

**San Joaquin Valley
Unified Air Pollution Control District**

Best Performance Standard (BPS) x.x.xx

Date: June 25, 2010

Class	Dryers
Category	Modified Continuous Mix Asphalt Plant Dryer
Best Performance Standard	<p>A. For modified continuous mix asphalt plant dryers producing asphalt for non-Caltrans projects:</p> <p>Warm Mix Asphalt with premium efficiency electric motors and exhaust fan operated with a variable frequency speed control (24.1 lb-CO₂e or equivalent).</p> <p>B. For modified continuous mix asphalt plant dryers producing asphalt for Caltrans projects:</p> <p>Counter-flow drum dryer/mixer with premium efficiency electric motors and exhaust fan operated with a variable frequency speed control (28.8 lb-CO₂e or equivalent).</p>
Percentage Achieved GHG Emission Reduction Relative to Baseline Emissions	<p>A. 17.2%</p> <p>B. 1.0%</p>

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TABLE OF CONTENTS

I. Best Performance Standard (BPS) Determination Introduction

- A. Purpose
- B. Definitions
- C. Determining Project Significance Using BPS

II. Summary of BPS Determination Phases

III. Class and Category

IV. Public Notice of Intent

V. BPS Development

- STEP 1. Establish Baseline Emissions Factor for Class and Category
 - A. Representative Baseline Operation
 - B. Basis and Assumptions
 - C. Unit of Activity
 - D. Calculations
- STEP 2. List Technologically Feasible GHG Emission Control Measures
- STEP 3. Identify all Achieved-in-Practice GHG Emission Control Measures
- STEP 4. Quantify the Potential GHG Emission and Percent Reduction for Each Identified Achieved-in-Practice GHG Emission Control Measure
- STEP 5. Rank all Achieved-in-Practice GHG emission reduction measures by order of % GHG emissions reduction
- STEP 6. Establish the Best Performance Standard (BPS) for this Class and Category
- STEP 7. Eliminate All Other Achieved-in-Practice Options from Consideration as Best Performance Standard

VI. Public Participation

VII. Appendices

- Appendix 1 Representative Baseline Units
- Appendix 2 Public Notice of Intent: Notice

I. Best Performance Standard (BPS) Determination Introduction

A. Purpose

To assist permit applicants, project proponents, and interested parties in assessing and reducing the impacts of project specific greenhouse gas emissions (GHG) on global climate change from stationary source projects, the San Joaquin Valley Air Pollution Control District (District) has adopted the policy: *District Policy – Addressing GHG Emission Impacts for Stationary Source Projects Under CEQA When Serving as the Lead Agency*. This policy applies to projects for which the District has discretionary approval authority over the project and the District serves as the lead agency for CEQA purposes. Nonetheless, land use agencies can refer to it as guidance for projects that include stationary sources of emissions. The policy relies on the use of performance based standards, otherwise known as Best Performance Standards (BPS) to assess significance of project specific greenhouse gas emissions on global climate change during the environmental review process, as required by CEQA. Use of BPS is a method of streamlining the CEQA process of determining significance and is not a required emission reduction measure. Projects implementing BPS would be determined to have a less than cumulatively significant impact. Otherwise, demonstration of a 29 percent reduction in GHG emissions, from business-as-usual, is required to determine that a project would have a less than cumulatively significant impact.

B. Definitions

Best Performance Standard for Stationary Source Projects for a specific Class and Category is the most effective, District approved, Achieved-in-Practice means of reducing or limiting GHG emissions from a GHG emissions source, that is also economically feasible per the definition of Achieved-in-Practice. BPS includes equipment type, equipment design, and operational and maintenance practices for the identified service, operation, or emissions unit class and category.

Business-as-Usual is - the emissions for a type of equipment or operation within an identified class and category projected for the year 2020, assuming no change in GHG emissions per unit of activity as established for the baseline period, 2002-2004. To relate BAU to an emissions generating activity, the District proposes to establish emission factors per unit of activity, for each class and category, using the 2002-2004 baseline period as the reference.

Category is - a District approved subdivision within a “class” as identified by unique operational or technical aspects.

Class is - the broadest District approved division of stationary GHG sources based on fundamental type of equipment or industrial classification of the source operation.

C. Determining Project Significance Using BPS

Use of BPS is a method of determining significance of project specific GHG emission impacts using established specifications. BPS is not a required mitigation of project related impacts. Use of BPS would streamline the significance determination process by pre-quantifying the emission reductions that would be achieved by a specific GHG emission reduction measure and pre-approving the use of such a measure to reduce project-related GHG emissions.

GHG emissions can be directly emitted from stationary sources of air pollution requiring operating permits from the District, or they may be emitted indirectly, as a result of increased electrical power usage, for instance. For traditional stationary source projects, BPS includes equipment type, equipment design, and operational and maintenance practices for the identified service, operation, or emissions unit class and category.

II. Summary of BPS Determination Phases

The District has established modified continuous mix asphalt plant dryers as a separate class and category which requires implementation of a Best Performance Standard (BPS) pursuant to the District’s Climate Change Action Plan (CCAP). The District’s determination of the BPS for this class and category has been made using the phased BPS development process established in the District’s Final Staff Report, Addressing Greenhouse Gas Emissions under the California Environmental Quality Act. A summary of the specific implementation of the phased BPS development process for this specific determination is as follows:

Table 1 BPS Development Process Phases for Modified Continuous Mix Asphalt Plant Dryers			
Phase	Description	Date	Comments
1	Public Notice of Intent	2/9/10	The District’s intent notice is attached as Appendix 2.
2	BPS Development	N/A	See evaluation document.
3	Public Participation	6/25/10	A Draft BPS evaluation was provided for public comment.

III. Class and Category

The dryers and dehydrators class consist of units used to drive free water from products like fruits, vegetables, and nuts, at an accelerated rate without damage to the product, and devices in which material is dried or curred in direct contact with the products of combustion. Since aggregate is dried in direct contact with the products of combustion in continuous mix asphalt plant dryers, they are included in the dryers and dehydrators class.

Continuous mix asphalt plants are used to make large amounts of one mix of asphalt for one client. This is different from a batch type asphalt plant which will make different mixes of asphalt for many different clients. Since the same mixes of asphalt are made in a continuous mix asphalt plant, facilities utilize a combination drum mixer to manufacture asphalt. In a drum/mixer, moist aggregate from stockpiles is dried in a rotary drum and then mixed with a binder in the same drum. The final product comes directly from the drum/mixer and is stored in heated storage silos.

