MARICOPA ASSOCIATION of GOVERNMENTS

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October 22, 2009

TO: Members of the MAG Air Quality Technical Advisory Committee

FROM: Doug Kukino, Glendale, Chair

SUBJECT: MEETING NOTIFICATION AND TRANSMITTAL OF TENTATIVE AGENDA

Thursday, October 29, 2009 - 1:30 p.m.
MAG Office, Suite 200 - Saguaro Room
302 North 1st Avenue, Phoenix

A meeting of the MAG Air Quality Technical Advisory Committee has been scheduled for the time and place noted above. Members of the Air Quality Technical Advisory Committee may attend the meeting either in person, by videoconference or by telephone conference call. Those attending by videoconference must notify the MAG site three business days prior to the meeting. If you have any questions regarding the meeting, please contact Chair Kukino or Lindy Bauer at 602-254-6300.

Please park in the garage underneath the building, bring your ticket, and parking will be validated. For those using transit, Valley Metro/Regional Public Transportation Authority will provide transit tickets for your trip. For those using bicycles, please lock your bicycle in the bike rack in the garage.

In 1996, the Regional Council approved a simple majority quorum for all MAG advisory committees. If the MAG Air Quality Technical Advisory Committee does not meet the quorum requirement, members who arrived at the meeting will be instructed a legal meeting cannot occur and subsequently be dismissed. Your attendance at the meeting is strongly encouraged. If you are unable to attend the meeting, please make arrangements for a proxy from your entity to represent you.

Pursuant to Title II of the Americans with Disabilities Act (ADA), MAG does not discriminate on the basis of disability in admissions to or participation in its public meetings. Persons with a disability may request a reasonable accommodation, such as a sign language interpreter, by contacting Jason Stephens at the MAG office. Requests should be made as early as possible to allow time to arrange the accommodation.

TENTATIVE AGENDA

	COMMITTEE ACTION REQUESTED
1. Call to Order	
2. Call to the Audience An opportunity will be provided to members of the public to address the Air Quality Technical Advisory Committee on items not scheduled on the agenda that fall under the jurisdiction of MAG, or on items on the agenda for discussion but not for action. Members of the public will be requested not to exceed a three minute time period for their comments. A total of 15 minutes will be provided for the Call to the Audience agenda item, unless the Air Quality Technical Advisory Committee requests an exception to this limit. Please note that those wishing to comment on action agenda items will be given an opportunity at the time the item is heard.	2. For information.
3. Approval of the September 24, 2009 Meeting Minutes	3. Review and approve the September 24, 2009 meeting minutes.
4. Evaluation of Proposed FY 2014 CMAQ Projects for the FY 2011-2015 MAG TIP An evaluation of proposed FY 2014 Congestion Mitigation and Air Quality Improvement (CMAQ) projects submitted for the FY 2011-2015 MAG Transportation Improvement Program (TIP) has been conducted. The deadline for submitting the projects was September 18, 2009. The evaluation includes emission reductions and cost-effectiveness information. In addition, a list of Air Quality Projects is also provided. It is requested that the Air Quality Projects be ranked and forwarded to the Transportation Review Committee. Please refer to the enclosed material.	4. For information, discussion, and recommendation to forward the evaluation of proposed FY 2014 CMAQ projects for the FY 2011-2015 MAG Transportation Improvement Program to the MAG Transportation Review Committee and modal committees for use in prioritizing projects. In addition, rank the Air Quality Projects to be forwarded to the MAG Transportation Review Committee.

5. Update on the Inventory of Unpaved Roads

On May 23, 2007, the MAG Regional Council approved thirteen additional measures for the Suggested List of Measures to Reduce PM-10 Particulate Matter. One of these measures requires MAG to conduct an annual inventory of unpaved roads and estimated traffic counts by jurisdiction to measure progress in eliminating unpaved roads. At the last meeting, a presentation was provided on the unpaved roads in the PM-10 nonattainment area which also included average daily traffic data. Since the meeting, additional information has been received. An update will be provided.

5. For information and discussion.

6. Status Report on Air Quality Monitoring Data

A status report will be provided on the air quality monitoring data for ozone and PM-10 for the region. The Arizona Department of Environmental Quality has also published a public notice requesting comments on Exceptional/Natural Events in the Greater Phoenix Area, 2008. Please refer to the enclosed material.

6. For information and discussion.

7. EPA Evaluation of Pinal County for Possible PM-2.5 and PM-10 Designations

In an October 14, 2009 letter, the Environmental Protection Agency notified the Governor regarding an initial designation of nonattainment for the 24-hour and annual PM-2.5 standards and the 24-hour PM-10 standard for Pinal County. For PM-2.5, the letter indicates that EPA will also be evaluating technical data for the ring of counties immediately surrounding Pinal County to determine whether they contribute to violations in Pinal County. For PM-10, EPA will be evaluating nearby areas that contribute to violations in Pinal County. Please refer to the enclosed material.

7. For information and discussion.

8. EPA to Reconsider the Eight-Hour Ozone Standard

On September 16, 2009, the Environmental Protection Agency announced that it would be reconsidering the 2008 primary and secondary eight-hour ozone standards (both are .075 parts per million). According to EPA, any needed revisions would be proposed by December 2009 and a final decision issued by August 2010. Plans would be due in December 2013. Please refer to the enclosed material.

8. For information and discussion.

9. Call for Future Agenda Items

The next meeting of the Committee has been tentatively scheduled for Thursday, December 10, 2009 at 1:30 p.m. The Chairman will invite the Committee members to suggest future agenda items.

9. For information and discussion.

MINUTES OF THE
MARICOPA ASSOCIATION OF GOVERNMENTS
AIR QUALITY TECHNICAL ADVISORY COMMITTEE MEETING

Thursday, September 24, 2009
MAG Office
Phoenix, Arizona

MEMBERS ATTENDING

John Kross, Town of Queen Creek, Chairman
*Sue McDermott, Avondale
*Elizabeth Biggins-Ramer, Buckeye
#Jim Weiss, Chandler
#Jamie McCullough, El Mirage
Kurt Sharp for Tami Ryall, Gilbert
Doug Kukino, Glendale
Cato Esquivel, Goodyear
#Greg Edwards for Scott Bouchie, Mesa
Gaye Knight, Phoenix
#Larry Person, Scottsdale
#Antonio DeLaCruz, Surprise
Oddvar Tveit, Tempe
#Mark Hannah, Youngtown
*Walter Bouchard, Citizen Representative
*Corey Woods, American Lung Association of Arizona
Grant Smedley, Salt River Project
Brian O'Donnell, Southwest Gas Corporation
Mark Hajduk, Arizona Public Service Company
*Gina Grey, Western States Petroleum Association
*Randi Alcott, Valley Metro/RPTA
*Dave Berry, Arizona Motor Transport Association
Jeannette Fish, Maricopa County Farm Bureau
Steve Trussell for Russell Bowers, Arizona Rock Products Association
*Greater Phoenix Chamber of Commerce
Amanda McGennis, Associated General Contractors
*Spencer Kamps, Homebuilders Association of Central Arizona
*Mannie Carpenter, Valley Forward
*Erin Taylor, University of Arizona Cooperative Extension
Beverly Chenausky, Arizona Department of Transportation
Diane Arnst, Arizona Department of Environmental Quality
*Wienke Tax, Environmental Protection Agency
Jo Crumbaker, Maricopa County Air Quality Department
#Duane Yantorno, Arizona Department of Weights and Measures
*Ed Stillings, Federal Highway Administration
Judi Nelson, Arizona State University
#Christopher Horan, Salt River Pima-Maricopa Indian Community
*David Rueckert, Citizen Representative

*Members neither present nor represented by proxy.
#Participated via telephone conference call.
+Participated via video conference call.

OTHERS PRESENT

Lindy Bauer, Maricopa Association of Governments
Julie Hoffman, Maricopa Association of Governments
Randy Sedlacek, Maricopa Association of Governments
Cathy Arthur, Maricopa Association of Governments
Taejoo Shin, Maricopa Association of Governments
Dean Giles, Maricopa Association of Governments
Feng Liu, Maricopa Association of Governments
Adam Xia, Maricopa Association of Governments
Paul Lopez, City of Avondale
Wendy Kaserman, Town of Queen Creek
Lawrence Odle, Maricopa County Air Quality Department
Dennis Dickerson, Maricopa County Air Quality Department
Scott DiBiase, Pinal County Air Quality
Russell Van Leuven, Arizona Department of Agriculture
Mitch Wagner, Maricopa County Department of Transportation
Joonwon Joo, Arizona Department of Transportation

1. Call to Order

A meeting of the MAG Air Quality Technical Advisory Committee was conducted on September 24, 2009. John Kross, Town of Queen Creek, Chair, called the meeting to order at approximately 1:30 p.m. Jamie McCullough, City of El Mirage; Jim Weiss, City of Chandler; Chris Horan, Salt River Pima-Maricopa Indian Community; Larry Person, City of Scottsdale; Greg Edwards, City of Mesa; Antonio DeLaCruz, City of Surprise; Mark Hannah, Town of Youngtown; and Duane Yantorno, Arizona Department of Weights and Measures, attended the meeting via telephone conference call.

2. Call to the Audience

Mr. Kross stated that, according to the MAG public comment process, members of the audience who wish to speak are requested to fill out comment cards, which are available on the tables adjacent to the doorways inside the meeting room. Citizens are asked not to exceed a three minute time period for their comments. Public comment is provided at the beginning of the meeting for nonagenda items and nonaction agenda items. He noted that no public comment cards had been received.

3. Approval of the May 26, 2009 Meeting Minutes

The Committee reviewed the minutes from the May 26, 2009 meeting. Doug Kukino, City of Glendale, moved and Amanda McGennis, Associated General Contractors, seconded and the motion to approve the May 26, 2009 meeting minutes carried unanimously.

4. New MAG Committee Operating Policies and Procedures

Lindy Bauer, MAG, discussed the new MAG Committee Operating Policies and Procedures. She stated that in January 2009, members of the MAG Regional Council expressed interest in reviewing the policies and procedures that have been in place for a number of years at MAG. Ms. Bauer indicated that the MAG Regional Council appointed a seven-member task force of the Regional Council to develop the new procedures. On July 22, 2009, the Regional Council approved the new MAG Committee Operating Policies and Procedures. Ms. Bauer mentioned that in some instances the new policies and procedures modify the way business is conducted at MAG. Ms. Bauer stated that the new policies and procedures indicate that the Committee cannot conduct a meeting or have a discussion without a quorum. She noted the importance of a quorum.

Ms. Bauer discussed the appointment of officers for technical and policy committees. She stated that the appointments will now be made by the MAG Regional Council Executive Committee. Ms. Bauer indicated that the officer positions will have one-year terms, with possible reappointment to serve up to one additional term, by the consent of the respective committee. She mentioned that the Chair of the MAG Air Quality Technical Advisory Committee, John Kross, was appointed in July 2007 and has therefore served as Chair of the Committee for two years. Ms. Bauer stated that Mr. Kross has been wonderful to work with during his term. She commented that Mr. Kross is the Town Manager for Queen Creek and has had a lot of responsibilities; nevertheless, he has been generous in giving his time to the Committee and working with MAG staff. Ms. Bauer noted that Mr. Kross read the entire MAG Five Percent Plan for PM-10 when he became Chair of the Committee. She mentioned that Mr. Kross is on the MAG Management Committee and has supported the Committee and the MAG staff whenever recommendations have gone forward to the Management Committee from the Air Quality Technical Advisory Committee. Ms. Bauer thanked Mr. Kross for his leadership.

Mr. Kross thanked Ms. Bauer for her kind words and complimented the MAG staff on the support provided to him as Chair. He thanked the Committee for their support and participation in the meetings. Mr. Kross also expressed his gratitude with the Committee for sharing in the success of the region and participating in and improving the quality of life for all the communities. He noted the importance of the work that the Committee does for the region. Mr. Kross mentioned that he enjoyed working with the Committee as well as the MAG staff.

Mr. Kross announced that the new Committee Chair is Doug Kukino, City of Glendale. He stated that Mr. Kukino is the Environmental Resources Director for Glendale and has been involved with the Committee for 20 years. Mr. Kross added that the new Committee Vice Chair is Gaye Knight, City of Phoenix. He mentioned that Ms. Knight is the Air Quality Specialist for Phoenix and has also served on the Committee for over 20 years. Mr. Kross indicated that the new Chair and Vice Chair will preside over the next Committee meeting in October.

5. Update on CMAQ Projects for the Federal Fiscal Year 2009 Interim Year End Closeout

Dean Giles, MAG, provided an update on the Congestion Mitigation and Air Quality Improvement (CMAQ) Projects for the Federal Fiscal Year 2009 Interim Year End Closeout. Mr. Giles stated that on May 26, 2009, the Committee made a recommendation to forward the evaluation of the proposed CMAQ projects to the Transportation Review Committee (TRC) for use in prioritizing proposed CMAQ projects for 2009 closeout funds. He added that in June 2009, the TRC made a recommendation and the MAG Management Committee concurred with the recommendation to fund 28 projects. Mr. Giles indicated that the MAG Regional Council approved the closeout recommendation, which included five PM-10 unpaved road projects, and concluded the interim closeout. He mentioned that the following month, after additional CMAQ funding was determined to be available, the Regional Council took final action on the closeout that provided additional funding for the remaining fiscal year 2009 PM-10 certified street sweepers.

Mr. Giles commented that there were a number of sweepers remaining on the list. He stated that there was approximately $402,000 available through closeout which was combined with some additional funding in savings associated with four sweeper projects that were requested to be deleted. Mr. Giles added that the funded sweeper projects include: City of Phoenix #2; City of Tempe; Salt River Pima-Maricopa Indian Community; City of Chandler; Town of Youngtown; and a portion of the first Town of Buckeye sweeper project.

6. Inventory of Unpaved Roads

Randy Sedlacek, MAG, provided a presentation on the unpaved roads inventory for the Maricopa County PM-10 nonattainment area. He indicated that on May 23, 2007, the MAG Regional Council approved additional items for the Suggested List of Measures to Reduce PM-10. He added that one of the measures was to develop an unpaved roads inventory for the PM-10 nonattainment area. Mr. Sedlacek mentioned that the primary use of the inventory will be to measure the progress in eliminating unpaved roads. He provided an overview of the steps used to develop the inventory. Mr. Sedlacek commented that the unpaved roads were identified by using aerial photos and the MAG Geographic Information Systems (GIS) data from MAG member agencies and the Maricopa County Department of Transportation (MCDOT). In addition, traffic data was incorporated and added to the data set. He stated that individual unpaved road maps were developed for each member agency for their review. Mr. Sedlacek commented that the maps were revised based on comments received and sent out for additional review. The data has now been summarized.

Mr. Sedlacek stated that MAG GIS staff analyzed aerial photos to locate unpaved roads. He added that the results from the aerial photo analysis were combined with GIS data from member agencies and MCDOT. Mr. Sedlacek indicated that traffic count data came from member agencies, MAG, and Maricopa County Department of Transportation studies. He commented that MAG estimated traffic counts using a housing count algorithm that is based on the assumption of one dwelling unit is equal to ten vehicle trips per day. He indicated that member agencies assisted MAG with developing the inventory. Mr. Sedlacek added that the unpaved road maps by jurisdiction were sent to member agencies for review and comment. The data requested by MAG included: changes in incorporated boundaries; verification of boundaries of county islands; paving of unpaved roads; public unpaved roads and ownership; unpaved roads that are alleys; private unpaved roads; unpaved roads closed to the public; and, if available, estimates of average daily traffic on unpaved roads. Mr. Sedlacek stated that MAG GIS staff revised the unpaved roads maps in response to the comments received from the member agencies. He added that the traffic count data was also revised in response to comments received.

Mr. Sedlacek discussed the unpaved roads not included in the final inventory which included: alleys, agricultural roads, canal roads, closed unpaved roads, easements, restricted access roads and utility roads. Mr. Sedlacek stated that as of September 2009 there are an estimated 634 miles of public unpaved roads in the PM-10 nonattainment area and 1,258 miles of private unpaved roads. He mentioned that the majority of the private unpaved roads are in unincorporated Maricopa County. He added that the total unpaved roads in the PM-10 nonattainment area is 1,892 miles. Mr. Sedlacek presented a regional map of the public unpaved roads. He indicated that most of the public unpaved roads are along the boundaries of the PM-10 nonattainment area. Mr. Sedlacek presented a map of the private unpaved roads that showed the majority of private unpaved roads in unincorporated Maricopa County.

Mr. Sedlacek discussed the uses of the unpaved roads inventory. The uses include: measuring progress in reducing miles of unpaved roads; assisting member agencies in prioritizing paving projects and in proposing paving projects for CMAQ funding; and providing unpaved roads data for air quality modeling and analyses. Mr. Sedlacek discussed the policy issue in regard to unpaved roads. He mentioned that there is currently no prohibition on construction of new unpaved roads in the unincorporated areas of the PM-10 nonattainment area. The MAG Suggested List of Measures to Reduce PM-10 includes Measure 34 which is to prohibit new dirt roads including those associated with lot splits. Mr. Sedlacek noted that the Arizona Legislature did not implement Measure 34. He indicated that MAG allocates CMAQ funds each year for paving existing public unpaved roads; however, the benefit of paving existing roads is offset by the creation of new unpaved roads. Mr. Sedlacek stated that other serious PM-10 nonattainment areas such as Clark County and San Joaquin Valley have adopted similar measures to prohibit new unpaved roads. He noted that Measure 34 needs to be implemented in the PM-10 nonattainment area.

Brian O'Donnell, Southwest Gas Corporation, asked about the need for Measure 34 to be implemented. He inquired if the measure was submitted as part of the Five Percent Plan for PM-10. Ms. Bauer responded that the measure was on the Suggested List of Measures which goes out to the entities with the authority to put the measure in place for their consideration for possible implementation. She added that the measure is associated with the lot split issue and fell under the jurisdiction of the Arizona Legislature. Ms. Bauer mentioned that during their deliberations, the Legislature considered the measure but did not pass a prohibition on the unpaved roads. Therefore, this measure was not included as a committed measure in the Five Percent Plan for PM-10. Mr.

O'Donnell inquired about why the measure has to be implemented if it is not a committed measure or part of the inventory. Ms. Bauer responded that the policy issue is that the cities, MAG, and Maricopa County are spending public monies to pave public unpaved roads. She noted that as public monies are being used to pave unpaved roads, which are a big part of the emissions inventory, more dirt roads are being created primarily through lot splits. The cities then inherit those dirt roads when they annex these areas. Mr. O'Donnell inquired if the dirt roads existed when the original inventory was developed. Ms. Bauer responded that some of the dirt roads likely existed when the inventory was being developed; however, there was not a precise handle on how many dirt roads were out there and which were public or private. She added that the private dirt roads are difficult to address since public monies can not be used on a private unpaved road.

Mr. O'Donnell inquired if the measure needs to be implemented in order to be in attainment. He added that if the measure is not required as part of the attainment plan then it does not need to be implemented, although it may be helpful. Ms. Bauer stated that the plan needs to include measures on all of the significant sources. Ms. Bauer noted that the unpaved roads are a problem. She indicated that if the region has three years of clean data at the monitors, then MAG can prepare a maintenance plan. Ms. Bauer added that it is not a good idea to create more sources of PM-10. Mr. O'Donnell indicated that the measure may hurt development.

Jeannette Fish, Maricopa County Farm Bureau, inquired if MAG has the number of new unpaved roads and miles that have been created on an annual basis. Mr. Sedlacek responded that this inventory is a 2009 baseline inventory. He added that MAG does not have the number for a year to year change; however, MAG hopes to have that information in the future.

Mr. Kross inquired if the 1,800 miles are more or less than what it was at the beginning of the planning process. Cathy Arthur, MAG, responded that MAG is working on analyses to determine the growth rate. She stated that a two percent increase in mileage per year was assumed in the Five Percent Plan for PM-10. Ms. Arthur added that this was a crude estimate based on data for only two points in time. She indicated that this 2009 inventory will be used as a base. She also mentioned that MAG GIS staff will be looking at lot split activity historically to determine the number of miles that are being created as a result of lot splits. Ms. Arthur mentioned that the MAG GIS staff initially looked at 2007 and 2008; however, that was not a peak activity period. She indicated that staff will be going back further in time with the Maricopa County Assessor's records to evaluate the growth rate in unpaved roads.

