required because control used to comply with the VDE and stabilized surface requirement will continue to be effective on days when 75 VT/day is not exceeded.

To summarize, speed limits will only apply to agricultural unpaved roads where that option was selected as a CMP. Roads with limited access or that are treated with dust suppressants will not be required to implement speed limits. As stated earlier, emission reductions were only taken for the CMP Program for this measure, therefore, no change in emission reductions is anticipated.

**3e Clarify that requirement for watering and speed controls on unpaved areas receiving up to 25 VT/day is included in CMP Program and not Rule 8081**

This measure was listed in the PM10 Plan as a control measure for Rule 8081; however, unpaved areas at this threshold and below were intended for control under the CMP Program. Emission reductions were claimed in the PM10 Plan for the CMP Program and not for Rule 8081 for this measure. Therefore, revision of this measure will cause no impact on emission reductions necessary for attainment.

### **3e Retain the daily vehicle trip (VDT) threshold on unpaved roads at 75**

The current threshold for agricultural unpaved roads in Rule 8081 is 75 vehicle trips per day. Although this is the most stringent threshold level in any area, EPA has requested additional information to document that this was the appropriate level to be considered BACM. The 2003 PM10 Plan proposed a threshold of 26 vehicle trips per day. After further analysis of this measure, the District has determined that this threshold results in excessively high cost-effectiveness (see Watering and Dust Suppression below). The District examined the cost-effectiveness of the existing 75 trip threshold for comparison to the 26 trip and 50 trip levels. The District proposes to retain the threshold at 75 vehicle trips per day including implements of husbandry. The 75 trip threshold has a cost-effectiveness of \$14,875/ton. This is better than the \$22,405/ton estimated for 50 trips/day, but is still considered marginally cost-effective compared to other District controls on similar sources. Heavy-duty vehicles with three or more axles will be subject to a lower threshold of 25 vehicle trips per day based upon their higher per vehicle emission rates. Heavy-duty vehicles have a gross vehicle weight of 14,001 pounds and up.

Cost-effectiveness is not the only determinant of economic feasibility. The District must consider the ability of the regulated industry to absorb the cost of this control. The owners of agricultural unpaved roads that would experience the greatest economic impacts for the least air quality benefit are those that exceed the threshold on the fewest days, have a short road segment, and are closest to the threshold level on the days when they exceed. This is because the cost of the equipment used to control the emissions is spread over fewer days and less area. Growers with roads that exceed the threshold on many days can better justify the capital expense of equipment and materials used to treat the surface. Although the cost-effectiveness is still relatively high at \$14,875/ton, this measure has been in place for nearly two years. When looking at cost-effectiveness for the entire industry, as will be accomplished during the socio-economic impact analysis conducted during rule development, impacts will be identified for the full range of growers. This will include those that experience the highest costs per the least benefit and also those that will have the lowest cost for the highest benefit. However, with other controls being imposed on this source category as described below, the District recognizes that many more growers will be required to expend resources to control emissions.

The District is proposing a two-tiered control program for agricultural unpaved roads and unpaved traffic areas. Unpaved roads and traffic areas exceeding a traffic volume threshold will be subject to Rule 8081. Unpaved roads and traffic areas below the traffic volume threshold will be required to implement controls under the District's proposed Conservation Management Practice (CMP) Program. This ensures that all unpaved

agricultural roads receiving significant use provide some degree of control, and allows the grower to select options that are the most cost-effective for their operation.

The most stringent requirements will be placed on unpaved roads and unpaved traffic areas receiving the highest traffic volumes. Agricultural unpaved roads typically have traffic volumes that vary greatly depending on the season and operation. For example, many unpaved roads may receive only a few trips per day during the growing season, but have much higher traffic volumes during the harvest season. If thresholds were set based on annual average daily trips (AADT), as is the case for public unpaved roads, very few would be subject to control. By relying on a threshold that is triggered on any day that number is exceeded, cost-effective controls can be used on more miles/segments of unpaved roads. In addition, growers are only required to provide control during periods when emissions are high enough to allow for cost-effective control.

The purpose and number of trips for agricultural unpaved roads vary with the intensity of the operation performed in the field, orchard, or vineyard. Day to day operations such as irrigation and fertilizer application are low intensity and may only involve one or two persons. Harvest, on the other hand may involve large work crews and, in many cases, heavy-duty trucks to haul away the crop. This means that an unpaved road produces very small amounts of emissions during much of the year, based on available information, but produces significant emissions from several days to several weeks per year depending upon the commodity. Therefore, although controls are only required during part of the year when vehicle activity is at its peak, it can cover the time periods when heavier traffic volumes result in most of the emissions generated from use of the unpaved road.