Batch asphalt plants typically operate in a different fashion since they manufacture many different mixtures of asphalt. Moist aggregate from stockpiles is first dried in a rotary dryer and then stored in a hopper. The hot/dried aggregate is then mixed with a binder in a pug mill and the finished product is stored in a heated storage silo.

Additionally, new and modified asphalt plants will differ in the types of equipment that can be installed. When a new asphalt plant is installed, the type of dryer/mixer can be chosen before it is installed. When an existing unit is retrofitted it is infeasible to have the facility remove the major components of their operation and install new equipment. In the later case, the District will limit their search to what retrofit technologies are available to lower BPS.

Continuous mix asphalt plants and batch asphalt plants differ in the way they produce their final product. In additions, new and modified asphalt plants will have limitations to what types of technologies can be employed. Based on this information and the information discussed in this section, modified continuous mix asphalt plants will be a separate category than other types of dryers.

IV. Public Notice of Intent

Prior to developing the development of BPS for this class and category, the District published a Notice of Intent. Public notification of the District's intent to develop BPS for this class and category was sent on February 9, 2010 to individuals registered with the CCAP list server. The District's notification is attached as Appendix 2.

No comments were received during the initial public outreach.

V. BPS Development

STEP 1. Establish Baseline Emissions Factor for Class and Category

The Baseline Emission Factor (BEF) is defined as the three-year average (2002-2004) of GHG emissions for a particular class and category of equipment in the San Joaquin Valley (SJV), expressed as annual GHG emissions per unit of activity. The Baseline Emission Factor is calculated by first defining an operation which is representative of the average population of units of this type in the SJV during the Baseline Period and then determining the specific emissions per unit throughput for the representative unit.

A. Representative Baseline Operation

For modified continuous asphalt plant dryers, the representative baseline operation has been determined to be a natural gas-fired counter-flow drum dryer/mixer with standard efficiency motors on burner and exhaust fans. This determination is based on a list of permitted asphalt plant dryers operating in the SJVAPCD during the baseline period (See Appendix 1), and information from industry on typical continuous asphalt plant dryer sizes.

B. Basis and Assumptions

- All direct GHG emissions are produced due to combustion of natural gas in this unit.
- GHG emissions are stated as "CO₂ equivalent" (CO₂e) which includes the global warming potential of methane and nitrous oxide emissions associated with gaseous fuel combustion.
- Fuel consumption for a representative unit is 0.24 MMBtu/ton throughput. This number is based on emission inventory results from the baseline period for natural gas-fired asphalt dryers and a conversation with a consultant from the industry.
- The GHG emission factor for natural gas combustion is 117 lb-CO₂e/MMBtu per CCAR document.

- Indirect emissions are produced due to operation of the main burner fan, the exhaust fan, and the rotary drum motor. A representative baseline unit has an approximately 120 MMBtu/hr burner. Based on information from industry, a 120 horsepower blower would be used to when operating a unit at a rate of 220 tons per hour. A search of current continuous mix asphalt plant dryers shows that the exhaust fan motor is typically rated at 250 horsepower and the drum motor is typically rated at 150 horsepower.
- Electric motor efficiency is estimated at 90% for a conventional electric motor.
- Indirect emissions from electric power consumption are calculated based on the current PG&E electric power generation factor of 0.524 lb-CO₂e per kWh

C. Unit of Activity

To relate Business-as-Usual to an emissions generating activity, it is necessary to establish an emission factor per unit of activity, for the established class and category, using the 2002-2004 baseline period as the reference.

The resulting emissions factor is the combination of:

GHG emission reductions achieved through technology, and
GHG emission reductions achieved through changes in activity efficiencies.

D. Calculations

Specific electricity consumption for the electric motors is:

$$(120 + 250 + 150) \text{ hp-hr}/220 \text{ tons} \times 0.7457 \text{ kW/hp} \times (1/90\%) = 1.96 \text{ kWh/ton}$$

Indirect GHG Emissions are:

$$1.96 \text{ kWh/ton} \times 0.524 \text{ lb-CO}_2\text{e per kWh} = 1.0 \text{ lb-CO}_2\text{e/ton}$$

Direct GHG emissions are:

$$0.24 \text{ MMBtu/ton} \times 117 \text{ lb-CO}_2\text{e/MMBtu} = 28.1 \text{ lb-CO}_2\text{e/ton}$$

The Baseline Emission Factor is the sum of the direct and the indirect emissions:

$$\text{BEF} = 1.0 + 28.1 = 29.1 \text{ lb-CO}_2\text{e/ton}$$

STEP 2. List Technologically Feasible GHG Emission Control Measures

A. Analysis of Potential Control Measures

The following findings and/or considerations are applicable to this class and category:

Warm Mix Asphalt:

Warm-mix asphalt is the generic term for a variety of technologies that allow the producers of hot-mix asphalt pavement material to lower the temperatures at which the material is mixed and placed on the road. Reductions of 50 to 100 degrees Fahrenheit have been documented. Such drastic reductions have the obvious benefits of cutting fuel consumption and decreasing the production of greenhouse gases.

Warm mix asphalt plant equipment is currently available from manufacturers and is currently in operation throughout the nation; however there is only one warm mix asphalt plant that is currently operated in the District. During conversations with industry, it has been noted that Caltrans has approved the use of warm mix asphalt on certain construction projects due to questions about characteristics of warm mix asphalt. It appears that the use of warm mix asphalt will eventually become the standard in the industry. Since not all asphalt paving projects require the approval of Caltrans (i.e. parking lots and driveways), this technology will be considered technologically feasible for facilities processing asphalt for projects that are not regulated by Caltrans.

Separate Dryer Drum and Mixing Chamber and the Use of Heat from the Dryer Drum to Mix Aggregate and Binder:

In typical dryer/mixer drum dryers, the aggregate is heated and dried in the first part of the dryer drum and then is mixed with binder to create the final product in the second part of the drum. By separating the drying and mixing portions of the drum, the aggregate can be dried along the entire length of the drum. The use of the entire drum length for drying allows for a longer more efficient drying of the aggregate. The separate mixing chamber will be solely heated from the heat captured from the drying drum. A thick layer of insulation surrounding the drum is needed to help retain the heat from the drying/mixing operation. (3% less fuel, 9% more throughput). Since the operation of this type of dryer/mixer is not considered a retrofit technology, this option would not be considered to be technologically feasible for retrofit projects. However, for construction of new asphalt dryer/mixers, this option would be considered to be technologically feasible.