Jo Crumbaker, Maricopa County Air Quality Department, inquired if it would be informative to have indicated where the PM-10 monitors are on the map in proximity to the unpaved roads. She added that this would help everyone have a sense of what lies ahead in addressing some of the issues. Mr. Sedlacek responded that the PM-10 monitors would be added to the maps.

Diane Arnst, Arizona Department of Environmental Quality, stated that even if the demonstration in the Five Percent Plan for PM-10 predicts attainment, it does not mean that the actual contributions from the additional sources will not make the opposite result appear. She inquired about the rationale for the unpaved roads that were not included in the final inventory. Ms. Arnst commented that canal roads were a significant contributor in the Yuma area and as a result speed limits were put in place since the roads were being used by off highway vehicles (OHVs). Mr. Sedlacek responded that the main rationale for not including certain unpaved roads was that there was not much average daily traffic (ADT) on those roads.

Oddvar Tveit, City of Tempe, referred to the slide that indicates that alleys are not included. He inquired about the determination for an alley that is a road to be included in the inventory. Mr. Sedlacek replied that in the final inventory alleys were not included since the average daily traffic was relatively small. Mr. Tveit inquired about the trip count threshold for including or not including alleys. Ms. Arthur replied that there is not a threshold; however, ten ADT is the default used for an alley if MAG is not given a specific number. She added that there were alleys that had higher ADTs but most of those are being paved. Therefore, the alleys were not included in the inventory.

Mr. Kukino inquired if the cities need the enabling legislation from the State in order to restrict lot splits. Mr. Kross responded that it is the minor subdivision provisions that allow up to three lot splits in State law for cities and towns. He added that there is a different threshold for the County. Mr. Kukino asked if a change in State Legislation is needed in order to implement Measure 34. Ms. Crumbaker responded that it will depend on whether the city is a charter or non-charter jurisdiction. She added that the non-chartered cities and the County, which is a creature of statute, will need a statutory change. Mr. Kross inquired if Maricopa County is a non-chartered county and therefore could not adopt a requirement for dust control with a lot split without legislation authority. Ms. Crumbaker responded that is correct. She stated that the voters turned down the bid for Maricopa County to become a chartered county.

Mr. O'Donnell mentioned that a dirt road for one residence on a five acre lot does not do a lot of damage. He added that the damage depends on how many homes and businesses will be served by that lot split. Mr. Kross commented on neighborhoods in the Southeast Valley with over 30 lots that have dirt streets. He added that as long as this behavior is allowed, it may be self-defeating at some point in time. Mr. Kross mentioned enabling legislation to give the cities, towns, and counties the powers and authority to address the issue in a more articulate and meaningful way in order to gain compliance.

Steve Trussell, Arizona Rock Products Association, requested clarification from Ms. Arthur on her statement about two percent growth in the amount of new unpaved roads. Ms. Arthur responded that the Five Percent Plan for PM-10 assumes a growth of two percent in unpaved road miles per year. She mentioned that the Plan also assumes an average of three dwelling units on each lot split which is equivalent to 30 ADT. Ms. Arthur added that multiplying the ADT by the road length gives you the vehicle miles of travel (VMT) which is an increase of 1.02 percent per year. She stated that the numbers are estimates since better data was not available at that point in time. She added that MAG staff is in the process of verifying whether that assumption is a reasonable estimate. The unpaved road VMT growth rate of 1.02 percent is also being used in conformity. Ms. Arthur added that an increase in unpaved road PM-10 of one percent per year really adds up over 20 years. Ms. Arthur indicated that by prohibiting new unpaved roads the growth rate would be zero and the problem can be addressed by paving the remaining public unpaved roads.

Mr. Kross inquired if the unpaved road inventory will be reported annually. He expressed the importance of the issue with respect to the region's ability to be successful in implementing the Five Percent Plan for PM-10. Ms. Bauer responded that MAG will be reporting the information annually. She added that the data from the CMAQ Annual Report could be used to update the inventory given that report includes the roads that have been paved using CMAQ monies.

Mr. Kross mentioned that the suggestion to add the monitors to the maps will be very helpful. Grant Smedley, Salt River Project, stated that it may also be helpful to show the values at the monitors over the past few years in order to target efforts toward the roads that are in areas with higher readings. Mr.

Sedlacek inquired if Mr. Smedley was referring to a max value at the monitors. Mr. Smedley responded that is correct.

Larry Person, City of Scottsdale, inquired about the compliance assumption that was made for unpaved roads that meet the ADT threshold in Maricopa County Rule 310.01. Ms. Arthur responded that MAG looked at each commitment that was submitted by a city, town, or Maricopa County and took credit for that particular commitment. She provided an example of how credit was taken and added that there was no single regional compliance rate.

Mr. Person stated that in the City of Scottsdale dust palliatives are used to control dust on roads that meet the ADT thresholds. He indicated that some residents of Scottsdale chose to live on the unpaved roads and consider it a quality of life issue, keeping them closer to the natural environment. Mr. Person mentioned the equestrian community. He commented that the citizens of Scottsdale have provided feedback and have indicated that they would like the City to keep the unpaved roads and balance that with controlling the dust by using dust palliatives to meet clean air requirements. Mr. Person stated that the City of Scottsdale has never had a Notice of Violation for dust from an unpaved road that met the regulatory threshold in the ten years that they have maintained the roads that way. Mr. Person suggested that an effective dust palliative program can be an acceptable alternative to paving unpaved roads. Ms. Arthur responded that MAG assumed a 50 percent reduction in the unpaved road emission rate for dust palliatives for commitments submitted by jurisdictions that indicated they are controlling unpaved roads in this manner.

Mr. Person inquired about the difference in dust generated from an unpaved road that has been effectively treated with a dust palliative versus a paved road where there is a re-entrainment issue. Ms. Arthur replied that the average PM-10 emission rate for unpaved roads is 666.62 grams per mile. She noted that 50 percent would be 331.31 grams per mile and that an average paved arterial has an emission rate of approximately 3.51 grams per mile. Ms. Arthur added that unpaved roads treated with dust palliatives are still emitting a lot higher PM-10 levels than a paved road. Mr. Person stated that the experience of the Scottsdale residents has been that the dust palliatives on the unpaved roads makes the road surface virtually the same in hardness as an asphalt road. He added that feedback was based on the horses hooves on the hard surfaces. Mr. Person mentioned that unless there is silt loading on top of the hardened surface, he is not sure that 331.31 grams per mile is an accurate assumption depending on the dust palliative that was used. Ms. Arthur responded that the 50 percent control assumption has not been validated and perhaps a study is needed. She added that MAG made a conservative assumption in the Five Percent Plan for PM-10. Mr. Person stated that he is hopeful that MAG would consider citizen view points throughout the Valley, including in the City of Scottsdale, and also consider the option of paved and treated unpaved roads as a goal.

Ms. Crumbaker inquired if MAG considered that the excluded roads are a source of trackout onto adjoining paved roads. Ms. Arthur responded that trackout was taken into account in the Five Percent Plan for PM-10. She indicated that the excluded roads could be added into the inventory; however, there is already a major challenge in paving or stabilizing the high traffic unpaved roads. Ms. Arthur commented on the large number of public unpaved roads that have not yet been paved and indicated that dealing with the bigger issues will have more of an impact on PM-10.

Beverly Chenausky, Arizona Department of Transportation, inquired if the access points from the dirt roads to paved roads can be identified and quantified. Ms. Arthur responded that previously, MAG GIS staff was unable to identify unpaved shoulders; therefore, it may be difficult to identify unpaved access points. However, Ms. Arthur mentioned that she would look into it. Mr. Person stated that he

hopes that MAG would also identify the access points that are similar to those in Scottsdale which have been paved 25 to 50 feet to minimize trackout onto a paved surface.

Mr. Kross commented on Scottsdale residents that are living on larger lots with dirt roads to their properties. He inquired if the concern for a rural lifestyle is shared by other parts of the City. Mr. Kross mentioned the equestrian community. He added that Mr. Person's suggestion for MAG to look at other alternatives to achieve dust control is a worthy suggestion and should be analyzed. Mr. Person responded that the City of Scottsdale has character area plans. He indicated that the character area plan for the equestrian areas calls for retaining unpaved roads in an attempt to preserve that lifestyle and the character of those regions. Mr. Kross inquired if this is discussed in the general plan. Mr. Person responded yes.

Ms. Knight inquired about the daily traffic counts for the unpaved roads. She asked if all the roads are under 150 trips per day. Mr. Sedlacek replied that the traffic counts were not included on the maps due to the scale of the map; however, that information is available.

7. Notice of Intent to File A Lawsuit From the Arizona Center for Law in the Public Interest for PM-10

Ms. Bauer discussed the notice of intent to file a lawsuit from the Arizona Center for Law in the Public Interest for PM-10. She mentioned that the Arizona Center for Law provided a notice of intent to file a lawsuit on August 4, 2009 to the Environmental Protection Agency (EPA) which contends that EPA failed to take final action on the Maricopa County Rule 316 that is tied to the Revised Salt River State Implementation Plan and the Five Percent Plan for PM-10. The letter indicates that if action is not taken within 60 days, the Arizona Center for Law in the Public Interest intends to file a lawsuit. She added that EPA is reviewing the Plan and MAG will keep the Committee informed.

8. Tentative MAG Air Quality Project Schedule

Ms. Bauer discussed the tentative MAG Air Quality Project Schedule. She stated that the updated schedule describes the major regional air quality activities for the next two years. She stated that the schedule includes a footnoted that indicates the due date for the Carbon Monoxide Maintenance Plan Revision. Ms. Bauer added that the conformity schedule has been updated with the latest changes.

Mark Hajduk, Arizona Public Service Company, stated that there has been some discussion about the ozone standard being reduced to a lower level than the current standard. He added that this change may require a new plan and more modeling. Mr. Hajduk inquired if MAG anticipates this change in the future. Ms. Bauer responded that this item will be discussed at the October Committee meeting. She added that MAG could provide the EPA fact sheet where EPA recently decided to stay the 0.075 parts per million standard. She added that the fact sheet indicates that EPA went against their own panel in setting the 0.075 parts per million standard. Ms. Bauer noted that the fact sheet also includes a revised schedule. Ms. Crumbaker commented that the revised schedule keeps the 2013 original due date; however, the schedule cuts the designation time for EPA. Mr. Hajduk inquired about the redesignation and asked if other areas will be affected. Ms. Arsnt responded probably yes.

Mr. O'Donnell commented on the Greenhouse Gas Reduction Requirements on the schedule. He stated that EPA made it official that the 2010 greenhouse gas inventory has to be completed in 2011. Mr. O'Donnell added that those with more than 25,000 metric tons will need to report on their greenhouse gases. Mr. Hajduk stated that the Markey-Waxman initiative is a separate action with respect to the mandatory greenhouse gas reporting rule. Mr. O'Donnell replied that in order to implement the rule, an inventory will need to be conducted. He noted that the inventory is now

required by EPA. Ms. Knight stated that the Greenhouse Gas Emissions Inventory is not the type of inventory that MAG develops for the whole region. She added that it is 700 pages of regulations and is divided by more than 100 industries. Ms. Knight mentioned that the City of Phoenix may be impacted because of landfills. She commented that a long list of industries will have to start reporting in January. Ms. Knight indicated that the Greenhouse Gas Emissions Inventory is different than the emissions inventory that is discussed by this Committee.

Mr. Person stated that it may be helpful for MAG to provide a briefing for the cities on the potential impacts. He added that the legislation exempted wastewater treatment facilities. He indicated that there are other elements in the Greenhouse Gas Emissions Inventory requirements that might eventually impact municipalities and others. Ms. Bauer responded that what was meant by including Greenhouse Gas Reduction Requirements on the schedule was that MAG has been monitoring the American Clean Energy and Security Act of 2009 as passed by the U.S. House of Representatives since it has some requirements for Metropolitan Planning Organizations. She added that a presentation was provided to the Committee previously on the Clean Energy and Security Act as well as CLEAN TEA. Ms. Bauer commented that the Surface Transportation Reauthorization Act of 2009 is quiet at the moment due to the extensions. She mentioned that Ms. Knight could potentially provide a presentation on the impacts of the Greenhouse Gas Emissions Inventory.

Ms. Knight stated that the City of Phoenix has spent a significant amount of time reviewing the rule and has made a number of comments. She added that many of the comments have been accepted. Ms. Knight stated that one of the comments was on landfills. She also indicated that wastewater treatment facilities are excluded. She mentioned that she is available for those who wish to contact her for additional information. Ms. Knight indicated that MAG would not normally be involved with what cities would be reporting as industrial sources of greenhouse gas emissions. Mr. Person expressed concern about the provision in the current rule regarding contiguous and adjacent facilities. Ms. Knight responded that this is strictly industrial and does not involve city boundaries.

Ms. Arnst mentioned that the Committee will be reviewing the CMAQ project evaluations next month. She requested that the Committee receive the project evaluations at least a week prior to the meeting to allow time for review. Ms. Bauer responded that MAG will make every effort to provide the evaluations one week in advance of the meeting. She added that the process depends on the projects being received according to schedule. Also, occasionally the data will change. Ms. Bauer indicated that MAG staff works hard to get the project evaluations completed and will continue to try and get them out as soon as possible. She noted that MAG understands the importance of having enough time to review the CMAQ project evaluations.

9. Call for Future Agenda Items

Ms. McGennis commented on the economic downturn and stated that there are new contractors coming in from out of state. She added that many of the contractors are responding to the requests for qualifications and are not aware of the air quality requirements in the area. Ms. McGennis indicated that the out of state contractors currently have bids on huge projects and have not included any type of air quality remediation in their bid. She asked the Committee to remember in their bid advertisement that the contractors must adhere to the Maricopa County Air Quality Department requirements. Ms. McGennis stated that a company may get into trouble in a high profile area. Ms. McGennis asked the Committee to be mindful when placing the advertisements. She added that the people from around the Valley know the regulations; however, those from out of state do not.

Mr. Trussell inquired if an update could be provided on the monitoring network. He commented on Pinal County and the potential for a PM-2.5 boundary extending into Maricopa County. Mr. Trussell discussed having the stakeholders weigh-in on where the boundaries would be located. He asked if Lawrence Odle, Maricopa County Air Quality Department Director, has had an opportunity to speak to the Committee. Mr. Kross responded that Mr. Odle provided a presentation at a previous Air Quality Technical Advisory Committee meeting. Mr. Kross inquired if Mr. Trussell was requesting an update on the readings at the monitors. Mr. Trussell responded yes and requested an item from ADEQ or EPA regarding the analyses and submittals that have be sent to EPA for natural events. He mentioned that some of the readings from the monitors have been flagged as natural events and he expressed interest in knowing where the region stands with regard to those events.

Mr. O'Donnell commented on redrawing the boundaries to reduce the areas that are not in attainment by removing the areas that are in attainment. The boundary does not always have to be expanded. Mr. O'Donnell mentioned that resources should be in areas that have an attainment problem.

Mr. Kross announced that the next meeting of the Committee has been tentatively scheduled for October 29, 2009 at 1:30 p.m. With no further comments, the meeting was adjourned at 2:36 p.m.

MARICOPA ASSOCIATION of GOVERNMENTS

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Agenda Item #4

October 22, 2009

TO: Members of the MAG Air Quality Technical Advisory Committee

FROM: Dean Giles, Air Quality Planning Program Specialist

SUBJECT: EVALUATION OF PROPOSED FY 2014 CMAQ PROJECTS FOR THE FY 2011-2015 MAG TRANSPORTATION IMPROVEMENT PROGRAM

The Maricopa Association of Governments staff has conducted an evaluation of proposed FY 2014 Congestion Mitigation and Air Quality Improvement (CMAQ) projects submitted for the FY 2011-2015 MAG Transportation Improvement Program. In Attachment A, Tables 1 through 4 provide the results of the project evaluation ranked by cost-effectiveness by modal category. In accordance with the FY 2009 Draft MAG Federal Fund Programming Principles, this information is being presented to the MAG Air Quality Technical Advisory Committee for a possible recommendation to forward the CMAQ evaluation to the MAG Transportation Review Committee and modal committees for use in prioritizing projects. In addition, it is requested that the Committee rank the Air Quality Projects in Table 1, to be forwarded to the MAG Transportation Review Committee.

It is important to note that the Regional Rideshare Program, Telework/Ozone Education Program, Trip Reduction Program, and Travel Reduction Program for the current and subsequent years (2010-2014) are under review by the MAG Regional Council Executive Committee. The Executive Committee is evaluating the programs for efficiencies and consolidation. Project amounts are being held in abeyance. Any ranking of these projects is subject to change depending on the decisions made by the Regional Council Executive Committee. Please refer to Attachment B on the role of the AQTAC in the Congestion Mitigation and Air Quality Improvement Project Evaluation Process.

BACKGROUND

According to the final Congestion Mitigation and Air Quality Improvement Program Guidance, published October 20, 2008, the purpose of the CMAQ program is to fund transportation projects or programs that will contribute to attainment or maintenance of the national ambient air quality standards for ozone, carbon monoxide, and particulate matter. A description of the 16 project categories contained in federal CMAQ guidance as well as general activities and projects eligible for CMAQ funding is provided in Attachment C.

Each year, MAG programs available federal funds. Jurisdictions are requested, through the MAG Management Committee, the Transportation Review Committee, and modal committees, to submit project requests for federal funding. The Regional Transportation Plan allocates CMAQ funding

percent by mode (see Attachment D). The approximate FY 2014 CMAQ funding levels include: Arterial Life Cycle Program and Intelligent Transportation Systems projects ($6.887 million), bicycle and pedestrian projects ($8.737 million), and air quality projects ($7.503 million). In addition to these categories of projects, the Regional Transportation Plan allocated CMAQ funding for Freeway Management System (FMS) projects and light rail transit. Since the specific FMS project improvements to be funded for FY 2014 are currently unknown, the CMAQ project evaluation will be made as this information becomes available. The deadline for submitting requests for FY 2014 projects was September 18, 2009.

The MAG Public Participation Process is divided into four phases: Early Phase, Mid-Phase, Final Phase, and Continuous Involvement. MAG is currently in the Continuous Involvement Phase and to obtain public input into the transportation programming process, a Transportation Public Meeting was conducted on October 13, 2009.

The Methodologies for Evaluating Congestion Mitigation and Air Quality Improvement Projects, April 16, 2009, were used to estimate the emission reduction benefits of the proposed CMAQ projects. The methodologies were presented at the CMAQ workshop conducted by MAG on March 31, 2009 and revised based on input received at the CMAQ workshop. Where appropriate, the emission reduction benefits and cost-effectiveness of CMAQ eligible projects have been quantified using these methodologies.

The CMAQ methodologies involve the estimation of the total daily weighted emissions reduction of PM-10, nitrogen oxides (NOx), and total organic gases (TOG) expressed in kilograms per day, and the cost-effectiveness of each project, measured in CMAQ dollars per metric ton of total annual emissions reduced. Since there have been no violations of the carbon monoxide (CO) standard since 1996, carbon monoxide has been assigned a weight of zero and therefore no CO emissions reductions are shown. The Environmental Protection Agency MOBILE6.2 emission model was used to estimate emission factors for NOx, TOG, and PM-10 exhaust, tire wear, and brake wear for the year of project implementation. The emission factors from EPA AP-42 were used to estimate reentrained PM-10 emissions from vehicles traveling on paved and unpaved roads.

All CMAQ eligible projects were evaluated for expected emission reductions and cost-effectiveness. Attachment A, Tables 1 through 4, provide the results of the project evaluation ranked by cost-effectiveness within each modal category. It is important to note that all of the proposed projects support committed control measures contained in the MAG air quality plans. It is anticipated that these projects will be reviewed and ranked by the modal committees and then forwarded to the Transportation Review Committee.

Following review of the CMAQ evaluation by the MAG Air Quality Technical Advisory Committee, it is anticipated that the Committee may make a possible recommendation to forward the CMAQ evaluation to the MAG Transportation Review Committee and modal committees for use in prioritizing projects. In addition, it is requested that the Committee rank the Air Quality Projects in Table 1 to be forwarded to the MAG Transportation Review Committee. The Transportation Review Committee will be requested to recommend a fiscally constrained list of projects for federal funding

to the MAG Management Committee for inclusion in the Draft FY 2011-2015 MAG Transportation Improvement Program.

If you have any questions, please contact me at (602) 254-6300.