EPA requested that the District provide justification for the exemption of implements of husbandry from trip counts in existing Rule 8081. The District requested that Sierra Research analyze the impact of the implements of husbandry exemption (see Reference Document 11, Implements of Husbandry memo). Based on their research, they concluded that implements of husbandry comprise up to 25 percent of all trips conducted on unpaved agricultural roads. In addition, Sierra Research examined factors that should be considered in determining the impact from implements of husbandry. The emission factors for unpaved roads are based on speed, and weight of the vehicle. The speed of implements of husbandry are relatively low. Tractor speeds average 15 or fewer miles per hour and can be much lower if it is pulling a heavy load or implement. As for weight, a 50 hp tractor is lighter than a full size pickup truck. A large tractor exceeding 150 hp may be much heavier than a full size pickup truck, especially when the implement weight is added. No direct measurements of PM10 from implements of husbandry in the San Joaquin Valley were found in a review of the literature. However, AP-42 (Chapter 13.2.2) contains a default emissions rate for various vehicle types. Some implements are supported by multiple wheelsets, thereby causing more contact with the soil surface, which subsequently results in higher emissions. Based upon this information, the District concludes that it is appropriate to count implements of husbandry in trip counts used to determine rule applicability; however due to their slower speeds, they should be counted as regular vehicles and not as trucks or vehicles with 3 or more axles.

The District received comments from agriculture industry representatives regarding the appropriateness of maintaining the proposed threshold of 25 trips by vehicles with 3 axles or more. They also asked the District to consider that trucks used for hauling of produce will be unloaded going in and will be loaded on the return trip. This information should be accounted for in the average emissions from these vehicles. District staff examined the effect of vehicle weight on emissions using the unpaved road equation from AP-42. The following factors are provided for comparison only and may not reflect actual vehicle weights and emissions:

Effect of weight on emissions:

$$\begin{aligned} 3 \text{ tons (6,000 lbs)} &= \text{baseline weight factor} = 1.0 \\ 5 \text{ tons (10,000 lbs)} &= (5/3)^{0.7} = 1.430 \\ 10 \text{ tons (20,000 lbs)} &= (10/3)^{0.7} = 2.33 \\ 20 \text{ tons (40,000 lbs)} &= (20/3)^{0.7} = 3.77 \\ 40 \text{ tons (80,000 lbs)} &= (40/3)^{0.7} = 6.13 \end{aligned}$$

Effect of the number of wheels on the vehicle

$$\begin{aligned} 4 \text{ wheels} &= \text{baseline vehicle} = 1.0 \\ 6 \text{ wheels} &= (6/4)^{0.5} = 1.22 \\ 8 \text{ wheels} &= (8/4)^{0.5} = 1.414 \\ 12 \text{ wheels} &= (12/4)^{0.5} = 1.732 \\ 18 \text{ wheels} &= (18/4)^{0.5} = 2.12 \end{aligned}$$

Pickup with 6 wheels – 3 tons =  $1.0 \times 1.22 = 1.22$   
Flat bed truck – 5 tons unloaded 10 tons GVW, 6 wheels =  $1.43 \times 1.22 = 1.74$   
Flat bed truck – 10 tons loaded =  $2.33 \times 1.22 = 2.84$   
Truck with single trailer – 10 tons unloaded, 8 wheels =  $2.33 \times 1.414 = 3.29$   
Truck with single trailer loaded 20 tons =  $3.77 \times 1.44 = 5.42$   
Truck with dual trailers 20 tons unloaded, 18 wheels =  $3.77 \times 2.12 = 7.99$   
Truck with dual trailers 40 tons loaded =  $6.13 \times 2.12 = 12.9$

Assume vehicle mix – 50 full size pickup, 25 percent flat bed, 15 percent single trailer, and 10 percent dual trailer with half trips loaded and half unloaded:

$$\begin{aligned} (1.22) \times .5 &= .61 \\ (1.74 + 2.84)/2 &= 2.29 \times .25 = .572 \\ (3.29 + 5.42)/2 &= 4.32 \times .15 = .648 \\ (7.99 + 12.9)/2 &= 10.4 \times .10 = 1.04 \end{aligned}$$