Use of Premium Efficiency Motors with Speed Control:

An electric motor efficiency standard is published by the National Electrical Manufacturers Association (NEMA) which is identified as the “NEMA Premium Efficiency Electric Motors Program”. For large motors, the NEMA premium efficiency motor provides a gain of approximately 5-8 percentage points in motor efficiency when compared to a standard efficiency motor. The NEMA specification covers motors up to 500 horsepower and motors meeting this specification are in common use and are available from most major electric motor manufacturers.

Control of a fan operation by use of a variable speed electric motor provide substantial energy savings when compared to a fan which is operated at a fixed speed and controlled by throttling the discharge flow. The most common and economical variable speed drive is the variable frequency drive (VFD) which has become commonly available in the last decade and is becoming typical for new asphalt applications. The VFD provides especially significant energy savings when a fan is operated at substantial turndown ratios which can result in throttling away more than half the rated energy output of the motor.

B. Listing of Technologically Feasible Control Measures

For the specific equipment or operation being proposed, all technologically feasible GHG emissions reduction measures are listed, including equipment selection, design elements and best management practices, that do not result in an increase in criteria pollutant emissions compared to the proposed equipment or operation.

Table 2 Technologically Feasible GHG Control Measures for Modified Continuous Mix Asphalt Plant Dryers	
GHG Control Measures	Qualifications
Warm Mix Asphalt	Lower processing temperature results in less fuel being used by the dryer.
Electric motors driving combustion air fans, induced draft fans, and drum motor shall have an efficiency meeting the standards of the National Electrical Manufacturer's Association (NEMA) for "premium efficiency" motors. Induced draft fans shall be operated with a variable frequency speed control or equivalent for control of fan speed.	Use of premium efficiency motors on all fans and electric motors and variable speed drives on induced draft fans significantly reduces electric power consumption by the drying operation, particularly during periods of reduced-rate operation.

All of the control measures identified above are equipped with control equipment for criteria pollutants which meets current regulatory requirements. None of the identified control measures would result in an increase in emissions of criteria pollutants.

STEP 3. Identify all Achieved-in-Practice GHG Emission Control Measures

For all technologically feasible GHG emission reduction measures, all GHG reduction measures determined to be Achieved-in-Practice are identified. Achieved-in-Practice is defined as any equipment, technology, practice or operation available in the United States that has been installed and operated or used at a commercial or stationary source site for a reasonable period of time sufficient to demonstrate that the equipment, the technology, the practice or the operation is reliable when operated in a manner that is typical for the process. In determining whether equipment, technology, practice or operation is Achieved-in-Practice, the District will consider the extent to which grants, incentives or other financial subsidies influence the economic feasibility of its use.

The following findings or considerations are applicable to this class and category:

- A survey of permitted units in the District indicated that there is one warm mix asphalt plant in operation in the District; however according to manufacturers, many other warm mix plants are operated throughout the country. This technology is not currently approved for projects regulated by Caltrans, therefore this option is not considered to be Achieved-in-Practice for facilities processing asphalt for Caltrans projects.
- Premium efficiency electric motors are readily available and currently operating at many facilities.

Based on a review of available technology and with consideration of input from industry, manufacturers and other members of the public, the following is determined to be the Achieved-in-Practice GHG emission reduction measures for this class and category:

Table 3 Achieved-in-Practice GHG Control Measures for Modified Continuous Mix Asphalt Plant Dryers	
GHG Control Measures	Achieved-Qualifications
1. Warm Mix Asphalt	A survey of permitted units in the District indicated that there is one warm mix asphalt plant in operation in the District. However, according the manufacturers, there are many warm mix asphalt plants in operation throughout the country.
2. Warm Mix Asphalt with premium efficiency electric motors and exhaust fan operated with a variable frequency speed control or equivalent	A survey of permitted units in the District indicated that there is one warm mix asphalt plant in operation in the District. However, according the manufacturers, there are many warm mix asphalt plants in operation throughout the country. In addition, premium efficiency electric motors in the required sizes are currently available. According to an asphalt drum/mixer manufacturer, premium efficiency motors will begin to be used in all their new plants starting in December of this year. In addition, VFD's are currently operating in several locations.

3. Counter-flow drum dryer/mixer	Counter-flow drum dryer/mixers are currently operated in the District.
4. Counter-flow drum dryer/mixer with premium efficiency electric motors and exhaust fan operated with a variable frequency speed control or equivalent	Counter-flow drum dryer/mixers are currently operated in the District. Premium efficiency electric motors in the required sizes are currently available. According to an asphalt drum/mixer manufacturer, premium efficiency motors will begin to be used in all their new plants starting in December of this year. In addition, VFD's are currently operating in several locations.
5. Premium efficiency electric motors and exhaust fan operated with a variable frequency speed control or equivalent	Premium efficiency electric motors in the required sizes are currently available. According to an asphalt drum/mixer manufacturer, premium efficiency motors will begin to be used in all their new plants starting in December of this year. In addition, VFD's are currently operating in several locations.

STEP 4. Quantify the Potential GHG Emission and Percent Reduction for Each Identified Achieved-in-Practice GHG Emission Control Measure

For each Achieved-in-Practice GHG emission reduction measure identified:

- a. Quantify the potential GHG emissions per unit of activity (G_a)
- b. Express the potential GHG emission reduction as a percent (G_p) of Baseline GHG emissions factor per unit of activity (BEF)

1. Warm Mix Asphalt Plant

A. Basis and Assumptions:

- All direct GHG emissions are produced due to combustion of natural gas in this unit.
- Fuel consumption for a representative baseline unit is 0.24 MMBtu/ton throughput.
- Indirect emissions are produced due to operation of the 120 horsepower main burner fan, 250 horsepower exhaust fan, and 150 horsepower drum motor.
- Electric motor efficiency is estimated at 90% for a conventional electric motor.
- A 15% reduction in fuel usage is expected from the operation of a warm mix asphalt dryer/mixer.