Attachments

Attachment A

Table 1 - Evaluation of Proposed AIR QUALITY Projects for the Federal Fiscal Year 2014 Sorted by Cost Effectiveness
Approximately $7.5 million available for FY 2014 (RTP)

Agency	Location	Work Type	FY	Length (miles)	Emission Reduction Weighted TOG(kg/day)	Emission Reduction Weighted NOx(kg/day)	Emission Reduction Weighted PM10(kg/day)	Emission Reduction Weighted Total(kg/day)	Cost Effectiveness ($/met.ton)	CMAQ Funds Requested
MAG	Regionwide	Purchase PM-10 Certified Street Sweepers[1]	2014		0.00	0.00	290.07	290.07	$1,211	$900,000
MAG	Regionwide	Pave Unpaved Roads Program[2]	2014	10.0	0.00	0.00	603.43	603.43	$1,423	$4,664,000
MAG	Regionwide	Telework/Ozone Education Program[3,13]	2014		69.45	62.95	197.55	329.95	$2,566	$300,000
MAG	Regionwide	Regional Rideshare Program[4,11]	2014		92.12	83.49	262.01	437.62	$3,830	$594,000
MAG	Regionwide	Trip Reduction Program[5,12]	2014		138.88	125.87	395.03	659.78	$3,892	$910,000
MAG	Regionwide	Travel Reduction Program[4,10]	2014		0.92	0.83	2.61	4.36	$87,411	$135,000

Table 2 - Evaluation of Proposed BICYCLE Projects for the Federal Fiscal Year 2014 Sorted by Cost Effectiveness (Includes Weighted Emission Reductions)

Agency	Location	Work Type	FY	Length (miles)	Emission Reduction Weighted TOG(kg/day)	Emission Reduction Weighted NOx(kg/day)	Emission Reduction Weighted PM10(kg/day)	Emission Reduction Weighted Total(kg/day)	Cost Effectiveness ($/met.ton)	CMAQ Funds Requested
Maricopa County	New River Road from Desert Hills Road to Venado Road	This project will widen the shoulders of New River Road to allow for a 5' bicycle lane without curb or gutter.[6,9]	2014	4.3	0.10	0.05	24.20	24.34	$6,919	$914,725
Fort McDowell Yavapai Nation	Fort McDowell Rd: SR-87 to Mohave Rd & Yavapai Rd	Widen the existing rural roadway section by 6 feet on each side and stripe the additional roadway as an on-road bicycle lane.[6,9]	2014	3.0	0.09	0.04	9.07	9.20	$13,882	$693,700
Youngtown	Outside limits are Grand Avenue and 111th Avenue to Olive Avenue and Agua Fria Parkway	Project will include creating new bike and pedestrian trails along undeveloped ROW; additionally existing roadways will be widened and/or bike lanes marked for bicycle safety.[6,7,9]	2014	5.0	0.07	0.03	0.59	0.70	$77,340	$292,800
Phoenix	Thomas Road: 22nd Street to Grand Canal	A 10' wide multi-use path will be installed along the south side of Thomas Road between the traffic signal at the Thomas Road and 22nd Street intersection to the existing asphalt path along the Grand Canal bank and providing an accessible connection.[6,7]	2014	0.1	0.37	0.16	0.21	0.75	$84,230	$341,950
Gilbert	Guadalupe Road & SRP Powerline Easement (between Val Vista Drive & Greenfield Road)	The project will improve five shared-use path crossings of arterial streets with appropriate bicycle facilities, such as bicycle signals.[6]	2014	0.5	0.42	0.20	0.26	0.88	$103,671	$497,000
Glendale	Grand Canal Outfall Channel and New River	Multi-use pathway ramps will connect to three separate multi-use pathways at a below grade location in the Grand Canal Outfall Channel.[6,7]	2014	0.09	0.33	0.15	0.19	0.66	$106,798	$663,320
Phoenix	Indian School Road: Grand Canal to 16th Street and 16th Street: Grand Canal to Indian School Rd	A 10' multi-use path will be installed along the north side of Indian School Road between the east side of the Grand Canal and the traffic signal at the intersection of 16th Street and Indian School Road.[6,7]	2014	0.2	0.45	0.20	0.26	0.91	$162,688	$1,396,500

Table 2 - Evaluation of Proposed BICYCLE Projects for the Federal Fiscal Year 2014 Sorted by Cost Effectiveness (Includes Weighted Emission Reductions)

Agency	Location	Work Type	FY	Length (miles)	Emission Reduction Weighted TOG(kg/day)	Emission Reduction Weighted NOx(kg/day)	Emission Reduction Weighted PM10(kg/day)	Emission Reduction Weighted Total(kg/day)	Cost Effectiveness ($/met.ton)	CMAQ Funds Requested
Glendale	Maryland Avenue and 75th Avenue to a point 257 feet east of 75th Avenue on the Maryland Avenue alignment	Existing drainage structure will be removed, surface area widened by excavation, retaining wall built, fence replaced, and pathway built.[6,7]	2014	0.05	0.19	0.08	0.11	0.38	$173,213	$358,529
Scottsdale	Arizona Canal from 64th Street to Goldwater Blvd and intersections at 64th St/Thomas, 64th/Osborn, 64th/Indian School, 68th/Indian School and 68th St and AZ Canal.	Improvements to the crosswalks and curb ramps at critical intersections.[6,7]	2014	0.9	0.53	0.23	0.30	1.06	$232,595	$2,323,780
Glendale	East bank of New River from Northern Avenue to the Bethany Home Road alignment	The addition of underpass lighting, landscaping, irrigation, ramada, tables, benches, and bike racks.[6,7]	2014	2.25	0.33	0.15	0.19	0.66	$278,309	$999,500
Chandler	Galveston Street & Loop 101 at milepost 59.6	Construct a 10' wide bicycle/pedestrian bridge, ramps, landing areas & path connections over the Loop 101 freeway at Galveston Street.[6,7]	2014	0.15	0.52	0.23	0.30	1.06	$323,998	$2,056,758
Avondale	Central Avenue in Avondale, Arizona - Van Buren Street south to Western Avenue	Bike lanes, mill & overlay, installation of planters, reduction of roadway width.[6]	2014	1.0	0.26	0.13	0.16	0.55	$361,137	$1,077,405
Litchfield Park	West side of Old Litchfield Road from W Fairway Drive north to E Bird Lane	Install a 10 foot wide integrally colored cement concrete pathway.[6,7]	2014	0.52	0.03	0.01	0.02	0.07	$426,216	$153,948
Tempe	El Paso Gas Easement Multi-Use Path: Rural Road to Kiwanis Park	Construct multi-use path, provide landscaping and lighting, and install furniture and art work.[6,7]	2014	0.5	0.26	0.12	0.15	0.53	$461,014	$1,323,000
Scottsdale	Along the north bank of the Arizona Canal, north of Camelback Road extending north	Construct 0.1 miles of 10-foot wide shared-use path along the north bank of the Arizona Canal from Camelback Road extending north, featuring landscaping, site furnishings, and art.[6,7]	2014	0.1	0.30	0.13	0.17	0.60	$797,171	$2,585,545
El Mirage	Thunderbird Road to Port Royale Lane	This project will include a concrete sidewalk, irrigation, landscaping and site furnishings.[6,7]	2014	0.85	0.07	0.03	0.04	0.13	$1,103,139	$792,835

Table 3 - Evaluation of Proposed PEDESTRIAN Projects for the Federal Fiscal Year 2014 Sorted by Cost Effectiveness (Includes Weighted Emission Reductions)

Agency	Location	Work Type	FY	Length (miles)	Emission Reduction Weighted TOG(kg/day)	Emission Reduction Weighted NOx(kg/day)	Emission Reduction Weighted PM10(kg/day)	Emission Reduction Weighted Total(kg/day)	Cost Effectiveness ($/met.ton)	CMAQ Funds Requested
Avondale	Western Avenue from Central Avenue to City Limits	Pavement preservation, landscaping, sidewalk modifications, pedestrian ramps.[7]	2014	0.42	0.03	0.01	0.01	0.05	$1,846,408	$465,658
Gilbert	A pathway located between Gilbert Road and Ash Street, from the Water Tower Plaza	The project will design and develop a quarter-mile pedestrian pathway connecting the Water Tower Plaza and Western Powerline Trail Park.[7]	2014	0.25	0.01	0.00	0.00	0.01	$2,963,238	$222,600
El Mirage	Varney Road from Dysart Road to El Mirage Road	This project will include new 8' sidewalk on the south and north sides of Varney Road from Dysart Road to El Mirage Road.[7]	2014	1.25	0.003	0.001	0.001	0.004	$11,357,278	$261,584

Attachment A

Table 4 - Evaluation of Proposed ITS Projects for the Federal Fiscal Year 2014 Sorted by Cost Effectiveness (Includes Weighted Emission Reductions)

Agency	Location	Work Type	FY	Length (miles)	Emission Reduction Weighted TOG(kg/day)	Emission Reduction Weighted NOx(kg/day)	Emission Reduction Weighted PM10(kg/day)	Emission Reduction Weighted Total(kg/day)	Cost Effectiveness ($/met.ton)	CMAQ Funds Requested
Phoenix	Within Phoenix	Develop the City of Phoenix ITS Strategic Plan.[8]	2014	770.0	205.94	92.63	0.00	298.57	$365	$182,000
Maricopa County	Associated with AZTech Center-to-Center traffic management system located primarily at ADOT and MCDOT	Upgrade the Regional Archive Data Center Equipment and Systems to enhance archiving capacity and the utility of real time traffic data.[8]	2014	700.0	100.30	45.11	0.00	145.41	$562	$136,500
Phoenix	Within Phoenix	To extend Phase B Fiber Optic Backbone.[8]	2014	770.0	205.94	92.63	0.00	298.57	$1,639	$818,000
Scottsdale	Loop 101 at three intersections, Hayden Road, the 101 Freeway interchange at Pima Rd and 90th Street	1. To identify traffic adaptive signal systems that have been deployed and returned successful outcomes in reducing traffic delay on stated corridors across the country. 2. Deploy the selected system on FLW and complete before and after delay studies. 3. Evaluate if the Adaptive System can minimize delay as well, or better than real-time control of the area signals through the Traffic Management Center and human intervention.[8]	2014	1.0	1.27	1.21	0.00	2.47	$9,518	$39,375
Peoria	Four Corridors: Peoria Ave, Northern Ave, Olive Ave and 75th Ave, located in the southern most area of City of Peoria	To upgrade the existing cabinets, traffic controllers and also upgrade the existing loop detection to video detection on selected corridors to improve the overall communication within the City's Network and also upgrade the hardware and software with the changing technologies in ITS.[9]	2014	15.0	9.99	8.56	0.00	18.55	$22,571	$700,000
El Mirage	Within City Limits	Various arterial traffic signal enhancements to improve existing signalized intersections for computerized signal control, closed circuit video, improved pedestrian control, improved signage and signal preemption.[8]	2014	16.0	2.83	2.36	0.00	5.18	$47,959	$415,660
Tempe	Corridors of Elliot/Guadalupe/Warner	This project proposes to use an existing conduit along Elliot for fiber optic communication to the signals. Wireless radios will be used to provide communication to signals along Guadalupe & Warner. CCTVs will be placed at the major intersections for traffic monitoring.[8]	2014	13.0	2.52	1.16	0.00	3.68	$67,465	$415,485
Chandler	Ray, Elliot, Dobson, connecting at Arizona back to TMC	Provide fiber communications to Traffic Signals in the project back to the TMC.[8]	2014	9.0	1.85	1.61	0.00	3.46	$138,621	$801,500
Gilbert	Seven intersections near Baseline Road & Val Vista Drive	The project enables the traffic control center to respond to traffic congestion at 7 intersections remotely and make real-time improvements.[8]	2014	3.0	0.54	0.21	0.00	0.75	$252,728	$317,122
Glendale	67th Avenue between Glendale Ave and Cholla Street, near the intersection of 83rd Ave/Maryland	Expand the city's remote traffic monitoring and management capabilities along with providing redundancies to the communications system.[8]	2014	3.5	0.90	0.41	0.00	1.31	$451,181	$987,000
Maricopa County	Various locations along MC85 from Agua Fria Bridge West Terminal to 75th Ave	To extend traffic management capabilities along MC 85, thus improving traffic flow and overall roadway capacity, and reducing reliance on private sector leased lines for required communication links.[8]	2014	5.5	0.71	0.28	0.00	0.98	$515,879	$847,000
Fountain Hills	Shea Blvd. and Downtown Area	Provide an Initial Deployment ITS system for the traffic signals on Shea Blvd. and in the Downtown Area; with monitoring/control sites at Town Hall and the Street Yard.[8]	2014	7.0	0.51	0.20	0.00	0.71	$847,724	$1,000,000

Table 4 - Evaluation of Proposed ITS Projects for the Federal Fiscal Year 2014 Sorted by Cost Effectiveness (Includes Weighted Emission Reductions)

Agency	Location	Work Type	FY	Length (miles)	Emission Reduction Weighted TOG(kg/day)	Emission Reduction Weighted NOx(kg/day)	Emission Reduction Weighted PM10(kg/day)	Emission Reduction Weighted Total(kg/day)	Cost Effectiveness ($/met.ton)	CMAQ Funds Requested
Goodyear	Van Buren Street - Estrella Parkway to Cotton Lane	This project will provide traffic signal connectivity to three existing and one future traffic signal. In addition, CCTV cameras will be provided at key intersections.[8]	2014	2.0	0.34	0.05	0.00	0.39	$1,236,143	$812,000

Notes:

[1]Supports the Measure in the MAG 2007 Five Percent Plan for PM-10: "Sweep Streets with PM-10 Certified Street Sweepers"

[2]Supports the Measure in the MAG 2007 Five Percent Plan for PM-10: "Pave or Stabilize Existing Public Dirt Roads and Alleys"

[3]Supports the Transportation Control Measures (TCM) in the Serious Area PM-10 Plan and CO Maintenance Plan:" Encouragement of Telecommuting, Teleworking and Teleconferencing" and "Areawide Public Awareness Programs"

[4]Supports the TCMs in the Serious Area PM-10 Plan and CO Maintenance Plan: "Areawide Public Awareness Program" and "Employer Rideshare Program Incentives"

[5]Supports the TCM in the Serious Area PM-10 Plan and CO Maintenance Plan: "Trip Reduction Program"

[6]Supports the TCM in the Serious Area PM-10 Plan and CO Maintenance Plan: "Development of Bicycle Travel Facilities"

[7]Supports the TCM in the Serious Area PM-10 Plan and CO Maintenance Plan: "Encouragement of Pedestrian Travel"

[8]Supports the TCMs in the Serious Area PM-10 Plan and CO Maintenance Plan: " Coordinate Traffic Signal Systems" and "Develop Intelligent Transportation Systems"

[9]These projects also include shoulder paving which supports the measure in the MAG 2007 Five Percent Plan for PM-10: "Pave or Stabilize Unpaved Shoulders"

[10]The funding amount for the Arizona Department of Administration Travel Reduction Program project is being held to the current level of $135,000.
This project will be considered and evaluated for regional funding amounts and effectiveness by the MAG Regional Council Executive Committee.
The Executive Committee is currently considering efficiencies and consolidation of the rideshare and alternate mode related activities.

[11]The funding amount for the Regional Public Transportation Authority Regional Rideshare Program project is being held to the current level of $594,000.
This project will be considered and evaluated for regional funding amounts and effectiveness by the MAG Regional Council Executive Committee.
The Executive Committee is currently considering efficiencies and consolidation of the rideshare and alternate mode related activities.

[12]The funding amount for the Maricopa County Trip Reduction Program project is being held to the current level of $910,000.
This project will be considered and evaluated for regional funding amounts and effectiveness by the MAG Regional Council Executive Committee.

[13]The funding amount for the Regional Public Transportation Authority Telework/Ozone Education Program project is being held to the current level of $300,000.
This project will be considered and evaluated for regional funding amounts and effectiveness by the MAG Regional Council Executive Committee.
The Executive Committee is currently considering efficiencies and consolidation of the rideshare and alternate mode related activities.

Attachment B

ROLE OF THE MAG AIR QUALITY TECHNICAL ADVISORY COMMITTEE IN THE CONGESTION MITIGATION AND AIR QUALITY IMPROVEMENT (CMAQ) PROJECT EVALUATION PROCESS

CMAQ Projects for the Transportation Improvement Program

- Forward the evaluation of proposed CMAQ projects for the MAG Transportation Improvement Program to the MAG Transportation Review Committee and modal committees for use in prioritizing projects.

- Rank the Air Quality Projects to be forwarded to the MAG Transportation Review Committee.

Sequence of Committee Actions: Air Quality Technical Advisory Committee, Transportation Review Committee and Modal Technical Advisory Committees, Management Committee, Transportation Review Committee, Regional Council.

PM-10 Certified Street Sweeper Projects

- Recommend a prioritized list of proposed PM-10 Certified Street Sweeper Projects for CMAQ funding and retain the prioritized list for any additional CMAQ funds that may become available due to year-end closeout, including redistributed obligation authority, or additional funding received by this region.

Sequence of Committee Actions: Air Quality Technical Advisory Committee, Management Committee, Regional Council.

Paving Unpaved Road Projects

- Rank the proposed Paving Unpaved Road Projects for CMAQ funding and forward to the MAG Transportation Review Committee.

Sequence of Committee Actions: Air Quality Technical Advisory Committee, Transportation Review Committee, Management Committee, Transportation Policy Committee, Regional Council.

MAG COMMITTEE STRUCTURE

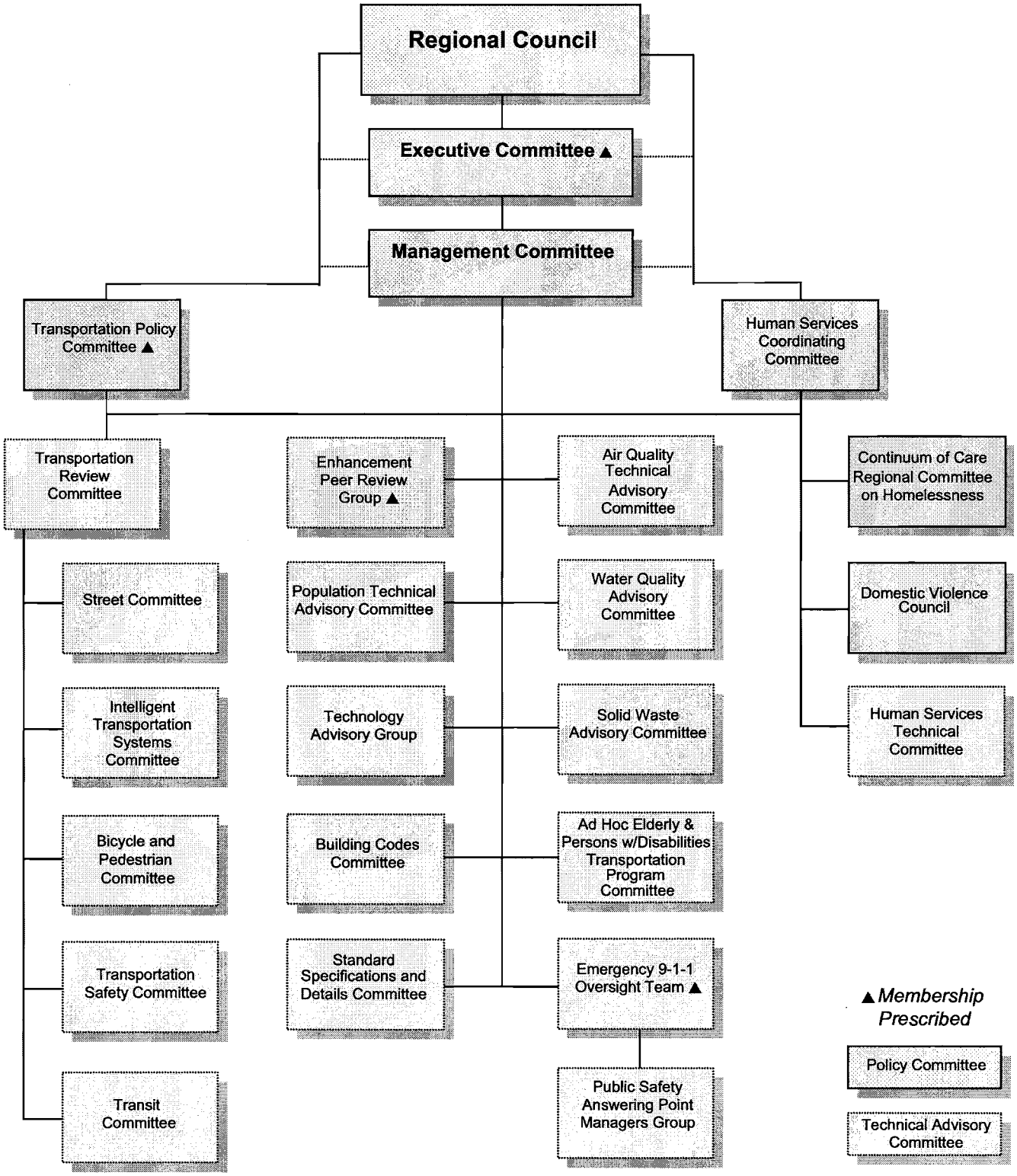

Figure 7: MAG Committee Structure

October 21, 2009

Attachment C

CONGESTION MITIGATION AND AIR QUALITY IMPROVEMENT PROGRAM FACT SHEET

According to the final Congestion Mitigation and Air Quality Improvement (CMAQ) Program Guidance, published October 20, 2008, the purpose of the CMAQ program is to fund transportation projects or programs that will contribute to attainment or maintenance of the national ambient air quality standards for ozone, carbon monoxide, and particulate matter. Table 1 provides a description of the 16 project categories contained in federal CMAQ guidance as well as general activities and projects eligible for CMAQ funding. Table 1 also includes the CMAQ eligible projects and programs added from transportation reauthorization, Safe Accountable Flexible Efficient Transportation Equity Act: A Legacy For Users (SAFETEA-LU). Table 2 provides a list of ineligible CMAQ activities and projects.