Combined weight and wheel factor = 2.87

Using this factor, 26 trips by trucks with 3 or more axles is roughly equivalent to 75 trips by vehicles weighing 3 tons. Roads that are used by a mix of heavier vehicles will produce more emissions than roads that are used by a mix of lighter vehicles. In conclusion, the 26 trip threshold for vehicles with 3 or more axles seems reasonable. One measure the District will consider during rule development is to add a weight threshold in addition to the 3-axle requirement. Heavy-duty vehicles are defined as

those exceeding 14,000 lbs gross vehicle weight. That may be an appropriate cut-off for separate counts.

Watering – 75 Vehicle Trips per day

**Cost-effectiveness analysis of watering for dust suppression on an unpaved road with 75 vehicle trips per day:**

Scenario description: 160-acre farm with 1 mile of unpaved roads.

Cost of control using water:

Cost of water truck rental and driver = \$50/hour

Truck and driver used for 8-hours  $8 \times \$50 = \$400/\text{day}$

Cost of water = .002 \$/gallon

Application rate = 629 gal/acre

Surface area watered = 5,280 feet X 20 foot road width = 2.42 acres

Water cost = .002 \$/gal X 629 gal/acre X 2.42 acres X 2 waterings = \$6.09/day

Total cost per day = \$400/day + 6.09/day = \$406.09/day

Baseline emissions:

Road length = 1 mile

Daily vehicle trips = 75

Vehicle miles traveled (VMT) = 75

Emission factor = 2.0 lbs PM10/VMT

Baseline emissions = 150.0 lbs/day

Control efficiency:

Hour 1        85%

Hour 2        50%

Hour 3        10%

Hour 4        0%

Assume reapplication of Water

Hour 5        85%

Hour 6        50%

Hour 7        10%

Hour 8        0%

Average control efficiency for 8 hours = 36.25%

Controlled emissions:

$150 \text{ lbs/day} \times 36.25\% = 54.4 \text{ lbs/day}$  PM10 reduced by watering twice daily

Controlled emissions =  $150 \text{ lbs/day} - 54.4 \text{ lbs/day} = 95.6 \text{ lbs/day}$

Emission reductions = 54.4 lbs/day

Cost-effectiveness =  $\$406.09/54.4 \text{ lbs/day} = \$7.46/\text{lb PM}_{10}$   
= $\$14,929/\text{ton PM}_{10}$

### Watering – 50 Vehicle Trips per Day

#### Cost-effectiveness analysis of watering for dust suppression on an unpaved road with 50 vehicle trips per day:

Scenario description: 160-acre farm with 1 mile of unpaved roads.

Cost of control using water:

Cost of water truck rental and driver = \$50/hour

Truck and driver used for 8-hours  $8 \times \$50 = \$400/\text{day}$

Cost of water = .002 \$/gallon

Application rate = 629 gal/acre

Surface area watered = 5,280 feet  $\times$  20 foot road width = 2.42 acres

Water cost = .002 \$/gal  $\times$  629 gal/acre  $\times$  2.42 acres  $\times$  2 waterings = \$6.09/day

Total cost per day =  $\$400/\text{day} + 6.09/\text{day} = \$406.09/\text{day}$

Baseline emissions:

Road length = 1 mile

Daily vehicle trips = 50

Vehicle miles traveled (VMT) = 50

Emission factor = 2.0 lbs PM<sub>10</sub>/VMT

Baseline emissions = 100.0 lbs/day

Control efficiency:

Hour 1        85%

Hour 2        50%

Hour 3        10%

Hour 4        0%

Assume reapplication of Water

Hour 5        85%

Hour 6        50%

Hour 7        10%

Hour 8        0%

Average control efficiency for 8 hours = 36.25%

Controlled emissions:

$100 \text{ lbs/day} \times 36.25\% = 36.25 \text{ lbs/day PM}_{10}$  reduced by watering twice daily

Controlled emissions = 100 lbs/day – 36.25 lbs/day = 63.75 lbs/day

Emission reductions = 36.25 lbs/day

Cost-effectiveness = \$406.09/36.25 lbs/day = \$11.20/lb PM10  
=\$22,405/ton PM10

### **Watering – 26 Vehicle Trips per Day**

**Cost-effectiveness analysis of watering for dust suppression on an unpaved road with 26 vehicle trips per day: (See previous calculations for detailed assumptions)**