B. Calculation of Potential GHG Emissions per Unit of Activity (G_a):

Specific electricity consumption for the burner fan and drum motor is:

$$(120 + 150) \text{ hp-hr}/220 \text{ tons} = 1.23 \text{ hp-hr/ton}$$

Specific electricity consumption for the exhaust fan:

$$250 \text{ hp-hr}/220 \text{ tons} = 1.14 \text{ hp-hr/ton}$$

Total specific electrical consumption:

$$(1.23 \text{ hp-hr/ton} + 1.14 \text{ hp-hr/ton}) \times 0.7457 \text{ kW/hp} \times (1/90\%) = 1.96 \text{ kWh/ton}$$

Indirect GHG Emissions are:

$$1.96 \text{ kWh/ton} \times 0.524 \text{ lb-CO}_2\text{e per kWh} = 1.0 \text{ lb-CO}_2\text{e/ton}$$

Direct GHG emissions are:

By converting a hot mix plant to a warm mix plant, the fuel consumption of the dryer is expected to be reduced by 15%.

$$\begin{aligned} \text{Fuel Consumption} &= (0.24 \text{ MMBtu/ton}) \times (1 - 0.15) \\ &= 0.20 \text{ MMBtu/ton} \end{aligned}$$

$$0.20 \text{ MMBtu/ton} \times 117 \text{ lb-CO}_2\text{e/MMBtu} = 23.4 \text{ lb-CO}_2\text{e/ton}$$

GHG Emissions per Unit of Activity is then calculated as:

$$G_a = 1.0 + 23.40 = 24.4 \text{ lb-CO}_2\text{e/ton}$$

C. Calculation of Potential GHG Emission Reduction as a Percentage of the Baseline Emission Factor (G_p):

$$G_p = (\text{BEF} - G_a) / \text{BEF} = (29.1 - 24.4)/29.1 = 16.2\%$$

2. Warm Mix Asphalt Plant with Premium Efficiency Electric Motors and VFD on Exhaust Fan

A. Basis and Assumptions:

- All direct GHG emissions are produced due to combustion of natural gas in this unit.
- Fuel consumption for a representative baseline unit is 0.24 MMBtu/ton throughput.
- Indirect emissions are produced due to operation of the 120 horsepower main burner fan, 250 horsepower exhaust fan, and 150 horsepower drum motor.
- Electric motor efficiency is estimated at 95% for a premium efficiency electric motor.
- A study of the use of VFD's on exhaust fans found that on average, a 68% reduction in the electrical power could be obtained by the installation of a VFD on the exhaust fan. For the calculations below, a more conservative 50% reduction in net specific electric power consumption from the exhaust fan motor equipped with a VFD will be used.
- A 15% reduction in fuel usage is expected from the operation of a warm mix asphalt dryer/mixer.

B. Calculation of Potential GHG Emissions per Unit of Activity (G_a):

Specific electricity consumption for the burner fan and drum motor is:

$$(120 + 150) \text{ hp-hr}/220 \text{ tons} = 1.23 \text{ hp-hr/ton}$$

Specific electricity consumption for the exhaust fan taking into account a 50% reduction due to the use of a VFD:

$$(250) \text{ hp-hr}/220 \text{ tons} \times (1 - 50\%) = 0.57 \text{ hp-hr/ton}$$

Total specific electrical consumption:

$$(1.23 \text{ hp-hr/ton} + 0.57 \text{ hp-hr/ton}) \times 0.7457 \text{ kW/hp} \times (1/95\%) = 1.41 \text{ kWh/ton}$$

Indirect GHG Emissions are:

$$1.41 \text{ kWh/ton} \times 0.524 \text{ lb-CO}_2\text{e per kWh} = 0.7 \text{ lb-CO}_2\text{e/ton}$$

Direct GHG emissions are:

By converting a hot mix plant to a warm mix plant, the fuel consumption of the dryer is expected to be reduced by 15%.

$$\begin{aligned}\text{Fuel Consumption} &= (0.24 \text{ MMBtu/ton}) \times (1 - 0.15) \\ &= 0.20 \text{ MMBtu/ton}\end{aligned}$$

$$0.20 \text{ MMBtu/ton} \times 117 \text{ lb-CO}_2\text{e/MMBtu} = 23.40 \text{ lb-CO}_2\text{e/ton}$$

GHG Emissions per Unit of Activity is then calculated as:

$$G_a = 0.74 + 23.40 = 24.1 \text{ lb-CO}_2\text{e/ton}$$

- C. Calculation of Potential GHG Emission Reduction as a Percentage of the Baseline Emission Factor (G_p):

$$G_p = (\text{BEF} - G_a) / \text{BEF} = (29.1 - 24.1) / 29.1 = 17.2\%$$

3. Counter Flow Dryer/Mixer

- A. Basis and Assumptions:

- All direct GHG emissions are produced due to combustion of natural gas in this unit.
- Fuel consumption for a representative baseline unit is 0.24 MMBtu/ton throughput.
- Indirect emissions are produced due to operation of the 120 horsepower main burner fan, 250 horsepower exhaust fan, and 150 horsepower drum motor.
- Electric motor efficiency is estimated at 90% for a conventional electric motor.

- B. Calculation of Potential GHG Emissions per Unit of Activity (G_a):

Specific electricity consumption for the burner fan and drum motor is:

$$(120 + 150) \text{ hp-hr}/220 \text{ tons} = 1.23 \text{ hp-hr/ton}$$

Specific electricity consumption for the exhaust fan:

$$250 \text{ hp-hr}/220 \text{ tons} = 1.14 \text{ hp-hr/ton}$$

Total specific electrical consumption:

$$1.23 \text{ hp-hr/ton} + 1.14 \text{ hp-hr/ton} \times 0.7457 \text{ kW/hp} \times (1/90\%) = 1.96 \text{ kWh/ton}$$

Indirect GHG Emissions are:

$$1.96 \text{ kWh/ton} \times 0.524 \text{ lb-CO}_2\text{e per kWh} = 1.0 \text{ lb-CO}_2\text{e/ton}$$

Direct GHG emissions are:

$$0.24 \text{ MMBtu/ton} \times 117 \text{ lb-CO}_2\text{e/MMBtu} = 28.1 \text{ lb-CO}_2\text{e/ton}$$

GHG Emissions per Unit of Activity is then calculated as:

$$G_a = 1.0 + 28.1 = 29.1 \text{ lb-CO}_2\text{e/ton}$$

- C. Calculation of Potential GHG Emission Reduction as a Percentage of the Baseline Emission Factor (G_p):

$$G_p = (\text{BEF} - G_a) / \text{BEF} = (29.1 - 29.1) / 29.1 = 0.0\%$$

4. Counter Flow Dryer/Mixer with Premium Efficiency Electric Motors and VFD on Exhaust Fan

- A. Basis and Assumptions:

- All direct GHG emissions are produced due to combustion of natural gas in this unit.
- Fuel consumption for a representative baseline unit is 0.24 MMBtu/ton throughput.
- Indirect emissions are produced due to operation of the 120 horsepower main burner fan, 250 horsepower exhaust fan, and 150 horsepower drum motor.
- Electric motor efficiency is estimated at 95% for a premium efficiency electric motor.
- A study of the use of VFD's on exhaust fans found that on average, a 68% reduction in the electrical power could be obtained by the installation of a VFD on the exhaust fan. For the calculations below, a more conservative 50% reduction in net specific electric power consumption from the exhaust fan motor equipped with a VFD will be used.