The SAFETEA–LU directs States and MPOs to give priority to two categories of funding. First, to diesel retrofits, particularly where necessary to facilitate contract compliance, and other cost-effective emission reduction activities, taking into consideration air quality and health effects. Second, priority is to be given to cost-effective congestion mitigation activities that provide air quality benefits.

The development of a CMAQ-eligible project may occur through a public-private partnership. Private entity proposals that benefit the general public by clearly reducing emissions require a legal written agreement between the public agency and private or nonprofit entity specifying the use of funds, roles and responsibilities of participating entities, cost sharing arrangements for capital investments and/or operating expenses, and how the disposition of land, facilities, and equipment should original terms of the agreement be changed. Eligible costs under this section may not include costs to fund an obligation imposed on private sector or nonprofit entities under the CAA or any other federal law except where the incremental portion of a project that exceeds the obligation under Federal law.

Table 1. Eligible CMAQ Activities and Projects

1. **Transportation control measures (TCMs) found in 42 U.S.C. §7408(f)(1)**
   - programs for improved public transit
   - restriction of certain roads or lanes to, or construction of such roads or lanes for use by, passenger buses or high occupancy vehicles
   - employer-based transportation management plans, including incentives
   - trip-reduction ordinances
   - traffic flow improvement programs that achieve emission reductions
   - fringe and transportation corridor parking facilities serving multiple-occupancy vehicle programs or transit service
   - programs to limit or restrict vehicle use in downtown areas or other areas of emission concentration particularly during periods of peak use
   - programs for the provision of all forms of high-occupancy, shared ride services
   - programs to limit portions of road surfaces or certain sections of the metropolitan area to the use of non-motorized vehicles or pedestrian use, both as to time and place
   - programs for secure bicycle storage facilities and other facilities, including bicycle lanes, for the convenience and protection of bicyclists, in both public and private areas
   - programs to control extended idling of vehicles
   - programs to reduce motor vehicle emissions from extreme cold-start conditions
   - employer-sponsored programs to permit flexible work schedules
   - programs and ordinances to facilitate non-automobile travel, provision and utilization of mass transit, and to generally reduce the need for single-occupant vehicle travel, as part of transportation planning and development efforts of a locality, including programs and ordinances applicable to new shopping centers, special events, and other centers of vehicle activity
   - programs for new construction and major reconstructions of paths, tracks or areas solely for the use by pedestrian or other non-motorized means of transportation when economically feasible and in the public interest

2. **Extreme Low-Temperature Cold Start Programs**
   - retrofitting vehicles and fleets with water and oil heaters
   - installing electrical outlets and equipment in publicly-owned garages or fleet storage facilities

3. **Alternative Fuels and Vehicles**
   - establishment of publicly-owned fueling facilities and other infrastructure needed to fuel alternative-fuel vehicles, unless privately-owned fueling stations are in place and reasonably accessible
   - support the conversion of private fueling facility to support alternative fuels through a public-private partnership
   - purchase of publicly-owned non-transit alternative fuel vehicles, including passenger vehicles, refuse trucks, street cleaners, and others
   - costs associated with converting fleets to run on alternative fuels
   - for private vehicles, the cost difference between alternative fuel vehicles and comparable conventional fuel vehicles
   - hybrid vehicles that have lower emission rates than their non-hybrid counterparts
   - hybrid passenger vehicles that meet EPA low emission and energy efficiency requirements for certification under the HOV exception provisions of SAFETEA-LU
   - projects involving heavier vehicles, including refuse haulers and delivery trucks may be eligible based on a comparison of the emissions projections of these larger candidate vehicles and other comparable models

4. **Congestion Reduction & Traffic Flow Improvements**
   - traditional traffic flow improvements, such as the construction of roundabouts, HOV lanes, left-turn or other managed lanes are eligible provided they demonstrate net emissions benefits
   - Intelligent Transportation Systems (ITS) projects such as traffic signal synchronization projects, traffic management projects, and regional multimodal traveler information systems, traffic signal control systems, freeway management systems, electronic toll-collection systems, transit management systems, and incident management programs
   - Value/Congestion Pricing projects that generate an emissions reduction, including, but not limited to: tolling infrastructure, such as transponders and other electronic toll or fare payment systems; small roadway modifications to enable tolling; marketing, public outreach efforts to expand and encourage the use of eligible pricing measures; and support services, such as transit in a newly tolled corridor
   - innovative pricing approaches supported through the Value Pricing Pilot Program
   - operating expenses for traffic flow improvements for a period not to exceed three years if shown to produce air quality benefits, if the expenses are incurred from new or additional services, and if previous funding mechanisms, such as fares or fees for services, are not displaced
   - projects or programs that involve the purchase of integrated, interoperable emergency communications equipment

5. **Transit Improvements**
   - new transit facilities (e.g., lines, stations, terminals, transfer facilities) are eligible if they are associated with new or enhanced mass transit service
   - rehabilitation of a facility may be eligible if the vast majority of the project involves physical improvements that will increase capacity and results in an increase in transit ridership
   - new transit vehicles (bus, rail, or van) to expand fleet or replace existing vehicles
   - diesel engine retrofits, such as replacement engines and exhaust after-treatment devices, are eligible if certified or verified by the EPA or CARB
   - other transit equipment may be eligible if it represents a major system-wide upgrade that will significantly improve speed or reliability of transit service, such as advanced signal and communications systems
   - fuel, whether conventional or alternative fuel, is an eligible expense only as part of a project providing operating assistance for new or expanded transit service, including fuel and fuel additives considered diesel retrofit technologies by EPA or CARB
   - operating assistance, including labor, fuel, maintenance, and related expenses, to introduce new transit service or expand existing transit service s is eligible for a maximum of 3 years
   - regular transit fares may be subsidized as part of a comprehensive area-wide program to prevent exceedances of NAAQS during periods of high pollutant levels; must be combined with a marketing program to inform SOV drivers of other transportation options

6. **Bicycle and Pedestrian Facilities and Programs**
   - construction of bicycle and pedestrian facilities (paths, bike racks, support facilities, etc.) that are not exclusively recreational and reduce vehicle trips
   - non-construction outreach projects related to safe bicycle use
   - establishment and funding of State bicycle/pedestrian coordinator positions for promoting and facilitating nonmotorized transportation modes through public education, safety programs, etc.

7. **Travel Demand Management**
   - activities explicitly aimed at reducing SOV travel and associated emissions including fringe parking, traveler information services, shuttle services, guaranteed ride home programs, market research and planning in support Transportation Demand Management implementation, carpools, vanpools, traffic calming measures, parking pricing, variable road pricing, telecommuting, and employer-based commuter choice programs
   - capital expenses and up to 3 years of operating assistance to administer and manage new or expanded TDM programs
   - marketing and outreach efforts to expand use of TDM measures may be funded indefinitely, but only if broken out as distinct line items
   - telecommuting activities including planning, preparing technical and feasibility studies, and training

8. **Public Education and Outreach Activities**
   - a wide range of public education and outreach activities, including activities that promote new or existing transportation services, developing messages and advertising materials (including market research, focus groups, and creative), placing messages and materials, evaluating message and material dissemination and public awareness, technical assistance, programs that promote the Tax Code provision related to commute benefits, transit "store" operations, and any other activities that help forward less-polluting transportation options

9. **Transportation Management Associations**
   - TMA start-up costs and up to 3 years of operating assistance

10. **Carpooling and Vanpooling**
    - carpools and vanpools marketing covers existing, expanded, and new activities to increase the use of carpools and vanpools and includes the purchase and use of computerized matching software and outreach to employers and guaranteed ride home programs
    - vanpool vehicle capital costs include purchasing or leasing vans that do not directly compete with or impede private sector initiatives; vanpool operating expenses are limited to 3 years and include empty-seat subsidies, maintenance, insurance, administration, and other related expenses

11. **Freight/Intermodal**
    - projects and programs (e.g. new diesel engine technology or retrofits of vehicles or engines, nonroad mobile freight projects) that provide a transportation function and target freight capital costs including rolling stock or ground infrastructure are eligible provided that air quality benefits can be demonstrated

12. **Diesel Engine Retrofits & Other Advanced Truck Technologies**
    - applicable to onroad motor vehicles and nonroad construction equipment, project types in the diesel retrofit area include: diesel engine replacement, full engine rebuilding and reconditioning, the purchase and installation of after-treatment hardware including particulate matter traps and oxidation catalysts, and other technologies, and support for heavy-duty vehicle retirements programs
    - purchase and installation of emission control equipment on school buses
    - refueling projects (e.g., ultra-low sulfur diesel), but only if required to support the installation of emissions control equipment, repowering, rebuilding, or other retrofits of nonroad engines and only until the standards are effective and the fuel becomes commonly available through the regional supply and logistics chain. Eligible costs are limited to the difference between standard nonroad diesel fuel and ULSD
    - outreach activities that provide information exchange and technical assistance to diesel owners and operators on retrofit options
    - under a public-private partnership, projects for upgrading long-haul heavy-duty diesel trucks with advanced technologies, such as idle reduction devices, cab and trailer aerodynamic fixtures, and single-wide or other efficient tires are eligible

13. **Idle Reduction**
    - capital costs of off-board projects (e.g., truck stop electrification projects) that reduce emissions and are located within, or in proximity to and primarily benefitting a nonattainment or maintenance area
    - capital costs of on-board projects (e.g., auxiliary power units, direct fired heaters, etc.) the heavy-duty vehicle must travel within, or in proximity to and primarily benefitting a nonattainment or maintenance area

14. **Training**
    - funds to support training and educational development for the transportation workforce must be directly related to implementing air quality improvements and be approved in advance by the FHWA Division Office

15. Inspection/Maintenance (I/M) Programs

- for publicly or privately owned I/M facilities that constitute new or additional efforts eligible activities include construction of facilities, purchase of equipment, I/M program development, and one-time start-up activities, such as updating quality assurance software or developing a mechanic training curriculum
- operating expenses are eligible for a maximum of three years
- State or local I/M program related administrative costs are eligible in States that rely on privately owned I/M facilities
- privately-owned I/M facilities such as service stations, that own the equipment and conduct emission test-and-repair services, requires a public-private partnership
- establishment of "portable" I/M programs, including remote sensing providing that they are public services, reduce emissions, and meet relevant regulations

16. Experimental Pilot Projects

- an "experimental" project or program must be defined as a transportation project and be expected to reduce emissions by decreasing vehicle miles traveled (VMT), fuel consumption, congestion, or by other factors

17. In particulate matter nonattainment or maintenance areas, examples of eligible projects and programs include:

- paving dirt roads
- street sweeping equipment

Table 2. Ineligible CMAQ Activities and Projects

1. **Projects outside of the nonattainment or maintenance area boundaries, except in cases where the project is located in close proximity to the nonattainment or maintenance area and the benefits will be realized primarily within the nonattainment or maintenance area**

2. **Light-duty vehicle scrappage programs**

3. **Projects that add new capacity for single-occupancy vehicle (SOV) are ineligible for CMAQ funding unless construction is limited to high occupancy vehicle (HOV) lanes**

4. **Routine maintenance and rehabilitation projects (e.g., replacement-in-kind of track or other equipment, reconstruction of bridges, stations, and other facilities, and repaving or repairing roads) are ineligible for CMAQ funding as they only maintain existing levels of highway and transit service, and therefore do not reduce emissions**

5. **Administrative costs of the CMAQ program may not be defrayed with program funds**

6. **Projects that do not meet the specific eligibility requirements under United States Code titles 23 or 49**

7. **Stand-alone projects to purchase fuel, except in certain states**

8. **Routine preventive maintenance for vehicles is not eligible as it only returns the vehicles to baseline conditions**

9. **Operating assistance for truck stop electrification projects is not an eligible activity since these projects generate their own revenue stream and can therefore recover all operating expenses**

Attachment D

TABLE 5-5

FUNDING PERCENT BY MODE (Expressed by Percentage)								
Mode	**Program Area**	**½ Cent**	**ADOT Funds**	**FTA (5307)**	**FTA (5309)**	**CMAQ**	**MAG-STP**	**Total Regional Funding**
Freeways	Capital	52.0	100.0	0.0	0.0	19.1	0.0	55.0
	Operations	4.2	0.0	0.0	0.0	0.0	0.0	2.2
	Total	56.2	100.0	0.0	0.0	19.1	0.0	57.3
Streets	Capital	10.2	0.0	0.0	0.0	13.4	100.0	9.3
Buses	Capital	4.2	0.0	90.6	12.7	0.0	0.0	8.4
	Operations	11.9	0.0	0.0	0.0	0.0	0.0	6.4
	Total	16.0	0.0	90.6	12.7	0.0	0.0	14.8
LRT	Capital	14.4	0.0	0.0	87.3	35.9	0.0	14.7
Other Transit	Capital	0.4	0.0	9.4	0.0	0.0	0.0	0.8
	Operations	2.5	0.0	0.0	0.0	0.0	0.0	1.3
	Total	2.9	0.0	9.4	0.0	0.0	0.0	2.1
Planning	Programs	0.4	0.0	0.0	0.0	0.0	0.0	0.2
Bicycle/ Pedestrian	Capital	0.0	0.0	0.0	0.0	17.0	0.0	0.8
Air Quality	Programs	0.0	0.0	0.0	0.0	14.6	0.0	0.7
Total Funding	Capital	81.1	100.0	100.0	100.0	85.4	100.0	89.1
	Operations	18.9	0.0	0.0	0.0	14.6	0.0	10.9
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Percent Funding by Major Mode								
Freeways		56.2	100.0	0.0	0.0	19.1	0.0	57.3
Streets		10.2	0.0	0.0	0.0	13.4	100.0	9.3
Transit		33.3	0.0	100.0	100.0	35.9	0.0	31.7
Other		0.4	0.0	0.0	0.0	31.6	0.0	1.8
Total		100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Maricopa Association of Governments

Agenda Item #6

PUBLIC NOTICE
Arizona Department of Environmental Quality
Request for Public Comments
On Exceptional/Natural Events in the Greater Phoenix Area, 2008

EPA allows data that have been directly influenced by exceptional and/or natural events (e.g., caused by blowing dust from major storms) to be excluded in the determination of exceedances and National Ambient Air Quality Standards (NAAQS) violations for State Implementation Plan (SIP) purposes. Persuant to 40 CFR 50.14(c)(3)(i), the Arizona Department of Environmental Quality (ADEQ) is soliciting comments on its final demonstrations of events that have caused elevated concentrations of PM_{10} in the Greater Phoenix area in 2008, on ADEQ's decision to flag these episodes based on these analyses, and on two white papers, the first titled, "Impact of Exceptional Events 'Unusual Winds' on PM_{10} Concentrations in Arizona" and the second titled, "High Wind Exceptional Events and Control Measures for PM_{10} Areas." Copies of these documents are available for review beginning Thursday, October 15, 2009, on the ADEQ Web-site at www.azdeq.gov/environ/air/plan/index.html. Interested parties can submit written comments throughout the comment period which will end at 5:00 p.m. on Friday, November 13, 2009. Any comments received will be forwarded to EPA with the final demonstrations.

Written comments should be addressed, faxed, or e-mailed to:
Andra Juniel, Air Assessment Section, Arizona Department of Environmental Quality, 1110 W. Washington Street, 3415-A, Phoenix, AZ 85007, PHONE: (602) 771-4417; FAX: (602) 771-2366, E-mail: juniel.andra@azdeq.gov.

In addition to being available on-line, copies of these documents are available for review at the following location:

> Arizona Department of Environmental Quality, Library, First Floor, 1110 W. Washington Street, Phoenix, Arizona 85007, Attn: Lorraine Cona, (602) 771-2217.

This document is available in alternative formats by contacting ADEQ TDD phone number at (602) 771-4829 or 1-800-234-5677 ext. 771-4829.

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Public Notices, Hearings & Meetings
Regional Haze
Salt River PM10 Plan
SIP Documents
Visible Emissions (Opacity) Rule Revisions
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Preventing Air Pollution
Public Notices
Rules
Smoke Management
Vehicle Emissions
Visibility & Regional Haze
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ADEQ Newsroom
Assistance
Compliance
Education & Outreach
Laws, Rules & Policies
Permitting
Publications & Forms
Employment
Doing Business with ADEQ
BROWSE BY PROGRAM
Air Quality
Tank Programs
Waste Programs
Water Quality

AIR QUALITY PLANS: PROPOSED 2008 REVISED DRAFT DEMONSTRATIONS FOR EXCEPTIONAL EVENTS IN THE GREATER PHOENIX AREA

ADEQ has notified the Environmental Protection Agency (EPA) of information regarding exceptional events that resulted in exceedances of the 24-hour PM_{10} National Ambient Air Quality Standards (NAAQS) in the Greater Phoenix area during 2008. After preliminary investigations of the extreme natural conditions that caused the exceedances, ADEQ determined that the aforementioned high PM_{10} concentrations were caused by exceptional events. ADEQ staff worked with EPA staff to add certain components to the assessment reports to improve clarity and better document the conditions that caused the exceedances. They have been posted to the ADEQ Web site for a formal 30-day review and comment period.

For definitions of exceptional events see 40 CFR 50.1(j) and (k), and for "treatment of air quality monitoring data influenced by exceptional events" see 40 CFR 50.14.

Event	PROPOSED Preliminary Assessment Reports
1	March 2, 2008 - Buckeye Event
2	March 14, 2008 - West 43rd Avenue Event
3	April 16, 2008 - West 43rd Avenue Event
4	April 30, 2008 - West 43rd Avenue Event
5	May 21, 2008 - West 43rd Avenue Event
6	June 4, 2008 - Buckeye Event June 4, 2008 - Coyote Lakes Event June 4, 2008 - West 43rd Avenue Event
7	July 1, 2008 - Buckeye Event
8	July 4, 2008 - Buckeye Event
9	Oct. 11, 2008 - South Phoenix Event
10	Oct. 22, 2008 - Coyote Lakes Event
11	Nov. 7, 2008 - Durango Event (cannot flag)
12	Nov. 9, 2008 - Durango Event Nov. 9, 2008 - South Phoenix Event Nov. 9, 2008 - West 43rd Avenue Event

To strengthen the request for EPA concurrence on exceptional/natural events in Arizona, ADEQ researched threshold wind speeds that suspend dust into the air and special circumstances that lead to elevated dust levels. ADEQ also examined the effectiveness of PM_{10} control measure for high wind events in Arizona. This research is described in the white papers listed below. The white papers are included as supplements to the exceptional event assessments.

