

## **Appendix E**

### **Evaluation of Smoke Dispersion**

SMP I – Time of day and setback requirements or SMP II requirements

SMP II – Required

Wildland fire use is exempt from this requirement

Evaluation of smoke dispersion is defined as the use of meteorological conditions to assess the ability to minimize smoke impacts.

#### **E.1. SMP I**

For SMP I burners, there are two approaches to meet the requirements of this element. The first option provides simple requirements that are easy to follow for the burner. The second option parallels SMP II requirements for this element, and involves more effort on the part of the burner. It is the burner's choice as to which option to follow under this element.

##### Option 1

Active ignition is only allowed during daylight hours, from one hour after sunrise to one hour before sunset. Burning is not allowed within a 300-foot setback from occupied structures or where people congregate on other property, so that the impacts from smoke are minimized.

If a burner needs to burn outside of these hours or within the setback, a waiver must be obtained from the AQB on a case-by-case basis. For example, a waiver for night burning may require a detailed description of the circumstances, the submittal of a map showing diurnal drainage(s), and a smoke mitigation plan. A request for waiver must be submitted no later than two weeks prior to the planned ignition date. Once the AQB staff receives the waiver request, they have seven days to consider the waiver and inform the burner of an approval or denial. The burner must receive written confirmation of the waiver to initiate the burn. (See Appendix H for waiver information and Appendix P for the Waiver Form.)

##### Option 2

Instead of the requirements under Option 1 above, the burner may choose to follow the ventilation requirements for this element as described in SMP II below, in addition to conducting visual monitoring as described in Appendix F.

#### **E.2. SMP II**

##### **E.2.1. Ventilation Index**

A ventilation index category describes the potential for smoke or other pollutants to ventilate away from a source, and is expressed in categories of Excellent, Very Good, Good, Fair, and Poor. Burning is allowed only in ventilation categories of Good or above, without a waiver.

The ventilation index is obtained by multiplying the mixing height by the transport winds. This information can be found in the National Weather Fire Forecast, which is available via the internet (<http://www.srh.noaa.gov/ridge2/fire/>).

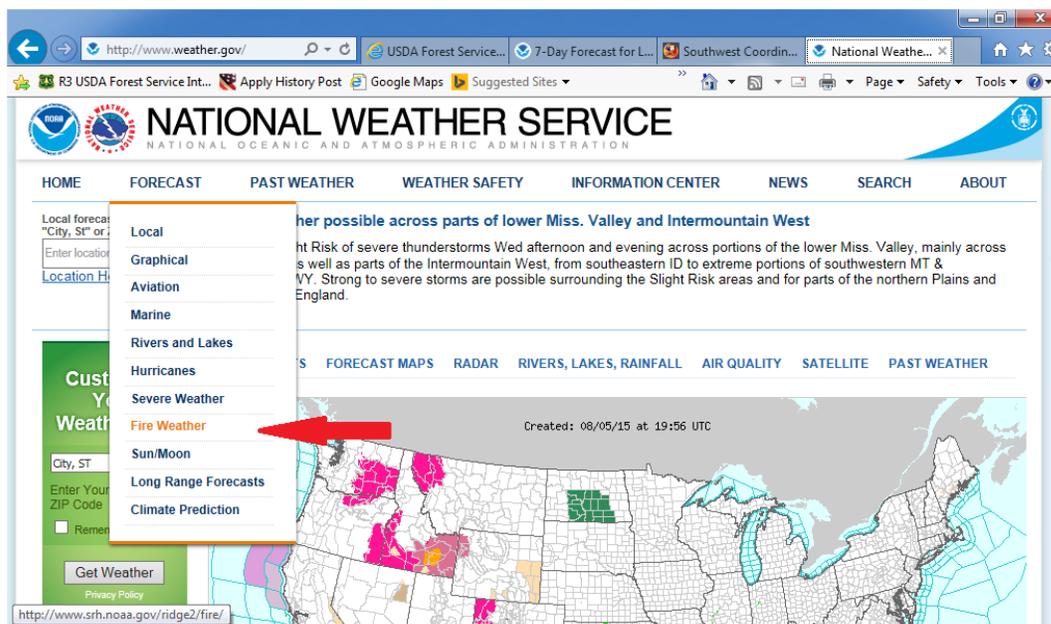
There are two options for burning under Fair or Poor ventilation conditions. Burning can occur under Fair or Poor conditions if all of the conditions have been met under the Statewide Ventilation Waiver, which can be submitted at the time of registration. Alternatively, if you have a unique situation and cannot meet the conditions in the Statewide Ventilation Waiver, you may apply for an individual waiver.