- B. Calculation of Potential GHG Emissions per Unit of Activity (G_a):

Specific electricity consumption for the burner fan and drum motor is:

$$(120 + 150) \text{ hp-hr/220 tons} = 1.23 \text{ hp-hr/ton}$$

Specific electricity consumption for the exhaust fan taking into account a 50% reduction due to the use of a VFD:

$$(250) \text{ hp-hr}/220 \text{ tons} \times (1 - 50\%) = 0.57 \text{ hp-hr}/\text{ton}$$

Total specific electrical consumption:

$$1.23 \text{ hp-hr}/\text{ton} + 0.57 \text{ hp-hr}/\text{ton} \times 0.7457 \text{ kW}/\text{hp} \times (1/95\%) = 1.41 \text{ kWh}/\text{ton}$$

Indirect GHG Emissions are:

$$1.41 \text{ kWh}/\text{ton} \times 0.524 \text{ lb-CO}_2\text{e per kWh} = 0.7 \text{ lb-CO}_2\text{e}/\text{ton}$$

Direct GHG emissions are:

$$0.24 \text{ MMBtu}/\text{ton} \times 117 \text{ lb-CO}_2\text{e}/\text{MMBtu} = 28.1 \text{ lb-CO}_2\text{e}/\text{ton}$$

GHG Emissions per Unit of Activity is then calculated as:

$$G_a = 0.7 + 28.1 = 28.8 \text{ lb-CO}_2\text{e}/\text{ton}$$

C. Calculation of Potential GHG Emission Reduction as a Percentage of the Baseline Emission Factor (G_p):

$$G_p = (\text{BEF} - G_a) / \text{BEF} = (29.1 - 28.8)/29.1 = 1.0\%$$

5. Premium Efficiency Electric Motors and VFD on Exhaust Fan

A. Basis and Assumptions:

- All direct GHG emissions are produced due to combustion of natural gas in this unit.
- Fuel consumption for a representative baseline unit is 0.24 MMBtu/ton throughput.
- Indirect emissions are produced due to operation of the 120 horsepower main burner fan, 250 horsepower exhaust fan, and 150 horsepower drum motor.
- Electric motor efficiency is estimated at 95% for a premium efficiency electric motor.
- A study of the use of VFD's on exhaust fans found that on average, a 68% reduction in the electrical power could be obtained by the installation of a VFD on the exhaust fan. For the calculations below, a more conservative 50% reduction in net specific electric power

consumption from the exhaust fan motor equipped with a VFD will be used.

B. Calculation of Potential GHG Emissions per Unit of Activity (G_a):

Specific electricity consumption for the burner fan and drum motor is:

$$(120 + 150) \text{ hp-hr}/220 \text{ tons} = 1.23 \text{ hp-hr}/\text{ton}$$

Specific electricity consumption for the exhaust fan taking into account a 50% reduction due to the use of a VFD:

$$(250) \text{ hp-hr}/220 \text{ tons} \times (1 - 50\%) = 0.57 \text{ hp-hr}/\text{ton}$$

Total specific electrical consumption:

$$1.23 \text{ hp-hr}/\text{ton} + 0.57 \text{ hp-hr}/\text{ton} \times 0.7457 \text{ kW}/\text{hp} \times (1/95\%) = 1.41 \text{ kWh}/\text{ton}$$

Indirect GHG Emissions are:

$$1.41 \text{ kWh}/\text{ton} \times 0.524 \text{ lb-CO}_2\text{e per kWh} = 0.7 \text{ lb-CO}_2\text{e}/\text{ton}$$

Direct GHG emissions are:

$$0.24 \text{ MMBtu}/\text{ton} \times 117 \text{ lb-CO}_2\text{e}/\text{MMBtu} = 28.1 \text{ lb-CO}_2\text{e}/\text{ton}$$

GHG Emissions per Unit of Activity is then calculated as:

$$G_a = 0.7 + 28.1 = 28.8 \text{ lb-CO}_2\text{e}/\text{ton}$$

C. Calculation of Potential GHG Emission Reduction as a Percentage of the Baseline Emission Factor (G_p):

$$G_p = (\text{BEF} - G_a) / \text{BEF} = (29.1 - 28.8) / 29.1 = 1.0\%$$

STEP 5. Rank all Achieved-in-Practice GHG emission reduction measures by order of % GHG emissions reduction

Based on the calculations presented in Section II.4 above, the Achieved-in-Practice GHG emission reduction measures are ranked in the table below:

Table 4 Ranking of Achieved-in-Practice GHG Emission Control Measures			
Rank	GHG Control Measures	Potential GHG Emission per Unit of Activity (G_a) (lb-CO₂e/ton)	Potential GHG Emission Reduction as a Percentage of the Baseline Emission Factor (G_p)
1	Warm Mix Asphalt with premium efficiency electric motors and exhaust fan operated with a variable frequency speed control or equivalent	24.1	17.2%
2	Warm Mix Asphalt	24.4	16.2%
3	Counter-flow drum dryer/mixer with premium efficiency electric motors and exhaust fan operated with a variable frequency speed control or equivalent	28.8	1.0%
4	Premium efficiency electric motors and exhaust fan operated with a variable frequency speed control or equivalent	28.8	1.0%
5	Counter-flow drum dryer/mixer	29.1	0.0%

STEP 6. Establish the Best Performance Standard (BPS) for this Class and Category

For Stationary Source Projects for which the District must issue permits, Best Performance Standard is – “For a specific Class and Category, the most effective, District approved, Achieved-In-Practice means of reducing or limiting GHG emissions from a GHG emissions source, that is also economically feasible per the definition of achieved-in-practice. BPS includes equipment type, equipment design, and operational and maintenance practices for the identified service, operation, or emissions unit class and category”.