Cost: \$406.09/day for water truck rental and driver, and water for 8 hours

Emissions:

Road length = 1 mile  
Daily vehicle trips = 26  
Vehicle miles traveled (VMT) = 26  
Emission factor = 2.0 lbs PM10/VMT  
Baseline emissions = 52.0 lbs/day  
Control efficiency = 36.25%

52 lbs/day X 36.25% = 18.85 lbs/day PM10 reduced by watering twice daily

Controlled emissions = 52.0 lbs/day – 18.85 lbs/day = 33.15 lbs/day

Emission reductions = 18.85 lbs/day

Cost-effectiveness = \$406.09/18.85 lbs/day = \$21.54/lb PM10  
= \$43,086/ton PM10

The District considers a cost-effectiveness rate of \$43,086/ton of PM10 to be excessive compared to other controls implemented by the District for similar sources.

Other factors that could affect cost-effectiveness:

If a grower owns a water truck or tractor pulled spray rig, it would likely result in a lower per day cost compared to renting a truck. Growers expecting to exceed the trip threshold on a few days per year would be more likely to rent a piece of equipment rather than purchase it. Large operations would be expected to have more miles of unpaved road to treat; therefore, the water truck can be used to cover more miles of unpaved road at the same daily cost except for the minor cost of water and fuel for the truck. For example, a grower that waters two miles of unpaved road per day would achieve a cost-effectiveness of \$5.68/lb or \$11,368/ton at 50 trips per day. Growers that have unpaved roads that exceed the vehicle threshold on many days per year may



choose to use chemical suppressants or road oil since the cost of daily watering will exceed the once per year cost of applying dust suppressants.

The cost of applying dust suppressants = \$1.10/sq.yd. or \$5,343/acre  
The cost of treating 1 mile of road with 20 foot width = \$14,140/year  
Watering costs = \$406.09/day X 35 days = \$14,213

Therefore, it would cost the grower approximately the same amount to treat the unpaved road with chemical dust suppressants as it would to water on 35 days. Growers that have water trucks or other devices to water their unpaved roads would likely find watering less costly than using chemical dust suppressants and would reach the break even point where chemicals would be less costly after more days of watering. For example, if the annualized cost of the water truck were half the rental rate, it would take about 70 days to reach the break-even point with chemicals. In conclusion, although the use of water may be less cost-effective for some growers, they can be expected to choose that option because of the lower capital costs of watering.

The District received comments from agriculture representatives regarding the effectiveness of watering for dust control and the speed used for the calculations. A UC Davis study of unpaved roads in the San Joaquin Valley showed that watering once per day achieved an 87% +/- 6% after 24 hours. This is much higher than was used by Sierra Research in the BACM Technical and Economic Feasibility Analysis and the calculations used in this document. The Midwest Research Institute report Particulate Emission Measurements from Controlled Construction Activities, April 2001 used by Sierra estimated much lower effectiveness for watering (see above). The emissions from unpaved roads are directly proportional to vehicle speed, so if the speed is reduced 50 percent to 12.5 mph, but the effectiveness of the control is more than doubled from 36% to 87%, it would result in no change to the outcome. If only one application of water were required to achieve control, this would significantly reduce the cost of control and improve cost-effectiveness. Therefore, the District believes that 75 trips per day has been demonstrated to be economically feasible for roads that experience seasonal peak travel and control with water under worst case conditions and under typical conditions and should be considered BACM for San Joaquin Valley agricultural roads. The decision to use chemical dust suppressants or road oil should be an economic decision made by the grower.

### **Analysis of Implements of Husbandry Emissions**

Representatives of the agriculture industry provided comments on the draft amendments stating that including implements of husbandry in the vehicle trip counts would not be appropriate due to the slow speeds that tractors, harvesters, and other implements travel on unpaved roads; especially when they are towing a farming implement. A UC Davis study of unpaved agricultural roads indicated that 93 percent of implements traveled at speeds less than 15 miles per hour. Using the emission equation for unpaved road emissions provided in the EPA document AP-42, the District prepared several scenarios to compare emissions of various implements of husbandry to other vehicles that would use the road. The emission calculations are only based on

vehicle weight, speed, and number of wheels. No emission factor for implements of husbandry is available. The scenarios are provided below.

Assumptions:

Roads exceeding the 75 trip threshold are likely to be main access roads to the fields and be capable of supporting speeds of 15 MPH in light duty pickup trucks.