If there are specific needs to burn under Fair or Poor ventilation categories that are not covered by the Statewide Ventilation Waiver (for example, night burning where there is a minimal mixing height and thus poor dispersion), special consultation is required with the AQB for an individual waiver to this requirement. Additional information that the AQB may request includes, but is not limited to, the justification for burning under Fair or Poor categories, a map showing prescribed wind direction, and a smoke mitigation plan.

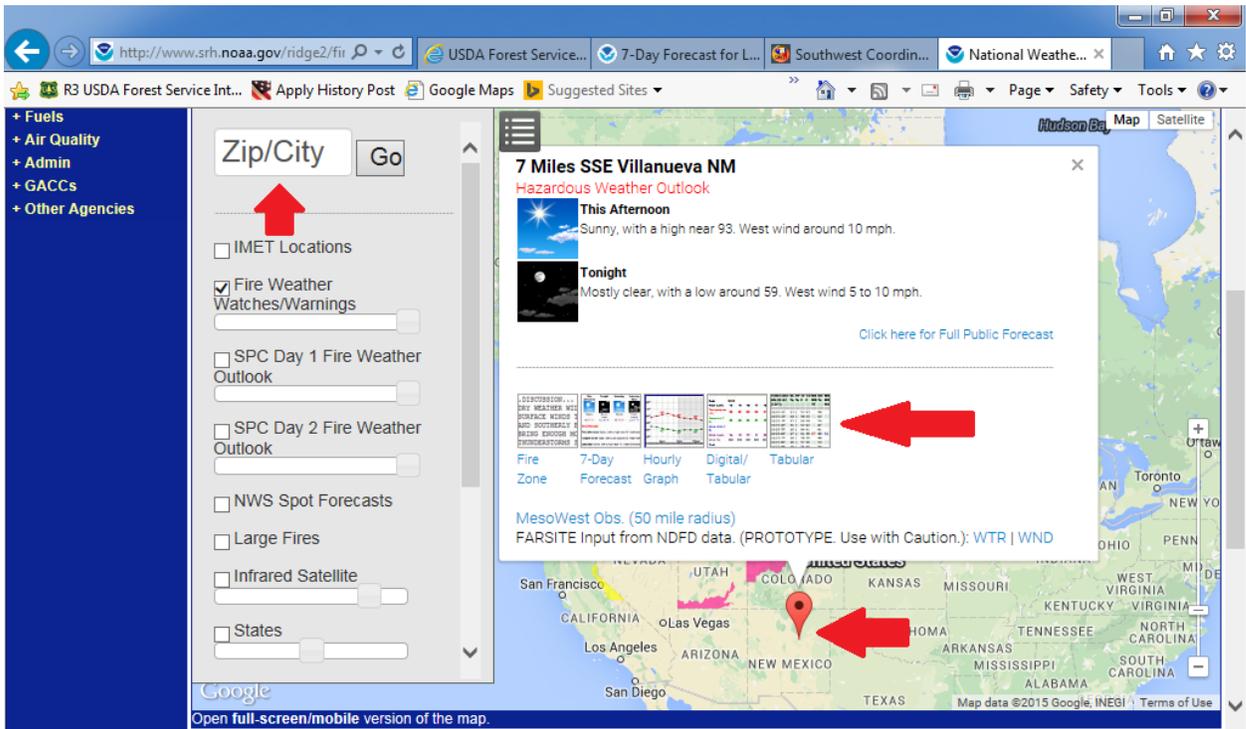
A request for waiver of ventilation category must be submitted no later than 10:00 a.m. one business day prior to planned ignition date (i.e., the notification deadline). The waiver submittal timeframe, in this case, is set to accommodate the limited time for assessing meteorological conditions. However, you may send in your ventilation waiver request at time of registration and obtain a waiver for the entire project. As with other waivers, no waivers for ventilation category will be approved by default. (See Appendix H for waiver information and Appendix P for the Waiver Form.)

## E.2.2. Instructions for Determining Burn Site Ventilation Category

1. To determine the ventilation category at the burn location, go to: <http://www.weather.gov/>, then select Fire Weather from the drop down menu under FORECAST.