Based on the definition above and the ranking of evaluated technologies, Best Performance Standard (BPS) for this class and category is determined as:

Best Performance Standard for Modified Continuous Mix Asphalt Plant Dryers

- ***For modified continuous mix asphalt plant dryers producing asphalt for non-Caltrans projects:***

Warm Mix Asphalt with premium efficiency electric motors and exhaust fan operated with a variable frequency speed control (24.1 lb-CO₂e or equivalent).

- ***For modified continuous mix asphalt plant dryers producing asphalt for Caltrans projects:***

Counter-flow drum dryer/mixer with premium efficiency electric motors and exhaust fan operated with a variable frequency speed control (28.8 lb-CO₂e or equivalent).

STEP 7. Eliminate All Other Achieved-in-Practice Options from Consideration as Best Performance Standard

The following Achieved-in-Practice GHG control measures identified and ranked in the table above are eliminated from consideration as Best Performance Standard since they have GHG control efficiencies which are less than that of the selected Best Performance Standard as stated in Step 6 of this evaluation:

For modified continuous mix asphalt plant dryers producing asphalt for non-Caltrans projects:

- Warm Mix Asphalt
- Premium efficiency electric motors and exhaust fan operated with a variable frequency speed control or equivalent

For modified continuous mix asphalt plant dryers producing asphalt for Caltrans projects:

- Counter-flow drum dryer/mixer
- Premium efficiency electric motors and exhaust fan operated with a variable frequency speed control or equivalent

VI. Public Participation

A Draft BPS evaluation was provided for public comment. Public notification was sent on June 25, 2010 to individuals registered with the CCAP list server.

VII. Appendices

Appendix 1	Representative Baseline Units
Appendix 2	Public Notice of Intent: Notice

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Appendix 1
Representative Baseline Units

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Best Performance Standard
 Class: Dryer
 Category: Modified Continuous Mix Asphalt Plant Dryer
 Date: June 25, 2010