Emission factor for unpaved roads = 2.0 lbs/VMT

Baseline speed used for emission factor = 25.9 mph

AP-42 Emission Factor Equation:  $E = k5.9(s/12)(S/30)(W/3)^{0.7}(w/4)^{0.5}$

Constant k = .36 for PM10

s = Silt content in percent

S = Speed in miles/hour

W = Weight in tons

w = Number of wheels

Effect of speed on emissions:

$$15 \text{ mph}/25.9 \text{ mph} = .579$$

$$9 \text{ mph}/25.9 \text{ mph} = .347$$

$$4 \text{ mph}/25.9 \text{ mph} = .154$$

Effect of weight on emissions:

$$3 \text{ tons (6,000 lbs)} = \text{baseline weight factor} = 1.0$$

$$5 \text{ tons (10,000 lbs)} = (5/3)^{0.7} = 1.430$$

$$10 \text{ tons (20,000 lbs)} = (10/3)^{0.7} = 2.33$$

Effect of the number of wheels on the vehicle

$$4 \text{ wheels} = \text{baseline vehicle} = 1.0$$

$$8 \text{ wheels} = (8/4)^{0.5} = 1.414$$

$$12 \text{ wheels} = (12/4)^{0.5} = 1.732$$

Scenario 1 – pickup truck weighing 6,000 lbs traveling 15 mph (proposed speed limit for roads not subject to the applicability threshold).

$$2.0 \text{ lbs/vmt} \times .579 \times 1.0 \times 1.0 = 1.158 \text{ lbs/VMT}$$

Scenario 2 – tractor weighing 10,000 lbs traveling 9 miles per hour with no implement attached

$$2.0 \text{ lbs/vmt} \times .347 \times 1.430 \times 1.0 = .99 \text{ lbs/VMT}$$

Scenario 3 – tractor and implement with 8 total wheels and weighing 20,000 lbs traveling 4 MPH

$$2.0 \text{ lbs/VMT} \times .154 \times 2.33 \times 1.414 = 1.02 \text{ lbs/VMT}$$

Discussion: Scenario one is provided for comparison with the emissions from an implement of husbandry in scenarios two and three.

Pickup Truck @ 15 mph	= 1.158 lbs/vmt
Tractor @ 9 mph	= .99 lbs/vmt
Tractor/w implement @ 4 mph	= 1.02 lbs/VMT

A 10,000 lb. tractor traveling at 9 mph produces 85 percent of the emissions produced by a pickup truck traveling at 15 mph. A tractor with an implement weighing 10 tons traveling at 4 mph produces 88 percent of the emissions of the pickup truck. This information supports including implements of husbandry in the trip threshold counts.

The agricultural representatives requested clarification of the definition of a trip on an unpaved road for an implement of husbandry. In general a trip would involve travel along the road to access a field, but not activities that cross the road or use the road for end of row turnarounds. The District commits to addressing this issue during rule development.

### **3d/3g Provide stabilized surface when trips exceed 75/day**

EPA has indicated that a stabilized surface requirement is necessary to meet the BACM requirement for unpaved roads and parking lots. The following provides justification for setting the stabilized surface requirement for all unpaved roads and unpaved surfaces that exceed the trip threshold.

Relying solely on a 20% opacity standard for unpaved roads is not always possible. It is not always possible to conduct opacity readings, for example, when an unpaved road parallels the track of the sun and the observer cannot position himself or herself properly. Other conditions can make it challenging to take opacity readings, such as lack of a contrasting visual background, or if traffic levels are too low at the time when the observer is present to obtain the minimum number of plume readings within a reasonable amount of time.

Also, because different vehicles have a different propensity to generate dust depending on their speed and weight, it's not certain that at the time an opacity test is taken, it fully represents the emissions potential of a given unpaved road. This is not to say that the opacity standard isn't important. However, another gauge for compliance is available for unpaved roads that does not have the same constraints. Since surface silt content/loading is proportional to the emissions potential of an unpaved road, a silt content/loading standard can serve as an indicator of whether or not a surface has been adequately stabilized.

The silt content test is designed to provide at least 50% control of an unpaved road surface. However, EPA has observed circumstances where a source passes the silt content test, but fails the opacity test, and vice versa. Therefore, EPA has not concluded that either test is more stringent than the other.