- Impact of Exceptional Events 'Unusual Winds' on PM_{10} Concentrations in Arizona
- High Wind Exceptional Events And Control Measures for PM_{10} Areas

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ADEQ
Arizona Department
of Environmental Quality

High Wind Exceptional Events And Control Measures for PM_{10} Areas

Air Quality Division

October 13, 2009

High Wind Exceptional Events and Control Measures for PM_{10} Areas

1.0 Background

Under the authority of the Clean Air Act (CAA), the Environmental Protection Agency (EPA) develops National Ambient Air Quality Standards (NAAQS) for each of the criteria pollutants (carbon monoxide, lead, nitrogen oxides, ozone, particulate matter, and sulfur dioxide). For each of these pollutants, EPA tracks air concentrations based on actual measurements of pollutant concentrations in the ambient (outside) air at selected monitoring sites throughout the country. Once an air quality standard for a particular pollutant is established, monitors record when ambient concentrations of that pollutant exceed a level at which human health is no longer protected.[1] Should these exceedances continue or grow in intensity, the regulatory remedy is to declare the area in violation of the standard and designate the area nonattainment for that pollutant. The only time an exceedance would not count toward a violation of a standard is if that exceedance could be classified as an exceptional event.

Exceptional Events impact air quality when their influence results in ambient air concentrations of particulate matter that fall outside the range of normal statistical fluctuations. For particulate matter, these events can be the result of large fires, high winds, man-made events such as explosions, or natural events such as volcanic eruptions. In the Western United States, high winds can accompany large storms (e.g., haboobs) that move across a regional or state-wide swath of land, or high winds can accompany "micro-bursts" with or without rain that descend upon a small, localized area. When a monitor within a planning area registers an exceedance of the PM_{10} NAAQS – or 150 micrograms per cubic meter ($\mu g/m^3$) over 24 hours – the exceedance is flagged in the EPA Air Quality System (AQS) database and an examination of the event begins to determine if the event could be classified as exceptional.[2] More than three exceedances at the same particulate matter monitor within three consecutive years add up to a violation of the NAAQS. A violation has a consequence to a planning area of either preventing an area from reaching attainment or returning an area to nonattainment that was previously redesignated to attainment. If an exceedance is flagged as an exceptional event, however, and the EPA's Regional Office concurs, the exceedance is not counted toward a violation of the NAAQS.

Control measures are established to bring a nonattainment area into attainment for a particular NAAQS; the control measures are to remain in place even after the area is redesignated to attainment. These control measures can include Best Available Control Measures (BACM) or Technology (BACT), Reasonable Control Measures (RACM) or Technology (RACT), Most Stringent Measures (MSM), and Lowest Achievable Emission Rate (LAER). Other control measures can be case-by-case control measures or practices that have been shown to be effective in reducing pollution from a particular source; for PM_{10} examples include Agricultural Best Management Practices (AgBMPs), stabilization of vacant lots, or paving unpaved roads or shoulders. A nonattainment area can be classified as Moderate, Serious, or Severe. The CAA requires areas designated as serious nonattainment for PM_{10} to implement BACM and BACT on all significant sources of PM_{10}.

1.1 PM_{10} Planning Areas in Arizona

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[1] A primary NAAQS standard prevents damage to human health; a secondary standard prevents environmental and property damage.

[2] Areas redesignated to attainment are subject to maintenance plans. An exceedance of the NAAQS is treated the same way as a nonattainment area; however, maintenance plan design values can be flagged as well but are not addressed by the federal Exceptional Events Rule. Maintenance plans are in place for 20 years.

Arizona has nine PM_{10} planning areas:

Ajo	Nonattainment; new plan under development
Bullhead City	Redesignated to attainment under a Limited Maintenance Plan
Douglas-Paul Spur	Nonattainment; new plan under development
Hayden	Nonattainment; plan to be revised[3]
Maricopa County	Nonattainment; under Five Percent Plan[4]
Miami	Nonattainment; Limited Maintenance Plan submitted to EPA
Nogales	Nonattainment; plan to be revised; also nonattainment for $PM_{2.5}$
Payson	Redesignated to attainment under a Limited Maintenance Plan
Rillito	Nonattainment; Limited Maintenance Plan submitted to EPA
Yuma	Nonattainment; Maintenance Plan submitted to EPA

Detailed information about the planning areas can be obtained by going to ADEQ's Web site at http://www.azdeq.gov/environ/air/plan/index.html.

1.2 High Wind Exceptional Events Versus Fire Events

As previously stated, exceptional events can include among other events, fire events and high wind events. For the purposes of this discussion, however, the focus is on high wind events as they are often the more prevalent cause of exceedances in areas throughout Arizona as well as other parts of the Western United States due to complex terrain and unique weather patterns. The characteristics of these high wind events are discussed further in a white paper titled, *Impact of Exceptional Events 'Unusual Winds' on PM_{10} Concentrations.*

2.0 Control Measures

The development of a state implementation plan (SIP) for an area designated as nonattainment for PM_{10} includes at the minimum:

- a review of all relevant monitoring sites and ambient monitoring data;
- development of an emissions inventory of all contributing sources of PM_{10};
- application of emission factors to the ambient concentrations recorded in the emissions inventory; any controls already in place for PM_{10} emissions;
- any controls in place in areas throughout the country, particularly the West, with similar characteristics to the planning area;
- any current research on effective control measures; current level of enforcement for any control measures already in place;
- and any modeling that shows the effectiveness of control measures on PM_{10} emissions.

Fortunately, there is a moderate amount of information about control measures for PM_{10}; unfortunately, much of the information is source and area-specific. Information on the relative effectiveness of control measures is not as abundant, nor is it easily applicable to the specific conditions in most of the PM_{10} planning areas in Arizona. Because the demonstrations required to obtain a concurrence on an exceptional event should account for the relative complexity of the emitting source mix, parsing out a specific source or source category along with the applicable control measure for a determination of relative effectiveness can be difficult and may even be counter-productive. This is compounded by the

[3] The Hayden area was previously included with the Miami area; split into two planning areas later approved by EPA.

[4] Maricopa County nonattainment area also include Apache Junction portion of Pinal County.

fact that PM_{10} cannot be characterized by a specific source category through routine examination of the particulates deposited on a monitor's filter. Through the SIP development process, however, the overall make-up of the planning area is known and fairly reliable assumptions about source contribution and implemented control measure effectiveness can be made in most cases.

2.1 Evaluating the Effectiveness of Control Measures; Implementation and Enforcement

There are several ways to evaluate the effectiveness of a control measure. The most direct approach is actual field testing. Planners can also query representatives of other planning areas for examples of effective control measures, sharing testing data, or replicating specific field tests. Another approach is to research control measures that have been recognized as BACM by EPA, other states, source emitters, or in some cases by the courts. Regardless of how a control measure is chosen and its relative effectiveness evaluated, it is often subjected to a computer model to demonstrate whether the control measure or measures actually show a reduction in emissions or prevent an increase in the concentration of emissions (i.e., reasonable further progress toward attaining the NAAQS).

Optimum effectiveness is measured by the degree of control efficiency; efficiency can be a set percentage or a range (i.e., the range can represent how the control measure is to be implemented over time) in relation to the level of compliance, or control efficiency multiplied by the compliance level. In the case where a control measure is a one-time, succinct action such as paving an unpaved road, the effectiveness should be high.[5] Other calculations of effectiveness can be less straightforward due to the variables in implementation and enforcement. Degree, range and timing of control measure implementation coupled with a variable level of enforcement make field inspections of vital importance to determine the true effectiveness of certain control measures. Without reliable or complete reporting of the implementation of control measures, the lower or lowest range of control efficiency is most likely reflective of actual field situations. It is difficult to calculate other types of control measure effectiveness when the implementation is more qualitative than quantitative in nature, even though the measure has proven effective in field tests (e.g., actions required only when special circumstances arise, or actions that rely on training and advanced communication). Field inspections, reporting, and a noticeable reduction in emissions provide verification of projected control efficiency for a particular control measure. A pattern of non-compliance would provide verification that the control efficiency has been compromised or the control measure itself was perhaps unenforceable as currently designed or implemented.

Due to the varied nature of control measures, a planning approach that commits to a series of control measures rather than relying solely on only a few is often the best way to gain an overall high level of control effectiveness for a planning area. The commitment to implement these measures suggests that an optimal level of enforcement will be in place, often strengthened further by permit conditions, rules, and ordinances with specific consequences for non-compliance. Control measures that are voluntary in nature can also have a high degree of effectiveness but often rely on ongoing outreach and inspections. Contingency measures are designed to provide additional emission reductions should the committed control measures fail to provide sufficient reductions. These measures are often not modeled toward progress in reducing emissions of a particular pollutant, but they can be effective should sources not wish to move to the higher degree of control these measures can represent.

By considering a control measure or suite of control measures in place around the time of an exceptional event, such as those triggered by high winds, it should be possible to determine the following: either (a) the control measure effectiveness was insufficient to control the background concentration of emissions thereby contributing to cumulative emissions sufficient to exceed the NAAQS when coupled with high

[5] In areas where a maintenance plan is in place, control measures that may appear permanent must be routinely revisited to assure that they are in good condition, or authority to enforce certain measures is still in place.

winds, or (b) the wind conditions were unique and severe enough to overwhelm the control measures regardless of control effectiveness.

3.0 Effect of Exceptional Events (High Winds) on Control Measures; Overwhelmed Controls

In parts of the Western United States high wind events can generally be classified as one of two types: mesoscale events or synoptic scale events. Mesoscale high winds associated with thunderstorm development are localized events that are often initially devoid of rain and cause a reduction in visibility due to lofted particles from disturbed arid land or certain soil types. Synoptic scale high wind events, on the other hand, have a greater tendency to transport particles over long distances. Both types of high wind events are capable of transporting particles into an area from distances outside of a specific planning area. This paper does not attempt to explain in detail the effect of these types of high winds, but in relation to planning area control measures it is important to note that at times these winds can overwhelm or greatly reduce the effectiveness of a control measure or suite of control measures.

Unfortunately, information on the effects of high wind events on control measures, specifically measures for the control of particulate matter, is not readily available. Most of the information is anecdotal in nature, observations after the fact. There are studies on the effects of high winds on particulate matter itself – effects of particle size bombardment and particle size relative to transport – but the information does not always translate well to control measure applications or is too case-specific. More to the point, however, is an understanding that certain measured high wind speeds do cause lifting of certain soil types or increase background concentrations of already existing particulates. There is a fair amount of agreement and observations to support that high winds over a certain speed can overwhelm most controls regardless of the level of implementation or enforcement. The phenomenon is discussed further in a corresponding white paper titled, *Impact of Exceptional Events 'Unusual Winds' on PM_{10} Concentrations.*

4.0 Tracking Relative Effectiveness of Implemented Control Measures During High Winds

As stated previously, it is essential that the control measures for a planning area be routinely inspected for implementation and level of enforcement in order to have a meaningful sense of control measure effectiveness. Text of permit conditions needs to be periodically reviewed, dust complaints need to be properly logged and the subject of timely and appropriate response, inspections and any enforcement actions that resulted need to be reported, along with any other action necessary to determine the full implementation of a control measure. When comparing the control measures to the effects of a high wind event, it is helpful to know what the conditions were on the ground and in the air prior to the high wind event, the day of the high wind event, and after the high wind event. The time before the event can determine possible contributors to elevated PM_{10} concentrations while the time after the event could expose non-compliance patterns that would not otherwise be directly tied to the event.

In order to obtain a better picture of what control measures are in place during the intervals of a high wind event, a simple reporting form has been constructed. This form, when reviewed by analysts of the high wind event, should provide a clearer picture of what could have contributed to the exceedance and could add to an argument that the event was indeed exceptional. The form requires several pieces of useful information. (1) Because some, but not all, planning areas have High Pollution Advisory (HPA) notification procedures, including high wind watches for particulate matter pollution, noting the existence of a HPA action on the day of or days prior to the event is important.[6] (2) Complaints are useful bits of

[6] For areas that do not have a HPA program in place, the National Weather Service issues storm watches and warnings to alert the public to possible heavy rain, flooding, gusty winds and blowing dust. Airports, both large and small regional air fields, also have data sources that register high winds and reduced visibility so aircraft warnings can be issued.

information as they often reveal insufficient implementation or enforcement of control measures, especially if the complaints are for the same source or group of sources; in the case of voluntary measures they can be the only available measure of effectiveness. (3) Inspections completed routinely or for special purposes (e.g., nighttime inspections) give specific information on what is happening in and around the planning area, particularly inspections required during a HPA. (4) Finally, any record of notices or actual enforcement actions on a source in the planning area tells a story of serious non-compliance with implemented control measures, or it tells of control measures that have been insufficiently implemented.

A sample form is attached to this paper. Each party responsible (i.e., State, County, or any other relevant public officer/agency) for sources in the planning area would complete the form, which would then be reviewed by those preparing the analysis that demonstrates whether the high wind event is truly an exceptional event. For those events that are obviously of such severity that control measures would be overwhelmed, it is still useful to note the control measure actions for the planning area, especially an issuance of a HPA or pertinent weather forecast. The reverse side of the form contains the committed control measures for the planning area. Control measures can vary considerably for particular planning areas, but including them on the form reminds everyone that they need to be considered in the exceptional event analysis.

5.0 Conclusion

A demonstration that a high wind event is in fact an exceptional event requires a robust analysis of the wind conditions coupled with an examination of the control measures in place in and around the area in which the monitor registered an exceedance. This demonstration must not only pass the scrutiny of regulators but also the general public. Should the high wind event that caused the exceedance truly reflect an influence that resulted in ambient air concentrations of particulate matter that fell outside the range of normal statistical fluctuations, then EPA's concurrence with the demonstration allows for a focus on PM_{10} emissions that can be controlled.

PM_{10} Control Measures Reporting Form
High Wind Exceptional Event Demonstration

Date of Flagged Event _____

PM_{10} Planning Area _____

Exceeding Monitor(s) _____

AQI/High Wind/Dust Forecast (rolling three day forecast) Issued?

Yes	No
☐	☐

Type: _____

In the spaces below, please provide information about the 72-hour period preceding the event, the day of the event, and the 72-hour period following the event. For a list of control measures for the planning area, see back of this form. Account for minimum 2 mile area around exceeding monitor(s). *Please attach additional information if necessary.*

Complaints:

_____
_____
_____

Inspections:

_____
_____
_____

Notices or Enforcement Actions:

_____
_____
_____

Regulating Agency _____

Information Supplied By _____

Date Completed _____

FOR INTERNAL PURPOSES ONLY
Reviewed by / date: _____

Measures included in the Maricopa County PM_{10} 5 Percent Plan
(25 committed measures in parentheses)

1. Extensive dust control training program (2).
2. Dust managers/Coordinators at earthmoving sites < than or equal to 5 acres (3,16).
3. Increase proactive Rule 310 and 316 inspections (9, 10, 44).
4. Strengthen Rule 310 to promote continuous compliance (36 thru 38, 28).
5. Conduct nighttime and weekend inspections (8).
6. Ban leaf blowers from blowing debris into streets (21).
7. Prohibit use of leaf blowers on unstabilized surfaces (45).
8. Implement a leaf blower outreach program (22).
9. Ban ATV use on high pollution advisory days (23).
10. Pave or stabilize existing unpaved parking lots (25).
11. Pave or stabilize unpaved road shoulders (28).
12. Strengthen and increase enforcement of Rule 310.01 for vacant lots (31, 32)
13. Recover costs for stabilizing vacant lots (33).
14. Restrict and enforce vehicle use/parking on vacant lots (31, 32).
15. Increase fines for open burning (34).
16. Restrict use of outdoor fireplaces/pits/ambience fireplaces (35).
17. Other wood burning restrictions in SB 1552 (47, 48).
18. Repave or overlay paved roads with rubberized asphalt (53).

Various additional SIP measures or sources:

1. Agriculture – Agricultural Best Management Practices (AgBMP) Program
2. Point sources – Permit Conditions (stack, fugitive, and area source emissions)
3. Rule 310 and 310.01; sand and gravel – Rule 316
4. Windblown, area sources – mobile, roadway, vacant lots, fires, et al.
5. Maintenance of micro-scale Salt River stabilization/improvement
6. Pave and stabilize public dirt roads and alleys
7. Covered loads
8. Registered subcontractors

ADEQ
Arizona Department
of Environmental Quality

The Impact of Exceptional Events 'Unusual Winds' on PM_{10} Concentrations in Arizona

Air Quality Division

October 15, 2009

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1.0 Introduction

Windblown dust has been and continues to be a pollutant of concern throughout the deserts of Arizona and southeastern California. The Arizona Department of Environmental Quality (ADEQ) requests that these dust episodes are excluded from regulatory decisions when the dust is associated with non-anthropogenic emissions or when control measures are overwhelmed by strong winds. During the last several years, these requests have increased substantially due to a greater deployment of continuous particulate matter (PM) monitors throughout Arizona. To supplement the exceptional event analyses for high wind and blowing dust events in Arizona, a review of historical meteorological and environmental data was conducted. Additionally, literature concerning the effects of strong winds on particulate emissions was examined. This literature review focused on (1) the theory behind dust suspension caused by wind; (2) laboratory experiments documenting wind speed thresholds that suspend soil particles; and (3) the frequency with which blowing dust occurs in the desert southwest as determined from meteorological data and observations of blowing dust.

The Western Regional Air Partnership (WRAP) conducted a thorough review of literature relating to impacts of fugitive dust on air quality. Much of this information was compiled into WRAP's *Fugitive Dust Handbook* (FDH) (WRAP FDH, 2006). While the handbook does not apply to ambient air quality monitoring, it does include specific information about various control measures for agricultural activity, construction activity, paved and unpaved roads, and more. Sections of this handbook cover the windblown suspension of dust from both anthropogenic and natural, barren areas. The FDH (2006) defines anthropogenic dust as "solids and dissolved solids entrained by wind passing over surfaces that have been disturbed or altered by humans beyond a natural range". The handbook gives examples of such anthropogenic sources of dust including construction and mining sites, agricultural activities, material storage piles, landfills, vacant lots, roadways, and parking lots. The FDH defines natural dust as "solids and dissolved solids entrained by wind passing over surfaces that have not been disturbed or altered by humans beyond a natural range" (WRAP FDH, 2006). Examples of these natural dust sources include naturally dry riverbeds and lakebeds, barren lands, sand dunes, and non-agricultural grass, range, or forest lands. It is important to note that "natural and anthropogenic dust will often be indistinguishable and may occur simultaneously", which means that while natural areas may emit dust during high wind events, those same areas will emit more dust when their surfaces have been or are in the process of being disturbed by human activities (WRAP FDH, 2006). One example of this would be a dry riverbed (a natural dust source) that has recently been the site of all-terrain vehicle activity (an anthropogenic influence).

While wind generated emissions may result from open dust sources during high wind events, those emissions can exhibit a high degree of variability from one site to another, and may fluctuate widely at any given site. The FDH gives two groups of site characteristics that can cause such variability:

(a) Properties of the exposed surface material from which the dust originates
(b) Measures of energy expended by wind interacting with the erodible surface

In addition to these site specific characteristics, the spatial and temporal variances in the interaction of the atmosphere with the surface also contribute to the variability of windblown dust emissions.

2.0 Spatial and Temporal Variability of Windblown Dust Events

Several studies have been conducted on the spatial and temporal variability of dust episodes associated with high wind events in Arizona and California. Dust events have been defined by a reduction in visibility to less than 11 km (Orgill and Sehmel, 1976; McTanish and Pitblado, 1987). Additionally, events with visibilities $\leq$ 1 km may have significant impacts on atmospheric pollution, health hazards, and

environmental air quality (Jauregui, 1989a cited by Bach et al. 1996; Middleton, 1989a cited by Bach et al. 1996). Many studies have used these < 11 km and ≤1 km visibility criteria to assess the temporal and spatial variability of windblown dust events. From the literature reviewed, the one location that overlaps a majority of the studies is Yuma, AZ. Descriptive statistics of annual average dust events in Yuma range from 9.6 events per year to 27 events per year (Bach et al. 1996; Holcombe et al. 1996; Brazel and Nickling 1987; Brazel and Nickling 1984). Brazel and Nickling's (1984) calculation of 9.6 events per year appears to be a low outlier in view of other studies. The disparity is likely due to differences in data and/or methodology and does not appear to be associated with the temporal coverage of the analyses. Brazel and Nickling's (1984) results are likely an underestimate of blowing dust events in Arizona (personal communication, Brazel). When using the 11 km visibility criteria, most studies report annual dust episodes in Yuma to range from 22.4 to 27 events per year (Bach et al. 1996; Holcombe et al. 1996; Brazel and Nickling 1987). When using the 1 km visibility criteria, annual average dust episodes in Yuma range from 1.6 events per year to 4.7 events per year (Bach et al. 1996; Brazel and Nickling 1987; Brazel and Nickling 1984). The use of the different criteria indicates that the occurrence of dust episodes of varying severity in the desert southwest has been an ongoing phenomenon since observations have been taken. The more severe 1 km visibility criteria episodes likely make up a majority of the windblown dust PM_{10} exceedances in Yuma, AZ. While these events do not occur every day, it is not uncommon for blowing dust episodes to affect a single location several times over the course of any given year.