sRegion	IFacilityID	IPermi	IModific	sStatus	dtImplemented	memEquipment
C	651	1	2	P	8/30/2003	MODIFICATION OF ONE 72 MMBTU/HR STANDARD STEEL ASPHALT BATCH PLANT, MODEL #5000, WITH HAUCK MODEL #375 BURNER AND ROTARY KILN DRYER SERVED BY A 100" DIAMETER CYCLONE AND AN ASTEC BAGHOUSE: ADD ANNUAL PRODUCTION LIMIT OF 432,875 TONS PER YEAR.
C	817	1	3	P	5/10/2004	MODIFICATION OF ASPHALT ROOFING MANUFACTURING CONSISTING OF THREE HORIZONTAL AND ONE VERTICAL MIXER, ONE HOLDING TANK/MIXER, ONE 1,400-GALLON COATING TANK, TWO 520-GALLON SATURATION TANKS, TWO 27,000-GALLON ASPHALT TANKS AND PUMPS ALL VENTED TO A MOSANTO MIST ELIMINATOR, AND ONE COMPRESSOR, ONE DRYER, AND ONE SIEFER TRIGONAL MACHINE: REPLACE EXISTING MANIFOLD AND THREE UPTAKE DUCTS WITH AN 8-INCH DIAMETER MANIFOLD AND THREE 6-INCH DIAMETER UPTAKE DUCTS, ONLY.
C	2696	2	4	P	5/29/2002	MODIFICATION OF 150 MMBTU/HR ASPHALT CONCRETE PLANT DRYER DRUM EQUIPPED WITH A LOW NOX BURNER INCLUDING: DRUM MIXER, PUGMILL MIXER, SLAT CONVEYOR, HOT ELEVATOR, DUST HANDLING SILO SYSTEM SERVED BY A CYCLONE EXHAUSTED INTO A BAGHOUSE: REMOVE THE CALCULATED PM10 EMISSIONS REQUIREMENT AND ADD A THROUGHPUT LIMIT OF 9,600 TONS/DAY
N	367	16	8	P	3/1/2004	MODIFICATION OF: DRUM MIX ASPHALT PLANT WITH A BMG (MODEL # 55R40S) DRYER/MIXER AND A 135 MMBTU/HR BURNER, BMG COMBUSTION CONTROL SYSTEM, UNDERFEED CONVEYOR AND KNOCK-OUT BOX TRANSITION TO INCREASE THE FUEL USAGE TO 3,240 MMBTU/DAY, INCREASE THE PRODUCTION RATE TO 11,677 TONS/DAY, RAISE THE PM10 EMISSION FACTOR TO 0.013 LB PM10/TON, LIMIT THE ANNUAL FUEL USAGE TO 486,800 MMBTU/YR, AND LIMIT THE ANNUAL PRODUCTION RATE TO 2,190,000 TONS/YR.
N	566	1	2	P	9/3/2002	MODIFICATION OF: ASPHALT BATCH PLANT: STANSTEEL MODEL RM80A HOT MIX BATCH PLANT WITH A 162.0 MMBTU/HR MODEL FP-162 GENCOR BURNER SERVED BY A WET SCRUBBER TO REPLACE THE 162 MMBTU/HR GENCOR MODEL FP-162 DRYER BURNER WITH A 135 MMBTU/HR GENCOR MODEL ULTRA II-135 DRYER BURNER
N	2303	1	2	P	4/14/2000	STANDARD STEEL (MODEL # M 6000 A) HOT MIX ASPHALTIC CONCRETE BATCH PLANT WITH A STAN STEEL AGGREGATE DRYER SERVED BY A GENCO (MODEL # AF60) 100 MMBTU/HR BURNER, SYMONS SCREEN, PUGMILL, WEIGH HOPPER CONVEYORS, ALL VENTED TO A STAN STEEL BAGHOUSE. MODIFICATION TO REPLACE THE EXISTING BAGHOUSE WITH A GENTEC (MODEL # AB 512-15) BAGHOUSE.
N	2835	68	0	P	7/20/2000	ASTEC COATER II HOT MIX ASPHALTIC CONCRETE BATCH PLANT WITH AN ASTEC (MODEL # SAD 1036F) AGGREGATE DRYER SERVED BY AN ASTEC POWER STAR 150 MMBTU/HR BURNER, SCREENS, PUGMILL, CONVEYORS, ALL VENTED TO AN ASTEC (MODEL # SBHT-85) BAGHOUSE
N	4013	1	1	P	10/9/1999	DRUM MIX ASPHALTIC CONCRETE PLANT INCLUDING FOUR AGGREGATE BINS; AGGREGATE DRYER WITH A CEDARAPIDS (MODEL # 8828) 110 MMBTU/HR LOW NOX BURNER, ELEVATORS, CONVEYORS, ALL VENTED TO A CEDARAPIDS (MODEL # STANDARD HAVEN) BAGHOUSE. THE PLANT IS SERVED BY ONE 75 TON AND ONE 125 TON ASPHALTIC CONCRETE STORAGE SILOS AND ASSOCIATED TRUCK LOADOUT OPERATION. MODIFICATION TO CHANGE THE PM10 EMISSION CONCENTRATION FROM THE BAGHOUSE AND CHANGE THE MAXIMUM DAILY ASPHALTIC CONCRETE THROUGHPUT
N	4013	2	2	P	10/20/2003	MODIFICATION OF DRUM MIX ASPHALTIC CONCRETE PLANT INCLUDING FOUR AGGREGATE BINS & ONE 75 TON STORAGE SILO; AGGREGATE DRYER WITH A HAUCK (MODEL # ES100) 115 MMBTU/HR LOW-NOX BURNER, ELEVATORS, DRAG SLAT CONVEYOR, ALL VENTED TO AN ALL MIX (MODEL # SIZE 300) BAGHOUSE: LOWER ASPHALT DAILY AND ANNUAL THROUGHPUT, AND LIMIT FUEL USAGE
N	4247	1	1	P	1/10/2000	DRUM MIX ASPHALTIC CONCRETE PLANT INCLUDING SIX AGGREGATE BINS, CONVEYORS, ONE 100 TON STORAGE SILO WITH TRUCK LOADOUT, AND AN AGGREGATE DRYER WITH A GENCOR (MODEL: ULTRA II-135H) 135 MMBTU/HR LOW NOX BURNER SERVED BY A GENCOR (MODEL: CFP-182) BAGHOUSE AND AN EXHAUST GAS RECIRCULATION SYSTEM
N	4473	3	0	P	8/14/2001	DRUM MIX ASPHALT CONCRETE PLANT: ASPHALT CONCRETE STORAGE AND TRUCK LOADOUT OPERATION CONSISTING OF TWO 200 TON EACH ASPHALT CONCRETE STORAGE SILOS. THE STORAGE SILOS AND TRUCK LOADOUT CHUTE ARE VENTED INTO THE 135 MMBTU/HR GENCOR DRYER (PERMIT N-4473-2)
N	4499	1	0	P	10/4/2001	ASPHALT SHEET PROCESSING LINE CONSISTING OF A KNEADER/MIXER STATION VENTED TO AN AMANO CO. LTD. MODEL PI 120BS DUST COLLECTOR, A HOLDING TANK, AN EXTRUDER, TWO WATER BATHS, A POLYETHYLENE APPLICATION MACHINE, TWO ELECTRIC DRYERS, A SHEET CUTTING STATION, AND A PERMIT EXEMPT (GAS FIRED, LESS THAN 5 MMBTU/HR) OIL HEATER.
S	363	1	5	P	5/1/2003	MODIFICATION OF ASPHALT BATCH PLANT INCLUDING 100 MMBTU/HR AGGREGATE DRYER W/DUST PICKUP, GENCOR MODEL GS-131-16-12 BAGHOUSE W/CYCLONE, HOT AGGREGATE ELEVATOR W/DUST PICKUP, SCREEN/MIXING WEIGH ASSEMBLY, HOT MIX STORAGE BIN, AND 4 UNDERGROUND ASPHALT BINDER STORAGE TANKS: DECREASE ALLOWABLE ASPHALT PRODUCTION FROM 783,000 TO 450,000 TONS IN ANY ONE YEAR
S	364	5	2	P	7/28/2003	MODIFICATION OF 103.5 MMBTU/HR CEDAR RAPIDS 7000# ASPHALTIC CONCRETE BATCHING OPERATION INCLUDING FOUR 25-TON COMPARTMENT FEED BINS, MODEL 10028 DRYER W/ FP-103 GEMCO BURNER ASSEMBLY (NATURAL GAS W/ DIESEL STANDBY), AND HOT AGGREGATE ELEVATOR SCREENS AND BINS: ADD ONE 18-TON COMPARTMENT FEED BIN