EPA recommends that the silt content test only be used when necessary to determine source compliance. Familiarity with the test enables an observer in most circumstances to visually examine a surface to gauge whether it is compliant or not. If the surface appears to be noncompliant, the test can be conducted to document noncompliance. The method allows for collecting and placing in containers or bags dirt samples from the unpaved road, and then conducting the sieve test later at the District office. When a surface is visibly moist, such that dirt would "stick" or clump rather than fall through a sieve unit, the surface is clearly in compliance and the test does not need to be conducted.

In conclusion, with the application of a 75 vehicle trips threshold in conjunction with the requirements of the Agricultural Conservation Management Practice Program, BACM would be achieved. Although the cost-effectiveness for watering is higher than the District's \$5,700/ton cost-effectiveness guideline with a threshold of 75 vehicle trips per day, the regulated source in most cases will be able to find options that reduce cost of implementation.

**3e/3f/3g Eliminate the existing one-acre exemption for unpaved vehicle and equipment parking and traffic areas for farms within one mile of any incorporated city or unincorporated rural community**

The District received comments from stakeholders that questioned the proposed elimination of the one acre exemption for agricultural sites. The objections related to two points. First, there was concern that rural sources with no sensitive receptors and low source density were subject to the same requirements as urban sources. Second, unpaved vehicle and equipment parking and traffic areas are also subject to the Agricultural Conservation Management Practices (CMP) Program. The CMP Program was envisioned to cover sources below the applicability thresholds for Rule 8081.

To recognize the difference between rural and urban sites, the District proposes to revise the control measure to eliminate the one-acre exemption only for sites within one mile of incorporated cities and unincorporated rural communities. This will provide additional control in the areas that will benefit the most and allow for the flexibility of the CMP Program for the vast majority of small sites located farther than one mile from urban development. The District is considering whether to consolidate the requirements of both rules into the CMP Program to eliminate some of the confusion over rule applicability. This will be determined during rule development.

Agricultural unpaved traffic areas tend to be larger than non-agricultural commercial sites with equivalent trip activity. Commercial sites rely on customer trips that can be accommodated on a small lot in many cases since the parking stalls are used over and over during the day. Agricultural sites must have more space to park farm implements and vehicles and have sufficient space for maneuvering large pieces of equipment. Sites used for staging of produce or commodity containers for further transportation off the farm will see significant activity during harvest season; however, these sites would also tend to be larger in order to accommodate this activity. In addition, Rule 8081 is only applicable to sources that exceed the trip thresholds of 50 AADT or 150 VT/day. Therefore, this exemption is expected to apply to few sources and those few will still be

subject to the CMP Program. This leads the District to conclude that revising the exemption will result in a negligible change in emission reductions.

#### **PA-5 Incorporate the language of California Vehicle Code 23112-23113 into Rule 8081**

The PM10 Plan mentioned that the California Vehicle Code (CVC) already requires immediate cleanup of trackout onto public roads. EPA has commented to the District that this measure must be specifically included in the PM10 Plan and Rule 8081 in order to receive BACM approval. Since this provision is already included in state law, no cost-effectiveness estimate was attempted. The PM10 Plan included no emission reductions from compliance with this existing regulation, therefore, including this provision in Rule 8081 will provide a minor increase in reductions due the added potential for District enforcement.

As an option to this provision, the District could develop specific trackout cleanup requirements during rule development for Rule 8081 that are as effective as the CVC provision, but more tailored to agriculture and to the rural roads that are typically adjacent to agricultural operations. Another possible option is to develop a conservation management practice that would be available as an option only for growers that are having problems with excessive trackout. The CMP program currently contains options for preventing trackout from unpaved roads onto public paved roads, but not for clean-up.

#### **PA-6 Revise the current threshold of 75 trips/day for specified controls and VDE limits for unpaved vehicle/equipment traffic areas to 50 AADT and 150 VT for single day control and 150 VT on 30 or more days**

The requirements for unpaved vehicle/equipment traffic areas in the existing version of Rule 8081 were the same as those required by Rule 8071. The District proposes to use the same new thresholds proposed for Rule 8071 for Rule 8081 (see analysis of the thresholds for Rule 8071 beginning on page G-C-10).

#### **Emission Reductions From Proposed Amendments to Rule 8081**

The District expects that revising the proposed threshold from 26 to 75 vehicle trips per day will have a minor effect on emission reductions. A large percentage of the growers that have unpaved roads falling in the category of 26 to 75 vehicle trips per day will be implementing watering or other dust suppressants to comply with the CMP Program.