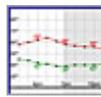
- Here you will find a map, where you can either click on the location of the burn on the map or enter the latitude and longitude of the burn into the box next to the “Go” button. Currently the box has the words, “Zip/City” inside it but the page will accept coordinates. By entering the location, you will access a gridded database with several options to choose from to find the hourly ventilation forecast for that location, as well as general forecast information.



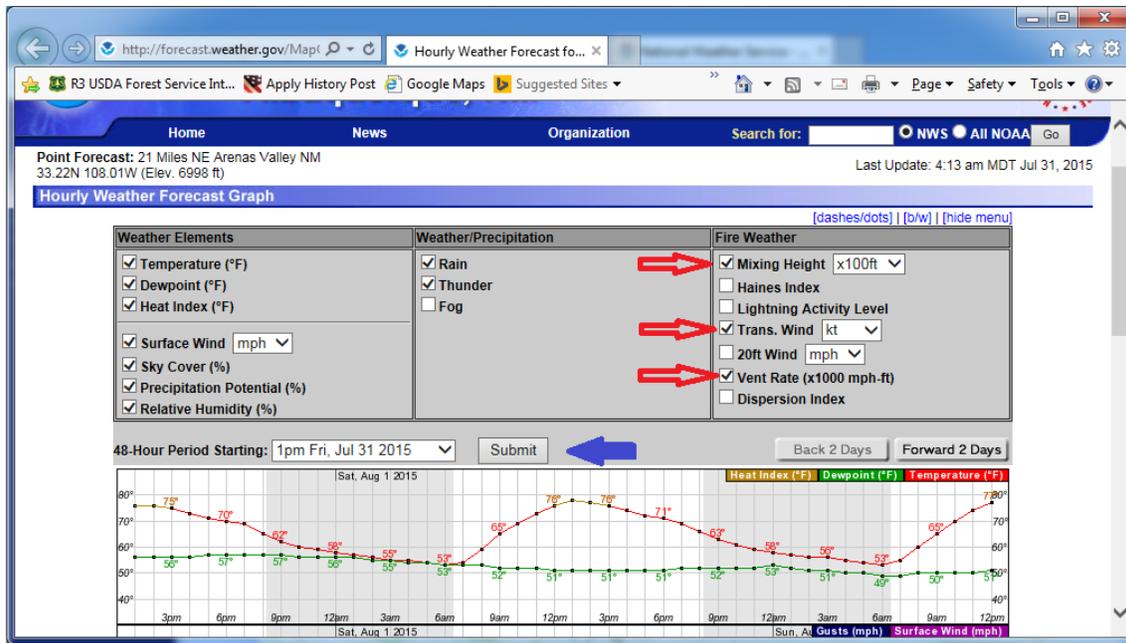
Note: This guidance was created by accessing the National Weather Service’s Fire Weather page using Internet Explorer 11. If the pop-up in the figure above does not appear or indicates that it is loading, and does not provide links to the Hourly Graph or Tabular data, see direction at the end of this section for an alternate way to access the data.

- There are three choices in the pop-up that will allow you to access the ventilation data, Hourly Graph, Digital/Tabular, and Tabular.