Table 2 – Frequency of Dust Episodes from Various Studies for Yuma, AZ

Source	Time Period	Annual Average Dust Episodes	
		Vis < 11 km	*Vis < 1 km*
Bach et al (1996)	1973-1984	22.4	2.6
Holcombe et al (1996)	1948-1978	27	N/A
Brazel and Nickling (1987)	1942-1982	23.9	4.7
Nickling and Brazel (1984)	1965-1980	9.4	1.6

While much of the research on dust episodes in Arizona has focused on Yuma, AZ, Brazel and Nickling (1984) also analyzed data for other regions of Arizona (i.e., Winslow, Tucson, and Phoenix). Their analysis determined that dust episodes occur more frequently in Yuma and Phoenix in comparison to Tucson and Winslow. While Phoenix and Yuma experience blowing dust episodes on a yearly basis, the characteristics of these episodes can be quite different between the two locations. For example, while Yuma experiences more moderately intense dust storms (i.e. visibilities < 11 km but ≥ 1 km) in any given year, Phoenix experiences more intense dust storms (i.e. visibility ≤ 1 km). On the other hand, Phoenix and Yuma contain a similar distribution in dust episodes throughout a given year with peak occurrences in August and April respectively. Brazel and Nickling (1986) further analyzed these dust episodes and associated them with differing weather types. In general, dust episodes in Yuma are most often associated with synoptic weather patterns, specifically frontal passages. These episodes occur most often in the spring months when the mid latitude storm track reaches furthest south. Phoenix is affected most by dust episodes associated with thunderstorm outflow boundaries during the monsoon season in July and August. Phoenix is more often affected by short duration, high intensity dust storms due to its proximity to the Mogollon Rim and SE Arizona, where thunderstorms develop more frequently. Typical storm motion during the monsoon season is from east to west, but storms can also approach from the north and south. Essentially, storms can approach from an area starting at 0° (north) and rotating clockwise to the 180° (south) azimuth. This is illustrated well in Brazel and Nickling's (1986) Figure 9(c). It should be noted, however, that dust episodes in Yuma are also associated with thunderstorm outflow boundaries during the monsoon season. Similarly, Phoenix is also affected by non-monsoonal dust storms associated with frontal passages. While dust episodes caused by high winds are most common in the spring and

summer for Yuma and Phoenix, respectively, these dust events can occur throughout the year for either location.

Dust storms associated with different weather types will also have differing characteristics based on the weather type. For example, dust storms associated with synoptic scale weather types (i.e. frontal passages or trough passages) typically are longer in duration (on the order of several hours to 10 hours) and less intense (i.e. visibilities between 2 and 11 km). Dust storms that are associated with mesoscale weather types (i.e. thunderstorm outflow boundaries) tend to be shorter in duration (1 hour to several hours) but are more intense (visibilities between ¼ mile and 5 miles). While each hour of a synoptic scale driven dust storm may be less intense than an hour in a mesoscale driven dust storm, the effect on human health when averaged over the entire day may be very similar (i.e. 24-hr average PM_{10} concentrations may be similar for the two types of dust storms). It should be noted that dust storms produced by synoptic type weather patterns are deemed synoptic because the area of high winds is typically fairly large. In many cases, however, the area of blowing dust may be much smaller than the extent of high winds due to the variability in soil characteristics throughout the region or the influences of local topography which can enhance wind speeds at a particular location. This is most often seen in areas such as El Centro, CA and Imperial, CA, and to a lesser degree, Yuma, AZ.

The susceptibility to blowing dust varies greatly over the Sonoran Desert region of the southwestern United States. Holcombe, Ley, and Gillette (1996) determined that mountains, irrigated agricultural areas, wetlands, rivers and lakes, and urban areas all can be characterized as having a low susceptibility to blowing dust. Meanwhile, basin areas have susceptibilities ranging from low to moderate while dry riverbeds and lakebeds and non-irrigated portions of the Colorado River delta are highly susceptible to blowing dust, especially in areas where desert pavement is disturbed exposing fine-grained sediments from beneath (Holcombe et al., 1996).

3.0 Threshold Friction Velocities and Threshold Wind Speeds

Another factor that has received some attention in the literature is the dependence of soil type characteristics on particle movement by wind (e.g. Nickling, 1988; Gillette et al., 1980; Gillette et al., 1982; Gillette, 1988; Nickling and Gillies, 1989; WRAP, 2006). There are three ways by which wind can transport soil particles: saltation, surface creep and suspension (Lyles 1988; Nickling 1988). Saltation normally occurs with particles that are too large to be suspended for a long period of time in the atmosphere. The process of saltation involves particles ranging from about 75 to 500 μm in diameter that are lifted from the surface and bounce within a layer close to the boundary between the air and the surface. Particles that are transported by surface creep can range from about 500 to 1,000 μm in diameter and move very close to the ground due to their larger size. Both wind friction and saltating particles can provide the mechanism for particles to move by surface creep (WRAP FDH, 2006).

Generally, particles less than about 75 μm in diameter may be suspended in the atmosphere, and these particles tend to follow air currents given strong enough surface winds. The threshold wind speed for the onset of saltation, which helps cause wind erosion leading to windblown dust emissions, is dependant on soil texture and particle size (Nickling, 1988). Thus, smaller dimension particles tend to have the lowest threshold friction velocities and threshold wind speeds at 10m above the surface. The saltation process causes particles to collide resulting in the release of particles in the PM_{10} size range that are typically bound by surface forces to larger clusters of sediment (WRAP FDH, 2006; Lyles, 1988).

WRAP developed a wind blown dust model in addition to creating the FDH. The model was based upon the characterization of various land types and soil conditions. To create this model, a number of assumptions were made, including a threshold wind velocity of 20 mph that is independent of land use and soil texture. This threshold wind speed assumption was based upon previous research measuring

both surface and ten meter threshold friction velocities and threshold wind speeds (WRAP, 2006; Lyles 1988). In order to calculate friction velocities or threshold wind speeds the Prandtl Equation is used:

$$\left(\frac{u_z}{u_*}\right) = \frac{1}{\kappa}\left(\frac{z}{z_o}\right) \qquad \text{Equation (1)}$$

Where uz is the wind velocity at height z (ms^{-1}), u* is the friction velocity (ms^{-1}), κ is von Karman's constant (~0.4), and zo is the aerodynamic roughness height (m) (Nickling and Gillies, 1989). Information about a surface's aerodynamic roughness is needed in order to apply the relationship shown in Equation 1 and determine the threshold friction velocity of a surface or the corresponding 10m wind speed. Unfortunately, this roughness height information is not generally available or reported in land use databases. It is possible, however, to use the land use designation of varying surfaces to determine estimated aerodynamic roughness lengths based on previously reported values for the same or similar surfaces. Factors such as the presence of vegetation on a surface, as well as the height and period of cover of the vegetation, can introduce a degree of uncertainty to assigning an aerodynamic roughness length to a surface (WRAP, 2006).

A number of studies have been conducted in an attempt to determine what threshold friction velocity is necessary to loft and transport dust from various soil types and under differing soil conditions. The WRAP (2006) Wind Blown Dust model study compiled threshold friction velocities that had been measured and estimated by some of this previous work. Table 2 shows one such compilation of data that compares threshold friction velocities for typical desert surfaces for two different surface conditions. The "Undisturbed" column presents surface threshold friction velocities for the natural state of each surface while the "Disturbed" column provides the threshold friction velocities for each surface that has undergone significant anthropogenic disturbance. In each case, the threshold friction velocity for disturbed soil is lowered significantly from the threshold friction velocity for undisturbed soil (WRAP, 2006). The effect that anthropogenic disturbances have on the threshold friction velocity at each site type is significant and ranges from a low of a 17% decrease for the alluvial fan type soils to a 92% decrease for the prairie site type. The average percent change in threshold friction velocity when comparing undisturbed surfaces to disturbed surfaces across all site types is a 55% drop from the undisturbed value (WRAP, 2006).

Table 2 – Threshold Friction Velocities for Typical Desert Surface Types

Site Type	Average u_{*_t} (ms^{-1}) Undisturbed	Number of Data Points	Average u_{*_t} (ms^{-1}) Disturbed	Number of Data Points	% Change
Agricultural Fields	1.29	41	0.55	37	57
Alluvial Fans	0.72	2	0.60	2	17
Desert Flat	0.75	4	0.51	4	32
Desert Pavement	2.17	4	0.59	5	73
Fan Surface	1.43	5	0.47	5	67
Play, Crusted	2.13	4	0.63	15	70
Playa	1.46	12	0.58	25	60
Prairie	2.90	1	0.24	3	92
Sand Dune	0.44	4	0.32	4	27

Sources: Gillette et al. (1980, 1982), Gillette (1988), and Nickling and Gillies (1989), WRAP (2006).

Nickling and Gillies (1989) used a portable wind tunnel at thirteen study sites, twelve of which were located in Arizona with one in Algodones, California, in order to analyze threshold friction velocities at sites exhibiting an array of different characteristics. Threshold friction velocities were determined by slowly raising the wind velocity in the portable wind tunnel until movement of particles was noted by observers. This process was repeated multiple times at each site to produce a reliable dataset. Resultant velocities were found to vary significantly across the 13 sampled surfaces. Surface threshold friction velocities ranged from 17.2 cms^{-1} to 58.2 cms^{-1}. These threshold friction velocities were then used to calculate the equivalent 10m threshold friction velocities. The threshold wind velocities at the 10m level varied from lows of 5.11 ms^{-1} (11.43 mph) at a mine tailings site in Hayden, AZ and 6.68 ms^{-1} (14.94 mph) in the dry Salt River channel in Mesa, AZ to highs of 16.59 ms^{-1} (37.11 mph) at a Yuma, AZ agricultural site and 18.31 ms^{-1} (40.96 mph) at the dune flats of Algodones, CA (Nickling and Gillies, 1989). Full descriptions of the test sites and results of the wind tunnel studies conducted by Nickling and Gillies (1989) are included in Table 3 and Table 4 below.

Table 3 – Aerosol Emission Test Results

Site	u_* (m/sec)	u_{10m} (m/sec)	zo (cm)	Mean Grain Size (µm)	% Silt & Clay	% Aggregates > .84 mm
Mesa, AZ (Agricultural)	0.569	15.63	0.0331	1077.0	18.6	26.8
Maricopa, AZ (Agricultural)	0.578	13.82	0.1255	749.3	11.2	37.3
Yuma, AZ (Agricultural)	0.582	16.59	0.0224	642.6	8.8	18.5
Casa Grande, AZ (Abandoned Agricultural)	0.246	7.80	0.0067	234.4	26.6	2.4
Glendale, AZ (Construction Site)	0.530	14.69	0.0301	1275.1	24.7	27.9
Tucson, AZ (Construction Site)	0.251	7.26	0.0191	1010.9	14.3	21.0
Ajo, AZ (Mine Tailings)	0.228	6.68	0.0176	335.3	8.9	0.5
Hayden, AZ (Mine Tailings)	0.172	5.11	0.0141	271.8	27.3	3.0
Algodones, CA (Dune Flats)	0.625	18.31	0.0166	2794.0	15.2	60.3
Yuma, AZ (Scrub Desert)	0.386	11.33	0.0163	1038.8	17.2	22.4
Yuma, AZ (Disturbed Scrub)	0.320	8.11	0.0731	591.8	3.2	7.7
Tucson, AZ (Santa Cruz River Terrace)	0.180	7.26	0.0204	1950.7	20.9	37.4
Mesa, AZ (Salt River Channel)	0.218	6.68	0.0100	398.7	27.7	11.3

Source: Nickling and Gillies, 1989.

It is interesting to note that of the four agricultural sites tested, the abandoned site in Casa Grande had the lowest threshold friction velocity (Table 3). Based upon the site descriptions, this may be a result of the abandoned field being relatively smooth with a weakly crusted surface. In addition, the abandoned field

appears to have lacked the large clods covering its surface that the other three active agricultural fields possessed. Equally interesting is that the sand dune flats of Algodones, California had the highest average threshold friction velocity and 10m wind speed (Table 3). The authors note a relation between aggregate grain size distribution and threshold velocities, and this may explain why the dune flats threshold velocity was found to be so high. The dune flats site had the highest percentage of aggregate particles greater than 0.84mm in size of all the test sites. Interestingly, previous research has suggested that the Algodones Dunes are likely the source for blowing dust that is commonly reported in Yuma, AZ (Brazel and Nickling 1986). Holcombe et al. (1996), on the other hand, hypothesized that the source for observational reports of blowing dust in Yuma may be the East Mesa area instead. All studies show that observational reports of blowing dust in Yuma were associated with wind speeds substantially lower than the Algodones 10m threshold velocity reported by Nickling and Gillies (1989). With the source areas in such close proximity to one another, it becomes difficult to determine which source area is responsible for blowing dust in Yuma, AZ. Other potential explanations for the above results may lie in the soil moisture content of each site, which would tend to vary both by site and by time of year. Neither of these important pieces of information was examined nor reported in the Nickling & Gillies (1989) study.

Upon first glance, the threshold velocity results from Nickling & Gillies (1989) might lead one to believe that wind erosion could be initiated at many of the sites under normally occurring winds, but a number of relatively high threshold values at three of the agricultural sites as well as test sites in Mesa, Maricopa, Yuma, AZ and a construction area in Glendale, AZ suggest that a major wind blown dust event would be a relatively infrequent occurrence. It is unclear from the study as to what extent the higher threshold values at these sites can be attributed to any specific control measures that may have been in place. Additionally, natural factors such as recent precipitation, mean grain size, or soil type may have played a role in causing the higher threshold values.

Table 4 – Site Surface and Textural Characteristics	
Site	**Site Characteristics**
Mesa, AZ (Agricultural)	Flat, laser leveled for irrigation; no vegetation or surface trash; double disked 2 days prior to testing; large clods of varying size covering the surface.
Maricopa, AZ (Agricultural)	Flat, laser leveled for irrigation; no vegetation or surface trash; secondary tillage operations in preparation for cotton planting; large clods of varying size covered the surface.
Yuma, AZ (Agricultural)	Flat, laser leveled for irrigation; no vegetation or surface trash; surface was loose and friable with few large clods.
Casa Grande, AZ (Abandoned Agricultural)	Flat, smooth, laser leveled at some previous time; sparse vegetation; primarily annual grasses; weakly crusted surface; easily disturbed.
Glendale, AZ (Construction Site)	Flat, smooth, machine-leveled surface; no vegetation; surface soil heavily pulverized by earthmoving machinery and regularly watered for dust control; easily disturbed by vehicular traffic.
Tucson, AZ (Construction Site)	Very flat, machine-leveled surface; no vegetation; surface soil heavily pulverized by earthmoving; fetch length over 1 km in all directions; regularly watered for dust control.
Ajo, AZ (Mine Tailings)	Extremely flat, extensive copper mine tailings; no vegetation; mainly unconsolidated sediment with some sparsely intermixed crusted areas; fetch lengths greater than 1 km.
Hayden, AZ (Mine Tailings)	Extremely flat copper tailings; no vegetation; light crust is easily disturbed; fetch lengths greater than 1 km.
Algodones, CA (Dune Flats)	Relatively flat, extensive outwash deposits adjacent to Algodones Dune complex; sparse vegetation cover; surface weakly crusted; lag of fine pebbles; heavily disturbed by off-road vehicles.
Yuma, AZ (Scrub Desert)	Relatively flat; sparse vegetation cover; surface is weakly crusted; lag of fine pebbles; heavily disturbed by off-road vehicles.
Yuma, AZ (Disturbed Scrub)	Slightly undulating surface; sparse vegetation cover; primarily annual grasses, sagebrush and creosote bush; surface soil is very loose with little cohesive structure; heavily disturbed by off-road vehicles.
Tucson, AZ (Santa Cruz River Terrace)	Flat terrace deposits adjacent to river; sparse vegetation cover; high silt content with fin gravel lag deposit.
Mesa, AZ (Salt River Channel)	Slightly undulating river bed; no vegetation; surface is very loose with no evidence of crusting; heavily disturbed by off-road vehicles.

Source: Nickling and Gillies, 1989.

Nickling and Gillies (1989) stresses an increased potential for aerosol (lofted dust) production at those sites which experience a periodic disturbance of soil such as the river channels and mine tailing sites, as they tended to exhibit lower threshold friction velocities. This was also a point of emphasis in the WRAP (2006) Wind Blown Dust model work that compared threshold friction velocities for disturbed and undisturbed soil of various study sites by compiling available data from previous research such as that done by Nickling and Gillies. Precipitation is another factor to consider, as periodic rains help to build up and maintain a surface crust on the soil by redistributing clay particles on the surface, creating a seal as they are left behind after infiltration and evaporation processes occur (Nickling and Gillies (1989). It is also possible that severe precipitation in the form of brief heavy rain or hail may serve to break up an already developed surface crust and naturally disturb the soil, leading to a greater possibility of a windblown dust event. It has also been shown that individual sites can have vastly different soil conditions based upon any soil vegetation, moisture, or the overall proportion of larger sized grains. That

is to say that not all agricultural fields, construction sites, and sand dune areas will experience the same threshold friction velocities as all other agricultural fields, construction sites, and sand dunes.

The University Corporation for Atmospheric Research (UCAR) maintains an educational website at http://www.meted.ucar.edu/mesoprim/dust that provides a comprehensive overview of the forecasting of dust storms while including a detailed explanation of the physical processes involved in the wind transport of sediment. It gives 15 knots (~17 mph) as a rule of thumb as to the minimum wind speed that is necessary for mobilizing dust without regard to varying soil types. After winds decrease below the initiation levels dust storms can continue and maintain the same intensity due to the breakdown in the bonds between dust particles and the surface. Once this bond is broken the saltation process can continue to allow dust to lift (UCAR, 2003). While 17 mph is given as an approximate baseline minimum for generating wind-blown dust, more detailed breakdowns of threshold wind speeds for various desert environments are also given in the UCAR educational website for the forecasting of dust storms (Table 5). These threshold wind speeds range from near 15 mph for fine to medium sand dune areas up to 40 mph in desert areas where desert pavement has been well-developed. "Desert pavement" is the term given for the thin veneer of rocks that is left behind once wind and other erosive processes remove finer grained material from the desert surface leaving only larger grains and stones on the surface. The formation of desert pavement thus suppresses windblown dust as fewer finer grained particles are available on the surface for transport

There is a large difference between the threshold wind speed given for sand dune areas on the UCAR webpage and that given in the Nickling and Gillies (1989) study. As previously mentioned, particle size (and possibly moisture content) provides a possible explanation for this disparity in threshold wind speeds. Additionally, the Nickling and Gillies (1989) study looked at a site on an outwash area adjacent to a sand dune complex composed of a significant percentage of larger sized grains whereas the UCAR page describes the sand grains of the dune area they studied as being fine to medium sized. This may account for the greater than twenty mph disparity in threshold wind velocities given for sand dune areas between the two studies. In Arizona, the most common source environments for windblown dust are likely to range from varying degrees of desert pavement to desert flats and salt flats, but dune areas outside of the state both to the south and west can also serve as potential particulate sources, particularly for Yuma, AZ. The minimum wind speeds necessary for dust transport in these types of source environments, according to the bulk of the research, has been shown to range from approximately 17 mph to 35 mph.

Table 5 – Threshold Dust-lofting Wind Speed in Various Desert Environments

Environment	Threshold Wind Speed
Fine to medium sand in dune-covered areas	10-15 mph
Sandy areas with poorly developed desert pavement	20 mph
Fine material, desert flats	20-25 mph
Alluvial fans and crusted salt flats (dry lake beds)	30-35 mph
Well-developed desert pavement	40 mph

Source: UCAR, 2003.

Research by Holcombe et al. (1996) focuses on the effect that both prior precipitation and particulate source area characteristics can have on threshold friction velocities for wind blown dust events. In their study, they mention that "threshold friction velocities computed from mean hourly wind speeds (MHWS) recorded during dust events are significantly lower than those obtained from wind tunnel experiments over loose desert soils" (Holcombe et al., 1996). However, the authors determine that when threshold friction velocities are computed from mean extreme wind speeds (maximum gusts) they are comparable

to resultant threshold wind speeds obtained from wind tunnel experiments. That is to say that the friction velocities computed from mean extreme winds, i.e., maximum wind gusts, are more in line with wind tunnel studies than are threshold friction velocities computed from MHWS, and thus maximum wind gust data may be a better predictor of windblown dust (or at least the threshold friction velocities that are required to begin the saltation process which can lead to dust emissions) than are mean hourly wind speeds (Holcombe et al., 1996).