The emissions estimates from this source category were recently updated to reflect survey data from growers regarding the patterns and purpose of their use of unpaved roads. They account for differences in commodities and seasonality. However, the sample size from the survey is too small to determine the difference between the thresholds using statistical methods. Therefore, the District is relying on qualitative analysis and engineering estimates to ensure that this change will not impact overall

emission reductions and the attainment demonstration. The CMP Program will require growers to provide information with their CMP Plans that will improve the District's ability to quantify traffic volumes and distribute trips on agricultural unpaved roads. The District will be preparing a Reasonable Further Progress Plan in 2005 that will take into account this information.

The emission reduction calculations in the 2003 PM10 Plan claimed a 25 percent reduction efficiency for watering. EPA indicates that areas that have a stabilized surface requirement for unpaved roads have been allowed to claim a 50 percent reduction. The District is proposing to lower the stabilized surface requirement from 100 vehicle trips to 75 vehicle trips, thus offsetting potential losses from the higher threshold. The District concludes that the CMP Program requirement and the stabilized surface requirement will result in nearly the same reductions as those proposed in the original control measures in the PM10 Plan. Farm roads are responsible for 10.6 tons/day in 2010 and assumed a reduction for all Rule 8081 controls of 1.5 tons/day. If a conservative 25 percent of the emissions are moved from Rule 8081 to the Ag CMP Program and the CMP Program is half as effective as Rule 8081, this would result in a loss in emission reductions of .116 tons/day.

### **Emission Reductions from Proposed Amendments to Rule 8061**

Lowering the threshold for unpaved roads subject to Rule 8061 from 75 to 26 and requiring a stabilized surface at this level provides a potentially substantial emission benefit for this source category. This source category totals 6.6 tons/day in 2005 and estimated a 16.2% emission reduction from all requirements or 1 ton/day. A 30 percent increase in emission reductions from this additional coverage would amount to approximately .3 tons/day. Therefore, the minor decreases in emission reductions from some of the measures are more than balanced by the increases in reductions from other measures proposed in the plan amendment.

### **Amendments with no Anticipated Effect on Creditable Emission Reductions**

Amendments with no anticipated effect on emissions reductions

<b>Rule</b>	<b>Measure(s)</b>
8021	4a, 7a, 7b
8031	4a
8041	2b, 2d, 2e,
8061	PA-4
8081	3a, 3e, 3d/3g, 4a, 7e

### **Changes to the Conservation Management Practices Program**

With the passage of Senate Bill (SB) 700, District staff began reviewing the Conservation Management Practices (CMP) Program concept that was included in the

2003 PM10 Plan for potential impacts. SB 700 requires the District to adopt a rule or regulation requiring agricultural sources to implement BACM and BARCT for on-field agricultural practices that generate PM10 and PM10 precursor emissions. District staff concluded that BACM for on-field activities is a management practice program that is currently adopted in the South Coast Air Basin and in Maricopa County, Arizona and was approved as BACM by EPA. The District originally proposed for growers to submit their CMP Plans to NRCS/RCDs for approval. Based on interpretation of SB 700 requirements to provide an enforcement mechanism to ensure that BACM and best available retrofit technology (BARCT) are implemented, the District now proposes that CMP Plans will be approved and will be on file at the District offices. This would allow inspectors responding to complaints or that see excessive emissions to efficiently identify the responsible party and verify compliance with their CMP Plan.

The change to District approval of the CMP Plans results in several changes to the control measure described in Chapter 4 as listed below:

- Plan submittal: Change plan submittal from NRCS/RCD to the District
- Plan approval: Change from NRCS/RCD approval to District approval
- Backstop provisions: Eliminate backstop provisions requiring the District to assume management responsibilities if program objectives not met since the District will already have those responsibilities
- Independent audit requirement: The District will assume enforcement responsibilities, so an independent audit is not required.
- NRCS Role: NRCS will perform its traditional role as technical advisor to the growers and will provide assistance in identifying CMPs and in completing CMP Plans. NRCS will also participate in drafting the CMP Handbook and the review and approval of new CMPs.
- Schedule: The projected rule adoption date is changed from January 2004 to April 2004. The rule implementation date remains unchanged at July 2004.

The proposed changes will have no impact on the emission reductions claimed for this measure in the 2003 PM10 Plan.