S	623	1	3	P	3/15/2002	MODIFY DIESEL FIRED ASPHALT BATCH PLANT W/ 57 MMBTU/HR ROTARY DRUM DRYER, SCREENS, AND PUGMILL ALL SERVED BY CYCLONE AND BAGHOUSE, CONVEYOR(S), AUGER(S), TANK(S), 185 TON HOT MIX SILO, AND LOADOUT: ALLOW LPG FIRING
S	1610	1	1	P	7/16/2001	MODIFY 70.0 MM BTU/HR ASPHALT BATCH PLANT INCLUDING AGGREGATE DRYER WITH MATERIAL CONVEYORS, ELEVATOR SCREEN AND MIXER, PRODUCT BINS, TWO CYCLONES WITH WATER SCRUBBER AND TOP LOAD COLD FEED BIN WITH CONVEYOR: CHANGE THE PROCESS WEIGHT RATES IN CONDITIONS 6, 7, 8, AND 10 FROM TON/HR TO TON/DAY.
S	1612	1	12	P	4/1/2002	MODIFY HOT MIX ASPHALT DRUM MIX PLANT WITH BMG MODEL 45R30P DRUM DRYER/MIXER WITH GENCO ULTRAFLAME MODEL II-135 LPG/NATURAL GAS-FIRED 135 MMBTU/HR LOW-NOX BURNER, GENCOR INDUSTRIES CYCLONE AND MODEL CFS-210 BAGHOUSE: REPLACE ASPHALT DRUM/BURNER WITH GENCOR MODEL 500 COUNTERFLOW ULTRADRUM WITH GENCO ULTRAFLAME MODEL II-135, 135 MMBTU/HOUR LPG/NATURAL GAS FIRED BURNER
S	1856	1	7	P	4/27/2000	MODIFICATION OF ASPHALTIC CONCRETE DRUM MIX PLANT W/ 3 COMPARTMENT 2 CONVEYOR AGGREGATE BIN AND KOLBERG MODEL 790 LPG FIRED 26.3 MM BTU/HR DRUM DRYER/MIXER VENTED TO BMG VENTURI SCRUBBER W/ CYCLONIC SEPARATOR: TRANSFER LOCATION FROM EDMUNSTON PUMP STN., CONVERT TO EXCLUSIVELY LPG GAS FUEL AND EXCLUSIVELY COLD MIX ASPHALTIC CONCRETE MANUFACTURING, AUTHORIZE USE OF PETROLEUM CONTAMINATED FEEDSTOCK, AND REVISE PM10, VOC, & CO EMISSION RATES
S	3825	3	1	P	4/16/2003	MODIFICATION OF 500 TPH ASTEC HOT MIX ASPHALTIC CONCRETE PLANT CONSISTING OF 4 BIN AGGREGATE FEED SYSTEM, LPG FIRED AGGREGATE DRYER WITH HAUCK ECO-STAR 200 MMBTU/HR LOW-NOX BURNER EQUIPPED WITH FLUE GAS RECIRCULATION SYSTEM VENTED TO A BAGHOUSE THROUGH A HORIZONTAL CYCLONE, MIXING DRUM, DRAG SLAT CONVEYER, 150 TON HOT MIX STORAGE SILO AND CANOPY-ENCLOSED LOAD-OUT VENTED TO A TWO FILTER PACK BLUE SMOKE CONTROL SYSTEM: REPLACE 150 TON HOT MIX STORAGE SILO WITH A 120 TON SILO, REPLACE DRAG SLAT CONVEYOR, AUTHORIZE OPERATION AT VARIOUS LOCATIONS, LOWER ANNUAL ASPHALTIC CONCRETE THROUGHPUT AND FUEL USE.
S	3827	1	0	P	6/10/2002	300 TPH STANSTEEL DRUM MIX ASPHALTIC CONCRETE PLANT INCLUDING AGGREGATE FEED BINS, GENCO MODEL FT162 LPG FIRED BURNER, DRYER DRUM MIXER, 100 TON HOT ASPHALTIC CONCRETE SILO, TRUCK LOADOUT, AND ASSOCIATED AGGREGATE AND FINISHED ASPHALTIC CONCRETE CONVEYORS WITH DRYER DRUM MIXER AND ASPHALTIC CONCRETE SILO VENTED TO STANSTEEL MODEL D-130 VENTURI SCRUBBER.
S	3984	2	0	P	8/12/2004	6000 TON PER DAY DUAL DRUM ASPHALTIC CONCRETE (A.C.) MANUFACTURING OPERATION WITH HAUCK ECO-STAR II MODEL 150 NATURAL GAS FIRED, STAGED FUEL BURNER, FABRIC COLLECTOR SERVING DRYER DRUM, MIXER DRUM, FINISHED A.C. CONVEYORS AND FINISHED A.C. SILOS

Appendix 2

Public Notice of Intent: Notice

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Notice Of Development Of Best Performance Standards

NOTICE IS HEREBY GIVEN that the San Joaquin Valley Air Pollution Control District solicits public comment on development of Best Performance Standards for the following Stationary Source class and category of greenhouse gas emissions:

DRYERS AND DEHYDRATORS Subject to District Permit Requirements

The District is soliciting public input on the following topics for the subject Class and Category of greenhouse gas emission source:

- Recommendations regarding the scope of the proposed Class and Category (Stationary GHG sources group based on fundamental type of equipment or industrial classification of the source operation),
- Recommendations regarding processes or operational activities the District should consider when establishing Baseline Emissions for the subject Class and Category,
- Recommendations regarding processes or operational activities the District should consider when converting Baseline Emissions into emissions per unit of activity, and
- Recommendations regarding technologies to be evaluated by the District, when establishing Best Performance Standards for the subject Class and Category.

Information regarding development of Best Performance Standard for the subject Class and Category of greenhouse gas emission source can be obtained from the District's website at http://www.valleyair.org/Programs/CCAP/CCAP_idx.htm.

Written comments regarding the subject Best Performance Standard should be addressed to Derek Fukuda by email, Derek.Fukuda@valleyair.org, or by mail at SJVUAPCD, 1990 East Gettysburg Avenue, Fresno, CA 93726 and must be received by **February 23, 2010**. For additional information, please contact Derek Fukuda by e-mail or by phone at (559) 230-5917.

Information regarding the District's Climate Action Plan and how to address GHG emissions impacts under CEQA, can be obtained from the District's website at http://www.valleyair.org/Programs/CCAP/CCAP_idx.htm.

Derek Fukuda

From: dryers_bps@lists.valleyair.org
Sent: Tuesday, February 09, 2010 9:27 AM
To: Derek Fukuda
Subject: [Dryers_BPS] Notice of Development - Dryers
Attachments: ATT4699359.txt

The San Joaquin Valley Air Pollution Control District is soliciting public input on the development of Best Performance Standards. The Notice of Development for Dryers, Dehydrators, and Ovens is available [here](#).

Written comments regarding the subject Best Performance Standard should be addressed to Derek Fukuda by email, Derek.Fukuda@valleyair.org, or by mail at SJVUAPCD, 1990 East Gettysburg Avenue, Fresno, CA 93726 and must be received by **February 23, 2010**. For additional information, please contact Derek Fukuda by e-mail or by phone at (559) 230-5917.

Derek Fukuda

From: dryers_bps@lists.valleyair.org
Sent: Thursday, February 25, 2010 1:21 PM
To: Derek Fukuda
Cc: Arnaud Marjollet
Subject: [Dryers_BPS] Notice of development of BPS for dryers/dehydrators:Extension to commenting period
Attachments: ATT2093692.txt

Subject: Extension to Commenting Period for Dryers/Dehydrators

The District is extending the initial commenting period regarding development of Best Performance Standards (BPS) for dryers/dehydrators. The information requested below will be used when establishing Best Performance Standards for the subject Class and Category:

- Aspects of operating the subject emissions source that are unique to your industry
- Technologies or operational activities currently in practice to which should be considered.

Comments must be received by the District by Thursday, March 4, 2010.

Written comments regarding the subject Best Performance Standard should be addressed to Derek Fukuda by email, Derek.Fukuda@valleyair.org, or by mail at SJVUAPCD, 1990 East Gettysburg Avenue, Fresno, CA 93726. For additional information, please contact Derek Fukuda by e-mail or by phone at (559) 230-5917.