- Hourly Graph:**

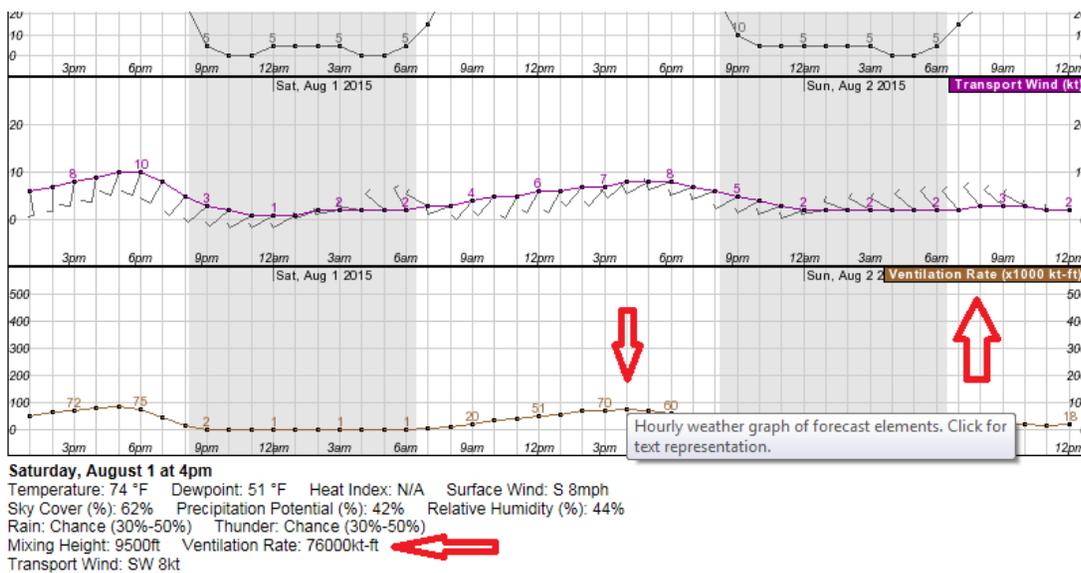


**Step 1:** By selecting the Hourly Graph icon, a new window will pop up with forecasted data for that location for the next 48 hours (you can get 7 days by clicking on the “Forward 2 Days” button). To get the ventilation data, you will need to select Mixing Height, Transport Winds with the drop down for knots (kt), and Vent Rate under Fire Weather.



After these have been selected, click on the submit button.

**Step 2:** After the window refreshes, scroll down, until you can see the graphical representation of Ventilation Rate (x 1000 kt-ft). As you scroll your cursor over the hourly increments, the text at the bottom of the screen will change to show the forecasted information for each hour. Using this data you will be able to determine the maximum ventilation forecasted for the day, as well as other information critical to managing smoke such as the burn window when ventilation is expected to disperse the smoke the best or when an inversion is expected to break or form.

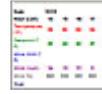


[Radars and Satellite Images](#)

[Additional Forecasts & Information](#)

- **Digital/Tabular**

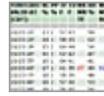


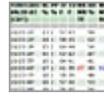
**Step 1:** By selecting the Digital/Tabular icon , a new window will pop up with forecasted data for that location for the next 48 hours (you can get 7 days by clicking on the “Forward 2 Days” button). To get the ventilation data, you will need to select Mixing Height, Transport Winds with the drop down for knots (kt), and Vent Rate under Fire Weather (see Step 1 instructions under Hourly Graph). After these have been selected, click on the submit button.

**Step 2:** After the window refreshes, scroll down, until you can see the forecasted Ventilation Rate (x 1000 kt-ft). Each value in a column represents the forecasted weather data for that hour. Using this data you will be able to determine the maximum ventilation forecasted for the day, as well as other information critical to managing smoke such as the burn window when ventilation is expected to disperse the smoke the best or when an inversion is expected to break or form. In the graphic below, at 1700 the ventilation will be 85,000 kt-ft or Good Ventilation.

Hour (MDT)	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04
Temperature (°F)	76	75	73	71	70	69	65	62	60	59	58	57	56	55	55
Dewpoint (°F)	56	56	56	57	57	57	57	57	56	56	56	56	55	55	54
Heat Index (°F)	76	75													
Surface Wind (mph)	8	9	8	8	7	6	6	5	5	3	3	3	3	3	3
Wind Dir	S	S	S	S	S	S	SE	E	E	NE	NE	NE	NE	NE	NE
Gust															
Sky Cover (%)	83	83	83	83	77	77	77	77	77	77	77	77	77	77	77
Precipitation Potential (%)	74	74	74	74	59	59	59	59	59	59	59	59	59	59	59
Relative Humidity (%)	51	53	56	61	62	66	73	81	87	91	95	97	99	98	98
Rain	Lkly														
Thunder	Lkly														
Mixing Height (x100ft)	90	90	90	85	75	55	25	5			5	5	5	5	
Transport Wind (kt)	7	8	9	10	10	8	5	3	2	1	1	1	2	2	2
Transport Wind Dir	S	S	S	S	S	SW	W	W	W						
Ventilation Rate (x1000 kt-ft)	63	72	81	85	75	44	13	2	0	0	1	1	1	1	0

- **Tabular**



Step 1: By selecting the Tabular icon , a new window will pop up with forecasted data for that location for the next 7 days. The Ventilation Rate (kt-ft) is provided for every hour for 7 days. Also included in this product are abbreviated and color coded adjective ratings.