4.0 Best Available Control Measures (BACM) Effectiveness

WRAP's Fugitive Dust Handbook (FDH, 2006) contains a plethora of information relating to the numerous strategies available to control dust emissions. The FDH goes into great detail in describing the different control measures and breaks them down into several source categories. Common control strategies for wind erosion include:

- Planting trees or shrubs as a windbreak
- Create cross-wind ridges
- Erect artificial wind barriers
- Apply dust suppressant or gravel
- Revegetate; apply cover crop
- Water exposed area before high winds

These control measures have differing reported control efficiencies ranging from 25% (planting trees or shrubs) to 90% (revegetating and watering exposed areas before high winds). In addition to the control efficiencies reported in the FDH, two field studies were performed for the South Coast Air Quality Management District (Fitz, 1996; MRI, 1995) that specifically mention wind speeds at which BACM becomes overwhelmed. Fitz (1996) concluded that BACM appeared to be effective at reducing PM_{10} emissions at wind speeds up to 18 m/s (about 40 mph); however, the small sample size in this study makes it difficult for these results to be conclusive. Additionally, this study was specific to emissions generated from a local landfill in California. It is not clear how factors mentioned in sections 2.0,3.0, and 5.0 would affect this defined wind speed. Information from Tables 3 and 4 (specifically data and metadata from the Tucson and Glendale construction sites) may suggest that wind speeds at which BACM becomes overwhelmed would also be highly variable from one site to another. In another study on the effective of BACM, the Midwest Research Institute (MRI, 1995) simply concluded that even moist soils became erodible at higher wind speeds. The emissions from moist soils became similar to that of dry soils when the moist soils were subjected to wind speeds 15-20 mph higher than winds impinging on dry soil. However, by looking at the data tables from this study, it is difficult to determine the different threshold velocities for moist and dry soils. With the limited research that has been conducted on this specific topic and the lack of detail in the few studies that have been performed, it does not seem appropriate to define a critical wind speed in which BACM becomes overwhelmed. Furthermore, such a critical wind speed would likely differ for each soil type and/or land use type. A more detailed review of general BACM effectiveness and control efficiencies can be found in "High Wind Exceptional Events and Control Measures for PM_{10} Areas".

5.0 Other Influential Factors in the Formation and Impact of Windblown Dust

Data from Holcombe et al. (1996) suggest that a wide range of wind speeds is capable of producing blowing and/or suspended dust in the Yuma area. Of the dust episodes in Yuma, 95% contain hourly mean wind speeds that range from 2.9 m/s to 12.96 m/s. This compares to a range of 3.8 m/s to 15.7 m/s at Blythe, indicating that dust may become suspended more easily in the Yuma area compared to Blythe. This may be a factor of Yuma receiving slightly less precipitation and/or various differences in soil

characteristics and available dust sources between Yuma and Blythe. In an attempt to determine the effect of prior precipitation on blowing dust episodes in Yuma, MacKinnon et al. (1990) used Nickling's (1988) wind tunnel data to calculate a 10 meter threshold wind speed of 9 m/s, which is similar to the median wind speed obtained from observational reports in the Holcombe et al. (1996) study. In general, dust episodes in Yuma are most common with 10 meter wind speeds between 5 m/s and 13 m/s with a median of 9 m/s. The large range in wind speeds is likely due to the variability in precipitation, prevailing wind direction, vegetation, anthropogenic sources, and other factors.

Bach et al. (1987) reported that annual precipitation explains about 20% of the variance in the incidence of blowing dust. When antecedent precipitation (previous winter's rainfall) is taken into consideration the explained variance increases to 26.5%. When taking the winter precipitation from previous 2 years into account, the explained variance increases to 42.3%. This effect of antecedent precipitation likely also includes a vegetative coverage factor with it. The general rule appears to be that the more rainfall a region receives the more vegetation grows and the greater its ability to keep soils from becoming suspended by high winds. Holcombe et al. (1996) concludes that precipitation can be an important factor in limiting soil suspension. They do, however, note that in places like Yuma where threshold MHWSs lie well below MHWSs recorded during most dust events, local mean annual precipitation could likely increase substantially without significantly reducing the occurrence of blowing dust episodes. While prior precipitation events do help explain some of the variance in dust events, there is a fair amount of variance that is still not explained by precipitation. This variance can likely be attributed to other factors such as soil type, prevailing wind direction, anthropogenic activity, control measures, and changes in land use / land cover.

While wind speed is obviously important for dust suspension, a number of articles also point out that the directional component of the wind is also important as it is an indicator of potential dust sources (MacKinnon et al. 1990; Holcombe et al. 1996; Brazel and Nickling 1986). The Holcombe et al. (1996) paper is particularly interesting as it attempts to apply a vulnerability index to each of the 16 directions. This type of analysis seems to be fairly effective at determining potential dust sources. Several articles indicate that for Yuma, the west and west-northwest directions are associated with high vulnerability and high frequency, while high winds from the east contain a high vulnerability but a low frequency. Conversely, high winds from the south-southeast and northerly directions frequently occur, but have a low vulnerability. The differences in vulnerability in relation to wind direction are an indication that soil characteristics may be an important factor in dust episodes. While not explicitly stated in the study, one could even define differing threshold friction velocities for each direction.

6.0 The Effect of Particle Size and Turbulence on Dust Settling Rates

Thus far the literature has suggested that the meteorological phenomena required to produce dust events in the desert southwest are highly variable. In fact, factors such as wind speed, wind direction, antecedent precipitation, vegetation coverage, anthropogenic activity, and the location of dust sources all may potentially contribute to the variability in blowing dust episodes. The UCAR dust forecasting education website discusses dispersion and settling rates of lofted dust in relation to buoyancy turbulence (UCAR, 2003). While such turbulence can work to help disperse an existing dust plume, it can also act to keep dust particles in suspension for a longer period of time. Given extremely turbulent flow, it is possible for dust to be lofted to heights well above 3000m (10000 ft.). As long as the upward lift acting on a particle is greater than that particles terminal velocity, the particle should remain aloft. The terminal velocity of a particle is directly proportional to its size, and as gravity acts to accelerate a dust particle downwards, atmospheric resistance acts against it as it falls. Acceleration continues only until the particle reaches its terminal velocity, and from that point on, the particle falls at a constant rate so long as no other factors such as atmospheric turbulence or precipitation influence it (Bagnold, 1984 cited by Wilkerson, 1991). UCAR (2003) states that "without sustained turbulence, dust generally settles at a rate of 1000 feet per

hour". This means that if dust is lofted to 5000 ft in extremely turbulent flow (i.e. downdrafts from thunderstorms), it may take the at least 5 hours to settle once turbulent winds decrease to below terminal velocity (i.e., light and variable winds). This can result in dust, once initially suspended by turbulent flow, remaining elevated in the atmosphere and being transported by light winds to impact areas that do not experience the extremely turbulent winds that initialized the dust event. This scenario most often occurs during the monsoon season in July and August when turbulent flow produced by thunderstorms is highly variable across space and time. While dust episodes driven by synoptic scale weather types would likely have similar wind speeds at the source area compared to the point where wind measurements are taken, this assumption may not apply to dust produced from mesoscale storms as the wind speed at the source area may be substantially different than the wind speed measured at the observation point (MacKinnon et al. 1990). The 1000 ft/hr settling rate has been reported for particles between the sizes of 10 to 50 micrometers; however this rate is highly dependent upon various environmental conditions (Larson, 1971 cited in Wilkerson, 1991). These dust settling rate factors include turbulence, humidity, and precipitation. Other studies have reported settling rates ranging from over 10000 ft/hr for particles greater than 150 microns to 36 ft/hr for particles as small as 5 microns (Greveris, 1977 cited in Wilkerson, 1991). Moisture is especially important in limiting the ability of dust to remain lofted in the atmosphere given the hygroscopic nature of most dust particles.

7.0 Literature Conclusion

In reviewing the literature, most studies have focused on the meteorological conditions that produce blowing dust. Specifically, wind speed is the most important factor; however, wind direction and antecedent precipitation also contribute to characteristics of dust emissions. There is also speculation that other factors such as vegetation and soil types affect dust emissions as well by raising threshold friction velocities and thus threshold wind speeds at 10m above the surface. While this information is important, for exceptional event purposes one must be able to show that a dust event is 'natural and unavoidable' or at least that there was an attempt to control dust emissions. For the 'natural and unavoidable' case, the prior studies contain some very useful information, particularly in the case of Yuma, AZ where the Algodones dunes (a natural dust source) are the suspected source of dust emissions. However, within an urban setting where Best Available Control Measures (BACM) are required to suppress dust emissions, it no longer becomes important to simply determine the wind speed at which dust emissions occur, but instead, the speed at which BACM is overwhelmed. While there is some literature on the effectiveness of BACM (i.e. WRAP Fugitive Dust Handbook, 2006), there appears to be very few studies that relate this effectiveness to wind speeds. With several factors influencing threshold friction velocities, defining exact wind speeds for overwhelming BACM or even dust suspension in general becomes a complicated process. Perhaps, the results from this literature review are best summarized by Nickling's (1988) conclusion which states, "The observations of this study suggest that the threshold of most natural sediments should not be defined by a finite value but by a range of threshold shear velocities."

8.0 EXAMINATION OF HISTORICAL WIND & PARTICULATE MATTER DATA IN ARIZONA - WIND THRESHOLD EFFECTS

Part of the justification for flagging an elevated particulate matter event associated with blowing dust is to show the winds were "unusual." This term is used in the preamble of the Exceptional Events Rule. The literature review provided significant justification for what constitutes unusual from various contexts. In order to place perspective on the issue for monitors in Arizona, an analysis of wind and particulate matter data is needed.

An examination of the measurements from several monitors where hourly measurements of the average wind speed, the maximum wind gust during the hour, and the average PM_{10} concentration from TEOM

monitors was performed. Data from April 1, 2005, through August 31, 2009, for four monitors operated by the Maricopa County Air Quality Department (MCAQD) over a broad geographic region were used in the analysis. These monitors were chosen because of the availability of a very long continuous record of data (38,000+ hours) for each monitor. The monitors included a monitor to the far west of the Phoenix area (Buckeye), two monitors in the central basin near the Salt River (West Forty Third Avenue and Durango Complex), and one monitor in the far east Valley (Higley). All of these monitors have experienced high ambient concentrations of particulate matter.

The monitoring data were extracted from the ADEQ Air Assessment Ambient Database (AAAD) which archives these readings on a daily basis. The winds speeds were rounded to the nearest 1 mile per hour, and the ambient PM_{10} concentrations were rounded to the nearest 1 microgram per cubic meter ($\mu g/m^3$). The ambient concentration data tend to be log-normally distributed. It was decided to create a simple cross-tabulation of the raw wind speed and particulate matter data for each monitor. In order to develop a useful consolidation of the data, wind and particulate matter values were transformed into categories. The following transformations were used to compute the categories:

For Wind: WindCat = 10.0*Log10(Speed_mph + 1.0) (rounded to the nearest whole number)
For PM10: PMCat = 5.0*Log10(PM_ug/m3 + 1.0) (rounded to the nearest whole number)

The choice of the scaling was to generate approximately 17 categories over the normal range of values found in the database.

In examining the cross-tabulated information, one would expect to observe two phenomena. For monitors in the central part of the valley, there could be a slight "stagnation" effect observed in the data. This would be where the mode of the distribution for a given wind speed category would go down as the wind speed increased from very low levels to moderate levels. Also, for all monitors, there should be a threshold effect, where the mode of the particulate matter concentration data for a given wind speed category should increase as the wind speed category increases. Between these two extremes, there would be little correlation between wind speed and particulate matter concentration.

Table 6 presents the cross-tabulated information for hourly average wind speed versus the particulate matter concentrations for the four monitors. The orange/pink highlighting in the figure is where the median of the distribution occurs for each wind speed category. The yellow highlighting shows the range where 80% of the data reside. The green highlighting shows the frequency of the higher wind speeds. It is noted that these represent approximately the highest 5% of the wind data (approximately 2,000 out of 40,000 observations). All four monitors demonstrate a strong "threshold" effect for wind speed when hourly average wind speeds exceed 10 miles per hour. Also, the West Forty Third Avenue and Durango Complex monitors appear to have a slight "stagnation" effect compared to the Buckeye and Higley monitors.

Table 7 presents the same cross-tabulated information as Table 6, except that instead of using average wind speeds, maximum hourly wind gusts are used to display the relationship between wind and PM_{10} concentrations. The same highlighting scheme used in Table 6 is also applied to Table 7. All four monitors demonstrate a strong "threshold" effect for wind speed when hourly wind gusts exceed 20 miles per hour.

It should be noted that there is not a "bright-line" in this type of data, only statistical tendencies. During some events, relatively low local wind speeds could be associated with very high particulate matter concentrations if dust is transported over a long distance. This is typical of a haboob, where local winds in the area of the storm may exceed 70 miles per hour, and create a wall of dust. The wind speed diminishes during transport but the suspended dust can be delivered over very long distances.

Table 6. Crosstabulation of Average Wind Speed and PM Concentrations

STATION — WIND SPEED CATEGORY (HOURLY AVERAGE WINDS - miles per hour)

BUCKEYE

PM10 Category	< 1	1 mph	2 mph	3 mph	4 mph	5-6	7 mph	8-10	11-13	14-16	17-21	22-27	28-34	TOTAL
1995-3161 ug/m3	-	-	-	-	-	-	-	-	1	-	1	2	-	4
1258-1994 ug/m3	-	-	1	-	-	1	-	3	-	-	1	-	-	6
794-1257 ug/m3	-	-	3	4	3	-	1	-	-	1	2	5	-	19
501-793 ug/m3	1	5	6	6	3	5	1	5	14	10	13	6	-	75
316-500 ug/m3	5	19	11	9	6	6	4	17	26	19	28	3	1	154
199-315 ug/m3	24	43	40	31	27	32	7	22	30	48	42	8	1	355
125-198 ug/m3	85	206	186	167	128	149	48	89	65	87	37	9	-	1,236
79-124 ug/m3	228	522	607	520	415	575	171	296	170	77	53	4	-	3,638
50-78 ug/m3	436	998	1,183	1,076	859	1,193	401	741	260	94	27	3	-	7,271
31-49 ug/m3	438	1,218	1,546	1,438	1,282	1,852	605	1,091	330	80	21	-	-	9,901
19-30 ug/m3	298	942	1,220	1,253	1,136	1,735	599	958	254	54	12	1	-	8,460
12-18 ug/m3	122	505	603	679	552	1,091	350	544	121	23	4	2	-	4,596
7-11 ug/m3	58	189	258	258	267	397	133	217	64	16	2	-	-	1,859
5-6 ug/m3	7	40	53	45	46	86	34	56	24	8	-	1	-	400
3-4 ug/m3	9	21	27	29	29	54	19	31	6	7	1	-	-	233
1-2 ug/m3	1	12	16	11	16	34	9	20	8	1	1	-	-	129
<1 ug/m3	1	7	13	12	8	20	16	13	8	2	2	-	-	102
TOTAL	1,693	4,727	5,773	5,538	4,777	7,230	2,398	4,101	1,381	527	247	44	2	38,438

WEST 43RD AVE

PM10 Category	< 1	1 mph	2 mph	3 mph	4 mph	5-6	7 mph	8-10	11-13	14-16	17-21	22-27	28-34	TOTAL
1995-3161 ug/m3	-	-	-	-	-	-	-	-	1	-	-	-		1
1258-1994 ug/m3	-	-	-	-	-	-	1	1	-	1	4	2		9
794-1257 ug/m3	-	1	2	4	1	-	1	1	1	5	21	5		42
501-793 ug/m3	2	13	6	1	-	4	1	6	7	22	38	4		104
316-500 ug/m3	20	101	74	25	9	9	4	10	24	50	28	2		356
199-315 ug/m3	68	380	349	153	54	39	9	32	70	72	22	1		1,249
125-198 ug/m3	106	794	883	470	165	169	29	88	158	98	21	1		2,982
79-124 ug/m3	193	1,384	1,547	850	403	438	112	288	235	72	6	-		5,528
50-78 ug/m3	255	1,515	1,754	1,274	828	847	272	634	274	48	1	-		7,702
31-49 ug/m3	192	1,333	1,791	1,383	1,185	1,519	441	894	232	28	1	-		8,979
19-30 ug/m3	114	777	1,080	1,120	906	1,367	432	655	109	16	-	-		6,576
12-18 ug/m3	49	362	454	492	451	567	194	271	47	11	-	-		2,898
7-11 ug/m3	11	134	183	190	161	235	65	120	25	4	2	-		1,130
5-6 ug/m3	5	26	34	36	32	40	25	26	5	1	-	-		230
3-4 ug/m3	2	12	22	22	20	32	18	22	5	2	-	-		157
1-2 ug/m3	-	8	14	9	9	14	8	8	3	-	-	-		73
<1 ug/m3	1	8	4	6	6	9	4	5	4	-	-	-		47
TOTAL	1,018	6,848	8,197	6,035	4,210	5,289	1,616	3,061	1,200	430	144	15		38,063

DURANGO COMPLEX

PM10 Category	< 1	1 mph	2 mph	3 mph	4 mph	5-6	7 mph	8-10	11-13	14-16	17-21	22-27	28-34	TOTAL
1995-3161 ug/m3	-	1	-	-	-	-	-	-	1	1	-	-		3
1258-1994 ug/m3	-	1	-	-	-	-	-	-	-	-	-	-		1
794-1257 ug/m3	-	2	3	1	-	-	1	1	-	3	6	3		20
501-793 ug/m3	2	7	4	-	-	2	3	10	7	9	13	-		57
316-500 ug/m3	36	67	46	13	3	5	3	14	26	19	10	1		243
199-315 ug/m3	82	310	169	56	12	16	7	33	47	32	26	-		790
125-198 ug/m3	187	932	526	198	89	66	19	85	67	65	14	-		2,248
79-124 ug/m3	377	1,622	1,123	535	298	321	80	178	126	72	6	-		4,738
50-78 ug/m3	314	1,942	1,724	1,034	688	916	284	535	238	38	-	-		7,711
31-49 ug/m3	310	1,713	1,866	1,451	1,142	1,816	542	946	247	21	-	-		9,855
19-30 ug/m3	142	927	1,288	1,150	1,033	1,510	515	785	151	9	-	-		7,510
12-18 ug/m3	44	354	531	545	488	707	228	317	57	3	-	-		3,274
7-11 ug/m3	16	162	203	204	197	258	86	115	16	5	-	-		1,262
5-6 ug/m3	2	21	50	41	40	60	25	27	8	1	-	-		275
3-4 ug/m3	1	18	24	33	19	36	18	29	3	1	-	-		182
1-2 ug/m3	-	11	9	18	11	22	8	11	4	-	-	-		94
<1 ug/m3	-	11	14	12	7	11	-	17	1	-	-	-		73
TOTAL	1,513	8,101	7,580	5,291	4,025	5,545	1,819	3,105	999	279	75	4		38,336

HIGLEY

PM10 Category	< 1	1 mph	2 mph	3 mph	4 mph	5-6	7 mph	8-10	11-13	14-16	17-21	22-27	28-34	TOTAL
3162+ ug/m3	-	-	-	-	-	-	-	-	-	-	1	-	-	1
1995-3161 ug/m3	-	-	-	-	-	-	-	-	2	-	1	1	-	4
1258-1994 ug/m3	-	-	-	-	-	-	-	1	-	-	1	-	-	2
794-1257 ug/m3	-	-	1	-	1	-	-	1	2	2	5	2	1	15
501-793 ug/m3	1	1	2	3	3	8	-	6	11	17	14	-	-	66
316-500 ug/m3	3	30	19	16	11	15	8	22	20	26	20	-	-	192
199-315 ug/m3	10	79	97	72	63	71	14	31	43	40	13	-	-	533
125-198 ug/m3	52	240	264	240	196	276	58	89	68	53	9	-	-	1,545
79-124 ug/m3	76	427	656	618	533	595	132	189	133	54	6	-	-	3,419
50-78 ug/m3	110	772	1,233	1,356	1,135	1,244	236	399	135	31	9	-	-	6,660
31-49 ug/m3	126	845	1,596	1,933	1,769	2,031	460	582	172	36	1	-	-	9,553
19-30 ug/m3	73	680	1,308	1,681	1,638	2,071	501	582	109	10	1	-	-	8,654
12-18 ug/m3	49	388	704	876	676	1,092	232	314	57	15	-	-	-	4,603
7-11 ug/m3	24	190	322	351	353	432	124	160	27	9	1	-	-	1,993
5-6 ug/m3	4	40	54	68	70	107	31	55	10	2	-	-	-	441
3-4 ug/m3	4	13	34	33	40	66	17	38	6	2	-	-	-	253
1-2 ug/m3	3	4	14	23	12	30	10	16	2	-	-	-	-	114
<1 ug/m3	-	7	6	9	9	10	10	9	1	-	-	-	-	61
TOTAL	537	3,716	6,310	7,279	6,709	8,048	1,833	2,494	798	299	82	3	1	38,109