WILCS:  
 FIRE ZONE FWF PRODUCT: [Click Here](#) to view the Fire Weather Narrative (FWF) for Zone  
 SUNRISE/SUNSET INFO: Sunrise: 6:23 AM MDT Sunset: 8:13 PM MDT  
 GRAPHIC FORMAT: [Click Here](#) to view Forecast Data in a Graphical Format

FORECAST VALID (MDT)	SC	PP	CWR	TF	TD	AT	MX	RH	MX	SFC	SFC	G	H	L	15K	15K	MIXG	TRAN	TRAN	VENTL	AJTV	QPF	SNOW	PRIMA	
	%	%	%	F	F	F	MN	%	MN	WIND	WIND	S	I	A	WIND	WIND	HGT	WIND	WIND	RATE	RATG	6HRS	6HRS	WX	TYI
							TF		RH	DIR	MPH	T	L	DIR	MPH	AGL	DIR	MPH	KT-FT		DUR	DUR			
07/31-2P	83	74		76	56	76		51		S	8	9	3	5			9000	S	8	62733	G				
07/31-3P	83	74		75	56	75		53		S	9	10	3	5			9000	S	9	72000	G				
07/31-4P	83	74		73	56	73		56		S	8	9	3	5			9000	S	10	83111	G				
07/31-5P	83	74		71	57	71		61		S	8	9	3	5			8500	SW	12	85840	G				
07/31-6P	77	59		70	57	70	76	62	50	S	7	8	3	3			7500	SSW	12	75000	G	0.29	0.0		
07/31-7P	77	59		69	57	69		66		SSE	6	7	3	3			5500	SSW	9	44584	F				
07/31-8P	77	59		65	57	65		73		SE	6	7	3	3			2500	SW	6	13568	P				
07/31-9P	77	59		62	57	62		81		ESE	5	6	3	3			500	SW	3	1500	P				
07/31-10P	77	59		60	56	60		87		E	5	6	3	3			0	SW	2	0	P				
07/31-11P	77	59		59	56	59		91		NE	3	5	3	3			0	WSW	1	0	P				
08/01-12A	77	59		58	56	58		95		NE	3	5	3	3			500	WSW	1	500	P	0.22	0.0		
08/01-1A	77	59		57	56	57		97		NF	3	5	3	3			500	WSW	1	575	P				

4. The three products also provide forecasted mixing height and transport winds, among other meteorological elements.
5. Using the number obtained from Hourly Graph or Digital/Tabular, check the ventilation category table and determine the adjective rating (Good, Poor, etc.) for the burn location (see Ventilation Categories and Values Table below in section E.2.3).

Note: Federal, State, and Local agencies can continue to use the ventilation provided on Spot forecasts as an alternative to the gridded hourly forecast data.

For an alternate way to access the hourly gridded weather data, go to [www.weather.gov](http://www.weather.gov), and enter the coordinates of your burn into the “Enter Location” Box and select “Go”. It is recommended to use the following format, as an example, for coordinates: -106.5, 35.5. Make sure the correct location is highlighted on the map when the new page loads. From this page you can select Hourly Weather Graph or Tabular Forecast, under Additional Forecasts and Information. Then follow the instructions under section E.2.2, number 3 to locate the hourly ventilation data.

The screenshot shows the weather.gov website interface. On the left, a 7-day forecast is displayed with the following details:

<b>Tonight</b>	Mostly clear, with a low around 61. West wind around 5 mph becoming calm in the evening.
<b>Thursday</b>	Sunny, with a high near 93. North wind around 5 mph becoming west in the afternoon.
<b>Thursday Night</b>	Partly cloudy, with a low around 61. West wind around 5 mph becoming north after midnight.
<b>Friday</b>	A 20 percent chance of showers and thunderstorms. Mostly sunny, with a high near 90. Northeast wind 5 to 10 mph becoming southwest in the afternoon.
<b>Friday Night</b>	A 20 percent chance of showers and thunderstorms. Mostly cloudy, with a low around 62.
<b>Saturday</b>	A 20 percent chance of showers and thunderstorms. Partly sunny, with a high near 88.
<b>Saturday Night</b>	A 30 percent chance of showers and thunderstorms. Mostly cloudy, with a low around 60.
<b>Sunday</b>	A 10 percent chance of showers and thunderstorms. Partly sunny, with a high near 86.
<b>Sunday Night</b>	A 20 percent chance of showers and thunderstorms. Mostly cloudy, with a low around 62.
<b>Monday</b>	A 20 percent chance of showers and thunderstorms. Mostly sunny, with a high near 88.
<b>Monday Night</b>	A 30 percent chance of showers and thunderstorms. Mostly cloudy, with a low around 62.
<b>Tuesday</b>	A 10 percent chance of showers and thunderstorms. Mostly sunny, with a high near 85.

Below the forecast is the "Additional Forecasts and Information" section, which includes a table of links:

<a href="#">Forecast Discussion</a>		<a href="#">Hourly Weather Graph</a>	<a href="#">Quality Forecasts</a>
<a href="#">Printable Forecast</a>		<a href="#">Tabular Forecast</a>	<a href="#">International System of Units</a>
<a href="#">Text Only Forecast</a>			<a href="#">About Point Forecasts</a>
<a href="#">Zone Area Forecast for Middle Rio Grande Valley/Albuquerque Metro Area, NM</a>		<a href="#">Albuquerque Home Pages</a>	

On the right side of the page, there is a map of the Jemez Mountains area with a green box indicating the forecast area. Below the map, the "Point Forecast" information is provided:

**Point Forecast:** 6 Miles NW San Felipe Pueblo NM  
35.5°N 106.51°W (Elev. 6093 ft)

**Last Update:** 4:11 am MDT Aug 5, 2015

**Forecast Valid:** 2pm MDT Aug 5, 2015-6pm MDT Aug 11, 2015

Additional Resources include a link for "Radar & Satellite Image".

### E.2.3. Ventilation Categories and Values Table

CATEGORY	KNOT-FEET
Excellent	$\geq 150,000$
Very Good	100,000-149,999
Good	60,000-99,999
Fair	40,000-59,999
Poor	$< 40,000$

### **E.3. Definitions**

AGL – above ground level.

Diurnal drainage – topographic area(s) where smoke may collect or flow on a daily or recurring cycle.

Fire weather forecast – a weather prediction specially prepared for use in wildland fire operations and prescribed fire.

Knot – nautical miles per hour, equal to 1.15 mph.

MSL – mean sea level, for these purposes it implies altitude above sea level.

Mixing height – the maximum height that rapid vertical mixing takes place in the atmosphere. The more unstable the atmosphere, the higher the mixing height is as a rule.

Red flag warning – term used by fire weather forecasters to alert forecast users to an on-going or imminent critical fire weather pattern.

Ridgetop winds – winds forecasted at approximately 10,000 feet above MSL.

Smoke mitigation plan – a plan in which the burner has identified areas that could be affected by smoke and documents ways they will reduce/mitigate these impacts.

Surface winds – air movement measured at 20 feet above the average vegetative cover, averaged over a 10-minute period.

Topographic map – a map having lines of equal elevation that represent the land surface.

Transport winds – an average of the horizontal wind speed (the surface and ridgetop winds) and direction from the surface to the mixing height.

Ventilation – the product of the mixing height and transport wind speeds.

Ventilation category – a classification that describes the potential for smoke or other pollutants to ventilate away from its source, and that is expressed in terms of Excellent, Very Good, Good, Fair, or Poor.

#### **E.4. References**

##### **Regional Haze Rule**

Published in the Federal Register on July 1, 1999, 64 FR 35714.

[http://www.epa.gov/ttn/oarp/t1/fr\\_notices/rhfedreg.pdf](http://www.epa.gov/ttn/oarp/t1/fr_notices/rhfedreg.pdf)

##### **National Weather Service, Fire Weather**

<http://www.weather.gov>

<http://www.srh.noaa.gov/ridge2/fire/>

##### **Smoke Management Techniques RX-410 Student Workbook**

National Wildfire Coordinating Group. NFES #2476. October 1994.

##### **Ventilation Values**

Southwest Area Mobilization Guide. March 2002.

##### **WRAP Policy on Enhanced Smoke Management Programs for Visibility**

Approved by the Western Regional Air Partnership, November 12, 2002.

[http://www.wrapair.org/forums/fejf/documents/esmptt/policy/030115\\_ESMP\\_Policy.pdf](http://www.wrapair.org/forums/fejf/documents/esmptt/policy/030115_ESMP_Policy.pdf)

##### **Air Quality Bureau Smoke Management Webpage**

[http://www.nmenv.state.nm.us/aqb/SMP/smp\\_index.html](http://www.nmenv.state.nm.us/aqb/SMP/smp_index.html)