Table 7. Crosstabulation of Hourly Maximum Wind Gust and PM Concentrations

STATION — WIND GUST CATEGORY (MAXIMUM WIND GUST DURING HOUR - miles per hour)

BUCKEYE

PM10 Category	< 1	1 mph	2 mph	3 mph	4 mph	5-6	7 mph	8-10	11-13	14-16	17-21	22-27	28-34	35-43	44+	TOTAL
1995-3161 ug/m3	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	2
1258-1994 ug/m3	-	-	-	-	-	-	-	1	1	1	-	2	-	-	1	6
794-1257 ug/m3	-	-	-	-	-	3	-	7	-	1	-	-	-	3	5	19
501-793 ug/m3	-	-	-	3	1	7	4	8	1	-	2	9	16	16	8	75
316-500 ug/m3	-	-	1	4	9	21	9	10	5	6	2	11	43	29	3	153
199-315 ug/m3	1	2	3	15	26	68	23	35	13	9	16	36	60	41	6	354
125-198 ug/m3	3	9	9	43	121	285	112	216	102	86	53	92	101	23	1	1,236
79-124 ug/m3	7	10	29	123	318	879	348	738	415	225	237	178	112	19	-	3,638
50-78 ug/m3	18	20	48	230	535	1,704	793	1,558	941	512	522	301	76	13	-	7,271
31-49 ug/m3	10	15	47	247	581	2,083	1,051	2,402	1,497	894	718	310	61	7	-	9,903
19-30 ug/m3	13	7	45	145	369	1,449	886	2,186	1,512	908	889	227	39	5	-	8,460
12-18 ug/m3	-	1	10	54	183	700	423	1,124	933	586	457	110	13	2	2	4,598
7-11 ug/m3	3	1	5	19	87	245	162	469	375	239	192	52	9	1	-	1,859
5-6 ug/m3	-	1	1	3	16	41	28	91	91	55	49	22	1	1	-	400
3-4 ug/m3	-	-	1	3	10	28	19	54	48	32	24	11	2	1	-	233
1-2 ug/m3	-	-	-	-	3	10	6	36	30	14	24	5	1	-	-	129
<1 ug/m3	-	-	-	-	1	6	7	23	21	14	15	10	3	2	-	102
TOTAL	55	66	199	889	2,260	7,509	3,851	8,958	5,985	3,562	3,000	1,376	538	163	27	38,438

WEST 43RD AVE

PM10 Category	< 1	1 mph	2 mph	3 mph	4 mph	5-6	7 mph	8-10	11-13	14-16	17-21	22-27	28-34	35-43	44+	TOTAL
1995-3161 ug/m3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1258-1994 ug/m3	-	-	-	-	-	-	-	-	-	-	2	-	-	7	-	9
794-1257 ug/m3	-	-	1	-	-	3	1	-	1	-	3	1	12	14	5	41
501-793 ug/m3	-	1	2	5	8	5	1	-	1	2	6	6	33	27	6	103
316-500 ug/m3	-	1	1	25	74	94	11	19	4	2	5	25	59	25	8	351
199-315 ug/m3	-	4	9	93	252	468	89	91	14	9	25	82	86	16	1	1,239
125-198 ug/m3	1	4	31	214	562	1,054	242	358	90	42	70	181	103	13	1	2,966
79-124 ug/m3	-	15	60	399	912	1,738	528	758	320	159	275	263	60	8	-	5,495
50-78 ug/m3	-	29	63	393	951	1,897	721	1,399	732	470	654	275	47	3	1	7,635
31-49 ug/m3	-	21	88	277	656	1,640	715	1,912	1,414	992	978	235	17	5	2	8,930
19-30 ug/m3	-	20	27	138	287	780	461	1,511	1,443	1,006	714	117	13	3	1	6,521
12-18 ug/m3	-	10	16	59	127	340	185	679	647	450	286	57	12	-	-	2,868
7-11 ug/m3	-	8	5	15	34	129	97	276	228	169	117	34	3	1	-	1,116
5-6 ug/m3	-	1	1	7	10	24	19	57	50	28	21	9	-	-	-	227
3-4 ug/m3	-	-	1	1	7	14	9	35	35	25	23	7	-	-	-	157
1-2 ug/m3	-	1	-	-	3	12	2	10	22	10	11	2	-	-	-	73
<1 ug/m3	-	-	-	-	1	7	3	9	7	7	10	2	-	-	-	46
TOTAL	1	115	285	1,626	3,884	8,205	3,084	7,114	5,008	3,371	3,198	1,296	445	122	23	37,777

DURANGO COMPLEX

PM10 Category	< 1	1 mph	2 mph	3 mph	4 mph	5-6	7 mph	8-10	11-13	14-16	17-21	22-27	28-34	35-43	44+	TOTAL
1995-3161 ug/m3	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1	2
1258-1994 ug/m3	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1
794-1257 ug/m3	-	-	-	-	-	3	2	-	1	-	2	-	2	5	3	18
501-793 ug/m3	-	-	1	2	5	4	-	-	-	4	7	4	10	16	4	57
316-500 ug/m3	-	-	7	39	57	34	13	9	4	1	7	18	29	22	3	243
199-315 ug/m3	1	4	35	109	175	204	43	44	13	6	18	47	67	20	2	786
125-198 ug/m3	2	4	90	355	490	608	164	186	64	29	61	94	84	15	2	2,248
79-124 ug/m3	-	1	169	659	809	1,210	394	657	306	111	164	166	79	11	2	4,738
50-78 ug/m3	-	3	127	634	909	1,870	660	1,514	838	474	501	315	60	5	1	7,711
31-49 ug/m3	-	3	91	429	732	1,575	721	2,199	1,700	1,090	945	333	31	5	1	9,855
19-30 ug/m3	-	2	31	159	313	809	498	1,885	1,631	1,207	946	209	18	3	-	7,511
12-18 ug/m3	-	-	11	47	109	275	197	740	779	571	457	75	9	3	-	3,273
7-11 ug/m3	-	-	5	16	36	110	92	325	282	217	150	25	2	2	-	1,262
5-6 ug/m3	-	-	-	1	5	17	17	71	69	48	35	10	2	-	-	275
3-4 ug/m3	-	-	-	2	2	15	10	36	51	24	31	10	1	-	-	182
1-2 ug/m3	-	-	-	1	2	4	3	28	20	13	20	5	-	-	-	94
<1 ug/m3	-	-	-	-	-	11	1	20	15	13	11	2	-	-	-	73
TOTAL	3	17	568	2,453	3,645	6,549	2,815	7,512	5,773	3,808	3,355	1,313	394	107	19	38,331

HIGLEY

PM10 Category	< 1	1 mph	2 mph	3 mph	4 mph	5-6	7 mph	8-10	11-13	14-16	17-21	22-27	28-34	35-43	44+	TOTAL
3162+ ug/m3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
1995-3161 ug/m3	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	4
1258-1994 ug/m3	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1
794-1257 ug/m3	-	-	-	-	-	-	-	1	-	-	1	-	4	5	3	14
501-793 ug/m3	-	-	-	1	1	4	-	6	1	2	4	6	20	16	4	65
316-500 ug/m3	-	-	2	12	14	29	5	19	4	4	8	21	42	24	5	189
199-315 ug/m3	-	1	4	26	50	113	50	99	40	12	17	51	52	16	2	533
125-198 ug/m3	4	-	17	78	129	356	193	382	111	41	52	96	69	15	1	1,544
79-124 ug/m3	5	2	30	127	255	862	423	898	289	115	156	182	76	14	1	3,415
50-78 ug/m3	-	1	25	204	444	1,803	884	1,933	617	297	353	234	54	8	-	6,657
31-49 ug/m3	3	-	30	187	510	1,755	1,145	2,780	1,354	815	647	297	40	4	-	9,547
19-30 ug/m3	1	-	11	113	327	1,235	789	2,374	1,702	1,058	814	208	22	3	-	8,652
12-18 ug/m3	2	-	3	54	153	622	422	1,210	940	664	426	96	8	2	1	4,603
7-11 ug/m3	-	-	4	24	68	290	187	562	391	270	149	42	6	2	-	1,995
5-6 ug/m3	-	-	-	4	17	51	40	107	101	63	36	16	6	-	-	441
3-4 ug/m3	-	-	-	1	6	24	21	63	52	47	29	8	2	-	-	253
1-2 ug/m3	-	-	-	1	1	15	9	23	26	21	16	2	-	-	-	114
<1 ug/m3	-	-	-	-	-	5	2	16	13	9	16	-	-	-	-	61
TOTAL	15	4	126	832	1,975	6,962	4,170	10453	5,641	3,418	2,724	1,236	402	111	20	38,089

9.0 Unusual Winds

For exceptional events purposes, "unusual winds" can be defined as any wind that has the ability to create wind blown dust. Literature and data from monitors indicate that the phenomenon of blowing dust can occur over a broad range, but generally is associated with hourly averaged wind speeds that are above 10 miles per hour, which are commonly associated with wind gusts above 20 miles per hour.

The National Weather Service (NWS) only includes "wind gust" information in the routine observations when the observed wind gust exceeds 15 miles per hour. As such, there is no bright-line indicator as to what constitutes unusual winds from the stand-point of a specific wind velocity, but the NWS generally uses 15 miles per hour as a significance point for wind gusts.

The data analyzed in this study suggest that hourly averaged wind speeds greater than 10 miles per hour (which are commonly associated with wind gusts over 20 miles per hour) occur less than 5% of the time, and are thus, not common, and can be considered 'unusual' for exceptional events purposes.

ADEQ's analysis of tabular wind summaries, which use highlighting criteria of 15 and 25 miles per hour for the maximum winds during the hour, are consistent with the literature reviewed, the data analyzed, and the NWS criteria for significance of winds

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Agenda Item #7

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

OFFICE OF THE
REGIONAL ADMINISTRATOR

OCT 1 4 2009

The Honorable Jan Brewer
Governor of Arizona
1700 West Washington
Phoenix, AZ 85007

Dear Governor Brewer:

I am writing in follow-up to Administrator Lisa Jackson's October 8 letter notifying you that the U.S. Environmental Protection Agency (EPA) has determined that changes are necessary to air quality designations within your state.

As explained in more detail below, these changes include promulgation of an initial designation of nonattainment for the 2006 24-hour national ambient air quality standard (NAAQS) for fine particles ($PM_{2.5}$), a revised designation of nonattainment for the 1997 annual $PM_{2.5}$ NAAQS, and a revised designation of nonattainment for the 1987 24-hour PM_{10} NAAQS. These changes are necessary based upon violations of all three standards in Pinal County, reflected in the most recently available air quality monitoring data for this area for 2006–2008.

Designation for the 2006 24-hour $PM_{2.5}$ NAAQS

Your state submitted its initial list of recommendations for designations to EPA by letter from Janet Napolitano, Governor, dated December 19, 2007. Last year, EPA notified you of its agreement with those recommendations by letter from Wayne Nastri, Regional Administrator, dated August 8, 2008.

EPA had intended to finalize the designation decisions in December of 2008. Due to the change of Administration, however, EPA did not complete the process at that time. Therefore, at the request of the new Administration, EPA has reviewed the status of areas for the 2006 24-hour $PM_{2.5}$ NAAQS in order to assure that the final decisions reflect current policy and the most up-to-date air quality monitoring data. In particular, this review has allowed consideration of 2006–2008 data for all areas. The new data indicate that an additional area in Arizona, Pinal County, now appears to be violating the 2006 24-hour $PM_{2.5}$ NAAQS leading EPA to believe that further modifications to your state's initial recommendations may be necessary. EPA is therefore deferring the designation for Pinal County for the 2006 24-hour $PM_{2.5}$ NAAQS so that EPA can collect and evaluate additional information before promulgating a designation.

Consistent with the approach used to assess other potential nonattainment areas, EPA also intends to evaluate relevant technical data for the ring of counties immediately surrounding Pinal County to determine whether any of these nearby counties contribute to the violation. EPA

is therefore deferring the designations for these counties[1] for the 2006 24-hour $PM_{2.5}$ NAAQS so that EPA can collect additional information sufficient to assess these areas before promulgating designations. We recognize that these are large geographical areas, and we recognize that the counties surrounding Pinal County are currently attaining the 2006 24-hour $PM_{2.5}$ NAAQS. Looking at the counties surrounding Pinal County is only a starting point for the evaluation; it should not be assumed that the final designated nonattainment area will include these counties. Consideration of the relatively long distances across which $PM_{2.5}$ and $PM_{2.5}$ precursors can be transported should be balanced with a key purpose of designations, which is to identify those nearby contributing areas that should be included within a designated nonattainment area to ensure the development of an appropriate State Implementation Plan for the area. This is explained further in the Federal Register notice for final 24-hour $PM_{2.5}$ designations, at www.epa.gov/pmdesignations/2006standards/regs.htm#3. Factors that should be considered as the basis for nonattainment area boundaries are described in a guidance memorandum entitled "Area Designations for the Revised 24-Hour Fine Particle National Ambient Air Quality Standard" from Robert J. Meyers, dated June 8, 2007 (enclosed).

When EPA's evaluation is complete, we will notify you of our intended designation and boundary for this area. Following this notification, which we will provide at least 120 days prior to promulgating a final designation, you will have the opportunity to comment on EPA's intended designation and to provide additional information to inform the final decision.

Designation for the 1997 annual $PM_{2.5}$ NAAQS

On January 5, 2005, EPA designated Pinal County, and surrounding areas, as "unclassifiable/attainment" for the 1997 annual $PM_{2.5}$ NAAQS because this area was then meeting the standard. Unfortunately, the most recent air quality monitoring data for $PM_{2.5}$, for the period from 2006-2008, indicate that Pinal County is now violating the 1997 annual $PM_{2.5}$ NAAQS. As a result of this violation, EPA is initiating the process under Clean Air Act section 107(d)(3) to redesignate Pinal County, along with any nearby areas that may be contributing to the violations in Pinal County, as "nonattainment" for the 1997 annual $PM_{2.5}$ NAAQS.

As a first step in this process, EPA is requesting that you provide your recommendations for the redesignation of Pinal County, and any nearby areas that may be contributing to violations in Pinal County, within 120 days of the receipt of this letter. EPA recommends that you assess the geographic boundaries for this area using the guidance for nonattainment area boundaries that EPA previously provided for designations for the 1997 $PM_{2.5}$ NAAQS. EPA provided this guidance in a Memorandum entitled "Designations for the Fine Particle National Ambient Air Quality Standards," from Jeffrey R. Holmstead, dated April 1, 2003 (enclosed).

EPA also provided additional guidance on defining area boundaries for $PM_{2.5}$ designations in a memo from Lydia N. Wegman, dated February 12, 2004 (enclosed). EPA believes that Pinal County and those nearby areas that may be contributing to the violations are

[1] The additional counties for which EPA will defer designation are Cochise County, Gila County, Graham County, La Paz County, Maricopa County, Pima County, Yavapai County, and Yuma County.

an appropriate starting point for the evaluation for this NAAQS and will evaluate your recommendation and the data in accordance with the previously issued guidance.

Designation for the 1987 24-hour PM_{10} NAAQS

The most recent air quality monitoring data for PM_{10}, for the period 2006-2008, indicate that Pinal County is now violating the 24-hour PM_{10} NAAQS. As a result of this violation, EPA is initiating the process to redesignate Pinal County, and any nearby areas that may be contributing to the violations in Pinal County, as "nonattainment" for the 24-hour PM_{10} NAAQS. EPA is therefore requesting that you also provide your recommendations for the redesignation of Pinal County, and any nearby areas that may be contributing to violations in Pinal County, for this NAAQS within 120 days of the receipt of this letter.

EPA recommends that you assess the geographic boundary for the 24-hour PM_{10} NAAQS in light of the different nature of PM_{10}. The boundary for this NAAQS may or may not be comparable to those that are appropriate for the different particles addressed by the 2006 24-hour $PM_{2.5}$ NAAQS and the 1997 annual $PM_{2.5}$ NAAQS.

We look forward to continuing to work with you and your staff to develop area designations. EPA will evaluate your recommendations and will work with your staff to assure that the final designations and boundaries for each of the NAAQS are appropriate, based on the relevant facts and circumstances. After promulgation of the new designations for this area for these NAAQS, EPA will likewise work with your staff to develop appropriate State Implementation Plans to assure the public health protections intended by the standards. If you have any questions, please do not hesitate to contact me. Your air quality staff may wish to contact Deborah Jordan, Air Division Director at (415) 947-8715 or Colleen McKaughan, Associate Air Division Director at (520) 498-0118.

Sincerely,

Laura Yoshii
Acting Regional Administrator

Enclosures

cc: Benjamin H. Grumbles, Director, Arizona Department of Environmental Quality
Patrick Cunningham, Deputy Director, Arizona Department of Environmental Quality
Nancy Wrona, Director, Air Quality Division, Arizona Department of Environmental Quality
Don Gabrielson, Director, Pinal County Air Quality Control District
Lawrence Odle, Director, Maricopa County Air Quality Department
Ursula Kramer, Director, Pima County Department of Environmental Quality

Agenda Item #8

FACT SHEET
EPA TO RECONSIDER OZONE POLLUTION STANDARDS

- On September 16, 2009, the U.S. Environmental Protection Agency (EPA) announced it would reconsider the 2008 national ambient air quality standards (NAAQS) for ground-level ozone, the primary component of smog.
- The health effects associated with ozone exposure include respiratory health problems ranging from decreased lung function and aggravated asthma to increased emergency department visits, hospital admissions and premature death. The environmental effects associated with seasonal exposure to ground-level ozone include adverse effects on sensitive vegetation, forests, and ecosystems.
- EPA Administrator Lisa P. Jackson will reconsider the ozone standards to ensure that two of the nation's most important air quality standards are clearly grounded in science, protect public health with an adequate margin of safety, and are sufficient to protect the environment.
- The Agency will propose any needed revisions to the ozone standards by December 2009 and issue a final decision by August 2010.
- The ozone standards set in 2008 were not as protective as recommended by EPA's panel of science advisors, the Clean Air Scientific Advisory Committee (CASAC).
- The reconsideration will be based on the scientific and technical record used in the March 2008 review, which included more than 1,700 scientific studies.
- EPA will work with states to accelerate the implementation of any new standards. This will limit any delays associated with moving to any new standards.
- States, tribes and EPA work together to ensure clean air after a NAAQS is set. The first step is designating areas as meeting or not meeting the standards, which can be resource-intensive. To reduce the workload for states during the interim period of reconsideration, the agency will propose to stay the 2008 standards for the purpose of attainment (meeting standards) and nonattainment (not meeting standards) area designations. The stay will allow states and EPA to prepare for an accelerated ozone designation process for the reconsidered standards to be completed by August 2011. EPA will work with states, local governments and tribes to ensure that air quality is protected during that time.
- EPA will continue to require permitting of new and modified air pollution sources under the Prevention of Significant Deterioration (PSD) program for the 2008 ozone standards. In addition, EPA and states will continue to implement the 1997 ozone standards.
- The reconsideration affects both the "primary" ozone standard, designed to protect public health, and the "secondary" standard, designed to protect the environment. EPA issued the ozone standards on March 12, 2008, and set both standards at a level of 0.075 parts per million (ppm).
- In May 2008, states, environmental groups and industry groups filed petitions with the D.C. Circuit Court of Appeals for review of the 2008 ozone standards In March 2009, the court

granted EPA's request to stay the litigation so the new administration could review the standards and determine whether they should be reconsidered.

Expected Schedule

Proposed Reconsidered NAAQS .....December 2009
Final Reconsidered NAAQS.....August 2010
Final Designations .....August 2011
State Implementation Plans (SIPs) due.....December 2013